Geophysical Research Abstracts
Vol. 18, EGU2016-1236, 2016
EGU General Assembly 2016
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TRAC-MIP: Tropical Rain bands with an Annual cycle and Continent - Model Intercomparison Project.

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Understanding and modeling tropical rainfall has proven to be one of the most stubborn challenges in climate science. Tropical rainfall biases such as a double inter-tropical convergence zone (ITCZ) in the East Pacific have now persisted more than two decades despite the general improvements of climate models, and projections for the ITCZ and the monsoon systems remain uncertain in magnitude and sign. Progress in these areas can be fostered by a set of idealized experiments that target the dynamics of tropical rain band, as long as these simple experiments are properly integrated within a full hierarchy of model simulations.

To this aim, we have designed the "Tropical Rain belts with an Annual cycle and Continent - Model Intercomparison Project." TRAC-MIP involves five experiments using idealized aquaplanet and land setups to explore the dynamics of tropical rainfall. By using interactive sea-surface temperatures and seasonally-varying insolation TRAC-MIP fills the gap between idealized aquaplanet simulations with prescribed SSTs and the fully-coupled realistic model simulations of CMIP5. TRAC-MIP includes the participation of 13 state-of-the art comprehensive climate models, and it also includes a simplified model that neglects cloud and water-vapor radiative feedbacks, thus allowing a more direct connection between the results from the TRAC-MIP comprehensive models and the theoretical studies of tropical rain belt dynamics.

We will present preliminary results from the ensemble, aiming to examine the mechanisms controlling tropical precipitation in the context of forced variability. First and foremost, we are interested in the largest forced variation: the annual cycle. Second, we are interested in the response to key forcings of the future (greenhouse gases) and of the Holocene (insolation). We will draw out the similarities and the distinctions between oceanic and continental rain bands, study the ways in which the two interact with each other, and investigate the extent to which established zonal-mean ITCZ frameworks contain information about regional rainfall characteristics.