

NEIGC – NYSGA 2018 Field Trip Schedule and Descriptions

Friday, October 12th

Trip A1

Migmatites of the Eastern Adirondack Mountains: New constraints on the Timing, Petrology, and Tectonic Setting of Partial Melting.

Leaders: Mike Williams, Tim Grover, Claire Pless, Kaitlyn Suarez, and Sean Regan

This trip will examine several migmatite localities in the eastern Adirondack Mountains and discuss new petrologic, geochronologic (monazite and zircon U-Pb dating), and structural results. The migmatites range from biotite-garnet gneisses to sillimanite-bearing khondalites. New results suggest that melting occurred during at least two major events with different localities experiencing different degrees of melting and melt loss. A major goal is to discuss the implications for the tectonic history of the Adirondack Mountains region of the Grenville Province and also the implications for mapping and studying high-grade migmatites in general.

Trip A2

Geology of the Carthage-Colton shear zone and Lyon Mountain granite: An Adirondack field trip in honor of Bruce Selleck

Leaders: William Peck

This field trip examines the Carthage Colton shear zone, the high strain boundary between the Adirondack Highlands and Lowlands. Field trip stops (both classic and new localities) will focus on the structural evolution of the shear zone and emplacement of the Lyon Mountain granite.

Trip A3

Structural and Stratigraphic Features of the Taconic Foreland, NW Vermont

Leaders: Adam Schoonmaker and William Kidd

This trip will focus on some of the spectacular structural and stratigraphic features exposed in NW Vermont at the Highgate Gorge, Lessor's Quarry, and the "Beam". The last two are Rolfe Stanley Memorial outcrops. The trip will cover the nearly continuously exposed Cambrian to Ordovician section in the Highgate Gorge. This section exposes the shelf to basin transition including bedded limestone and massive dolomite, a spectacular shelf slope limestone breccia, as well as basal slates with likely transported carbonate shelf beds. The out-of-sequence cataclastic Highgate Falls Thrust is well-exposed, as well as a number of other Taconic-aged structures including folds, axial plane cleavage, and rotated en echelon fractures. The "Beam" is a superb meso-scale illustration of duplex faulting in thin-skinned foreland belts, while Lessors Quarry exposes fault-bend fold structures as well as a number of fault zone features, and an excellent example of an out-of-sequence thrust. This trip is highly recommended for students to examine a number of well-exposed and clear stratigraphic and structural features.

Trip A4

New views on the deglaciation of Mt Mansfield

Leaders: Paul Bierman, Lee Corbett, Stephen Wright, PT Davis, Chris Halstead, Jeremy Shakun

Mt. Mansfield, the highest peak in Vermont, preserves diverse evidence of Pleistocene glaciation including erratics, striations, and ice moulded rock outcrops. Over the past several years, we have been collecting samples of bedrock and erratics for cosmogenic nuclide analysis and dating. To place those measurements in context, we have done LIDaR based mapping of recessional sedimentary features including moraines and have mapped striations where bedrock crops out on the mountain. This 2/3 of a day trip will (weather permitting) travel to the top of the mountain by car and visit locations we have sampled while discussing the ages that resulted from these analyses. We will discuss evidence for ineffective erosion at the mountain peak (could there have been cold-based ice) and examine ice marginal deposits in the valley resulting from ice channelized by the topography. If time permits, we may end the trip with a tour of the Vermont cosmogenic facility at the end of the day.

Trip A5

Surprisingly late (late Early Cambrian) rift--passive margin transition in the Taconic allochthon and macroscale alternations of continental slope oxic and anoxia with eustatic changes

Leaders: Ed Landing

Summary: The excursion focuses on a synthesis of the Cambrian--Ordovician of the north and central Taconic allochthon. It emphasizes continuation or reinvigoration of rifting into the late Early Cambrian (Rensselaer and Bomoseen formations). Oxic (on slope) feldspathic sandstones are replaced by oxic mudstones with limited carbonates of the Truthville Formation. The latter are succeeded by highly calcareous, almost completely anoxic mudstones of the Browns Pond Formation at a unique, fully exposed section on Mettawee River. A regional carbonate debris flow ('Holcolmville Member,' in press) marks onset of HST facies in the shelf Dunham Formation and is overlain by oxic green mudstones of the Middle Granville Formation and oxic interval (MGOI, new, in press). The transitions of black--green--black mudstone formations (Browns Pond--Middle Granville--lower Hatch Hill [= "West Castleton Formation", abandoned]) are late Early Cambrian, with the Hatch Hill persisting into the lowest Ordovician and receiving sands produced by epeirogenic (not eustatic) activity in the terminal Early--Middle Cambrian "Hawke Bay Event(s)". Early--Middle Ordovician Taconic stratigraphy is dominated by green mudstone with macroscale anoxic intervals equated to shelf onlap and unconformity-bounded depositional sequences. The earliest evidence of the Taconic orogeny is condensed, highly oxic (red, heavily burrowed) mudstone with thin ashes and radiolarites of the Indian River Formation that represent the first break in the linkage of east Laurentian shelf and Taconic slope facies.

Saturday, October 13th

Leaders: Trip B1

Geology of the Copper-Kiln Landslide: a glimpse into the Marcy massif detachment zone

Sean Regan, Victor Guevara, Tess Drauschak, and Jeff Chiarenzelli

The field trip will look at the Copper-Kiln Landslide, which exposes deformed marginal rocks of the Marcy anorthosite massif, including: garnetiferous gabbroic anorthosite, deformed skarn rocks, and syn-kinematic leucogranites. We will discuss the geologic significance of rare kinematic indicators exposed in the Copper-Kiln landslide (and in other slides throughout the Marcy massif), as well as U-Pb zircon geochronology of syn-kinematic leucogranite. Together, the structural and geochronologic data indicate that the Marcy massif is draped by a domed top-to-the-southeast detachment zone that likely initiated during collapse of the Grenville Province, which corresponds in time to the development of granulite-facies assemblages and onset of leucogranitic plutonism that hosts IOA deposits of current economic interest. The field trip will involve a > 3 mile hike (one way) and steep rocky terrane. Please bring your lunch and ample water.

Trip B2

The Piseco Lake shear zone: a Shawinigan cryptic suture in the southern Adirondacks

Leaders: Dave Valentino and Jeff Chiarenzelli

Highly deformed Piseco granitic gneisses occur in an arching east-west transpressional ductile shear zone (Piseco Lake shear zone) that spans the width of the exposed southern Adirondacks. The highly deformed granitic gneisses have restricted silica content, are metaluminous, alkali-calcic to calc-alkalic, continental arc trace element signatures. These granitic rocks intruded supracrustal gneisses resulting in extensive Shawinigan partial melting. The Piseco Lake shear zone correlates with pronounced linear magnetic anomalies that extend well beyond the exposed Adirondack basement window. The shear zone is 20-30 km wide and forms the cryptic suture between the Adirondack Highlands (underlain primarily by anorthosite and related granitic rocks, AMCG suite; ca. 1155-1165 Ma) and the Southern Adirondack Terrane (underlain by calc-alkaline tonalitic arc rocks, ca. 1300-1350 Ma) (Valentino et al., 2018). Within the shear zone the gneisses have lineated quartz and rodded feldspar megacrysts attesting to their original coarse-grain size. Along the axis of the shear zone there are thick (1-2 km), subvertical zones of granitic L-S and L-tectonites, and the zone includes foliation domes cored by L-tectonite. Overall, the shear zone forms the core of a region of intense ductile deformation with left-lateral kinematic indicators and subhorizontal E-W ribbon lineations. This NYSGA excursion will visit field locations that span the length and width of the shear zone to highlight strain variation, and to examine lithologic differences north and south of the proposed cryptic suture. The trip will begin at 9:30AM, October 13, at the Charlie John's Market parking lot in Speculator, NY (43.502622°, -74.363973°). Faculty with large groups of students are especially welcome to join this trip.

Trip B3

Faults of all kinds in the map of the Ordovician Champlain thrust zone around southern Lake Champlain

Leaders: William Kidd, Stephen Howe, and Chul Lim

The field trip will visit outcrops in the area of Whitehall NY and West Haven VT showing exposures of strands of the southern extension of the Champlain Thrust, as well as the westernmost thrust carrying Taconic Allochthon slates, and the easterly-downthrown Mettawee River normal fault which cuts both Champlain thrust and Taconic thrust strands. Exposures of NE-striking steeply-dipping faults with visible strike slip displacements of both left- and right-lateral sense, which at West Haven cut both thrusts and the Mettawee River fault, will also be visited. High vein fluid inclusion temperature data suggest that these strike-slip faults are also Ordovician in age. Outcrops covering a persisting stratigraphic fault, caused by failure of the compiler of the recent geological map of Vermont to recognise the presence of the extension of the Pinnacle Thrust in this area, will also be included.

Trip B4

New Insights into Glacial Lakes Vermont and Albany

Leaders: John Rayburn, David DeSimone, Amy Frappier

This field trip will primarily follow our recent efforts to better delineate and correlate the glacial lake levels in the northern Hudson Valley in an effort to identify the true Coveville level threshold. Field stops will begin with lacustrine varves above the limit of Lake Albany near Warrensburg. From there we will travel to the originally proposed threshold at Coveville. We will do a transect of lacustrine deltas north of Coveville along the Battenkill River and then a transect of lacustrine deltas south of Coveville along the Hoosic River. Our lunch stop will take place at a park in Eastline along a well-developed meltwater channel and an imbricated boulder till, as described by Stoller (1911). We will continue south to Cohoes Falls where we will review why that underfit knickpoint signals that the true Coveville threshold must be north of the modern Mohawk/Hudson confluence. From there we will turn north to the Speigletown kame moraine complex (Shock, 1962) which may very well have been the dam for the Coveville level lake. On the return trip we will stop briefly at the Saratoga National Historic Park for a final vista of the Valley, and a discussion of the new SNHP surficial map (DeSimone, 2015).

Sunday, October 14th

Trip C1

The Cheever and Mineville Iron Oxide-Apatite (IOA) Deposits

Leaders: Marian Lupulescu, Jeffrey Chiarenzelli, Sean Regan, David Bailey, Jared Singer

The participants will visit and examine the magnetite-apatite ore, host rock, alterations, and field relations from Cheever and Mineville IOA deposits located in the eastern Adirondack Mountains. The mineralogy, texture, geochemistry, geochronology, and origin of ores and host rock will be presented and discussed on site. The former ore processing plant from Mineville and a short visit at the Iron Museum in Port Henry are included.

Trip C2

Geology of the northern Taconic allochthon: Strain variation in thrust sheets, brittle faults, and postrift dike emplacement

Leaders: Jean Crespi, Jenifer Cooper Boemmels, and Jessica Robinson

In the 1970s and 80s, Bill Kidd and students at SUNY Albany produced detailed maps of the bedrock geology of the northern part of the Giddings Brook thrust sheet in the Taconic allochthon. Together with the 2011 Bedrock Geologic Map of Vermont, these maps show that (1) regional-scale structures within the thrust sheet curve to define a salient and recess and (2) the thrust sheet plunges gently to the south such that shallower structural levels are progressively exposed along strike from north to south. On this field trip, we will visit localities in the northern part of the Giddings Brook thrust sheet and present a synthesis of our work on strain variation within a 60-km-long along-strike transect of the thrust sheet. The localities also illustrate the nature of brittle faults of presumed Mesozoic age in the thrust sheet and of Early Cretaceous dikes in the Taconic lobe of the New England–Québec igneous province. We will also present our preliminary work on the stress fields recorded by these features and their significance for the development of the eastern North American margin.

Trip C3

A traverse through the suture zone between Laurentia and the Moretown terrane

Leaders: Paul Karabinos, Francis Macdonald, James Crowley

We will begin in North Adams, Massachusetts, in rocks belonging to the Laurentian margin and end in Shelburne Falls, Massachusetts, in 475 Ma arc-plutonic rocks exposed in the Shelburne Falls dome. Particular focus will be on the Rowe Schist-Moretown Formation contact, and evidence that this boundary is a fundamental suture between Laurentia and the Gondwanan-derived Moretown terrane. We will also discuss evidence that the Ordovician Shelburne Falls arc, represented by the Hallockville Pond Gneiss and the Hawley and Collinsville Formations, was built on the Moretown terrane, and that a major pulse of magmatism at 475 Ma occurred when the arc was close enough to Laurentia to capture Laurentian-derived detritus in clastic units in the Hawley Formation.

Trip C4

Mt. Greylock as a Cosmogenic Nuclide Dipstick to Determine the Timing and Rate of Southeastern Laurentide Ice Sheet Thinning

Leaders: Chris Halsted, Jeremy Shakum, Paul Bierman, P. Thompson Davis, Alexandria Koester, and Lee Corbett

The objective of this field trip will be to discuss the glacial history of Mt. Greylock, including its inundation by the Laurentide, and to demonstrate the field methodology of the cosmogenic nuclide dipstick approach. The trip will begin at the summit of Mt. Greylock, which is accessible by an auto road. The majority of the glacial history and an overview of the dipstick approach will be discussed at the summit, which not only provides stunning views of the nearby Berkshire and Taconic mountains, but features a lodge with bathrooms for any trip members who may need to use them following the ~2-hour drive to Greylock. Following the discussion at the Greylock summit, the trip will proceed on foot, following the Appalachian Trail north as it descends from the summit about 2.2 miles to Mt. Williams, which protrudes from the flank of Mt. Greylock. Along the way, we will point out some of the glacial features of Mt. Greylock, including 'The Hopper', the most southerly glacial cirque in New England, and several glacially-transported boulders which were sampled for cosmogenic nuclide exposure dating. The trip will proceed another mile down from Mt. Williams, across the auto road that leads to the summit, and up to a ridgeline that leads to Mt. Prospect. Another couple of samples were collected here for cosmogenic nuclide exposure dating. The trip will then return the ~0.3 miles to the auto road, where vans will be waiting. In total, this trip will entail approximately 3.2 miles of walking, mostly downhill, along the Appalachian Trail.

Trip C5

Heavy metal contamination from illegal burn piles in an ecologically sensitive site in West Haven, Vermont

Leaders: Helen Mango, Mary Droege, Murray McHugh, Michele Hluchy

The 4000-acre Helen Buckner Memorial Preserve in West Haven, Vermont, is owned and managed by The Nature Conservancy. It is located along the Poultney River and southern Lake Champlain shoreline, and contains floodplain and upland forest and wetlands. It has one of the highest levels of biodiversity in the state, including rattlesnakes and Vermont's only lizard, as well as many rare/uncommon plants and ten distinct plant communities. Along the banks of the Poultney River are several illegal garbage dumps containing different kinds of household and commercial trash and construction debris. These piles have been periodically burned, leading to the release of contaminants into the soil, air and water. Concentrations up to hundreds and even thousands of ppm Pb, Zn, Cu, As, Cr and other heavy metals have been recorded. This trip will discuss the source, transport and fate of these contaminants in the context of the ecological diversity of the site, and will include a 2.8-mile hike into Vermont's only piece of the Adirondacks.