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Characterising flow and transport in fractured geological media: 20 years later

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In 2002, Brian published his seminal review paper that concisely and elegantly summarises the key challenges and advancements in the characterisation of flow and transport processes in fractured geological formations [1]. 20 years later, much progress has been made but many of the challenges that Brian outlined still remain, most notably how to model flow and transport processes effectively, efficiently, and robustly in practical applications where we need to represent fracture networks that "do not possess any homogenization scale, so that, strictly speaking (at least in mathematical terms), a representative elementary volume (REV) cannot be defined."

This presentation, inspired by Brian's many contributions in the field, will review some of the recent ideas and concepts that allow us to design improved hierarchical fracture models that represent multi-scale fracture networks in reservoir models, as well as the interactions between fractures and rock matrix, with greater accuracy while keeping computational challenges at bay. Furthermore, the emergence of machine learning to decipher flow behaviours in fractured geological formations and link them to the key characteristics of the fracture network will be discussed.

The endeavour to continue improving our understanding of flow and transport processes in fractured geological formations is instrumental to providing our society with secure and affordable access to energy (e.g. geothermal) and freshwater resources as well as to sequestering waste products such as CO_2 and radioactive waste securely in the subsurface - key points that Brian has made 20 years ago.

[1] Berkowitz B, Characterizing flow and transport in fractured geological media: A review. Advances in Water Resources, 25, 861-884, 2002.

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Time Block Preference

Time Block B (14:00-17:00 CET)

Participation

Unsure

Primary author: GEIGER, Sebastian

Presenter: GEIGER, Sebastian

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