

# Flux Density Monitoring of AGN and SgrA\* at Submillimeter Wavelengths with the Submillimeter Array

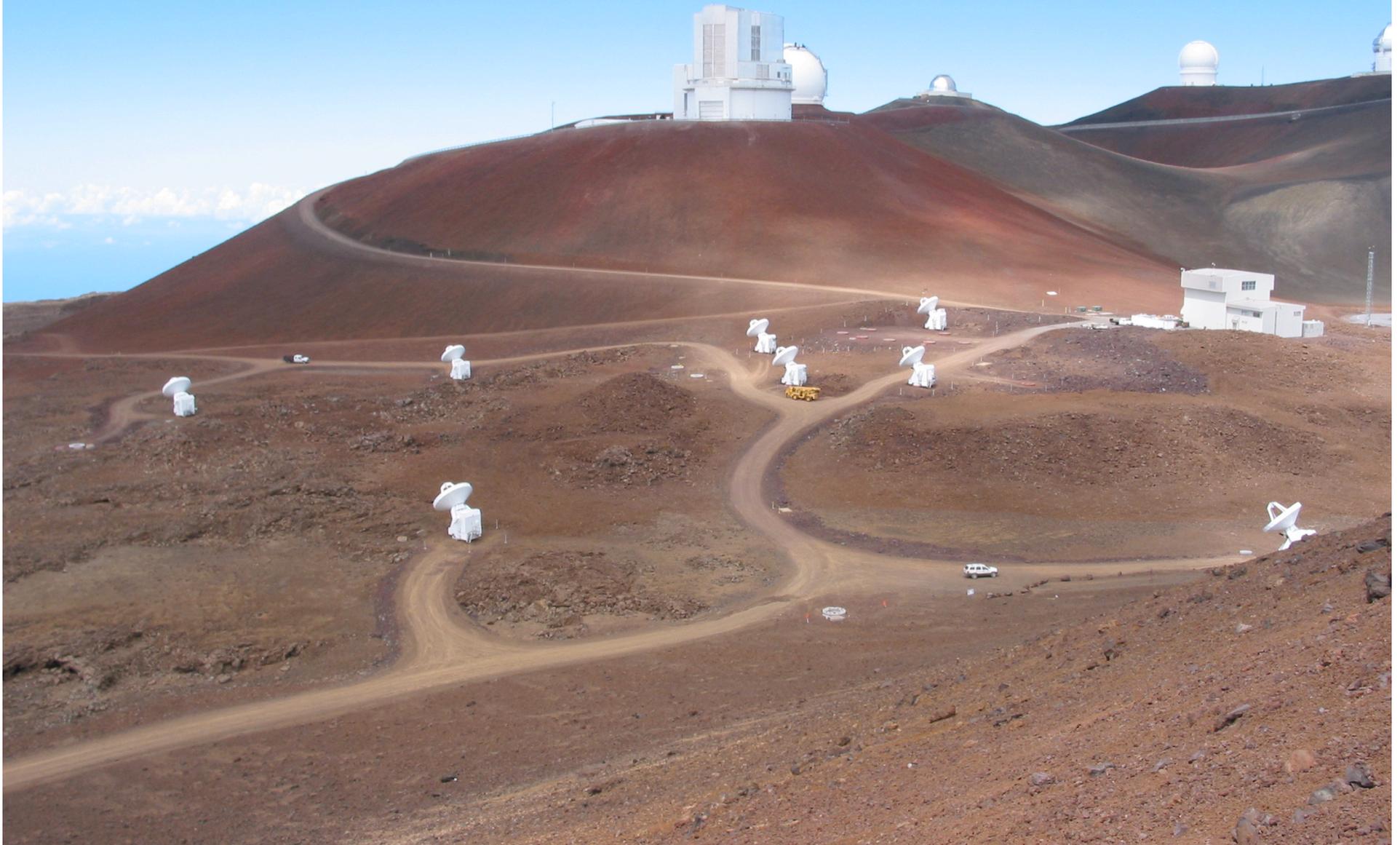
By

James Moran

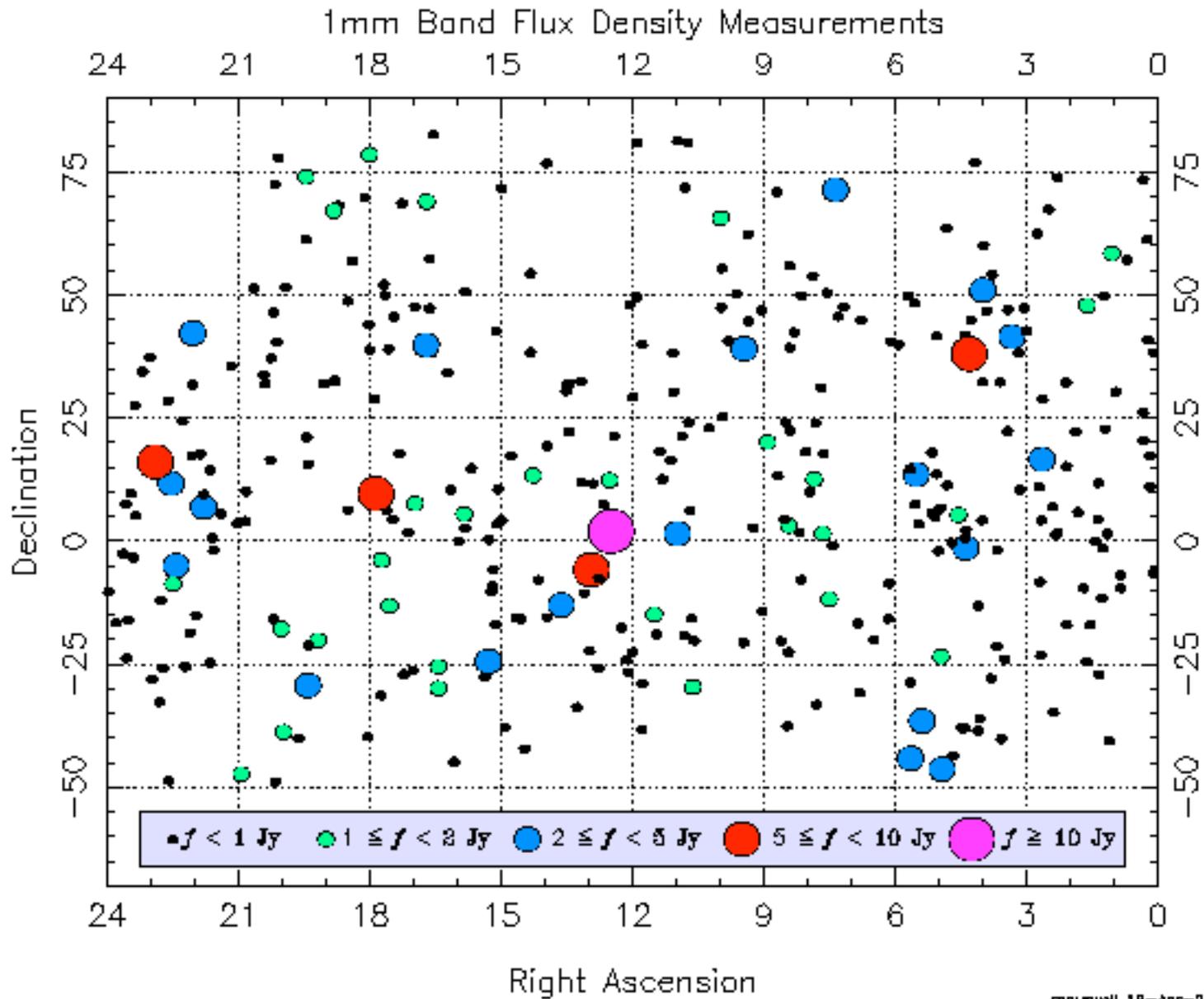
Harvard-Smithsonian Center for Astrophysics

Workshop on VLBI in the GLAST Era, NASA/GODDARD, April 23-24, 2007

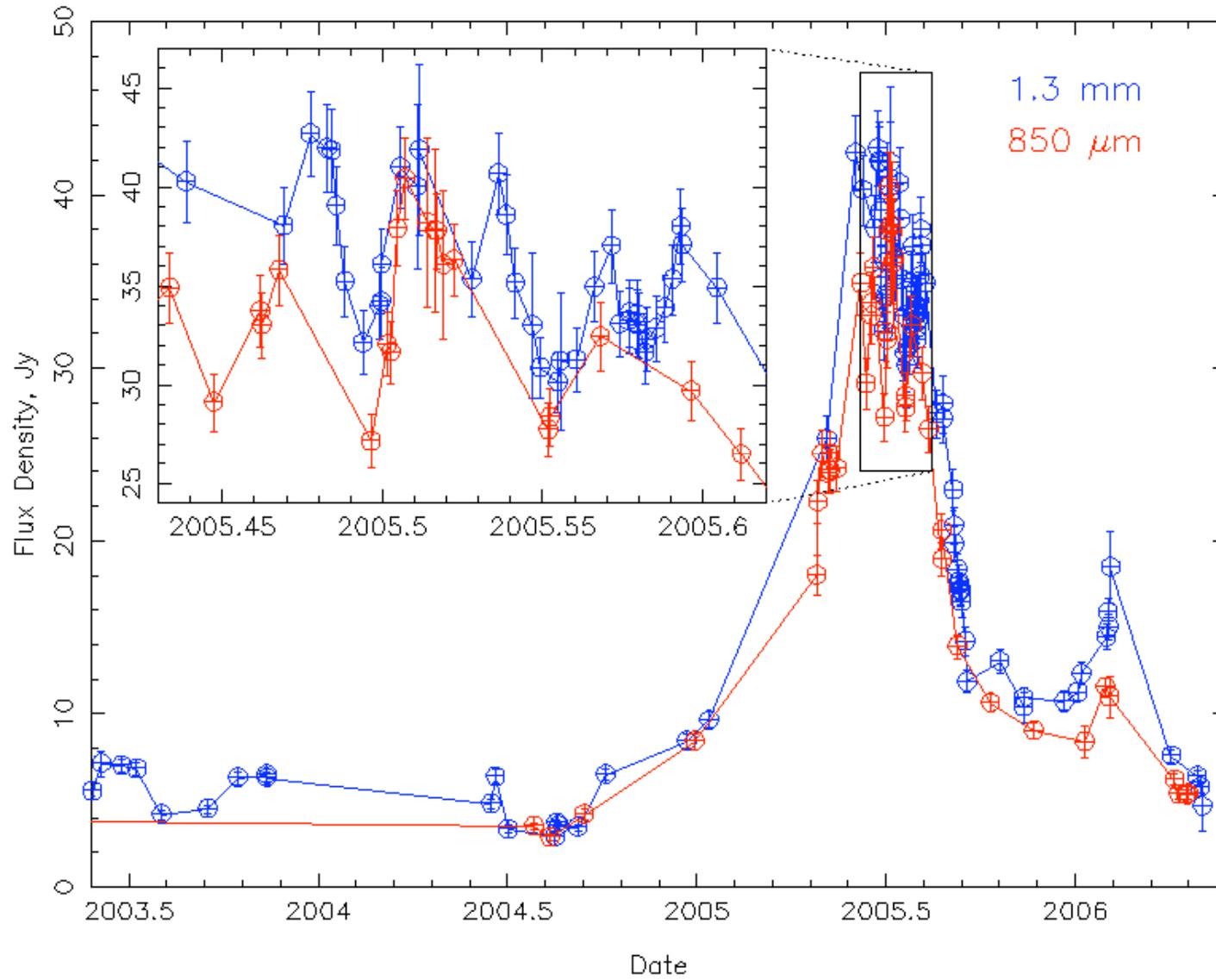
SMA in Intermediate Configuration  
About 0.5 Arcsec resolution at 1 mm

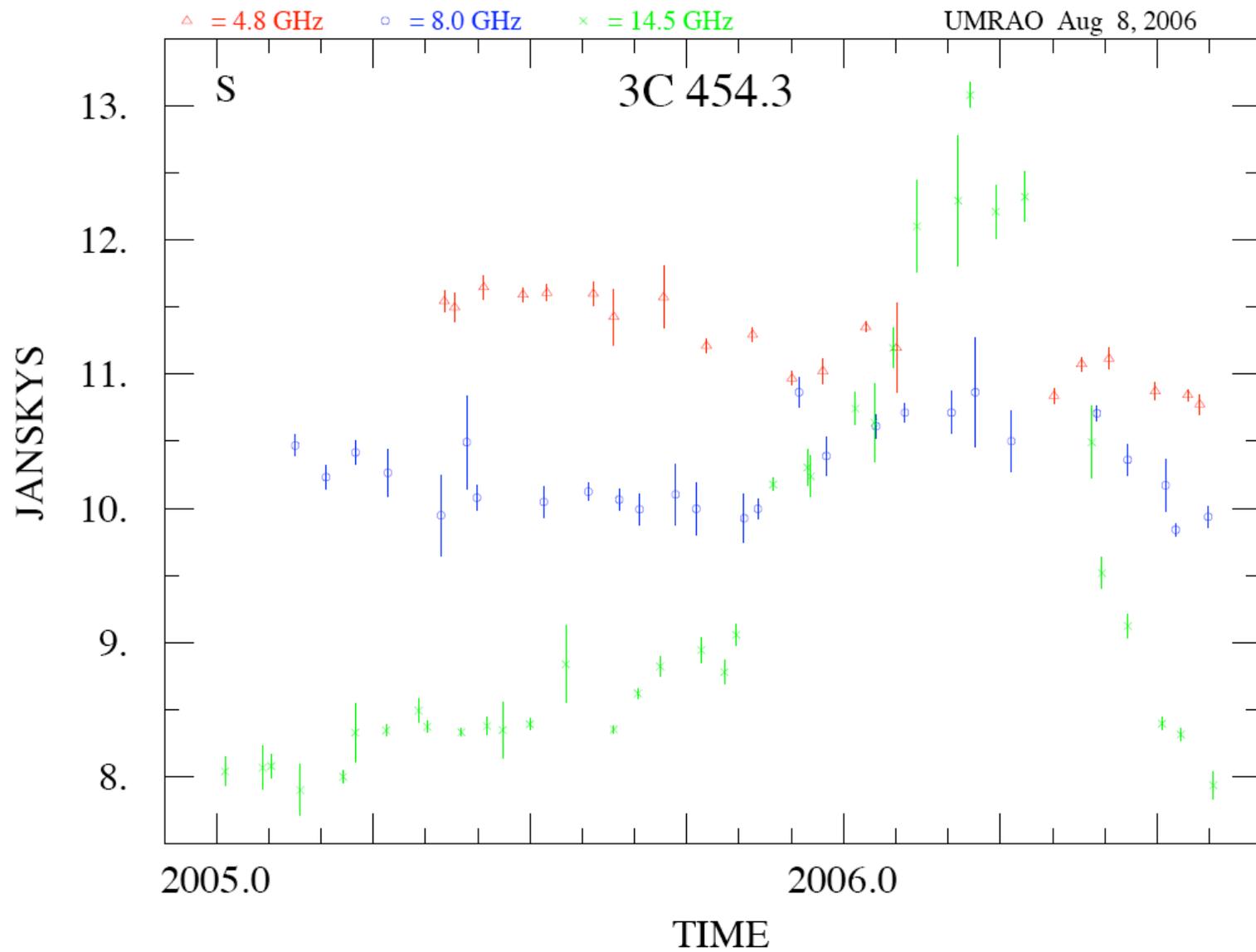


# Potential Calibrators for the SMA: $S > 200$ mJy



SMA Monitoring of 3C454.3





Tue Aug 8 15:52:56 2006 haller

# New Results from the SMA at 230 GHz (1.3 mm)

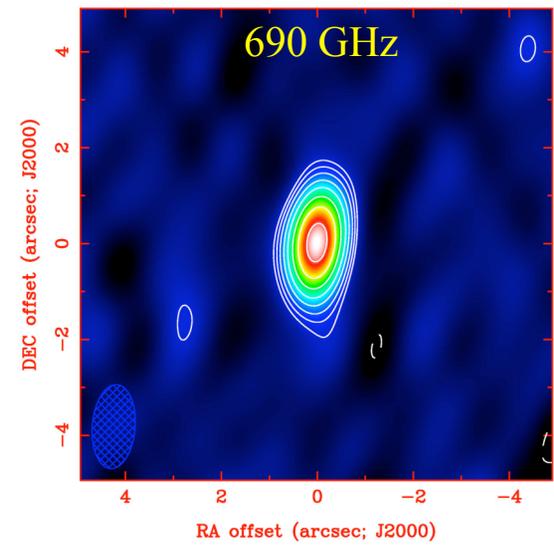
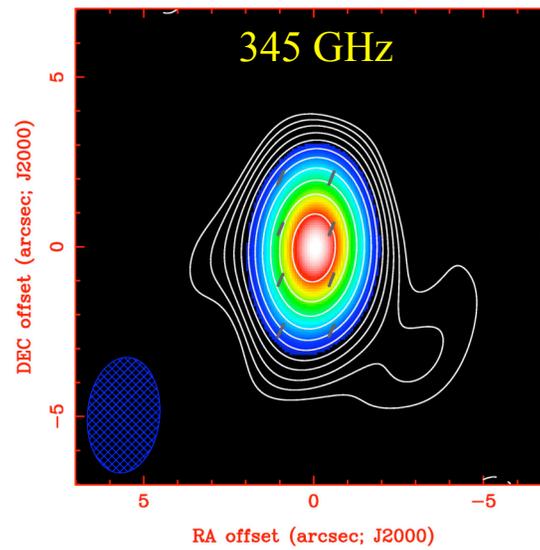
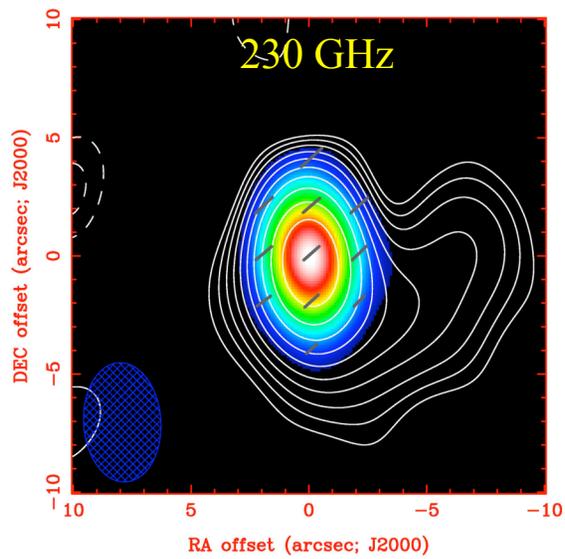
Rotation measure determined and found to vary by less than 30 percent.

Intraday intrinsic polarization variations measured.

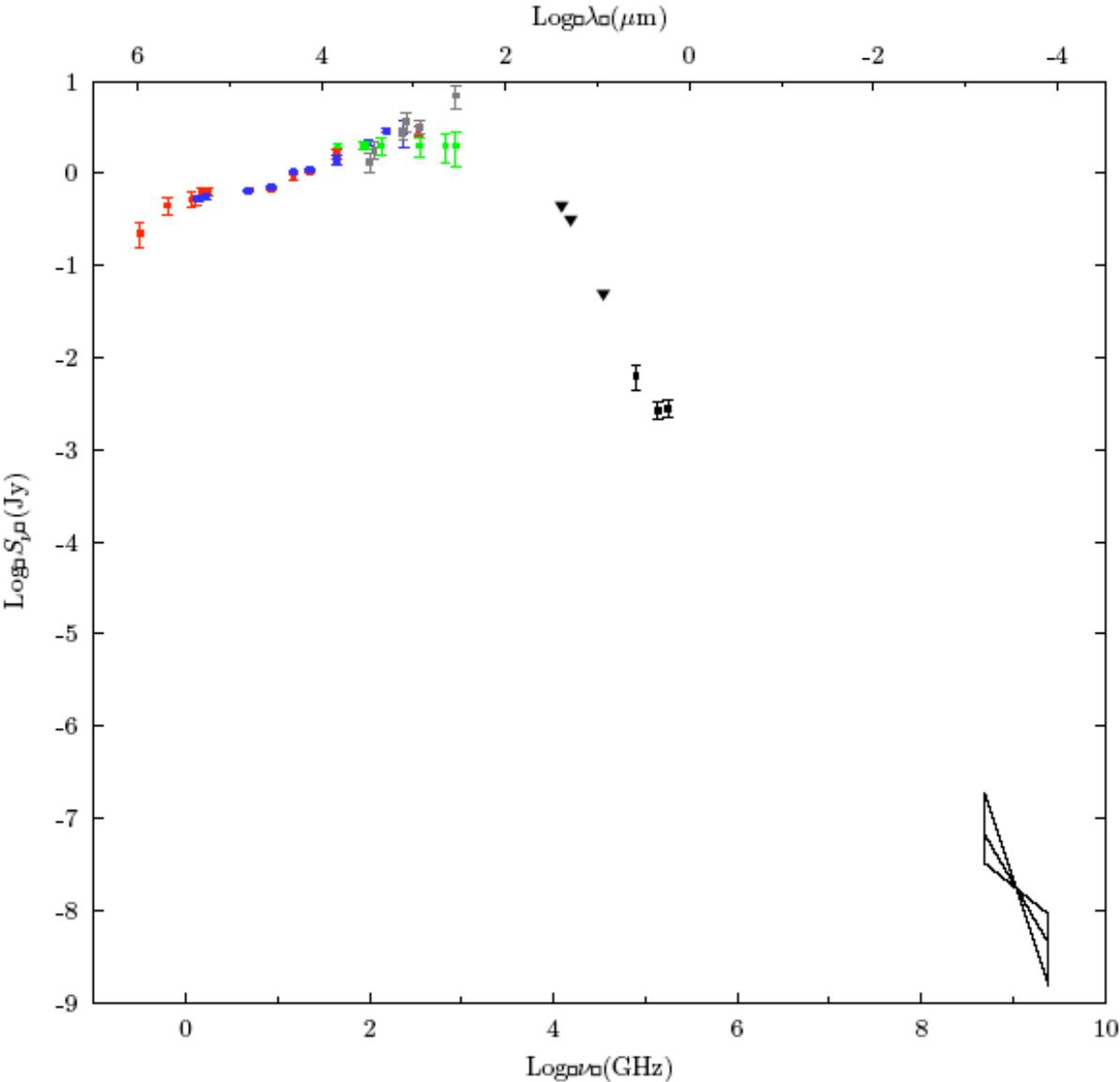
Peak of the “Submillimeter Bump” is at about 500 GHz

First detection of a submillimeter flare associated with an X Ray flare.

# Submillimeter Polarization of Sgr A\*



# SED for Sgr A\*





# Accretion Rate and Faraday Rotation



$$RM = -5.1 \times 10^5 \text{ rad/m}^2$$

Assumptions:

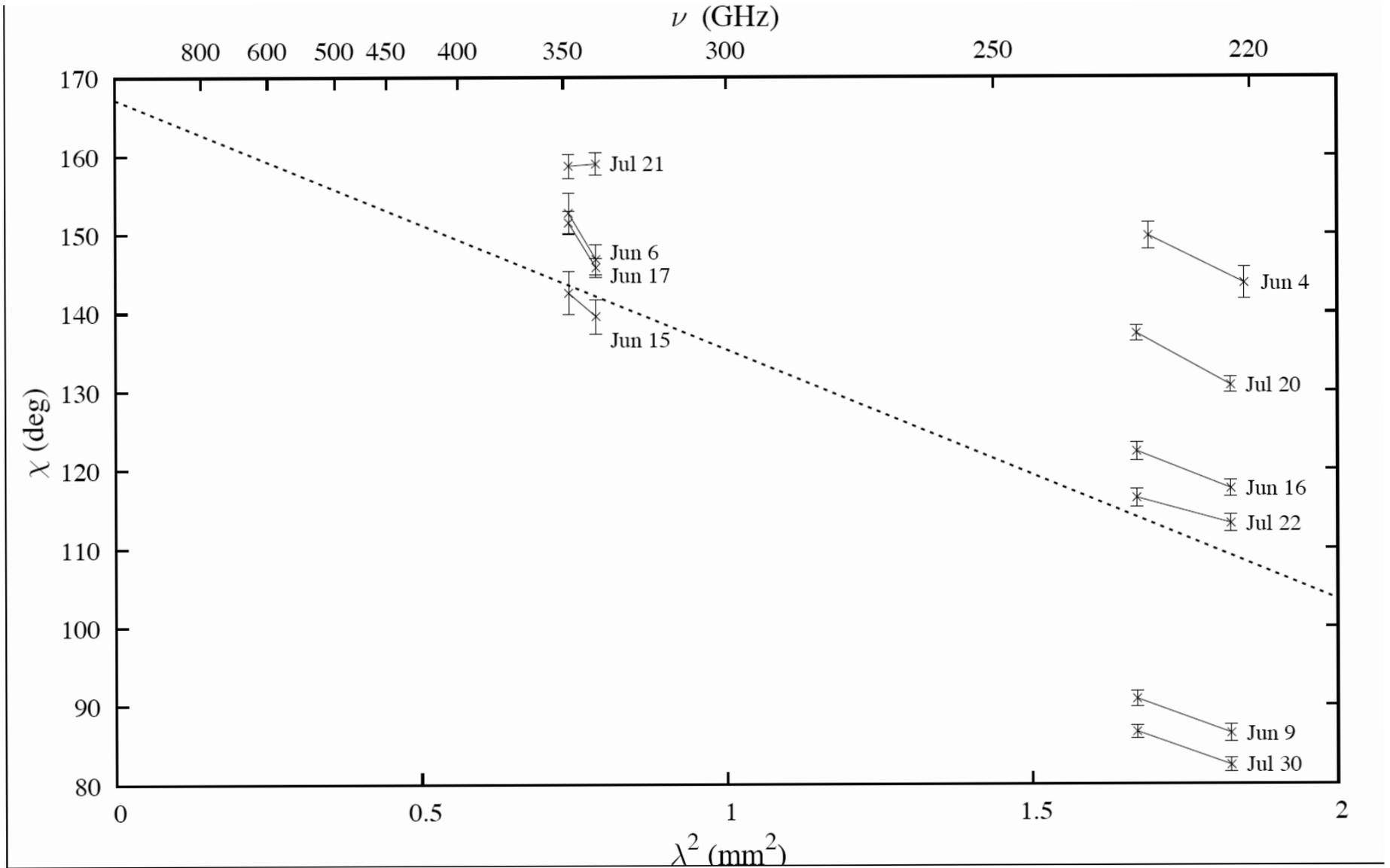
equipartition

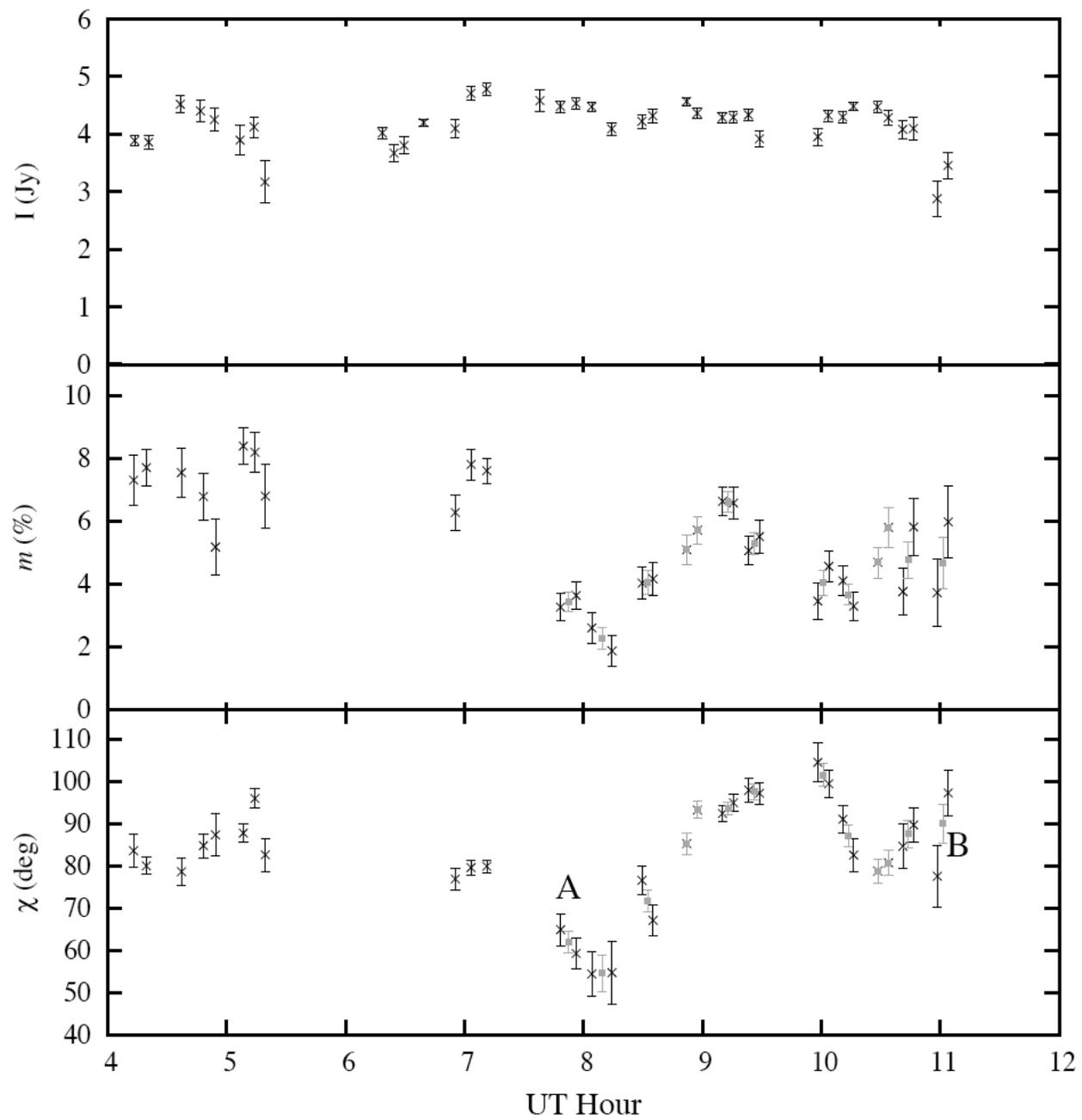
density power law

inner radius cutoff of Faraday screen

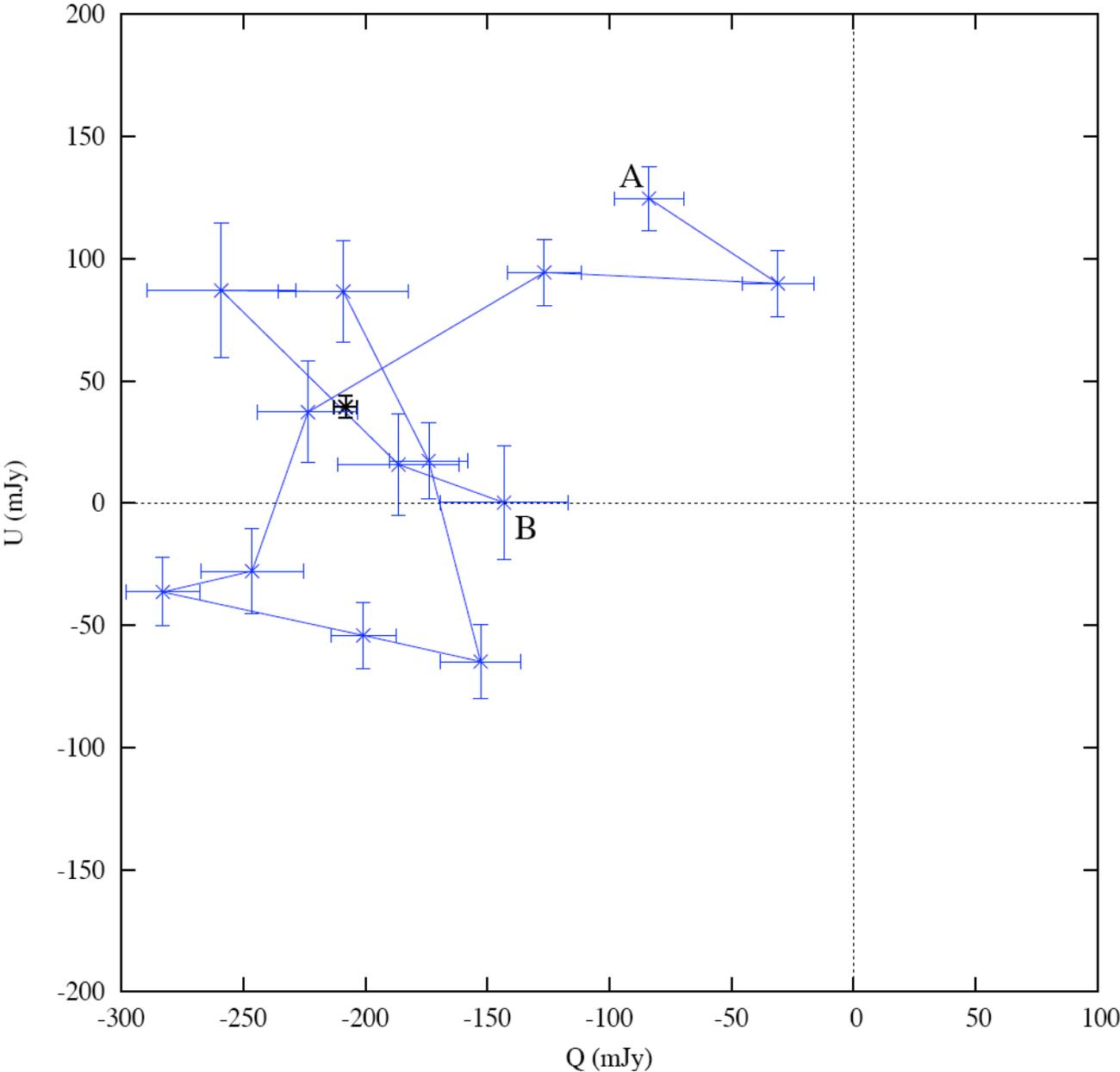
$$\text{Accretion Rate} = 10^{-9} - 10^{-7} M_{\text{Sun}}/\text{yr}$$

# 2005 SMA Measurements of Faraday Rotation in Sgr A\*

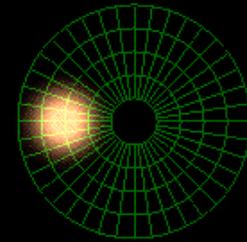
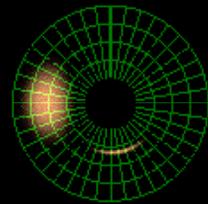




# Polarization Event of July 30, 2005 in Sgr A\* (3 hours)



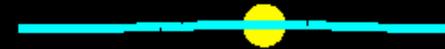
$a=0, r=6M$



$F_{LP}$

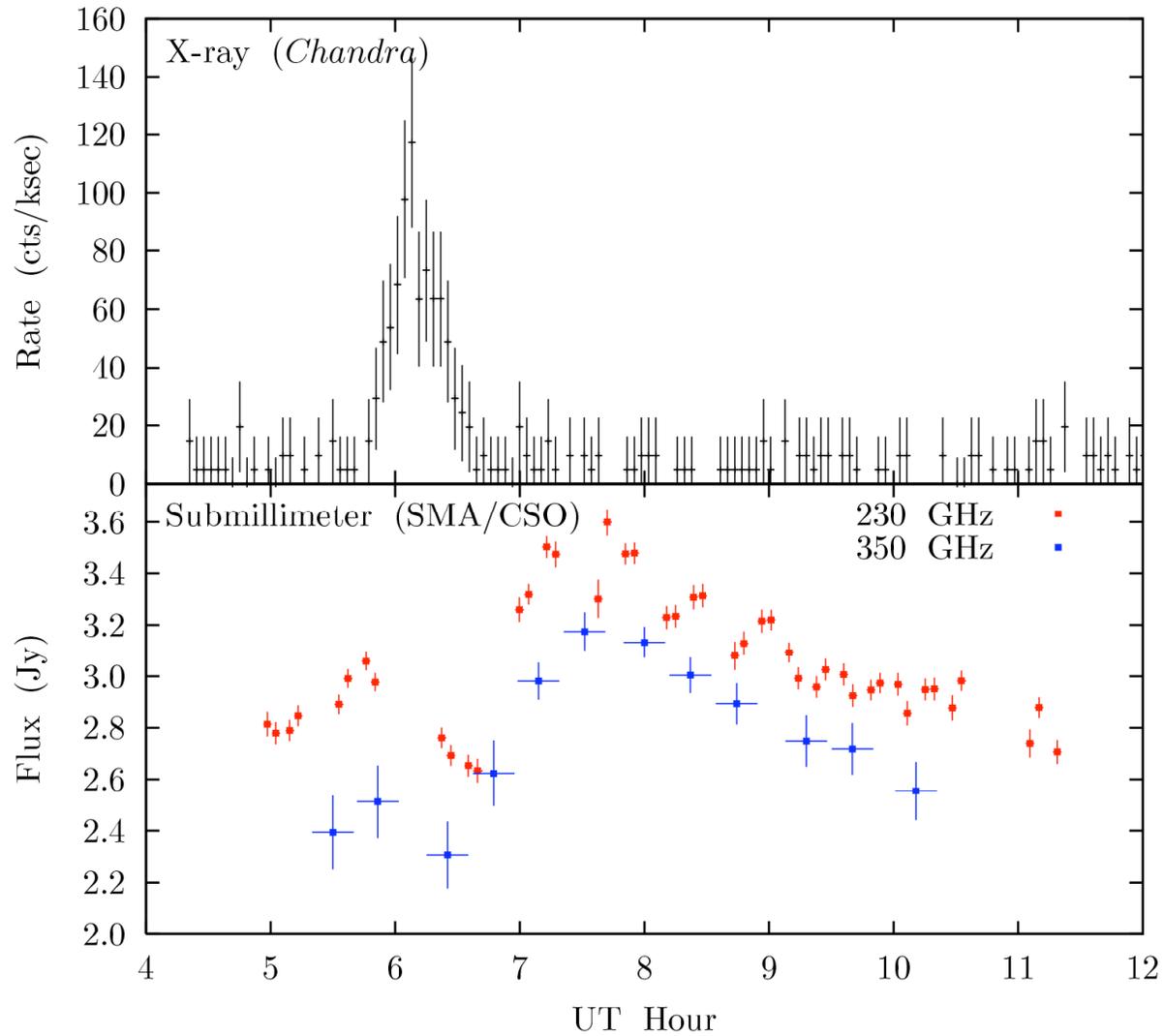


$F_{tot}$

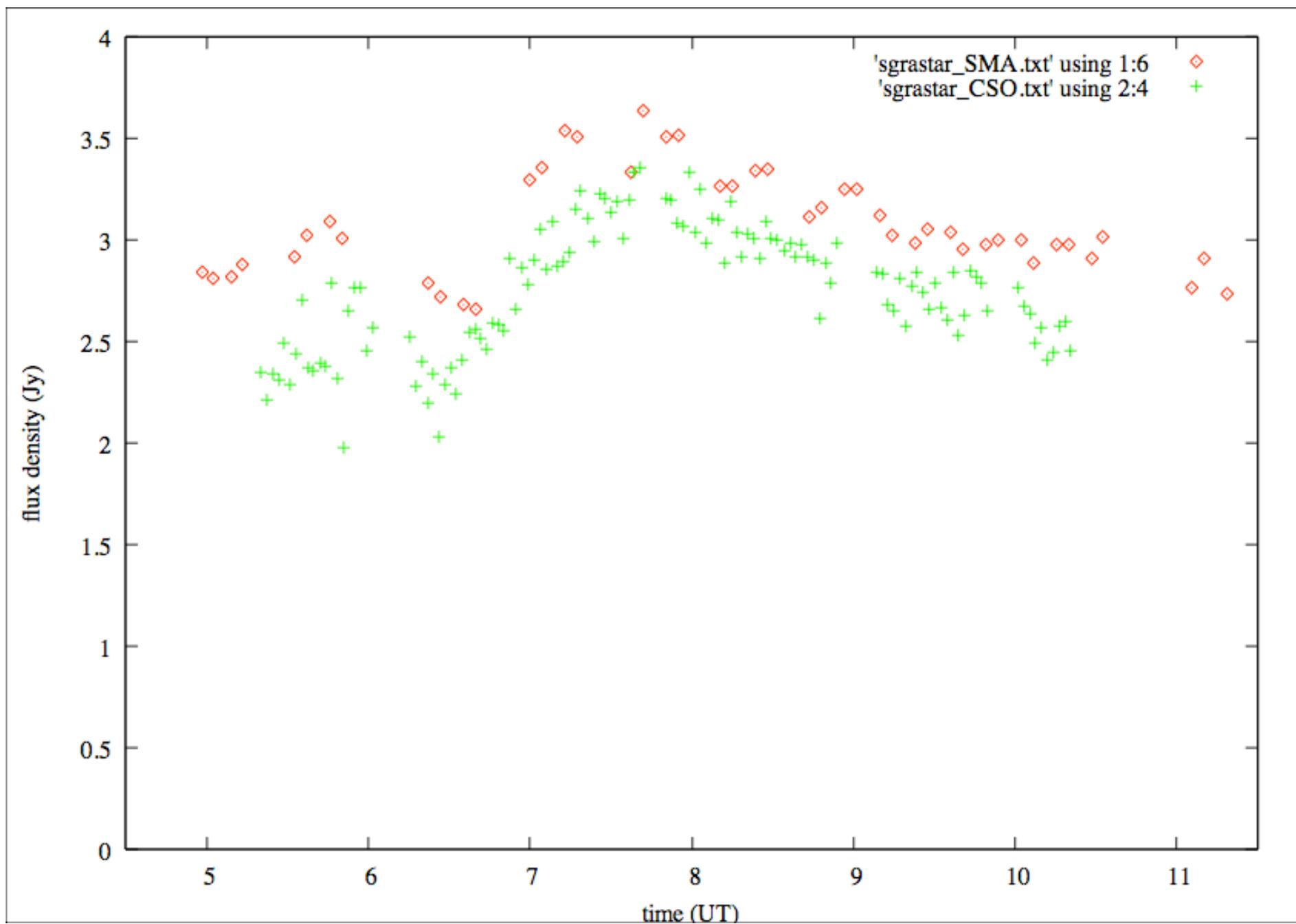


Broderick & Loeb, 2006, MNRAS, 367, 905

# Flare in Sgr A\* on July 17, 2006

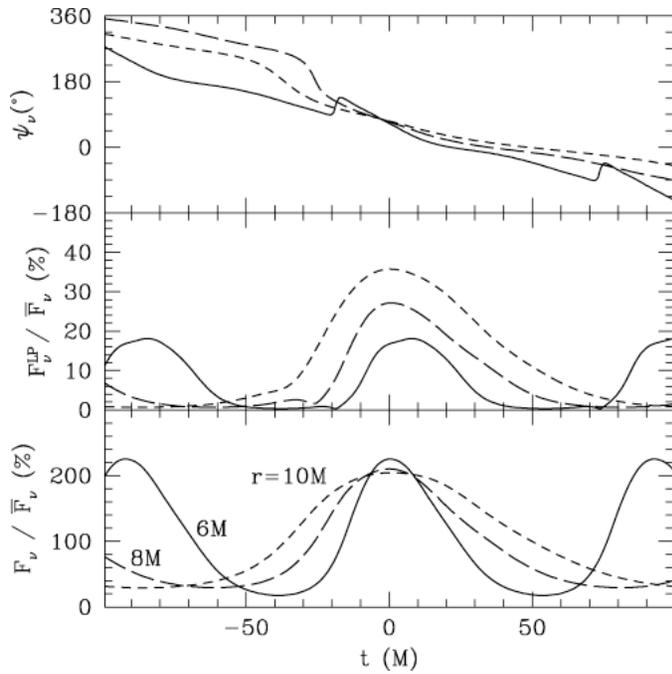






# Sgr A\*: Polarization Variability

- GR radiative transfer important for understanding LP



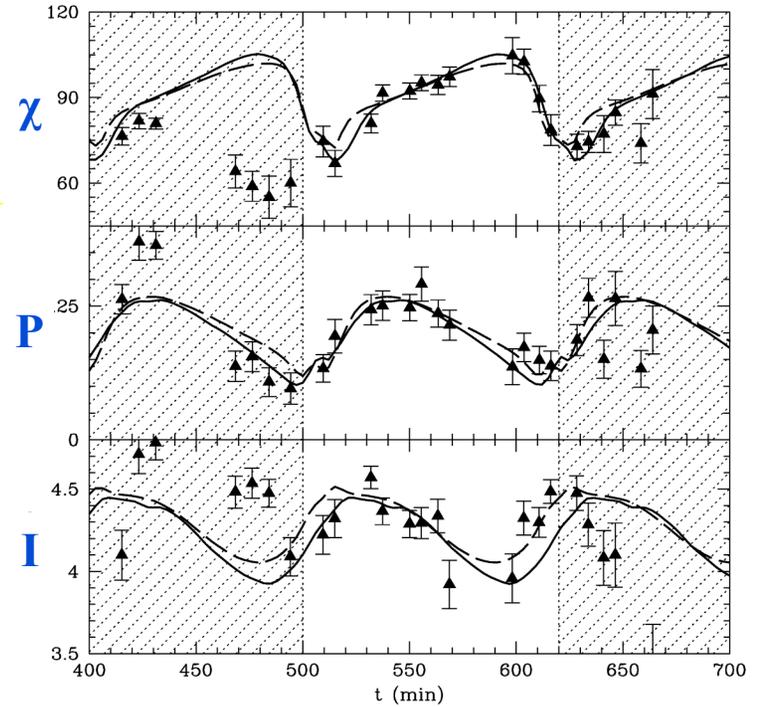
$$R \sim 8 r_S$$

$$r_{\text{spot}} \sim 1 r_S$$

$$\theta \sim 75^\circ$$

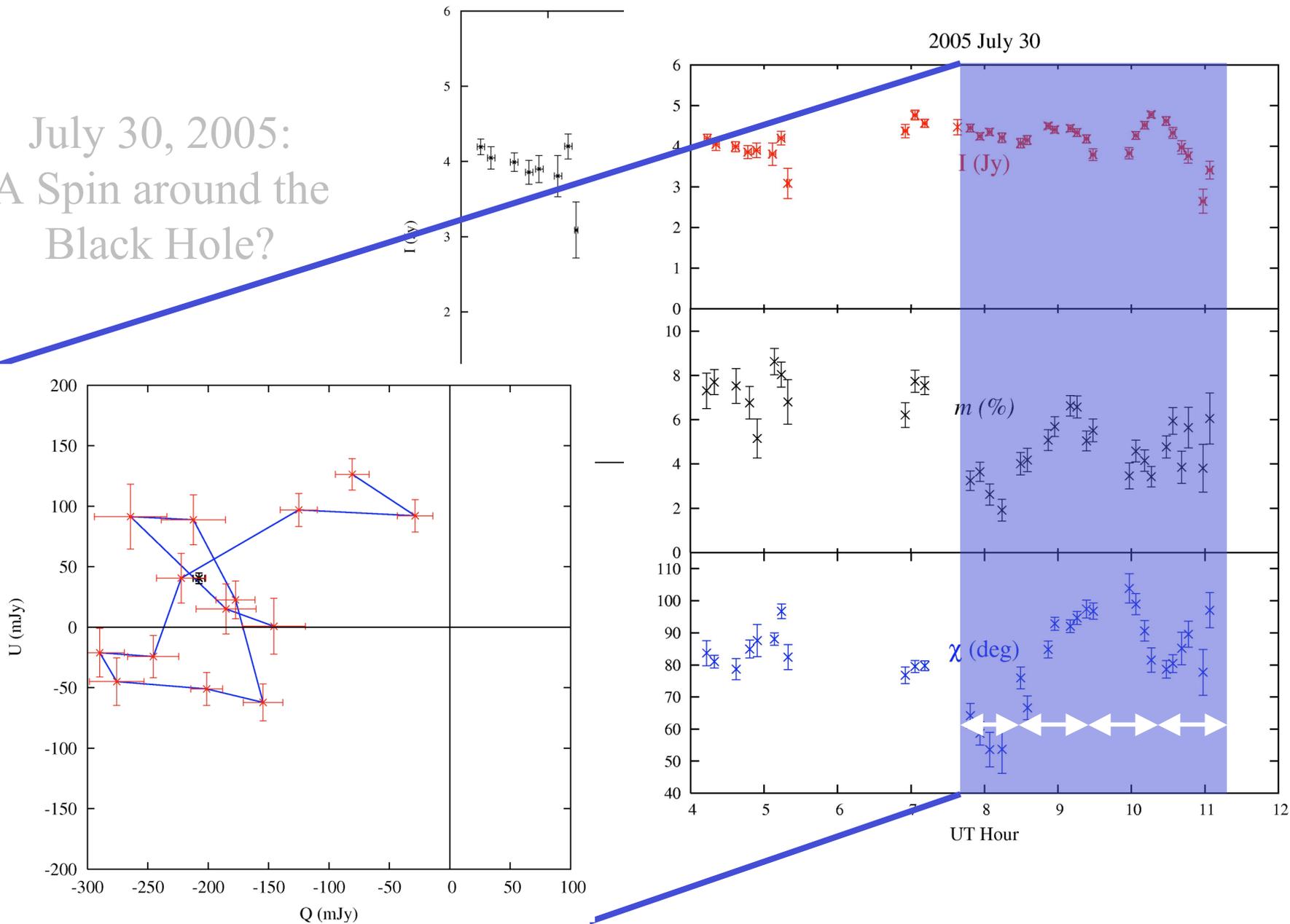
$$a = ?$$

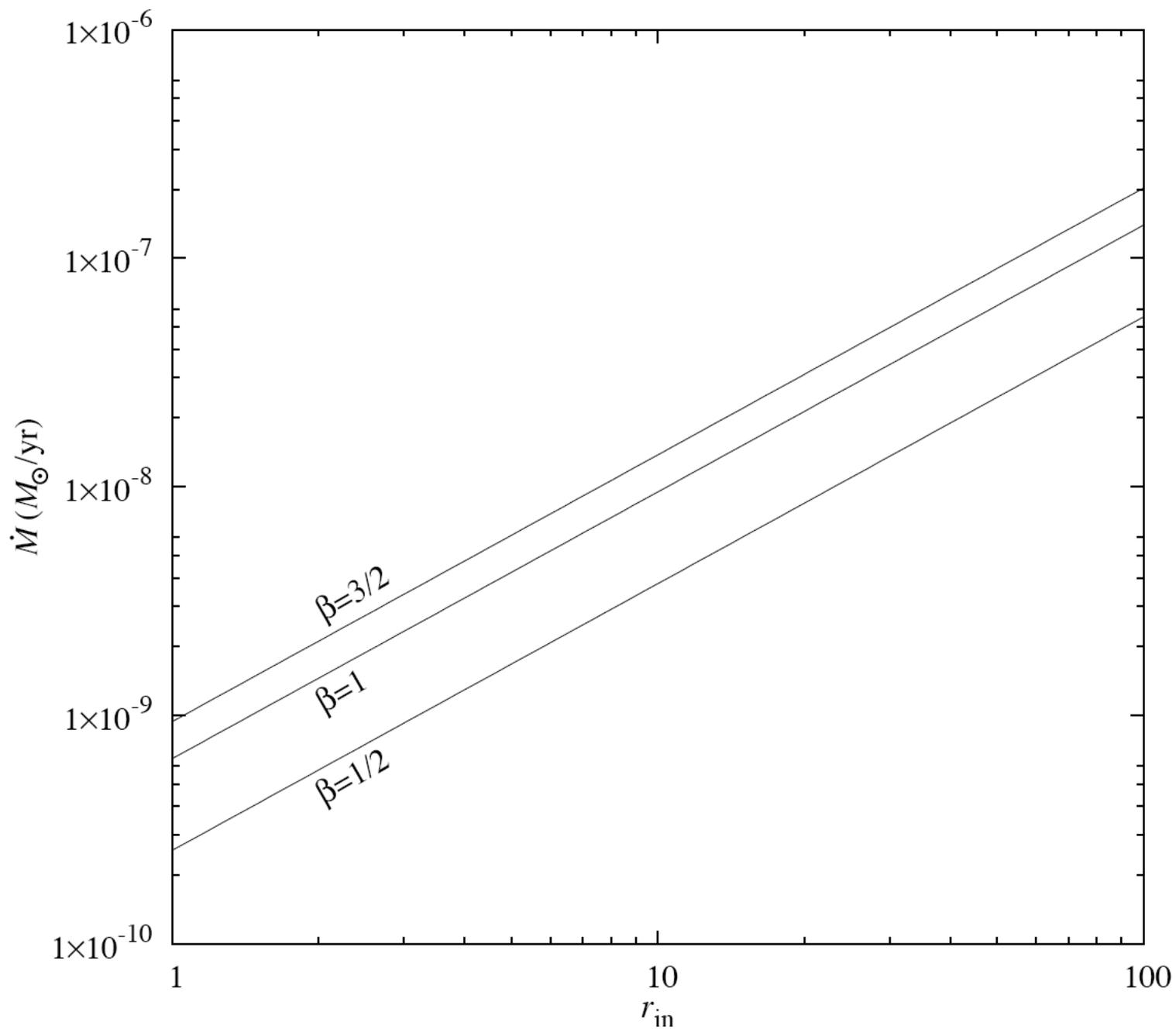
should  
*d inte.*



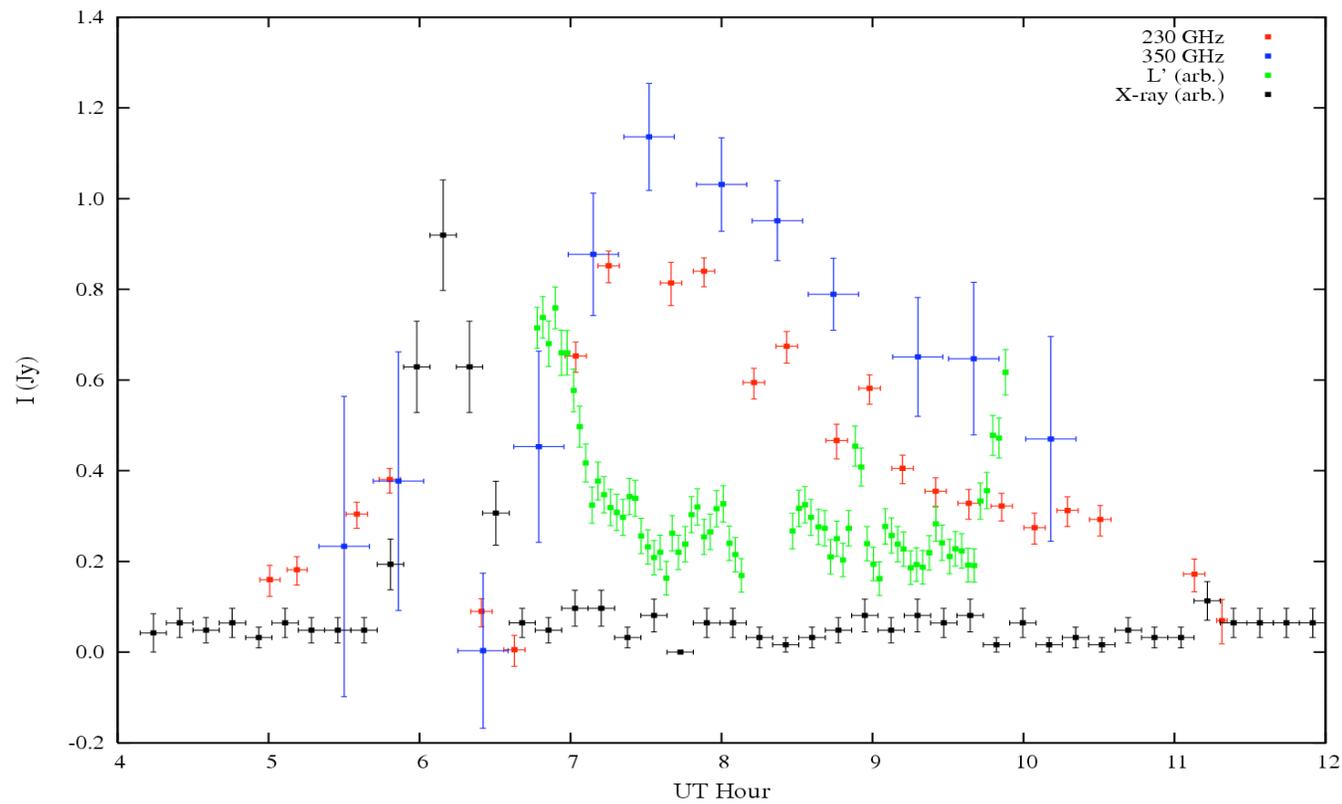
Hotspot light curves (Broderick & Loeb 2006)

# July 30, 2005: A Spin around the Black Hole?

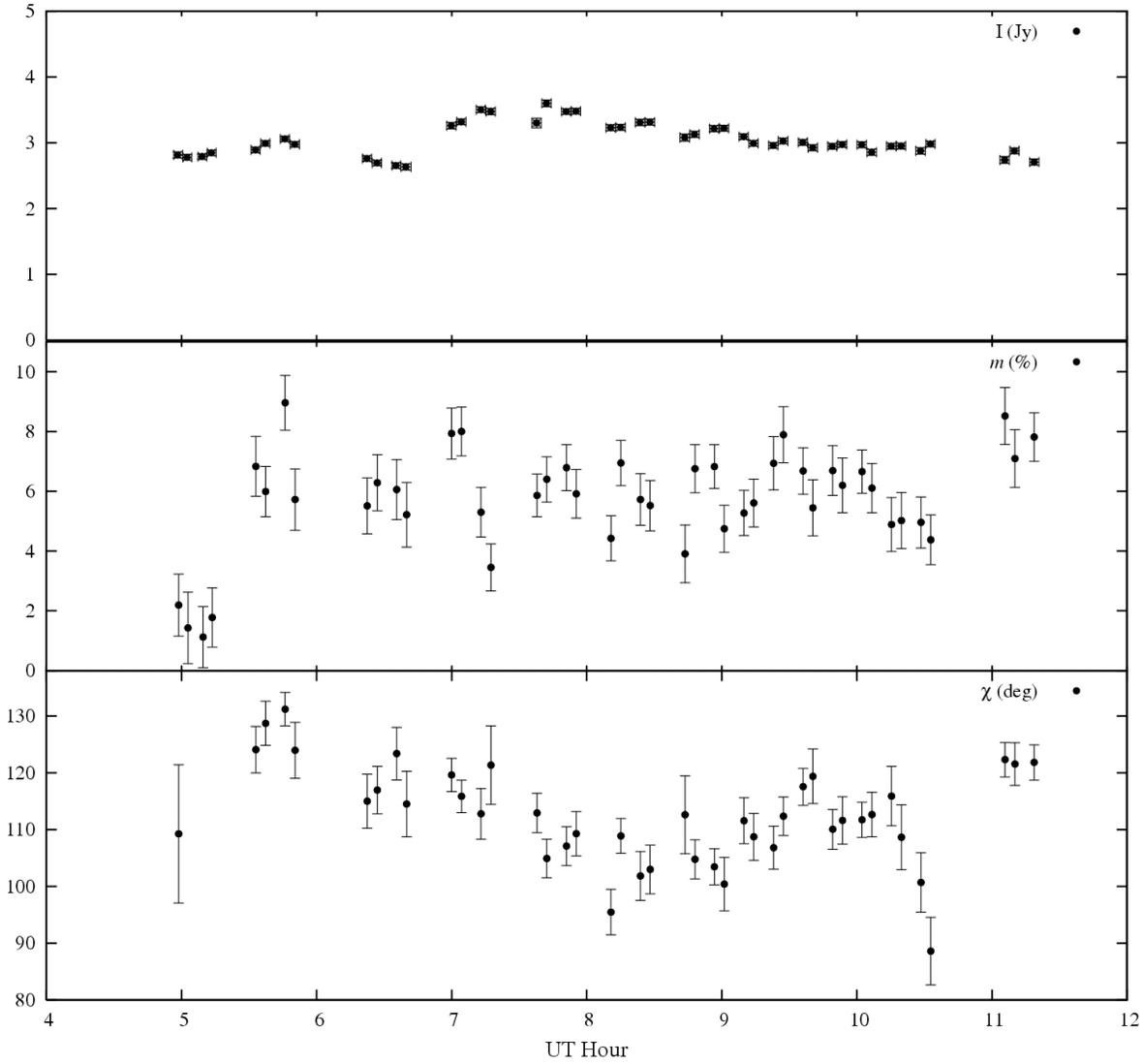




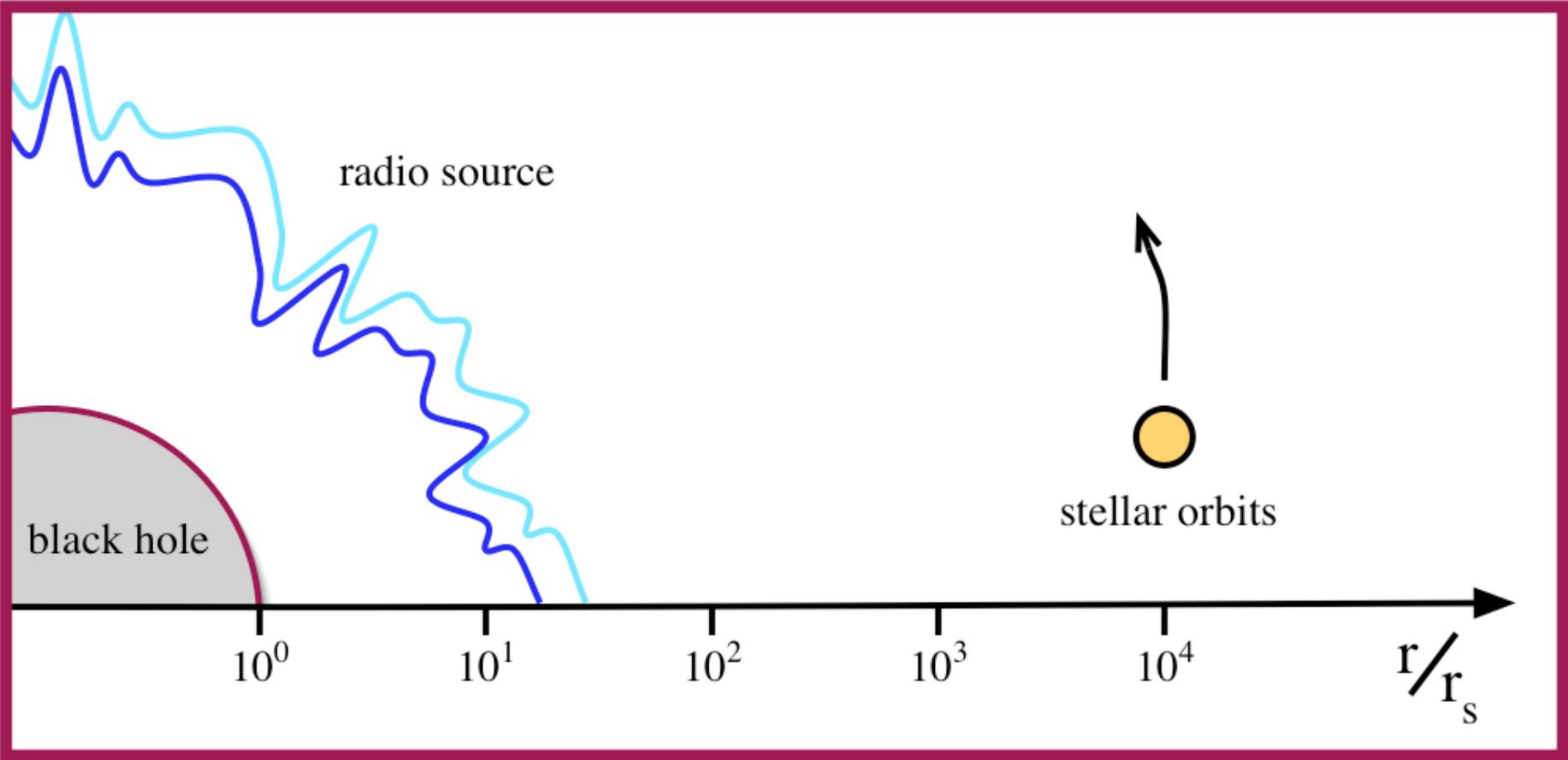
# July 17, 2006 Flare



# July 17, 2006 Flare



# Some Scales in the Galactic Center



A Definitive Measurement of the Faraday  
Rotation in Sgr A\* and the Constraints  
It Provides on the Black Hole Accretion  
Rate

by

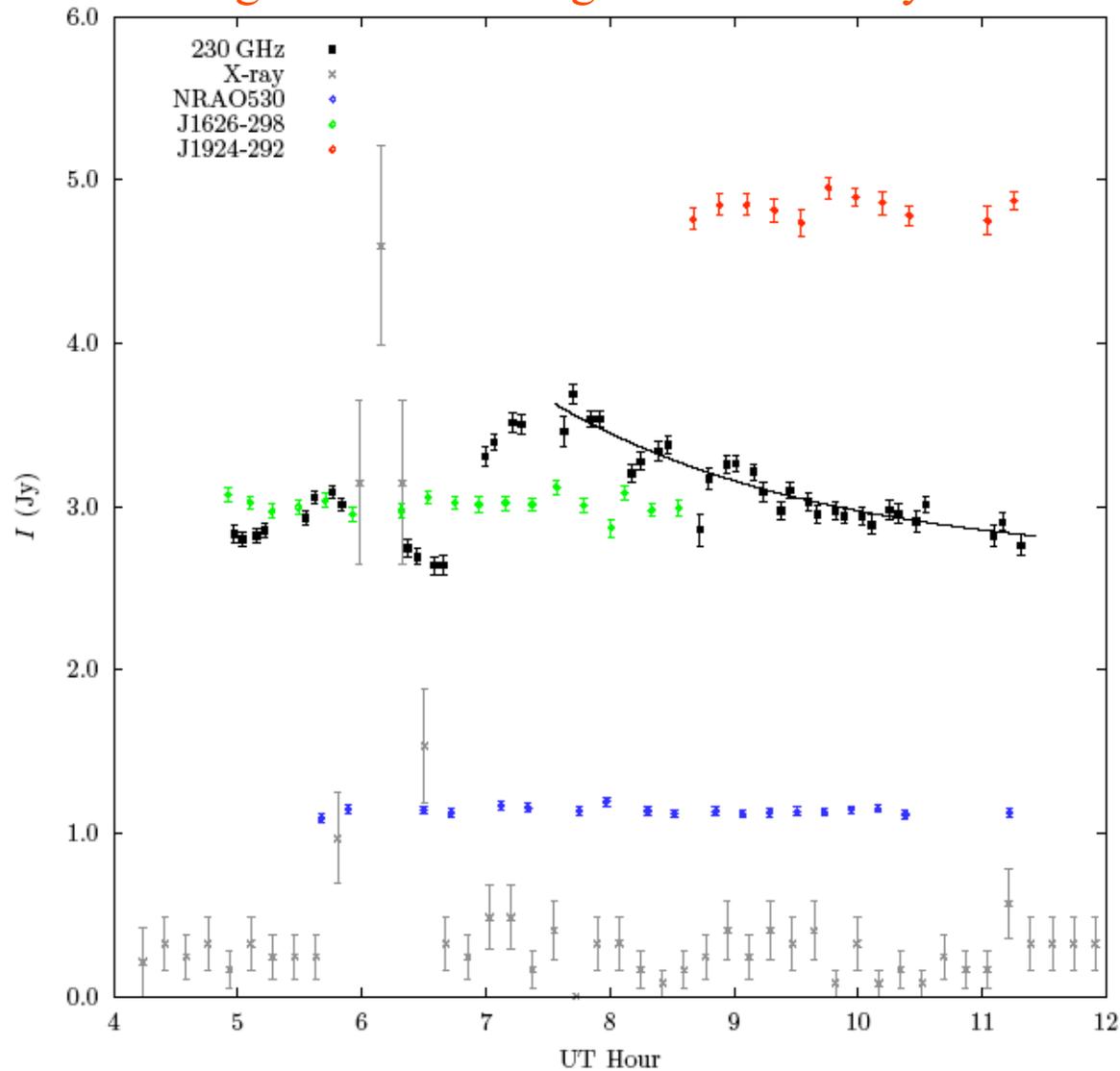
James Moran

Dan Marrone (PhD student, submitted thesis yesterday)

Jun Hui Zhao

Harvard-Smithsonian Center for Astrophysics

# X Ray (Chandra) and Submillimeter Wavelength (Submillimeter Array) Light Curves for Sgr A\* 2006 July 17



Chandra Team: Baganoff, Bautz, Ricker, Bradt, Garmire and Morris  
SMA Team: Marrone, Moran and Zhao