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The impact of the characteristics of volcanic ash on forecasting.

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The eruption of Eyjafjallajökull during April – May 2010 and Grímsvötn in May 2011, Iceland, caused the widespread dispersion of volcanic ash across the NE Atlantic, and ultimately into UK and European airspace. This resulted in thousands of flights to and from affected countries across Europe to be cancelled. The Met Office, UK, is the home of the London VAAC, a Volcanic Ash Advisory Centre, and as such is responsible for providing reports and forecasts for the movement of volcanic ash clouds covering the UK, Iceland and the north-eastern part of the North Atlantic ocean.

To forecast the dispersion of volcanic ash requires that the sedimentation of ash particles through the atmosphere is effectively modelled. The settling velocity of an ash particle is a function of its size, shape and density, plus the density and viscosity of the air through which it is falling. We consider the importance of characterising the physical properties of ash when modelling the long range dispersion of ash particles through the atmosphere. Using the Reynolds number dependent scheme employed by NAME, the Lagrangian particle model used operationally by the Met Office, we calculate the settling velocity and thus the maximum travel distance of an ash particle through an idealised atmosphere as a function of its size, shape and density. The results are compared to measured particle sizes from deposits across Europe following the eruption of Eyjafjallajökull in 2010. Further, the particle size distribution (PSD) of ash in a volcanic cloud with time is modelled using NAME: the particle density distribution and particle shape factor are varied and the modelled PSD compared to the PSD measured in the ash cloud during the eruption of Eyjafjallajökull in 2010 by the FAAM research aircraft. The influence of the weather on PSD is also considered by comparing model output using an idealised atmosphere to output using NWP driven meteorological fields. We discuss the sensitivity of forecasts of the dispersion of volcanic ash to the representation of particle characteristics in NAME, the importance of representing the weather in ash fall models, and the implications of these results for the operational forecasting of volcanic ash dispersion at the London VAAC.