Implementing the Integrated Global Observing Strategy

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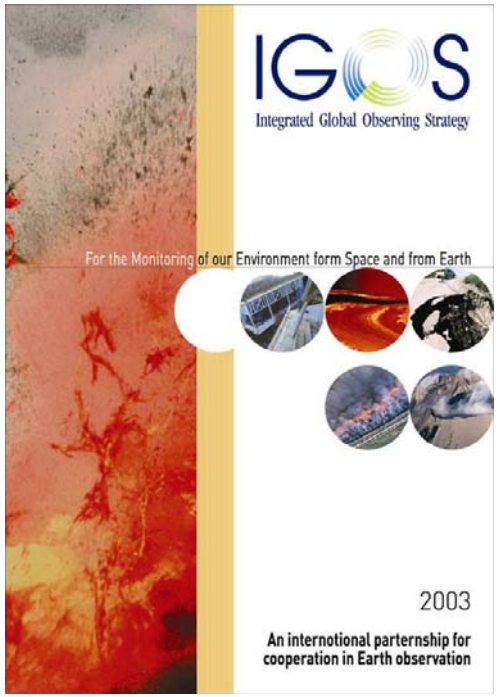

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[2]British Geological Survey

[3]European Space Agency

French Geological Survey[4]

United States Geologic Survey[5]

Outline

- Context: The Impact of Geohazards
- The IGOS Geohazard Theme Report
- IGOS Geohazard Theme Implementation

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Geohazards…

igos GEOHAZARDS

Earthquakes

Volcanos

Landslides

Subsidence

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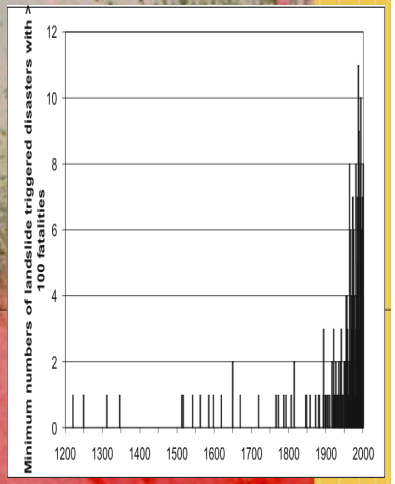
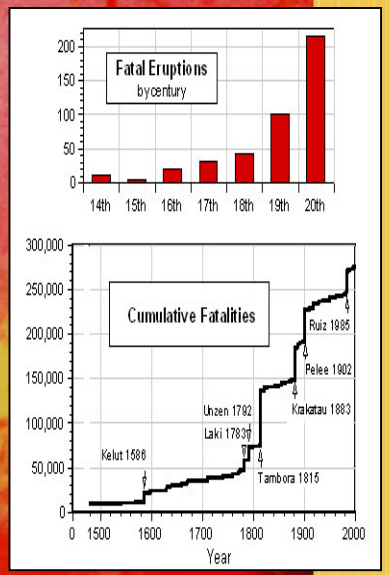
…impose a high cost on society





Each year geohazards cost:

- Lives (thousands)
- Livelihoods (millions)
- Infrastructure (billions)

Population growth is focused in hazardous areas

The UN assessment of all natural hazards is that:

- 97% of lives lost are in developing countries
- Economic impacts affect rich and poor alike
- UN estimate: costs have risen x10 in 40 years
- Impact of losses long-lasting; affects insurance

Can society afford this? The short answer is no!

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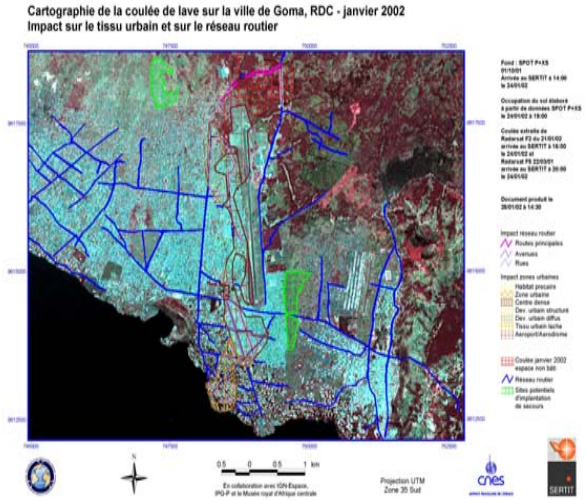
International responses

Major events put geohazards on global agenda:

- Kobe Earthquake
- Goma Volcano
- Italian Landslides
- Urban subsidence



Responses to this agenda:

- Politics: Sustainability, EO Summits, GEO Process
- UN: International Strategy for Disaster Reduction
- Operations: UN Action Team, International Charter
- Tools: CEOS Disaster Management Support Group
- Projects: EC, World Bank, NASA, ESA and others

All hindered by gaps in mapping and monitoring

Filling the gap: the Integrated Global Observing Strategy for Geohazards

- What was missing: strategy for global observation
- NOAA saw potential for IGOS to fill geoscience gap
- UNESCO, NOAA, CEOS & ICSU took this forward:
  - Town meeting scoped out a 'Geo' Theme in May 2001
- Ad-hoc Working Group established in May 2001
  - Proposed the IGOS Geohazards Theme in June 2002
- Theme Team co-chaired by BGS, ESA, and UNESCO
  - Report approved by IGOS Partners in November 2003

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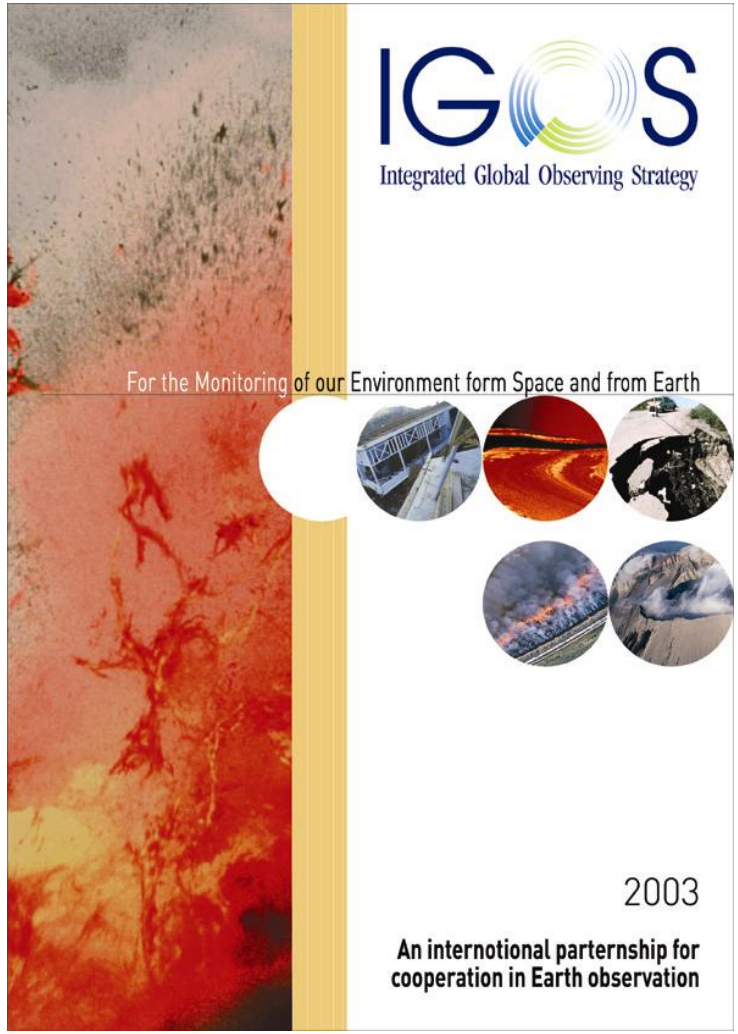
IGOS Geohazard Theme Report

- Published by ESA in April 2004
- Available from the IGOS Geohazards Executive Bureau:
  - s.hosford@brgm.fr
- Available online at:
  - http://igosg.brgm.fr



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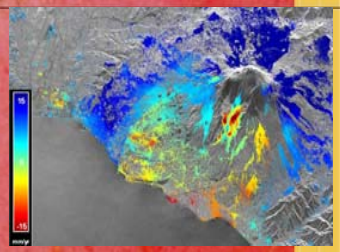

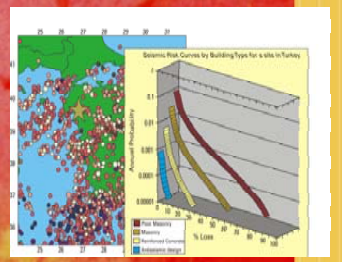

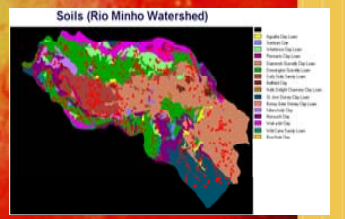

Goal and Objectives until 2014

Integrating current disparate, applied EO research into global, operational, geohazards systems via:

Building capacity

Integration activities

Improving observations

Promoting action

IGOS Geohazards has a clear scope and context:

Global tectonic geohazards

– Only geological hazards

– All linked by deformation

– Use similar ground-based and satellite observations

A socio-economic context

Building on previous work

Focus on preparedness:

i.e. mitigation, mapping, monitoring, forecasting

Cross-membership/links:

- UN Action Team 7

- International Charter

- Other IGOS Themes

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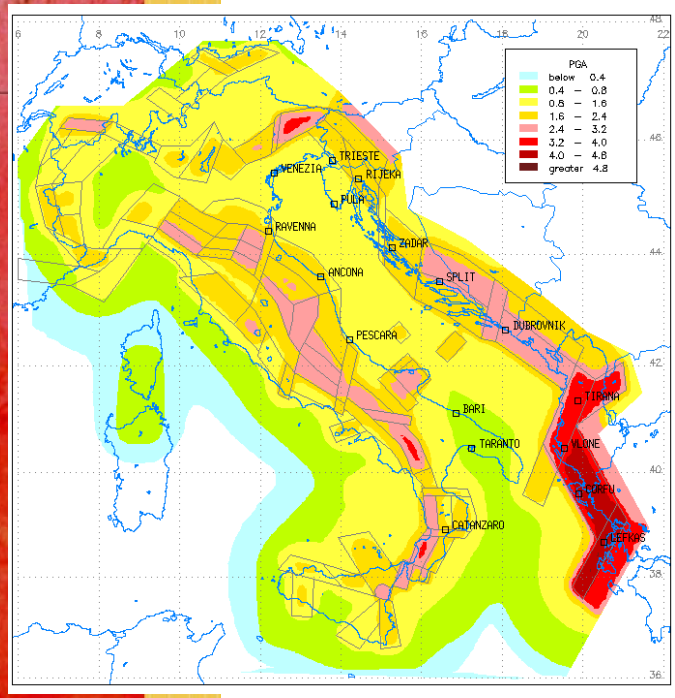
Users and Beneficiaries

Citizens are ultimate beneficiaries of strategy…

… but there are 3 main data/information users:



- Responsible Authorities, who are provided with key information by…
- …Scientists in Monitoring and Advisory Agencies, who are provided with geohazards knowledge by…
- …Research Scientists

In-situ, airborne, and satellite-based observing systems, media and public are key stakeholders

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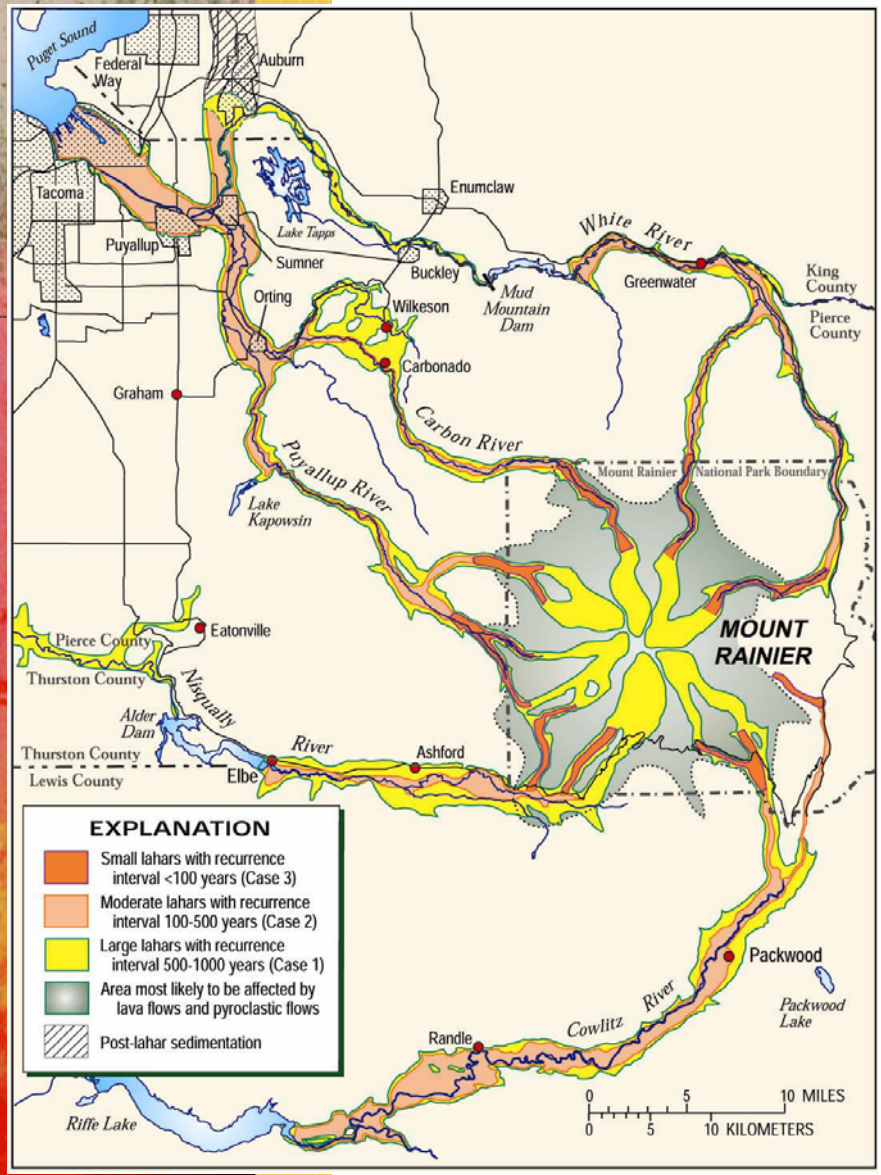
User Needs



- Citizen's questions are:
  - What will happen?
  - How? Where?
  - Over what area?
  - When? For how long?
- User's have shared needs:
  - Baseline hazard inventory
  - Ongoing monitoring of a hazard against baseline
  - Rapid information supply during a crisis
- Specific types of users have additional specific needs

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Required Observations

To meet user need we need four main observations:

Baseline Topography

- Against which to measure change
- For modelling and visualisation

➢ Topographic models:

- Stereoscopy & radar interferometry
- Ground-based surveying tools

Baseline Mapping

- Geology, structure, soils
- Regional to local scale

➢ Supported by:

- Aerial photography and field work
- Various airborne & spaceborne EO

Deformation Monitoring

- Sudden change
- Gradual processes

➢ Deformation measured by:

- Radar Interferometry (INSAR)
- GPS, and terrestrial LiDAR/INSAR

Seismic Monitoring

- Hazard magnitude
- Depth and location

➢ Seismicity measured by:

- In-situ networks of seismometers
- Coverage, density, real time data

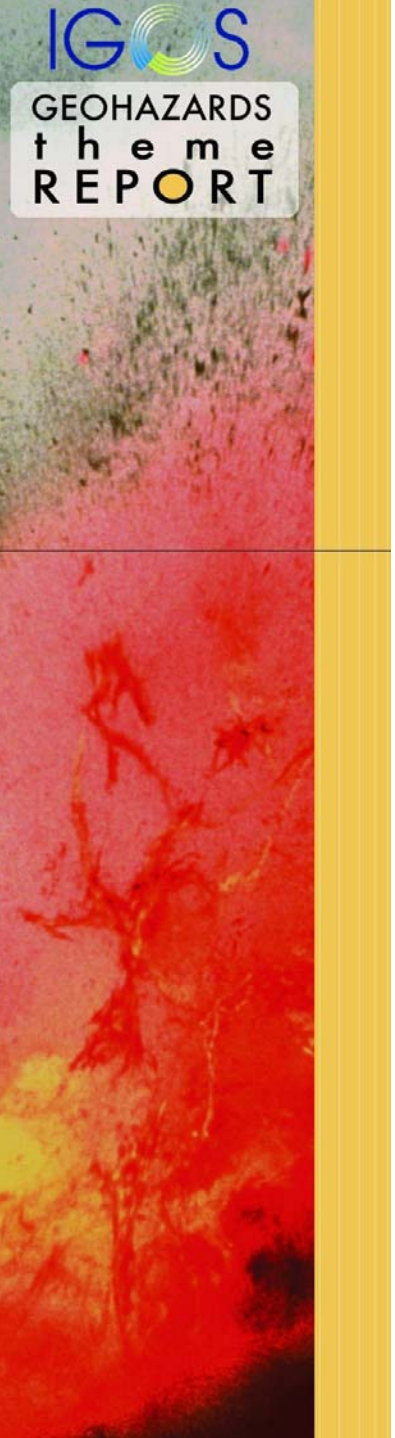
Each hazard (e.g. volcanos) needs other observations (e.g. thermal)

Integration Issues

Infrastructure is required to turn observations into useful information for users, based on knowledge

There are 3 main integration issues:

- Data Management – establishment of strategic datasets: long term; complete; global; validated; geographically registered; accessible; and visible
- Integration and Modelling – improved knowledge, on which to base better hazard models; software, to turn data into information products; shared knowledge and experience; an integrated scientific community
- Capacity Building – a global geohazard community to support transfer of geohazards data, information, knowledge and technology to users in all countries



Gap Analysis

Existing Observations

- e.g. No global high resolution topographic dataset

Key systems

- e.g. Limited continuity of L and C band INSAR

Data Management

- e.g. Too few archives are visible and fit for purpose

Integration and Modelling

- e.g. In-situ and EO integration happens rarely

Building the Geohazards Community

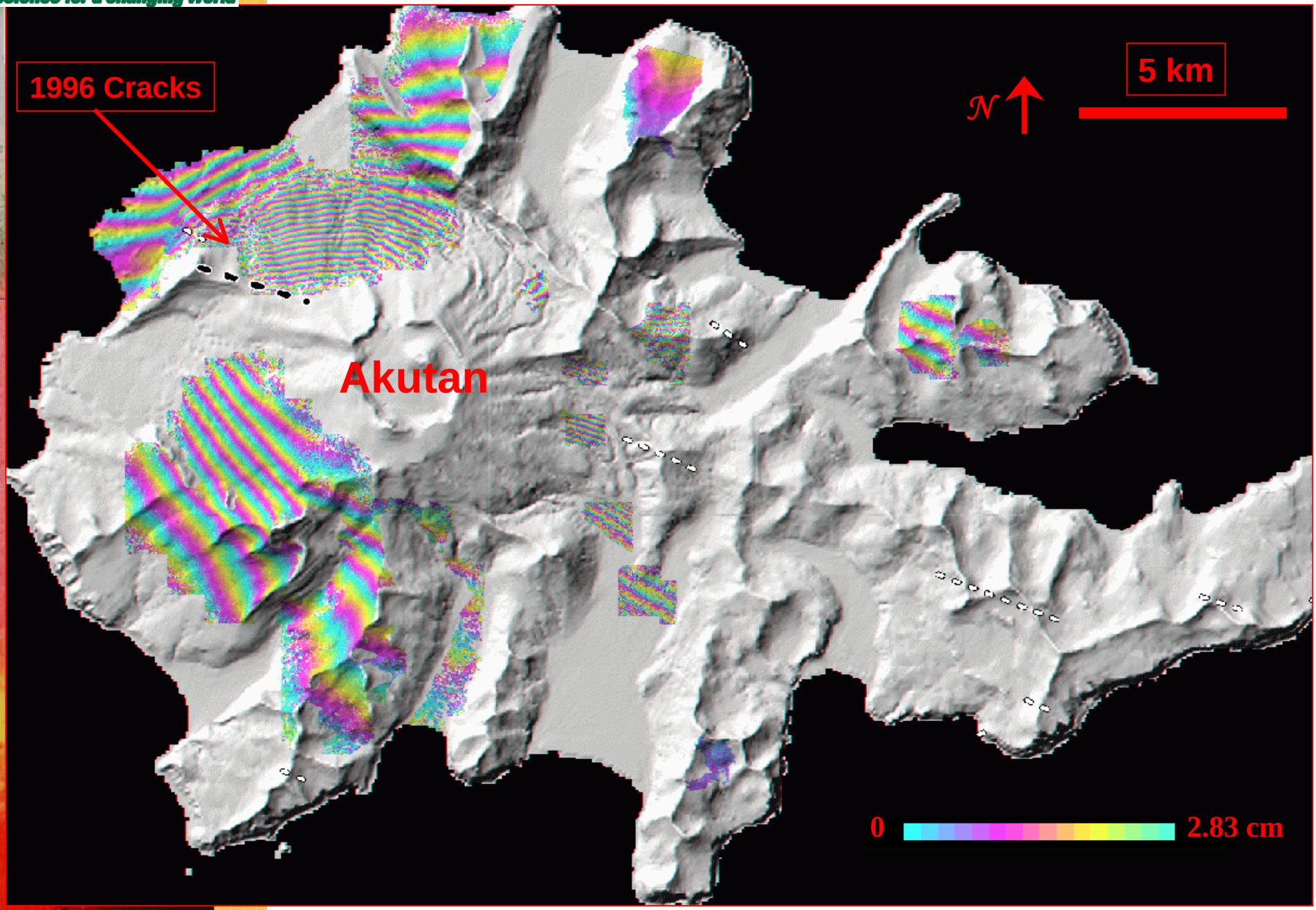
- e.g. No global mechanism to implement strategy

Science Research Agenda

- e.g. Models, knowledge inadequate for prediction

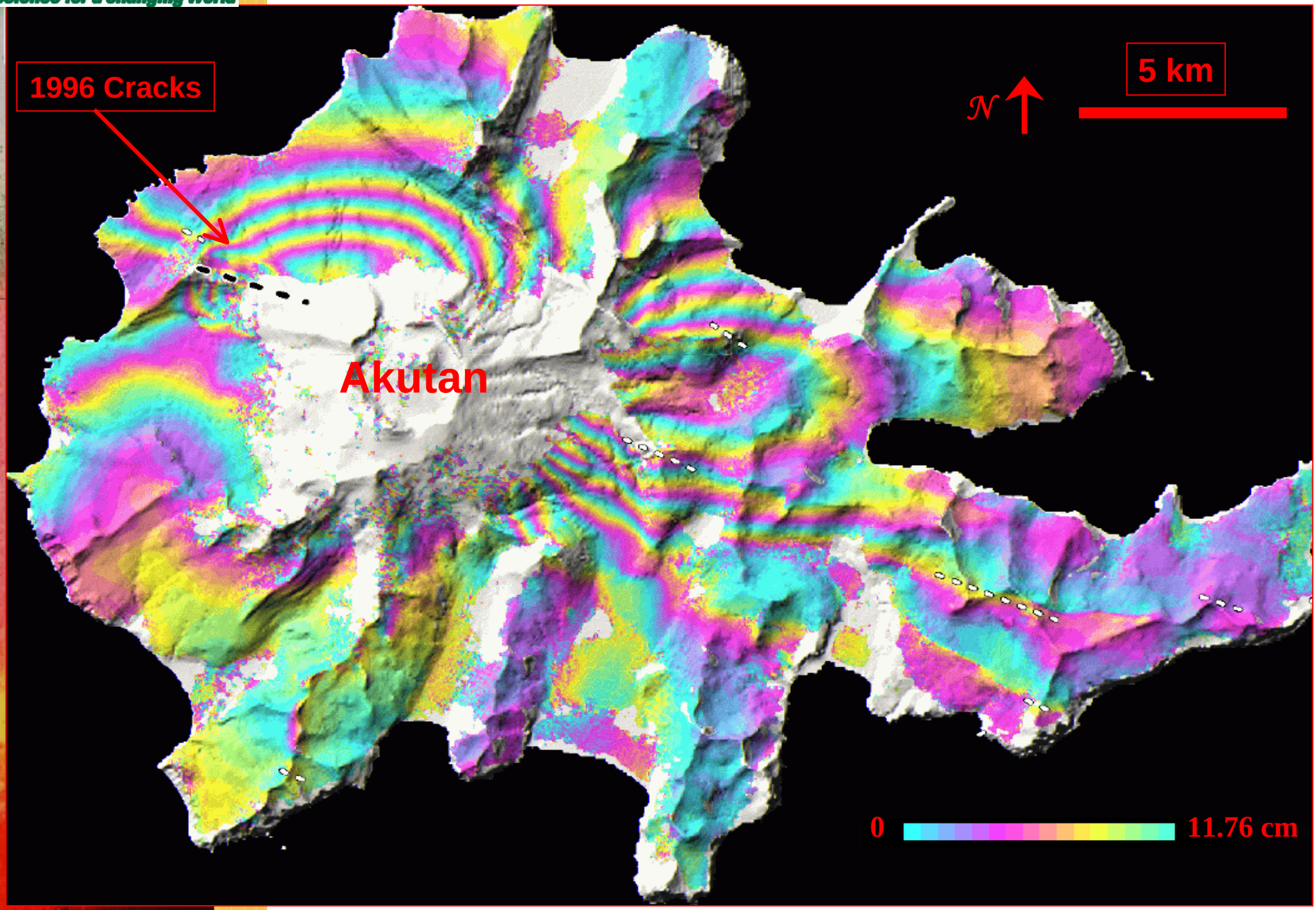
USGS
science for a changing world

Co-event deformation mapped by ERS (C-band, λ = 5.66 cm)



USGS
science for a changing world

Co-event deformation mapped by JERS (L-band, λ = 23.53 cm)



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Implementation Mechanism

IGOS Partners

ESA Co-Chair | UNESCO Co-Chair | BGS Chair

ICSU — **ESA** — **UNESCO** — **IUGS**

GARS Sponsors

Geohazards Theme… *…led by two IGOS partners' Programme*

Implemented by Executive

BRGM Director

IGOS Geohazards Executive Bureau

(In **BRGM**, funded by **BRGM** & **ESA**)

Geological Applications of Remote Sensing Programme

(**BGS** Chair/Secretary, funded by **BGS**, **UNESCO** and **IUGS**

Programme Steering

BGS Chair

Coordination with GARS

GEOLOGICAL SURVEYS working within IGOS

ESA Chair

Joint GARS – IGOS Geohazards Committee

UNESCO & **ESA** (IGOS Geohazards Co-Chairs)

BRGM (as IGOS Geohazards Executive Bureau)

BGS (as GARS Chair & IGOS Geohazards Chair)

USGS (GEOSS link) **JAXA** (**CEOS** Agencies)

IUGS (GARS Sponsor and **ICSU** representation)

Coordination with IGOS

SPACE AGENCIES working within GARS

UNESCO Co-Chair

IGOS Projects

IGOS Geohazard Working Groups

Capacity, Observation, Integration, Database & Science

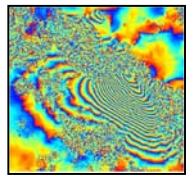
GARS Working Group

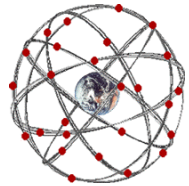
e.g. Africa & Mid East Groundwater

GARS Projects

Implementation Plan Highlights

- Commence capacity building through IGOS
  - Develop GARS as implementation mechanism
- Maximise existing observations
  - Seek release of SRTM and ASTER DEMs
- Lobby for new observation tools
  - L- and C-band radar satellite continuity
- Promote integration of data into products
  - Integration of INSAR with GPS networks
- Improve Infrastructures
  - Support WOVO and then use as a template
- Increase knowledge of geohazard processes
  - Define a global geohazards research agenda





Attend the 1st IGOS Geohazards Workshop, 6-8 April 2005, BRGM

Geological Surveys, Space Agencies, International Bodies, Research Institutes, Private Companies

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UNESCO

British Geological Survey — NATURAL ENVIRONMENT RESEARCH COUNCIL

USGS science for a changing world

brgm — Géosciences pour une Terre durable

esa

Uni Bonn

Royal Museum for Central Africa - 3080 Tervuren - Belgium

cnes — CENTRE NATIONAL D'ETUDES SPATIALES

BNSC — BRITISH NATIONAL SPACE CENTRE

NPA SATELLITE MAPPING

ITC

IPGP — INSTITUT DE PHYSIQUE DU GLOBE DE PARIS

UNIVERSITÀ DEGLI STUDI DELLA BASILICATA — 1982

UNESCO ARS JUGS

ICSU — International Council for Science

Consiglio Nazionale delle Ricerche

Natural Resources Canada / Canada Centre for Remote Sensing

Ressources naturelles Canada / Centre canadien de télédétection