Study of groundwater resources of the Kouris catchment (Cyprus) under the conditions of semi-arid climate and growing water demands.

Par Anastasia BORONINA
En Post-doc à HydroSciences Montpellier

The Kouris catchment is experiencing water scarcity problems due to semi-arid conditions in its southern part and an increase in ground- and surface water extraction. Quantification of the regional water balance is necessary, but it is rather difficult task due to rock heterogeneity and high spatial and temporal variability of water balance components.

The catchment is composed by two main geological zones: an ophiolitic complex in the North that contains the major groundwater resources of the island and overlying sedimentary rocks in the South with few water resources. The region has a Mediterranean climate and the mountain topography: an altitude goes up from the sea level to 2000 meters within a distance of 30 kilometres; local slopes can reach 80 % and a relief is controlled by river valleys.

In this study, steady state and transient groundwater flow and transport numerical modelling was applied to quantify the regional water balance.

The chemical and water isotope data, collected during the years 1998-2002, allowed to validate model assumptions and to calibrate steady state recharge for the groundwater model. The deuterium altitude effect in recharge, derived from the data of 33 springs, helped to trace origin of groundwaters in different aquifers of the basin. It was demonstrated, that the ground water in the alluvium originates mainly from the ophiolites, whereas, the groundwaters in consolidated rocks originate from local recharges.

The tritium transport in the aquifer was simulated by the means of PMPATH advective transport model that was calibrated by measured tritium concentrations in springs. The simulated residence times for the groundwaters discharging from springs of the ophiolitic aquifer were at the range of 1÷25 years; the “young” waters appeared in wet seasons. Residence times of the groundwater in the sedimentary aquifer were estimated to be higher than 45 years. The model calibration resulted in the optimal distribution of the porosity between 0.04 and 0.06 for the ophiolitic aquifer.

Combination of different numerical models, field observations and hydrochemistry and isotope studies resulted in estimates of transient groundwater balance, calibrated set of hydrogeological properties and a map of endangered, due to over-exploitation, areas.