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EVOLUTION OF THE NORTHERN PART OF THE LESSER ANTILLES ARC - GEOCHEMICAL CONSTRAINTS FROM ST. BARTHELEMY ISLAND LAVAS

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This study presents an extensive geochemical data set of 23 samples from St. Barthélemy Island, which belongs to the Paleogene extinct branch of the Lesser Antilles arc and is currently exposed in the northern part of the subduction forearc. Samples were selected to represent all lithologies and main periods of magmatism, that are, Middle-Late Eocene, Early Oligocene and Late Oligocene. They show enrichment in light rare earth element/medium rare earth element, large ion lithophile elements (Rb and Ba) and isotopic characteristics, suggesting mixing between the mantle and a subduction component (oceanic crust + sediments). Trace element ratios suggest that primary magmas were generated in a normal mid-oceanic ridge basalt-type mantle-wedge that underwent 8%–18% partial melting in the spinel-stability field. The sediment contribution was low (0.1%–1%) irrespective of the age of the samples. This is similar to what is observed for the northern Lesser Antilles active branch. St. Barthélemy Island shares strong similarities with St. Martin Island, located on the same extinct arc branch, which suggest a similar geodynamic evolution. Oligocene samples displayed an increase in incompatible elements in the magma source, suggesting an increase in sediment melts, which could be correlated with a drastic change in the tectonic regime at that time, characterized by stretching perpendicular to the trench and subsequent intra-arc rifting. On Δ7/4Pb versus $^{206}Pb/^{204}Pb$, the samples showed a similar trend for both active and extinct islands of the northern Lesser Antilles, suggesting negligible changes in the nature of the magma sources. A comparison with lavas from the Greater Antilles arc indicates sources and processes close to those active in the Lesser Antilles.