VLBA Science Highlights

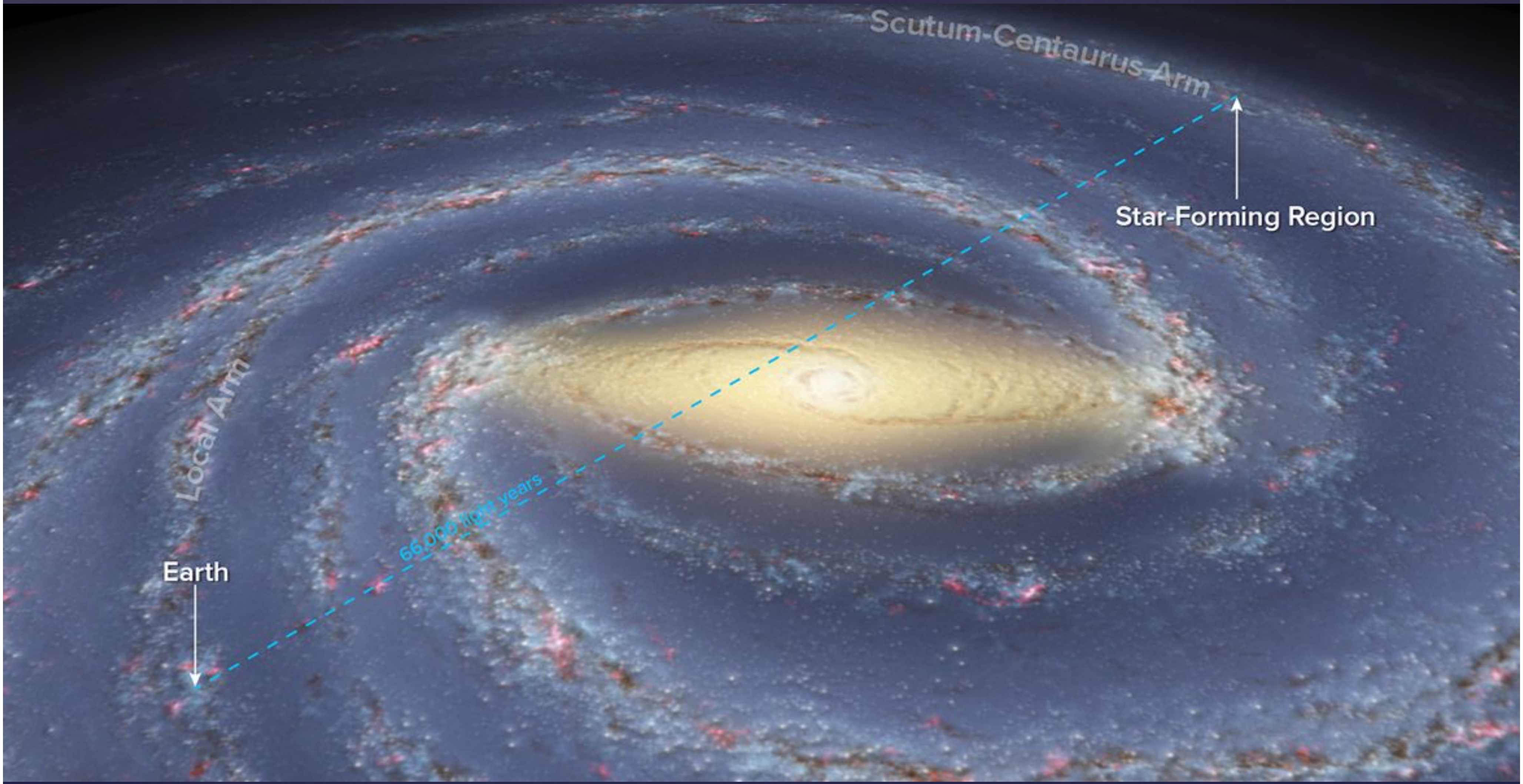
Greg Taylor (UNM)

URSI, 1/7/2018

VLBA Publications 2017

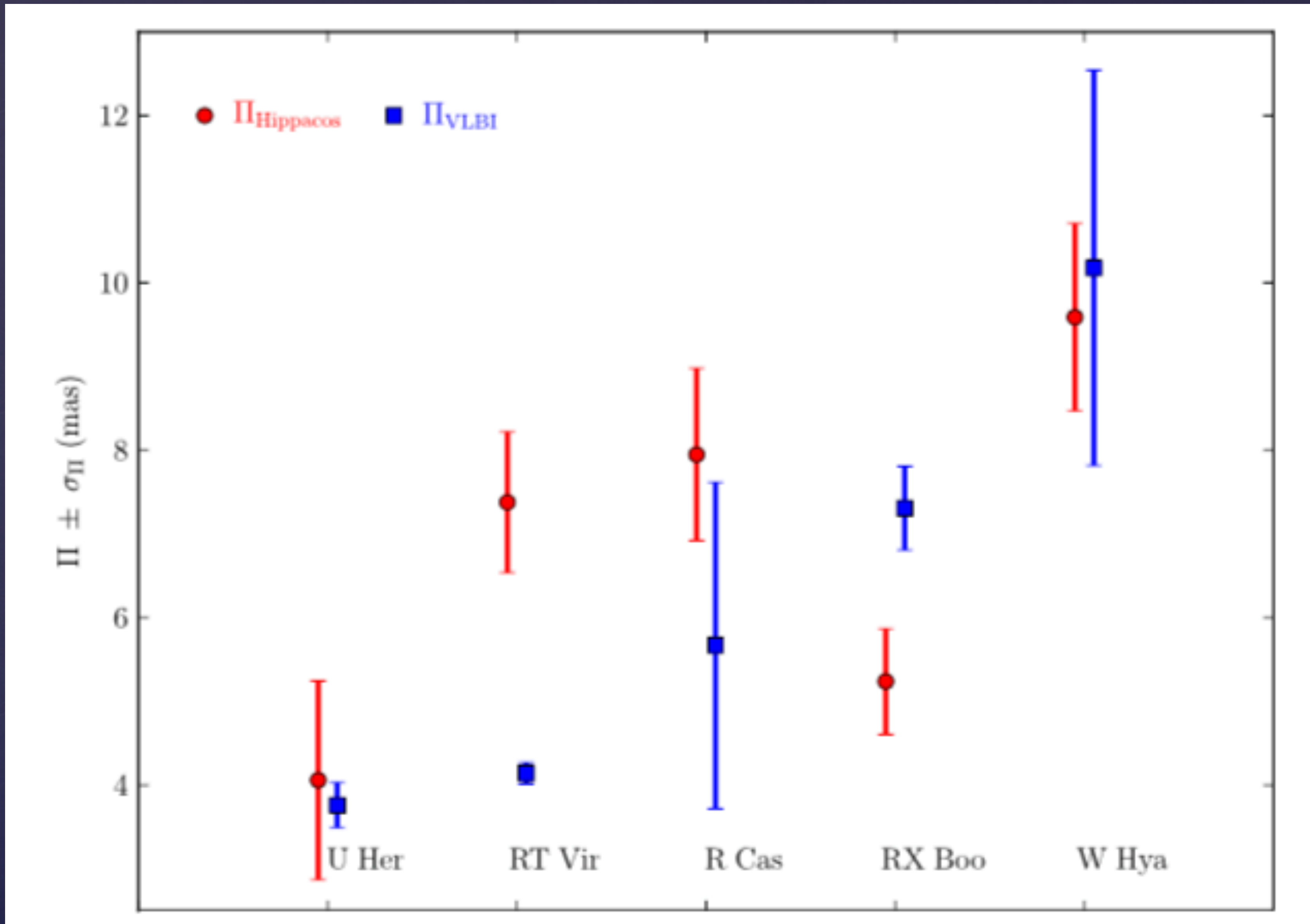
- 4 press releases
- 33 refereed publications

Distance Measurements anywhere in the Milky Way



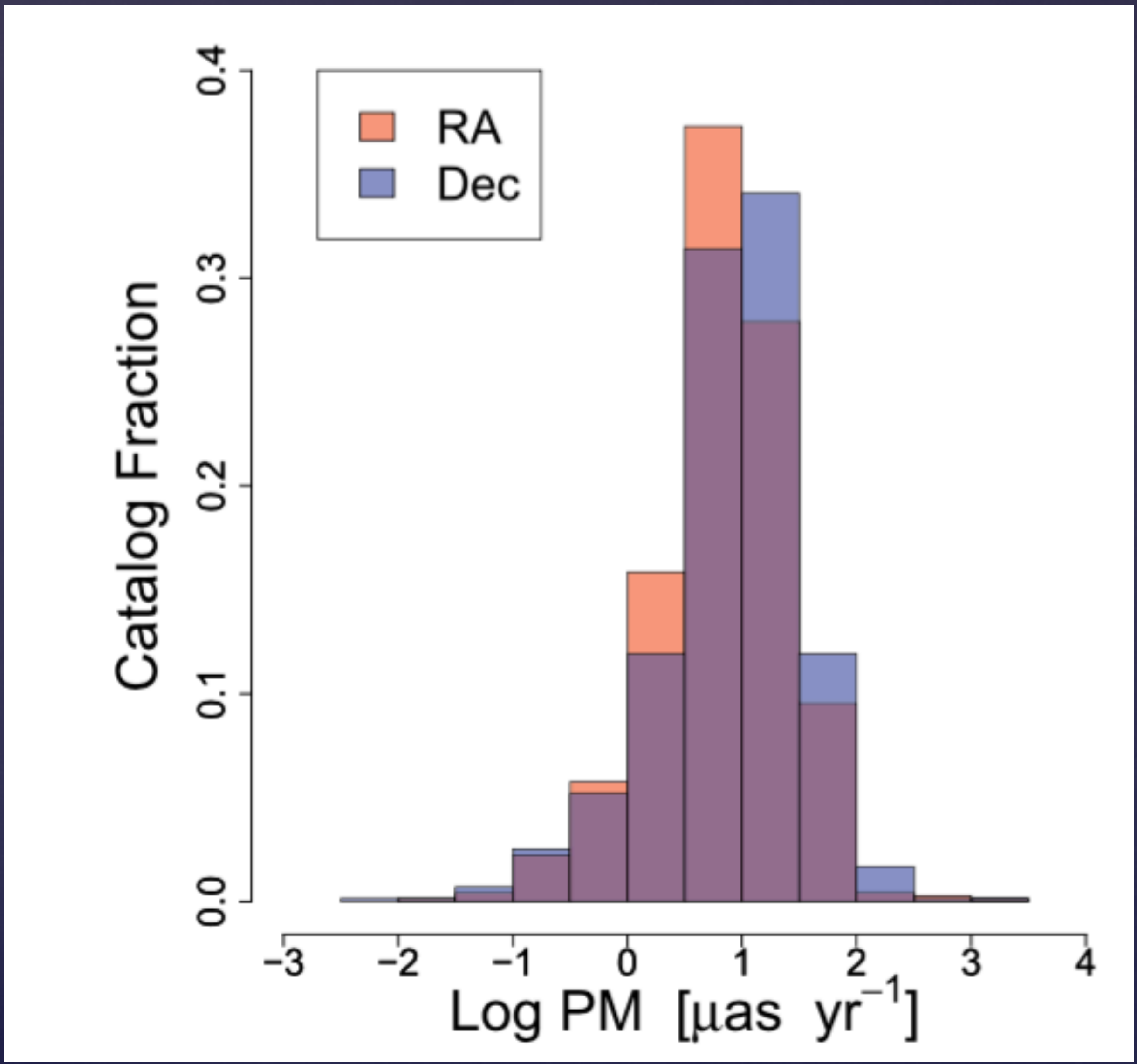
G007.47+00.05 at 20 +/- 2.6 kpc - Sanna et al. 2017 (Science)

Comparison on Hipparcos vs VLBI Parallaxes



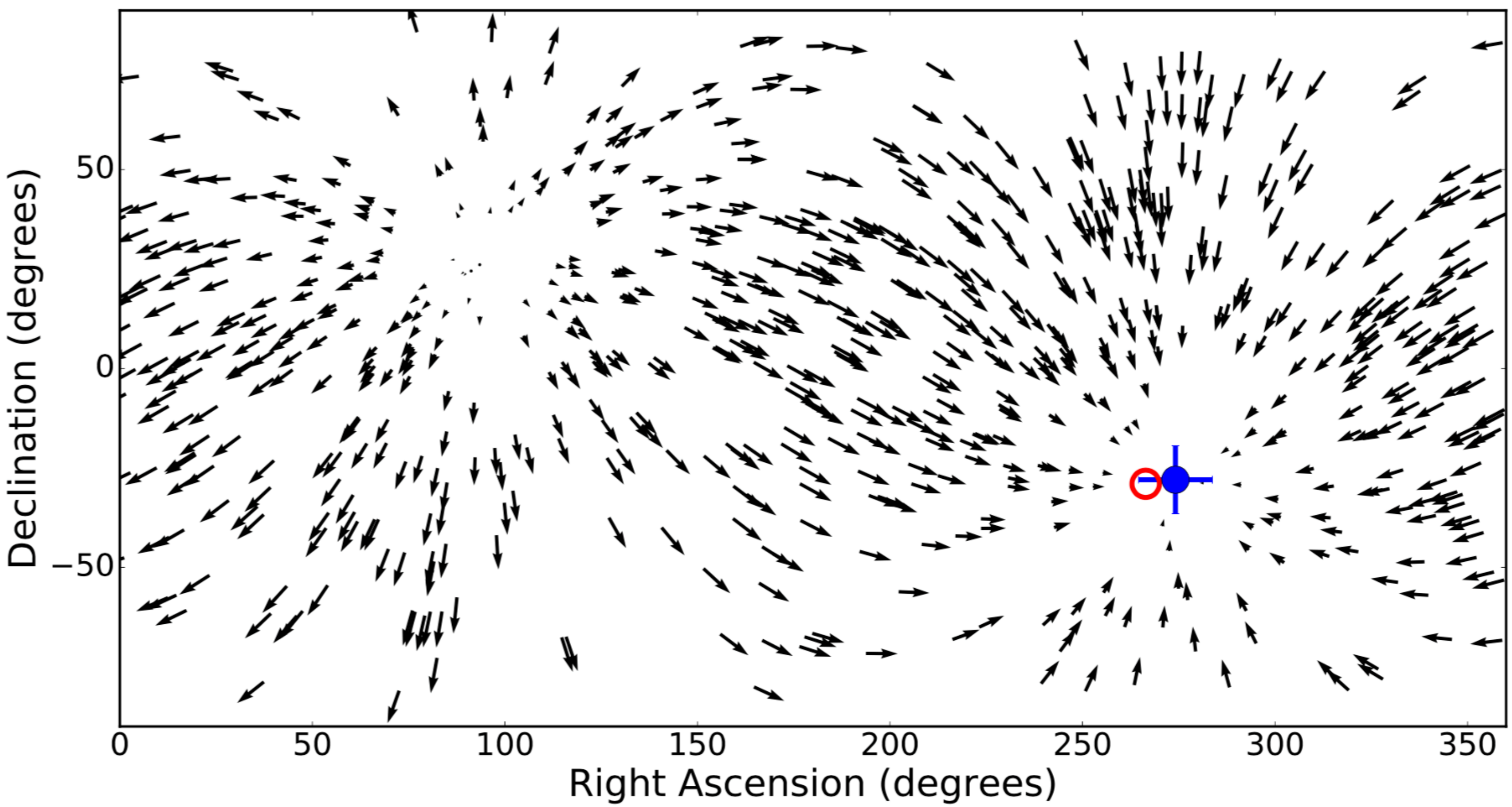
Some Long Period Variables (LPVs) like RT Vir are mis-measured by Hipparcos
Zhang et al. 2017 suggesting Gaia may have similar issues

A Measurement of the Secular Aberration Drift



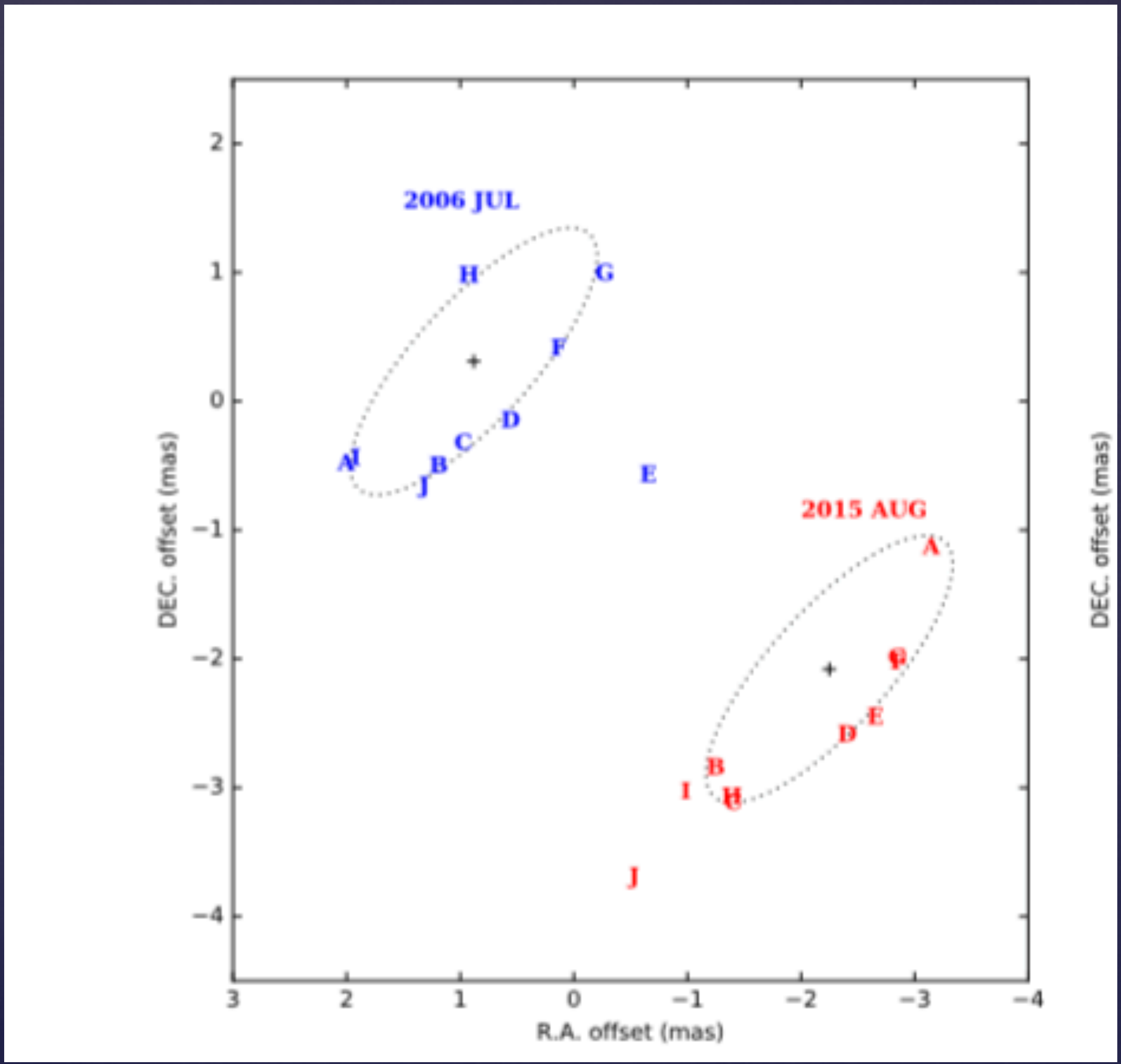
Amplitude of secular aberration: 1.69 +/- 0.27 μas/yr – Truebenbach & Darling 2017

A Measurement of the Secular Aberration Drift

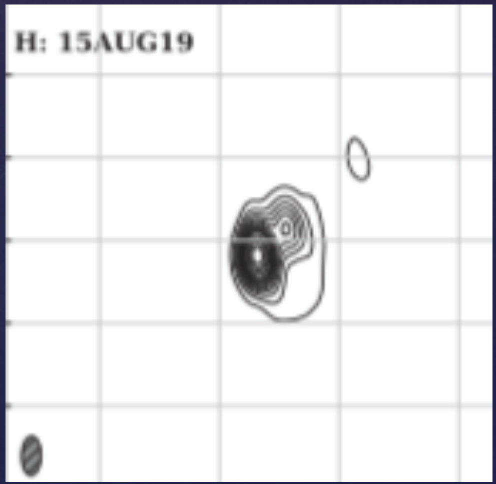


Apex of dipole shown in blue, GC position in red– Truebenbach & Darling 2017

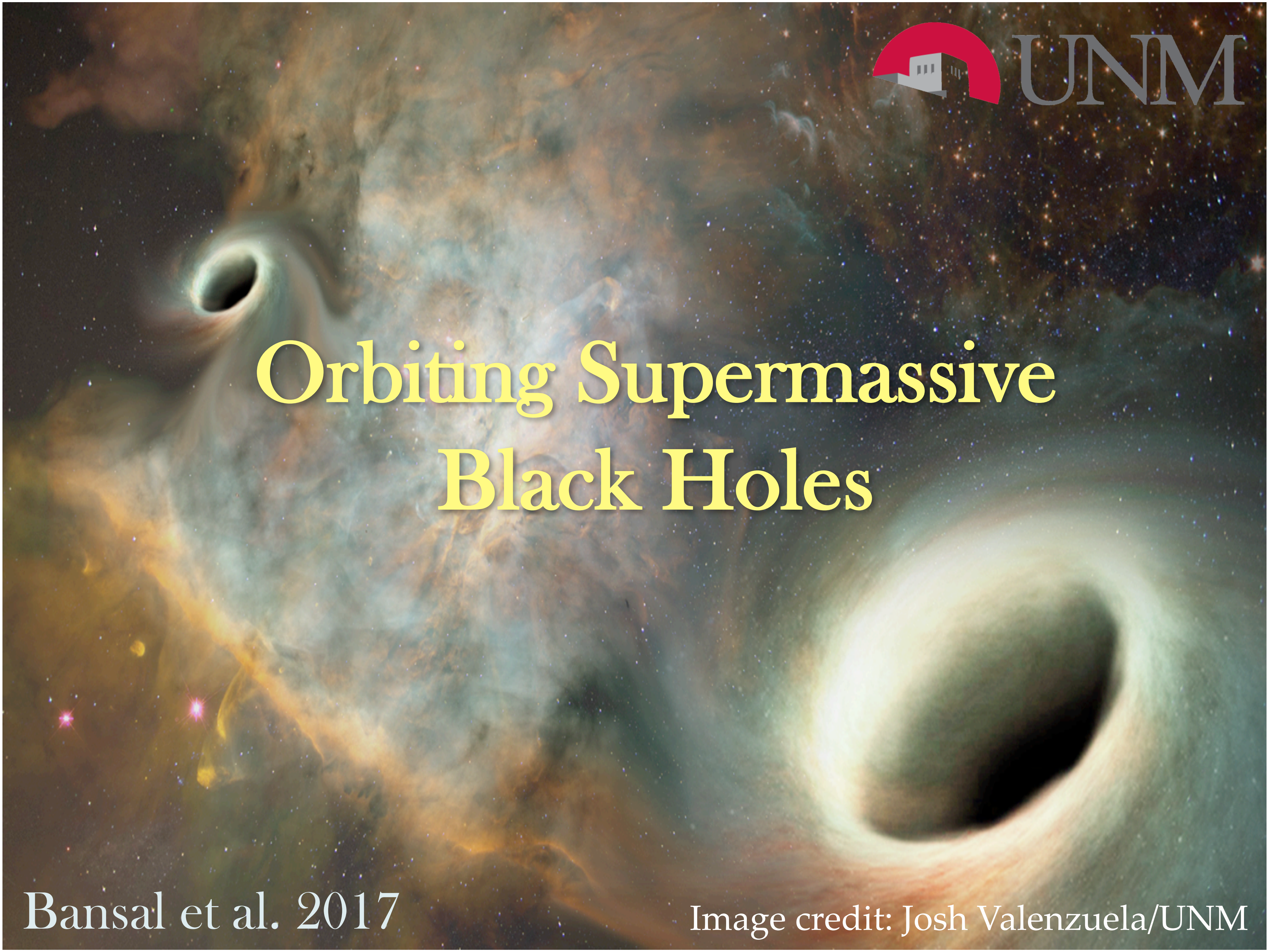
The Precessing MicroQuasar LSI+61 303



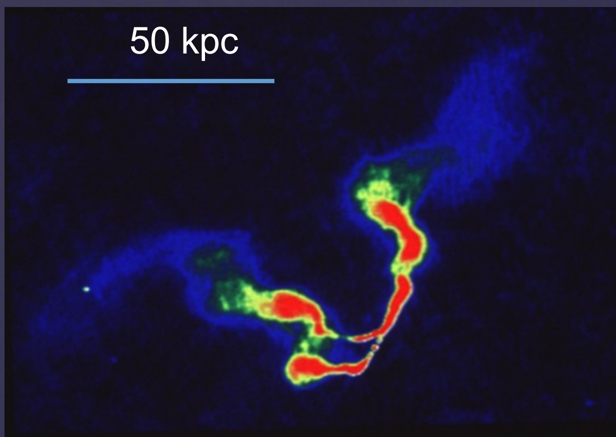
P = 26.926 days



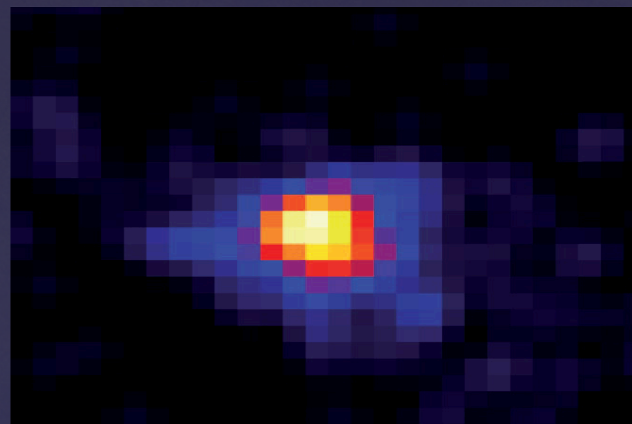
LSI 61 303 motion of 16 km/s suggests a small kick velocity – Wu et al. 2018


UNM
Orbiting Supermassive
Black Holes
Bansal et al. 2017
Image credit: Josh Valenzuela/UNM

Supermassive Binary Black Hole Candidates

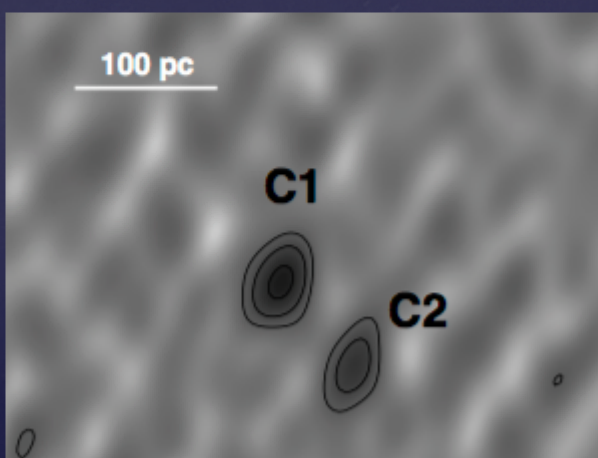


3C75 (credit: NRAO/AUI and F.N. Owen et al 1985)

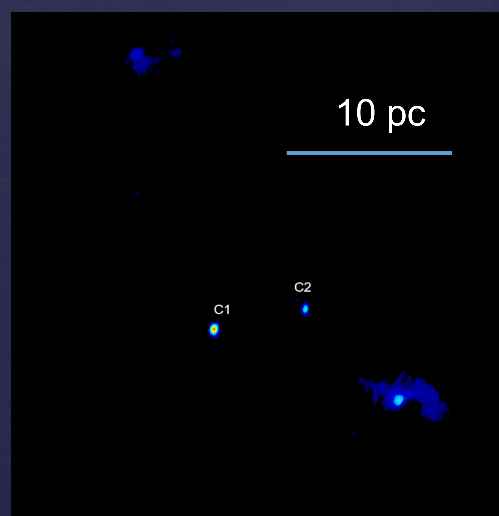


NGC 3393 (Fabbiano et al)

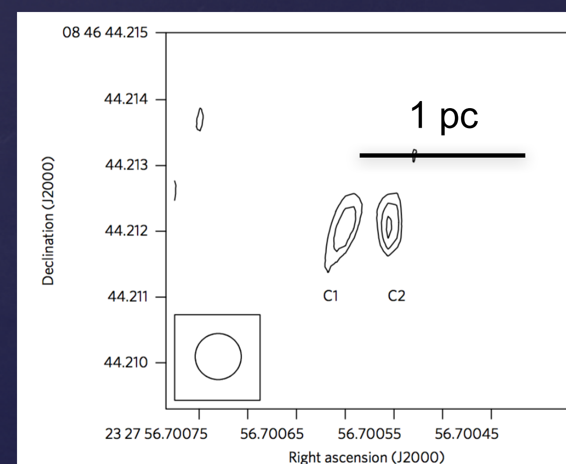
NGC6240 (Komossa et al 2003)



RBS 797 (Gitti et al 2014)

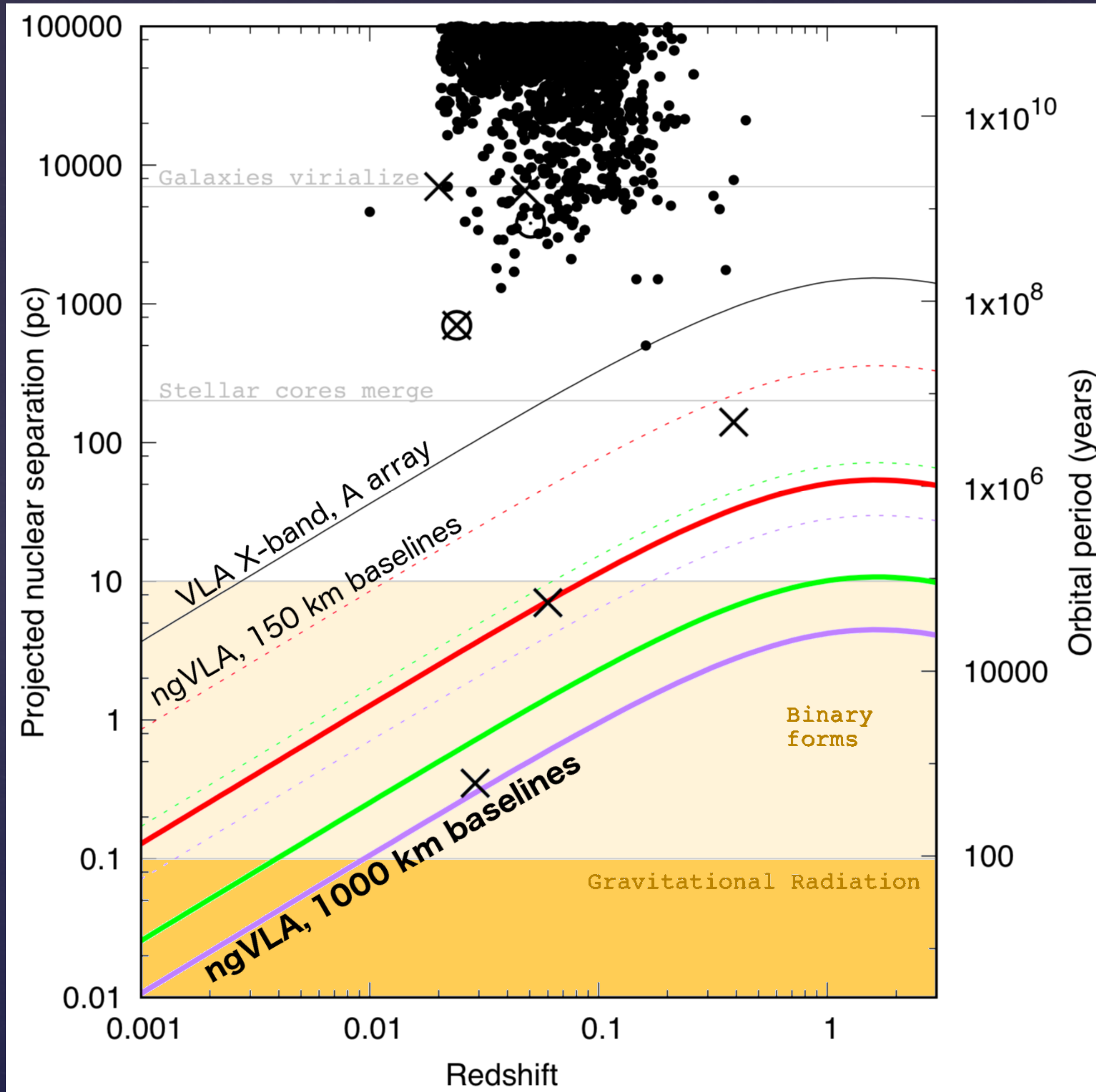


0402+379 (Credit: NRAO and Greg Taylor, UNM)

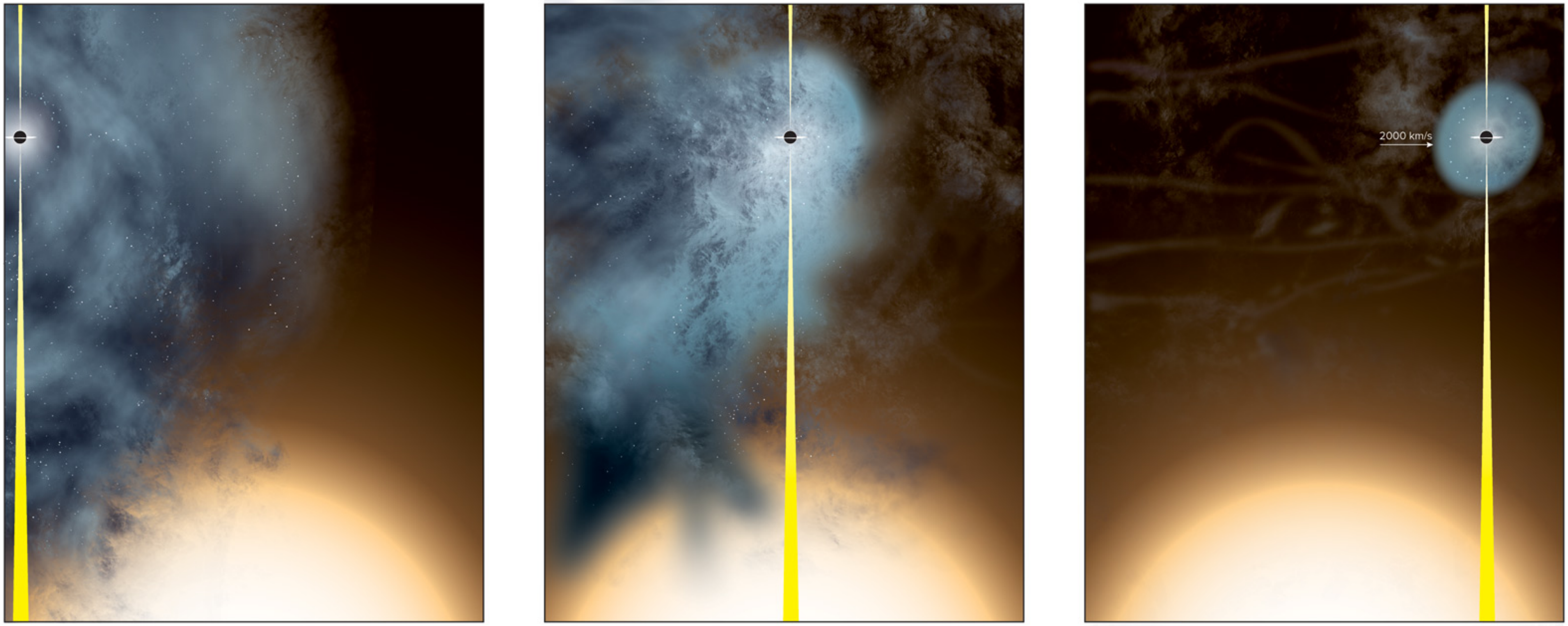


NGC 7674 (Kharb et al 2017)

Burke Spolaor
in prep.

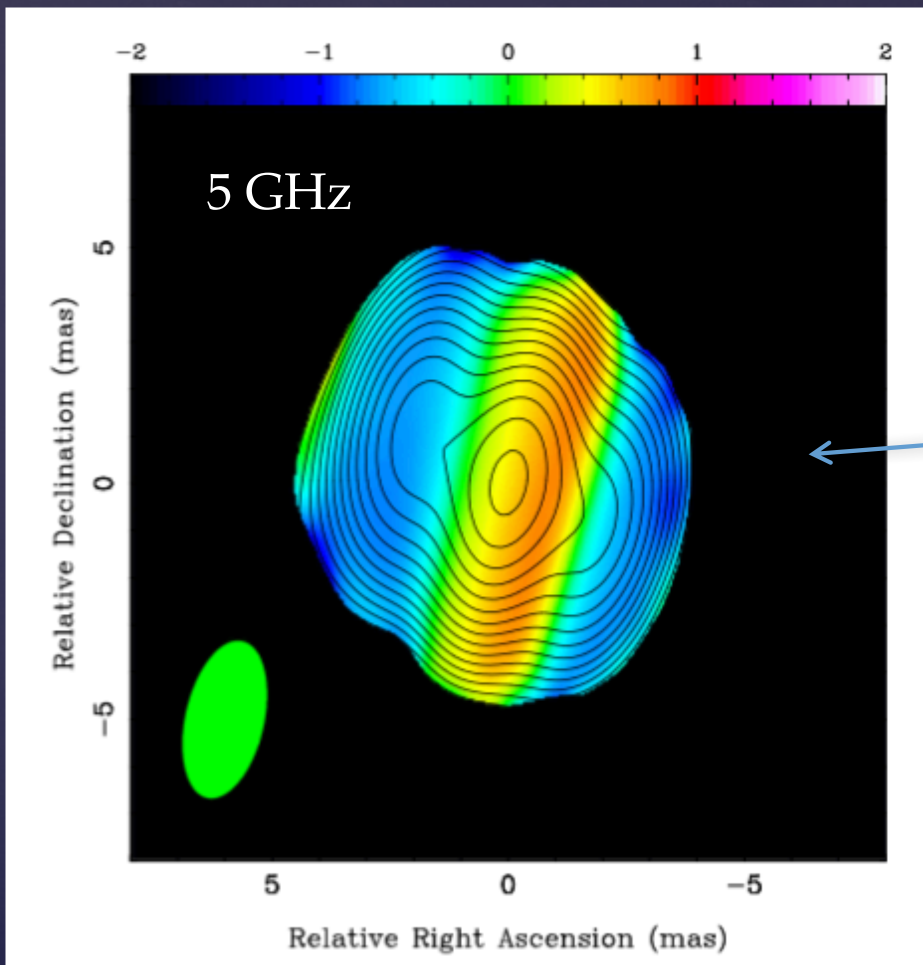


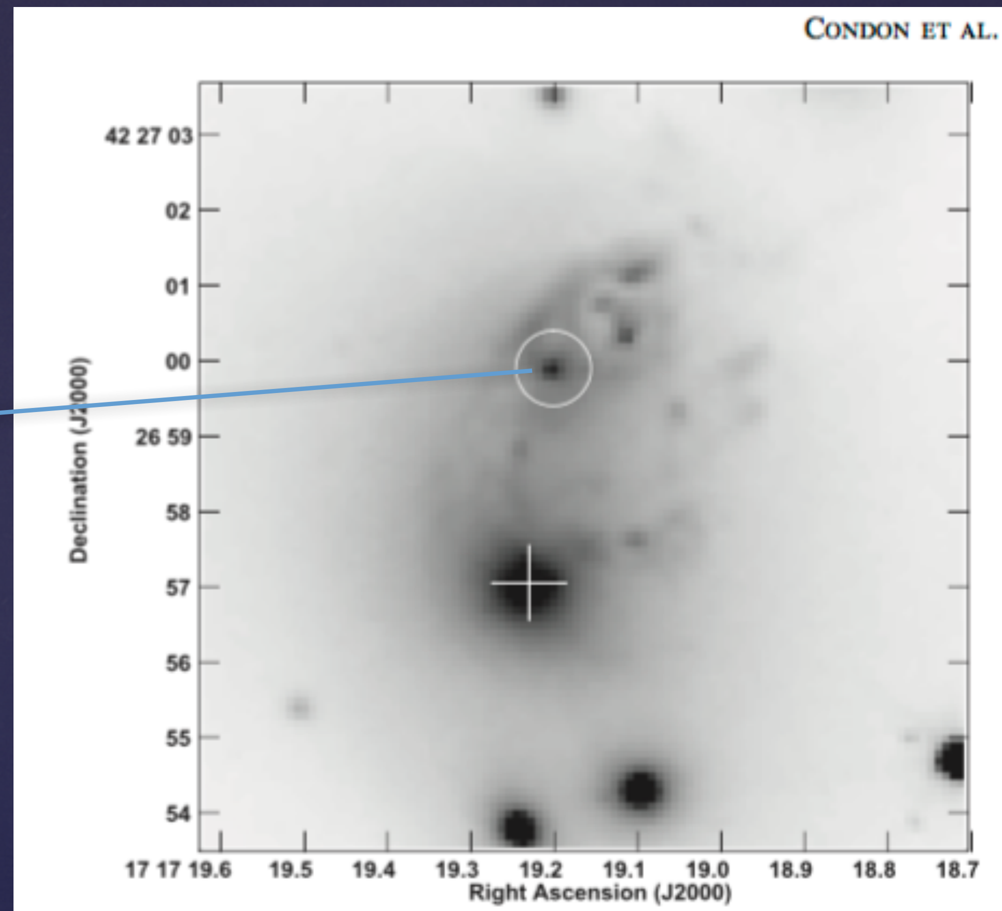
Nearly Naked Black Holes



ZwCl 8193 nearly naked runaway black hole reported by Condon et al. 2017

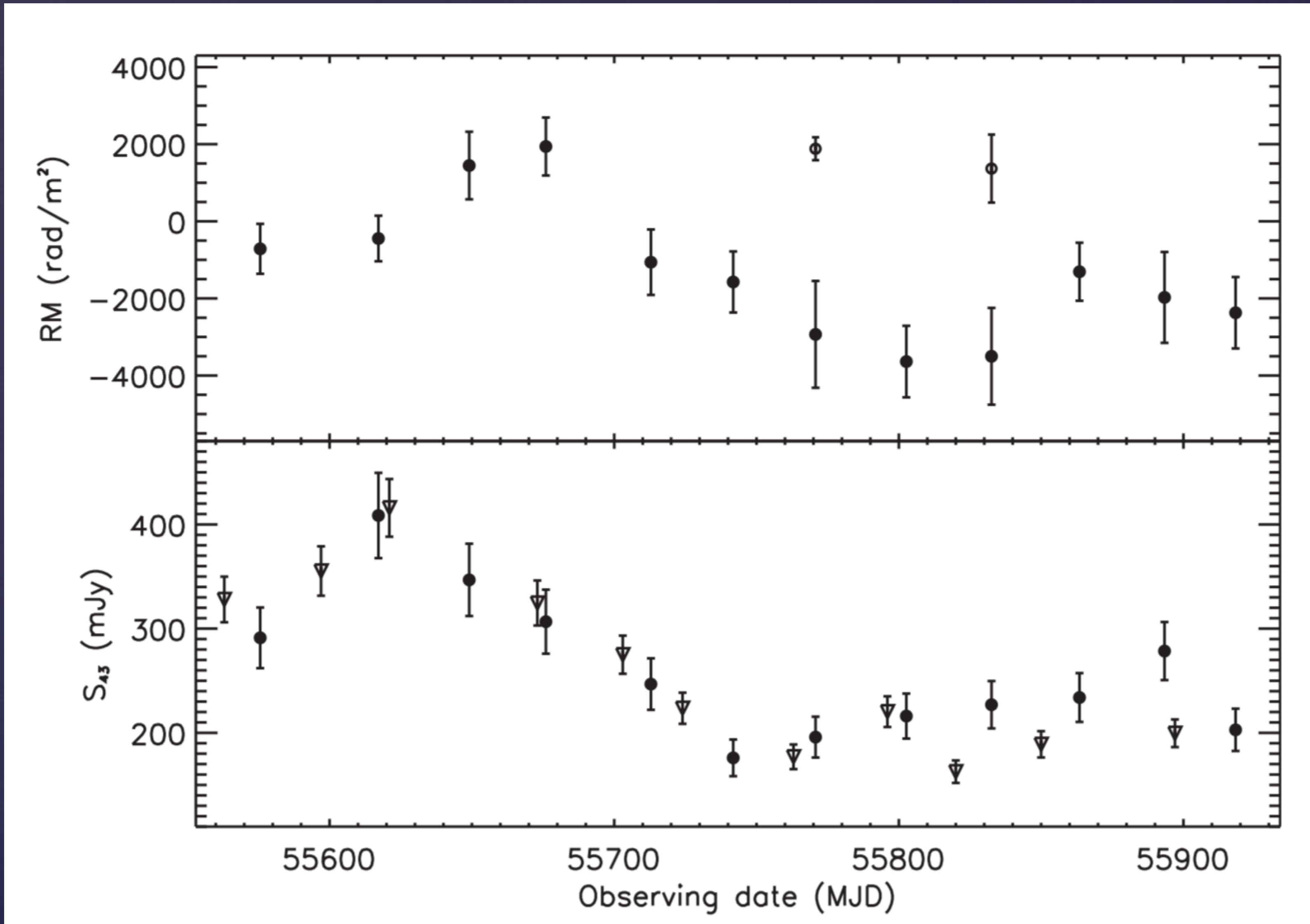
Nearly Naked Black Holes





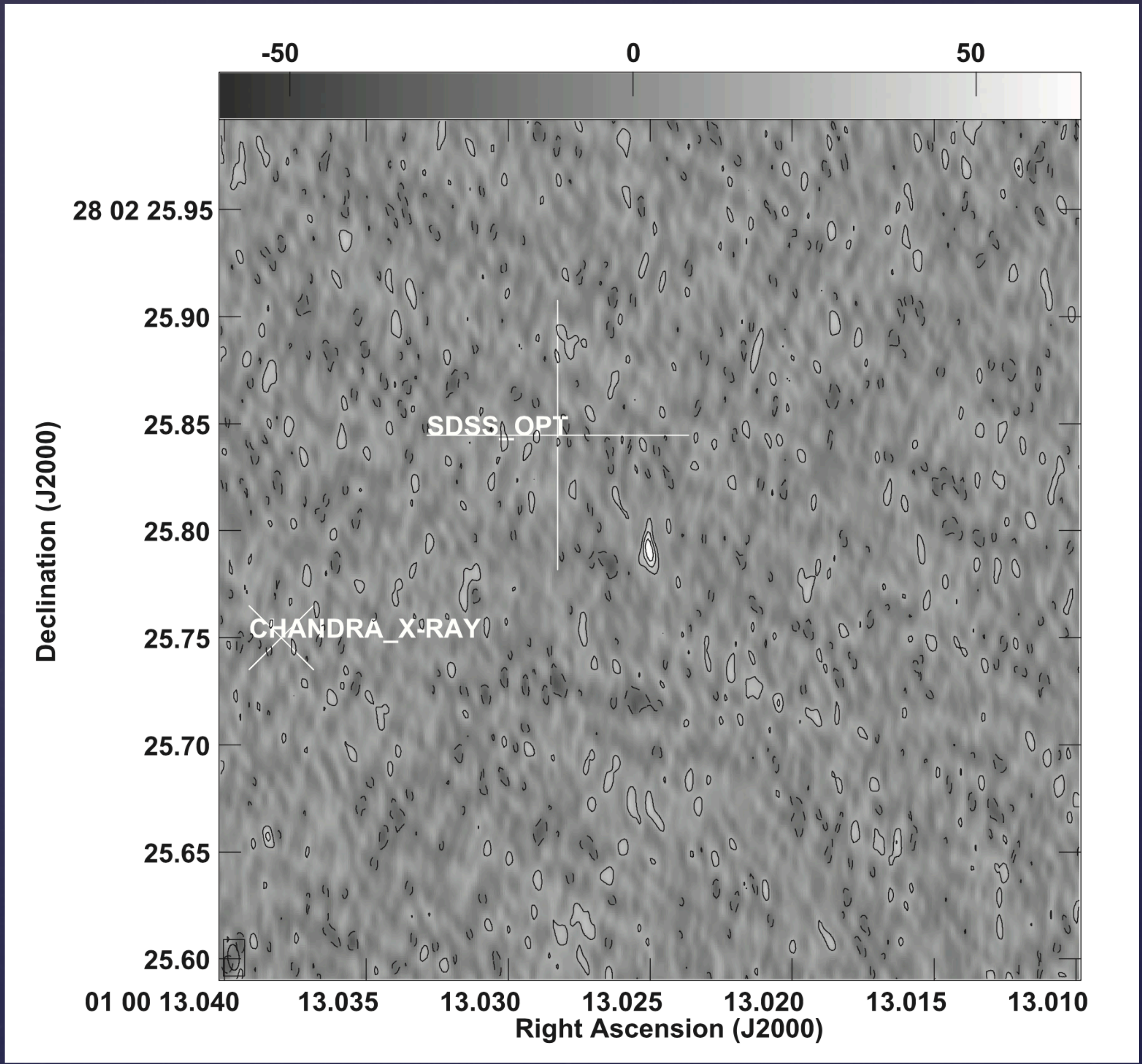
ZwCl 8193 nearly naked runaway black hole reported by Condon et al. 2017

Time Variable Rotation Measures in Mrk 421



Interpreted as the result of a jet sheath with field reversals - Lico et al. 2017

VLBA Imaging of Most Massive Black Hole at z>6



Brightness temperature > 10^7 confirms AGN nature of J0100+2802
– Wang et al. 2017   17 microJy/beam rms noise at 5 GHz

VLBA Upgrades

- Increase bandwidth

- Consider real-time operations for gains in operational efficiency

- Combined receiver upgrades, and bandwidth expansion net gains of > 3

- Expand frequency coverage

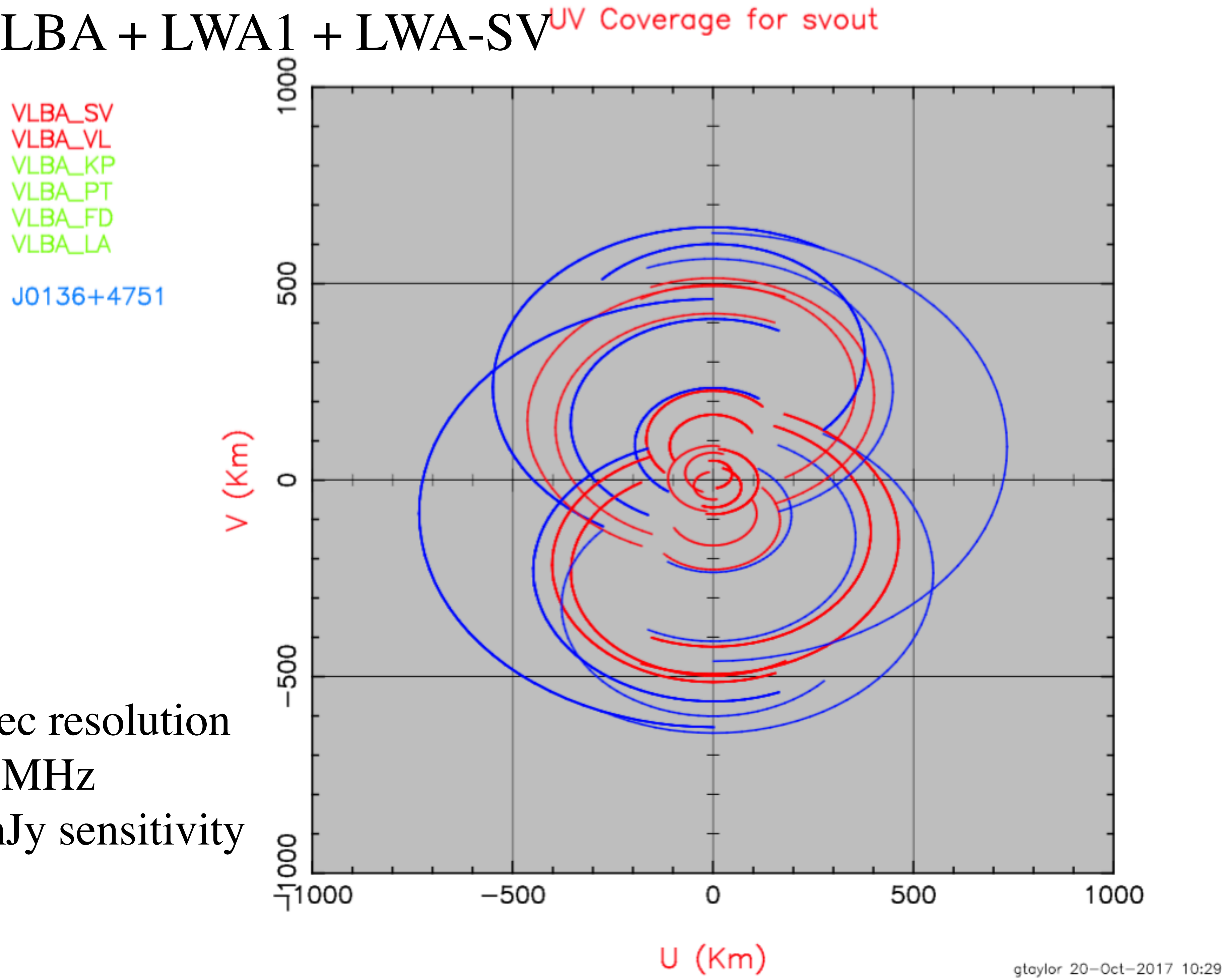
- Add new frequency band

VLA 50-86 MHz

New 4 band feeds (MJP)
4 meter band: 50-86 MHz
21 installed

All 27 by end of 2018

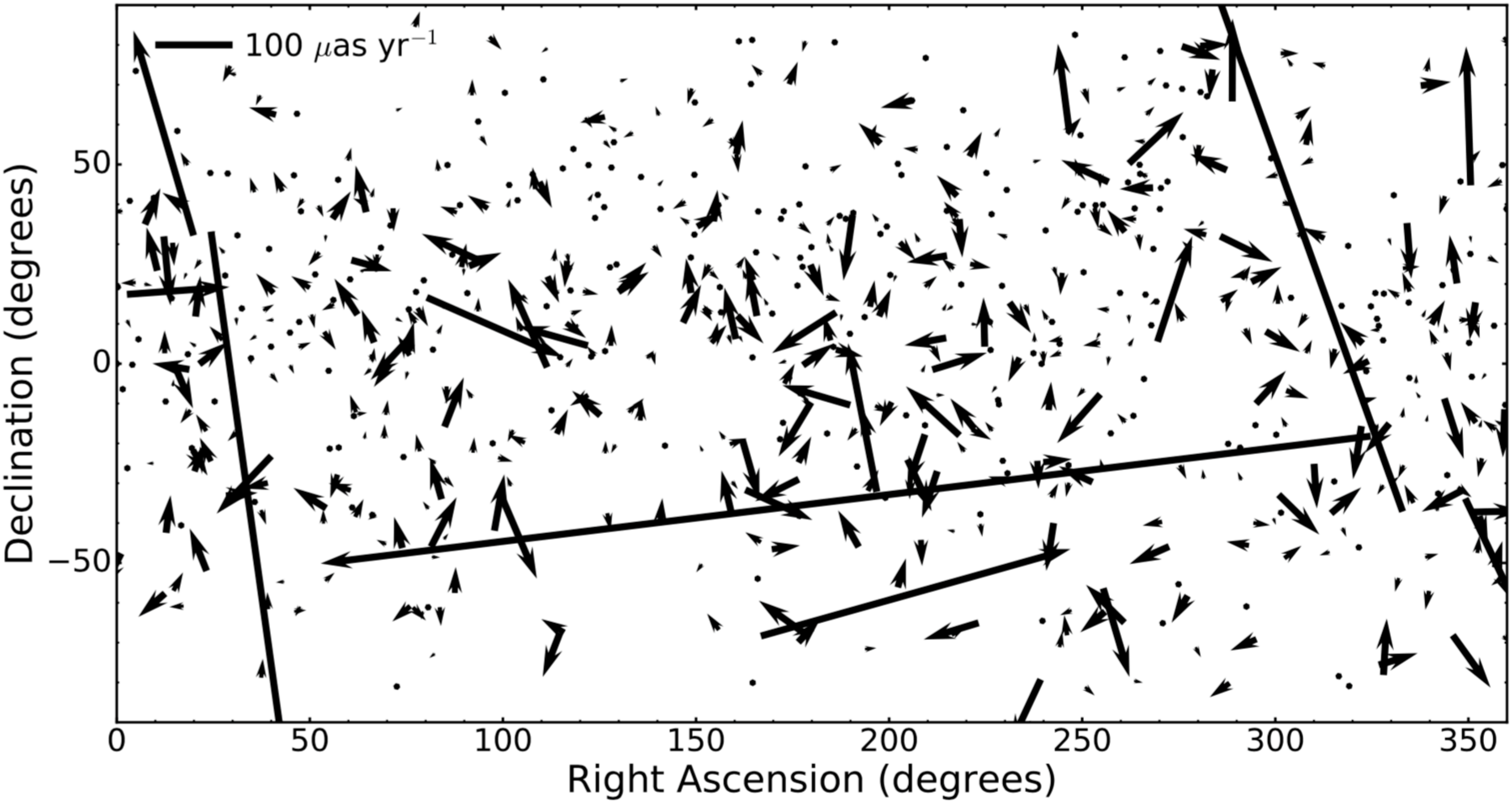
4 VLBA + LWA1 + LWA-SV



2 arcsec resolution
at 74 MHz
~30 mJy sensitivity

Backup Slides

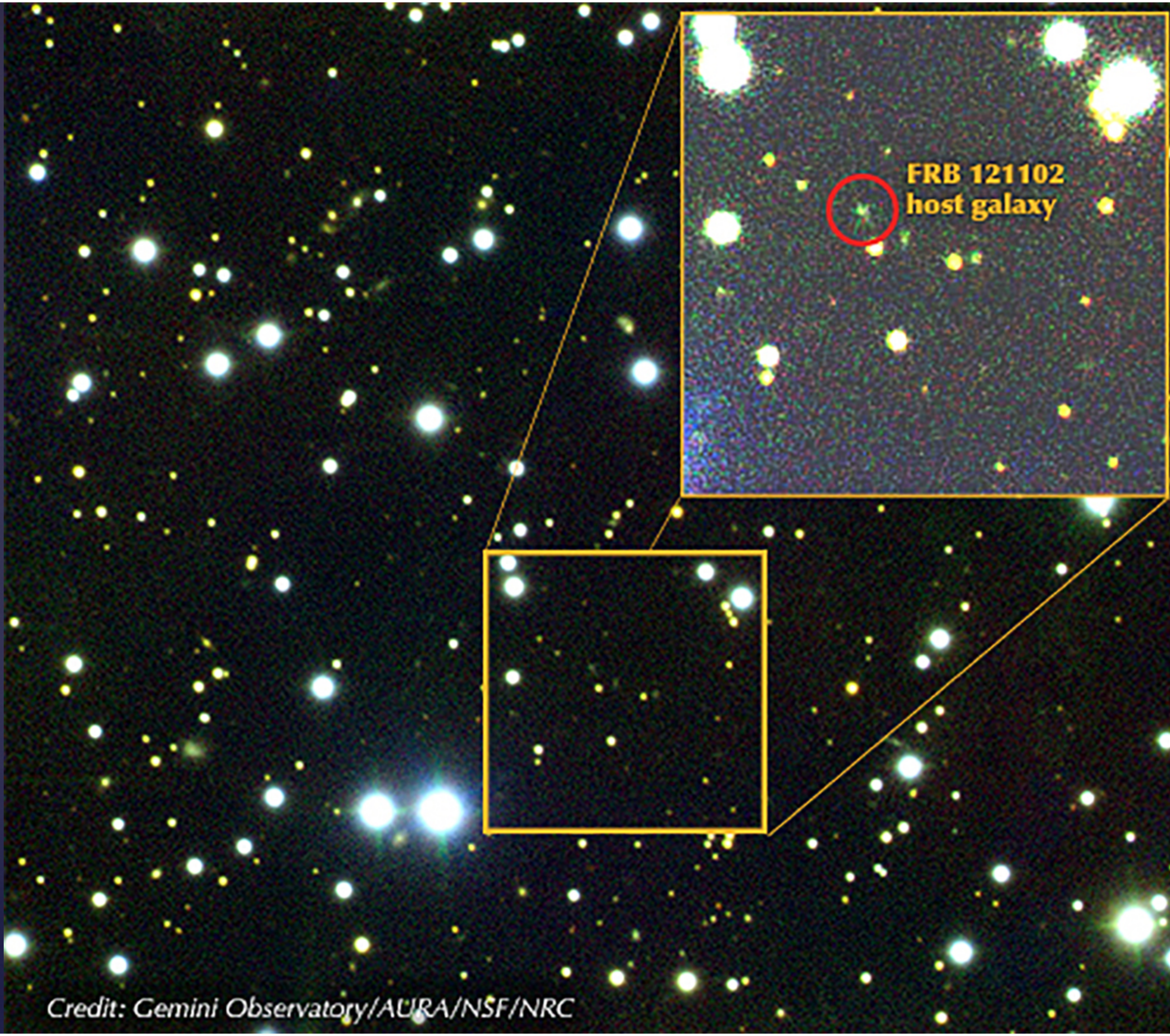
A Measurement of the Secular Aberration Drift



Data from the catalog of proper motions – Truebenbach & Darling 2017

ngVLBA Upgrades

- replace each 25 m VLBA antenna with 4 x 18 m ngVLA dishes operating as a phased array for a factor 2 improvement in sensitivity
- allow simultaneous observations of source and calibrator
- use ngVLA receiver suite and transmit to correlator over fiber
- fully integrate ngVLBA with the ngVLA
- real-time operations at full ngVLA bandwidth for gains of 3-5
- Combined collecting area, receiver upgrades, and bandwidth expansion net gains of > 10
- Add new frequency band


FRB 121102
host galaxy
Credit: Gemini Observatory/AURA/NSF/NRC