Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Symmetry-reduced Dynamic Mode Decomposition of the near-wall turbulence in channel flow[1] ELENA MARENSI, GOKHAN YALNIZ, BJOERN HOF, NAZMI BURAK BUDANUR, IST Austria — In the past ten years dynamic mode decomposition (DMD) has emerged as a powerful tool for the data-driven characterization of large-scale systems, such as those that arise from complex fluid flow phenomena. DMD is based on singular value decomposition (SVD), which is known to struggle in systems with continuous symmetries, as the modal expansion is dominated by drifts and cannot, in general, provide information about the underlying physical mechanisms. Here, we tackle this problem for the case of plane Poiseuille flow by combining DMD with a pre-processing continuous-symmetry reduction that removes the translations both in the streamwise and spanwise directions. We consider a long turbulent trajectory in a minimal flow unit at a $Re = 2000$ and perform many DMD calculations over sliding windows of increasing durations. Tracking the DMD reconstruction error as a function of time, we uncover episodes of the turbulent evolution that can be well captured by a reduced linear expansion. In addition, we argue that identification of nearly-cyclic processes via symmetry-reduced DMD offers a data-driven method for discovering sustaining processes of near-wall turbulence. In both cases, symmetry-reduction is found to be crucial to obtain meaningful representations of the system under stud

[1]EM acknowledges financial supports from the ISTPlus postdoctoral fellowship program.

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Date submitted: 03 Aug 2020 Electronic form version 1.4