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Effects of vegetation changes on evapotranspiration in semi-arid region.

Vegetation is a key factor which affects actual evapotranspiration for a basin. Affected by human activities, in northern China , the vegetation types and their corresponding area have changed a lot leading to the variation of evapotranspiration for the basin. In this paper, three methods have been tried to reflect the influence of vegetation on the actual evapotranspiration by calculating actual evapotranspiration, which are VIC-3L hydrological model, Zhang (2004) empirical formula and Penman formula respectively. The basin is mainly composed of three vegetation types, namely woodland, grassland and farmland. According to the variation of vegetation, the time sequence is divided into three eras which are the 1980s (1964-1989), the 1990s (1990-1999) and 2000s (2000-2008) respectively. The results showed that in the period of the 1980s to the 1990s, with variation in areas of woodland, grassland and farmland which is 13%,-4.22% and -9.85% respectively, the actual evapotranspiration simulated by VIC-3L increases by 11%, and the case in the period of the 1990s to the 2000s is 4% increasement in actual evapotranspiration with 3%, -21.6% and 12.1% rate of change respectively for the three vegetations mentioned above. It indicates that the actual evapotranspiration of woodland is bigger, and grassland and farmland show similar results. In order to quantify the differences in terms of evapotranspiration for the three vegetations, assumption has been made that the whole basin is covered by only one vegetation type (extreme vegetation method), then results calculated by VIC model, Zhang (2004) empirical formula and Penman formula respectively are analysed with good correlation with each other. In general, it is feasible to simulate actual evapotranspiration by using VIC-3L hydrological model in semi-arid areas. Meanwhile, in case of lack of precipitation, evapotranspiration in woodland is bigger than grassland and farmland with closer trends with precipitation.