INOWAS DSS: web-based modeling framework for managed aquifer recharge (MAR)

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The INOWAS DSS modeling platform contains a compilation of web-based tools for planning, management and optimization of main components of managed aquifer recharge (MAR) schemes. Tools of varying complexity solve empirical, analytical and numerical equations and are running on a web-server which can be accessed via standard web browsers. The simulation core of the system is represented by a numerical groundwater flow model based on MODFLOW-2005 and FloPy. The platform enables the user to set up and calculate a new groundwater flow model. In addition, a scenario analyzer helps to easily vary boundary conditions to evaluate new management options as well as future development. This can be done either manually or by using a multi-objective optimisation based on an evolutionary algorithm. Besides the MODFLOW-based core, simple tools solving empirical and analytical equations to address MAR-related issues are ported on the server. These include, among others, the assessment of saltwater intrusion induced by pumping or sea-level rise, the calculation of travel time through unconfined aquifers and pumping-induced river drawdown. The groundwater mounding calculator can be used to estimate the rise of groundwater levels beneath infiltration basins. An analytical tool solving the advection-dispersion equation can be utilized to determine the contaminant concentration downgradient of a constant source. Further tools are under development and will be added in the near future. The compilation of tools provided by the INOWAS DSS platform facilitates the sustainable management of groundwater resources and provides best accessibility of project data as well as multi-institutional collaboration through web-based implementation.