

Interactive comment on “Spatial and temporal variability of turbulence dissipation rate in complex terrain” by Nicola Bodini et al.

Anonymous Referee #1

Received and published: 6 January 2019

General Comments: This paper presents a unique set of observations of turbulence dissipation rates, both on the mesoscale across the Columbia River Gorge, and on a scale about the size of a model grid cell. The variability between sites is shown to exist in time and in space. Overall, this is an important study, to understand the differences that can be expected on different spatial scales. The paper is very well written, with figures and supplemental material to support the discussion.

Specific Comments: There is a lot of mention of topography being the reason for differences and variability between sites, but what is it about the sites' topography? Is it, for example, complexity of topography in a ~ 1 km radius? Or maybe the slopes of the sites? In order to attribute the variability to topography, we need to know more about that topography. Furthermore, with no explanation of how the topography impacts dis-

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sipation, it is hard to negate the possibility that different instruments produce different magnitudes of dissipation and its diurnal cycle.

In the conclusion, discuss what the microscale variability means for mesoscale modeling. How do models need to account for this subgridscale variability?

P3 1st full paragraph: Mention that Troutdale is on W side of Cascades, with the other sites in the Columbia Basin to the east of the Range P3L14: What height are the towers? P3 2nd full paragraph: The sentence about the wind farms/turbine in the larger region is out of place in the paragraph about the sonics at the physics site. Move this sentence to the paragraph before, or break into pieces in previous paragraph and this one. P4: Mention that Wasco, Gordon's Ridge and Vansycle Ridge are on the east side of the Cascades, in the Basin. How far apart from each other are the sites? P5L11: why does a fast scan rate need to be removed? Figure 2: identify the maximum of the local regression, which is used for N Figure 3: Can you show an additional day on either end, to show the more-typical diurnal cycles? P12: How does the topography impact the east vs west side of the Physics Site? What is the variability in terrain (there's 50m between the highest and lowest points, but is there a ridge, is it a uniform slope, which direction is higher/lower, etc)? P12: Is this analysis done only when winds are from the southwest? If not, it would be interesting to see if the easterly winds contribute to the ratios greater than 1 in Fig 5. P16L6: mention in the text the height shown in the figure P18L2: There are wind turbines east of Wasco; do these directions show elevated dissipation rates under easterly winds? It's hard to see in the supplement figure. P18L14: what is it about Gordon's ridge that makes its topography special, compared to the other sites?

Supplement Fig 3: add interquartile range, like Fig 7 Supplement 4: Why is Troutdale SO small in summer?

Technical Corrections: P2L28: observational assessments P3L19: Physics P5L3: should one of the 260m top heights be different? Why specify Vansycle Ridge to 260m

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AGL? P6L16: “to the their” P12L9: an ideal candidate

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2018-1131>, 2018.