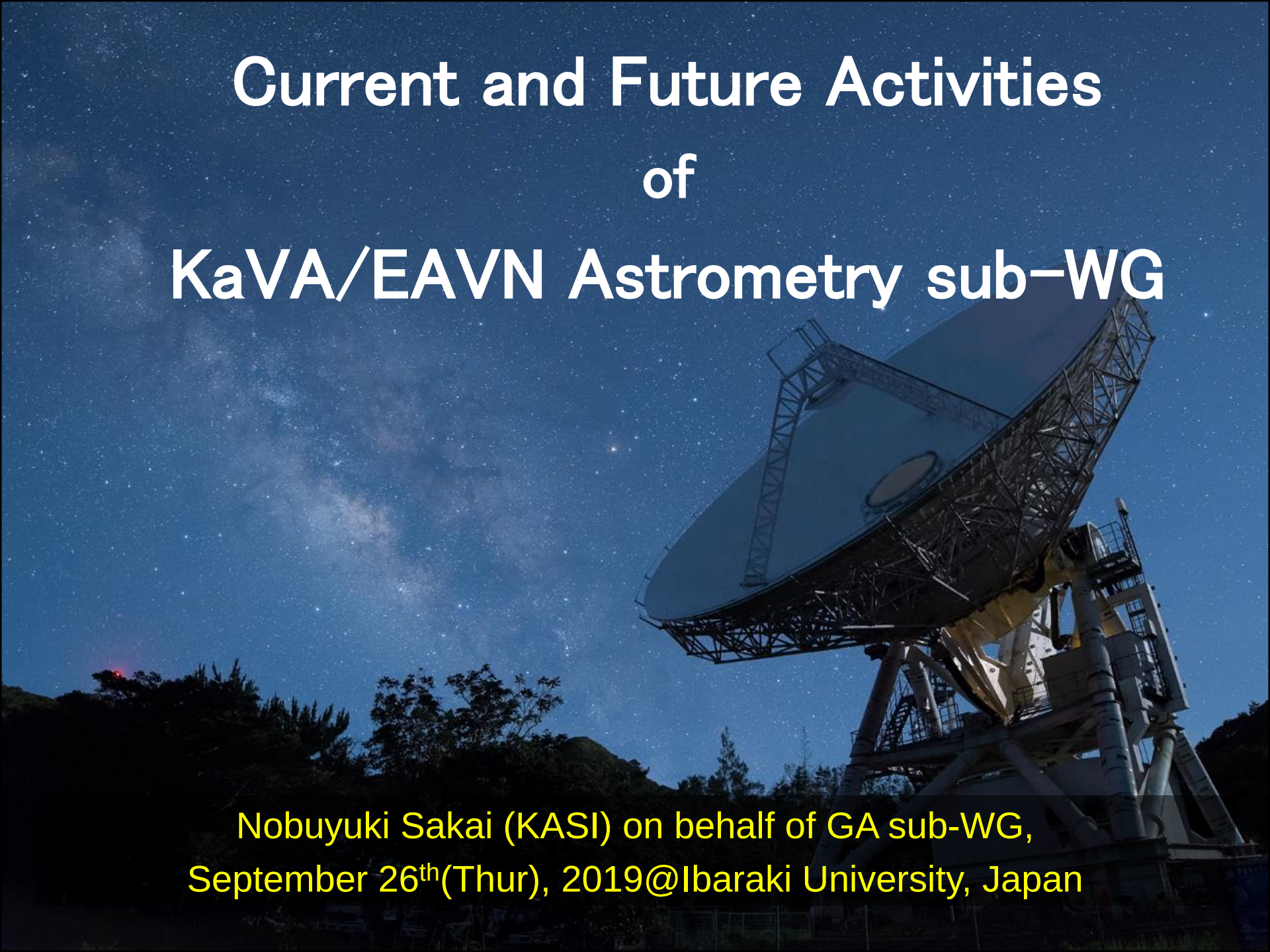
Current and Future Activities of KaVA/EAVN Astrometry sub-WG



Nobuyuki Sakai (KASI) on behalf of GA sub-WG,

September 26th(Thur), 2019@Ibaraki University, Japan

Today's contents

1. Members of Galactic Astrometry sub-WG

2. Previous activity
   - KaVA QSO pair astrometry
   - KaVA maser (line) astrometry
   - KaVA Geodesy
   - Atmospheric calibrations

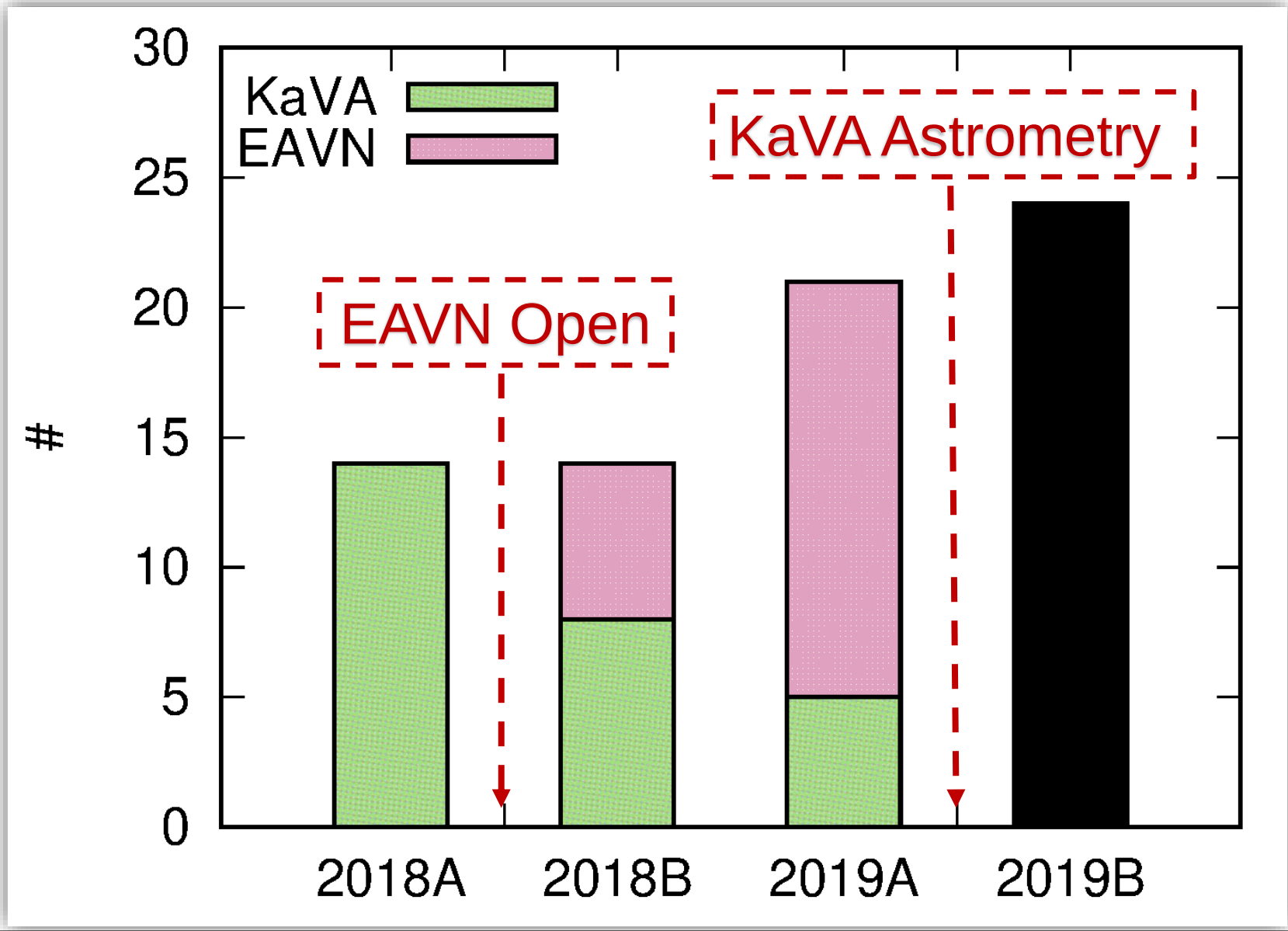
3. Future activity
   - EAVN QSO pair astrometry
   - EAVN maser (line) astrometry
   - EAVN Geodesy
   - Possible Science cases/
     Large programs

Technical talk

→ Science talk

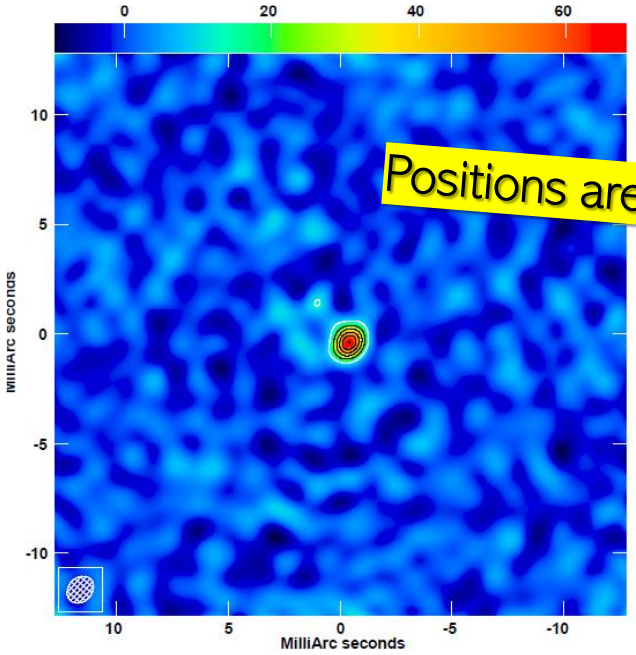
Core and New (?) members

Number of proposals for EAVN/KaVA



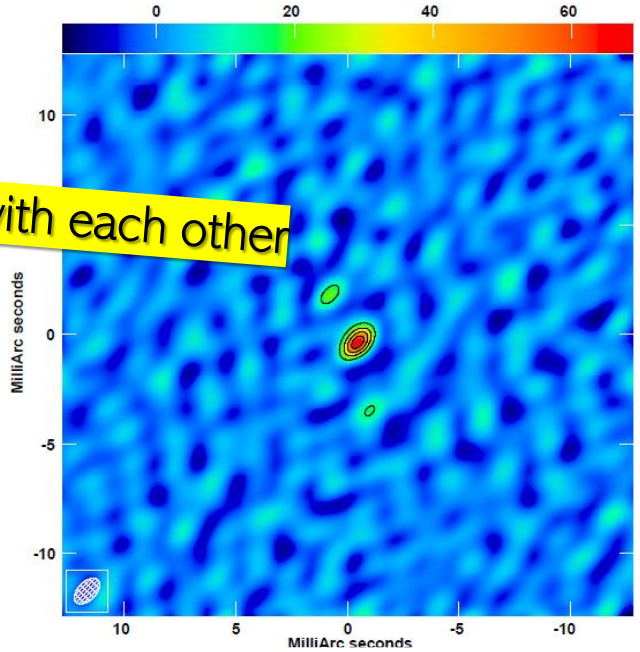
KaVA Phase-Referencing Open

Phase-referencing with **KaVA**



Target: 0556+238 with SN = 24
PR: 0601+245

Phase-referencing with **VERA**



Target: 0556+238 with SN = 19
PR: 0601+245

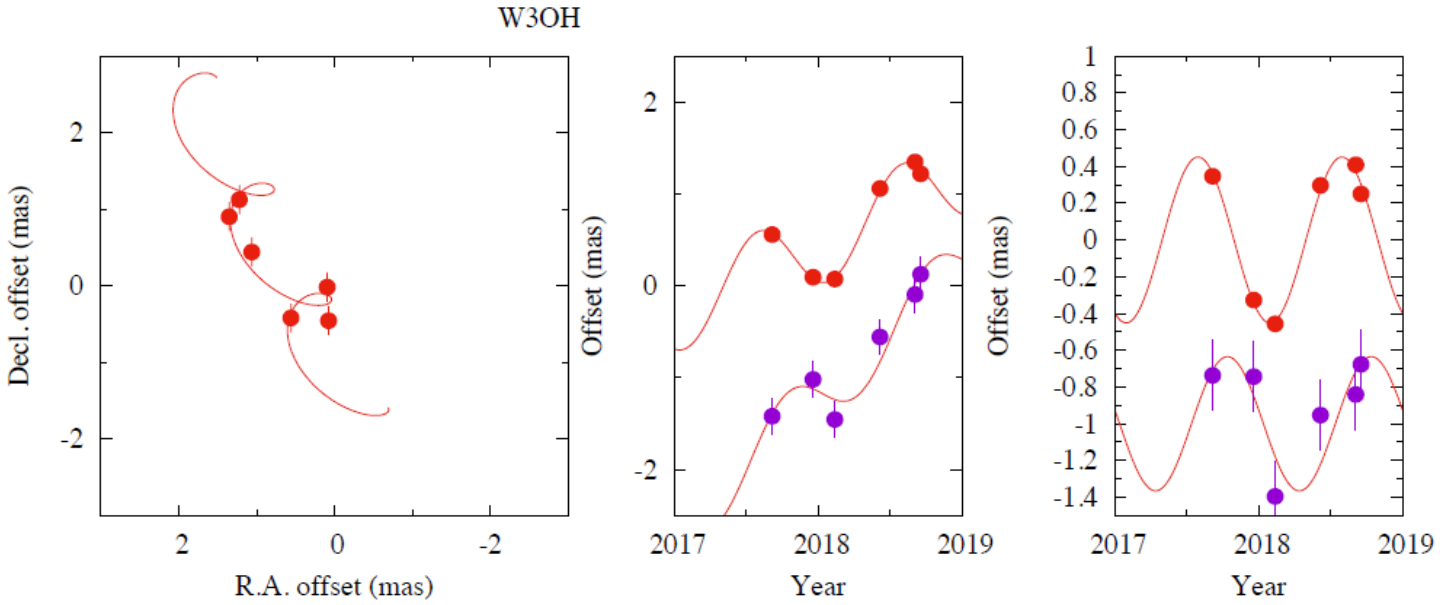
Positions are consistent with each other

Open from 2019A
Lead Analyzer: Shuangjing

Ref: KaVA Status report

KaVA Astrometry (Parallax) Open

Parallax fitting with latest KVN position (June 2019)



Parallax = 0.476±0.024 mas

$(\delta \mathrm{RA}, \delta \mathrm{Dec}) = (0.037, 0.19)$ mas

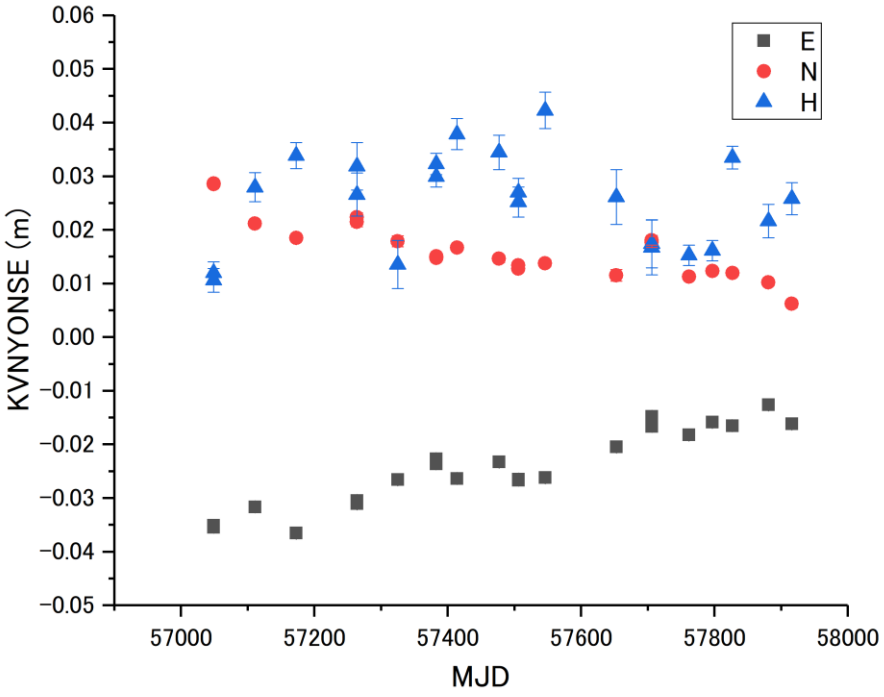
VLBA parallax = 0.489±0.017 mas (Hachisuka+09)

Open from 2019B, Lead Analyzer: D. Sakai

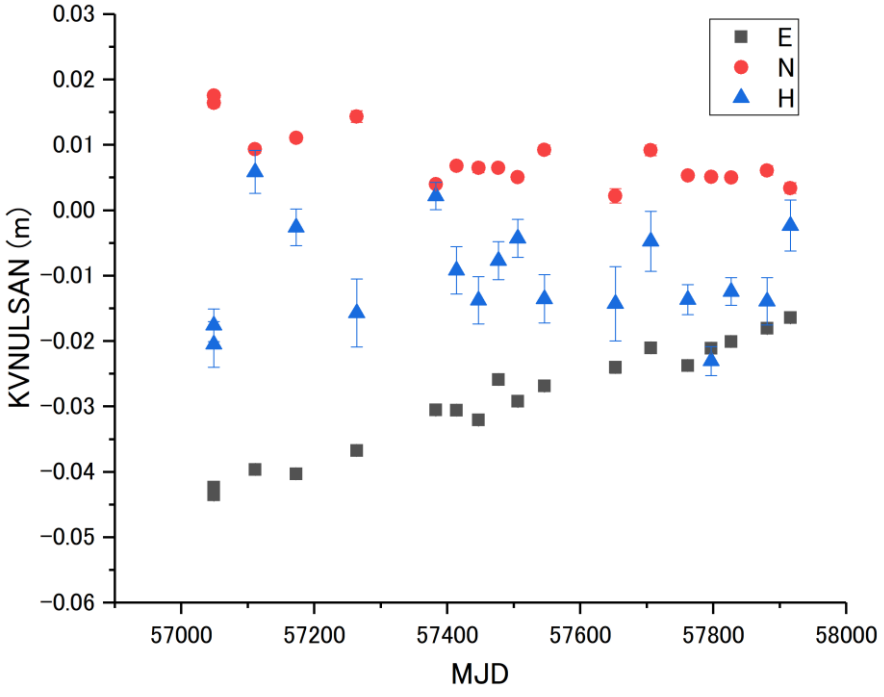
Made by D. Sakai

KaVA Geodesy: 2015 Jan～2018 June

KVN Yonsei



KVN Ulsan



Roughly linear motions

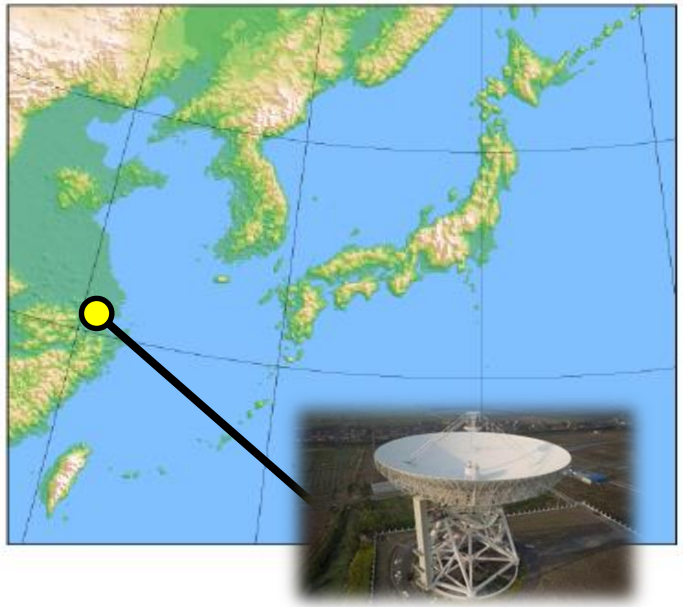
mm-level accuracy

Estimated by T. Jike-san

Water Vapor Radiometer

The WVR on the VERA 20m

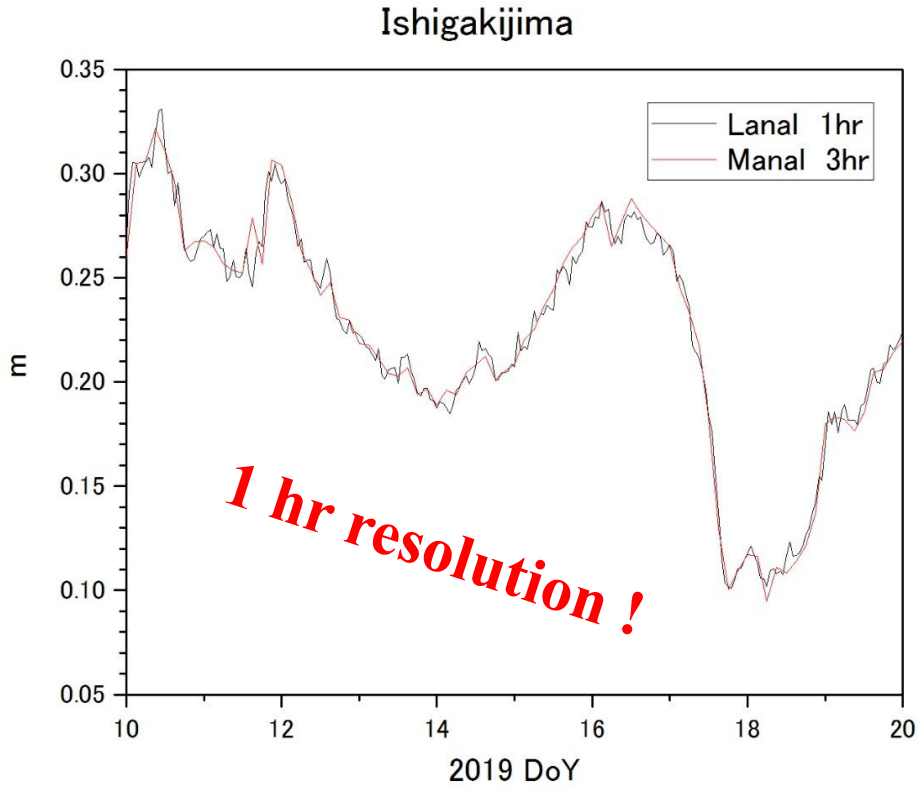
Japan Meteorological Agency data



Tianma 65m

Figure 2.7.1: domains of LA and LFM. (Local Forecast Model)

OUTLINE OF THE OPERATIONAL NUMERICAL WEATHER PREDICTION AT THE JAPAN METEOROLOGICAL AGENCY (March 2019)



Tropospheric zenith delay of Ishigaki-jima station, estimated with JMA data.

Estimated by Y. Tamura-san

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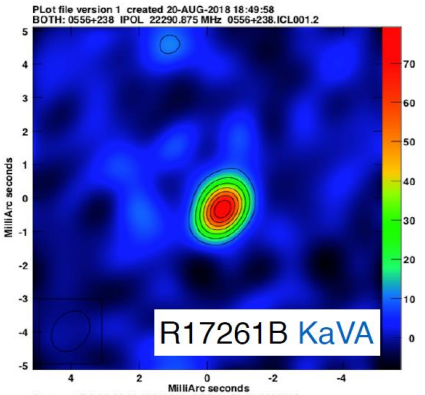
     Large programs

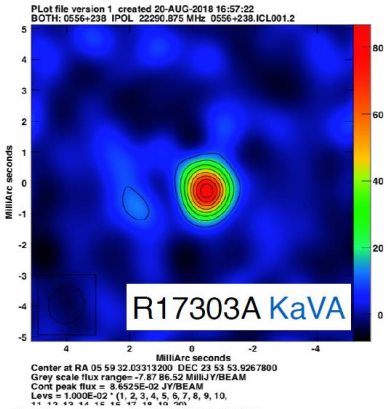
Technical talk

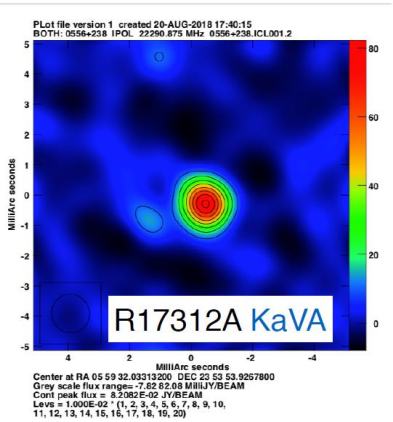
Science talk

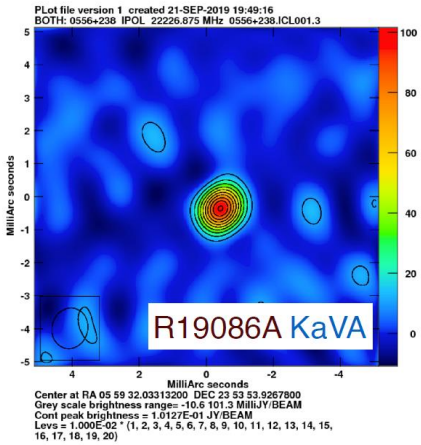
EAVN QSO pair astrometry

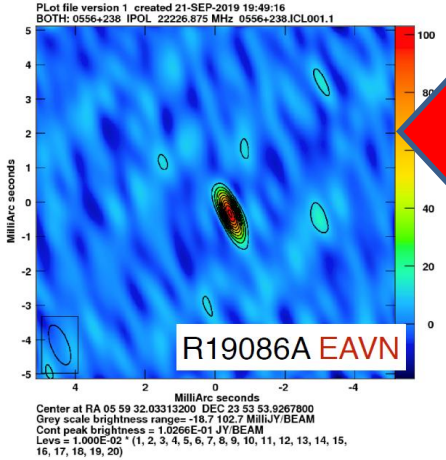
preliminary image results











EAVN

phase-referenced image

Ref. 0601+245

Target 0556+238

Open from 2020B (planned)

Lead Analyzer: Shuangjing

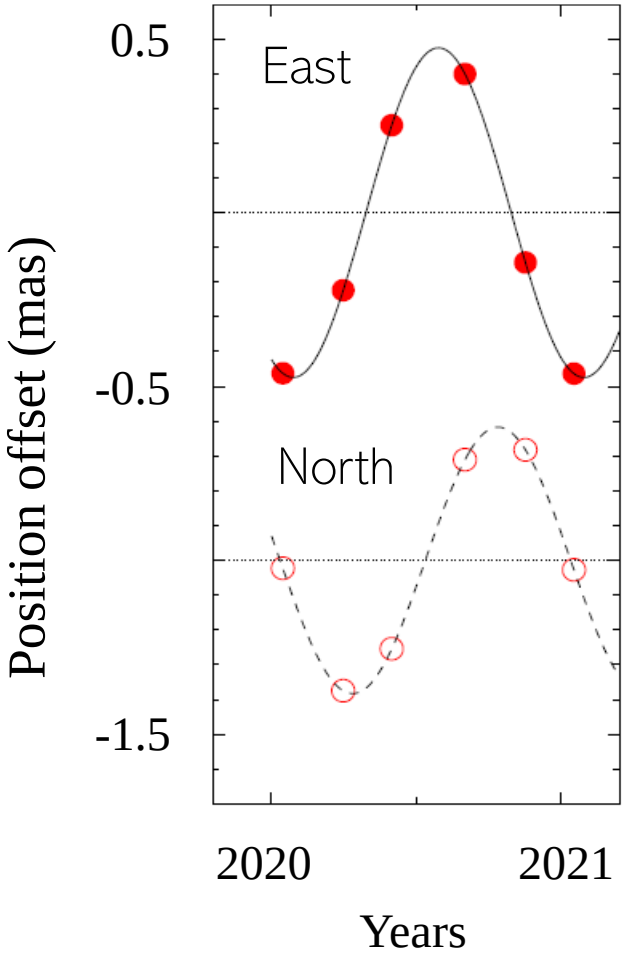
Given by Shuangjing Xu

EAVN maser astrometry

Requested observation dates
(within +/- 2 weeks):

① Mid of Jan, 2020
② End of Mar
③ End of May
④ End of Aug
⑤ Mid of Nov
⑥ Mid of Jan, 2021

#Bold indicates a date close to parallax maximum in right ascension.



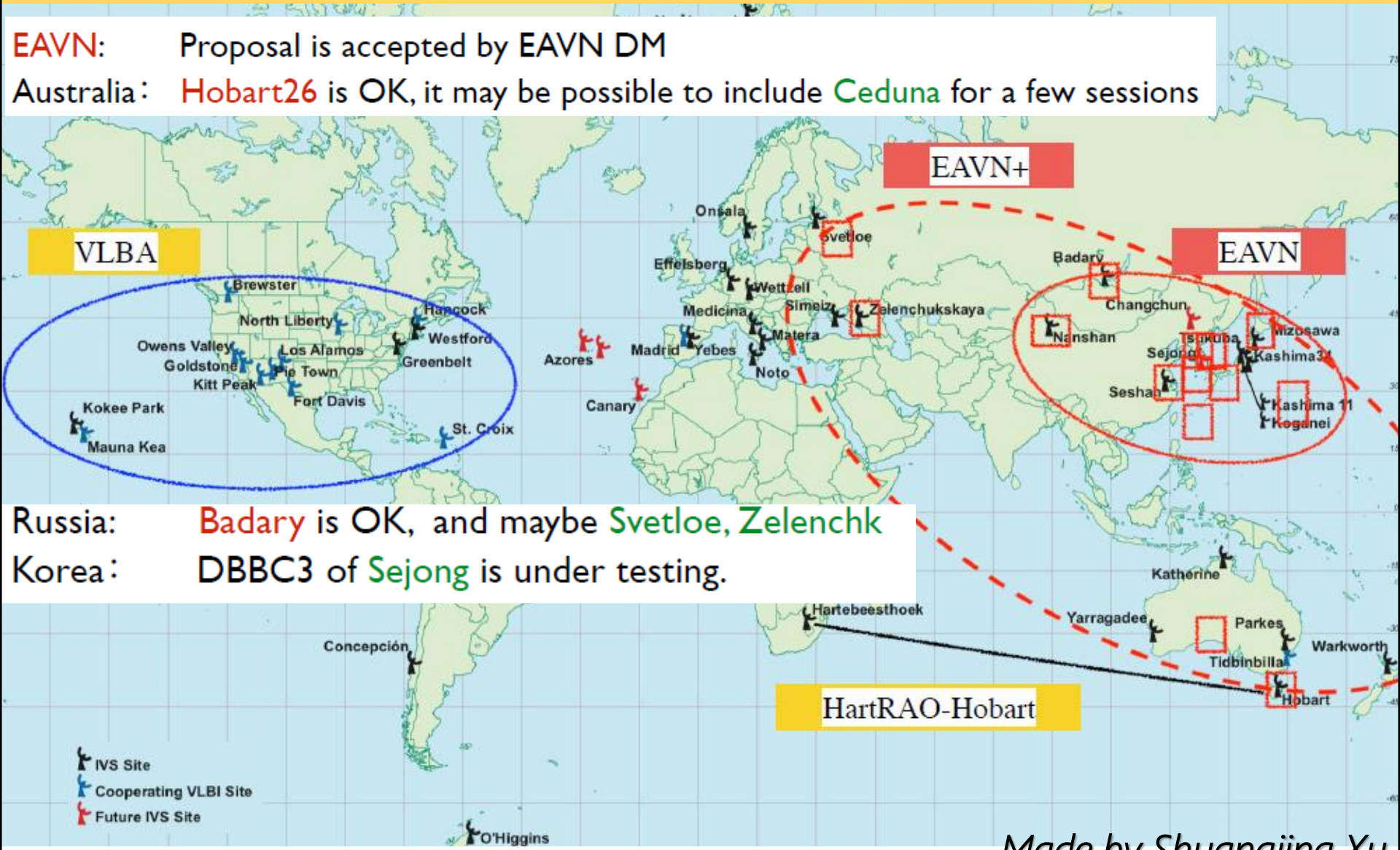
Open from 2021B (planned)
Lead Analyzer: D. Sakai

Parallax phase for W3OH.
Red circle = offset in R.A. (mas),
Green 〃 = 〃 Decl (mas).

EAVN geodesy

EAVN: Proposal is accepted by EAVN DM

Australia: Hobart26 is OK, it may be possible to include Ceduna for a few sessions

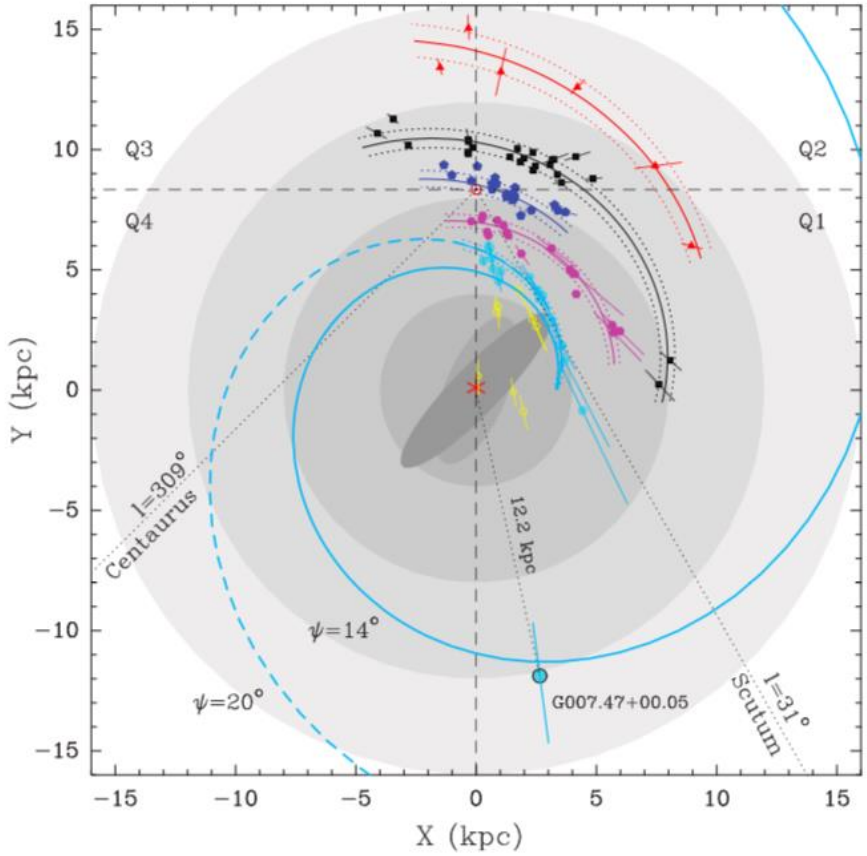


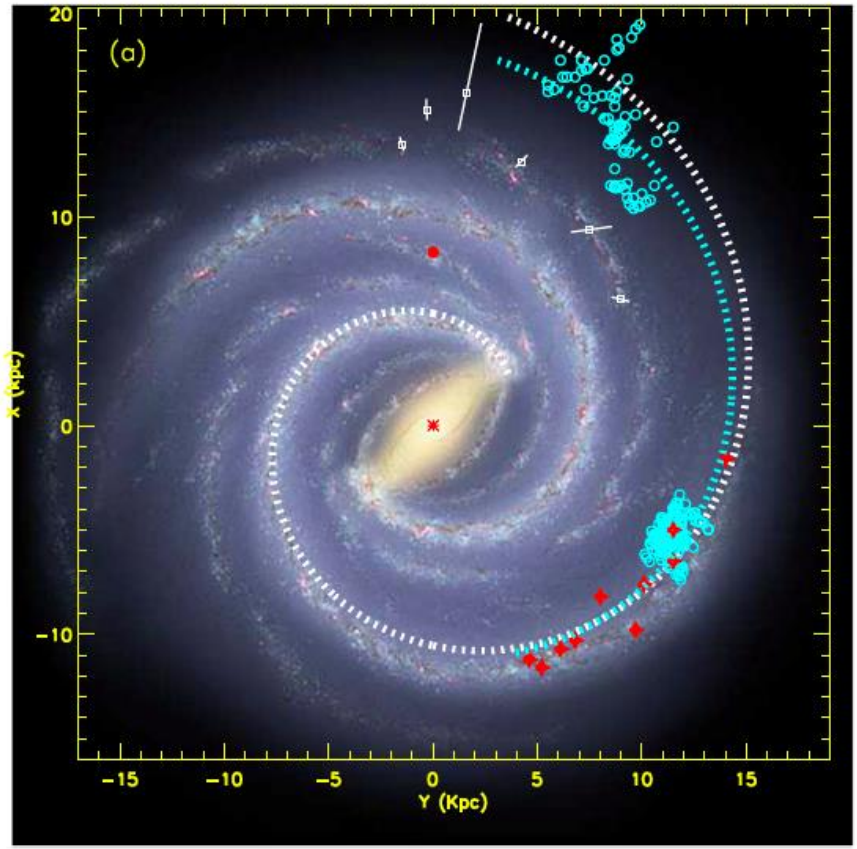
Russia: Badary is OK, and maybe Svetloe, Zelenchk

Korea: DBBC3 of Sejong is under testing.

Made by Shuangjing Xu

Possible EAVN large programs





Credit: Reid

Sun et al. 2017

Made by Bo Zhang

Possible EAVN large programs

VLBI projects

- VLBA:

  Yang et al. 2017A.

  G040.28+1.14 (<0.5Jy, failed)

- EAVN:

  Sakai et al. 2019B. G034.84+00.94

  GA sub-WG

  (> 25 Jy, approved)

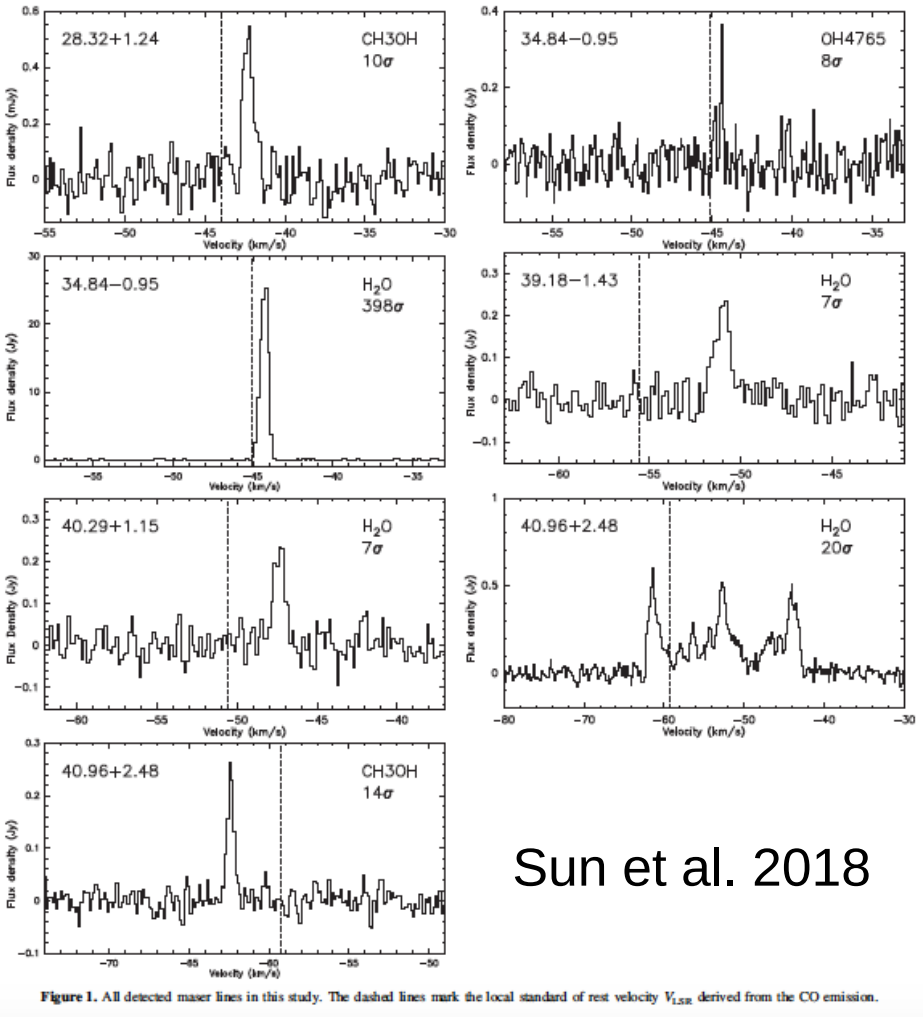
- VLBA:

  Bian et al. 2020A. G034.84+00.94

  (> 25 Jy, under review)

Another possible candidate:

G040.96+2.48 H2O: ~1 Jy @ 22 GHz



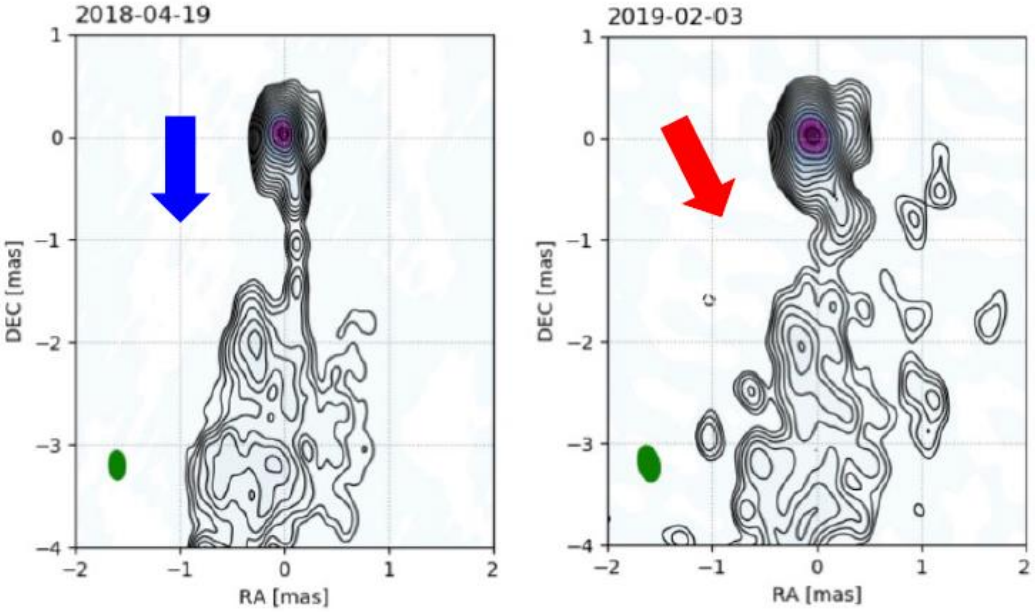
Sun et al. 2018

Figure 1. All detected maser lines in this study. The dashed lines mark the local standard of rest velocity V_{LSR} derived from the CO emission.

Made by Bo Zhang

EAVN astrometric science ①

Jet swinging in 3C84



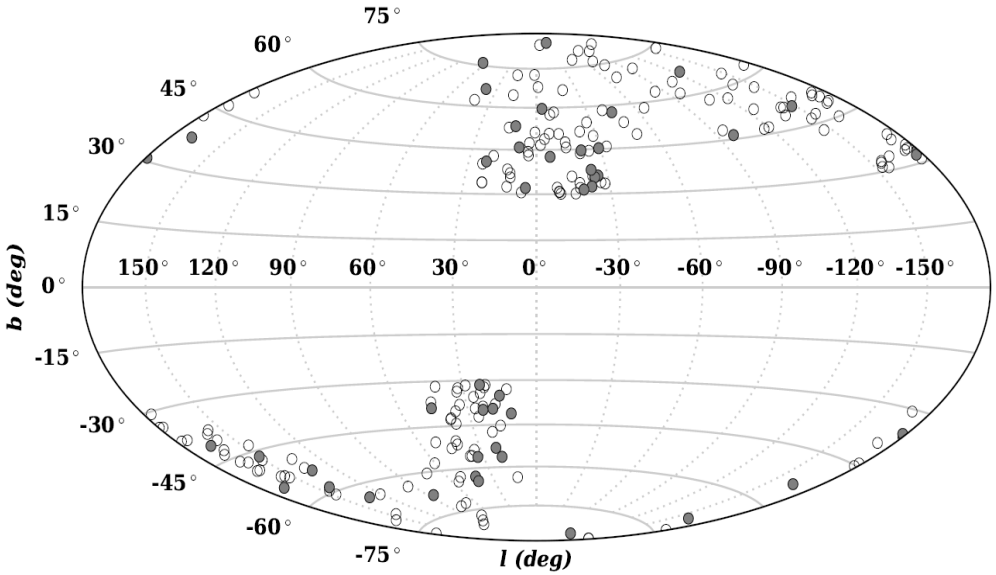
- VLBA 43 GHz, BU blazar group

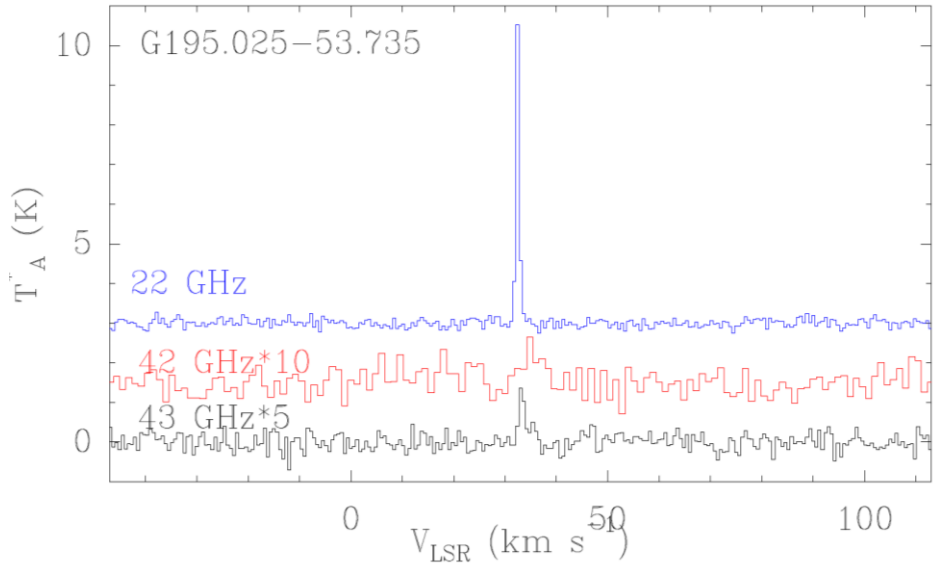
- Radical/abrupt change of jet direction (~14° / year)
- Heading to "C2" region
- No significant flux / polarization change
- Proposed astrometric observation with KaVA at 22 and 43 GHz

Accepted by 2019B
1st observation is on Sep 26th !

Given by Junghwan Oh

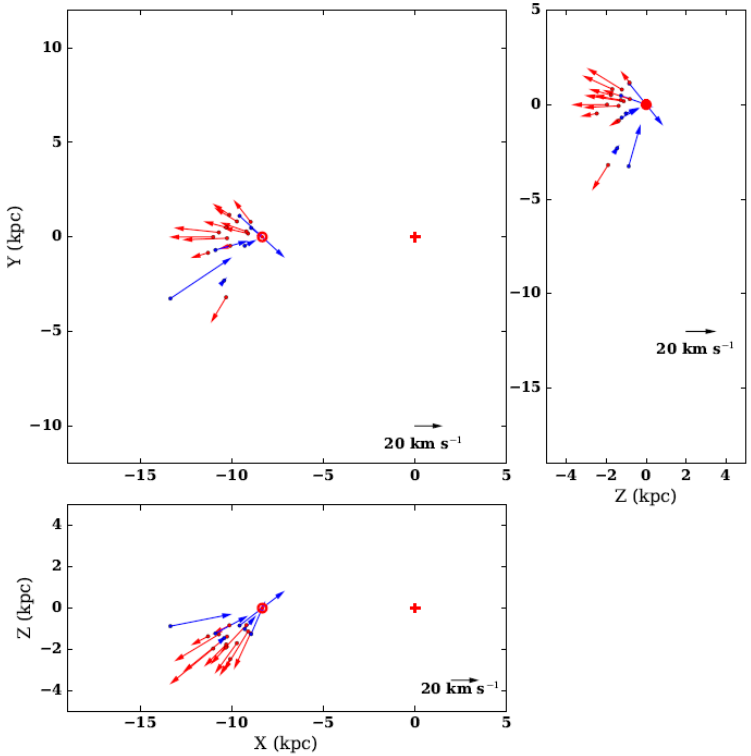
EAVN astrometric science ②





SiO maser survey towards Halo AGBs that may trace **Sgr. Stellar Stream**

Wu, Matsunaga, Burns & Zhang 2018



Given by Yuanwei Wu

EAVN astrometric science ③〜⑪

Oral presentation

Gaia vs. VLBI

Central Molecular Zone

Symbiotic star

Shuangjing	Xu	SHAO
Daisuke	Sakai	NAOJ
Haneul	Yang	SNU/KASI
Pengfei	Jiang	XAO

Binary star

Poster presentation

Geodesy (VGOS)

AGB study

Galactic structure

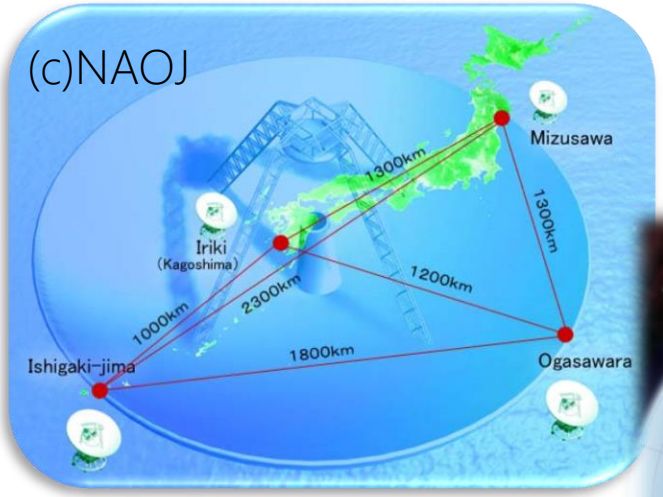
Ionospheric calibration

P4	Hui	Zhang	SHAO
P24	Se-Hyung	Cho	KASI
P25	Nobuyuki	Sakai	KASI
P26	Bo	Zhang	SHAO
P27	Jeong-Sook	Kim	KASI

MicroQSO

VERA→KaVA→EAVN astrometry

VERA (Open from 2004)

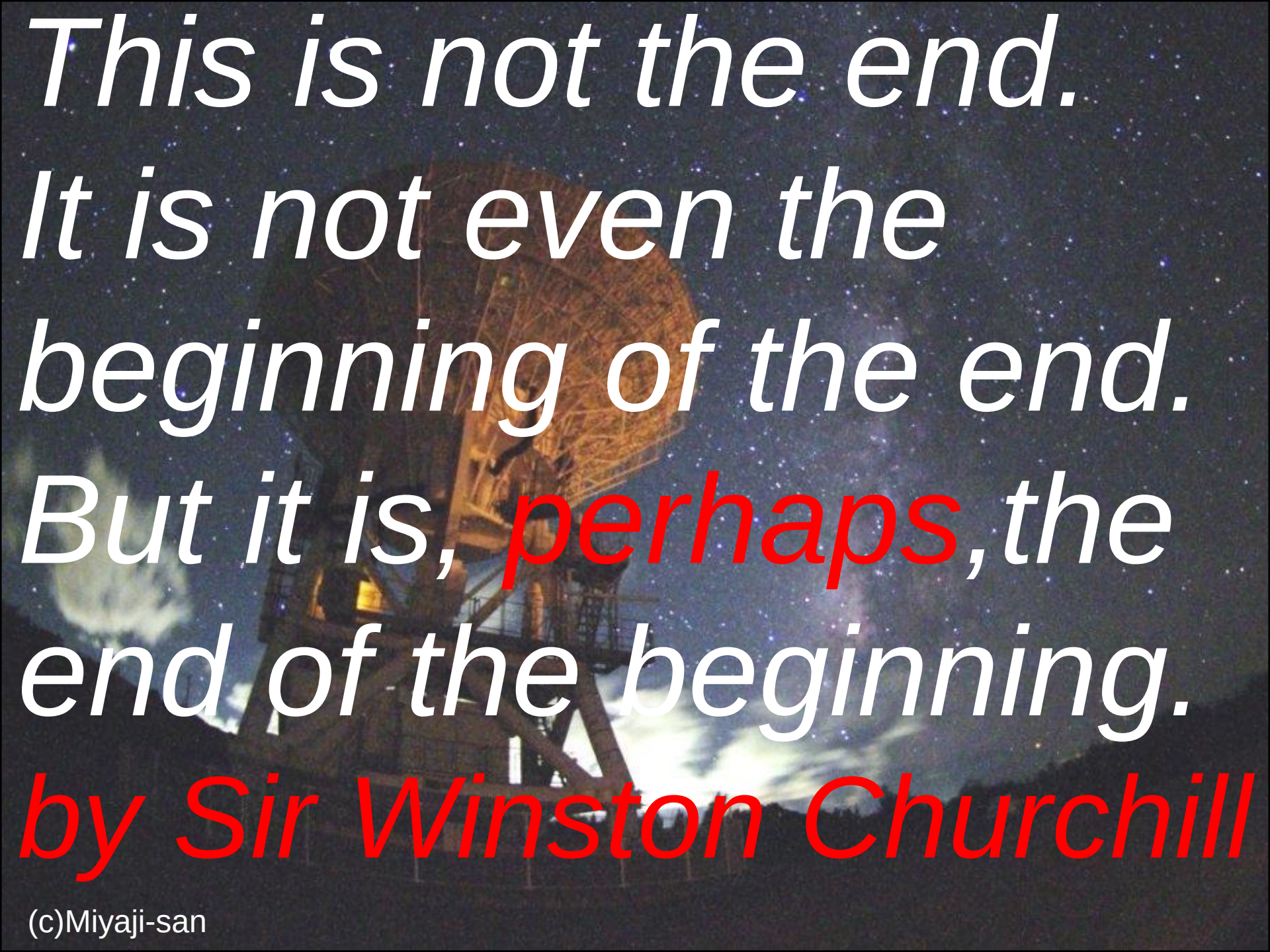


KaVA (2019B~)

~x2 Sensitivity
Short baselines
(< 500 km)

EAVN (2021B?)

~x5 Sensitivity
~x2 Parallax accuracy


This is not the end.
It is not even the
beginning of the end.
But it is, perhaps,the
end of the beginning.
by Sir Winston Churchill
(c)Miyaji-san