

The paper presents measurements of stratospheric aerosols using the POPS instrument. The authors describe in detail how the POPS instrument works, as well as the limitations and uncertainties associated with the measurements and results, and they should be congratulated for this thorough description. Nevertheless, there are several issues and errors that need to be addressed.

First, the title does not accurately reflect the content of the paper, which is mainly dedicated to the description of the instrument and the analysis of the raw POPS measurements. The B2SAP project is only briefly presented, and there is no scientific analysis of stratospheric aerosol number and size distributions. In particular, there is no figure showing typical aerosol size distributions measured during the flights.

Second, the authors have largely ignored the work conducted by European teams on stratospheric aerosols using both aircraft and balloon measurements. The bibliography is surprisingly incomplete and does not adequately cite European aerosol counters and related measurements. This is neither fair to previous work nor consistent with a comprehensive scientific approach. Moreover, at least one of the authors of this paper is presumably aware of the work conducted by European teams. Therefore, the entire Introduction should be substantially revised and the relevant literature should be included.

Third, there are several errors and missing pieces of information, as detailed in the specific comments below.

For all these reasons, the paper is currently far from the standard expected for this journal and requires a serious revision, and perhaps even a substantial rewriting.

Specific comments

Lines 135–136: This statement is not correct. The stratosphere can often be longitudinally heterogeneous and perturbed by various sources. A more comprehensive and appropriate bibliography should be considered before making such an assumption.

Lines 144–145: What is the basis for this assumption? Can the authors provide a reference? Numerous publications report measurements obtained with satellites and balloon-borne instruments in the tropics. Also, what is the link between this statement and the tropopause height?

Section 3.1: What is the measurement size range of the POPS instrument? This information is only provided much later, in line 296, and should be given here.

Section 3.2: The authors point out an interesting issue. If the real part of the refractive index differs from, or even slightly changes relative to, the assumed value of $1.45 + 0.00i$, the Mie oscillations will change both in position and amplitude. A discussion of the resulting uncertainty in size attribution and particle misclassification is therefore needed here, rather than much later in the text.

Line 21: Are the authors certain about this interpretation? Another possibility is that the noise decreases because of the lower temperature, while stray light may change as a result of mechanical deformation caused by temperature variations. These possibilities should at least be discussed.

Parts 6 and 7: These sections are much too short compared with the other parts of the paper. They should either be substantially expanded or merged.

Lines 334–335: This statement appears to be in contradiction with much of the published literature, which shows a decrease in aerosol concentrations with increasing altitude. Once again, a more comprehensive review of the literature is needed, together with a meaningful comparison with previous measurements.

Figure 7: Can the authors explain the small excess in aerosol concentration observed in the 27–29 km range? Has such a feature already been observed with other instruments?

Line 339: The optical diameter is not a function of aerosol composition or refractive index. It is a geometrical parameter. The terminology and/or definition should therefore be reconsidered.

Figure 8: The results in Figure 8 are presented in terms of surface area, whereas Figure 7 presents number concentration. How can a relatively stable number concentration in the middle stratosphere result in decreasing surface area and decreasing extinction? This point requires clarification and, ideally, a quantitative explanation.

Line 383: This value may be too low. Values as high as $2.0 \pm 0.1i$ can be found in the literature for soot particles. The authors should justify their choice and discuss the sensitivity of the results to the assumed refractive index.

Line 403: POPS should not be described as a low-cost instrument.

Part 8: There is a Section 8.1, but no Section 8.2. The section numbering should be corrected.

Line 418: A clear conclusion is needed at the end of the discussion in Part 8 to summarize the actual accuracy and uncertainties associated with the POPS measurements. The reader should be left with a clear understanding of the confidence that can be placed in the retrieved aerosol properties.

Line 437: Can the authors show an example of the Hunga Tonga measurements and refer to previous work published on this subject? This would also provide an opportunity to demonstrate the capabilities of the POPS measurements in detecting volcanic aerosol perturbations.