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Gravimetry for monitoring water movements: the Classical Karst as a natural laboratory

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The Karst environment is characterized by a peculiar water system circulation, governed by a network of conduits in which the water flows. The name Karst is derived from the Classic Karst region which is located across Italy, Slovenia and Croatia borders. This area gave name to the phenomenon because it was one of the first worldwide to be studied and it is still object of many researches and hosts an important monitoring network.
In this area the water is supplied mainly by infiltration during the autumn-spring rainfall events but also from the Reka river that sinks in the Škocjan caves and then flows underground up to the Timavo Springs.
The water path is very well known near the Škocjan cave where the water inflow from the Reka river and the rain fall are continuously monitored and also the karst conduits have been mapped directly by speleology inspection. Such data are indispensable in order to construct and constrain 2D hydraulic models that explain very well the water dynamics in the area.
However in Skocjan the water circulation is superficial while in other parts of the Karst the water flows deeper underground: in the Grotta Gigante, a natural cave, the water flow is located over 200m below the surface.
Its movement could be hardly monitored by direct observation and also modelling is limited due to the lack of a 3D model of the aquifer. Indirect geophysical methods, in particular gravimetry, could be exploited in order to obtain some constraints for the underground conduits and cavities and also to gain information about the water mass movements through time.
In this contribution we present some preliminary synthetic models for assessing the gravity signals expected for the underground cavities typical for the karstic area. In addition we evaluate the time gravity field change during strong rainfall events where the water is expected to fill the conduits and cavities. In future we will take advantage of these models to place a continuous gravity meter that could be useful to constrain the water fluxes in area where a direct observation of the water is difficult.