Reply to reviewer: for "**Impact of swell waves on atmospheric surface turbulence: Wave-turbulence decomposition methods"**

Reviewer comments are presented in black text using the "Calibri" font format with a size of 12.
My responses are displayed in blue text using the "Calibri" font format with a size of 13.

Reviewer 1

1. If sigma_beta in Eq. 3 is the standard deviation, there is no reason this is an adjustable parameter. It is a parameter that one could compute. In principle A and k_0beta should be the only adjustable parameters.

This is the variance estimate through fitting by discarding the waveband contribution. The method is based on a two-parameter least-squares fit between the model spectrum and observations to estimate σ and ko, which describe **the variance** and spatial scale of the energy-containing eddies, respectively. The fit has been performed in log-log space to give all parts of the model fit equal weight. This method has also been tested for measuring the dissipation rate of TKE, which is beyond the scope of this paper. The variable is velocity variance, which, in Gerbi et al. (2009), Eqs 16-17, has been used and compared with the estimate of the same quantity suggested by D'Asaro (2001). I then refer to Appendix 3 of

Bakhoday Paskyabi, Mostafa. *A wavelet-entropy based segmentation of turbulence measurements from a moored shear probe near the wavy sea surface. Springer Nature Applied Sciences 2019.*

And also Gerbi et al 2009. I have also added above reference in the description:

where k denotes wavenumber, $\beta = u, v, w$, $A = 5\sin(3\pi/5)/(6\pi)$ is a constant, and $k_{0\beta}$ and σ_β are two adjustable parameters describing the roll-off wavenumber (the length scales of turbulent eddies in the energy-containing subrange) and the standard deviation of β, respectively (Gerbi et al., 2009; Bakhoday-Paskyabi, 2019). Here, I perform a two-parameter least squares fit

2. You have some repeated sentences, e.g., those in lines 85-86

Few changes applied to this paragraph. As follows:

- Line 77: are two parameters
- Line 86: I added " to ensure equal weight is given to all parts of the model fit" for the sake of further clarity

In the first part, from line 79-80, the aim is to introduce the fitting parameters. Towards line 86, additional details about the type of fitting and more insights are provided. I have checked and applied the changes according to the reviewer's comment, ensuring that the explanations are consistent and necessary for clarity in describing the curve fitting procedure.

3. Line 88: I think it is nice you are honest about saying that the interval is determined with trial and error, but then what happens for other datasets? Could you say they also need to do this? Or can they use the same interval?

This is a reliable interval for the vast majority of the OBLEX-F1 campaign dataset: I modified accordingly as follows:

"This interval is determined through a trial-and-error process using all sonic datasets employed in this study, providing a reliable estimate of the frequency band for the entire campaign dataset too."

4. Line 90: this sounds as you do two fits. One below waveband and the other above it. Then this means that you might have 4 different parameters (2 per fit) and then what do you do?

In summary, this approach neglects velocity fluctuations only within the observed wave band and applies the fitting based on frequencies below and above the wave frequency band. Therefore, I use only two parameters for curve fitting. I cited another reference here to facilitate the understanding of method (appendix 3).

Bakhoday Paskyabi, Mostafa. *A wavelet-entropy based segmentation of turbulence measurements from a moored shear probe near the wavy sea surface. Springer Nature Applied Sciences 2019.*

using all datasets employed in this study, providing a reliable estimate of the frequency band for the entire campaign dataset too. The energy spectrum is then divided into three bands: below-wave-band ($k < 0.6k_p$), wave-band, and above-wave-band ($k > k_p + 0.1$) parts, see Fig. 1 and refer to Appendix 3 of Bakhoday-Paskyabi (2019). After discarding the wave-band, the Kaimal spectrum Eq. (3) is fitted over below and above wave-band wavenumbers and replace the wave-induced bump by the

5. In many instances you have word “cuttings” such as “doesn’t” or “It’s”. This is not scientific language.

Thanks for the comment. It has been applied for the entire paper by changing from “doesn’t” to “does not” and “it’s” to “it is”.

6. I still do not know which type of sonic anemometers you use and if there is any correction to the probe distortion.

Both 15m and 12m, we used a Gill R3-100. In this analysis no correction applied to the probe distortion.

“During the OBLEX-F1 campaign between 2015 and 2016 two additional **Gill R3-100** sonic anemometers were installed at 15 and 20 m above”

7. Line 200: L has units

Yes. The L unit is meter and it has been introduced in line 198 (this is why I just used L<0 and L>0 in this line).

8. Line 203: there is no such a thing as a three-dimensional wind speed

I changed to “three-dimensional wind measurement”

9. Fig 2 does not portrait the Obukhov length as the caption says but z/L

Caption of Fig. 2 has changed for “(c) the values of the stability parameter from which the Obukhov length, L, was calculated from sonic measurement at height of 15 m above ….”

10. Sentences around line 220 does not read very scientific

I tried to slightly modify this but the essence remains the same to reflect the purpose of plot:

“The parameters depicted in this figure are idealized to enhance conceptual clarity and technical demonstration, rather than reflecting real-world values. They serve as a theoretical framework to facilitate detailed illustrations of the underlying concept and are not representative of practical measurements or actual conditions.”

11. Caption fig 3: 0.1 at the end has units

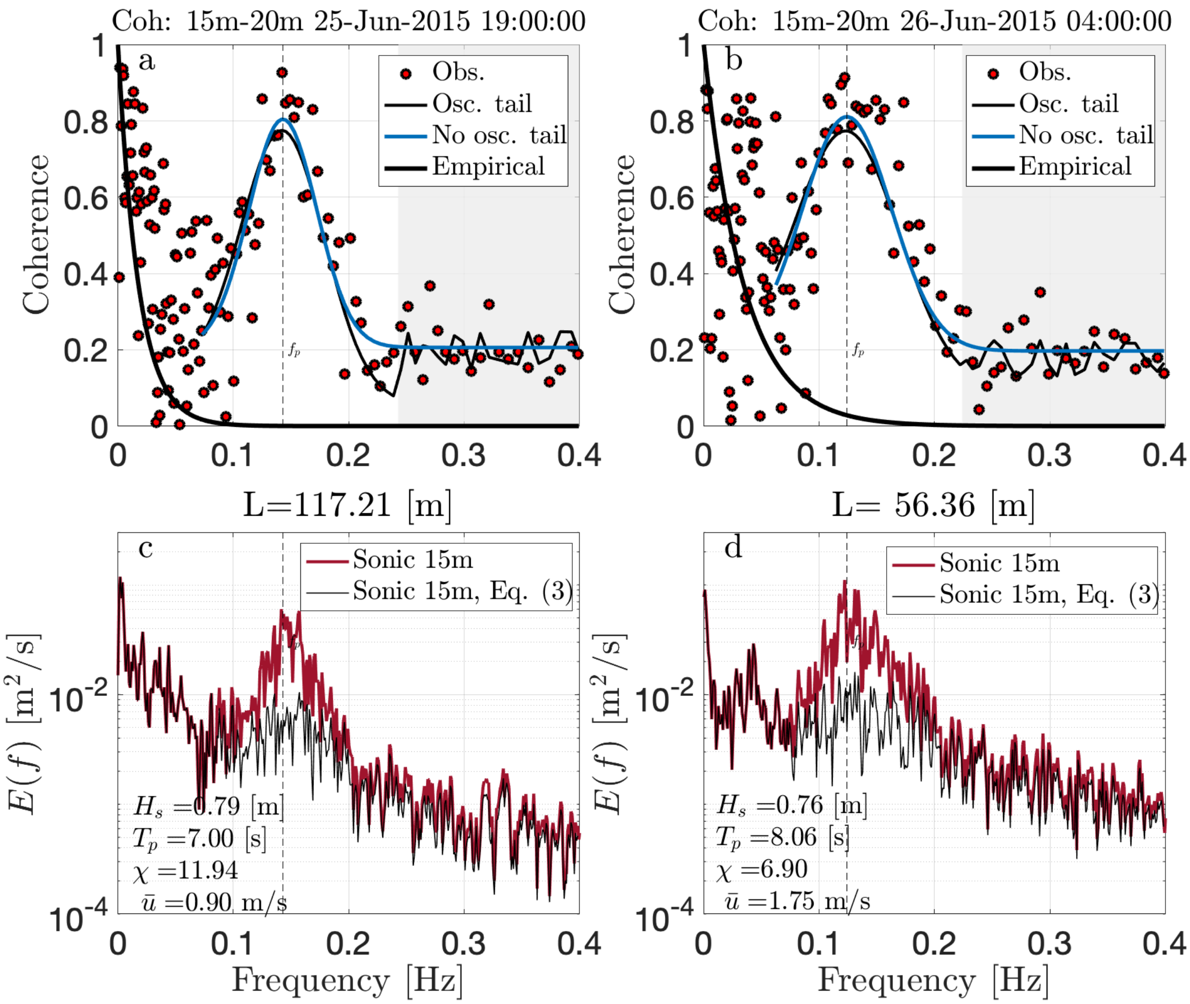
I modified the fig. Caption:

“... Furthermore, the green-coloured areas in these figures represent the wave-affected frequency band with lower and upper frequencies of $f_l=0.6f_p$ in Hz and $f_u=f_p+0.1$ in Hz, respectively.”

12. Fig. 4 for the c frame would not be better to see a frequency pre-multipled spectra that is scaled with wind speed squared for example? Right now spectra beyond 26-05 disappears because wind speeds are too low and the spectra does not have the energy of the period before

Thank you for your comment. In order to maintain consistency in the plot, I attempted various methods to visualize both Fig 4.b and c, but ultimately decided not to make changes for the sake of representation.

13. The L values above Fig. 6 have units?
The figure has been replotted.



Coh: 15m-20m 25-Jun-2015 19:00:00
Coh: 15m-20m 26-Jun-2015 04:00:00
a
b
Obs.
Osc. tail
No osc. tail
Empirical
Coherence
f_p
L=117.21 [m]
L= 56.36 [m]
c
d
Sonic 15m
Sonic 15m, Eq. (3)
$E(f)$ [m^2/s]
H_s =0.79 [m]
T_p =7.00 [s]
χ =11.94
$\bar{u}$ =0.90 m/s
H_s =0.76 [m]
T_p =8.06 [s]
χ =6.90
$\bar{u}$ =1.75 m/s
Frequency [Hz]