The Global Geodetic Observing System (GGOS): A New Governance Structure in Support of Integration

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Proposal for Discussion at GGOS SC16

1 Introduction

In 2005, the International Association of Geodesy (IAG) tasked the newly appointed Chair and the two Vice-Chairs of GGOS, which at that time was a project of IAG, to work with the GGOS Steering Committee on the development and the implementation of a governance structure for GGOS. The initial governance structure was basically in place in 2007, when IAG elevated GGOS to its observing system and a full structural component of IAG. Main components of the current governance structure of GGOS are a large Steering Committee with broad representation of the IAG Services, IAG Commissions, and GGOS components as the main joint oversight and decision making component, an Executive Committee responsible for the day-to-day business under direction of the Steering Committee, a Science Panel as the main advisory body for the Steering Committee, and several Working Groups focusing on specific aspects of GGOS. The GGOS Chair, who is appointed by the IAG Executive Committee, reports to the IAG Executive Committee.

In the GGOS 2020 process (Plag and Pearlman, 2009), some modification of the structure were proposed, including the establishment of a Coordination Office and three GGOS Bureaus (Figure 1). A Call for Proposals for these new components was issued in July 2008. This CfP resulted only in two proposals for two of the Bureaus. No proposal was submitted for the Coordination Office. Subsequent attempts of the GGOS Chairs to secure funding for the Coordination Office were not successful.

Moreover, there is a visible lack of broad support of some of the GGOS activities through IAG Services and Commissions. The visibility of GGOS to the outside world, in particular within the frame of GEO, might actually exceed its visibility within IAG.

The failure to attract proposals for important, if not crucial, components of GGOS, and the continuous challenge of soliciting support for GGOS activities within IAG is taken here as an opportunity to critically review the current governance structure and to analyze the potential causes that may have led to the lack of support. In the next Section, we will first briefly describe the current situation, before we in Section 3 critically review the current governance structure with focus on its versatility for the integration of the observing activities of IAG under a unified umbrella. In Section 4, we discuss alternative business models as they may apply to the relation between the IAG Services and GGOS. In Section 5, we will then propose modifications to the governance structure that might help to facility a higher level of integration as well as more direct participation of the IAG Services in GGOS activities. The main goal of the proposed changes is to promote ownership of GGOS by the IAG Services as the key building blocks. In Section 6, we will review initiatives taken over the last years to improve the international and intergovernmental framework for the sustained operation of the infrastructure on which GGOS and the IAG Services are built and propose the next steps for the way forward.

2 Present governance structure

In the years between 2005 and 2007, a governance structure for GGOS was established with three main components:

- Steering Committee (SC): The relatively large SC with more than 30 voting members acts as the

"parliament" of GGOS where all major decision on policy, strategy, and implementation should be made. The membership is designed to ensure broadest representation of all relevant IAG components: the Commissions and the Services. Currently six Members at Large have the main function to increase representation of all main geographical regions of the World. Moreover, the main components of GGOS also are represented in the SC, although mostly without voting rights. Up to now, the GGOS SC has meet up to three times a year, normally for one day, with longer retreats being organized about every second year.

- Executive Committee (EC): The EC, with a total of six members (the GGOS Chair and the two Vice-Chairs plus three Members at Large, which are elected by the GGOS SC) and two permanent guests (the Chair of the GGOS Science Panel, and the IAG President), takes care of the development of GGOS between GGOS SC meetings and is supposed to work along the directions agreed upon at the GGOS SC meetings. The GGOS EC holds frequent (most of the time fortnightly) telecons.
- Science Panel (SP): The SP is intended as the main advisory component of GGOS, where all relevant scientific expertise should be represented. The SP has never formally met. So far, the main contribution was to the GGOS 2020 Book (Plag and Pearlman, 2009) as co-authors (and two lead authors) of several chapters. Moreover, SP members have contributed and, in some case, organized GGOS Science Workshops.

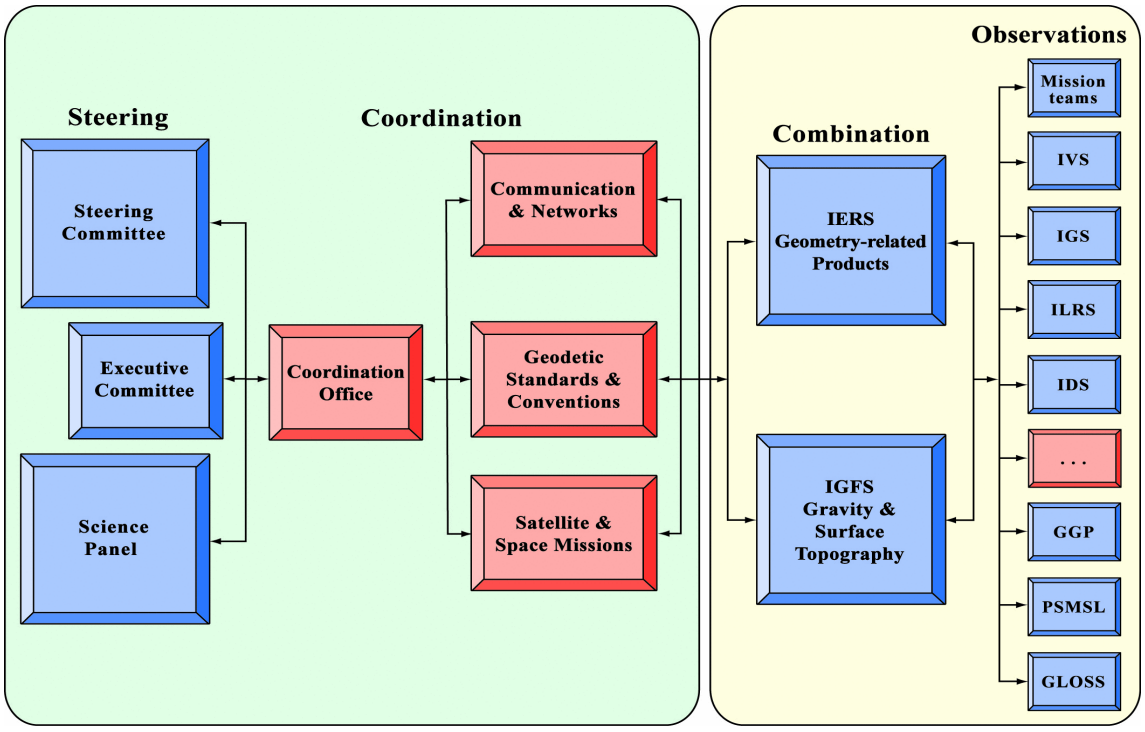


Figure 1: GGOS Governance Structure as proposed by Beutler et al. (2009). Steering Committee, Executive Committee, and Science Panel are in place since early 2006, although with slightly modified composition since December 2008. The Bureaus for Networks and Communication and Standards and Conventions were established in 2009, while the Bureau for Satellite and Space Mission and the Coordination Office do not exist.

Since there is no GGOS Secretariat, this function is currently provided by one of the two Vice-Chairs, who provides all meeting documentation (agendas, minutes, other relevant documents), hosts and maintains the GGOS web pages, and maintains action item lists for the SC and EC.

It is also mentioned here that GGOS originally established five Working Groups (WGs). Up to the revision of the GGOS Terms of Reference (ToR) in December 2008, the WG Chairs were voting members of the SC. Since then, they are members ex-officio without voting rights. Of these original WGs, two have been replaced by GGOS Bureaus, one has been terminated, and one is currently without chair and therefore not active. One new WG was established in 2007 and another one in 2008. An annotated list of the current WGs is given in Table 1.

Table 1: Current GGOS Working Groups. N is the number of members in the Working Group.

WG Title	Chair	N	Comments
Data and Information Systems	Bernd Richter and Carey Noll	?	Has prepared the CfP for the GGOS Coordination Office and the Web Portal; otherwise limited activities
Satellite Missions	C.K. Shum	~15	Has prepared the CfP for the GGOS Bureau on Satellite Missions; otherwise limited activity until new leadership took over in 2008.
GEO-Relations	Hans-Peter Plag	~10	Established in 2007. Coordinates all activities in the frame of the GEO Work Plan.
Outreach and User Linkage	n.n.	?	Was active until 2007, when the chair resigned; no new chair determined.
ITRS Standard	Claude Boucher	~10	Was established in 2008; is working towards a position paper.

3 A critical review of the current structure

The current governance structure of GGOS is associated with a number of critical aspects, which warrant a careful rethinking. Key issues are a apparent disconnect between and duplication of activities of GGOS and the Services, and a limited support for GGOS from the Services in terms of resources. Moreover, critical resources that are crucial for GGOS are not available. In this situation, GGOS appears to look stronger than it actually is.

The GGOS SC meets regularly, mainly in conjunction with large scientific assemblies. At these assemblies, many of the IAG Services also hold Board meetings, and GGOS has been in a constant competition for favorable meeting days. For the AGU Fall meeting 2009, all possible days were blocked by IAG Services, so that the GGOS SC meeting was detached from the AGU Fall meeting and moved to Spring 2010.

During its meetings, the GGOS SC receives reports from various GGOS components, discusses the further development of GGOS and decides on a number of action items. Very limited dedicated resources are available for the day-to-day business between the SC meetings.

The main driver for business between SC meetings is the GGOS EC. To a large extent, this EC works independent and decoupled from the IAG Services. Information flow in both directions is rather limited, despite the fact that several of the EC members also have key functions within Services. Official contact between the GGOS EC and IAG Services is limited to the GGOS SC meetings. Therefore, very few, if any, of the activities carried out or initiated by the GGOS EC in an attempt to follow up the directives set by the GGOS SC are closely linked to or directly coordinated with the Services.

It also needs to be mentioned that the GGOS EC has no support through a secretary or a central bureau.
In order to improve this situation, attempts to associate GGOS with a United Nations' agency were made in 2006 and 2007 (Plag et al., 2009). After an initial dialog between the GGOS Chair and one Vice-Chair (Plag) on the one side and UNESCO and UNEP on the other side, it was agreed that GGOS best would be associated with UNESCO. UNESCO signaled that there was a possibility to host a GGOS Secretariat at UNESCO in Paris. UNESCO also was open to discuss a proposal for an Intergovernmental Geodetic Commission (IGC, see Plag, 2006), comparable to the Intergovernmental Oceanographic Commission (IOC). However, because of concerns in IAG, this opportunity was not further developed.

Since 2005, the GGOS Chair has not be able to solicit support for even the most limited GGOS Secretariat, partly because such a Secretariat is not a component in the GGOS Structure, and focus has been on a much larger and more comprehensive GGOS Coordination Office. The lack of secretarial support for GGOS put a heavy load on the EC and in particular one of the Vice-Chairs (Plag), who developed into a (unfunded) GGOS

Secretary.

Since its initiation in 2003 as the ad hoc Group on Earth Observations (GEO), GEO has developed into a major intergovernmental program in the field of Earth observation. Participation of IAG and GGOS in the broad range of GEO activities is considered crucial. IAG has delegated its representation in GEO to GGOS. The GGOS Chair is the official GEO principal of IAG. GGOS nominated IAG representatives to the four GEO Committees, and GGOS established a Working Group on GEO Relations to coordinate the activities in GEO and the contribution to GEOSS. IAG has taken responsibility for the co-lead of two of the GEO Work Plan Tasks, but in both cases, the co-lead is the chair of the GGOS Working Group on GEO Relations. The Chair of this Working Group is also the Deputy GEO Principal. The current situation is characterized by a disconnect between the IAG GEO Principal (the GGOS chair) and those contributing to the GEO activities on GEO Committee and GEO Work Plan Task level. The IAG Principal has attended the annual GEO Plenary meetings, but otherwise not been able to participate in the work of the GGOS Working Group and the GEO activities. Thus, a key aspect of the representation of GGOS to the outside world, which formally rests with the GGOS chair, has been provided by others with limited formal basis.

In summary, the current GGOS governance structure is characterized by a partial disconnect between GGOS and the IAG Services, a lack of urgently needed resources for the day-to-day business, the absence of an intergovernmental backing for the sustained funding of core infrastructure, some ambiguous and unclear roles, and a partly uncoordinated development of activities of GGOS and the IAG Services.

4 Alternative business models for GGOS

Steps towards a reconciliation of the current unsatisfactory situation requires a consensus on a common "business model" for GGOS and the IAG Services. The review report for the Earth System Science Partnership (ESSP, 2008) discusses four different generic business models, which are of relevance for GGOS. ESSP is an "umbrella" for the ICSU and IGFA-sponsored programs DIVERSITAS, IGBP, IHDP, and WCRP. Similarly, GGOS is an "umbrella" for the IAG Services sponsored by IAG.

Table 2 gives an overview of the four business models discussed for ESSP and provides comments on the degree to which these could apply to GGOS. During the 2008 GGOS Retreat, there was consensus, that of these four models the Flagship model was the most appropriate model for GGOS. For this model, the governance structure need to ensure that GGOS is in the process of developing a facility that could be common to all IAG Services, i.e., the GGOS Portal. A common purpose is already given through the focus on reference systems and frames and the geodetic observation of global changes processes. The initial steps towards the development of a common program and plan has been made with the GGOS 2020 book. However, the future governance structure needs to ensure that the Portal, the GGOS strategy, and the implementation plans are truly common to all Services. For that, all Services need to be engaged in the relevant processes and not just in the oversight component. Based on this requirement, in the following Section, a new governance structure is proposed.

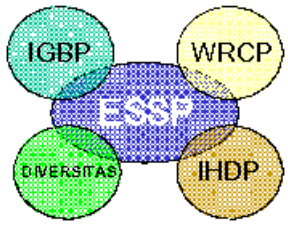
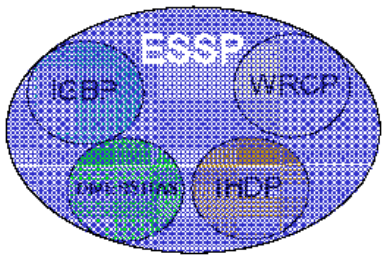
5 More integration through more participation: a new governance by the IAG Services

5.1 GGOS Governance: the Board of Directors

More integration of the IAG Services into the work of GGOS can only be expected to result from a strengthened role of the Services in GGOS. Therefore, it is proposed to give the main responsibility for the development and work of GGOS to a Board of Directors (BoD). This main new GGOS component is composed of the Directors of the Central Bureaus (or similar entities) of all or part of the IAG Services. If necessary, a Service could choose to delegate the representation on the BoD to a different person than the Director of the Central Bureau. However, in such cases it would be important to ensure that the BoD representative has sufficient resources (in particular, dedicated work time) for this role of BoD member. The BoD is the governing component of GGOS, which reports to an oversight committee (see below). All other GGOS components report to the BoD. Membership of the BoD is ex-officio. The oversight committee decides on which IAG Services are represented on the BoD.

Normally all IAG Services would be represented on the BoD, and the guiding principle should be inclusive. However, it may be necessary to give the key Services more weight on the BoD.

Table 2: Potential common business models for the IAG Services and GGOS. The models are illustrated for the case of the ESSP, and adapted to the situation of GGOS and the IAG Services.

Model	ESSP Case	Applied to GGOS
	**Status-quo model** Independent components contribute information to center; no regular interactions; no common business plan; A regular "network" model.	**Status-quo model** Independent services contribute information to the Coordination Office
	**Alliance model** Development of a common business plan; Regular interactions and communication; A common framework for operations.	**Alliance model** Development of GGOS 2020; Regular interactions and communication (WGs, workshops, newsletters, ...); A common framework for operations (Conventions, standards, procedures, web portal).
	**Flagship model** A common facility grown out of many different components (e.g., CERN); A common purpose driving components to do something substantial together; Greater sharing of intellectual capital; A common program where all give inputs.	**Flagship model** A common facility: Portal; A common purpose: Ref.Sys. And global change observations; Sharing of intellectual capital: algorithms, products; A common program: GGOS 2020/implementation plan.
	**Fusion model** Shared vision and mission; Integrated structure and governance; Shared funds.	**Fusion model** Shared vision and mission: No; Integrated structure and governance: No; Shared funds: No.

The proposed BoD would meet at least twice a year, normally for more than one day, and discuss during these meetings all levels of GGOS business in detail. The proposed BoD would be responsible for the GGOS strategy, implementation plan, implementation through the Services and/or specific GGOS components, publication plan, meeting plan, development of proposals for modified GGOS ToR, establishment of GGOS Working Groups, development of GGOS Projects, and Calls for Participation. The BoD members would also have to ensure, through appropriate consultations, that decisions made by the BoD are accepted, supported, and implemented by the Services.

The Chair of GGOS, who represents GGOS inside and outside of IAG, would preside over the BoD. However,

the Chair would not be a director of any of the IAG Services. The Chair could be appointed by the IAG (current solution) or elected by the IAG membership.

5.2 Oversight

The oversight for GGOS either could come from (1) the IAG Executive Committee, or (2) a modified GGOS Steering Committee. For alternative (1), the GGOS SC would be eliminated and the above role of oversight of the BoD would be given to the IAG Executive Committee. However, the IAG EC does not have the breadth of the current GGOS SC. Therefore, this could lead to a considerable disconnect between the wider IAG Community and GGOS. Moreover, although the IAG EC currently has some limited role in oversight of GGOS (selection of chair, and acceptance of GGOS ToR), it is questionable whether the IAG EC would have the resources to actually provide any reasonable oversight.

For alternative (2), the current role of the GGOS SC as the main governance body would have to be reduce to oversight of the BoD. With this new role, the SC could maintain a composition and size similar to the current SC. The chair of the SC would be elected by the GGOS SC from its members. The chair would have the main function to chair the meetings of the SC, and to provide a report to the IAG EC, but the Chair of the GGOS SC would not represent GGOS.

The frequency of meetings of the SC would be dramatically reduced to ones a year or every second year in conjunction with major IAG meetings. The main purpose of the meeting would be to hear, review, comment on, and accept the (extensive) report of the BoD. It is envisioned that these meetings would have a duration of at least one full day, and that the report of the BoD would be presented in a number of presentations, partly given by speakers solicited by the BoD.

The future SC would also be in the position to change the ToR of GGOS based on proposals made by the BoD. Thus, the main purpose of the SC would be to provide the means for the overall IAG Community to have influence on the development of GGOS.

5.3 Role of GGOS Executive Committee

It is proposed that the GGOS BoD be supported by a modified GGOS EC. This GGOS EC will have a strong focus on implementation and development of GGOS Portal, GGOS services, and interoperability with IAG Services, other observing systems, and GEO. This EC reports to the BoD (not the SC, as is the case now).

5.4 The GGOS Secretariat

Instead of aiming for a large and central GGOS Coordination Office, it is proposed to establish a much smaller and focused GGOS Secretariat. Both, the EC and the BoD are proposed to be supported by this GGOS Secretariat, which is responsible for the organization and documentation of EC and BoD meetings, maintenance of e-mail lists and overall organization of elections. The GGOS Secretariat will also support the BoD and EC in the maintenance of action item lists, and provide web contents to the GGOS Web Site.

Resources for the GGOS Secretariat could come from a single host institution, a shared funding from those institutions hosting the Central Bureaus of the IAG Services, or other shared sources. For reasons of continuity, it would be desirable to have a GGOS Secretariat established with a longer time perspective. Outsourcing to a private company could also be a potential alternative.

The dedicated GGOS Secretariat could be rather small particularly if resources of the Central Bureaus of the IAG Services could be utilized to delegate specific tasks to. In this case, a GGOS Secretary/Director plus minimal support might be sufficient to ensure oversight and coordination of the various secretarial activities required to run GGOS.

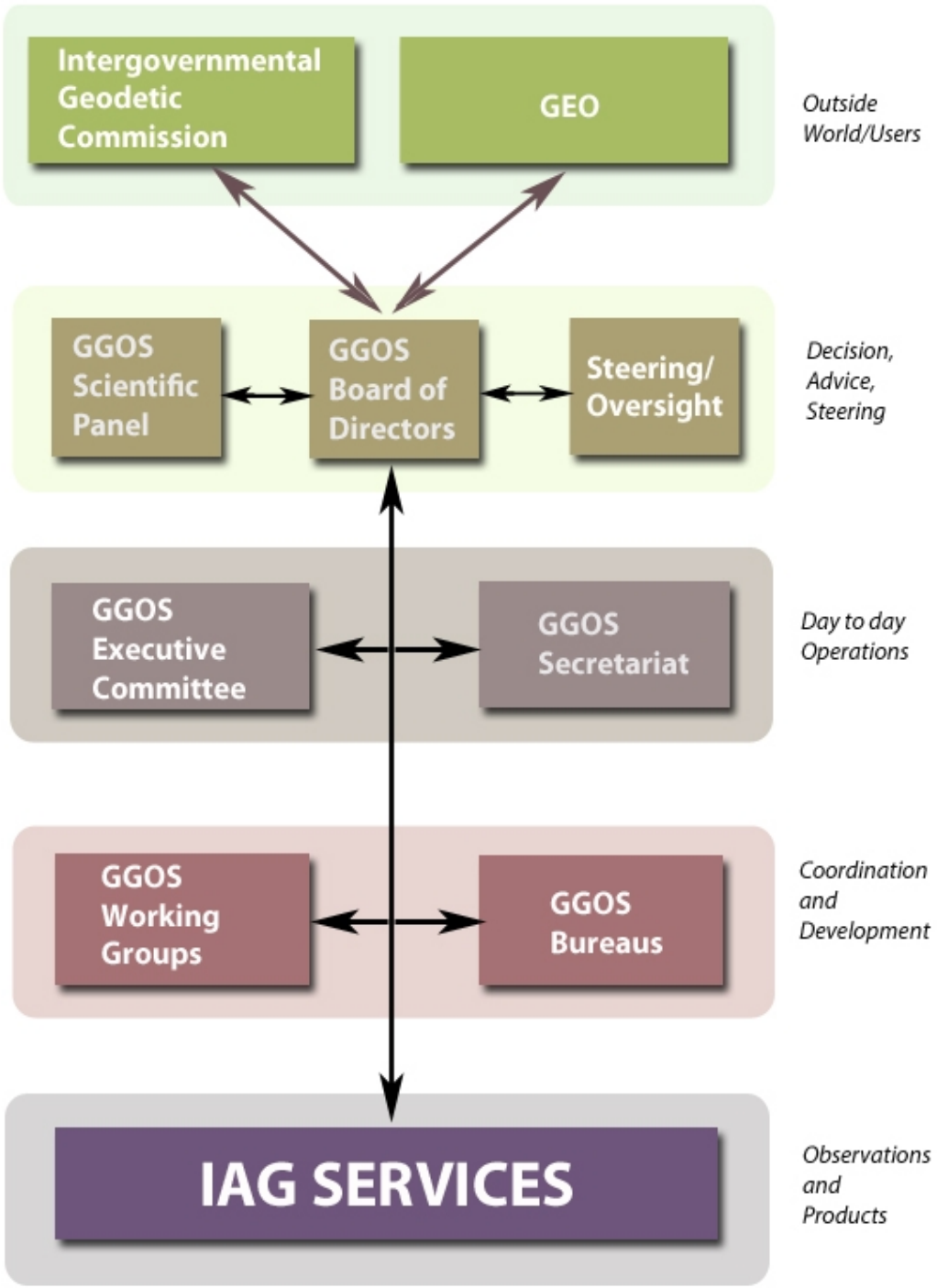


Figure 2: Proposed new governance structure of GGOS. The main decision making element is the Board of Directors, which reports to an oversight and steering committee. This committee could be either the IAG Executive Committee or a modified GGOS Steering Committee. Scientific advice to the BoD is provided by the Science Panel. Day-to-day business is taken care of by a GGOS Executive Committee, which reports to the BoD and a GGOS Secretariat, which serves both the BoD and GGOS EC. GGOS Bureaus and Working Groups provide the means for coordination across Services and development of multi-Service activities. Both Bureaus and Working Groups report to the BoD and interact with the GGOS EC on a day-to-day basis. The BoD provides the formal link to the outside world, including GEO and a proposed Intergovernmental Geodetic Commission.

5.5 Advisory

The GGOS Science Panel is proposed to continue to be the main scientific advisory committee of GGOS, which will advice the GGOS BoD. The members of the Science Panel could be appointed by the BoD or proposed by the BoD and approved by the oversight component.

5.6 IAG and GGOS representation in and contribution to GEO and GEOSS

As recommended by the Chair of the GGOS Working Group on GEO Relations at the SC15, GGOS contribution (for IAG) to GEO is currently rather broad and spread out (a horizontal approach). At the same time, this contribution is based on the effort of very few of the members of the GGOS WG. Therefore, it was proposed to take an alternative, vertical approach with a focus on one key theme and representation through all levels of GEO related to that theme. The choice of a GGOS theme in GEO would have to be associated with one of the Societal Benefit Areas (SBAs), and potential themes would be in the SBAs of Disaster, Weather, Climate, and Water, with a strong preference for Water. Representation at all levels in GEO would included participation in the relevant Communities of Practice (CoPs), Work Plan Tasks, and Committees. For the Committees it was proposed to focus on one of the four Committees and to aim for a Co-Chair of this committee. Providing a Co-Chair of a GEO Committee also implies participation in the so-called C4-Meetings. C4-meetings are those of all Co-Chairs of the GEO Committees, and these meetings have a strong influence the development of GEO.

Providing a Co-Chair of a GEO Committee would require dedication of the person to this activity, and it would have to be associated with sufficient resources (particularly in terms of dedicated work time and resources to participate in the Committee and C4 meetings. GGOS should only aim for this alternative, if a successful (i.e., active) co-chairing is likely. GEO has developed into a very fast acting and developing organization, and successful participation requires considerable focus and constructive contributions.

The membership of the GGOS Working Group in GEO relations should be revised in order to ensure that more active participation in GEO activities is facilitated. Moreover, GEO is now entering a phase where contributions to GEOSS increasingly are necessary. In order to ensure a significant contribution of GGOS to GEOSS, it will be necessary that the WG members actively facilitate connections between activities of GGOS and the IAG Services and the GEOSS infrastructure. The membership of the GGOS WG should reflect this important role.

6 Towards an intergovernmental framework for sustained global geodetic infrastructure

As mentioned in Section 2, IAG and GGOS have made a number of steps with the goal to improve the basis for a sustained operation of the global geodetic infrastructure. Recent degradation in key infrastructure elements, both as a result of a lack of investment in new technology and decisions of individual governments to withdraw funding and close down stations, has underlined the importance of reaching binding international or intergovernmental agreements for the operation of the core global geodetic infrastructure.

Many of the activities initiated since 2003 can be seen as steps towards the end of developing the concept and implementation for an international agreement. In 2004 GGOS initiated an effort to become a member of the Integrated Global Observing Strategy Partnership (IGOS-P), and membership was granted in 2006. Although IGOS-P was not on an intergovernmental level, a number of United Nations' Agencies were members and so were major international observation and funding programs. Since 2004, IAG is a Participating Organization in the intergovernmental GEO and there represented by GGOS. In 2005 and 2006, UNESCO and GGOS initiated a discussion about a potential association of GGOS to UNESCO in the frame of a Intergovernmental Geodetic Commission (IGC). Through IGS, IAG is also represented in the International Committee on GNSS, which has its Secretariat at the United Nations Office for Outer Space Affairs (UNOOSA). Finally, GGSO has recently established a Working Group with the charter to look into an international standard for ITRS, which would provide added visibility for the infrastructure necessary for compliance with the standard.

Specific activities developed over recent years include the initiation of the GEO Work Plan Task AR-07-03

"Global Geodetic Reference Frames", which has the goal to improve the intergovernmental frame for the maintenance of the geodetic reference frames and emphasizes the need for sustained core geodetic infrastructure. One of the main outcomes of the work in this Task is the GGOS 2020 Book (Plag and Pearlman, 2009), which also details the requirements in terms of global geodetic infrastructure. In the GEO Work Plan 2009-2011, this task is continued under the same title as Sub-Task DA-09-02c. In the frame of the revision of this Work Plan in 2009, IAG proposed the new Sub-Task AR-09-03e "Global Geodetic Observing System", which will focus on the implementation of the core global geodetic infrastructure. Thus, IAG and GGOS are utilizing the intergovernmental frame provided by GEO to improve the conditions for both key infrastructure and a key product.

Although all of these activities are important and have the potential to gradually improve the recognition of the geodetic contribution to Earth observation, it is likely that an essential improvement would only results from a more formal and binding intergovernmental framework. It is therefore recommended here that the dialog between GGOS/IAG and UNESCO is taken up again to discuss an intergovernmental framework for the sustained operation of the core geodetic infrastructure, which could be the focus of an Intergovernmental Geodetic Commission. The GGOS 2020 Book provides the basis for this dialog.

7 Summary

There is broad consensus that GGOS needs to be built on the existing IAG Services. Therefore, the success of GGOS ultimately depends on the IAG Services taking ownership of GGOS. This can only be achieved if the governing structure of GGOS acknowledges the important role of the Services and puts the Services in control of the decision making component.

GGOS also needs sufficient operational resources in order to succeed. These resources can hardly be made available in addition to the resources made available for the IAG Services. Therefore, GGOS needs to explore synergies and utilize resources currently available to the Services. Again, this requires a governing structure that links GGOS to the Services more strongly than the current structure. The proposed BoD is a key element to facilitate ownership of GGOS by the Services and to link GGOS to the resources of the Services.

With a BoD taking charge of GGOS, there is no need for a new GGOS Coordination Office. Thus, the need for significant additional resources for an organizational component would be eliminated. Instead, these resources could be focused on the actual implementation. Under the proposed structure, only minor resources for a small GGOS Secretariat would be required, which partly could utilize existing resources already available to the Central Bureaus of the IAG Services.

The role of GGOS as the representative of IAG in GEO should be strengthened through a "vertical approach" with a focus on one major theme and a representation of GGOS in this theme through all organizational levels of GEO. This would include co-chairing one of the GEO Committees.

The opportunity to develop an intergovernmental framework for the sustained operation of core global geodetic infrastructure together with UNESCO, which was initiated by GGOS in 2006, should be explored further. An Intergovernmental Geodetic Commission under the auspice of UNESCO could provide the background needed to develop and maintain the geodetic infrastructure required to serve the increasingly demanding needs of a global society for geodetic observations, products and services.

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