# Coordinated observations of dayside polar cap flow channels by all-sky imagers and DMSP

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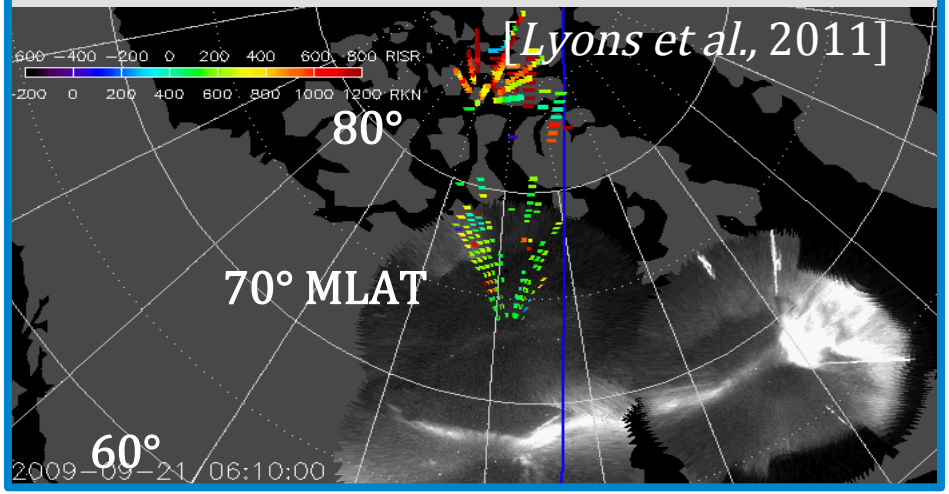
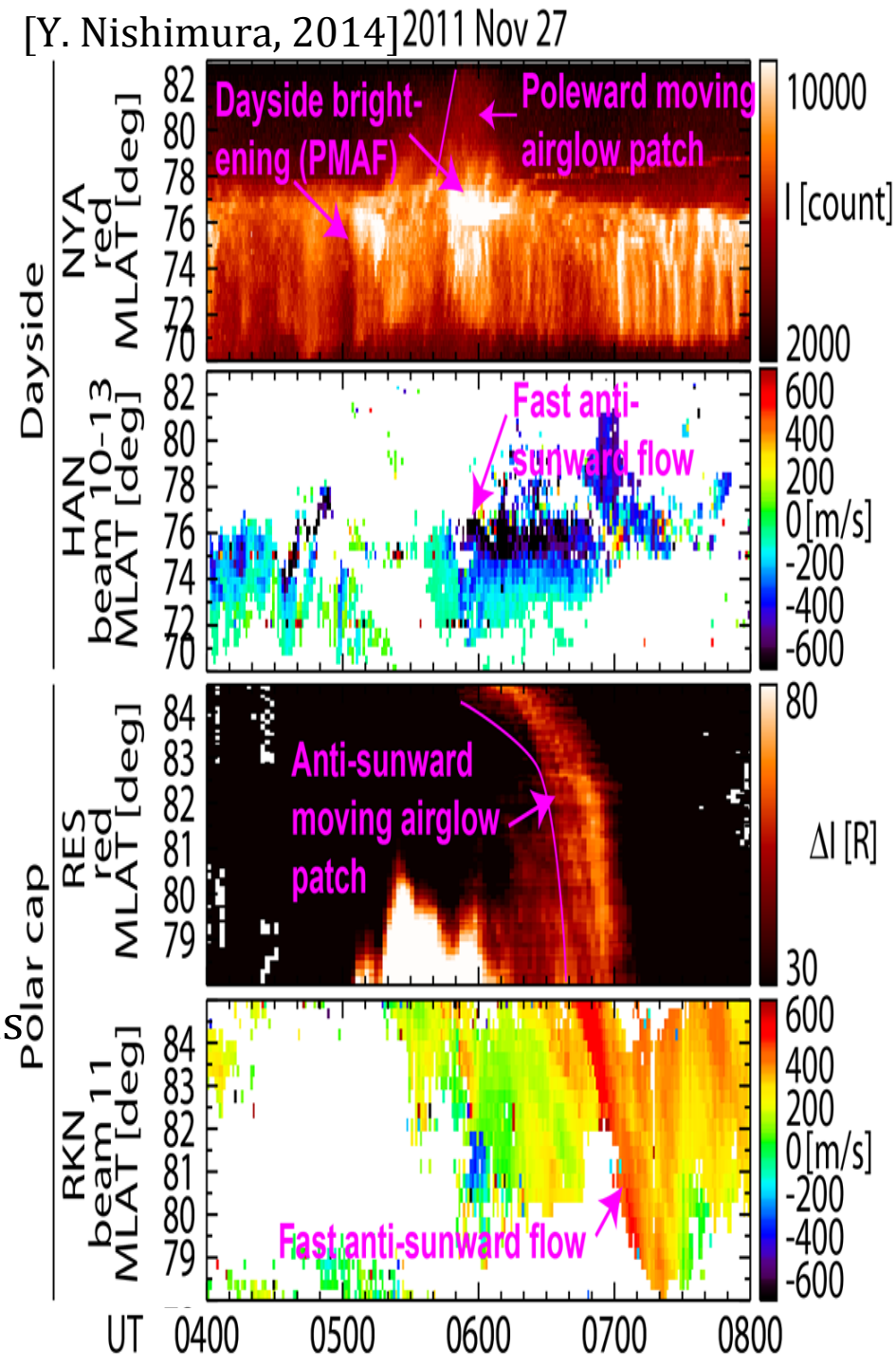
# Introduction & Motivation

**1. Two Cell Convection (Large-Scale)**
Size: >~ 1000 km (Larger)
Flow Speed : >~100 m/s (Slower)

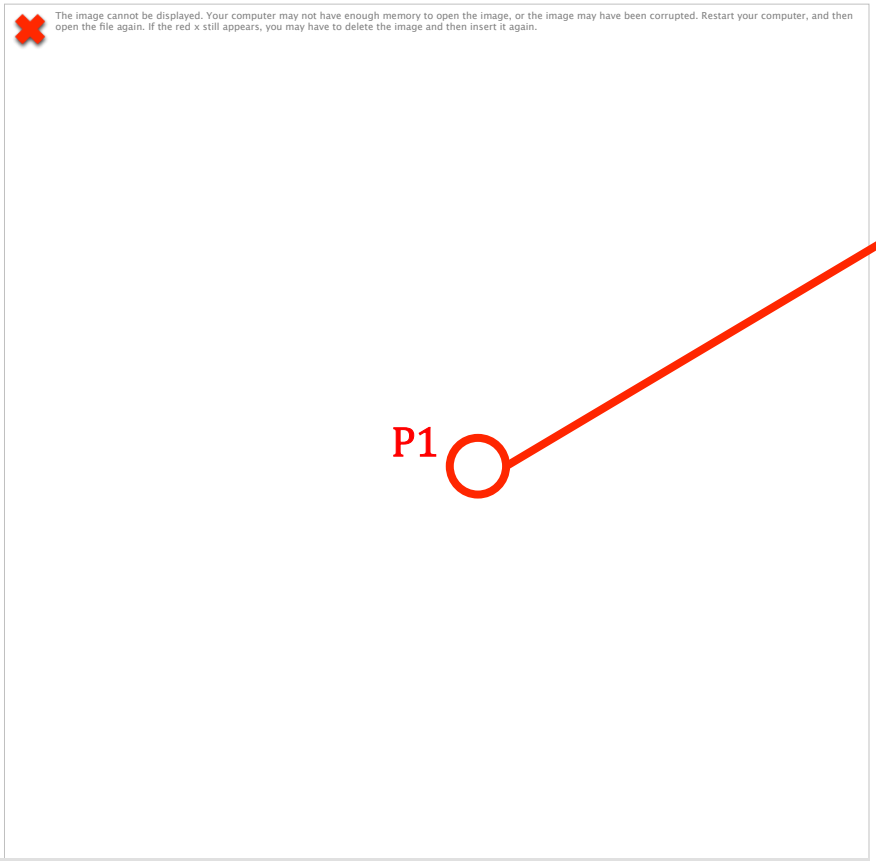
**2. Fast Localized Flow (Meso-Scale)**
Size: >~ 100 km (Smaller)
Flow Speed : 500~1000 m/s (Faster)




Previous works have revealed the night side airglow patch-auroral connections. It is crucial to understand how those polar cap flows/patches are created and propagate deep into the polar cap. To achieve this goal, we are studying dayside polar cap patches and related flow structures.



# Instruments



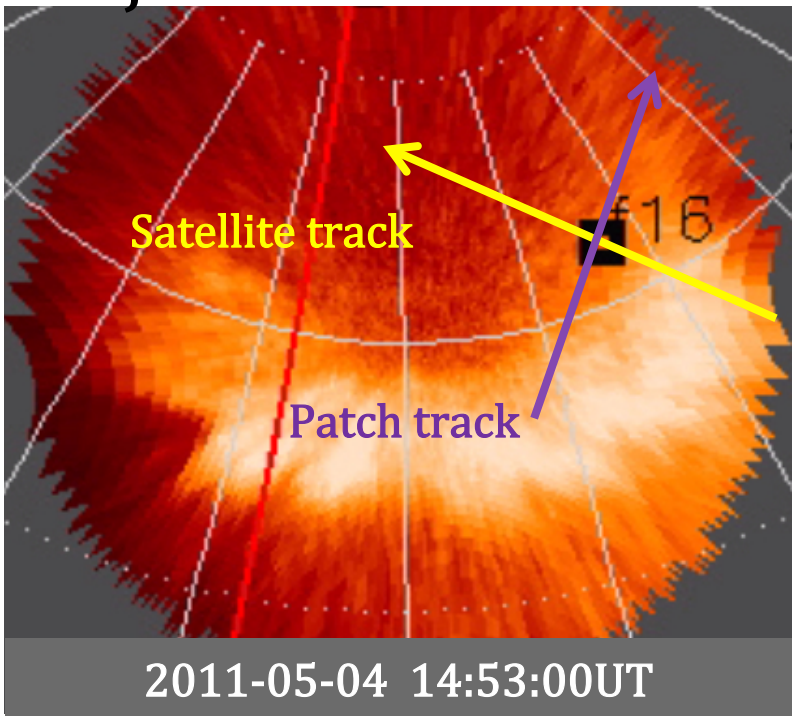

DMSP: Satellite Observation

**AGO** (Automatic Geophysical Observatories) are Currently operating in **Antarctica.**

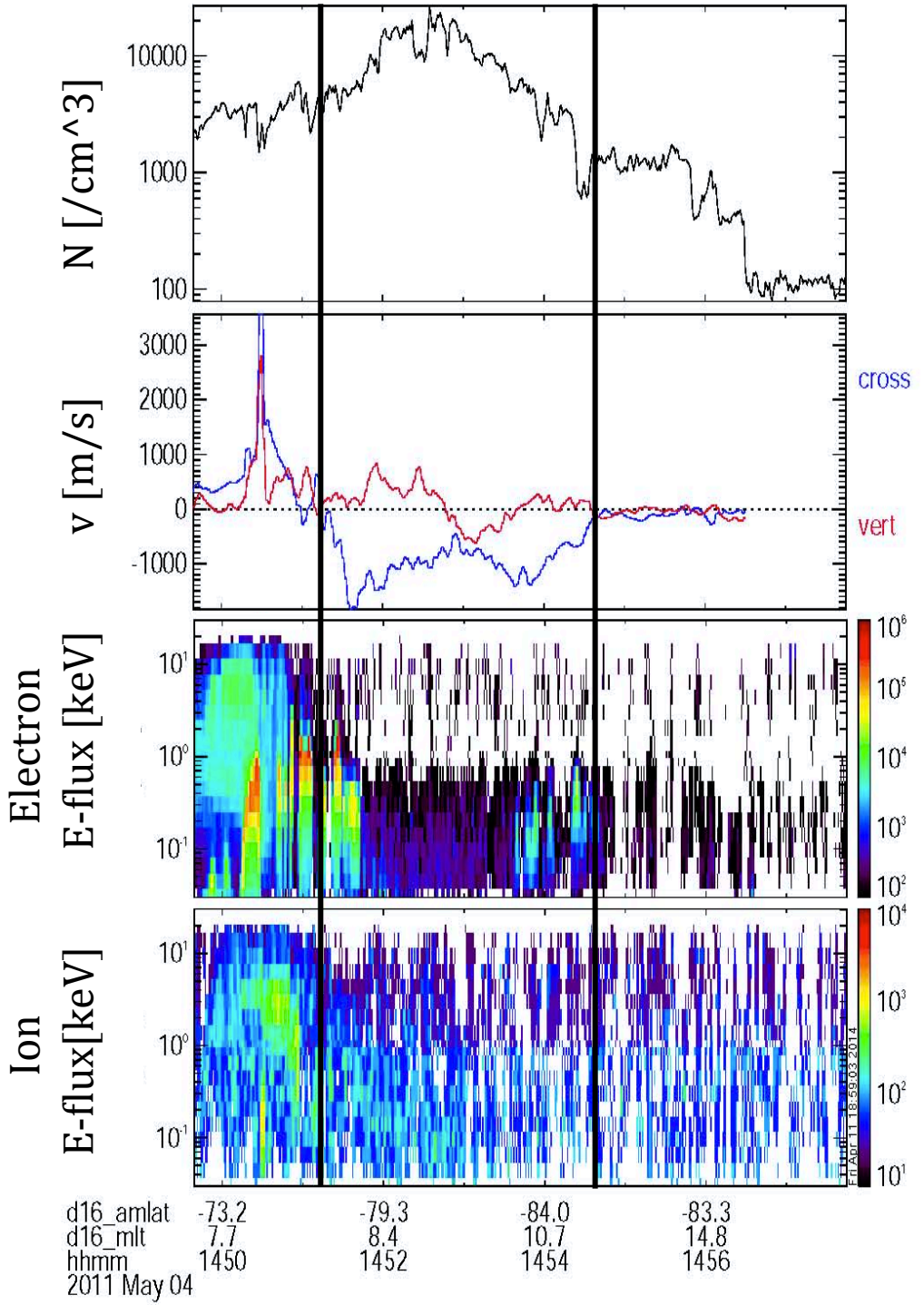
**DMSP** provides density, velocity and energetic particle measurements from polar orbits that are sun-synchronous at the altitude of 830 km.

# Observations: Polar Cap Case:

## Conjunction with DMSP 16

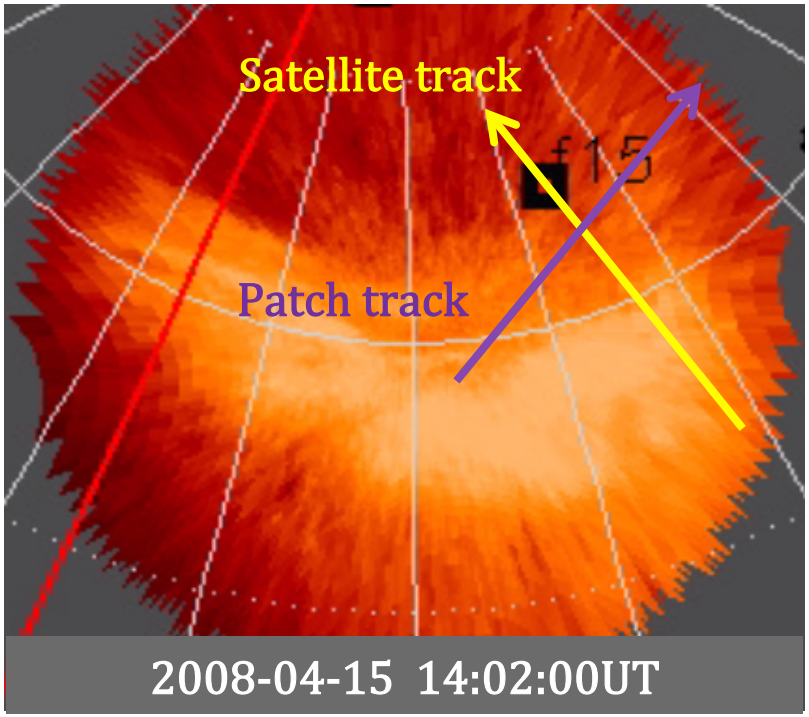



- ✓ The enhancement of density is associated with the enhancement of flow;
- ✓ The width of patch is similar to the width of fast flow.

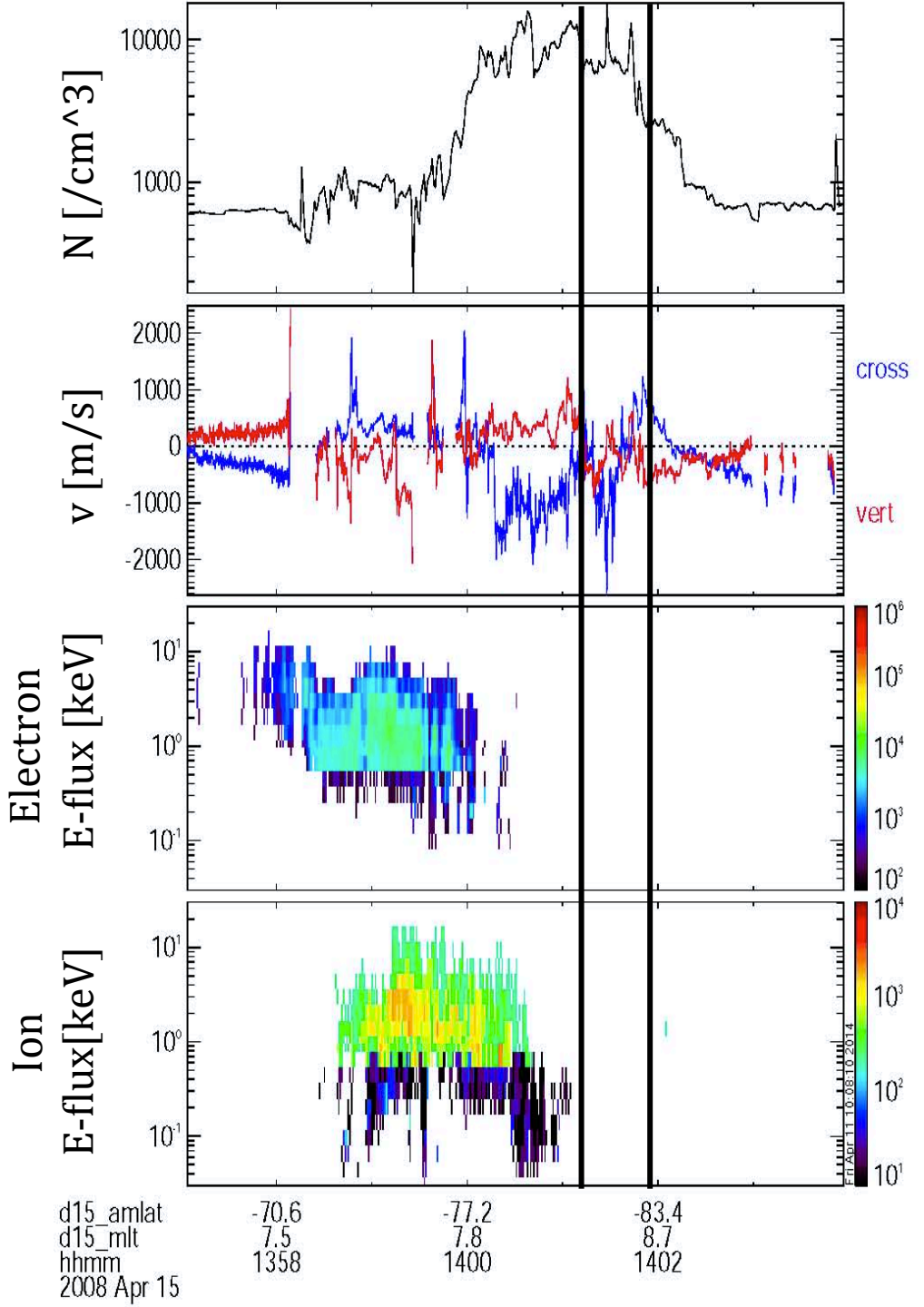


# Observations: Along Auroral Oval Case

## Conjunction with DMSP 15




- ✓ The enhancement of density is associated with the enhancement of flow;
- ✓ The width of patch is similar to the width of fast flow.



# IMF Condition:

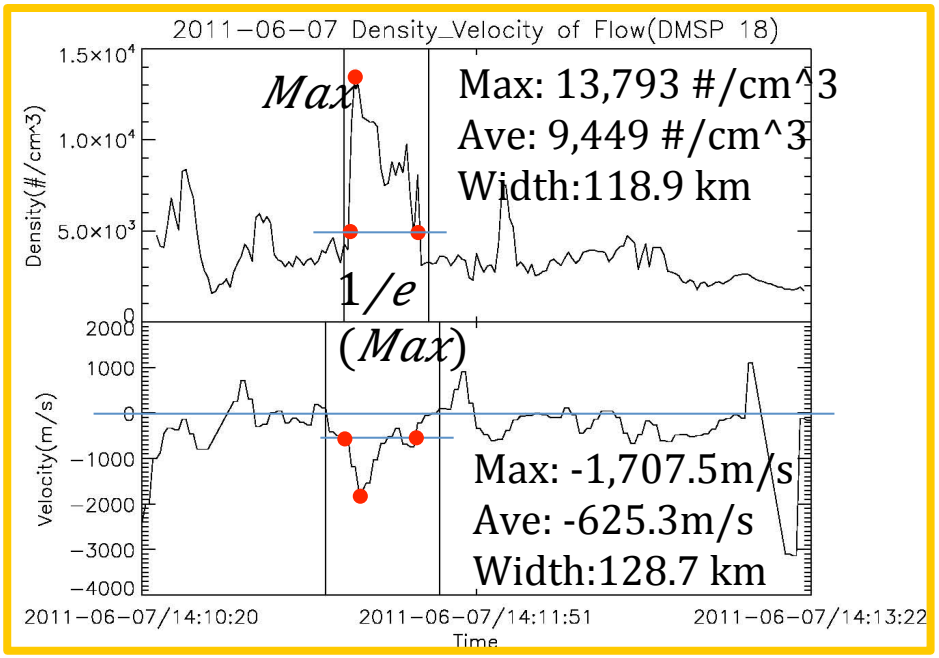
- ✓ Negative Bz will trigger reconnections on dayside magnetopause.
- ✓ Positive Bz will trigger KH Instabilities in LLBL.

## Examples of Conjunction Cases:

| Time when Patches occurred | Type | Region | Bz | By |
|---|---|---|---|---|
| 2011-05-04/11:31UT | Move into the polar cap | Dawnside | - | - |
| 2011-05-04/14:53UT | Move into the polar cap | Dawnside | - | - |
| 2008-04-15/12:20 UT | Move along the auroral oval | Dawnside | + | - |
| 2008-04-15/14:01UT | Move along the auroral oval | Dawnside | + | - |
| 2008-04-15/15:38 UT | Move along the auroral oval | Dawnside | + | - |

Lyons [1996] pointed out that for large, negative By , the boundary between dawn and dusk convection cells is shifted toward dawn in the southern hemisphere.

# Statistical Results




**Fast Localized Flow (Meso-Scale):** Size: >~ 100 km ; Flow Speed : 500~1000 m/s

**Total Conjunction Time: 62**

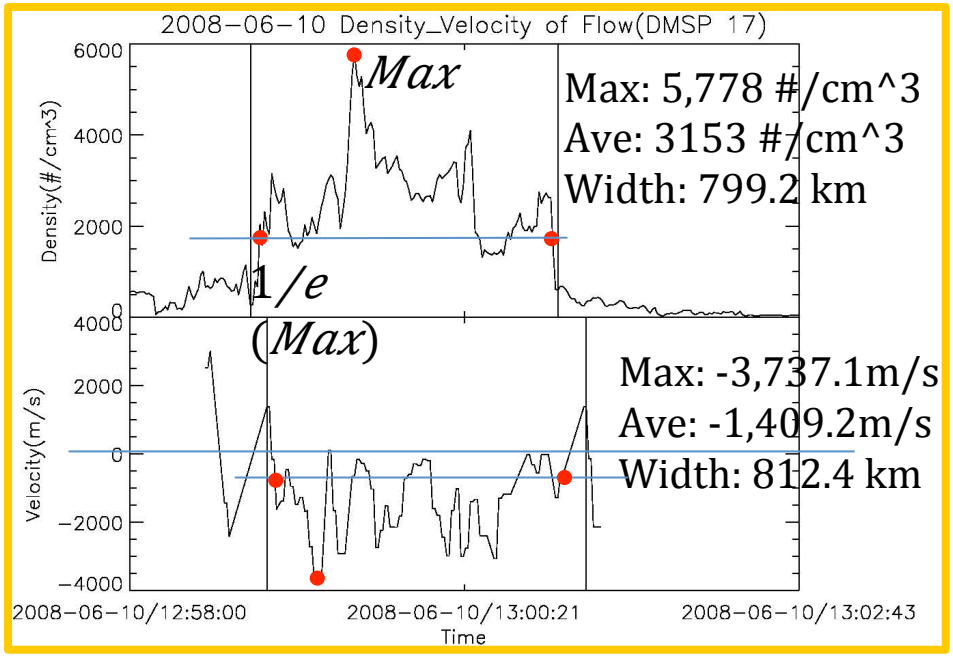
Average Width of Density: **~389.5 km**

Average Width of Flow: **~446.6 km**

→ **Similar Widths**

Average Velocity of Flow: **~776.0 m/s** → **Fast Localized Flow**

- ✓ **These flows are belong to fast localized flow but not two cell convection;**
- ✓ **The widths of patches are similar to the widths of the corresponding fast flows.**


2008-06-10 Density_Velocity of Flow(DMSP 17)
Density(#/cm^3)
6000
4000
2000
0
Max
1/e
(Max)
Max: 5,778 #/cm^3
Ave: 3153 #/cm^3
Width: 799.2 km
Velocity(m/s)
4000
2000
0
−2000
−4000
Max: -3,737.1m/s
Ave: -1,409.2m/s
Width: 812.4 km
2008-06-10/12:58:00
2008-06-10/13:00:21
2008-06-10/13:02:43
Time