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**Evolution of the dynamic Rayleigh-Plateau instability on liquid jets**[1] FABIAN DENNER, FABIEN EVRARD, BEREND VAN WACHEM, Imperial College London, ALFONSO ARTURO CASTREJON-PITA, University of Oxford, JOSE RAFAEL CASTREJON-PITA, Queen Mary University of London — The Rayleigh-Plateau instability (RPI) is the dominating mechanism leading to the breakup of surface-tension-dominated liquid jets. Although linear stability analysis has proven to be a powerful tool to study the evolution of the RPI for (quasi-)static liquid jets and filaments, in typical practical applications (e.g. inkjet printing) the inertia of liquid jets is significant, giving rise to nonlinear effects that influence the spatiotemporal evolution of the RPI and which are not captured by linear stability analysis. Using direct numerical simulation and laboratory experiments, we study the evolution of the dynamic RPI on liquid jets with different Weber and Ohnesorge numbers as well as different velocity profiles, perturbation amplitudes and wavenumbers. Our results show how inertia as well as the amplitude/wavenumber of the perturbation change the velocity and pressure fields of the liquid jet, which changes the spatiotemporal growth of the dynamic RPI and, consequently, the breakup length of the jet, with a local reversal of the RPI under certain conditions. We identify the key mechanisms that govern the complex evolution of the dynamic RPI and highlight the main differences between static and dynamic RPI.

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