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Metavolcanics trace the development of ocean rifting, SW Svalbard

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This study investigates late Neoproterozoic metavolcanics from southwestern Spitsbergen to determine the evolution of rifting and the relationship with continental breakup. A number of exposures of metavolcanics are connected with the regional Torellian unconformity, which is associated with Late Neoproterozoic orogenesis - post 640 Ma. This unconformity divides the older metasedimentary sequence of the Deilegga Group from the younger Sofiebogen metasedimentary Group. Samples have been collected from three areas from south to the north: Wedel Jarlsberg Land including the Werenskiöldbreen area (Jens Erikfjellet Formation) and the Chamberlindalen area as well as pillow lavas from Nordenskiöld Land, all belonging to the Sofiebogen Group.
The rocks from the Werenskiöldbreen area are classified as subalkaline basalt to basaltic andesite, while metavolcanics from Chamberlindalen are alkaline basalts, whereas rocks from Nordenskiöld Land are tholeiitic basalts. All of them are affected by metamorphism under a minimum of greenschist facies conditions. The immobile REE are used throughout, because they are least affected by metamorphism. The REE profiles show flat patterns for samples from Nordenskiöld Land, whereas the rest of the samples are enriched in LREE. The trace element geochemistry indicates LREE-enrichment for samples from the Werenskiöldbreen area (Lan/Smn 2.1 – 5.7) and Chamberlindalen (Lan/Smn = 1.8 – 3.2), but LREE-depletion for Nordeskiöld metabasalts (Lan/Smn = 1.0 – 1.5). The Smn/Ybn ratio is low for metavolcanics from the Werenskiöldbreen area and from Nordenskiöld Land, while rocks of Chamberlindalen have elevated Smn/Ybn.
The metavolcanics from SW Svalbard indicate an increasingly depleted character from south to north. We believe this reflects increasing degrees of melting as rifting develops, signaling continental break-up.

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