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Oscillatory behavior in two-pulse dynamics in active-dissipative systems MARC PRADAS, Department of Mathematics and Statistics, The Open University, TE-SHENG LIN, Department of Applied Mathematics, National Chiao Tung University, DMITRI TSELUIKO, Department of Mathematical Sciences, Loughborough University, SERAFIM KALLIADASIS, Department of Chemical Engineering, Imperial College London — Coherent structures appear in a wide variety of active-dissipative systems and are typically characterized by a rich and complex dynamics emerging as a consequence of their interaction. An example is the dynamics of a liquid film flowing down an inclined plane with the free surface of the film described by interacting solitary pulses, which under certain conditions may form bound states.

In our previous coherent-structure theories [1,2], we showed that bound states play a crucial role in the dynamics of film flows. In this study, we present a rigorous analysis of other dynamic states emerging when pulses are sufficiently close to each other, namely oscillatory states. We show that the oscillatory dynamics is associated with a peculiar object, the so-called resonance pole, which may give rise to either self-sustained or damped oscillations, something that largely depends on the particular values of the system parameters and the initial pulse separation length. We find excellent agreement between analytical and numerical work.

[1] M. Pradas, D. Tseluiko, S. Kalliadasis. Phys. Fluids 23, 044104 (2011).
[2] D. Tseluiko, S. Kalliadasis. IMA J. Appl. Math. 79, 274 (2014).

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