

Interactive comment on “Denitrification, dehydration and ozone loss during the Arctic winter 2015/2016” by Farahnaz Khosrawi et al.

Anonymous Referee #1

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Review of the paper by Khosrawi et al.

General statement: This is a fine paper on an important topic that merits publication after revision. I do have several comments for the authors, delineated below. Important ones are marked with *.

*1) The question of how denitrification and dehydration as such, versus a longer duration of cold temperatures into later parts of the spring season, have not been examined quantitatively here. The authors should therefore avoid trying to make statements about how important denitrification and dehydration were (or would be) for the ozone loss. I suggest that the authors consider this point carefully in revision. I point out one place to make a change in text but I think there could well be others.

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2) page 2, line 15. Please change 'ice' to 'water ice' here since some literature speaks of nitric acid ices. With this change, I don't think you need to say 'water ice' later in the text; doing it once is sufficient.

*3) page 2, line 27. This statement makes a lot of assumptions that I don't think are merited. First, it ignores the literature on 'denoxification', much of which suggests that denoxification later in the spring, when there is more sunlight, can be as important or more so in prolonging ozone loss provided temperatures are cold enough. Second (and related), I would argue that prolonging the ozone loss depends more on vortex stability and dynamics than it does on the degree of denitrification. Please add a discussion of these issues here, with appropriate references.

4) page 4, line 28-29. I don't think these accuracy claims are true for MLS below 100 mb. Please check.

5) page 5, line 2. Missing a word. Lowest retrieval level?

6) page 5, line 30. Reader needs a pointer ahead to indicate that you will define what you mean by 'unprecedented'. Add 'leading to unprecedented formation of ice PSCs (defined quantitatively below)'....

7) page 7, line 10. $2\text{CH}_4 + \text{H}_2\text{O}$ isn't quite total hydrogen. I don't think it matters much for your purposes, but please have a look at LeTexier et al. (QJRMS, 1988) on this.

*8) page 7, line 18, 19. Need to be more careful here. You could say something like 'The Arctic winter 2015/2016 had the greatest potential yet seen for record Arctic ozone loss if the vortex had remained stable (and temperatures had therefore remained cold) through late March'.

*9) page 9, line 30. Interesting – can you say something more about which other ClOx species are likely to be holding too much active chlorine? Cl_2O_2 ? ClONO_2 ? Also, I don't think you can rule out that the activation is at the right time but just too weak? What is your justification for ruling that out? Please clarify this here, as well as in other

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places where it is mentioned.

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Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2017-503>,
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