

Geologic and hydrologic controls on the economic potential of hydrothermal systems associated with upper crustal plutons

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Heat and mass transport in hydrothermal systems associated with upper crustal magmatic intrusions can result in resources with large economic potential (Kesler, 1994). Active hydrothermal systems can form high-enthalpy geothermal reservoirs with the possibility for renewable energy production. Fossil continental or submarine hydrothermal systems may have formed ore deposits at variable crustal depths, which can be mined near today's surface with an economic profit. In both cases, only the right combination of first-order geologic and hydrologic controls may lead to the formation of a significant resource. To foster exploration for these hydrothermal georesources, we need to improve our understanding of subsurface fluxes of mass and energy by combining numerical process modelling, observations at both active and fossil systems, as well as knowledge of fluid and rock properties and their interactions in natural systems.

The presentation will highlight the role of non-linear fluid properties, phase separation, salt precipitation, fluid mixing, permeability structure, hydraulic fracturing and the transition from brittle to ductile rock behavior as major geologic and hydrologic controls on the formation of high-enthalpy and supercritical geothermal resources (Scott et al., 2015), and magmatic-hydrothermal mineral resources, such as porphyry copper, massive sulfide and epithermal gold deposits (Lecumberri-Sanchez et al., 2015; Weis, 2015).

References:

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