Influences of Leaf Area Index estimations on the soil water balance predictions in Mediterranean regions

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In semi-arid and sub-humid areas of the Mediterranean region, the development of hydrological models able to describe the seasonal dynamics of vegetation cover becomes crucial in SVAT applications. A simple approach to describe the heterogeneity of vegetation cover was introduced by Eagleson (1982) who derived the fractional vegetation cover M of a grid cell as a function of the Leaf Area Index (LAI). In most of the cases, the LAI values are determined from satellite data using vegetation indices such as the NDVI. The inherent problem is that the vegetation heterogeneity of Mediterranean region - including soil disturbances - has a large influence on the spectral bands and so the relation between LAI and NDVI is not unambiguous. In the present work, the soil water balance and the hydrological losses (e.g., evapotranspiration) are estimated in a medium-sized river basin in Southern Italy using distributed approach where the vegetation status is characterised through a data-set of multi-temporal NDVI images. Adopting a process-based model (DREAM) with a distributed parameterisation, the influence of different NDVI-LAI regression models on main features of water balance predictions is investigated. The results show a limited influence in the prediction of flood dynamics while sensible differences in the soil water regime and evapotranspiration are determined as a consequence of the alternative LAI estimations. The proposed method for the local calibration of the non-linear NDVI-LAI regression is based on the comparison between NDVI values, obtained by satellite data, and local LAI estimations of the vegetation cover in recognized landscape elements of the catchment. Results show that the accurate estimation of LAI may significantly improve the model performances especially in the simulated groundwater contribution to the streamflow.