Atmos. Chem. Phys. Discuss., 4, S1681–S1682, 2004
www.atmos-chem-phys.org/acpd/4/S1681/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Polar mesosphere summer echoes (PMSE): review of observations and current understanding" *by* M. Rapp and F.-J. Lübken

Anonymous Referee #2

Received and published: 2 September 2004

Referee report on the paper by Rapp and Lübken (Ms. No. ACPD-2004-0112)

General comments:

This is a very comprehensive overview paper that describes the development of our understanding of Polar Mesosphere Summer Echoes (PMSE) in detail from the first observations made in the late 1970s. The paper is well written, and structured, and gives an excellent overview of what we know about PMSE at present. The authors have treated all the main characteristics of PMSE based upon ground-based and in situ measurements. Based upon these measurements they also discuss different models that have been developed to explain PMSE as well as developing their own model based upon turbulence and the lifetime of charged ice particles in the upper mesosphere.

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Their arguments are convincing as well as the conclusions they reach. My basic conclusion is therefore that the paper is sound and should be published in Atmospheric Chemistry and Physics.

Specific comments:

At the end of Section 2.4.3, the authors claim that PMSE can solely be explained by volume scattering from electron number density irregularities and not from specular reflections from single steep gradients (e.g. at the edges of electron bite-out regions). However, I find this statement to be inconsistent with the authors' statement earlier in the paper (Section 2.3.3) where they discuss the aspect sensitivity of PMSE. In this section they say that the aspect sensitivity and also the spectral width measurements suggests that the structures in the upper part of PMSE layers are more isotropic whereas they appear to be strongly stratified in the lower part. Volume scattering does not show any aspect sensitivity, so how can this type of scattering explain all PMSE? I agree with the authors that single steep gradients cannot account for the observed PMSE, but horizontal layering of small-scale structures that may develop after turbulence has died out should also results in significant backscatter. Such structures should also be aspect sensitive, in agreement with what the authors mention in Section 2.3.3. I would appreciate if the authors could clarify this potential disagreement in the paper.

Concerning the figures, I would appreciate if the quality of Figures 1, 15 and 16 could be improved. I realize that these figures are taken from other publications, but they appear somewhat "blurred" in the present paper. That can be improved in the final version of the paper.

Interactive comment on Atmos. Chem. Phys. Discuss., 4, 4777, 2004.

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4, S1681–S1682, 2004

Interactive Comment