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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Observation of a mesospheric front in a dual duct over King George Island, Antarctica" *by* J. V. Bageston et al.

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Overall, this paper identifies an interesting wave event, and is well written. It can be improved with minor revisions and corrections, both to the text and presentation of figures. Listed below are some comments and questions:

It is suggested that the wave likely propagated in a "dual duct". I agree with other reviewers that this term should be carefully defined to prevent confusion. I first interpreted this to mean that the wave was propagating in a region where Thermal and Doppler ducts existed at two separate altitudes. In the context of this manuscript draft, "dual duct" appears to refer to a duct where Thermal and Doppler effects play some role in shaping the duct, which is a typical case for the MLT region (as stability and winds vary significantly with altitude).

Here it appears that a dominant cause of trapping may be the temperature / stability profile... In Figure 5d, for example, some trapping must occur since the stability goes to zero around 82 and 91 km. It is made clear that the winds also influence the shape of the duct. But would the winds alone be strong enough to produce an effective Doppler duct? If it is true that the winds could not have produced a duct, then it might be more appropriate to call this something like Thermal-Doppler ducting, since both effects contribute, but thermal trapping may dominate, and winds alone may have been insufficient to trap the waves. A way to clarify this might be to include an additional profile in Figure 5a, calculating mˆ2 using the observed winds but with Nˆ2 set constant at the average value seen within the range of $\sim$83-90 km.

As minor comments:

Is it possible to adjust the contrast of the wave in the airglow images on Fig.1? This looks like a reasonably clear event, but it does not appear well when printed.

In figure 5, "Backgroudn" should be changed to "Background".

Like the anonymous reviewer, I might be cautious calling this a "bore", since actual wave amplitude and structure hasn't been clearly determined – Nevertheless, it is certainly a moderately strong ducted wave event that exhibits front-like character.

One reference that might be of interest is Snively et al. [2007], where Doppler-ducting within a tidal wind field is considered for a front-like ducted wave event. In this case, Doppler ducting is alone sufficient to trap the wave, although it is still possible that a contributing thermal duct (via an inversion layer) may have existed at the time of observation:

Snively, J. B., V. P. Pasko, M. J. Taylor, and W. K. Hocking (2007), Doppler ducting of short-period gravity waves by midlatitude tidal wind structure, J. Geophys. Res., 112, A03304, doi:10.1029/2006JA011895.

Another reference that might be of interest (but that is probably less relevant to the

current paper) is Simkhada et al. [2009], where a study similar to Isler et al. [1997] was completed in conjunction with numerical modeling examples of waves in measured wind fields:

Simkhada, D. B., Snively, J. B., Taylor, M. J., and Franke, S. J.: Analysis and modeling of ducted and evanescent gravity waves observed in the Hawaiian airglow, Ann. Geophys., 27, 3213-3224, doi:10.5194/angeo-27-3213-2009, 2009.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 16185, 2011.