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Advantages and opportunities in using multisensor remote sensing data for evapotranspiration retrieval as well as better partitioning between evaporation and transpiration

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Quantification of evapotranspiration is crucial for a sustainable management of scarce water resources. Surface energy balance models driven by remotely sensed surface temperatures observations enable to estimate total evapotranspiration and average (surface) water stress conditions. For improved agricultural water management as well as ecosystem health monitoring, it is also important to provide an estimate of evapotranspiration components, i.e. transpiration and soil evaporation, and target the water status of the plant. This is possible through the use of dual-source energy balance models because they solve separate energy budgets for the soil and vegetation. However, the dual-source models rely on specific assumptions on plant water stress to get both components out of the sole surface temperature information. Additional information are thus required, either specifically related to evaporation (such as surface water content, as it can be derived from active microwave information) or transpiration (such as physiological indices derived from specific optical bands). Present work evaluates the ability of the SPARSE dual-source energy balance model to compute not only total evapotranspiration, but also water stress and transpiration/evaporation components, exploiting the complementarities of multiple data sources, including those acquired at lower spatial resolution or from a different view angle. Flux datasets including available sapflow and lysimeter measurements acquired over rainfed and irrigated crops in temperate, Mediterranean and semi-arid regions are used to evaluate the retrieval performances of the evaporation and transpiration components. More than a systematic increase of retrieval performance, the main positive outcome of combining those different sources of data, as well as rightfully accounting for their specific signature (direction, resolution...), seems to be an increased robustness and a better realism of the subcomponents that are retrieved.