Geophysical Research Abstracts
Vol. 16, EGU2014-2025, 2014
EGU General Assembly 2014

Scaling ET from different data sources gives insight in catchment processes

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Depending on the available funding and equipment, environmental data are often available at one scale, while predictions or forecasts are needed at a larger or smaller scale. The scientific literature is therefore full of comments and papers about scaling, upscaling and downscaling.
Brought back to its basics, all scaling problems are essentially model prediction problems. Thus seeking a universal scaling law is unlikely to deliver results. Our interest has been in scaling evapotranspiration. A literature review revealed that most of the work in estimating evapotranspiration in Australia has occurred at short time scales at the local tree level, scaling to the stand or hillslope level. There has been limited work at scaling to larger scales, such as the catchment, although there has been work at the much larger continental scales (reference), scaling from a limited number of EC towers.
However, from a hydrological prediction point of view, estimates of evapotranspiration at the catchment scale or distributed across the catchment scale are crucial to improve water balance estimates for water resource management.
Here we compare several different approaches to scale local ET estimates to catchment scale ET and highlight how they all produce different results due to limitations with each of the methods. However, each of the scaling exercises reveals other aspects of the overall catchment system behaviour that cannot be identified at an individual scale. In this research we used collected field site in a model (WAVES) to predict local scale ET using different approaches and scaled this to catchment level ET, derived from the water balance and derived from the satellite MODIS ET estimates. The model was calibrated to sapflow measurements scaled to stand, introducing another opportunity for uncertainty. We discuss how at each of this scales lack of knowledge influences the estimates, but that the combined analysis reveals more about the temporal and spatial variation in ET across the catchment.