Review of:

Radar observations of winds, waves and tides in the mesosphere and lower thermosphere over South Georgia Island (54°S, 36°W) and comparison to WACCM simulations.

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by Neil P. Hindley et al.

It is always good to have data from a new location. There is a very impressive list of references (it is a bit hard to tell which are the most important). An important comment made is that different models may be better at some heights and locations than others - a reminder of something which is easily forgotten.

Figure 1: given the "lopsided" azimuthal distribution, please add a comment on the possible, or not, effects on the analysis results.

Comments on Section 3.1: inversion of an NxN matrix is not necessary.

$$e_i^2 = \left[\frac{V_{r_i}}{\sin\phi_i} - W_i(V_N\cos\theta_i + V_E\sin\theta_i)\right]^2$$

$$\frac{\partial\Sigma e_i^2}{\partial V_N} = 0$$

$$\frac{\partial\Sigma e_i^2}{\partial V_E} = 0$$

That is two equations in two unknowns.

I would like to argue about the Fig 3. significance levels which based on a Lomb-Scargle-type analysis. The original L-S papers assume that variance is divided equally between frequency bins- that is the spectrum is flat-ish. Since geophysical spectra are generally pink noise, the variance in the low frequency bins, noise or not, is already higher than the equally divided variance- so it is *easier* for those frequencies to be *significant*.

However those are still accepted in journals .... so I guess I can't complain

Pg. 7. A further refinement could be applied: because the meteor rate has a strong peak (around 90 Km), actual heights are effectively nearer the peak because increased number weighting. A way around this is to un-weight the echoes according to the local meteor rate so each height has equal weight, e.g. by fitting a Gaussian to the average height profiles, and weighting each meteor,"i", by it inverse, $(1/W_1)(i)$, the wanted Gaussian height profile, $W_2(i)$, and wanted time profile $(W_3)(i)$.

Pg. 10 line 400-406. Please give more details. At the moment it reads as if all the tidal removal and high-pass filtering operations are performed on a single day (24 hrs) interval(s), and if they are, then the 12 hr was removed. If such residual days are stuck together, considering that the residuals may not have zero daily mean, the discontinuities between days may create 24, 12hr,... artifacts. Also, were the tides and mean removed in one fit, or sequentially?

Pg. 10. Line 414-415. The most likely reason for residual ∼12hr periods is sidelobes of a varying tide. A sine wave over a long time interval has a narrow bandwidth - a notch filter when subtracted, so some sidelobes may not be removed. Please add a comment, or modify the discussion accordingly.

Pg. 18. Comments on "sub variance" lines 416-427: Because of radial echo measurement, it is not possible to get independent component variances (e.g. North, East). E.g. perturbations in eastward wind will "bleed" into the northward by an amount depending on echo azimuths. A simple model quickly shows the resulting re-distribution of variance. The actual distribution of echo azimuths adds to the problem. Selection of just ∼N and ∼E echoes might help - but in practice it results in very noisy wind values, because there are never enough echoes. For this reason conclusions based on the "sub-volume" component variances should be avoided. On the other hand, the total variance is a meaningful parameter; that is rms (radial velocity minus radial velocity from fit).

minor, and typos

Fig 2 caption: "(a,c)" and "(b,d)"

Pg. 3. line 79- "It operates as an interferometer ..."

Pg 3. line 84 "radial component of drift velocities ..." [but I don't agree with this unless vertical velocity is assumed zero]

Pg 4. line 90 "receivers are blanked during each ..."

Pg 4. line 91 "to avoid saturating the receivers"

Line 115: "greater than ∼10 km ..." according to V5 documentation.

Pg. 11, Line 240: "The reason for this ..." What is this? the low meteor count?

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