**Direct numerical simulation of bag-breakup – mechanism of sea spray generation in strong winds**

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In [1] the mechanisms of spray generation under hurricane winds were experimentally studied and it was found that for friction velocities u* > 1 m/s (at wind speeds at 10 m height exceeding 20 m/s), bag-breakup determines the contribution to the formation of large drops.

For the direct numerical simulation of the bag-breakup phenomenon, the Gerris software package was used [2, 3]. In Gerris a numerical algorithm is implemented that solves the Navier-Stokes equations for incompressible media with variable density and surface tension.

As an initial configuration for numerical simulation a drop of liquid was placed in the air flow. It was shown [4] that the droplet destruction mechanism depends on the Weber number characterizing the system $We = \frac{\rho_a v^2 D}{\sigma}$, where $\rho_a$ – the external medium density, $v$ – the external medium velocity, $D$ – the initial diameter of the drop, $\sigma$ – the surface tension.

A drop of water with a diameter of 1 cm (the characteristic size of the perturbation from which the bag arises) placed in the air stream at a speed of 20 m/s corresponds best to the experimental situation, such a system is characterized by the Weber number We = 54.

Modeling the dynamics of two media with very different densities, such as water and air, require a lot of computational time, so we used liquids that differ in density by a factor of 10, but to maintain the same Weber number, we changed the value of external the medium velocity.

The calculation was carried out with preservation of the Ohnesorge number, which determines the Weber numbers, under which there is a transition from one droplet destruction regime to another, and also with the preservation of the Reynolds number and the Reynolds number reduced by a factor of 10. In our simulation just as in an experiment under the action of an air stream a drop is blown into a micro-sail that bursts to form a micro-spray. As the Reynolds number decreases (with increasing viscosity of both media), the lifetime of the bag increases, in addition, the process of separating the droplets from the edge of the film changes.

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