

# Numerical analysis of the thermo-mechanical behavior of an energy pile in Mexico

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## Abstract

Energy geostructures, particularly energy piles, are foreseen as an alternative to reduce the environmental impact of the growing energy demand for space conditioning. This environmental friendly technology is a type of closed-loop Ground Source Heat Pump (GSHP) in which foundation elements are used to extract or inject thermal energy from/to the soil. Despite their multiple benefits, energy piles have not yet been employed in Mexico, where there is a general lack of knowledge about these systems. In the present paper the feasibility, limitations and challenges of using energy piles in the Mexican context are discussed. In order to understand the geotechnical implications of their functioning, a numerical simulation of the behavior of an energy pile subjected to different combinations of thermo-mechanical loads considering Coatzacoalcos (Veracruz) subsoil conditions is presented. The fully coupled thermo-hydro-mechanical analysis are made using the finite element program PLAXIS 2D Thermal. Vertical displacement and axial load distributions are obtained. The results of the parametric studies show that the magnitude of the thermal-induced stresses is significant, but their effects on the behavior of the foundation depends on the magnitude of the applied mechanical load.