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A new mechanism for atomization and the primary instability in liquid-gas mixing layers STEPHANE ZALESKI, DALEMBERT, Universite Pierre et Marie Curie, Paris 6, ALAIN CARTELLIER, LEGI, CNRS and UJF, Grenoble, DANIEL FUSTER, JÉRÔME HOEPFFNER, DALEMBERT, Universite Pierre et Marie Curie, Paris 6, JEAN-PHILIPPE MATAS, LEGI, CNRS and UJF, Grenoble — We investigate numerically and experimentally the appearance of instabilities in two planar coflowing liquids sheets. As a function of the momentum ratio $M = \rho_G U_G^2/\rho_L U_L^2$, two different regimes are distinguished. At low momentum ratios the frequency of the waves appearing in the primary atomization region is influenced by the liquid velocity, whereas another asymptotic regime is obtained for large momentum ratios. In this regime, the gas velocity and the ratio between the gas boundary layer and the thickness of the separator plate influence the observed frequency. The low M, liquid-dominated regime appears to be a noise amplifier, while the gas-dominated, large M regime displays the characteristics of a global mode. Current computational results are in agreement with experimental observations. These results are compared to the predictions of linearized stability theory. We discuss both the inviscid linearized stability theory and the viscous, Orr-Sommerfeld stability theory, and conjecture that the viscous stability theory is valid in the low M regime.

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