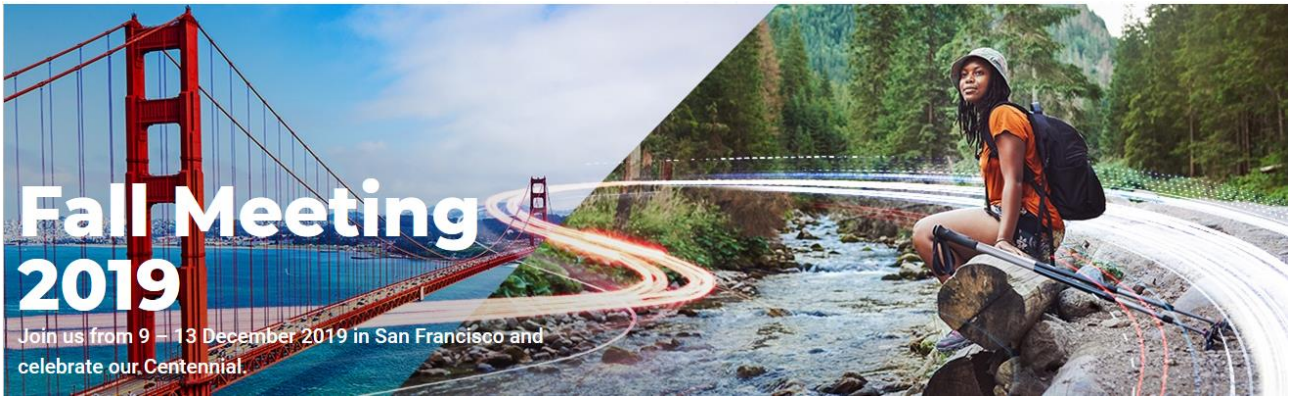

Water mass movements in Classical Karst depicted by continuous gravity measurements

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Depicting the water dynamics in a Karst environment frequently represents a challenge due to the more complex drainage system compared to porous media and to logistic difficulties in deploying an efficient monitoring network. The observations of key physical parameters such as discharge are usually carried out sparsely only where a direct access to the drainage channels is possible. For this reason indirect geophysical methods, such as gravimetry, could be a valid complement to classical hydrological prospections to study the hydrodynamics of such systems. A typical karst environment is the "Carso/Kars" region which is a 600km^2 limestone aquifer shared between Italy and Slovenia. The aquifer is constituted by an extended network of caves, shafts and conduits fed by authigenic waters and the allogenic contribution of the Reka river. The Reka river sinks in the Škocjan caves and continues its underground flow for over 30 km, finally outflowing in the Adriatic sea at the Timavo Springs. The river shows high discharge variability between dry and wet periods (0.3- 350 m^3/s) and as the karst conduit system cannot efficiently drain large discharge, huge water masses are temporarily stored in the epiphreatic voids during flood events.

In July 2018 we set a continuous recording gravimeter near the Škocjan caves with the aim to monitor the water variations.

In this contribution we present the gravity data and the processing in order to remove tidal and other non-hydrologic components and insulate the gravity variations linked to the Karst water circulation. Some challenges in the processing arise since the study area is close to the Adriatic sea, where marine tidal and non-tidal contributions are unneglectable.

Our gravity measurements revealed many transients linked to the local hydrology: one important event flooded the caves on Febraury 2019 causing a gravity change of 40 microGal. The event is compatible with the gravity estimate derived from an hydraulic model of the cave which reported an accumulation of about 10 10^6 m^3 of water in the whole cave system in 1.5 days.

The case discussed in this contribution represents a first promising application of gravimetry for tracking the water paths in the Classical Karst, easily applicable to other sectors of the Karst less known.