

Observations of magnetic anomaly signatures in Mars Express ASPERA-ELS data

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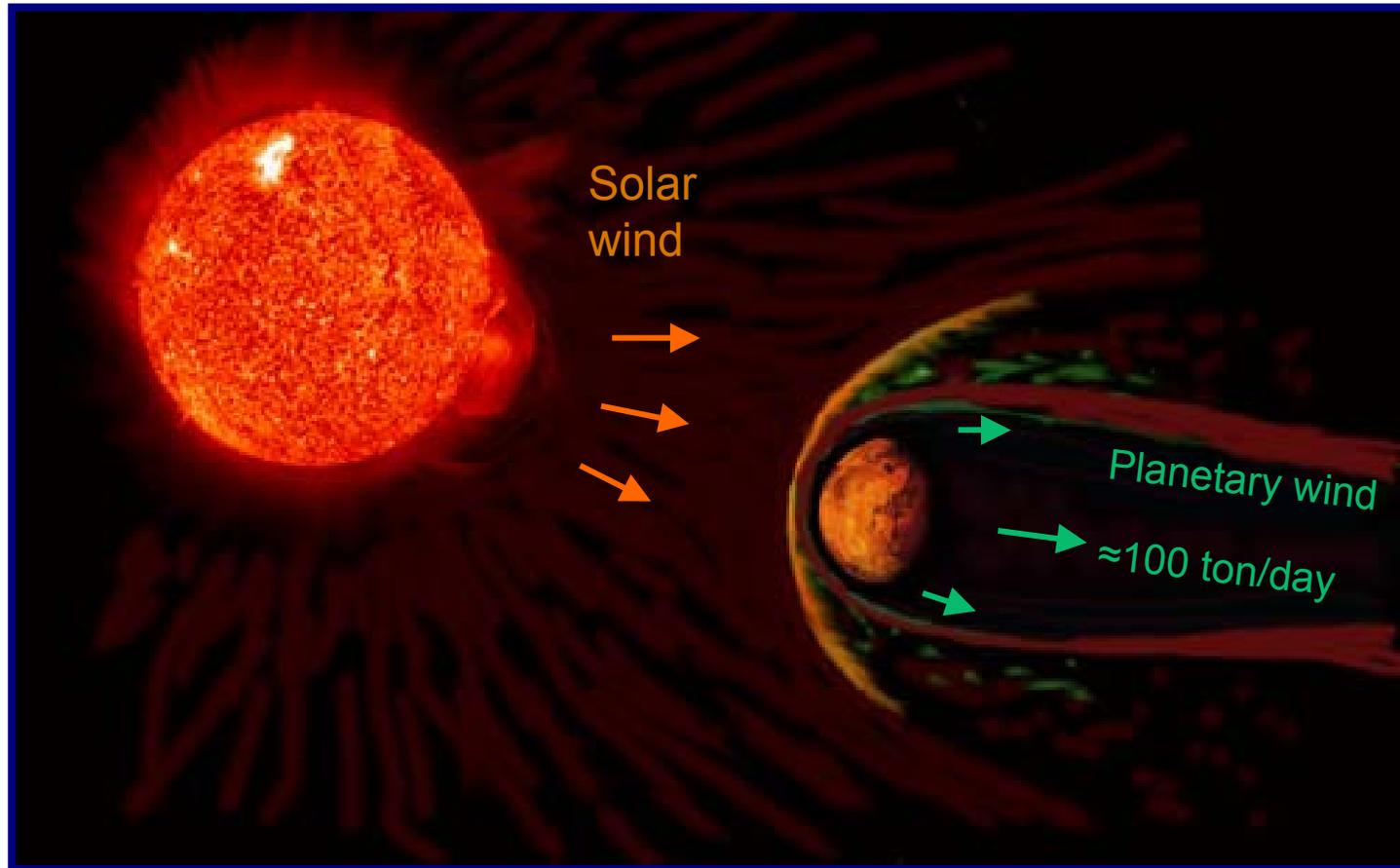
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1. Signatures on day side
2. Signatures on night side
3. Statistics



Solar wind scavenging of the Martian atmosphere



- *Mars lacks a strong intrinsic magnetic field*
- *Planetary wind; Outflow of atmosphere and ionosphere giving dehydration*

Mars Global Surveyor (1997 – Present)

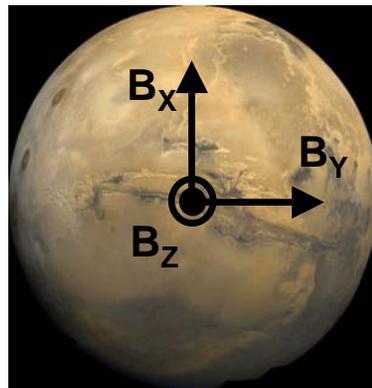
- Results from Magnetometer/ Electron Reflectometer
 - Determined Mars does not possess internal dynamo
 - Discovered strong magnetized regions in ancient crust
 - Multiple magnetic cusps

- Mars Express versus Mars Global Surveyor

	Mars Express	Mars Global Surveyor
Magnetic Field	Crustal Model	Magnetometer
Electrons	Electron Spectrometer	Electron Reflectometer
Ions	Ion Mass Analyzer	×

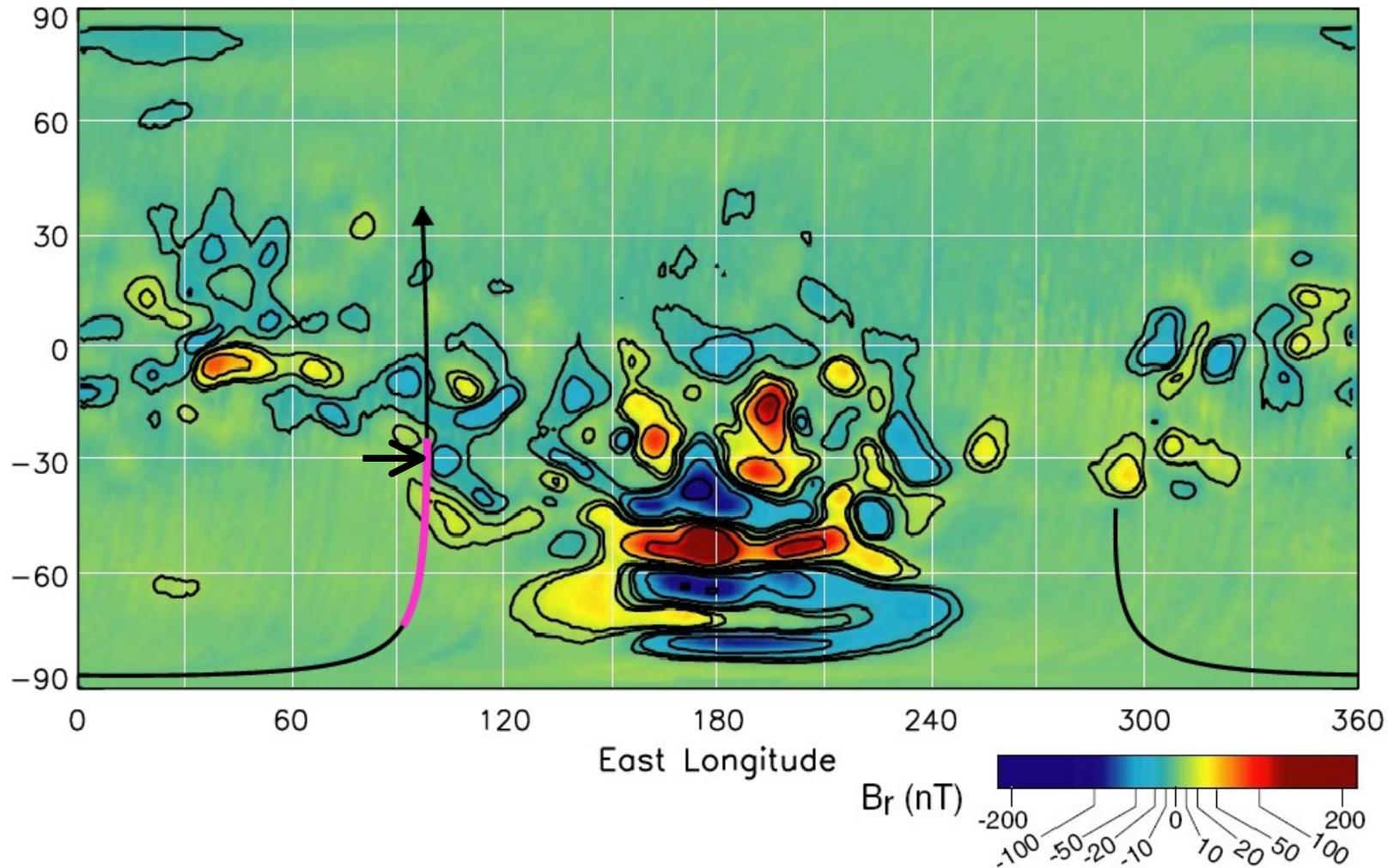
Investigation into Magnetic Anomalies on Mars

- MEX ELS observations of irregular signatures over regions of magnetic anomalies
 - MEX has highly elliptical orbit with closest approach <300km
 - No magnetometer on Mars Express
- Cain et al. [2003] – spherical harmonic potential model based on selected vector data from the Mars Global Surveyor spacecraft
 - Global data sets of three magnetic field components (altitudes below 200km and between 367-435km)
 - Accurate from 170km to 400km altitude
- Converted magnetic field vectors determined by model:

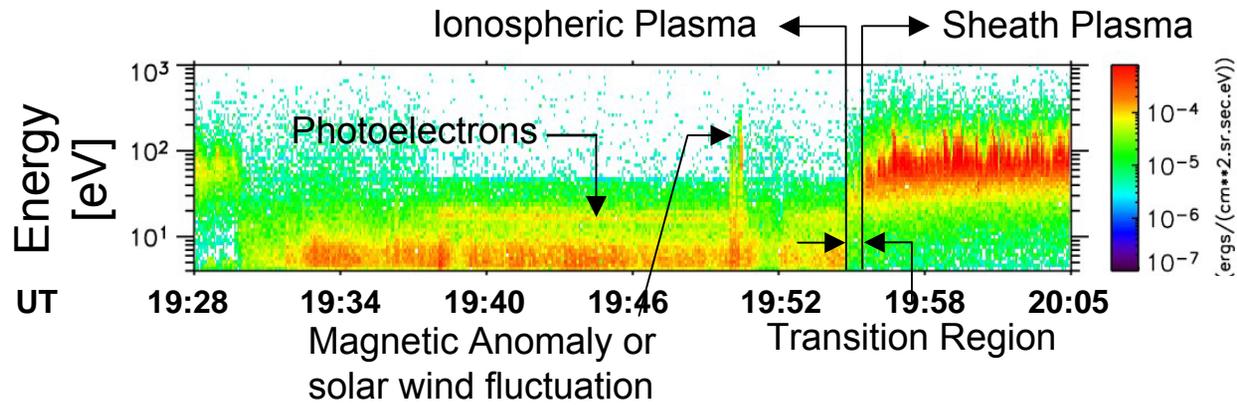


- Mars centred B_z (positive downward to spheroid)
- East component B_y
- Mars centred B_x (horizontal to spheroid & northward)

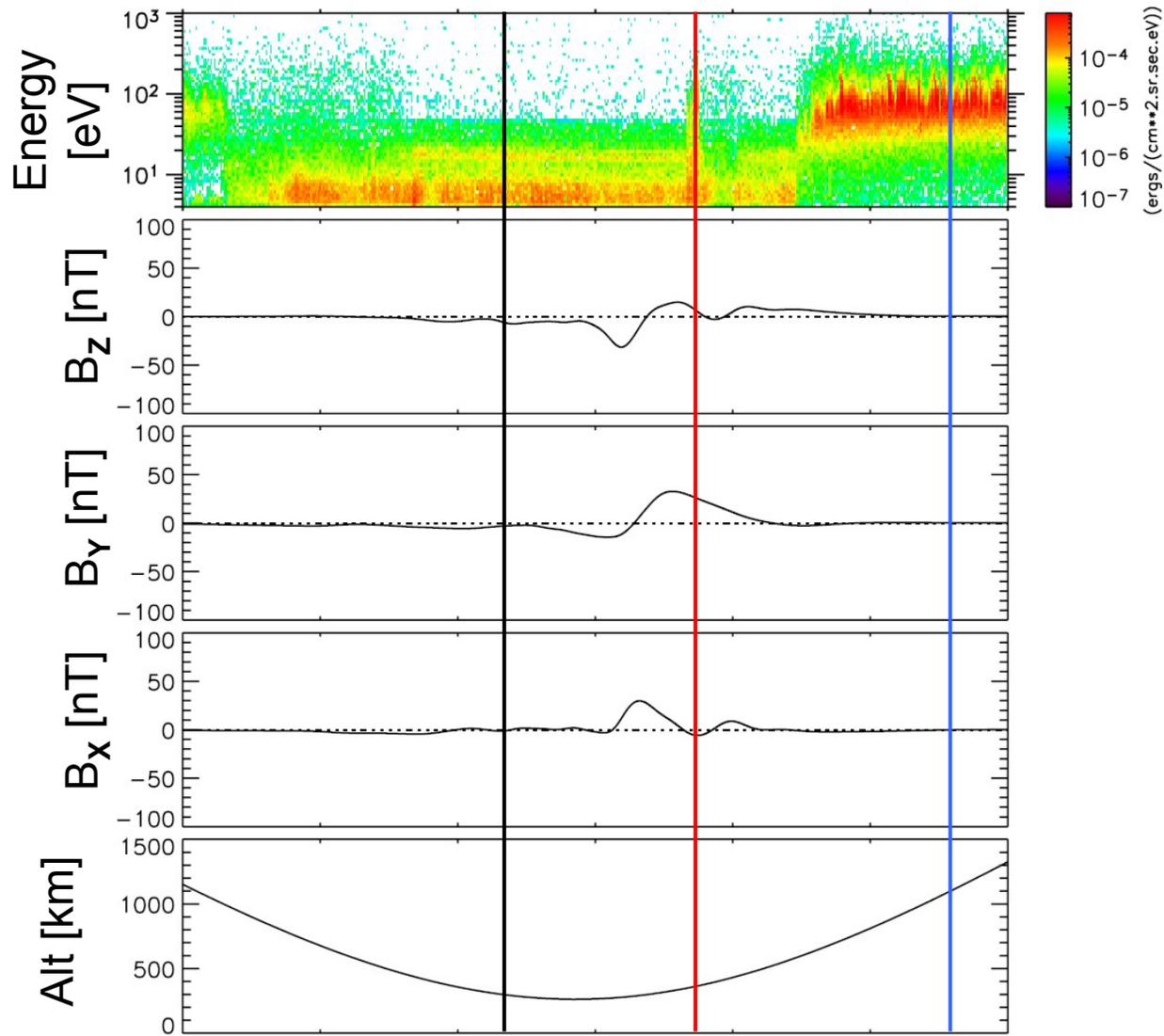
Dayside approach on 9th April 2004



Dayside ELS Spectrogram & FSU90 results [9th April 2004]

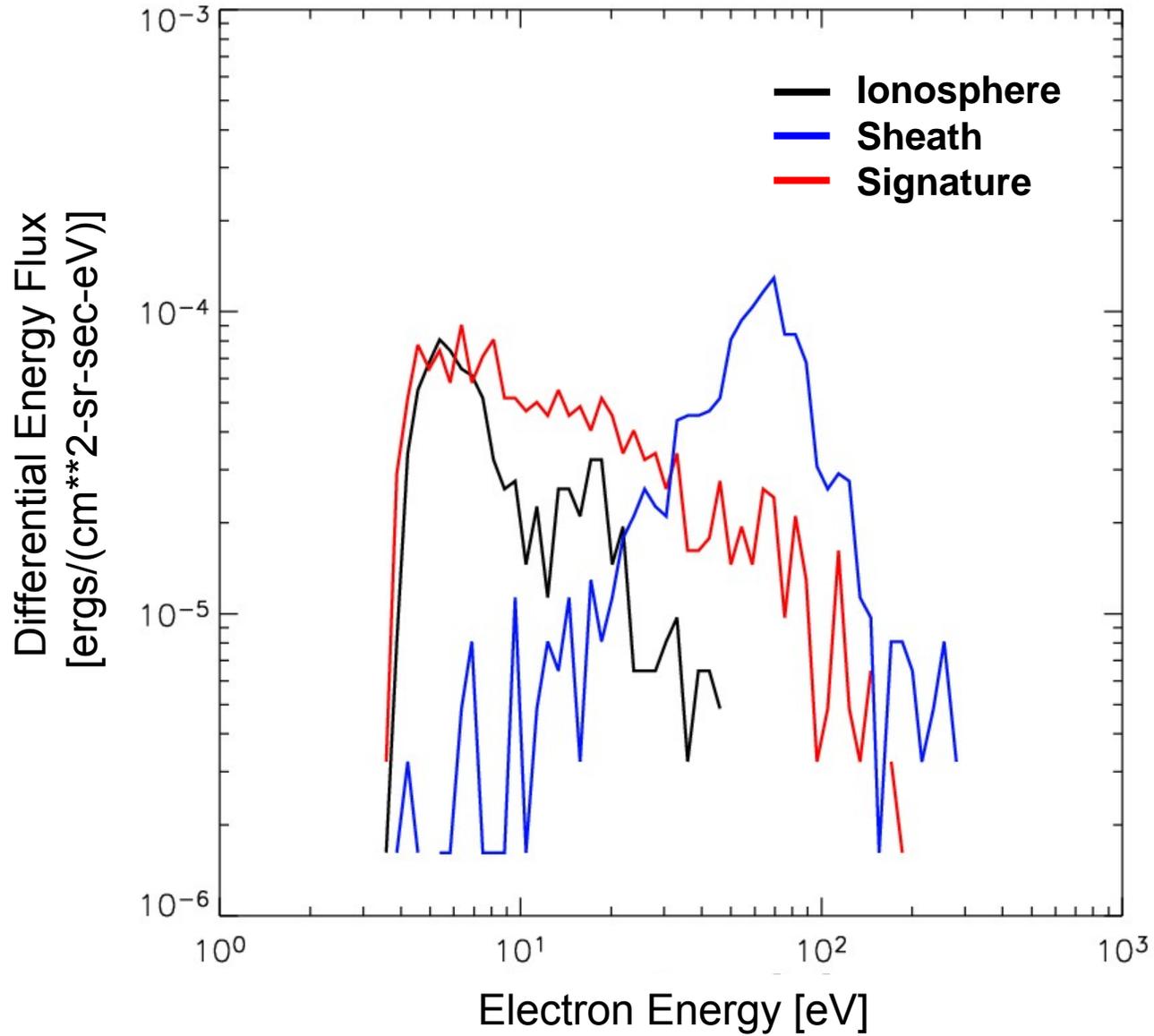


Dayside ELS Spectrogram & FSU90 results [9th April 2004]

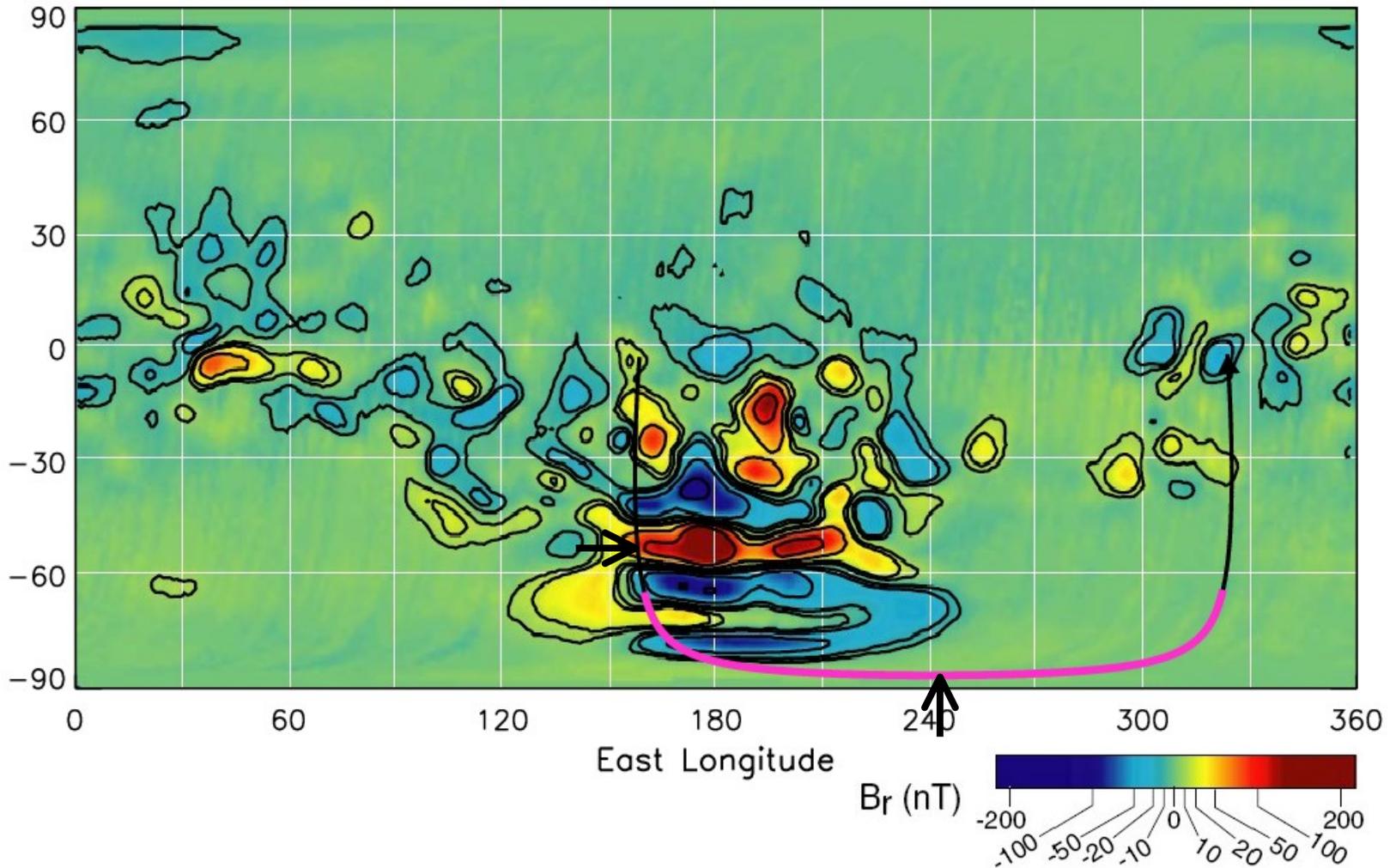


UT	19:28	19:34	19:40	19:46	19:52	19:58	20:05
LT	2.85	5.33	7.89	9.41	10.32	10.96	11.56
SZ	118.03	100.57	79.14	55.32	32.84	17.25	17.43

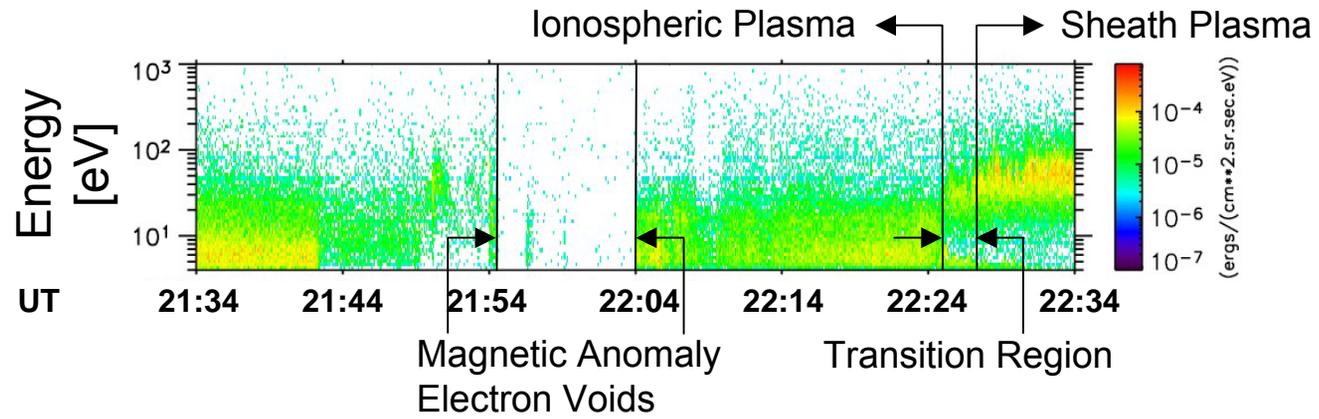
Dayside 9th April 2004



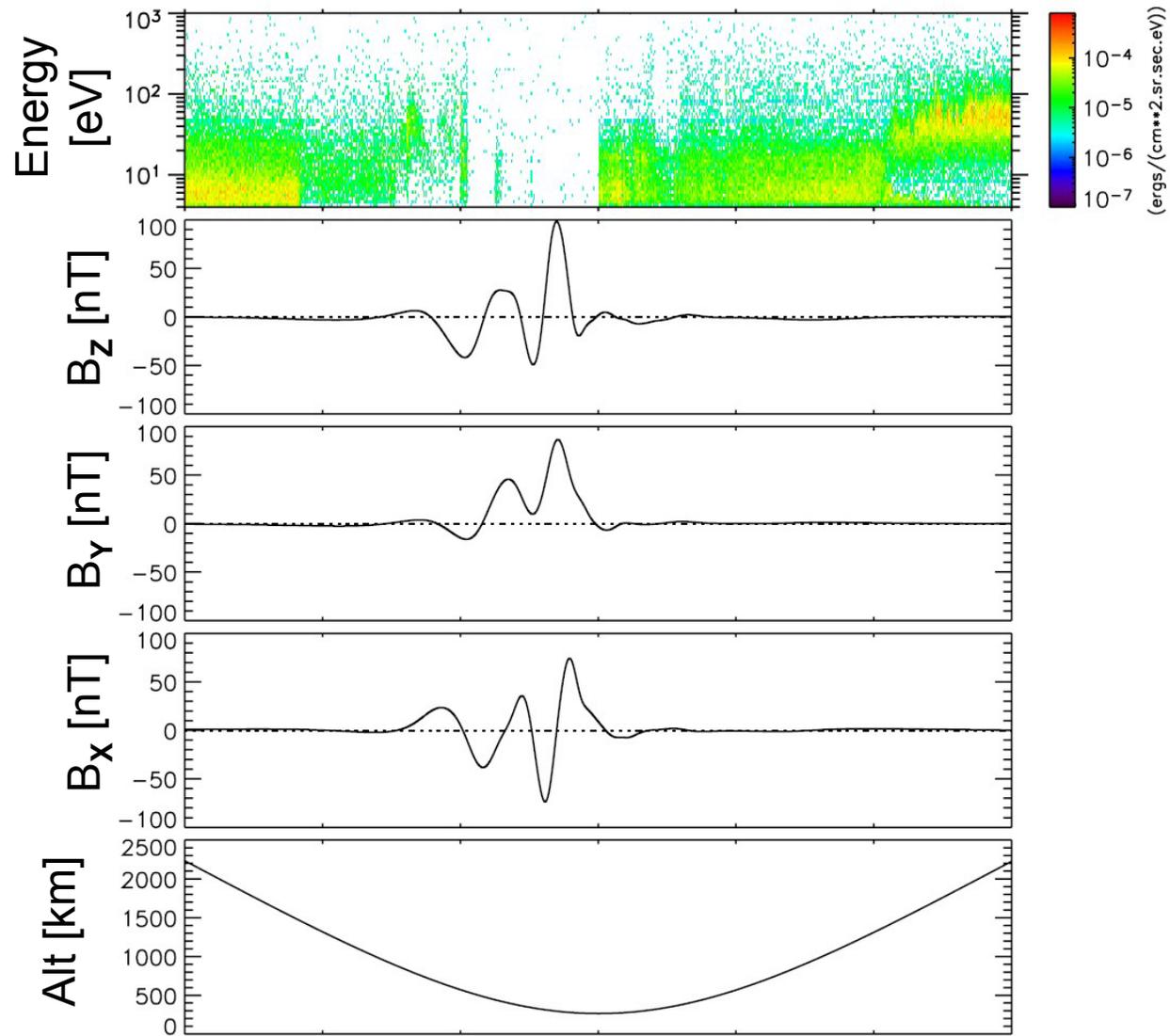
Nightside approach on 17th June 2004



Nightside ELS Spectrogram & FSU90 results [17th June 2004]

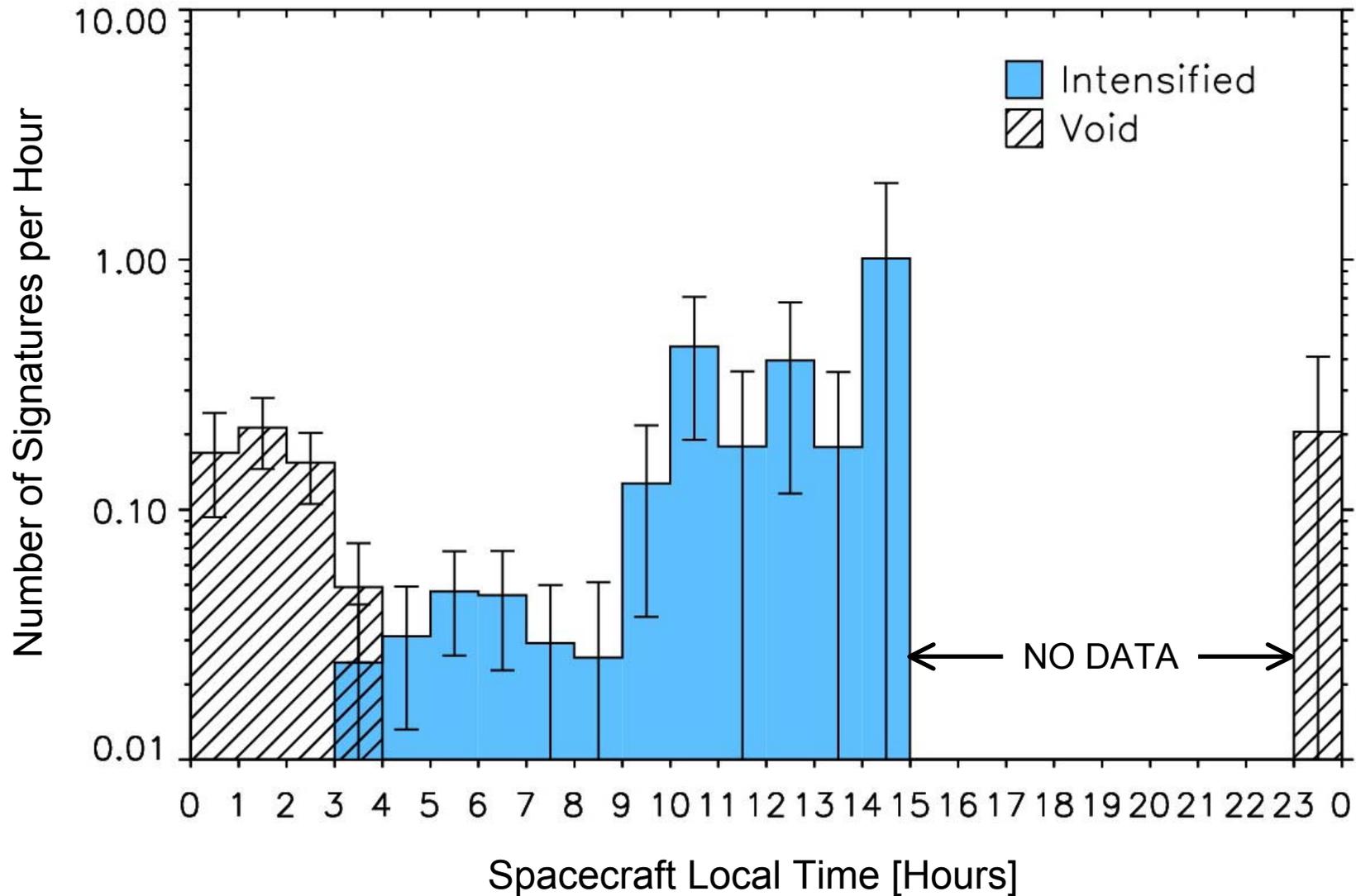


Nightside ELS Spectrogram & FSU90 results [17th June 2004]

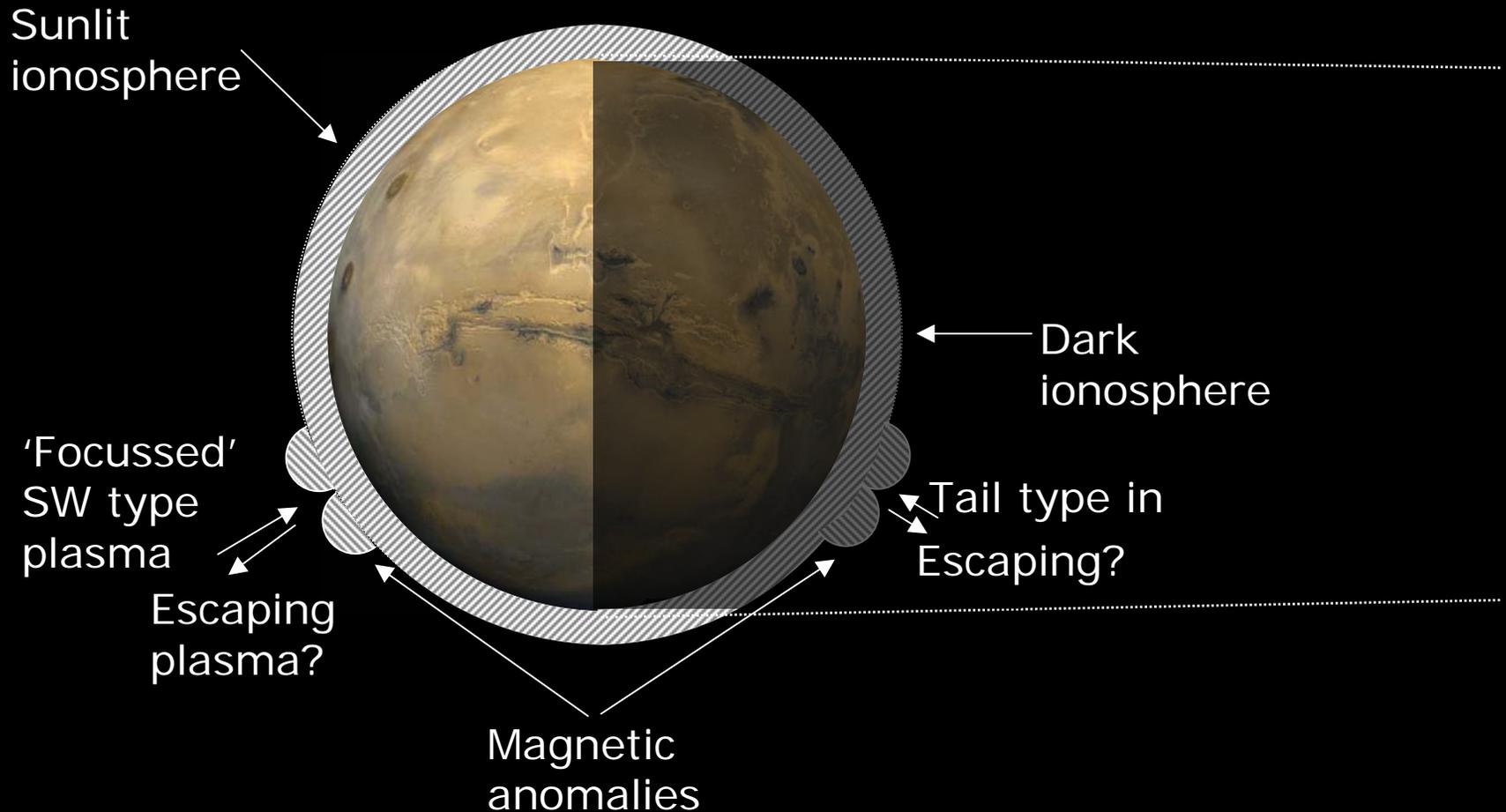


UT	21:34	21:44	21:54	22:04	22:14	22:24	22:34
LT	20.54	21.24	22.69	2.93	6.52	7.75	8.41
SZ	127.75	133.75	130.86	111.06	84.79	65.30	54.07

Rate of electron signatures occurring near magnetic anomalies in Spacecraft Local Time (as observed by MEX ELS)

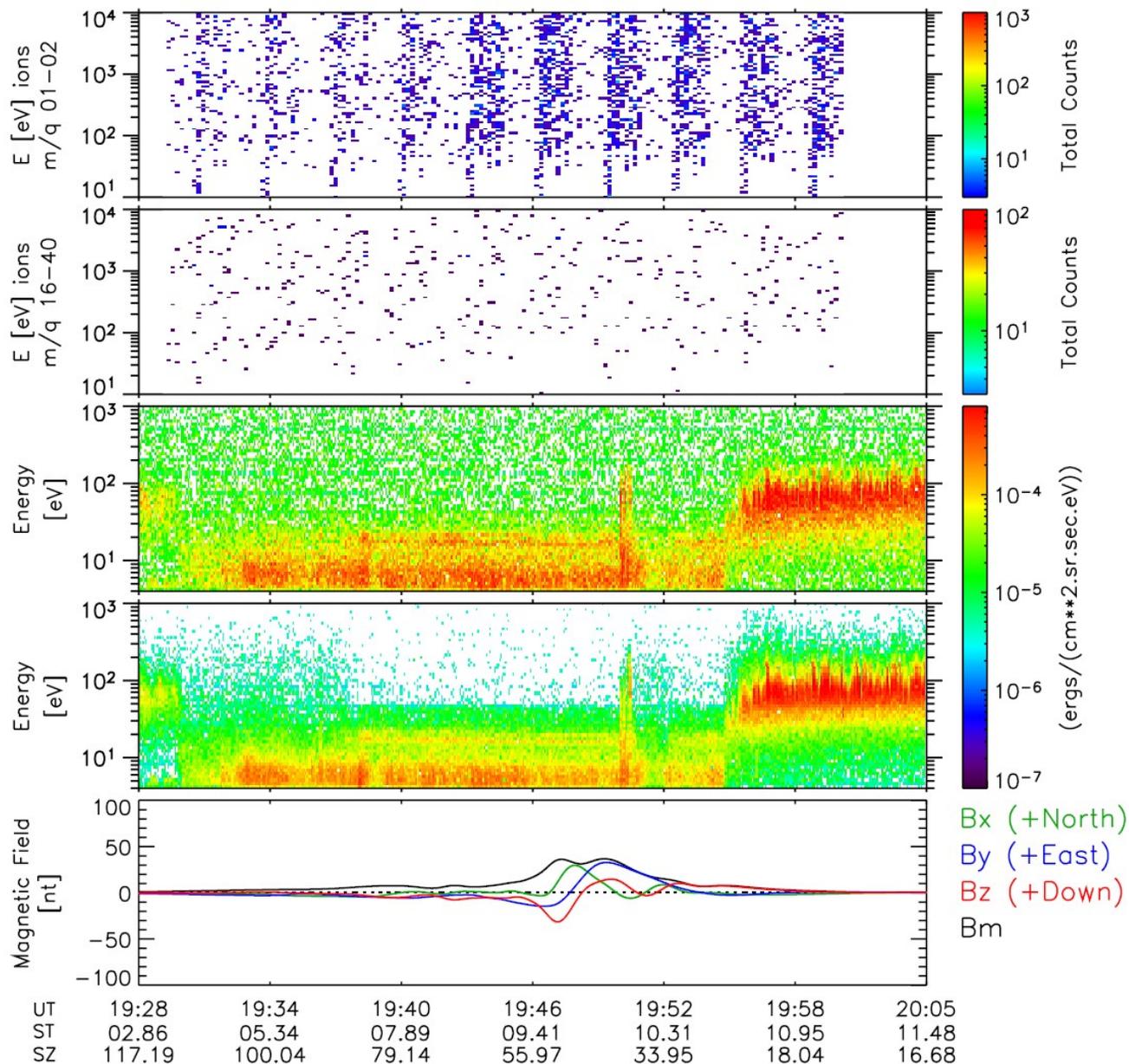


Conclusions



- Intensified signatures on dayside; Intermediate of ionosphere and magnetosheath & broad range in local time
- Void signatures on nightside; No detection of electron spectrum from voids & Narrow range in local time

Dayside Electron-Ion Comparison [9th April 2004]



Nightside Electron-Ion Comparison [17th June 2004]

