

Learning by doing: seasonal and diurnal features of tropical precipitation in a global-coupled storm-resolving model

H. Segura¹, C. Hohenegger¹, C. Wengel¹, B. Stevens¹

¹Max-Planck-Institute for Meteorology, Hamburg, Germany

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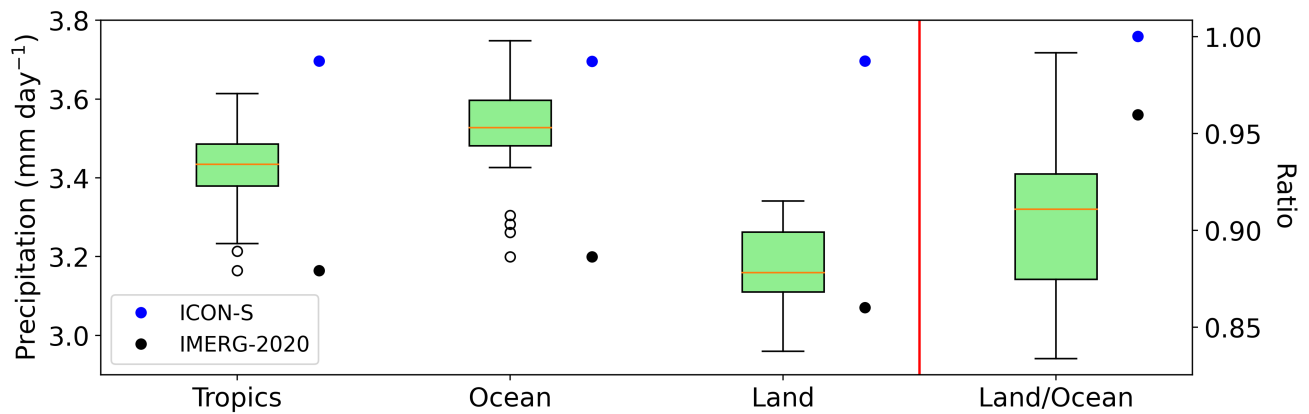
Figure S1

Figure S1. To the left of the vertical red line: box plot of the annual mean values of precipitation in the tropics (Tropics), tropical ocean (Ocean), and tropical land (Land) using IMERG from January 2001 to December 2020. The annual mean of precipitation in ICON-S and IMERG in 2020 (IMERG-2020) is plotted as a blue and black circle, respectively, to the right of each box. For ICON-S and IMERG-2020, the annual mean value is calculated using data from February 2020 to January 2021. To the right of the vertical red line: box plot of the annual mean precipitation ratio between land and ocean in the tropics (Land/Ocean) in IMERG. The ratio is calculated for each year between January 2001 to December 2020. The ratio in ICON-S and IMERG-2020 is shown as a blue and black circle, respectively, to the right of the box. The ratio in ICON-S and IMERG-2020 is calculated using the annual mean precipitation between February 2020 to January 2021

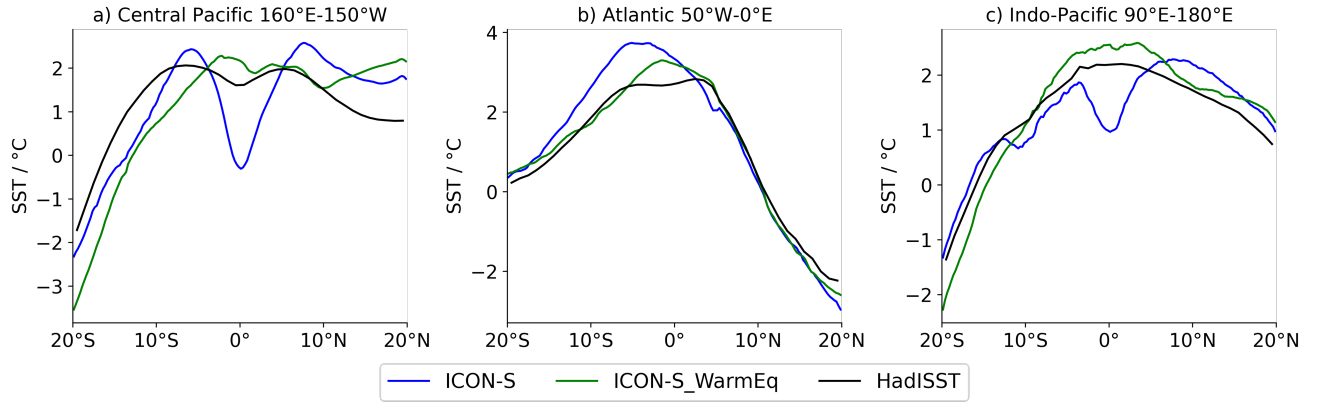
Figure S2

Figure S2. Zonal-mean sea surface temperature anomalies (SST) using ICON-S (blue line), ICON-S_WarmEq (green line) and the climatology of the HadISST data (black line, 2001-2020) in: a) the central Pacific, b) the Atlantic and c) the Indo-Pacific. The anomalies are calculated by subtracting the mean of each region between 30°S-30°N. In a), b), c) the zonal-mean is calculated from June to September 2020, from March to May 2020, and from February to September 2020, respectively, for ICON-S and ICON-S_WarmEq. In both simulations SST is interpolated to a resolution of 0.25°. For HadISST, the zonal-mean is computed using the climatology of the months used for ICON-S.

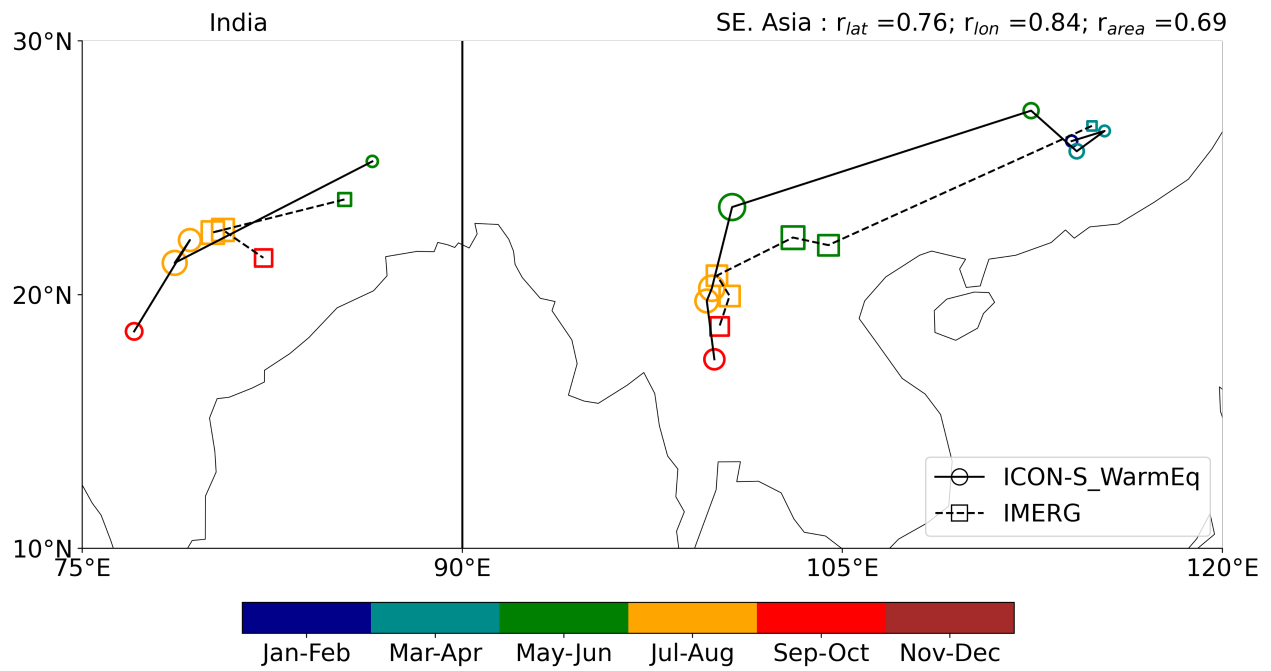
Figure S3

Figure S3. Location of the centroid of the rainbelt over India (70°E-90°E;10°N-30°N) and Southeast Asia (90°E-120°E;10°N-30°N) calculated by using the SAL method and monthly mean precipitation values from ICON-S_WarmEq (circles) and IMERG (squares). Circles are connected by a solid line, while squares are by a dashed line. The color of the edge of the markers indicates the month used to calculate the centroid (from January to December) and for a better visualization, colors are grouped by two months. The size of the markers represents the ratio between the area of the precipitation structure in each month and the annual mean area, calculated for ICON-S_WarmEq and IMERG, separately. The correlation values between the longitude and the latitude of the centroids between ICON-S_WarmEq and IMERG, as well as the correlation between the areas of the precipitation structures, are shown in the upper part of the plot only for Southeast Asia.

Table S1. Ocean configuration in ICON-S and ICON-S_WarmEq

Simulation	Vertical coordinate	First layer depth	TKE coefficient	Jerlov scheme	Viscosity
ICON-S	Z	7 meters	0.3	la	Leith
ICON-S_WarmEq	Z*	2 meters	0.1	lb	Biharmonic

^a Footnote text here.