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Continuum Modeling of Multiscale Drop Impact on Wet and Dry Surfaces

By Prof. Taehun Lee

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EVENT DETAILS

DATE:
Wednesday,
October 1, 2014

TIME:
11:00 AM

LOCATION:
Carnegie 315
Stevens Institute of Technology

ATTENDANCE:
Public

ABSTRACT

In this talk, the impact of liquid drops on wet and dry surfaces is presented using continuum lattice Boltzmann method (LBM) simulations. LBM is a mesoscale approach, which can accommodate coarse-grained, molecular-level information into the macroscopic description of complex interfacial phenomena. Nano- and micro-length scale drop impact on dry surfaces is commonly encountered in drop-on-demand inkjet applications. The size of the liquid drops considered in this work ranges from nanometer to millimeter scales, although the focus is on the nanoscale drop impact with relatively low impact velocities leading to bouncing or spreading drops. The LBM simulations are validated with available experimental results and compared with Molecular Dynamics (MD) simulations in terms of dimensionless variables. In most situations we observe similar drop behavior at both nano- and micro-length scales; the two methods agree best at low impact velocities on partially wetting surfaces while discrepancies are most pronounced for strongly hydrophobic surfaces and for higher velocities.

BIOGRAPHY

Dr. Lee is an associate professor in the Department of Mechanical Engineering at City University of New York (CUNY). He is a core faculty member of the CUNY Energy Institute and a guest faculty of the Mathematics and Computer Science (MCS) Division at the Argonne National Laboratory. He received his B.S. and M.S. degrees from the Seoul National University, and Ph.D. degree in Mechanical Engineering from the University of Iowa. Dr. Lee is the recipient of the 2005 J.H. Wilkinson Fellowship from the MCS Division at Argonne and the 2009 Faculty Development Grant from NRC. His research expertise is in the areas of multiphase/multiscale computational fluid dynamics and high-order methods for the lattice Boltzmann equation. His research program has been funded by ACS, DOE, NASA, NRC, and NSF.