

Hydrologic processes in China and their association with summer precipitation anomalies

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A climate version of MM5 is applied to study hydrologic processes in China and their association with precipitation anomalies in 1980 and 1985, which are two anomalous years with opposite signs of summer precipitation anomalies. The study reveals that anomalous atmospheric moisture transport due to synoptic scale circulation was primarily responsible for initiating the anomalous wet (dry) summer in south-central China and dry (wet) summer in northeastern China in 1980 (1985). The recycling ratio (defined as contribution of local evaporation to total precipitation) ranges from less than 4% in northwestern China to more than 30% in south-central China at 1000 km space scale. Higher (lower) values of recycling ratio correspond to drier (wetter) summers in south-central China and northeastern China. However, the opposite is true in northwestern China. The recycling ratio reflects feedback among hydrologic components over both land and atmosphere. In northwestern China, these feedbacks will further sustain drought events that are triggered by anomalous synoptic scale disturbances, and turn them into prolonged and possibly perpetual phenomenon. However, in south-central China and northeastern China, these feedbacks help reducing severity of drought. The large differences in recycling ratio between the dry and wet years of 1980 and 1985 are indicative of powerful feedback between hydrologic and climatic processes, and imply that surface-atmosphere interaction in China is highly sensitive to climatic perturbation.

JOURNAL OF HYDROLOGY, VOL. 301, ISSUES 1-4, doi:10.1016/j.jhydrol.2004.06.016, 2005