



GROUP ON  
EARTH OBSERVATIONS

## GEO-VII

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Report of the User Interface Committee

Document 16

For information.



## Report of the User Interface Committee (UIC)

### EXECUTIVE SUMMARY

The User Interface Committee (UIC) has been working throughout the past year through a variety of paths to improve user engagement, document user needs, support user-oriented applications of Earth Observations, provide user-based feedback on GEOSS, improve collaboration with Committees, deliver Work Plan content, improve internal Committee organization and productivity, and expand communication throughout all aspects of GEO. Our focus remains on user engagement and increasing participation in targeted regions.

The UIC is pleased to report that it has completed a final report for identifying Earth observation priorities in each of the Societal Benefit Areas (SBA) and the observation priorities common to many SBAs (Task US-09-01a); see Annex. The reports will be available on the GEO website. In addition, the UIC supported a workshop on methods to determine socioeconomic benefits of applications of Earth observations to decision making (Task US-09-02a).

User engagement continues to be a key focus within the UIC, with additional data being collected at the GEO Work Plan Symposium in Pretoria, South Africa in May 2010, to feed into the proactive strategy developed to improve the user engagement role. This strategy will be further refined and implemented over the coming year.

In 2010, the UIC continued to encourage the establishment of new Communities of Practice (CoP) and provide periodic oversight of their progress. The UIC is developing documentation that will provide clear guidance for groups wishing to create a GEO CoP.

In cooperation with the Capacity Building Committee (CBC), we would like to thank the Plenary for its continued support for the Call for Proposals “Earth Observations for Decision Support”. The UIC encourages the Plenary to provide assistance to these projects, and look forward to the successful implementation of ideas brought together in the context of GEO. We thank the Architecture and Data Committee (ADC), CBC and Science and Technology Committee (STC) for their continued active engagements with the UIC, and welcome the opportunity to provide support to activities of mutual interest.

The UIC requests that the GEO-VII Plenary:

- 1) Recognize the significant progress that the UIC has made in the last year;
- 2) Recognize the significant contributions by Countries and Participating Organizations in providing experts to the ad hoc Advisory Groups that helped identify Earth observation priorities common to many SBAs;
- 3) Continue to support the Communities of Practice by volunteering new participants to these groups and identifying in-kind contributions to their work plans;
- 4) Continue its support for the CBC-UIC Call for Proposals “Earth Observations for Decision Support”;
- 5) Extend a special request to Members and Participating Organizations, especially from Asia and Oceania, to nominate participants to the UIC Meetings, e.g. in April 2011 co-located with the ISRSE meeting in Sydney, Australia;

- 6) Request volunteers to participate in UIC meeting and initiatives to accomplish the priority activities and user engagement opportunities.

## **1 UIC ORGANIZATION AND OBJECTIVES**

The UIC consists of representatives of GEO Members and Participating Organizations. The UIC Co-chairs are the European Commission, France, Germany, IEEE, India and the United States.

The UIC engages users in the 9 Societal Benefit Areas (SBA) in the development, implementation and use of a sustainable GEOSS that provides the data and information required by user groups at national, regional and global scales. The UIC is to address cross-cutting issues by coordinating Communities of Practice (CoPs), ensuring added value to existing activities. The objectives of the UIC are to: (1) Enable GEO to address the needs and concerns of a broad range of users; (2) Enable GEO, in the implementation of GEOSS, to engage a continuum of users, from producers to the final beneficiaries of the data and information; (3) Facilitate linkages and partnerships between established CoPs and new groups or organizations interested in collaborating. The UIC also provides review, discussion and oversight of the progress for the 6 Sub-Tasks in the GEO Work Plan 2009-2011 User Engagement Section.

## **2 SIGNIFICANT 2010 ACTIVITIES AND OUTCOMES**

The UIC held four meetings since the GEO-VI Plenary: the 13<sup>th</sup> UIC meeting was held in Nov, 2009 in Washington DC, USA (hosted by USA); the 14<sup>th</sup> UIC meeting in March 2010 in Reading, UK (hosted by ECMWF); the 15<sup>th</sup> UIC meeting in May 2010 in Pretoria, South Africa (hosted by South Africa); and the 16<sup>th</sup> UIC meeting in September 2010 in Oslo, Norway (hosted by Norway). Detailed minutes of the meetings are available on the GEO UIC website. These meetings addressed the UIC activities and outcomes, as summarized in the following:

### **2.1 Usability Testing of the GEOSS Common Infrastructure and Portals**

From 2009 May to 2010 May, the UIC supported a series of five rounds of GEO Web Portal usability tests. Nearly 250 users participated in these five rounds of testing. Based on the first four rounds of testing, the GEO Web Portal providers made improvements to their portals. The fifth round of testing was a comparative test among the portals to select a single GEO Web Portal provider. The UIC provided input to the Initial Operating Committee Task Force for their recommendation to the GEO-VI Plenary to establish a single GEO Web Portal and a single GEOSS Clearinghouse. Subsequently, GEO charged the GEOSS Common Infrastructure (GCI) Coordination Team (CT) to establish a process for selecting a single GCI GEO Web Portal and a single GCI Clearinghouse. The UIC provided support to the GCI CT in their GEO Web Portal assessment and recommendation to the GEO Executive Committee. Based on the usability testing, a series of GEO Web Portal improvements also were provided to the GCI-CT for consideration by the single GCI GEO Web Portal provider.

### **2.2 User Engagement Activities**

Over the course of 2010, the UIC participated in the Work Plan Symposium, and used the opportunity to further engage the task leaders who were present on the issue of their users. Leads were asked to answer three questions (who their users were, how the users were engaged, and how the users will be engaged), and the answers were analyzed at the Oslo meeting. As a result of that meeting, and combined with the previous user engagement-oriented work plan analysis completed in 2009, the UIC identified a set of actions likely to result in a high degree of user engagement. Over the remainder of 2010, these actions will be formulated into concrete activities and conducted within the next version of UIC Activity Plan, scheduled for adoption by the UIC at the January meeting. These activities dovetail nicely with those begun by the UIC in 2009, findings identified by the Monitoring and

Evaluation Working Group, and desires expressed by the Executive Committee of GEO regarding continued, focused user engagement.

In addition, the UIC developed and provided a User Engagement Handbook to the Task Leads at the GEO Work Plan Symposium; this handbook provided guidance and suggestions for activities to pursue to improve user engagement.

### **2.3 Update on US-09-01a – Earth Observations Priorities**

The GEO Task US-09-01a, which collected Earth observation needs for each SBA and identified the observation priorities common to many of the GEO SBAs, produced a final report. The task assessed needs across a spectrum of user types in each SBA, including the needs of users in developing countries and across diverse geographic regions. The task involved 167 experts in the SBA Advisory Groups and analyzed over 1700 documents. The top three Earth observation priorities common to the SBAs are Precipitation, Soil Moisture, and Surface Air Temperature. The full US-09-01a report and observation priorities for individual SBAs are available through the Task website (<http://sbageotask.larc.nasa.gov>). The Annex to this document has a summary of the Task report.

### **2.4 Prototype User Requirements Registry**

A prototype GEO User Requirements Registry (URR) has been developed under the guidance of the UIC. The URR allows the publishing, sharing, and analysis of user needs, applications depending on Earth observations and derived information, and Earth observation requirements. The core of the URR is a comprehensive, on-line database describing user types, applications, requirements, and research needs, as well as links between these entities. Initially, the URR has been populated using information from the reports produced by the GEO Task US-09-01a for two SBAs – Disasters and Health. In the first case, the entries in the URR capture information relevant for disaster reduction and risk management for natural hazards (e.g., landslides, earthquakes, volcanoes, and floods). In the second case, the needs of research, mapping, and early warning for health risks (e.g., related to air quality, aeroallergens, and infectious diseases) have been extracted from the reports. In 2010, a series of URR demonstrations and tests have been conducted in conjunction with co-sponsored GEO Conferences and independently with Advisory Group members who assisted in the preparation of the Task US-09-01a SBA Reports. Based on these tests, the URR prototype has been improved – Version 3.0 will be available for testing at the GEO-VII Plenary and Ministerial Summit Exhibition.

### **2.5 Communities of Practice**

CoPs play a critical role in implementing GEO's mission, connecting GEO to the broader scientific and user communities, and leveraging the synergies and potential that exist when groups and individuals collaborate toward a common goal. As self-organized groups, each GEO CoP charts its own path in coordination with GEO's mission, Committees, Tasks, and objectives. However, in general, CoPs:

- Develop a shared vision for the most important work they can do to promote application of earth observations for societal benefit, and then work to achieve that vision;
- Define which earth observation data and products are most important within their area of shared interest and how they can be applied to address issues and tasks identified by GEO. Lead or contribute to GEO Tasks/Sub-tasks within their field of expertise;
- Seek members and partners within GEO and from external organizations and communities. Raise awareness of the importance of earth observations for as a critical tool for societal benefit;
- Actively connect colleagues with GEO through networking and outreach (e.g., participation in workshops/conferences/task forces);

- Engage end users through workshops, networking, and interactive websites in identifying issues and potential solutions for societal benefit through application of earth observations.

The UIC discussed the latest version of guidance to groups wishing to become known as GEO Communities of Practice. The documentation being drafted within the UIC intends to elaborate on the concepts identified above, and provide further guidance, clarification, and expectations on the relationship between GEO and Communities of Practice. Upon completion, this documentation will be available on the GEO UIC web site.

## **2.6 STC/CBC/ADC Coordination Activities.**

The UIC has continued or begun activities in support of various other Committee efforts, including the CBC-UIC Call for Proposals, the STC GEO Label concept and Continuity Indicators effort (both still in the early phases), and ADC activities centering on support for the GCI (listed above). The CFP seeks to promote practical applications of Earth observations for improved decision making and to highlight specific examples of how Earth observations can benefit society. In 2010 GEO received 72 full proposals in the four areas of focus: 18 in Agriculture, 2 in Energy, 13 in Health, and 39 in Water. For each SBA, a dedicated Review Panel has reviewed the proposals. For the selected proposals, the GEO Committees will broker connections between project teams and resource providing organizations. Joint STC activities encourage the UIC link with and understanding of various user communities, through mechanisms such as Communities of Practice, and will be addressed in the UIC Activity Plan for 2011-2012.

## **2.7 Proposal to Create GEOSS Professorships**

The UIC is currently discussing a new proposal, introduced by one of the UIC Co-Chairs that aims to establish a set of academically-oriented positions to develop research based on GEOSS, and dedicated to specific SBAs, in order to enhance the links between users and GEO activities. The proposed goals of people in those positions as GEOSS professorships are to develop student-level modules related to various aspects of GEOSS, and to contribute to broader information dissemination of GEOSS activities and accomplishments. This idea is still very much a work in progress and under discussion, however the UIC would welcome participation from those who are interested and have ideas to contribute.

## **2.8 Socioeconomic Benefits of Earth Observations**

The UIC supported a workshop aligned with GEO Task US-09-02a on methods to determine socioeconomic benefits of applications of Earth observations to decision making. The workshop, *Value of Information: Methodological Frontiers and New Applications*, brought together social scientists, economists, and physical scientists from the Earth observations community, and it examined a cross-section of techniques and identified opportunities for collaboration. The workshop and its report support the development of knowledge in the global Earth observations community regarding socioeconomic benefit analysis techniques. The workshop report is available on the GEO UIC website.

## **2.9 UIC at the Beijing Exhibition**

The UIC is sponsoring an exhibit at the GEO-VII Plenary and Ministerial Summit Exhibition, 3-5 November 2010, Beijing, China. The booth will include a UIC display, a 5-computer workstation for online URR usability testing and data entry, and a display area for eight of the ten GEO CoPs – Air Quality, Biodiversity, Carbon, Coastal Zone, Energy, Geohazards, Health and Environment, and Water Cycle. Each of these CoP displays will include videos on their activities, as well as posters and handout materials. Two computer workstations will be available to provide access to the CoP websites and a flat-screen LCD will continually run video presentations on the CoP activities. More than 20 different handout materials will be available in the UIC booth in Beijing offering summary

information and GEO points of contacts for the various GEOSS activities. Please stop by and review the materials.

### **3 UIC MEETING PLANS FOR 2011**

UIC will continue to meet regularly during the year at different institutions, preferably in different regions. Each meeting aims to include a presentation by the host about their Earth observations activities, GEO and User Engagement activities.

The first UIC meeting will be held at the end of January 2011 (25.-28.01.11) in Vienna (Austria) at the kind invitation of the ZMAG (Austrian Meteorological Service).

UIC will then meet in April 2011 (estimated 06.-08.04.11) in Sydney (Australia) shortly before the International Symposium on Remote Sensing of Environment (ISRSE) meeting. The UIC has proposed several special sessions focused on user engagement at the ISRSE meeting. The first is a session on papers describing the accomplishments and important issues within the various GEO Communities of Practice; the second is a combination of papers and panel discussion focused on the way ahead. UIC members will attend and interact with panelists in a round-table fashion.

Further UIC meetings in 2011 will be scheduled later and in line with the general GEO planning, e.g. before the next plenary 2011; when a Joint Committee Meeting is scheduled, the UIC will plan a co-located meeting. Meeting information regarding the UIC is regularly posted on the GEO web site.

### **4 UIC ISSUES FOR THE ATTENTION OF THE GEO-VII PLENARY MEETING**

The UIC requests that the GEO-VII Plenary:

- 1) Recognize the significant progress that the UIC has made in the last year;
- 2) Recognize the significant contributions by Countries and Participating Organizations in providing experts to the ad hoc Advisory Groups that helped identify Earth observation priorities common to many SBAs;
- 3) Continue to support the Communities of Practice by volunteering new participants to these groups and identifying in-kind contributions to their work plans;
- 4) Continue its support for the CBC-UIC Call for Proposals “Earth Observations for Decision Support”;
- 5) Extend a special request to Members and Participating Organizations, especially from Asia and Oceania, to nominate participants to the UIC Meetings, e.g. in April 2011 co-located with the ISRSE meeting in Sydney, Australia;
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## ANNEX

### GEO TASK US-09-01A: CRITICAL EARTH OBSERVATION PRIORITIES

Numerous countries and organizations have produced reports in the past decade that articulate Earth observation needs across a broad range of user types. This document summarizes the results of GEO Task US-09-01a, which collected the needs specified in those reports and identified the Earth observations priorities common and most critical to many of the GEO Societal Benefit Areas (SBA). The full GEO Task US-09-01a report and observation priorities for individual SBAs are available through the Task website (<http://sbageotask.larc.nasa.gov>).

#### I INTRODUCTION TO GEO TASK US-09-01A

The objective of GEO Task US-09-01a is to establish and conduct a process to identify critical Earth observation priorities common to the GEO SBAs.

Many countries and organizations have published reports, conducted workshops, and produced documents that specify Earth observation needs, including the GEO 10-Year Implementation Plan. Researchers and practitioners have also identified and recommended key Earth observation needs in publications and peer-reviewed literature. The Task US-09-01a process focused on compiling information on observation parameters from a sampling of *existing* materials. The Task Team analyzed these materials and prepared reports on the Earth observations priorities within each SBA. Then, the Task Team conducted a meta-analysis across the individual SBA reports to produce a final cross-SBA report on the priority observations common to many SBAs.

The Task included all observation needs articulated in the documents, whether the needs are related to ground-based, *in situ*, airborne, or space-based observations. The Task involved both observed and derived parameters as well as model products. The Task Team sought to identify Earth observation needs across a full spectrum of user types in each SBA, such as scientific researchers, resource managers, and policy makers. The Task Team made concerted efforts to ensure international breadth, including materials and needs across all geographic regions and representation of developing countries.

The Task focused on the “demand” side of observation needs. The Task addressed the desired, needed observations, independent of whether an observation currently exists and independent of the instrument or technology involved with producing the observation. The purpose of this approach was to focus on needs and allow maximum flexibility in how to satisfy a need. Overall, by focusing on users’ needs, this Task can support GEO organizations’ efforts to determine priority investment opportunities to serve users.

The Task Team sought to preserve end user terminology and descriptions of their needs. Hence, many of the required observation parameters discussed in the cross-SBA report are phenomena of interest to end users rather than technical specifications of parameters as discussed in measurement communities. As such, the observation priorities reflect users’ wants and needs. Follow-on activities would be needed to determine technical specifications and engineering requirements for any specific parameter.

## II. TASK PROCESS

The process of identifying observation priorities within each SBA was a nine-step process that the Task Lead and User Interface Committee (UIC) developed and vetted with the GEO Secretariat. The nine-step process involved identifying existing documents, developing analytic methods and priority-setting criteria, analyzing the documents, determining priorities, vetting results, and preparing the report. The Task website (<http://sbageotask.larc.nasa.gov>) has a detailed description of the process.

For each SBA, an “Analyst” and an *ad hoc* “Advisory Group” conducted the nine-step process. The Analysts served as the main coordinators to manage the activities, compile the priorities, and develop the respective SBA reports. The Advisory Groups aided their respective Analysts by identifying relevant documents, critiquing the analytic methods and priority-setting criteria, and reviewing the findings, priorities, and reports.

The nine-step process provided consistency across the nine SBAs. Each Analyst worked with the Advisory Group to tailor the process to specific aspects of the SBA, such as by developing priority-setting criteria unique to the SBA. The Analysts referred to the GEO 10-Year Implementation Plan for a description and summary of topics within each SBA.

Once the individual priorities were determined for the respective SBAs, the Task Team conducted a meta-analysis across the SBA reports. The Task Team developed statistically-robust methods to combine the priorities identified in the individual reports and produce a cross-SBA report on the priority observations common to many SBAs.

## III. SBA ANALYSTS AND ADVISORY GROUPS

The Task Lead and UIC identified and sponsored people to serve as the Analysts. The GEO Secretariat issued a request to the GEO community in January 2009 for nominations of Advisory Group members. The Analysts identified and selected the Advisory Group members based on the Task methodology requirement to maximize breadth of expertise and geographic representation. Analysts engaged contacts at the GEO Secretariat, relevant GEO Communities of Practice, former IGOS Themes, and GEO Participating Organizations, such as the Committee on Earth Observation Satellites and World Meteorological Organization.

The *ad hoc* Advisory Groups consisted of 6 to 23 members each. The members had technical, scientific, management, or policy expertise and are respected in their fields. The members are from both developed and developing countries and include representatives of GEO Members Countries and Participating Organizations. Across all the SBAs, 167 experts participated in the Advisory Groups. The Task website has names of the respective SBA Analysts and Advisory Group members.

GEO Task US-09-01a	
<i>Geographic Distributions of Advisory Group Members</i>	
Africa	19
Asia & Middle East	17
East Asia	7
Europe	28
North America	45
Oceania/Australia	14
South/Central America	14
International	23
<b>Total</b>	<b>167</b>

## IV. ANALYSIS AND PRIORITIZATION

Within each SBA, the Analysts developed prioritization methods and criteria in coordination with their respective Advisory Groups. The prioritization methods involved a combination of quantitative and qualitative approaches, and included one or more of the following types for each SBA report: frequency or bibliometric analysis, weighted frequency analysis, cross-cutting applicability within the SBA, consideration of document types, and Advisory Group input. The variation in methods was part of a deliberate effort to gather information on prioritization approaches for future GEO efforts at this Task.

Combining the observation priorities of the individual SBAs produced a total of 146 observation parameters indicated as priority needs by end users. In the cross-SBA meta-analysis, the Task Team employed an ensemble of prioritization methods to prioritize the 146 parameters. The Team used three main methods and generated a mean rank and range, which the Team used to determine overall priorities of Earth observation parameters:

- Method 1 involved an unweighted frequency analysis of the SBAs that require a given observation. Essentially, this method ranked and prioritized the 146 observations based on the number of SBAs that specified each individual observation;
- Method 2 involved a weighted frequency analysis of the number of SBAs that require a given observation, taking into account the importance (high/medium/low) assigned by the SBA Analysts. Within this method, there were two sub-methods involving different weighting schemes for the importance assignments;
- Method 3 involved a key parameters method, allowing each SBA Analyst to identify 15 observations to be considered highest priority for the SBA. This method produced a set of 99 observations that were part of at least one SBA’s list.

**V. RESULTS**

Based on the methods described above, the Task Team calculated an average ranking for each observation parameter along with the variance depicting the range of rankings from the three methods.

The Task Team found that the observation parameters with the highest average ranks generally had smaller ranges in rank, indicating agreement among the three methods on the most critical priorities. Below the 19<sup>th</sup> highest-ranked parameter, the range in rankings across the methods increases, indicating slightly less consensus on the remaining critical priorities. Thus, the Team chose to present only the top 19 Earth observations parameters in this document.

The full cross-SBA report provides significantly more information about the observations and prioritization methodology and results.

<b>GEO Task US-09-01a</b>	
<i>Top 19 Critical Earth Observation Parameters Common to Many GEO SBAs</i>	
1. Precipitation	11. Vegetation Type
2. Soil Moisture	12. Surface Atmospheric Pressure
3. Surface Air Temperature	13. Glacier/Ice Sheet Extent
4. Surface Wind Speed	14. Urbanization
5. Surface Humidity	15. Sea Surface Temperature
6. Land Cover	16. Lead Area Index
7. Surface Wind Direction	17. Upper Level Winds
8. NDVI	18. Stream/River Flow
9. Vegetation Cover	19. Upper Level Humidity
10. Land Surface Temperature	

**VI. CONCLUSIONS**

The Task and the results represent a significant undertaking to analyze priority observation needs across all the documents and engage experts in the SBAs. The efforts within individual SBAs and the cross-SBA activity represent significant contributions and first steps within GEO to articulate Earth observation priorities. Through this Task, GEO can document in a transparent way how Earth observation needs have been identified, involving numerous organizations and experts.

The set of critical observations includes many observations that the GEO community may have expected. The value of the Task's results and cross-SBA report is twofold: (1) to confirm any expected priority observations as backed up by an analysis of the literature, and (2) to provide a baseline and entry point for further engagement with end users on their needs, such as through Communities of Practice or other venues. The larger set of observations includes many parameters that may be different than some expected. The full cross-SBA report discusses the set of priority observations at length.

In the process, the SBA Analysts, Advisory Groups, and Task Team have highlighted strengths and areas for improvement. For example, the overall Task involved over 1,700 documents, though there were limited documents for some geographic regions in some SBAs. In addition, documents varied in their level of specificity of observations needs.

The cross-SBA report also includes findings from the individual SBA activities and the overall prioritization effort. The report provides insights about the process from the Analysts, Advisory Groups, and Task Team. In addition, the cross-SBA report includes recommendations for ways to refine and improve efforts to identify critical Earth observations priorities common to many SBAs.

The results of this Task can support numerous activities within GEO. For example, the Task Lead and the UIC are beginning an effort to use the results to conduct a gap analysis of current and future availability of the priority observations. In addition, the results of this Task could be used to support an update of the GEO 10-Year Implementation Plan.

Overall, the Task Lead and the UIC want to recognize and thank the SBA Analysts, Advisory Group members, and Task Team for their service and contributions.