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Resolvent mode identification in a turbulent boundary layer[1]
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— The resolvent analysis developed by McKeon and Sharma (J. Fluid Mechanics, 2010) has demonstrated a connection between the most amplified disturbances in wavenumber/frequency space and observed structures in wall turbulence. Three simultaneous hotwire measurements are made across a zero-pressure gradient turbulent boundary layer to identify the resolvent modes associated with these structures. A resolvent mode is designated by a streamwise wavenumber, a spanwise number, and a temporal frequency (k, n, ω respectively) and physically represents a travelling wave. The three wires are aligned in the wall normal direction and spaced in the streamwise and spanwise directions. The signals are filtered at the frequency corresponding to the resolvent mode of interest and ensemble averaged over a single period; the resulting phase differences between wires and their respective separation distances allows for the calculation of the spatial wavenumbers. The eventual goal is to sense these modes in real time as this will provide an important first step towards the development of closed-loop control schemes, specifically within the context of the resolvent framework.

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