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Convective instabilities in a ternary alloy mushy layer[1] DANIEL ANDERSON, George Mason University, PETER GUBA, Comenius University — We investigate a mathematical model of convection, thermal and solutal diffusion in a primary mushy layer during the solidification of a ternary alloy. In particular, we explore the influence of phase-change effects, such as solute rejection, latent heat and background solidification, in a linear stability analysis of a non-convecting base state solution. We identify how different rates of diffusion (e.g. double diffusion) as well as how different rates of solute rejection (double solute rejection) play a role in this system. Novel modes of instability that can be present under statically stable conditions are identified. Parcel arguments are proposed to explain the physical mechanisms that give rise to the instabilities.

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