Analysis the role of LST and air temperature inconsistency in TSEB estimates

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MAIN BODY OF TEXT

Applications of the two-source energy balance (TSEB) scheme require either in-situ meteorological data to characterize the upper boundary conditions or the implementation of complex multi-scale approaches (ALEXI/DisALEXI) [1],[2]. Over remote areas, detailed meteorological forcing (i.e., air temperature and wind speed) are often missing, limiting the quality of the simulated fluxes. The possible inconsistency between satellitebased land-surface temperature (LST) estimates and upper boundary air temperature represents one of the most important sources of uncertainty in evapotranspiration (ET) estimates from residual surface energy balance methods. To compute surface energy fluxes, the use of wet and dry boundary conditions, commonly referred to as hot and cold pixels, is a widely adopted strategy in thermal-based, single-source surface energy balance models for defining the relationship between satellite LST and the surface-atmosphere temperature gradient [3],[4]. This contextual scaling approach reduces model sensitivity to biases in LST retrievals, but it has been previously tested within the TSEB modelling framework only in limited capacity.

In this work, results from different experiments across Europe, the US, and northern Africa, are reported to highlight how the potential inconsistency between LST and air temperature can affect the TSEB model outcomes [5],[6], and how simplified strategies based on boundary conditions can be integrated in operational models to try to limit such influences. Results highlights how inconsistencies still exists even in most recent satellite products, and how automatic procedures can be implemented to limit the effects of such discrepancies. Applications support an the adoption of an integrated approach to minimize the influences and reduce the uncertainty.

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