The Holuhraun eruption plume and SO_2 pollution episodes in East Iceland

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The plume

The Holuhraun eruption takes place in a region that is in general dry, cold and, if not snow covered, prone to dust storms. The plume from the eruption does not contain significant amount of ash and seems to be mostly vapour and gas plume.

Figure 1 The view towards the north from Dyngjujökull on 1 Sept 2014. The plume can be seen rising through a background dust storm past a cloud layer. The plume reached peak height at around 4 km above ground level approx. 10 km from the eruption. (Photo: Halldór Björnsson)

Figure 2 Left: A close up of the plume rising past a background cloud bank on 1 Sept. Close to the eruption dust from the dust storm may possibly mix with the eruption cloud. Right: The top of the eruption cloud at 3 km a.g.l. on 13 sept. The eruption cloud can easily be distinguished from nearby clouds (Left photo: Halldór Björnsson, right photo: Sara Barsotti)

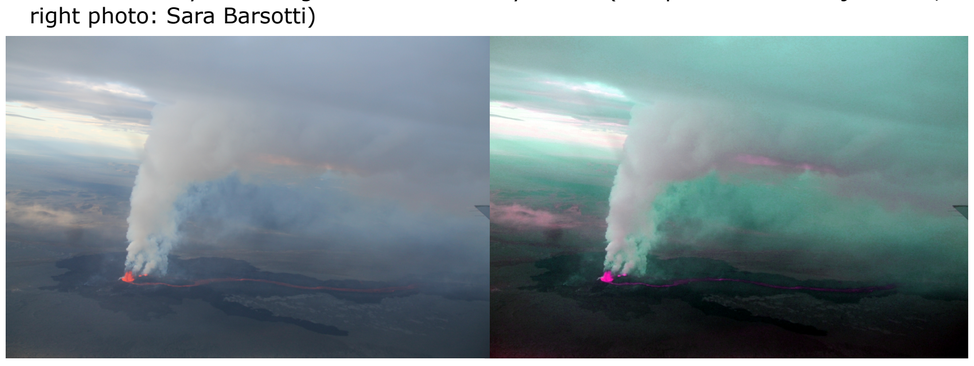

Figure 3 Left: The plume close to the vent on 13 Sept. A white vapour plume rose from the largest craters active during this day, but beneath a weaker plume was rising from smallest vent and from the lava field. Right: Same as left, but with color scale altered to draw out details of the lower cloud. (Potos: Tobias Durig)

Since it is composed mostly of vapour and gas, the plume is buoyant at the vent. As a wet plume it rises pseudo-adiabatically and the heat release from the condensing vapour increases the altitude the cloud reaches.

The gases released by the eruption are a severe health hazard near the craters, but during the eruption they have also been transported into the distal field, with sulfur pollution being measured as far away as Norway.

In nearby towns there have been several cases with episodes of SO_2 pollution reaching dangerous levels.

The pollution

During the 10th and 12th of September a similar weather situation played out in front of the glacier. On both days winds from the from the south or south west turned westerly bringing SO_2 polluted air towards towns in East Iceland.

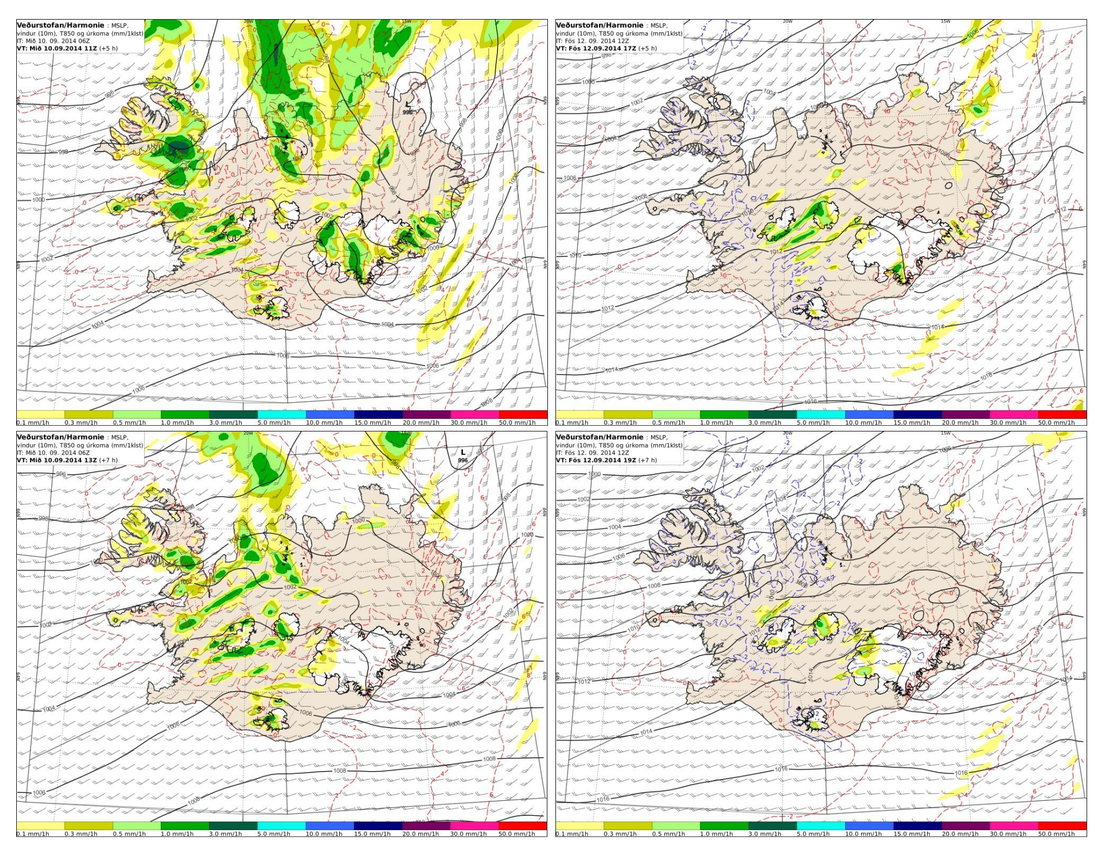

Figure 4 The weather situation early on 10 Sept and in the afternoon on 12 Sept. In both cases winds in front of Vatnajökull glacier turned from southerly or south westerly to a more westerly direction.

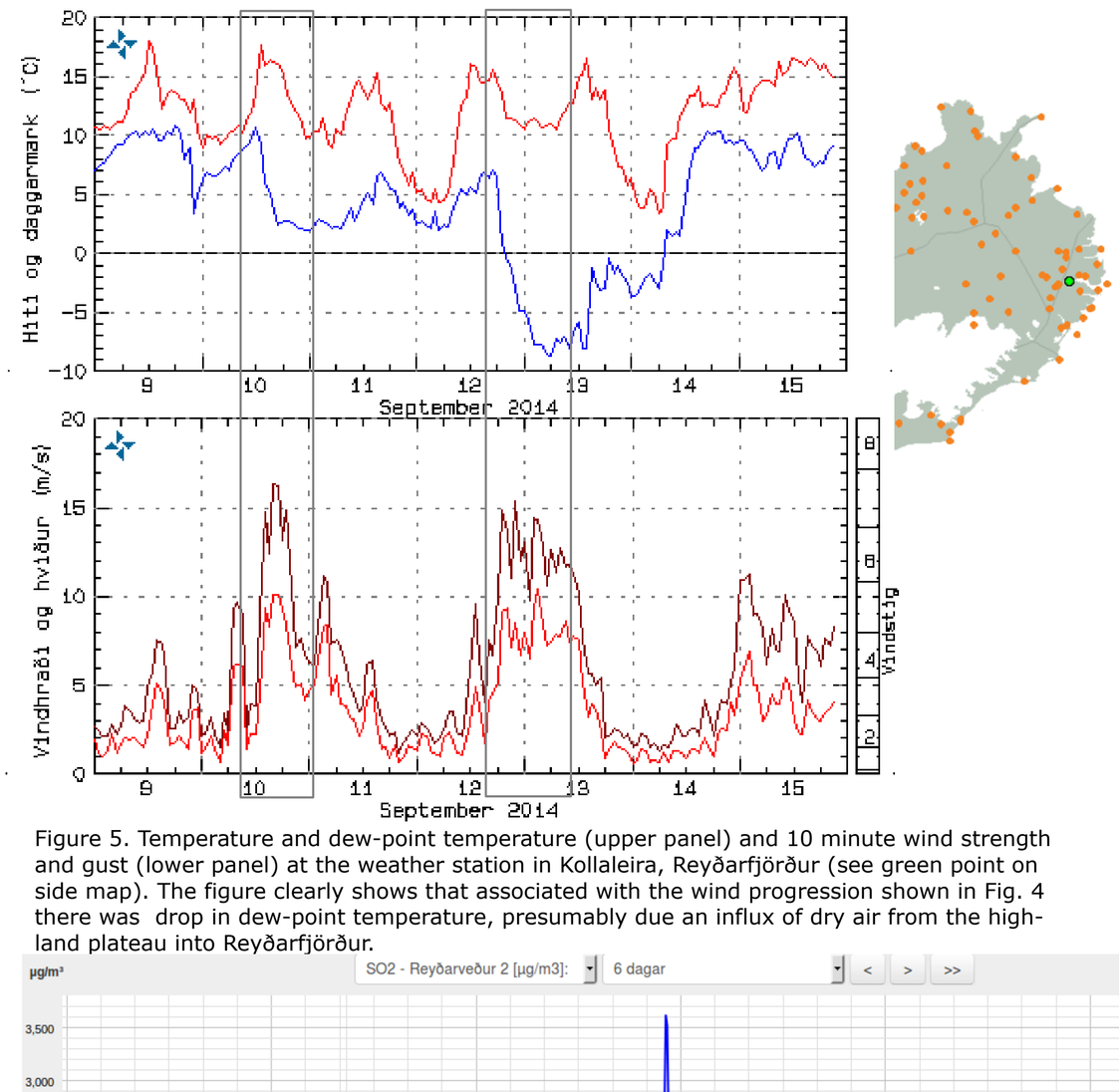

Figure 5. Temperature and dew-point temperature (upper panel) and 10 minute wind strength and gust (lower panel) at the weather station in Kollaleira, Reyðarfjörður (see green point on side map). The figure clearly shows that associated with the wind progression shown in Fig. 4 there was drop in dew-point temperature, presumably due an influx of dry air from the high-land plateau into Reyðarfjörður.

Figure 6. SO_2 measurements from Reyðarfjörður, East Iceland. Associated with the influx of dry air there was on both occasions an exceptionally high jump in the atmospheric concentration of SO2. (Data from Alcoa, Data courtesy of Alcoa, Vista Engineering and the Environment Agency of Iceland)

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