

AIRCRAFT OBSERVATIONS AND MODEL SIMULATIONS OF CONCENTRATION AND PARTICLE SIZE DISTRIBUTION IN THE EYJAFJALLAJÖKULL VOLCANIC ASH CLOUD

H.F.Dacre¹, A.L.M.Grant¹ and B.T.Johnson²

¹Department of Meteorology, University of Reading, Reading, UK

²Met Office, Exeter, UK

Abstract: The Eyjafjallajökull volcano in Iceland emitted a cloud of ash into the atmosphere during April and May 2010. Over the UK the ash cloud was observed by the FAAM BAe-146 Atmospheric Research Aircraft which was equipped with in-situ probes measuring the concentration of volcanic ash carried by particles of varying sizes. The UK Met Office Numerical Atmospheric-dispersion Modelling Environment (NAME) has been used to simulate the evolution of the ash cloud emitted by the Eyjafjallajökull volcano during the period 4-18th May 2010. In the NAME simulations the processes controlling the evolution of the concentration and particle size distribution include sedimentation and deposition of particles, horizontal dispersion and vertical wind shear. For travel times between 24 and 72 hours a $1/t$ relationship describes the evolution of the concentration at the centre of the ash cloud and the particle size distribution remains fairly constant. Although NAME does not represent the effects of microphysical processes it can capture the observed decrease in concentration with travel time in this period. This suggests that, for this eruption, microphysical processes play a small role in determining the evolution of the distal ash cloud. Quantitative comparison with observations shows that NAME can simulate the observed column integrated mass if around 4% of the total emitted mass is assumed to be transported as far as the UK by small particles ($<30\mu\text{m}$ diameter). NAME can also simulate the observed particle size distribution if a distal particle size distribution that contains a large fraction of $<10\mu\text{m}$ diameter particles is used, consistent with the idea that phraetomagmatic volcanoes, such as Eyjafjallajökull, emit very fine particles

Key words: *Volcanic ash, free tropospheric dispersion*

REFERENCES

Dacre, H. F., A. L. M. Grant and B. T. Johnson, 2013: Aircraft observations and model simulations of particle size distribution in the Eyjafjallajökull volcanic ash cloud. *Atmos. Chem. Phys.*, **13**, 1277-1291.