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Melting driven by Rotating Rayleigh-Bénard Convection[1] S. RAVICHANDRAN, JOHN S. WETTLAUFER[2], Nordita, KTH Royal Institute of Technology and Stock- holm University, SE-106 91 Stockholm, Sweden — We study numerically the melting of a horizontal layer of a pure solid above a convecting layer of its fluid rotating about the vertical axis. In the rapidly rotating regime, and for the Rayleigh numbers of order 10^7 considered here, convection takes the form of columnar vortices. Since these vortices transport heat from the bottom surface to the upper boundary, the melt pattern reflects the number and size of the columnar vortices, which in turn depend on the Prandtl, Reynolds, Rossby and Stefan numbers of the system, and on whether we treat periodic or confined horizontal geometries. We study how the morphology of the phase boundary, as well as the overall rate of melting, vary with the system parameters. For large values of the latent heat of fusion, we find that the vertical convective heat flux and the melt rate balance each other and reach constant maximal values over long time intervals. Concurrently, the interfacial roughness is also maximal, independent of the flow parameters. The confluence of processes responsible for the range of phase boundary geometries found should influence the treatment of moving boundary problems in mathematical models, particularly when rotational effects are important. Preprint: arXiv:2007.12751

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