Center for Environmental & Applied Fluid Mechanics

"Experimental Evidence that Turbulent Evolution can be Approximated by Recurrent Flows"

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Despite a long and rich history of scientific investigation, fluid turbulence remains one of the most challenging problems in science and engineering. One of the key outstanding questions concerns the role of coherent structures that describe frequently observed patterns embedded in turbulence. It has been suggested, but not proven, that coherent structures correspond to unstable, recurrent solutions of the governing equations of fluid dynamics. In this talk, I will present the first experimental evidence that three-dimensional, weakly turbulent (spatiotemporally chaotic) flow tracks, episodically but repeatedly, the spatial and temporal structure of multiple such solutions. These results provide compelling evidence that coherent structures, grounded in the governing equations, can be harnessed to predict how turbulent flows evolve.

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