

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

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REPORT OF CURRENT ACTIVITIES OF ITALY FOR 2000-2002

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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 e Vulcanologia, 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 as a first hand reference, it is not meant to be 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 (DAU, Politecnico di Bari, 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 in 2000-01 Expedition was the completion of the network surveying, started 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 series 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 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.

The connections (1000km) between VLNDEF and TAMDEF are part of the more general problem of evaluating the inclusion of a regional network in ITRF reference system in Antarctica, generating a consistent continental and global solution.

GPS data were processed with Gipsy and Bernese software.

In 2001-02 Expedition the survey of the network around Mt.Melbourne was repeated. It is a detailed network aimed at the crustal deformation control of the volcano.

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

Interferometric SAR data processing was made with the aim to detect the grounding line position of the glacier ice tongues and to estimate the ice surface velocities. First tests for parameters evaluation in high precision geoid estimates were made.

1.3 Tide Gauge Data

The Tide Gauge, pressure sensitive, was in operation at TNB in 2000-2001 and 2001-02 Expeditions.

1.4 Local and regional Geoid computation

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 local and regional geoid computation in Antarctica.

Italian scientists are currently taking part into VECTRA Project, a 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 expeditions geomorphological and glaciological surveys at different scales were made, mostly in areas which are included in the 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.

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

The following maps have been recently issued:

- Satellite Image Map, Northern Foothills and Inexpressible Island, 1:50.000;
- Antarctic Geomorphological and Glaciological 1:250.000 Map Series, Relief Inlet Quadrangle;
- Antarctic Geological 1:250.000 Map Series, Relief Inlet Quadrangle;
- Antarctic Geological 1:250.000 Map Series, Mount Joice Quadrangle;
- Antarctic Geomagnetic 1:250.000 Map Series, Total Magnetic Anomaly Map of Marie Byrd Land.

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.

Coast line has been surveyed at a large scale (1:1000; somewhere 1:500). Also the bathymetric surveys have been performed at the same scale, mostly in the area of the existing jetty which should allow in the future the safe 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.

In the last two years the following chart has been issued:

- Da Capo Russell a Campbell Ice Tongue, 1:50.000;

2.3 Metadata

About 40 Antarctic maps and charts issued by Italian Institutions are to be included in the SCAR Catalog. However the operation has not been completed yet due to some difficulties with the database software and limited time available.

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.

A Geographic Information System (GIS-ILA, Italian Logistics in Antarctica), mainly intended for the needs of the office which organizes the Italian expeditions, has been set up in Rome. A suitable topographic base for the area of operations i.e. Northern Victoria Land has been achieved. That was made by digitizing existing maps. The first level of information, consisting of data retrieved from the reports of all Italian expeditions (seventeen), is available.

4. SCIENTIFIC PAPERS PUBLISHED / PRESENTED

Capra A., Cefalo R., Gandolfi S., Manzoni G., Tabacco I.E., Vittuari L.

Surface topography of Dome Concordia (Antarctica) from kinematic interferential GPS and bedrock topography” Annals of Glaciology, n.30, pp.42-46, 2000

Capra A., Gandolfi S., Mancini F., Sarti P., Vittuari L., Zanutta A.

“Il progetto VLNDEF (Victoria Land Network for DEFormation control) per lo studio della geodinamica a scala regionale in Antartide. Atti della IV Conferenza nazionale ASITA, Genova, Ottobre 2000, vol.1, pp.339-341, 2000.

Armadillo E., Bonaccorso A., Caneva G., Capra A., Falzone P., Ferraccioli F., 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). Proceedings of VII ISAES (International Symposium on Antarctic Earth Sciences), Wellington, July 1999, 2000.

Capra A., Gandolfi S.

A Project for archiving and managing physical geodesy data in Antarctica . IUGG/IAG 99, SCAR Report n.20, pp.16-20, May 2001.

Capra A., Gandolfi S., Mancini F., Sarti P., Vittuari L.

VLNDEF project: geodetic contribution to geodynamics study of Victoria Land, Antarctica. Proceedings of Gravity, Geoid and Geodynamics GG2000 IAG Symposium, Banff, Alberta, Canada, July 2000, pp. 379-385, 2001.

Barzaghi R., Borghi A., Capra A., Gandolfi S.
Analysis of Regional Geoid Estimation in Victoria Land. AGS '01 (Antarctic Geodesy Symposium), St.Petersburg, July 2001, SCAR Report N.21, pp.6-8, January 2002.

Capra A., Gandolfi S., Mancini F., Sarti P., Vittuari L .
"VLNDEF project for crustal deformation control of northern Victoria Land". AGS '01 (Antarctic Geodesy Symposium), St.Petersburg, July 2001, SCAR Report N.21, pp.8-10, January 2002.

Folco L., Capra A., Chiappino M., Frezzotti M., Mellini M., Tabacco I.E.
"The Frontier Mountain meteorite gap (Antarctica)". Meteoritics and Planetary Science 37, 209-228, 2002.

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 three contributions to be tabled at Shanghai meetings.

a) The first of them is entitled **"What's new in the CGA"**. It contains all the addenda or amendments intervened after August 2000 and before July 2002. The document updates the first edition (March 1998) of the SCAR Composite Gazetteer of Antarctica (CGA) and the "Supplement to the First Edition" issued in year 2000 and circulated at the Tokyo Meeting.

The document "What's new in the CGA" is meant to be kept in the shelf by the users beside the Volume 1, Volume 2 and Supplement and be consulted jointly.

"What's new in the CGA" lists 242 names and features not existing in the CGA in August 2000 plus 235 names already existing in the CGA but adopted by new countries, plus several tens items somehow modified.

All new acquisitions of the database can be followed looking at the CGA website.

Italy maintains the CGA web site www.pnra.it/SCAR_GAZE and updates it quarterly starting from August 1998. The last updating was done on 1st July 2002.

b) The second contribution is the "**Composite Gazetteer of Antarctica (CGA), Volume 2, Draft July 2002, Letter A only**". The draft is not only preliminary but also partial preview of the future edition of Volume 2 of the CGA. Since 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 felt necessary to allow the development of the future work of comparison and, perhaps, choice of the names. All countries were requested to supply the additional information. The effort required to the nations was however limited, at the initial stage, to names beginning with letter "A" only. In this sense the present draft is partial.

A document of the same kind was tabled at Tokyo meeting but in the meantime other countries have contributed their descriptions and data of approval (mostly for the letter "A" only, as required) and it was deemed useful for everybody to see the result achieved in a two year span.

As it was said already in the past, such a contribution to the CGA, to be circulated at Shanghai meeting, is nothing more than a good example, suitable for the discussion, of what the new SCAR CGA would look like. Not all nations have yet responded and only the first letter of the alphabet 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, are there.

c) The third contribution has been called "**Analysis of the CGA**". The document takes into consideration a sample set made of 830 features which have received a name (at least one name) beginning with the letter "A". All names beginning with "A" which are in the present CGA database are thus considered, i.e. 1811 names. The analysis, which follows the lines of a preliminary document discussed at the Pontignano's meeting, classifies features according to the number of names received, i.e. single or multiple naming. For multiple naming, the features are further classified to separate conflicting cases from cases in which identical and quasi-identical multiple names are in use.

The main result of the analysis is that an estimated three quarter of the features in the CGA do not exhibit any naming problem. Serious differences, which would require a discussion on a case by case base, affects about 10% of the features.

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.

The complete network repetition is scheduled for 2002-03 Expedition.

Gravity observation will be made in Northern Victoria Land in 2002-03 Expedition.

GPS data and relative gravity measurements will be used for a high precision geoid estimate of the area.

A new design for a tide measuring instrument is going on. The installation of the new gauge is planned for the 2003-04 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 also be applied to compute the DTM in areas lacking of ground control points.

6.2 Composite Gazetteer of Antarctica

The compilation of the CGA will continue collecting definitions and dates of approval for all the already recorded names, collecting at the same time new names for the features not yet named. Countries will be urged once more to send their contributions.

The CGA web site will be quarterly updated.

It is matter for the WG-GGI, or whatever Action Group will be tasked with the CGA, to decide if and when all the data collected are ready for a publication or alternatively the data should remain, as they are now, only accessible on the web; and to discuss if sometime in the future a policy about existing multiple names should be undertaken.