Geophysical Research Abstracts
Vol. 18, EGU2016-11022-1, 2016
EGU General Assembly 2016

The drivers of ET sensitivity for different climate zones

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Assessing evapotranspiration (ET) sensitivity is critical to understand the impact of different climate variables for ET estimation under changing climate. This study assesses the ET sensitivity across a large number of plausible climate conditions as a function of both the baseline hydroclimatic conditions and the ET model choice. We first define the plausible ranges of change for each variable based on available climate projections, over which the ET sensitivity will be estimated. We investigate the impact of different hydro-climatic conditions on the sensitivity of the Penman-Monteith PET estimates with 30 study sites across Australia. By perturbing each ET-related climate variable individually within their plausible range, we observe that the baseline conditions, especially T, RH, R_s and PET, play important roles on the ET sensitivity. Importantly, humid temperate catchments show higher sensitivity to climate changes while catchments within the dry and hot regions tend to maintain a more stable PET in the future. PET also shows higher sensitivity to changes in climate variables under energy-limited conditions, which can mean an elevated water loss through increasing actual ET and can have substantial implications on water balance under changing climates. To allow comparison of ET sensitivities across 11 alternative ET models with different input data requirements, we then followed the global sensitivity analysis in which the ET-related climate variables are perturbed jointly. From different ET models, we obtained contrasting ranges of ET estimates and identified different key climate variables that drive the estimates, which can be explained by their different process representations and assumptions. The results highlighted the importance of ensemble modelling for enhancing our overall understanding of the expected ranges of ET estimates under future climate changes.