

VERA project observations: status and future

Mareki Homa

Mizusawa VLBI Observatory



Overview of science outputs

2007	Initial results (Orion-KL, S269)
2008	PASJ special issue (1)
2009	
2010	
2011	PASJ special issue (2)
2012	First galactic structure paper
2013	
2014	PASJ special issue (3-a), First KaVA results
2015	PASJ special issue (3-b) First discussion on asymmetry by arm

Project observations

- ~2000 hour per year
- ~40 sources / year
- more than 200 sources have been observed for more than 8 epochs

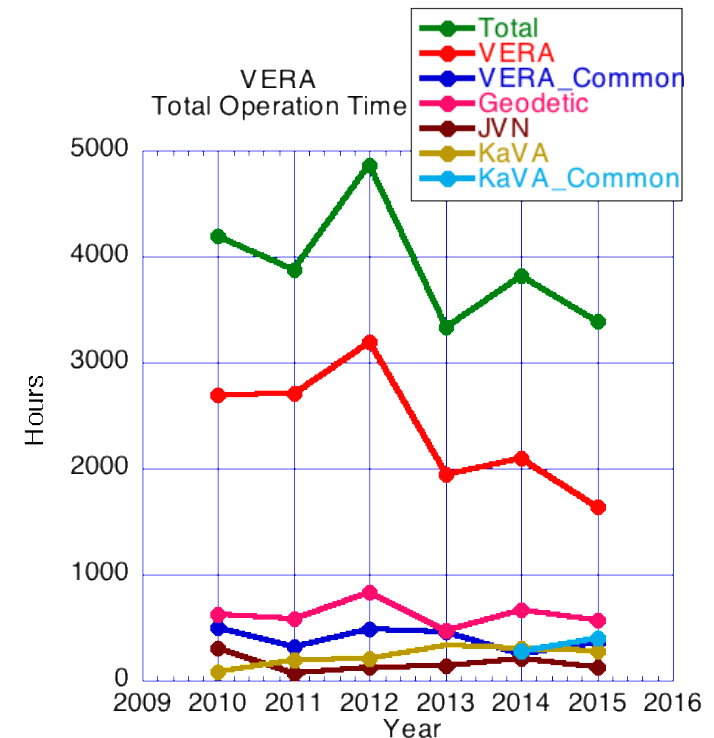
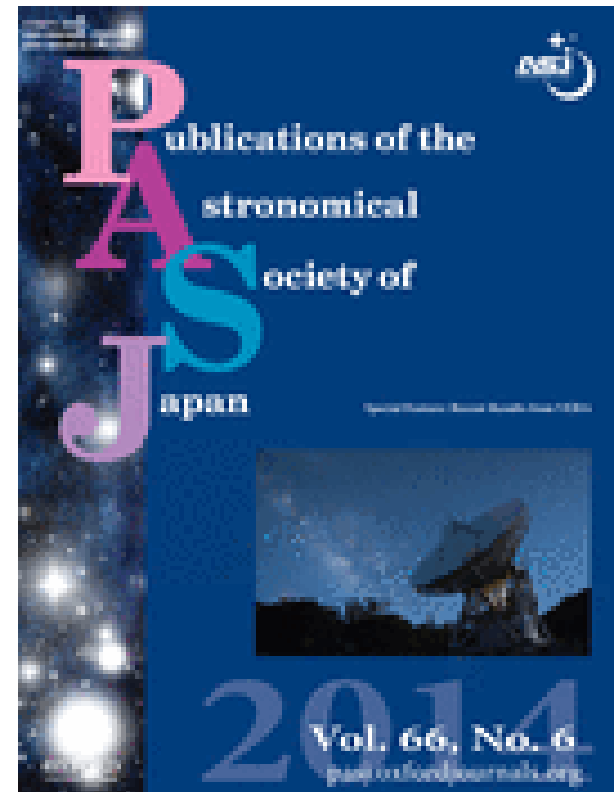


Fig. 1. VERA operation time for the categories of observations from the last September to August of each year except 2015 (from September to June).

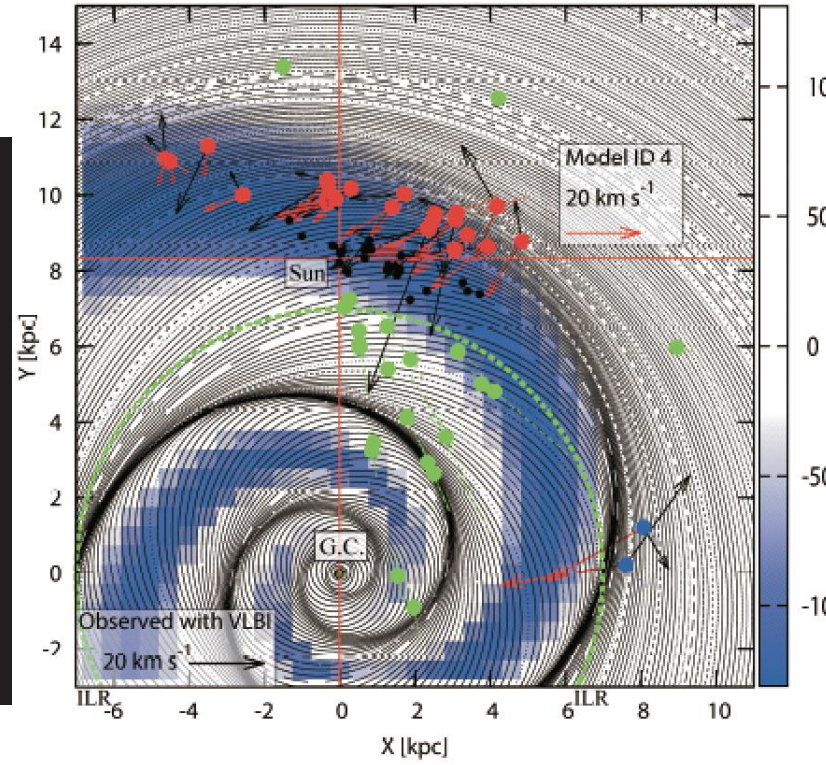
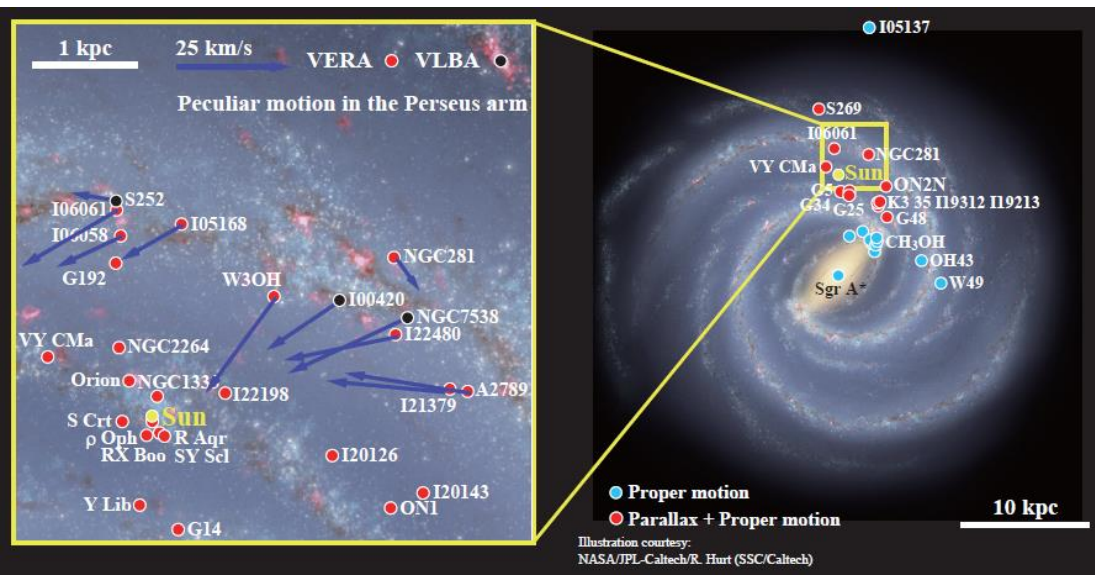
Recent results

- 3rd PASJ special issue (2014/15)
- 7 papers in 2014 Dec
- 6 papers in 2015 Aug
- Including astrometry, Galaxy dynamics etc. (+AGN, KaVA...)



Sakai et al.(2015)

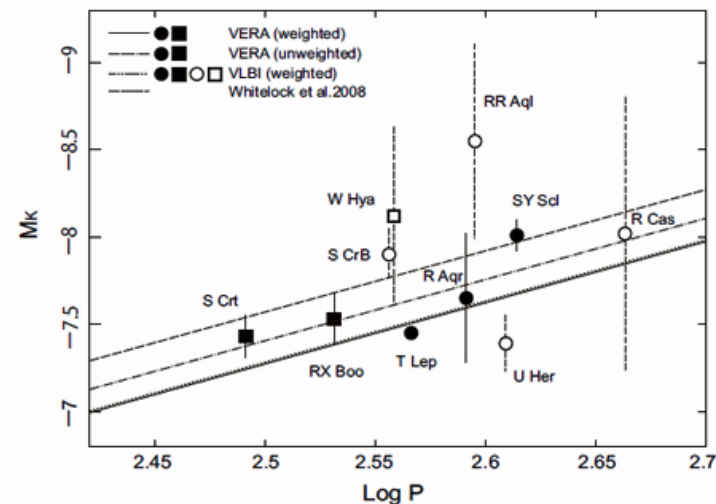
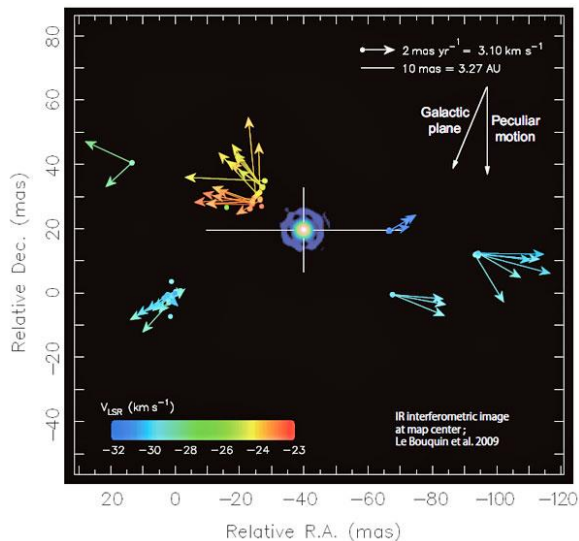
- Systematic deviation from circular rotation seen
- Lag behind the rotation + inward motion



Comparison with theories will discriminate if the spiral arms are density wave or material wave (e.g., Sakai et al. 2015)

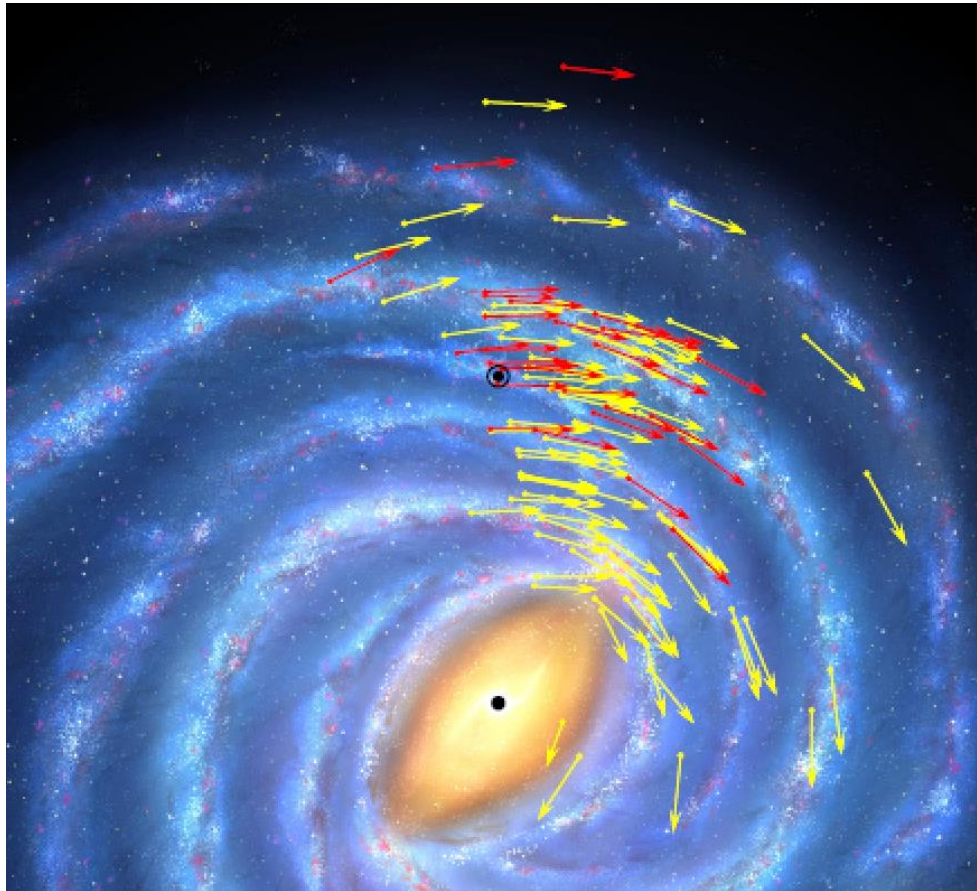
Nakagawa et al. (2014)

- **VLBI astrometry of AGB variables with VERA: A Mira-type variable T Lepus; Nakagawa, A., et al. 2014, PAJS, 66, 101**
- Accuracy calibration of AGB distance and PL.



Galaxy Astrometry Status as of 2015

VERA/VLBA/EVN (114 SFR masers)



Corrections in the text: 32 VERA sources in the above plot.

Other than that, 8 Miras published, 10 new parallax are in prep. (totally 50 parallaxes)

Science operation plan

- Requirements for the VERA operation until 2022

Operation Requirements	
Target accuracy	10% parallax error, 10 μ as at best
Number of target sources in total	~300
Number of sources to be observed	~200 (assuming failure rate of 0.75)
Number of epochs per source	~10 epochs
Hours per epoch	~6 hr
Total hour required	~12000 hr
Necessary project time per year	~1800 hr/yr