Forming networks to save lives and livelihoods

International networks

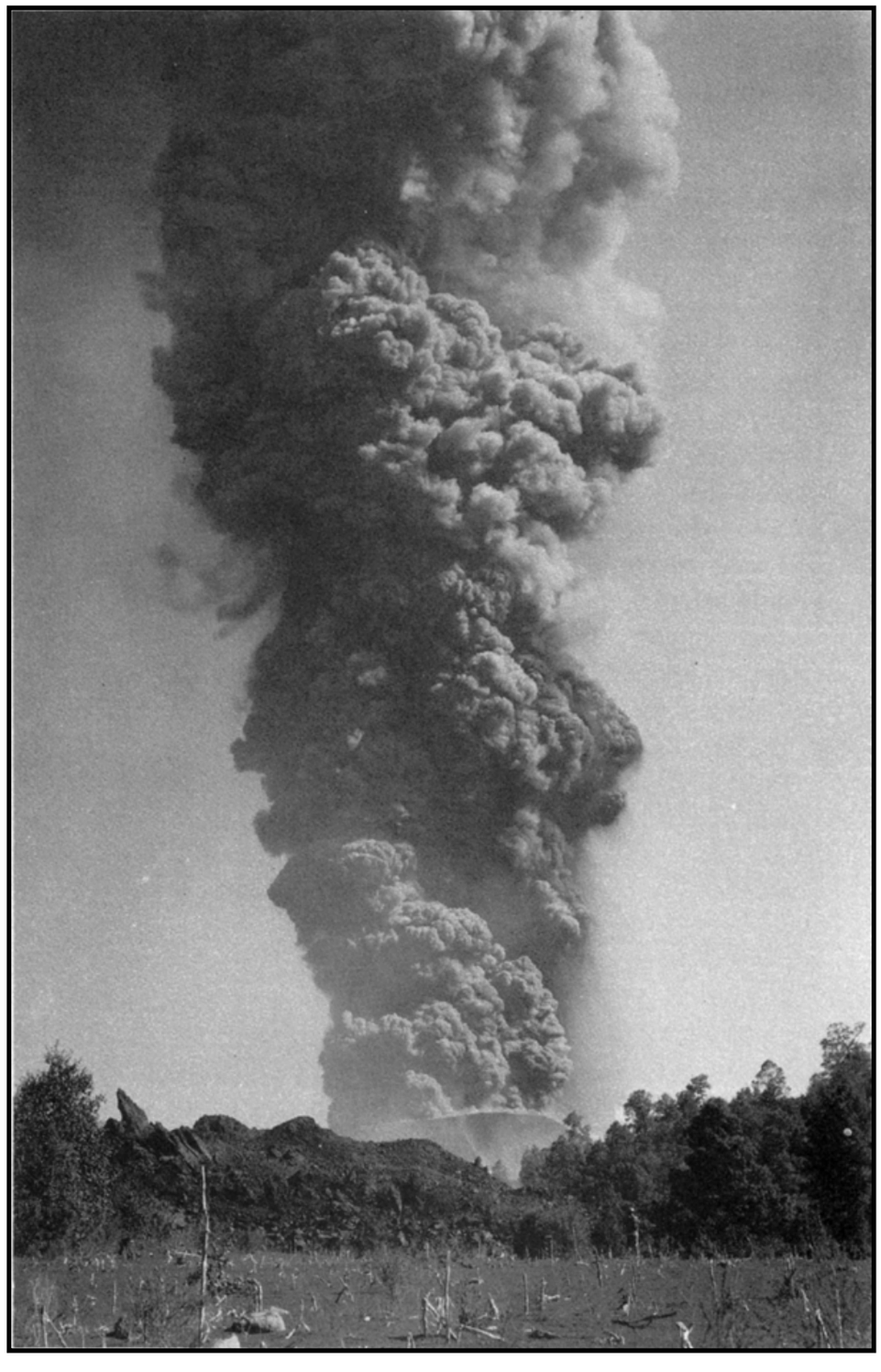
Kathy Cashman, University of Bristol

Why are international networks important?

- Earthquakes and volcanic eruptions do not respect national borders (the events themselves are often international)

- Large events are infrequent, thus gaining scientific expertise on active processes requires learning from global events

- Similarly, we can all learn lessons from what works and what doesn't work in any given natural disaster



Eyjafjallajökull Volcano, Iceland – April 2010

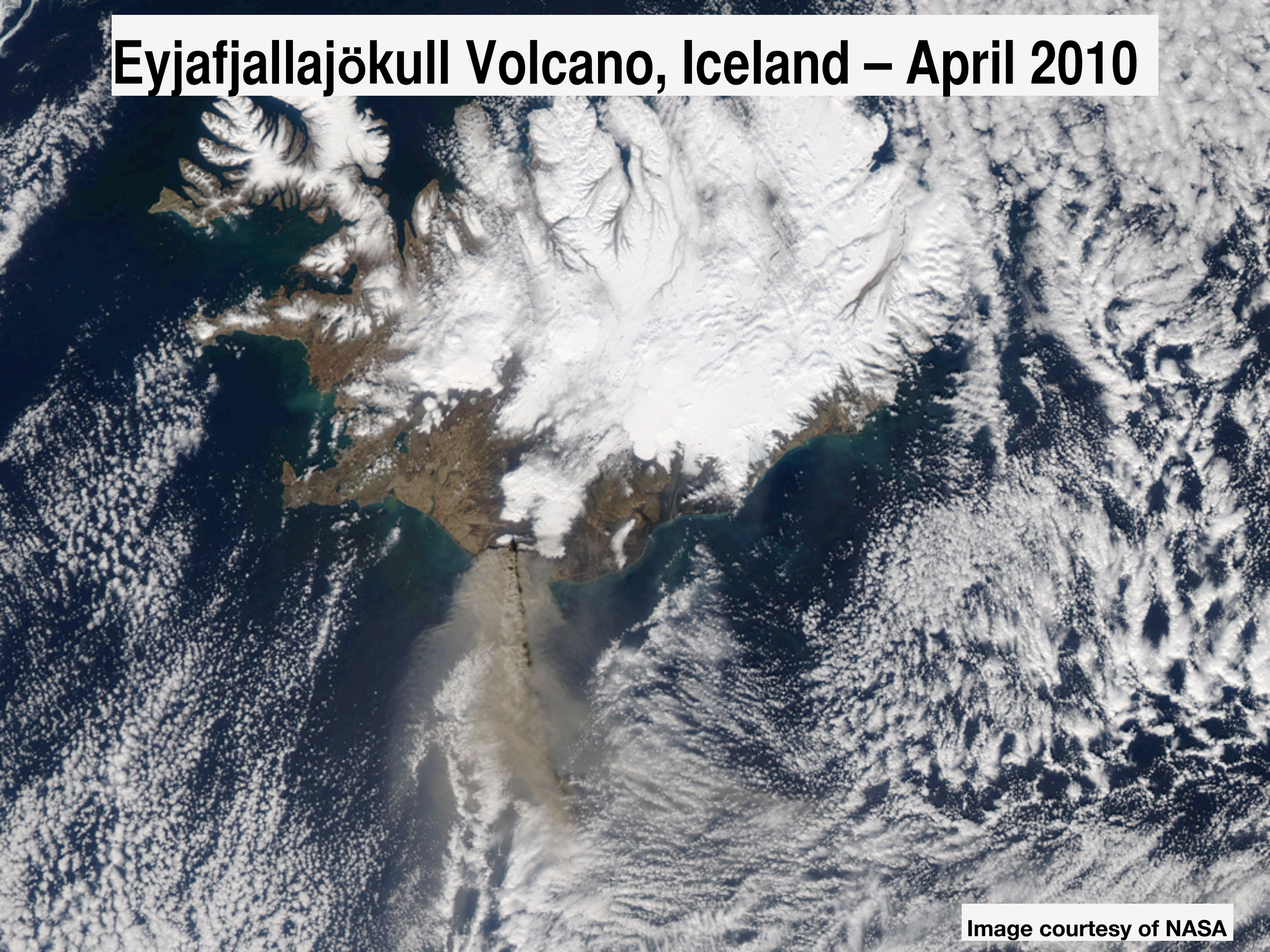
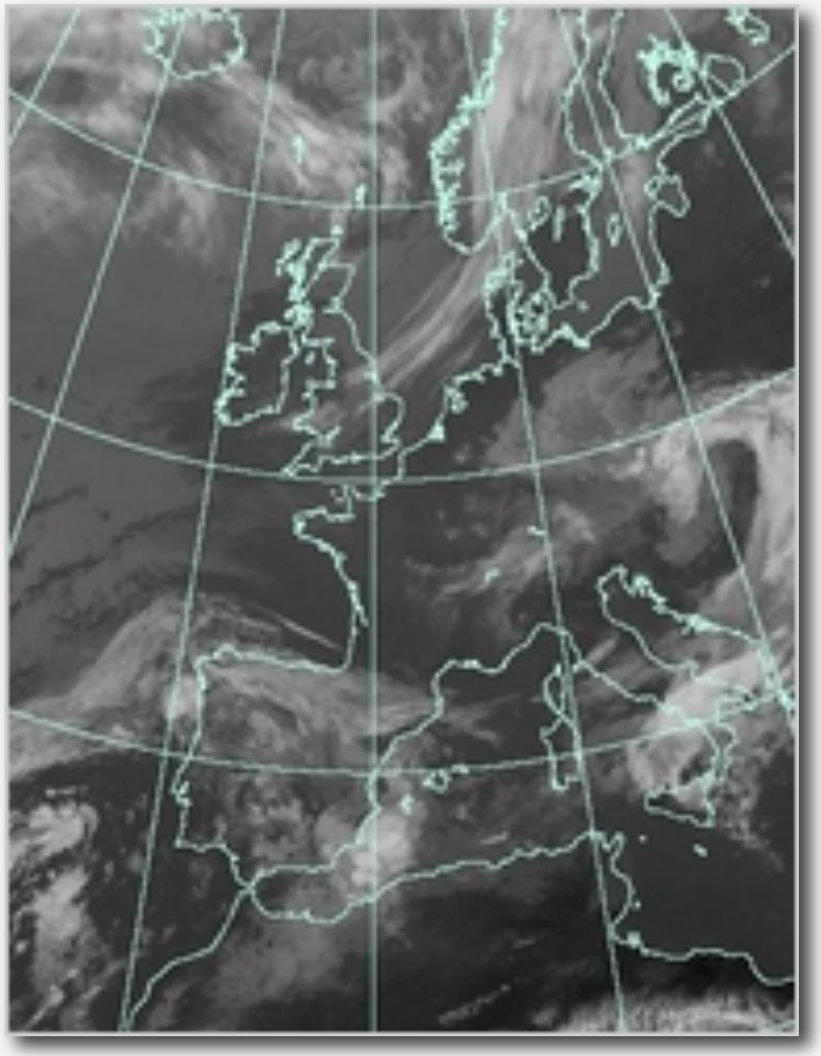


Image courtesy of NASA

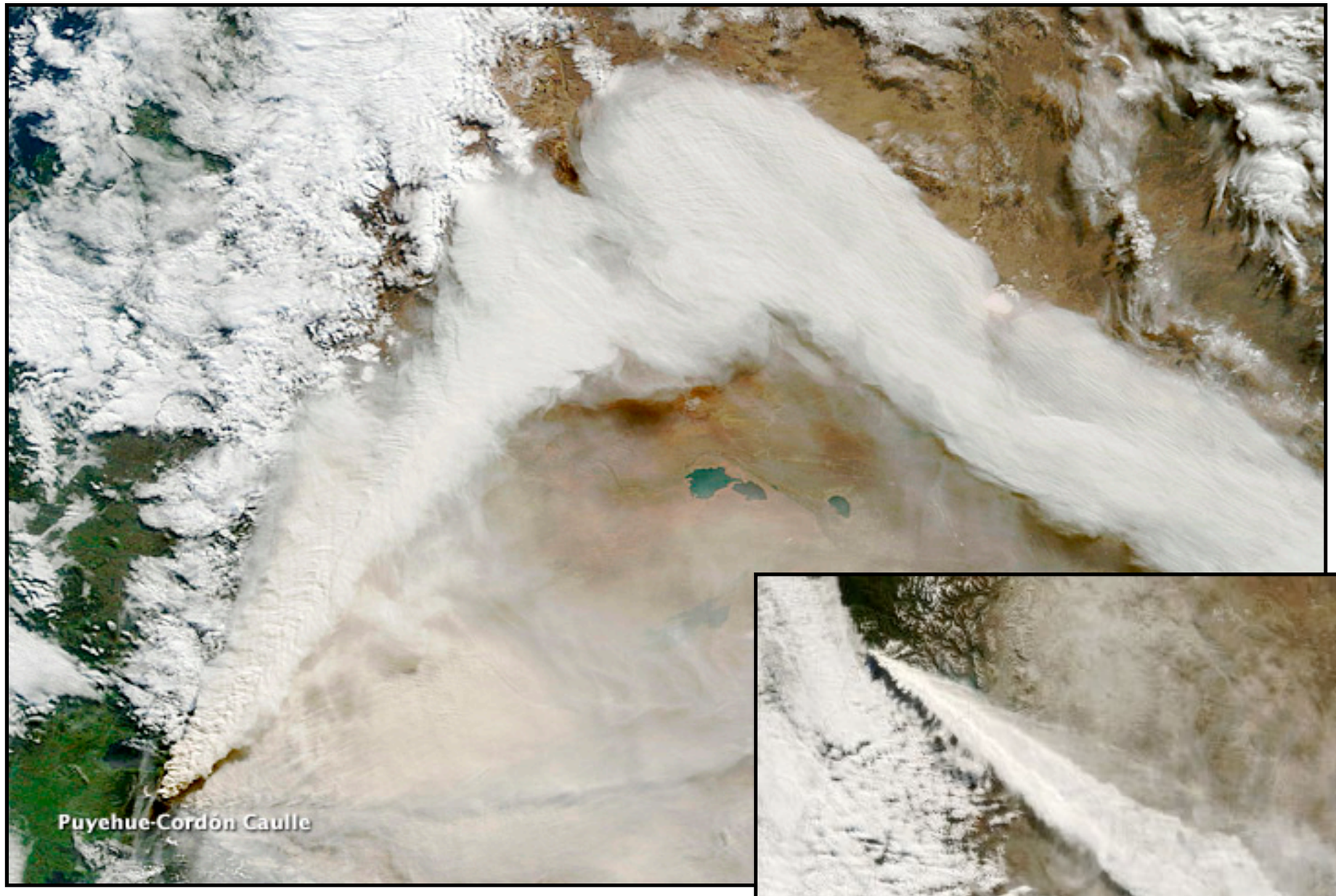
Some of the impacts:

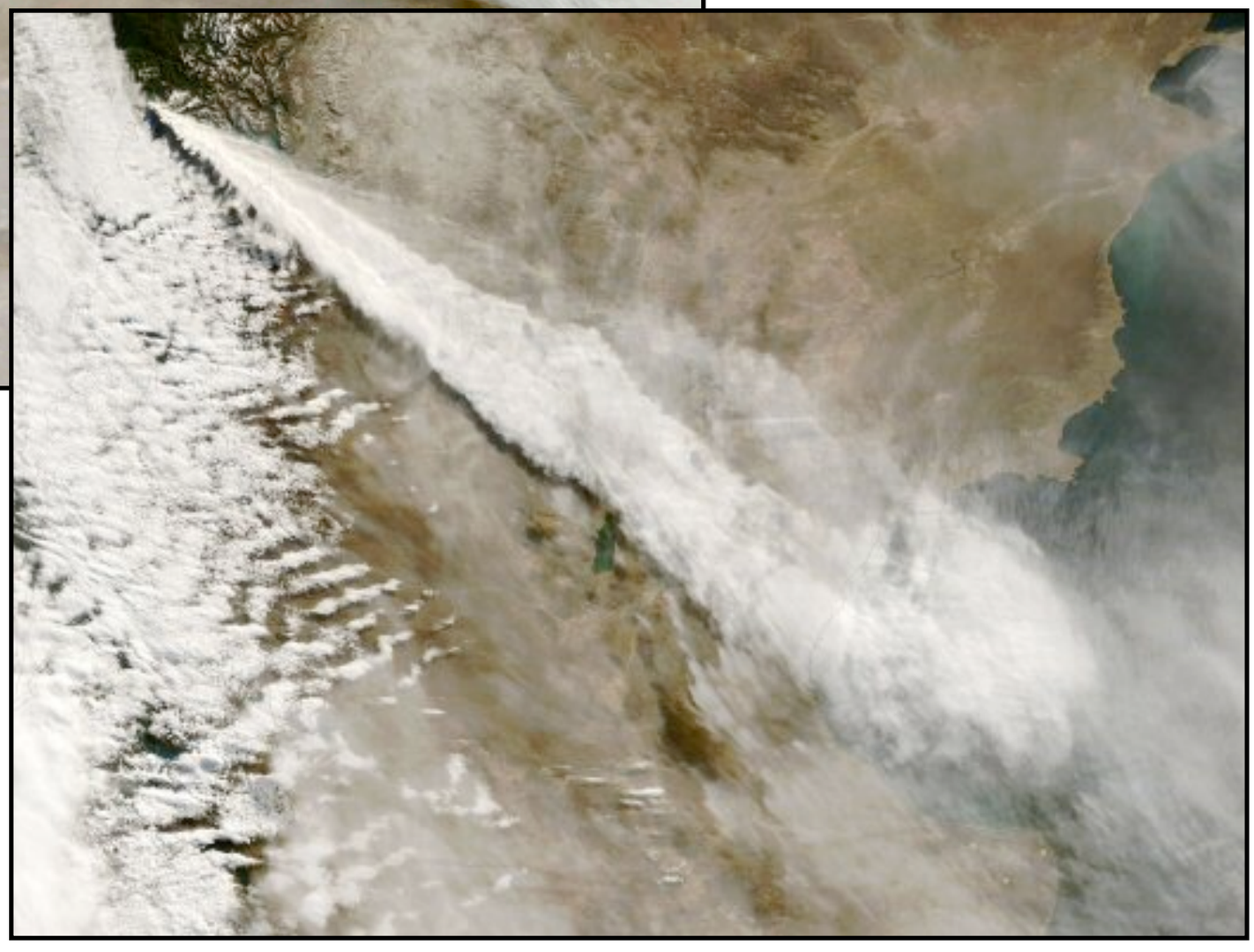
- Airlines: £1.1 billion (International Air Transport Agency)
- Airports: £80 million (Airport Operators association)
- Compensation (Payouts from EU Solidarity Fund and National Governments)
- People stranded
- Supply chains disrupted



"Flying to Europe"
Spring 2010

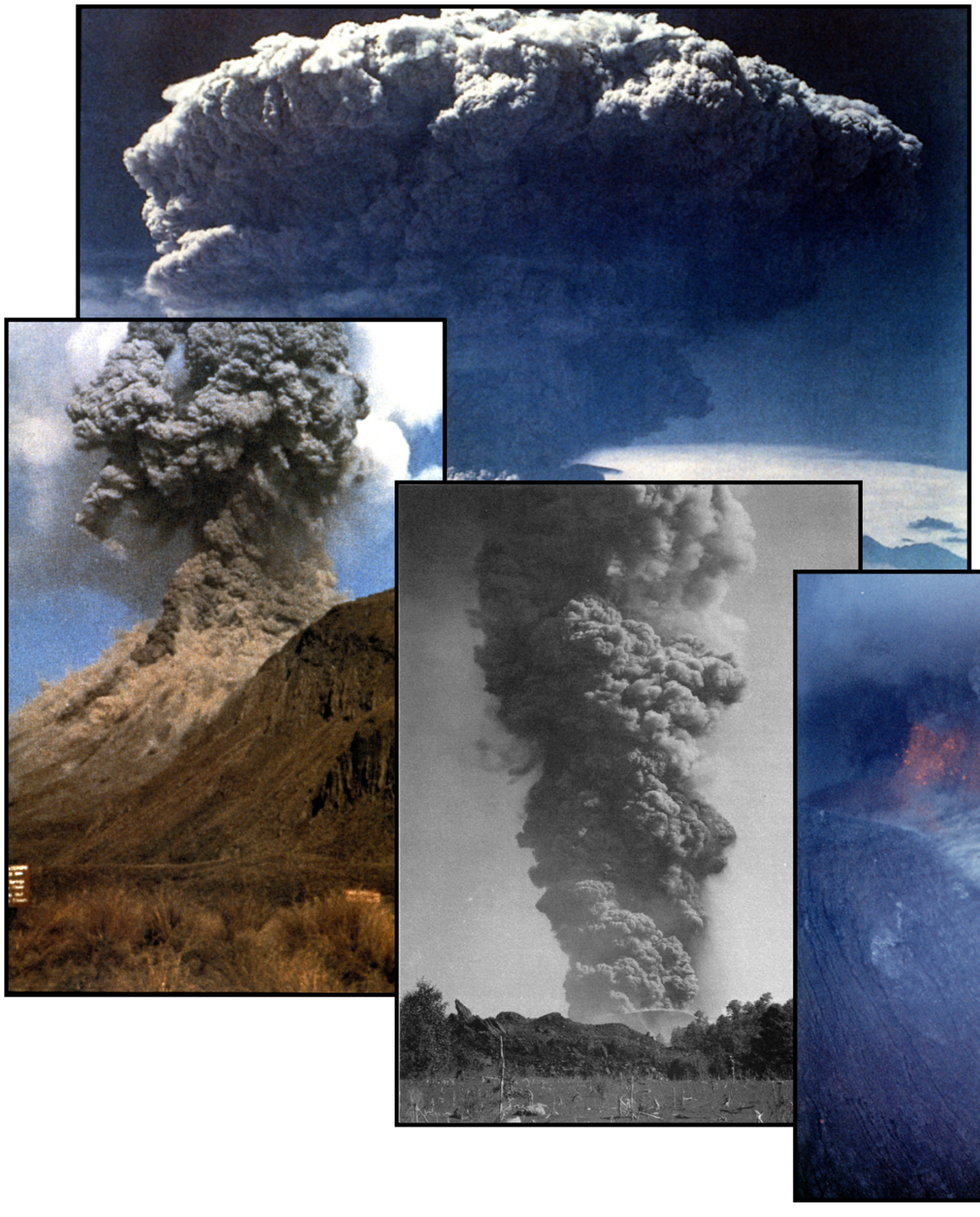
Puyehue 2011





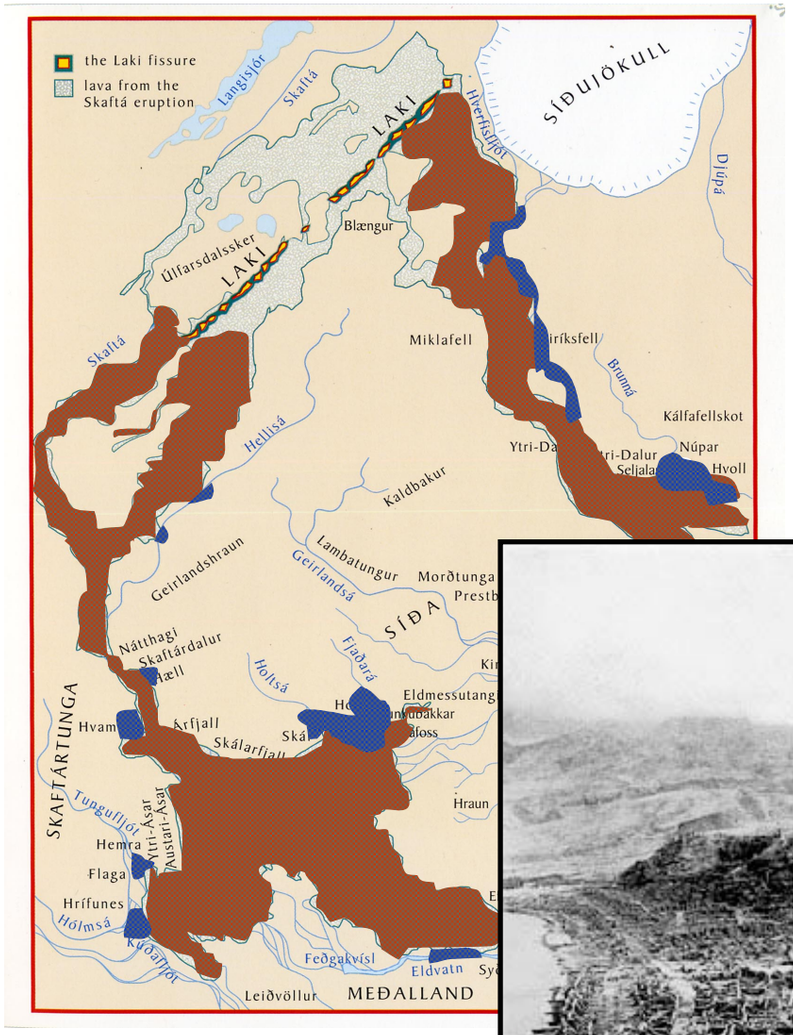
Chaiten 2008

Why we need global expertise



Wide range in eruption styles, each of which brings its own set of hazards

Why we need global expertise



Associated hazards:

Fires, floods and avalanches

The end of an eruption is not the end of the problem

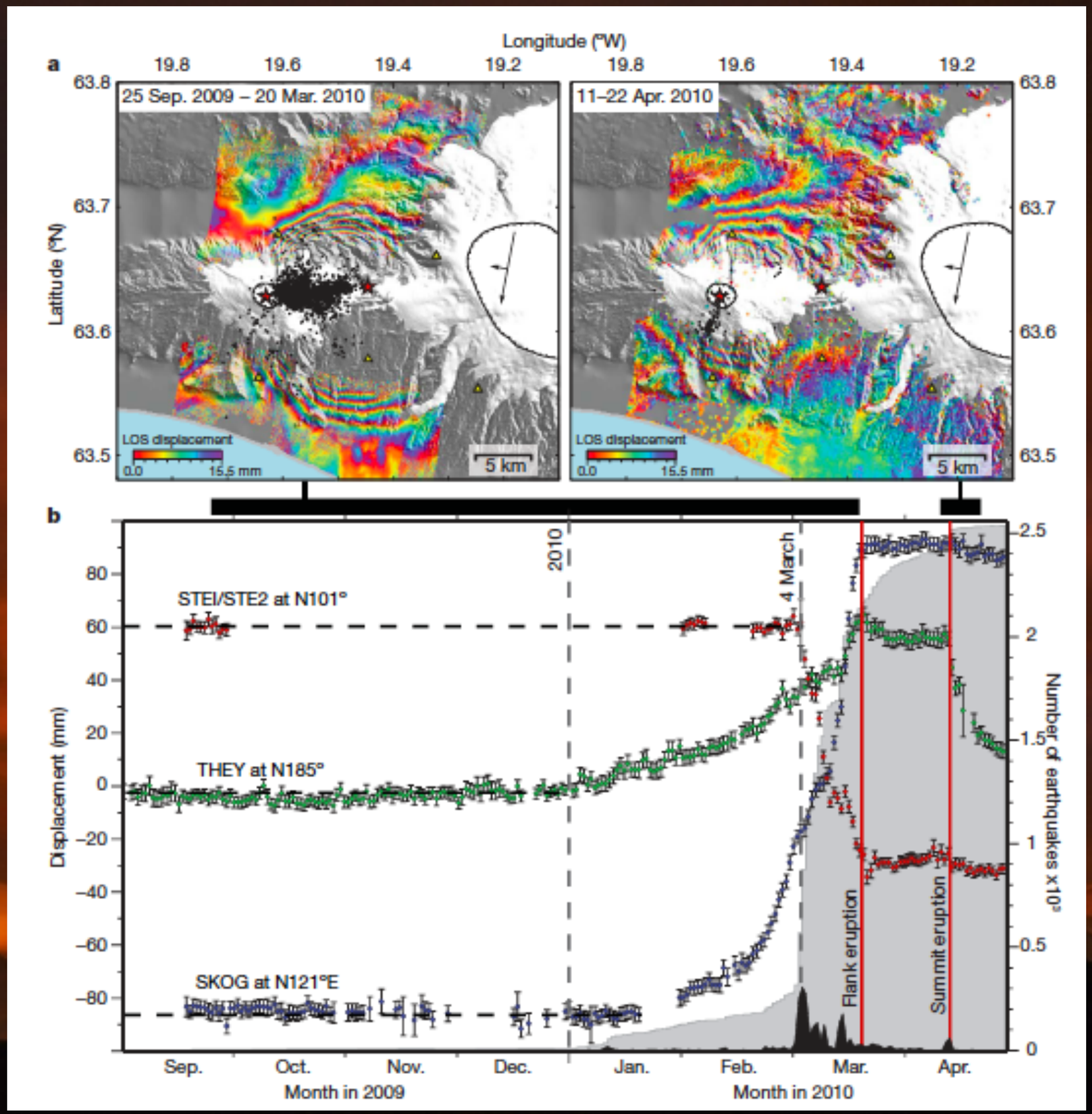
Long term impacts

remobilization of pyroclastic material by wind and water

On the positive side...

We usually know when volcanoes are restless, and therefore where eruptions will occur... sometimes we even know approximately when they will happen

photo by Snævarr Guðmundsson



Sigmundsson et al. (2010)

Global Volcano Model

An international platform for information on volcanic hazard and risk

S. C. Loughlin, R. S. J. Sparks, L. Cottrill, G. Valentine,
S. Takarada, C. Newhall, J. Eichelberger, G. Norton,
P. Papale and many, many others.

Global Volcano Model

Start-up funded by the NERC 'International Opportunities Fund' November 2011 – 2014 (with possible extension).

Small GVM Management Board

Large GVM Steering Committee

Available funds will support meetings, workshops, secondments and some research.

The intention is to build on funded projects worldwide – a global community effort to build our knowledge base and ability to analyse and assess hazard and risk.

Please join us!

GRIP
better risk information for sound decision making

NATURAL ENVIRONMENT RESEARCH COUNCIL

WOVO

GNS SCIENCE TE PŪ AO

IVHHN

erc European Research Council

IAVCEI

U.S. DEPARTMENT OF THE INTERIOR MARCH 3, 1849

Münchener Rück
Munich Re Group

GFDRR

USF UNIVERSITY OF SOUTH FLORIDA

University of BRISTOL

RMS

MANAGING EXTREMES Willis Re

NGI

EPOS EUROPEAN PLATE OBSERVING SYSTEM

GEOPHYSICAL INSTITUTE University of Alaska Fairbanks

UWI
SEISMIC RESEARCH CENTRE
TRINIDAD & TOBAGO W.I.

Smithsonian Institution

EARTH OBSERVATORY OF SINGAPORE
An institute of Nanyang Technological University

INGV

IPGP
INSTITUT DE PHYSIQUE DU GLOBE DE PARIS

Australian Government
Geoscience Australia

BGS 1835
British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

地質調査所
Geological Survey of Japan

Mission of the Global Volcano Model

GVM is a growing international network that aims to create a sustainable, accessible information platform on volcanic hazard and risk. GVM will provide systematic evidence, data and analysis of volcanic hazards and risk on global, regional and local scales, and will develop the capability to anticipate future volcanism and its consequences.

International activities

Global Volcanism Program (GVP) Smithsonian Institution, US
IAVCEI Volcanology community
WOVO IAVCEI commission
WOVOdat Earth Observatory of Singapore: Chris Newhall
VOGRIPA Bristol , BGS and global partners
Volcano Observatory Best Practise workshops IAVCEI/WOVO
GFDRR (World Bank) volcanic risk Bristol and Norwegian Geotechnical Institute
VHub NSF project - SUNY at Buffalo, USF, Michigan
IVHHN (International Volcanic Health Hazard Network Durham University
Global Earthquake Model International effort

National and Regional activities

G-EVER Asia Pacific Region
ALVO Latin America Asociación Latinoamericana de Volcanología
NZ Volcanology Platform GNS New Zealand and NZ Universities

GVM

GLOBAL VOLCANO MODEL

www.globalvolcanomodel.org

A A

Adjust Text Size

Home | Search VOGRIPA | Who We Are | Partners | Funding | Publications | News | Contact Us | Related Information

Search | The Web | GVM

Welcome to the Global Volcano Model Network (GVM) Website

- Management Board
- Scientific Steering Group
- User Group
- Committee Meetings
- International Events
- Newsletters
- Regulations
- Workshops
- Secondments

This project aims to develop a major international effort to create a Global Volcano Model (GVM) that provides systematic evidence, data and analysis of volcanic hazards and risk. The GVM project addresses hazards and risks on global, regional and local scales, and develops the capability to anticipate future volcanism and its consequences.

The GVM project will develop an integrated global database system on volcanic hazards, vulnerability and exposure, make this globally accessible and crucially involve the international volcanological community and users in a partnership to design, develop, analyse and maintain the database system. The GVM project will aim to establish new international metadata standards that will reduce ambiguity in the use of global volcanic datasets. Vulnerability and exposure data will be integrated into the GVM and again new methods of assessment and analysis will be investigated and tested.

The project also intends to establish methodologies for analysis of the evidence and data to inform risk assessment, to develop complementary volcanic hazards models, and create relevant hazards and risk assessment tools.

The research will provide the scientific basis for mitigation strategies, responses to ash in the atmosphere for the aviation industry, land-use planning, evacuation plans and management of volcanic emergencies.

GVM Sponsors & Partners

- BGS (British Geological Survey)
- CEV
- EOS (Earth Observatory of Singapore)
- EPOS (European Plate Observing System)
- ERC (European Research Council)
- Geophysical Institute University of Alaska
- GFDRR (Global Facility for Disaster Reduction & Recovery)
- GNS (New Zealand)
- GRIP (Global Risk Identification Programme)
- IAVCEI (International Association of Volcanology and Chemistry of the Earth's Interior)
- INGV, Italy (Institute National Geology and Volcanology)
- IVHHN (International Volcanic Health Hazard Network)
- Munich RE
- NERC (Natural Environmental Research Council)
- NGI (Norwegian Geological Institute)
- RMS (Risk Management Solutions)
- Smithsonian Institute
- UB (University of Buffalo)
- University of Bristol

A sustainable international network

- Inclusive and participatory and yet agile in terms of decision-making
- Expert groups, regular focused meetings
- Task forces (e.g. Indices)

Current activities

- Global Assessment of Risk 2015 (UNISDR) and Task Force
- Support for ‘Volcano Observatory Best Practice’ workshop II (Communications) 2013
- Indices Task Force
- VOGRIPA and hazards databases
- Interaction with IAVCEI commissions (e.g. Tephra modelling)
- Initial recommendations on hazard models

VOGRIPA project

- Volcanic global hazards databases
  - Community effort to build the databases
  - Web access to analyze and update
    - Large Magnitude Explosive Eruptions (LaMEVE)
    - Lava dome eruptions
    - Fatalities
    - Debris avalanches...

LaMEVE database

Global database on Quaternary LArge Magnitude Explosive Eruptions of M = 4 or greater (LAMEVE)

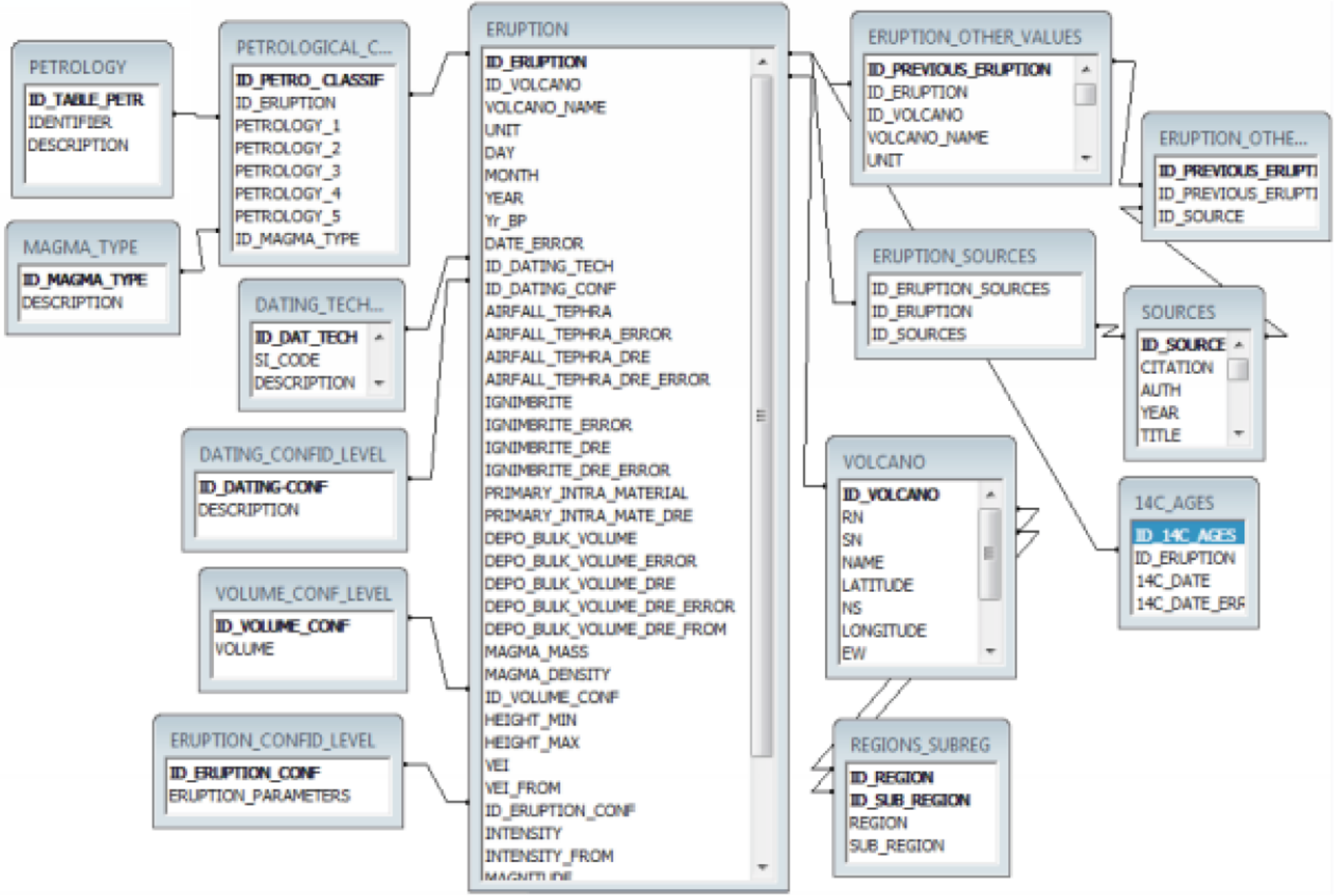
1929 entries from 481 Quaternary volcanoes

Analysis of recurrence rates of different magnitude eruptions, and completeness of eruptive records

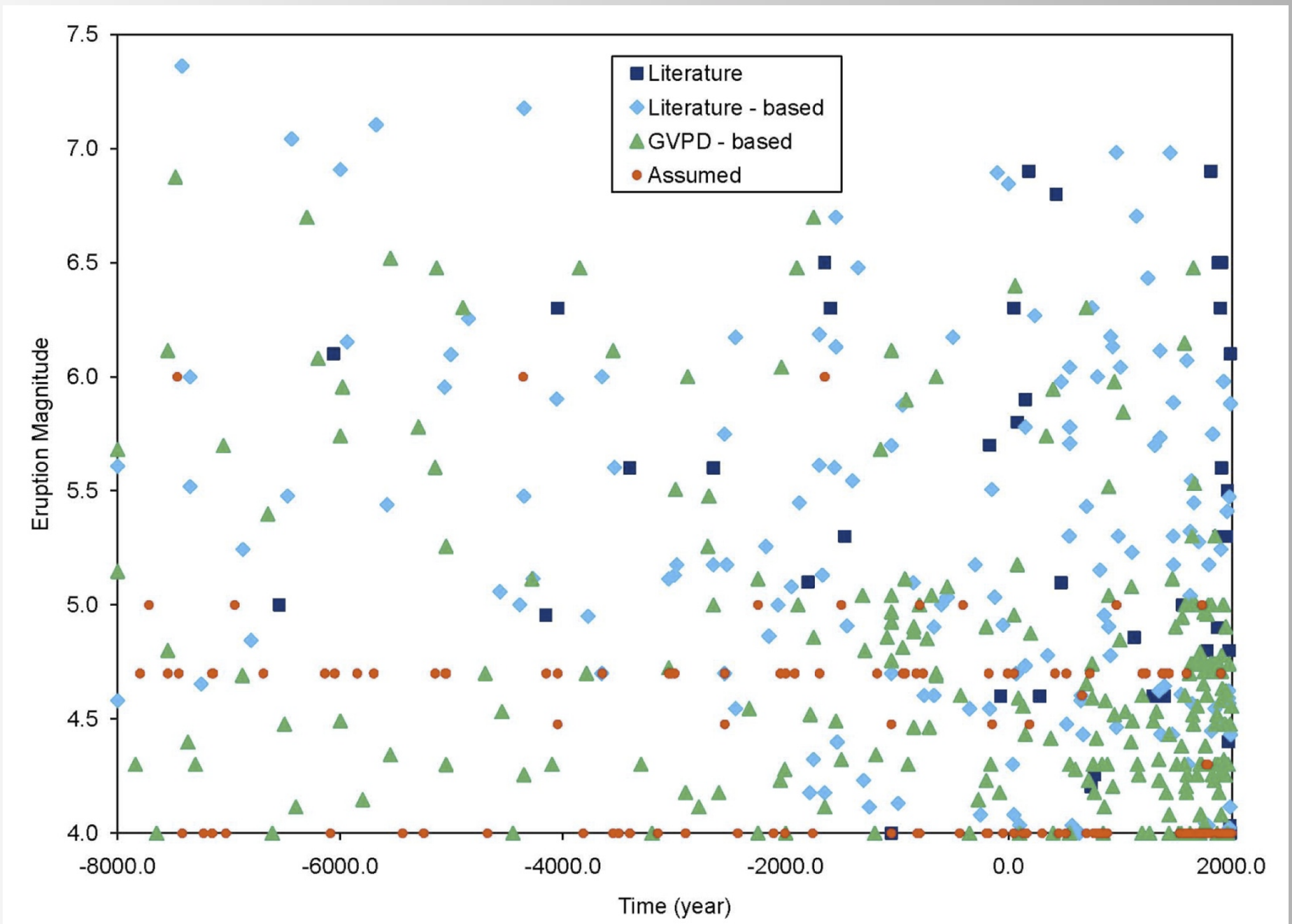
Relational database with portal for public access, interrogation and input

Uncertainty, reliability

Multiple records, ranking


PETROLOGY
ID_TABLE_PETR
IDENTIFIER
DESCRIPTION
PETROLOGICAL_C...
ID_PETRO_CLASSIF
ID_ERUPTION
PETROLOGY_1
PETROLOGY_2
PETROLOGY_3
PETROLOGY_4
PETROLOGY_5
ID_MAGMA_TYPE
MAGMA_TYPE
ID_MAGMA_TYPE
DESCRIPTION
DATING_TECH...
ID_DAT_TECH
SI_CODE
DESCRIPTION
DATING_CONFID_LEVEL
ID_DATING-CONF
DESCRIPTION
VOLUME_CONF_LEVEL
ID_VOLUME_CONF
VOLUME
ERUPTION_CONFID_LEVEL
ID_ERUPTION_CONF
ERUPTION_PARAMETERS
ERUPTION
ID_ERUPTION
ID_VOLCANO
VOLCANO_NAME
UNIT
DAY
MONTH
YEAR
Yr_BP
DATE_ERROR
ID_DATING_TECH
ID_DATING_CONF
AIRFALL_TEPHRA
AIRFALL_TEPHRA_ERROR
AIRFALL_TEPHRA_DRE
AIRFALL_TEPHRA_DRE_ERROR
IGNIMBRITE
IGNIMBRITE_ERROR
IGNIMBRITE_DRE
IGNIMBRITE_DRE_ERROR
PRIMARY_INTRA_MATERIAL
PRIMARY_INTRA_MATE_DRE
DEPO_BULK_VOLUME
DEPO_BULK_VOLUME_ERROR
DEPO_BULK_VOLUME_DRE
DEPO_BULK_VOLUME_DRE_ERROR
DEPO_BULK_VOLUME_DRE_FROM
MAGMA_MASS
MAGMA_DENSITY
ID_VOLUME_CONF
HEIGHT_MIN
HEIGHT_MAX
VEI
VEI_FROM
ID_ERUPTION_CONF
INTENSITY
INTENSITY_FROM
ERUPTION_OTHER_VALUES
ID_PREVIOUS_ERUPTION
ID_ERUPTION
ID_VOLCANO
VOLCANO_NAME
UNIT
ERUPTION_OTHE...
ID_PREVIOUS_ERUPTI
ID_PREVIOUS_ERUPTI
ID_SOURCE
ERUPTION_SOURCES
ID_ERUPTION_SOURCES
ID_ERUPTION
ID_SOURCES
SOURCES
ID_SOURCE
CITATION
AUTH
YEAR
TITLE
VOLCANO
ID_VOLCANO
RN
SN
NAME
LATITUDE
NS
LONGITUDE
EW
14C_AGES
ID_14C_AGES
ID_ERUPTION
14C_DATE
14C_DATE_ERR
REGIONS_SUBREG
ID_REGION
ID_SUB_REGION
REGION
SUB_REGION

Statistical analysis of databases



Deligne, Coles and Sparks (JGR,115, 2010, doi:10.1029/2009JB006554)

GVM

GLOBAL VOLCANO MODEL

www.globalvolcanomodel.org

Hazard and Risk Assessment

SHORT TERM: managing volcanic crises

LONG TERM: learning to live with volcanoes

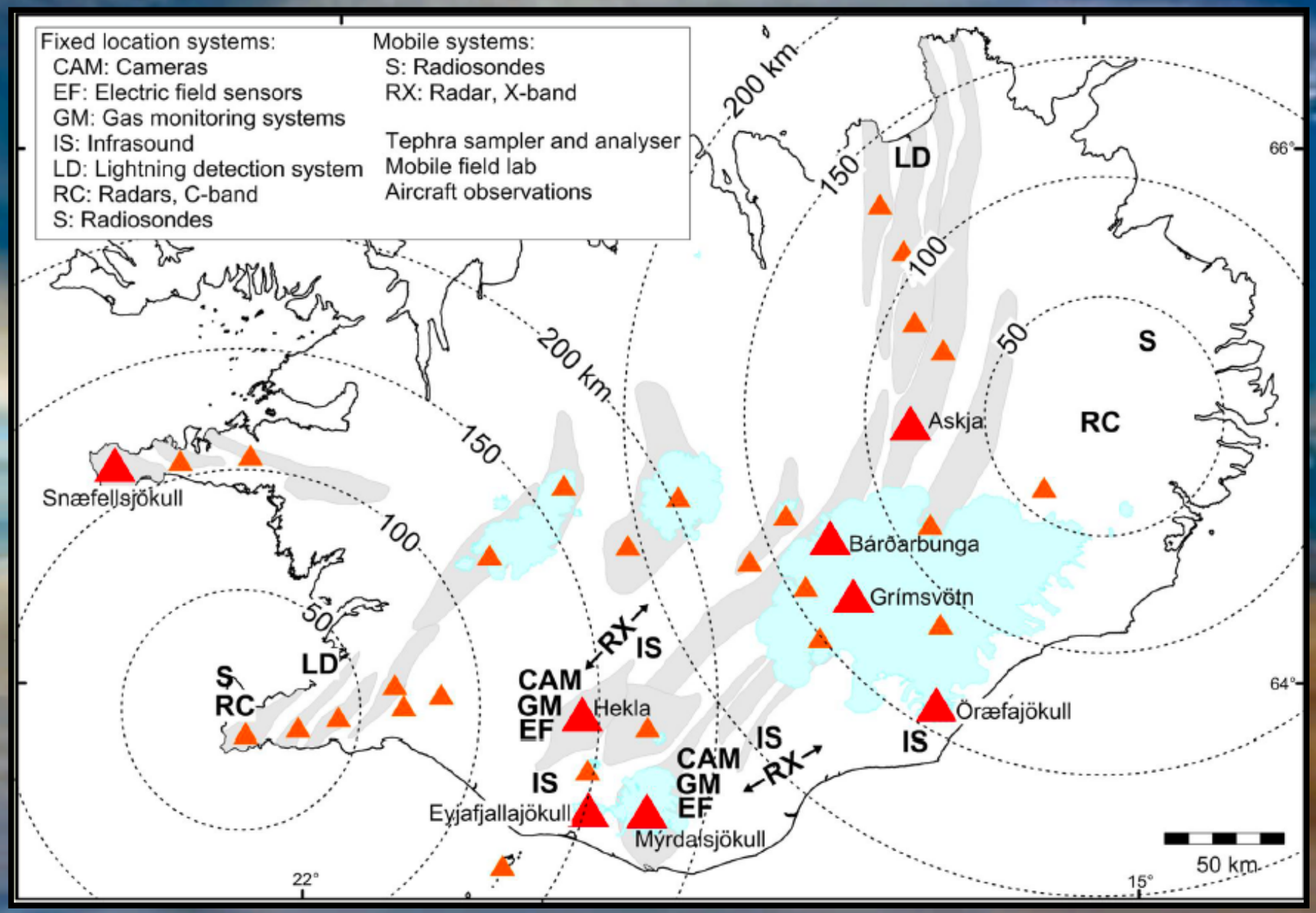
Risk assessment of volcanic eruptions

1.9.2011

Grímsvatnagos: Eftirlitsflug að kvöldi 21. maí 2011. Ljósmynd: Steinunn S. Jakobsdóttir.

The Icelandic government approved on August 26th a proposal by the Minister for the Environment, Svandís Svavarsdóttir, for the preparation of a general risk assessment regarding volcanic eruptions in Iceland. The proposal was based on an estimate made by the Icelandic Meteorological Office in collaboration with the Civil Protection Department of the National Commissioner of the Icelandic Police, the Institute of Earth Sciences at the University of Iceland, the Soil Conservation Service of Iceland and the Icelandic Road Administration.

Futurevolc: Real-time assessment of mass eruption rate



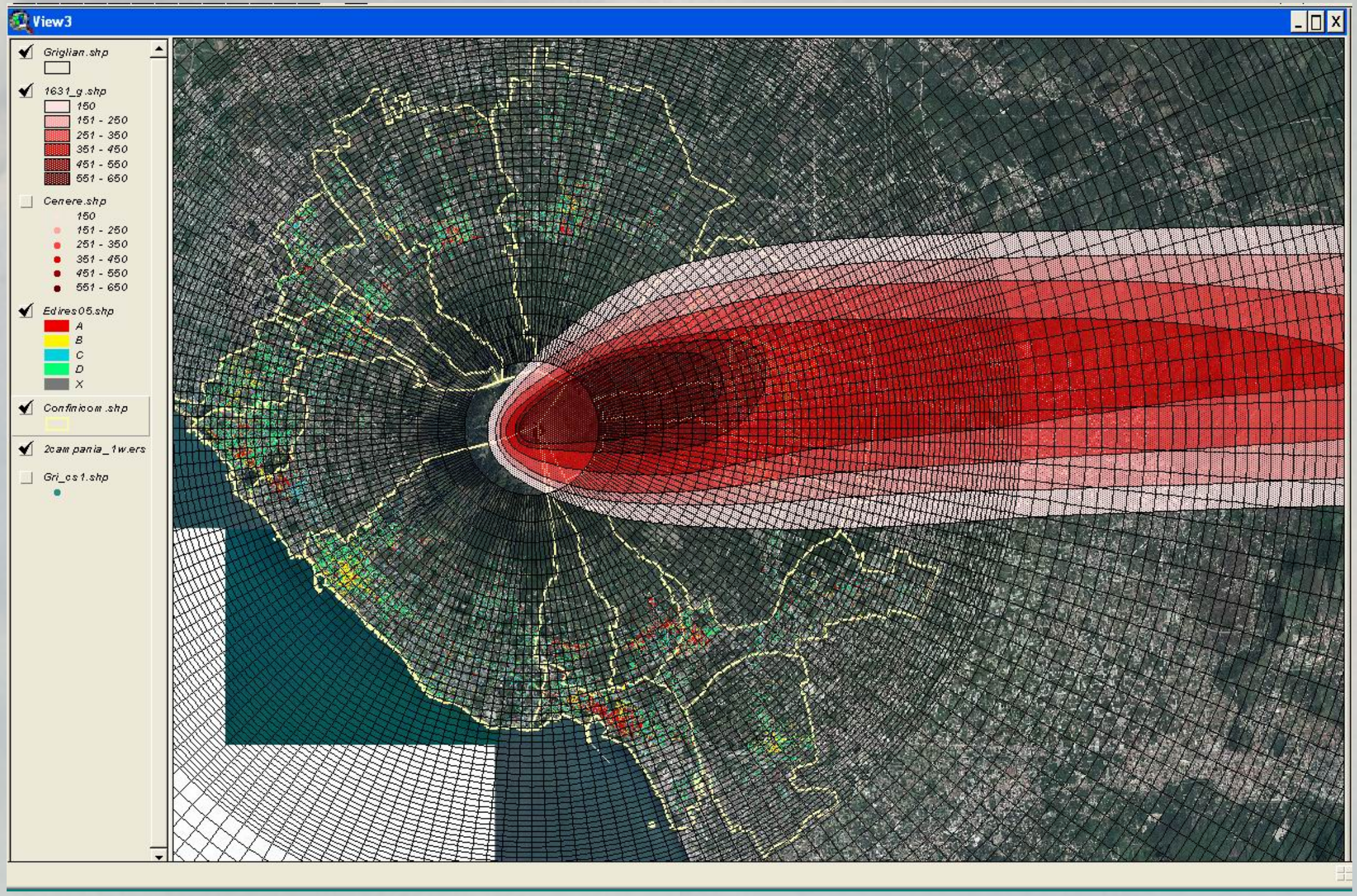
courtesy of M. Gudmundsson

Vesuvius – planning for the next eruption

- Hazard and risk assessment
- Scenario development
- Scenario response

Improved long-term hazard and risk assessment

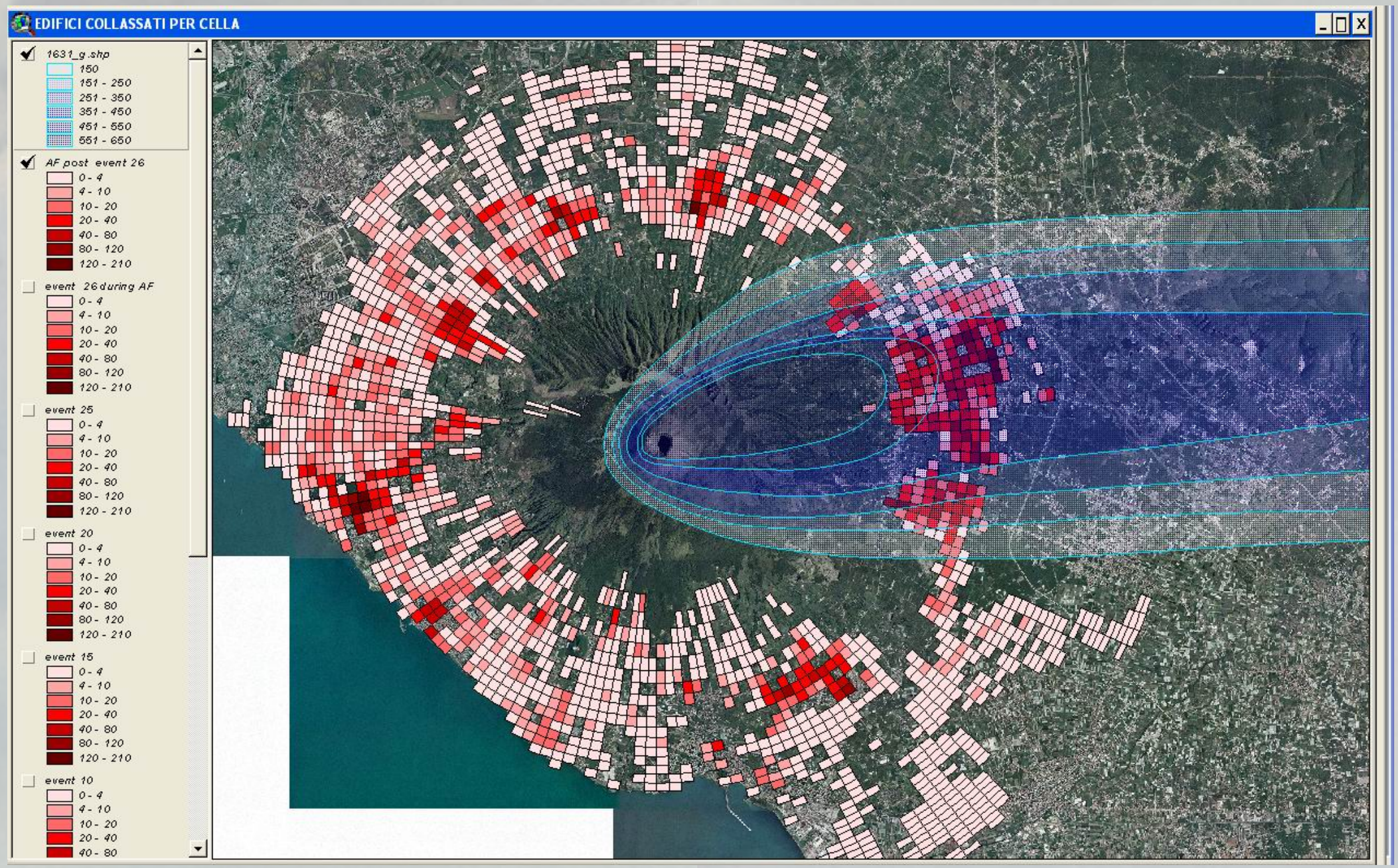
Vesuvius: ashfall probability



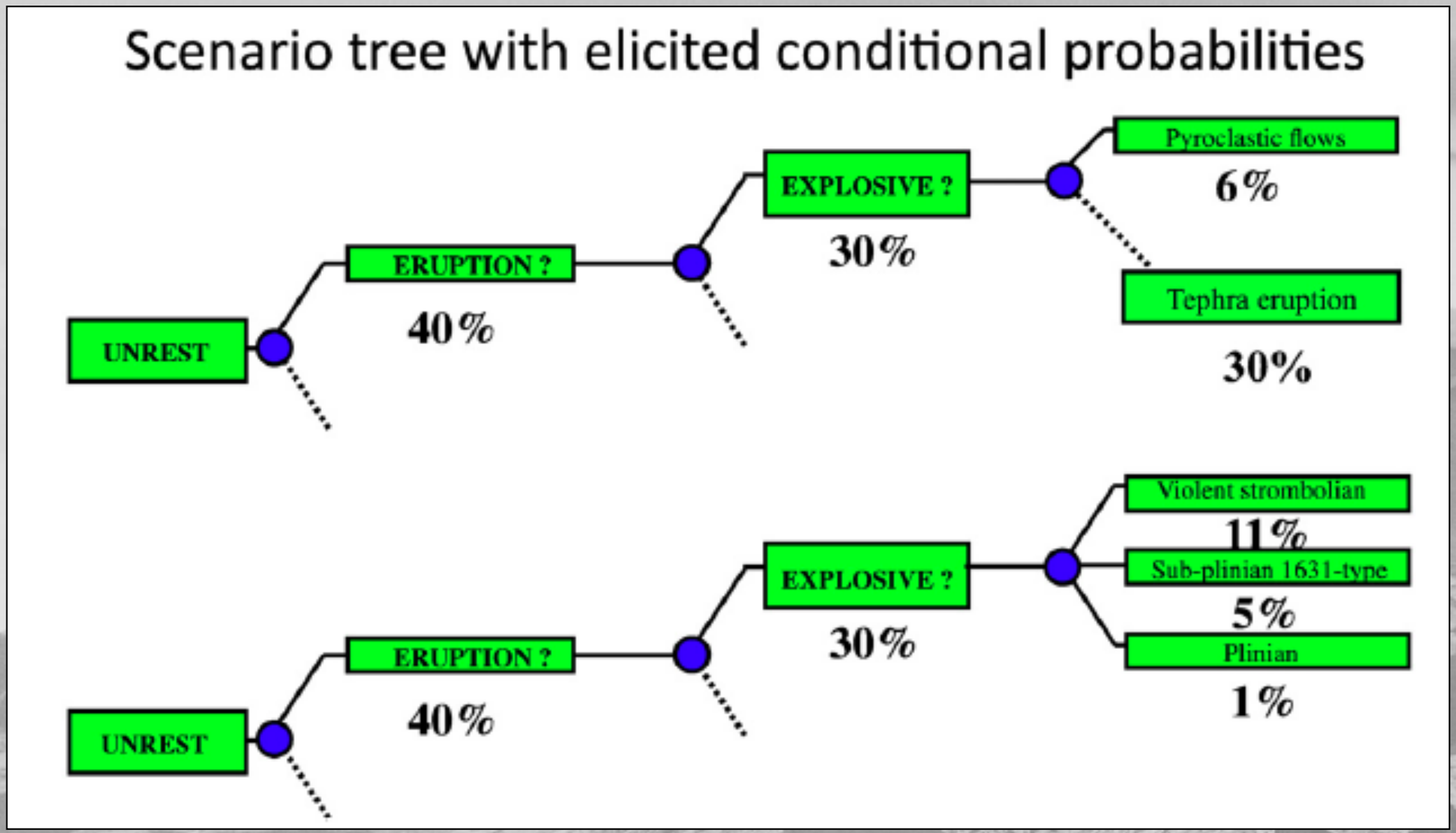
EXPLORIS project

Improved long-term probability assessment

Vesuvius: combined impact of ash fall (roof collapse) and earthquake damage



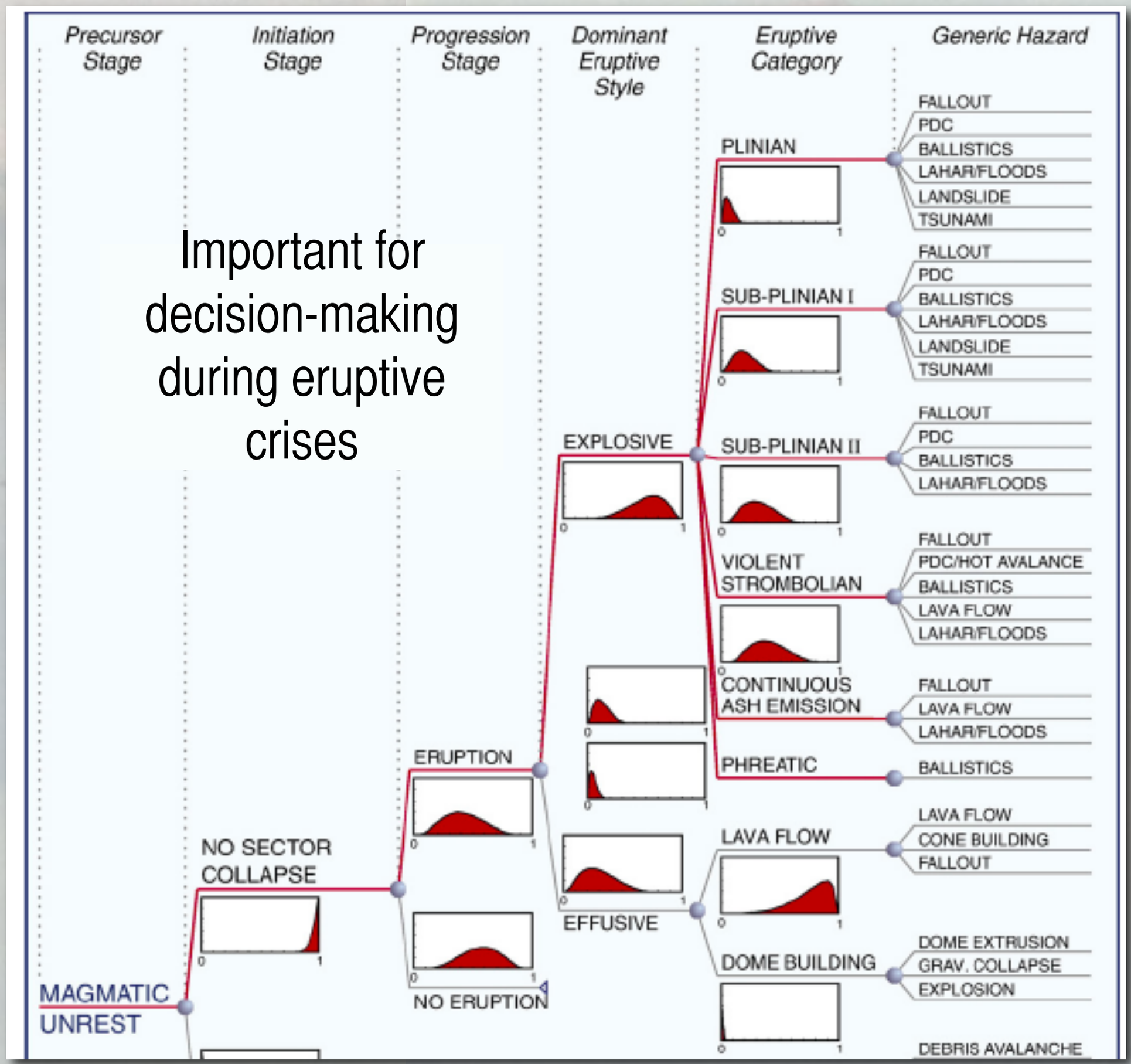
Pre-eruption planning: quantifying risk



Baxter et al. (2008)

Vesuvius

Important for decision-making during eruptive crises



Neri et al. (2008)

After Code Red

- response (e.g. cell phone network)
- how to anticipate rapid shifts in activity?
[event trees are linear]
- the “unknown unknowns”?

After Code Red

- The aftermath... the L'Aquila story

Complications

When to evacuate?

What happens when you lose trust of community?

Improving resilience – lessons from the past

Perspectiva del Volcán de Tunguragua ... y de su erupción el día 23 de abril de 1773.
AGI MP-Panama, 180

Demarcación del país que ha cubierto de ceniza, y cascajo, la erupción ... de Tunguragua.
AGI MP-Panama, 181

Historic accounts provide precise dates and times

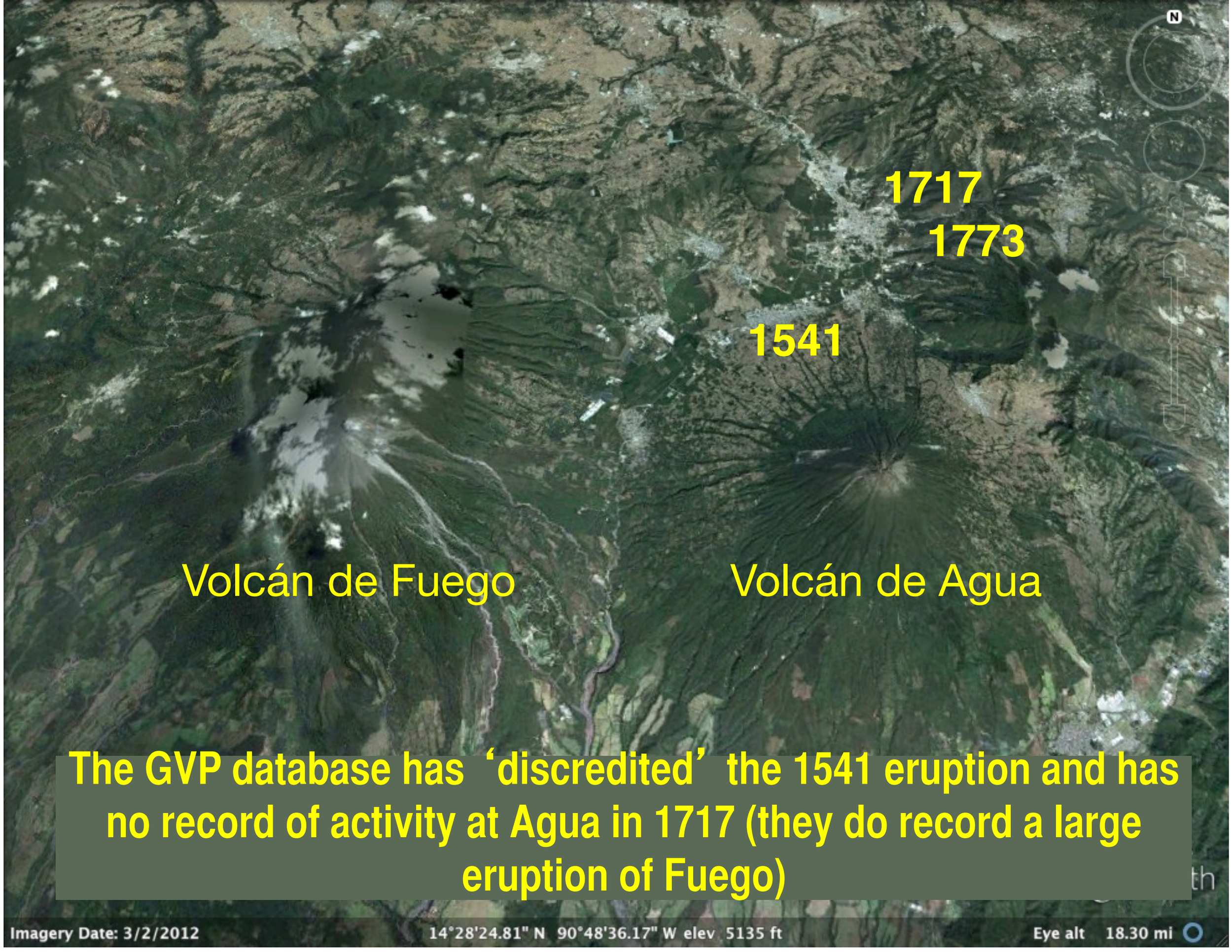
- **1773 Tungurahua eruption**: ‘Between 4 and 5 on the afternoon of 23 April, the volcano erupted, having given no prior signs to indicate the … devastation it would wreak … tremendous roaring, vomiting fire, sparks, sand, mud, ash, water, and dense smoke that covered the atmosphere … new openings appeared in the mountain during this eruption through which the volcano spewed the same substances as through the main one’

- **1698 earthquake/lahar**: ‘at between 1 and 2 in the morning of 20 June the earth began to shudder and at exactly the same time as the tremors began Mount Chimborazo and another nearby [volcano] both erupted expelling vast torrents of water mixed with mud which flooded the fields and [led] the Ambato and other rivers to overflow’

A curious event...

- 1698: the volcano expelled ‘such vast quantities of water ... [that] the river overflowed and destroyed all the plantations, mills, farms ... houses, and livestock along its banks ... the tremors were felt at exactly the same time in every place between Chimbo and the village of San Miguel, and in the district of Ambato no stone remained on top of another ... many people of both sexes and all classes died, as most were asleep [when the earthquake struck] ... In the town of Patate four leagues distant from Ambato ... more than 200 people were killed ... because they did not run fast enough they drowned... Of this town nothing is left ... In ... Latacunga ... most residents [asleep at the time] were buried under their beds and houses ... others choked on the dust [as they tried to escape]’.

The Global Volcanism Program database has no record of historic activity at Chimborazo and no record at all of Carihuairazo


N
1717
1773
1541
Volcán de Fuego
Volcán de Agua
The GVP database has ‘discredited’ the 1541 eruption and has no record of activity at Agua in 1717 (they do record a large eruption of Fuego)
Imagery Date: 3/2/2012
14°28'24.81" N 90°48'36.17" W elev 5135 ft
Eye alt 18.30 mi