

## Viscous Extensional Flow and Drop Break-Off Under Gravity

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Smooth honey dripping from a spoon is an everyday example of a viscous fluid in a long filament-like extensional flow which may eventually break up into drops. Similar filament or drop forming flows are important in modern technologies including ink-jet printing, molten metal processing, polymer and glass fibre spinning, and for rheological measurement. We study here finite drops of very viscous Newtonian fluids falling under gravity in an extensional flow, starting from rest in contact with a solid boundary. We emphasise the role of initial conditions and the geometry of the original drop boundary, together with balances between forces such as inertia, gravity, viscosity and surface tension. For example, under gravity and viscosity alone, break-up occurs in finite time, but inertia makes that time formally infinite, and surface tension will further modify this conclusion. A slender-filament theory is used to illustrate these effects.

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