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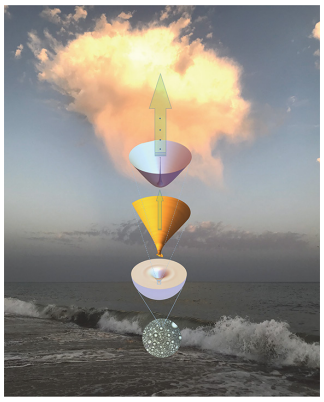
Framework explains how bubble bursting creates ocean fine spray, which plays an important role in cloud formation.



Turbulent motion between air and water causes the ocean surface to diffuse into differently sized droplets. The ultrafine component of this constant spray enters the atmosphere and catalyzes cloud formation, which is an important atmospheric process.

Alfonso Gañán-Calvo proposed an integrated framework that describes the mechanistic pathways leading to ocean fine spray and aerosols. The theory assumes that bubble bursting is the main mechanism for ejecting and diffusing fine aerosols from the ocean surface.

In the first stage, bubbles are displaced by acceleration (of a mechanical origin, including but not limited to gravity) until they encounter the surface of the liquid. There, they form a liquid film by pushing against the surface. Next, the film shatters and expels a small cloud of film droplets.

Finally, the cavity of the bubble collapses by surface tension and ejects a fine, fast capillary jet that also breaks into droplets. Using a single parameter, the proposed general physics framework can predict the jet size and speed and the number of ejected jet droplets.

The results minimize the role of film droplets and suggest jet droplets are the main components of ocean fine aerosols.

"After the bursting of the bubble, the bottom of the remaining cavity momentarily acquires the shape of a uterus of microscopic scales," said Gañán-Calvo. "From this 'womb,' provided by Mother Nature, comes the fine spray that is vital for life on Earth.

"However, the presence of contaminants (oils, microplastics, etc.) alters the surface tension of seawater and can affect nature's ability to deliver the fine ocean spray."

Source: "The ocean fine spray," by Alfonso M. Gañán-Calvo, *Physics of Fluids* (2023). The article can be accessed at https://doi.org/10.1063/5.0139151.