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Jetting-to-bubbling transition in planar coflowing air-water sheets[1] R. BOLAÑOS-JIMÉNEZ, Universidad de Jaen, Spain, A. SEVILLA, Universidad Carlos III de Madrid, Spain, C. GUTIÉRREZ-MONTES, E. SANMIGUEL-ROJAS, C. MARTÍNEZ-BAZÁN, Universidad de Jaen, Spain — We study the transition between the two regimes experimentally observed when a plane air sheet surrounded by a coflowing water sheet discharges into stagnant air: a bubbling regime, which leads to the periodic break-up of the air sheet, and a jetting regime, where both sheets evolve slowly downstream without breaking. A jetting-to-bubbling transition curve has been experimentally obtained for a fixed liquid-to-gas thickness ratio, $h = h^*_{w,0}/h^*_{a,0} \simeq 5.27$, as a function on the values of two control parameters, namely, the Weber number, $We = \rho_w\, u^{*2}_{w,0}\, h^*_{a,0}/\sigma$, and the velocity ratio, $\Lambda = u^*_{w,0}/\bar{u}^*_{a,0}$, where $u^*_{w,0}$ and $\bar{u}^*_{a,0}$ are the water velocity and the mean air velocity at the exit slit, respectively, and $h^*_{a,0}$ and $h^*_{w,0}$ are the half-thicknesses of the air and water sheets at the exit. A linear spatiotemporal stability analysis, contemplating the downstream evolution of the sheets, shows good agreement with the experiments if a sufficiently long region of absolute instability is postulated.

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