Geophysical Research Abstracts
Vol. 17, EGU2015-12729, 2015
EGU General Assembly 2015

Conceptual model of a coastal hydrosystem in a semi-arid environment subjected to the climate change: the case of Lavrion, Greece

Christos Pouliaris (1), Philipp Schumann (1), Nils-Christian Danneberg (1), Laura Foglia (1), Andreas Kallioras (2), and Christoph Schüth (1)

(1) Technical University of Darmstadt, Institute of Applied Geosciences, Chair of Hydrogeology, Darmstadt, Germany, (2) National Technical University of Athens, School of mining and Metallurgical Engineering, Laboratory of Engineering Geology and Hydrogeology, Athens, Greece

Groundwater management in arid areas has become a major issue worldwide, and it is expected to be exacerbated due to climate change. Low annual precipitation and high evaporation potential are the key features of these areas, with additional pressure added to the system due to abstractions for irrigation and water supply purposes. Typical example of such scenarios exist in the Mediterranean area, where drought and water scarcity, especially in the warm period of the hydrological year, give rise to major management issues in coastal areas. Among the different solutions, the implementation of Managed Aquifer Recharge (MAR) schemes have been suggested in the EU FP7 project MARSOL (Demonstrating Managed Aquifer Recharge as a Solution to Water Scarcity and Drought). In the project, different sites across the Mediterranean are tested for investigating the viability of various MAR techniques in different hydrological systems facing qualitative and quantitative deterioration of their groundwater resources. The coastal hydrosystem of Lavrion was selected due to its typical Mediterranean characteristics (climatic, hydrologic, hydrogeological, geological etc.); all within a rather small area of extent (< 50km2), that render it as a reference site for hydrologic modeling applications. It consists of a set of aquifer layers (karstified limestone and alluvial) which are hydraulically connected to the sea and an ephemeral torrent (wadi) that flows through a typical small Mediterranean alluvial valley. The major water resources problems of the area are mainly qualitative issues of the groundwaters; in specific: (i) seawater intrusion, (ii) nitrate contamination and (iii) heavy metal pollution due to past and recent mining and metallurgical activities

The modelling approach will include the development of three distinct models that will be integrated. The aim is to depict how systems with characteristics like the ones mentioned above perform and, which different scenarios can be applied, aiming at identifying the most viable (with respect to water budget) MAR strategy for the specific area. Meteorological data, field data and site investigations provide the input data for all the different models. The field activities already conducted included: an inventory of all existing pumping wells; the development of a monitoring network for qualitative and quantitative environmental data acquisition at different scales and hydrologic zones; installation of multi-level piezometers for tailored monitoring of the seawater wedge; and geophysical surveys of subsurface characterization.

The combination of literature review and field investigations led to the development of the conceptual model of the area along with the realization of the spatial distribution of each model. The hydraulic connections of the two aquifers, the surface water system and the sea have been identified and the upcoming activities aim in quantifying them and include them in the models being under development. The groundwater chemical characteristics have been examined, with results showing the major influence from seawater intrusion. All the data mentioned above are used for the development of the integrated hydrological model of the Lavrion area.