Code: G-SC-۱۱

Seismic Geomechanics

Instructor: Dr Jorg Herwanger (MP Geomechanics, UK)

Date: ۹۷/۱۰/۳۰ – ۹۷/۱۱/۰۱
Duration: ۲ days- (۱۶ hours)

Course Description:

Three-dimensional geomechanical models are becoming more frequently used to assess the state of stress inside the Earth. Knowledge of the stress-state in a reservoir and the surrounding rock allows assessing the risk of reservoir compaction, wellbore failure, sanding, breach of seal integrity, fault re-activation and allows the design of mitigation for these issues. Three-dimensional seismic data and inversion models can be used in building geomechanical models and time-lapse (۴D) seismic data provide a means of calibrating the dynamic behavior of reservoir geomechanical models.

The purpose of this course is to provide an overview of currently available workflows to build and run calibrated reservoir geomechanical models maximizing the use of ۳D and ۴D seismic data. Rock-physics, relating the state of stress in the Earth and the propagation velocity of seismic waves, forms the link between seismic observations and the geomechanical model, and this link will be discussed both from experimental data and from a theoretical viewpoint. Attendees will learn how a combination of ۳D geomechanical models, coupled to flow models, built and calibrated with ۳D and ۴D seismic data help in creating a deep understanding of the reservoir depletion processes and the state of stress in the reservoir and surrounding rock.

Course Outline:

- Field observations of geomechanically induced time-lapse seismic signals. Where do they occur and why?
- Building a ۳D geomechanical model. Demonstrating a seismic-to simulation workflow, including
- building a framework model to surface and property population from seismically derived properties.
- Running coupled modeling of a reservoir simulation model and a geomechanical model. Non-linear
- stress-strain relationship, reservoir compaction, failure models, stress and strain tensors.
- Rock-physics for elastic and inelastic deformation. Velocity-stress relationship for elastic and inelastic
- deformation. Velocity during loading and unloading. Stress-induced velocity anisotropy.
- Time-lapse seismic observations. Time-lapse time-shifts, AVO attributes, shear-wave splitting.
- Case-study of integrating flow model, geomechanical model and time-lapse observations.