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Evaluation of subsidence hazard in mantled karst setting: a case study from Val d'Orléans (France)

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Soil subsidence/collapse is a major geohazard occurring in karst region. It occurs as suffosion or dropout sinkholes developing in the soft cover. Less frequently it corresponds to a breakdown of karst void ceiling (i.e. collapse sinkhole). This hazard can cause significant engineering challenges. Therefore decision-makers require the elaboration of methodologies for reliable predictions of such hazards (e.g., karst subsidence susceptibility and hazards maps, early-warning monitoring systems).

A methodological framework was developed to evaluate relevant conditioning factors favouring subsidence (Perrin et al. submitted) and then to combine these factors to produce karst subsidence susceptibility maps. This approach was applied to a mantled karst area south of Paris (Val d'Orléans). Results show the significant roles of the overburden lithology (presence/absence of low-permeability layer) and of the karst aquifer piezometric surface position within the overburden.

In parallel, an experimental site has been setup to improve the understanding of key processes leading to subsidence/collapse and includes piezometers for measurements of water levels and physico-chemical parameters in both the alluvial and karst aquifers as well as surface deformation monitoring. Results should help in designing monitoring systems to anticipate occurrence of subsidence/collapse.

Perrin J., Cartannaz C., Noury G., Vanoudheusden E. 2015. A multicriteria approach to karst subsidence hazard mapping supported by Weights-of-Evidence analysis. Submitted to Engineering Geology.