Physical and numerical modelling of the thermally induced wedging mechanism

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Resumen

Field observations and laboratory experiments show that temperature cycles can lead to wedging and accumulation of permanent displacements in several geosystems. The magnitude of these displacements depends on the geometric configuration of the components, the thermo-mechanical properties of the materials and interfaces, and the signature of the temperature signal. A physical model of a geometry susceptible to thermally induced wedging is analysed both experimentally and numerically in this article. The model consists of a driving wedge and a resisting block that rests on a rigid L-shaped base. The geometrical conditions required for the mechanism to manifest itself are found using equilibrium analysis of sliding and toppling. These conditions are reproduced in a physical model that is instrumented to measure changes in displacement and temperature in response to a cyclic temperature input. A numerical model was also developed to simulate the thermo-mechanical behaviour of the geometry. The numerical results and experimental measurements show that the accumulation of plastic displacement induced by temperature cycling is proportional to the period and amplitude of the input temperature signal.

Palabras clave

Palabras clave de autor:finite-element modelling; model tests; repeated loading; temperature effects
KeyWords Plus:ROCK SLOPES; STABILITY; MASADA

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