Fractures and Associated Structural Concepts for the GeoEnergy Transition: a Virtual Field Course (G511)

Tutor(s)

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Overview

Making extensive use of virtual outcrop technologies, this course will provide participants with a field trip itinerary that includes contrasting natural fracture networks from a wide range of rock types and structural settings. The course will combine fieldwork-based appraisal of fractures with collation and processing of different types of fracture data and their practical uses in GeoEnergy Transition applications.

Duration and Logistics

Classroom version: A 3-day course comprising a mix of lectures, case studies and exercises. The manual will be provided in digital format and participants will be required to bring a laptop or tablet computer to follow the lectures and exercises.

Virtual version: Five 3.5-hour interactive online sessions presented over 5 days. A digital manual and exercise materials will be distributed to participants before the course. Some reading and exercises are to be completed by participants off-line.

Level and Audience

Intermediate. The course is intended for geoscientists looking to understand the importance of fracture systems and to learn practical methods of appraising natural fracture networks. Target participants include geologists, geoengineers and hydrogeologists, as well as oil and gas professionals looking to apply their existing expertise in new sectors.

Objectives

You will learn to:

1. Describe the geometry and morphology of individual fractures in outcrop, and interpret the mode of fracturing.
2. Assess relative timing of fractures, and designate fractures to different sets.
3. Supplement outcrop data with interpretation from aerial and satellite imagery.
4. Characterize spatial properties of the fracture network, including spacing, clustering and scaling (size-intensity) relationships.
5. Evaluate the nature of fracturing in relation to larger scale features: folds, faults and mechanical stratigraphy.
6. Collate fracture data to produce a conceptual fracture model.
7. Understand the interplay between fractures and matrix, in terms of porosity and permeability, and the implications for fluid storage and flow.
8. Predict the general performance of a fracture network in practical GeoEnergy Transition applications.

9. Recognize the strengths and limitations of different sources of fracture data, and the advantage of combining field data with other data types.

Course Content

Course Details

The field-trip itinerary will focus on the following:

- Introduction and overview – fracturing in outcrop (and in relation to theory)
- Practical description and measurement of fractures and fracture networks
- Scaling relationships, upscaling and spatial heterogeneity
- Collation of data into a Conceptual Fracture Model
- GeoEnergy Transition case studies