

## **Response to droughts and heat waves of the productivity of natural and agricultural ecosystems in Europe within ISI-MIP2 historical simulations**

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According to the projections of climate models, extreme events such as droughts and heat waves are expected to become more frequent and more severe in the future. Such events are known to severely impact the productivity of both natural and agricultural ecosystems, and hence to affect ecosystem services such as crop yield and ecosystem carbon sequestration potential. Dynamic vegetation models are conventional tools to evaluate the productivity and carbon sequestration of ecosystems and their response to climate change. However, how far are these models able to correctly represent the sensitivity of ecosystems to droughts and heat waves? How do the responses of natural and agricultural ecosystems compare to each other, in terms of drought-induced changes in productivity and carbon sequestration?

In this contribution, we use ISI-MIP2 model historical simulations from the biome sector to tentatively answer these questions. Nine dynamic vegetation models have participated in the biome sector intercomparison of ISI-MIP2: CARAIB, DLEM, HYBRID, JULES, LPJ-GUESS, LPJml, ORCHIDEE, VEGAS and VISIT. We focus the analysis on well-marked droughts or heat waves that occurred in Europe after 1970, such as the 1976, 2003 and 2010 events. For most recent studied events, the model results are compared to the response observed at several eddy covariance sites in Europe, and, at a larger scale, to the changes in crop productivities reported in national statistics or to the drought impacts on gross primary productivity derived from satellite data (Terra MODIS instrument). The sensitivity of the models to the climatological dataset used in the simulations, as well as to the inclusion or not of anthropogenic land use, is also analysed within the studied events. Indeed, the ISI-MIP simulations have been run with four different historical climatic forcings, as well as for several land use/land cover configurations (natural vegetation, fixed land use and variable land use).