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On thin evaporating drops: when is the d^2-law valid? MATTHEW SAXTON, JONATHAN WHITELEY, DOMINIC VELLA, JAMES OLIVER, University of Oxford — We study the evolution of a thin, axisymmetric, partially wetting drop as it evaporates. The stress singularity at the contact line is regularized using slip and we perform a matched-asymptotic analysis in the limit of small slip. A generalization of Tanner's law to account for the effect of mass transfer is derived and the behaviour of the drop close to extinction is analysed. We find a criterion for when the contact-set radius close to extinction evolves as the square-root of the time remaining until extinction — the famous d^2-law. However, for a sufficiently large rate of evaporation, our analysis predicts that a '$d^{13/7}$-law' should be more appropriate. Our asymptotic results are validated by comparison with numerical simulations.

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