

Understanding the mechanisms of fluid flow and fracturing in poorly consolidated porous media

**Dr. Charalampos Konstantinou,
University of Cyprus**

Thursday, May 30, 2024, 9 a.m. Central Time



Dr. Charalampos Konstantinou is currently a postdoctoral researcher under the supervision of Prof. Panos Papanastasiou at the University of Cyprus. He will speak on Thursday, May 30, 2024. The topic is “Understanding the mechanisms of fluid flow and fracturing in poorly consolidated porous media.”

Abstract

The fundamental processes of fluid flow and fracturing within porous media play a crucial role in various applications within the fields of energy geomechanics. Design parameters include the composition and properties of the fluid, the hydraulic and mechanical properties of the porous media, and the injection methods. These parameters are selected based on the specific objectives of each application, such as inducing fractures or uniformly replacing pore fluids through infiltration, the depth of the operation, and rock strength. Many of these operations take place in weakly-cemented and poorly-consolidated sands, which constitute the host rock for a significant portion of oil and gas reservoirs. These materials exhibit higher porosity and permeability compared to stronger rocks, resulting in a different response under fluid injection conditions. Fluid experiments were conducted on artificially cemented porous media to reveal the underlying mechanisms. The synthetic rock specimens used in the experiments are generated via microbially induced carbonate precipitation (MICP), a method that leads to the formation of calcium carbonate around silica particles. The resulting bio-treated specimens have prescribed properties (i.e., permeability, porosity, strength). The experimental behavior is then analyzed, encompassing factors such as infiltration/fracturing response regimes and fracturing patterns. Critical concepts from advanced geomechanics and groundwater hydrology

are utilized to interpret the findings, including the brittleness index (BI), the cavity expansion theory, and the sand erosion problem.

Biography

Dr Charalampos Konstantinou received his MEng degree in Civil Engineering from NTU of Athens in 2015, his MSc in Environmental Engineering and Business Management in 2016 from Imperial College London, and his Ph.D. in 2020 from the University of Cambridge. He. He published 18 scientific articles and holds a patent. His expertise, scientific contributions, and research interests include the generation of artificially cemented sands via microbially induced carbonate precipitation (MICP), investigation of mechanical and hydraulic properties of cemented granular materials, flow in porous media, and related applications in oil and gas and water resources.