

Satellites of Giant Extrasolar Planets as Possible Harbor of Life

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Search of analogues of the of terrestrial group planets remains far beyond reached technically possibilities: the Kepler speed of the Sun produced by the Earth makes $0.09 \text{ m}\cdot\text{s}^{-1}$ only. At the beginning of 2007 the total number of discovered giant planets at other stars exceeds 200, and many of them are of «hot jupiters» types, whose major semiaxis of the orbit lies within the limit 0.15 a.u. It would be naive to suppose existence of life (in known to us amino-nucleic acid form) on the massive gas-liquid extrasolar giant planets. Nevertheless conditions for onset and evolutions of life can be realized on their hypothetical satellites.

All giant planets of the Solar system have a big number of satellites, exceeding 50 for Jupiter and Saturn each. A part of them consist very large bodies, comparable to planets of terrestrial type, but including much more significant share of water ice. Some from them have a rarified atmosphere. Formation (or capture) of satellites is a natural phenomenon, and satellite systems definitely should exist at extrasolar planets. If the way of search of such satellites will be found, their detection can become the important event for bioastronomy.

As for massive giants they are met practically in all orbits. In «a habitable zone» (from 0.8 up to 1.1 a.e.) few planets have been found with a small orbit's eccentricity (less than 0.12) that provides approximately constant stellar radiation at a level of a solar constant, during the whole planet's year.

Let's assume that there is a massive giant planet at a distance of about 1 AU from a Sun-like star. A hypothetical satellite of the planet, with a dense enough atmosphere and hydrosphere, could have biosphere of terrestrial type (within the limits of our notion about an origin of terrestrial biosphere). The nature of a hypothetical satellite of the planet obviously would have special features. A body at the planet with a 3 Jupiter mass, in an orbit in size of the Jovian satellite's Europe, will have the period about 2 days, according to the Kepler's third law. The body would have rather long period of rotation, synchronous with its revolution period. Nevertheless the period would be considerably smaller, than that of the Moon; due to the extrasolar planet's high mass. Interestingly, if the inclination of polar axis of the planet to a plane of its orbit is not too big, at midday long eclipse of a star will be observed on a regular basis (in the shown example – by duration for about 3 hour). The eclipses will be observed only on one hemisphere of the satellite. The feature is a result of huge diameter of a planet and that orbits of satellites are usually placed close to its equatorial plane.

There are also other interesting features, – for example, a small, on 2 %, distinction in a stellar constant for two hemispheres of the satellite. All these features cannot, however, hamper the chances for a long pre-biological evolution of this type satellites and onset on them of life and biosphere.