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Impact of drought stress on photosynthetic and respiratory C fluxes in a Mediterranean shrubland

G. Guidolotti, D. Liberati, G. de Dato, and P. De Angelis
University of Tuscia, Viterbo, Italy (guidolotti@unitus.it)

The seasonal changes of net ecosystem exchange of terrestrial ecosystems (NEE), is the result of the different interactions of assimilation (GPP) and total ecosystem respiration (TER) with the environmental drivers. In the Mediterranean garrigue object of our study, the length and the intensity of the summer drought is the main determinant of the ecosystem C balance. With the aim of quantify the effects of the natural drought stress and its recovery on the photosynthetic and respiratory processes we measured: soil CO_2 efflux (SR), net ecosystem CO_2 exchange (NEE), total ecosystem respiration (TER), for two years using a new canopy chamber specifically designed for the site. The measurements were conducted in a climate-manipulated field experiment, where prolonged drought or increased night temperature were obtained by a mobile roof approach. The reduction of photosynthetic activity (GPP) was stronger than the reduction of soil respiration, an important component of the total ecosystem respiration, resulting as a decreased NEE in response to water limitation. On the other hand, the autumnal recovery of SR was faster than GPP resulting as an extension of drought on NEE. Under this conditions the ecosystem could be a net source of CO_2. Integrating the fluxes on annual basis the microclimatic manipulation sensibly affect the carbon use efficiency of this ecosystem.