

# Geological studies in the outer Chilean Fiords, R/V *Hero* cruise 79-5

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During July of the austral winter of 1979 the scientific party of the R/V *Hero* conducted geological surveys within the remote outer Pacific fiords of southern Chile. The two areas investigated (see figure 1) were the last zones to be investigated to complete a reconnaissance study of pre-Late Jurassic terranes exposed in a semicontinuous belt along the Pacific perimeter of the southern Andes. In addition, two other projects were undertaken: (1) to survey systematically the uplifted sea-level features preserved within the outer fiords, and (2) to obtain gravity readings during the cruise whenever possible. Blaine Hall coordinated the survey of uplift features and Sergio Barrientos conducted the gravity study.

*Survey of pre-Late Jurassic terranes.* As the two simplified geological maps in figure 2 illustrate, there is a major division within the pre-Late Jurassic terranes between very-

low- to low-grade metasedimentary complexes and low- to medium-grade complexes of highly foliated, lineated, and quartz veined tectonites. The existence of these low- to medium-grade metamorphic tectonites had not been reported previously. Field relations suggest that structural and lithologic transitions exist between the two types of complexes. The transitions are probably quite similar to that described for the "basement" complexes of the South Orkney Islands (Dalziel, Elliot, Thomson, Thomson, Wells, and Zinsmeister 1977).

Within the metamorphic tectonite complex on Diego de Almagro Island, a zone of metamorphosed mafic (?basalt, gabbro) to ultramafic rocks has been discovered. This zone (dark shaded areas in figure 2A) is approximately 7 kilometers wide and includes serpentinite, amphibolite, garnet amphibolite, green to blue amphibole-epidote-feldspar-quartz schist, and subordinate quartz-feldspar-mica-garnet schist.

The very-low- to low-grade complexes contain metamorphosed flysch-like sequences; massive limestone or marble; and interbedded chert, argillite, and limestone assemblages.

The deformation history is quite complex, but field data suggest that all complexes have experienced at least two phases of deformation.

The presence of blue amphiboles and the observed tectonic juxtaposition of highly incompatible rock types, as well as the inferred protoliths, are all features consistent with prior interpretations for the pre-Late Jurassic rocks exposed in adjacent regions of the southern Andes. In general, these terranes have been ascribed to a late Paleozoic to early Mesozoic subduction complex (Dalziel in press; Dalziel, de Wit, and Ridley 1975; Forsythe 1978; Forsythe and Allen in press; Forsythe and Mpodozis 1979).

*Uplifted sea-level features.* Three main types of uplift features were studied at 20 different localities during the 79-5 cruise. Fourteen of the localities have wave-cut platforms and scarps developed along sea cliff exposures of massive limestone bodies within the pre-Late Jurassic terranes. These are developed along glaciated valleys and therefore are thought to be postglacial (probably less than 10,000 years). Three of the localities were on flat terraces developed along the east and northeast shores of Mornington Island. These terraces contain isolated rock pillars that probably were once sea stacks.

The three remaining sites are high terrace-like features that are preserved on some of the islands most toward the Pacific. These may also be sea-level features, but in this case their high altitudes suggest uplift prior to the last glacial advance.

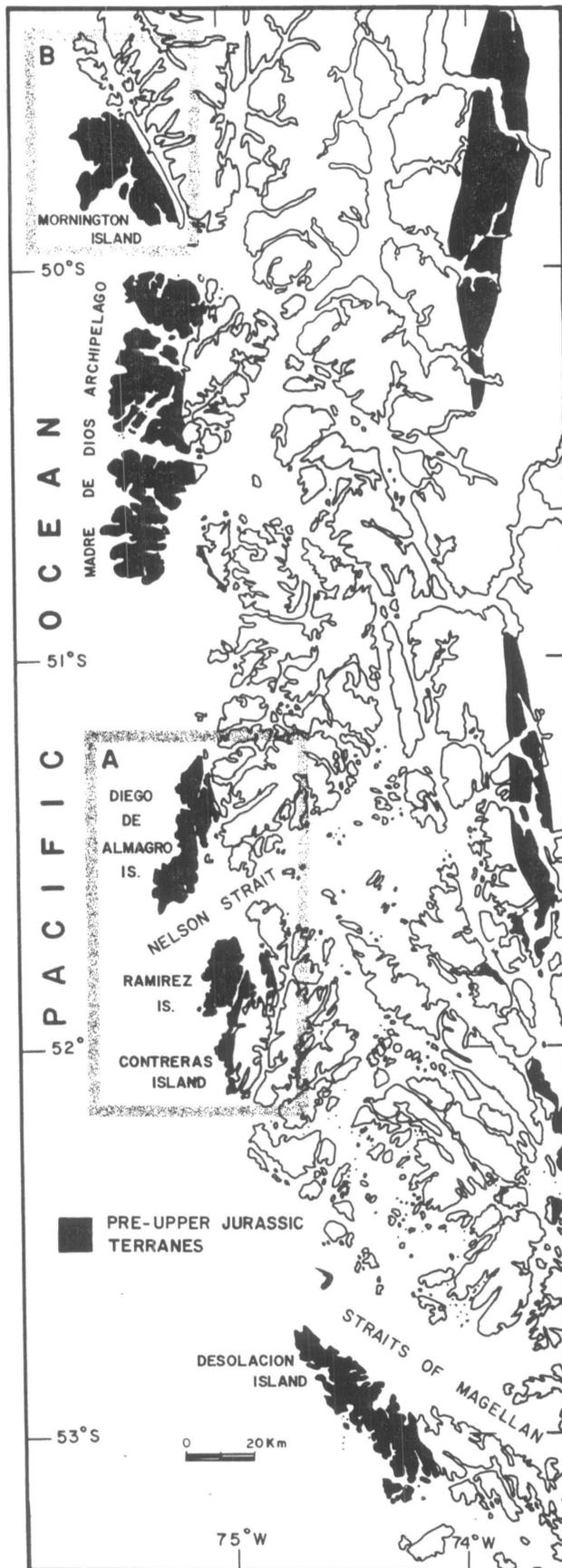


Figure 1. Blocked areas are those studied (R/v Hero 79-5).

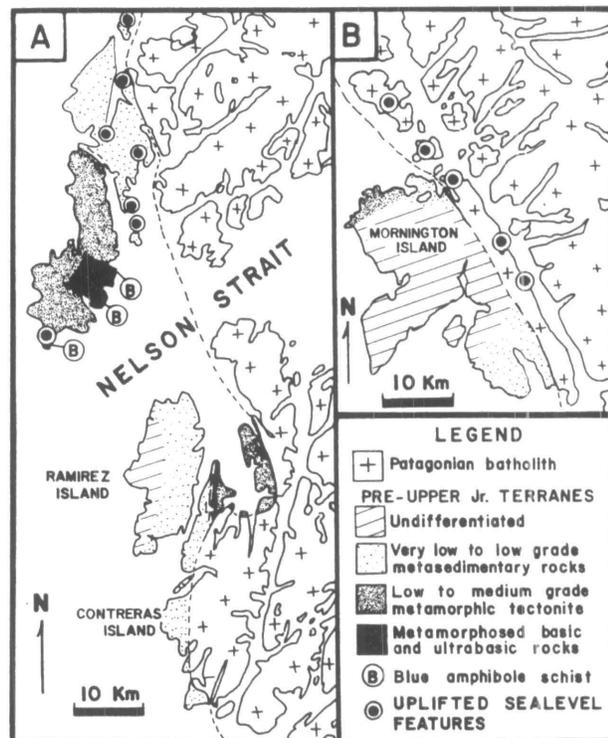


Figure 2. Simplified geologic maps for the Nelson strait area and Mornington Island.

*Gravity stations.* During the cruise, gravity readings were taken at 63 stations along shore at or near the high-tide position. These records, together with data obtained by S. Barrientos with the cutter *21 de Mayo* will allow the construction of a trans-Andean gravity profile. The approximate trend of this profile is shown in figure 3.

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### References

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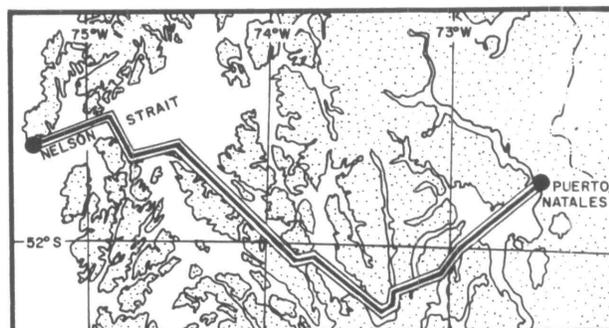


Figure 3. General trend of gravity profile.