

# THE FORMATION OF THE HAIL AND THE NEWLYCOME SNOW

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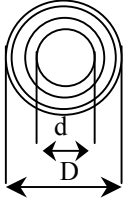


Fig. 1

According to the existent viewpoint, the base of hail consists of a little ice-crystal, which then during eddy motion rolls up with the layers of frozen water, which is formed, from the clouds around. By the way, the formation of ice-crystals is not explained, yet [1].

The structure of the newlycome snow also needs a new explanation.

The model of the hail formation is the following: as the drops form by the joining of the smallest drops, thus the total charge of the formed drop equals with the sum of the charges of the smallest drops. If the smallest drops with  $n$  quantity,  $r$  radius,  $q$  charge are joint then  $R$  radius of the formed drop will be  $R = \sqrt[3]{nr}$ ; the total charge:  $Q = nq$ . As the surface density of every smallest drop's charge is  $\frac{q}{4\pi r^2}$ , then the surface density of the charge of the formed drop

will be: 
$$\frac{Q}{4\pi R^2} = \frac{nq}{4\pi R^2} = \frac{nq}{4\pi \sqrt[3]{n^2} r^2} = \sqrt[3]{n} \frac{q}{4\pi r^2}$$

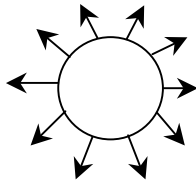


Fig. 2

It means the charge density in the drop is thrice bigger than it is in the smallest drop, i.e. the electrostatic field strength of the charges, distributed by a spherical surface, briefly increases compared with the charge of the smallest drop. As it is obvious from picture 2, the Coulomb forces try to remove the charged layer.

But the surface intensity of the water-drop prohibits the removal. But when the density of the charges exceeds the certain critical value, Coulomb forces already overcome the surface intensity forces and the exterior layer of the drop is briefly removed. And this leads to the formation of hail nucleus. Thus, the electrostatic field strength distributed by a spherical surface is  $\frac{Q}{4\pi R^2 \epsilon_0}$ . On the every point there is  $\frac{Q}{4\pi R^2}$  charge, so the voltage formed from the Coulomb

forces, on the given point will be  $\frac{Q^2}{16\pi^2 R^4 \epsilon_0}$  which tries to remove the exterior surface

diaphragm of the drop. The surface intensity of the spherical waterdrop equals to  $\frac{2\sigma}{R}$ .

As soon as the extended force of the charges exceeds the surface intensity force, the exterior layer will be off immediately. Mathematically it will be expressed by the following way  $\frac{Q^2}{16\pi^2 R^4 \epsilon_0} \geq \frac{2\sigma}{R}$ . Therefrom we will have the critical amount of the charge, which will be

enough to remove the exterior diaphragm of a drop with  $R$  radius.  $Q \geq 4\pi \sqrt{2\sigma R^3 \epsilon_0}$ . E.g. for the drop with radius  $R=2.5mm$  the critical amount of the charges will be  $Q \geq 10^{-9}$ .

As the removal of the diaphragm takes place very fast, the process is adiabatic, it means

$$\frac{T_1}{T_2} = \left( \frac{V_2}{V_1} \right)^{\chi-1} \quad (2).$$

Let's use the following classical problem of the physics: we have liquid ( $0^{\circ}\text{C}$ ) with  $m$  mass, which is in a closed glass, and the air removes from it fast. Clear up, what part of the liquid becomes ice?

From the answer of the problem it turns out, that the 87% of the mass of the water converts into ice. Taking into consideration that the density of ice is less almost by 10% than the density of water, it turns out that the drop with all its volume becomes ice. And this is the solid nucleus of hail, which then moving between clouds rolls up with a softer shell. The temperature of the nucleus is much smaller than the temperature around. Thus, the formation of the drop from the smallest drops brings to the conclusion that the density of the charges exceeds a certain critical value (for a drop with given radius), and fast removal of the exterior diaphragm takes place, so hail (nucleus) is formed. And why it rains simultaneously while hailing? This fact comes to confirm once more this physical model of the hail formation. According to the existent viewpoint it will never rain simultaneously while hailing. As the particles of the cloud, which is in eddy motion, are under the same conditions, there will be only hailfall. But in this model the simultaneous rain is not excluded (even it is supposed), as in some drops charge accumulation does not take place, and they fall as rain.

The principally new approach of the hail formation is given in [2]. The existence of the hail is conditioned by the fact that the clouds are charged, especially when they are highly charged [2]. But the real structure of the hail (pic1.) that has a big, solid nucleus ( $\approx 5\text{mm}$ ) cannot be explained by the existent explanation. And there is a real contradiction when egg-sized hailstone falls. It is also well known, that the hail is always accompanied with powerful thunders, which, naturally, is connected with the chargedness of the clouds.

Basing on this viewpoint, the hail formation is explained in the following way: the formation of the drop from smallest drops brings to the fact, that the charge density exceeds a certain critical value on the influence of Coulomb forces a rapid removal of the exterior layer of the drop takes place, which leads to the formation of a big, solid, icy nucleus of the hail. The formation of newlyfallen snow is the result of the cavitation in the domain of the clouds. In the basis of the formation of the newlyfallen snow are the cavitations in the clouds. The newlyfallen snow generally comes in early spring and in a warm late autumn. In that period the ground is still warm, but in the domain of the clouds it is already cold but not much enough to become snow, the powerful convective streams bring to cavitations inside the clouds, and in the formed cavities the temperature briefly reduces and the newlyfallen water is formed. The lightness and the porosity of the newlyfallen snow can be explained by the cavitations.

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