Development of irrigation management services based on integration of innovative soil moisture monitoring and hydrological modelling

Vassilios Pisinaras[1], Cosimo Brogi[2], Heye Bogena[2], Harrie-Jan Hendricks-Franssen[2], Olga Dombrowski[2], and Andreas Panagopoulos[1]

[1]Soil & Water Resources Institute, Hellenic Agricultural Organization "DEMETER", Thessaloniki, Greece (v.pisinaras@swri.gr)

[2]Agrosphere (IBG-3), Forschungszentrum Jülich GmbH, Jülich, Germany

The H2020 ATLAS project (www.atlas-h2020.eu/) aims to develop an open, flexible and distributed platform that will provide services for the agricultural sector based on the seamless interconnection of sensors and machines. Two interconnected services that will be included in the platform are the soil moisture monitoring and the irrigation management services. The soil moisture monitoring service will integrate both invasive (wireless sensor network (SoilNet)) and non-invasive soil moisture monitoring methods (cosmic-ray neutron sensors (CRNS)). Ultimately, a model will be developed that combines SoilNet and CRNS measurements to predict soil moisture time series. Soil water potential sensors will be incorporated as well.

Data provided by the above described service will be incorporated in an irrigation management service which will be based on hydrological modelling. The fully distributed, deterministic Community Land Model (CLM, version 5) will be applied which incorporates physically-based simulation of soil water balance and crop growth. Two different levels of application will be considered, namely the farm and watershed scale, which will be combined to weather forecast in order to provide irrigation scheduling advice. The farm scale application will take advantage of soil moisture monitoring data and provide farm specific irrigation scheduling, while the watershed scale application will provide a more generic irrigation advice based on the average cultivation practices. Furthermore, the CLM model will be coupled to a groundwater flow model in order to connect irrigation to groundwater availability. By doing so, it will be possible to support the efficient and sustainable groundwater management as well as competent water uses in an area that suffers from water scarcity.

These services will be implemented in the area of Pinios Hydrologic Observatory, located in central Greece. Three pilot orchards will be established introducing different soil moisture monitoring setups, while the boundaries of the Observatory will be used for the pilot implementation of irrigation management service on the watershed scale. Furthermore, two pilot vineyards located in northern Greece will be established in order to further test the services functionality on the farm scale.