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# Refractive-light-transmission measurements of density-driven convection with application to solubility trapping of geologically sequestered CO2

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Density-driven convection can accelerate the rate of CO2 solubility trapping during geological CO2 storage in deep saline aquifers. We present a bench-scale experimental method based on refractive light transmission (RLT) in an analogue system that enables comprehensive study of solutally induced density-driven convection in saturated porous media. In an analogue system, we investigate density-driven convective mixing under conditions relevant to geological CO2 storage. A range of Ra values relevant to potential storage sites are investigated by varying the grain size and density contrast in the laboratory setup. We show that the method accurately determines the solute concentration in the system with high spatial and temporal resolution. We can thereby quantify the onset time of convection (t_c), mass flux (F) and flow dynamics for the different Ra values tested. Based on our findings, we present a scaling law for t_c. The resulting dependence of t_c on Ra, indicates that t_c is more sensitive to large Ra than previously thought. Our findings can also show why F is described equally well by a Ra-dependent or a Ra-independent scaling law. The new method and findings can serve to improve the understanding of convective mixing processes in saturated porous media, and aid the assessment of CO2 solubility trapping, including potential for trapping under given field conditions.

## References

Rasmusson, M, F. Fagerlund, K. Rasmusson, Y. Tsang, A. Niemi, 2017. Refractive-Light-Transmission Technique Applied to Density-Driven Convective Mixing in Porous Media With Implications for Geological CO2 Storage. Water Resources Research, DOI: 10.1002/2017WR020730

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