Atmos. Chem. Phys. Discuss., 11, C8451–C8453, 2011
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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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Received and published: 1 September 2011

General comments

- On Pg. C6849

REPLY: The authors thank the referee for understanding the limitations in this work, for his recognition on our effort with the available dataset, and his favorable opinion for publication.

- On Pg. C6849: Referee's question: Impact of this paper on the field?

REPLY: Although the referee recognizes the job done and agrees that this paper should be published, he remains with a question regarding the impact of the present paper.

Also, the referee pointed out motivation from this paper for future study with atmospheric conditions close to the ideal. We should emphasize here that the imposed limitations did not compromise the main results, mainly because it is difficult to obtain temperature profiles from satellite over the observatory simultaneously with rare events like the bore reported in this work, and on the other hand the usage of the winds observed above Rothera Station was well justified in this paper. In future works we will be benefited from local wind measurements, since we have a meteor radar operating at Ferraz since last year.

The impact of this paper on the field is obvious since for the first time are suggested observational evidences of both tidal winds and temperature influences (nearly simultaneous) in the duct configurations for mesospheric fronts (like bore and wall events) that propagate at the airglow layers height.

Specific points

- On Pg. C6850

1) The referee remains unconvinced that the reported event is a bore.

REPLY: We believe that with the new Figure 1 and the discussions regarding this figure in the paper will convince the referee, and we don't think that will be necessary to show cross sections of the image to show the sharp discontinuity that now is evident mainly in the first two images in Figure 1.

1.1) Referee's question: Why is this Antarctic event a bore?

REPLY: This event appears to be a bore mainly because: 1) it was seen a sharp front that is maintained while the event propagates; 2) it was seen the growth in the number of crests behind the main front; 3) the event is supported by a duct, and the observed wave parameters (mainly its phase velocity) are in agreement with bore's characteristics (Dewan and Picard, 1998). These three points are stressed in the new version of the paper. Also, a dominant leading maximum larger than successive peaks

is not a requirement for mesospheric bore events (Laughman et al. 2011).

References:

Dewan, E. and Picard, R.: Mesospheric bores, J. Geophys. Res., 103, 6295–6305, 1998. Laughman, B., Fritts,D. C., and Werne, J.: Comparisons of predicted bore evolutions by the Benjamin-Davis-Ono and Navier-Stokes equations for idealized mesopause thermal ducts, J. Geophys. Res., 116, D02120, 405 doi:1029/2010JD014409, 2011.

2) “Perhaps they could do a search to see if the presence of a duct in SABER and MF radar data is unusual or not. That would help determine the significance of the duct.”

REPLY: The presence of temperature inversions in SABER temperature data at high latitudes is likely, but has not been widely reported, despite the frequent occurrences at lower latitudes. Given the apparently ubiquitous occurrence of inversions (and velocity ducts), we believe the more important factor in observing a bore event is its characterization and the presence of a source, that in this case could be away from the observatory.

References:

Nielsen, K. Climatology and case studies of mesospheric gravity waves observed at polar latitudes. PhD thesis in Physics - Utah State University, Logan, 2007.

Fechine, J., Wrasse, C.M., Takahashi, H., Medeiros, A.F., Batista, P.P., Clemesha, B.R., Lima,L.M., Fritts, D., Laughman, B., Taylor, M.J., Pautet, P.D., Mlynczak, M.G., and Russell III, J.M.: First observation of an undular mesospheric bore in a Doppler duct, Ann. Geophys., 27, 1399-1406, doi:10.5194/angeo-27-1399-2009, 2009.

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