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Lithostratigraphy and Tectonics of Miers Bluff Formation at Hurd Peninsula, Livingston Island (South Shetland Islands)

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INTRODUCTION

The Miers Bluff Formation (MBF) is one of the low grade metasedimentary sequences of greywackes and shales extensively exposed in Graham Land, South Shetland Islands and South Orkney Islands (Fig. 1). These sequences display similar lithology and tectonic style, share a common provenance, and are possibly of the same? Late Triassic age. The MBF is exposed at Hurd Peninsula on Livinston Island (Fig. 2). The exposures are excellent and offer a good opportunity of insight into the composition and structure of the MBF. This poster presents results of our field work at Hurd Peninsula in 1988 and 1991.

LITHOLOGY

The MBF (redefined) reaches ca. 1,600 m in thickness (base unknown) (Fig. 3). It consists mainly of sandstones intercalated with mudstones and shales. Six facies associations were distinguished in the MBF based on

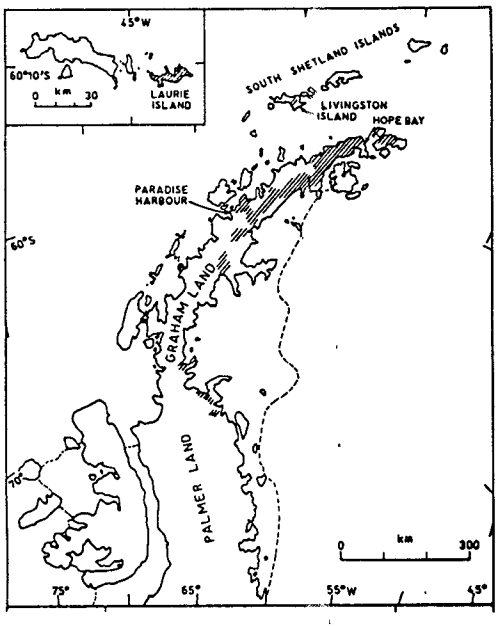

Fig. 1. Outcrops of the MBF and equivalents (*hatchured*) in Graham Land and on off-lying islands. The South Orkney Islands are shown in inset.

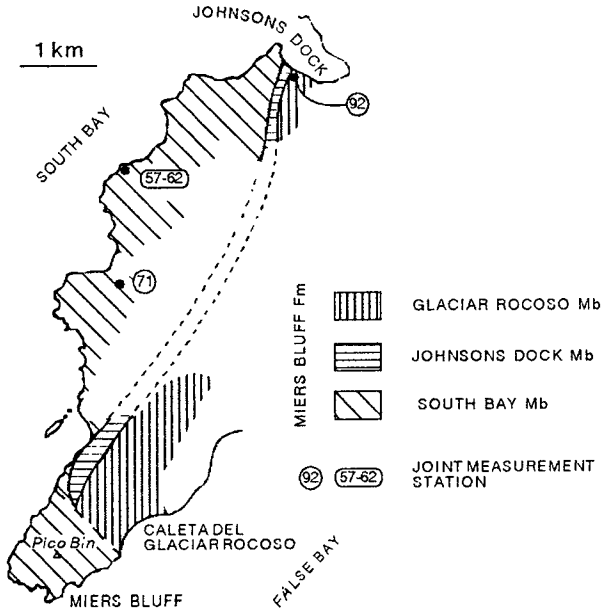

Fig. 2. Geological sketch of the MBF between Johnsons Dock and Sally Rocks with location of joint measurement stations.

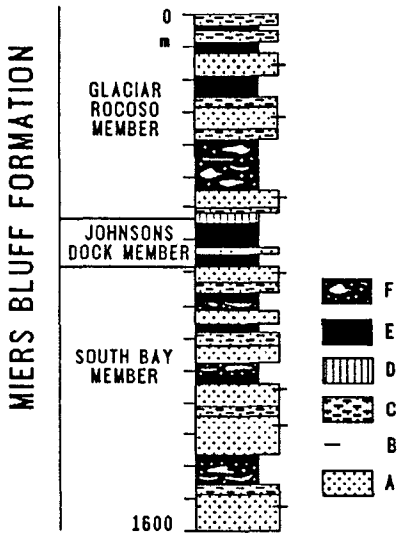

Fig. 3. Lithostratigraphic section of the Miers Bluff Formation.

its lithology and bedding characteristics: A-massive sandstones; B-bedded sandstones; C-sandstones and mudstones; D-sandstone/mudstone rhythmites; E-mudstones; F-chaotic deposits.

LITHOSTRATIGRAPHY

The differences in the lithology of the MBF have permitted subdivision of the formation into three mappable members (Figs 2, 3).

South Bay Member (SBM). The SBM is more than 850 m thick (base unknown). It consists mainly of sandstones with relatively rare mudstone interbeds, representing association A and B, and to a lesser degree C.

Johnsons Dock Member (JDM). The JDM attains ca. 150 m in thickness. The dominant lithology comprises claystones and mudstones of association E and D.

Glaciar Rocoso Member (GRM). The GRM (600 m thick) consists of sandstones and mudstones forming associations A-D, F, occasionally E. In contrast to the other members, there is no single dominant association.

DEPOSITIONAL ENVIRONMENT

The South Bay Member and Glaciar Rocoso Member correspond to the proximal and Johnsons Dock Member to the distal parts of a submarine fan.

PETROGRAPHY

The MBF is composed of mudstones, arkosic wakes, arkosic arenites, and pebbly mudstones containing exotic pebbles. The petrologic differentiation of mudstones, arkosic wackes and arenites is insignificant. Differentiation

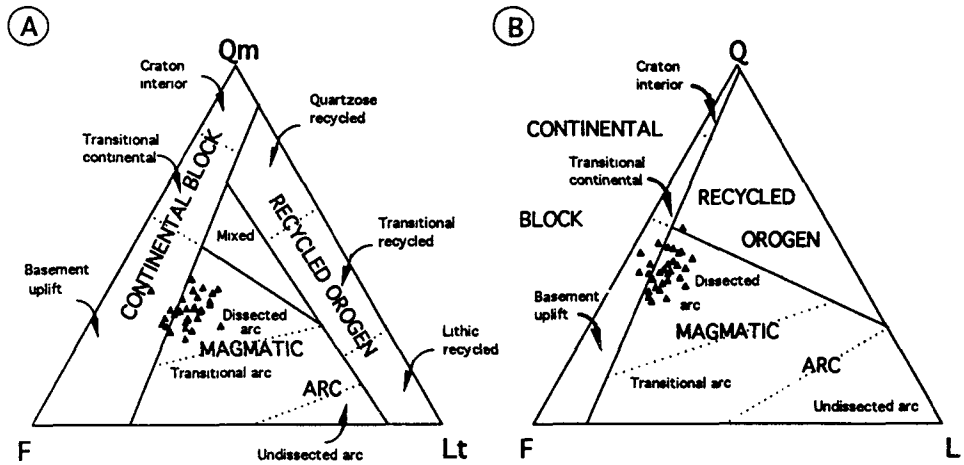

Fig. 4. Detrital modes for arenites plotted on provenance diagrammes; provenance fields after Dickinson; number of samples (n) = 32. A. QmFLt diagramme: Qm-monocrystalline quartz; f-total feldspar; Lt-total lithic grains (= polycrystalline quartz grains Qp + aphanic unstable lithic grains L;) B. QFL diagramme: Q-total monocrystalline Qm and polycrystalline Qp quartz grains; F-total feldspar; L-aphanic lithic grains.

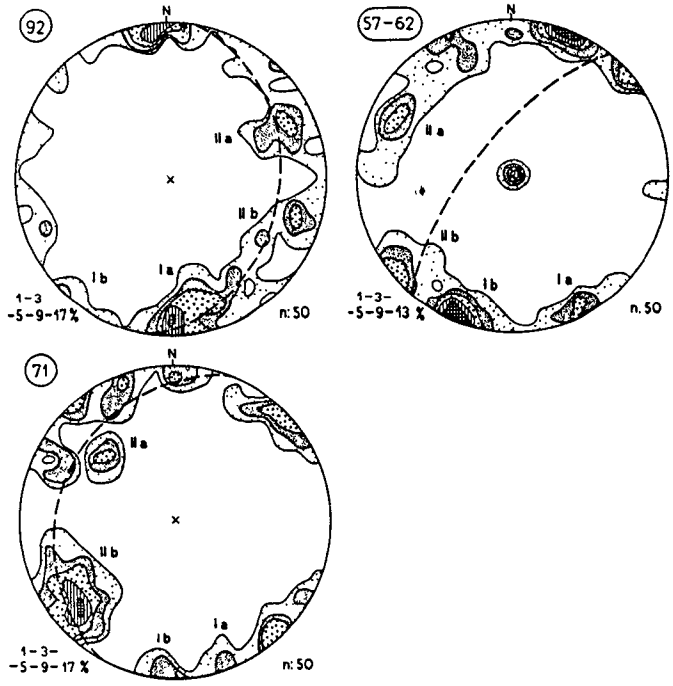

Fig. 5. Joints. Lower hemisphere plot. Great circle denotes attitude of bedding. Location of joint measurements stations on Fig. 2.

of arenites from various facies associations is very weak. There is no trend in change of the detrital modes in the stratigraphic succession of the MBF. For all facies associations, the average relative propottions of quartz (Q), feldspar (F) and lithic clasts (L) in terms of the QFL diagram are the same: $Q_{42\text{-}48}$ $F_{41\text{-}48}$ $L_{7\text{-}12}$ (Fig. 4B). On the QmFLt diagram of Dickinson the MBF samples of arenites plot within the dissected magmatic arc and basement uplift fields (Fig. 4A).

The source area of the MBF consisted largely of metamorphic and volcanic rocks, however, no traces of contemporaneous extrabasinal volcanism were found. The source area was possibly a dissected continental margin.

TECTONICS

The majority of the MBF strata occur in tectonically inverted position, striking NNE and dipping moderately towards WNW. This monocline is locally disturbed by folds of wavelenghts ranging from centimeter scale to a map scale. These folds are not cylindrical, they die out along their axes. Folded MBF strata are cut by two systems (I, II) of structures resulting from brittle deformation: joints (Fig. 5), quarz and magmatic veins and, minor, mostly strike-slip, faults.

STRUCTURAL DEVELOPMENT

The discussed structures correspond to three successive deformation stages: (1) folding around NNE oriented axis; and (2) and (3) brittle deformation in strike-slip tectonic regime with the maximum stress axis oriented respectively N90 (2) and N0 (3).