

## ***Interactive comment on “Simple measures of ozone depletion in the polar stratosphere” by R. Müller et al.***

**R. Müller et al.**

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We thank Geraint Vaughan for his comments. We have taken his and the reviewer's comments fully into consideration when revising the paper.

In the following we cite the key points made by the Editor (shown in *italics*) followed by our response. In some cases, we also cite additions to our paper made in response to the comments (shown in *slanted* letters).

*This paper presents an argument for discontinuing the practice of taking the minimum total ozone value encountered poleward of a fixed latitude during March/October as a proxy for chemical ozone destruction, as has been the practice with a number of recent assessments. It is impossible to disagree with this argument if one stops to think for more than a few seconds, and it is remarkable that such an inappropriate measure has*

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been used at all for the Arctic.

We certainly agree with this comment. And we argue that a paper published in the international literature to justify the discontinuation of its use should be helpful. However, in the revised version, our paper goes considerably beyond of making this particular point.

*The authors recommend [...] the minimum of the daily average of total ozone poleward of a fixed latitude, and claim that this quantity agrees better with more sophisticated measures [...]. However, I did not find a convincing proof that this measure is much better than the daily minimum. This is because the paper does not show a direct, simple comparison between the two measures and a more sophisticated one.*

In the revised version of the paper we now show a direct comparison of the two customarily employed measures and of the new measure we are suggesting with observed chemical ozone loss, as recommended. Indeed, this comparison shows that the new measure shows the most compact relation with chemical ozone loss.

For the relevant section of the abstract reads now: *“As an alternative to the March and October mean column polar ozone we suggest considering the minimum of daily average total ozone poleward of 63° equivalent latitude in spring (except for winters with an early vortex break-up). [...] this measure shows a reasonable correlation ( $r = -0.75$ ) with observed chemical ozone loss.”* The correlation of the other two measures is clearly lower. Further time series of our new measure convey rather different message than those of March mean polar ozone that are usually shown; we have added such a figure and the following discussion to the paper: *“a time series is shown of the spring minimum of daily average total ozone poleward of 63° equivalent latitude for March in the Arctic and October in the Antarctic. Compared to the frequently shown figure of the temporal development monthly mean total ozone poleward of 63° geographic latitude [Fig. 4-7 in WMO2007], shows a different picture [...] the time series of minimum daily average column ozone avoids the impression of an apparent “recovery” of polar ozone*

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since the late nineties that the customary monthly mean total ozone figure conveys.

... recommend removing figs 6 (which is incomprehensible anyway) and 7, and the text from lines 290-345. A much shorter paragraph, summarising the results of this section, might be acceptable,...

We have followed this recommendation. We have removed the two figures and have condensed the text in question to a short paragraph

*There is a danger with a paper like this that some people will take the result as an endorsement for using simple measures of ozone destruction, whereas the clear message for me is that they must be used with a great deal of caution and only if more sophisticated measures are not available. The abstract and conclusions should absolutely nail this point.*

We completely agree with this point. We have made sure that the entire paper and in particular abstract and conclusions “nail this point”. For example the last sentence of the abstract reads now: “*Nonetheless, simple measures of polar ozone loss must be used with caution; if possible, it is preferable to use more sophisticated measures that include additional information to disentangle the impact of transport and chemistry on ozone.*”

and the last sentence of the paper (in the conclusions) reads: “*In any event, it is always preferable to employ more sophisticated measures of chemical polar ozone loss (Harris2002, Rex2004, Tilmes2006, Lemmen2006, WMO2007) that bring in additional information to disentangle the impact of transport and chemical change on ozone.*”

All technical comments have been taken into account.

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Interactive comment on Atmos. Chem. Phys. Discuss., 7, 9829, 2007.