TETRA TECH RPS ENERGY | TRAINING

N053: Compressional Structural Styles: Models for Exploration and Production *(Alberta, Canada)*

Instructor(s): Malcolm Lamb and Co-instructor

Format and Duration

Field - 5 Days
High Physical Demand

Summary

The course is a combined lecture and field-based investigation of thrust and fold structures in compressional belts, examining the changes in structural geometries in different lithologies, at different burial depths and along strike. Comparisons with subsurface examples and seismic models of exposed structures are made throughout the course.

Learning Outcomes

Participants will learn to:

1. Assess structural styles in compressional belts and their variability in 3D.
2. Appraise structural geology of imperfectly imaged subsurface structures and problems associated with multiple detachment levels.
3. Formulate fault and fold geometries in time, depth and anisotropic depth migrated seismic sections.
4. Characterise fracture systems in contractional systems.
5. Integrate surface outcrop exposures into subsurface interpretation to aid in prospect definition.

Training Method

A five-day course comprising fieldwork in the Canadian Rockies and Foothills of Southern Alberta (70%) and classroom sessions with lectures, data examples and exercises.

Physical Demand

The physical demands for this class are HIGH according to the Tetra Tech RPS field course grading system. A high level of fitness is required for this class. Walks of over 3 miles (5 km) are common, some taking in difficult, steep terrain. The field area is at an elevation of over 7000 ft (2100 m); this may lead to unexpected fatigue and shortness of breath in some participants. The weather is very changeable and many of the locations are remote.

Who Should Attend

Exploration and development geologists and geophysicists concerned with seismic imaging, exploration and exploitation of fold and thrust belts, and reservoir engineers working on compressional tectonics within integrated teams.

Course Content

Focus will be on the integration of geology and geophysics to define and predict the 3D geometry of structural traps.

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1. Introduction to stratigraphy and tectonic framework of the Canadian Rockies
2. Structural styles in compressional belts and their variability in 3D
3. Tying surface geology to imperfectly imaged subsurface structures and problems associated with multiple detachment levels
4. Interpreting fault and fold geometries in time, depth and anisotropic depth migrated seismic sections
5. Case studies from the subsurface

Itinerary

The itinerary below is pending and subject to change

Day 0

Participants travel to Calgary. Free Night.

Day 1

The day starts with a short introduction and safety brief before leaving for the field. Examining foothills deformation in Bragg Creek Provincial Park; thrust sheets of the Moose Dome structure; fracture development and hangingwall anticline of the Dyson Mtn Thrust; and thrust linkages and lateral ramps of the Fullerton Tear.
Fieldwork includes observing well-exposed folds and fracture systems along Canyon Creek in the McConnell thrust sheet.

Day 2

Travelling from Canmore to Lake Louise to complete our TransCanada transect of classic structures and then on into British Columbia, to examine the outcrops in Yoho National Park, with specific examples of how lithotectonic units of different strengths and thicknesses effect fold and fault geometries.

Day 3

Travelling from Canmore to Blairmore, examining classic compressional structures and lateral variations in several Front Range thrust sheets (McConnell, Exshaw, Lac des Arcs, Rundle, Lewis) from the Bow River Valley (Highways 1 and 1A) and to the south along the Kananaskis Valley (Highway 40). A short hike around fault-related folds west of Exshaw also provides good views of structural variations along strike. Examining how thrust faults and associated folds die out along strike and are linked to other thrusts. The McConnell, Misty, Rundle and Sulphur Mountain thrusts die out southward as displacement on the Livingstone, Coleman and Lewis thrusts increases. Fold geometries and their fracture distributions are also examined.

Day 4

In the Crowsnest Pass area examining duplexes and a klippe of the Lewis Thrust sheet, complex 3D fold-fault geometries and fracture distributions.
We build a cross-section based on the Turtle Mountain structure, looking at the Fernie Detachment along the Carbondale, then move up to Adanac and look at the southern plunge. Continue onto Drum Creek

and hike across the fold, look at the Frank slide and describe the thrust and then move up to Grassy mountain and look at the pre-shortening of the Mesozoic section.

Day 5
Travelling from Blairmore to Calgary examining Foothills and Triangle Zone structures and changes in fold-fault geometries along the way.
Review and Summary.

Day 6
Participants are free to depart Calgary.