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Linear Response of a Viscous Liquid Sheet

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The paper to be presented investigates the propagation of disturbance signals in a uniform thin viscous liquid sheet of infinite extent which is in contact with a passive ambient medium. The disturbances are induced by moving local external pressure perturbations on the sheet interfaces. The tool of analysis is the Fourier-Laplace transformation of the linearized perturbation equations, and the inverse Fourier-Laplace transform for the reconstruction of the signal, the amplitude of the interface deflections. The response is determined by the shape of the disturbance and by the intrinsic response properties of the viscous sheet, codified in its dispersion functions which determine the singularities of the Fourier-Laplace integrand. Symmetric (varicose) and antisymmetric (sinuous) disturbances are investigated in the long time limit by numerical signal evaluation. The exact disturbance responses are compared with their longwave approximations and with experiment.

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