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The 2010 Eyjafjallajökull eruption: Estimations of volcanic ash release and transport modelling using different models

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Volcanic ash is a threat to aviation because of the potential of the ash particles to block and stall the aircraft's engines with a possible fatal result. Also the cost for airlines after cancellations and re-routing of flights due to volcanic ash clouds can be enormous. Furthermore, the ash concentration limits for safe flying in volcanic ash clouds are vague and need to be assessed in more detail. To accurately simulate the transport and concentrations of volcanic ash, an estimate of the ash release rate is needed. The ash release rate is here defined as the emitted mass of volcanic ash and the altitude at which it is effectively released into the atmosphere. With two different dispersion models (FLEXPART and NAME), run on different meteorological input data, we simulate the ash transport from the 2010 Eyjafjallajökull eruption. Furthermore, with an inversion method and satellite observations (SEVIRI) of the ash cloud we optimise the ash release estimate as a function of height and time for the whole 40 days eruption period in April-May 2010. Using the estimated ash emission rate, we can simulate with potentially increased accuracy, the ash transport and ash concentrations over Europe in the weeks of the eruption. The results are validated against independent observations (e.g. aircraft-, lidar-, and ground-based measurements) to assess the degree of improvement. The estimation of the ash release rate is independent of which dispersion model is used, hence the method can successfully be adapted to be used with other dispersion models. This method can potentially provide information to more accurately predict the fate of hazardous volcanic emissions and determine the air space which the air traffic has to avoid.