Seasonal Monsoon rainfall prediction over the South Asian Region by Dynamical Downscaling

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Seasonal climate forecasting, especially during monsoon seasons, is an utmost important for many sectors such as agriculture, water resources, energy, health, etc. Monsoon rain is of enormous importance to give shape to agriculture, economy and rhythms of life of the South Asian region. Asian Monsoon is one of the major components of the earth climate system. Realistic Modeling, simulation and prediction of monsoon are challenging scientific tasks for the world's science community. The science pertaining to monsoon has progressed significantly in the last two decades due to an increased wealth of new data from satellite observations, understanding the processes and enhanced computing power. Numerical models and data assimilation algorithms have been further improved at all major international centers across the globe. The WRF model was run at 40 km resolution and 27 vertical levels. Kain-Fritch cumulus parameterization scheme and WRF-Single moment 3-class microphysics scheme (simple ice and snow scheme) are used for simulating all the events. Surface layer is treated using Monin-Obukhov with Carslon-Bolan viscous sub-layer option and boundary layer is treated with Yonsei University scheme. Noah 4-layer land surface model is utilized with the above combination. The model is run perpetually for 4 months for each of the 4 years 2007 to 2010. The boundary conditions are updated at every 6 hours intervals using the NCEP/ FNL data. Both spatial and temporal variations of the rainfall are analyzed. 7 separated boxes are selected representing different geographical characteristics over the Bangladesh, Bhutan, India and Nepal for studying the monsoon rainfall. Observed rainfall by TRMM, GPCP, and CMAP are used for verifications of the simulated rainfall. Results show that in general the large scale seasonal distributions of rainfall simulated by the model are depicted fairly well as compared to the observations.

Keywords: WRF-ARW model, FNL data, monsoon rainfall, LBC.