Variation Trends of Meteorological variables and Their Impacts on Potential Evaporation in the Hailaer River Basin

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Evaporation, which is an important component of water cycle, is a critical variable in determination of local water resources available. Since potential evaporation is mainly influenced by meteorological variables, it is necessary to investigate the extents to which different meteorological variables affect potential evaporation. The aim of this paper is to explore the variation trends of different meteorological variables, including air temperature, sunshine hours, relative humidity, wind speed, and their impacts on potential evaporation. This paper selected the Hailaer meteorological station of the Hailaer River basin which is situated in cold, semi-arid and semi-humid region as case study site. Based on the daily observed meteorological data during 1951 to 2009, the potential evaporation is calculated by Penman formula, and the variations of meteorological variables were investigated by the nonparametric Mann-Kendall test. The correlation between potential evaporation and each meteorological variable at annual and seasonal scales was also analyzed. The results revealed that annual and seasonal potential evaporation and air temperature showed increasing trends, whereas the wind speed, sunshine hours and relative humidity presented decreasing trends. Among the meteorological variables, air temperature and relative humidity are the key factors that affect potential evaporation with different time scales, and the impacts of other meteorological variables on potential evaporation are not significant and vary with time scales. The output of this paper provides a valuable reference for the forecast of future water resource available and the sustainable development and utilization of water resources in cold, semi-arid and semi-humid regions.