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Can mineral compositions tell us more about the origin and genesis of silicic volcanics associated with the Vøring Plateau, NE Atlantic Ocean?

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Silicic magmatic rocks are an intrinsic component of many large igneous provinces (LIP) such as continental flood basalt provinces, oceanic plateaus and volcanic passive margins, which are however more well known for their extensive successions of mafic magmatic rocks. Although these silicic rocks commonly make up only smaller proportions of the volcanic sequence, they are locally voluminous and may bear valuable information on the initial phases of continental break-up and LIP formation. These silica-rich melts may be generated by crustal anatexis or by fractional crystallization or by a combination of both processes.

In this study we reinvestigate silicic volcanics from the Palaeogene Vøring Plateau, an early formed part of the North Atlantic Igneous Province (NAIP) off Norway, which was drilled during ODP Leg 104 at Hole 642E. The recovered volcanic succession was subdivided into the texturally, mineralogically and chemically distinct “Upper Series” (US) and “Lower Series” (LS), separated by a small estuarine sedimentary sequence. The US comprises mainly subaerially erupted transitional MORB.

The LS comprises the lower 130 m of the core and it is made up of glassy dacitic lavas and some minor basaltic andesitic lava flows with an interbedded rhyolitic ignimbrite. These calc-alkaline dacitic lavas have perlitic to variolitic textures and are high-K-type (K_2O = 2.5 – 3.3 wt.%), peraluminous magmas. Their trace element geochemistry and isotopic composition (e.g. very radiogenic Sr isotopic ratios) characterize the dacites as partial melts of upper crustal metasedimentary rocks (S-type granodioritic melts).

Mineral analyses substantiate these assumptions by the finding of cordierite glomerocrysts within the glassy dacites which are indicative of partial melts derived from reworking of continental sediments. Ongoing in-situ analyses on mineral phases and glass of these silicic volcanics by electron microprobe (EMP) and laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) will help to provide thermobarometric data, as well as more information on the source rock compositions and the possible magma mixing processes.

Our aim is to check for the hypothesis that upper crustal sediments which were subducted to deep crustal levels during the Caledonian closure of the Iapetus ocean may represent the source rocks for the partial melts generated during the initial phase of continental rifting and represented by the LS dacites of the Vøring Plateau.

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