IAG Newsletter

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The *IAG Newsletter* is under the editorial responsibility of the *Communication and Outreach Branch* (COB) of the IAG.

It is an open forum and contributors are welcome to send material (preferably in electronic form) to the IAG COB (newsletter@iag-aig.org). These contributions should complement information sent by IAG officials or by IAG symposia organizers (reports and announcements). The *IAG Newsletter* is published monthly. It is available in different formats from the IAG new internet site: http://www.iag-aig.org

Each *IAG Newsletter* includes several of the following topics:

I. news from the Bureau Members
II. general information
III. reports of IAG symposia
IV. reports by commissions, special commissions or study groups
V. symposia announcements
VI. book reviews
VII. fast bibliography

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General Announcements

The IAG Scientific Assembly 2005 – personal impressions

by GERHARD BEUTLER, IAG PRESIDENT

IAG Scientific Assemblies take place at four-year intervals, midway between the IAG/IUGG General Assemblies. The IAG held its Scientific Assembly in 2005 in Cairns, Australia, midway between the General Assemblies in Sapporo in 2003 and in Perugia 2007. It had the general title *Dynamic Planet 2005*. The conference attracted more than 750 scientists from all over the world. 60 countries were represented.

The Cairns Scientific Assembly was a joint assembly of IAG, IAPSO (International Association for the Physical Sciences of the Ocean), and IABO (International Association for Biological Oceanography). We all know that IAG is the scientific organisation in the field of geodesy, promoting scientific cooperation and research in geodesy on a global scale and contributing to it through its various research activities. IAPSO has the prime goal of promoting the study of scientific problems relating to the oceans and the interactions taking places at the sea floor, coastal, and atmospheric boundaries. IABO has the objective to promote the advancement of knowledge of the biology of the sea.

From this description of IAG, IAPSO, and IABO (taken from the conference's homepage) it is clear that strong links between IAG and IAPSO must exist. This is reinforced by the fact that there were three joint IAG/IAPSO sessions in Cairns, namely on ocean circulation and the contributions from the new gravity field missions, on global sea-level change (altimetry, GNSS, and tide gauge measurements), and on oceanography and geodesy in polar regions. Needless to point out that the three topics are of primary interest to geodesy.

These joint symposia were accompanied by eight "pure" IAG symposia on frontiers in the analysis of space geodetic measurements, on gravity field determination, on Earth processes, on advances in the realization of global and regional reference frame, on GGOS (Global Geodetic Observing System), on the geodesy of the planets, on systems and methods for airborne mapping, on geophysics and hazards and disaster monitoring, and, last but not least, on atmospheric studies using space geodetic techniques.

Each session contained oral and poster presentations. It must have been difficult for the scientific program committee to make a proper selection. Viewed from my perspective, there was no difference in quality between posters and oral presentations – the poster sessions had the advantage that drinks were served and a direct contact with the authors was easily established. We are indepted to the scientific organizing committee chaired by Paul Tregoning of the Local Organizing Committee, and by Michael Sideris for the IAG liaison.

As many events took place in parallel, and as there also was administrative work to be handled on top of the scientific program, it was impossible for an individual to get a comprehensive overview of the conference. From what I could see the quality of the vast majority of the papers was outstanding, and they gave an excellent picture of the developments in the fields covered.

Knowing that this is somewhat unfair, I cannot resist the temptation to make a few very personal comments based on that part of the program I could follow or was involved in.

From the IAG side the assembly truly was a joint assembly. I had the impression that there are not only strong links between geodesy and oceanography, but that an interdisciplinary field is being established. This is undoubtedly thanks to the gravity missions with their strong oceanographic component. This is of course the IAG interpretation. The IAPSO president might as well say that this is undoubtedly thanks to the oceanography missions, which have a strong geodetic component. We know of course that the former interpretation is the correct one …

The interest in the session on advances in the realization of global and regional reference frame was as a matter of fact so great that there was not enough room in the auditorium – the only case where one might speak of a logistics problem. The interest also indicates that the geodetic contribution to Earth sciences is viewed as an extremely important component of the IAG work. The progress made

was only possible thanks to the excellent work of the IAG services (in particular the IERS, IGS, IVS, ILR, and IDS), and commissions 1 and 4.

Originating from celestial mechanics, I was of course very much impressed by the results coming out of the gravity missions CHAMP and GRACE. Many, if not most, results are interdisciplinary in nature: Who would, for example, have believed twenty years ago that we would be able to make statements about the global water circulation by analysing gravity signals?

I also became aware of problems related to the GRACE mission (e.g., in the IAG session on frontiers in the analysis of space geodetic measurements). Right now, it is not fully understood why the accuracy of results considerably lags behind theoretical expectations. According to my understanding the reasons are currently sought in the field of separating the observed signal into its physical sources.

When attending the session on gravity field determination I was (again due to my background in celestial mechanics) amazed by the multitude of methods developed to determine the Earth's gravity field from space missions. From the celestial mechanics point of view there is "of course" one and only one correct method, and this is the "head through the wall method", which models the observations (GPS phases, K-band measurements between satellites, accelerometer measurements) directly by the parameters describing the force field acting on the satellite. From the fact that more "artistic" methods (based on the energy integral or the Jacobi integral, on the reconstruction of the potential, on first and second derivatives of kinematically determined trajectories) are very successful, currently, one might be allowed to conclude that the celestial mechanics modelling part is not yet fully under control. These thoughts may also raise the question as to whether the conclusions in the previous sentence are completely correct!

This brings me to the activities and session on GGOS, IAG's project on the establishment of the Global Geodetic Observing System. A milestone was reached at the Cairns symposium:

- From 2003 to 2005 the GGOS Project was in its definition phase. It was chaired by Prof. Christopher Reigber from the GeoForschungsZentrum in Potsdam, and Prof. Hermann Drewes from DGFI (German Geodetic Research Institute) in Munich was the secretary of the Project.
- The work of the group is contained in a 26 page document called "GGOS: Implementation Plan". It covers the GGOS objectives, science rationale, the status of GGOS in 2005, including its links to GEO and GGOS, and makes proposals for the future developments of GGOS. The report was accepted by the IAG Executive as a working document, on which the further development of GGOS should be based.
- In the time period 2003-2005 the GGOS Project, which was based on IUGG resolution No. 3 of the IUGG General Assembly 2003 in Sapporo (see Geodesist's Handbook 2004, p. 700), could be established within the Group on Earth Observation (GEO). IAG, represented by GGOS, became a participating organization in GEO and was rather active developing the GEOSS (Global Earth Observation System of Systems) and the implementation plan associated with it.
- Furthermore, strong links were established with IGOS (Integrated Global Observing Strategy) working under the auspices of UNESCO. It is planned to firmly relate GGOS to IGOS-P through a three-step procedure in the near future:
    1. GGOS shall become a member of IGOS-P as a new Global Observing System;
    2. GGOS shall establish links to the existing IGOS-P Themes, allowing GGOS to influence the development of the different theme-specific strategies, and to determine the way in which GGOS can best serve the observing systems implemented under these strategies;
    3. GGOS shall, together with relevant members of IGOS-P, develop the *Earth System Dynamics Theme* further and prepare a proposal for consideration by the IGOS-P members.
    - Due to the retirement of Prof. Christoph Reigber as Director of GFZ, Department 1, a new leadership had to be found for GGOS. At the IAG Executive committee, Prof. Markus Rothacher was appointed Chair of the GGOS Project, and Ruth Neilan (Director, IGS Central Bureau) and Prof. Hans-Peter Plag (University of Reno) as Vice-Chairs of the Project. The Executive Committee thanked Proffs. Reigber and Drewes for their work over the period 2003-2005, and wished the new team all the best for the upcoming implementation phase.

Let me mention two other important issues. Based on an initiative by Dr. Wolfgang Bosch, chair of the inter-commission project on Satellite Altimetry, the IAG Executive Committee adopted the following resolution:
On the occasion of the Dynamic Planet 2005 conference in Cairns, Australia, the International Association of Geodesy, IAG, and the International Association of the Physical Science of the Ocean, IAPSO, both recognize satellite altimetry as an important space technique with interdisciplinary application in oceanography, geodesy, hydrology, and glaciology, demonstrating that satellite altimetry has to be an essential component of any global observing system such as GOOS, GGOS.
•IAG and IAPSO also recognize the necessity to set up and maintain the longest possible time series of altimeter observations with up-to-date geophysical corrections and consolidated geocentric reference, which implies a close attention to the long-term stability of altimeter and ancillary sensors.
•IAG and IAPSO therefore recommend to establish a mission-independent International Altimeter Service with the primary objective to serve operational and scientific users with altimeter data and value-added products, to coordinate and cooperate with space agencies, processing centres, and scientific laboratories, and other existing services.
We hope that IAPSO will come up soon with a similar resolution.
The existing good relationships between FIG (Fédération Internationale des Géomètres) were underlined by the further development of the document *Liaison between the International Federation of Surveyors (FIG) and the International Association of Geodesy (IAG).* We owe thanks to Matt Higgins of the FIG for the draft of the document. It was discussed at a splinter meeting in Cairns. The document is based on an MoU between IAG and FIG signed in 2000, and attempts to formulate concrete common fields of interest and common activities. The IAG entities are invited to contribute to the document. Once screened, it will be made publicly available.
The IAG Assembly, 22-26 August 2005, in Cairns, Australia was a full success. This was, to a large extent, due to the hard work of the Local Organizing Committee, which was chaired by Prof. Chris Rizos, president of the IAG Commission 4, and his team. Not only the scientific program, but also the social program, the barrier reef, and the cordial hospitality of our hosts will be remembered for a long time. Thanks to everybody for making the IAG Scientific Assembly 2005 a success!

GERHARD BEUTLER
IAG PRESIDENT

Minutes of the IAG Executive Committee Meeting

Cairns, Australia, August 24, 2005; 1 p.m. – 5 p.m.

Attendants: Gerhard Beutler (EC), Carl Christian Tscherning (EC), Hermann Drewes (EC), Chris Rizos (EC), Véronique Dehant (EC), Chris Jekeli (EC), Ruth Neilan (EC), József Ádám (EC), Harald Schuh (EC), Markus Rothacher (EC), Jean-Pierre Barriot, René Forsberg, Klaus-Peter Schwarz, Luiz Paulo S. Fortes (EC).
EC: Voting EC members
Guests: Christopher Reigber (agenda item 2), Daniel Gambis (agenda item 3).

1. Adoption of agenda

The meeting was opened at 1 p.m. by the president. The written agenda, prepared by the IAG secretary general, was adopted. The minimum number of seven voting EC members to have a quorum was reached.

2. GGOS status and Leadership.

Prof. Christoph Reigber (GFZ Potsdam), chair of the GGOS project, presented the 36-pages document **GGOS Implementation Plan** (see Appendix 1, http://www.gfy.ku.dk/~iag/ecag05doc/GGOS_IP_draft1_180805.pdf), which was developed between 2003 and 2005. Reigber pointed out that the document should not be viewed as a *final*, but as a *working* document, which should be used as a guide to implement GGOS in the following years. He also reported on the meeting of the GGOS steering committee on Monday, August 22. At this meeting, Reigber confirmed that he will not be available as GGOS chair after the IAG executive committee meeting on August 24. In the name of the steering committee he proposed Prof. Markus

Rothacher, new Director of GFZ Department 1, as Chair and Ruth Neilan, director of the IGS Central Bureau, as Vice-chair of the new GGOS steering committee. Beutler mentioned that he was contacted by several members of the "old" steering committee after the Monday meeting, who pointed out the work of Hans-Peter Plag to establish a geodesy-related theme in IGOS-P and proposed that Plag might be a valuable candidate as a second Vice-chair. Concerns regarding this proposal (in particular whether it was "legal") were raised by Drewes and Forsberg. After discussion, the following decisions were taken:

1. GGOS shall continue and enter the implementation phase starting October 1, 2005.

2. The implementation should be based on the above mentioned *GGOS implementation pla*n.

3. Prof. Markus Rothacher was appointed as the new GGOS Chair for the time period 2005-07.

4. Ruth Neilan and Hans-Peter Plag were appointed as Vice-chairs for the same time period.

The steering committee is free to further define its internal structure (e.g., to establish a secretariat). Major modifications and the composition of the steering committee shall be reported to the IAG Executive committee..Beutler thanked Reigber for his work in the past two years and asked him to forward the thanks to the entire committee. Reigber left the meeting.

3. Proposed changes in UTC.

Daniel Gambis (Observatoire de Paris) informed the IAG Executive Committee on the attempt of ITU (Intl. Telecommunication Union) to change the definition of UTC in the near future. It is proposed to stop introducing leap seconds – making UTC in essence another realization of the international atomic time (apart from the origin). For details see http://www.gfy.ku.dk/~iag/ecag05doc/ecag05doc.htm .
No consensus could be reached on the best possible way to solve the problem. The outcome of the "opinion poll" performed by the IERS indicates, however, that a clear majority of IERS/IAG-related scientists and practitioners wish to stay with the current practice. Eventually, the following resolution was adopted by 6 votes to 3(text by Ch. Jekeli):*On the basis of the outcome of the surveys conducted by the IERS, which indicate that a large majority in the IAG user community is for maintaining the status quo, the IAG EC recommends at this time no change in the current method of relating UTC to UT1.*A letter, to be signed by the IAG president, will be sent to ITU (address to be provided by Daniel Gambis)
within the next 2-3 weeks. Beutler thanked Daniel Gambis for his presentation.
After that, Daniel Gambis left the meeting.

4. Best Young Author Award and Report on JoG.

There was only one proposal (by the JoG editor in chief, Will Featherstone). In order to give the EC members the opportunity to read the article, the Secretary General will send out an e-mail with the reference and thereafter conduct a vote by e-mail.

5. Cairns meeting

Ch. Rizos presented some statistical information concerning the combined IAG/IAPSO/IABO meeting. All in all more than 700 participant registered, of which about 130 from IAG. From attending the IAG sessions, one is tempted to conclude that in reality there were more than 130 IAG delegates. It is not possible to reconstruct more accurate figures a posteriori. Rizos also asked for feed-back of the organisation.

6. IUGG Perugia

As usual, the Secretary General will roughly structure the union and inter-association symposia for the IUGG General Assembly in Perugia. The IAG-"internal" symposia will have to be structured by the IAG commissions, taking into account also the interests of the inter-commission committees. Tscherning presented preliminary proposals for the union and inter-association symposia. More/alternative proposals for inter-association symposia should be sent to Tscherning (through the commission presidents) before September 10, 2005. Tscherning's proposal (see http://www.gfy.ku.dk/~iag/ecag05doc/ecag05doc.htm) was discussed and accepted by the EC.

7. New IUGG Association on Glaciology

The International Commission on Snow and Ice, currently a sub-entity of IAHS, (Intl. Ass. Of Hydrological Science) made the proposal to become the eighth association of the IUGG (International Union of Geodesy and Geophysics). As no new IUGG association was created in the last fifty+ years, the IAG president wanted to have an indication how to vote at the IUGG Executive committee meeting.in Perugia (see http://www.gfy.ku.dk/~iag/ecag05doc/ecag05doc.htm). All voting members were in favor, one, however, asked for more information (which he received meanwhile). The issue was not further discussed, the outcome of the e-mail vote is taken as an indication for IAG to vote in favor of founding the IUGG association.

8. ICC on Planetary Geodesy

Jean-Pierre Barriot reported on the status of the newly created Inter-commission committee on planetary geodesy and recommended that either the ICC should be discontinued in 2007 or the scope of the ICC should be broadened by including radio-science. A combination of the ICC with a sub-entity of URSI might make sense. From the formal point of view this is possible (observe, e.g., that Commission 1, and previously CSTG are/were also COSPAR units). Barriot will prepare a concrete proposal concerning the future of the ICC on planetary geodesy in the near future, which will be discussed by e-mail.

9. ICC on Standards – Status

The proposal to establish an ICC on Standards was not accepted by the EC (see minutes of IAG EC meeting 2004). The GGOS planning group was given the responsibility to take over this responsibility. This is still the plan. GGOS is responsible for issuing and publishing in the Geodestist's Handbook 2008 the next article "fundamental parameters and current best estimates …" corresponding to Erwin Groten's article in the Geodesist's Handbook 2004 (pp. 724-731). There should be no conflicts between the IERS conventions and the new document.

10. IGFS status

Rene Forsberg gave a brief report on the status of the newly created International Gravity Field Service IGFS (see http://www.igfs.net for more information). It was pointed out by the president and others that the IGFS, among other, should play a comparable role in the gravity field description and determination, as the IERS plays it for the geometry-related IAG products. This implies in particular that the IGFS should compare, evaluate, and possibly combine different solutions for the gravity field. It should define the official IAG product. As in the geometry-related products, the user community should have no difficulty in finding the official IAG gravity field (and geoid). Forsberg indicated that currently the IGFS is not yet in a position to deliver these products, but that it is a declared goal to do that some time in the future.

11. Altimetry Service status

Drewes briefly summarized the work performed in the Inter-commission project IC-P1. 1 (joint with commissions 2, 3) on satellite altimetry. The Inter-commission project is chaired by Wolfgang Bosch. The IC-P wishes to have a resolution adopted by both, IAG and IAPSO, to support the creation of an altimetry service.

After discussion, the following resolution was unanimously approved:

- *On the occasion of the Dynamic Planet 2005 conference in Cairns, Australia, the International Association of Geodesy, IAG, and the International Association of the Physical Science of the Ocean, IAPSO, both recognize satellite altimetry as an important space technique with interdisciplinary application in oceanography, geodesy, hydrology, and glaciology, demonstrating that satellite altimetry has to be an essential component of any global observing system such as GOOS, GGOS.*
- *IAG and IAPSO also recognize the necessity to set up and maintain the longest possible time series of altimeter observations with up-to-date geophysical corrections and consolidated geocentric reference, which implies a close attention to the long-term stability of altimeter and ancillary sensors..*

- *IAG and IAPSO therefore recommend to establish a mission-independent International Altimeter Service with the primary objective to serve operational and scientific users with altimeter data and value-added products, to coordinate and cooperate with space agencies, processing centres, and scientific laboratories, and other existing services.*

Two options to proceed were discussed. Either the IAG president sends a letter to Dr. Wolfang Bosch stating that "the IAG Executive Committee, on the occasion of its meeting on August 24, 2005 in Cairns approved the resolution (cited above) or, alternatively, one letter signed by the IAG- and the IAPSO-president is sent to Wolfgang Bosch. The decision how to proceed was left to the IAG Bureau. *Epilogue:* As IAPSO did not deal with the issue (due to a misunderstanding) at its EC meeting, the solution with separate letters seems appropriate. The IAPSO-president currently deals with the issue by e-mail and "promised" to write a comparable letter as the IAG president.

12. Review of the commission sub-entities (study groups, projects)

Ole Anderson, assistant secretary general, sent out a letter (e-mail) to the IAG entities (and some officers) asking for mid-term reports. Unfortunately, Ole did not follow up on this issue. The Commissions are now requested to send their reports (if not already done) for electronic publication in the next issue of the *IAG Travaux* till the end of September. The travaux shall be published this year on the IAG website.

13. Interface/MoU between commissions and services

In 2004 Beutler wrote a draft version of the MoU concerning the interface between commissions and services. Meanwhile, experiences were gained in some of the services (e.g., the IGS) and commissions (e.g., 1 and 3). Based on these experiences, the Interface/MoU shall be revised by R. Neilan, M. Rothacher, H. Schuh (EC services representatives) and Rizos, Drewes (the commissions having most interfaces with the services). A first review hopefully will be available at the end of 2005.

14. Review Committee: Status of Work

The Committee was previously called Cassinis Committee. Klaus-Peter Schwarz, head of the Committee, gave a status report. Further input is welcome from EC members and IAG individual members in order to prepare the revised statutes / by-laws.

15. Nomination Committee

Around mid-term, the IAG president has to nominate the president and the members of the IAG nomination committee, who are responsible to come up with a list of candidates for IAG officers in the next IAG legislation period. Following the tradition, Beutler asked the immediate past president of IAG to preside the committee. Fernando Sanso was asked prior to the meeting to serve. He accepted. Proffs. Reiner Rummel, C. Wilson, L.P.S. Fortes were asked and accepted to become members of the committee. Schwarz, who presided the committee for the 2003 elections, promised to provide Sanso, the committee members, and the IAG president with a "roadmap". Due to the retirement of Christian Tscherning as IAG Secretary General, a new IAG Secretary General has to be elected. In a first stage, the procedure for electing the new Secretary General is separated from the other nominations and elections, because the election is based on a call for proposals, which have to be evaluated by the IAG Executive. Beutler proposed that Tscherning will come up.with a draft for the call for proposals in the near future. The proposal will be reviewed in the Bureau and the call will be sent out before Christmas 2005.

16. Report from Secretary General

Chritian Tscherning gave a brief report concerning the IAG finances including the membership status. The full report is provided in http://www.gfy.ku.dk/~iag/ecag05doc/ecag05doc.htm . It seems that the Association is healthy – at least when viewed from the financial side. He also reminded the EC members that IAG spends most of its money (coming from IUGG, individual membership fees and donations) for meetings and to sponsor young scientists to attend IAG(-related) meetings. This policy found the approval of the EC.

17. Report on activities for French-speaking communities

Barriot reported on his activities related to attracting the francophone community interested in or related to geodesy. Certain possibilities will be persued especially in the area of education.

18. Sponsorship of meetings, workshops, symposia

Tscherning mentioned that no requests had been received recently.

19. Citation of products from IAG Services

Ruth Neilan pointed out the importance that the work of the services is recognized by the larger scientific community (see http://www.gfy.ku.dk/~iag/ecag05doc/ecag05doc.htm). The recognition is fully justified: Many scientific papers are based on the IAG services' work. Attempts are underway to improve the visibility on the level of the services. In future, the services should have on their homepages references, the users of products are asked to quote. Some services already established this policy. It seems that the services' work and the GGOS project might be highlighted in a series of short articles in EOS (contact established between Tscherning and Richard Gross).

20. Next meeting

The next meeting will take place during the EGU Assembly, Vienna, 10 April 2006 at the premises of Technical University of Vienna.

21. AOB

Luis Paulo Fortes gave a short report on the activities of committee of developing countries.

Respectfully submitted

CHRISTIAN TSCHERNING
SECRETARY GENERAL
Perugia, September 9, 2005

Struve Publicity Piece

First for Surveyors and a first for World Heritage

On 15 July 2005 the UNESCO World Heritage Committee inscribed a new name on its list of important sites – the Struve Geodetic Arc. This is a triangulation network observed between 1816 and 1855 which stretched from near North Cape in Norway to the Black Sea. In today's geography it passes through ten countries, namely Norway, Sweden, Finland, Russian Federation, Estonia, Latvia, Lithuania, Belarus, the Republic of Moldova and Ukraine.

The Struve Geodetic Arc is the first survey scheme and also the first such scientific and technological landmark to be entered on the World Heritage List and it joins a select list of less than 900 such listed sites around the world. Whereas one is used to seeing ancient buildings, stunning scenery and famous archaeological sites as Heritage monuments the Struve Arc is but a series on marks in the ground barely covering a square metre or so each. However taken as a whole the Arc was, for its time, a major scientific achievement using state-of-the-art instrumentation to achieve amazing accuracies straddling such a vast distant and several countries. Much smaller similar schemes preceded it and longer and more accurate ones succeeded it but it was a veritable milestone in the quest to determine accurate values for the parameters of the earth.

Arc measurement is the determination of the linear length of a section of meridian (line of longitude) on the earth together with the astronomical determination of the positions of the two end points. Whilst it should theoretically follow exactly along such a line of longitude in practice this is not essential, and indeed would be impractical, and appropriate corrections can be made. The terminal points of the Struve Arc are at Fuglenaes, latitude 70º 40' 12" N and longitude 23º 39' 48" E, and Staro-Nekrassowka, latitude 45º 19' 54" N and longitude 28º 55' 41" E. Hence it is said to run more or less along the 26º E line of longitude for a distance of 2820 km.

The use of such a scheme was particularly designed to assist in the accurate determination of the size and shape of the earth. It was an extraordinary example of scientific collaboration among scientists from different countries and of collaboration between monarchs for a scientific cause. Additionally it formed the basis upon which long required accurate mapping of the areas concerned could be based.

The historic monument is defined by the initial preservation of 34 of the 265 main survey stations involved. The ten countries involved, with encouragement and help from the International Institution for the History of Surveying & Measurement (IIHSM), a Permanent Group within the International

Federation of Surveyors (FIG), cooperated since 1954 in the recovery, verification, monumentation and documentation of the selected points. These were chosen (a) to give a spread of preserved points along the whole arc, (b) to be representative of all countries, (c) that could be verified as original points (d) were reasonably accessible to the public (e) were in such positions that if restored, they would not by liable to imminent destruction by building developments
and (f) were generally in areas where the local population were keen to take such a monument under their wing for its up-keep.

Where possible the most prominent sites have been selected including the obelisks at each terminal, the Tartu Observatory in Estonia (known at the time as Dorpat) which served as the origin of the scheme and the point in the tower of Alatornio church. The church itself has remained unchanged since the time of the measurements. Other points take a variety of forms such as drill holes in rock, cairns and crosses chiselled rock.

F G W Struve (1793-1864), after whom the arc gets its name, was born in Altona, Holstein and died in Pulkova, Russia. He married twice and had 18 children. By age 20 he became Professor of Mathematics and Astronomy at Dorpat. His involvement in the survey of Livonia was the start of almost 40 years work on the meridian arc. He founded Pulkova astronomical observatory, then the best in the world, and of the Russian Geographical Society. The other principal name associated with the arc was that of the Russian military officer Carl F Tenner (1783-1859). In 1816 he became Head of the vast Russian triangulation work in western provinces of the Empire. He had started in 1817, on his own initiative, a triangulation scheme to the south of Livonia. After Struve and Tenner became acquainted with each others activities they joined forces. Some of the route in the northern parts covered similar territory to that surveyed in 1735 by Maupertuis when observing his much shorter scheme that was is particularly remembered, with a similar expedition to Peru, 1735-1745, for solving once and for all the controversy between Newton in England and the Cassinis in France, regarding the shape of the earth i.e. was it a prolate (flattened at the Equator) or oblate (flattened at the Poles) spheroid. The latter version was proven to be correct.

With the achievement of World Heritage Monument status for this arc what enhancements are possible? Monuments can be extended at any later date and a “monument” such as the Struve arc can be extended southwards as far as South Africa.
This is feasible because (a) in the 1930s a join was made from the Struve Arc in Belarus to Crete and (b) the Arc of the 30th Meridian through East Africa stretches from near Port Elizabeth to near Cairo but in the 1950s a connection was made across the Mediterranean Sea to Crete. Hence there exists a connection that would extend the whole arc to one of 105º. Such an extension would though involve a further 20 or so countries and would be no small task.

Other related activities are also envisaged:

(i) the restoration of the Old Tartu Observatory (now owned by Tartu University) to become a Struve Museum,
(ii) for the Struve archival material, presently in several locations, to be properly indexed – a task already well under way with the assistance of Vitali Kaptjug and the IIHSM,
(iii) for there to be scientific experiments across the 34 points that could in the future be archive material for tectonic and other investigations.
(iv) the translation of Struve’s volumes into English.

Further information can be obtained from:-

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IAG Sponsored Meetings

7th conference on Optical 3-D Measurement Techniques

3-5 October 2005, Vienna, Austria
The 7th conference on "Optical 3-D Measurement Techniques" will be held from October 3-5, 2005 in Vienna, Austria and is co-sponsored by the ISPRS Commission V, the FIG Commission 5 and 6, and the IAG Sub-commission 4.2. The conference website is: http://info.tuwien.ac.at/ingeo/optical3d/o3d.htm. The first announcement in pdf format can be downloaded from the conference website at: http://info.tuwien.ac.at/ingeo/optical3d/o3d1st.pdf.

Summer School on Microgravimetric methods: static and dynamic aspects

23-28 October, 2005, Lanzarote, Canaries
The International Gravimetric Bureau (BGI), the International Center for Earth Tides (ICET) and the Instituto de Astronomia y Geodesia (IAG) are pleased to announce their joint Summer School on Microgravimetric Methods: static and dynamic aspects. The request for information email is to: bernard.langellier@cnes.fr. Please also visit the BGI website for further details: http://bgi.cnes.fr

Fifteen Years of Progress in Radar Altimetry Symposium

13-18 March 2006, Venice, Italy
Fifteen years after the launch of ERS-1 and TOPEX/POSEIDON, the European Space Agency, in collaboration with the French Space Agency, CNES, is organising an exceptional Symposium on “15 Years of Progress in Radar Altimetry”. For further information visit the website http://www.esa.int/venice06.

3rd IAG Symposium on Geodesy for Geotechnical and Structural Engineering and 12th FIG Symposium on Deformation Measurements

22-24 May, 2006, Baden, Austria
The FIG symposia on deformation measurements and analysis have a long tradition dated back to 1975. The IAG Symposium was established in 1998 and held twice. It will be the first time that the two symposia will be held together as a joint conference. Researchers, engineers, educators, designers, manufacturers, contractors, public authorities, and other professionals are cordially invited to attend this international event. Please also visit the symposium website for further details: http://info.tuwien.ac.at/ingeo/sc4/baden.

VI Hotine-Marussi Symposium of Theoretical and Computational Geodesy: Challenge and Role of Modern Geodesy

29 May - 2 June 2006, Wuhan University, PR China
The symposium will be held at Wuhan University, PR China, 29 May - 2 June 2006. More information will be circulated as soon as available and can be found at the website: http://www.sgg.whu.edu.cn/icct_hm.html

“Gravity Field of the Earth” – 1st International Symposium of the IGFS

28 August - 1 September 2006, Istanbul, Turkey
The 1st symposium of IGFS as being a continuation of the symposia series of the former International Gravity and Geoid Commission will be held in Istanbul, Turkey. The major objective is to bring together the geoscientists working in general areas of modeling the Earth's gravity field. For more information visit the website: www.igfs2006.org.

Geodetic Reference Frames GRF2006

9-13 October 2006, Munich, Germany
The Commission 1 „Reference Frames“ of the International Association of Geodesy (IAG) invites scientists and experts from all countries to participate in the Symposium “Geodetic Reference Frames”. The symposium shall give the opportunity to present new ideas, discuss improved models and approaches, and report on latest results of the definition and realization of geodetic reference frames. Detailed information is available at the symposium website: http://iag.dgfi.badw.de/?grf2006.

IAG Related Meetings

4th Congress of the Balkan Geophysical Society

9-12 October 2005, Bucharest ,Romania
The International Conference and Exhibition "Geophysics Without Frontiers" is organized and hosted by the Romanian Society of Geophysics in cooperation with EAGE, SEG, EGU and AGU, under the auspices of the IUGG. The Congress focuses the attention of the whole community of geophysicists on Balkans. The conference webpage is www.bgs-bucharest2005.ro.

The International Symposium on GPS/GNSS 2005 (GNSS2005)

8-10 December 2005, Hong Kong
The International Symposium on GPS/GNSS 2005 (GNSS2005) will take place in Hong Kong, 8-10 December 2005. The symposium will feature a session of presentations from the Civil GPS Service Interface Committee (CGSIC). For details, please visit the following URL: http://www.lsgi.polyu.edu.hk/GNSS2005/.

IAG Sister Societies' General Assemblies

INTERGEO 2005

4-6, October 2005, Düsseldorf, Germany
Intergeo 2005. At the Conference FIG Forum will be organised. Website: www.intergeo.de

Meeting Reports

"Monitoring and Understanding a Dynamic Planet with Geodetic and Oceanographic Tools"

22-26 August 2005, Cairns, Australia

"Dynamic Planet" was a *joint* conference of the International Association of Geodesy (IAG), International Association of the Physical Sciences of the Ocean (IAPSO), and the International Association of Biological Oceanographers (IABO). "Dynamic Planet" offered an opportunity to present and discuss cross-disciplinary research into the solid earth and oceans. In fact the scientific program, under the theme "Monitoring and Understanding a Dynamic Planet with Geodetic and Oceanographic Tools", emphasised the interaction of the earth and oceanographic sciences.

"Dynamic Planet" attracted 796 delegates (including 44 accompanying persons), from 62 countries (Appendix 1). There were 27 distinct topic themes, in which a total of 812 papers were presented – 495 posters and 317 oral presentations (Appendix 2). The IAG sessions attracted 215 posters and 205 oral presentations.

There were three IAG/IAPSO joint sessions:
GP1 Ocean circulation and contributions from new gravity field missions
GP2 Global sea-level change: Altimetry, GNSS and tide gauge measurements
GP3 Oceanography and geodesy in polar regions

There were eight IAG sessions:
G1 Frontiers in the analysis of space geodetic measurements
G2 Gravity field determination from a synthesis of terrestrial, satellite, airborne and altimetry measurements
G3 Earth Processes: geodynamics, tides, crustal deformation and temporal gravity changes
G4 Advances in the realization of global and regional reference frames
G5 Global Geodetic Observing System (GGOS)
G6 Systems and methods for airborne mapping, geophysics and hazards and disaster monitoring
G7 Atmospheric studies using space geodetic techniques
G8 Geodesy of the planets

Selected papers from the above 11 sessions will be reviewed for the IAG Proceedings published by Springer.

Visit the photo gallery at http://www.gmat.unsw.edu.au/album/20050830IAG_conference/

Prof. CHRIS RIZOS
Chairman Local Organising Committee

APPENDIX 1

Number of countries represented

The Dynamic Planet Delegates represented these 62 countries:

- ARGENTINA
- AUSTRALIA
- AUSTRIA
- BANGLADESH
- BELGIUM
- BRAZIL
- BRUNEI
- BULGARIA
- CANADA
- CHILE
- CHINA
- CZECH REPUBLIC
- DENMARK
- EGYPT
- ESTONIA
- FIJI
- FINLAND
- FRANCE
- FRENCH POLYNESIA
- GAMBIA
- GERMANY
- GHANA
- HONG KONG
- GREECE
- HUNGARY
- INDIA
- INDONESIA
- IRAN
- ISRAEL
- ITALY
- JAPAN
- KENYA
- KOREA
- MALAYSIA
- MEXICO
- MOROCCO
- NEPAL
- NETHERLANDS
- NEW CALEDONIA
- NEW ZEALAND
- NIGERIA
- NORWAY
- PERU
- PHILIPPINES
- POLAND
- PORTUGAL
- PR CHINA
- REPUBLIC OF KOREA
- ROMANIA
- RUSSIA
- SOUTH AFRICA
- SPAIN
- SWEDEN
- SWITZERLAND
- TAIWAN
- THAILAND
- TUNISIA
- TURKEY
- UNITED KINGDOM
- USA
- UZBEKISTAN
- VIETNAM

APPENDIX 2

TOTAL PRESENTATIONS PER THEME	**Posters**	**Orals**	**Total**
Joint IAG/IAPSO Sessions	**35**	**42**	**77**
GP1 Ocean circulation and contributions from new gravity field missions (Conveners: D. Chambers, V. Zlotnicki)			
GP2 Global sea-level change: Altimetry, GNSS and tide gauge measurements (Conveners: R. Coleman, G. Mitchum)			
GP3 Oceanography and geodesy in polar regions (Conveners: M. Drinkwater, S. Rintoul)			
Joint IAPSO/IABO Sessions	**20**	**78**	**98**
PB1 Acoustical remote sensing of physical and biological processes in the ocean (Conveners P. Worcester, S. McClatchie)			
PB2 Chemical and physical controls and impacts on marine biota (Conveners: C. Roy, D. Smythe-Wright, J. Hall)			
PB3 Internal waves, mixing, and biological processes in the ocean (Conveners: E. Morozov, J. Hwang).			
PB4 The climate of the last glacial cycle (Conveners: A. Weaver, P. Clarke)			
PB5 Continental shelf, reef processes and biology (Conveners: M. Heron, C. Griffith)			
PB6 Biological and physical interactions in inter-tidal environments (Conveners: G. Perillo, E. Wolanski)			
Joint IAPSO/IABO/SCAR (Scientific Committee for Antarctic Research)	**7**	**16**	**23**
PBA1 Southern Ocean circulation and marine life (Conveners: S. Nicol, E. Hofmann, V. Strass)			
IAG Sessions	**180**	**163**	**343**
G1 Frontiers in the analysis of space geodetic measurements (Conveners: M. Rothacher, M. King, J. Kusche)			
G2 Gravity field determination from a synthesis of terrestrial, satellite, airborne and altimetry measurements (Conveners: C. Jekeli, M. Kuhn)			
G3 Earth Processes: geodynamics, tides, crustal deformation and temporal gravity changes (Conveners: V. Dehant, P. Tregoning)			
G4 Advances in the realization of global and regional reference frames (Conveners: R. Neilan, J. Dawson, H. Drewes)			
G5 GGOS (Conveners: C. Reigber, Hans-Peter Plag, F. Lemoine, Jean-Pierre Barriot) – see G8			
G6 Systems and methods for airborne mapping, geophysics and hazards and disaster monitoring (Conveners: R. Forsberg, C. Rizos, T Kato)			
G7 Atmospheric studies using space geodetic techniques (Conveners: S. Skone, N. Penna)			
G8 Geodesy of the Planets			
IAPSO Sessions	**66**	**174**	**240**
P1 CLIVAR theme I: Interannual climate predictability - ENSO/Indian Ocean/SST impacts on Australian and New Zealand climate variability (Conveners: G. Myers, T. Yamagata)			
P2 CLIVAR theme II: Decadal to Century climate variability of the ocean-atmosphere system (Conveners: C. Reason, T. Busalacchi, T. Suga)			
P3 Marine risks and sustainability (Conveners: T. Beer, E. Kontar)			
P4 Argo and GODAE - global and regional partners (Conveners: N. Smith, J. Gould)			
P5 Ocean interactions with sea ice, polynyas, ice shelves and Icebergs (Conveners: D. Holland, I. Allison)			
P6 Deep ocean exchanges with the shelf and upwelling (Conveners: J. Johnson, J. Middleton)			
P7 Processes in oceanic fronts (Conveners: M. Tomczak, I. Belkin)			
IABO Sessions	**9**	**22**	**31**
B1 Pelagic Biogeography (Conveners: A. Pierrot-Bults, P. Ried, G. Hosie)			
B2 Census of Marine Life (Conveners: M. Costello, I. Poiner, R. O'Dor)			