

A review of the effects of coupled fluid/rock reactions in rock deformation at different geological environments

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ABSTRACT

Interactions and phase transitions between fluids and host rocks have been recently shown to govern the macroscopic response of rocks during deformation, in all geological settings (Poulet et al 2014b; Veveakis and Regenauer-Lieb 2015). Examples include fluid release reactions (Alevizos et al 2014; Poulet et al 2014a; Veveakis et al 2014), as well as fluid-assisted dry transitions (Peters et al, 2015). In this work a review of the methods used to tackle the effect of these reactions to deformation and vice versa is presented. The methods are then tested in a suite of case studies.

In particular, for the case of fluid-release reactions we present cases studies of (1) carbonate decomposition/precipitation and serpentine dehydration/hydration in thrusting environments, (2) smectite-to-illite transitions during shale diagenesis in gas reservoirs, (3) clay dehydration in major landslides and (4) K-Feldspar dissolution/precipitation in faulting environments.

For the case of fluid-assisted dry transitions, we present examples of solid rock-fluidised rock transition and grain size evolution in (1) compressive environments forming compaction bands, (2) large scale deformations during boudinage and folding and (3) the formation of zebra bands.

References

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