Systems analysis of wall turbulence:
Characterizing natural and synthetic self-sustaining processes

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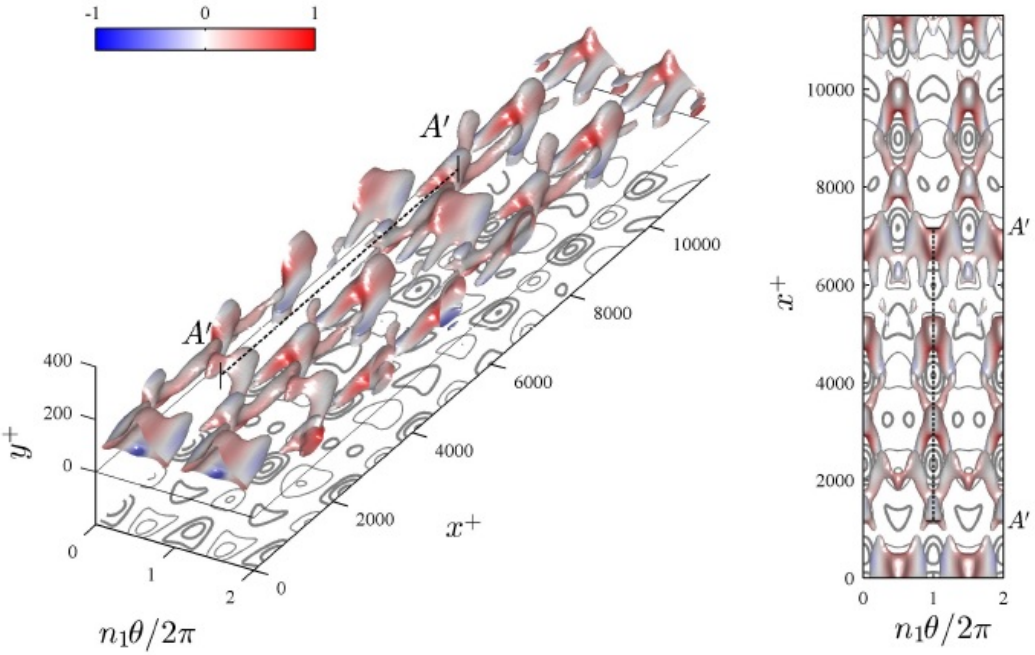
Abstract

The financial and environmental cost of turbulence is staggering: manage to quell turbulence in the thin boundary layers on the surface of a commercial airliner and you could almost halve the total aerodynamic drag, dramatically cutting fuel burn, emissions and cost of operation. Yet systems-level tools to model scale interactions or control turbulence remain relatively under-developed. The resolvent analysis for turbulent flow proposed by McKeon & Sharma (*J. Fluid Mech, 2010*) provides a simple, but rigorous, approach by which to deconstruct the full turbulence field into a linear combination of (interacting) modes. After a brief review of some key results that can be obtained by analysis of the linear resolvent operator concerning the statistical and structural make-up of wall turbulence, I will describe some of our recent progress towards determining how to reconstruct self-sustaining turbulent systems, both natural and synthetic. Implications for both the classical picture of wall turbulence and control of turbulent flows will be discussed.



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