Visibility network analysis of large-scale intermittency in convective surface layer turbulence. (English) Zbl 07394314

Summary: Large-scale intermittency is a widely observed phenomenon in convective surface layer turbulence that induces non-Gaussian temperature statistics, while such a signature is not observed for velocity signals. Although approaches based on probability density functions have been used so far, those are not able to explain to what extent the signals’ temporal structure impacts the statistical characteristics of the velocity and temperature fluctuations. To tackle this issue, a visibility network analysis is carried out on a field-experimental dataset from a convective atmospheric surface layer flow. Through surrogate data and network-based measures, we demonstrate that the temperature intermittency is related to strong nonlinear dependencies in the temperature signals. Conversely, a competition between linear and nonlinear effects tends to inhibit the temperature-like intermittency behaviour in streamwise and vertical velocities. Based on present findings, new research avenues are likely to be opened up in studying large-scale intermittency in convective turbulence.

MSC:
76-XX Fluid mechanics

Keywords:
adversatile flows; intermittency

Full Text: DOI

References:


[37] Manshour, P.2015Complex network approach to fractional time series. Chaos25 (10), 103105. · Zbl 1378.62078


Zorzetto, E., Bragg, A.D. & Katul, G. 2018 Extremes, intermittency, and time directionality of atmospheric turbulence at the crossover from production to inertial scales. Phys. Rev. Fluids 3 (9), 094604.


This reference list is based on information provided by the publisher or from digital mathematics libraries. Its items are heuristically matched to zbMATH identifiers and may contain data conversion errors. It attempts to reflect the references listed in the original paper as accurately as possible without claiming the completeness or perfect precision of the matching.