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Nonlinear stability analysis of a thin-melt film on its crystalline phase LUCIEN BRUSH, University of Washington, STEPHEN DAVIS, Northwestern University, MICHAEL BEERMAN, Andrews Space — The instability of an ultra-thin, metallic melt film, situated between its non-premelting crystalline phase and a gas phase, is studied using bifurcation analysis near the instability threshold. The threshold is finite wave number due to competition between a stabilizing thermal gradient and gas-melt capillary forces and the destabilizing attractive van der Waals forces. At fixed mode-number the amplitudes of the two interfaces obey coupled nonlinear evolution equations that admit standing and traveling waves all of which bifurcate subcritically. The additional effects of repulsive intermolecular interactions and crystal-melt surface tension on the nature of the bifurcation are presented.

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