

Abstract Submitted
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Colouring turbulence with the nonlinear terms¹ SEAN SYMON, SIMON ILLINGWORTH, IVAN MARUSIC, University of Melbourne — We study the behaviour of the nonlinear terms in turbulent channel flow from direct numerical simulations (DNS) at low and moderate Reynolds numbers. These terms correspond to the nonlinear forcing of the (linear) resolvent-based models of McKeon & Sharma 2010. Spectral proper orthogonal decomposition (SPOD) is used to extract the most energetic structures and identify the power spectrum of the most energetic modes. We also compare the nonlinear terms to the equivalent nonlinear forcing supplied by eddy viscosity-enhanced resolvent models. At spatial wavenumbers where there is energetic activity, the nonlinear terms share many similarities with their velocity fluctuation counterparts. The nonlinear terms are also a good match with predictions from eddy viscosity at wavenumber pairs where the resolvent operator including eddy viscosity is low-rank. The implications for estimation techniques such as spectral linear stochastic estimation and the Kalman filter will be discussed.

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