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Nonlinear Processes in Geophysics
Discussions

Interactive comment on "Influence of Atmospheric Stratification on the Integral Scale and Fractal Dimension of Turbulent Flows" *by* M. Tijera et al.

Anonymous Referee #2

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The manuscript reports experimental measurements of velocity components recorded with a sonic anemometer in the Atmospheric Boundary Layer (ABL) over homogeneous terrain. The goal of the work is to study the behaviour of the wind fluctuations integral scale, and so-called fractal dimension, at changing the atmospheric stratification. Temporal resolution is moderate, but this is not a problem in principle since the authors do not focus on rapidly varying observables.

Let me first recall that over the last 10 years, the statistical characterisation 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.

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.

The computation the fractal dimension is in principle an easy task, provided there exists an extended range of scales where there is scaling. The authors extract the fractal dimensions at fixed heights in the ABL with no discussion about the evolution of the mixed layer, and kind of flow they expect to measure at different height depending on the stratification. For example: similar to homogeneous and isotropic 3D turbulence during convection, similar to homogeneous stratified flow at night, etc.. Even if the diurnal cycle is never really stationary, there are stages of quasi-stationarity when statistical properties can be assessed.

Which fractal dimension do the authors expect to measure for daily convection and nightly stratified flows? There is no theoretical frame of reference in their analysis, just measurements.

Additionally to this major problems, the paper contains many "descriptive" sentences, whose necessity is at least doubtful, while the quantitative part on the analysis and discussion is very very weak.

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 5 speed and its relations with turbulent and stability parameters , Intech, Fractal Analisis 6 and Chaos in Geosciences, 29-46, 2012"

For all these reasons, I think that the paper is not suitable for publication.

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