

Regional frequency analysis of annual precipitation in data-sparse regions using large-scale atmospheric variables

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Abstract Regional precipitation frequency analysis (RPFA) is widely used for predicting precipitation quantiles at target sites in data-sparse areas. The RPFA involves fitting a frequency distribution to information pooled at target site from a region (group of similar sites). Conventional approaches to RPFA use precipitation statistics as attributes to form regions. Therefore, sufficient number of sites with contemporaneous data is required to form meaningful regions. This requirement cannot be met in data sparse areas. To address this issue, an approach is presented in this paper. Large-scale atmospheric variables affecting precipitation in the study area, location parameters (latitude, longitude and altitude) and seasonality of precipitation are suggested as attributes to form regions using fuzzy cluster analysis, and precipitation statistics are suggested for use in validating the delineated regions for homogeneity. Results from application to India indicate that the approach is effective for RPFA in data-sparse areas.

Key words regionalization; precipitation frequency analysis; fuzzy cluster analysis; large-scale atmospheric variables; India