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Comment on amt-2021-335

Anonymous Referee #2

Referee comment on "Adaptive thermal image velocimetry of spatial wind movement on landscapes using near-target infrared cameras" by Benjamin Schumacher et al., Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2021-335-RC2, 2022

Review: Adaptive Thermal Image Velocimetry of spatial wind movement on landscapes using near target infrared cameras

The authors present a modification of the thermal image velocimetry (TIV) method called adaptive TIV (A-TIV). They use fluctuations in surface brightness temperature derived from time series of UAS-based thermal imagery for estimating two- dimensional near surface wind velocities.

With my background (I use UAS-based thermal imagery for assessing turbulent energy fluxes), parts of the manuscript remain unclear. The description of the method is not detailed enough in my opinion and the structure of the methods part is also a bit unclear to me (some sections would probably better fit into the results part?). The results part lacks important information, e.g. it does not provide any comparison of the presented A-TIV algorithm with the existing TIV algorithm, which would be essential for assessing the benefit of the new method.

Since I am not a native myself, I do not comment on language in general. But long sequences of nouns (e.g. multiple surface brightness temperature perturbation filter sizes) make the text hard to read, which might be avoided by rearranging sentences.

In my opinion this manuscript needs a thorough revision before publication.

I list some more specific comments below:

P4: I would rephrase the objectiveimagerys since in the current form it is clear that the objectives were defined after conducting the experimimageryents as they already provide information about the outcomes.

P5, line 118: I have no experience with the HHT, but what would happen if you chose the second highest frequency? The highest frequency is obviously the noisiest and might include camera noise effects?

P 5, line 126: Add the weights here.

P5, line 136: This sentence belongs to 2.1

P6: In part C the colors are not correct, it depicts twice the same 3x3 window. To me it is not clear why the correlation map has numbers in all pixels. A sentence on what the numbers in the correlation map mean would make it much easier to understand for people not familiar with the method.

P7, line 144: This sentence is totally unclear to me: *The weather station data is used to contextualize the A-TIV output in respect to the other experiments*.

P 10, line 178: Did the scattered clouds have any effect on surface temperature perturbations?

P10, table 1: what is the height of the grass? Grass can easily reach the same height as the wheat stubble. What is the ground resolution of the imagery? Why did flying altitude vary between the experiments?

P11, line 186: I do not see the cold spots. What is the emissivity of the high emissivity targets? Grass itself has a high emissivity. What is the approximate emissivity of turf? I am wondering why high emissivity targets are cold spots and not the low emissivity targets? If I understand it correctly, this means that the air (the reflected part of the signal) is warmer than the surface, which drives a negative sensible heat flux? Could you explain this in more detail?

P11, figure 4: Why is the peak in the standard deviation spatially shifted between a) and b)? It would make the interpretation of the images easier if also RGB images of the same scene were provided.

P12, line 200: it is not clear to me how error vectors are assessed here?

P13 & 14, figure 6 & 7: I do not understand why these figures are part of the methods section? It would be more interesting to have something similar in the results section including a comparison of the different wind speed estimates with the reference data.

P15, line 223: Can you explain why you used a spatial shift of 9 m?

P15, line 233: how was the location of these 15x15 m windows selected?

P16, line 249: I am confused concerning the p value. Is the null hypothesis that both data sets stem from the same distribution? Then this would be rejected for TURF-T1?

P16, figure 8: In general, legends are missing in the figures. I would further encourage the authors to make their plots a bit more black/white friendly.

P17 line 262: maybe I missed it but I think it was never stated before that the TC wind speed is limited to >= 0.25 m/s.

P18 figure 9: this plot is a bit hard to read

P22, figure 13: which ratio is used for the dashed expected line?

P22 line 291: this sentence is not clear to me

P23 line 295: what would happen if the resetting mechanism is set to a longer interval? What would be the effect on the thermal patterns and on the absolute values? It is not clear to me how these data gaps were accounted for in the analysis.

P23 line 305: this sentence is not clear to me

P23, line 312: If I am correct then EC measurements are missing mostly the lower

frequencies (larger eddies). Can you put this sentence a bit more into context with your experiment?

P23, line 323: A very general question: can you describe why one would expect that the air and surface temperature perturbations show similar magnitudes given differences in thermal properties?

P24 line 344: It would be helpful if you could link these statements to the single figures that support these claims?

P24 line 356: this sentence is a bit unclear to me