

Abstract Submitted
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Simultaneous velocity-temperature measurements in the heated wake of a cylinder with application to the modeling of turbulent passive scalars¹ ARPI BERAJEKLIAN, LAURENT MYDLARSKI, McGill University —

The principal objective of this work is to study the sensitivity of (i) the turbulent Prandtl number (Pr_T), and (ii) the mechanical-to-thermal time-scale ratio (r) to differences in the scalar field's injection method within the same (hydrodynamic) flow. Both are recurring quantities employed in turbulence models, determined from experiments, and generally assumed to be (flow-dependent) constants. To this end, mixed velocity-temperature measurements were made in the heated wake of a circular cylinder. The passive scalar under consideration was temperature and the wake was heated by one of two ways: heating the cylinder itself, or by use of a mandoline placed downstream of the cylinder. For each case, the distributions of the turbulent Prandtl number and the mechanical-to-thermal time-scale ratio were compared. The experimental results demonstrate that both Pr_T and r differ for the two scalar injection methods (in addition to varying across the wake). Hence, both Pr_T and r not only depend on the type of flow, but on the scalar field injection method as well - a result that is generally not taken into account when turbulent flows are modeled.

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