Prediction of monsoon using a seamless coupled modelling system

Ashis K. Mitra[1],*, E. N. Rajagopal[1], G. R. Iyengar[1], D. K. Mahapatra[1],
I. M. Momin[1], A. Gera[1], K. Sharma[1], J. P. George[1], R. Ashrit[1], M. Dasgupta[1],
S. Mohandas[1], V. S. Prasad[1], Swati Basu[1], A. Arribas[2], S. F. Milton[2],
G. M. Martin[2], D. Barker[2] and M. Martin[2]

[1]National Centre for Medium Range Weather Forecasting, A-50, Institutional Area, Sector 62, Noida 201309,
India
[2]UK Met Office, FitzRoy Road, Exeter, EX1 3PB, UK

Abstract

Rainfall for India and South Asian region mainly comes during the summer monsoon period. Realistic model representation of monsoon rainfall variability is a scientific challenge and is of great societal consequences. Due to scale interactions, study of monsoon variability and predictability from hours to a season using a realistic model is of vital importance. Under the Ministry of Earth Sciences, National Monsoon Mission, National Centre for Medium Range Weather Forecasting (NCMRWF) is focussing on the week-2 forecast of monsoon rainfall using a coupled model and its initialization. Improving the skill of models within the timescale of the first two weeks period is vital because of its seamless connection to the monsoon intraseasonal and seasonal variability and prediction. Model development for monsoon rainfall has to be dealt in a holistic way, including the scales from days to a season. NCMRWF on its effort to undertake advanced research in tropical/monsoon simulation /prediction across a range of timescales from hours to a season, has made one incremental step forward by implementing a state-of-the-art coupled model. In this study, we report results from monsoon simulations from the high-resolution global assimilation–forecast setup in NWP medium range timescale and also from the simulation results from a relatively coarser coupled model. The monsoon lower tropospheric flow and associated rainfall patterns are quite realistic. The existing model biases in flow, rainfall and surface parameters are also discussed. To remain at the forefront of monsoon prediction, a much higher resolution version of the coupled model and its initialization component will be implemented in the coming years on a more powerful supercomputer. The focus will be to improve simulation of coupled monsoon variability in timescale of hours to a season with an aim to improve forecast skill in week-2 time-period over the Indian region.

[Keywords: Coupled model, data assimilation, monsoon modelling, rainfall variability]