

Did the Grenville – Sveconorwegian belt go north?

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The Grenville and Sveconorwegian orogenic belts in SE Laurentia and SW Baltica, respectively, together with the Sunsas belt in SW Amazonia, formed during the late Mesoproterozoic to early Neoproterozoic assembly of the supercontinent Rodinia. In the ‘Samba’ model of Johansson (2009, 2014), Baltica and Amazonia, together with West Africa, formed a coherent unit already prior to this collision, which rotated clockwise relative to Laurentia before colliding with its present-day southeast margin, thereby creating a wedge-shaped combined Grenville – Sveconorwegian – Sunsas orogenic belt.

According to this model, the Grenville – Sveconorwegian belt would close northwards in an area between SW Scandinavia and eastern Labrador, that may also involve the northern British Isles. However, Lorentz et al. (2012) and Gee et al. (2015) have proposed a northerly branch of the Grenville – Sveconorwegian orogen extending between Scandinavia and eastern Greenland into the High Arctic, paralleling the future Caledonian orogen, based on the presence of detrital zircons with Grenvillian and older Mesoproterozoic ages in many Neoproterozoic sedimentary sequences in these areas, as well as granites of late Grenville age (900 – 1000 Ma) within the Caledonides of the Arctic areas.

However, a northerly branch of the Grenville – Sveco-norwegian belt between Scandinavia and Greenland, also including older Labradorian-Pinwarian or Gothian-Telemarkian rock units, would require an ocean with active margins separating Laurentia and Baltica throughout the Mesoproterozoic, thereby destroying the generally accepted NENA (Northern Europe – North America; Gower et al. 1990) connection, and necessitating a drastic revision of the configuration of the Columbia (Nuna) supercontinent. Alternatively, if this ocean only existed for a shorter period prior to the Grenville – Sveconorwegian orogeny, one would either see a purely Grenvillian (900 – 1200 Ma) detrital zircon signature in the Neoproterozoic sequences, or a Grenville signature mixed with Archean and Paleoproterozoic zircons, but not the dominantly Mesoproterozoic (900 – 1800 Ma) signatures actually seen.

Instead, a wedge-shaped geometry of the Grenville – Sveconorwegian belt is preferred, with an ocean opening between Greenland and Baltica in the late Mesoproterozoic due to the clockwise rotation of Baltica, followed by geographically and geodynamically separate early Neoproterozoic subduction-related magmatism along the part of the outer margin of Rodinia bordering that ocean, as proposed by Cawood et al. (2010), and transport of sediments from the eroding Grenville – Sveconorwegian mountain belt across the cratonic foreland into this ocean or into local rift-related basins.

References:

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