

A) General comments

The Paper of Arnone et al. is the third one with respect to the ozone depletion in the Arctic in winter/spring 2010/2011 (see Manney et al. 2011 and Sinnhuber et al. 2011). The presented data set from 1 December 2010 till 15 April 2011 is nevertheless unique (e.g. article Manney: MLS data gap from 27 March till 20 April and only a few PSC data shown; article Sinnhuber: no PSC data). As in the Manney article Arnone et al. concentrate on measured data sets and interpret these measurements in comparison to measured data during the years before, Sinnhuber et al. intercompare measured data of 2010/2011 with corresponding CTM calculations.

The main results of the three articles are the same; a long-lasting Arctic vortex in 2011 with persistent cold temperatures, an obvious denitrification of the vortex and extraordinary ozone loss in spring 2011 (something like the first "ozone hole" in the Arctic).

On the other hand there are also differences in the content of the three papers. MIPAS data are available up to the North Pole and cover therefore the vortex very well. Arnone et al. use a 2 D-retrieval which takes best into account the strong horizontal inhomogeneity of the atmosphere during polar winter. They also have determined the PSC distribution and its temporal development for the whole Arctic winter. Looking into detail of ozone loss there are also some discrepancies between the three papers which should be explained as far as possible.

Concluding the general comments, the paper of Arnone et al. deserves to be published in ACP but the authors should consider the following detailed comments and improve the paper.

B) Specific comments:1. Title of the paper

The title should be changed because total depletion of ozone may be accomplished only in atmospheric layers, if at all (see comments below)

Proposal: "Extreme ozone depletion..."

2. Sect. 2.1, page 33195

In principle, MIPAS is able to collect measurements from pole to pole. The actual tangent points depend on the time of measurements. Delete "89.3° and 87.5°" and replace it by "MIPAS to measure from pole to pole".

3. Sect. 2.2, page 33196,

"... the distance of MIPAS tangent points from their along track projection (up to 2° latitude)".
Not true e.g. in case of a tangent point at 89,3°N !

4. Sect. 3.1, page 33201:

Fig 1/2: Why are there so many small gaps in the time series of temperature and trace gas concentrations? An explanation is expected.

5. Sect. 3.3.4., page 33208:

"... 100% depletion of O₃ in a fraction of the vortex in late March and early April."

Have the authors of this paper checked this statement carefully? Sinnhuber et al. presented on 31 March 2011 a vortex minimum value of ozone of 0,3 ppmv (at about 18km altitude).

6. Sect. 4.1, page 33210:

"PSCs reaching altitudes above 30 km."

It is recommended to intercompare the MIPAS data with the results of the CALIOP-Lidar Experiment in order to confirm this new finding.

C) Technical comments

page 33193, line 11:
“... chlorine molecules are converted into...”

page 33194, line 4:
“... ranged between 25% and 35% in...”

page 33197, line 4 from bottom:
Replace “clean” by “clear” !

page 33204:
Replace “continue” by “continuous” !

page 33206, line 7:
Replace “... actual denitrification ...” by “... denitrification must have occurred previously.”

Various figures have to be improved because several curves or symbols respectively cannot be identified unambiguously:

Figure 3/4: outer and inner edge of vortex

Figure 5: vortex edges (black lines)

Figure 7: gray circles

Figure 8: gray lines