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Mesoproterozoic Bimodal Volcanism in SW Norway, Evidence for Recurring Pre-Sveconorwegian Continental Margin Tectonism.

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Between ca. 1.3 Ga and the onset of the Sveconorwegian orogeny (ca. 1.0 Ga) in the Baltic Shield, the margin of Baltica was subjected to repeated episodes of bimodal magmatism. A new TIMS U-Pb date of 1259+/-2 Ma for magmatic zircon from metarhyolite of the Trossovdal Formation is presented. Based on new U-Pb zircon geochronology, at least two distinct episodes of bimodal volcanism in southern Norway; the 1.26 Ga Valldal Group and 1.16 Ga Oftefjell and Høydalsmo Groups. The Dal Group in south-western Sweden most likely represents a more distal equivalent of the latter.

In the Valldal region, volcanism developed in an extensional setting, following the initial deposition of clastic sediments. The earliest volcanics are A-type peraluminous rhyolites, with Nd and Hf isotopic compositions supporting formation by remelting of 1.5-1.9 Ga granitic basement, initiated by the intrusion of mafic magmas. Subsequent volcanism comprised subaerial basaltic lava flows, locally intercalated with clastic sediments. The earliest basaltic magmas (Hagastøl Formation) are chemically the more evolved and contain the lavas that suffered crustal contamination, whereas, the later basalts (Austmannali Formation) are consistent with melting of a depleted mantle source. However, all of the basalts have elevated La/Nb values relative to MORB. This feature is consistent with asthenospheric melts variably contaminated

by a lithospheric mantle component, which had been previously enriched by an earlier subduction event. The combination of early clastic sedimentation, bimodal volcanism and igneous geochemistry suggests that the Valldal volcanics formed in a continental back-arc setting.

The new data suggest that at least from ca. 1.3 Ga the proto-margin of Baltica was possibly a convergent continental margin, with back-arc development occurring diachronously along its length from ca. 1.26 to 1.16 Ga. Magmas produced during these two volcanic episodes have distinct geochemical and isotopic signatures and their geographic distribution suggests that each is restricted to a discrete crustal terrain. This further supports the view that during the Sveconorwegian orogeny large scale strike slip tectonics juxtaposed the different terranes to give the present crustal geometry.