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Quantitative analysis of the 16-17 September 2013 resuspended ash event in Iceland

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In Iceland more than 20,000 km^2 of sandy deserts are active with aeolian processes. Annually on average 34-135 days are dusty making it one of the dustiest areas of the world. Substantial amounts of dust are transported southward and deposited in the North-Atlantic possibly providing significant iron fertilization to regions deficient in iron. Volcanic ash including resuspended ash may have an adverse effect on ecosystems and human health, and resuspended ash levels may be high enough to cause problems to aviation. A strong gale force northerly wind prevailed over south east Iceland on 16-17 September, 2013. During this period ash from the recent eruptions of Eyjafjallajokull (2010) and Grimsvotn (2011) was resuspended into the air and blown southwards. The event was captured by surface based optical particle counters (OPC) in Iceland, and cloudless skies south of Iceland made it possible to observe the resuspended ash by the Moderate Resolution Imaging Spectroradiometer (MODIS) as the ash was transported more than 320 km over the ocean. The aim of this study is to quantify the amount of ash that was resuspended during the event. Simulations of the event using the Numerical Atmospheric dispersion Modeling Environment (NAME) agree well with the location of the resuspended ash cloud observed by MODIS. By comparing the simulated height of the resuspended ash cloud to meteorological data we show that the maximum height of the cloud coincides with a temperature inversion at about 1300 m asl. The total mass column loading was retrieved from infrared MODIS channels using the ash cloud height identified from the dispersion model output. The OPC data provide surface ash concentrations. Using the satellite and OPC measurements the NAME dispersion model output was calibrated and the total resuspended ash amount for the whole event estimated.