Relation between electromagnetic waves and FTE's

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On May 20th, 2007, the 5 THEMIS spacecraft passed by a FTE, in the post-noon sector. Spacecraft configuration was particularly interesting since the satellites bracketed the FTE structure, with Thb and Thc on the magnetospheric side, Tha and The on the magnetosheath side, while Thd was close to the magnetopause current layer. The geometry and the general characteristics of this event will be discussed elsewhere by Sibeck et al. Here we look for possible wave-particle interactions.

The spacecraft in the magnetosphere observe (i) a bipolar magnetic field signature normal to the nominal magnetopause, (ii) a crater-like variation in the magnetic field strength, (iii) enhanced densities, (iv) enhanced ion flow velocities, (v) intense fluxes of medium energy electrons, and (vi) enhanced magnetic components of the ULF waves. Densities and ion velocities in the core region are comparable to those in the magnetosheath, but electrons are apparently heated/accelerated well above magnetosheath values.

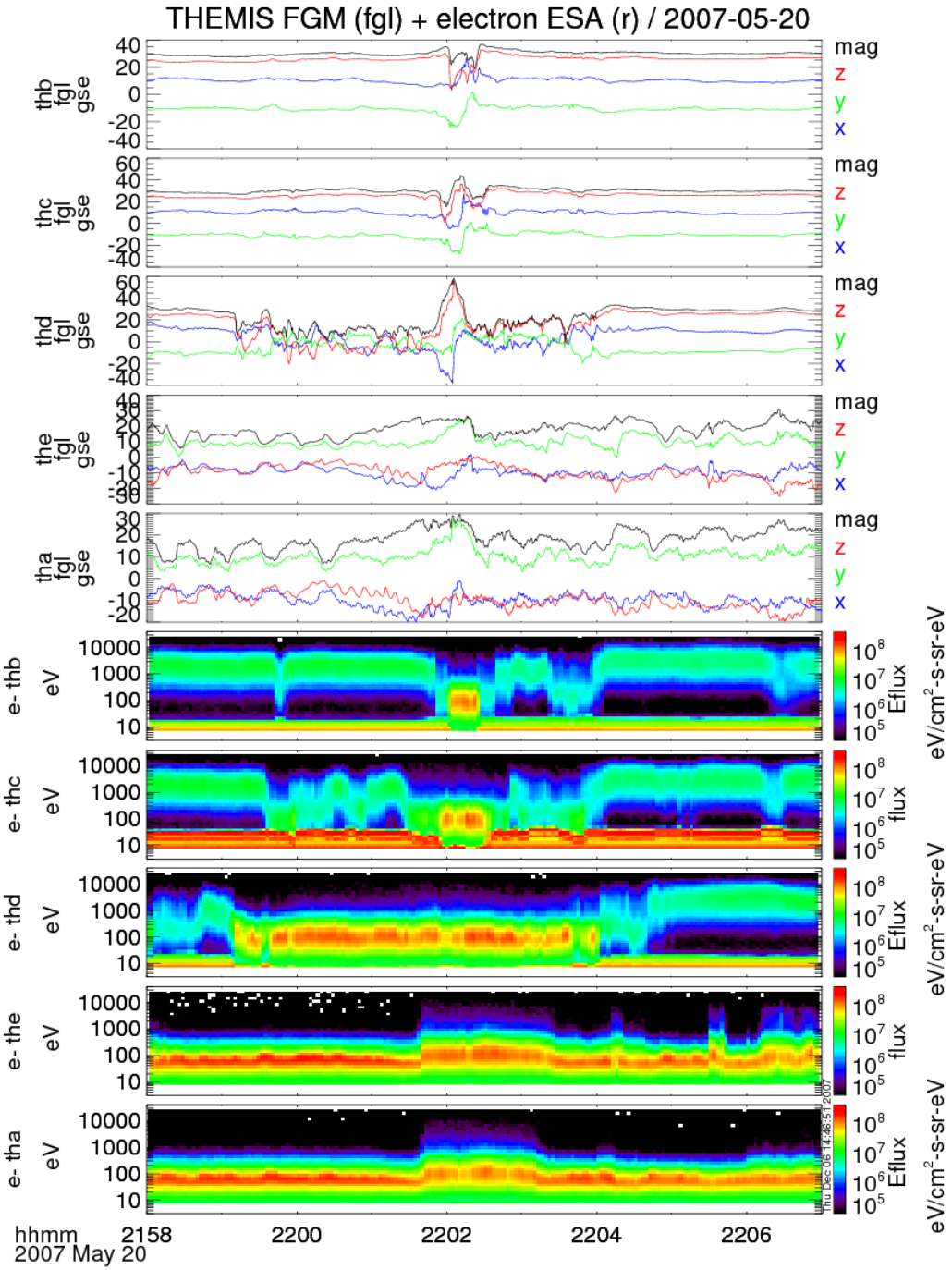
Near the magnetopause, and in the magnetosheath, electron heating/acceleration is not limited to the vicinity of the FTE magnetic field signature, but rather extends over a broader region, where it still coincides with ULF waves. Densities and ion flow velocities vary little as the FTE passes the spacecraft in the magnetosheath. However, in conjunction with large amplitude ULF waves, the magnetosheath electrons are heated/accelerated significantly

These preliminary observations suggest that electromagnetic waves interact with electrons, inside the FTE, on the magnetospheric side, and in a broader region, in the current layer and magnetosheath side. We will analyse wave characteristics, as well as the shape of the electron distribution function, and investigate possible signatures of wave particle interactions as a potential heating mechanism.

Magnetic signature of a FTE & electron spectrograms

Thb, Thc in the Sphere, Thd in the MP CS, The &Tha in the Sheath.

- Sheath electrons are heated & penetrate in the sphere (Thb&c).
- Electron heating also occurs in the MPCS (Thd) and in the Sheath (The&a).
- Electron heating is not restricted to FTE signature.



• Typical FTE signature in MVA:
•B crater-like and Bn reversal.

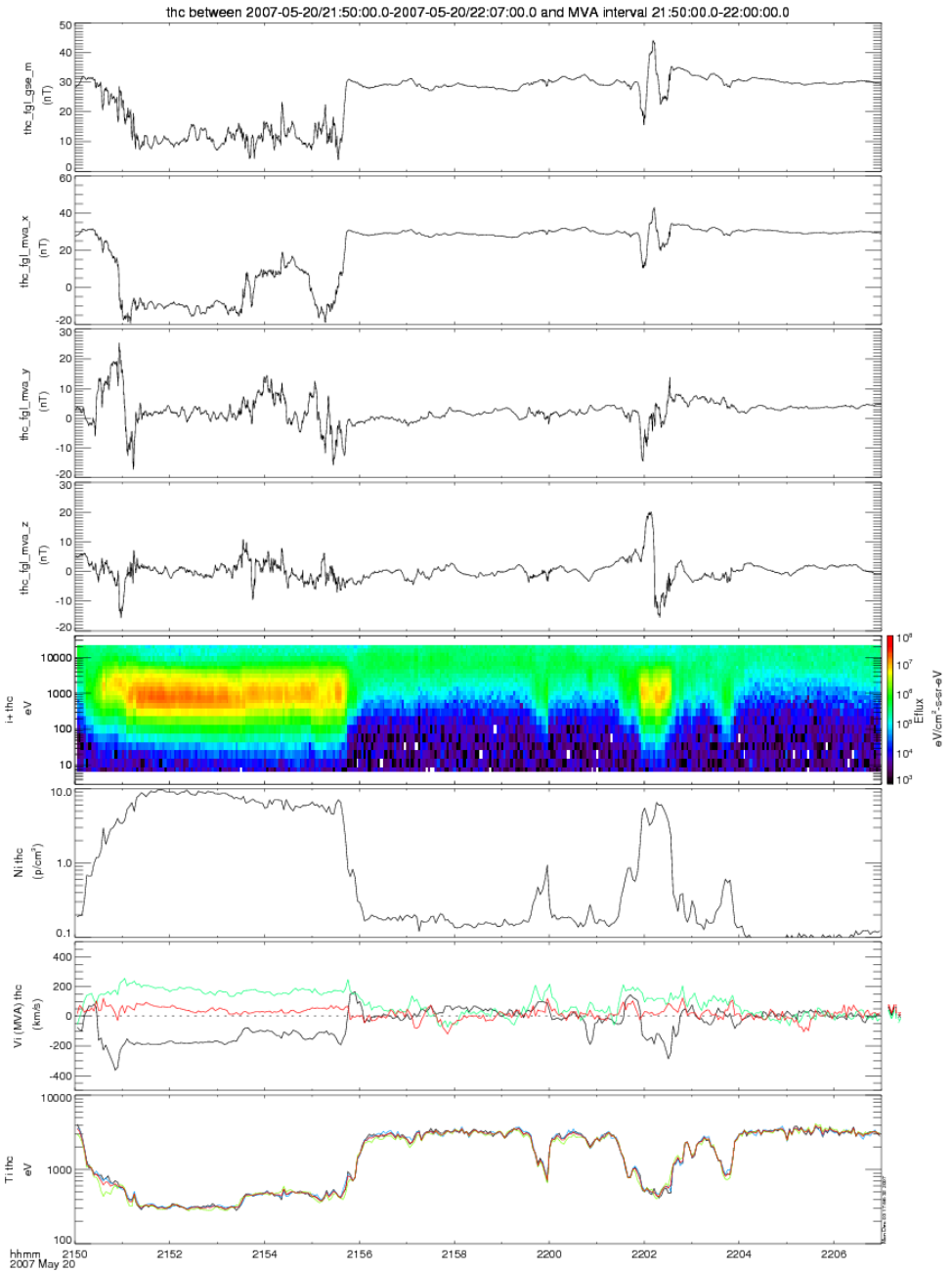
• Magnetic signature ~ Current density structure with J essentially along Zgse, moving along MP in azimuthal direction (toward dusk)

•Consitent with V~Vy (with a smaller Vx<0)

•Bn is approximately normal to a « nominal » MP

Time period for MVA calculations
215000-220000

0.40	-0.53	0.81
-0.41	0.71	0.57
-0.82	-0.56	0.11

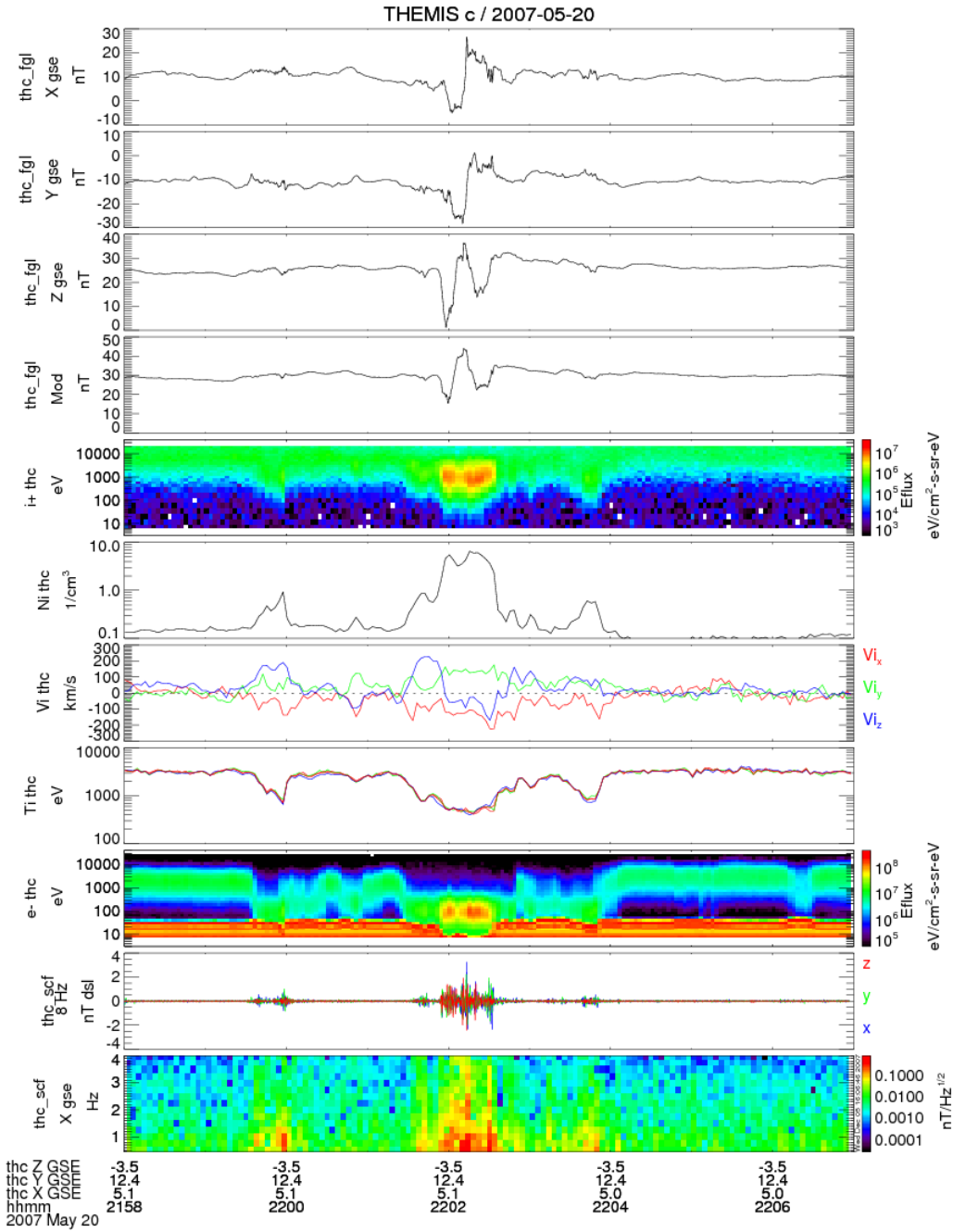


- Heated electrons ⇔ FTE signature ⇔ large densities, Te decreases, Vi~Vsheath (mass&momentum tranferred) + localized bursts (Vz) on the sides of the FTE.

- Waves (~few nT) are observed at the same time as the FTE&heating of sheath elctrons.

- Is there a relation between FTE, electron heating and waves.

- What is the situation on other s/c



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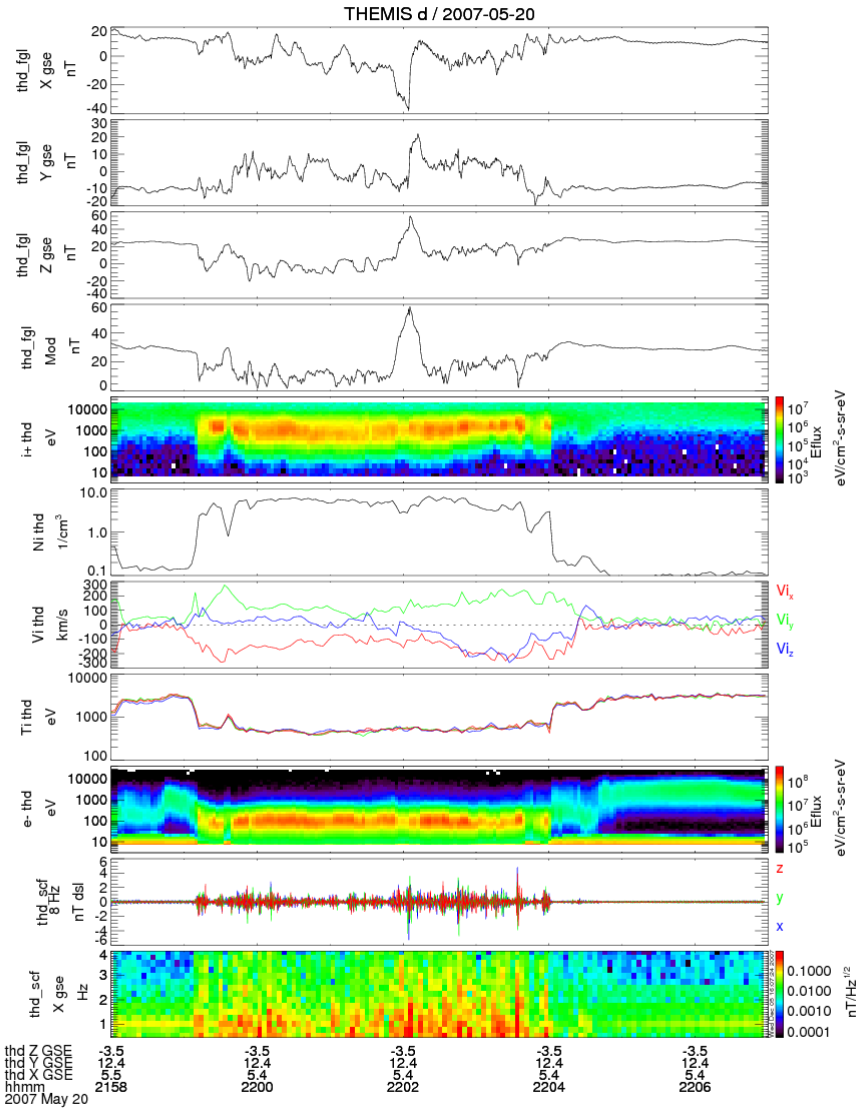
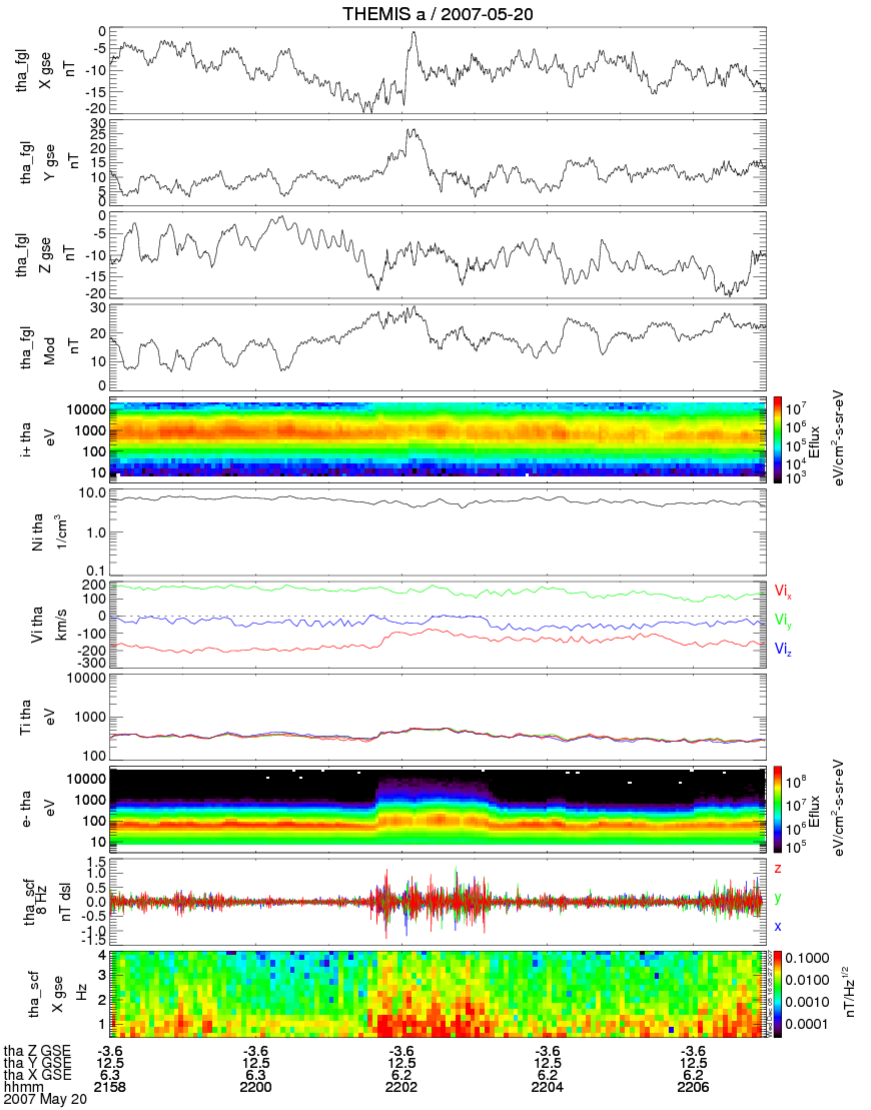
scm FFT parameters: Nbps= 32, Sample Period=0.125000 s, df=0.250000 Hz, FFT duration=4.0000 s, wind=1, FFT number=134





32, Step=5 ,Despin=1, N_spinfit=2, cleanup (ole)=full, 1st av. wind.= 3.00, 2nd av. wind.= 1.0, Fdet= 0.00Hz, Fcut= 0.10Hz, Fmin= 0.45Hz, Fmax= 0.00= 32, Step=5 ,Despin=1, N_spinfit=2, cleanup (ole)=full, 1st av. wind.= 3.01, 2nd av. wind.= 1.0, Fdet= 0.00Hz, Fcut= 0.10Hz, Fmin= 0.45Hz, Fmax=

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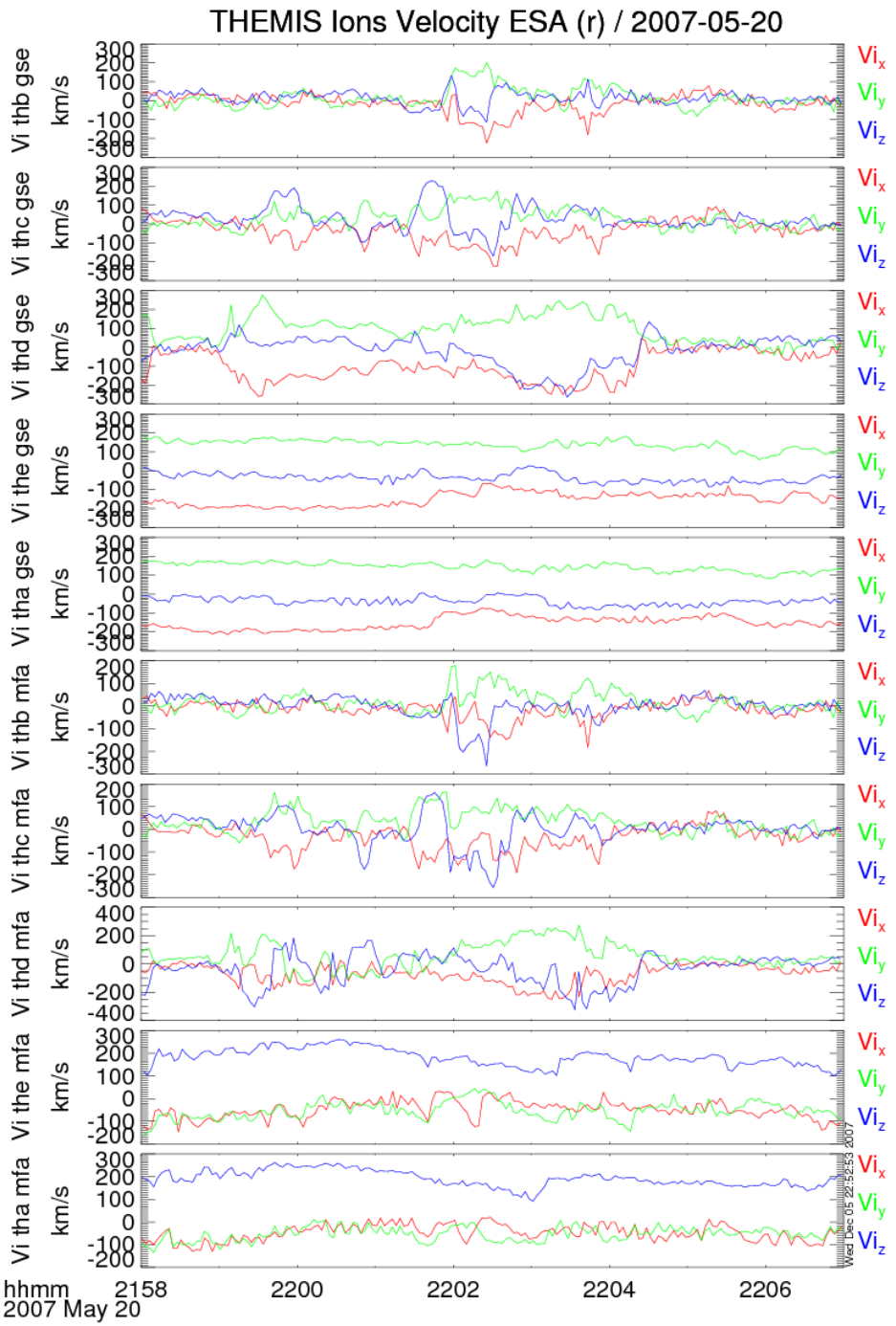
Vi gse and mfa
blabla



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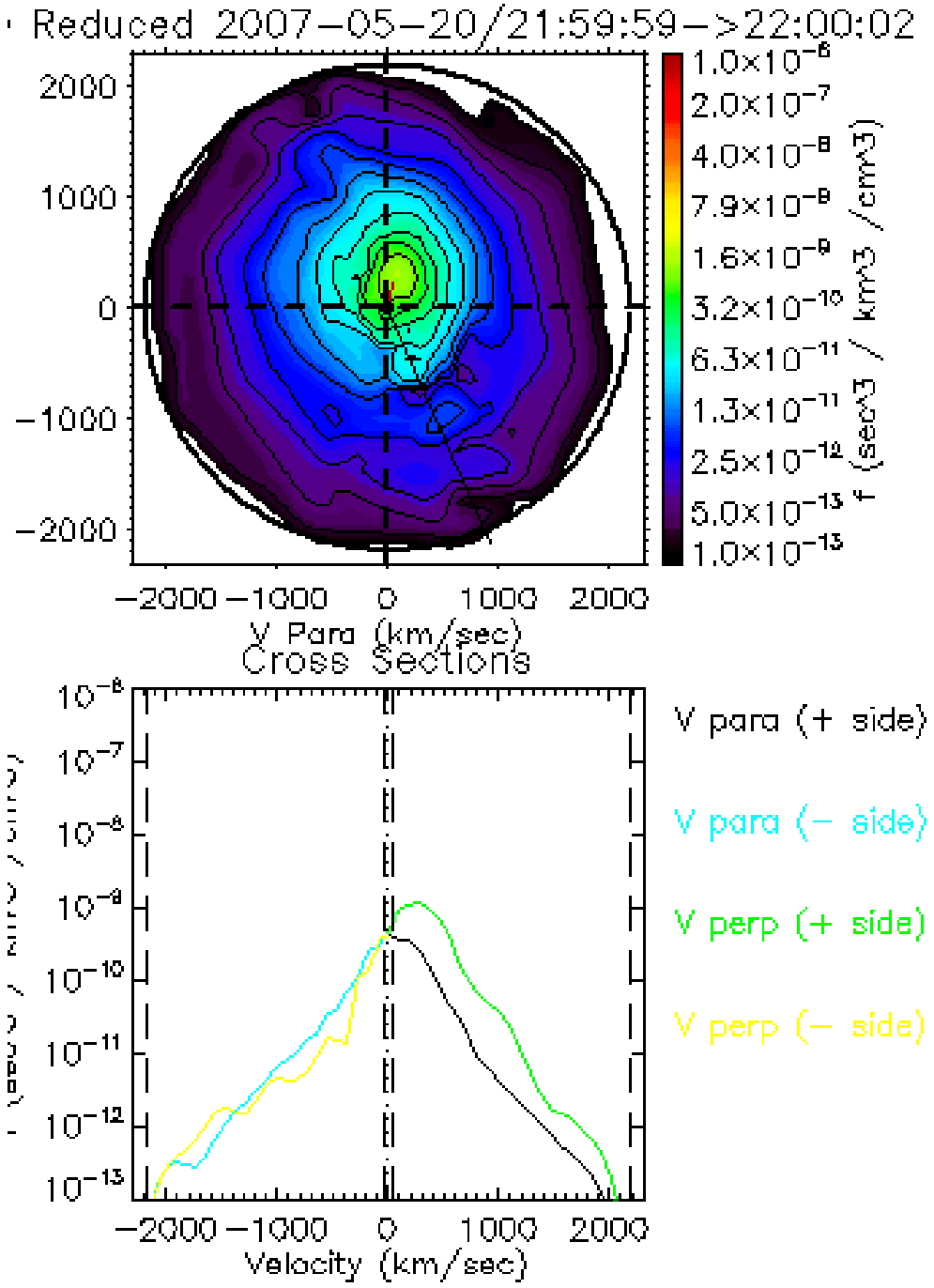
Double clic pour lancer
Clic pour stopper
Clic pour reprendre



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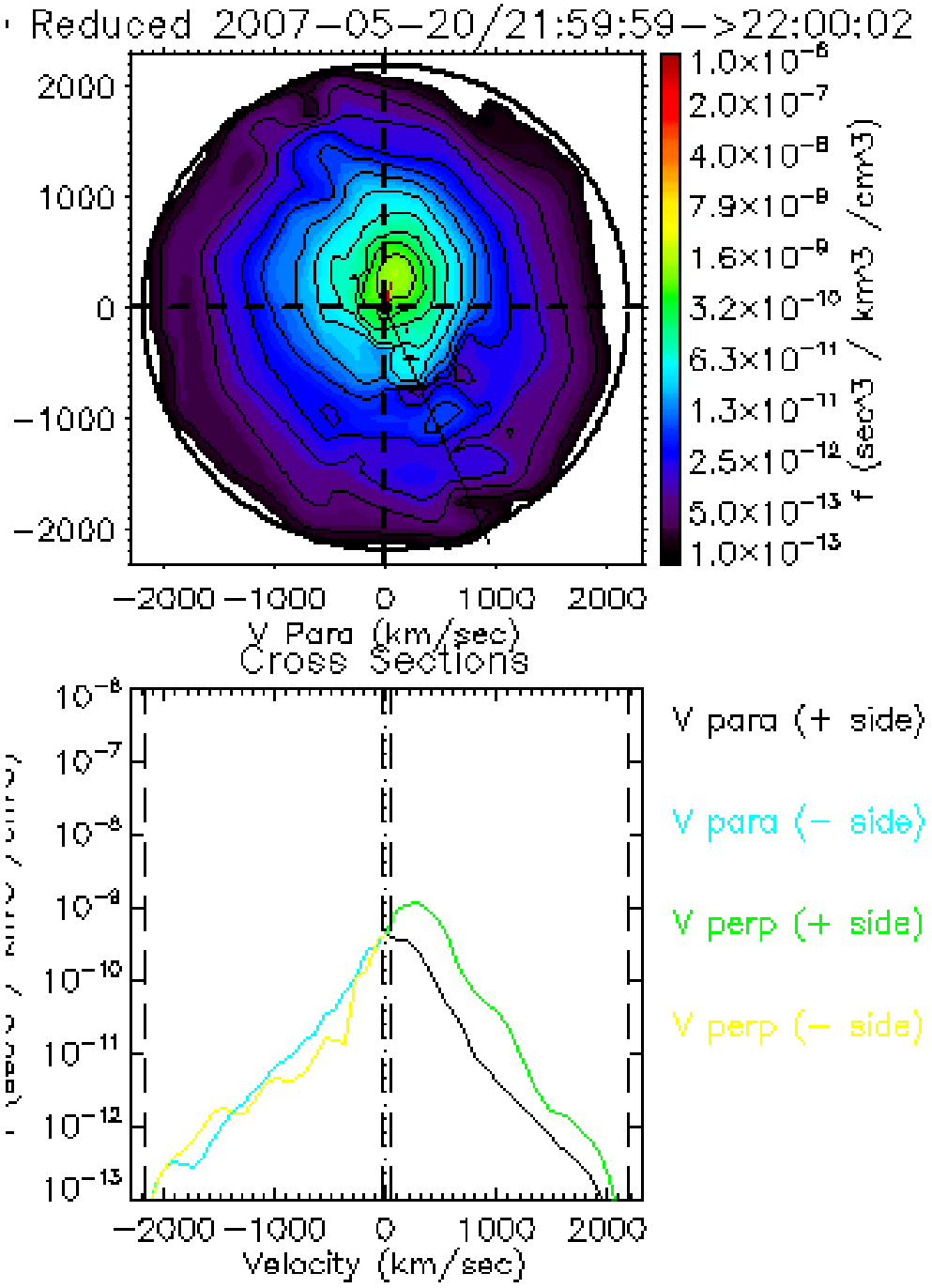

CONCLUSIONS

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