Paper ID: 73534
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IAF SPACE EXPLORATION SYMPOSIUM (A3)
Interactive Presentations - IAF SPACE EXPLORATION SYMPOSIUM (IP)

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DESIGN FOR AN EXPLORATORY MISSION TO EUROPA TO CONDUCT A TOPOLOGICAL STUDY FOR DETERMINATION OF POSSIBLE LANDING SITES

Abstract

Jupiter and its moons have always been a keen interest to the scientists and engineers and it marks an important milestone in the world of space exploration. Europa, Jupiter's second largest satellite, is about the size of Earth's Moon, although it has water ice on its surface, unlike the Moon. It has been suggested that an oxygen atmosphere should arise around such a body as a result of reactions that break up water molecules and produce molecular hydrogen and oxygen. The lighter H2 molecules would easily escape off Europa, leaving an oxygen-rich atmosphere behind. The ratio of Europa's mean motion to the mean motion of a low-altitude Europa orbiter is about 0.02, meaning that Europa will shift an angle of only 7 degrees in one orbital period. Analytical and numerical techniques are used to investigate the stability of orbit dynamics around Europa. A spacecraft injected in a Jovian orbit can be steered into a capture orbit around Europa using a certain V (to be determined later by computation). Because of the massive, liquid oceans that may exist beneath its frozen cover, Europa is thought to be a location suitable to life. The project's goal is to develop a numerically integrated and continuous trajectory that begins in a Jovian orbit and progresses to orbit around Europa continuously. We have presumed, that the planetary satellite is in a near-circular orbit around the primary, that the orbiter is in a tightly bound, low-altitude orbit around the planetary satellite, and that the planetary satellite's mass is suitably modest in comparison to the planet's mass. Here we study the moon's surface, its atmosphere and identify a suitable surface for future landing missions. The observation of atomic oxygen emissions from Europa is investigated, and it is proven that they are caused by the simultaneous dissociation and excitation of atmospheric O2 by electrons from Jupiter's magnetosphere.