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Water dynamics and nitrogen balance under different agricultural management practices in the low-lying plain of north-east Italy

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In the last decades the adoption of sustainable land management practices (e.g. conservation agriculture, use of cover crops) has been largely subsidized by the EU policy in an attempt to combine competitive agricultural production with environmental protection, e.g. reduce nitrogen losses and optimize water management. However, the real environmental benefits of these practices is still questioned since strongly dependent on local pedo-climatic variability.
This study aimed to evaluate water and nitrogen balances in sustainable land management systems including conservation agriculture (CA) practices or use of cover crops (CC).
The experimental fields, established in 2010, are localized in the low-lying plain of the Veneto Region (NE Italy), characterized by a shallow water table and identified as Nitrate Vulnerable Zone.
In March 2016, a total of nine soil-water monitoring stations have been installed in CA, CC and conventional fields. The stations (three per each field) were set up with multi-sensors probes (10 cm, 30 cm and 60 cm depth) for the continuous monitoring of soil electrical conductivity (EC, dS m-1), soil temperature (T, °C) and volumetric water content (WC, m3 m-3). A wireless system in ISM band has been designed to connect the soil-water monitoring stations to a unique access point, where the data were sent to a cloud platform via GSM.
Water samples at each station were collected every two weeks using a suction cups (installed at 60 cm depth) and a phreatic wells, which were also used to record the water table level. Climatic data, collected from a weather station located in the experimental field, were combined with soil-water data to estimate water and nitrogen fluxes in the root zone.
During the first year, relevant differences in water and nitrogen dynamics were observed between the treatments. It can be hypothesized that the combined effect of undisturbed soil conditions and continuous soil cover were major factors to affect water distribution and N fluxes within the soil profile.