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Itinerant Siberia during the Neoproterozoic

Priyatkina, N. S.[1,2], Collins, W. J.[1] and Khudoley, A. K.[2]

[1]New South Wales Institute of Frontiers Geoscience, University of Newcastle, Newcastle, NSW 2308, Australia [2 2] Institute of the Earth Sciences, St. Petersburg State University, 7/9 University Nab., St. Petersburg 199034, Russia

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Siberia's position in Neoproterozoic continental reconstructions is problematic, largely because of a lack of geological data establishing its affinity to other continents. The margins of NE Laurentia, eastern Baltica and northern and western Siberia that probably were located along the periphery of Rodinia are surrounded by Neoproterozoic to Early Cambrian orogenic belts, but how they related geodynamically remains enigmatic.

To establish cratonic affinities of Neoproterozoic arc terranes currently located near the northern (Taymyr belt) and western margins (Yenisey Ridge, East Sayan) of the Siberian Craton, we compared U-Pb-Hf detrital zircon signatures from pre-accretionary Mesoproterozoic to post-accretionary Neoproterozoic and Cambrian sediments. The detrital signature of Siberia is significantly different from that of Laurentia and Baltica, because the Siberian cratonic basement incorporates Archean and Paleoproterozoic but not Mesoproterozoic crust [1]. Neoproterozoic to Early Cambrian sediments of both western and northern Siberian margins reveal ca. 980-800 Ma and ca. 750-600 Ma zircon populations, broadly consistent with ages of the magmatic belts recognized within Taymyr, Yenisey Ridge [2] and East Sayan [3]. Both margins were surrounded by continental arcs at ca. 900-800 Ma, as evidenced by large vertical Hf isotopic arrays extending εHf (T) values from ~+12 to -10. A peri-Siberian origin for the Early Neoproterozoic Taymyr arc can be inferred from inheritance of 2.15-2.0 Ga juvenile zircon population, which is derived from Siberian basement. The 1.86 Ga peak in detrital age spectra of post-accretionary sediments from near Yenisey Ridge provides a clear link to granitoids from the Angara belt along the western cratonic edge. However, another accretionary event that ocurred at ca. 600 Ma introduced a 750-600 Ma arc-related zircon population and an exotic Mesoproterozoic detrital signature to the platform cover of northern Siberia. This U-Pb-Hf detrital signature is similar to the coeval detrital record of eastern Baltica, supporting juxtaposition of the two margins during the Timanian orogeny at the Precambrian/Paleozoic transition. By contrast, all post-accretionary sediments near the Yenisey Ridge and East Sayan inherit detritus derived solely from the Siberian cratonic basement.

Integration of U-Pb-Hf detrital zircon data and available geological records suggest that the northern and western margins of Siberia became active at ca. 970 Ma, likely as an extension of coeval Valhalla orogen that formed on the margin of NE Laurentia [4]. Possibly, at ca. 800-750 Ma, subduction rollback along this margin of Rodinia promoted the rift and drift of Siberia from northern Laurentia and ultimately caused its collision with Baltica at ~600 Ma. In this model, Neoproterozoic crust that formed along this subduction zone currently occupies the northernmost (Arctic) parts of Siberia, Baltica and Laurentia, commonly referred to as Arctida. By contrast, the western margin of Siberia remained a part of a peri-Siberian accretionary orogen until the Early Paleozoic.

References:

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