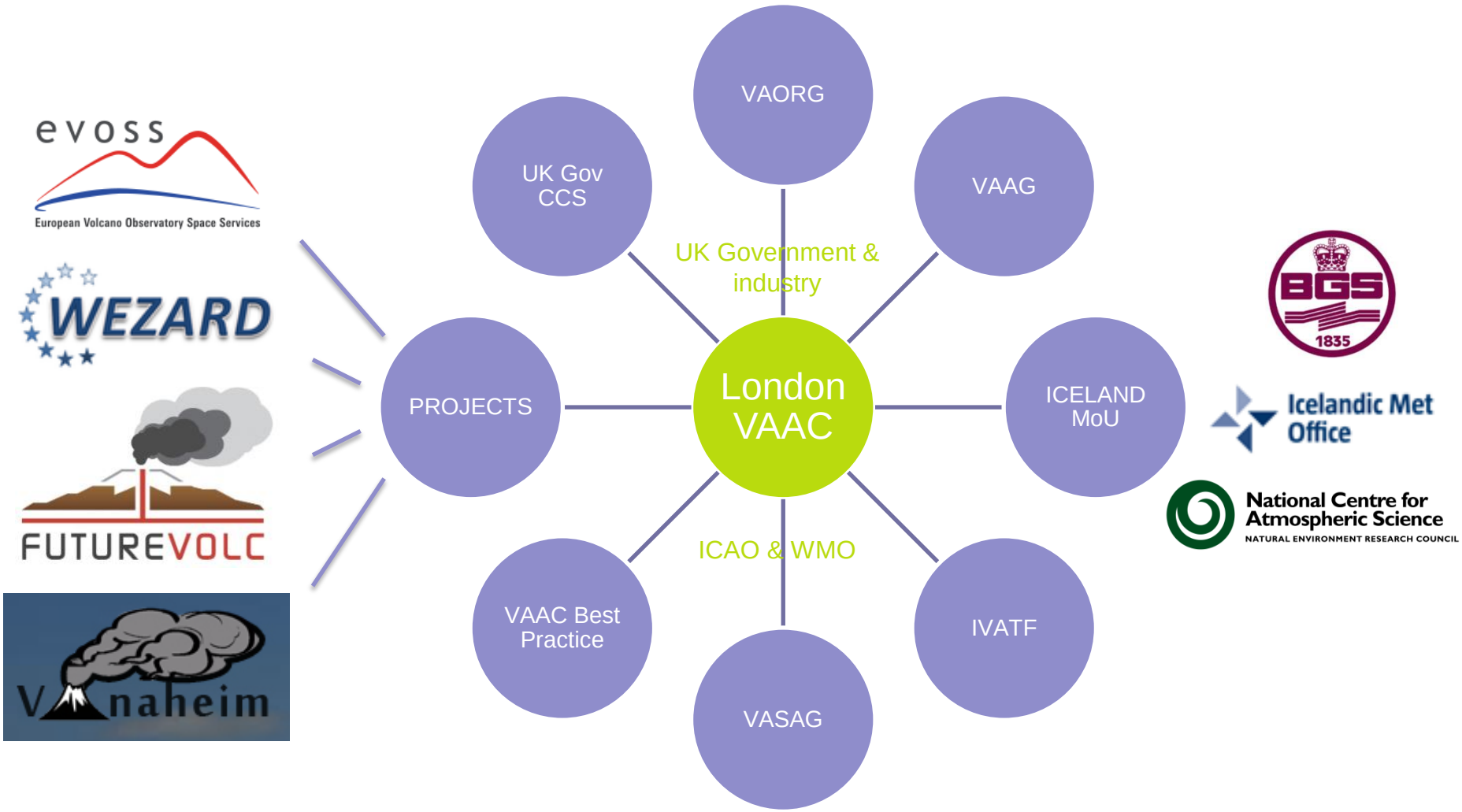
VAAC London operational developments following the recent Icelandic eruptions

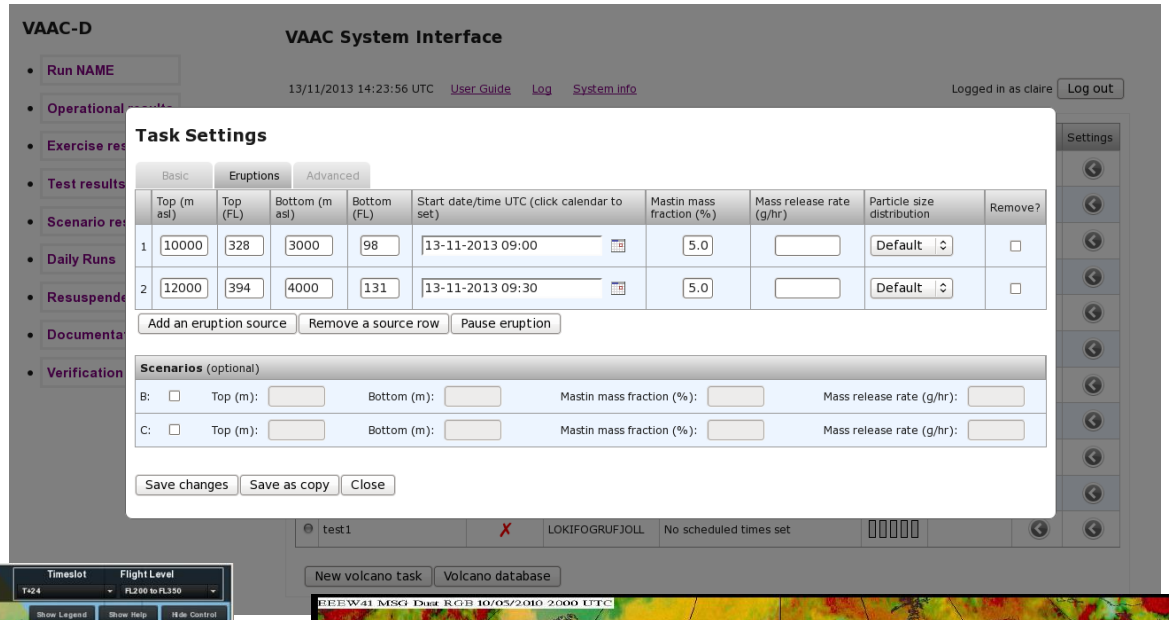
Claire Witham, Anton Muscat, Rachel Pelley, Matthew Hort, Susan Leadbetter, Peter Francis, Michael Cooke, Sarah Millington, Ian Lisk

New linkages since 2010

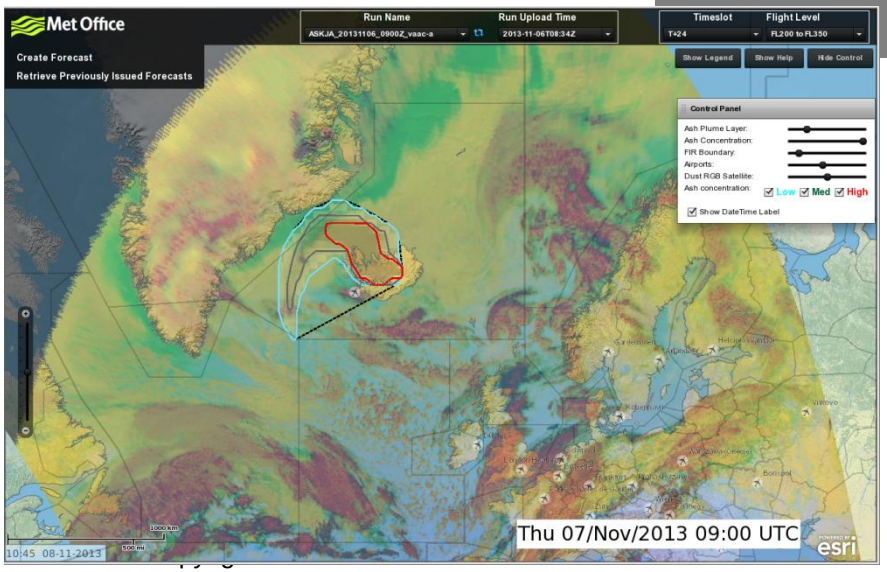


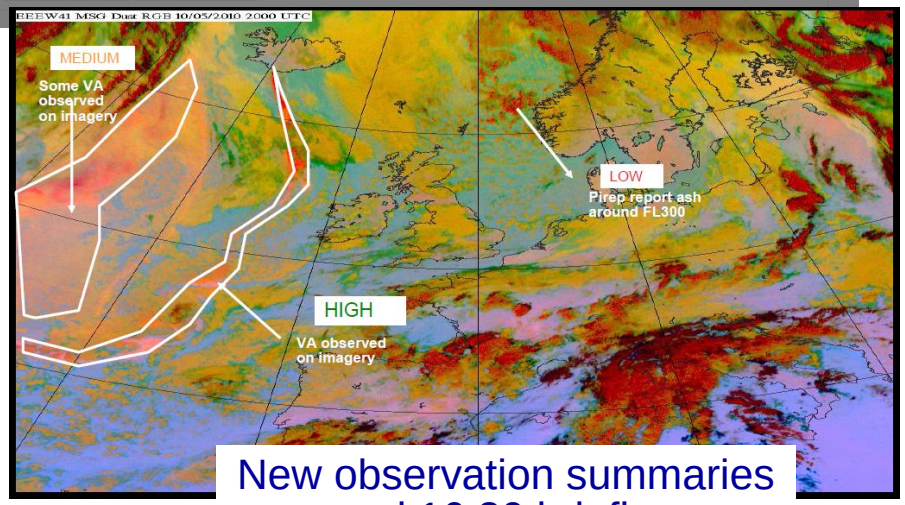
Operational system developments

New forecaster interface to NAME with ESP options



New forecaster tool for VAA/VAG and concentration charts



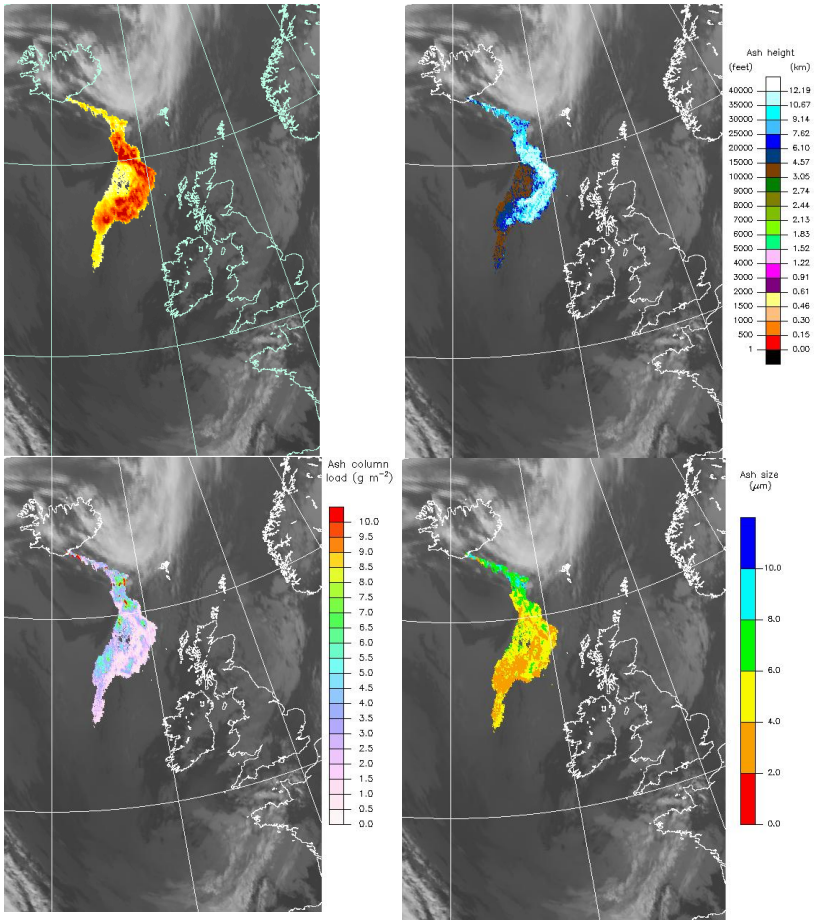


New observation summaries and 16:30 briefing

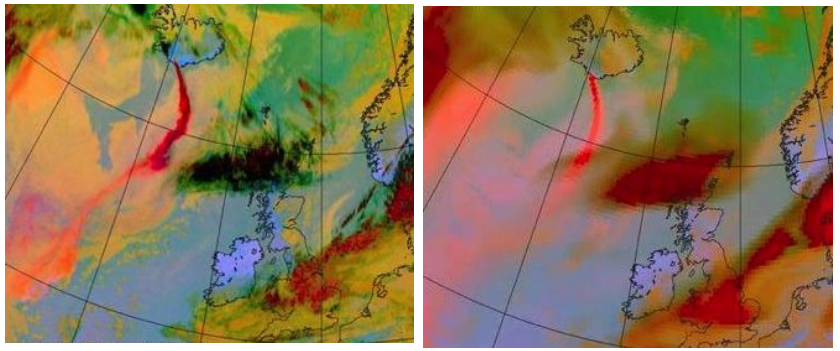
Satellite developments

See poster by Sarah Millington

Quantitative ash retrievals

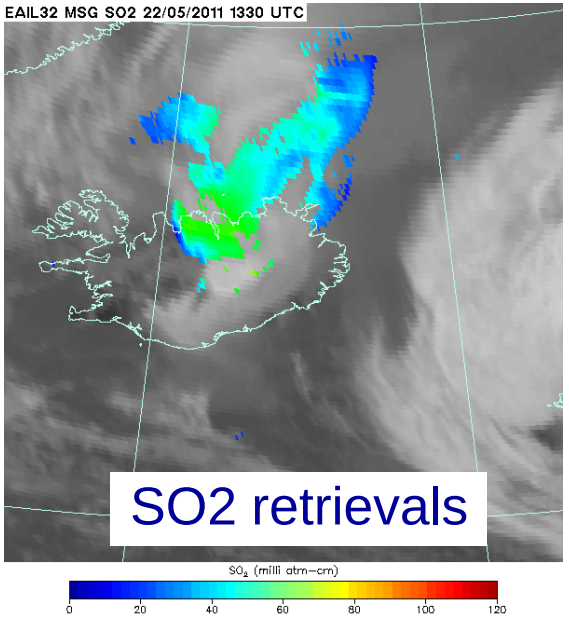


Francis et al, 2012, JGR spec. ed.

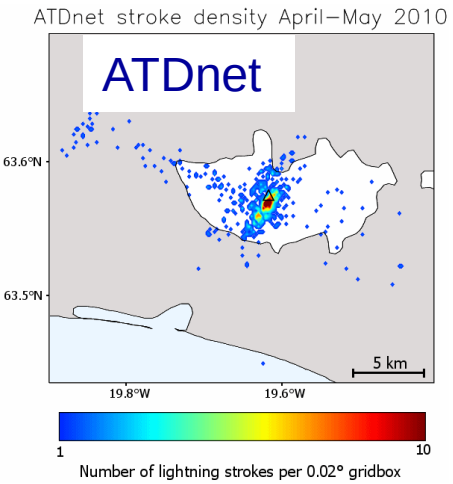


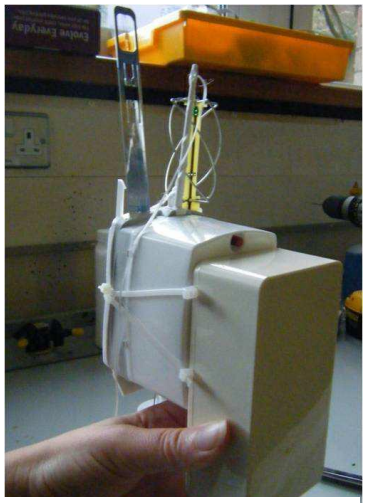
Simulated ash products

Millington et al, 2012, JGR spec. ed.

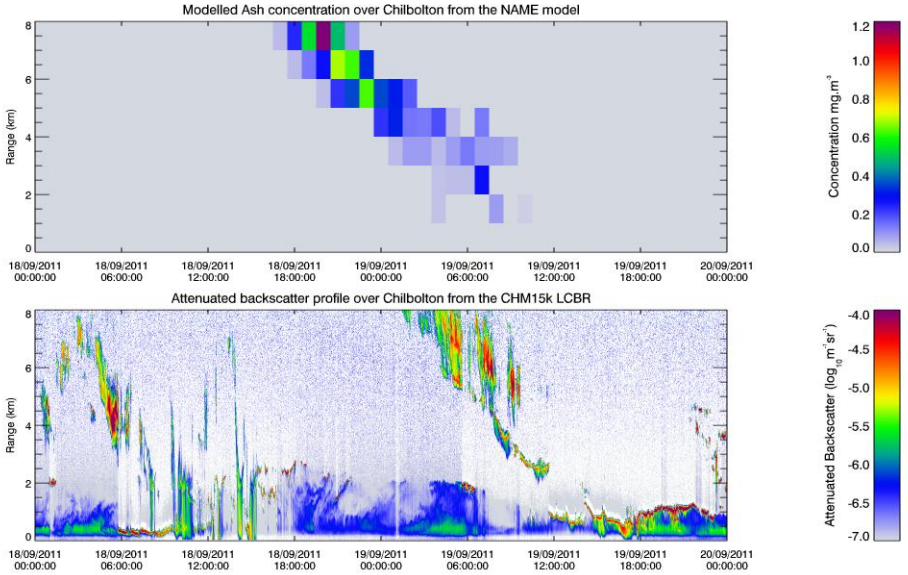


Observation developments

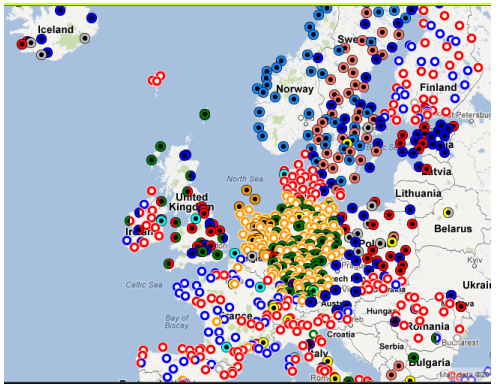




Aerosol sonde



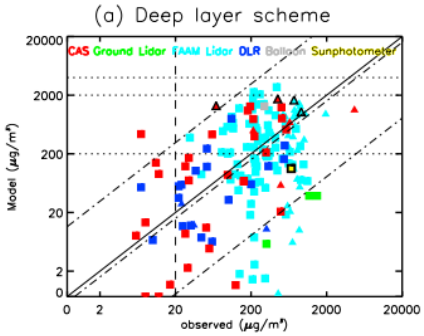
LIDAR



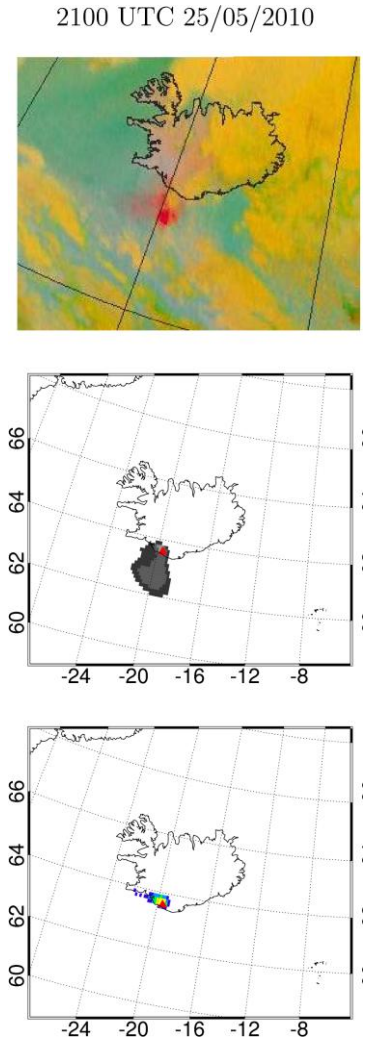
European ‘LidarNet’

New UK network

Model developments



Webster et al, 2012, JGR spec. ed.

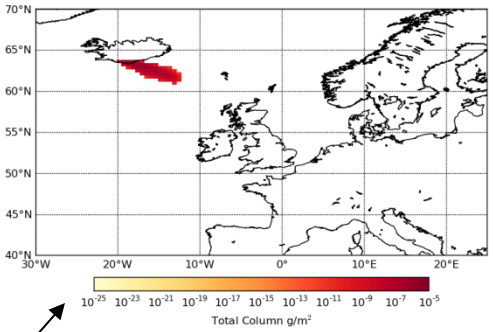


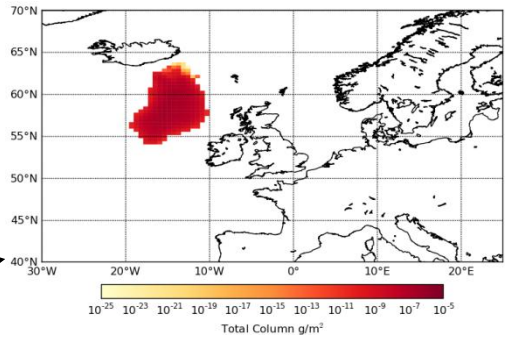
Leadbetter et al, 2012, JGR spec. ed.

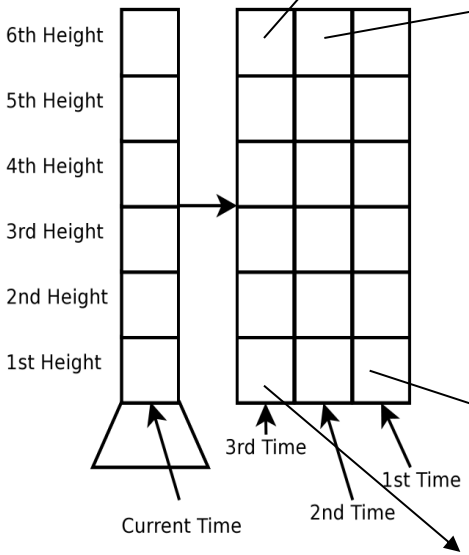
- Validation, analysis and publication
- Ash resuspension scheme and forecast
- Improved wet deposition scheme
- Eulerian-Lagrangian hybrid scheme
- Inversion system for real-time use
  - Ash mass retrievals from SEVIRI

Inversion work conducted primarily by Rachel Pelley and Michael Cooke, UK Met Office

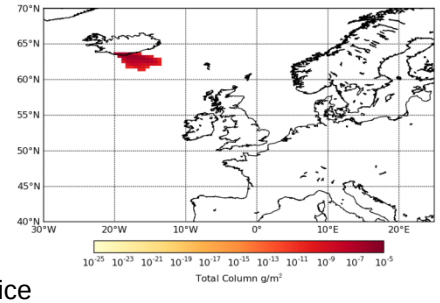
NAME run for use with InTEM

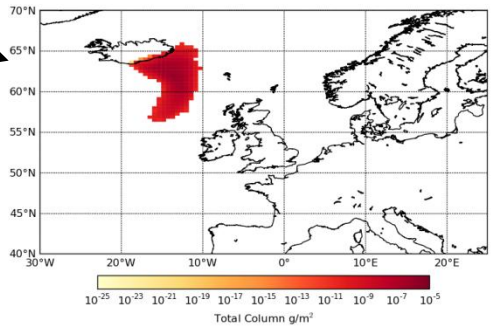






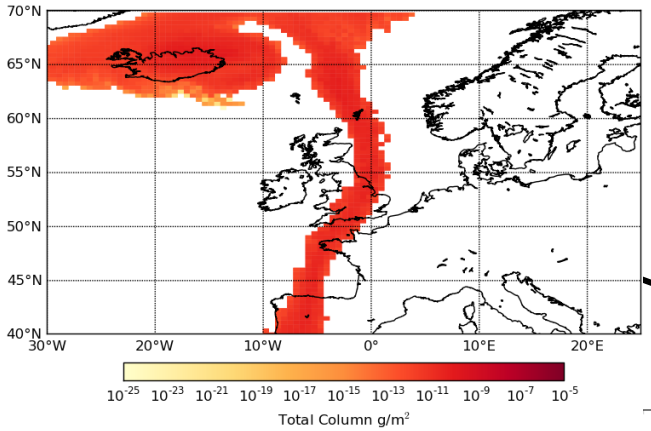
- Particles are released from the volcano at a rate of 1g/s within each height block.
- 3-hour time-steps
- Model and satellite compared hourly
- Sensitivity tests have been conducted for different time-steps and height ranges



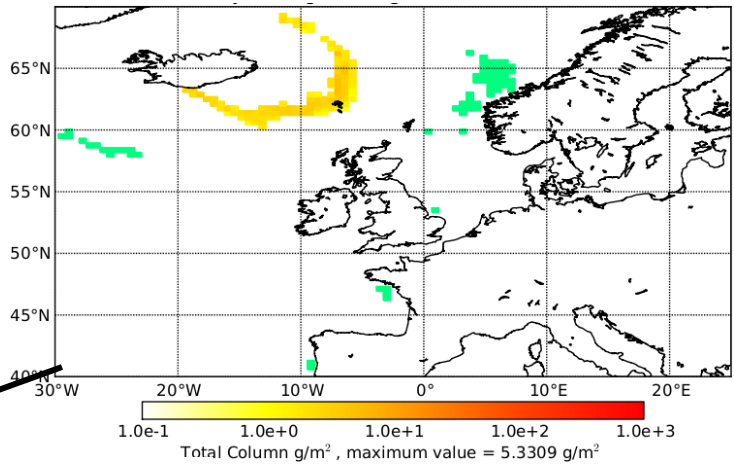


Inversion Modelling

Example of modelled plume from 1g/s release

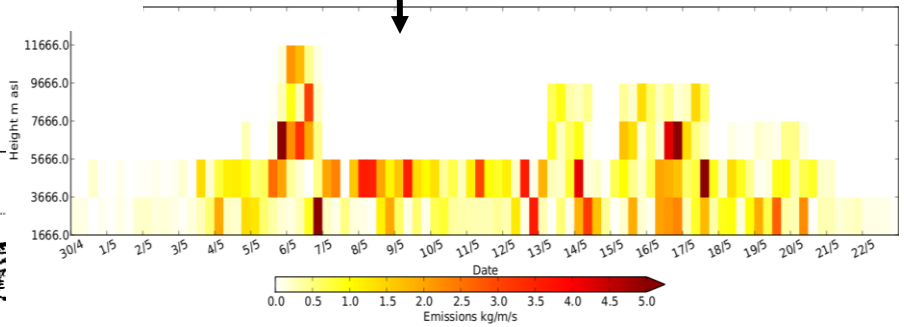


Observational Data

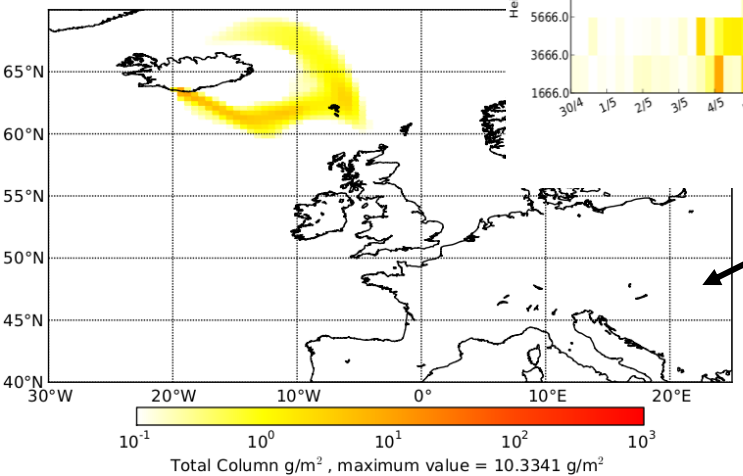


Inversion system

$$\mathbf{Me} \approx \mathbf{o}_a$$

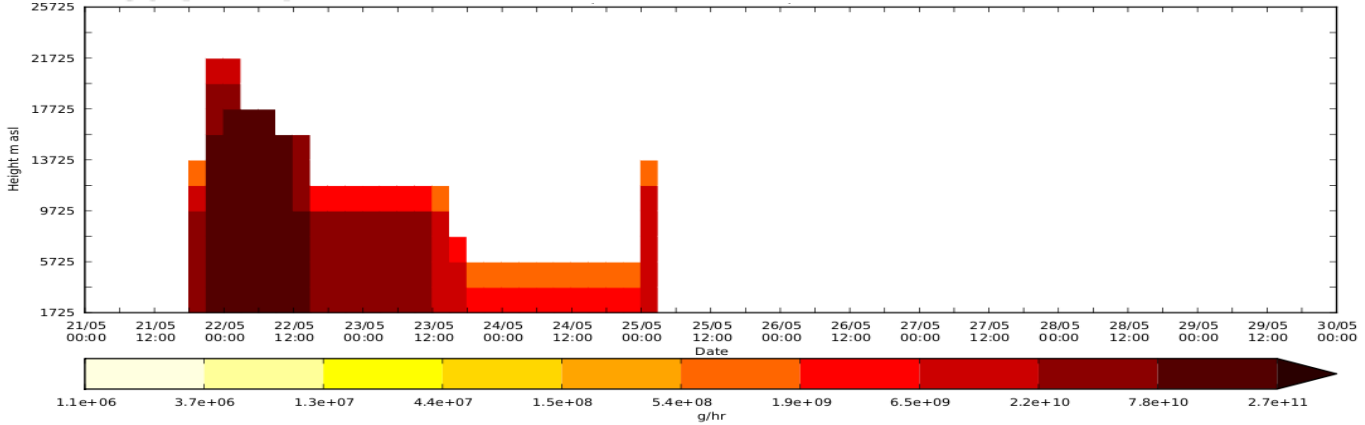


New source term profile

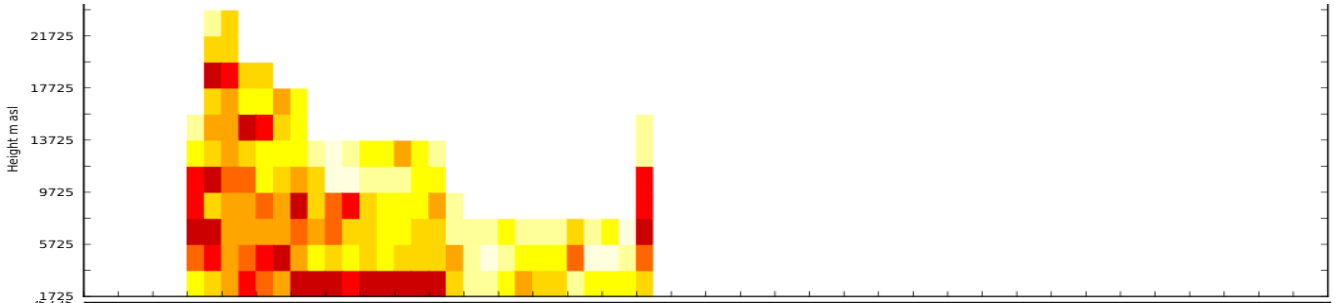


Gives a new modelled plume closer to satellite observations

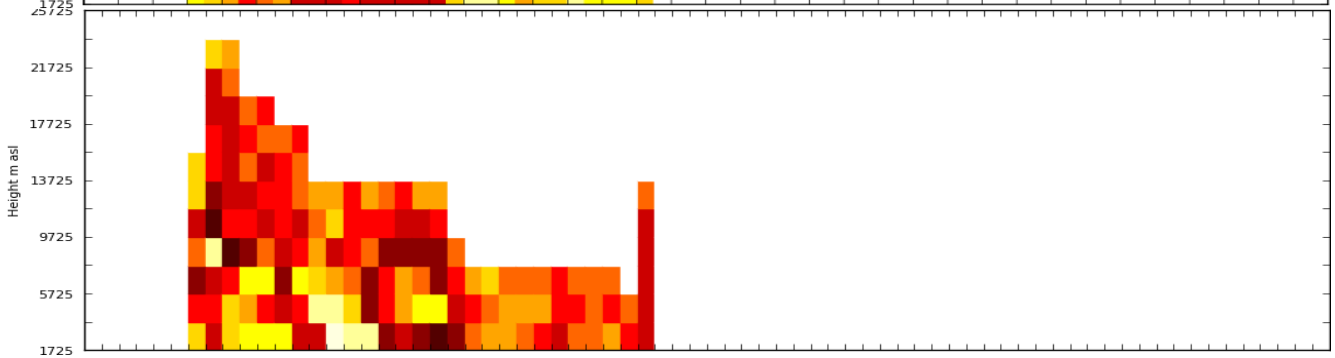
Grimsvötn 2011 results



a priori

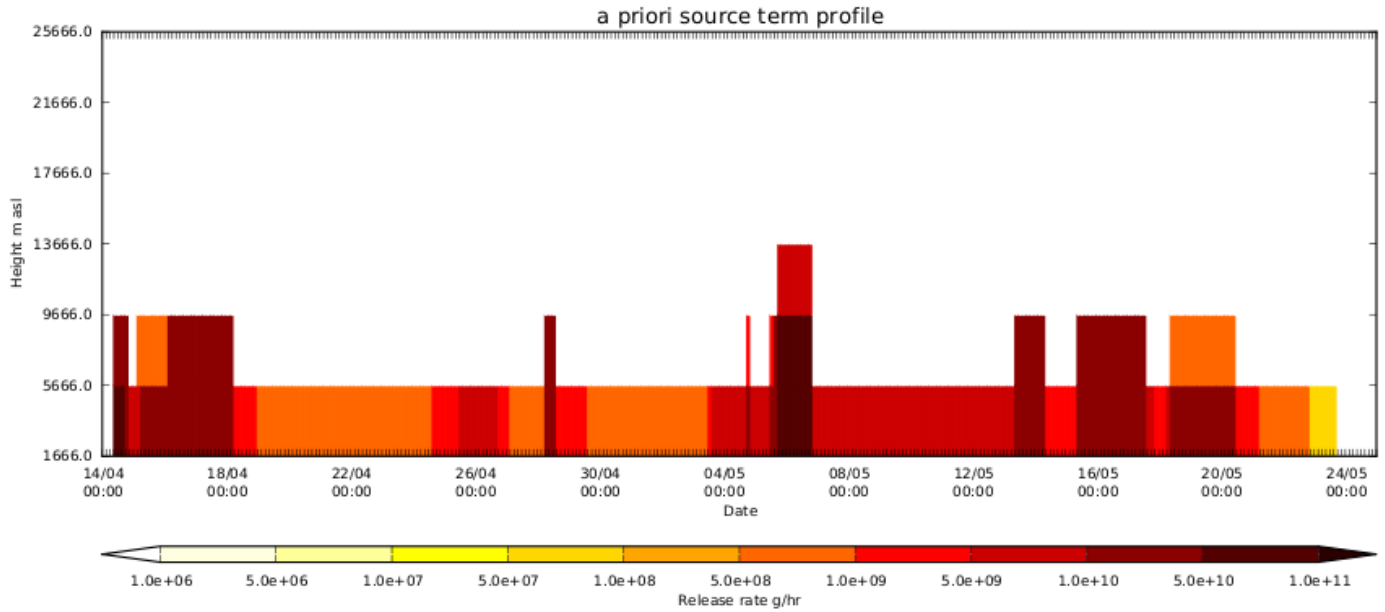


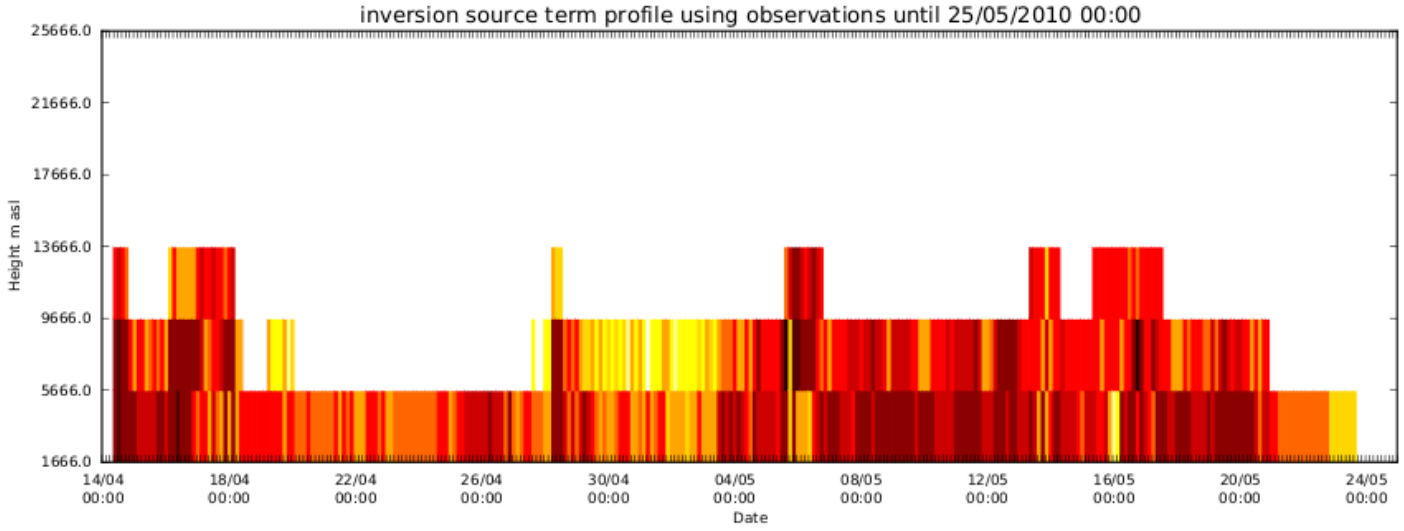
inversion with clear sky retrievals



inversion without clear sky retrievals

Eyjafjallajokull 2010 results



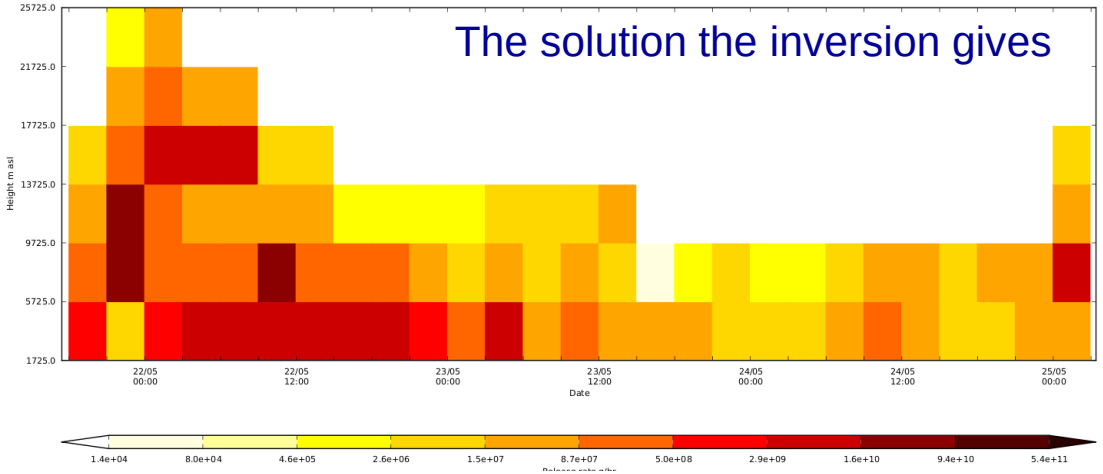


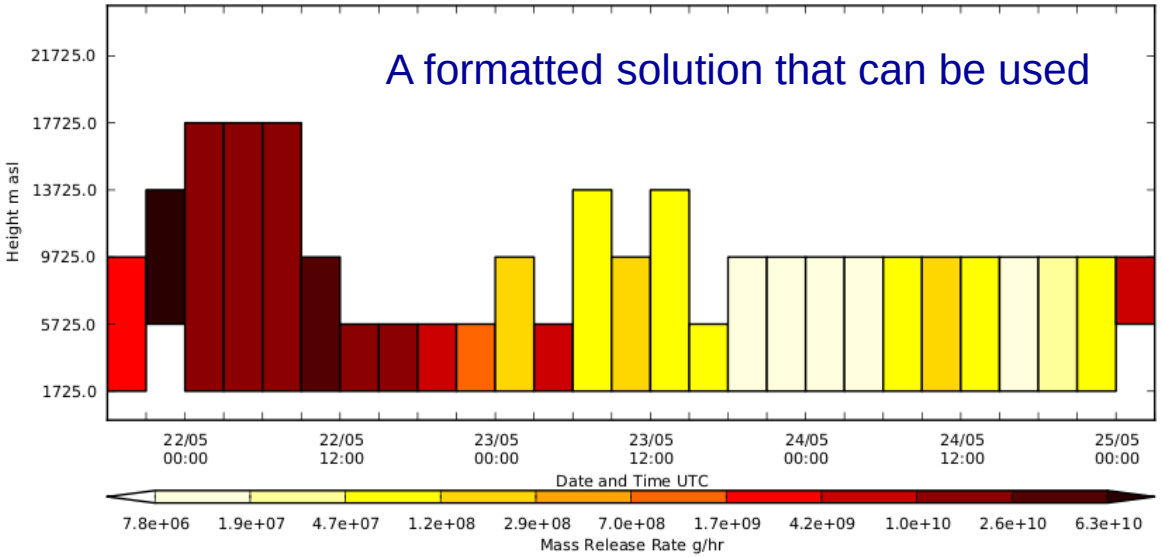
Using the Solution in Operations

- How reliable is the inversion vertical distribution?

Per time-step:

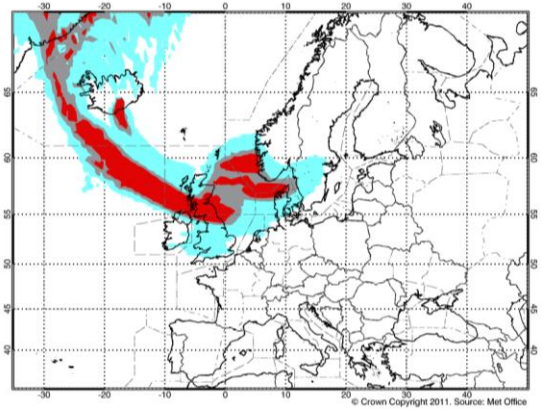
- Calculate the total mass released
- Estimate a bottom height for from the location of the 5th mass percentile
- Estimate a top height from the location of the 95th percentile
- Guidance values provided to forecasters to use with complimentary data





Start Time	Low mass	Inv. Mass	Prior Mass	High mass	Bottom	Top
21/05/2011 18:00	2.21e+09	2.21e+09	1.23e+11	2.22e+09	1725.0	9725.0
21/05/2011 21:00	6.30e+10	6.30e+10	1.39e+12	6.30e+10	5725.0	13725.0
22/05/2011 00:00	1.06e+10	1.06e+10	1.72e+12	1.06e+10	1725.0	17725.0
22/05/2011 03:00	1.92e+10	1.92e+10	2.07e+12	1.92e+10	1725.0	17725.0
22/05/2011 06:00	1.54e+10	1.54e+10	2.07e+12	1.55e+10	1725.0	17725.0
22/05/2011 09:00	4.98e+10	4.98e+10	1.16e+12	4.98e+10	1725.0	9725.0
22/05/2011 12:00	1.33e+10	1.34e+10	4.95e+11	1.34e+10	1725.0	5725.0

Operational Challenges



- Computational resource limitations
  - Real-time requirement
- Forecaster familiarity with new data streams and their limitations
  - Training courses & competency testing
- EUR/NAT requirement for a contoured Safety Risk Assessment product
- Over-reliance on radar height data as ESP
- Understanding and conveying uncertainty