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Seasonal and interannual variations in carbon dioxide exchange of a Mediterranean maquis ecosystem

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Shrubland ecosystems are rarely investigated on the energy and carbon exchange. Mediterranean maquis is a typical shrubland ecosystem of the Mediterranean Basin, but it is also spread in several regions of the world with similar climate conditions (i.e., summer drought and mild winter temperature). In this study, maquis ecosystem was investigated to improve the knowledge about CO_2 fluxes and the relationship between NEE and environmental variables. Micrometeorological data were collected near the northwest coast of Sardinia, Italy, over the period 2004-2007. The climate is characterized by wet and cool winters and hot summers, with a severe water deficit from May through September. An open-path eddy covariance system was installed over the vegetation at about 2.0 m height. Fluxes and meteorological data were quality-controlled, and gaps in the data were filled. An LI-2000 leaf area instrument was used to estimate the LAI. The estimation of physiological processes and biomass factors affecting water exchange was made calculating the decoupling coefficient (Ω) according to Jarvis and McNaughton (1986). Higher values were recorded during winter and spring, and lower values were recorded during summer (average value of 0.2 in the entire period). The ratio (H+LE)/(Rn-G) was approximately equal to 0.92; indicating good energy balance closure. The Bowen ratio values were high in the winter and clearly decreased during the summer drought season. Maquis ecosystem was generally a sink of carbon, showing a CO_2 highest uptake in the spring and fall and a lowest uptake during the summer drought period. NEE was relatively low compared to other

forest ecosystems, and climate conditions affected NEE values during the years. In particular, the drought and air temperature were the mainly affecting factors. A good relationship was found between GPP and LE. Also air temperature had a role in carbon production. Similar relationships were found between Reco and LE and between Reco and air temperature.