

Empirical approach to seasonal forecasting of Indian summer monsoon: problems and prospects

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It is well known that the Indian summer monsoon has a major component of variability that operates on sub-continental and seasonal scales. Several observational and modelling studies have indicated that slowly varying surface boundary conditions, particularly in the winter and pre-monsoon seasons, constitute a major forcing on the interannual variability of the monsoon. Parameters representing these conditions, global as well as regional, provide the handle for seasonal prediction. Empirical modelling strategies include identification of reliable precursors as well as an optimal utilization of the information contained in the data on precursors. The reasonable success achieved by the empirical approach has motivated persistent exploration of regional/global teleconnections of the Indian summer monsoon season since Walker's time, which resulted in a large number of predictors as well as a variety of statistical techniques. Despite the fact that atmospheric general circulation models have made rapid strides in the recent past with vastly improved representations of the Asian summer monsoon, empirical approaches continue to have an important place in operational seasonal forecasting.

Notwithstanding the strong physical basis inherent in the empirical formulations, the relationships considered are by no means consistent in space and time, with consequent implications to their predictive skills. The notable failure of empirical models in predicting the deficient summer monsoon of 2002 is a case in point. In this background, this presentation tries an assessment of the current status of the empirical approaches, with a view to highlight the major problems. In this context, it is essential that we look more closely at the predictands as well as predictors, and what they represent. The current set of predictors seems to be heavily tilted towards ENSO-related forcing. Modelling methodologies do not appear to substantially improve forecast skill for a given set of predictors. Further, several studies have shown that decadal variability plays a major role in the secular variation of predictand-predictor relationships. Predictability of intraseasonal variability also is a limiting factor that is proving to be a daunting task.

In order to provide seasonal monsoon predictions of practical value, predictands based on sub-regional and sub-seasonal monsoon rainfall need to be given more emphasis in empirical forecasting research. While a few attempts have been made in this direction, sufficient number of predictors is not available specific to such predictands. Therefore, predictor identification needs to be pursued in a comprehensive manner using modern data sets (e.g., reanalyses), to identify new predictors with possibly non-linear teleconnections. There have been some methodological innovations recently to handle secular variations in the teleconnections and optimize the predictive information. A brief overview of these results will be presented and prospects for more reliable empirical predictions will be highlighted.

Tuesday I (Keynote talk)

ICTP/PROMISE conference on:
**Monsoon Environments: Agricultural and Hydrological Impacts of Seasonal Variability and
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