The large aspect ratio air-blasted liquid sheet revisited

A. Lozano*, F. Barreras J.A. García and E. Calvo
LITEC, CSIC-Univ. Zaragoza
María de Luna, 10
50018 Zaragoza, Spain

Abstract

Over the last few years, the large aspect ratio air-blasted liquid sheet has been extensively studied and has almost become a canonical flow. This is because, in spite of its simplicity, it is very suitable to study the complex mechanisms behind atomization, and in particular, the onset and growth of the instabilities that eventually lead to the liquid break up. By now, most characteristics of the atomization processes in this specific geometry have been experimentally observed and satisfactorily explained, and the theories utilized to this end are well established and commonly accepted. There are, however, some other aspects that are also generally accepted, but have not been supported by reliable experimental data, and their justifications are mere hypothesis. In some more extreme cases, some theories that have been proven to be incorrect are still in use and references to them can be seen in recent papers. In this work, some of these topics are debated, supporting our points of view with measurements, images and numerical results from our research team. Besides, new longitudinal oscillation frequency measurements simultaneously obtained both with a laser diffraction method and a microphone are presented to complete the discussion. In particular, some of the questions that are raised, and hopefully most of them answered, are related to the presence of dilatational waves, the accuracy of inviscid linear instability analysis, the transition between atomization modes, the influence of the air boundary layer, the equivalence of different measurement techniques and the factors fixing the transverse waves.

Key words: liquid sheets, atomization

*Corresponding author: Antonio Lozano, alozano@litec.csic.es