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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Dimethylsulphide (DMS) emissions from the West Pacific Ocean: a potential marine source for the stratospheric sulphur layer" *by* C. A. Marandino et al.

Anonymous Referee #2

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1 General comments

The paper is a useful contribution to ACP but needs revision because of misleading conclusions. It is important to present new measurements of DMS and its consequences for the sulphur budget in the upper troposphere and lowermost tropical stratosphere. This includes the HIPPO data not available in the cited website and reference. DMS from tropical convection contributes to lower stratospheric SO_2 and sulphate aerosol but is minor compared to the effects of volcanoes and of COS oxidation in contrast to the impression from the abstract and the conclusions. Nevertheless, it is worth to be addressed since it helps to reduce differences between model results and

most recent satellite data for SO_2 over the tropical Pacific in the UTLS.

2 Specific comments

In the introduction (page 30545, lines 13f) the references are misinterpreted, they all argue against anthropogenic SO_2. DMS might contribute to stratospheric sulphur since it is much less soluble than SO_2 and can be therefore better transported by convection.

Please explain better on page 30546, second paragraph, why the West Pacific is a region which favors penetration of DMS into the stratosphere (convection, low OH etc.). You may cite also Newell and Gould-Stewart (1981).

ElNino enhances convection over the East and mid Pacific but reduces it over the West Pacific. Please improve this part in section 2.1.

I suppose the DMS flux in paragraph 3 of section 2.2 is estimated from the ship measurements. A remark on the consistency of this number with other cited datasets (Kettle, Lana etc) would be useful already here (or at least a cross reference to next section).

At the beginning of section 3.1 'marine boundary layer' should be inserted for clarity (right?).

Figure 5b and the discussion on mg of DMS in the Lagrangian parcels on top of page 30554 should be skipped or much better explained concerning units, area and reference time.

The back of the envelope calculations on pages 30554f and in Table 1 are misleading and appear to be wrong. First, only the area of the tropical oceans (or better the regions with strong convection) should be counted if transport to the TTL is considered; second, what is the meaning of a 1 cm wide track along 6000 km (surface area of cruise track)?

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Is this related to the inlet device? Due to these strange numbers the scaling factor for DMS at the TTL also given in the conclusions is strongly overestimated.

What is the meaning of 30 g S/month (page 30554, line 25) also mentioned in the abstract? Please explain better and/or convert to a more reasonable scale, this is very confusing. I suppose, the number is again based on the 1 cm wide track. Since transport to the TTL is dominated by fast deep convection, lifetime of DMS in the boundary layer is secondary here and I'm surprised that it scales almost linear. Are diurnal effects taken into account?

What means tropical in Figure 7? It might be useful to show the 'fountain region' over the West Pacific separately. Compared to CCM-results using the Kettle DMS in seawater as lower boundary condition the presented values appear to be at the high end for zonal average but this might be related to the Emanuel convection scheme used in FLEXPART (see Tost et al).

3 Technical corrections

PSL is an acronym usually not used for the Junge layer.

Please use a rectangular projection in Figure 1 for regions on both sides of the equator.

On page 30546, line 15, refer to Fig.1.

In Figure 2 an additional axis with time would be useful to see possible diurnal variations.

In Figure 4 a logarithmic scale might be better in the right panel. The vertical axis should be extended to 17 km even if there are no HIPPO data.

In the caption of Figure 5 parts a and b are messed up.

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There are several typos in the reference list (e.g. p30559, l.19), also standard abbreviations for journals should be used.

4 References

Newell, R.E. and S. Gould-Stewart: A stratospheric fountain? J.Atmos.Sci. 38, 2789-2796, 1981.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 30543, 2012.