Abstract Submitted
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A finite-time thermodynamics of unsteady shear flows[1] BERND R. NOACK, MICHAEL SCHLEGEL, Berlin University of Technology, Germany, BOYE AHLBORN, University of British Columbia, Vancouver, Canada, GERD MUTSCHKE, Forschungszentrum Dresden-Rossendorf, Germany, MAREK MORZYŃSKI, Poznan University of Technology, Poland, PIERRE COMTE, Universite de Poitiers, France, GILEAD TADMOR, Northeastern University, Boston, USA — A finite-time thermodynamics (FTT) formalism (Andresen, Salamon & Berry 1977) is proposed to compute the mean flow and fluctuation levels of unsteady, incompressible, shear flows. That formalism yields a definition for a thermodynamic degree of freedom of the velocity fluctuation as well as conditions for local thermal equilibrium. In general, the dynamics of unsteady flow is shown to be in partial thermal equilibrium, a state governed by finite time scales of energy transfer. The FTT model has been successfully applied to shear flows with simple to complex dynamics, e.g. vortex shedding and homogenous shear turbulence.

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