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ソーラー電力セイルによる木星トロヤ群往復探査と深宇宙クルージング観測
The Solar Power Sail for Round Trip Exploration to Jupiter Trojans and Deep Space Cruising Observation

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Since 2002, the Solar Power Sail WG has been studying a mission design of Japan’s first outer planet region exploration, by demonstrating the solar power sail technology, and it is bound to Jupiter Trojan asteroids, which may hold fundamental clues of the Solar System formation and revolution discussed by two competing hypotheses between the classic model and the planetary migration model. The former suggests that Trojan asteroids are mainly survivors of building blocks of the Jupiter system, while the latter claims that they must be intruders from outer regions after the planetary migration of gas planets settled.

After Jupiter flyby, the spacecraft will reach to a candidate Trojan asteroid, hopefully being larger than a few 10’s of km in size. Both global remote observation and deployment of an autonomous lander will be conducted. On the surface of the Trojan asteroid, sampling will be attempted for in-situ TOF mass spectrometry and passing the sample container to the mothership for a possible sample return option.

Also during the cruising operation, ”dust free” astronomical platform beyond the cocoon of the zodiacal light formed by the main asteroid belt for the benefit of infrared astronomy searching for the first generation light of the Universe, let alone continuous observation of the zodiacal light structure of the Solar System. Extremely long baseline with the observation from the Earth, gamma-ray burst observation can identify their sources.

This presentation discusses major scientific objectives of an exploration mission to Jupiter Trojans for the first time in the history, its mission design and spacecraft system using solar power sail, a hybrid propulsion system of electric propulsion and photon sail, which inherited from the IKAROS deep space solar sail spacecraft, together with major engineering challenges, in-situ observation instruments and operational options including landing and sample return from the surface of a Trojan asteroid.

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