Abstract Submitted
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Representation of the velocity spectra and Reynolds stress co-spectrum in turbulent channel flow using resolvent modes[1] RASHAD MOARREF, California Institute of Technology, ATI S. SHARMA, University of Southampton, JOEL A. TROPP, BEVERLEY J. MCKEON, California Institute of Technology — We represent the velocity field in channel flow as a weighted sum of a small number of 'resolvent modes' that are obtained by Fourier decomposition in the wall-parallel directions and time, and singular value decomposition of the resolvent operator in the wall-normal direction, following McKeon & Sharma (J. Fluid Mech., 2010). Building on previous efforts in which the Reynolds number scaling and geometric self-similarity of the resolvent modes were identified in a study of the streamwise velocity variance, we determine the resolvent mode weights required to minimize the deviation between an assembly of resolvent modes at Re_tau = 2003 and the time-averaged two-dimensional spectra (uu, vv, ww and uv) from direct numerical simulations (Hoyas & Jimenez, Phys. Fluids, 2006). While the spectra corresponding to small wavelengths can be approximated by a few resolvent modes, a larger number of modes is necessary for matching at large wavelengths. The Reynolds number scaling of the spectra and the associated implications of previously-identified self-similar attached eddies are further discussed.

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