Linear stability analysis of a convecting ternary alloy undergoing solidification[1] T.J. FLYNN, DANIEL ANDERSON, George Mason University — We analyze the linear stability of a solidifying, aqueous ternary alloy cooled from below. During the solidification process, four layers are present. These include a completely liquid layer, two distinct mushy layers (primary and secondary) and a solid layer. Both diffusion of heat and solute as well as convection are treated by the model under study. After identifying a nonconvecting basic solution to the problem, infinitesimal linear perturbations are included to numerically determine the stability of the base state. A Chebyshev pseudospectral collocation method is used to compute the normal mode perturbations and their respective growth rates for various system parameter combinations. Marginal stability curves are presented along with the identification of critical Rayleigh numbers and wavenumber values.

T.J. Flynn
George Mason University

Date submitted: 18 Jul 2008   Electronic form version 1.4