General Comments:
This manuscript uses three months of data collected during the XPIA field campaign from 4 lidars and sonic anemometers on a 300m tower to calculate turbulence dissipation rates. The manuscript furthers a method of calculating epsilon from OConnor etal 2010, using the line of sight velocity spectra, and conducts an error analysis to determine the time scale that produces the most accurate turbulence dissipation rates. The minimum mean absolute error is determined for stable, unstable, and neutral conditions with good agreement with sonics, particularly when averaged to 30-minutes. These results are then compared for different heights, wind speeds, Obukhov length, and during one nocturnal low-level jet case to understand the variability of turbulence dissipation rates in a large range of conditions.

Overall, this is a well-conducted error analysis that allows for further analysis of variability of a difficult-to-measure quantity. My major concern comes from the fact that in situ observations are necessary for this analysis to be reasonably, so the extension of the method to a broad number of lidar sites without sonic anemometers seems unlikely.

I recommend publication of this manuscript after major revisions, as listed below.

Specific Comments:
The fact that on many plots the v1s are not included is worrisome; looks like only the good results are shown. A short sentence that results are similar is insufficient. It deserves a short discussion on the differences, benefits and drawbacks of each of the systems and why there is expected to be some variation (even if small).

These results of appropriate time scales for reducing error are very interesting, but can they be applied everywhere? With the dependence on stability and scales of turbulence, terrain would undoubtedly have a large affect on the time scales with minimum error. If there are no sonics available for the error analysis done here, and individual spectra need to be inspected to find an appropriate inertial range, the method breaks down and isn't reasonable. This problem needs to be addressed here.

- page 2, line 5: Is the 3km scale a result from Albertson et al also? If so, move citation to end of sentence. If not, include citation for this fact also
- page 5, table 1: include the temporal resolution of each lidar
- page 7, lines 14-15: what is theta here? How small is small?
- page 7: Are LOS velocity spectra calculated for all beams or only the vertically pointing? If all, isotropy must be assumed. Clarify and comment on this.
- page 10, lines 4-5: why is a wider inertial range expected at higher altitudes?
- page 14, line 15: this final sentence doesn't make sense. Why would the filter change the choice of shorter time scales being averaged?

Technical Corrections:
- On all figures with units of epsilon shown, use $m^2 s^{-3}$, not m^2/s^3
- When referring to figure subplots, remove space between number and letter (check AMT standard)
- Include the time scale of epsilon on all plots
- Yellow lines are hard to see, especially the yellow shading. I appreciate the use of consistent colors for each instrument across all figures, but need a better choice for yellow. If v1s are used rarely, use purple or green instead of yellow, maybe the same color with different weights or dashes?

Page 1
- line 7: accurate forecast
Page 2
- 1: small enough that molecular diffusion is capable of dissipating

- 7: when using models
- 34: velocity spectra. We assess the uncertainty of this method, and present

Page 3

- 5-6: as a case study… during a nocturnal low-level jet event
- 18: measurement accuracy or precision (not resolution)

Page 4

- 14-15: For atmospheric stability, we classify neutral conditions as L … unstable conditions as … stable conditions as…
- 24: who deployed the v2?
- 30: wrong dates for the v1s

Page 5

- 19: remove space after tower

Page 6

- 5: which must be within

Page 7

- 9: define k_1 and N earlier

Page 8

- 6: period after equation
- 22-23: different heights and atmospheric conditions

Page 9

- 11: looks more like 40s, not 50s

Page 10

- 24: found to be at shorter time scales than unstable

Page 11

- 9-10: because they occurred less than 5% of the time

Page 12

- 9: due to hard strikes
- 10: v1-61, so the comparison… 150m AGL has been performed using only this lidar's data…

Page 14

- 8 conditions and smoothing
- 12: note the time scales of the raw time series
- 20: lower case section (only capitalize when referring to Section X)
- 23: Materials, and are
- 26 & 27: space before units
- 28: intermittent

Page 16

- 1: lowercase section
- 2: confusing wording
- 14: not all instruments

Page 17

- 1-2: $L>0$ and $L<0$

Page 18

- 4: impact on
- 11: increases of 1-2 orders (stable increases two orders)

Page 19

- 1: wind energy resources
- 18: cite Yang et al, (2017). Sensitivity of turbine-height wind speeds to parameters in planetary boundary-layer and surface-layer schemes in the weather research and forecasting model. *Boundary-Layer Meteorology*, *162*(1), 117-142.

Figure 1: legend on right plot is not readable – match size of left legend. Colors on right subplot does not correspond to color scale legend on left subplot – include a new color scale for this subplot also
Table 1: WINDCUBE v1 (61 & 68)
Figure 5: Use a different color than yellow (purple?)
Figure 6: variability (misspelled); indicate which time scale is used for each stability class: minimum MAE for optimized Nt, at the appropriate time scales?
Figure 8: labels columns (raw and smoothed) and rows (all stability, stable, unstable) on figure
Figure 9: label instruments on figures; nighttime variability mentioned in text is hard to see on this color scale – maybe change to "jet" blue-red scale; I'd prefer the y-axes to be the same on the two left plots, or at least both start at 0; are these 30-minute or raw values?