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Structure from the critical layer framework in turbulent flow ATI SHARMA, Imperial College, BEVERLEY MCKEON, California Institute of Technology — We extend the critical layer framework for turbulent pipe flow proposed by McKeon & Sharma (*J. Fluid Mech, 2010*) to investigate vortical structure generated at particular streamwise/azimuthal wavenumber and frequency combinations, (k, n, ω). This framework utilizes an input-output formulation of the Navier-Stokes equations in a divergence-free basis to analyze the transfer function (the "resolvent") and identify the dominant forcing and response mode shapes at each (k, n, ω) combination relevant to experimental spectra. It is shown that the hairpin vortex is a natural constituent of the velocity field associated with so-called wall modes, such that our model gives important predictive information about both the statistical and structural make-up of wall turbulence. Thus the dominant response mode shapes form a suitable basis by which to decompose the full turbulent velocity field.
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