

Structural features and tectonic implications of a sub-horizontal cleavage in metavolcanics and metaturbidites of the Jeffers Group, Cobequid Highlands, Nova Scotia

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The late Proterozoic Jeffers Group, Avalon Composite Terrane, Nova Scotia, consists of arc-related, mafic to felsic rocks with interlayered metaturbidite sequences. The Jeffers Group was metamorphosed to greenschist facies and deformed prior to the (ca. 606 Ma) intrusion of the Jeffers Brook diorite. The intensity and style of deformation of the Jeffers Group, atypical of Avalonian rocks, is characterised by a sub-horizontal to moderately dipping, penetrative cleavage. Although the kinematic interpretation of this Precambrian cleavage is hindered by a Carboniferous overprint (e.g., in the Harrington River/Lynn Road area), other areas (such as at Jeffers Brook) demonstrate unequivocally that the deformation is of Proterozoic age. In this latter area the sub-horizontal cleavage: (i) cross-cuts earlier sub-horizontal folding; (ii) forms wide zones (10's metres) of intense foliation commonly associated with steeply dipping kink bands, which strike sub-parallel to the cleavage; (iii) develops a shallow, south-southwestly plunging, chlorite lineation; (iv) is associated with sub-parallel calcite veining; and (v) lacks mesoscopic kinematic indicators, but displays microstructures that suggest a

northwesterly direction of thrusting. In contrast, the sub-horizontal cleavage in the Harrington River/Lynn Road area is associated with: (i) sub-parallel granite/pegmatite veins (of possible Carboniferous age); (ii) kink bands formed by offset of E-W trending joints; (iii) a south-southeasterly plunging mineral lineation; (iv) metre scale folding adjacent to an E-W trending (strike-slip?) fault of Carboniferous age; and (v) a shallow, northerly dipping zone of brittle reverse faulting. From these observations it is hypothesised that the exposed Jeffers Group displays the stratigraphic base of a northerly verging, Precambrian thrust system. This ductile deformation is characterised by a pervasive sub-horizontal cleavage with a strongly developed stretching lineation and a lack of discrete thrust surfaces and thrust-related folding (the style and direction of thrusting is similar to that proposed for Precambrian deformation within the stratigraphically equivalent Folly River Formation to the east). During the Carboniferous, the Jeffers Group was probably uplifted and locally overprinted by a more brittle, thrusting event with a southerly transport direction.