EGU21-5868
https://doi.org/10.5194/egusphere-egu21-5868
EGU General Assembly 2021

Understanding of reservoirs in karst: the case of Vora Bosco cave (Salento, Italy)

Tamara Leins[1], Isabella Serena Liso[2], Mario Parise[2], and Andreas Hartmann[1]
[1]Chair of Hydrological Modeling and Water Resources, Albert Ludwigs-University of Freiburg, Freiburg, Germany
[2]Department of Earth and Environmental Sciences, University Aldo Moro, Bari, Italy

Vora Bosco Cave is located in the Salento karst peninsula (Apulia, S Italy), surrounded by the Ionian and Adriatic Seas. In this part of Apulia, due to climate change, the typical Mediterranean climate is moving towards arid and semi-arid, with scarce or absent surface runoff. The Salento groundwater is a freshwater lens fluctuating on seawater, entering inland because of intrusion phenomena. The freshwater volume stored in the lens is subjected to both sea level rise and an increasing pressure caused by the high water demand, especially in summer time, for touristic purposes. Therefore, developing an understanding of the hydrogeological dynamics of the karst aquifer can be a useful tool for planning better protection and management actions on Apulian groundwater resources.

Vora Bosco cave was instrumented with a multi-parameter probe for groundwater level measurements from November 2017 to July 2018. Thereby, the system behaviour within the cave recharge area can be explored. To characterise and quantify the natural recharge and discharge behaviour of the system, a simple reservoir model was developed and calibrated with the measured data. The model consists of 4 reservoirs, which are filled and emptied using simple discharge equations. The model considers evapotranspiration from the soil, slow flow in the unsaturated and saturated zone, as well as fast flow in the karstic conduits. Daily data of precipitation and potential evapotranspiration are used as model inputs. The model simulates the water level at Vora Bosco and is calibrated by comparison of simulated and measured water level, using the Kling-Gupta-Efficiency as an objective function. Our results reveal that the model simulations show acceptable performance in reflecting the dynamics of the observed water level data. The calibration achieves reasonable results for the model parameters. In addition to the water level simulations, quantifying predictions uncertainty by Monte Carlo approach, it is shown that there is still potential to produce more reliable estimates of future groundwater dynamics, in order to better manage the precious regional groundwater resources.