

地磁気脈動に伴う低緯度電離圏 電場とグローバル電流系

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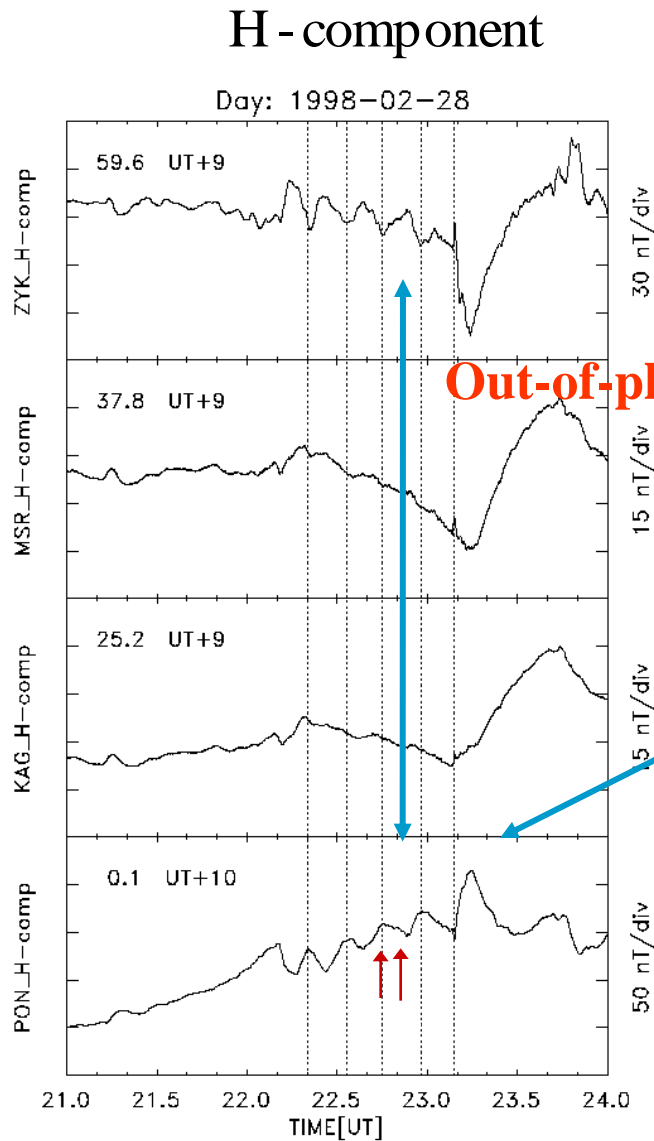
6 National Institute of Information and Communications Technology

目的と計画

- SuperDARNレーダ（高中緯度）とHF Doppler（低緯度）、低高度衛星により、PC5, Pi2の電離圏電場の緯度、地方時特性を求める。
- 地磁気変動、オーロラ光との対応を調べ、沿磁力線電流 - 電離層電流系と電離圏電場の関係を調べる。
- グローバルMHDシミュレーションによりダイナモの機構を調べる。

Global PC5 coherent at high latitude and dayside dip equator (morning sector)

Motoba et al.(JGR 2003)



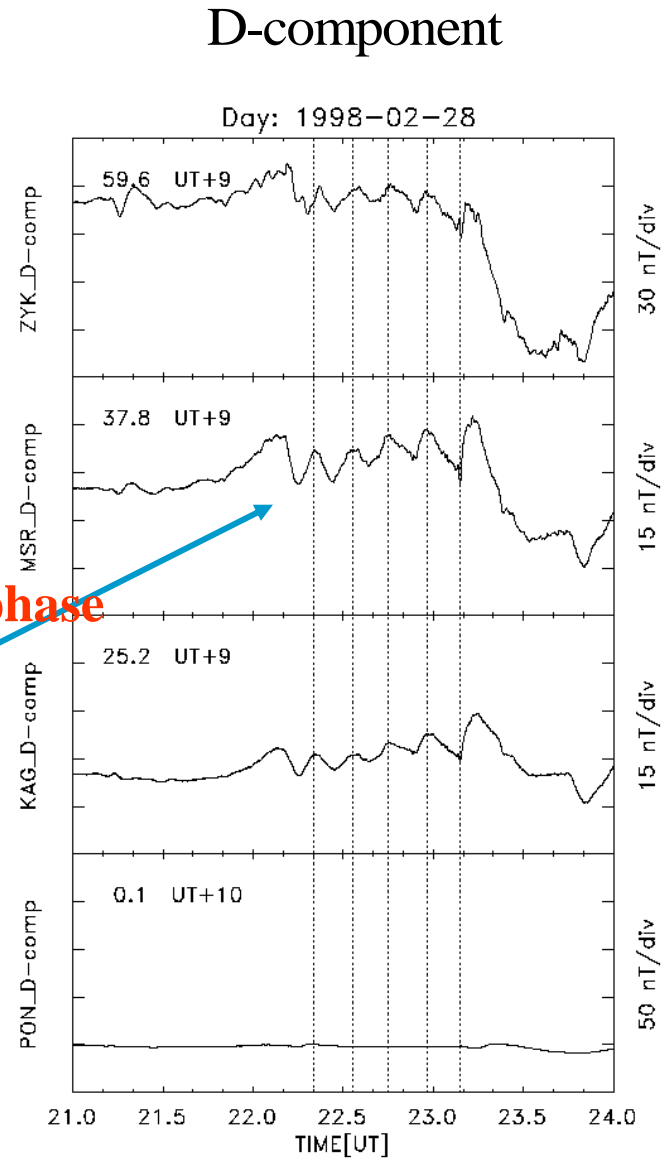
High latitude

Out-of-phase

Mid latitude

In-phase

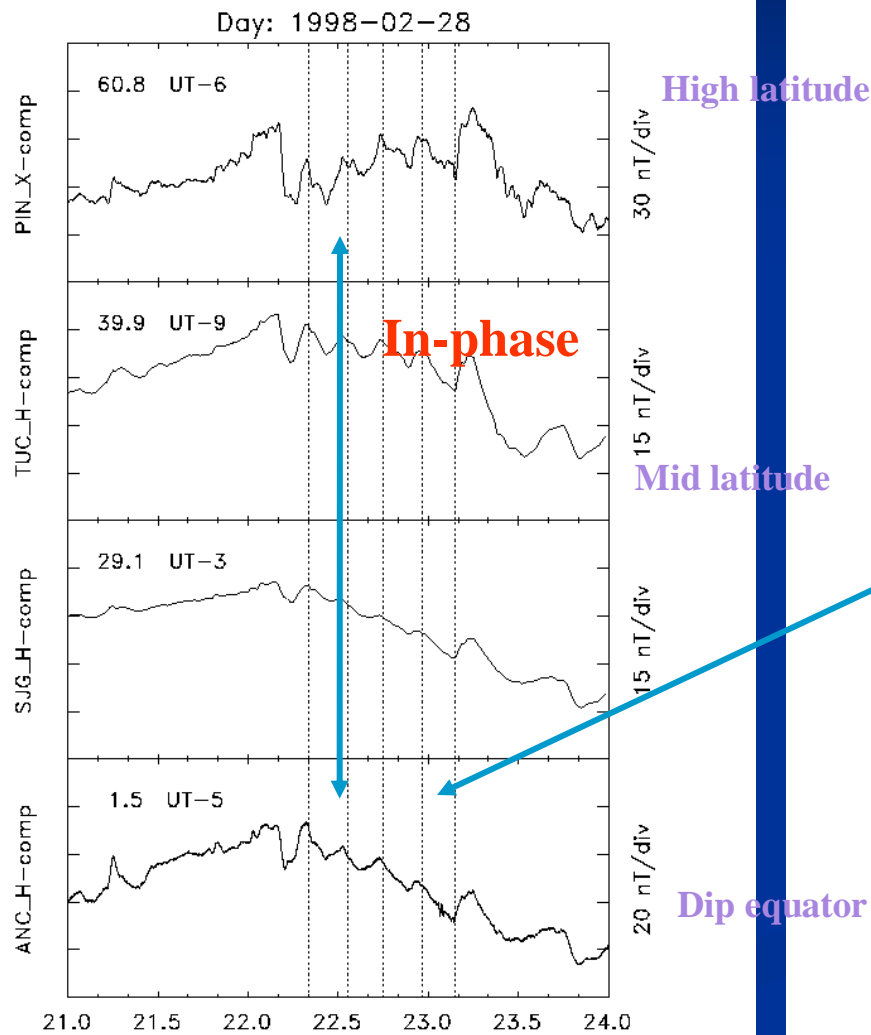
Dip equator



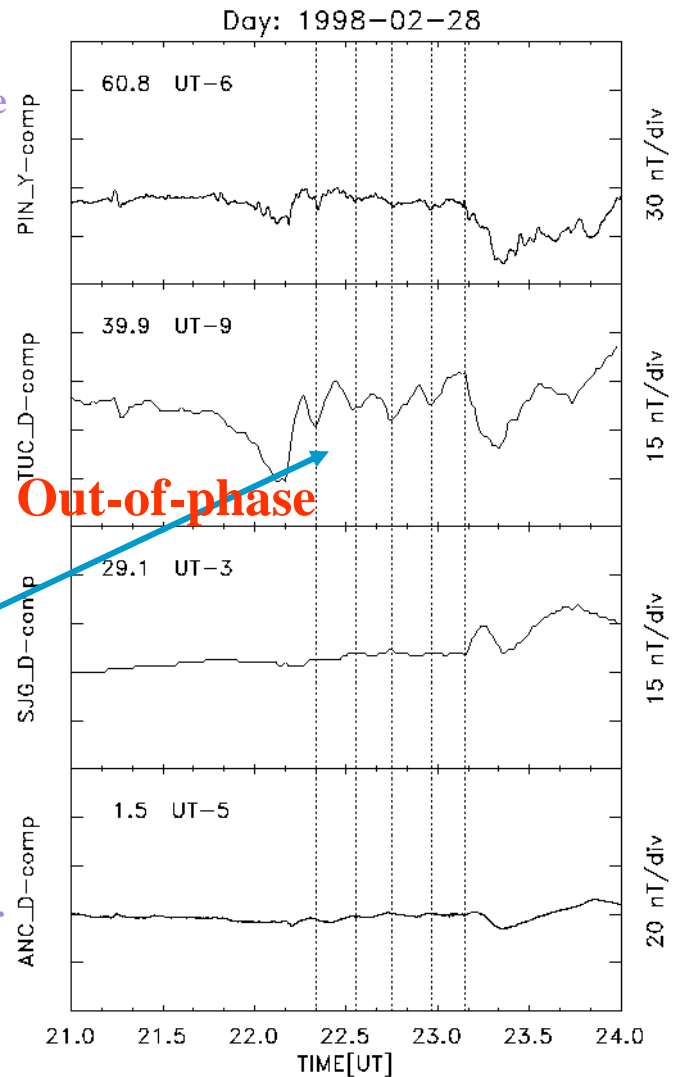
Global PC5 coherent at high latitude and dayside dip equator (afternoon sector)

Motoba et al.(JGR 2003)

H - component



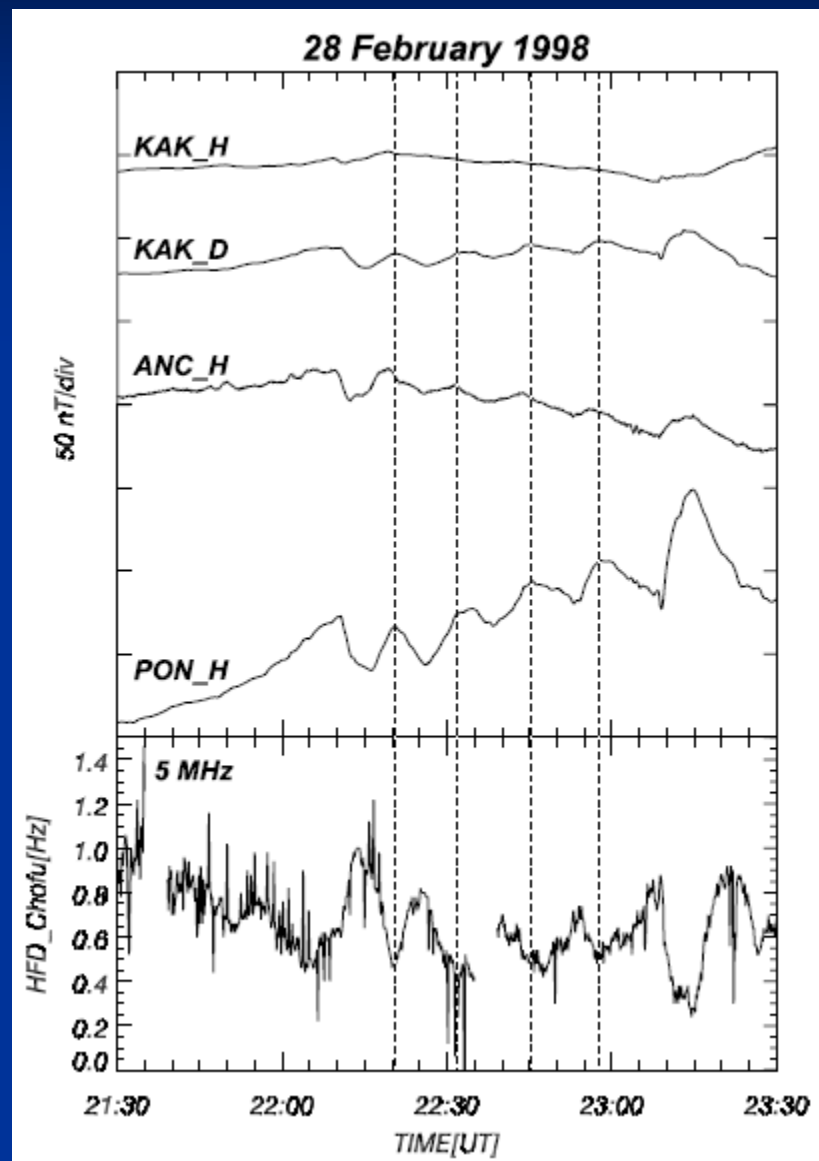
D-component



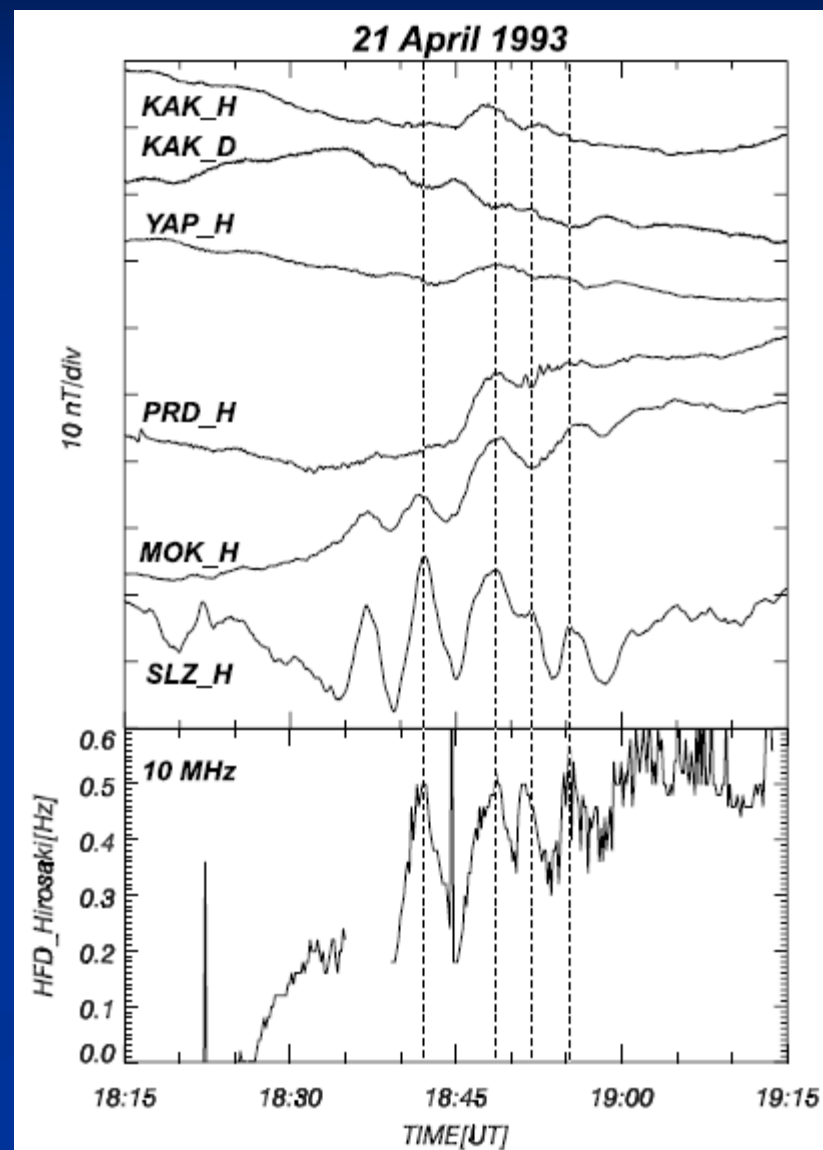
PC5 oscillations in the HF Doppler frequency

(Motoba et al., JGR 2004)

Dayside

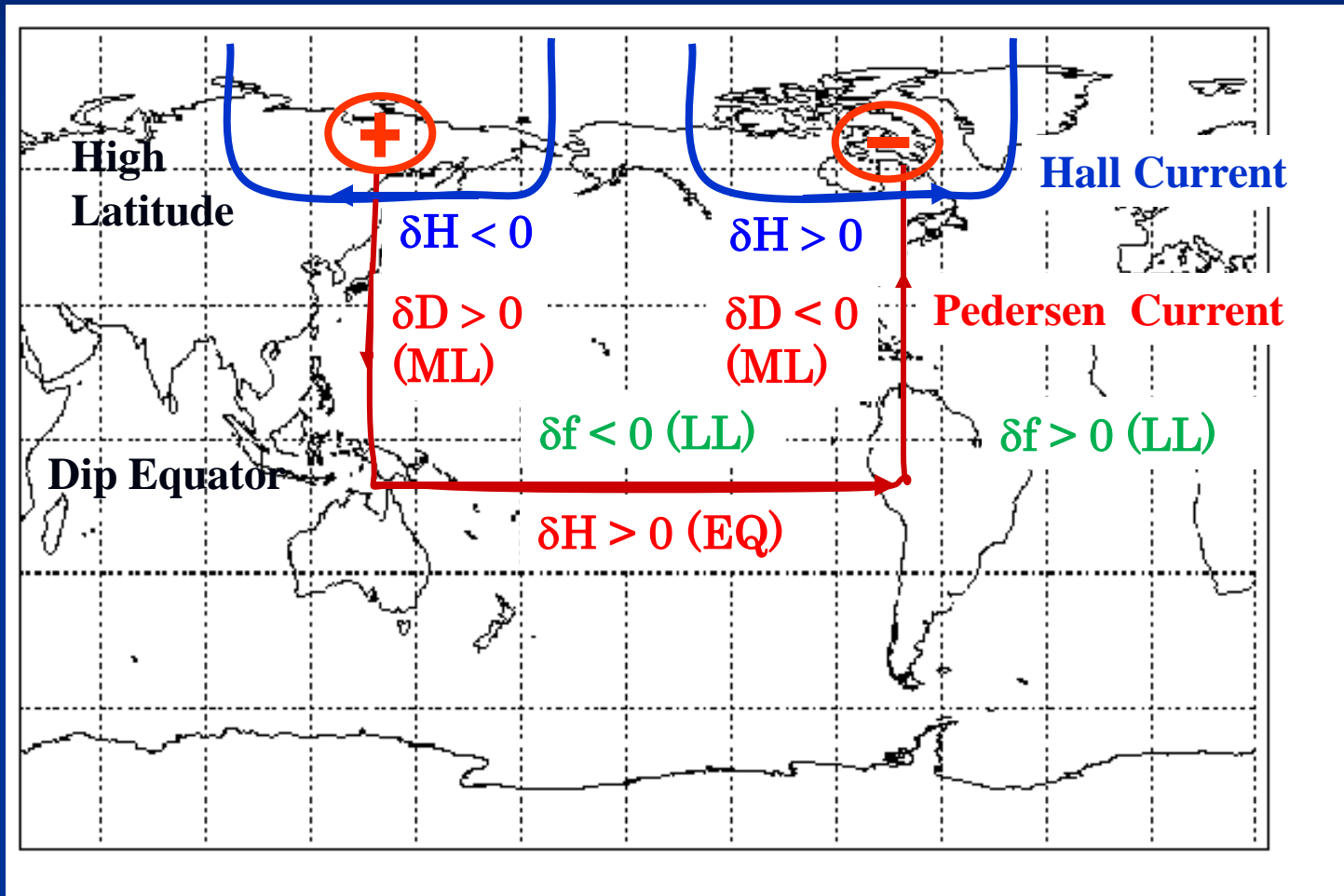


Nightside



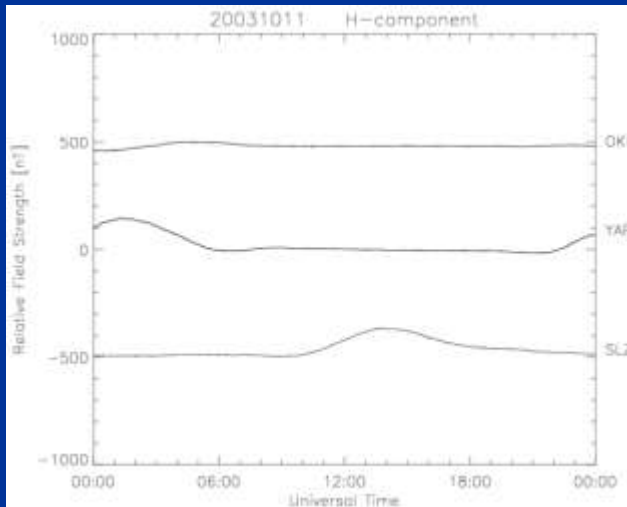
DP2-type ionospheric currents of the global PC5

Motoba et al.(JGR 2003)

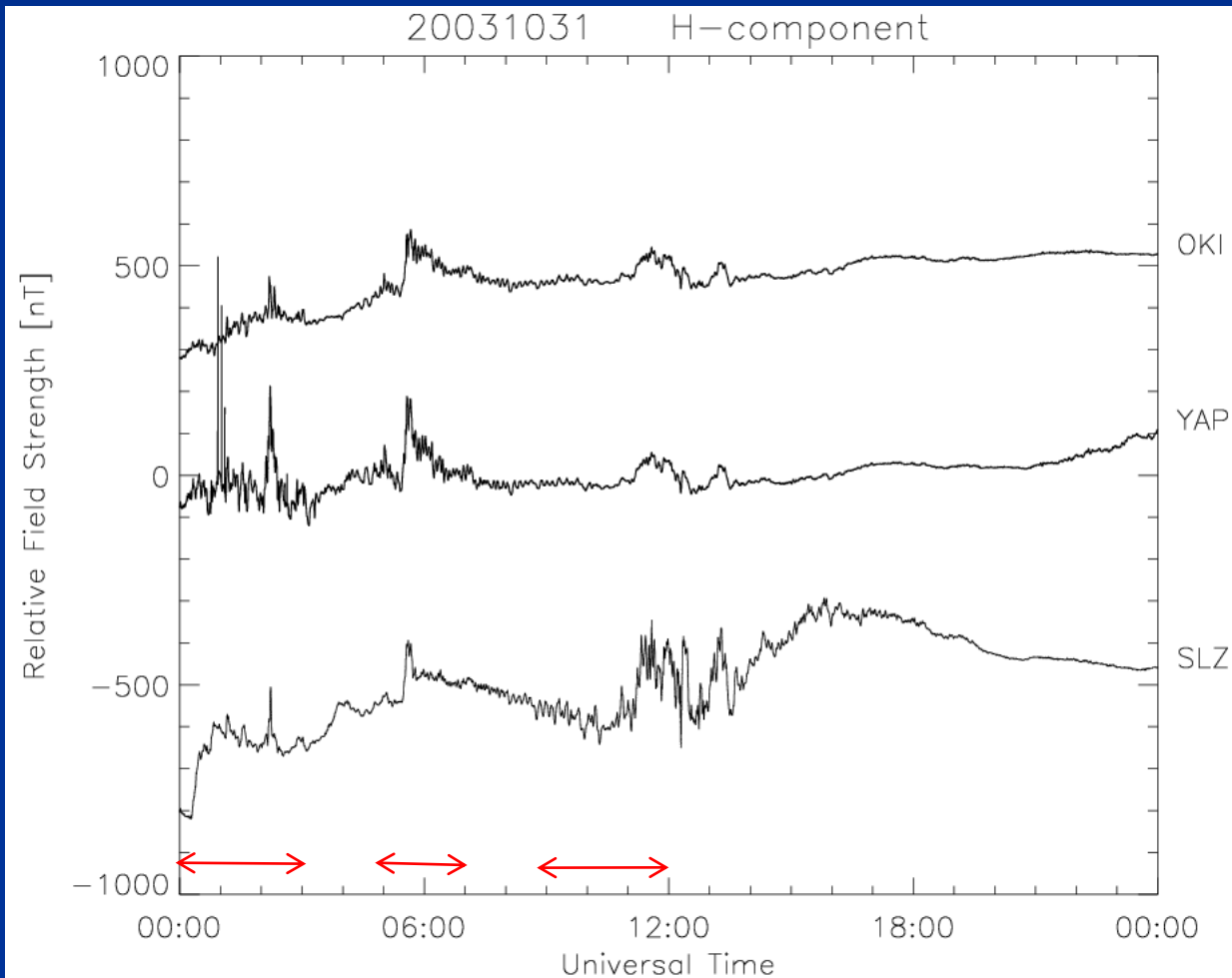


Geomagnetic storm recorded on October 31, 2003 at Okinawa (OKI), Yap, Micronesia (YAP) and Sao Luis, Brazil (SLZ)

Quiet-time diurnal variations



Storm-time variations



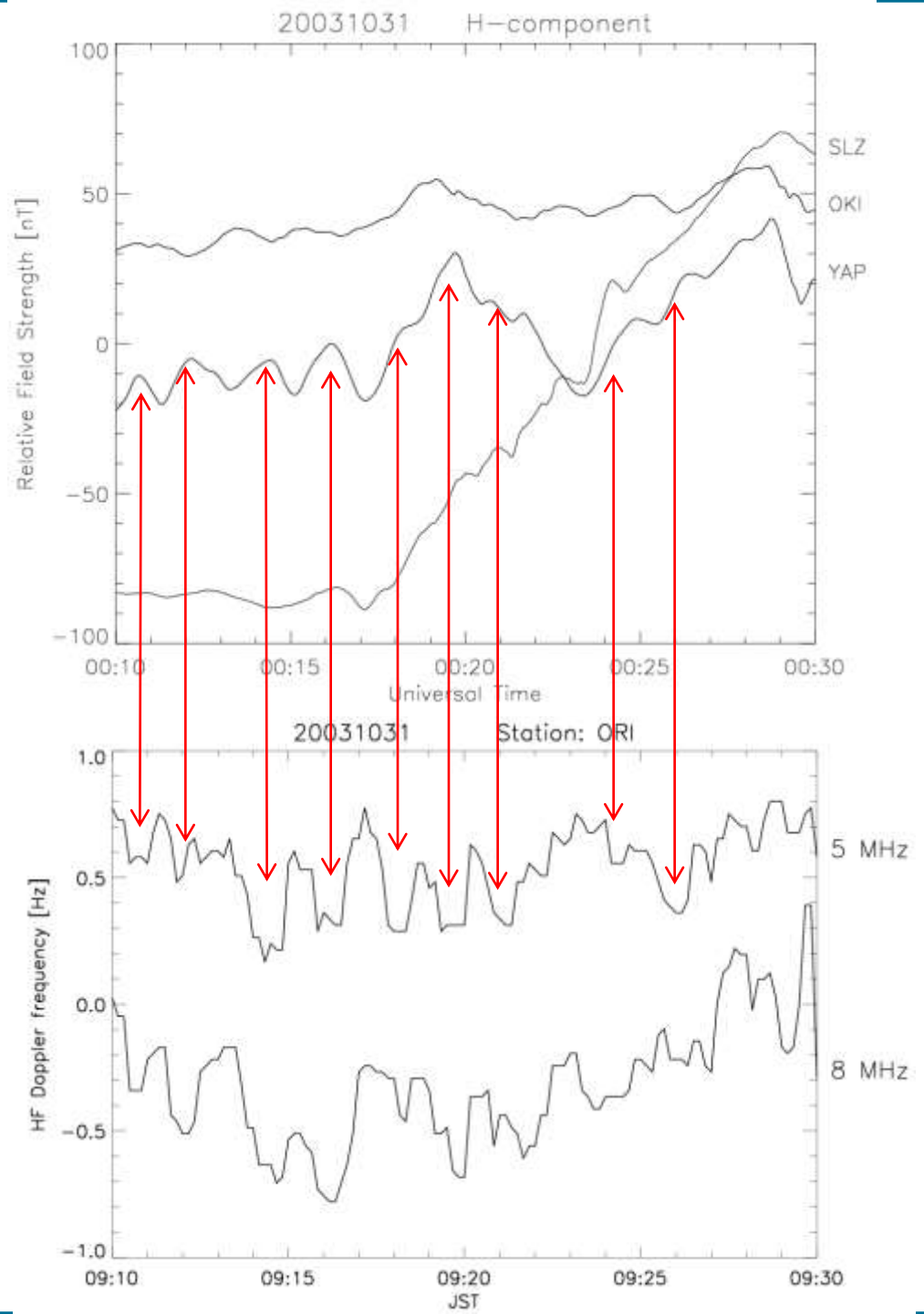
Daytime HFD pulsations are anti-correlated with equatorial PCs in the period range of 1-2 min.

09MLT

09MLT

21MLT

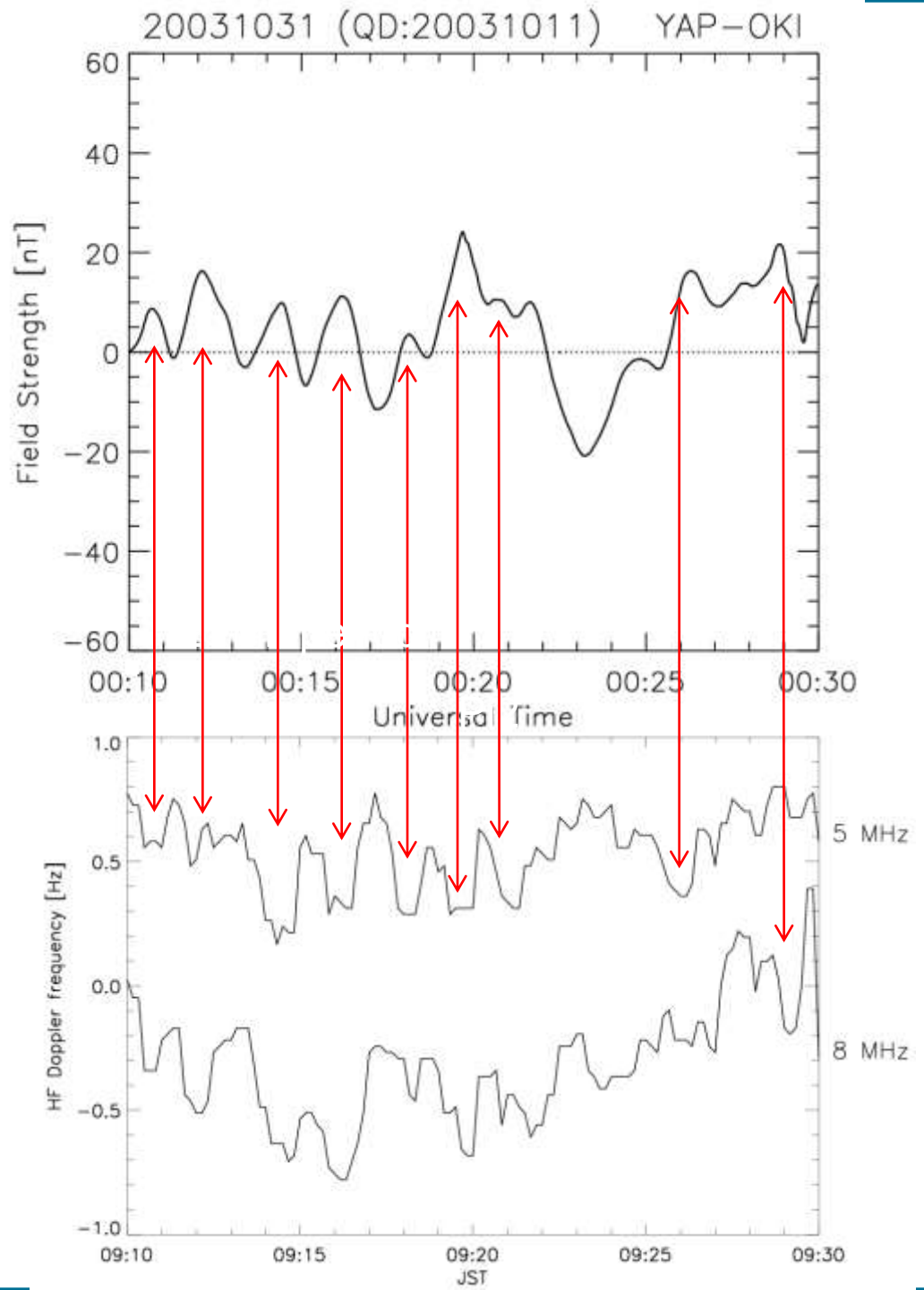
09MLT



Daytime HFD pulsations are anti-correlated with EEJ oscillations in the period range of 1-2 min.

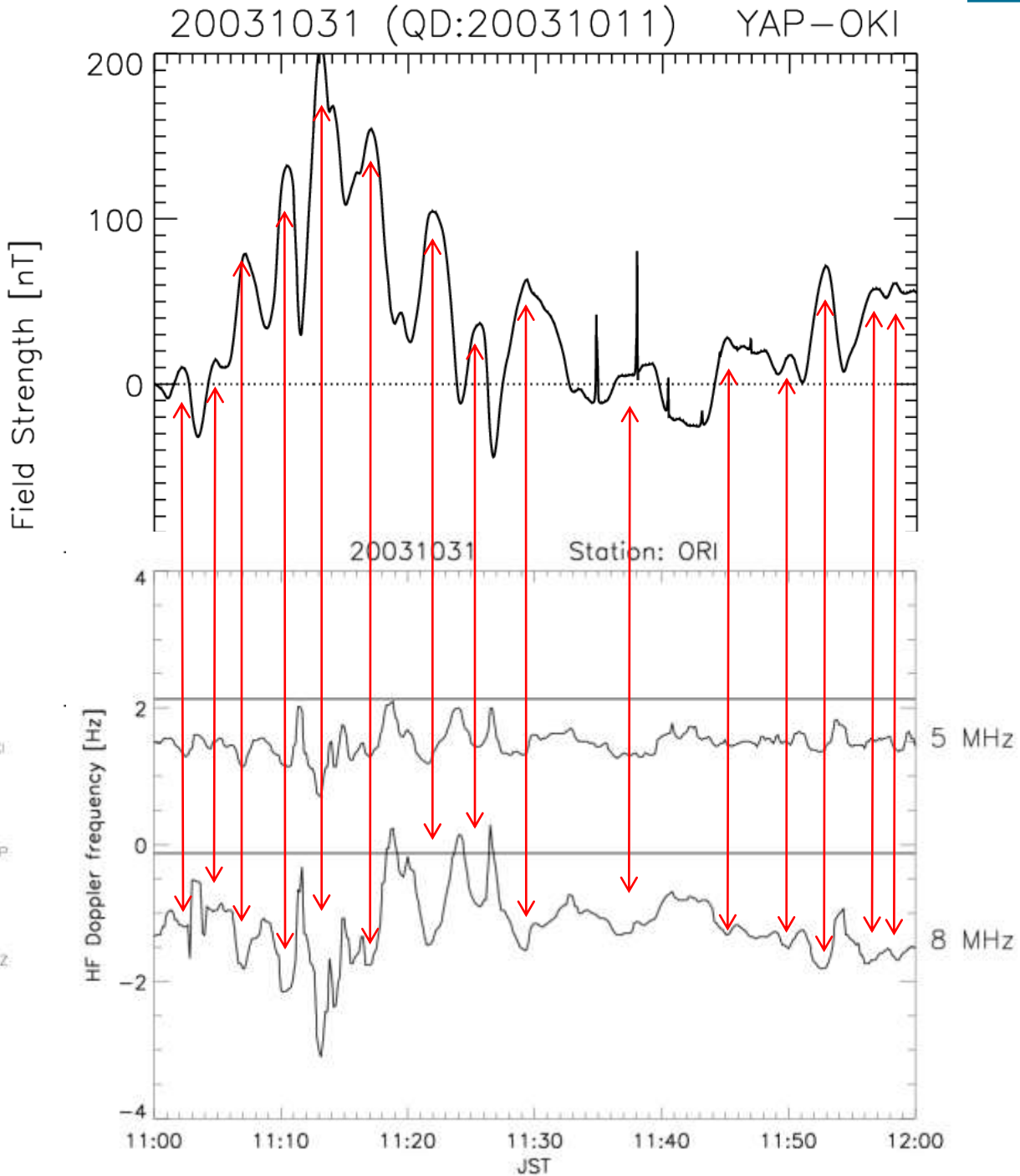
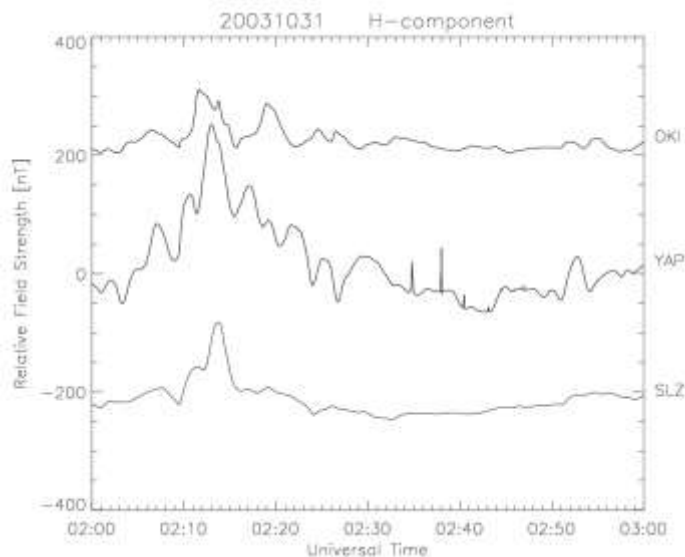
09MLT

09MLT



Daytime HFD pulsations are anti-correlated with EEJ oscillations in the period range of 2-3 min.

11MLT



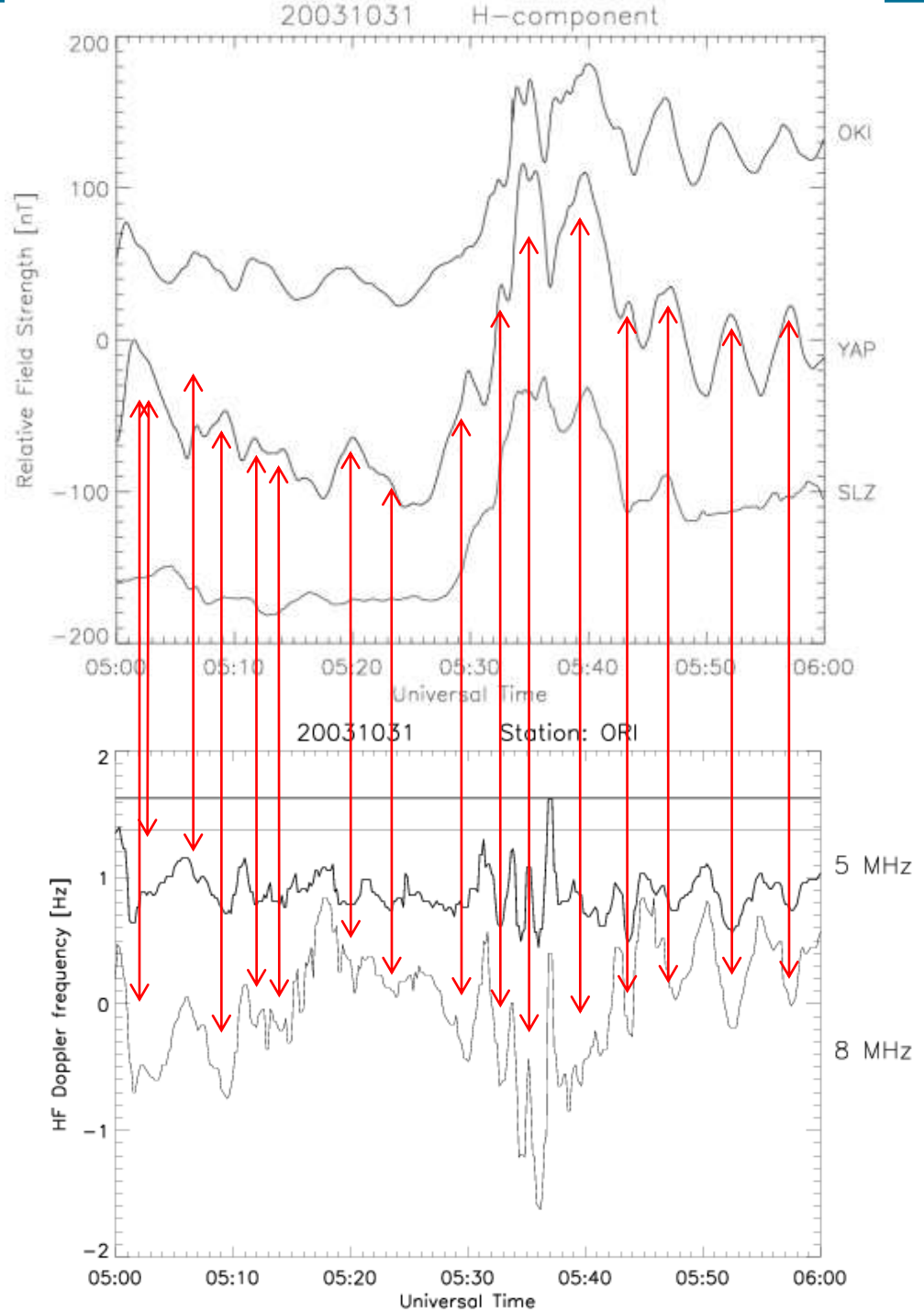
Daytime HFD pulsations
are anti-correlated with
EEJ oscillations in the
period range of 2-5 min.

14MLT

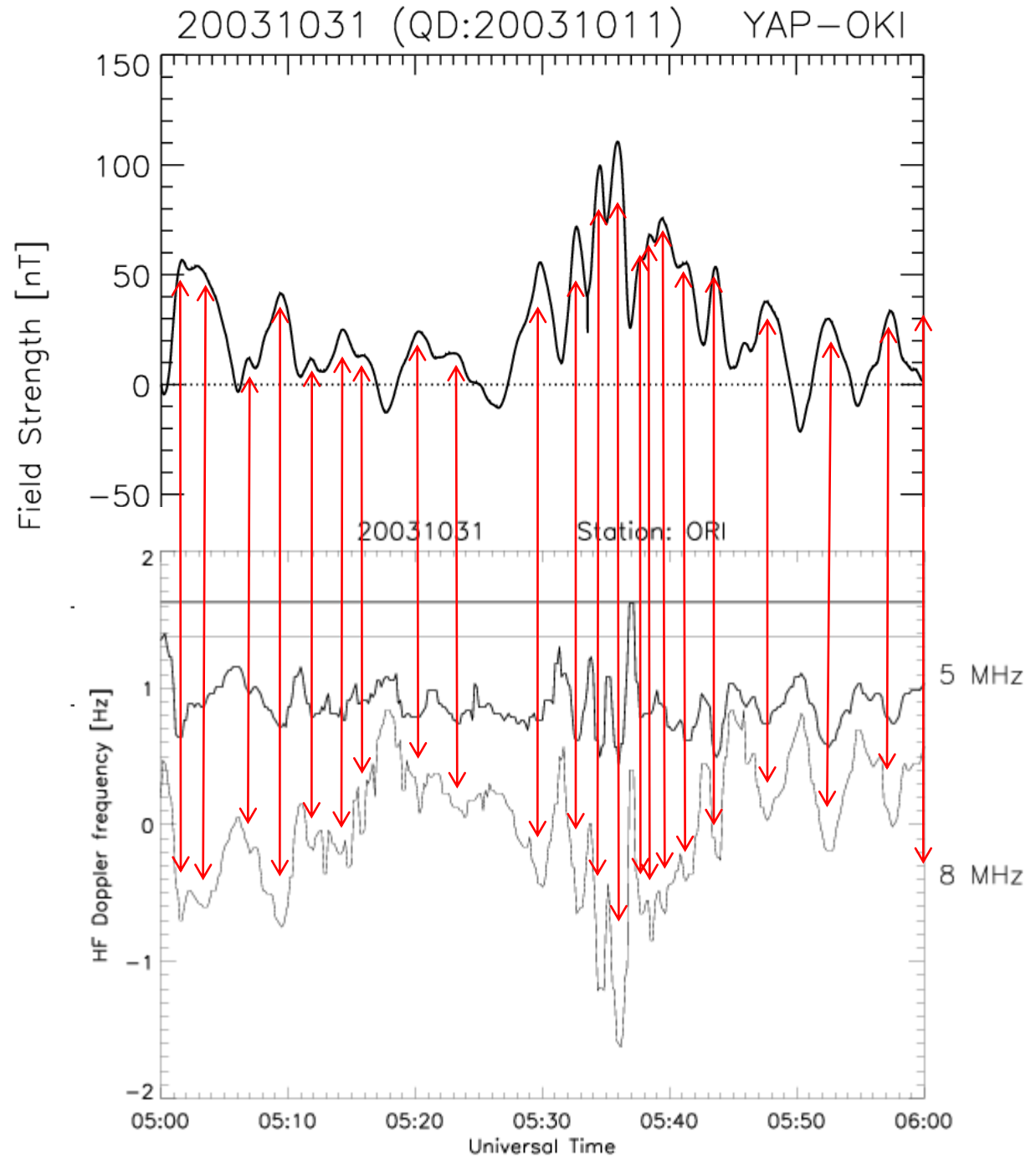
14MLT

02MLT

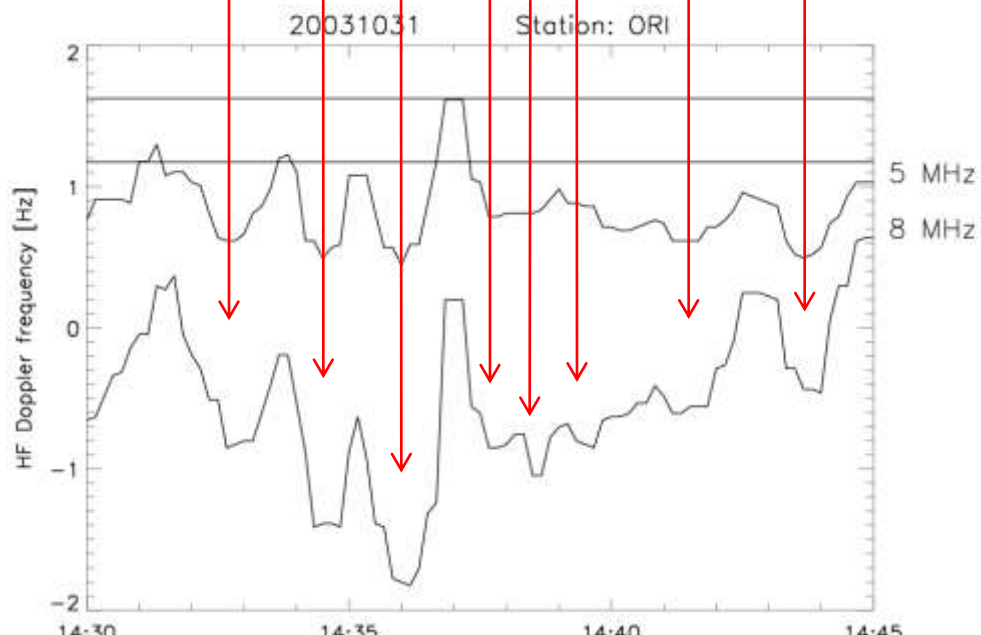
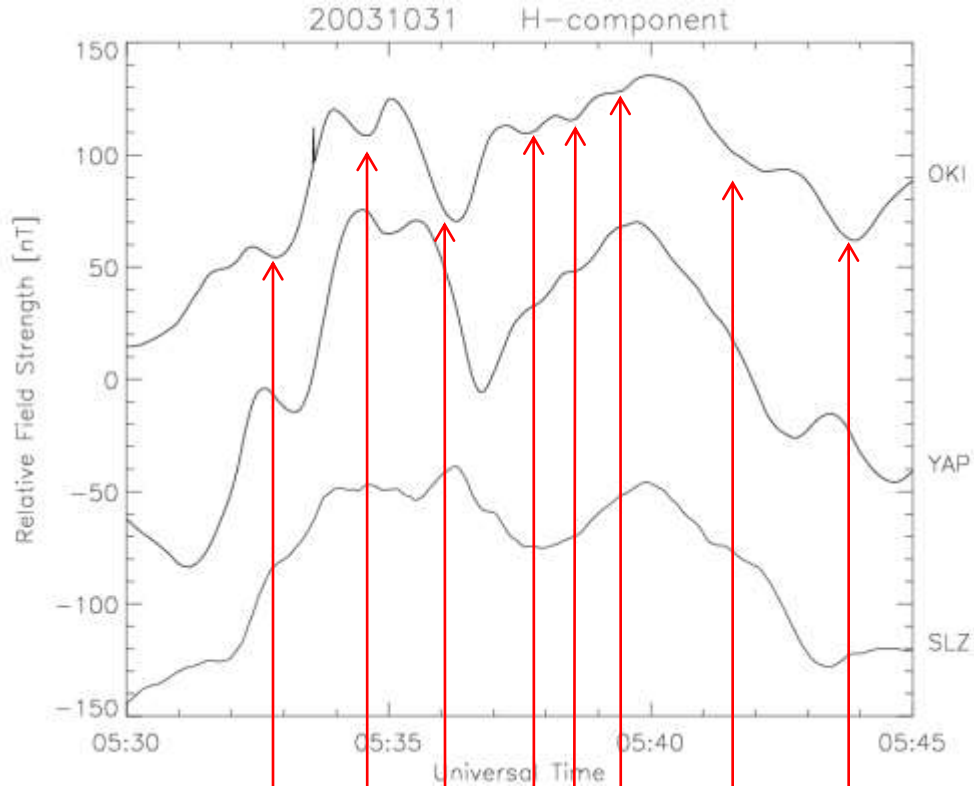
14MLT



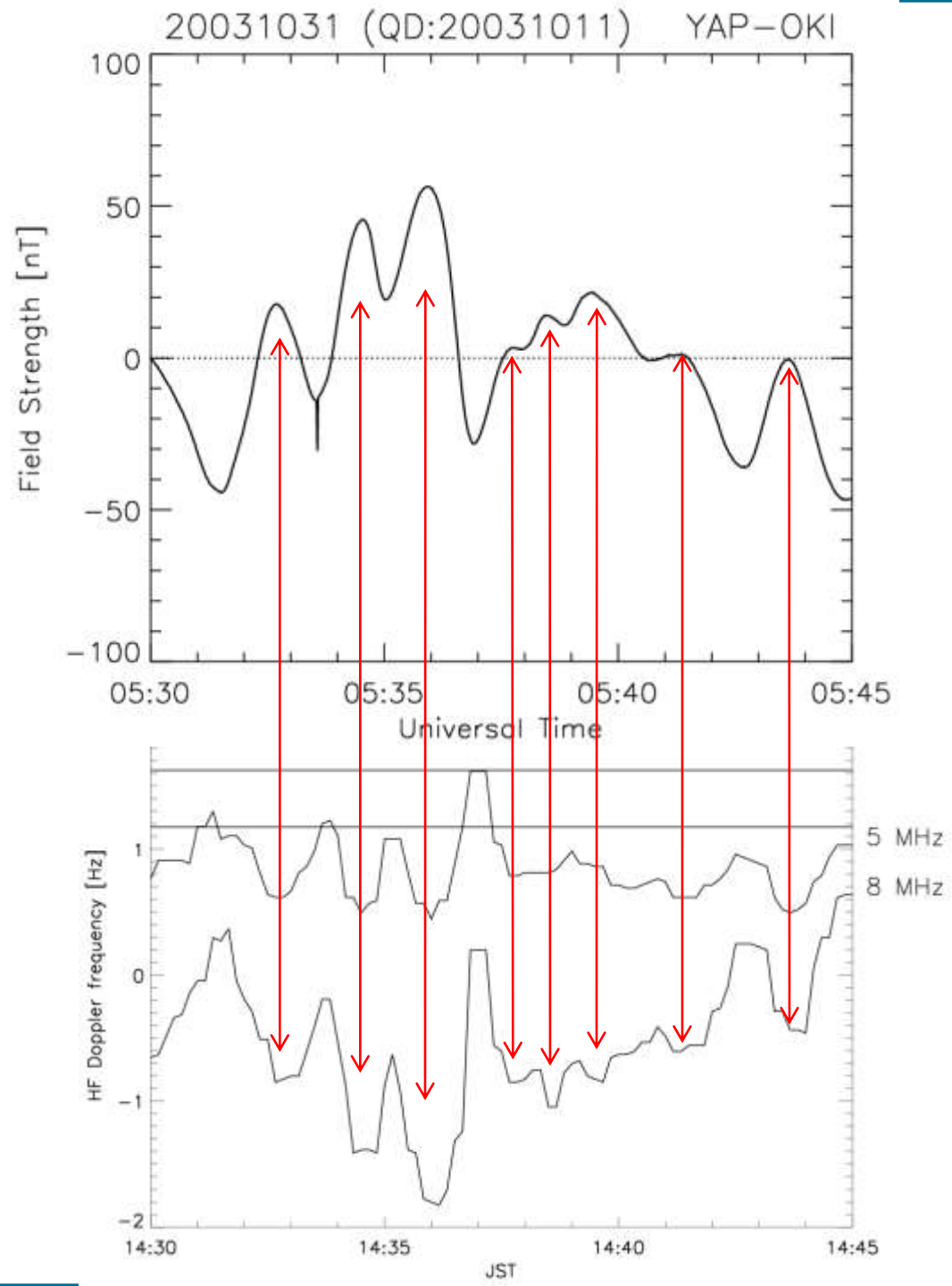
Daytime HFD pulsations are anti-correlated with EEJ oscillations in the period range of 2-5 min.



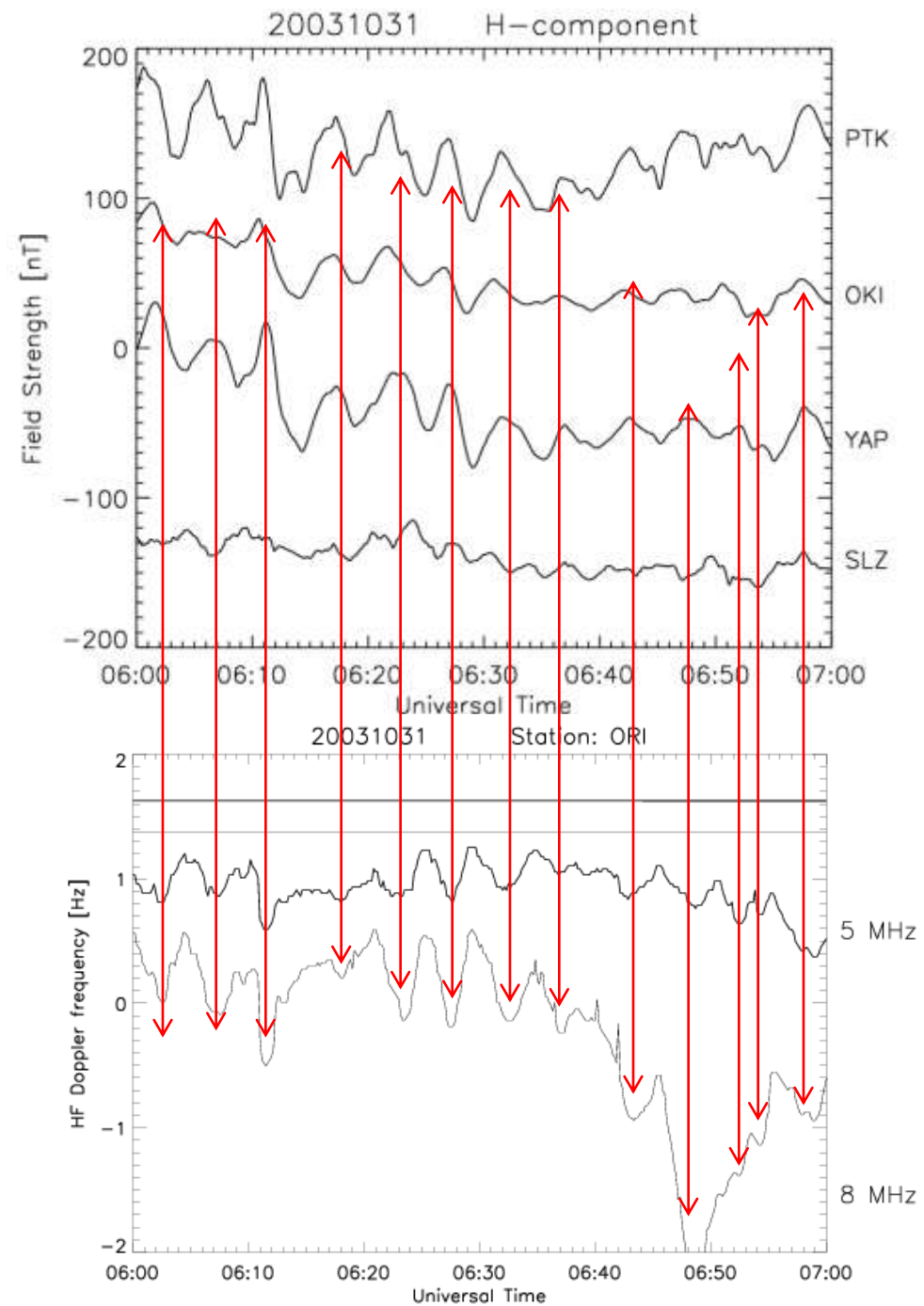
HFDはOKIと正相関。HFDはYAPと逆相関。



Daytime HFD pulsations are anti-correlated with EEJ oscillations in the period range of 1-3 min.

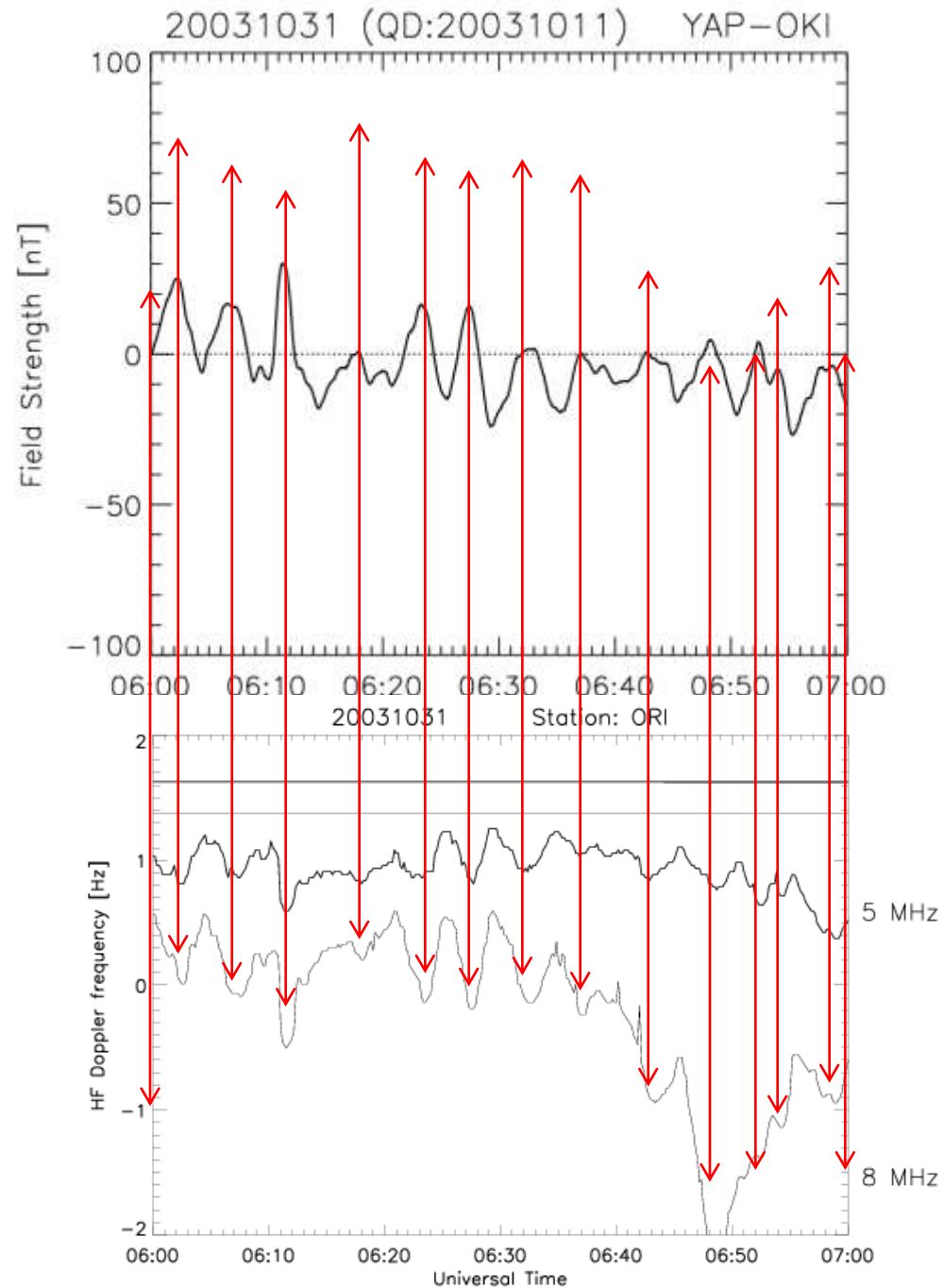


HFDはYAPとほぼ逆相関。
OKIとは位相ずれ。

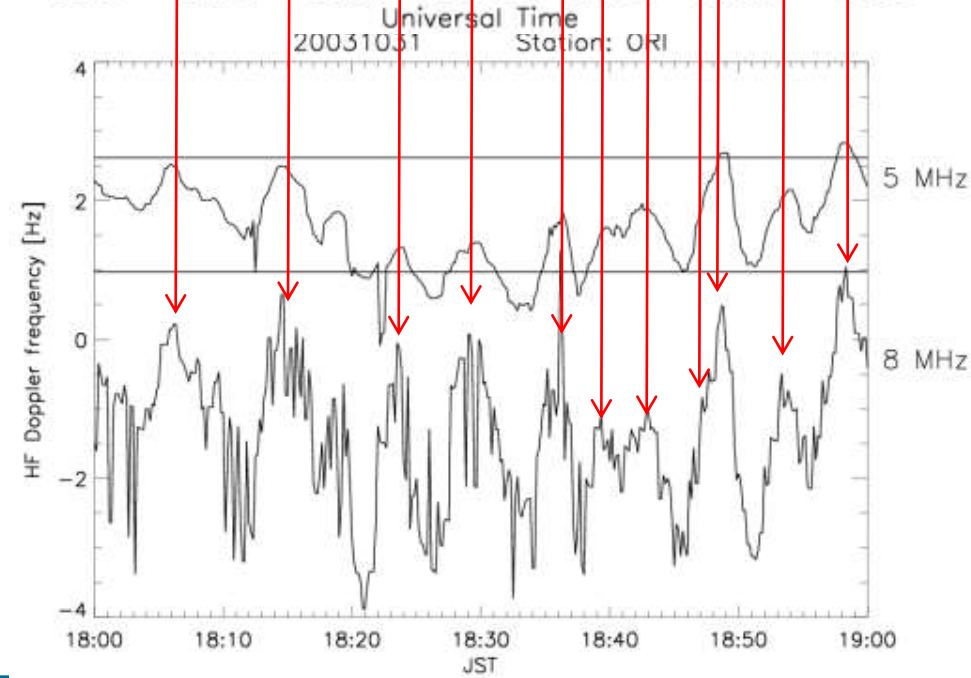
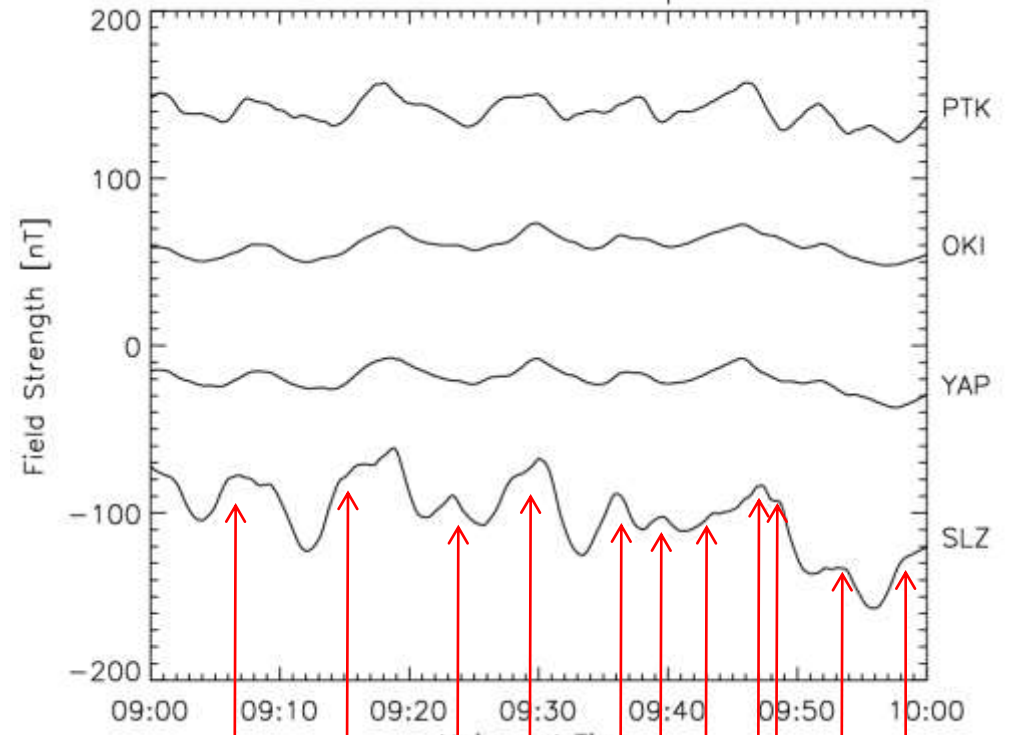


Daytime HFD pulsations are anti-correlated with EEJ oscillations in the period range of 2-5 min.

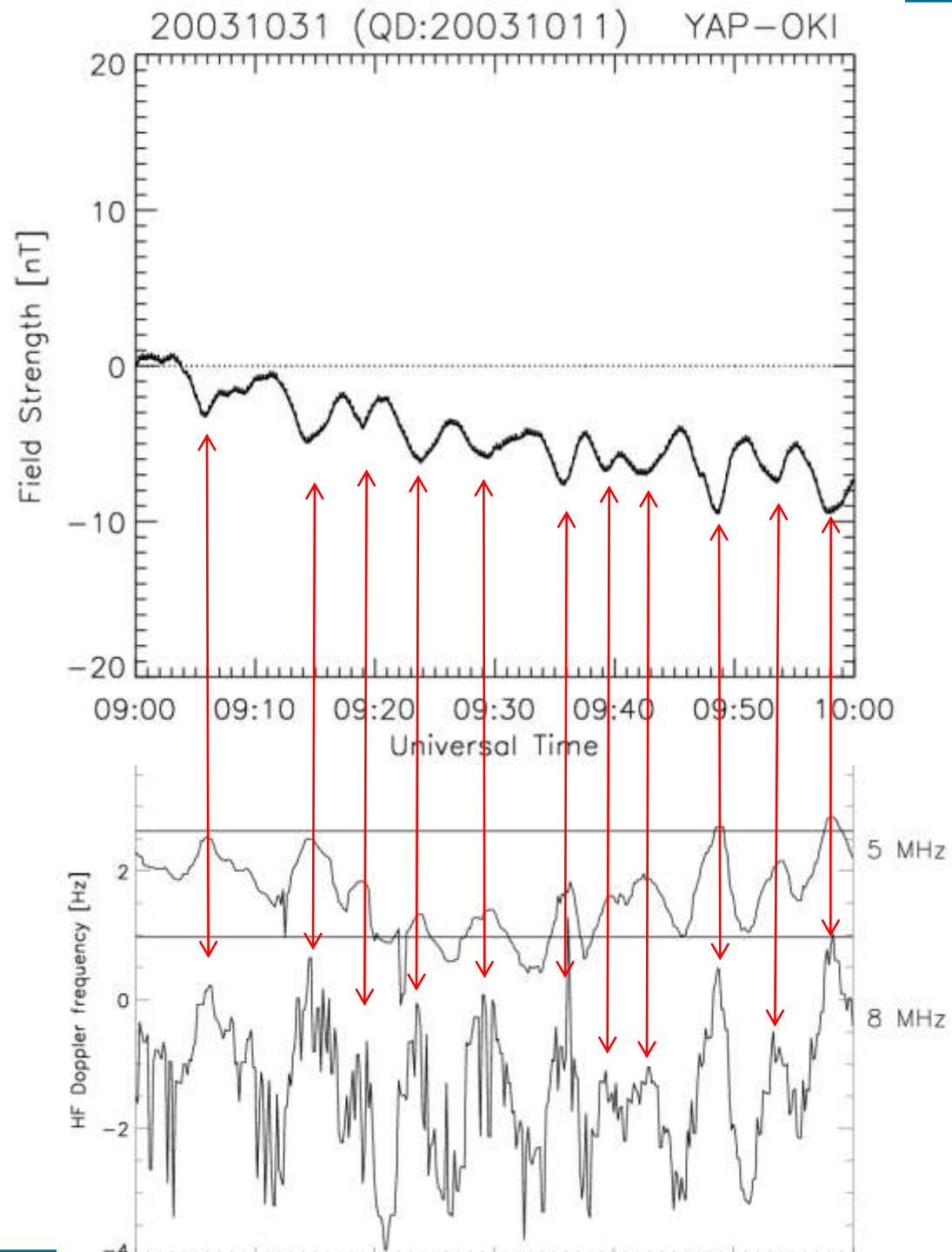
YAP-OKIはHFDと逆相関。
0.6Hz/30nT 0.8Hz/40nT
0.02Hz/nT



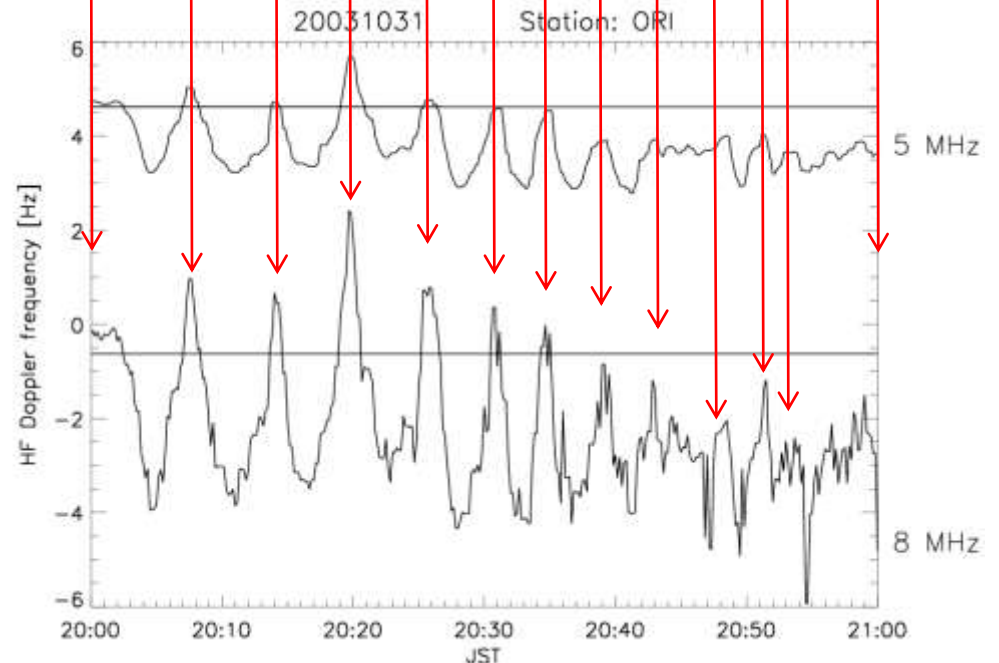
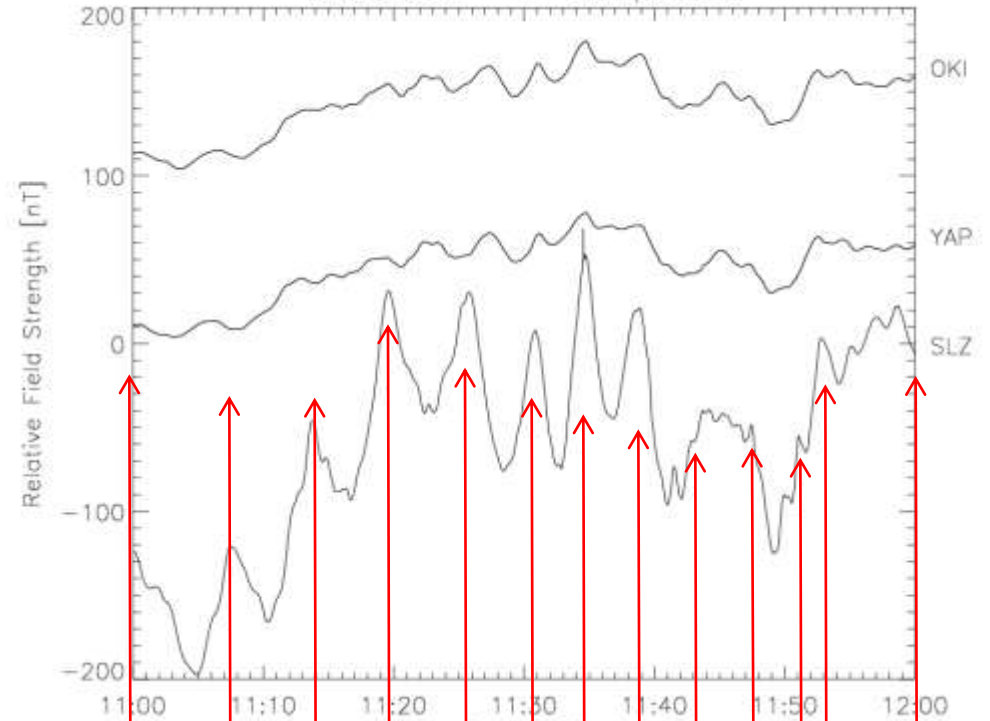
20031031 H-component



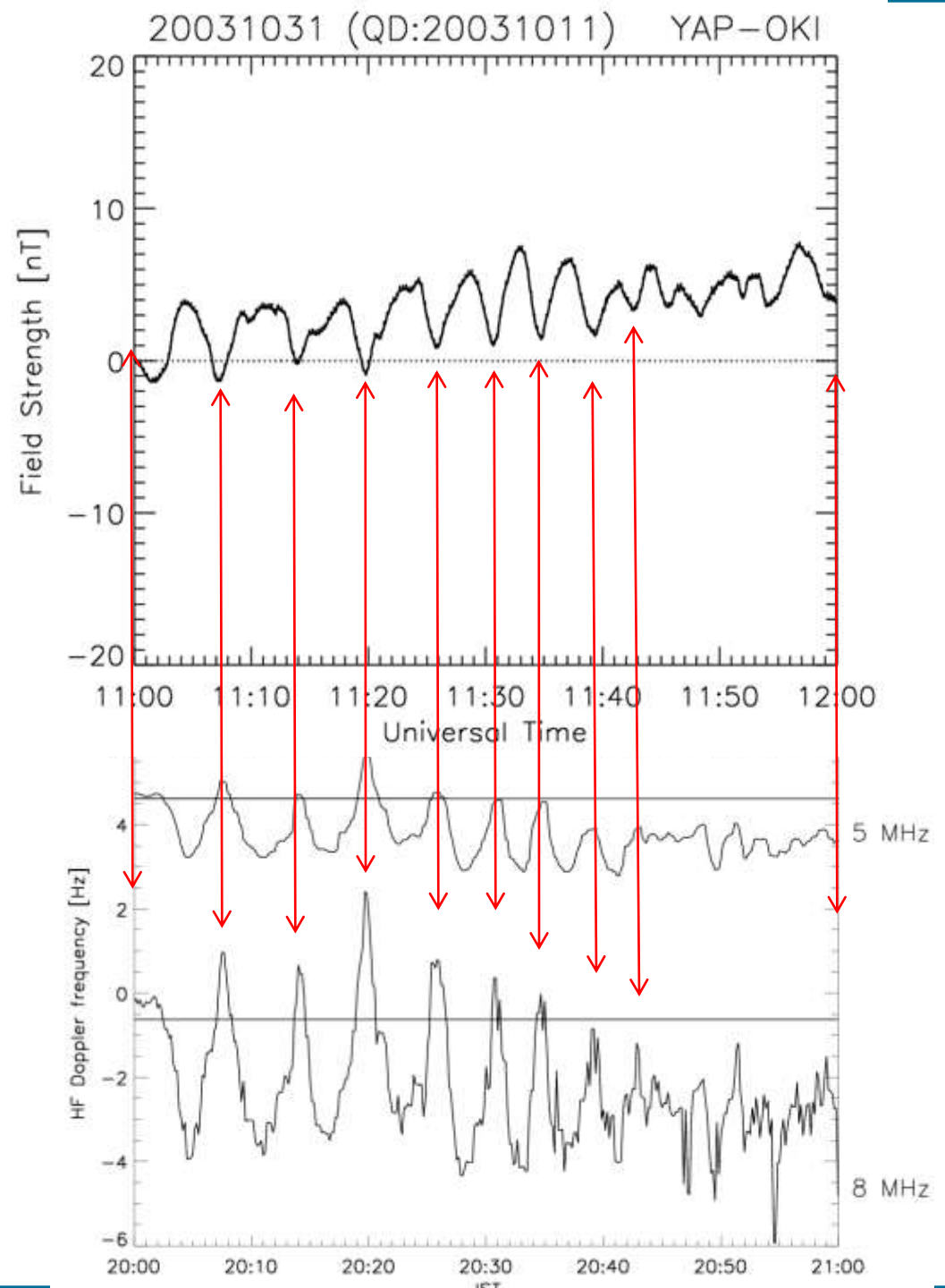
Nighttime HFD
pulsations are anti-
correlated with EEJ
oscillations in the period
range of 2-5 min.



20031031 H-component

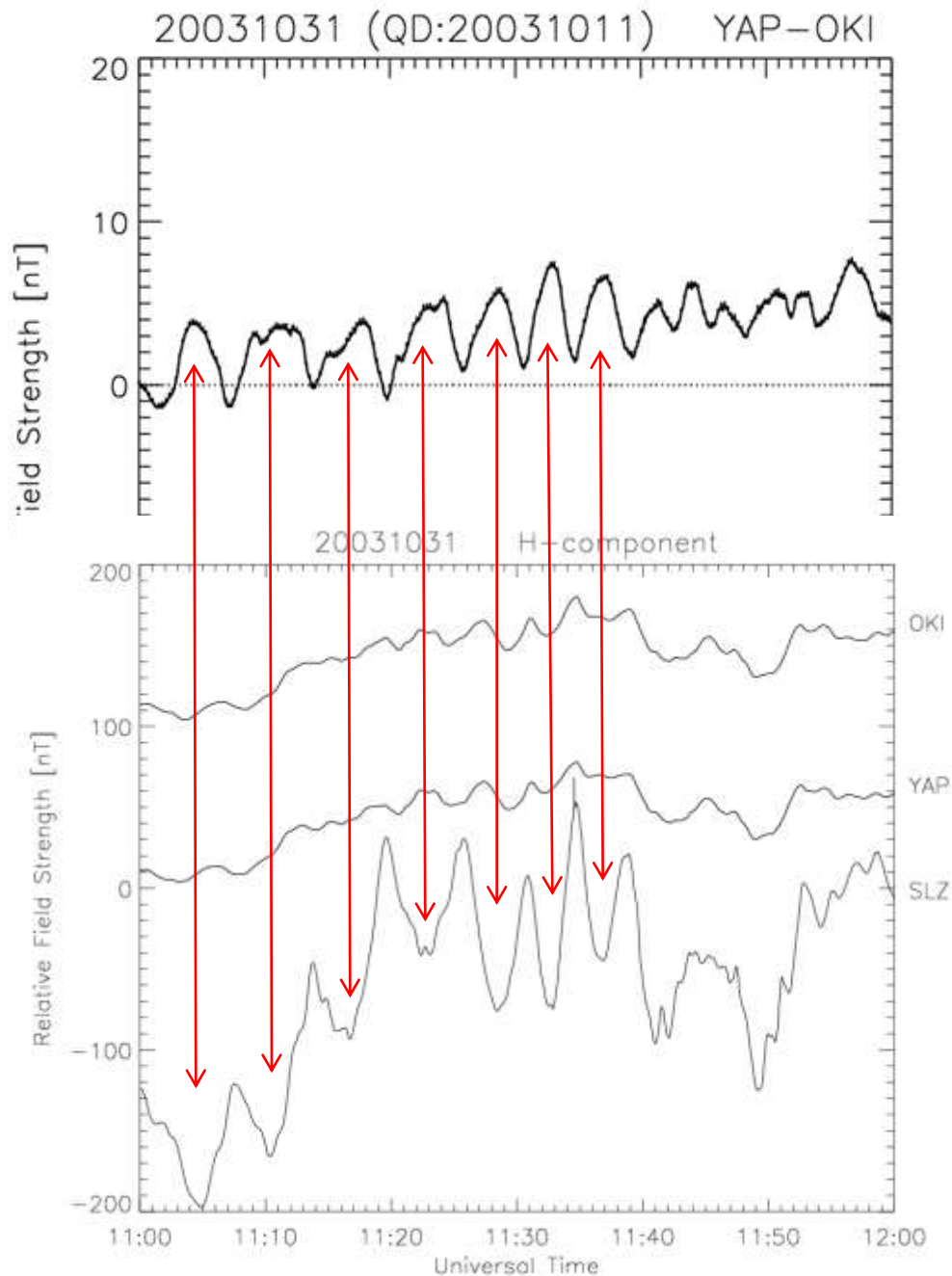


Nighttime HFD pulsations are anti-correlated with EEJ oscillations in the period range of 3-7 min.



伝搬モードに関する考察

OKIとYAPはほぼ同じ変化で compressional mode の変動を表している。SLZとの位相関係は同位相もあれば逆位相もある。しかし、YAP-OKIとSLZは逆位相となる。夜側赤道電離層に電流が流れていることを示しており、昼間赤道電離層電流と逆方向である。電離層電流はAlfven modeで極域電離層へ伝搬し、TM0 modeで昼と夜の赤道電離層へ伝搬する。



Conclusion

- Geomagnetic pulsations with periods of 1 to 10 min are amplified at the dayside geomagnetic equator, caused by the ionospheric currents transmitted from the polar ionosphere.
- The geomagnetic pulsations are composed of DL and DP components in the same way as the sudden commencement.
- The HF Doppler frequency deviations are negatively correlated with the DP component of the PCs on both the day- and nightside.
- The ionospheric electric field associated with the geomagnetic pulsations is a potential field carried by field-aligned currents.
- The dynamo for the field-aligned currents should be clarified to understand the physics of the geomagnetic pulsations.