LAVA STRUCTURES AND EMPLACEMENT OF NORTH MOUNTAIN BASALT AT GRAND MANAN ISLAND

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The North Mountain basalt of the Early Mesozoic Fundy rift basin between New Brunswick and Nova Scotia is a giant lava flow at 6,600 km^3, part of the enormous c.200 Ma Central Atlantic Magmatic Province. The lava was ponded into the wide basin valley, with thicknesses of 300 to 400 m along the eroded margins and up to 1,000 m in the south-central area of the basin. The original flow probably extended well beyond the present basin.

Three distinct members are displayed along the western shore of Nova Scotia and on Grand Manan Island in the southwestern end of the basin. The lower unit is massive, dense, columnar basalt in a colonnade up to 190 m thick over its basal contact with Blomidon siltstone. In place of the expected entablature, there is a middle member of 10 to 12 amygduloidal flows and sills, each about 3 to 7 m thick and totaling about 50 m. Some of these strata show distinct flow tops and basal contacts with pipe vesicles. Above them is about 90 m of medium-coarse to porphyritic columnar basalt, which forms the third or upper member.

Rather than forming independently in a sequence of fissure eruptions, the basalt members and strata are co-magmatic expressions of a single gigantic ponded flow, as shown in spectacular outcrops on Grand Manan. As the massive lower flow unit expanded into the basin, it produced the initial middle member layer as a gas bubble-rich crust, and additional amygduloidal flows overran this crust as gas-rich extrusive surges from the upper levels of the lower member. Intrusions from the lower member also crosscut the middle flows, including a large dike that bends to become a sill within the amygduloidal flows. The entire middle-flow package was breached and overflowed by a massive extrusion of magma from the lower member, which produced the third or upper member.

The North Mountain basalt members and structures reflect eruptive surges from one or more volcanic fissures beneath the western side of this immense lava flow. The surge events inflated the liquid interior of the lower flow, which then produced additional flows into and over its amygduloidal surface strata across the basin.