

Climatic change on the Tibetan Plateau: Potential evapotranspiration trends from 1961–2000

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Abstract.

Time series (1961–2000) of Penman-Monteith potential evapotranspiration estimates for 101 stations on the Tibetan Plateau and surrounding areas are analyzed in this paper. For the Tibetan Plateau as a whole potential evapotranspiration (PET) has decreased in all seasons. The average annual evapotranspiration rate decreased by 13.1 mm/decade or 2.0% of the annual total. Superimposed on this general decline are fluctuations ranging from app. 600 to 700mm with above average rates in the 1970s and 1980s. On a regional basis, spatial trend distributions remain stable throughout the year with similar seasonal variations. Decreasing PET rates are more pronounced in winter and spring (80% of all stations) as compared to summer and autumn (58% of all stations). Maximum negative (positive) annual rates were recorded at two stations in the southern Qaidam Basin with –79.5 mm/decade (84.8 mm/decade) even though in general negative rates tend to be noticeably higher than positive rates. Changes in wind speed and to a lesser degree relative humidity were found to be the most important meteorological variables affecting PET trends on the Tibetan Plateau while changes in sunshine duration played an insignificant role. Stable daytime temperatures on the Tibetan Plateau have limited the importance of temperature trends for changes of PET rates. Negative evapotranspiration trends are therefore thought to be linked to a general decrease in intensity of the regional monsoon circulation rather than to reductions in sunshine duration. Reduced PET rates appear to be in contrast to a predicted increased hydrological cycle under global warming scenarios.