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Atmospheric Measurement Techniques Discussions

Interactive comment on "Validation of the Aura High Resolution Dynamics Limb Sounder geopotential heights" *by* L. L. Smith and J. C. Gille

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Dear Anonymous Referee #2, thank you for your comment.

Re. comment 1: We agree comparisons with other GPH datasets above 1mb would be valuable. The referee refers to SABER data. We are investigating utilizing SABER GPH for comparisons.

We welcome information about any additional released GPH datasets above 1hPa.

Re. comment 2: It is not definitive which dataset(s) are closest to "the truth." Each dataset considered has its own inherent biases. For example, see Dee, D. P., Uppala, S. M., Simmons, A. J., et al., 2011: "The ERA-Interim reanalysis: configuration and

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performance of the data assimilation system," Quart. J. Roy. Met. Soc., 137, 553-597. DOI: 10.1002/qj.828. and references therein for a discussion of ERA-Interim biases.

Regarding WACCM: We used SD-WACCM nudged to MERRA during the HIRDLS period where output was for the HIRDLS coordinates (lat,lon,time). More specifically the version was Community Earth System Model, version 1, Whole Atmosphere Chemistry Climate Model (CESM1 WACCM). Meteorological fields were taken from the NASA Global Modeling and Assimilation Office (GMAO) Modern-Era Retrospective Analysis for Research and Applications (MERRA). We were remiss in not thanking our colleague D.E. Kinnison for supplying us with the data. We'll add this to the acknowledgments.

For more information about WACCM, please see: Marsh, D. R., M.J. Mills, D.E. Kinnison, J.-F. Lamarque, N. Calvo, and L. M. Polvani, 2013: Climate change from 1850 to 2005 simulated in CESM1(WACCM), 73727391, J. Clim., 26(19), doi:10.1175/JCLI-D-12-00558.1

For more information about MERRA, please see: Rienecker, M. M., et al., 2011: MERRA: NASA's Modern-Era Retrospective Analysis for Research and Applications, J. Clim., 24, 14 (July 2011), 3624, doi: 10.1175/JCLI-D-11-00015.1

We will post all referenced, but not included, plots as supplementary materials so the reader can judge for him/herself the agreement with HIRDLS.

Regarding the Kapton material: HIRDLS was launched on the Aura S/C on 15 July 2004. Once we started to obtain data it was discovered an obstruction in the optics was blocking the view from the scan mirror to the aperture, as well as the view to the in-flight black-body calibration target (IFC), preventing radiance from outside the aperture or the IFC from reaching the detectors. This obstruction is believed to be a layer of plastic Kapton film displaced during launch. Unfortunately, 80-95% of the aperture was covered, depending on channel. The optical blockage restricted viewing to 47° from the orbital plane, on the side away from the sun, limiting latitudinal coverage to 63°S to 80°N. However, the loss of capability to scan at multiple azimuths allowed all

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scans to be spaced $\sim$ 100 km apart along the scan track. Gille et al. [2008] describe the damage, and early approaches to correcting for this optical blockage, as well as validation of those Version 3 temperatures. Since that time work has continued to improve the quality and number of data products, resulting in the recently released V7 data.

For more information, please see: Gille, J., et.al., 2008: High Resolution Dynamics Limb Sounder: Experiment overview, recovery, and validation of initial temperature data, J.G.R., 113, D16S43, doi:10.1029/2007JD008824.

Re. the geoid heights: The differences between the ellipsoid and the geoid are due to local variations in height of the geoid due to the gravitational effects of such features as mountains, and are on the order of +/-100 m. To create accurate geopotential heights we need to take into account such variations in local height.

Re. the derivative discussion on p 1007: We will explicitly state the derivatives are within the 0.04m/km criteria.

Re. p 1008 reference: We will include a reference for the temperature usefulness up to 0.01mbar. e.g. France, J.A., Harey, V.L., Alexander, M.J., Randall, C.E., Gille, J.C., 2012: High Resolution Dynamics Limb Sounder observations of the gravity wave-driven elevated stratopause in 2006, J.G.R., 117, D20, doi:10.1029/2012JD017958.

Re. p1009 ln.20 data comparisons including GEOS-5, WACCM, NCEP: We will include these figures as supplemental information.

Re. p1011 ln. 18 and p 1012 ln. 7: Please note zonal and meridional winds are not released HIRDLS products and therefore we are not validating HIRDLS zonal and meridional winds. We discuss the winds in the context of validating the geopotential heights. The means and standard deviations of the differences of HIRDLSv7 zonal and meridional winds with respect to ERA-Interim winds for the 2005-2007 period show generally good agreement including at 1mb. This indicates the HIRDLSv7 GPH are

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reasonable and may be used for scientific purposes including at 1mb and above.

Re. p 1012 ln. 12: The altitude dependent precisions discussed here are consistent with Figure 1. Thus the lowest precisions are near 10 hPa and increasing as one moves away from this level. We'll rephrase this sentence to make this more clear.

Re. wind analysis in conclusions: We will include a discussion of the wind analysis in the conclusions with the caveat that we are not validating HIRDLS winds.

Re. Technical comments on comment page C345: Thanks for your careful reading of the paper. We are implementing these corrections.

Re. data gaps at 0E in Figures 5,6,8,10: As illustrated in these figures, there is in fact a small gap in the data at 0E. We will consider linear interpolation across this gap.

Re. small fonts in figures: We are implementing an increase in all Figure font sizes.

Re. Figures 8,10, 9,11 color bars: The referee's color bar suggestions are helpful. We are implementing them.

Interactive comment on Atmos. Meas. Tech. Discuss., 7, 1001, 2014.