

Mineral-fluid interactions at Earth's surface: Thermodynamics, kinetics and isotopes

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Mineral formation and dissolution processes in Earth's surface and shallow subsurface environments control the cycling of elements such as nutrients and carbon. The formation of secondary phases, particularly of carbonates, act as archives of the environmental conditions that occurred at the time of their formation. These natural dissolution-precipitation processes can also be engineered for environmental remediation such as the storage of CO₂ in carbonate phases for climate change mitigation. Understanding the processes controlling element cycles, robust interpretation of paleo-proxies, and engineering of mineral reactivity all require knowledge of the thermodynamics and kinetics of mineral-fluid interactions. Additional insights into the controls of mineral-fluid interactions can be provided by the stable isotope fractionation between minerals and fluids, provided that the mechanisms controlling isotope fractionation are adequately understood. In this session we invite contributions that study mineral-fluid interactions including aspects such as thermodynamics, kinetics, and isotope fractionation in the lab or field. Insights from modeling at various scales are also welcome.