

Quantification of the dissolution kinetics of natural gypsum and particle transport processes in the evolution of dissolution cavities

The dissolution mechanisms of natural gypsum and the hydrodynamic, chemical and mechanical conditions involved in this process are investigated, mainly experimentally, under unsaturated conditions. Gypsum samples with different porosity and content of insoluble impurities were taken from the north-eastern suburbs of Paris, where the development of sinkholes due to gypsum dissolution is a common phenomenon. The main objectives are to evaluate the variability of gypsum dissolution rate as function of the surface roughness and heterogeneity and to identify the respective role of particle transport and dissolution processes in the formation of cavities in gypsum horizons. In fact, for gypsum with interstitial porosity, the release of grains and their transport by the flow (suffusion phenomenon) could very strongly increase the growth of the cavity compared to considering only the dissolution. The understanding of these chemico-physical processes will enhance the management of risks linked to this kind of geological processes which are common but not well known.