PURDUE UNIVERSITY | School of Nuclear Engineering

Nuclear Engineering Seminar

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3:30 pm | MATH 175

Is the Two-Fluid Model Ill-Posed?

Abstract

The two-fluid model (TFM) has become the basis of numerical codes for engineering analysis of two-phase flows applied to nuclear reactor safety. However, the completeness of the model is still disputed because, in its usual form, the momentum conservation equations are elliptic, which, among other things, causes the solutions of short wavelength perturbations to have infinite growth rate. Recently it has been shown that well-posed instances of the TFM can be derived using the variational principles. The presentation shows a complete formulation of the TFM for boiling flows that renders the equations hyperbolic by incorporating physics-based inertial coupling between phases. The equations are cast in two canonical motion modes, namely, the center-of-mass flow and the relative motion between the fluids, which have different temporal and spatial scales, and so are easier to analyze independently. The influence of the inertial coupling parameters is analyzed.

Prof. Bertodano joined the department in 1992 after obtaining his PhD at Rensselaer. His

expertise is the stability and numerical simulations of the Two-Fluid Model (TFM), which is

the theory of the nuclear reactor safety codes used worldwide.