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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 describes a series of high altitude flights through the Arctic polar vortex. Particles greater than 10 nm (diameter) were measured using several low pressure condensation counters, including one with a heated inlet channel to evaporate volatile particles. Chemical tracers (N2O and CFC-11) were also measured. The particle measurements are analysed through a series of correlations - with potential temperature, chemical tracer mixing ratio, and "vortex tracer" index. The major conclusion is that

there is a source of particles from the upper stratosphere. Because these particles contain a non-volatile core, the authors conclude that these are meteoric smoke particles. There is evidence that these provide nuclei for the heterogeneous condensation of H2O and H2SO4, which in turn could have potentially important effects on ozone in the lower stratosphere inside the polar vortex.

The relative absence of these non-volatile particles outside the polar vortex also implies that most of the meteoric smoke is swept by the meridional circulation in the mesosphere to the winter pole, before descending in the vortex. One recent reference that should be discussed in the paper is Gabrielli et al., Meteoric smoke fallout over the Holocene revealed by iridium and platinum in Greenland ice, Nature, 432, 1011-1014, 2004. This study showed that the flux of meteoric smoke in Greenland snow is about 5 times larger than expected if the downward flux of meteor debris is uniform over the earth, a further illustration of the focusing effect of the meridional circulation. In order for the particles to avoid sedimenting out of the mesosphere within the 2 - 4 weeks that it takes to transport them to the polar vortex, the particles must be smaller than about 4 nm in diameter. A new meteoric smoke model presented by Gabrielli et al., which updated the seminal paper by Hunten and co-workers from 1980, shows that this should indeed be the case if the global daily input of interplanetary dust particles into the atmosphere is 50 tonnes or less. However, an interesting problem remains: will these very small particles coagulate sufficiently quickly during their descent in the vortex to reach a size greater than 10 nm (and thus be detectable) in the lower stratosphere?

The paper is a very clearly written account of an important study. It contains the level of detail required to satisfy the reader that the performance of the particle counters was carefully checked. I therefore recommend publication in ACP after consideration of the (minor) points listed below:

1. The terms meteoroid, meteor and meteoritic are quite specific. A meteoroid is a dust particle entering the atmosphere; this may produce an optical or radio signal, the meteor; and if it survives entry and reaches the ground, it becomes a meteorite. Hence,

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the use of “meteoritic” in numerous places in the paper (including the title) is not strictly correct. Refer instead to “meteoric” or “meteor” smoke particles and debris. On page 5042, l. 25, use “meteoroids”, not “meteorites”.

2. The Gabrielli et al. reference should be included.

3. page 5045, l. 2 “the present volcanically quiescent period ”.

4. page 5051, l. 24. The sentence starting “Additionally ” needs clarification. What does “temporal” mean here?

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