Structural Geology Transect in the Eastern Canadian Rocky Mountains, Calgary (AB) to Field (BC)

Instructor:
Normand Bégin, Nanook Geo-Exploration Inc.

Pre-Meeting Field Course– 1 Day: Thursday September 16, 2021

Field Course Outline:
A full-day roadside field structural geology transect in the Laramide Orogeny of the Eastern Canadian Rockies, that will take place along the TransCanada Highway 1 from Calgary (AB) to Field (BC). The trip will include 8 to 10 stops and involve very short walking away from the vehicles. Stunning views of classic Rocky Mountain Geology features of the Laramide Orogeny in the Eastern Cordillera and Foreland Foothills belts, with explanations provided at each stop with useful diagrams and maps.

The structural architecture and evolution of compressive deformation will be discussed, throughout the Proterozoic to Tertiary stratigraphy. Influence of the mechanical stratigraphy on the deformation styles will be addressed for the Cretaceous clastic units in the Triangle Zone of the Foothills Belt and Paleozoic carbonaceous units in Front Ranges of the Cordillera Belt. Examples of localized accommodation features during folding, such as layer-parallel stretching and inner-arc fold compression will be shown.

Although the trip will be along the road, the leader will show the participants examples of along-strike deformation in the various mountain ranges and displacement transfer between thrust faults, using a collection of photos captured from hiking and climbing he did in the Kananaskis and Banff mountain parks over the last 30 years.

No hiking boots required, but binoculars and cameras will be good to have. An illustrated field guidebook will be provided.

Field Course Objectives:

1. Illustrate the main deformation features of the Laramide (Cretaceous) Orogeny in the Eastern and Main Ranges of the Canadian Rockies Belt, with thrusted and folded continental Paleozoic carbonate sequences overlain by the siliciclastic Mesozoic sequences of the foreland basin.
2. Get a general understanding of mountain belt evolution in the Front Ranges and observing good surface structural geology analogs of folded and fractured rocks explored and drilled in the subsurface of other thrust-fold belts.
3. Discuss the control of mechanical stratigraphy on the structural styles of compressive deformation, thrusting vs folding and presence of main detachment horizons.
4. Provide a visual representation of complexed leading-edge thrust sheet deformation, sometimes difficult to image and interpret on seismic data, both in the footwall and hanging wall compartments.

Who Should Attend:
Geoscientists, engineers, managers working in thrust-fold belt regimes, keen to get some great field examples of surface deformation features in a mountain belt. The outcrops shown in the trip will greatly benefit those exploring for hydrocarbons in a subsurface structural trap setting, with folded and fractured clastic and carbonate reservoirs. Of interest to seismic interpreters and operational geologists steering wells in deformed belts.

*Meeting registration is **NOT** required to sign-up for this course*
Registration Rates: *(rates do not include GST)*

- *CSPG* Member rate: $475
- Non-member rate: $675

Registration Close:** **September 10, 2021
Maximum registrants: 26 **CPD: 9**
Registration includes: Transportation and Field course manual

Time: 7:30am– approximate return time 5:00pm

Meeting location: CSPG Office, 540-5th avenue SW, Calgary

About the Instructor

Normand graduated with a BSc in Geological Engineering at Laval University in 1985, then completed a Ph.D. in Geology at Queen's University in 1989. He worked as a Postdoctoral Fellow at the University of Calgary (1990-1992), then in mining exploration in the NWT for 2 years as a structural geologist and field mapper. He worked as a structural geologist with the Foothills Research Project (University of Calgary) from 1994 to 1996, before joining Talisman Energy as an exploration and structural geoscientist in various deformed belts around the world. Along with his teammates, he has successfully geosteered over 50 wells with several commercial hydrocarbon discoveries in thrust-fold belts of the Canadian Rockies Foothills, Llanos Foothills of Columbia, Zagros Belt of Kurdistan. From 2015 to 2019 with Repsol Canada, he worked on projects in Papua New Guinea, Russia, Algeria and Bolivia. Since the mid 1990's, he has safely led several structural geology trips for the industry in areas of various remoteness of mountain belts of Canada (Alberta, BC, NWT), Iraq (Kurdistan) and Australia (Queensland). In addition of extensive knowledge about structural geology in the Eastern Canadian Rockies, Normand has also hiked and scrambled to several peaks over the last 30 years in the Kananaskis and Banff parks, capturing photos of stunning mountain geological features. His vast outdoor experience also includes over 25 self-guided ski mountaineering and backpacking expeditions in mountainous and icefield terrains of Western Canadian Rockies and Baffin Island. His passion for the outdoors transcends to his keen desire to transmit his knowledge of mountain geology in the field, to anyone in the general public or geoscientists and engineers in the resources industry.

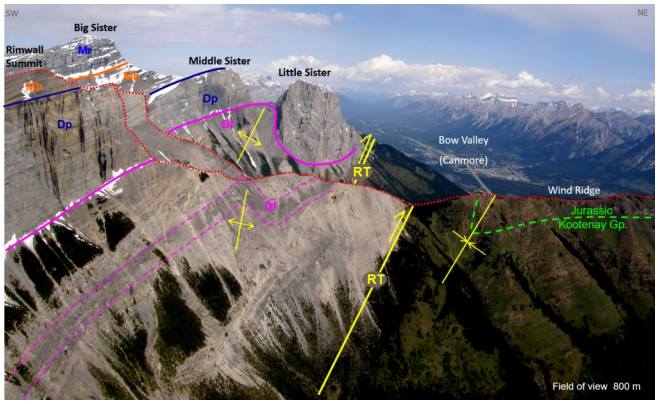

Figure 1: View looking to the NW from the summit of Wind Tower toward the Bow Valley and Three Sisters Peaks (Big, Middle and Little) for Stop 3 of the field trip. The Rundle Thrust (RT) is outlined in yellow at the top of Wind Ridge in the foreground (red dotted line), and at the base of Little Sister Peak in the background. Trace of the footwall overturned syncline in the Jurassic units on Wind Ridge is shown in green over the mixed rock and treed area. The hangingwall section consists of a foreland-verging anticline-syncline pair in Paleozoic carbonate units. Abbreviations are RT = Rundle Thrust; Df = Devonian – Fairholme Group; Dp = Devonian – Palliser Formation; Mb = Mississippian - Banff Formation; Mr = Mississippian - Rundle Group.

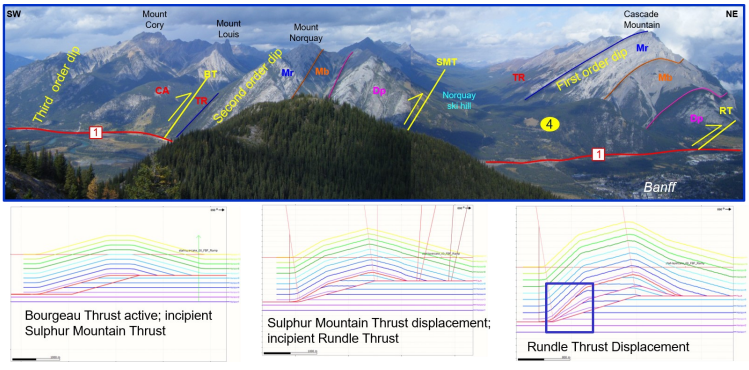

Figure 2: Stop 4 of the field trip. Panoramic view looking to the NW taken from the summit of Sulphur Mountain, above the Banff townsite. The TransCanada Highway 1 is outlined in red. We can see three of the major imbricate thrust sheets in the Front Ranges: the Rundle, Sulphur Mountain and Bourgeau Ranges. At this location the Rundle and Sulphur Mountain thrusts carry Upper Devonian Palliser carbonates in the immediate hangingwall, while Upper Cambrian carbonates are present in the immediate hangingwall of the Bourgeau thrust sheet. Foreland progression (SW to NE) of thrusting is evident - 15-25 degrees first order dips in Rundle Range, to second order (~35-45 degrees in Sulphur Mountain Thrust and vertical and third order (vertical to overturned) dips in Bourgeau Thrust are present. Progressive steepening of beds by younger, deeper thrust sheets is shown in the forward modelled three diagrams (Bégin and Veilleux, 2017; thrusts in red). Abbreviations are RT = Rundle Thrust; SMT = Sulphur Mountain Thrust; BT = Bourgeau Thrust; CA = Cambrian; Dp = Devonian – Palliser Formation; Mb = Mississippian - Banff Formation; Mr = Mississippian - Rundle Group; TR = Triassic.