Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Temporal coherence of turbulent dynamics in minimal channel flow and its connection to exact coherent states[1] JAE SUNG PARK[2], MICHAEL GRAHAM, University of Wisconsin-Madison — The dynamics of the turbulent near-wall region is known to be dominated by coherent structures. These near-wall coherent structures are observed to burst in an intermittent way, exporting turbulent kinetic energy to the rest of the flow. In addition, they are closely related to invariant solutions known as exact coherent states (ECS), some of which display nonlinear critical layer dynamics. In this study, temporal coherence in minimal channel flow relevant to burst and critical layer dynamics is investigated. The turbulence displays frequencies very close to the critical layer frequency displayed by an ECS family recently identified in the channel flow geometry. The bursting frequency is predominant near the wall, while the critical layer frequency becomes predominant over the bursting frequency as we move away from the wall. In particular, the critical layer frequency becomes more prominent near the channel center and at higher Reynolds number. Finally, turbulent bursts are classified into strong and relatively weak classes with respect to an intermittent approach to a lower branch ECS. The relationship between the strong burst class and the instability of the lower branch ECS is further discussed.

[1]This work was supported by the Air Force Office of Scientific Research through grant FA9550-15-1-0062 (Flow Interactions and Control Program).
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Date submitted: 01 Aug 2016 Electronic form version 1.4