Geophysical Research Abstracts
Vol. 16, EGU2014-5892-1, 2014
EGU General Assembly 2014

Magnetospheric ULF wave studies in the frame of Swarm mission: new advanced tools for automated detection of pulsations in magnetic and electric field observations

Georgios Balasis (1), Ioannis A. Daglis (1,2), Constantinos Papadimitriou (1,2), Marina Georgiou (1,2), Sigiava A. Giamini (1), Ingmar Sandberg (1), and Roger Haagmans (3)

(1) National Observatory of Athens, Institute for Astronomy, Astrophysics, Space Applications and Remote Sensing, Penteli, Greece (gbalasis@noa.gr, +302106138343), (2) Faculty of Physics, University of Athens, Athens, Greece, (3) ESTEC, European Space Agency, Noordwijk, Netherlands

The rekindling of the interest in space science in the last 15 years has led to many successful satellite missions in the Earth's magnetosphere and topside ionosphere, which were able to provide the scientific community with high-quality data on the magnetic and electric fields surrounding our planet. This data pool will be further enriched by the measurements of ESA's Swarm mission, a constellation of three satellites in different polar orbits, flying at altitudes from 400 to 550 km, which was launched on the 22nd of November 2013.

Aiming at the best scientific exploitation of this corpus of accumulated data, we have developed a set of analysis tools that can cope with measurements of various spacecraft, at various regions of the magnetosphere and in the topside ionosphere. Our algorithms are based on a combination of wavelet spectral methods and artificial neural network techniques and are suited for the detection of waves and wave-like disturbances as well as the extraction of several physical parameters. Our recent work demonstrates the applicability of our developed analysis tools, both for individual case studies and statistical analysis of ultra low frequency (ULF) waves.

We provide evidence for a rare simultaneous observation of a ULF wave event in the Earth's magnetosphere, topside ionosphere and surface: we have found a specific time interval during the Halloween 2003 magnetic storm, when the Cluster and CHAMP spacecraft were in good local time (LT) conjunction, and have examined the ULF wave activity in the Pc3 (22-100 mHz), Pc4 (7-22 mHz) and Pc5 (1-7 mHz) bands using data from the Geotail, Cluster and CHAMP missions, as well as the CARISMA, GIMA and IMAGE magnetometer networks. Our study shows that the same wave event, characterized by increased activity in the high end of the Pc3 band, was simultaneously observed by all three satellite missions and by certain stations of ground networks. This observation provides a strong argument in favour of the global nature of this event, as would have been expected for waves following one of the most prominent geomagnetic disturbances of recent times, namely the Halloween 2003 superstorm.

This work has received funding from the European Space Agency under contract ESTEC 4000103770/11/NL/JA/ef.