

Abstract Submitted
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Energetic modes in turbulent pipe flow from resolvent analysis

ATI SHARMA, Imperial College London, BEVERLEY MCKEON, California Institute of Technology — We describe a method to investigate the mode shapes in turbulent pipe flow at a given wavenumber pair that are most responsive to harmonic forcing. Specifically, these modes correspond to the largest singular values in a Schmidt decomposition of the linear Navier-Stokes operator using the turbulent mean profile as the base flow. The ideas follow logically from the work of Sharma & McKeon (2009), who considered a similar approach for laminar pipe flow. The dominant modes exhibit the inner and outer scaling behavior expected from experiment. A comparison of the mode shapes with the largest response with the results of a Karhunen-Loeve analysis on a pipeflow DNS by Dugdale *et al* (2007), i.e. an *a posteriori* evaluation of the most energetic mode shapes, shows reasonable agreement. An additional consequence of this analysis in terms of the scaling of the very large scale motions is discussed further in the presentation by McKeon & Sharma.

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