IGS

EXECUTIVE REPORTS

The Development of the IGS in 1998 - The Governing Board's Perspective

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A Year of Tradition and Transition

In the executive summary (Beutler, 1999) published in the IGS Annual Report for 1998 earlier this year, I stated that the year 1998 was a year of tradition and transition. Let me address a few details that were not, or could not yet, be addressed in this short summary.

It has become an IGS tradition that the Analysis Centers, Data Centers, Stations, etc., are reporting about progress made in their domain during the past year in the IGS Annual Report and IGS Technical Report series. I was personally quite pleased to see that in 1997 the progress, and its documentation, did not suffer by separating this information into two reports. The technical report was extremely valuable for the IGS experts and for the expert users of IGS products.

The same observation applies to the IGS Annual and Technical Reports for the year 1998. When browsing through the pages of the latter, one undoubtedly is impressed by the network's increase in size and quality, the improvements in data transmission, the many advances in processing, the steadily increasing consistency of the contributing product time series of the IGS Analysis Centers, and the impressive quality, reliability, and robustness of the IGS combined products.

Speaking of traditions and transitions: The IGS Technical Report 1998 marks the end of Jan Kouba's period as IGS Analysis Coordinator. It is appropriate to add a few remarks in this context - remarks which will be understood and hopefully appreciated by the "inner circle" of the IGS community.

I believe that we, the authors of the IGS Technical Report 1998 and the entire IGS community, owe Jan many thanks for his fine work as a coordinator in the time period 1993-1998. We all know that it is mainly due to his vision and energy that the IGS combined products (orbits, EOPs, clocks, etc.) have reached the above-mentioned high level of accuracy, robustness, and consistency. We all hope that this particular IGS tradition will be continued.

The Analysis Coordinator's Report in this Volume once more documents Jan's dedication to the IGS case. I personally hope that Jan Kouba will continue to sacrifice a fair portion of his time to IGS matters, even if there is no longer the pressure of deadlines for delivering reports, products, etc.

As a matter of fact, I am convinced that Jan's fine analysis of the IGS contributed and combined ERP series (Kouba et al., 1999), prepared for the IAU Colloquium No. 178 in Cagliari, Italy (September 1999), further indicates his continued dedication. Jan Kouba still is serving on the Governing Board till the end of 1999, the official end of his term.

As past chairman of the IGS, I will be hopefully allowed to continue with a minor "faux pas", namely with a "free preview" to the year 1999. It is possible to do that because the 1998 Technical Reports volume is suffering from an unusual delay. These lines are actually written a few hours prior to the ultimate Technical Report editor's deadline in November 1999(!). We all hope that such a long delay will remain the exception. This is why the Annual and the Technical Report shall be prepared in parallel rather than in the sequential processing mode in the years to come. Be this as it may, I think it is important to view the changes within the IGS structure that took place in 1999 within the context of the developments which happened already in 1998.

It came as a shock during the XXII IUGG General Assembly in July 1999 in Birmingham, when the members of the IGS Governing Board learned that Ivan I. Mueller had decided to resign as the IAG representative on the IGS Governing Board. This was an extremely difficult decision for him after having served in leading positions since 1989 (first in the IGS Planning Committee, then in the IGS Campaign Oversight Committee, and eventually in the IGS Governing Board since 1994). We all know that the IGS is, to a great extent, "his child" and it is really difficult to imagine IGS Governing Board meetings and other IGS events without his expertise and advice. Ivan I. Mueller will be succeeded in the IGS Governing Board by Tom Herring from MIT.

We also learned in September 1999 that Yehuda Bock would no longer be available for a second term in the IGS Governing Board. Yehuda is known to all of us as one of the most illustrious "IGS warriors." He undoubtedly is one of the most experienced analysis and network experts among us, and this expertise made him an excellent Chairman of the IGS Infrastructure Committee. He will be succeeded in the IGS Board by Markus Rothacher of the Technical University of Munich.

Having mentioned these dramatic developments, which were not yet known when the 1998 Annual Report was written, it is appropriate to remind ourselves of the other changes that took place at the end of 1998: In the Governing Board, Mike Bevis and Robert I. Serafin have succeeded Bob Schutz and Gerald L. Mader, and Christoph Reigber is Chairman of the Governing Board since January 1, 1999.

I personally hope that the "IGS veterans" will follow the future developments within the IGS, and I expect that they would "ring the alarm bell" if some of the domains do not receive the appropriate attention by the new IGS crew. It is thus my hope that they will rather play the role of "guardian angels," and not that of veterans.

IGS Events in 1998

Table 1, summarizing the essential IGS-related events of the year 1998, was already included in my contribution to IGS Annual Report 1998 (Beutler, 1999). I refer to this report for detailed comments and restrict myself here to a few personal remarks.

In looking at Table 1, I would still say that from the IGS perspective, the two 1998 IGS workshops were the outstanding events in 1998. From my personal perspective, the IGS spirit of collaboration sensed at both workshops was equally as important as the resolutions, recommendations, and reports about problems or progress made. This spirit and the focus on science rather than administration is the primary motivation for all IGS colleagues and the key element for the success of the IGS. At both workshops I felt very much at home in the "IGS family." This was also due to the cordial hospitality that we experienced in Darmstadt and Annapolis.

Table 1: Important IGS-Related Events in 1998

Start Date	Event
09-Feb-98	1998 IGS Analysis Center Workshop
12-Feb-98	Business meeting of the Governing Board
28-May-98	9th IGS Governing Board Meeting in Boston
16-Jul-98	COSPAR Symposium with interdisciplinary lecture on IGS
04-Oct-98	Business Meeting of the Governing Board
05-Oct-98	IGGOS Symposium in Munich
18-Oct-98	Start of IGEX-98, the first global GLONASS tracking and analysis experiment
02-Nov-98	IGS Network and Data Center Workshop in Annapolis, MD
11-Dec-98	10th IGS Governing Board Meeting in San Francisco

For a discussion of the essential events at the three Governing Board meetings in 1998 I refer to (Beutler, 1999) and to the IGS Mail Messages Nos. 1806 and 2086.

The IGS played an essential role at the COSPAR meeting in Nagoya and at the IGGOS meeting in Munich. The article (Beutler et al., 1999) made the authors, and hopefully the readers of the article, aware of the interdisciplinary impact of the IGS. (This seems to be the case actually, since the article was reprinted in the 1999 IGS Directory).

The magic three letters "IGS" played an important role at the IGGOS Meeting in Munich as well, where "reviewing and restructuring the IAG (International Association of Geodesy)" was the central issue. It was amazing to see how often the IGS was (ab)used as a so-called "good example" and as one of the important elements of IAG. It seems to be

the general opinion that in future the IGS should (together with other IAG services) play a more prominent role within the IAG structure.

Let me conclude this overview with a few personal comments, some of which were already contained in (Beutler, 1999): I was a member of the IGS Planning Committee (1990-1991), was then elected as the Chairman of the IGS Campaign Oversight Committee (1991-1993), and eventually became the first Chairman of the IGS Governing Board (1994-1998). I am proud to have contributed to the development of the IGS in all these years. It was particularly an honor for me to have served as Chairman of two IGS governing bodies for approximately seven years. I sincerely hope that I will be able to play the role mentioned above as "normal" Governing Board member in future --- to some extent at least: I do not (yet) feel like an angel.

I would like to thank all previous and current colleagues from the Governing Board and all friends from all IGS components for their help and gentle guidance.

References

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Kouba, J., G. Beutler, M. Rothacher (1999). "IGS Combined and Contributed Earth Rotation Parameter Solutions", Proceedings of IAU Colloquium no. 178, Cagliari, Italy, submitted for publication.

Central Bureau Report 1998

Opportunities Within Change

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The year 1998 was a year of significant change within the structure of the IGS that was accommodated with little impact to the levels of service provided by the organization. The official name of the IGS changed, new Terms of Reference were adopted in December 1998, the IGS Analysis Coordination shifted from Natural Resources of Canada under the direction of Dr. Jan Kouba to the University of Bern, Switzerland under Dr. Tim Springer. Policies were adopted to incorporate working groups and pilot projects into the IGS, and the heads of these groups have been added to the IGS Governing Board. The year 1998 marked the end of Gerhard Beutler's term of office as the Chairman of the IGS Governing Board. He is succeeded by Prof. Christoph Reigber who became the new chair by acclamation of the Board in December.

Change spread quickly to the Central Bureau as we implemented a considerable reorganization. This was in part a response to the recommendations stemming from the Napa Valley Retreat of December 1997:

- "that at least two persons should be given full time responsibility within the CB. One of these should be the Director, the other may be the Network Coordinator", and
- that "the IGS Global Network needs overall enhancement".

These recommendations underscored the necessity of a more defined Central Bureau and staff to manage varied aspects of the service with increased emphasis on the rapidly expanding GPS tracking network and extensive IGS infrastructure. These two recommendations set the direction of change at the Central Bureau throughout 1998. A summary report on the Napa Valley Retreat and final recommendations for all IGS components can be found in Dow et al. 1998.

A very positive outcome of internal restructuring at JPL was the ability to create within the Central Bureau the new position of Deputy Director/Network Coordinator for the IGS. Dr. Angelyn Moore was appointed to this position in October '98 and is actively engaging with the IGS components to address critical issues of the network system. Responsibilities of a Network Coordinator or 'Network Engineer' have been discussed since the inception of the IGS and it is refreshing to see this role and position finally

realized. The report from the IGS Network Coordinator follows in Chapter 4. Nonetheless, the CB sustained significant changeovers in personnel and positions due to the reorganization, which were challenging both professionally and personally.

In particular, three people who worked very closely with me over the last years all moved to different positions in 1998. There three were Steve Fisher, Priscilla Van Scoy and Judy Pons. I would wager that most people involved in the IGS appreciate the very special qualities of each of these people in contributing to the IGS and working to meet CB objectives during the first four years of service. Steve Fisher and I worked closely together for over a decade, first at JPL on regional GPS experiments and the fledgling global network, and then while Steve was the on-site Project Manager at UNAVCO in Colorado. His insight, attention to detail and strategic thinking characterize his excellent skills as a first rate project manager. Priscilla Van Scoy was the Central Bureau Administrator for a number of years. Priscilla was responsible for the smooth functioning of the many details from resource management, exhibits, correspondence, and occasionally as secretariat to the GB. It is since Priscilla's departure that I realize how many tasks she handled through self-motivation and how well we worked together on a daily basis. Priscilla was always able to find a way to get things done. Judy Pons provided me with secretarial support and a daily dose of positive energy. Judy was a joy to work with, I can truly say that if more people had the unbridled optimism that Judy possesses, the world would be a better place. I treasure each of these three people and am grateful for the opportunity that we had to work together. It was certainly challenging to keep Central Bureau productive with these changes. A key factor in maintaining the semblance of stability was the support of the Deputy Director/Network Coordinator of the Central Bureau, Angelyn Moore, and our new secretary, Carol Lorre.

The increasing focus on network issues throughout 1997 similarly resulted in a further recommendation from the Napa retreat stating:

> 'the GB should consider organizing an IGS Network Workshop to have an open discussion on network/station issues and to develop a direct interaction between the GB and the stations, upon which rest all IGS activities.'

The CB organized a meeting in April in order to initiate planning for this workshop. Carey Noll, the manager of the CDDIS IGS Global Data Center at Goddard Space Flight Center, proposed to host the workshop and the meeting was jointly convened between the Central Bureau and the CDDIS. All who attended the Network workshop in Annapolis in November 98 considered it a great success. Both the technical content and the social atmosphere contributed to a refocusing on critical infrastructure issues and a strengthening of the IGS network community. This workshop generated additional recommendations and actions to be approved by the Governing Board in 1999. Proceedings from this workshop are currently on the CBIS and available from the Central Bureau.

Future Directions and Influences

GPS users and applications strongly influence the directions of the IGS and one of the most visible impacts will certainly be the IGS response in support of Low Earth Orbiting (LEO) missions beginning in 1999 and spanning at least the next decade. Requirements of over a dozen missions, each carrying GPS on-board flight receiver(s), necessitate close to real-time GPS data and IGS products to generate various additional products in support of mission objectives. A key mission objective for a number of the missions, such as CHAMP, SAC-C, COSMIC, etc. are radio occultation measurements derived from GPS that are tailored nominally every three hours as input observations for numerical weather models and forecasting. This demands that IGS take a major evolutionary leap this year as the entire system moves toward sub-daily network operations and analysis processes. Since inception the IGS has been operating on a system of daily data files and daily production of orbits. It is envisioned that data and orbit products will be available within hours as we collectively upgrade the IGS. There are a number of applications and projects that will benefit greatly from this stepping up of IGS.

The next decade will also see modernization of the GPS satellite system solidifying its realization and recognition as a truly dual-use system employed worldwide for many applications, some yet to be imagined. The civil users will benefit from the implementation of a C/A code on the L2 frequency by 2003 and future GPS satellites will implement a third civil frequency at 1176 Mhz by 2005, according to current plans. Recommendations were recently made by the European Commission to develop and implement a Global Navigation Satellite System (GNSS) called Galileo, which may be both complementary and competitive with the GPS. Utilizing the space segments to their fullest will require additional considerations by the IGS in the future. A demonstration of the extensibility and flexibility of the IGS was the successful international GLONASS tracking experiment, IGEX, (Willis, Slater this volume).

In summary, the future appears full of potential to take advantage of new technologies by building on the very solid foundation of the IGS and the international community of participants.

Central Bureau Activities in 98

The Central Bureau Information System was completely redesigned and implemented in September 1998. This was one of the first sites on the World Wide Web designed in 1993 by Werner Gurtner from the University of Bern, Switzerland. The new system was declared operational and presented at the Network Systems workshop in November. The responses to date have been very positive and it is proving to be a valuable resource for IGS users and information seekers. Plans are progressing to have a full active back-up of the system and better mirroring of the site at other global locations to increase the ease of access by users on different continents.

The IGS Annual Report Series in 1997 is also considered a successful change. The revised format was proposed in order to migrate to a two volume series, the first, a summary annual report with a very wide distribution and the second, an in-depth technical report primarily of interest to internal IGS participants. Both are available on the CBIS. 1998 Annual Report is intended to be made available by July of 1999. This transition was made possible through the help of Ken Gowey, who manages the editing and publishing (hardcopy and electronic) of the Technical Reports and the web site location for submission of contributions to the various publications. The 1997 Annual Report was very well received and this was made possible through the support of Marilyn Morgan, Audrey Riethle and their staff in the graphics department at JPL. The professionalism that Ken, Marilyn and Audrey demonstrate in developing and producing the IGS publications is a real benefit to the IGS community.

In the latter part of 1998 the Central Bureau was actively involved in organizing the Low Earth Orbiter workshop held March of 1999 at GeoForschungsZentrum Potsdam, Germany convened by Prof. Christoph Reigber, Dr. Bill Melbourne and Prof. Gerhard Beutler.

Activities and accomplishments of the Central Bureau within the area of the IGS network are included under the section of network coordinator in this volume.

External Meeting Participation and Support during 1998:

- The Central Bureau attended the following meetings and workshops representing the IGS through presentations, exhibits or participation in working groups.

- Constellation Observing System for Meteorology, Ionosphere and Climate (COSMIC) Science Workshop, February, Taipei, Taiwan.

- Newcastle Workshop on ‘GPS in the Middle-East’, Newcastle, UK, March.

- European Geophysical Society Annual Meeting, May, Nice, France.

- Asian Pacific Space Geodesy Project Meeting, May, Tahiti.

- IGS/Bureau International des Poids et Measures (BIPM) Meeting on Precise Time Transfer Joint Project, May, Paris, France.

- Japan, June Programmatic visits to Geographical Survey Institute and University of Tokyo.

- China, June. Programmatic visits to Shanghai Observatory and Kunming Observatory, Chinese Academy of Sciences.

- Organizational support of the first IGS tutorial at the annual meeting of 'Working group of European Geoscientists for the Establishment of Networks for Earth-science Research' (WEGENER) June, Honefoss, Norway.

- Sea Level in the Western Pacific Meeting organized by the Permanent Service for Mean Sea Level, hosted by the Institute of Earth Sciences, Academia Sinica July, Taipei, Taiwan.

- Western Pacific Geophysical Union Meeting, July, Taipei, Taiwan.

- Institute of Navigation, Nashville, Tennessee USA, September.

- International Earth Rotation Service meeting, October, Potsdam, Germany.

- Towards and Integrated Global Geodetic Observing System, International Association of Geodesy, Section II Symposium, October, Munich, Germany.

- Precise Time and Time Interval Meeting participation, IGS/BIPM pilot project meeting, Reston, Virginia USA.

- American Geophysical Union meeting, December, San Francisco California, USA.

Publications of the IGS Central Bureau in 1998

IGS Annual Report 1997
IGS Technical Reports 1997
IGS Directory 1997
Resource Sheets

All IGS publications are available electronically at the CBIS.
http://igscb.jpl.nasa.gov

The Central Bureau is responsible for the overall coordination and management of the IGS service and as stated in the Terms of Reference adopted in December 1998, is the executive arm of the IGS Governing Board. The Central Bureau is located at NASA's Jet Propulsion Laboratory, which is operated for NASA by the California Institute of Technology. The International Governing Board is the oversight body that actively makes decisions that determine the activities and directions of the IGS.