

## Analysis of Isotopic and Molecular Compositions of Materials from a Jupiter Trojan Asteroid Using High Resolution Mass Spectrometry (HRMS) in the Solar Power Sail OKEANOS Mission

\*Yoko Kebukawa<sup>1</sup>, Tatsuaki Okada<sup>2,3</sup>, Jun Aoki<sup>4</sup>, Motoo Ito<sup>5</sup>, Yosuke Kawai<sup>4</sup>, Shoichiro Yokota<sup>4</sup>, Jun Matsumoto<sup>2</sup>, Hisayoshi Yurimoto<sup>6,2</sup>, Hajime Yano<sup>2</sup>, Hervé Cottin<sup>7</sup>, Noel Grand<sup>7</sup>, Osamu Mori<sup>2</sup>, The OKEANOS team

1. Yokohama National University, 2. Japan Aerospace Exploration Agency, 3. The University of Tokyo, 4. Osaka University, 5. JAMSTEC, 6. Hokkaido University, 7. LISA, Université Paris-Est Créteil

The OKEANOS (Outsized Kite-craft for Exploration and AstroNautics in the Outer Solar system) is a candidate for the upcoming strategic middle-class space exploration to rendezvous with and land on a Jupiter Trojan asteroid using a Solar Power Sail (SPS). The mission concept includes in-situ sampling analysis of the surface and subsurface (up to 1 m) materials of a Jupiter Trojan asteroid using a multi-turn time-of-flight type high-resolution mass spectrometry (HRMS) system.

We plan to analyze isotopic and elemental compositions of volatile materials from organic matter, hydrated minerals, and ice, in order to understand origin and evolution of the Jupiter Trojan asteroids. It will provide insights into (1) planet formation/migration theories, (2) evolution and distribution of volatiles and organic matter in the Solar System, and (3) evolutionary history of the Solar System small bodies beyond the snow line.

The HRMS system is under development aiming to measure H, N, C, O isotopic compositions and elemental compositions of organic compounds. The system also includes various pre-MS procedures; stepwise heating up to 600°C, gas chromatography (GC), and high-temperature pyrolysis with catalyst to decompose the samples into simple gaseous molecules (e.g., H<sub>2</sub>, CO, and N<sub>2</sub>) for isotopic ratio analysis.

Keywords: Jupiter Trojan asteroids, Mass spectrometry, OKEANOS