Using information theory for turbulence prediction: a statistical approach\textsuperscript{1} WALTER GOLDBURG, RORY CERBUS, University of Pittsburgh — Information theory provides a tool for quantifying the amount of uncertainty or disorder in physical systems through the entropy density $h$. Going beyond this, physics is often concerned with prediction. The goal here is to predict a subsequent string of velocity measurements on the basis of a set of prior observations. The predictability is captured in a function called the system’s statistical complexity $C$, which is the average information needed for the prediction. There have been very few attempts to use this theory with experimental data. We have measured $C$ in a quasi-2D soap film flow as a function of Reynolds number $Re$. The measurements point to a sharp transition in $C(Re)$ when the turbulence becomes fully developed. This approach to complexity through predictability promises to be an interesting way of looking at turbulence and other complex systems.

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