Regionality of interannual variation of seasonal precipitation over India

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This study investigated the interannual variations (IAVs) of seasonal precipitation in India and their relation to atmospheric circulation. To focus on the relation between the regional characteristics of precipitation and the large-scale circulation system, we defined homogeneous regions based on pentad rainfall seasonality using hierarchical cluster analysis. Seven obtained clusters (regions) were used to analyze the long-term trends, IAVs, and their relation to atmospheric circulation. Based on regression analysis, the IAV of seasonal precipitation and its relation to atmospheric circulation over the ocean surrounding India were detected for each season. Enhancement of the southwesterly monsoon flow over the Indian Ocean and the strength of the southeasterly wind related to the activity of the monsoon trough around the Gangetic Plain both affected the increase of summer monsoon precipitation in regions CL3 (central and eastern India) and CL6 (western coast of the Arabian Sea in southern India). In contrast, neither region CL5 (eastern coastal region of southern India) nor CL7 (northeastern India and part of the western coastal region of southern India) showed a relationship between IAV of summer monsoon precipitation and the southwesterly flow or the southeasterly flow over the Indian Ocean or the Gangetic Plain, respectively. Region CL5 showed strong correlation with the northeasterly monsoon flow (strength of the southeasterly flow over the Bay of Bengal) during the post-monsoon season. IAV of precipitation in region CL7 showed no correlation with either the southwesterly monsoon during the summer monsoon season or the northeasterly monsoon during the post-monsoon season.