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Evaluating the use of thermal imagery in crop water use management

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Monitoring agricultural water use is of much interest, as it represents a considerable strain on aquifers and other water sources in many regions around the world. The need for accurate estimates of crop water use is of particular importance in dryland systems, where irrigation can account for 80% or more of the local water consumption. Here, we explore the information advantage that exploiting thermal retrievals may have on estimating crop water use by comparing evaporation modelling approaches with and without this additional data. To do this, we present a comparison of three well established evaporation estimation methods: the Priestley Taylor Jet Propulsion Lab (PT-JPL) approach, which uses imagery in the optical range; PT-JPL-thermal, which incorporates thermal data to enable a better quantification of soil moisture status; together with a more traditional two-source energy balance model (TSEB), which has had broad application in thermal-based studies of agricultural water use. Each of the models was forced with the same in-situ meteorological information and Landsat 8 imagery in order to derive crop water use at the farm scale, with retrievals compared against available eddy covariance measurements. Understanding the relative merit of incorporating thermal data, versus the use of more optically-derived vegetation-driven estimates of evaporation, forms a key motivation for this work.