

***Polarized Near-infrared Flares  
from Sagittarius A\*:  
Orbiting hotspot?***

**(Nishiyama et al. 2009 ApJL, 702, L56)**

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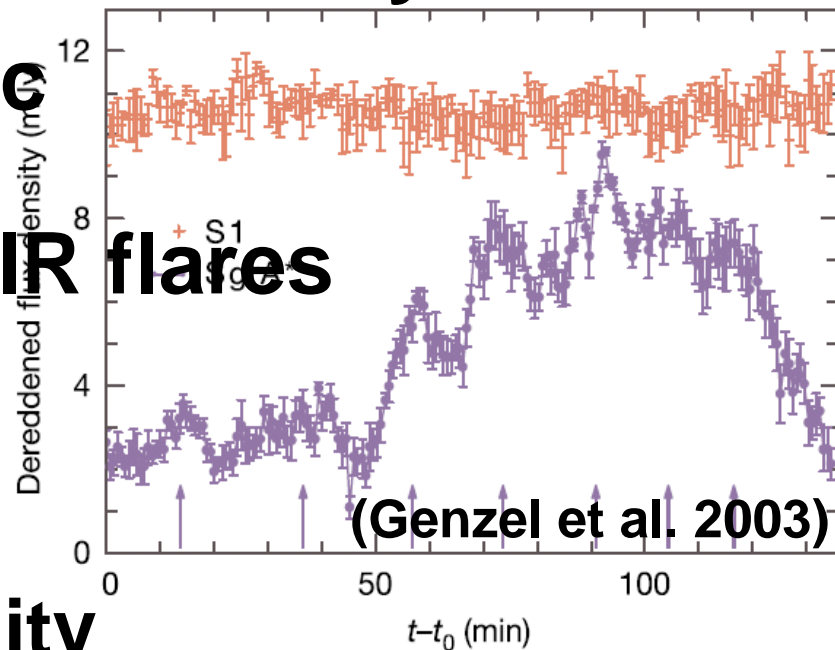
# Sgr A\* ... SMBH at the Galactic Center

**Sgr A\* : Supermassive black hole (SMBH)  
at the center of our Galaxy**

- ❑ **Closest SMBH : ~8 kpc**
- ❑ **Mass :  $\sim 4 \times 10^6 M_{\text{sun}}$**
- ❑ **Since 2000, many X/NIR flares**

## NIR Polarimetry

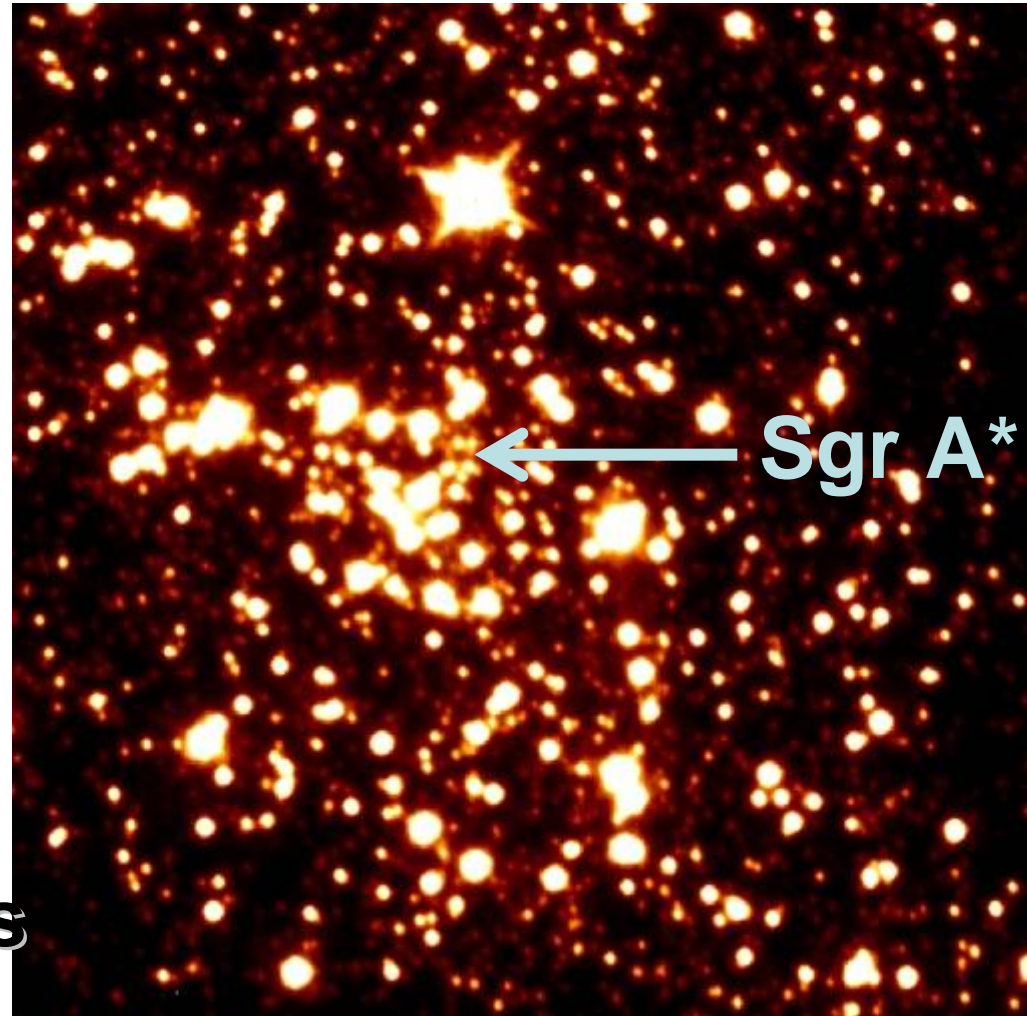
- ◆ **High spatial resolution**
- ◆ **Short timescale variability**
  - **phenomenon close to SMBH ( $< 10 r_s$ )**
- ◆ **High flare rate → large samples**
- ◆ **Additional information with polarimetry  
(mag. field geometry, orientation of disk, etc.)**



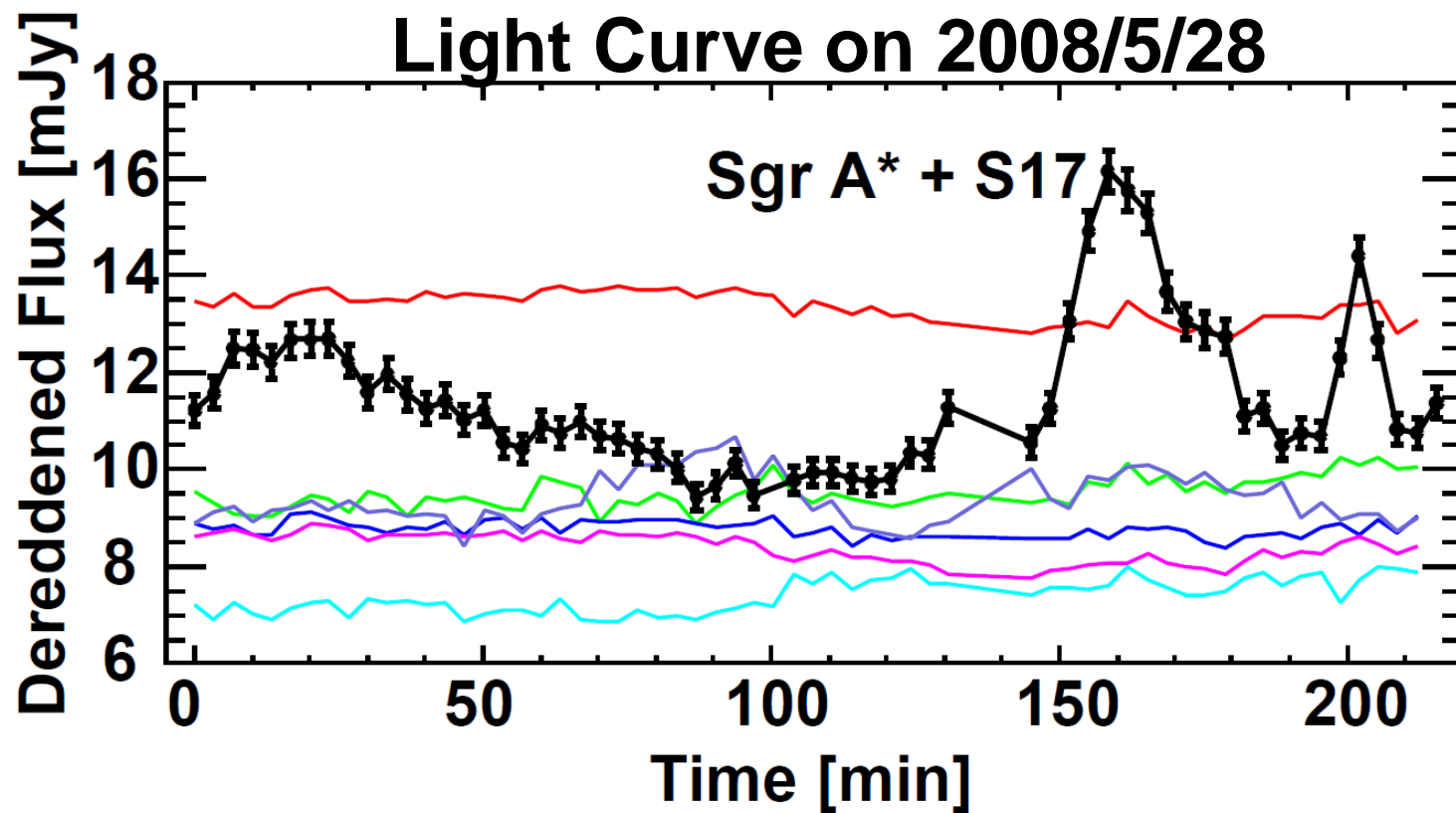
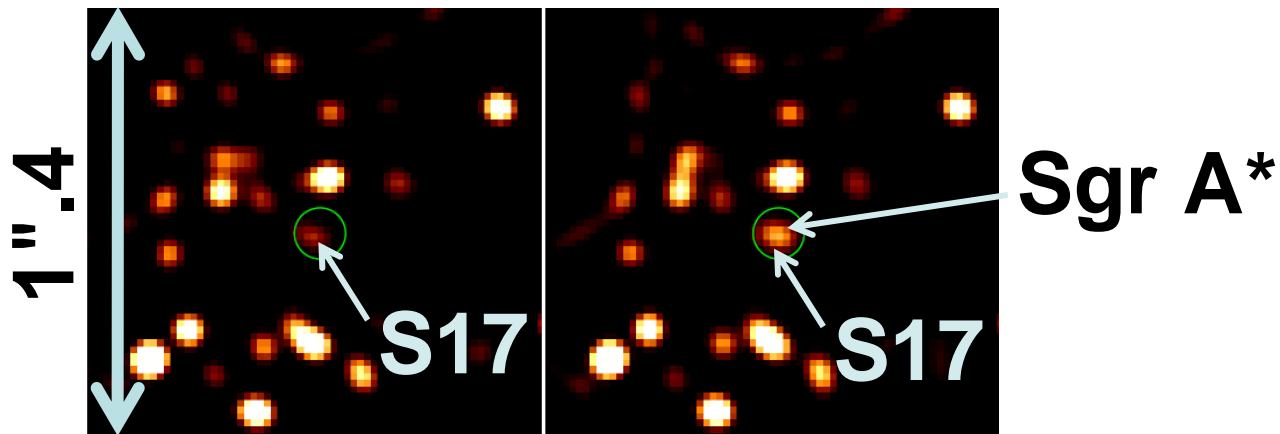
# *Sgr A\* Observations with Subaru/CIAO* 3/8

← 22".2 x 22".2 (0.86pc @8kpc) →

- 2008/5/28
  - Subaru/CIAO/AO36
  - AO guide star:  
USNO0600-28577051  
( $R = 13.7$ ,  $\sim 20''$ )
  - Ks polarimetry  
20sec exposure  
at 4 wave plate angles
- polarimetry every  $\sim 3.3$ min



# Sgr A\* Observations with Subaru/CIAO

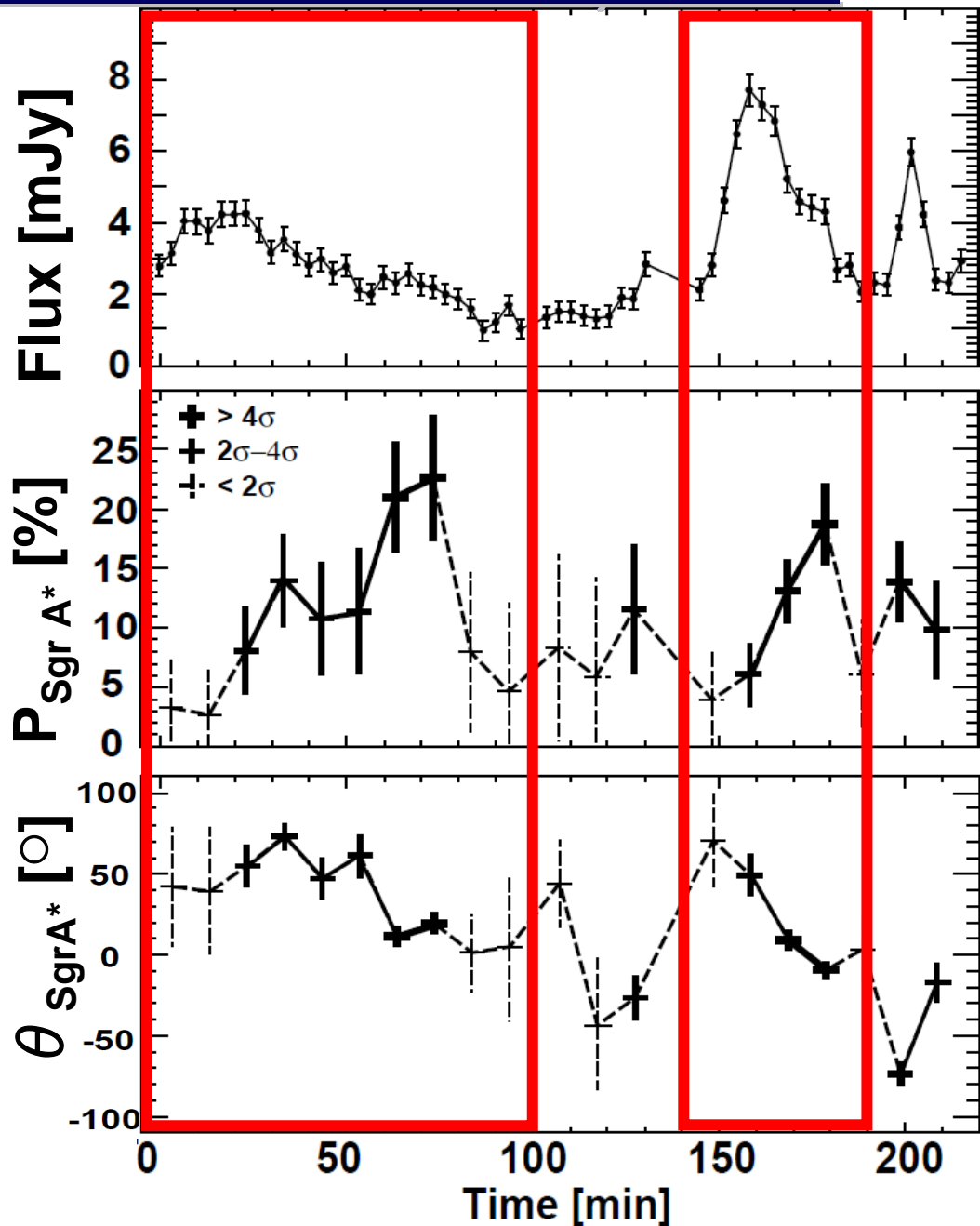


# Sgr A\* Observations with Subaru/CIAO

Light curve  
(contribution of S17  
is subtracted)

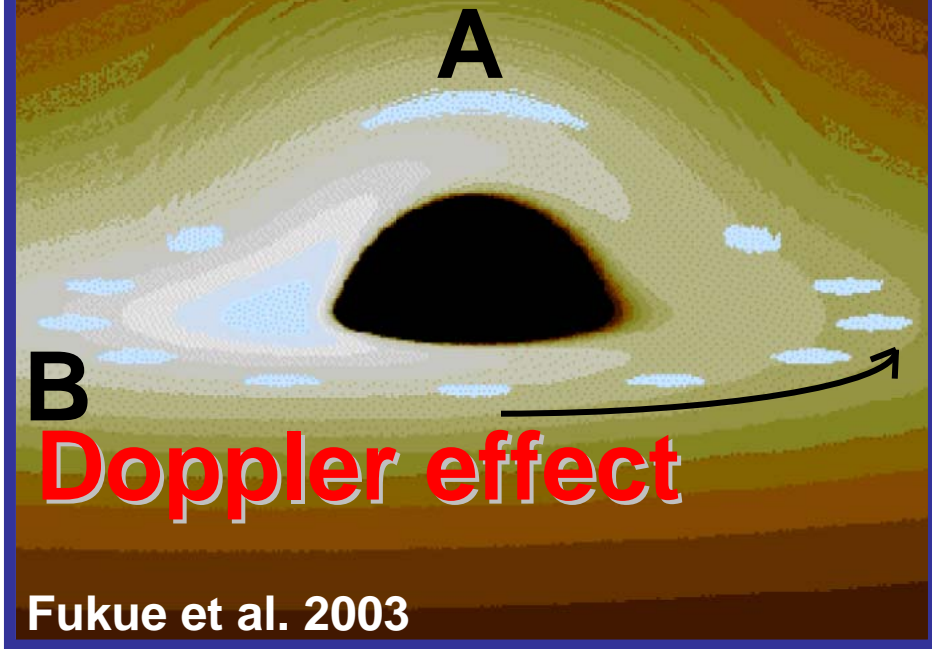
Degree of  
polarization

Position angle



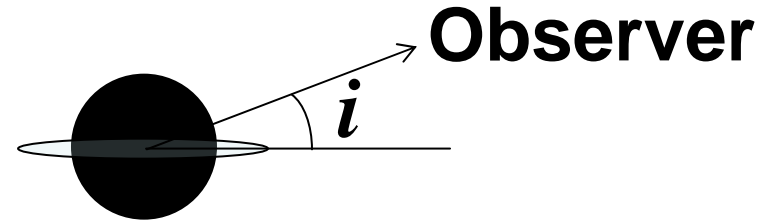
# Discussion: Hotspot Model

**Gravitational lensing**



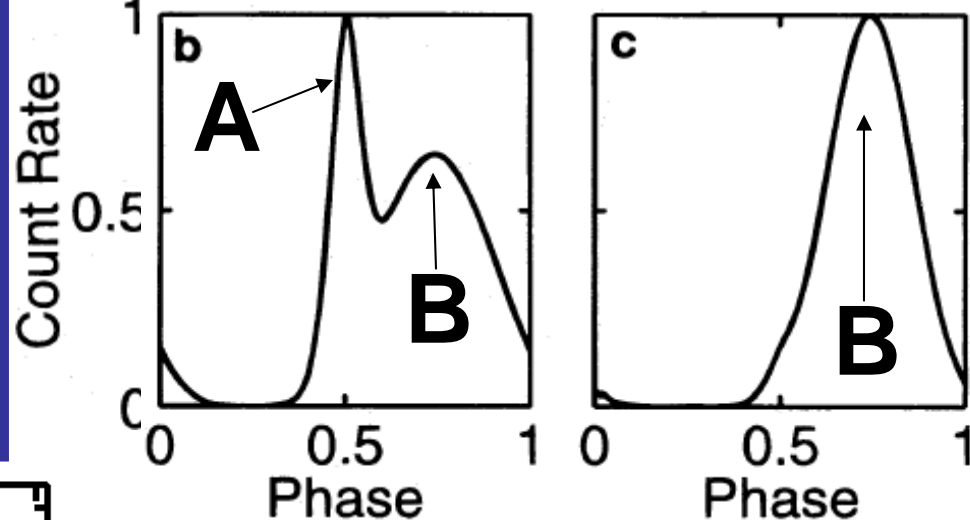
**Doppler effect**

Fukue et al. 2003

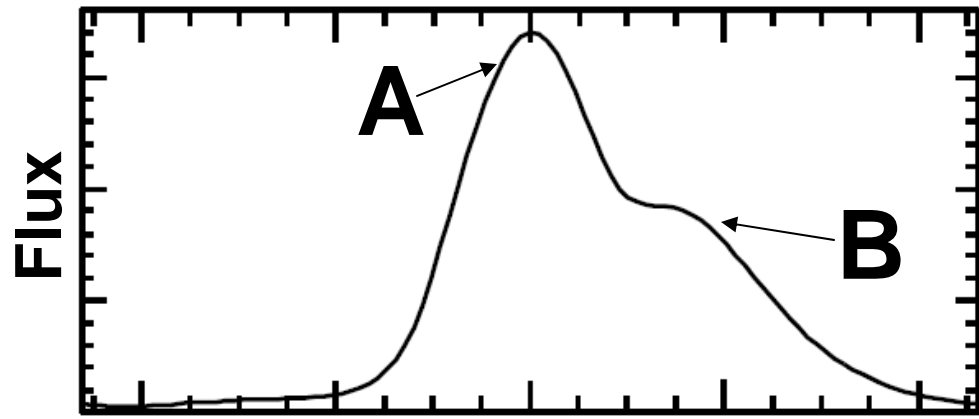


$i = 10^\circ$

$i = 70^\circ$

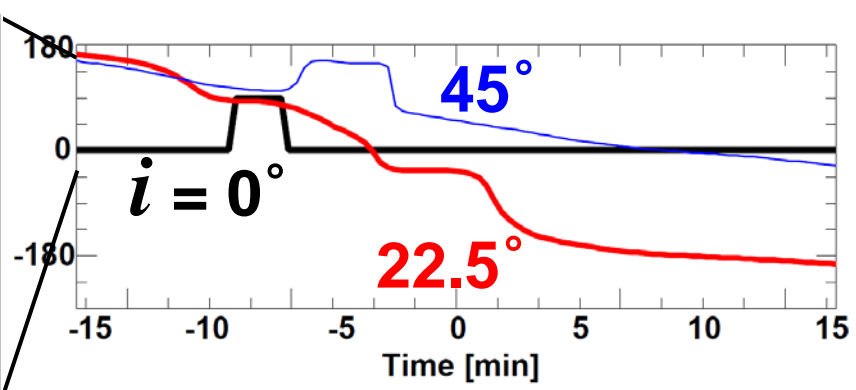
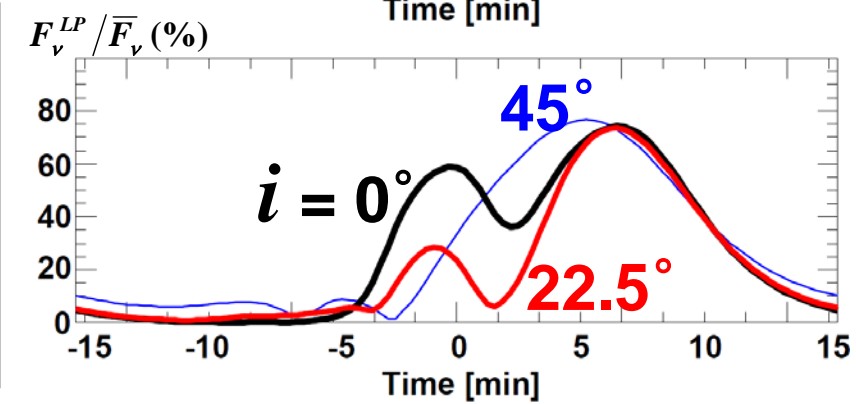
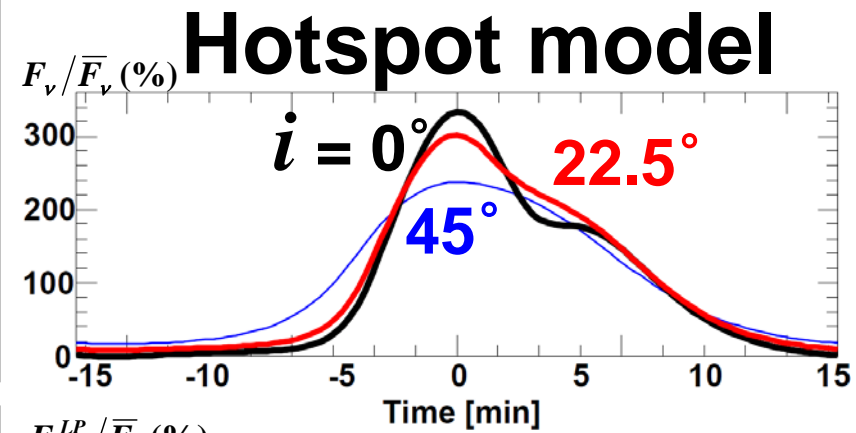
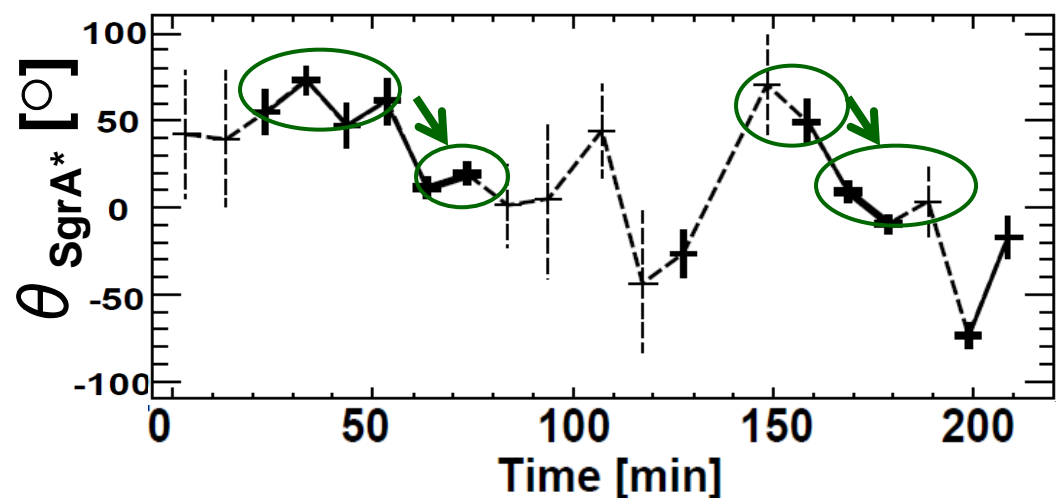
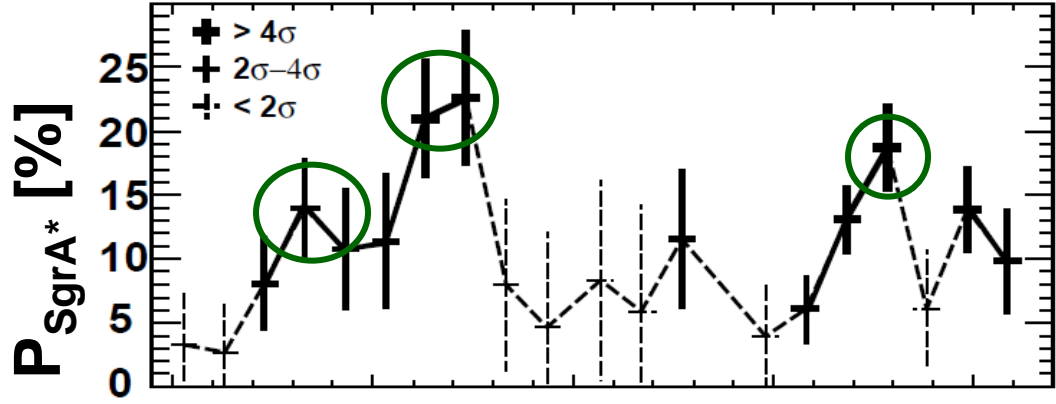
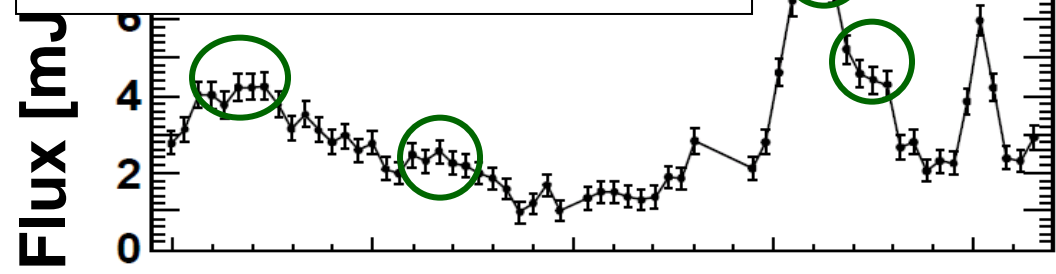
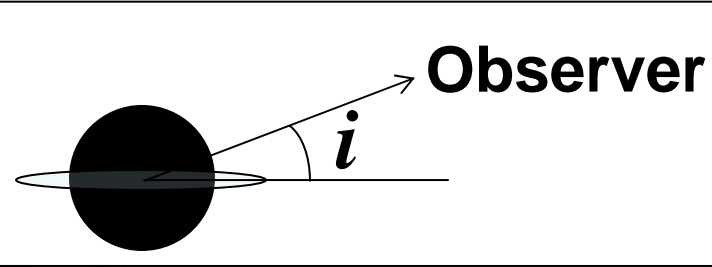


Karas (1996)



Broderick & Loeb (2006)

# Observation: Hotspot Model



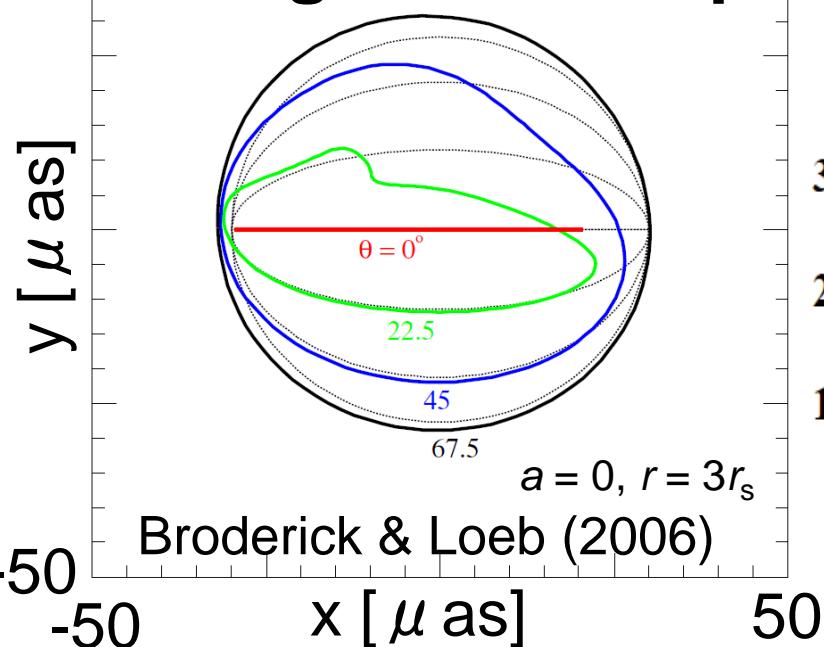
Broderick & Loeb (2006)

## Future works

### Is the hotspot picture correct?

- ❑ Campaign observations (radio/NIR/X)
- ❑ Better precision polarimetry
- ❑ 10-micro-arcsecond astrometry
- ❑ **Multi-NIR-band simultaneous photometry**

### NIR image centroid path



### Simulated light curve with HiCIAO (Black dots, every $\sim 22$ sec)

