



Interannual variability and predictability over the Arabian Peninsula Winter monsoon region

Muhammad Adnan Abid (2), Fred Kucharski (1,2), Mansour Almazroui (2), In-Sik Kang (2,3)

(1) Abdus Salam International Centre for Theoretical Physics, Earth System Physics Section, Trieste, Italy (kucharsk@ictp.it),
(2) Center of Excellence for Climate Change Research/Department of Meteorology, King Abdulaziz University, Jeddah, Saudi Arabia, (3) School of Earth and Environmental Sciences, Seoul National University, South Korea

Interannual winter rainfall variability and its predictability are analysed over the Arabian Peninsula region by using observed and hindcast datasets from the state-of-the-art European Centre for Medium-Range Weather Forecasts (ECMWF) seasonal prediction System 4 for the period 1981–2010. An Arabian winter monsoon index (AWMI) is defined to highlight the Arabian Peninsula as the most representative region for the Northern Hemispheric winter dominating the summer rainfall. The observations show that the rainfall variability is relatively large over the northeast of the Arabian Peninsula. The correlation coefficient between the Nino3.4 index and rainfall in this region is 0.33, suggesting potentially some modest predictability, and indicating that El Nino increases and La Nina decreases the rainfall. Regression analysis shows that upper-level cyclonic circulation anomalies that are forced by El Nino Southern Oscillation (ENSO) are responsible for the winter rainfall anomalies over the Arabian region. The stronger (weaker) mean transient-eddy activity related to the upper-level trough induced by the warm (cold) sea-surface temperatures during El Nino (La Nina) tends to increase (decrease) the rainfall in the region. The model hindcast dataset reproduces the ENSO–rainfall connection. The seasonal mean predictability of the northeast Arabian rainfall index is 0.35. It is shown that the noise variance is larger than the signal over the Arabian Peninsula region, which tends to limit the prediction skill. The potential predictability is generally increased in ENSO years and is, in particular, larger during La Nina compared to El Nino years in the region. Furthermore, central Pacific ENSO events and ENSO events with weak signals in the Indian Ocean tend to increase predictability over the Arabian region.