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Probabilistic Prediction of Intraseasonal Oscillations of Indian Summer Monsoon Rainfall in Extended Range Scale Using A Self Organizing Map Based Ensemble Forecasting Technique

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The long-range prediction of the seasonal mean monsoon at least one season in advance is important but may not be very useful and meaningful when the mean is close to normal. This is because the spatio-temporal distribution of rainfall anomalies is very inhomogeneous even when the all India mean is close to normal. In such cases or otherwise, the extended range prediction of active and break spells of the monsoon 3-4 weeks in advance would be very useful for sowing, harvesting and water resources management and to anticipate and mitigate disasters associated with monsoon variability.

The prediction of monsoon in the extended range time scale is a major challenge to the meteorological research community owing to its complexity. Efforts had been made to explore the potential for the extended range prediction of monsoon ISO but became inconclusive. The comparable amplitude of Intraseasonal Variability (ISV) to that of the seasonal cycle now provides optimism for extended range prediction.

The empirical prediction of rainfall on the extended range largely relies on the evolution of the large scale dynamical parameters. Based on the relationship of the large scale parameters and their past temporal evolution with rainfall an analog technique has been defined to separate various shades of intraseasonal oscillations from past data. For the prediction purpose analogs of the present ISO is being identified from the past database and the future is being predicted from the evolution of the past analog. Having proved this hypothesis in Chattopadhyay, Sahai and Goswami (JAS 2008) we have developed a non-linear statistical technique based on this for large ensemble of extended range empirical prediction and generation of probabilistic forecast of summer monsoon rainfall on regional and sub-divisional scale over India from a large pool of parameters constructed depending on the variability on different regions and using a nonlinear pattern recognition technique known as Self Organizing Map (SOM), which can effectively extract various shades of the convectively coupled intraseasonal oscillation of rainfall (e.g. active, break, normal conditions and their transitions) in a better way without directly involving rainfall. This technique incorporates the uncertainties in the prediction scheme arises due to the selection of-lead/lag pentads, lattice dimension, parameters and years in the training period. The forecast is being developed for the monsoon core zone of India (MZI) which is roughly from 18˚N to 28˚N and 65˚E to 88˚E (Rajeevan. et., al., 2010).