8 Deep marine slide and channel deposits from the Jurassic–Cretaceous Fossil Bluff Group, Alexander Island, Antarctica

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Setting

The Fossil Bluff Group (FBG: ?Bathonian–Albian) is the fill of a forearc basin which lay between the Antarctic Peninsula volcanic arc and an accretionary complex (LeMay Group) to the west (Figs 8.1 and 8.2). Volcanism in the arc, and accretion and deformation in the LeMay Group, were contemporaneous with sedimentation in the forearc basin. The basin was inverted during Late Cretaceous or Tertiary times during an episode of dextral transpressive deformation (Storey and Nell 1988). Tertiary igneous rocks in central and northern Alexander Island reflect arc migration, followed by Neogene extension.

Most of the FBG is made up of five formations, with an aggregate thickness of 7.2 km (Table 8.1; Butterworth *et al.* 1988; Moncrieff and Kelly 1993). These range in age from Kimmeridgian to Albian, are entirely arc-derived (Butterworth 1991) and form a broad shallowing-upward succession from deep marine to terrestrial (Butterworth and Macdonald 1991). This paper deals with large slide deposits (Ablation Point Formation) and submarine channel deposits (part of the Himalia Ridge Formation), which are particularly well exposed. Both formations have a consistent west or WNW palaeoslope.

Methodology

The FBG forms cliffs up to 600 m high and access is possible only in very few places. Most of the large cliffs have been photographed from the air using a hand-held 35 mm camera from a De Havilland Canada Twin Otter. Flying distance varied due to operating conditions, but was usually *c.* 500–1000 m at a speed of 80-90 knots. There was at least 60% overlap between frames which have been made into panoramic montages. Most of the oblique air photo montages are curved; this is due to changes in heading, or to unavoidable changes in aircraft attitude. Interpretive line drawings of all panoramas have been made, attempting to smooth out the worst of the curvature.

The interpretation is aided by the restricted number of lithologies and their distinctive appearance. Mudstones are silty and weather to black, smooth slopes. Sandstones of all grades weather white–cream, due to their high diagenetic laumontite content. Conglomerates tend to be brown-weathering and form distinctive rugged cliffs.

Ablation Point Formation

The Ablation Point Formation is defined on the presence of large syn-sedimentary slide deposits and consists of rafts and blocks of turbidite sandstone, with variable amounts of chaotic, mudstone-rich matrix. The formation is one of the largest ancient slide deposits recognized. The Ablation Point Formation is particularly well-exposed at its type locality at Ablation Point and at Belemnite Point, 20 km to the north. At neither locality is the base exposed.

The Himalia Ridge Formation

The Himalia Ridge Formation is a major unit of turbidite mudstone, sandstone and conglomerate. It is 2.2 km thick at its type locality, which is just inland of Ablation Point, and contains four major conglomerate complexes with WNW palaeocurrents. The conglomerate complexes are from 15 km to more than 22 km wide and 100–250 m thick. They represent inner fan channels incised into inter-channel deposits (Butterworth 1985, 1991). The Himalia Ridge Formation thins to both north and south from its type locality and the proportion of conglomerate declines. In the northern part of Planet Heights, which lie 25 km south of the type locality, the Himalia Ridge Formation is 1 km thick and comprises mainly mudstone. South from this is another channel complex which can be traced along strike for more than 17 km.

Discussion

The scale of these features is comparable to those seen on seismic sections. The exposure of the conglomerate complexes of the Himalia Ridge Formation permits detailed analysis of changes of depocentre with time (e.g. Butterworth 1991). The slide deposits of the Ablation Point Formation are the largest ever recognized in outcrop (Macdonald *et al.* 1993). Similar-scale features have been recognized on the Labrador Slope (Hesse, Ch. 2).

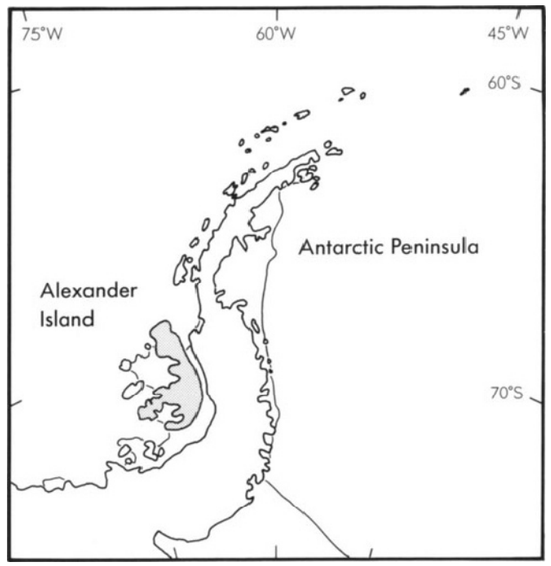

Fig. 8.1. Location of Alexander Island on the west side of the Antarctic Peninsula.

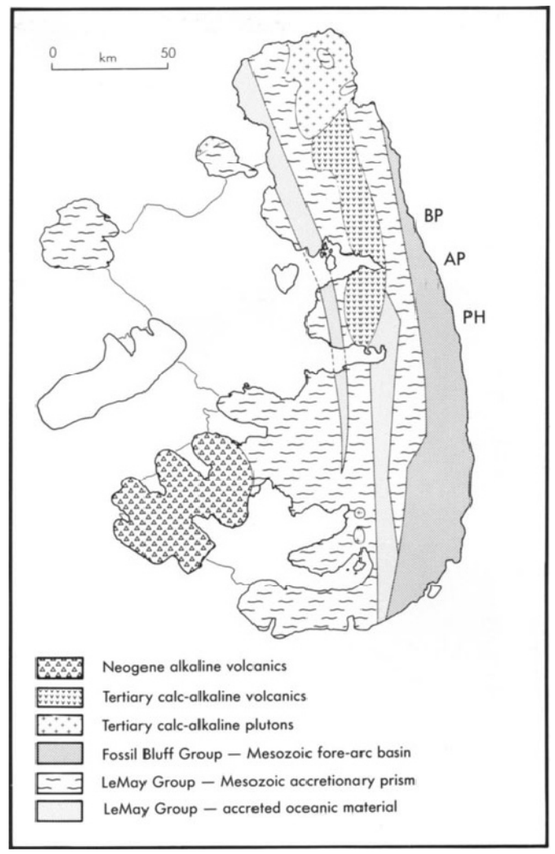

Fig. 8.2. Geological sketch map of Alexander Island. The position of the three localities figured in this paper are shown: AP: Ablation Point; BP: Belemnite Point; PH: Planet Heights.

Atlas of Deep Water Environments: Architectural style in turbidite systems. Edited by K.T. Pickering, R.N. Hiscott, N.H. Kenyon, F. Ricci Lucchi and R.D.A. Smith. Published in 1995 by Chapman & Hall, London. ISBN 0 412 56110 7.

Fig. 8.3. The Ablation Point Formation at Ablation Point.
Photo-mosaic (a) and interpretive sketch (b) of the slide deposits of the Ablation Point Formation at Ablation Point. The precise location of the photographic panorama is shown in (c), and the key used in this and all subsequent diagrams. Note that the top of Ablation Point (the prominent peak on the left) is *c*. 550 m above sea level (masl); the base of the screes varies between 25 and 50 masl.

At this locality, the Ablation Point Formation is at least 440 m thick. The lower part consists of a high proportion of matrix with blocks and sheets of interbedded turbidite sandstone and mudstone. The sheets are up to 1500 m long and 50 m thick and are only deformed at their margins; where adjacent sheets touch the contact is sharp (Fig. 8.4). Sheets define a series of slide planes with an east-dipping imbricate pattern. Near the top of the cliff at 3.5 km, a prominent area of chaotic matrix outlines the nose of two sheets. The proportion of matrix decreases and the size of the sheets increases down the inferred transport direction to the WNW. At 1–1.5 km one slide plane is overlain by blocks of pebbly sandstone up to 100 m long by 50 m thick. The upper part of the Ablation Point Formation is formed of several sheets (300–1000 m long). The number of sheets is uncertain, as contacts are sharp and sub-parallel to bedding. Strata in these sheets downlap sharply onto the slide plane below. The upper boundary can only be recognized where undisturbed strata onlap local relief.

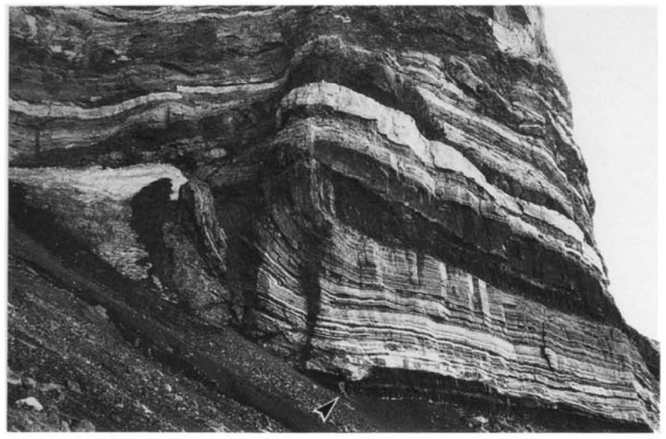

Fig. 8.4. Contact between two large rafts of turbidite sandstone and mudstone. Note figure for scale (arrowed).