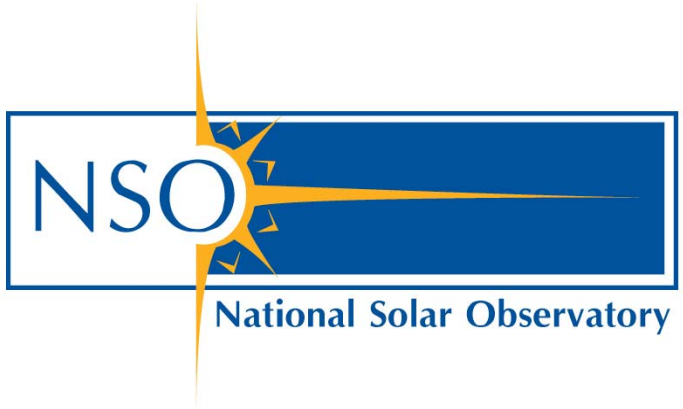



# On the relationship between coronal jets and plumes

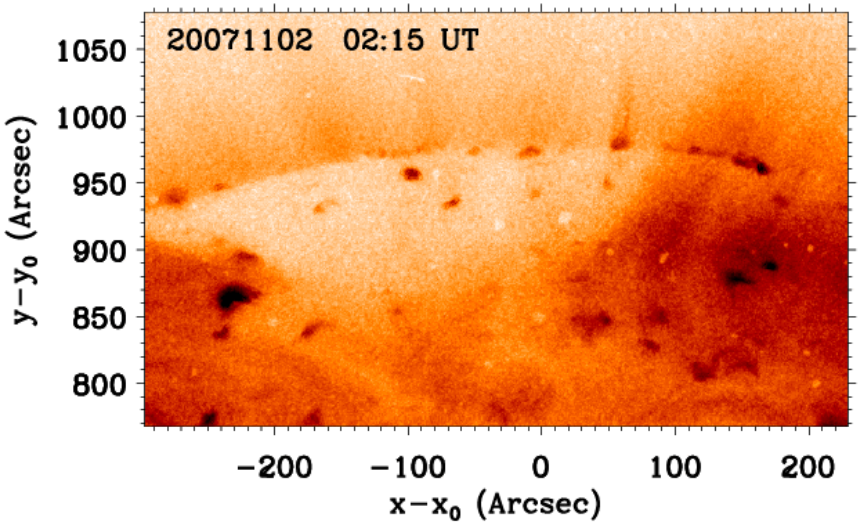
**N.-E. Raouafi**

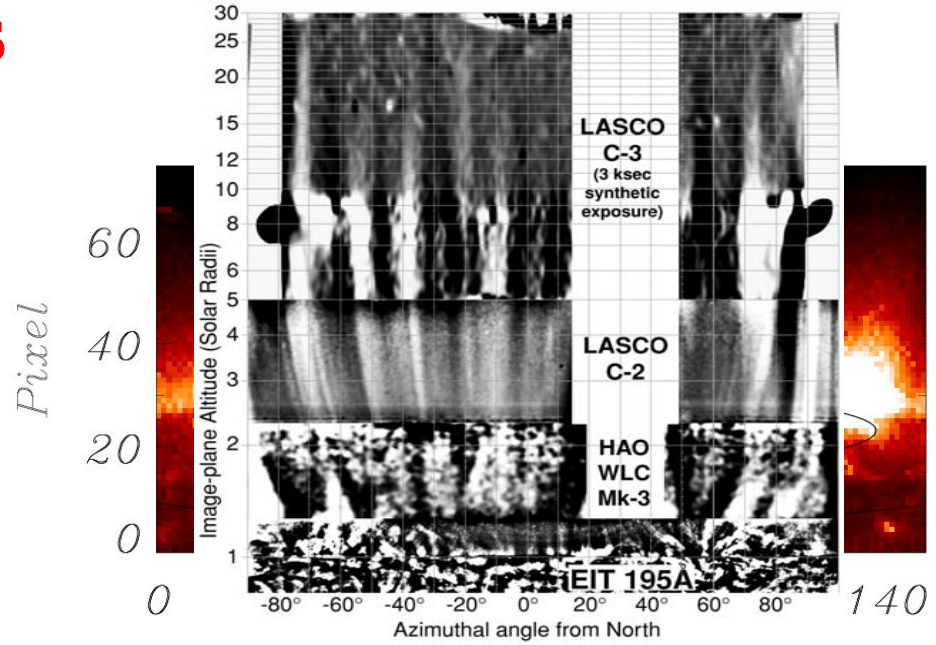
**2nd Hinode Science meeting**
**29 Sep. – 3rd Oct. 2008, Boulder, Colorado**

# Polar coronal jets vs. plumes

**Literature:** **no connection between these prominent polar structures**

# Polar coronal jets vs. plumes




DeForest et al. 2001

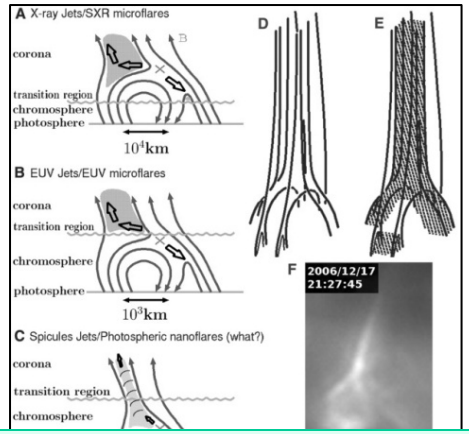
- ✓ Sharp edged structures collimated by newly open magnetic fields
- ✓ Typical width: ~ 10 Mm
- ✓ Reach coronal heights of $10^5$ - $10^6$ km
- ✓ Typical lifetime: seconds – tens of minutes
- ✓ Plasma outflow speed 100 – 1000 km $s^{-1}$

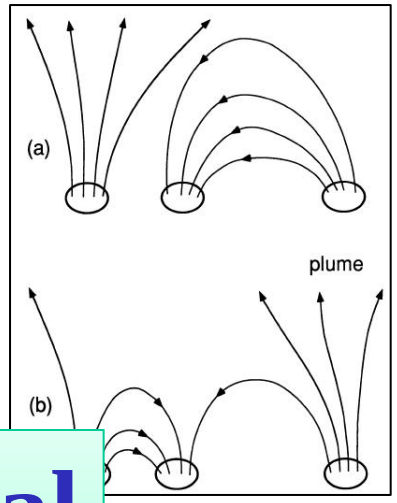
- ✓ Hazy structures: no clear edges
- ✓ Typical width: ~ 40 Mm
- ✓ Reach coronal heights up to 30 Rsun
- ✓ Typical lifetime: hours - days
- ✓ Plasma in quasi-static state up to about 2 Rsun

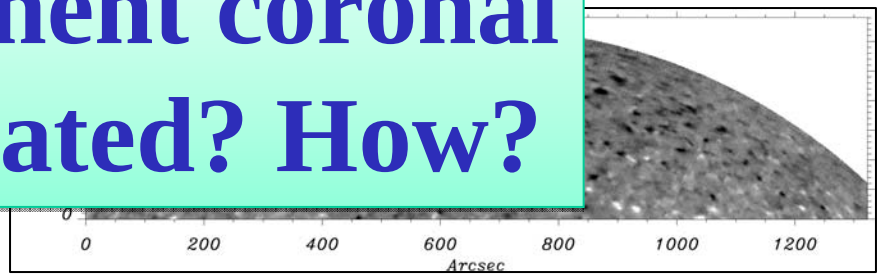
# Jets vs. Plumes: common properties

## Jets
Shibata et al. 2007

## Plumes
Wang & Sheeley 1995

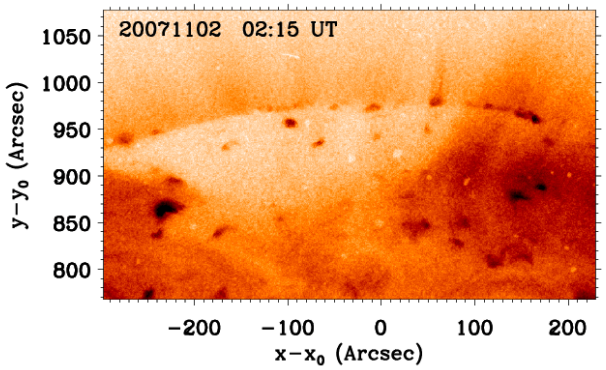


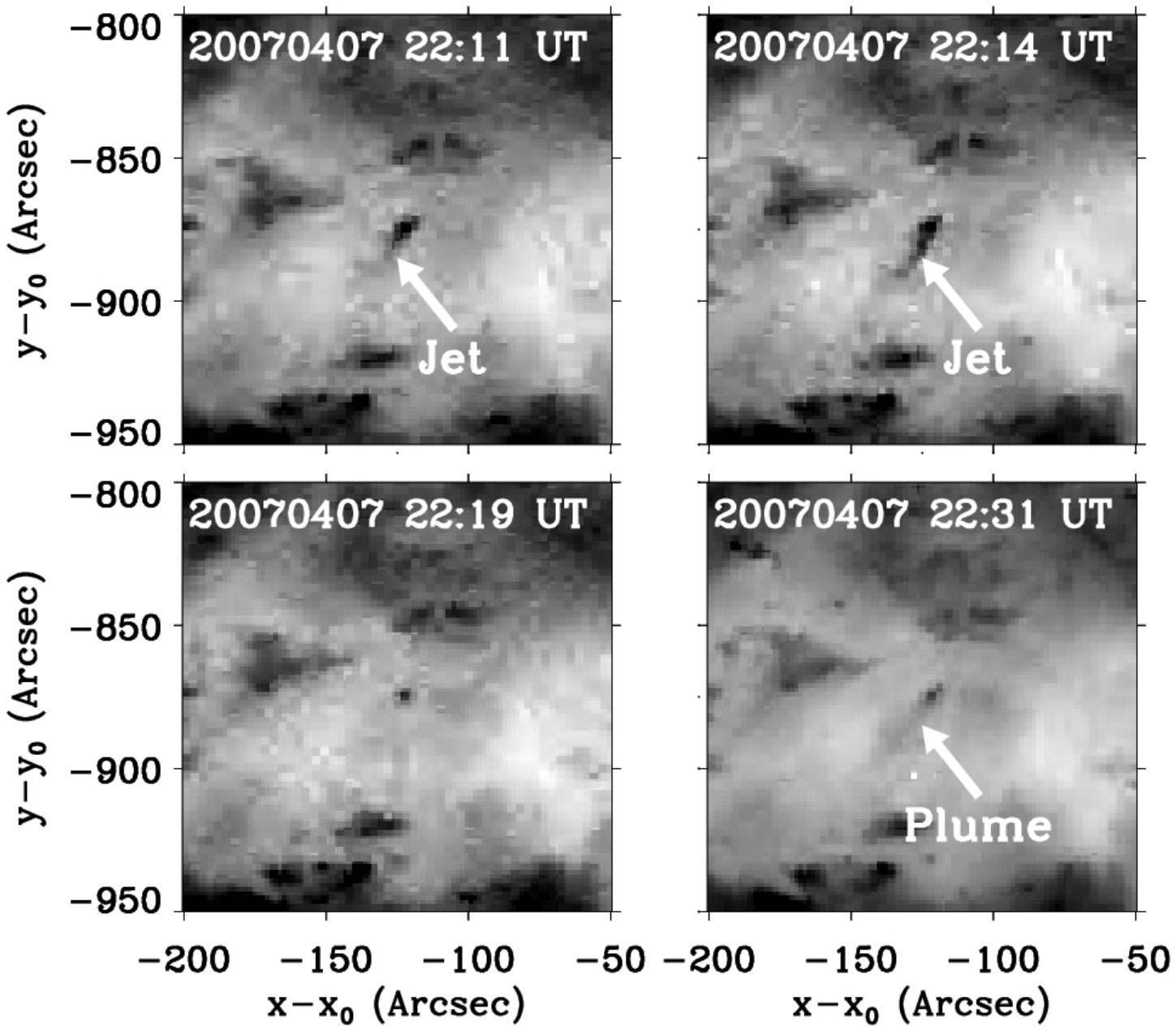




- ✓ **Formed by reconnection of emerging bipolar flux with the ambient field**
- ✓ **Rooted**
  **coincidi**
- ✓ **Of episodic nature**

**Can these prominent coronal structures be related? How?**






***STEREO/SECCHI/EUVI* 171 Å**

# Observations

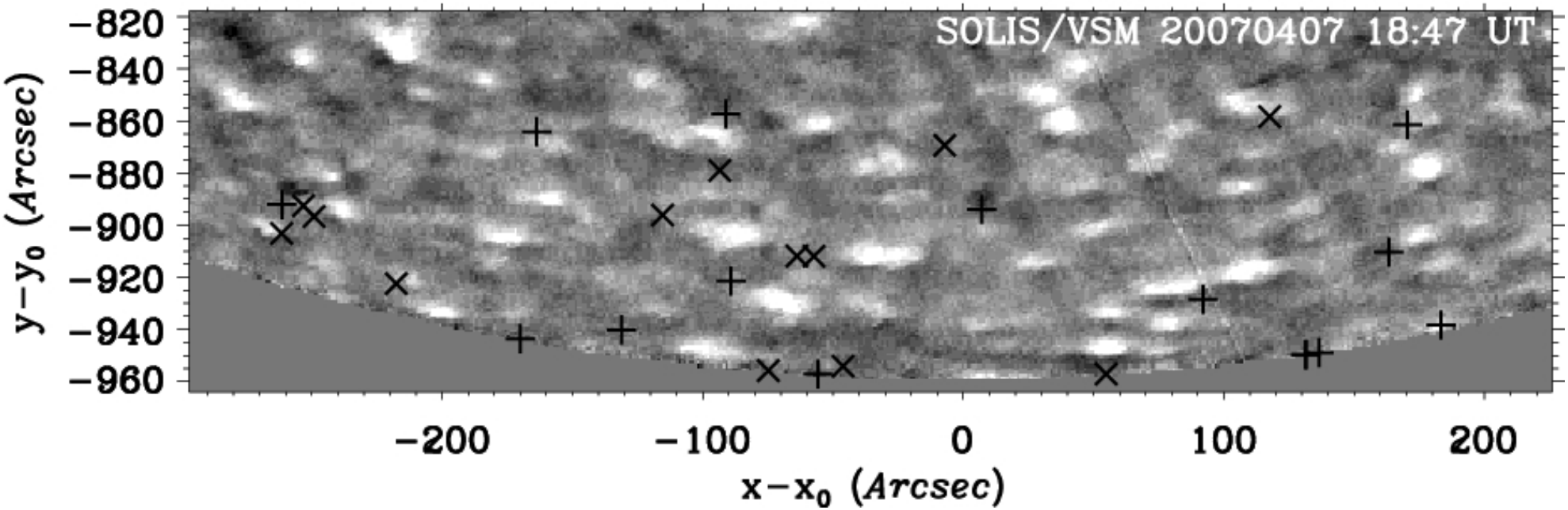
**Observations of the southern polar coronal hole on April 7 – 8, 2007, from**

- ✓ **X-ray data from Hinode/XRT ;**
- ✓ **EUV data from STEREO/SECCHI/EUVI;**
- ✓ **SOLIS/VSM LOS-chromospheric (Ca II 8542 Å) magnetograms: footpoints of jets & plumes.**

**28 X-ray and EUV jet events are identified**

# Observations

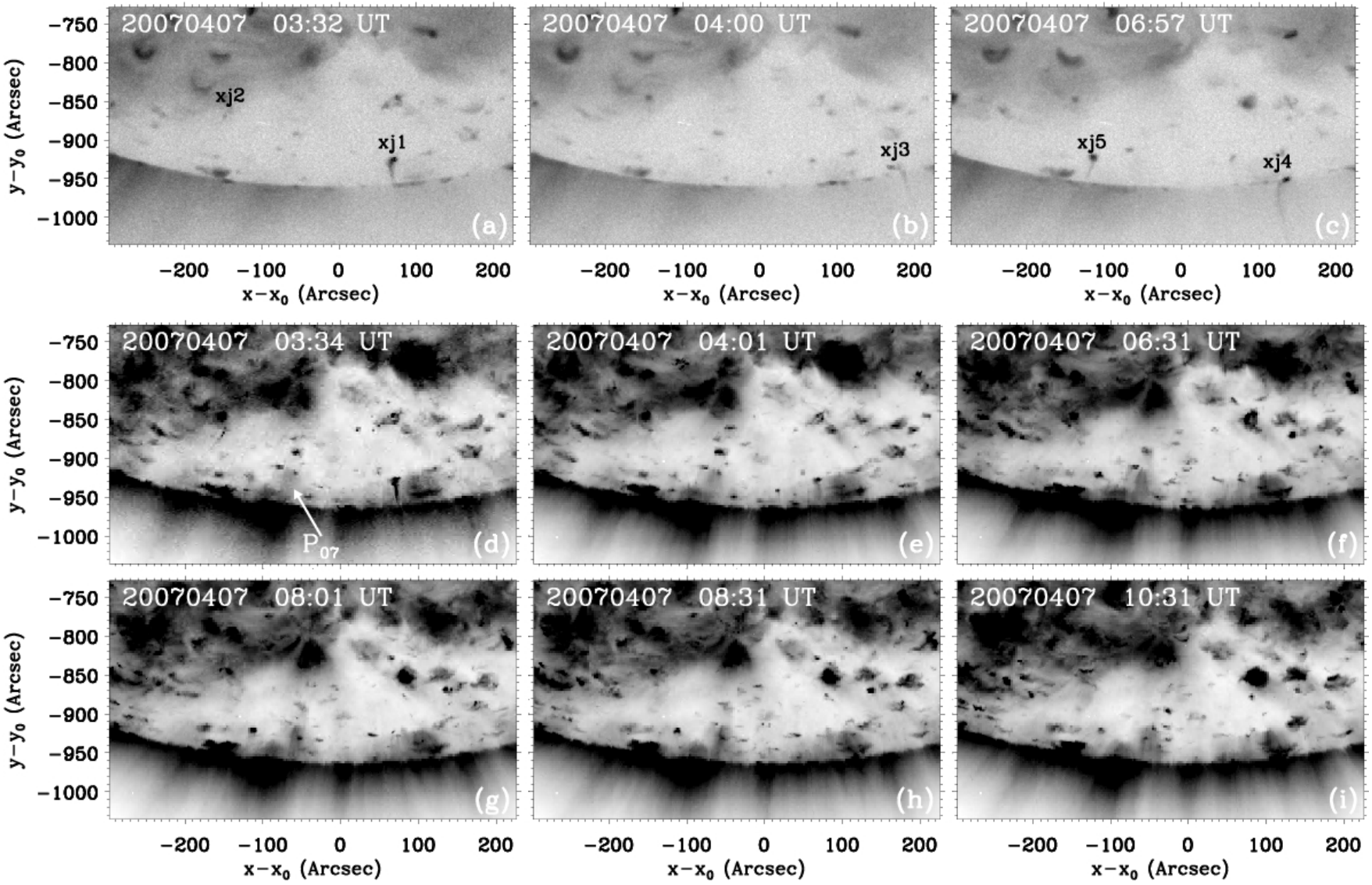
***SOLIS/VSM*** **LOS-chromospheric (Ca II 8542 Å) magnetogram**




**+ : April 7, 2007**

**× : April 8, 2007**

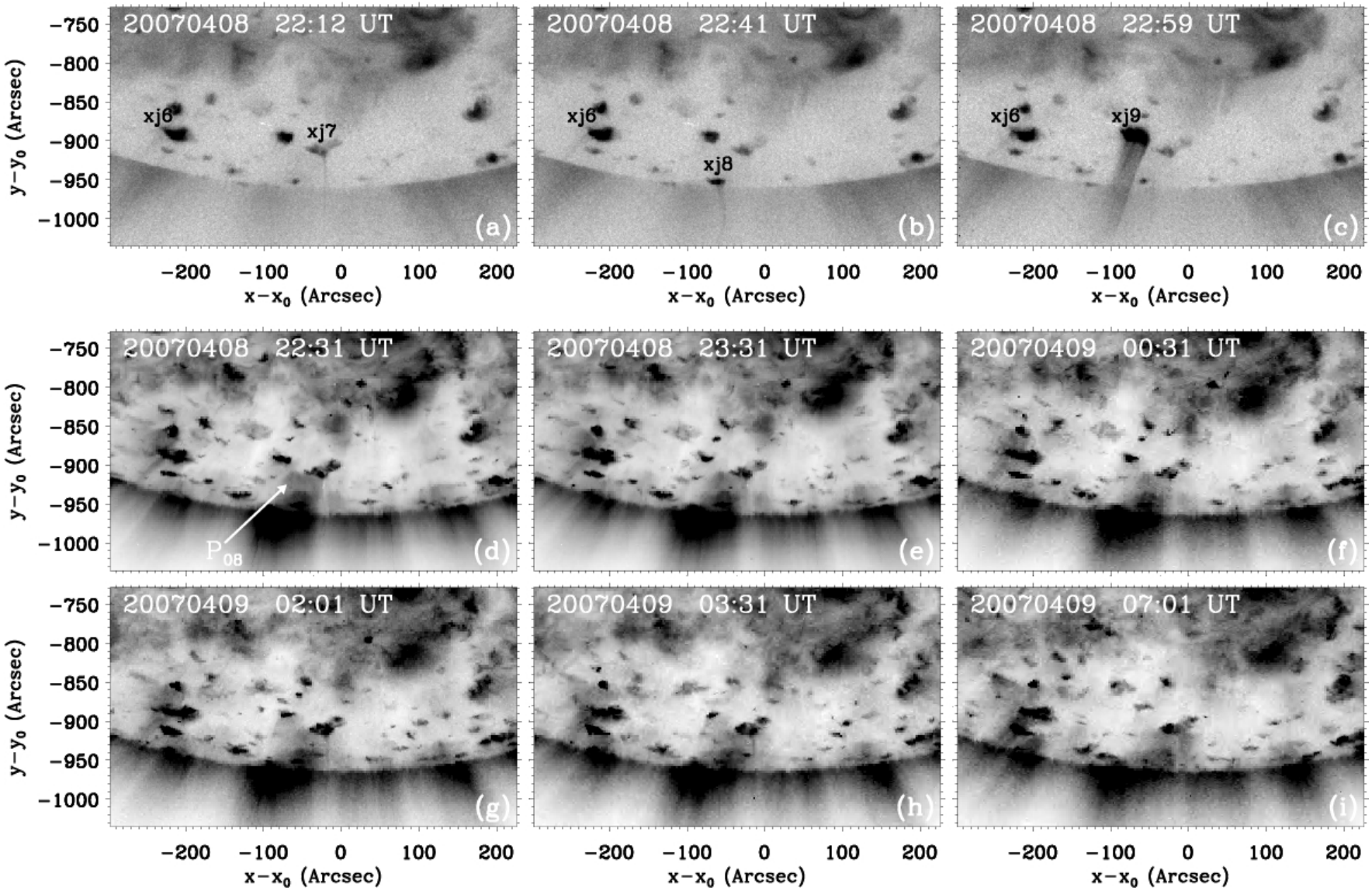
# Observations




*X-rays*

*EUV*

# Observations



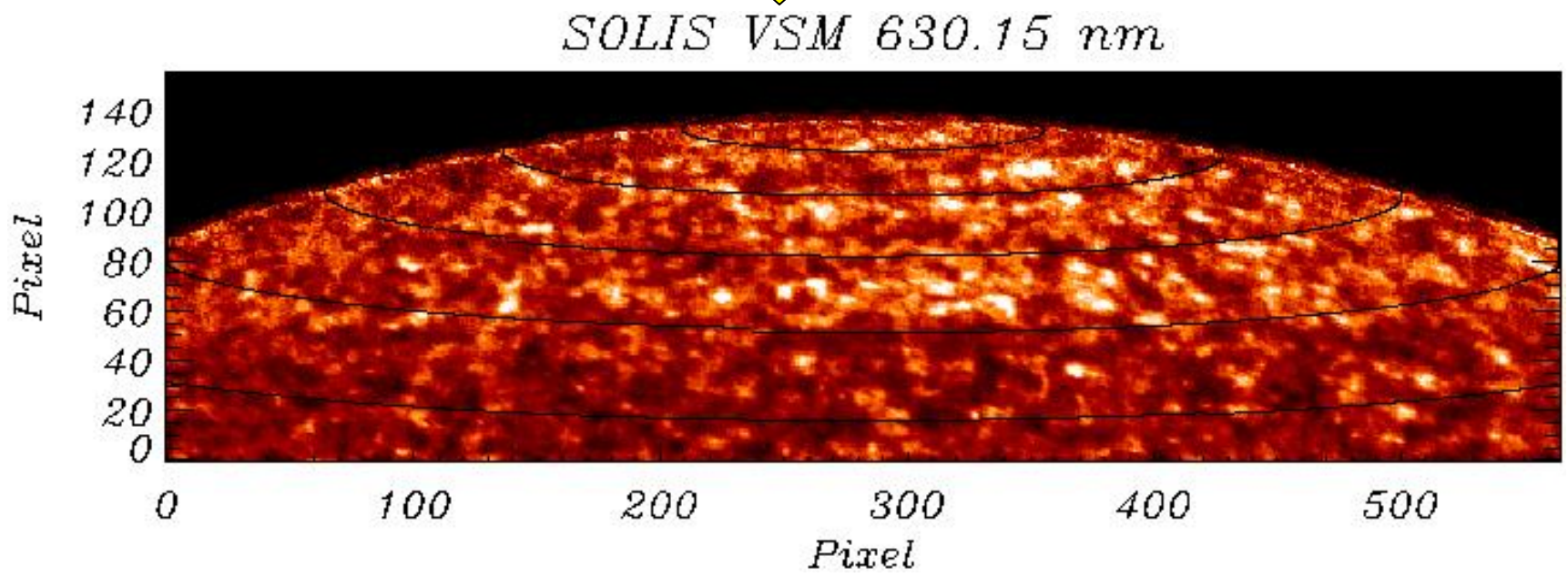

*X-rays*

*EUV*

# Latitude distribution of jets & plumes

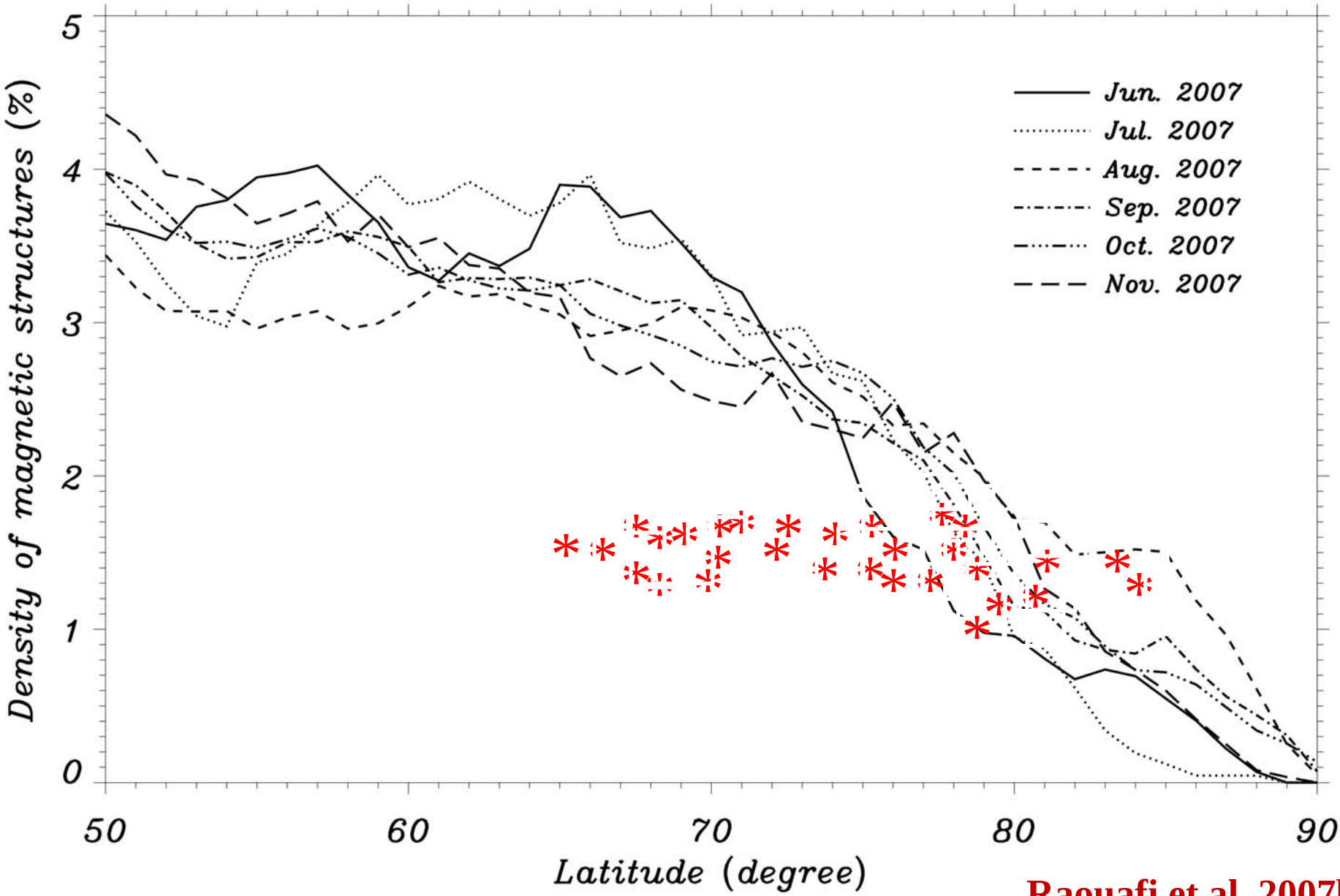
**Modeling of plasma dynamics within polar plumes constrained by SOHO/UVCS observation: Observations are better reproduced when plumes are based more than 10º away from the solar pole.**

**Raouafi et al. 2007a**




**Average of magnetic flux distribution around the north pole for Sep. 2005 from SOLIS/VSM**

# Latitude distribution of jets & plumes




Raouafi et al. 2007b

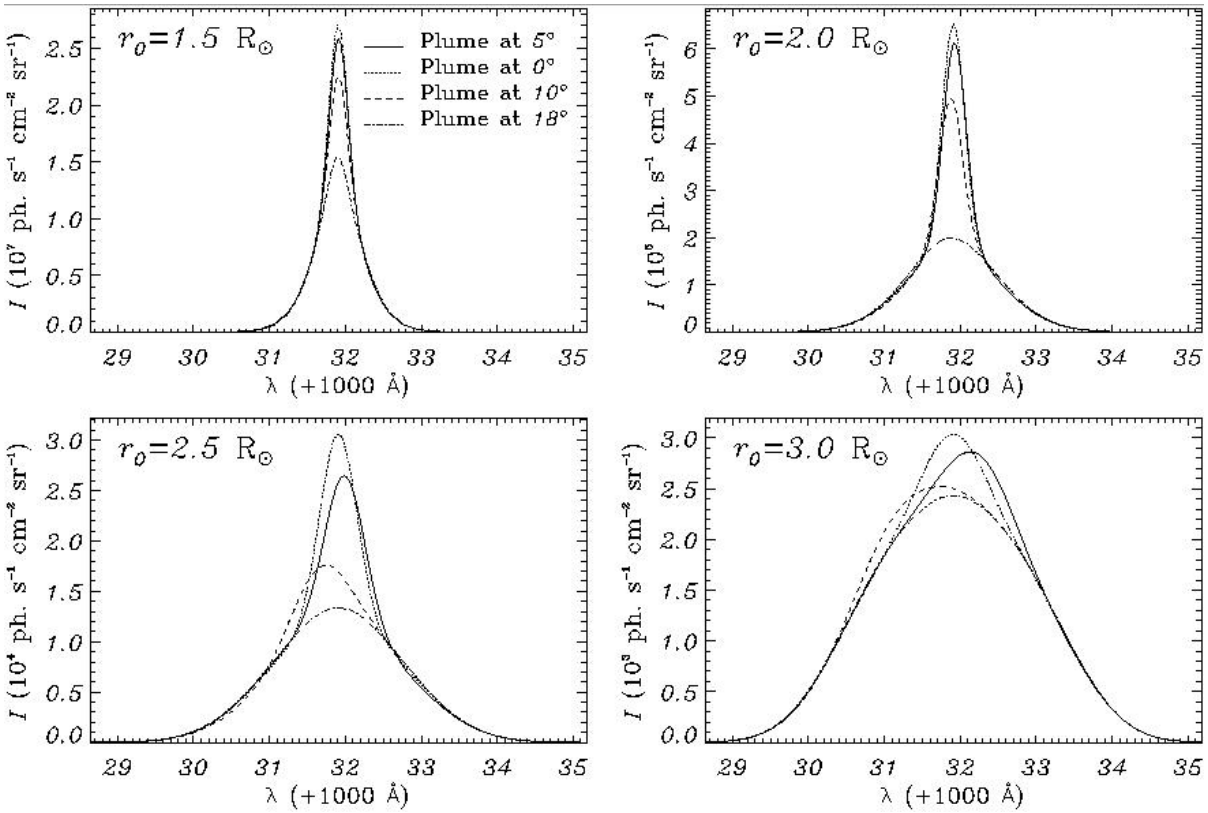
# Conclusions

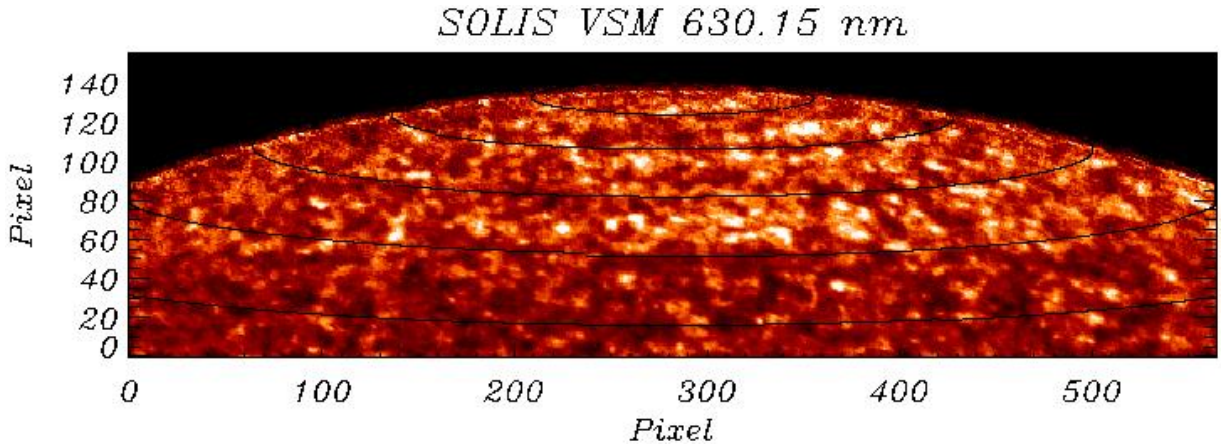
**Among the 28 jets observed in the southern polar hole on April 7-8, 2007:**

- **More than 90% of the jets are associated with plume haze.**
- **70% of these events are followed by polar plumes with a time delay rangin** ***he solar limb w***
- **All jets**
- **Long li** **s and transient bright points that contribute to their brightness changes.**
- **Most of jets, and then plumes, are rooted in network elements away from the solar pole.**

**Any model aiming to understand jets & plumes must explain both structure in the same time.**

# On the plume footpoints



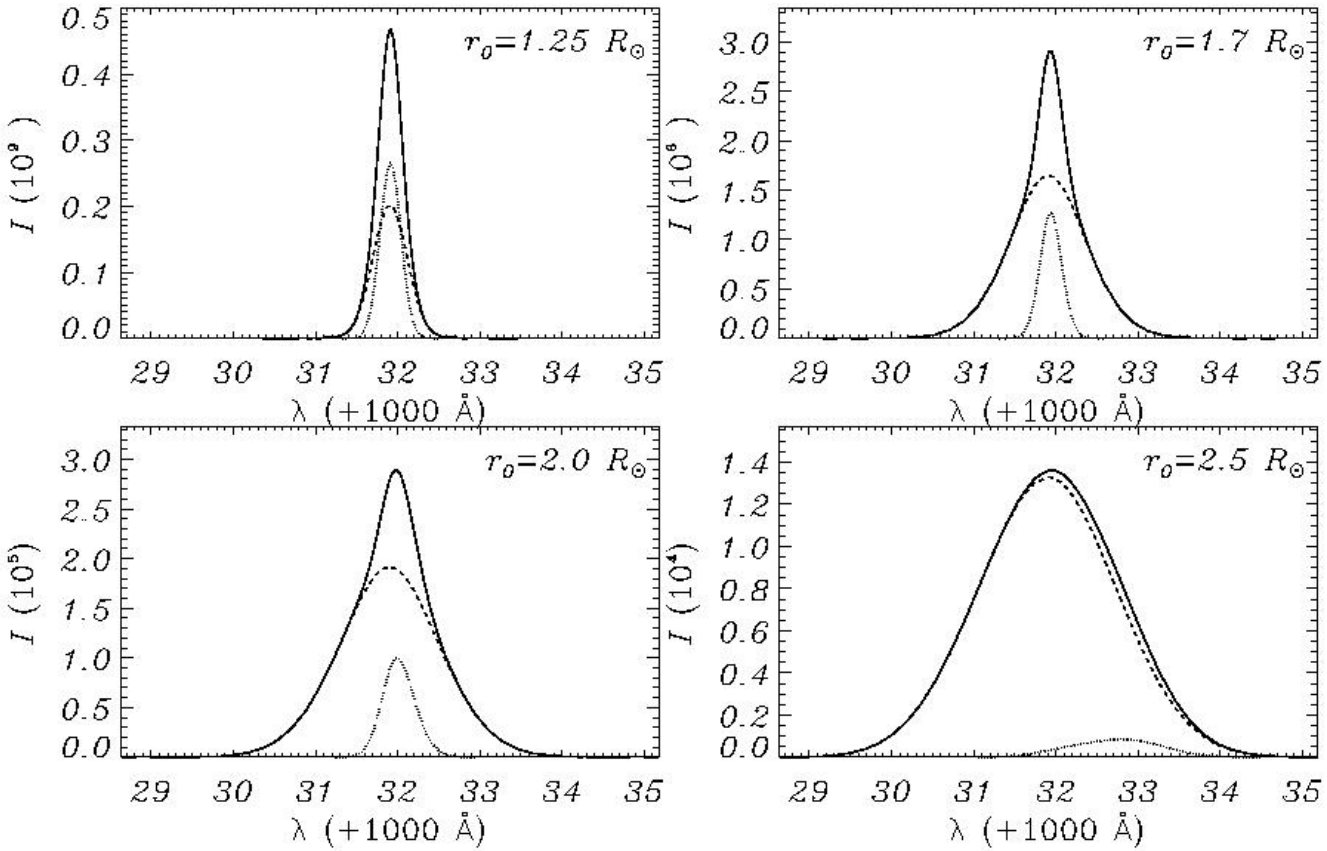



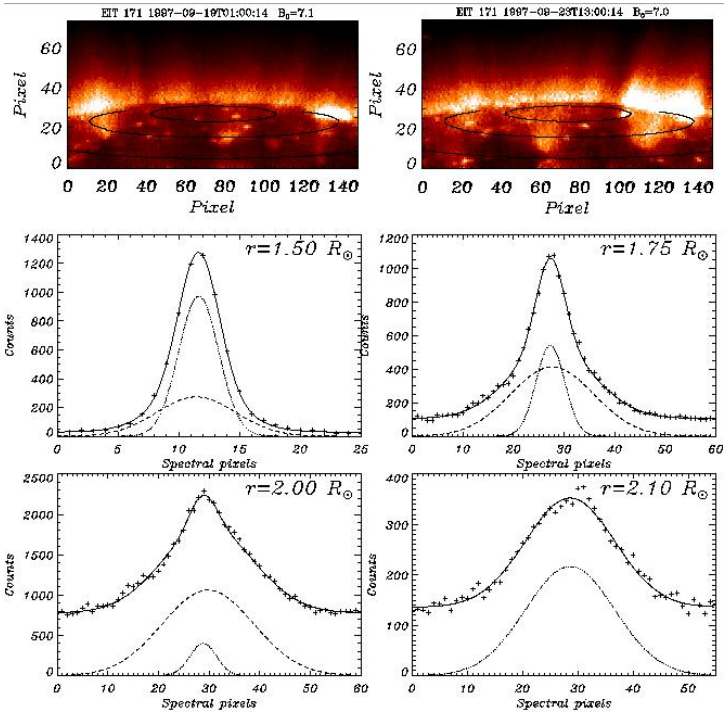

**Contrary to the observations, narrow components from PP close to the pole are present at most heights**

**This suggests that PP preferentially originate away from the pole**

**Magnetic flux distribution around the north pole for Sep. 2005 from SOLIS Supporting this hypothesis**

# Polar plume plasma dynamics: best fit case




**O VI 1032 line profiles with contribution**

**from the PP at 15° from the pole**

## Note the similarity to the observed ones