IGOS Geohazards: toward an improved use of Earth Observations for Geohazards mitigation

Scientific and Technical Subcommittee session

Vienna, 15th February 2007

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IGOS Geohazards Bureau

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esa

Géosciences pour une Terre durable

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Summary

- Some geological disaster management related issues
- Earth Observations and geological disaster management
- From user needs to multi-risk/hazards approaches
- IGOS Geohazards GeoHazData demonstrator
- International cooperation

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Hazards and risk

A short example: in December 2003, 3 earthquakes of magnitude 6,5 occurred:

- **Taiwan, 0 damage, 0 victims**
- **California, 0 damage, 1 victim**
- **Bam, Iran, city destroyed to 80%, 38 000 victims**

<u>Lessons learnt:</u>

- **Same probability of occurrence and of intensity of hazards does not mean "identical risk"**
- **Need to assess vulnerability of exposed elements, in order to take appropriate mitigation measures**

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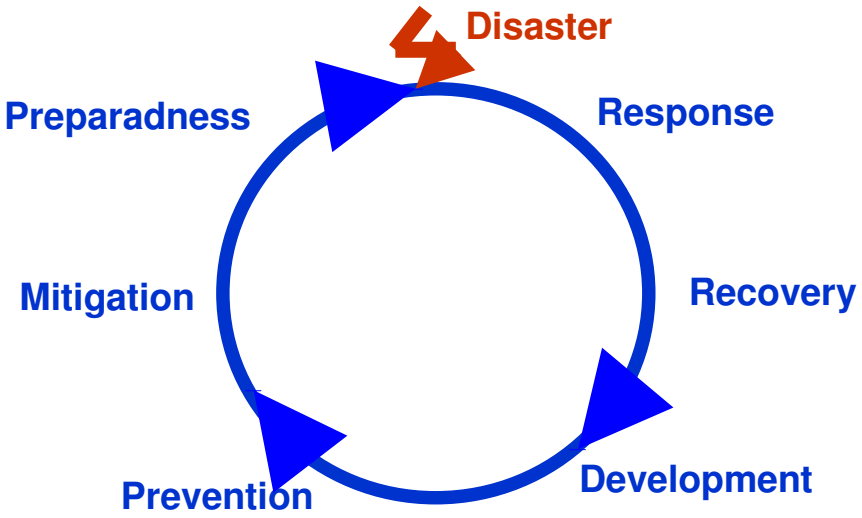
Mitigation and response policies



Policies focusing on crisis finally save lives, but recovery costs continue to increase

Mitigation policies:

- reduce vulnerability of exposed elements, saving lives and costs
- contribute to sustainable use of natural resources

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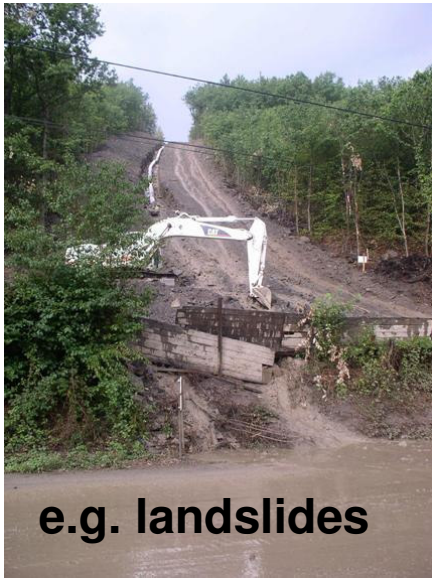
Mitigation policies can focus on

Reducing hazard



Need of information to identify hazards and level of threat

Reducing exposure

Need of input information for **LAND USE PLANING**

Reducing vulnerability

Need of information for the assesment of systemic and physical vulnerabilities

Need to collect all available information and data and to use it for multi-risk assessment

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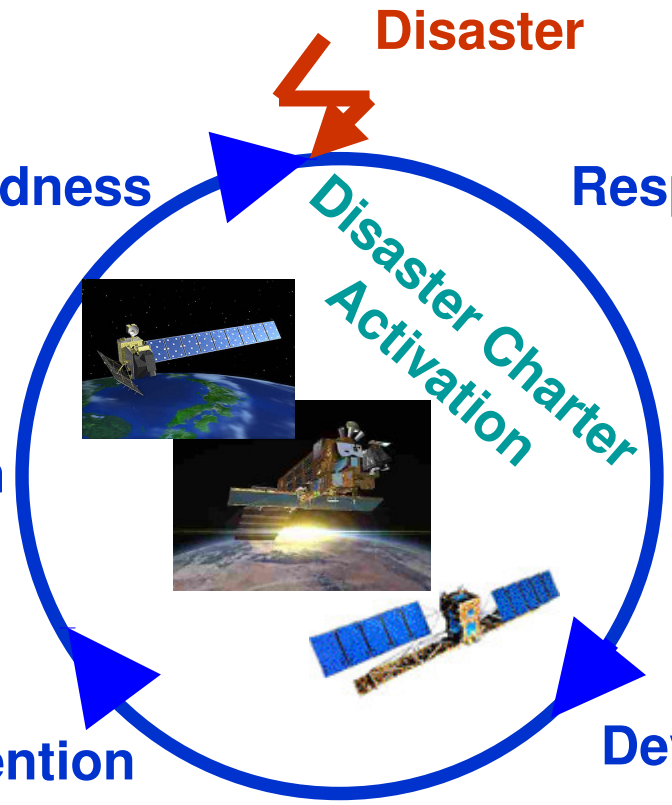
Access to data at different phases of the disaster cycle



- Upon requests
- Subject to satellite tasking priorities
- Conflict with the need of regular acquisitions

⇒ Need to facilitate access to Earth Observation data for Mitigation and Prevention of Geohazards

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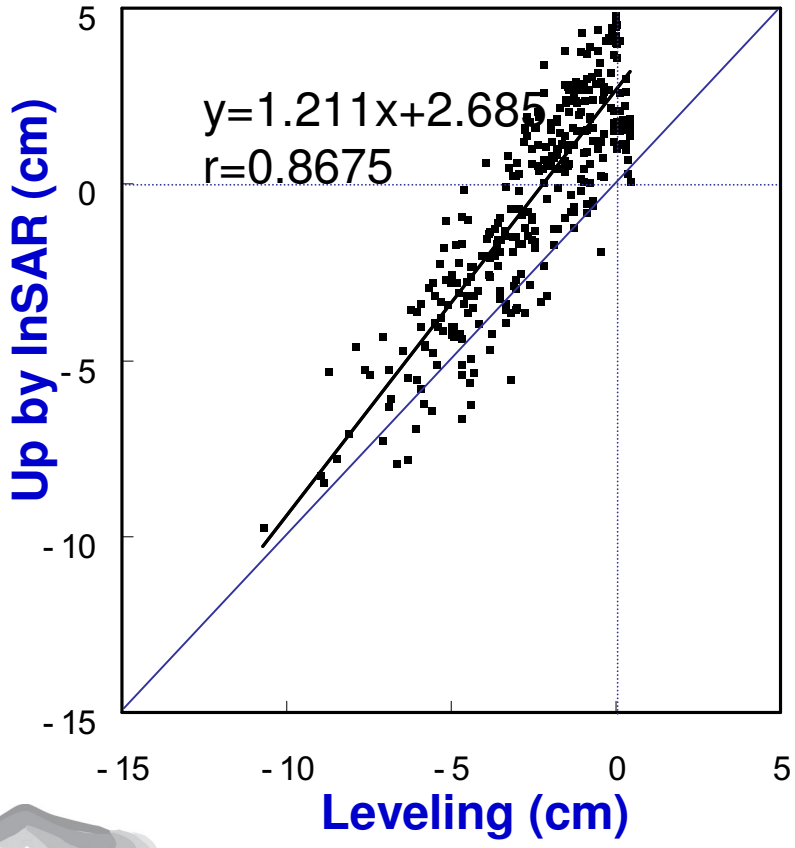
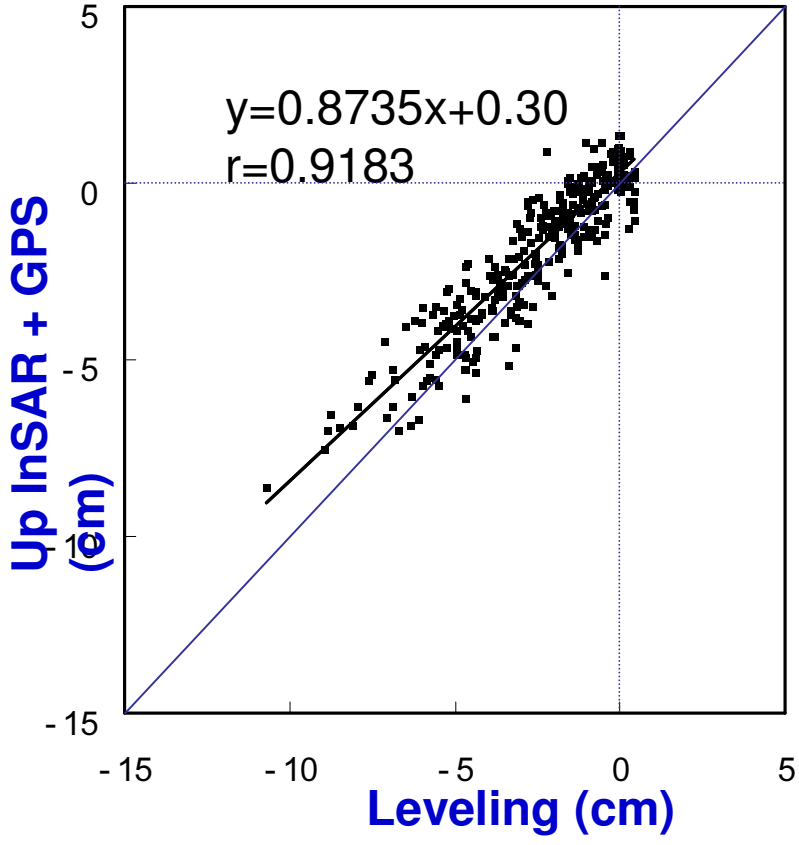
The need for multiple data sources: using Remote sensing together with in-situ data

GPS makes InSAR accurate.

Before (InSAR only)



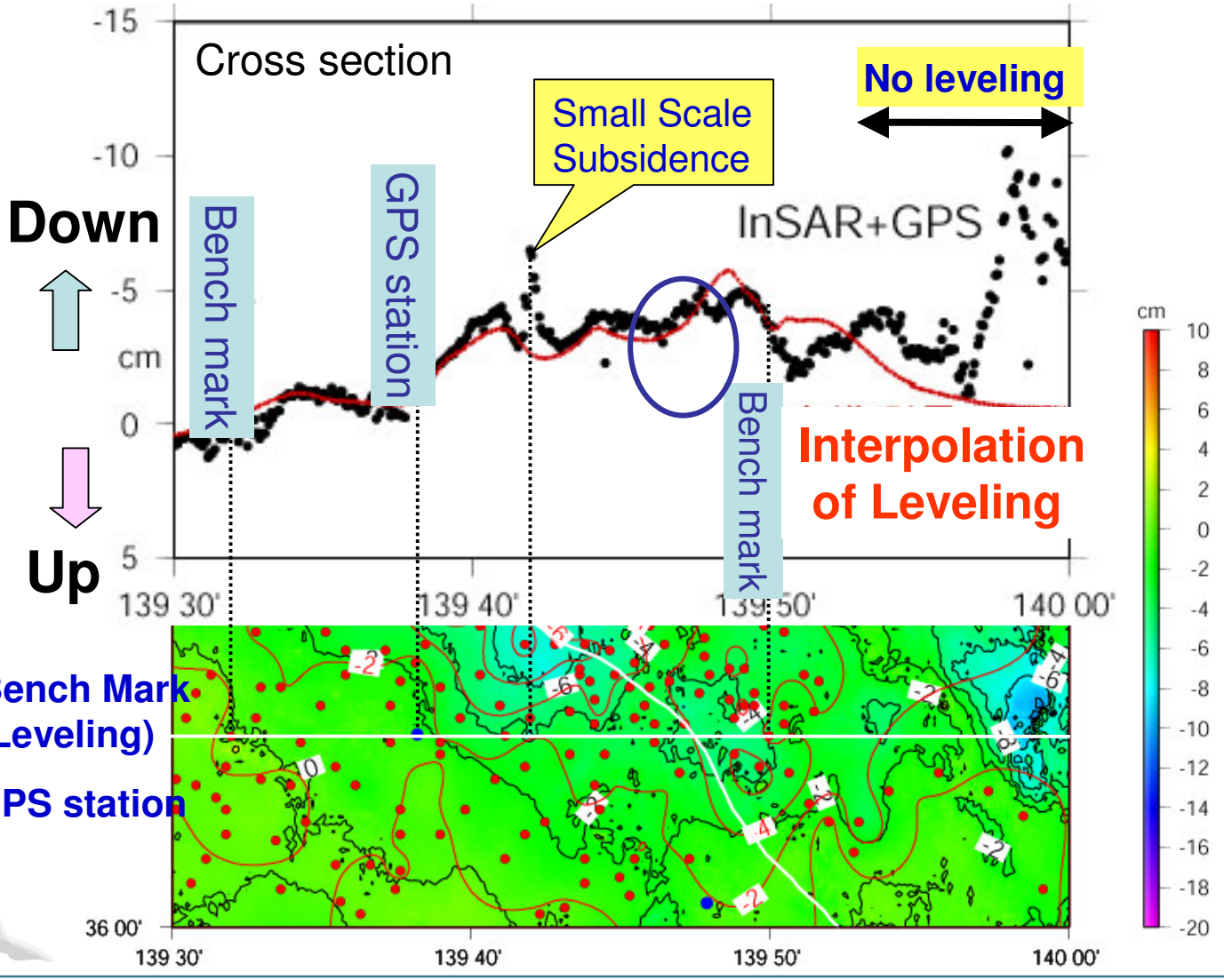
After (InSAR+GPS)



After Tobita, et al., 2004

Leveling vs. InSAR+GPS

After Tobita, et al., 2004



Bench Mark (Leveling)

GPS station

GSI SAR

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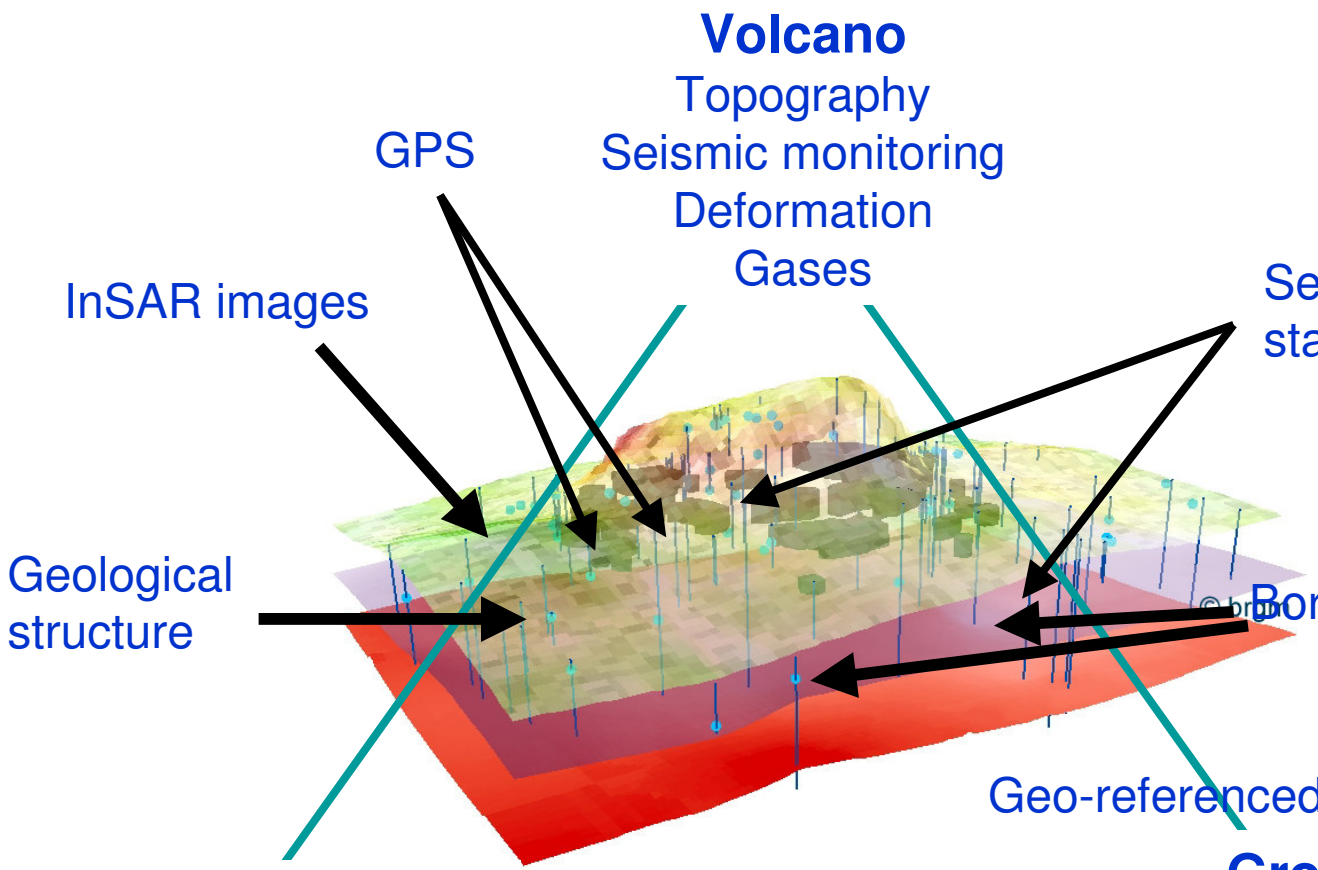
Geohazards observations



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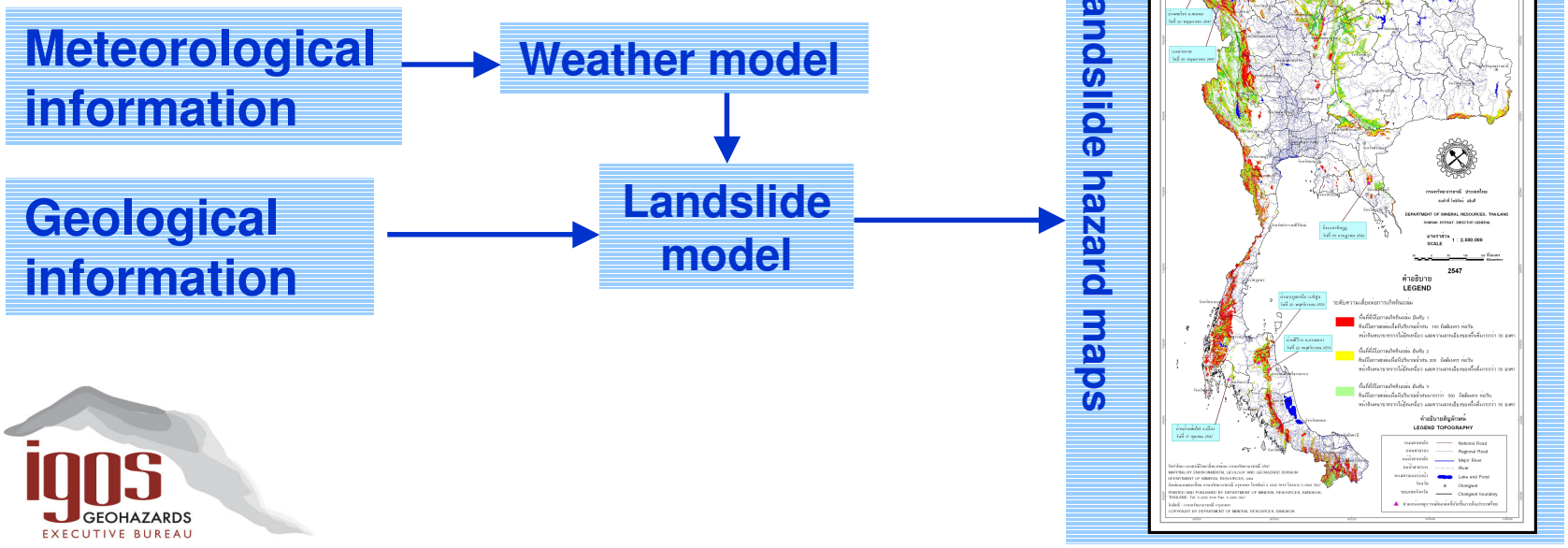
Multi-hazard approach:
Synergies Geo- and Meteorological Hazards

Meteorological data can be used for the mitigation of Geohazards: e.g. Landslides

- In Thailand, Landslides can be due to seism occurring in a near country during the rainy season.
- Implementation of a system using both meteorological and geological data to produce Landslide hazard maps and inform people living in the exposed area



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Source: Department of Mineral Resources
Ministry of Natural Resources and Environment

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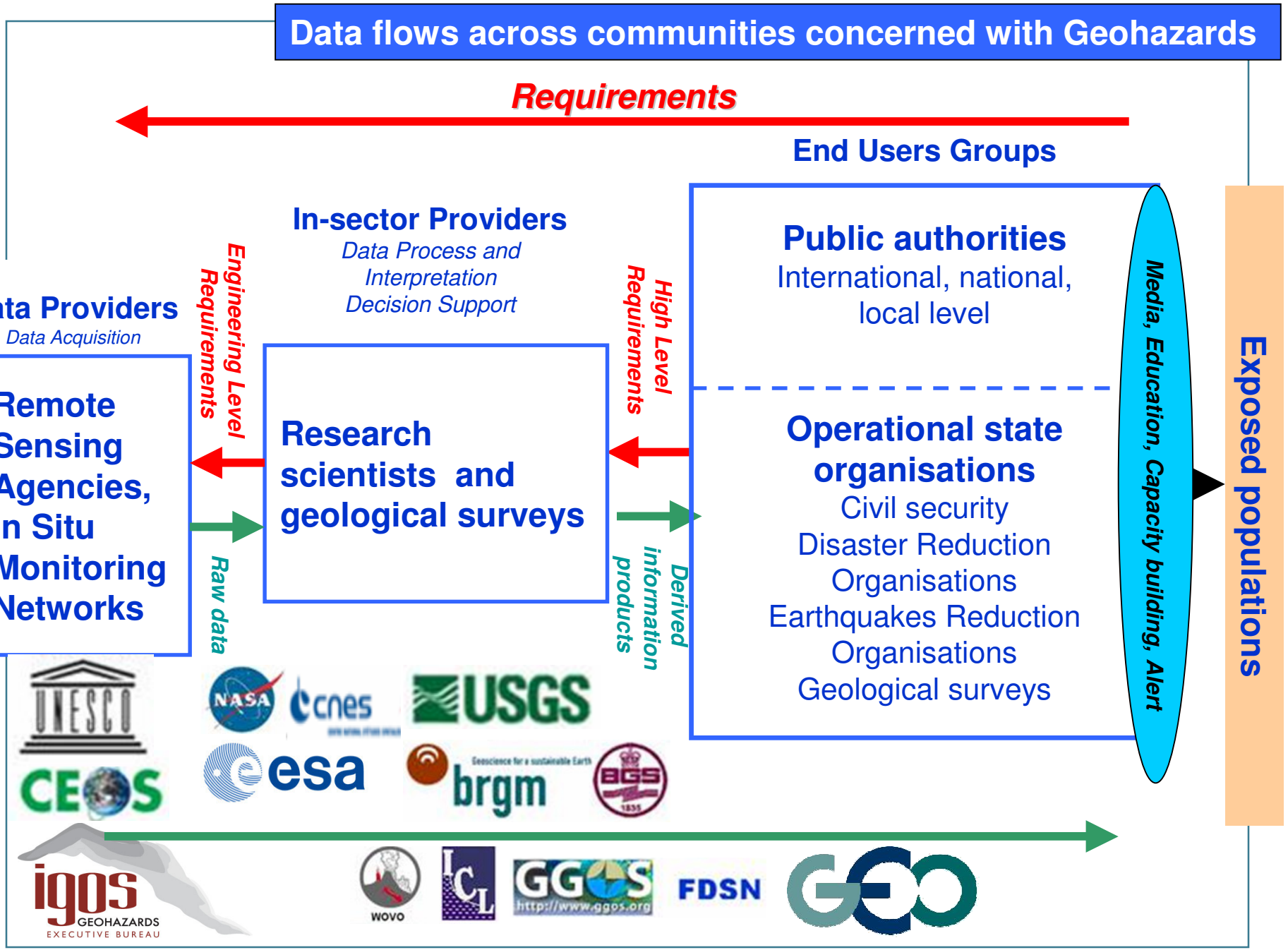
Data flows across communities concerned with Geohazards
Requirements
End Users Groups
In-sector Providers
Data Process and
Interpretation
Decision Support
Data Providers
Data Acquisition
Engineering Level Requirements
High Level Requirements
Public authorities
International, national,
local level
Remote Sensing Agencies, In Situ Monitoring Networks
Research scientists and geological surveys
Operational state organisations
Civil security
Disaster Reduction Organisations
Earthquakes Reduction Organisations
Geological surveys
Raw data
Derived information products
Media, Education, Capacity building, Alert
Exposed populations
UNESCO
NASA
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USGS
CEOS
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GEO

Benefits of multihazards/risk approach for Geohazards mitigation

- **Geohazards remains a highly diverse community with little interaction between thematic areas**
- **This is DESPITE significant overlap in earth observations for different Geohazards**

In addition, multi-hazard/risk strategies are expected to:

- **homogenize** hazard/risk assessments for all hazards
- facilitate the setting of **priorities** among the threats at international to local level
- facilitate **mitigation** actions
- facilitate the anticipation of **cascade** effects

Tsunami example: regional disaster, global response

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Need of a trans-disciplinary and Global coordination mechanism for geohazards

The need for coordination in Geohazards

- Multi-risk/hazards approach: many national initiatives, EC… At the international level: GEO, IGOS

Cooperations possibilities with UNOOSA SPIDER Programme

IGOS Geohazards limitation: only earthquake, volcanoes, landslides and tsunamis are considered, while geologists (and geological surveys) need to address the full range of geology related hazards, including floods, land heave and subsidence, gaseous emanations and more…

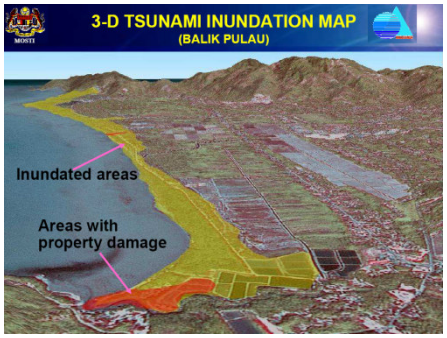
Geohazards products

Users are:

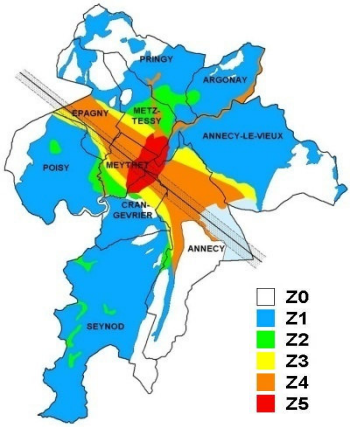
- **Public authorities: disaster management and land use planning authorities**
- **Private: building and insurance companies**
- **Citizens**
- **Scientific community**

Inventories of geohazards data, sensors and events

Damage and response scenarii



Hazard and risk maps (local to regional scale)



Annecy (France) microzonation map

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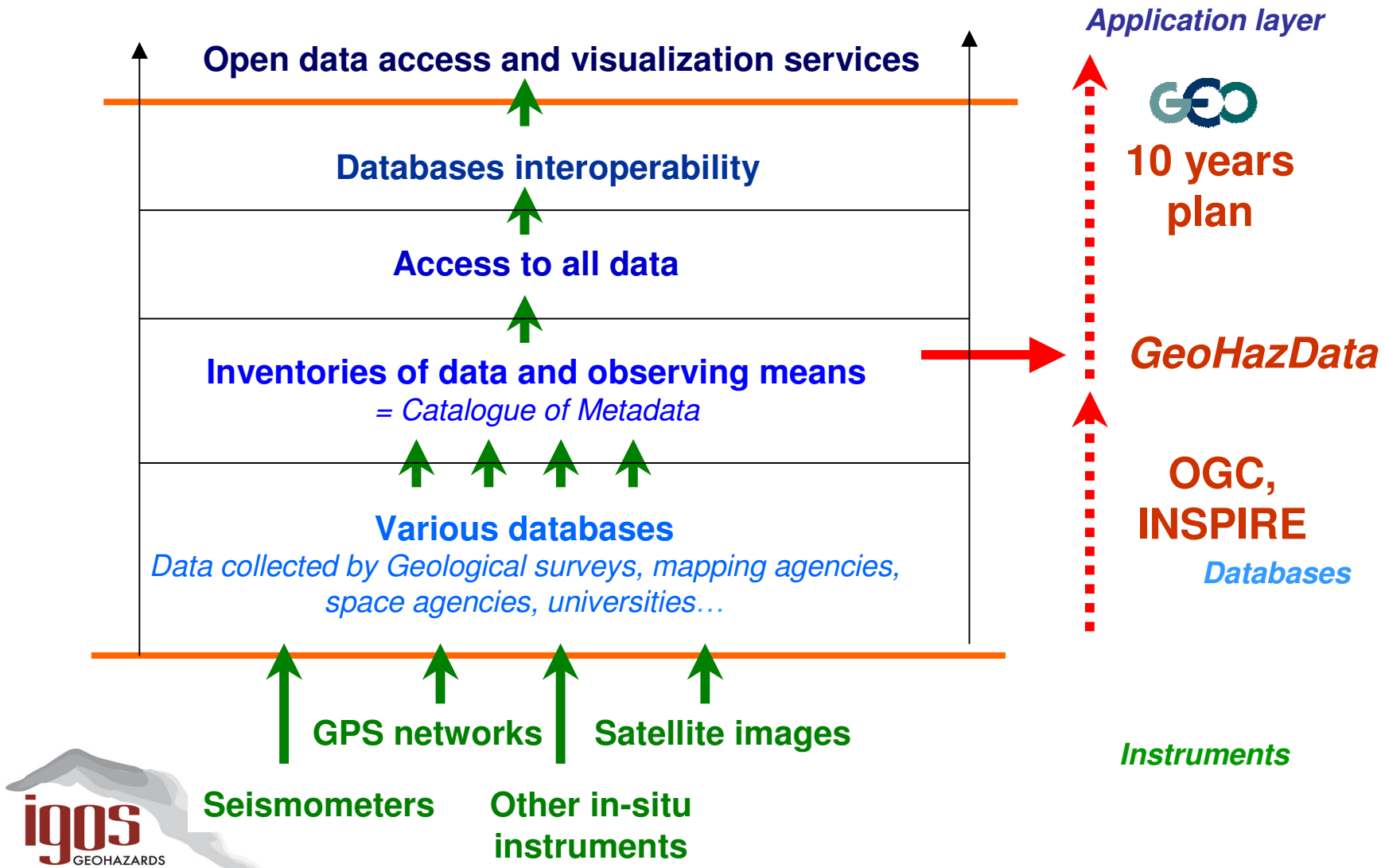
The IGOS Geohazards vision:

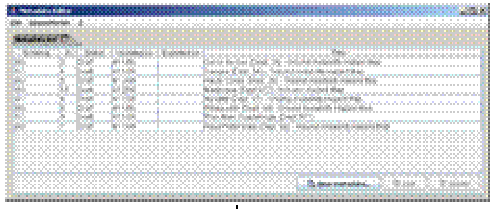
Toward a geohazards Earth Observation data clearing house



Task DI-06-07

Metadata Acquisition

Metadata Editor



To another OGC catalogue

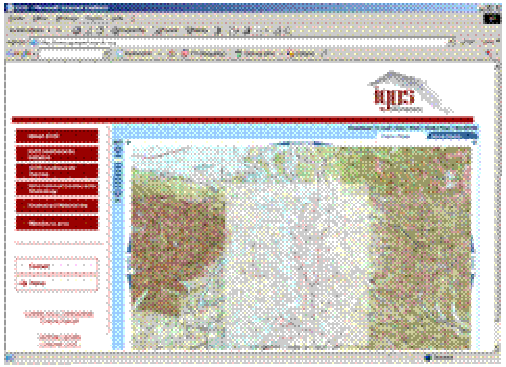
XML file

Metadata Publishing

OGC Metadata Catalogue

Catalogue can index metadata stored in other OGC metadata catalogues

Catalogue can be Interrogated by other OGC client applications



Geospatial portal to present extent of hazard assessments

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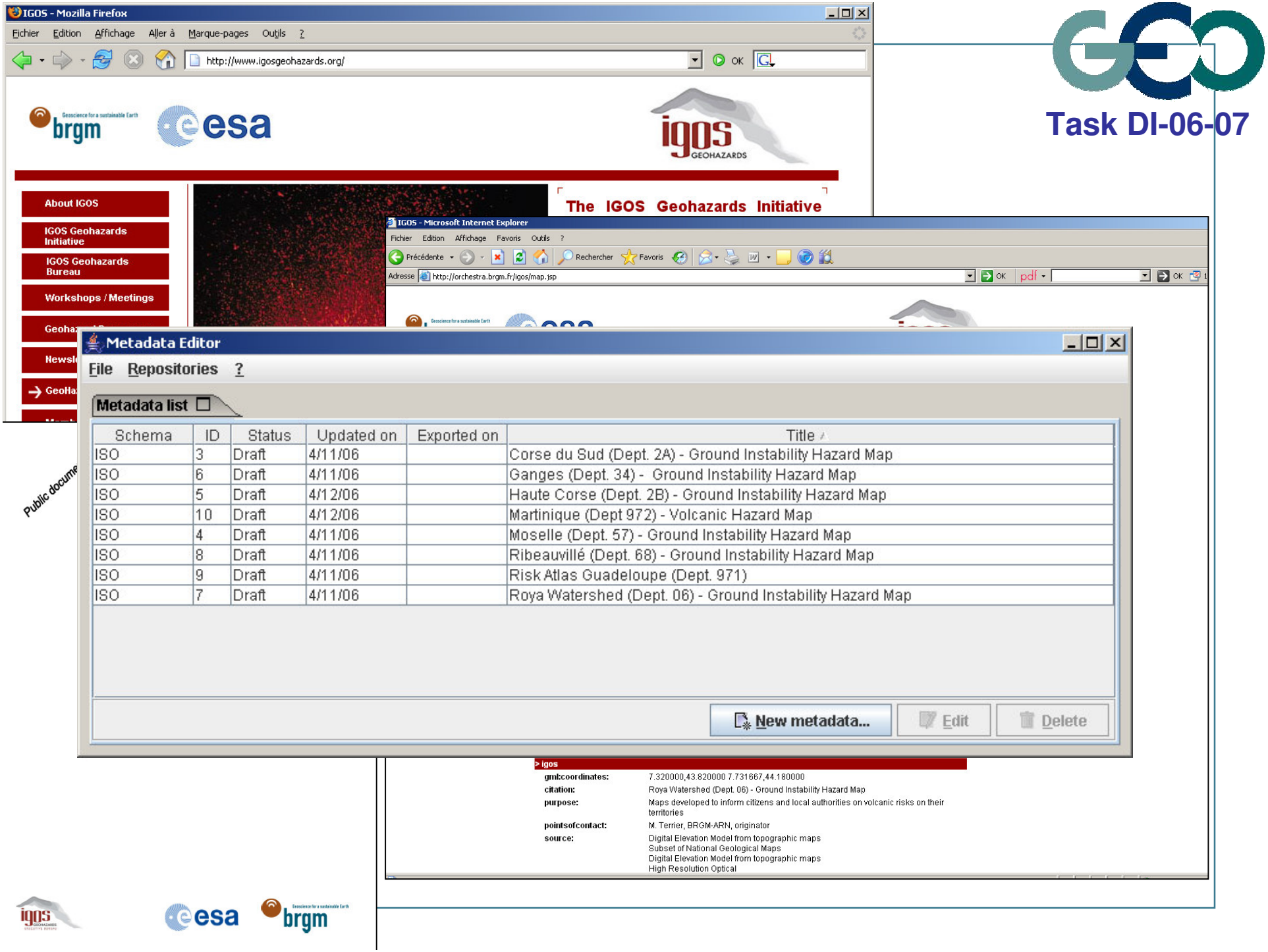

Task DI-06-07

The Hazard maps inventory requires coordination of many organisations working on different thematics in different countries.

GEO members such as Italy, Germany or Portugal, participate in task DI-06-07, and collected information on new and already existing hazards maps.

Other steps to increase the amount of metadata available through the system are detailed in working documents (promote voluntary basis, seek funding to perform regional inventories and increase cooperation with other initiatives and projects)

Task DI-06-07

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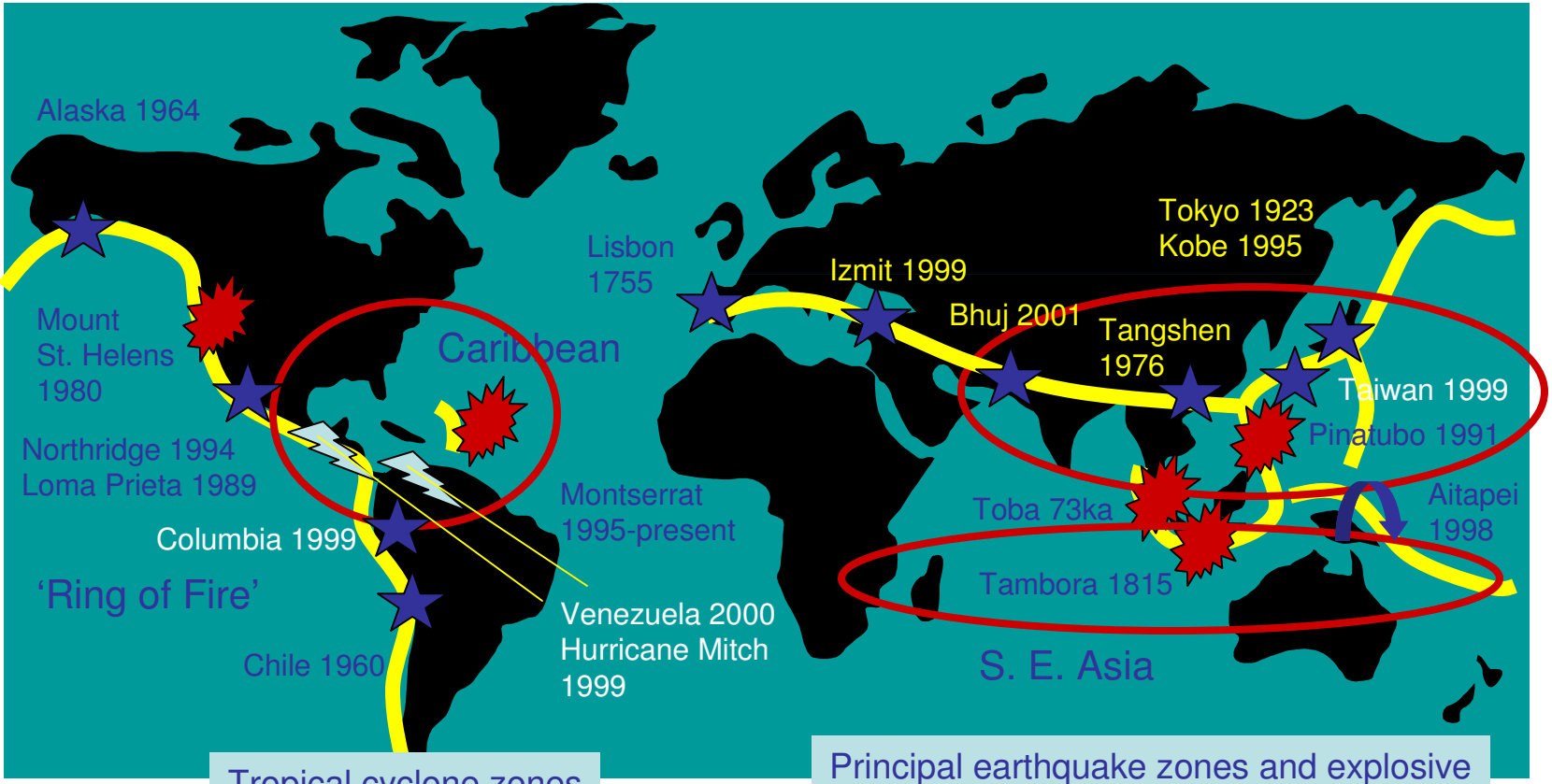
Multi-hazards approach: need of global and regional approaches

Spatial distribution of hazards



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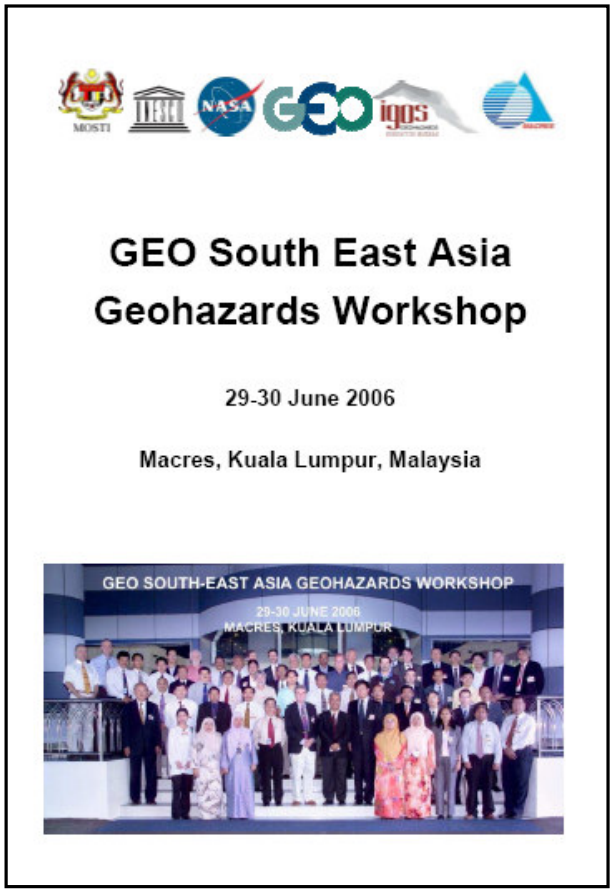
after UCL Benfield Hazard Research Centre

Report on the GEO Geohazards Workshop in South East Asia



The Malaysian remote sensing Center (MACRES), the Group on Earth Observation (GEO), NASA, UNESCO and IGOS Geohazards organised this workshop in order to enhance regional and international cooperation on geological disasters in South East Asia.

More than 90 participants

Participants stressed the need of a Regional Multi-Hazards approach.

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Workshop recommendations

- ***Data timeliness and coverage:***

Workshop outcome:

IGOS Geohazards advocates space agencies for providing an easier access to spaceborne data in specific high risks areas for disaster mitigation.

- ***System interoperability:***

GEO TASK DI-06-07

- ***Historical and archive data:***

Partnership with CCOP

- ***Regional cooperation:***

Toward a community of practice on Geohazards in South East Asia ?...

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- This workshop will address data user/ providers issues, try to make a step forward in databases interoperability, mutual exchange of knowledge with developing countries.

- You are cordially invited to this workshop; Please contact the Bureau

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Conclusions

- Need to focus on an easier data provision disaster mitigation
- IGOS Geohazards aims at
  - supporting a multi-disaster approach
  - increase the exchange of data from various sources
  - moving toward an open access to data
- Involvement within the GEO framework to progress
- Cooperation with other organization programmes (UNESCO, WMO, UNOOSA, UNISDR) is expected to help coordinating the initiative

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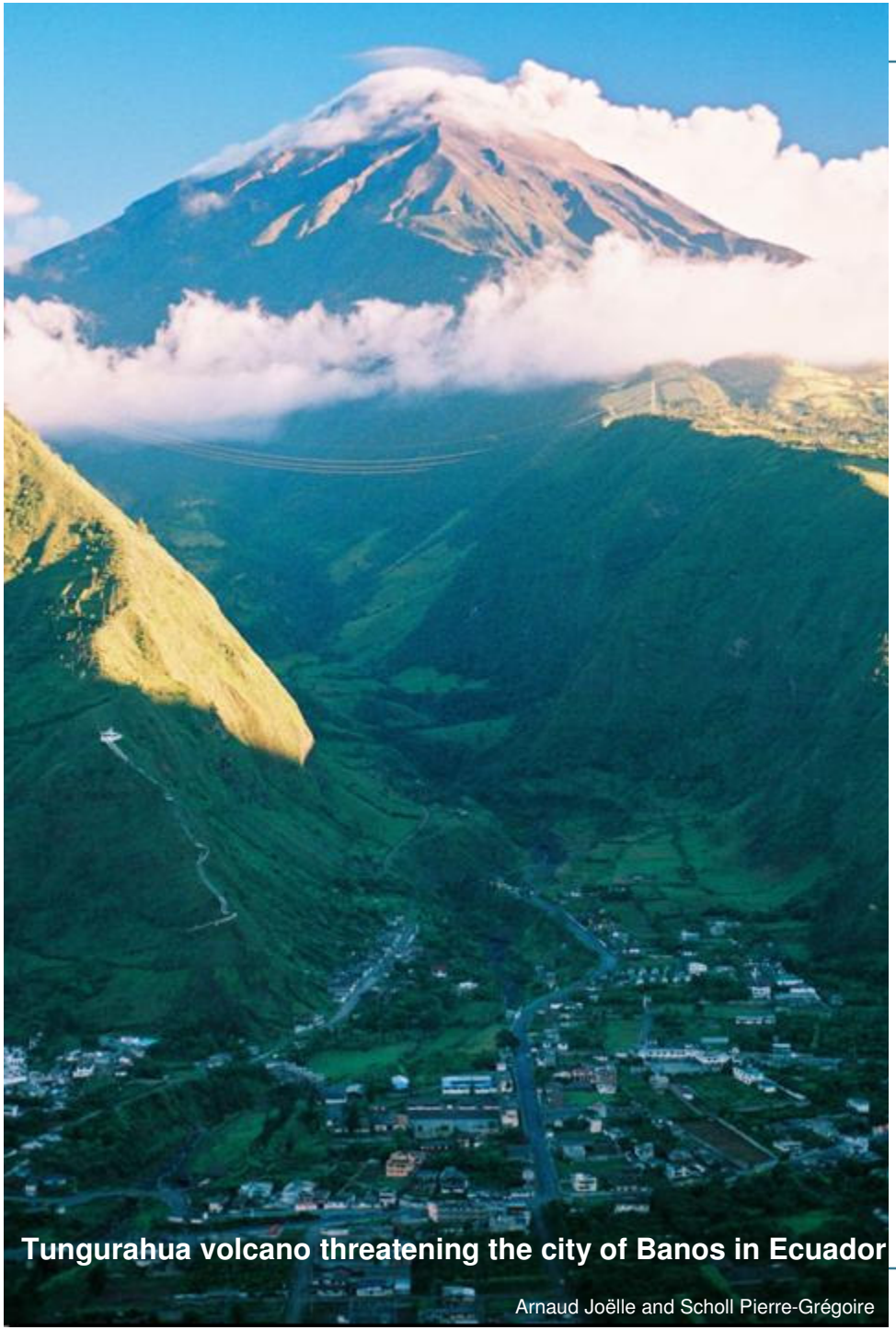

Tungurahua volcano threatening the city of Banos in Ecuador

Arnaud Joëlle and Scholl Pierre-Grégoire

Vielen Dank für Ihre Aufmerksamkeit

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