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We consider the convective flow in horizontal mushy layer during alloy solidification. During alloy solidification, such mushy layer, which is adjacent the solidification front and is composed of solid dendrite and liquid, is known to produce vertical chimneys that contain convective flow. The convective flow within the chimneys can produce freckles in the final form of the solidified alloy. Freckles are imperfections that reduce the quality of the solidified materials. In the present work we carry out modeling and numerical investigation for different cases of the permeability and interface conditions and for particular parameter values, which cover those of the available experimental studies, to determine the convective flow at the onset of motion. We plan to extend our investigation to cases for controlling the convective flow by including the presence of a vertical magnetic field in the flow system. (Received September 08, 2008)