Fire and ice on the SE Greenland Margin

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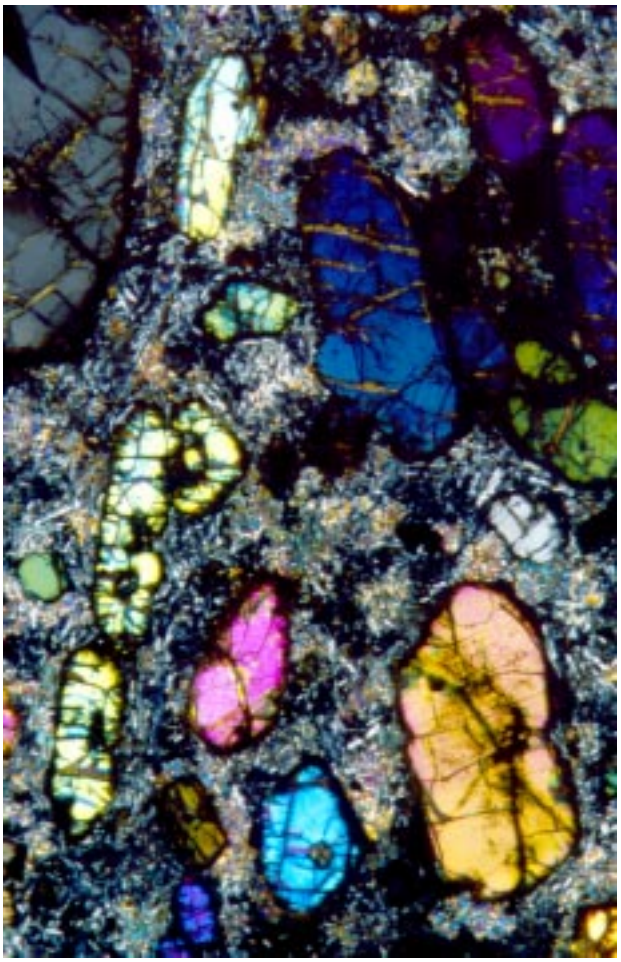

Prior to 65 million years ago (Ma), Greenland and Europe were a single continent, although a shallow seaway partly separated the two landmasses. During the early Tertiary, however, a major event occurred that was to change not only the local geology, but also the plate distribution at a regional scale. Drilling during Leg 152 has revealed a series of continent-based lavas (mainly basalts, but also high-temperature picrites (photo) and crustal melts) in the deeper parts of the volcanic successions along the SE Greenland margin. The age of these lavas, ca. 60 Ma, is the same as lavas in West Greenland and the British Isles, implying a widespread, voluminous volcanic event of almost catastrophic proportions. We relate this event to the arrival of a thermal pulse, or plume, from the deep mantle. Shortly after this event, the continent ruptured to form the proto-NE Atlantic Ocean, accompanied by the eruption of further large volumes of basaltic magma in the developing rift zone. However, unlike normal ocean basins, the plate margins did not initially subside to abyssal depths to form typical mid-ocean ridges, but were supported close to sea level for several million years. This buoyancy was provided by the plume, the effects of which eventually became focused beneath the Greenland-Faeroes Ridge and, ultimately, its present location beneath Iceland.

Interestingly, the results of Leg 152 also provided insights into the development of the northern hemisphere's oceanic circulation and ice caps. Drilling at Site 918, in the Irminger Basin, demonstrated the onset of North Atlantic Deep Water at about 10-12 Ma, probably associated with the subsidence of the Greenland-Faeroes Ridge and subsequent overflow of cold water from the north. Another important discovery of Leg 152 was the presence of glacial dropstones in core of late Miocene age, showing that ice caps were in existence along the SE Greenland coast by 7 Ma, significantly older than previous estimates of North Atlantic glaciation.