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**Thin film instabilities on heated substrates: conjugate heat transfer** MICHAEL DALLASTON, Department of Chemical Engineering, Imperial College London, DMITRI TSELUIKO, Department of Mathematical Sciences, Loughborough University, SERAFIM KALLIADASIS, Department of Chemical Engineering, Imperial College London — Heat transported from a surface by a thin coating film of liquid is greatly affected by instabilities on the free surface of the film. If the solid substrate is heated above the ambient temperature, the hydrodynamic instability of the flow at sufficiently large Reynolds number is exacerbated by Marangoni stresses that result due to the temperature gradient in the fluid. Most studies of this phenomenon assume constant temperature or heat flux at the wall. Here we discuss the less-studied but more realistic situation in which the heat flow within the liquid film is coupled to conduction within the solid substrate, which has a complicated effect on the stability of the free surface. Analytical progress is made possible by linear stability analysis and low-dimensional nonlinear evolution equations derived using a weighted residual method.

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