

Structural geology of Sri Lankan lower crust

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Central Sri Lankan granulites of the Highland Complex show a complex structural-metamorphic history. The main gneissosity is a second tectonic foliation in some paragneisses, as shown by the presence of crenulated sillimanite-needles included in garnet porphyroblasts. This foliation, S2, had a subhorizontal attitude before subsequent refolding events. Structural phenomena associated with S2 include isoclinal folds at various scales, a strong N-S mineral lineation, boudinage phenomena, often associated with partial melt in the neck regions, and foliation-parallel extensional shear zones. Both these shear zones and sheared orthopyroxene crystals generally show a top to the N displacement, pointing to non-coaxial flow during at least part of D2. All these structures were formed shortly after peak metamorphic conditions were attained. In some other localities, displacement along similar shear zones in extremely biotite-rich khondalites is top to the SW. Those shear zones refold the N-S lineation, but were active before the breakdown of garnet to cordierite. This points to a shift in the stretching direction at a late stage of the D2 extensional event.

The Highland Complex is overlain by mainly tonalitic gneisses variously called Kadugannawa gneisses or "Arenas". These gneisses generally show E-W trending subvertical foliations S1, which are axial planar to isoclinal folds. These foliations are locally folded around folds with axial planes parallel to S2 in the underlying Highland Complex. It is argued that S1 is transposed to S2 at the contact.

Both units have been refolded around upright D3 folds with a roughly N-S trend. In several areas in the south and southeast, both this trend and the N-S D2 mineral lineation rather abruptly change to E-W. It is argued that this is due to a separate D4 phase of refolding.

E-W lineations on flat-lying S2 as well as recumbent isoclinal folds with E-W fold axes have also been found in areas unaffected by D4, not far from the eastern contact with the Vijayan Complex. As eastward overturned D3 folds cut by eastward thrusts parallel to the fold axes have also been found in those areas, these E-W lineations are interpreted in terms of eastward thrusting of the Highland Complex over the Vijayan Complex, which is in accordance with observations on the southeastern contact zone. However, N-S lineations and fold axes of recumbent folds in the Vijayan Complex, parallel to those in the Highland Complex may indicate the thrusting direction was southward at an earlier stage.

These structural data are combined with published P-T data and P-T data on sapphirine-bearing granulites from two new localities. Possible tectonic settings for Sri Lankan lower crust will be discussed.