ESA’s contribution to GEOSS

Stephen Briggs
Senior Advisor, European Space Agency
ESA Earth Observation Programmes

**Meteorological Missions**
Driven mainly by weather forecasting and climate monitoring needs, these missions developed in partnership with EUMETSAT include the Meteorological Operational Satellite programme (Meteosat), forming the space segment of EUMETSAT’s Polar System (EPS), and the new generation of geostationary meteorological satellites (MSG & METOS satellites).

**Sentinel Missions**
Driven by user needs to contribute to European Copernicus initiative. These six focus missions developed in partnership with the EU include: 6-band imaging radar (Sentinel-1), high-resolution optical (Sentinel-2), optical and infrared spectral (Sentinel-3) and atmospheric composition monitoring (Sentinel-5P & Sentinel-5Q respectively).

**Earth Explorer Missions**
Driven by scientific needs to advance our understanding of how the ocean, atmosphere, hydrosphere, cryosphere and Earth’s interior operate and interact as part of an interconnected system. These Research missions, exploiting Europe’s excellence in technological innovation, pave the way towards new development of future EO applications.

**Data from non-ESA Missions**

**EOP Operated Missions**
ESA contribution to GEOSS

1. Satellite data, including coordinated data acquisitions for special initiatives of GEO
   1. GFOI
   2. Geoglам
   3. Supersites initiative
   4. Etc.

2. Contribution of projects/initiatives (CCI, TIGER, ...) directly and through CEOS
   1. International Charter Space and Major Disasters
   2. Climate measurements – ESA Climate Change Initiative
   3. Capacity building / Water resource management in Africa (TIGER)
   4. Etc...

3. Support of infrastructure
   1. GEOSS Portal
   2. Participation in Implementation Boards, Working Groups and Task Forces
   3. Seconded expert
   4. etc
The Global Forest Observations Initiative

Global Forest Observations Initiative fosters the sustained availability and use of satellite data for national forest monitoring systems to better manage forest resources.

GFOI will support countries’ national efforts to implement the national forest monitoring systems in accordance with relevant internationally standards, including: UNFCCC guidance and the IPCC Good Practice Guidance by:

- **providing a platform for coordinating observations**: work with space agencies (CEOS) in order to assure the systematic, sustained and worldwide acquisition and supply of forest observations;
- **providing assistance and guidance on utilising observations**: in collaboration with national institutions and international bodies such as the FAO, World Bank;
  - develops methods, guidance and advice;
  - provides capacity building;
  - promotes ongoing research and development.
GFOI ensures the acquisition of core satellite data for 11 countries in 2013 rising to global coverage in 2016.

GFOI reviews and promotes research and development needed to implement national forest monitoring.

GFOI provides capacity building in coordination with others such as UN-REDD. It supports the use of satellite and ground data to monitor forests, estimate carbon stocks and greenhouse gas emissions.

GFOI Methods and Guidance report guiding the use of Satellite and Ground data for national forest monitoring and estimation of carbon stocks and greenhouse gas emissions. This advice is consistent with IPCC Guidelines and UNFCCC requirements as agreed in November 2013 in Warsaw.
<table>
<thead>
<tr>
<th>Year</th>
<th>Coverage added</th>
<th>No. countries*</th>
<th>Area* (Mkm²)</th>
<th>Total Area* (Mkm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>GEO-FCT National Demonstrator countries</td>
<td>15</td>
<td>20.5</td>
<td>20.5</td>
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<tr>
<td></td>
<td>GFOI Participating Countries</td>
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<td>2014</td>
<td>UN-REDD National Programme Countries</td>
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<td>18.5</td>
<td>39.0</td>
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<td></td>
<td>WB-FCPF Participating Countries</td>
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<td>CD-REDD Project Countries (BMU)</td>
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<td>2015</td>
<td>UN-REDD Partner Countries</td>
<td>17</td>
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<td>48.0</td>
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<td></td>
<td>WB-FCPF Partner Countries</td>
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<tr>
<td></td>
<td>Other Pan-Tropical Countries</td>
<td></td>
<td></td>
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<tr>
<td>2016</td>
<td>Global</td>
<td>127</td>
<td>84.8</td>
<td>132.8</td>
</tr>
<tr>
<td>Year</td>
<td>Coverage added</td>
<td>No. countries*</td>
<td>Area* (Mkm²)</td>
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<td></td>
<td>GFOI Participating Countries</td>
<td></td>
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</tr>
</tbody>
</table>
Element 2: Coordinated strategies for national data acquisitions

Designed to address the fundamental national information requirements for GFOI

National-level complement to the Global Baseline Strategy

Developed in consultation with 17 countries at SDCG and SilvaCarbon meetings

Provides a GFOI Space Data Services ‘menu’ for countries to choose from in support of their national forest monitoring systems’ needs

<table>
<thead>
<tr>
<th>Meeting</th>
<th>Participating Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDCG-4 (Pasadena)</td>
<td>Mexico, Colombia, Ecuador, Peru, Guyana, Honduras</td>
</tr>
<tr>
<td>SDCG-5 (Rome)</td>
<td>Uganda, Tanzania, Kenya, Democratic Republic of Congo</td>
</tr>
<tr>
<td>SilvaCarbon Asia (Chiang Mai)</td>
<td>Thailand, Vietnam, Cambodia, Laos, Philippines, Nepal, Indonesia</td>
</tr>
</tbody>
</table>

Table 1: Countries Consulted to Date
The GEO Geohazards Supersites Initiative

- Pooling satellite imagery and terrestrial in-situ data for earthquake and volcano studies.

- Aims at enriching our knowledge about geohazards by empowering the global scientific community through collaboration of space and in-situ data providers and cross-domain sharing of data and knowledge.

- Primarily through providing easy and free-of-charge access to comprehensive satellite and ground-based geophysical (raw) data sets derived from different sources and different disciplines.
Permanent Supersites

Hawaii, Iceland, Marmara Region, Mt Etna, Vesuvius - Campi Flegreii
Considered: Piton de la Fournaise, New Zealand Volcanoes, San Andreas Fault Supersite
GOCE: Seismometer in Space

- Large earthquakes cause seismic waves and make the Earth’s surface vibrate.
- Resulting sound waves travel upwards.
- GOCE’s accelerometers sensed atmosphere displacements.
Operational GEOGLAM Global Crop Condition Assessments published monthly within the G-20 AMIS Market Monitor Bulletin
THE SECOND REPORT ON THE ADEQUACY OF THE GLOBAL OBSERVING SYSTEMS FOR CLIMATE IN SUPPORT OF THE UNFCCC

EXECUTIVE SUMMARY

April 2003
GCOS – 82 (ES)
(WMO/TD No. 1143)
ESA Cimate Change Initiative

Realise the full potential of the long-term global EO archives that ESA, together with its Member states, has established over the last thirty years …

... as a significant and timely contribution to the ECV databases required by the United Nations Framework Convention on Climate Change

95 MEuro over 6 years.
## EUMETSAT & ESA CCI

### ECV capability

<table>
<thead>
<tr>
<th>Atmosphere</th>
<th>Ocean</th>
<th>Terrestrial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Composition</td>
<td>Surface</td>
<td>Land Cover</td>
</tr>
<tr>
<td>Aerosol Properties</td>
<td>Sea Surface Temperature</td>
<td>Fire Disturbance</td>
</tr>
<tr>
<td>Methane &amp; Long Lived GHGs</td>
<td>Sea Level</td>
<td>Soil Moisture</td>
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<tr>
<td>Ozone</td>
<td>Sea Ice</td>
<td>Glacier and Ice Caps</td>
</tr>
<tr>
<td>Carbon Dioxide</td>
<td>Ocean Colour</td>
<td>Ice Sheets</td>
</tr>
<tr>
<td>Precursors (for Aerosol &amp; O3)</td>
<td>Sea State</td>
<td>Snow Cover</td>
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<tr>
<td>Upper Air</td>
<td>Current</td>
<td>Albedo</td>
</tr>
<tr>
<td>Cloud Properties</td>
<td>Sea Surface Salinity</td>
<td>Leaf Area Index</td>
</tr>
<tr>
<td>Temperature</td>
<td>Carbon Dioxide Partial Pressure</td>
<td>FAPAR</td>
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<tr>
<td>Water Vapour</td>
<td>Phytoplankton</td>
<td>Lakes</td>
</tr>
<tr>
<td>Wind Speed and Direction</td>
<td>Ocean Acidity</td>
<td>Above Ground Biomass</td>
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<tr>
<td>Earth Radiation Budget</td>
<td>Sub Surface</td>
<td>Permafrost</td>
</tr>
<tr>
<td>Surface</td>
<td>Carbon</td>
<td>Ground Water</td>
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<tr>
<td>Surface Air Pressure</td>
<td>Current</td>
<td>River Discharge</td>
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<tr>
<td>Surface Air Temperature</td>
<td>Nutrients</td>
<td>Soil Carbon</td>
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<tr>
<td>Surface Precipitation</td>
<td>Ocean Acidity</td>
<td>Land Surface Temperature</td>
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<td>Surface Radiation Budget</td>
<td>Oxygen</td>
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<td>Water Vapour (Surface Humidity)</td>
<td>Salinity</td>
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<tr>
<td>Near-surface Wind Speed</td>
<td>Temperature</td>
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<td></td>
<td>Tracers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Global Ocean Heat Content</td>
<td></td>
</tr>
</tbody>
</table>
In 2002, ESA launched the TIGER as a CEOS contribution to implement the recommendations of the WSSD.

The paucity and poor quality of information on water & land resources required for IWRM is considered a key limitation to achieve the WSSD goals;

The TIGER goal is to “assist African countries to overcome problems faced in the collection, analysis and dissemination of water related geo-information by exploiting the advantages of Earth Observation technology”.

© ESA 2004
Water extend and Flood mapping

Soil moisture

Land cover and use dynamics

Water levels

Water Quality

Groundwater potential

Topography

Evapotranspiration

Precipitation
Other relevant ESA projects and initiatives

- Global Land Cover and Land Cover Change: GlobCover and CCI Land Cover
- Disaster Risk Management (CEOS)
- Biodiversity
- Water Quality, Water-Cycle and Water Management
- Life-Cycle Data Management
- Etc.

Expertise and resources

- Experts in Implementation Boards
- Experts in Working Groups and Task Forces
- Expert seconded to the GEO Secretariat
Summary involvement with GEO

Putting in:
• Data from a number of satellite missions
  – Archives
  – Coordinated data acquisitions
• Projects and initiatives
• GEOSS Portal
• Expertise and resources

Getting out:
• Advocacy for the importance of Earth Observation at high political level
• Additional visibility for ESA
• Support for open data policy
• New collaborations