We thank the reviewer for valuable comments and suggestions to improve the manuscript *Uncertainty of eddy covariance flux measurements over an urban area based on two towers*. Please find our point-by-point responses below.

General comments:

This paper presents a comparison analysis between two identical EC systems in central Helsinki to understand uncertainty of a single point EC measurement of the cumulative vertical fluxes of momentum, sensible and latent heat, and carbon dioxide in a highly dense urban area using several statistics and variables such as stationarity (FS), skewness (SK) and kurtosis (K), relative random uncertainty (RRE), TKE, turbulent transfer efficiencies (|ruw|, |rwt|) and power and co-spectra. As the authors stress this is the first study using a combination of two close EC systems conducted in a densely built urban area, this research is a step forward for understanding the impact of complex urban structure on fluxes and provides a useful guideline in general for other similar urban EC measurements.

However, there are some aspects that need to be illustrate more clearly to improve the manuscript. Please address the comments below and hopefully reflect them into the revised version.

Specific comments:

1. P5 L25. The RRE calculation equation (Eq. 3) is inconsistent with that in Lenschow et al. 1994, which they presented as

Thus, the relative error is

$$\frac{\sigma_F(T)}{|F|} = \left(\frac{2\mathcal{T}_f}{T}\right)^{1/2}\left(\frac{1+r_{ws}^2}{r_{ws}^2}\right)^{1/2}. \qquad (48)$$

In Eq. 3, the square root seems missing.

We noticed that this form of the relative random error is not directly used in our calculations but rather equation (46) from Lenschow et al. is used, where the flux variance follows the left-hand side of their equation (47). We have now fixed the manuscript accordingly (P5-6, L28-3).

And variables in Eq. 3 are not expressed clearly. i.e. What's the exact formula for calculating the integral time-scale (Γ*f*) or does it have a relation to the averaging period (30min) or have a specific value? How to calculate the correlation coefficient (*rws*)? Moreover, the expression (*rws*) is confusing with that of the turbulent transfer efficiencies in Eq. 5 and 6, are they indeed the same or different?

Integral time-scale is defined as the integral over the autocovariance function Rwx and in practice is estimated as the lag when R_{wx} drops to e^{-1}. We added this explanation to the manuscript. Its equation follows Lenschow et al. equation (26) and as this is simply an integration of Rwx, we left the equation out.

rws in the old equation (3) is the same as the turbulent transfer coefficient, but as that part of the manuscript was modified, no additional clarification for this connection was made.

We noticed that we use different abbreviation s and x for the variable to which the flux is calculated. To be concise we use x now throughout Section 2.2.

2. P6. For the calculation of spectra and co-spectra (Eq. 7-9), do they have any citations? What do the variables Sx(*f*) and Sxw(*f*) represent and what are their formulas? Why are spectra divided into 76 bins? How to determine the frequency *f* (HZ)?

Could you explain all these aspects more clearly, so that potential readers can better understand this work?

The book by Stull (1988) is probably the best citation on how to calculate spectra and co-spectra. We added this to P6, L13. Sx(*f*) is the power spectra of variable x and Sxw(*f*) the co-

spectra between variable x and vertical wind speed. We added a bit more detailed explanation of these to the manuscript (P6, L15-18) but as these are calculated with Fast Fourier Transformation (FFT), which is a commonly known computational method, we decided not to add the detailed methodology on how these are calculated. The methodology can be found from e.g. Stull (1988).

The number of bins over which the raw spectral data are averaged is always a bit arbitrary but 76 bins have been used at the site also in the past (Nordbo et al. 2013). This will not affect the results but rather the visualization of the spectra. f is the frequency of the measurements (Hz) and this information was added to the manuscript (P6, L16).

3. P6 L24. It's confusing that the angles outside the flow distortion areas are so small: 5-18o for EC1 and 2-15o for EC1. Why aren't these angles ranges excluding the flow distortion area, i.e. 0-40 and 150-360 for EC1, 0-230 and 340-360 for EC2?

By angle here mean the vertical deflection angle and not wind direction. "Vertical deflection" was added to the sentence (P7,L7) to clarify this.

4. P8 L19. For daytime (Fig. 6a), the lowest RRE is sensible heat rather latent heat.

Yes. This is true for daytime. We changed the text to "…the lowest to daytime H (medians 12 and 13%)…" (P9, L18).

5. P8 L23. What's the possible reason for the contrary results between those previous studies (RRE lowest with momentum flux)?

The reason for the higher RRE in this study is likely the complex measurement location and to emphasize this, we added a sentence "…which is because of the complex measurement location and source-sink distribution at our site." to P9, L23-24.

6. P11 L8. Except the summer SKC and KC shown in Fig. 8, how about other months?

Same diurnal behavior is seen on other months but we only added summer here as we would need separate plots for different seasons due to day light saving. We added a sentence "Same behaviour is also seen on other months (not shown)." to the manuscript (P12, L8-9) to be clear.

7. P16 L5. What does inertial subrange mean? How to distinguish between negative and positive contributions? What do -4/3 slope and -2/3 slope represent in Fig. 10 and what's the basis to clarify between solid and open circles in Fig. 10a? How about other months except July 2014?

Inertial subrange is the range where turbulent energy is cascading from larger eddies to smaller ones. We added the approximative range of this (n = 0.1-0.4) to the manuscript (P17, L5). We are not sure we understand what the reviewer means with distinguish between negative and positive contributions. These negative values are only observed in the spectra of momentum flux and we clarified this in the manuscript (P17, L6). The value for each normalized frequency is the flux in that frequency bin. The two slopes are those predicted by Kolmogorov's theory. Explanations for these were added to Figure 10 caption: "The -4/3 and -2/3 slopes are those predicted by Kolmogorov". Frequencies with negative contributions are against the net flux and thus we wanted to show how at certain eddy sizes the eddies transport scalars in different directions.

Technical corrections:

P2 L21. Replace "paid on" with "paid to". Also in P21 L17.

Corrected on both locations.

P3 L26. “the systems are located at 60.3 m”, isn’t it 60 m?
The measurement height is 60.0 m. There was a typo in the text and it has now been fixed.

P5 L1. “10 1 min-1”, what does the space between 0 and 1 mean?
The units of flow rates is litre per minute and l (not 1) is abbreviation for this. To avoid confusion, we now opened the units.

P5 Eq. 4. the prime over v is missing.
Prime added.

P7 L12. “correlation coefficient (R2)”, I think it’s determination coefficient.
Yes. Squared R is the coefficient of determination, which in our case is the square of Pearson correlation coefficient and that is why we used incorrectly only correlation coefficient. We have changed this to coefficient of determination throughout the text.

P12 L10. Typo: ldecreased.
Typo fixed.

P12 L23.Typo: hgreater.
Typo fixed.

P13 Fig. 7. To make it more clear, legend is recommended to add into the figure.
The figure legends were added to Figs. 7, 8 and 9 and A1.

Fig. 6 and Fig. 7. It would be better to use the same definition for daytime and nighttime. Either based on solar elevation angle (Fig. 6) or hour ranges (Fig. 7).
We agree that it is a bit unusual to have the different definitions for day and night-time in the two plots, but this was done on purpose due to the need of each figure. In Figure 6 the main point is to show how the RRE varies in different atmospheric conditions, which are to a large extent determined by solar radiation, whereas in Figure 7 we want to refer to human activity which is independent on the different hours of sunlight or darkness. Thus, we prefer leaving the different definitions to the manuscript.

P17 L17-18. The directions 250-330 and 50-130 are still not changed.
The limits have now been corrected also in the main text.