

# **Jupiter Trojan Exploration as a Key for Testing Planetary Migration Theories**

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Exploration of Jupiter Trojans has been studied and proposed since 2000's, first in Japan and later followed by both Europe and the U.S.A. In particular, recent uprising hypotheses of planetary migrations such as the Nice model, Grand Tack model, and their recent evolved versions (e.g., the Jumping Jupiter model) have made the strongest case for the need of direct exploration of structures and materials of the Jupiter Trojan objects ever. Recently, major scientific roadmaps and visions in Japan, Europe and the U.S.A. mention the Jupiter Trojans as a viable exploration target.

The main science quest is to determine the originated region(s) of present Jupiter Trojans in order to prove or disprove these planetary migration theories. To achieve this goal, various working theories are proposed from recent spectroscopic observations, orbital dynamic evolution models, analogous discussion from possible "relatives" like cometary nuclei, EKBOs, main belt comets, irregular and retrograde satellites of Jupiter, Centaurs, etc. through results of astronomical observations and spacecraft missions.

This paper summarizes the past and present efforts of the exploration of this unique group of the small bodies including the Solar Power Sail mission and other proposals. Also we discuss on mission design and observation strategies, ranging from multiple flybys and rendezvous to landing and sample returns, about how one can achieve the above goal in the best way of our time, particularly with geochemical points of view.