

# Landslide risk

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University of Florence (Italy)

Preparatory Workshop on Science and  
Technology for the Global Platform for  
Disaster Risk Reduction Third Session

**Pavia, Italy, 5-6 April 2011**

# onsortium on Landslides

ICL is an International non-governmental and  
profit scientific organization, which is supported  
by UNESCO, WMO, FAO and UN/ISDR and other  
governmental bodies



# International Programme on Landslide (IPL)

s an international initiative of **ICL**

aims to conduct international  
**cooperative research and capacity**  
**building** on landslide risk mitigation,  
especially in developing countries.

**Protection of cultural and natural heritage** is addressed for the benefit of society and the environment.

activities of IRI will contribute to the



# Strengthening Research and Learning on Landslides and Related Earth System Disasters for Global Risk Preparation



The Tokyo Action Plan was adopted at the Round Table Discussion organized at the United Nations University in Tokyo from 18th to 20th January 2006.

The Plan proposed the IPL, for implementation of the Hyogo Framework for Action, jointly managed by ICL and global stakeholders in the field.



ICL exchanged MoU with UNEP, WMO, FAO, UNISDR, UNU, and



# Integrated Strategy for Landslide Risk Reduction

Adopted at the Session on landslide risk reduction,  
International Disaster Reduction Conference, IDRC Davos, 30 August 2006

CONFERENCE

## IDRC Davos 2006

August 27th – September 1st, 2006  
Davos, Switzerland.



**DAVOS APPEAL**  
Integrated Strategy for Landslide Risk Reduction

Adopted at the Session on landslide risk reduction,  
International Disaster Reduction Conference, IDRC Davos, 30 August 2006

In the framework of the UN International Strategy for Disaster Reduction, the International Centre for Landslides (ICL) supported by the main UN Organizations such as UNESCO, UNEP and UNU, launched the **2006 Tokyo Action Plan** to be implemented through the **Framework for Action 2005-2015 "Building the Resilience of Nations and Communities to Disasters"** declared at the United Nations World Conference on Disaster Reduction in Kobe 2005.

A Session on landslide risk reduction was held at the International Disaster Reduction Conference in Davos on 30 August 2006 for the implementation of the Action Plan, enhancing a standard approach to landslide risk reduction and building upon existing European initiatives.

The participants of the Session recommend that global cooperation in landslide risk reduction be implemented through a global multidisciplinary **International Programme on Landslide Risk Reduction** implemented by the following actions:

- 1. Establishment of the IPL Framework:** The IPL Global Promotion Committee was established by the ICL and its supporting organizations (such as UNESCO, WMO, FAO, UNU, etc.). The IPL World Centre was also established in Kyoto Japan to coordinate the implementation of the IPL and to work as secretariat of the Committee.
- 2. Promotion of the Global Cooperating Fields of the IPL:** Four major fields of cooperation: Technology Development (Monitoring and early warning, Hazard mapping, assessment); Mechanisms and impacts of catastrophic landslides and landslides in natural heritage sites; Capacity Building (Enhancing human and institutional capacity, disseminating information/knowledge); Mitigation, preparedness and recovery.
- 3. Promotional Activities:** The First World Landslide Forum will be organized at the United Nations University in Tokyo; Identification and promotion of World Centres of Excellence (WCoE) on Landslide Risk Reduction; Contributions to Global landslide issues: landslide in Philippines, the Machu Picchu World Heritage and other sites in mountainous countries; the partnership with other global initiatives, such as the International Hydrological Programme (IHP), International Geoscience Programme (IGCP), Mountain Partnership, International Geosphere and Biosphere Programme (IGBP), Mountain Partnership, International Geosphere and Biosphere Programme (IGBP), Global Earth Observation System of Systems (GEOSS), International Geosphere and Biosphere Programme (IGBP), Global Monitoring for Environment and Security (GMES) and 7th European Commission.

An European Centre of ICL has been established in Florence, Italy, in order to promote landslide risk reduction in Europe. Through the European Centre, ICL intends to participate to the major research and development programmes in Europe, contributing to the implementation of the 2006 Tokyo Action Plan. Within this global framework, the European strategy will be focused on the harmonization of information systems, enhancement of monitoring and early warning capabilities, assessment methods and procedures, and support to disaster reduction policies. The promotion of other regional centres and strategies will be furthered.

Workshop on Landslide Risk Reduction  
organized at IDRC in Davos 2006 for  
adopting the Davos Appeal

## **The 2008 Tokyo Declaration**

**Strengthening the International Programme on Landslides (IPL) with UN-ISDR**

World Landslide Forum (18-21 November 2008, Tokyo, Japan),  
organized by the ICL and other supporting organizations

Participants from 48 countries adopted the 2008 Tokyo Declaration

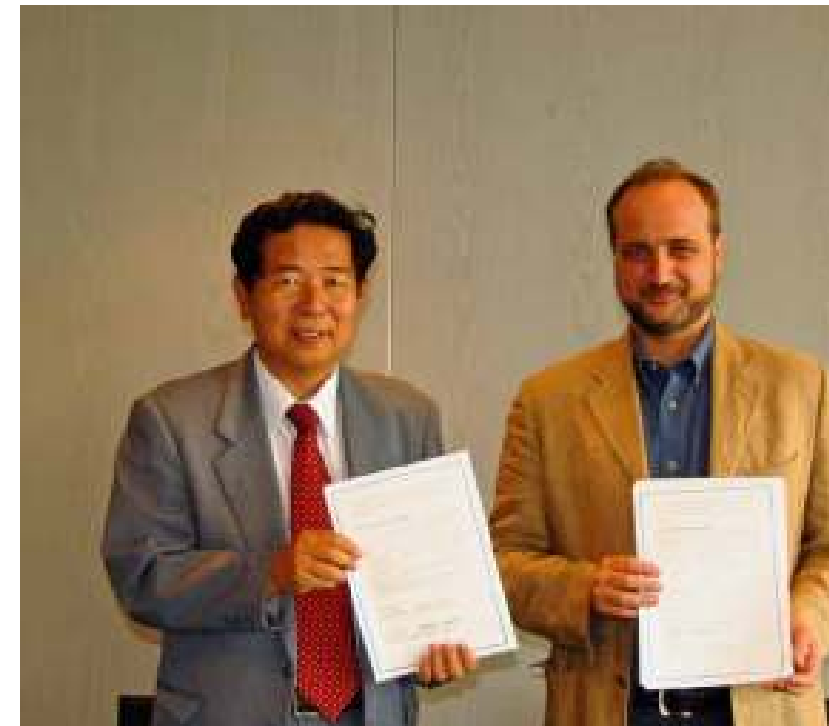




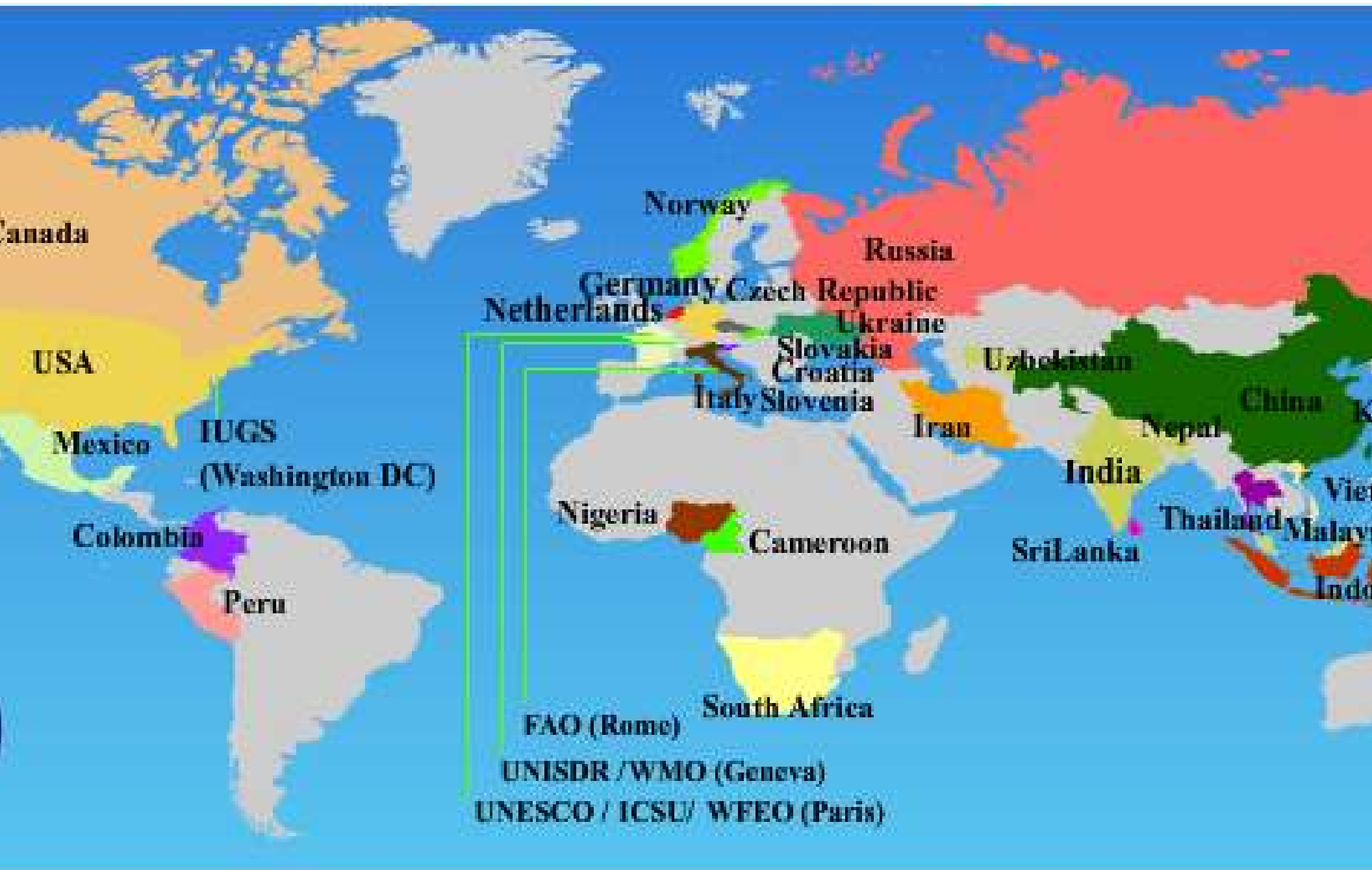
European Centre of ICL  
established at the Earth  
Sciences Department of the  
University of Florence with  
the following objectives:

- raise funds, from the EC and other  
funding agencies, for supporting IPL
- promote IPL in order to bring  
together the landslide community in  
Europe
- aid the co-ordination of activities of

On **29th June 2006** in  
**Heidelberg**, a MoU b  
ICL and UNIFI was  
exchanged to establish  
European Centre of ICL



# ICL/IPL members



# ICL/IPL members



# Landslides International Journal

Journal addresses a wide array of disciplines, is of broad interest, easily readable and of high quality

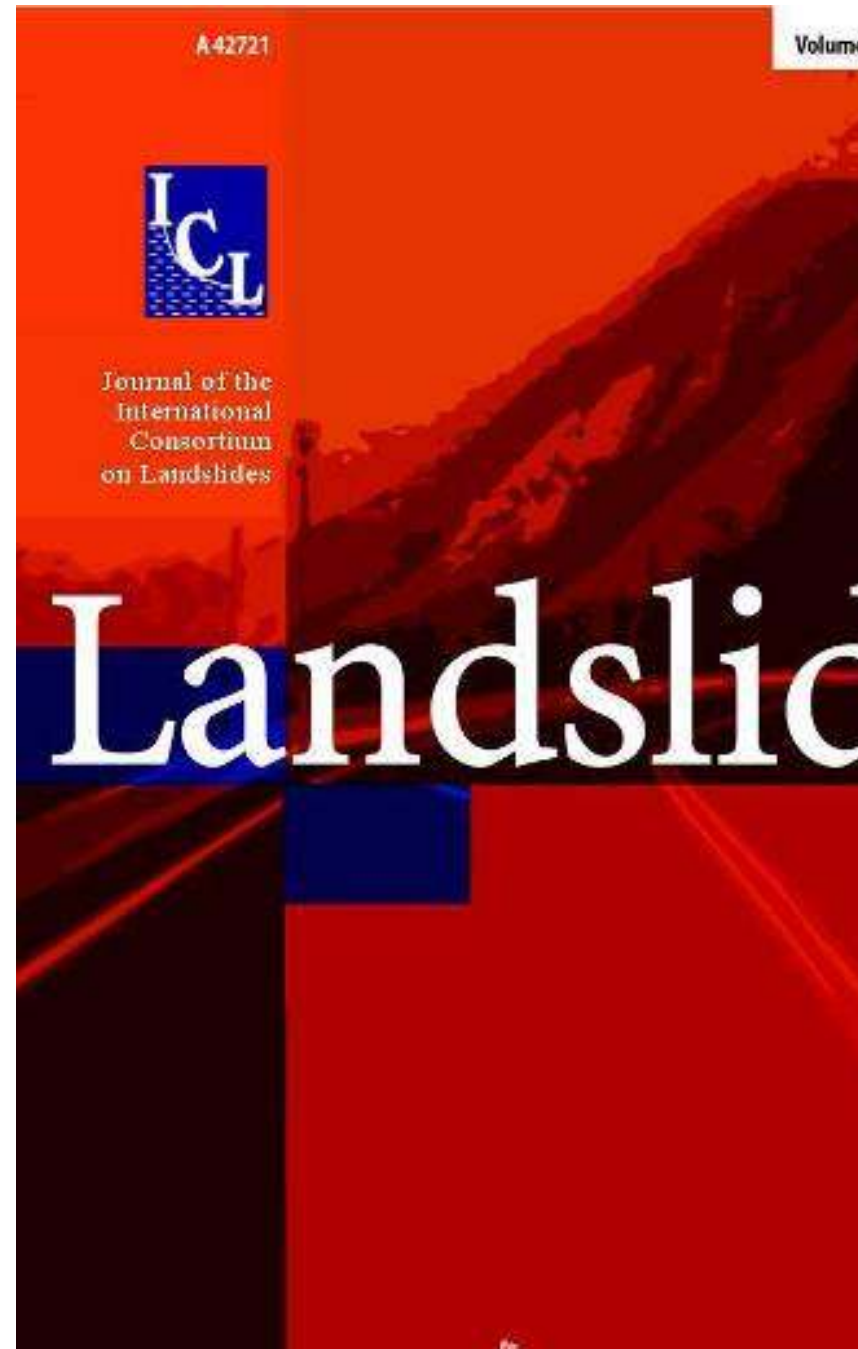
Issues per year

Started from January 2004

Published by Springer

Color

Types of contributions: Landslide  
s, Scientific papers and  
technological development





PL Project Landslide  
Investigation in Machu Picchu,  
, involves working groups  
L from Peru, Japan, Italy,  
ch, Slovakia, Canada and

Investigation by all working  
os is coordinated as an  
project, and the report of  
Investigation are presented to  
vian Government through  
SCO as a single



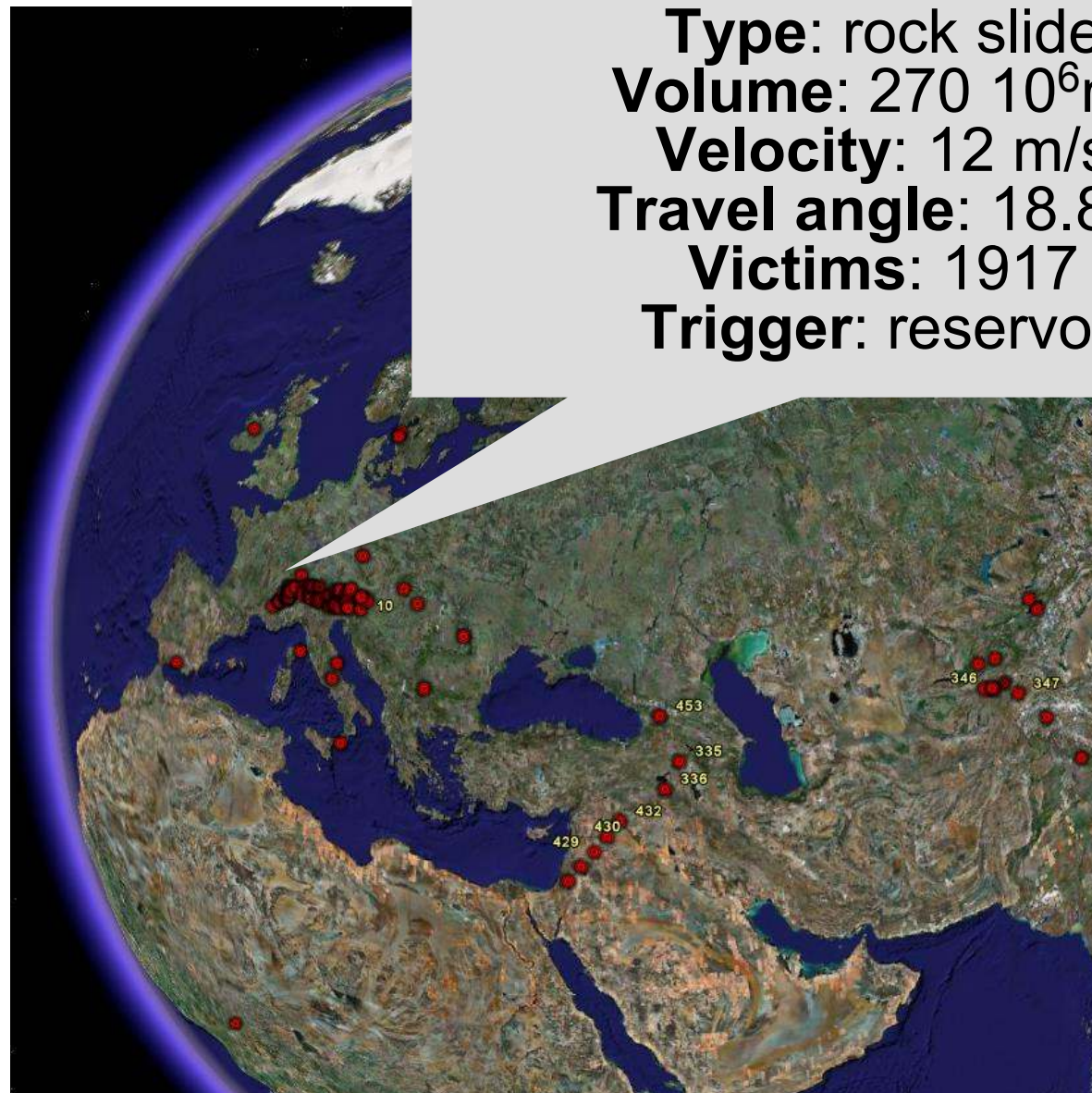
Project coordinated by  
Tokuoka

Project contains  
working groups from all  
members

**Objectives:**

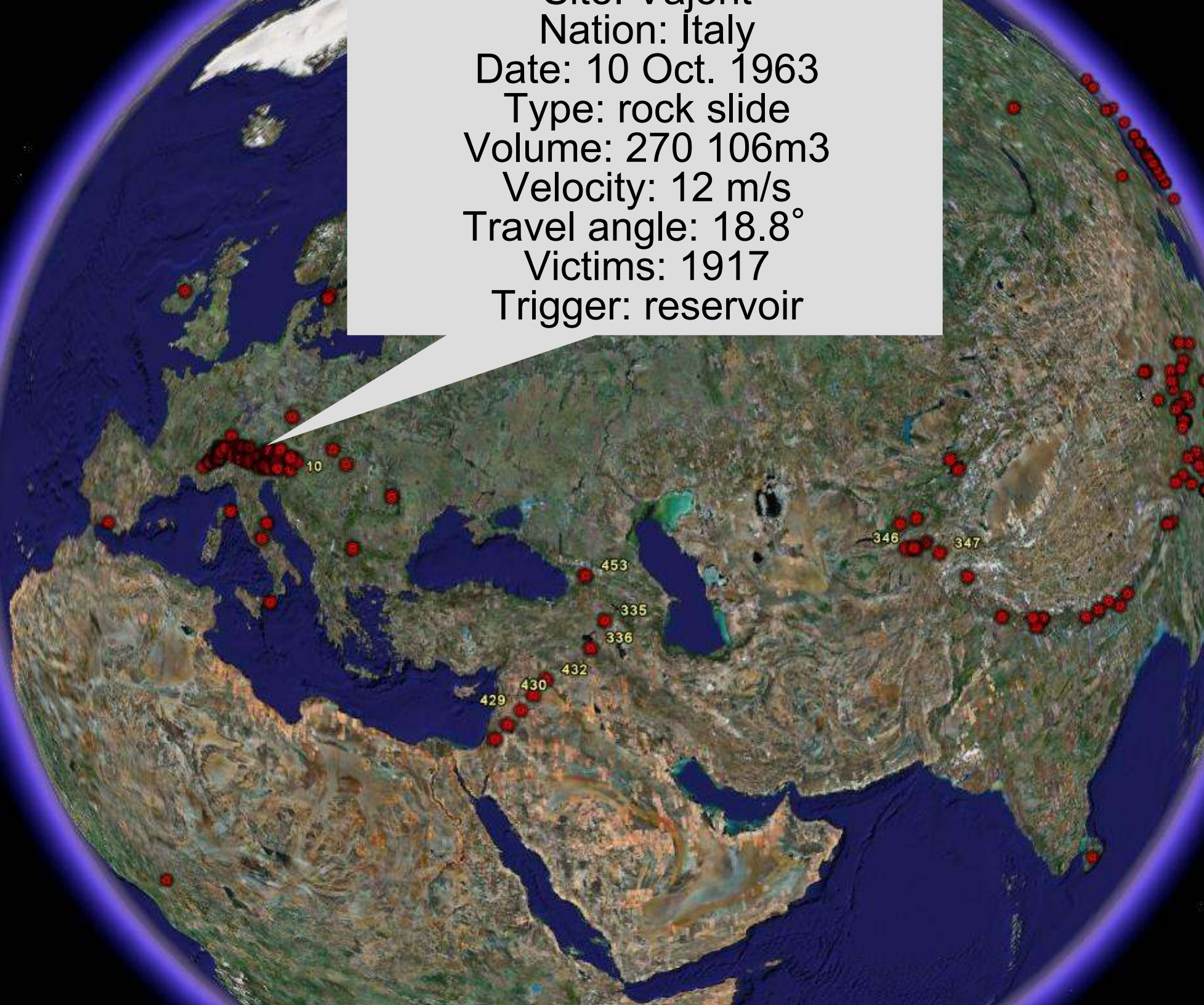
1. Create a global landslide  
2. Database of major events  
3. Register them in a  
4. Standard data-format on-

5. Present them on a  
6. Global map service on the

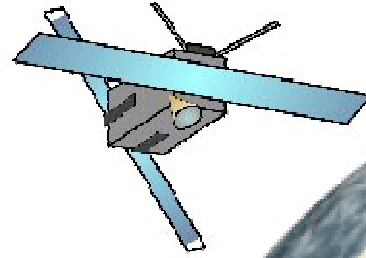




Orto Vajont  
Nation: Italy  
Date: 10 Oct. 1963  
Type: rock slide  
Volume: 270 106m<sup>3</sup>  
Velocity: 12 m/s  
Travel angle: 18.8°  
Victims: 1917  
Trigger: reservoir



# Strategy



Project Coordinated by  
M. Casaghi and N. Casagli

Project contains working  
group of ICL European members  
and JRC

Goal: to seek better methodologies for monitoring  
and forecasting landslides in hazardous areas in the







# Integrated GEO Observing Strategy

GOS GeoHazards Initiative intends to respond to specific and operational geospatial information needs for the prediction and monitoring of geophysical hazards caused by earthquakes, volcanoes and land instability.

The logo for ESA (European Space Agency), featuring the letters 'esa' in a blue, lowercase sans-serif font.



# Global Monitoring for Environment and Security (GMES)



GMES is a European initiative for the implementation of information services dealing with environment and security.

GMES will be based on observation data received from Earth Observation satellites and ground based information.

GMES is a set of services for European citizens aiming to improve their quality of life regarding environment and security.



## Dissemination Information and Early Warning

EC Integrated Project

Coordinator: ASTRIUM

## Information services to help risk management

Based on Core Users needs - Mature and New Services

Dissemination & Training - Pre operational Validation

## Operational platforms

Floods

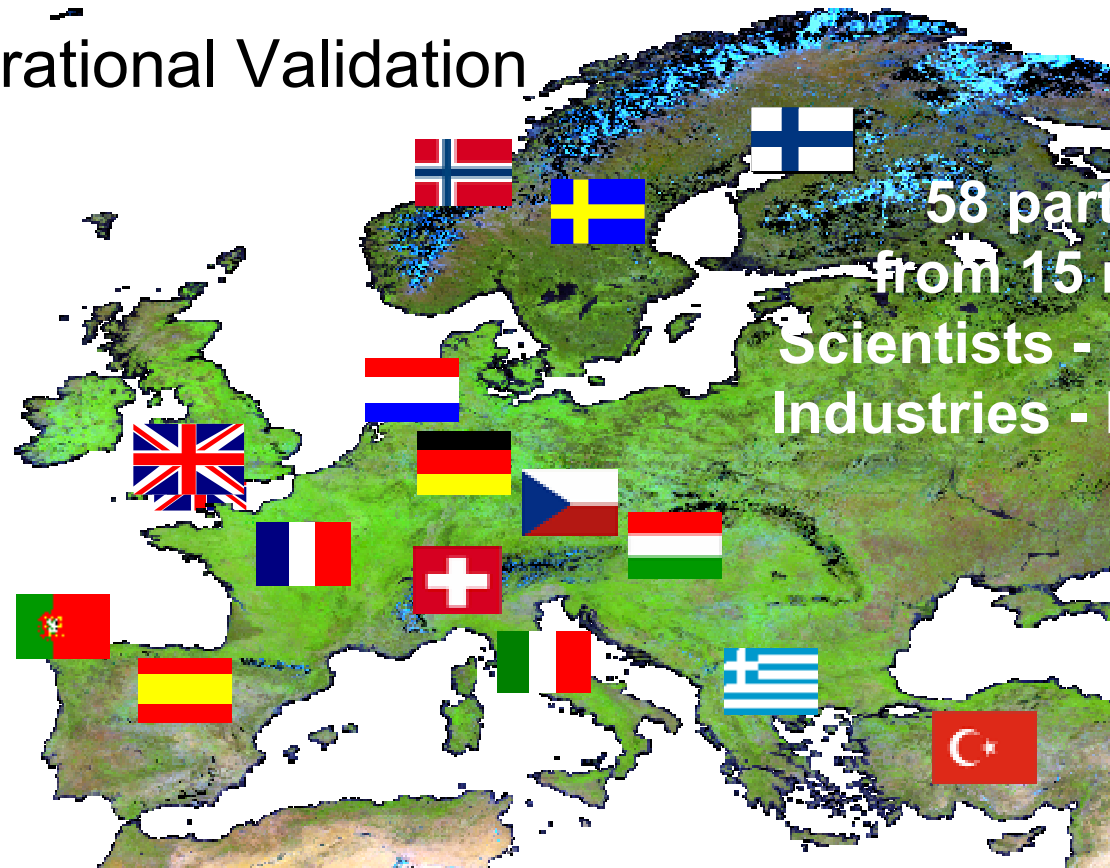
Windstorms

Fires

Earthquake & Volcanoes

Landslides

Man-made Risks



# EC GMES: Safer

**Strategic level**  
*1 meeting per year*

**Steering Committee (STEERCOM)**  
*Service providers + users*  
(6 permanent members)

*Provides  
recommendations  
and strategic guidance*

*Reports*

**Management and  
coordination level**

**Project Coordination Team (COTEAM)**  
(1 project coordinator + deputies + project assistant)

*Organises  
annual  
meetings  
and reports*

**General  
Assembly**

*1 meeting per year*

*Support for the  
operational management  
(WP, thematic platforms,  
transverse activities)*

**Executive committee (EXCOM)**

**Operational levels**  
*4 meetings per year  
+ on demand when needed*

*4 permanent  
members*

*Depending  
on the  
agenda*

*2 permanent  
members*

**Service  
Management**

**WP and  
platform**

**Project  
Users Board**

*Strengthen  
Users  
Involvement*

**External  
Users Advisory**

# Core Services

Landslides Inventory Mapping in Italy, Austria  
(spatial coverage ~ up to 4,000 km<sup>2</sup>)

Landslides Monitoring in Italy, Slovakia (spatial coverage ~2-15 km<sup>2</sup>)

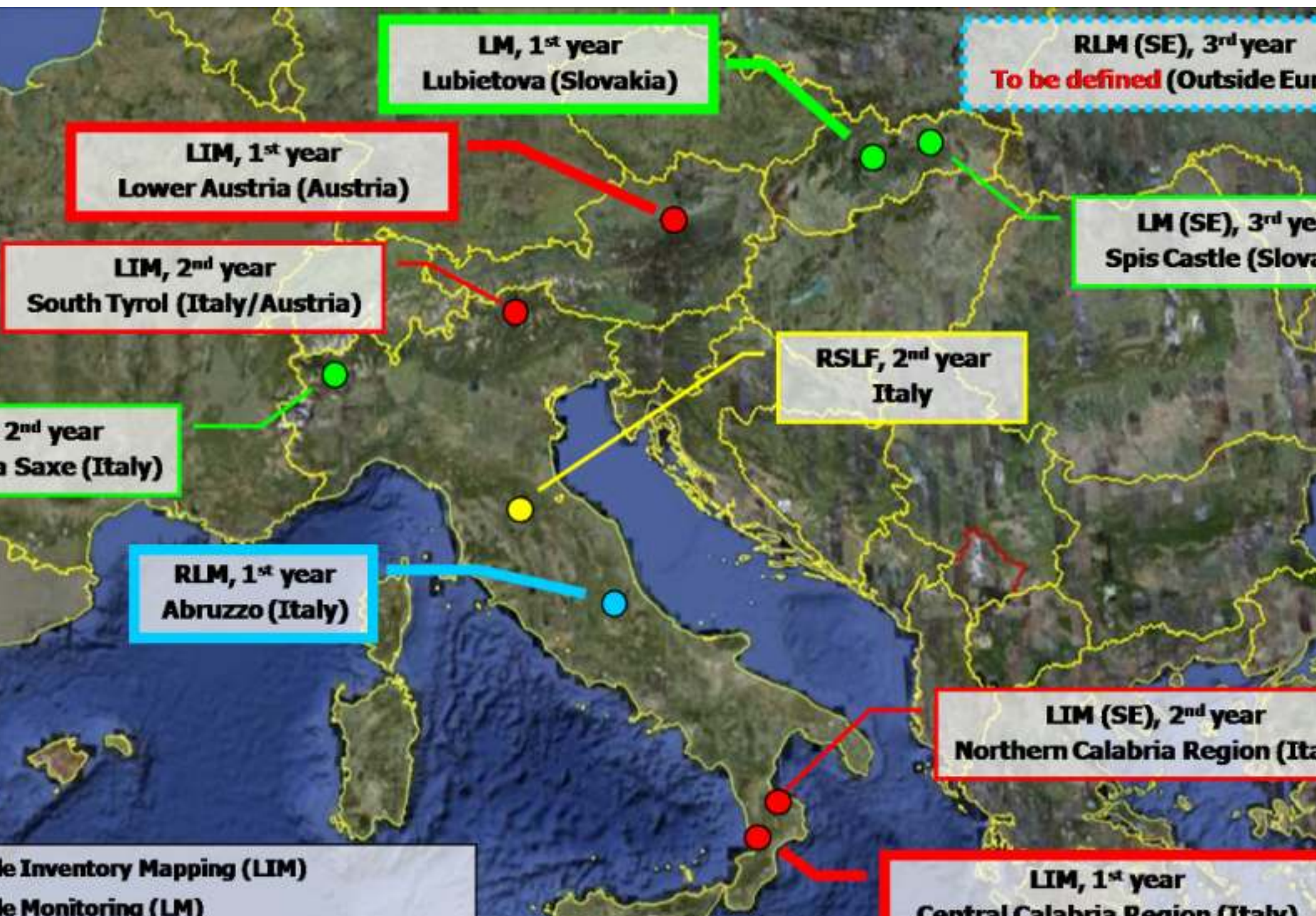
Rapid Landslides Mapping in support to emergency in and outside  
Italy (spatial coverage ~10-250 km<sup>2</sup>)

Real-time Shallow Landslides Forecasting at national level in Italy  
(spatial coverage: test areas ~40-50 km<sup>2</sup>; Italy ~300,000 km<sup>2</sup>)





# Core Services





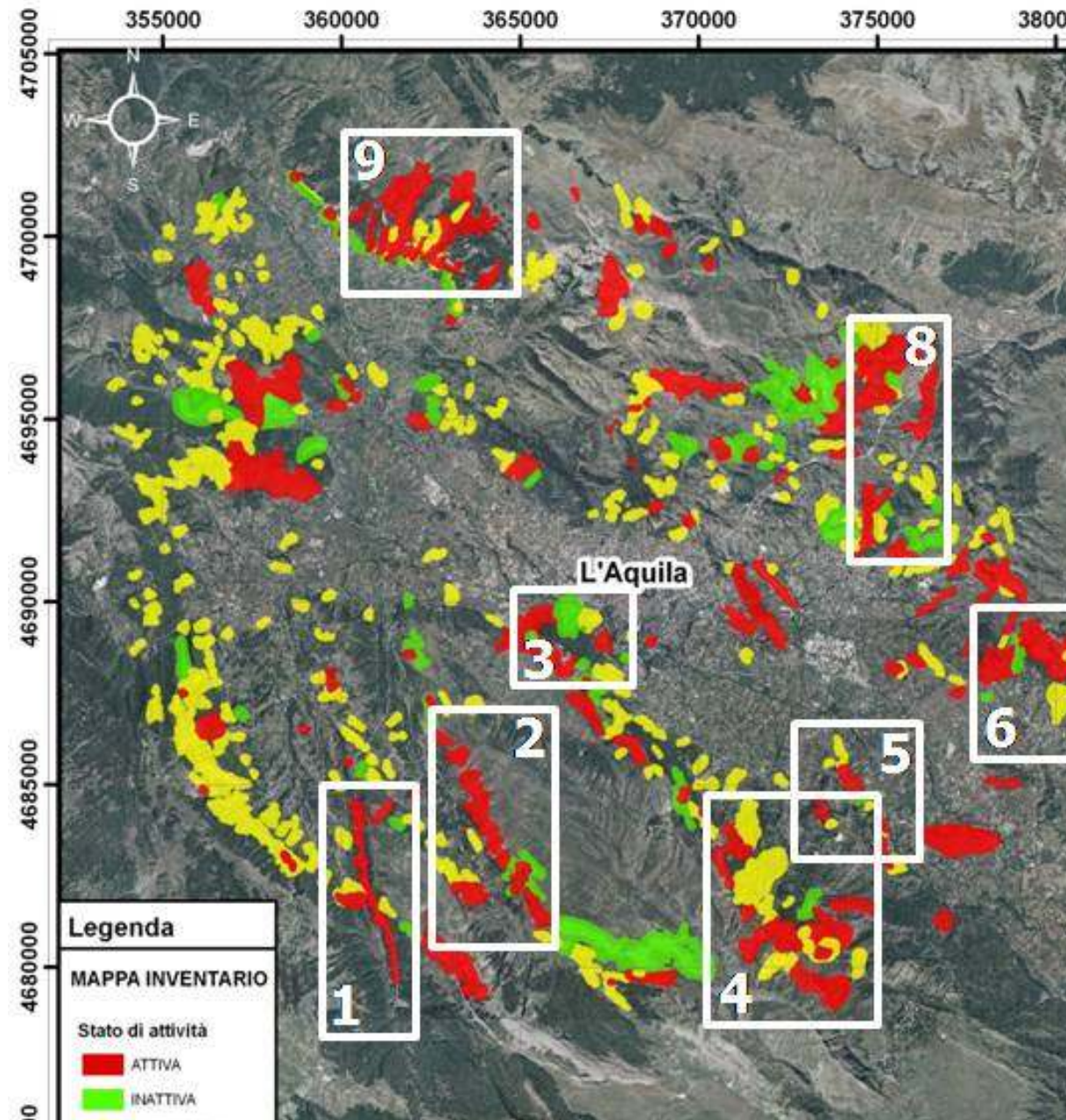
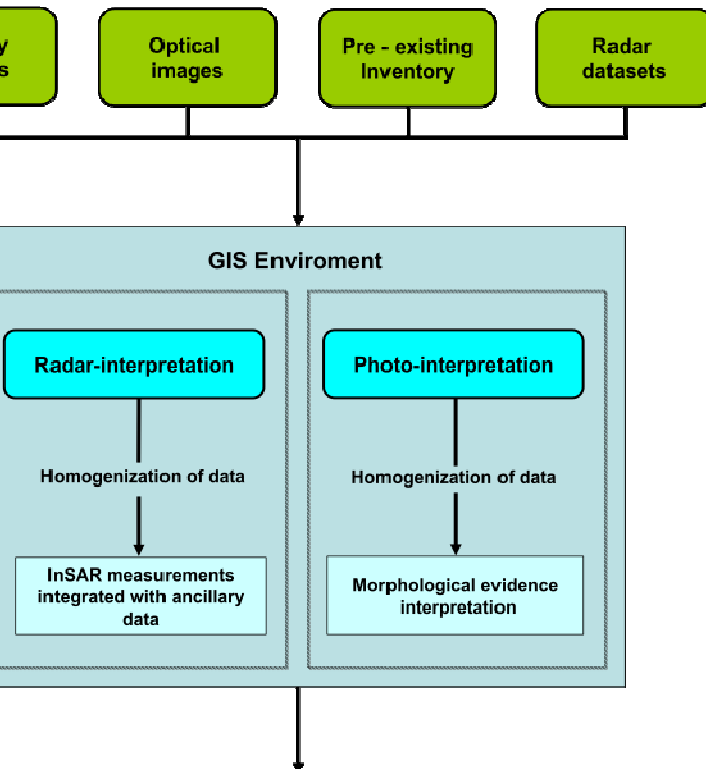
## Rapid Landslide Mapping (RLM)

Coverage: ~10-250 km<sup>2</sup>

Time: ~6 weeks

Use: emergency response

In Civil Protection Dept.; Disaster  
Research Center of the National Cheng  
Taiwan; Central Geological Survey,



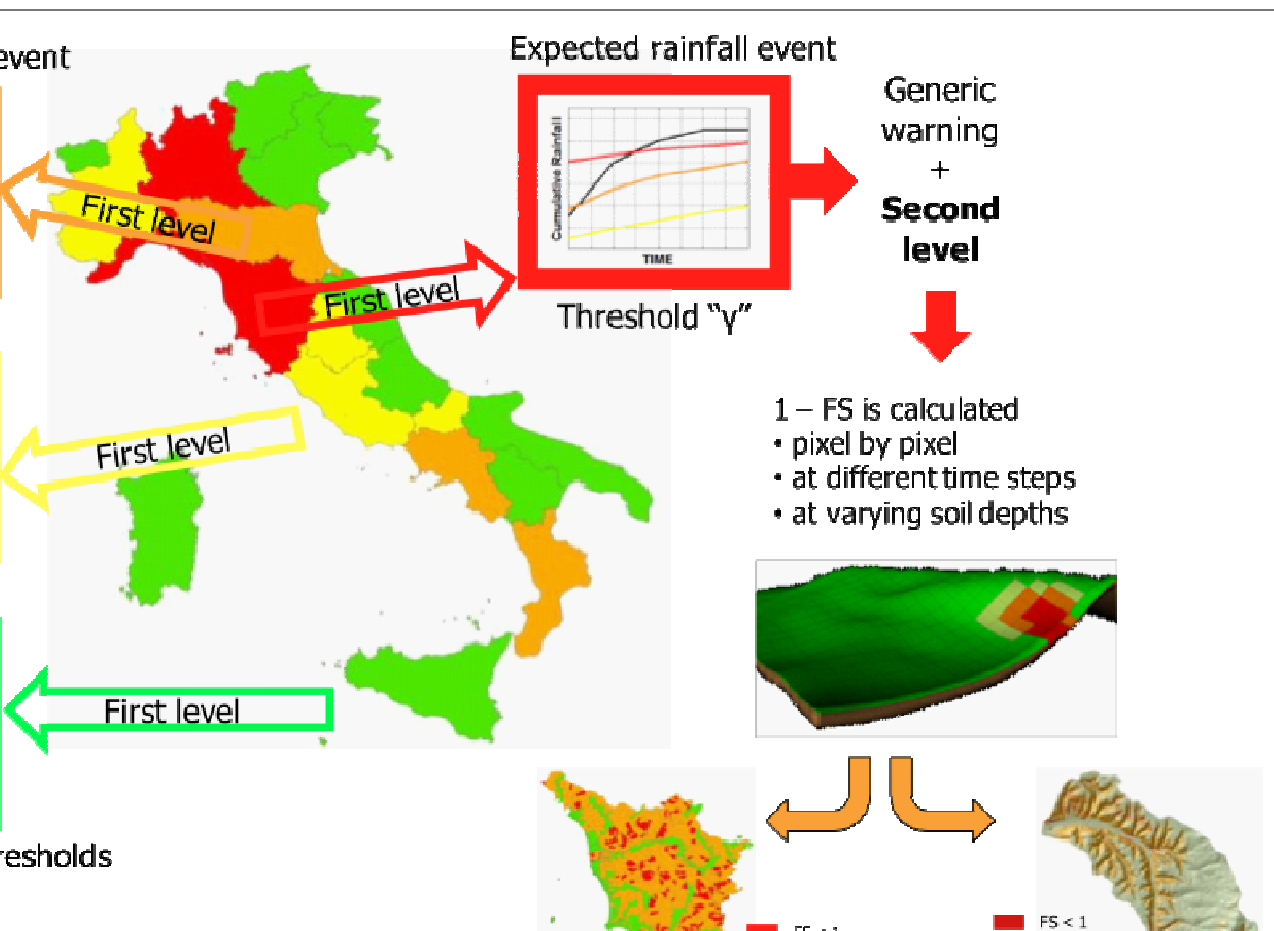
## Real-time Shallow Landslides Forecasting (RSLF)

Area: ~300,000 km<sup>2</sup> (Italy)

Time: ~16-24 weeks

Purpose: preparedness/prevention, emergency response

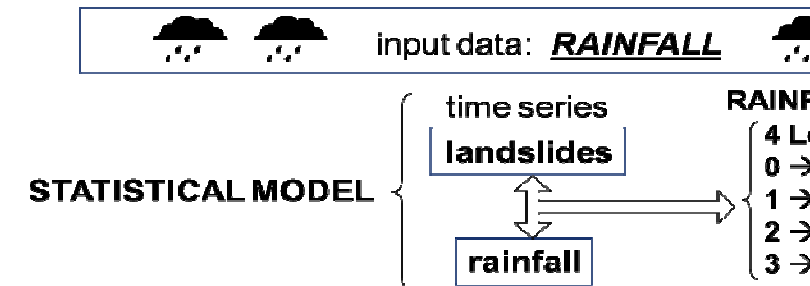
Responsible: Civil Protection Dept.



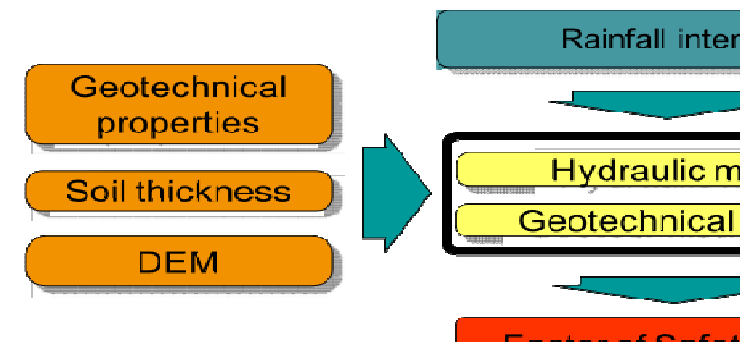
First level - EMPIRICAL MODEL

### SIGMA MODEL

- 🌐 Large area (national or European scale)
- 🕒 High temporal resolution (hourly or daily)
- 📡 Alert system (software)



Second level - DETERMINISTIC MODEL

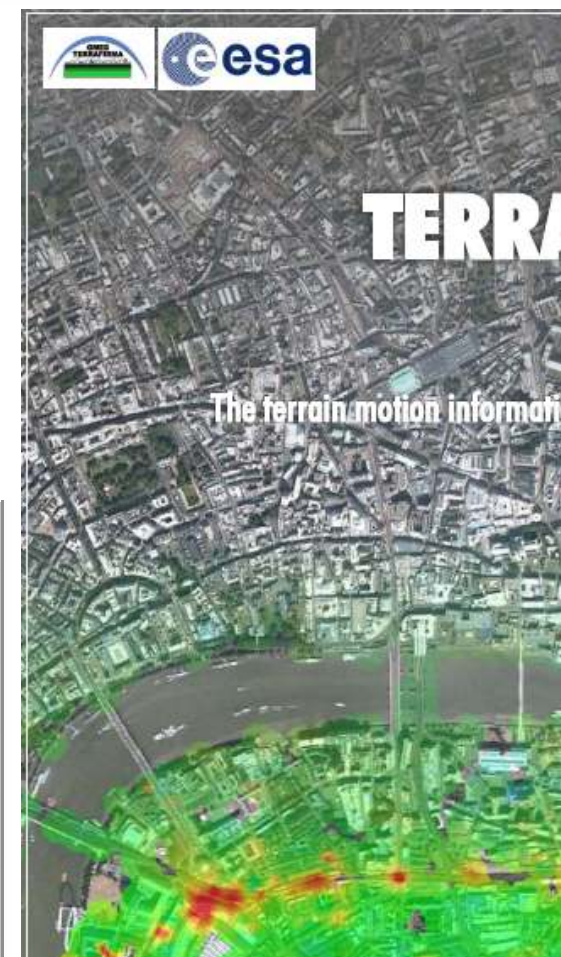


## GMES Service Element Programme

and motion hazard information service  
 provided throughout Europe via national  
 technical surveys and other institutions.

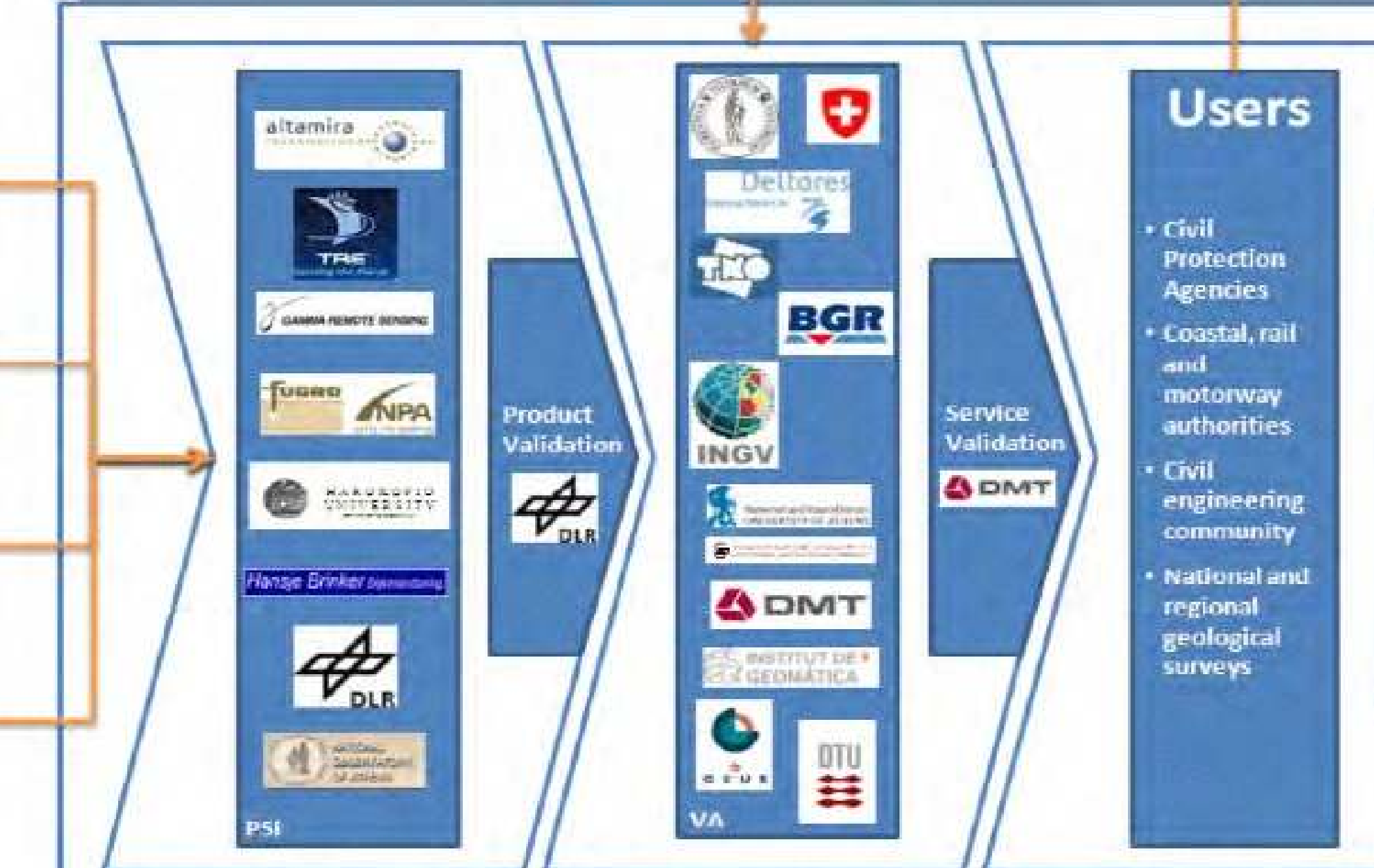
motion hazards:

Hazard	Motion magnitude
inking soils	Millimetres to centimetres
(slides, flows, falls, topples and cambers)	Centimetres to 100s metres
	Centimetres to 10s metres
d collapsible soils	Millimetres to centimetres
ns	Millimetres to metres
	Centimetres to 10s metres





products



geology

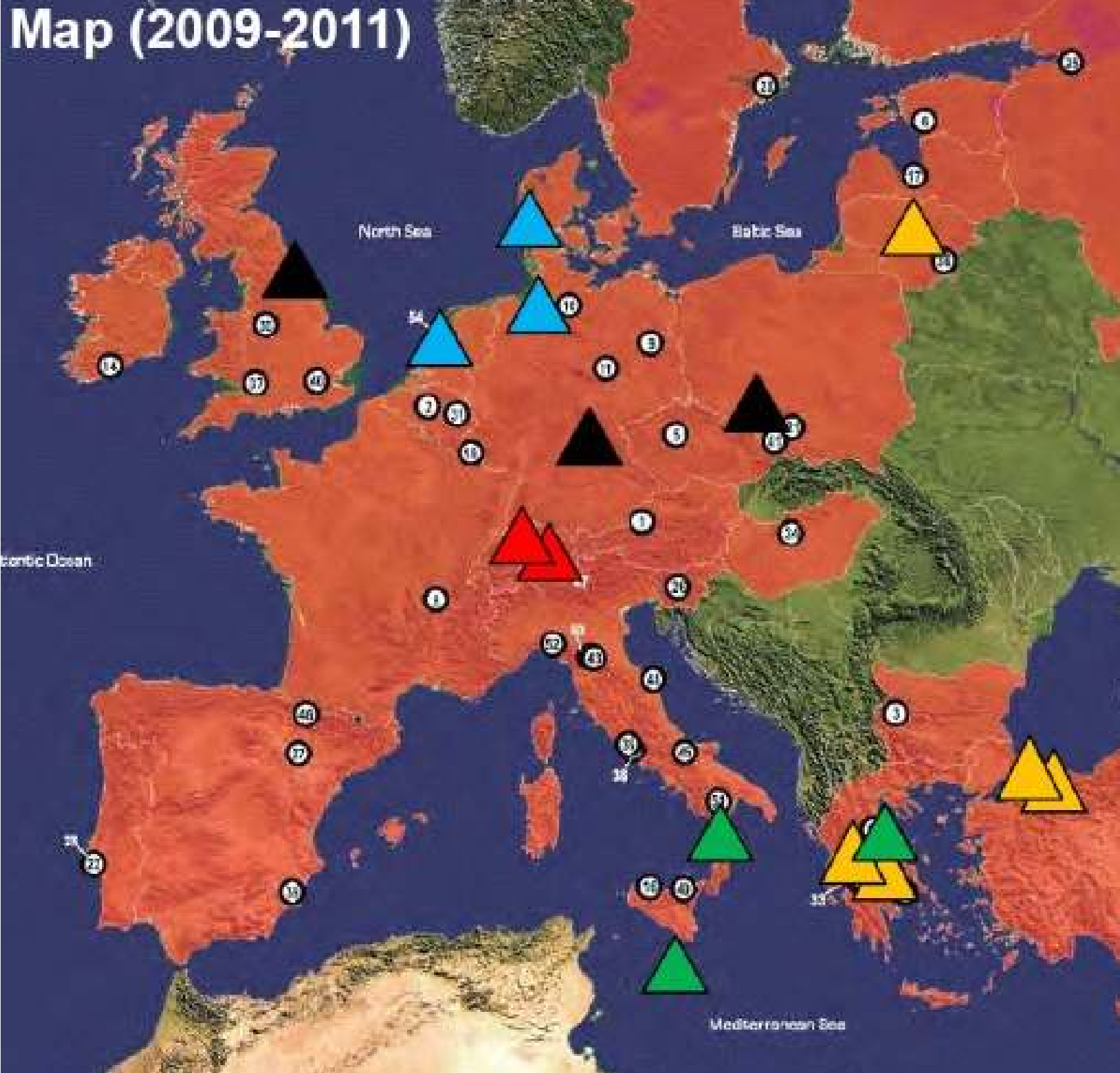
groundwater

landslide

abandoned Mines

onics

MES  
AFIRMA



from prediction to management and governance

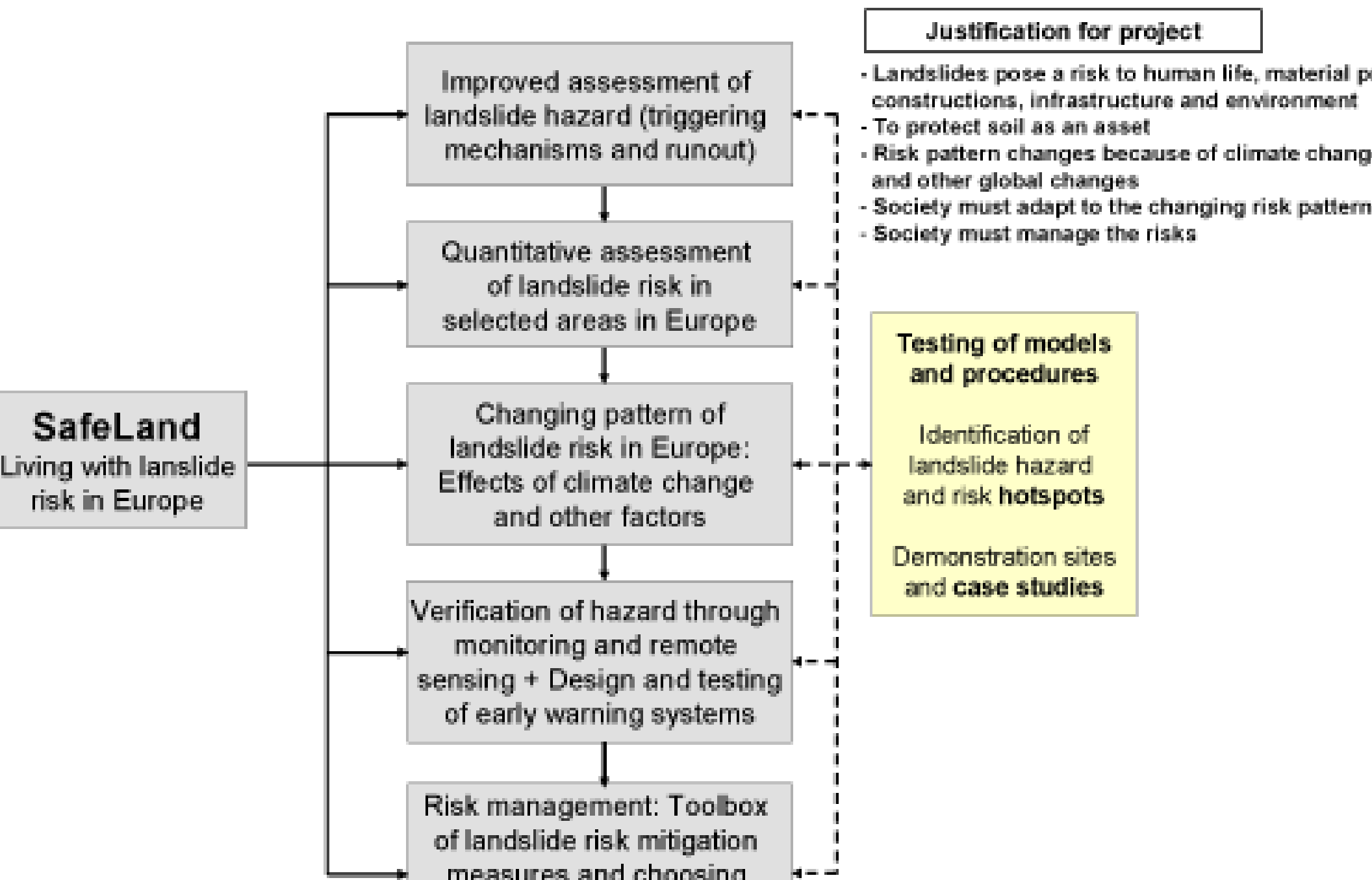
## **FP6 project - Marie Curie Research Training Network**

framework for the professional development of the new generation of researchers in the field of hazard and risk management

**Objective:** to develop an enhanced understanding of main hydro-morphological hazards and apply this knowledge to long-term habitation with such



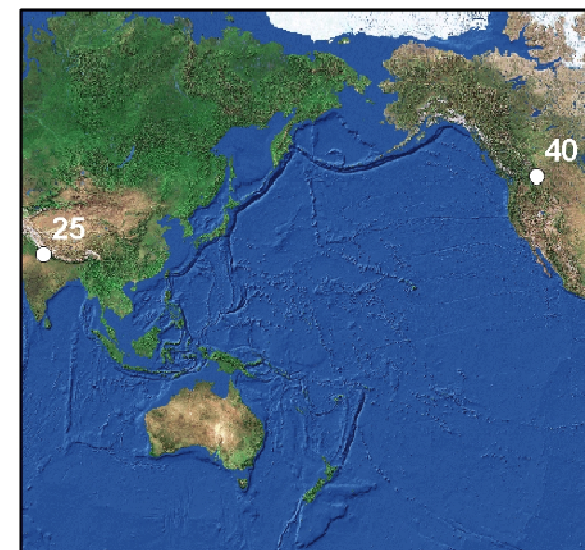
# SafeLand



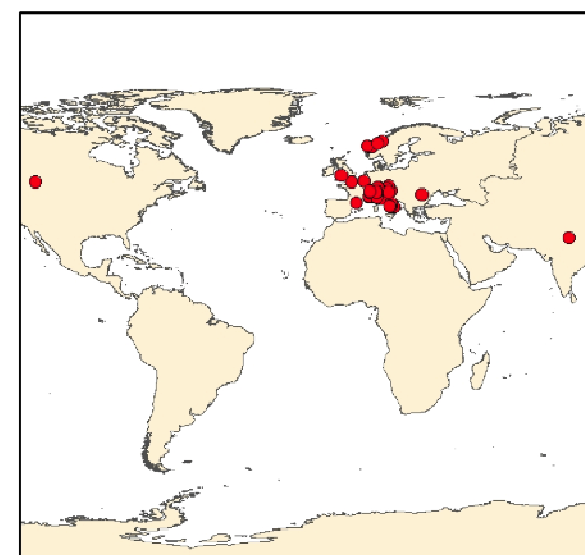




India and North America



Global View

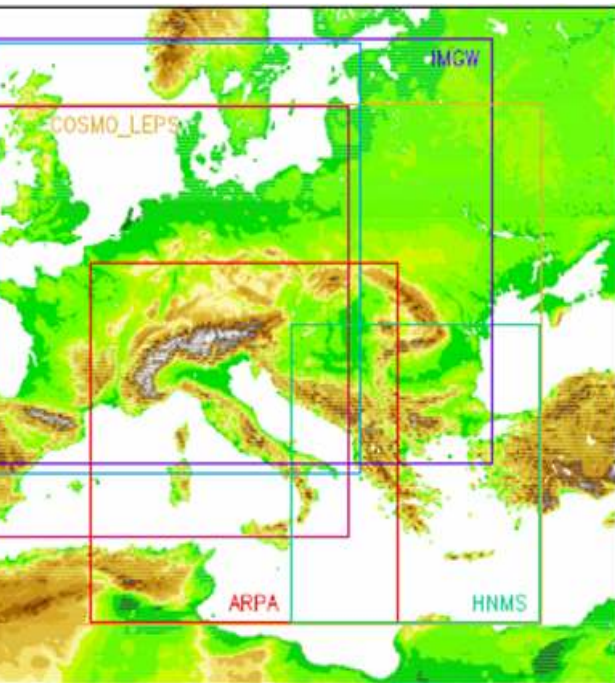


1	Mon...
2	Arvel
3	Bindo
4	Super
5	Villerv...
6	Ancona
7	Bagna...
8	Casella
9	Casella
10	La Fra...
11	Maces...
12	Stožer...
13	La But...
14	Gschlie...
15	Sonnbr...
16	Sibrats...
17	Latema...
18	Pesa -
19	Val d'E...
20	Valdar...
21	Petaco...
22	Pizzo d...
23	Valloce...
24	Äknes
25	Nainita...
26	La Val...
27	Barcele...
28	Slano
29	Castag...
30	Bindo
31	Courme...
32	Fiumel...
33	Liri - G...
34	Manne...
35	Aalesu...
36	Namsco...
37	Rissa
38	Aberfa...
39	Fourvi...
40	Frank
41	Arvel



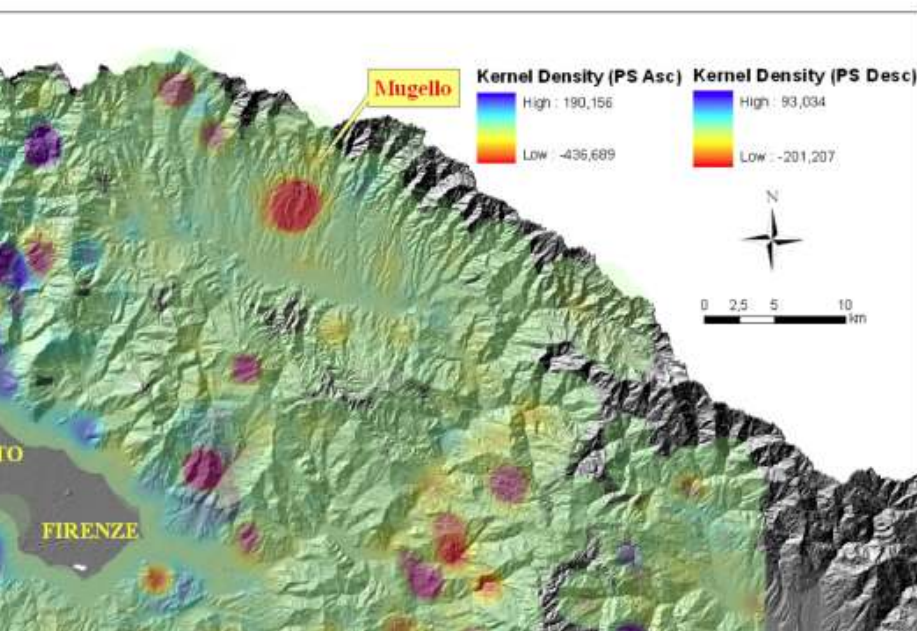
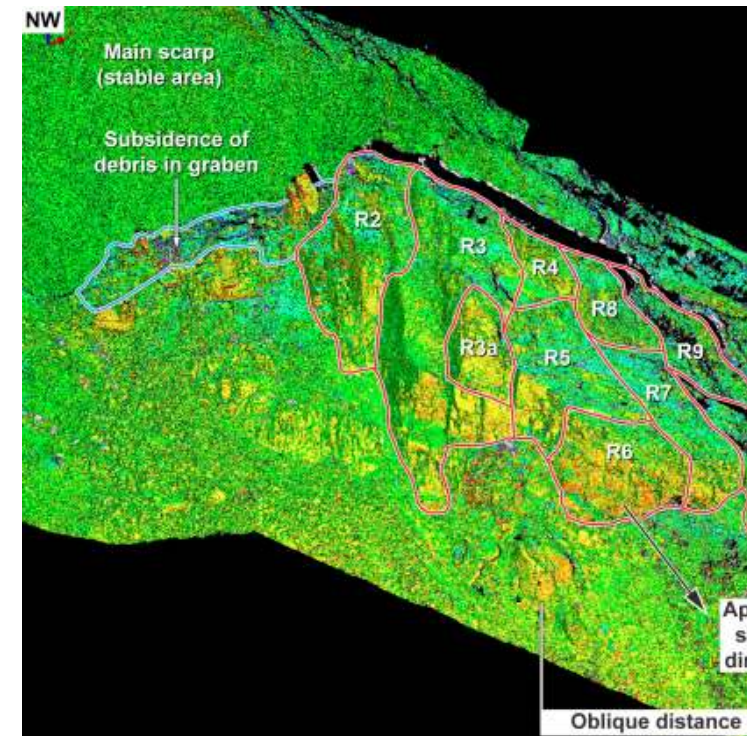
# SafeLand

WORK  
E



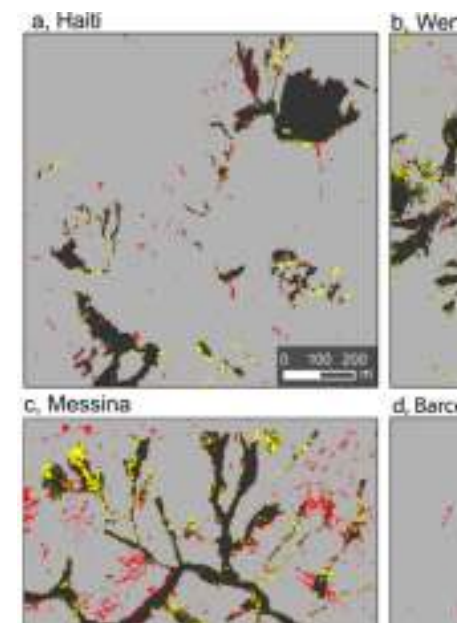
Cosmo LM

TLS



Radar imagery

Optical imagery



# Ground Deformations Risk Scenario an Advanced Assessment Series

**Collaborative project**

*financed by the European Commission 7 Framework Programme*

**Activity area 5**

*Space-based applications at the service of European Society*

**Topic address**

*stimulating the development of downstream GMES services*

*(SPA.2009.1)*



Exploit **multiple** Earth observation and ground based **technologies** to foster our understanding of the phenomena that cause **ground deformations**

to improve the **preparedness** and **response** capability of civil protection authorities





**Silesian Basin**

**Saint Moritz**

**Budapest**

**Zermatt**

**Dolomites**

**Palma de Mallorca**

**Umbria**

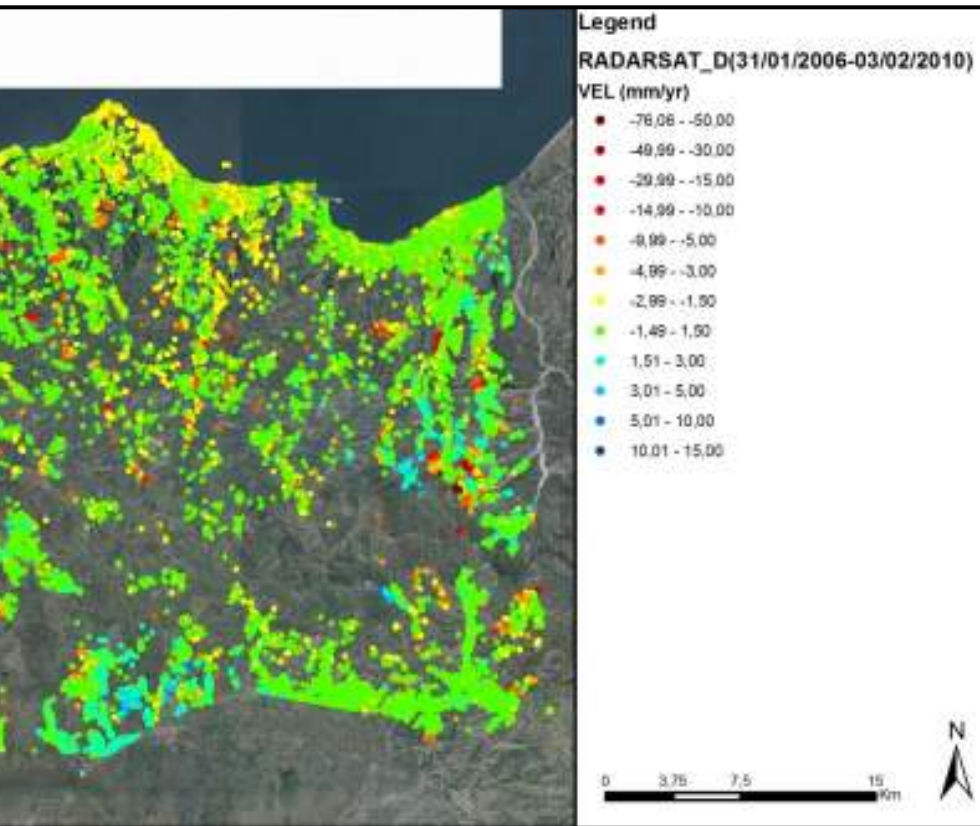


Consiglio Nazionale delle Ricerche



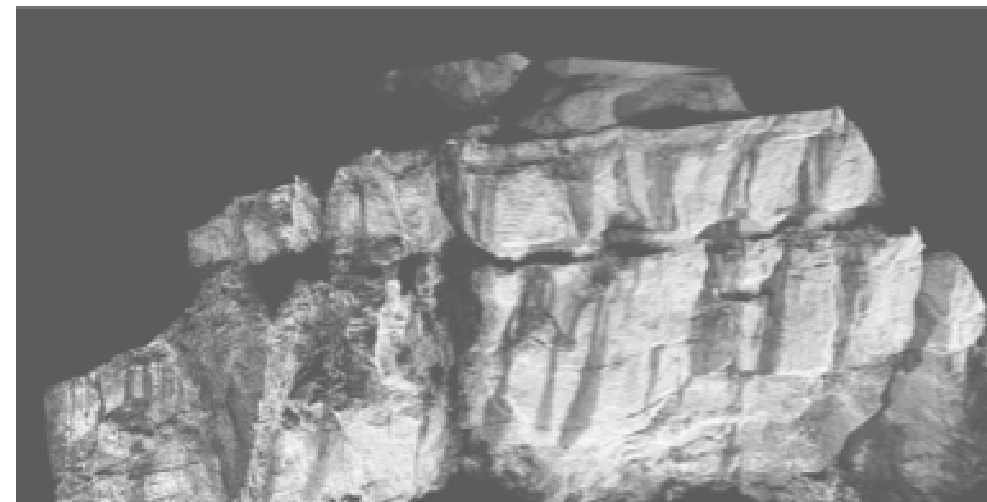
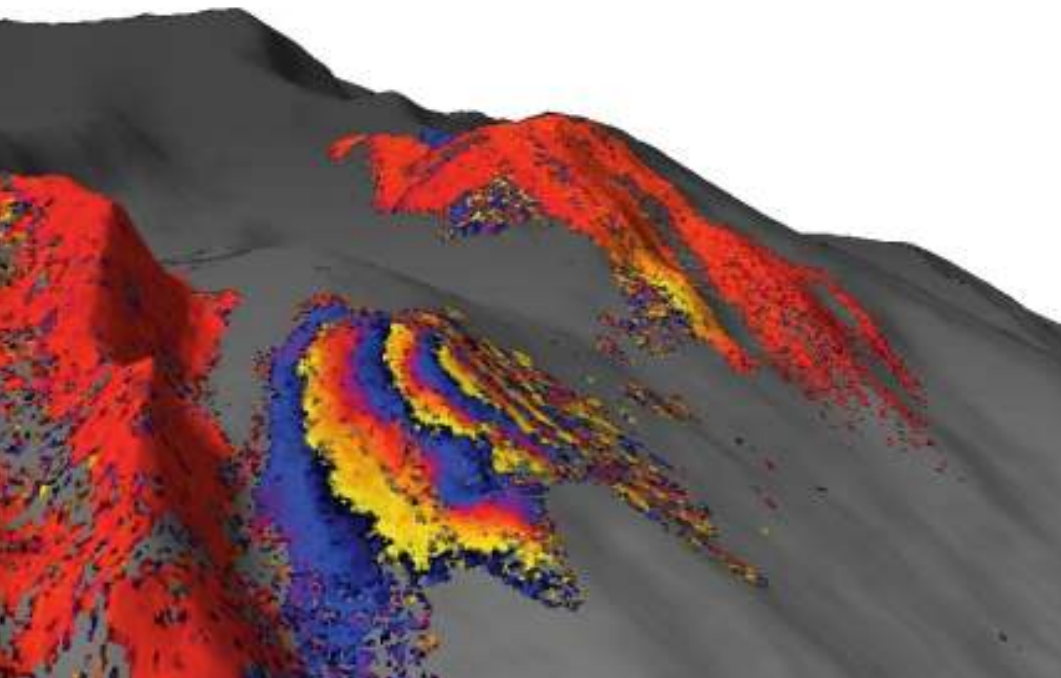
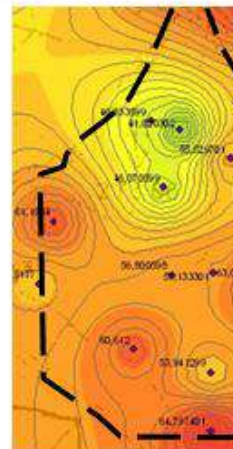
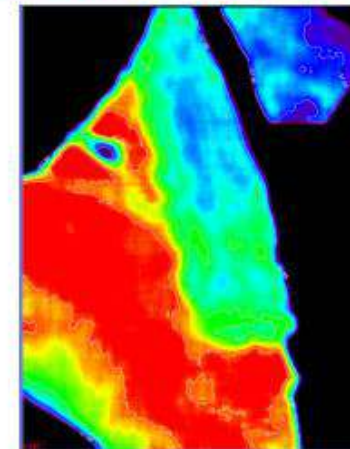
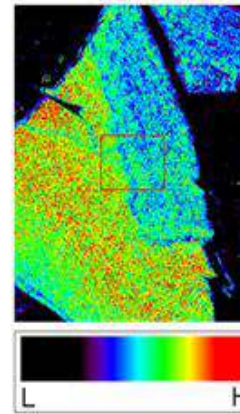


PSInSAR  
GBInSAR  
Hyperspectral  
Laser scanning



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(ref. Wile & Montmar, absorption at 2215 nm)

CLAY INDEX - Field 2





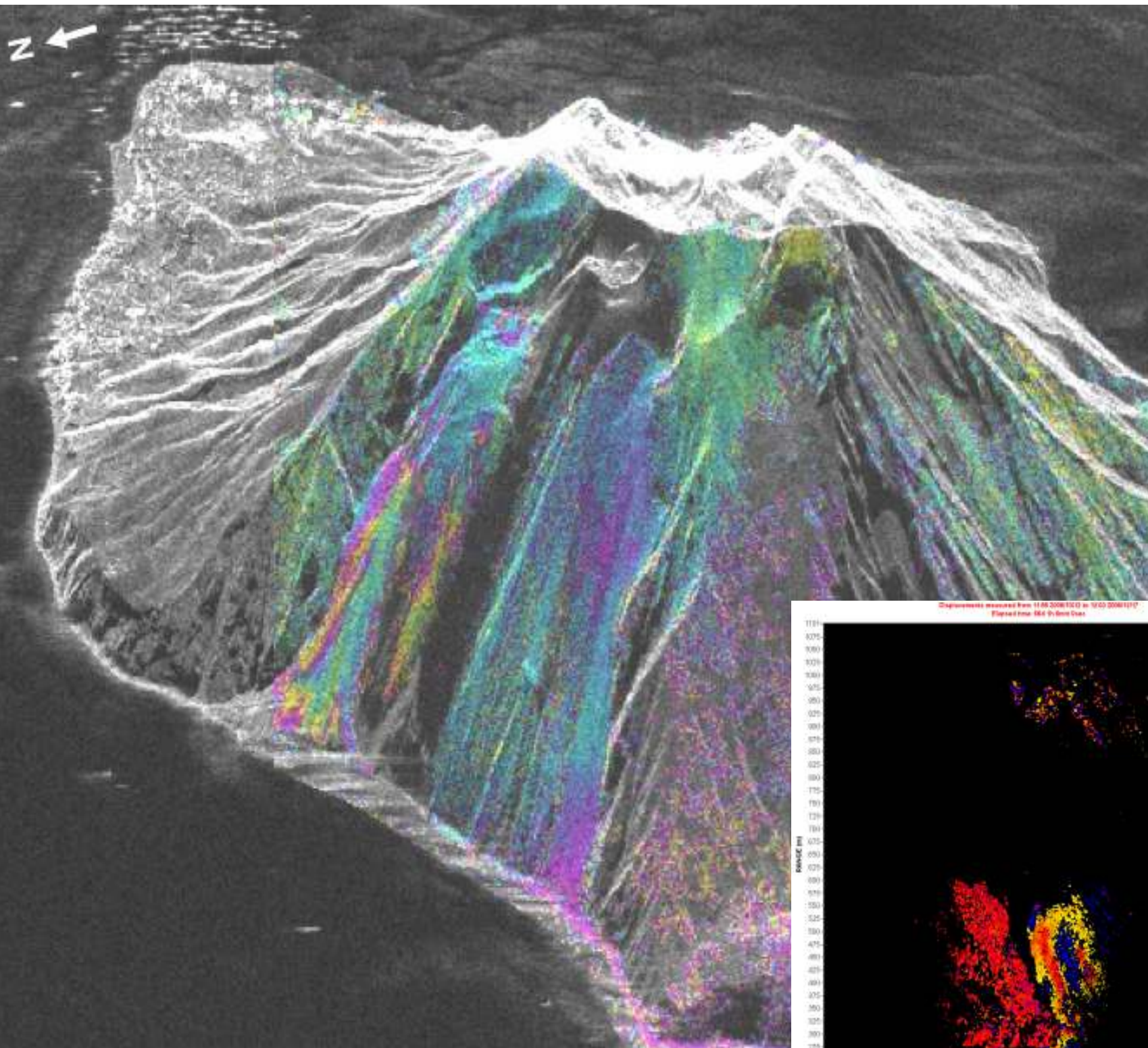
08 – 17/12/08

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DTM\_2007  
March'07)





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## Home page

**Welcome to the Second World Landslide Forum!**



Search Site

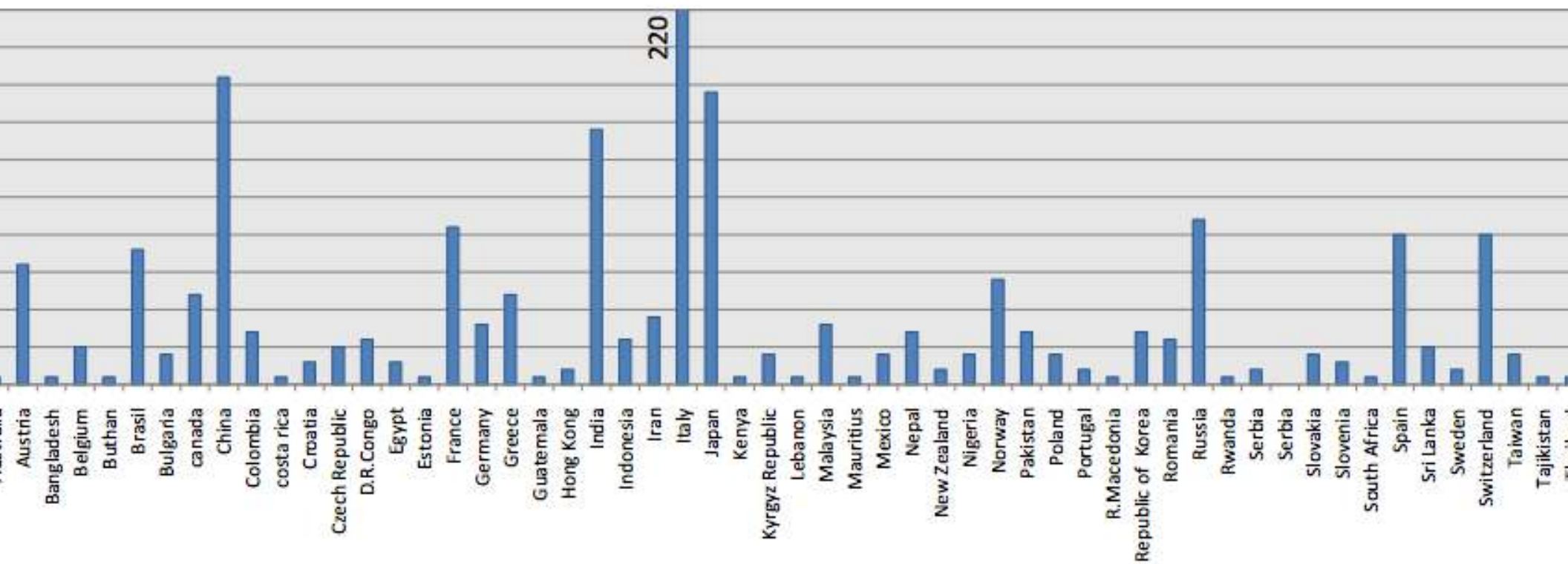
[Advanced S](#)

## Video Gallery





## Pre-registered Participants (15 March 2011)



ca. 500 pre-registered participants from 66 countries



# Facebook

E-mail

☐ Resta collegato

Password

Hai dimenticato la password?

**Strazione** Facebook ti aiuta a connetterti e rimanere in contatto con le persone della tua vita.



## World Landslide Forum 2

Mi piace

Organizzazione no-profit · Rome, Italy

Bacheca

World Landslide Forum 2 · Post più popolari ▼



### World Landslide Forum 2

call for abstracts deadline March 15 2011

10 marzo alle ore 10.48 · Mi piace · Commenta

Attività recenti



Commento sulla Bacheca di Federal Emergency Management Agency:  
"Second World Landslide Forum 3-9..."



World Landslide Forum 2 ha modificato i suoi campi Sito Web,  
Descrizione e Informazioni generali



Commento sulla Bacheca di Dipartimento di Scienze della Terra:  
"World Landslide Forum II call..."

Mostra tutte

Pacific Disaster  
Center

Columbia  
University in the



### World Landslide Forum 2



World Landslide Forum  
[www.wlf2.org](http://www.wlf2.org)



**IPL-ICL Session in Global Platform 2011**

## **Round Table Discussion**

**Towards a dynamic and global development of International Programme on Landslides (IPL)-**

**Date: 10:00-17:00 on 9 May (Monday) 2011**

**Venue: CCV Room D, Centre International de Conference Geneve (CICG)**

advancements and innovation

ordinating activities (HFA1): ICL, IPL, FP7, GM

onitoring (HFA2): remote sensing

redicting and warning (HFA2): Landslide forecasts  
odels based on rainfalls or deformation time series

ducation, advocacy and awareness (HFA3): training  
etworks FP7 MC RTN, UNITWIN, Laram School  
andslide School Network

... (HFA4): ...

# Major gaps in Society

**Global level:** poor resources with respect to other risks, lower attention

**Regional level:** low risk perception and awareness, poor know how in developing countries

**National level:** lack of national inventories, sparse data, difficulties in modeling, insufficient prevention

**Local level:** low resilience of local communities, scarce preparedness, insufficient education and information to citizens, poor coordination of local



# technical knowledge

lack of systematic inventories and catalogues

difficulties in triggering models

difficulties in quantitative risk assessment

relationships with other hazards and multirisk  
assessment

low spatial and temporal resolution of EO systems

low effectiveness of engineering risk reduction



United Nations  
Educational, Scientific and  
Cultural Organization



Landslide and Water-related  
Disaster Risk Management

IPL: <http://iplhq.org/>

ICL: <http://iclhq.org/>

# Thank you

[nicola.casagli@unifi.it](mailto:nicola.casagli@unifi.it)