OCGC Seminar

Metamorphic Subduction packages in the Vermont Appalachians: Petrologic and Tectonic Insights from Ultramafic, Mafic and Pelitic Rocks

Dr. Ian Honsberger

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GSC

588 Booth Street

Gamble Hall (01-111)

Jeudi le 1 decembre 2017, 11h30

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Exhumed ultramafic-mafic-pelitic packages along the Iapetan Ocean tract in Vermont preserve subduction zone metamorphism related to Ordovician accretion of peri-Gondwanan crust (Moretown terrane) to the Laurentian margin. The packages are meter- to kilometer-scale metamorphic highs in the Appalachian hinterland, just east of the intersection of the Ottawa-Bonnechere Graben with the Appalachian front. They are fault-bound and consist of carbonatized serpentinite in fault contact above either mafic igneous rocks or depositionally and/or tectonically intermixed mafic and pelitic rocks. The northernmost package in Vermont is marked by eclogite and blueschist (Tillotson Peak Complex) just south of the Quebec border, whereas barroisite-bearing amphibolite (e.g. Belvidere Mountain Complex) and greenstone trace the metamorphic highs farther south towards the Green Mountain Massif. Upper greenschist to lower blueschist facies (~ 425-500 °C, 0.55-0.95 GPa) mafic greenstones mark the southernmost package in the Vermont subduction zone terrane. Structural data in combination with mineral assemblages, amphibole compositions, and thermodynamic modeling suggests that the metamorphic packages, and also different mafic bodies contained within them, were exhumed from different depths prior to ubiquitous greenschist facies overprint during Devonian intracontinental deformation.

Serpentinite slivers throughout the terrane track H2O and CO2 fluxes and major oxide metasomatism during subduction, exhumation, and intracontinental deformation. The presence of antigorite in serpentinite coupled with the association of high-pressure mafic rocks is consistent with high-grade serpentinization in a subduction zone environment. Textural and chemical evidence from the ultramafics suggests that initial carbonatization of serpentinized peridotite began prior to major oxide metasomatism and greenschist facies overprint, thus, CO2 was introduced to the ultramafics during either subduction or exhumation. A subduction-channel model involving a lithologically heterogeneous serpentine- and fluid-rich exhumation corridor along a slab-mantle interface may help explain the numerous occurences of ultramafic slivers throughout the terrane and, as well, underplating of high-pressure mafic rocks and intermixed mafic and pelitic rocks.

Biography: Dr. Ian Honsberger is a new Postdoctoral Researcher at the Geological Survey of Canada, Ottawa, ON. Ian grew up in New England and developed an early interest in northern Appalachian geology. He completed his PhD at the University of New Hampshire in 2015 working on metamorphism, structure, and tectonics of exhumed subduction zone rocks in central Vermont, under the supervision of Dr. Jo Laird. Prior to joining the Survey, Ian was a two-year term Assistant Professor at Carleton University where he taught courses in mineralogy, petrology, field geology, structural geology, and tectonics.

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