# Experimental Study of Dissolution Patterns under the Action of Turbulent Water Flow: Competition between Forced and Solutal Convection

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**Résumé**

Landscapes on Earth's surface are shaped by erosion, whether mechanical or chemical. For instance, chemical erosion, or more specifically, erosion by dissolution, is the main mechanism for the erosion of limestone or gypsum. During this process, topography, flow, and solute transport interact to generate regular patterns whose size and shape are believed to reflect past hydrodynamic conditions. Recently, we discovered that the scallop patterns on some walls of the Saint Marcel cave in Ardèche are oriented differently than the cave conduit, suggesting a possible influence of gravity on pattern formation. Dissolution creates density gradients that generate solutal convection flows under the influence of gravity. External flow also affects the local dissolution rate by shearing the solute boundary layer. Consequently, we investigate the formation of dissolution patterns under the action of turbulent water flow in the laboratory using salt and gypsum plates. Specifically, we characterize the dissolution rate and pattern orientation depending on plate inclination relative to vertical and the strength of the imposed flow. In experiments with fast-dissolving materials, we effectively demonstrate that dissolution pattern shapes and directions are clearly affected by the competition between forced and solutal convection.

**Mots-Clés:** expériences, hydrologie, convection, karst, formation de motifs, turbulence, dissolution, convection

*Intervenant