The Galactic Center Stellar Population

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LESIA

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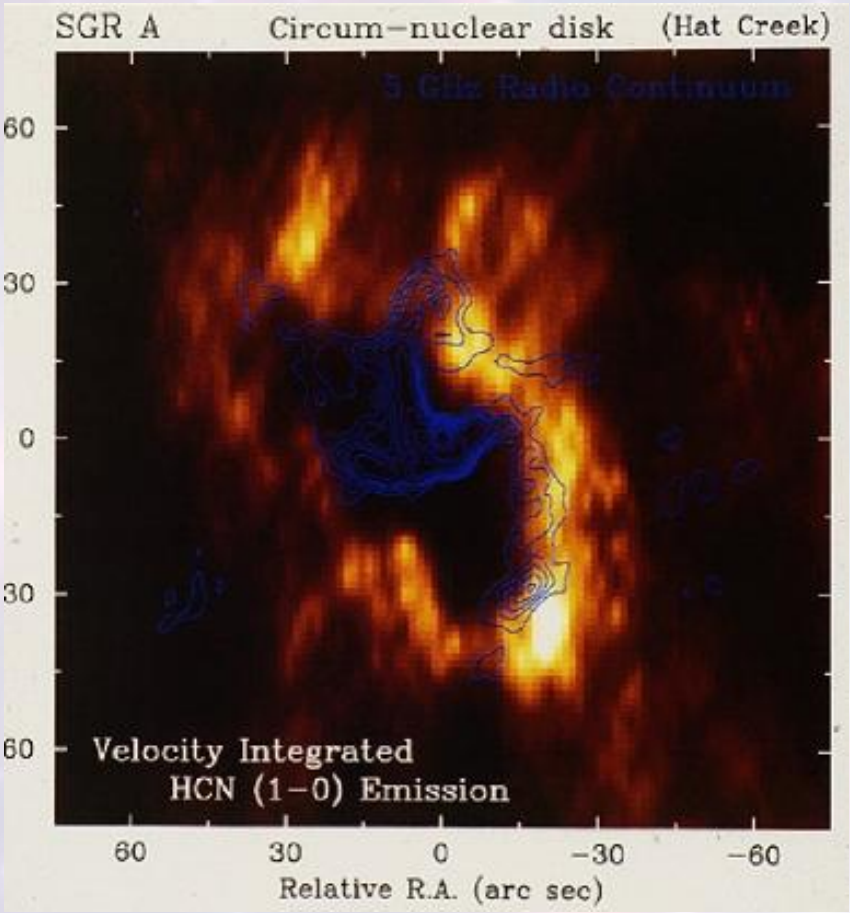


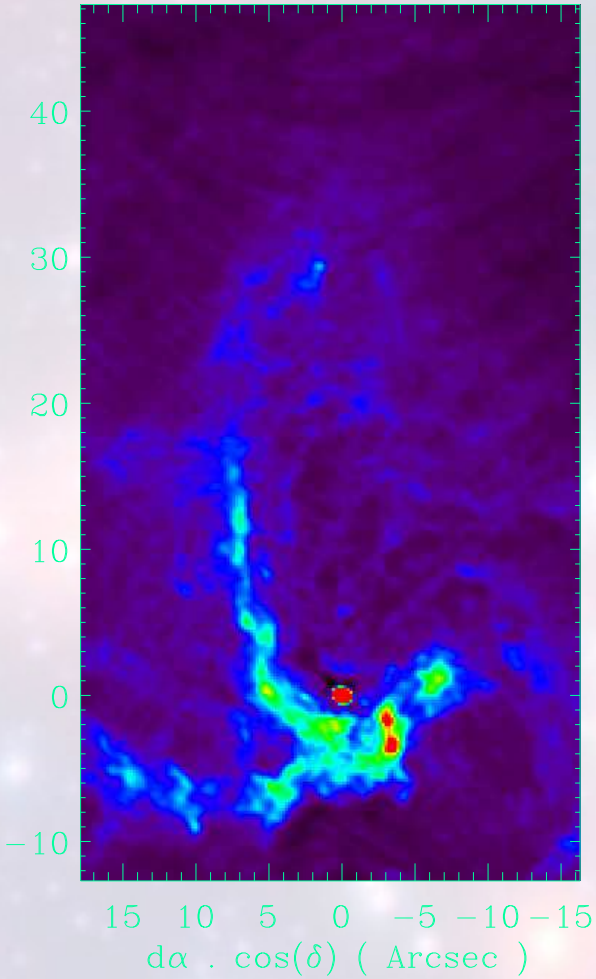
Blitz et al.

Stuff that orbits Sgr A*

- The CND (torus of molecular gas);
- Sgr A Ouest (the Minipiral, an HII region);
- The nuclear cluster of early type stars;
- The S cluster.

GPhys questions

- Sgr A*'s metric;
- Additional dark-matter;
- Baryonic vs. non-baryonic.



Roberts & Goss '93, VLA H92α

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NACO H, K', L

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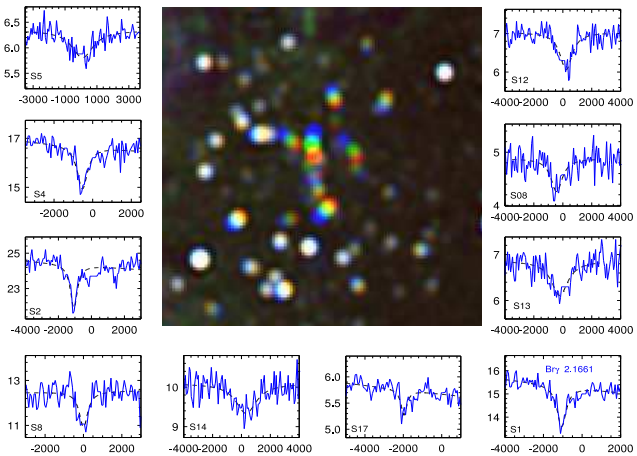

NACO 3 epochs,
SINFONI spectra

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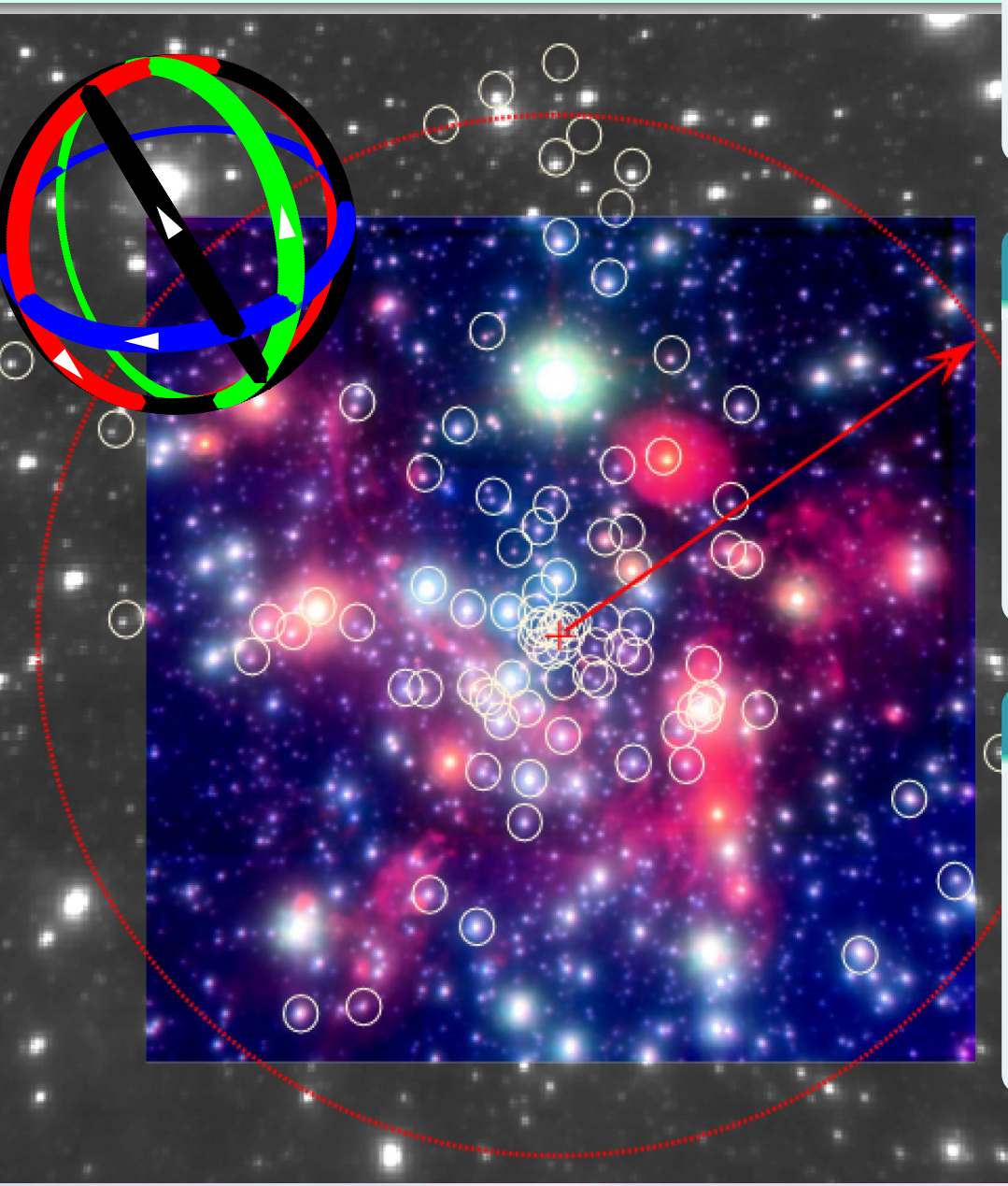
Nuclear Cluster



Current limits

- B main sequence stars;
- orbits: a couple arcsec (20 stars).

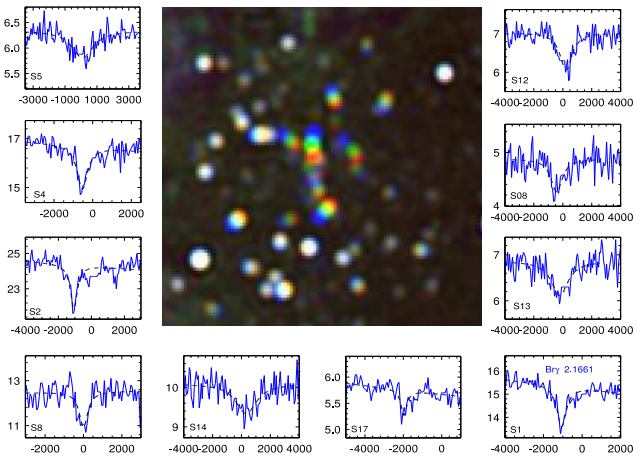
GRAVITY capabilies

- Measure size of few stars;
- Accelerations for few stars throughout central parsec. $a_{5''} \simeq 0.5$ km/s$\simeq 12$ μas/yr^2

Results

- Mass profile in central parsec
- GCIRS 13E: intermediate mass black-hole?
- Significant dark matter halo?

The Cusp or S Star Cluster



3-epoch NACO imaging
SINFONI spectra

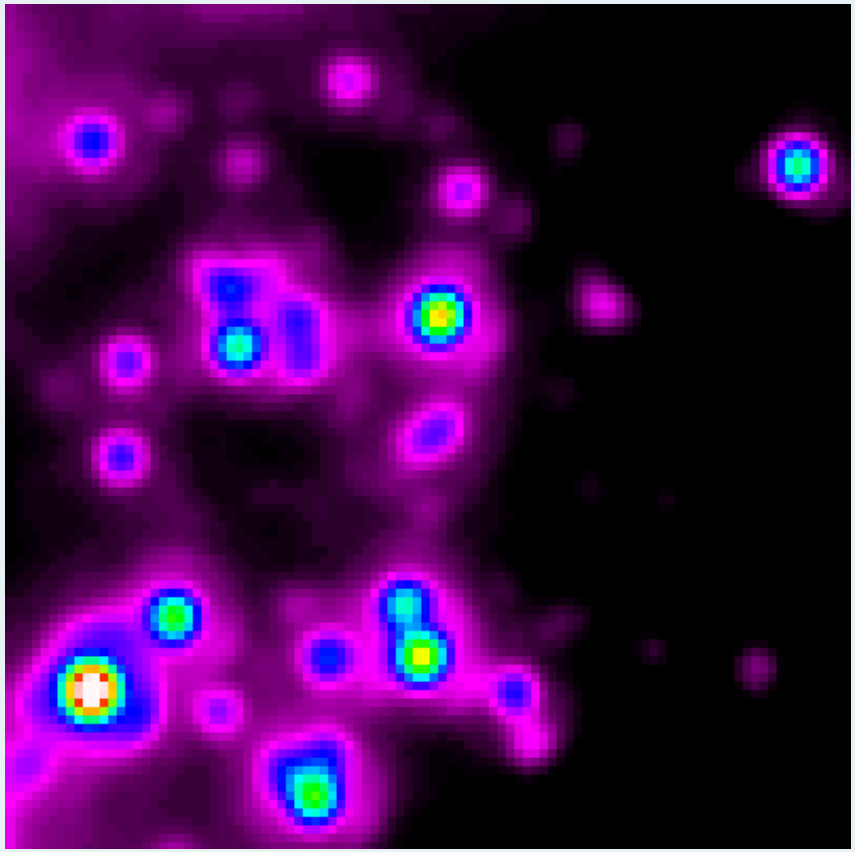
1 light-month

- (too) many OB stars;
- excentric orbits;
- S2: 15-year period, 1% light-speed;
- Keplerian orbits to within uncertainties.

Limitations

- spatial crowding;
- astrometric precision.

The cusp in the central arcsecond



actual NACO image

What we will see

- break confusion limit
- 10-fold better astrometry
- fast orbits (few years)

Weinberg, Milosavljević & Ghez 2005

- 100-fold improvement on R_0 and M_{SgrA*}
- Dark cusp
  - Newtonian precession (retrograde);
  - 2-body encounters with stellar remnants;
- Relativistic precession (prograde);
- Galactic dark halo shape!

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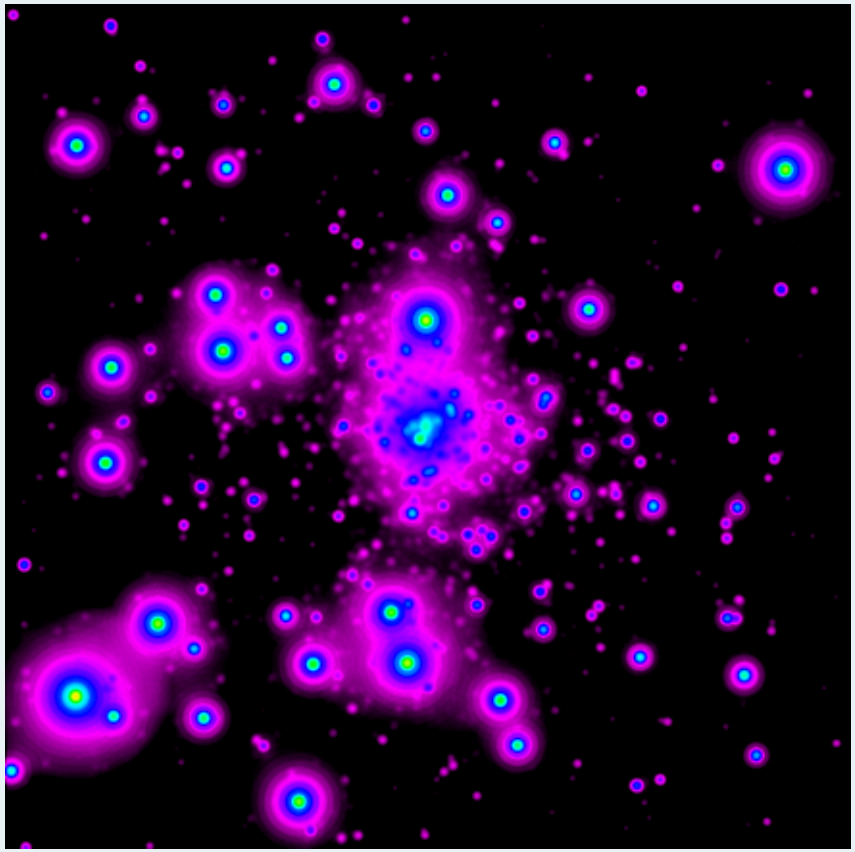

simulated MICADO image
S. Trippe & R. Genzel

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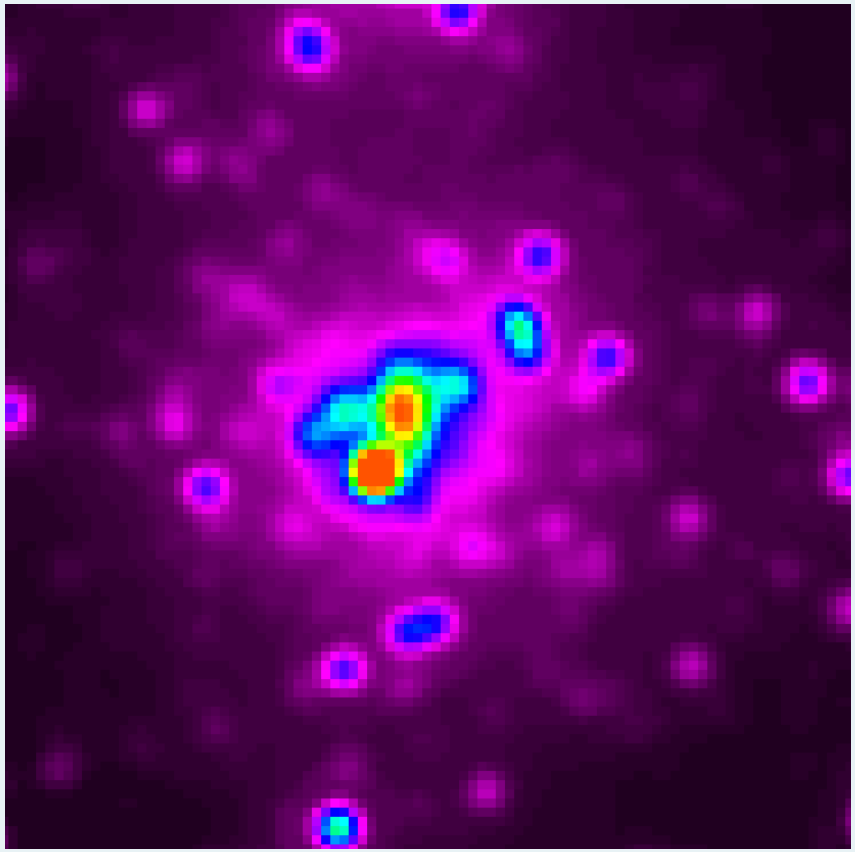

MICADO zoom
S. Trippe & R. Genzel

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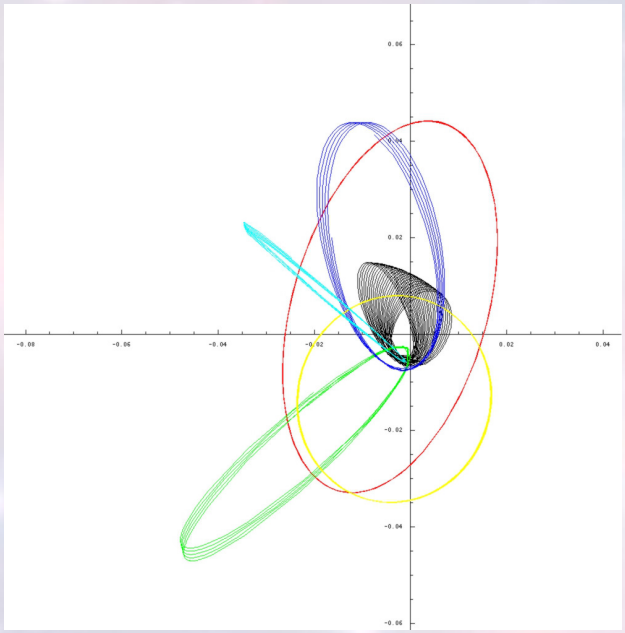
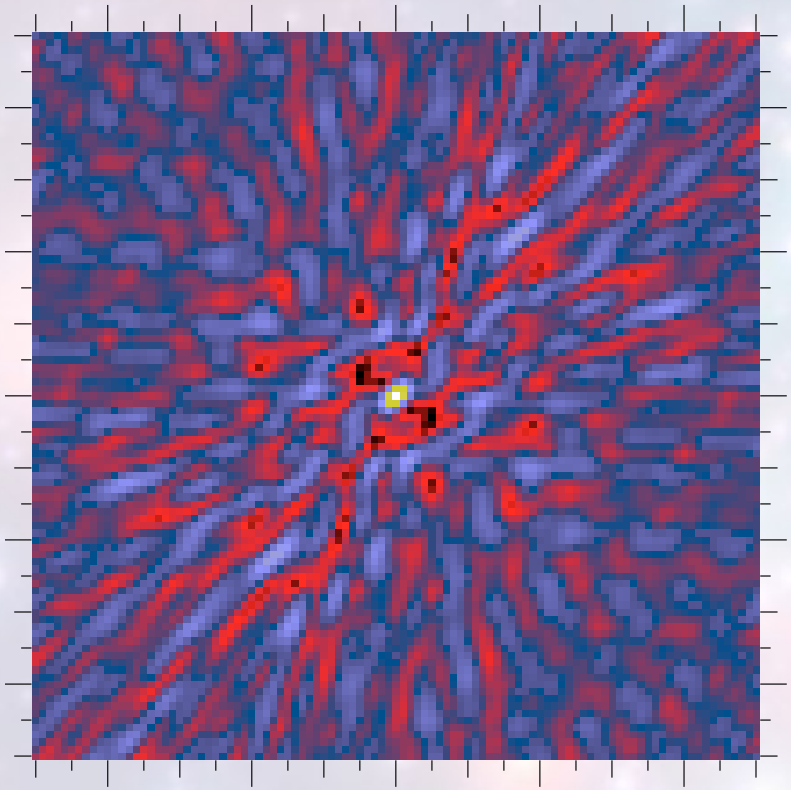
Down-sized S cluster



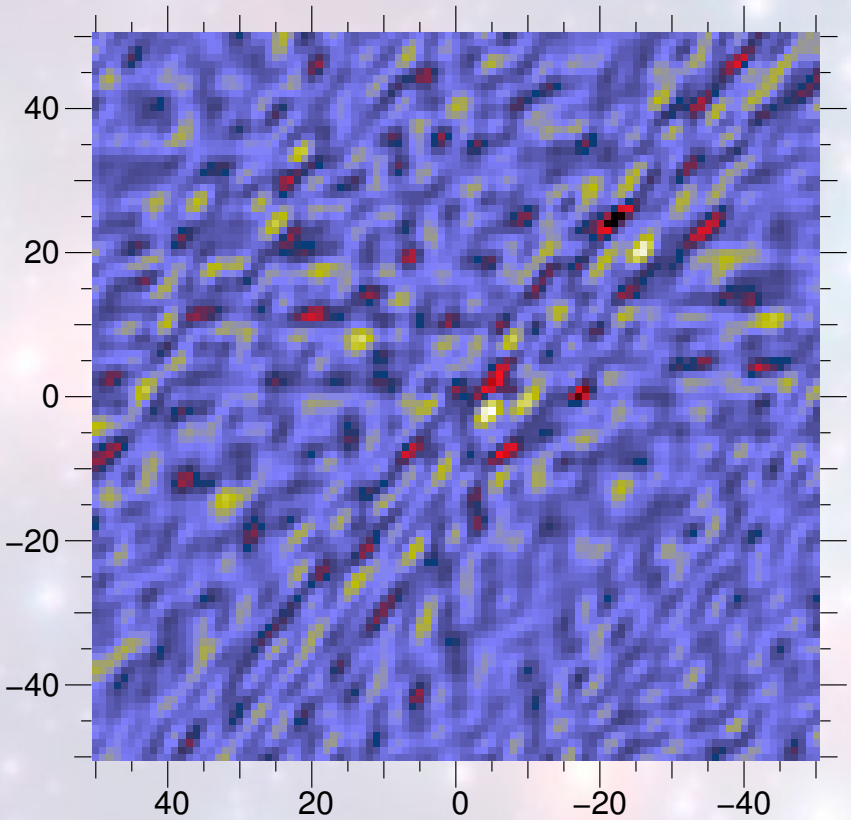
PSF: 3 (V, φ) sets, K-band, 4 UTs



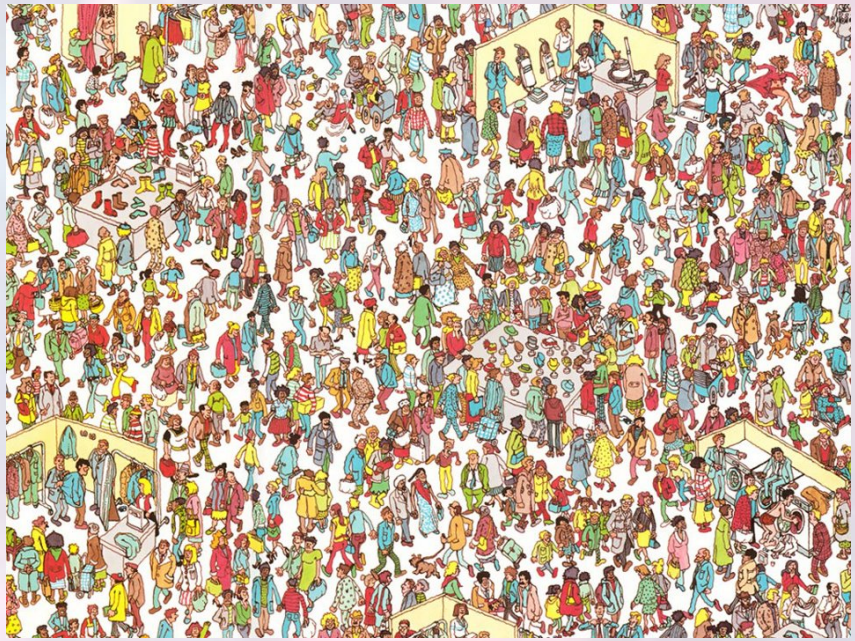
Assumed constraints

- 3h per observation;
- 5 spectral elements in the K band;
- dynamic range: $\simeq$ 1 mag;
- error on visibility:1%;
- error on phase: 2°.

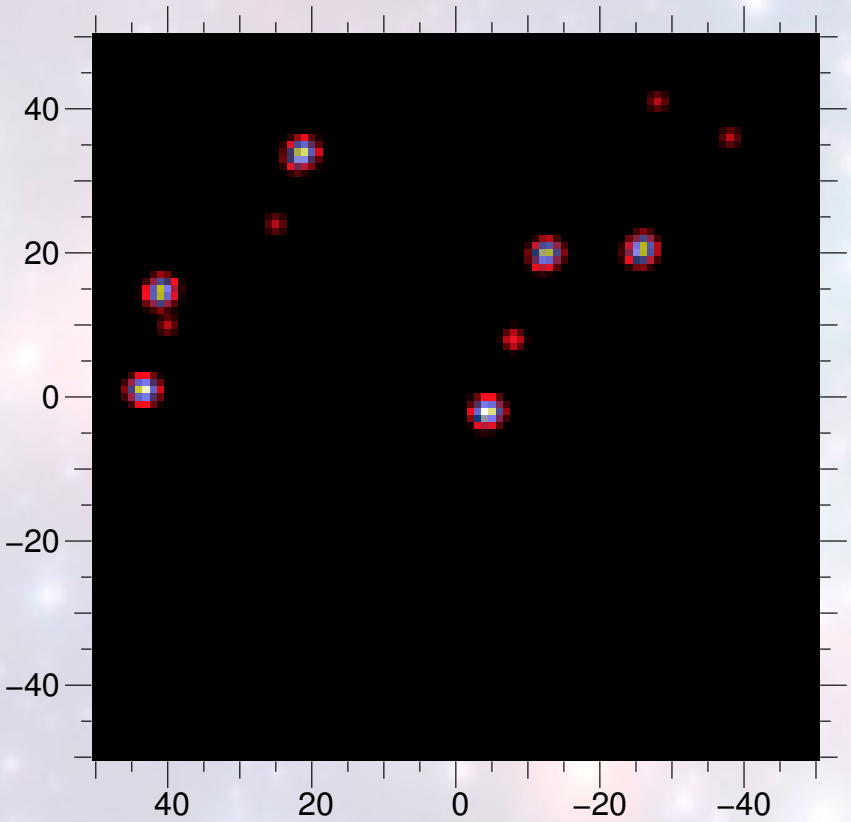
Synthesised image



Where are the six stars?



Synthesised image, cleaned



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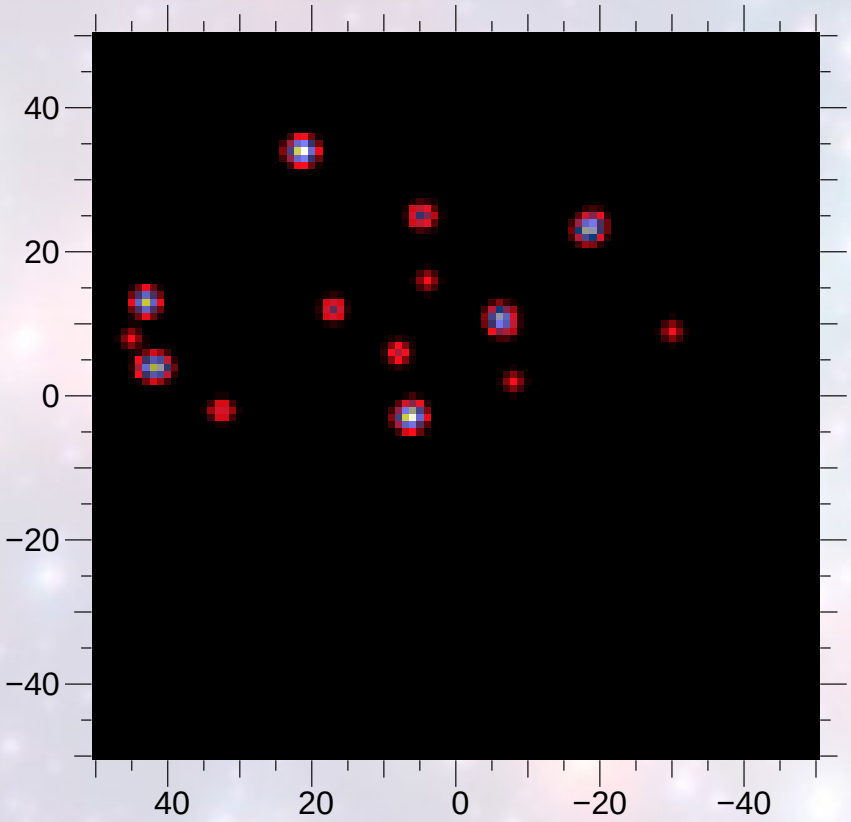
3 months proper motion



May (2 (V, φ) sets)

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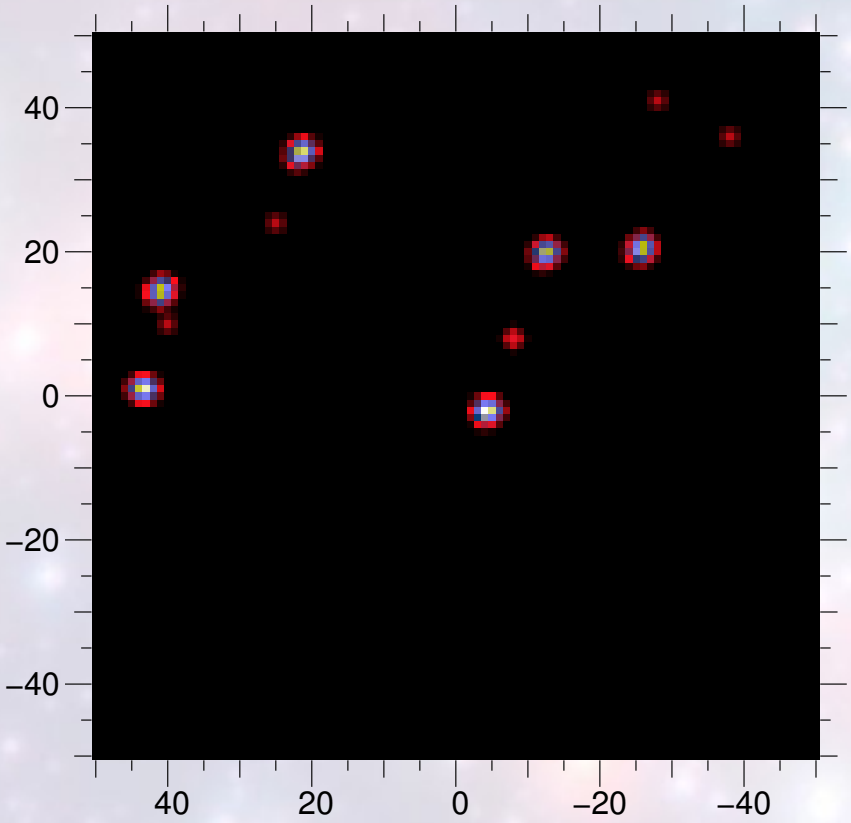

June (3 (V, φ) sets)

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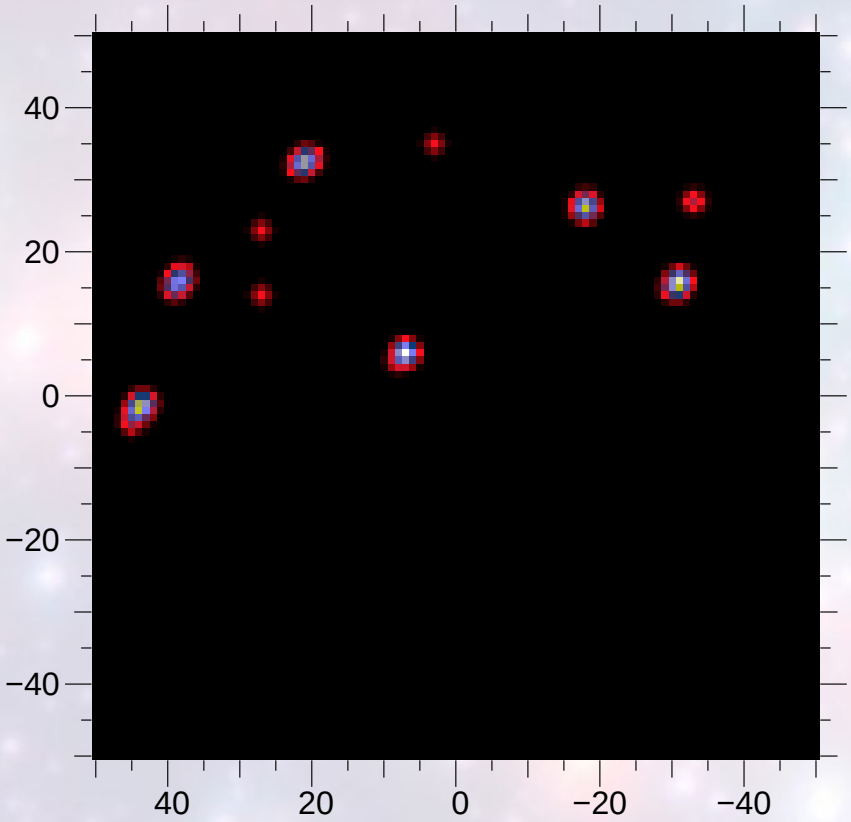
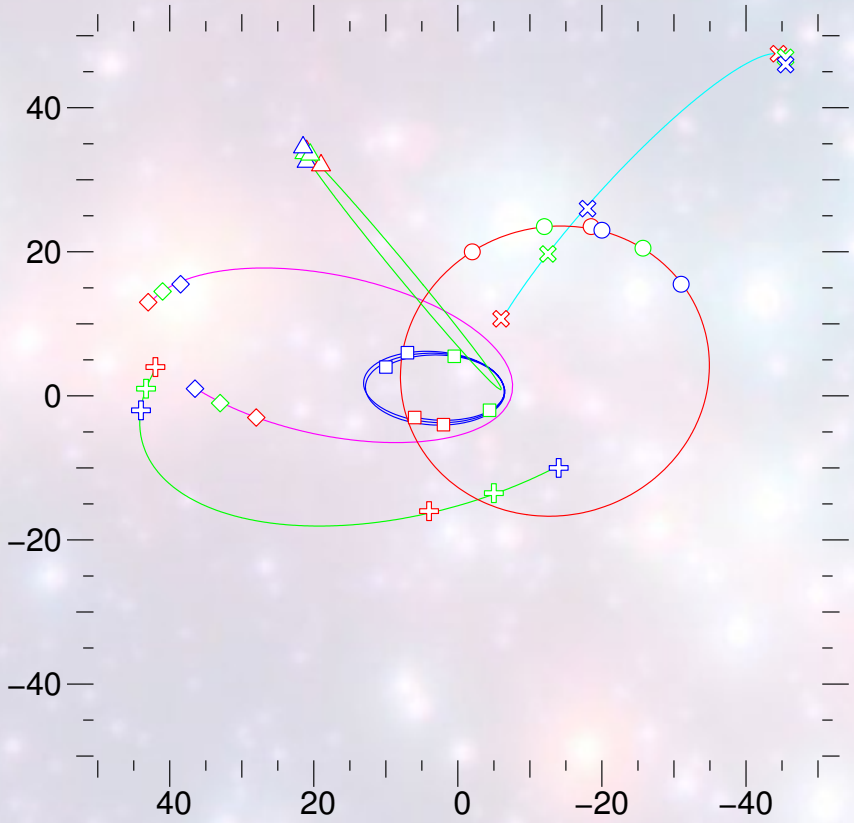


July (2 (V, φ) sets)

2 seasons proper motion



Relativistic precession within 2 years!

- Here: Crude measured astrometry + input orbits.
- Real model fitting somewhat complex (Römer effect, lensing effects). See Marion's talk.

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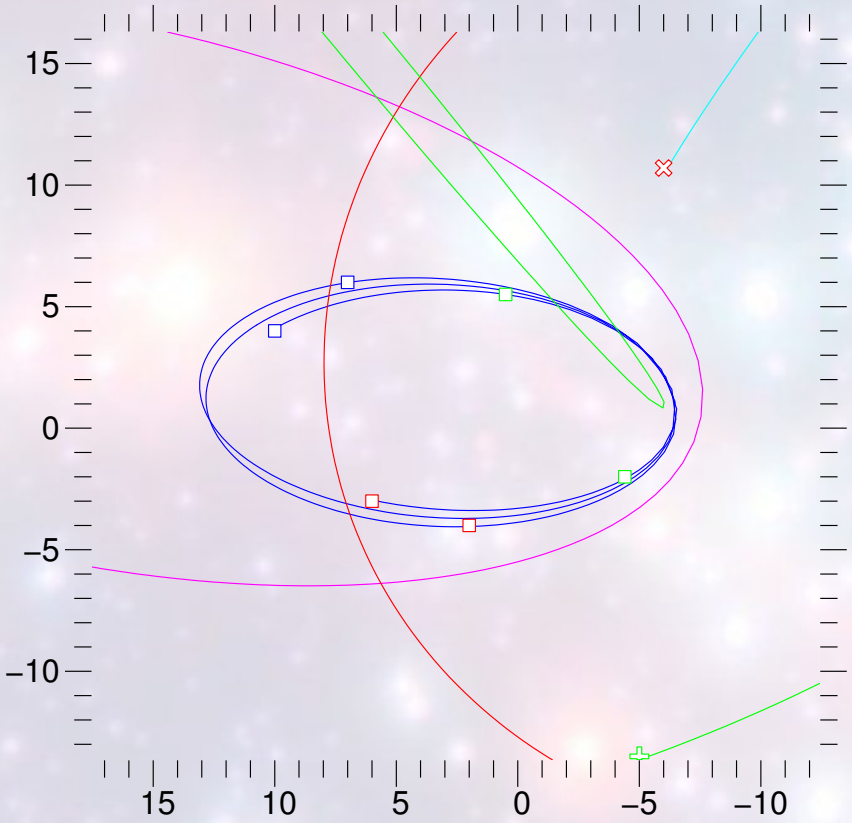

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