

Abstract Submitted
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Orientation and circulation of vortices in a turbulent boundary layer¹ QI GAO, CECILIA ORTIZ-DUEÑAS, ELLEN LONGMIRE, Dept. Aerospace Engineering & Mechanics, University of Minnesota — The strengths of individual vortices are important in determining the generation and development of surrounding vortices in turbulent boundary layers. The dual-plane PIV data at $z^+ = 110$ and $z/\delta = 0.53$ in a turbulent boundary layer at $Re_\tau = 1160$ obtained by Ganapathisubramani et al. (2006) were investigated. 3D swirl strength was used to identify vortex cores. The eigenvector of the velocity gradient tensor was used to determine the orientation of each core, and the resulting eigenvector direction was compared with the average vorticity direction. Circulation of the cores was calculated using the vorticity vector only and using the vorticity vector projected onto the eigenvector. The probability distribution of the angle between the eigenvector and the vorticity vector indicated a peak at 15-20 degrees. The eigenvector angle distributions indicate that at $z^+ = 110$, more hairpin legs cross the measurement plane while at $z/\delta = 0.53$, more heads are evident. Details of the orientation and circulation distributions will be discussed in the presentation.

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