Atmos. Chem. Phys. Discuss., 13, C2105–C2109, 2013
www.atmos-chem-phys-discuss.net/13/C2105/2013/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Mean winds, SAO and QBO in the stratosphere, mesosphere and lower thermosphere over Ascension Island (8deg; S 14deg; W)" *by* K. A. Day and N. J. Mitchell

Anonymous Referee #2

Received and published: 7 May 2013

Review of Mean winds, SAO and QBO in the stratosphere, mesosphere and lower thermosphere over Ascension Island (8 S 14 W) by K. A. Day1,2 and N. J. Mitchell1

The paper reports 10 years of meteor radar data taken at a tropical station. A 'climatology' of zonal and meridional wind in the mesospause region for this station is presented and compared with the empirical HWM-07 model. Strong easterlies in early 2002 are explained through a specific QBO phasing allowing large flux of gravity waves with westward phase speed to reach the mesosphere.

Major comments:

Whereas the topic is appropriate and the data set presented can very valuable as only

few long-term horizontal wind observations are available for the tropical mesopause region, the paper lacks an adaquate analysis of the data, in my opinion. On the one hand, the climatology and the differences to the empirical model could be analysed more thoroughly. (Quantitative) comparisons with other data sets or model results could bring the data record in a meaningful context. The fact, that the HWM-07 model shows a quite different seasonal cycle of the meridional wind, is just mentioned but reasons are not further discussed. On the other hand, the analysis of the year 2002 with its exceptional strong easterlies does not go beyond the analysis already presented by Garcia et al. (1997) and the paper in that respect just adds another example of the suggested connection of QBO and mesospheric SAO features.

In addition, the paper is too often not accurate in its statements. For example, the altitude range of the radar data is described to be 80 to 100 km, but the altitude range shown is 82 – 96 km. Or in the abstract the maximum easterlies have -75 m/s, then on page 6786 they have maximum of – 70 m/s, and in Fig. 7 a maximum value of -90 m/s is shown. Quite similar, often sentences like 'it was shown' are used without a reference is given.

In summary, I cannot recommend the paper for publication in its present form.

Specific comments:

Title:

The title strongly goes beyond what is really shown and discussed in the paper. There are just original data of the mesopause region, QBO data are taken from the FUBerlin website, and for the middle stratosphere and lower mesosphere data are not shown nor discussed

Section Introduction:

The introduction motivates for a different paper than exposed in the abstract. From the beginning, it focusses on wave coupling processes in the equatorial mesosphere which

in the course of the paper is discussed only in the special case of 2002. Therefore some of the text of the introduction could be transferred to the discussion section, or, as an alternative, the paper could be rewritten with the special focus on the QBO-SAO coupling.

P6782L4: do you mean equatorial mesosphere?

P6782L9: dominated seems too strong for the SQBO (see Fig. 2)

P6782L10: give reference

P6782L25: Pena-Ortiz et al. observe a change in altitude of the MSAO, not in the strength.

P6782L28: you present only observations of winds in the mesospause region. Please rewrite paragraph

Section Data Analysis

That's not really data analysis but an (incomplete) description of the observations record and observation technique. What is the number of observations per day within an altitude interval? What is the error of the measurement? Is there any further signal processing applied? The Singapore winds are not part of your observations, and can be referenced in the discussion section of the paper.

Fig. 1: what is shown on the y-axis? It seems not to be just daily observations. The figure title is misleading too, as the green bars are not the gaps.

Section results:

The term 'results' implies some specific analysis technique described in foregoing section. Perhaps some part of this section can be combined with the previous section, whereas section 3.2 and 3.3 can be part of the discussion section. This would also avoid too much repetition in the two sections.

Section 3.1

P6784L5: what do you mean with low frequency? Why do you apply low pass filtering?

P6784L6: please give a reference and a short characterization of the method.

P6784L10: What is the significance of the corresponding signals in Fig. 2? Is it possible to make the spectral analysis altitude dependent? If you want to look for QBO signatures is the the method best suited for that purpose?

P6785L6: do you observe mass flux, or do you mean just the wind speed?

P6785L16: I cannot really find a complete discussion of meridional and zonal wind inter-annual variability in 3.3

P6786L11: please note thats just for the zonal wind

P6785L18: only the absolute value would be increased

Section 3.3

In the paragraph the essentially same procedure is applied and comes to the same conclusions as presented in Garcia et al. 1997. Please give reference and shorten! Is Fig. 8 and 9 really needed? This section misses a critical discussion of the robustness of the results! How does the minimum amplitude depend on the altitude range selected (25 – 30 km), why the winds below and above play no role in your analysis; are Singapore winds adequate for your site, or what would change when applying local winds from analyses. What about short term effects? Are there any indications of enhanced GW or PW activity in the data?

Fig. 6: Please give the reference in the caption here..

P6788L19: Here I cannot follow. Please describe in detail any analysis according Baldwin which is applied.

Fig.7: here another low pass filter is applied; really 15 months??

Section Discussion

As proposed before, sections 3.2, 3.3 and discussions could be combined.

Typos: pL22: Horizontal winds are calculated for each height gate is observed

p6793l14: The zonal winds in the model were similar but more eastward than the observed atmosphere.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 6779, 2013.