

Astronomy

On the Nature of Pluto

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ABSTRACT. Pluto is a planet in process of formation. A swarm of particles formed around it traps particles from the space. Part of these bodies then fall down, another part in future will make satellites. After the passage of cosmogonic scale of time, a great planet must be created containing 13 Earth's masses. © 2007 Bull. Georg. Natl. Acad. Sci.

Key words: *Pluto, formation, swarm of particles.*

Is Pluto a planet?

At the present Pluto has become the object of discussion: Is it a normal planet or only a minor one? The argument for the last opinion is that outside Pluto's orbit many bodies (Plutoids) of nearly the same size have now been discovered.

This problem was studied by the author in papers dedicated to the origin of the rotation of the planets [1 - 6]. Lately, the results of these investigations were summed up in a monograph [7].

The main idea of these studies is that during the process of formation some planets with short periods of axial rotation (from the Earth to Neptune) had very great cross-sections, necessary for them to acquire recent spins. This would be possible if swarms of small particles around them were formed, opaque to similar particles.

Then, part of these bodies (particles) with low spin moments fall down (on the planet), while the part with great spin moments will form satellites in future.

Mercury and Venus had not such swarms, accordingly they rotate slowly and have no satellites.

Thus, the presence of satellites is connected with the fast rotation of planets, as both of these phenomena result from the existence of particle swarms around central bodies in the past. It is curious that such simple dependence remained unnoticed for a long time.

The structure of circumplanetary particle swarms has been investigated in [5, 8].

In these studies the main results connected with Pluto were formulated as the following predictions:

1. The mass of Pluto is no more than 0.09 Earth's mass [1 - 3];
2. Pluto has a satellite [4];
3. Pluto is surrounded with swarms of particles and is still growing [9 - 11], the radius of the swarm is 1 - 2 million km and its mass is about of 10^{-6} Pluto's mass;
4. The total mass of material moving outside Pluto's orbit is about 13 Earth's masses [7];
5. Mean radius of small particles outside Pluto's orbit is estimated as about 0.3 mm [6].

The first two predictions were based on the conclusion about the connection between the presence of satellites and fast rotation of planets. Inasmuch as Pluto's rotation is fast (relative to Pluto's year), the conclusion follows: it must have at least one satellite.

Because of a great distance from the Sun the relaxation time of the accretion process for Pluto is many times greater than the age of the solar system. Hence, Pluto has not completed its evolution and now it must have its own swarm of particles - not visible from the Earth.

Indirect arguments supporting this point of view are given by photometric data: since the moment of the discovery of Pluto its albedo has been permanently decreasing and the color index growing [9 - 11]. In my opinion, it happens because all this time Pluto has been recessing from the ecliptic plane (where the spatial density of inter-

planetary material is maximal) and, accordingly, the total mass of swarm decreases with time.

The discovery of two small satellites of Pluto in 2006 by the Hubble Space Telescope also seems to strengthen my conclusion about the presence of a swarm around Pluto: these satellites seem to be the greatest members of this object.

Finally, basing on the estimation of particle sizes [6] and on the still hypothetic fact of a swarm's presence around contemporary Pluto, for the total mass of interplanetary material in the neighborhood of Pluto's orbit we obtain 13 Earth's masses as the lower boundary [7]. This material is slowly accreted by Pluto's swarm and in future must partly fall down, partly form satellites.

Conclusions

Thus, at present Pluto is a planet in the unfinished process of formation. The swarm of particles around it traps particles from the space. Part of these bodies with low spin moment fall down, another part with great spin moment in future will create satellites. The radius of the swarm is 1-2 million km and its mass is about of 10^{-6} Pluto's mass.

After the passage of cosmogonic scale of time, as a result of the competition during the growing process between Plutoids, a great planet containing about 13 Earth's masses will be created instead of many bodies at present moving outside Pluto's orbit.

ასტრონომია

პლუტონის ბუნების შესახებ

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აკადემიის წევრი, ე. ხარაძის საქართველოს ეროვნული ასტროფიზიკური ობსერვატორია, აბასთუმანი

პლუტონი არის ფორმირების პროცესში მყოფი პლანეტა. მის გარშემო არსებული ნაწილაკების გროვა იტაცებს ნიუთონურებას გარშემო სივრცეიდან. ამ სხეულების ნაწილი ძირს ცვეთა, ხოლო მეორე ნაწილი მომავალში წარმოშობს თანამგზავრებს. კოსმოგონიური მასშტაბით საკმაო დროის გასვლის შემდეგ წარმოიშობა დედამიწის 13 მასის მქონე დიდი პლანეტა.

REFERENCES

1. R. I. Kiladze (1965), Bull. Abastumani Astrophys. Observatory, **32**, 231-234 (Russian).
2. R. I. Kiladze (1967), Astronom. Vestnik, **1**, 4, 223-225 (Russian).
3. R. I. Kiladze (1968), Brit. Astr. Ass., **78**, 2, 124-125.
4. R. I. Kiladze (1977), Bull. Abastumani Astrophys. Observatory, **48**, 191-212 (Russian).
5. R. I. Kiladze (1979), Bull. Georgian Acad. Sci., **95**, 3, 589-592 (Russian).
6. R. I. Kiladze (1980), Bull. Georgian Acad. Sci., **99**, 3, 589-592 (Russian).
7. R. I. Kiladze (1986), Sovremennoe vraschenie planet, kak rezul'tat razvitiya okoloplanetnykh roev melkikh chastits (Contemporary Rotation of Planets as the Result of Development of Circumplanetary Swarms of Small Particles), Tbilisi, 244 p (Russian).
8. R. I. Kiladze (1989), Bull. Abastumani Astrophys. Observatory, **68**, 125-134 (Russian).
9. R. I. Kiladze (1988), Astronom. Vestnik, **22**, 1, 79-82 (Russian).
10. R. I. Kiladze (1991), V. J. Kukhianidze Astronom. Vestnik, **25**, 4, 439-441 (Russian).
11. R. I. Kiladze., V. J. Kukhianidze (1995) Astronom. Vestnik, **29**, 6, 504-505 (Russian).

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