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Spectral analysis of temporally resolved velocity field data for Taylor-Couette flow JOHN W. LAAGE, MICHAEL G. OLSEN, R. DENNIS VIGIL, Iowa State University — High speed stereoscopic particle image velocimetry (PIV) data were collected for Taylor-Couette flow for flow regimes varying from wavy through turbulent. The Taylor-Couette apparatus used had an aspect ratio of 34 and a radius ratio of 0.733. The working fluid was an index-of-refraction matched sodium iodide and water solution. Data were obtained for rotational Reynolds numbers ranging from 6 up to 200. Each high speed PIV data set consisted of 2048 images separated in times ranging from 1/60 through 1/2000 second as required by the rotational Reynolds number observed. The time resolved velocity field data were subjected to Fourier Decomposition to find the frequency behavior for a given rotational Reynolds number by calculating the power spectral density. For each investigated rotational Reynolds number, several data sets were averaged together to reduce the effect of observational "noise." Turbulent kinetic energy and Reynolds Stresses were also calculated for the turbulent flow cases. Data at different rotational Reynolds numbers are compared to characterize flow transitions.

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