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Bouncing and Merging of Liquid Jets ABHISHEK SAHA, MINGLEI LI, CHUNG K. LAW, Princeton University — Collision of two fluid jets is a technique that is utilized in many industrial applications, such as in rocket engines, to achieve controlled mixing, atomization and sometimes liquid phase reactions. Thus, the dynamics of colliding jets have direct impact on the performance, efficiency and reliability of such applications. In analogy with the dynamics of droplet-droplet collision, in this work we have experimentally demonstrated, for n-alkane hydrocarbons as well as water, that with increasing impact inertia obliquely colliding jets also exhibit the same nonmonotonic responses of merging, bouncing, merging again, and merging followed by disintegration; and that the continuous entrainment of the boundary layer air over the jet surface into the colliding interfacial region leads to two distinguishing features of jet collision, namely: there exists a maximum impact angle beyond which merging is always possible, and that merging is inhibited and then promoted with increasing pressure. These distinct response regimes were mapped and explained on the bases of impact inertia, deformation of the jet surface, viscous loss within the jet interior, and the thickness and pressure build-up within the interfacial region in order to activate the attractive surface van der Waals force to effect merging.

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