Dear Editor and referees,

Thank you for the various comments on our paper. We have made significant changes to the paper as a result of comments from both referees and believe it is much improved as a result.

Please note that the paper has changed significantly from the pre-Discussions version, mainly because of the suggestions of Referee 1. In particular, we have removed the results relating to observations of temperatures made by Aura MLS and re-focussed the paper on i) determination of mean winds in the mesosphere and lower thermosphere over Ascension Island and ii) the coupling of the SQBO and MSAO.

Response to Referee #1

Thank you for reading the paper and the many helpful suggestions. We have considered addressed them all.

Specific Comments (page number, line)

(6780, 18) A reference has not been added to at the Abstract as it is not best practice in the Abstract. However, the first time it is mentioned after the Abstract a reference has been added. Further, the qualifier "empirical" has been added before "model" as suggested as it does clarify the model.

(6781, 8) There is such a thing as a mesospheric QBO, but it is not the main focus of the paper and we are only giving it as an example of phenomena in the atmosphere as with Kelvin waves and ISO's. We agree that is should not be a focus and this part of the paper has been thinned to make it clear that we are not focusing on the MQBO, Kelvin waves, ISO's etc.

(6781, 24) The title of the paper has been corrected, it was transferred wrong in the copying of the bibtex, sorry for this mistake.

(6782, 2) We agree and this has been removed.

(6782, 12) We agree it is not only plausible to occur in the first westward phase, but this is the only time when the conditions have been favourable. A paragraph commenting on the required conditions and reference have been added to explain this further.

(6782, 17) We agree and changes have been made to address this.

(6783, 3) Reference and additional text added as suggested.

(6784, 12) Agree, the figure has been changed and now focuses on 60-500 days. The text has been changed to reflect this and as the MQBO is not a focus of the paper comments on it have been removed.

(6784, 14) Statistical analysis of the peak boarding has been added to the text to support our statement.

(6785, 3) We agree and this has been rewritten.

(6783, 23) In all cases months and not seasons have been used throughout the paper to make it clear to the reader.

(6786, 3) Agree as stated above (months are specified).

(6786, 15) We agree, the text and the figure have been changed accordingly.

(6786, 17) This has been removed in the rewrite.

(6787, 10) Agree as stated above (months are specified).

(6787, 12) Changed as suggested.

(6787, 27) Agree as stated above (months are specified).

(6788, 9) We agree as discussed above and thus we have changed the text to reflect this.

(6788, 25) We agree this was not described above and the text has been changed for clarity.

(6789, 1) Agree and the caption changed.

(6789, 18) Agree and figure and text have been removed as it does not add to the paper.

(6789, 25) Not applicable and removed.

(6790, 1) Text has been added to explain this fully as suggested.

(6790, 8) The text has been changed and additional explanation added to the text.

(6790, 10) Agree and this has been moved.

(6791, 5) Sentence rewritten to clarify.

(6791, 14) Changed accordingly.

(6791, 21) We agree and the text has been changed to reflect this.

(6792, 11) This paragraph has been rewritten.

(6792, 18) Agree and changed.

(6793, 1) Removed as agreed that it does not add to the paper.

(6793, 17) “first” has removed and this has been rewritten.

(6793, 18) Agree and rewritten.

(6793, 20) This has been reworded.

(6793, 22) We agree and stated above it is no longer referred to as the first westward phase.

Response to Short Comments

1 A comment has been added to the paper to address this important issue of the year 2004 seeming as it could be a possible candidate for the apparent modulation. It has been explained that the atmosphere does not appear to meet all of the conditions required and that the gravity-waves are in fact filtered by the Stratosphere.

2 and 3 are beyond the scope of this paper and with the lead author no longer working at the initial institution the availability of data and time is greatly reduced for more new analysis to be added to this paper. However, we do feel that is a very useful suggestion for a follow-on paper for the group at the institution.

Response to Referee #2
Thank you for your useful comments for improving the paper, we have address each as follows:

Major Comments:
When comparing the radar wind climatology data with that of HWM-07 we have added more quantitative values to enhance the comparison. A paragraph has been added on quantitative analysis. The differences between the observations by the radar and those predicted by the model have been considered. The meridional winds were a particular focus as they were dramatically different.

The reviewer questions whether our study of the 2002 mesospheric zonal wind event goes “beyond” that of Garcia et al. (1997). We respond that these rare events are of such a dramatic and unusual nature that reporting and investigating them in itself has scientific value and the event we report in 2002 was obviously not available for investigation by Garcia et al. (1997). Further, we have demonstrated that our observations provide strong support for the proposal of Garcia et al. that the mechanism producing such events is a particular phasing of the SQBO that allows gravity waves of westward phase speeds to reach the upper mesosphere where their dissipation results in the anomalous observed westward winds. We feel that this additional support for a proposed

mechanism whereby the QBO and MSAO are coupled is also of scientific value.NICK

We agree, the text has been rewritten and any inconsistencies of values have been addressed.

Specific Comments:
Title changed to:
Mean winds in the MLT, the SQBO and MSAO over Ascension Island (8degS, 14degW)

Introduction.
This has been changed to give greater emphases to the climatology part of the paper and a special focus on the QBO-SAO coupling as suggested.

P6782L4: Yes, this has been added to the text. It should have read “equatorial mesosphere”.

P6782L9: This has been changed as we agree dominated is too strong a term in hindsight. Changed to “strongly influenced”

P6782L10: The following reference of Garcia et al 1997 has been added and values changed from 40:20 to 80:40.

P6782L25: We agree that they did they observed a change in the thickness/altitude of the MSAO, but they also noted a change in strength.

P6782L28: We agree and this has been clarified.

Data Analysis.

It is agreed that Data Analysis is not the correct name for this section and it has been changed to observations and only describes the observations used in the paper. The Singapore winds information has been moved to the results section.

Figure 1 has been improved to explain the y-axis.

Results.
In light of other changes made to the paper we feel that the results from the analysis of the data should stay in this section thus we have not moved them.

Section 3.1
P6784L5: The term low-frequency and the reason for the filter has been explained.

P6784L6: The low-pass limit has been specified (a 60-days frequency cut-off).

P6784L10: The text has been changed to include more detail of the significance of the signals. The spectral analysis is altitude dependent, it is at 90 km over AI.

We agree and are no longer looking for a QBO signature in the mesosphere so this aspect has been removed from the paper.

P6785L6: Yes, we observe winds, this has been highlighted in the paper by the removal of the word flow and replacing it with winds.

P6785L16: Now 3.2

P6786L11 and P6785L18: Are no longer applicable as the text has been changed in light of the comments of Referee #1.

Section 3.3 (now 3.2)

We agree and have edited the text as advised.
We agree and figure 8 has been removed.
The text has been rewritten to explain the significance of the 25-30 km height range. From Balwin 2001 the minimum amplitude depends on the 25-30 km height range were SQBO has the greatest amplitude. The winds above and below are not included in the analysis as from Fig. 30 of Baldwin 2001 the winds decay very rapidly above and below the height 27 km. Singapore winds have been used as we are considering the role of the equatorial QBO.
When we investigated the GW and planetary waves in a prelim study we found that the activity had little influence and thus was not a focus of this study. However, they could be investigated in a follow on study, but it is felt that is beyond the scope of this paper and would not add to the paper.

Figure 6: We agree and a reference has been added to the caption: (http://www.cdc.noaa.gov/data/correlation/qbo.data).

P6788L19: We agree and this has been rewritten.

Figure 7. We agree the low pass filter not 15 months as in the text, it is a 60-day, we have changed text.

Discussion.
Section 3.2 and 3.3 have not been combined as 3.1 and 3.2 were combined as they focused on the climatological winds and 3.3 focused on the SQBO and MSAO interaction observed in 2002. Therefore we have not moved them into the discussion.

Typo corrected.

Thank you all for your time and support.

Regards,

Kerry Day