

GEO Task US-09-01a

Critical Earth Observation Priorities

Summary of Results • October 2010





Critical Earth Observation Priorities

Earth observations provide benefits to society. Some observations may be critical to a particular field, such as disasters or agriculture. Some observations may be commonly needed by many fields. What do users in these fields need and what are their priorities?

An activity of the Group on Earth Observations addressed this question. The activity, known as Task US-09-01a, examined needs across a range of users to identify critical and common observations. Precipitation, Soil Moisture, and Surface Air Temperature were the highest-ranked priority observations.

The Group on Earth Observations (GEO) is an intergovernmental organization working to improve the availability, access, and use of Earth observations to benefit society. GEO involves over 140 countries and organizations as members, and it focuses on 9 societal benefit areas (SBA). GEO is coordinating efforts to establish a Global Earth Observation System of Systems which builds on national, regional, and international observation systems and data from thousands of instruments.

Many countries and organizations have produced documents over the past 10 years that specify Earth observation needs. The Task Team harvested users' needs from these existing, publicly-available documents – over 1,700 documents in total. The documents were drawn from all geographic regions, including a special emphasis on developing countries. The analysis of the documents examined needs related to ground-based, *in situ*, airborne, or space-based observations. With guidance from the GEO User Interface Committee, the Task Team sought to identify needs across a full spectrum of users in each SBA, such as resource managers, researchers, and policy makers.

Task US-09-01a focused on the “demand” side of Earth observation needs. The Task Team concentrated on the observations needed and desired by users, independent of the current availability of the observations or the sensor technology involved with producing them.

The Task Team first produced reports on critical, priority observations for each individual SBA. Advisory Groups of experts for each SBA reviewed the reports (see far right panel). Then, the Task Team conducted a meta-analysis across those reports, using statistically-robust methods in a Cross-SBA analysis to identify the priority observations common to many SBAs.

What are the results? An overall ranking of 146 critical Earth observations. Of these, the top 18 observations are common to 5 or more SBAs. 50 observations, or 34% of the observations, are common to 3 or more SBAs. Precipitation is the top-ranked observation and common to all the SBAs in the Cross-SBA analysis.

The results of this Task can support numerous activities within GEO, including an assessment of current and planned availability of these highest-ranked observations. Overall, the results can support efforts to determine investment opportunities to serve users. The results are a baseline to engage user communities further, especially as new needs develop and users' priorities evolve.

The Task Team and GEO User Interface Committee invite you to review the individual SBA and Cross-SBA reports. How do your needs compare with the priorities of other user communities?

“Earth observations are the indispensable foundation for addressing the global environmental and resource challenges of our time.”

- Dr. John P. Holdren, GEO Plenary VI



25 Highest-Ranked Earth Observations and Associated SBAs

Earth Observation Parameter	GEO Societal Benefits Areas*							
	Agriculture	Climate	Disasters	Ecosystems	Energy	Health	Water	Weather
Precipitation								
Soil Moisture								
Surface Air Temperature								
Surface Wind Speed								
Land Cover								
Surface Humidity								
Vegetation Cover								
Surface Wind Direction								
Normalized Difference Vegetation Index								
Sea Surface Temperature								
Urbanization								
Vegetation Type								
Land Surface Temperature								
Surface Atmospheric Pressure								
Leaf Area Index								
Glacier/Ice Sheet Extent								
Upper Level Humidity								
Elevation								
River Flow Observations								
Upper Level Winds								
Land Use								
Upper Level Temperature								
Net Primary Productivity								
Sea Level								
Snow Cover Extent								

What Is Next?

The user-based list of priority Earth observations can support many activities.

GEO Members can ...

- Compare the results with their own needs and priorities
- Identify key opportunities to serve their users' needs
- Partner with other members to provide key observations for broad societal benefit
- Register data and information to support users across many SBAs

GEO Committees and Tasks can ...

- Identify key gaps in current and planned availability of priority observations
- Examine access to the observations through GEOSS
- Build capacity in use of high-priority observations
- Assess maturity of science and technology to serve priority needs
- Engage users on needed characteristics of key observations

Communities of Practice can ...

- Compare priorities, needs, and uses within the Community of Practice
- Engage users and organizations with common interests
- Identify linkages with other Communities of Practice
- Broaden their communities across user types

Users can ...

- Compare their needs and priorities to those of others
- Identify linkages with other SBAs
- Discover observations of possible use and benefit

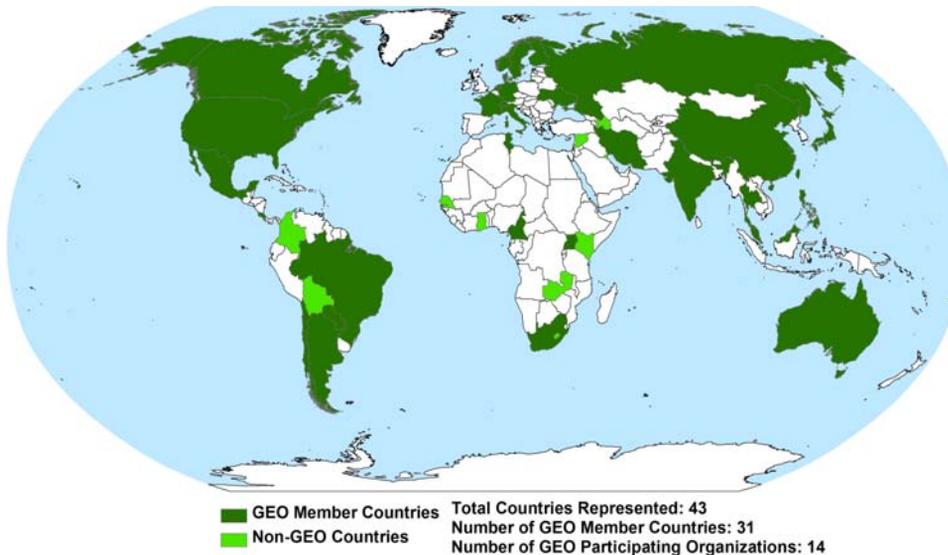
-  the observation was included in the SBA's set of priorities
-  the observation was not included in the SBA's set of priorities

*The Biodiversity SBA did not produce a list of priority Earth observations. Thus, the Cross-SBA analysis involved observations from only 8 SBAs.

This table presents the 25 highest-ranked Earth observations, listed according to the score in the Cross-SBA analysis. The table indicates the corresponding SBAs that identified the observation as a priority. This table conveys both the priority and commonality of the observations to many SBAs.



Countries Represented in Advisory Groups



Task US-09-01a Advisory Groups

The US-09-01a Task Team formed ad hoc Advisory Groups for each SBA. The Advisory Groups consisted of 6 to 23 members, and the members were technical, scientific, management, or policy experts in their fields. Under the coordination of an Analyst for each SBA, the Advisory Groups identified relevant documents, critiqued analytic methods, reviewed priority-setting criteria, assessed results, and reviewed the SBA reports.

The Task Team emphasized engagement with the GEO Communities of Practice and former IGOS Themes for Advisory Group members. Some GEO organizations, such as the Committee on Earth Observation Satellites and World Meteorological Organization, provided members for several Advisory Groups.

Across all of the SBAs, 167 experts from 43 different countries participated in the Advisory Groups. The members were from all geographic regions and from developed and developing countries. The Advisory Groups included representatives from 31 GEO Member Countries and 14 Participating Organizations, as shown in the figure above.

Did You Know...

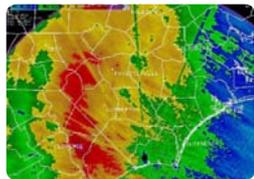
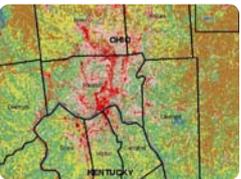
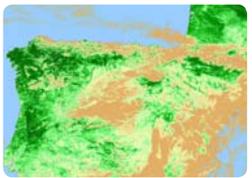
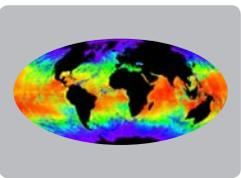
...**Wind Speed** information is needed by users affiliated with Health and Ecosystems SBAs? Health SBA users require Wind Speed data to monitor and forecast the spread of infectious diseases. Health SBA users also require Wind Speed data to study aerobiological processes, including emission and dispersion of pollen. Ecosystems SBA users require Wind Speed data for reasons such as assessing storm impacts on various ecosystems.

...**Vegetation Cover** observations are required at different levels of specificity by users associated with the Water and Ecosystems SBAs? Water SBA users have a general need for Vegetation Cover, with few specific details regarding the type of vegetation observations. Ecosystems SBA users require many distinct vegetation observations, such as forest cover, canopy structure, canopy height, shrub cover, tree-line location, and grasses.

...**Global Horizontal Irradiation (GHI)** is needed by users affiliated with the Energy, Agriculture, and Human Health SBAs? Energy SBA users need GHI (direct and diffuse irradiation) for flat plate solar applications such as photovoltaics. Agriculture SBA users need GHI for crop management. Health SBA users need GHI for understanding the presence of salmonella and hemorrhagic fever.

GEO Task US-09-01a Website: <http://sbageotask.larc.nasa.gov>

10 Highest-Ranked Earth Observations

<p>Precipitation</p>	<p>Soil Moisture</p>	<p>Surface Air Temperature</p>	<p>Surface Wind Speed</p>	<p>Land Cover</p>
				
<p>This parameter includes observations of the phase, amount, frequency, and duration of precipitation; precipitation in thunderstorms; and extreme precipitation events.</p>	<p>Soil Moisture is the 2nd highest-ranked need, and is on the list of priorities for the 8 SBAs in the Cross-SBA analysis. Observation needs include surface and sub-surface soil moisture.</p>	<p>Surface air temperature is on the list of priorities for the 8 SBAs in the Cross-SBA analysis. The related Land Surface Temperature is on the list of priorities for 5 SBAs, and is within the 30 highest-ranked parameters.</p>	<p>Surface Wind Speed is on the list of priorities for 7 SBAs. Users typically distinguish between a need for surface wind direction vs. speed. The parameter Upper Level Winds is related and is a priority for 4 SBAs.</p>	<p>Land cover is on the list of priorities for 6 SBAs. As a derived parameter, land cover draws on multiple data sources. The parameter Urbanization is related and is within the 30 highest-ranked observations.</p>
<p>Surface Humidity</p>	<p>Vegetation Cover</p>	<p>Surface Wind Direction</p>	<p>NDVI</p>	<p>Sea Surface Temperature (SST)</p>
				
<p>Surface humidity is on the list of priorities for 7 SBAs. The related parameter of Upper Level Humidity is within the 30 highest-ranked observations. Together, these two parameters are critical for global numerical weather prediction models.</p>	<p>Vegetation cover is on the list of priorities for 5 SBAs, including Agriculture, Ecosystems, Health, Water, and Weather. Some users require additional information such as Vegetation Type and Vegetation Indices.</p>	<p>Surface Wind Direction is on the list of priorities for 6 SBAs. In the overall rankings shown here, this observation is slightly less critical than Surface Wind Speed.</p>	<p>Normalized Difference Vegetation Index is on the list of priorities for 5 SBAs. NDVI is often used as a surrogate for vegetation parameters such as biomass, status, greenness, and moisture, which may be the underlying user data need.</p>	<p>Sea Surface Temperature (SST) is on the list of priorities for 5 SBAs. SST is critical for seasonal to long-range forecasts. Other ocean parameters such as Ocean Topography and Sea Level also are within the 30 highest-ranked observations.</p>

GEO Societal Benefit Areas



Agriculture



Disasters



Health



Biodiversity



Ecosystems



Water



Climate



Energy



Weather

THE GLOBAL EARTH OBSERVATION SYSTEM OF SYSTEMS



Group on Earth Observations

The Group on Earth Observations is an intergovernmental organization working to improve the availability, access, and use of Earth observations to benefit society. GEO is coordinating efforts to establish the Global Earth Observation System of Systems.

GEO User Interface Committee

The User Interface Committee engages a broad range of user communities in the development of GEOSS, identification of needs, and use of Earth observations on national, regional and global scales.

GEO Task US-09-01a: Critical Earth Observation Priorities

Task US-09-01a is an activity to identify critical Earth observation priorities common to many societal benefit areas across a range of users.