Response to the Referee #2

We thank the reviewer 2 for the comments and the possible suggestions that can help to improve the paper. Although some of them we do not agree, below we respond point-by-point to the reviewers' comments (colored in blue)

Let me first recall that over the last 10 years, the statistical characterization of velocity turbulent fluctuations in the atmosphere is a widely studied topic. Numerous results from experiments and from numerical simulations are published in the literature.

It is true that there are numerous papers that have been published in the last 10 years over statistical characterization of velocity turbulent fluctuations in the atmosphere but not many of them establish the relation between the fractal dimension and the integral scale at changing the atmospheric stratification.

The fractal dimension, or box-counting dimension D_0, is a statistical property of turbulent signals, providing a measure of the degree of roughness, and it is thought to be a 'universal' property of it (see also many text books on the topic of the relation among the generalized fractal dimensions and the singularity spectrum of a turbulent signal).
This means, in particular, that it should not depend on the value of the integral scale of the flow, something that is clearly not universal but depends on the geometry of the system, and on its stability. If the authors differently think the such a relation exist, they should give a solid basis to their working hypothesis. A linear regression can be applied to any pair of observables.

We do not consider as a universal property the fractal dimension of u' and w' components of wind velocity, in fact we find that this magnitude depend on integral scale and stratification. This is deduced from the experimental data. During diurnal cycle the average values of the integral scale increase versus the fractal dimension for the u' horizontal component due to the instability of stratification into the ABL, and these values can be adjusted to the straight regression line with a R^2 acceptable. At nighttime hours due to the atmosphere stability the average values of the integral scale decrease with the increase in the fractal dimension. These values also fit a straight line as it is indicated in Fig 5 and Fig 6. For the w' vertical component have fitted a quadratic function as it is indicated in Fig 7. In all these cases the R^2 values and confidence levels are high. To find a theoretical background why this happens in the three heights is not easy.

The authors think that if the fractal dimension is a statistical property of turbulent signals providing a measure of the degree of roughness, the atmospheric stability of stratification somehow softens the irregular flow and instability increases such irregularity as is indicated in Fig 3. At night hours the fractal dimension decreases with an increase in noon as is observed in Fig 3.

The computation the fractal dimension is in principle an easy task, provided there existsan extended range of scales where there is scaling. The authors extract the fractaldimensions at fixed heights in the ABL with no discussion about the evolution of themixed layer, and kind of flow they expect to measure at different height depending

onthe stratification. For example: similar to homogeneous and isotropic 3D turbulenceduring convection, similar to homogeneous stratified flow at night, etc.. Even if thediurnal cycle is never really stationary, there are stages of quasi-stationarity when statisticalproperties can be assessed.

It is true that we do not discuss about the evolution of the mixed layer at fixed heights but that is not the objective of our work. The kind of flow measuring expected was that during the day there was instability due to sun radiation reaches the ground increasing the temperature of the lowest layer and during the nighttime hours expected stratified flows which it is confirmed by experimental data.

Finally, I find that the manuscript contains limited novelty with respect to Ref. "Tijera M.,Maqueda G.,Yaque C., and Cano J.: Analysis of fractal dimension of the wind speed and its relations with turbulent and stability parameters , Intech, Fractal Analisis 6 and Chaos in Geosciences, 29-46, 2012"

Although this work deal on the fractal dimension of the velocity components, there are significant differences with the cited paper because, both papers study different parameters of the turbulent flows. In the paper that you just quoted, the fractal dimension is analyzed versus the potential temperature, the turbulent kinetic energy, the friction velocity and Bulk Richardson number; but do not study the behavior of the wind fluctuations integral scale versus the fractal dimension at changing the atmospheric stratification nor separates hours of day and night to better analyze the influence of diurnal and nighttime cycle.