

Working Group on Solid-Earth Geophysics

Reports to SCAR XXVI 10-14 July 2000, Tokyo, Japan

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The Working Group met on 10-14 July 2000, and also met jointly with the Working Group on Geology on 11 and 13 July for discussing matters of common interest. A separate report has been prepared of the proceedings of the joint meeting. A joint meeting of the Working Groups on Geodesy and Geographic Information, Glaciology, Geology, and Solid-Earth Geophysics took place on 11 July 2000.

ATTENDEES

Representatives: R Bell (USA); M Canals (Spain); D Damaske (Secretary, Germany); F J Davey (New Zealand); K Kaminuma (Japan); Y Kim (South Korea); Y Kristofferson (Norway); G Leitchenkov (Russia); P O'Brien (Australia); R Schlich (France).

Apologies for absence were received from M Ghidella (Argentina); H Gupta (India); A Meloni (Italy); J Souza (Brasil); H Rovera (Uruguay); T Ruotoistenmäki (Finland).

Since the retirement of P F Barker as the UK representative this position is vacant.

Observers (for 1 or more sessions): S Borg (NSF/OPP, USA); K Shibuya (NIPR, Japan); M Kanao (NIPR, Japan); T J Wilson (OSU, USA).

M. Canals informed the group that the Spanish representative to the WG in Concepcion, Jesus Baraza, passed away just a few weeks before our present meeting. The Working Group expressed condolences.

AGENDA ITEMS

(Some of the following were also discussed and reported in the joint meeting of the Working Groupson Geology and on Solid-Earth Geophysics.)

1. NATIONAL REPORTS

National Reports were presented by representatives and paper copies circulated. The major science programmes reported were discussed. The secretary will circulate copies of written reports to absentees.

2. ADMAP

The Antarctic Digital Magnetic Anomaly Project (ADMAP) was launched (1995 workshop in Cambridge, UK) to compile and integrate, into a digital database, all existing near-surface and

satellite magnetic anomaly data collected in Antarctica and the surrounding oceans south of 60°S. ADMAP was encouraged by both SCAR (WG SEG) and IAGA. In 1997, a second workshop was held at ING (Istituto Nazionale di Geofisica) in Rome, Italy, to evaluate the progress on the development of a digital magnetic database for the production of an Antarctic magnetic anomaly map. In 1999, the third workshop was held in Columbus, Ohio, where preliminary compilations and draft maps of three subsets of the map were discussed and further steps taken to develop the digital data base. Subsequently these three maps have been integrated. At this SCAR meeting in Tokyo the preliminary map of magnetic anomalies for the whole Antarctic region has been presented and discussed. Suggestions for the improved presentation of the map were made and will be brought to the attention of the ADMAP group to be considered before final publication. The WG acknowledged the work of ADMAP and supports the request for funding the printing of the map. The WG also supports the request for financial support of the 2001 workshop which will conclude the work of the ADMAP group along with the release of the digital data base.

3. ENVIRONMENTAL ASPECTS ON THE USE OF ACOUSTIC TECHNIQUES

The Working Group on Solid-Earth Geophysics received a report from D Damaske (Germany) on the decision of the German environmental agency (UBA) to require a Comprehensive Environmental Evaluation on the effect on marine animals of seismic reflection airguns, echo-sounders, multibeam seabed mapping systems and other standard marine acoustic devices. This decision cancelled major marine science programs in the Antarctic including a joint German/Italian geophysical survey. The decision effectively prevents German research into climate change and marine geology as well as fish and krill populations. The Working Group on Solid-Earth Geophysics consulted with the Working Groups on Geology and Biology and developed three recommendations. One recommendation is for a letter from SCAR to the German National Committee supporting its concerns with the decision. The second recommendation is to form an ad hoc group to prepare a SCAR report on the the impact of acoustic techniques on marine organisms based on the available scientific research. The third recommendation is that SCAR send a paper on this subject to the CEP.

4. SCAR REVIEW

The Solid Earth Working Group has examined and discussed extensively the SCAR review document during the SCAR Tokyo meeting. The WG SEG applauds the committee's effort to identify the shortcomings with the present structure of SCAR and supports the finding that SCAR needs to change in order to be relevant and effective in the global science community. We offer the following comments:

- (1) The Working Group proposes a science steering committee that would initiate, prioritize and oversee the scientific activities of SCAR.
- (2) The Working Group strongly advocates a direct connection between a science steering group and the action groups. A science based steering group is essential to the future relevance and effectiveness of SCAR.
- (3) The Working Group recognizes the review group's recommendation to have the delegates be active scientists. We feel that the National Committees for various reasons will be unable to meet this recommendation. An independent science steering group consisting of internationally recognized scientists is a more desirable alternative.
- (4) The Working Group believes that for SCAR to play a central role in the future of Antarctic science SCAR must also adopt a proactive role in data management. We recommend a Vice President take special responsibility for data management.

5. MEETINGS

The SCAR 8th International Symposium on Antarctic Earth Sciences was held in Wellington, New Zealand, in July 1999, supported by WG Solid Earth Geophysics and WG Geology. The meeting was very successful with over 300 scientists attending from 22 countries. A wide range of lectures, poster sessions, and field trips took place. The symposium volume is in preparation with publication expected in early 2001.

A first circular for the 9th ISAES has been distributed. The symposium will be held 8-12 September 2003 in Potsdam, Germany. Preparations are underway and a number of excursions are planned. The WG supports the request for financial support of the meeting.

The first circular for the 11th meeting of the European Union of Geosciences (EUG) in Strasbourg in April 2001 was presented.

6. ANTEC

A general report by T Wilson, chair of the ANTEC GoS, was given in the joint meeting with WG Geology. In another brief report to WG SEG, T Wilson outlined the need for new station seismic arrays and temporary seismic arrays in the field to collect adequate data on Antarctic seismicity and crustal structure. A further need is for all station and temporary arrays to collect data in an internationally recognised standard format and for the data to be archived in international data repositories so they can be used widely.

The WG supports the concept of a GoS on Lake Vostok.

7. ANTOSTRAT

A full report on the ANTOSTRAT subcommittees activities was given in joint meeting with WG Geology.

Y Kristofferson reported on approaches and recommendations for shallow drilling campaigns on the circum-antarctic continental margin developed at a workshop held in Wellington in conjunction with 8th ISAES. The objectives were to identify specific actions needed for geological studies to model Antarctic paleoenvironments over the past 100 million years. The workshop recommended that future research effort should focus on three particular time periods of the climate history - early Cenozoic glaciation, middle Miocene ice build-up, and Plio-Pleistocene glacial/interglacials. The focus should be on collection and analysis of ground-truth geologic information from around Antarctica and its continental margin. The first shallow-drilling campaign in the field and cutting core is targeted to take place before spring 2003.

8. GRAVITY PROJECT

A Capra from the WG GGI reported on the work of an Antarctic gravity project as part of GGI and IAG efforts. The WG SEG supports this initiative especially the aspect of compilation of all existing Antarctic geodetic and gravity data. The proposed product of a new free air gravity map, new Bouguer gravity map and a new geoid will be a tremendous asset to the solid earth community. The WG SEG will ensure close collaboration with WG GGI through a subcommittee/oversight group including 2 members from WG SEG.

The WG strongly recommends that all countries contribute both their gridded and the along track

gravity data to this important international project. The resulting compilation will benefit all Antarctic research programs.

9. LAKE VOSTOK

Most WG members attended the lecture on Subglacial Lakes In Antarctica.

G Leitchenkov reported to the WG on data collected in the Lake Vostok area during recent (1996&endash;2000) Russian Antarctic Expeditions and their interpretation together with older oversnow gravity, reflection seismic and radio-echo-sounding data.

Available data show that lake morphology is defined by steep (15-20°) bedrock scarps up to 1000 m high with local step-like features probably related to faulted blocks. Modelling of large negative free-air gravity anomalies (up to -120 mGal) recorded over the lake suggests the existence of a sedimentary fill of 2&endash;4 km thickness. Based on these general features, the geological nature of Lake Vostok is seen as being of tectonic origin with the formation of the basement depression attributed to intracontinental rifting which presumably started in preglacial (Late Mesozoic) time and has been reactivated recently.

10. RECOMMENDATIONS

The WG reviewed the recommendations of the 1998 meeting. SEG 1998-1 was revised to include recommendations on standards for data archiving. In addition, the WG considered the deployment of temporary broad-band seismograph arrays to be important and developed a new recommendation for this activity. SEG 1998-2 was dropped since it appeared that it served its main purpose to maintain the Mawson geomagnetic observatory and no other magnetic observatories were reported to be likely to be downgraded at this time. SEG 1998-3 was continued as there is still the need for this activity. SEG 1998-4 was extended to emphasize the need for an improvement in the techniques for oversnow seismic profiling. SEG 1998-5 was dropped since the compilation of magnetic data has been achieved and publication of a map and digital data base are under way. SEG 1998-6 has had minor changes emphasizing the importance of this activity.

11. CREATION OF NEW WG ON EARTH SCIENCES

For some time, WGs SEG and Geology have had joint meetings with an increasing number of topics of common interest. Major decisions on science initiatives have been made jointly. The need for a broad range of expertise to deal with basic geophysical problems can be addressed by the establishment of subcommittees. The new WG should allow each nation to name a member and an alternate.

The current Working Group identified the following overarching goals for the new Geoscience Working Group

- (1) Identifying developing science problems;
- (2) Steering international cooperation;
- (3) Applying Antarctic research to global problems;
- (4) Providing a forum to encourage integration and preservation of data;
- (5) Disseminating data;
- (6) Involving more young scientists in Antarctic research;
- (7) Providing adequate scientific advice for management of the Antarctic;
- (8) Provide liaison between Antarctic research and other groups.

12. NEW SECRETARY

After 4 years in office D Damaske (Germany) stepped down from the position of Secretary of the WG SEG. Phil O'Brien (Australia) was elected unanimously to succeed.

13. NEXT MEETING

The WG in its present or revised form requests that it meets formally in 2002 at XXVII SCAR in China.

RECOMMENDATIONS TO XXVI SCAR

SEG 2000-1 (revised from SEG 1998-1).

Recognising the importance of global seismic monitoring in understanding the structure of the deep interior of the earth, the Working Group supports the continued operation of existing broad-band seismographs on the Antarctic continent. The data from permanent seismic stations, including waveform data, should conform to Federation of Digital Seismographic Networks (FDSN) standards for instrument type and format, and should be archived in an internationally acceptable data repository.

SEG 2000-2.

Recognising the importance of broad-band seismic monitoring for understanding the structure and neotectonics of the Antarctic lithosphere, the Working Group encourages the deployment of temporary broad-band seismograph arrays on the Antarctic continent. The data from temporary seismic stations, including waveform data, should conform to FDSN standards for instrument type and format and should be archived in an internationally acceptable data repository.

SEG 2000-3 (continued from SEG 1998-3).

Recognising the importance of permanent GPS sites and absolute gravity measurements to geodynamic studies and in providing ground truth for upcoming satellite missions, the Working Group encourages the establishment of new permanent GPS sites and absolute gravity measurements in optimal locations.

SEG 2000-4 (revised from SEG 1998-4).

Recognising that seismic profiling over snow is essential to an understanding of the geological structure of the Antarctic continent, the Working Group strongly recommends the further development of the techniques and the expansion of field measurements.

SEG 2000-5 (revised from SEG 1998-6).

Recognising that swath mapping and high-resolution acoustic profiling are essential for the identification of glacial, neotectonic and other developments in and around Antarctica related to Global Change, the Working Group strongly endorses the expansion of these activities and

recommends their integration with coring and drilling.

LIST OF ACRONYMS AND ABBREVIATIONS

ADMAP Antarctic Digital Magnetic Anomaly Project

ANTEC Group of Specialists on Antarctic Neotectonics

ANTOSTRAT Antarctic Offshore Stratigraphy Project

CEP Committee for Environmental Protection

EUG European Union of Geosciences

FDSN Federation of Digital Seismographic Networks

GoS Group of Specialists

GPS Global Positioning System

IAG International Association of Gravimetry

IAGA International Association of Geomagnetism and Aeronomy

ING Istituto Nazionale di Geofisica

ISAES International Symposium on Antarctic Earth Sciences

NIPR National Institute of Polar Research

NSF National Science Foundation

OPP Office of Polar Programs

OSU Ohio State University

UBA Umweltbundesamt

WG SEG Working Group on Solid-Earth Geophysics

WG Working Group