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## **Forward and Inverse Modeling of Nonisothermal Multiphase Flow in Fractured Porous Media**

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The evaluation of geothermal, oil, and gas resources, the assessment of nuclear waste repositories, and the remediation of contaminated sites all require predictions of multiphase fluid and heat flow in fractured porous media. The numerical solution of the corresponding governing equations is challenging because of the strong nonlinearities and coupled nature of the processes to be considered. Moreover, the multiscale heterogeneity inherent in subsurface systems poses significant characterization challenges and leads to high-dimensional inverse problem.

In this presentation, I will talk about the role of modeling in various hydrogeological applications, present the numerical solution based on the integral finite difference method, and discuss issues related to the formulation and solution of multiphase inverse problems.