



Hydrodynamic interactions between karst conduits and matrix: some example from Classical Karst

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Karst aquifers are very different from other aquifers due to the high heterogeneity of hydraulic characteristics which leads to complex groundwater flow dynamics and storage mechanism. In this context there are some point related to practical aspects; one of this is represented from the interaction between karst conduits and matrix especially during flood events.

To better understand these processes the Department of Geological, Environmental and Marine Sciences of the University of Trieste is long time studying the Classical Karst plateau.

The aquifer of the Classical Karst area (about 900 km² wide), which is divided between Italy and Slovenia, is mainly replenished by rains (1400 – 1500 mm/year). Another important contribution is given by Škocjanske Jame, a huge swallow hole which drains the waters of the Reka river (average stream flow 8 m³/s) into the karst aquifer thus feeding the hypogea system of the Timavo river. Timavo waters flow in depth, crossing the plateau longitudinally with SE – NW direction through a system of karst conduits which develop in phreatic and epiphreatic zones with very high hydraulic transmissivity. The spring system of the aquifer is located close to the north-western section of Karst and has a mean total water discharge of 40 m³/s, 75% of which is drained by the Timavo resurgent rivers (mean discharge approximately 30 m³/s).

To focused the problem several years ago a water level and water physical-chemical characteristics monitoring network was set up. This network is composed by several water point: mainly springs, many caves reaching the groundwater level and the conduit network and some piezometer affecting the karst matrix groundwater circulation with various hydraulic conductivity conditions.

Collected data show that the biggest water level oscillations are often strictly connected to Reka river flood pulses. The interaction mechanism between matrix and conduits is not always the same, but it depends on the entity of the pulses and on the previous hydraulic conditions of the karst system. During a great flood event it could be observe in the karst matrix a huge water level variation which is strictly depending on the hydraulic pressure transmission from the conduit network and not much affected by the local water seepage such demonstrated by the water conductivity behaviour.

Several monitoring point show water level fluctuations related to the handling of the sluice at the most important spring of the area located a few kilometres away.