

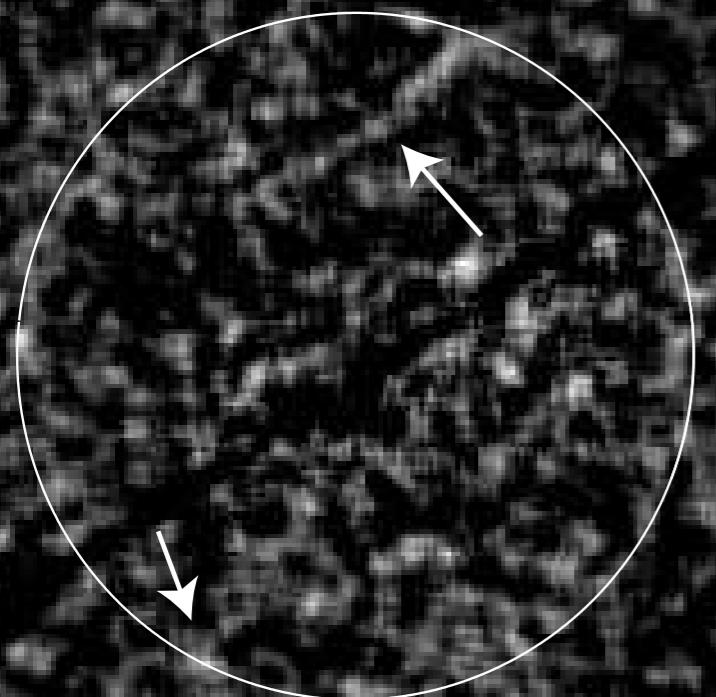
# Aurores uraniennes et dynamique magnétosphérique



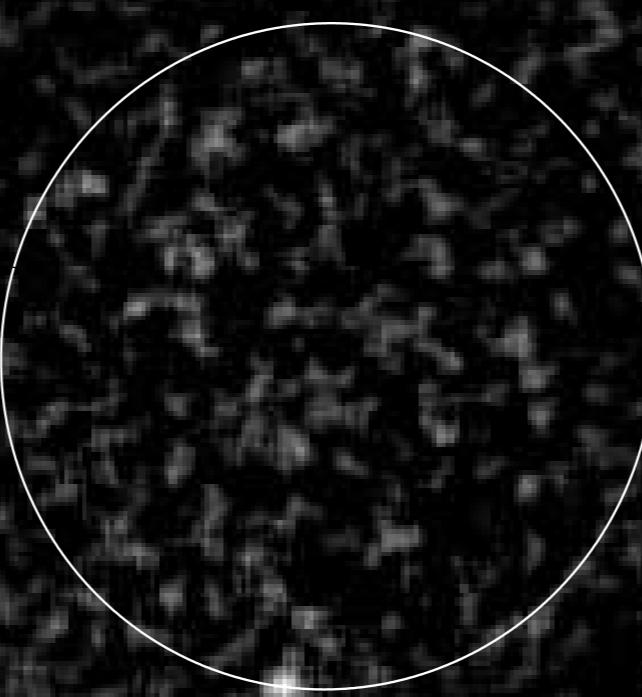
L. Lamy, R. Prangé  
LESIA - Observatoire de Paris

# Results : positive detections with HST

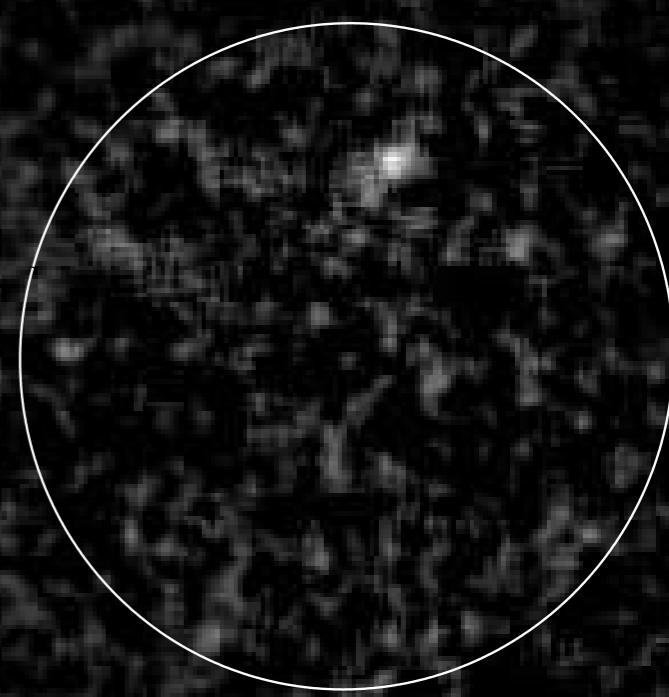
(a) 29 Jul. 1998



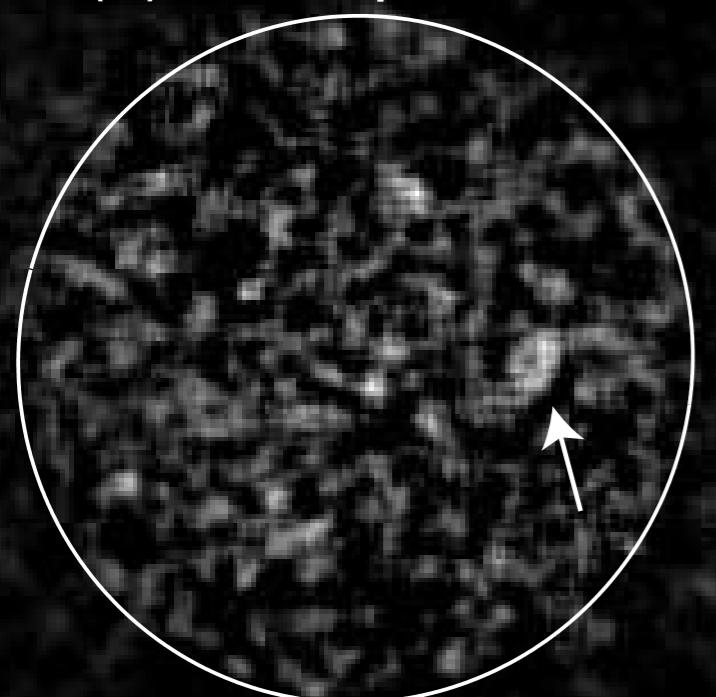
(b) 16 Nov. 2011



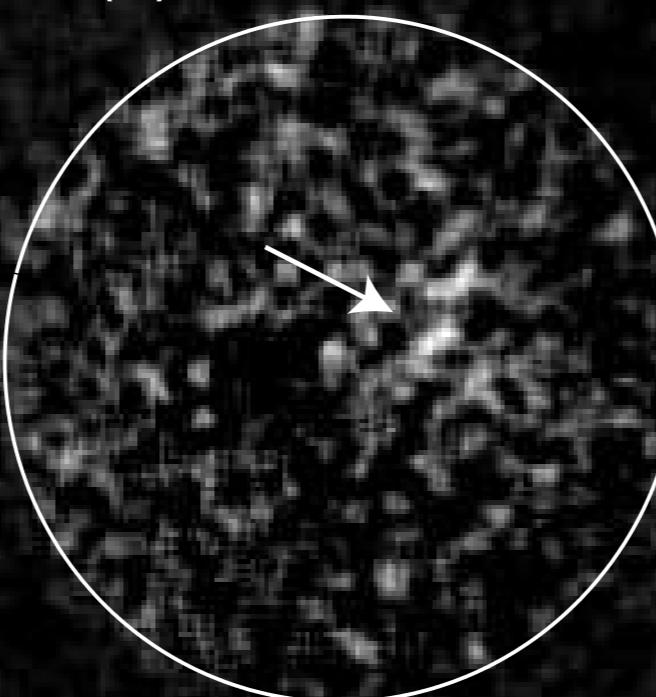
(c) 29 Nov. 2011



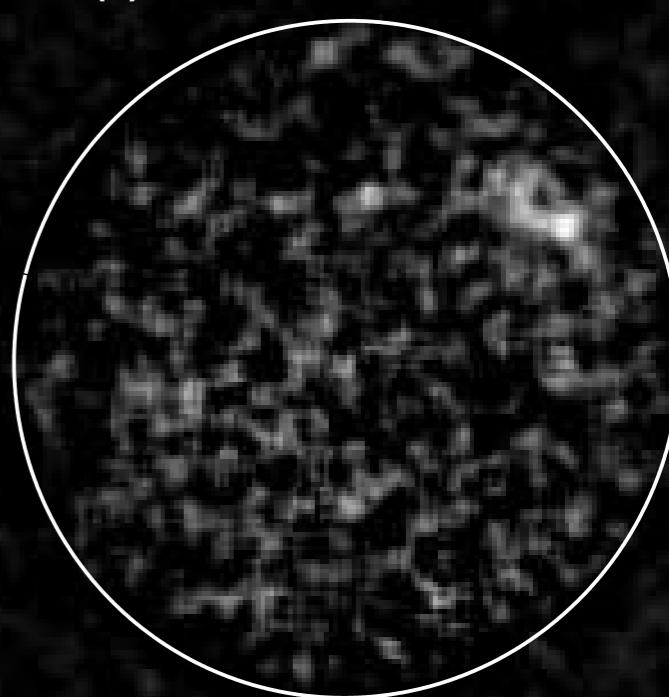
(d) 27 Sept. 2012



(e) 1 Nov. 2014

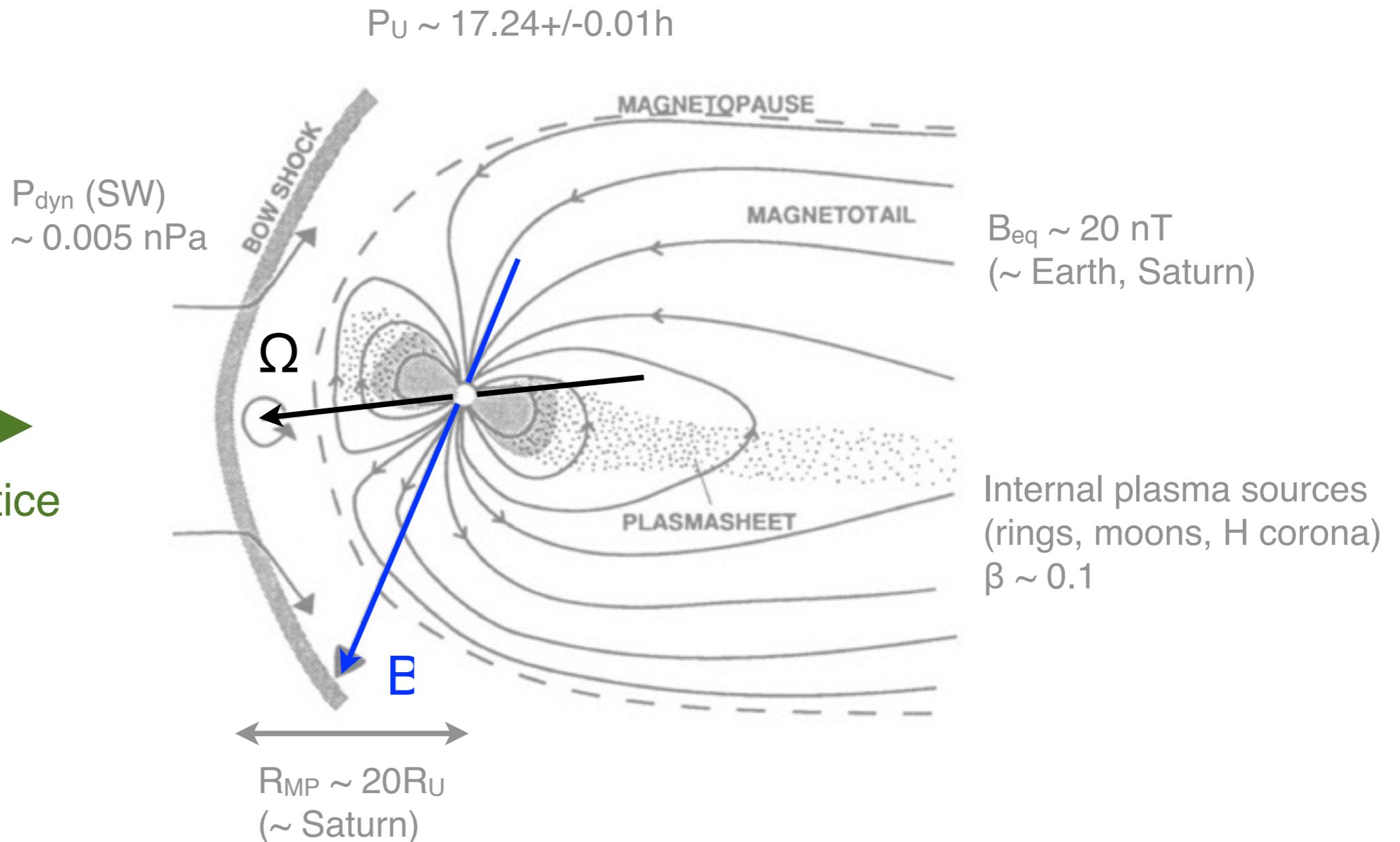


(f) 24 Nov. 2014



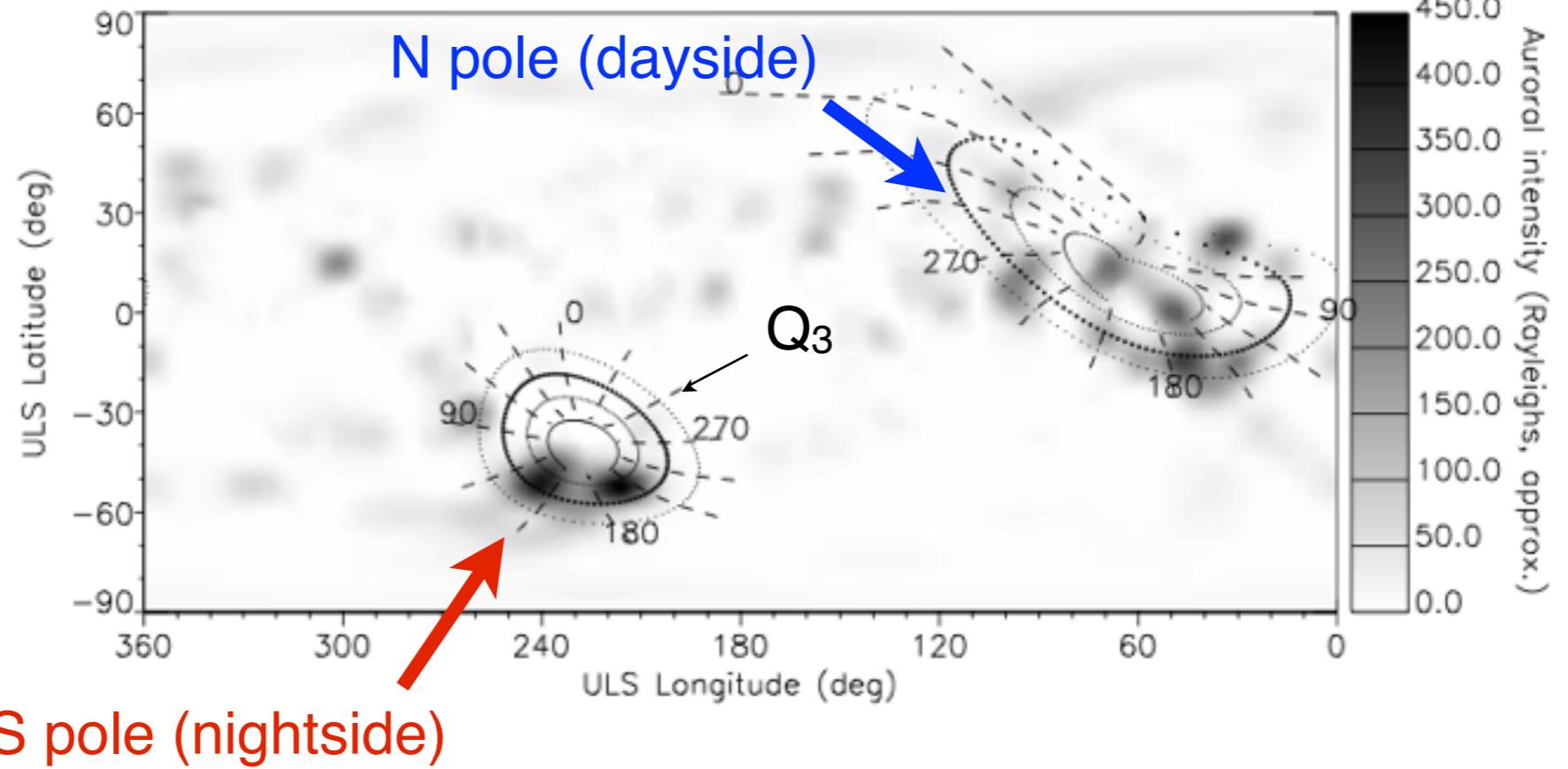
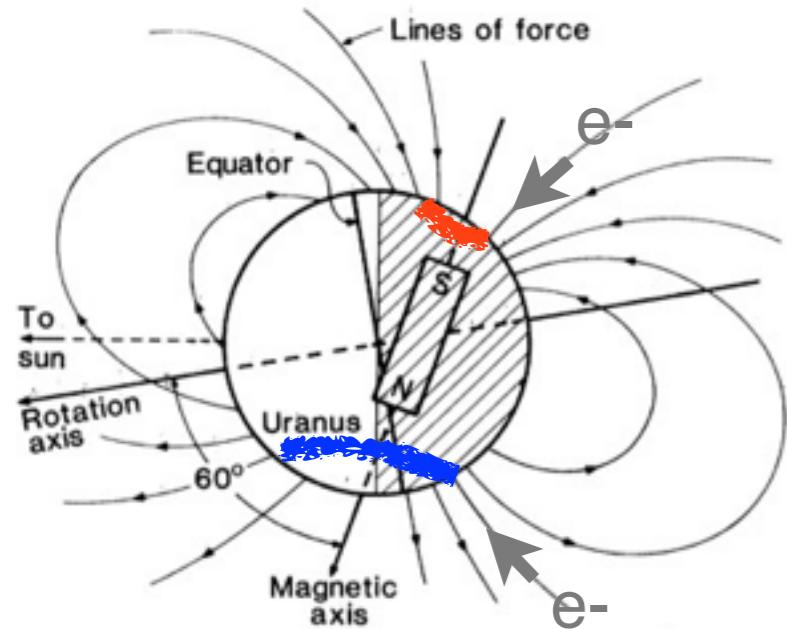
# 1986 : Voyager 2

SW →  
1986 : Solstice



# 1986 : Voyager 2

(Herbert et al., 2009)



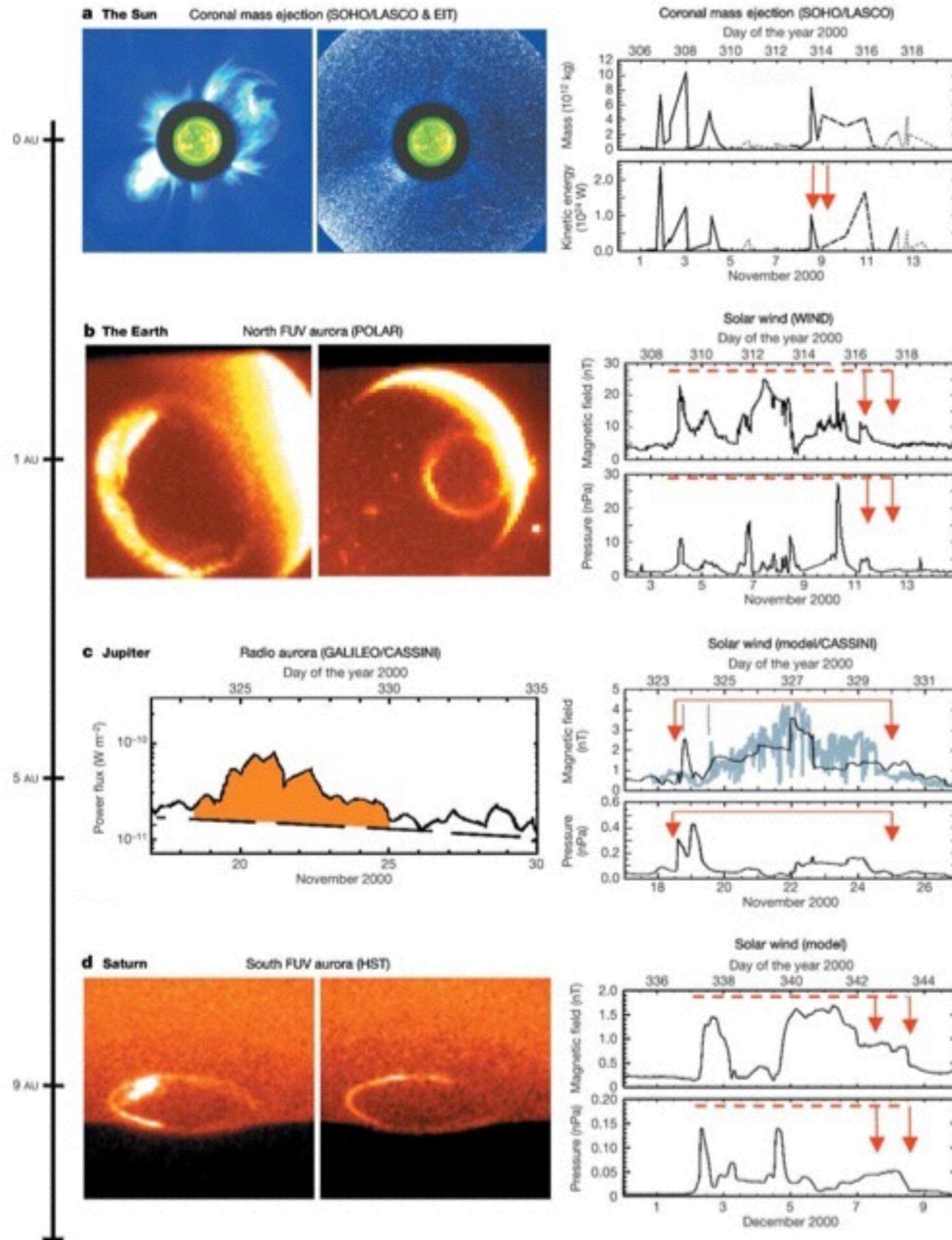
Auroral processes :

- MS acceleration processes => energetic plasma (1-30keV e-) => auroral emissions
- detected at UV wavelengths (70-190nm) by the UVS spectrometer : 9kR of H and H<sub>2</sub>

Main properties :

- N and S aurora magnetically conjugate at ~60-65° latitude (L=5-10)
- enhanced along the magnetotail direction (~180° long.) => solar wind convection
- radiated power : N = 3.10<sup>9</sup> W / S = 7.10<sup>9</sup> W => input power ~ a few 10<sup>10</sup> W
- modulated at the planetary rotation period : 17.24±0.01h => ULS longitude system

# 2011 : HST with a new strategy



(Prangé et al., 2005)

- Interplanetary shocks known to activate planetary aurorae

- Planetary alignment in Nov. 2000 => increase of auroral power along the same CME :

Earth : >10 (UV)

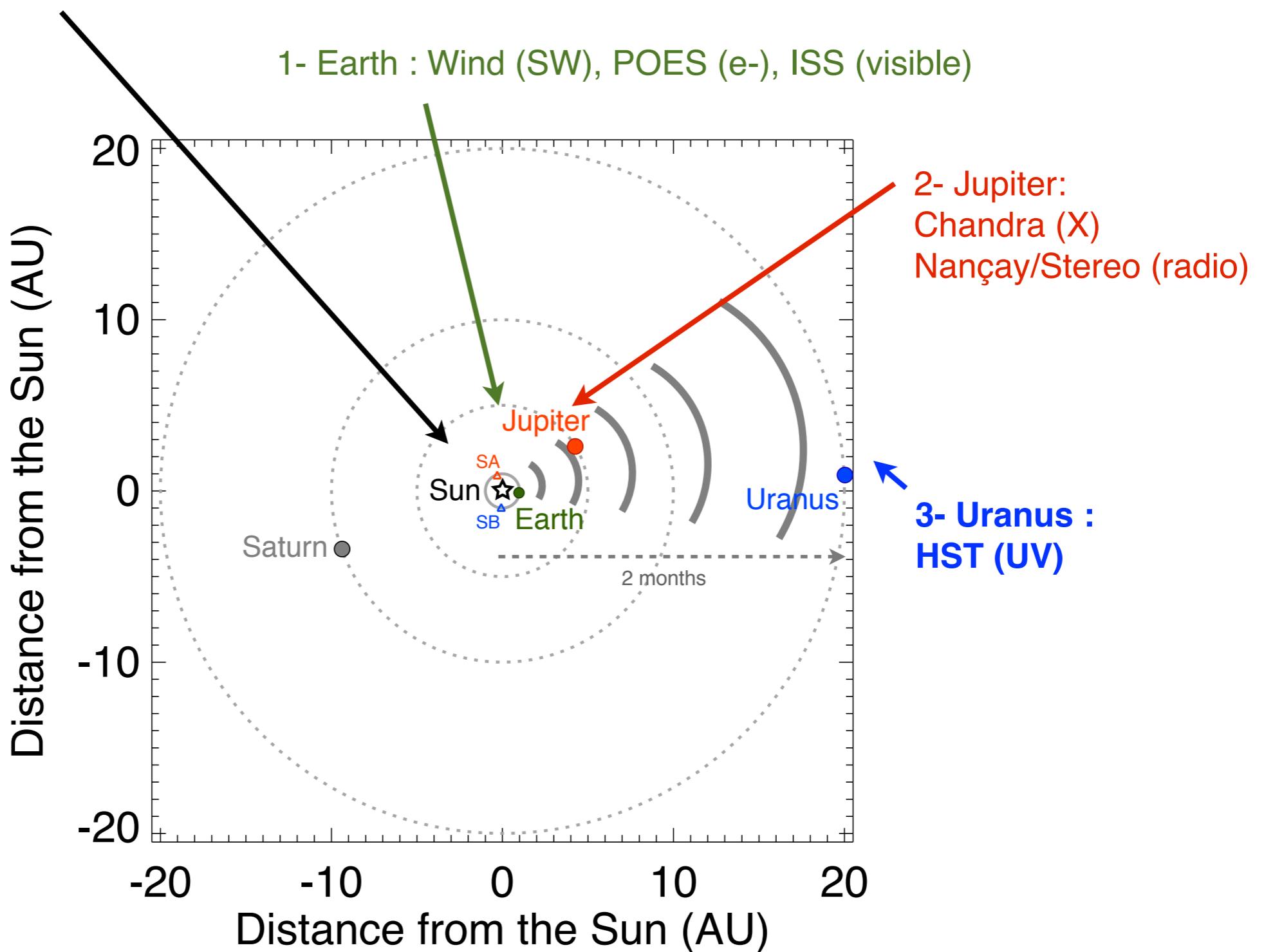
Jupiter : ~3 (radio)

Saturn : 3-5 (UV)

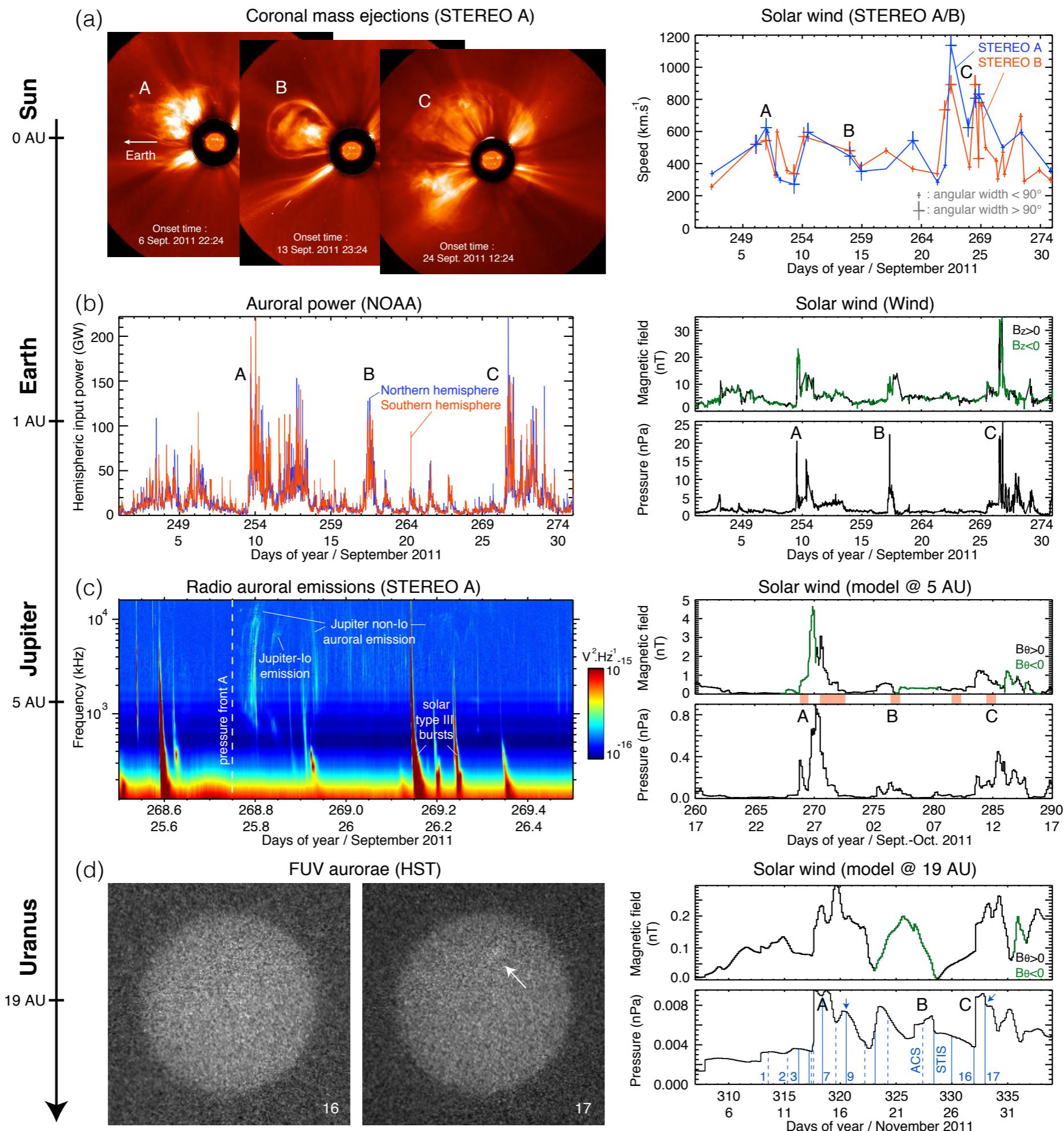
=> Uranus expected to be particularly sensitive to SW

0- Sun: Soho/Stereo

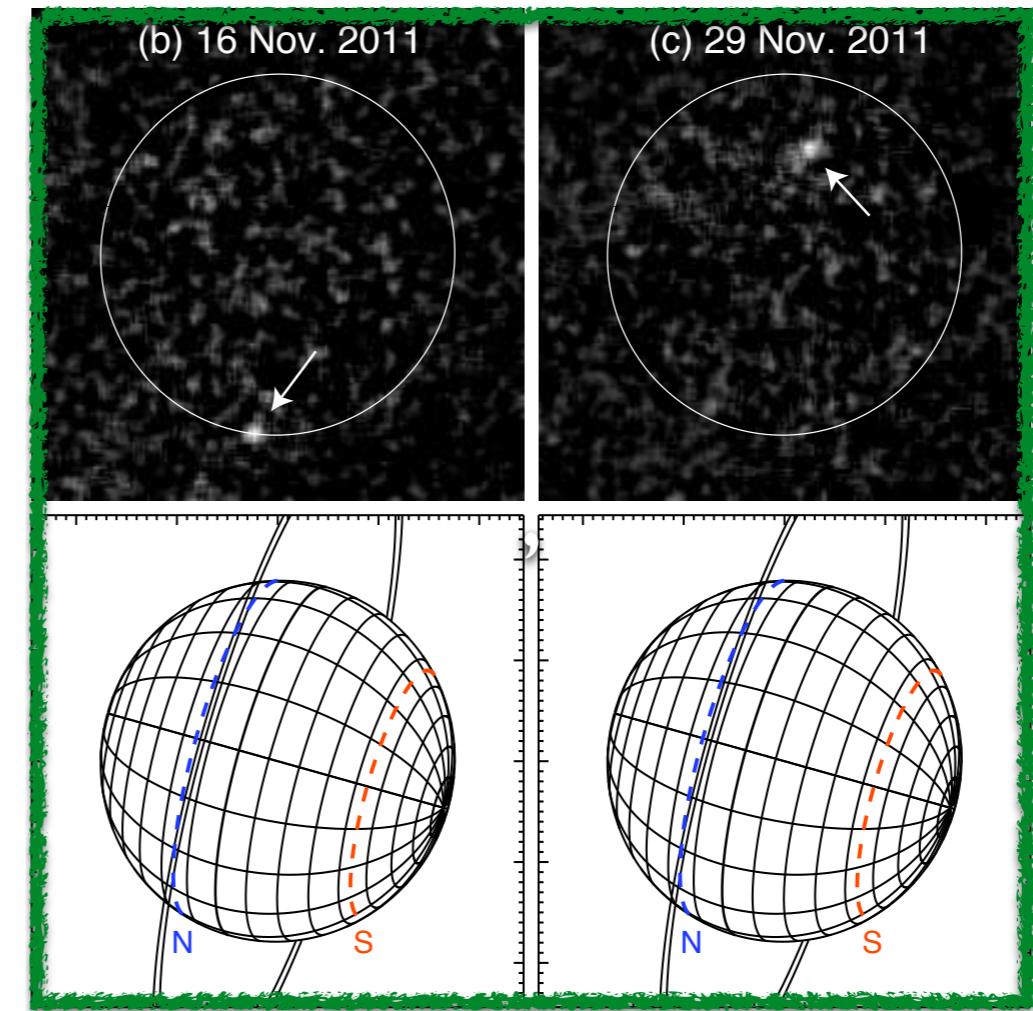
2011



# Results



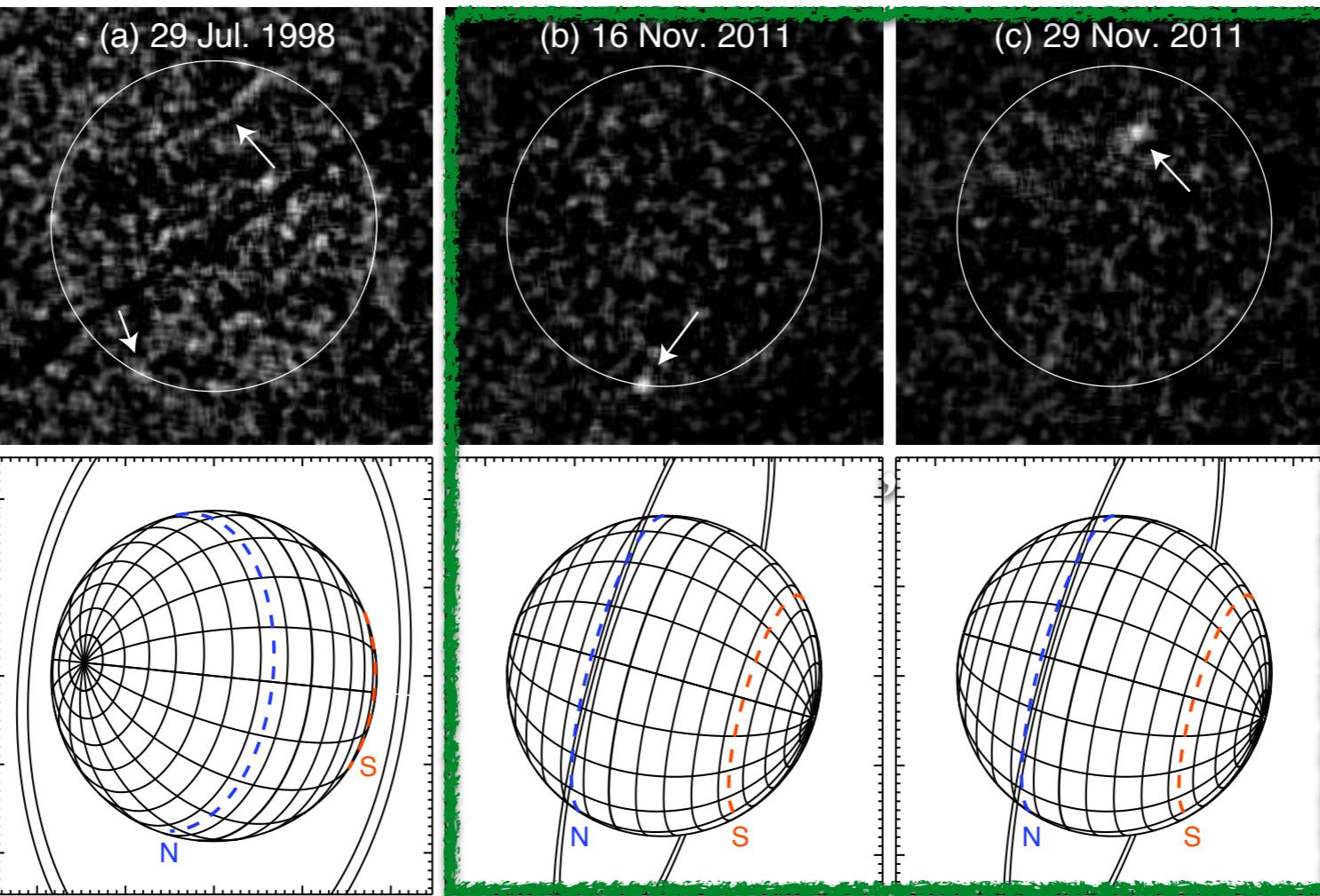
# Unambiguous detections



2011

# Unambiguous detections

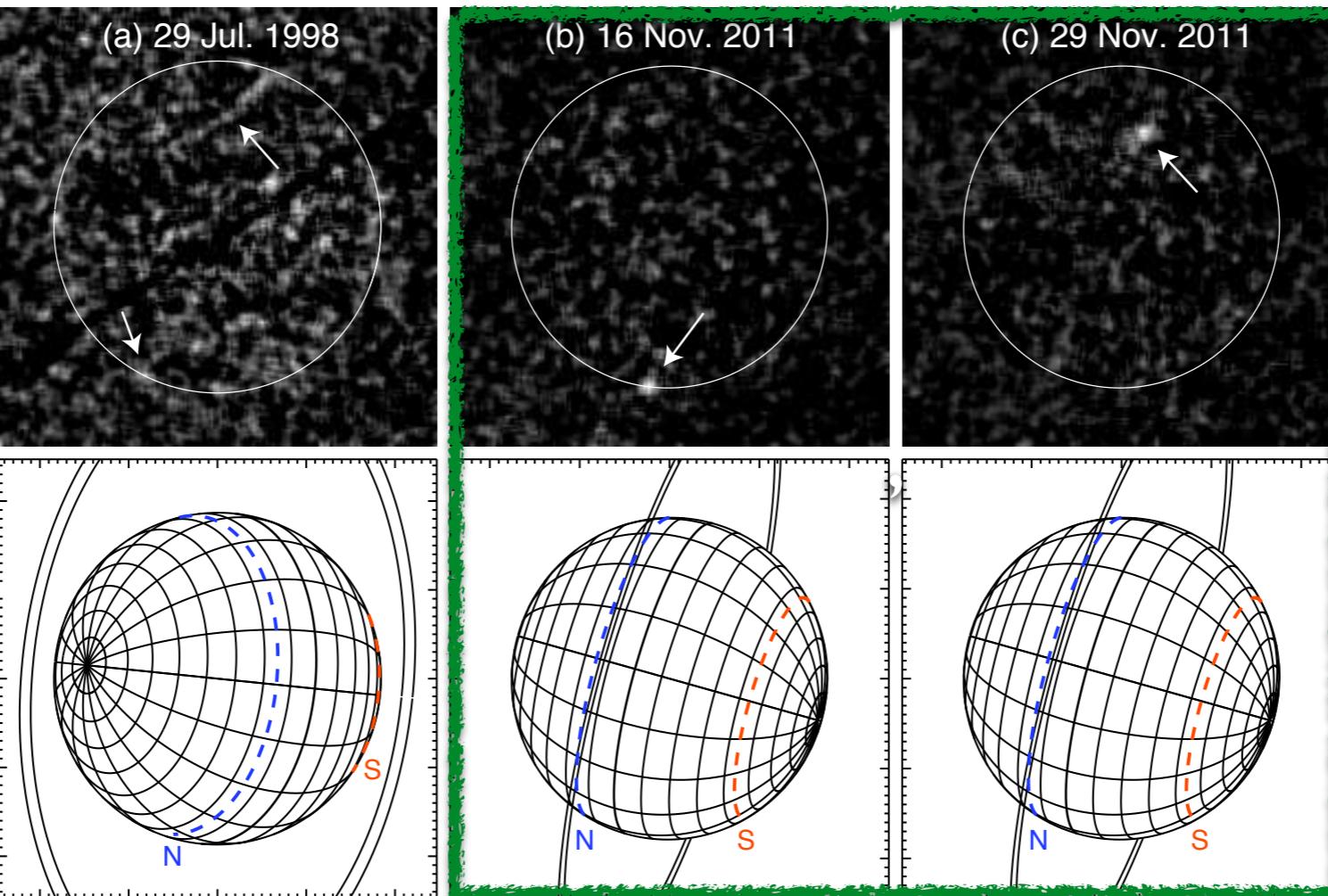
1998



2011

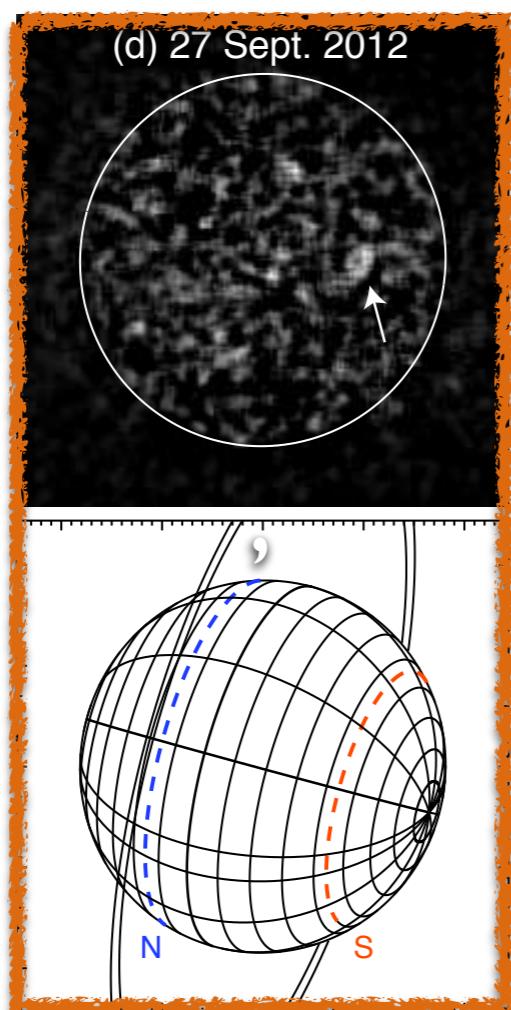
# Unambiguous detections

1998



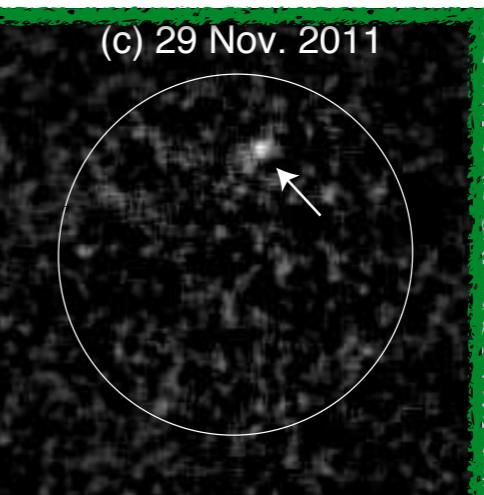
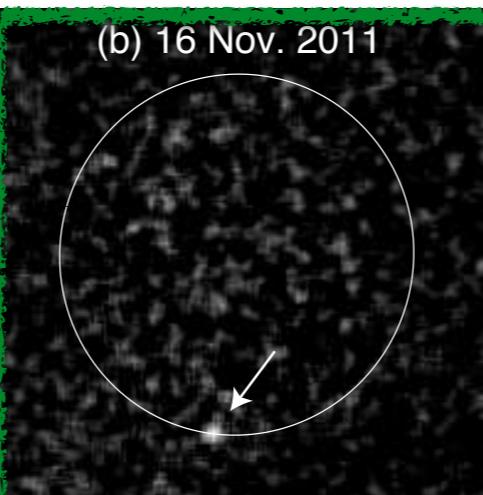
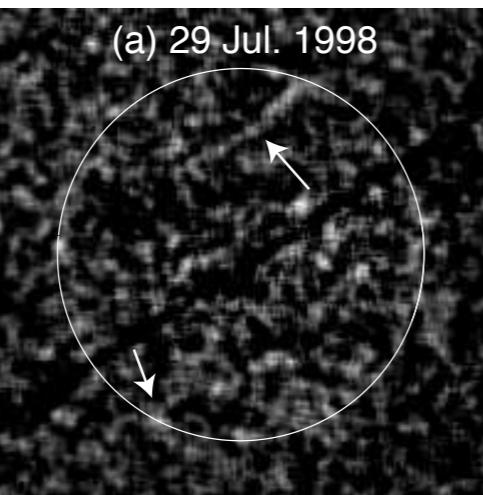
2011

2012

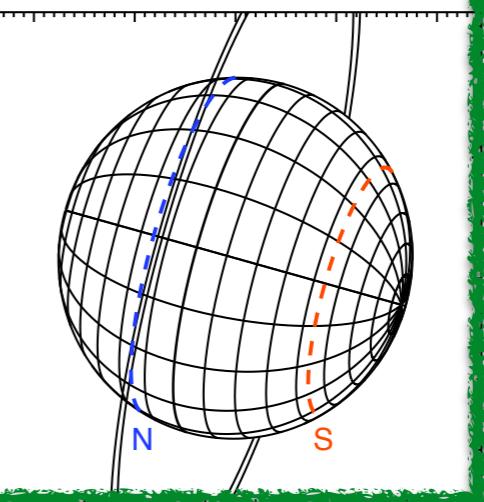
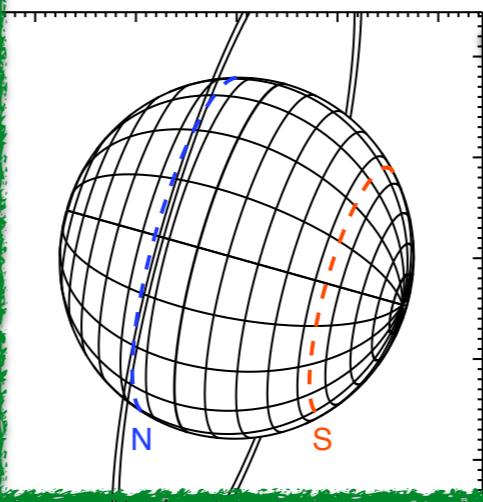
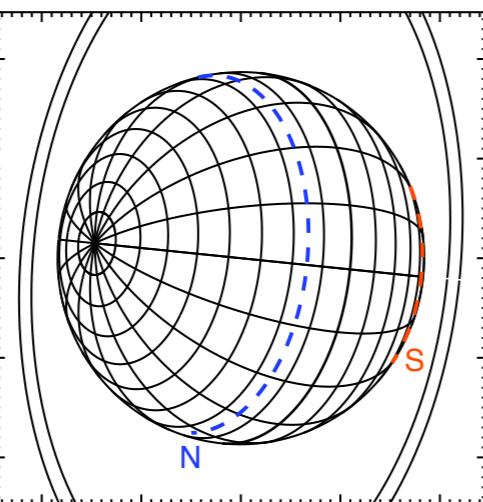


# Unambiguous detections

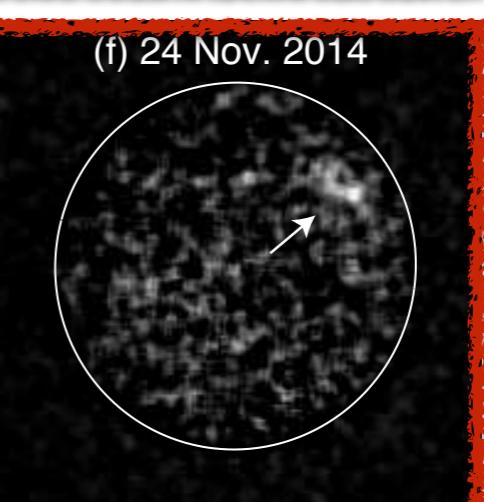
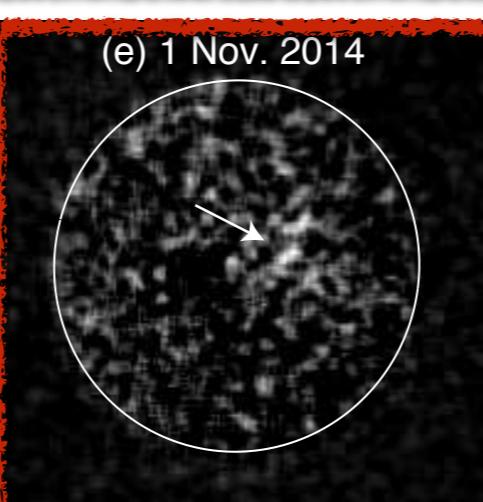
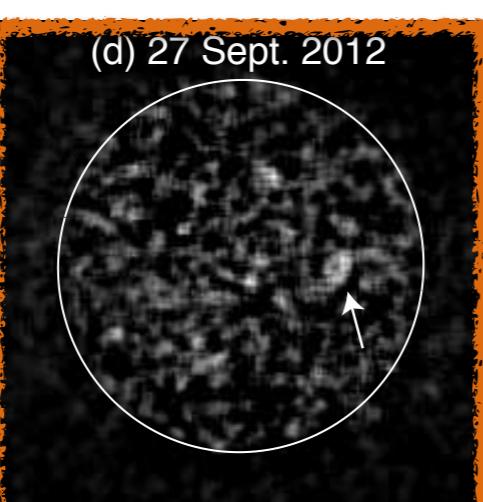
1998



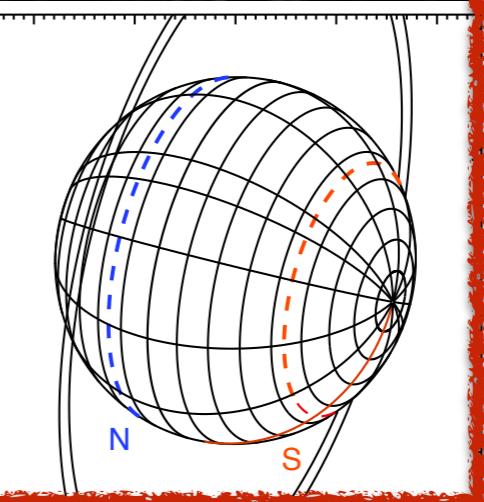
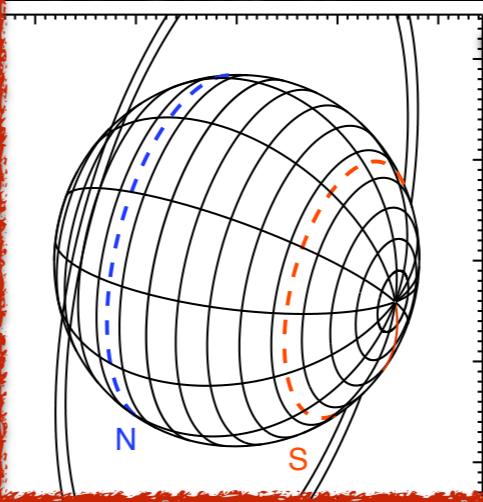
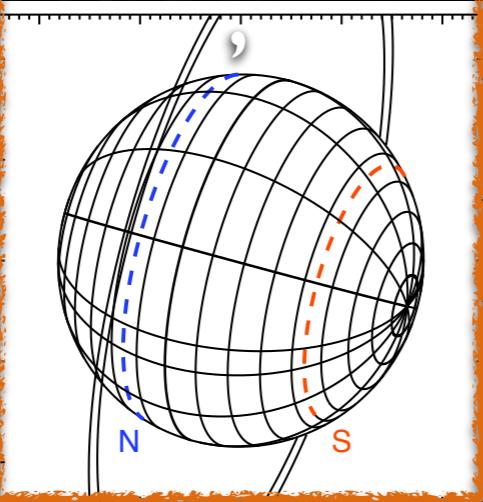
2011



2012



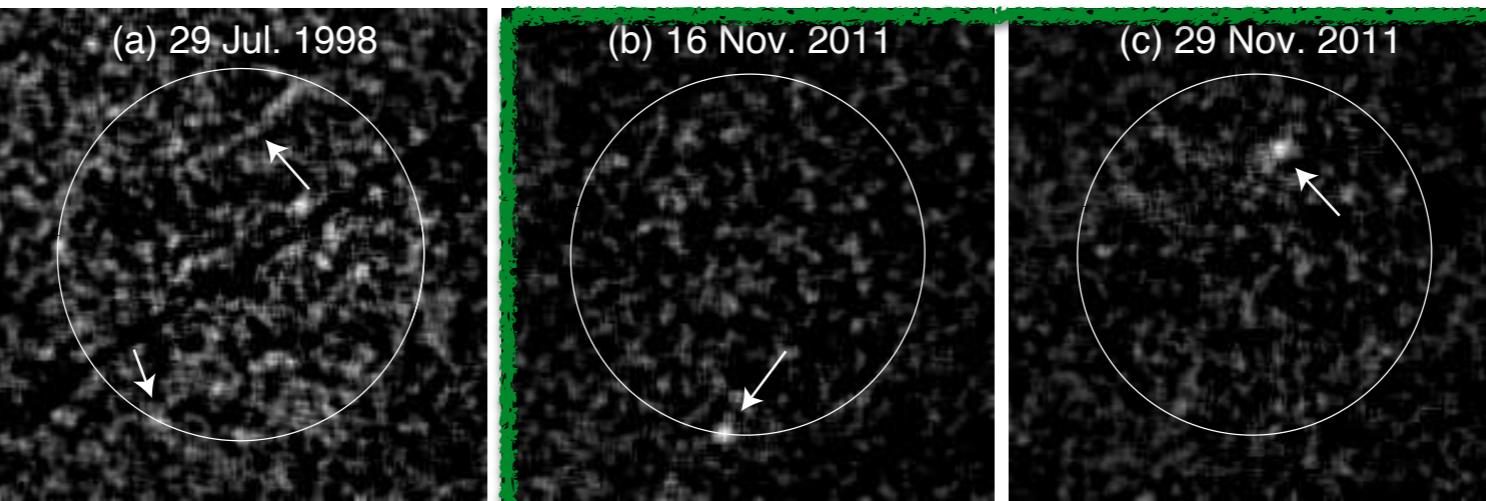
2014



# Properties

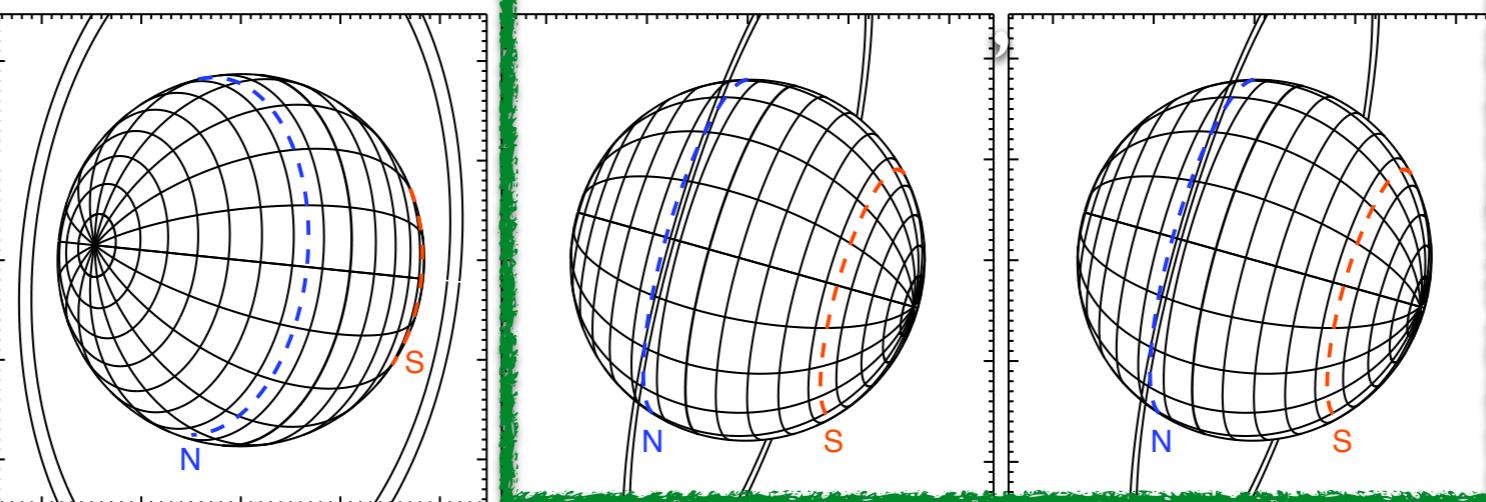
**1998**

- quasi-continuous ovals (shifted wrt N/S poles)
- polar emission ?



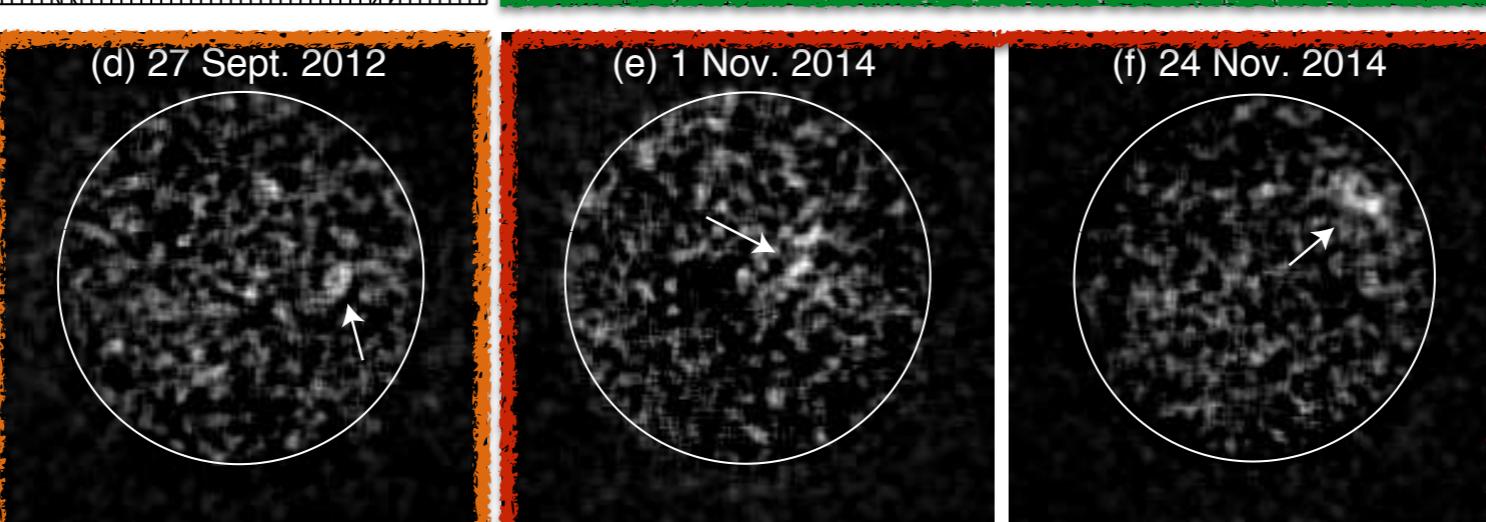
**2011**

- short-lived spots
- N oval ?
- faint  $\sim 1kR$



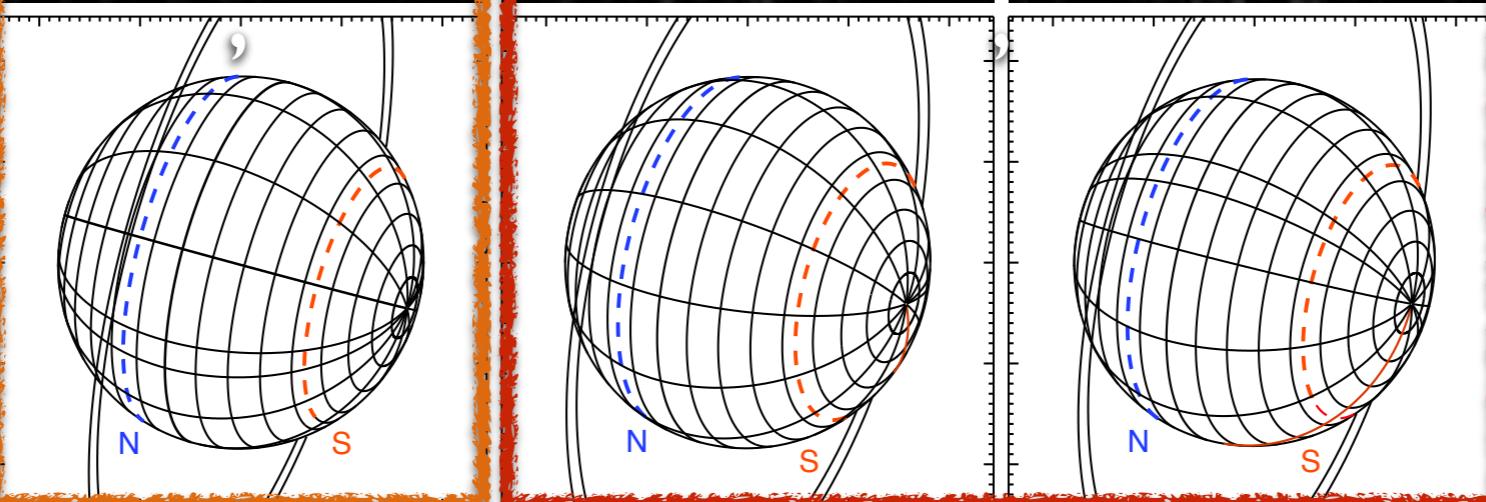
**2012**

- $\sim$  idem 2011



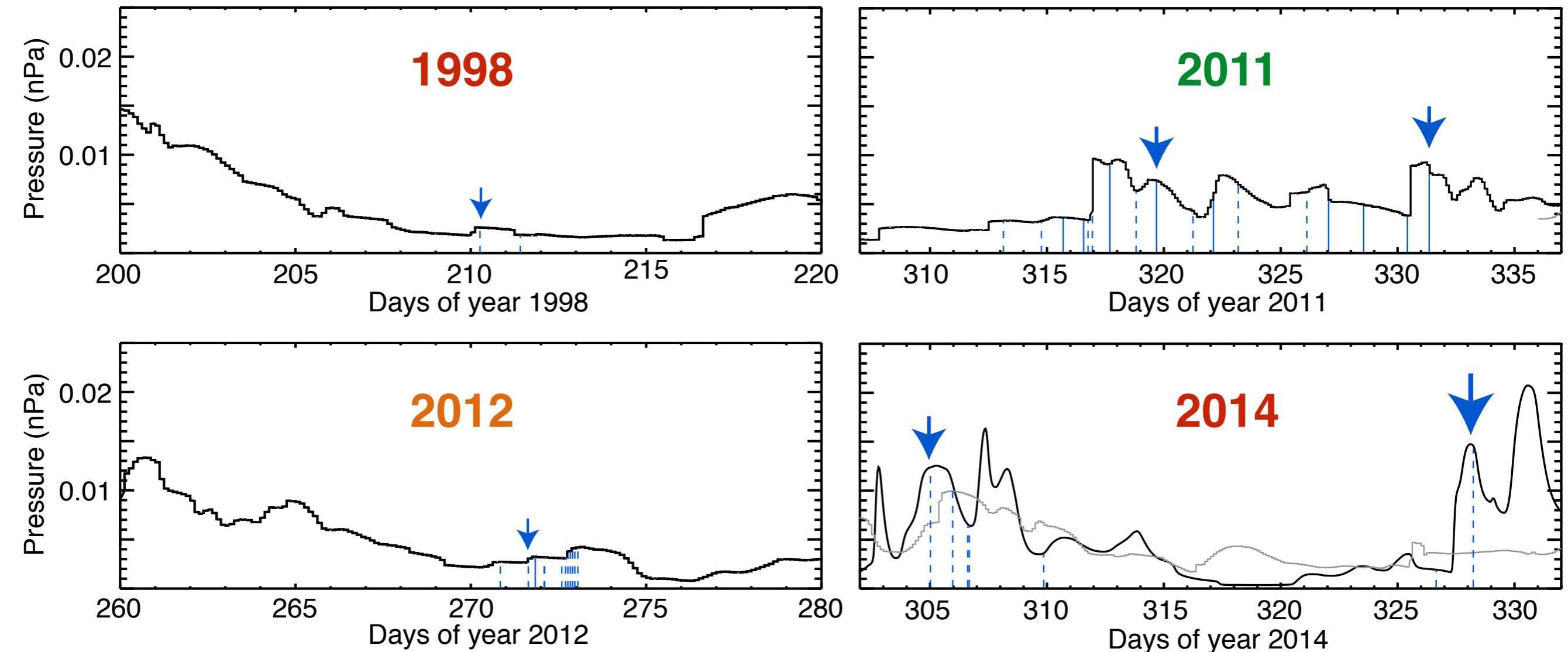
**2014**

- longer-lived + larger regions
- S oval



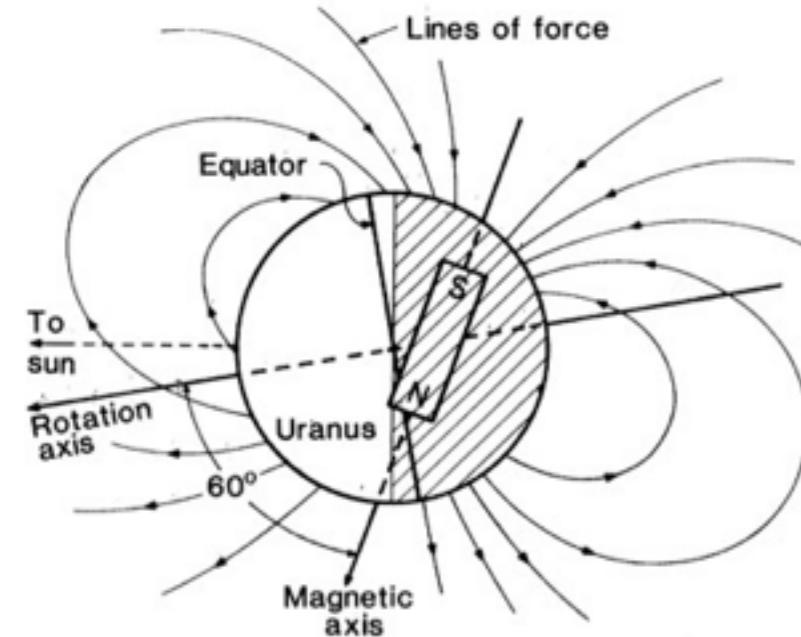
# Solar Wind

Solar wind (model @ 19 AU)

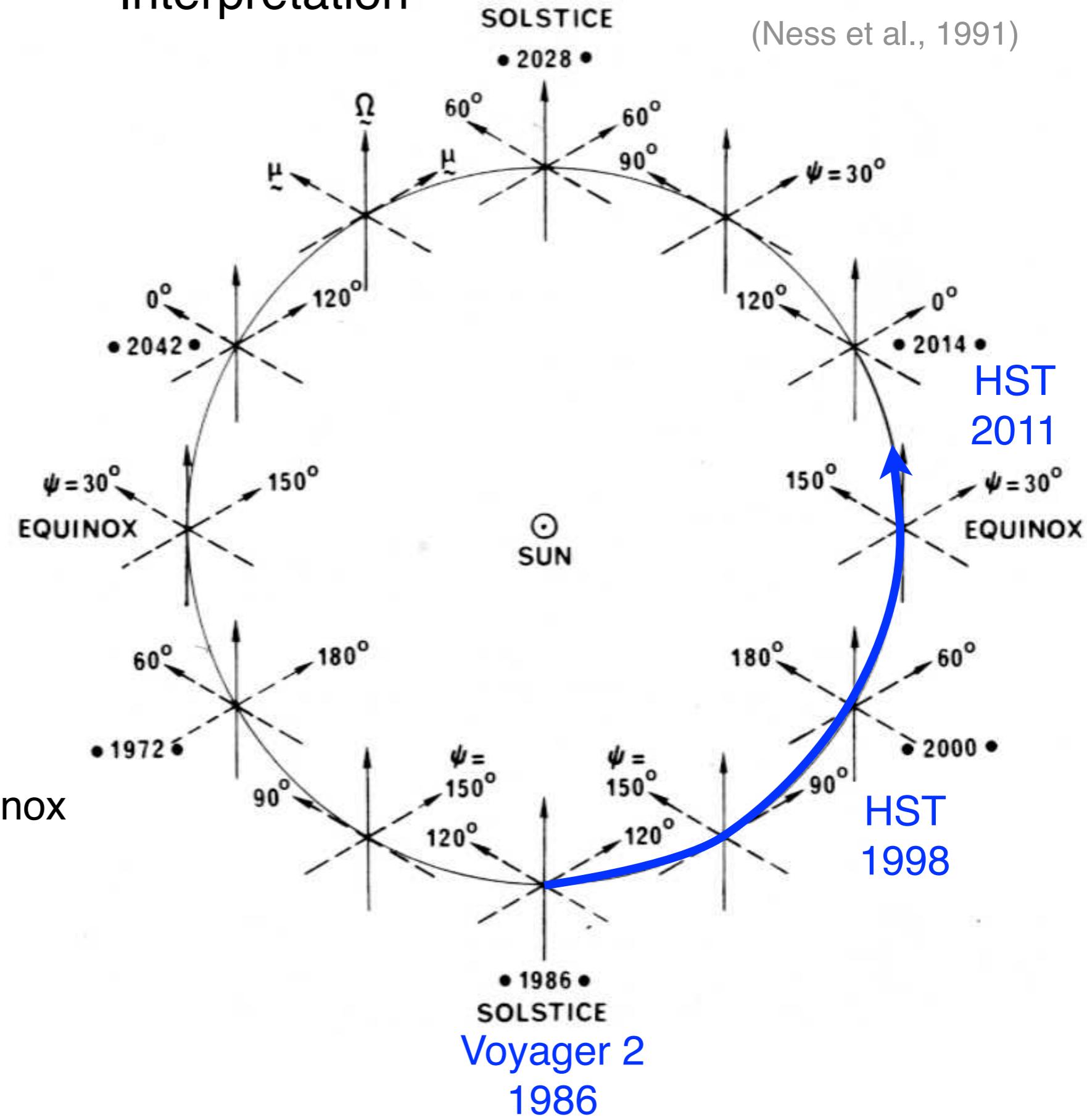


- 2011, 2014 : brightest signatures occur « close » to SW shocks
- 1998, 2012 : transient emission also observed during quiet SW

# Interpretation

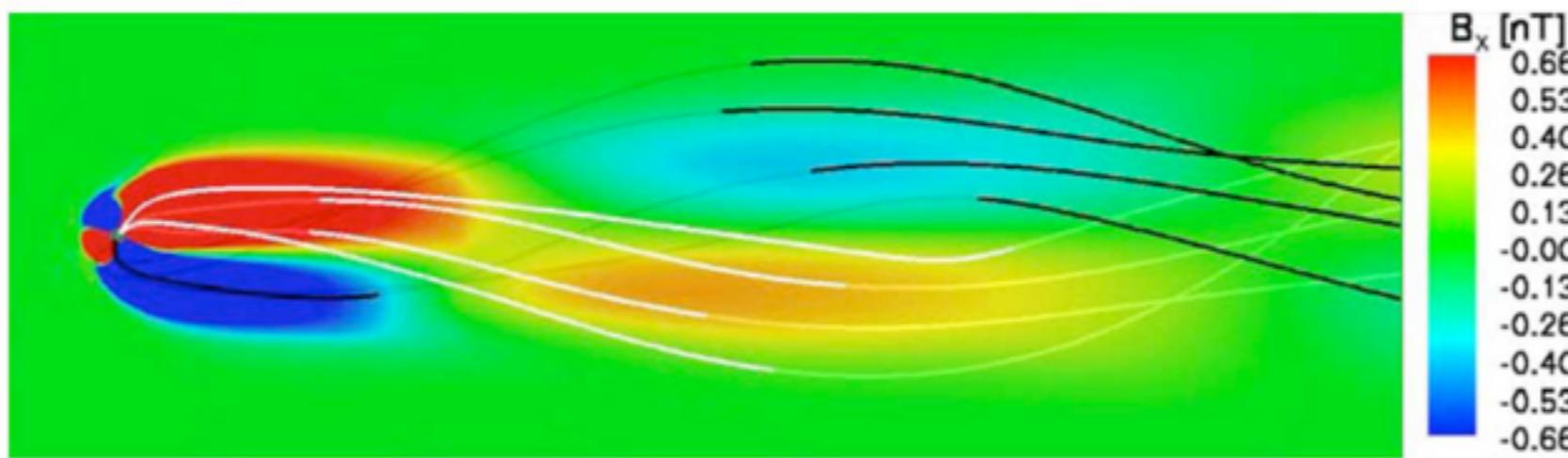
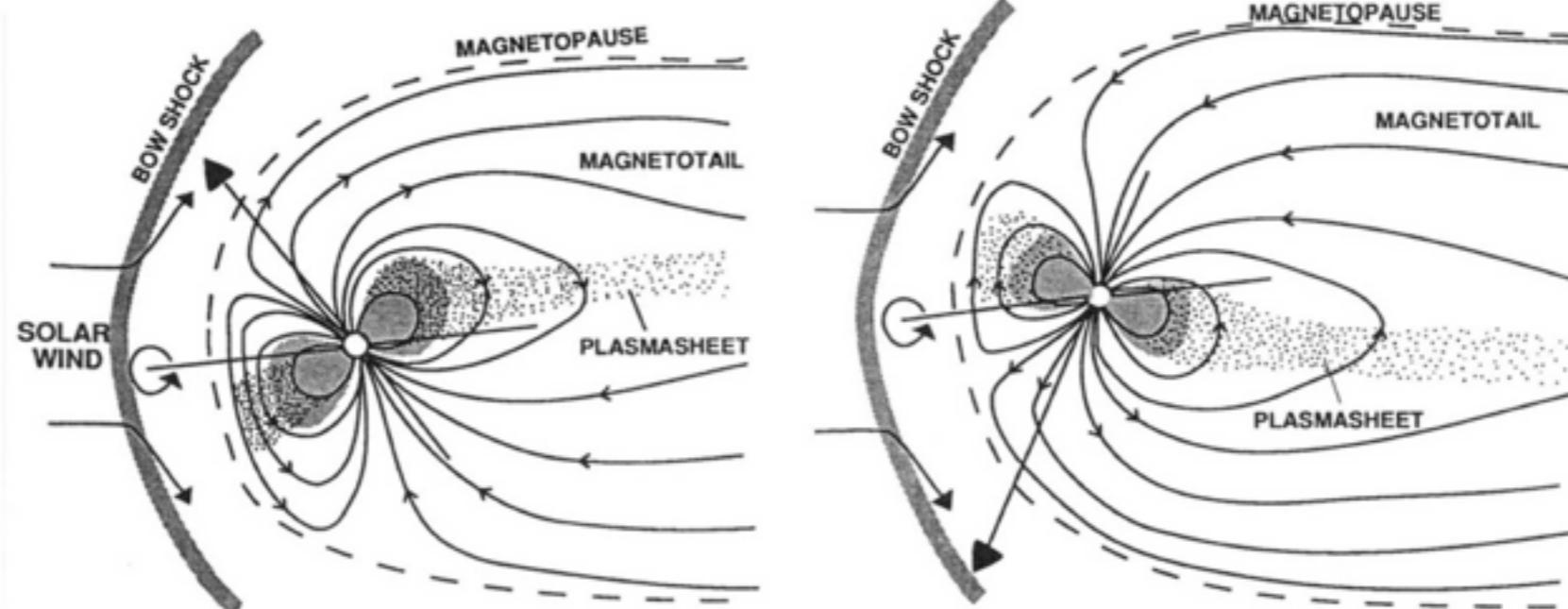


Sun ← 1986 : Solstice  
 Sun 2011 : Near-equinox



# Interpretation

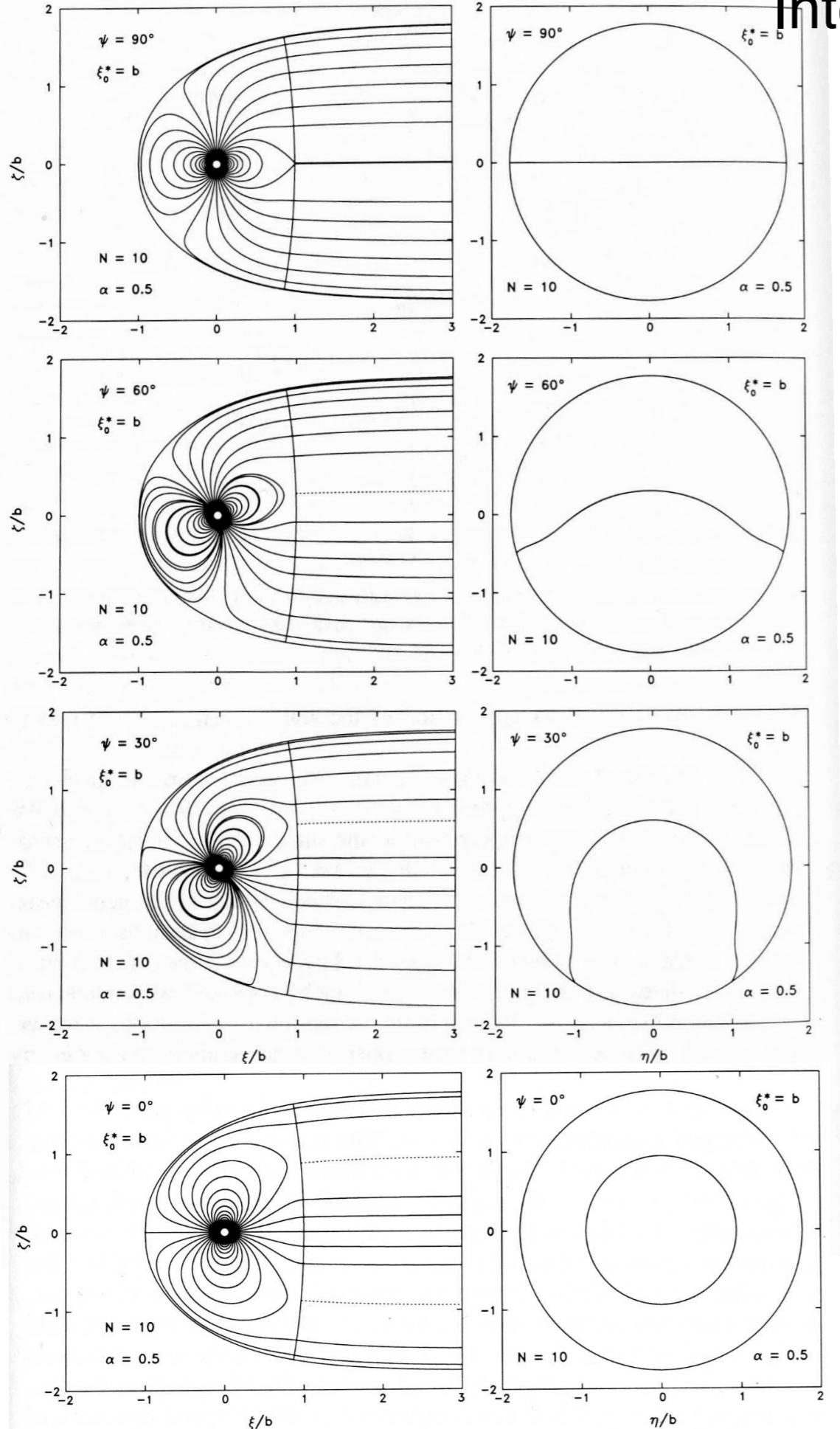
(Bagenal et al, 1992)



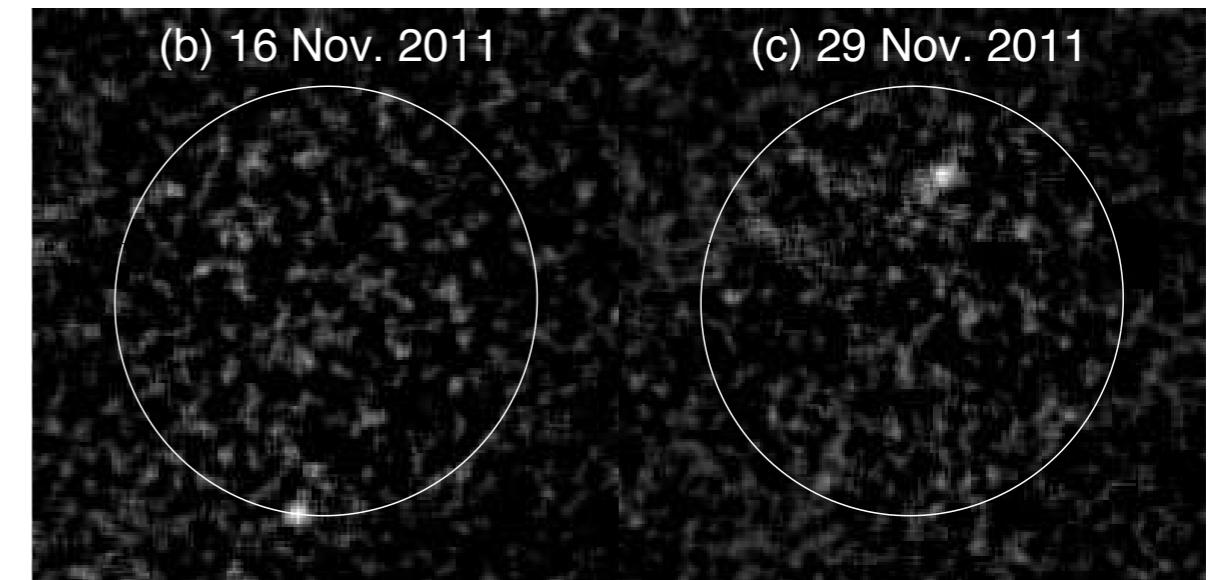
(Toth et al., 2004)

- 1986 : N (S) magnetic pole rotates on the dayside (nightside)  
=> SW convection and planetary rotation act in orthogonal planes  
=> stable helical plasma sheet  
=> Earth-type situation (nightside auroral precipitations)  
NB : Voyager 2 UV data acquired during a SW shock

(Ness et al, 1991)



## Interpretation

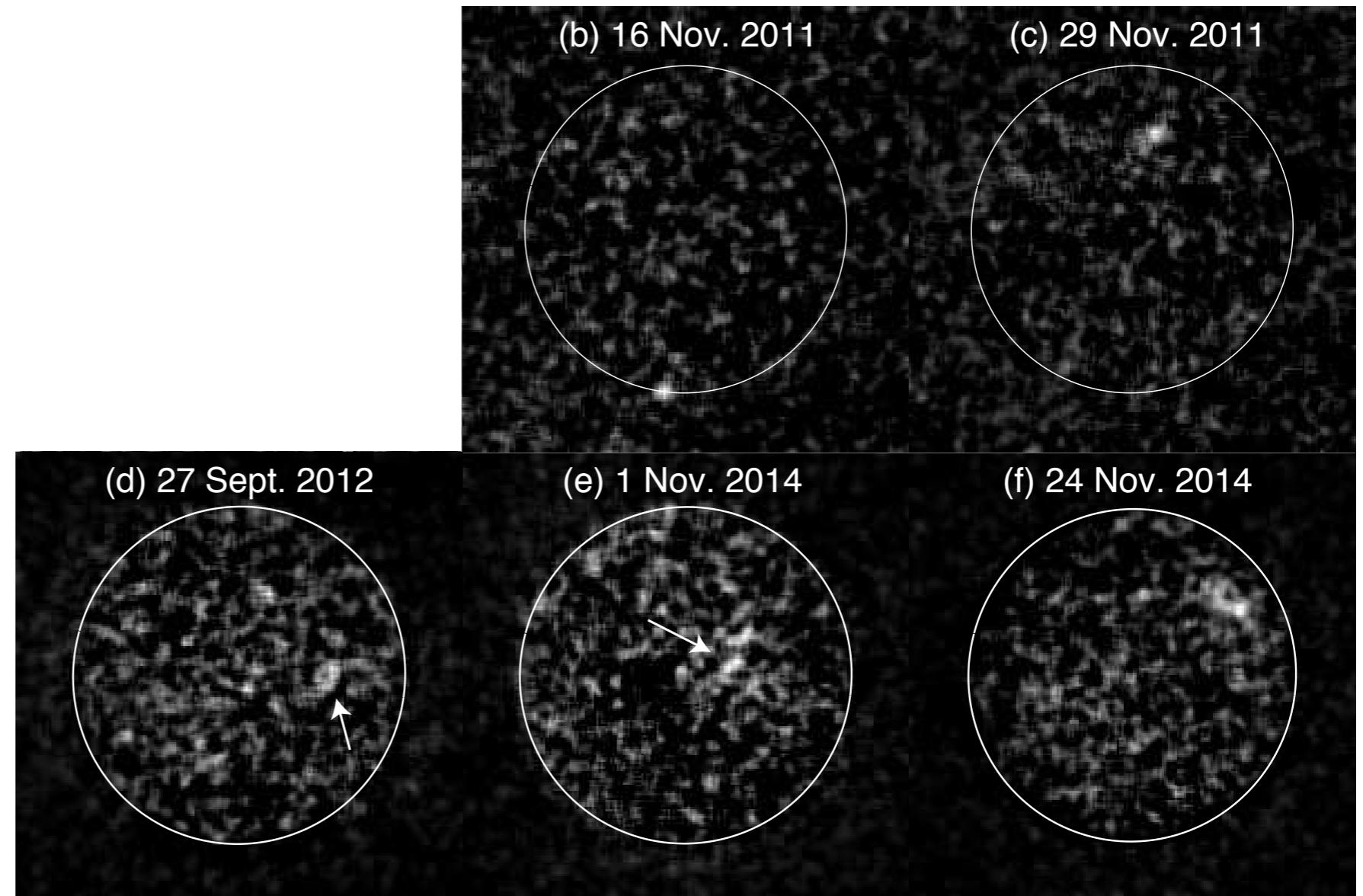


**2011 :** extreme SW/MS configurations during each rotation from Earth-like to ‘pole-on’

(i) unlikely that a significant plasma sheet survives more than half a rotation  
=> occurrence close to SW shocks but short lifetime, MS compressions have a different effect - if any - than at other planets

(ii) dayside reconnection with interplanetary magnetic field favored once per rotation  
=> may cause observed bright spots

# Interpretation

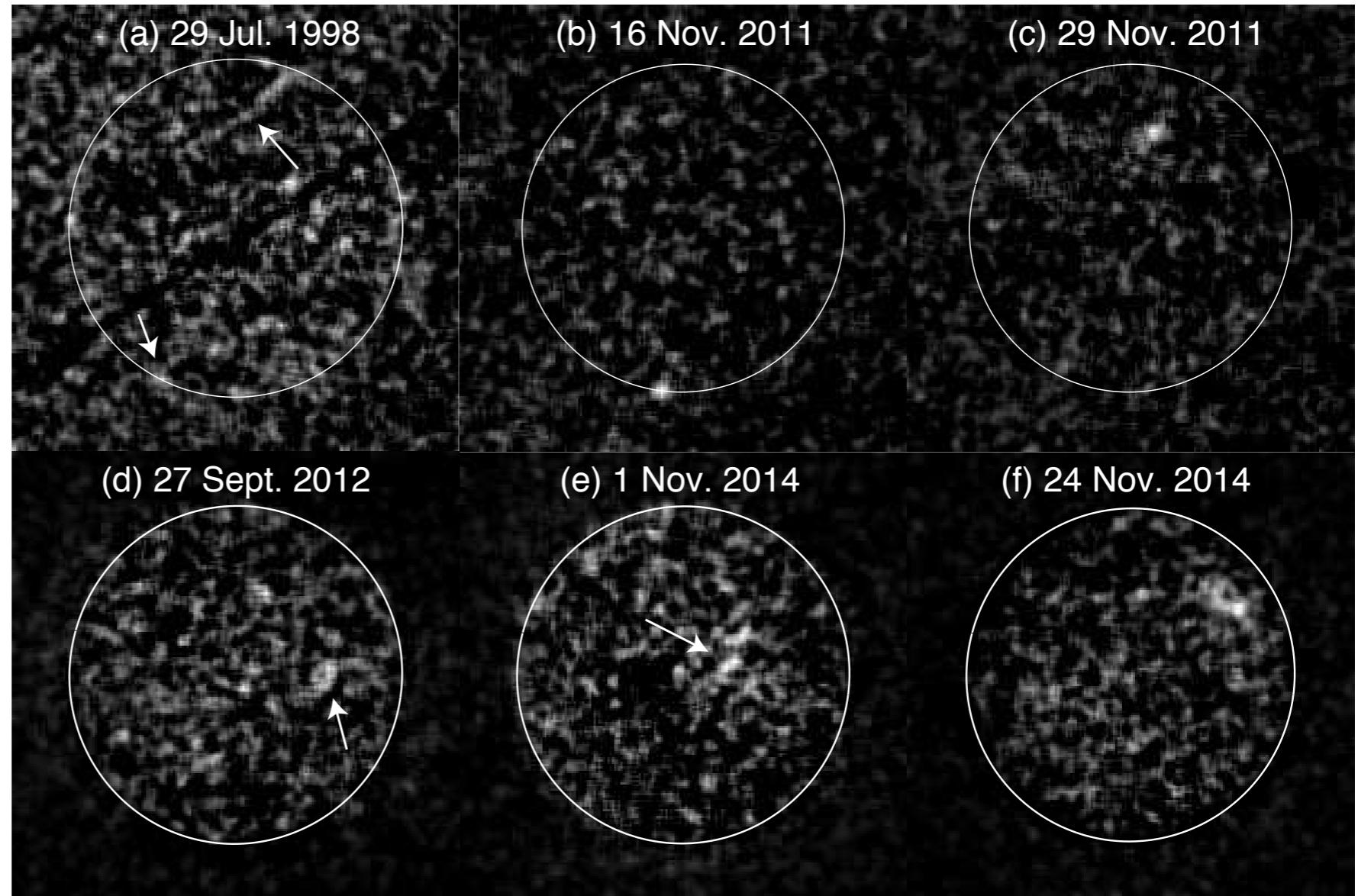


**2012 :** idem 2011

**2014 :** brightest ever signatures  
=> suggests a prominent role of SW  
dynamic pressure  
=> induced reconnection ?

## Interpretation

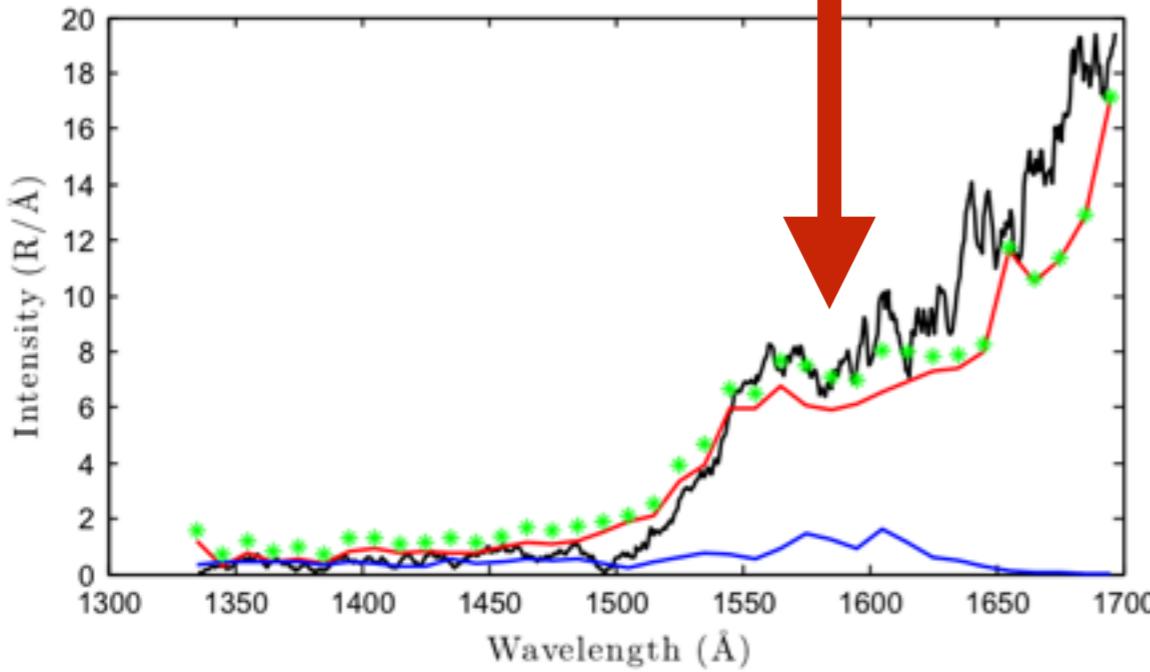
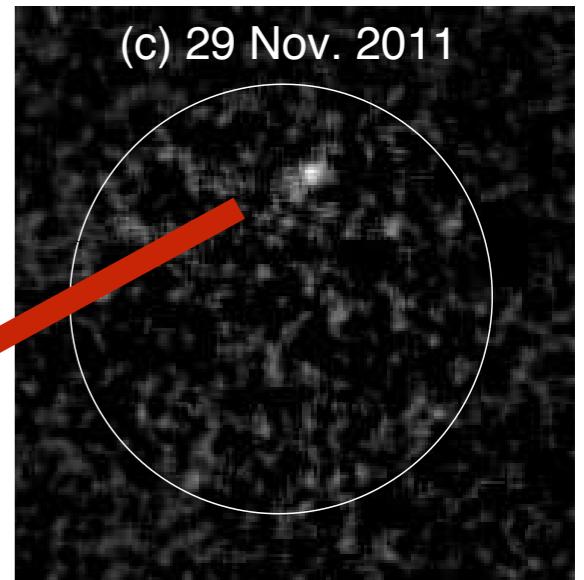
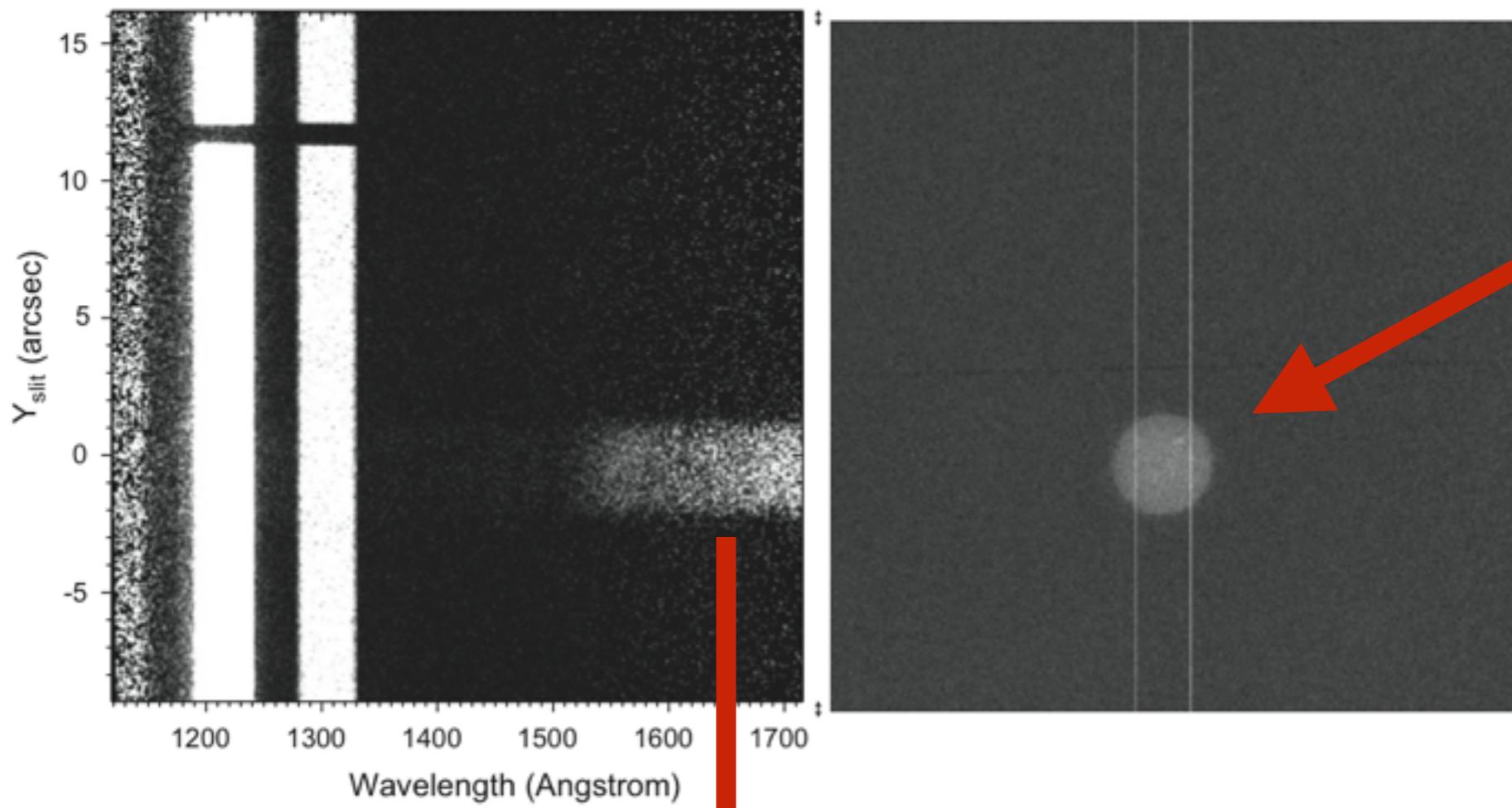
**1998** : solstice-to-equinox intermediate case, transient rings  
=> possible short-live twisted magnetotail  
=> acceleration mechanism(s) and plasma source(s) at work to be determined



**2012** : idem 2011

**2014** : brightest ever signatures  
=> suggests a prominent role of SW dynamic pressure  
=> induced reconnection ?

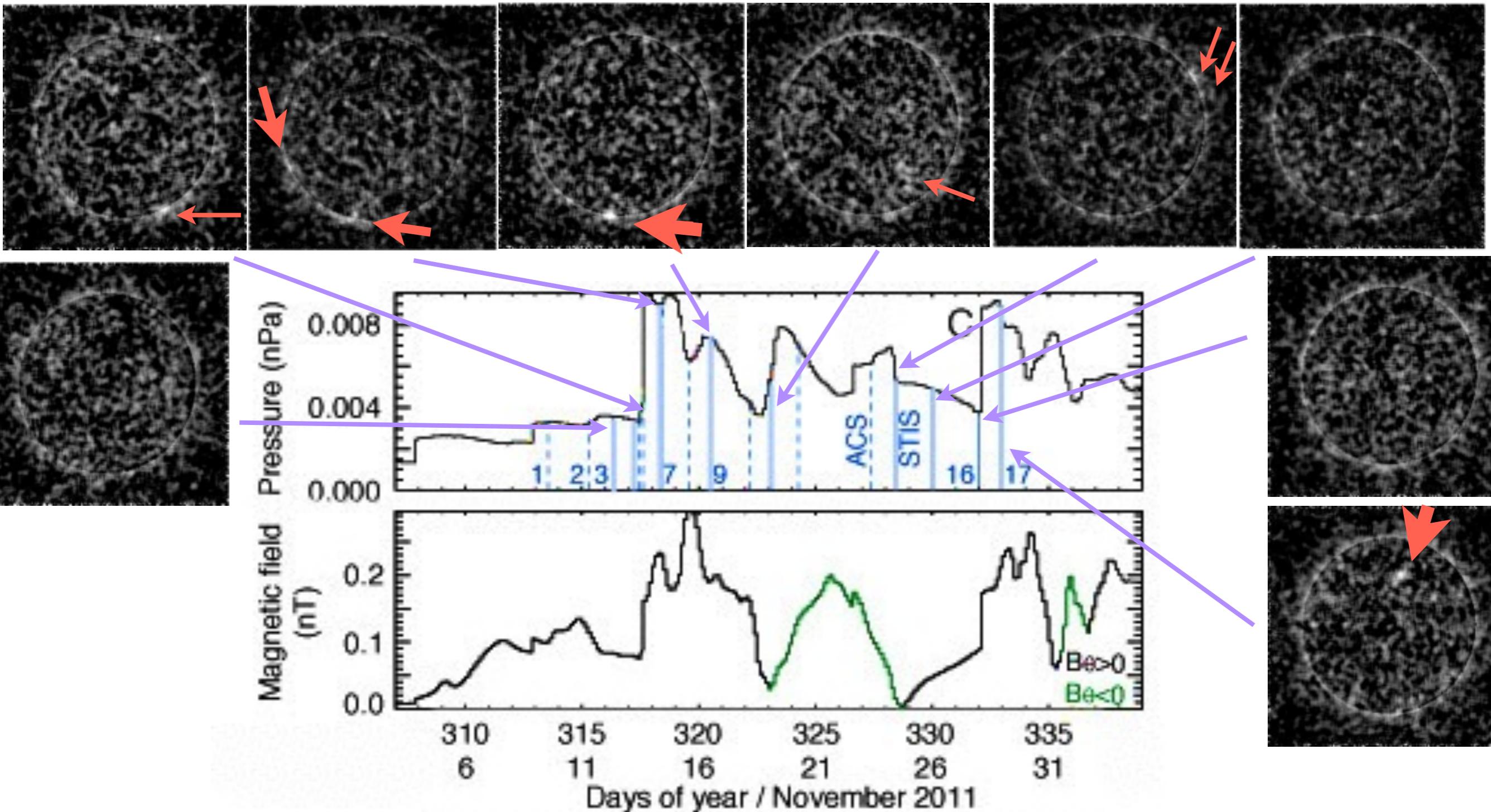
# Aeronomy



- H<sub>2</sub> emission with 0.05 erg cm<sup>-2</sup>.s<sup>-1</sup> at 3 keV
  - Updated constraints on the FUV albedo
- (Barthélémy et al., 2014)

# In progress : statistical study of AMBIGUOUS detections

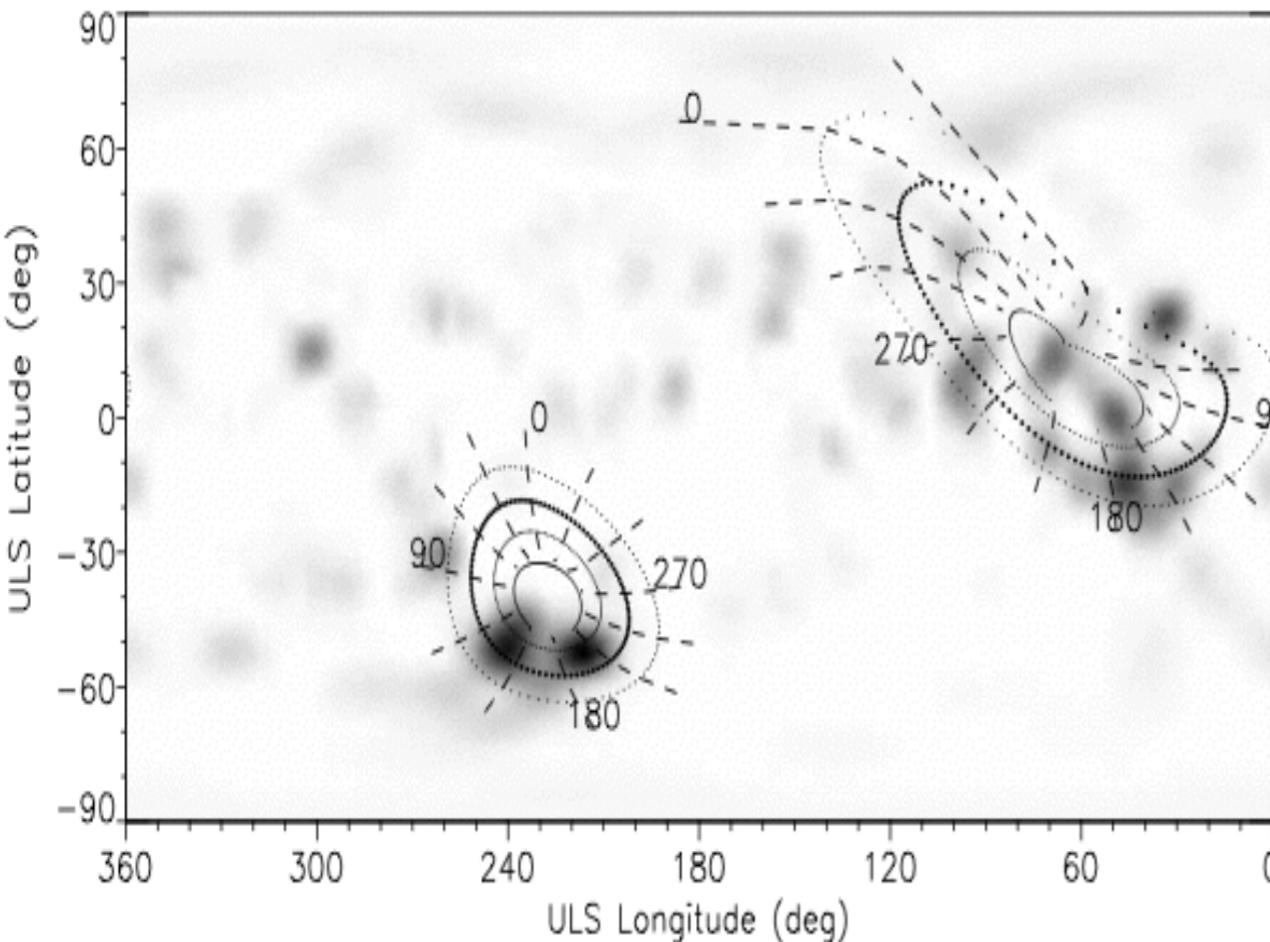
2011



Propagated solar wind (@ 19 UA)

# In progress : statistical study of AMBIGUOUS detections

1986



2011

