

## Introduction to the THOR mission

\*Yasuhito Narita<sup>1</sup>, Andris Vaivads<sup>2</sup>, Alessandro Retino<sup>3</sup>, Yuri Khotyaintsev<sup>2</sup>, Jan Soucek<sup>4</sup>, Philippe Escoubet<sup>5</sup>, Francesco Valentini<sup>6</sup>, Christopher H. K. Chen<sup>7</sup>, Andrew Fazakerley<sup>8</sup>, Benoit Lavraud<sup>9,10</sup>, Federica Marcucci<sup>11</sup>, Rami Vainio<sup>12</sup>, Martin Gehler<sup>5</sup>, Arno Wielders<sup>5</sup>, Jens Romstedt<sup>5</sup>

1. Space Research Institute, Austrian Academy of Sciences, Austria, 2. Swedish Institute of Space Physics Uppsala, Sweden, 3. Laboratoire de Physique des Plasmas, France, 4. Institute of Atmospheric Physics, Czech Academy of Sciences, Czech Republic, 5. ESA/European Space Research and Technology Centre (ESTEC), The Netherlands, 6. Calabria University, Italy, 7. Imperial College London, UK, 8. Mullard Space Science Laboratory (MSSL), UK, 9. University of Toulouse, L'Institut de Recherche en Astrophysique et Planetologie, France, 10. Centre national de la recherche scientifique (CNRS), L'Institut de Recherche en Astrophysique et Planetologie (IRAP), France, 11. Istituto Nazionale di Astrofisica (INAF), Italy, 12. University of Turku, Finland

Fundamental plasma processes at kinetic scales such as wave-particle and wave-wave interactions play an important role in the heliosphere and various astrophysical systems. Turbulence Heating Observer (THOR) is the first mission under a study for ESA M4 candidate ever flown in space dedicated to understanding the heating process in collisionless plasma turbulence. THOR explores the kinetic plasma processes that determine the fundamental behavior of the majority of baryonic matter in the universe. THOR aims to find answers to the fundamental questions on the turbulent plasma processes by achieving the highest-resolution in the particle and electromagnetic field measurements in the solar wind and the regions around Earth's bow shock. Toward the launch in 2026, the spacecraft design, the instrument design, the orbit plan, and the analysis tools are presented on the THOR mission.

Keywords: plasma turbulence, spacecraft mission, solar wind, bow shock