Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Identification of nonlinear interaction of the self-sustaining process in wall-bounded turbulence using resolvent analysis[1] H. JANE BAE, BEVERLEY MCKEON, California Institute of Technology — The nonlinear interaction in the self-sustaining process of wall-bounded shear flows is investigated using resolvent analysis. Resolvent analysis (McKeon & Sharma 2010) is used to identify the principal forcing mode which produces the maximum amplification in the minimal channel (Jiménez & Moin 1991). The identified mode is then removed from the nonlinear term of the Navier-Stokes equations at each time step from a direct numerical simulation of a minimal channel. The results show that the removal of the principal forcing mode is able to laminarize the flow, while the removal of subsequent modes only marginally affects the flow. Using conditional averaging, the flow structures that are responsible for generating the principal forcing mode, and thus the nonlinear interaction to self-sustain turbulence, are identified to be spanwise rolls interacting with meandering streaks.

[1]This work was funded in part by the Coturb program of the European Research Council.

H. Jane Bae
California Institute of Technology

Date submitted: 26 Jul 2019 Electronic form version 1.4