
Shear instabilities in the context of liquid atomization

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Abstract

Liquid atomization is the process by which a liquid bulk is fragmented into droplets: in air assisted atomization, efficient droplet break-up is obtained via the destabilization of a slow liquid stream by a fast gas stream (Lasheras Hopfinger *Ann. Rev. fluid Mech.* 2000). There has been a debate over the nature of the shear instability initiating destabilization: is it inviscid, or viscous? We will show that it is actually both. We will next demonstrate that this instability is not only controlled by mean flow features, but also by velocity fluctuations in the gas phase. We will finally discuss more generally how liquid atomization is impacted by large scale motions in the case of air assisted round liquid jets: we will show in particular that the shear instability discussed above is still dominant in controlling large scale motion, and ultimately droplet sizes.

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