



The effect of climate variability on the carbon cycle of a Mediterranean forest

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Measurements of Net Ecosystem Exchange (NEE) of carbon dioxide have operated since 1999 in the Mediterranean forest ecosystem (*Pinus pinaster*, L.) located in San Rossore (Pisa – Italy). Using night time values of NEE it is possible to estimate the Ecosystem Respiration (Reco) and the Gross Ecosystem Productivity (GEP), i.e. the photosynthetic uptake of CO₂ without respiratory losses.

The analysis of such fluxes shows that on annual base San Rossore is a CO₂ sink. This ecosystem experiences a strong reduction of carbon uptake during summer when the rainfall is low and the air temperature is high. In such condition trees close stomata in order to avoid alteration of the leaf water status. This is the typical behaviour of the drought avoiding species. The reduction of the carbon uptake is due mainly to a reduction of photosynthesis whereas the ecosystem respiration undergoes a lower decrease. The summer 2003 is an extreme example of this pattern.

The long time series collected in San Rossore allows to test the reaction of the forest to a wet summer (summer 2002), when the rainfall was 506 mm (300 mm more than the summer average 1999-2007), and the effect of high temperature in winter (January 2007). During summer 2002 both GEP and Reco were higher than the average but the GEP experienced the higher increase. The high temperature in January 2007 (3 °C higher than the average 1999-2007), was responsible for the huge increase of the ecosystem respiration not balanced by the little increase of GEP.