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Application of a conceptual distributed dynamic vegetation model to a semi-arid basin, SE of Spain.

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The hydrological cycle is regulated by a complex dynamic and interactions between climate, soil and vegetation. Soil moisture represents the physical linkage between the three of them (Isham et al., 2005). It is well known that arid and semi-arid ecosystems are controlled by water availability: soil moisture is the most important resource affecting vegetation structure and organization (Rodriguez-Iturbe et al., 2001). In semi-arid climates, a negative correlation between insolation and vegetation density has been pointed out (Gallardo-Cruz et al., 2009); which can be explained considering that higher insolation causes higher evapotranspiration and, consequently, lower soil moisture. In this work, a conceptual dynamic vegetation model, originally developed for a single homogeneous cell by Quevedo and Francés (2005), has been implemented at a distributed scale and coupled with a conceptual hydrologic model, TETIS (Vélez, 2001), creating the hydrological-vegetation model TETIS-VEG. TETIS-VEG model reproduces the plant growth process and the seasonal leaf shedding as well as the one due to water stress. Moreover, it takes into account the plant transpiration regulation process caused by variations in soil moisture. The model was applied to the Valdeinfierno basin (south of Spain), comparing the obtained results to 188 NDVI satellite images. The correlation between the relative leaf biomass simulated by the model and the NDVI values is positive, significant, and higher, in absolute value, than the correlation between insolation and NDVI. The model aims to reproduce differences in vegetation density between more insolated and less insolated zones. This result is thought to have important feedbacks on erosion model results, since it is well known the trapping/retention-effect that vegetation may exert on runoff and sediment transport. Hence, a better representation of vegetation distribution and density may lead to improved sediment simulations. Finally, the TETIS-VEG model will be used as a useful tool to evaluate landscape alterations caused by climate changes.