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Glacial Squeegee: Elastic Landau-Levich and the Tidal Modulation of Ice Streams KATARZYNA WARBURTON, DUNCAN HEWITT, JEROME NEUFELD, University of Cambridge — Glacier speed is sensitive to fluctuations in subglacial water pressure. For marine ice sheets, the tidal cycle is linked to the upstream pressure fluctuations as water enters and exits the subglacial environment across the grounding line. We analyse the elastic analogue of the Landau-Levich dip-coating problem, in which a plate (here the earth) is withdrawn from a bath of fluid (the ocean) on whose surface lies a thin elastic sheet (the ice), for arbitrary angle of withdrawal θ (basal slope). The flow is controlled by the elasticity number, El, which is a measure of the relative importance of viscous and bending stresses, and θ. The leading order solution for small El is a steady profile in which the thickness of the film deposited on the plate is found. The breakdown of this asymptotic regime in the limit of large El is also discussed. These solutions are interpreted in the context of the tidal grounding line problem, and related to observations from the Rutford Ice Stream.

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