

Structure and Kinematics of the Galactic Spiral Arms and Warp

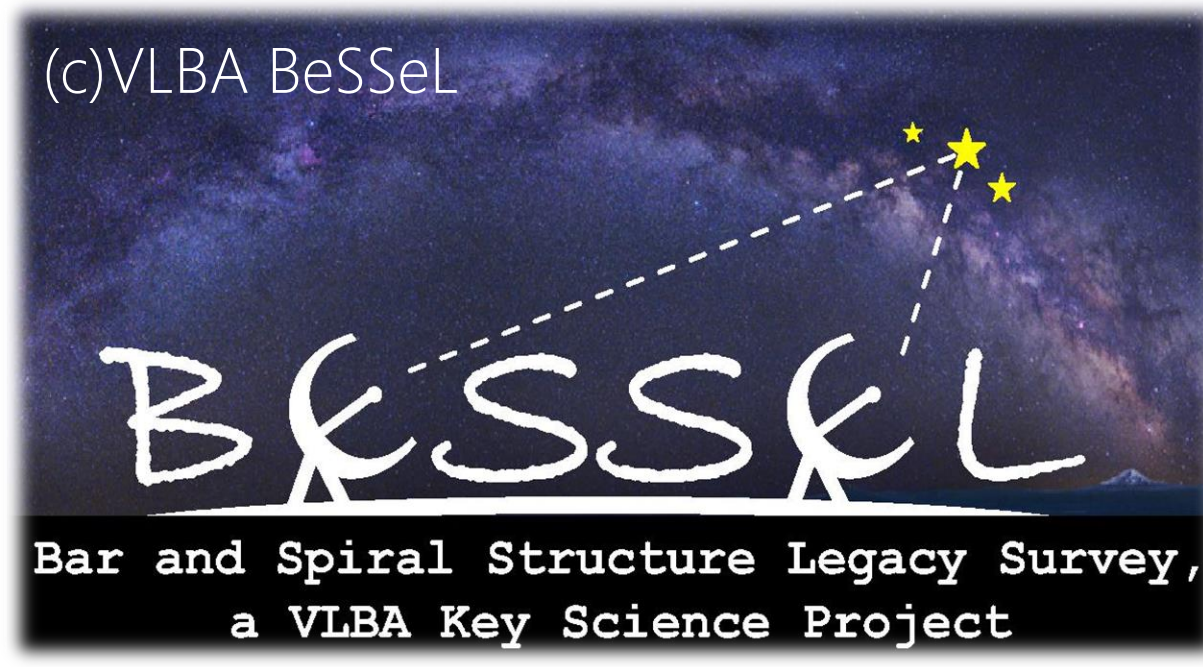
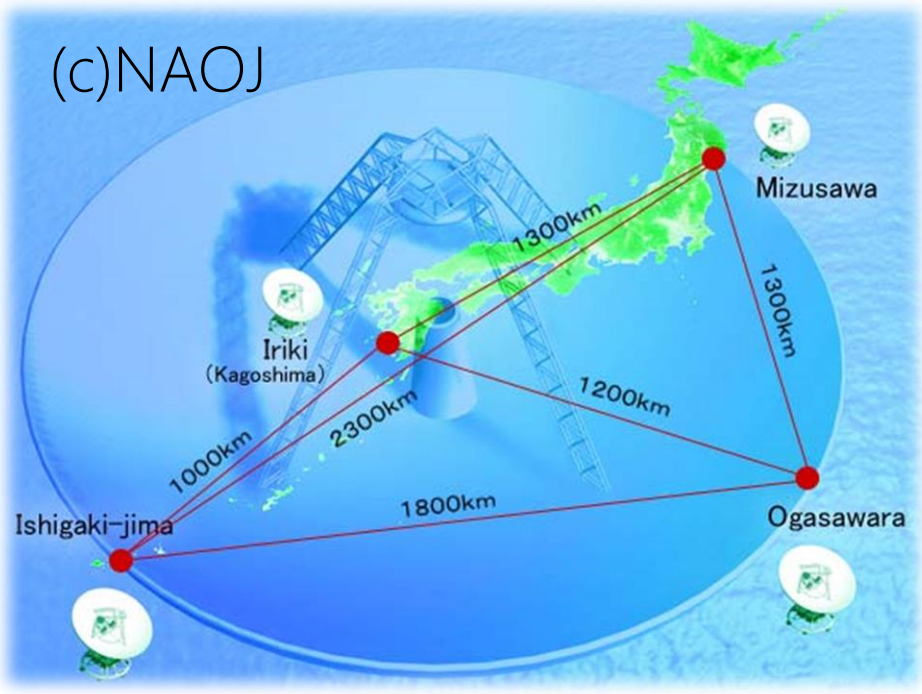
Nobuyuki Sakai (NAOJ), VERA and BeSSeL projects member

nsakai@kasi.re.jkr

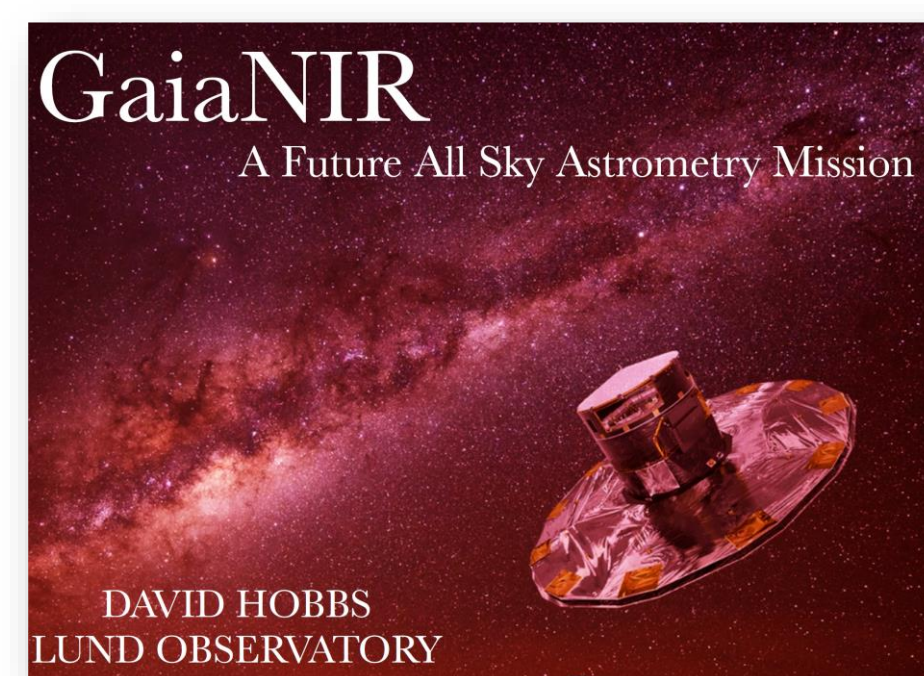
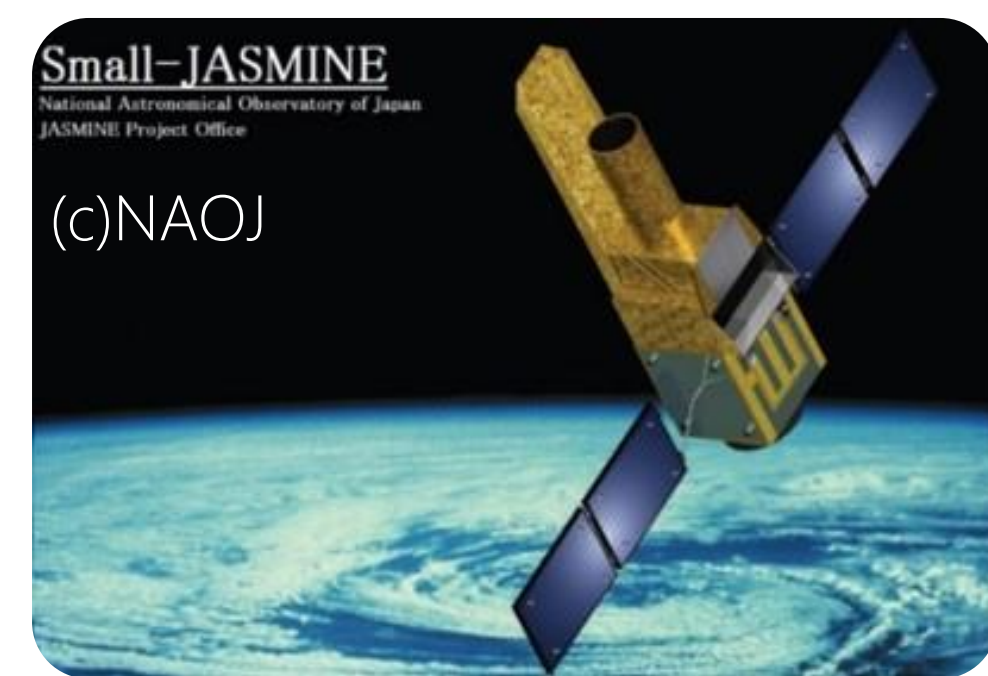
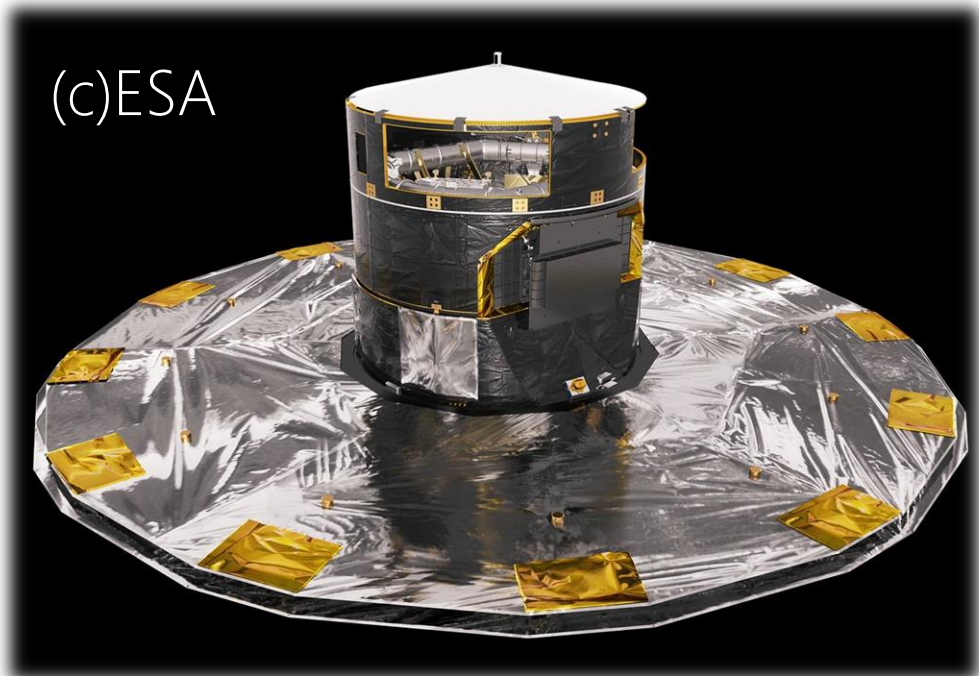


① Context

2000s: VLBI astrometry



2010s: Optical astrometry



2020-30s: IR astrometry

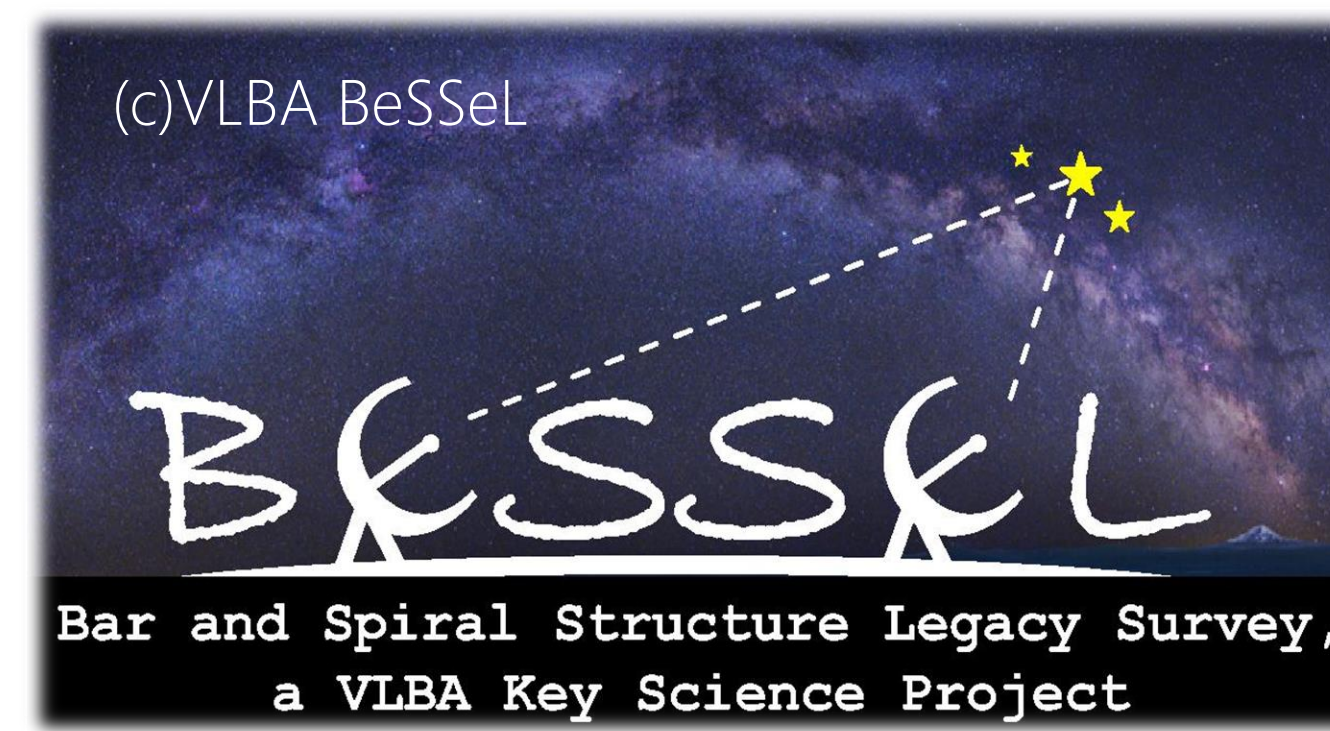
Astrometric observation is an only way to derive 6D phase information of the astronomical object. The 6D phase information can be crucial for resolving a wide variety of astronomical mysteries. Indeed, VLBI astrometric results have drastically improved our understanding of the Galactic structure (e.g., Reid+09; Honma+12; Reid+14).

From 2000s to 2030s, VLBI, Optical, and IR astrometric observations are available (see the upper figures), which allow us to tackle a wide variety of astronomical mysteries.

② VLBA & VERA Observations

VLBA BeSSeL project observations until 2016

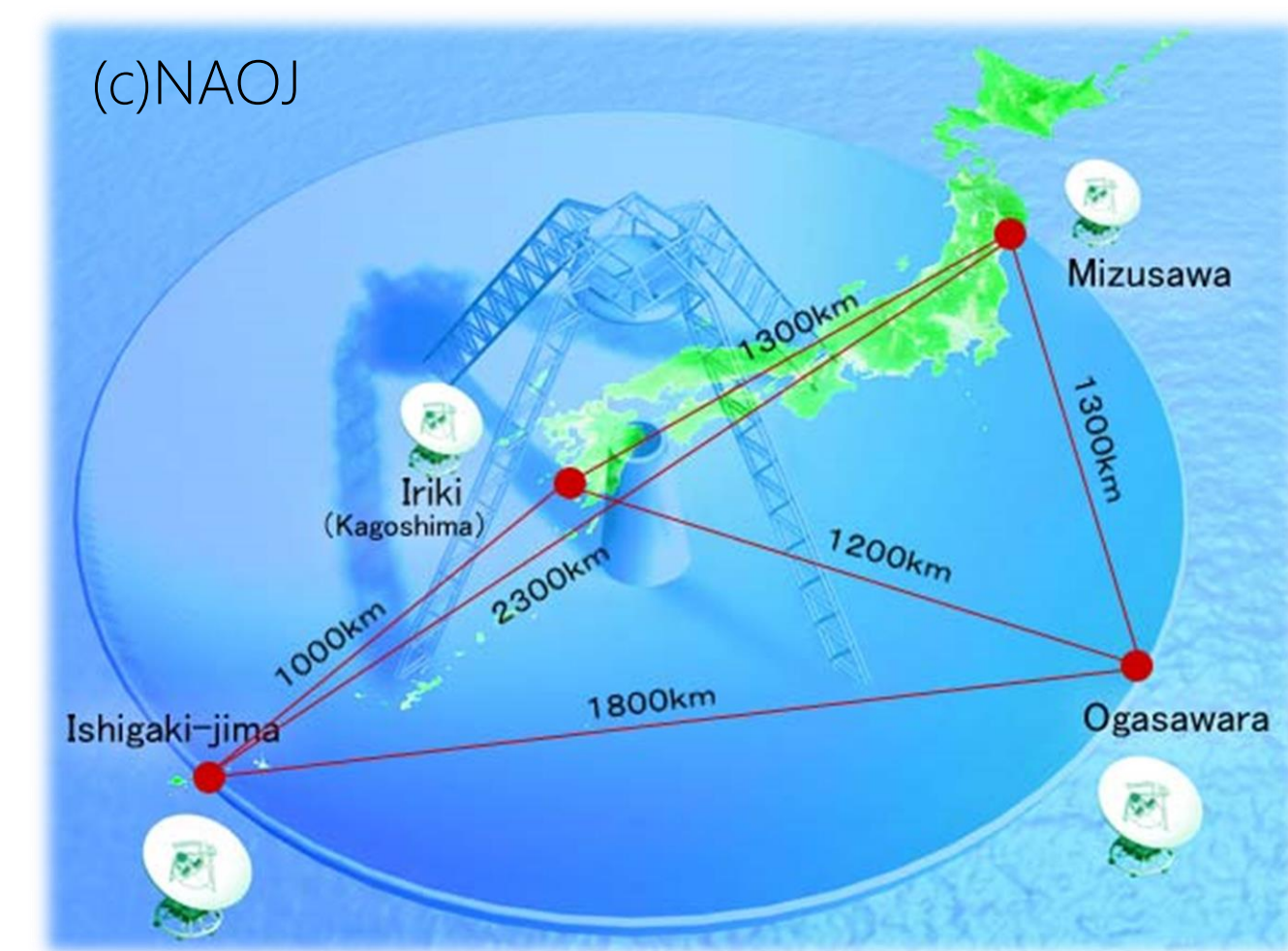
- Band:** 6.668519 GHz
- Target:** CH₃OH masers (HMSFRs)
- Cadence:** 4 epochs in 1yr
- Velocity Spacing:** 0.36 km s⁻¹
- Polarization:** LHCP & RHCP
- Recording rate:** 512 Mbps



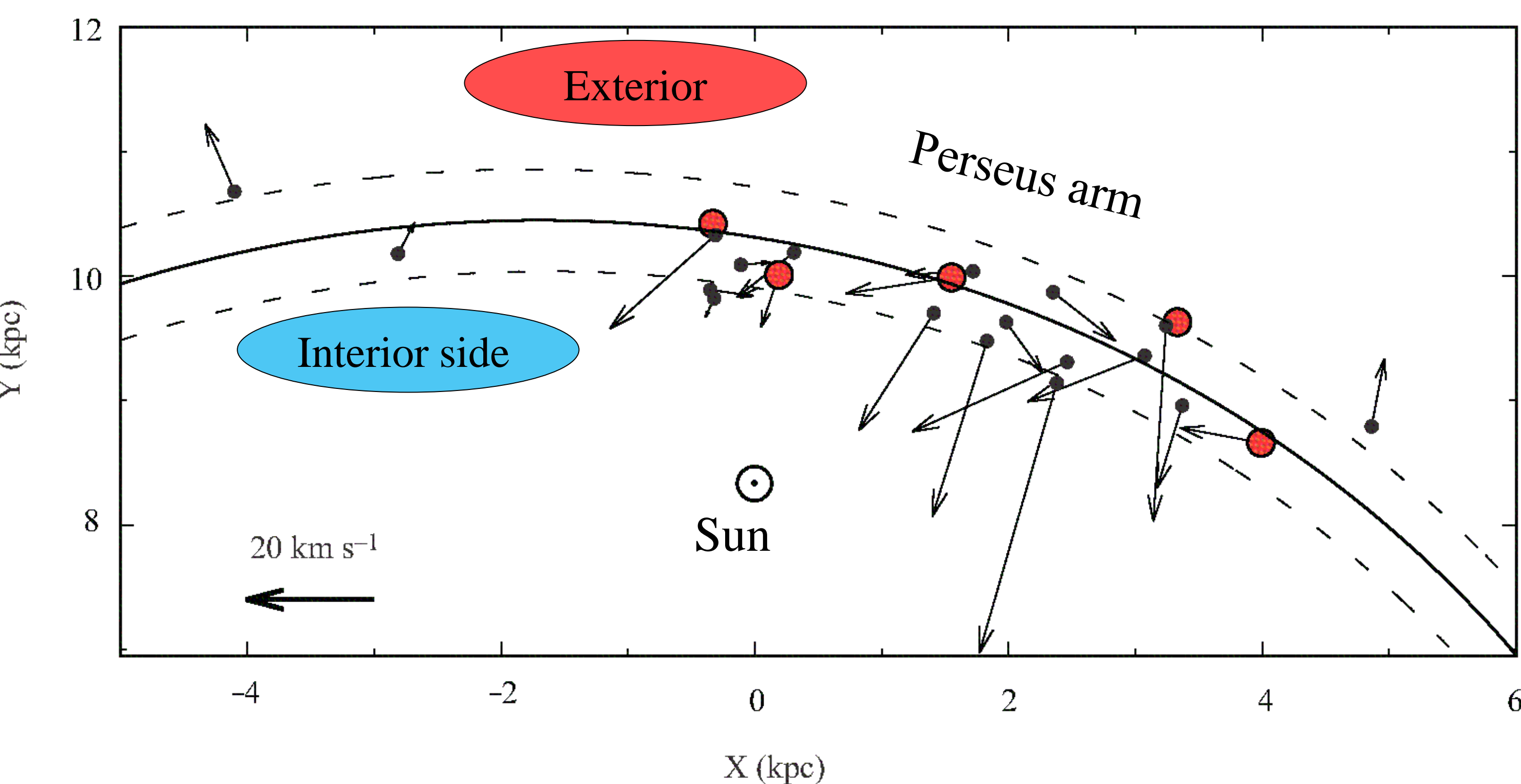
The largest VLBA program (~3,500 hr)

VERA project observations until 2021

- Band:** 22.23508 GHz
- Target:** H₂O masers (SFRs)
- Cadence:** Bimonthly observations
- Velocity Spacing:** 0.42 km s⁻¹
- Polarization:** LHCP
- Recording rate:** 1 Gbps

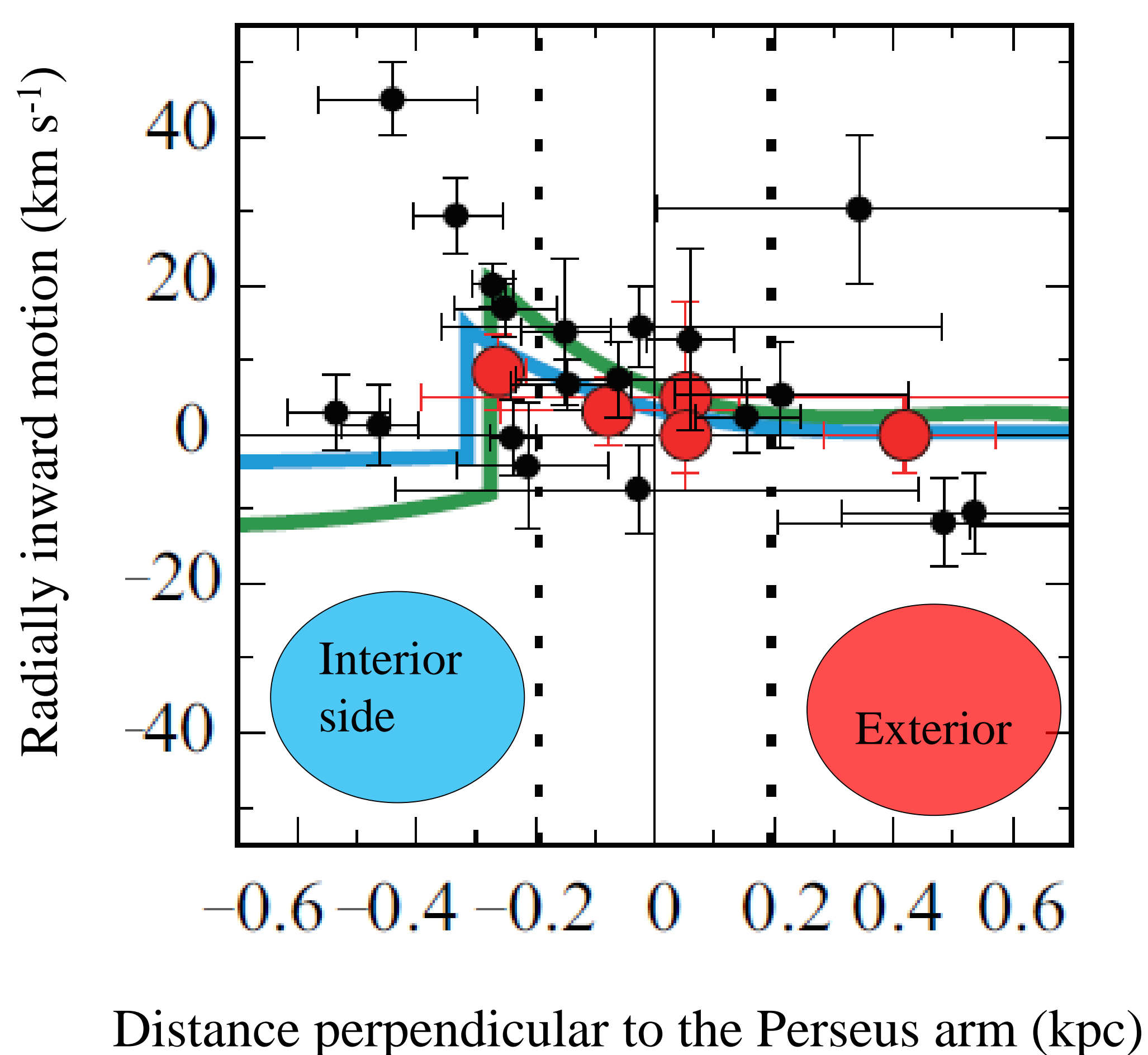


③-1 Galactic shock ?



- : New results with VLBA (Sakai+19a)
- (Non-circular motion): Observables – Solar motion – Rotation curve

Shock model vs Observation



③-2 Fingerprint of a satellite galaxy ?

