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# Numerical Modeling for Large Scale Hydrothermal System

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Moderate-to-high enthalpy systems are driven by multiphase and multicomponent processes, fluid and rock mechanics, and heat transport processes, all of which present challenges in developing realistic numerical models of the underlying physics. The objective of this work is to present an approach, and some initial results, for modeling and understanding dynamics of the birth of large scale hydrothermal systems. Numerical modeling of such complex systems must take into account a variety of coupled thermal, hydraulic, mechanical and chemical processes, which is numerically challenging. To provide first estimates of the behavior of this deep complex systems, geological structures must be constrained, and the fluid dynamics, mechanics and the heat transport need to be investigated in three dimensions. Modeling these processes numerically at adequate resolution and reasonable computation times requires a suite of tools that we are developing and/or utilizing to investigate such systems. Our long-term goal is to develop 3D numerical models, based on a geological models, which couples mechanics with the hydraulics and thermal processes driving hydrothermal system. Our first results from the Lusi hydrothermal system in East Java, Indonesia provide a basis for more sophisticated studies, eventually in 3D, and we introduce a workflow necessary to achieve these objectives. Future work focuses with the aim and parallelization suitable for High Performance Computing (HPC). Such developments are necessary to achieve high-resolution simulations to more fully understand the complex dynamics of hydrothermal systems.