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Vegetation stress from increased vapor pressure deficit implicated in recent decline in U.S. evaporation

Guido D., Salvucci (1), and Angela Rigden (2)
(1) Boston University, Boston, USA (gdsalvuc@bu.edu), (2) Boston University, Boston, USA (ajrigden@bu.edu)

We detect and attribute long-term changes in evapotranspiration (ET) over the contiguous United States from 1961 to 2013 using an approach we refer to as the ETRHEQ method (Evapotranspiration from Relative Humidity at Equilibrium). The ETRHEQ method primarily uses meteorological data collected at common weather stations. Daily ET is inferred by choosing the surface conductance to water vapor transport that minimizes the vertical variance of the calculated relative humidity profile averaged over the day. The key advantage of the ETRHEQ method is that it does not require knowledge of the surface state (soil moisture, stomatal conductance, leaf are index, etc.) or site-specific calibration. We estimate daily ET at 229 weather stations for 53 years. Across the U.S., we find a decrease in summertime (JJAS) ET of 0.21 cm/yr/yr from 1961-2013 with recent (1998-2013) declines in summertime ET of 1.08 cm/yr/yr. We decompose the ET trends into the dominant environmental drivers. Our results suggest that the recent decline in ET is due to increased vegetation stress induced by increases in vapor pressure deficit. We will present out results in context of other commonly used, regional ET data products.