Evapotranspiration in a post-fire regenerated Mediterranean holm oak forest

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Abstract

Evapotranspiration from forest ecosystems is one of the main components of the water budget, at both local and regional scales. Forests play an important role in regulating the hydrologic cycle, especially in semi-arid regions. Evapotranspiration patterns of the Mediterranean holm oak forests, present in these areas, show a specific and marked seasonality affected by the limited water supply. The main objective of this study is to analyse the effect of a forest fire on the holm oak evapotranspiration, as well as the decrease of this effect with the vegetation re-growth after the disturbance. With this aim, an experiment was carried out in a holm oak stand of Castilla-La Mancha, central Spanish plateau. This area was affected by a forest fire in July 2001. The experiment covered an eight-year period, from January 2000 to December 2007. Simulations from the operative model for estimating recharge and evapotranspiration HidroMORE were used. HidroMore is a distributed water balance model implementing the FAO56 dual crop coefficient approach. A sequence of high spatial resolution multi-temporal images is required as a basic input to characterize the state and dynamics of the vegetation.

A different technique was also applied to estimate the evapotranspiration in this regenerated holm oak stand, the Simplified Two-Source Energy Balance model (STSEB) together with satellite thermal IR images. The STSEB model considers a patch treatment of the surface flux sources. Land surface temperature information is needed in this case. A set of Landsat images was used in this work.

Direct evapotranspiration measures started in July 2007, using a Bowen Ratio Energy Balance (BREB) system placed in the experimental site. Half-hourly data were used to evaluate the performance of the two mentioned models. It is proved the feasibility of these approaches based on the use of remote sensing data to register both the inter-annual variability and the effect of fire and post-fire regrowth on actual evapotranspiration.

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