# Gravitational Generation of Rain

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Here we show a new process for producing artificial rain. A region of low pressure is produced in Earth's troposphere, using gravity control. Then clouds are attracted to this region, and thus a bigger cloud can be formed. During the compression process of the cloud, water droplets become large drops through collision and coalescence, and consequently they acquire sufficient fall velocities to reach the ground as rainfall.

**Key words:** Artificial rain, Cloud condensation, Gravity Control, Weather modification.

## 1. Introduction

The weather modification is the act of intentionally manipulating or altering the weather. The most common form of weather modification is the artificial production of rain [1].

Experiments in artificial production of rain, or induced rainfall, date back to XIX century [2], and are in progress in many parts of the world.

Several countries spend millions of dollars in artificial rain programs. In 2011, China spent $150 millions of dollars on a single regional artificial rain program. The US, by comparison, spends around $15 millions of dollars a year [3].

Here we show a new process for producing artificial rain. A region of low pressure is produced in Earth's troposphere, using a gravity control process patented on 2008 (BR Patent number: PI0805046-5, July 31, 2008 [4]). Then clouds are attracted to this region, and thus a bigger cloud can be formed. During the compression process of the cloud, water droplets become large drops through collision and coalescence, and consequently they acquire sufficient fall velocities to reach the ground as rainfall.

## 2. Theory

Consider an ellipsoidal *gravitational spacecraft* [5] floating in the Earth's *troposphere*. There is an oscillating electric field, $E$, with extremely low frequency $(f = 1Hz)$, starting from the external surface of the spacecraft (See Fig.1). An air layer with *several centimeters of thickness*, around the spacecraft is strongly ionized by means of *alpha* particles emitted from several radioactive ions sources (a very small quantity of *Americium* 241*) distributed in the external surface of the spacecraft.

A convenient distribution of the ions sources can strongly increase the electrical conductivity, $\sigma$, in the air layer around the spacecraft, in such way that values of $\sigma > 10^{-4} S/m$ can be obtained. Thus, for example, if we make $\sigma = 10^{-3} S/m$, then we have $\sigma >> \omega\varepsilon = 2\pi f \varepsilon_r \varepsilon_0$, ($\varepsilon_r$ is the relative permittivity of the air and $\varepsilon_0$ is the permittivity of free space). In this case, the index of refraction of the air, $n_r$, around the spacecraft, is expressed by means of the following equation [6]:

$$n_r = \sqrt{\frac{\mu_r \sigma}{4\pi\varepsilon_0 f}} \qquad (1)$$

where $\mu_r$ is the relative magnetic permeability.

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* The radioactive element Americium (Am-241) has a half-life of 432 years, and emits *alpha particles* and low energy gamma rays $(\approx 60KeV)$. The *Americium* (Am-241) is widely used in *ionization smoke detectors*. The Americium is present in oxide form ($AmO_2$) in the detector. The amount of radiation in a smoke detector is extremely small. It is also predominantly alpha radiation. Alpha radiation cannot penetrate a sheet of paper, and it is blocked by *several centimeters of air*. The americium in the smoke detector could only pose a danger if inhaled.

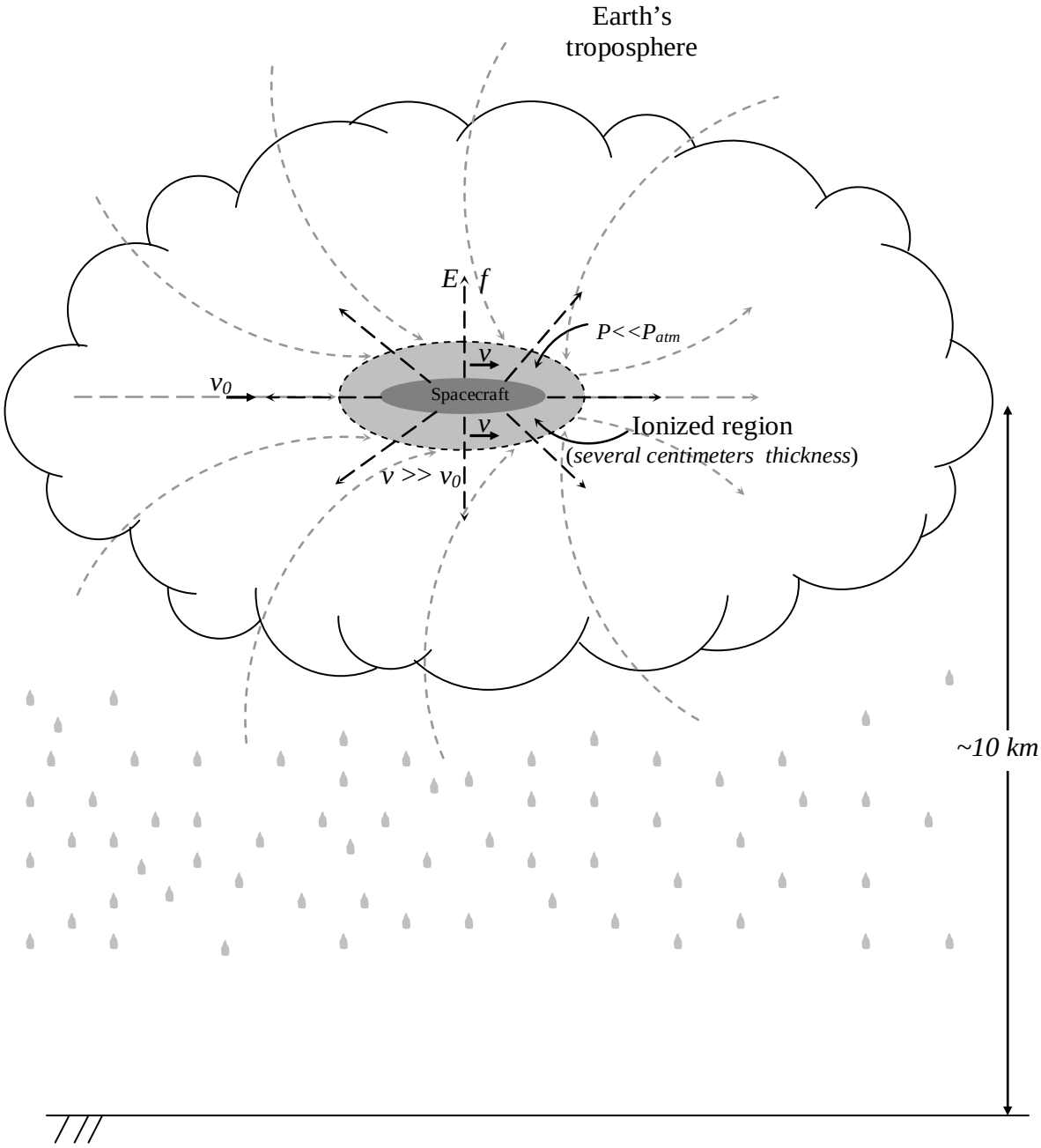


Fig.1 – *Gravitational Generation of Rain.* A region of low pressure is produced in Earth's troposphere, using gravity control. Then clouds are attracted to this region, and thus a bigger cloud can be formed. During the compression process of the cloud, water droplets become large drops through collision and coalescence, and consequently they acquire sufficient fall velocities to reach the ground as rainfall.

The gravitational mass of the air, $m_{g(air)}$, in the mentioned region is then expressed by means of the following equation [7]:

$$m_{g(air)} = \left\{1-2\left[\sqrt{1+\left(\frac{\mu_r \mu_0 \sigma D}{4\pi f \rho c}\right)^2}-1\right]\right\} m_{i0(air)} =$$

$$= \left\{1-2\left[\sqrt{1+6.49\times10^{-37} D^2}-1\right]\right\} m_{i0(air)} \quad (2)$$

where $\rho$ is the air density, $\rho = 0.4135 kg.m^{-3}$ at 10km height [8]; $\mu_0$ is the magnetic permeability of free space; $c$ is the light speed and $m_{i0(air)}$ is the inertial mass of the air.

Considering that $D$ can be expressed by the following equation [9]:

$$D = \frac{E_m^2}{2\mu_0 f} = \frac{E_{rms}^2}{\mu_0 f} \quad (3)$$

where $E_m$ is the amplitude of the oscillating electric field and $E_{rms} = E_m / \sqrt{2}$. Then, Eq. (2) can be rewritten as follows

$$m_{g(air)} = \left\{1-2\left[\sqrt{1+4.11\times10^{-25} E_{rms}^4}-1\right]\right\} m_{i0(air)} \quad (4)$$

For example, if $E_{rms} = 1.24\times10^6\ V.m^{-1}$ †, then the gravitational mass of the air is reduced to $m_{g(d)} \cong 0.2 m_{i0(d)}$. Consequently, we can say that, close to the external surface of the spacecraft, the air velocity will be increased up to 5 times, i.e., if $a_0 = F_0 / m_{i0(d)}$, $v_0 = a_0 t$, then

$$a = F_0 / m_{g(d)} = F_0 / 0.2 m_{i0(d)} \rightarrow a = 5a_0 \rightarrow v = 5v_0 \quad (5)$$

This causes a decreasing of about 25 times in the local pressure (Bernoulli principle). Then clouds are attracted to the region of low pressure, and thus a bigger cloud can be formed around the spacecraft. During the compression process of the cloud the collisions (and coalescence collisions) among the water droplets become more frequent and lead to the formation of *large drops* with sufficient fall velocities to reach the ground as rainfall.

† Corona effect arises when $E > 3\times10^6 V.m^{-1}$ [10]

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