

There are two parts to this TIMAS presentation

1. **Data and analysis since resolution of the telemetry anomaly**
 - Bill Peterson
2. **Spatial Structures in the CUSP**
 - Karlheinz Trattner

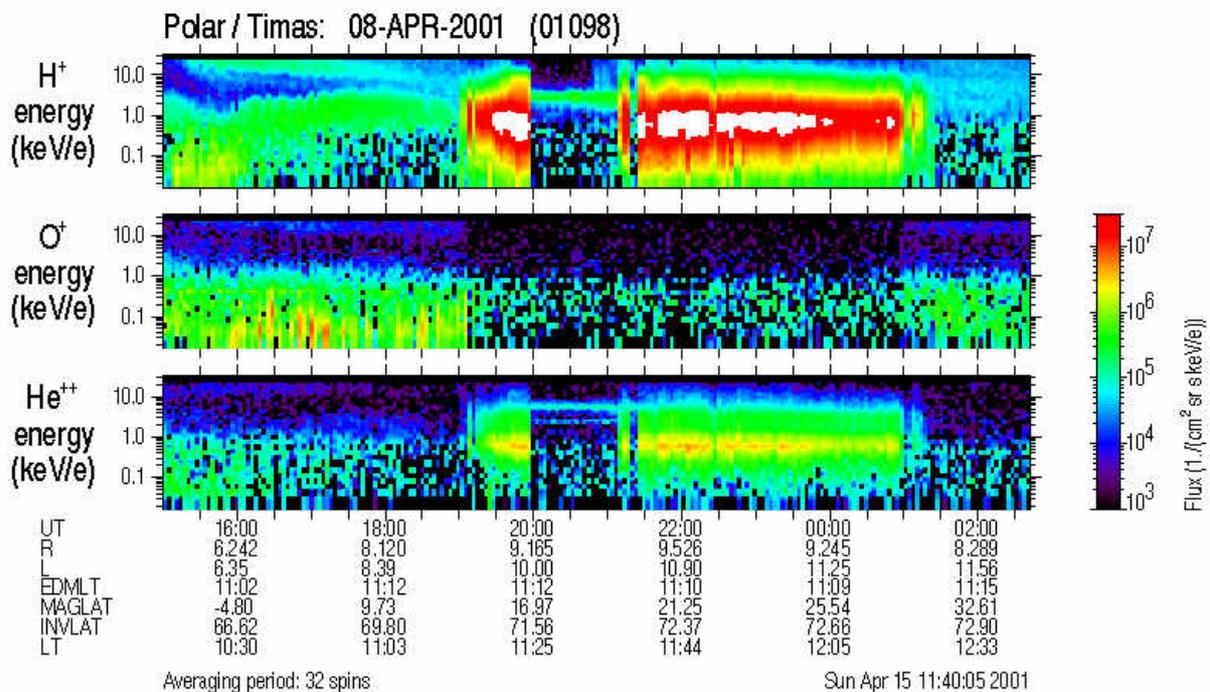
Part 1: Examples of the TIMAS data acquired after 16:00 on March 30, 2001.

These data have not been calibrated. We are using a calibration file appropriate to data acquired in June 1999.

• TIMAS data for April 8, 2001

On April 8, 2001 Polar was near the sub solar point and there was a significant increase in the solar wind dynamic pressure

ACE and WIND show $|B_x| > |B_y| > |B_z|$



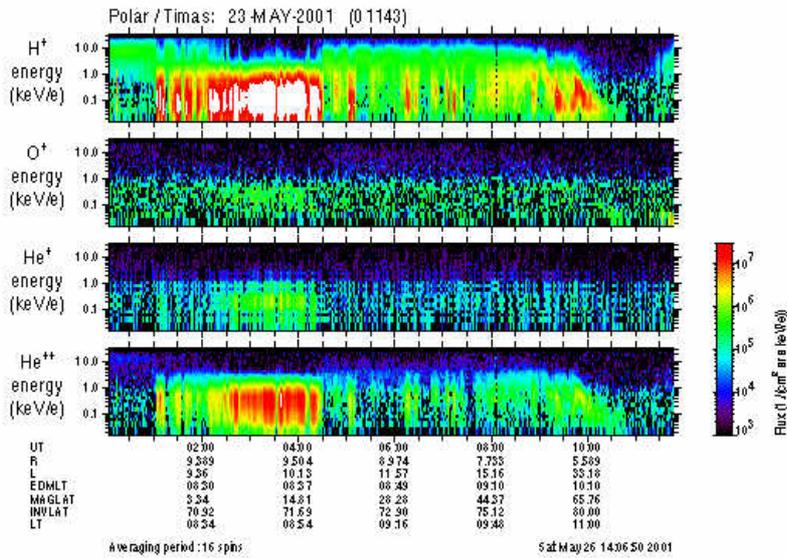
- Geomagnetic equator crossing ~16:30
- First magnetosheath crossing ~19:00 to ~20:00
- In the solar wind ~20:00 to 21:00 and briefly again ~21:15
- Second magnetosheath crossing ends about 01:00 on April 9, 2001
- the TIMAS detector is saturated both in the magnetosheath and in the solar wind
- Identification of regions is done by
 - Temperature (i.e. energy width) of H+ and He++ distributions
 - Relative energies of H+ and He++ in the solar wind have the appropriate relation for about 400 km/s
 - The intense Hot O+ population ends at the magnetosheath boundary
 - Magnetometer data (in the PDF file below) are consistent with these boundaries.

- o Note that the relative concentration of energetic (~10 keV) ions in the magnetosphere is less after the solar wind excursion than before. This could be a spatial effect, but is most likely temporal.

Composition data such as these, in conjunction with large scale magnetospheric models can be used to determine the energy and transport of solar wind plasma in the magnetosphere.

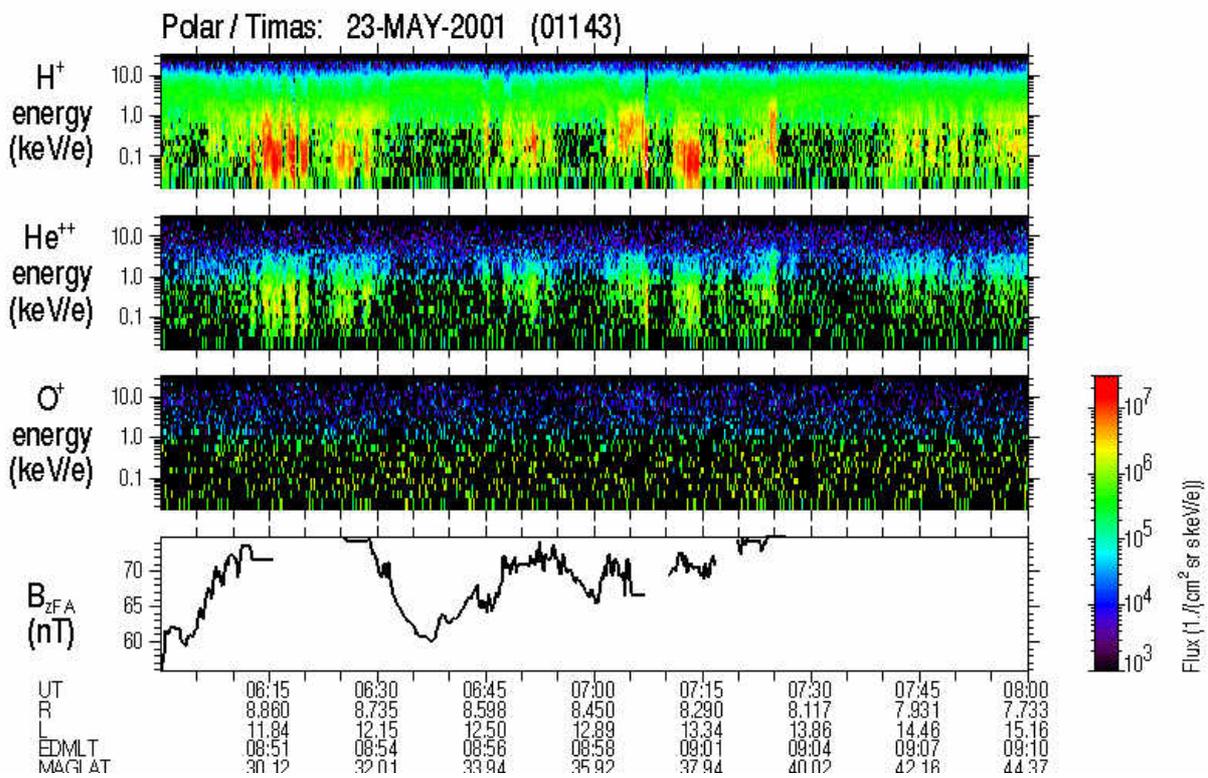
• TIMAS and other data for May 23, 2001

On May 23, 2001, Polar was near the sub solar point and there was an increase in the solar wind dynamic pressure that resulted in an extended interval when Polar was in the low and mid latitude boundary layers.



- o Magnetic equator crossing 01:20
- o Magnetosheath encounters ~01:00 to ~04:30
- o Boundary layer/injected solar wind plasma encounters from ~04:30 until about 09:00
- o Typical high latitude boundary layer signature seen as Polar entered the polar cap ~10:00

Focus on the interval 06:00 to 08:00 which has multiple solar wind injection signatures

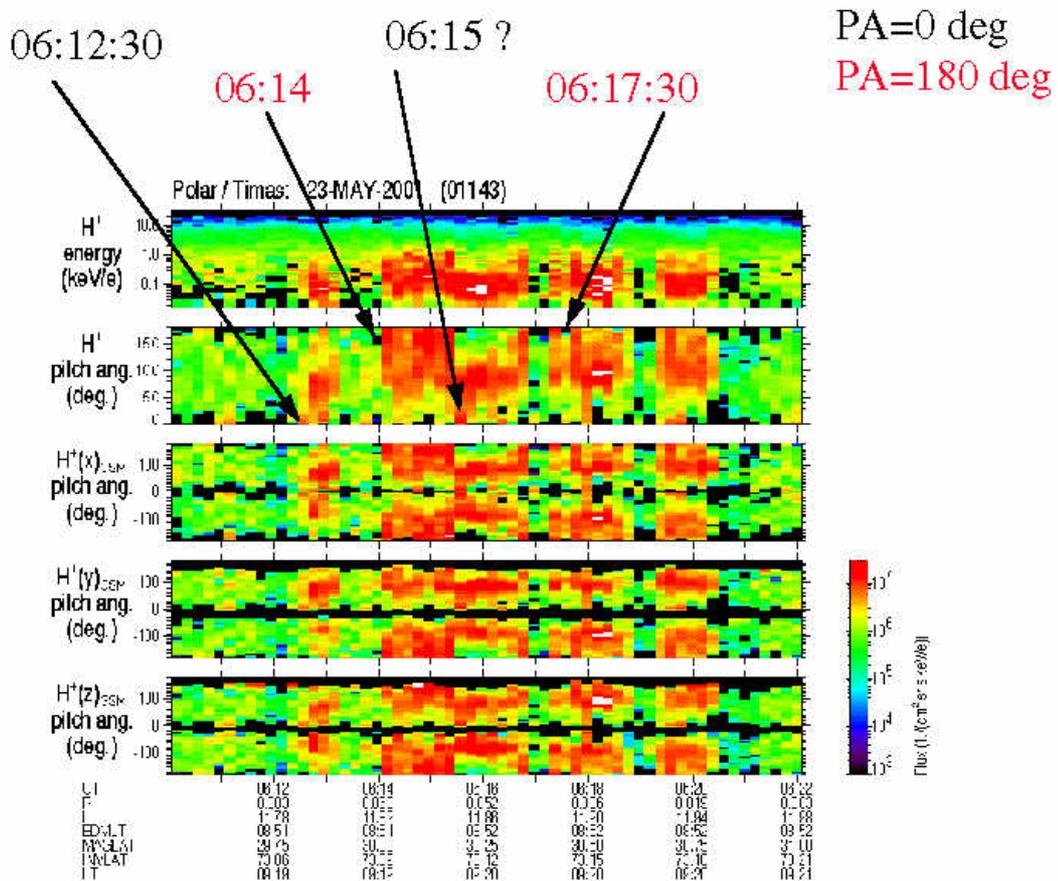


The magnetometer data indicate fluctuations in intensity in this region characteristic of the strong magnetic pulsations and field line movement typically found here.

The gaps in total magnetic field intensity are where TIMAS codes can't interpret the magnetometer data in the Polar housekeeping data files

Magnetic field angles from the HYDRA data stream confirm large scale magnetic pulsations

Detailed angular data indicate source of injected solar wind plasma is alternately NORTHWARD and SOUTHWARD of the Polar Position



The bottom four panels are angle time plots of the PRELIMINARY, UNCALIBRATED, H+ TIMAS data in the energy range from 35 eV to 1.8 keV. The top panel is a typical energy time spectrogram, the second panel shows normal pitch angle, and the bottom three panels show the TIMAS data observed sorted along the GSMx, y, and z directions, sorted in angles with respect to those directions.

In particular you will see a burst of 0 degree pitch angle H+ data at 06:12:30 and 06:15:30 (maybe) and 180 degree pitch angle data at 06:14 (maybe continuously) and again at 06:17:30.

The data show injections of ions on field lines sampled by Polar alternating between northward and southward of the polar location.

The three bottom panels, in GSM coordinates, show bulk motion in the GSMx and GSM y directions near 06:13, and in the opposite direction at 06:17

Note that angular data have been averaged over energy using the 1999 calibration data that needs to be updated. That is a long process that has begun

- o Wind at -140 Re GSY and +60 Re GSx
- o **Bz mostly northward in the intervals of interest**
- o Solar wind dynamic pressure ~2-3 nP

What does it all mean?

At this point we have more questions than answers.

- Is this another example of the 5/29/96 type event with lower dynamic pressure?
 - Need to check--
 - HYDRA electron data
 - TIDE distributions at appropriate times
 - Compare with analysis in papers by Chandler, Onsager, Fuselier, Scudder, and others.
 - Are the oscillations in reconnection site occurring during intervals of steady northward IMF?
 - Fueselier et al. [O+ Observations in the Cusp: Implications for Dayside Magnetic Field Topology, J. Geophys. Res., 106, 5977, 2001] examined these kinds of events by looking for beams of downflowing O+ and found very few events consistent with oscillations in the reconnection site.
 - OR are the oscillations in reconnections site related to features in the solar wind?
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But FIRST we need to calibrate the TIMAS data.

so that we can push the TIMAS angular distribution data harder by more reliably integrating over fixed energy ranges.

We are working with the HYDRA team to get the data so that we can normalize TIMAS data to HYDRA at times when the plasma is more or less isotropic and mostly H+.

- **Recalibration**

- We have software in place to normalize TIMAS and HYDRA data.
- The recalibration software is cumbersome (read very labor intensive) to use
- We intend to use the recalibration software only to support analysis of event data

[Web page with 24 hour spectrograms](#) for All intervals with valid TIMAS data through July 15, 2001.

Part 2: Spatial Structures in the CUSP

- [Pointer to Karlheinz Trattner's presentation](#)
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