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Passive Scalar Transport in Pipe Flows KEITH MERTENS, University of North Carolina, UNC RTG Joint Fluids Lab, ROBERTO CAMASSA, RICHARD MCLAUGHLIN, MATTHEW MOORE, MATT HERNANDEZ, University of North Carolina, UNC RTG Joint Fluids Lab — The problem of passive scalar transport in pipe flows has a long standing history. Recent work has been re-examining the concentration evolution during the initial transient timescale before G.I. Taylor's 1953 theory becomes applicable. Using high resolution digital photography we experimentally investigate this transient concentration evolution in laminar pipe flow. Gravitational effects associated with non-homogeneous densities induced by the passive scalar are shown to play a role, especially at short timescales, and need to be carefully mitigated through density matching. In density matched experiments, we observe anomalous behavior in the form of the development of non-zero skewness and identify the relevant timescales of these anomalies. Comparisons with theoretical predictions, including recent advancements based on a mathematically rigorous stochastic differential equations approach, will be presented.

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