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Estimation of the evapotranspiration over a mountain region using a Two-Source Energy Balance model driven by LANDSAT data

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The evapotranspiration over mountain regions still currently not very known due to the complexity of the terrain. In general, the complexity is associated with the type and the cover of the vegetation canopy as well as with changes in topography, which make the heat and mass transfers more complicated than over homogenous and flat surfaces. In the present study, the issue of using a Two-Source-Energy-balance model (TSEB) driven by the LANDSAT data for estimating evapotranspiration over Tahaouant site has been investigated. This site, which located about 35 km to Marrakech city (Morocco), consisted of a mixed of arboriculture, wheat, corn, alfalfa, follow and bare sol. Therefore, the heterogeneity caused either by the contrast in soil moisture, cover or slope generates a large variability of fluxes which limit the use of local scale measurements device such as the eddy covariance system (EC), unless one deploys a network of EC devices which is not technically and economically always feasible. In this context, a Large Aperture scintillometer (LAS) was installed over a transect of about 1.4 km to measure the convective fluxes.
The LANDSAT-7 and -8 data used as inputs for the TSEB model such surface temperature, albedo emissivity and Leaf Area Iindex (LAI) derived from land cover, were firstly aggregated based on the values of LAS footprint. The results obtained by comparing the evapotranspiration values simulated by the TSEB model and measured by the LAS showed good consistency (r = 0.72, rmse = 52.4 Wm-2, bias = 19 Wm-2). On the other hand, TSEB slightly underestimates the sensible heat flux but the comparison remains acceptable (r = 0.65, rmse = 75.5 Wm-2, bias = 56.2 Wm-2).