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The role of turbulence in the development of round jets in cross-flow GRAHAM FREEDLAND, RAUL BAYOAN CAL, Portland State University, STEPHEN SOLOVITZ, Washington State University, LARRY MASTIN, United States Geological Survey — The behavior of wind-bent plumes is important to a wide variety of fields, including volcanic plume models. By understanding the fundamental physics involved in the mixing of a round jet in cross-flow, models predicting the concentration of volcanic ash can be improved by identifying the role of turbulence and wind speed on the rate of entrainment within the plume. Using laboratory experiments, jets of air are ejected orthogonally into a closed-loop wind tunnel with several cross-flow velocities. Mean flow statistics are collected using particle image velocimetry (PIV) to describe the production of turbulence within the jet. Mapping the trajectory of the jets and evaluating the Reynolds stresses produce a traceable shear layer that allows for control volume analysis of the jet. This is used to create an energy balance relating the inflow conditions to the entrainment of air. Further analysis provides relationships between the inflow conditions and the transfer of energy within the bending region of a jet. This is expanded through incorporation of an active grid system of winglets rotating within a predefined range of speeds to produce turbulence within the wind tunnel to identify the role of different turbulence properties on the development of jets in cross-flow.

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