Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

A Coupled Lagrangian Model for Flow-mediated Transmission of SARS-CoV-2 through Respiratory Ejecta in a Skilled Nursing Facility. JOSEPH WILSON, SHELLY MILLER, University of Colorado, Boulder, NICHOLAS CLEMENTS, Mayo Clinic, General Internal Medicine, CEDRIC STEINER, Eastern University, DEBANJAN MUKHERJEE, University of Colorado, Boulder — The SARS-CoV-2 pandemic has fundamentally altered societal structures and norms in ways that will continue for years to come. SARS-CoV-2 can be transmitted between individuals through respiratory ejecta from infected persons. Infection transmission risks are particularly high in occupied indoor spaces, especially nursing and care facilities with vulnerable older population. It is therefore important to understand the transport of respiratory particles in closed indoor spaces, to better characterize infection spread. These include aerosolized particles, surface-based particles, and the particles that potentially become re-suspended after being disturbed due to some human activity. In this work, we propose a Lagrangian model for virus-laden particle transport in indoor air flow. The model accounts for coupled transport and mass-transfer phenomena at the individual particle scale. This is combined with full-scale building air flow models to understand indoor viral particle transport. We used this model to conduct a study on designing and implementing a negative-pressure isolation space in a skilled nursing facility to control infection spread. Model results illustrate how particle transport was controlled within the isolation space.

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Date submitted: 10 Aug 2020 Electronic form version 1.4