

Whistler and electron cyclotron harmonic waves at the near-Earth dayside plasma sheet: statistics of modulation by ultra-low frequency waves

Abdul Waheed¹ M. Fraz Bashir² Anton Artemyev² and Xiaojia Zhang²

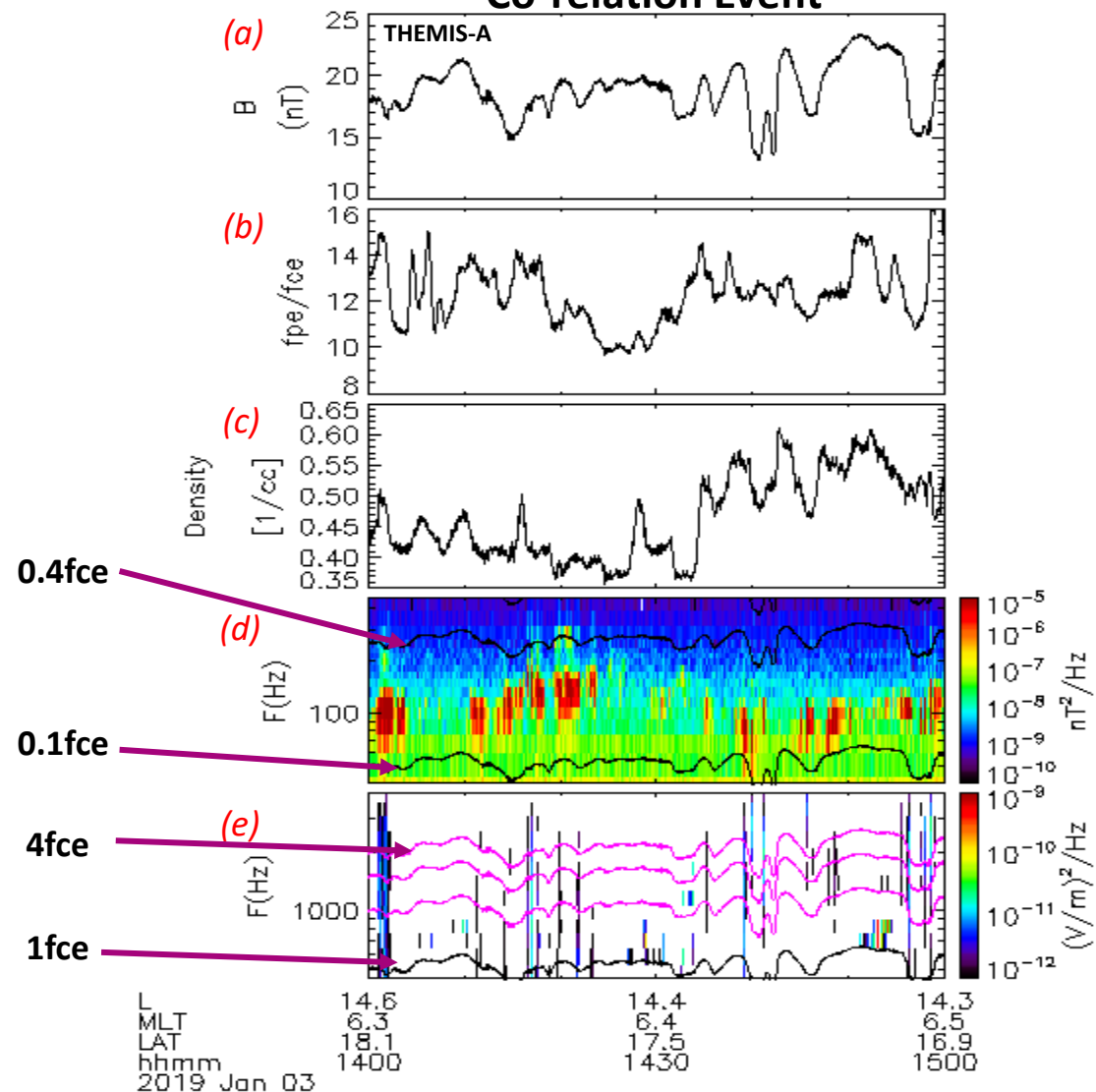
University of Science and Technology China¹

University of California, Los Angeles, USA²

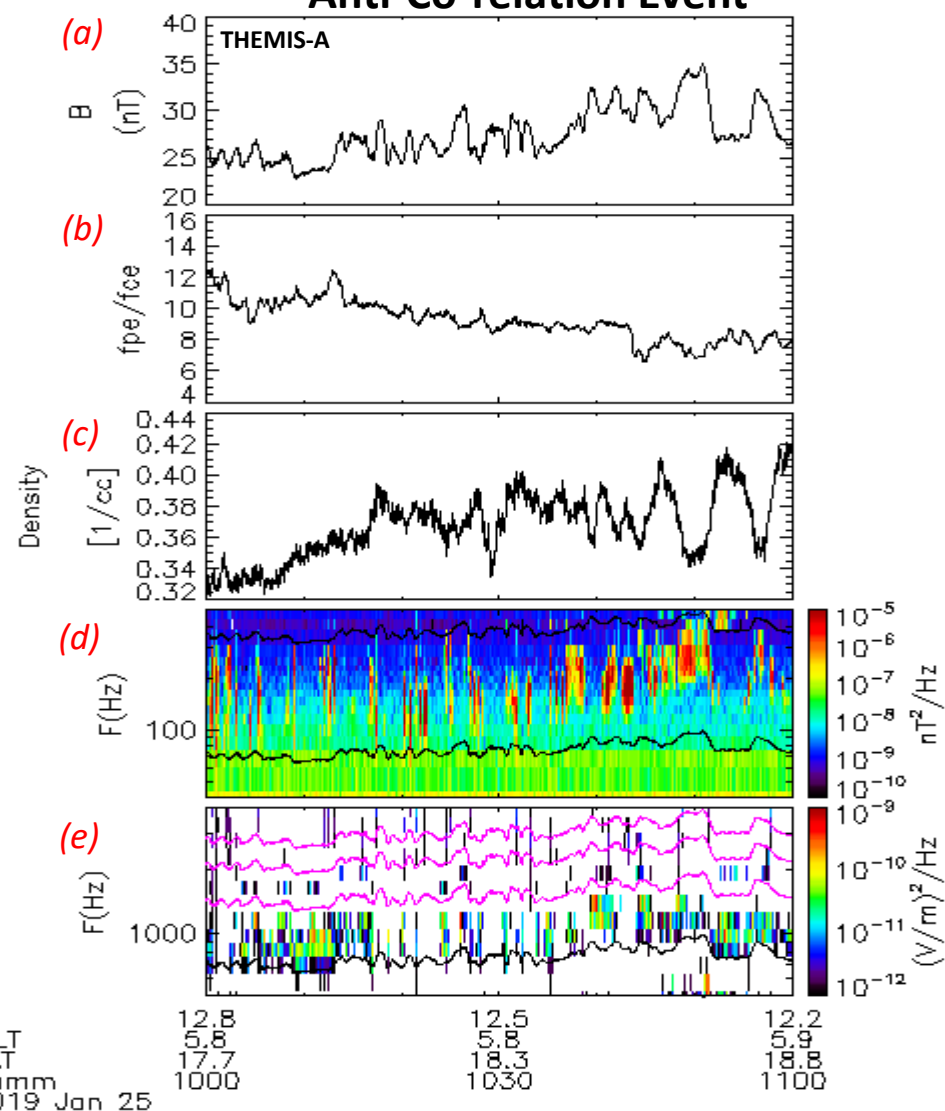


Simultaneous Observation of ECH and Whistler Waves by THEMIS

Co-relation Event

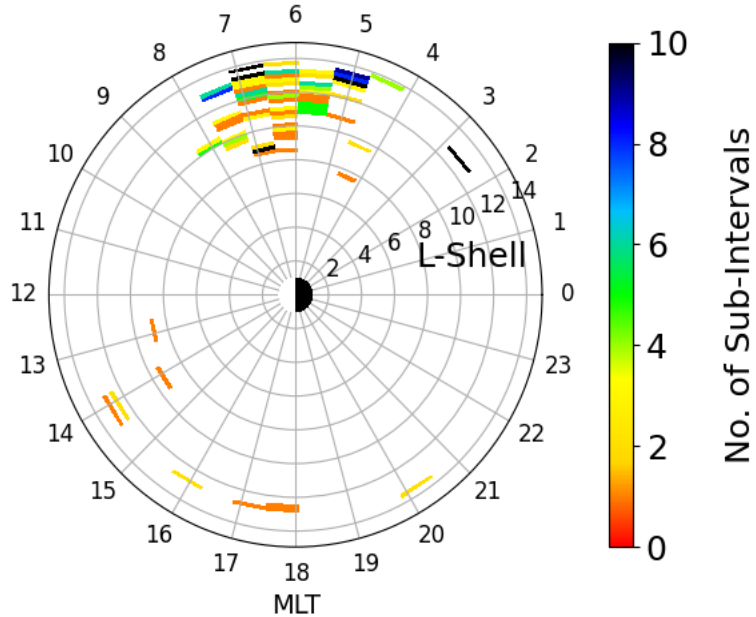


Anti-Co-relation Event

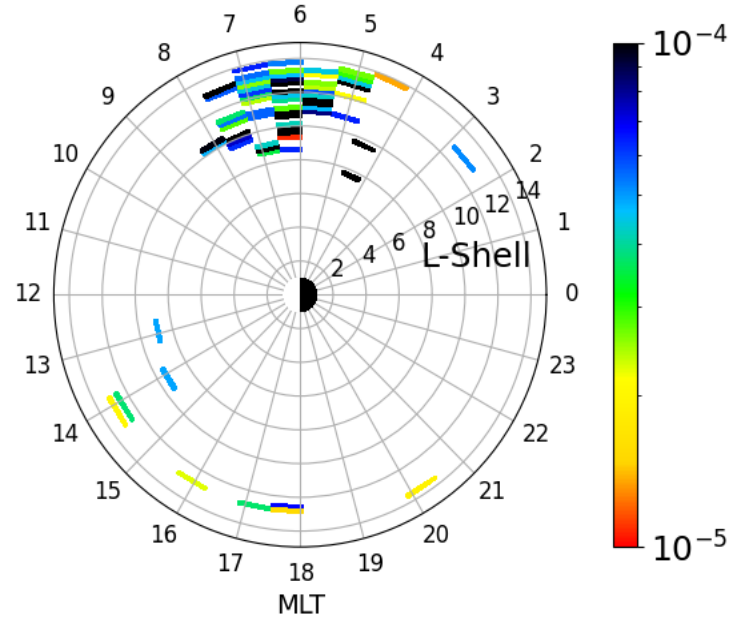


Statistical Properties of ECH & Whistler Waves (L-Shell vs MLT)

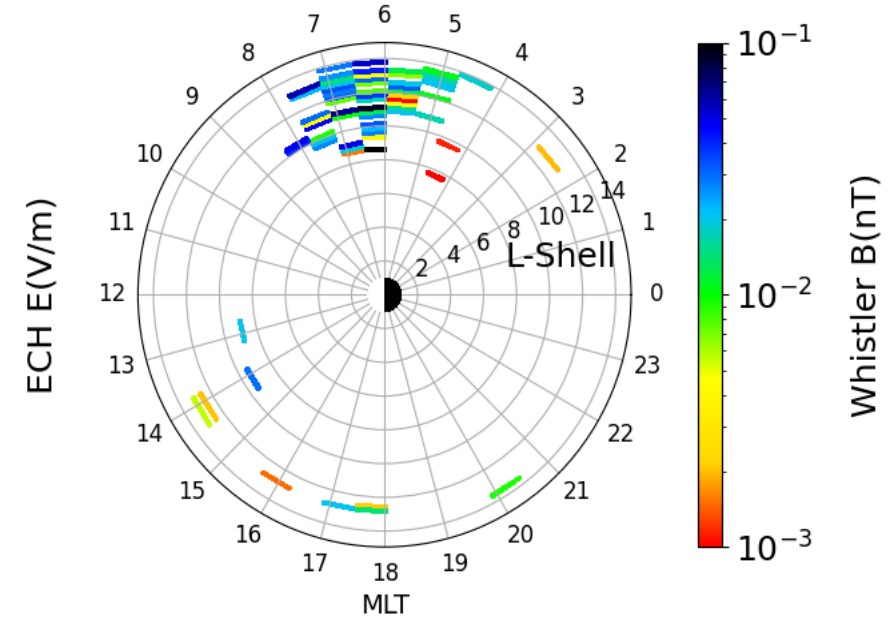
Correlation of ECH & Whistler Waves



Correlation of ECH & Whistler Waves

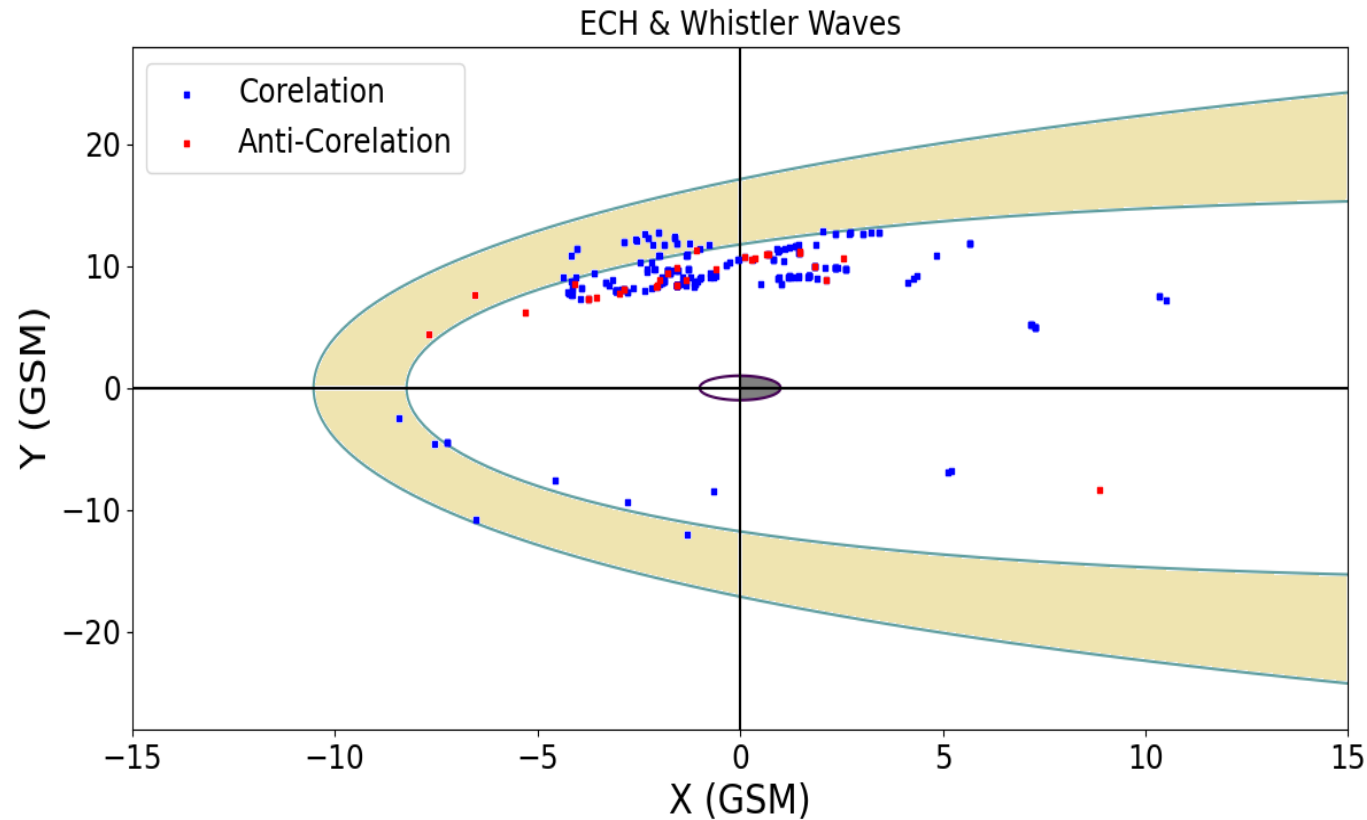


Correlation of ECH & Whistler Waves

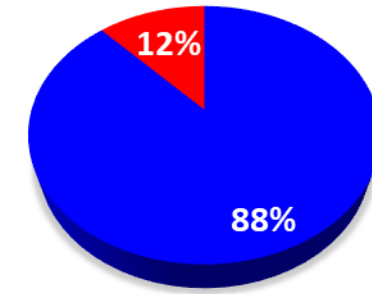


Total Correlation	229
Sides	Correlation
Dawn	95%
Dusk	5%

Co-relation & Anti-co-relation of ECH & Whistler Waves



Statistic Data of ECH & Whistler

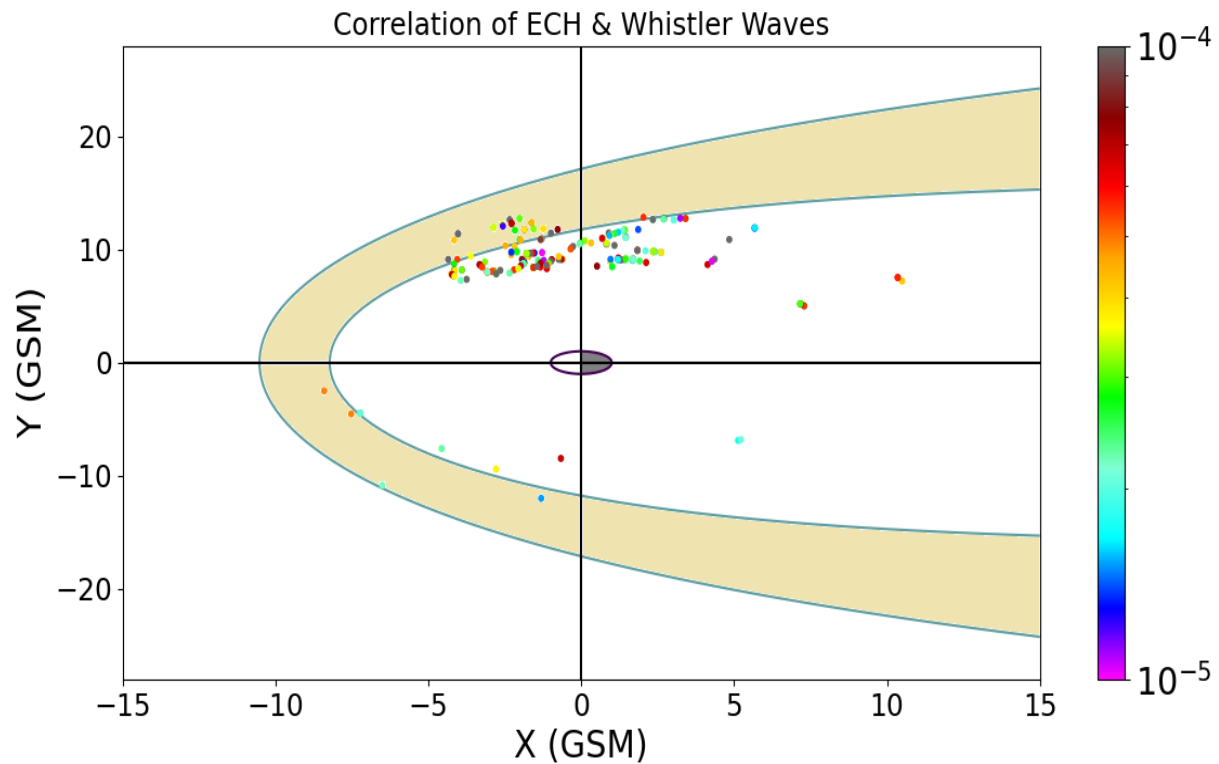


■ Correlation Sub-Intervals

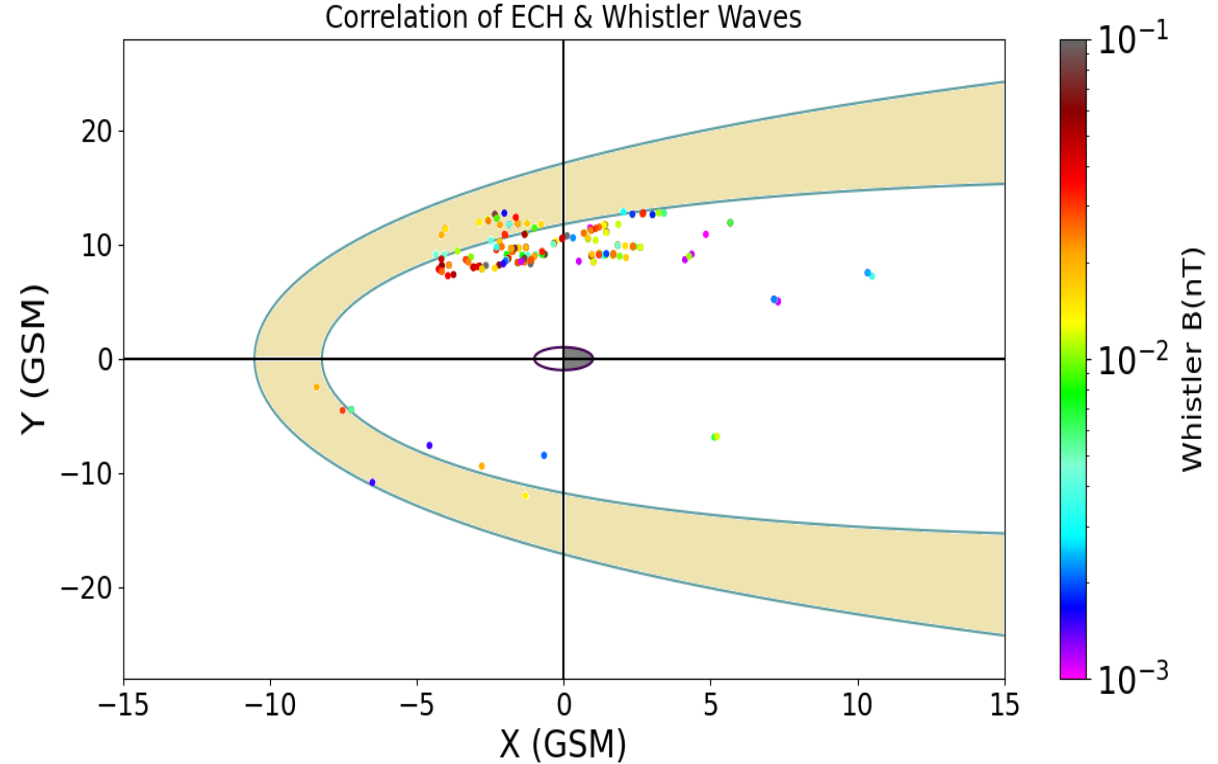
■ Anti-Correlation Sub-Intervals

Absolute majority of events are observed on the dawn flank. Only 12% of events show anti-correlation of ECH and whistler waves, and in most of events ECH and whistler wave bursts are correlated in time.

Co-relation Statistical Properties of ECH & Whistler Waves



ECH wave amplitudes are distributed between 0.01mV/m and 0.1mV/m.



Whistler wave amplitudes are distributed between 10pT and 100pT.

Conclusion

- We collect a statistics of **ECH and whistler** mode wave emissions observed by **THEMIS** spacecraft at the flank magnetosphere and associated with intense compressional ULF waves.
- The strong **correlation of ECH and whistler-mode** wave bursts suggests that both wave modes are generated by the same electron population trapped within local magnetic field minima of **compressional ULF waves**.
- Most of such ULF-modulated events are observed on the dawn flank and are characterized by moderate ECH ($<0.1\text{mV/m}$) and whistler ($<100\text{pT}$) wave amplitudes
- As a next step, we plan to expand our statistics and investigate geomagnetic and solar wind conditions of such ULF-VLF coupling to provide the **empirical model** describing ULF-modulated populations of ECH and whistler waves. Such model should be useful for investigations of quasi-periodical electron precipitations in the near-Earth plasma sheet and outer radiation belt.

Thanks