



Which input of detailed knowledge related to 2D up to 3D geometry of a karst Mediterranean aquifer to set up a conceptual model and to select the appropriate hydrogeological modeling?

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Hydrogeological modeling of karst aquifer is developed in order to test the likelihood of a conceptual model inferred from data analysis, but also for predicting flow rate variations as a function of rainfall events and pumping rate to enable sound resource management, and to deal with the protection of resources, for quality purpose. Various approaches of modeling are used; for the quantity purpose, generally lumped model such as reservoirs models is set up, giving satisfactory results. For the quality purpose such model shows its constraints; transport could be simulated with 1D model, however 2 or 3D model integrating distributed geometry and heterogeneity of the karst aquifer is necessary. If 2D geological cross sections are used to define the geometry of a distributed hydrogeological model, do they constitute an essential element to interpret geochemical data and to set up a conceptual model. This question will be discussed using the Lez karst aquifer as test site.

The Lez karst aquifer is a typical karst Mediterranean aquifer, located in Southern France. One of its characteristics is related to its active management, through three boreholes intercepting the karst conduits upstream the outlet, allowing a mean pumping rate of 1300 l/s for the water supply of Montpellier and suburban areas. The second characteristic is the influence of the Messinian crisis on the development of deep karstification, probably several hundred meters below the present day sea level. As this aquifer is used for water supply for about 400 000 inhabitants in a Mediterranean area where the demographic pressure is high, there is a strong interest from management authorities to improve their management procedures. It could concern the possibility of exploiting at higher pumping rate. In order to answer to such question, updating of knowledge concerning geology, geometry, hydrogeology, hydrogeochemistry was undertaken in the framework of a multi-users management project (Lez project cofounded by the Montpellier Agglomération, AERMC water agency, Hérault Conseil Général and brgm). A series of 8 geological cross sections had been build covering an area of about 50 km x 60km, from Vidourle river (East) to Hérault river in the West and in the North and till the Mediterranean shoreline in South. They were built based considering seismic profiles interpretation, log of deep boreholes and geodynamic and tectonic framework. Lithological sound, the karst aquifer has been developed within massive Late Jurassic limestone (650 to 1100m thick) and the lower part of the Early Cretaceous (Berrisian) layer. Marl and marly-limestone of the Middle Jurassic constitute the lower limit of the aquifer. The marly series of the Albian constitute the upper limit of the aquifer and may locally confine it. The aquifer is affected by some major faults inherited from the Pyrenean and Oligocene tectonics. The Lez spring appears to be an overflow of a deep regional flow system, part of whose groundwater probably flows to other systems and/or to the sea (Bonnet and Paloc, 1969).

Hydrogeochemical data interpretation (major ions and trace elements) of water points located in and outside of the catchment area of the Lez spring shows anomalies of mineralization. To discuss the origin of this salinity (high mineralised waters pour éviter le terme de salinité?), the confrontation to the 2D geological cross section is an important stage.

Hydrological modeling of the Lez karst system developed with reservoir approach (Fleury et al. 2009) and with transfer function models allow to simulate the hydrograph of the spring as well the groundwater level time series at the capture work. Results of these two models will be presented. However, does this type of model allows to test higher pumping rate or is it necessary to set up a distributed model integrating heterogeneities such as major conduits of karst network ?