

Final project report

Project ID: 2002/2.4
Title: *Geodetic surveying and monitoring of northern Victoria Land, eastern Antarctic, pacific sector*

Principal investigator: Alessandro Capra
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Duration: two years
Assigned funding: € 49.000

Activities and results

TNB1 GPS permanent trackers has been acquired data that were processed in order to obtain long time series. Data were sent to international data processing centres, IGS and SCAR GPS Epoch.

The installation of new GNSS permanent trackers has been started on Cape Hallett and Cape Adare sites, including wind generator installation tests.

VLNDEF (Victoria Land Network for DEformation control) network was surveyed again and GPS data were processed with different software: Bernese, GAMIT and Gipsy.

The analysis of data acquired on VLNDEF stations and TNB1 long time series allowed to determine crustal deformations of northern Victoria Land. The results will give a fundamental contribution for geodynamics study of the area.

Preliminary models of absolute horizontal and vertical movements were obtained and even horizontal residual movement were determined.

VLNDEF network was connected to TAMDEF (Trans Antarctic Mountain DEformation control), managed by USA researchers. The connection between the two networks will permit to extend surface kinematics control to north and South Victoria Land.

The integration between gravimetric, geodetic and sea tidal measurements permitted to determine a high resolution geoid of a significant portion of northern Victoria Land.

A GPS data processing strategy was implemented to compute zenithal tropospheric delay (ZTD) due to hydrostatic component (ZHD) and wet component (ZWD); these parameters were introduced in NWPM in order to estimate nowcasting and forecasting.

A structure of geodetic metadata was designed for PNRA and Geodesy Project web site was created on <http://www.geodant.unimo.it>

Products

A – papers in scientific magazines

1. Negusini M., Mancini F., Gandolfi S., Capra A. (2005) *Terra nova bay gps permanent station (Antarctica): data quality and first attempt in the evaluation of regional displacement*. Journal of Geodynamics, 39/2, pp81-90.
2. Capra A., Mancini F., Negusini M. (2007) "GPS as a geodetic tool for geodynamic in the Northern Victoria Land, Antarctica" Antarctic Science 19 (1), 107-114 . 2007
3. Sterzai P., Coren F., Capra A., Marson I., (2007) . *Local geoid determination by gravimetric measurements in Northern Victoria Land*. In corso di stampa su terra Antartica.
4. Zanutta A., Vittuari L., Gandolfi S. (2008) Geodetic GPS-based analysis of recent crustal motions in Victoria Land (Antarctica). Global and Planetary Change, 62, pp.115-131.

B – book chapters

Programma Nazionale di Ricerche in Antartide (PNRA)

1. Sarti P., Negusini M., Lanconelli A., Lupi C., Tomasi A., Cacciari A. A GPS derived Precipitable Water Vapour content and its relationship with 5 years of long-wave radiation measurements at MZS station, Terra Nova Bay, Antarctica, on "Geodetic and Geophysical observations in Antarctica- an overview in IPY perspective" eds A.Capra, R.Dietrich, pp. 145-178, Springer. In press

C - proceedings of international conferences

1. Sterzai P., Coren F., Capra A., Marson I., (200X). *Local geoid determination by gravimetric measurements in Northern Victoria Land*. In corso di stampa su Terra Antarctica.
2. Capra A. (2006) *Overview of Geodetic Reference Frame and Related Activities in Antarctica* Proceedings of the workshop "Frontiers and Opportunities in Antarctica Geosciences" Siena, 2004. Terra Antarctica Reports, n.12, pp.21-28, MNA Siena (ISBN 978-88-88395-04-3) 2006
3. Mancini F, Negusini M., Zanutta A., Capra A. (2008) *Vertical motions in Northern Victoria Land inferred from GPS.: a comparison with the glacial isostatic adjustment models..* On Antarctica : a keystone in a changing world- online proceedings for X ISAES, Santa Barbara , Cal, USA august 2007. Ed. By A.Cooper, C.Raymond and the ISAES editorial team- 2007, ISSN: 0196-1497 DOI:10.3133/of2007-1047 ISBN: 1.411-31788-2(for Cd-ROM version)

D – proceedings of national meetings and conferences

1. Capra A., Galeandro A., Negusini M., Vittuari L. (2007) *Inquadramento delle reti regionali VLNDEF e TAMDEF (Antartide) nel sistema di riferimento globale*. Atti Convegno SIFET 2007 "Dal rilevamento fotogrammetrico ai data base topografici", Arezzo, Giugno 2007, pp.66-73, 2007, ISBN 88-901939-4-8.
2. Capra, S. Gandolfi, F. Mancini, L. Vittuari, G.Bitelli, P. Sarti, A.Zanutta (2003). *Il progetto VLNDEF per il monitoraggio delle deformazioni crostali della Terra Vittoria settentrionale*. Atti ASITA 03, pp.603-605.
4. Capra, M.Dubbini, F. Mancini, S.Montaguti, M. Negusini, L. Vittuari, A.Zanutta. *Deformazioni orizzontali e verticali della Terra Vittoria Settentrionale, Antartide*. Atti 9a Conferenza ASITA 05– Catania, 15-18 Novembre 2005, pp.583-585, 2005.

E - carte tematiche

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F - brevetti, prototipi e database

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G - mostre, organizzazione convegni, editing ed altro

Creazione della pagina web <http://www.geodant.unimo.it/>

H - attività di formazione (tesi di dottorato, assegni di ricerca, etc.)

Tesi di Dottorato del'Ing. Angelo Galeandro dal titolo "Superficial kinematics study with GNSS measurement technique – application in Victoria Land (Antarctica)" - Dottorato in Ingegneria dell'Ambiente e del Territorio- curricula Topografia e Cartografia - Tutor Prof. Ing. Alessandro Capra

Research units

1. MOR-BIT

Responsabil: Gabriele Bitelli

Istituto di appartenenza: Dipartimento DISTART- Universit* di Bologna

Nome/Name	Qualifica/Role	Istituto/Institution
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Programma Nazionale di Ricerche in Antartide (PNRA)

Gabriele Bitelli	Professore Ordinario	DISTART Dip.- Univ. Bologna
Luca Vittuari	Professore Associato	DISTART Dip- UNiv.Bologna
Stefano Gandolfi	Ricercatore	DISTART Dip- UNiv.Bologna
Antonio Zanutta	Ricercatore	DISTART Dip- UNiv.Bologna
Carlo Lusetti	Ricercatore	Istituto Idrografico Marina

2 MOR-CAP

Responsabile: Alessandro Capra

Istituto di afferenza: Dipartimento DIMeC- Università di Modena e Reggio Emilia

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Alessandro Capra	Professore Ordinario	DIMeC Dip.- Univ. Modena e Reggio Emilia
Francesco Mancini	Ricercatore	DAU Dip -Politecnico Bari
Marco Dubbini	Borsista	DIMeC Dip.- Univ. Modena e Reggio Emilia
Eleonora Bertacchini	Dottoranda	DIMeC Dip.- Univ. Modena e Reggio Emilia
Cristina Castagnetti	Dottoranda	DIMeC Dip.- Univ. Modena e Reggio Emilia

3 MOR-DEC

Responsabile / Principal investigator: Grazia De Cillia

Istituto di afferenza: Istituto nazionale di Oceanografia e di Geofisica Sperimentale

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Carla De Cillia	Ricercatore	
Franco Coren	Ricercatore	
Francesco Palmieri	Ricercatore	
Paolo Sterzai	Ricercatore	
Roberto Vidmar	Ricercatore	
Claudio Zanolli	Ricercatore	

4 MOR-SAR

Responsabile / Principal investigator: Pierguido Sarti

Istituto di afferenza: INAF

Nome/Name	Qualifica/Role	Istituto/Institution
Pierguido Sarti	Ricercatore	ITIS-CNR
Pier Francesco Coppola	Maggiore	Aviazione Militare
Paolo Tomasi	Ricercatore	ITIS- CNR
Monia Negusini	Ricercatore	ITIS-CNR

Date: 27 Ottobre 2008