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Multiscale Sample Entropy of 2D Decaying Turbulence ILDOO
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Hospital, XIAO-LUN WU, University of Pittsburgh — Kolmogorov-Sinai entropy
has been used to quantify degrees of complexity of spatiotemporally chaotic systems.
However, it is not always convenient to implement in real experiments. Recently a
Multiscale Sample Entropy (MSE) measure has been proposed, which allows easier
analyses of time series. In this study, we have generated decaying turbulence in a
two-dimensional soap film and have measured velocity fluctuations as functions of
time and downstream distance using a laser Doppler velocimeter. We performed
MSE analysis and found there is a time scale $\tau_0$ at which the MSE is maximized.
The value of $\tau_0$, which correlates well with the large-eddy turn-over time, gets larger
as turbulence decays. Other aspects of 2D turbulence are also analyzed using the
velocity time series.

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