

## ***Interactive comment on “Stratospheric water vapour as tracer for vortex filamentation in the Arctic winter 2002/2003” by M. Müller et al.***

### **Anonymous Referee #1**

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This manuscript presents a few vertical profiles of H<sub>2</sub>O, O<sub>3</sub> and temperature. Filaments with lower H<sub>2</sub>O in the vortex edge region appear not to be related to dehydration by PSC sedimentation, as indicated by measured temperatures, back-trajectory calculations, and correlations with lower O<sub>3</sub> in the filaments. The authors conclude that these filaments are associated with midlatitude air and suggest that H<sub>2</sub>O can be used as a tracer of transport near the Arctic vortex.

Tracer lamination in the vortex region is common and has been demonstrated many times, and the use of H<sub>2</sub>O as a tracer is not new, e.g., Kley et al., "In situ measurements of the mixing ratio of water vapor in the stratosphere", J. Atmos. Sci., 36, 2513, 1979, and Kley et al., "On the structure and microstructure of stratospheric water vapor" in Atmospheric Water Vapor, Academic Press, 1980. This manuscript does not add significantly to our current understanding of the atmosphere, nor does it put the work

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in the context of the vast body of other work in this field.

I recommend that the native English-speaking coauthor(s) read this manuscript and make corrections. The figures also need significant work. For instance, why is H<sub>2</sub>O shown in units of mixing ratio, O<sub>3</sub> by lidar in number density, and O<sub>3</sub> by sonde in partial pressure? This manuscript does not merit publication, certainly not without an explanation by the authors of how this work adds to the work that has already been published in this area over the past several decades.

More specific comments:

Second sentence of abstract, fourth sentence of Section 2.2, third sentence of Section 4: The authors note that at altitudes above 24 km, they measured a water vapour mixing ratio of 7 ppmv, which exceeds values used in calculations of PSC formation. However, most papers (e.g., Santee et al., *J. Geophys. Res.* 103, 13,285, 1998; Tabazadeh et al., *Science* 288, 1407, 2000; Tabazadeh et al., *Science* 291, 2591, 2001; Dessler et al., *J. Geophys. Res.* 104, 13,993, 1999), including the paper the authors cite (Carslaw et al.), do not perform these calculations for altitudes that high. It's difficult to tell from Figures 1 and 2, but it looks like the water vapor measured at altitudes where one might expect to find PSCs is in the range of values used in such calculations.

Last paragraph of Section 2.2: Was there no descent between Jan 17 and Feb 11?

First sentence of Section 3.1: I suggest the authors reference Hintsä et al., *Geophys. Res. Lett.* 25, 501, 1998.

Sentence before start of Section 3.1: The MIMOSA model is mentioned without any explanation of what it is or an indication that it will be discussed later in the manuscript.

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Interactive comment on *Atmos. Chem. Phys. Discuss.*, 3, 4393, 2003.

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