IAF EARTH OBSERVATION SYMPOSIUM (B1)
Interactive Presentations - IAF EARTH OBSERVATION SYMPOSIUM (IP)

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SPATIAL ASSESSMENT OF EVAPOTRANSPIRATION FROM SATELLITE IMAGES: ACCOUNTING FOR TOPOGRAPHIC EFFECTS

Abstract

Efficient management of water resources in hilly and mountainous ecosystems depends on accurate estimates of evapotranspiration (ET), the largest component of the water balance. The current algorithms for retrieving evapotranspiration from satellite images were developed on the basis of the surface energy balance equation over flat surfaces, thus neglecting the effects of the topography. Furthermore, these algorithms assume the homogeneity of the meteorological variables over the images, which are highly challenged by their variations induced by topography, leading to significant biases on derived ET and land surface fluxes. In this research, we introduced two topographic corrections in the S-Sebi and VI-Ts methods, accounting for variations of air temperature (Ta) with altitude, and in incoming solar energy (Rs) with topography. These topographic corrections were tested, alone and in combination, against in-situ ET measurements obtained on two contrasted sites (Puechebon and Roujan) in southern France. The evaluation results show that the Ta correction appears to improve ET estimates on both sites, whereas the Rs correction performed better only on the Roujan site, whose topography is less complex. After being tested over other sites, covering a larger range of altitude and slopes, these corrections should improve the remotely sensed estimates of ET, especially in the context of the future satellite mission TRISHNA.
Keywords: evapotranspiration, satellite images, energy balance equation, s-sebi, vi-ts, topography.