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Interactive comment on "Study of the overturning length scales at the Spanish planetary boundary layer" *by* P. López and J. L. Cano

Anonymous Referee #2

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The authors study an interesting problem in modelling the atmospheric boundary layer by analysing the relationship between the maximum Thorpe displacement, and the Thorpe scale, which is the statistical mean of displacements. The results are based on the set of detailed observations. The authors argue that the relationship under consideration is not linear, as found previously for the atmospheric boundary layer, but powerlike, and find the corresponding power laws for the complete set of data, and separately for day and night observations.

First, the authors write, in section 4.1, that they have found two qualitatively different behaviours of Thorpe displacements. It is rather difficult to visualize these cases from the explanation. Perhaps it would be better to illustrate these behaviours with a figure.

Second, it does appear from figures 3-5 that a power law fits the data better than

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a linear one. However, it would be better to explain it clearly in statistical terms. The authors need to make sure that all statistical concepts they use (P value, F test, etc) are properly defined. I can trust that they have chosen the best exponent for the powerlike fit, but how much better it is, in statistical terms, than a linear fit with a certain coefficient, similar to what has been found by other authors? For example, most (although not all) data in figure 3 appear to fit rather well to a linear dependence.

Also, the use of the term "linear" needs to be more consistent in the paper. The authors write "We observe that the linear relationship $|(d_T)_{max}| = L_T$ proposed by other authors... "; but the other authors have proposed, in particular, a linear relationship with a ratio $|(d_T)_{max}|/L_T$ which is different from 1. It is not clear why the light grey line in figure 5 represents the linear fit, as stated in the caption, while it is clearly a powerlike function, in logarithmic coordinates. I guess the authors use the term "linearity" interchangeably in algebraic and statistical sense, which is rather confusing.

The text can benefit from some editing and proofreading.

Interactive comment on Nonlin. Processes Geophys. Discuss., 2, 1531, 2015.