Journal of Maps

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/tjom20

Geology of the northern Convoy Range, Victoria Land, Antarctica

Giovanni Capponi , Chiara Montomoli , Stefano Casale & Matteo Simonetti

To cite this article: Giovanni Capponi , Chiara Montomoli , Stefano Casale & Matteo Simonetti (2020) Geology of the northern Convoy Range, Victoria Land, Antarctica, Journal of Maps, 16:2, 702-709, DOI: 10.1080/17445647.2020.1822218

To link to this article: https://doi.org/10.1080/17445647.2020.1822218

JOURNAL OF MAPS
2020, VOL. 16, NO. 2, 702–709
https://doi.org/10.1080/17445647.2020.1822218

Science

OPEN ACCESS Check for updates

Geology of the northern Convoy Range, Victoria Land, Antarctica

Giovanni Capponi [a], Chiara Montomoli [b], Stefano Casale[c] and Matteo Simonetti[b]

[a]DISTAV, University of Genoa, Genoa, Italy; [b]Dipartimento di Scienze della Terra, University of Turin, Turin, Italy; [c]Dipartimento di Scienze della Terra, University of Pisa, Pisa, Italy

ABSTRACT
In this paper, we supply a geological map of the area between 76°–76°30′S and 159°–163°E, that was the only missing portion to complete an entire coverage of Victoria Land, filling the gap between the GIGAMAP program (to the north) and the maps by the New Zealand Antarctic program (to the south). The mapped area encompasses an early Paleozoic basement, and a flat-lying cover of sedimentary and igneous rocks, Permo-Triassic to Jurassic in age. The basement consists of large bodies of the Granite Harbour Igneous Complex, a granitic complex linked to the Ross Orogeny. After the early Paleozoic Ross Orogeny, the area was uplifted and eroded, and the sandstones of the Beacon Supergroup were deposited on the resulting erosion surface. The Beacon Supergroup sandstones were in turn covered and in most cases incorporated into the volcanic and sub-volcanic rocks of the Jurassic Ferrar Group.

ARTICLE HISTORY
Received 14 November 2019
Revised 17 March 2020
Accepted 7 September 2020

KEYWORDS
Geological mapping; Convoy Range; Victoria Land; Antarctica

1. Introduction

In northern Victoria Land (Antarctica), the activity of German and Italian geologists has resulted in several geological maps (Carmignani et al., 1987; Ganovex & ItaliAntartide, 1991; Ganovex & ItaliAntartide, 2003; Ganovex Team, 1987). Additionally, in 1995, German and Italian geologists signed an agreement of cooperation (the GIGAMAP program, Capponi et al., 2002) to cover the entire northern Victoria Land region with new geological mapping at the scale 1:250,000. In the Dry Valleys area, geological mapping has been carried out principally by New Zealand geologists (Cox et al., 2012; Gunn & Warren, 1962; Pocknall et al., 1994), and their maps, together with the GIGAMAP maps, give an almost complete coverage of Victoria Land. However, the area between 76° and 76°30′S (the northern part of the Convoy Range and Franklin Island quadrangles, 1:250,000 topographic sheets by USGS) has yet to be mapped in any detail and is devoid of updated geological observations: the aim of this paper is to supply the geological map of this area.

2. Methods

The 1:250,000 scale Main Map covers an area of about 6665 km^2. Mapping was performed during two ItaliAntartide expeditions (XXXIII Expedition in austral summer 2017/2018 and XXXIV Expedition in austral summer 2018/2019). Field work was carried out by a three-person team and was helicopter-supported. Field activity was organized in daily missions from the Italian Mario Zucchelli Station (2017/2018) and in a period of stay in a tent camp (2018/2019), at Starr Nunatak (75°54′S 162°35′E), in order to be able to reach the most distant sectors of the study area. Mapping was coupled with the collection of rock samples that we studied in thin section after the expeditions, in order to better characterize the lithotypes.

The topographic base comes from a mosaic of two 1:250,000 USGS quadrangles i.e. the Convoy Range and the Franklin Island quadrangles; they were used both in the field and for the final construction of the Main Map. The Franklin Island quadrangle includes a large area of the Ross sea, with two small islands in the eastern part, i.e. the Beaufort and Franklin islands, that we were not able to visit and map. Because of this, we excluded from the Franklin Island quadrangle the area covering the sea and the unvisited islands and join the trimmed area with the Convoy Range quadrangle.

3. Geological framework

The Convoy Range-Franklin Island quadrangles encompass an early Paleozoic granitic basement, and a flat-lying cover of sedimentary and igneous rocks, spanning in age from Permo-Triassic to Jurassic.

The early Paleozoic basement consists of large bodies of the late Cambrian-early Ordovician Granite Harbour Igneous Complex, enclosing minor bodies of metamorphic rocks of the Wilson Terrane. The Wilson Terrane includes low-medium- to high-grade

CONTACT Giovanni Capponi capponig@gmail.com DISTAV, University of Genoa, Corso Europa 32, 16132 Genoa, Italy

metamorphic rocks of inferred Precambrian-Cambrian age, deformed and metamorphosed in the early Paleozoic Ross Orogeny (late Cambrian–early Ordovician). After the Ross Orogeny, the area was uplifted and eroded, and the sandstones of the Beacon Supergroup were deposited on the resulting peneplain surface. The Beacon sandstones were in turn intruded by the sills of the Jurassic Ferrar Dolerite, and in most cases incorporated into the dolerite.

4. Wilson Terrane

4.1. Wilson metamorphic complex (Wa)

In this area, the Wilson Metamorphic Complex includes low-to medium-grade metasediments; such rocks are restricted to small bodies and slivers, occurring at Mt Murray, south of Mt Chetwynd and at northern Walker Rocks. The protoliths of these metasediments appear to belong to a unique sequence of fine- to medium-grained siliciclastic sediments, with intercalations of conglomerate (Walker Rocks, Figure 1(A)). Their depositional age is widely unknown and a late Neoproterozoic to Cambrian age is likely, on the basis of detrital white mica geochronology (Di Vincenzo et al., 2014; Tessensohn & Henjes-Kunst, 2005). Such metasediments underwent metamorphic equilibration from low to high grades, during the Ross Orogeny (Carmignani et al., 1987; Casnedi & Pertusati, 1989; Castelli et al., 1997; Lombardo et al., 1987; Skinner, 1989).

4.2. Johnnie Walker formation (Wf)

This formation crops out at the southern area of Walker Rocks, in the centre of the study area, and consists of unmetamorphosed andesite, brecciated andesite, rhyolite and granophyric rhyolite (Tessensohn et al., 1990). The rock types and the field observations suggest a formation in a sub-volcanic environment.

Such rocks unconformably overlie the metamorphic rocks of the Wilson Terrane and are intruded by the Granite Harbour Intrusives. The age of these rocks is unknown, but must be older than the emplacement of the ~490 Ma Granite Harbour Igneous Complex. The temporal position of these rocks, between Ross-age metamorphic rocks and the post-tectonic Granite Harbour Igneous Complex, is quite unusual and requires a rapid and short-lived uplift event, between metamorphism and ~490 post-tectonic granite intrusion (Tessensohn et al., 1990).

4.3. Granite harbour igneous complex

4.3.1. Granodiorite and granite (GHgr–GHgra)

The Granite Harbour Igneous Complex rocks are restricted to the western part of the area, close to the coast of the Ross Sea, and are characterized by the association of the syn-tectonic Larsen granodiorite with post-tectonic granite. Such rocks represent a typical arc-related calc-alkaline orogenic suite, linked to the subduction zone magmatism associated to Ross Orogeny. The dominant rock type is an unfoliated to weakly foliated metaluminous biotite granite and granodiorite. Radiometric age data (U–Pb on zircon) indicate that the emplacement sequence of the Granite Harbour Igneous Complex spanned nearly 30 Myr, from 521 to 481 Ma (Bomparola et al., 2007; Giacomini et al., 2007); no data specifically related to this quadrangle are available.

At many places, the dominant granitoid type is intruded by the younger Irizar Granite (GHgra), that is a homogeneous, unfoliated, equigranular, medium- to coarse-grained syeno-monzogranite, characterized by pink–red colour, due to the presence of pink alkali feldspar. A 489 ± 4.4 Ma U–Pb zircon crystallization age was obtained at Cape Irizar (Rocchi et al., 2009), in agreement with Di Vincenzo et al. (2003), who supplied an age of 486.1 ± 8.4 Ma by Ar–Ar and Rb–Sr techniques. Major Irizar outcrops are in the northern cliffs of Mt Gauss and in the western slopes of Mt Endevour; Irizar granite occurs also as m-thick dykes, with the same age of emplacement (Rocchi et al., 2009).

4.3.2. Diorite and gabbro (GHt)

Large bodies of unfoliated to weakly foliated microgabbro-microdiorite occur in the area of Mt Smith, beneath the light grey granite. Due to the dark colour, they resemble Ferrar dolerite, but the clear gradational contact with respect to the overlying granites (Figure 1 (B)) rules out this option and supports a genetic relation with the Granite Harbour Igneous Complex.

Other rocks related to the Granite Harbour Igneous Complex are the Vegetation Lamprophyres, that constitute a widespread association of hypabyssal tabular intrusions (Rocchi et al., 2009), with hundreds of subvertical mafic dikes, with thicknesses around 1 m, and an overall strike between NE–SW and NNE–SSW. Dykes sampled at Bruce Point, Cape Hickey and Mt Endevour returned an Ar–Ar age around 490 Ma (see Rocchi et al., 2009, for details).

5. Beacon supergroup (Bs)

The base of the Beacon Supergroup is represented by a remarkable erosion surface which is equivalent to the Kukri Peneplain as defined in the Dry Valleys (Barrett et al., 1986). In this quadrangle, however, the outcrops of Beacon sandstone are quite limited and only at Mt Smith do small bodies of sandstone that rest above the erosion surface, between the granitic basement and the overlying dolerite (Figure 1(C)). In a cliff south of Mt Chetwynd, a layer of Beacon sandstone, that is continuous for about 1 km, lies below the Ferrar dolerite,

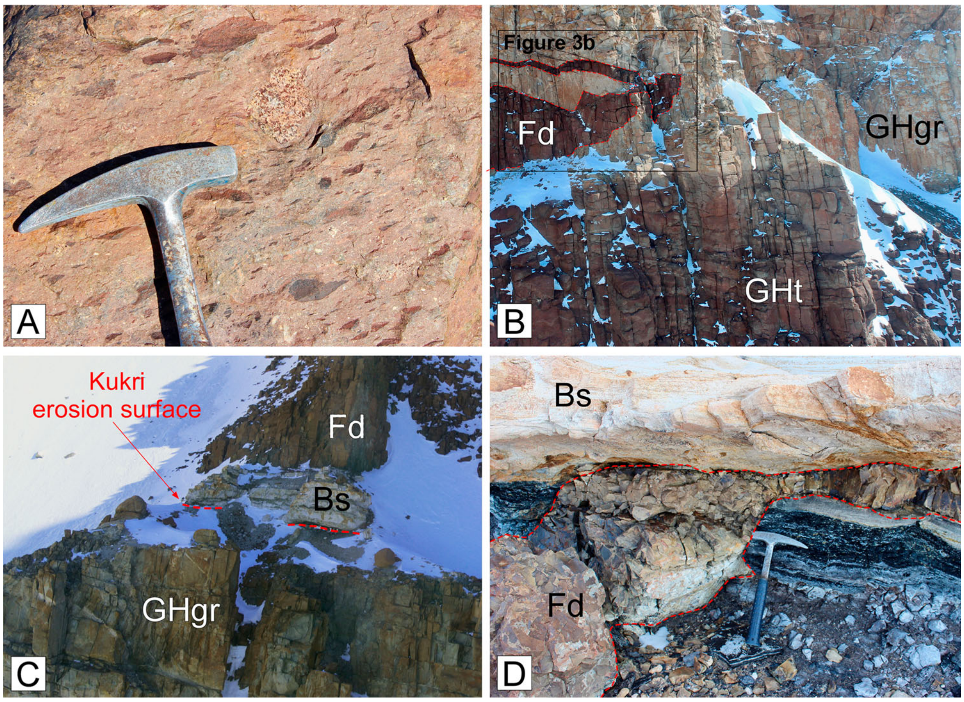

Figure 1. (A) Deformed conglomerate cropping out at the Walker Rocks, showing flattened clasts; (B) gradational contact between the Granite Harbour Granite (GHgr) and the Granite Harbour microgabbro-microdiorite (GHt) in the Mt Smith area. A Ferrar Dolerite dike (Fd) crosscutting the granite is present (red, detail in Figure 3(B)); (C) Beacon Sandstone body above the Kukri erosion surface, between the granitic basement (GHgr) and the overlying dolerite (Fd) in the Mt Smith area; (D) beds of Beacon sandstone rich in organic matter, truncated by Ferrar Dolerite. McLea Nunatak.

but the erosion surface is not visible; the Granite Harbour granitoids are not exposed here.

Elsewhere the Beacon outcrops are restricted to 100–1000 m-large bodies, encapsulated in the Ferrar dolerite, that locally truncates the stratification of the sandstone (Figure 1(D)).

Due to the scarcity and limited extension of outcrops, it was impossible to differentiate the Beacon rocks in their Permian and Triassic-Jurassic sequences (i.e. the Takrouna and Section Peak formations, respectively) and so they remain undifferentiated. Cross bedding is common; ripple marks (western slopes of Mt Endevour) and trace fossils (Mt Smith) are present in places. Beds rich in organic matter occur at the nameless nunatak SE of Beckett Nunatak, at McLea Nunatak and at Reckling Peak, with the presence of petrified trunk and coal measures (Figure 1(D)); however, no age-related fossils were found so far.

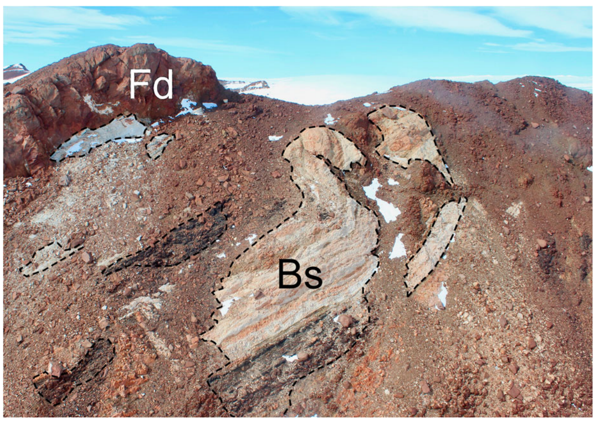

Figure 2. Bodies of Beacon sandstone (Bs) suspended in the Ferrar Dolerite (Fd) at the Reckling Peak.

Layers with clay galls (chip or flake of clay embedded in a sandy matrix) occur as well, and in places, beds display syn-sedimentary deformation and slumping. In most places, the stratification is horizontal or shallowly inclined; only in a few cases, beds of Beacon sandstone are steeper or even vertical (e.g. at Reckling Peak), but this is clearly linked to the emplacement of the Ferrar rocks (Figure 2).

6. Ferrar volcanic suite

6.1. Ferrar dolerite (Fd)

The Ferrar Dolerite represents the dominant rock unit in the area (Elliot et al., 1997) and constitutes the majority of the Beckett Nunatak, of the Mt Armytage, of the Shultz Peak, of the Trinity and Jarina Nunatak; it also occurs at the top of the Kirkwood Range and at Mt Smith. Such rocks consist of tholeiitic dolerite sills and minor dykes, which form spectacular cliffs commonly characterized by a typical columnar jointing (Figure 3(A)).

A K–Ar age of 174 ± 10 Ma has been reported for these rocks from the Mount Murchison quadrangle (Brotzu et al., 1989). Fleming et al. (1997) indicate an Ar–Ar age of 176.7 ± 8 Ma for the Ferrar tholeiitic

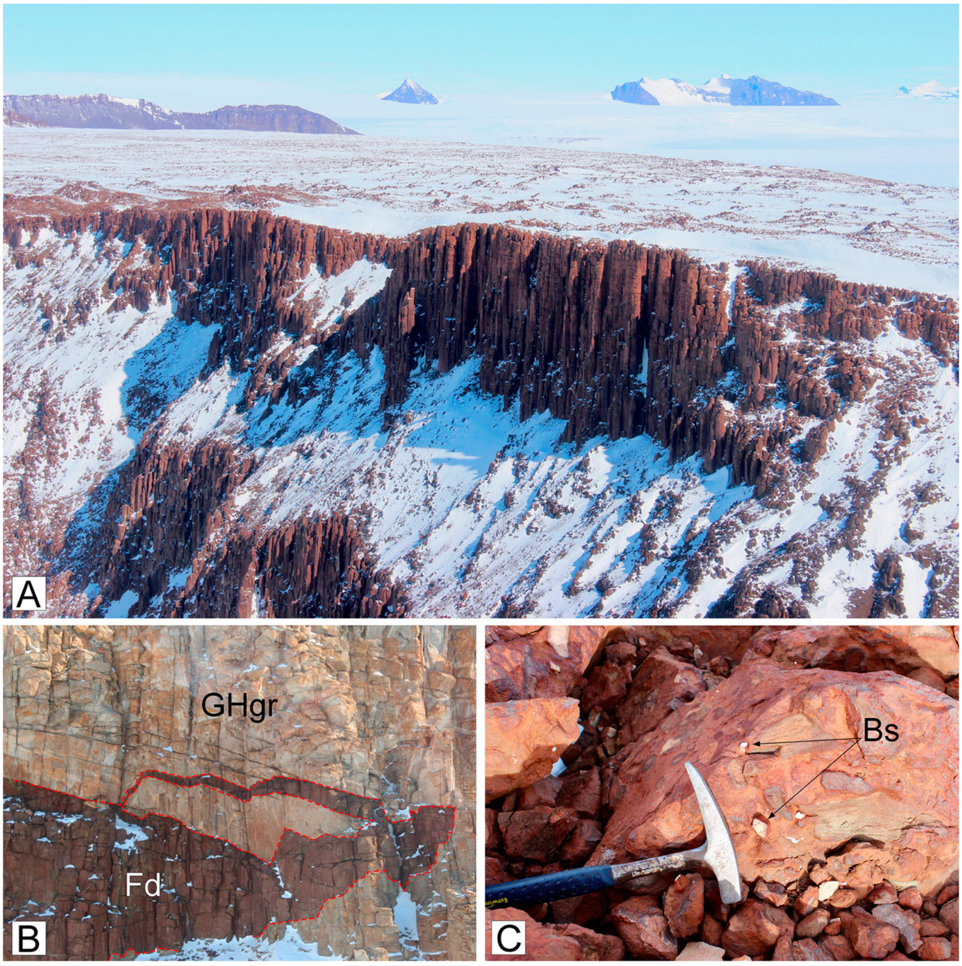

Figure 3. (A) columnar jointing of the Ferrar Dolerite in the Mt Smith area; (B) Ferrar Dolerite dike (Fd) with sharp margins cross-cutting the Granite Harbour Granite (GHgr) in the Mt Smith area; (C) Outcrop appearance of the Mawson Formation at the Reckling Peak; clasts and rafts of Beacon sediment (Bs) are present.

rocks as a whole. Encarnación et al. (1996) provided more precise zircon and baddeleyite U–Pb ages for the Ferrar dolerite, of 183.6 ± 1.0 Ma. This age is slightly older than the other ages quoted before but within error.

At Mt Smith the dolerites are emplaced over the Kukri erosion surface, with the occasional interposition of small bodies of Beacon sandstone. Minor dykes are also present in the underlying granitic basement (Figure 3(B)).

South of Mt Chetwynd, the dolerite occurs above a level of Beacon sandstone, that is continuous for about 1 km, but the erosion surface is not exposed here.

In the eastern cliffs of Mt Endevour the Ferrar sills occur on the erosion surface with no interposition of any Beacon sandstone. At Mt Murray, the dolerite occurs above the Wilson Terrane rocks, with no Beacon sandstone in between. Elsewhere the base of the Ferrar sills is not exposed.

6.2. Mawson formation (Mf)

The Mawson Formation (Ballance & Watters, 1971; Borns & Hall, 1969) is the equivalent to the Exposure Hill Formation (Elliot et al., 1986) and is limited to the outcrops at Battlements Nunatak and at Reckling Peak, both in the western part of the quadrangle. The relationships with the overlying Kirkpatrick Basalt are preserved at Battlements Nunatak.

This formation is made of volcaniclastic rocks and the most abundant lithologies are debris avalanche deposits, unsorted to poorly sorted lapilli tuff and breccia, often with clasts and rafts of Beacon sediment (Figure 3(C)). Sandstone and siltstone with associated basaltic lavas also occur. Cementation by quartz and zeolites is very common.

6.3. Kirkpatrick basalt (Kb)

In this quadrangle, the basalt flows of the Kirkpatrick Basalt are limited to small outcrops in the eastern part of the Battlement Nunatak and a very small outcrops at McLea Nunatak. Locally they are associated with volcaniclastic sandstone (e.g. at Battlement Nunatak).

K–Ar dates from the Mesa Range basalts (Mt Murchison quadrangle) indicate a 178 Ma minimum age for the whole lava sequence (Elliot & Foland, 1986). A $^{40}Ar/^{39}Ar$ age of 174.2 ± 1 Ma was obtained by Mcintosh et al. (1986).

7. Quaternary deposits

The Quaternary deposit mapping was conducted on the basis of previous studies (Cox et al., 2012; Gunn & Warren, 1962; Pocknall et al., 1994) and following criteria used for the existing Terra Victoria geomorphological and geological cartography (Baroni et al., 2004, Baroni, Biasini, Bondesan, et al., 2005; Baroni, Biasini, Cimbelli, et al., 2005; Baroni, Frezzotti, et al., 2005; Capponi et al., 2002; Salvatore et al., 1997).

Glacial deposits consist in ridges (moraines) and/or scattered boulders (glacial drift) resting on bedrock or regolith. For instance, both features can be simultaneously appreciated at Beckett Nunatak, where different erratic boulder lines can be interpreted as different moraines, left by ice masses as they fluctuated over time. At the same site, a poorly organized glacial drift leans directly on the lower outcropping bedrock. The above-described configuration can also be observed at other sites of the study area, e.g. The Mitten, Mt Murray and Mt Armytage. Several floating moraines occur in the study area, and one of the longest moraine of this type is located at Reckling Peak (Figure 4); it is several hundred meters long and is mainly comprised by angular and sub-angular blocks, with a smaller portion of thin sediment.

Slope deposits are mainly located along the flanks of the topographic relief (e.g. Mt Murray and Beckett Nunatak) and consist of clasts and blocks with different sizes, and angular to sub-angular shapes.

8. Tectonics

8.1. Ross tectonics

The effects of the Ross deformation are limited to the development of the tectonic foliation (S_1) that can be observed in the rare slivers of Wilson Terrane schist. Both at Mt Murray and at the eastern slopes of Mt Endevour, such tectonic foliation is steeply dipping to the NE (see Main Map, stereonet A), in this way matching the regional strike of most Wilson Terrane rocks. In the Mt Murray area, a mineral lineation (L_1), steeply plunging toward the E, is present.

Another result is the weak foliation that locally affects the Granite Harbour granitoids.

On the base of the NE–SW strike of the subvertical Irizar and Vegetation dykes, Rocchi et al. (2009) suggested a NW–SE extension during the latest stages of the Ross Orogeny.

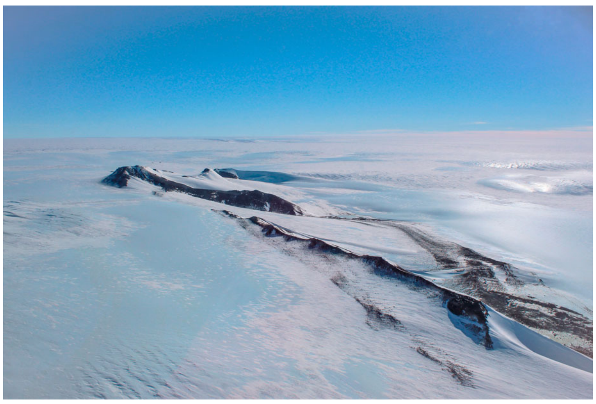

Figure 4. The floating moraine at the Reckling Peak.

8.2. Post-ross tectonics

The most striking feature related to the post-Ross tectonics is represented by the regional unconformity along the pre-Beacon erosion surface. This surface is the equivalent to the Kukri Peneplain as defined in the Dry Valleys (Barrett et al., 1986) and testifies to the uplift and erosion of the Ross Orogen. This erosion surface is visible at Mt Smith, Mt Gauss, Mt Murray, Mt Chetwynd and at the eastern slopes of Mt Endevour; at all sites, it appears to be horizontal or very close to the horizontal.

The elevation of the erosion surface is not constant and is around 1200 m at Mt Endevour, 1100 at Mt Chetwynd and Mt Gauss, around 1000 m at Mt Murray and around 1300 m at Mt Smith. So the Mt Gauss–Mt Murray sector appears to be lowered with respect to the sectors to the south (Mt Endevour) and to the north (Mt Smith). Such changes in the height of the erosion surface can be due to original changes in reliefs along the surface, related to differential erosion of the Cambrian-Ordovician basement complex in the area. An alternative possibility is the post-Kukri activity of faults with some vertical offset, though, due to the ice coverage, the occurrence of such faults is not evident in the field.

Beacon strata (S_0) are generally sub-horizontal or dip toward the W–SW with very low angle (see Main Map, stereonet A); no evidence of regional deformation is present. Variations in the angle of dip are just a local feature (e.g. at Reckling Peak), due to the local deformation caused by the emplacement of the Ferrar rocks.

Minor faults, affecting the Granite Harbour Igneous Complex, have been observed at Mt Chetwynd, in the northern part of the Kirkwood Range, and at the Walker Rocks, in the central sector of the study area. In the Mt Chetwynd area, faults (Sf) strike mostly E–W and dip at moderate angles, both toward the N and the S (see Main Map, stereonet B), suggesting the occurrence of two conjugated fault sets (Sf_1 and Sf_2). Striae (Lf) along N-dipping faults plunge toward the NW at a moderate angle (see Main Map, stereonet C). No striae were observed on S-dipping faults.

At the Walker Rocks, two fault sets have been recognized: one set (Sf_1) strikes NE–SW and the other one (Sf_2) strikes NW–SE (see Main Map, stereonet B). Faults belonging to the first set are subvertical

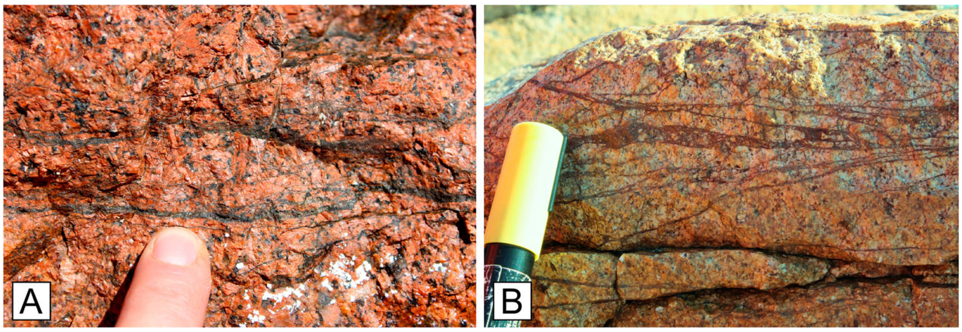

Figure 5. (A) thin levels of dark material associated to fault planes crosscutting the Irizar Granite at the Walker Rocks; (B) cataclasite in the Granite Harbour granitoid, Shoulder Mountain.

or steeply dipping toward the SE or NW; faults of the second set dip at a moderate angle toward the NE. Striae (Lf) along fault surfaces generally plunge at low angles toward the NE and only locally steeply plunge toward the SSE (see Main Map, stereonet C).

Taking into account the orientation of the striae on fault planes in the two areas, it is likely that at least some of them accommodate a component of strike-slip movement. In particular, in the Mt Chetwynd area, two faults show striae with a pitch of 50° and 31°, whereas at the Walker Rocks two faults show striae with a pitch of 8° and 15°. This can be related to the relevance of strike-slip faulting in the post-Ross evolution of northern Victoria Land (Salvini et al., 1997; Storti et al., 2001). All the other faults have down-dip striae with pitch near to 90°.

On one fault in the Chetwynd area and on both sets of faults in the Walker Rocks, we observed dark seams of very fine material, 1–10 mm thick, parallel to the fault planes (Figure 5(A)). In some cases, we observed injection veinlets, 2–3 mm in length. Even if the occurrence of injection veinlets is typical of pseudotachylites, we cannot exclude that these structures could be related to the presence of ultracataclasites or to later mineralization. At the Shoulder Mountain (southern Kirkwood Range) cataclasites and protocataclasites of centimetric thickness crosscut the Granite Harbour granitoid (Figure 5(B)).

9. Discussion and conclusion

Detailed geological mapping, structural and petrographical analyses allow us to compile a new geological map which completes the coverage of Victoria Land and highlights some key features of this area:

- rocks of the Wilson Metamorphic Complex in this area are restricted to small bodies and slivers surrounded by the granitoid of the Granite Harbour Igneous Complex.
- We recognized and mapped large bodies of unfoliated to weakly foliated microgabbro-microdiorite, belonging to the Granite Harbour Igneous Complex. As they are very similar to the Ferrar Dolerites at the outcrop scale, we suggest that the occurrence of gradational contacts with the granites, where present, can be a key feature to distinguish these rock units.
- The occurrence of sedimentary rocks of the Beacon Supergroup is very limited in this area and it is not possible to specifically assign them to stratigraphic intervals found within the Devonian to Triassic-Jurassic portions of the section.
- Several fault systems in the Mt Chetwynd and Walker Rocks areas are associated to dark seams of very fine material with the presence of injection veinlets testifying the presence of ultracataclasite and/or possible pseudotachylites. Further petrographic investigations could discriminate the presence of such structures.
- Difference in elevation of the erosion surface can be due to original relief along such surface, linked to differential denudation of the Ross orogenic belt, or alternatively to the post-Kukri activity of dip-slip faults, though not evident in the field.

Software

Topographic Base was assembled with the software Qgis 2.18 and map final layout was made with Adobe Illustrator CC 2018.

Acknowledgements

Thanks are due to Piero Pertusati for providing his provisional geological map and to Gianluca Cornamusini for his help with the Beacon stratigraphy. Skilful helicopter piloting by Bob McElhinney, Dave Sowman and Justin Gloag made this work possible. Help by Gianluca Ippolito, Stefano Piantoni and Danilo Collino both in the field and at the Starr Nunatak camp is greatly acknowledged. Careful revisions by Brendan Dyck, Mike Shand and Timothy Paulsen helped to improve the manuscript.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This work benefited from the logistical and financial support of the Italian Programma Nazionale di Ricerche in Antartide [grant number PNRA16_00042, responsible G. Capponi].

ORCID

Giovanni Capponi http://orcid.org/0000-0002-9237-3212
Chiara Montomoli http://orcid.org/0000-0002-0364-5395

References

Ballance, P. F., & Watters, W. A. (1971). The Mawson Diamictite and the Carapace sandstone, formations of the Ferrar Group at Allan Hills and Carapace Nunatak, Victoria Land, Antarctica. *New Zealand Journal of Geology and Geophysics*, *14*(3), 512–527. https://doi.org/10.1080/00288306.1971.10421945

Baroni, C., Biasini, A., Bondesan, A., Denton, G. H., Frezzotti, M., Grigioni, P., Meneghel, M., Orombelli, G., Salvatore, M. C., Della Vedova, A. M., & Vittuari, L. (2005). Mount Melbourne quadrangle, Victoria Land, Antarctica 1:250,000 (Antarctic geomorphological and Glaciological Map Series). Museo Nazionale dell'Antartide, Dipart. Scienze della Terra, Univ. Siena. In W. Haeberli, M. Zemp, M. Hoelzle, & R. Frauenfelder (Eds.), *Fluctuations of glaciers. A contribution to the Global Environment Monitoring Service (GEMS) and the International Hydrological Programme, Vol VIII (1995-2000)* (pp. 38–40). World Glacier Monitoring Service, Int. Ass. of Hydrological Sciences (Int. Comm. on Snow and Ice), U.N. Env. Programme, and U.N. Educational, Scientific and Cultural Organization.

Baroni, C., Biasini, A., Cimbelli, A., Frezzotti, M., Orombelli, G., Salvatore, M. C., Tabacco, I., & Vittuari, L. (2005). Relief inlet quadrangle, Victoria Land, Antarctica 1:250,000 (Antarctic geomorphological and glaciological map series). Museo Nazionale dell'Antartide, Dipart. Scienze della Terra, Univ. Siena. In W. Haeberli, M. Zemp, M. Hoelzle, & R. Frauenfelder (Eds.), *Fluctuations of glaciers. A contribution to the global environment monitoring service (GEMS) and the international hydrological programme, Vol VIII (1995-2000)* (pp. 43–44). World Glacier Monitoring Service, Int. Ass. of Hydrological Sciences (Int. Comm. on Snow and Ice), U.N. Env. Programme, and U.N. Educational, Scientific and Cultural Organization.

Baroni, C., Frezzotti, M., Salvatore, M. C., Meneghel, M., Tabacco, E. I., Vittuari, L., Bondesan, A., Biasini, A., Cimbelli, A., & Orombelli, G. (2005). Mount Murchison quadrangle (Victoria Land), Antarctic geomorphological and glaciological 1:250,000 map series. Carta e note illustrative. *Annals of Glaciology*, *39*(2004), 256–264.

Baroni, C., Frezzotti, M., Salvatore, M. C., Meneghel, M., Tabacco, I., Vittuari, L., Bondesan, A., Biasini, A., Cimbelli, A., & Orombelli, G. (2004). *Antarctic geomorphological and glaciological 1/250'000 map series: Mount Murchison quadrangle, northern Victoria Land*. MNA Siena.

Barrett, P. J., Elliot, D. H., & Lindsay, G. F. (1986). The Beacon supergroup (Devonian – Triassic) and the Ferrar Group (Jurassic) in the Beardmore Glacier area (Antarctica). In M. D. Turner & J. F. Spettstoesser (Eds.), *Geology of the central transantarctic mountains*. Antarctic research Series (vol. 36, pp. 339–428). American Geophysical Union

Bomparola, R. M., Ghezzo, C., Belousova, E., Griffin, W. L., & O'Reilly, S. Y. (2007). Resetting of the U–Pb zircon system in Cambro-Ordovician intrusives of the deep freeze range, northern Victoria Land, Antarctica. *Journal of Petrology*, *48*(2), 327–364. https://doi.org/10.1093/petrology/egl064

Borns, H. W., & Hall, B. A. (1969). A reinvestigation of the Mawson Tillite, Victoria Land, Antarctica. *Antarctic Journal of the United States*, *4*, 133–134.

Brotzu, P., Capaldi, G., Civetta, L., Melluso, L., & Orsi, G. (1989). Jurassic Ferrar dolerites and Kirkpatrick basalts in northern Victoria Land (Antarctica): stratigraphy, geocronology and petrology. *Memorie della Società Geologica*, *43*, 97–116.

Capponi, G., Meccheri, M., & Pertusati, P. C. (2002). Italian geological mapping in northern Victoria Land: The GIGAMAP project. In J. Gamble, D. Skinner, & S. Henrys (Eds.), *Antarctica at the close of a Millennium*, *35* (pp. 621–624). Royal Society of New Zealand Bullettin.

Carmignani, L., Ghezzo, C., Gosso, G., Lombardo, B., Meccheri, M., Montrasio, A., Pertusati, P. C., & Salvini, F. (1987). Geology of the Wilson Terrane in the area between David and Mariner Glaciers, Victoria Land (Antarctica). *Memorie della Società Geologica*, *33*, 77–97.

Casnedi, R., & Pertusati, P. C. (1989). Geology of the Priestley formation (north Victoria Land – Antarctica) and its significance in the context of early Palaeozoic continental reconstruction. *Memorie della Società Geologica*, *46*, 145–156.

Castelli, D., Oggiano, G., Talarico, F., Belluso, E., & Colombo, F. (1997). Metamorphic history of the eastern Wilson Terrane from Retreat Hills to Lady Newnes Bay (northern Victoria Land, Antarctica). *Geol. Jarb B*, *85*.

Cox, S. C., Turnbull, I. M., Isaac, M. J., Townsend, D. B., & Smith Lyttle, B. (2012). *1:250 000 geological map of southern Victoria Land, Antarctica*. Institute of geological and Nuclear Sciences 22, 1 sheet + 135 pp.

Di Vincenzo, G., Grande, A., & Rossetti, F. (2014). Paleozoic siliciclastic rocks from northern Victoria Land (Antarctica): provenance, timing of deformation, and implications for the Antarctcica–Australia connection. *Geological Society of America Bulletin*. https://doi.org/10.1130/B31034.1

Di Vincenzo, G., Viti, C., & Rocchi, S. (2003). The effect of chlorite interlayering on 40Ar-39Ar biotite dating: An 40Ar-39Ar laserprobe and TEM investigation of variably chloritised biotites. *Contributions to Mineralogy and Petrology*, *145*(6), 643–658. https://doi.org/10.1007/s00410- 003-0472-z

Elliot, D. H., Fleming, T. H., Conaway, C., & Braddock, P. (1997). Geologic studies in the Prince Albert Mountains. *Antarctic Journal Review*, *14*.

Elliot, D.H., & Foland K.A. (1986). Potassium–Argon age determinations of the Kirkpatrick Basalt, Mesa Range. In: Stump E. (ed), Geological investigations in *northern Victoria Land*. Antarctic research Series, 46 (pp. 279–288). American Geophysical Union.

Elliot, D. H., Haban, M. A., & Siders, M. A. (1986). The exposure hill formation, mesa range. In E. Stump (Ed.), *Geological investigation in northern Victoria Land*. Antarctic research Series, 46 (pp. 267–279). American Geophysical Union.

Encarnación, J., Fleming, T. H., Elliot, D. H., & Eales, H. V. (1996). Synchronous emplacement of Ferrar and Karoo dolerites and the early breakup of Gondwana. *Geology*, *24*(6), 535–538. https://doi.org/10.1130/0091-7613(1996)024<0535:SEOFAK>2.3.CO;2

Fleming, T. H., Heimann, A., Foland, K. A., & Elliot, D. H. (1997). ^{40}Ar/^{39}Ar geochronology of Ferrar dolerite sills from the Transantarctic Mountains, Antarctica: Implications for the age and origin of the Ferrar magmatic province. *Geological Society of America Bulletin*, *109*(5), 533–546. https://doi.org/10.1130/0016-7606(1997)109<0533:AAGOFD>2.3.CO;2

Ganovex & ItaliAntartide. (1991). Preliminary geological – structural map of Wilson, Bowers and Robertson Bay Terranes in the area between Aviator and Tucker Glaciers (northern Victoria Land, Antarctica). *Memorie della Società Geologica*, *46*, 267–272.

Ganovex & ItaliAntartide. (2003). Geological and structural map of the area between the Aviator and Victory Mountains (northern Victoria Land, Antarctica). *Geol. Jb.*, *B85*, 9–33.

Ganovex Team. (1987). Geological Map of north Victoria Land, Antarctica, 1/500000. Explanatory Notes. *Geol. Jb.*, *B66*, 7–79.

Giacomini, F., Tiepolo, M., Dallai, L., & Ghezzo, C. (2007). On the onset and evolution of the Ross-orogeny magmatism in north Victoria Land – Antarctica. *Chemical Geology*, *240*(1-2), 103–128. https://doi.org/10.1016/j.chemgeo.2007.02.005

Gunn, G. M., & Warren, G. (1962). Geology of Victoria Land between Mawson and Mullock Glaciers, Antarctica. *New Zealand Geological Survey Bulletin*, *71*, 157.

Lombardo, B., Cappelli, B., Carmignani, L., Gosso, G., Memmi, I., Montrasio, A., Palmeri, R., Pannuti, F., Pertusati, P. C., Ricci, C. A., Salvini, F., & Talarico, F. (1987). The metamorphic rocks of the Wilson Terrane between David and Mariner Glaciers, north Victoria Land, Antarctica. *Memorie della Società Geologica Italiana*, *33*, 99–130.

Mcintosh, W. C., Kyle, P. R., & Sutter, J. F. (1986). Paleomagnetic results from the Kirkpatrick Basalt Group, Mesa Range, north Victoria Land, Antarctica. In E. Stump (Ed.), *Geological investigations in northern Victoria Land*. Antarctic research Series, 46 (pp. 289–303). American Geophysical Union.

Pocknall, D. T., Chinn, T. J., Skyes, R., & Skinner, D. N. B. (1994). Geology of the Convoy Range, southern Victoria Land, Antarctica. *GNS Geological Map*, *11*.

Rocchi, S., Di Vincenzo, G., Ghezzo, C., & Nardini, I. (2009). Granite-lamprophyre connection in the latest stages of the early Paleozoic Ross Orogeny (Victoria Land, Antarctica). *Geological Society of America Bulletin*, *121*(5/6), 801–819. https://doi.org/10.1130/B26342.1

Salvatore, M. C., Bondesan, A., Meneghel, M., Baroni, C., & Orombelli, G. (1997). Geomorphological sketch map of the Evans Cove area (Victoria Land, Antarctica). *Geografia Fisica Dinamica Quaternaria*, *20*(2), 283–290.

Salvini, F., Brancolini, G., Busetti, M., Storti, F., Mazzarini, F., & Coren, F. (1997). Cenozoic geodynamics of the Ross Sea region, Antarctica: Crustal extension, intraplate strike-slip faulting and tectonic inheritance. *Journal of Geophysical Research*, *102*(B11), 24669–24696. https://doi.org/10.1029/97JB01643

Skinner, D. N. B. (1989). Metamorphic basement contact relationships in the southern Wilson Terrane, Terra Nova Bay, Antarctica – The Boomerang thrust. *Memorie della Società Geologica Italiana*, *46*, 163–178.

Storti, F., Rossetti, F., & Salvini, F. (2001). Structural architecture and displacement accommodation mechanisms at the termination of the Priestley fault, northern Victoria Land, Antarctica. *Tectonophysics*, *341*(1-4), 141–161. https://doi.org/10.1016/S0040-1951(01)00198-6

Tessensohn, F., & Henjes-Kunst, F. (2005). Northern Victoria Land terranes, Antarctica: Far traveled or local products? In A. P. M. Vaughan, P. T. Leat, & R. J. Pankhurst (Eds.), *Terrane processes at the margins of Gondwana, 246* (pp. 275–291). Geological Society London Special Publications.

Tessensohn, F., Worner, G., Kleinshmidt, G., Henjes-Kunst, F., Fenn, G., & Matzer, S. (1990). The Johnnie Walker formation: A pre-granite Harbour sub-volcanic unit in the Wilson Terrane, lower Mawson Glacier, Victoria Land, Antarctica. *Polarforschung*, *60*(2), 91–95.