

Supporting Information for

The impact of a land-sea contrast on convective aggregation in radiative-convective equilibrium

Beth Dingley¹, Guy Dagan², Philip Stier¹, Ross Herbert¹

¹ Atmospheric, Oceanic and Planetary Physics, Department of Physics, University of Oxford

²The Hebrew University of Jerusalem, Israel

Contents of this file

1. Captions for Movies S1 to S2
2. Figures S1 to S2

Introduction

- This supporting information contains animations to show the aggregation of convection through the outgoing longwave radiation (OLR) and column relative humidity (CRH) for radiative convective equilibrium global simulations with an idealized, flat, circular island. These simulations have the same setup as described in Section 2.2 of the main manuscript, where S1 has interactive radiation and movie S2 has homogenized radiative heating rates. Also included are a 'zoomed in' version of Figure 3 for closer inspection of the initial 10 days of the simulation, and an alternative version of Figure 6 where the simulation was initialized from a previously aggregated simulation.

Movie S1. 180-day animation of the column relative humidity (CRH; top) and outgoing longwave radiation (OLR; bottom) in a global RCE simulation with an idealized, circular (40° radius), flat tropical rainforest island. Sea surface temperatures are fixed at 305K and there is no rotation or diurnal cycle. (File attached separately: nohomog_olr_crh.mp4)

Movie S2. 180-day animation of the column relative humidity (CRH; top) and outgoing longwave radiation (OLR; bottom) in a global RCE simulation with an idealized, circular (40° radius), flat tropical rainforest island. Sea surface temperatures are fixed at 305K and there is no rotation or diurnal cycle. Longwave heating rates have been horizontally homogenized at every model timestep. (File attached separately: homogLW_olr_crh.mp4)

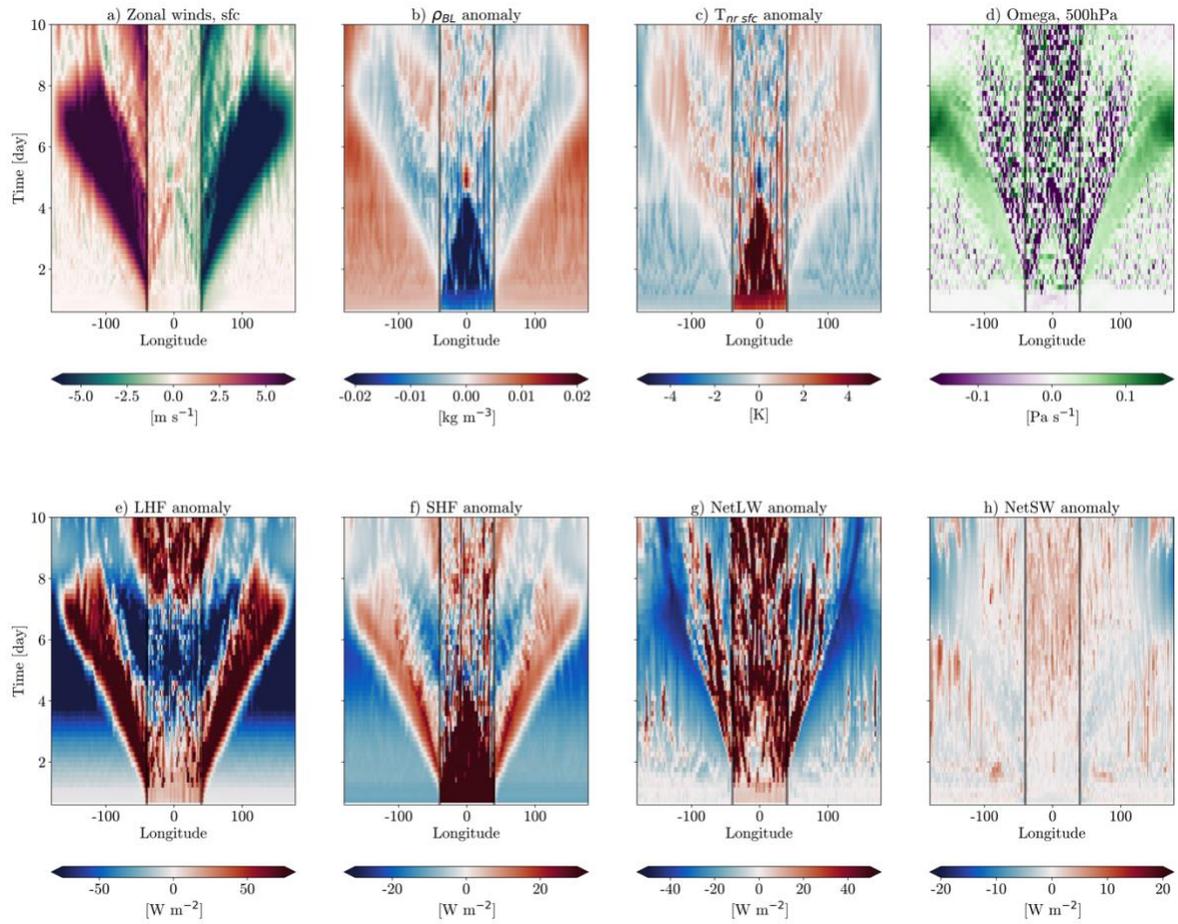


Figure S1: Hovmöller plots of a) Surface zonal winds, b) Density anomaly averaged over the boundary layer (lowest 1km) c) Near-surface temperature anomaly d) Omega at 500 hPa, e) Latent heat flux anomaly, f) Sensible heat flux anomaly, g) NetLW anomaly, h) NetSW anomaly, over the first 10 days of an RCE simulation with land, taken as a zonal slice through latitude=0°. The black lines show the coasts of the island. $NetLW = LW_{sfc} - LW_{toa}$, $NetSW = SW_{toa} - SW_{sfc}$, where LW_{sfc}/SW_{sfc} are the net longwave/shortwave fluxes at the surface and LW_{toa}/SW_{toa} are the net longwave/shortwave fluxes at the top of atmosphere. Positive fluxes are defined upwards.

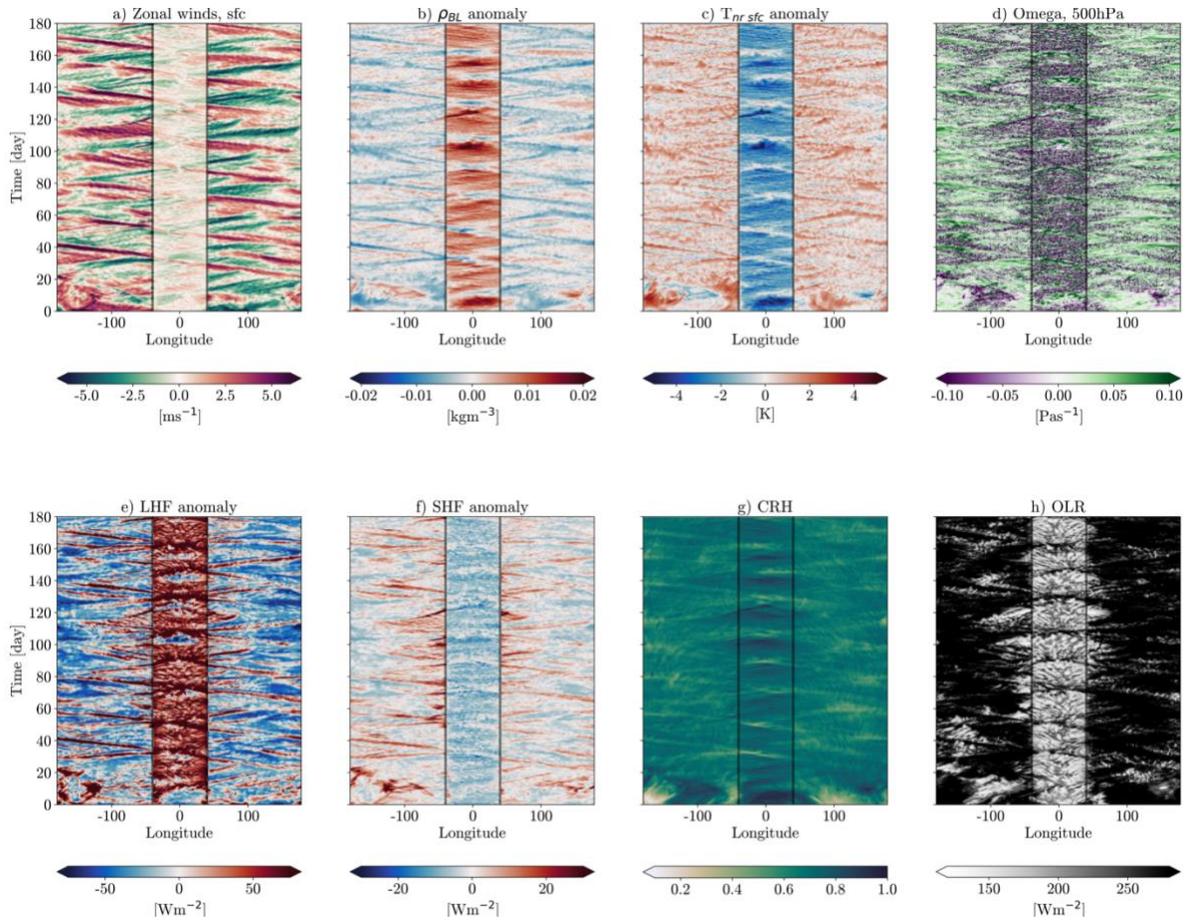


Figure S2: Hovmöller plots of a) Surface zonal winds, b) Density anomaly averaged over the boundary layer (lowest 1km) c) Near-surface temperature anomaly d) Omega at 500 hPa, e) Latent heat flux anomaly, f) Sensible heat flux anomaly, g) Column relative humidity, h) Outgoing longwave radiation, over the first 180 days of an RCE simulation with land where longwave fluxes are horizontally homogenized at each timestep, taken as a zonal slice through latitude=0\degree. The black lines show the coasts of the island. Simulation shown here was initialized with the equilibrium state of an aggregated RCE simulation with land.