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Mesozoic evolution of the Otago Schist constrained from integrated aeromagnetic, electromagnetic and field structural data

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The Otago Schist preserves the tectonic juxtaposition and imbrication of the sedimentary terranes to the southeast margin of Gondwana during the Mesozoic. The regionally deformed schist belt comprises a small section of a wide accretionary complex at this margin, and was metamorphosed during burial. Rifting and exhumation of the Otago Schist belt (OSB) by the late Cretaceous (ca. 85 Ma) reveals a broad structural arch of predominantly continental crustal and felsic volcaniclastic material, intercalated with mafic and metabasaltic material. Peak metamorphic conditions (garnet-biotite upper greenschist facies) are preserved in the core of the schist belt, with flanking material of progressively lower grade. Textural development of schistosity accompanies metamorphic facies increases from unmetamorphosed country rock up to well-segregated, gneissic textures and is described locally as increasing 'textural zones' and their concomitant 'isotects'.
Textural and metamorphic evolution of the OSB is accompanied by L-S tectonite development and a ubiquitous mineral stretching lineation dominantly hosted by quartzo-feldspathic segregation layers. Field observations suggest that an early deformation event was coeval with metamorphism to produce the folded mineral segregation layers. Cylindricity of folded layers is variable and together with development of the stretching lineation suggests that local zones of high strain intensity and constrictional deformation exist throughout the OSB. Using field evidence in conjunction with aeromagnetic and electromagnetic data, we suggest that the internal geometries and patterns of deformation in the OSB are more complex than previously described, and that localised zones of increased shear strain intensity, constriction and deformation reflecting inherited or deep crustal structures of the accretionary complex may be identified in geophysical data.
Understanding the evolution of the internal geometry and strain localisation within accretionary complexes is significant to our understanding of the evolution of the modern crust including deep crustal geometries and fluid pathways. The OSB provides a useful analogue for both existing and evolving accretionary systems to understand the latest stages of the evolution and cessation of subduction margins and accretionary complexes.