Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Nonlinear forcing in the resolvent analysis of wall-turbulence[1]
KEVIN ROSENBERG, California Institute of Technology, ADRIAN LOZANO DURAN, AARON TOWNE, Center for Turbulence Research, BEVERLEY MCKEON, California Institute of Technology — The resolvent analysis of McKeon and Sharma (JFM, 2010) formulates the Navier-Stokes equations as an input/output system in which the nonlinearity is treated as a forcing that acts upon the linear dynamics to yield a velocity response across wavenumber/frequency space. DNS data for a low Reynolds number turbulent channel ($Re_\tau = 180$) is used to investigate the structure of the nonlinear forcing directly. Specifically, we explore the spatio-temporal scales where the forcing is active and analyze its interplay with the linear amplification mechanisms present in the resolvent operator. This work could provide insight into self-sustaining processes in wall-turbulence and inform the modeling of scale interactions in large eddy simulations.

[1]We gratefully acknowledge Stanford's Center for Turbulence Research for support of this work

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Date submitted: 01 Aug 2016 Electronic form version 1.4