SM53A-1649
Magnetospheric Response to Solar Wind Discontinuities

Polar UVI and THEMIS GBO Observations of the Ionospheric and Magnetospheric Response to a Hot Flow Anomaly

M. O. Fillingim[1] (matt@ssl.berkeley.edu), J. P. Eastwood[1], G. K. Parks[1], V. Angelopoulos[2], I. R. Mann[3], S. B. Mende[1], C. T. Russell[2], A. T. Weatherwax[4]

[1]Space Sciences Laboratory, University of California, Berkeley, [2]Institute of Geophysics and Planetary Physics, UCLA, [3]Department of Physics, University of Alberta, Edmonton, AB, [4]Department of Physics, Siena College, Loudonville, NY

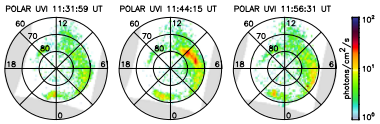
SM53A-1649
Magnetospheric Response to Solar Wind Discontinuities

Introduction and Previous Work

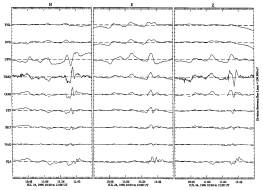
- *Sibeck et al.* [1998, 1999], *Sitar et al.* [1998] and *Weatherwax et al.* [1999] reported the ionospheric and magnetospheric responses to a hot flow anomaly (HFA)

These responses included:

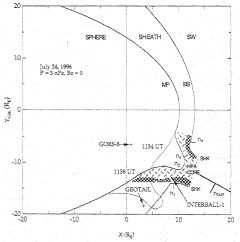
- Brightening of the dayside pre-noon aurora



- Magnetic signatures of traveling convection vortices (TVCs) consisting of up and down field-aligned current (FAC) pairs

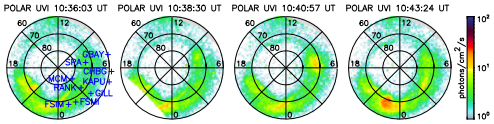


- Large deformation of the magnetopause

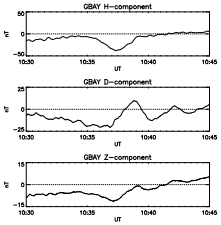


New results

- Recently, *Eastwood et al.* [2008] reported THEMIS spacecraft observations of an HFA
- Here, we report the ionospheric and magnetospheric response to the HFA using Polar UVI auroral images, THEMIS Ground Based Observatory (GBO) magnetometer data, and Antarctic magnetometer and photometer data



Polar UVI images from the Southern Hemisphere. The first image shows the mapped positions of the ground stations. The dayside pre-noon aurora brightens at 10:38:30 UT (2nd image). The region of emission brightens, grows, and moves anti-sunward.

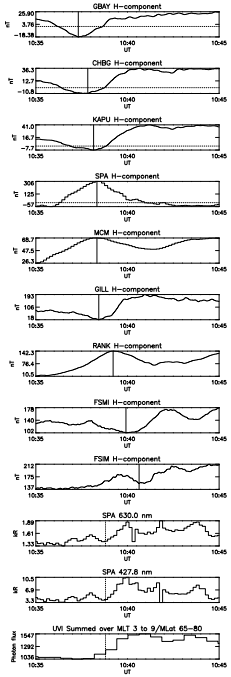


Magnetometer data from Goose Bay (GBAY) in eastern Canada (at 07 local time) showing signatures of a TVC. Similar signatures are seen at other stations.

Station	Mapped Latitude	Mapped Local Time[a]	Time of maximum H deflection[b] (UT)
GBAY	-60.2	7.01	10:37:19
CHBG	-59.1	5.74	10:37:50
KAPU	-59.4	4.96	10:38:09
SPA[c]	-74.0	6.76	10:38:20
MCM[c]	-79.9	3.35	10:38:20
GILL	-66.0	3.43	10:38:26
RANK[d]	-72.5	3.20	10:39:13
FSMI	-67.7	1.75	10:39:55
FSIM	-67.8	1.00	10:40:38

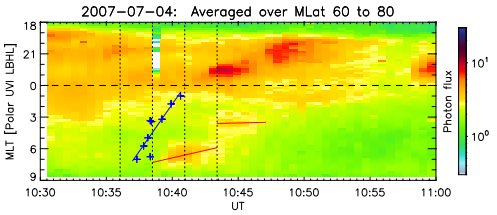
[a] Magnetic local time at 10:40:00 UT.
[b] Times for THEMIS GBOs are ± 1 second; times for Antarctic stations are ± 5 seconds.
[c] Antarctic stations.
[d] Mapping to the southern hemisphere is uncertain.

(Above) **Table** of the mapped locations of ground stations and times of maximum H deflection.



(Right) **Magnetometer**, **photometer**, and **UVI data**. Vertical solid lines mark times of maximum H deflection; dotted lines mark time of onset of auroral brightening.

Analysis



- **Local time keogram of UVI data** shows initial brightening occurs at 10:38:30 UT near 08 LT and 75° latitude. The region of emission moves anti-sunward at a speed of 0.29 hours of MLT per minute ≈ 2.7 km/s (red line). Five minutes later, the emission jumps to 04 LT and slows to 0.027 hrs/min (second red line).
- Blue pluses (+) show the UT and LT of ground stations at times of maximum H deflection. The best-fit line indicates a speed of 1.8 hrs/min ≈ 17 km/s over ~ 3000 km in the ionosphere – **6 X faster than the aurora**.

Conclusions

- HFA → magnetopause deformation → TCV
- *Expect* upward FAC → auroral emission: **No!**
- Speed of magnetic signatures (current) ≠ speed of aurora – *Why?* [*Luhr et al.*, 1996]
- **Decoupling** of FAC and auroral emission Does **ionospheric conductivity** play a role? TCV observed in NH; aurora observed in SH
- Is substorm at ~ 10:42 UT related to HFA?