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Natural convection and the evolution of a reactive porous medium[1] LINDSEY RITCHIE, DAVID PRITCHARD, University of Strathclyde — In many geological settings the equilibrium concentration of a dissolved chemical species depends on the vertically varying chemical properties of the rock. As a prototype for such systems, this study considers the solutal convection of a reactive fluid in a permeable medium, subject to chemical equilibrium on the bounding surfaces, and where the chemical equilibrium varies vertically throughout the layer. Over relatively short timescales, the exchange of solute between fluid and matrix stabilises the system against the onset of convection and promotes the development of narrower convective cells: we investigate this process using linear stability analysis and numerical simulation. Over longer timescales, when convection has developed, the reaction drives spatial and temporal changes to the porosity and permeability of the rock. We describe numerical results which reveal novel interactions between the convection pattern and the evolving matrix. Ultimately these interactions can restabilise the system, shutting down the convection but preserving "signatures" of convective cells or more complex structures in the varying porosity of the rock.

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