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Use of Mohid-Land to model water balance for implementation of deficit irrigation in vineyards

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The Water4ever project aims to increase irrigation water and fertilization efficiencies through precision irrigation. The project has 3 major components: A technological component devoted to the development of measuring technologies based on optical sensors; a modelling component addressing both the local and the catchment scales; and a fieldwork component based on 3 case studies dedicated to vineyards and fruit trees where the new sensor and modelling tools will be combined with field data obtained by conventional monitoring and remote sensing. The project aims also to improve modelling at plot and catchment scale in order to quantify the effect of agriculture practices on water availability and quality. MOHID-Land is a physically-based, spatially distributed, continuous, variable time step model for the water and property cycles. It integrates four compartments or mediums (atmosphere, porous media, soil surface, and river network). In this study, the MOHID-Land model has been calibrated and implemented at plot scale in two of the project's study cases, located in Portugal and Italy, that are representative of local vineyards, with different management, climate and topographical conditions: (i) the Vinha do Mel - Companhia das Lezírias (Portugal) is an irrigated vineyard of 14000 m^2 with limited slope, while (ii) the Cannona Erosion Plots (NW Italy) are 1200 m^2 portions of a rainfed hillslope experimental vineyard, with different inter-rows' management. Water inputs (precipitation and irrigation), meteorological parameters and soil water content at different depths have been monitored in both plots during two years (2017-2018), using field sensors. Direct runoff measurements are available for the Cannona Erosion Plots. The vegetative development of the vineyards has been estimated from remote imagery. The field and remote datasets were used to calibrate and validate the MOHID-Land model, by comparing with simulated values of soil water content and LAI, with satisfactory to good efficiency of the model. The performance of the model was considered acceptable to support the IrrigaSys decision support system, using the Portuguese study case as reference for weekly irrigation recommendation in the region. The Italian study case was also used to estimate the water balance in two growing seasons with contrasting weather conditions, in order to evaluate the different behaviour with respect to the adopted soil management and the needing to introduce irrigation in a region where vines are traditionally rainfed.

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