

Programma Nazionale di Ricerche in Antartide (PNRA)

Final project report

<i>Project ID</i>	2004/2.7-8
<i>Title</i>	Broad-band seismology, lithospheric structure and geodynamics in the Scotia Sea region
<i>Principal investigator</i>	Dr. Marino RUSSI
<i>Institution</i>	Istituto Nazionale di Oceanografia e di Geofisica Sperimentale - OGS
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<i>Duration</i>	3 years
<i>Assigned funding</i>	280.000,00 Euro

Activities and results

All the objectives planned for the PEA 2004-2005-2006 in the fields of instrumental development and data acquisition (U.O OGS resp. Dr. Russi), and research activities (U.O UTS, resp. Prof. Panza) have been achieved. In the period from 2005 to 2009, in addition to the standard operation of the ASAIN network, Ushuaia (USHU) station was moved to Termas del Rio Valdes (TRVA, Tierra del Fuego, Argentina, 2005), Esperanza (ESPZ) station was reopened (2005) and two new stations were installed at the Argentinean bases San Martin (SMAI, 2007) and Belgrano II (BELA, 2009). SMAI and BELA, both located beyond the Antarctic Polar Circle, constitute a PNRA-DNA/IAA contribution to Antarctic Seismology during the International Polar Year, also. Between 2001 and 2003 a major upgrade in the ASAIN hardware took place. The RefTek recorders were disconnected and were replaced by Güralp DM24 24 bit digitizers connected to a PC server running Scream! software to control the acquisition settings, local data storage on high capacity disks and networking functions. This scheme has also been applied to all the stations installed after 2003. Scream! software is used today both to control data acquisition locally and to manage remote connection with the OGS data server. All ASAIN 20 sample/s and 2 sample/s data channels recorded by CMG-3TD (CMG-3ESPCD at BELA) seismometers are routinely transmitted, in real-time, to the OGS server and to the IAA. Each night the complete 40, 20, and 2 sample/s ASAIN data set, recorded during the previous 24 hours, DSPA and TRVA stations included, is retransmitted to the OGS server to eliminate possible gaps in the real-time data. Since 2005, 20 samples/s data recorded by ASAIN stations are retransmitted in the original raw Güralp Compress Format (GCF) to the ORFEUS Data Centre (ODC) where they are converted into MiniSEED format and included in the VEBSN archives. Today ESPZ, JUBA, ORCD, SMAI are available at ODC on a routine basis. In the near future also BELA data will be added. The U.O. UTS executed the refinement and the updating of the structural models for the Scotia Sea, the Carribean Sea and the Mediterranean. Using the FTAN methodology hundreds of seismic signals have been analyzed to determine the dispersion curves that have been inverted to obtain the structural models. The database GEOWEB has been developed: it allows to access seismological data and enable the comparison between the west-verging subduction zones related to the Scotia, the Carribean Sea and the Mediterranean. This project funded two Ph.D.'s in Geophysics at University of Trieste: one related to the study of the seismic sources of the 4 August 2003 earthquake with magnitude 7.5 and epicenter in the Scotia Sea area; another related to the development of computational codes for simulating wave propagation in 3D anelastic media.

Programma Nazionale di Ricerche in Antartide (PNRA)

Products

A – papers in scientific magazines

1. Russi, M., Febrer J. M. and Plasencia Linares M. P. (2010) The Antarctic Seismographic Argentinean Italian Network (ASAIN). Technical development and scientific research from 1992 to 2009. *Bollettino di Geofisica Teorica ed Applicata*, Vol. 51, n.1, 23-41.
2. La Mura C., Yanovskaya T.B., Romanelli F., Panza G.F. (2010) Three-dimensional seismic wave propagation by modal summation: method and validation. *Pure Appl. Geophys*, DOI: 10.1007/s00024-010-0165-2.
3. Boyadzhiev G., Brandmayr E., Pinat T., Panza G.F. (2008) - "Optimization For Non-Linear Inverse Problem In Geophysics", *Rendiconti Lincei, Scienze Fisiche e Naturali*, 19, 17 - 43. DOI: 10.1007/s12210-008-0002-z
4. Raykova R., Panza G.F. (2006), Surface waves tomography and non-linear inversion in the southeast Carpathians, *Phys. Earth Planet. Int.*, 157, 164-180.
5. Guidarelli, M., and Panza, G.F., 2006. Determination of the seismic moment tensor for local events in the South Shetland Islands and Bransfield Strait, *GJI*, 167, 684-692.
6. Guidarelli, M., Pilat, S. and Panza, G.F., 2006. P-SV multimode summation differential seismograms for layered structures: extension to high frequencies and oceanic structural models, *Rendiconti Accademia Nazionale delle Scienze detta dei XL, Memorie di Scienze Fisiche e Naturali*, 123°, Vol. XXIX, t. I, pp. 91-108.
7. Vuan, A., Robertson-Maurice, S.D., Wiens, D.A., and Panza, G.F., (2005). Crustal and upper mantle S-wave velocity structure beneath the Bransfield Strait (West Antarctica) from regional surface wave tomography, *Tectonophysics*, 397, 241-259.
8. Vuan, A., Lodolo, E., Panza, G.F., and Sauli, C., 2005. Crustal structure beneath Discovery Bank in the Scotia Sea from group velocity tomography and seismic reflection data- *Antarctic Science*, 17, 97-106.
9. Carcione, J. M., Helle, H. B., Seriani, G., and Plasencia, M. P., 2005, On the simulation of seismograms in a 2-D viscoelastic Earth by pseudospectral methods, *Geophys. Internat.*, 44, 123-142.

B – book chapters

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C - proceedings of international conferences

1. M. Guidarelli, M.P. Plasencia Linares, M. Russi and G.F. Panza, 2004. Lithospheric structures and regional seismicity in the Scotia Sea area: a review, *Bollettino di Geofisica Teorica ed Applicata*, Vol. 45, n. 2 GEOSUR 2004 supplement, 84-87.
2. M.P. Plasencia Linares, B.G. Bukchin, M. Guidarelli, M. Russi and G.F. Panza, 2004. The 4 August earthquake recorded by ASAIN network in Antarctica and Tierra del Fuego. *Bollettino di Geofisica Teorica ed Applicata*, Vol. 45, n. 2 GEOSUR 2004 supplement, 87-91.
3. M. Russi, M.P. Plasencia Linares and M. Guidarelli, 2004. Further developments of the ASAIN network in Antarctica and Tierra del Fuego. *Bollettino di Geofisica Teorica ed Applicata*, Vol. 45, n. 2 GEOSUR 2004 supplement, 92-95.

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. Antarctic Seismographic Argentinean Italian network recordings database

G – exhibits, organization of conferences, editing and similar

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

1. Plasencia Linares, M. P., 2008. Lithospheric characteristics and seismic sources in the Scotia Arc through waveform inversion. Tesi di Dottorato, Università di Trieste.

Programma Nazionale di Ricerche in Antartide (PNRA)

2. La Mura C. (2009), Wave propagation in three-dimensional anelastic media: the modal summation method in the WKBJ-approximation. Tesi di Dottorato, Università di Trieste.
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Research units

Unit 1

Principal researcher: Marino Russi - Istituto nazionale di Oceanografia e di Geofisica Sperimentale

Roberto Laterza	Tecnico elettronico	OGS
Francesco Militello	Tecnico Elettronico	OGS
Maurizio Grossi	Tecnico Elettronico	OGS
Josè Febrer	Ricercatore	Instituto Antartico Argentino
Gustavo Rodriguez	Operatore	Instituto Antartico Argentino
Milton Plasencia	Ricercatore	Borsista OGS-ICTP
Claudio Coto	Operatore	CADIC (Ushuaia, Argentina)
Eduardo Olivero	Ricercatore	CADIC (Ushuaia, Argentina)
Nestor Rossi	Operatore	Universidad Nacional La Plata

Unit 2

Principal researcher: Giuliano Panza – Università di Trieste

Mariangela Guidarelli	Assegnista	Università di Trieste
O' Leary Gonzales Matos	Ricercatore	Centro Nacional de Investigaciones Sismologica-CUBA
Boris Bukchin	Ricercatore	Intern. Inst. Earthquake Prediction Theory & Mathematical Geophysics
Antonella Peresan	Assegnista	Università di Trieste
Cristina La Mura	Dottorando	Università di Trieste
Tommaso Pinat	Dottorando	Università di Trieste

Date:

Notes