



GFDI SEMINAR

Title

“Double-diffusive fingering in porous media”

Speaker

Mr. Christopher Werner
GFD Ph.D. Candidate

Time and Place

11:30AM, Tuesday April 3, 2007

GFDI Reading Room, 18 Keen Bldg.

Abstract:

Laboratory experiments were conducted on a double-diffusive fluid with components of dissolved salt and sucrose contained within a porous medium of nearly spherical glass beads. The fluid is stabilized by the faster diffuser (Sa) and destabilized by the slower diffuser (Su) arranged in such a way so that the system is finger-favorable. The experiments were conducted in a tank of depth 30 cm, with initial vertical opposing linear profiles of Sa and Su between two reservoirs, the top containing the Su solution and the bottom Sa solution of known values. Measurements show that the Rayleigh-Darcy number experimental range is up to $|R_{SA}| \sim 10^5$ and density ratio range of $R_\rho = 1.1$ to 1.4. The finger flux for salt was $F_{SA} \sim CR_{SA}^a$ with $a = 0.17$ to 0.25 and was $F_{SU} \sim CR_{SU}^b$ with $b = 0.12$ to 0.14 for sugar. The non-dimensional spacing λ of the fingers was also measured. The results were found to be related to the salt Rayleigh-Darcy number $\lambda \sim R_{SA}^m$ with $m = -0.31$ for glass bead size $d = 0.05$ cm and $m = -0.55$ for $d = 0.10$ cm and the relation to the sucrose Rayleigh-Darcy number $\lambda \sim R_{SU}^n$ with $n = -0.41$ for $d = 0.05$ cm and $n = -0.69$ for $d = 0.10$ cm compared to the prediction of $\lambda \sim R_{SA}^{-1/2}$ from linear theory.

DISSERTATION DEFENSE WILL FOLLOW THE SEMINAR