Geophysical Research Abstracts
Vol. 18, EGU2016-1580, 2016
EGU General Assembly 2016

Soil organic carbon pools in olive groves of different age

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In the last years, the practices which favor the increase of soil organic carbon in the agroecosystem have been widely studied because of their influence on the reduction of atmospheric CO_2 (Lal, 1993; Schlesinger, 2000). The accumulation of the organic carbon into the soil depends to a great extent upon climate and pedological properties (Burke et al., 1989; Miller et al., 1994), although in the agricultural soils the cultivation system also plays a key role. The olive grove might potentially represent a relevant land use to improve C sequestration in soil, but there are few data available to support this hypothesis. In a study site located in central Italy (Deruta, PG), we analyzed the soil organic carbon (SOC) pools in two olive groves of different age (7 and 30 years) and, as control, in a site adjacent to the groves cropped with cereals for at least 30 years. With the aim to isolate and quantify the active, intermediate and passive functional SOC pools in the olive groves and in the control, we used a combined physical and chemical fractionation method (Zimmermann et al., 2007). The main results shown that the total organic carbon content in the Ap horizons was the highest in the 30-years-old olive grove, followed by the 7-years-old olive grove, and then by the control soil. The content of active C, in form of particulate organic matter (POM) and water soluble organic matter (WEOM), was greater in the olive grove compared to the control soil and increase with the age of the grove. About the amount of C in the intermediate and passive pools, no significant differences were found among the olive groves and the control.
These preliminary results indicated that the greater total organic C content occurred in the 30-year-old olive grove with respect to the 7-years-old grove and the control, has to be ascribed to the greater content of active organic matter (POM and WEOM), and not to the accumulation in soil of organic C in a more stabilised form.