Geophysical Research Abstracts
Vol. 13, EGU2011-7983, 2011
EGU General Assembly 2011
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Observed interaction of the Eyjafjallajökull eruption plume and the ambient atmosphere

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The volcanic plume of the Eyjafjallajökull eruption in 2010 was monitored using a C-band weather radar situated 154 km from the volcano and by web cameras near the volcano. In addition, airborne observations allowed for detailed examination of the plume, and pilot reports and on-site visual observations were useful in verifying the radar data.

The eruption had two explosive phases, 14-18 April and 3-20 May. The magma flow and explosive activity then decreased slowly and on 23 May the magma inflow ceased. During these phases the plume from the eruption reached altitudes of 5 to 9 km. Between the two explosive phases a mixed phase occurred, with lava effusion and mild magmatic explosive activity of lower intensity. The volcanic plume was much lower, with altitude range from below radar detection limit to about 5 km.

Due to the length of the eruption and the variations in the plume activity the two data series of the plume altitude as observed by the weather radar and a web camera situated 34 km from the volcano, together with atmospheric soundings and numerical modelling provide unique opportunity to study the interaction of the ambient atmosphere with the small to medium size volcanic plume.

A diurnal oscillation is observed in the volcanic plume from Eyjafjallajökull volcano during the less explosive phase of the eruption when the plume was rather weak. While the plume is below radar detection limit during the morning it rises in the afternoon reaching maximum height in late afternoon. This behaviour in the plume is most readily explained by a diurnal oscillation in the stability of the atmosphere above the volcano, with a nocturnal inversion acting to cap the weak plume and the plume only reaching above this altitude when the inversion weakens or dissipates.