



Impact of climate manipulation on a Mediterranean shrubland ecosystem

Paolo De Angelis, Giovanbattista de Dato, Gabriele Guidolotti, and Dario Liberati
University of Tuscia, DISAFRI, Viterbo, Italy (pda@unitus.it, +390761357389)

The last IPCC report predicts warmer and drier conditions for the future European climate and the Mediterranean basin could be highly sensitive to future climatic change. In order to investigate how the forecast more stressing factors could affect Mediterranean shrubland ecosystems, an appropriate manipulation of the microclimate was carried out in an area covered by Mediterranean maquis aimed at extending the drought period and increasing the night-time temperature. The experimental site is part of a European network of six large-scale climate change field experiments, presently supported by EU as “research infrastructure”.

The experimental site is located in the natural reserve Porto Conte Le Prigionette in the Capo Caccia peninsula (North-East Sardinia, Italy). The climate is semi-arid: rain (640 mm yr⁻¹) falls in autumn and spring with a long dry period from May to August. The mean annual temperature is 16.8 °C. The soil is rocky and shallow (20-30 cm); the texture is sandy loam, with an ABC profile, and neutral pH.

The nine experimental plots, installed in June 2001, are located in a typical Mediterranean gariga, a short shrubland formation re-colonizing soil after disturbance (fires, cutting, grazing). The soil is covered by a shrubland community (gariga) made up mainly by *Cistus monspeliensis* and *Helichrysum microphyllum*; *Dorycnium pentaphyllum*, *Rosmarinus officinalis* and *Pistacia lentiscus* represent sporadic presences and the percentage of bare soil amounts to about 20%.

The experimental manipulation of climate conditions at field scale is carried out employing a newly developed night-time warming technique and an automated covering system to extend summer drought. Extended summer drought was induced by covering the plots with waterproof plastic curtains, transparent to infrared radiation, during rain events that occurred during two periods per year. Passive night-time warming was induced throughout the year by covering vegetation and soil with aluminium curtains at night. This method enables the ecosystem to retain a portion of energy accumulated during the light period, simulating the mechanism of global warming. The warming treatment increased the daily minimum air temperatures by about 1 °C and the mean annual temperature by about 0.5 °C. At the soil level, this treatment increased the daily minimum temperature by 0.5 °C - 0.3 °C, according to the depth. Drought treatment was applied in two periods: before and after summer, in order to extend the natural dry period. On annual basis, the drought treatment reduced the amount of rainfall by 15-40%.

This presentation summarises the main results obtained in this site during 9 years of climate manipulation, also to attract European researchers to work in this “infrastructure” thanks to the financial support to the travel and subsistence cost that we can offer.

The obtained results span from leaf to plant and to soil processes, and more recently the analysis of Net Ecosystem CO₂ exchanges and Total Ecosystem Respiration offers the possibility to evaluate the role of this community also at the biosphere-atmosphere level.