

IAG Retreat, Guiding document for IAG strategy document

April 25-26, 2016

Gerhard Beutler, on behalf of the retreat participants

Preamble: Essentials from IAG statutes (Geodesist's Handbook, 2016)

The current structure and mission of the Association, including the creation of GGOS were initiated at the IAG Section II Symposium in Munich in 1998, developed in a review process in the (IAG) period 1999—2003, and applied for the first time in the period 2003—2007. More information is available in (Beutler, 2004). According to the most recent statutes the key elements of the Association are:

IAG mission: The Mission of the Association is the advancement of geodesy. The IAG implements its mission by furthering geodetic theory through research and teaching, by collecting, analyzing, modeling and interpreting observational data, by stimulating technological development and by providing a consistent representation of the figure, rotation, and gravity field of the Earth and planets, and their temporal variations.

IAG structure: The Association's structure comprises a small number of components: Commissions, the Inter-Commission Committee on Theory (ICCT), Services, the Global Geodetic Observing System (GGOS), and the Communication and Outreach Branch (COB).

According to <http://www.ggos.org/> the key elements of GGOS are:

GGOS is the Observing System of the IAG. GGOS works with the IAG components to provide the geodetic infrastructure necessary for monitoring the Earth system and for global change research. It provides observations of the three fundamental geodetic observables and their variations, that is, the Earth's shape, the Earth's gravity field, and the Earth's rotational motion.

For more information related to GGOS consult (Beutler and Rummel, 2011) and (Plag and Pearlman, 2009).

Goals of the Retreat

A thorough review of the Association was to be performed. The outcome should be presented in the form of a **guiding document**

- (a) containing a number of action items to improve the performance of IAG, to be implemented as soon as possible;
- (b) serving, within the period 2015—2019, as the *basis for an IAG structure analysis* to be approved eventually at the IUGG/IAG General Assembly 2019 in Montreal, Canada.

Schedule of the Retreat

The retreat was divided into an introductory part on Monday, April 25, 4:00 p.m. – 6:15 p.m., and a one-day review on Tuesday, April 26. A proposal how to structure the one-day review was presented by Beutler on the first day. This proposal was discussed by all retreat participants. The following decisions were taken:

A *SWOT analysis* (S: Strengths, W: Weaknesses, O: Opportunities, T: Threats) should reveal the current state of the Association. The SWOT analysis should be performed in two groups with about the same number of participants. Both groups were given the same task, namely to perform a SWOT analysis of the Association within about 2 hours.

Subsequently, the two *SWOT analyses* should be *discussed and “synchronized”* by all retreat participants in about 1.5 hours.

Other important issues, not touched by the SWOT analysis, should be discussed in another 1.5 hours. Another hour was reserved to sketch the “*road to Kobe*”. The program of the review of April 26 is summarized in Table 1.

Time	Agenda item
08:30—10:30	SWOT Analysis of the IAG in two groups
11:00—12:30	Discussion and synchronization of the outcome of the two analyses
13:30—15:30	Additional agenda items
16:00—17:00	Road to Kobe, final discussion

Table 1: Schedule of the retreat, Tuesday April 26

Participants

The review participants consisted of the IAG EC members 2015—2019 (Chris Rizos could not participate, Ruth Neilan partly participated through Skype). Gerhard Beutler served as moderator, Allison Craddock and Franz Kuglitsch were responsible for taking the minutes of the two SWOT groups, Allison in addition for taking the minutes of the following sessions. Richard Gross and Szabolcs Rozsa were also invited to the review process. Eventually, the retreat consisted of the 19 members (18 without the moderator) listed in Table 2.

SWOT Analysis, Group 1	SWOT Analysis, Group 2
Roland Pail (rapporteur)	Harald Schuh (rapporteur)
Allison Craddock (minutes)	Franz Kuglitsch (minutes)
Zuheir Altamimi	Jozsef Adam
Riccardo Barzagli	Ludwig Combrinck
Geoffrey Blewitt	Hansjörg Kutterer
Hermann Drewes	Pavel Novák
Richard Gross	Axel Nothnagel
Manabu Hashimoto	Szabolcs Rózsa
Maria Cristina Pacino	Marcello Santos

Table 2: SWOT Analysis in two groups

SWOT Analysis Summary

In hindsight, it proved to be most informative to produce two SWOT analyses in two groups with identical tasks. The results were in good agreement, one might even say, congruent, where “Strengths”, “Opportunities”, and “Threats” are concerned. Differences resulted where the “Weaknesses” are concerned.

- (a) **Strengths:** IAG comprises the *top experts* in the field of geodesy. The Association provides an open, friendly, and supportive environment. IAG is based on highly motivated voluntary contributions, which are funded by national and institutional resources. The *services* make the Association strong among the other IUGG associations and among other international scientific organizations, none of which may rely on comparably strong services. The services are stable in a statistical sense. Compared to AGU and EGU, IAG is “more international” thanks to the about 70 member countries. IAG Commissions and the ICCT are ideal to work on new methodologies by involving the respective experts in the respective fields. IAG offers well-established schools, e.g., organized by several commissions and services, mainly addressing the academic sector. IAG also offers, through its services, products relevant to science *and* society (e.g., reference frames and systems, standards and conventions, GNSS orbits, geoid surface(s)).

IAG is to a large degree interdisciplinary and its research is contributing to global challenges and societal needs such as weather forecast, global change, natural hazards, and sea level rise.

- (b) **Weaknesses:** Both groups saw the low *visibility* of IAG to policy-makers, geo-sciences, educational institutions, and the general public, as a serious problem. It is also viewed as problematic that some *research areas of vital interest*, e.g., SAR and altimetry, are currently *not well covered* in IAG. Also, IAG does not (and cannot) impose the principle of *free access to original data* in all IAG cases, because the Association in general is not the owner of the data. It can also be seen as a weakness that most IAG activities are based on *voluntary contributions*. The high motivation resulting from voluntary work was, however, also seen as a strength (see analysis section (a)).

One of the groups saw it as a problem that *GGOS*, more than ten years after its creation, is *not yet working as originally intended*. The group sees *insufficient communication among IAG components* regarding tasks/responsibilities and in particular *overlap of commission work with GGOS*: according to this group, GGOS should not be an entity that “consumes other parts of IAG”, but rather an entity for enabling and issuing new products based on the services’ work *in collaboration with the commissions and ICCT*. Overall, *the structure of IAG and GGOS* looks *too complicated* for some members of the group. The difference between IAG and GGOS should be made clear, and the overlaps minimized. The other group “only” saw general problems of the type that *interrelations between IAG entities are not fully explored*. In the discussion of this criticism with all members it became clear that the criticism is one of IAG, and not (only) GGOS.

- (c) **Opportunities:** Both groups agree in their assessments: *IAG is pivotal to achieve quantitative results* in many areas relevant to society, e.g., related to global change, sea level change, exploration of variations of the global water cycle. Also, *governments and space missions depend more and more on geodetic products* like reference frames and gravity field models.

It was pointed out that *projects with the focus on water* in all its phases – are very important to society (water resources in some locations, sea level change, ice sheet melting, and atmospheric monitoring).

The *UN GGRF initiative* was viewed as a *great opportunity* to publicize geodesy to a broad public, and to substantially increase the involvement of developing countries in geodesy. The initiative is of crucial importance to improve/optimize the current global geodetic infrastructure.

ICSU initiatives, e.g., *Future Earth* and/or the project *Research Data Alliance* have a great potential for the future. The IAG relations to these initiatives should be strengthened.

The cooperation with other IUGG associations should be strengthened. In view of the interdisciplinary role of geodesy, this should be relatively easy.

New promising technological and/or scientific developments like optical clocks, quantum technologies, are most relevant for geodesy and should be developed within IAG in collaboration with fundamental physics institutions.

- (d) **Threats:** *Aspects of the UN initiative*, seen as a great opportunity (Section (c)), *might also become a threat to IAG*: depending on how the UN resolution is implemented, a *new governance structure* (outside of the one established by IAG) might result. There is a possible increase of responsibility/commitment/obligations. In any case, IAG needs its

place in a future governmental structure with UN participation, which might result in a *Geodetic Commission* under UN auspices.

IAG is not as attractive as it should be to early-career scientists (pre/post doctorate level), to engineers, and other members of the community. There is a lack of networking opportunities offered by IAG. Organizations like UNAVCO or FIG seemingly have much better models in place.

Maintaining and developing the global infrastructure necessary for performing IAG-type research is a real problem, in particular because IAG can only try to convince national institutions and space agencies to provide support to the geodetic infrastructure.

Other Important Issues

Two issues mentioned in one of the two working groups:

Balance of representation in the IAG EC: It was mentioned in one of the two working groups that, to the extent possible, the IAG Executive Committee should have the broadest possible representation, country-wise and geographically and to avoid over-representation of particular countries and regions. This issue only can be influenced by the nomination committee, and only in a restricted sense. The election process cannot and should not be influenced by additional considerations.

GGOS2020: The book *Global Geodetic Observing System: Meeting the Requirements of a Global Society on a Changing Planet in 2020* (Plag and Pearlman, 2009) was published in 2009 and offers a comprehensive overview of geodesy's contribution to science and society around 2010. It was written by a large team comprising in essence all experts in the field of global geodesy and the relevant experts from the other geo-sciences. According to its preface the book wishes to serve two purposes: (1) *to inform users of Earth observations (in particular, GEO) of the potential of GGOS, and (2) to ensure that the GGOS community is aware of the users' needs and requirements so as to integrate GGOS into GEOSS for maximum mutual benefit.* The attendants of the IAG Retreat 2016 agreed that such a book is necessary in future, as well, but that it risks being outdated soon — 2020 is only about 3+ years away. The issue needs immediate attention (next section) and consideration for the IAG Strategic plan (section after the next).

Planetary geodesy in IAG or on IUGG level: The issue was considered as important in the past IAG periods, but attempts to set up an ICC on planetary geodesy in the first decade of the new millennium failed. With the successful NASA mission GRAIL, recent, current, and future planetary missions containing geodetic elements, the situation may be different, today. Also, IUGG established its *Union-Commission on Planetary Sciences (UCPS)* in 2015. The issue needs attention in future (see next two sections).

IAG and Commercial companies: It is logical that IAG maintains good relationships with “its instrument manufacturers”, like, e.g., producers of GNSS receivers. In addition, many commercial companies like, e.g., *Google*, make use of IAG products without acknowledging these contributions and without contributing to IAG. The issue shall be addressed in the near future (next section).

Projects/activities on IUGG or ICSU level of interest to IAG: ICSU's project *Future Earth* is described in (<http://www.futureearth.org>) as follows: *Future Earth is a global platform for international scientific collaboration, providing the knowledge required for societies in the world to face risks posed by global environmental change and to seize opportunities in a transition to global sustainability.* Large projects like IGBP, WCRP, ESSP, shall work under this umbrella in future. It goes without saying that IAG has the potential to contribute a lot to such activities.

IAG and other international organizations: Big international projects (like the EU-funded project *EGSIEM*), or up-coming space missions (such as *GRACE-FO*) with heavy involvement of institutions working also under the auspices of IAG, might be of interest to other IUGG associations. New inter-association activities should/could be considered in the fields of *seismo-geodesy, gravity/magnetic interpretation, mass transport, satellite altimetry, meteorology, volcanology, ionosphere/space weather, Tsunami Early Warning*, where IAG is active. IGS orbit determination and monitoring activities are of interest to the *International Committee on Global Navigation Satellite Systems (ICG)*.

Short-term Action Items

The following action items were proposed for “immediate implementation”:

A bundle of action items were proposed to *engage early career scientists of the community*:

- IAG Study and Working Group chairs shall identify potential early career candidates for their SG/WG and invite them to actively contribute,
- IAG chairs should issue a call for participation for young/early career participants in their groups,
- IAG shall establish *awards* for early career scientists at IAG (and possibly IUGG affiliated/sponsored conferences), i.e., at scientific and general assemblies,
- IAG shall organize *early career sessions* at meetings,
- IAG may consider to offer *a member-at-large position in the EC to early career scientists*,
- IAG may consider an *IAG early-career organization* (like FIG’s Young Surveyors style organization).

IAG shall work with IUGG’s UCPS (previous section) to establish a *Planetary Geodesy Sub-commission* in the IUGG UCPS; alternatively, a working group should be established within IAG (*contact for instance Jürgen Oberst, DLR*).

IAG has a *JWG for Relativistic Geodesy* (chaired by Jakob Flury). *The JWG* should be encouraged to write a *white paper on relativistic geodesy*.

An *IAG task force* should be established to improve the contacts of IAG to commercial companies.

IAG shall in general continue or even improve its excellent cooperation with other IUGG associations.

GGOS2020: The document (Plag and Pearlman, 2009) should be reviewed by a small group, which should propose how to replace or amend this document in 2019 (at the latest). This review should answer the following questions: Did the GGOS document meet the two goals mentioned in the previous section? Should a document *GGOS2030* be written to meet the requirements of the future? Is an *amendment to GGOS2020* sufficient? Does IAG/GGOS meet today the expectations stated in 2009?

Formal aspects:

1. To avoid conflicts with the document (Plag & Pearlman, 2009) a new GGOS Explanatory Supplement should be written (and not an addendum or something like that).
2. The new document, which might be called *GGOS Explanatory Supplement*, should be much shorter than the old one: one should rather strive for 50-70 pages, and not for 300, like the old one.
3. The new document should clearly explain the role of GGOS in IAG and w.r.t. science and society in general.

4. The GGOS Science Panel should be responsible to coordinate the effort, implying that Richard Gross shall be the lead editor. Other editors might be Hansjörg Kutterer, Chris Rizos, and Harald Schuh (ex officio).
5. The first task of the editors would be the definition of the structure (Chapters and lead authors) of the new document.
6. The new document should be available in print at the IUGG General Assembly in Montreal, Canada in 2019.

Strategy Analysis

IAG's mission in the years 2020-2030 shall consist (a) of the *permanent monitoring of the Earth* through its observing system GGOS and by geodetic space missions, and (b) of *making available to the geosciences and to society* easy to understand and to use *products emerging from the observing system*. Relationships with oceanography, hydrology, seismology, etc. should be strengthened on this basis.

IAG should furthermore (c) be active in the sector "*emerging technologies*", in particular where new clocks, gravimeters, and inertial systems (to measure the rotational motion of the Earth) are concerned.

The *strategy document* shall be based on this *guiding document*, an *analysis of GGOS2020*, and a *revised version of the document replacing GGOS2020*.

Eventually, (d) IAG cannot stay away from planetary geodesy (including Moon(s) of planets). The author of the guiding document volunteers to write the first draft strategy document together with Richard Gross. After that the participants of the IAG Retreat 2016 will review the document and Beutler will take the remarks into account. The document will then be handed over to the IAG Bureau (Harald Schuh, Zuheir Altamimi, and Hermann Drewes) for further action.

Towards the IAG Structure Analysis

Mid July, 2016: Final guiding document delivered by Beutler. The result is the basis for the strategy document.

December 31, 2016: Proposal for successor of GGOS2020 should be available.

March 1, 2017: Skeleton for IAG Structure Analysis should be available (draft by Beutler and Richard Gross).

March, April 2017: Review of the draft document by Executive Committee

EC meeting April 28, 2017 in Vienna: final discussion & approval of the draft strategy document.

The strategy document is presented to the public, in particular to the IAG delegates, at the IAG scientific assembly in Kobe, **July 2017**.

IUGG & IAG General Assembly 2019 in Montreal, Canada: Final version of the strategy document to be approved by IAG delegates; GGOS Explanatory Supplement printed.

References:

Beutler G (2004) The new IAG Structure. *Journal of Geodesy*, Vol 77, pp. 560-584

Beutler G, Rummel R (2011) Scientific Rationale and Development of the Global Geodetic Observing System. *Geodesy of Planet Earth*, Vol. 136 IAG Symposia Series, pp. 987-993, Springer Verlag, Heidelberg, New York.

Plag HP, Pearlman M; eds (2009) *Global Geodetic Observing System: Meeting the Requirements of a Global Society on a Changing Planet in 2020*. ISBN 978-3-642-02687-4, Springer Verlag, Heidelberg, New York