

Abstract Submitted
for the DFD07 Meeting of
The American Physical Society

Azimuthal correlation in the outer layer of turbulent pipe flow¹

SEAN BAILEY, MARCUS HULTMARK, ALEXANDER SMITS, Princeton University, MICHAEL SCHULTZ, United States Naval Academy — Two point hot-wire measurements of streamwise velocity were performed in the log-layer and wake region of turbulent pipe flow for Reynolds numbers ranging from 8×10^4 to 8×10^6 at four wall-normal positions with azimuthal probe separation. The azimuthal correlations were found to be consistent with the presence of very large scale coherent regions of low-wavenumber, low-momentum fluid observed in previous studies of wall-bounded flows. Within the log-layer the azimuthal scale determined from the correlations was found to be similar to that observed for channel flows. As wall-normal position increased outside the log-layer, there was a decrease in azimuthal scale relative to that of channel flow. Using cross-spectral analysis, high-wavenumber motion was found to grow azimuthally with wall-normal distance at a faster rate than the low-wavenumber motions.

¹Supported by ONR through N00014-07-1-0111 (Program Manager Ron Joslin). Support for S Bailey provided by NSERC.

Alexander Smits
Princeton University

Date submitted: 19 Jul 2007

Electronic form version 1.4