Ministero dell'Università e della Ricerca Scientifica e Tecnologica
Programma Nazionale di Ricerche in Antartide

GIGAMAP
GERMAN-ITALIAN GEOLOGICAL ANTARCTIC MAP PROGRAM
PERTUSATI P.C. & TESSENSOHN F. Coord.

MOUNT JOYCE

Museo Nazionale dell' Antartide
Sezione di Scienze della Terra - Siena (Italy)

ANTARCTIC GEOLOGICAL 1:250,000 MAP SERIES
MOUNT JOYCE QUADRANGLE (VICTORIA LAND)

1999

co - Authors:
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EXPLANATION

- Scree, glacial debris and moraine (m). Quaternary.
- Ricker Hills tillite (RHt): massive matrix-supported diamictite (Sirius Formation?).

POST-ROSS MAGMATISM AND SEDIMENTATION

FERRAR VOLCANIC SUITE

KIRKPATRICK BASALT (Kb)
Subaerial lavas, a few metres up to several ten metres thick, randomly separated by thinner sedimentary volcanogenic interlayers and pillow lavas. Blue lines (omitted in the cross sections): local beds and lenses of whitish marly siltstones, fine grained sandstones and minor black shales, with fauna and flora relics mostly in the lower portion of the volcanic sequence.

FERRAR DOLERITE (Fd)
Tholeiitic dolerite sills and minor dykes, usually intruded in the sedimentary sequence of the Beacon Supergroup, immediately above the pre-Beacon peneplain. Black lines (omitted in the cross sections): major lenses and seams (meanly some ten metres thick) of Takrouna Formation sandstones forming sandwich type interlayers within the Ferrar Dolerite sills.

BEACON SUPERGROUP

Mainly fluviatile, cross-bedded, coarse- to medium-grained sandstone with a feldspathic to quartzose composition. Minor intercalations of conglomerate, black shale, carbonaceous or noncarbonaceous silty mudstone and minor coal occur as well. A Permian to (?) upper Triassic age is inferrable from "glossopteris flora" at Beta Peak and *Dicroidium* at Benson Knob.

TERRANES OF THE ROSS OROGEN
WILSON TERRANE

GRANITE HARBOUR IGNEOUS COMPLEX

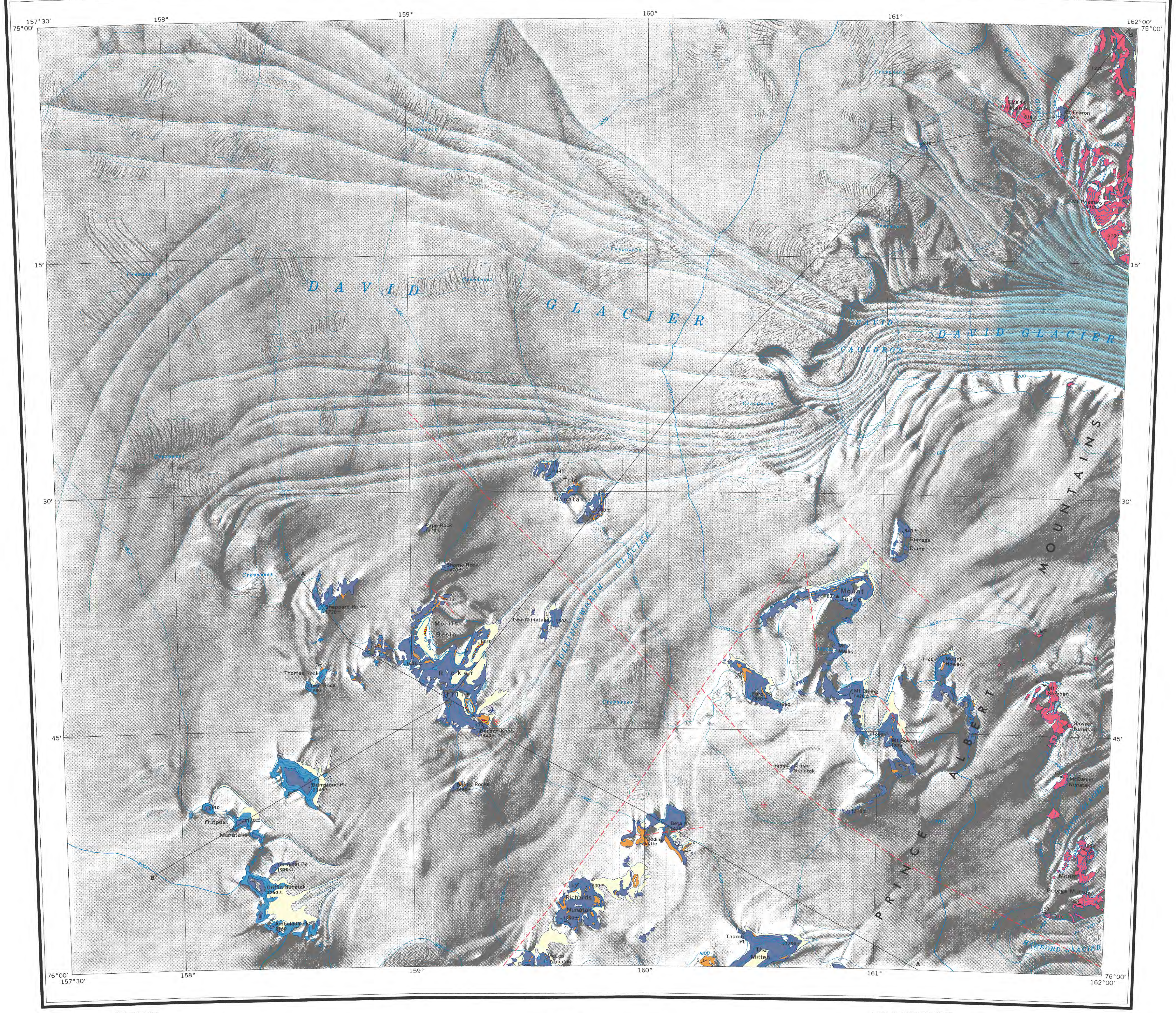
a **GRANITE HARBOUR GRANODIORITE AND GRANITE (GHgr)**
Syn- to post-kynematic biotite granite, granodiorite and tonalite intruded in the Wilson metamorphic complex before 480±20 Ma (cooling ages).
At some places, an intrusive breccia (a) forms large and thick bodies made up of migmatite gneiss blocks and pods in a granitoid matrix.

WILSON METAMORPHIC COMPLEX

AMPHIBOLITE FACIES METASEDIMENTS (Wa)
Fine- to medium-grained biotite schist with minor intercalations of quartz-biotite metasandstone. Biotite cooling ages indicate that metamorphism is older than 480 Ma. (Only in the geological cross section: A-A').

SYMBOLS

〜	Geological boundary.
⤫ 26	Bedding.
⤫ 30	Magmatic fluidality.
▨	**Felsic and mafic dyke swarm.** A lot of dykes, both felsic and mafic in composition, belong to the Granite Harbour Igneous Complex, but several mafic dykes pertain to the McMurdo Igneous Complex.
၆	Fossils (branchiopods).
♣	Fossil plants.
⊥	Fault; tick (on the downthrown side) or arrows where the sense of motion is known.
✳	Shots ACRUP 1993 - 1994.



TOPOGRAPHIC BASE:
U.S. GEOLOGICAL SURVEY MAPS, ANTARCTICA , 1:250.000 RECONNAISSANCE SERIES
Provided by courtesy of the U.S. Geological Survey

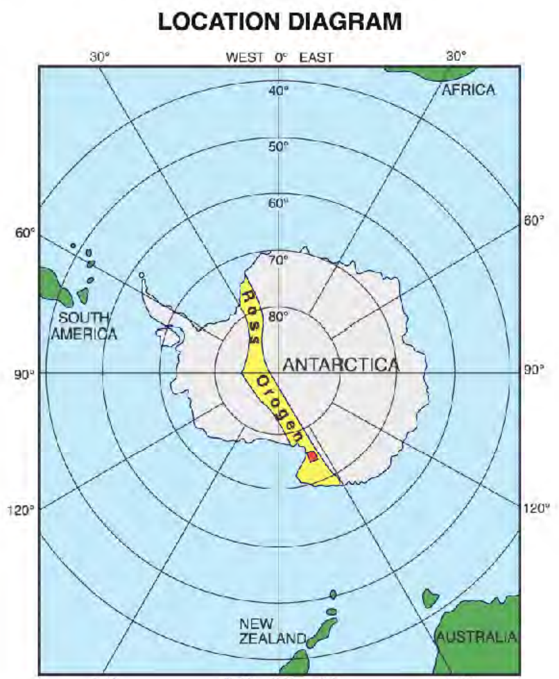
SCALE 1:250,000

5 0 5 10 15 20 Statute Miles

5 0 5 10 15 20 25 30 Kilometres

Lambert Conformal Conic Projection · Standard Parallels 72°40' and 75°20' · Contour Interval 200 Meters · Datum is mean sea level

LOCATION DIAGRAM



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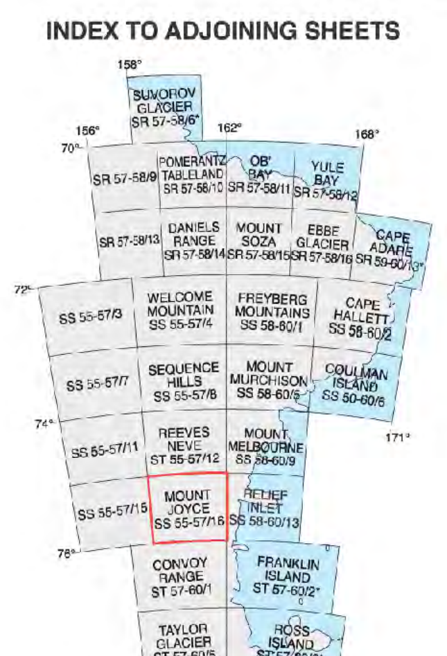

GEOLOGICAL OUTLINES

PREVIOUS WORK

The region considered here was first visited during the Heroic Age of Antarctic exploration. The Magnetic Pole Party of the Shackleton Expedition (1907 - 1909) crossed the Transantarctic Mountains at the David Glacier. The party included two geologists, Edgeworth David and Douglas Mawson, who did geological observations during the sledging toward the Magnetic Pole (David, 1909).

Scott's Northern Party surveyed the region around Terra Nova Bay in 1912, before being forced to winter-over in a snow-cave on Inexpressible Island (Priestley, 1914, 1915, 1923; David and Priestley, 1914; Smith and Priestley, 1921). In the sixties several field parties (Gunn and Warren, 1962; Ricker, 1964; Skinner and Ricker, 1968a, 1968b; Warren, 1969, Skinner, 1983), surveyed the area between McMurdo Sound and Terra Nova Bay establishing the overall framework of regional geology. In the 1985/86, geologists of the first ItaliAntartide expedition carried out some geological investigations in Terra Nova Bay area, which continued in the following seasons and produced a 1/500,000 geological map (Carmignani et al., 1987). ItaliAntartide and Ganovex expeditions of the following years triggered the publication of a number of papers. Contributions by Antonini et al. (1997); Armienti et al. (1988); Biagini et al. (1989); Cimini et al. (1995); Coren et al. (1997); Delisle (1994a, 1994b); Fitzgerald and Baldwin (1997); Ghezzo et al. (1987); Redfield and Behrendt (1992); Redfield et al. (1990); Reitmayr (1994, 1997); Rocchi et al. (1994); Salvini et al. (1997a, 1997b); Wörner (1992) are specifically related to the Mount Joyce quadrangle.

In the austral summer 1993/94, a joint scientific party including researchers from Germany, Italy and U.S. carried out an onshore-offshore geophysical transect, the ACRUP-1 Experiment. It was performed along two east-west crustal profiles at 76°S and 77°S for a total length of about 900 km (Della Vedova et al., 1994; ACRUP Group, 1995), from the Transantarctic Mountains across part of the West Antarctic Rift System (Behrendt et al., 1996, and ref. therein). The WNW-ESE onshore part of the northern transect runs from far to the west of Brimstone Peak to the Ross Sea coastline, south of Varney Nunatak (Relief Inlet quadrangle). The ACRUP-1 Experiment involved gravity, geomagnetic, radar and wide-angle seismic investigations, and its goal was to study the crustal and subcrustal structures at the transition between the Transantarctic Mountains and the Ross Sea depression. The main results are summarised in Bozzo et al., (1997a, 1997b, 1997c), Della Vedova et al. (1997), Ferraccioli and Bozzo (1999), Pondrelli et al. (1997) and Reitmayr et al. (1997).

SHORT DESCRIPTION OF GEOLOGY

The Mount Joyce quadrangle encompasses an early Paleozoic granitic basement and a flat-lying cover spanning in age from Permian to Jurassic. The basement consists of large bodies of the late Cambrian Granite Harbour Igneous Complex, belonging to the Wilson Terrane, the westernmost of the tectonic units which form the Ross Orogen at the Pacific edge of the Transantarctic Mountains. During the Paleozoic this orogen was uplifted and eroded. On the resulting peneplain surface, the Permian-Triassic Beacon Sandstone was deposited, which in turn was covered by large flows of the Jurassic Kirkpatrick Basalt. The Jurassic Ferrar Dolerite formed sills chiefly along the basal Beacon horizon.

The geological history is scanty recorded from the Jurassic age. A thermal event is hypothesised at the Cretaceous (Delisle & Fromm 1989). Some basaltic dykes are the record of the widespread Paleogenic magmatism. Tillites (Miocene-Pliocene?), tentatively correlated to the Sirius Formation, and younger moraine deposits are the most evident features of the Cainozoic-to-recent glacial evolution.

LITHOSTRATIGRAPHY

WILSON TERRANE

Granite Harbour Igneous Complex

During the last fifteen years, some petrographic and geochemical differences with a regional significance have been described for these plutonic rocks in Victoria Land, particularly in the area between Aviator Glacier and the Mountaineer Range, Mount Murchison quadrangle (Capponi et al., 1997). Borg (1984), Borg et al. (1986), and Vetter and Tessensohn (1987) stated that these intrusive rocks occur in two NW-SE trending belts throughout the Wilson Terrane, which are interpreted as the magmatic signature of an active continental margin. The western belt is made up of S-type, peraluminous, two-mica and mainly K-feldspar porphyritic granite; coeval I-type hornblende granodiorite, diorite and tonalite form minor plutons and dykes. The eastern belt comprise I-type, mainly granodioritic to tonalitic intrusive rocks. All the granitic bodies that occur in this quadrangle belong to the western belt.

Granite Harbour Granodiorite and Granite (GHgr)

These rocks form the massifs that crop out in easternmost part of the quadrangle, i.e. in the Prince Albert Mountains north and south of the David Glacier (Mount Priestley, Mount Stephen, McDaniel Nunatak, and Mount George Murray). Intrusive rocks mainly consist of coarse-grained disequigranular granite and granodiorite, with K-feldspar megacrysts. Microgranular mafic enclaves of dioritic composition are widely diffuse in the granodiorite, while their abundance strongly decreases in the granite. The granodiorites show a foliated fabric defined by shape preferred orientation of K-feldspar megacrysts and mafic enclaves; the latter have strongly elongated shapes parallel to the K-feldspar alignment. This fabric corresponds to a magmatic foliation, well developed at Mount George Murray and McDaniel Nunatak, which trends N110°-120°E and dips moderately to steeply toward NE. The granites, although characterised by more abundant content of K-feldspar megacrysts, show poorly foliated or unfoliated fabrics and are further characterised by diffuse occurrence of pegmatite dykes of variable thickness.

In northern Victoria Land, the Granite Harbour rocks are emplaced in the metamorphic rocks of the Wilson Terrane. In this quadrangle the metamorphic rocks do not occur, and the only relationships between the intrusive rocks and an older metamorphic basement can be observed at the southern slopes of Mount Priestley. Here an intrusive breccia is exposed and, although no landing was possible, it is very probable that this outcrop contains several fragments and blocks of the high-grade metasedimentary rocks of the Wilson Terrane (i.e. the Priestley Schists). Most of the granitic bodies are cut by dykes, which are widespread at Starr Nunatak, Mount George Murray, McDaniel Nunatak and Sawyer Nunatak. Most of the dykes are subvertical and strike from N5°E to N40°E (see also Kleinschmidt and Matzer, 1992; Stackebrandt and Thiedig, 1992). In some outcrops different generations of dykes with mutual crosscutting relationships were observed. Subvertical red-coated dykes proved to be related to the Irizar Granite (Dallai et al., 1998) and in places are crosscut by black mafic dykes, which are probably related to the McMurdo volcanic rocks. A truly spectacular example of this occurs at the D'Urville Wall, on the northern side of the David Glacier, close to the eastern border of the map (see Relief Inlet quadrangle, Capponi et al., 1999). No radiometric data are available for the intrusive rocks in this area. However, their petrographic features allow to refer these rocks to the Larsen Granodiorite for which, in the adjacent Relief Inlet Quadrangle, a biotite Rb/Sr cooling age of 498 ±11 Ma has been obtained (Borsi et al., 1987). Therefore, also in the Mount Joyce quadrangle a similar age can be assumed for the intrusive rocks lying beneath the Beacon Supergroup sedimentary cover.

BEACON SUPERGROUP

The base of the Beacon Supergroup is represented by a remarkable peneplain surface, which is equivalent to the Kukri Peneplain as defined in the Dry Valleys (Barrett et al., 1986). Above this surface the clastic Beacon deposits unconformably rest on the underlying basement. In the Freyberg Mountains quadrangle the Beacon strata rest on the Late Paleozoic diamictite (50–70 m thick; Collinson & Kemp, 1983). The same tillites at the base of the Beacon, have been found in the SW corner of the Mount Melbourne quadrangle. The occurrence of these tillites confirms the pre-Permian erosion of the basement. The "Glossopteris flora" newly discovered at Beta Peak (Pertusati et al., 1998) testifies the presence of the Permian interval of the Beacon succession also in this region. The abundant flora relics were found in a coal-rich sequence of arenitic to shaly strata cropping out at a low small ridge SSE of Beta Peak; the sequence is about 40 m thick and is exposed over some hundred metres of lenght.

Moreover, well preserved Dicroidium odontopteroides subsp. orbiculoides and Dicroidium zuberi relics to be ascribed to Middle Triassic (Ladinian) and Early Triassic ((Scythian)(Pertusati et al., 1998; Brambilla,1999 unpublished data) were found at Benson Knob, southern Ricker Hills. It must be underlined that the occurrence of both "Glossopteris flora" and Dicroidium in these sediments implies existence of both the Takrouna Formation (Dow and Neall, 1974) and the Section Peak Formation (Collinson et al., 1986), but problems of stratigraphic correlation and nomenclature arise as well, as we cannot locate at any place the contact between the two lithostratigraphic units. As a consequence, we have indicated all the Beacon Supergroup outcrops as "Beacon sediments" (Bs), and attributed the indexes Tf (=Takrouna Formation) and Sf (Section Peak Formation) only to the Bs outcrops at Beta Peak and Benson Knob (souther Riker Hills), respectively, where the guide flora fossils where found (Pertusati et al., 1998). The contact between the Beacon sediments and the underlying Ross age granitic basement is exposed in the NE side of the Convoy Range Quadrangle, adjacent to the southern boundary of this map; the Ross basement is directly in contact with the Ferrar Dolerite in the NE corner of this quadrangle (southern slopes of Mt Fearon).

Major outcrops of Beacon Supergroup are at Ricker Hills, Thomas Rock, Pudding Butte, Richards Nunatak, the unnamed outcrop west of The Mitten, and the northwestern part of the Ford Peak. Minor outcrops occur in the upper parts of Mount Howard and Mount Billing. Several 10 to 100 m-wide slices and bodies of Beacon sandstone are incorporated in the Ferrar dolerites at Mount Joyce (northern side), Mount Howard, The Mitten, and Mount Bowen (eastern side).

Due to the cross-bedding inside these blocks, and their tilting caused by the emplacement of the dolerite sills, the attitude of the Beacon sandstones can not be always correctly estimated. Anyway, at large scale the sandstone beds dip very gently toward south and/or southwest, and the dolerite sills share the same attitude.

FERRAR VOLCANIC SUITE

Two formations are distinguished in this suite: Ferrar Dolerite and Kirkpatrick Basalt. The stratigraphic relationships of these formations are puzzling; the sills are regarded younger than the basalt flows (Roland and Wörner, 1996), but their relationships are not always clear, due to the partial convergence in lithological features and colour. In places, an emplacement of dolerite sills in basalt flows is supported by rafts of basalts floating in the dolerite (e.g. at Brimstone Peak), just the same as the rafts of Beacon sediments.

Ferrar Dolerite

The Ferrar Dolerite (Fd) consists of tholeiitic dolerite sills and minor dykes, usually emplaced inside the lower part of the sedimentary sequence of the Beacon Supergroup. Spectacular examples of concordant and discordant sills are visible along the Trio Nunataks southeastern hill. Major outcrops are in the central part of the quadrangle, where all the nunataks are made up of Ferrar dolerite. In the westernmost part of the quadrangle (Brimstone Peak, Outpost Nunataks, Griffin Nunatak), the occurrence of the Ferrar Dolerite is restricted to the upper part of the nunataks, above the Kirkpatrick Basalt. North of the David Glacier the Ferrar Dolerite occurs at Mount Fearon and at the spot height ±810. The sills show a general dip to the west or southwest; due to the very low inclination this is best evident in a panoramic view.

No radiometric age data are available for the Ferrar Dolerite that occurs in this quadrangle. To the north (at Archambault Ridge, Mount Murchison quadrangle), a K/Ar age of 174±10 Ma was reported by Brotzu et al. (1990).

Kirkpatrick basalt

The Kirkpatrick Basalt (Kb) consists of amygdaloidal lavas with rare tuffaceous and sedimentary interbeds. The lavas are typical tholeiites with two pyroxenes, plagioclase and glassy mesostasis. Vugs and cavities are very frequent and filled by secondary minerals, in most cases zeolites (Vezzalini et al., 1994). The lowermost part of the sequence was distinguished as a separate formation by Elliot et al. (1986), and named the Exposure Hill Formation by the same authors. It consists of volcanoclastic matrix-supported sediments with elements up to some metres in size; vegetal relics are common, and marly sandstones and marls occur at some levels.

In this quadrangle the Kirkpatrick Basalt flows extensively occur at Tent Rock, Brimstone Peak, Outpost Nunataks, Ambalada Peak and McLea Nunatak. Spectacular fossil trees occur at a small unnamed nunatak north of Brimstone Peak. A sample collected at Brimstone Peak and coming from the Ricker's collection (Tash, 1982) supplied Conchostracans of Jurassic age. In some outcrops, where the basal stratigraphic contact with the underlying Beacon sandstone is well exposed (Thomas Rock and an unnamed nunatak east of Thomas Rock), volcanoclastic deposits occur at the base of the whole Ferrar Volcanic Suite. These deposits, on the ground of their lithology and stratigraphic position, are correlated with the Mawson Formation (Gunn and Warren, 1962; Korsch, 1984) and the Exposure Hills Formation (Elliot et al., 1986), which represent two volcanoclastic horizons defined in South Victoria Land (Dry Valleys) and North Victoria Land (Mesa Range) respectively. The volcanoclastic deposits (not distinguished in the map) consist of angular to subrounded clasts of dolerites, basalts and Beacon sandstone, ranging from centimetre to metre size, which are embedded in an arenaceous volcanic matrix.

The presence of these clasts could suggest the occurrence of an early magmatic pulse with the emplacement of dolerites and basaltic lava flow. Erosion and sedimentation before the main flood basalt eruption, dated at 176.6±1.8 Ma (Fleming et al. 1997) followed it. The widespread occurrence of these volcanoclastic breccias (this quadrangle, Mawson Formation and Exposure Hills Formation) indicates two magmatic pulses at regional scale. These considerations are in good agreement with Elliot et al. (1986) who concluded that Ferrar volcanism consists of two magmatic events: the Exposure Hill explosive volcanism which was followed by rapid erosion and flood basalt eruptions (Kirkpatrick Basalt *sensu stricto*). The duration of the whole Ferrar magmatism less than 1 m.y. (Heimann et al., 1994; Fleming et al., 1997) indicates a very high rate of volcanic and sedimentary processes at regional scale (1400 km). According to Heimann et al. (1994) the short duration of Ferrar volcanism is strictly comparable with other flood basalt sequences, e.g. the Deccan Traps, Siberian Traps and Paraná basalts.

Further age data were obtained north and south of this quadrangle. To the north, K/Ar dates indicate 178 Ma as a minimum age for the whole volcanic succession of the Mesa Range (Elliot and Foland, 1986); in the same area, a $^{40}Ar/^{39}Ar$ date of 174.2±1 Ma was obtained by McIntosh et al. (1986). To the south (Convoy Range quadrangle), a $^{40}Ar/^{39}Ar$ date of 176.4±0.4 was obtained at Carapace Nunatak (Heimann et al., 1994).

Ricker Hills Tillite

Tillite sediments crop out at different elevations in the Ricker Hills area. They are covered by Late Pleistocene glacial drift, and lie unconformably on the Beacon sandstone and Ferrar Dolerite. Tillite consists of massive matrix-supported diamictite with frequent striated pebbles and cobbles. Clasts are mainly dolerite, basalt, sandstone, marl, charcoal and silicified marl. The sandy-silt matrix is yellowish at the weathered surface and grey in the interior. The maximum thickness is 20 m. These tillites can tentatively be correlated to the Sirius Formation in the Dry Valleys (Miocene-Pliocene?).

MCMURDO IGNEOUS COMPLEX

No major outcrop occurs in this quadrangle and the presence of McMurdo volcanic rocks is limited to dyke sets, emplaced in the Granite Harbour Intrusive rocks. Seemingly, no McMurdo dykes was emplaced in the Ferrar Dolerite and Kirkpatrick Basalt, but due to similar field aspect and colour, the possible occurrence of dykes could go unnoticed.

TECTONICS

ROSS TECTONICS

In this quadrangle the effects of the Ross tectonic events are not evident, apart the occurrence itself of the Granite Harbour intrusive rocks which were interpreted as the magmatic signature of a Ross-age continental margin convergence. The most common mesoscopic structure is the magmatic foliation, which characterises most of the intrusions belonging to the Larsen Granodiorite. The occurrence of foliated intrusive bodies, testifies that the emplacement of Granite Harbour Igneous Complex was coeval with the Late Cambrian - Early Ordovician Ross Orogen deformation.

From a geophysical point of view, the magnetic lineament flanking the eastern side of the Gitara Anomaly Complex (Bozzo et al., 1997d) separates areas featuring contrasting high-frequency anomalies as well as more regional patterns. This NW-SE magnetic lineament crosses the David Glacier in the NE corner of the quadrangle, and continues in the adjoining Relief Inlet quadrangle, roughly parallel to the coast; it was defined by Ferraccioli and Bozzo, (1999) the "Central Victoria Land Boundary". This lineament is tentatively interpreted to be the unexposed southern continuation of the Exiles Thrust of Ross Age, recognized from geological field work and magnetic survey much more northwards, along the Pacific Coast (Flöttmann & Kleinschmidt 1991). Bosum et al. (1989) and Roland (1991) suggested that this lineament marks the boundary between the Ross Orogen and the East Antarctic shield.

POST - ROSS TECTONICS

The most striking and widespread feature related to the post-Ross tectonics, is represented by the regional unconformity along the pre-Beacon peneplained surface. This surface is the only record that testifies a pre-Permian uplift and erosion of the Ross Orogen. At the regional scale this surfaces postdates the emplacement of Devonian Admiralty Igneous Complex in the Mount Murchison Quadrangle (Capponi et al., 1997) and predates the deposition of Beacon strata with Glossopteris flora of Permian age, cropping out in this quadrangle.

The most prominent physiographic and tectonic lineament linked to the post-Ross tectonics is the David Glacier. The northern shoulder of this glacier corresponds to a system of NW-SE trending normal faults steeply dipping toward southwest, with a minimum vertical throw of 200 m. To the south of the David Glacier, the Late Paleozoic-Mesozoic volcano-sedimentary cover weakly dips (2°-4°) toward south and southwest, and is affected by gently folding at the map scale. Two, NW-SE and NE-SW trending fault systems dissect the Paleozoic basement and the volcano-sedimentary cover with a vertical throw of some hundred meters on single fault. Their occurrence has been recognised on the basis of: (i) difference in elevation of the Beacon strata along east-west sections, (ii) sub-ice topography (Delisle 1994b) and (iii) local tilting (up to 15°) of sedimentary layering (e.g. north of Mt. Bowen and Morris Basin).

The NW-SE system is more prominent than the NE-SW one; the latter corresponds to a NW dipping fault that lowered the area west of the Hollingsworth Glacier. On the fault surfaces, which can be rarely observed, the slickensides and striae are down dip with a minor component of strike-slip motion. According to Fitzgerald et al. (1986) and Fitzgerald (1992), the David Glacier Lineament separates two segments of the Transantarctic Mountains characterised by different amount of uplift and direction of the rift shoulder escarpment. Mazzarini et al. (1997) interpreted the David Glacier Lineament as a major transfer structure, separating the northern and southern Victoria Land segments. The data on the distribution of Mesozoic and Cenozoic rocks and of the Kukri Peneplain suggest a smaller amount of uplift for the southern segment with respect to the northern Victoria Land (Fitzgerald, 1992). The David Glacier Lineament marks also a change in direction of the rift shoulder escarpment of the West Antarctic Rift System, which is locally right-lateral offset by about 10 km. Emplacement of post-Ross E-W dacitic dykes is also connected with a dextral sense of shearing (Stackebrandt and Thiedig, 1992).

The age and activity of the David Glacier Lineament is not well constrained; its offshore prolongation affects the acoustic basement only and not the Cenozoic sequences. However, a genetic link between the E-W trending features and the Jurassic magmatism is suggested by Wilson (1995) and Bozzo et al.(1997d); hence, a Mesozoic-Cenozoic reactivation of these tectonic features is probable. In this case the David Glacier Lineament may well have influenced the tectonic patterns of the moderately uplifted Prince Albert Mountains block during rift/uplift phases, which occurred along the margin of the East Antarctic Craton in the Mesozoic and Cenozoic. Other field data by Rossetti and Storti (1998) indicate that the Cenozoic tectonic framework is dominated by NW-SE trending right-lateral strike-slip faulting, which is in good agreement with the features of the Ross Sea. The Mount Joyce and the adjoining Relief Inlet quadrangles were the site of the ACRUP-1 (Antarctic Crustal Profile), a geophysical experiment which complements the previous GANOVEX V seismic refraction experiment over the Deep Freeze Range (O'Connell and Stepp, 1993). One of the most interesting results from the onshore part of this seismic experiment is the presence of a 7.7 to 7.8 km/s layer just beneath the interpreted Moho. This could be a cushion of soft upper mantle material similar to the one detected at the base of the Deep Freeze Range crust (O'Connell and Stepp, 1993). This layer may have a regional extent and be related to the thermal perturbation of the mantle beneath the Transantarctic Mountains. Progressive migration of such a layer beneath the Transantarctic Mountains could be the origin of differential thermal uplift of different crustal blocks (Della Vedova et al., 1997).

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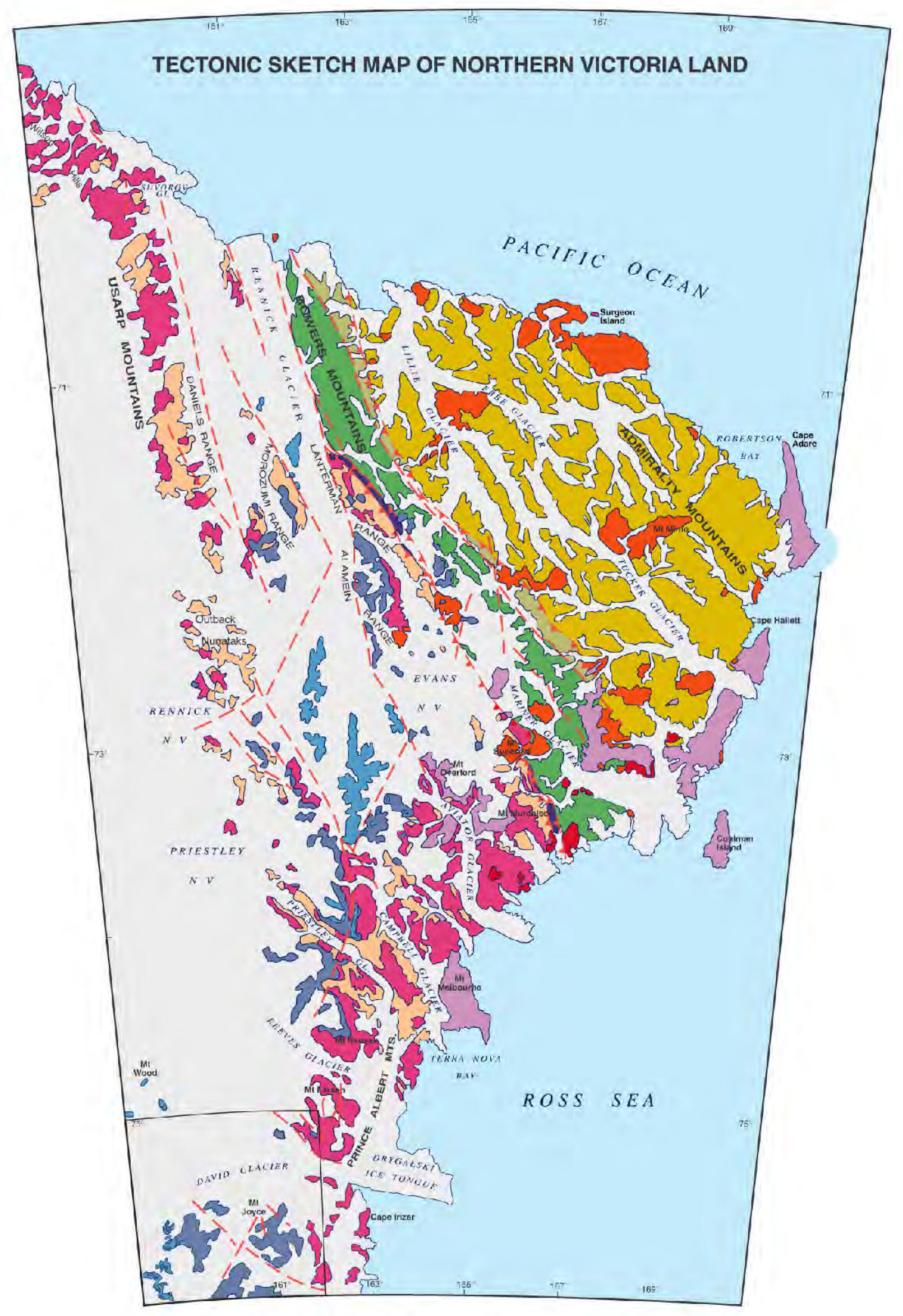
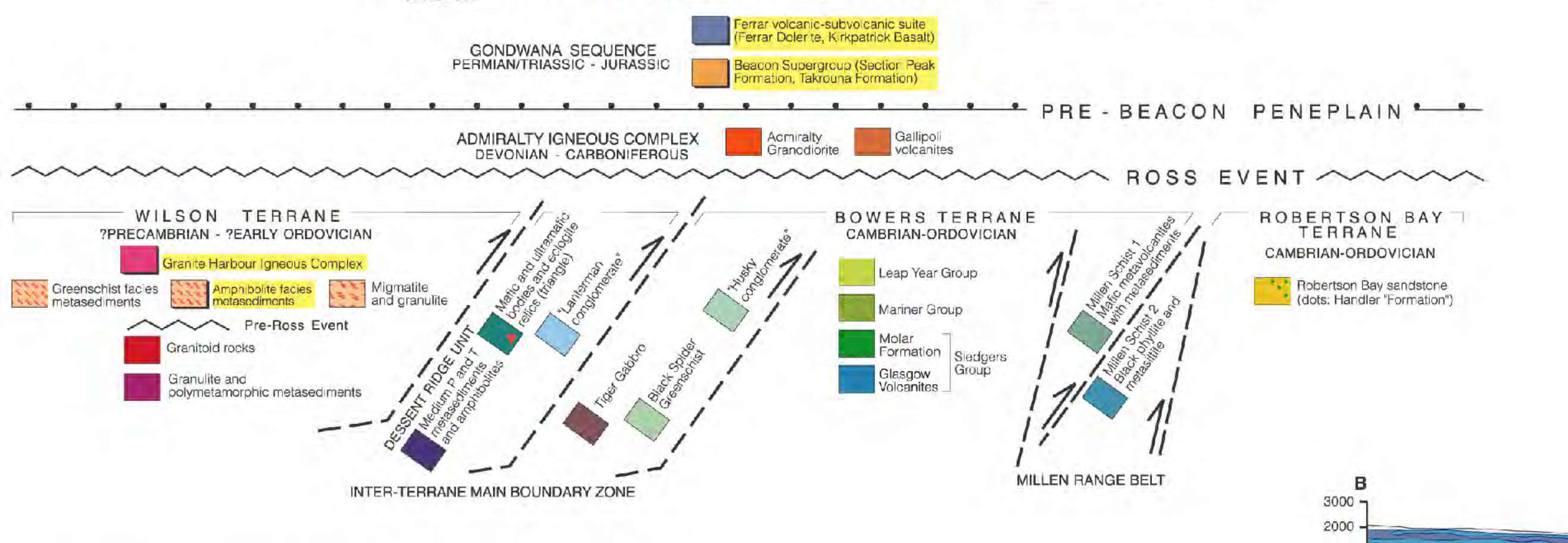

TECTONIC SKETCH MAP OF NORTHERN VICTORIA LAND

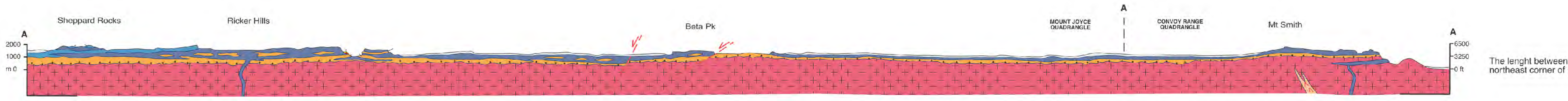
CENOZOIC MAGMATISM AT THE ROSS SEA MARGIN
- McMurdo Igneous Complex: Meander Granite and Syenite (a); Malta, Hallett and Melbourne Volcanic Suites (b)

POST-ROSS MAGMATISM AND SEDIMENTATION
- Kirkpatrick Basalt (a); Ferrar Dolerite and Beacon Supergroup (b)
- Admiralty Igneous Complex
- Thrusts
- Faults

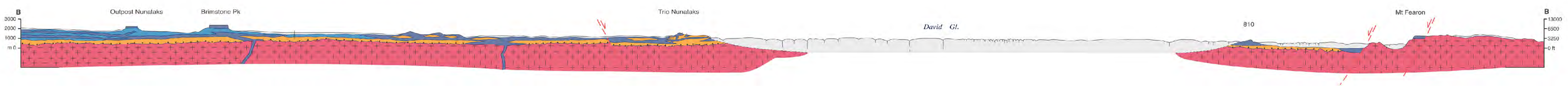
TERRANES AND UNITS OF THE ROSS OROGEN
- Wilson Terrane: Wilson Metamorphic Complex (a); Granite Harbour Igneous Complex (b)
- Dessent Ridge Unit in the Mountaineer Range and possible correlatives at the eastern margin of the Lanterman Range
- Bowers Terrane
- Millen Schist
- Robertson Bay Terrane

SYNOPTIC TABLE OF STRATIGRAPHIC AND TECTONIC RELATIONSHIPS IN NORTHERN VICTORIA LAND
Units occurring in the quadrangle are highlighted in yellow





The lenght between A and A referes to the northeast corner of Convoy Range Quadrangle



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