Geophysical Research Abstracts
Vol. 17, EGU2015-6724, 2015
EGU General Assembly 2015

Future changes in seasonality in tropical precipitation: ocean ITCZs and land monsoons.

Michela Biasutti (1), John Dwyer (2,3), Adam Sobel (1,2)

(1) Lamont Doherty Earth Observatory, Columbia University, Palisades, NY, United States (biasutti@ldeo.columbia.edu), (2) Applied Physics and Applied Mathematics, Columbia University, New York, NY, United States, (3) Massachusetts Institute of Technology, Cambridge, MA, United States

Forced by an increase in greenhouse gasses, comprehensive coupled models in the CMIP3 and CMIP5 ensembles project changes to the seasonality of both tropical surface temperature and precipitation. Nearly all models project an amplification and a phase delay of the annual cycle for both quantities, indicating a greater annual range and extrema reached later in the year. For precipitation this means enhanced summer ITCZ and monsoonal precipitation and delays to the meridional movement of the ITCZ and a later start and end to the monsoons.

We complement the analysis of the CMIP projections with insights from idealized simulations, all the way to aquaplanet configurations. We find that a uniform SST warming is sufficient to force both an amplification and a delay of the annual cycle of the zonal mean precipitation of similar magnitude as in the CMIP5 models, while AGCM simulations solely forced with seasonal SST changes do not reproduce the seasonal changes in precipitation found in the CMIP5 models.

Yet, the mechanisms that are responsible for the anomalies in the zonal mean and the oceanic ITCZs are not relevant for the changes in monsoonal lands, such as the African Sahel. There, changes in the regional circulation that are linked to changes in land-sea temperature contrast and in sea surface temperature are key players.