EGU24-16770, updated on 20 May 2024
https://doi.org/10.5194/egusphere-egu24-16770
EGU General Assembly 2024

Exploring the role of evaporation in atmospheric heat transport and seasonal low-latitude precipitation biases in CMIP6

Ruth Geen[1], Marysa Laguë[2], and Robert Fajber[3]
[1]School of Geography, Earth and Environmental Sciences, University of Birmingham, Birmingham, United Kingdom of Great Britain – England, Scotland, Wales (r.geen@bham.ac.uk)
[2]Department of Atmospheric Sciences, University of Utah, Salt Lake City, United States (marysa.lague@utah.edu)
[3]Department of Atmospheric and Oceanic Sciences, McGill University, Montreal, Canada (robert.fajber@mcgill.ca)

Tropical and subtropical precipitation impact millions of people via agriculture and rainfall driven disasters. However, a wide spread remains in future regional projections of low-latitude precipitation, dominated by uncertain shifts in rainfall, and models continue to show a variety of biases in the location and intensity of rain.

The Energy Flux Equator framework has emerged as a powerful tool in interpreting the location of low-latitude rainfall via atmospheric heat transport (AHT), which in turn can be understood through the top of atmosphere and surface energy fluxes. Recent work using a novel decomposition of the zonal-mean AHT suggests that its spatial structure is dominated by the meridional structure of the latent heat flux. Here, we apply this decomposition to investigate intermodel differences in AHT on the seasonal timescale.

We find that throughout the year, intermodel differences in total AHT and the latitude of maximum zonal mean precipitation both correlate strongly with the heat transport contribution attributed to evaporation. Curiously, spatial regressions appear to suggest that evaporation over land provides a key contribution to this spread, despite the net surface heat flux over land being close to balanced. To interrogate the causality underlying this correlation with land evaporation, we make use of the 1pctCO2-bgc simulations, in which only the carbon cycle responds to increasing carbon dioxide, with one consequence being altered evapotranspiration.