

## ***Interactive comment on “Sulfur dioxide (SO<sub>2</sub>) as observed by MIPAS/Envisat: temporal development and spatial distribution at 15–45 km altitude” by M. Höpfner et al.***

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The manuscript presents (1) a new method to retrieve zonal mean SO<sub>2</sub> profiles from Envisat MIPAS, (2) an almost complete 10-year dataset obtained with this new method, and (3) a scientific analysis and interpretation of this dataset, which includes a state-of-the-art regression analysis representing a fully quantitative approach. This nearly comprehensive scientific exploitation of the new dataset leads to some groundbreaking improvements in our understanding of stratospheric sulfur. There is a lot of interest in this topic, so the paper comes very timely and should be interesting to a large audience. The science seems sound, and the presentation quality is high, so I recommend that

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the paper should be rapidly promoted to ACP. I add only a few minor suggestions and technical corrections below that may hopefully help to further improve this fantastic manuscript.

Minor comments:

Section 5.2: I agree that the differences in the comparison with ACE-FTS are not overly large as to hint a problem with one of the instruments. However, they are large enough to make me want to see a graphical representation, ideally one that also shows how these differences compare to the variability in the data.

Section 5.3: could a higher loading of SO<sub>2</sub> in the NH midlatitude troposphere around 1980 compared to today have an impact on the lower stratospheric in-situ SO<sub>2</sub> measurements made at the time?

Section 6.1: I think that the mid-strat-maximum could be illustrated even better than in Figure 7 by color maps showing a zonal mean (probably four altitude-latitude panels, one for each season).

For recent volcanically perturbed periods, could you also compare to Aura-MLS? They have, for example, presented some SO<sub>2</sub> vertical profiles in the context of the Nabro eruption (cf. comments to the Bourassa et al. reference in SCIENCE).

Technical corrections:

"which" should always be preceded by a comma. But on several occasions, it may be possible or even preferable to replace "which" by "that", in which case there is no comma.

P12390, L7-8: if it was just one comparison, delete the s at the end of situations, if there were more, then delete the a in front of volcanically

P12392, L14: replace "height" by "vertical"

P12392, L15: better say "...on the order of..."

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P12392, L24: "...overview of..."

P12392, L26: insert comma after "Sect. 4"

P12399, L6: "...to a lesser extent..." (lesser, and extent), and the first year should be 1992, shouldn't it?

P12399, L13: "Above, ATMOS shows..." following line.

P12410, L4: replace "height" with "altitude" or "vertically" and delete "region of the" (just "covering nearly the entire stratosphere" sounds good)

P12410, L18/19: "...smaller values than MIPAS..."

P12410, L20: time-periods (plural)

P12410, L23: replace "heights" by "levels" or "altitudes"

P12411, L13: "The global, altitude-resolved fields..."

P12412, L3: Remove "As shown, ". There is no doubt that the results will be useful for sulfur budget and CCM validation, but you have not literally "shown" that.

P12421: If you cite the "connected discussion" in the context of the Bourassa et al. Science paper on Nabro, then the maximum injection height should go up to at least 18 km in the last line of Table 2.

P12432: To show the strong downward transport, you should show data from earlier month (March, April) as well. But if you move the second sentence in the caption to the main text (it is an interpretation and not a description of the Figure, so strictly, it should be in the main text), then you can discuss in the context of Figs. 11 and 7, where the earlier months are shown.

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