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The Rift-inherited structural architecture of the South and South-Central Scandinavian Caledonides

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The Caledonide Orogen was formed during the continental collision of Laurentia with Baltica/Avalonia in the Silurian and Lower-Devonian. During the collision, the pre-Caledonian margin of Baltica was partly subducted beneath Laurentia and a stack of nappes was transported southeast-wards hundreds of kilometres onto Baltica. The allochthons of the South-Central Caledonides can be described from bottom to top as: A) a series of nappes mainly composed of metamorphosed, Neoproterozoic, pre- to syn-rift, continental margin sequences that are mostly without syn-rift magmatism; B) a series of Baltican affine gneisses that also are mostly devoid of syn-rift magmatism, C) a second series of Neoproterozoic, metamorphosed, pre- to syn-rift, continental margin sequences that contain a large number of syn-rift plutons and volcanics, and which are interpreted as the magma-rich segment of the pre-Caledonian rifted margin of Baltica; D) a series of Cambrian-Ordovician, mostly fine-grained sedimentary units that also contain a number of mafic bodies and Alpine-type metaperidotites; E) outboard Iapetus ophiolites and island-arcs of Early Ordovician to Middle Silurian age. All are overlain by nappes of Laurentian origin.

Unlike the Central Caledonides, the South Caledonian allochthons are dominated by the presence of large crystalline basement nappes, including the Bergsdalen, Jotun, Lindås, and Dalsfjord nappe complexes. The break in the structural architecture between the South-Central and South Caledonides occurs along a lineament parallel with the Gudbrandsdalen Antiform and the Sveconorwegian front in the Baltican basement. Notably, the number of syn-rift magmas in the second series of continental margin successions (C) strongly decreases towards this lineament. Crossing the Gudbrandsdalen Antiform to the southwest, the eastern flank of the Jotun Nappe overlies continental margin succession characterised by a paucity of syn-rift magmatism. The western flank of the Jotun Nappe Complex, however, overlies another series of Cambrian-Ordovician mostly fine-grained meta-sediments, containing Alpine-type metaperidotites. Petrographic and lithostratigraphic considerations suggest that the units below the western Jotun Nappe can be correlated across the Gudbrandsdalen Antiform with those in the South-Central Caledonides.

We suggest that the decrease in the abundance and volume of mafic rocks in the continental margin successions north of the Gudbrandsdalen Antiform is linked to a transition zone between the magma-rich segments of the pre-Caledonian margin of Baltica and transitional magma-poor crust inboard of a “Jotun microcontinent/continental sliver”. Moreover, the correlation of the units in the South and South-Central Caledonides challenge the traditional across-strike correlations of the nappes. Therefore, we also suggest that the Baltican affine units in the South-Central Caledonides (A-D) represent nappe-stacks of rift-inherited domains, including the proximal, necking, hyperextended and distal domains of the rifted margin of Baltica. In the South Caledonides, remnants of the proximal-necking domains are structurally overlain by remnants of magma-poor transitional crust and by rocks of the “Jotun microcontinent/continental sliver”.