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Mediterranean savanna system: understanding and modeling of olive orchard.

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Nowadays most of the studies on C and N exchange were focused on forest ecosystems and crop systems, while only few studies have been focused on so called "savanna systems". They are long-term agro-ecosystems (fruit trees, grapevines and olive trees, etc.) usually characterized by two different layers (ground vegetation and trees). Generally, there is a lack of knowledge about these systems due to their intrinsic structural complexity (different eco-physiological characteristics so as agricultural practices). However, given their long-term carbon storage capacity, these systems can play a fundamental role in terms of global C cycle. Among all of them, the role that olive trees can play in C sequestration should not be neglected, especially in Mediterranean areas where they typify the rural landscape and are widely cultivated (Loumou and Giourga, 2003). It is therefore fundamental modelling the C-fluxes exchanges coming from these systems through a tool able to well reproduce these dynamics in one of the most exposed areas to the risk of climate change (IPCC, 2007). In this work, 2 years of Net CO_2 Ecosystem Exchange (NEE) measures from eddy covariance were used to test the biogeochemistry model DayCent. The study was conducted in a rain-fed olive orchard situated in Follonica, South Tuscany, Italy (42 ° 55'N, 10 ° 45'E), in an agricultural area near the coast. The instrumentation for flux measurement was placed 1.9 m above the canopy top (6.5 m from the ground) so that the footprint area, expressed as the area containing 90% of the observed flux, was almost entirely contained within the olive orchard limits (Brilli et al., in press). Ancillary slow sensors have included soil temperature profiles, global radiation, air temperature and humidity, rain gauge. Fluxes of sensible heat, latent heat, momentum and CO_2 as well as ancillary data were derived at half-hourly time resolution. Specific soil (texture, current and historical land use and vegetation cover) and vegetation data (biomass partition, C and N content in olive trees branches and roots) were additionally collected to improve the model calibration. Preliminary results showed that olive grove can be an important C sink while agronomic practices and hottest conditions can induce large C losses. DayCent simulations have confirmed that the model properly tuned for the two components can be used to simulate total olive grove NEE. Additional studies should be conducted to assess the possibility of further improving model performances.

References

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