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THE FREEWAT PLATFORM FOR PLANNING AND MANAGEMENT OF CONJUNCTIVE USE OF GROUND- AND SURFACE-WATER

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Integrating advanced simulation techniques and data analysis tools can represent a valuable contribution for sustainable management of conjunctive use of ground- and surface-water. As such, developing innovative software tools to address water management issues is of paramount importance, especially for the application of EU and other water-related Directives (Rossetto et al., 2015).

Within the EU HORIZON 2020 FREEWAT (FREE and open source software tools for WATer resource management – www.freewat.eu) a free and open source platform, QGIS-integrated, for planning and management of ground- and surface-water resources was developed. The FREEWAT platform, a large QGIS plugin, allows simulating the hydrologic cycle, coupling the power of GIS geo-processing and post-processing tools in spatial data analysis with that of process-based simulation models. This results in a modeling environment where large spatial datasets can be stored, managed and visualized and where several simulation codes (mainly belonging to the USGS MODFLOW family) are integrated to simulate multiple hydrological, hydrochemical or economic-social processes.

The FREEWAT platform includes so far six modules:

- AkvaGIS allows to produce plots and thematic maps for the analysis of hydrochemical and hydrogeological data;
- Observation Analysis Tool facilitates the import, analysis and visualization of time-series data to support model construction and calibration;
- groundwater flow dynamics in the saturated and unsaturated zones may be simulated using MODFLOW-2005 (Harbaugh, 2005);
- solute transport in the saturated zone can be simulated using MT3DMS (Zheng & Wang, 1999);
- simulation of viscosity- and density-dependent flows is accomplished through SEAWAT (Langevin et al., 2007);
- management of conjunctive use of ground- and surface-water in rural environments is accomplished by the Farm Process module embedded in MODFLOW-OWHM (Hanson et al., 2014);

• UCODE_2014 (Poeter et al., 2014) is implemented to perform sensitivity analysis and parameter estimation to improve the model fit.

The FREEWAT platform is now applied to 14 selected case studies aiming at addressing specific water management issues. Such case studies may be divided in two clusters: i) 9 case studies (8 in EU Countries and one in Switzerland) are specifically referred to meet the requirements of the Water Framework Directive, Ground Water Directive and other water-related Directives for water resource management; ii) 5 case studies (2 in EU Countries, one in Ukraine, one in Turkey and one in Africa) are devoted to address water management issues mostly related to the rural environments.

In the framework of these case studies, relevant stakeholders are involved in the technical activities in order to enlarge and present to a wider audience the benefits of ICT tools in water planning and management.

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