Stratigraphy, Structure, and $^{40}Ar/^{39}Ar$ Geochronology in the Lochaber-Mulgrave area, Nova Scotia[1]

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The Lochaber-Mulgrave area of northern mainland Nova Scotia is underlain by rocks of the Early Carboniferous Horton Group, in faulted contact with Devonian and Silurian rocks to the south and west and younger Carboniferous rocks to the north and east. On the basis of lithology and sedimentary characteristics, the Horton Group is divided into four formations: Clam Harbour River, Tracadie Road, Caledonia Mills, and Steep Creek. These formations have a total thickness of at least 4000 m, and were deposited in varied braided fluvial and shallow to deep lacustrine environments. Sparse paleontological data from macrofossils and spores indicates an age of Famennian to late Tournaisian. Compared to the Horton Group in other areas of Nova Scotia, the rocks in the Lochaber-Mulgrave area appear to be somewhat older, exhibit higher thermal maturity indicating deeper burial, and are more deformed and metamorphosed, especially in the southern part of the area near the Roman Valley Fault. Detrital muscovite yielded $^{40}Ar/^{39}Ar$ ages of ca. 500 Ma, for which no source is apparent in either of the now-adjacent Avalon or Meguma terranes.

Based on petrographic studies, the rocks have undergone low-grade regional metamorphism with the development of slaty cleavage defined by new muscovite growth with a strongly preferred optical orientation. Whole-rock $^{40}Ar/^{39}Ar$ dating of muscovite-rich slate indicates that new muscovite growth occurred at ca. 350-340 Ma. These data require that the sedimentary rocks underwent extremely rapid burial, deformation, and cooling through the argon retention temperature in muscovite by ca. 350-340 Ma. A possible explanation is overthrusting of the Horton Group from the south by Devonian rocks of the Guysborough block, as a result of transpression at a restraining bend along the Chedabucto-Roman Valley fault system during juxtaposition of the Avalon and Meguma terranes. Further evidence of an overthrusting event is evident to the northeast in Cape Breton Island where equivalent units in the L'Ardoise block display overturned sequences with recumbent folds and near-horizontal cleavage. Uplift and subsequent deformation that also involved younger units in the region were probably the result of on-going movement on the terrane-bounding fault system.

[1]Presentation at the Northeastern Section, Geological Society of America 38th Annual Meeting, March 27-29, 2003; i*n* Geological Society of America, 2003 Abstracts with Programs, v. 34, p. 28
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