

SCAR WG on GEODESY and GEOGRAPHIC INFORMATION (WG-GGI)

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REPORT OF CURRENT ACTIVITIES OF ITALY FOR 1998-2000

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The following Italian organizations/institutes have developed working programmes to conduct research or operational work in the Antarctic in the field of Geodesy, Remote Sensing, Bathymetry, Geographic Information, Cartography.

Consiglio Nazionale delle Ricerche, Dipartimento Attività Scientifiche
Consiglio Nazionale delle Ricerche, Istituto per le Metodologie Geofisiche Ambientali
Consiglio Nazionale delle Ricerche, Istituto per l'Automazione Navale, Genova
Dipartimento di Scienze dell'Ambiente e del Territorio, Università di Milano
Dipartimento DISTART, Università di Bologna
ENEA Progetto Antartide, Roma
ENEA-INN, Roma
ENEA-AMB, Roma
Istituto Nazionale di Geofisica, Roma
Istituto Idrografico della Marina, Genova
Istituto Geografico Militare Italiano, Firenze
Museo Nazionale dell'Antartide, Sezione di Scienze della Terra, Università di Siena
Società Geografica Italiana, Roma
Università di Siena, Dipartimento di Scienze della Terra
Università di Siena, Istituto di Diritto Pubblico e Internazionale

The list above is provided mainly for a first hand reference. It is not the complete list of all partners involved in the scientific research relevant to WG GGI.

1. FIELD ACTIVITIES

1.1 Geodetic Surveys and Data Processing (Dipartimento DISTART, Università di Bologna).

In the framework of VLNDEF Programme (Victoria Land Network for DEFormation control) aimed at the crustal deformation detection in the Victoria Land area, the main field activity was materialization and surveying of network. Both goals were fully achieved during the 1999-2000 Italian Antarctic Expedition.

The VLNDEF project is carried on within the ANTArctic neoTECtonics Programme (ANTEC). Two Italian scientists, Alessandro Capra (geodesy specialist) and Andrea Morelli (seismologist), are members of the SCAR Group of Specialists ANTEC.

The VLNDEF network consists of 20 GPS stations. It extends for about 500 km northwards of Terra Nova Bay (TNB) to reach the coast on the Pacific Ocean; and for about 200 km inland.

A set of GPS measurements was made on several stations in collaboration with the U.S. project "TAMDEF" for the study of the Deformation of Transantarctic Mountains.

Another series of GPS measurements was made at Terra Nova Bay (TNB) as a contribution to the GPS SCAR Epoch campaign 2000. The GPS data were acquired at the point TNB1, previously called point 0100, where a GPS permanent station is located.

Very long connections (1000 km) from GPS permanent and fixed stations at TNB1 and McMurdo, Dumont d'Urville and Dome C were processed. The study is aimed at evaluating the performance of TNB1 station and to verify the regional consistency of ITRF reference system in Antarctica. GPS data were processed with Gipsy and Bernese software.

The Tide Gauge, pressure sensitive, in operation at TNB was controlled together with data downloading and stability of the sensor cage.

It was found that unfortunately, during winter 1999, the sensor was broken by the sea ice. A new installation is planned.

In support to studies of glaciology about the ice surface deformation, GPS measurements were made of Dome C and Talos Dome strain nets.

1.2 Remote sensing (Dipartimento DISTART, Università di Bologna).

Interferometric SAR data processing was made with the aim to detect the grounding line position and to estimate the ice surface velocities.

1.3 Other international activities and co-operation in geodesy and remote sensing

At the EGS (European Geophysical Society) 2000 General Assembly, Nice, April 2000, a special Symposium was held on "Neotectonics deformation of the Antarctic Plate" promoted by ANTEC. Convenor was A. Capra, co-convenors were J. M. Ibanez, A. Morelli and T. Wilson.

The "Physical Geodesy" project of the WG GGI steered by A. Capra kept on with the data collection as an input to the Data Base Management System. The System aims to archiving and managing all geodetic data available for a local and a regional geoid computation in Antarctica.

The preparation of different geodetic data for geoid computation was also made. Italian scientists are currently taking part into VECTRA Project, an European programme for the application of INSAR techniques to ice glacier monitoring in polar areas.

2. MAPPING ACTIVITIES

2.1 Thematic Mapping (Museo Nazionale dell'Antartide, Sezione di Scienze della Terra, Università di Siena)

During the last two expeditions (1998-99 and 1999-2000) geomorphological and glaciological surveys at different scales were made, mostly in areas which are included in the following USGS sheets: Coulman Island, Mt Murchison, Mt Joice. More specifically the following sites have been surveyed: David Glacier, Ricker Hills, Richards Nunatak, Griffin Nunatak, Ambalada Peak, Brimstone Peak, Mt Bowen, Mt Billing, Mt Hovard, Malta Plateau, Daniell Peninsula and Cape Hallett.

Some measurements by GPS receivers have been performed in support to the activities referred to above, to georeference Landsat satellite images.

2.2 Hydrography (Istituto Idrografico della Marina, Genova)

Coast lines and bathymetric profiles have been determined in the areas in front of, or adjoining, the Italian Station Terra Nova Bay. The activity is part of a multiyear programme aimed at providing a safer navigation.

The coast line has been surveyed at a large scale (1:1000; somewhere 1:500). Also the bathymetric surveys have been performed at the same scales, mostly where the existing jetty could allow in the future the docking of a cargo vessel.

Bathymetry at the scale of 1:200.000 has been carried on in the Wood Bay and north of Drygalski Ice Tongue as a part of the survey needed to complete the nautical chart no.884.

3. GEOGRAPHIC INFORMATION ACTIVITIES

3.1 GIS Established (Università di Siena; ENEA - INN, Roma)

A Geographic Information System (GIS) designed for earth science applications is being maintained at the University of Siena.

Another Geographic Information System (GIS-ILA, Italian Logistics in Antarctica), mainly intended for the needs of the team which organizes the Italian expeditions, has been set up in Rome. Most of the time has been spent, up to now, for achieving a suitable topographic base. That was made by digitizing existing maps. A first level of information, mostly consisting of data retrieved from the reports of all Italian expeditions (fifteen), is now available. The GIS-ILA is the object of presentations at Tokyo's SCALOP Symposium and at Wuhan's Workshop on King George Island GIS, both events occurring in July 2000.

4. SCIENTIFIC PAPERS PUBLISHED / PRESENTED

Armadillo E., Bonaccorso A., Caneva G., Capra A., Falzone P., Ferraccioli F., Gandolfi S., Mancini F., Privitera E., Vittuari L. **Geophysical features of the Mt. Melbourne area and first results from the integrated network for monitoring the volcano (Antarctica)**. In press on the Proceedings of 8th ISAES Symposium, Wellington, New Zealand, 5-9 July 1999

Capra A., Coren F., Frezzotti M., Mancini F., Sterzai V., Vidmar R.- **Verso il monitoraggio ambientale dell'Antartide su scala globale. Il progetto VECTRA**. Atti 3a Conferenza Nazionale ASITA, Napoli, 9-12 Novembre, pp. 489-494, 1999

- Capra A., Gandolfi S.. **A data base for physical geodesy data collection and analysis**. In press on a Special SCAR Bulletin dedicated to AGS 99 (Antarctic Geodesy Symposium) , Warsaw, Poland, 15-16 July, 1999
- Capra A., Gandolfi S. **A project for archiving and managing physical geodesy data in Antarctica**. Presented at IUGG/IAG General Assembly, Birmingham, Great Britain, 19-30 July, 1999.
- Capra A., Gandolfi S., Mancini F., Sarti P., Vittuari L. **La rete GPS per il controllo delle deformazioni nell'area di Baia Terra Nova (Antartide)**. Proceedings of XVIII Convegno GNGTS, Roma, 9-12 Novembre 1999.
- Capra A., Gandolfi S., Mancini F., Sarti P., Vittuari L. **VLNDEF: GPS geodetic network for crustal deformation control in Victoria Land, Antarctica**. EGS 2000 General Assembly, Nice, France, 24-29 April 2000.
- Capra A., Gandolfi S., Mancini F., Sarti P., Vittuari L. **Geodetic network for crustal deformation control in Terra Nova Bay area**. EGS 2000 General Assembly, Nice, France, 24-29 April 2000.
- Cervellati R., Ramorino C., Sievers J., Thomson J., Clarke D. **A Composite Gazetteer of Antarctica**. To be published in the current year on the SCAR Bulletin and Polar Records
- De Muro S. **La trasgressione marina olocenica nello Stretto di Magellano: il contributo della cartografia geomorfologica delle coste. Atlante in scala 1:50.000**
Workshop Ricostruzioni paleoclimatiche dai sedimenti marini del Mare di Ross (Antartide) e dell'Oceano meridionale: riassunti, Trieste, Dipartimento di scienze geologiche, ambientali e marine, 1998, 47-48.
Submitted at the Workshop Ricostruzioni paleoclimatiche dai sedimenti marini del Mare di Ross (Antartide) e dell'Oceano meridionale, Trieste, 1998. In collaboration with Brambati A., Di Grande A., Dini M.
- Falcidieno B., Pizzi C., Sanguineti A., Spagnuolo M., Stocchino C. **Three-dimensional modelling of the Terra Nova Bay sea floor (Ross Sea, Antarctica)**. International Hydrographic Review, 75 (1): 42-57
- Coren F., Marson I., Stoka M., Zanolla C. **Computation of the Moho depths and geoid ondulation from gravity data in the Ross Sea (Antarctica)**. In: C. A. Ricci, ed. The Antarctic region: geological evolution and processes. Proceedings of the VII International Symposium on Earth Sciences, Siena, 1995. Siena, Terra Antartica Publication, 603-608. Submitted at ISAES, International Symposium on Antarctic Earth Sciences, 7., Siena, 1995
- Caneva G., Bozzo E. **Gravity survey on Lanterman-Evans Névé-Salamander Range: an extension of the gravimetric networks in North Victoria Land**. Terra Antartica reports, 2: 57-59
- Capra A. **Geodetic network in a global reference frame**. Terra Antartica reports, 2: 109-113
- Frezzotti M., Capra A., Vittuari L. **Comparison between glacier ice velocities inferred from GPS and sequential satellite images**. Annals of glaciology, 27: 54-60. Submitted at the International symposium on Antarctica and global change: interactions and impacts. Hobart, Australia, 1997
- Pertusati P. C., Capponi G., Crispini L., Meccheri M. **GIGAMAP: German-Italian Geological Antarctic Map Programme**. Terra Antartica reports, 2: 43-45
- Rebesco M., Camerlenghi A., Zanolla C. **Bathymetry and morphogenesis of the continental margin West of the Antarctic Peninsula**. Terra Antartica, 5 (4): 715-728
- Tabacco I. E., Passerini A., Corbelli F., Gorman M. **Determination of the surface and bed topography at Dome C, East Antarctica**. Journal of glaciology, 44 (146) :185-191, (correspondence)
- Bitelli G., Capra A., Frezzotti M., Gandolfi S., Mancini F., Urbini S., Vittuari L. **Reti di deformazioni superficiali di Talos Dome e Dome C: analisi e deformazioni**. Materiali, Dipartimento di geografia dell'Università di Padova, 21: 59-60
Submitted at the National Meeting on Antarctic Glaciology and Paleoclimate, 3., Padova, 1999
- Coren F., Frezzotti M., Vidmar R., Sterzai P. **SAR Interferometric analysis of David-Drygalski glacial system and Nansen Ice Sheet**. Materiali, Dipartimento di Geografia dell'Università di Padova, 21: 19-20. Submitted at National Meeting on Antarctic Glaciology and Paleoclimate, 3., Padova, 1999

Gandolfi S., Urbini S., Frezzotti M., Vittuari L., Flora O. **Attività geodetica lungo la Traversa ITASE**. *Materiali, Dipartimento di geografia dell'Università di Padova*, 21: 47-49. Submitted at National Meeting on Antarctic Glaciology and Paleoclimate, 3., Padova, 1999

Guarracino M., Frezzotti M., Raffi R. **Carta glaciologica della Oates Coast occidentale**. *Materiali, Dipartimento di geografia dell'Università di Padova*, 21: 74-75. Submitted at National Meeting on Antarctic Glaciology and Paleoclimate, 3., Padova, 1999

Vittuari L., Bondesan A. **Valutazione preliminare degli spessori di parte della piattaforma di Hells Gate (Baia Terra Nova, Antartide) attraverso misure fotogrammetriche**. *Materiali, Dipartimento di geografia dell'Università di Padova*, 21: 9-11. Submitted at National Meeting on Antarctic Glaciology and Paleoclimate, 3., Padova, 1999

5. PLACE NAMES

5.1 Composite Gazetteer of Antarctica (ENEA - Progetto Antartide, Roma)

The Italian team entrusted with the compilation of existing geographical names of Antarctica has prepared two contributions to the first edition (March 1998) of the SCAR Composite Gazetteer of Antarctica (CGA). Both contributions are to be presented and discussed at Tokyo meetings.

a) The first of them is entitled "Supplement to the first edition of the CGA". It contains all the addenda or amendments necessary to update the previous edition of the CGA. The Supplement is meant to be kept by the users beside the Volume 1 and Volume 2 of the CGA and consulted jointly.

In the Supplement, the section "Addendum to Vol.1" lists names not existing in the first edition, names with modified coordinates, names to be associated to a different reference number and names with modified spelling or modified geographical class. All together they are 1258 names.

The second section of the Supplement, "Addendum to Vol. 2", is the straightforward consequence of the previous section. Actually Volume 2 of the CGA was a different arrangement of the main database where all the existing geographical features have been listed according to the reference number, each record grouping all applicable names to a given feature.

In the past two years, 773 new place names have been approved by national naming authorities and submitted for the inclusion in the CGA. The new names in the Supplement were contributed by Australia (4), Germany (6), Ecuador (9), Great Britain (56), New Zealand (193), Poland (87) and USA (418).

Additional sections in the Supplement list winter and summer-only Antarctic Stations, Specially Protected Areas, Sites of Special Scientific Interest, Specially Reserved Areas, Multiple-use Planning Areas.

b) The second contribution is a draft, not only preliminary but also partial, of the future second edition of Volume 2 of the CGA. Since the time of the first publication, i.e. March 1998, it was recognized that the SCAR CGA should incorporate, for each listed name, the description of the feature and the date of approval of the name. The additional information, which is not always present in national Gazetteers, was necessary in our case to allow the development of the future

work of comparison and, perhaps, choice of the names. Following the discussions in Concepción, further refined in Rome (March 1999) and in Heppenheim (July 1999), all countries were requested to supply the additional information. The effort required to the nations was however limited, at the present stage, to names beginning with letter "A" only. In this sense the present draft is partial.

Accordingly, the second contribution to the CGA, to be circulated at Tokyo meeting, is nothing more than a good example, suitable for the discussion, of what the new SCAR CGA would look like. Not all requested nations have responded in time and only the first letter of the alphabet, as stated above, has been taken into consideration at the moment; however most editorial aspects, such as the format of the printed issue and the necessary computer routines, have been set up.

Italy maintains the CGA web site www.pnra.it/SCAR_GAZE and updates it quarterly starting from August 1998.

6. PLANNED ACTIVITIES FOR THE NEXT TWO YEARS

6.1 Geodetic Surveys and Data Processing

The VLNDEF network will be extended southwards and westwards in order to cover the area between the present VLNDEF and TAMDEF networks.

A new design for a sea tide measuring instrument is going on. The installation of the new sensor is planned for the 2000-2001 Expedition.

In the framework of VECTRA project, the INSAR technique will be applied to ice glacier monitoring in those areas of Victoria Land already covered by GPS ground control points. The technique will be applied also to compute the DTM in areas without ground control points.

A GPS set of measurements will be aimed at glacier monitoring along the coast (Drygalski and Campbell ice tongues) and inland (Dome C and Talos Dome).

GPS measurements will assist the ITASE Project for vehicle navigation and station positioning along the traverse; in addition, accurate GPS measurements will allow the survey of network for ice deformation determination.

6.2 Place Names

The development of a project of this kind is not fully in the hands of the Countries in charge (Convenors). It is instead in large measure based on the decisions to be taken by the WG GGI. Despite the fact that the planned activities for the next two years would better be outlined after the Meeting in Tokyo, possible lines are sketched here in the following.

New approved names, and descriptions plus date of approval of old names, will be acquired and verified as in the past and will enter into the database.

The web site of the CGA will be maintained and quarterly updated.

A new addendum, listing the additions/deletions of the last two years, could be possibly issued in 2002, depending on the amount of the collected items and also on the stage reached by the planned "Dictionary" (see below).

A draft of the new CGA, to be called "Dictionary of Antarctic Names", should be ready for the discussion and approval at the next WG GGI Meeting. The Dictionary will contain descriptions and dates of approval for all geographical names (all countries and all letters of the alphabet, obviously) following the lines of the example discussed in Tokyo (par 5.1 b).

Rome, 21 June 2000