

The Eyjafjallajökull Volcanic Ash Cloud and its Effects on Scottish Air Quality. Update 19 Apr 2010

The volcanic ash cloud that arrived over the UK on the 15th April continues to cover Scotland and most of Europe; Figure 1 shows the most recent graphic issued by the Volcanic Ash Advisory Centre (VAAC) illustrating the expected extent of the ash cloud (http://metoffice.com/aviation/vaac/data/VAG_1271676889.png).

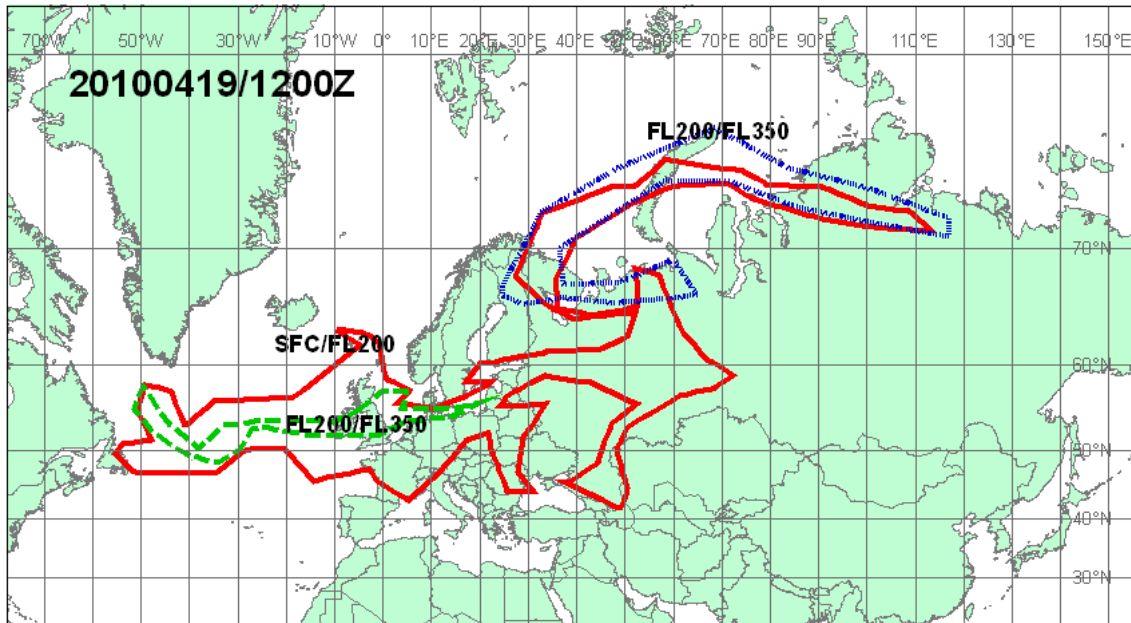


Figure 1. VAAC graphic showing the extent of the Volcanic Ash Cloud as of 12:00Z 19th April 2010

The VAAC also states that the eruption has virtually ceased and that only small amounts of ash are being ejected up to 5000ft. By 06:00 on 20th April the VAAC expect the volcanic ash cloud to have moved away from Scotland as shown in Figure 2.

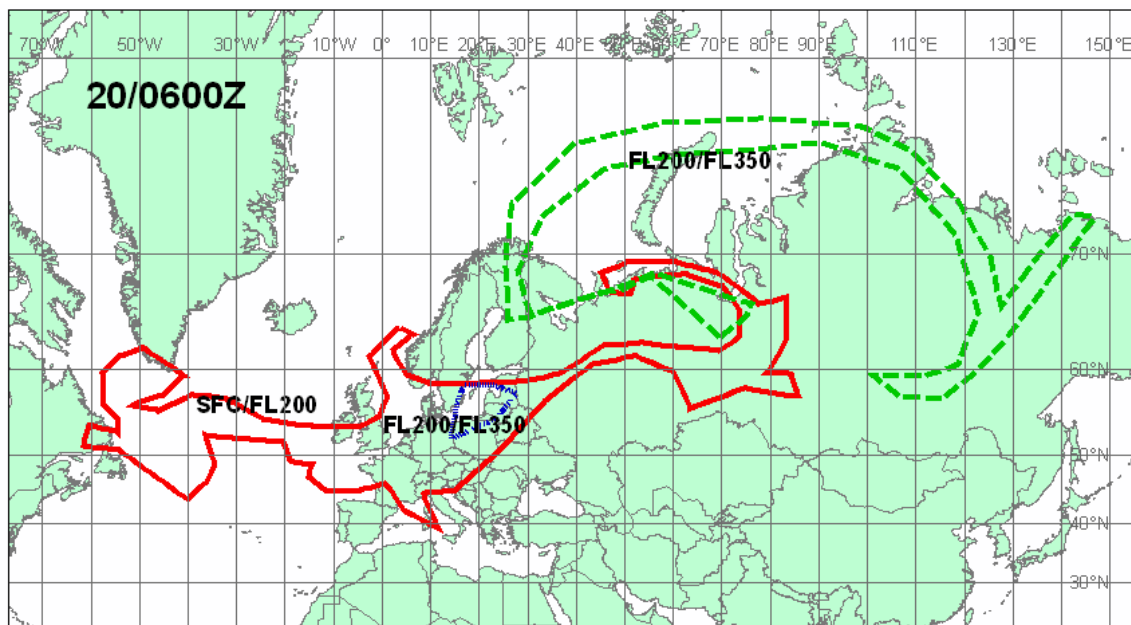


Figure 2. VAAC graphic showing the expected extent of the Volcanic Ash Cloud as of 06:00Z 20th April 2010

Data from the Scottish Government network of Local Authority air quality monitoring stations (www.scottishairquality.co.uk) indicate there has not been any significant increases in PM₁₀ or SO₂ which would have been characteristic of the volcanic plume grounding. Figures 3 and 4 show hourly PM₁₀ and SO₂ concentrations as measured by analysers in the Scottish Government network.

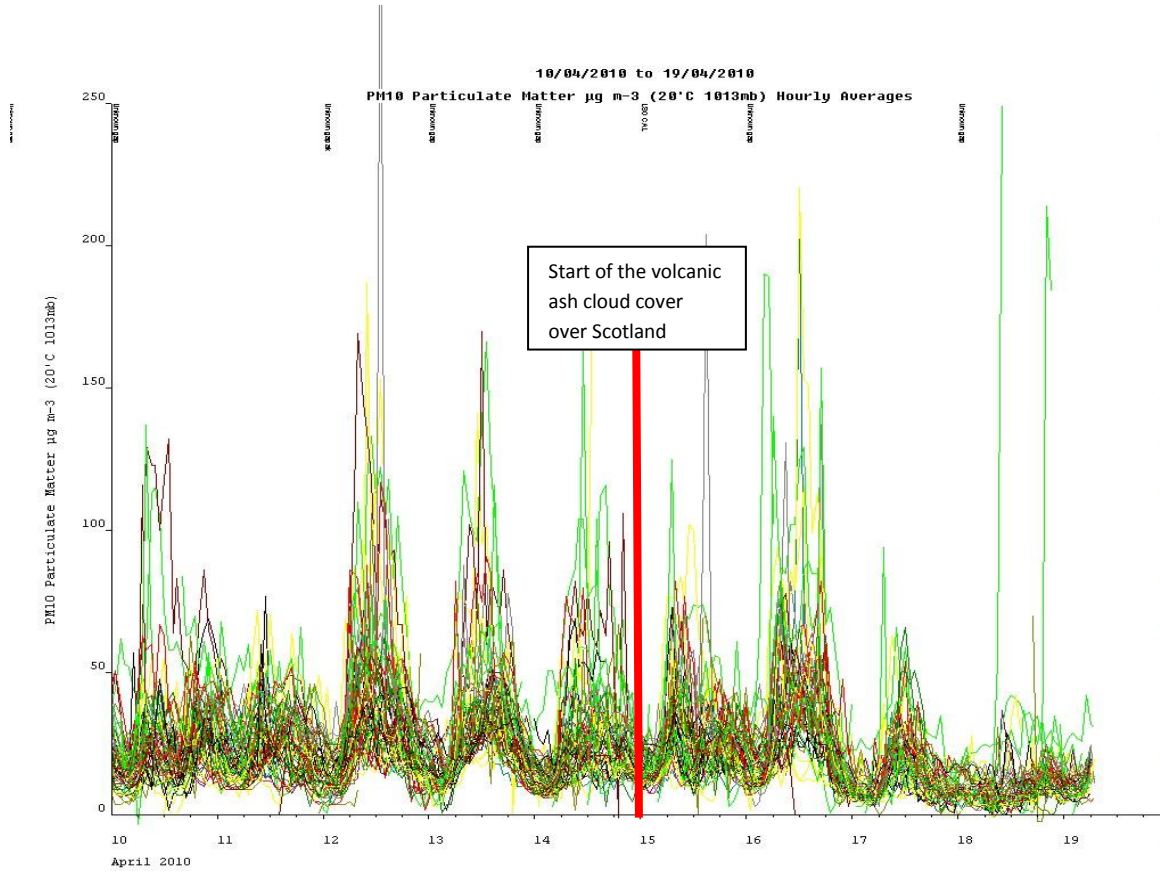


Figure 3. PM₁₀ concentrations as measured by analysers in the Scottish Government network

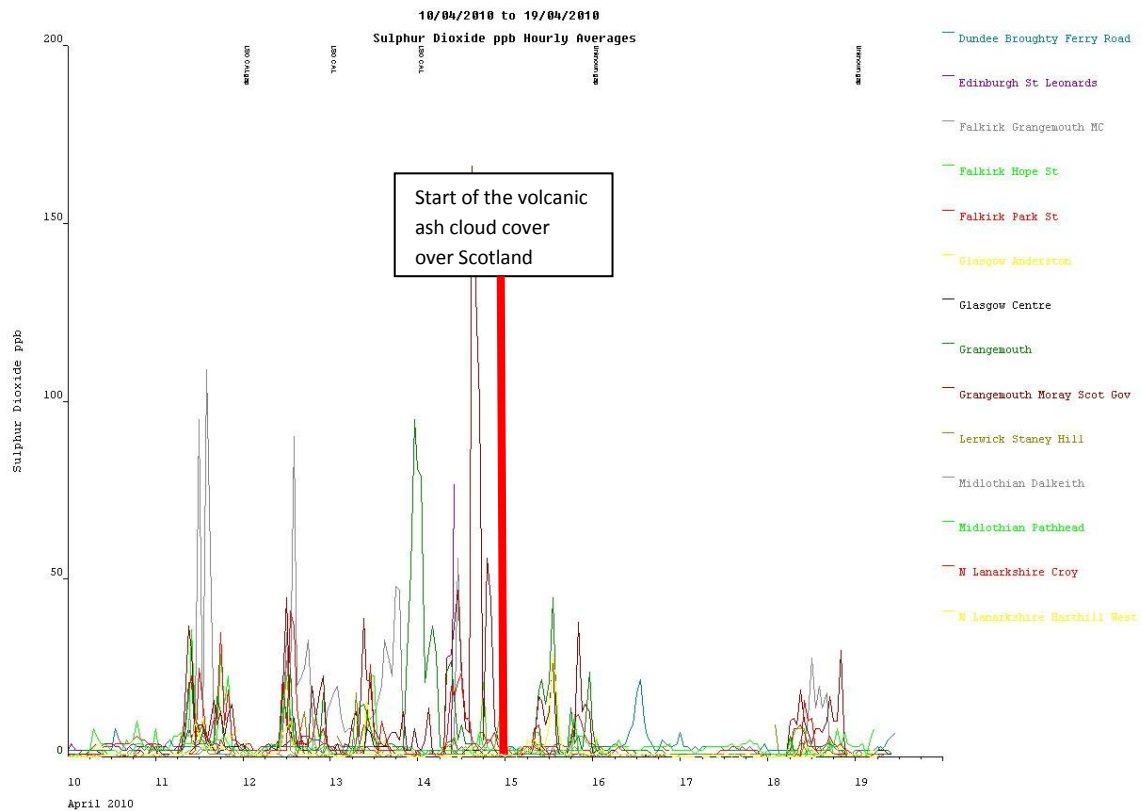


Figure 4. SO₂ concentrations as measured by analysers in the Scottish Governments network.
(note – units are in parts per billion (ppb))

As can be seen in Figure 3 there have been no appreciably elevated readings during the course of the eruption. The two spikes on the 18th April are thought to be erroneous data and are likely to be removed during the data ratification process. The SO₂ plot shows a clear increase in SO₂ concentrations on Sunday 18th April however this plot is more difficult to interpret than the PM₁₀ plot as many of the SO₂ analysers in the network are situated near to industrial SO₂ sources, so can therefore be affected by local emissions to air. Figure 5 is the same plot as Figure 4 but with the sites situated near to large industrial sources removed.

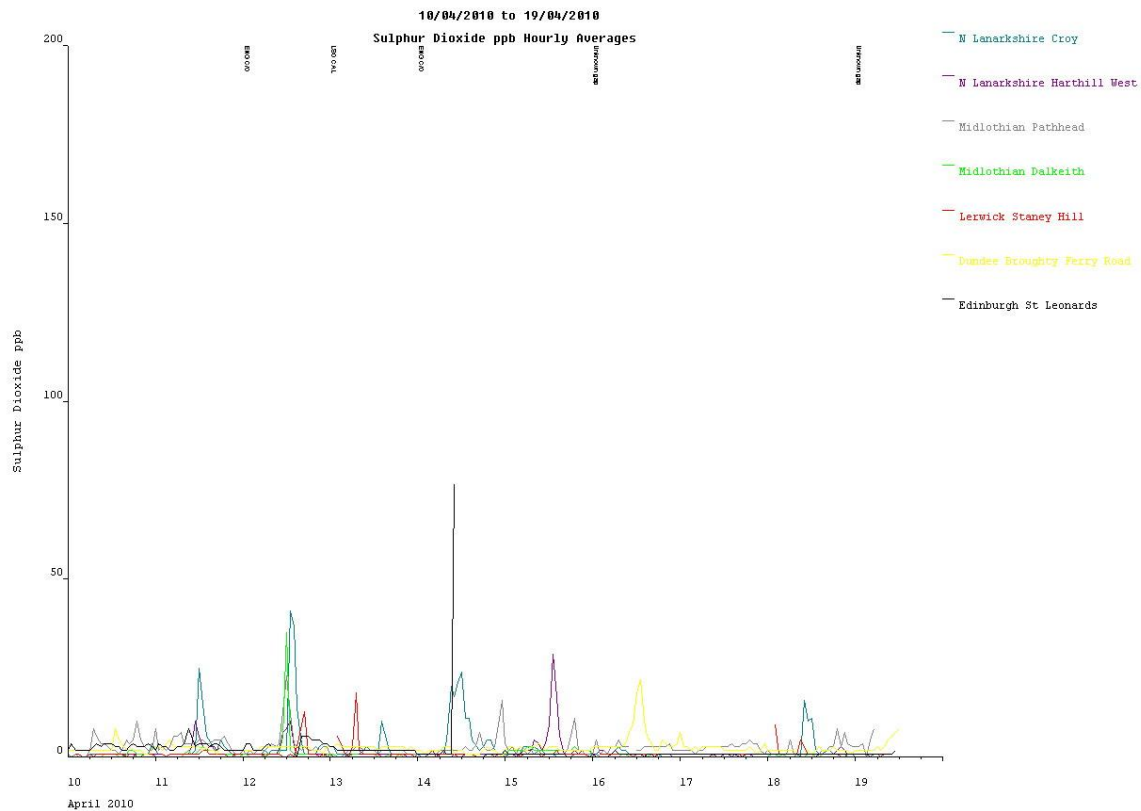


Figure 5. SO₂ concentrations as measured by analysers in the Scottish Governments network excluding analysers that are located in close proximity to industrial sources.
(note – units are in parts per billion (ppb))

Figure 5 suggests that the elevated SO₂ concentrations seen in Figure 4 were primarily due to the industrial sources and not a wide spread event.

Over the course of the period when the volcanic ash cloud has been present over Scotland there have been many reports of volcanic ash on cars. This could be because people have paid more attention to dust deposits on cars that may actually have been deposited over the past few weeks due to the calm, dry and sunny conditions experienced across Scotland.

Some reported grounding of volcanic ash has however been well documented and scientific analysis has been undertaken. On the evening of Thursday 15th April it was reported that some volcanic ash had grounded in Lerwick. This was analysed by SEPA and verified to be from volcanic origin (http://www.sepa.org.uk/about_us/news/2010/volcanic_ash_cloud_%e2%80%93_the_lat-1.aspx). Figure 6 shows samples of the volcanic ash as photographed under x200 magnification by SEPA.

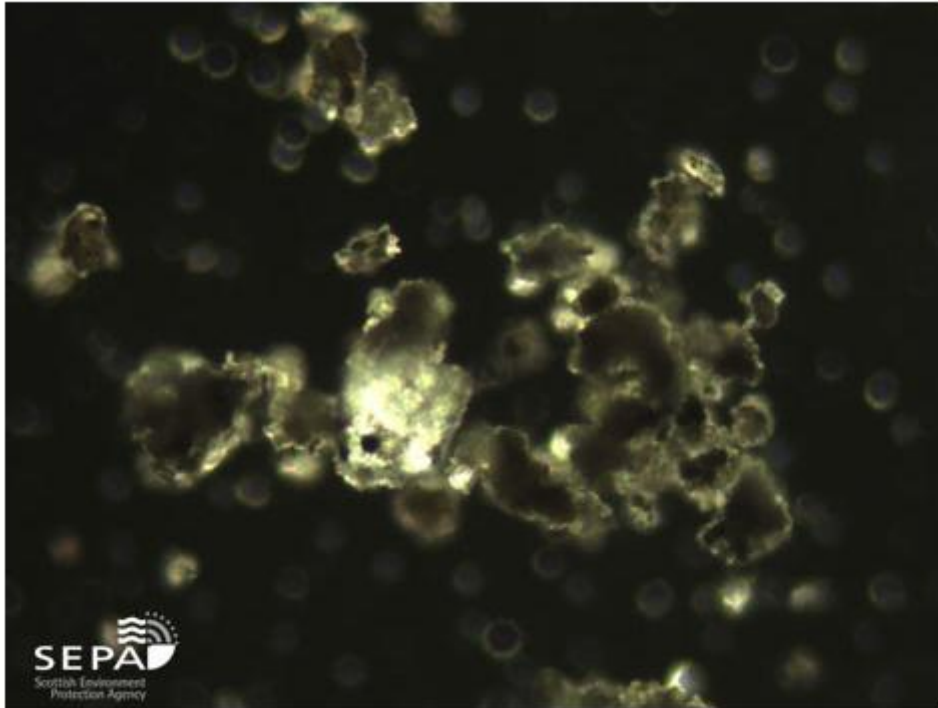


Figure 6. Ash dust particles at x200 magnification as photographed by SEPA.

The particulate matter (PM) as measured by SEPA was found to be between $15 \times 20 \mu\text{m}$ to $70 \times 85 \mu\text{m}$ in size. The PM analysers utilised by Government and Local Authorities are designed to measure particulate material of $10 \mu\text{m}$ or less (PM_{10}), as these are deemed to pose the greatest health risk to humans. This could be a contributing factor as to why no increase in PM_{10} was observed. However, no increase in SO_2 concentration was observed which suggests that the plume grounding was not a widespread event and only occurred in localised areas.

Conclusions

There may have been some grounding of the volcanic ash plume in areas of The Shetland Islands and Aberdeen as indicated by SEPA analysis.

The ash that has so far grounded appears to be too large to be measured by the Scottish Government Air Quality Network, as analysers in the network measure particles of $10 \mu\text{m}$ or less which are deemed to be more detrimental to human health.

The current ash cloud is anticipated to move away from Scotland by Tuesday Morning (Figure 2), however new eruptions may throw up more ash into the atmosphere.

AEA will continue to monitor the situation and keep the Scottish Government up-to-date regarding air quality issues and the volcanic ash cloud.

19/04/2010

AEA Air Quality Forecasting Team