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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Spatial, temporal, and vertical variability of polar stratospheric ozone loss in the Arctic winters 2004/05–2009/10" *by* J. Kuttippurath et al.

Anonymous Referee #1

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General:

This paper is a valuable contribution to the ongoing effort of monitoring and characterising Arctic polar ozone loss using models and observations. The two main ingredients for the assessment presented are satellite observations from MLS and a chemistry transport model (Mimosa-Chim). The paper is fairly well written and has an interesting emphasise on interannual variability and differences of ozone loss. In addition, it tries to put the derived losses into context with earlier studies (for 2005). The paper is suitable for ACP and should be accepted after some revisions, as indicated in the detailed assessment below.

Point-by-point:

p14676, l23-24: This sentence is an oversimplification; provide more detail (see below).

p14677, l10: Not sure this is entirely true, but you should at least provide more details and explain what you are adding to the discussion.

p14678, l3-4: What does climatological H2O and CO2 mean? Not the values used or provided in ECMWF?

p14678, l20: I think the initialisation is a central point Please see comments below.

p14680, l3: Not sure what "tangibly illustrate" means. Is there anything more to it than pointing out that interannual variability is large?

p14680, l10-13: You are not talking about the different meteorological conditions clearly. You should add a little bit more about the meteorology, in conjunction with improving your vague statement at p14676,l23-24)! Please be slightly more specific! I am not talking about a long story, but a few sentences putting the years into context – you do this a little in section 4, so you could expand there and refer back to it.

p14681, l11: Diagnosing ozone loss using MLS observations and the passive tracer in the model seems to be a reasonable approach, but for my feeling you tell the story the wrong way round. First you should convince the reader that the initial condition of ozone is in good agreement with MLS observations (see p14678, l20)); than you should show how well the model does the time evolution in comparison to MLS and finally you should discuss the modelled and the observationally derived ozone loss. I feel it would be appropriate to swap figures after figure 1: first figure 4, followed by figure 2 and 3, and the structure of the text should be adapted accordingly. In addition, error sources for the estimate should be addressed more clearly: Likely the observationally derived ozone loss is to first order a chemical ozone loss, but a certain component is coming from the transport scheme. Please provide a little discussion (you only mention it in passing).

p14682, l1: The paragraph starting here should come earlier and should link closely to the discussion of the initial conditions for ozone.

p14684, l23: It is good to cite Jackson and Orsolini (2008), but the reader should be reminded what their findings were.

Section 6 (first part): I feel that the first part of the section does not add much with quite a large number of words. It would be a good strategy to shorten the section and sharpen it up - I have no strong feelings about it - but the authors should consider this suggestion.

Section 6.3: I got quite confused here: Basically you are talking about different partial column losses. Because one column has a larger vertical extent you identify this column with a total column. I don't think I agree! I would suggest you refer to all of them as partial columns (this is what they are – none of them is a column as defined by e.g. TOMS or SAOZ). This should be reflected in table 2. In table 3 many different partial columns are compared: Interestingly you have one of the largest disagreements with the study that uses the same height regime. I think some more explanation is required here. You might even consider to calculate different partial columns from your model (e.g. 380K to 580K). What is the error/uncertainty of your assessment? In addition, I would prefer a structure in which the earliest year (including the intercomparison of ozone losses) is discussed first and later years follow in order.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 14675, 2010.