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Atmospheric Chemistry and Physics Discussions



# *Interactive comment on* "Small scale density variations of electrons and charged particles in the vicinity of polar mesosphere summer echoes" *by* M. Rapp et al.

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The reviewer asks an interesting question: "How can there be a strong radar reflectivity when free electrons are absent [in a bite-out]?"

A possible answer may lie in the horizontal extent of the plasma structures. A real "common volume" measurement of a radar and a rocket-borne instrument is not possible: In the present case, the diameter of the radar measurement volume is about 10 km, the diameter of the rocket instrument is about 10 cm. Hence, if electron bite-outs occur in patches of a few kilometres horizontal extent, they may be passed by a rocket payload while filling only a fraction of the radar volume. In this case, the rocket would see an electron bite-out while the radar receives a PMSE signal from the remaining



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volume.

What is the horizontal patchiness of electron bite-outs? It can be expected to be controlled by the horizontal patchiness of the ice particle population. If typical Kelvin-Helmholtz structures of noctilucent clouds are representative for this patchniness, then horizontal structures of a few kilometres can indeed be expected.

Therefore, some important questions to be answered by future PMSE research: What is the patchiness (both spatial and temporal) of turbulent activity? And what is the patchiness (both spatial and temporal) of electron bite-outs?

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Interactive comment on Atmos. Chem. Phys. Discuss., 3, 3469, 2003.