PROFILING OF ATMOSPHERIC VOLCANIC ASH LAYERS USING AN AEROSOL RADIOSONDE

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Routine meteorological data is obtained in the atmosphere using disposable radiosondes. These give temperature, pressure, humidity and wind speed. Additional measurements are acquired from dropsondes, released from research aircraft. However, a crucial property not yet measured for lack of suitable low-cost instrumentation is the size and concentration of atmospheric particulates. Instead, indirect measurements are employed, relying on remote sensing, to meet the demands from areas such as climate research, air quality monitoring, civil emergencies etc. In addition, research aircraft can be used *in situ*, but these measurements are expensive, and restricted to near-horizontal profiling, which can be a limitation, as phenomena such as long-range transport depend strongly on the vertical distribution of aerosol.

Centre for Atmospheric and Instrumentation Research at University of Hertfordshire develops light-scattering instruments for the characterization of aerosols and cloud particles. Recently a range of low-cost, miniature particle counters has been created, intended for use with systems such as disposable balloon-borne radiosondes, dropsondes, or in dense ground-based sensor networks. Versions for different particle size ranges exist. They have been used for vertical profiling of aerosols such as mineral dust (Nicoll et al., Ulanowski et al.) and for air quality monitoring in dense ground-based sensor networks (Mead et al.).

An early counter version, developed for use with Vaisala RS92 radiosondes and an electric charge sensor, was deployed to profile ash from the Eyjafjallajökull eruption. The layer detected over Stranraer, Scotland, on 19 April 2010 was centered on 4000m altitude and was about 600m thick, with fairly uniform, sharply defined aerosol concentration (Harrison et al.). The sounding was compared to ash dispersion model runs using WRF. Agreement could be reached only by carefully adjusting the height of the initial ash emission column. This finding demonstrates that correct initialization of dispersion models can be achieved by profiling aerosol layers using disposable sondes containing low-cost optical particle counters.

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