Electronic Supplementary Information (ESI) – Cooperative breakups induced by drop-to-drop interactions in one-dimensional flows of drops against micro-obstacles

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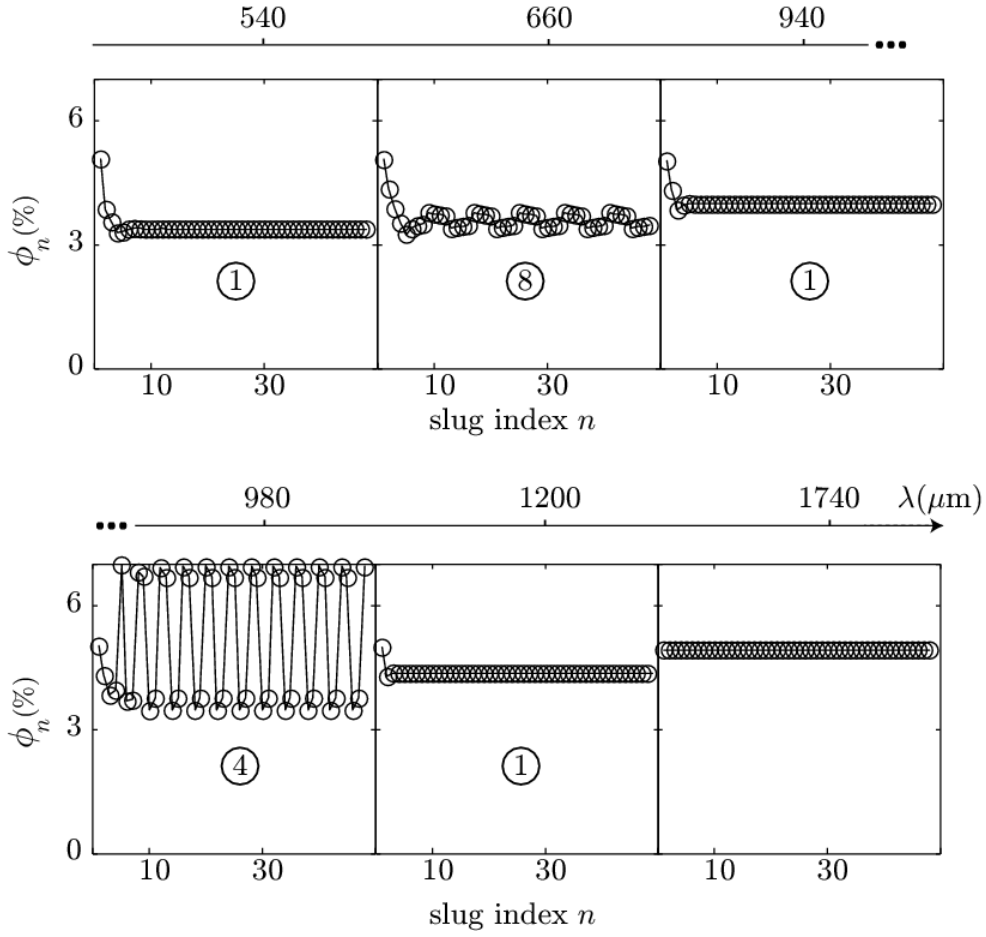
Caption of Movies S1–S3 illustrating cooperative breakups

A periodic train of monodisperse slugs collides with a linear obstacle of length $L = 700\ \mu\text{m}$. One observes cooperative effects: breakup events in which the size of the daughter slugs is either constant after a transient state (regime ①) or becomes a function of time (period $T \geq 2$). As shown in the movies, the size of the slugs, their speed, and the inter-slug distance are: Movie S1 (regime ①) $L_d = 310\ \mu\text{m}$, $v = 8350\ \mu\text{m/s}$, and $\lambda = 720\ \mu\text{m}$, Movie S2 ($T = 2$) $L_d = 330\ \mu\text{m}$, $v = 13200\ \mu\text{m/s}$, and $\lambda = 1410\ \mu\text{m}$, Movie S3 ($T = 4$) $L_d = 320\ \mu\text{m}$, $v = 8750\ \mu\text{m/s}$, and $\lambda = 760\ \mu\text{m}$.



Caption of Figure S1 – An illustration of the diversity of cooperative breakup regimes obtained numerically when a periodic assembly of drops collides with a rectangular micro-obstacle

Shown are sequences of breakup events obtained numerically when assemblies of regularly-spaced slugs collide with a rectangular micro-obstacle. For each of these sequences, we plot the variations of the volume fraction ϕ_n with the index of the mother drop n. For large enough capillary numbers, we observe cooperative effects: periodic breakup events in which ϕ_n is a function of time. As shown, the period of periodic regimes depends on the inter-slug distance λ. The size of the slugs, the capillary number, and the length of the obstacle are $L_d = 280$ µm, $C = 2.3\ 10^{-3}$, and $L = 700$ µm, respectively. Other geometric parameters and fluid properties are identical to those provided in the text.