



Eyjafajallajökull eruption

Centre for Ecology & Hydrology Capability and Activities



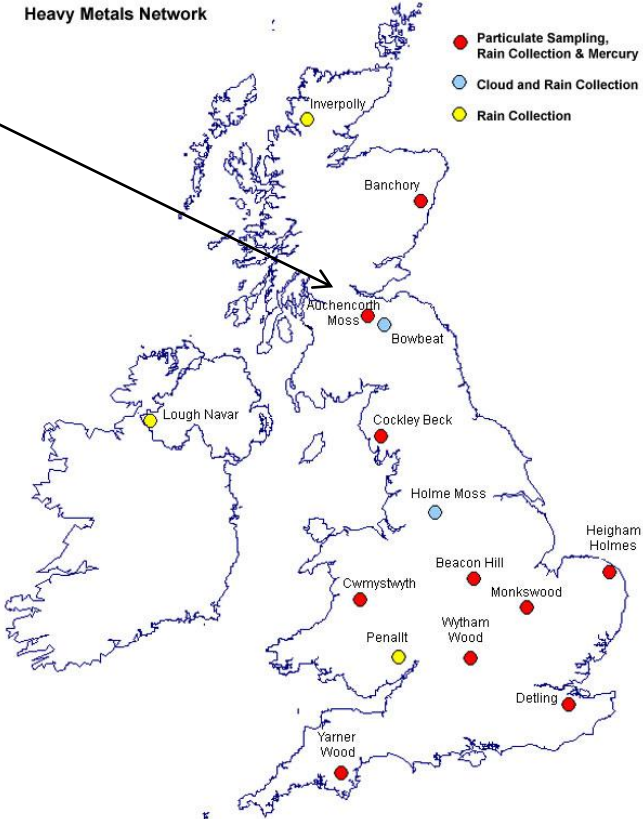
Immediate questions from Defra

- What were risks to environmental and human health?
- Could we detect it in our atmospheric networks?
- Could we analyse herbage for fluorine?
- Could we enhance sampling to collect vegetation for F analysis?

Atmosphere

Hg and heavy metals

- Auchencorth continuous (5 min internal) Hg data from 16th April: no increase in Hg concentration so far, potential for changes as plume falls
- Weekly and monthly samples collected from the heavy metals network (see map for sites)
- Aerosol mass spectrometer running at CEH Edinburgh since the plume was identified: no evidence of detection as yet (plume high)
- Large particulate concentration recorded 23-25 April
SO₄ 10 ug^m³
NO₃ 10ug^m³
Organics 10 ug^m³
Volatiles: 5ug^m³
Non-volatile particulates up to 31ug^m³ (annual mean 6ug^m³)



Atmosphere

Inorganic ions in rain, air and aerosol

- 46 rain samples (current, recent, historic) being analysed including Fluoride

UKEAP (UK Acidifying and Eutrophying Atmospheric Pollutants) network (CEH, AEA and Defra)

- Daily rain samples,
- fortnightly bulk chemistry at 38 sites,
- monthly averages of acid gases at 30 sites (see map)

Environmental Change Network (ECN) sites

- Collecting bulk deposition filter papers for mineralogy of particulates



Water

- Intensive sampling for a range of Catchments : potential acidification episodes
- 15 sites on the Thames regularly monitored
- Episodic samplers installed to capture any ‘event’ at Plynlimon (Mid-West Severn/Wales) and Conwy catchments(N Wales).
- 20-30 yr records for a variety of lakes and rivers in acid sensitive areas + intensive 7-hour sampling of some catchments



Plynlimon catchment

© AWMN, 1999



English Acid waters sites

Vegetation & Soil

- Analytical expertise in Fluoride analysis in vegetation: detection limit 1 ug/g
- Analytical expertise in wide range of metals, silica and titanium

Environmental Change Network (ECN) sites

Samples from a number of sites being analysed for Fluoride

Countryside Survey

- Ca 300 current-year shoot vegetation samples for heather & moss in archive (baseline)
- >3000 archived soil samples could be analysed for total Fluoride (baseline).

F Transfer to Animals and Humans

- transfer to human food chain via milk or meat : little existing research on concentration ratios for F
- Samples of ash taken 19 April contained 850 mg F/kg ash.
- If fodder contains 250 mg/kg on a steady basis → acute poisoning after a short time.
- Tolerance limits for cattle ca.25-30 mg/kg fodder and 70–100 mg/kg for sheep.



Water

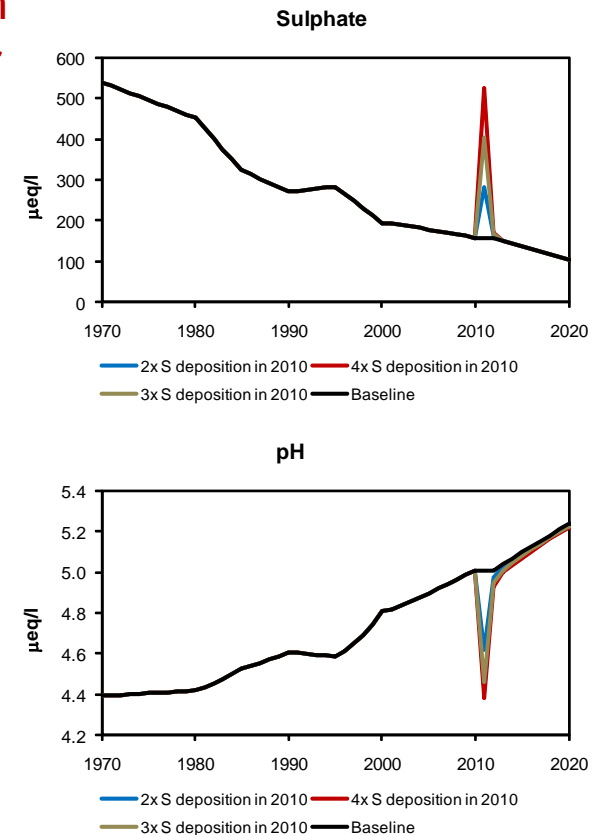
- Modeling capabilities to determine risk to waters and biota
- If any available Ash samples CEH could analyse and run MAGIC and CHUM (CHEMistry of the Uplands Model) for scenarios across a range of sites for acidification & heavy metal impacts

Scenario case study on increased S deposition for one catchment

• MAGIC model (Model of Acidification of Groundwater In Catchments) run with three scenarios

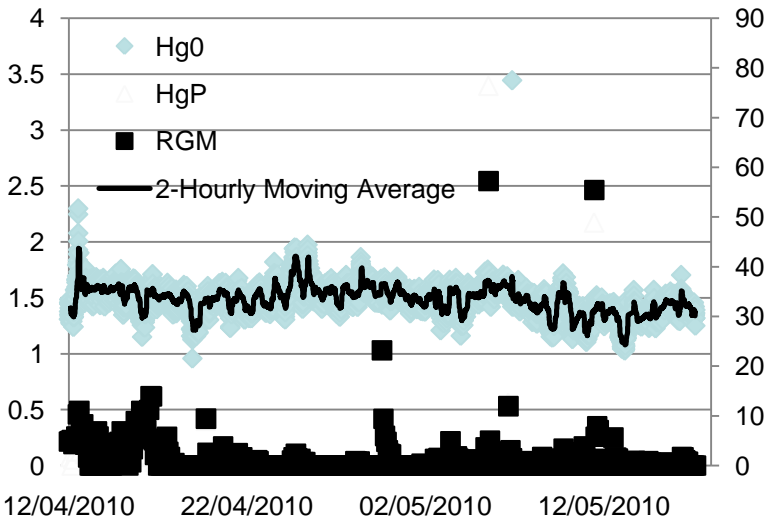
- 2 x Sulphur input: reversion to mid-1990s
- (pH, sulphate, inorganic Al)
- 3 x Sulphur input: reversion to mid-1980s
- 4 x Sulphur input: reversion to mid-1970s

• Short-lived/spike increases with rapid recovery, but significant biological damage



Examples of some data

Continuous mercury analysis at Auchencorth



Acidity in rainfall at Plynlimon

Data set	Min pH	Max pH	Median pH	Q1 pH value	Q3 pH value	No. samples
Ash cloud sampling	3.16	5.48	4.48	3.45	4.81	13
7 hourly fractals	3.24	6.30	4.80	4.44	5.12	832
Weekly over fractal sampling period	4.32	5.97	5.04	4.78	5.22	74
Weekly sampling – 27 years	3.36	7.68	5.00	4.76	5.22	1124

Concluding remarks

- Potential impacts on health of animals and environment high
- Very little evidence of any anomalous deposition
- Existing Observing networks (and stored samples) provide an invaluable infrastructure to assess impact of events such as these
- Control samples essential - what is usual mean and variability?
- Co-location of air, water and vegetation sampling crucial.