Abstract Submitted
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Bound-state formation in falling liquid films[1] PHUC-KHANH NGUYEN, Department of Mechanical Engineering, University of Thessaly, MARC PRADAS, SERAFIM KALLIADASIS, Department of Chemical Engineering, Imperial College London, VASILIS BONTOZOGLOU, Department of Mechanical Engineering, University of Thessaly — Direct numerical simulation shows that the interaction between solitary pulses may give rise to the formation of bound states consisting of two or more pulses separated by well-defined distances and traveling at the same velocity. Stationary pulse couples are studied first. The resulting equilibrium pulse distances compare favorably to theoretical predictions at large and intermediate pulse separations. When the two pulses are closely spaced, the theory becomes increasingly less accurate. Their time-dependent simulations indicate that all initial conditions of large separations lead to a monotonic attraction or repulsion to the stable bound states. However, intermediate range leads to a self-sustained oscillatory variation of the pulse separation distance, with well-defined amplitude and period, and a mean separation coinciding with the stationary distance. Eventually a very close separation causes an explosive repulsion of two pulses toward much larger stable separation. Bound states consisting of three pulses are computed next. The equilibrium separation distances in a symmetric system are similar to predictions based on simple couples. However, in an asymmetric one, they deviate significantly from simple predictions.

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