

Interactive
Comment

Interactive comment on “Large-scale planetary disturbances in stratospheric temperature at high-latitudes in the Southern Summer Hemisphere” by M. G. Shepherd and T. Tsuda

Anonymous Referee #2

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This manuscript has well-defined objectives: (i) by using the GPS COSMIC temperature data the authors demonstrate the ability of this data set to provide useful information for studying the large-scale planetary disturbances in the high-latitude stratosphere, and (ii) to show that usually accepted quiet Antarctic summer stratosphere is actually dynamically active; the authors note that the found eastward propagating waves with zonal wavenumbers 1 and 2 and periods ~ 10 , 16 and 23 days, as well as the zonally symmetric waves with the same periods are more consistent with late winter and spring conditions. The topic of the manuscript is very interesting and important for understanding the basic features of the dynamical and thermal regime of the high-latitude Southern Hemisphere (SH) stratosphere and in this way it is suitable for

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publication in the journal. The problem is presented clearly and concisely written; the standard of English is very good. The authors use different approaches to investigate the structure of the large-scale temperature disturbances. For a preliminary diagnostic they use a 40° -binning in longitude of the data and Hovmöller diagrams to consider the predominant zonal structure of the planetary-scale temperature disturbances. To extract from the data the main planetary waves with zonal wavenumbers from -3 to 3 the authors use a 15° -binning in longitude and 2-D (time-longitude) least-square fitting method. In this way the main features of the planetary waves with periods ~ 10 , 16 and 23 days at altitude of 30 km and observed between 1 December 2006 and 1 March 2007 in the high-latitude SH are obtained and discussed in detail. The principal results are presented clearly in the abstract and it can be understood without reading the paper first. All figures are of good quality and the captions give appropriate information. The manuscript makes suitable reference to previous work.

Therefore, I recommend this manuscript for publication however after minor to moderate revision. I have a general and a couple of specific comments below for their consideration.

General comment:

- It has been mentioned by the authors that the GPS COSMIC temperature data provide information for altitude range between 10 and 40 km at each kilometre and for latitudes between 55°S and 80°S . Therefore, I do not understand well why the authors miss the opportunity to study the spatial (altitude and latitude) structure of the considered in the paper planetary waves.

Specific comments:

- In order to clarify not only the predominant periods but also the zonal structures (direction of propagation and zonal wavenumber) of the planetary waves it would

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- be better the 2D Lomb-Scargle periodogram analysis instead of dynamic Lomb-Scargle periodogram analysis (whose results are shown in Fig. 4) to be utilized.
- How the 30-day peak seen at the LS periodogram could be related to the length of the used time segment (p. 16420 – 15)
 - The authors may like to clarify the situation regarding the absence of a truncation term in (1) (p.16417 – 20).
 - The zonally symmetric waves rapidly amplify after day number 370 when the SPW1 and the zonally travelling planetary waves have modest or even small amplitudes (Fig. 6); does this situation support the coupling mechanism between the SPWs and the travelling waves in generating the zonally symmetric waves?
 - Please, clarify what you mean suggesting that the results for the 16- and 23-day zonally symmetric waves shown in Fig. 6b “might be presenting the same oscillation” (p. 16421 – 25).
 - What about the errors of the derived planetary waves; some amplitudes have magnitudes less than 0.3 K (Fig. 6)?
 - Please, note that for altitudes below 20 hPa pressure level and during the period of time considered in the manuscript the zonal mean zonal wind over the equator was eastward (please, see Fig. 1 from the recently published paper by Wu et al., *J. Geophys. Res.*, v. 113, A05308, 2008) – (p. 16427 – 4).
 - Please, remove from the abstract “from 10 to 40 km altitude” because the planetary waves only at 30 km height are investigated.

Interactive comment on *Atmos. Chem. Phys. Discuss.*, 8, 16409, 2008.

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