Geology and Fractures for High Enthalpy Geothermal (G507)

Tutor(s)

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Overview

This course covers aspects of geoscience relevant to high enthalpy geothermal systems. It will introduce the geothermal system play concept and geothermal field classification. Teaching materials and exercises will provide skill development in how to characterize important aspects of the geology of these geothermal systems from structural networks, permeability, geomechanics and more.

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, comprising three lecture sessions and two practical sessions (one on working with borehole image logs in geothermal wells and interpreting these datasets, and the other on stress field characterization from well data). The sessions are presented over 5 days. A digital manual and exercise materials (including well logs) will be distributed before the course. Some reading and exercises are to be completed by participants off-line.

Level and Audience

Advanced. The course is intended for all career stage industry professionals and early career researchers with a geoscience or geo-engineering background, including those with a familiarity in oil and gas production.

Objectives

You will learn to:

1. Recognize the geological components of a geothermal system play.
2. Understand the range of data required to characterize a fractured geothermal reservoir.
3. Characterize fracture and stress data from a geothermal reservoir that can be used in geomechanical models and flow models.
4. Determine potential geological controls on well permeability.

Course Content

Course Details

This course will focus on establishing the geological components of a high enthalpy geothermal system, specifically the interplay between geological structure, stress and fluid flow.

Session 1: High enthalpy geothermal systems

- Classification of geothermal systems
- Geothermal system plays
- Structure and fluid flow in fractured reservoirs

Session 2: Characterizing geothermal systems

- Building blocks of a geothermal resource model
- Geothermal borehole logging
- Structural analysis and rock properties for geothermal models

Session 3: Working with borehole images in geothermal wells

- Fundamentals of borehole imaging
- Quality control, processing and analysis of borehole images and their data

Session 4: Quantifying geomechanical inputs from well data and rock properties

- Geomechanical models
- Measuring stress fields
- Applying geomechanical modelling to geothermal fields

Session 5: Case studies of geothermal geomechanics and wrap up

- Taupo Volcanic Zone
- Coso Geothermal field