

## N414: Practical Prospect, Trap and Fault Seal Analysis

Instructor(s): Titus Murray

Format and Duration

Classroom - 4 Days

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### Summary

Leads and prospects are increasingly smaller and closer to seismic resolution - the use of straightforward mapping and structural techniques can take these prospects to successful discoveries. In many cases, significant fault dependencies mean mapping and fault seal analysis are key to estimating trapped columns, fluid contacts, volume and risk. Participants will learn how a map works or fails as well as quantitative techniques to test multiple dependencies and complex fault interactions.

### Learning Outcomes

Participants will learn to:

1. Appraise fault geometries and estimate throw uncertainties to better constrain potential prospects and traps.
2. Develop quick look techniques for structural maps and in order to assess whether a map works or fails for a faulted prospect.
3. Assess prospects and traps and map their structural closures to accurately assess fluid volumes and fluid contacts.
4. Estimate the risks associated with stratigraphic juxtaposition and sealing likelihood across faults.
5. Integrate structural and mapping techniques to determine complex fault interactions and dependencies.
6. Predict sub-seismic faulting within a reservoir through an understanding of fault populations and distribution and evaluate the impact of these faults on fluid flow.
7. Assess which faults can be removed from the field, thereby increasing reserves.

### Training Method

A four-day classroom course comprised of lectures, exercises (some involving paper mapping) and illustrations of simple structural techniques. In a syndicate exercise, participants will be split into groups to analyse data from real prospects in the Southern North Sea and from offshore Western Australia. The groups will mature and rank the prospects and present their findings and compare them against the actual well results.

Participants are also encouraged to bring their own data, suitably anonymised, as there is an opportunity to present and discuss their own prospects with the group.

### Who Should Attend

This course is relevant to all geoscientists who are engaged in the assessment and appraisal of prospects and trapped hydrocarbon volumes and who require a better understanding of the controls on faulted traps.

### Course Content

During the training, common sense and simple techniques will be used to assess faulted prospects. The ability to see how a map works or fails to work as a prospect will be a key skill participants will be

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expected to leave the course with.

As well as the 'quick look' techniques there will be time to develop quantitative techniques to make, test and break prospects. In particular, the consideration of multiple fault dependencies and the ability to hand-contour complex fault interactions (relay ramps, branch lines and soft-linked faults) that may be required to get a prospect to work. Participants will also examine real faults and fault rocks through the use of high resolution images and 3D digital outcrop models to reinforce their understanding of fault structure and complexity. Where applicable and available local examples from the NW Borneo margin will be used. At the end of the training participants will have the skills both to produce better prospects of their own and to help peer review other's prospects.

### Introduction to the scale of structures and trap analysis

- Maps
- Interpreting Faults
- Reviewing Maps
- Trap Analysis, Spill Points, Faults and Crest
- Seal Stratigraphy
- Blocking Stratigraphy
- Practical Allen Mapping Fault Uncertainty
- Picking Faults

### Juxtaposition and SGR analysis

- Displacement Profiles
- Reviewing Prospects
- Structural Analysis
- Shale Gouge Ratio Theory
- Prospect Volumetrics
- East Irish Sea Juxtaposition and SGR
- Multi Fault Analysis

### Pressure and volumetrics

- Perched Water and Breakover
- Geomechanical Seal Breach
- Column Height Statements
- Multi Fault Connected
- Flow Across Faults
- Prospect Risking
- Revising Volumetrics with Risk

### Software demonstration and exercises

Practical exercises and demonstrations using FaultRisk software will be undertaken to illustrate the use of

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software systems in fault seal analytical techniques. Typical workflows and required inputs will be used and outputs including displacement profiles, interactive Allan maps, cumulative frequency plots and summary leak point tables will be discussed and assessed.

Final wrap up and course evaluations.