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A non-intrusive velocity measurement technique for naturally-occurring turbulent shear flows CHIN HEI NG, RYAN KEEDY, ALBERTO ALISEDA, University of Washington — Turbulent shear flows are common in nature (atmospheric low level jets, ocean hydrothermal vents, volcanic eruptions, convective cells, etc) and play an important role in environmental processes. These frequently inaccessible and measurements that require a physical probe are both restricted and inaccurate. We propose a non-intrusive technique that estimates the velocity of these flows by taking advantage of the existence of natural markers, such as condensation droplets, gas bubbles, reflective turbulent features on the mixing interface, that can be observed in video of the phenomena. Displacement of these markers, assumed to behave as fluid material elements, is measured by digital image correlation, and that velocity is associated with the fluid superlayer at the mixing interface between the "seeded" and unseeded flows. The relationship between these superficial velocities and the velocity in the interior of the flow has been investigated in a turbulent round jet laboratory experiment that allows for variations in jet Reynolds number, jet density, and jet viscosity. Influence of imaging parameters was also studied, with particular relevance to the application of this technique to the field.

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