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Anomalous diffusion process detected in macroscale Taylor dispersion BRIAN WOOD, EHSAN TAGHIZADEH, Oregon State University, DIOGO BOLSTER, University of Notre Dame, FRANCISCO VALDS-PARADA, Universidad Autnoma Metropolitana-Iztapalapa — Anomalous dispersion process is described by a non-linear relationship (usually a power law one) between the second centered spatial moment of a solute under transport and time. In this work, we show that anomalous spreading regimes can be seen in the transient upscaled balance equation describing Taylor dispersion assuming that the appropriate transient dispersion coefficient is adopted. While most of the previous work on anomalous behavior for Taylor dispersion has focused on directly solving the microscale transport equations in free space; here we illustrate that the anomalous dispersion is also evident within the averaged equations themselves. Similar to the microscale equations, three distinct dispersive regimes can be observed in the averaged equations: (i) early time diffusive spreading, (ii) anomalous / ballistic dispersive spreading, and (iii) classical Taylor dispersion. Dispersion of solutes shows significant superdiffusive behavior for $Pe > 10$, and ballistic-type spreading is observed at early times for $Pe < 1000$. The observations about the spreading regimes for the averaged equation are corroborated by averaging the results of microscale numerical simulations.

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