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Hierarchical Bayesian space-time interpolation versus spatio-temporal BME approach

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Abstract. The restrictions of the analysis of natural processes which are observed at any point in space or time to a purely spatial or purely temporal domain may cause loss of information and larger prediction errors. Moreover, the arbitrary combinations of purely spatial and purely temporal models may not yield valid models for the space-time domain. For such processes the variation can be characterized by sophisticated spatio-temporal modeling. In the present study the composite spatio-temporal Bayesian maximum entropy (BME) method and transformed hierarchical Bayesian space-time interpolation are used in order to predict precipitation in Pakistan during the monsoon period. Monthly average precipitation data whose time domain is the monsoon period for the years 1974–2000 and whose spatial domain are various regions in Pakistan are considered. The prediction of space-time precipitation is applicable in many sectors of industry and economy in Pakistan especially; the agricultural sector. Mean field maps and prediction error maps for both methods are estimated and compared. In this paper it is shown that the transformed hierarchical Bayesian model is providing more accuracy and lower prediction error compared to the spatio-temporal Bayesian maximum entropy method; additionally, the transformed hierarchical Bayesian model also provides predictive distributions.

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