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Obtaining self-similar scalings in focusing flows JOSHUA DIJKSMAN, Wageningen University, SHOMEEK MUKHOPADHYAY, Yale University, CAMERON GAEBLER, Harvey Mudd College, THOMAS WITELSKI, ROBERT BEHRINGER, Duke University — The surface structure of converging thin fluid films displays self-similar behavior, as was shown in the work by Diez et al [Q. Appl. Math 210, 155, 1990]. Extracting the related similarity scaling exponents from either numerical or experimental data is non-trivial. Here we provide two such methods. We apply them to experimental and numerical data on converging fluid films driven by both surface tension and gravitational forcing. In the limit of pure gravitational driving, we recover Diez' semi-analytic result, but our methods also allow us to explore the entire regime of mixed capillary and gravitational driving, up to entirely surface tension driven flows. We find scaling forms of smoothly varying exponents up to surprisingly small Bond numbers. Our experimental results are in reasonable agreement with our numerical simulations, which confirm theoretically obtained relations between the scaling exponents.

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