



Basement structural controls on late orogenic geometries in the Caledonides of north-central Scandinavia

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The Caledonides of north-central Scandinavia are dominated by a series of crystalline thrust sheets (“nappes”) that structurally overlie autochthonous and internally imbricated pre-Caledonian crystalline basement and cover rocks of the Baltic Shield. The lowest laterally persistent nappe constitutes a major shear zone at the base of the nappe stack. Late stage, ESE-directed translation of a previously assembled nappe stack across the margin of Baltica occurred in a largely passive, piggy-back style along this shear zone. At least one major late-stage Caledonian thrust (Øse thrust) is also recognised at higher structural levels within the nappe stack, causing regional scale repetition and truncation within the tectonostratigraphy. Hanging-wall and footwall geometries indicate that the development of this thrust closely relates to reactivation of the underlying basement, and presumably results from oversteepening of the lower shear zone as basement culminations evolved at a late stage in the Caledonian orogeny.

Structures recorded in these late Caledonian thrust zones are dominated by complex systems of W- or NW-vergent back-folds. These have been interpreted as resulting from late-stage extensional backsliding of the orogen. In the lowest thrust zone, however, back-folds of differing geometry vary with position relative to the major basement culminations. Along moderately dipping western margins to the culminations, back-folds are typically open to tight, moderately inclined structures that re-fold top-to-the-SE shear indicators. A SE-dipping spaced crenulation foliation is often also developed. Occasional isoclinal, recumbent back-folds, with highly attenuated limbs indicating a top-to-the-NW sense of shear, are less commonly observed in this zone. Above the sub-horizontal roof zones of the basement culminations, back-folds are

typically dismembered by superimposed shearing along the limbs especially in roof zones to the culminations. Contractional crenulations and associated foliations typify the hinge regions and steep SE-dipping limbs. Less steep SE-dipping limbs are often attenuated and consistently display an ESE-directed shear sense, typical of an extensional crenulation cleavage.

A model is developed to account for these structural geometries during Late Caledonian contractional tectonics. This involves progressive ESE-directed thrust sheet translation over an evolving basement ramp-duplex system. It is concluded that it is not necessary to invoke major late orogenic extensional collapse in order to satisfy the main Late Caledonian structural configurations in north-central Scandinavia.