Third review of "Evidence of a Transient Ozone Depletion Event in the Early Hunga Plume Above the Indian Ocean" by Millet et al.

The manuscript has once again been substantially revised in response to referee comments, including major changes in the analysis approach (with consequent considerable effects on the magnitudes of the calculated ozone anomalies) and the addition of a coauthor. With these latest changes, the manuscript has again been greatly improved. However, some new issues, mostly instances of unclear wording, have been introduced through the revision process. Thus minor corrections are still needed before the paper can be published.

Specific comments and questions:
Both substantive issues and minor points of clarification, wording suggestions, and grammar / typo corrections are listed together in sequential order through the manuscript. Line numbers refer to the "clean" version of the revised manuscript, not the tracked-changes file.

- L5: while also incorporating --> and also incorporates
- L10: "Revealed" has already been used in this abstract; this word should not be overused. In addition, the term "ozone depletion" is easily misinterpreted. For clarity, I suggest rewriting this sentence as "IASI ozone spatial distributions showed marked decreases in total and stratospheric ozone on that date, with the 5^{th} percentile …".
- L12-13: As currently worded, non-specialist readers could misinterpret this sentence as saying that MLS measures aerosol. Rearranging can alleviate this problem: "A key finding, as shown by MLS profiles, is that the ozone reduction was confined to two distinct layers, each associated with a separate aerosol cloud." Since this is indeed a key finding, it is curious that the authors have chosen not to include any details about the magnitudes of the ozone anomalies in these two layers, whereas this information is provided in the Conclusions.
- L53: more surface for --> more particle surfaces for
- L74-77: This discussion mixes processes occurring over different timescales and is therefore very likely to confuse readers. Evan et al. (2023) and Zhu et al. (2023) talk about the chemical processing and ozone loss that occurred in the Hunga plume within the first week of the eruption. These companion papers should be discussed together. In contrast, the studies by Santee et al. (2023), Wilmouth et al. (2023), and Zhang et al. (2024) focus on perturbations in stratospheric composition observed months after the eruption. The distinction between these two sets of studies should be made more clearly. Moreover, although it is good to mention them for completeness, the studies of the chemical processing in subsequent months are less relevant to this manuscript, which concentrates on the immediate aftermath of the eruption. I suggest re-writing these sentences for clarity. Maybe something along these lines would work: "In this context, Evan et al. (2023) provided evidence of HCl activation on sulfate aerosols within the fresh volcanic plume, and Zhu et al. (2023) elucidated the mechanisms giving rise to the changes observed immediately following the event. (For completeness, we note that comprehensive discussions of the stratospheric chemical processes at work in subsequent months can be found in Wilmouth et al. (2023), Santee et al. (2023), and Zhang et al. (2024).)

- L93: Again, Zhang et al. (2024) is not concerned with the immediate aftermath of the eruption (but rather focuses on the following SH winter, JJA) and does not discuss the same processes as the papers by Evan et al. and Zhu et al. Hence the reference to Zhang et al. (2024) here should be deleted.
- L126: "ozone TCO" is redundant, so delete "ozone".
- L133: "data should be used to study observations --> data should be used to study conditions; within the Hunga plume --> within the fresh Hunga plume for the first few weeks after the eruption
- L136: ozone --> MLS ozone
- L154: due to sedimentation --> due to particle sedimentation
- L161-164: This discussion is not quite correct. Neither v4 nor v5 MLS H_2O measurements should be quality screened for the first ~3 weeks after the eruption. Standard filtering protocols should be applied to the O_3 data in both versions, as indicated here, but not to either version of the H_2O data.
- L180: in (Boynard et al., 2018) --> by Boynard et al. (2018)
- L182: to the top of the atmosphere (~60 km): 60 km is not the top of the atmosphere
- L214: near-real time --> near-real-time
- L321: I'm not sure that ACP style will allow the ampersands ("&") in these lines, and in any case I do not think that their meaning is clear. I suggest just using a forward slash instead (e.g., "MLS/DIAL"). Alternatively, "vs" might also work.
- L330-345: I find this discussion a bit confusing. First it is stated that MLS has a relative bias and error with respect to DIAL measurements of 0.11 ± 0.20% in the 20–40 km altitude range. In this case a statement such as "MLS slightly overestimates DIAL in this region" would be appropriate. But then it is stated that over the whole altitude range, the linear regression $y = 1.00\ x$ shows that "MLS profiles tend to slightly over-estimate ozone concentrations relative to DIAL … irrespective of the altitude". I do not see how the statement "slightly over-estimate" is justified given the value of "1.00" in the linear relationship.
- L347: "an elevated correlation" --> "a fairly strong correlation" (the word "elevated" raises the question "compared to what?")
- L350: altitudes of the Hunga volcanic plume … that are --> altitudes of the Hunga-affected layers … that are
- L351: low deviation --> low relative deviation
- L375-376: This wording is unclear. To avoid misinterpretation, it would be better to rewrite this sentence as "IASI recorded the highest number of negative ozone anomalies linked to Hunga on 20 and 21 January (panels (a6)-(a7) and (b6)-(b7) of Figures 5 and A1).
- 378-379: It's possible that I have misunderstood the point here, but to me it seems that the sentence "These values significantly exceed climatological variability" is redundant with "meaning this anomaly is more than three times larger than the typical variation". The first sentence should be either deleted or rewritten to clarify what information it provides that is not covered in the second sentence.
- L400: with respect the --> with respect to the
- L400-405: This discussion is opaque and hard to follow. For one thing, "resp.", used repeatedly in these lines, is not a common abbreviation, and I am not sure what it means

here. I believe that the authors intend to provide percent anomalies for the upper and lower aerosol clouds relative to both the MLS averaged Indian Ocean profile and the mean lidar profile from DIAL, but if so this is a very awkward way to go about doing so. It is also confusing to call an anomaly expressed in terms of percent a "volume mixing ratio anomaly". Finally, panel (e) of Figure 6 is no longer referenced in the text. I think that it would be much clearer to not only rewrite these sentences, but also to rearrange this entire paragraph such that the percent anomalies for each layer are given immediately following their associated absolute anomalies. Assuming that I have understood correctly, I suggest something like: "The ozone mean anomaly associated with the higher-altitude aerosol cloud is (1σ) significant at the 12 hPa level and barely (1σ) significant at the 14 hPa pressure level, with an average anomaly relative to the average background MLS profile of –0.7 ± 0.6 ppmv (–1.0 ± 1.0 DU/km) across these two pressure levels. In percentage terms, this corresponds to –5.5 ± 4.7% and –6.3 ± 4.8% with respect to the average MLS profile over the Indian Ocean (Figure 6e) and the mean lidar profile (Figure 3), respectively. For the lower-altitude aerosol cloud, (1σ) significant ozone anomalies occur across the 21–32 hPa pressure range, with a mean anomaly of –0.6 ± 0.5 ppmv (–1.7 ± 1.4 DU/km), corresponding to –7.5 ± 7.0% and –8.5 ± 8.1% with respect to the mean MLS Indian Ocean and the mean lidar profiles, respectively."

- L417: This construction ("the latter shows") appears to point only to Figure 5. For clarity, this should be rewritten as "… in Figs. 5 and A1; these two figures also show a westward …".
- L421: amounts water --> amounts of water
- L423-425: The way these sentences are written makes it sound like IASI "observations are derived from IASI, MLS, and OMPS satellite data", which makes no sense. This problem can be solved by re-wording / rearranging: "Here we use satellite observations from IASI, MLS, and OMPS, complemented by ground-based measurements from Reunion, to provide a detailed view of the evolution of … Indian Ocean. This study presents the first analysis of IASI data in the context of Hunga."
- L436: exceed --> exceeding
- L438-440: Anomalies expressed in terms of percent will be more meaningful to many readers than the values given here. It would be good to add the corresponding relative anomalies in a manner similar to that suggested above.
- Figure 6 caption: Panels (a-b) presents --> Panels (a-b) present; panels (c-d) shows --> panels (c-d) show; influenced by one of the aerosol clouds --> influenced by the aerosol clouds