Disasters and the CEOS Implementation Plan

Ivan Petiteville, ESA
CEOS Executive Officer

Guy Séguin, CSA
CEOS disaster coordinator

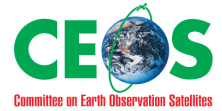# **Plan**

- Introduction

- 2009 CEOS Activities related to Disaster

- 2010 CEOS Activities related to Disaster

Introduction

CEOS Overview

- **CEOS** = **C**ommittee on **E**arth **O**bservation **S**atellites (www.ceos.org)

- Since 1984, Major international forum for:
  - coordination of international civil Earth Observation (EO) satellite programs
  - interaction of these programs with users of satellite data worldwide.

- 28 Members (mostly space agencies) and 20 Associates (associated national and international organizations)
  - Individual participating agencies make their best efforts to implement CEOS recommendations.

Three primary CEOS objectives

1. **to optimize benefits of spaceborne Earth observations through:**
   - ❑ cooperation of its participants in mission planning
   - ❑ development of compatible data products, formats, services, applications, and policies;

1. **to serve as a focal point for international coordination of space-related Earth observation activities;**

1. **to exchange policy and technical information** to encourage complementarity and compatibility of observation and data exchange systems.

CEOS Support to GEO *(1/2)*

- CEOS is the space arm of GEO

- Lead or Co-lead 16 GEO Tasks (out of 115)
  - Point of Contact (Task Coordinator) for 11 out of 16

- … including 2 GEO Tasks on Disaster:
  1. *Use of satellite for Disaster Management (DI-06-09 ; POC: Guy Seguin, CSA)*
  2. *Regional end-to-end Disaster management Applications (DI-09-02b ; POC: Guy Seguin, CSA)*

- In 2009, CEOS activities are related to 1/3 of the GEO 2009-2011 Tasks (36 out of 115)

CEOS Support to GEO *(2/2)*

- Support to GEO groups:
  - GEO Committees, adhoc GEO groups (e.g. Target Team), GEO Task Teams

- Strong involvement of CEOS Support Groups:
  - 3 Working Groups, 6 Virtual Constellation teams, 8 CEOS SBA teams of experts, SEO
  - Many resources from CEOS Agencies
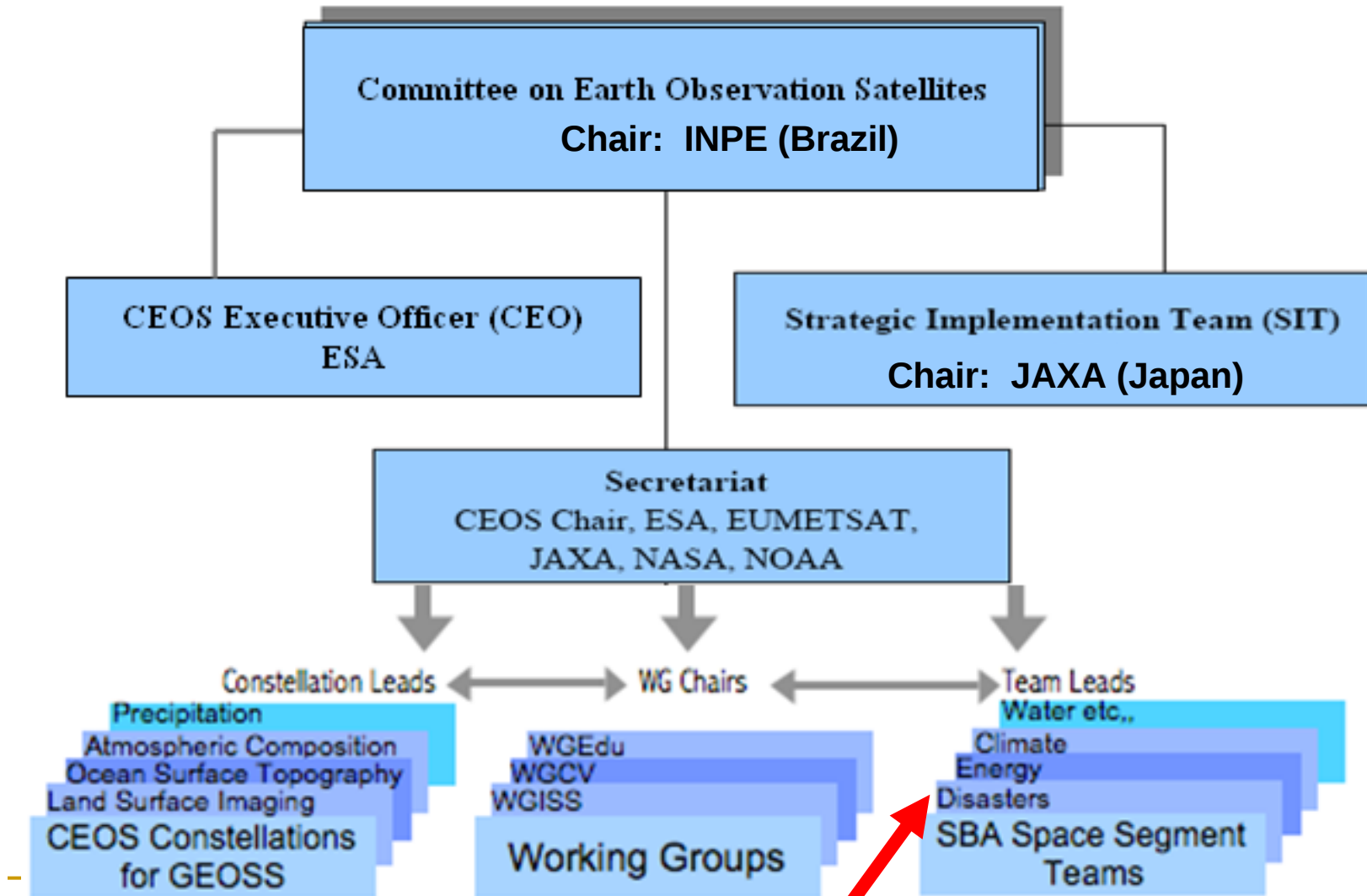
GEO Tasks/Sub-Tasks Co-Led by CEOS in 2009

	GEO 2009-2011 Task	CEOS Point of Contact
AR-09-02a	*Virtual Constellations*	Mary Kicza (NOAA, CEOS SIT Chair)
CB-09-05b	*CBERS*	Daniel Matsapola (CSIR)
DA-09-01a	*GEOSS Quality Assurance Strategy*	Pascal Lecomte (ESA, WGCV Chair)
DA-09-01b	*Data, Metadata and Products Harmonisation*	Ken McDonald (NOAA)
DA-09-03a	*Global Land Cover*	Pascal Lecomte (ESA, WGCV Chair)
DA-09-03d	*Global DEM*	Jan-Peter Muller (BNSC/UCL, WGCV)
CL-06-01a	*Sustained Reprocessing and Reanalysis of Climate Data*	Mitch Goldberg (NOAA)
CL-06-01c	*Key Climate Data from Satellite Systems*	Mitch Goldberg (NOAA)
CL-09-03a	*Integrated Global Carbon Observation (IGCO)*	Takashi Moriyama (JAXA)
CL-09-03b	*Forest Carbon Tracking*	Frank Martin Seifert (ESA)
CL-09-03c	*Global Monitoring of Greenhouse Gases from Space*	Takashi Moriyama (JAXA)
DI-06-09	*Use of Satellites for Risk Management*	Guy Seguin (CSA)
DI-09-02b	*Regional End-to-End Disaster Management Applications*	Guy Seguin (CSA)
HE-09-03b	*Implementation of a Malaria Early Warning System*	George Jungbluth (NOAA)
EN-07-01	*Management of Energy Sources*	Richard Eckman (NASA)
WA-06-07b	*Africa*	Diego Fernández Prieto (ESA)

only CEOS POC

both CEOS & GEO POC

CEOS Organization

CEOS Support Groups

- **3 CEOS Working Groups**
  - **Working Group on Education, Training, and Capacity Building (WGEdu)**
    - to develop a strategy for future CEOS activities in education and training, particularly in developing countries.
  - **Working Group on Calibration & Validation (WGCV):**
    - to ensure long-term confidence in the accuracy and quality of Earth observation data and products.
  - **Working Group on Information Systems & Services (WGISS)**
    - to stimulate, coordinate, and monitor the development of the systems and services which manage and supply the data and information from participating agencies' missions.

- **6 CEOS Virtual Constellations Teams** (see next slide)

- **9 CEOS SBA Teams** *(SBA = Societal Benefit Area) incl. CEOS Disaster SBA Team (Lead: Guy Seguin , CSA - Canada)*

CEOS Groups

VIRTUAL CONSTELLATIONS

CONSTEL.	NAME	AGENCY
Atmospheric Composition	Ernest Hilsenrath Claus Zehner	NASA ESA
Land Surface Imaging	Tom Holm V.S. Hegde	USGS ISRO
Ocean Surface Topography	Stan Wilson Francois Parisot	NOAA EUMETSAT
Precipitation	Steven Neeck Riko Oki	NASA JAXA
Ocean Surface Vector Wind	Stan Wilson Hans Bonekamp B.S. Gohil	NOAA EUMETSAT, ISRO
Ocean Colour Radiometry	Hiroshi Murakami Mark Dowell Paula Bontempi Jim Yoder *(support)* Venetia Stuart *(support)*	JAXA EC/JRC NASA IOCCG/WHOI IOCCG

CEOS SBA

SBA	NAME	AGENCY
DISASTER	Guy Seguin	CSA
HEALTH	Murielle Lafaye	CNES
CLIMATE	Mitch Goldberg	NOAA
WATER	Osamu Ochiai	JAXA
WEATHER	Paul Counet Rob Husband *(Support)*	EUMETSAT
ECOSYSTEMS	Asanda Ntisana	CSIR
AGRICULTURE	Brad Reed	USGS
ENERGY	Richard Eckman	NASA
TRANSVERSE	Ivan Petiteville	CEOS

CEOS WORKING GROUPS

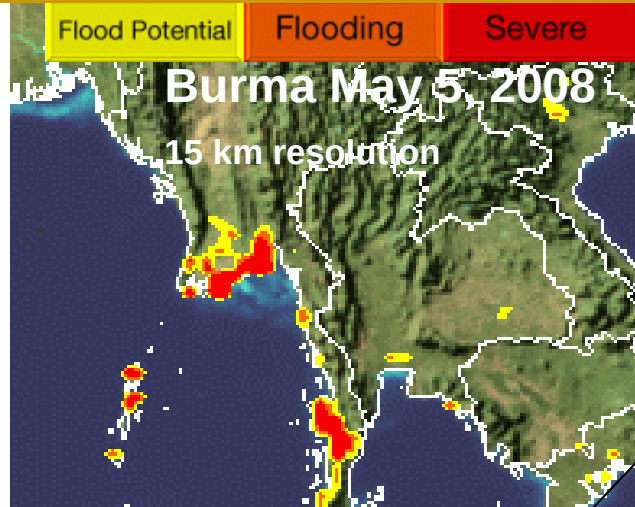| WG	NAME	AGENCY
WGCV	Pascal Lecomte	ESA
WGEdu	Gordon Bridge	EUMETSAT
WGISS	Martha Maiden	NASA

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2009

CEOS Activities related to

Disaster

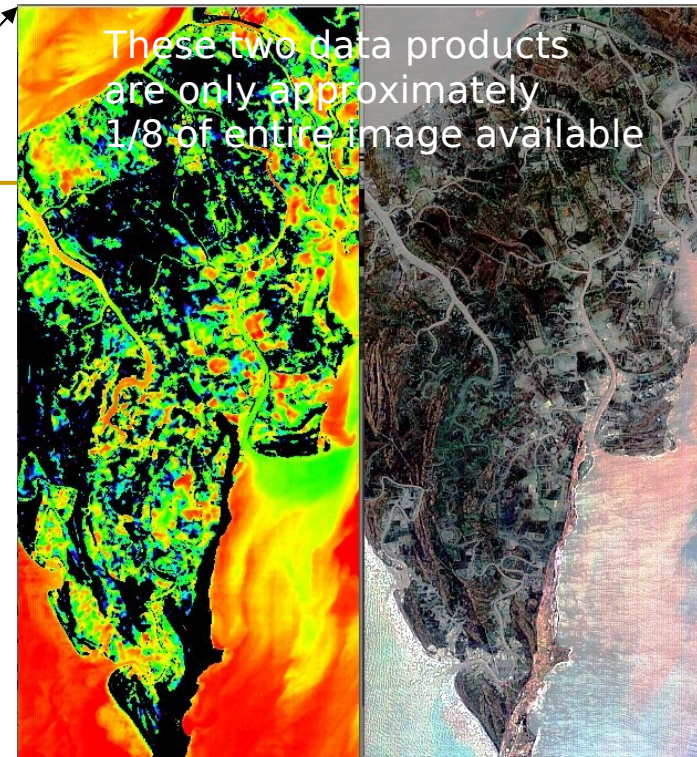# Current CEOS Agencies activities related to Disaster

- Many CEOS Agencies are actively involved in Disaster activities
  - either directly or through CEOS

- Examples of activities or initiatives:
  - **Charter**
    - several Space Agencies members of CEOS through **International Charter**
    - CEOS Actions
  - **Flood Monitoring in Myanamar, Caribbean, Africa**
    - CEOS WGISS
  - Several activities through Virtual Constellations such as **Volcanic Ash Alert System**
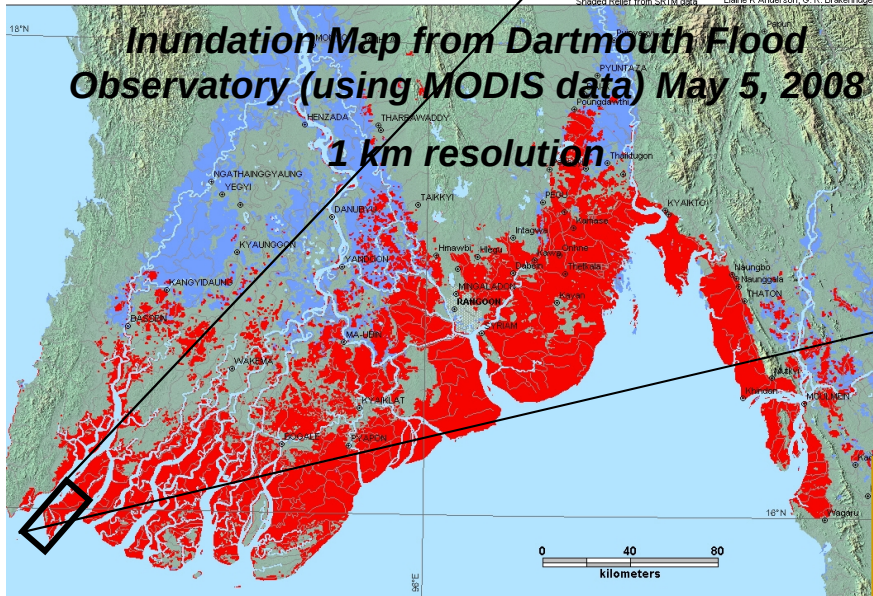   - CEOS **A**tmospheric **C**omposition Virtual **C**onstellation (ACC)

1. Real-time flood estimate using global hydrological model and satellite rainfall estimate - Adler

Flood Potential   Flooding   Severe

Burma May 5, 2008

15 km resolution

4. Future experiment will be to substitute predicted rainfall into Adler model to obtain predicted flood warning

These two data products are only approximately 1/8 of entire image available

DFO Event # 2008-052 - Glide#: TC-2008-000057-MMR - Burma - Cyclone Nargis - Irrawaddy Delta - Rapid Response Inundation Map

Copyright 2008

| MODIS flood inundation limits May 5, 2008: | Maximum Observed Inundation Limit 1999 - 2006: | SRTM SWBD reference water: DCW Rivers: ─── Urban Areas: | Universal Transverse Mercator UTM Zone 47 North - WGS 84 Graticule: 1 degree Shaded Relief from SRTM data | Dartmouth Flood Observatory Dartmouth College Hanover, NH 03755 USA Elaine K Anderson, G. R. Brakenridge |

Inundation Map from Dartmouth Flood Observatory (using MODIS data) May 5, 2008

1 km resolution

3. EO-1 Advanced Land Imager automatically triggered and pointed to get more water depth details in area of interest.

Water Depth Classifier True color
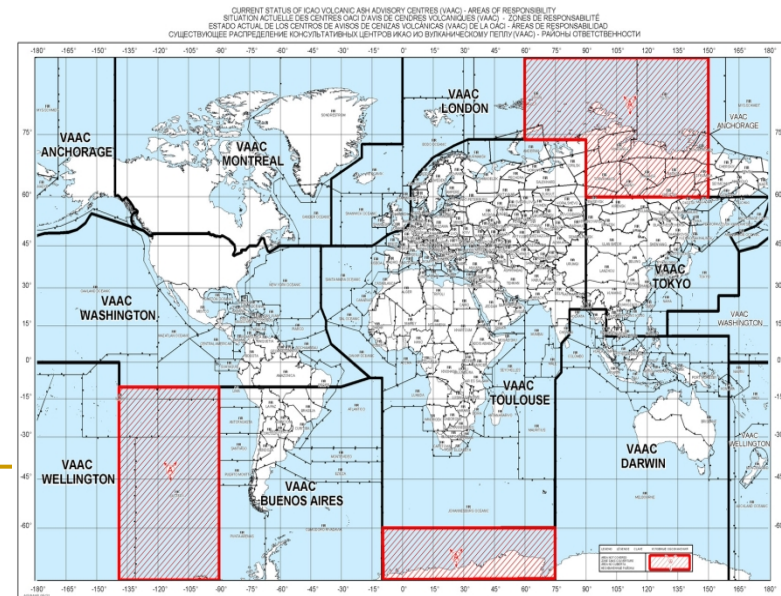   **Advanced Land Imager 30m**
       May 5, 2008

2. MODIS used to validate flood locations with direct observation

Yellow - medium 1
Green - medium 2
Blue - shallow
Black - no water

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Accomplishments Cappelaere tasks

ACC Project – Aviation Volcanic Advisory

- **Volcanic eruptions impact aviation safety; engine, window and skin damage**

- **The US (NASA, USGS, and NOAA) and ESA (PROMOTE) support national VAACs** (Volcanic Ash Advisory Center) **by providing alerts based on satellite data**

- **National services coordinated and extended to provide global service using enhanced capabilities through US and ESA combined efforts**
  - Aura, Envisat, and MSG
  - Improved latency and accuracy of SO_2 and ash detection
  - Global alerts

CURRENT STATUS OF ICAO VOLCANIC ASH ADVISORY CENTRES (VAAC) - AREAS OF RESPONSIBILITY

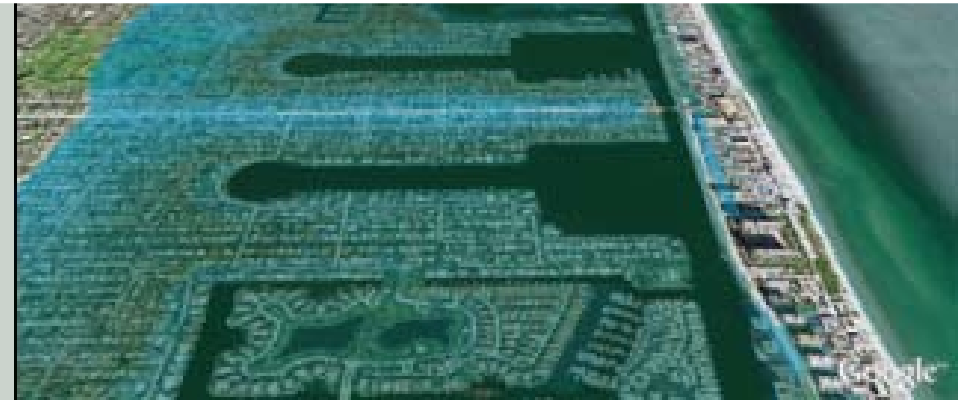# Ocean Surface Topography constellation

Ocean Surface Topography Constellation

146,000,000 worldwide live within 1 meter of MHW

Guerin, Thorp & Thompson (2007) *www.architecture2030.org*

Hollywood, FL – Population Impacted 140,000

Miami Beach – Population Impacted 88,000

Potential impact of sea

1.5 m - Impact
Total population affected: 17 Million (15%)
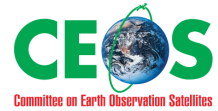Total land area affected: 22,000 km^2 (16%)

Precipitation Constellation

CEOS DISASTER SBA Team

- Guy Seguin (guy.seguin@space.gc.ca) Coordinator & CSA
- Stuart Frye, (stuart.w.frye@nasa.gov), NASA
- Dan Mandl, (dan.mandl@nasa.gov), NASA
- Steven Hosford, (steven.hosford@CNES.FR) CNES
- Laura Frulla, (lfrulla@conae.gov.ar) CONAE
- Ivan Csiszar, (ivan.csiszar@noaa.gov), NOAA
- Wolfgang Lengert (wolfgang.lengert@esa.int), ESA
- Claus Zehner, (claus.zehner@esa.int) ESA
- Philippe Bally (Philippe.Bally@esa.int) ESA
- Masanobu Shimada (shimada.masanobu@jaxa.jp) JAXA
- Pakorn Apaphant (pakorn@gistda.or.th) GISTDA
- Giovanni Valentini (giovanni.valentini@asi.it) ASI

Other participants
GEO disaster coordinator (vacant) acting Mike Tanner
Ivan Petiteville, (ivan.petiteville@esa.int), CEOS CEO, ESA
Lorant Czaran, (lorant.czaran@unoosa.org) UNOOSA
Conrado Varotto, (varotto@conae.gov.ar), CONAE
Brian Killough, (brian.killough@nasa.gov), CEOS SEO, NASA
Shelly Stover, (Shelley.stover@nasa.gov), CEOS SEO, NASA

2009 Disaster Actions Roadmap
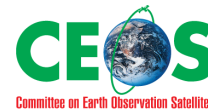
2008   2009   2010   2011

DI-06-09_5   Charter Metadata Catalogue   CNES

DI-06-09_6   Broadened Charter Access   ESA

DI-06-09_7   Process Modelling for earthquakes, fires and floods

WGISS

DI-06-09_8   Satellite Systems Architecture for Disaster CSA

DI-09-01a_2 INSAR Data Use for Geohazards   ESA

DI-09-01a_3 INSAR Data for Operational Hazard Mapping CCRS

DI-09-02a_2 Global Operational Volcanic Ash Alert   ESA

DI-09-02b_1 Caribbean Flood Pilot and African Flood/Disease

Response   NASA

DI-09-03b_2 Global Geostationary and Polar Fire Warning

System   NOAA

DI-09-03b_3 Operational Geostationary Fire Monitoring

NOAA

	Flooding	Earthquake	Landslide	Windstorm	Volcano	Fire	Tsunami	Drought
Mitigation/ Preparedness	End-to-end Flood demonstrator	Super Sites	Super Sites		Super Sites			
Early Warning					Volcanic Ash	NOAA Fire		
Response								
		C H A R T E R						
Recovery								

2010

CEOS Activities related to

Disaster

2010 CEOS Activities - Disaster

- **Disaster** mentioned as high priority field during last CEOS Plenary

- **Disaster** one of the top priorities listed in the last G8 Declaration (Italia, Jul. 09). Declaration includes:
  - Sustainable use of natural resources
  - Fighting climate change
  - Improving risk analysis from threats from natural disasters
  - Promoting emission reductions to reduce deforestation

- Continuation of the ten 2009 CEOS Actions on Disaster (all on-going)

- Definition of new additional 2010 CEOS Actions in support to newly updated GEO 2009-2011 Work Plan
  - **GEO Tasks identification:** Working meeting CEOS-GEO Secretariat (Dec. 22, 2009)
  - **CEOS-wide Call for Actions Proposals (mid-Jan 2010)**
  - **CEOS Actions Consolidation** Workshop (Jan. 25-27, 2010)

2010 Potential CEOS Contribution to GEO Disaster Tasks

DI-06-09: Use of Satellites for Risk Management

- **DI-09-01: Systematic Monitoring for Geohazards Risk Assessment**
  - a) Vulnerability Mapping and Risk Assessment
  - b) Seismographic Networks Improvement and Coordination

- **DI-09-02: Multi-Risk Management and Regional Applications**
  - a) Implementation of a Multi-Risk Management Approach
  - b) Regional End-to-End Disaster Management Applications

- **DI-09-03: Warning Systems for Disasters**
  - a) Tsunami Early Warning System of Systems
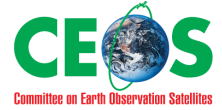 - b) Implementation of a Wildland Fire Warning System at Global Level

… and to other GEO Tasks related to Disaster

- Several other GEO Tasks not classified as Disaster Tasks (DI-xx-xx) are related to Disaster e.g.
  - Data Democracy
  - Development of Global Map for GEOSS Societal Benefit Areas
  - Climate Information for Decision-making, Risk Management and Adaptation
  - Global Monitoring of Greenhouse Gases from Space
  - Capturing Historical and New Biodiversity Data
  - Several Capacity Building Tasks
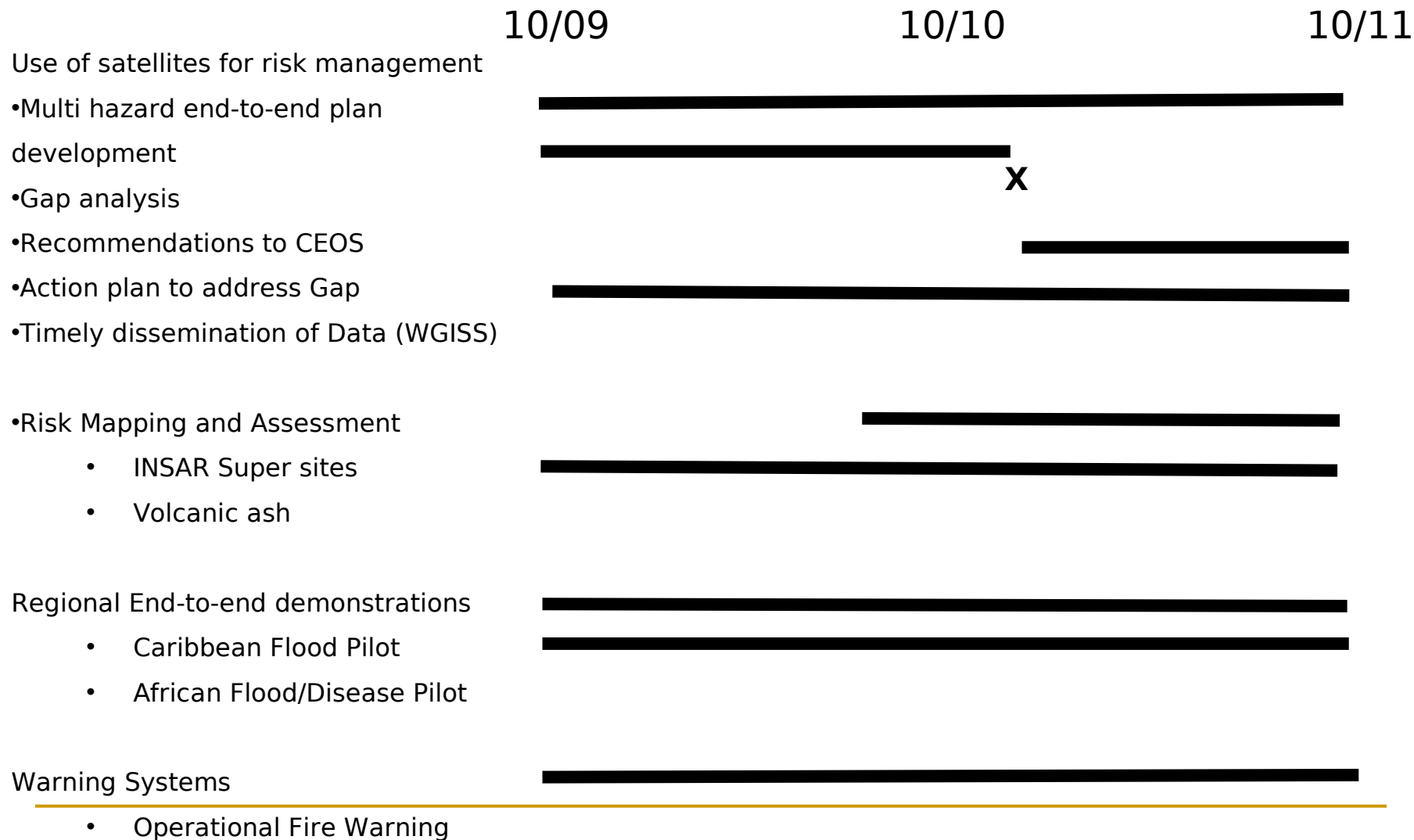 - Sensor Web Enablement for In-Situ Observing Network Facilitation
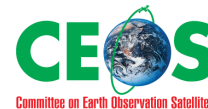
Call for CEOS Actions Proposals

- Beginning of Jan. 2010, CEOS Agencies will be requested to propose CEOS Actions in support to GEO WP, in particular related to Disaster

- Answers expected by mid Jan. 2010

- List of 2010 CEOS actions finalized at Workshop (Jan. 27-28, 2010)

Proposed Disaster Management Roadmap

10/09   10/10   10/11

Use of satellites for risk management

•Multi hazard end-to-end plan

development

X

•Gap analysis

•Recommendations to CEOS

•Action plan to address Gap

•Timely dissemination of Data (WGISS)

•Risk Mapping and Assessment

• INSAR Super sites

• Volcanic ash

Regional End-to-end demonstrations

• Caribbean Flood Pilot

• African Flood/Disease Pilot

Warning Systems

• Operational Fire Warning

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CEOS coordination role

CEOS has obtained good result in engaging member Space agencies to provide SAR data for the Carribean Flood Pilot and for the Forest Carbon Initiate.

CEOS will support a request for interferometric data over supersites !