

Interactive comment on “Chemical analysis of refractory stratospheric aerosol particles collected within the arctic vortex and inside polar stratospheric clouds” by Martin Ebert et al.

Anonymous Referee #2

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Ebert et al. have submitted a manuscript on observations of meteoritic particles in the UTLS region of the polar vortex. While meteoritic material has long been known to be a component of the upper atmosphere and that that material must follow general stratospheric circulation downward through the vortex, these are nice observations that enhance our knowledge of this area. This paper should be published after revisions.

The major weakness of this manuscript is that the authors essentially produce a report of data with insufficient literature support or analysis. The major revisions suggested are therefore (1) to spend time supporting each statement made in the paper with literature or more work (examples follow) and (2) consider if statements, e.g. regarding rocket launch emissions, can be supported. There are too many assumptions that

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could be clarified with additional literature search and this would be a much stronger paper if more work was done supporting statements. To highlight this : In the conclusions the statement “For an unambiguous identification of distinct particle origin further research is necessary.”– the “further research” alluded to should be part of THIS paper, not a hanging statement or something to be tackled in a follow on paper.

Overall, I encourage the authors to perform a more thorough review of the literature. There are too many examples (listed below) where there is substantial work that has been done that would allow for more unambiguous statements in the paper that the authors have not referenced. This should be corrected.

Introduction Page 2, Paragraph starting “One source. . .” : Suggest that the work of Murphy et al., Science, 1998 and Murphy et al., Carbonaceous material in aerosol particles in the lower stratosphere and tropopause region, JGR, 2007 be referenced here. Murphy quantified many of the sources and their effect on the UTLS that are described here and that work predate that referenced here.

Section 4.1.3 : It seems odd that the authors discuss large silicate particles as being non-chondritic in composition and use this to dismiss a meteoritic origin. High temperature processing is known to lead to loss of more volatile materials (e.g. Mg over Si) and that residual spherules are the remains of heated but not fully ablated material (the authors should see e.g. F. J. M. Reitmeijer, G. J. Flynn, Meteorit. Planet. Sci. 35, A136 (2000)). It is therefore unclear why this assumption has been made; it should be better quantified or reconsidered. The authors should go back and read the literature in this area.

Section 4.1.8 Aluminium oxide spheres : This section would be stronger if enhanced with some of the more common references in this field. The authors references the modeling study of Jackman et al., 1998 and the size distribution of . Suggest looking at (and referencing) the more comprehensive work of Danilin, M. Y., et al., Global stratospheric effects of the alumina emissions by solid fueled rocket motors, J. Geo-

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phys. Res., 2001 and the compositional work of Cziczo et al. Composition of individual particles in the wakes of an Athena II rocket and the space shuttle, GRL, 2002. Again, there is considerable literature in this area – indeed, NASA ran an entire program on the effects of these emissions on the upper atmosphere that is not referenced – that needs to be reviewed. Also, were there rocket launches that might have led to the observations? Can the authors support their assumptions with any ancillary data e.g. back trajectories?

Regarding nucleation in PSCs : the unsupported statement that ends the paper “Thus, the observed refractory particles seem to provide a surface for heterogeneous condensation during PSC events.” is another example where there exists considerable literature (starting with the work of Biermann et al., GRL, 1996) that would make this case. Absence of citation of previous work should not occur.

Editorial comments:

There are too many subjective terms in the paper. One example is page 5 line 29 ‘very low’; please remove ‘very’ which carries no quantitation and check the manuscript for other examples. This is only one.

This manuscript would benefit from a careful editing. There are numerous areas that could be improved. One example is at line 24, page 2 (again, by no means is this the only location) : ‘Of course’ should be removed from this sentence – this is not actually a statement of the obvious - and there is no period to end. Please review carefully.

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