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Land-surface initialisation affects Indian monsoon subseasonal predictability

Obbe Tuinenburg
Utrecht University, Copernicus Institute, Utrecht, The Netherlands (o.a.tuinenburg@uu.nl)

The influence of the land surface wetness state on precipitation is known to vary across the world. In areas where there exists such a strong coupling between land and atmosphere, land surface wetness state information can be used to increase the predictability of precipitation on several timescale, varying from the daily to the seasonal timescale.

Whether there is a strong coupling between land surface and precipitation depends on how the surface energy balance affects turbulent atmospheric boundary layer processes and cloud formation. If the atmosphere is too dry, no precipitation will occur regardless of land surface conditions. If the atmosphere is too moist, precipitation will always occur regardless of land surface conditions. Moreover, there should be some conditional instability the to allow convective precipitation to occur.

India is a location with a strong coupling between land and atmosphere. Moreover, atmospheric models have a strong dry bias during the monsoon season.

Here, we will study Indias summer monsoon predictability based on (sub-)seasonal atmospheric simulations (S2S-project archive) up to the seasonal timescale. We specifically analyse the precipitation difference between ensemble members and regress these differences against the different land surface initialisations of the ensemble members. This regression is used to determine how sensitive monsoon precipitation is to land surface conditions for each model.
Finally, we analyse this sensitivity based on local land-atmosphere coupling as well as atmospheric moisture transport.

Initial results show that there is a strong relation between initialised surface wetness and India summer monsoon precipitation. An analysis of land surface wetness-precipitation coupling in the S2S-database, as well as its atmospheric moisture transport pathways, will be presented.