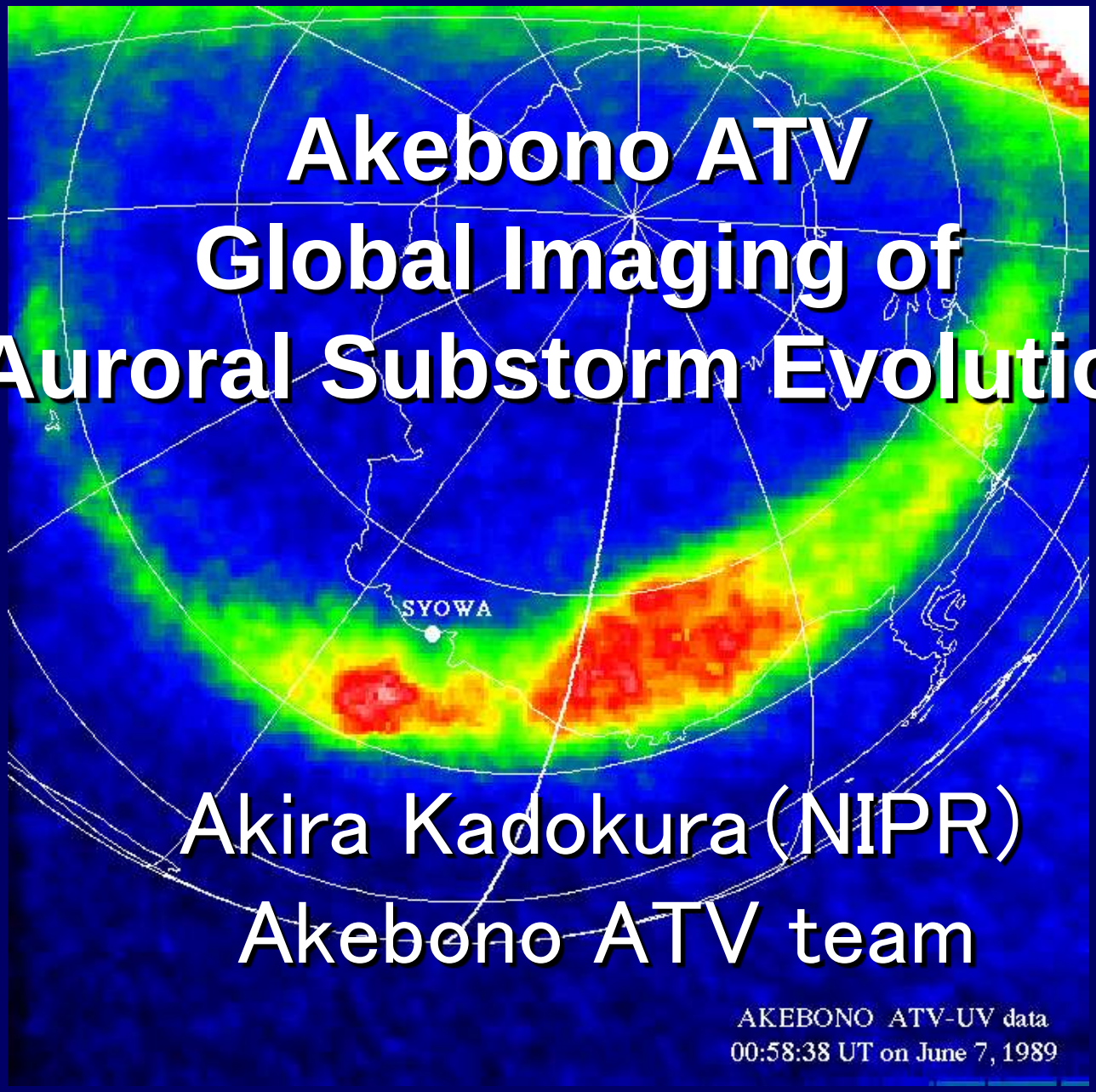
2010 年 11 月 22 日～24 日　あけぼの22周年記念シンポジウム　東京工業大学

Akebono ATV Global Imaging of Auroral Substorm Evolution



Akira Kadokura（NIPR）
Akebono ATV team

Akebono ATV

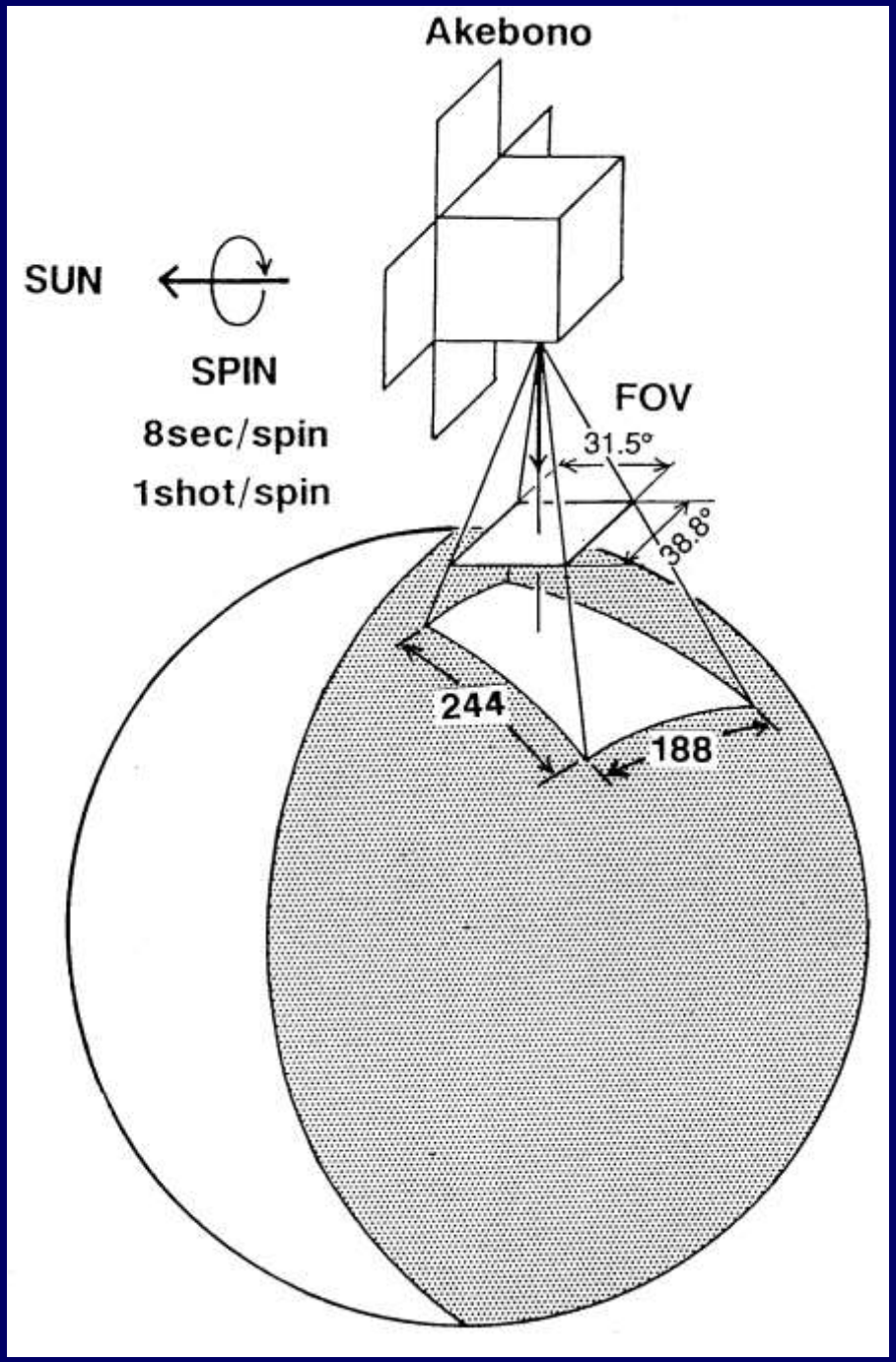
ATV	Wave length(nm)	CCD (pixel)	FOV (deg)	Exposure	Interval (sec)
UV	115-139	488x376	36x36	400ms	8
VIS	557.7	488x376	30x40	400ms	8

ATV	Data start	Data end
UV	Apr.12, 1989	Feb.28, 1990
VIS	May 1, 1991	Jan.28, 1993

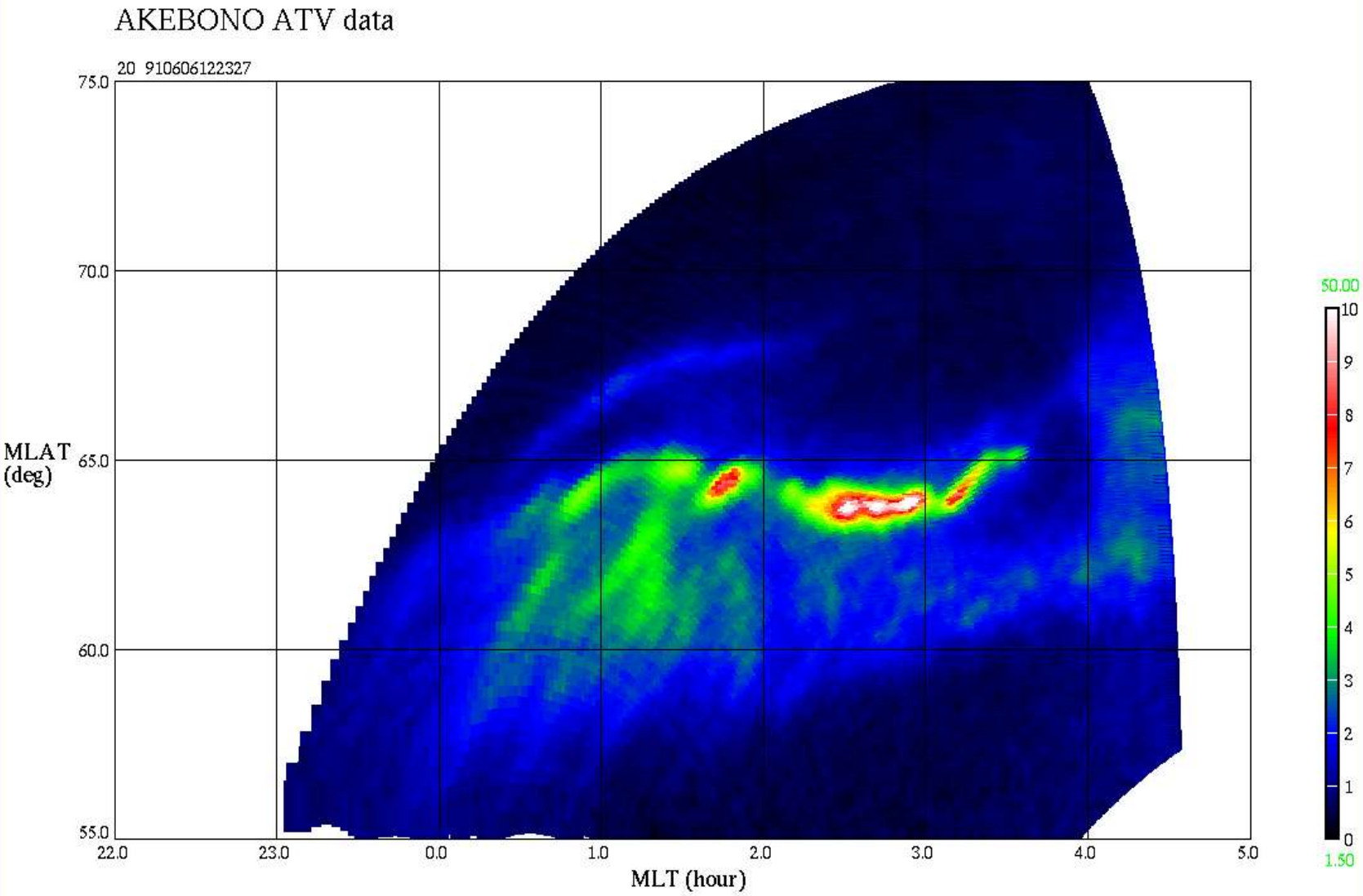
Akebono ATV

Normal operation:
8–8–8–40 sec
244 x 188 pixel

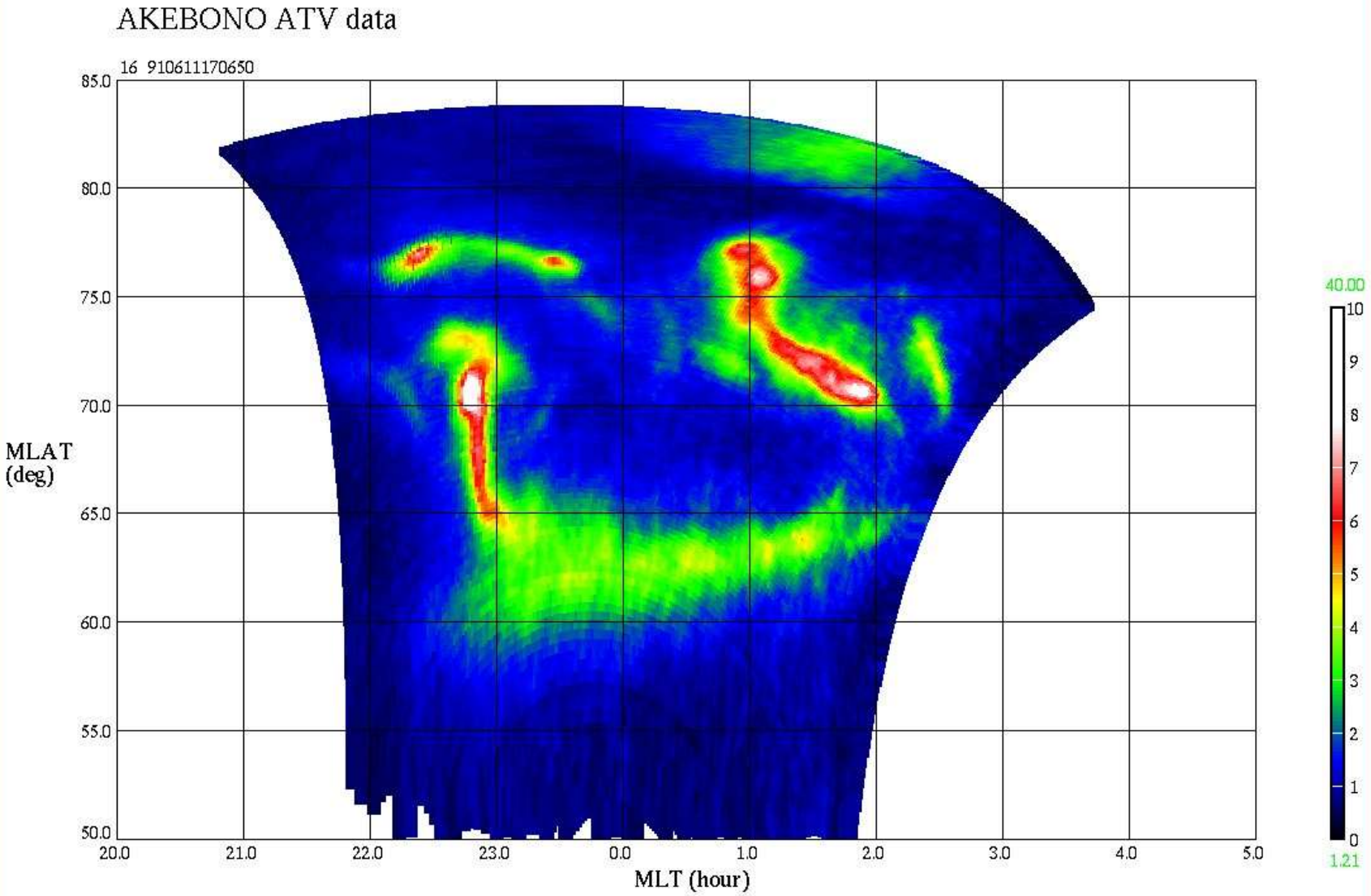
Ap: 10,500km
Pe: 274km



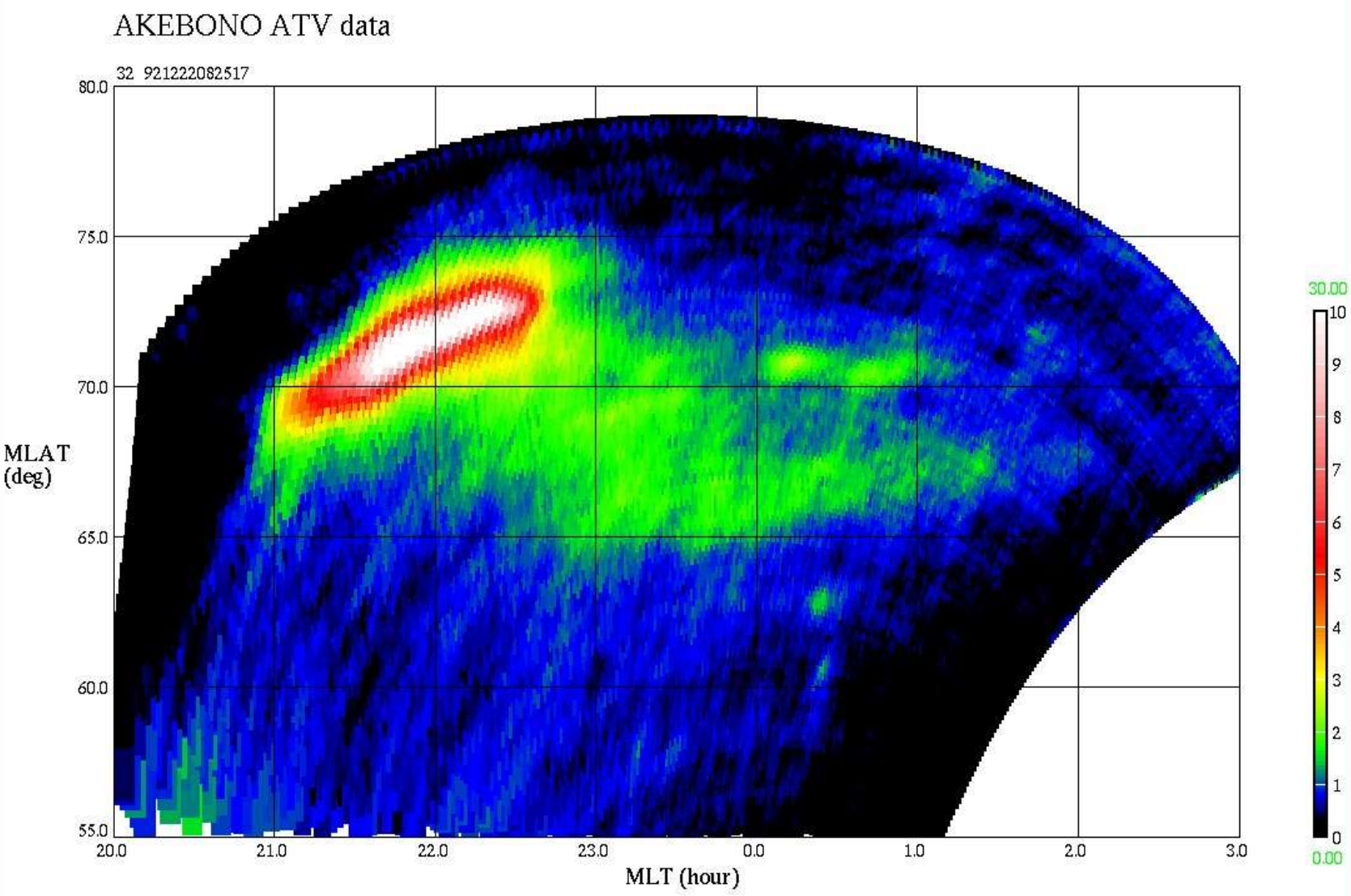
ATV-VIS observation-1



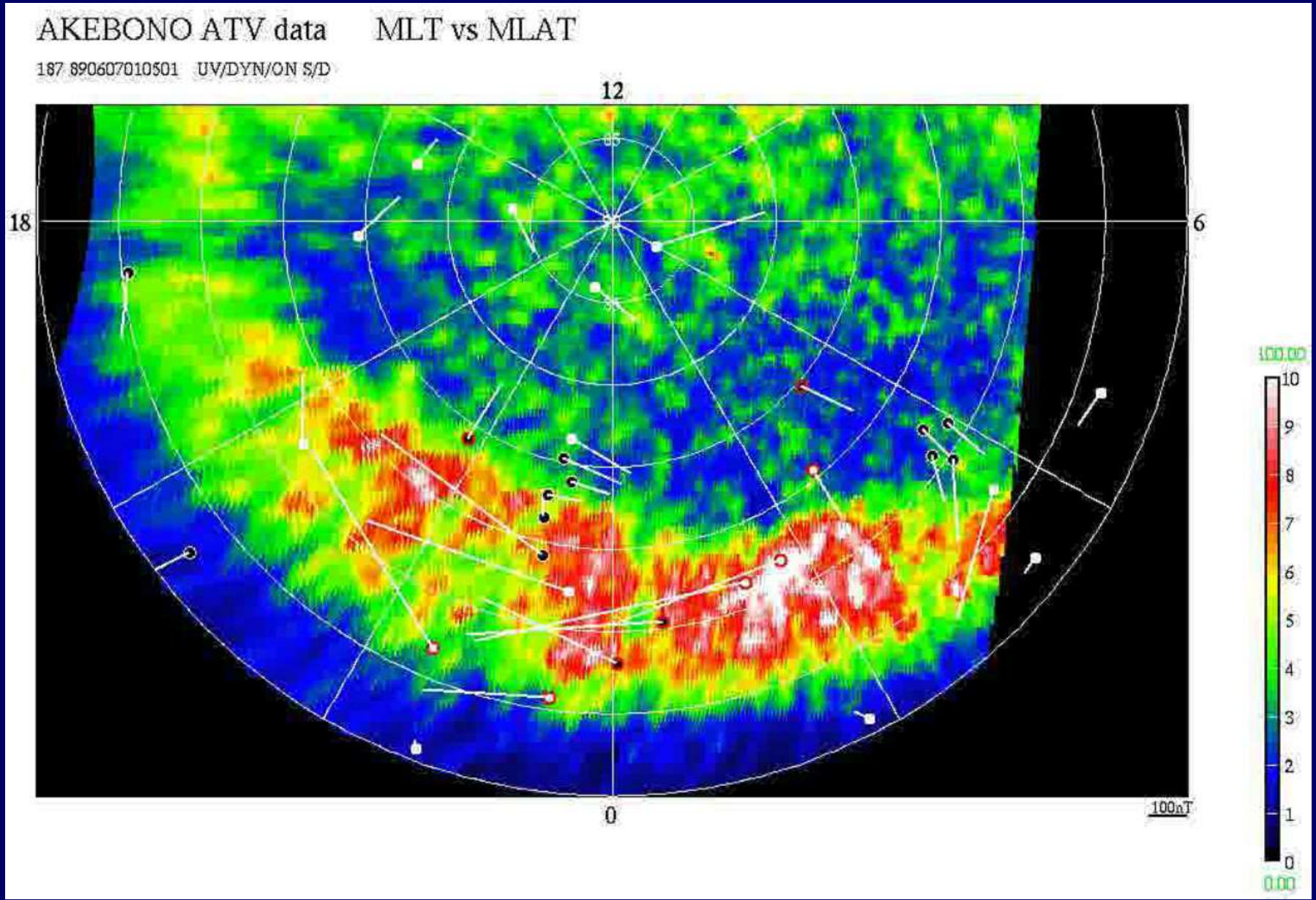
ATV-VIS observation-2



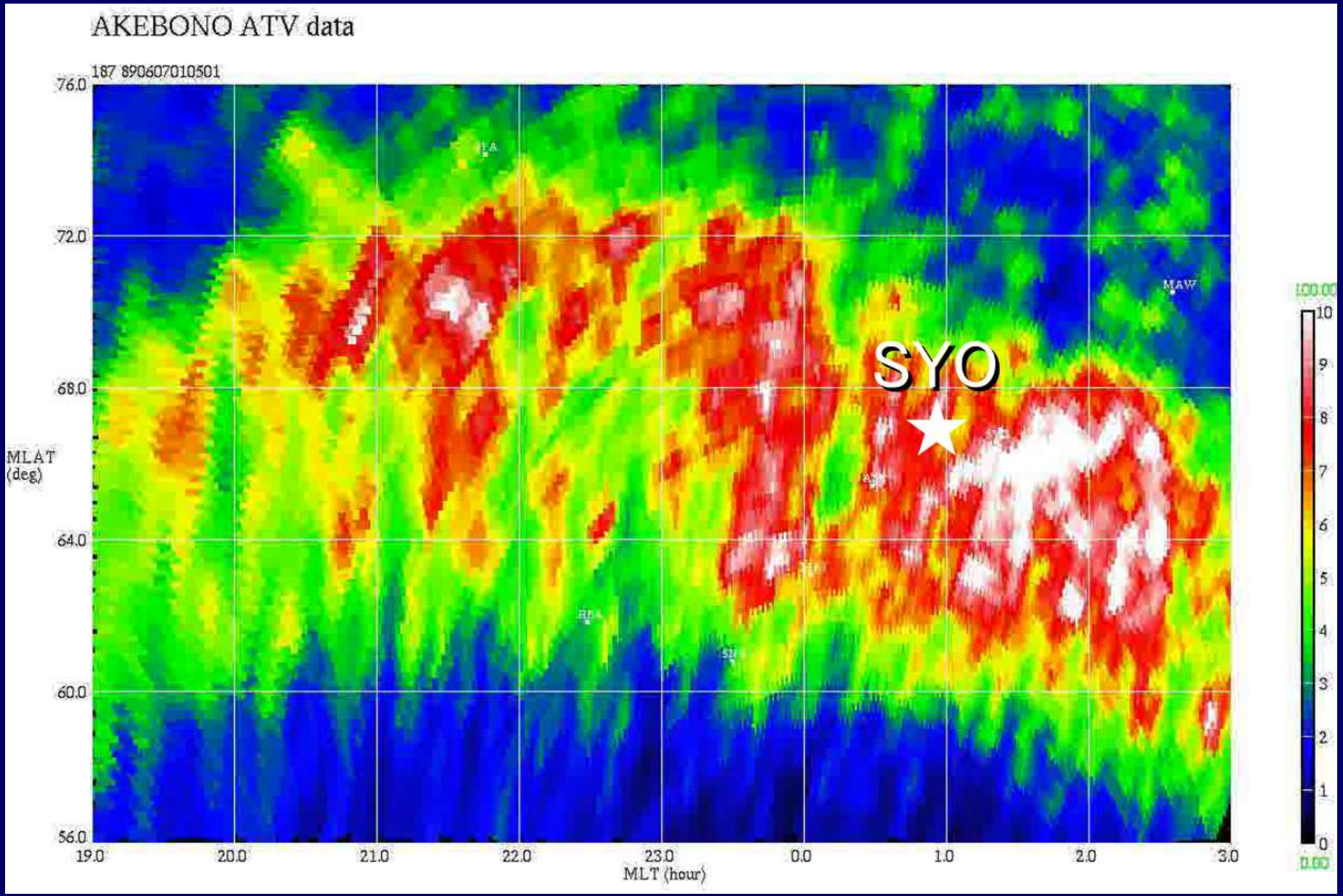
ATV-VIS observation-3



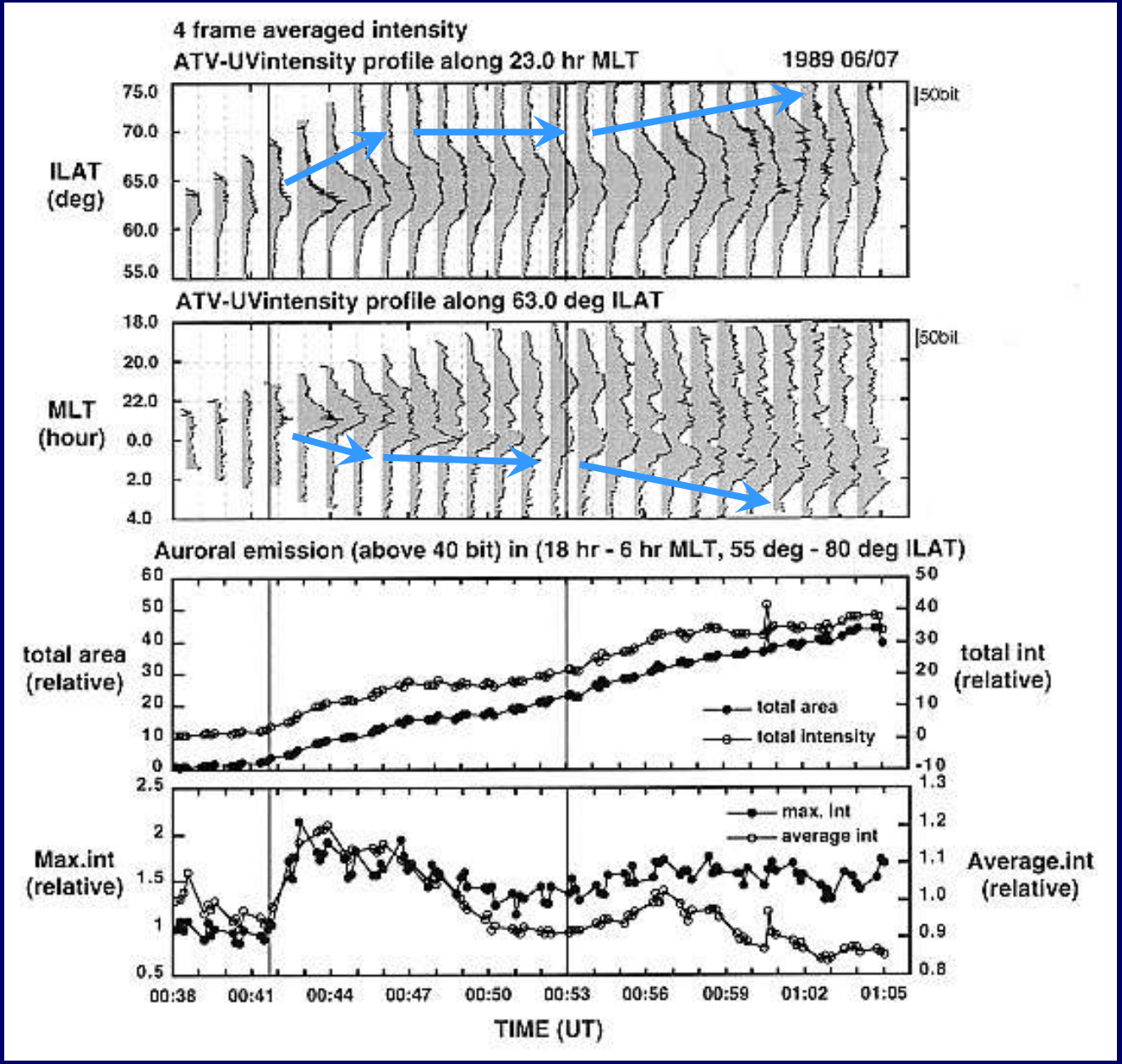
ATV-UV observation



ATV-UV observation

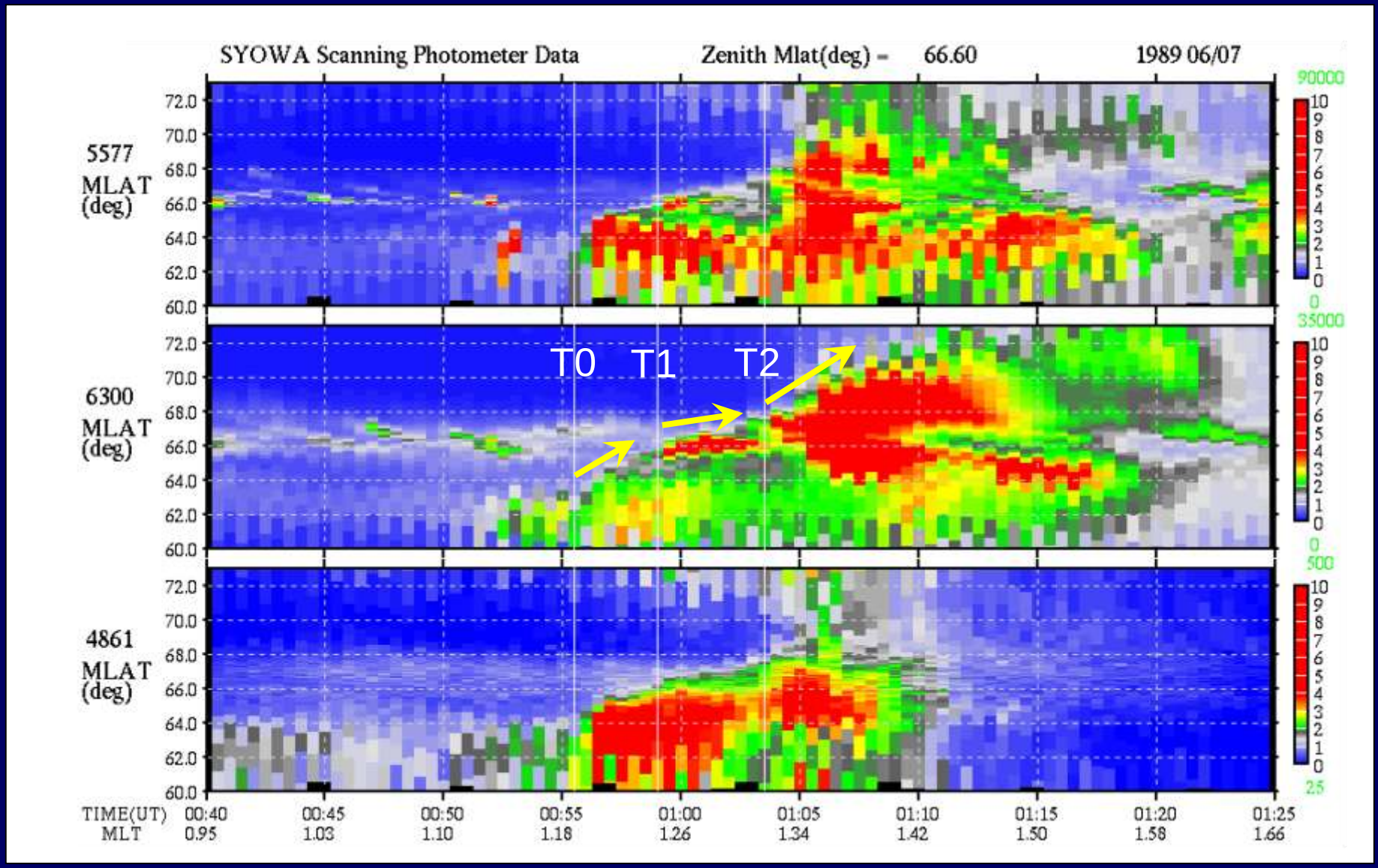


Stepwise Evolution of Auroral Bulge



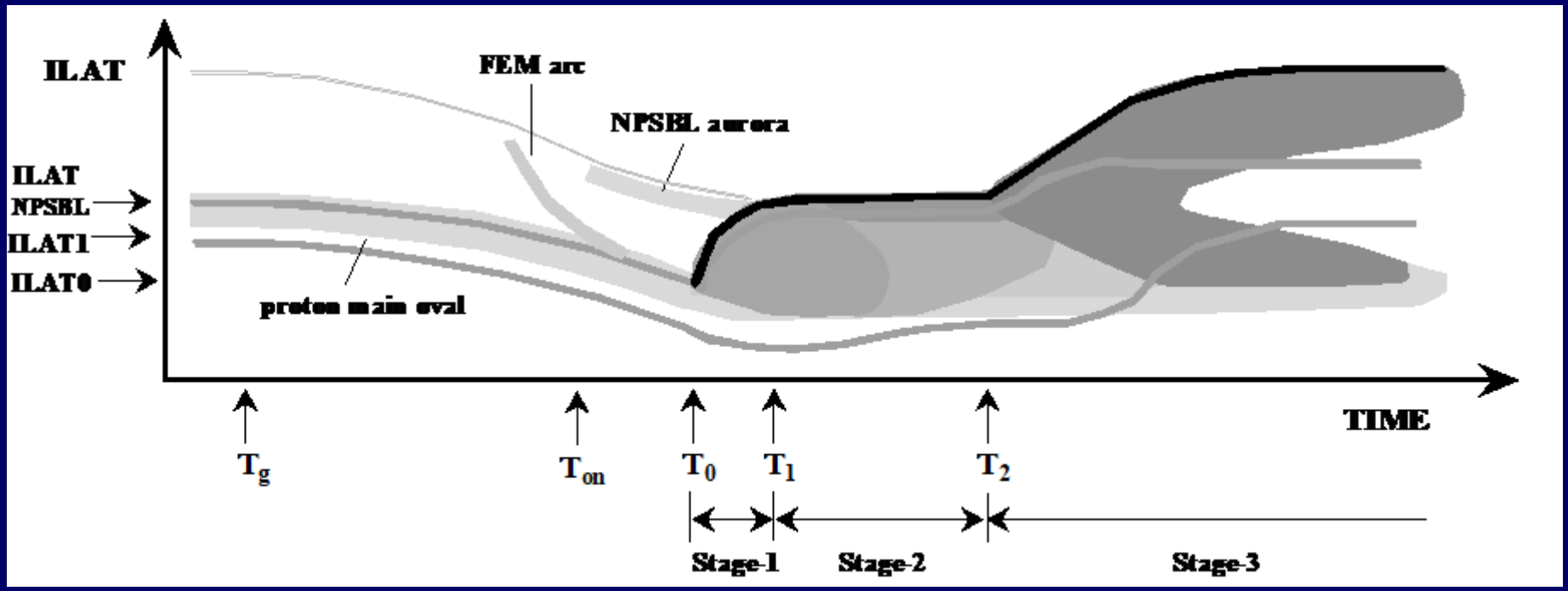
Stepwise Evolution of Poleward Expansion

Meridian Scanning Photometer at Syowa



Stepwise Evolution of Poleward Expansion

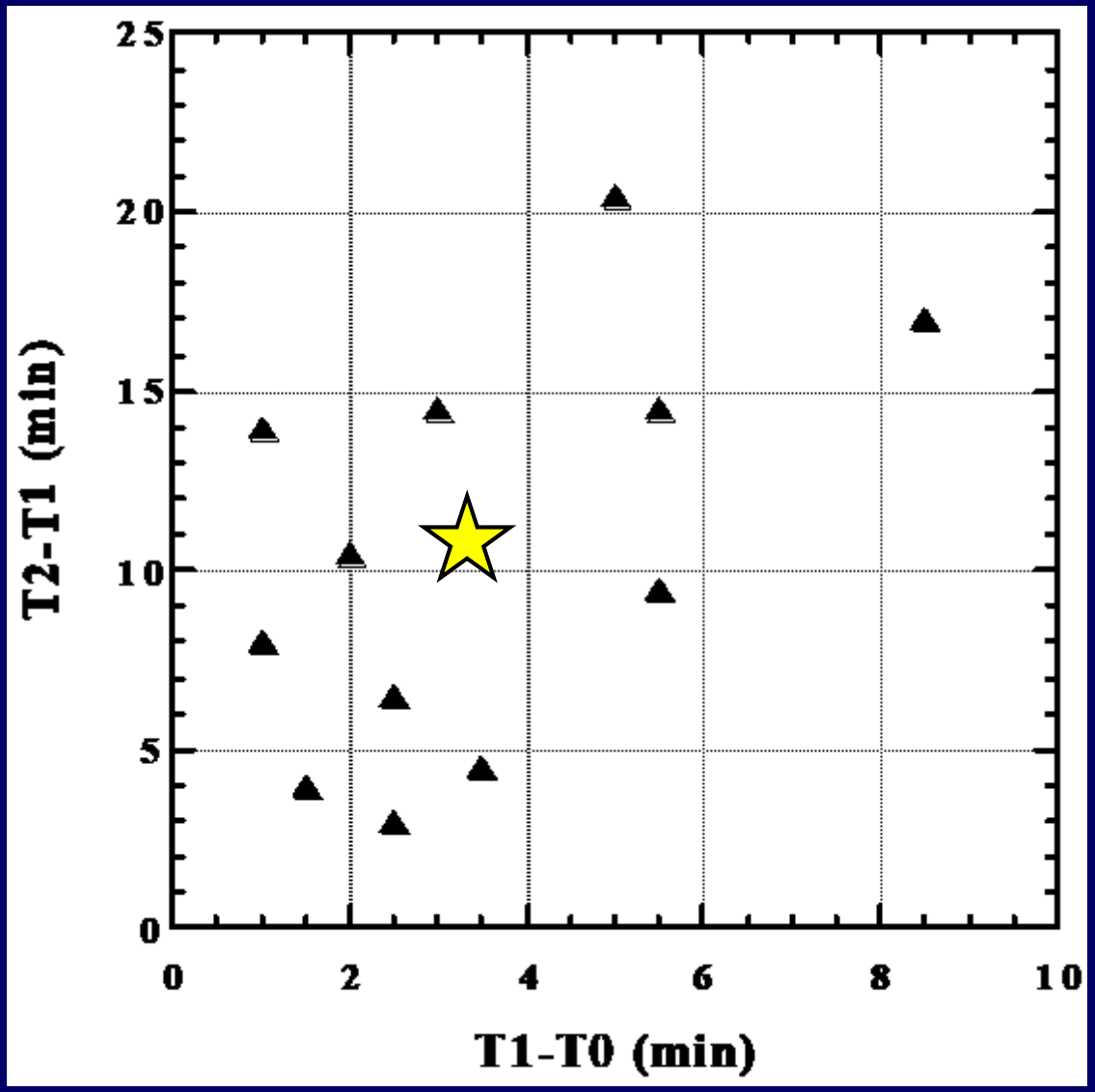
Features in MSP data



Stepwise Evolution of Poleward Expansion

For 12 events
in 1989
at Syowa Station

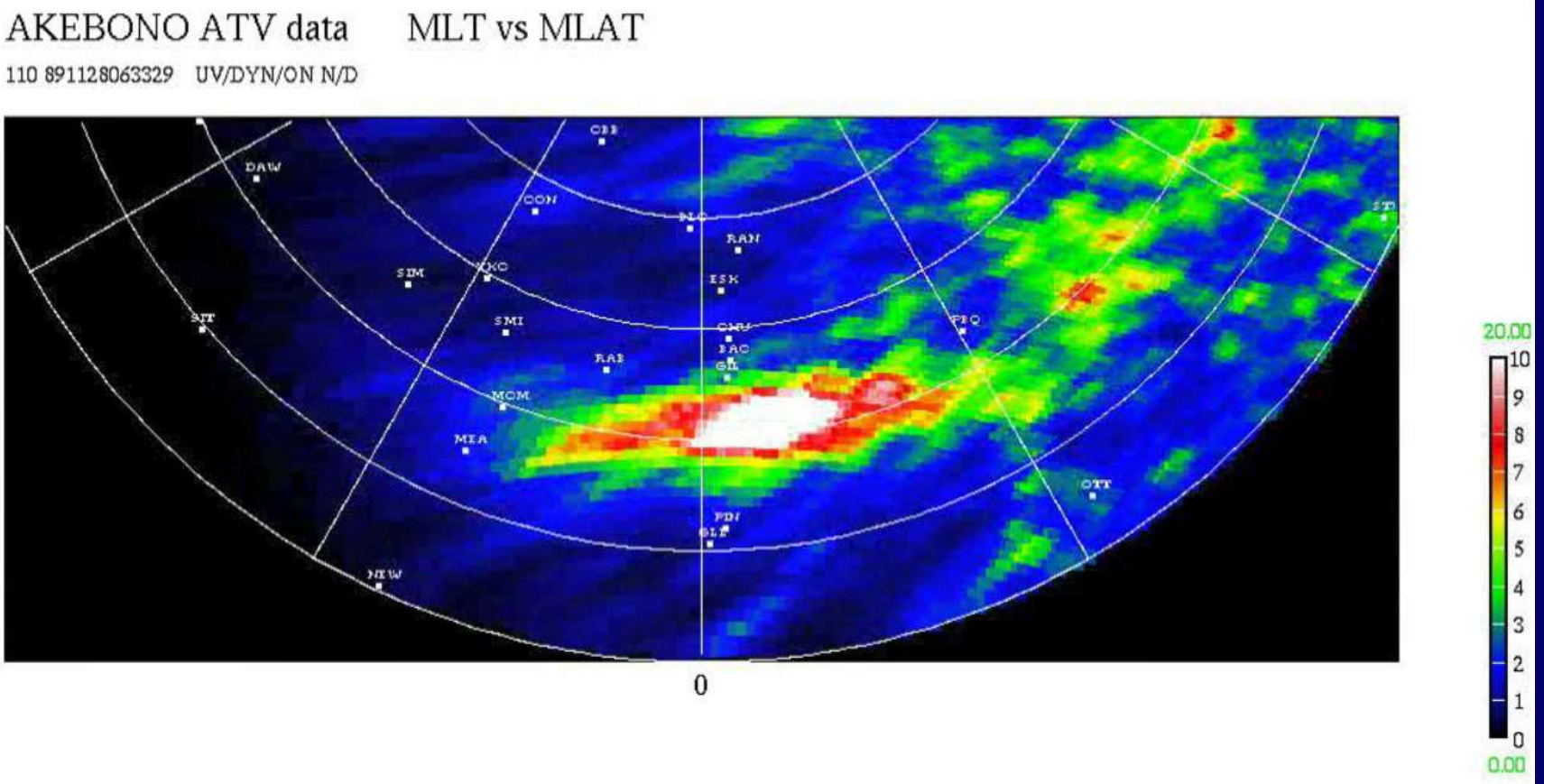
Average:
T1−T0 : 3.3 min
T2−T1 : 10.8 min



Stepwise Evolution of Poleward Expansion

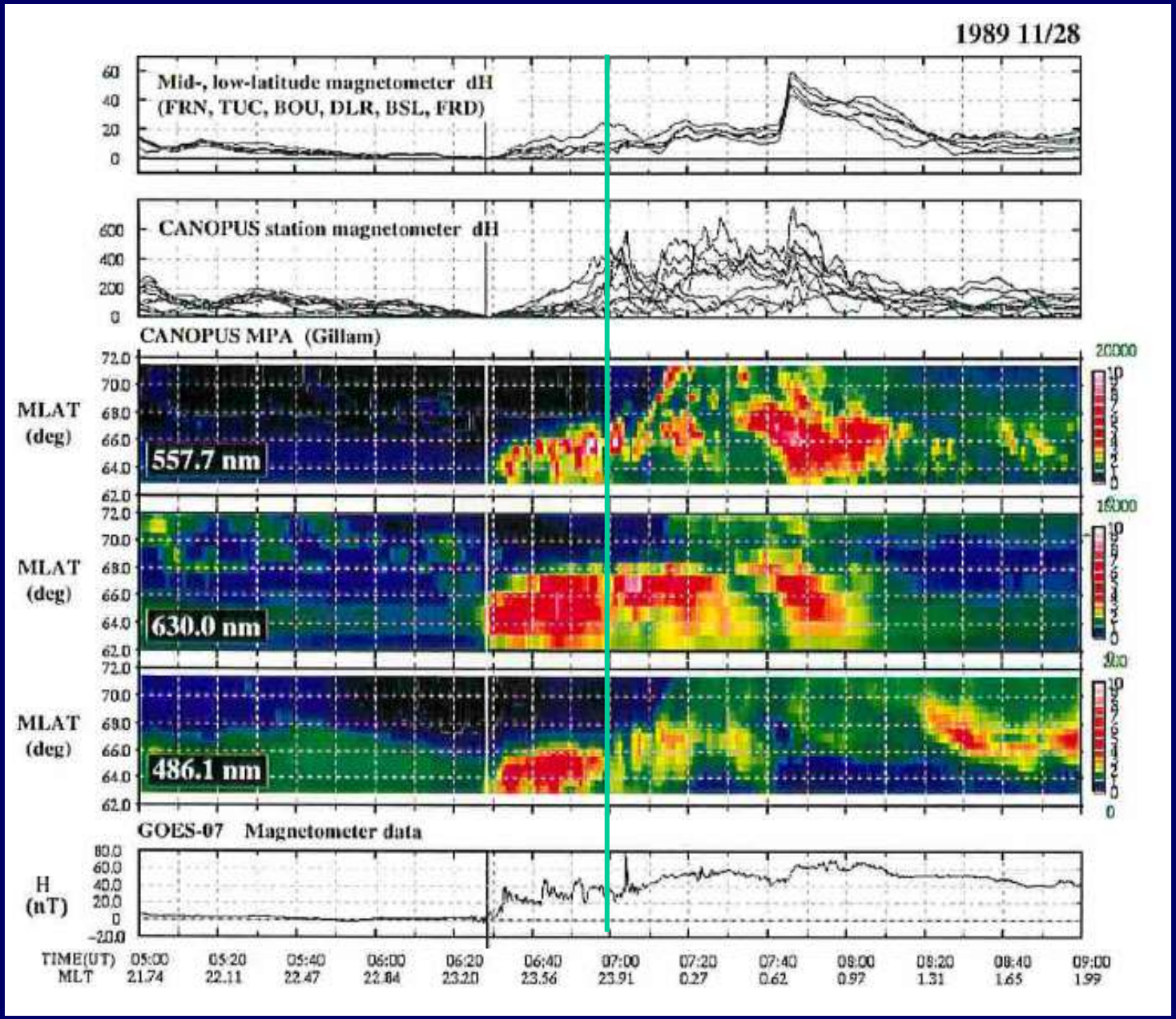
Onset near the CANOPUS sites

Nov. 28, 1989



Stepwise Evolution of Poleward Expansion

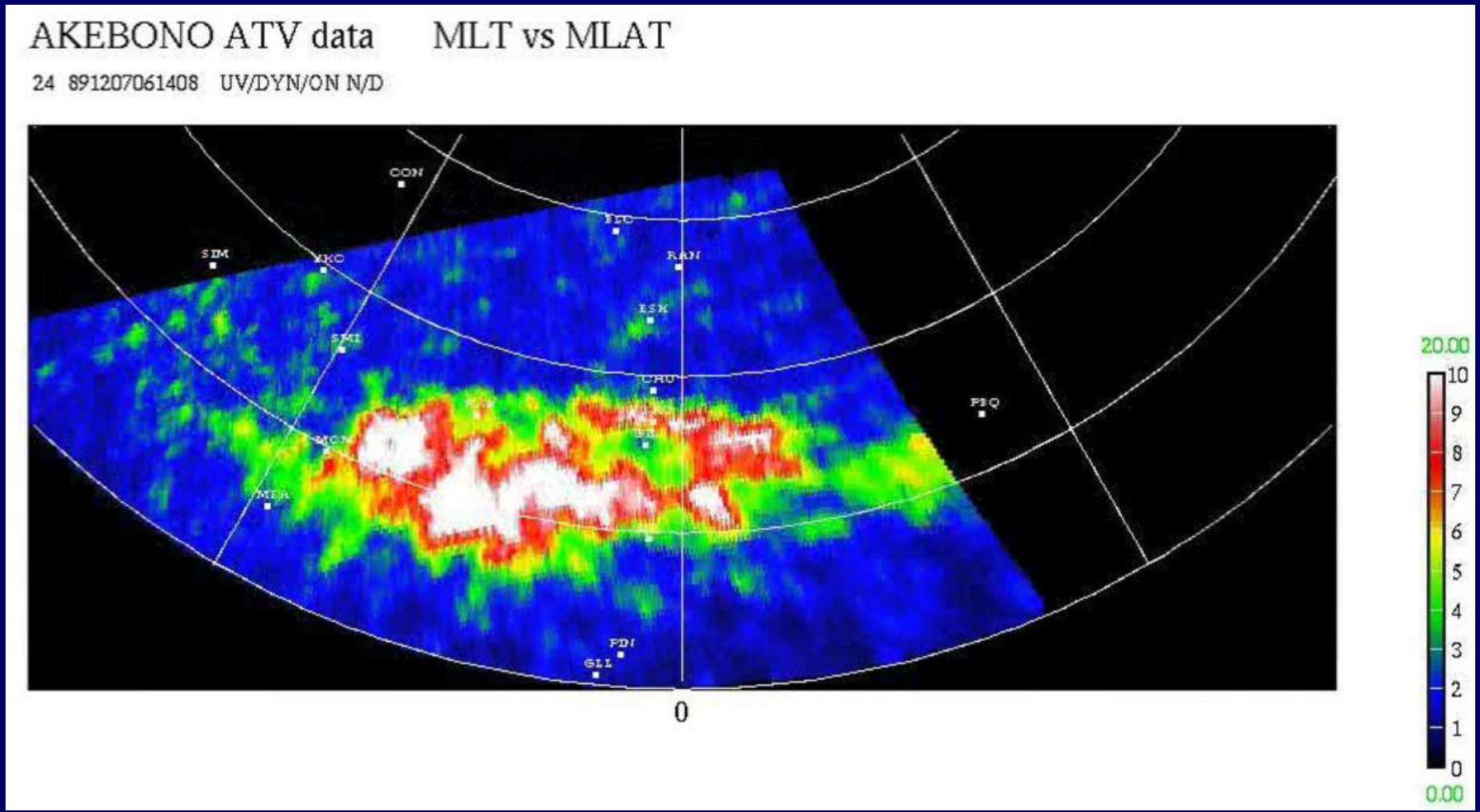
CANOPUS
Gillam
MPA data
Nov.28,
1989



Stepwise Evolution of Poleward Expansion

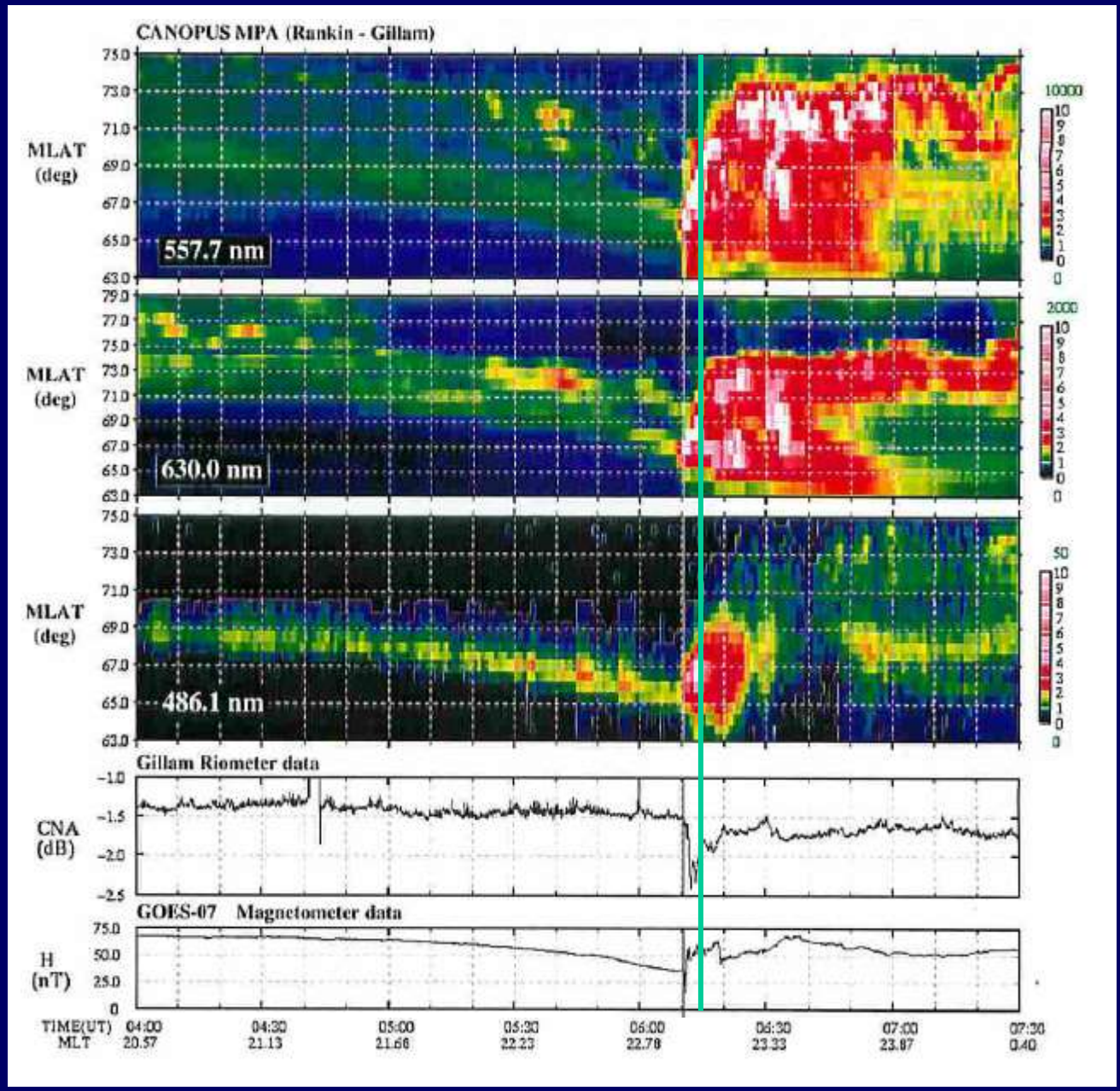
Onset near the CANOPUS sites

Dec. 07, 1989



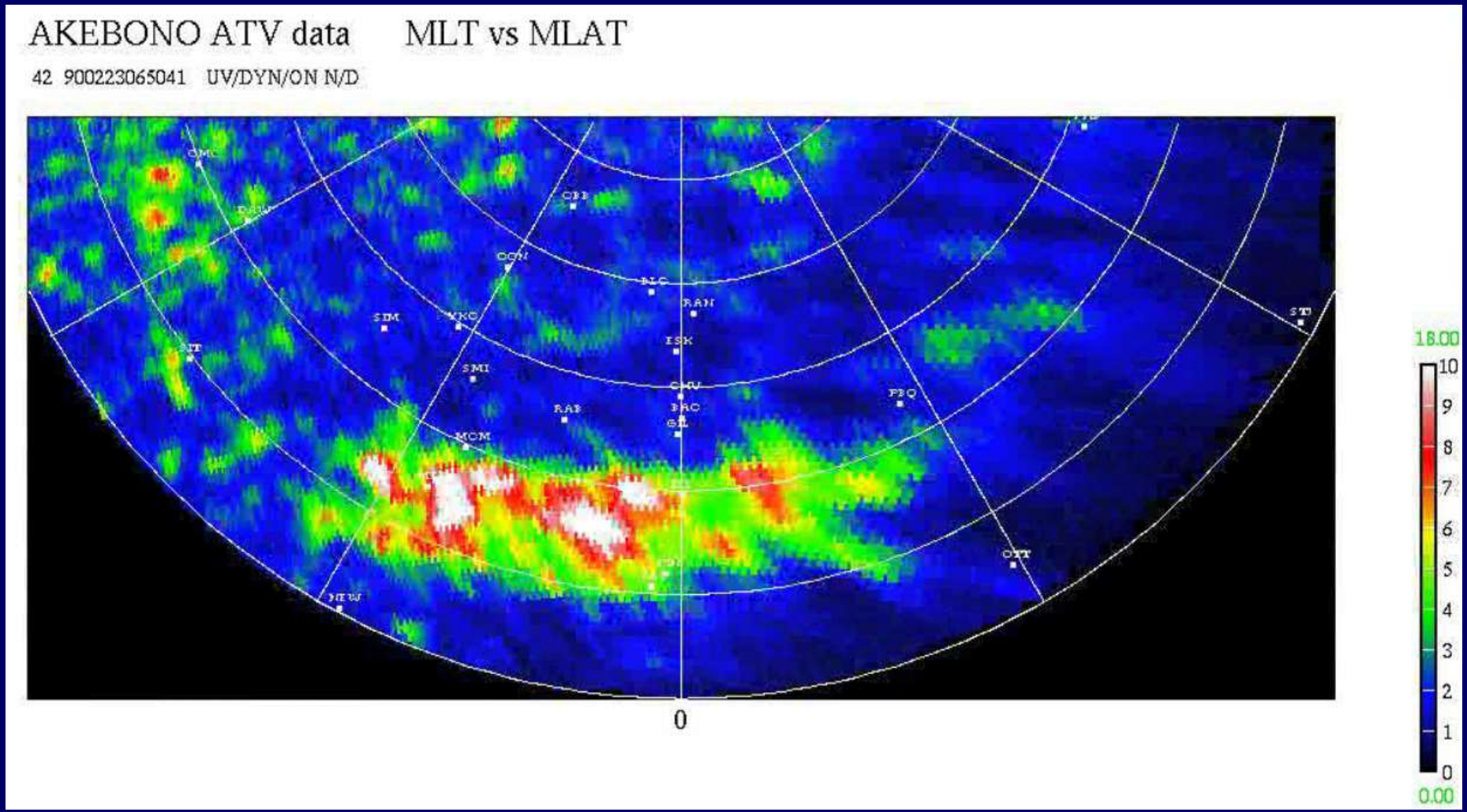
Stepwise Evolution of Poleward Expansion

CANOPUS
Rankin-Gillam
MPA data
Dec.07,1989



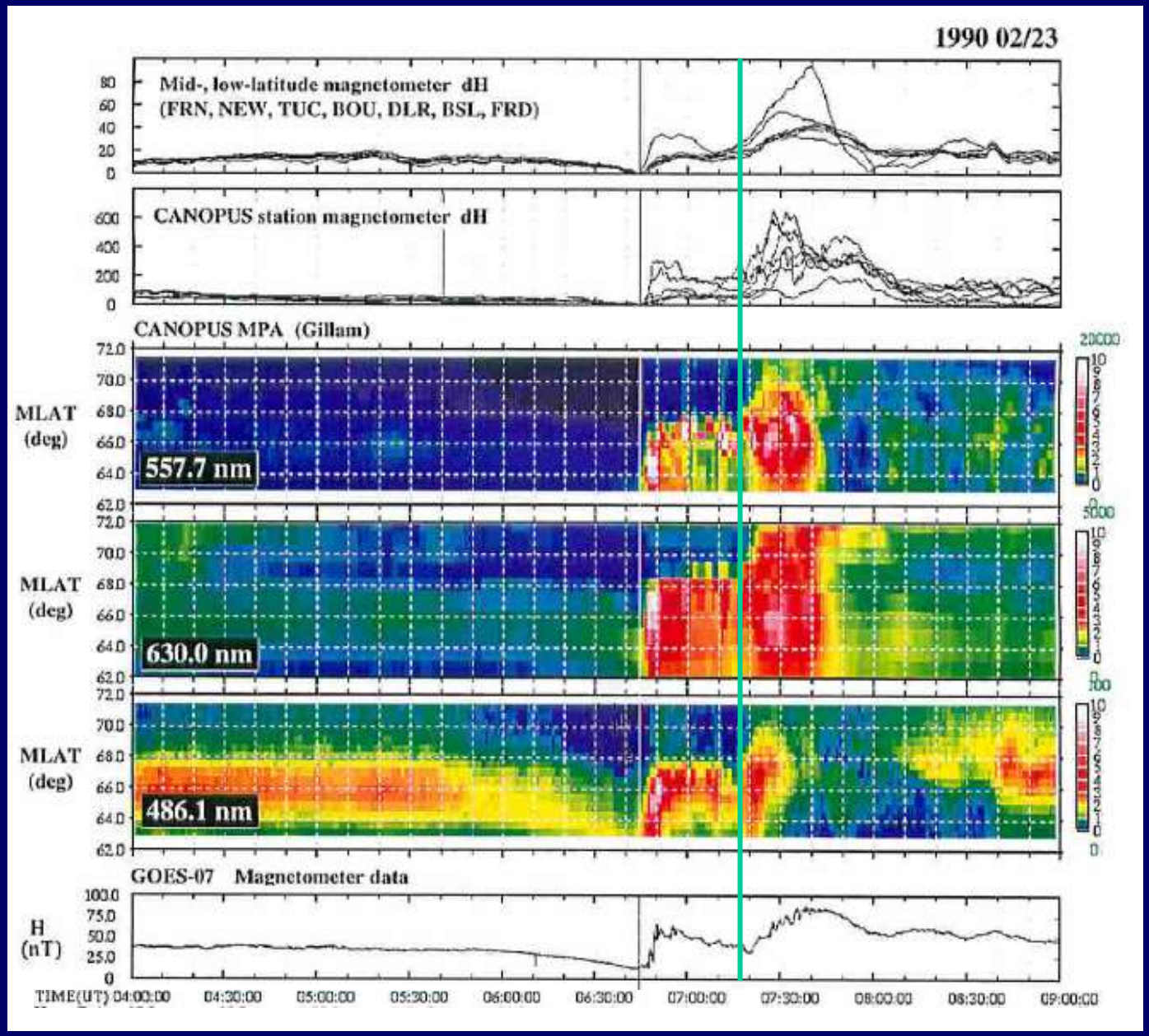
Stepwise Evolution of Poleward Expansion

Onset near the CANOPUS sites
Feb. 23, 1990



Stepwise Evolution of Poleward Expansion

CANOPUS
Gillam
MPA data
Feb.23,1990



Evolution of Auroral Bulge

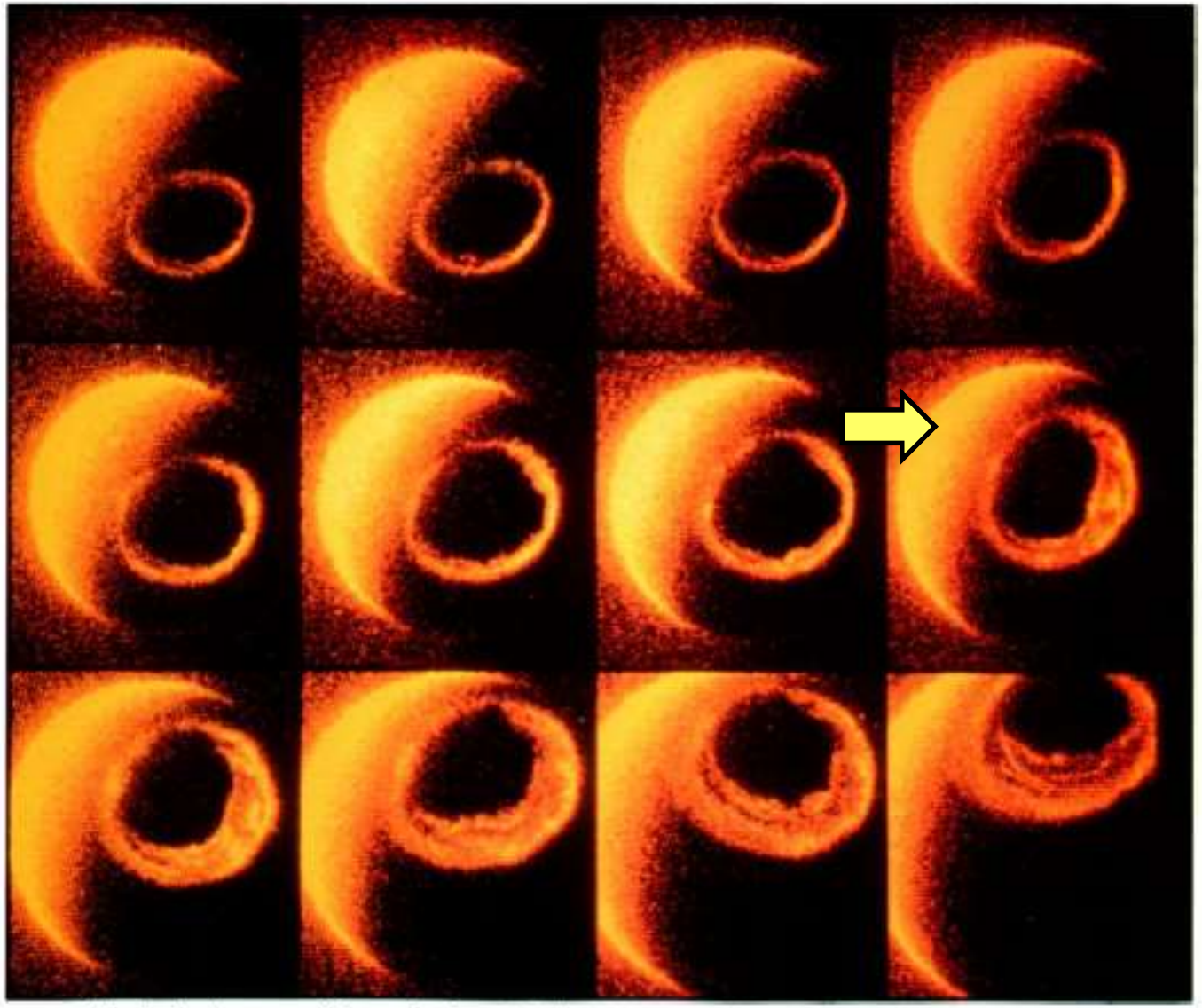


Plate 1. Imaging sequence of 12 consecutive frames displaying global auroral activity at ultraviolet wavelengths during a substorm on November 8, 1981. The 12-min imaging periods of the frames start 12 min apart, and the start time of the first (upper left) frame is 0719 UT. The onset of the substorm occurred at ~0719 UT and its maximum epoch, at ~0850 UT, occurred during the eighth frame (start time 0844 UT) [from *Craven et al.*, 1984]

DE-1

Δt = 12min

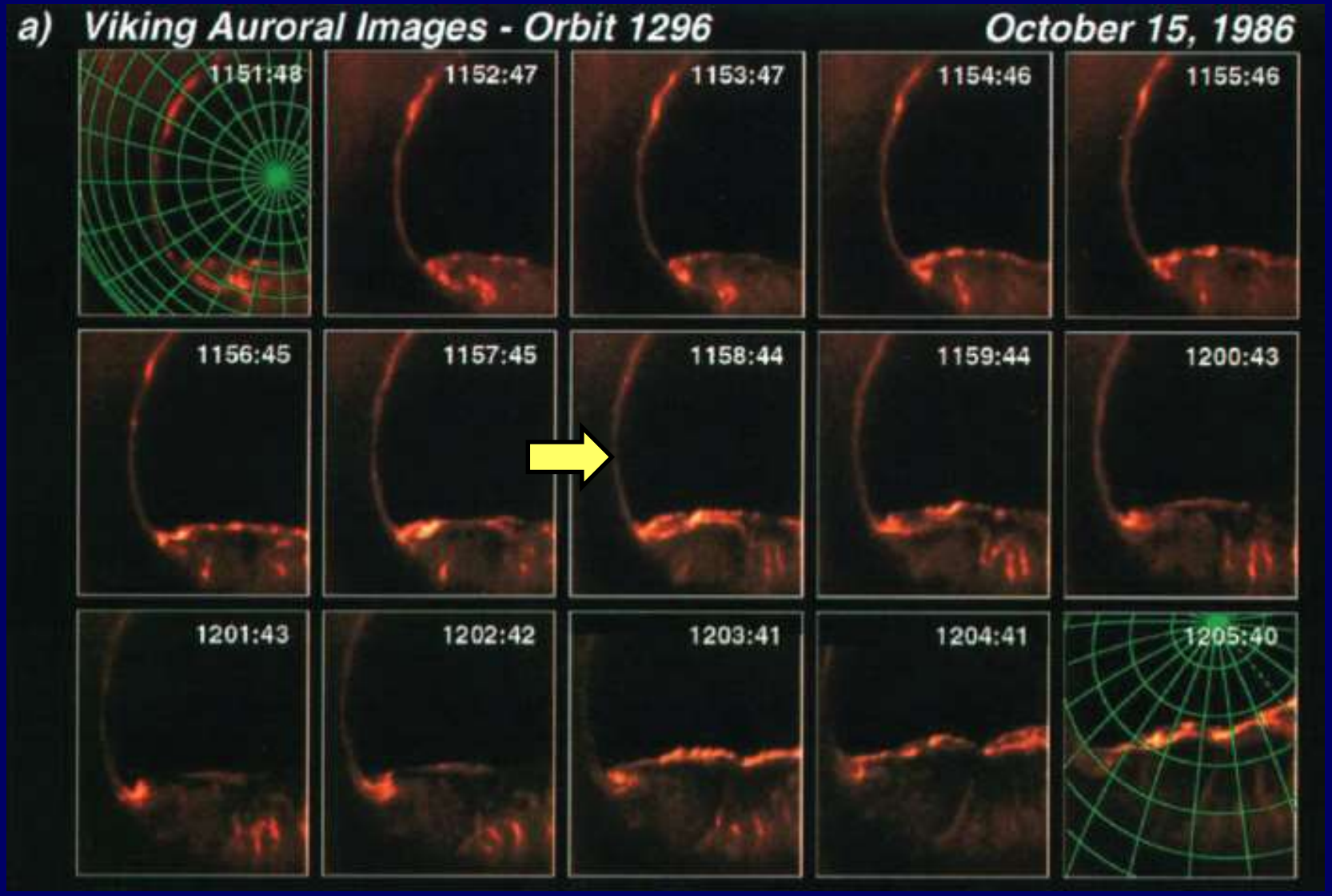
Ap: 3.63Re

Pe: 570km

Hones (1985,JGR)

Evolution of Auroral Bulge

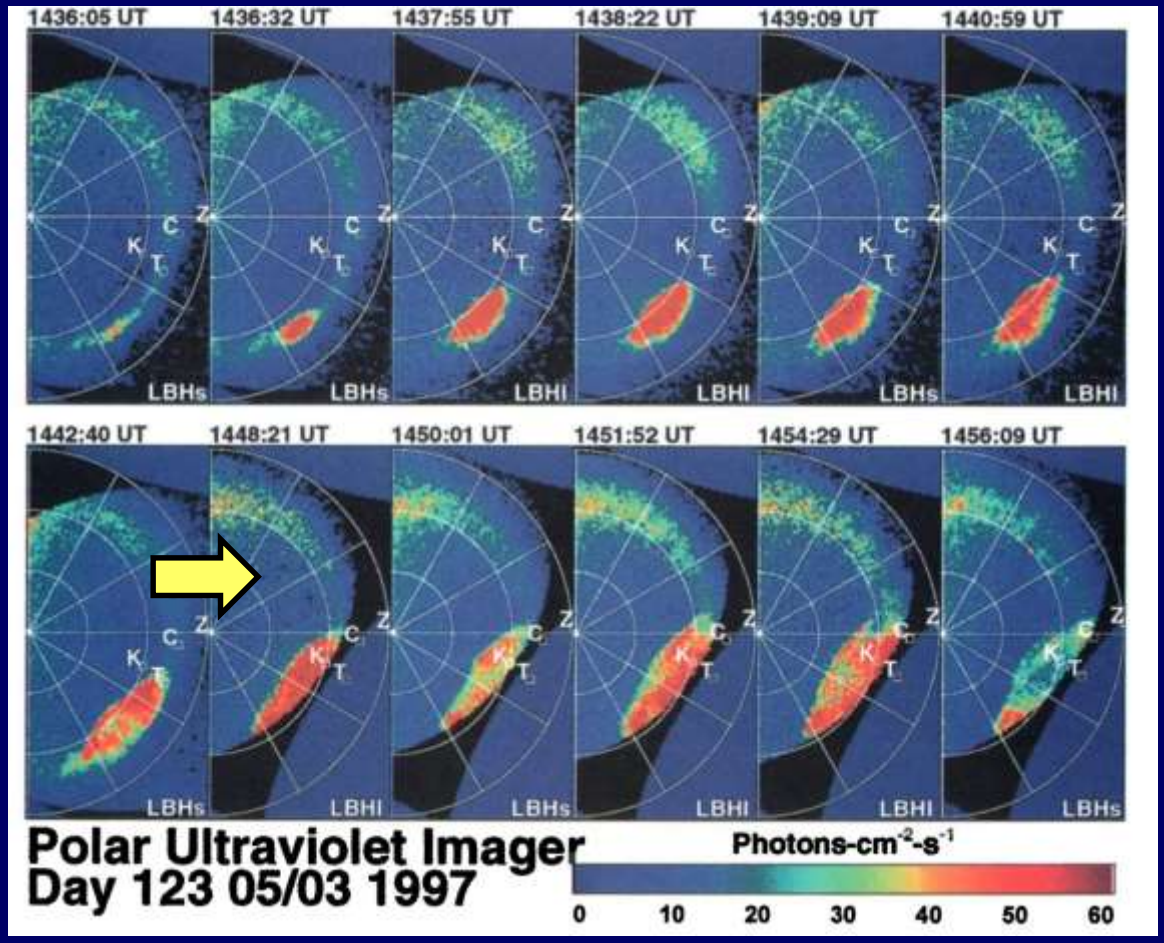
Viking, Δt = 20sec (normal 60sec) , Ap:14,000km, Pe:822km

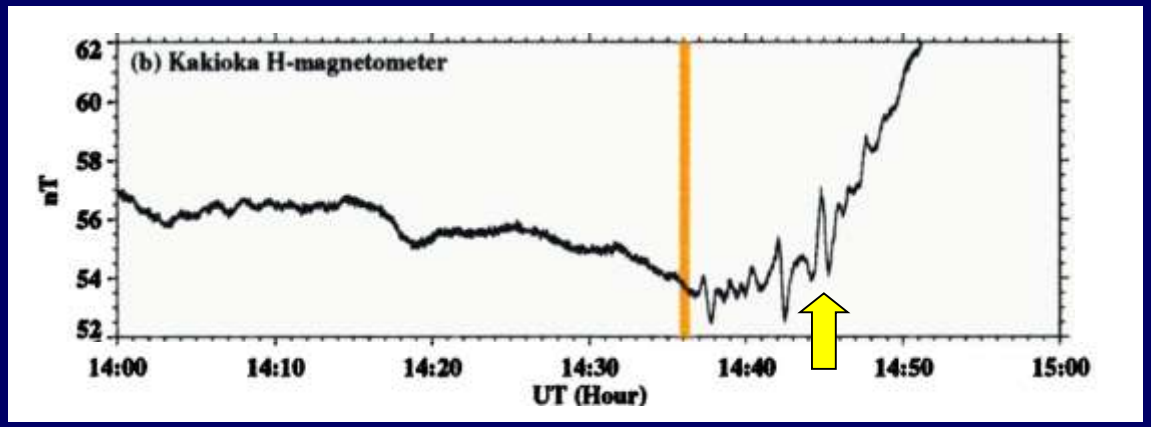


Henderson, et al. (1998,GRL)

Evolution of Auroral Bulge

Polar-UVI
Δt = 37sec
Ap: 7.9Re
Pe: 185km

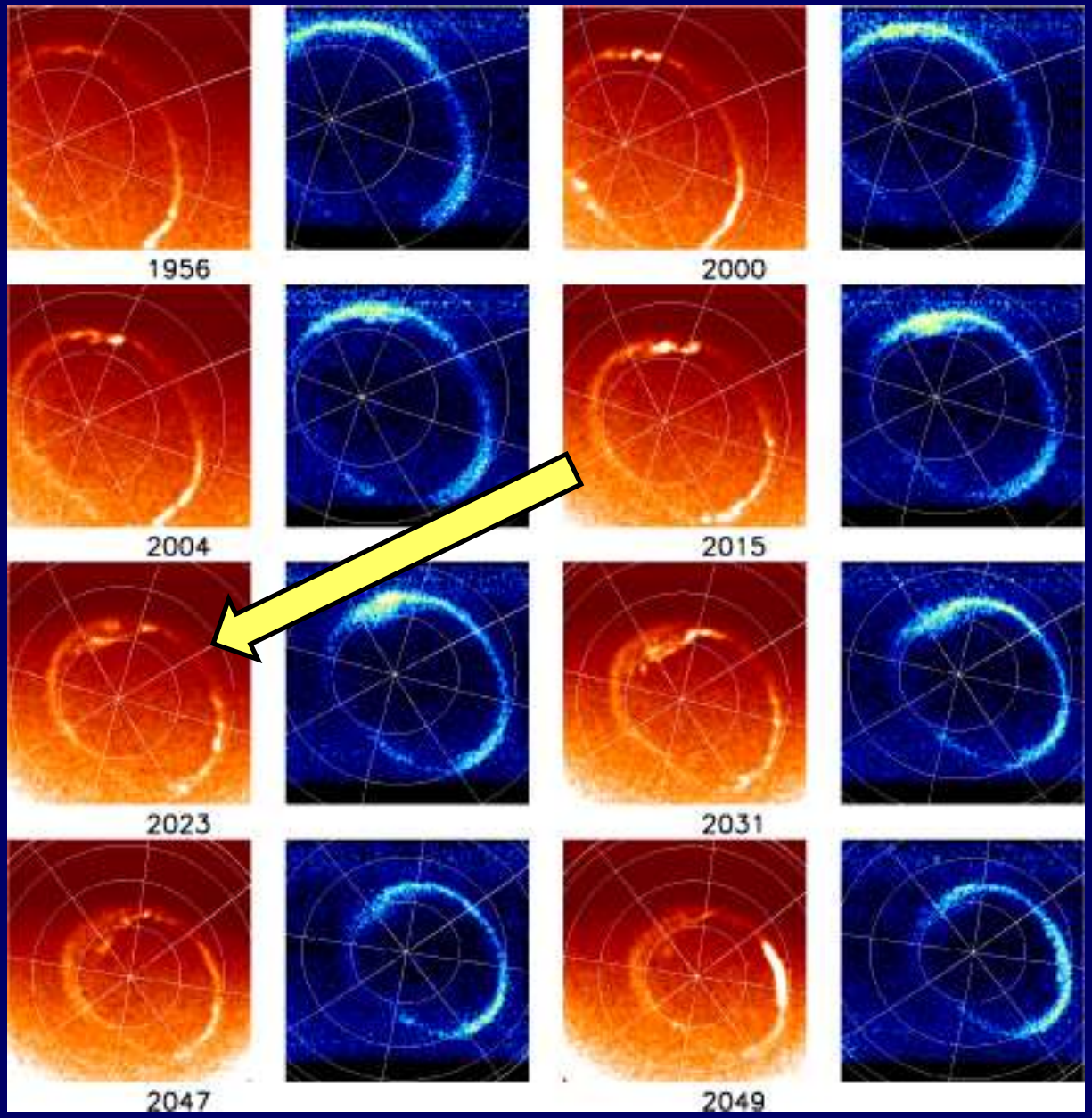




Liou, et al.
(1999,JGR)

Evolution of Auroral Bulge

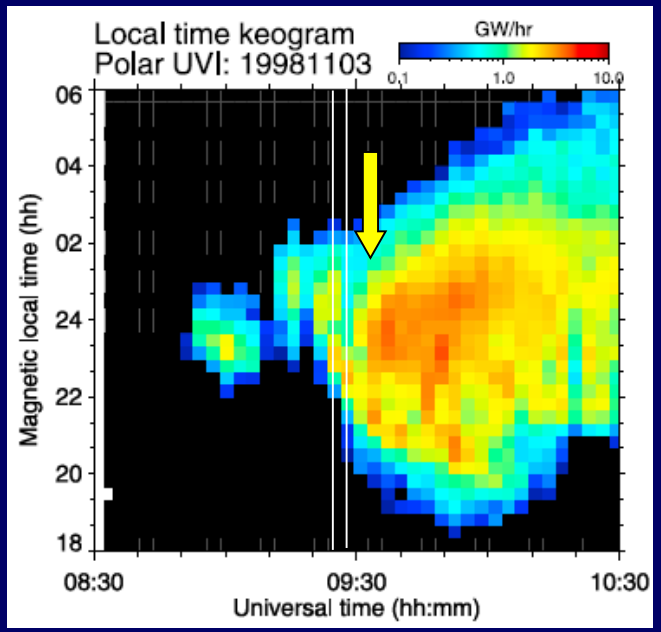
IMAGE
WIC, SI(Ly-a)
Δt = 2min
Ap: 7 Re
Pe: 1,000km

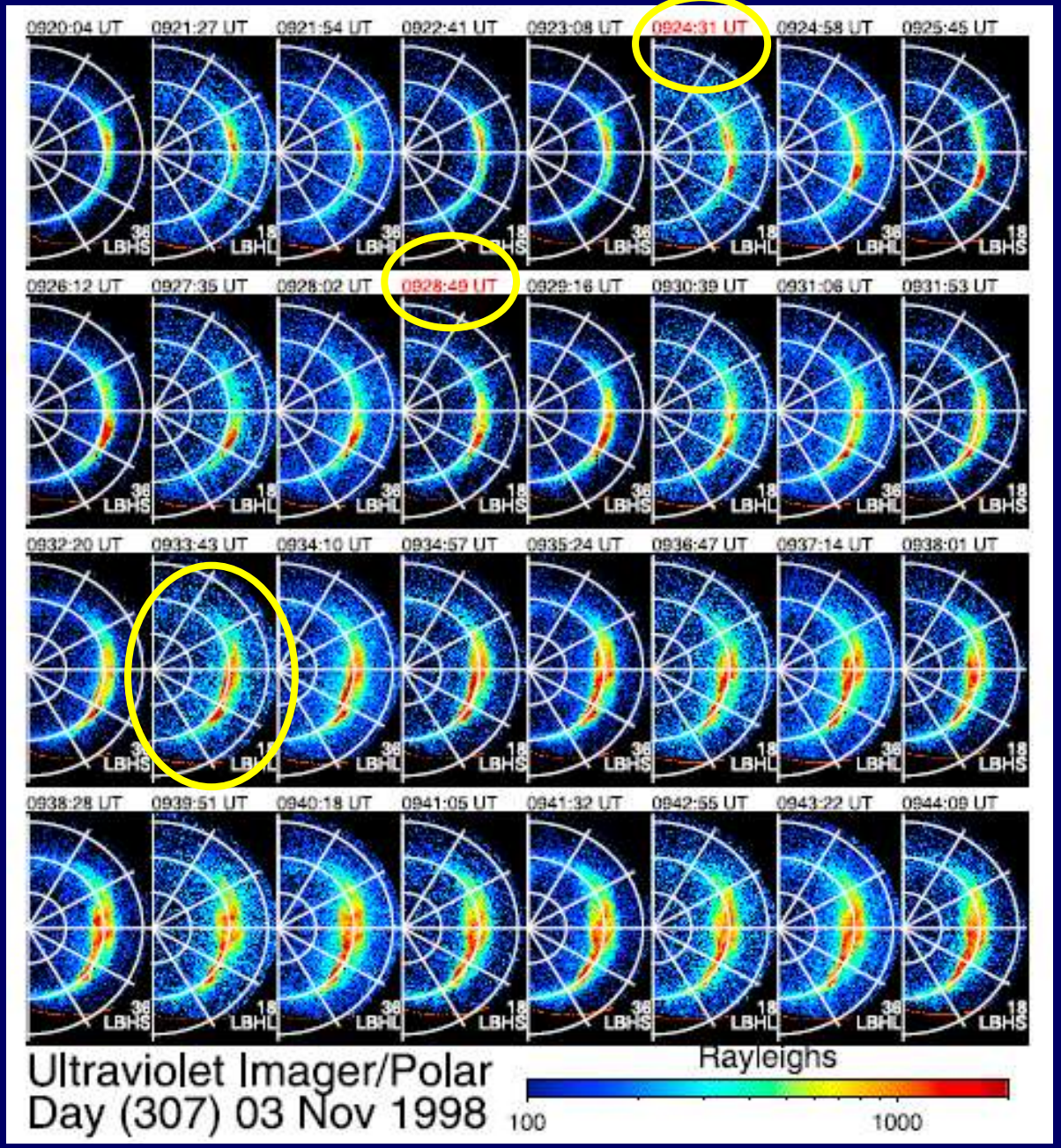


Mende, et al. (2001,GRL)

Polar-UVI

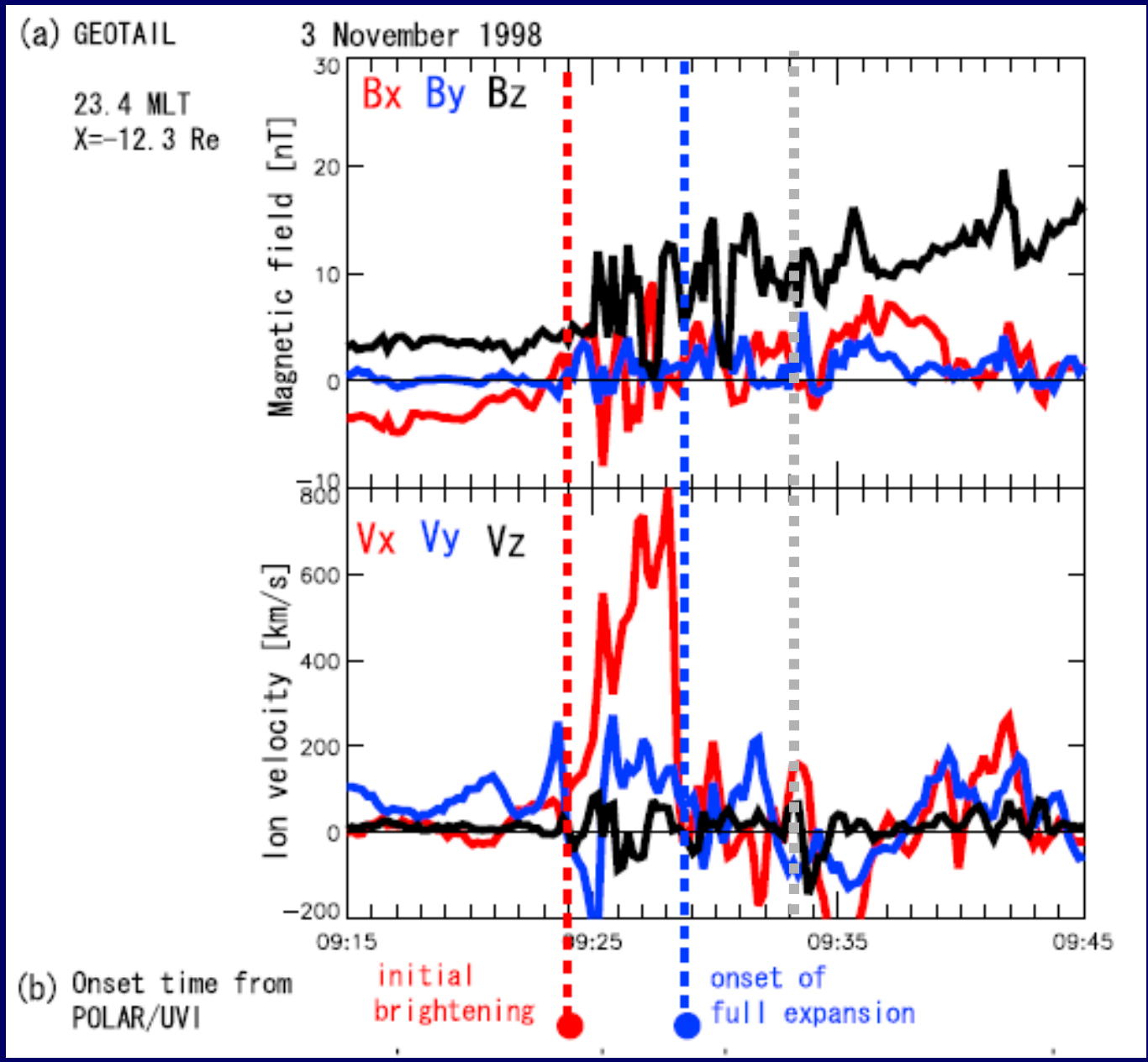
Saito, et al. (2010,JGR)





Geotail

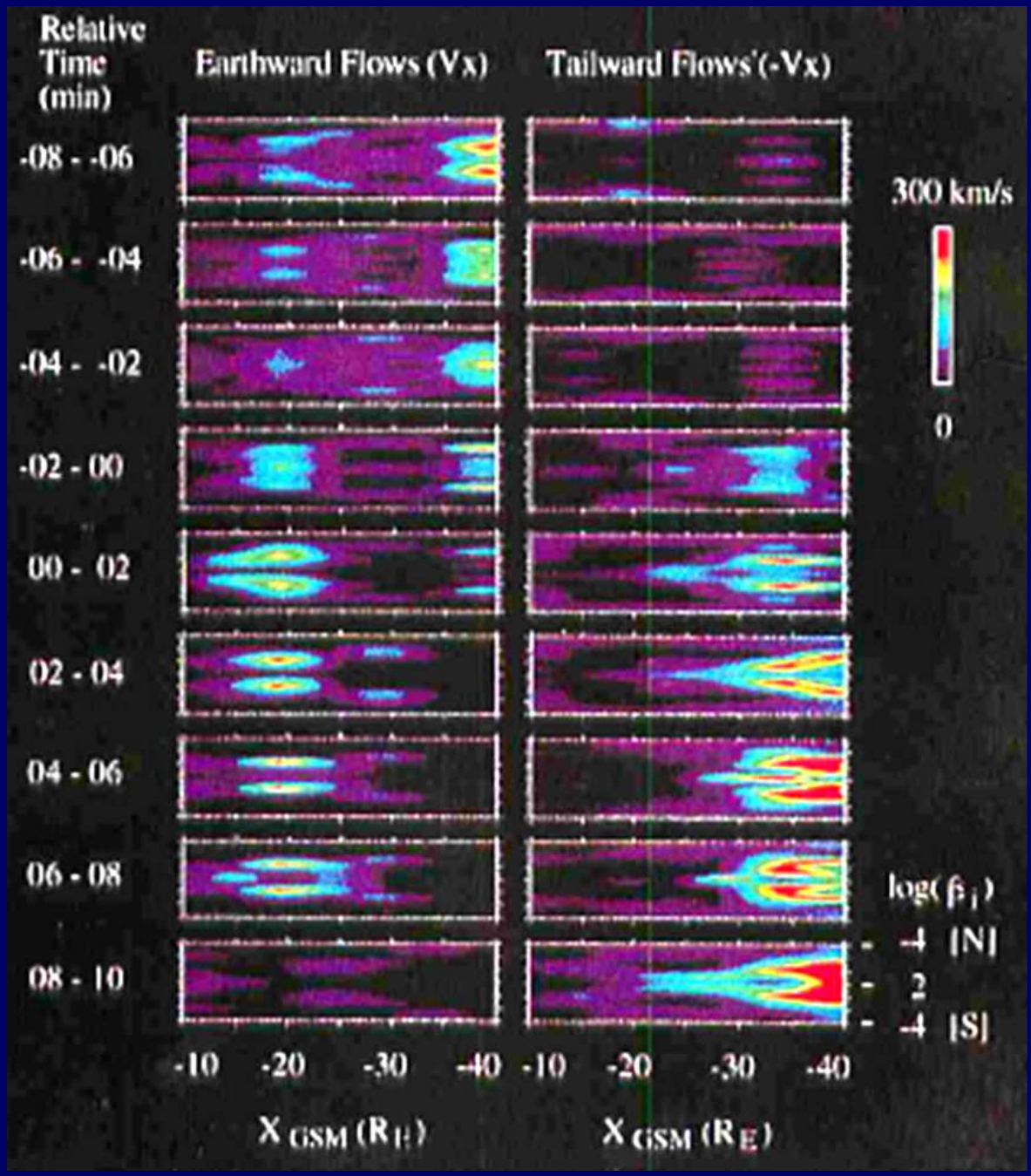
Saito, et al. (2010,JGR)



What are going on in the magnetosphere at those timings ?

Geotail

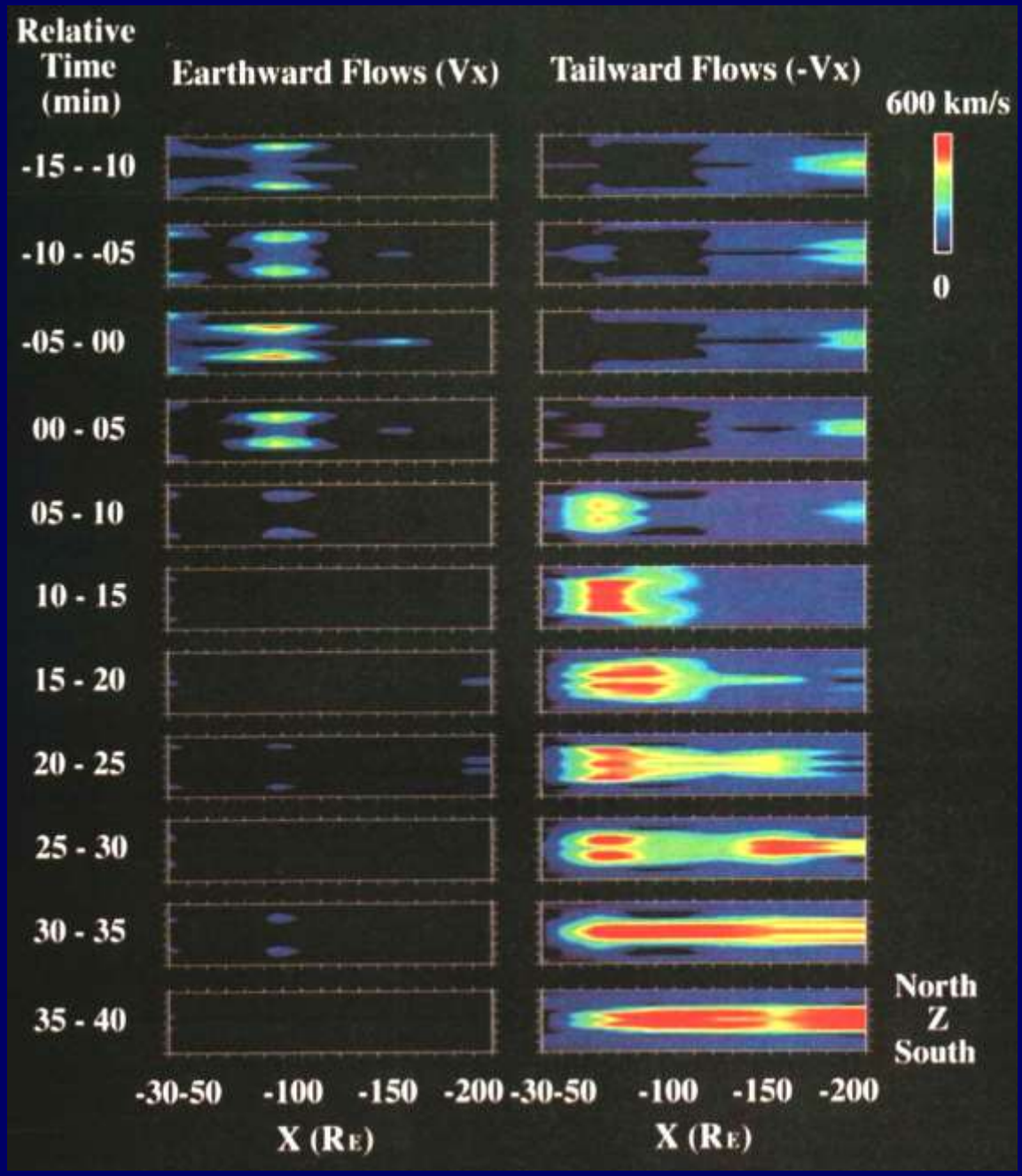
Nagai and Machida (1998,AGU Monograph)



What are going on in the magnetosphere at those timings ?

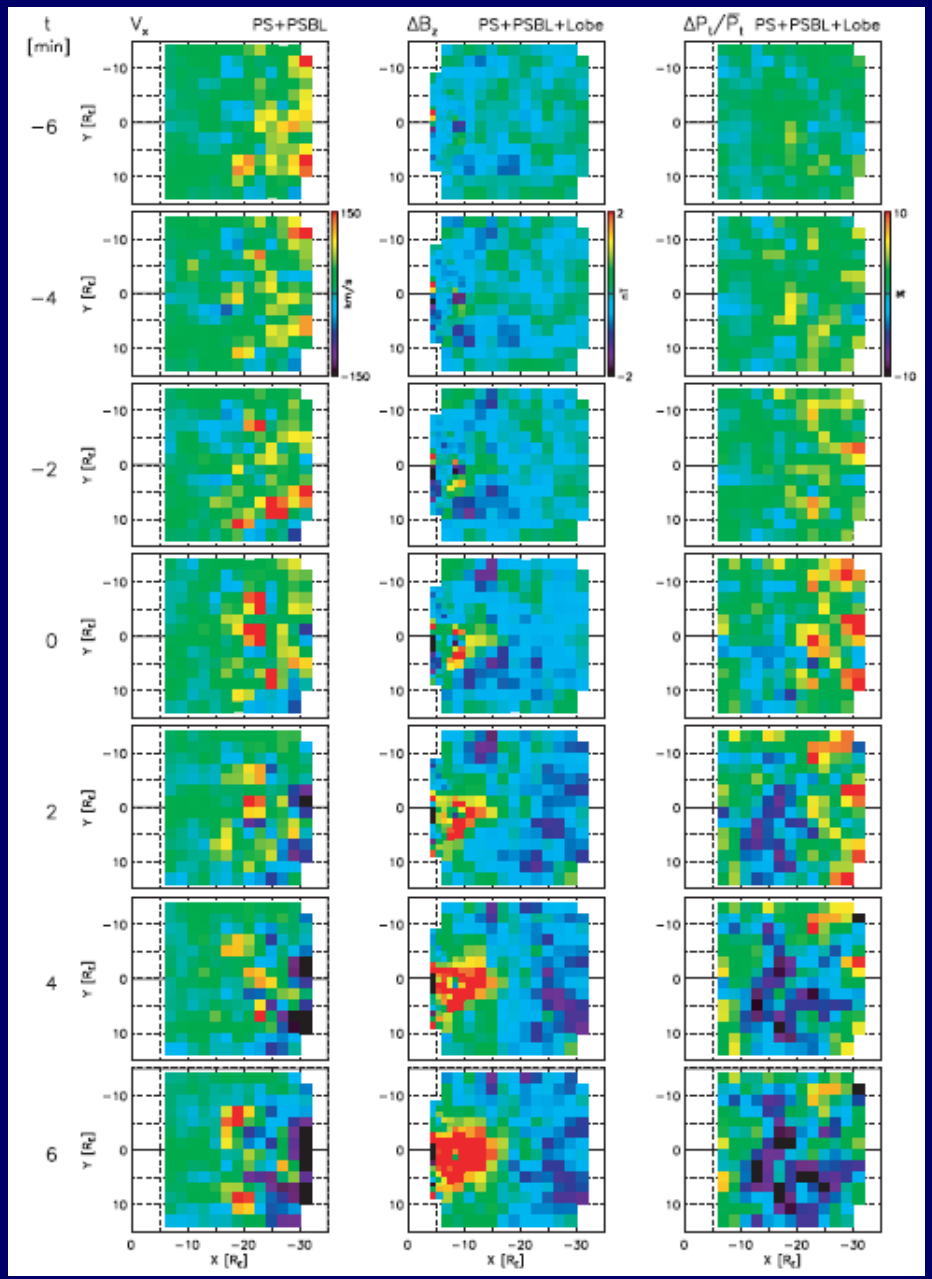
Geotail

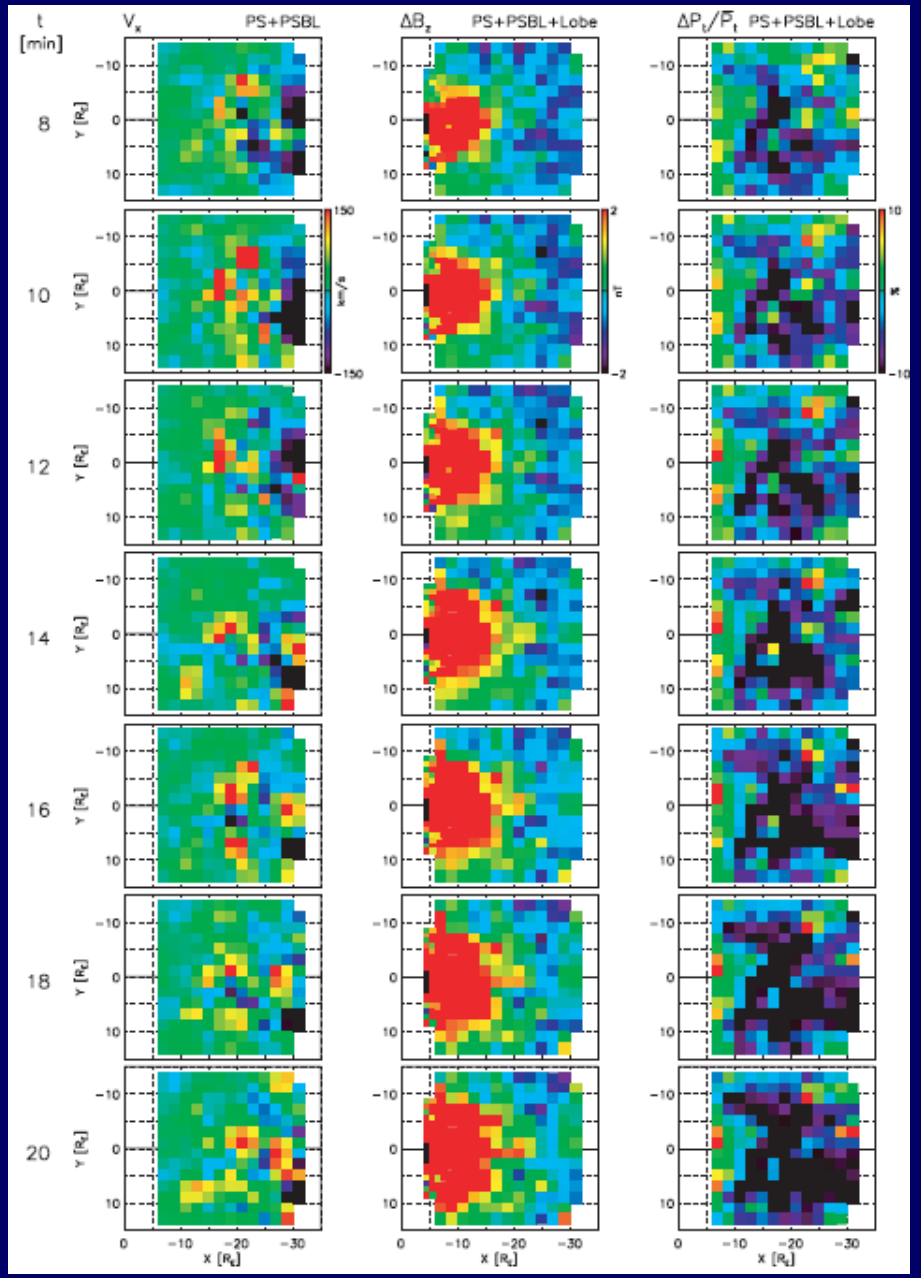
Machida, et al. (2000,JGR)



Geotail

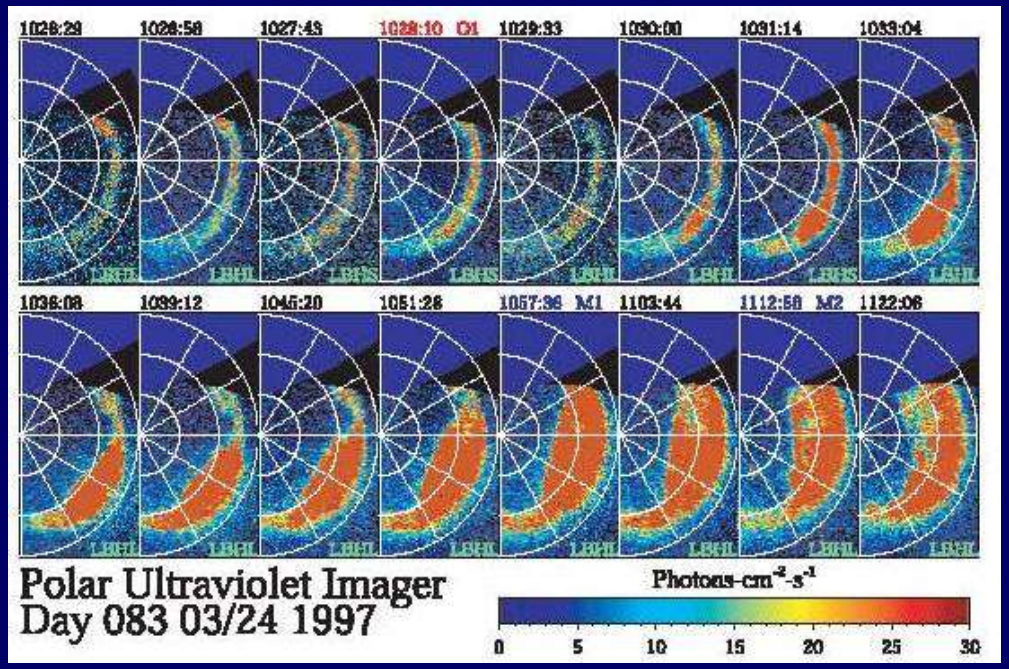
Miyashita, et al.(2009,JGR)

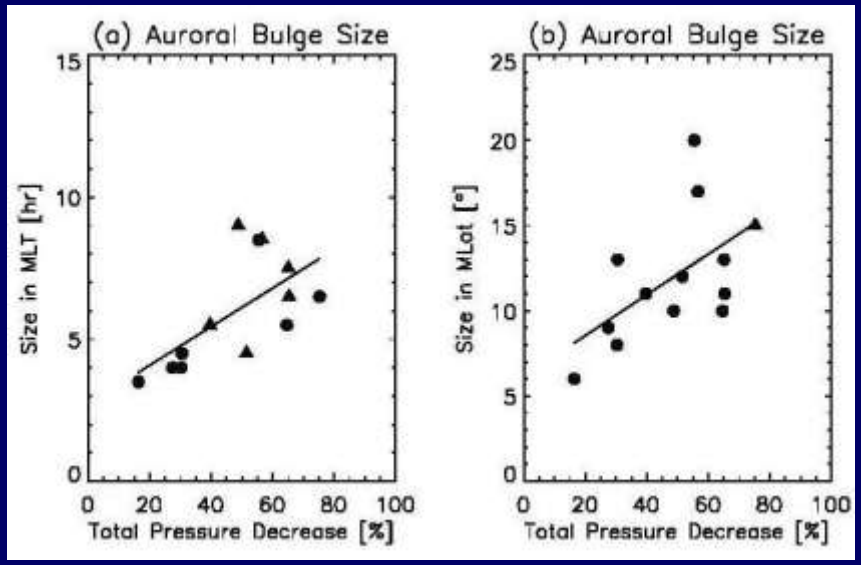


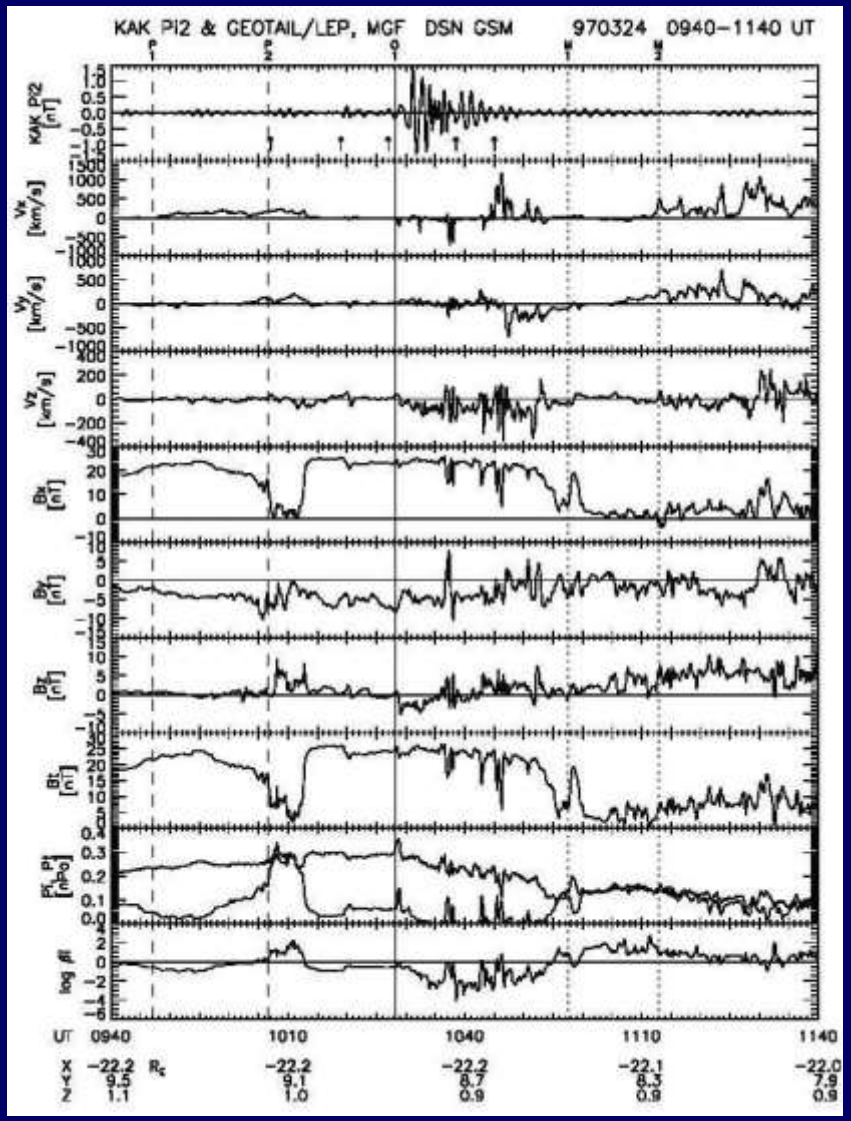


Polar & Geotail

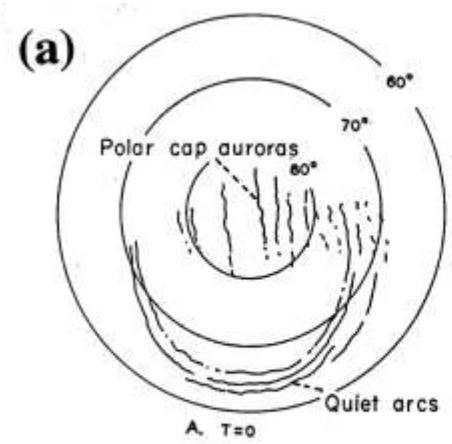
Miyashita, et al.(2003,JGR)



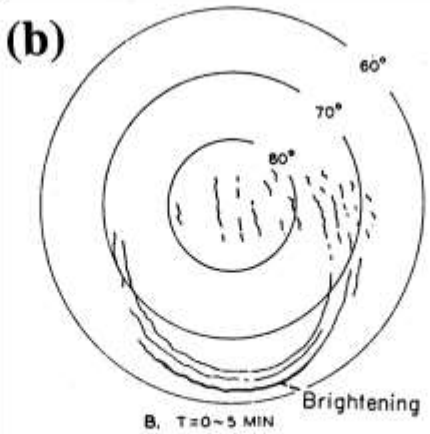




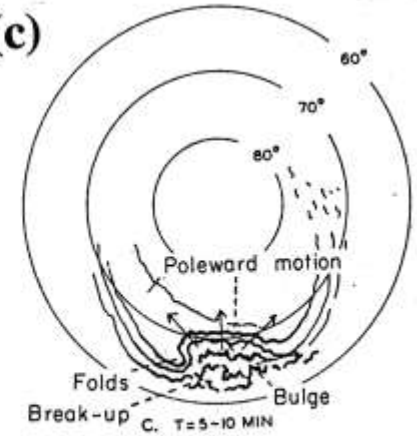
Classical Morphology



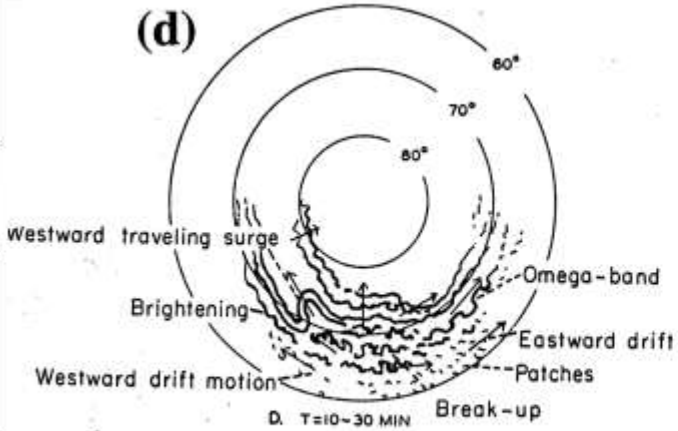
Quiet Phase (T=0)



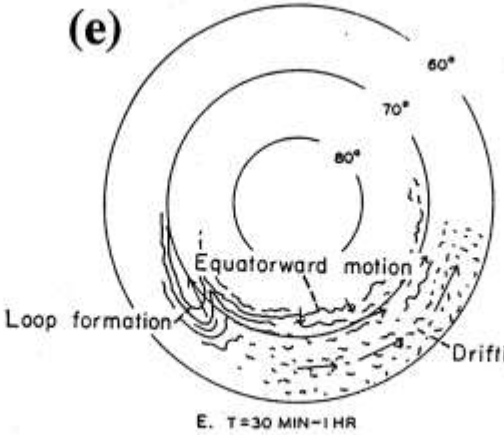
Expansive Phase (T=0~5 min)



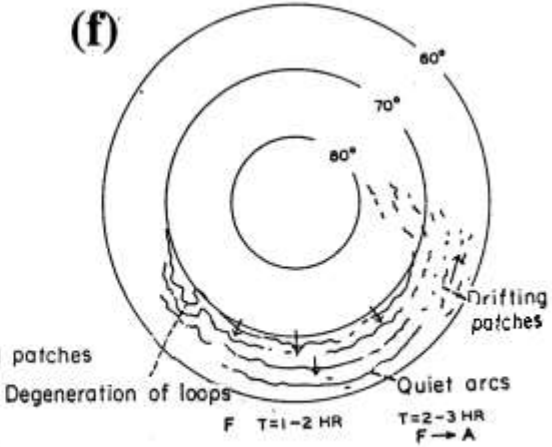
Expansive Phase (T=5~10 min)



Expansive Phase (T=10~30 min)



Recovery Phase (T=30~60 min)

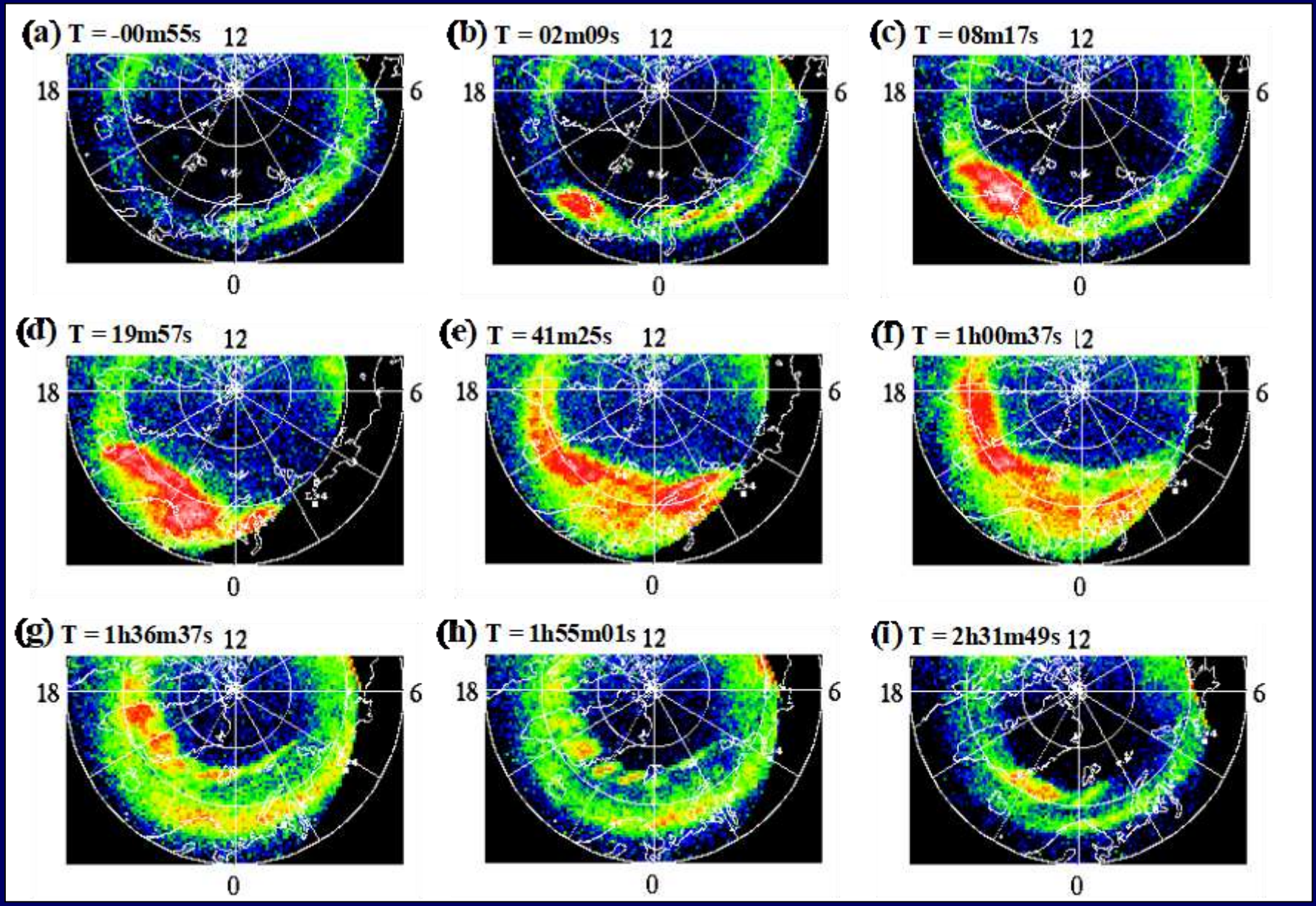


Recovery Phase (T=1~2 hour)

Akasofu, S.-I. (1964, *Planet. Space Sci.*)

Satellite Observation

POLAR UVI (1997)



Summary

- Can the stepwise evolution of the auroral bulge become a general knowledge of the substorm community ?
- Then, what kind of process in the magnetosphere is responsible for each timing of the stepwise evolution of auroral bulge ?
- Can a new complete synthetic morphology of auroral and magnetospheric substorm be constructed in near future ?
- New global auroral imaging satellite ?