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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Observations of in-situ generated gravity waves during a stratospheric temperature enhancement (STE) event" *by* A. J. Gerrard et al.

Anonymous Referee #1

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Main Review Points

This manuscript reports lidar measurements of temperature and density over Sondrestrom, Greenland where waves are found to occur simultaneously and above a stratospheric temperature enhancement (STE). Based on previous modeling results (Fairlie et al 1990) it is assumed that these waves are gravity waves. The dispersion relation is used to obtain possible horizontal wavelengths from the available frequency and vertical wavelength. One possible horizontal wave number would imply downward group propagation. It is speculated that this might be physical, with the waves having been emitted from the lower mesosphere.

While these might really be the first measurements of gravity waves emitted from an STE, I find the paper does not provide strong evidence for this. A simultaneous analysis of wind fields would be informative, and hopefully demonstrate that the polarization relations are fulfilled. It is obvious that the lidar cannot provide more information in this regard, but what about analysis data or a regional simulation? If the authors cannot provide such additional support, they should rather admit the speculative nature of their interpretations. Also, why should the downward propagating solution be physical? What evidence is there beyond a somewhat indistinct allusion to baroclinic processes above an STE?

In the analysis of the dispersion relation I am missing some information. 1. What dispersion relation is used (equation)? 2. Has the Coriolis effect been taken into account? Since the ratio between horizontal and vertical wavelengths of the identified waves is large, inertia should be taken into account. 3. How have the roots of the fourth-order equation been determined? 4. How have the group velocities been determined, and what results has one obtained in this regard? 5. It is assumed that the waves are aligned with the wind, without strong reasoning. What results would one get if one assumed propagation in the horizontal at angle 30°, 60°, 90°, . . .?

Minor Review Points

None

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 14221, 2011.