

Application of Hydrological Model in Support of Streamflow Allocation in Arid Watersheds in Northwestern China

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Abstract : Spatial heterogeneity of landscape significantly affects watershed hydrological processes, particularly in high elevation and cold mountainous watersheds such as the inland river (terminal lake) basins in Northwest China, where the upper reach mountainous areas are the main source of streamflow for the downstream agricultural oases and desert ecosystems. Thus, it is essential to take into account spatial variations of hydrological processes in streamflow allocation at the watershed scale. This paper adapts the Distributed Large Basin Runoff Model (DLBRM) to the Heihe River Watershed, the second largest inland river with a drainage area of about 128,000 km² in Northwest China, for understanding the transfer and partitioning mechanism among the glacier and snowmelt, surface runoff, evapotranspiration, and groundwater recharge among the upper, middle, and lower reaches in the study area. Results indicate that the upper reach Qilian Mountain area is the main source of streamflow for the middle reach agricultural oasis and downstream desert areas. Large withdrawals for agricultural irrigation in the middle reach had significantly depleted river flow for the lower reach desert ecosystems. Innovative conservation and enforcement programs need to be undertaken to ensure the successful implementation of water allocation plan of delivering 0.95 x 10⁹ m³ of water downstream annually by the State Council in the Heihe River Watershed.

Keywords : DLBRM, Northwestern China, spatial variation, water allocation

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