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The use of MODIS and LANDSAT in conjunction with the scintillometer measurements for estimating the evapotranspiration over a mountain region.

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The management of water resources in agricultural areas requires a precise knowledge of the evapotranspiration (ET). The eddy covariance system is the only method that can measure directly ET with high precision. However, over heterogeneous surfaces, a network of EC systems is needed which is costly and requires a continuous availability of well-trained staff to operate and maintain the devices. In this context, a number of different techniques have been introduced for research applications, such as displaced-beam laser scintillometers, and large or extra-large aperture scintillometers (LAS, XLAS). Compared to e.g. eddy-covariance systems, the scintillometer is easy to install, relatively cheap and it is a practical method to obtain area-average surface [U+FB02]uxes over several kilometres. The instrument is capable of continuous measurements with minimum human intervention. However, this instrument measures only the sensible heat fluxes and the evapotranspiration can be derived as the residual term of the energy balance equation. Therefore, the available energy (AE) should be measured at the LAS footprint. Thanks to the high spatial and temporal resolutions, the satellites can be a good tool to derive AE at large scale but only at each overpass. To derive daily evapotranspiration which is required for crop water management, extrapolation methods should be applied. In this work, a large aperture scintillometer (LAS) was installed over an heterogeneous transect of 1.4 km to measure sensible heat flux over a mountain region which located about 90km of Marrakech city (Morocco) and the AE is derived from the MODIS, LANDSAT-7/8 images and is weighted by using the LAS footprint values. The heterogeneity of the transect 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. Two eddy systems were installed over the LAS transect for validation purposes.
By comparing the average ET measured by eddy covariance and that derived from the LAS showed the use of the LANDSAT 7/8 which have a high spatial resolution yielded a good statistical results (R2=0.86; RMSE=25.32 W/m^2) compared to the MOIDS (R2=0.87; RMSE=112.04 W/m^2).

Keywords: Scintillometer, MODIS, LANDSAT, sensible heat, latent heat, available energy, mountain area, footprint.