OBSERVING BLACK HOLES WITH THE EVENT HORIZON TELESCOPE

Characterizing the Jet Precession of Quasar 3C273 at 1.3mm

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THE EVENT HORIZON TELESCOPE

- AGN anatomy

Credit: Jonathan McKinney (KIPAC)
THE EVENT HORIZON TELESCOPE

- Jet formation:
  - Blandford-Znajek
  - Blandford-Payne

Credit: Jonathan McKinney (KIPAC)

Credit: Xie et al. 2012)
THE EVENT HORIZON TELESCOPE

- Resolution: $\theta \sim \frac{\lambda}{D}$

Credit: Jonathan McKinney (KIPAC)

Credit: Xie et al. 2012)
THE EHT IN 2011

- 2011 array description
PROBLEMS WITH THE EHT IN 2011

- **SMA:**
  - High band bias w/ P station,
  - SP vs. SO/SJ -- 23% bias

- **CARMA:**
  - Hybrid maser setup, multi-band delay
  - Atmosphere on day 92
ZOOMING IN ON 3C273

- History: first quasar
- Large-scale structure: jet, superluminal motion
ZOOMING IN ON 3C273
MODELING THE EMISSION

- Why we can't image:
  - No visibility phase information
  - Poor uv coverage
MARKOV CHAIN MONTE CARLO (MCMC)

- MCMC description: Bayesian framework, maximum-likelihood estimation, chain that walks through parameter space, calculating likelihood at each step then swapping
- EMC: Metropolis algorithm too simple, too step-dependent, various temperatures
- Advantages over least-squares
THE RESULTS

CLEAN I map. Array: BFKLMO

3C273 at 43.218 GHz 2011 Mar 01

Map center: RA: 12 29 08.700, Dec: +02 03 05.096 (2000.0)
Map pixels: 3.1 Jy/beam
Contours: 0.5, 0.5, 0.7071, 1.41, 2.83, 4.39, 5.86 mJy
Contours: 11.3, 16.6, 32, 43.3, 64, 90.5
Beam FWHM: 0.576 x 0.171 (mas) at -3.39
THE RESULTS
THE RESULTS

- Precession is clear over different years
- Different from 43 GHz
CONCLUSIONS

• Precession observable at sub-parsec scales
• Can use polarimetric ratios for astrometry
• Future:
  • follow up of GeV flares
  • physically motivated models
  • imaging capabilities
THANK YOU!

- Vincent Fish, Ru-Sen Lu, Kazunori Akiyama, Sheperd Doeleman