



**British
Geological Survey**

NATURAL ENVIRONMENT RESEARCH COUNCIL

Applied geoscience for our
changing Earth

Summary of volcanology projects since 2010

Sue Loughlin, British Geological Survey

2nd WMO-IUGG workshop on ash dispersal forecast and civil aviation

1st WMO-IUGG workshop

- → model developers, meteorologists, volcanologists and stakeholders need to work closely together in order to develop new and improved strategies for ash dispersal forecasting
- **MAIN CONCLUSIONS:**
 1. improve the definition of the source term and critical aspects of particle sedimentation,
 2. design models and forecasting strategies that can better characterize uncertainties,
 3. explore the best ensemble strategies that can be adapted to ash dispersal forecasting,
 4. identify optimized strategies for the combination of models and observations



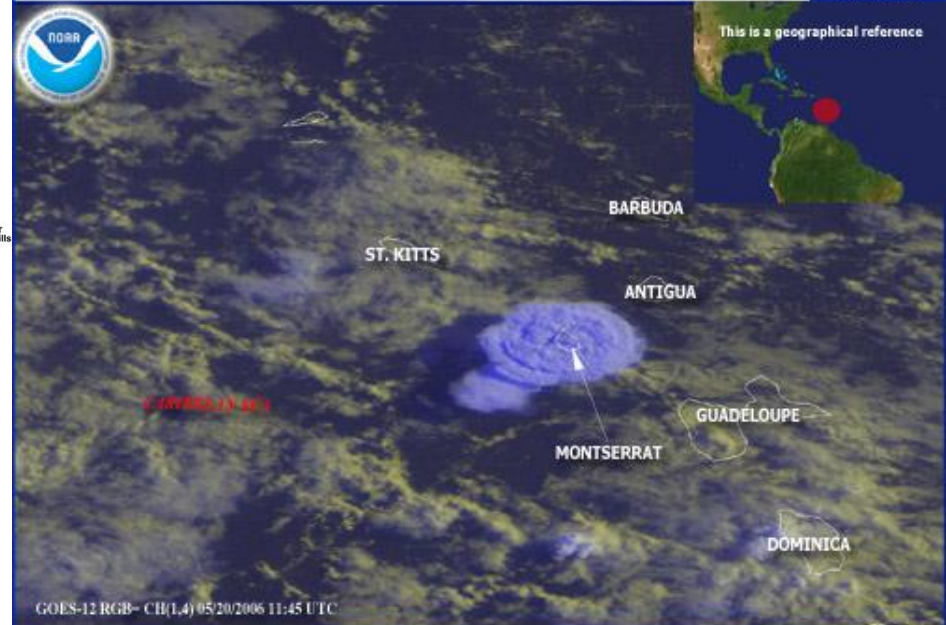
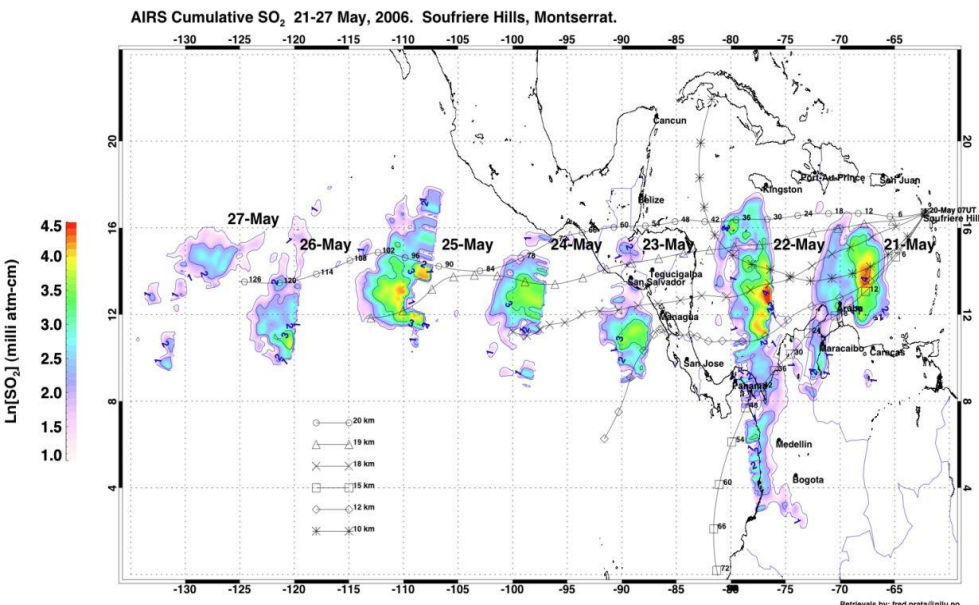
Montserrat 2006

- Loss of monitoring equipment
- Loss of international comms
- Loss of visibility
- Information needed for response
- Provided by satellite remote sensing



The volcano Soufriere Hills on the island of Montserrat erupted violently this morning at approximately 7AM EST. A pilot report in the vicinity of the volcano indicated ash reached a height of 55,000 feet.

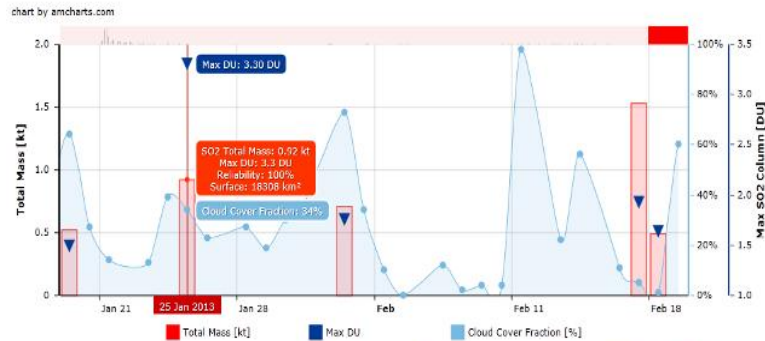
Credit: NOAA



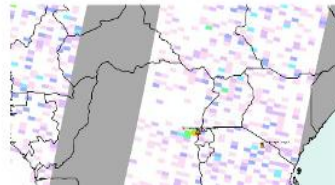
EVOSS : global near real-time satellite monitoring



SO₂ Column and Total Mass @15km (GOME-2) - Nyiragongo - Nyamuragira (Congo)

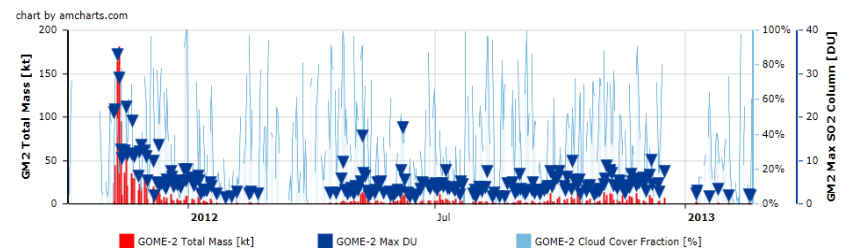
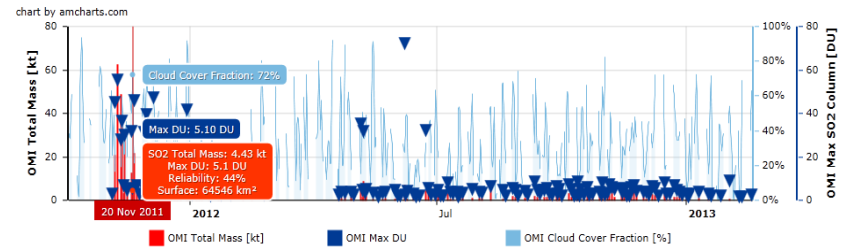


Product Information	
Date	2013/01/25
Max DU	3.3 DU
Total Mass	0.92 kt
Cloud Coverage	34 %
Reliability	100 %
Surface	18308 km ²



Nyiragongo - Nyamuragira (Congo)

SO₂ Total Mass @17km (OMI) vs SO₂ Total Mass @15km (GOME-2)



Special Notices

FLIGHTS FROM ALL UK
AIRPORTS ARE DISRUPTED
DUE TO VOLCANIC ASH.

PASSENGERS ADVISED TO
CHECK WITH THEIR AIRLINE.

BY 15:00 27/04/2010

Many Projects...e.g.

- EC: WEZARD, Supersites (FUTUREVOLC, Med-SUV)
- ESA: SACS2, VAST, SMASH
- UK NERC: Urgency grants
- National funding: Research, monitoring infrastructure
- Ash experiments: Dusseldorf University, Uni of Wuerzburg, VIPR (NASA)
- Aviation sector funding: e.g. AVOID
- ICAO: e.g. Iceland catalogue
- Civil Protection: Future volcanic risks



Coordination and collaboration

WMO-IUGG workshop 'Ash dispersal forecast and civil aviation' 2010

Bonadonna et al. 2011

Volcano Observatory Best Practice (VOBP) workshop 2011

- Short term forecasting

Volcano Observatory Best Practice (VOBP2) workshop 2013

- Communication
 - knowledge
 - role and responsibility
 - practice



The screenshot shows the WOVO.org website. At the top left is the logo, which features a stylized volcano with a red plume and a red arrow pointing towards it, set within a circular frame. To the right of the logo is the text "WOVO.org" in a large, bold, red font. Below the logo and text is the full name "World Organization of Volcano Observatories" and a subtitle "A Commission of the International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI)".

On the right side of the page is a navigation menu with the following items: Home, Observatories, WOVodat, Volcanic Alert Levels, NEWS, and Contacts.

Below the navigation menu is a search bar and a "Latest News" section. The "Latest News" section contains several entries, each with a title, date, and time. The most recent entry is "2nd IUGG-WMO workshop on 'Ash dispersal forecast and civil aviation'", dated 06-Feb-13 05:56. Below this entry is a "To all," heading followed by a paragraph of text announcing the workshop. The text states that the workshop will take place at the Geneva headquarters of the World Meteorological Organization on 18-20 November 2013. It also provides a link to the preliminary website: <http://www.unige.ch/sciences/terre/mineral/CERG/Workshop2.html>. The text further states that the workshop will focus on the following objectives:

1. To review and institutionalize the interaction between meteorological, atmospheric, volcanological, modelling and remote sensing communities
2. To document scientific and operational progress from the 1st meeting
3. To identify best practice modelling strategies to support operational implementation
4. To identify and develop concepts to address current challenges

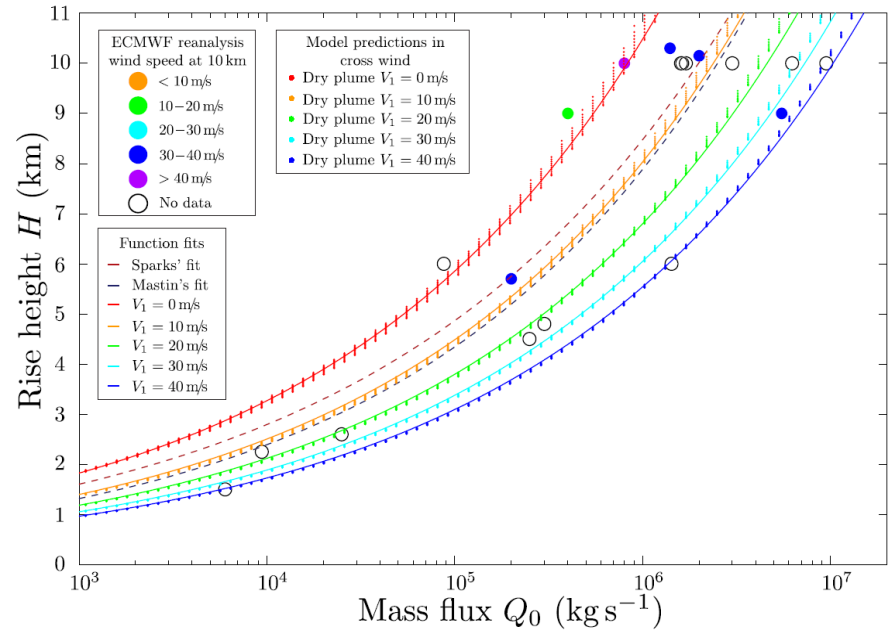
Below the objectives is another paragraph of text stating that the first IUGG-WMO workshop took place in Geneva on 18-20 October 2010 and promoted stronger interactions between the volcanological and the operational forecasting communities. It also provides a link to the benchmark exercise for model comparison: <http://www.unige.ch/sciences/terre/mineral/CERG/Workshop/results.html>. The text concludes by stating that the outcomes of the second meeting will facilitate further collaborations and help join the effort towards improved forecasting strategies.

National: VANAHEIM!

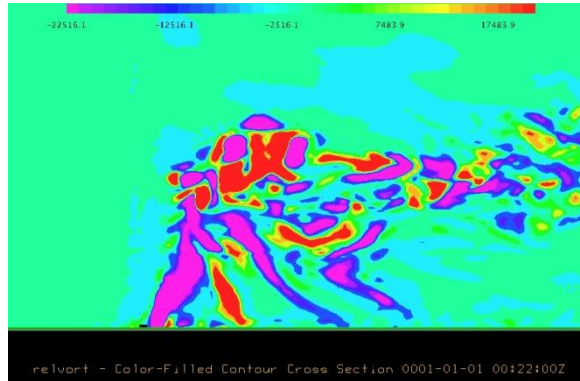


Characterisation of the near-field Eyjafjallajokull plume and its long-range influence

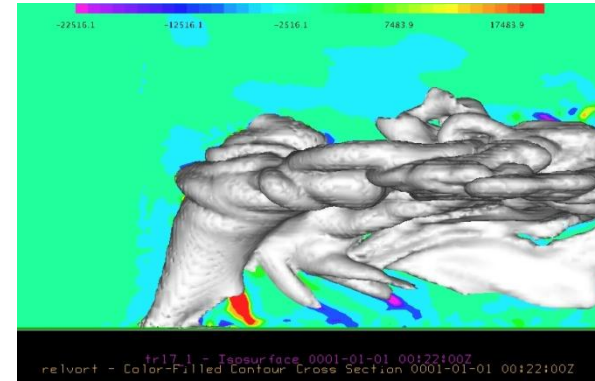
Woodhouse et al. 2013. JGR, 118.



Ash



Relative vorticity



Relative vorticity + ash

Real-time information

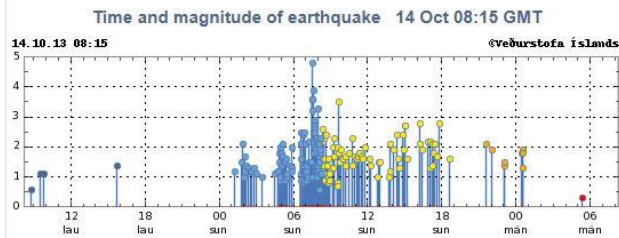
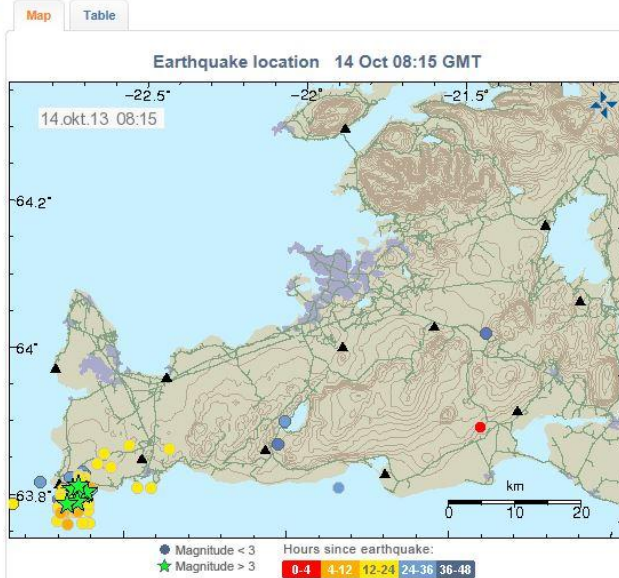
<http://en.vedur.is/> Icelandic Met Office (Iceland's volcano observatory)

Warning A strong gale (more than 20 m/s) is expected in north Snæfellsnes until late evening. Valid to 15.10.2013 18:00 [More](#)

Reykjanes peninsula - earthquakes during the last 48 hours

(Preliminary results)

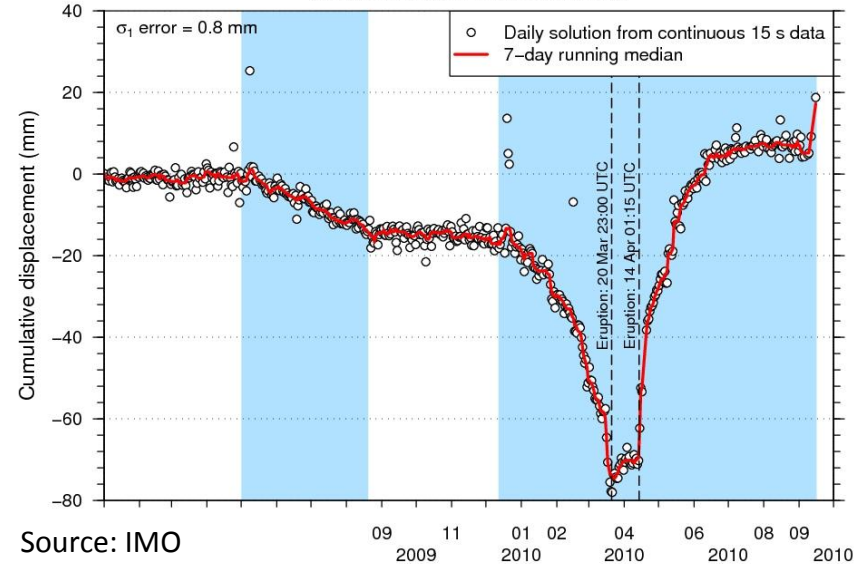
Seismicity
Earthquakes - all regions
East fjords
Hengill
Hofsjökull
Langjökull
Mýrdalsjökull
Mývatn
N-Atlantic
Reykjanes ridge
Reykjanes peninsula
Snæfellsnes
Southern Iceland
Tjörnes fracture zone - small
Tjörnes fracture zone - large
Vatnajökull
West fjords
Vestmannaeyjar
Volcanic eruptions
Tremor measurements
Strain measurements
GPS measurements
Articles
Reports and publications
Conferences
Other institutions



- ### Related topics
- Instructions on using earthquake pages
 - Grímsvötn 2011 - overview
 - Eyjafjallajökull 2010 - overview
 - Useful links
 - Institute of Earth Sciences
 - Earthquake Engineering Research Centre - University of Iceland
 - Incorporated Institutions for
 - National Earth Center

THEY: North component relative to REYK

Latest update: 08:05 UTC, 16 September 2010



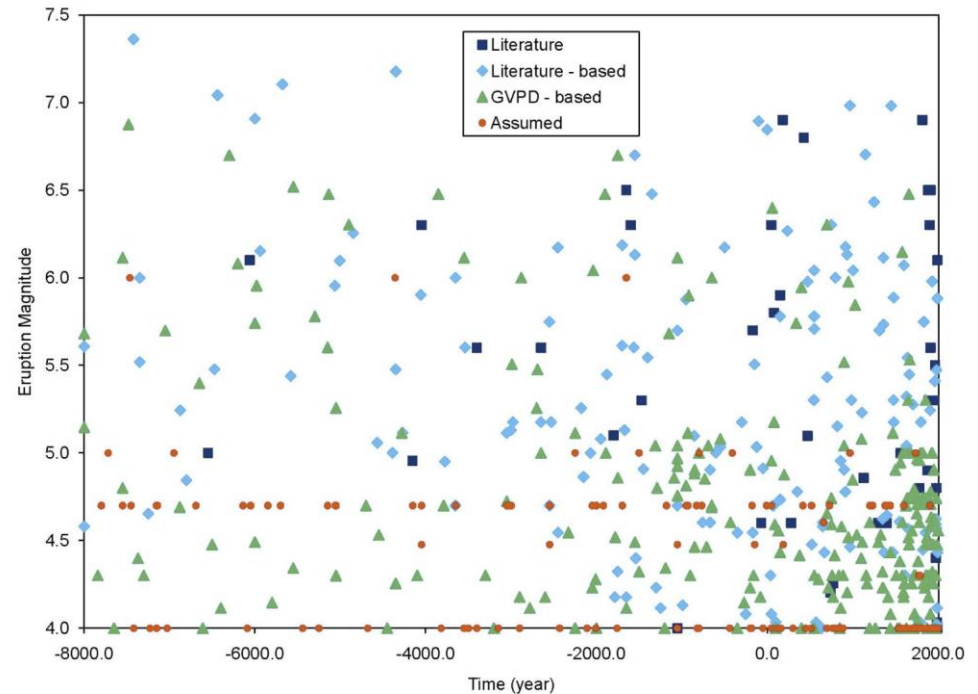
What is the threat?

Global Volcano Model

‘A sustainable, accessible international platform for information on volcanic hazard and risk’

Initiated by BGS and Bristol University

- Coordination
- Systematic data, evidence, analysis
- Task forces
- Community-led, co-production



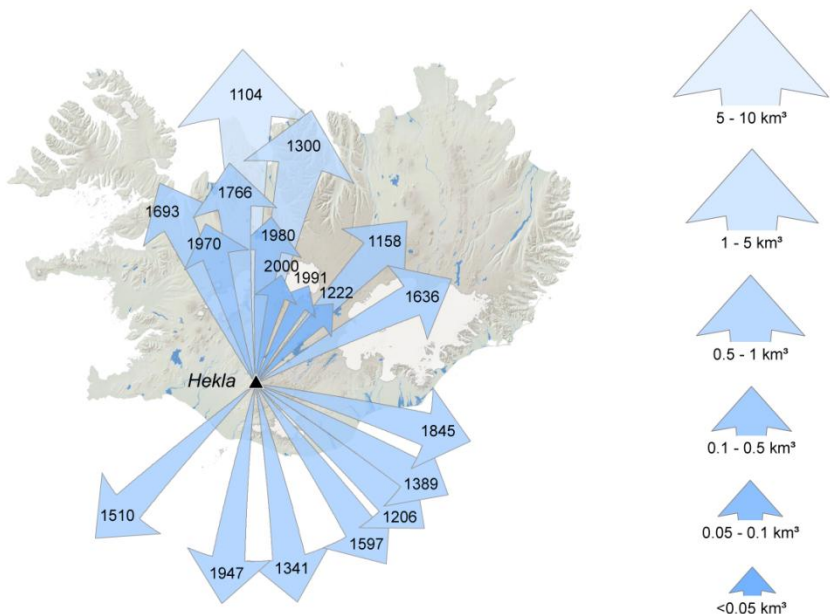
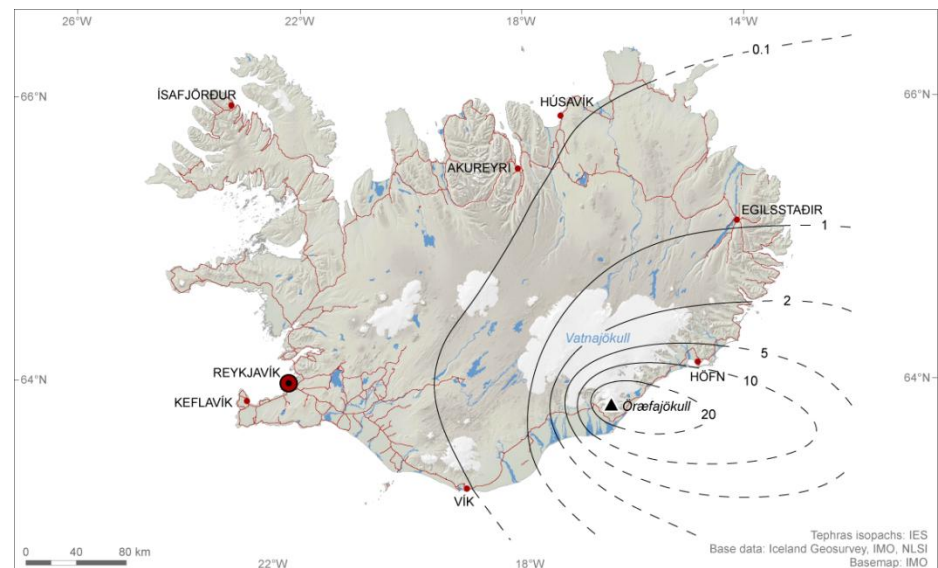
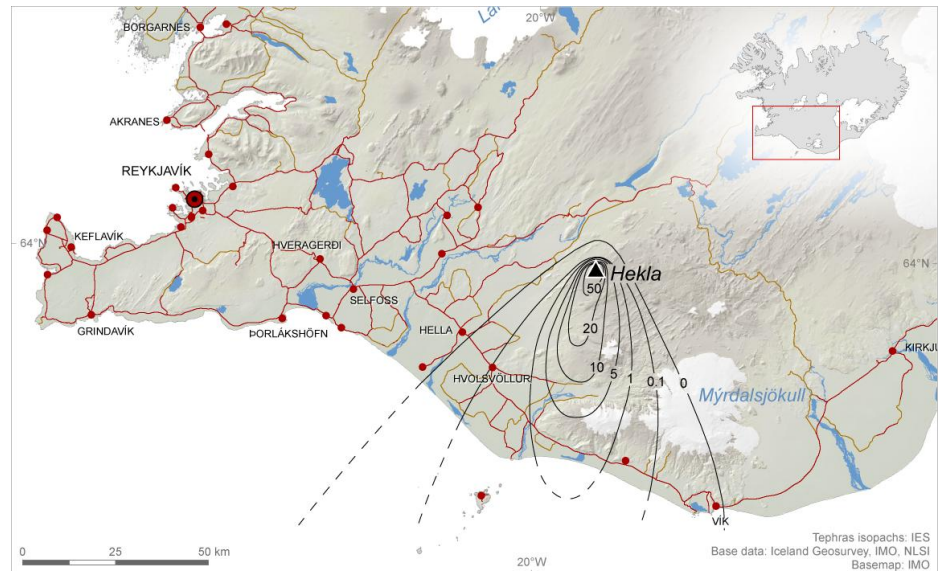
Deligne, Coles and Sparks (JGR,115, 2010, doi:10.1029/2009JB006554)

www.globalvolcanomodel.org

Iceland Catalogue

Icelandic Met Office / ICAO

2014 : Interactive resource on Iceland's volcanoes



Fissure eruptions



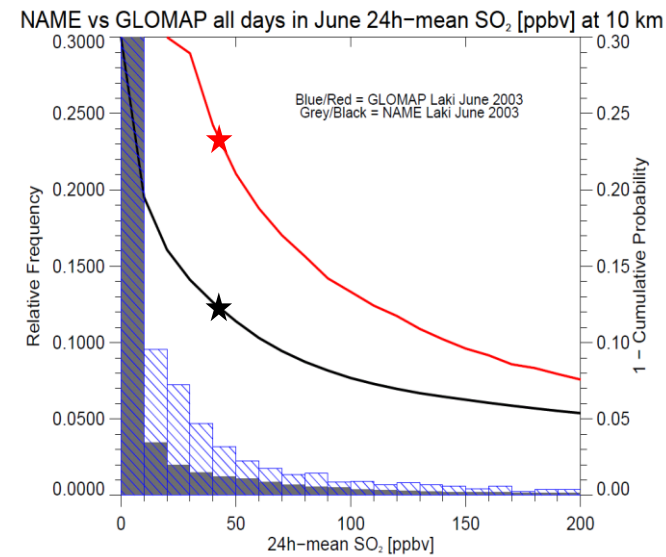
From <http://www.geostudy.zoomshare.com>

UK Risk Register – gases and aerosols
Expert elicitation to establish preliminary uncertainty on
source terms
Leeds University, Met Office, BGS, CEH, Bristol University...

GLOMAP: 24% chance to encounter
24h-mean SO₂ conc. > 40 ppbv on
any day in June using 2003 met
fields

NAME: 12% chance to encounter
24h-mean SO₂ conc. > 40 ppbv
on any day in June using 2003
met fields

Schmidt and Witham, unpublished data



Research aircraft (in-situ observations)

- German Weather Service DWD and the Federal Ministry of Transport. One instrumented research aircraft, pilot and scientist on standby in order to be in the air for airborne ash measurements within 24 hours after alert by the DWD. Presently using one single engine aircraft and two different twin engine aircraft. **Dusseldorf University.**
- **MOCCA UK Met Office**
NERC purchase of FAAM aircraft.
- More progress elsewhere too...



Ground-based observational networks (1)

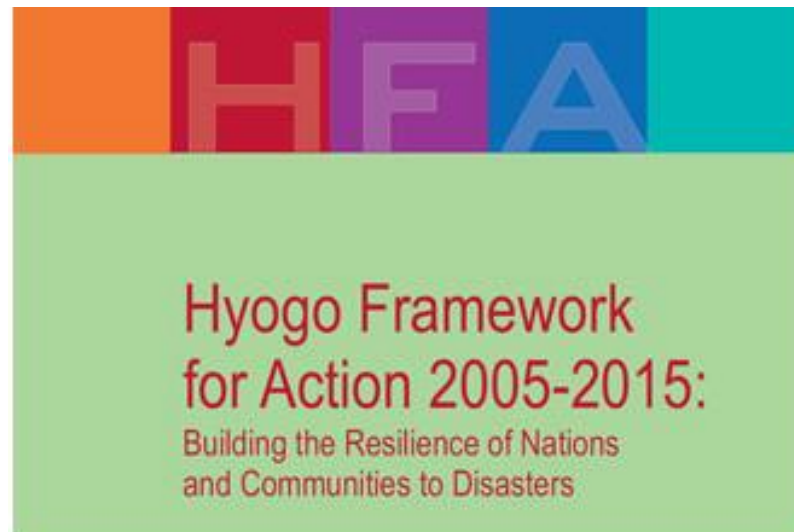
- **EARLINET** is addressing the need for near-real-time and freely available data: cooperating with commercial lidar and ceilometer companies; developing software for automatic data processing; maintaining lidar quick-look web-page, and integrating lidar, sun-photometer and radar data for volcanic monitoring.
- **E-PROFILE (EUMETNET)** is a network for vertical profiling of wind and aerosols. A continuation of E-WINPROF (windprofiler network). Integration of ceilometers and lidars.

Ground-based observational networks (2)

- **TOPROF (COST):** Towards operational ground-based profiling with ceilometers, doppler lidars and microwave radiometers for improving weather forecasts
- **EG-CLIMET (COST):** European Ground-Based Observations of Essential Variables for Climate and Operational Meteorology

Hyogo Framework for Action

- The Hyogo Framework for Action (HFA) is the first plan to explain, describe and detail the work that is required from all different sectors and actors to reduce disaster losses. The HFA outlines five priorities for action, and offers guiding principles and practical means for achieving disaster resilience.
- Its goal is to substantially reduce disaster losses by 2015 by building the resilience of nations and communities to disasters. This means reducing loss of lives and social, economic, and environmental assets when hazards strike.



Summary

- There is a great deal of scientific activity and progress
- We need to document it
- How to get research outputs into operations?
- How to maintain/enhance working across disciplines?
- How to avoid duplication?
- We must engage with operational partners
- We must try to maintain the momentum

A large, billowing plume of dark volcanic ash and smoke rises into the sky, filling most of the frame. The plume has a dense, textured appearance with many small, rounded protrusions. The color is a dark, charcoal grey. The background is a pale, overcast sky. The word "Thanks" is centered in the middle of the image in a white, sans-serif font.

Thanks