Mira型変光星プロジェクト報告

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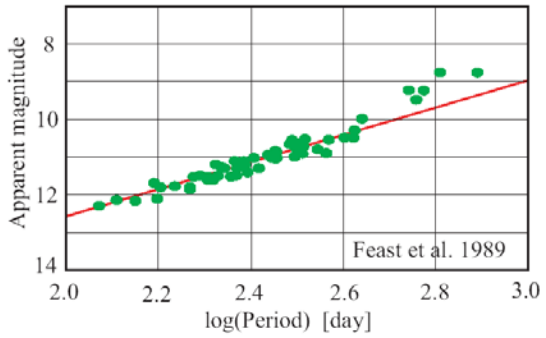
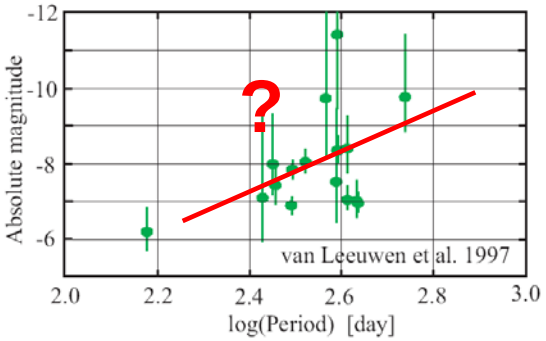
PLR of LMC Miras

- Based on apparent magnitudes



PLR of the Galactic Miras

- Absolute magnitude obtained with Hipparcos results
- Large errors of distances



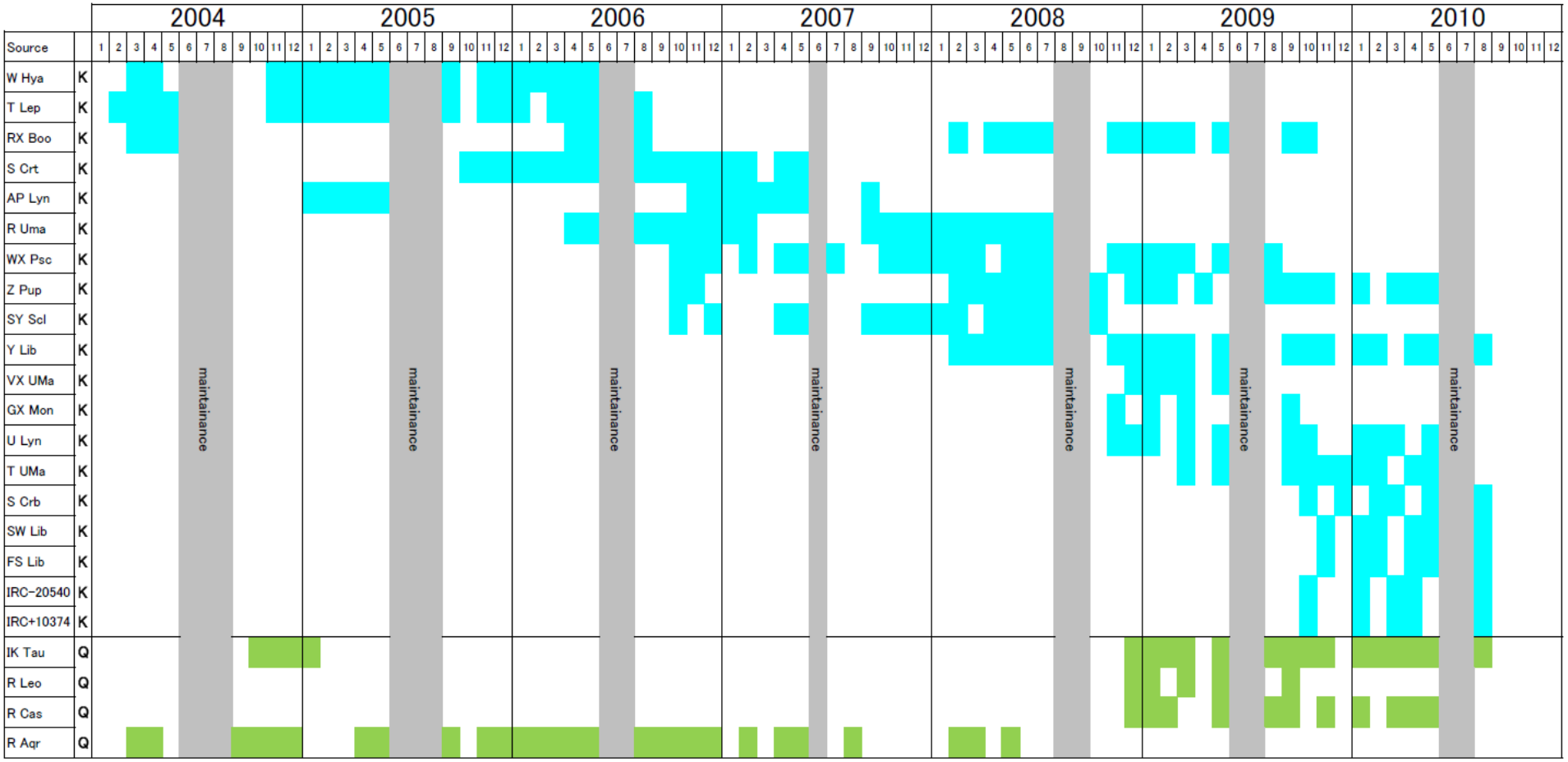
→ Mk determination : Distance obtained with VERA

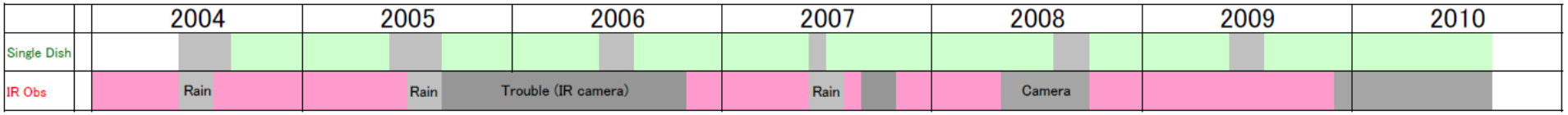
→ Calibration of a distance ladder

Obs. with VERA + IR

23 AGB Sources.

Blue : 22GHz
Green : 43GHz





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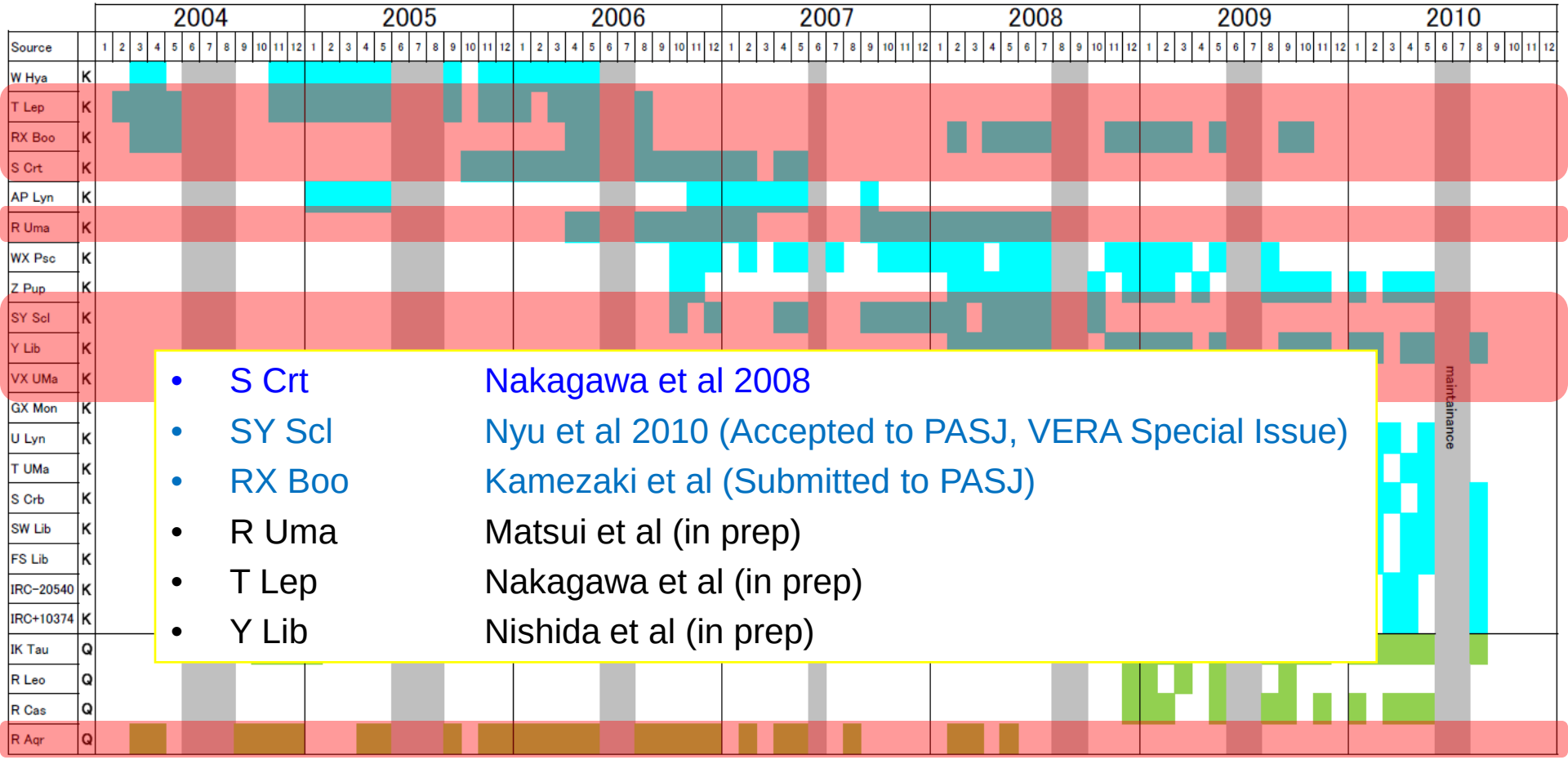
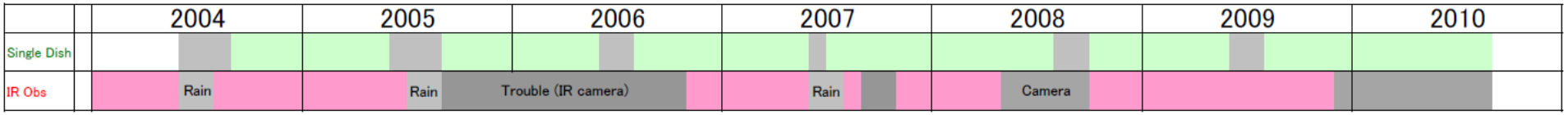


- S Crt — Nakagawa et al 2008
- SY Scl — Nyu et al 2010 (Accepted to PASJ, VERA Special Issue)
- RX Boo — Kamezaki et al (Submitted to PASJ)
- R Uma — Matsui et al (in prep)
- T Lep — Nakagawa et al (in prep)
- Y Lib — Nishida et al (in prep)

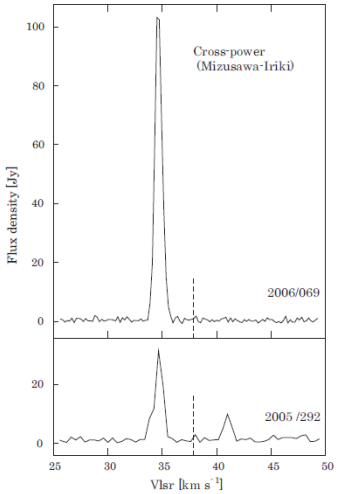


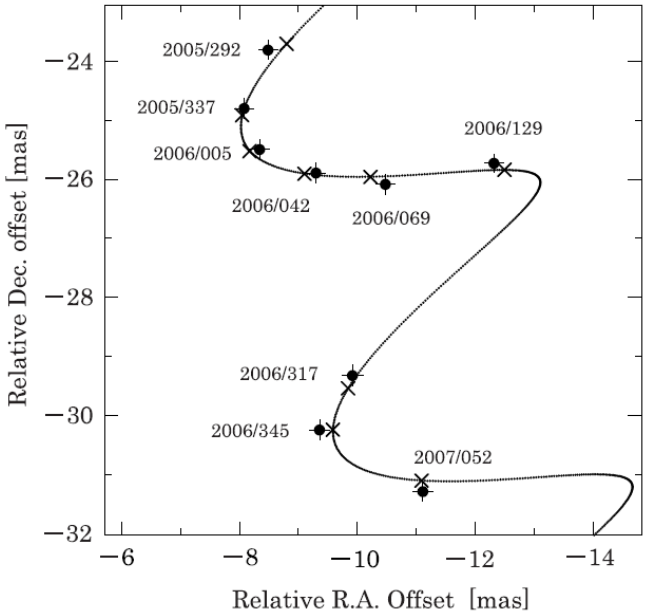
First Results; S Crt

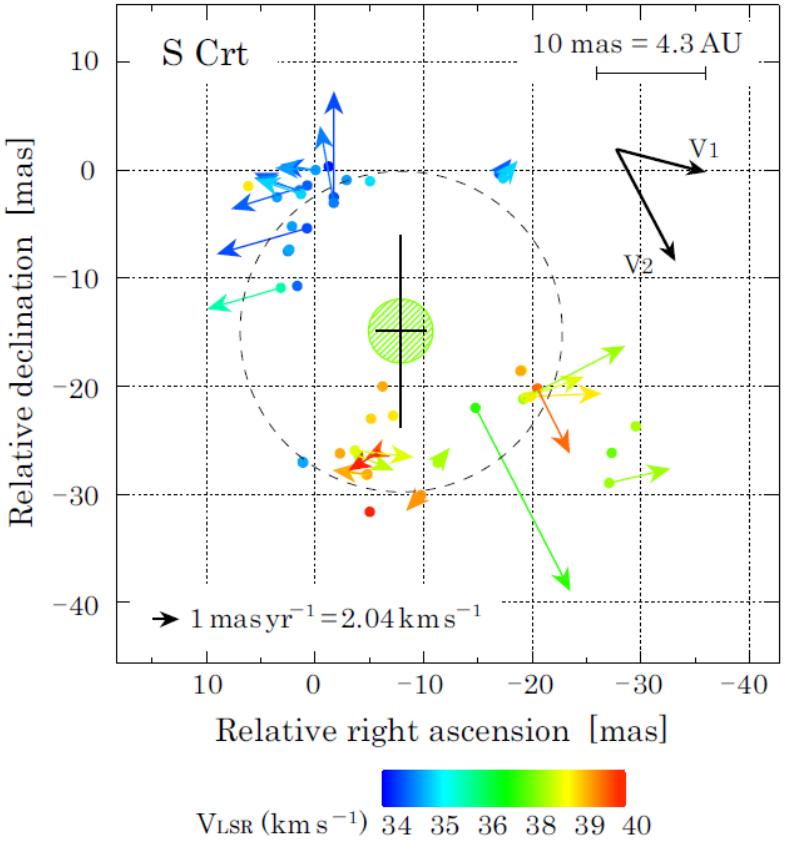
Nakagawa et al. 2008

- Bipolar Outflow
- Inclination angle of flow axis = 43°
- Photosphere 260±20R。
  ～Lower limit of Mira size
- Maser distribution 9～10AU

- Parallax
  2.33±0.13 mas
- Distance
  430+25-23pc





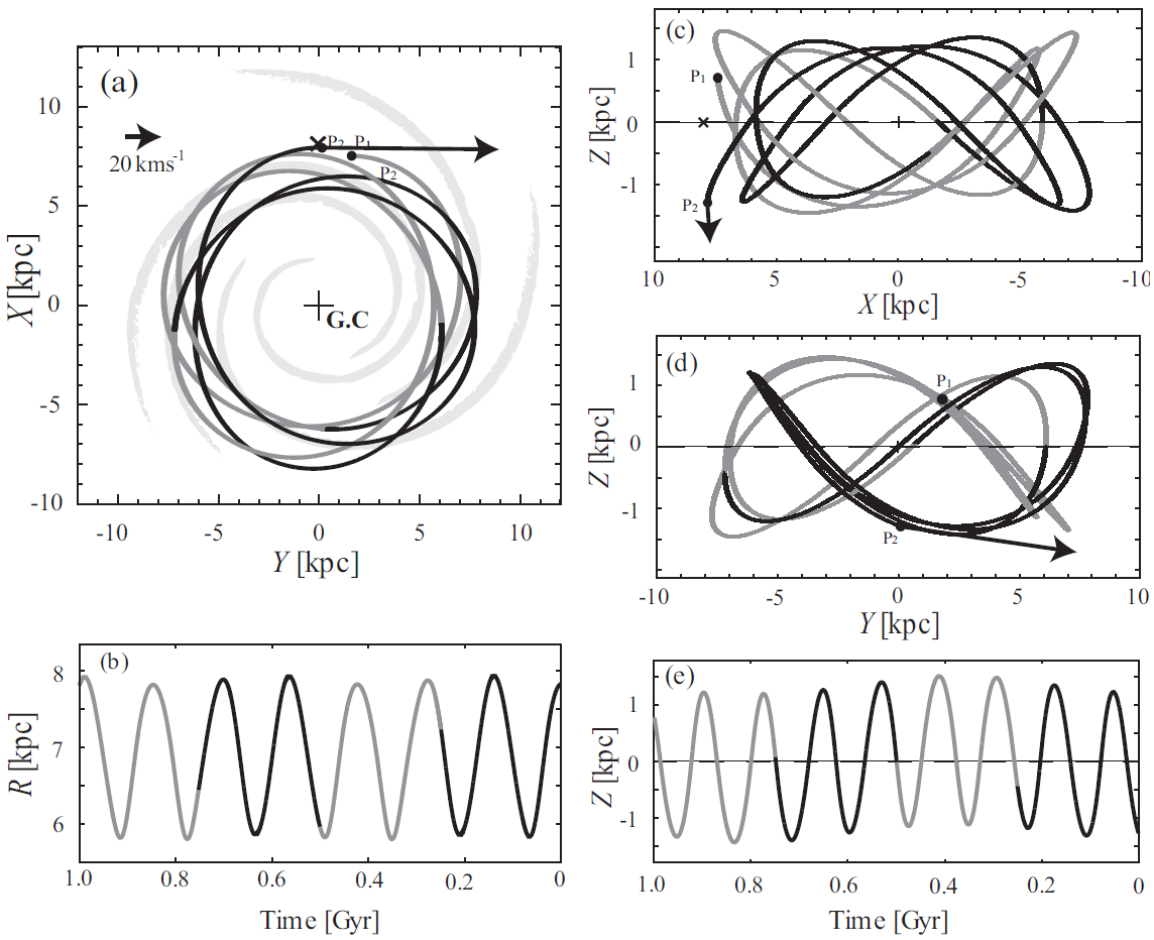


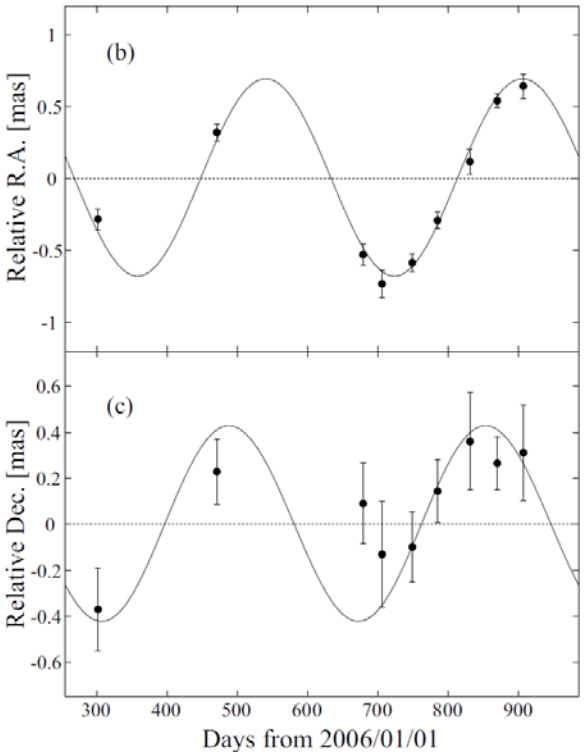
SY Scl

Nyu et al 2010 (VERA Special Issue)

>Rotation and oscillation of SY Scl in the Galaxy
>motion of circumstellar water masers

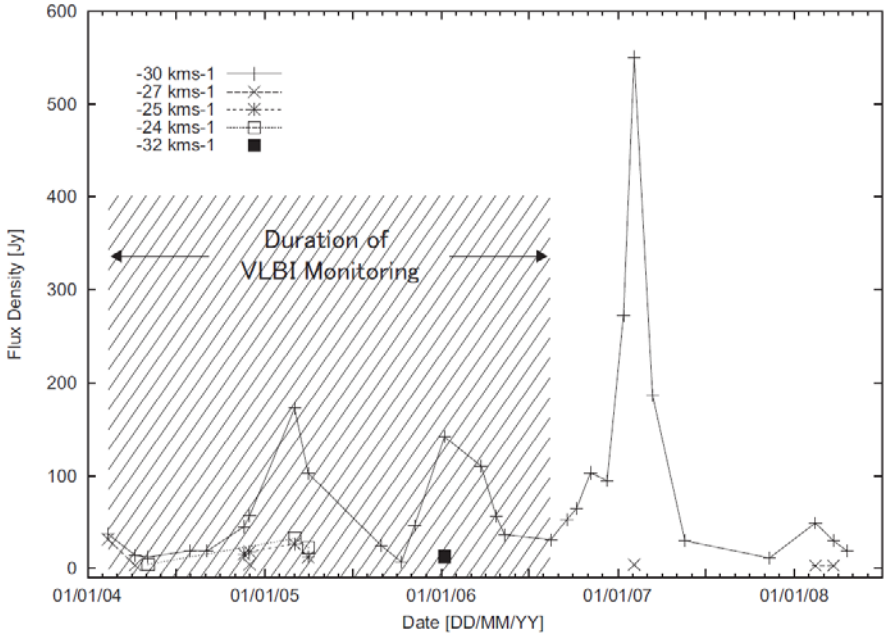
π = 0.76 ± 0.03 [mas]
D = 1.33±0.05 [kpc]

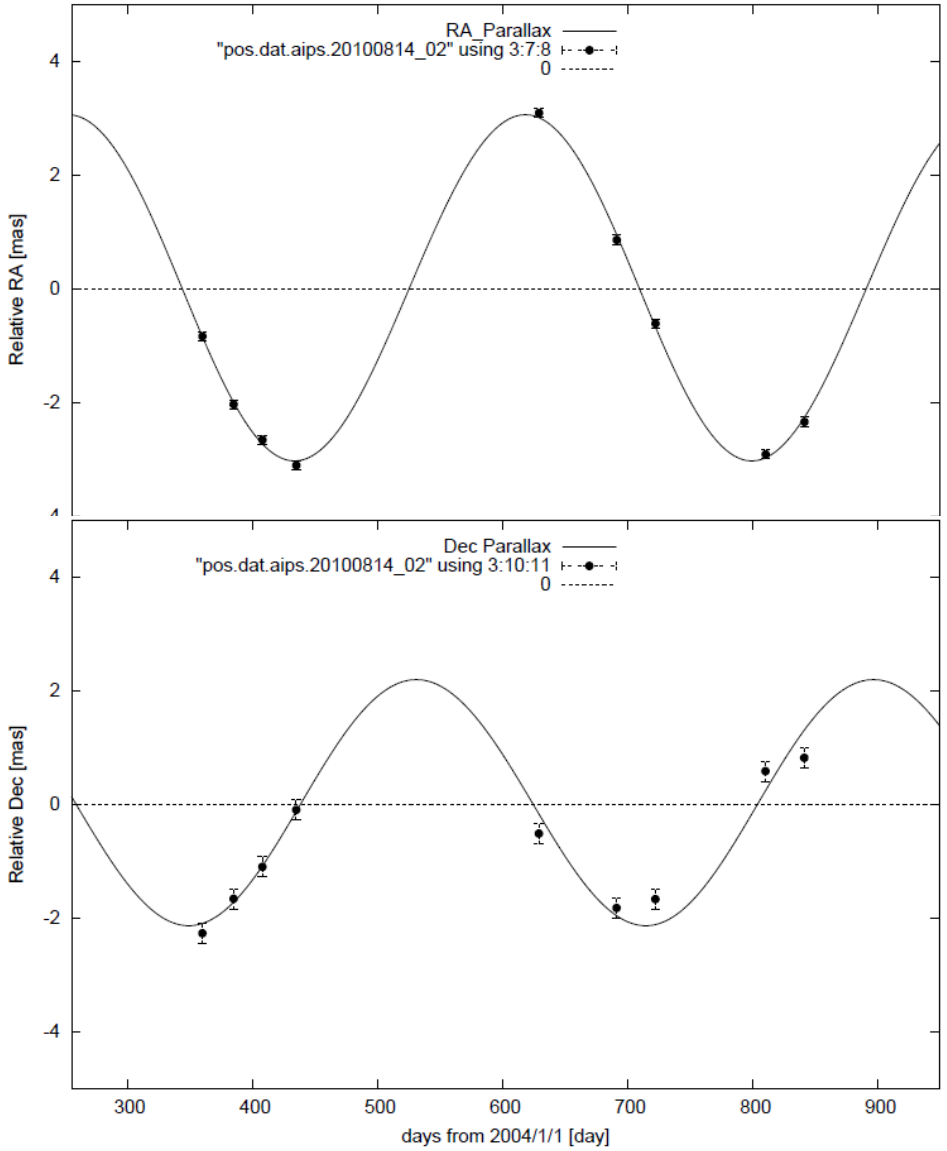




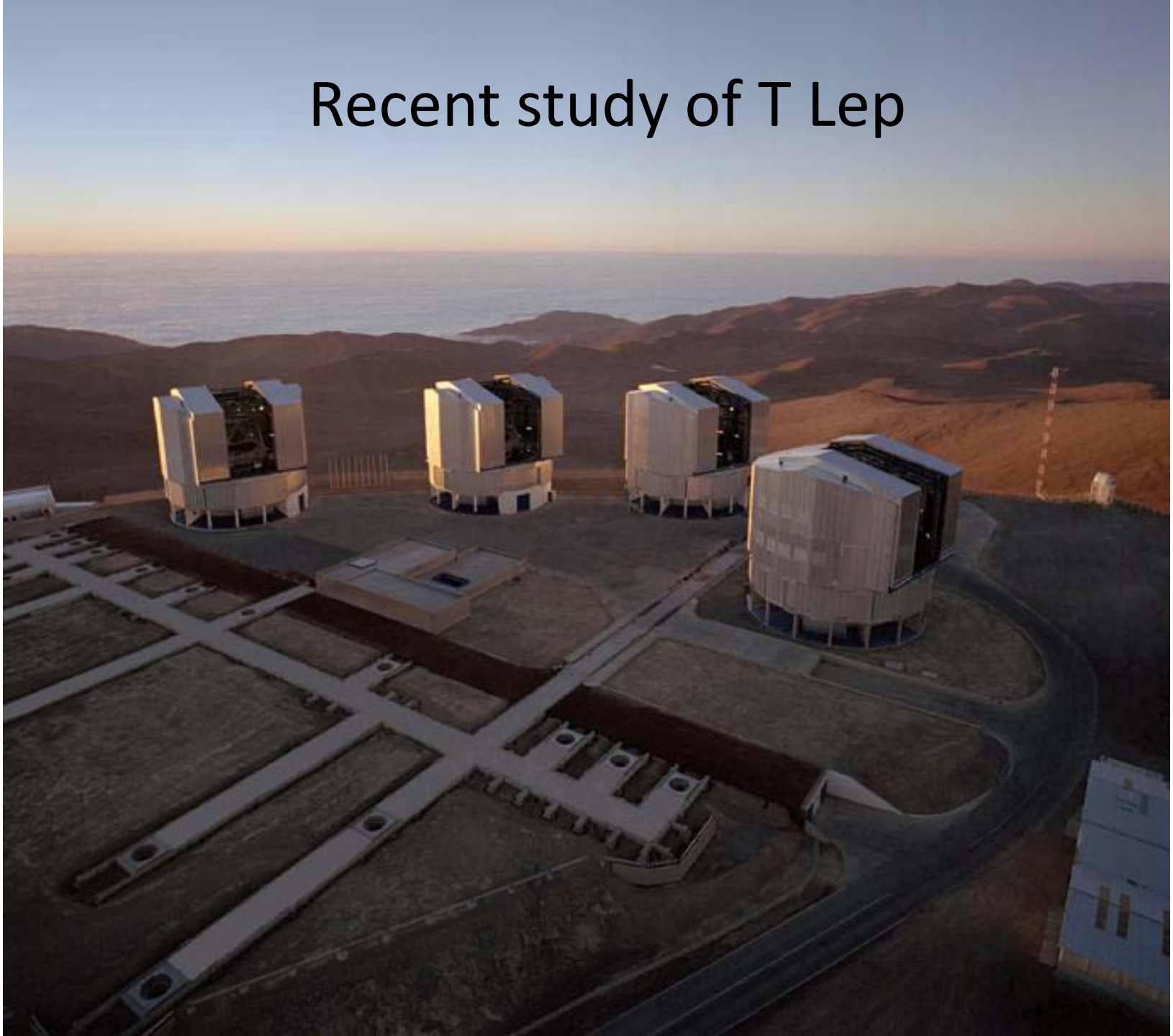
T Lep

- 約2年のVLBI観測
- 9観測で同一視線速度のメーザーを検出
- 年周視差　3.058±0.042　mas
- 距離　327.0±4.6　pc
- RA　　05h 04m 50.8436s
- DEC　−21d 54’ 16”.505





Recent study of T Lep



Recent study of T Lep

Pre-maximum spectro-imaging of the Mira star T Leporis with AMBER/VLTI⋆

J.-B. Le Bouquin[1], S. Lacour[2], S. Renard[2], E. Thiébaut[3], A. Merand[1], and T. Verhoelst[4]

A&A 496, L1–L4 (2009)
DOI: 10.1051/0004-6361/200811579

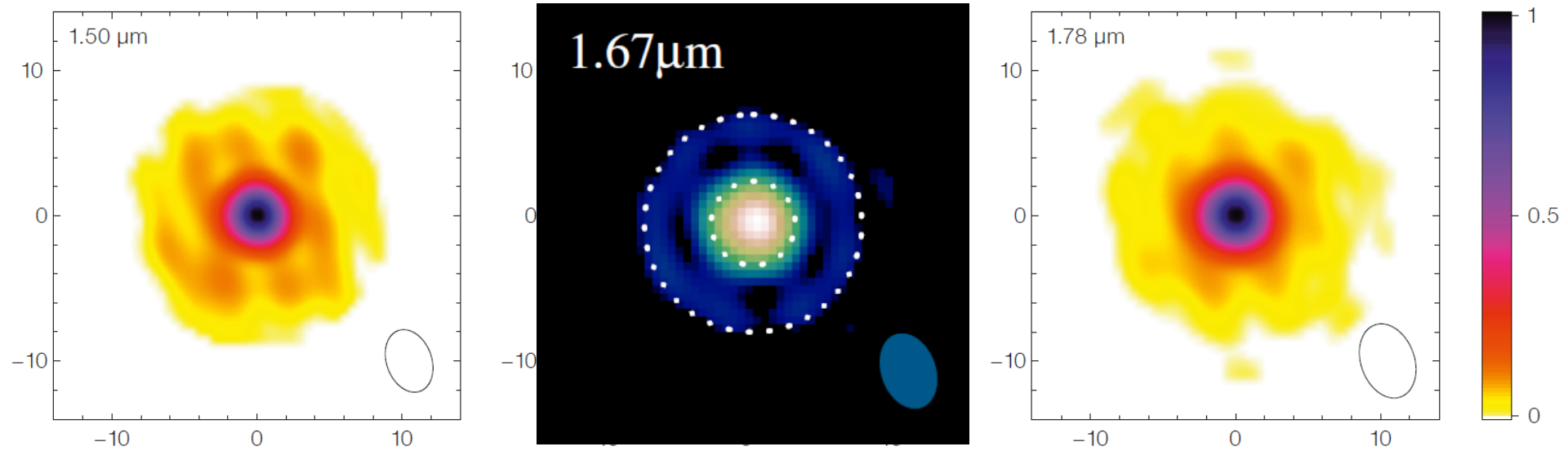
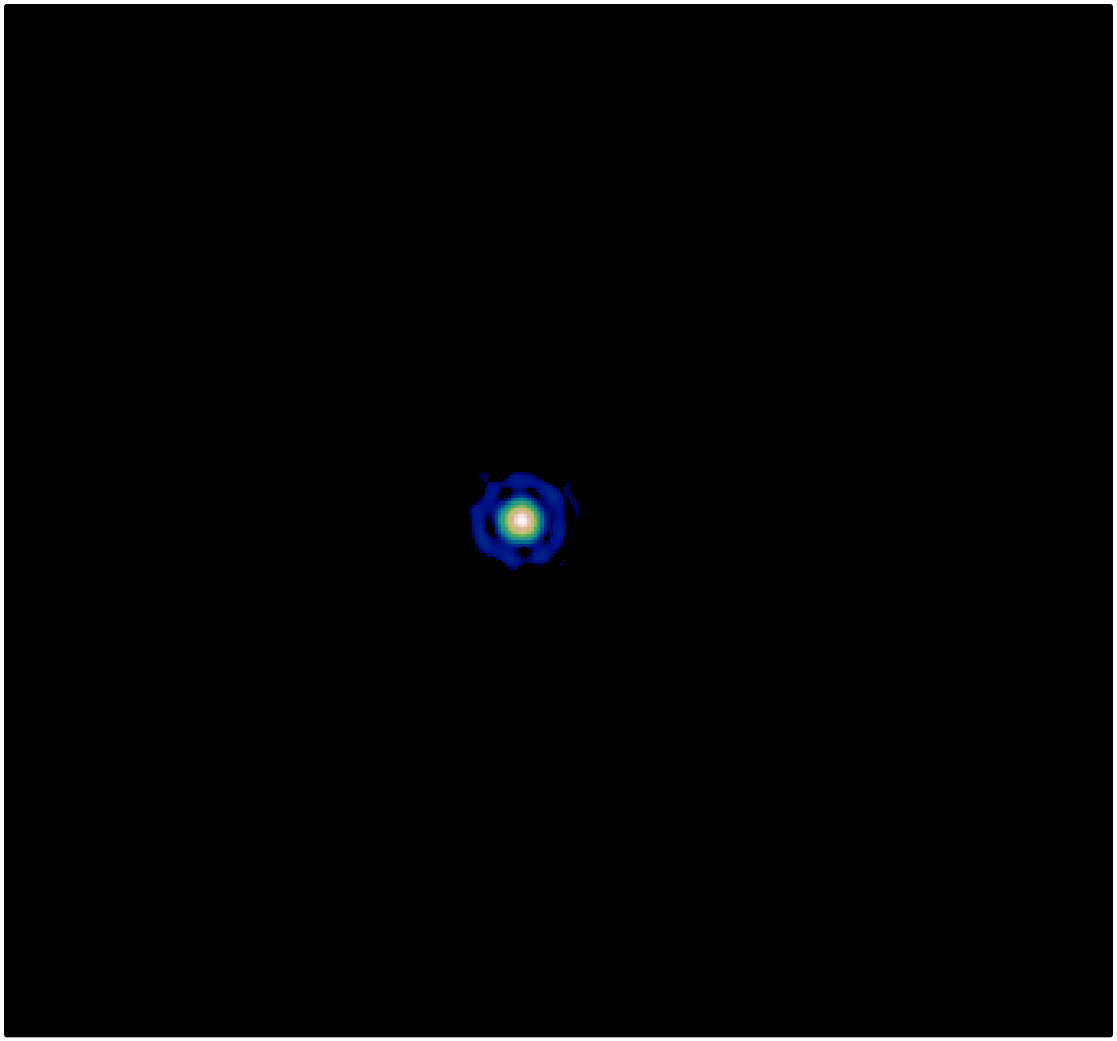


Fig. 4. Reconstructed images of T Lep with the `MIRA` software for several AMBER spectral bins across the H and K bands. The interferometric beam size is displayed in the bottom-right part of each image. Spatial scale is in mas. The white circles in the first column represent the average radius for the molecular layer ($\Phi_l \sim 15$ mas) and for the central star ($\Phi_l \sim 5.8$ mas), extracted from the modeling of Sect. 4. It corresponds to the respective diameters of 2.5 and 1 AU (assuming 5.95 ± 0.70 mas parallax from van Leeuwen 2007). The mean surface brightness ratio between the photosphere and the molecular environment is around 10%.

星周メーザーの運動

- VLTIによる1.76μm イメージとの重ね合わせ



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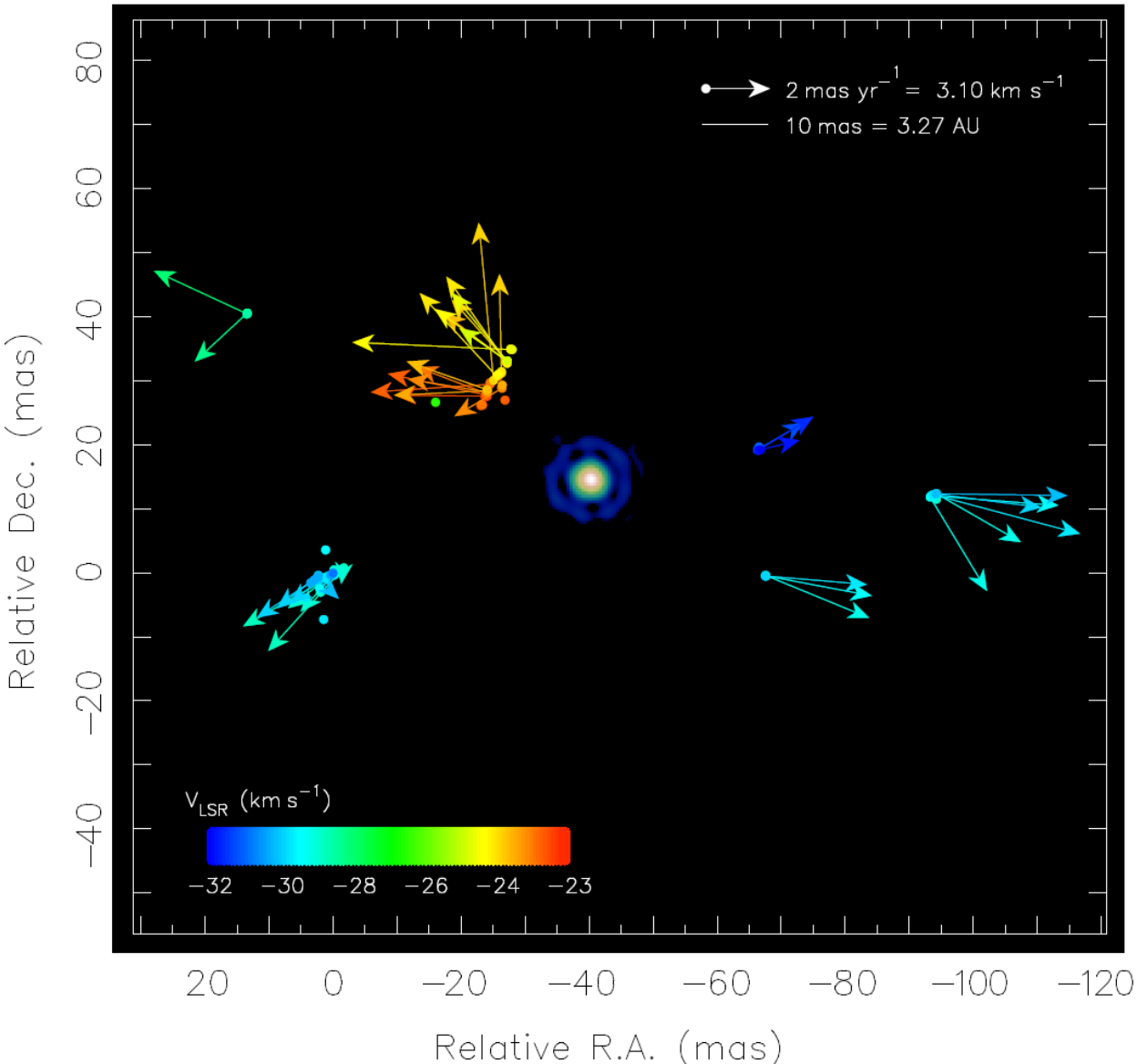


Le Bouquin et al. 2009 → VERA

- Central star

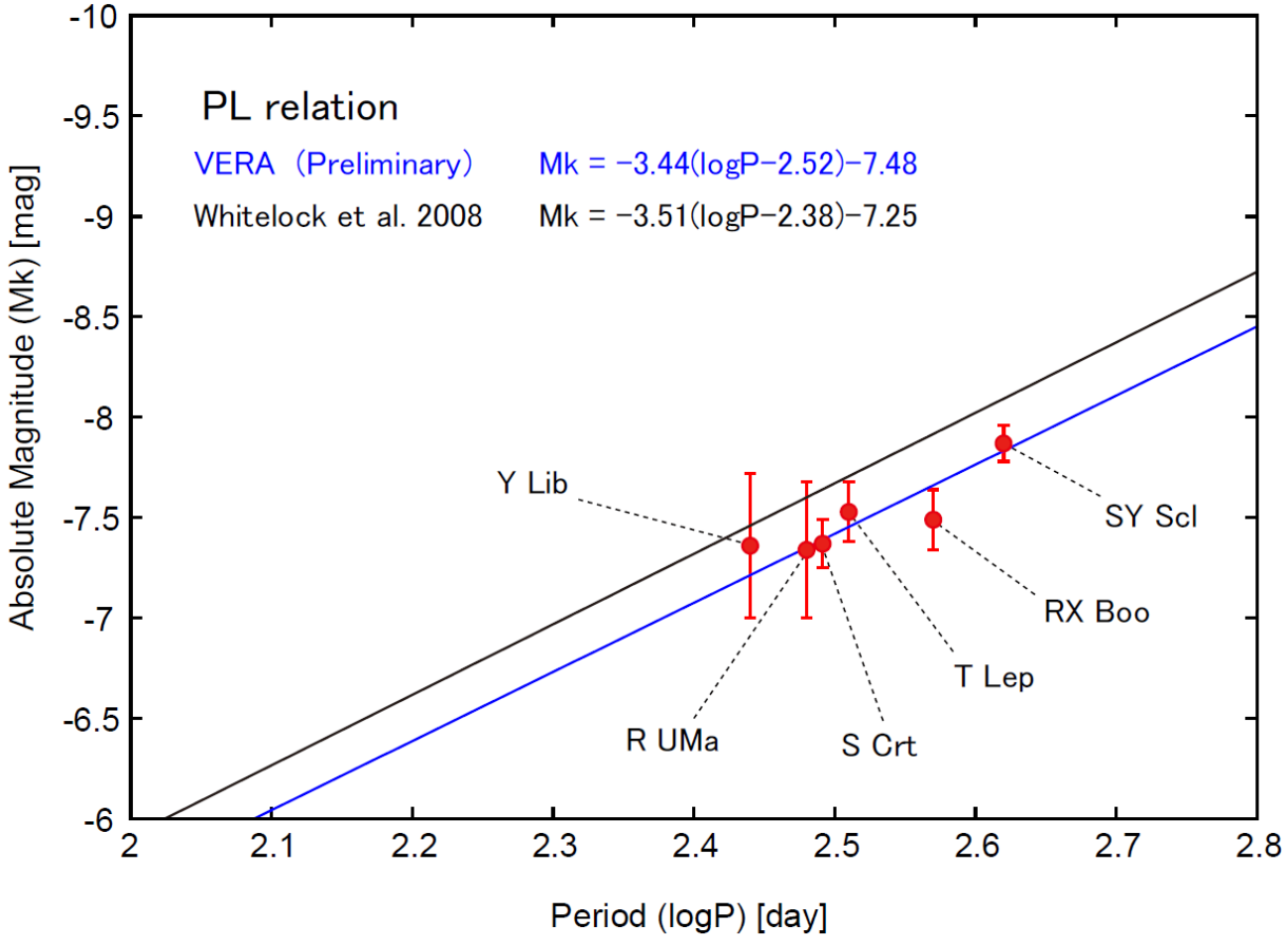
  1AU (208R$_0$) → 2.5AU (475R$_0$)
- Molecular layer

  2.5AU (520R$_0$) → 5.7AU (1080R$_0$)

PLR of the Galactic AGB variables

(preliminary, 2010 Sep 16)

- Whitelock et al. 2008 との比較



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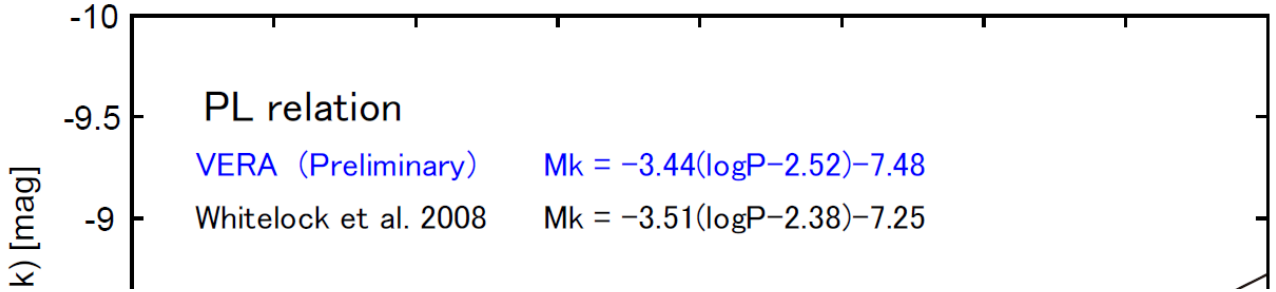
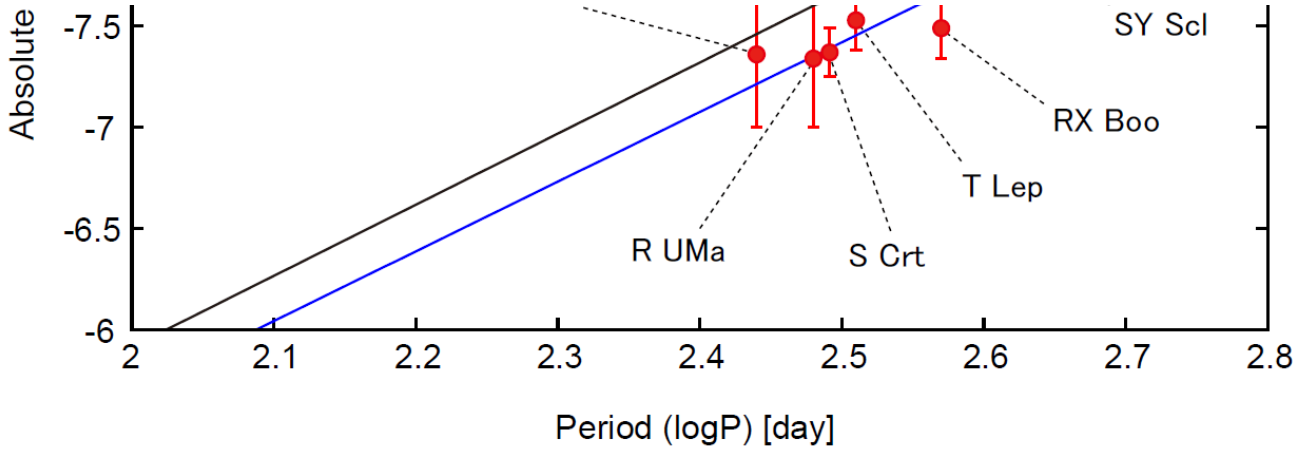


位置天文の誤差 ≲ 実視等級の誤差



Application of the PLR

AGB星の利点は何か？

●銀河系の動力学

Z > 1 kpc

6D (X, Y, Z, Vx, Vy, Vz) information of AGB stars

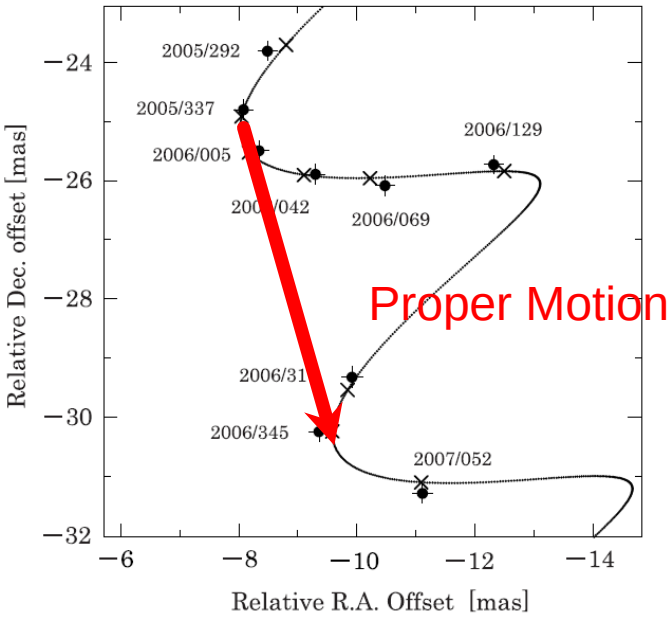
>Galactic Potential in Z-direction
- evolved stars = thick disk stars?
- シミュレーションとの比較

>Stellar evolution : SR → Mira ?
- Velocity dispersion

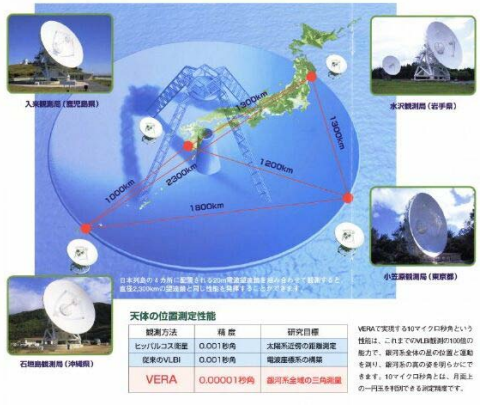
●星の進化、星周の状態

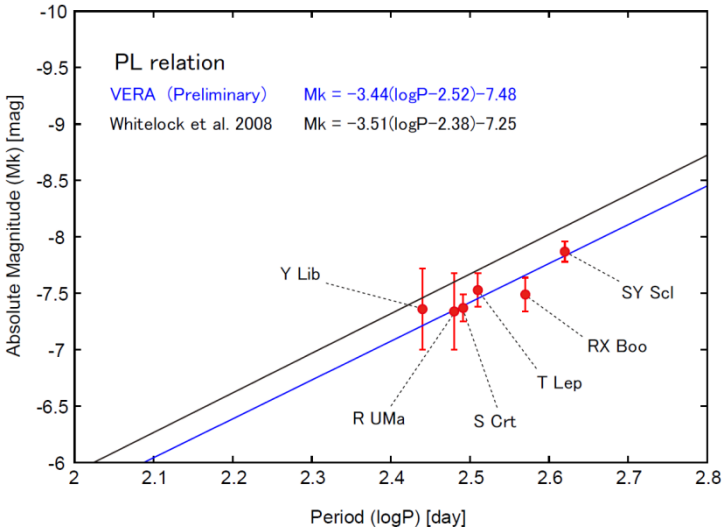
Proper Motion, V_{LSR} Survey

- １年の間隔をあけて2回の観測を行う → 固有運動, V_{LSR}
- 大口径、高感度、短基線による暗くて淡いメーザーの検出
- 星のサンプリングをどう選定するか



Summary





- In 2010, Parallax measurement of 6 AGB sources
  - PLR of the Galactic AGB variables
- Successful detection of other AGB sources.
- Application of the Galactic PL-relation
  - 3D kinematics of AGB Sources -> Galactic potential in Z-direction.
  - Relation between Miras and Semiregular variables