

## ***Interactive comment on “The impact of mid-latitude intrusions into the polar vortex on ozone loss estimates” by J.-U. Grooß and R. Müller***

### **Anonymous Referee #2**

Received and published: 7 February 2003

#### General Remark

The paper is well written, the structure is clear and it addresses a topic of high scientific relevance. The Chemical Lagrangian Model of the Stratosphere (CLaMS) is used to examine the impact of mid-latitude intrusions on ozone losses within the Arctic vortex in January 1992. By comparing the vortex average ozone mixing ratio with an advected tracer for a period of 23 days the authors show that for the considered period the major fraction of the change in vortex ozone mixing ratio is due to the dynamically caused intrusions into the polar vortex and not due to chemical ozone loss. Furthermore a "virtual Match" simulation is performed in order to assess the impact of vortex intrusions on results of the Match method. I would recommend acceptance after considering the following comments:

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(1.) There have probably been previous attempts to validate the model in general (e.g. in former publications). This should be mentioned here in order to give the reader more confidence in the presented results.

(2.) An attempt to validate the model within the presented period should also be made. For the presented period it would be valuable to show another figure (e.g. for the 27.1.2003) that shows, e.g., a measured O<sub>3</sub> or N<sub>2</sub>O distribution.

(3.) The authors should give more background information about the unexplained stratospheric ozone loss in January, e.g. What has already been examined to solve the problem? Is there a preferred meteorological situation when a high discrepancy between the modeled and the observed ozone loss is found?

(4.) The authors cite the paper Rex et al., 2002 where the unexplained stratospheric ozone loss in cold Januarys is examined. Rex et al. 2002 summarise that the cause of the January ozone loss is unclear, but that it might be related to photolytic processes at high SZA. This should somehow be shortly picked up in the current paper.

(5.) The authors should be careful with general statements, because they are just looking at one single period (e.g.: However, from this analysis it is evident that the major fraction of the change in vortex average ozone mixing ratio... This is only true for the considered period).

(6.) Maybe also a period where the agreement between Match analysis and model is better (e.g. in a different winter) could be considered. There might be less intrusions?

#### Specific Comments:

- page 2490, line 6: This study focuses on the winter 1991/92. Why?
- page 2490, line 25: ... below the Match radius within one week.
- page 2490, line 23/24: ...estimates...estimates
- page 2491, line 24: ... ozone loss estimates. For this time...

- page 2491, line 24: ... For this time both large intrusions took place... Why do you know that? Is it the model which shows it or do you have experimental background for it?

- page 2491, line 25: ... between Match and model (Rex et al., 2002).

- page 2494, line 3: ... from this analysis it is evident that for the considered period ...

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Interactive comment on Atmos. Chem. Phys. Discuss., 2, 2489, 2002.

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