INTERUNIVERSITY PHD COURSE

"SUSTAINABLE LAND MANAGEMENT"

Cycle XXXVI

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Title of the Research Project	Soil water content monitoring using a CMD mini-explorer to assess the accuracy of an agro-hydrological model FLOW-HAGES
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Summary of the Research Project

1-Introduction

In Mediterranean countries the irrigated area has more than doubled in 40 years, totaling 24,200,000 ha in 2009 (17.8 million in the Mediterranean Europe and 6.4 million in Northern Africa). However, irrigation is often wasteful and highly inefficient (Hsiao et al., 2007). Beside water losses, in some Mediterranean countries the excessive water applied may lead to other serious problems, such as rising water tables, waterlogging and upward movement of salts. To solve the problem, irrigation managers should be able to determine actual crop water requirements, deciding the optimal timing, quantity and quality of irrigation water to be supplied to the soil in each farm in order to control crop yield, while minimizing deep percolation fluxes of water and nutrients, hence water losses and groundwater degradation. Advanced, agro-hydrological models, embedded in decision support systems (DSS), are nowadays available for for calculating soil water content along the whole soil profile and, more in general, for describing the water (and energy) transfer in the soil-plant-atmosphere system (Gerke and van Genuchten, 1993; Jarvis, Coppola et al., 2012).

2-Objectives

In line with the latter study, the main aim of this study is to carry out a large-scale monitoring campaign of water storage in an irrigation district irrigation network by using an EMI sensor: CMD miniexplorer. The CMD- based water storages will be used for evaluating the goodness of the water storage estimations coming from simulations of an agrohydrological model called FLOWS-HAGES. The work will be mostly devoted to develop a survey protocol based on EMI sensors to characterize the spatial and temporal variability of soil water content in order to calibrate and validate the FLOWS-HAGES model simulations.

3-Methodology

The soil water storage patterns extrapolated from apparent electrical conductivity, ECa, measurements obtained by a CMD mini explorer sensor will be compared with those simulated by FLOW-HAGES model to assess its accuracy in describing the soil water dynamic during an irrigation season.

4-Expected results

The main result of this study will be the development of a methodology based on a non-invasive sensor to systematically calibrate and validate the agro-hydrological model in terms of water storage. In other words, the monitoring methodology and the model will be integrated in a unique tool where storage estimations by the CMD sensor will be systematically used to validate storage simulations during the whole irrigation season.

References

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