Abstract Submitted
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Impinging planar jets: hysteretic behaviour and origin of the self–sustained oscillations[1] ALESSANDRO BONGARZONE, ARNAUD BERTSCH, PHILIPPE RENAUD, FRANÇOIS GALLAIRE, École Polytechnique Fédérale de Lausanne — In a recent experimental and numerical investigation we studied the oscillatory regime induced by the interaction of two impinging jets in feedback–free microfluidic devices. The physical mechanism behind these self–sustained oscillations remains still undetermined. The present paper focuses on an two-dimensional (2D) fluidic oscillators. The linear global stability analysis performed confirms the existence of an oscillating mode, whose spatial structure qualitatively coincides with the one observed in our experiments, suggesting that the physical mechanism from which the oscillations originate is predominately 2D. The interaction of the oscillating mode with a steady symmetry–breaking mode is examined making use of the weakly nonlinear theory, which shows how the system exhibits hysteresis in a certain range of aspect ratios. The theory of sensitivity analysis is exploited to identify the wavemaker region associated with the instability modes, whose accurate examination allows us to spot the core of the symmetry–breaking instability at the stagnation point and to propose the Kelvin–Helmholtz instability as the main candidate for the origin of the flow oscillations observed in both 2D and 3D fluidic devices.

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François Gallaire
École Polytechnique Fédérale de Lausanne

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