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Measurements of atmospheric volcanic ash using an aerosol radiosonde

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A low-cost, miniature aerosol particle counter has been developed, intended for use with balloon-borne radiosondes. The counter provides a size distribution in five size bins and is interfaced to a Vaisala RS92 radiosonde, which transmits data from the counter together with meteorological parameters and GPS position to a ground receiver at 1 Hz rate. The counter was used together with an electric charge sensor to profile ash layers from the Eyjafjalla eruption. The layer over Stranraer, Scotland, profiled on 19 April 2010 was centered on 4000m altitude and was about 600m thick, with fairly uniform, sharply defined aerosol concentration. The mean diameter by volume was 3 micrometres and the effective diameter 2.2 micrometres. Estimated optical thickness of the layer was 0.12 at 780nm. The mass concentration peaked around 0.3 mg per cubic metre, assuming the density of silica. The total mass load was 140 mg per square metre. The electric charge density within the layer was positive, and peaked around 0.5pC per cubic metre.