

## ***Interactive comment on “Aerosols in the tropical and subtropical UT/LS: in-situ measurements of submicron particle abundance and volatility” by S. Borrmann et al.***

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Review of Borrmann et al., Aerosols in the tropical and subtropical UT/LS: in-situ measurements of submicron particle abundance and volatility, submitted for publication in ACP.

This paper presents very interesting airborne (and balloon-borne) measurements of aerosols in the tropical transition layer (TTL), covering a wide span in latitudes and altitudes. By comparison with older measurements, the paper substantially widens our understanding of aerosol abundances in the tropical TTL. Of particular interest is an affirmation of the apparently persistent layer of small particles in the global tropical

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latitude belt at altitudes between 340-380 K as a source for stratospheric aerosols. Another interesting feature is the fairly homogeneous latitudinal distribution of aerosols as observed in the several flights. In addition, the paper presents very interesting observations of the fraction of non-volatile particle cores in the aerosols. The paper also points to some still unresolved gaps in our understanding, e.g. the increasing fraction of non-volatile particles at high altitudes in measurements from Australia.

The paper is very well written with a clear composition and illustrative figures. By including older measurements in comparison with the observations from the three new field campaigns from different tropical locations on the globe, the paper offers very interesting discussions, but also indicates where further research is needed.

I can therefore fully recommend the paper for publication in APC. I can offer a few comments that the authors may want to take into consideration.

p. 24600, line 27 and page 24601, line 23-24: You could give a few comments on possible different phases of the QBO between the measurements as a possible reason (or lack of so) for the differences to the Brock et al. measurements at high altitudes.

p. 24604, line 5 and line 18: You could also make reference to Khaykin et al., ACP 9, 2275-2287, 2009 (their figure 1) where all balloon flights from Niamey August 2006 showed the presence of the volcanic plume.

About the discussion of the stratospheric source particle layer in the TTL at 340-380K (page 24606, line 25-25, page 24607, line 10-13, page 24608, line 4-5). Apparently there is a vertical gradient in terms of non-volatile particle fraction ( $f$ ) upward through this layer. Is there an explanation why this layer is not homogeneous with respect to  $f$ ? I don't know if you can say much about size distributions from the COPAS measurements (?), but perhaps the balloon-borne optical particle counter measurements from Niamey could reveal if there is a gradient in size distributions, or if the MAS could tell if there are differences in optical properties (e.g. colour ratio) throughout this layer.

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p. 24607, line 17: although you show a flight leg southward out of Darwin in Fig 1, apparently reaching even further south than the Brazil flights, it appears from Fig.2 that you do not include data from this flight leg. Would data from this flight leg actually show the same feature in terms of  $f$  as seen in the Brazil flights?

Minor comments:

p. 24600, line 8: about the Geophysica contrails: is this the measurements at altitudes between 410-420 K?

Figure 10: should be made larger (and shown side by side).

p. 24591, line 1-5: as a convenience to the reader you might, with a vertical bar, indicate the upper and lower “boundary” of the TTL and the TP in the plots with vertical profiles.

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Interactive comment on Atmos. Chem. Phys. Discuss., 9, 24587, 2009.

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