

Center for Environmental & Applied Fluid Mechanics

“Bubbles Spray Aerosols: Certitudes, Mysteries, and a hint from Stanley Corrsin”

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Tiny water drops produced from bubble bursting play a critical role in forming cloud, scattering sunlight and transporting pathogens from water to the air. Bubbles burst by nucleating a hole at their cap foot and may produce jets, or film drops. The latter originate from the fragmentation of liquid ligaments formed by the centripetal destabilization of opening hole rim. They constitute a major fraction of the aerosols produced from bubbles with cap radius of curvature R larger than the capillary length a . However, our present understanding of the corresponding mechanisms does not explain the production of most sub-micron film drops, which represents nevertheless the dominant number fraction of sea spray aerosols.

Recent observations show that bursting bubbles with $R < a$ are actually mainly responsible for sub-micron film drops production, through a mechanism involving the flapping shear instability of the cap with the outer environment. With this newly found pathway, the complex relations between bubble size and number of drops produced per bubble is finally explained, providing a fundamental framework to understand production flux of aerosols and other substances mediated by bubble bursting through air-water interfaces, and the sensitivity of the process to the nature of the environment.

The production mechanisms of bubbles at the ocean surface by wave breaking will also be alluded to, and it will be shown that Corrsin's 1961 vision of turbulent cascades is useful at understanding their size distribution.

Fall 2022 CEA FM Seminar Series

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<https://wse.zoom.us/j/93762992307>