Contribution ID: **72** Type: **Poster (+) Presentation**

Effect of Viscosity Contrast on Miscible Rayleigh-Taylor Convection in Porous Media

Tuesday, 1 June 2021 19:00 (1 hour)

Rayleigh-Taylor (RT) convection is a buoyancy-driven instability arising when a denser fluid overlies a less dense one in a gravitational field. In this work, we study RT instability in porous media where the denser fluid on the top is also more viscous. We perform high-resolution numerical simulations through hybridization of pseudo-spectral and compact finite difference methods. Using our simulations, we study RT instability for a wide range of viscosity ratios, up to 3000. For the first time, we find that there is a critical viscosity ratio beyond which the up-down symmetry of fingers breaks down such that the downward fingers become more extended than upward fingers as the viscosity ratio increases. In this regard, we develop universal scaling relations for the spreading rate of fluids and the convective mass flux at the interface. Finally, we introduce a new secondary fingering instability and verify our finding by comparing the results with a set of previous experiments. Our study provides a more realistic understanding of miscible Rayleigh-Taylor convection in porous media by accounting for the viscosity variations.

Time Block Preference

Time Block C (18:00-21:00 CET)

References

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Student Poster Award

Primary authors: SABET, Nasser (Research Assistant); HASSANZADEH, Hassan (University of Calgary); DE WIT, Anne (ULB); Dr ABEDI, Jalal (University of Calgary)

Presenter: SABET, Nasser (Research Assistant)

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