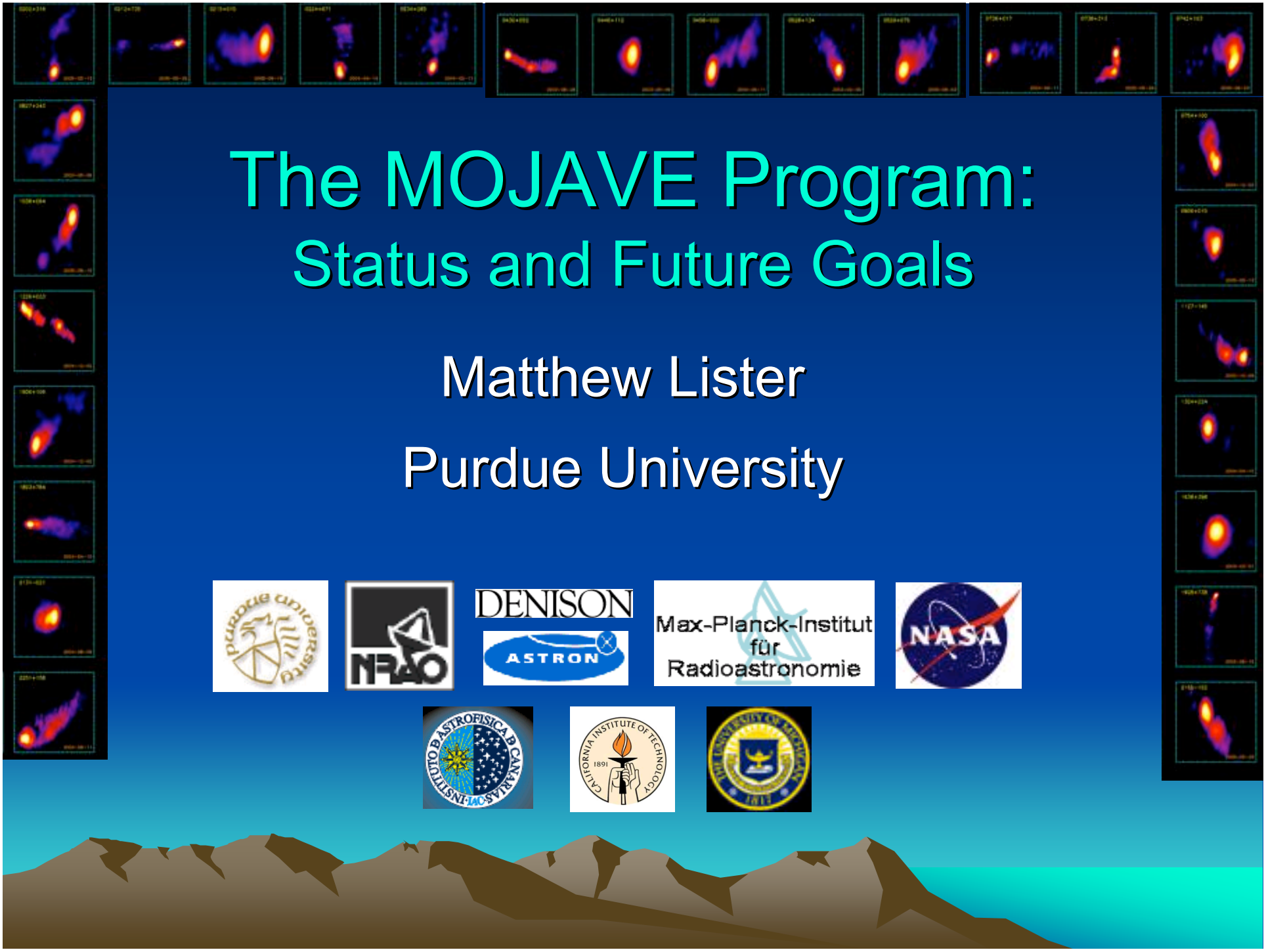

The MOJAVE Program:
Status and Future Goals

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- R. Vermeulen (ASTRON)

Outline

1. Origins and goals of the MOJAVE program
2. Data archive
3. MOJAVE in the GLAST era
4. Challenges facing large VLBA monitoring surveys

Monitoring

Of

Jets in

Active Galaxies with

VLBA

Experiments

History

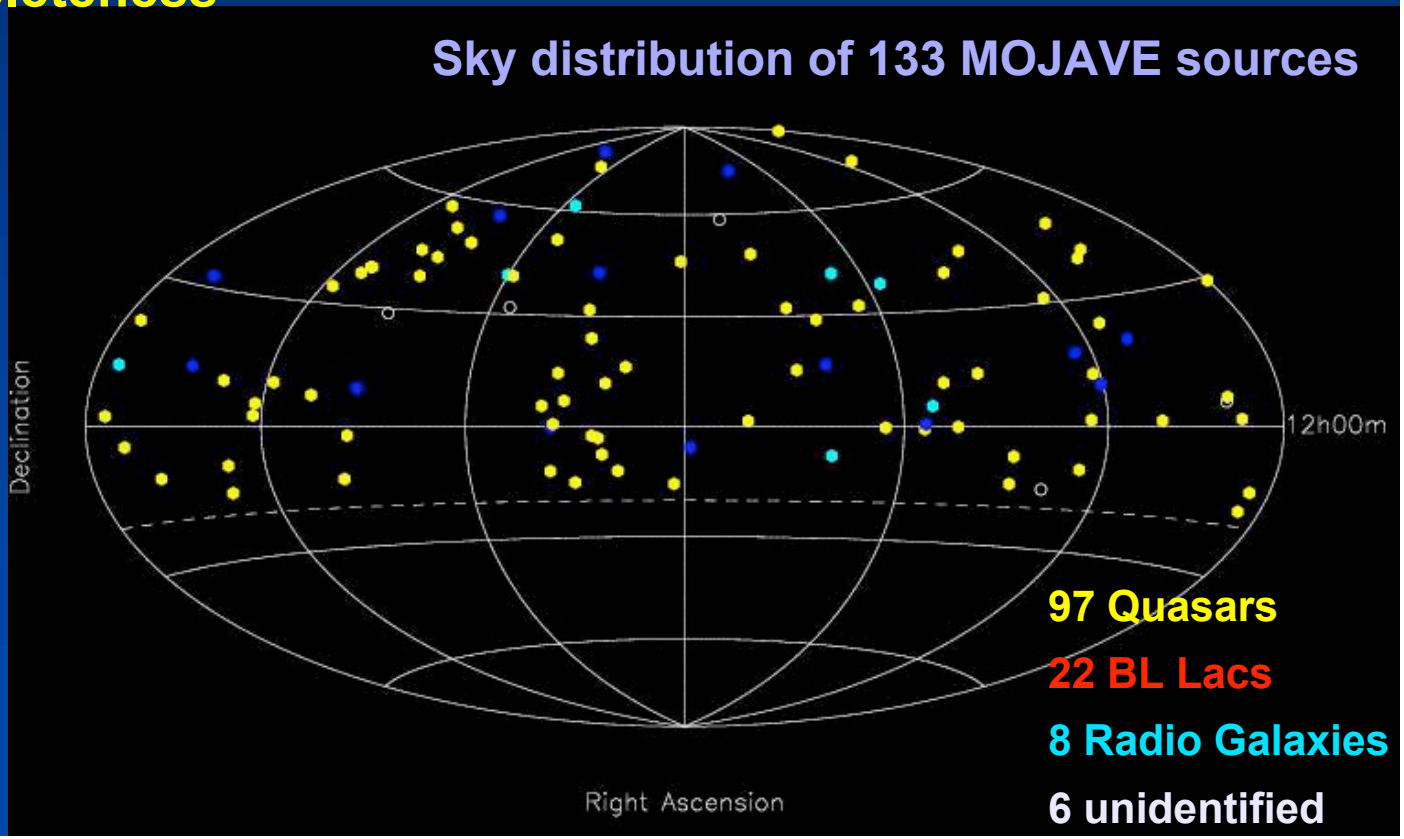
- Pre-VLBA era:
  - only a few dozen reliable AGN jet speeds
  - irregular VLBI temporal sampling

- 1994-2002:
  - over 200 AGN imaged regularly with *VLBA 2 cm Survey*
  - all had > 200 mJy of compact flux density
  - primary goal: understand long-term kinematics of AGN outflows

MOJAVE Phase 1 Survey

- 2002: Full polarization imaging added (linear and circular)

- Source list revised to a flux-limited sample of 133 sources:
  - **15 GHz VLBA flux density > 1.5 Jy (> 2 Jy below celestial equator)**
  - **high completeness**



Lister & Homan
2005, AJ
130,1389

2006: MOJAVE Phase-2

- Sample expanded to 192 jets:
  - 58 EGRET blazars with dec. > -20°
  - 33 low-luminosity AGN (< 10^{26} W/Hz @ 15 GHz)
  - 11 jets from 2 cm Survey with unusual kinematics
- Single epoch on every source at 8.1, 8.4, 12.1 and 15.3 GHz

MOJAVE Archive: Community Resource

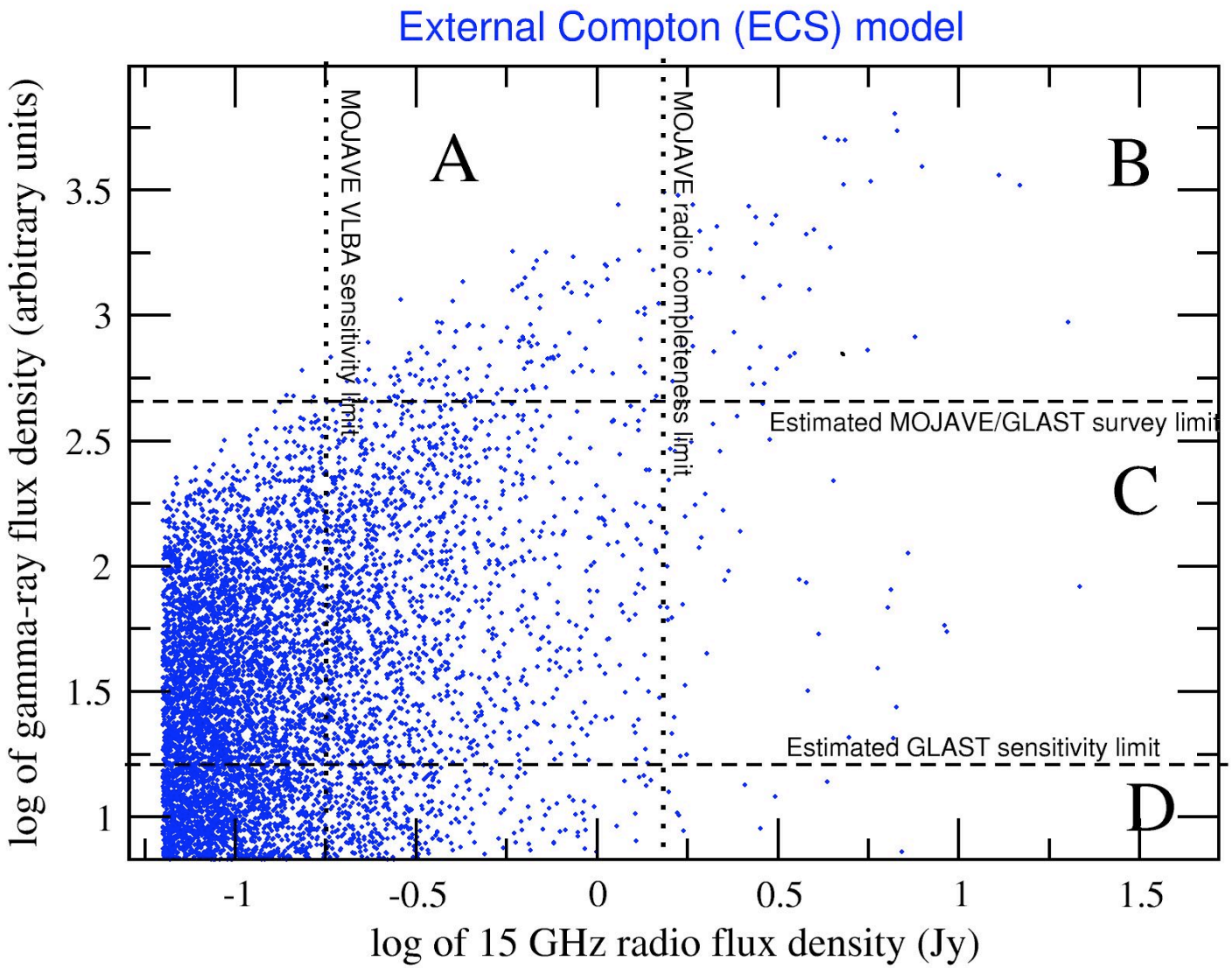
- www.physics.purdue.edu/MOJAVE

- Data on brightest radio AGN in northern sky available typically 5 weeks after observation.
  - **images, visibility data, movies**
  - **radio flux densities and spectra**
  - **kinematics plots (publication in preparation)**

- Please consider contributing any published 2 cm VLBA AGN data you may have lying around.

MOJAVE: Current Status

- 2007 January – 2008 June:
  - one 24hr VLBA 15 GHz run per month
  - 25 sources selected from MOJAVE-2 sample:
    - **individual source cadences (every 2 months to 2 years, depending on angular speed)**
    - **flaring/unusual activity**
    - **community interest/requests**
  - upcoming observing source list at www.physics.purdue.edu/MOJAVE/data.html



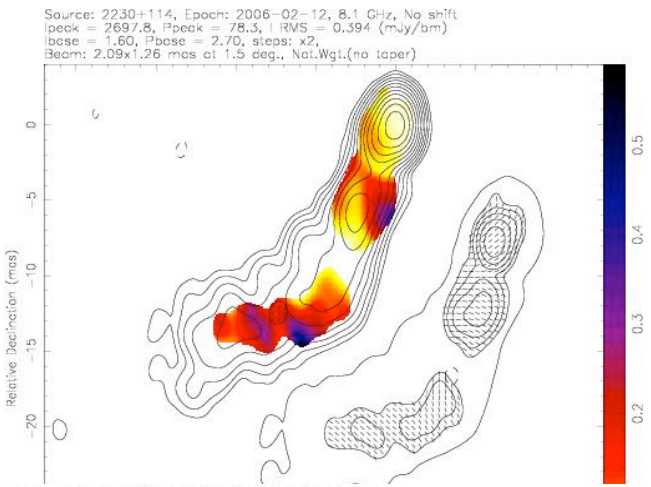
2008-2009: Add up to 100 GLAST AGN detections

-require > 100 mJy VLBA flux density at 15 GHz and dec > -30°

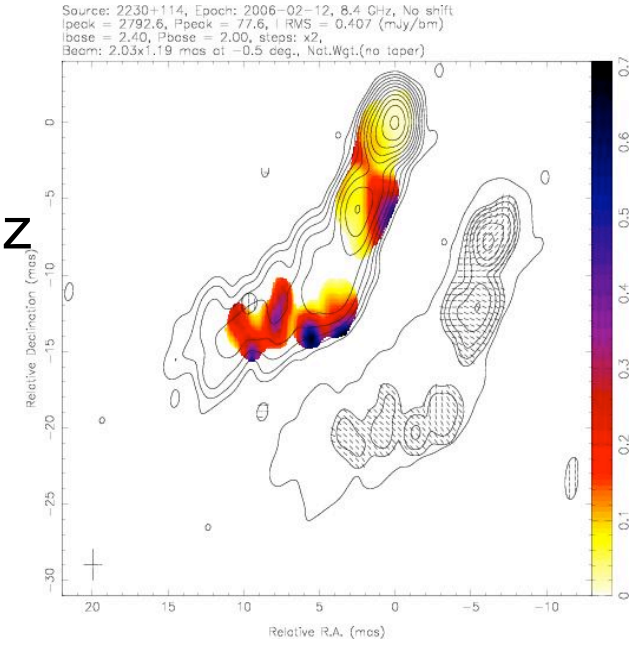
Challenges for VLBA Blazar Monitoring

1. Observing wavelength tradeoffs
2. Temporal sampling requirements
3. Multi-wavelength coordination

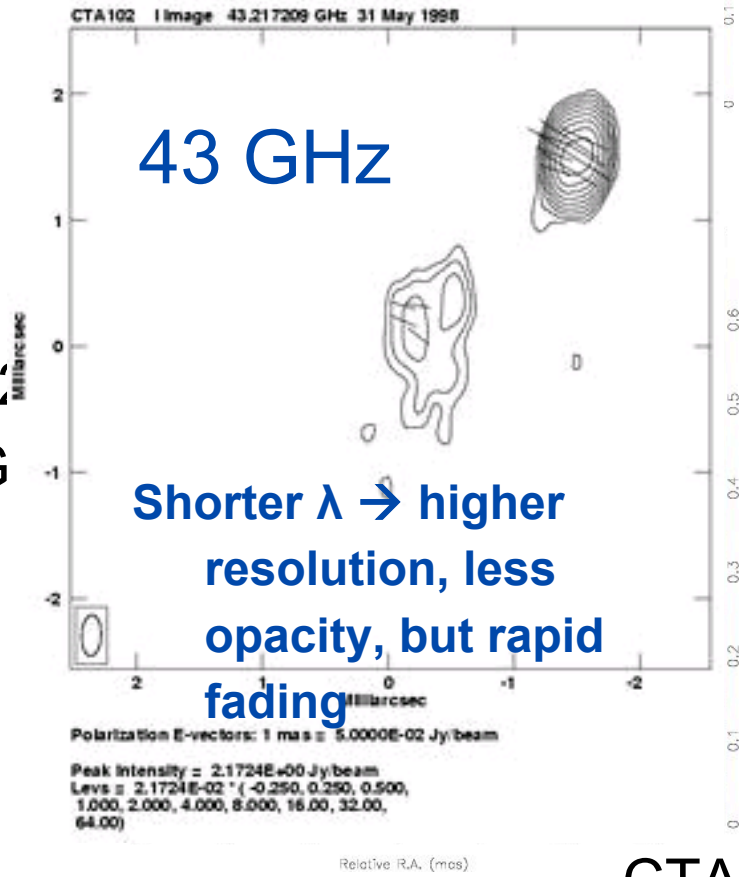
8.1 GHz



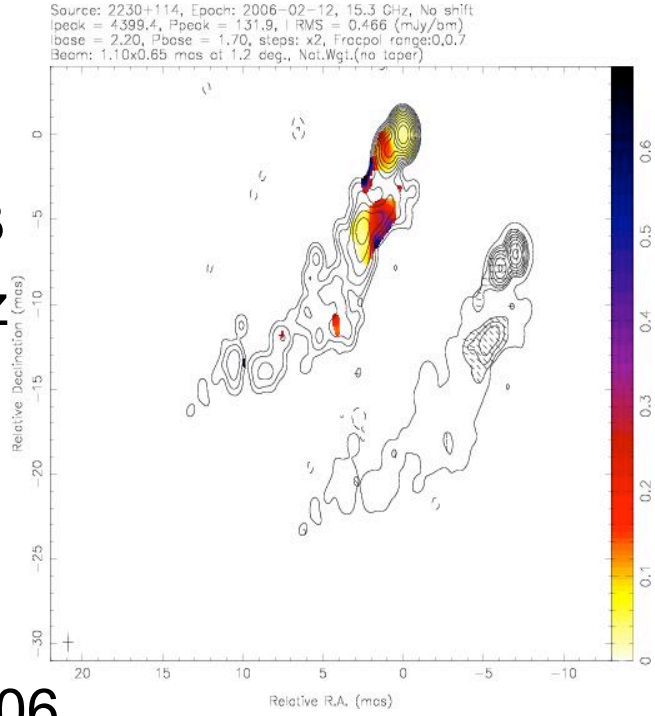
8.4 GHz



12 GHz



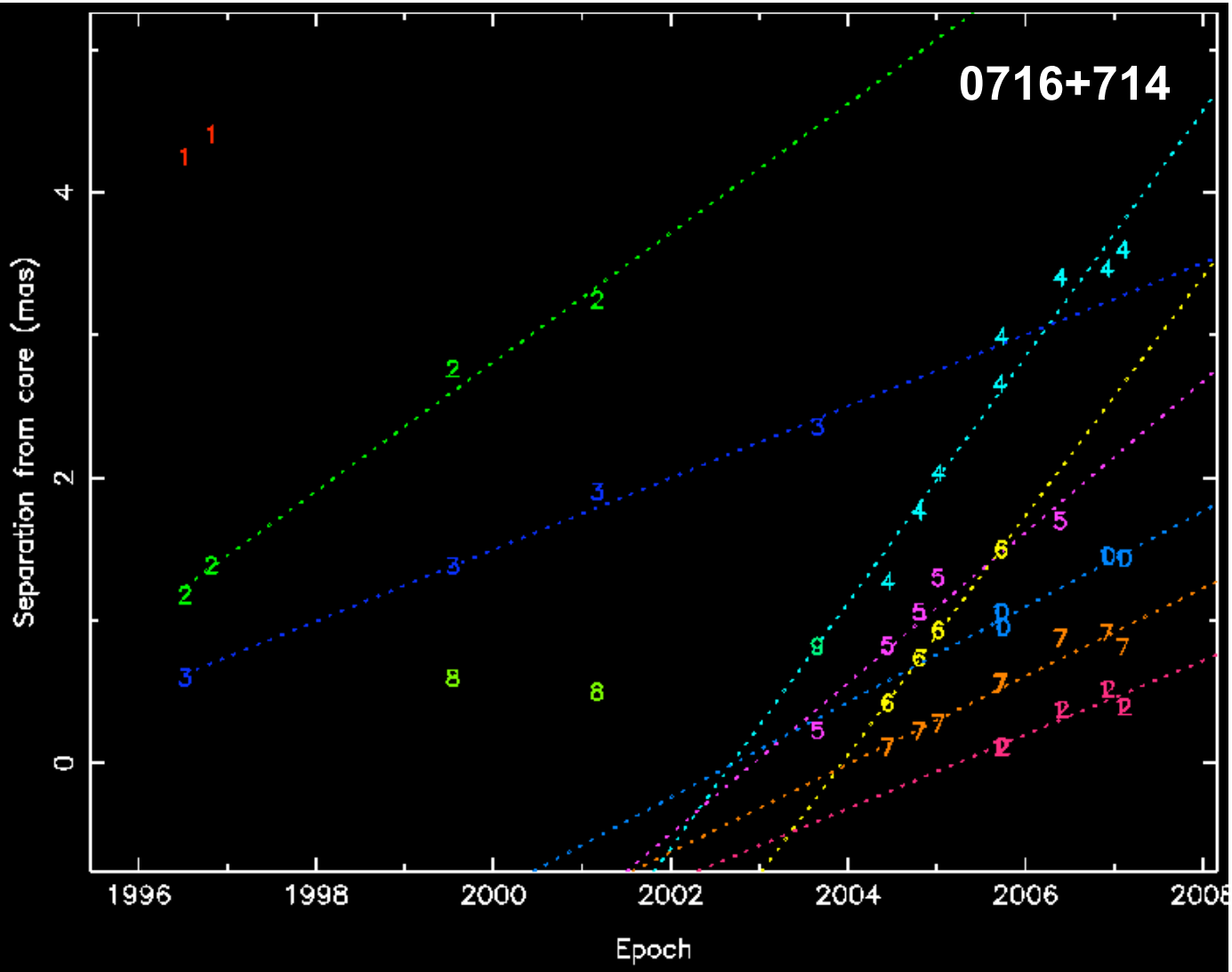
15.3 GHz



CTA 102: Feb 2006

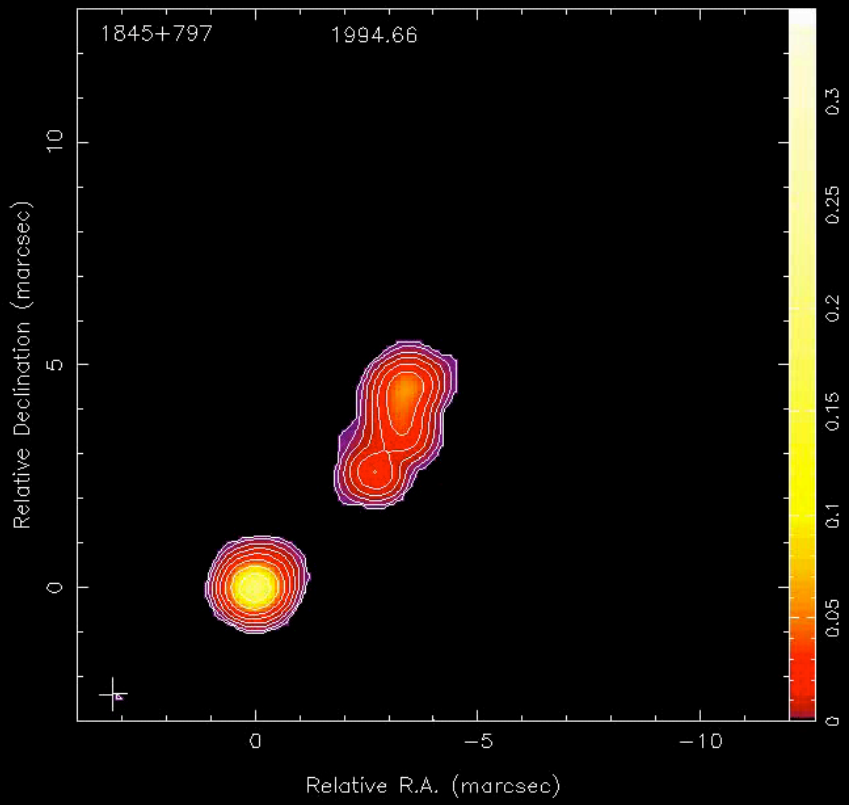
Must sample regularly at appropriate rate:

- **angular speed**
- **component ejection rate**
- **predictability of the source**



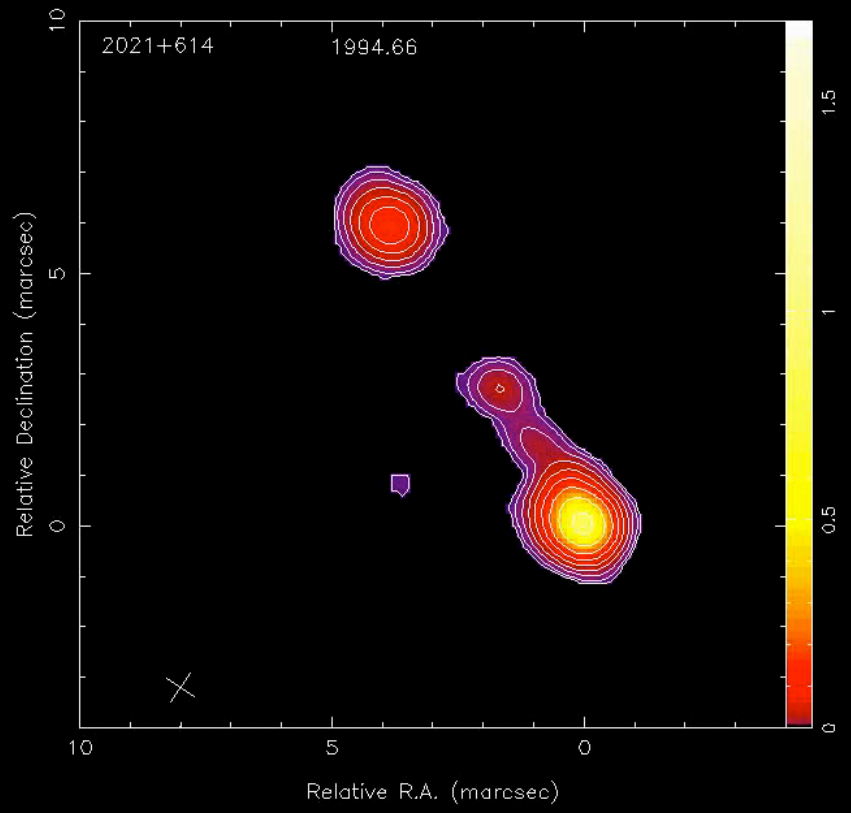
- Want to avoid ‘stroboscopic’ effects:
  - **motion between epochs < ½ component spacing.**
  - **shorter wavelengths require more frequent sampling**

Different jets can require vastly different sampling rates



BLRG 3C 390.3

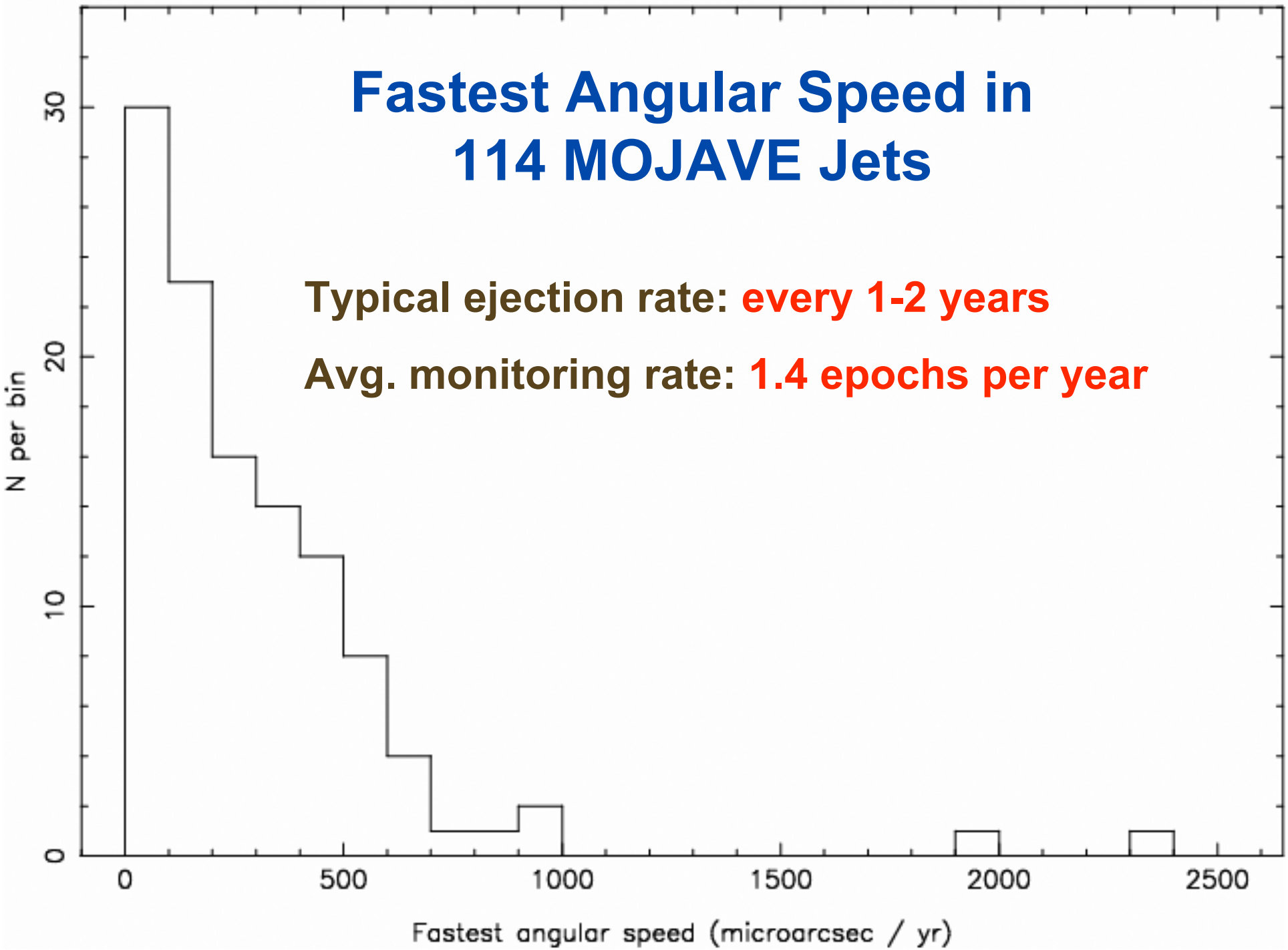
Maximum speed = 605 ± 10 μarcsec/yr



GPS galaxy 2021+614

Maximum speed = 24 ± 4 μarcsec/yr

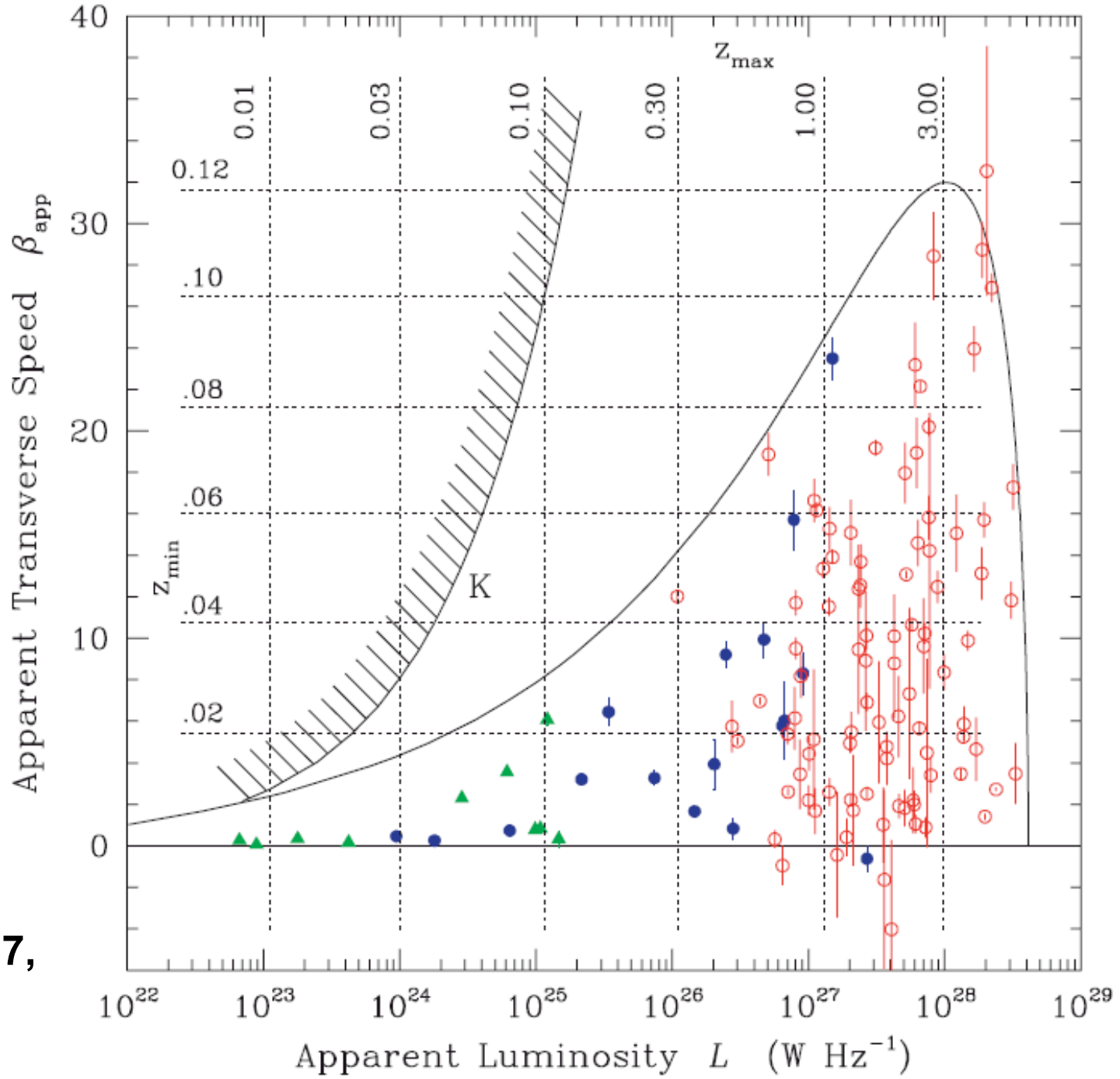
Fastest Angular Speed in 114 MOJAVE Jets



Typical ejection rate: every 1-2 years

Avg. monitoring rate: 1.4 epochs per year

Can use VLBA luminosity to predict maximum jet speed



Cohen et al. 2007, ApJ 658, 232

Multiwavelength Coordination

- Short variability timescales pose serious challenge for studying blazar SEDs

- VLBA scheduling:
  - weather a concern at shorter wavelengths
  - dynamic schedule made 2-3 days in advance
  - high dynamic queue priority essential
  - ideally need time ‘window’ on other facilities

- MOJAVE:
  - 2-3 Swift targets within 48 hrs of VLBA run
  - UMRAO observations of all sources within 48 hrs

Summary

- The VLBA has enormous potential for enhancing GLAST science on AGNs:
  - **apparent jet speeds and Doppler factors**
  - **sizes of emission regions**
  - **ejection dates of moving features**
- Challenges for large VLBA surveys:
  - **establishing optimal sampling rate for each jet**
  - **achieving necessary temporal coverage**
  - **coordinating with multiwavelength observations**
- MOJAVE aims to provide useful service to community during GLAST mission

www.physics.purdue.edu/MOJAVE