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Seasonal variation in net ecosystem carbon exchange, photosynthesis and respiration in a montane shrubland ecosystem

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Changes in the global carbon cycle induced by human activities represent potential feedbacks to climate change. Nearly half of the carbon emitted each year from fossil fuel combustion accumulates in the atmosphere; it is believed that oceans and terrestrial ecosystems take up the rest, but identification and explanation of the "missing sink" mechanisms remain incomplete. While worldwide assessments of ecosystem carbon exchange, associated through the FLUXNET project, have examined the role that forests and other ecosystems play in the global carbon cycle, little attention has yet been focused on shrubland ecosystems which are widespread across the semi-arid climates of the globe.

We study net ecosystem CO_2 exchange and energy fluxes in a montane shrubland ecosystem located in Sierra de Gádor (Almería) in southeast Spain, an "associated site" for CARBOEUROPE. Fluxes are measured using the eddy covariance technique; meteorological, radiation and soil sensors are used to develop empirical models of ecophysiological processes. The data presented here cover nearly one year of measurements since May of 2004, and illustrate how photosynthesis and respiration are strongly related to phenological state and soil humidity (in addition to the anticipated light and temperature dependencies of such processes). Preliminary results highlight functional differences between this semi-arid shrubland and previously studied land use (forest) in aspects such as light response and seasonality.