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Hydrological minimal model for fire regime assessment in Mediterranean ecosystem

N. Ursino (1) and M.C. Rulli (2)
(1) Universita' di Padova, IMAGE, Padova, Italy (nadia@idra.unipd.it), (2) Politecnico di Milano, Milano, Italy

A new model for Mediterranean forest fire regime assessment is presented and discussed. The model is based on the experimental evidence that fire is due to both hydrological and ecological processes and the relative role of fuel load versus fuel moisture is an important driver in fire ecology. Diverse scenarios are analyzed where either the hydrological forcing or the feedback between fire and hydrological characterization of the site is changed. The model outcome demonstrates that the two way interaction between hydrological processes, biology and fire regime drives the ecosystem toward a typical fire regime that may be altered either by an evolution of the biological characterization of the site or by a change of the hydrological forcing. This tenet implies that not every fire regime is compatible with the ecohydrological characterization of the site under study. This means that natural (non antropogenic) fire cannot be modeled as an arbitrary external forcing because the coupled hydrological and biological processes determines its statistical characterization, and conversely, the fire regime affects the soil moisture availability and the outcome of different species competition under possible water stress. The new modelling approach presented here, when provided by a proper model parameterization, can advance the capability in predicting and managing fires in ecosystems influenced by climate and land use changes.