Supporting Information for "Application of the Pseudo-Global Warming Approach in a Kilometer-Resolution Climate Simulation of the Tropics"

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1. Figures S1 to S7

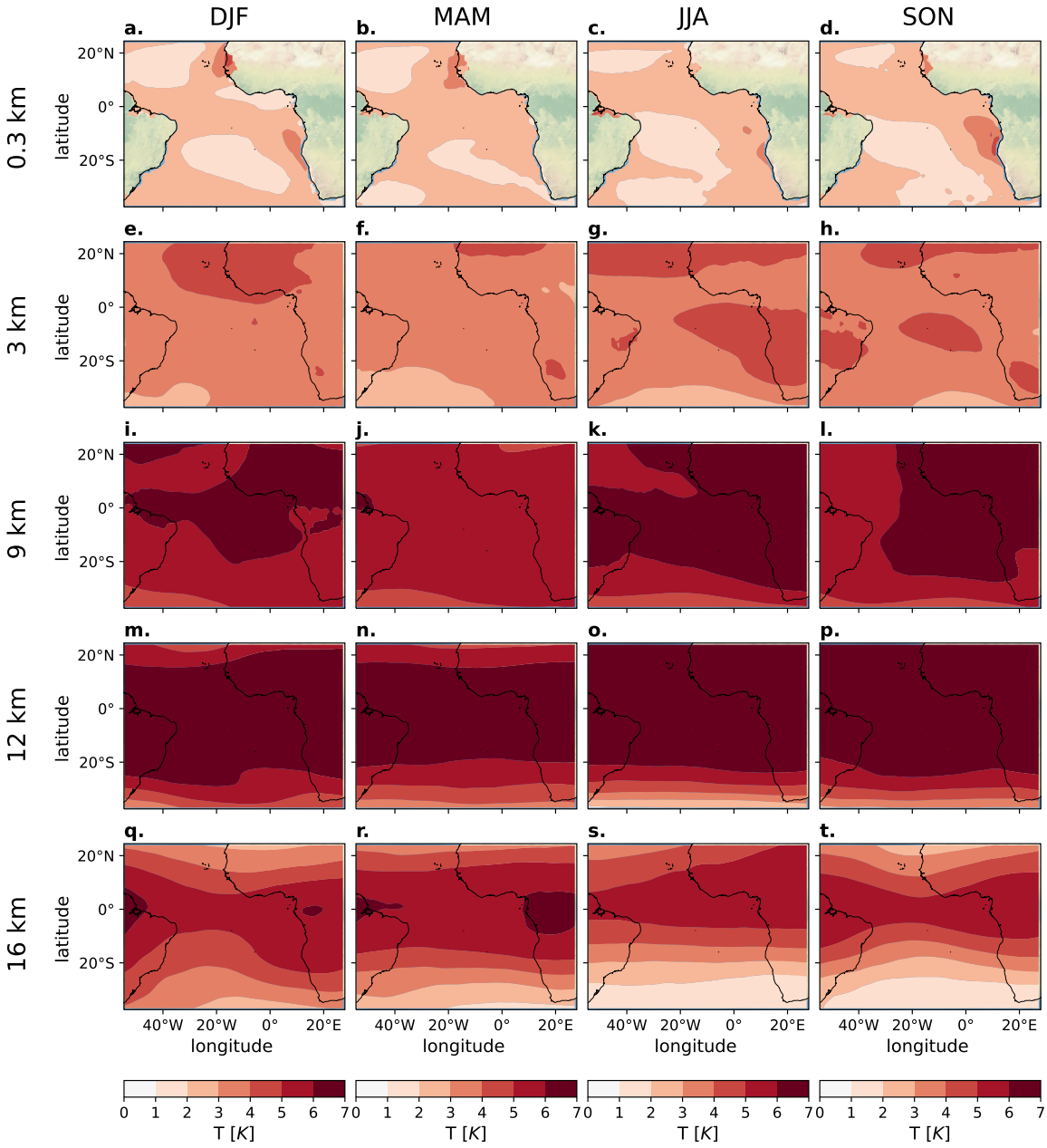

Figure S1. Climate delta for temperature shown at (first row) 0.3 km, (second row) 3 km, (third row) 9 km, (fourth row) 12 km, and (fifth row) 16 km altitude for the seasons (first column) December-February, (second column) March-May, (third column) June-August, and (fourth column) September-November. The delta is computed as the difference between SCEN (SSP5-8.5, 2070-2099) and HIST (historical, 1985-2014) for the MPI-ESM1-2-HR model.

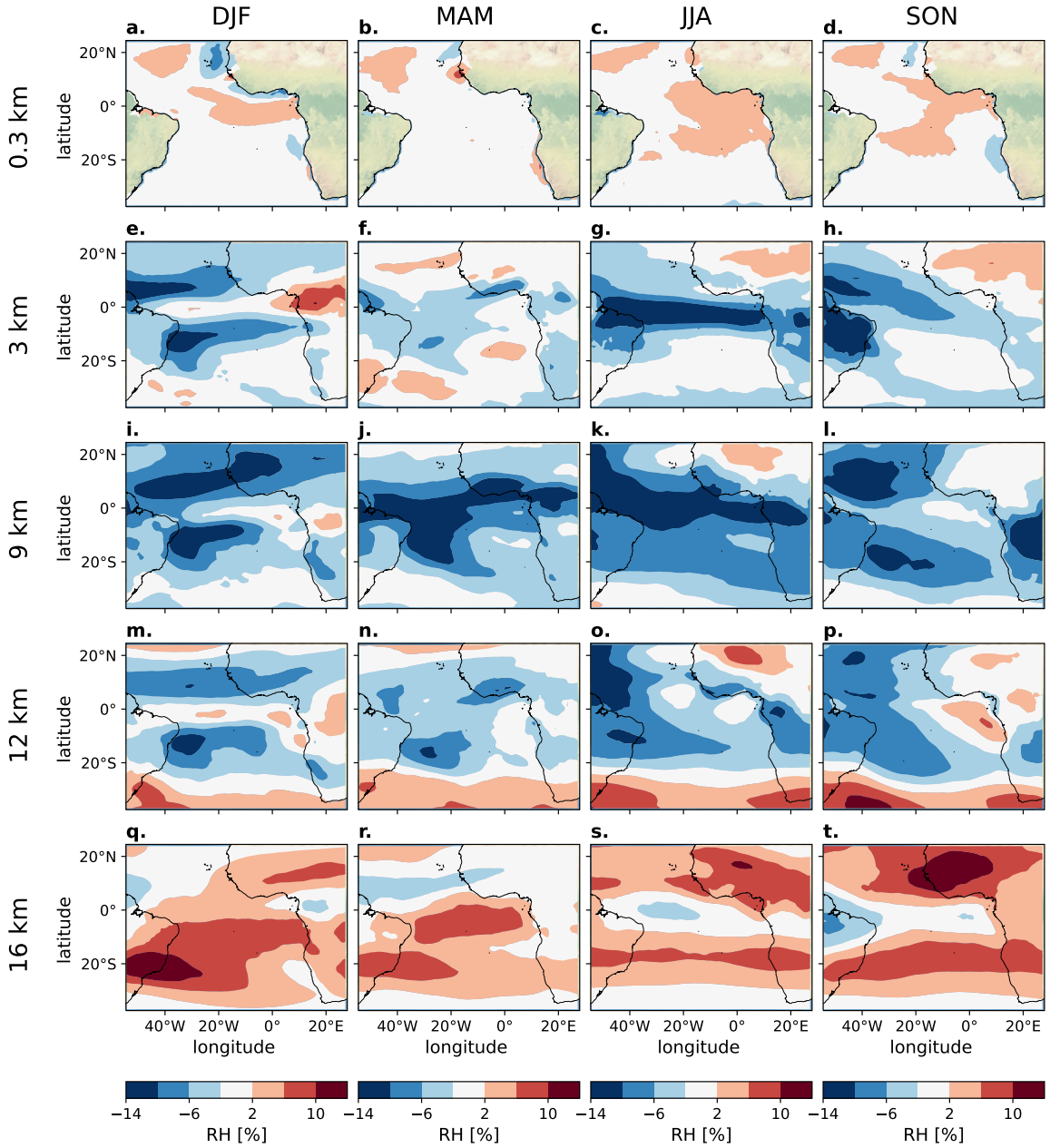

Figure S2. As Fig. S1 but shown for the relative humidity.

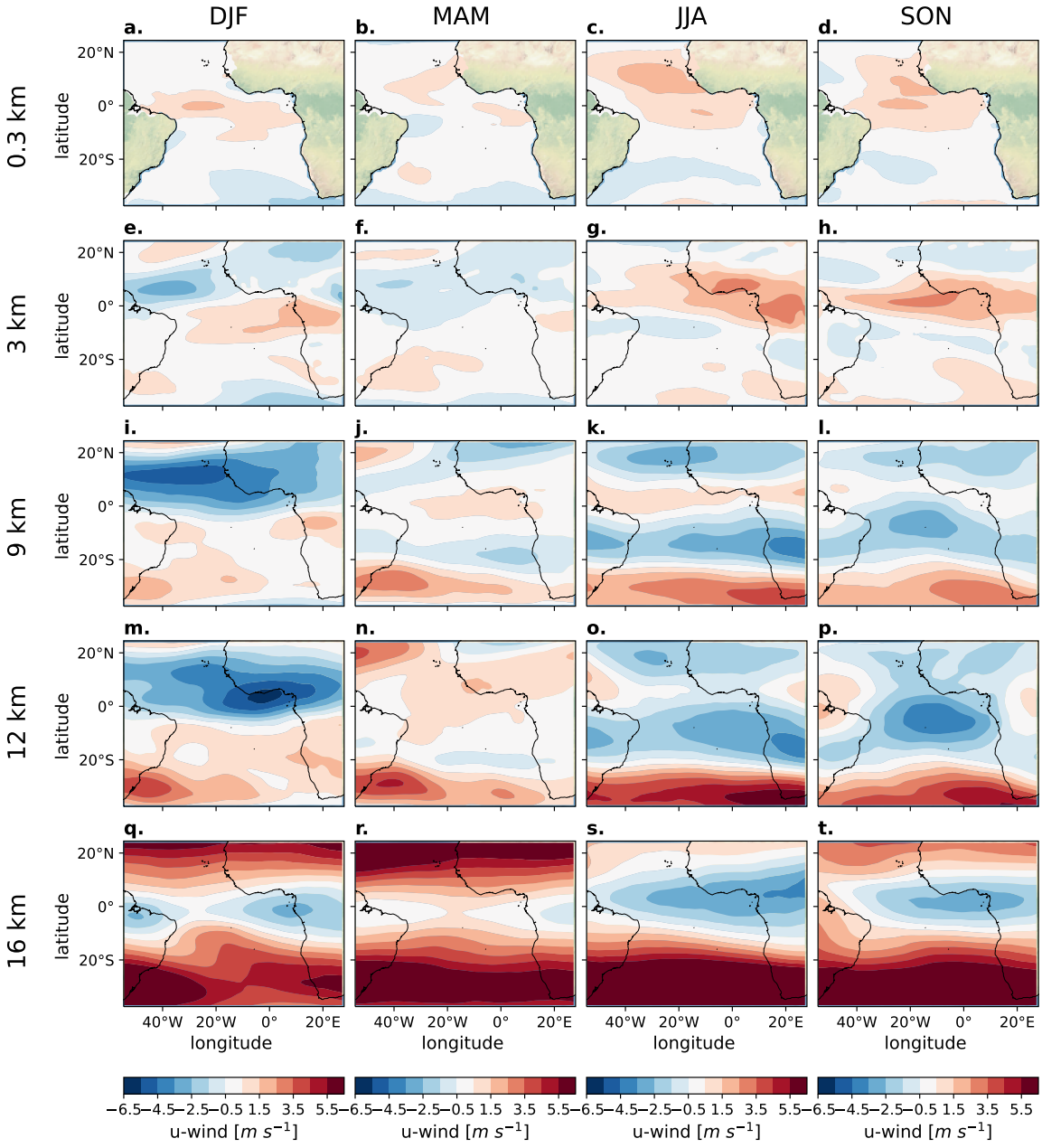

Figure S3. As Fig. S1 but shown for the zonal wind.

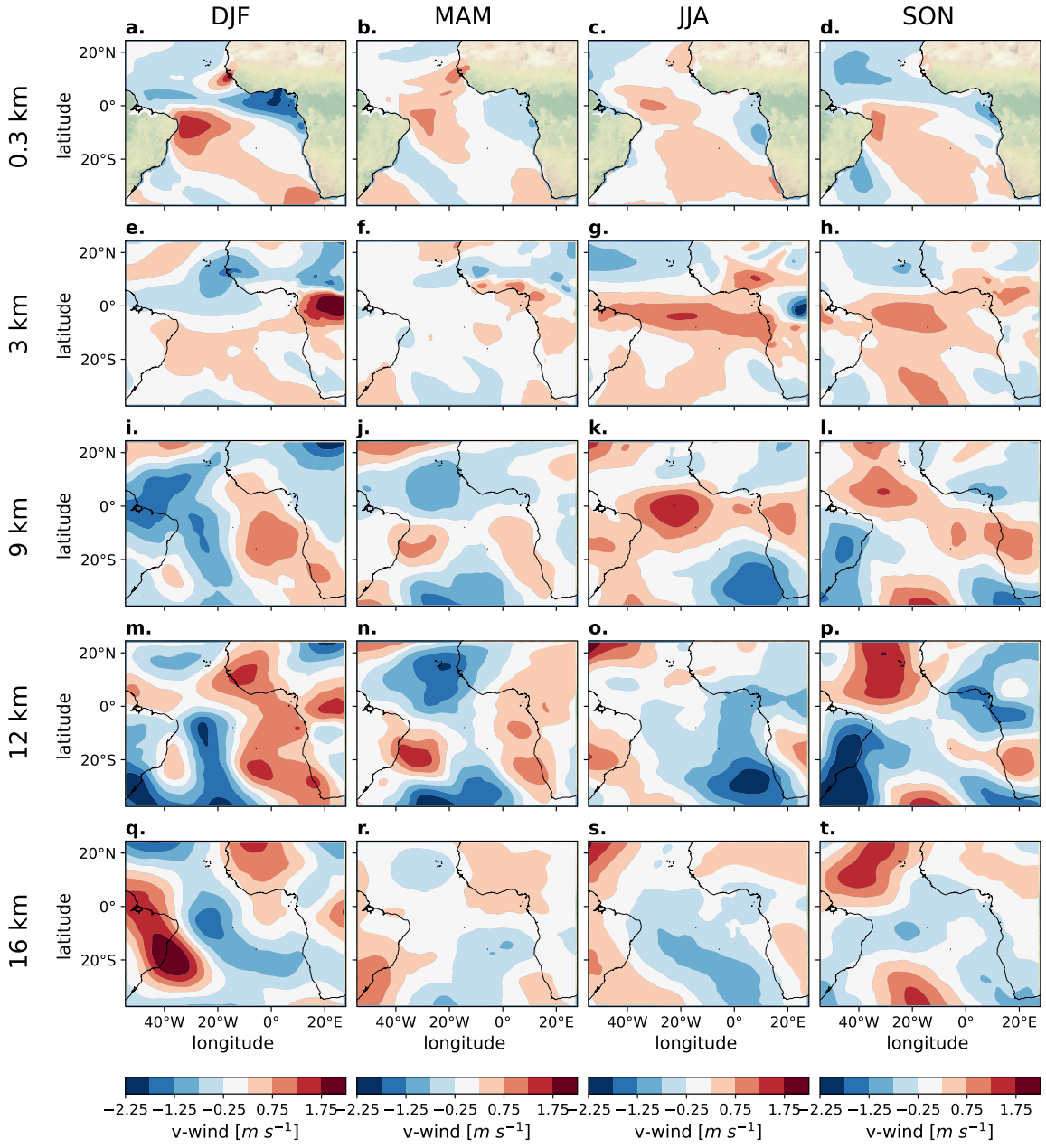

Figure S4. As Fig. S1 but shown for the meridional wind.

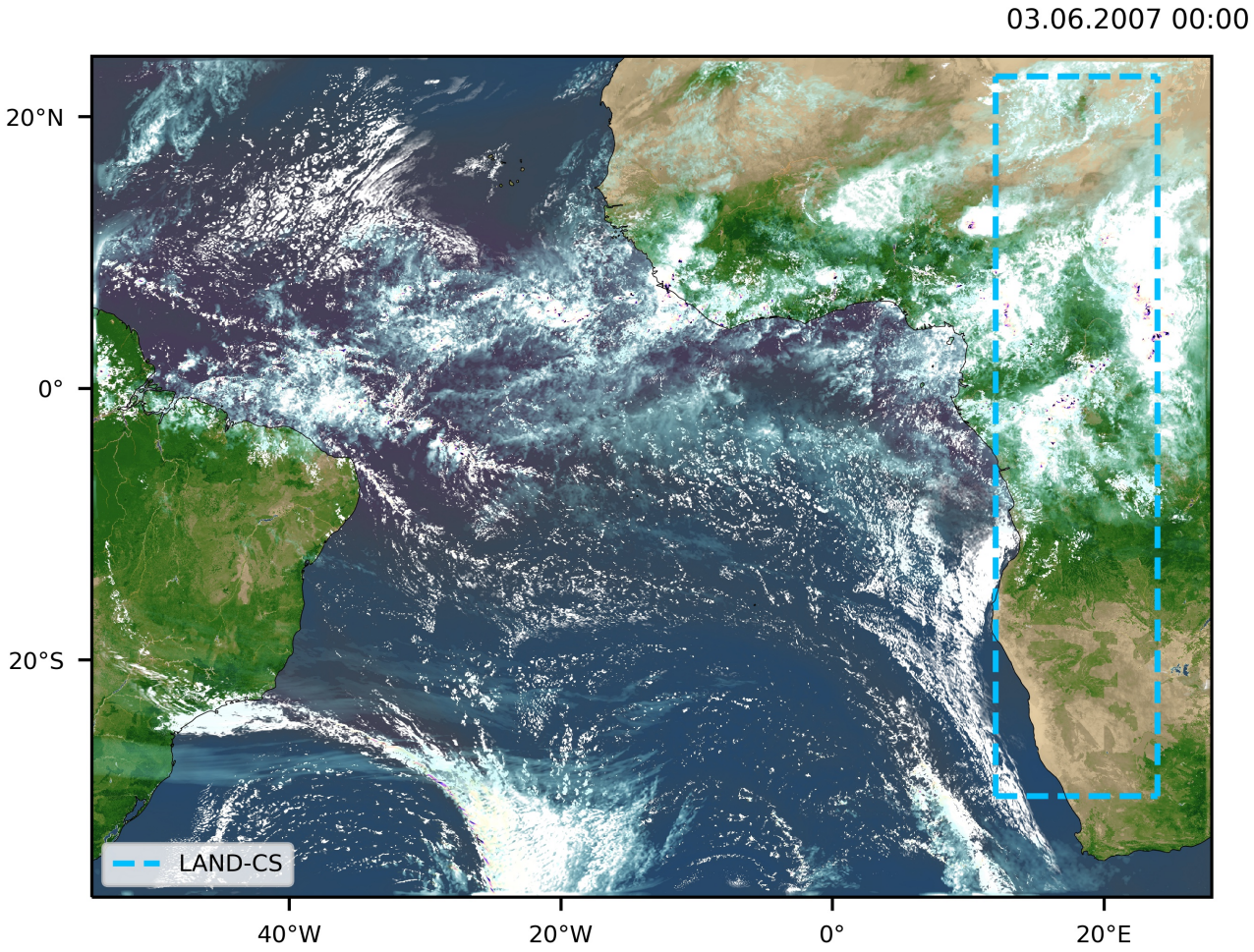

Figure S5. Simulation visualization and LAND-CS analysis domain used in supplementary Fig. S6.

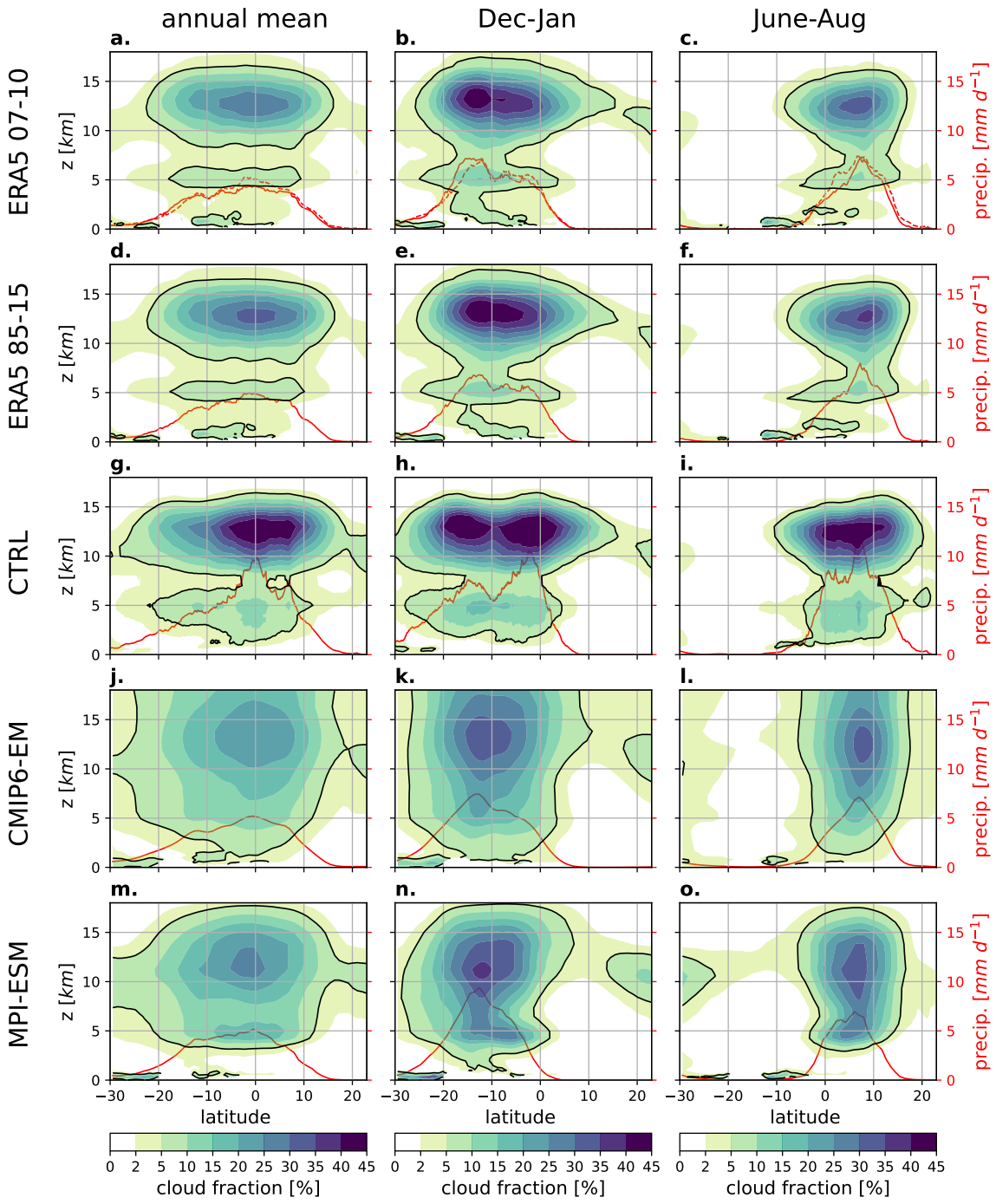

Figure S6. Altitude-latitude cross-sections of the cloud fraction [%] (green-to-blue contours) averaged along the longitudes of the LAND-CS domain. The black contour lines locate the 5% cloud fraction level. The solid red lines show surface precipitation [mm d^{-1}] represented on the right y-axis. The panels show (a-c) ERA5 (2007-2010), (d-f) ERA5 (1985-2014), (g-i) CTRL (2007-2010), (j-l) CMIP6-EM HIST (1985-2014), and (m-o) MPI-ESM HIST (1985-2014). The values represent multi-year averages (left panels) during the entire year, as well as (middle panels) during December, January, February and (right panels) June, July, August when the continental ITCZ reaches its southernmost and northernmost extent, respectively. As a complementary reference observation, GPM IMERG precipitation is shown as a red dashed line in panels (a-c).

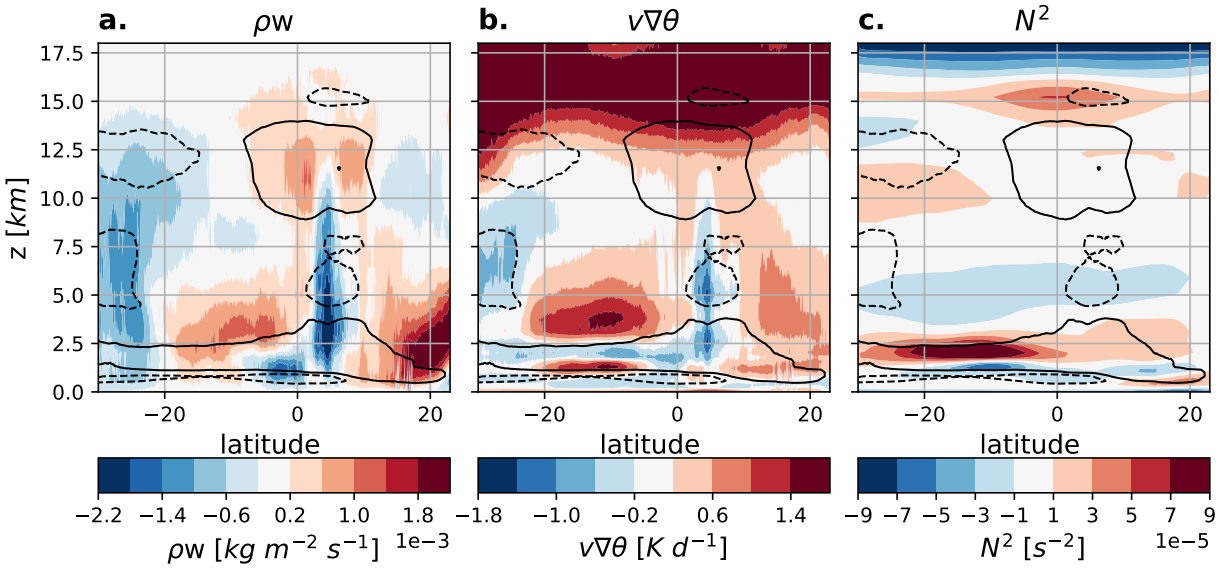

Figure S7. Altitude-latitude cross-sections of the difference CTRL−ERA5 (2007-2010) in (a) the vertical mass flux [kg m^{-2} s^{-1}], (b) the diabatic heating rate $\dot{\theta}$ [K d^{-1}] approximated by $\dot{\theta} \approx \mathbf{v} \cdot \nabla\theta$., and (c) the Brunt-Väisälä frequency [s^{-1}] along the longitudes of the HC-CS domain. The black contour lines indicate the 2% level of difference in the cloud fraction level where solid (dashed) lines represent a positive (negative) difference. The comparison of all panels reveals that the weaker subsidence in the lower subtropical free troposphere in CTRL compared to ERA5 results from a weaker diabatic cooling rather than increased stability. The stability of the lower free troposphere is lower in CTRL than in ERA5.