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Interactive comment on "Effect of neutral winds on the creation of non-specular meteor trail echoes" *by* Freddy Galindo et al.

Anonymous Referee #2

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This manuscript presents an interesting analysis of radar observations of meteors and the effects of winds on these. It is trying to answer an important question in meteor physics: what are the effects of winds on wave growth in meteor trails and, hence, on non-specular radar detections. It uses a simple model developed more than 15 years ago and applies it to a range of atmospheric characteristics. However, as explained in the comments made below this manuscript leaves a lot of unanswered questions.

Major Comments:

1) Extensive observations at JRO (See Sugar et al, 2010 and Oppenheim et al, 2009) seem to show that, as trails span many km (sometimes over 15 km), through regions of the atmosphere with vastly different wind speeds trails seem to develop regardless of wind speed. This is odd because simulations and theory, like that presented in this

manuscript and more recent ones, imply one would expect that wave growth would depend on wind speed. This may result from drifts and currents that travel along the length of the trail, making the local wind speed less important to wave growth. 2) Line 50: The background has no references past 2011 but there has been extensive progress made on topics immediately relevant to the manuscript since then. 3) Line 55 Correct me if I'm wrong but this model is not exactly the state of the art and is a highly simplified 2-D model of a 3-D phenomenon. It may catch the basic physics but still, the authors should look into the more sophisticated models of instability for a 3-D meteor plasma of Dimant, et al (2015-2017). Also, the 3-D simulations of Oppenheim et. al (2015). 4) Line 167: These observations are interesting and help to make this case. However, when we've examined high-resolution images containing both head and trail echoes, we've generally seen that the heads and trails have gaps at the same ranges, implying that reduced returns were due to the nulls. Also, there are 2 papers where wind data was inferred from trail echoes and those winds go through zero and they still returned trail echoes. I agree that I would expect weaker trails when the winds are small but that is not what we have seen observationally. The field needs a larger statistical analysis of data comparing head and trail gaps to really see what the pattern is. A handful of cases will not be compelling either way because of the complexity and noise in this data. 5) Line 168: This image seems to show a gap in both head and trail, though the head isn't well resolved. Fig. 8a though does seem to show a reasonably strong head but a gap in the trail. This is intriguing but a single case is not sufficient. The Oppenheim, 2013 JGR shows that we do often get echoes at low velocities. 6) Line 219: The gap between the trail and the head is usually fairly constant or changing slowly, more so than the winds typically do.

Minor Comments: Line 19: "Past decade" -> at least two decades now (Chapin and Kudeki is over 25 years...)

Line 65: A summary of what physics is and is not in this model would be helpful to readers so they need not return to these 3 papers. I believe you could say it's a 2-D local theory that assumes an infinite homogeneous trail and background (or something similar). It neglects physics along B or inhomogeneities of any kind. Or something similar.

Line 167: The word "considerable" is too vague.

Line 184: This implies this was a skimmer. Is that right? Line 186: “below or above” means all of them? And the feature referred to is unclear. Line 192: 11 years is not so recent. Line 204: These LATE flares also seem to effect the head echoes, are not all at low altitudes and are quite rare (while wind shears are not). Line 214: Divergence not “divergent”

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