3-D STRAIN SYMMETRY AND VORTICITY OF FLOW ALONG THE MOINE THRUST, NW SCOTLAND: IMPLICATIONS FOR THRUST SHEET EVOLUTION AT MID-CRUSTAL LEVELS

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Traditional models of ductile thrust sheet emplacement that assume either simple shear or some other form of plane strain as the dominant deformation symmetry are remarkably simple, especially given the observed variation of mylonitic fabrics within ductile thrust sheets. L, S, and L-S tectonites, which are believed to approximate varying amounts of orogen parallel stretching and constriction, are observed both together and within distinct separate zones. This may indicate that simple shear or plane strain models cannot accurately describe ductile thrust mechanics. Although many studies have suggested that these variations may represent apparent rather than real strains, current analytical techniques allow separation of the former from the latter. Approximately 140 samples were collected in both the hanging wall and footwall of the Moine thrust from the northern Sutherland coast to just south of Loch More. Each sample is analyzed to determine the vorticity and strain symmetry, as well as the deformation mechanisms operating during ductile emplacement of the Moine thrust. Quantitative methods for vorticity analysis allow the components of pure and simple shear present during deformation to be recognized. By quantifying 3-D strain symmetry and vorticity of flow along an orogenic scale ductile thrust, insight may be gained as to the kinematics of ductile thrust deformation and movement of material during emplacement. This quantification will also allow proposed models of ductile thrusting and deformation to be tested, including: 1) gravity spreading and flow, 2) orogenic wedge extrusion-Beaumont model, 3) dislocation models, 4) surge zones, and 5) flow pertubation folding-sheath folding.

Figure 1: (a) Exposure of the Moine thrust near Knockan Crag, represented by mylonitic Moine Supergroup rocks thrust over protomylonitic Cambrian quartzite of the Eriboll Formation.

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