

Example of the large-scale translation along the Gondwanaland

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Structural analysis by shear criteria as asymmetric mesoscopic structures recognized in melange fabrics indicates that the formation of the Chrystalls Beach accretionary complex in South Island of New Zealand proceeded by the subduction of oceanic plate towards the south under the continental margin of Gondwanaland during Middle Triassic time. In contrast, the ductile shear deformation suggests a large-scale dextral strike-slip deformation with reverse dip-slip component towards the west associated with the collision and the amalgamation between the Capeles and Torlesse Terranes. It is possible that the Torlesse Terrane underwent more than 5000 km translation along the continental margin southward to the location of the Caples Terrane.

South Island of New Zealand is composed of nine terranes designated by their features of lithology, stratigraphy and structure. It is widely accepted that the Otago Schist, part of the Haast Schist in southern New Zealand, results from a metamorphic overprint on a suture zone involving two separate terranes; the Torlesse Terrane on the north and east, and the Caples Terrane to the south and west. However, the terrane affinity of the coastal block in southeast Otago has become a matter of debate. Strata exposed on the coastline between Chrystalls Beach and Taieri Mouth, southwest Dunedin were referred as the Chrystalls Beach Complex.

As a result of the geological study of the Chrystalls Beach Complex as having the characteristics of an accretionary complex yields the following results :

1. The Chrystalls Beach Complex is composed of five thrust sheets consisting of the coarsening-upward sequence of felsic tuffaceous mudstone with greenstones and chert, black mudstone, and interbedded sandstone and mudstone in ascending order, and interbedded sandstone and mudstone.

2. Middle Triassic (Anisian-Ladinian) radiolarians, possibly of Southern Hemisphere high-latitude origin have been discovered in phosphatic nodules in metamorphosed argillite of the Chrystalls Beach Complex. It seems reasonable to conclude that the Chrystalls Beach Complex is an extended Caples Terrane, younger than dated rocks preserved in the type (inland) area. It follows from this that the Caples Terrane has the younging polarity of accretionary age towards the east.

3. The Chrystalls Beach Complex have undergone a regional metamorphism associated with terrane collision, and the grade of metamorphism increases progressively from southwest to northeast.

4. Structural analysis by shear criteria as asymmetric mesoscopic structures recognized in melange fabrics indicate that the both units of the Chrystalls Beach Complex deformed in a top-to-the-north sense of shear. This suggests that the formation of the Chrystalls Beach accretionary complex proceeded by the subduction of oceanic plate towards the south under the continental margin of Gondwanaland during Middle Triassic time.

5. In contrast, the northern part of the Chrystalls Beach Complex which is composed of higher-grade metamorphic rocks is characterized by the ductile shear deformation which indicates a top-to-the-south sense of shear determined by microscopic kinematic indicators under the microscope. This suggests a large-scale dextral strike-slip deformation with reverse dip-slip component towards the west associated with the collision and the amalgamation between the Capeles and Torlesse Terranes. It is possible that the Torlesse Terrane underwent more than 5000 km translation along the continental margin southward to the location of the Caples Terrane considering from the recent detrital zircon age and fossil data.