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Soil denitrifying and nitrifying activities and their different contribution to N_2O emission from a Mediterranean irrigated cropland.

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The microbial processes of nitrification and denitrification are the main source of N_2O by soils. The increased N-input, in the last 20-30 years, by application of N mineral fertilizers or manures and large use of irrigation have greatly increased the amount of N_2O evolved from agricultural lands. The scanty data about N_2O fluxes from Mediterranean croplands are limiting to provide the necessary information in order to develop and validate global models.

Nitrous oxide emissions, denitrifying-nitrifying activities and their different contribution to N_2O production were measured in an irrigated cropland (*Lolium italicum* L) in Campania Region (South Italy). The measurements were related to key drivers such as degree of anaerobicity, organic substrate availability and soil N-mineral content.

The experimental site is located near Eboli about 25 km NW of Salerno, in the middle of the plain of Sele river, the largest flatland of Campania region. The site was registered as contributing to the FLUXNET network.

The parent material of the soil at the site is carbonate, but most of the material has an alluvial origin, deriving from nearby Sele River. Two contrasting soil profiles were described along an E-W transect. In the East profile the parent material has alluvial origin, with alternate sandy and clay layers, and it is very rich in carbonates. An accumulation soil layer for carbonates is evident at 1.2 m depth. Hydromorphic traits related to winter waterlogging are evident, soil texture is clay in the top 0.2 m, then more sandy and silty-clay at 1.2 m. The West profile appears more heterogeneous with a sandy texture and with little presence of carbonates; the hydromorphyc characteristics are less evident.

The measurements were performed in three plots (10m x 10m) along the transect E-W in order to screen the soil heterogeneity. Two plots were located inside the clay site (1E, 1W) and one inside the sandy site (2W). Soil samplings were performed along 0-30 cm profile. The soil samples were characterized for mineral N, organic matter and soil water content. Soil N_2O emissions were measured with closed chambers method; net nitrification rates and denitrification were performed in intact soil cores with Buried-bag method and Acetylene Inhibition Method, respectively. New measurements and data analysis along the soil profile are in progress.

N_2O emissions ranged from 1.63 Kg N_2O-N ha^{-1} a^{-1} to 3.94 Kg N_2O-N ha^{-1} a^{-1} showing a high spatial variability (CV more than 70%) and were higher in the two sites characterized by clay soil compared to the site characterized by sandy texture. The same pattern was observed for the denitrification activity and appeared correlated to soil nitrate concentrations.

The highest net nitrification rates were measured in the sandy soil and showed a decrease during the plant growing season; no net nitrification was detected at the 1E clay site.

However, even if the greatest N_2O emissions were attributed to denitrification at the clay site, preliminary analyses (Short Exposure Inhibition Method, with intact soil cores) performed on sandy soil in order to asses the apportioning of nitrification and denitrification to N_2O emission, showed nitrifier activity as the prevailing process contributing to N_2O fluxes.