

Atmos. Meas. Tech. Discuss., 5, C1428–C1431, 2012

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AMTD

5, C1428–C1431, 2012

Interactive
Comment

***Interactive comment on* “Combined wind measurements by two different lidar instruments in the Arctic middle atmosphere” by J. Hildebrand et al.**

Anonymous Referee #1

Received and published: 29 June 2012

Review of Hildebrand et al. June 2012 submission to Atmos. Meas. Tech. entitled “Combined wind measurements by two different lidar instruments in the Arctic middle atmosphere”:

Summary

This paper is a follow-up to a 2010 paper by Baumgarten describing the ALOMAR Rayleigh-Mie-Raman-Doppler (RMR) lidar for stratosphere and mesosphere wind measurements. In this paper, the utility of the RMR lidar for the study of middle-atmospheric wave phenomena, and connecting to measurements at higher altitude by the co-

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located Na resonance lidar are described. Wind measurements are compared in the narrow overlap region between ca. 80 and 85 km. The importance of common volume for such measurements is emphasized and reasonably demonstrated.

This is an important paper introducing the utility of a recently-developed Doppler capability for middle atmospheric wind measurements using the DoRIS filter. It shows some measurements that, to the best of my knowledge, have not been achieved before. I am particularly pleased about the techniques developed to fine-tune the calibration of the DoRIS filter. Having worked with this type of measurement before, I can say that prior measurements have often swept many things under the table inappropriately, and Hildebrand et al. have found ways to account for them.

I have no major modifications to recommend in order for this paper to be published, although I do have some suggestions. These follow ...

Abstract

I would reiterate the time averaging of 1-h when you discuss wind inhomogeneities of 20 m/s at 55 km altitude.

1. Introduction

Line 7, you should include Tepley, 1994 for Rayleigh lidar wind measurements to (or above) the stratopause.

Tepley, C. A. (1994), Neutral winds of the middle atmosphere observed at Arecibo using a Doppler Rayleigh lidar, *J. Geophys. Res.*, 99(D12), 25,781–25,790, doi:10.1029/94JD02213.

2. Instruments

Page 4, line 22 change "is" to "are"

Page 6-7, The Na lidar is not the main concern of your paper, but I wonder about this system for which the laser beam divergence is slightly greater than the field of view.

This opens the possibility of biases caused by slight misalignments. Is this something that has been resolved, and perhaps is there a publication the authors can point to explaining it so as to alleviate the concern?

On page 4, line 17 the authors refer to a ratio of differential frequency to frequency, while on page 7, line 13 they refer to the ratio of differential velocity to velocity. It is an unfortunate coincidence that the symbol for the Greek letter nu and that for velocity v are nearly identical. Perhaps one or the other can be changed to a secondary, but still appropriate variable so as to avoid the confusion?

3. Database and analysis

Page 7 Line 16, 33 ms should be 33 s

4. Results

There are several areas where the use of English can cause minor confusion. I have not recommended changes to this point, but the third paragraph of this section, on page 9, could stand to have clearer writing.

Page 10, the authors introduce ECMWF without explanation. It is only explained what the initials mean and what it is in the acknowledgements. This should be done in the paper text. I was confused until reading the acknowledgements, as the authors assume here that the lidar measurements are correct while ECMWF is an estimate. Once I understood that ECMWF is a model, it became clearer. I understand that it is an obvious assumption that ECMWF is a model (how else to you get wind data above the stratopause?), but it is perhaps unfair to your readers to ask them to make that assumption.

Page 10, I am not certain the paragraph between lines 20 and 24 is needed. However, should you decide to keep it, change the word "this" to "that" on line 24.

Page 11, line 3 change "were" to "where"

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Page 12, line 20, a better word than "wrong" is indicated. It seems to me that "inaccurate" is more accurate.

Page 14, line 14 the equation appears to be wrong. Do you not want to multiply 'a' to the exponential?

Page 14, line 17 "we conclude" sounds very convinced in your belief in your explanation. This may be too strong. I would suggest "we may conclude" or "we conjecture".

Page 17, The downward phase progressions at 96 to 87 and 109 to 95 km appear to be wavefronts of a semidiurnal tide (at least by period). There is the issue of the short wavelength to consider. Perhaps here the authors are being overly cautious not considering this dichotomy?

5. Conclusions

Page 17, the potential inhomogeneity of the wind field is worthy of a follow-up study. If the authors are already working on this, perhaps it should be mentioned.

Page 18, line 1, change "looses" to "loses"

Page 18, line 7, "the extend of" is incorrect. You could say "the extent of", but it might be better to simply remove that phrase. It will not change the meaning of the sentence.

Page 18, line 9: "the sounding volumes must be of comparable size" ... This seems to contradict the text starting on line 5 of page 7, which states: "... the fields of view have diameters of about 15 m and 33 m ... Since they are slightly tilted against each other their centers are separated by 50 m. These distances are covered by air motion in a few seconds, which is much shorter than the integration times of both lidars ... For this reason it is appropriate to state that both lidars sound in a common volume."

Interactive comment on Atmos. Meas. Tech. Discuss., 5, 4123, 2012.

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