*Electronic Supplement for*

**Balloon-borne measurement of the aerosol size distribution from an Icelandic flood basalt eruption**

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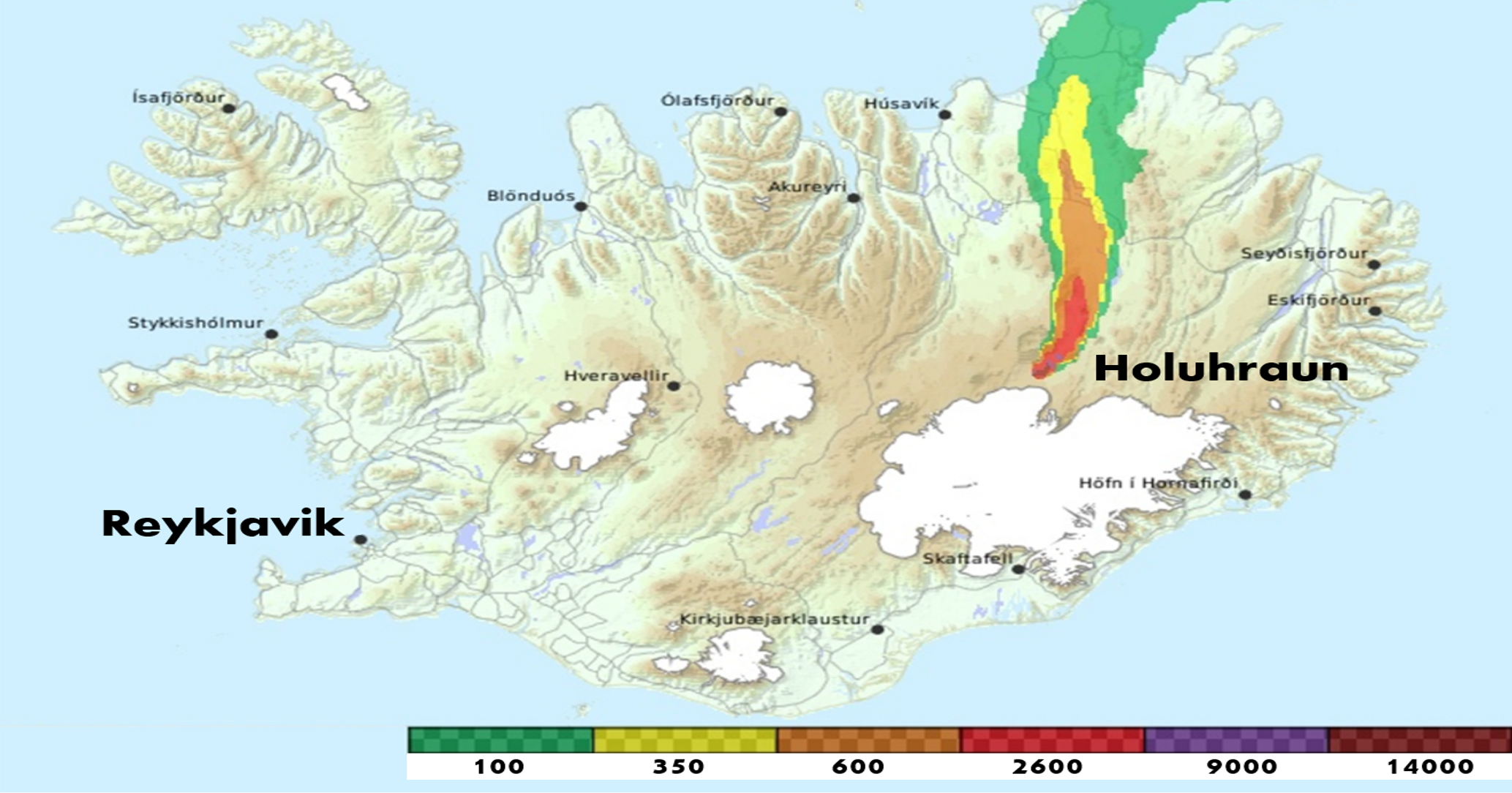
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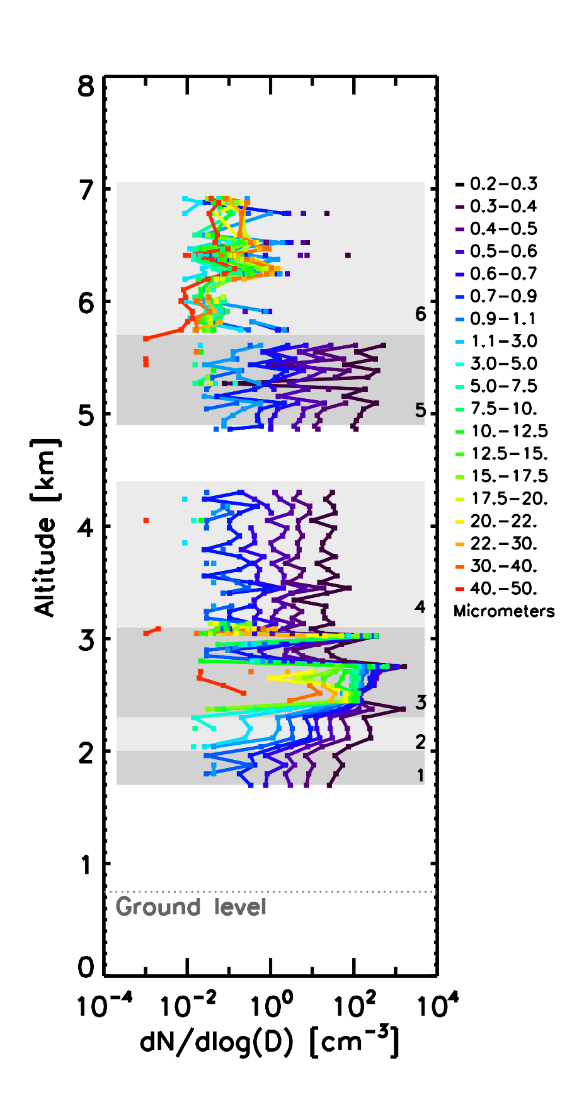
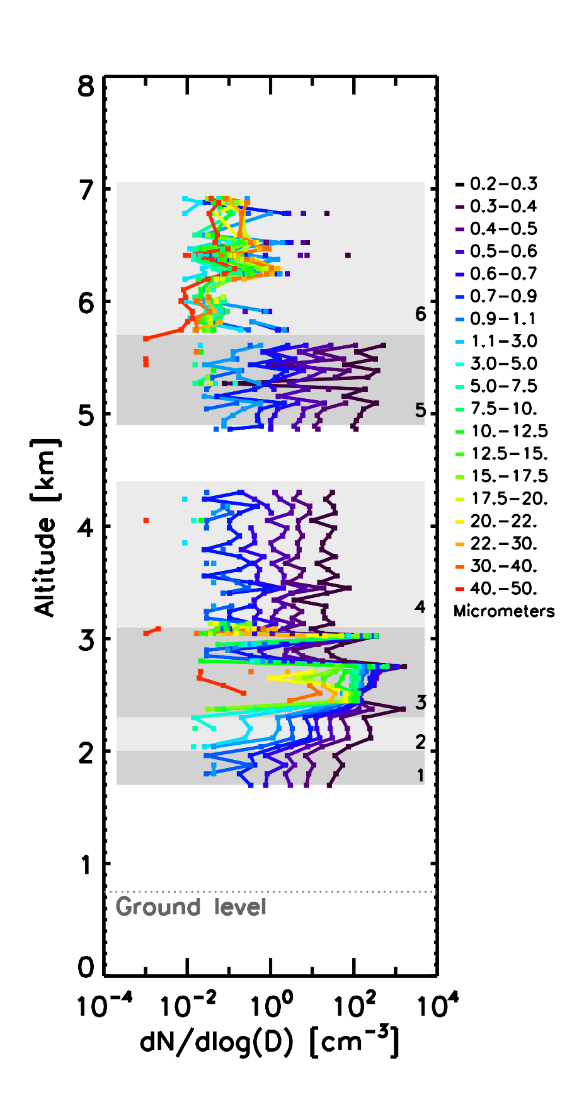
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Appendix 1: CALPUFF forecast from the Icelandic Meteorological office



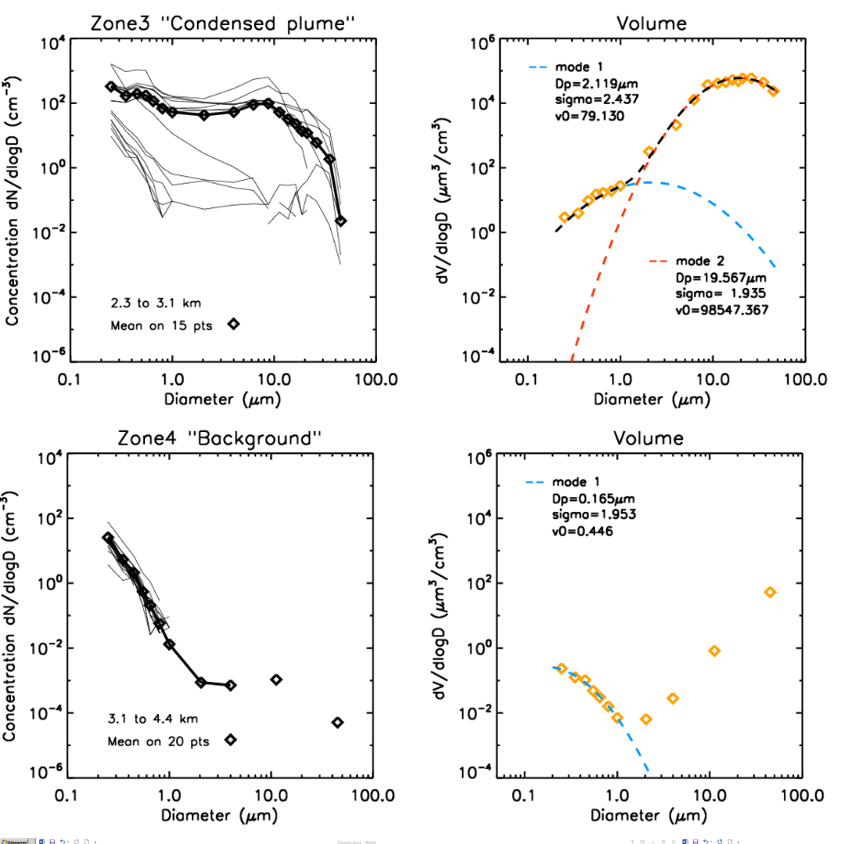
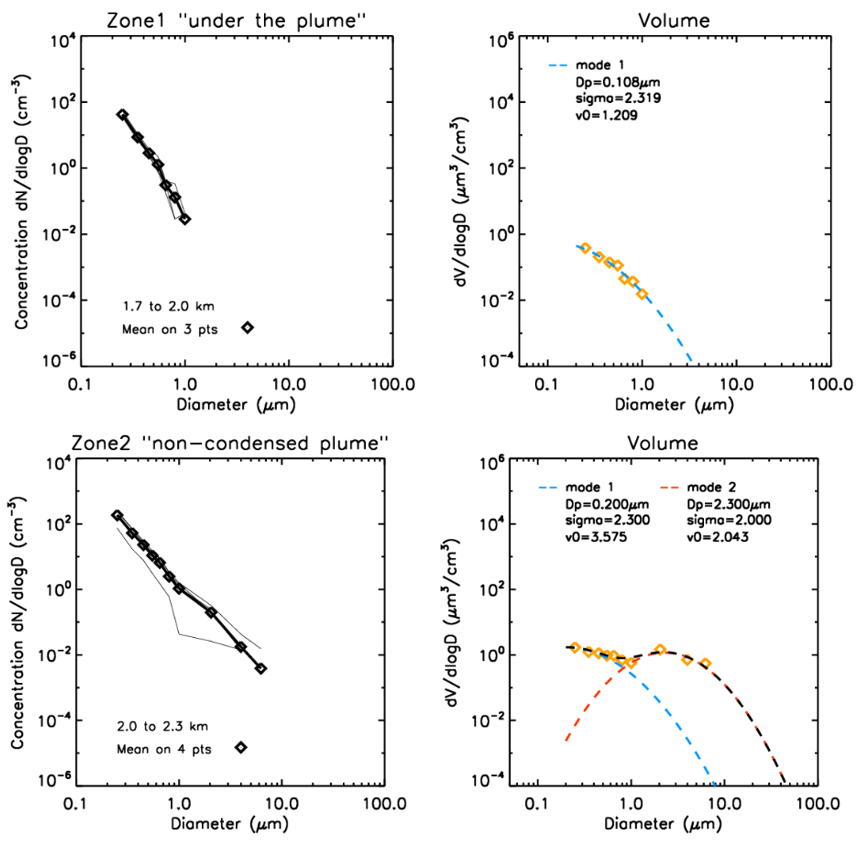
**Figure A1.** Forecast from the Iceland Meteorological Office (CALPUFF model) showing the direction of the plume dispersion and the concentration of SO2 in µg.m-3 at 22UTC on January 22nd, within 30 minutes of the balloon launch. This forecast calculated by the model CALPUFF was used in the field to select the balloon launch location.

Appendix 2: Aerosol size distribution as a function of altitude



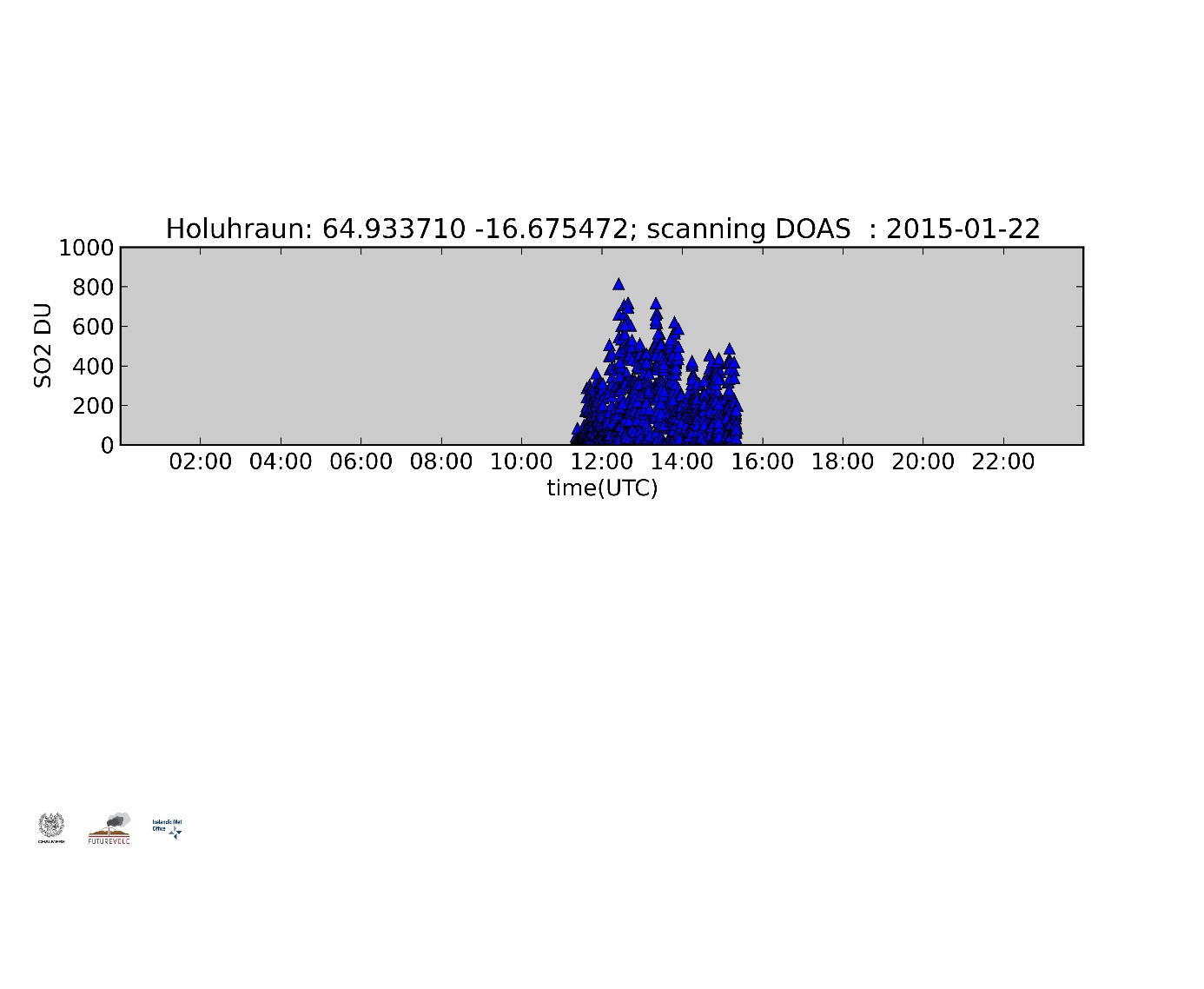
**Figure A2.** Normalized concentration of aerosols as a function of altitude in *dn/dLog(d)* where *n* is the number concentration and *d* the mean diameter of the class size. Each color is relative to a size class expressed in diameter in micrometer, the key is on the right.

Appendix 3: Size distribution in number and volume for each Zone and shape parameters for volume log normal fits.



**Figure A3.** Size-distribution in particle number concentration (left) and by particle volume concentration (right) with lognormal fit for Zones 1 to 4. Left panel: the particle number distribution (dn/dLog(d)), measured in 19 size bins from 0.2 µm to 100 µm, the thick black line with diamond represents mean distribution over measurements represented in thin grey lines. Right panel: volume distribution calculated for each average size distribution. We assume spherical particles with diameter centered on the mean diameter of each size class.

Appendix 4: Column SO2 density measured by DOAS scanning spectrometer at Holuhraun



**Figure A4.** Time series collected on January 22nd 2015 of SO2 column density as measured by NOVAC scanning DOAS positioned 10 km from the eruption site. The average SO2 column density is 200 DU and the emission rate is 400 kg/s.