

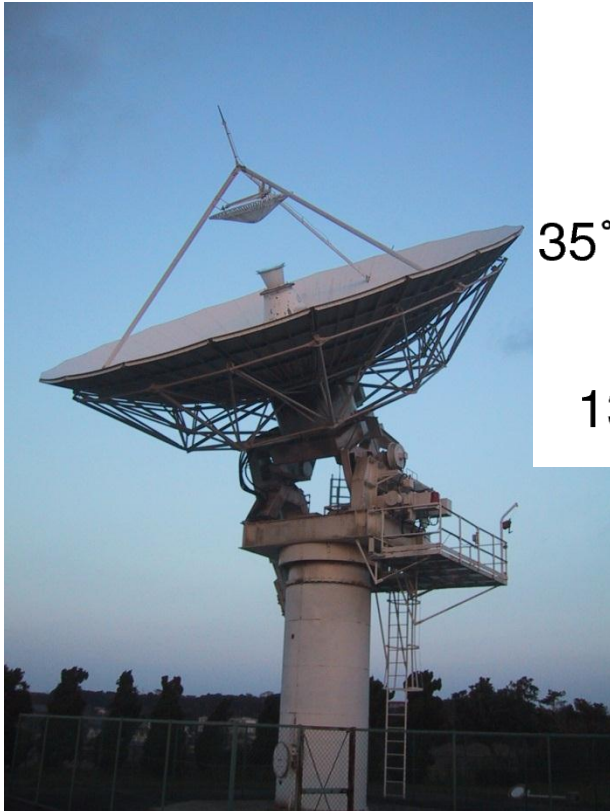
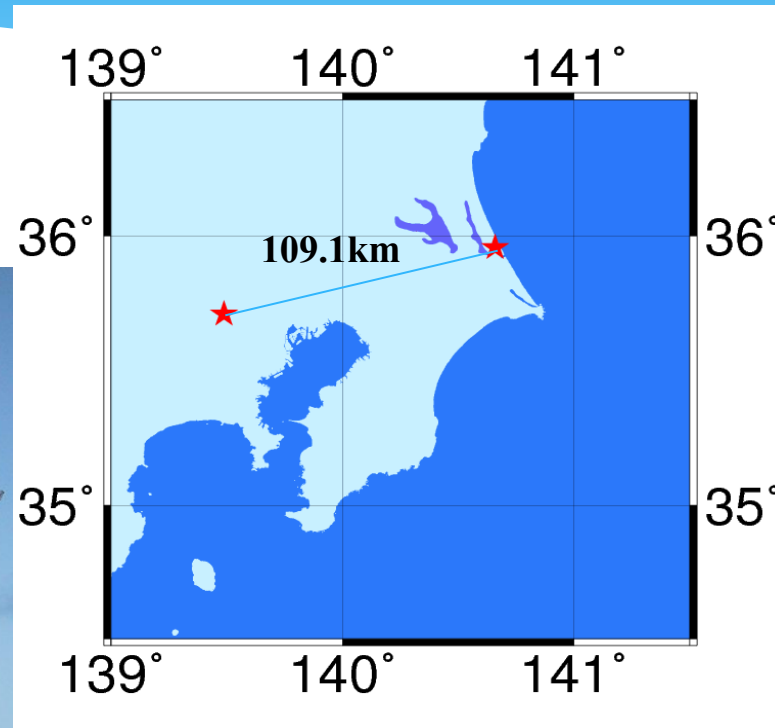
# 鹿島—小金井11m (100km) 基線で 観測したS/X 帯でのSgr-A のフリンジ 強度モニター

関戸 衛

NICT 鹿島宇宙技術センター

時空標準研究室

# Kashima 11 – Koganei 11

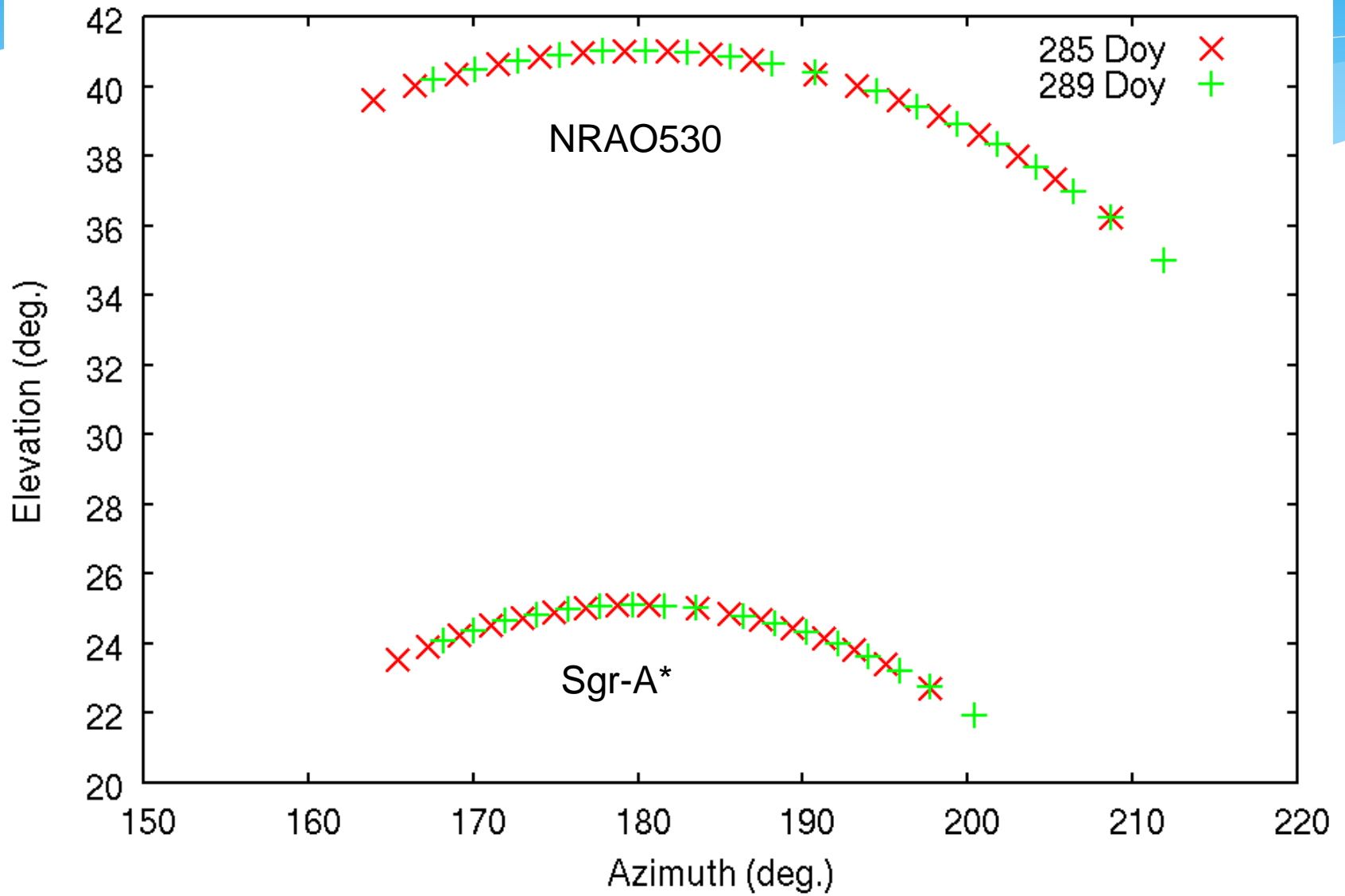


# Sgr-A\*のモニター観測

<http://www2.nict.go.jp/aeri/sts/stmg/people/sekido/Sgr-series/sgrA-monit.html>

- \* 第1回 2012年6月28日～7月9日
- \* 第2回 2012年10月11日～15日
- \* 観測システム: K5VSSP32 (32Msps/1bit/16ch) ソフトウェア相関処理
- \* 観測周波数: 2.21-2.29GHz, 8.2-8.5GHz
- \* 観測時間: 南中前後 2.5時間程度
- \* Best Effort Basisで実行(1人)

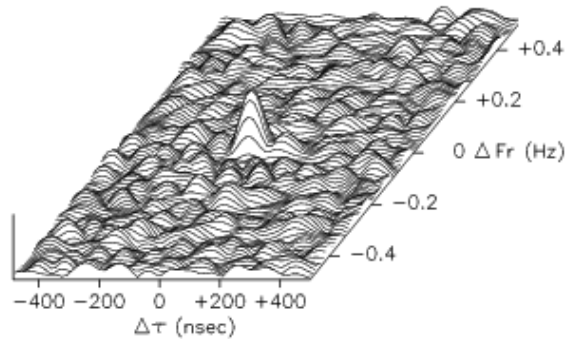
# Target/Ref 仰角差



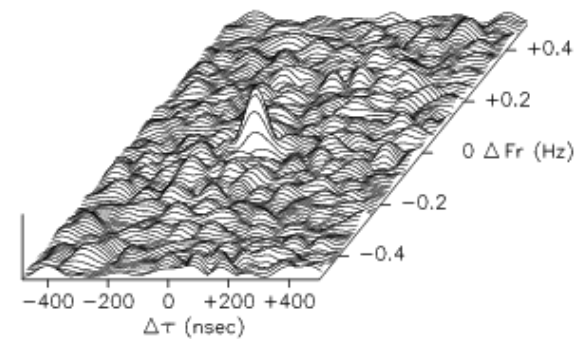
# Flux Calibrator NRAO530

## BW=16MHz, t=19sec

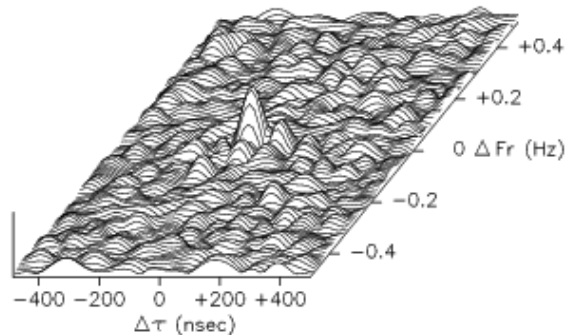
KOGANEI - KASHIM11  
CH#:1 8210.99MHz U 1bit 32MHz sampling  
Source : NRAO530, Integ(sec)=29.0, PRT:2012/285 06:00:15  
Amp = 0.000598, SNR = 18.2 (no amp correction)  
Delay Res (sec) :  $-4.822e-08$  Rate Res(s/s) :  $-1.535e-12$



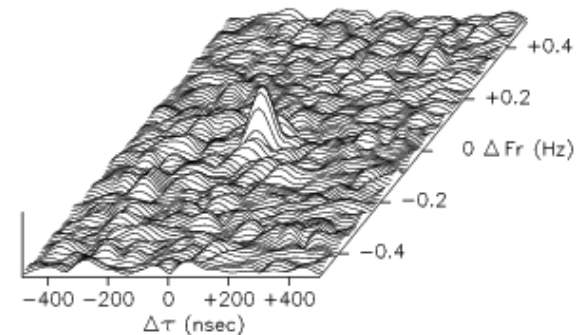
KOGANEI - KASHIM11  
CH#:2 8220.99MHz U 1bit 32MHz sampling  
Source : NRAO530, Integ(sec)=29.0, PRT:2012/285 06:00:15  
Amp = 0.000653, SNR = 19.9 (no amp correction)  
Delay Res (sec) :  $-6.785e-08$  Rate Res(s/s) :  $-9.941e-13$



KOGANEI - KASHIM11  
CH#:3 8250.99MHz U 1bit 32MHz sampling  
Source : NRAO530, Integ(sec)=29.0, PRT:2012/285 06:00:15  
Amp = 0.000638, SNR = 19.4 (no amp correction)  
Delay Res (sec) :  $-4.904e-08$  Rate Res(s/s) :  $-1.237e-12$



KOGANEI - KASHIM11  
CH#:4 8310.99MHz U 1bit 32MHz sampling  
Source : NRAO530, Integ(sec)=29.0, PRT:2012/285 06:00:15  
Amp = 0.000673, SNR = 20.5 (no amp correction)  
Delay Res (sec) :  $-4.677e-08$  Rate Res(s/s) :  $-1.025e-12$



# X-band

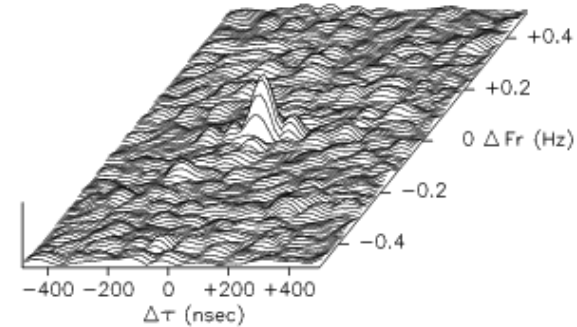
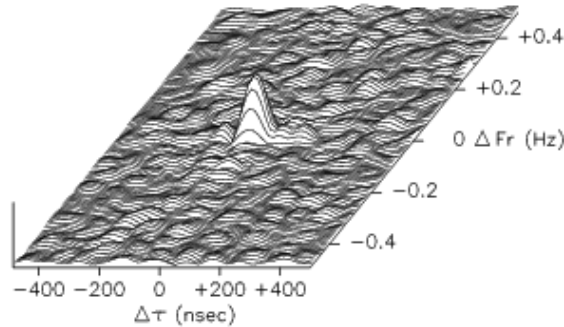
# Flux Calibrator NRAO530

## BW=16MHz, t=19sec

KOGANEI - KASHIM11  
CH#:1 2212.99MHz U 1bit 32MHz sampling  
Source : NRAO530, Integ(sec)=29.0, PRT:2012/285 06:00:15  
Amp = 0.001187, SNR = 36.2 (no amp correction)  
Delay Res (sec) :  $-4.253e-08$  Rate Res(s/s) :  $-1.495e-12$

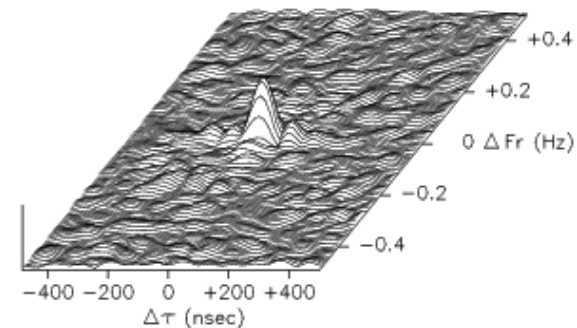
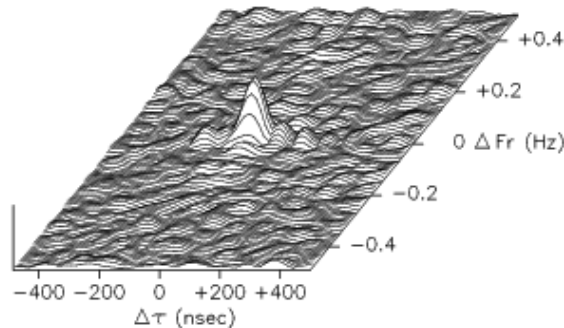
KOGANEI - KASHIM11  
CH#:2 2227.99MHz U 1bit 32MHz sampling  
Source : NRAO530, Integ(sec)=29.0, PRT:2012/285 06:00:15  
Amp = 0.000986, SNR = 30.0 (no amp correction)  
Delay Res (sec) :  $-4.943e-08$  Rate Res(s/s) :  $-6.116e-13$

### S-band



KOGANEI - KASHIM11  
CH#:3 2237.99MHz U 1bit 32MHz sampling  
Source : NRAO530, Integ(sec)=29.0, PRT:2012/285 06:00:15  
Amp = 0.001301, SNR = 39.6 (no amp correction)  
Delay Res (sec) :  $-4.627e-08$  Rate Res(s/s) :  $-1.128e-12$

KOGANEI - KASHIM11  
CH#:4 2267.99MHz U 1bit 32MHz sampling  
Source : NRAO530, Integ(sec)=29.0, PRT:2012/285 06:00:15  
Amp = 0.001310, SNR = 39.9 (no amp correction)  
Delay Res (sec) :  $-4.841e-08$  Rate Res(s/s) :  $-8.491e-13$



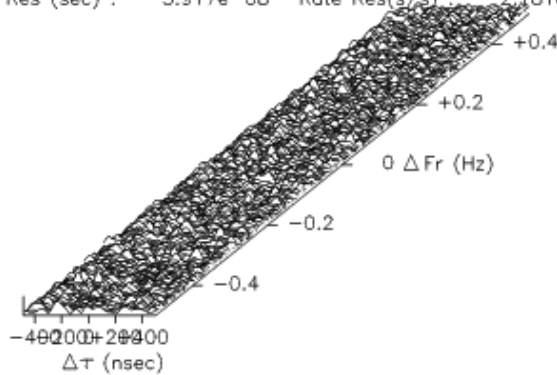


# Target Sgr-A\*

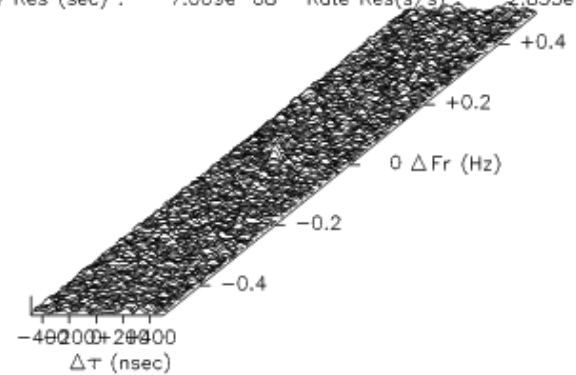
## BW=16MHz, t=300sec

### X-band

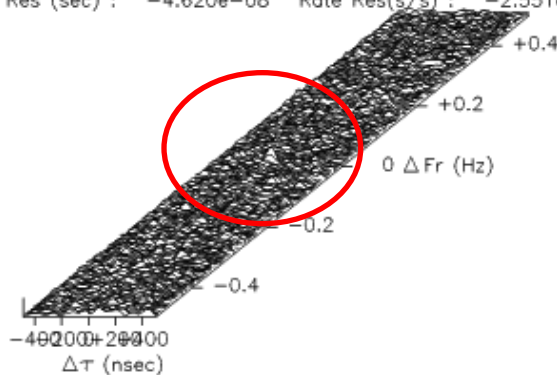
KOGANEI - KASHIM11  
CH#:1 8210.99MHz U 1bit 32MHz sampling  
Source : SGRAST, Integ(sec)=299.0, PRT:2012/285 06:04:30  
Amp = 0.000085, SNR = 8.3 (no amp correction)  
Delay Res (sec) :  $-3.917e-08$  Rate Res(s/s) :  $-2.181e-13$



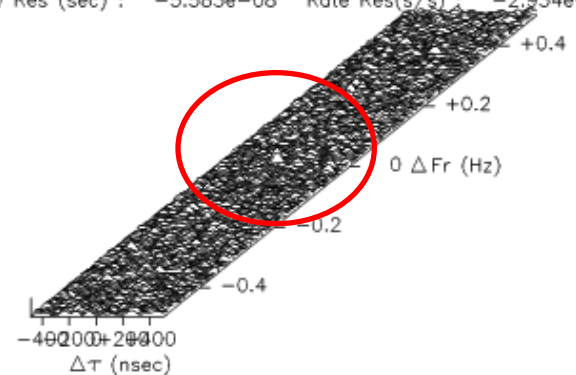
KOGANEI - KASHIM11  
CH#:2 8220.99MHz U 1bit 32MHz sampling  
Source : SGRAST, Integ(sec)=299.0, PRT:2012/285 06:04:30  
Amp = 0.000125, SNR = 12.3 (no amp correction)  
Delay Res (sec) :  $-7.009e-08$  Rate Res(s/s) :  $-2.835e-13$



KOGANEI - KASHIM11  
CH#:3 8250.99MHz U 1bit 32MHz sampling  
Source : SGRAST, Integ(sec)=299.0, PRT:2012/285 06:04:30  
Amp = 0.000132, SNR = 12.9 (no amp correction)  
Delay Res (sec) :  $-4.620e-08$  Rate Res(s/s) :  $-2.551e-13$



KOGANEI - KASHIM11  
CH#:4 8310.99MHz U 1bit 32MHz sampling  
Source : SGRAST, Integ(sec)=299.0, PRT:2012/285 06:04:30  
Amp = 0.000136, SNR = 13.3 (no amp correction)  
Delay Res (sec) :  $-5.583e-08$  Rate Res(s/s) :  $-2.934e-13$

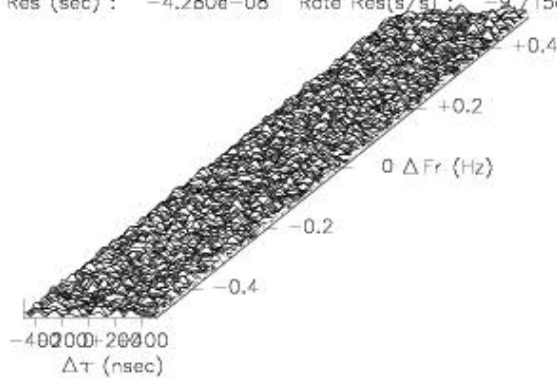


# Target Sgr-A\*

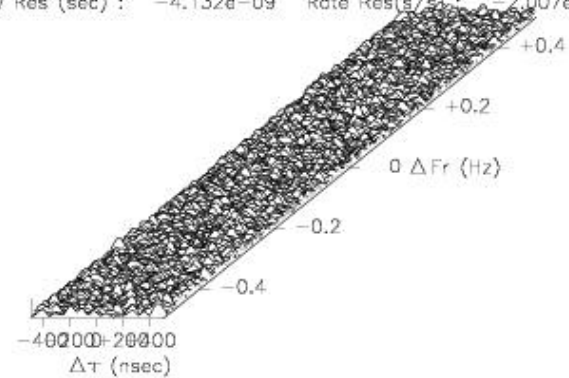
## BW=16MHz, t=300sec

### S-band

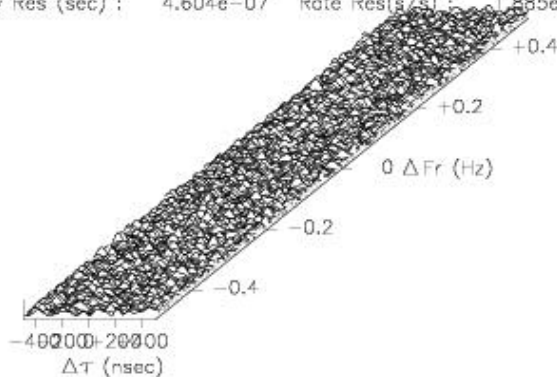
KASHIM11 - KOGANEI  
CH#:1 2212.99MHz U 1bit 32MHz sampling  
Source : SGRAST, Integ(sec)=298.0, PRT:2012/159 16:36:29  
Amp = 0.000090, SNR = 8.8 (no amp correction)  
Delay Res (sec) :  $-4.280e-08$  Rate Res(s/s) :  $-9.715e-11$



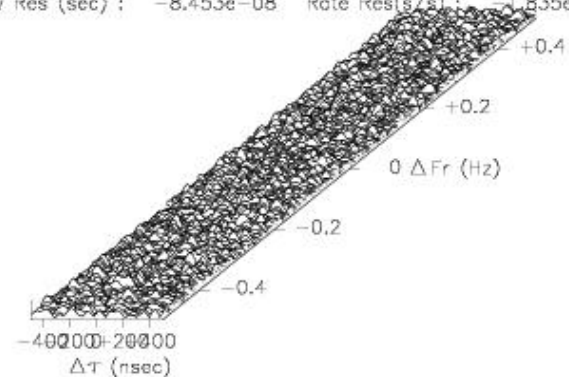
KASHIM11 - KOGANEI  
CH#:2 2227.99MHz U 1bit 32MHz sampling  
Source : SGRAST, Integ(sec)=298.0, PRT:2012/159 16:36:29  
Amp = 0.000075, SNR = 7.4 (no amp correction)  
Delay Res (sec) :  $-4.132e-09$  Rate Res(s/s) :  $-2.007e-10$



KASHIM11 - KOGANEI  
CH#:3 2237.99MHz U 1bit 32MHz sampling  
Source : SGRAST, Integ(sec)=298.0, PRT:2012/159 16:36:29  
Amp = 0.000074, SNR = 7.2 (no amp correction)  
Delay Res (sec) :  $4.604e-07$  Rate Res(s/s) :  $-1.885e-10$



KASHIM11 - KOGANEI  
CH#:4 2267.99MHz U 1bit 32MHz sampling  
Source : SGRAST, Integ(sec)=298.0, PRT:2012/159 16:36:29  
Amp = 0.000074, SNR = 7.2 (no amp correction)  
Delay Res (sec) :  $-8.453e-08$  Rate Res(s/s) :  $-1.835e-10$





**No Fringe  
in S-band**

```
***** SDELAY (Ver. 2010-04-13) SUMMARY OUT PUT *****
COUT      : ./couth122850002GRc.txt
X DATA   : /k57c/ad7/sg285/G285060200c.dat
Y DATA   : /k56c/ad5/sg285/R285060200c.dat
BASELINE  : KOGANEI - KASHIM11
SOURCE    : SGRAST           SAMPLING : 1 bit  32 MHz
PRT       : 2012/285 06:04:30  Tinteg(s) : 299.0
CLOCK     : offset -5.000e-07(s) rate  0.000e+00(s/s)
EOP       : ut1-utc 0.000000(s)
           : x-wobb 0.000000(asec)
           : y-wobb 0.000000(asec)
```

CH#	FREQUENCY (MHz)	AMP MAX	POSITION ( 64x 512)	RESIDUAL Delay (usec)	Rate (ps/s)	SNR
1	2212.99 U	8.351e-05	( 30, 498)	-0.046	212.446	8.2
2	2227.99 U	7.941e-05	( 21, 72)	-0.182	-162.192	7.8
3	2237.99 U	7.733e-05	( 47, 96)	0.221	-140.414	7.6
4	2267.99 U	7.087e-05	( 49, 194)	0.249	-54.285	6.9

Note: No amplitude correction is made.

```
***** SDELAY (Ver. 201
COUT      : ./couth122850002GRa.txt
X DATA   : /k57a/ad4/sg285/G2850602
Y DATA   : /k56a/ad5/sg285/R2850602
BASELINE  : KOGANEI - KASHIM11
SOURCE    : SGRAST           SAM
PRT       : 2012/285 06:04:30  Tin
CLOCK     : offset -5.000e-07(s)
EOP       : ut1-utc 0.000000(s)
           : x-wobb 0.000000(asec)
           : y-wobb 0.000000(asec)
```

CH#	FREQUENCY (MHz)	AMP MAX	POSITION ( 64x 512)	RESIDUAL Delay (usec)	Rate (ps/s)	SNR
1	8210.99 U	8.535e-05	( 30, 256)	-0.039	-0.218	8.3
2	8220.99 U	1.253e-04	( 29, 256)	-0.070	-0.283	12.3
3	8250.99 U	1.321e-04	( 30, 256)	-0.046	-0.255	12.9
4	8310.99 U	1.358e-04	( 29, 256)	-0.056	-0.293	13.3

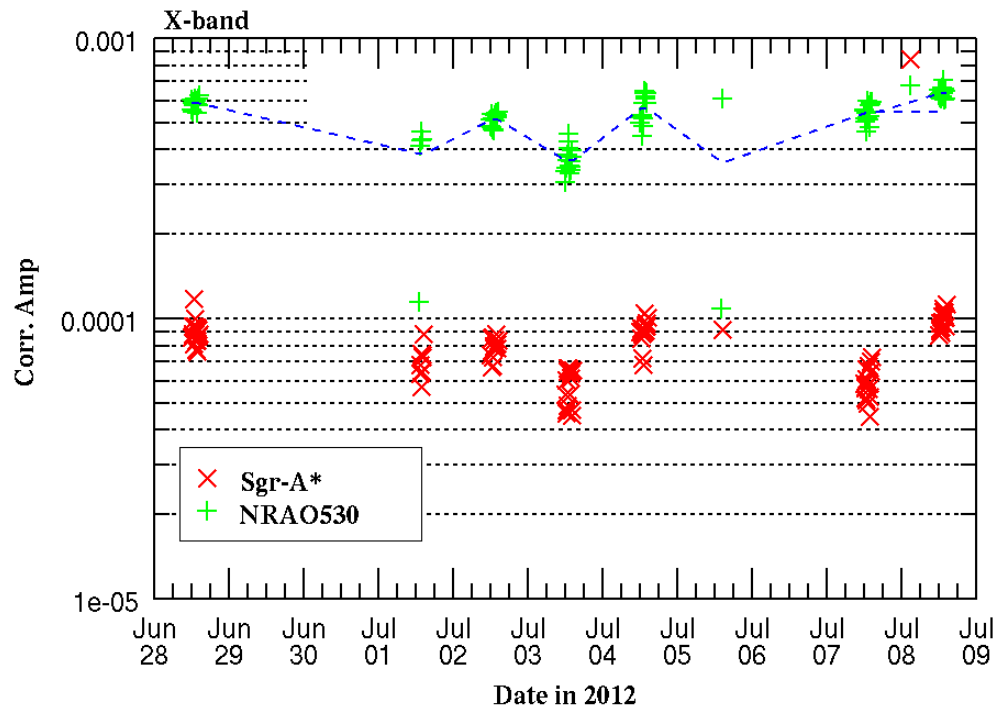
Note: No amplitude correction is made.

**Detected in  
X-band!**

# 2012.6.28-7.09 の観測

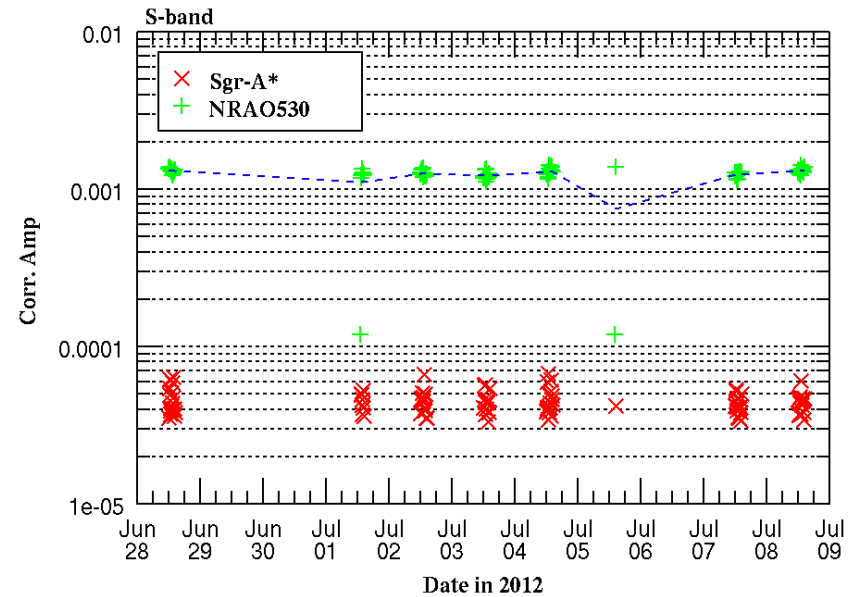
$$\rho \propto S \cdot D_1 D_2$$

X-band



S-band

(no Fringe on Sgr-A\*)



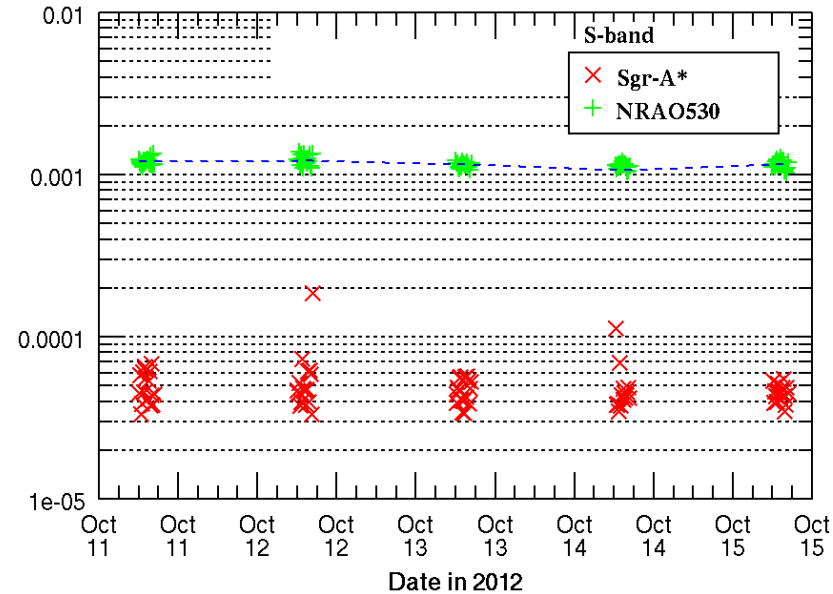
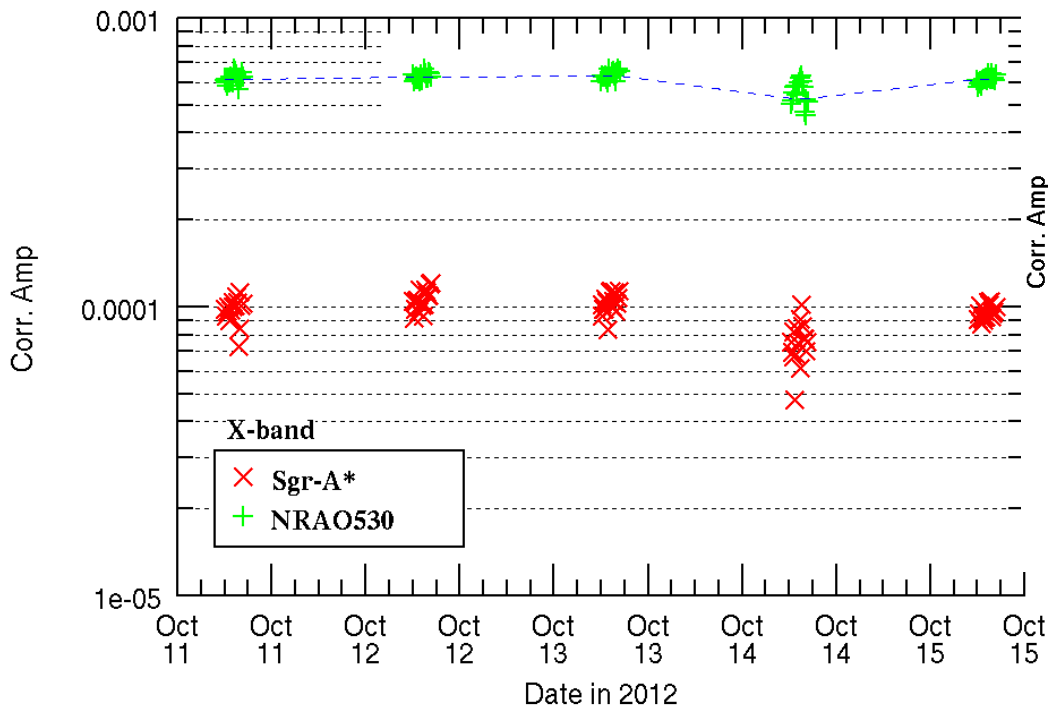
# 2012.10.11-15 の観測

$$\rho \propto S \cdot D_1 D_2$$

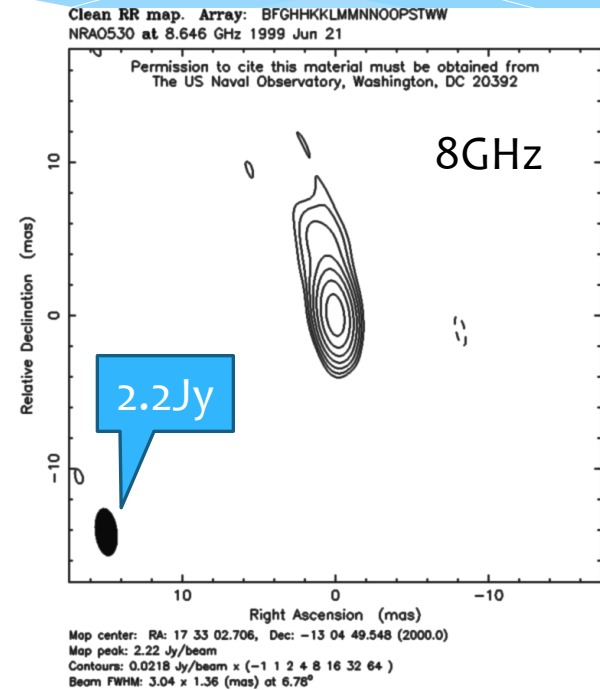
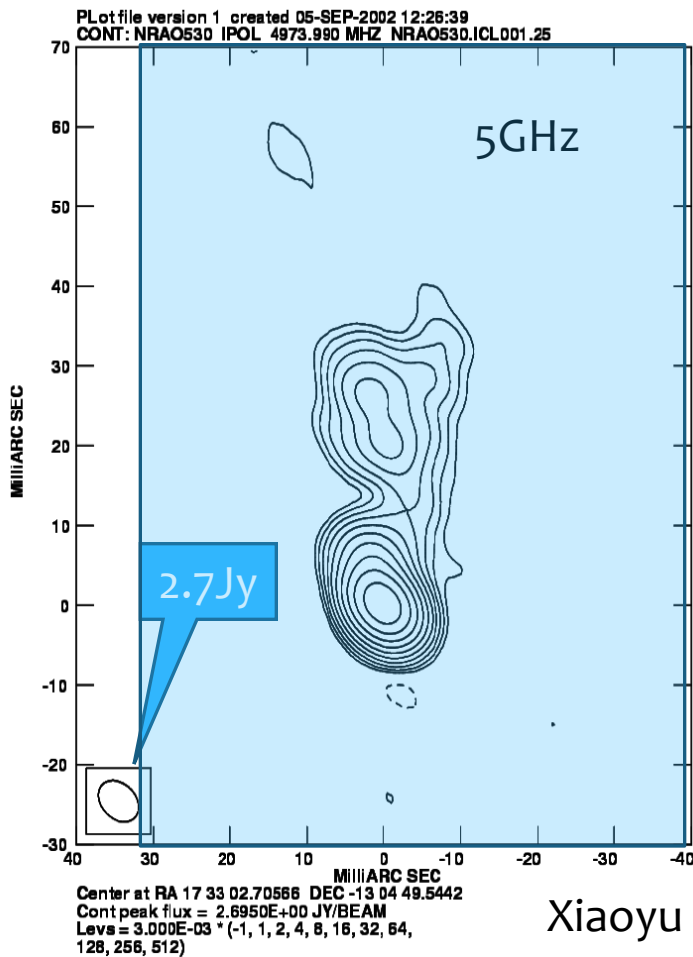
X-band

S-band

(no Fringe on Sgr-A\*)



# NRAO530のFlux(3.3Jy)測地VLBIカタログより

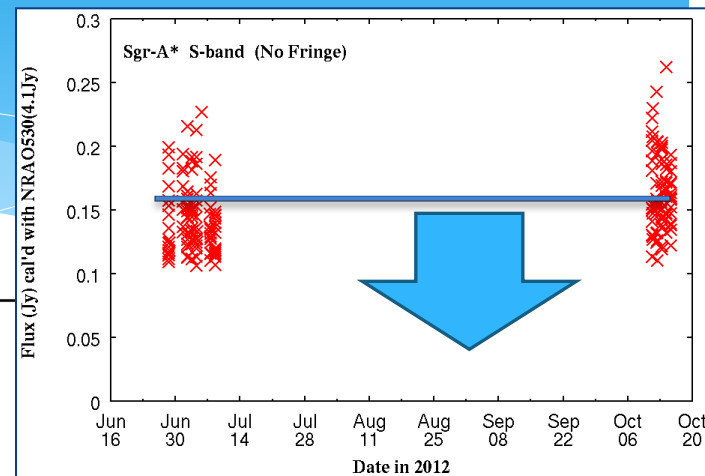
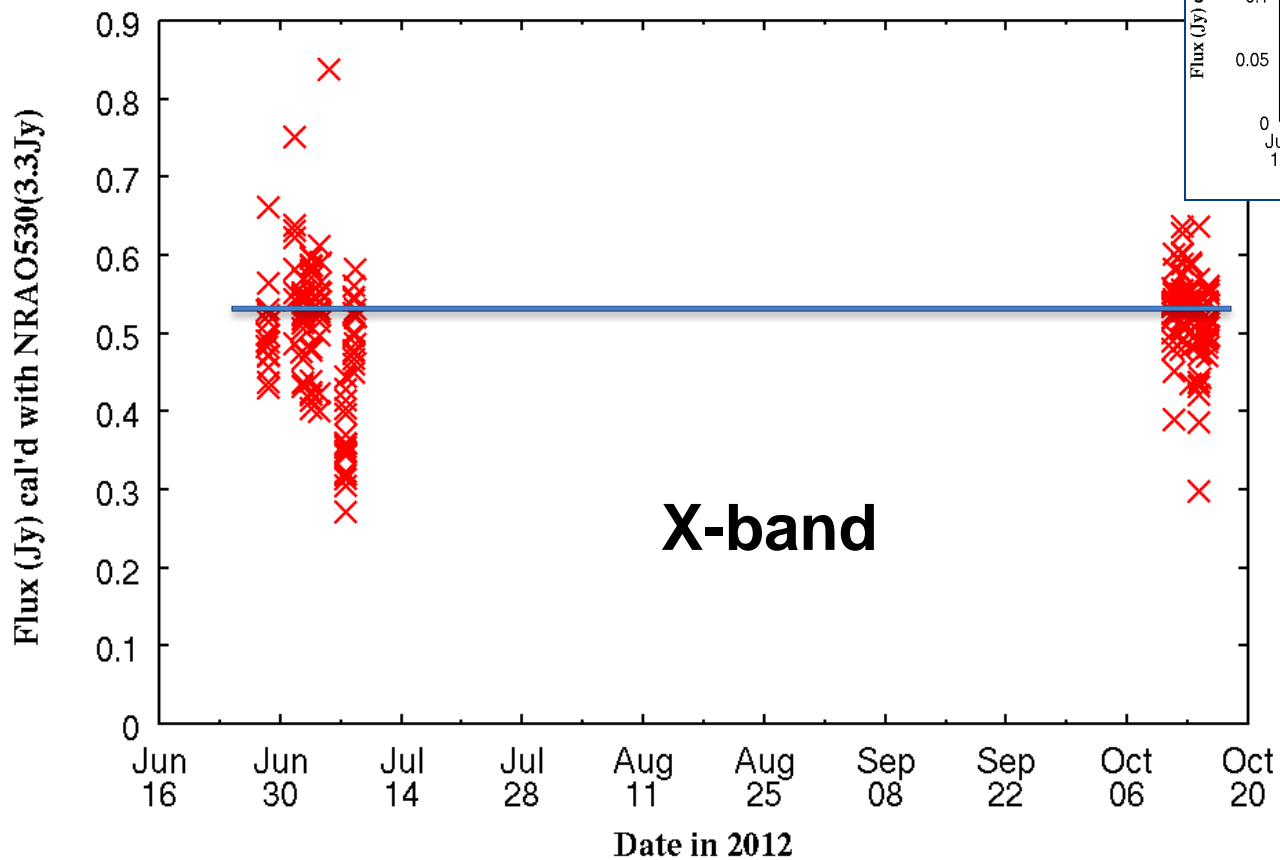


Xiaoyu HONG et al., 2004

# 2012年6月、10月の観測

$$\rho \propto S/T_{sys}$$

$$S_{Sgr} = \frac{\rho_{Sgr}}{\rho_{NRAO}} S_{NRAO}$$



# まとめ

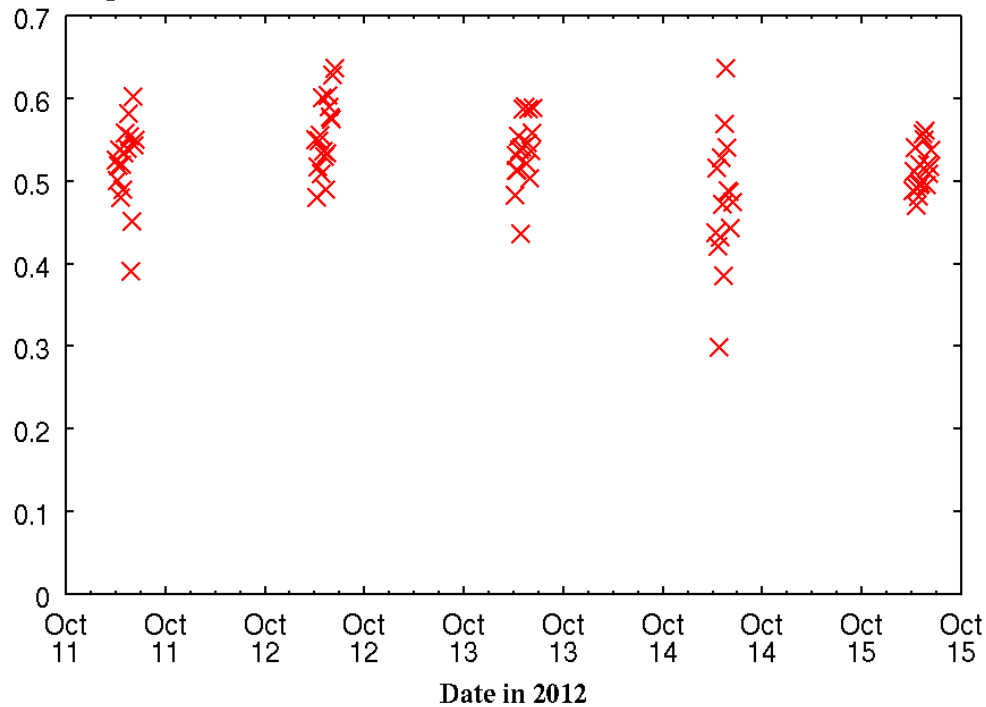
- \* 平穏時でのSgr-A\*の電波強度レベルと変動具合を確認した。
  - \* X-bandでSgr-A\*のフリンジを確認した。
  - \* S-bandでは検出できないレベル。
- \* 今後、可能な範囲で、夏までモニタ観測を継続していきたい。協力者歓迎。



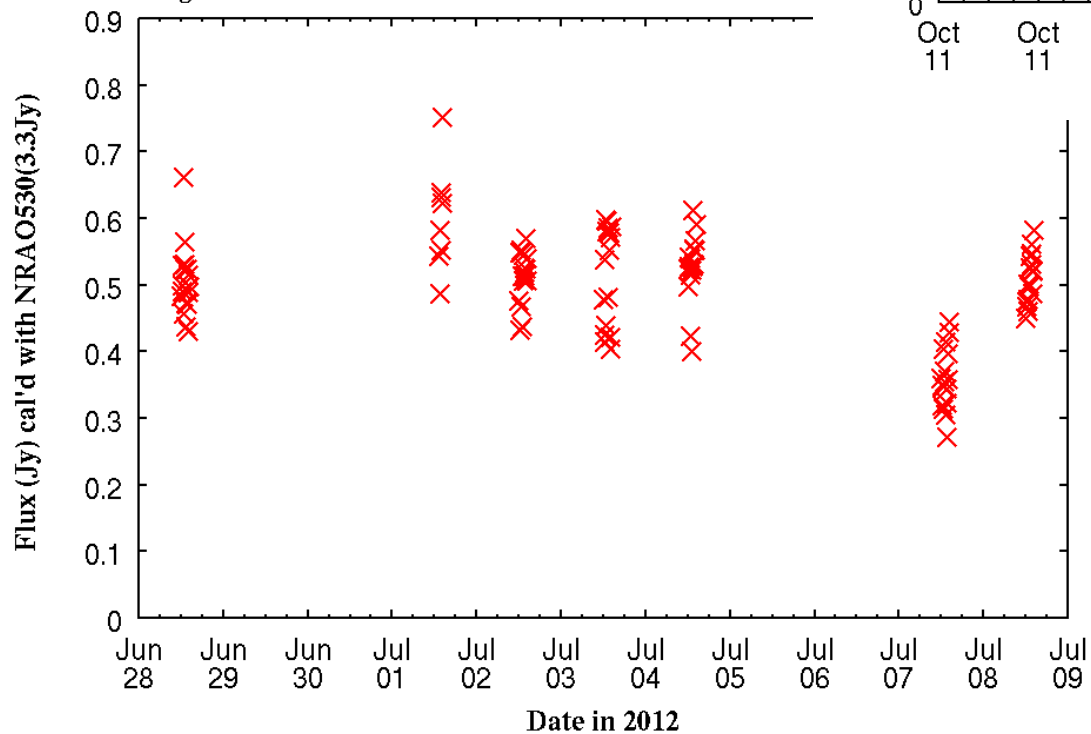
# X-band

Flux (Jy) cal'd with NRAO530(3.3Jy)

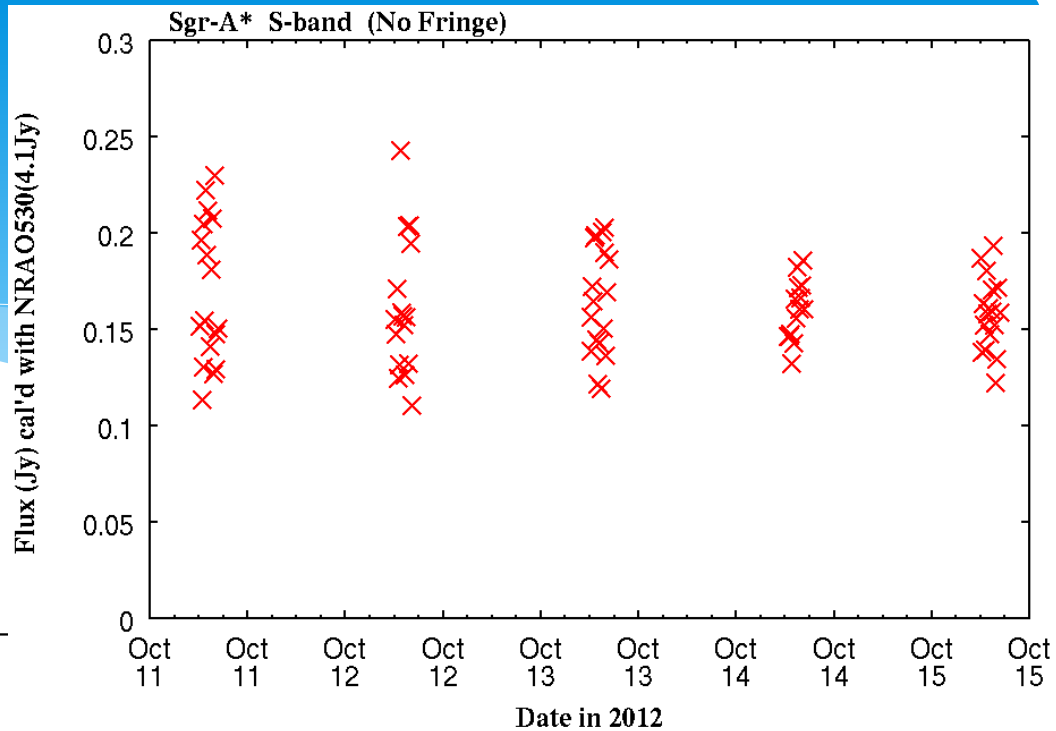
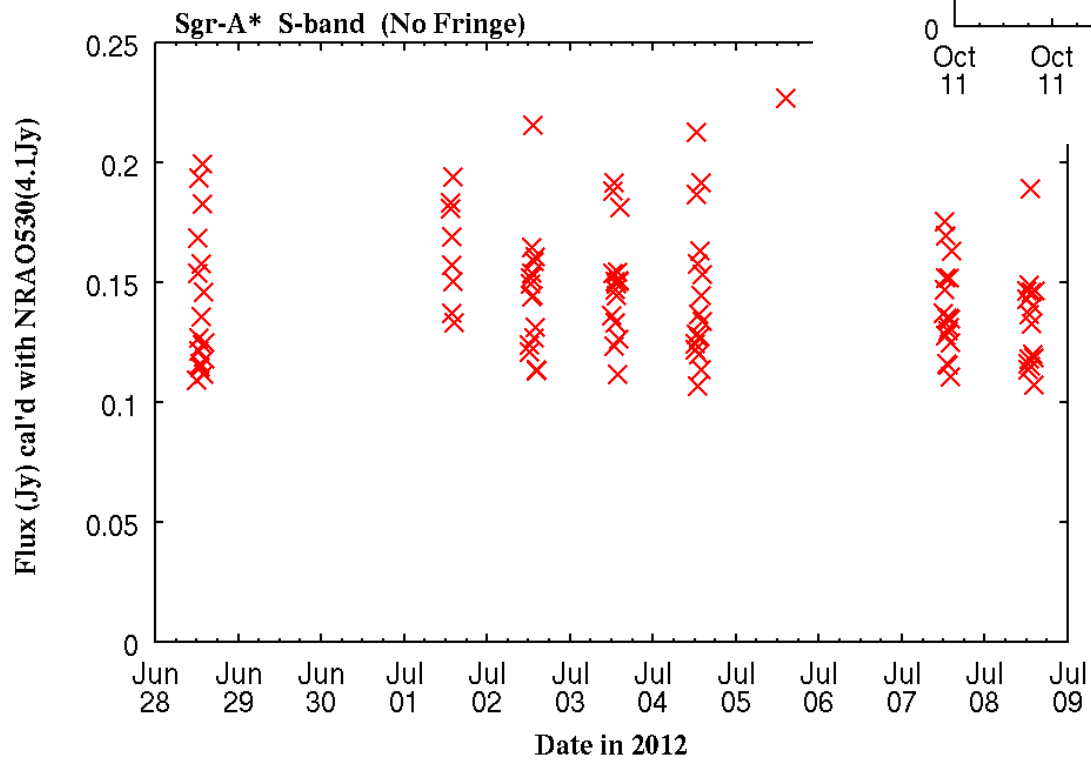
Sgr-A\* X-band



Sgr-A\* X-band



# S-band



# Target/Ref 仰角差

