Geophysical Research Abstracts
Vol. 21, EGU2019-10528, 2019
EGU General Assembly 2019

The role of *in situ* ET observations in providing new insights into water and energy cycle variability

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Evapotranspiration (ET) is a key process in the hydrological cycle. However the understanding and predicting of water balance changes due to land use and climate change is complex because of the poor representation of ET in most models and sparse observations. In this contribution, I will discuss how different ET observations from have provided important insight into: a) the sensitivity of ET to soil moisture (Teuling et al., 2006), b) consistency in ET estimates over contrasting land cover (Teuling et al., 2018), c) the response of energy balance partitioning over different ecosystems to heatwaves (Teuling et al., 2010), d) the contribution of ET anomalies to storage anomalies during drought (Teuling et al., 2013), and e) the control of land use and vegetation properties on large-scale water balance partitioning (Teuling et al., 2019) and sap flow (Hoek van Dijke et al. 2019). In many cases, these insights conflict with assumptions behind current modelling approaches. It will be argued that ET observations across a range of scales and techniques are needed to drive scientific discovery and improve current modelling approaches.

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