

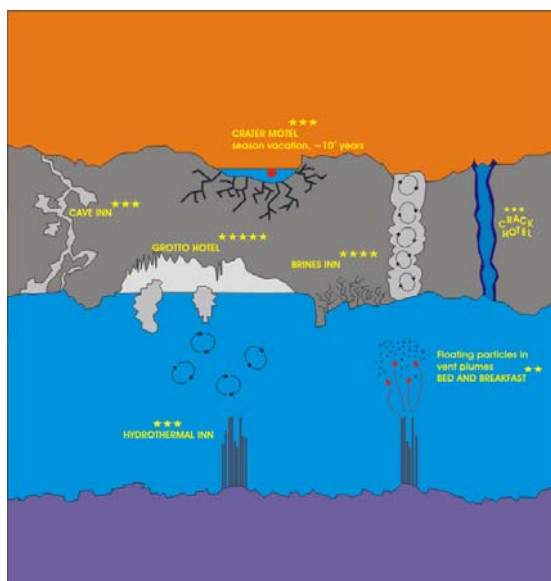
Exobiology of Titan

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Abstract

Titan, the largest satellite of Saturn has a dense nitrogen atmosphere and a large quantity of liquid water under ice cover and so has a great exobiological significance. The most recent models of the Titan's interior lead to the conclusion that a substantial liquid layer exists today under relatively thin ice cover inside Titan. The putative internal water ocean along with complex atmospheric photochemistry provide some new exobiological niches on this body: (1) an upper layer of the internal water ocean; (2) pores, veins, channels and pockets filled with brines inside of the lowest part of the icy layer; (3) the places of cryogenic volcanism; (4) set of caves in icy layer connecting with cryovolcanic processes; (5) the brine-filled cracks in icy crust caused by tidal forces; (6) liquid water pools on the surface originated from meteoritic strikes; (7) the sites of hydrothermal activity on the bottom of the ocean [1].



We can see all conditions needed for exobiology - liquid water, complex organic chemistry and energy sources for support of biological processes - are on the Saturnian moon. On Earth life exists in all niches where water exists in liquid form for at least a portion of the year. Possible metabolic processes, such as nitrate/nitrite reduction [2], sulfate reduction and methanogenesis could be suggested for Titan [3]. Excreted products of the primary chemoautotrophic organisms could serve as a source for other types of microorganisms (heterotrophes). Subglacial life may be widespread among such planetary bodies as Jovian and Saturnian satellites and satellites of other giant planets, detected in our Galaxy at last decade.

Galileo spacecraft has given indications, primarily from magnetometer and gravity data, of the possibility that three of Jupiter's four large moons, Europa, Ganymede and Callisto have such oceans also. The existing of liquid water ocean within icy world can be consequences of the physical properties of water ice, and they neither require the addition of antifreeze substances nor any other special conditions.

References

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