

Theme

Geohazards: Mitigating the Risks



Geohazards can have a drastic effect upon society. While developed nations suffer mostly in **financial** terms, the **human impact** of geohazards is concentrated in the less developed world.

earthquakes, volcanic activity, landslides, tsunamis, floods, health hazards of geological materials

Earth scientists undertake research to better understand hazards and contribute to risk management policies related to social and technical issues associated with geohazards as well as disaster mitigation. This has resulted in improved forecasting where geohazards may occur, and how these may impact communities.

Challenge facing Earth scientists is how best to communicate information on risk reduction to stakeholders to assist better risk management.

Earth science in the Service of Society!



IGCP 640: Significance of Modern and Ancient Submarine Slope LandSLIDEs (S4LIDE)

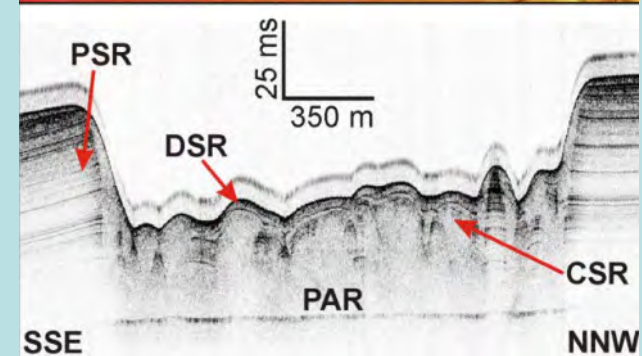
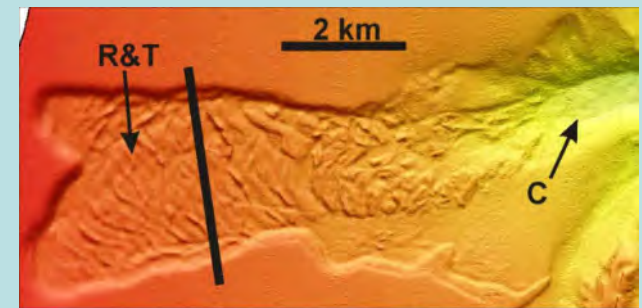
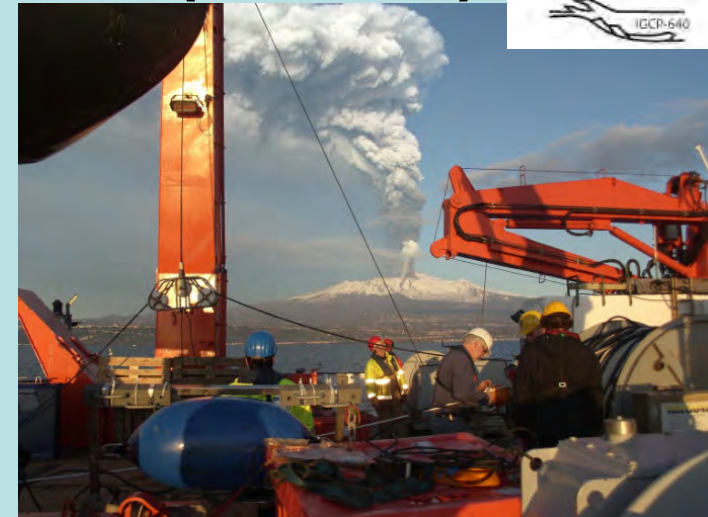
Significance of Modern and Ancient Submarine Slope LandSLIDEs



2015-2019

Subaquatic landslides pose a risk to coastal communities and offshore infrastructure. Lack of **understanding of the causal mechanisms** and timing of submarine landslides has hampered progress in the **prediction effort**. Wide range of sub-disciplines involved: **geologists** studying the link between climate change and gas hydrate dissociation, **planetary geologists** using submarine landslides as terrestrial analogs, **petroleum geologists** evaluating the seal/reservoir capacity of ancient landslides, **engineers** evaluating geotechnical risks, **geo-modellers** filling the gap between landslide occurrence, dynamics and tsunami genesis.

- IGCP 511: Submarine mass movements and their consequences (2005-2009)
- IGCP 585: Earth's continental MARgins: aSsessing the geoHAzard from submarine Landslides (E-MARSHAL) (2010-2014)



IGCP 641: Deformation and fissuring by exploitation of subsurface fluids (M3EF3)



2015-2018

Earth fissures and reactivation of pre-existing faults **caused by extraction of fluids** is observed in sedimentary basins worldwide. Unexpected fissure generation associated with **anthropogenic land subsidence** strongly impact the development of urban areas. The project is aimed to improve the understanding of the processes involved in ground rupturing by **integrated approach**:

- **in-situ monitoring** of surface deformation,
- **remote sensing techniques**,
- **hydro-mechanical laboratory** characterization,
- **mathematical modeling**,
- **test areas** in Mexico, California, and China,
- the approach will be transferred to sites in other developing countries,
- **development of effective tools** to manage the geological risks,
- **recommendations** for sustainable exploitation of subsurface fluids.



IGCP 606: Addressing Environmental and Health Impacts of Major and Abandoned Mines in Sub-Saharan Africa

IGCP 594: Impact of Mining on Environment in Africa

2011-2014

Main topics:

- **Soils contamination** by metals
- Dispersion of **dust and gaseous emissions** from mining operations
- **Contamination of wetlands**, surface and ground waters
- Response of plants to heavy metal stress and bioremediation
- **Mitigation of environmental impacts** and application of modern rehabilitation technologies
- **Geochemical modeling** of the pollutants spreading
- Evaluation of potential **links between contamination and health**
- **Environmental policy and legislation** – best practices
- Compilation of **inventory of abandoned mines**
- Radiation and **radon exposure** risk

Main goals:

- **Integrate the results** of multidisciplinary studies performed in contaminated areas
- **Strengthen the capacity** of African institutions
- **Raise public awareness** about impacts of mining on the environment and human health
- **Facilitate cooperation** among geoscientists and medical scientists.



IGCP 588: Preparing for coastal change

2010-2014

Coastal areas are dynamic and fast changing environments. **Ten per cent of the global population** live less than 10 m above sea level. The predicted **future sea-level rise**, combined with **recent devastating extreme events** has placed significant socioeconomic relevance on the **understanding of coastal dynamics**. The project focused on three research themes: **catastrophic events**, **sea-level fingerprints** and **sea-level change** to identify **records of past coastal change**, and to understand the impacts of human interaction, coastal dynamics and vulnerability at different timescales.

The **project results** are important for:

- **sustainable development** of coastal communities,
- **emergency services** (extreme events),
- resource management and strategies for **adaptation to sea-level change**,
- **planning defense** against sea-level change.



IGCP 601: Seismotectonics and Seismic Hazard in Africa

2011-2014

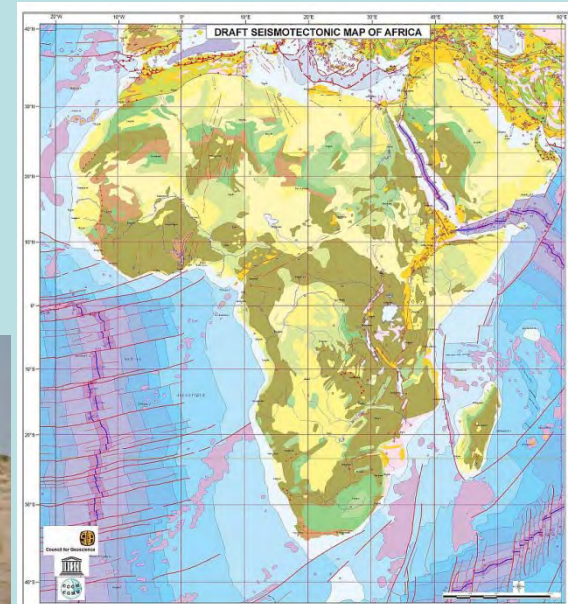
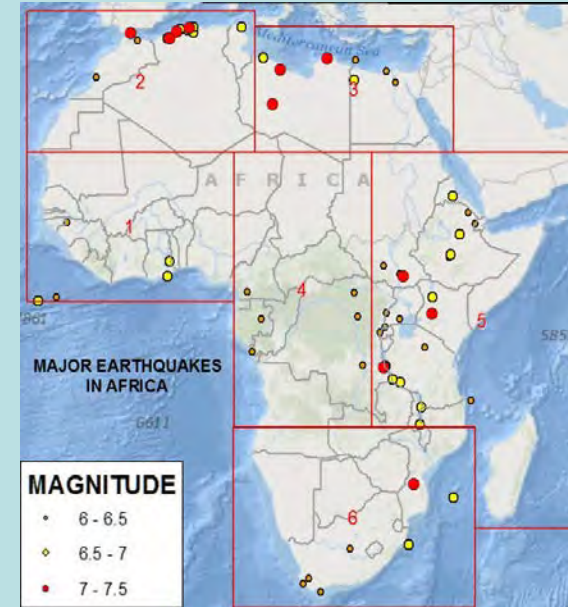


Main topics:

- Compilation of the **seismotectonic database** and related seismic parameters
- Characterization of the potential of faults as **seismogenic sources**
- Compilation of **seismic catalogue**, and analysis of **earthquake recurrence**
- Prepare a database of **Ground Motion Prediction Equations**
- Prepare a **seismic hazard map** of six provinces in Africa
- Analysis of **seismic vulnerability** and **seismic risk**
- Analysis of **Tsunami threats** for African coasts

Main goals:

- Development of the **Guidelines for the seismotectonic map** preparation
- **Strengthen the cooperation** within the Organisation of African Geological Surveys and AfricaArray - a program to promote geoscience in Africa
- Providing a basis for implementing seismic and geodetic networks for **early warning systems**



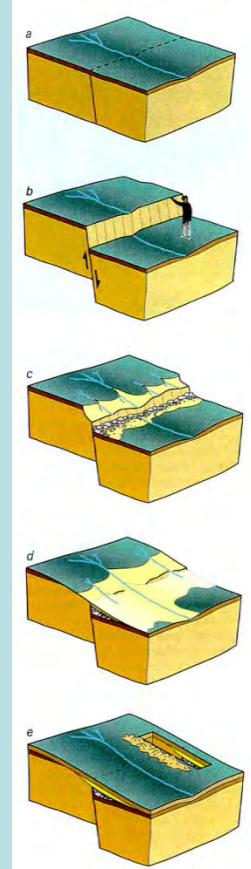
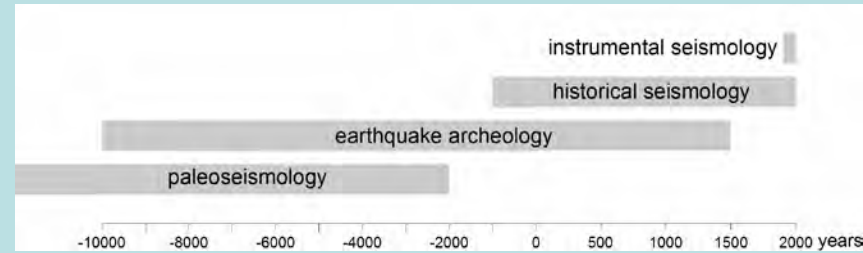
IGCP 567 Earthquake Archeology



2008-2012

Damaging earthquakes typically recur at intervals of centuries to millennia, but the **seismological instruments** have only been available for about a hundred years. To reliably assess the seismic hazard, we need a longer record. **Archaeological evidence** has the potential to reveal earthquake activity over millennial time spans, especially when integrated with **historical documents** and **geological evidence (paleoseismology)**. Project demonstrates that **earthquake archaeology** can make a valuable contribution to long-term **seismic hazard assessment** in earthquake-prone regions.

Interdisciplinary approach based on the expertise of **historians, anthropologists, archaeologists, geologists, seismologists, geophysicists, architects and structural engineers.**

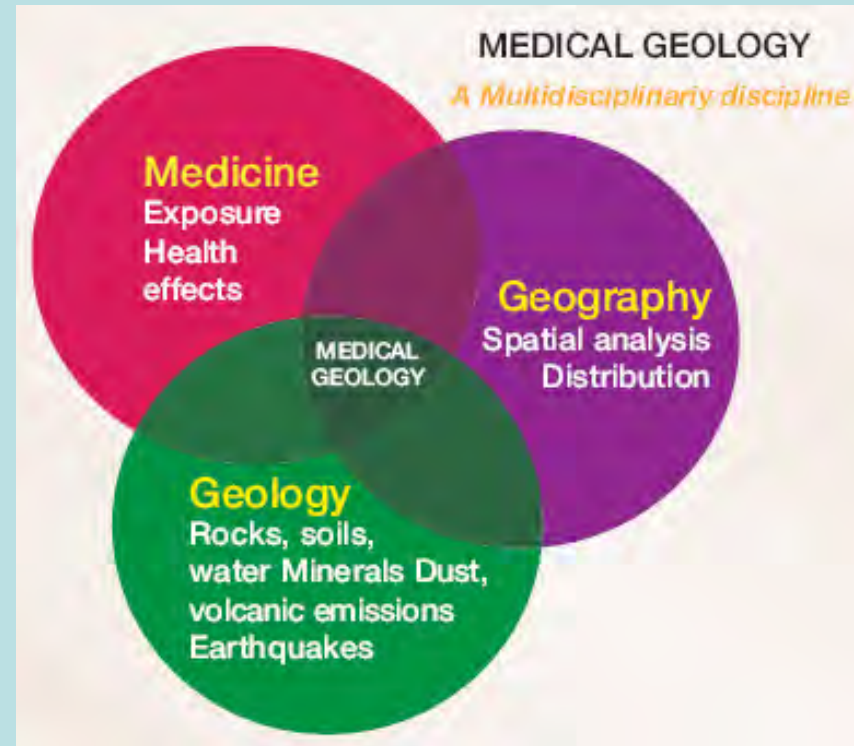


IGCP 454: Medical Geology

2000-2004

Brings together **geoscientists** with **biomedical** and **public health** researchers to address a range of **environmental health problems**. Toxic elements in **soil, rocks** and the **atmosphere**, arising from **natural** (rock chemistry) and **human pollution** may impact human health. All people on Earth are affected in some way either from an **excess** or **lack** of certain **elements** and **natural processes**. Primary aim was to raise awareness on these issues based on results of profound multidisciplinary research.

- **International Medical Geology Association** - launched in 2006.
- IYPE - one of topics **Earth and Health: Medical Geology**





United Nations
Educational, Scientific and
Cultural Organization



International
Geoscience
Programme



International
Union of Geological
Sciences

Tales Set in Stone

40 Years of the
International Geoscience Programme (IGCP)

