Supporting Information for "Multistatic specular meteor radar network in Peru: System Description and Initial Results"

J. L. Chau[1] *, J. M. Urco[1], J. Vierinen[2], B. J. Harding[3], M. Clahsen[1], N. Pfeffer[1], K. M. Kuyeng[4], M. A. Milla[4], P. J. Erickson[5]

[1]Leibniz Institute of Atmospheric Physics at the University of Rostock, Kühlungsborn, Germany

[2]Arctic University of Norway, Tromso, Norway

[3]Space Sciences Laboratory, University of California, Berkeley, CA, USA

[4]Radio Observatorio de Jicamarca, Instituto Geosfísico del Perú, Lima, Peru

[5]MIT Haystack Observatory, Westford, MA, USA

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Introduction

In this document we present supplemental material aimed to complement the information and results presented in the article.

Description of datasets

*Schloss Str. 6, Kuehlungsborn, 18225,

Germany

The data used in the plots presented in this article can be found at `ftp://ftp.iap-kborn.de/data-in-publications/ChauESS2020`.

We present three types of filed in HDF5 format:

- Multilink files used to generate Figure 2 (*multilink* directory).
- Daily files containing the estimates of wind fields with one-hour and one-kilometer bins (*gradient* directory) as well as four-hours and four-kilometer bins (*gradientsmooth* directory).
- Daily files containing 3D estimates of wind fields using the regularized wind field inversion method (*inversion* directory)

Description of daily detections

As mentioned in the main text, the received rawdata is reduced by a decoding and a detection processing. Figure S1 shows an example of typical daily detections as a function of time and total range, in this case for JRO-Azpitia link. Besides the almost point-like echoes corresponding to our main targets, i.e., specular meteor echoes, one can also see echoes due to the daytime equatorial electrojet, and non-specular meteor echoes. These "unwanted" echoes are later removed during the identification process, if they do not fit to a typical underdense echo response. Some of the unwanted echoes might still be present in the identified files, in that case they are clean when data from all links are combined, using the clustering algorithm DBSCAN (Ester et al., 1996) to find clusters of echoes in range, time and angle and remove them. Specular meteors echoes are not expected to be cluster in all three parameters.

In the main document we have presented the results obtained with the homogeneous and gradient methods, M1 and M2, respectively, obtained with one-hour and one-kilometer time-altitude bins. Here we present similar results but obtained with four-hour and four-kilometer bins, in order to have a better representation of large-scale features. By filtering

in altitude and time, we also expect that features with small horizontal scales will be also filtered out, particularly if they are related to gravity waves (Fritts & Alexander, 2003). Figure S2 show the mean winds obtained with M1 and M2. The gradient derived parameters obtained with M2 are shown in Figure S3. Note that in both cases, mean winds and gradients, the dominant features are of diurnal nature.

Movie S1.

Wind field frames similar to Figure 10 obtained every fifteen minutes for three consecutive days are combined into a gif animate movie (Movie S1).

References

Ester, M., Kriegel, H.-P., Sander, J., & Xu, X. (1996). A Density-Based Algorithm for Discovering Clusters in Large Spatial Databases with Noise. In *Kdd'96: Proceedings of the second international conference on knowledge discovery and data mining* (pp. 226–231). Retrieved from `www.aaai.org`

Fritts, D. C., & Alexander, M. J. (2003). Gravity wave dynamics and effects in the middle atmosphere. *Reviews of Geophysics*, *41*(1). Retrieved from `https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1029/2001RG000106` doi: 10.1029/2001RG000106

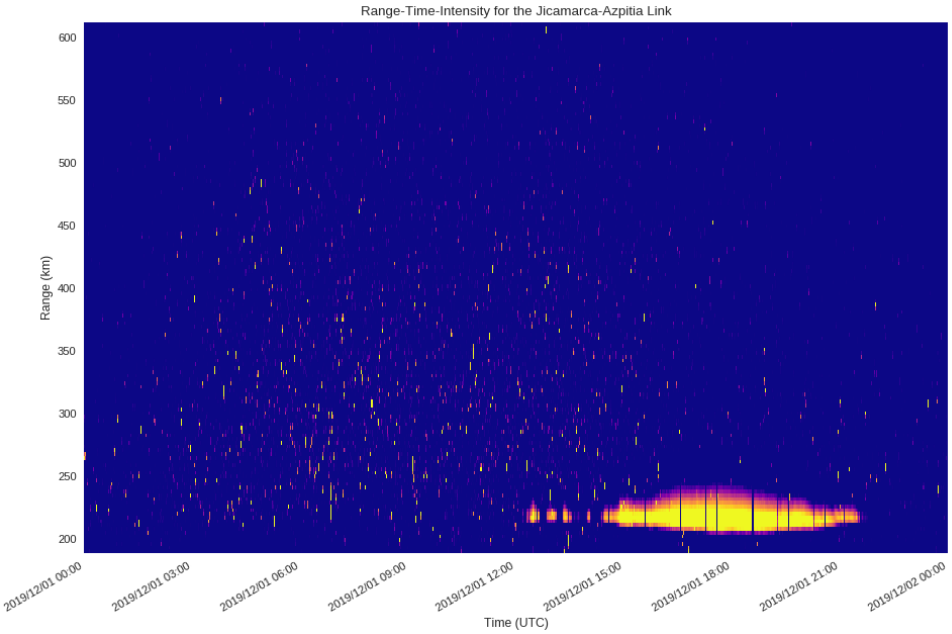

Figure S1. Typical example of daily detections with JRO-Azpitia link. The strong and continuous detections around 1800 UT and 200 km total range, correspond to EEJ echoes.

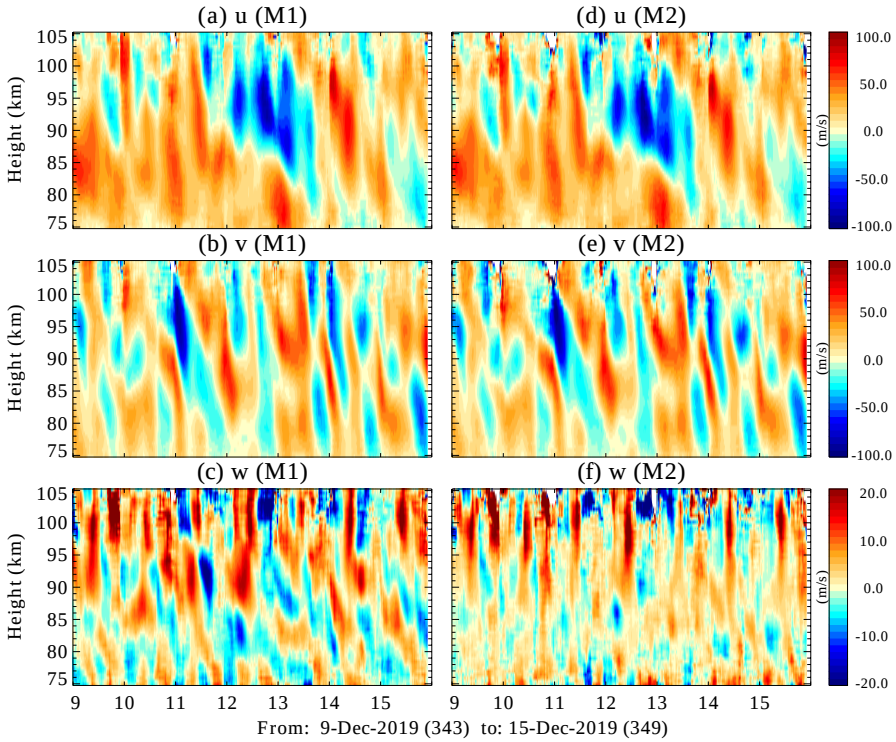

Figure S2. Mean 3D winds between December 9 and 16, 2019 obtained with: (left) zero-order method (M1) and (b) gradient method (M2), in both cases using four-hour and four-kilometer bins.

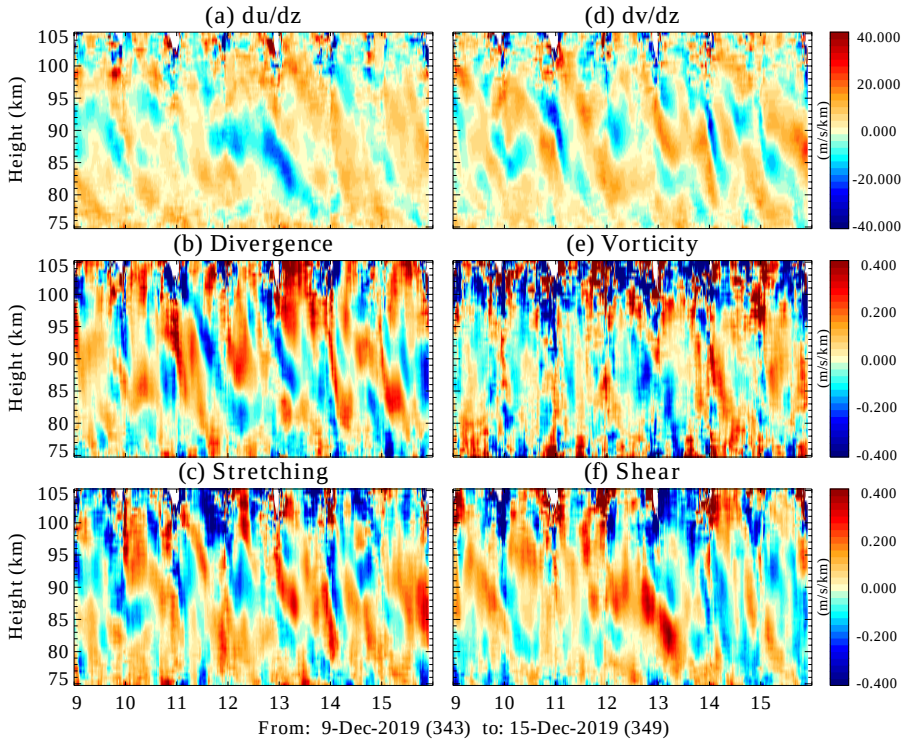

Figure S3. Derived components of horizontal winds with the gradient method: (a) zonal wind vertical gradient, (b) Horizontal divergence, (c) stretching, (d) meridional wind vertical gradient, (e) relative vorticity, (f) shear, using the same period and sampling as in Figure S2.