The 2019 Raikoke volcanic eruption part 2: Particle phase dispersion and concurrent wildfire smoke emissions

Martin Osborne et al.

This paper presents a detailed study of the different kinds of aerosol present in the stratosphere over the Northern Hemisphere in late June and early July 2019. The use of the NAME model, together with satellite and ground-based observations for verification, allows the authors to disentangle volcanic ash, volcanic aerosol and biomass burning aerosol and therefore to determine the composition of the aerosol measured over the UK during this period. The paper is thorough and well written, and I have only minor comments on the manuscript.

Minor comments

p.4 l.88 comma can't be used to separate two full sentences.

p.7 l.156 Raikoke eruption

p.7 l. 171. What does 'unoptimised' mean? I found this section hard to follow – the ash profile is set equal to the SO_2 profile from IASI but the SO_2 profile is set to something different! I think the text would be easier to follow if the SO_2 and ash sections were swapped round and the text modified accordingly.

p.9 l.194. This sentence leads the reader to expect results from all ten lidars but in fact only Glasgow, Loftus and Camborne produced data used in this paper. That point should be made here.

p.13 l.261 The right-hand column shows sulfate aerosol, not the left-hand one.

p.13 l.266 Please point out the 'two distinct structures' more clearly. Also 'Figure 3 shows that, in the model…….'

p.13 l. 271 SO_2

p.14 l.280 'classified as'

p.14 l.285 'are too weak to be identified'

Fig 5 caption is not compatible with figure – these are lidar data not OMPS

p.14 l.308. Here a value of 0.01% is given for the sulfate pdr whereas on l 297 a value of 1% is quoted. They need to be consistent

p.15 l.325. Text is confusing. What is meant by 'higher layers'? The maximum ash concentration in fig 5b (10 km, afternoon of 26 June) is ~700 μgm^{-3} not 400, and for sulfate (5c) it is 2 not 25 μgm^{-3} . These values are not consistent with lines 310-314, and for sulfate

the concentration is lower than the 10 μgm^{-3} estimated from the lidar. This section needs re-writing to be consistent with the figure. The erroneous values are repeated in the Conclusions (line 491) which also needs revision.

p.17 l.337. Surely 'north-westerly jet' – the motion is towards the south-east

p.19 l.379. 59°N and 60°N

Fig 8 caption, $m^{-1}sr^{-1}$

p.22 l.408. 77°N is far beyond the range of fig. 9b – presumably this should be 67°
p.25 l.450 reference call-outs wrongly formatted

p.25 l.452 'Possible explanations are'

p.26 l.458 Panels B not Axes B

p.29 l. 532 article number (art. no. D00U02) should be given rather than n/a for page number

p.30 l.557 reference incomplete (needs name of book and its editor(s) as well as the Chapter)

p.30 l.560 reference needs putting in proper format

p.31 l.598 article number missing - also l.632, l.635, l.665, l.673, l.689, l.733, l.745, l.768

p.31 l.623 Journal shouldn't be capitalised

p.33 l.668 reference not correctly formatted

p.33 l.771 needs page numbers and doi

p.34 l.713 is this an article number?

p.35 l.747 No journal given, or doi

p.35 l.770 reference incorrectly formatted (two page number ranges, text before year is anomalous)

General typos

- the paper often uses the syntax 'on the 2 July' when the correct syntax is simply 'on 2 July' – please correct all such errors throughout the paper. (Sometimes the correct syntax has been used so the paper needs to be consistent)
- Each reference has two web links, which are often the same. Only one is needed – it is customary when there is a doi to give just that
- Where the paper references web pages, the date of last access is needed
- There are a lot of references to Discussion papers, some of them many years old. Either these should be replaced by the accepted journal article or they should be replaced by another reference – it should be assumed that papers that get stuck in Discussions have been rejected.
- The authors should check the references carefully as I'm sure I have missed many errors. This should not be left as a task for the copyeditors.