The zonally averaged annual mean intertropical convergence zone (ITCZ) is in the northern hemisphere. The models of varying complexity are used in idealized setups to test the importance of each forcing. Models of varying complexity are used in idealized setups to test the importance of each forcing.

- Gray radiation atmosphere (Frierson et al., 2006)
- Aquaplanet slab ocean moist GCM
- Spectral T42 / B-grid (2x2) dynamical core, 25 vertical levels
- No clouds, no water vapor radiative feedback

MOMMA (ICCMp1) (Far det and Vallis, 2009)
- Sector coupled ocean-atmosphere GCM
- 8-grid gray radiation atmosphere, 3.75x3.75, 7 vertical levels
- MOM ocean (Griffies et al., 2005), 2x2, 24 vertical levels
- Also includes sea ice and land models

AM2 (Anderson et al., 2003)
- Aquaplanet with slab ocean model GCM
- Finite volume core, 2.5x2, 24 vertical levels
- Complex radiation and clouds

Some components of the Earth System must be forcing this climate asymmetry. The energetic response in the tropics of AM2 is similar when adding either Andes or surface heat fluxes. There is an increase in the absorbed NH-SH radiation in the tropics from adding an Andes mountain range.

AM2 over-responds to a given ocean heat forcing, while GRAM under-responds. AM2 over-responds to a given ocean heat forcing, while GRAM under-responds.

The change in precipitation and circulation presents with and without Andes in two simulations: a flat simulation (green) and a simulation with Andes (orange) with added heat fluxes. We replaced the wind stress in a simulation with Andes with a weaker wind stress in a simulation with a flat atmosphere (gray).

Ocean heat fluxes result in a stronger shift of precipitation than the addition of the Andes. Ocean heat fluxes result in a stronger shift of precipitation than the addition of the Andes.

The change in precipitation without wind-evaporation feedback looks nearly identical. The energetic response in the tropics of AM2 is similar when adding either Andes or surface heat fluxes. There is an increase in the absorbed NH-SH radiation in the tropics from adding an Andes mountain range.

The Andes induce radiation anomalies that change the energy transport at the equator. The Andes induce radiation anomalies that change the energy transport at the equator. The energetic response in the tropics of AM2 is similar when adding either Andes or surface heat fluxes. There is an increase in the absorbed NH-SH radiation in the tropics from adding an Andes mountain range.

In simulations that add an Andes mountain range, precipitation still shifts northward even when wind-evaporation feedback is removed. In simulations that add an Andes mountain range, precipitation still shifts northward even when wind-evaporation feedback is removed.