

REDISCOVERY OF THE LIVERPOOL LAND ECLOGITES (CENTRAL EAST GREENLAND): A POST AND SUPRA-SUBDUCTION UHP PROVINCE

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The eclogites of the Western Gneiss Region in Norway, that became famous by the work of Eskola, suggested that the high pressures were a record of large stresses, seeing no mechanism to bring rocks from large depths to the surface. At the same time Eskola confirmed that hand samples from Liverpool Land (East Greenland) were eclogites. Since then the latter eclogite province has been mapped out, but little modern petrological studies or dating exist from the province. Moreover, a large late Caledonian UHP eclogite province has been documented in Northeast Greenland. Collectively these eclogite provinces cover far greater areas than the Western Gneiss Region in Norway, but nevertheless the Norwegian eclogites are explained by subduction of Baltic continental crust deep into the mantle below Laurentia.

A 'rediscovery' and modern study of the Liverpool Land eclogites is reported here, in hopes of bringing these rocks back into tectonic models for the Caledonides. Fieldwork in the area generally confirmed the classic studies: The region consists of granitic gneiss densely packed with eclogite lenses varying in size of dm to 1 km across. Petrologic analysis confirm that the rocks are eclogites *s. s.* and record peak metamorphic conditions of > 25 Kbar, and 800 °C.

Peak metamorphism is dated by U-Pb TIMS to extend from ca. 397 to 393 Ma. Widespread migmatites appear to have generated in the high strain zones between the eclogites and their host rocks, and typically collect in the boudin necks of the lenses. Locally the melts collect into sheeted dikes cutting both eclogites and their hostrocks. A suite of U-Pb TIMS ages on these late to post-strain granites group from ca. 388 to 385 Ma. U-Pb TIMS dating of titanite and rutile from both eclogites, host rocks and granites confirm that these cooled nearly instantly to below 450 °C, within 1 million years after melting (384 Ma). Petrological analysis suggests a cold cooling path, through prehnite-pumpellyite facies.

A very important feature in understanding the setting of the Liverpool Land eclogites, is that they occur in basement gneisses cut by large (> 1000 km²) stocks of ca. 425 Ma granitoids. The eclogites and their strained hostrocks, has hereto been regarded as predating these virtually unstrained plutons. However, the new data show that deformation, melting and UHP metamorphism all are local phenomena.

Collectively the Greenland data calls for revisions of models of Caledonian Tectonics. The asymmetric distribution of subduction products (arcs, ophiolites, etc.) probably confirms a westerly pre-collision subduction. However the Greenland UHP eclogite provinces are in direct contrast with models of these areas riding above a continental subduction zone, as the same anchor of oceanic lithosphere could not have pulled down both continental plates synchronously. Invariably the expanding documentation of dual sided Caledonian UHP metamorphism, and the link between high strain and high pressures questions a simple pressure to depth correlation.