

Thermal history of the Silurian Passamaquoddy Bay mafic sills, New Brunswick, Canada

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The mafic sills in Passamaquoddy Bay, New Brunswick are part of the Coastal Volcanic Belt, a 4 km-thick belt of bimodal volcanic rocks. In Passamaquoddy Bay, there are four cycles of mafic and felsic volcanism, intruded by mafic sills throughout. The Silurian Passamaquoddy Bay mafic dyke swarm likely fed many of these mafic sills. Currently, little is known about the thermal history of Passamaquoddy Bay sills. The current study determined the cooling history of three separate mafic sills in the Passamaquoddy Bay region by developing 2D thermal models. The magma is constrained to the dimensions of the examined intrusions; however, the duration of the magma flow is unknown. To replicate prolonged magma flow, the temperatures of the sills were held constant for defined periods of sill flow. After a series of static conduction simulations and thermal profiles were developed, the models were compared against petrographic observations and field relations. Surprisingly, preliminary results suggest that the sills in the Passamaquoddy Bay region were rapidly injected into lithified sediment, and then rapidly cooled to the solidus within a period of fifteen days. In addition, the current estimates for duration of magma flow were found to be less than 5 hours. These results provide new information and insight into the complex history of the Passamaquoddy Bay volcanism.