

Near real-time alerting for humanitarian disasters
using satellite and in-situ sensors:

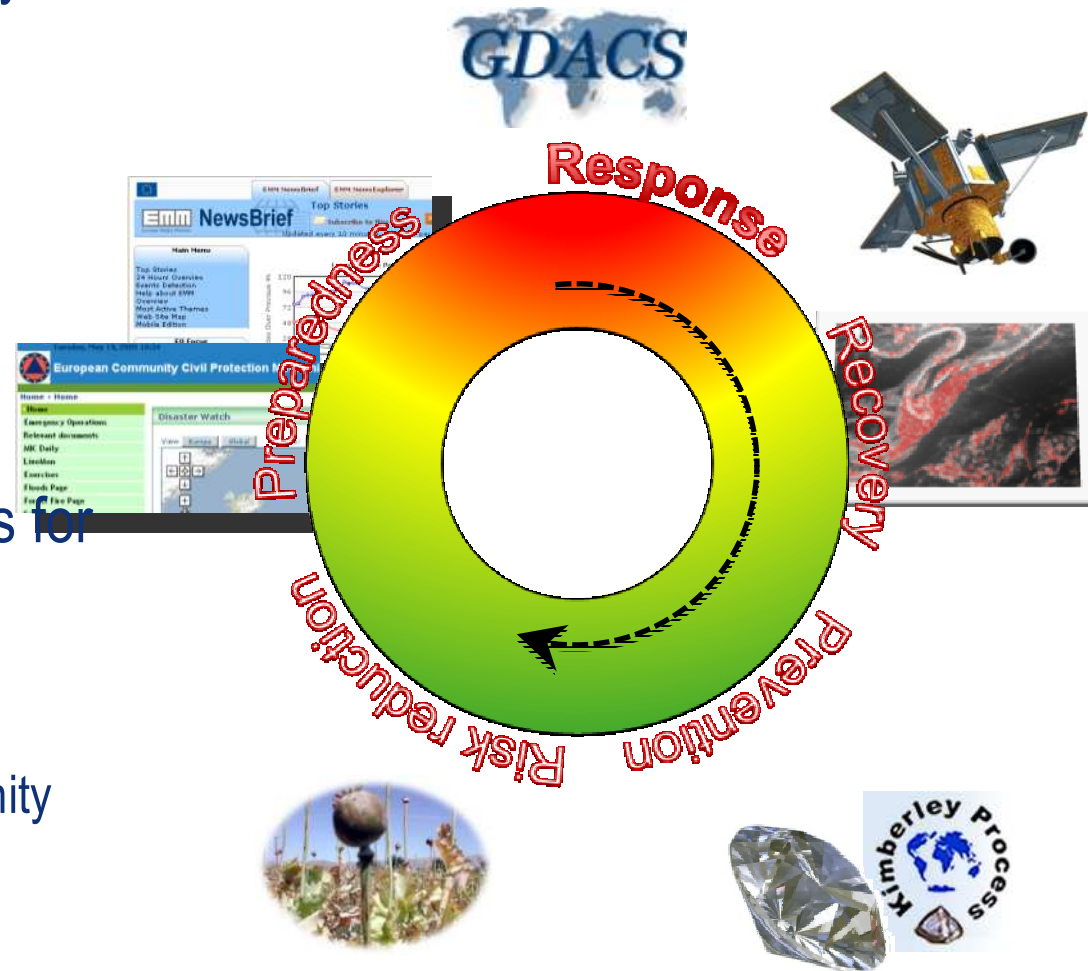
Global Disaster Alert and Coordination System

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Institute for the Protection and the Security of the Citizen
Unit for Global Security and Crisis Management

- Europe and European Commission are large players in **international disaster management**
- JRC provides scientific and technical support
- Policy and action for disasters
 - Humanitarian aid office (ECHO):
 - largest **humanitarian aid** donor in the world
 - Civil Protection Mechanism
 - **Coordination of European first response**
 - Monitoring and Information Center (MIC), field coordination missions
- External Relations:
 - **Prevention, mitigation, reconstruction** programmes
 - **World Bank Post Disaster Needs Assessment**: JRC does technical implementation
- Development:
 - Reduction of **vulnerability** and improvement of **resilience**
 - **African Caribbean Pacific Observatory**: direct, long-term support to ACP countries

- JRC Unit for Global Security and Crisis Management
 - Preparedness
 - **Response**
 - Recovery
 - Prevention
 - Risk reduction
- Alert and response systems for natural disasters
 - Real time systems: **GDACS**
 - Physical and risk modelling
 - Strong practitioners community
 - Multidisciplinary scientific community



- GDACS: system for **international disaster response** community
 - Information gap in the initial response phase
 - Monitoring
 - Impact / risk analysis
 - Information integration
 - 10000 active users of 184 countries
 - Secretariat: OCHA

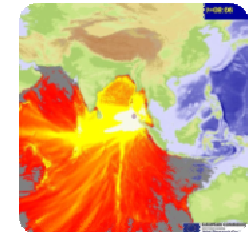


- Open access, standards
 - OGC, INSPIRE, Web2.0
 - GLIDE number

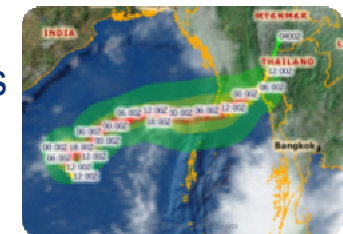


- JRC's role: alert and monitoring system

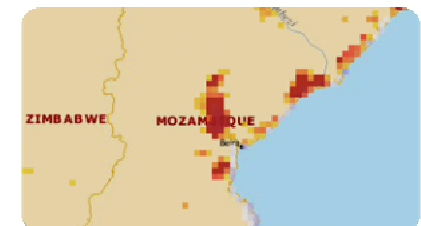
- Earthquakes and tsunamis
 - 13 scientific partners
 - Tsunami modelling
 - Impact modelling



- Tropical cyclones
 - 2 scientific partners
 - Wind modelling
 - Impact modelling



- Volcanic eruptions, Floods
 - 6 scientific partners
 - New scientific monitoring networks





The Global Disaster Alert and Coordination System provides near real-time alerts about natural disasters around the world and tools to facilitate response coordination, including media monitoring, map catalogues and Virtual On-Site Operations Coordination Centre.

New and ongoing disasters

☐ Reload page every 60 seconds



This google map mashup is using the GDACS KML file: <http://www.gdacs.org/kml/gdacs.kml>



Office for the
Coordination of
Humanitarian
Affairs



Joint Initiative of the United Nations and the European Commission -- [Contact us](#) -- [Disclaimer](#)

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GDACS Red Earthquake Alert Chile

Summary

On 2/27/2010 6:34:14 AM UTC (about 01:42h local time) an earthquake of magnitude 8.8 occurred in the moderately populated region of Bio-Bio in Chile. The earthquake happened 104km from Concepción. The nearest populated places are: [None]. The closest civilian airport is Quivolo (88km).

It is likely that a tsunami was generated. The maximum tsunami wave height near the coast of **Tres Esquinas** will be **8.65m**. Please refer to the [GDACS tsunami report](#) for more details.

Potentially affected critical infrastructure:

- Nuclear plants:** [None]
- Hydrodams:** [None]
- Airports:** Los Angeles (177km), La Playa (148km), Siberia (167km), Carriel Sur International (98km), General Bernardo O Higgins (119km), Linares (134km), Panguilemo (142km), Quivolo (88km)
- Ports:** Lebu (198km), Puerto Yana (173km), Lota (135km), Coronel (127km), San Vicente (94km), Lirquen (90km), Talca (89km), Talcahuano (88km), Tome (81km), Constitución (87km)

Based on an automated impact model, this earthquake, which occurred in a region with **low vulnerability** to natural disasters, has potentially a **high humanitarian impact**.

Whether international humanitarian aid is needed must be decided by an expert.

Event Date Univ. Time:	Sat, 2/27/2010 06:34 UTC
European Time of the event:	Sat, 2/27/2010 07:34 CET (Brussels, Paris, Rome)
East America Time of the event:	Sat, 2/27/2010 01:34 EST (New York, Washington)
West America Time of the event:	Fri, 2/26/2010 22:34 PST (San Francisco, Los Angeles)
East Asia Time of the event:	Sat, 2/27/2010 15:34 JTI (Tokyo)

This email report was automatically created by a computer at: 3/24/2010 8:51:41 AM UTC (25 day(s)2 hours 17 minutes after the event)

See the [GDACS website](#) for live news coverage (including OCHA Situation Reports), the [full earthquake report](#) and [tsunami report](#).

For information on emergency response, please consult the [GDACS Virtual OSOCC](#).

Tsunami Event

It is likely that a tsunami was generated. Based on precalculated scenarios, the maximum tsunami wave height near the coast of **Tres Esquinas** will be **8.65m**.

A detailed tsunami wave height calculation is ongoing and should be available 20 minutes after this report was created. Results can be slightly different than the precalculated scenario. The outcome can be checked here: [GDACS tsunami report](#).



GDACS system (times relative to event)

23 min Detection of earthquake, but inaccurate

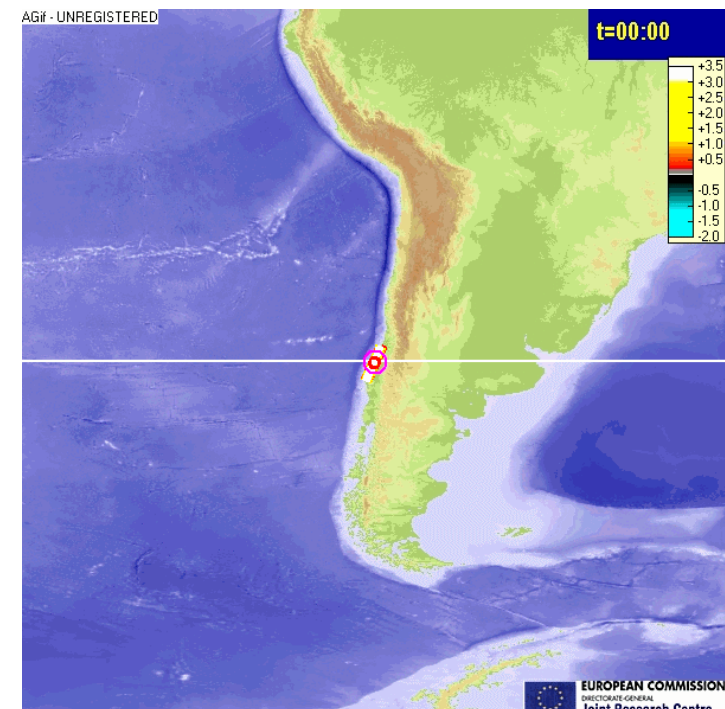
43min Detection of strong EQ through NEIC

53min GDACS Red tsunami Alert

53min GDACS report published on-line

53min SMS, Email, Fax alert sent to 11000 users

all automatic



GDACS system (times relative to event)

collaboration of first responders

12 Jan 21:53

18 min GDACS/JRC red alert

1h GDACS Virtual OSOCC topic created

1h30 UNDAC Alert Message

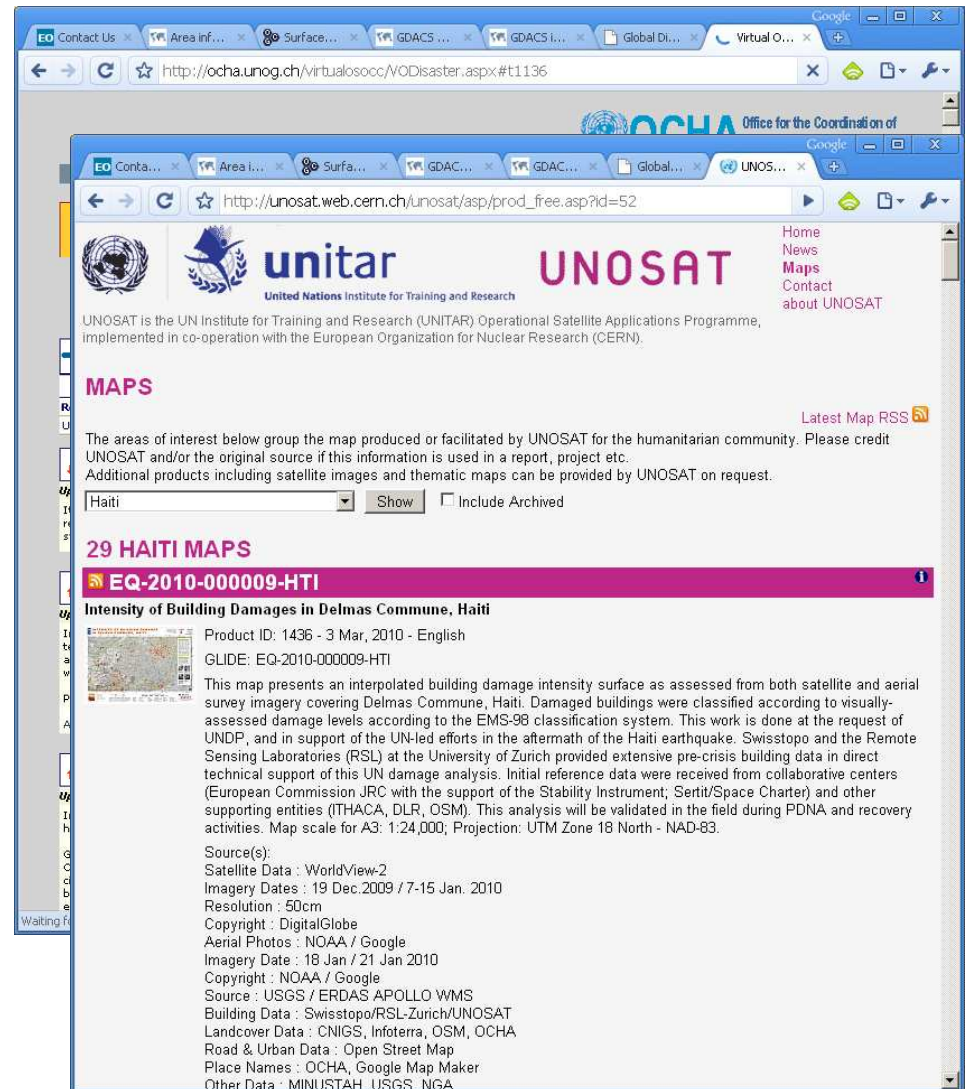


<4h Media “no reports of casualties”

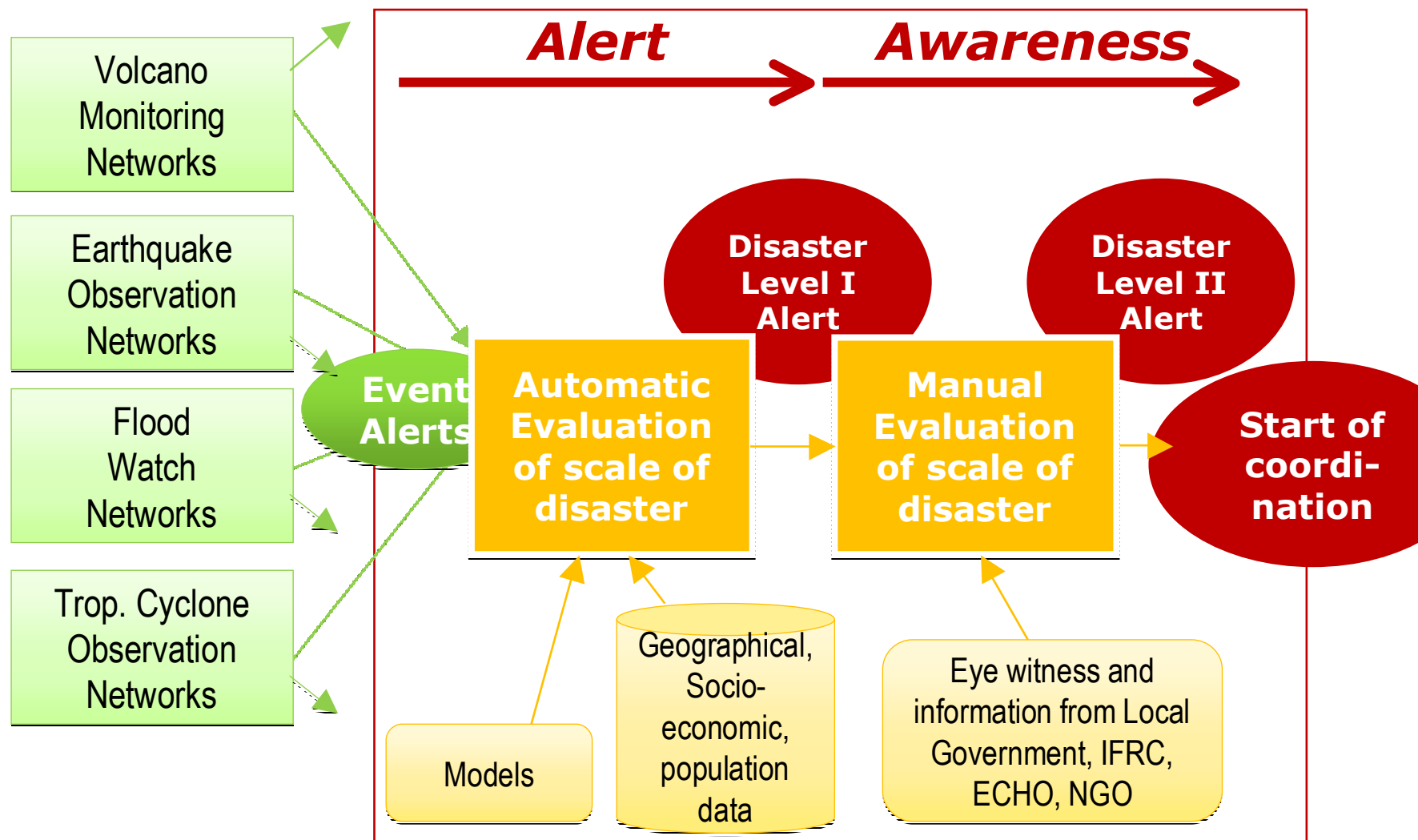
4h Media reports “many deaths feared”

18h Media reports “hundreds / thousands death”

16 Jan First satellite based damage map



The screenshot shows a web browser displaying the UNOSAT website. The browser's address bar shows the URL: <http://ocha.unog.ch/virtualosocc/VODisaster.aspx#t1136>. The website header includes the UNOSAT logo and the text "UNITAR United Nations Institute for Training and Research". Below the header, there is a section titled "MAPS" with a description: "The areas of interest below group the map produced or facilitated by UNOSAT for the humanitarian community. Please credit UNOSAT and/or the original source if this information is used in a report, project etc. Additional products including satellite images and thematic maps can be provided by UNOSAT on request." A search bar shows "Haiti" and a "Show" button. Below this, there is a section titled "29 HAITI MAPS" with a highlighted entry: "EQ-2010-000009-HTI". The entry title is "Intensity of Building Damages in Delmas Commune, Haiti". The product ID is "1436 - 3 Mar, 2010 - English". The GLIDE is "EQ-2010-000009-HTI". The description states: "This map presents an interpolated building damage intensity surface as assessed from both satellite and aerial survey imagery covering Delmas Commune, Haiti. Damaged buildings were classified according to visually-assessed damage levels according to the EMS-98 classification system. This work is done at the request of UNDP, and in support of the UN-led efforts in the aftermath of the Haiti earthquake. Swisstopo and the Remote Sensing Laboratories (RSL) at the University of Zurich provided extensive pre-crisis building data in direct technical support of this UN damage analysis. Initial reference data were received from collaborative centers (European Commission JRC with the support of the Stability Instrument; Sertit/Space Charter) and other supporting entities (ITHACA, DLR, OSM). This analysis will be validated in the field during PDNA and recovery activities. Map scale for A3: 1:24,000; Projection: UTM Zone 18 North - NAD-83." The source(s) are listed as "Satellite Data : WorldView-2", "Imagery Dates : 19 Dec 2009 / 7-15 Jan. 2010", "Resolution : 50cm", "Copyright : DigitalGlobe", "Aerial Photos : NOAA / Google", "Imagery Date : 18 Jan / 21 Jan 2010", "Copyright : NOAA / Google", "Source : USGS / ERDAS APOLLO WMS", "Building Data : Swisstopo/RSL-Zurich/UNOSAT", "Landcover Data : CNIGS, Infoterra, OSM, OCHA", "Road & Urban Data : Open Street Map", "Place Names : OCHA, Google Map Maker", and "Other Data : MINUSTAH, USGS, NSA".



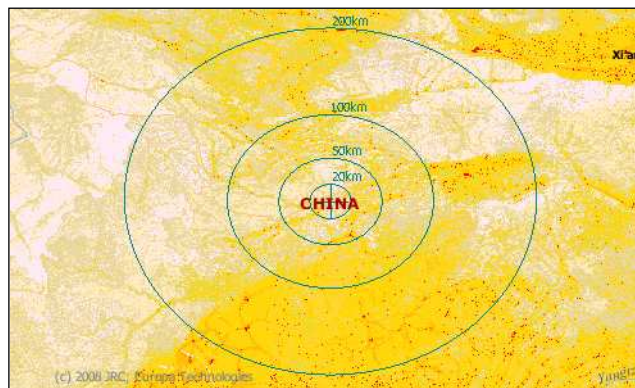
- Risk analysis
 - **Risk = Hazard x Population x Vulnerability**
 - Hazard = 0 then Risk = 0
 - Population = 0 then Risk = 0
 - Vulnerability = 0 then Risk = 0
- Impact analysis is similar
 - **Impact =**
Event magnitude x Population in affected area x Vulnerability

Volcano
Monitoring
Networks

Earthquake
Observation
Networks

Flood
Watch
Networks

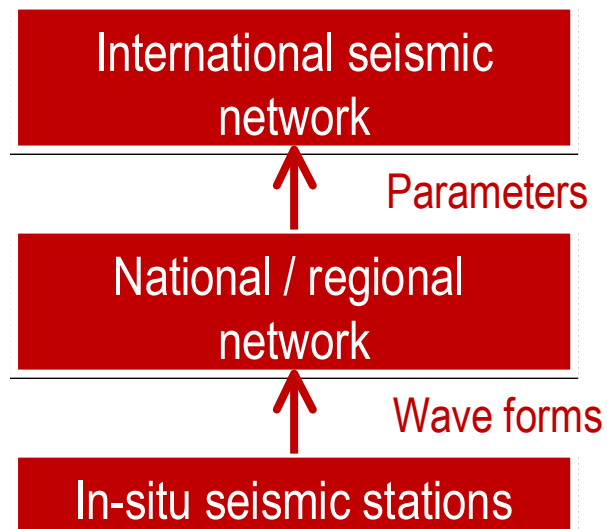
Trop. Cyclone
Observation
Networks



Socio-economic
Indicators (e.g.
UNDP, World
Bank)

	<i>Data collection</i>	<i>Global aggregation</i>	<i>Standard-based dissemination</i>	<i>Affected area estimation</i>
Volcano Monitoring Networks	some	 lacking		
Earthquake Observation Networks	 mature	 mature	 developing	 developing
Flood Watch Networks	 developing			
Trop. Cyclone Observation Networks	 mature	 mature	 lacking	

- Well established monitoring
 - IRIS, Orpheus
 - NEIC, EMSC
 - **In situ seismic stations**
- Several standards for data exchange
 - EIDS, miniSeed, QDDS



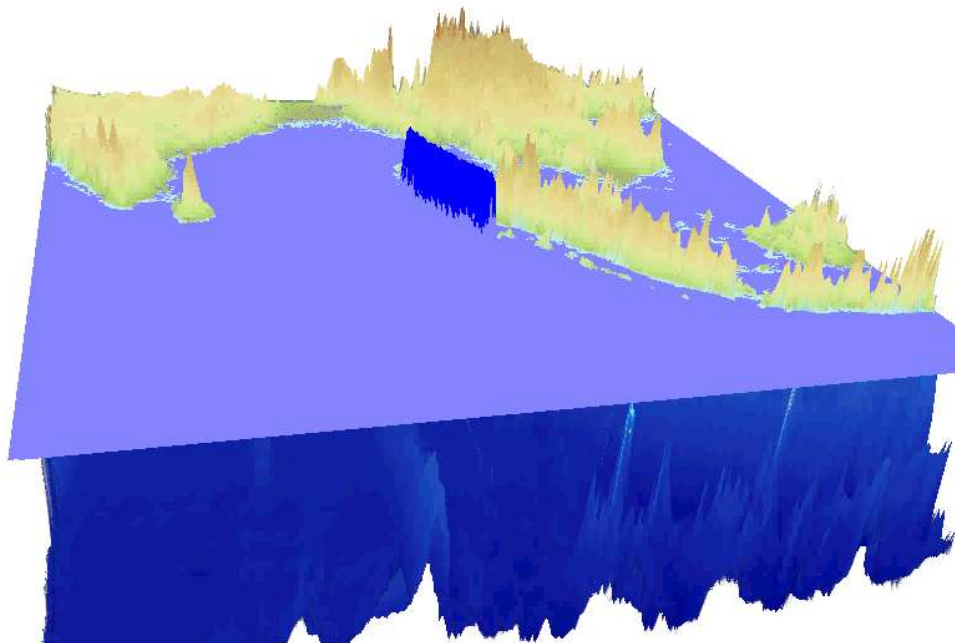
GDACS earthquake data push procedure: 24 Mar 2010 10:36:35 AM



List of latest events

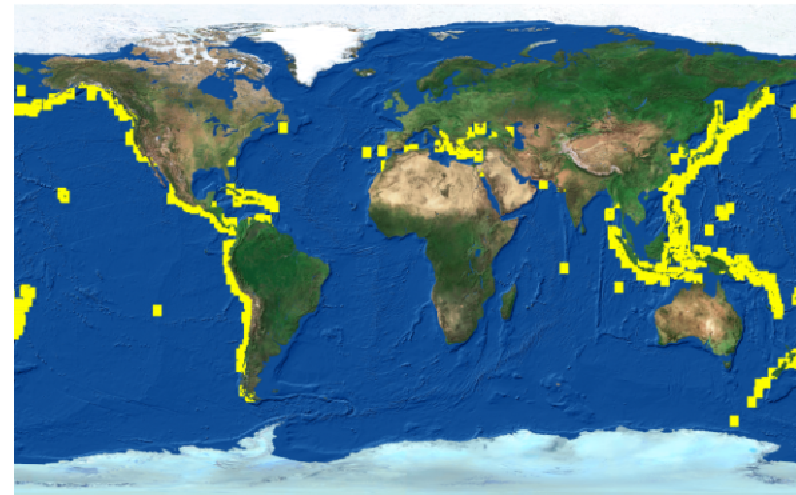
ID	Source	Date	lat	lon	mag	depth	Location	eventID	status	Note
33756	EMSC	24 Mar 2010 8:52:32 AM	39.78	42.76	2.9	8	EASTERN TURKEY	161785	test	reported
33753	EMSC	24 Mar 2010 7:21:48 AM	45.13	165.94	4.4	10	OFF W. COAST OF S. ISLAND, N.Z.	161773	test	reported

- Monitoring: earthquakes
- Affected area:
 - Wave propagation models
- JRC developed 2 models
 - JRC/SWAN: deep ocean
 - HyFlux2: coastal inundation



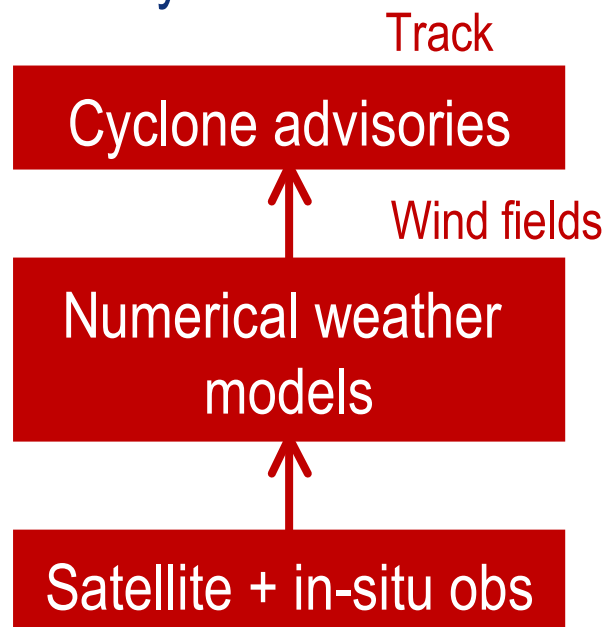
Indian Ocean 2004

- Implementation
 - Tsunami GRID 135000 calc's

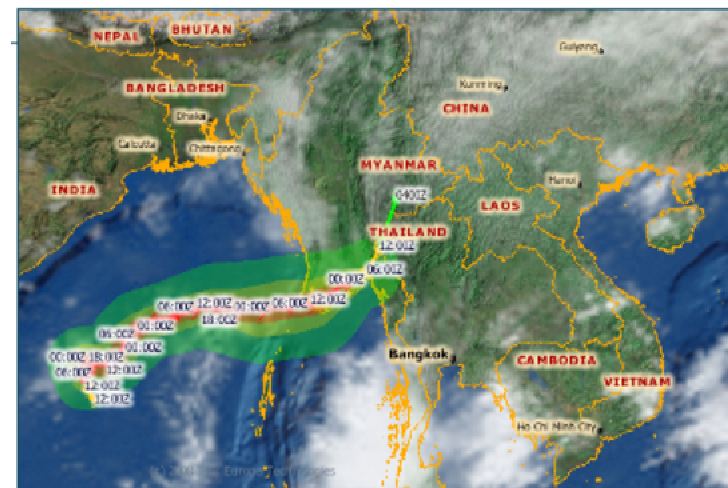


- Real-time validation
 - **In-situ ocean sensors**
 - JRC Tsunami Analysis Tool

- Well established monitoring
 - WMO Tropical Cyclone Program
 - WMO Severe Weather
- But: data on tracks and affected area not easily available for risk analysis



- JRC and Pacific Disaster Centre:
 - textual advisories → WFS/KML

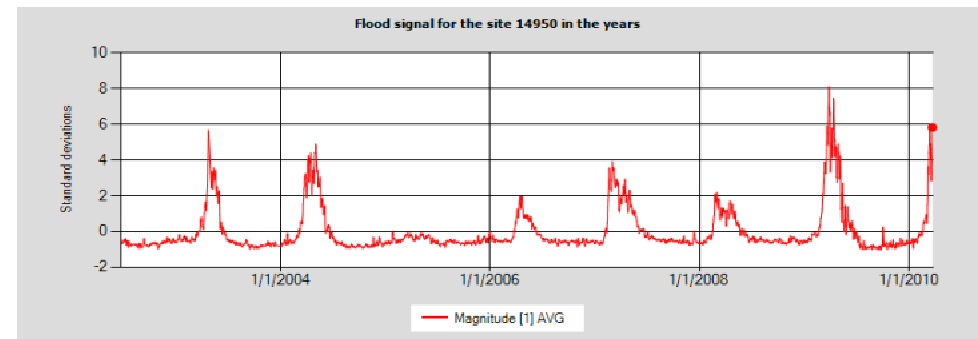


Typhoon Nargis

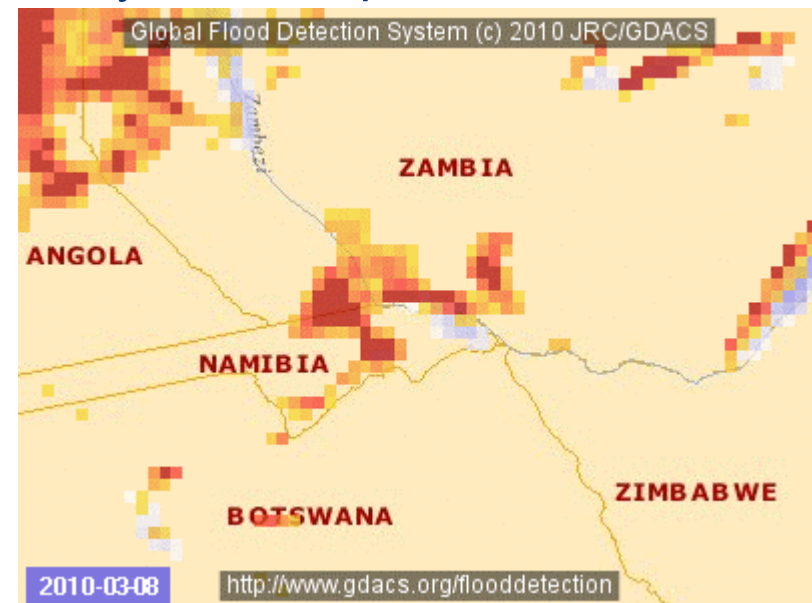
- Extra-tropical storms?

- No global monitoring yet
- JRC: experimental global flood detection and monitoring
 - Passive microwave remote sensing
 - AMSR-E and TMI sensors: multiple observations per day
 - Surface water changes
 - Pixels of 10x10km²
 - Very sensitive
- www.gdacs.org/flooddetection

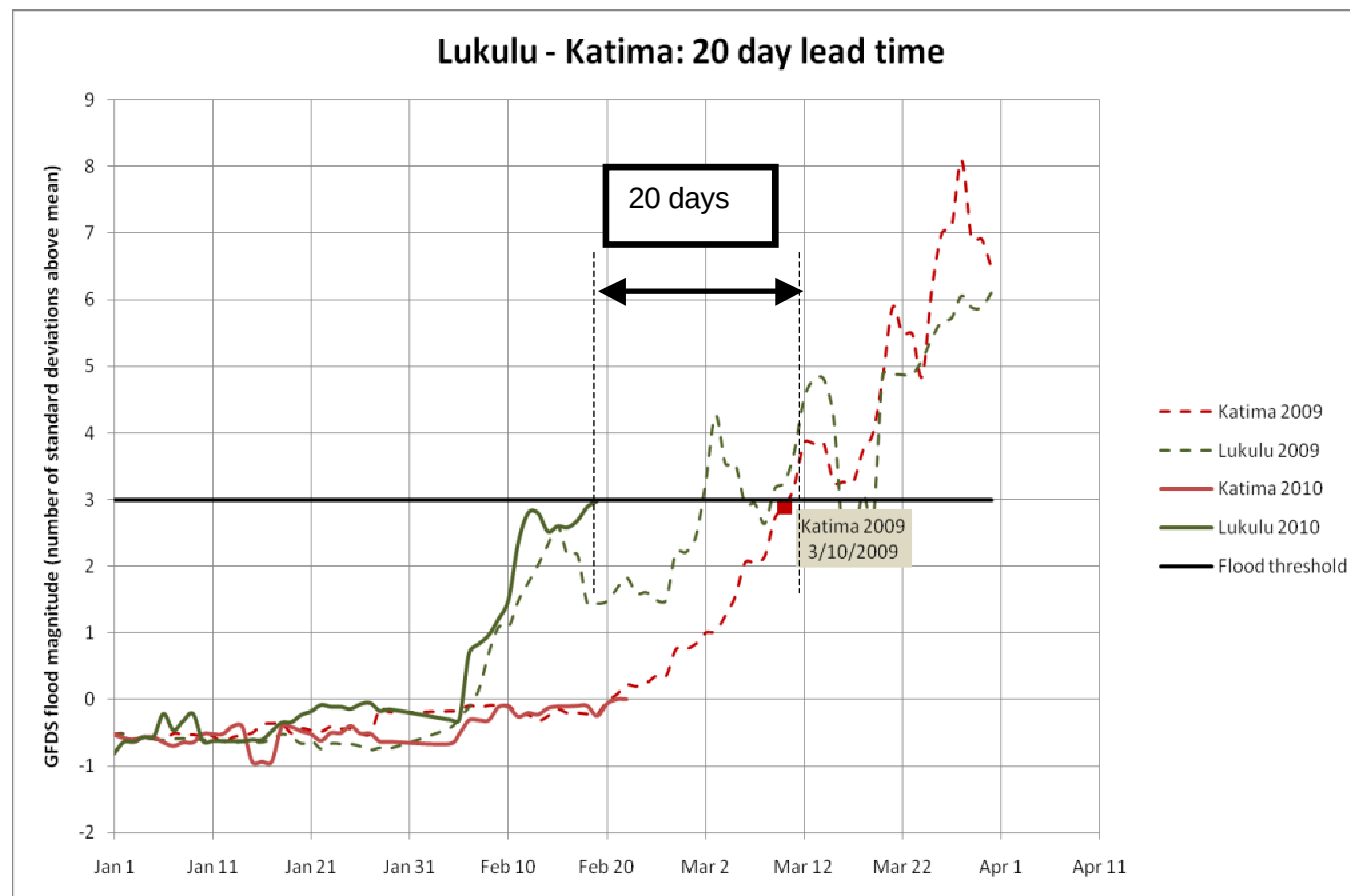
- Virtual hydrographs



- Daily flood maps



- Validation: Pilot in Namibia
 - Up to 20 day early warning
- Can be used as trigger for high resolution satellite acquisitions



	<i>Data collection</i>	<i>Global aggregation</i>	<i>Standard dissemination</i>	<i>Affected area estimation</i>
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- Global Disaster Alert and Coordination System
 - System for **international disaster response** community
 - Over 10000 users
- Based on monitoring systems
 - In-situ
 - Satellite
 - *Social media / crowd-sourcing*
- JRC's key contributions
 - Added value: impact analysis
 - Modelling: tsunamis
 - Monitoring: floods
- Partnerships
 - **United Nations** OCHA, UNOSAT, JLS, WFP, UNEP, HABITAT
 - **Scientific organisations**
 - **Earthquakes:** US, Italian, Portuguese, European, German, Russian, Indonesian seismological institutes
 - **Tropical cyclones:** Pacific Disaster Centre, NOAA, *WMO*
 - **Floods:** Dartmouth Flood Observatory, NASA, NOAA, Namibia, Ithaca, UNOOSA
 - **Volcanic eruptions:** Smithsonian Global Volcanism Program
 - **Tsunamis:** Pacific Tsunami Warning Centre, NOAA, UNESCO, Portugal