On the source of the anomalous ULF waves detected at ground and space on June 23, 2020

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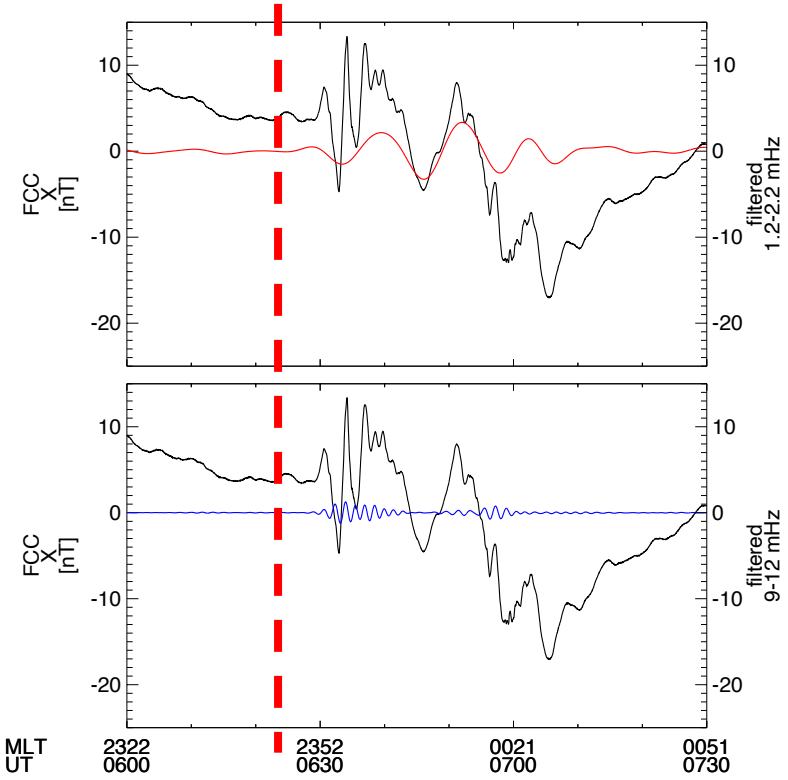
Global ULF wave activity (≈1.67 mHz) during very quiet conditions

Kp≈0-1 from June 21 to June 25, 2020

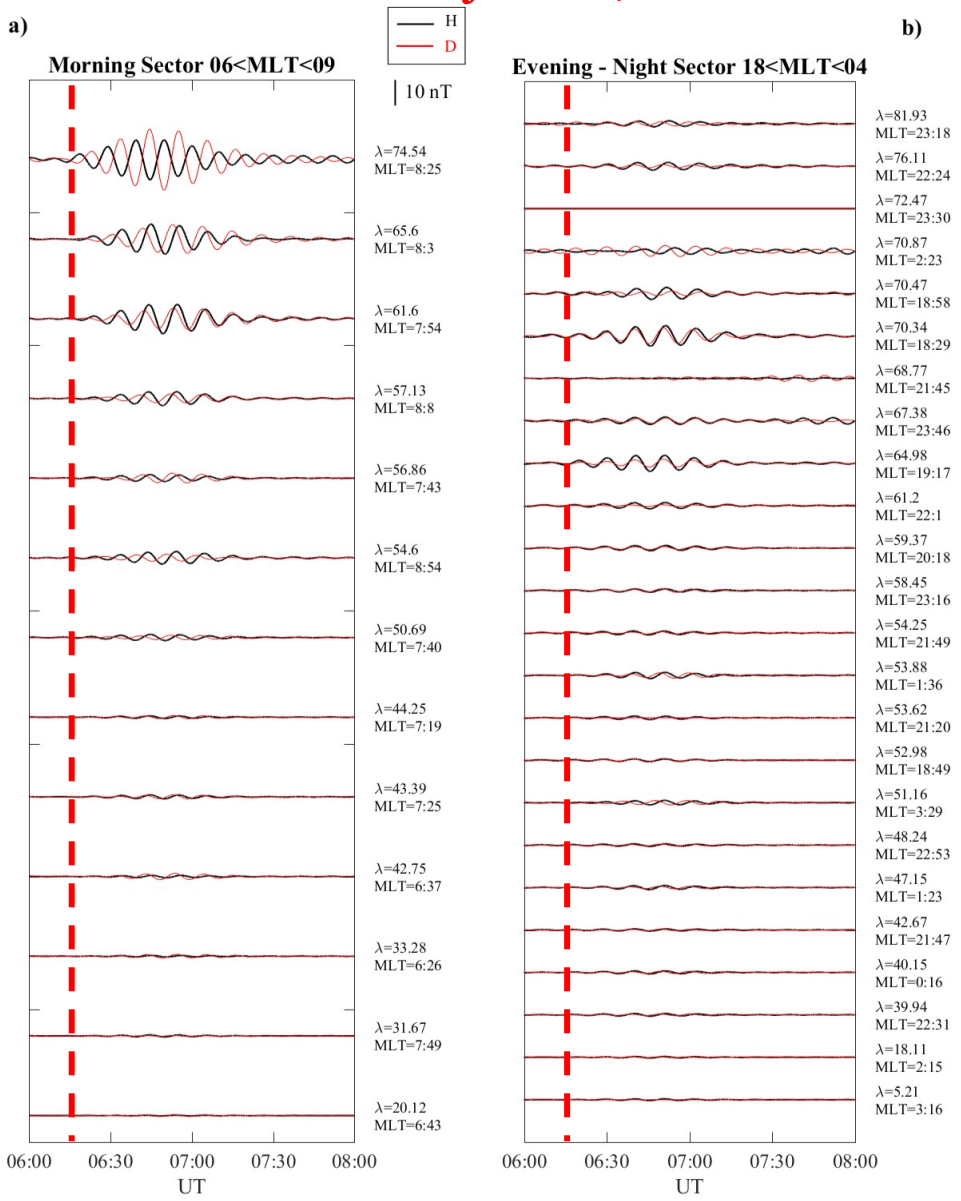
Coupling between the waveguide mode and magnetospheric field line resonance at ≈1.67 mHz

Global Pc5 wave activity at ≈1.67 mHz

Pi2 wave activity in the nightside sector at ≈11.6 mHz



≈6:22 UT on June 23, 2020

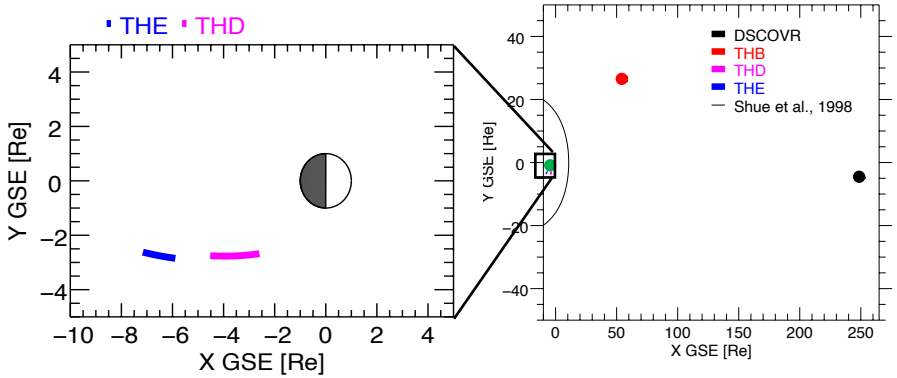


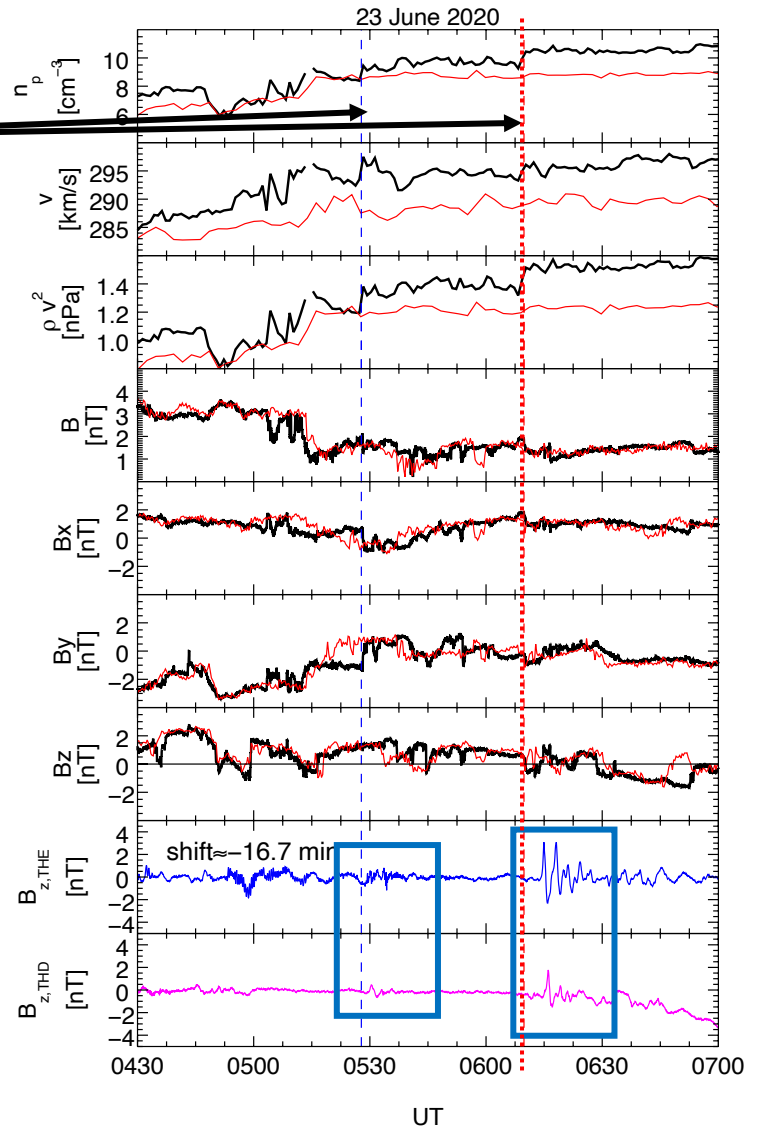
Possible driver in solar wind pressure jump and southward interplanetary magnetic field

At DSCOVR we observed sharp variation of the interplanetary magnetic field (IMF) associated with a small jump in the dynamic pressure

DSCOVR data shifted forward of ≈71.3 min → propagation speed of ≈290 km/s → Expected interaction with the magnetosphere after ≈16.7 min, that is at ≈06:26 UT

THEMIS-E and THEMIS-D observe strong wave activity after the pressure pulses impact

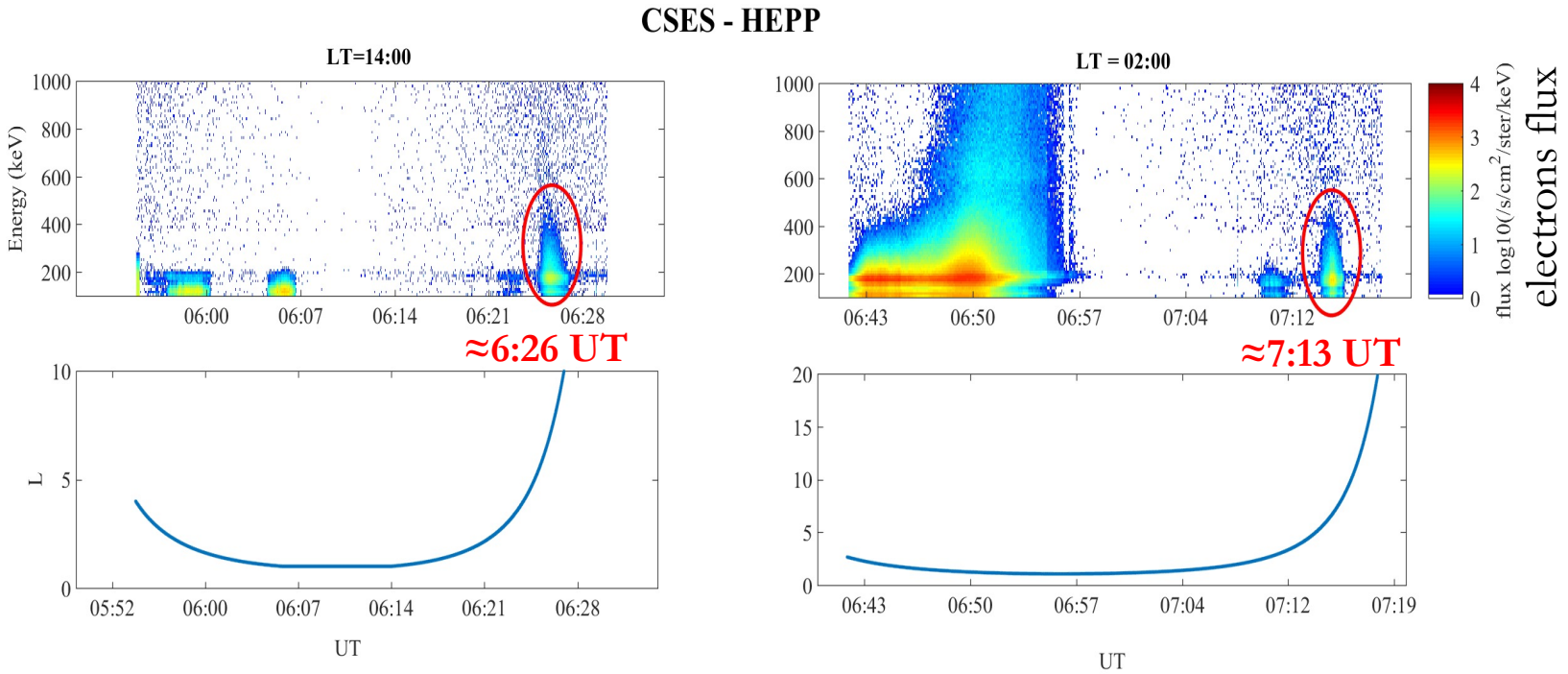




Signatures of particle precipitation at LEO orbit during Pc5 and Pi2 wave activity

High-Energy Particle Package (HEPP) detector on board the China Seismo-Electromagnetic Satellite (CSES), which is a sun-synchronous LEO satellite orbiting at about 500 km height.

Enhancement of energetic particle flux at latitude compatible with Field Line Resonance locations.



For more information:

M. Piersanti, S. Di Matteo, Z. Zhima, Y. Yang, Z. Zhang, M.F. Marcucci, A. Parmentier, G. D'Angelo, D. Recchiuti, P. Diego, P. Ubertini (2022). "On the source of the anomalous ULF waves detected at both ground and space-borne data on June 23, 2020" *Journal of Geophysical Research: Space Physics*, 127, e2021JA030044. https://doi.org/10.1029/2021JA030044.

Thank you for your attention