

SCIENCE EXPERIMENTS ON A JUPITER TROJAN ASTEROID IN THE FUTURE SOLAR POWERED SAIL MISSION.

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Introduction: A new mission to a Jupiter Trojan asteroid is under study in Japan using a solar-powered sail (SPS), and a scientific lander is being investigated in the joint study between engineers and scientists from Japan and Europe. We present here the key objectives and the strawman payloads of science experiments on the asteroid proposed in this mission.

Science Objectives: Jupiter Trojan asteroids are located around the Sun-Jupiter Lagrange points (L4 or L5) and most of them are classified as D- or P-type asteroids, but their origin remains unknown. A classical (static) model of solar system evolution suggests that they formed around the Jupiter region and survive until now as the outer end members of asteroids. A new (dynamical) model such as Nice model indicates that they formed at the far end of the solar system and were transferred inward due to dynamical migration of giant planets. So the physical, mineralogical, and isotopic studies of the surface materials and volatile compounds could solve their origin as well as the solar system formation.

Strawman Payloads: The SPS orbiter will carry a 100 kg class lander with 20 kg mission payloads. Just after landing, geological, mineralogical, and geophysical observations will be conducted to characterize the site using panoramic camera, infrared hyperspectral imager, magnetometer, and thermal radiometer. Its surface and subsurface materials will be collected into a carousel by the bullet-type and the pneumatic drill type samplers, respectively. Samples in the carousel will be viewed by visible and infrared microscope, and transferred for high resolution mass spectrometry (HRMS). Mass resolution $m/\Delta m > 30,000$ is expected to investigate isotopic ratios of D/H, $^{15}\text{N}/^{14}\text{N}$, and $^{18}\text{O}/^{16}\text{O}$, as well as molecules from organic matters. A set of strawman payloads are determined for the lander system study.

In the SPS mission, sample-return is also studied as an option, and the lander can carry the mechanisms for sample collection and sample transfer to the mother ship.