

Final project report

<i>Project ID</i>	2004/2.1
<i>Title</i>	Geophysical and Volcanological Observatory of Mount Melbourne
<i>Principal investigator</i>	Alessandro Bonaccorso
<i>Institution</i>	Istituto Nazionale di Geofisica e Vulcanologia
<i>Email</i>	bonaccorso@ct.ingv.it
<i>Duration</i>	2 years
<i>Assigned funding</i>	41.500,00 Euro

Activities and results

The first year was dedicated to a preliminary survey in Antarctica, specifically requested by CSNA, that envisaged both the inspection of the sites of the permanent stations as well as their testing and maintenance. In addition, the successive funding, reduced with respect to the demands of the submitted and approved project, has meant a consequent reformulation of the project itself. Together with these limitations, the delay in distributing the first year funds (PEA 2004) should be noted, which in fact only happened on 16/02/2007.

After a number of examinations, it was decided to: *i)* continue with the technological developments for the existing tiltmeters network, and *ii)* above all, at the same time, to evaluate the best technical solutions for the installation of multi-parametric stations and a permanent GPS network, with continuous recording able to resist the extreme conditions of the volcano under study.

Numerous surveys and tests have been carried out in order to optimize the instrumentation concerning point *ii)*, executing numerous tests also in extreme conditions (at summit altitudes on Etna in the winter). Numerous tests have been made on new instrumentation (tiltmeters, GPS), on power systems (wind and photovoltaic) and battery packs (high power batteries), and regarding the technical solutions to adopt. In the course of the project, various technical solutions have been evaluated, and infrastructure for complete geophysical stations of resistant material, suitable insulation, power systems and transmission have been designed. Experimentation on various components of a permanent GPS network, both in the laboratory and at high altitude in climatic conditions that are close to the extremes present in Antarctica, has been carried out.

In particular, an experimentation has been conducted at the summit area of Etna where, with different modalities compared to the stations currently used for monitoring activities (i.e., stations with reduced thermal insulation, with verification of temperature), probing tests on the capacity of the receiver to tolerate 1) temperatures in the range -20° - 0° , 2) sharp changes in temperature values (day-night, above 15°) and 3) sharp changes in the humidity values, have been carried out.

It is worth underlining that this part of the project has been possible thanks to co-funding from the Catania Section of the INGV, both in terms of know-how as well as the dedicated staff and funding made available.

All these tests, with the aid of numerous staff and proven know-how, should be considered unique in their field and highly prized for the correct scientific and applicative exploitation in Antarctic situations.

Summary of achieved objectives

- Survey in Antarctica with verification of sites and existing stations.
- Laboratory tests:
 - Testing power systems (wind and solar, new batteries), and solutions for various energy combinations
 - Testing control systems (new datalogger)
 - Testing and verification of instruments
 - Planning and realization of specific infrastructure for the stations to be used in the Antarctic;
 - Installation of infrastructures and high altitude stations with verification of the experimentation undertaken and the adopted technical solutions
 - Realization of innovative solutions, for specific use in Antarctic situations, on power systems and

Programma Nazionale di Ricerche in Antartide (PNRA)

components of GPS stations

Products

A – papers in scientific magazines

1. Campisi O., Falzone G., Ferro A., Gambino S., Laudani G., Saraceno B., [Realizzazione di un sito test per clinometri di tipo bore-hole](#), rapporti Tecnici n. 106, 2009
2. Ferro A. (2007), RETE_TILT : un software per il monitoraggio dello stato di funzionamento delle reti clinometriche dell'Etna e delle isole Eolie, Rapporti Tecnici n.38, INGV
3. Ferro A., [Un sistema per il rilievo immediato di eventi di deformazione del suolo nel versante nord dell'Etna e relativa segnalazione via SMS/Email, Rapporti Tecnici n. 94, INGV](#)
4. Ferro A. e Laudani G. (2008), Un prototipo industrializzabile di nuova stazione clinometrica, Rapporti Tecnici n. 199, INGV
5. Gambino S. (2005) Air and permafrost temperature at Mt. Melbourne (1989-1998). *Antarctic Science*, 17 (1), 151-152.
6. Rossi M., Pellegrino D., Pulvirenti M., Mattia M., (2008) Applicazione di sistemi di comunicazione Wi-Fi al monitoraggio delle deformazioni del suolo. Rapporti Tecnici n.65, INGV
7. Scientific contribution of Bonaccorso A. AND Gambino S. in volume "ANTARCTICA – A natural laboratory for understanding Earth", 64 pp, PNRA, 2006
8. Scientific contribution of Bonaccorso A. AND Gambino S. in volume "ANTARTIDE – Un osservatorio naturale per comprendere la terra, italian version, 78 pp, PNRA, 2006

B – book chapters

--

C - proceedings of international conferences

--

D – proceedings of national meetings and conferences

--

E – thematic maps

--

F – patents, prototypes and data bases

--

G – exhibits, organization of conferences, editing and similar

1. Gambino S., Ferro A., Zuccarello L. (2006) Le attività svolte dalla Sezione di Catania dell'INGV-CT sui vulcani dell'Antartide. Presentazione orale alla Settimana della Cultura, 13-18 marzo, 2006, INGV Catania.
2. Gambino S., Falzone G., Ferro A. (2005) Air and permafrost temperature at Mt. Melbourne (1989-1998) Poster EGU 2005 Geophysical Research Abstracts, Vol. 7, 04840, 2005

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

--

Research units

RU TILTMETRY

Bonaccorso Alessandro	Dirigente di Ricerca INGV CT
Ferro Angelo	CTER INGV CT
Gambino Salvatore	Tecnologo INGV CT
Laudani Giuseppe	CTER INGV CT

Programma Nazionale di Ricerche in Antartide (PNRA)

RU PROTOTYPES AND IMPLEMENTATION OF GEOPHYSICAL MONITORING SYSTEMS

Campisi Orazio	CTER INGV CT
Falzone Giuseppe	CTER INGV CT
Ferro Angelo	CTER INGV CT
La Via Mariano	CTER INGV CT
Reitano Danilo	Tecnologo INGV CT

RU PERMANENT GPS NETWORK

Bonaccorso Alessandro	Dirigente di Ricerca INGV CT
Mattia Mario	Tecnologo INGV CT
Ferro Angelo	CTER INGV CT
Rossi Massimo	CTER INGV CT
Pellegrino Daniele	CTER INGV CT

Date: April 20, 2010
