Subsurface Characterization, Modeling, Monitoring, and Remediation of Fractured Porous Rocks

Carlos Santamarina *(carlos.santamarina@ce.gatech.edu)*
Committee on Geological and Geotechnical Engineering

Geological and geotechnical characterizing, modeling, and monitoring of the subsurface are integral to safe, economical, and environmentally responsible development, maintenance, operation, remediation, and decommissioning of infrastructure related to energy, water, waste, and transportation. Modeling and monitoring fluid travel paths and velocities through subsurface fractures and pore space are among the most significant engineering challenges associated with these tasks. Monitoring and modeling of subsurface fluid flow and transport are especially important at sites where wastes or hazardous substances are produced, stored, or unintentionally released. We propose that an ad hoc committee of the National Research Council will conduct a study to address issues relevant to how flow and transport in fractured porous rocks affect groundwater quality near existing and planned facilities. Subsurface characterization, modeling, monitoring, and remediation (SCMMR) aspects applicable throughout the lifecycle of engineered facilities that have potential to release contaminants will be considered. The committee will plan and hold a workshop to examine the state-of-art and state-of-practice in:

- Subsurface fracture and matrix characterization, especially relevant geotechnical and hydrological properties, and the development of conceptual models;
- Detection of fluid and contaminant pathways and travel times;
- Detection and modeling of factors that affect change in geotechnical and hydrological properties over time;
- Groundwater and contaminant transport modeling, monitoring, and remediation, and how these can aid decision making during facility design, operation, remediation, and decommissioning;
- Early indicators (such as change in fracture properties; moisture levels) of system failures resulting in unintentional release of fluids; and
- Potential mitigation measures to eliminate or reduce adverse impacts of system failures and related releases.

The committee will issue a final report that will include recommendations with respect to (i) where research and development could improve the current state-of-art in SCMMR, and (ii) where incorporation of scientific and technical advances could enhance the state-of-practice in SCMMR and inform federal regulations and implementing guidance. We welcome your input regarding this proposed study.