International Forum on Research Institutes for Disaster Risk Reduction

Uji Campus, DPRI, Kyoto University
March 11-13, 2013

BRGM

The french geological survey

Jean-François ROCCHI
Chairman and CEO

- Geology
- Mineral resources
- Geothermal energy
- Geological storage of CO_2
- Water
- Post-mining
- Risks
- Polluted soils and waste
- Metrology
- Information systems

Geoscience for a sustainable Earth
brgm

Outline

Introduction to BRGM

Our vision to disaster risk reduction:
From research collaborations to field implementation

Perspectives

BRGM is France's leading public institution in Earth Sciences applications for the management of surface and subsurface resources and risks.

Key objectives

> Understanding geological processes and associated risks, developing new methodologies and techniques, producing and disseminating high-quality data.

> Developing and delivering necessary tools
for the management of soils, subsoils and their resources, the prevention of natural risks and pollution and the development of public policy responses to climate change.

BRGM : the French Geological Survey

Created in 1959, the Bureau de Recherches Géologiques et Minières was given a new legal status in September 2004 as a public industrial and commercial establishment.

It reports to the Ministry of Higher Education and Research, the Ministry for Ecology, Sustainable Development and Energy, and the Minister for Productive Recovery.

The 2013-2017 state BRGM contract

18 goals, 65 targets
Performance and evaluation indicators
Growth in activities and resources under contract
Coherence with P4 organisations and the Budget Act (LOLF)

Quality certification

ISO 9001-version 2008
covering all BRGM activities.
ISO 14001
Our analytical laboratories are COFRAC-accredited for environmental matrices.

Key roles

Scientific Research

- Furthering geological knowledge through observations and modelling of surface and subsurface processes.

- Applications to support public policy development.

- Transfers to industry.

These activities are undertaken through projects financed from multiple sources (Regional,European), partnerships with targeted agencies (ANR, ADEME) and involvement in technological networks (Ministry for Research).

The BRGM is one of the Carnot Institutes.

INSTITUT CARNOT brgm

Participation in **41** European research projects (FP7),

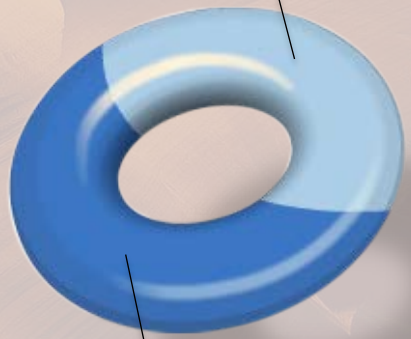
Including 6 as coordinator

Key figures 2011

(budgeted for 2012)

SR contracts

€ 16.9 M *(€ 16.5 M)*



SR state allocations

€ 28.4M *(€ 28.8 M)*

Scientific Research

€ 45.3 M *(€ 45.3 M)*

Key roles

Support to public policy-making

- Monitoring, capitalisation and dissemination of knowledge on soils and subsoils (databases).
- Independent public expert studies.
- Methodological and synoptic studies.
- Training and knowledge transfer to support public policy development: state, central and local government, public enterprises and institutions.

Broad guidelines are determined to meet the needs of the stakeholders concerned, expressed under the aegis of the Regional Prefects.

96 agreements

signed with regional and local authorities

Key figures 2011

(budgeted for 2012)

PS under contract

€ 33.4 M *(€ 31.7 M)*

PS state allocations

€ 17.4 M *(€ 17.4 M)*

Public service activities

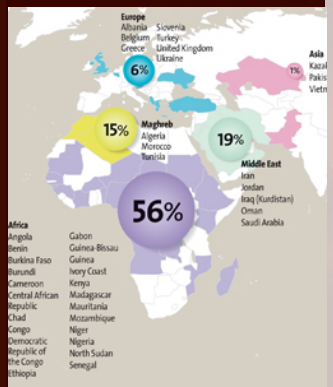
€ 50.8 M *(€ 49.1 M)*

Key roles

International cooperation

• Internationally as well as in France, BRGM contributes its particular know-how and expertise in geological infrastructure, natural risks, mineral resources, groundwaters and the environment.

• The BRGM acts on several fronts:
- Support to French cooperation policy development;
- Public policy-making support to States;
- Services to businesses in the environmental, mining and energy fields;
- Contributions to the work of international geological bodies;
- Support to EU policy development.



200 + *international cooperation* projects

Key figures 2011
(budgeted for 2012)

Service activities in France

€ 6.9 M *(€ 4.9 M)*

Services activities internationally

€ 6.9 M *(€ 13.5 M)*

Services

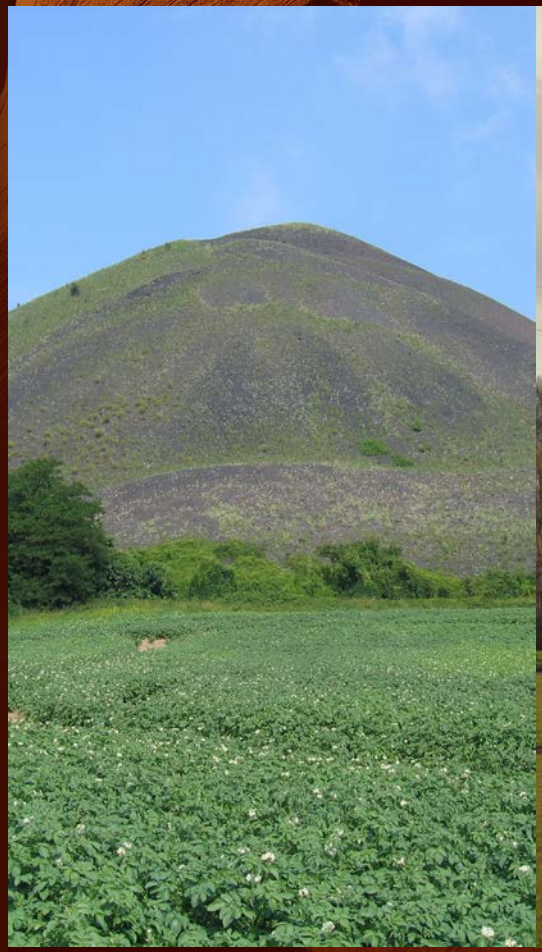
€ 12.2 M *(€ 18.4 M)*

Key roles

Mine safety

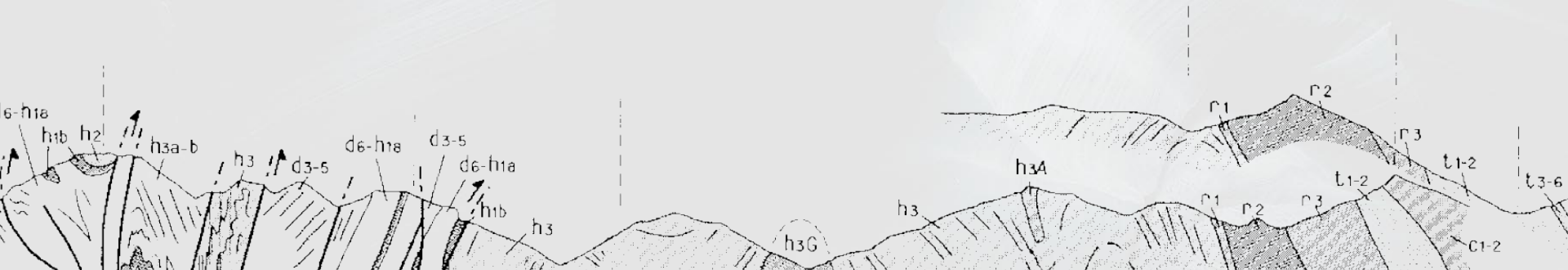
• In 2006, after the closure of coal and potash mines, BRGM became responsible, on behalf of the French State, for the prevention of pollution and risks in former mining sites.
Under a specific State budget allocation, the BRGM is responsible for:
- Operation and maintaining the safety facilities and equipment transferred to the State
- Studies, proposals and implementation of any additional work required to comply with safety standards.

• The goal is to guarantee the safety of people and property and to preserve mining know-how and knowledge.



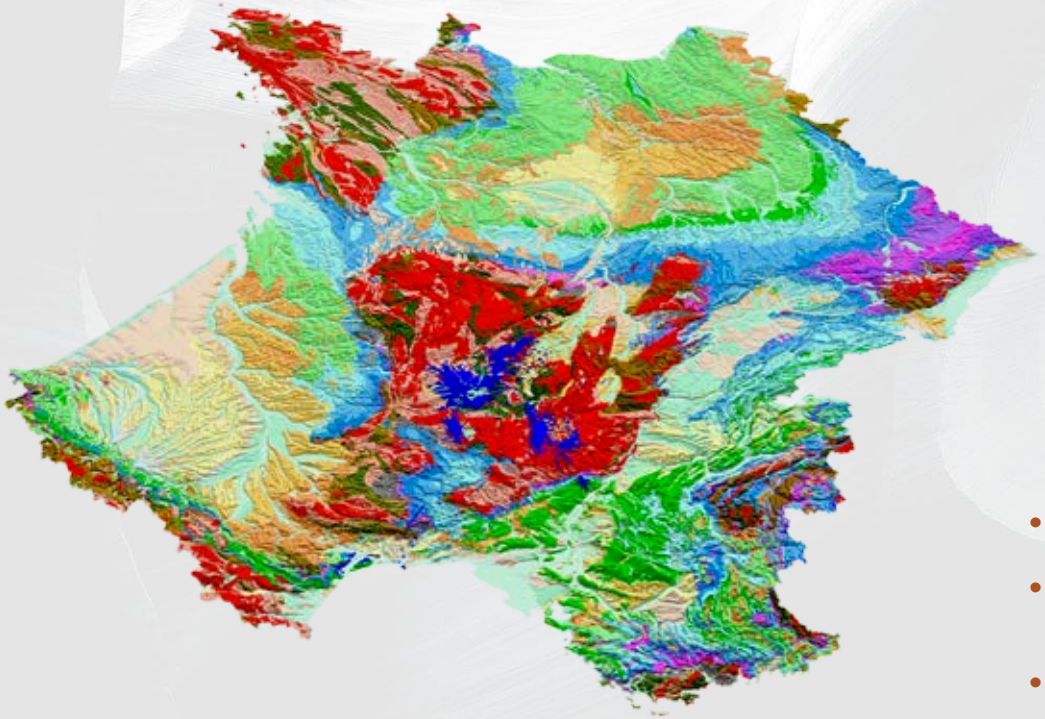
10 *topic areas*

Geology	€ 11.9 M
Mineral resources	€ 9.1 M
Geothermal energy	€ 7.4 M
Geological storage of CO_2	€ 5.5 M
Water	€ 23.4
Post-mining	€ 25.1 M
Risks	€ 17.2 M
Polluted soils and waste	€ 17.4 M
Metrology	€ 2.9 M
Information systems	€ 7.6 M



Key figures 2011

Geology and information systems



More than

2500 **books, CD-ROMS**
maps, BRGM Editions

176 **publications**
in Class A scientific journals

10.4 **million visits**
to www.brgm.fr

- Geological maps covering all of France
- Data digitisation and delivery (databases including the BSS subsoils database)
- Geographic information systems, virtual reality, 3D modelling

BRGM school - enag

Training programme:
Sustainable management of mineral resources

- Train high-level specialists in geosciences
  - meet the needs of mining companies
  - National geological surveys
  - or States governments
- Provide graduates with a trio of skills
  - Geology
  - Economics
  - Management
- As much emphasis upon resource governance as upon technical excellence in geosciences
- 16 months programme including 6 months work experience in a company
- Instructors from French and foreign organizations, companies or universities

Géosciences pour une Terre durable

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Risks and Prevention Division

Geological Hazards

Multi-hazards

Vulnerabilities

Risks

Multi-risks

Systemic analysis

Uncertainties

Climate change

Action Plans

Crisis management

Resilience

"Fukushima and other recent events clearly show the need for a systems-based approach"

Post-mining

Risks

Metrology

Information systems

Risks and Prevention Division: major objectives

- **Foresee and forewarn naturals or man-made phenomena and their consequences:**
  - Geological risks: earthquakes, volcanic eruptions, landslides
  - Coastal risks : tsunamis, submersion, coastal erosion
  - Man-made risks related to geological storages and exploitations
- **Ensure former mines safety**
- **Develop diagnostic and decision-helping tools regarding risks for sustainable territorial planning:**
  - Monitoring systems
  - Inventories and databases
  - Zoning, hazard and risk maps
  - Risks scenarios
  - Mitigation and adaptation measures…
  - Simulation tools
- **Support public-policies through expertise** in terms of analysis and integrated management of naturals and anthropic risks

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Risks and Prevention Division

6 TEAMS

Seismic and Volcanic Risks
Gravitational Instability and Erosion Risks
Coastal and Climate Change Risks
Storage and Subsoil Exploitation Risks
Cavities Risks, Subsoil Planning and Imaging
Prevention and Mining Safety

≈200 PERSONS

Engineers and Researchers
Support functions
Post-doc and PhD. Students
Internship students

Risks and Prevention Division: main funding sources

FROM FRENCH STATE

- *Ministry of Ecology, Sustainable Development and Energy*
- *Ministry of Higher Education and Research*
- *Ministry of Foreign and European Affairs*
- *Local services and communities*

  Municipalities, provinces…

FROM FUNDING AGENCIES

- *French National Research Agency (ANR)*
- *Carnot Institutes Network (ANR)*
- *European Commission 7th Framework Program (FP7)*
- *World Bank*

FROM PRIVATE COMPANIES

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Risks and Prevention Division

25 STATE ACTIONS

25 as coordinator

24 ANR* PROJETS

12 as coordinator

18 FP7** PROJECTS

3 as coordinator

* ANR : French National Research Agency
** FP7 : 7th Framework Program

Research Collaborations

BRGM in the French research: recent ANR projects

CASAVA	Volcanic hazards, scenarios, and risks in the Lesser Antilles – implications for decision-making, crisis management, and pragmatic development
BELLE-PLAINE	Study of liquefiable soils in natural conditions ; pilot borehole site and predictive (numerical / experimental) models (Guadeloupe)
DEBATE	Development of Broadband Acceleration Time-histories for Engineers
DYNTOHOKU	Dynamics of the 2011 Tohoku earthquake: from long term stress accumulation to asperities
EVSIM	Seismic vulnerability of masonry buildings: a mechanical approach
ONAMAZU	Quantitative assessment of nonlinear soil response during the great Tohoku earthquake
SEISMULATOR	Seismic simulation in complex source-site context
URBASIS	Urban Seismology: seismic vulnerability and damages assessment using innovative methods
CECILE	Coastal environmental changes: impact of sea level rise
MISEEVA	Marine inundation hazard exposure modeling and social, economic and environmental vulnerability assessment
VULSACO	Vulnerability of coastal systems faced to climate change and human pressures
SAMCO	Society adaptation for coping with mountain risks in a global changes context
SISCA	Integrated Early Warning System of Landslide Crises
D2SOU	Considering soil and subsoil as sustainable criterion for land use planning
EM-HONTOMIN	CSEM/electric methods for the monitoring of CO2 and application to the Hontomin pilot site (Spain)
FISIC	Faults and induced seismicity under CO2 injection conditions
BIO-PHY	Process optimization of bio-clean-up of contaminated groundwater by hydrocarbon by a geophysical monitoring and gas analysis
DSS_EVAC	Decision Support System for Large-Scale Evacuation Logistics

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Risks and Prevention Division

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* ANR : French National Research Agency
** FP7 : Framework Program 7

Research Collaborations

BRGM in the European research: recent FP7 projects

NEMOH	Numerical, Experimental and stochastic Modelling of volcanic processes and Hazard: an Initial Training Network for the next generation of European Volcanologists
MedSuv	MEDiterranean SUpersite Volcanoes
Mia-Vita brgm	Mitigate and Assess risk from Volcanic Impact on Terrain and human Activities
MarSite	New Directions in Seismic Hazard Assessment through focused Earth Observation in the Marmara Supersite
PERPETUATE	Performance-based approach to the earthquake protection of cultural heritage in European and Mediterranean countries
REAKT	Real-time earthquake risk reduction
SHARE	Seismic Hazard Harmonization in Europe
Syner-G	Systemic seismic vulnerability and risk analysis for buildings, lifeline networks and infrastructures safety gain
Mi-Core	Morphological Impacts and Coastal Risks induced by Extreme storm Events
THESEUS	Innovative technologies for safer European coasts in a changing climate
ENSURE brgm	Enhancing resilience of communities and territories facing natural and na-tech hazards
MOVE	Methods for the improvement of vulnerability assessment in Europe
MATRIX	New multi-hazard and multi-risk assessment methods for Europe
SafeLand	Living with landslide risk in Europe: assessment, effects of global change and risk management strategies
DigiSoil brgm	An integrated system of data collection technologies for mapping soil properties

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Risks and Prevention Division

25 STATE ACTIONS
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24 ANR* PROJETS
12 as coordinator

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* ANR : French National Research Agency
** FP7 : Framework Program 7

Research Collaborations

ANR SEISMULATOR (2006-2008) aimed to dynamically model the entire chain of the earthquake phenomena.

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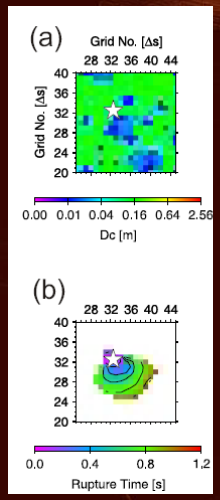
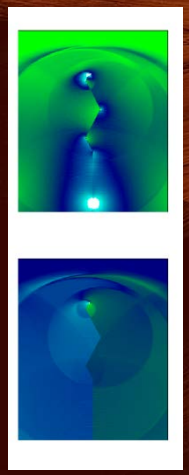
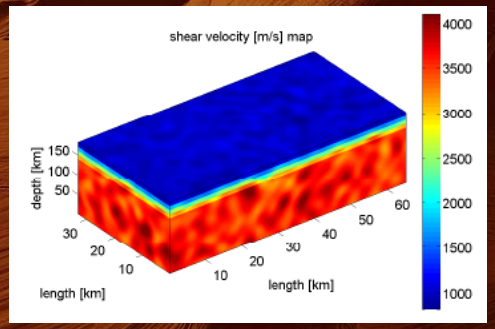
Risks and Prevention Division

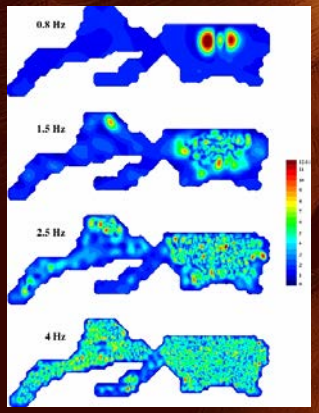
Earthquake Source



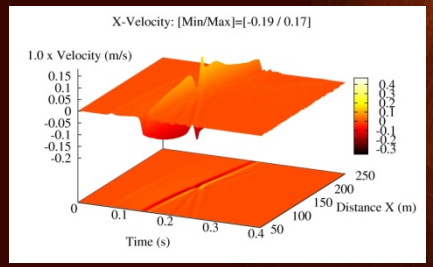




Regional wave propagation



Local site effect



Synergy of partners

25 STATE ACTIONS
25 as coordinator

24 ANR* PROJETS
12 as coordinator

18 FP7** PROJECTS
3 as coordinator

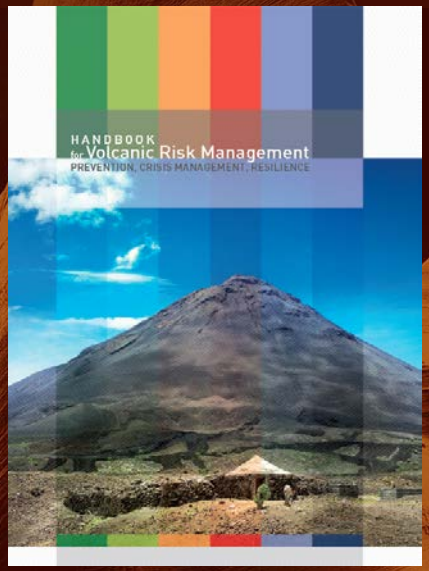
* ANR : French National Research Agency
** FP7 : Framework Program 7

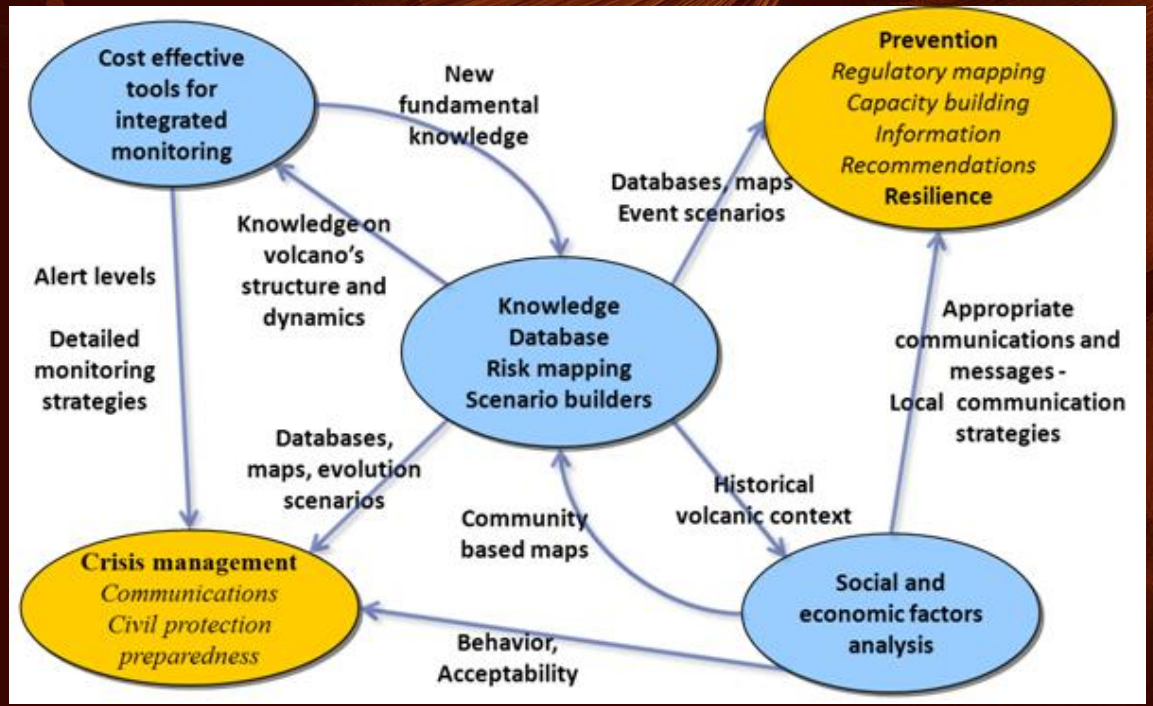
FP7 Mia-Vita

Mitigate and Assess risk from Volcanic Impact on Terrain and human Activities

*Developing **tools and integrated cost effective methodologies** to mitigate risks from various hazards **on active volcanoes***

*Methodology designed for **developing countries contexts** and based on **shared experiences and expertise***





Research Collaborations

MIA VITA

Risks and Prevention Division

4 Years: 2009-2012

miavita.brgm.fr

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Géosciences pour une Terre durable

FP7 ENSURE

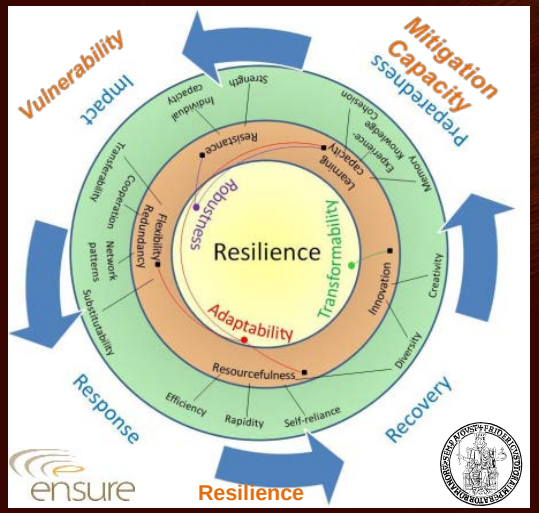
Enhancing resilience of communities and territories facing natural and Na-tech hazards

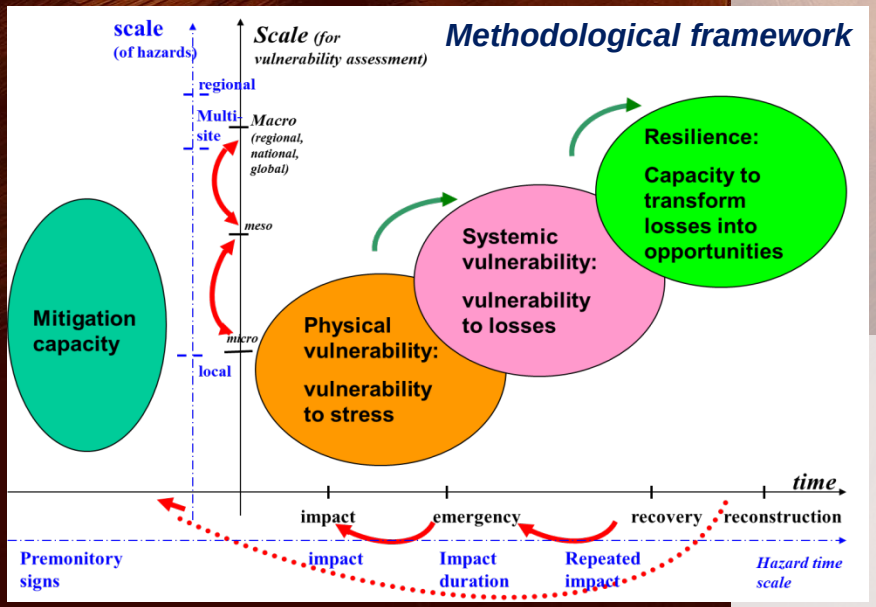
Vulnerability assessment: *a key part of risk assessment and management,* ***but the influence of vulnerability of exposed systems*** *on the death toll and losses in case of natural or man-made disasters* ***is often neglected in the majority of studies***

⇒ Defining a ***methodological integrated framework***

⇒ Defining the ***relationship between vulnerability concept and other concepts*** (e.g. risk, resilience, adaptation, …)

⇒ Investigating the ***temporal and spatial variability*** of the relations between various vulnerability and damage types.





Research Collaborations

ensure

Risks and Prevention Division

3 Years: 2009-2011

www.ensureproject.eu

brgm
ITC
Middlesex University
UNIVERSITÉ DE GENÈVE

SEVENTH FRAMEWORK PROGRAMME

Géosciences pour une Terre durable
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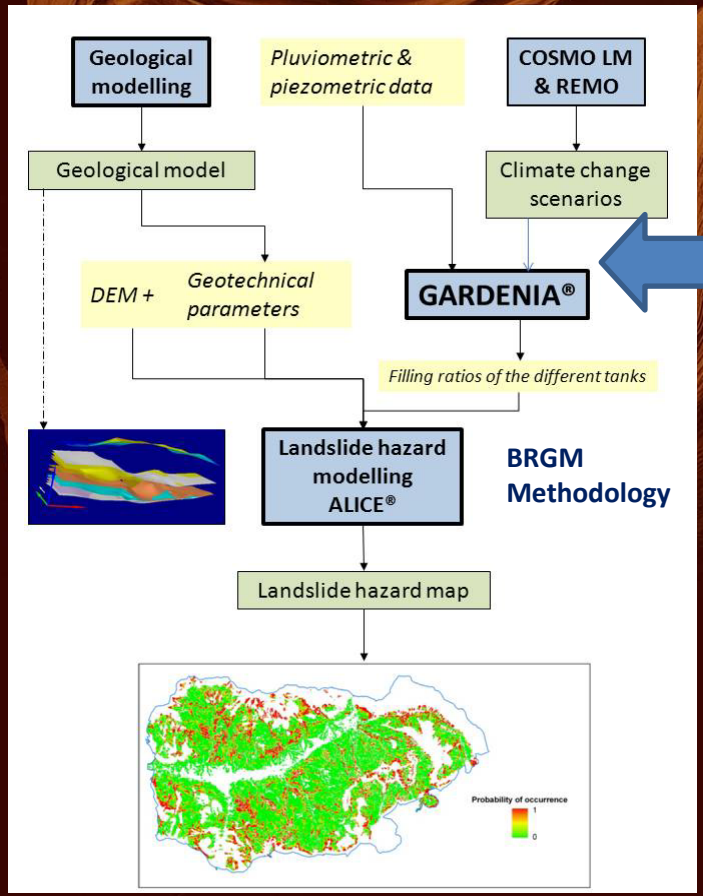
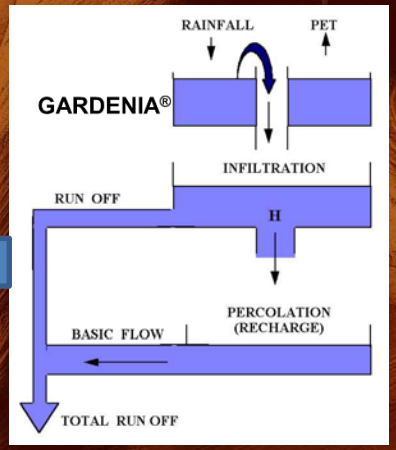
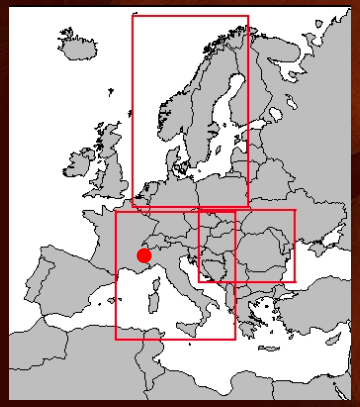
FP7 SafeLand

Living with landslide risk in Europe: Assessment, effects of global change, and risk management strategies.

*Integrate **global changes scenarios** in the assessment of **landslide hazard and risk evolution** in selected "hotspot" areas in Europe*







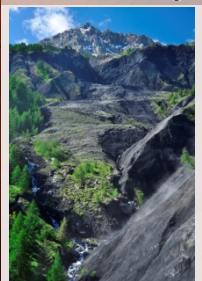
Research Collaborations

SafeLand

Risks and Prevention Division

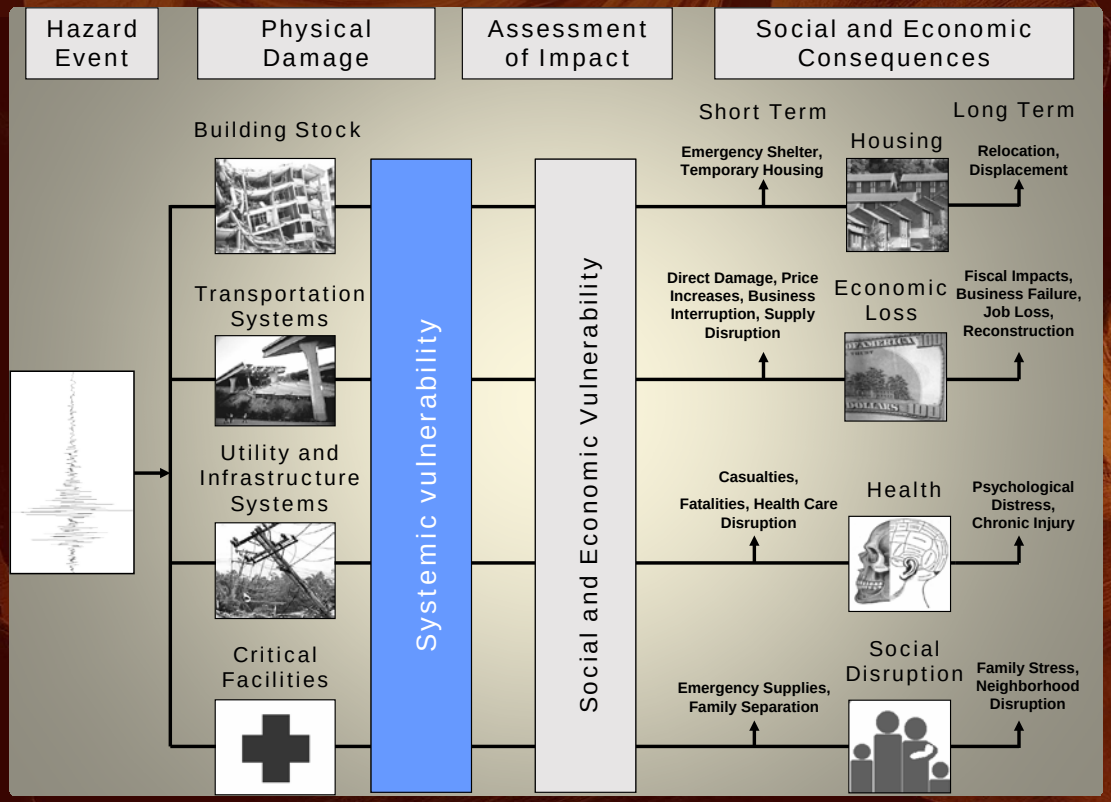
3 Years: 2009-2012

http://www.safeland-fp7.eu

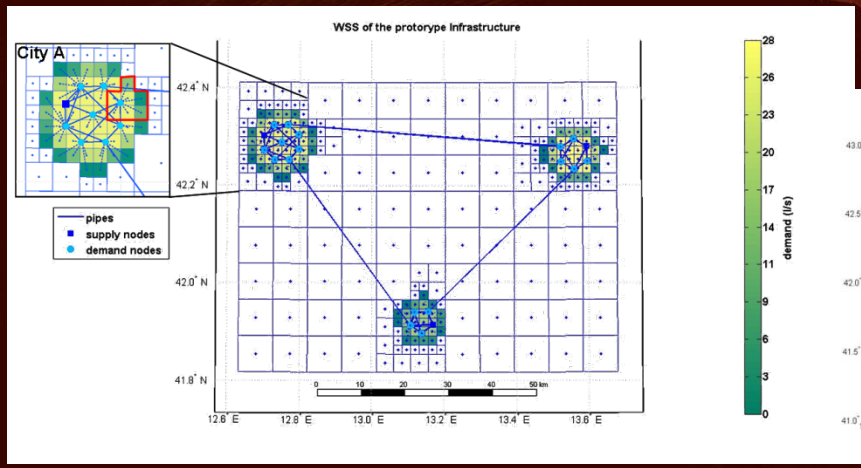


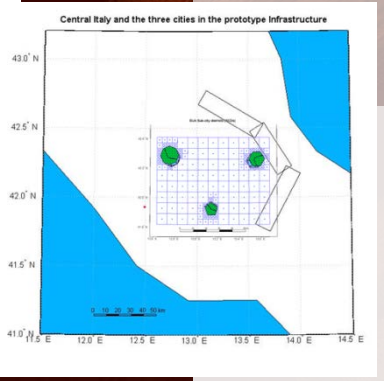
FP7 Syner-G

Systemic Seismic Vulnerability and Risk Analysis for Buildings, Lifeline Networks and Infrastructures Safety Gain



Demand on nodes of regional Supply Systems (water, energy), proportional to the actual population and industrial facilities





Research Collaborations

Risks and Prevention Division

4 Years: 2009-2013

http://www.vce.at/SYNER-G

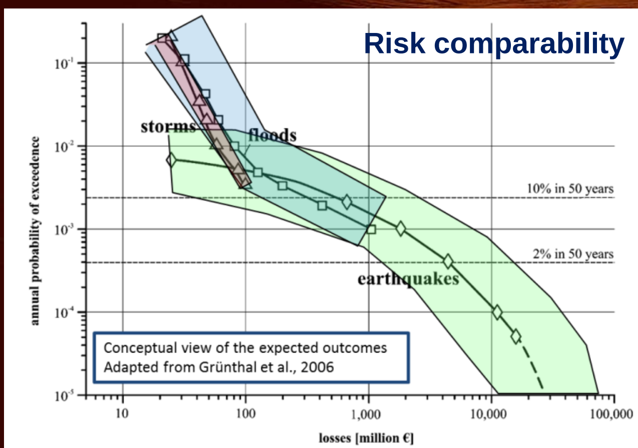
FP7 Matrix

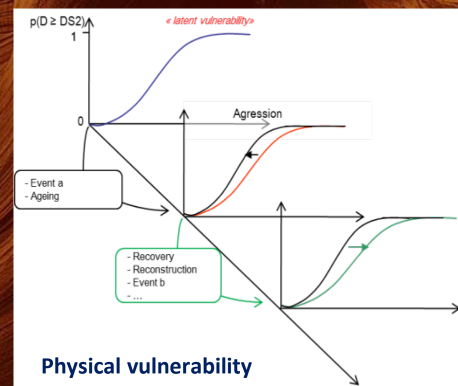
New Multi-HAzard and MulTi-RIsK Assessment MethodS for Europe

To develop methods and tools to tackle multiple natural hazards within a common framework.

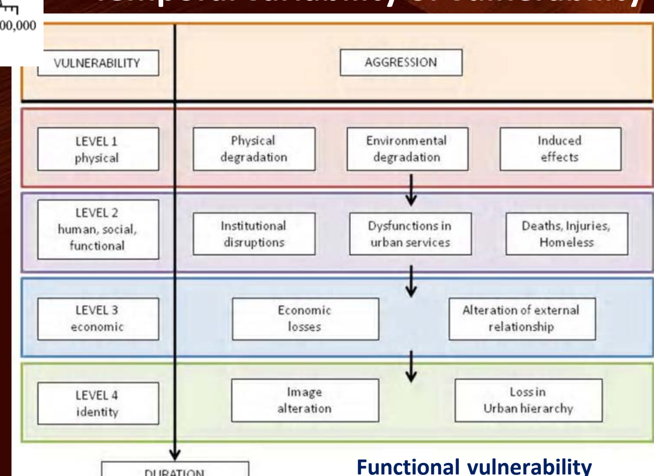
Focusing on:

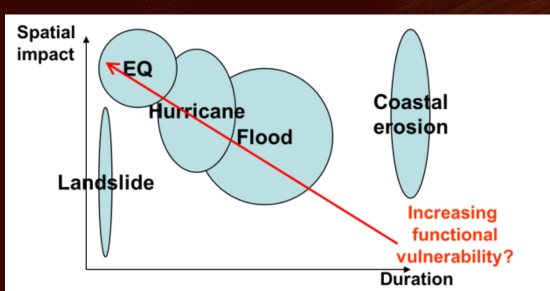
- ⇒ ***Risk comparability and uncertainties***
- ⇒ ***Cascading hazards and impacts***
- ⇒ ***Time-dependent vulnerability for conjoint/successive hazards***





Temporal variability of vulnerability





Research Collaborations

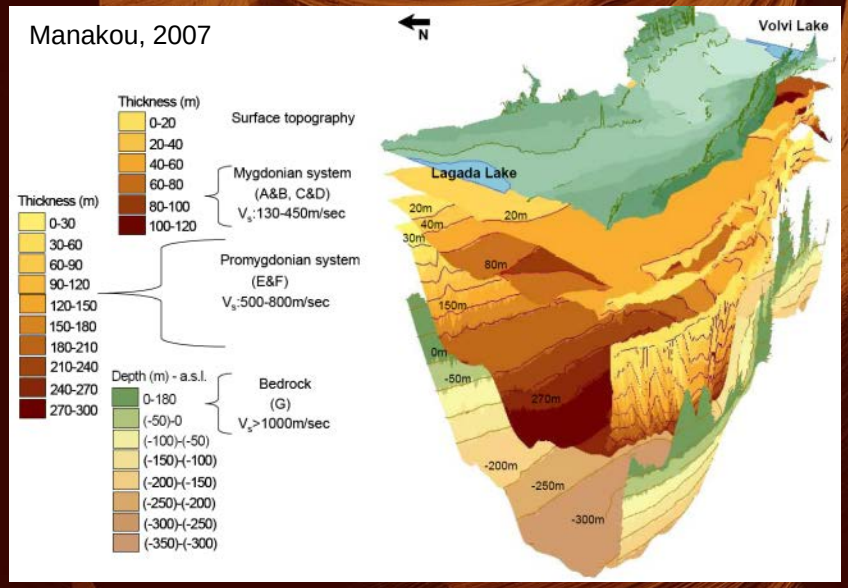
Risks and Prevention Division

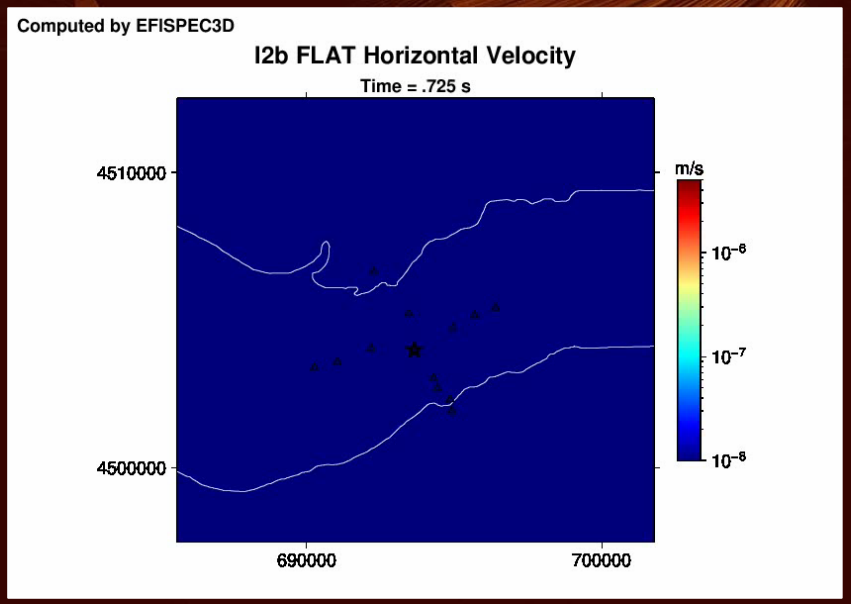
3 Years: 2010-2013

http://matrix.gpi.kit.edu

Research Collaborations

EUROSEISTEST VERIFICATION AND VALIDATION PROJECT





3D conception of the Mygdonia basin, Greece

Earthquake simulation within the 3D basin

Estimation of seismic hazard

E-2VP

EUROSEISTEST VERIFICATION AND VALIDATION PROJECT

Risks and Prevention Division

4 Hz

Realistic large-scale simulations

In a context of low or moderate seismicity, the use of numerical tools becomes essential to estimate hazard

Challenge: evaluate the reliability of ground motion simulations in a real case for civil engineering design purposes

Supported by

Atomic Energy Commission

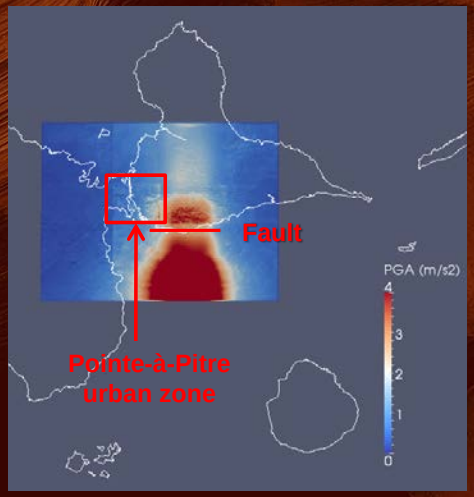
Institute of Earth's Science

Laue-Langevin Institute

Research Collaborations
INTERNATIONAL EXCHANGES

Sending and receiving young scientists at the forefront of recent knowledge enables BRGM to renew and strengthen its creativity on original scientific issues

Toward a realistic seismic hazard assessment
→ past exchanges with DPRI led to improve understanding of waves propagation in complex geological medium



Seismic waves propagation at regional scale in the French Riviera (left) and Guadeloupe (right) computed by EFISPEC3D©BRGM

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Géosciences pour une Terre durable

Risks and Prevention Division

8 EXCHANGES DPRI-BRGM

5 stays of BRGM's researchers at DPRI

3 stays of DPRI's researchers at BRGM

Supported by

INSTITUT CARNOT brgm

文部科学省 MEXT

Research implementation for disaster risk reduction

Haiti National Microzonation program

- Funded by UNDP for the Haitian Ministry of Public Work
- Microzonation of Port au Prince ; then Cap Haitien, Fort-Liberté, Ouanaminthe, Port de Paix

Objectives:

- **Training of the Haitian team** to perform seismic microzonation
- Producing **microzonation maps**:
  - Site effects maps: soil seismic response and ground motion spectra
  - Induded effects maps: lands instability and liquefaction
  - Recommandations for risk prevention plans

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Risks and Prevention Division

4 Years:
2011-2015

Collaboration between

- *BRGM*
- *Bureau des Mines et de l'Energie*
- *Laboratoire National du Bâtiment et des Travaux Publics*

Research implementation for disaster risk reduction

Seismic crisis management simulations:

« RICHTER » exercises

- Partnership with the French Ministry of Interior

Objectives

- Provide **training** for risk management services
- Raising **awareness** for local communities and the public
- **Evaluate and adapt** the content of risk management plans

Contributions

- Provide scientifically relevant data on credible seismic events and their **potential damage** to buildings and populations
- Support the writing of the game **scenario** and the **animation** of local players

Challenges

- Simulate various phases of a crisis
- Integrate site-specific conditions, including the presence of industrial or nuclear risks

Géosciences pour une Terre durable
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Risks and Prevention Division

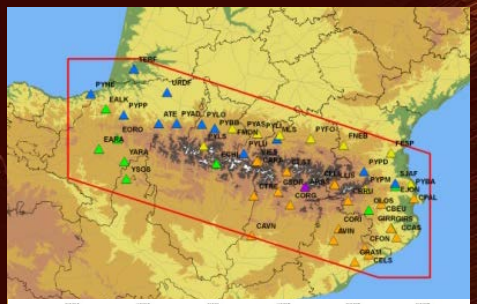
7 exercises over the last 6 years

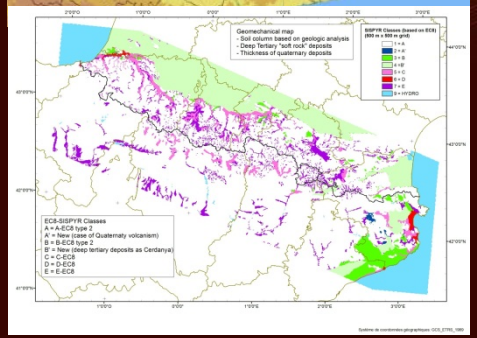
In 6 French metropolitan provinces and in the French West Indies

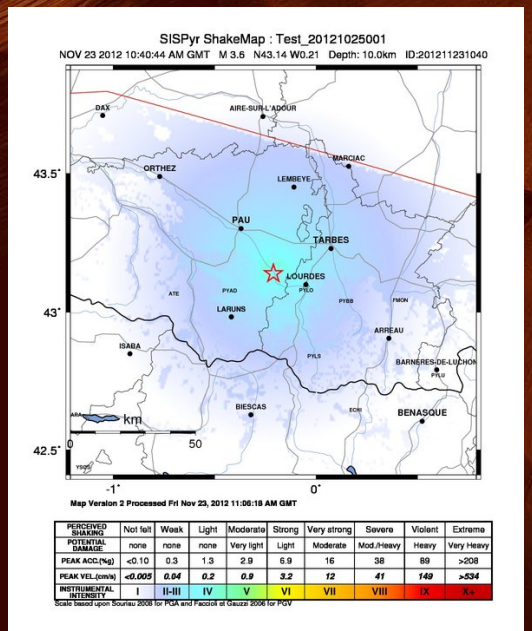
Research implementation for disaster risk reduction

Development of seismic risk assessment and management tools for the Pyrenean area

- ***French-Spanish collaboration*** funded by the EU
- ***Produce Shakemaps*** (earthquake effects maps) to be provided to authorities:
  - **Automatic treatment** of seismological and macroseismic data
  - For magnitudes Ml ≥ **3,5**
  - Based on a **geological characterization of site effects**
  - **Consistent analysis over both sides of the border**







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46 seismic stations over the Pyrenean chain

5 minutes to deliver the first ShakeMap at www.sispyr.eu

Collaboration between BRGM, OMP, IGC, IGN, UPC, Geocat with data from BCSF

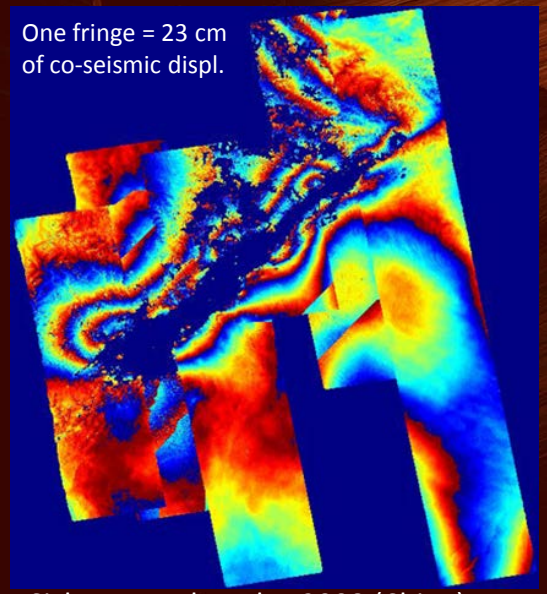
Unión Europea
Fondo Europeo de Desarrollo Regional

International Charter "Space and Major Disasters"

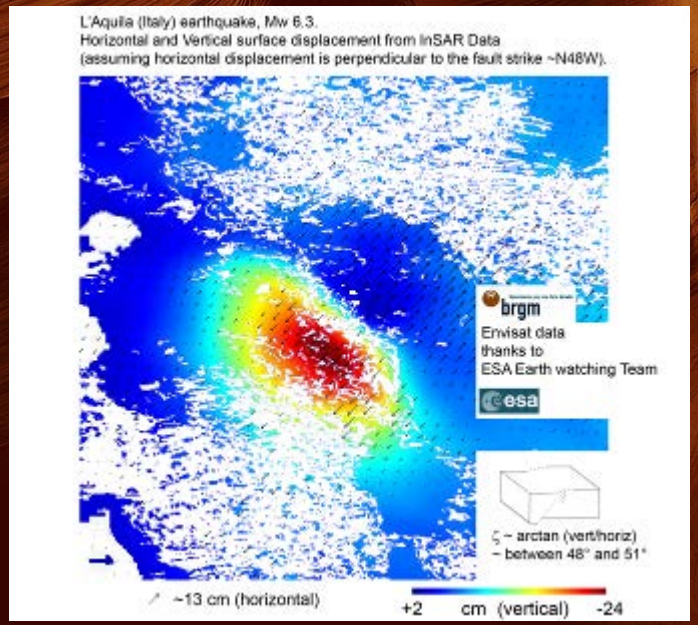
The Intervention Cell of technical and scientific expertise (CIEST, since 2005)

To ease:

- *Collaborative effort of French institutions (CNES, INSU-CNRS, BRGM, CEA, IRD, IPGP)*
- *Exchanges of information and data between the Charter partners and the space agencies during and after events (earthquakes, volcanic eruptions, landslides, tsunami) triggering the International Charter .*



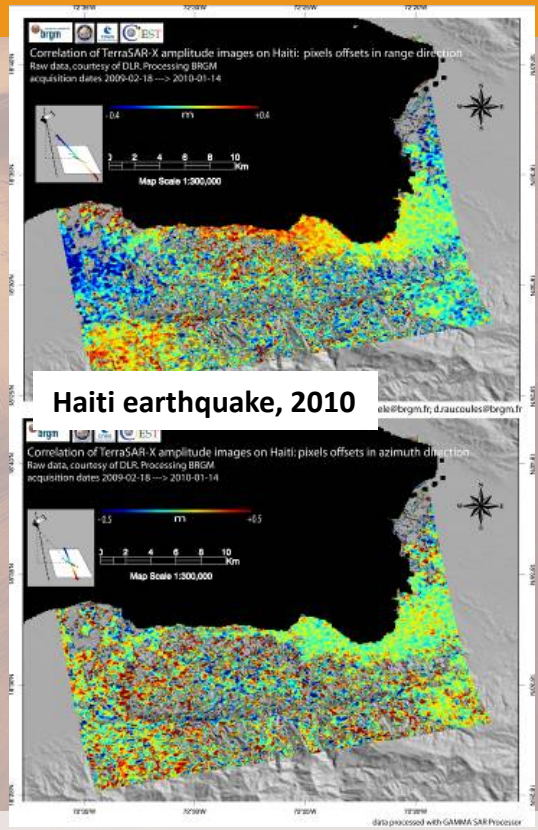
Sichuan earthquake, 2008 (China):
Alos PALSAR L-band interferometry



L'Aquila earthquake, 2009 (Italy)

www.disasterscharter.org

Risks and Prevention Division



Haiti earthquake, 2010

CIEST Cellule d'Intervention et d'Expertise Scientifique et Technique

cnes

Strategy and Perspectives

From Geo-hazards expertise to integrated risks management in the context of global change

- *Improve and disseminate the knowledge about geological hazards*
  - Integrate global change in their assessment
- *Develop multi-hazard and multi-risk approaches*
  - Including uncertainty management
- *Assess urban systems vulnerability*
  - Reduce communities vulnerability
- *Develop mitigation and adaptation strategies*
  - Improve resilience to geological and climatic risks
  - Elaborate adaptation strategies to climate change-induced hazards
- *Strengthen early warning and crisis management preparedness*

Géosciences pour une Terre durable
brgm

Strategy and Perspectives

- ***Take up more and more complex challenges arising to human communities***
  - Develop transverse approaches to man-made subsurface risks
- ***Keep heading towards leading-edge research in Geosciences***
  - New demand for geosciences to support the development of “green” industries
  - Strengthen innovation and industrial competitiveness
  - Foster national and international collaborations and exchanges
- ***Guide and advise public-policies to find answers to emergent questioning***
  - Accompanying the evolution of the roles of the State at all levels
- ***Inform actors and raise awareness of the public***
  - Educate and communicate in the field of geoscience

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