Global Earth Observing System of Systems (GEOSS): Progress and Plans

User Interface Committee Meeting
1-3 August 2007

Douglas Muchoney, GEO Secretariat
GEO MINISTERIAL SUMMIT
Cape Town
30 November 2007
The Earth is a complex system of systems.
The Earth is a complex system of systems

I do not know how the parts are interconnected, and how each part accords with the whole; for to know this it would be necessary to know the whole of nature and all of its parts.

Baruch Spinoza 1632-1677
Any Single Problem Requires Many Data Sets

A Single Data Set Will Serve Many Communities
**SSE Data Set**

Access through: [http://eosweb.larc.nasa.gov/sse/](http://eosweb.larc.nasa.gov/sse/)

- Monthly averaged from 11 years of data (1983-1993)
- Data tables for a particular location
- Color plots on both global and regional scales
- Over 200 satellite-derived meteorology and solar energy parameters
- Data for the RETScreen® Clean Energy Project Analysis Software

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**Helioclim Database**

Access through SoDa: [http://www.soda-is.com/](http://www.soda-is.com/)

- Database and time-series of irradiance or irradiation
- Produced by the processing of satellite images, especially from the Meteosat series of satellites
- Covering Europe, Africa, the Mediterranean Basin, the Atlantic Ocean and part of the Indian Ocean
- Period runs from 1985 onwards

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**Solar Energy**

**The SoDa Service Integrator**
IGOS-P Migration to GEO

- IGOS-P-13bis meeting in Buenos Aires 12 November 2006
- Transition Document (Doc 11 to ExCo 3-4 July 2007)
- Active Role of Theme Teams in the Communities of Practice
- Continuation of IGOS Theme Team Reports with (new) emphasis from requirements to implementation of recommendations/activities
- Representation of Theme Teams in GEO Committees (UIC, STC, ADC, CB)
- Agreed at IGOS-P-14 that Co-chairs will monitor overall transition
- Transition Document completed in time for IGOS–P-14bis in Cape Town 27 November 2007
Ministerial Summit Preparations

• Report on Progress (TF2 Draft V4.1, 20 July 2007)
• Early Achievements
• Draft Agenda
• Draft Declaration
• Booths
• Publication – The Full Picture: Tudor Rose
• Don’t Forget: GEO Plenary
# Relation of IGOL Recommendations to GEO Tasks

<table>
<thead>
<tr>
<th>Sub-Theme</th>
<th>Status</th>
<th>Bodies carrying out tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Cover</td>
<td>Largely transitioned to GEO: DA-07-02 &amp; 03</td>
<td>GOFC-GOLD, FAO/GTOS, CEOS etc</td>
</tr>
<tr>
<td>Land Use/Change</td>
<td>Ag LU transitioned to GEO: GEO needs a more comprehensive global LU activity.</td>
<td>GOFC-GOLD and FAO/GTOS</td>
</tr>
<tr>
<td>Fire</td>
<td>Partly transitioned to GEO: DI-06-13</td>
<td>GOFC-GOLD and FAO/GTOS</td>
</tr>
<tr>
<td>Biodiversity/Conservation</td>
<td>Report submitted to GEO</td>
<td>GEO, CBD, WHC etc.</td>
</tr>
<tr>
<td>Agriculture</td>
<td>Transitioned to GEO: AG-07-03</td>
<td>IGOL Ag Team with FAO and GEO</td>
</tr>
</tbody>
</table>
| Biophysical Properties (relating to Ecosystem Dynamics) | Many remote sensing needs correspond to GIP; in situ needs development. Regional: GEO Task: EC-06-07. | - GCOS/CEOS for RS; Ag NPP to GEO-Ag.  
- In situ: Fluxnet.  
- Ecosystem props TBD. |
| Soils                                         | On-going                                                               | FAO; ISRIC                                                    |
| Water Availability & Use,                     | Introduced by FAO: needs more development                             | FAO + Water Theme                                             |
| Topography                                    | Main recommendations unlikely to change                                | GEO task on-going                                             |
GEO Biodiversity Observation Network: What is it?

• A Network of Networks of Biodiversity Information Data Providers and Users

• An ecoregion-based framework for global planning and management applications

• A global data development and analysis effort

• An advisory resource for other networks and processes like IABIN, the Convention on Biological Diversity, the Conservation Measures Partnership, the UN Millennium Development Goals, etc.
GEO Biodiversity Observation Network - Successes to Date

• Diversitas has launched the GEO BioObservation.org website with a declaration and mechanism to join the network: http://www.bioobservation.net/

• Interoperability Demo (IP3), Biodiversity and Climate Change (FAO, ESA, GBIF, U. of Toronto, U. of Florence, Italy)

• Primarily through the USGS/NBII-supported Global Data Toolkit (GDT; http://rockyitr.cr.usgs.gov/gitan/) and partnerships with GBIF, WCMC-UNEP, IABIN and most recently with Conservation International, IUCN and the Zoological Society of London, the GDT is or will be used for Threatened and Endangered Species assessments, and supporting the global biodiversity assessments (like mammals, amphibians and reptiles).
GEO Biodiversity Observation Network - Successes to date

- The functionality of the GDT has increased tremendously, as have the data holdings. Modules now include protected areas, BirdLife and species assessments (T&E and global).
- Integrate the **Model GEO Biodiversity Observation Network** portal and the **Global Data Toolkit** (http://rmgsc.cr.usgs.gov/GITAN/) into the GEO WebPortal.
- Demo the **Rapid Biological and Ecological Assessment of Biosphere Reserves** project showing power of integrating data and providing models and tools such as ATtI LLA landscape and hydro models and the GEO ecosystem model.
- Formation of the new **GEO Invasive Species Monitoring Network**.
- Release of the **Rapid Land Cover Mapping Tool**.
GEO Value-Added

• Cost Saving: reduce redundant data collection, management and analyses

• Integrated Analysis: Data Sharing and Interoperability allows for analyses that would not be performed

• Capacity Building: providing data and tools
GEOSS: A Global, Coordinated, Comprehensive and Sustained System of Observing Systems
GEOSS will Address Nine Societal Benefit Areas

1. Reduction and Prevention of Disasters
2. Human Health and Epidemiology
3. Energy Management
4. Climate Variability & Change
5. Water Management
6. Weather Forecasting
7. Ecosystems
8. Agriculture
9. Biodiversity
GEOSS achievement through 5 Transverse Areas

1. Architecture
2. Data Management
3. User Engagement
4. Capacity Building
5. Outreach
Global Argo Float Array (red – Argo UK; yellow – all Argo; blue – proposed array)

In Situ Observation Systems

Assistant Deputy for Environmental Impact Control Facility
Deputy Minister for Technical Infrastructure for Environmental Management
Ministry Environment

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Data Policy

Comparison courtesy of V. Gorokhovich, CIESIN

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Let’s not forget aerial ...
Understand Continental Water Cycle

- Power Generation
- Irrigation
- Drinking & Sanitation
- Flood Prevention
- Understanding Sea-level Rise
Integrate Space and In-situ Observations

PARANA

El Niño

La Niña
Understand Global Emerging Diseases

* Modified from Morens et al. 2004 Nature 430:242
Forecast Outbreaks

Vibrio Cholerae has a Marine Zoonotic Cycle Associated with Algal Blooms and Sea Surface Temperature

COPEPOD

BAY OF BENGAL

AVHRR SEPT 1992 FALSE COLOR INFRARED
CHOLERA CASES FOLLOW SEA SURFACE TEMPERATURE

BAY OF BENGAL

© GEO Secretariat
Lobitz et al. 2000 PNAS 97:1430
A Warning System for Sand and Dust Storms

Why a Sand and Dust Storm – Warning System?

**Mineral Desert Dust**

**Impacts**

- **Life and Property**
  - Severe reduction of visibility on roads and airports affecting operations
- **Visibility**
- **Climate and Meteorology**
  - Dust causes large uncertainties in assessing climate forcing by atmospheric aerosols
- **Human Health**
  - Bronchial tubes
  - Eye infections
  - Asthma
  - Heart stress
- **Related to epidemics of lethal Meningitis in the Sahel Belt**

**Ozone Chemistry**

- Iron deposition into the oceans, increasing nitrification processes

**Oceanic and Terrestrial Biochemical Cycles**

- Infection of coral reefs
THORPEX will develop, demonstrate and evaluate a multi-model, multi-analysis and multi-national ensemble prediction system, referred to as THORPEX Interactive Grand Global Ensemble. Access to WEATHER data for other societal benefit areas are facilitated and supported.

**GEO Role**
- Data available to 9 GEO SB Areas
- Broad & easy access through GEO Portal
- Awareness of data availability
- Development of socio-economic applications
- Data policy
TIGGE data bases open for general user access - expected 2007

**TIGGE Core Dataset**

- Global ensemble forecasts to around 14 days generated routinely at different centres around the world
- Outputs collected in near real time and stored in a common format for access by the research community
- Easy access to long series of data is necessary for applications such as bias correction and the optimal combination of ensembles from different sources
CBERS Data for Africa and the Caribbean

*China Brazil Earth Resources Satellite
From Satellite to End-Users

• CBERS Data to Africa and Caribbean will be Available Free of Charge

• Data Reception and Image Processing in Africa
  – Southern Africa - SAC (South Africa)
  – North and Western Africa - Maspalomas (Spain)
  – Possibly North & Eastern Africa - Malindi (Italy/ Kenya)

• Products Distribution to Users
  – GEOPortal
  – GEONETCast
A Portal to DATA and SERVICES

Search by theme
- Disaster
- Health
- Energy
- Climate
- Water
- Weather
- Ecosystem
- Agriculture
- Biodiversity

Direct Access To Data & Services

Search by location

About GEO

Capacity Building

GEONETCast
GEO Web Portal - Objective -

Define a model prototype system for access to all Earth observation data

• The Web Portal to support GEO-wide content management, SBA community collaboration space, and user interface access to clearinghouse and registered GEOSS resources

• The Clearinghouse to provide search and additional services of GEOSS services and resources;

• Utilize existing systems and develop recommendations for GEOSS interoperability arrangements
Search the services

Clearinghouse

Registries
Catalogue
Data Access
Value Added Services

AR-07-01
Initial Sets of Registries

ESA NASA JRC Canada Japan
GEONETCast

- **EUMETCast**: Europe (Ku band), Africa and Caribbean (C band)
- **GEONETCast-Americas**: North-, Central & South-America
  - pilot EUMETCast-C band for 2006-2008
  - transition to a NOAA ADM by 2008
- **FengYunCast**: Asia-Pacific regions
  - trial to be followed by operational system (C-band)
- **MITRA satellite data dissemination system**: Potential Contributor

**Coverage Areas**

**Main Contributors**

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GEONETCast

- A near real-time system to disseminate space-based, air-borne and in situ data, metadata and products through satellites
- The vision is to provide easy access to as much data and as many people as possible
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GEO Global Data Toolset
Senegal: Rapid Land Cover Mapping
Senegal Land Cover – 0.5 km Resolution Raster
GEO Value-Added

- **Cost Saving**: reduce redundant data collection, management and analyses

- **Integrated Analysis**: Data Sharing and Interoperability allows for analyses that would not be performed

- **Capacity Building**: providing data and tools
Thank You!

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