

## ***Interactive comment on “Why unprecedented ozone loss in the Arctic in 2011? Is it related to climatic change?” by J.-P. Pommereau et al.***

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This paper describes an analysis of SAOZ measurements and Reprabus. It is good work and should be published after some corrections.

### Major Comments

A good description of the Reprabus photochemistry and microphysics is required since that underlies some of the later discussion and there have been many changes to our understanding since 1994. For example on p316, line 17 a conclusion is made about the importance of HOx - NOx chemistry based on the Reprabus calculations. The validity of this conclusion is significantly weakened by the lack of (a) a real description of the Reprabus chemistry and microphysics, and (b) a comparison between the

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observed and modelled column NO<sub>2</sub>.

The section on the ozone loss/ PSC relationship needs refining. First, given that SAOZ measures total column ozone, how are ozone losses between 400-675K calculated? Second, given the importance of ozone loss at potential temperatures below 400K in some winters, why is 400K chosen as the lower limit? Third, what is the proposed mechanism relating sunlit VPSC with ozone loss? VPSC is an empirical proxy for activation, and sunlit vortex is an empirical proxy for ClO/ photochemistry. But they do not have to occur at the same time. Finally, given the long periods of low temperatures over a large altitude range in which extensive denitrification probably occurred (e.g. Fig 3c in Manney et al (2011)), it is not clear why the authors propose denoxification as the additional parameter. The SAOZ-based observations are consistent with the analysis in Section 5.3 of Harris et al (2010) - but without the offsetting reduction of the ozone loss at lower altitudes due to renitrification. The SAOZ measurements (Fig 9) show that the ‘column denitrification’ was similar to other years (i.e. probably zero) on Feb 1 and 15, but thereafter became progressively more of an outlier with only 2000, a winter with directly observed, extensive denitrification, anywhere close.

I do not think the shading in the figures helps. Make the lines stronger if anything.

### Minor comments

p. 312, line 7: ‘Aside’

312, 21 ‘either’

312, 22 ‘or’

313, 1 delete ‘all’

313, 2 ‘...sonde and.’

313, 11/14 This does not accurately reflect what Rex et al. say. We reported that the extreme cold winters were getting colder, but there was no trend in the warm winters.

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313, 21 ‘..winter were examined..’

314, 1 ‘..method, in which the total ozone columns. . . . Changes) are compared to the ‘passive’...’

314,24 ‘..or loss. The ozone chemical loss is diagnosed as the difference between..’

316, 25 ‘Aside’

318, 1-7 The description of the PSC evolution needs to be rewritten – as it stands it is not very clear.

320, 10 Start a new paragraph with ‘A major difference. . .’. It will make the paragraph much easier to read.

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