

The Jurassic North Mountain Basalts, Nova Scotia: More Than Just Simple Flood Basalts¹

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The 201 Ma North Mountain Basalt (NMB) is a sequence of continental tholeiitic basalts erupted within a continental rift (Fundy Basin) that has been subdivided into lower, middle and upper flow units (LFU, MFU, UFU, respectively). Petrographically the basalts are medium- to fine-grained with ophitic textures and are variably vitrophyric ($\leq 30\%$). Results of ongoing investigations of the features of the NMB are summarized below followed by inferences regarding their nature and origin.

1. The LFU (≤ 190 to ≤ 40 m) is a medium- to coarse-grained, massive, columnar jointed basalt of dominantly holocrystalline texture with minor vitrophyre. The top few m are often amygdaloidal and mafic pegmatites local occur with felsic layers ($\leq 2-3$ cm). Rarely spectacular Neptunian dykes ($\leq 20-30$ cm) are controlled by columnar jointing. Although the LFU forms a prominent valley wall along the Annapolis Valley, this topographic feature diminishes westwards.
2. The MFU contains numerous (4-16), variably thick (≤ 1 to ≤ 25 m) flows with a laterally variable composite thickness (150 to 10 m) that decreases westwards. The basalts are fine- to medium-grained and contain abundant, variably textured mesostasis ($\leq 30-40\%$). The MFU is characterized by a systematic zonation of zeolites occluding primary vugs. Minor amounts of massive, fine-grained, homogeneous, red inter-flow sediment occurs as thin (cm scale) beds, and discordant vein networks or dykes; zeolites cross cut and locally replace the dyke rock.
3. The UFU (≤ 160 m) consists of at least two or more flows and is similar to the LFU. It is a massive, columnar jointed basalt with a medium- to coarse-grained texture and contains abundant vitrophyre ($\leq 30\%$). Segregation pipes of 3-5 cm to 1 m occur locally and a pervasive early silica alteration along columnar joints post-dates pipe formation. The distribution of the UFU is poorly constrained with the greatest exposure at the west end and the bottom part only observed along the length of the valley coast line; it is not exposed along the north side of the Fundy Basin.
4. Silica veins overlap zeolite formation and occur in the MFU and UFU. The veins form en echelon arrays, occupy brittle structures, are massive to finely laminated, and color varies (clear, cloudy white, green, red). There is a change in orientation from N-S to NE from Long Island to Scots Bay.
5. Disconformably overlying weathered flows of the MFU are red-brown sediments of the Scots Bay and McCoy Brook formations.

The above observations indicate: (1) deposition of NMB in sub-basin of variable thickness, (2) extraction of MFU from a different magma source or one that changed post LFU; (3) sinistral movement along E-W bounding faults, (4) rapid deposition and minor inter-flow exposure to weathering, (5) formation of zeolites from circulating hydrothermal fluids post volcanism.

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