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Changes of ecosystem functions in a Mediterranean shrubland exposed for eight years to prolonged summer droughts

Giovanbattista de Dato (1), Paolo De Angelis (1), Carla Cesaraccio (2), Grazia Pellizzaro (2), Pierpaolo Duce (2), Costantino Sirca (3), Donatella Spano (3), and Claus Beier (4)

(1) DISAFRI Department of Forest Environment and Resources - University of Tuscia, Viterbo, Italy (gdd@unitus.it, 0761 357 389), (2) IBIMET Institute for Biometeorology - CNR Headquarter of Sassari, Sassari, Italy, (3) DESA Department of Economics and Woody Plant Ecosystems, University of Sassari, Sassari, Italy, (4) RiSØ National Laboratory, Biosystems Department, POB 49, DK-4000 Roskilde, Denmark

Where water is a limiting factor, like in arid and semiarid shrubland ecosystems of the Mediterranean basin, soil moisture, strengthen by high temperatures, is the key limiting factor controlling biogeochemical cycles. During the drought season, the unavailable water reduces plant growth, litter decomposition and microbial soil respiration. In order to assess the impacts of precipitation reduction on Mediterranean shrublands, a natural community has been exposed since 2001 to prolonged summer droughts by means of mobile plastic roofs, covering three experimental plots (20 m^2) during rain events, in spring and in autumn. Three additional plots were used as control. The vegetation reaches a maximum height of 1.0 m and the main shrub species are *Cistus monspeliensis*, *Helichrysum italicum* and *Dorycnium pentaphyllum*. Bare soil constitutes about 20% of the plot surface.

The aim of this paper is to summarize the impact of the treatment on the plant community structure and on ecosystem functions, after 8 years of experimentation.

A general increase of vegetation cover was observed in the whole community during the years, as result of a natural process of recolonisation. This positive temporal pattern was mainly observed in the control plots, whereas in the drought treatment it was less evident and practically null in the year 2003. At species-specific level, a clear negative effect of drought treatment was observed for *C. monspeliensis.* Moreover, anticipated drought reduced C assimilation and induced an earlier change of leaf morphology in *Cistus.* These effects produced the reduction of LAI and of whole plant productivity.

The seasonal pattern of soil CO_2 efflux was characterized by higher rates during the wet vegetative season (autumn-spring) and lower rates during the dry non-vegetative season (summer). Significant negative effects were occasionally recorded during the period with the treatment turned on. The relation of soil respiration with temperature and soil water content was not altered by the drier conditions, but was affected by the season. The annual soil CO_2 emissions were not significantly affected by the treatments.