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Comment

## ***Interactive comment on “Planetary wave activity in the Arctic and Antarctic lower stratospheres during 2007 and 2008” by S. P. Alexander and M. G. Shepherd***

**S. P. Alexander and M. G. Shepherd**

simon.alexander@aad.gov.au

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Reply to Referee 1

We appreciate the Referee’s helpful comments and suggestions on the original manuscript and in particular those concerning the approach employed for the spectral decomposition of the planetary waves. While there is no definitive proof as to which method yields more correct results we agree that using a combination of least mean square fitting to the observational data for separating discrete wave periods together with the Hayashi-type algorithm might not have been the best solution. For COSMIC satellite observations, where there is almost a full range of local time sampling

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on a given day and latitude, we have demonstrated that both PW spectral decomposition schemes can be successfully employed yielding very similar results (compare with Shepherd & Tsuda (2008)). However, for consistency in the approach used in the revised manuscript we have now followed the Referee's suggestions considering the wavelet spectra of all of the eastward and westward travelling waves, rather than using the linear least squares method for separating discrete wave periods as done previously. In addition, we have also expanded our study to include stationary wave spectra, which were calculated using the method suggested by the Referee. The manuscript is being substantially reworked to accommodate these changes.

We have removed those paragraphs of the manuscript which dealt with extraction of waves with discrete periods and rewritten the manuscript to account for this removal. In the process Figures 11 – 13 became obsolete and have been removed. We have also used the opportunity to revise the other figures in an attempt to make them clearer and more informative.

We have also taken advantage of the recent availability of COSMIC data from the boreal winter of 2008-09 to include a discussion on wave activity during that year's major sudden stratospheric warming. In our opinion, the inclusion of this winter strengthens the results presented in the manuscript and allows comparison of wave activity across three boreal winters during which time the background state of the atmosphere varied markedly.

2) Minor comments:

a) & b) Covered by the comments above and also not relevant to the revised manuscript where linear least squares fitting is not used.

c) Results on the vertical structure of the stratosphere throughout the 10-40 km range as seen by COSMIC were available at the time of the submission of the original manuscript. However, as we had a different idea about which results to include, some of the earlier variability-with-height results were not considered further. We are

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now placing significantly more emphasis on the vertical structure of planetary waves throughout the manuscript, which can be examined in detail with COSMIC data. In particular, the detailed time-height variability in eastward, westward (in the Northern Hemisphere) and stationary waves are shown and discussed in detail.

With these changes in mind we hope the Referee will find the new results interesting and the corrections satisfactory for a publication.

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Interactive comment on Atmos. Chem. Phys. Discuss., 9, 14601, 2009.

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