



## **The anatomy of a major late-stage thrust and implications for models of late-stage collisional orogenesis in the Caledonian crust of northern Scandinavia**

Mark Anderson (1), Willis Hames (2), and Alison Stokes (1)

(1) University of Plymouth, Geography, Earth and Environmental Sciences, Plymouth, (manderson@plymouth.ac.uk), (2) Department of Geology and Geography, Petrie Hall, Auburn University, Auburn, AL36849, USA

Within the stack of Caledonian crystalline thrust sheets of northern Scandinavia, a single amphibolite facies lithotectonic unit, the Småtinden nappe, is identified as a major, basement-coupled (“stretching”) shear zone. This dominantly pelitic unit achieved peak metamorphic conditions of 535-550°C and 8-9kbars, and the stretching geometry suggests that this most likely occurred in response to overthrusting of a hot, pre-assembled Caledonian thrust stack. Along-strike variations in microstructural geometries and patterns of mineral zoning in widely developed porphyroblast phases suggest, however, subsequent strain partitioning within the zone during late-stage decoupling of the thrust stack from the basement along major out-of-sequence thrusts.

Large parts of the nappe are characterised by relatively late, static growth preserving concordant Si-Se relationships, and typically symmetrical external fabrics consistent with formation under dominantly pure shear conditions. In the Salangen area, however, the nappe is characterised by early garnet growth, with discordant Si-Se relationships and asymmetric external fabric geometries consistent with formation during ESE-directed simple shear. Remarkably consistent thermometric estimates from chlorites in both regimes (post- and syn-shearing) suggest that out-of-sequence ramping occurred at temperatures in the range 370-400 °C, within the typical range of blocking temperatures for argon retention in muscovite. <sup>40</sup>Ar-<sup>39</sup>Ar dating of muscovites from S-C fabrics in the out-of-sequence shear zone suggest that late-stage thrusting occurred during the middle-late Devonian (ca. 395-375 Ma). Hanging-wall and footwall geometries coupled with these radiometric dates indicate that the development of these late thrusts closely relates to reactivation of pre-Caledonian Baltic basement during the Devonian (400-370 Ma). East-west contraction during the upper end of this time frame is peculiar considering that this was the period of large magnitude and rapid extension in western Norway.