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Did evaporation paradox disappear after 1980s? A case study for China

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The evaporation and transpiration play an important role in the global water and energy cycle, and their change will make great effect on global climate, hydrological cycle, water resources, crop growth and ecological environment. It is now well established that the surface of Earth has, on average, warmed over the past 50 years. One expected consequence of this warming is that the air near the surface should be drier, which should result in an increase in the rate of evaporation from terrestrial open water bodies. However, lots of observations show that the rate of evaporation from open pans of water has been steadily decreasing all over the world over the past 50 years, and it is similar for the reference evapotranspiration. The contract between expectation and observation is called the evaporation paradox. The decreasing in potential evapotranspiration may be caused by the radiation reducing, the vapor pressure difference reducing or wind speed reducing. And the radiation reducing, also called global dimming, is reported as the main cause. But after 1980s, the trend changed for the radiation and the potential evaporation so that the potential evaporation increased with the global warming, which mean that the evaporation paradox disappeared. Based on data of 317 weather stations in China from 1956 to 2005, the trends of the pan evaporation and the air temperature then the evaporation paradox are analyzed specially after 1980s. The result indicates the evaporation paradox existed for most stations in the past 50 years but disappeared for most stations after 1980s even inconsistently. Furthermore, the weather factors such as sunlight time, wind speed, vapor pressure are analyzed to find the cause of potential evaporation change. In addition, the actual evaporation change with the precipitation and the potential evaporation is discussed.