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Assessment of the soil-water dynamics in an intensively used agricultural lowland area of Lombary, Italy

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The use of hydrological models can be a suitable basis for the development of sustainable land use and respective water management policies, according to the sustainable development goals (SDGs) of EU. In this study, a process-based numerical model was developed, to determine the hydrological dynamics of a micro-scale basin in a flat and intensely used agricultural area that is partly irrigated, in the Lombardy Region, Italy. In this area, agriculture has a fundamental role in the local hydrological cycle, indeed, landuse and land management practices date back to medieval times with the construction of irrigation channels and reuse of water along the fluvial terrace cascade of the Ticino River. From a hydrological point of view the study area is very complex: there is almost no natural surface runoff, but prevailing vertical soil water dynamics. The water infiltrates on the highest and oldest fluvial terrace level and reemerges in form of springs (risorgive) at the base of the terrace escarpments and is further used for irrigation on the next terrace level.

The objective of this study is to assess the hydrological dynamics of this complex area that is getting under increasing pressure related to climate changes and socioeconomic transformations. In order to achieve the study goals, we applied the Soil Water Assessment Tool (SWAT), a complex hydrological model that works at the basin scale and generates variable spatio-temporal outputs and is being applied successfully worldwide for soil and water management studies. We present the methodological approach for deriving the model input and boundary conditions. Moreover, we show the effects of selecting different model entity configurations as well as calibration and validation procedures. First preliminary results show that SWAT is able to simulate the general hydrological dynamics of the area according to the use of satellite soil moisture and evapotranspiration data. In addition, through local soil moisture measurements carried out in the field, qualitative evaluation of infiltration capacities have been made and with these measurements it will be possible to validate the model. Hence, the model results obtained, provide information on the soil water dynamics that can be used as a basis for studying future scenarios (i.e., impacts of climate change or different management such as different irrigation schemes).