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Interactive Comment

Interactive comment on "Observations of meteoritic material and implications for aerosol nucleation in the winter Arctic lower stratosphere derived from in situ particle measurements" *by* J. Curtius et al.

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This paper presents valuable observations of the volatility of particles in the lower polar stratosphere. The discussion is solid and well-referenced.

I have some suggestions for improving the clarity and extending the discussion:

- Figure 2 could be eliminated. Figure 3 shows the same data in a more useful format.

- Figure 8 would be more informative if it showed particles mg-1 rather than cm-3.

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The former is analogous to mixing ratio and is the more conserved quantity. There are systematic changes in air density with potential vorticity that make it difficult to understand what is causing the relationships shown in this figure using cm-3.

- In the discussion, the authors suggest that the fraction of nonvolatile particles is a tracer of vortex air. There is a tracer there, but should one use the fraction of nonvolatile particles or the mixing ratio of nonvolatile particles? The question is which quantity is more quantitative about mixing vortex air with low-latitude air that might contain variable numbers of new (volatile) particles from the tropical tropopause. Some critical discussion of which is the better tracer would strengthen the paper.

- To follow this, I'd like to see added to Figure 4 a separate panel showing non-volatile particles as a function of N2O.

- Figure 4a allows some rough estimates of the source strength of meteoritic smoke particles. Combining Figure 4a and Figure 5, it appears that below 200 ppbv of N2O there is a slope of about 1 particle mg-1 per ppbv of N2O. If this is representative of the stratosphere, then one could multiply this slope times the global sink of N2O to get a source strength (Murphy and Fahey, JGR, 1994). Using a stratospheric sink of N2O, the global high altitude source of non-volatile particles would be about 2e25 per year. The authors can do better calculation from their actual data than my eyeball fit. Inserting the lower limit diameter from the manuscript (26 nm) gives a lower limit global incoming meteor flux of 0.4 Gg per year, with some uncertainty due to the density of the particles. A more realistic diameter of about 80 nm for the meteoritic cores gives an annual flux of order 10 Gg per year. This is consistent with independent estimates of the global flux of meteors and is further support for the authors' contention that the non-volatile cores are meteoritic material.

Interactive comment on Atmos. Chem. Phys. Discuss., 5, 5039, 2005.