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Baltica at 1.55-1.40 Ga: Contrasting tectonics vs rotations

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After the East European Craton/Baltica became a coherent continental block at ca. 1.7 Ga, it was affected by contrasting tectonic processes [1]. At 1.55-1.40 Ga, central western Baltica was involved in AMCG- and A-type granitoid magmatism, sedimentation, NNE-SSW compression and metamorphism during the Danopolonian intracontinental orogeny [2]. These processes were mostly accommodated within ca. 200-km wide belts of EW-trending faults superimposed onto the Paleoproterozoic tectonic grain as well as within pre-existing NW zones of deformation. These zones characterized by repeated magmatic activity and attendant deformations, probably switching from extension to compression. Metamorphism and migmatization reached granulite facies at low- to moderate pressure as seen in more eroded crustal domains in southern Sweden [3, 4], where these processes at ca. 1.47-1.38 Ga are also referred to as the “Hallandian” orogenesis [4].

In contrast, sedimentation and magmatism in eastern Baltica were associated with transtensional rifting of the crust and the formation of aulacogens [1], particularly intensive at 1.38 Ga [5]. Several unconformities within the sedimentary successions and intermittent magmatic events indicate probable periods of inversion tectonics and kinematic changes in developing aulacogens.

The differences between western and eastern Baltica imply that rotation during plate reorganization could control its overall tectonic settings. Paleomagnetic data [6, 7, 8, 9] indicate that between 1.63 and 1.45 Ga Baltica travelled close to the Equator, both to its south and north, simultaneously rotating clockwise as well as anticlockwise for about 5 to 10°. A pronounced change took place between 1.45 and 1.38 Ga, when Baltica moved from a site north of the Equator far to the south, sharply turning clockwise 15°. From 1.38 Ga to 1.27 Ga, Baltica rotated anticlockwise 32° moving to the south of the Equator.

We suggest that several rotations of Baltica caused the contrasting styles of its tectonics at 1.55-1.40 Ga, mostly compressional in the west and extensional in the east, and also the kinematic inversions with time. Generally, the concerned Mesoproterozoic period was remarkable in regard to variable paleogeographical positions of Baltica, which corroborate with plate reorganization and the onset of breakup of Paleo-Mesoproterozoic supercontinent Nuna/Columbia.

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