Annales Geophysicae Discussions

Ann. Geophys. Discuss., referee comment RC1
https://doi.org/10.5194/angeo-2021-48-RC1, 2021

Comment on angeo-2021-48

Anonymous Referee #1

Referee comment on "A case study of a ducted gravity wave event over northern Germany using simultaneous airglow imaging and wind-field observations" by Sumanta Sarkhel et al., Ann. Geophys. Discuss., https://doi.org/10.5194/angeo-2021-48-RC1, 2021

The work combines Airglow imager and Meteor radar observations from Germany and uses SABER measurements to bring out/discuss a special gravity wave event that leaves its footprint in oxygen green line, O2 emissions but not in OH emission. The authors propose the formation of a leaky duct to explain the observations. While this is a realistic possibility, other factors need to be ruled out to strengthen the argument. The observation of this wave activity in Na emission is also enigmatic and require more attention. The observations reported merit publication but the authors need to critically address a few issues described below.

On dataset and techniques: Does this imager consist of 512 × 512 pixels ANDOR back-illuminated CCD camera or 1k × 1k camera as mentioned by Vargas et al. (2021)? For completeness, provide details on the bandwidth of the interference filters. Is there a possibility of contamination of OH broadband emission from other mesospheric lines? How do the authors rule that this contamination is not responsible for the lack of wave signatures in the OH band? What are the integration times used for these observations?

Figures 2-5: Why does the central dark spot appear in all the images? Detector issue? How does the 2D FFT filtering remove this feature?

Science issues: Figures 2-5: The wind fields are widely different even within the “ducted” layer. Why? This is contrary to the argument (used later for Figure 7a) that the profile does not show any drastic change within the ducted layer.

Figure 6: Why is the downward phase progression not seen in the Na airglow intensity? The authors have mentioned 91 km as the emission height of this emission and 85-91 km as the altitude extent of the thermal duct. The intensity variation at this wavelength also seems to be different at larger horizontal distance.

I feel that the sub-units of Figure 7 are wrongly described in the text. For example, 7c and 7e (instead of 7d and 7e) show variations in m^2. Same for Figures 7b and 7c.

Is m^2 negative at 85 km? How important is the negative m^2? If it is less but positive (at 85 km), how efficient is the ducting? This is an important issue as the authors propose a leaky duct here. If there is leakage each time the wave is reflected from the edges of the duct, how does the Na intensity variation show similar intensity variation but different phase progression (at least at shorter horizontal distances) in Figure 6? Will the original and reflected waves inside the duct not interfere? How is the spatial coherence maintained? This is also an important issue given the different wind fields at the airglow emission altitudes. The authors need to discuss these issues.