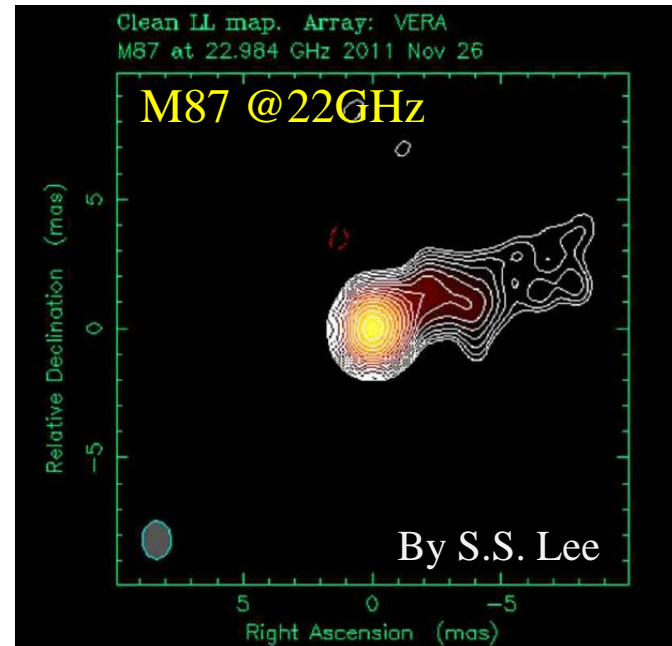


AGN science with KaVA



M. Kino (ISAS/JAXA) 모 토 키 키 노
On behalf of KVN+VERA AGN Sub-WG

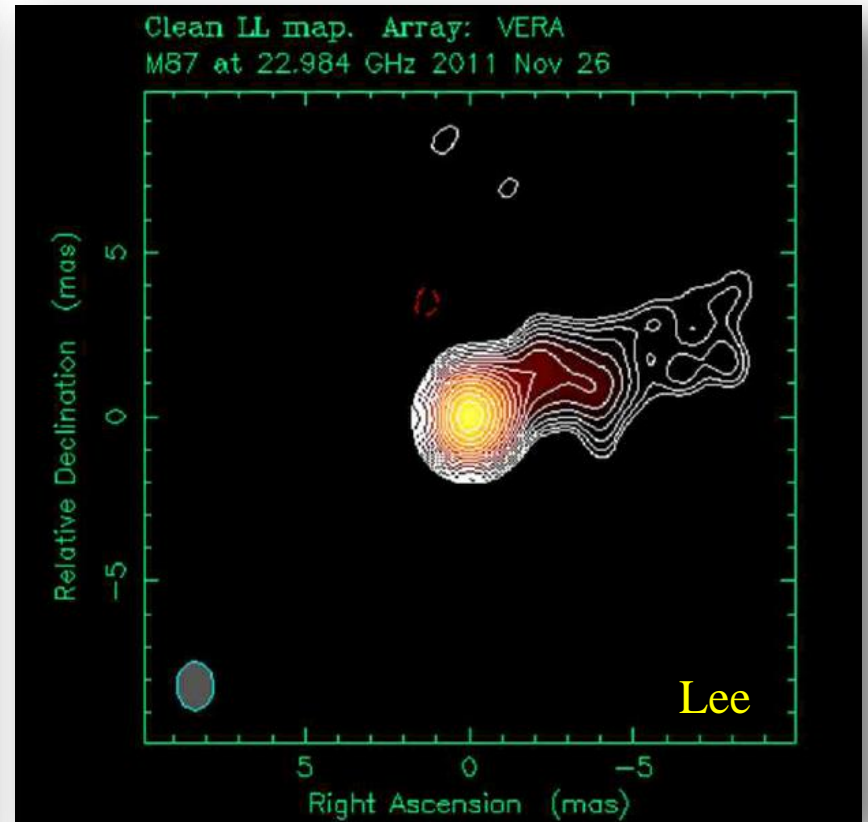
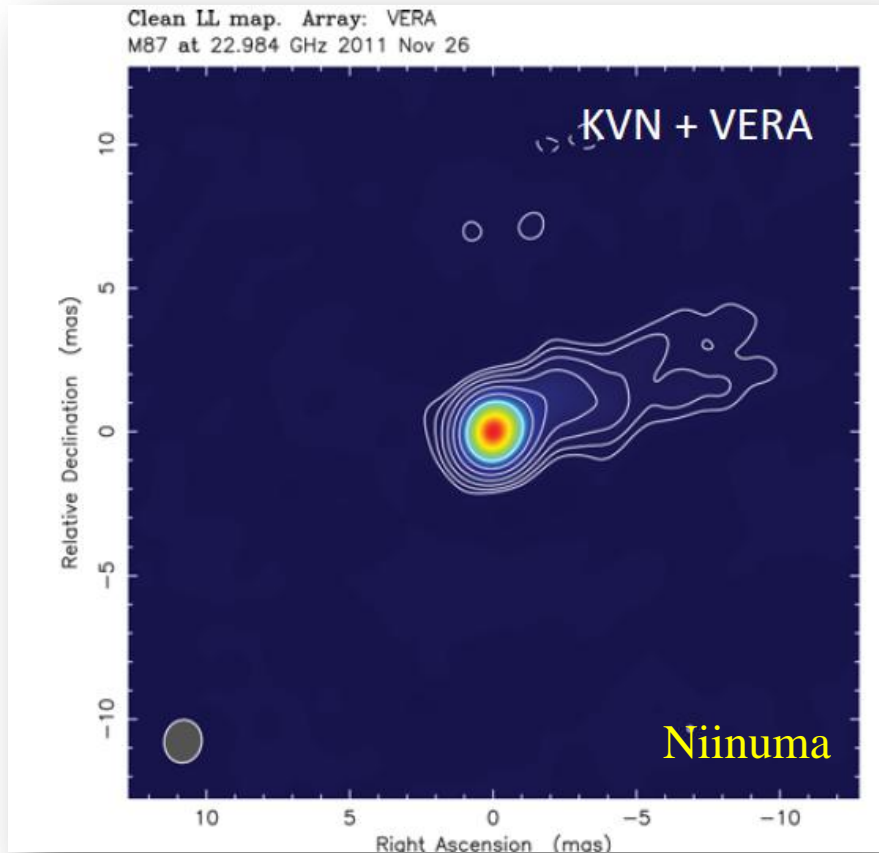
Progress in 2013

- Bright AGN jets:
- Sgr A*:
- Phase referencing:
- Longer Baseline:

VERA UM 2013

Bright AGN jets

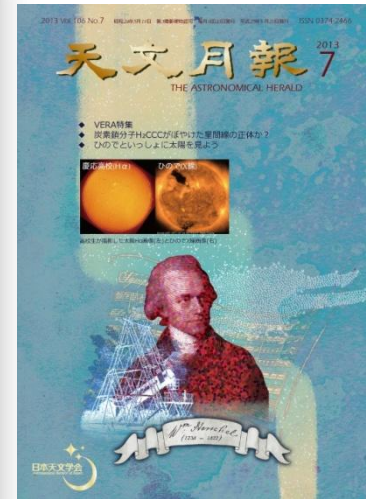
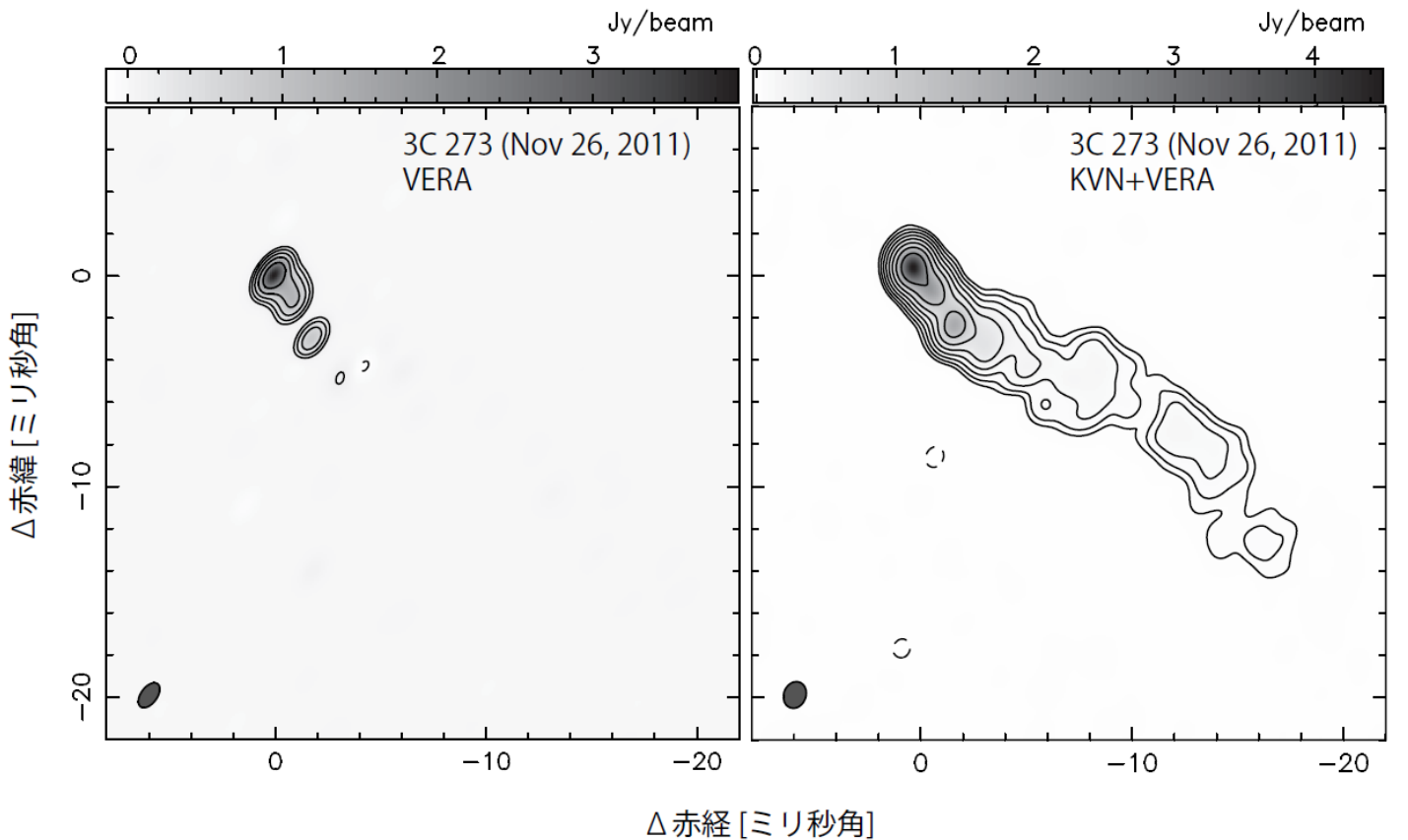
M87 images Double check



We verify both images are consistent. (i.e., no significant differences of rms, peak-flux etc. between both images.)

Improved image of 3C273@22GHz

Data analysis: K. Akiyama



Astronomical herald
(2013 July):
by Sawada-Satoh

Problem: flux loss (report by Niinuma)

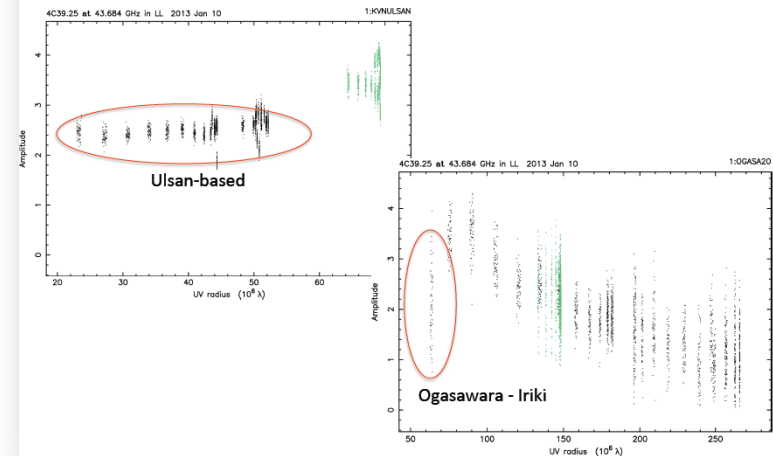
KAVA AGN skype meeting @2013-Apr-18

Results – calibrated visibility (4C39.25)

- Flux loss can be seen in the specified station-based data
 - 22 GHz: Tamna-based visibility
 - 43 GHz: Ulsan-, Ogasawara-based visibility
 - Additionally, large scatter of Ishigaki-based flux

KAVA AGN skype meeting @2013-Apr-18

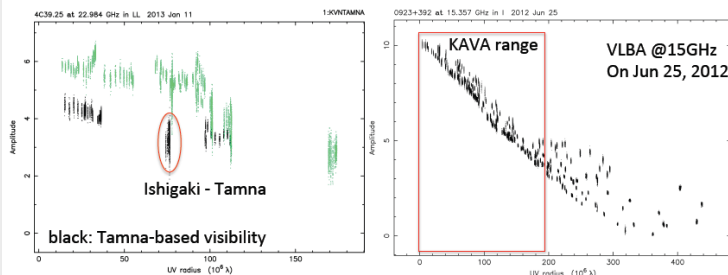
Only each array – 43GHz



KAVA AGN skype meeting @2013-Apr-18

Amplitude – (u, v) plot (4C39.25)

- R13011B (K-band): VERA-Oga was lacked



KAVA AGN skype meeting @2013-Apr-18

What caused flux loss?

- For 22 GHz
 - Tamna-based flux is approximately 30 % lower than other KVN stations
 - Iriki-based flux is also 20% lower than other VERA stations
- For 43 GHz
 - Ulsan-, and Ogasawra-based flux is approximately 30 - 40 % lower than the other stations

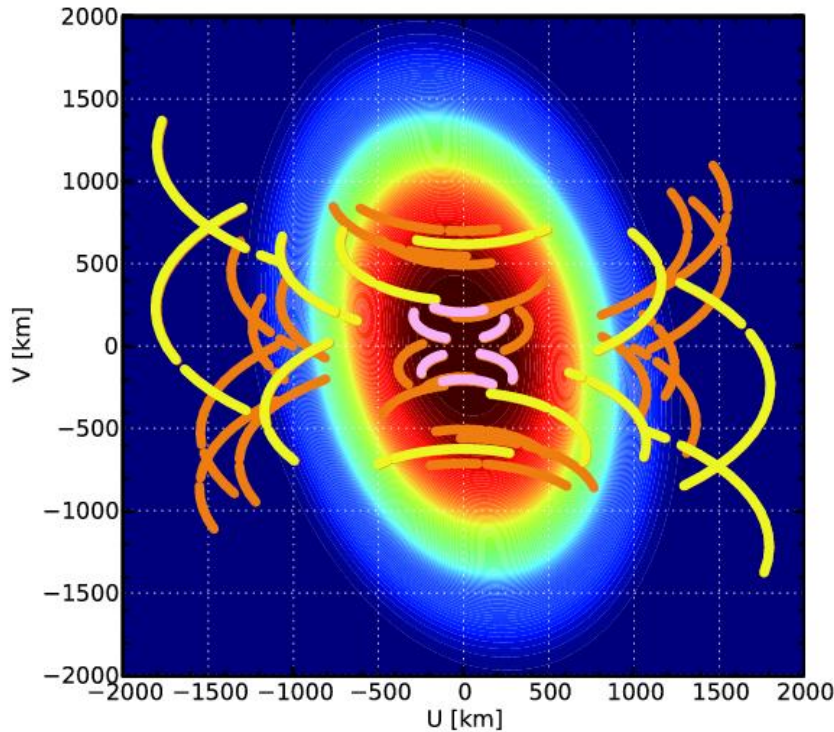
GC parameters?
Pointing offset?

VERA UM 2013

Sagittarius A*

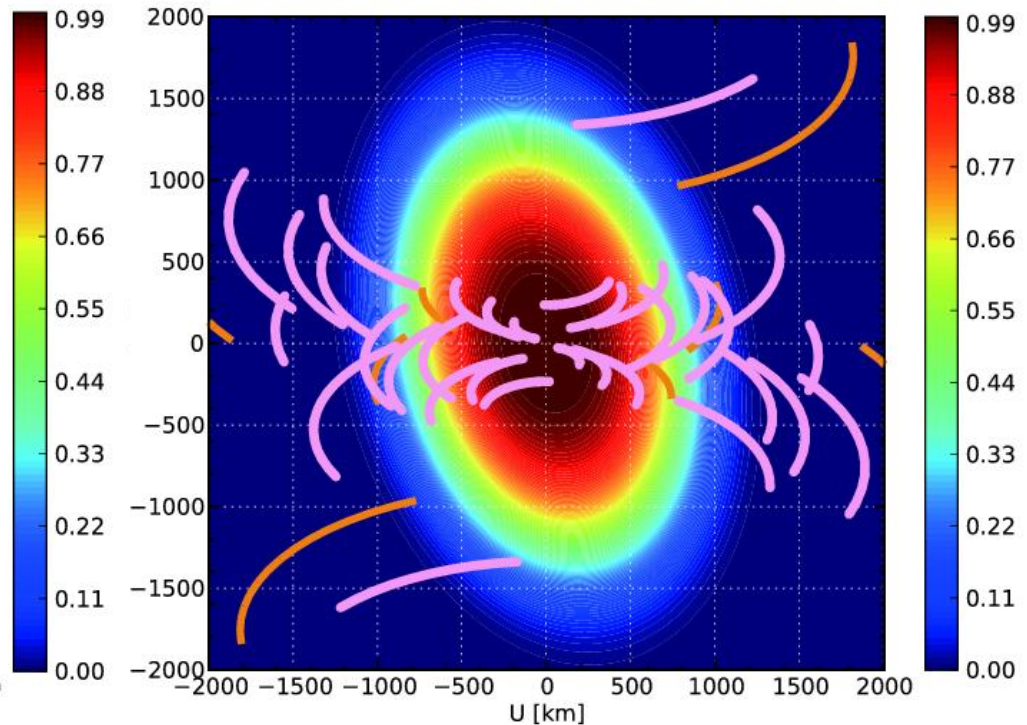
KVN+VERA has better (u,v) coverage
than VLBA+GBT @ 43GHz!

KVN+VERA



Pink: KVN
Orange: KVN+VERA
Yellow: VERA only

VLBA+GBT



Pink: VLBA+GBT
Orange: VLBA only

Pericenter Passage of G2 (Gillessen et al. 2013)

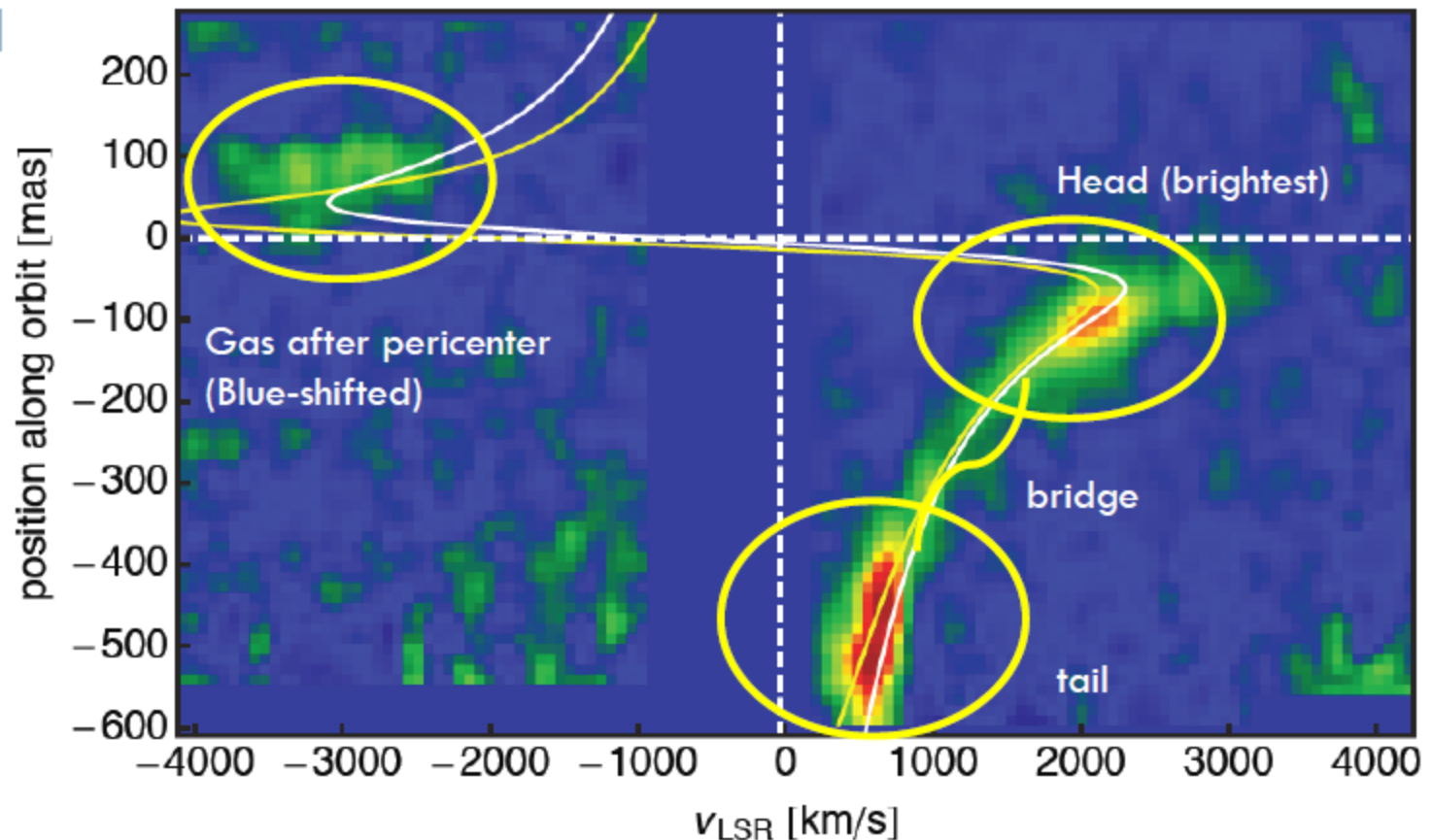
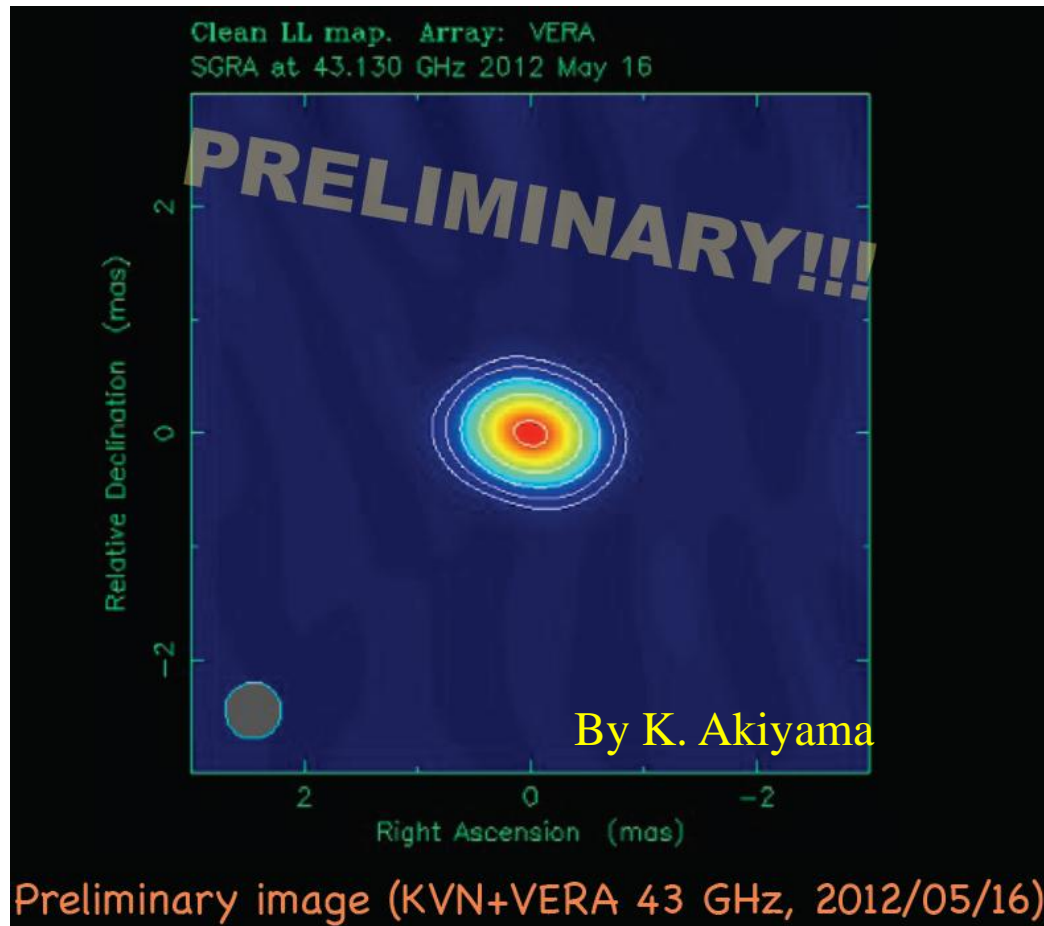


Figure 2: Position-velocity-diagram of G2, extracted from our April 2013 SINFONI data set along the orbit projected into the cube. This diagram is a co-add around the lines Brackett- γ , Helium-I, and Paschen- α . The yellow line delineates the L'-band based orbit, the white line the Brackett- γ based one.

Sgr A* Image @ 43GHz on 16th May 2012



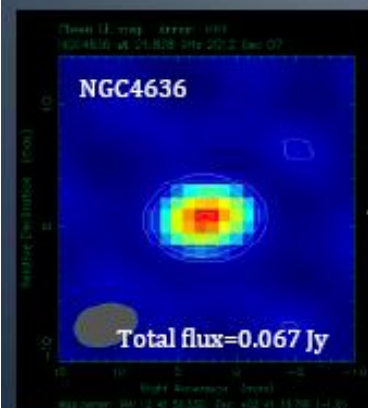
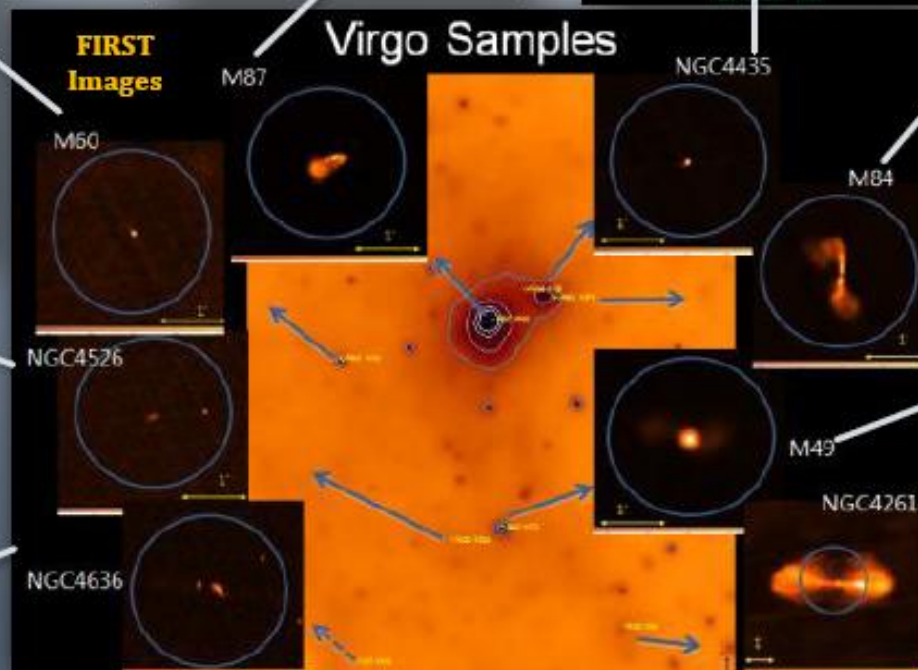
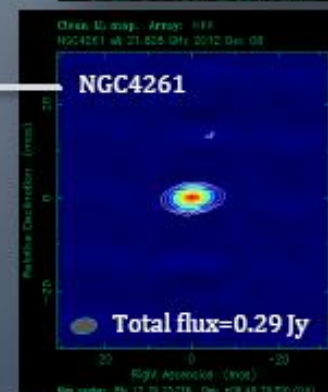
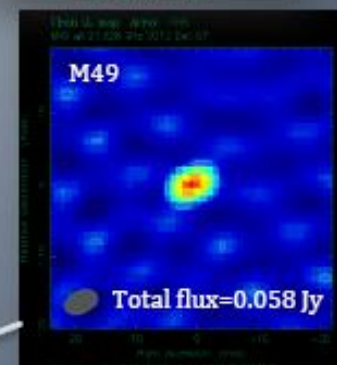
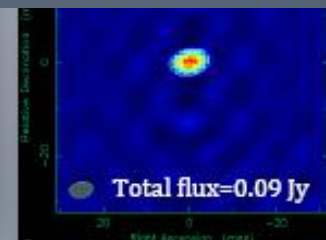
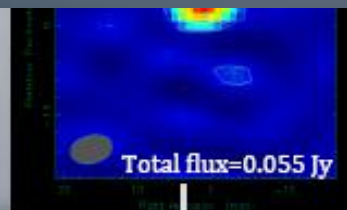
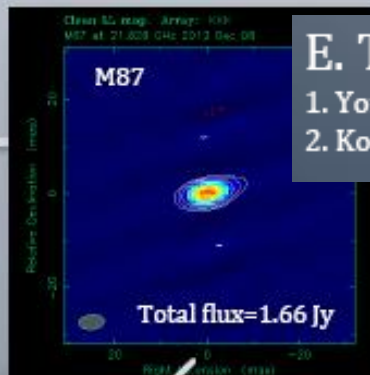
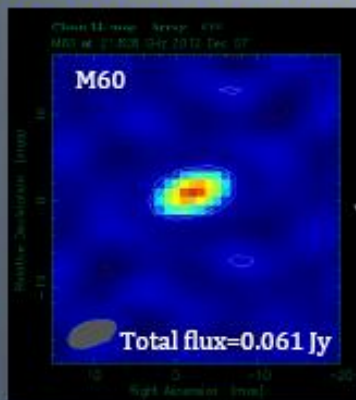
Data looks promising, but still problems to conduct full-correlations.

VERA UM 2013

Faint AGN observation in Phase referencing mode

Why Virgo?

KVN K-band PR Images



Virgo samples are good to test phase referencing capability because sources have various separation angles between calibrator and target (0.6 ~ 5 deg) with a wider flux range (0.05 ~ 1.6Jy) at K-band

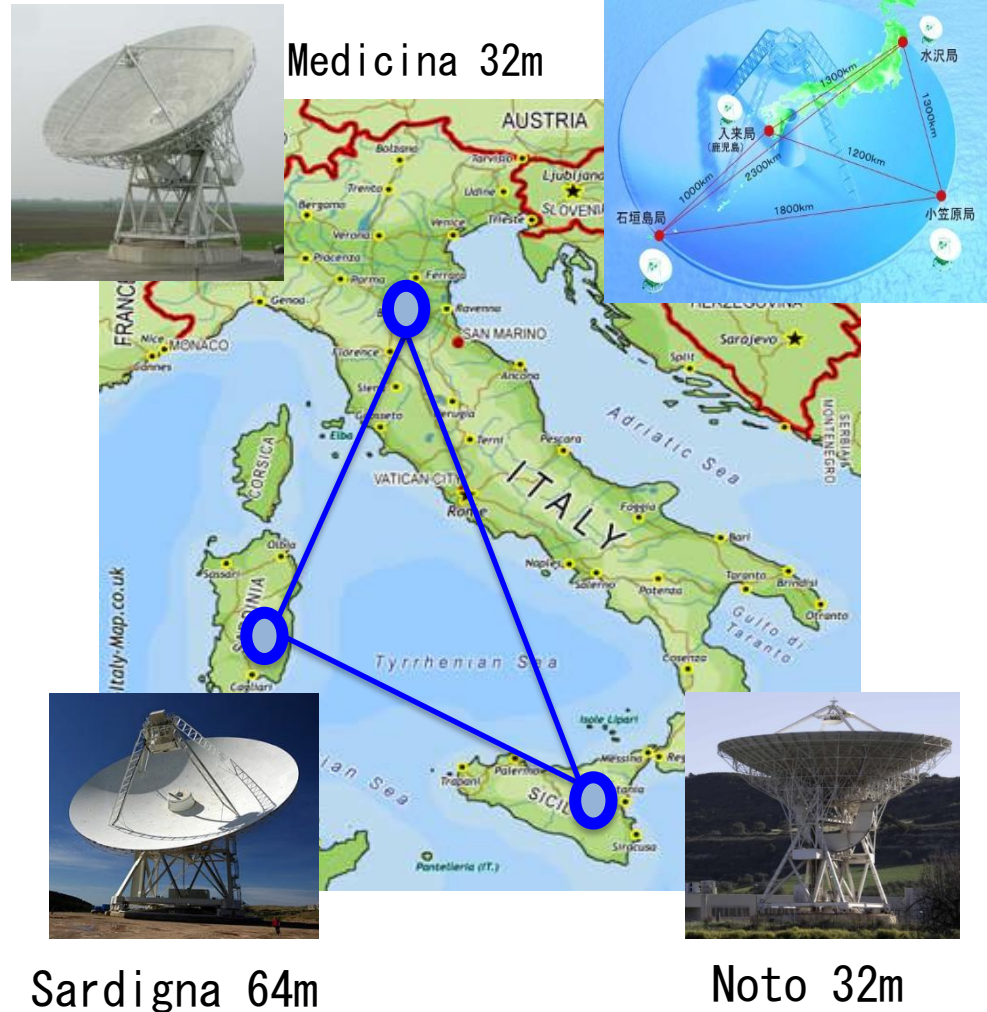
- Total observation time : 9hr x 2 epoch (for each K/Q band)
 - It is difficult to observe all samples so we selected five targets
 - K-band : M84, NGC4435, M49, NGC4636, NGC4526
 - Q-band : M84, NGC 4435, NGC4636, M49
 - approximately 3 hours switching time for each pair
 - 15~20 min switching for each pair / 1 hour
 - image sensitivity < 0.5 mJy
- Recording mode : 1 Gbps recording
(KVN: Mark5B, VERA: DIR2000 or OCTADISK)

This demonstration will allow evaluation of our KVN+VERA PR performance and will provide an important basis to prepare the "phase referencing and astrometric observations" with the KVN+VERA.

**Towards longer baseline:
I-J-K collaboration**

日伊共同VLBI

- AGN分野において近年研究交流を深めているイタリアIRAとの共同事業(イタリア外務省2国間研究交流プログラムから支援を受けている)
- VERA単独に比べ約5倍の分解能実現。AGNジェット根元の超高解像度観測等を目指す
- キックオフとしてNoto-VERA4局フリンジ試験観測実施(2013年5月)
 - 日伊VLBIのパスを通すのが主目的
 - Q band, LHCP
 - 1Gbps記録(16MHz x 16ch)
 - データを伊から三鷹にファイル転送、ソフト相関処理の準備中
- 将来的にはSardigna64m参加視野



Sardigna 64m

Noto 32m

Summary

- Bright AGN jets: Problems have not been resolved. We somehow try to prepare 1st paper using various amplitude calibrations.
- Sgr A*: We keep on intensive monitoring towards G2 passage! (& waiting for past 1Gbps data correlations).
- Phase referencing: We kick-off a test in Virgo
- Longer Baseline(s): We kick-off a test of Italy-Japan baseline.

BACK UP

Peri-center passage of G2 in the center: Position Velocity diagram

Gillessen+13

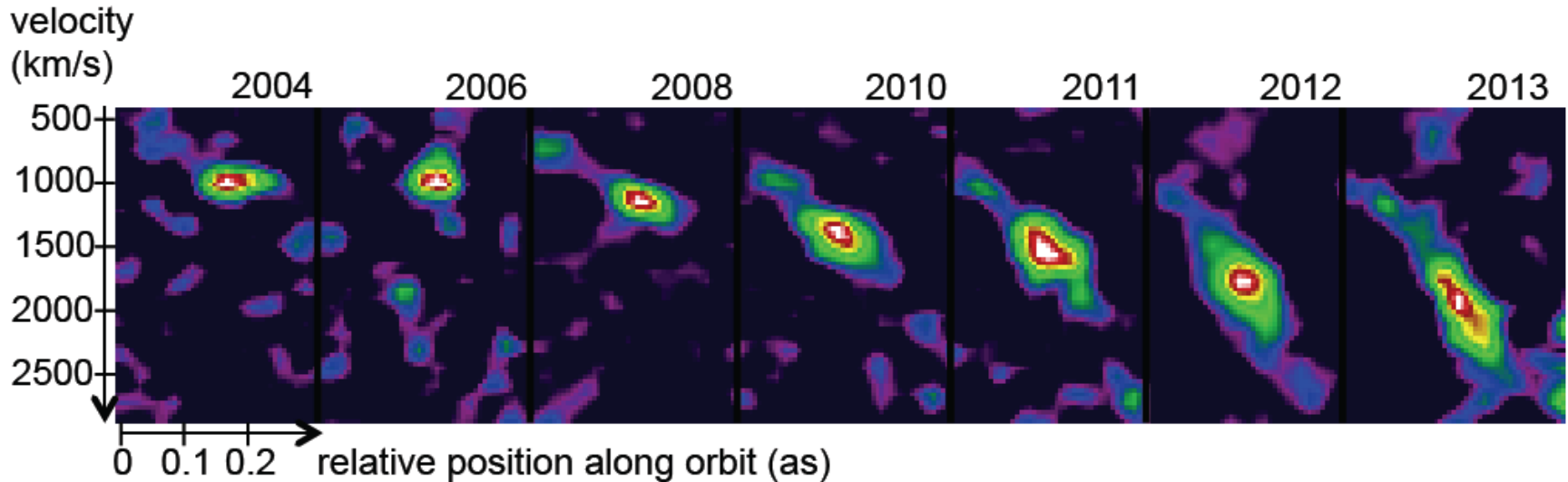


Figure 3: Series of position-velocity-diagrams from 2004 to 2013 extracted from SINFONI data, scaled to identical peak luminosities. For illustration purposes, the original data were resampled in each axis to twice as many pixels as the original, and the diagram was smoothed with a Gaussian kernel of $\text{FWHM} = 2$ pix. The evolution of the tidal shear is obvious.

G2 does not wait for us!

(1) Imaging of possible structural change of Sgr A*

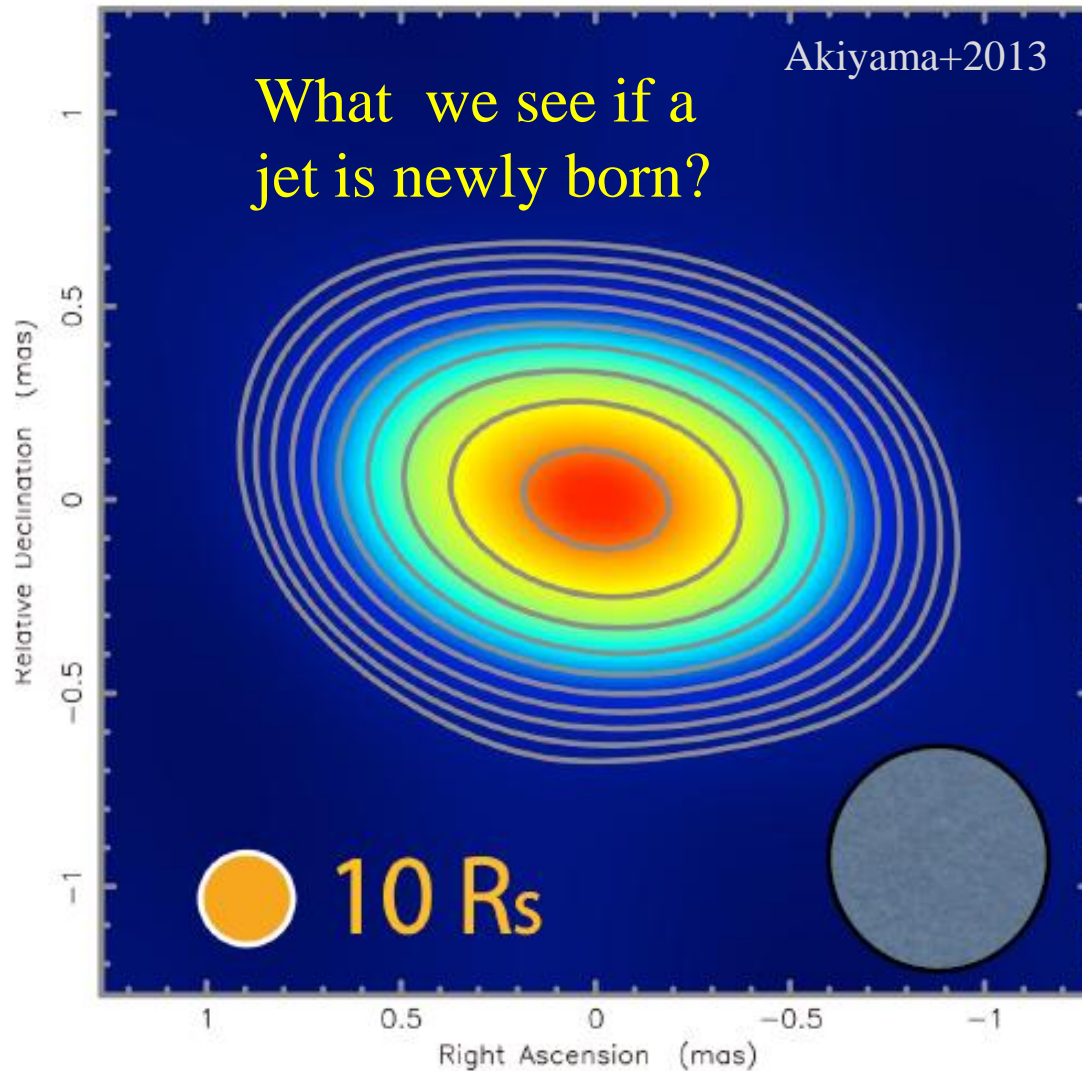


図1 VERAによるSgr A*の43 GHzのイメージ (2008/11/5 観測)

Peri-center passage of G2 in the center: L'-band images

Gillessen+13

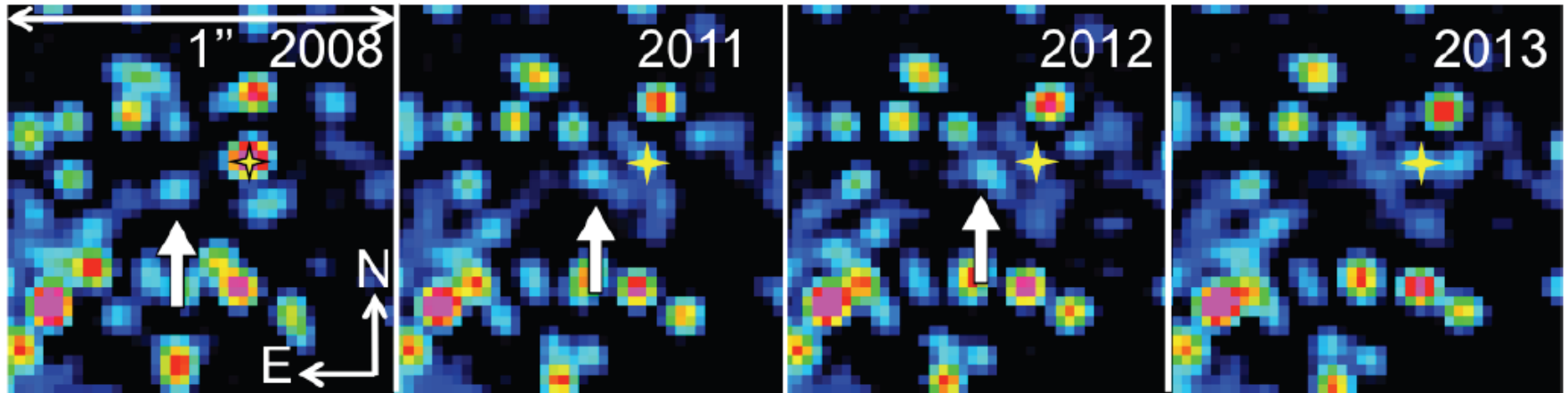


Figure 1: Series of deconvolved L'-band images of the central arcsecond. G2 is unambiguously detected up to 2012, but not in 2013, where the image does not show a source. Starfinder detects a source but only at roughly the expected position. The high confusion around Sgr A* and G2's lowered surface brightness appear to hamper a detection.