Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Can numerical simulations accurately predict hydrodynamic instabilities in liquid films?[1] FABIAN DENNER, ALEXANDROS CHAROGIANNIS, MARC PRADAS, BEREND G.M. VAN WACHEM, CHRISTOS N. MARKIDES, SERAFIM KALLIADASIS, Imperial College London — Understanding the dynamics of hydrodynamic instabilities in liquid film flows is an active field of research in fluid dynamics and non-linear science in general. Numerical simulations offer a powerful tool to study hydrodynamic instabilities in film flows and can provide deep insights into the underlying physical phenomena. However, the direct comparison of numerical results and experimental results is often hampered by several reasons. For instance, in numerical simulations the interface representation is problematic and the governing equations and boundary conditions may be oversimplified, whereas in experiments it is often difficult to extract accurate information on the fluid and its behavior, e.g. determine the fluid properties when the liquid contains particles for PIV measurements. In this contribution we present the latest results of our on-going, extensive study on hydrodynamic instabilities in liquid film flows, which includes direct numerical simulations, low-dimensional modelling as well as experiments. The major focus is on wave regimes, wave height and wave celerity as a function of Reynolds number and forcing frequency of a falling liquid film. Specific attention is paid to the differences in numerical and experimental results and the reasons for these differences.

[1]The authors are grateful to the EPSRC for their financial support (grant EP/K008595/1).

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Date submitted: 31 Jul 2014 Electronic form version 1.4