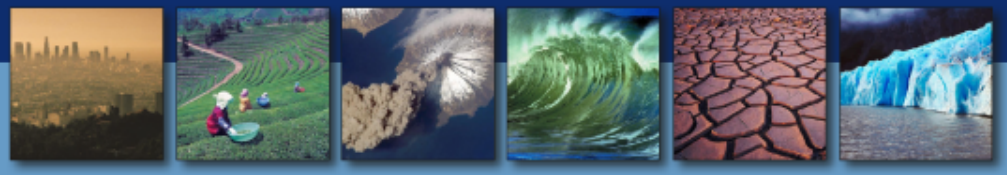
CEOS Disaster Risk Management

Capacity Building

Ivan Petiteville (ESA) on behalf of CEOS DRM Team

WGCapD Meeting
ESA ESRIN (Frascati)
4 March 2013



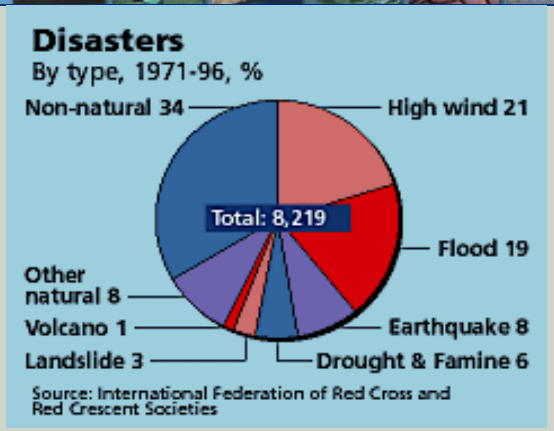
Plan

- **Background on Disaster Risk Management (DRM)**
- **Improving the CEOS Support to DRM**

Disaster Definitions

What is a disaster ?

either a natural or man-made hazard resulting in significant physical damage or destruction & loss of life.



Examples of natural disasters:

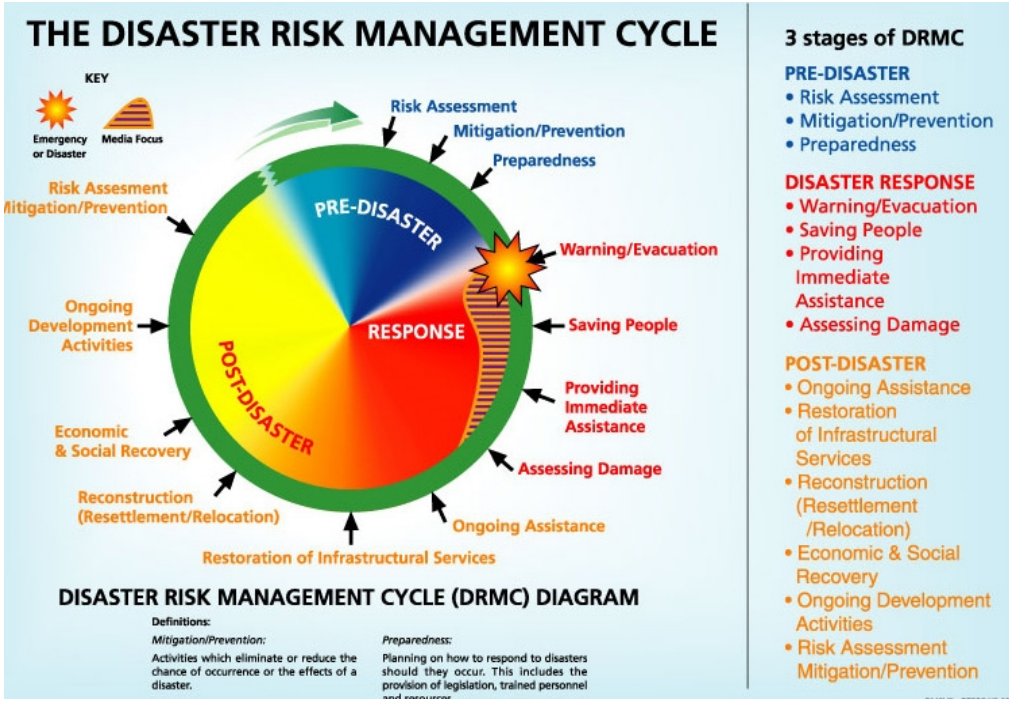
- geo-hazard such as earthquakes, volcanic eruptions, tsunami, landslides
- climatic/hydrometeorological origin such as drought, flood, cyclone, wildfires.

Examples of Man-made hazards:

nuclear incidents, fires, oil spills

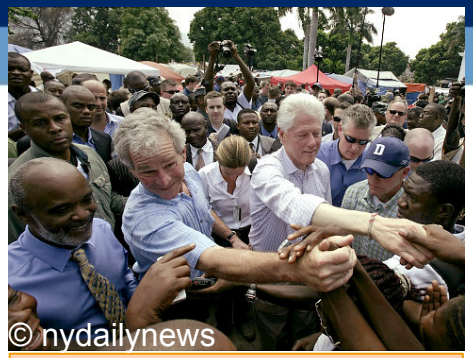
EO capabilities & Risk Management cycle

- Emergency Response,
  - Rapid Crisis Mapping & Damage Assessment,
  - Situation Mapping.
- Prevention, Preparedness, Recovery, Reconstruction
  - Detailed Damage Mapping,
  - Risks Assessment.
    (Floods, Fires, Geo-Hazards)
- All phases
  - Reference Mapping,
  - Digital Elevation and Digital Terrain models,
  - LU/LC cover Mapping,
  - Asset Mapping.



EO techniques (in red) both in response phases and other phases of risk management (such as prevention)

Increasing Politicians' Interest in DRM



Bill Clinton in Haiti

DRM gaining more political importance for economic, political and geopolitical reasons

- 2010, 385 natural disasters: 297 000 people killed worldwide, 217.0 million others affected, $ 123.9 billion of economic damages.
- Increase of economic impacts: growing urbanization (x2 in 2050) + increasing number of extreme events (x3 in 2100).
- Politicians very sensitive to consequences of disasters ; want to show leadership when a crisis strikes.
- Humanitarian aid can be motivated by governments' will to increase their influence in devastated regions.

Bush - Katrina

Schröder – Flood 2002

Aid from Jordan - Haiti

Increasing Politicians' Interest in DRM (cont')

In last 5 years, increasing political attention on preparedness & mitigation while maintaining past level of efforts on response & reconstruction

Disaster risk considerations in land-use planning and building may be 4 times less expensive than rebuilding or repairing infrastructure damages . Mortality can be reduced by 40 %.

World Bank: return on investments in disaster prevention is between 400% and 700%

Strong political presence at major recent events related to DRM: growing interest by Politicians

e.g. Hyogo Framework for Action 2005-2015 (2005), Global Platform for Disaster Risk Reduction (conferences in 2007, June 2009, May 2011)

DRM addressed in major 2012 events with strong political presence

e.g. Planet Under Pressure; Rio+20 Summit

PLANET UNDER PRESSURE 2012 MARCH 26-29 LONDON

PLANET UNDER PRESSURE 2012 MARCH 26-29 LONDON

RIO+20 United Nations Conference on Sustainable Development

Increasing Organisation Interest in DRI

Growing international engagement (financial, programmatic, ..) by international organizations e.g. World Bank, UN agencies, EC, G8,..

- **World Bank**: Natural disaster assistance : about 10% of total WB commitments between 1984 and 2005. Since 1980, more than 500 operations (US$40 billion).
- **UN International Strategy for Disaster Risk Reduction** (UNISDR) created in 2000.
- **WMO Disaster Risk Reduction** started in 2003 (one of 4 GFCS' priorities)
- **European Commission**: 2007: "disaster prevention" inserted in Lisbon Treaty; 2010: development of integrated approach to disaster management addressing response, preparedness and prevention activities; 2014-2020 €455 million-budget proposed for Civil protection and future European Emergency Response Capacity

Ban Ki-Moon - Floods in Pakistan (2010)

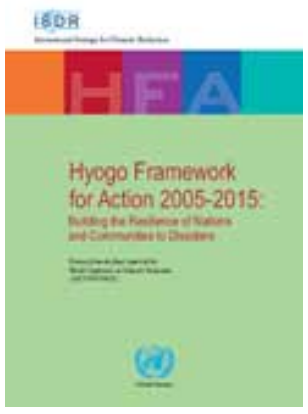
Humanitarian aid from EC to Cambodian flood victims (2011)

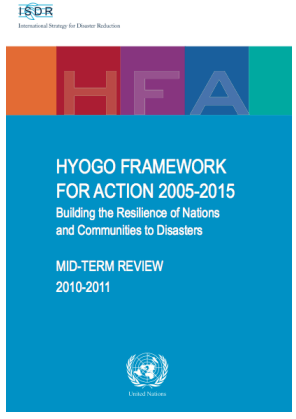
An Opportunity for Space Agencies

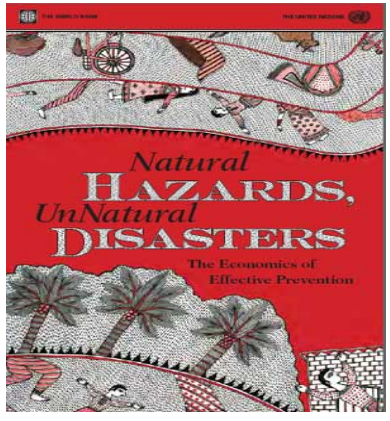
Growing political interest in DRM: might be an opportunity (and obligation ?) for space agencies to play a major role in near future

- Recent major international conferences, publications and declarations from decision-makers explicitly refer to the necessity to increase the means of observations including from satellites.

- Space agencies' support to post-crisis response can still be improved (e.g. International Charter), but space agencies should be ready to respond to the current increasing political pressure to invest more in preparedness and prevention phases.







World Bank 2010 report:
Recommendations to governments for better spending the funds allocated to DRM.

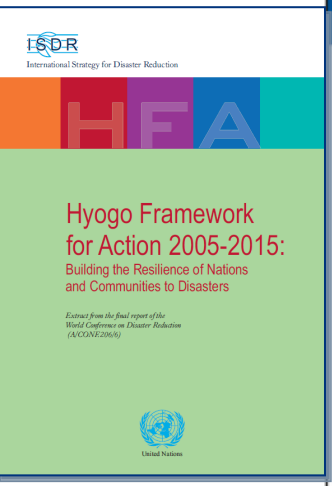
SIT-28 Meeting
Hampton, Virginia, USA
11-15 March 2013

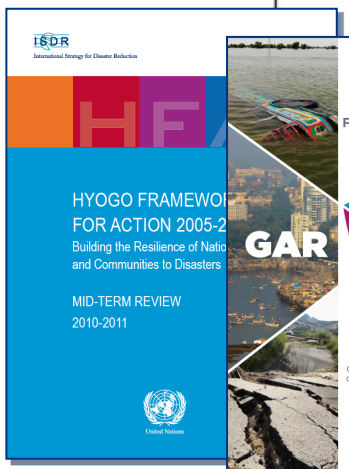
Key Milestones in DRM

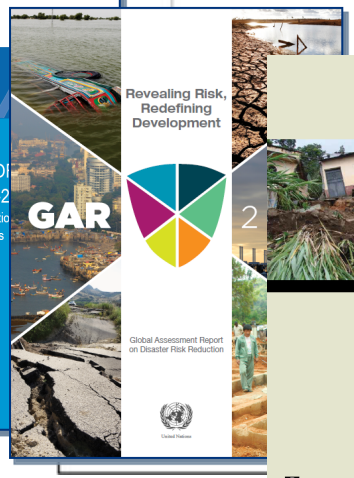
United Nations
International Strategy for Disaster Reduction

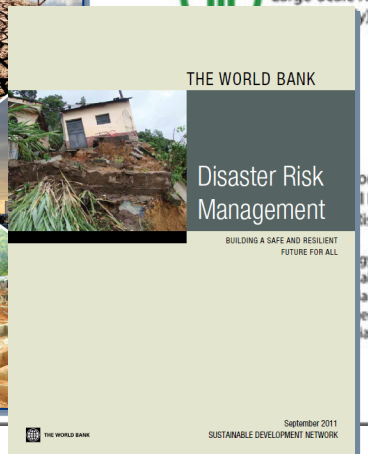
Timeline of Main Events for Post-2015 Framework for Disaster Risk Reduction

Version: 16 February 2012



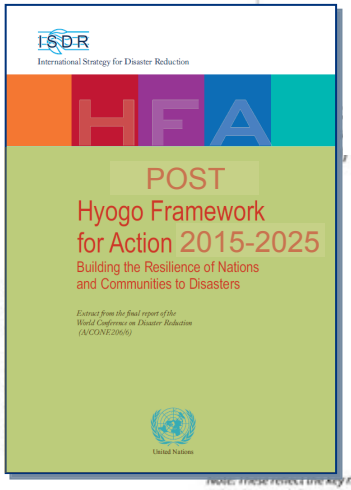






2011 2012 2013 2014 2015

Europe (Norway - TBD)
Africa (TBD)

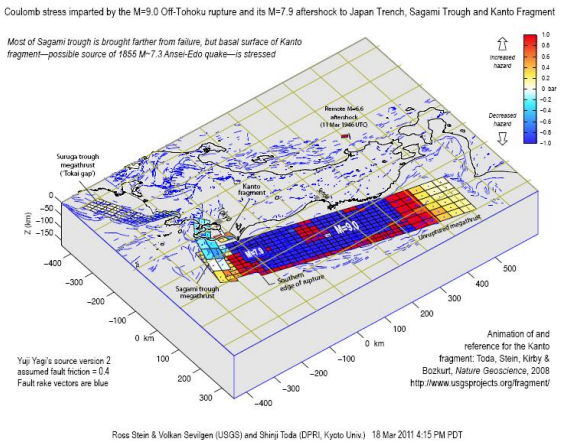


NEW

Note: These reflect the key milestone events for disaster risk reduction. Other events and consultation meetings will also be part of the process.

Many Stakeholders in DRM

- **National governments, Local authorities, Civil Protections Agencies (field teams and decision makers)**
- **The International Humanitarian community**
  - **UN aid organisations (e.g. UN OCHA) and Red Cross/Red Crescent & NGOs**
- **International Development Organisations**
  - **World Bank, World Health Org., UN International Strategy for Disaster Reduction (UN ISDR), etc**



- GEO & CEOS
- Science community
- National agencies incl. Space agencies
- Mass media

From S.Toda (DPRI, Kyoto Univ.), R.Stein (USGS), V.Sevilgen (USGS)

Space Agencies Contribution to Disaster Risk Management

Several initiatives involving space agencies contribute to disaster management in GEO framework

Multi-lateral agreements outside CEOS with various forms of cooperation:

- International Charter Space & Major Disasters (15 members) incl. China National Space Administration (CNSA)
- Sentinel Asia (Asia Pacific region) incl. 5 Chinese organizations.
- SERVIR (NASA,..)
- GMES Emergency Management Services (SAFER, etc)
- Preparedness through DLR (Tsunamis), Astrium/Meteo Fr (flash flood)

Other international initiatives with significant CEOS involvement (e.g. via CEOS Disaster SBA team, WGs, VCs, SEO)

- Volcanic ash monitoring,
- GEO GeoHazards Supersites
- Regional flood prediction & monitoring over Caribbean and over Namibia

CEOS strong support to GEO GeoHazards Community of Practice (previous IGOS GeoHazards group)

GEO Disaster SBA

Disaster: one of 9 GEO Societal Benefit Areas (SBA) …

Implemented through specific GEO task:
focus on 4 main areas -

1. Support to operational systems
2. Enable and inform risk and vulnerability analyses
3. Implement regional end-to-end pilots projects
4. Conduct gap analyses to identify missing data, system and capacity gaps

For more details: http://www.earthobservations.org/

International Charter Space and Major Disasters

Disaster Charter Activations since Jan. 2012

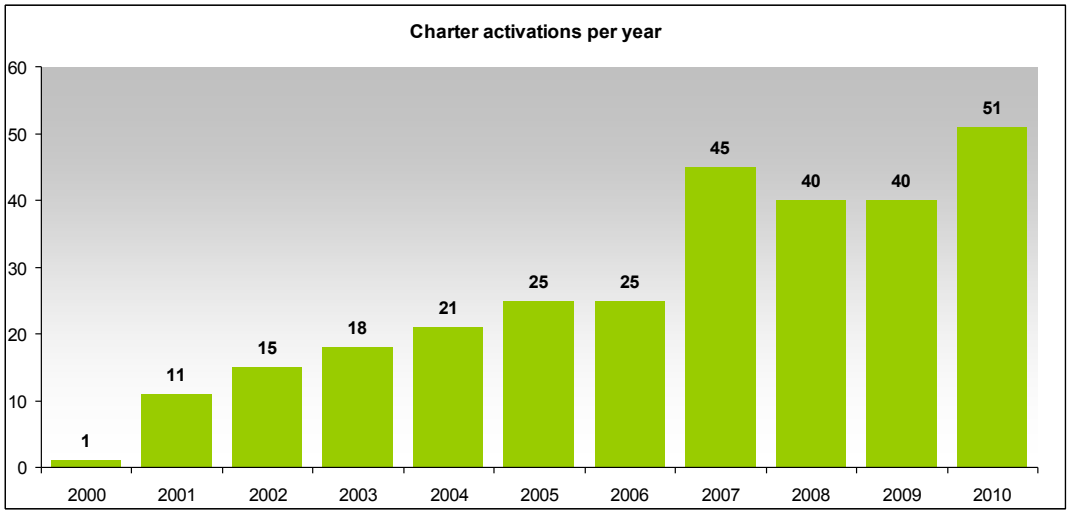
Over 11 years, 320+ activations in 100+ countries

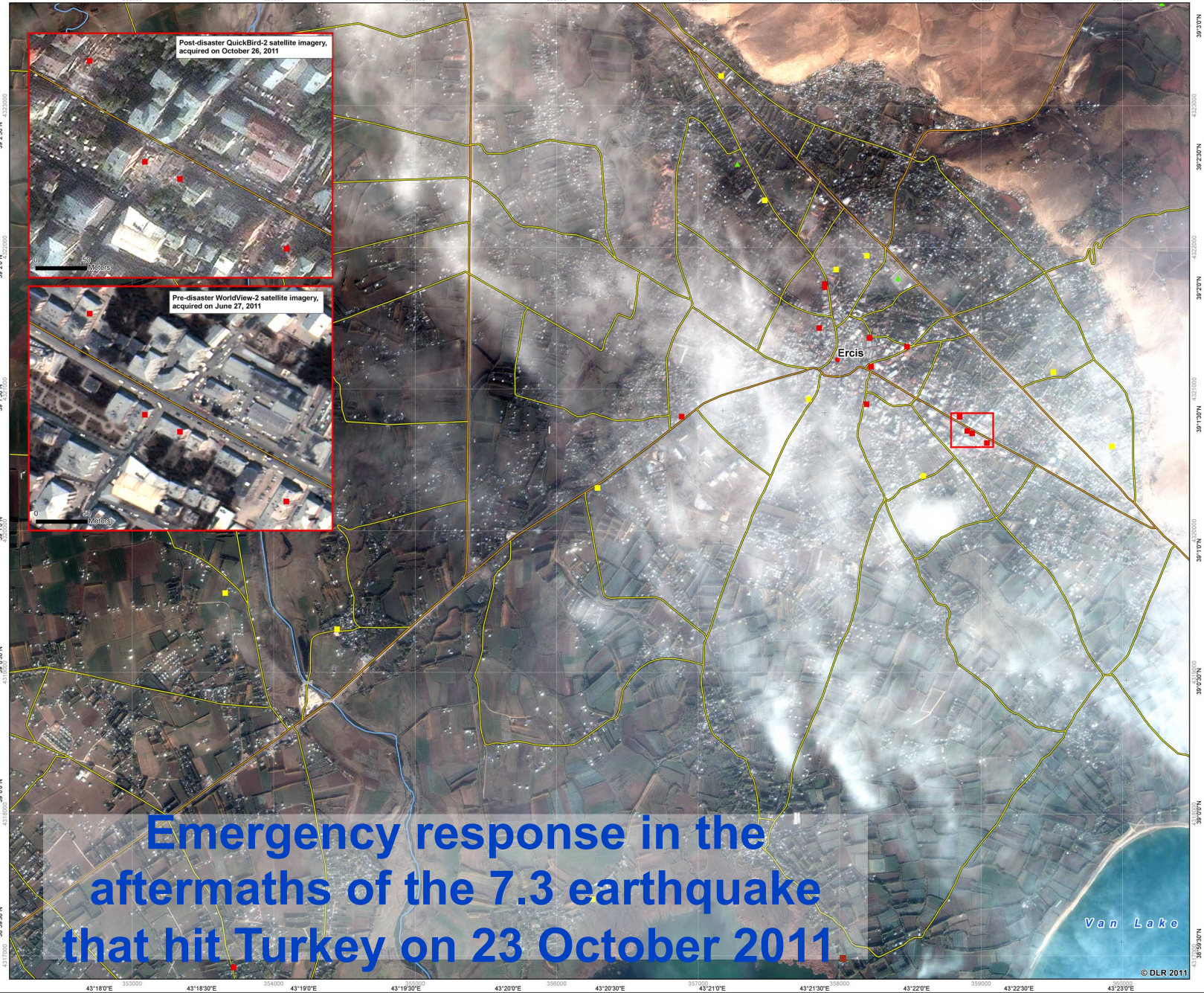
Data provided by more than 30 satellites from space agencies and commercial providers.

Satellite agencies members of CEOS

Covers immediate disaster response.

Charter activations per year 2000-2010





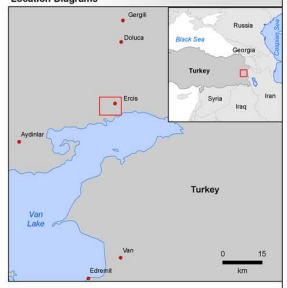
Emergency response in the aftermaths of the 7.3 earthquake that hit Turkey on 23 October 2011

SAFER Activation No. 110
Glide No. 2011-000162
Product No. 07

TURKEY - ERCIS

Situation as of October 26, 2011
Damage Assessment Map - Detail
Scale: 1:12,000

Location Diagrams



Legend

Buildings | Cloud | Water

Infrastructure
- Town
- Primary road
- Secondary road
- Bridge

Hydrography
- River

Damage Assessment
- Highly damaged
- Possibly damaged
- Temporary shelter

Interpretation

On October 23, 2011 an earthquake with a magnitude of 7.3 at 5 km depth hit the province of Van in eastern Turkey, followed by a series of powerful aftershocks of magnitudes up to 5.6. The epicentre was located at 38° 37' 40.80"N, 43° 29' 9.60"E, at the village of Tabanli 19 km north-east of the city of Van between the Van Lake and the Iranian border. Several municipalities around the Van Lake were affected.
The map shows the city of Ercis, located at the north-eastern side of the Van Lake, with a total population of about 70,000 inhabitants. Damaged structures were derived by visually comparing high resolution post-disaster QuickBird-2 satellite imagery, acquired on October 26, 2011, with pre-disaster WorldView-2 satellite imagery, acquired on June 27, 2011. Due to differing acquisition angles, clouds and haze effects, the analysis provides only a coarse estimation of potentially damaged buildings.
Orthorectified and pansharpened QuickBird-2 imagery (0.6 m spatial resolution), acquired on October 26, 2011 serves as background.

Cartographic Information

0 250 500 750 1.000 Meters

N

Local projection: UTM Zone 38N, Datum: WGS 1984
Geographic projection: Lat/Lon (DMS), Datum: WGS 84
Scale: 1:12,000 for DIN A1 prints.

Data Sources

QuickBird-2 (0.6m)	© DigitalGlobe, Inc. 2011, provided by EUSI under EC/ESA/GSC-DA, all rights reserved
WorldView-2 (0.5m)	
Vector data	© DLR 2011

Framework

The products elaborated for this Rapid Mapping Activity are realised to the best of our ability, within a very short time frame, optimising the material available.
All geographic information has limitations due to the scale, resolution, date and interpretation of the original source materials. No liability concerning the content or the use thereof is assumed by the producer. The research leading to these results has received funding from European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 218802.
The ZKI crisis maps are constantly updated. Please make sure to visit http://www.zki.dlr.de for the latest version of this product.
Map produced October 26, 2011 by ZKI
© DLR 2011

zki@dlr.de
http://www.zki.dlr.de

EMERGENCY RESPONSE SERVICE gmes — European Commission Service and Applications For Emergency Response — safer

Center for Satellite Based Crisis Information
– Emergency Mapping & Disaster Monitoring –
a service of DFD

German Remote Sensing Data Center
German Aerospace Center
DLR

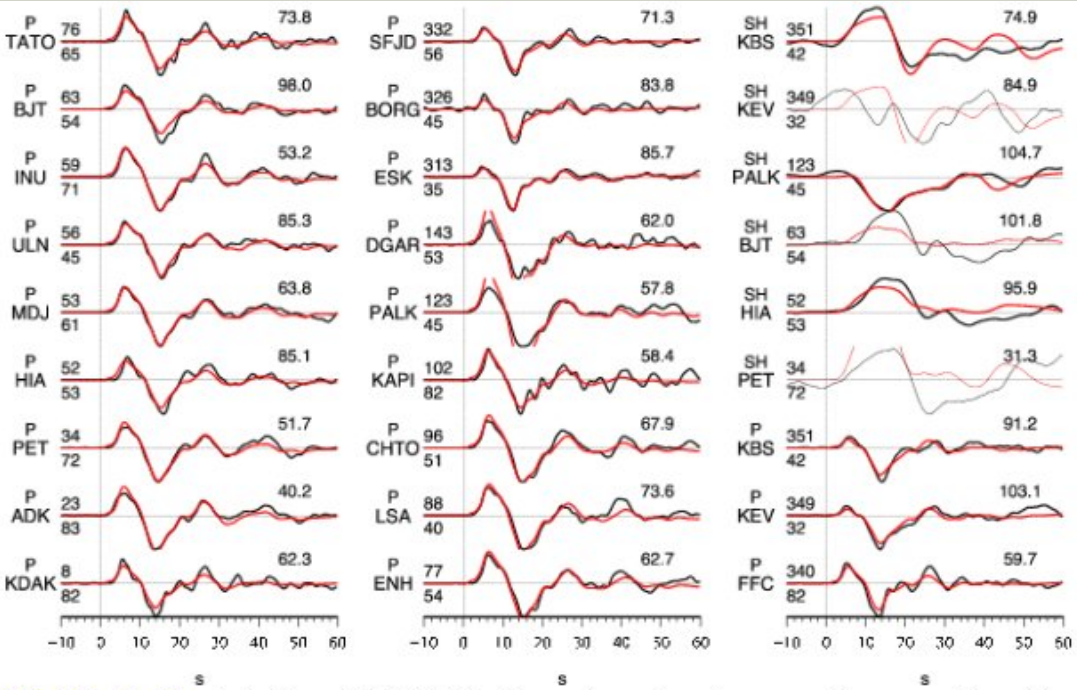
SIT-28 Meeting
Hampton, Virginia, USA
11-15 March 2013

Emergency response in the aftermaths of the 7.3 earthquake that hit Turkey on 23 October 2011.

The Geo-Hazard Supersites created a new page for the Van earthquake of last Sunday; preliminary results contributed by researchers are already available.

ENVISAT ASAR acquisitions already planned & other **HR/ VHR SAR missions** will follow with sensor options tuned for INSAR).

→ not crisis response; **INSAR data + in-situ data** to help scientist better characterise the EQ event.

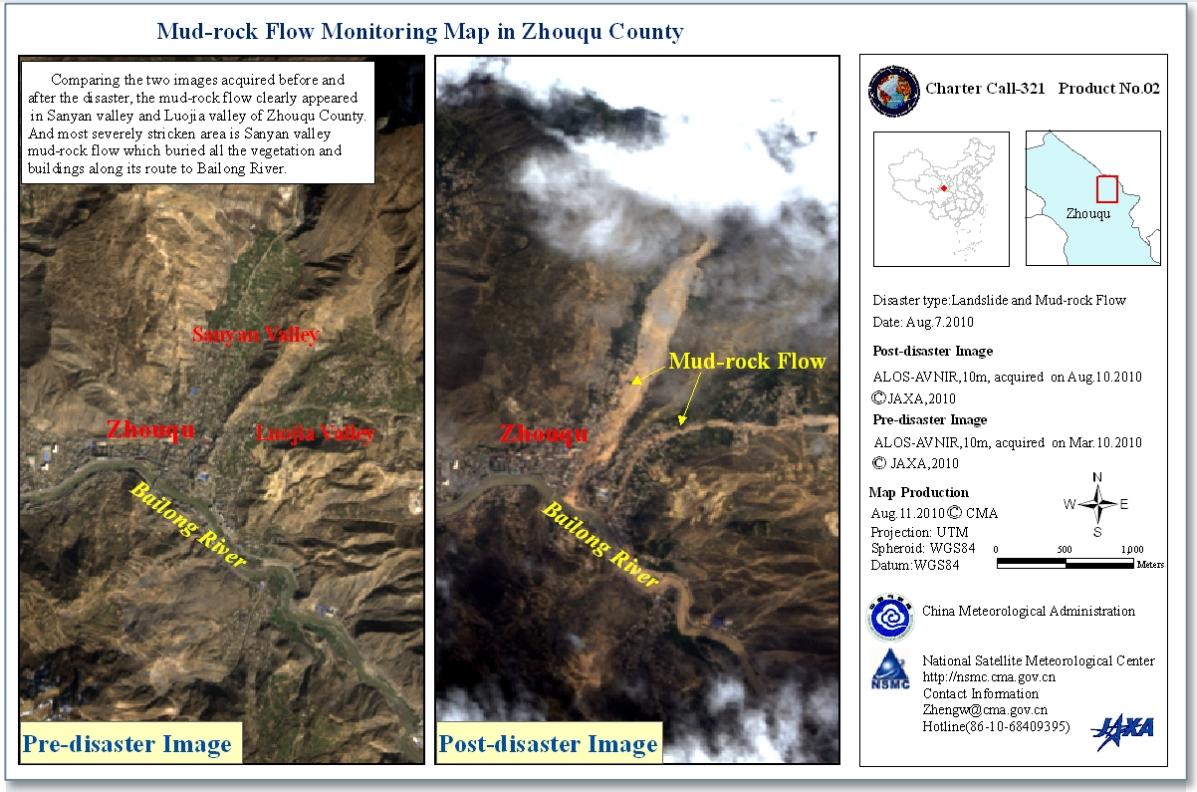


Finite fault Model by Gavin Hayes, USGS NEIC. The figures above show slip on one of the two possible nodal planes and a fit to body waves.

Mainshock and aftershock locations from Kandilli Obs. and DEPREM.

Charter Activation – Landslide in China (August 2010)

In August 2010, landslides and floods triggered by torrential rain have engulfed a town in north-western China, killing at least 127 people and leaving 1,300 missing.
Nearly 3,000 soldiers and 100 medics have been sent to assist local rescue teams in Zhouqu, in an isolated region of Gansu province..



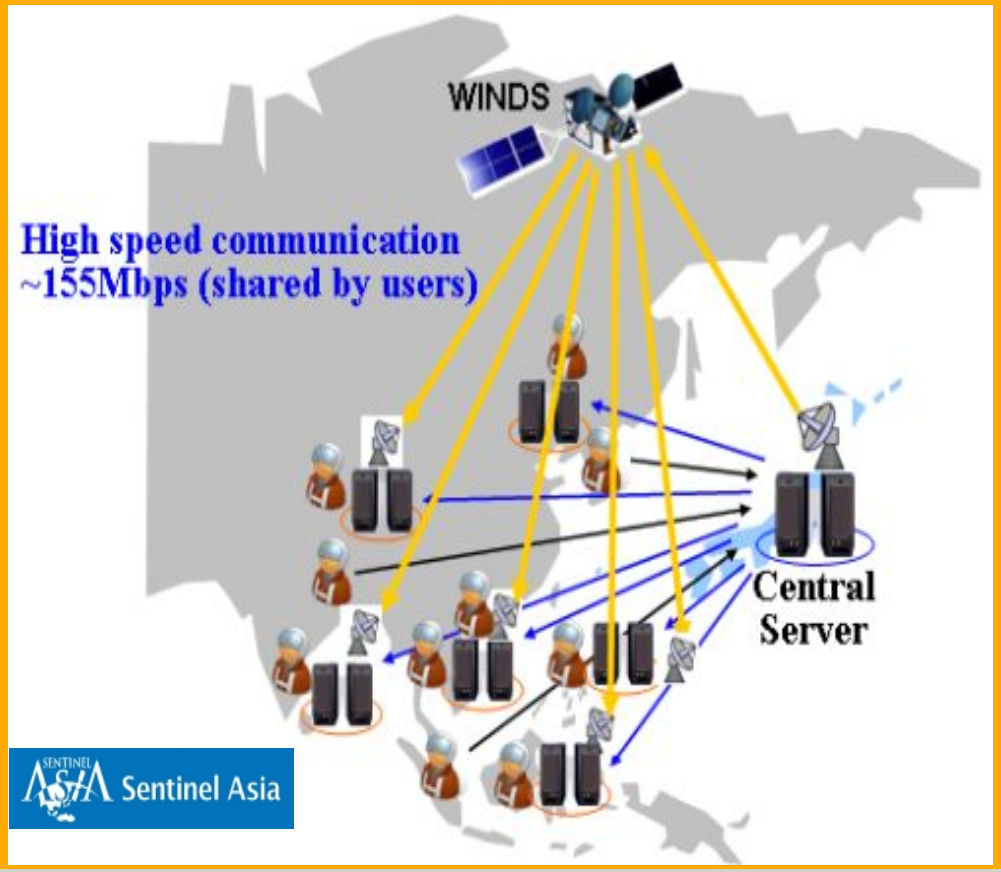
Mud-rock Flow Monitoring Map in Zhouqu County
Source: ALOS-AVNIR, JAXA 2010
Acquired: Pre-event 10/03/2010; post-event 10/08/2010
Copyright China Meteorological Administration

Volcanic Ash Monitoring

(incl. CEOS Atmos. Composition Constellation)

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

Sentinel Asia



Sentinel Asia (Disaster management in Asia-Pacific region) (72 organizations from 24 countries/regions and 13 international organizations)., including 5 agencies from China

Plan

- Background on Disaster Risk Management (DRM)
- **Improving the CEOS Support to DRM**

CEOS Vision for DRM

Top Objectives:

1. Increase and strengthen the contribution of EO satellite to the various DRM phases through a series of coordinated enlarged actions

2. Raise the awareness of politicians, decision-makers and major stakeholders on the benefits of using satellite EO in all phases of DRM.

How ? …

Improve the coordination between EO satellites observations and take appropriate actions aiming at better distributing EO satellite data and fostering its use by the DRM users…

If successful, demonstration of space agencies' capacity to provide the right EO data that can be transformed into high-value information

Facilitate the positioning of EO from Space in the 2015 post-Hyogo framework of actions …

CEOS Vision for DRM: Actions

5 Major Actions:

1. **Define a Global Satellite Observation Strategy for DRM**
   - Detailed assessment of needs, gaps and definition of observation requirements in terms of EO data (similar to FCT and JECAM)
   - Definition of strategy in response to observation requirements;

2. **Implement the Global Satellite Observation Strategy for DRM**
   - each CEOS agency to acquire, process and archive the EO satellite data and products (e.g. L0 to L2)

3. **Set up a virtual repository for DRM-relevant data / products / information from both space agencies and DRM-Users and make the repository content accessible to all DRM users**
   - provide DRM user community with a series of tools to discover & access EO data through DRM-dedicated web portal (one stop shop); includes access to DRM Baseline Dataset

4. **Set up DRM Data Processing Platform**:
   - a capacity to enable access to EO based Value Added products, tools & on demand processing - support science & services exploitation of Satellite EO (requires infrastructure for science data) – enable EO based content generation & hosting user generated content

5. **Ensure the positioning of EO from Space in the 2015 post-Hyogo Framework of Actions**
   - 2015 post-Hyogo FA Plan (2015-2025) to be adopted at 2015 World Conference on Disaster Risk Reduction and UN Nations Assembly
   - Close dialog with the major stakeholders in charge of defining the 2015 post-Hyogo FA

3 Supporting Actions:

6. **DRM Outreach & Evaluation of CEOS DRM Actions**
7. **EO Capacity Building for DRM,**
8. **Satellite EO DRM Projects Database**

Overview

Following approval of 2012 CEOS Plenary, team work focused on:

- CEOS Observation Strategy
- Positioning of EO space agencies in 2015 World Conference of Disaster Risk Reduction (incl. post-Hyogo Framework for Action)
- Supporting actions: *Outreach, Capacity Building, Satellite EO DRM Projects Database*

Implementation Plan available at SIT-28.

- Cover 2013-2015 period with initial focus on 2013.
- Will be updated annually e.g. addition of follow-on actions after endorsement of CEOS Observation Strategy @ 2013 CEOS Plenary

CEOS Observation Strategy

- Will be delivered at 2013 CEOS Plenary

CEOS Observation Strategy

Staged approach: initial focus on 3 types of hazards: flood, seismic risks and volcanoes

- only 3 thematic priorities to focus efforts across a limited number of demonstrators and geographic areas, over the coming 3 years .
- 3 Thematic Teams created.

3 Pilots to demonstrate the added value of both EO satellite data and CEOS coordination to a set of activities of different nature: various user communities, various stakeholders, various DRM phases, …

Interface to User Communities/ Stakeholders to get real User Needs in relation to the 3 Pilots

Observation Strategy Development Work Structure

DRM Team

Name	Agency
Stefano Bruzzi, Laura Candela	ASI
Steven Hosford	CNES
Christine Giguere, Ahmed Mahmood, Surendra Parashar, Guy Seguin (Team Co-Chair)	CSA
Jens Danzeglocke, Jörn Hoffman	DLR
Philippe Bally, Maurice Borgeaud, Stephen Briggs, Ivan Petiteville (Team Co-Chair)	ESA
Brian Killough, Frank Lindsay, Karen Moe, Shelley Stover.	NASA
Yana Gevorgyan	NOAA
Takao Akutsu, Osamu Ochiai	JAXA
Brenda Jones	USGS

Floods (
NASA &
C

eismic (
& Hoffm

Volcan
Poland/
Zoffo

Thematic Teams

Thematic Team	Name	Agency
Floods	Guy Seguin	CSA
	Francis Lindsay	NASA
	Stuart Frye	NASA
	John Bolten	NASA
	Bob Kuligowski	NOAA
	Laura Candela	ASI
	Philippe Bally	ESA
Seismic Risks	Philippe Bally	ESA
	Jörn Hoffman	DLR
	Alain Giros	CNES
	Delphine Fontannaz	CNES
	Laura Candela	ASI
Volcanoes	Michael Poland	USGS
	Simona Zoffoli	ASI
	Michael Pavolonis	NOAA
	Rick Wessels	USGS

* : external to the Ad Hoc Team

EO Capacity Building for DRM - Action # 7

Main Objective:

Establish a network of regional capacity building partners to ensure that countries active in DRR have space-based EO related capacity to be applied to DRM – helping others use EO.

WGCapD is the Lead identified in the Implementation Plan to be issued at SIT-28.

DRM Capacity Building: Implementation

1. Liaise with partners such as UN-SPIDER to ensure that existing regional networks can be brought to bear in developing approaches to implement CEOS DRM capacity building initiatives;

2. Review content of thematic demonstrators and identify opportunities for regional leverage through capacity building initiatives;

3. Identify on a regional basis volunteer CEOS agencies for specific theme-based EO capacity building support;

4. Integrate specific recommendations under this action into content of demonstrators;

5. Consider cross-cutting capacity issues and identify separate recommendations beyond demonstrators;

6. Seek input and support from CEOS WGCapD. Looking for ideas !!!

2013 Meetings

In addition to monthly telecons, 2 meetings planned:

1. DRM Team & Thematic Teams meeting (NASA Goddard, USA – May 13-14, 2013)

2. (still TBC): DRM Team & Thematic Teams meeting (location TBD, could be side meeting to Living Planet meeting in Edinburgh September 2013.)

A WGCapD person is invited to join the CEOS DRM team and to participate to all activities, making the liaison with the WG itself …

THANK YOU …

Pictures from www.weburbanist.com, www.redsticknow.com, www.untasdamis.fr

Supporting Slides

3 Thematic Pilots *(1/2)*

Guidelines produced to help Thematic Teams define pilots from existing projects or based on new activities

3 Thematic Pilots to:

- **Highlight support satellite EO to full-cycle risk management.**
- **to foster the use of EO satellite data by stakeholders, alleviate / remove some of the existing barriers to data access. Fill identified gaps and flaws whenever feasible with Agencies' resources available**
- **Demonstrate that proper coordination of CEOS Agencies efforts can improve on-going DRM-related projects.**
- **Demonstrate that some global / worldwide activities can be achieved only through appropriate collaboration of CEOS space agencies.**
- **Reinforce existing and create new links with the major DRM stakeholders.**
- **Ensure a greater role for EO space data providers in the next 2015-2025 post-Hyogo Framework for Action.**

3 Thematic Pilots *(2/2)*

Three 3-year thematic coordinated pilots, in partnership with user communities:

- **Initial regional focus to make a visible and concrete CEOS' contribution to the 2015 review of the post Hyogo FA.**
- **Strong user involvement to be successful; bring providers and users of EO together**
- **Demonstrate added value of EO to DRM Users;**
- **Present EO in a non-satellite centric, 'integrated' solution that shows how satellite EO can be an enabler, bringing innovative solutions to traditional DRM challenges.**

Implementation Plan

Describes how the DRM team will work during the period 2013-2015.

- Initial focus on 2013. Plan will be updated end of 2013 to include the follow-on actions related to CEOS Observation Strategy

Pilots will rely largely on on-going disaster-related activities from space agencies and CEOS (e.g. CEOS Disaster SBA team activities on Flood Monitoring)

Schedule:

- Pilot templates completed (draft 1): end of March
- Proposed pilot descriptions (draft 2): end of April
- Refined pilots (draft 3): mid-June
- EO data requirements for each pilot: end of July
- Final proposed pilots: early September
- Presentation of pilots to SIT Workshop: September
- Presentation of both **CEOS Observation Strategy** and **set of follow-on recommended actions for 2014 onwards** to CEOS Plenary