Geophysical Research Abstracts
Vol. 18, EGU2016-15240, 2016
EGU General Assembly 2016

Exploring turbulent energy dissipation and particle energization in space plasmas: the science of THOR mission

Alessandro Retinò and the THOR Team

Laboratoire de Physique des Plasmas, Ecole Polytechnique, Palaiseau, France (alessandro.retino@lpp.polytechnique.fr)

The Universe is permeated by hot, turbulent magnetized plasmas. They are found in active galactic nuclei, supernova remnants, the intergalactic and interstellar medium, as well as in the solar corona, the solar wind and the Earth's magnetosphere. Turbulent plasmas are also found in laboratory devices such as e.g. tokamaks. Our comprehension of the plasma Universe is largely based on measurements of electromagnetic radiation such as light or X-rays which originate from particles that are heated and accelerated as a result of energy dissipation in turbulent environments. Therefore it is of key importance to study and understand how plasma is energized by turbulence. Most of the energy dissipation occurs at kinetic scales, where plasma no longer behaves as a fluid and the properties of individual plasma species (electrons, protons and other ions) become important. THOR (Turbulent Heating ObserveR - http://thor.irfu.se/) is a space mission currently in Study Phase as candidate for M-class mission within the Cosmic Vision program of the European Space Agency. The scientific theme of the THOR mission is turbulent energy dissipation and particle energization in space plasmas, which ties in with ESA's Cosmic Vision science. The main focus is on turbulence and shock processes, however areas where the different fundamental processes interact, such as reconnection in turbulence or shock generated turbulence, are also of high importance. The THOR mission aims to address fundamental questions such as how plasma is heated and particles are accelerated by turbulent fluctuations at kinetic scales, how energy is partitioned among different plasma components and how dissipation operates in different regimes of turbulence. To reach the goal, a careful design of the THOR spacecraft and its payload is ongoing, together with a strong interaction with numerical simulations. Here we present the science of THOR mission and we discuss implications of THOR observations for space, astrophysical and laboratory turbulent plasmas.