



The Continent-Ocean Transition in the Mid-Norwegian Margin: Insight From Seismic Data and the Onshore Caledonian Analogue in the Seve Nappe Complex

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The continental breakup and initial seafloor spreading in the NE Atlantic was accompanied by widespread intrusive and extrusive magmatism and the formation of conjugate volcanic passive margins. These margins are characterized by the presence of seaward dipping reflectors (SDR), an intense network of mafic sheet intrusions of the continental crust and adjacent sedimentary basins and a high-velocity lower crustal body. Nevertheless many issues remain unclear regarding the structure of volcanic passive margins; in particular the transitional crust located beneath the SDR. New and reprocessed seismic reflection data on the Mid-Norwegian margin allow a better sub-basalt imaging of the transitional crust located beneath the SDR. Different high-amplitude reflections with abrupt termination and saucer shaped geometries are identified and interpreted as sill intrusions. Other near vertical and inclined reflections are interpreted as dykes or dyke swarms. We have mapped the extent of the dyke reflections along the volcanic margin. The mapping suggests that the dykes represent the main feeder system for the SDR. The identification of saucer shaped sills implies the presence of sediments in the transitional zone beneath the volcanic sequences.

Onshore exposures of Precambrian basement of the eroded volcanic margin in East Greenland show that, locally, the transitional crust is highly intruded by dykes and intrusive complexes with an increasing intensity of the plumbing and dilatation of the continental crust ocean-ward. Another well exposed analogue for a continent-ocean transitional crust is located within the Seve Nappe Complex (SNC) of the Scandinavian Caledonides. The best-preserved parts of SNC in the Pårte, Sarek, Kebnekaise, Abisko, and Indre Troms mountains are composed mainly of meta-sandstones and shales (now hornfelses) truncated typically by mafic dykes. At Sarek and Pårte, the dykes intrude the sedimentary rocks of the Favoritkammen Group, with a dyke density up to 70-80%. This complex was photographed in a regional helicopter survey and sampled for the study of the different dyke generations, their geochemistry and ages in 2014. Extending for at least 800 km within the SNC, the mafic igneous rocks most probably belonged to a volcanic system with the size of a large igneous province (LIP). This volcanic margin is suggested to have formed along the Caledonian margin of Baltica or within hyperextended continental slivers outboard of Baltica during the breakup of Rodinia. The intensity of the pre-Caledonian LIP-magmatism is comparable to that of the NE Atlantic volcanic margins. The SNC-LIP is considered to represent a potential onshore analogue to the deeper level of the Mid-Norwegian margin transitional crust, and permits direct observation, sampling and better understanding of deeper levels of magma-rich margins.