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Interactive comment on "Dynamic Spectra of Small-Mass Meteors" *by* Emma R. Mirizio et al.

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Overview This research tried to simultaneously collect optical spectra and radar returns for faint meteors, but the use of the term faint here really corresponds to moderately bright meteors above magnitude 3.0 and no radar counterparts were observed. So the paper examines the optical spectra obtained but only at a very high level. Differential ablation was allegedly observed but no conclusive evidence was shown in the figures.

Technical Questions Section 1 44 - Explain how meteor composition helps you to constrain luminous efficiency ? 48 - How do radar head-echoes provide composition information ? Elements are not directly observed, so is this inferred based on past optical studies ? Explain better. 56 - These are elements that are efficient emitters and make themselves easily visible in meteor spectra. This is not the same as the most common elements in meteoroids and thus are only partially representative of the true elemental

abundances. Clarify that these are common spectral element emission lines in meteor spectra. 58 - Provide a reference. 61 - Borovicka's papers were some of the earliest evidence of differential ablation associated with early Na loss. He should be cited. 64 - Section 1 should have (or end) with a statement of your goal for this data collection and analysis. You bring up a lot of good points, so focus your specific project goals and objectives for the reader. Section 2 67,71 - I would not call meteors with an absolute magnitude lower limit of +3 as "faint". These are easily seen by networks of moderate field of view non-intensified cameras deployed around the world by amateurs and professionals. I understand you need the intensification because of the spectral dispersion, but you are looking at a very high mass range for the radar. 73,76 - If the spectral camera was pointed at the zenith, please explain that you must be seeing both the zeroth order and first order spectra in the FOV y using a low dispersion grating. Otherwise you would need to point the grating camera off the zenith to capture first order spectra for meteors passing through the zenith. 77 - What type of calibration. Are you referring to spectral response of the camera/lens optical system ? Or was this strictly for wavelength calibration as I see later in the paper you use a F0 star for spectral response ? So what type of lab calibration is this and what was it used for ? Predeployment system testing ? 79 - Why were meteors generally traveling east-west? Was this associated with a sporadic source location? Generally sporadic meteors move randomly. I am not aware of a meteor shower active May 17-20 that would give you that preferred radiant direction. 84 - A diagram of where in the FOV the spectral meteors passed (zeroth order) relative to the radar beam would be helpful. 84 - Do you fold in the optical observations of Mitchell 2019 at all in this paper. What is the coincidence of optical meteors detected by both the spectral camera and Mitchell 2019 optical camera. Figure 1 should more clearly point out the 1st order spectrum and the meteor (zeroth order) trace for the uninitiated reader. Figure 1 - From the images, you obviously have other stars that you could have used and done a smoother averaging of the spectral response of the system. Why limit it to one star ? Figure 2. It not good practice to use only 4 stars in a photometric calibration fit. You should do this for as many stars as possible and spread over the night to obtain a more reliable and believable fit. Figure 4 - I see only 3 frames but the caption states 6 frames Figure 4 and 5 - These spectra look like noise and anyone would be hard pressed to say they see spectral emission lines evident. Perhaps better to show the temporally integrated spectrum since Figure 1 does show clear evidence of a meteor spectrum. For the temporal evolution, try combining 2 or 3 adjacent frames to get the spectral lines to show more clearly. 131 - There is no evidence for differential ablation shown in any figure. Is this based on visually looking at the spectral images or examining spectral wavelength plots like figure 4 and 5 ? 133 - I am highly suspect of Ca being visible in these meteors. Usually this element is associated with very bright fast moving meteors. Figure 3 left panel shows virtually no spectral response of the system to the F0 star down at 380 nm. So how can you detect Ca so readily - is the camera a blue sensitive intensifier. But that still doesn't jive with the star spectral response curve in Figure 3 left where the star's black body spectra peaks near 380 nm (Figure 3 right) but the response is at the noise level. Point out the magnitude of the F0 star. 135 - What background radiation are you referring to ? Are you simply talking about background noise and the spectra is buried in the noise ? Overall - you need to show a few actual spectral IMAGES (zoomed in) with lines labeled and then associated integrated line plots along the meteor trace. Otherwise you show no visible evidence of the conclusions stated in the end. Did you try to do an abundance ratio between the lines? Did you try to associate any meteor direction to an active shower those night's - how do you conclude that they are mostly sporadic for this bright a magnitude range ? Explain in the summary conclusions what would you do differently next time to improve the system and analysis. For example... triangulation of the meteors to get true velocities and heights. Did you do any flat fielding or dark removal. It is not stated specifically if that was done anywhere in the paper, but seemed to be implied by the caption of Figure 1.

Editing Issues None found

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