30th IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)
Small Space Science Missions (2)

Author: Mr. Lorenzo Provinciali
Argotec, Italy

Dr. Ludovica Bozzoli
Argotec, Italy
Mr. Giorgio Saita
Argotec, Italy
Mr. Paride Amabili
Argotec, Italy
Mr. Davide Calcagno
Argotec, Italy
Mr. Andrea Pipino
Argotec, Italy
Mr. Luca Conterio
Argotec, Italy
Mr. Alessandro Balossino
Argotec, Italy
Dr. Elisa Maria Alessi
Consiglio Nazionale delle Ricerche (CNR), Italy
Dr. Stefano Cicalò
Space Dynamics Services s.r.l., Italy
Dr. Maria Federica Marcucci
INAF - Istituto Nazionale di AstroFisica, Italy
Dr. Monica Laurenza
INAF-IAPS, Italy
Prof. Simone Landi
Università degli Studi diFirenze (UniFI), Italy
Prof. Gaetano Zimbardo
Università della Calabria, Italy

HELIOSPHERIC PIONEER FOR SOLAR AND INTERPLANETARY THREATS DEFENCE (HENON) MISSION: SPACE WEATHER MONITORING AND FORECASTING

Abstract

Space Weather is driven by a chain of physical phenomena beginning on the Sun. Solar Flares, Geomagnetic Storms, Coronal Mass Ejection and other Space Weather Phenomena represent a threat for human life and for technologies, on Earth and in Space. Therefore, their monitoring and forecasting represent a key asset to study and consequently limit their impacts.
With these intents, "The HEliospheric pioNeer for sOlar and interplanetary threats defeNce (HENON)" mission has been conceived as a pathfinder in the Space Weather (SWE) forecasting and science. The HENON mission envisions one 12U CubeSat orbiting along a Distant Retrograde Orbit (DRO) in the Sun-Earth system. This orbit features an advantage point in terms of observation of Space Weather

events. Sun-Earth DRO has never been reached before and features an apparent slow retrograde motion of the spacecraft as seen from the Earth, as well as optimal conditions for the Space Weather observations in real-time.

HENON aims to embark advanced scientific instruments able to provide measurements of energetic particle spectra, solar wind, and magnetic field. These features make HENON a pioneer also in the real time monitoring of the particle radiation environment and the forecasting of geo-effective interplanetary structures in deep space. Such ambitious objectives imply great technological challenges in the Satellite design in terms of radiation assurance, system budgets, and lifetime in Deep Space. This work presents the mission description and also the main challenge of the mission itself: ensuring the capability of operating a CubeSat to provide its service while a Solar Event is ongoing. In fact, HENON shall perform its mission exactly in harsh Deep Space conditions. Moreover, the long cruise required to reach DRO imposes unprecedented requirements for a CubeSat in terms of lifetime, maneuvering capabilities and operability. These challenges make the whole HENON CubeSat design and integration a cutting-edge scientific demonstration itself for Deep Space CubeSats. Phase B activities of the mission are developed under ESA's General Support Technology Programme Fly Element (GSTP) and funded by the Italian Space Agency as part of the ALCOR program.