Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Influence of shear on fingering dynamics in double diffusive convection PEJMAN HADI SICHANI, CRISTIAN MARCHIOLI, University of Udine, FRANCESCO ZONTA, ALFREDO SOLDATI, TU Wien — We examine the effect of shear on double-diffusive convection (DDC) in a confined fluid layer under the Oberbeck-Boussinesq condition. DDC is characterized by the competing action of a stably-stratified, rapidly-diffusing scalar (temperature) and an unstably-stratified, slowly-diffusing scalar (solute concentration). This problem has five governing parameters: The thermal Prandtl number, Pr_T (momentum to thermal diffusivity ratio); the thermal Rayleigh number, Ra_T (measure of the fluid instability due to temperature and density differences); the Lewis number, Le (thermal to solute diffusivity ratio); the density stability ratio, R_{rho} (measure of the effective flow stratification), and the shear rate, Γ. We investigate double-diffusive fingering subject to uniform shear in a wall-bounded domain by performing a campaign of highly-resolved numerical simulations in the (Pr_T, Ra_t, Le, R_{rho}, Γ) parameter space. Preliminary results show that shear tends to dampen the growth of fingering instability, leading to highly anisotropic DDC dynamics associated with the formation of regular sheets of the slowly-diffusing scalar. The resulting modifications of vertical heat transport and solute concentration are investigated at varying shear rates.

Cristian Marchioli
University of Udine

Date submitted: 30 Jul 2019 Electronic form version 1.4