## Regional Features of the 20-30 Day Periodic Behavior in the Southern Hemisphere Summer Circulation

Zhaoyu Liu<sup>1</sup> and Lei $\mathrm{Wang}^1$ 

<sup>1</sup>Purdue University

May 2, 2023

### Abstract

The Southern Hemispheric (SH) storm tracks exhibit a robust intraseasonal periodicity of 20-30 days as the leading mode of zonal-mean eddy kinetic energy. To what extent this hemispheric-scale mode of variability translates to smaller scales remains debated. This work studies the regional features of SH storm tracks through the filtered variance of local finite-amplitude wave activity. While the synoptic variance is zonally elongated over the storm track, we find a strong enhancement of intraseasonal variability within the South Pacific with a minimum strength of the storm track. This enhanced region is marked with 20-30 day periodic behavior of local wave activity and precipitation and is driven by enhanced variability of low-level eddy heat flux on the same timescale. The local nature of 20-30 day periodicity offers a potential source of intraseasonal predictability for weather analysts and forecasters.

## Regional Features of the 20-30 Day Periodic Behavior in the Southern Hemisphere Summer Circulation

1

2

3

4

# Zhaoyu Liu<sup>1</sup>, Lei $Wang^1$

 $^1\mathrm{Department}$  of Earth, Atmospheric, and Planetary Sciences, Purdue University

# Key Points: The hemispheric 20-30 day periodicity in the austral summer has a strong localization in local wave activity and precipitation. Strong enhancement of intraseasonal variability and local periodic behavior is identified within the South Pacific. The local nature of 20-30 day periodicity offers a potential source of intraseasonal predictability for weather analysts and forecasters.

Corresponding author: Lei Wang, leiwang@purdue.edu

#### 12 Abstract

The Southern Hemispheric (SH) storm tracks exhibit a robust intraseasonal peri-13 odicity of 20-30 days as the leading mode of zonal-mean eddy kinetic energy. To what 14 extent this hemispheric-scale mode of variability translates to smaller scales remains de-15 bated. This work studies the regional features of SH storm tracks through the filtered 16 variance of local finite-amplitude wave activity. While the synoptic variance is zonally 17 elongated over the storm track, we find a strong enhancement of intraseasonal variabil-18 ity within the South Pacific with a minimum strength of the storm track. This enhanced 19 20 region is marked with 20-30 day periodic behavior of local wave activity and precipitation and is driven by enhanced variability of low-level eddy heat flux on the same timescale. 21 The local nature of 20-30 day periodicity offers a potential source of intraseasonal pre-22 dictability for weather analysts and forecasters. 23

#### <sup>24</sup> Plain Language Summary

Storm activities in Southern Hemisphere (SH) midlatitudes are characterized by 25 20-30 day periodic behavior, representing a hemispheric-scale pulsing of zonal-mean ex-26 tratropical eddy activity. This phenomenon has been termed the Baroclinic Annular Mode 27 (BAM) defined as the leading EOF mode of the zonal-mean eddy kinetic energy. If this 28 large-scale mode were to have a strong local nature, such periodic behavior in subseasonal-29 to-seasonal time scale would have important implications for understanding and predict-30 ing the medium-range weather system, especially for extreme events. However, to what 31 extent we can identify regional features of such hemispheric-scale mode of variability re-32 mains unclear. 33

We demonstrate the regional feature of this periodic variability by showing the vari-34 ance of local wave activity in different time scales. We find that the variability in a shorter 35 weather time scale (2-7 days) exhibits a largely zonally-symmetric structure, but the vari-36 ability in the intraseasonal time scale exhibits a strong localization concentrated in the 37 South Pacific. We further assess the distribution of periodicity within the intraseasonal 38 variability and find that the 20-30 day periodicity is also localized within South Pacific. 39 The local nature of this 20-30 day periodicity indicates the potential utility of the BAM 40 for weather analysts and forecasters. 41

### 42 **1** Introduction

High-quality societal applications for decision-makers for optimizing resource man-43 agement and preventing disaster require accurate sub-seasonal to seasonal (S2S, intrasea-44 sonal) predictions, because high-impact extreme weather events, such as long-lasting heat-45 waves and extreme cold spells, often occur on this timescale. Recent research has iden-46 tified multiple sources of S2S predictability, such as the Madden-Julian oscillation (MJO), 47 the basic state of the ENSO, soil moisture, tropical-extratropical teleconnections, etc (see 48 the review in (Vitart et al., 2017)). However, nearly all of these sources are outside of 49 the midlatitude internal dynamics. This is due to the conventional understanding that 50 the large-scale midlatitude variability is typically consistent with Gaussian red noise rather 51 than periodic behaviors (Feldstein, 2000; Lorenz & Hartmann, 2001). As a 'null hypoth-52 esis,' intraseasonal variability can be considered as a response to stochastic forcing by 53 higher-frequency synoptic system's disturbances (Leith, 1973; Hasselmann, 1976; Green, 54 1977). Assuming synoptic disturbances as Gaussian white noise forcing  $F_t$ , this 'null hy-55 pothesis' suggests the time series of intraseasonal variability  $x_t$  as a Gaussian red noise 56 process  $x_t = \alpha x_{t-1} + F_t$ , where  $\alpha$  is a positive constant defining the e-folding timescale 57 of the intraseasonal variability. Hence, no unique source of predictability on regional scales 58 has been identified within the midlatitude atmosphere beyond the synoptic weather range. 59

Baroclinic Annular Mode (BAM), however, a recently discovered large-scale mid-60 latitude variability over the SH, is characterized by a robust intraseasonal periodicity about 61 20-30 day (Thompson & Barnes, 2014; Thompson & Woodworth, 2014). BAM is defined 62 by the leading empirical orthogonal function (EOF) of the zonal-mean eddy kinetic en-63 ergy (EKE), representing the intraseasonal oscillation of eddy activity on a hemispheric 64 scale. If such periodic nature were to translate to smaller scales at certain regions, it could 65 serve as a new source of S2S predictability. In a regional scale study of BAM, Thompson 66 et al. (2017) find that the periodicity in the upper troposphere eddy kinetic energy is not 67 apparent at a fixed location. As the averaging windows reduce from the entire global cir-68 cle to 30-degree wide regions, the power spectra reduce from a robust quasi-periodic shape 69 to a red noise without any major enhancement of the variance on the 20-30 day frequency 70 range. The discovery of the lack of local periodicity for regions smaller than 30 degrees 71 is explained through a conceptual model featuring out-of-phase anomalies between the 72 upper and lower troposphere. A similar finding was also confirmed in Xue et al. (2021), 73 that the domain should be wide enough to accommodate a wave packet so that the in-74 traseasonal periodicity can be identified. Therefore, as the averaging domain size reduces 75 to smaller scales, periodic behavior at a fixed region is not expected, which is consistent 76 with the above 'null hypothesis.' To what extent such a leading mode of variability is 77 translated to regional scale intraseasonal variability - and thus modulating serial clus-78 tering of extreme weather events - remains an open question. 79

To address this question, we will adopt a filtered variance approach, which has been 80 well-developed to identify the geographic distributions of the storm tracks (Blackmon 81 et al., 1977). Typically, a scalar quantity combining multiple information is preferred, 82 such as the 500 hPa geopotential height field (Z500), which is related to both the wind 83 and temperature. Blackmon et al. (1977) developed this filtered variance framework us-84 ing the Northern Hemisphere (NH) Z500, with the spectral domains separated into syn-85 optic and intraseasonal bands, respectively (also see Blackmon et al. (1984)). Through 86 a similar filtered variance analysis, Trenberth (1981, 1991) studied the SH circulation 87 within synoptic time scales and found that the SH storm tracks exhibit strong zonal sym-88 metry along with a maximum located at the Southern Indian Ocean and a minimum at 89 the South Pacific. Kidson (1991) found a zonal-symmetric pattern for the intraseasonal 90 variability in the SH (see also Hartmann (2015)). Therefore, we aim to make progress 91 on deepening the understanding of the regional features of the intraseasonal variability 92 - a less explored territory. Specifically, we ask: are these regions with enhanced intrasea-93 sonal variance mainly characterized by a Gaussian red-noise spectrum as expected from 94 the 'null hypothesis,' or have certain quasi-periodic behaviors that may be connected with 95 the hemispheric-scale 20-30 day periodic mode of variability? 96

To answer this question, we start with the surface precipitation analysis, a directly 97 measured quantity as a surrogate for the local behavior of storm activities. Then we will 98 quantify the regional variability pattern by applying the filtered variance approach (Blackmon 99 et al., 1977) to key representative variables, including Z500, EKE, and a newly devel-100 oped quantity local wave activity (LWA), as well as the low-level eddy heat flux that drives 101 LWA tendency. This work focuses on Austral summer season (DJF) since the periodic 102 behavior is much more significant in austral summer than other seasons (Wang & Naka-103 mura, 2015). Comparisons to the Northern Hemisphere and with different seasons will 104 be addressed in follow-up studies. The paper is organized as follows. In Section 2, we 105 introduce data and key methodologies such as LWA and filtered variance framework. In 106 Section 3, we first discuss the regional features of surface precipitation and then demon-107 strate the synoptic and intraseasonal variability patterns of different variables associated 108 with spectral analysis. Section 4 concludes with a summary. 109

### <sup>110</sup> 2 Data and Method

We use ECMWF-Interim reanalysis products, including zonal and meridional velocities, air temperature, and geopotential height, with a horizontal resolution  $1.25^{\circ} \times$  $1.25^{\circ}$  and daily resolution from 1979 to 2018. Additionally, the daily precipitation is obtained from the Advanced Microwave Scanning Radiometer(AMSR) - E from 2003 to 2010 processed by a three-day moving average. AMSR-E measures the surface rain rate covering from 70°N-70°S.

The filtered variability approach is based on the standard deviation in the 2-7 day band for synoptic analysis and the 10-45 day band for intraseasonal analysis. The temporal filter is based on Fast Fourier Transform (FFT) with Hanning window from 1 December to 28 February between 1979 and 2018. The framework is applied to Z500, EKE, LWA, and 850hPa eddy heat flux, respectively. EKE is defined as  $((u^*)^2+(v^*)^2)/2$  and is averaged with density weighting along the vertical column. 850hPa eddy heat flux is defined as  $v^*T^*$ , where the asterisks represent the departures from the zonal mean.

Unlike EKE, local finite-amplitude wave activity emphasizes on coherent meandering of the contours of a quasi-conserved quantity. Conserving flow circulation through Kelvin's circulation theorem, the area bounded by the reference quantity contour is the same as the one bounded by the latitude circle. Finite-amplitude wave activity (FAWA, see N. Nakamura and Zhu (2010)) focuses on the total displacement over the entire longitudes, while LWA (see Huang and Nakamura (2016), Chen et al. (2015)) measures the displacement for each longitude, so that a full longitude-latitude pattern of wave activity can be quantified. For example, the field of Z500 can be used to define the local wave activity (Chen et al., 2015):

$$A_{z500}(\phi_e,\lambda,t) = \frac{a}{\cos\phi_e} \left( \int_{z' \ge 0, \phi \le \phi_e, \lambda = const} z' \cos\phi d\phi - \int_{z' \le 0, \phi \ge \phi_e, \lambda = const} z' \cos\phi d\phi \right), \quad (1)$$

where a is the earth radius,  $\phi$ ,  $\lambda$ , represents the latitude and longitude respectively,  $z' = z - Z(\phi_e)$  is the deviation from the reference Z500 contour  $Z(\phi_e)$  at its equivalent latitude  $\phi_e$ . The relation between  $Z(\phi_e)$  and  $\phi_e$  is connected by the same bounded area  $\phi_e(Z) = arcsin[1 - \frac{S(Z)}{2\pi a^2}]$ .

A quasi-geostrophic potential vorticity (QGPV) -based LWA allows one to quantify the role of eddy forcing. Local wave activity at each pseudo-height level can be assessed independently, and the density-weighted vertically averaged value is used to represent the barotropic wave activity. See supplementary material for more details.

### 132 3 Results

We start with analyzing the temporal and spatial features of precipitation, since surface rain rate is a directly measured quantity by space-based meteorological satellites, and is highly correlated with the variability of storm activity. Thompson and Barnes (2014) found that the mid-latitude mean precipitation can also exhibit a significant intraseasonal periodicity around 20-30 days as a key feature of BAM. Is there any localization of such periodic behavior in the precipitation?

To illustrate the regional feature, we calculated the power spectra of surface rain 139 rate retrieved from AMSR-E in four separated regions as shown in Figure 1c:  $0^{\circ}-90^{\circ}E$ , 140  $90^{\circ}$ E-180°,  $180^{\circ}$ -90°W,  $90^{\circ}$ W-0°, all of which are averaged between  $40^{\circ}$ S-50°S, and we 141 find that the most significant 20-30 day periodicity is located at the South Pacific ( $180^{\circ}$ -142 90°W with 95% confidence level), while spectra features in other three regions are mainly 143 characterized by enhanced synoptic variability  $(0^{\circ}-180^{\circ}E)$  or similar to a red-noise  $(90^{\circ}W)$ 144  $0^{\circ}$ ). Thus, there is a localization of the surface rain rate's 20-30 day periodic behavior. 145 Is this localization of rain rate periodicity a coincidence? Or it implies a strong local-146



Figure 1: Power spectra of surface precipitation in austral summer(DJF) from 2002-2010 for (a)zonal-mean, (b)zonal-mean and averaged between 40°S-50°S, (c)regional mean of 0°-90°E, 90°E-180°, 180°-90°W, 90°W-0°, all of which averaged between 40°S-50°S.

ization of the 20-30 day periodic behavior for the underlying large-scale atmospheric cir-culation?

We adopt the filtered variance approach of Blackmon et al. (1977) to quantify the 149 regional features of synoptic and intraseasonal variability, respectively. The variability 150 of Z500 exhibits a more zonally symmetric regional pattern within both synoptic and 151 intraseasonal timescales as consistent with the previous work (see Supplementary Fig-152 ure S1). Centered around 50°S, the synoptic variance is strongest in the South Indian 153 Ocean, while the maximum of intraseasonal variance is zonally elongated over much of 154 the South Pacific. The zonal-mean Z500 field does not show any periodic behavior in the 155 intraseasonal timescales (see Supplementary Figure S2), thus we would not expect any 156 local periodic behavior in the Z500 field. 157

As the variable central to the BAM definition, zonal-mean EKE is characterized 158 by a robust periodic behavior (Thompson & Woodworth, 2014). However, as Thompson 159 et al. (2017) discovered, the periodicity in EKE is not apparent at a fixed location, and 160 we find consistent results that the regional variability is much weaker in the intrasea-161 sonal band at pixel(i.e., grid point) level (see Supplementary Figure S3). Instead, a two-162 branch structure is observed in the intraseasonal variance pattern of EKE, and can be 163 attributed to the intense wave-breaking processes at the South Pacific that generate in-164 tense local values of zonal and meridional velocities, since qualitatively speaking, EKE 165 reaches maximum where the circulation contours are the densest. The two-branch struc-166 ture belongs to the same storm activity region - as the below LWA analysis would illus-167 trate more clearly. 168

Therefore, an accurate diagnostic approach for eddy activity that can illustrate both spatial and temporal features is required to study our key question. As a comparison with Z500 or EKE, the local finite-amplitude wave activity (LWA) provides a more objective



Figure 2: Bandpass-filtered variance converted to standard deviation for Z500\_based LWA (LWA\_Z) in austral summer(DJF): (a)synoptic variability(2-7 days), and (b)intraseasonal variability(10-45 days). The shading represents values between  $0m^2$  and  $1.9 \times 10^7 m^2$ .

approach for the diagnostic of eddy activity. QGPV-based LWA is a conserved quantity 172 and driven by eddy flux terms - each bearing clear physical interpretations, directly rep-173 resenting the pseudo-momentum carried by eddy. Z500-based LWA shares many features 174 of the QGPV-based LWA, and it is more straightforward to calculate. Regarding the spa-175 tial feature, LWA can capture the breaking waves as part of an underlying coherent pat-176 tern (see the comparison between LWA and EKE in Huang and Nakamura (2017)). For 177 example, for a large-scale dipole structure, the maximum value of LWA locates only at 178 the center of the overturning contours of PV (or Z500). In contrast, the maximum val-179 ues of EKE are found at two distinct places - the edge of the upper high-pressure sys-180 tem and the edge of the lower low-pressure system. Regarding the temporal feature, Wang 181 and Nakamura (2015) confirmed that FAWA also exhibits a robust 20-30 day periodic-182 ity, consistent with features of BAM defined by the EOF-based EKE framework. Since 183 zonal-average of LWA naturally conforms to FAWA, LWA has the strength to pinpoint 184 regional features more precisely, and to allow for a direct connection with the hemispheric-185 scale 20-30 day periodic behavior as defined by FAWA. Both the QGPV and Z500 fields 186 can be used to calculate the LWA, with the former directly connected with the eddy fluxes 187 terms and the latter more commonly available among climate model outputs. Our anal-188 ysis confirms that both approaches yield qualitatively consistent results. 189

Figure 2 shows the synoptic and intraseasonal variability pattern of Z500-based LWA 190 in austral summer. The synoptic variability still exhibits a zonally symmetric pattern, 191 with the maximum variance concentrated in the Southeast (SE) Indian Ocean as well 192 as in the SE Atlantic, and the minimum variance in the SE Pacific close to South Amer-193 ica (also see Supplementary Figure S4 for QGPV-based LWA). This result is qualitatively 194 consistent with the pattern shown by the filtered variance of the Z500 field, but further 195 captures a more detailed and coherent structure clearly emphasizing the maximum re-196 gion. Such intensified synoptic variability at the SE Indian Ocean and Atlantic can be 197 largely attributed to the downstream development of baroclinic waves (Berbery & Vera, 198 1996), and therefore the largest synoptic variance is expected to occur closely downstream 199 to the regions of maximum observed baroclinicity, which is located at the Southwest (SW) 200 Indian Ocean and SW Atlantic (the sea surface temperature frontal zones, see H. Naka-201



Figure 3: Power spectra of QGPV-based LWA as functions of longitude and frequency at two representative latitudes 45°S (upper panel) and 55°S (lower panel), respectively.

mura and Shimpo (2004)). The weakened synoptic signal at the South Pacific is associated with the decaying process of extratropical cyclones' lifecycles.

With an ability to capture larger-scale meandering, the filtered variance of Z500-204 based LWA captures the corresponding intraseasonal variability more efficiently than that 205 of the Z500 and EKE field. As shown in Figure 2b, the intraseasonal variance of LWA 206 is near twice its synoptic counterpart. Besides, the intraseasonal pattern is not as zonally-207 elongated as the synoptic variance or the pattern captured by Z500. In contrast, a strong 208 local enhancement is found confined at the South Pacific, largely within 180°-150°W and 209  $50^{\circ}$ S- $60^{\circ}$ S. This region is right at the center between the two branches shown in the in-210 traseasonal pattern of EKE (Supplementary Figure S3b), which demonstrates the ad-211 vantage of LWA in capturing coherent patterns for large-scale eddies. Similarly, the fil-212 tered variance of QGPV-based LWA shows consistent results: a robust intensification 213 of intraseasonal variability at the South Pacific is observed located within 180°-150°W 214 (see Supplementary Figure S4b). Despite the minor difference that the QGPV-based LWA 215 shows a more equatorward intraseasonal pattern, both types of the filtered variance of 216 LWA show a consistent key region of intraseasonal variability of storm activities confined 217 within the South Pacific. 218

With a region of enhanced intraseasonal variance pinned down, we next investigate whether the enhanced frequencies is related to the 20-30 day periodic mode. To zoom into the crucial latitudes where such periodicity is concentrated. Figure 3 shows the power spectra of QGPV-based LWA as the function of longitudes and frequencies at 45°S and 55°S, since Wang and Nakamura (2015) found that the 20-30 day periodic variability mainly dominates the midlatitudes from 40°S-60°S (also see Supplementary Figure S5). Within the intraseasonal domain, the 20-30 day periodicity (0.03-0.05 cpd, bounded by two blue



Figure 4: Bandpass-filtered variance converted to standard deviation for 850hPa eddy heat flux in austral summer(DJF): (a)synoptic variability(2-7 days), and (b)intraseasonal variability(10-45 days). The shading represents values between 0mK/s and 10mK/s.

lines in Figure 3) exhibits a strong localization as hinted by the filtered variance approach. 226 At  $45^{\circ}$ S for example, the strongest 20-30 day frequency band is largely confined between 227  $180^{\circ}$ - $150^{\circ}W$ , overlapping the region where the intrasesonal variance reaches its maximum 228 (shown in Figure 2b). This regional feature of periodicity might slightly vary with dif-229 ferent latitudes, for example the most significant 20-30 day periodicity at  $55^{\circ}$ S exhibits 230 an elongated range covering  $180^{\circ}$ - $100^{\circ}$ W. By and large, all cross sections within mid-231 latitudes demonstrate that the 20-30 day periodicity has a strong regional preference lo-232 cated at the South Pacific. A similar result can be observed if the LWA is meridionally 233 averaged between 40°S-60°S (see Supplementary Figure S6), the 20-30 day periodicity 234 is still strongly localized at the South Pacific, resembling the pattern at individual lat-235 itudes. Note that, in this case, the budget term of meridional eddy momentum flux is 236 removed due to the meridional average, and therefore it can suggests that, the merid-237 ional eddy momentum flux plays a non-dominant role in the intraseasonal variability. The 238 zonal wave flux convergence, as another important budget term of LWA, will not directly 239 impact LWA's intraseasonal variability neither, as the zonal wave flux convergence pri-240 marily populate the synoptic variability of wave activity (Huang & Nakamura, 2017). 241 The cross-section of power spectra for Z500-based LWA shows similar results to the QGPV-242 based LWA, whereas that for EKE does not show robust 20-30 day periodicity (see Sup-243 plementary Figure S7 and S8). 244

What would be a key factor that drives such locally confined intraseasonal vari-245 ability including the 20-30 day periodicity? Wang and Nakamura (2015, 2016) find that 246 eddy forcing due to the low-level eddy heat flux drives the 20-30 day periodicity in zonal-247 mean of LWA (i.e., FAWA). A local enhanced variance of eddy heat flux should be ex-248 pected if this can also translate into regional scales. Figure 4 confirmed this expectation 249 by showing that the intraseasonal variance of 850hPa eddy heat flux is also localized be-250 tween  $180^{\circ}$ - $150^{\circ}W$ , largely overlapping the region where the intraseasonal variance of 251 LWA is strongly enhanced, as shown in Figures 2 and 3. The cross-section power spec-252 tra of 850 hPa eddy heat flux further indicates that the low-level eddy heat flux also ex-253 hibits enhanced 20-30 day periodicity at fixed locations, largely confined within the South 254 Pacific as well (see Supplementary Figure S9). This locally enhanced intraseasonal vari-255 ability of 850hPa eddy heat flux is marked with a strong r.m.s. eddy streamfunction as 256 a surrogate of eddy diffusivity for estimating the horizontal eddy heat flux (Kushner & 257

Held, 1998; Held, 1999). Strong thermal damping over this area reduces linear baroclinic
eddy growth rates (Swanson & Pierrehumbert, 1997). Thus, this sufficient temperature
homogenization in the lower troposphere sustains states neutral to the growth of synoptic eddies but favorable to intraseasonal variability and the associated periodic behavior.

### <sup>263</sup> 4 Conclusion and Discussion

We study the regional features of storm tracks' 20-30 day periodic variability in aus-264 tral summer by applying the filtered variance approach to local wave activity. While the 265 synoptic variance is largely zonally elongated over the storm track, we find a strong lo-266 cal enhancement of intraseasonal variability within the South Pacific with a minimum strength of the storm track. For this region, we find that this enhanced region is marked 268 with local 20-30 day periodic behavior of precipitation and local wave activity whereby 269 rejecting the 'null hypothesis' that intraseasonal variability is nothing more than a red-270 noise response to stochastic forcing by synoptic transients. The local periodicity is driven 271 by enhanced variability of low-level eddy heat flux on the same timescale. The filtered 272 variance of LWA analysis offers insights into the regional features of the coherent and 273 slowly meandering structures of the circulation. 274

Internal modes of variability, such as BAM, result from the deterministic dynam-275 ics of the atmosphere. Thus a translation into regional scales may indicate unique pre-276 dictability beyond the typical weather range. While the fundamental dynamics of BAM 277 remain an open question, it is clear that cross-scale interactions between the synoptic 278 and intraseasonal scales set the regional structure of this internal mode. The local na-279 ture of the 20-30 day periodicity identified by local wave activity provides a potential 280 source of intraseasonal predictability for weather analysts and forecasters. As an inter-281 nal mode that has yet to be tapped for extending the forecast beyond the typical weather 282 range, more work is needed to connect this intraseasonal mode of variability with serial 283 clustering of extreme weather events to quantify this potential regional predictability. 284 In a warming climate, BAM is projected to increase its strength (Wang et al., 2018). A 285 further implication of this work is the question of how the intraseasonal mode of vari-286 ability and the associated regional impacts will evolve as climate changes. With the rapid 287 development of high-resolution Earth system modeling, we are at a crucial era to deepen 288 our understanding of the synoptic-intraseasonal interactions and the associated Earth 289 system's regional variability and predictability. 290

### <sup>291</sup> 5 Data Availability Statement

The authors acknowledge the use of NASA AMSR-E product for precipitation dataset: https://www.earthdata.nasa.gov/sensors/amsr-e, and ERA-Interim reanalysis dataset: https://apps.ecmwf.int/datasets/data/interim-full-daily/. The open repository including codes and related data for plotting key figures in this work is pasted here: https://doi.org/10.5281/zenodo.7855573

### 297 Acknowledgments

<sup>298</sup> The authors acknowledge to NASA for providing AMSR-E precipitation observation and

299 ECMWF for providing ERA-Interim reanalysis dataset.

### 300 References

Berbery, E. H., & Vera, C. S. (1996, February). Characteristics of the South ern Hemisphere Winter Storm Track with Filtered and Unfiltered Data.
 Journal of the Atmospheric Sciences, 53(3), 468–481. Retrieved 2023-04-

<ul> <li>1520-0469.1996.053.0468.cotshv.2.0.co.2.xnl (Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1996)053(0468:COTSHW)2.0.CO;2</li> <li>Blackmon, M. L., Lee, YH., &amp; Wallace, J. M. (1984, March). Horizontal Structure of 500 mb Height Fluctuations with Long. Intermediate and Short Time Scales. Journal of the Atmospheric Sciences, 41(6), 961-980. Retrieved 2023-04-16, from https://journals.ametsoc.org/view/journals/atsc/41/ 6/1520-0469 1984.041.0961.Hsouhf.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469 1984.041.0961.HSOMIFP.20.CO;2</li> <li>Blackmon, M. L., Wallace, J. M., Lau, NC., &amp; Mullen, S. L. (1977, July). An Observational Study of the Northern Hemisphere Wintertime Circulation. Journal of the Atmospheric Sciences, 34(7), 1010–1053. Retrieved 2023-03-31, from https://journals.metsoc.org/view/journals/atsc/34/ 7/1520-0469(1977)034.004.oasotn.2.o.co.2.xnl (Publisher: American Meteorological Society Section: Journal of the Atmospherie Sciences) doi: 10.1175/1520-0469(1977)034.004.03005TN)2.0.CO;2</li> <li>Chen, G., Lu, J., Burrows, D. A., &amp; Leung, L. R. (2015). Local finite-amplitude wave activity as an objective diagnostic of midfattude extreme weather. Geophysical Research Letters, 42(24), 10,952-10,960. Retrieved 2023-03-24, from https://onlinelibrary.wiley.com/doi/abs/10.1002/2015GL066959 (.eprint: https://onlinelibrary.wiley.com/doi/abs/10.1002/2015GL066959 (.eprint: https://onlinelibrary.wiley.com/doi/abs/10.1002/2015GL066959 (.eprint: https://journals/climy13/2/1520-0442.2000.013.4430.ttpasc.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of Climate) doi: 10.1027/015GL006059.</li> <li>Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate Noise Properties of Teleconcological Society Section: Journal of Climate). Joi: 10.1015/15/150-0462(203-03-31, from https://journals.ametsoc.org/viev/jo</li></ul>	304	16, from https://journals.ametsoc.org/view/journals/atsc/53/3/
<ul> <li>Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1996)053(0468:COTSHW)2.0.CO;2</li> <li>Blackmon, M. L., Lee, YH., &amp; Wallace, J. M. (1984, March). Horizontal Structure of 500 mb Height Fluctuations with Long, Intermediate and Short Time Scales. Journal of the Atmospheric Sciences, 14(6), 961–980. Retrieved 2023-0416, from https://journals.ametsoc.org/view/journals/atsc/41/6/1520-0469(1984)041(0961.HSOMHF)2.0.CO;2</li> <li>Blackmon, M. L., Wallace, J. M., Lau, NC., &amp; Mullen, S. L. (1977, July). An Observational Study of the Northern Hemisphere Wintertime Circulation. Journal of the Atmospheric Sciences, 34(7), 1040–1053. Retrieved 2023-033,1, from https://journals.ametsoc.org/view/journals/atsc/34/7/1520-0469(1977)034.1040.aosotn.2.0.co.2.xnl (Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1977)034(1040.AOSOTN)2.0.CO;2</li> <li>Chen, G., Lu, J., Burrows, D. A., &amp; Leung, L. R. (2015). Local finite-amplitude wave activity as an objection: Journal of the Atmospherie Sciences) doi: 10.1175/1520-0469(1977)034(1040.AOSOTN)2.0.CO;2</li> <li>Chen, G., Lu, J., Burrows, D. A., &amp; Leung, L. R. (2015). Local finite-amplitude wave activity as an objective diagnostic of midlatitude extreme weather. Geophysical Research Letters, 42(24), 10,952-10,960. Retrieved 2023-03-24, from https://onlinelibrary.wiley.com/doi/pdf/10.1002/2015GL066959</li> <li>Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate Noise Properties of Teleconnection Patterns. Journal of Climate, 13(24), 4430-4440. Retrieved 2023-03-24, 2000.013.4430.ttpsac.2, o. co. 2.ml</li> <li>Fudstein, S. B. (2000) Retrieved 2023-04:19, from https://journals.ametsoc.org/</li> <li>view/journals.climative/aluly19476: Some Dynamical Considerations of the Drought. Weather, 32(4), 120-126. Retrieved 2023-04:19, from https://journals.ametsoc.org/</li> <li>view/journals.climaty.viley.com/doi/pdf/10.1002</li></ul>	305	1520-0469_1996_053_0468_cotshw_2_0_co_2.xml (Publisher: American
<ul> <li>10.1175/1520-0469(1996)053(0468:COTSHW)2.0.CC;2</li> <li>Blackmon, M. L., Lee, Y. H., &amp; Walkace, J. M. (1984, March). Horizontal Structure of 500 mb Height Fluctuations with Long, Intermediate and Short Time Scales. Journal of the Atmospheric Sciences, 41(6), 961-980. Retrieved 2023-04-16, from https://journals.ametsoc.org/view/journals/atsc/41/</li> <li>6/1520-0469(1984.041.0961.hsonhf.2.0.co.2.xnl (Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1984)041(0961:HSOMHF)2.0.CO;2</li> <li>Blackmon, M. L., Wallace, J. M., Lau, NC., &amp; Mullen, S. L. (1977, July). An Observational Study of the Northern Hemisphere Wintertime Circulation. Journal of the Atmospheric Sciences, 34(7), 1040-1053. Retrieved 2023-03-31, from https://journals.ametsoc.org/view/journals/atsc/34/</li> <li>7/1520-0469(1977)04(040.acostn.2.oc.oc.x.nl (Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1977)034(1040-AOSOTN)2.0.CO;2</li> <li>Chen, G., Lu, J., Burrows, D. A., &amp; Leung, L. R. (2015). Local finite-amplitude wave activity as an objective diagnostic of midlatitude extreme weather. Geophysical Research Letters. Journal of Zinate (2023-03-24, from https://onlinelibrary.wiley.com/doi/pdf/10.1002/2015GL066959 (.eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/2015GL066959 (.eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/2015GL066959 (.eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/2015GL066959 (.eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/2015GL066959 (.eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/314430.ttpsac.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of Climate 13(24), 4430-4440. Retrieved 2023-04-32, 40: 10.1002/j.1477-8696.1977. tb04532.x Joi: 10.1002/j.1477-8696.1977.tb04532.x Joi: 10.1077/1520-0442(2000)13(4430:TTPSAC)2.0.CO;2</li> <li>Green, J. S. A. (1977). The Wather During July 1976: Some Dynam</li></ul>	306	Meteorological Society Section: Journal of the Atmospheric Sciences) doi:
<ul> <li>Blackmon, M. L., Lee, YH., &amp; Wallace, J. M. (1984, March). Horizontal Structure of 500 mb Height Fluctuations with Long, Intermediate and Short Time Scales. Journal of the Atmospheric Sciences, 41(6), 961–980. Retrieved 2023-04-16, from https://journals.ametsoc.org/view/journals/atsc/41/</li> <li>6/1520-0469-1984.041.0961.hsonhf.2.0.co.2. xml (Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469.1984.041.0961.HSOMHEP2.0.CO;2</li> <li>Blackmon, M. L., Wallace, J. M., Lau, NC., &amp; Mullen, S. L. (1977, July). An Observational Study of the Northern Hemisphere Winterline Circulation. Journal of the Atmospheric Sciences, 34(7), 1040-1053. Retrieved 2023-09-31, from https://journals.ametsoc.org/view/journals/atsc/34/</li> <li>7/1520-0469.1977.034.1040.asostn.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1977)034(1040:AOSOTN)2.0.CO;2</li> <li>Chen, G., Lu, J., Burrows, D. A., &amp; Leung, L. R. (2015). Local finite-amplitude wave activity as an objective diagnostic of midlattinde extreme weather. Geophysical Research Letters, 42(24), 10.952–10.960. Retrieved 2023-03-24, from https://onlinelibrary.wiley.com/doi/pdf/10.1002/2015GL066959 doi: 10.1002/2015GL066959</li> <li>Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate Noise Properties of Teleconnection Patterns. Journal of Climate, 13(24), 4430-4440. Retrieved 2023-03-31, from https://journals.ametsoc.org/ view/journals/clim/13/24/1520-0469.1977.b043/24/22000.013.4430.ttpsac.2.0.co.2.xml</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Considerations of the Drought. Weather, 32(4), 120-126. Retrieved 2023-04-19, from https://journals/ats/in/doi/ads/in/10.1002/j.1477-8696.1977</li> <li>tb04532.x (cprint: https://olinelibrary.wiley.com/doi/pdf/10.1002/j.1477-8696.1977</li> <li>tb04532.x (cprint: https://olinelibrary.iley.com/doi/ads/in/</li></ul>	307	10.1175/1520-0469(1996)053(0468:COTSHW)2.0.CO;2
<ul> <li>ture of 500 mb Height Fluctuations with Long, Intermediate and Short Time Scales. Journal of the Atmospheric Sciences, 41 (6), 961–980. Retrieved 2023-04-16, from https://journals.ametsoc.org/view/journals/atsc/41/</li> <li>6/1520-0469_1984_041_0961_hsonhf_2_0_co_2_xml</li> <li>Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1984)041(0961:HSOMHF)2_0.CO;2</li> <li>Blackmon, M. L., Wallace, J. M., Lau, NC., &amp; Mullen, S. L. (1977, July). An Observational Study of the Northern Hemisphere Wintertime Circulation. Journal of the Atmospheric Sciences, 34 (7), 1040–1053. Retrieved 2023- 03-31, from https://journals.ametscc.org/view/journals/atsc/34/</li> <li>7/1520-0469_1977_034_1040_aosotn_2_o.co_2_xml</li> <li>(Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1977)034(1040:AOSOTN)2.0.CO;2</li> <li>Chen, G., Lu, J., Burrows, D. A., &amp; Leung, L. R. (2015). Local finite-amplitude wave activity as an objective diagnostic of midlatitude extreme weather. Geophysical Research Letters, 42(24), 10.952-10.960. Retrieved 2023-03-24, from https://onlinelibrary.wiley.com/doi/pdf/10.1002/2015GL066959</li> <li>Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate Noise Properties of Teleconnection Patterns. Journal of Climate, J3(24), 430-4440. Retrieved 2023-03.1, from https://journals.ametsoc.org/ view/journals/clim/13/24/1520-0442.2000.013.4430.ttpsac_2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of Climate) doi: 10.1175/1520-0442(2000)018(4430:TTPSAC)2.0.CO;2</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Consider- ations of the Drought. Weather, 32(4), 120-126. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8666.1977</li> <li>tb04532.x (.eprint: https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8666.1977</li> <li>tb04532.x (.eprin</li></ul>	308	Blackmon, M. L., Lee, YH., & Wallace, J. M. (1984, March). Horizontal Struc-
<ul> <li>Scales. Journal of the Atmospheric Sciences, 41(6), 961-980. Retrieved 2023-04-16, from https://journals.ametsoc.org/view/journals/ats/ats/41/</li> <li>6/1520-0469.1984.041.0961.hsonhf.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1984)041(0961:HSOMHF)2.0.CO;2</li> <li>Blackmon, M. L., Wallace, J. M., Lau, NC., &amp; Mullen, S. L. (1977, July). An Observational Study of the Northern Hemisphere Wintertime Circulation. <i>Journal of the Atmospheric Sciences</i>, 3(7), 1040-1053. Retrieved 2023- 03-31, from https://journals.ametsoc.org/view/journals/atsc/34/</li> <li>7/1520-0469(1977)034(1040.aosotn.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1977)034(1040:AOSOTN)2.0.CO;2</li> <li>Chen, G., Lu, J., Burrows, D. A., &amp; Leung, L. R. (2015). Local finite-amplitude wave activity as an objective diagnostic of midlatitude extreme weather. <i>Geophysical Research Letters</i>, 42(24), 10.952–10.960. Retrieved 2023-03-24, from https://onlinelibrary.wiley.com/doi/pdf/10.1002/2015GL066959</li> <li>Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate Noise Properties of Teleconnection Patterns. <i>Journal of Climate</i>, 13(24), 430-4440. Retrieved 2023-03.1, from https://journals.ametsoc.org/ view/journals/clim/13/24/1520-0442.2000.013.4430.ttpsac.2.0.co.2.xml</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Consider- ations of the Drought. <i>Weather</i>, 32(4), 120-126. Retrieved 2023-04-19, from https://olinelibrary.viley.com/doi/abs/10.1002/j.1477- 8696.1977.tb04532.x (cprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477- 8696.1977.tb04532.x) doi: 10.1002/j.1477-8096.1977.tb04532.x</li> <li>Hartmann, D. L. (2015). Global Physical Climatology: Second Edition (2nd ed ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-19, from https://public.ebookcentral_proquest.com/choice/pu</li></ul>	309	ture of 500 mb Height Fluctuations with Long, Intermediate and Short Time
<ul> <li>2023-04-16, from https://journals.ametsoc.org/view/journals/ats/24/1</li> <li>6/1520-0469-1984.041.0961.hsomh7.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1984)041(0961:HSOMHF)2.0.CO;2</li> <li>Blackmon, M. L., Wallace, J. M., Lau, NC., &amp; Mullen, S. L. (1977, July). An Observational Study of the Northern Hemisphere Wintertime Circulation. Journal of the Atmospheric Sciences, 34(7), 1040-1053. Retrieved 2023-03-31, from https://journals.ametsoc.org/view/journals/ats/34/</li> <li>7/1520-0469.1977.034.1040.aosotn.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1977)034(1040:AOSOTN)2.0.CO;2</li> <li>Chen, G., Lu, J., Burrows, D. A., &amp; Leung, L. R. (2015). Local finite-amplitude wave activity as an objective diagnostic of midlatitude extreme weather. Geophysical Research Letters, 42(24), 10.952-10.960. Retrieved 2023-03-24, from https://ollinelibrary.wiley.com/doi/pdf/10.1002/2015GL066959</li> <li>Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate Noise Properties of Teleconnection Patterns. Journal of Climate, 13(24), 4430-4440. Retrieved 2023-03-31, from https://journals.ametsoc.org/view/journals/at/24/1520-0442.200.013.4430.ttpsac.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of Climate) doi: 10.1175/1520-0442(2000)013(4430:TTPSAC)2.0.CO;2</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Considerations of the Drought. Weather, 32(4), 120-126. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8666.1977.tb04532.x (c.print: https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977.tb04532.x (c.print: https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977.tb04532.x (c.print: https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977.tb04532.x (c.print: https://onlinelibrary.wiley.com/doi/</li></ul>	310	Scales. Journal of the Atmospheric Sciences, $41(6)$ , 961–980. Retrieved
<ul> <li>6/1520-0469.1984.041.0961.hsomhf.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1984)041(0961:HSOMHF)2.0.CO;2</li> <li>Blackmon, M. L., Wallace, J. M., Lau, NC., &amp; Mullen, S. L. (1977, July). An Observational Study of the Northern Hemisphere Wintertime Circulation. Journal of the Atmospheric Sciences, 34(7), 1040-1053. Retrieved 2023-03-31, from https://journals.metsoc.org/view/journals/atsc/34/ 7/1520-0469(1977)034(1040.aostn.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1977)034(1040:AOStOTN)2.0.CO;2</li> <li>Chen, G., Lu, J., Burrows, D. A., &amp; Leung, L. R. (2015). Local finite-amplitude wave activity as an objective diagnostic of midlatitude extreme weather. Geophysical Research Letters, 42(24), 10.952-10.960. Retrieved 2003-03-24, from https://onlinelibrary.wiley.com/doi/pdf/10.1002/2015GL066959</li> <li>Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate Noise Properties of Teleconnection Patterns. Journal of Climate, 13(24), 4430-4440. Retrieved 2023-003-31, from https://journals.ametosc.org/ view/journals/clim/13/24/1520-0442, 2000.013, 4430.ttpsac.2.0.co.2.xml</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Considerations of the Drought. Weather, 32(4), 120-126. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977. tb04532.x) doi: 10.1002/j.1477-8696.1977.tb04532.x) doi: 10.1002/j.1477-8696.1977.tb04532.x</li> <li>Hartmann, D. L. (2015). Global Physical Cimatology: Second Edition (2nd ed ed.). Kent: Elsevice Science &amp; Technology. Retrieved 2023-04-19, from https://public.ebookcentral.proquest.com/doi/abs/10.1002/j.1477-8696.1977.tb04532.x</li> <li>Haselmann, K. (1976). Stochastic climate models Part I. Theory. Telhas, 28(6), 473-485. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-34</li></ul>	311	2023-04-16, from https://journals.ametsoc.org/view/journals/atsc/41/
<ul> <li>Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1984)041(0961:HSOMIF)2.0.CO;2</li> <li>Blackmon, M. L., Wallace, J. M., Lau, NC., &amp; Mullen, S. L. (1977, July). An Observational Study of the Northern Hemisphere Wintertime Circulation. <i>Journal of the Atmospheric Sciences</i>, 34(7), 1040–1053. Retrieved 2023- 03-31, from https://journals.ametsoc.org/view/journals/atsc/34/ 7/1520-0469.1977.034.1040.acsotn.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1977)034(1040-AOSOTN)2.0.CO;2</li> <li>Chen, G., Lu, J., Burrows, D. A., &amp; Leung, L. R. (2015). Local finite-amplitude wave activity as an objective diagnostic of midlatitude extreme weather. <i>Geophysical Research Letters</i>, 42(24), 10,952–10,960. Retrieved 2023-03-24, from https://onlinelibrary.wiley.com/doi/abs/10.1002/2015GL066959</li> <li>Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate Noise Properties of Teleconnetion Patterns. <i>Journal of Climate</i>, 13(24), 4430–4440. Retrieved 2023-03-31, from https://journals.ametsoc.org/ view/journals/clim/13/24/1520-0442/2000.013.4430.ttpsac.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of Climate) doi: 10.1175/1520-0442(2000)013(4430:TTPSAC)2.0.CO;2</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Consider- ations of the Drought. <i>Weather</i>, 32(4), 120–126. Retrieved 2023-04-19, from https://joulinelibrary.wiley.com/doi/pdf/10.1002/j.1477- 8096.1977.tb04532.x (acjint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477- 8096.1977.tb04532.x (acjint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477- 8096.1977.tb04532.x (acjint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477- 8096.1977.tb04532.x (acjint: https://alimate/j.sci/adulos/j.scom/doi/j.df/10.1111/j.2153-3490.1976.tb00696.x (epinit: https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477- 8096.6977.tb04532.x</li> <li< td=""><td>312</td><td>6/1520-0469_1984_041_0961_hsomhf_2_0_co_2.xml (Publisher: American</td></li<></ul>	312	6/1520-0469_1984_041_0961_hsomhf_2_0_co_2.xml (Publisher: American
<ul> <li>10.1175/1520-0469(1984)041(0961:HSOMHF)2.0.CO;2</li> <li>Blackmon, M. L., Wallace, J. M., Lau, NC., &amp; Mullen, S. L. (1977, July). An Observational Study of the Northern Hemisphere Wintertime Circulation. Journal of the Atmospheric Sciences, 34(7), 1040-1053. Retrieved 2023-03-31, from https://journals.ametsoc.org/view/journals/atsc/34/</li> <li>7/1520-0469(1977)034(1040.aostn 2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1977)034(1040:AOSOTN)2.0.CO;2</li> <li>Chen, G., Lu, J., Burrows, D. A., &amp; Leung, L. R. (2015). Local finite-amplitude wave activity as an objective diagnostic of midlatitude extreme weather. Geophysical Research Letters, 42(24), 10.952-10.960. Retrieved 2023-03-24, from https://onlinelibrary.wiley.com/doi/abs/10.1002/2015GL066959</li> <li>(.eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/2015GL066959) doi: 10.1002/2015GL066959</li> <li>Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate Noise Properties of Teleconnection Patterns. Journal of Climate, 13(24), 4430-4440. Retrieved 2023-03-31, from https://journals.ametsoc.org/</li> <li>view/journals/clim/13/24/1520-0442.2000.013.4430.ttpsac2.0.co.2.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of Climate) doi: 10.1175/1520-0442(2000)013(4430:TTPSAC).2.0.CO;2</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Considerations of the Drought. Weather, 32(4), 120-126. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477-8696.1977tb04532.x (.eprint: https://onlinelibrary.elley.com/doi/pdf/10.1002/j.1477-8696.1977tb04532.x (.eprint: https://onlinelibrary.01.002/j.1477-8696.1977.</li> <li>Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-19, from https://public.ebookcentral.proquest.com/choice/publicfullrecord .aspx?p=5754480 (OCLC: 1099348114)</li> <li>Hasselmann, K. (1976). Stochastic climate</li></ul>	313	Meteorological Society Section: Journal of the Atmospheric Sciences) doi:
<ul> <li>Blackmon, M. L., Wallace, J. M., Lau, NC., &amp; Mullen, S. L. (1977, July). An Observational Study of the Northern Hemisphere Wintertime Circulation. <i>Journal of the Atmospheric Sciences</i>, 34(7), 1040–1053. Retrieved 2023- 03-31, from https://journals.ametsoc.org/view/journals/atsc/34/ 7/1520-0469/1977.034.1040.aosotn.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1977)034(1040:AOSOTN)2.0.CO;2</li> <li>Chen, G., Lu, J., Burrows, D. A., &amp; Leung, L. R. (2015). Local finite-amplitude wave activity as an objective diagnostic of midlatitude extreme weather. <i>Geophysical Research Letters</i>, 42(24), 10.952–10.960. Retrieved 2023-03-24, from https://onlinelibrary.wiley.com/doi/abs/10.1002/2015GL066959 doi: 10.1002/2015GL066959</li> <li>Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate Noise Properties of Teleconnection Patterns. <i>Journal of Climate</i>, 13(24), 4430–4440. Retrieved 2023-03-31, from https://journals.ametsoc.org/ view/journals/clim/13/24/1520-0442.2000.013.4430.ttpsac.2.0.co.2.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of Climate) doi: 10.1175/1520-0442(2000)013(4430:TTPSAC)2.0.CO;2</li> <li>Green, J. S. A. (1977). The Weather Juring July 1976: Some Dynamical Consider- ations of the Drought. <i>Weather</i>, 32(4), 120–126. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977. tb04532.x (.eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477- 8696.1977.tb04532.x) doi: 10.1002/j.1477-8696.1977.tb04532.x</li> <li>Hartmann, D. L. (2015). Global Physical Climatology: Second Edition (2nd ed ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-16, from https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. <i>Tellus</i>, 28(6), 473–485. Retrieved 2023-04-19, from https://oliinelibrary</li> <li>Maselm</li></ul>	314	10.1175/1520-0469(1984)041(0961:HSOMHF)2.0.CO;2
<ul> <li>Observational Study of the Northern Hemisphere Wintertime Circulation. Journal of the Atmospheric Sciences, 34(7), 1040–1053. Retrieved 2023- 03-31, from https://journals.metsoc.org/view/journals/atsc/34/ 7/1520-0469,1977.034.1040.aosotn.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1977)034(1040.AOSOTN)2.0.CO;2</li> <li>Chen, G., Lu, J., Burrows, D. A., &amp; Leung, L. R. (2015). Local finite-amplitude wave activity as an objective diagnostic of midlatitude extreme weather. <i>Geophysical Research Letters</i>, 42(24), 10.952–10.960. Retrieved 2023-03-24, from https://onlinelibrary.wiley.com/doi/abs/10.1002/2015GL066959</li> <li>(eprint: https://onlinelibrary.wiley.com/doi/abs/10.1002/2015GL066959</li> <li>Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate Noise Properties of Teleconnection Patterns. Journal of Climate, 13(24), 4430–4440. Retrieved 2023-03-31, from https://journals.ametsco.org/ view/journals/clim/13/24/1520-0442.2000.013.4430.ttpsac.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of Climate) doi: 10.1175/1520-0442(2000)013(4430:TTPSAC)2.0.CO;2</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Consider- ations of the Drought. Weather, 32(4), 120–126. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477- 8696.1977.tb04532.x doi: 10.1002/j.1477-8696.1977.tb04532.x</li> <li>Hartmann, D. L. (2015). Global Physical Climatology: Second Edition (2nd ed ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-16, from https://public.ebookcentral.proquest.com/choice/publicfullrecord .aspx?p=5754480 (OCLC: 1099348114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. Tellus, 28(6), 473-485. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1996, Jasuary). The macroturbulence of the tropos</li></ul>	315	Blackmon, M. L., Wallace, J. M., Lau, NC., & Mullen, S. L. (1977, July). An
Journal of the Atmospheric Sciences, 34(7), 1040–1053. Retrieved 2023- 03-31, from https://journals.ametsoc.org/view/journals/atsc/34/ 7/1520-0469/1977.034.1040_aosotn.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1977)034(1040:AOSOTN)2.0.CO;2 Chen, G., Lu, J., Burrows, D. A., & Leung, L. R. (2015). Local finite-amplitude wave activity as an objective diagnostic of midlatitude extreme weather. <i>Geophysical Research Letters</i> , 42(24), 10,952–10,960. Retrieved 2023-03-24, from https://onlinelibrary.wiley.com/doi/abs/10.1002/2015GL066959 (.eprint: https://onlinelibrary.wiley.com/doi/abs/10.1002/2015GL066959 io.10.1002/2015GL066959 Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate Noise Properties of Teleconnection Patterns. <i>Journal of Climate</i> , 13(24), 4430–4440. Retrieved 2023-03-31, from https://journals.ametsoc.org/ view/journals/clim/13/24/1520-0442.2000.013.4430_ttpsac.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of Climate) doi: 10.1175/1520-0442(2000)013(4430.TTPSAC)2.0.CO;2 Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Consider- ations of the Drought. <i>Weather</i> , 32(4), 120–126. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8666.1977 .tb04532.x (ceprint: https://olimelibrary.wiley.com/doi/pdf/10.1002/j.1477- 8696.1977.tb04532.x) doi: 10.1002/j.1477-8696.1977.tb04532.x Hartmann, D. L. (2015). <i>Global Physical Climatology: Second Edition</i> (2nd ed ed.). Kent: Elsevier Science & Technology. Retrieved 2023-04-16, from https://polisks/10.1111/j.2153-3490.1976.tb00696.x (ceprint: https://olimelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x Held, I. M. (1997). Stochastic climate models Part I. Theory. <i>Tellus</i> , 28(6), 473–485. Retrieved 2023-04-19, from https://olimelibrary. viiley.com/doi/abs/10.1111/j.2153-3490.1976.tb00696.x (ceprint: https://olimelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x	316	Observational Study of the Northern Hemisphere Wintertime Circulation.
<ul> <li>03-31, from https://journals.ametsoc.org/view/journals/atsc/34/</li> <li>7/1520-0469/1977.034.1040.aosotn.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1977)034(1040:AOSOTN)2.0.CO;2</li> <li>Chen, G., Lu, J., Burrows, D. A., &amp; Leung, L. R. (2015). Local finite-amplitude wave activity as an objective diagnostic of midlatitude extreme weather. <i>Geophysical Research Letters</i>, 42(24), 10.952-10.960. Retrieved 2023-03-24, from https://onlinelibrary.wiley.com/doi/abs/10.1002/2015GL066959</li> <li>Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate Noise Properties of Teleconnection Patterns. <i>Journal of Climate</i>, 13(24), 4430-4440. Retrieved 2023-03-31, from https://journals.ametsoc.org/view/journals/clim/13/24/1520-0442.2000.013.4430.ttpsac.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of Climate, 13(24), 10.1175/1520-0442(2000)013(4430:TTPSAC)2.0.CO;2</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Considerations of the Drought. <i>Weather</i>, 32(4), 120-126. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477-8696.1977.tb04532.x (.eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477-8696.1977.tb04532.x (.eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477-8696.1977.tb04532.x) doi: 10.1002/j.1477-8696.1977.tb04532.x</li> <li>Hartmann, D. L. (2015). <i>Global Physical Climatology: Second Edition</i> (2nd ed ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-18, from https://public.ebookcentral.proquest.com/choice/publicfullrecord .aspx7p=5754480 (OCLC: 1099348114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. <i>Tellus</i>, 28(6), 473-485. Retrieved 2023-04-19, from https://olinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. <i>Tellus A: Dynamic Meteorol</i></li></ul>	317	Journal of the Atmospheric Sciences, $34(7)$ , 1040–1053. Retrieved 2023-
<ul> <li>7/1520-0469.1977.034.1040.aosotn.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1977)034(1040:AOSOTN)2.0.CO;2</li> <li>Chen, G., Lu, J., Burrows, D. A., &amp; Leung, L. R. (2015). Local finite-amplitude wave activity as an objective diagnostic of midlatitude extreme weather. <i>Geophysical Research Letters</i>, 42(24), 10.952–10.960. Retrieved 2023-03-24, from https://onlinelibrary.wiley.com/doi/abs/10.1002/2015GL066959</li> <li>Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate Noise Properties of Teleconnection Patterns. <i>Journal of Climate</i>, 13(24), 4430–4440. Retrieved 2023-03-31, from https://journals.ametsco.org/ view/journals/clim/13/24/1520-0442.2000.013.4430.ttpsac.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of Climate, doi: 10.1175/1520-0442(2000)013(4430:TTPSAC)2.0.CO;2</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Consider- ations of the Drought. <i>Weather</i>, 32(4), 120–126. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477- 8696.1977.tb04532.x) doi: 10.1002/j.1477-8696.1977.tb04532.x</li> <li>Hartmann, D. L. (2015). <i>Global Physical Climatology: Second Edition</i> (2nd ed ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-16, from https://public.ebookcentral.proquest.com/choice/publicfullrecord aspx?p=5754480 (OCLC: 1099348114)</li> <li>Haselmann, K. (1976). Stochastic climate models Part I. Theory. <i>Tellus</i>, 28(6), 473–485. Retrieved 2023-04-19, from https://olinelibrary.</li> <li>#16d, I. M. (1996).Ja9710.3402/tellusa.v5111.12306 (Dublesher: Mariet Artipitary./olinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. <i>Tellus A: Dynamic Meteorology and Occanography</i>, 51(1), 59-70. Retrieved 2023-04-19, from https://doi.org/10.3402/tellusa.v5111.12306) doi: 10.3402/ tellusa.v5111.12</li></ul>	318	03-31, from https://journals.ametsoc.org/view/journals/atsc/34/
<ul> <li>Meteorological Society Section: Journal of the Atmospheric Sciences) doi:</li> <li>10.1175/1520-0469(1977)034(1040:AOSOTN)2.0.CO;2</li> <li>Chen, G., Lu, J., Burrows, D. A., &amp; Leung, L. R. (2015). Local finite-amplitude wave activity as an objective diagnostic of midlatitude extreme weather.</li> <li><i>Geophysical Research Letters</i>, 42(24), 10,952-10,960. Retrieved 2023-03-24, from https://onlinelibrary.wiley.com/doi/abs/10.1002/2015GL066959</li> <li>Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate Noise Properties of Teleconnection Patterns. Journal of Climate, 13(24), 4430-4440. Retrieved 2023-03-31, from https://journals.ametsoc.org/view/journals/clim/13/24/1520-0442.2000.013.4430.ttpsac.2.0.co.2.ml</li> <li>(Publisher: American Meteorological Society Section: Journal of Climate) doi: 10.1175/1520-0442(2000)013(4430:TTPSAC)2.0.CO;2</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Considerations of the Drought. Weather, 32(4), 120-126. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977.tb04532.x)</li> <li>Hartmann, D. L. (2015). Global Physical Climatology: Second Edition (2nd ed ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-16, from https://public.ebookcentral.proquest.com/choice/publicfullrecord .spx?p=5754480 (OCLC: 109938114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. Tellus, 28(6), 473-485. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A: Dynamic Meteorology and Occanography, 51(1), 59-70. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A: Dynamic Meteorology and Occanography, 51(1), 59-70. Retrieved 2023-04-19, from https://oli.org/10.3</li></ul>	319	7/1520-0469_1977_034_1040_aosotn_2_0_co_2.xml (Publisher: American
<ul> <li>10.1175/1520-0469(1977)034(1040:AOSOTN)2.0.CO;2</li> <li>Chen, G., Lu, J., Burrows, D. A., &amp; Leung, L. R. (2015). Local finite-amplitude wave activity as an objective diagnostic of midlatitude extreme weather. <i>Geophysical Research Letters</i>, 42(24), 10,952–10,960. Retrieved 2023-03-24, from https://onlinelibrary.wiley.com/doi/abs/10.1002/2015GL066959</li> <li>Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate Noise Properties of Teleconnection Patterns. <i>Journal of Climate</i>, 13(24), 4430–4440. Retrieved 2023-03-31, from https://journals.ametsoc.org/view/journals/clim/13/24/1520-0442.2000.013.4430.ttpsac_2.0.co.2.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of Climate) doi: 10.1175/1520-0442(2000)013(4430:TTPSAC)2.0.CO;2</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Considerations of the Drought. <i>Weather</i>, 32(4), 120-126. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477-8696.1977.tb04532.x</li> <li>Hartmann, D. L. (2015). <i>Global Physical Climatology: Second Edition</i> (2nd ed ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-16, from https://public.ebookcentral.proquest.com/choice/publicfullrecord .aspx?p=5754480 (OCLC: 1099348114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. <i>Tellus</i>, 28(6), 473-485. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. <i>Tellus A: Dynamic Meteorolog and Oceanography</i>, 51(1), 59-70. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2163-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. <i>Tellus A: Dynamic Meteorology and Oceanography</i>, 51(1), 59-70. Retrieved 2023-04-19, from https://doi.org/10.3402/tellusa.v5111.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). L</li></ul>	320	Meteorological Society Section: Journal of the Atmospheric Sciences) doi:
<ul> <li>Chen, G., Lu, J., Burrows, D. A., &amp; Leung, L. R. (2015). Local finite-amplitude wave activity as an objective diagnostic of midlatitude extreme weather. <i>Geophysical Research Letters</i>, 42(24), 10,952–10,960. Retrieved 2023-03-24, from https://onlinelibrary.wiley.com/doi/abs/10.1002/2015GL066959</li> <li>[London 2015GL066959</li> <li>Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate Noise Properties of Teleconnection Patterns. <i>Journal of Climate</i>, 13(24), 4430–4440. Retrieved 2023-03-31, from https://journals.ametsoc.org/ view/journals/clim/13/24/1520–0442.2000.013.44430.ttpsac.2.0.co.2.xm</li> <li>(Publisher: American Meteorological Society Section: Journal of Climate) doi: 10.1175/1520-0442(2000)013(4430:TTPSAC)2.0.CO;2</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Consider- ations of the Drought. <i>Weather</i>, 32(4), 120–126. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977 .tb04532.x (ceprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477- 8696.1977.tb04532.x) doi: 10.1002/j.1477-8696.1977.tb04532.x</li> <li>Hartmann, D. L. (2015). <i>Global Physical Climatology: Second Edition</i> (2nd ed ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-16, from https://public.ebookcentral.proquest.com/choice/publicfullrecord aspx?p=5754480 (OCLC: 109348114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. <i>Tellus</i>, 28(6), 473–485. Retrieved 2023-04-19, from https://onlinelibrary .wiley.com/doi/abs/10.1111/j.2153-3490.1976.tb00696.x doi: 10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. <i>Tellus A:</i> <i>Dynamic Meteorology and Oceanography</i>, 51(1), 59–70. Retrieved 2023-04-19, from https://doi.org/10.3402/tellusa.v5111.12306</li> <li>Huag, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave Activity as Diagnostic of Anomalous Weather Events. <i>Journal of the Atmosphe</i></li></ul>	321	10.1175/1520-0469(1977)034(1040:AOSOTN)2.0.CO;2
<ul> <li>wave activity as an objective diagnostic of midlatitude extreme weather.</li> <li><i>Geophysical Research Letters</i>, 42(24), 10,952–10,960. Retrieved 2023-03-24,</li> <li>from https://onlinelibrary.wiley.com/doi/pdf/10.1002/2015GL066959</li> <li>(_eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/2015GL066959</li> <li>Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate</li> <li>Noise Properties of Teleconnection Patterns. Journal of Climate, 13(24),</li> <li>4430–4440. Retrieved 2023-03-31, from https://journals.ametsoc.org/</li> <li>view/journals/clim/13/24/1520-0442.2000_013.4430_ttpsac_2.0.co_2.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of Climate)</li> <li>doi: 10.1175/1520-0442(2000)013(4430:TTPSAC)2.0.CO;2</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Consider-</li> <li>ations of the Drought. Weather, 32(4), 120–126. Retrieved 2023-04-19, from</li> <li>https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977.tb04532.x)</li> <li>Hartmann, D. L. (2015). Global Physical Climatology: Second Edition (2nd ed</li> <li>ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-16, from</li> <li>https://public.ebookcentral.proquest.com/choice/publicfullrecord</li> <li>.aspx?p=5754480 (OCLC: 1099348114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. Tellus,</li> <li>28(6), 473–485. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/choice/publicfullrecord</li> <li>.aspx?p=5754480.1111/j.2153-3490.1976.tb00696.x (.eprint: https://oli.03402/tellusa.v5111.12306</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A:</li> <li>Dynamic Meteorology and Oceanography, 51(1), 59–70. Retrieved 2023-04-19,</li> <li>from https://doi.org/10.3402/tellusa.v5111.12306) doi: 10.3402/tellusa.v5111.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local</li></ul>	322	Chen, G., Lu, J., Burrows, D. A., & Leung, L. R. (2015). Local finite-amplitude
<ul> <li>Geophysical Research Letters, 42(24), 10.952-10.960. Retrieved 2023-03-24, from https://onlinelibrary.wiley.com/doi/abs/10.1002/2015GL066959</li> <li>Geprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/2015GL066959</li> <li>Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate Noise Properties of Teleconnection Patterns. Journal of Climate, 13(24), 4430-4440. Retrieved 2023-03-31, from https://journals.ametsoc.org/</li> <li>view/journals/clim/13/24/1520-0442.2000.013.4430.ttpsac.2.0.co.2.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of Climate) doi: 10.1175/1520-0442(2000)013(4430:TTPSAC)20.CO;2</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Consider- ations of the Drought. Weather, 32(4), 120-126. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977 .tb04532.x (.eprint: https://onlinelibrary.wley.com/doi/pdf/10.1002/j.1477- 8696.1977.tb04532.x) doi: 10.1002/j.1477-8696.1977.tb04532.x</li> <li>Hartmann, D. L. (2015). Global Physical Climatology: Second Edition (2nd ed ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-16, from https://public.ebookcentral.proquest.com/choice/publicfullrecord .aspx7p=5754480 (OCLC: 1099348114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. Tellus, 28(6), 473-485. Retrieved 2023-04-19, from https://onlinelibrary .wiley.com/doi/abs/10.1111/j.2153-3490.1976.tb00696.x (.eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.5153-3490.1976.tb00696.x) doi: 10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A: Dynamic Meteorology and Occanography, 51(1), 59-70. Retrieved 2023-04-19, from https://doi.org/10.3402/tellusa.v5111.12306 (Publisher: Taylor &amp; Francis.eprint: https://doi.org/10.3402/tellusa.v5111.12306) doi: 10.3402/ tellusa.v5111.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local</li></ul>	323	wave activity as an objective diagnostic of midlatitude extreme weather.
<ul> <li>from https://onlinelibrary.wiley.com/doi/abs/10.1002/2015GL066959</li> <li>(.eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/2015GL066959</li> <li>Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate Noise Properties of Teleconnection Patterns. Journal of Climate, 13(24), 4430-4440. Retrieved 2023-03-31, from https://journals.ametsoc.org/</li> <li>Yiew/journals/clim/13/24/1520-0442.2000.013.4430.ttpsac.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of Climate) doi: 10.1175/1520-0442(2000)013(4430:TTPSAC)2.0.CO;2</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Considerations of the Drought. Weather, 32(4), 120-126. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977</li> <li>tbd532.x (.eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477-8696.1977.tb04532.x) doi: 10.1002/j.1477-8696.1977.tb04532.x</li> <li>Hartmann, D. L. (2015). Global Physical Climatology: Second Edition (2nd ed ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-16, from https://public.ebookcentral.proquest.com/choice/publicfullrecord .aspx?p=5754480 (OCLC: 1093348114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. Tellus, 28(6), 473-485. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x (.eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x) doi: 10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A: Dynamic Meteorology and Occanography, 51(1), 59-70. Retrieved 2023-04-19, from https://doi.org/10.3402/tellusa.v5111.12306 (Publisher: Taylor &amp; Francis .eprint: https://doi.org/10.3402/tellusa.v5111.12306) doi: 10.3402/tellusa.v5111.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave Activity as a Diagnostic of Anomalous Weather Events. Jo</li></ul>	324	Geophysical Research Letters, $42(24)$ , $10,952-10,960$ . Retrieved 2023-03-24,
<ul> <li>(Apprint: https://onlinehorary.whey.com/doi/pdf/10.1002/2015GL060959)</li> <li>Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate Noise Properties of Teleconnection Patterns. Journal of Climate, 13(24), 4430-4440. Retrieved 2023-03-31, from https://journals.ametsoc.org/view/journals/clim/13/24/1520-0442_2000.013.4430.ttpsac_2.0.co_2.xml</li> <li>Publisher: American Meteorological Society Section: Journal of Climate) doi: 10.1175/1520-0442(2000)013(4430:TTPSAC)2.0.CO;2</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Considerations of the Drought. Weather, 32(4), 120-126. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977.tb04532.x) doi: 10.1002/j.1477-8696.1977.tb04532.x</li> <li>Hartmann, D. L. (2015). Global Physical Climatology: Second Edition (2nd ed ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-16, from https://public.ebookcentral.proquest.com/choice/publicfullrecord .aspx?p=5754480 (OCLC: 1099348114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. Tellus, 28(6), 473-485. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x</li> <li>Wiley.com/doi/abs/10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A: Dynamic Meteorology and Oceanography, 51(1), 59-70. Retrieved 2023-04-19, from https://doi.org/10.3402/tellusa.v51i1.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave Activity as a Diagnostic of Anomalous Weather Events. Journal of the Attmospheric Sciences, 73(1), 211-229. Retrieved 2023-03-24, from https:// journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of the Attmospheric Sciences, 0doi: 10.1175/JAS-D-15-0194.1</li> </ul>	325	from https://onlinelibrary.wiley.com/doi/abs/10.1002/2015GL066959
<ul> <li>Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate Noise Properties of Teleconnection Patterns. Journal of Climate, 13(24), 4430-4440. Retrieved 2023-03-31, from https://journals.ametsoc.org/view/journals/clim/13/24/1520-0442.2000_013.4430.ttpsac_2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of Climate) doi: 10.1175/1520-0442(2000)013(4430:TTPSAC)2.0.CO;2</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Considerations of the Drought. Weather, 32(4), 120-126. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977</li> <li>tb04532.x (_eprint: https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977</li> <li>tb04532.x (_eprint: https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977</li> <li>tb04532.x (_eprint: https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977</li> <li>tb04532.x (_eprint: https://onlinelibrary.wiley.com/choice/publicfullrecord</li> <li>aspx?p=5754480 (OCLC: 1099348114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. Tellus, 28(6), 473-485. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x (_eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x)</li> <li>doi: 10.1111/j.2153-3490.1976.tb00696.x (_eprint: https://onlinelibrary.wiley.com/doi/pdf/10.3402/tellusa.v5111.12306 (Publisher: Taylor &amp; Francis_eprint: https://doi.org/10.3402/tellusa.v5111.12306 doi: 10.3402/tellusa.v5111.12306 doi: 10.3402/tellusa.v5111.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave Activity as a Diagnostic of Anomalous Weather Events. Journal of the Atmospheric Sciences, 73(1), 211-229. Retrieved 2023-03-24, from https://journals.ametsoc.org/view/journals/asc/73/1/jas-d-15-0194.1.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of the Atmospheric Scie</li></ul>	326	(_eprint: https://onlineilorary.wiley.com/doi/pdi/10.1002/2015GL000959) doi:
<ul> <li>Feldstein, S. B. (2000, December). The Timescale, Fower Spectra, and Climate 13(24), 4430–4440. Retrieved 2023-03-31, from https://journals.ametsoc.org/view/journals/clim/13/24/1520-0442.2000.013.4430_ttpsac_2.0.co_2.xml (Publisher: American Meteorological Society Section: Journal of Climate) doi: 10.1175/1520-0442(2000)013(4430:TTPSAC)2.0.CO;2</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Considerations of the Drought. Weather, 32(4), 120–126. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977.tb04532.x (.eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477-8696.1977.tb04532.x) doi: 10.1002/j.1477-8696.1977.tb04532.x</li> <li>Hartmann, D. L. (2015). Global Physical Climatology: Second Edition (2nd ed ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-16, from https://public.ebookcentral.proquest.com/choice/publicfullrecord .aspx?p=5754480 (OCLC: 1099348114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. Tellus, 28(6), 473–485. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x (.eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A: Dynamic Meteorology and Occanography, 51(1), 59–70. Retrieved 2023-04-19, from https://doi.org/10.3402/tellusa.v51i1.12306 (Publisher: Taylor &amp; Francis .eprint: https://doi.org/10.3402/tellusa.v51i1.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave Activity as a Diagnostic of Anomalous Weather Events. Journal of the Atmospheric Sciences, 73(1), 211–229. Retrieved 2023-03-24, from https:// journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml (Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/JAS-D-15-0194.1</li> </ul>	327	10.1002/2010GL000939
<ul> <li><sup>339</sup> From the set of the connection fracterins. <i>Landrate of Cumule</i>, 15(24), 4430–4440. Retrieved 2023-03-31, from https://journals.ametsoc.org/</li> <li><sup>330</sup> view/journals/clim/13/24/1520-0442_2000_013.4430_ttpsac_2.0.co_2.xml</li> <li><sup>331</sup> (Publisher: American Meteorological Society Section: Journal of Climate) doi:</li> <li><sup>332</sup> 10.1175/1520-0442(2000)013(4430:TTPSAC)2.0.CO;2</li> <li><sup>333</sup> Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Consider-</li> <li><sup>334</sup> atoms of the Drought. Weather, 32(4), 120–126. Retrieved 2023-04-19, from</li> <li><sup>335</sup> https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977</li> <li><sup>336</sup></li></ul>	328	Noise Properties of Teleconnection Patterns Learnel of Climate 12(24)
<ul> <li>view/jourals/clim/13/24/1520-0-0442_200_013_4430_ttpsac_2.0.co_2.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of Climate) doi:</li> <li>10.1175/1520-0442(2000)013(4430:TTPSAC)2.0.CO;2</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Consider- ations of the Drought. Weather, 32(4), 120-126. Retrieved 2023-04-19, from</li> <li>https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977.</li> <li>tb04532.x (.eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477- 8696.1977.tb04532.x) doi: 10.1002/j.1477-8696.1977.tb04532.x</li> <li>Hartmann, D. L. (2015). Global Physical Climatology: Second Edition (2nd ed ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-16, from</li> <li>https://public.ebookcentral.proquest.com/choice/publicfullrecord .aspx?p=5754480 (OCLC: 1099348114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. Tellus, 28(6), 473-485. Retrieved 2023-04-19, from https://onlinelibrary</li> <li>.wiley.com/doi/abs/10.1111/j.2153-3490.1976.tb00696.x (.eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x)</li> <li>doi: 10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A: Dynamic Meteorology and Oceanography, 51(1), 59-70. Retrieved 2023-04-19, from https://doi.org/10.3402/tellusa.v5111.12306 (Publisher: Taylor &amp; Francis.eprint: https://doi.org/10.3402/tellusa.v5111.12306 doi: 10.3402/ tellusa.v5111.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave Activity as a Diagnostic of Anomalous Weather Events. Journal of the At- mospheric Sciences, 73(1), 211-229. Retrieved 2023-03-24, from https:// journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of the Atmo- spheric Sciences) doi: 10.1175/JAS-D-15-0194.1</li> </ul>	329	4/30-4/40 Betrieved 2022-03-31 from https://journals.ametsoc.org/
<ul> <li>(Publisher: American Meteorological Society Section: Journal of Climate) doi: 10.1175/1520-0442(2000)013(4430:TTPSAC)2.0.CO;2</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Consider- ations of the Drought. Weather, 32(4), 120–126. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977</li> <li>.tb04532.x (.eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477- 8696.1977.tb04532.x) doi: 10.1002/j.1477-8696.1977.tb04532.x</li> <li>Hartmann, D. L. (2015). Global Physical Climatology: Second Edition (2nd ed ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-16, from https://public.ebookcentral.proquest.com/choice/publicfullrecord .aspx?p=5754480 (OCLC: 1099348114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. Tellus, 28(6), 473–485. Retrieved 2023-04-19, from https://onlinelibrary .wiley.com/doi/abs/10.1111/j.2153-3490.1976.tb00696.x (.eprint: https://onlinelibrary.wiley.com/doi/pdf/10.10111/j.2153-3490.1976.tb00696.x)</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A: Dynamic Meteorology and Oceanography, 51(1), 59–70. Retrieved 2023-04-19, from https://doi.org/10.3402/tellusa.v51i1.12306 (Publisher: Taylor &amp; Francis _eprint: https://doi.org/10.3402/tellusa.v51i1.12306) doi: 10.3402/ tellusa.v51i1.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave Activity as a Diagnostic of Anomalous Weather Events. Journal of the At- mospheric Sciences, 73(1), 211–229. Retrieved 2023-03-24, from https:// journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of the Atmo- spheric Sciences) doi: 10.1175/JAS-D-15-0194.1</li> </ul>	331	view/journals/clim/13/24/1520-0442 2000 013 4430 ttpsac 2.0.co 2.xm]
<ul> <li>10.1175/1520-0442(2000)013(4430:TTPSAC)2.0.CO;2</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Consider- ations of the Drought. Weather, 32(4), 120-126. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977</li> <li>.tb04532.x (_eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477- 8696.1977.tb04532.x) doi: 10.1002/j.1477-8696.1977</li> <li>Hartmann, D. L. (2015). Global Physical Climatology: Second Edition (2nd ed ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-16, from https://public.ebookcentral.proquest.com/choice/publicfullrecord .aspx?p=5754480 (OCLC: 1099348114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. Tellus, 28(6), 473-485. Retrieved 2023-04-19, from https://onlinelibrary .wiley.com/doi/abs/10.1111/j.2153-3490.1976.tb00696.x (_eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x)</li> <li>doi: 10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A: Dynamic Meteorology and Oceanography, 51(1), 59-70. Retrieved 2023-04-19, from https://doi.org/10.3402/tellusa.v51i1.12306 (Publisher: Taylor &amp; Francis _eprint: https://doi.org/10.3402/tellusa.v51i1.12306) doi: 10.3402/ tellusa.v51i1.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave Activity as a Diagnostic of Anomalous Weather Events. Journal of the At- mospheric Sciences, 73(1), 211-229. Retrieved 2023-03-24, from https:// journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of the Atmo- spheric Sciences) doi: 10.1175/JAS-D-15-0194.1</li> </ul>	332	(Publisher: American Meteorological Society Section: Journal of Climate) doi:
<ul> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Consider- ations of the Drought. Weather, 32(4), 120–126. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977 .tb04532.x (_eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477- 8696.1977.tb04532.x) doi: 10.1002/j.1477-8696.1977.tb04532.x</li> <li>Hartmann, D. L. (2015). Global Physical Climatology: Second Edition (2nd ed ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-16, from https://public.ebookcentral.proquest.com/choice/publicfullrecord .aspx?p=5754480 (OCLC: 1099348114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. Tellus, 28(6), 473–485. Retrieved 2023-04-19, from https://onlinelibrary .wiley.com/doi/abs/10.1111/j.2153-3490.1976.tb00696.x (_eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x) doi: 10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A: Dynamic Meteorology and Oceanography, 51(1), 59–70. Retrieved 2023-04-19, from https://doi.org/10.3402/tellusa.v5111.12306 (Publisher: Taylor &amp; Francis _eprint: https://doi.org/10.3402/tellusa.v5111.12306) doi: 10.3402/ tellusa.v5111.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave Activity as a Diagnostic of Anomalous Weather Events. Journal of the At- mospheric Sciences, 73(1), 211–229. Retrieved 2023-03-24, from https:// journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of the Atmo- spheric Sciences) doi: 10.1175/JAS-D-15-0194.1</li> </ul>	333	10.1175/1520-0442(2000)013/4430:TTPSAC>2.0.CO:2
<ul> <li>ations of the Drought. Weather, 32(4), 120–126. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977</li> <li>.tb04532.x (_eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477- 8696.1977.tb04532.x) doi: 10.1002/j.1477-8696.1977.tb04532.x</li> <li>Hartmann, D. L. (2015). Global Physical Climatology: Second Edition (2nd ed ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-16, from https://public.ebookcentral.proquest.com/choice/publicfullrecord .aspx?p=5754480 (OCLC: 1099348114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. Tellus, 28(6), 473–485. Retrieved 2023-04-19, from https://onlinelibrary .wiley.com/doi/abs/10.1111/j.2153-3490.1976.tb00696.x (_eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x) doi: 10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A: Dynamic Meteorology and Oceanography, 51(1), 59–70. Retrieved 2023-04-19, from https://doi.org/10.3402/tellusa.v5111.12306 (Publisher: Taylor &amp; Francis _eprint: https://doi.org/10.3402/tellusa.v5111.12306) doi: 10.3402/ tellusa.v5111.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave Activity as a Diagnostic of Anomalous Weather Events. Journal of the Att- mospheric Sciences, 73(1), 211–229. Retrieved 2023-03-24, from https:// journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of the Attmo- spheric Sciences) doi: 10.1175/JAS-D-15-0194.1</li> </ul>	334	Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Consider-
<ul> <li>https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977</li> <li>.tb04532.x (_eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477-8696.1977.tb04532.x)</li> <li>Hartmann, D. L. (2015). Global Physical Climatology: Second Edition (2nd ed ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-16, from https://public.ebookcentral.proquest.com/choice/publicfullrecord</li> <li>.aspx?p=5754480 (OCLC: 1099348114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. Tellus, 28(6), 473-485. Retrieved 2023-04-19, from https://onlinelibrary</li> <li>.wiley.com/doi/abs/10.1111/j.2153-3490.1976.tb00696.x (_eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x)</li> <li>doi: 10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A: Dynamic Meteorology and Oceanography, 51(1), 59-70. Retrieved 2023-04-19, from https://doi.org/10.3402/tellusa.v51i1.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave Activity as a Diagnostic of Anomalous Weather Events. Journal of the At-mospheric Sciences, 73(1), 211-229. Retrieved 2023-03-24, from https://journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml</li> </ul>	335	ations of the Drought. Weather, 32(4), 120–126. Retrieved 2023-04-19, from
<ul> <li>.tb04532.x (_eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477- 8696.1977.tb04532.x) doi: 10.1002/j.1477-8696.1977.tb04532.x</li> <li>Hartmann, D. L. (2015). Global Physical Climatology: Second Edition (2nd ed ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-16, from https://public.ebookcentral.proquest.com/choice/publicfullrecord .aspx?p=5754480 (OCLC: 1099348114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. Tellus, 28(6), 473-485. Retrieved 2023-04-19, from https://onlinelibrary .wiley.com/doi/abs/10.1111/j.2153-3490.1976.tb00696.x (_eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x) doi: 10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A: Dynamic Meteorology and Oceanography, 51(1), 59-70. Retrieved 2023-04-19, from https://doi.org/10.3402/tellusa.v51i1.12306) doi: 10.3402/ tellusa.v51i1.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave Activity as a Diagnostic of Anomalous Weather Events. Journal of the At- mospheric Sciences, 73(1), 211-229. Retrieved 2023-03-24, from https:// journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xm1</li> <li>(Publisher: American Meteorological Society Section: Journal of the Atmo- spheric Sciences) doi: 10.1175/JAS-D-15-0194.1</li> </ul>	336	https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977
<ul> <li>8696.1977.tb04532.x) doi: 10.1002/j.1477-8696.1977.tb04532.x</li> <li>Hartmann, D. L. (2015). Global Physical Climatology: Second Edition (2nd ed ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-16, from https://public.ebookcentral.proquest.com/choice/publicfullrecord .aspx?p=5754480 (OCLC: 1099348114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. Tellus, 28(6), 473-485. Retrieved 2023-04-19, from https://onlinelibrary .wiley.com/doi/abs/10.1111/j.2153-3490.1976.tb00696.x (_eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x)</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A: Dynamic Meteorology and Oceanography, 51(1), 59-70. Retrieved 2023-04-19, from https://doi.org/10.3402/tellusa.v51i1.12306 (Publisher: Taylor &amp; Francis _eprint: https://doi.org/10.3402/tellusa.v51i1.12306) doi: 10.3402/tellusa.v51i1.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave Activity as a Diagnostic of Anomalous Weather Events. Journal of the Atmospheric Sciences, 73(1), 211-229. Retrieved 2023-03-24, from https://journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/JAS-D-15-0194.1</li> </ul>	337	.tb04532.x (_eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477-
<ul> <li>Hartmann, D. L. (2015). Global Physical Climatology: Second Edition (2nd ed ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-16, from https://public.ebookcentral.proquest.com/choice/publicfullrecord .aspx?p=5754480 (OCLC: 1099348114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. Tellus, 28(6), 473-485. Retrieved 2023-04-19, from https://onlinelibrary .wiley.com/doi/abs/10.1111/j.2153-3490.1976.tb00696.x (_eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x) doi: 10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A: Dynamic Meteorology and Oceanography, 51(1), 59-70. Retrieved 2023-04-19, from https://doi.org/10.3402/tellusa.v5111.12306 (Publisher: Taylor &amp; Francis _eprint: https://doi.org/10.3402/tellusa.v5111.12306) doi: 10.3402/ tellusa.v5111.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave Activity as a Diagnostic of Anomalous Weather Events. Journal of the At- mospheric Sciences, 73(1), 211-229. Retrieved 2023-03-24, from https:// journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of the Atmo- spheric Sciences) doi: 10.1175/JAS-D-15-0194.1</li> </ul>	338	8696.1977.tb04532.x) doi: $10.1002/j.1477-8696.1977.tb04532.x$
<ul> <li>ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-16, from</li> <li>https://public.ebookcentral.proquest.com/choice/publicfullrecord</li> <li>.aspx?p=5754480 (OCLC: 1099348114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. Tellus,</li> <li>28(6), 473-485. Retrieved 2023-04-19, from https://onlinelibrary</li> <li>.wiley.com/doi/abs/10.1111/j.2153-3490.1976.tb00696.x (_eprint:</li> <li>https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x)</li> <li>doi: 10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A:</li> <li>Dynamic Meteorology and Oceanography, 51(1), 59-70. Retrieved 2023-04-19,</li> <li>from https://doi.org/10.3402/tellusa.v51i1.12306 (Publisher: Taylor</li> <li>&amp; Francis _eprint: https://doi.org/10.3402/tellusa.v51i1.12306) doi: 10.3402/</li> <li>tellusa.v51i1.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave</li> <li>Activity as a Diagnostic of Anomalous Weather Events. Journal of the At-</li> <li>mospheric Sciences, 73(1), 211-229. Retrieved 2023-03-24, from https://</li> <li>journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xm1</li> <li>(Publisher: American Meteorological Society Section: Journal of the Atmo-</li> </ul>	339	Hartmann, D. L. (2015). Global Physical Climatology: Second Edition (2nd ed
<ul> <li>https://public.ebookcentral.proquest.com/choice/publicfullrecord</li> <li>.aspx?p=5754480 (OCLC: 1099348114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. Tellus,</li> <li>28(6), 473-485. Retrieved 2023-04-19, from https://onlinelibrary</li> <li>.wiley.com/doi/abs/10.1111/j.2153-3490.1976.tb00696.x (_eprint:</li> <li>https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x)</li> <li>doi: 10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A:</li> <li>Dynamic Meteorology and Oceanography, 51(1), 59-70. Retrieved 2023-04-19,</li> <li>from https://doi.org/10.3402/tellusa.v51i1.12306 (Publisher: Taylor</li> <li>&amp; Francis _eprint: https://doi.org/10.3402/tellusa.v51i1.12306) doi: 10.3402/</li> <li>tellusa.v51i1.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave</li> <li>Activity as a Diagnostic of Anomalous Weather Events. Journal of the At-</li> <li>mospheric Sciences, 73(1), 211-229. Retrieved 2023-03-24, from https://</li> <li>journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of the Atmo-</li> </ul>	340	ed.). Kent: Elsevier Science & Technology. Retrieved 2023-04-16, from
342.aspx?p=5754480 (OCLC: 1099348114)343Hasselmann, K. (1976). Stochastic climate models Part I. Theory. Tellus,344 $28(6), 473-485.$ Retrieved 2023-04-19, from https://onlinelibrary345.wiley.com/doi/abs/10.1111/j.2153-3490.1976.tb00696.x (_eprint:346https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x347doi: 10.1111/j.2153-3490.1976.tb00696.x348Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A:349Dynamic Meteorology and Oceanography, 51(1), 59-70. Retrieved 2023-04-19,350from https://doi.org/10.3402/tellusa.v51i1.12306 (Publisher: Taylor351& Francis _eprint: https://doi.org/10.3402/tellusa.v51i1.12306) doi: 10.3402/352tellusa.v51i1.12306353Huang, C. S. Y., & Nakamura, N. (2016, January). Local Finite-Amplitude Wave354Activity as a Diagnostic of Anomalous Weather Events. Journal of the At-355mospheric Sciences, 73(1), 211-229. Retrieved 2023-03-24, from https://356journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml357(Publisher: American Meteorological Society Section: Journal of the Atmo-358spheric Sciences) doi: 10.1175/JAS-D-15-0194.1	341	https://public.ebookcentral.proquest.com/choice/publicfullrecord
<ul> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. Tellus, 28(6), 473–485. Retrieved 2023-04-19, from https://onlinelibrary</li> <li>.wiley.com/doi/abs/10.1111/j.2153-3490.1976.tb00696.x (_eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x)</li> <li>doi: 10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A: Dynamic Meteorology and Oceanography, 51(1), 59–70. Retrieved 2023-04-19, from https://doi.org/10.3402/tellusa.v51i1.12306 (Publisher: Taylor &amp; Francis _eprint: https://doi.org/10.3402/tellusa.v51i1.12306) doi: 10.3402/</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave Activity as a Diagnostic of Anomalous Weather Events. Journal of the At- mospheric Sciences, 73(1), 211–229. Retrieved 2023-03-24, from https:// journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of the Atmo- spheric Sciences) doi: 10.1175/JAS-D-15-0194.1</li> </ul>	342	.aspx?p=5754480 (OCLC: 1099348114)
<ul> <li>28(6), 473–485. Retrieved 2023-04-19, from https://onlinelibrary</li> <li>.wiley.com/doi/abs/10.1111/j.2153-3490.1976.tb00696.x (_eprint:</li> <li>https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x)</li> <li>doi: 10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A:</li> <li>Dynamic Meteorology and Oceanography, 51(1), 59–70. Retrieved 2023-04-19,</li> <li>from https://doi.org/10.3402/tellusa.v51i1.12306 (Publisher: Taylor</li> <li>&amp; Francis _eprint: https://doi.org/10.3402/tellusa.v51i1.12306) doi: 10.3402/</li> <li>tellusa.v51i1.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave</li> <li>Activity as a Diagnostic of Anomalous Weather Events. Journal of the At-</li> <li>mospheric Sciences, 73(1), 211–229. Retrieved 2023-03-24, from https://</li> <li>journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of the Atmo-</li> </ul>	343	Hasselmann, K. (1976). Stochastic climate models Part I. Theory. <i>Tellus</i> ,
345.wiley.com/doi/abs/10.1111/j.2153-3490.1976.tb00696.x(_eprint:346https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x)doi: 10.1111/j.2153-3490.1976.tb00696.x347doi: 10.1111/j.2153-3490.1976.tb00696.x348Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A:349Dynamic Meteorology and Oceanography, 51(1), 59–70. Retrieved 2023-04-19,350from https://doi.org/10.3402/tellusa.v51i1.12306351& Francis _eprint: https://doi.org/10.3402/tellusa.v51i1.12306)352tellusa.v51i1.12306353Huang, C. S. Y., & Nakamura, N. (2016, January). Local Finite-Amplitude Wave354Activity as a Diagnostic of Anomalous Weather Events. Journal of the At-355mospheric Sciences, 73(1), 211–229. Retrieved 2023-03-24, from https://356journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml357(Publisher: American Meteorological Society Section: Journal of the Atmo-358spheric Sciences) doi: 10.1175/JAS-D-15-0194.1	344	28(6), 473-485. Retrieved 2023-04-19, from https://onlinelibrary
<ul> <li>https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x)</li> <li>doi: 10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A: Dynamic Meteorology and Oceanography, 51(1), 59–70. Retrieved 2023-04-19,</li> <li>from https://doi.org/10.3402/tellusa.v51i1.12306 (Publisher: Taylor &amp; Francis _eprint: https://doi.org/10.3402/tellusa.v51i1.12306) doi: 10.3402/</li> <li>tellusa.v51i1.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave Activity as a Diagnostic of Anomalous Weather Events. Journal of the At- mospheric Sciences, 73(1), 211–229. Retrieved 2023-03-24, from https://</li> <li>journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of the Atmo- spheric Sciences) doi: 10.1175/JAS-D-15-0194.1</li> </ul>	345	.wiley.com/doi/abs/10.1111/j.2153-3490.1976.tb00696.x (_eprint:
<ul> <li>doi: 10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A: Dynamic Meteorology and Oceanography, 51(1), 59–70. Retrieved 2023-04-19, from https://doi.org/10.3402/tellusa.v51i1.12306 (Publisher: Taylor &amp; Francis _eprint: https://doi.org/10.3402/tellusa.v51i1.12306) doi: 10.3402/ tellusa.v51i1.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave Activity as a Diagnostic of Anomalous Weather Events. Journal of the At- mospheric Sciences, 73(1), 211–229. Retrieved 2023-03-24, from https:// journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml (Publisher: American Meteorological Society Section: Journal of the Atmo- spheric Sciences) doi: 10.1175/JAS-D-15-0194.1</li> </ul>	346	https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x)
<ul> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A: Dynamic Meteorology and Oceanography, 51(1), 59–70. Retrieved 2023-04-19, from https://doi.org/10.3402/tellusa.v51i1.12306 (Publisher: Taylor &amp; Francis _eprint: https://doi.org/10.3402/tellusa.v51i1.12306) doi: 10.3402/</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave Activity as a Diagnostic of Anomalous Weather Events. Journal of the At- mospheric Sciences, 73(1), 211–229. Retrieved 2023-03-24, from https:// journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of the Atmo- spheric Sciences) doi: 10.1175/JAS-D-15-0194.1</li> </ul>	347	doi: 10.1111/j.2153-3490.1976.tb00696.x
349Dynamic Meteorology and Oceanography, 51(1), 59–70.Retrieved 2023-04-19,350from https://doi.org/10.3402/tellusa.v51i1.12306(Publisher: Taylor351& Francis _eprint: https://doi.org/10.3402/tellusa.v51i1.12306)doi: 10.3402/352tellusa.v51i1.12306doi: 10.3402/353Huang, C. S. Y., & Nakamura, N. (2016, January).Local Finite-Amplitude Wave354Activity as a Diagnostic of Anomalous Weather Events.Journal of the At-355mospheric Sciences, 73(1), 211–229.Retrieved 2023-03-24, from https://356journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml357(Publisher: American Meteorological Society Section: Journal of the Atmo-358spheric Sciences) doi: 10.1175/JAS-D-15-0194.1	348	Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A:
<ul> <li>from https://doi.org/10.3402/tellusa.v5111.12306 (Publisher: Taylor</li> <li>&amp; Francis _eprint: https://doi.org/10.3402/tellusa.v5111.12306) doi: 10.3402/</li> <li>tellusa.v5111.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave</li> <li>Activity as a Diagnostic of Anomalous Weather Events. Journal of the At-</li> <li>mospheric Sciences, 73(1), 211–229. Retrieved 2023-03-24, from https://</li> <li>journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of the Atmo-</li> <li>spheric Sciences) doi: 10.1175/JAS-D-15-0194.1</li> </ul>	349	Dynamic Meteorology and Oceanography, 51(1), 59–70. Retrieved 2023-04-19,
<ul> <li><sup>351</sup> &amp; Francis Leprint: https://doi.org/10.3402/tellusa.v5111.12306) doi: 10.3402/</li> <li><sup>352</sup> tellusa.v51i1.12306</li> <li><sup>353</sup> Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave</li> <li><sup>354</sup> Activity as a Diagnostic of Anomalous Weather Events. Journal of the At-</li> <li><sup>355</sup> mospheric Sciences, 73(1), 211–229. Retrieved 2023-03-24, from https://</li> <li><sup>356</sup> journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml</li> <li><sup>357</sup> (Publisher: American Meteorological Society Section: Journal of the Atmo-</li> <li><sup>358</sup> spheric Sciences) doi: 10.1175/JAS-D-15-0194.1</li> </ul>	350	from https://doi.org/10.3402/tellusa.v5111.12306 (Publisher: Taylor $f_{\rm s}$ Francis and the https://doi.org/10.2402/tellusa.v5111.12306) doi: 10.2402/
<ul> <li>tenusa.v3111.12500</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave</li> <li>Activity as a Diagnostic of Anomalous Weather Events. Journal of the At-</li> <li><i>mospheric Sciences</i>, 73(1), 211–229. Retrieved 2023-03-24, from https://</li> <li>journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of the Atmo-</li> <li>spheric Sciences) doi: 10.1175/JAS-D-15-0194.1</li> </ul>	351	& Francis _eprint: https://doi.org/10.3402/tellusa.v5111.12306) doi: $10.3402/$
<ul> <li><sup>353</sup> Inuang, C. S. I., &amp; Nakamura, N. (2010, January). Local Finite-Amplitude Wave</li> <li><sup>354</sup> Activity as a Diagnostic of Anomalous Weather Events. Journal of the At-</li> <li><sup>355</sup> mospheric Sciences, 73(1), 211–229. Retrieved 2023-03-24, from https://</li> <li><sup>356</sup> journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml</li> <li><sup>357</sup> (Publisher: American Meteorological Society Section: Journal of the Atmo-</li> <li><sup>358</sup> spheric Sciences) doi: 10.1175/JAS-D-15-0194.1</li> </ul>	352	Unong C S V & Nobomuno N (2016 Innioni) I 1 Et damaite 1 W
<ul> <li><sup>354</sup> Activity as a Diagnostic of Anomalous Weather Events. <i>Journal of the At-</i></li> <li><sup>355</sup> mospheric Sciences, 73(1), 211–229. Retrieved 2023-03-24, from https://</li> <li><sup>356</sup> journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml</li> <li><sup>357</sup> (Publisher: American Meteorological Society Section: Journal of the Atmo-</li> <li><sup>358</sup> spheric Sciences) doi: 10.1175/JAS-D-15-0194.1</li> </ul>	353	Activity as a Diagnostic of Anomalous Weather Events Learnal of the At
<ul> <li>journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of the Atmo-</li> <li>spheric Sciences) doi: 10.1175/JAS-D-15-0194.1</li> </ul>	354	mospheric Sciences 72(1) 211-220 Retrieved 2022 03 24 from h++ng.//
(Publisher: American Meteorological Society Section: Journal of the Atmo- spheric Sciences) doi: 10.1175/JAS-D-15-0194.1	356	journals.ametsoc.org/yiew/journals/atsc/73/1/jas-d-15-0194_1_vm]
spheric Sciences) doi: 10.1175/JAS-D-15-0194.1	357	(Publisher: American Meteorological Society Section: Journal of the Atmo-
	358	spheric Sciences) doi: 10.1175/JAS-D-15-0194.1

359	Huang, C. S. Y., & Nakamura, N. (2017). Local wave activity budgets of the win-
360	tertime Northern Hemisphere: Implication for the Pacific and Atlantic storm
361	tracks. Geophysical Research Letters, 44 (11), 5673–5682. Retrieved 2023-03-31,
362	from https://onlinelibrary.wiley.com/doi/abs/10.1002/2017GL073760
363	$(\_eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/2017GL073760)$ doi:
364	10.1002/2017 GL073760
365	Kidson, J. W. (1991, September). Intraseasonal Variations in the Southern Hemi-
366	sphere Circulation. Journal of Climate, $4(9)$ , 939–953. Retrieved 2023-
367	04-16, from https://journals.ametsoc.org/view/journals/clim/4/
368	9/1520-0442_1991_004_0939_ivitsh_2_0_co_2.xml (Publisher: Amer-
369	ican Meteorological Society Section: Journal of Climate) doi: 10.1175/
370	1520-0442(1991)004(0939:1111SH)2.0.00;2
371	Kushner, P. J., & Held, I. M. (1998). A test, using atmospheric data, of a method for estimating according ddy diffusivity.
372	Lettere 25(22) 4213-4216 Botrioved 2023 04 10 from https://
373	$\frac{1}{1000} = \frac{1}{1000} = 1$
375	https://onlinelibrary.wiley.com/doi/pdf/10/1029/1998GL900142
376	10.1029/1998GL900142
377	Leith, C. E. (1973, September). The Standard Error of Time-Average Estimates
378	of Climatic Means. Journal of Applied Meteorology and Climatology, 12(6),
379	1066-1069. Retrieved 2023-04-19, from https://journals.ametsoc.org/
380	view/journals/apme/12/6/1520-0450_1973_012_1066_tseota_2_0_co_2.xml
381	(Publisher: American Meteorological Society Section: Journal of Applied
382	Meteorology and Climatology) doi: $10.1175/1520-0450(1973)012(1066:$
383	TSEOTA $2.0.CO;2$
384	Lorenz, D. J., & Hartmann, D. L. (2001, November). Eddy–Zonal Flow Feedback
385	in the Southern Hemisphere. Journal of the Atmospheric Sciences, $58(21)$ ,
386	3312-3327. Retrieved 2023-03-31, from https://journals.ametsoc.org/
387	(Dublishern American Materralegical Society Section, Journal of the Atmos
388	(Publisher: American Meteorological Society Section: Journal of the Atmo-
389	Spheric Sciences) doi: $10.1173/1520-0409(2001)050(5512.12)FT11/2.0.00,2$
390	ern Hemisphere Storm Tracks and let Streams as Revealed in a Reanaly-
392	sis Dataset. Journal of Climate, 17(9), 1828–1844. Retrieved 2023-04-
393	16. from https://journals.ametsoc.org/view/journals/clim/17/9/
394	1520-0442_2004_017_1828_svitsh_2.0.co_2.xml (Publisher: Ameri-
395	can Meteorological Society Section: Journal of Climate) doi: 10.1175/
396	1520-0442(2004)017(1828:SVITSH)2.0.CO;2
397	Nakamura, N., & Zhu, D. (2010, September). Finite-Amplitude Wave Activity
398	and Diffusive Flux of Potential Vorticity in Eddy–Mean Flow Interaction.
399	Journal of the Atmospheric Sciences, 67(9), 2701–2716. Retrieved 2023-
400	03-24, from https://journals.ametsoc.org/view/journals/atsc/67/9/
401	2010 jas 3432.1.xml (Publisher: American Meteorological Society Section:
402	Journal of the Atmospheric Sciences) doi: 10.11/5/2010JAS3432.1
403	Swanson, K. L., & Pierrehumbert, R. T. (1997, June). Lower-Tropospheric Heat
404	11 ansport in the racine storm 1rack. Journal of the Atmospheric Sciences, 5/(11) 1533-1543 Retrieved 2023 04 10 from https://journal.comet.com
405	$\sigma_{4}(11)$ , 1000-1040. Inconcrete 2020-04-19, Itoll Ittps://journals.ametsoc
407	.co 2.xml (Publisher: American Meteorological Society Section: Jour-
408	nal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1997)054/1533:
409	LTHTIT>2.0.CO:2
410	Thompson, D. W. J., & Barnes, E. A. (2014, February). Periodic Variability in
411	the Large-Scale Southern Hemisphere Atmospheric Circulation. Science,
412	343(6171), 641-645. Retrieved 2023-03-24, from https://www.science.org/
413	doi/10.1126/science.1247660 (Publisher: American Association for the

doi/10.1126/science.1247660 (Publisher: American Association for the

414	Advancement of Science) doi: 10.1126/science.1247660
415	Thompson, D. W. J., Crow, B. R., & Barnes, E. A. (2017, March). Intrasea-
416	sonal Periodicity in the Southern Hemisphere Circulation on Regional Spatial
417	Scales. Journal of the Atmospheric Sciences, 74(3), 865–877. Retrieved 2023-
418	03-31, from https://journals.ametsoc.org/view/journals/atsc/74/3/
419	jas-d-16-0094.1.xml (Publisher: American Meteorological Society Section:
420	Journal of the Atmospheric Sciences) doi: 10.1175/JAS-D-16-0094.1
421	Thompson, D. W. J., & Woodworth, J. D. (2014, April). Barotropic and Baro-
422	clinic Annular Variability in the Southern Hemisphere. Journal of the Atmo-
423	spheric Sciences, 71(4), 1480–1493. Retrieved 2023-03-31, from https://
424	journals.ametsoc.org/view/journals/atsc/71/4/jas-d-13-0185.1.xml
425	(Publisher: American Meteorological Society Section: Journal of the Atmo-
426	spheric Sciences) doi: 10.1175/JAS-D-13-0185.1
427	Trenberth, K. E. (1981). Seasonal variations in global sea level pressure
428	and the total mass of the atmosphere. Journal of Geophysical Research:
429	$O_{ceans.}$ 86(C6), 5238–5246. Retrieved 2023-04-16, from https://
430	onlinelibrary.wiley.com/doi/abs/10.1029/JC086iC06p05238 (eprint:
431	https://onlinelibrary.wiley.com/doi/pdf/10.1029/JC086iC06p05238) doi:
432	10.1029/JC086iC06p05238
122	Trenberth K E (1991 October) Storm Tracks in the Southern Hemisphere
433	<i>Journal of the Atmospheric Sciences</i> 48(19) 2159–2178 Betrieved 2023-
435	04-16 from https://iournals.ametsoc.org/view/iournals/atsc/48/
435	19/1520-0469 1991 048 2159 stitsh 2 0 co 2 xml (Publisher: American
430	Meteorological Society Section: Journal of the Atmospheric Sciences) doi:
438	10.1175/1520-0469(1991)048(2159:STITSH)2.0.CO:2
420	Vitart F Ardilouze C Bonet A Brookshaw A Chen M Codorean C
439	Zhang L (2017 January) The Subseasonal to Seasonal (S2S) Prediction
440	Project Database. Bulletin of the American Meteorological Society, 98(1).
442	163-173. Betrieved 2023-03-31. from https://iournals.ametsoc.org/view/
443	iournals/bams/98/1/bams-d-16-0017.1.xm] (Publisher: American Meteo-
444	rological Society Section: Bulletin of the American Meteorological Society) doi:
445	10.1175/BAMS-D-16-0017.1
446	Wang L. Lu, J. & Kuang Z. (2018) A Robust Increase of the Intraseasonal Peri-
447	odic Behavior of the Precipitation and Eddy Kinetic Energy in a Warming Cli-
448	mate. Geophysical Research Letters, 45(15), 7790–7799. Retrieved 2023-03-24.
449	from https://onlinelibrary.wiley.com/doi/abs/10.1029/2018GL078495
450	(_eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1029/2018GL078495) doi:
451	10.1029/2018GL078495
452	Wang L & Nakamura N (2015) Covariation of finite-amplitude wave ac-
453	tivity and the zonal mean flow in the midlatitude troposphere: 1. The-
454	ory and application to the Southern Hemisphere summer. <i>Geophysi-</i>
455	cal Research Letters, 42(19), 8192–8200. Retrieved 2023-04-16, from
456	https://onlinelibrary.wiley.com/doi/abs/10.1002/2015GL065830
457	(eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/2015GL065830)
458	doi: 10.1002/2015GL065830
459	Wang, L., & Nakamura, N. (2016, December). Covariation of Finite-Amplitude
460	Wave Activity and the Zonal-Mean Flow in the Midlatitude Troposphere.
461	Part II: Eddy Forcing Spectra and the Periodic Behavior in the Southern
462	Hemisphere Summer. Journal of the Atmospheric Sciences, 73(12), 4731–
463	4752. Retrieved 2023-04-22, from https://journals.ametsoc.org/view/
464	journals/atsc/73/12/jas-d-16-0091.1.xml (Publisher: American Me-
465	teorological Society Section: Journal of the Atmospheric Sciences) doi:
466	10.1175/JAS-D-16-0091.1
467	Xue, D., Lu, J., Qian, Y., & Zhang, Y. (2021). Evidence for Coupling Be-
468	tween the Subseasonal Oscillations in the Southern Hemisphere Midlat-

469	itude Ocean and Atmosphere.	Journal of Geophysical Resea	rch: Atmo-
470	spheres, 126(4), e2020JD033872.	Retrieved 2023-03-31, from	https://
471	onlinelibrary.wiley.com/doi/ab	s/10.1029/2020JD033872	(_eprint:
472	https://onlinelibrary.wiley.com/doi/	pdf/10.1029/2020JD033872)	doi:
473	10.1029/2020JD033872		

## Regional Features of the 20-30 Day Periodic Behavior in the Southern Hemisphere Summer Circulation

1

2

3

4

# Zhaoyu Liu<sup>1</sup>, Lei $Wang^1$

 $^1\mathrm{Department}$  of Earth, Atmospheric, and Planetary Sciences, Purdue University

# Key Points: The hemispheric 20-30 day periodicity in the austral summer has a strong localization in local wave activity and precipitation. Strong enhancement of intraseasonal variability and local periodic behavior is identified within the South Pacific. The local nature of 20-30 day periodicity offers a potential source of intraseasonal predictability for weather analysts and forecasters.

Corresponding author: Lei Wang, leiwang@purdue.edu

#### 12 Abstract

The Southern Hemispheric (SH) storm tracks exhibit a robust intraseasonal peri-13 odicity of 20-30 days as the leading mode of zonal-mean eddy kinetic energy. To what 14 extent this hemispheric-scale mode of variability translates to smaller scales remains de-15 bated. This work studies the regional features of SH storm tracks through the filtered 16 variance of local finite-amplitude wave activity. While the synoptic variance is zonally 17 elongated over the storm track, we find a strong enhancement of intraseasonal variabil-18 ity within the South Pacific with a minimum strength of the storm track. This enhanced 19 20 region is marked with 20-30 day periodic behavior of local wave activity and precipitation and is driven by enhanced variability of low-level eddy heat flux on the same timescale. 21 The local nature of 20-30 day periodicity offers a potential source of intraseasonal pre-22 dictability for weather analysts and forecasters. 23

#### <sup>24</sup> Plain Language Summary

Storm activities in Southern Hemisphere (SH) midlatitudes are characterized by 25 20-30 day periodic behavior, representing a hemispheric-scale pulsing of zonal-mean ex-26 tratropical eddy activity. This phenomenon has been termed the Baroclinic Annular Mode 27 (BAM) defined as the leading EOF mode of the zonal-mean eddy kinetic energy. If this 28 large-scale mode were to have a strong local nature, such periodic behavior in subseasonal-29 to-seasonal time scale would have important implications for understanding and predict-30 ing the medium-range weather system, especially for extreme events. However, to what 31 extent we can identify regional features of such hemispheric-scale mode of variability re-32 mains unclear. 33

We demonstrate the regional feature of this periodic variability by showing the vari-34 ance of local wave activity in different time scales. We find that the variability in a shorter 35 weather time scale (2-7 days) exhibits a largely zonally-symmetric structure, but the vari-36 ability in the intraseasonal time scale exhibits a strong localization concentrated in the 37 South Pacific. We further assess the distribution of periodicity within the intraseasonal 38 variability and find that the 20-30 day periodicity is also localized within South Pacific. 39 The local nature of this 20-30 day periodicity indicates the potential utility of the BAM 40 for weather analysts and forecasters. 41

### 42 **1** Introduction

High-quality societal applications for decision-makers for optimizing resource man-43 agement and preventing disaster require accurate sub-seasonal to seasonal (S2S, intrasea-44 sonal) predictions, because high-impact extreme weather events, such as long-lasting heat-45 waves and extreme cold spells, often occur on this timescale. Recent research has iden-46 tified multiple sources of S2S predictability, such as the Madden-Julian oscillation (MJO), 47 the basic state of the ENSO, soil moisture, tropical-extratropical teleconnections, etc (see 48 the review in (Vitart et al., 2017)). However, nearly all of these sources are outside of 49 the midlatitude internal dynamics. This is due to the conventional understanding that 50 the large-scale midlatitude variability is typically consistent with Gaussian red noise rather 51 than periodic behaviors (Feldstein, 2000; Lorenz & Hartmann, 2001). As a 'null hypoth-52 esis,' intraseasonal variability can be considered as a response to stochastic forcing by 53 higher-frequency synoptic system's disturbances (Leith, 1973; Hasselmann, 1976; Green, 54 1977). Assuming synoptic disturbances as Gaussian white noise forcing  $F_t$ , this 'null hy-55 pothesis' suggests the time series of intraseasonal variability  $x_t$  as a Gaussian red noise 56 process  $x_t = \alpha x_{t-1} + F_t$ , where  $\alpha$  is a positive constant defining the e-folding timescale 57 of the intraseasonal variability. Hence, no unique source of predictability on regional scales 58 has been identified within the midlatitude atmosphere beyond the synoptic weather range. 59

Baroclinic Annular Mode (BAM), however, a recently discovered large-scale mid-60 latitude variability over the SH, is characterized by a robust intraseasonal periodicity about 61 20-30 day (Thompson & Barnes, 2014; Thompson & Woodworth, 2014). BAM is defined 62 by the leading empirical orthogonal function (EOF) of the zonal-mean eddy kinetic en-63 ergy (EKE), representing the intraseasonal oscillation of eddy activity on a hemispheric 64 scale. If such periodic nature were to translate to smaller scales at certain regions, it could 65 serve as a new source of S2S predictability. In a regional scale study of BAM, Thompson 66 et al. (2017) find that the periodicity in the upper troposphere eddy kinetic energy is not 67 apparent at a fixed location. As the averaging windows reduce from the entire global cir-68 cle to 30-degree wide regions, the power spectra reduce from a robust quasi-periodic shape 69 to a red noise without any major enhancement of the variance on the 20-30 day frequency 70 range. The discovery of the lack of local periodicity for regions smaller than 30 degrees 71 is explained through a conceptual model featuring out-of-phase anomalies between the 72 upper and lower troposphere. A similar finding was also confirmed in Xue et al. (2021), 73 that the domain should be wide enough to accommodate a wave packet so that the in-74 traseasonal periodicity can be identified. Therefore, as the averaging domain size reduces 75 to smaller scales, periodic behavior at a fixed region is not expected, which is consistent 76 with the above 'null hypothesis.' To what extent such a leading mode of variability is 77 translated to regional scale intraseasonal variability - and thus modulating serial clus-78 tering of extreme weather events - remains an open question. 79

To address this question, we will adopt a filtered variance approach, which has been 80 well-developed to identify the geographic distributions of the storm tracks (Blackmon 81 et al., 1977). Typically, a scalar quantity combining multiple information is preferred, 82 such as the 500 hPa geopotential height field (Z500), which is related to both the wind 83 and temperature. Blackmon et al. (1977) developed this filtered variance framework us-84 ing the Northern Hemisphere (NH) Z500, with the spectral domains separated into syn-85 optic and intraseasonal bands, respectively (also see Blackmon et al. (1984)). Through 86 a similar filtered variance analysis, Trenberth (1981, 1991) studied the SH circulation 87 within synoptic time scales and found that the SH storm tracks exhibit strong zonal sym-88 metry along with a maximum located at the Southern Indian Ocean and a minimum at 89 the South Pacific. Kidson (1991) found a zonal-symmetric pattern for the intraseasonal 90 variability in the SH (see also Hartmann (2015)). Therefore, we aim to make progress 91 on deepening the understanding of the regional features of the intraseasonal variability 92 - a less explored territory. Specifically, we ask: are these regions with enhanced intrasea-93 sonal variance mainly characterized by a Gaussian red-noise spectrum as expected from 94 the 'null hypothesis,' or have certain quasi-periodic behaviors that may be connected with 95 the hemispheric-scale 20-30 day periodic mode of variability? 96

To answer this question, we start with the surface precipitation analysis, a directly 97 measured quantity as a surrogate for the local behavior of storm activities. Then we will 98 quantify the regional variability pattern by applying the filtered variance approach (Blackmon 99 et al., 1977) to key representative variables, including Z500, EKE, and a newly devel-100 oped quantity local wave activity (LWA), as well as the low-level eddy heat flux that drives 101 LWA tendency. This work focuses on Austral summer season (DJF) since the periodic 102 behavior is much more significant in austral summer than other seasons (Wang & Naka-103 mura, 2015). Comparisons to the Northern Hemisphere and with different seasons will 104 be addressed in follow-up studies. The paper is organized as follows. In Section 2, we 105 introduce data and key methodologies such as LWA and filtered variance framework. In 106 Section 3, we first discuss the regional features of surface precipitation and then demon-107 strate the synoptic and intraseasonal variability patterns of different variables associated 108 with spectral analysis. Section 4 concludes with a summary. 109

### <sup>110</sup> 2 Data and Method

We use ECMWF-Interim reanalysis products, including zonal and meridional velocities, air temperature, and geopotential height, with a horizontal resolution  $1.25^{\circ} \times$  $1.25^{\circ}$  and daily resolution from 1979 to 2018. Additionally, the daily precipitation is obtained from the Advanced Microwave Scanning Radiometer(AMSR) - E from 2003 to 2010 processed by a three-day moving average. AMSR-E measures the surface rain rate covering from 70°N-70°S.

The filtered variability approach is based on the standard deviation in the 2-7 day band for synoptic analysis and the 10-45 day band for intraseasonal analysis. The temporal filter is based on Fast Fourier Transform (FFT) with Hanning window from 1 December to 28 February between 1979 and 2018. The framework is applied to Z500, EKE, LWA, and 850hPa eddy heat flux, respectively. EKE is defined as  $((u^*)^2+(v^*)^2)/2$  and is averaged with density weighting along the vertical column. 850hPa eddy heat flux is defined as  $v^*T^*$ , where the asterisks represent the departures from the zonal mean.

Unlike EKE, local finite-amplitude wave activity emphasizes on coherent meandering of the contours of a quasi-conserved quantity. Conserving flow circulation through Kelvin's circulation theorem, the area bounded by the reference quantity contour is the same as the one bounded by the latitude circle. Finite-amplitude wave activity (FAWA, see N. Nakamura and Zhu (2010)) focuses on the total displacement over the entire longitudes, while LWA (see Huang and Nakamura (2016), Chen et al. (2015)) measures the displacement for each longitude, so that a full longitude-latitude pattern of wave activity can be quantified. For example, the field of Z500 can be used to define the local wave activity (Chen et al., 2015):

$$A_{z500}(\phi_e,\lambda,t) = \frac{a}{\cos\phi_e} \left( \int_{z' \ge 0, \phi \le \phi_e, \lambda = const} z' \cos\phi d\phi - \int_{z' \le 0, \phi \ge \phi_e, \lambda = const} z' \cos\phi d\phi \right), \quad (1)$$

where a is the earth radius,  $\phi$ ,  $\lambda$ , represents the latitude and longitude respectively,  $z' = z - Z(\phi_e)$  is the deviation from the reference Z500 contour  $Z(\phi_e)$  at its equivalent latitude  $\phi_e$ . The relation between  $Z(\phi_e)$  and  $\phi_e$  is connected by the same bounded area  $\phi_e(Z) = arcsin[1 - \frac{S(Z)}{2\pi a^2}]$ .

A quasi-geostrophic potential vorticity (QGPV) -based LWA allows one to quantify the role of eddy forcing. Local wave activity at each pseudo-height level can be assessed independently, and the density-weighted vertically averaged value is used to represent the barotropic wave activity. See supplementary material for more details.

### 132 3 Results

We start with analyzing the temporal and spatial features of precipitation, since surface rain rate is a directly measured quantity by space-based meteorological satellites, and is highly correlated with the variability of storm activity. Thompson and Barnes (2014) found that the mid-latitude mean precipitation can also exhibit a significant intraseasonal periodicity around 20-30 days as a key feature of BAM. Is there any localization of such periodic behavior in the precipitation?

To illustrate the regional feature, we calculated the power spectra of surface rain 139 rate retrieved from AMSR-E in four separated regions as shown in Figure 1c:  $0^{\circ}-90^{\circ}E$ , 140  $90^{\circ}$ E-180°,  $180^{\circ}$ -90°W,  $90^{\circ}$ W-0°, all of which are averaged between  $40^{\circ}$ S-50°S, and we 141 find that the most significant 20-30 day periodicity is located at the South Pacific ( $180^{\circ}$ -142 90°W with 95% confidence level), while spectra features in other three regions are mainly 143 characterized by enhanced synoptic variability  $(0^{\circ}-180^{\circ}E)$  or similar to a red-noise  $(90^{\circ}W)$ 144  $0^{\circ}$ ). Thus, there is a localization of the surface rain rate's 20-30 day periodic behavior. 145 Is this localization of rain rate periodicity a coincidence? Or it implies a strong local-146



Figure 1: Power spectra of surface precipitation in austral summer(DJF) from 2002-2010 for (a)zonal-mean, (b)zonal-mean and averaged between 40°S-50°S, (c)regional mean of 0°-90°E, 90°E-180°, 180°-90°W, 90°W-0°, all of which averaged between 40°S-50°S.

ization of the 20-30 day periodic behavior for the underlying large-scale atmospheric cir-culation?

We adopt the filtered variance approach of Blackmon et al. (1977) to quantify the 149 regional features of synoptic and intraseasonal variability, respectively. The variability 150 of Z500 exhibits a more zonally symmetric regional pattern within both synoptic and 151 intraseasonal timescales as consistent with the previous work (see Supplementary Fig-152 ure S1). Centered around 50°S, the synoptic variance is strongest in the South Indian 153 Ocean, while the maximum of intraseasonal variance is zonally elongated over much of 154 the South Pacific. The zonal-mean Z500 field does not show any periodic behavior in the 155 intraseasonal timescales (see Supplementary Figure S2), thus we would not expect any 156 local periodic behavior in the Z500 field. 157

As the variable central to the BAM definition, zonal-mean EKE is characterized 158 by a robust periodic behavior (Thompson & Woodworth, 2014). However, as Thompson 159 et al. (2017) discovered, the periodicity in EKE is not apparent at a fixed location, and 160 we find consistent results that the regional variability is much weaker in the intrasea-161 sonal band at pixel(i.e., grid point) level (see Supplementary Figure S3). Instead, a two-162 branch structure is observed in the intraseasonal variance pattern of EKE, and can be 163 attributed to the intense wave-breaking processes at the South Pacific that generate in-164 tense local values of zonal and meridional velocities, since qualitatively speaking, EKE 165 reaches maximum where the circulation contours are the densest. The two-branch struc-166 ture belongs to the same storm activity region - as the below LWA analysis would illus-167 trate more clearly. 168

Therefore, an accurate diagnostic approach for eddy activity that can illustrate both spatial and temporal features is required to study our key question. As a comparison with Z500 or EKE, the local finite-amplitude wave activity (LWA) provides a more objective



Figure 2: Bandpass-filtered variance converted to standard deviation for Z500\_based LWA (LWA\_Z) in austral summer(DJF): (a)synoptic variability(2-7 days), and (b)intraseasonal variability(10-45 days). The shading represents values between  $0m^2$  and  $1.9 \times 10^7 m^2$ .

approach for the diagnostic of eddy activity. QGPV-based LWA is a conserved quantity 172 and driven by eddy flux terms - each bearing clear physical interpretations, directly rep-173 resenting the pseudo-momentum carried by eddy. Z500-based LWA shares many features 174 of the QGPV-based LWA, and it is more straightforward to calculate. Regarding the spa-175 tial feature, LWA can capture the breaking waves as part of an underlying coherent pat-176 tern (see the comparison between LWA and EKE in Huang and Nakamura (2017)). For 177 example, for a large-scale dipole structure, the maximum value of LWA locates only at 178 the center of the overturning contours of PV (or Z500). In contrast, the maximum val-179 ues of EKE are found at two distinct places - the edge of the upper high-pressure sys-180 tem and the edge of the lower low-pressure system. Regarding the temporal feature, Wang 181 and Nakamura (2015) confirmed that FAWA also exhibits a robust 20-30 day periodic-182 ity, consistent with features of BAM defined by the EOF-based EKE framework. Since 183 zonal-average of LWA naturally conforms to FAWA, LWA has the strength to pinpoint 184 regional features more precisely, and to allow for a direct connection with the hemispheric-185 scale 20-30 day periodic behavior as defined by FAWA. Both the QGPV and Z500 fields 186 can be used to calculate the LWA, with the former directly connected with the eddy fluxes 187 terms and the latter more commonly available among climate model outputs. Our anal-188 ysis confirms that both approaches yield qualitatively consistent results. 189

Figure 2 shows the synoptic and intraseasonal variability pattern of Z500-based LWA 190 in austral summer. The synoptic variability still exhibits a zonally symmetric pattern, 191 with the maximum variance concentrated in the Southeast (SE) Indian Ocean as well 192 as in the SE Atlantic, and the minimum variance in the SE Pacific close to South Amer-193 ica (also see Supplementary Figure S4 for QGPV-based LWA). This result is qualitatively 194 consistent with the pattern shown by the filtered variance of the Z500 field, but further 195 captures a more detailed and coherent structure clearly emphasizing the maximum re-196 gion. Such intensified synoptic variability at the SE Indian Ocean and Atlantic can be 197 largely attributed to the downstream development of baroclinic waves (Berbery & Vera, 198 1996), and therefore the largest synoptic variance is expected to occur closely downstream 199 to the regions of maximum observed baroclinicity, which is located at the Southwest (SW) 200 Indian Ocean and SW Atlantic (the sea surface temperature frontal zones, see H. Naka-201



Figure 3: Power spectra of QGPV-based LWA as functions of longitude and frequency at two representative latitudes 45°S (upper panel) and 55°S (lower panel), respectively.

mura and Shimpo (2004)). The weakened synoptic signal at the South Pacific is associated with the decaying process of extratropical cyclones' lifecycles.

With an ability to capture larger-scale meandering, the filtered variance of Z500-204 based LWA captures the corresponding intraseasonal variability more efficiently than that 205 of the Z500 and EKE field. As shown in Figure 2b, the intraseasonal variance of LWA 206 is near twice its synoptic counterpart. Besides, the intraseasonal pattern is not as zonally-207 elongated as the synoptic variance or the pattern captured by Z500. In contrast, a strong 208 local enhancement is found confined at the South Pacific, largely within 180°-150°W and 209  $50^{\circ}$ S- $60^{\circ}$ S. This region is right at the center between the two branches shown in the in-210 traseasonal pattern of EKE (Supplementary Figure S3b), which demonstrates the ad-211 vantage of LWA in capturing coherent patterns for large-scale eddies. Similarly, the fil-212 tered variance of QGPV-based LWA shows consistent results: a robust intensification 213 of intraseasonal variability at the South Pacific is observed located within 180°-150°W 214 (see Supplementary Figure S4b). Despite the minor difference that the QGPV-based LWA 215 shows a more equatorward intraseasonal pattern, both types of the filtered variance of 216 LWA show a consistent key region of intraseasonal variability of storm activities confined 217 within the South Pacific. 218

With a region of enhanced intraseasonal variance pinned down, we next investigate whether the enhanced frequencies is related to the 20-30 day periodic mode. To zoom into the crucial latitudes where such periodicity is concentrated. Figure 3 shows the power spectra of QGPV-based LWA as the function of longitudes and frequencies at 45°S and 55°S, since Wang and Nakamura (2015) found that the 20-30 day periodic variability mainly dominates the midlatitudes from 40°S-60°S (also see Supplementary Figure S5). Within the intraseasonal domain, the 20-30 day periodicity (0.03-0.05 cpd, bounded by two blue



Figure 4: Bandpass-filtered variance converted to standard deviation for 850hPa eddy heat flux in austral summer(DJF): (a)synoptic variability(2-7 days), and (b)intraseasonal variability(10-45 days). The shading represents values between 0mK/s and 10mK/s.

lines in Figure 3) exhibits a strong localization as hinted by the filtered variance approach. 226 At  $45^{\circ}$ S for example, the strongest 20-30 day frequency band is largely confined between 227  $180^{\circ}$ - $150^{\circ}W$ , overlapping the region where the intrasesonal variance reaches its maximum 228 (shown in Figure 2b). This regional feature of periodicity might slightly vary with dif-229 ferent latitudes, for example the most significant 20-30 day periodicity at  $55^{\circ}$ S exhibits 230 an elongated range covering  $180^{\circ}$ - $100^{\circ}$ W. By and large, all cross sections within mid-231 latitudes demonstrate that the 20-30 day periodicity has a strong regional preference lo-232 cated at the South Pacific. A similar result can be observed if the LWA is meridionally 233 averaged between 40°S-60°S (see Supplementary Figure S6), the 20-30 day periodicity 234 is still strongly localized at the South Pacific, resembling the pattern at individual lat-235 itudes. Note that, in this case, the budget term of meridional eddy momentum flux is 236 removed due to the meridional average, and therefore it can suggests that, the merid-237 ional eddy momentum flux plays a non-dominant role in the intraseasonal variability. The 238 zonal wave flux convergence, as another important budget term of LWA, will not directly 239 impact LWA's intraseasonal variability neither, as the zonal wave flux convergence pri-240 marily populate the synoptic variability of wave activity (Huang & Nakamura, 2017). 241 The cross-section of power spectra for Z500-based LWA shows similar results to the QGPV-242 based LWA, whereas that for EKE does not show robust 20-30 day periodicity (see Sup-243 plementary Figure S7 and S8). 244

What would be a key factor that drives such locally confined intraseasonal vari-245 ability including the 20-30 day periodicity? Wang and Nakamura (2015, 2016) find that 246 eddy forcing due to the low-level eddy heat flux drives the 20-30 day periodicity in zonal-247 mean of LWA (i.e., FAWA). A local enhanced variance of eddy heat flux should be ex-248 pected if this can also translate into regional scales. Figure 4 confirmed this expectation 249 by showing that the intraseasonal variance of 850hPa eddy heat flux is also localized be-250 tween  $180^{\circ}$ - $150^{\circ}W$ , largely overlapping the region where the intraseasonal variance of 251 LWA is strongly enhanced, as shown in Figures 2 and 3. The cross-section power spec-252 tra of 850 hPa eddy heat flux further indicates that the low-level eddy heat flux also ex-253 hibits enhanced 20-30 day periodicity at fixed locations, largely confined within the South 254 Pacific as well (see Supplementary Figure S9). This locally enhanced intraseasonal vari-255 ability of 850hPa eddy heat flux is marked with a strong r.m.s. eddy streamfunction as 256 a surrogate of eddy diffusivity for estimating the horizontal eddy heat flux (Kushner & 257

Held, 1998; Held, 1999). Strong thermal damping over this area reduces linear baroclinic
eddy growth rates (Swanson & Pierrehumbert, 1997). Thus, this sufficient temperature
homogenization in the lower troposphere sustains states neutral to the growth of synoptic eddies but favorable to intraseasonal variability and the associated periodic behavior.

### <sup>263</sup> 4 Conclusion and Discussion

We study the regional features of storm tracks' 20-30 day periodic variability in aus-264 tral summer by applying the filtered variance approach to local wave activity. While the 265 synoptic variance is largely zonally elongated over the storm track, we find a strong lo-266 cal enhancement of intraseasonal variability within the South Pacific with a minimum strength of the storm track. For this region, we find that this enhanced region is marked 268 with local 20-30 day periodic behavior of precipitation and local wave activity whereby 269 rejecting the 'null hypothesis' that intraseasonal variability is nothing more than a red-270 noise response to stochastic forcing by synoptic transients. The local periodicity is driven 271 by enhanced variability of low-level eddy heat flux on the same timescale. The filtered 272 variance of LWA analysis offers insights into the regional features of the coherent and 273 slowly meandering structures of the circulation. 274

Internal modes of variability, such as BAM, result from the deterministic dynam-275 ics of the atmosphere. Thus a translation into regional scales may indicate unique pre-276 dictability beyond the typical weather range. While the fundamental dynamics of BAM 277 remain an open question, it is clear that cross-scale interactions between the synoptic 278 and intraseasonal scales set the regional structure of this internal mode. The local na-279 ture of the 20-30 day periodicity identified by local wave activity provides a potential 280 source of intraseasonal predictability for weather analysts and forecasters. As an inter-281 nal mode that has yet to be tapped for extending the forecast beyond the typical weather 282 range, more work is needed to connect this intraseasonal mode of variability with serial 283 clustering of extreme weather events to quantify this potential regional predictability. 284 In a warming climate, BAM is projected to increase its strength (Wang et al., 2018). A 285 further implication of this work is the question of how the intraseasonal mode of vari-286 ability and the associated regional impacts will evolve as climate changes. With the rapid 287 development of high-resolution Earth system modeling, we are at a crucial era to deepen 288 our understanding of the synoptic-intraseasonal interactions and the associated Earth 289 system's regional variability and predictability. 290

### <sup>291</sup> 5 Data Availability Statement

The authors acknowledge the use of NASA AMSR-E product for precipitation dataset: https://www.earthdata.nasa.gov/sensors/amsr-e, and ERA-Interim reanalysis dataset: https://apps.ecmwf.int/datasets/data/interim-full-daily/. The open repository including codes and related data for plotting key figures in this work is pasted here: https://doi.org/10.5281/zenodo.7855573

### 297 Acknowledgments

<sup>298</sup> The authors acknowledge to NASA for providing AMSR-E precipitation observation and

299 ECMWF for providing ERA-Interim reanalysis dataset.

### 300 References

Berbery, E. H., & Vera, C. S. (1996, February). Characteristics of the South ern Hemisphere Winter Storm Track with Filtered and Unfiltered Data.
 Journal of the Atmospheric Sciences, 53(3), 468–481. Retrieved 2023-04-

<ul> <li>1520-0469.1996.053.0468.cotshv.2.0.co.2.xnl (Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1996)053(0468:COTSHW)2.0.CO;2</li> <li>Blackmon, M. L., Lee, YH., &amp; Wallace, J. M. (1984, March). Horizontal Structure of 500 mb Height Fluctuations with Long. Intermediate and Short Time Scales. Journal of the Atmospheric Sciences, 41(6), 961-980. Retrieved 2023-04-16, from https://journals.ametsoc.org/view/journals/atsc/41/ 6/1520-0469 1984.041.0961.Hsouhf.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469 1984.041.0961.HSOMIFP.20.CO;2</li> <li>Blackmon, M. L., Wallace, J. M., Lau, NC., &amp; Mullen, S. L. (1977, July). An Observational Study of the Northern Hemisphere Wintertime Circulation. Journal of the Atmospheric Sciences, 34(7), 1010–1053. Retrieved 2023-03-31, from https://journals.metsoc.org/view/journals/atsc/34/ 7/1520-0469.1977.034.104.0.asoct.2.o.co.2.xl (Publisher: American Meteorological Society Section: Journal of the Atmospherie Sciences) doi: 10.1175/1520-0469(1977)034.004.03005TN)2.0.CO;2</li> <li>Chen, G., Lu, J., Burrows, D. A., &amp; Leung, L. R. (2015). Local finite-amplitude wave activity as an objective diagnostic of midiatitude extreme weather. Geophysical Research Letters, 42(24), 10,952-10,960. Retrieved 2023-04-24, from https://onlinelibrary.wiley.com/doi/abs/10.1002/2015GL066959 (.eprint: https://onlinelibrary.wiley.com/doi/abs/10.1002/2015GL066959 (.eprint: https://onlinelibrary.wiley.com/doi/abs/10.1002/2015GL066959 (.eprint: https://journals/clim4/13/24/1520-0442, 2000.013,4430.ttpasc.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of Climate) doi: 10.1026/2015GL066959.</li> <li>Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate Noise Properties of Teleconcological Society Section: Journal of Climate). Joi: 10.10175/1520-0442(2000)013(4430:tTPSAC).20.co; 2</li> <li>Gree</li></ul>	304	16, from https://journals.ametsoc.org/view/journals/atsc/53/3/
<ul> <li>Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1996)053(0468:COTSHW)2.0.CO;2</li> <li>Blackmon, M. L., Lee, YH., &amp; Wallace, J. M. (1984, March). Horizontal Structure of 500 mb Height Fluctuations with Long, Intermediate and Short Time Scales. Journal of the Atmospheric Sciences, 14(6), 961–980. Retrieved 2023-0416, from https://journals.ametsoc.org/view/journals/atsc/41/6/1520-0469(1984)041(0961.HSOMHF)2.0.CO;2</li> <li>Blackmon, M. L., Wallace, J. M., Lau, NC., &amp; Mullen, S. L. (1977, July). An Observational Study of the Northern Hemisphere Wintertime Circulation. Journal of the Atmospheric Sciences, 34(7), 1040–1053. Retrieved 2023-033,1, from https://journals.ametsoc.org/view/journals/atsc/34/7/1520-0469(1977)034.1040.aosotn.2.0.co.2.xnl (Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1977)034(1040.AOSOTN)2.0.CO;2</li> <li>Chen, G., Lu, J., Burrows, D. A., &amp; Leung, L. R. (2015). Local finite-amplitude wave activity as an objection: Journal of the Atmospherie Sciences) doi: 10.1175/1520-0469(1977)034(1040.AOSOTN)2.0.CO;2</li> <li>Chen, G., Lu, J., Burrows, D. A., &amp; Leung, L. R. (2015). Local finite-amplitude wave activity as an objective diagnostic of midlatitude extreme weather. Geophysical Research Letters, 42(24), 10,952-10,960. Retrieved 2023-03-24, from https://onlinelibrary.wiley.com/doi/pdf/10.1002/2015GL066959</li> <li>Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate Noise Properties of Teleconnection Patterns. Journal of Climate, 13(24), 4430-4440. Retrieved 2023-03-24, 2000.013.4430.ttpsac.2, o. co. 2.ml</li> <li>Fudstein, S. B. (2000) Retrieved 2023-04:19, from https://journals.ametsoc.org/</li> <li>view/journals.climative/aluly19476: Some Dynamical Considerations of the Drought. Weather, 32(4), 120-126. Retrieved 2023-04:19, from https://journals.ametsoc.org/</li> <li>view/journals.climaty.viley.com/doi/pdf/10.1002</li></ul>	305	1520-0469_1996_053_0468_cotshw_2_0_co_2.xml (Publisher: American
<ul> <li>10.1175/1520-0469(1996)053(0468:COTSHW)2.0.CC;2</li> <li>Blackmon, M. L., Lee, Y. H., &amp; Walkace, J. M. (1984, March). Horizontal Structure of 500 mb Height Fluctuations with Long, Intermediate and Short Time Scales. Journal of the Atmospheric Sciences, 41(6), 961-980. Retrieved 2023-04-16, from https://journals.ametsoc.org/view/journals/atsc/41/</li> <li>6/1520-0469(1984.041.0961.hsonhf.2.0.co.2.xnl (Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1984)041(0961:HSOMHF)2.0.CO;2</li> <li>Blackmon, M. L., Wallace, J. M., Lau, NC., &amp; Mullen, S. L. (1977, July). An Observational Study of the Northern Hemisphere Wintertime Circulation. Journal of the Atmospheric Sciences, 34(7), 1040-1053. Retrieved 2023-03-31, from https://journals.ametsoc.org/view/journals/atsc/34/</li> <li>7/1520-0469(1977)04(040.acostn.2.oc.oc.x.nl (Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1977)034(1040-AOSOTN)2.0.CO;2</li> <li>Chen, G., Lu, J., Burrows, D. A., &amp; Leung, L. R. (2015). Local finite-amplitude wave activity as an objective diagnostic of midlatitude extreme weather. Geophysical Research Letters. Journal of Zinate (223-03-24, from https://onlinelibrary.wiley.com/doi/pdf/10.1002/2015GL066959 (.eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/2015GL066959 (.eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/2015GL066959 (.eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/2015GL066959 (.eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/2015GL066959 (.eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/314430.ttpsac.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of Climate 13(24), 4430-4440. Retrieved 2023-04-32, 40: 10.1002/j.1477-8696.1977. tb04532.x doi: 10.1012/j.1477-8696.1977.tb04532.x doi: 10.1012/j.1477-8696.1977.tb04532.x doi: 10.1002/j.1477-8696.1977.tb04532.x doi: 10.1002/j.1477-8696.1977.tb04532.x doi: 10.1</li></ul>	306	Meteorological Society Section: Journal of the Atmospheric Sciences) doi:
<ul> <li>Blackmon, M. L., Lee, YH., &amp; Wallace, J. M. (1984, March). Horizontal Structure of 500 mb Height Fluctuations with Long, Intermediate and Short Time Scales. Journal of the Atmospheric Sciences, 41(6), 961–980. Retrieved 2023-04-16, from https://journals.ametsoc.org/view/journals/atsc/41/</li> <li>6/1520-0469-1984.041.0961.hsonhf.2.0.co.2. xml (Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469.1984.041.0961.HSOMHEP2.0.CO;2</li> <li>Blackmon, M. L., Wallace, J. M., Lau, NC., &amp; Mullen, S. L. (1977, July). An Observational Study of the Northern Hemisphere Winterline Circulation. Journal of the Atmospheric Sciences, 34(7), 1040-1053. Retrieved 2023-09-31, from https://journals.ametsoc.org/view/journals/atsc/34/</li> <li>7/1520-0469.1977.034.1040.asostn.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1977)034(1040:AOSOTN)2.0.CO;2</li> <li>Chen, G., Lu, J., Burrows, D. A., &amp; Leung, L. R. (2015). Local finite-amplitude wave activity as an objective diagnostic of midlattinde extreme weather. Geophysical Research Letters, 42(24), 10.952–10.960. Retrieved 2023-03-24, from https://onlinelibrary.wiley.com/doi/pdf/10.1002/2015GL066959) doi: 10.1002/2015GL066959</li> <li>Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate Noise Properties of Teleconnection Patterns. Journal of Climate, 13(24), 4430-4440. Retrieved 2023-03-31, from https://journals.ametsoc.org/ view/journals/clim/13/24/1520-0469.1977.b043/24/22000.013.4430.ttpsac.2.0.co.2.xml</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Considerations of the Drought. Weather, 32(4), 120-126. Retrieved 2023-04-19, from https://journals/ats/24/22000.013(4403.TFPSAC)2.0.CO;2</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Considerations of the Drought. Weather, 32(4), 120-126. Retrieved 2023-04-19, from https://</li></ul>	307	10.1175/1520-0469(1996)053(0468:COTSHW)2.0.CO;2
<ul> <li>ture of 500 mb Height Fluctuations with Long, Intermediate and Short Time Scales. Journal of the Atmospheric Sciences, 41 (6), 961–980. Retrieved 2023-04-16, from https://journals.ametsoc.org/view/journals/atsc/41/</li> <li>6/1520-0469_1984_041_0961_hsonhf_2_0_co_2_xml</li> <li>Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1984)041(0961:HSOMHF)2_0.CO;2</li> <li>Blackmon, M. L., Wallace, J. M., Lau, NC., &amp; Mullen, S. L. (1977, July). An Observational Study of the Northern Hemisphere Wintertime Circulation. Journal of the Atmospheric Sciences, 34 (7), 1040–1053. Retrieved 2023- 03-31, from https://journals.ametscc.org/view/journals/atsc/34/</li> <li>7/1520-0469_1977_034_1040_aosotn_2_o.co_2_xml</li> <li>(Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1977)034(1040:AOSOTN)2.0.CO;2</li> <li>Chen, G., Lu, J., Burrows, D. A., &amp; Leung, L. R. (2015). Local finite-amplitude wave activity as an objective diagnostic of midlatitude extreme weather. Geophysical Research Letters, 42(24), 10.952-10.960. Retrieved 2023-03-24, from https://onlinelibrary.wiley.com/doi/pdf/10.1002/2015GL066959</li> <li>Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate Noise Properties of Teleconnection Patterns. Journal of Climate, J3(24), 430-4440. Retrieved 2023-03.1, from https://journals.ametsoc.org/ view/journals/clim/13/24/1520-0442.2000.013.4430.ttpsac_2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of Climate) doi: 10.1175/1520-0442(2000)018(4430:TTPSAC)2.0.CO;2</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Consider- ations of the Drought. Weather, 32(4), 120-126. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8666.1977</li> <li>tb04532.x (.eprint: https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8666.1977</li> <li>tb04532.x (.eprin</li></ul>	308	Blackmon, M. L., Lee, YH., & Wallace, J. M. (1984, March). Horizontal Struc-
<ul> <li>Scales. Journal of the Atmospheric Sciences, 41(6), 961-980. Retrieved 2023-04-16, from https://journals.ametsoc.org/view/journals/ats/ats/41/</li> <li>6/1520-0469.1984.041.0961.hsonhf.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1984)041(0961:HSOMHF)2.0.CO;2</li> <li>Blackmon, M. L., Wallace, J. M., Lau, NC., &amp; Mullen, S. L. (1977, July). An Observational Study of the Northern Hemisphere Wintertime Circulation. <i>Journal of the Atmospheric Sciences</i>, 3(7), 1040-1053. Retrieved 2023- 03-31, from https://journals.ametsoc.org/view/journals/atsc/34/</li> <li>7/1520-0469(1977)034(1040.aosotn.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1977)034(1040:AOSOTN)2.0.CO;2</li> <li>Chen, G., Lu, J., Burrows, D. A., &amp; Leung, L. R. (2015). Local finite-amplitude wave activity as an objective diagnostic of midlatitude extreme weather. <i>Geophysical Research Letters</i>, 42(24), 10.952–10.960. Retrieved 2023-03-24, from https://onlinelibrary.wiley.com/doi/pdf/10.1002/2015GL066959</li> <li>Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate Noise Properties of Teleconnection Patterns. Journal of Climate, 13(24), 430-4440. Retrieved 2023-03.1, from https://journals.ametsoc.org/ view/journals/clim/13/24/1520-0442.2000.013.4430.ttpsac.2.0.co.2.xml</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Consider- ations of the Drought. Weather, 32(4), 120-126. Retrieved 2023-04-19, from https://olinelibrary.viley.com/doi/abs/10.1002/j.1477- 8696.1977.tb04532.x (.eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477- 8696.1977.tb04532.x (.eprint: https://olinelibrary.wiley.com/doi/pdf/10.1002/j.1477- 8696.1977.tb04532.x (.eprint: https://olinelibrary.</li> <li>Hastmann, D. L. (2015). Global Physical Climatology: Second Edition (2nd ed ed.). Kent: Elsevier Science &amp; Technology. Retr</li></ul>	309	ture of 500 mb Height Fluctuations with Long, Intermediate and Short Time
<ul> <li>2023-04-16, from https://journals.ametsoc.org/view/journals/ats/24/1</li> <li>6/1520-0469-1984.041.0961.hsomh7.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1984)041(0961:HSOMHF)2.0.CO;2</li> <li>Blackmon, M. L., Wallace, J. M., Lau, NC., &amp; Mullen, S. L. (1977, July). An Observational Study of the Northern Hemisphere Wintertime Circulation. Journal of the Atmospheric Sciences, 34(7), 1040-1053. Retrieved 2023-03-31, from https://journals.ametsoc.org/view/journals/ats/34/</li> <li>7/1520-0469.1977.034.1040.aosotn.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1977)034(1040:AOSOTN)2.0.CO;2</li> <li>Chen, G., Lu, J., Burrows, D. A., &amp; Leung, L. R. (2015). Local finite-amplitude wave activity as an objective diagnostic of midlatitude extreme weather. Geophysical Research Letters, 42(24), 10.952-10.960. Retrieved 2023-03-24, from https://ollinelibrary.wiley.com/doi/pdf/10.1002/2015GL066959</li> <li>Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate Noise Properties of Teleconnection Patterns. Journal of Climate, 13(24), 4430-4440. Retrieved 2023-03-31, from https://journals.ametsoc.org/view/journals/at/24/1520-0442.200.013.4430.ttpsac.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of Climate) doi: 10.1175/1520-0442(2000)013(4430:TTPSAC)2.0.CO;2</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Considerations of the Drought. Weather, 32(4), 120-126. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8666.1977.tb04532.x (c.print: https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977.tb04532.x (c.print: https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977.tb04532.x (c.print: https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977.tb04532.x (c.print: https://onlinelibrary.wiley.com/doi/</li></ul>	310	Scales. Journal of the Atmospheric Sciences, $41(6)$ , 961–980. Retrieved
<ul> <li>6/1520-0469.1984.041.0961.hsomhf.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1984)041(0961:HSOMHF)2.0.CO;2</li> <li>Blackmon, M. L., Wallace, J. M., Lau, NC., &amp; Mullen, S. L. (1977, July). An Observational Study of the Northern Hemisphere Wintertime Circulation. Journal of the Atmospheric Sciences, 34(7), 1040-1053. Retrieved 2023-03-31, from https://journals.metsoc.org/view/journals/atsc/34/ 7/1520-0469(1977)034(1040.aostn.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1977)034(1040:AOStOTN)2.0.CO;2</li> <li>Chen, G., Lu, J., Burrows, D. A., &amp; Leung, L. R. (2015). Local finite-amplitude wave activity as an objective diagnostic of midlatitude extreme weather. Geophysical Research Letters, 42(24), 10.952-10.960. Retrieved 2003-03-24, from https://onlinelibrary.wiley.com/doi/pdf/10.1002/2015GL066959</li> <li>Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate Noise Properties of Teleconnection Patterns. Journal of Climate, 13(24), 4430-4440. Retrieved 2023-003-31, from https://journals.ametosc.org/ view/journals/clim/13/24/1520-0442, 2000.013.4430.ttpsac.2.0.co.2.xml</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Considerations of the Drought. Weather, 32(4), 120-126. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977. tb04532.x. dc:in: 1.1002/j.1477-8696.1977.tb04532.x. dc:in: 1.0102/j.1477-8696.1977.tb04532.x.</li> <li>Hartmann, D. L. (2015). Global Physical Cimatology: Second Edition (2nd ed ed.). Kent: Elsevice Science &amp; Technology. Retrieved 2023-04-19, from https://public.ebookcentral.proquest.com/choice/publicfullrecord .aspx7p=5754480 (OCLC: 109348114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. Telhas, 28(6), 473-485. Retrieved 2023-04-19, from https://olinelibrary.wiley.com/doi/pdf/</li></ul>	311	2023-04-16, from https://journals.ametsoc.org/view/journals/atsc/41/
<ul> <li>Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1984)041(0961:HSOMIF)2.0.CO;2</li> <li>Blackmon, M. L., Wallace, J. M., Lau, NC., &amp; Mullen, S. L. (1977, July). An Observational Study of the Northern Hemisphere Wintertime Circulation. <i>Journal of the Atmospheric Sciences</i>, 34(7), 1040–1053. Retrieved 2023- 03-31, from https://journals.ametsoc.org/view/journals/atsc/34/ 7/1520-0469.1977.034.1040.acsotn.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1977)034(1040-AOSOTN)2.0.CO;2</li> <li>Chen, G., Lu, J., Burrows, D. A., &amp; Leung, L. R. (2015). Local finite-amplitude wave activity as an objective diagnostic of midlatitude extreme weather. <i>Geophysical Research Letters</i>, 42(24), 10,952–10,960. Retrieved 2023-03-24, from https://onlinelibrary.wiley.com/doi/abs/10.1002/2015GL066959</li> <li>Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate Noise Properties of Teleconnetion Patterns. <i>Journal of Climate</i>, 13(24), 4430–4440. Retrieved 2023-03-31, from https://journals.ametsoc.org/ view/journals/clim/13/24/1520-0442/2000.013.4430.ttpsac.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of Climate) doi: 10.1175/1520-0442(2000)013(4430:TTPSAC)2.0.CO;2</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Consider- ations of the Drought. <i>Weather</i>, 32(4), 120–126. Retrieved 2023-04-19, from https://joulinelibrary.wiley.com/doi/pdf/10.1002/j.1477- 8096.1977.tb04532.x (acjint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477- 8096.1977.tb04532.x (acjint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477- 8096.1977.tb04532.x (acjint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477- 8096.1977.tb04532.x (acjint: https://alimate/j.sci/adulos/j.scom/doi/j.df/10.1111/j.2153-3490.1976.tb00696.x (epinit: https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477- 8096.6977.tb04532.x</li> <li< td=""><td>312</td><td>6/1520-0469_1984_041_0961_hsomhf_2_0_co_2.xml (Publisher: American</td></li<></ul>	312	6/1520-0469_1984_041_0961_hsomhf_2_0_co_2.xml (Publisher: American
<ul> <li>10.1175/1520-0469(1984)041(0961:HSOMHF)2.0.CO;2</li> <li>Blackmon, M. L., Wallace, J. M., Lau, NC., &amp; Mullen, S. L. (1977, July). An Observational Study of the Northern Hemisphere Wintertime Circulation. Journal of the Atmospheric Sciences, 34(7), 1040-1053. Retrieved 2023-03-31, from https://journals.ametsoc.org/view/journals/atsc/34/</li> <li>7/1520-0469(1977)034(1040.aostn 2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1977)034(1040:AOSOTN)2.0.CO;2</li> <li>Chen, G., Lu, J., Burrows, D. A., &amp; Leung, L. R. (2015). Local finite-amplitude wave activity as an objective diagnostic of midlatitude extreme weather. Geophysical Research Letters, 42(24), 10.952-10.960. Retrieved 2023-03-24, from https://onlinelibrary.wiley.com/doi/abs/10.1002/2015GL066959</li> <li>(.eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/2015GL066959) doi: 10.1002/2015GL066959</li> <li>Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate Noise Properties of Teleconnection Patterns. Journal of Climate, 13(24), 4430-4440. Retrieved 2023-03-31, from https://journals.ametsoc.org/</li> <li>view/journals/clim/13/24/1520-0442.2000.013.4430.ttpsac2.0.co.2.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of Climate) doi: 10.1175/1520-0442(2000)013(4430:TTPSAC).2.0.CO;2</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Considerations of the Drought. Weather, 32(4), 120-126. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477-8696.1977tb04532.x (.eprint: https://onlinelibrary.elley.com/doi/pdf/10.1002/j.1477-8696.1977tb04532.x (.eprint: https://onlinelibrary.01.002/j.1477-8696.1977.</li> <li>Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-19, from https://public.ebookcentral.proquest.com/choice/publicfullrecord .aspx?p=5754480 (OCLC: 1099348114)</li> <li>Hasselmann, K. (1976). Stochastic climate</li></ul>	313	Meteorological Society Section: Journal of the Atmospheric Sciences) doi:
<ul> <li>Blackmon, M. L., Wallace, J. M., Lau, NC., &amp; Mullen, S. L. (1977, July). An Observational Study of the Northern Hemisphere Wintertime Circulation. <i>Journal of the Atmospheric Sciences</i>, 34(7), 1040–1053. Retrieved 2023- 03-31, from https://journals.ametsoc.org/view/journals/atsc/34/ 7/1520-0469/1977.034.1040.aosotn.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1977)034(1040:AOSOTN)2.0.CO;2</li> <li>Chen, G., Lu, J., Burrows, D. A., &amp; Leung, L. R. (2015). Local finite-amplitude wave activity as an objective diagnostic of midlatitude extreme weather. <i>Geophysical Research Letters</i>, 42(24), 10.952–10.960. Retrieved 2023-03-24, from https://onlinelibrary.wiley.com/doi/abs/10.1002/2015GL066959 doi: 10.1002/2015GL066959</li> <li>Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate Noise Properties of Teleconnection Patterns. <i>Journal of Climate</i>, 13(24), 4430–4440. Retrieved 2023-03-31, from https://journals.ametsoc.org/ view/journals/clim/13/24/1520-0442.2000.013.4430.ttpsac.2.0.co.2.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of Climate) doi: 10.1175/1520-0442(2000)013(4430:TTPSAC)2.0.CO;2</li> <li>Green, J. S. A. (1977). The Weather Juring July 1976: Some Dynamical Consider- ations of the Drought. <i>Weather</i>, 32(4), 120–126. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977. tb04532.x (.eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477- 8696.1977.tb04532.x) doi: 10.1002/j.1477-8696.1977.tb04532.x</li> <li>Hartmann, D. L. (2015). Global Physical Climatology: Second Edition (2nd ed ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-16, from https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. <i>Tellus</i>, 28(6), 473–485. Retrieved 2023-04-19, from https://oliinelibrary</li> <li>Maselm</li></ul>	314	10.1175/1520-0469(1984)041(0961:HSOMHF)2.0.CO;2
<ul> <li>Observational Study of the Northern Hemisphere Wintertime Circulation. Journal of the Atmospheric Sciences, 34(7), 1040–1053. Retrieved 2023- 03-31, from https://journals.metsoc.org/view/journals/atsc/34/ 7/1520-0469,1977.034.1040.aosotn.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1977)034(1040.AOSOTN)2.0.CO;2</li> <li>Chen, G., Lu, J., Burrows, D. A., &amp; Leung, L. R. (2015). Local finite-amplitude wave activity as an objective diagnostic of midlatitude extreme weather. <i>Geophysical Research Letters</i>, 42(24), 10.952–10.960. Retrieved 2023-03-24, from https://onlinelibrary.wiley.com/doi/abs/10.1002/2015GL066959</li> <li>(eprint: https://onlinelibrary.wiley.com/doi/abs/10.1002/2015GL066959</li> <li>Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate Noise Properties of Teleconnection Patterns. Journal of Climate, 13(24), 4430–4440. Retrieved 2023-03-31, from https://journals.ametsco.org/</li> <li>view/journals/clim/13/24/1520-0442.2000.013.4430.ttpsac.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of Climate) doi: 10.1175/1520-0442(2000)013(4430:TTPSAC)2.0.C0;2</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Consider- ations of the Drought. Weather, 32(4), 120–126. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477- 8696.1977.tb04532.x doi: 10.1002/j.1477-8696.1977.tb04532.x</li> <li>Hartmann, D. L. (2015). Global Physical Climatology: Second Edition (2nd ed ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-16, from https://public.ebookcentral.proquest.com/chice/publicfullrecord .aspx?p=5754480 (OCLC: 1099348114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. Tellus, 28(6), 473-485. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x</li> <li>deid, I. M. (1199, January). The macroturbulence o</li></ul>	315	Blackmon, M. L., Wallace, J. M., Lau, NC., & Mullen, S. L. (1977, July). An
Journal of the Atmospheric Sciences, 34(7), 1040–1053. Retrieved 2023- 03-31, from https://journals.ametsoc.org/view/journals/atsc/34/ 7/1520-0469/1977.034.1040_aosotn.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1977)034(1040:AOSOTN)2.0.CO;2 Chen, G., Lu, J., Burrows, D. A., & Leung, L. R. (2015). Local finite-amplitude wave activity as an objective diagnostic of midlatitude extreme weather. <i>Geophysical Research Letters</i> , 42(24), 10,952–10,960. Retrieved 2023-03-24, from https://onlinelibrary.wiley.com/doi/abs/10.1002/2015GL066959 (.eprint: https://onlinelibrary.wiley.com/doi/abs/10.1002/2015GL066959 io.10.1002/2015GL066959 Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate Noise Properties of Teleconnection Patterns. <i>Journal of Climate</i> , 13(24), 4430–4440. Retrieved 2023-03-31, from https://journals.ametsoc.org/ view/journals/clim/13/24/1520-0442.2000.013.4430_ttpsac.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of Climate) doi: 10.1175/1520-0442(2000)013(4430.TTPSAC)2.0.CO;2 Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Consider- ations of the Drought. <i>Weather</i> , 32(4), 120–126. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-866.1977 .tb04532.x (ceprint: https://olimelibrary.wiley.com/doi/pdf/10.1002/j.1477- 8696.1977.tb04532.x) doi: 10.1002/j.1477-8696.1977.tb04532.x Hartmann, D. L. (2015). <i>Global Physical Climatology: Second Edition</i> (2nd ed ed.). Kent: Elsevier Science & Technology. Retrieved 2023-04-16, from https://polisks/10.1111/j.2153-3490.1976.tb00696.x (ceprint: https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x Held, I. M. (1997). Stochastic climate models Part I. Theory. <i>Tellus</i> , 28(6), 473–485. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x doi: 10.1111/j.2153-3490.1976.tb00696.x Held, I. M. (1999, January). The macroturbule	316	Observational Study of the Northern Hemisphere Wintertime Circulation.
<ul> <li>03-31, from https://journals.ametsoc.org/view/journals/atsc/34/</li> <li>7/1520-0469/1977.034.1040.aosotn.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1977)034(1040:AOSOTN)2.0.CO;2</li> <li>Chen, G., Lu, J., Burrows, D. A., &amp; Leung, L. R. (2015). Local finite-amplitude wave activity as an objective diagnostic of midlatitude extreme weather. <i>Geophysical Research Letters</i>, 42(24), 10.952-10.960. Retrieved 2023-03-24, from https://onlinelibrary.wiley.com/doi/abs/10.1002/2015GL066959</li> <li>Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate Noise Properties of Teleconnection Patterns. <i>Journal of Climate</i>, 13(24), 4430-4440. Retrieved 2023-03-31, from https://journals.ametsoc.org/view/journals/clim/13/24/1520-0442.2000.013.4430.ttpsac.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of Climate, 13(24), 10.1175/1520-0442(2000)013(4430:TTPSAC)2.0.CO;2</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Considerations of the Drought. <i>Weather</i>, 32(4), 120-126. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477-8696.1977.tb04532.x (.eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477-8696.1977.tb04532.x (.eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477-8696.1977.tb04532.x) doi: 10.1002/j.1477-8696.1977.tb04532.x</li> <li>Hartmann, D. L. (2015). <i>Global Physical Climatology: Second Edition</i> (2nd ed ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-18, from https://public.ebookcentral.proquest.com/choice/publicfullrecord .aspx7p=5754480 (OCLC: 1099348114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. <i>Tellus</i>, 28(6), 473-485. Retrieved 2023-04-19, from https://olinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. <i>Tellus A: Dynamic Meteorol</i></li></ul>	317	Journal of the Atmospheric Sciences, $34(7)$ , 1040–1053. Retrieved 2023-
<ul> <li>7/1520-0469.1977.034.1040.aosotn.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1977)034(1040:AOSOTN)2.0.CO;2</li> <li>Chen, G., Lu, J., Burrows, D. A., &amp; Leung, L. R. (2015). Local finite-amplitude wave activity as an objective diagnostic of midlatitude extreme weather. <i>Geophysical Research Letters</i>, 42(24), 10.952–10.960. Retrieved 2023-03-24, from https://onlinelibrary.wiley.com/doi/abs/10.1002/2015GL066959</li> <li>Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate Noise Properties of Teleconnection Patterns. <i>Journal of Climate</i>, 13(24), 4430-4440. Retrieved 2023-03-31, from https://journals.ametsco.org/ view/journals/clim/13/24/1520-0442.2000.013.4430.ttpsac.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of Climate, doi: 10.1175/1520-0442(2000)013(4430:TTPSAC)2.0.CO;2</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Consider- ations of the Drought. <i>Weather</i>, 32(4), 120-126. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477- 8696.1977.tb04532.x) doi: 10.1002/j.1477-8696.1977.tb04532.x</li> <li>Hartmann, D. L. (2015). <i>Global Physical Climatology: Second Edition</i> (2nd ed ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-16, from https://public.ebookcentral.proquest.com/choice/publicfullrecord aspx?p=5754480 (OCLC: 1099348114)</li> <li>Haselmann, K. (1976). Stochastic climate models Part I. Theory. <i>Tellus</i>, 28(6), 473-485. Retrieved 2023-04-19, from https://olinelibrary.</li> <li>#16d, I. M. (1996).Ja9710.3402/tellusa.v5111.12306 (Dublesher: Mariet Arospheric Sciences, 73(1), 211-229. Retrieved 2023-04-24, from https://olinelibrary.</li> <li>#16d, I. M. (1999, January). The macroturbulence of the troposphere. <i>Tellus A: Dynamic Meteorology and Occanography</i>, 51(1), 59-70. Retrieved 2023-04-19, from https://doi.org/10.3402/tellusa.v5111.12306 doi: 10.3402/ tellusa.v</li></ul>	318	03-31, from https://journals.ametsoc.org/view/journals/atsc/34/
<ul> <li>Meteorological Society Section: Journal of the Atmospheric Sciences) doi:</li> <li>10.1175/1520-0469(1977)034(1040:AOSOTN)2.0.CO;2</li> <li>Chen, G., Lu, J., Burrows, D. A., &amp; Leung, L. R. (2015). Local finite-amplitude wave activity as an objective diagnostic of midlatitude extreme weather.</li> <li><i>Geophysical Research Letters</i>, 42(24), 10,952-10,960. Retrieved 2023-03-24, from https://onlinelibrary.wiley.com/doi/abs/10.1002/2015GL066959</li> <li>Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate Noise Properties of Teleconnection Patterns. Journal of Climate, 13(24), 4430-4440. Retrieved 2023-03-31, from https://journals.ametsoc.org/view/journals/clim/13/24/1520-0442.2000.013.4430.ttpsac.2.0.co.2.ml</li> <li>(Publisher: American Meteorological Society Section: Journal of Climate) doi: 10.1175/1520-0442(2000)013(4430:TTPSAC)2.0.CO;2</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Considerations of the Drought. Weather, 32(4), 120-126. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977.tb04532.x)</li> <li>Hartmann, D. L. (2015). Global Physical Climatology: Second Edition (2nd ed ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-16, from https://public.ebookcentral.proquest.com/choice/publicfullrecord .spx?p=5754480 (OCLC: 109938114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. Tellus, 28(6), 473-485. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A: Dynamic Meteorology and Occanography, 51(1), 59-70. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A: Dynamic Meteorology and Occanography, 51(1), 59-70. Retrieved 2023-04-19, from https://oli.org/10.3</li></ul>	319	7/1520-0469_1977_034_1040_aosotn_2_0_co_2.xml (Publisher: American
<ul> <li>10.1175/1520-0469(1977)034(1040:AOSOTN)2.0.CO;2</li> <li>Chen, G., Lu, J., Burrows, D. A., &amp; Leung, L. R. (2015). Local finite-amplitude wave activity as an objective diagnostic of midlatitude extreme weather. <i>Geophysical Research Letters</i>, 42(24), 10,952–10,960. Retrieved 2023-03-24, from https://onlinelibrary.wiley.com/doi/abs/10.1002/2015GL066959</li> <li>Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate Noise Properties of Teleconnection Patterns. <i>Journal of Climate</i>, 13(24), 4430–4440. Retrieved 2023-03-31, from https://journals.ametsoc.org/view/journals/clim/13/24/1520-0442.2000.013.4430.ttpsac_2.0.co.2.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of Climate) doi: 10.1175/1520-0442(2000)013(4430:TTPSAC)2.0.CO;2</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Considerations of the Drought. <i>Weather</i>, 32(4), 120-126. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477-8696.1977.tb04532.x</li> <li>Hartmann, D. L. (2015). <i>Global Physical Climatology: Second Edition</i> (2nd ed ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-16, from https://public.ebookcentral.proquest.com/choice/publicfullrecord .aspx?p=5754480 (OCLC: 1099348114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. <i>Tellus</i>, 28(6), 473-485. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. <i>Tellus A: Dynamic Meteorolog and Oceanography</i>, 51(1), 59-70. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2163-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. <i>Tellus A: Dynamic Meteorology and Oceanography</i>, 51(1), 59-70. Retrieved 2023-04-19, from https://doi.org/10.3402/tellusa.v5111.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). L</li></ul>	320	Meteorological Society Section: Journal of the Atmospheric Sciences) doi:
<ul> <li>Chen, G., Lu, J., Burrows, D. A., &amp; Leung, L. R. (2015). Local finite-amplitude wave activity as an objective diagnostic of midlatitude extreme weather. <i>Geophysical Research Letters</i>, 42(24), 10,952–10,960. Retrieved 2023-03-24, from https://onlinelibrary.wiley.com/doi/abs/10.1002/2015GL066959</li> <li>[London 2015GL066959</li> <li>Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate Noise Properties of Teleconnection Patterns. <i>Journal of Climate</i>, 13(24), 4430–4440. Retrieved 2023-03-31, from https://journals.ametsoc.org/ view/journals/clim/13/24/1520–0442.2000.013.44430.ttpsac.2.0.co.2.xm</li> <li>(Publisher: American Meteorological Society Section: Journal of Climate) doi: 10.1175/1520-0442(2000)013(4430:TTPSAC)2.0.CO;2</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Consider- ations of the Drought. <i>Weather</i>, 32(4), 120–126. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977 .tb04532.x (ceprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477- 8696.1977.tb04532.x) doi: 10.1002/j.1477-8696.1977.tb04532.x</li> <li>Hartmann, D. L. (2015). <i>Global Physical Climatology: Second Edition</i> (2nd ed ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-16, from https://public.ebookcentral.proquest.com/choice/publicfullrecord aspx?p=5754480 (OCLC: 109348114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. <i>Tellus</i>, 28(6), 473–485. Retrieved 2023-04-19, from https://onlinelibrary .wiley.com/doi/abs/10.1111/j.2153-3490.1976.tb00696.x (ceprint: https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x) doi: 10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. <i>Tellus A:</i> <i>Dynamic Meteorology and Oceanography</i>, 51(1), 59–70. Retrieved 2023-04-19, from https://doi.org/10.3402/tellusa.v5111.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Ampl</li></ul>	321	10.1175/1520-0469(1977)034(1040:AOSOTN)2.0.CO;2
<ul> <li>wave activity as an objective diagnostic of midlatitude extreme weather.</li> <li><i>Geophysical Research Letters</i>, 42(24), 10,952–10,960. Retrieved 2023-03-24,</li> <li>from https://onlinelibrary.wiley.com/doi/pdf/10.1002/2015GL066959</li> <li>(_eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/2015GL066959</li> <li>Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate</li> <li>Noise Properties of Teleconnection Patterns. Journal of Climate, 13(24),</li> <li>4430–4440. Retrieved 2023-03-31, from https://journals.ametsoc.org/</li> <li>view/journals/clim/13/24/1520-0442.2000_013.4430_ttpsac_2.0.co_2.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of Climate)</li> <li>doi: 10.1175/1520-0442(2000)013(4430:TTPSAC)2.0.CO;2</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Consider-</li> <li>ations of the Drought. Weather, 32(4), 120–126. Retrieved 2023-04-19, from</li> <li>https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977.tb04532.x)</li> <li>Hartmann, D. L. (2015). Global Physical Climatology: Second Edition (2nd ed</li> <li>ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-16, from</li> <li>https://public.ebookcentral.proquest.com/choice/publicfullrecord</li> <li>.aspx?p=5754480 (OCLC: 1099348114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. Tellus,</li> <li>28(6), 473–485. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/choice/publicfullrecord</li> <li>.aspx?p=5754480.1111/j.2153-3490.1976.tb00696.x (.eprint: https://oli.03402/tellusa.v5111.12306</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A:</li> <li>Dynamic Meteorology and Oceanography, 51(1), 59–70. Retrieved 2023-04-19,</li> <li>from https://doi.org/10.3402/tellusa.v5111.12306) doi: 10.3402/tellusa.v5111.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local</li></ul>	322	Chen, G., Lu, J., Burrows, D. A., & Leung, L. R. (2015). Local finite-amplitude
<ul> <li>Geophysical Research Letters, 42(24), 10.952-10.960. Retrieved 2023-03-24, from https://onlinelibrary.wiley.com/doi/abs/10.1002/2015GL066959</li> <li>Geprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/2015GL066959</li> <li>Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate Noise Properties of Teleconnection Patterns. Journal of Climate, 13(24), 4430-4440. Retrieved 2023-03-31, from https://journals.ametsoc.org/</li> <li>view/journals/clim/13/24/1520-0442.2000.013.4430.ttpsac.2.0.co.2.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of Climate) doi: 10.1175/1520-0442(2000)013(4430:TTPSAC)20.CO;2</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Consider- ations of the Drought. Weather, 32(4), 120-126. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977 .tb04532.x (.eprint: https://onlinelibrary.wley.com/doi/pdf/10.1002/j.1477- 8696.1977.tb04532.x) doi: 10.1002/j.1477-8696.1977.tb04532.x</li> <li>Hartmann, D. L. (2015). Global Physical Climatology: Second Edition (2nd ed ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-16, from https://public.ebookcentral.proquest.com/choice/publicfullrecord .aspx7p=5754480 (OCLC: 1099348114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. Tellus, 28(6), 473-485. Retrieved 2023-04-19, from https://onlinelibrary .wiley.com/doi/abs/10.1111/j.2153-3490.1976.tb00696.x (.eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.5153-3490.1976.tb00696.x) doi: 10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A: Dynamic Meteorology and Occanography, 51(1), 59-70. Retrieved 2023-04-19, from https://doi.org/10.3402/tellusa.v5111.12306 (Publisher: Taylor &amp; Francis.eprint: https://doi.org/10.3402/tellusa.v5111.12306) doi: 10.3402/ tellusa.v5111.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local</li></ul>	323	wave activity as an objective diagnostic of midlatitude extreme weather.
<ul> <li>from https://onlinelibrary.wiley.com/doi/abs/10.1002/2015GL066959</li> <li>(.eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/2015GL066959</li> <li>Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate Noise Properties of Teleconnection Patterns. Journal of Climate, 13(24), 4430-4440. Retrieved 2023-03-31, from https://journals.ametsoc.org/</li> <li>Yiew/journals/clim/13/24/1520-0442.2000.013.4430.ttpsac.2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of Climate) doi: 10.1175/1520-0442(2000)013(4430:TTPSAC)2.0.CO;2</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Considerations of the Drought. Weather, 32(4), 120-126. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977</li> <li>tbd532.x (.eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477-8696.1977.tb04532.x) doi: 10.1002/j.1477-8696.1977.tb04532.x</li> <li>Hartmann, D. L. (2015). Global Physical Climatology: Second Edition (2nd ed ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-16, from https://public.ebookcentral.proquest.com/choice/publicfullrecord .aspx?p=5754480 (OCLC: 1093348114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. Tellus, 28(6), 473-485. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x (.eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x) doi: 10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A: Dynamic Meteorology and Occanography, 51(1), 59-70. Retrieved 2023-04-19, from https://doi.org/10.3402/tellusa.v5111.12306 (Publisher: Taylor &amp; Francis .eprint: https://doi.org/10.3402/tellusa.v5111.12306) doi: 10.3402/tellusa.v5111.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave Activity as a Diagnostic of Anomalous Weather Events. Jo</li></ul>	324	Geophysical Research Letters, $42(24)$ , $10,952-10,960$ . Retrieved 2023-03-24,
<ul> <li>(Apprint: https://onlinehorary.whey.com/doi/pdf/10.1002/2015GL060959)</li> <li>Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate Noise Properties of Teleconnection Patterns. Journal of Climate, 13(24), 4430-4440. Retrieved 2023-03-31, from https://journals.ametsoc.org/view/journals/clim/13/24/1520-0442_2000.013.4430.ttpsac_2.0.co_2.xml</li> <li>Publisher: American Meteorological Society Section: Journal of Climate) doi: 10.1175/1520-0442(2000)013(4430:TTPSAC)2.0.CO;2</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Considerations of the Drought. Weather, 32(4), 120-126. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977.tb04532.x) doi: 10.1002/j.1477-8696.1977.tb04532.x</li> <li>Hartmann, D. L. (2015). Global Physical Climatology: Second Edition (2nd ed ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-16, from https://public.ebookcentral.proquest.com/choice/publicfullrecord .aspx?p=5754480 (OCLC: 1099348114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. Tellus, 28(6), 473-485. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x</li> <li>Wiley.com/doi/abs/10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A: Dynamic Meteorology and Oceanography, 51(1), 59-70. Retrieved 2023-04-19, from https://doi.org/10.3402/tellusa.v51i1.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave Activity as a Diagnostic of Anomalous Weather Events. Journal of the Attmospheric Sciences, 73(1), 211-229. Retrieved 2023-03-24, from https:// journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of the Attmospheric Sciences, 0doi: 10.1175/JAS-D-15-0194.1</li> </ul>	325	from https://onlinelibrary.wiley.com/doi/abs/10.1002/2015GL066959
<ul> <li>Feldstein, S. B. (2000, December). The Timescale, Power Spectra, and Climate Noise Properties of Teleconnection Patterns. Journal of Climate, 13(24), 4430-4440. Retrieved 2023-03-31, from https://journals.ametsoc.org/view/journals/clim/13/24/1520-0442.2000_013.4430.ttpsac_2.0.co.2.xml (Publisher: American Meteorological Society Section: Journal of Climate) doi: 10.1175/1520-0442(2000)013(4430:TTPSAC)2.0.CO;2</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Considerations of the Drought. Weather, 32(4), 120-126. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977</li> <li>tb04532.x (_eprint: https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977</li> <li>tb04532.x (_eprint: https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977</li> <li>tb04532.x (_eprint: https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977</li> <li>tb04532.x (_eprint: https://onlinelibrary.wiley.com/choice/publicfullrecord</li> <li>aspx?p=5754480 (OCLC: 1099348114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. Tellus, 28(6), 473-485. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x (_eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x)</li> <li>doi: 10.1111/j.2153-3490.1976.tb00696.x (_eprint: https://onlinelibrary.wiley.com/doi/pdf/10.3402/tellusa.v5111.12306 (Publisher: Taylor &amp; Francis_eprint: https://doi.org/10.3402/tellusa.v5111.12306 doi: 10.3402/tellusa.v5111.12306 doi: 10.3402/tellusa.v5111.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave Activity as a Diagnostic of Anomalous Weather Events. Journal of the Atmospheric Sciences, 73(1), 211-229. Retrieved 2023-03-24, from https://journals.ametsoc.org/view/journals/asc/73/1/jas-d-15-0194.1.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of the Atmospheric Scie</li></ul>	326	(_eprint: https://onlineilorary.wiley.com/doi/pdi/10.1002/2015GL000959) doi:
<ul> <li>Feldstein, S. B. (2000, December). The Timescale, Fower Spectra, and Climate 13(24), 4430–4440. Retrieved 2023-03-31, from https://journals.ametsoc.org/view/journals/clim/13/24/1520-0442.2000.013.4430_ttpsac_2.0.co_2.xml (Publisher: American Meteorological Society Section: Journal of Climate) doi: 10.1175/1520-0442(2000)013(4430:TTPSAC)2.0.CO;2</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Considerations of the Drought. Weather, 32(4), 120–126. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977.tb04532.x (.eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477-8696.1977.tb04532.x) doi: 10.1002/j.1477-8696.1977.tb04532.x</li> <li>Hartmann, D. L. (2015). Global Physical Climatology: Second Edition (2nd ed ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-16, from https://public.ebookcentral.proquest.com/choice/publicfullrecord .aspx?p=5754480 (OCLC: 1099348114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. Tellus, 28(6), 473–485. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x (.eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A: Dynamic Meteorology and Occanography, 51(1), 59–70. Retrieved 2023-04-19, from https://doi.org/10.3402/tellusa.v51i1.12306 (Publisher: Taylor &amp; Francis .eprint: https://doi.org/10.3402/tellusa.v51i1.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave Activity as a Diagnostic of Anomalous Weather Events. Journal of the Atmospheric Sciences, 73(1), 211–229. Retrieved 2023-03-24, from https:// journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml (Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences, 0 doi: 10.1175/JAS-D-15-0194.1</li> </ul>	327	10.1002/2010GL000939
<ul> <li><sup>339</sup> From the set of the connection fracterins. <i>Landrate of Cumule</i>, 15(24), 4430–4440. Retrieved 2023-03-31, from https://journals.ametsoc.org/</li> <li><sup>330</sup> view/journals/clim/13/24/1520-0442_2000_013.4430_ttpsac_2.0.co_2.xml</li> <li><sup>331</sup> (Publisher: American Meteorological Society Section: Journal of Climate) doi:</li> <li><sup>332</sup> 10.1175/1520-0442(2000)013(4430:TTPSAC)2.0.CO;2</li> <li><sup>333</sup> Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Consider-</li> <li><sup>334</sup> atoms of the Drought. Weather, 32(4), 120–126. Retrieved 2023-04-19, from</li> <li><sup>335</sup> https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977</li> <li><sup>336</sup></li></ul>	328	Noise Properties of Teleconnection Patterns Learnel of Climate 12(24)
<ul> <li>view/jourals/clim/13/24/1520-0-0442_200_013_4430_ttpsac_2.0.co_2.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of Climate) doi:</li> <li>10.1175/1520-0442(2000)013(4430:TTPSAC)2.0.CO;2</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Consider- ations of the Drought. Weather, 32(4), 120-126. Retrieved 2023-04-19, from</li> <li>https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977.</li> <li>tb04532.x (.eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477- 8696.1977.tb04532.x) doi: 10.1002/j.1477-8696.1977.tb04532.x</li> <li>Hartmann, D. L. (2015). Global Physical Climatology: Second Edition (2nd ed ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-16, from</li> <li>https://public.ebookcentral.proquest.com/choice/publicfullrecord .aspx?p=5754480 (OCLC: 1099348114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. Tellus, 28(6), 473-485. Retrieved 2023-04-19, from https://onlinelibrary</li> <li>.wiley.com/doi/abs/10.1111/j.2153-3490.1976.tb00696.x (.eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x)</li> <li>doi: 10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A: Dynamic Meteorology and Oceanography, 51(1), 59-70. Retrieved 2023-04-19, from https://doi.org/10.3402/tellusa.v5111.12306 (Publisher: Taylor &amp; Francis.eprint: https://doi.org/10.3402/tellusa.v5111.12306 doi: 10.3402/ tellusa.v5111.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave Activity as a Diagnostic of Anomalous Weather Events. Journal of the At- mospheric Sciences, 73(1), 211-229. Retrieved 2023-03-24, from https:// journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of the Atmo- spheric Sciences) doi: 10.1175/JAS-D-15-0194.1</li> </ul>	329	4/30-4/40 Betrieved 2022-03-31 from https://journals.ametsoc.org/
<ul> <li>(Publisher: American Meteorological Society Section: Journal of Climate) doi: 10.1175/1520-0442(2000)013(4430:TTPSAC)2.0.CO;2</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Consider- ations of the Drought. Weather, 32(4), 120–126. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977</li> <li>.tb04532.x (.eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477- 8696.1977.tb04532.x) doi: 10.1002/j.1477-8696.1977.tb04532.x</li> <li>Hartmann, D. L. (2015). Global Physical Climatology: Second Edition (2nd ed ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-16, from https://public.ebookcentral.proquest.com/choice/publicfullrecord .aspx?p=5754480 (OCLC: 1099348114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. Tellus, 28(6), 473–485. Retrieved 2023-04-19, from https://onlinelibrary .wiley.com/doi/abs/10.1111/j.2153-3490.1976.tb00696.x (.eprint: https://onlinelibrary.wiley.com/doi/pdf/10.10111/j.2153-3490.1976.tb00696.x)</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A: Dynamic Meteorology and Oceanography, 51(1), 59–70. Retrieved 2023-04-19, from https://doi.org/10.3402/tellusa.v51i1.12306 (Publisher: Taylor &amp; Francis _eprint: https://doi.org/10.3402/tellusa.v51i1.12306) doi: 10.3402/ tellusa.v51i1.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave Activity as a Diagnostic of Anomalous Weather Events. Journal of the At- mospheric Sciences, 73(1), 211–229. Retrieved 2023-03-24, from https:// journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of the Atmo- spheric Sciences) doi: 10.1175/JAS-D-15-0194.1</li> </ul>	331	view/journals/clim/13/24/1520-0442 2000 013 4430 ttpsac 2.0.co 2.xm]
<ul> <li>10.1175/1520-0442(2000)013(4430:TTPSAC)2.0.CO;2</li> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Consider- ations of the Drought. Weather, 32(4), 120-126. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977</li> <li>.tb04532.x (_eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477- 8696.1977.tb04532.x) doi: 10.1002/j.1477-8696.1977</li> <li>Hartmann, D. L. (2015). Global Physical Climatology: Second Edition (2nd ed ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-16, from https://public.ebookcentral.proquest.com/choice/publicfullrecord .aspx?p=5754480 (OCLC: 1099348114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. Tellus, 28(6), 473-485. Retrieved 2023-04-19, from https://onlinelibrary .wiley.com/doi/abs/10.1111/j.2153-3490.1976.tb00696.x (_eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x)</li> <li>doi: 10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A: Dynamic Meteorology and Oceanography, 51(1), 59-70. Retrieved 2023-04-19, from https://doi.org/10.3402/tellusa.v51i1.12306 (Publisher: Taylor &amp; Francis _eprint: https://doi.org/10.3402/tellusa.v51i1.12306) doi: 10.3402/ tellusa.v51i1.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave Activity as a Diagnostic of Anomalous Weather Events. Journal of the At- mospheric Sciences, 73(1), 211-229. Retrieved 2023-03-24, from https:// journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of the Atmo- spheric Sciences) doi: 10.1175/JAS-D-15-0194.1</li> </ul>	332	(Publisher: American Meteorological Society Section: Journal of Climate) doi:
<ul> <li>Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Consider- ations of the Drought. Weather, 32(4), 120–126. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977 .tb04532.x (_eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477- 8696.1977.tb04532.x) doi: 10.1002/j.1477-8696.1977.tb04532.x</li> <li>Hartmann, D. L. (2015). Global Physical Climatology: Second Edition (2nd ed ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-16, from https://public.ebookcentral.proquest.com/choice/publicfullrecord .aspx?p=5754480 (OCLC: 1099348114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. Tellus, 28(6), 473–485. Retrieved 2023-04-19, from https://onlinelibrary .wiley.com/doi/abs/10.1111/j.2153-3490.1976.tb00696.x (_eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x) doi: 10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A: Dynamic Meteorology and Oceanography, 51(1), 59–70. Retrieved 2023-04-19, from https://doi.org/10.3402/tellusa.v5111.12306 (Publisher: Taylor &amp; Francis _eprint: https://doi.org/10.3402/tellusa.v5111.12306) doi: 10.3402/ tellusa.v5111.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave Activity as a Diagnostic of Anomalous Weather Events. Journal of the At- mospheric Sciences, 73(1), 211–229. Retrieved 2023-03-24, from https:// journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of the Atmo- spheric Sciences) doi: 10.1175/JAS-D-15-0194.1</li> </ul>	333	10.1175/1520-0442(2000)013/4430:TTPSAC>2.0.CO:2
<ul> <li>ations of the Drought. Weather, 32(4), 120–126. Retrieved 2023-04-19, from https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977</li> <li>.tb04532.x (_eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477- 8696.1977.tb04532.x) doi: 10.1002/j.1477-8696.1977.tb04532.x</li> <li>Hartmann, D. L. (2015). Global Physical Climatology: Second Edition (2nd ed ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-16, from https://public.ebookcentral.proquest.com/choice/publicfullrecord .aspx?p=5754480 (OCLC: 1099348114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. Tellus, 28(6), 473–485. Retrieved 2023-04-19, from https://onlinelibrary .wiley.com/doi/abs/10.1111/j.2153-3490.1976.tb00696.x (_eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x) doi: 10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A: Dynamic Meteorology and Oceanography, 51(1), 59–70. Retrieved 2023-04-19, from https://doi.org/10.3402/tellusa.v5111.12306 (Publisher: Taylor &amp; Francis _eprint: https://doi.org/10.3402/tellusa.v5111.12306) doi: 10.3402/ tellusa.v5111.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave Activity as a Diagnostic of Anomalous Weather Events. Journal of the Att- mospheric Sciences, 73(1), 211–229. Retrieved 2023-03-24, from https:// journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of the Attmo- spheric Sciences) doi: 10.1175/JAS-D-15-0194.1</li> </ul>	334	Green, J. S. A. (1977). The Weather During July 1976: Some Dynamical Consider-
<ul> <li>https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977</li> <li>.tb04532.x (_eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477-8696.1977.tb04532.x)</li> <li>Hartmann, D. L. (2015). Global Physical Climatology: Second Edition (2nd ed ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-16, from https://public.ebookcentral.proquest.com/choice/publicfullrecord</li> <li>.aspx?p=5754480 (OCLC: 1099348114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. Tellus, 28(6), 473-485. Retrieved 2023-04-19, from https://onlinelibrary</li> <li>.wiley.com/doi/abs/10.1111/j.2153-3490.1976.tb00696.x (_eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x)</li> <li>doi: 10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A: Dynamic Meteorology and Oceanography, 51(1), 59-70. Retrieved 2023-04-19, from https://doi.org/10.3402/tellusa.v51i1.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave Activity as a Diagnostic of Anomalous Weather Events. Journal of the At-mospheric Sciences, 73(1), 211-229. Retrieved 2023-03-24, from https://journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml</li> </ul>	335	ations of the Drought. Weather, 32(4), 120–126. Retrieved 2023-04-19, from
<ul> <li>.tb04532.x (_eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477- 8696.1977.tb04532.x) doi: 10.1002/j.1477-8696.1977.tb04532.x</li> <li>Hartmann, D. L. (2015). Global Physical Climatology: Second Edition (2nd ed ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-16, from https://public.ebookcentral.proquest.com/choice/publicfullrecord .aspx?p=5754480 (OCLC: 1099348114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. Tellus, 28(6), 473-485. Retrieved 2023-04-19, from https://onlinelibrary .wiley.com/doi/abs/10.1111/j.2153-3490.1976.tb00696.x (_eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x) doi: 10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A: Dynamic Meteorology and Oceanography, 51(1), 59-70. Retrieved 2023-04-19, from https://doi.org/10.3402/tellusa.v51i1.12306) doi: 10.3402/ tellusa.v51i1.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave Activity as a Diagnostic of Anomalous Weather Events. Journal of the At- mospheric Sciences, 73(1), 211-229. Retrieved 2023-03-24, from https:// journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xm1</li> <li>(Publisher: American Meteorological Society Section: Journal of the Atmo- spheric Sciences) doi: 10.1175/JAS-D-15-0194.1</li> </ul>	336	https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1477-8696.1977
<ul> <li>8696.1977.tb04532.x) doi: 10.1002/j.1477-8696.1977.tb04532.x</li> <li>Hartmann, D. L. (2015). Global Physical Climatology: Second Edition (2nd ed ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-16, from https://public.ebookcentral.proquest.com/choice/publicfullrecord .aspx?p=5754480 (OCLC: 1099348114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. Tellus, 28(6), 473-485. Retrieved 2023-04-19, from https://onlinelibrary .wiley.com/doi/abs/10.1111/j.2153-3490.1976.tb00696.x (_eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x)</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A: Dynamic Meteorology and Oceanography, 51(1), 59-70. Retrieved 2023-04-19, from https://doi.org/10.3402/tellusa.v51i1.12306 (Publisher: Taylor &amp; Francis _eprint: https://doi.org/10.3402/tellusa.v51i1.12306) doi: 10.3402/tellusa.v51i1.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave Activity as a Diagnostic of Anomalous Weather Events. Journal of the Atmospheric Sciences, 73(1), 211-229. Retrieved 2023-03-24, from https://journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/JAS-D-15-0194.1</li> </ul>	337	.tb04532.x (_eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.1477-
<ul> <li>Hartmann, D. L. (2015). Global Physical Climatology: Second Edition (2nd ed ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-16, from https://public.ebookcentral.proquest.com/choice/publicfullrecord .aspx?p=5754480 (OCLC: 1099348114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. Tellus, 28(6), 473-485. Retrieved 2023-04-19, from https://onlinelibrary .wiley.com/doi/abs/10.1111/j.2153-3490.1976.tb00696.x (_eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x) doi: 10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A: Dynamic Meteorology and Oceanography, 51(1), 59-70. Retrieved 2023-04-19, from https://doi.org/10.3402/tellusa.v5111.12306 (Publisher: Taylor &amp; Francis _eprint: https://doi.org/10.3402/tellusa.v5111.12306) doi: 10.3402/ tellusa.v5111.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave Activity as a Diagnostic of Anomalous Weather Events. Journal of the At- mospheric Sciences, 73(1), 211-229. Retrieved 2023-03-24, from https:// journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of the Atmo- spheric Sciences) doi: 10.1175/JAS-D-15-0194.1</li> </ul>	338	8696.1977.tb04532.x) doi: $10.1002/j.1477-8696.1977.tb04532.x$
<ul> <li>ed.). Kent: Elsevier Science &amp; Technology. Retrieved 2023-04-16, from</li> <li>https://public.ebookcentral.proquest.com/choice/publicfullrecord</li> <li>.aspx?p=5754480 (OCLC: 1099348114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. Tellus,</li> <li>28(6), 473-485. Retrieved 2023-04-19, from https://onlinelibrary</li> <li>.wiley.com/doi/abs/10.1111/j.2153-3490.1976.tb00696.x (_eprint:</li> <li>https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x)</li> <li>doi: 10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A:</li> <li>Dynamic Meteorology and Oceanography, 51(1), 59-70. Retrieved 2023-04-19,</li> <li>from https://doi.org/10.3402/tellusa.v51i1.12306 (Publisher: Taylor</li> <li>&amp; Francis _eprint: https://doi.org/10.3402/tellusa.v51i1.12306) doi: 10.3402/</li> <li>tellusa.v51i1.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave</li> <li>Activity as a Diagnostic of Anomalous Weather Events. Journal of the At-</li> <li>mospheric Sciences, 73(1), 211-229. Retrieved 2023-03-24, from https://</li> <li>journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xm1</li> <li>(Publisher: American Meteorological Society Section: Journal of the Atmo-</li> </ul>	339	Hartmann, D. L. (2015). Global Physical Climatology: Second Edition (2nd ed
<ul> <li>https://public.ebookcentral.proquest.com/choice/publicfullrecord</li> <li>.aspx?p=5754480 (OCLC: 1099348114)</li> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. Tellus,</li> <li>28(6), 473-485. Retrieved 2023-04-19, from https://onlinelibrary</li> <li>.wiley.com/doi/abs/10.1111/j.2153-3490.1976.tb00696.x (_eprint:</li> <li>https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x)</li> <li>doi: 10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A:</li> <li>Dynamic Meteorology and Oceanography, 51(1), 59-70. Retrieved 2023-04-19,</li> <li>from https://doi.org/10.3402/tellusa.v51i1.12306 (Publisher: Taylor</li> <li>&amp; Francis _eprint: https://doi.org/10.3402/tellusa.v51i1.12306) doi: 10.3402/</li> <li>tellusa.v51i1.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave</li> <li>Activity as a Diagnostic of Anomalous Weather Events. Journal of the At-</li> <li>mospheric Sciences, 73(1), 211-229. Retrieved 2023-03-24, from https://</li> <li>journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of the Atmo-</li> </ul>	340	ed.). Kent: Elsevier Science & Technology. Retrieved 2023-04-16, from
342.aspx?p=5754480 (OCLC: 1099348114)343Hasselmann, K. (1976). Stochastic climate models Part I. Theory. Tellus,344 $28(6), 473-485.$ Retrieved 2023-04-19, from https://onlinelibrary345.wiley.com/doi/abs/10.1111/j.2153-3490.1976.tb00696.x (_eprint:346https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x347doi: 10.1111/j.2153-3490.1976.tb00696.x348Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A:349Dynamic Meteorology and Oceanography, 51(1), 59-70. Retrieved 2023-04-19,350from https://doi.org/10.3402/tellusa.v51i1.12306 (Publisher: Taylor351& Francis _eprint: https://doi.org/10.3402/tellusa.v51i1.12306) doi: 10.3402/352tellusa.v51i1.12306353Huang, C. S. Y., & Nakamura, N. (2016, January). Local Finite-Amplitude Wave354Activity as a Diagnostic of Anomalous Weather Events. Journal of the At-355mospheric Sciences, 73(1), 211-229. Retrieved 2023-03-24, from https://356journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml357(Publisher: American Meteorological Society Section: Journal of the Atmo-358spheric Sciences) doi: 10.1175/JAS-D-15-0194.1	341	https://public.ebookcentral.proquest.com/choice/publicfullrecord
<ul> <li>Hasselmann, K. (1976). Stochastic climate models Part I. Theory. Tellus, 28(6), 473–485. Retrieved 2023-04-19, from https://onlinelibrary</li> <li>.wiley.com/doi/abs/10.1111/j.2153-3490.1976.tb00696.x (_eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x)</li> <li>doi: 10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A: Dynamic Meteorology and Oceanography, 51(1), 59–70. Retrieved 2023-04-19, from https://doi.org/10.3402/tellusa.v51i1.12306 (Publisher: Taylor &amp; Francis _eprint: https://doi.org/10.3402/tellusa.v51i1.12306) doi: 10.3402/</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave Activity as a Diagnostic of Anomalous Weather Events. Journal of the At- mospheric Sciences, 73(1), 211–229. Retrieved 2023-03-24, from https:// journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of the Atmo- spheric Sciences) doi: 10.1175/JAS-D-15-0194.1</li> </ul>	342	.aspx?p=5754480 (OCLC: 1099348114)
<ul> <li>28(6), 473–485. Retrieved 2023-04-19, from https://onlinelibrary</li> <li>.wiley.com/doi/abs/10.1111/j.2153-3490.1976.tb00696.x (_eprint:</li> <li>https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x)</li> <li>doi: 10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A:</li> <li>Dynamic Meteorology and Oceanography, 51(1), 59–70. Retrieved 2023-04-19,</li> <li>from https://doi.org/10.3402/tellusa.v51i1.12306 (Publisher: Taylor</li> <li>&amp; Francis _eprint: https://doi.org/10.3402/tellusa.v51i1.12306) doi: 10.3402/</li> <li>tellusa.v51i1.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave</li> <li>Activity as a Diagnostic of Anomalous Weather Events. Journal of the At-</li> <li>mospheric Sciences, 73(1), 211–229. Retrieved 2023-03-24, from https://</li> <li>journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of the Atmo-</li> </ul>	343	Hasselmann, K. (1976). Stochastic climate models Part I. Theory. <i>Tellus</i> ,
345.wiley.com/doi/abs/10.1111/j.2153-3490.1976.tb00696.x(_eprint:346https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x)doi: 10.1111/j.2153-3490.1976.tb00696.x347doi: 10.1111/j.2153-3490.1976.tb00696.x348Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A:349Dynamic Meteorology and Oceanography, 51(1), 59–70. Retrieved 2023-04-19,350from https://doi.org/10.3402/tellusa.v51i1.12306351& Francis _eprint: https://doi.org/10.3402/tellusa.v51i1.12306)352tellusa.v51i1.12306353Huang, C. S. Y., & Nakamura, N. (2016, January). Local Finite-Amplitude Wave354Activity as a Diagnostic of Anomalous Weather Events. Journal of the At-355mospheric Sciences, 73(1), 211–229. Retrieved 2023-03-24, from https://356journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml357(Publisher: American Meteorological Society Section: Journal of the Atmo-358spheric Sciences) doi: 10.1175/JAS-D-15-0194.1	344	28(6), 473-485. Retrieved 2023-04-19, from https://onlinelibrary
<ul> <li>https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x)</li> <li>doi: 10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A: Dynamic Meteorology and Oceanography, 51(1), 59–70. Retrieved 2023-04-19,</li> <li>from https://doi.org/10.3402/tellusa.v51i1.12306 (Publisher: Taylor &amp; Francis _eprint: https://doi.org/10.3402/tellusa.v51i1.12306) doi: 10.3402/</li> <li>tellusa.v51i1.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave Activity as a Diagnostic of Anomalous Weather Events. Journal of the At- mospheric Sciences, 73(1), 211–229. Retrieved 2023-03-24, from https://</li> <li>journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of the Atmo- spheric Sciences) doi: 10.1175/JAS-D-15-0194.1</li> </ul>	345	.wiley.com/doi/abs/10.1111/j.2153-3490.1976.tb00696.x (_eprint:
<ul> <li>doi: 10.1111/j.2153-3490.1976.tb00696.x</li> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A: Dynamic Meteorology and Oceanography, 51(1), 59–70. Retrieved 2023-04-19, from https://doi.org/10.3402/tellusa.v51i1.12306 (Publisher: Taylor &amp; Francis _eprint: https://doi.org/10.3402/tellusa.v51i1.12306) doi: 10.3402/ tellusa.v51i1.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave Activity as a Diagnostic of Anomalous Weather Events. Journal of the At- mospheric Sciences, 73(1), 211–229. Retrieved 2023-03-24, from https:// journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml (Publisher: American Meteorological Society Section: Journal of the Atmo- spheric Sciences) doi: 10.1175/JAS-D-15-0194.1</li> </ul>	346	https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.2153-3490.1976.tb00696.x)
<ul> <li>Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A: Dynamic Meteorology and Oceanography, 51(1), 59–70. Retrieved 2023-04-19, from https://doi.org/10.3402/tellusa.v51i1.12306 (Publisher: Taylor &amp; Francis _eprint: https://doi.org/10.3402/tellusa.v51i1.12306) doi: 10.3402/</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave Activity as a Diagnostic of Anomalous Weather Events. Journal of the At- mospheric Sciences, 73(1), 211–229. Retrieved 2023-03-24, from https:// journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of the Atmo- spheric Sciences) doi: 10.1175/JAS-D-15-0194.1</li> </ul>	347	doi: 10.1111/j.2153-3490.1976.tb00696.x
349Dynamic Meteorology and Oceanography, 51(1), 59–70.Retrieved 2023-04-19,350from https://doi.org/10.3402/tellusa.v51i1.12306(Publisher: Taylor351& Francis _eprint: https://doi.org/10.3402/tellusa.v51i1.12306)doi: 10.3402/352tellusa.v51i1.12306doi: 10.3402/353Huang, C. S. Y., & Nakamura, N. (2016, January).Local Finite-Amplitude Wave354Activity as a Diagnostic of Anomalous Weather Events.Journal of the At-355mospheric Sciences, 73(1), 211–229.Retrieved 2023-03-24, from https://356journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml357(Publisher: American Meteorological Society Section: Journal of the Atmo-358spheric Sciences) doi: 10.1175/JAS-D-15-0194.1	348	Held, I. M. (1999, January). The macroturbulence of the troposphere. Tellus A:
<ul> <li>from https://doi.org/10.3402/tellusa.v5111.12306 (Publisher: Taylor</li> <li>&amp; Francis _eprint: https://doi.org/10.3402/tellusa.v5111.12306) doi: 10.3402/</li> <li>tellusa.v5111.12306</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave</li> <li>Activity as a Diagnostic of Anomalous Weather Events. Journal of the At-</li> <li>mospheric Sciences, 73(1), 211–229. Retrieved 2023-03-24, from https://</li> <li>journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of the Atmo-</li> <li>spheric Sciences) doi: 10.1175/JAS-D-15-0194.1</li> </ul>	349	Dynamic Meteorology and Oceanography, 51(1), 59–70. Retrieved 2023-04-19,
<ul> <li><sup>351</sup> &amp; Francis Leprint: https://doi.org/10.3402/tellusa.v5111.12306) doi: 10.3402/</li> <li><sup>352</sup> tellusa.v51i1.12306</li> <li><sup>353</sup> Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave</li> <li><sup>354</sup> Activity as a Diagnostic of Anomalous Weather Events. Journal of the At-</li> <li><sup>355</sup> mospheric Sciences, 73(1), 211–229. Retrieved 2023-03-24, from https://</li> <li><sup>356</sup> journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml</li> <li><sup>357</sup> (Publisher: American Meteorological Society Section: Journal of the Atmo-</li> <li><sup>358</sup> spheric Sciences) doi: 10.1175/JAS-D-15-0194.1</li> </ul>	350	from https://doi.org/10.3402/tellusa.v5111.12306 (Publisher: Taylor $f_{\rm s}$ Francis and the https://doi.org/10.2402/tellusa.v5111.12306) doi: 10.2402/
<ul> <li>tenusa.v3111.12500</li> <li>Huang, C. S. Y., &amp; Nakamura, N. (2016, January). Local Finite-Amplitude Wave</li> <li>Activity as a Diagnostic of Anomalous Weather Events. Journal of the At-</li> <li><i>mospheric Sciences</i>, 73(1), 211–229. Retrieved 2023-03-24, from https://</li> <li>journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of the Atmo-</li> <li>spheric Sciences) doi: 10.1175/JAS-D-15-0194.1</li> </ul>	351	& Francis _eprint: https://doi.org/10.3402/tellusa.v5111.12306) doi: $10.3402/$
<ul> <li><sup>353</sup> Inuang, C. S. I., &amp; Nakamura, N. (2010, January). Local Finite-Amplitude Wave</li> <li><sup>354</sup> Activity as a Diagnostic of Anomalous Weather Events. Journal of the At-</li> <li><sup>355</sup> mospheric Sciences, 73(1), 211–229. Retrieved 2023-03-24, from https://</li> <li><sup>356</sup> journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml</li> <li><sup>357</sup> (Publisher: American Meteorological Society Section: Journal of the Atmo-</li> <li><sup>358</sup> spheric Sciences) doi: 10.1175/JAS-D-15-0194.1</li> </ul>	352	Unong C S V & Nobomuno N (2016 Innioni) I 1 Et damaite 1 W
<ul> <li><sup>354</sup> Activity as a Diagnostic of Anomalous Weather Events. <i>Journal of the At-</i></li> <li><sup>355</sup> mospheric Sciences, 73(1), 211–229. Retrieved 2023-03-24, from https://</li> <li><sup>356</sup> journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml</li> <li><sup>357</sup> (Publisher: American Meteorological Society Section: Journal of the Atmo-</li> <li><sup>358</sup> spheric Sciences) doi: 10.1175/JAS-D-15-0194.1</li> </ul>	353	Activity as a Diagnostic of Anomalous Weather Events Learnal of the At
<ul> <li>journals.ametsoc.org/view/journals/atsc/73/1/jas-d-15-0194.1.xml</li> <li>(Publisher: American Meteorological Society Section: Journal of the Atmo-</li> <li>spheric Sciences) doi: 10.1175/JAS-D-15-0194.1</li> </ul>	354	mospheric Sciences 72(1) 211-220 Batriavad 2022 03 24 from h++na.//
(Publisher: American Meteorological Society Section: Journal of the Atmo- spheric Sciences) doi: 10.1175/JAS-D-15-0194.1	356	journals.ametsoc.org/yiew/journals/atsc/73/1/jas-d-15-0194_1_vm]
spheric Sciences) doi: 10.1175/JAS-D-15-0194.1	357	(Publisher: American Meteorological Society Section: Journal of the Atmo-
	358	spheric Sciences) doi: 10.1175/JAS-D-15-0194.1

359	Huang, C. S. Y., & Nakamura, N. (2017). Local wave activity budgets of the win-
360	tertime Northern Hemisphere: Implication for the Pacific and Atlantic storm
361	tracks. Geophysical Research Letters, 44 (11), 5673–5682. Retrieved 2023-03-31,
362	from https://onlinelibrary.wiley.com/doi/abs/10.1002/2017GL073760
363	$(\_eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/2017GL073760)$ doi:
364	10.1002/2017 GL073760
365	Kidson, J. W. (1991, September). Intraseasonal Variations in the Southern Hemi-
366	sphere Circulation. Journal of Climate, $4(9)$ , 939–953. Retrieved 2023-
367	04-16, from https://journals.ametsoc.org/view/journals/clim/4/
368	9/1520-0442_1991_004_0939_ivitsh_2_0_co_2.xml (Publisher: Amer-
369	ican Meteorological Society Section: Journal of Climate) doi: 10.1175/
370	1520-0442(1991)004(0939:1111SH)2.0.00;2
371	Kushner, P. J., & Held, I. M. (1998). A test, using atmospheric data, of a method for estimating according ddy diffusivity.
372	Lettere 25(22) 4213-4216 Botrioved 2023 04 10 from https://
373	$\frac{1}{1000} = \frac{1}{1000} = 1$
375	https://onlinelibrary.wiley.com/doi/pdf/10/1029/1998GL900142
376	10.1029/1998GL900142
377	Leith, C. E. (1973, September). The Standard Error of Time-Average Estimates
378	of Climatic Means. Journal of Applied Meteorology and Climatology, 12(6),
379	1066-1069. Retrieved 2023-04-19, from https://journals.ametsoc.org/
380	view/journals/apme/12/6/1520-0450_1973_012_1066_tseota_2_0_co_2.xml
381	(Publisher: American Meteorological Society Section: Journal of Applied
382	Meteorology and Climatology) doi: $10.1175/1520-0450(1973)012(1066:$
383	TSEOTA $2.0.CO;2$
384	Lorenz, D. J., & Hartmann, D. L. (2001, November). Eddy–Zonal Flow Feedback
385	in the Southern Hemisphere. Journal of the Atmospheric Sciences, $58(21)$ ,
386	3312-3327. Retrieved 2023-03-31, from https://journals.ametsoc.org/
387	(Dublishern American Materralegical Society Section, Journal of the Atmos
388	(Publisher: American Meteorological Society Section: Journal of the Atmo-
389	Spheric Sciences) doi: $10.1173/1520-0409(2001)050(5512.12)FT11/2.0.00,2$
390	ern Hemisphere Storm Tracks and let Streams as Revealed in a Reanaly-
392	sis Dataset. Journal of Climate, 17(9), 1828–1844. Retrieved 2023-04-
393	16. from https://journals.ametsoc.org/view/journals/clim/17/9/
394	1520-0442_2004_017_1828_svitsh_2.0.co_2.xml (Publisher: Ameri-
395	can Meteorological Society Section: Journal of Climate) doi: 10.1175/
396	1520-0442(2004)017(1828:SVITSH)2.0.CO;2
397	Nakamura, N., & Zhu, D. (2010, September). Finite-Amplitude Wave Activity
398	and Diffusive Flux of Potential Vorticity in Eddy–Mean Flow Interaction.
399	Journal of the Atmospheric Sciences, 67(9), 2701–2716. Retrieved 2023-
400	03-24, from https://journals.ametsoc.org/view/journals/atsc/67/9/
401	2010 jas 3432.1.xml (Publisher: American Meteorological Society Section:
402	Journal of the Atmospheric Sciences) doi: 10.11/5/2010JAS3432.1
403	Swanson, K. L., & Pierrehumbert, R. T. (1997, June). Lower-Tropospheric Heat
404	11 ansport in the racine storm 1rack. Journal of the Atmospheric Sciences, 5/(11) 1533-1543 Retrieved 2023 04 10 from https://journal.comet.com
405	$\sigma_{4}(11)$ , 1000-1040. Inconcrete 2020-04-19, Itoll Ittps://journals.ametsoc
407	.co 2.xml (Publisher: American Meteorological Society Section: Jour-
408	nal of the Atmospheric Sciences) doi: 10.1175/1520-0469(1997)054/1533:
409	LTHTIT>2.0.CO:2
410	Thompson, D. W. J., & Barnes, E. A. (2014, February). Periodic Variability in
411	the Large-Scale Southern Hemisphere Atmospheric Circulation. Science,
412	343(6171), 641-645. Retrieved 2023-03-24, from https://www.science.org/
413	doi/10.1126/science.1247660 (Publisher: American Association for the

doi/10.1126/science.1247660 (Publisher: American Association for the

414	Advancement of Science) doi: 10.1126/science.1247660
415	Thompson, D. W. J., Crow, B. R., & Barnes, E. A. (2017, March). Intrasea-
416	sonal Periodicity in the Southern Hemisphere Circulation on Regional Spatial
417	Scales. Journal of the Atmospheric Sciences, 74(3), 865–877. Retrieved 2023-
418	03-31, from https://journals.ametsoc.org/view/journals/atsc/74/3/
419	jas-d-16-0094.1.xml (Publisher: American Meteorological Society Section:
420	Journal of the Atmospheric Sciences) doi: 10.1175/JAS-D-16-0094.1
421	Thompson, D. W. J., & Woodworth, J. D. (2014, April). Barotropic and Baro-
422	clinic Annular Variability in the Southern Hemisphere. Journal of the Atmo-
423	spheric Sciences, 71(4), 1480–1493. Retrieved 2023-03-31, from https://
424	journals.ametsoc.org/view/journals/atsc/71/4/jas-d-13-0185.1.xml
425	(Publisher: American Meteorological Society Section: Journal of the Atmo-
426	spheric Sciences) doi: 10.1175/JAS-D-13-0185.1
427	Trenberth, K. E. (1981). Seasonal variations in global sea level pressure
428	and the total mass of the atmosphere. Journal of Geophysical Research:
429	$O_{ceans.}$ 86(C6), 5238–5246. Retrieved 2023-04-16, from https://
430	onlinelibrary.wiley.com/doi/abs/10.1029/JC086iC06p05238 (eprint:
431	https://onlinelibrary.wiley.com/doi/pdf/10.1029/JC086iC06p05238) doi:
432	10.1029/JC086iC06p05238
122	Trenberth K E (1991 October) Storm Tracks in the Southern Hemisphere
433	<i>Journal of the Atmospheric Sciences</i> 48(19) 2159–2178 Betrieved 2023-
435	04-16 from https://journals.ametsoc.org/view/journals/atsc/48/
435	19/1520-0469 1991 048 2159 stitsh 2 0 co 2 xml (Publisher: American
430	Meteorological Society Section: Journal of the Atmospheric Sciences) doi:
438	10.1175/1520-0469(1991)048(2159:STITSH)2.0.CO:2
420	Vitart F Ardilouze C Bonet A Brookshaw A Chen M Codorean C
439	Zhang L (2017 January) The Subseasonal to Seasonal (S2S) Prediction
440	Project Database. Bulletin of the American Meteorological Society, 98(1).
442	163-173. Betrieved 2023-03-31. from https://iournals.ametsoc.org/view/
443	iournals/bams/98/1/bams-d-16-0017.1.xm] (Publisher: American Meteo-
444	rological Society Section: Bulletin of the American Meteorological Society) doi:
445	10.1175/BAMS-D-16-0017.1
446	Wang L. Lu, J. & Kuang Z. (2018) A Robust Increase of the Intraseasonal Peri-
447	odic Behavior of the Precipitation and Eddy Kinetic Energy in a Warming Cli-
448	mate. Geophysical Research Letters, 45(15), 7790–7799. Retrieved 2023-03-24.
449	from https://onlinelibrary.wiley.com/doi/abs/10.1029/2018GL078495
450	(_eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1029/2018GL078495) doi:
451	10.1029/2018GL078495
452	Wang L & Nakamura N (2015) Covariation of finite-amplitude wave ac-
453	tivity and the zonal mean flow in the midlatitude troposphere: 1. The-
454	ory and application to the Southern Hemisphere summer. <i>Geophysi-</i>
455	cal Research Letters, 42(19), 8192–8200. Retrieved 2023-04-16, from
456	https://onlinelibrary.wiley.com/doi/abs/10.1002/2015GL065830
457	(eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/2015GL065830)
458	doi: 10.1002/2015GL065830
459	Wang, L., & Nakamura, N. (2016, December). Covariation of Finite-Amplitude
460	Wave Activity and the Zonal-Mean Flow in the Midlatitude Troposphere.
461	Part II: Eddy Forcing Spectra and the Periodic Behavior in the Southern
462	Hemisphere Summer. Journal of the Atmospheric Sciences, 73(12), 4731–
463	4752. Retrieved 2023-04-22, from https://journals.ametsoc.org/view/
464	journals/atsc/73/12/jas-d-16-0091.1.xml (Publisher: American Me-
465	teorological Society Section: Journal of the Atmospheric Sciences) doi:
466	10.1175/JAS-D-16-0091.1
467	Xue, D., Lu, J., Qian, Y., & Zhang, Y. (2021). Evidence for Coupling Be-
468	tween the Subseasonal Oscillations in the Southern Hemisphere Midlat-

469	itude Ocean and Atmosphere.	Journal of Geophysical Resea	rch: Atmo-
470	spheres, 126(4), e2020JD033872.	Retrieved 2023-03-31, from	https://
471	onlinelibrary.wiley.com/doi/ab	s/10.1029/2020JD033872	(_eprint:
472	https://onlinelibrary.wiley.com/doi/	pdf/10.1029/2020JD033872)	doi:
473	10.1029/2020JD033872		

- Supporting Information for "Regional Features of the
- <sup>2</sup> 20-30 Day Periodic Behavior in the Southern
- Hemisphere Circulation"

Zhaoyu Liu<sup>1</sup>, Lei Wang<sup>1</sup>

<sup>1</sup>Department of Earth, Atmospheric, and Planetary Sciences, Purdue University

### 5 Contents

- 6 1. QGPV-based local finite-amplitude wave activity
- $_{7}$  2. Figures S1 to S9
- 8

### <sup>9</sup> QGPV-based local finite-amplitude activity

As mentioned in the main text, another way to calculate the local finite-amplitude wave activity is based on quasi-geostrophic potential vorticity (QGPV), given the fact that QGPV is a material conserved quantity. Following Huang and Nakamura (2016), the equation for QGPV based local finite-amplitude is showed below:

$$A_q(\phi_e, \lambda, z, t) = \frac{a}{\cos\phi_e} \left( \int_{q' \ge 0, \phi \le \phi_e, \lambda = const} q' \cos\phi d\phi - \int_{q' \le 0, \phi \ge \phi_e, \lambda = const} q' \cos\phi d\phi \right), \quad (1)$$

<sup>15</sup> where *a* is the earth radius,  $\phi$ ,  $\lambda$ , represents the latitude and longitude respectively, *z* is <sup>16</sup> the pressure pseudoheight defined by z = -Hln(p/1000hPa) with H = 7km, the QGPV <sup>17</sup>  $q(\phi, \lambda, z, t) = f + \zeta + \frac{f}{\rho_0} \frac{\partial}{\partial z} [\frac{\rho_0(\theta - \tilde{\theta})}{\partial \tilde{\theta}/\partial z}]$ , in which  $f = 2\Omega sin\phi$  is the Coriolis parameter,  $\zeta$ <sup>18</sup> is relative vorticity,  $\theta$  is the potential temperature ( $\tilde{\theta}$  is the hemispheric averaged basic

<sup>19</sup> state), and  $q' = q - Q(\phi_e)$  denotes the deviation from the reference QGPV at the equivalent <sup>20</sup> latitudes. A monotonic relationship between  $\phi_e$  and Q lies below:

 $\phi_e(Q) = \arcsin[1 - \frac{S(Q)}{2\pi a^2}],\tag{2}$ 

where S(Q) is the area bounded by the Q contour. Additionally, to consider the LWA at all pseudo-height levels, the density weighted LWA along the whole column is defined following Wang and Nakamura (2015):

$$\langle A_q \rangle = \int_0^\infty e^{-z/H} A(\phi_e, \lambda, z, t) dz \Big/ \int_0^\infty e^{-z/H} dz.$$
(3)

### References

- Huang, C. S. Y., & Nakamura, N. (2016, January). Local Finite-Amplitude Wave Activity
  as a Diagnostic of Anomalous Weather Events. *Journal of the Atmospheric Sciences*,
  73(1), 211–229. Retrieved 2023-03-24, from https://journals.ametsoc.org/
  view/journals/atsc/73/1/jas-d-15-0194.1.xml (Publisher: American Meteorological Society Section: Journal of the Atmospheric Sciences) doi: 10.1175/
  JAS-D-15-0194.1
- Covariation of finite-amplitude wave Wang, L., & Nakamura, N. (2015).32 activity and the zonal mean flow in the midlatitude troposphere: 1. 33 Theory and application to the Southern Hemisphere summer. Geophys-34 ical Research Letters, 42(19), 8192-8200. Retrieved 2023-04-16, from 35 https://onlinelibrary.wiley.com/doi/abs/10.1002/2015GL065830 (\_eprint: 36 https://onlinelibrary.wiley.com/doi/pdf/10.1002/2015GL065830) 10.1002/doi: 37 2015GL065830 38



**Figure S1.** Bandpass-filtered variance converted to standard deviation for 500hPa geopotential height in austral summer(DJF): (a)synoptic variability(2-7 days), and (b)intraseasonal variability(10-45 days). The shading represents values between 0*gpm* and 70*gpm*.



**Figure S2.** Power spectra in austral summer(DJF) of (a)zonal-mean Z500, and (b)zonal-mean Z500 at 46.5°S.



:

Figure S3. Bandpass-filtered variance converted to standard deviation for vertical averaged eddy kinetic energy (EKE) in austral summer(DJF): (a)synoptic variability(2-7 days), and (b)intraseasonal variability(10-45 days). The shading represents values between  $0m^2/s^2$  and  $48m^2/s^2$ .



Figure S4. Bandpass-filtered variance converted to standard deviation for QGPV-based local wave activity in austral summer(DJF): (a)synoptic variability(2-7 days), and (b)intraseasonal variability(10-45 days). The shading represents values between 0m/s and 6m/s.



**Figure S5.** Power spectra in austral summer(DJF) of (a)zonal-mean QGPV-based LWA, and (b)zonal-mean QGPV-based LWA at 46.5°S.



**Figure S6.** Power spectra of QGPV-based LWA averged between 40°S and 60°S as functions of longitude and frequency.



**Figure S7.** Power spectra of Z500-based LWA as functions of longitude and frequency at two representative latitudes 45°S (upper panel) and 55°S (lower panel), respectively.



**Figure S8.** Power spectra of vertical averaged EKE as functions of longitude and frequency at two representative latitudes 45°S (upper panel) and 55°S (lower panel), respectively.



:

Figure S9. Power spectra of 850hPa eddy heat flux as functions of longitude and frequency at 55°S.