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Comparison of MODIS-based scaling of potential evapotranspiration with on-ground observations

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Australia is struggling to meet multiple demands on its already highly developed and probably dwindling water resources. In the Murray-Darling Basin, low relief, a fragmented river system, significant surface-groundwater exchanges, low but very variable rainfall, a modest gauge network, and high but also very uncertain ET losses all conspire to make river modelling to underpin water management decisions a very challenging exercise. ET from dry land, irrigation areas, wetlands and surface water bodies need to be known with considerable accuracy and spatial detail to allow the proper attribution of water losses in these river models. We developed a method to combine the enhanced vegetation index (EVI) and land surface wetness index (LSWI) derived from MODIS with gridded monthly potential ET data and estimate actual ET at 1 km resolution. For the purpose of validation, we compared these estimates with observations from three flux towers across Australia: a monsoon savannah, dry savannah and wet forest site. A relatively simple model formulation with a single set of five parameters reproduced the observations well, with r^2=0.82-0.89 and a standard error of estimate of $\pm$5-14 mm per month, depending on how the data was split for calibration and validation. The results emphasise the value of simultaneous flux tower observations in developing, constraining and validating methods for remote sensing based ET estimation.