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Carbon sequestration in a Cork oak forest

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Most cork in the world is produced in managed forests known as montados in Portugal and dehesas in Spain. These ecosystems cover nearly 2.3 million hectares in the Mediterranean region. In Portugal, montados reach 736,700 ha, representing 23% of the Portuguese forests. The montado is a savanna-type ecosystem, with evergreen scattered trees (*Quercus suber*) and an herbaceous ground layer, where woodlands, pastures and agricultural cultivation co-exist in the same area. Data on carbon sequestration in this particular ecosystem, with pure cork oak stands, is lacking. Our aim is to evaluate and understand the montado seasonal and interannual variability in net ecosystem exchange (NEE), gross primary production (GPP) and ecosystem respiration (R_{eco}) in relation to the Mediterranean climate. In a certified montado with sustainable management we installed an eddy flux tower during 2008. Surface fluxes of CO_2, water vapour and energy were measured by eddy covariance. The basic equipment for these measurements was installed at the top of a 22 m metallic tower (IRGA 7000, R3 Gill Ultrasonic Anemometer). Standard Meteorological data on rainfall, solar radiation, net radiation, wind speed and direction, humidity, temperature were collected continuously since the beginning of 2009 and were available in 30 min time steps. Within the tower footprint it was also measured the soil temperature (up to 30 cm depth) and soil water volumetric content (up to 100 cm depth), as well as the soil CO_2 flux (EGM-1, PP Systems, Hitchin, UK). The raw data from the eddy-covariance measurements were processed off-line using the software Eddyflux (Meteotools, Jena, Germany).

The experimental site is located in southern Portugal (39º 08' 20.9 N and 8º 19' 57.7 W). The climate is typically Mediterranean, with a hot and dry summer. More than 80% of annual precipitation occurs between October and April. The long-term (1961–1990) mean annual temperature was 15.9 ºC and average annual precipitation ca. 642 mm. The tree cover is about 26-50%, with a tree density of 90-177 trees per ha. Average tree height is 7.9 m. Vegetation under canopy covers approximately 60%, dominated by herbaceous species (42%) and shrubs (16%). During the first experimental period (Jan. – Oct. 2009) although total precipitation was low (330 mm) the cork oak forest was a moderate sink for carbon with a NEE of -169 g C m^{-2} $year^{-1}$, a GPP of 794 g C m^{-2} $year^{-1}$ and a R_{eco} of 624 g C m^{-2} $year^{-1}$.