



Evaluation of the different climate and hydrological changes in the headstream areas and oases of Tarim River Basin with the complementary relationship

S. Han (1), H. Hu (1) and F. Tian (1)

State Key Laboratory of Hydrosience and Engineering, Department of Hydraulic Engineering, Tsinghua University, Beijing 100084, China (huhp@tsinghua.edu.cn)

The climate and hydrological changes in the four headstream areas and oases in Tarim River Basin, the Yerqiang, Kashigar, Aksu and Kaidu-Kongque River Basin, were evaluated with the dimensionless form of the complementary relationship of evaporation, in which the evaporation ratio (the ratio of the actual evaporation (E) to the potential evaporation (E_0)) is expressed as a function of the proportion of the radiation term (E_{rad}) in Penman potential evaporation (E_{rad}/E_0). The advection term of the annual potential evaporation changes in the opposite direction with the water availability of the land surface, but the radiation term is relatively stable. Therefore, E_{rad}/E_0 can be served as the wetness index implying the water availability of the land surface by atmospheric conditions. In the headstream areas, with the increasing of the precipitation and temperature, the wetness index E_{rad}/E_0 increases, and the discharge trends of the four head streams have a significant increase trend from 1960 to 2006 with the Mann–Kendall test. In the oases, the wetness index E_{rad}/E_0 increases with the development of irrigation during last fifty years. But the characteristics of the climate change are different from that in the headstream areas. The results show that there are distinct climatic effects caused by oases developments on local climate change. The increasing trend of the air temperature in oases is weak than that in the headstream areas, while the decreasing trend of the wind speed in oases is more obvious.