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Liquid falling films: linear stability and direct numerical simulation[1] PATRICK SCHMIDT, University of Edinburgh, LENNON O'NARAIGH, University College Dublin, PRASHANT VALLURI, MATHIEU LUCQUIAUD, University of Edinburgh — Interfacial instability of falling liquid films in counter-current contact with a turbulent gas phase is investigated by means of an Orr-Sommerfeld analysis. This study is complemented by a full energy budget analysis, identifying the key mechanisms of the instability. This gives first insight into the dynamic behaviour of the two-phase system, which is relevant for a wide range of technical applications, such as absorption and distillation. The linear stability analysis is also used to identify the operating limits of a counter-current operation i.e. the so-called loading and flooding limits. In addition, the results of this analysis are benchmark for direct numerical simulations using the newly launched Two-Phase Level Set (http://sourceforge.net/projects/tpls/) solver. High resolution DNS is used to obtain detailed knowledge of important mechanisms at play, especially with regard to interfacial instability and transient system behaviour, which can help to design more efficient mass transfer equipment such as structured packings.

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