



# THE UNIVERSITY OF CHICAGO

Department of Statistics

## SCIENTIFIC AND STATISTICAL COMPUTING SEMINAR

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OANA MARIN

Mathematics and Computer Science Division  
Argonne National Laboratory

### Modelling of Multiphase Flow Phenomena; Partial Differential Equations or Boundary Integral Equations Formulations

THURSDAY, OCTOBER 30, 2014 at 4:30 PM  
133 Eckhart Hall, 5734 S. University Avenue

#### ABSTRACT

Multiphase flows are characterized by the coexistence of two different fluid flows, each of them determined by different material properties and moving at different velocities, e.g. oil and water or water and vapor. According to the chemical composition of the two fluids they may be miscible, immiscible, or undergo phase transitions. In the present talk, different types of mathematical models and subsequent numerical treatments are described for certain classes of multiphase flows. An example of two immiscible fluids is presently modelled using Boundary Integral Equations and simulated using the collocation method. However, flows that undergo phase transitions pose additional difficulties and cannot be reduced to a Boundary Integral formulation, thus they must be solved in full as Partial Differential Equations (PDEs). Of special interest to the Nuclear Engineering community at Argonne National Laboratory (ANL) is the water-vapor two phase problem which arises in connection to simulations of boiling water reactors. The boiling phenomenon is described mathematically using the drift flux model and discretized via the Spectral Element Method. Preliminary results using the ANL in-house code Nek5000 are also shown.

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#### Organizers:

Lek-Heng Lim, Department of Statistics, [lekheng@galton.uchicago.edu](mailto:lekheng@galton.uchicago.edu), Ridgway Scott, Departments of Computer Science and Mathematics, [ridg@cs.uchicago.edu](mailto:ridg@cs.uchicago.edu), Jonathan Weare, Department of Statistics and The James Franck Institute, [weare@uchicago.edu](mailto:weare@uchicago.edu). SSC Seminar URL: [http://www.stat.uchicago.edu/seminars/SSC/\\_seminars.shtml](http://www.stat.uchicago.edu/seminars/SSC/_seminars.shtml).

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