Contribution ID: **69** Type: **Poster**

Factors controlling precipitation in idealised monsoon simulations over an aquapatch

Monday, 16 May 2022 12:30 (2 minutes)

The traditional view of monsoons as continental sea breezes generated by land-sea contrasts was shown to have serious limitations. Therefore, it remains unclear if the surface temperature contrast matters for the monsoon precipitation, and why there is a non-linear intensification of precipitation intensity with surface temperature forcing. Here, we aim to determine if monsoon non-linearities with surface forcing come from convective processes, dynamical feedbacks, or from non-linearities in the forcing themselves.

Idealised studies such as aquaplanets often help improve our understanding of basic mechanisms. But there are very few idealised simulation studies of monsoons at high resolution. So we devise a modular framework to simulate idealised monsoons at convection-permitting resolution with the WRF model, in a domain based on an aquapatch (rectangular mini-aquaplanet), but in which we can gradually add more realistic components, such as an interactive land surface. The model is forced by a meridional contrast of surface temperature, with comprehensive physics, rotation, and symmetric boundary conditions at the North and South boundaries. In particular, we analyse a series of aquapatch experiments with varying Sea Surface Temperature (SST) gradients, varying SST peak locations, with and without rotation.

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Session Classification: Poster pitches