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Time-lapse ERT monitoring of changes in groundwater content and flows in an epikarst system: implementation and challenges

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Present knowledge of karst systems has evidenced the importance of the unsaturated zone on the water dynamics. Karst Aquifer ReseArch by Geophysics (KARAG) project aims at leveraging our previous experience in karst, hydrogeology, gravimetry and geophysics to understand the water dynamics and storage in the unsaturated and epikarst zones of a karst system, which are the lesser known part in the karst water balance and dynamics. For a better understanding of the infiltration processes within the epikarst, a continuous monitoring of spatial and temporal changes in the water content within the epikarst is necessary. An ERT monitoring system is needed to image, at least on a daily basis, the spatial variability of resistivities due to the complex geometry of the epikarst. We present here a state of progress of the project focusing on the implementation of such a monitoring system at the Rochefort Cave Laboratory (Belgium). Onsite ERT response was tested on different locations by achieving different 2D profiles and 3D layouts. Some additional monitoring tools are required as well. A network of buried temperature sensors is needed to correct for thermal effects on resistivities. Flow recorders inside the cave are useful to monitor discharge, temperature and conductivity of the water that percolate throughout the epikarst. The ground moisture will also be monitored locally through a network of time domain reflectometry (TDR) and water conductivity probes. Finally, gravimetric measurements will also provide valuable insights on changes in the soil water content.