

We thank Daniele Visioni (Reviewer 2) for the helpful comments that improved our manuscript.

Reviewer #2 comment:

Here are a few final suggestions/comments. The important ones are: 1) A disconnect between Fig. 1 and Fig. S1 and the statements concerning water vapor reaching the stratopause. 2) Use of the word pre-existing. 3) The complicated speculation about how sea salt residues could have reached the stratosphere. Without evidence the simplest explanation is best.

More detail follows here by line number. I don't need to see a revised copy.

141 Change "passes" to descends below ...

Thanks, that is better.

150 What month in Fig. 1 does the water vapor anomaly reach above 1 hPa? This statement is not supported by Fig. 1. It is only supported by the supplementary figure, but then that brings Fig. 1 and Fig. S1 into disagreement.

We have clarified why that is visible in the supplementary fig but not in Fig. 1.

271 "...adding pre-existing aerosol from the HT-22 eruption..." This is confusing language. What is meant by pre-existing. Pre-existing compared to what? Perhaps the authors mean ... adding additional, non-sulfate, aerosol to the plume from the HT-22 eruption to obtain the ... And it should be added here that the amount of additional aerosol added was adjusted to obtain the measured AOD.

We have changed in accordance with the comment.

275 Then change this sentence to ... The next question is what is the source of the additional aerosol required before the conversion of SO₂? And replace all "pre-existing" to additional or something like that. Pre-existing is misleading.

Thanks, we have changed.

275-276 The authors may want to temper this statement. Some aircraft composition measurements made in an HT-22 aerosol plume, probably in the NH, arose in a discussion I had recently. Those measurements indicated no sea salt components. Unfortunately I don't have a reference or know if it has been published, but the investigators were confident they were sampling HT-22 aerosol. The authors may want to search the literature to see if there is anything published on this point.

We are not aware of such results. However, a recent preprint presented one composition measurement deep into the stratosphere with low sulfate concentration and clearly higher concentrations of sodium and chloride together with some other species. (Vernier et al, <https://doi.org/10.5194/egusphere-2025-924> Preprint. Discussion started: 1 April 2025)

285-287 “In the competition for water, preferentially large particles are scavenged in cloud formations prior to the formation of precipitation. This leaves the smaller particles as an interstitial aerosol (Martinsson et al., 1999).” Delete this sentence. It is confusing, bringing in clouds and precipitation and is unnecessary.

Clearly the volcanic plume entrained a lot of sea water leading to the record-breaking amount of water injected deep into the stratosphere. The water in the plume would evaporate quickly from the sea water residue, but that residue is also in the plume and so carried with it into the stratosphere. It seems a straight forward and simple process for that aerosol to reach the stratosphere. There is no need to complicate it with sentences such as this and the ones about bubble bursting.

We prefer to not remove these sentences. Most scientists connect aerosol from the sea to the coarse size mode (super micron). Therefore, we argue that it is important to communicate that clouds and precipitation affected both water and aerosol before the volcanic effluents reached the stratosphere.

290-302 Make this a new paragraph.

We agree.

364-365 This statement on water vapor reaching the stratopause is not supported by Fig. 1. Until it is, or explained why not, this statement should not be included here. It is ancillary to the paper anyway.

We have clarified, see the answer to comment “150”.