Programma Nazionale di Ricerche in Antartide (PNRA)

Final project report

Project ID:	2002/4.2
Title:	Interregional correlations for the Ross Orogen in the Ross Sea/Ross Ice Shelf sector of the Transantarctic Mountains: implications for the tectonic evolution of the palaeo-Pacific Antarctic margin of Gondwana (INTERTAM)
Principal investigator:	Prof. F.M. Talarico
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Duration:	2 years
Assigned fundgin:	NA

Activities and results

The general tectonic history of the Neoproterozoic- early Paleozoic Ross Orogen is fairly well known within each of the major segments of the Transantarctic Mountains (TAM); however, significant variations in lithostratigraphic, structural, and metamorphic patterns, as well as in granitoid geochemical affinity, are evident between the different segments. Until our knowledge of the relationships of the tectono-metamorphic histories and of the detailed chronology of the magmatic episodes between the segments is understood, a comprehensive tectonic model of the development of the Ross Orogen remains to be formulated. In this context, targeted metamorphic and igneous units in three distinct segments of the TAM (the Northern Victoria Land-Oates Land-George V Land transect (NVL-OL-GVL), Southern Victoria Land (SVL), and the central Transantarctic Mountains (CTAM)) were selected and investigated for their potential to provide valuable information for regional correlation of lithostratigraphy and structural development, as well as the main magmatic and metamorphic episodes within each of the three regions. Data sets already available from previous PNRA expeditions were also used and implemented with field data collected during two field summer seasons (2003/04 and 2005/06) from the Deep Freeze Range-Eisenhower Range area (NVL), the Mackay Glacier - Skelton Glacier area (SVL) and the Britannia Range (SVL).
The results help to constrain significant steps in Ross Orogen tectonic evolution and address key questions regarding 1) the reconstruction of tectono-metamorphic paths in low- to high-grade metamorphic units of several areas in the orogenic belt; and 2) the contribution of petrological and geochronological data to the study of several key-areas hosting major tectonic discontinuities (i.e. the high pressure and ultra high pressure rocks along the Lanterman Fault in NVL, the Ross Orogen/east Antarctic Craton relationships in the Mertz Glacier in GVL, the Byrd Glacier Discontinuity identified in the Byrd Glacier area in SVL).
The collected data constitute the first contribution to a petrologic and geological data set enlarged to cover a significant sector of the Ross Orogen and they will be useful for future investigations finalized to 1) the correlation of litostratigraphic and structural development, as well as the main magmatic and metamorphic episodes in the Ross orogen thoughout the wide area between the CTAM and the NVL-GVL transect, and, consequently 2) the discussion of critical aspects of the tectonic development of an extensive portion of the Gondwana palaeo-Pacific margin.
The part of the research activity regarding the field activity in the Byrd Glacier area was based on a coordinated program with the Arizona State University (Prof. Edmund Stump). This cooperation was already established between the P.I. and Prof. E. Stump, in the frame of former PNRA project 4.11 (99/01) and NSF project G-116-0 (00/02), respectively. The part of the research activity regarding the George V Land was carried out in collaboration with the Institut für Geowissenschaften, of the Frankfurt University (prof. G. Kleinschmidt).

Products

A – papers in scientific magazines

1. F. TALARICO, E. STUMP, B. GOOTEE, . K. FOLAND, R. PALMERI, W. VAN SCHMUS , P. BRANDT, C. A. RICCI - 'First evidence of a "Barrovian"- type metamorphic regime in the Ross orogen of the Byrd Glacier area, Central Transantarctic Mountains' (2007) ANTARCTIC SCIENCE, Vol.19, 1 - 20
2. DI VINCENZO, F. TALARICO, G. KLEINSCHMIDT - 'An 40Ar-39Ar investigation of the Mertz Glacier area (George V Land, Antarctica): implications for the Ross Orogen - East Antarctic Craton relationship and Gondwana reconstructions' (2007) PRECAMBRIAN RESEARCH, Vol.152, 93 - 118
3. D. DAMIANI, G. GIORGETTI - 'Provenance of glacial-marine sediments under the McMurdo/Ross Ice Shelf (Windless Bight, Antarctica): Heavy minerals and geochemical data. (2008). PALAEOGEOGRAPHY PALAEOCLIMATOLOGY PALAEOECOLOGY, 7 , 262 - 283.
4. TALARICO, E. ARMADILLO, E. BOZZO - 'Antarctic Rock Magnetic Properties:New Susceptibility Measurements in the Daniels Range,Outback Nunataks and in the Rennick Glacier Area ' (2007) Terra Antartica Reports, Vol.13, 87 - 96
5. R. CAROSI, F. GIACOMINI, F. TALARICO, E. STUMP - 'Geology of the Byrd Glacier Discontinuity (Ross Orogen): New survey data fromthe Britannia Range, Antarctica ' (2007) U.S. Geological Survey and The National Academies; USGS OF-2007-1047, Vol.1047, 1 - 6
6. DI VINCENZO G., CAROSI R., PALMERI R., TIEPOLO M. (2007) - A comparative U-Th-Pb (zircon-monazite) and 40Ar–39Ar (muscovite-biotite) study of shear zones from northern Victoria Land (Antarctica): implications for geochronology and localized reworking of the Ross-Orogen. J. Metamorphic Geology, 25, 6, 605-630
7. F. GIACOMINI, M. TIEPOLO, L. DALLAI, C. GHEZZO (2007). ON THE ONSET AND EVOLUTION OF THE ROSS-OROGENY MAGMATISM IN NORTH VICTORIA LAND (ANTARCTICA). CHEMICAL GEOLOGY, 240, 1-2, 103-128
8. R. M. BOMPAROLA, C. GHEZZO, E. BELOUSOVA, W. GRIFFIN, S. O'REILLY (2007). Resetting of the U-Pb zircon system in the Cambro-Ordovician intrusives of the Deep Freeze Range (Northern Victoria Land, Antarctica). JOURNAL OF PETROLOGY, 48(2), 327-364.
9. R. PALMERI, B. GHIRIBELLI, G. RANALLI, F. TALARICO, C. A. RICCI - 'ULTRAHIGH-PRESSURE METAMORPHISM AND EXHUMATION OF GARNET-BEARING ULTRAMAFIC ROCKS FROM THE LANTERMAN RANGE(NORTHERN VICTORIA LAND, ANTARCTICA)' (2007) JOURNAL OF METAMORPHIC GEOLOGY, Vol.25, 34 - 53
10. F. TALARICO, R. FINDLAY, N. RASTELLI - 'Metamorphic evolution of the Koettlitz Group in the Koettlitz-Ferrar Glaciers region (southern Voctoria Land, Antarctica)' (2005) Terra Antartica, Vol.12, 3 - 23
11. D. CASTELLI, G. OGGIANO, F. TALARICO, E. BELLUSO, F. COLOMBO - 'Mineral Chemistry and Petrology of the Wilson Terrane Metamorphics from Retreat Hills to Lady Newnes Bay, Northern Victoria Land, Antarctica' (2005) Geologisches Jahrbuch, B85 , Vol.b85, 67 – 88
12. STUMP, B. GOOTEE, F. TALARICO, . W. VAN SCHMUS, P. BRAND, . K. FOLAND, M. FANNING - 'Correlation of Byrd and Selborne Groups, with implications for the Byrd Glacier discontinuity, central Transantarctic Mountains, Antarctica' (2004) NEW ZEALAND JOURNAL OF GEOLOGY AND GEOPHYSICS, Vol.47, 157 – 171
13. U. SCHÜSSLER, F. HENJES-KUNST, F. TALARICO, T. FLÖTTMANN - 'High-grade crystalline basement of the northwestern Wilson Terrane at Oates Coast: new petrological and geochronological data and implications for its tectonometamorphic evolution' (2004) Terra Antartica, Vol.11, 15 – 34
14. F. TALARICO, R. PALMERI, C. A. RICCI - 'Regional metamorphism and P-T evolution of the Ross Orogen in Northern Victoria Land (Antarctica): a review.' (2004) Periodico di mineralogia , Vol.73, 185 – 196
15. KLEINSCHMIDT, A. LAUFER, F. TALARICO - 'Antarktis und Australien, die (fast) Unzertrennlichen - ein Uberblick' (2003) Berichte zur Polarforschung, Vol.71, 97 – 108
16. TALARICO, E. ARMADILLO, F. FERRACCIOLI, N. RASTELLI - 'Magnetic petrology of the Ross Orogen in Oates Land (Antarctica)' (2003) Terra Antartica, Vol.10, 197 – 220
17. KLEINSCHMIDT, F. TALARICO - 'Structural and metamorphic evolution of the Mertz Shear Zone (East Antarctic Craton, George V Land): implications for Australia/Antarctica correlations and East Antarctic Craton/Ross orogen relationships' (2003) Terra Antartica, Vol.10, 229 – 248
18. FERRACCIOLI, D. DAMASKE, E. BOZZO, F. TALARICO - 'The Matusevich aeromagnetic anomaly over Oates Land, East Antarctica' (2003) Terra Antartica, Vol.10, 221 – 228
19. TALARICO, G. KLEINSCHMIDT - 'The Mertz Shear Zone (George V Land): implications for australia/Antarctica correlations and East Antarctic Craton/Ross orogen relationships' (2003) Terra Antartica Reports, Vol.9, 149 – 153
20. R. PALMERI, B. GHIRIBELLI, F. TALARICO, C. A. RICCI - 'Ultra high pressure metamorphism in felsic rocks: the garnet – phengite gneisses and quartzites from Lanterman Range (Antarctica).' (2003) EUROPEAN JOURNAL OF MINERALOGY, Vol.15, 513 – 525

B – book chapters

1. STUMP, B. GOOTEE, F. TALARICO - 'Tectonic model for development of the Byrd Glacier discontinuity and surrounding regions of the Transantarctic Mountains during the Neoproterozoic-early Paleozoic' (2006) , Chapter 4.3 - 181 - 190 Volume: Antarctic: Contributions to Global Earth Sciences, Casa Editrice: Springer-Verlag, New York and Heidelberg

C - proceedings of international conferences

1. CRISPINI L., G. CAPPONI, FEDERICO L., F. TALARICO - 'Gold bearing veining linked to transcrustal fault zones in the Transantarctic Mountains (northern Victoria Land, Antarctica) ' 1 - 4, ISAES X, Santa Barbara (USA) dal 26/8/2007 al 1/9/2007
2. R. CAROSI, F. GIACOMINI, F. TALARICO, E. STUMP - 'Geology of the Byrd Glacier Discontinuity (Ross Orogen): New survey data from the Britannia Range, Antarctica ' U.S. Geological Survey and The National Academies; USGS OF-2007-1047, , Vol.1047, 1 - 6

D – proceedings of national meetings and conferences

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E – thematic maps

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F – patents, prototypes and data bases

1. Sample database at the Museo Nazionale dell'Antartide - Siena

G – exhibits, organization of conferences, editing and similar

1. F. TALARICO, E. STUMP, P. BRAND, R. CAROSI, - 'Progetto 4.2: INTERTAM "Correlazioni inter-regionali nell'orogene di Ross nel settore Ross Sea/ Ross Ice Shelf delle Montagne Transantartiche: implicazioni sull'evoluzione tettonica del margine paleo-Pacifico antartico del Gondwana" ' (pubblicazione su volume collettaneo, 2004) Volume: PNRA- Rapporto sulla campagna 2003/04, Casa Editrice: Progetto Antartide -ENEA, Roma, Italia
2. F. TALARICO, R. CAROSI, P. F. GIACOMINI, - 'Progetto 4.2: INTERTAM "Correlazioni inter-regionali nell'orogene di Ross nel settore Ross Sea/ Ross Ice Shelf delle Montagne Transantartiche: implicazioni sull'evoluzione tettonica del margine paleo-Pacifico antartico del Gondwana" ' (pubblicazione su volume collettaneo, 2006) Volume: PNRA- Rapporto sulla campagna 2005/06, Casa Editrice: Progetto Antartide -ENEA, Roma, Italia

H - formation (PhD thesis, research fellowships, etc.)

1. PhD thesis (M Lombardi)
2. Borsa Post-Laurea (P Senserini)

Research units

1. Responsabile / Principal investigator: FRANCO TALARICO
Istituto di afferenza: DIPARTIMENTO DI SCIENZE DELLA TERRA, Università di Siena
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Compito di ricerca: Geologia strutturale, petrologia e geocronologia delle rocce metamorfiche
Elenco di ricercatori dell'Unità di ricerca

Nome/Name	Qualifica/Role	Istituto/Institution
FRANCO TALARICO	PROF. ASSOCIATO	Dip. Scienze d. Terra -Siena
MARCO MECCHERI	PROF. ASSOCIATO	Dip. Scienze d. Terra -Siena
ENRICO TAVERNELLI	PROF. ASSOCIATO	Dip. Scienze d. Terra -Siena
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BARBARA CALONACI	DOTTORANDO	Dip. Scienze d. Terra -Siena
SONIA SANDRONI	DOTTORANDO	Dip. Scienze d. Terra -Siena
NADIA RASTELLI	BORSISTA	Museo Naz.dell'Antartide-Siena
ED STUMP	PROF. ORDINARIO	Arizona State University
BRIAN GOOTEE	BORSISTA	Arizona State University
DANIELA RUBATTO	RICERCATORE	Australian N.Univ.-Canberra
ROSARIA PALMERI	RICERCATORE	Museo Naz.dell'Antartide-Siena

Time devoted to the research program (man-months): 53

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Elenco di ricercatori dell'Unità di ricerca/
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MARIA LUCE FREZZOTTI	RICERCATORE	Dip. Scienze d. Terra -Siena
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Time devoted to the research program (man-months): 29

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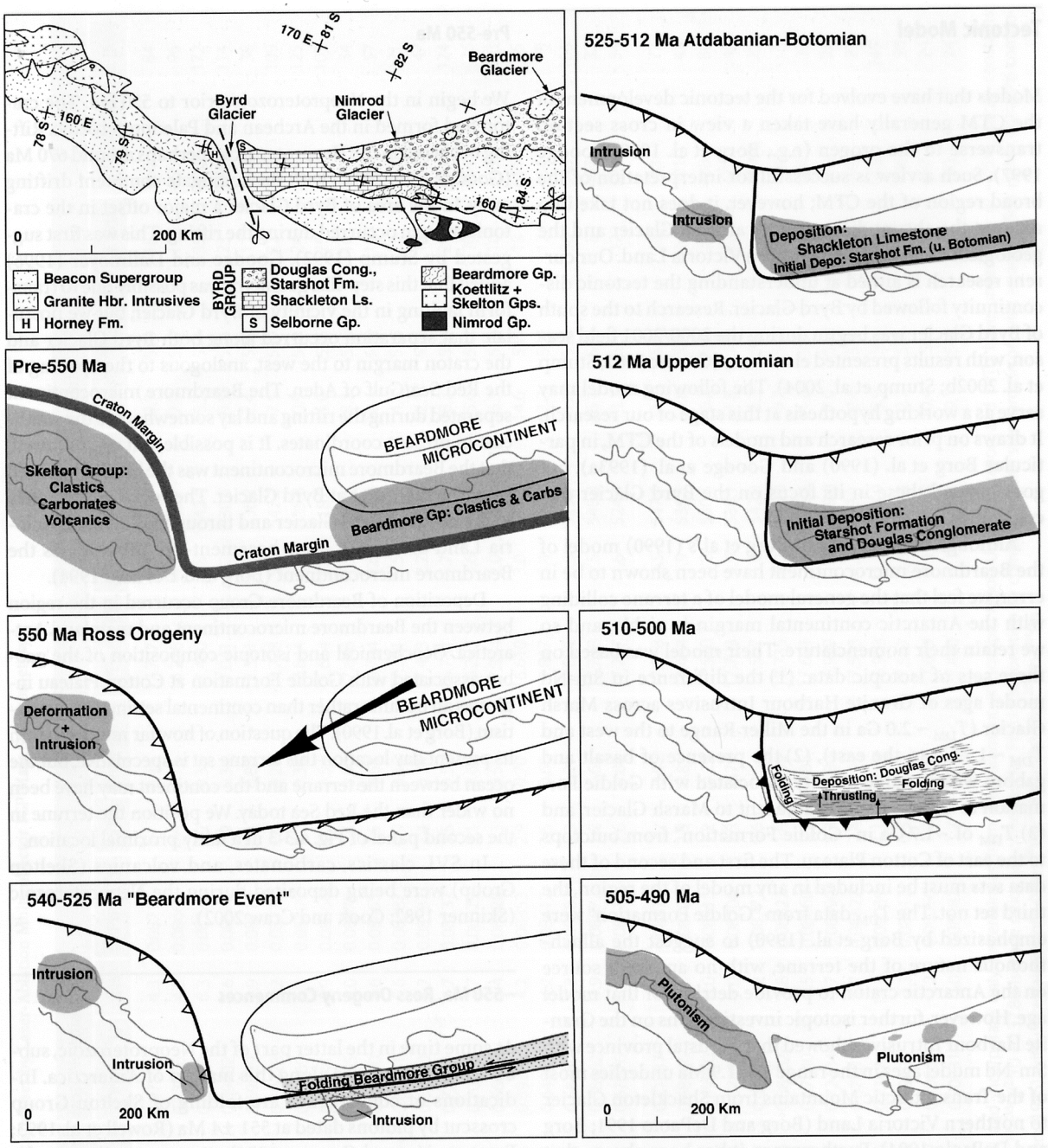
CHIARA MONTOMOLI	ASSEGNISTA DI RICERCA	Dip. Scienze della Terra-Pisa
GIOVANNI MUSUMECI	RICERCATORE	Dip. Scienze della Terra-Pisa

Time devoted to the research program (man-months): 20

Date:

October, 20, 2008

Notes



Tectonic model for development of the Byrd Glacier Discontinuity and surrounding regions of the Transantartic Mountains during the Neoproterozoic – Early Paleozoic (from Stump, Gootee and Talarico, 2006, Springer-Verlag ©).

Remote camp in the Britannia Range, base of INTERTAM field activity during the 2005/06 summer season.