

GIANT PROGRESS REPORT TO SCAR WG-GGI COORDINATORS MEETING

Heppenheim 26/27th July 1999

Activities since Conception meeting July 1998 for the GIANT program are summarised below.

1. PERMANENT GEODETIC OBSERVATORIES

• **Manned GPS sites**

New GPS continuous base station have been installed at Dumont d'Urville, Terra Nova, Zhong Shan, Frei, Maitri Stations and Falklands (see <www.scar-ggi.org.au/geodesy/gps/gpsite.htm>)

Continuous Sites operating with Satellite data retrieval for IGS data centre are:

- Mawson
- Davis
- Casey
- McMurdo
- Amundsen-Scott
- Palmer
- Sanae
- O'Higgins
- Sub Antarctic: *Macquarie, Kerguelen, Gough*
- Syowa

Continuous Sites without Satellite retrieval of data currently are at:

- Dumont d'Urville
- Zhong Shan
- Maitri
- Jubany
- Frei
- Belgrano
- Terra Nova
- San Martin

• **Remote location GPS sites**

Reymond (JPL) in Transantarctic Mountains, Donnellan (JPL) in Edward VII land, are developing technology for power generation for continuous remote observatories. Annual download approach is also being trialed by Tregonning (ANU) at Beaver Lake . ANTEC has been involved in arranging a specialist meeting in Pasadena in late August 1999 for operations in extreme environments.

The initial meeting of ANTEC led to the development of a draft plan for remote site GPS occupation for consideration (see <www.scar-ggi.org.au/geodesy/antec/proposed_sites.gif>)

• **Support for O'Higgins VLBI**

Meeting requested with BKG on 28th July to reinforce the importance of O'Higgins for Global geodesy

• **Satellite data retrieval**

Sanae, Mawson and Syowa are now IGS sites so priority sites for satellite download from existing manual continuous sites are

- Dumont d'Urville
- Terra Nova Bay

- **Space Geodesy solutions**

Australia is processing data from satellite retrieved data from permanent sites for global solutions. Requirements for submission of epoch campaigns to ITRF are being investigated by AUSLIG.

- **Permanent site Web information**

Details of permanent sites have been posted on WG-GGI web site. Metadata records for all IGS permanent GPS and DORIS sites have been entered into the Australian Antarctic Data Centre's metadata database <http://www-aadc.antdiv.gov.au/Metadata/>

- **GPS Base Station specifications**

Specifications for GPS base stations are being reviewed. The best existing international standard for GPS base stations is probably the IGS guidelines for GPS stations. These are the interim recommended standard for Antarctic sites and are being crosslinked from the GIANT web site. The de facto international specifications for stations transmitting DGPS corrections are the USCG standards with RTCM similar to the CORS base station at. These are cross-linked from the GIANT web site. UNAVACO also has useful specifications for base stations, which is under review for preparations of guidelines for Antarctic installation.

- **Geodetic ties to collocated instruments**

Information from all GIANT members was requested in GIANT Newsletter #3 (24/6/99). Specific follow up action is being taken in regards to collocated information at O'Higgins, Dumont Durville, Syowa to obtain local survey information for the WG-GGI web site.

- **Tide Gauge data**

Tide Gauge data is principally held by the Permanent Committee for mean sea level (PCMSL) in London. The Southern Ocean Sea Level Centre (SOSLC) at The National Tidal facility in Australia will archive all southern ocean data it receives. Currently most data is held sent directly to PCMSL in London. All SOSLC data, such as that for the Australian sites is accessible through the NTF web site. Facilitation of data to SOSLC is proceeding (Currently Cape Roberts, Faraday and O'Higgins).

2. GPS EPOCH CAMPAIGNS

The general situation with epoch surveys is illustrated in the overheads supplied by Reinhard Dietrich, who is unable to attend due to IUGG commitments.

3. PHYSICAL GEODESY

See also separate report by A. Capra

- **Data collection and analysis of Gravity Data**

EGM96 gravity set is available from NIMA and needs to be reviewed for Antarctic content Discussion with Steve Kenyon, Munie Kumar commenced.

- **Antarctic Satellite Missions**

GIANT Convenor has been approached about involvement in the CHAMP and GRACE satellite gravity projects. These will produce long wavelength gravity over the Polar Regions and will benefit from ground calibration sites in Antarctica. GIANT convenor registered as Co investigator for CHAMP and GRACE satellite gravity missions with principal investigator C.K. Shum OSU. Links have been made to ICESAT project (Schutz and Herring) re investigator status and ground truthing for the project, which will produce a geopotential model over

Antarctica. An opportunity exists for the WG-GGI to facilitate a sea level or Geoid based DEM over the continent.

- **Collaboration for Fundamental data sets**

The AGDI project (Glenn Johnstone) will create data libraries and assemble compatible fundamental data sets which will assist the Geoid project particularly for collation of Topography and Bathymetry and interface with BEDMAP, RAMP, ADGRAV, IAG, IgeS etc.

- ◆ **ADMAP Meeting**

ANTEC poster prepared by Terry Wilson and as displayed version set up by Glenn Johnstone.

- ◆ **Gravity Data Base**

Capra designed draft data base for discussion/adoption before being populated

- **Evaluation of EGM96 Vs OSU91**

As the new data set does not have significant extra ground gravity data there is little improvement and the lack of ground truthing points to really check any general improvement.

- **Improved Tidal Models**

No progress on this item.

- **Prepare for Computation of high resolution Geoid**

No progress, awaiting data collection from AGDI, RAMP, BEDMAP, ADGRAV and discussions with IAG gravity group. Offer by Russia to host a discussion meeting on Antarctic Geodesy.

4. GLONASS EVALUATION

- **Participation in IGEX Observations campaign**

A Javad GLONASS receiver was run for 2 months at McMurdo,

- ◆ **Data linkage**

GLONASS data was sent to the Global CDDIS data centre by satellite.

- **Analysis of observations**

To date the focus of the IGEX campaign has been to compute and compare GLONASS orbits and GPS orbit.

- **Presentation of results at IGEX meeting**

As only one Antarctic site was observed there is little specialist Antarctic analysis which can be done in relation to ground truthing of transformation parameters until more sites can be occupied.

The major reporting event will be the ION IGEX meeting in Nashville in September 1999 where ground position values will be presented along with orbital information.

- ◆ **Future use of Glonass in Antarctica**

The future of GLONASS campaigns will be evaluated at this time but AUSLIG will be looking to install a permanent JAVAD receiver at an Australian station.

5. DIFFERENTIAL GPS BASE STATIONS

- **Global DGPS Standards**

The default global standard for DGPS transmission for marine transmissions is that of the US Coastguard which now operates many sites in the USA. This is the standard which should be used for Antarctic operations.

- **Antarctic Peninsula DGPS coverage**

Three DGPS transmitting sites, operating to the US standard (with a nominal 200 mile range) could provide 1- 2 metre accuracy positioning for field operations and all shipping in the region to the east of the Antarctic Peninsula. The suggested best location of these stations would be:

- Any Station On King George Island
- Palmer
- Rothera or San Martin

Further investigation on the transmission coverage over sea ice needs to be undertaken.

- **Multiple Applications from GPS Base Stations**

No progress to date on aviation and Kinematic applications

- ◆ **COMNAP submission**

Information on globally accepted standards is being collated for preparation of report to COMNAP.

6. REMOTE GEODETIC OBSERVATORIES

- Technological developments are being monitored but no clear breakthrough has yet been made
- A special Technical Workshop being arranged by NSF through ANTEC to assess the state of the technology for extreme environmental operations. Manning and Hothem invited to attend the workshop 23-27 August in USA for cooperation and feedback with non SCAR researchers

7. INFORMATION ACCESS

- GIANT paper presented at AGS99 Warsaw, this constitutes the core of a more extensive paper for publication (copies circulated)
- Access to GPS data observations from all permanent base stations bringing data out from Antarctic by satellite now readily available through IGS.
- Contact list for access to data from other sites in preparation for web entry
- Cross-links established from WG-GGI web site to individual web sites where they existing for geodetic information. Most links are however to general national Antarctic sites
- Meta data records for IGS GPS and DORIS sites entered into Australian antarctic data base system
- Newsletter and email newsgroups established
- Some progress made on posting photo indents of Geodetic sites on web by USA and Australia. An important stage is identifying a total network of geodetic sites and their accuracies are now being reached.
- ANTEC group and web site established (see <www.scar-ggi.org.au/geodesy/antec/antec.htm>) and interaction with other SCAR working groups and non-Scar researchers continued through this approach and through IAG/IUGG
- Report from IAG Sub commission on Antarctica submitted to IAG Commission X Continental Geodetic Networks
- Draft WGS84-ITRF paper prepared

- AGS99 Warsaw - Some 30 participants and ten nations represented a very successful event with papers to be published by SCAR.
- Discussion commenced to obtain additional information for web posting on VLBI and absolute gravity programs

8. OTHER ITEMS

A number of other issues have developed since the Concepcion meeting:

- **Antarctic Geodesy Conferences**
There has been considerable Antarctic Geodesy exposure at recent conferences.
 - AGU December 98 Antarctic Geodesy sessions (Hothem and Dietrich)
 - EUG Polar Earth Geoscience Symposium involving Neotectonics of the Antarctic Continent (Dalziell and Dietrich convenors)
 - European Geophysical Society - Antarctic Geodesy Symposium (Ihde convenor.)
 - AGS99 Cisak convenor
- **New conferences proposed in the next 12 months**
 - EGS 2000 Italy where special session on ANTEC is proposed
 - GIANT technical meeting in April 2000. Hosting invitations received from Russia (St Petersburg) and Scandinavia.

IAG Activities

Alessandro Capra presented his physical Geodesy data base approach during IUGG and it is expected that a special group on Polar Gravity will be reformed, initially to look at Arctic Coordination but eventually to focus on Antarctica.

Internet based GIS

China presented a proposal for a web based distributed system for an Antarctic GIS and offered to host a GIS meeting at the Chinese Antarctic Centre immediately before SCAR2000

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25th July 1999