

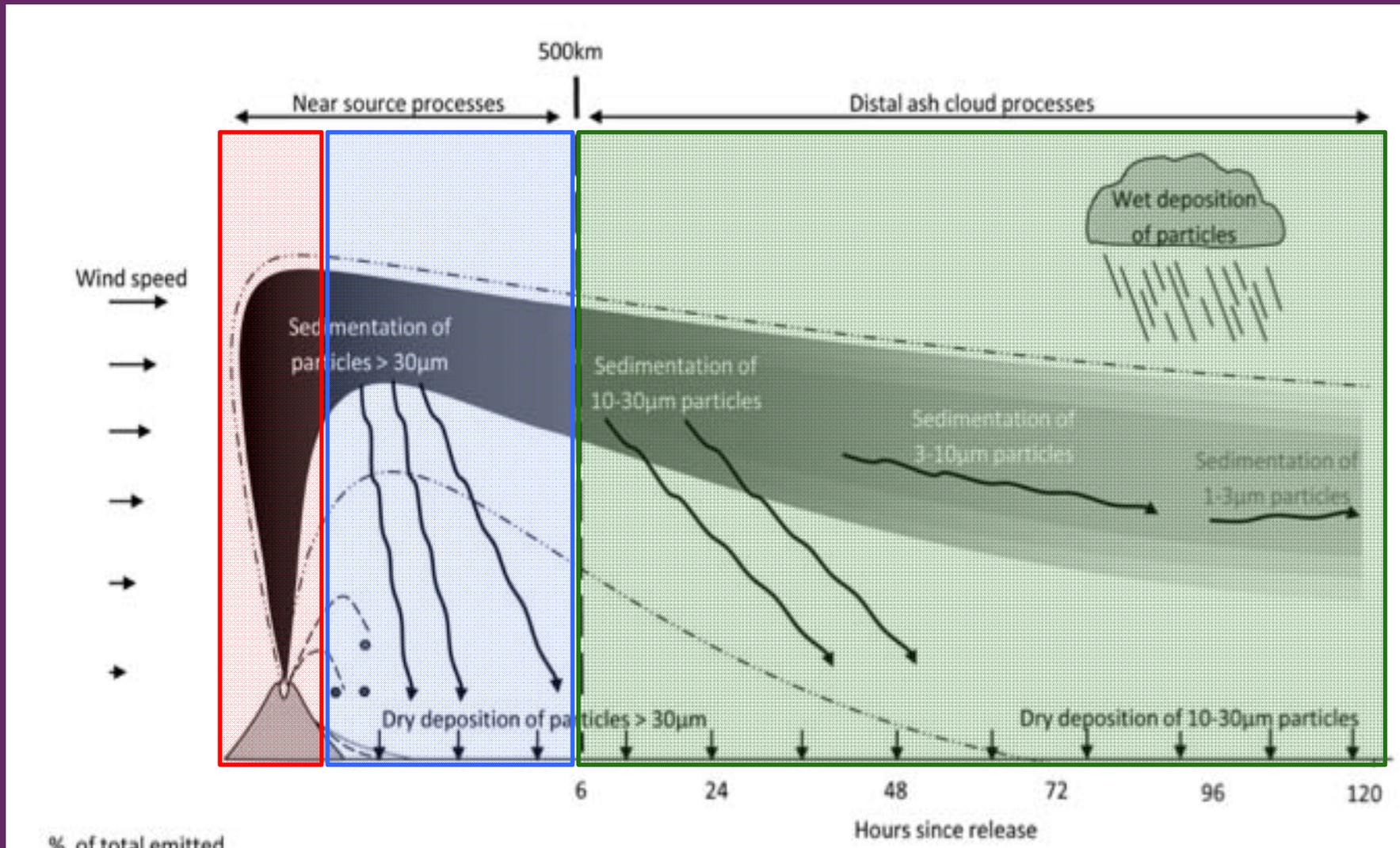


# Modelling Long Range Transport Of The Eyjafjallajokull Volcanic Ash Cloud

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# Volcanic Ash Modelling



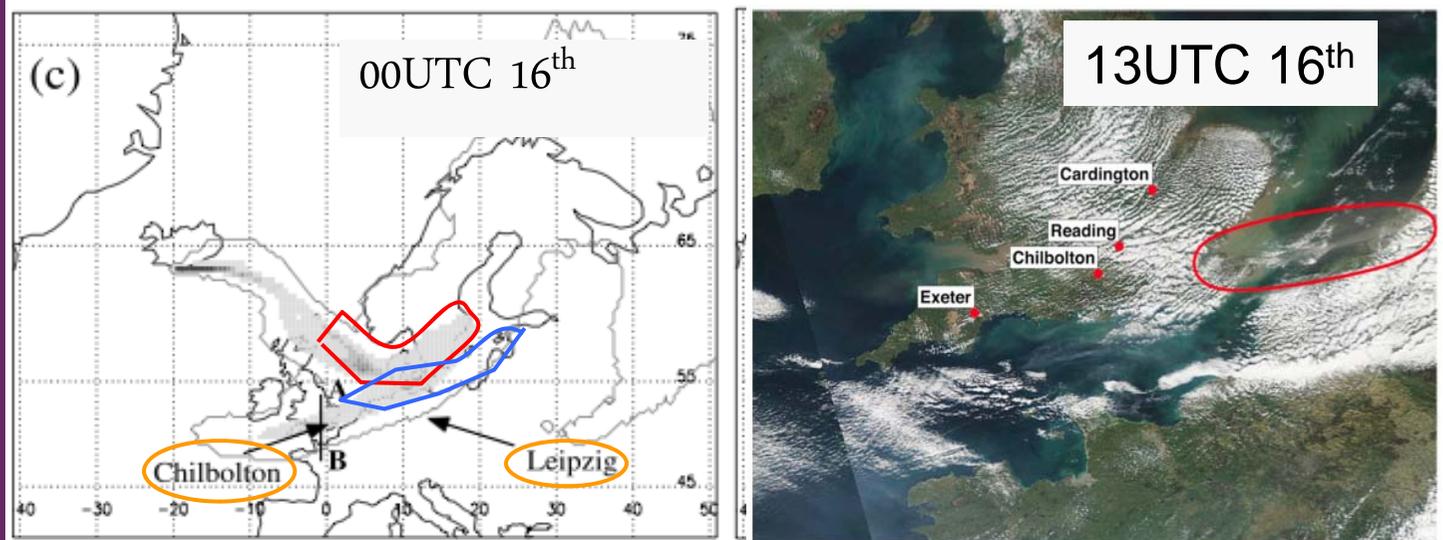
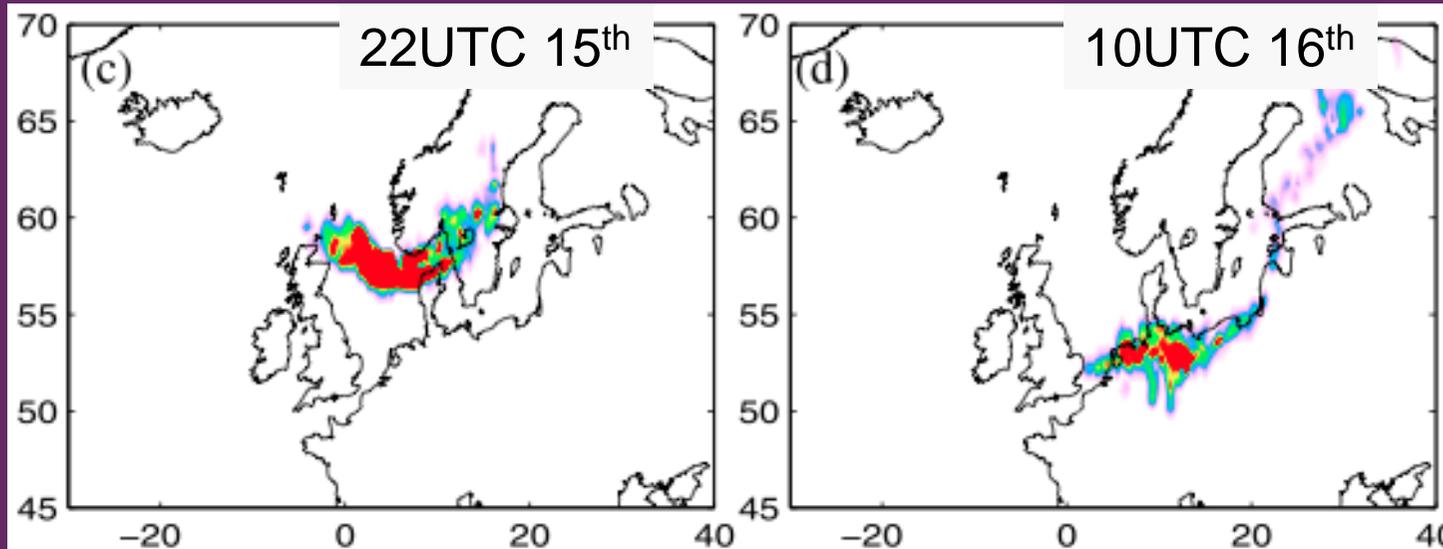
# Questions

1. How accurately can long range transport models predict the structure of volcanic ash clouds?
2. How accurately can long range transport models predict the concentration of volcanic ash?
3. Can explain the general dispersion characteristics of volcanic ash?

# ASH CLOUD STRUCTURE

# Horizontal ash cloud structure

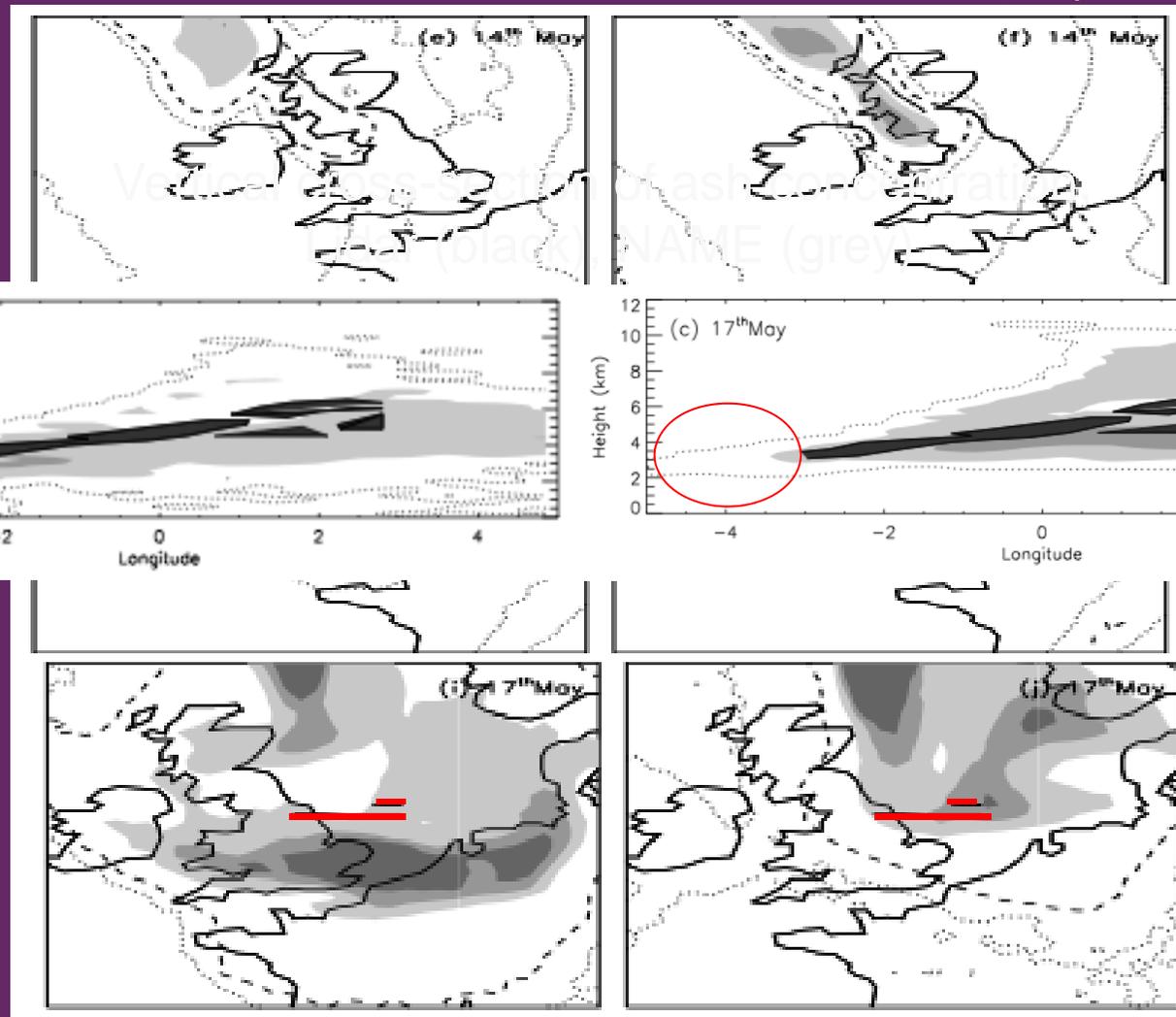
NAME Column Integrated Mass Loading



# Horizontal ash cloud structure

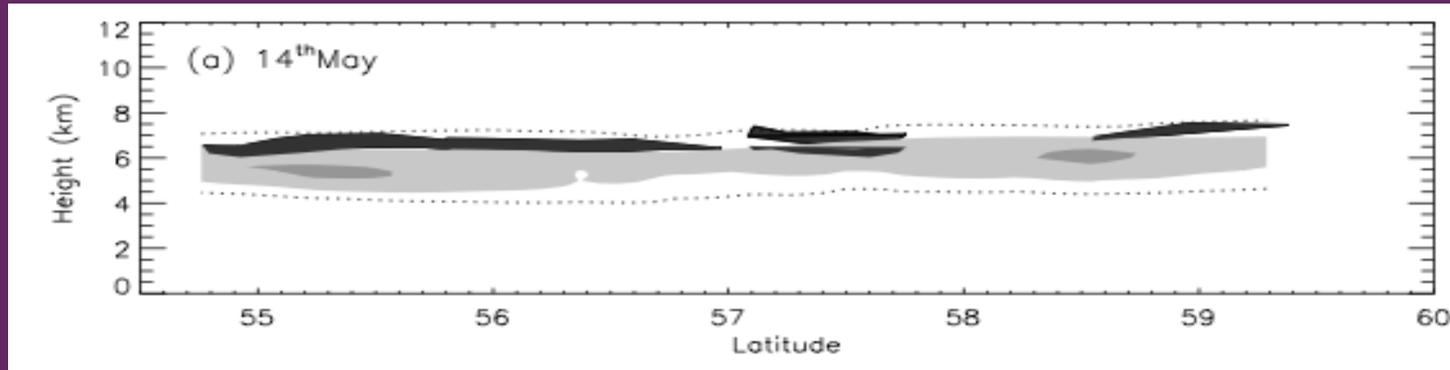
Column Integrated Mass Loading

Uniform emission (left), top emission (right)

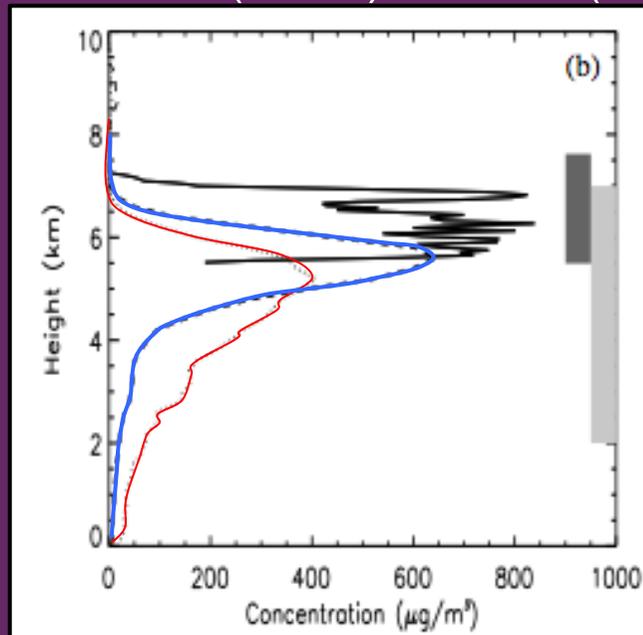


# Vertical ash cloud structure

## Vertical cross-section of ash concentration

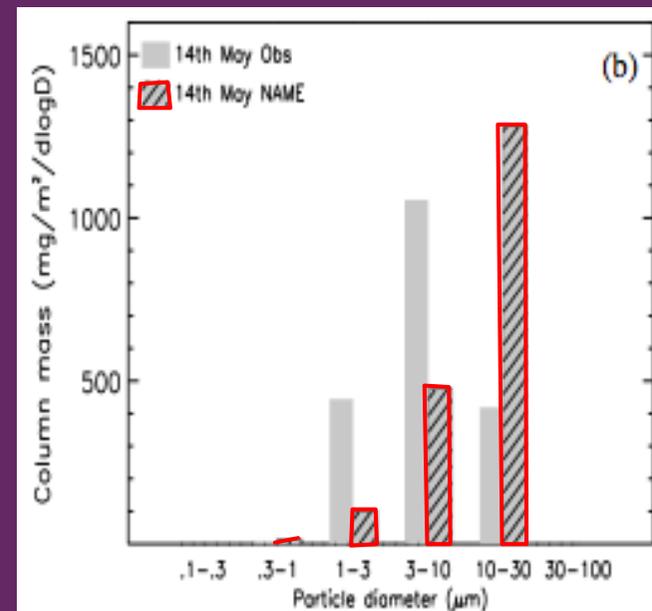


## Profile of ash concentration Measured (black), NAME (red)



## Particle size distribution

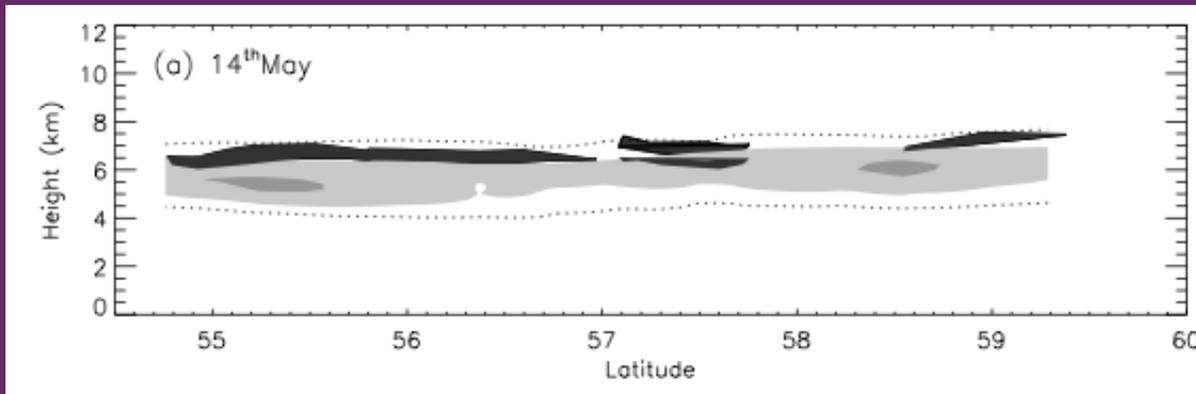
Measured (grey), NAME (red)



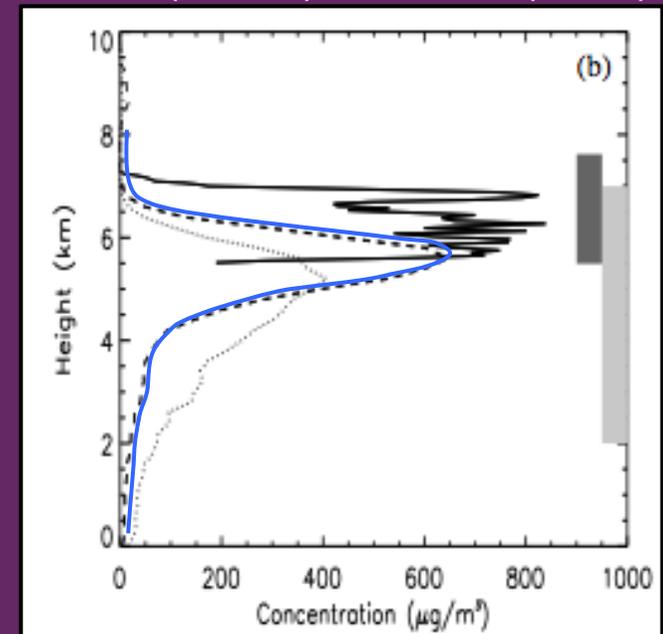
# ASH CLOUD CONCENTRATION

# Column Integrated Mass Loading

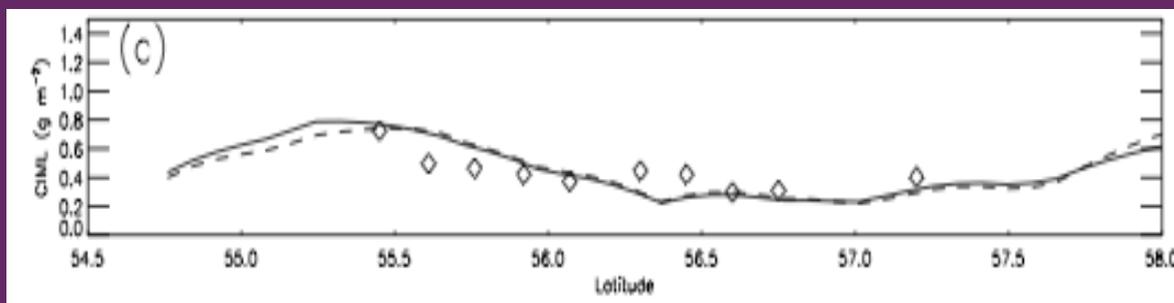
Vertical cross-section of ash concentration



Ash concentration  
Obs (black), NAME (blue)

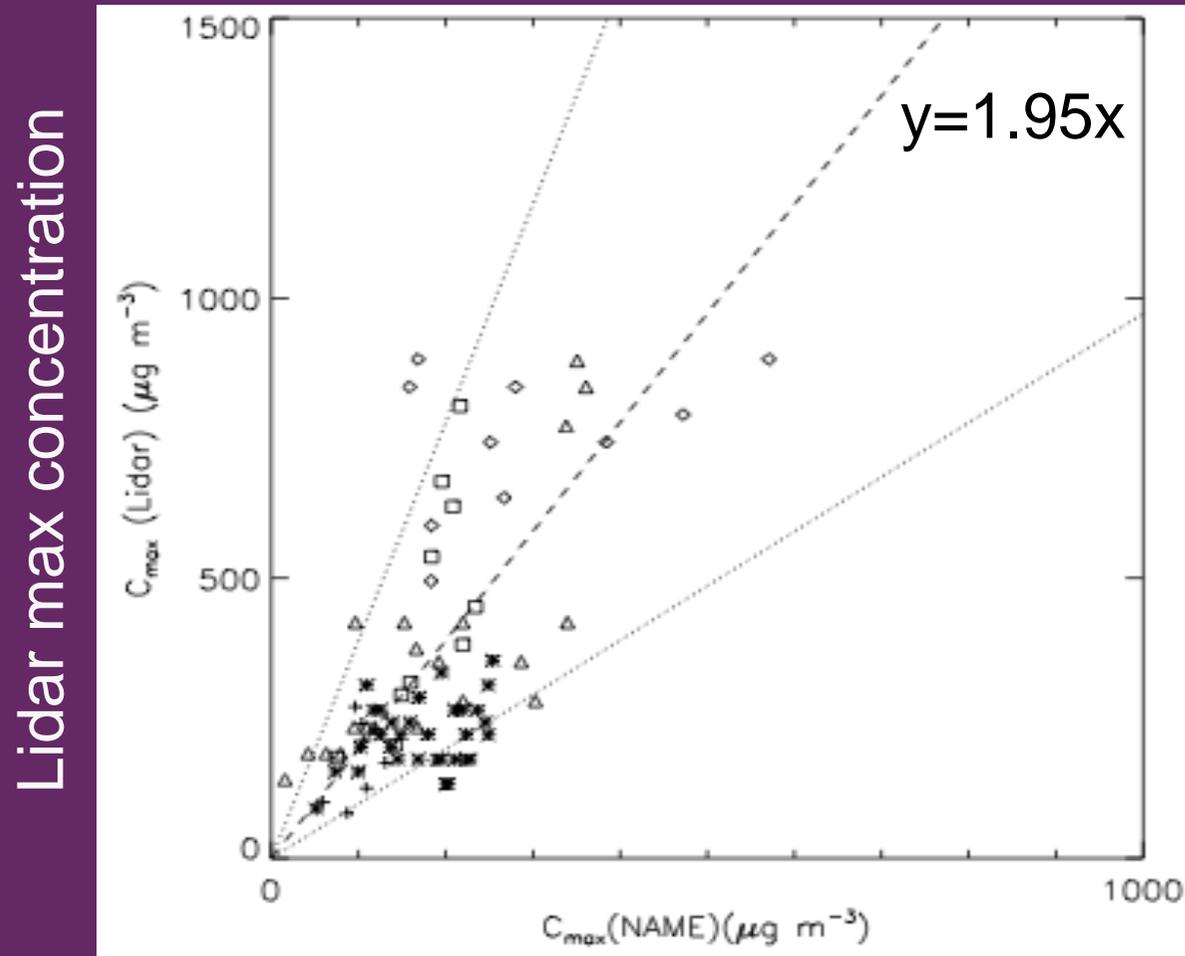


Column Integrated Mass Loading  
Lidar (symbols), NAME (lines)



# Ash Cloud Concentration

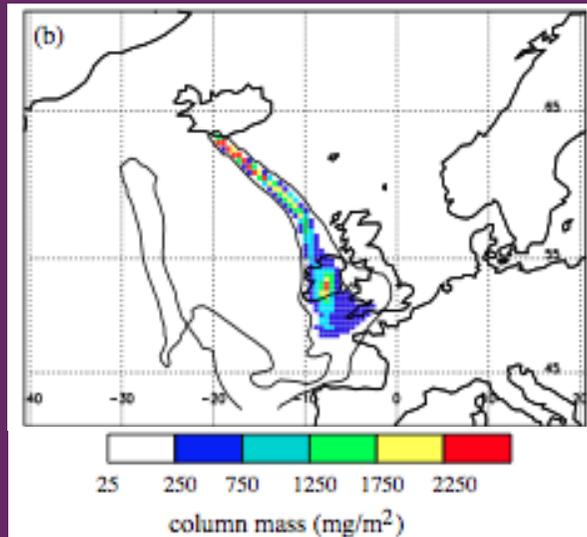
Maximum ash concentration



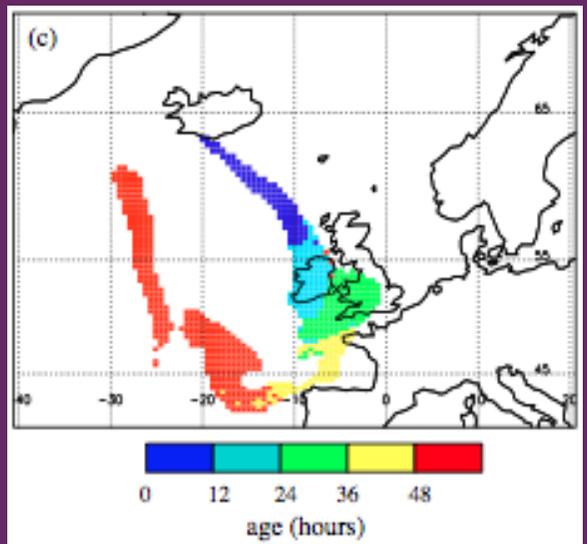
# GENERAL DISPERSION CHARACTERISTICS

# Evolution of ash concentration

## Column Integrated Mass Loading

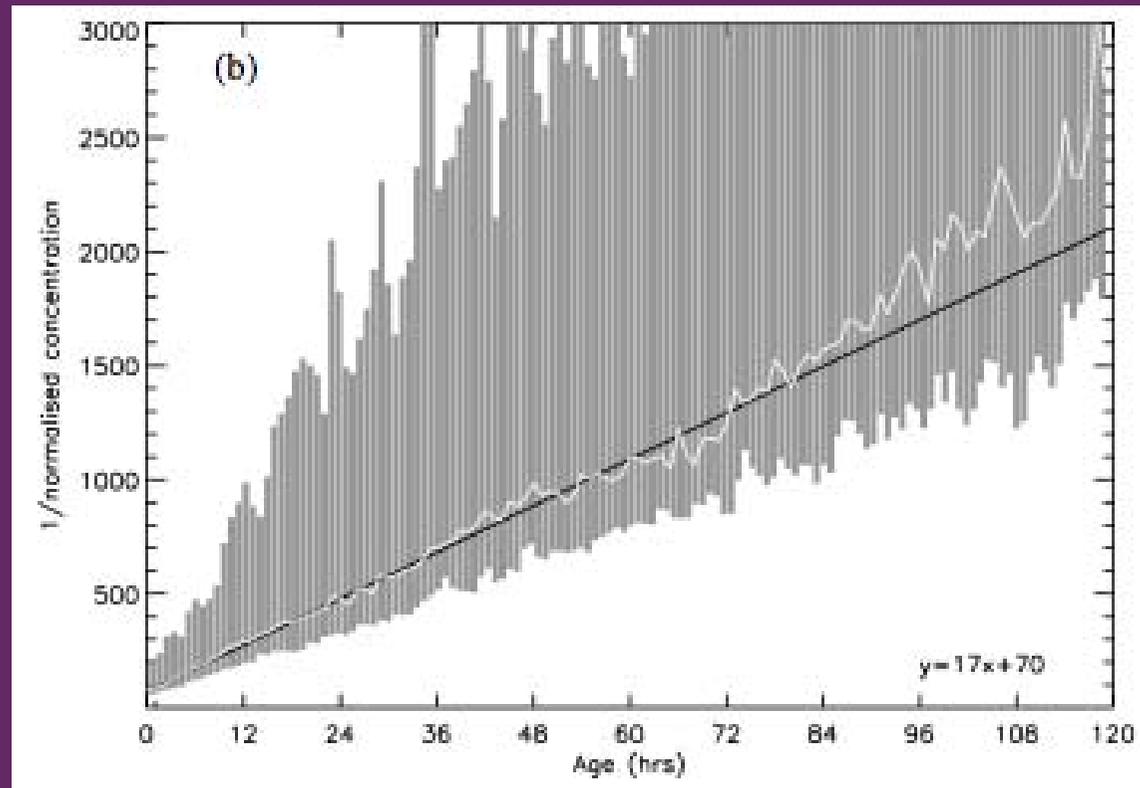


Ash Travel Time



Helen Dacre

## Normalised concentration as a function of time



# Summary

1. How accurately can long range transport models predict the *structure* of volcanic ash clouds?

- Horizontally to within ~100km
- Vertically peak to within ~ 1km but ash layers too thick

2. How accurately can long range transport models predict the *concentration* of volcanic ash clouds?

- Reasonably when combined with an appropriate distal fine ash fraction of ~ 2-6%. Peak concentrations underestimated

3. Can explain the general dispersion characteristics of volcanic ash?

- A  $1/t$  relationship describes the decrease in concentration at the centre of the ash cloud, due to geometric spreading of the ash cloud

# Questions?

H.F.Dacre, A.L.M.Grant and B.T.Johnson (2013), *Aircraft observations and model simulations of particle size distribution in the Eyjafjallajokull volcanic ash cloud*, Atmos. Chem. Phys.

A.L.M.Grant, H.F.Dacre, D.J.Thomson and F.Marenco (2012), *Horizontal and vertical structure of the Eyjafjallajokull ash cloud over the UK: A comparison of airborne lidar observations and simulations*, Atmos. Chem. Phys.

H. F. Dacre et al. (2011), *Evaluating the structure and magnitude of the ash plume during the initial phase of the 2010 Eyjafjallajokull eruption using lidar observations and NAME simulations*, J. Geophys. Res.