

Enhancing water resource management in rural areas by means of simulation tools

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Conjunctive use of ground- and surface-water in agriculture is of paramount importance in many rural areas of Europe, where freshwater resource is facing growing pressure, due to both human impacts and climate changes. In this framework, the development of open source public domain GIS-integrated, fully distributed and numerically-based simulation platforms may provide powerful tools to support planning, management and monitoring activities.

The HORIZON 2020 FREEWAT (FREE and open source software tools for WATER resource management, www.freewat.eu) implements the Farm Process (FMP) embedded in MODFLOW-OWHM to simulate conjunctive water use in rural areas under demand-driven and supply-constrained conditions, taking also into account constraints on well abstraction and water-rights ranking of water accounting units. The choice to integrate the FMP, after a careful review of the available codes, is related to the rigorous approach in dealing with the groundwater component. Thus the FMP allows to dynamically integrate infiltration, surface runoff and deep percolation components, to effectively balance crop water demand and supply from both sources of water.

The FMP is further coupled with the Crop Growth Module, a free and open source module based on the EPIC family models, to estimate crop water uptake and provide crop yield at harvest. The CGM is a radiation-based model requiring few input data, most of which are also used as input parameters for FMP. The coupling between the two of them is easily achieved as the water uptake is computed by the FMP and then used in the CGM.

Needs and priorities highlighted by the project partners include also the integration of simulation tools for nutrient transport from agricultural areas to ground- and surface-water bodies. Such integration is considered as a priority for future developments of the FREEWAT platform.