



The edges of Precambrian shields in Scandinavia and the UK

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The process of forming shields and establishing their physical characteristics can be studied by examining their margins. Geological interpretations suggest that in the UK the present day western margin of the Caledonian orogen is exposed along the line of the Moine Thrust in NW Scotland. In Sweden the eastern side of the Caledonian orogen is exposed as a major thrust fault at the base of the lower allochthon. Both sides of the orogen are in contact with shields (in the sense of large areas of Precambrian rock). Geological observations show that at the surface the transition from shield to reworked shield/younger orogenic belt is characterised by a major low angle thrust fault. Thrusting within the orogenic belt exhumes allochthonous slices of basement rock and continental margin sediments (the Moine Supergroup with intercalated slices of Lewisianoid basement in NW Scotland and the lower, and middle allochthons in Scandinavia). However, the results of deep seismic experiments show different deep structures at the transition from shield to the orogenic belt in these two areas. In Scandinavia the crust directly beneath the edge of the orogen is thicker than or as thick as the crust beneath the core of the orogen. In NW Scotland the crust thins westward beneath the edge of the orogen and critically, despite having the same age and origin, it is considerably thinner than the shield beneath Fennoscandia. In simple terms this thinning can be explained by stretching of the Late Archean to Proterozoic Lewisian complex which lies beneath Scotland during the protracted opening of the North Atlantic. This suggests that shields are strong in compression when their edges are reworked by orogenic activity but weak when affected by stretching. This observation has a significant implication. The formation and longevity of shields can be undermined by stretching of the lithosphere.