EGU21-15124
https://doi.org/10.5194/egusphere-egu21-15124
EGU General Assembly 2021

On the origin of Ultra-Low Frequency (ULF) waves in sudden and quasiperiodic solar wind dynamic pressure variations penetrating into Earth's magnetosphere

Marina Georgiou[1], Christos Katsavrias[1,2], Ioannis Daglis[1,3], Georgios Balasis[4], and Alexander Hillaris[1]

[1]National and Kapodistrian University of Athens, Department of Physics, Athens, Greece (margeo@phys.uoa.gr)
[2]Space Applications and Research Consultancy (SPARC), Athens, Greece
[3]Hellenic Space Center, Athens, Greece
[4]National Observatory of Athens, Institute for Astronomy, Astrophysics, Space Applications and Remote Sensing, Penteli, Greece

Several observational studies have shown that external (i.e. solar wind and magnetosheath) dynamic pressure variations can drive quasi-periodic perturbations of the geomagnetic field. In this study, we utilise multi-spacecraft (ARTEMIS, Cluster, GOES, and THEMIS) mission measurements and investigate step-like increases and quasi-periodic variations of solar wind dynamic pressure as the source mechanism of geomagnetic pulsations with frequencies between ~0.5 to 15 mHz. During intervals of slow solar wind and low geomagnetic activity — to exclude waves generated by velocity shear at the magnetopause and substorm contributions — common periodicities in electromagnetic field oscillations inside the magnetosphere and the solar wind driver are detected in Lomb-Scargle periodograms. The causal relationship is examined in frequency and polarisation signatures of waves detected at the various probes using continuous wavelet transform, cross-wavelet spectra and wavelet transform coherence. The observed dependence of wave properties on their localisation offers excellent source verification for ULF Pc4-5 waves originating in dynamic pressure variations in the upstream solar wind and propagating in the dayside magnetosphere through the field line resonance process.

This research is co-financed by Greece and the European Union (European Social Fund - ESF) through the Operational Programme "Human Resources Development, Education and Lifelong Learning 2014-2020" in the context of the project ULFpulse (MIS: 5048130).