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Intermittency effects in multi-phase flows and anomalous in heterogeneous porous media[1] ZO PENKO, University of Notre Dame, YAOFA LI, Montana State University, DIOGO BOLSTER, KENNETH CHRISTENSEN, University of Notre Dame — Multi-phase flow and transport in porous media is prevalent in a wide range of challenging fluid mechanics problems in sustainability, energy, and the environment. The small- or pore-scale study of such flows spatial and temporal evolution can impact flow behavior at system scales in a nontrivial manner. Therefore, the underlying physics of the spreading, mixing, and interfacial processes at these very small scales must be understood for the development of accurate system-scale prediction models of transport in multi-phase flow systems. We present results from a coordinated numerical and experimental study of intermittency effects over a range of viscous and inertial flow regimes in single- and multi-phase flows in 2D heterogeneous micromodels to quantify Lagrangian flow statistics to better inform pore-scale models. The applicability of different modeling frameworks such as the correlated-continuous time random walk is tested by studying statistics of particle trajectories obtained by particle tracking velocimetry measurements and Lattice Boltzmann simulations from single- and multi-phase flows. The results make particular note of the presence of trapped ganglia, the influence of the pore Reynolds number, and inertial effects on intermittency, and compare these effects.

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