Geophysical Research Abstracts
Vol. 19, EGU2017-9055, 2017
EGU General Assembly 2017

Aerodynamic resistance parameterizations in distributed hydrological models for evapotranspiration estimation

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A correct evaluation of the aerodynamic resistance to heat transfer,r_{ah}, is fundamental in several fields of application, such as sustainable water management at the basin scale and irrigation planning at the field scale. This is due to the fact that this variable has a significant impact on the estimation of surface heat fluxes, sensible and latent heats (H and *LE*), and, consequently, of evapotranspiration (*ET*), which plays a key role in the hydrological cycle and in land-atmosphere interaction.

Thus, the analysis focuses on the validation of some parameterizations for r_{ah} for different vegetation types and surface roughness. In particular, eight equations chosen from literature (either in accordance with the Monin-Obukhov theory or empirical, with different assumption and levels of simplification) were compared with two estimates of aerodynamic resistance from eddy covariance measurements (one for momentum, r_{am}, and one for scalars, r_{ah}) in a maize canopy, low crops and a forest. In order to assure data quality, observations have been selected considering only unstable conditions, where eddy covariance measurements techniques theoretical framework is respected. The analysis has been carried out distinguishing also the different growing phases of the vegetation, from bare soil to the maximum vegetation height.

In accordance with the results of the validation phase, the most reliable parameterizations have been implemented in the distributed hydrological model FEST-EWB, in order to evaluate the effect of r_{ah} on the estimation of H and *ET* over different vegetation coverages.