Atmos. Meas. Tech. Discuss., 2, C11–C14, 2009
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Atmospheric Measurement Techniques Discussions

Interactive comment on "New perspectives on gravity wave remote sensing by spaceborne infrared limb imaging" *by* P. Preusse et al.

Anonymous Referee #2

Received and published: 26 March 2009

General remarks

The article aims at demonstrating the ability of a spaceborne infrared limb imaging (ILI) sensor in quantifying gravity-wave momentum fluxes in the middle atmosphere. As stressed in the article, such observations are particularly important, as gravity waves (GW) are parametrized in most of atmospheric general circulation models (GCM) and the existing parameterizations rely on very few observations. Such an instrument would therefore provide unprecedented measurements on the activity of GW at global scale. The article first presents the state-of-the-art method for diagnosing GW momentum fluxes from space (that are used with "classical" limb sounder observations), as well as the errors and limitations associated with this method. This part of the article is very

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clearly written and reviews in a very concise and synthetic way these techniques. The various advantages of an ILI with respect to previous spaceborne instruments are then presented and illustrated on a very appealing example.
The various utilizations that could be made of ILI observations are described in part 3. Details on the improvements brought by an ILI sensor with respect to other techniques are given.
The last part of the article direclty comapres the available techniques for diagnosing GW momentum fluxes, and insists on the unique advantages of the proposed ILI.
The article is generally well written, and certainly of high value for the scientific communauty involved in the observations of gravity waves. I therefore strongly support its publication. I have nevertheless a few minor remarks (detailed below) that I would like to be taken into account by the authors.

Minor remarks

- p827, l6: Although I think I have understood it, the sentence is not very clear and should be rephrased.
- p829, equation (1): these are actually the pseudomomentum fluxes. In my mind, pseudomomentum fluxes appear in Transformed Eulerian Mean equations (and are important to diagnose the net impact of GWs on the mean flow), but only momentum fluxes are prescribed in GCMs.
- p831, l3: delete "with"
- p832, l6: I do not totally agree with the fact that GWs are primarily zonally propagating: for instance, convective sources that are expected to be very important in the tropics (and for which an ILI could provide very useful observations) tend to produce waves propagating in an almost isotropic way out of the clouds.

AMTD
2, C11–C14, 2009

- l16: I would like further precisions on the sensitivity diagram shown in Figure 2a: is it obtained by assuming a wave direction of propagation (as in the example) or is it obtained with a set of randomly oriented waves ? More generally, the authors should stress whether the wave orientation with respect to the instrument LOS is an important factor in the instrument obervational filter.
- p833, l5: I have the same question than above on this sensitivy diagram.
- l11 and 12: Can one really always estimate the horizontal wavelength from the across-track dimension ? For instance, what happens if:
  - the wave direction of propagation is parallel to the satellite track ?
  - the wave direction of propagation is perpendicular to the satellite track, but the horizontal wavelength is significantly longer than 320 km (the width of the across-track image) ?

  How do these cases impact the ILI sensitivity diagram ?
- l23: "along-track" rather than horizontal may be more precise
- p839, l26-27: Rephrase: "...platforms and should therefore be primarily used..."
- p844, l6-9: This is not really true: Hertzog et al. 2008 for instance used a wavelet analysis technique to identify the wave packets, and did not only extract the most significant wave.

Figures

- Figure 3: "along-track" instead of "horizontal" in the label of the x axis, and in the caption.

AMTD
2, C11–C14, 2009

- Figure 5: Please give the units of the temperature colour code.
- Figure 6: Please indicate the colour code.

Interactive comment on Atmos. Meas. Tech. Discuss., 2, 825, 2009.