On the separation of droplets from a liquid jet

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The droplet separation from a liquid jet was investigated experimentally. Details of the shape of the thin liquid neck joining the droplet to its parent body were studied in terms of the fluid viscosity and the jet diameter. As the viscosity increased, the neck rapidly elongated creating a long thread. Its final diameter before rupture was approximately one micrometer and seems to be constant within wide range of parameters varied. One or multiple breakups of the micro-thread were observed, which produced micro-satellites, i.e. droplets in a micrometer range. The experimental results only partly confirmed the predictions of Eggers' (Phys. Rev. Lett. 71 (1993) 3458) similarity solution. The predicted shape of the pinch-off region well overlaps the long thread observed for very viscous liquids. However, the final jet diameter, retraction velocity of the thread and presence of multiple breakups differentiate the experimental evidence from the model expectations.

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