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Theory and numerical computation of the von Karman constant in two-dimensional turbulent flows[1] NICHOLAS GUTTENBERG, NIGEL GOLDENFELD, University of Illinois at Urbana-Champaign, JASON LARKIN, ALISIA PRESCOTT, University of Pittsburgh, HAMID KELLAY, Université Bordeaux, WALTER GOLDBURG, University of Pittsburgh — We present a calculation of the velocity profile in two-dimensional (2D) turbulent flows. The method is based upon the momentum-transfer theory for the friction factor, proposed by Gioia and Chakraborty, and when fitted to a putative law of the wall profile yields a value for the von Kármán constant which is in satisfactory agreement with direct numerical simulations at width Reynolds numbers between 20,000 and 80,000. We compare the theoretical results with experimental results on turbulent 2D soap films, taking into account the effects of air resistance. Our findings indicate that the von Kármán constant in 2D is significantly less than the accepted value in 3D.

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