

Abstract Submitted
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Scaling the viscous circular hydraulic jump¹ MEDERIC ARGENTINA, Universit Cote d'Azur, ENRIQUE CERDA, Universidad de Santiago de Chile, ALEXIS DUCHESNE, Technical University of Denmark, LAURENT LIMAT, Universit Paris Denis Diderot — The formation mechanism of hydraulic jumps has been proposed by Belanger in 1828 and rationalised by Lord Rayleigh in 1914. As the Froude number becomes higher than one, the flow super criticality induces an instability which yields the emergence of a steep structure at the fluid surface. Strongly deformed liquid-air interface can be observed as a jet of viscous fluid impinges a flat boundary at high enough velocity. In this experimental setup, the location of the jump depends on the viscosity of the liquid, as shown by T. Bohr et al in 1997. In 2014, A. Duchesne et al have established the constancy of the Froude number at jump. Hence, it remains a contradiction, in which the radial hydraulic jump location might be explained through inviscid theory, but is also viscosity dependent. We present a model based on the 2011 Rojas et al PRL, which solves this paradox. The agreement with experimental measurements is excellent not only for the prediction of the position of the hydraulic jump, but also for the determination of the fluid thickness profile. We predict theoretically the critical value of the Froude number, which matches perfectly to that measured by Duchesne et al.

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