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Why don't clouds fall?

Abstract

Based on gravitomagnetism theory, a mathematical model of cloud is suggested. It allows answering the question put in the header.

First of all, let us describe briefly the known concept of formation, composition and structure of a cloud [1–5].

Cloud formation is always associated with adiabatic cooling of rising air [1]. Only adiabatic processes are executed in the existing cloud. [2]. Cloud consists of drops. The droplet diameter being 2 to 200 µm. The bigger diameter drops are rain drops. A drop is formed as a result of steam condensation on an ultimate solid particle. Usually these are sea salt particles present in air.

Processes of drop disintegration, merging, attraction and repelling (physics of these processes will not be reviewed here [1-5]). But on average there is some distance between drops. countable in millimetres. The drops can be held by light air flow (no more than 0.5 metres per second) [2, 5].

So, a cloud is a limited air volume in which separate drops move. Since all processes in a cloud are adiabatic type, no energy is transferred into this volume, and there is no exterior air flow.

The question we are interested in is: how can such a structure of separate drops exist and avoid falling? For the interior adiabatic processes can not create an ascentional force for the whole cloud, and no exterior air flow is present.

Another question is not so evident, it is identifying the energy source which mixes thousand tons of water. The internal energy which appeared in the cloud when it was formed at adiabatic cooling of ascending air is evidently insufficient for performance of such a work.

The identical questions arise during consideration of a dust whirl [6]. There the separate dust particles form a stable vertical column. In [6] it is shown within the gravitomagnetism that the sand whirl energy source is gravitational field energy, and then the whirl shape preservation is explained. For details about gravitomagnetism theory see [8].

By analogy with sand whirl, the cloud model is based on the following assumptions. A cloud consists of material particles – drops.

The particle movement assimilates to <u>mass flows</u>. Mass flows in gravitational field are described by Maxwell-like gravitation equations – MGE equations. The interaction between moving masses is described by Lorentz gravitomagnetic forces.

The mass flows generated in the cloud circulate across the whirl and vertically (up and down). Kinetic energy of such circulation is consumed on losses due to collisions of drops. It is transferred from a gravitating body – Earth. Potential energy of cloud does not change and, consequently, it is not consumed. It means that in this case there is no conversion of potential energy to kinetic energy and vice versa. However, <u>gravitating body consumes its energy</u> on generation and maintenance of mass flows.

Support of the cloud above earth is explained as follows. From analogy between Maxwell equations and MGE equations it follows that gravitational energy flow S may exist. Such a flow can exist and be **<u>unchanged</u>** over time. A gravitational impulse exists alongside with the flow. If a body is in a gravitational energy flow (and such a flow **<u>is unchanged</u>** over time), then force $F=S\backslash c$ (c is light velocity) opposite flow S acts on the body. It is a consequence of law of conservation of momentum [7]. Let us emphasise again that it is a perfect analogy between gravitational and electromagnetic fields.

Thus, a time-constant gravitational energy flow exists in the cloud alongside with constant mass flow. It is <u>downward-directed</u>. In accordance with the foregoing, an <u>upward-directed</u> force acts on the cloud. It holds the cloud at some height.

Since such a mathematical model is a perfect analogy of the mathematical model of a sand whirl, it will not be discussed in detail.

In conclusion, let us pay attention to similarity in formation of a sand whirl and a cloud. Both need initial air stratification: cool heavy air is at the top, warm light air is at the bottom. The warm air will float upwards in such a situation, but it can not lift from a uniformly heated surface. An irregularity is necessary for lifting. It can be a hill, building, a single tree, a car moving across the field, and for a sand whirl also a barchan. Such irregularities are referred to as triggers. The wind twists a whirlwind near the trigger. A rotating mass flow creates a column of mass flow in which particles rotate, move along radiii and circulate vertically. It is a direct consequence of the mathematical model.

References

1. A.M. Borovikov, I.I. Gaivoronskiy et al. Physics of clouds / Under the editorship of A. Kh. Khrgian - Leningrad:

Hydrometeorological Publishers, 1961. - 248 p. (А. М. Боровиков, И.И. Гайворонский и др. Физика облаков / Под ред. А.Х. Хргиана. - Ленинград: Гидрометеорологическое издательство, 1961. – 248 с.)

2. Andreyev A.O., Dukalskaya M.V., Golovina Y.G. Clouds: origin, classification, recognition. - St. Petersburg: RGPMU, 2007 - 228 p. (Андреев А.О., Дукальская М.В., Головина Е.Г. Облака: происхождение, классификация, распознавание. - СПб: РГГМУ, 2007. – 228 с.)

3. B. Kazhinskiy Physics of a rain cloud, "Tekhnika – Molodyozhi", 1955, No. 1, p.28–32. (Б. Кажинский, Физика дождевого облака, "Техника – молодёжи", 1955, №1, стр. 28-32)

4. Why do clouds exist? Mechanics of clouds. http://principact.ru/content/view/262/29/ (in Rusian)

5. https://en.wikipedia.org/wiki/Cloud

6. Khmelik S.I. Mathematical Model of Dust Whirl, http://vixra.org/abs/1505.0087

7. R. Feynman, R. Leighton, M. Sands. The Feynman Lectures on Physics, v. 6, Electrodynamics.

8. Khmelik S.I. Gravitomagnetism: natural phenomena, experiments, mathematical models. Published by "MiC", Israel. (Хмельник С.И. Гравитомагнетизм: природные явления, эксперименты, математические модели, Published by "MiC", Israel). Printed in USA, Lulu Inc., ID 20262327, ISBN 978-1-365-62636-4. See also http://vixra.org/pdf/1508.0071v3.pdf