Wind Energ. Sci. Discuss., author comment AC1
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Reply on RC1

Elena Cantero et al.

Author comment on "On the measurement of stability parameter over complex mountainous terrain" by Elena Cantero et al., Wind Energ. Sci. Discuss., https://doi.org/10.5194/wes-2021-44-AC1, 2021

Dear anonymous **referee #1** many thanks for the generally positive feedback about our manuscript. Your comments are really appreciated. We are preparing a review of the document but as a preview please find below our point-by-point responses to your suggestions and concerns.

Specific comments

Anonymous Referee #1: Interesting to note that unstable situations are found in the 330º-350º direction sector, which is a predominant one (page 8). If possible, please add a possible explanation for that.

Answer: As can be seen in figure 2, and it is explain in line119, the North face of Alaiz Mountain has a steep slope (the RIX value in the north sector in MP5 position is 22.4%) that empties into a large valley at around 700 m lower altitude. According to the reference book "*An Introduction to Boundary Layer Meteorology*" (Stull 1998) this topography causes ascending hillside/valley winds that generate convective turbulence and therefore situations of instability that could explain some of the instability found in the 330º-350º direction sector. We will clarify it in the revised version of the manuscript.

Anonymous Referee #1: At page 10, please clarify that the bulk Richardson number is also calculated on a 10-min interval, i.e. the same period used for the calculation of the Obukhov length.

Answer: Yes, the bulk Richardson number is also calculated on 10-min interval.

Anonymous Referee #1: As stated in the paper, sonic anemometers are not commonly used in the wind industry, so the Bulk Richardson number method would be of great interest for the industry. As the author mentions, one of the problems here for using that method is that the mast does not have a surface temperature sensor. It would be very useful if the authors can give their opinion on whether having the surface temperature sensor would improve the accuracy of the Bulk Richardson number method and thus the consistency between the 2 analyzed methods. If possible, please also give some guidance

for future studies to estimate atmospheric stability using the Bulk Richardson number.

Answer: According to the good results with Richardson Bulk in offshore sites where the bulk Richardson method seems to be a robust approach to characterize stability offshore (refrernce in the article "*Atmospheric stability assessment for the characterization of offshore wind conditions*",Sanz et al. 2015) and where it is calculated using sea temperature, we think that having the surface temperature sensor would improve the accuracy of the Bulk Richardson number method in onshore sites. In future experiments in Alaiz, we would like, on the one hand, to use measurements of the surface temperature and, on the other, keeping the heights close to the ground, of two meters or less, and use differential temperature sensors instead absolute ones to see if the results improve. With this information it would be possible to give clear guidelines on how to proceed.

Corrections:

Answer: We will correct them in the revised version of the manuscript.