# Collective Intermittency of Wind Power Fluctuations

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**Résumé**

Renewable energy sources are inherently variable, leading to fluctuations in power generation. In the case of wind energy, atmospheric turbulence can cause extreme variations in output, placing stress on electrical infrastructure. Gaining a deeper understanding of these intermittent dynamics is a crucial first step toward designing and optimizing next-generation renewable energy systems.
In this study, we analyze the correlation structure of wind power fluctuations across a farm of 80 turbines over a five-year period. We identify the presence of universal, collective, and nonlinear correlations, which drive the pronounced persistence and intermittency observed in the aggregated power output of the farm.
These insights offer a fresh perspective on wind power variability, emphasizing the critical role of nonlinear correlations in the dynamics of power production. By more accurately characterizing these fluctuations, our findings can inform strategies for grid management, energy storage optimization, and wind farm design, ultimately facilitating the more effective integration of wind energy into modern power systems.

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