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Cross-strike Discontinuities in the Moine Thrust Belt of NW Scotland; their identity, tectonic significance, and visualisation.

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Abrupt lateral changes in thrust geometry occur in many mountain-building fold-and-thrust belts. Whilst many works have dealt with palinspastic reconstructions and transport-direction-parallel balanced cross-sections, far fewer show a full three-dimensional architecture, or examine how these lateral variations in thrust architecture can be linked via so-called 'transverse zones' that serve to demarcate different segments of the thrust belt. When identified, these transverse zones are commonly thought to be related to kinematic responses to irregularities generated across pre-existing, sometimes re-activated, sub-décollement basement faults, contrasts in pre-thrusting cover strata deformation across basement faults, development of duplex structures/antiformal stacks, and/or along-strike variations in mechanical stratigraphy. In many cases however the causative structure is concealed, either by distal parts of the thrust belt or by the foreland basin, and so must be deduced from the overall structural architecture. The amplitude and complexity of the disturbance associated with the transverse zone is typically much greater than amplitude of any irregularity identified in the basement below the thrust belt.

In NW Scotland, the classic WNW-vergent Caledonian Moine Thrust Belt (MTB) incorporates a variety of crustal-scale segments. In the Assynt Culmination of the thrust belt, the Traligill Transverse Zone trends sub-parallel to the thrust transport direction, and is associated with an en echelon fault system cutting thrusts, with discontinuity of the thrust and thrust sheet architecture, and with oblique fold and thrust structures. This transverse zone is developed above a basement cross-fault which records repeated brittle reactivation of a Proterozoic shear zone. Thrusting thus deformed a sedimentary sequence that was already disrupted by faults aligned sub-parallel to the thrust transport direction.

In the Kinlochewe district where the Loch Maree Fault Zone (LMF) transects the MTB, a fold-and thrust architecture can be clearly identified on the northern wall of the LMF. That architecture is in sharp contrast to classically imbricated repetitions on the southern wall of the LMF. The structural compartmentalization is thought to be a response to a significant offset of the pre-thrust template on the proto-LMF.

Three-dimensional visualizations of these complexities are challenging to construct and deliver to the geological community – this presentation will include examples of British Geological Survey progress in rendering fold and thrust surfaces in 3D and making them interactively available to the end-user.