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Comparison of three different approaches to estimate evapotranspiration over large areas: remotely sensed method, complementary approach and SVAT model.

Maliko Tanguy (1), Alain Baille (1), Christopher Taylor (2), and Phil Harris (2)

(1) Universidad Politecnica de Cartagena, Spain (tanguymaliko@yahoo.com), (2) Centre for Ecology and Hydrology, UK (cmt@ceh.ac.uk)

Methods able to accurately estimate ET over large areas are important for many applications. Spatial mapping of evapotranspiration (ET) is a prerequisite to a wide range of studies in hydrology, forestry, land and crop management, irrigation, water resources planning, etc. In this study, three different approaches to estimate ET over large areas are compared and evaluated.

(1) The first one is a variant of the so-called "triangle" method (Jiang et al., 2004), which uses almost exclusively remote sensing data. Vegetation Fraction (Fv) - from the Normalised Difference Vegetation Index (NDVI) - and surface temperature (Ts) were obtained from MODIS products at satellite overpass. The graphical analysis of the Ts-Fv space allows estimating the evaporative fraction (EF), which is then used to derive ET.

(2) The second method is the Advection-Aridity (AA) model (Brusaert et al., 1979). This simple approach, which only requires routinely available meteorological data, assumes that a complementary relationship exists between Potential Evapotranspiration (ETpot) and Actual Evapotranspiration (ETa). Although questioned for the lack of scientific basis of the complementary assumption, the AA model is currently used in hydrological applications requiring spatial mapping of ET.

(3) The third method relies on the use of a land surface scheme ("JULES" - the Joint UK Land Environment Simulator) which is integrated within the UK Met Office climate model. This approach, based on equations that take into account the different biophysical processes involved in land surface environment, is likely to be the most reliable in theory but in practice it may be limited by the availability of parameters describing the soil and vegetation in a particular area, required to solve the set of equations describing land-atmosphere interactions.

The three methods were applied to ET mapping of the Segura River Basin, a semi-arid region of South-Eastern Spain. Results from the case-study are presented and analyzed. Discussion is centred on (i) advantages and limitations of simple ET-retrieval methods vs. complex mechanistic models and (ii) benefits of integrating remote sensing data into ET-models (e.g. data assimilation).