GROUP ON EARTH OBSERVATIONS

Keynote: GEOSS and Space Applications for Public Health

Masami Onoda, GEO Secretariat
GEO Health & Environment CoP, and
GEO Air Quality CoP

NASA Public Health Program Review
Santa Fe, 13-16 Sep. 2011

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Questions to begin with…

1. Who are GEO?

2. What is GEOSS?

3. Why a GEOSS?

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Contents

1. Overview of GEO/GEOSS
2. Current Activities: GEO Health Tasks
3. The GEO Health & Environment Community of Practice
4. Summary and Way Forward

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4. **Summary and Way Forward**

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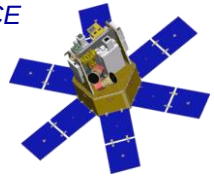
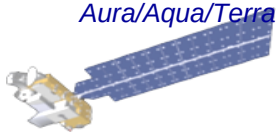
SORCE

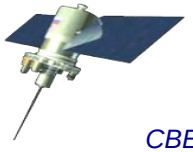


Envisat

Aura/Aqua/Terra

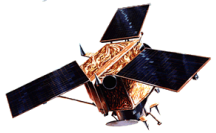


Sage



QuikScat

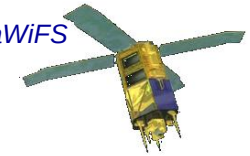
IKONOS



SPOT 4, 5

CBERS

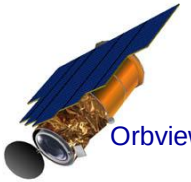
SeaWiFS



SPIN-2

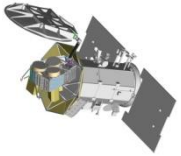
SeaWinds

Orbview 2, 3

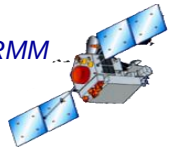


DMC

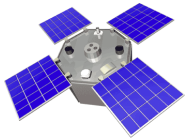
SAC-D/Aquarius



TRMM

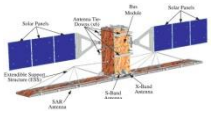


ACRIMSAT

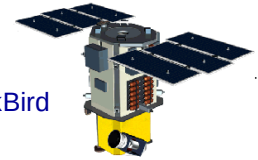


ERBS

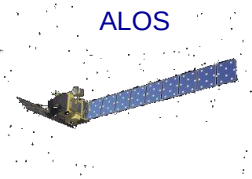
Radarsat



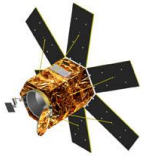
QuickBird



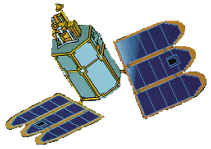
ALOS



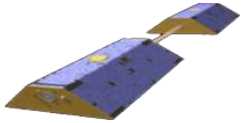
EROS A1



Toms-EP

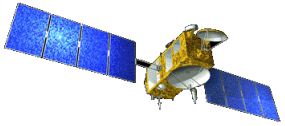


Grace

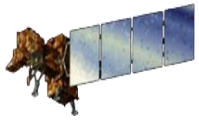


UARS

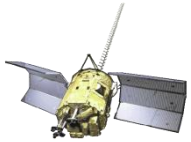
Jason



Landsat 7



SAC-C



GROUP ON EARTH OBSERVATIONS

GEO, the Group on Earth Observations

An Intergovernmental Body with 87 Members and 61 Participating Organizations

U.S. Department of State, Washington DC
July 31, 2003

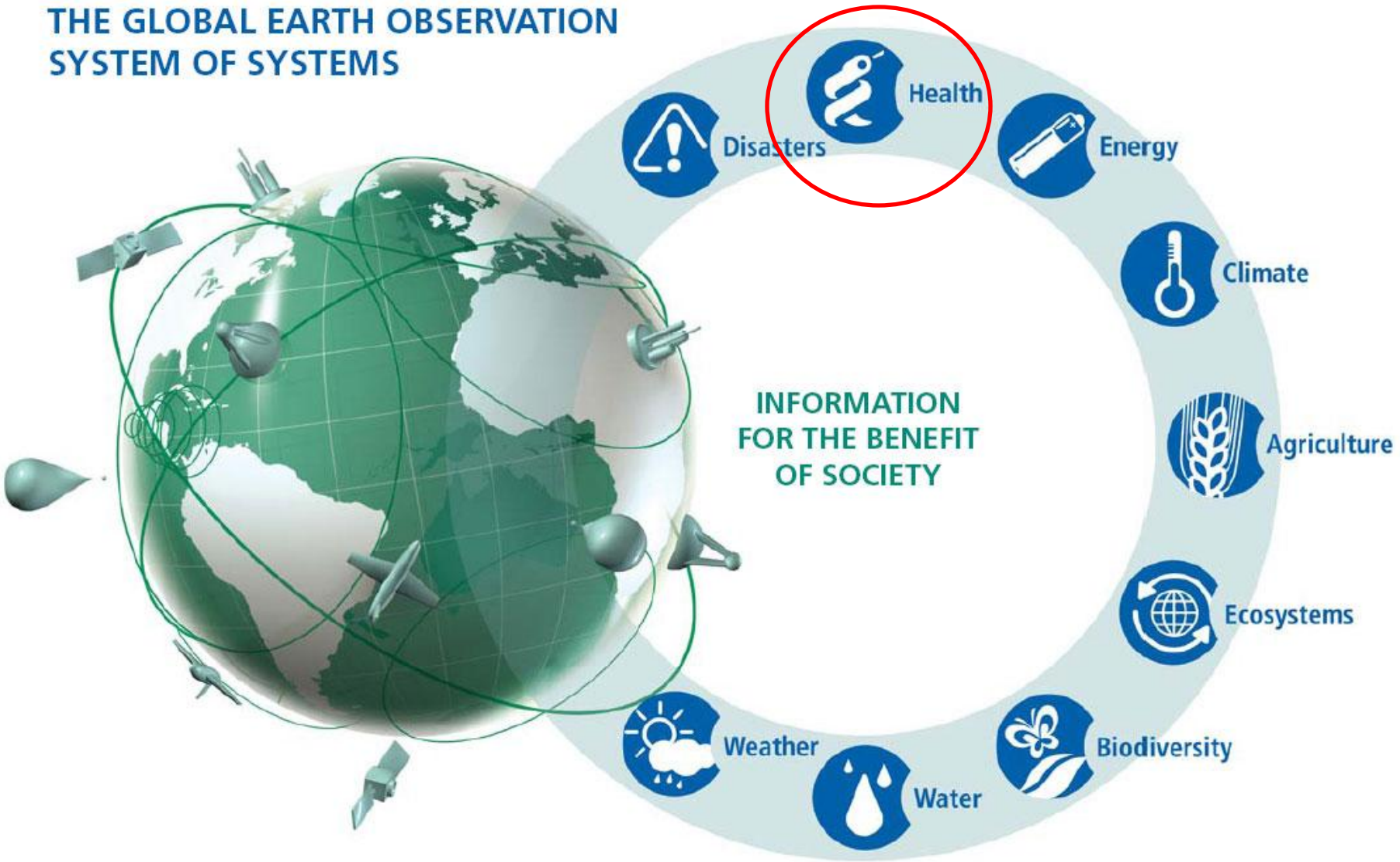
GROUP ON
EARTH OBSERVATIONS

GEO
Group on Earth Observations

GEOSS
Global Earth Observation System of Systems

GROUP ON
EARTH OBSERVATIONS

THE GLOBAL EARTH OBSERVATION SYSTEM OF SYSTEMS



GEO Data Sharing Principles

- Full and Open Exchange of Data, recognizing Relevant International Instruments and National Policies
- Data and Products at Minimum Time delay and Minimum Cost
- Free of Charge or minimal Cost for Research and Education

→GEOSS Common Infrastructure & GEOSS Data-CORE

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GEOSS Common Infrastructure (GCI)

Common set of core services that promote the integration of GEO and GEOSS as a functional System-of-Systems

Includes:

- Component and Service Registry
- Standards and Interoperability Registry
- User Requirements Registry (in development)
- Best Practices Wiki
- GEO Web Portals
- GEOSS Clearinghouse

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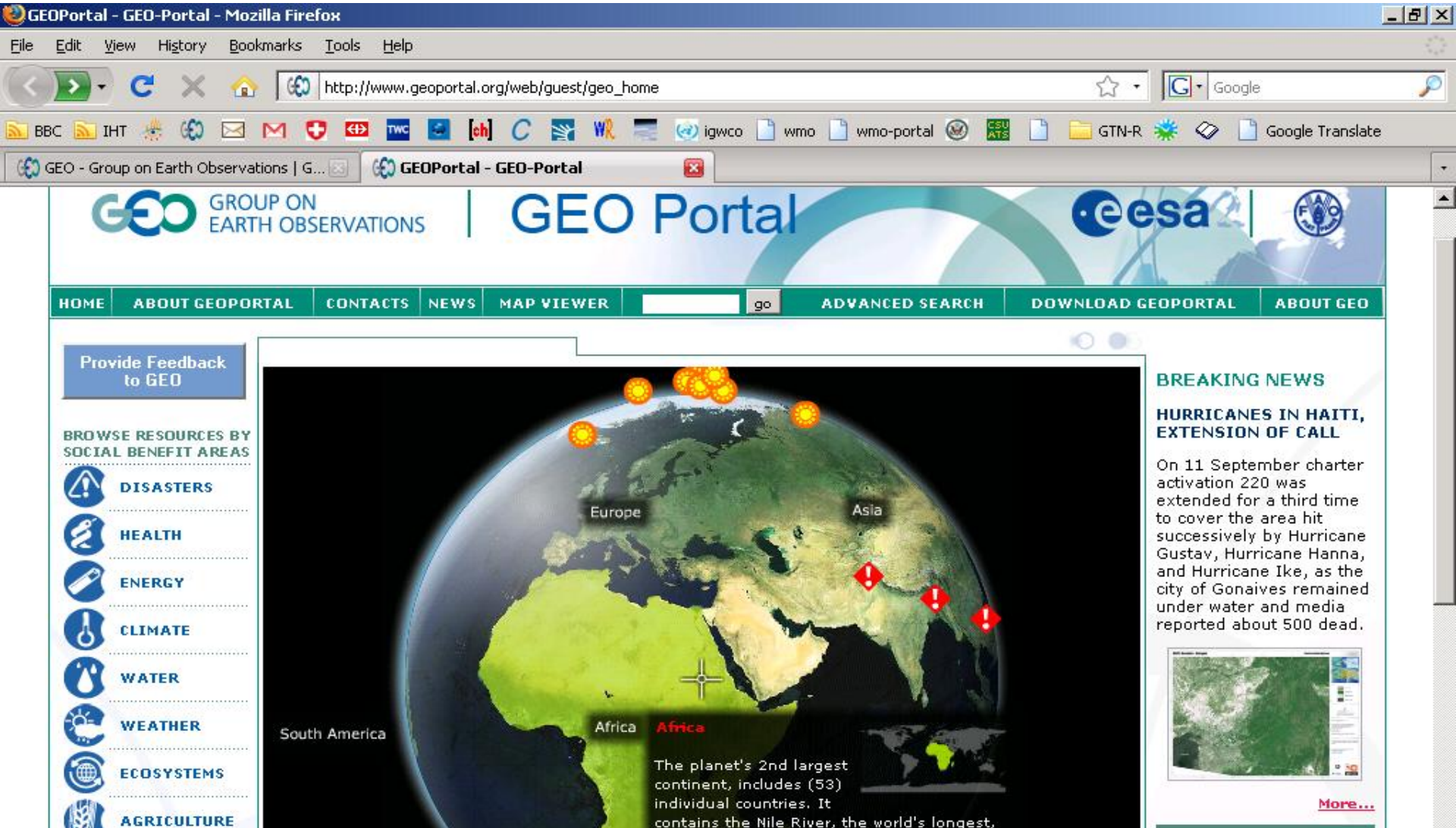
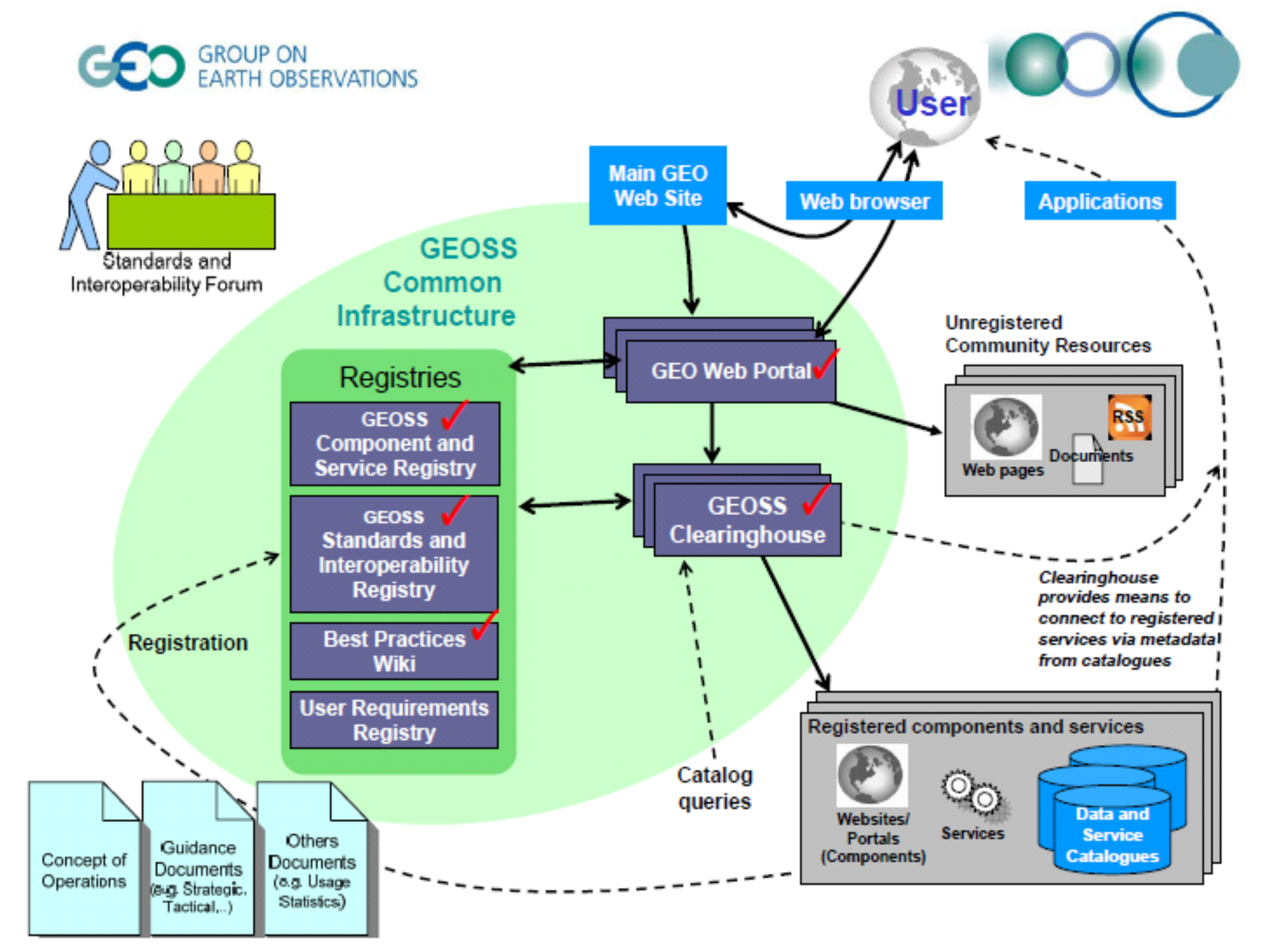
GEO Portal

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User
Standards and Interoperability Forum
Main GEO Web Site
Web browser
Applications
GEOSS Common Infrastructure
Registries
GEOSS Component and Service Registry
GEOSS Standards and Interoperability Registry
Best Practices Wiki
User Requirements Registry
GEO Web Portal
GEOSS Clearinghouse
Unregistered Community Resources
Web pages
RSS
Documents
Clearinghouse provides means to connect to registered services via metadata from catalogues
Registration
Catalog queries
Registered components and services
Websites/ Portals (Components)
Services
Data and Service Catalogues
Concept of Operations
Guidance Documents (e.g. Strategic, Tactical,..)
Others Documents (e.g. Usage Statistics)

Strategic Targets for Health

Before 2015, GEO aims to:

12. Substantially expand the availability, use and application of environmental information for public health decision-making in areas of health that include allergens, toxins, infectious diseases, food-borne diseases, and chronic diseases, particularly with regard to the impact of climate and ecosystem changes.

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GEO Health Tasks
(Overview based on proposed 2012-15 Work Plan)

1. Tools and Information for Health Decision-Making

1) Air-borne Diseases, Air Quality and Aeroallergens
2) Water-borne Diseases, Water Quality and Risk
3) Vector-borne Diseases
4) A Holistic Approach to Health: Transmission Dynamics, Urban Health Forecasting, Linkages and New Technologies

2. Tracking Pollutants

1) Global Mercury Observation System
2) Global Monitoring of Persistent Organic Pollutants

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Tools and Information for Decision Making

Air-borne Diseases, Air Quality and Aeroallergens

Leads: EC (EO2HEAVEN), Spain (AEMET), USA (EPA, HCF, NASA), WMO

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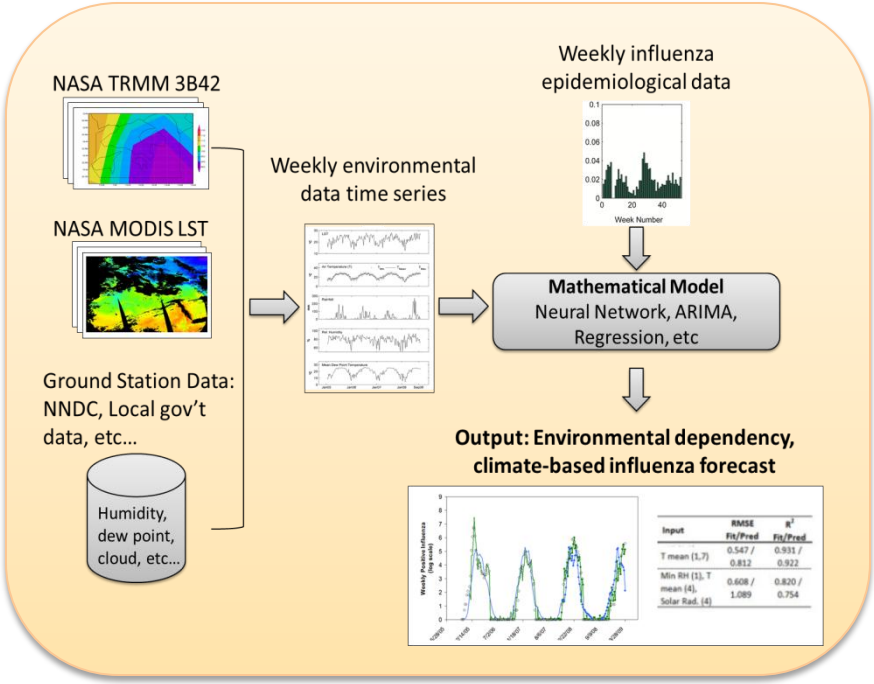
The Meningitis Environmental Risk Information Technologies MERIT Project

- Established in 2007
- Collaborative initiative of WHO and members of the environmental, public health and epidemiological communities to help reduce the burden of epidemic meningitis in Africa
- About 30 members, regional and international organizations, research institutes, climate and health working groups

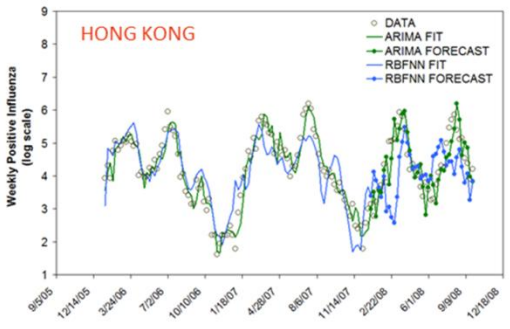
Photos by WHO

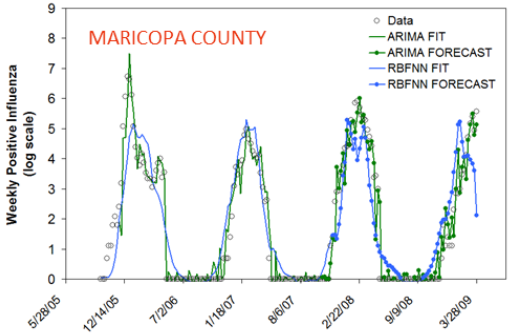
Influenza

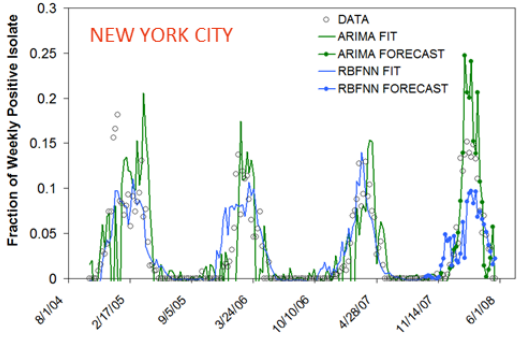
- Assess the role of environmental factors on influenza transmission in populated cities
- Short-term environmental-based influenza forecast
- Collaborators include US CDC Influenza Division, US CDC-CAP, WHO EURO, and Health Ministries.



Test case:







NASA

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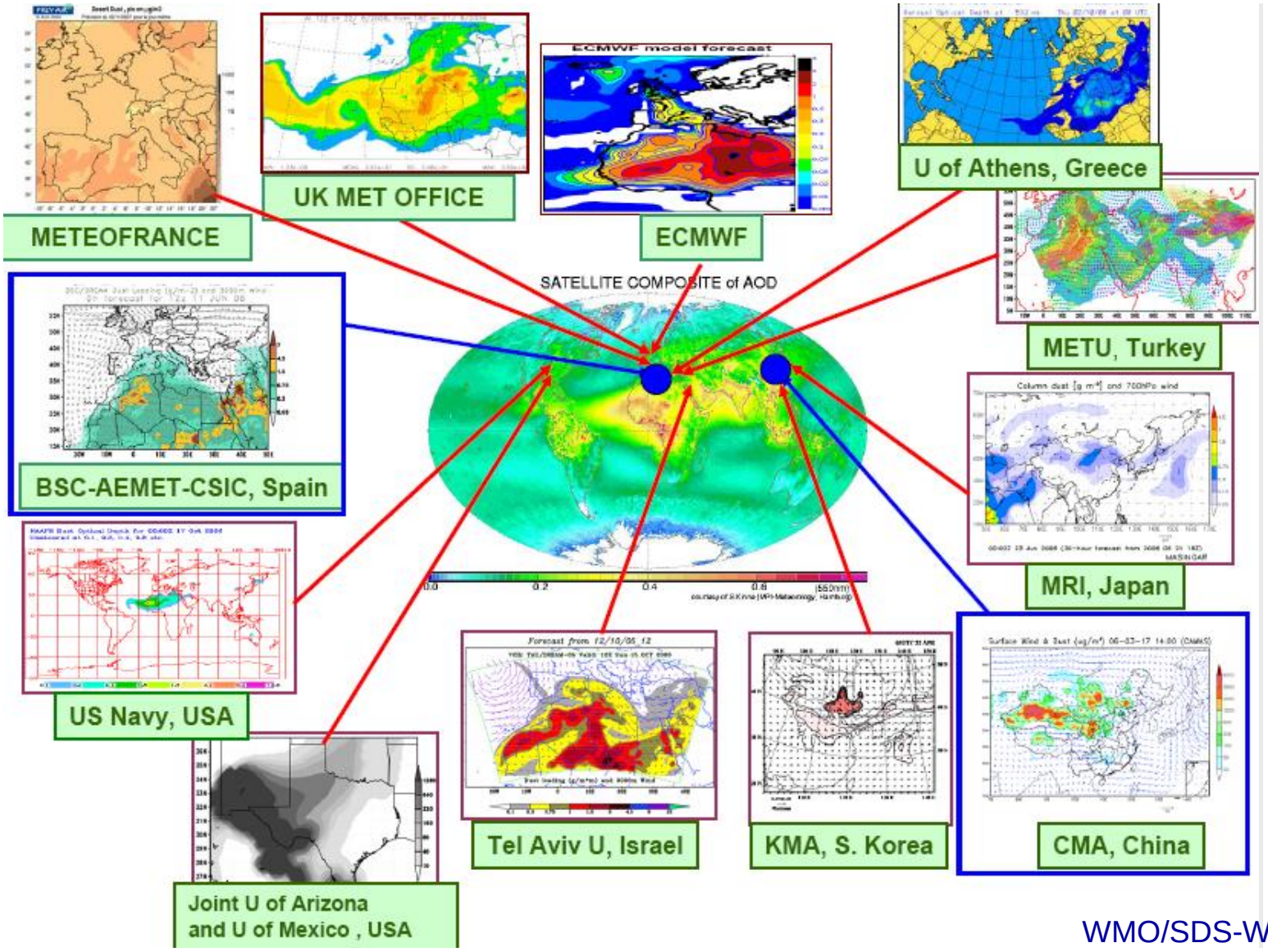
SDS-WAS

Research and Operational Forecasting



Air Quality

- Provide near-real-time AQ observations and forecasts for health management, research and public information
- Improve EO data assimilation schemes
- Implement a system that reduces adverse respiratory and cardiovascular outcomes among residents exposed to ambient pollution
- Build upon: EO2HEAVEN, AIRNow International, and Real Time Data Dissemination for Air Quality

AIRNow
AIRNow-Tech (web site)
AIRNow-Gateway (distribution service)

AIRNow-International
•New Software System
•Shanghai Pilot at World Expo
•GEO Air Quality CoP

USEPA

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Tools and Information for Decision Making

Water-borne Diseases, Water Quality and Risk

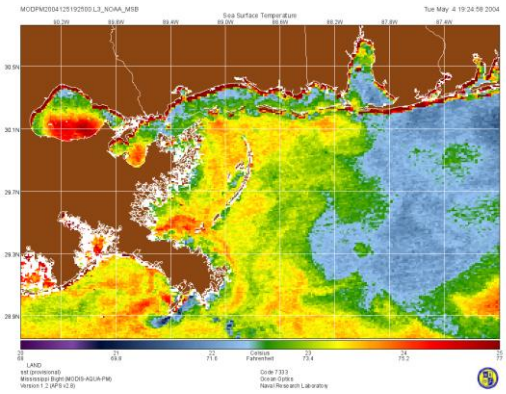
Leads: EC (EO2HEAVEN), France (CNES),
USA (EPA, HCF, NASA, NOAA), WHO

Water-borne Diseases
Public Health Forecasting

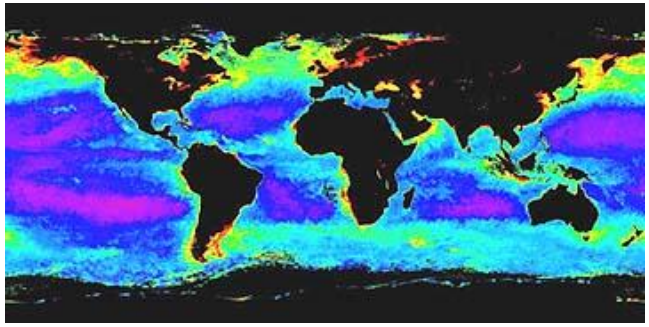
- Satellites, computers and molecular biology have made public health forecasting a reality
- Sea surface temperature, sea surface height, color and other products can be used to predict the presence of harmful microbes in water and seafood

Harmful microbes

- Toxic algae
- Dinoflagellates
- Bacteria
  - *V. cholerae*
  - *V. parahaemolyticus*
  - *V. vulnificus*
  - Fecal indicators



MODIS SST (NRL, & USM)



Color (NASA SeaWiFS)

NOAA

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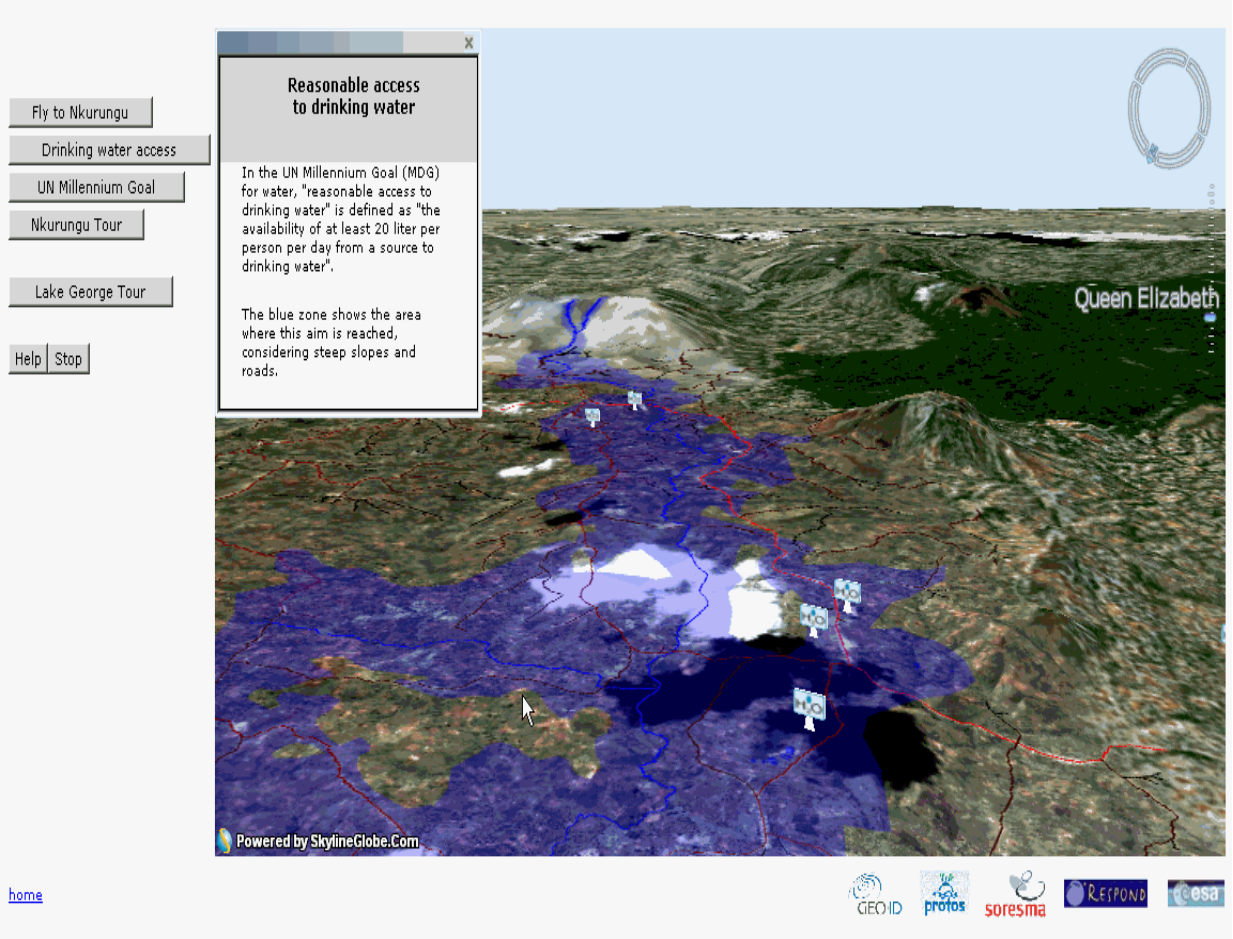
Waterborne diseases
Global Information Management System (GIMS)



Platform for data integration & EWS

A comprehensive, dynamic, wiki style data management system

Launched at OECD World Forum 2009 and lead by WHO

Data collection from earth observation satellites (2-35m^2 resolution)

- Water quality data
- Hydrological data
- Land use
- Risk assessment (catchment)
- Risk assessment (water-related disease)
- Trends

In-situ data:

- Validation of coverage data
- Validation of access data
- Input to models

WHO

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Tools and Information for Decision Making

Vector-borne Diseases

Leads: Brazil (FIOCRUS, UFPR), France (CNES), India (ICMR), US (IRI, NASA)

Space Tools for Innovative Risk Maps

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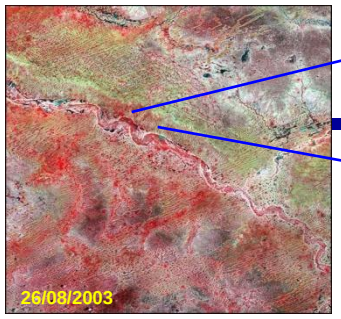
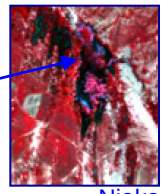
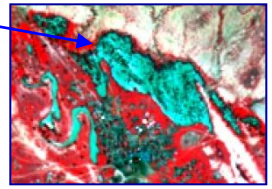
Identify environmental factors of Aedes & Culex presence by remote sensing to obtain risk map

SPOT5 multispectral Image
high spatial resolution -10m
(Program ISIS/CNES)



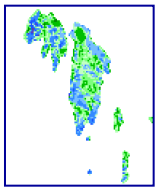
1354 ponds

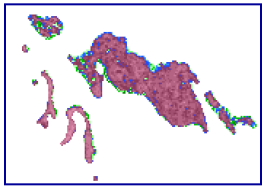

Niaka

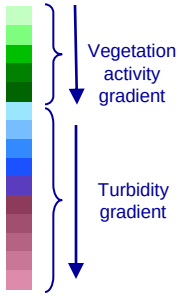

Barkedji

Ponds detection NDPI

Ponds' area


Characterization NDVI & NDTI

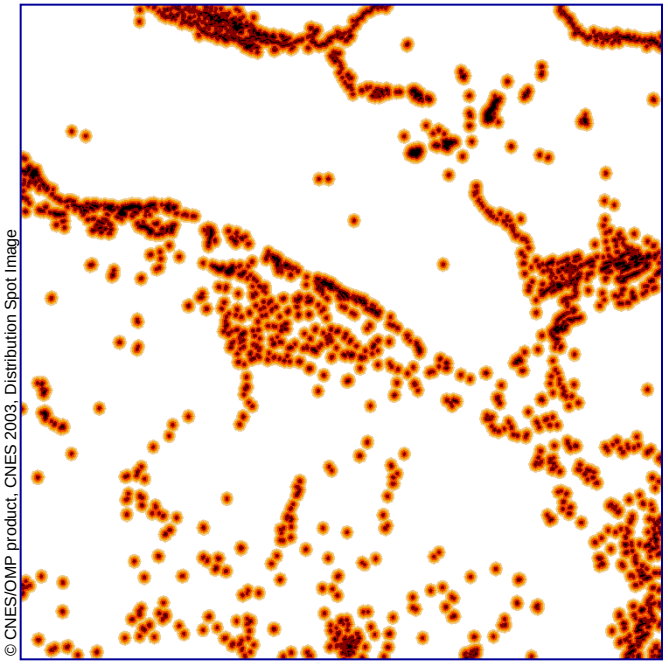

Ponds' characterization



Vegetation Cover

Turbidity

Zones Potentially Occupied by Mosquitoes (ZPOM)



© CNES/OMP product, CNES 2003, Distribution Spot Image

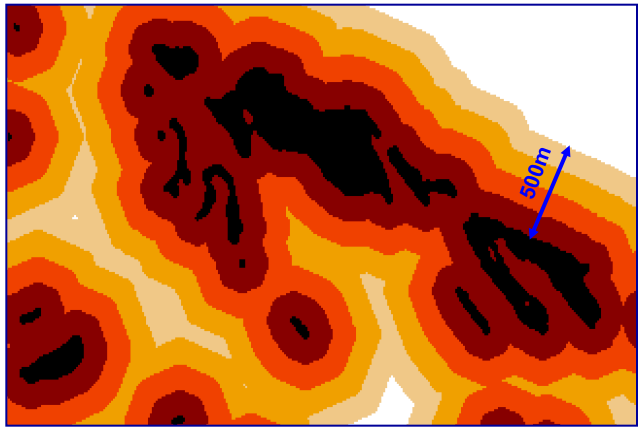
26/08/2003

Ponds ~ 1%

ZPOM = 25%

Mosquitoes flying range
~500m (Bâ et al., 2005)

Mapping the ZPOM



CNES

Analyses and processing of high-spatial resolution images (SPOT 5, 10m) allows to detect ponds' area like their vegetation cover and turbidity and finally evaluate Zone Potentially Occupied by Mosquitoes (ZPOM)

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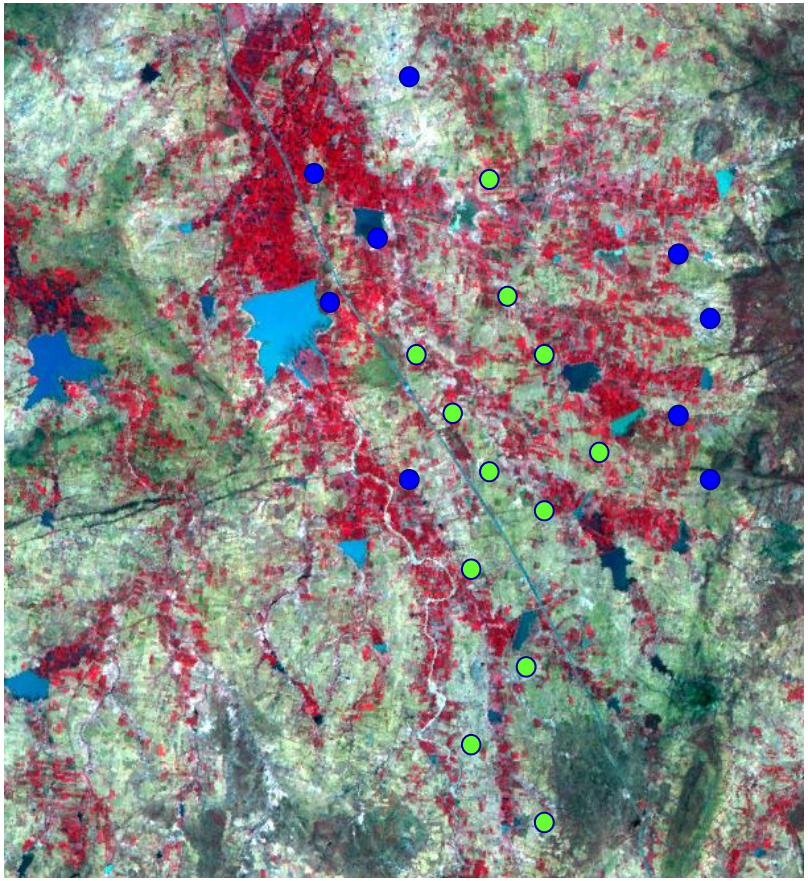
IRS Image and Malaria (India)



- High malarious villages
- Low malarious villages

Satellite image (IRS P6 MX) showing high and low malarious villages in Kallembella (Sira Taluka , Tumkur)

Validation of relationship between Remote Sensing derived landscape features and malaria endemicity in Tumkur and Chitradurga districts of Southern Karnataka.

Presence of irrigation tanks(>5), vegetation cover (>20 %), low barren area (< 10%) were associated with high malaria endemicity. Ground truth validation in unknown areas confirmed the earlier findings.

ICMR

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Tools and Information for Decision Making

A Holistic Approach to Health: Transmission Dynamics, Urban Health Forecasting, Linkages and New Technologies

Leads: EC (JRC), USA (EPA, HCF)

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Ecosystems, Biodiversity and Health

Ixodes scapularis is a tick that spreads Lyme disease from animals to people.

White-footed mouse. Very abundant in forests, a good host for ticks to feed on and become infected with the Lyme disease pathogen.

Forest fragmentation and destruction in the U.S. have been shown to reduce mammalian species diversity and to increase populations of the white-footed mouse.

USEPA

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Urban Public Health Advisory and Warning Services: “Fit City, Fit World”

- Chronic diseases such as COPD, cardiovascular disease and children’s asthma
- Provide high-resolution environmental information

  →***Multi-hazard early warning system***

- Annual meeting in Shiang Hai, conference in London in 2011.

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Tracking Pollutants

Global Mercury Observation System

Leads: EC (GMOS), Germany (HZG),
Italy (CNR), Japan (NIES), USA (EPA)

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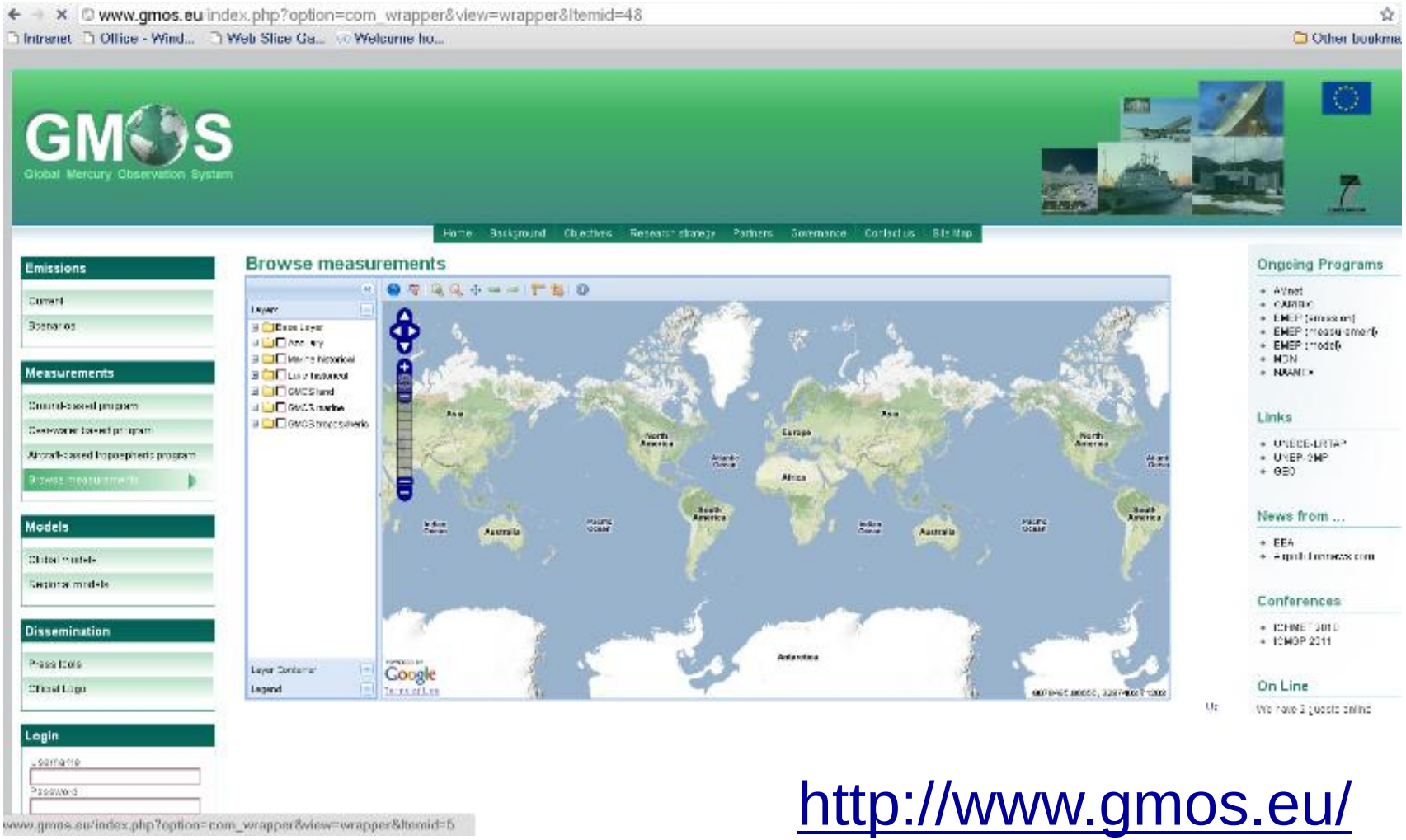
Global Mercury Observation System
GMOS Image Browser



http://www.gmos.eu/

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Tracking Pollutants

Global Monitoring of Persistent Organic Pollutants

Leads: UNEP (Stockholm Convention Secretariat), Czech Republic (RECETOX)

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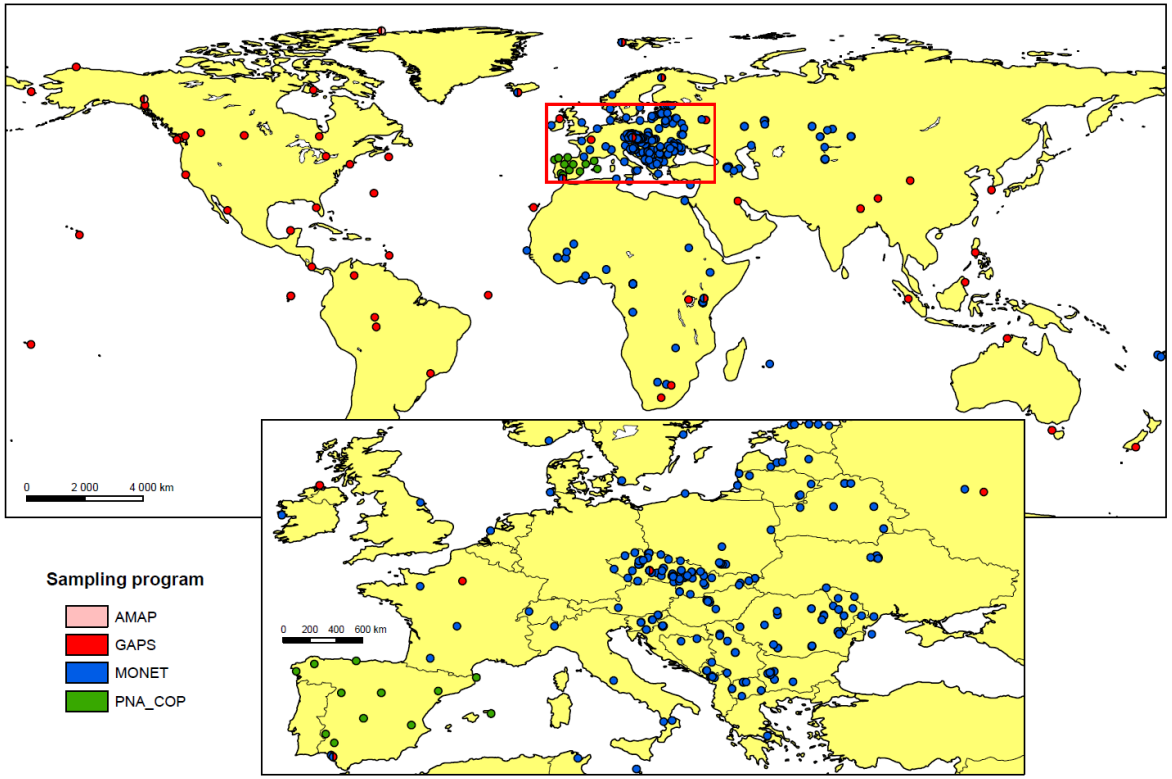
Global Monitoring Plan for Persistent Organic Pollutants (POPs)



Air Sampling: Passive Samplers

UNEP/Stockholm Convention Secretariat

- Implement global monitoring plan to track changes in POPs levels in humans and the environment
- Evaluate the effectiveness of international efforts to reduce POP releases
- Interlink existing and emerging systems for monitoring air, water, ice caps, and human health

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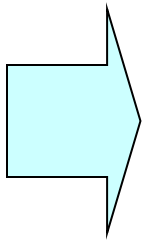
1. Overview of GEO/GEOSS
2. Current Activities: GEO Health Tasks
3. The GEO Health & Environment Community of Practice
4. Summary and Way Forward

The Concept of "Community of Practice"

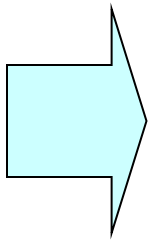
Groups of people who share a concern, a set of problems, or a passion about a topic and deepen their knowledge by interacting on an ongoing basis

Bring together...

- Users
- Providers
- Universities and research institutions
- Technology development actors
- Developed countries
- Developing countries



Health & Environment CoP formed in 2009



Air Quality CoP formed in 2010, Fucus on AQ Data Networking

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GEO Health and Environment Community of Practice Members

Set up in 2009 with currently 100 members, the CoP on Health & Environment aims to address the user perspective on issues involving environment and health, with emphasis on using environmental observations to improve health decision-making at the international, regional, country, and district levels.

Brazil	ACMAD
EC	HCF
France	ICSU
Germany	IEEE
India	OGC
Italy	UNEP
Japan	UNOOSA
Senegal	WHO
Switzerland	World Bank
UK	WMO
USA	and many others…

1st Health & Environment CoP Workshop, Washington DC, 2009

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GEO Air Quality Community of Practice

- The GEO AQ CoP fosters the application of air quality observations to Health, Disasters, Weather and other SBAs.
- It aims to support, not compete with other integrating initiatives.
- A tangible goal of AQ CoP is to enable an air quality data network as a System of Systems by 2015.

Technical Workshop, August 2011:

Networking Air Quality Data Systems: From Virtual to Real

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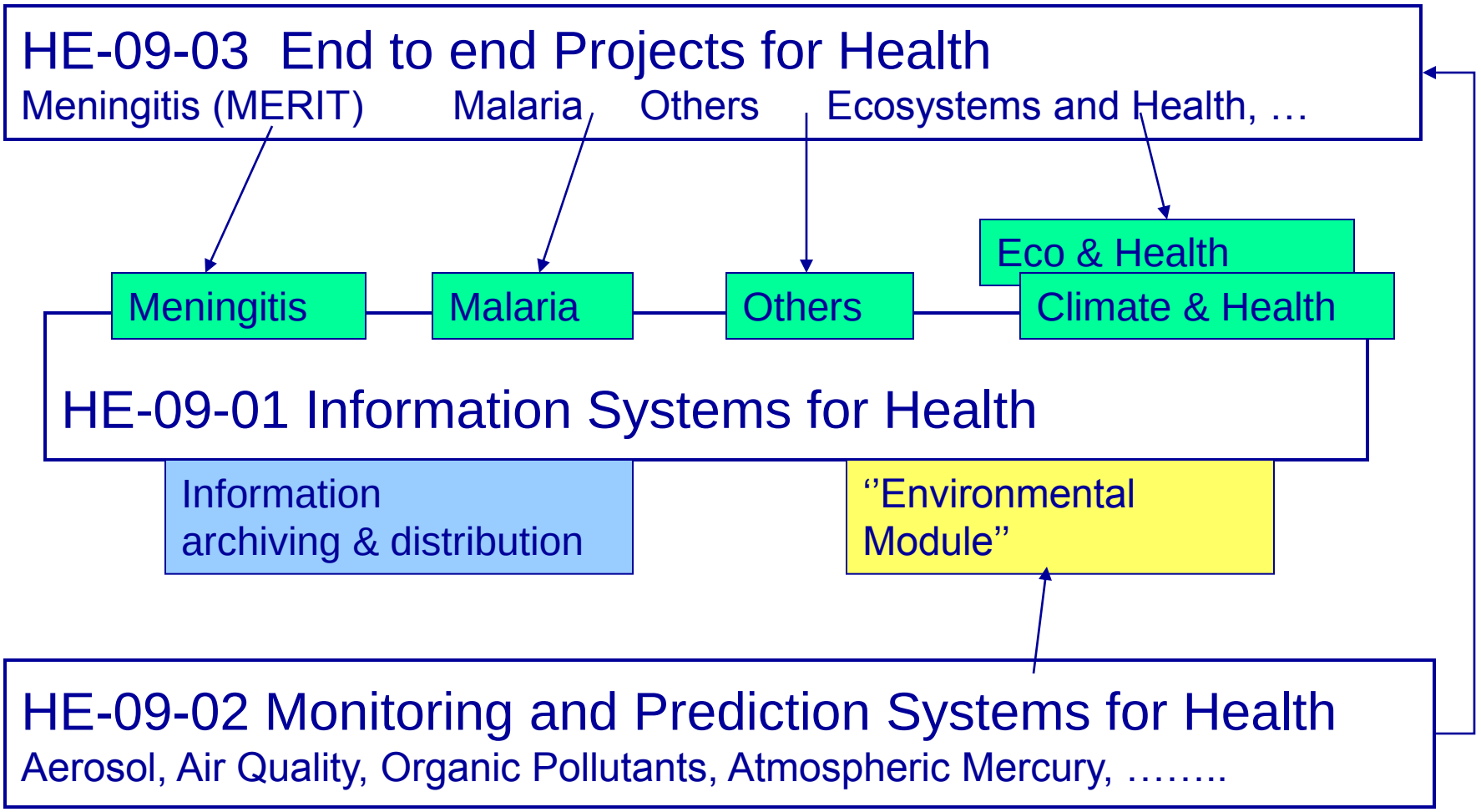
Health SBA Tasks 2009-2011



Health SBA Tasks 2012-15

HE-01 Tools and Information for Health Decision-Making:

1) Air-borne Diseases, Air Quality and Aeroallergens
2) Water-borne Diseases, Water Quality and Risk
3) Vector-borne Diseases
4) A Holistic Approach to Health

HE02 Tracking Pollutants:

1) Global Mercury Observation System
2) Global Monitoring of Persistent Organic Pollutants

Each Task to include steps of:

a) Understanding environment relevant health problems ;
b) Identifying info for decision making ;
c) Training, capacity building;
d) Promote the use of data & information

→ **More holistic, streamlined and user-oriented approach**

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Summary: Let's answer the questions!

1. Who are GEO?

→ The **Group on Earth Observations (GEO)** is an intergovernmental body consisting of 87 Members and 61 international organizations, collaborating to build a GEOSS.

2. What is GEOSS?

→ **The Global Earth Observation System of Systems (**GEOSS) is a global distributed system, including satellite observation systems, Global in situ networks and systems, And local and regional in situ networks.

3. Why a GEOSS?

→ To provide a core strategy and international community to promote space applications for Health; to drive the projects and resources, and to build a collective knowledge base and data sharing platform***… plus, your own answers!***

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Special Thanks to GEO Health Task and CoP Leads:

Murielle Lafaye, Centre National d'Études Spatiales (CNES), France

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Gary Foley, Environment Protection Agency (EPA), USA

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Thank you!

http://www.earthobservations.org