Stimulated Rayleigh breakup

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The size and speed of droplets in sprays are the two main parameters to control to obtain an adequate spray. We use mechanical vibrations to stimulate the Rayleigh breakup in a single jet, in order to modify the size of the droplets formed, and investigate the size and the trajectories followed by the emerging droplet train. We find that perturbing the jet with a frequency in the right range leads to a very stable droplet train, with precisely controlled droplet radius and inter-droplet distance. By changing the flow rate and excitation frequency, we can tune the drop size and wavelength of the droplet train. Furthermore, we investigate the ballistic trajectory followed by the droplets in order to gather information on the distance the droplets travel through the air. We find that the slipstreaming in the droplet train drastically decreases the friction with the air compared to a single droplet [1]. In addition, the difference between a mechanically controlled and spontaneous breakup is very small, implying that drop coalescence (that is very frequent for the spontaneous breakup) does not play a major role. We also investigate the size distribution of the droplets along the trajectory to understand to what extent the train can be seen as monodisperse.

Références

1. H.C.Lee, *IBM Journal of Research and Development*, **21**, p48-51, (1977)