Suggestions for revision or reasons for rejection
(visible to the public if the article is accepted and published)

The authors have addressed the majority of my initial comments. Below, I outline two remaining methodological and interpretive concerns that require further attention.

While I agree that the in-plume area should be based on the defined SO2 threshold, the extent of the out-of-plume box should be consistent between both datasets. This would furthermore be consistent with Peace et al. (2024), who keep the extent of the out-of-plume box consistent between model and observations, always using the out-of-plume box defined from the satellite retrievals. As outlined in my initial review, meteorological conditions and, therefore, cloud characteristics vary spatially, and using different out-of-plume areas may influence the interpretation of perturbation signals.

We thank the referee for this helpful comment regarding the consistency of the out-of-plume regions between the model and satellite-derived datasets. In response, we conducted an additional sensitivity study using hybrid plume masks. In this experiment, the in-plume regions are defined using the same 0.5 DU threshold on simulated SO_2 as in the main analysis, while the extent of the out-of-plume regions follows the satellite-derived plume masks based on a 1.0 DU threshold, consistent with the approach adopted by Peace et al. (2024).

The corresponding methodological description has been updated in Section 2.8, and the results are discussed in the last paragraph of Section 3.3 (copied below).

Regarding the different choices of the SO2 threshold, I disagree with the wording of the authors that an 18% change in CDNC w.r.t. V.In (and even 25% w.r.t. V.Out) is quantitatively small.

We thank the referee for pointing out our previous wording that was not sufficiently clear. Text has been revised and moved to Section 3.3 (second paragraph);

Here is a copy of Section 3.3.

3.3 Results using different plume masks

As described in Section 2.8, we examine the sensitivity of our results to different definitions of plume masks. In the preceding sections, a 0.5 DU threshold of simulated column SO_2 was used to define in-plume and out-of-plume regions. Here, we instead apply a 1.0 DU threshold, consistent with the SO_2 criterion used to construct the satellite-derived plume masks. This choice yields smaller in-plume regions and, consequently, smaller associated out-of-plume regions compared to the satellite-derived masks.

Figure S9 shows that using the 1.0 DU criterion leads to a slightly higher contrast in CDNC between in-plume and out-of-plume regions than in the main analysis (compare Volc.In vs. Volc.Out in Figures 4 and S9). This indicates that the main results, based on the 0.5 DU threshold, provide a conservative estimate of the magnitude of volcanic plume effects on clouds. Consequently, the statistical significance of the volcanic effects identified in the main analysis is strengthened.

A second sensitivity experiment was performed using hybrid plume masks, in which the in-plume regions are identical to those in the main analysis, while the boundaries defining the out-of-plume regions follow the satellite-derived masks from Peace et al. (2024). Figure S10 shows the resulting CDNC distributions, which are identical to those in Figure 4 except for the simulated values in the out-of-plume regions (V.Out and N.Out). CDNC values in both V.Out and N.Out increase in week 1, decrease in weeks 2 and 3, and remain nearly unchanged in week 4. The largest deviation occurs in week 3, when the LOCATION effect increases by 22% and the AEROSOL effect decreases by 14% (Table S1). Although these differences are not negligible, they do not alter the overall conclusions of this study.