



Review of South Asian Monsoon: A new Framework of aquaplanet coupled with an Interactive Vegetation model

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In the current study, we re-visited the South Asian summer (June-September) seasonal rainfall mechanism in an idealized Earth System Modeling framework using the intermediate complexity model namely as SPEEDY. The seasonal radiative heating tends to shift the Inter-tropical convergence zone (ITCZ) from southern to the northern hemisphere. A series of idealized aquaplanet experiments forced with fixed 20-m slab ocean model are conducted to identify the mechanisms contribution to the main climatological features of the South Asian summer monsoon. The role of land-surface feedbacks is investigated by coupling an interactive dynamic vegetation model (VEGAS) to SPEEDY in the South Asian region.

The advantage of an interactive dynamics vegetation coupling is that crucial parameters, like surface albedo and evaporation fractions do not have to be prescribed in an ad-hoc manner. Furthermore, the role of orography mimicking the Himalaya is studied. It is found that the land-sea contrast in combination with the orography are the main drivers of the most important monsoon features, such as the northward extension of the ITCZ and monsoon onset. This is consistent with previous studies. The idealized orography improves the simulation of the Tibetan high in the upper troposphere that tends to maintain the east-west gradient and modulates the rainfall in the region. Moreover, a stronger tropical easterly jet is noted in the Indian sector in simulations with land along with orography and Q-flux. We also find that desert developments to the west as well as the high pressure over the ocean to the east of the South Asian monsoon region are strongly influenced by the presence of orography