Contribution ID: **731** Type: **Poster (+) Presentation**

Control of chemically-driven convective dissolution by differential diffusion effects

Friday, 4 June 2021 09:40 (1 hour)

We numerically study the effect of differential diffusion in chemically-driven convective dissolution that can occur upon the reaction of a dissolving species A in a host phase when the chemical reaction destabilises an otherwise stable density stratification. For example, an A+B⟶C reaction is known to trigger such convection when, upon dissolution into the host solution, A reacts with B present in the solution to produce C if the difference between C and B in the contribution to the solution density is above a critical threshold. We show that differential diffusivities impact the convective dynamics substantially giving rise to additional convective effects below the reaction front, where C is generated. More specifically, we show that below the reaction front either double-diffusive or diffusive-layer convection can arise, modifying the local Rayleigh-Taylor instability. When B diffuses faster than C, a double-diffusive instability can develop below the reaction front, accelerating the convective dynamics and conversely, when B diffuses slower than C, diffusive-layer convection modes stabilize the dynamics compared to the equal diffusivity case. Our results are relevant for various geological applications or engineering set-ups that involve non-reactive stable density stratifications where transport can be enhanced by reaction-induced convection.

Time Block Preference

Time Block A (09:00-12:00 CET)

References

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