



Large Annual Net Ecosystem CO₂ Uptake of a Mojave Desert Ecosystem

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The net ecosystem CO₂ exchange (NEE) between a Mojave Desert ecosystem and the atmosphere was measured over the course of 2 years at the Mojave Global Change Facility (MGCF, Nevada, USA) using the eddy covariance method. The investigated desert ecosystem was a sink for CO₂, taking up 102 ± 67 and 110 ± 70 g C m⁻² during 2005 and 2006, respectively. A comprehensive uncertainty analysis showed that most of the uncertainty of the inferred sink strength was due to need to account for the effects of density fluctuations on CO₂ densities measured with an open-path infrared gas analyser. In order to keep this uncertainty within acceptable bounds, highest standards with regard to maintenance of instrumentation and flux measurement post-processing have to be met. Most of the variability in half-hourly NEE was explained by the amount of incident photosynthetically active radiation (PAR). On a seasonal scale, PAR and soil water content were the most important determinant of NEE. Precipitation events resulted in an initial pulse of CO₂ to the atmosphere, temporarily reducing NEE or even causing it to switch sign. During summer, when soil moisture was low, a lag of 3-4 days was observed before the correlation between NEE and precipitation switched from positive to negative, as opposed to conditions of high soil water availability in spring, when this transition occurred within the same day the rain took place. Together, our results indicate that desert ecosystem CO₂ exchange may be playing a much larger role in global carbon cycling and in modulating atmospheric CO₂ levels than previously assumed - especially since arid and semi-arid biomes make up more than 30 % of Earth's land surface.