N180: Fault Mapping: Class and Field Seminar *(Texas, USA)*

Tutor(s): David Ferrill / Alan Morris

5 Days	Competence Level: Basic Application
Field Course	
Classroom Elements	
LOW	Low Physical Demand

Summary

This structural geology seminar enables exploration and production geoscientists to significantly improve their fault mapping skills and deepen their understanding of fault networks. Field observations and exercises enhance classroom lectures and exercises. The course is taught in and within 50mi (81km) north of San Antonio, Texas.

Learning Outcomes

Participants will learn to:

1. Analyze various types of fault systems, including those that form in contractional, strike-slip, extensional and salt regimes.
2. Differentiate the types and geometry of faults.
3. Analyze the processes and conditions involved in faulting.
4. Demonstrate ways in which faults influence hydrocarbon exploration and production.
5. Apply rules for fault and horizon mapping and cross-section construction in order to avoid exploration and production failures.
6. Demonstrate pitfalls in fault mapping.
7. Compare different fault styles, and discuss how faults can affect reservoir quality.
8. Employ recent developments in structural geology and fault trap and seal analysis.

Duration and Training Method

A five-day classroom (3 days) and field (2 days) seminar comprising of lectures and exercises with two days fieldwork, also with practical exercises.

Physical Demand

The physical demands for this class are LOW according to the Nautilus Training Alliance field course grading system. Field sites are in the Hill Country near San Antonio; conditions are typically warm-hot and humid. On the two field days, participants will be taking short hikes that are less than 3.2 km (2 miles) over flat to hilly terrain. The maximum elevation change in a hike is about 100 m (330 ft). Transport in the fi eld will be by bus.

Who Should Attend

The course is intended for geoscientists performing hydrocarbon exploration or production activities in structurally deformed regions. Technical support staff involved in mapping and reservoir engineers will also benefi t from the course.

Prerequisites and Linking Courses

We believe this class is best taken soon after entering the oil industry. Participants should have prior training and/or experience in geology in order to fully benefit from this course. Non-geoscientists can gain this background knowledge by taking N913 (Petroleum Geology for Engineers). Persons wanting an

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introductory overview of structural geology should consider N138 (Structural Interpretation in Petroleum Exploration and Development). The European equivalent of N180 is N207 (Fault Mapping: Class and Field Seminar, Haute Savoie, France). A classroom course that develops mapping skills is N260 (Practical Subsurface Mapping). Other classes to consider at the same stage available on the Nautilus Foundation Program are: N154 (USA) and N140 (Europe), introductions to the E&P business, N085 on seismic interpretation and N155 on clastic depositional systems.

Course Content

Designed to address the critical need to improve the structural interpretation and mapping abilities of exploration and production geoscientists, the course covers a broad spectrum of topics including:

1. fault system basics (terminology, geometry),
2. structural styles of natural fault systems,
3.rules and relationships for fault and horizon mapping and cross section construction, and
4. recent developments in structural geology and fault trap and seal analysis.

The focus is on making maps that are both based on available data and consistent with structural styles, rules, and relationships appropriate for the structural regime, stratigraphic setting, and deformation conditions. Contractional, strike-slip, extensional, and salt regimes are addressed. Included are lessons on the importance of honoring the data, the variability of natural fault systems, pitfalls in fault mapping, and good practices to avoid exploration and production failures.

Itinerary (all nights are spent in the San Antonio area):

Day 1: Fault Fundamentals in the classroom
-Stress, strain and faulting
-Mechanical stratigraphy
-Fault topology and terminology
-Extensional faults and fault systems
-Fault geometry, including fault bend folding

Day 2: Field trip in the Balcones Fault System

Day 3: Intermediate Topics in the classroom
-Cross-section interpretation
-Fault zone processes
-Fault seals

Day 4: Field trip to Hidden Valley Fault in Canyon Lake Gorge

Day 5: Advanced Concepts and Pointers in the classroom

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-Slip tendency and dilation tendency
-Fault juxtaposition analysis