VORTICITY BASED INTERMITTENCY MEASUREMENTS IN A LARGE SINGLE-STREAM SHEAR LAYER

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A single-stream shear layer has two entraining boundaries: i) its high ($u=U_o$) speed, and ii) low ($u=0$) speed sides. The (external) intermittency (I) in both regions is marked by the presence ($I(t)=1$) or absence ($I(t)=0$) of vortical fluid at the measurement location. The experimental facility of [1] provided the subject flow for this investigation. The four-sensor (transverse) vorticity probe, [2], was used to determine the I=0,1 conditions. With x as the streamwise coordinate and $\partial\bar{u}/\partial y>0$, the probe was oriented to obtain $\omega_z(t)$ at discrete points across the shear layer. Ten channels of anemometry (two X-arrays flanked the vorticity probe with two additional single sensors in a 4 cm span) were used to identify sweeps of the viscous superlayer [3] past the array. The vorticity probe was used to "train" the other probes in their (locally corrected) evaluations of the $I=0\leftrightarrow1$ transitions. Hot-wire measurements are the "method of choice" for the high speed side. Large angle variations on the low speed side prompted the use of PIV as a complementary measurement tool. The strong challenge was to deliver adequate seed into this region with minimal disturbance to the irrotational flow state of the entrained flow made possible by the auxiliary fans-plus-turbulence manipulators of the Morris and Foss [1] facility. Experimental results will be presented and interpreted at the conference. Specific reference will be made to prior studies: [4], [5], [6] and [7].

Supported by NSF Grant: CTS-0352710

References

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Keywords: Shear layer, intermittency