

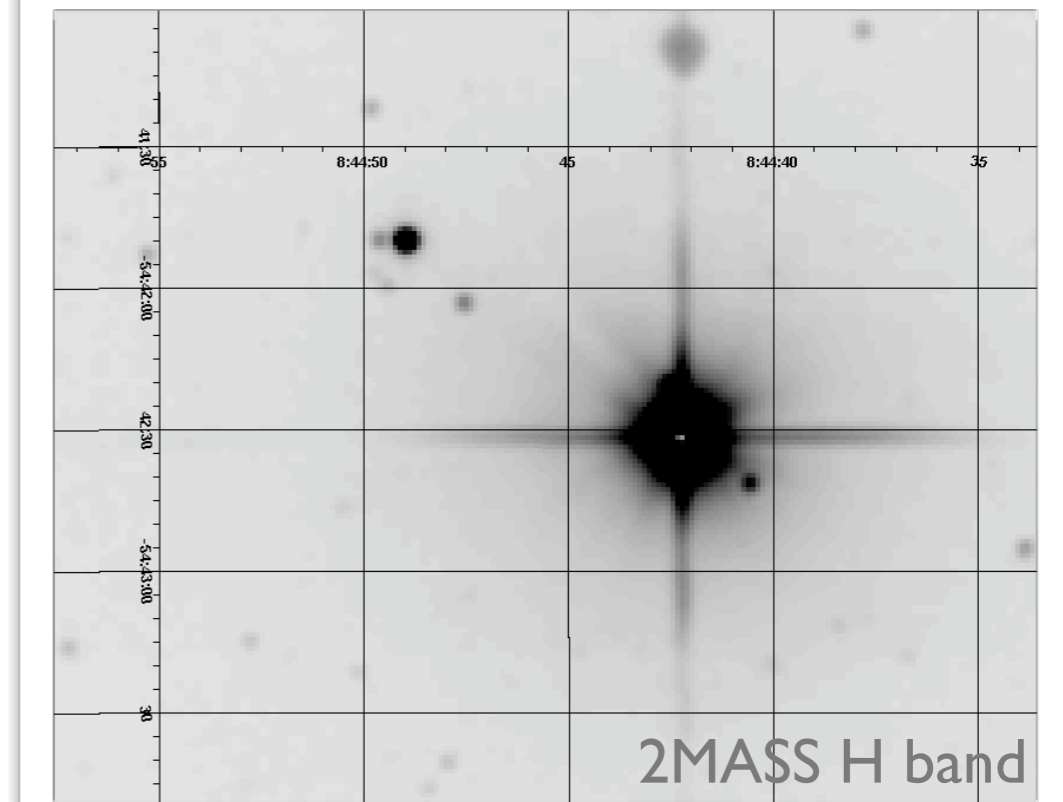
Interferometry, spectroscopy and astrometry of the bright eclipsing binary δ Velorum

Pierre Kervella,
Antoine Mérand, Theo Pribulla

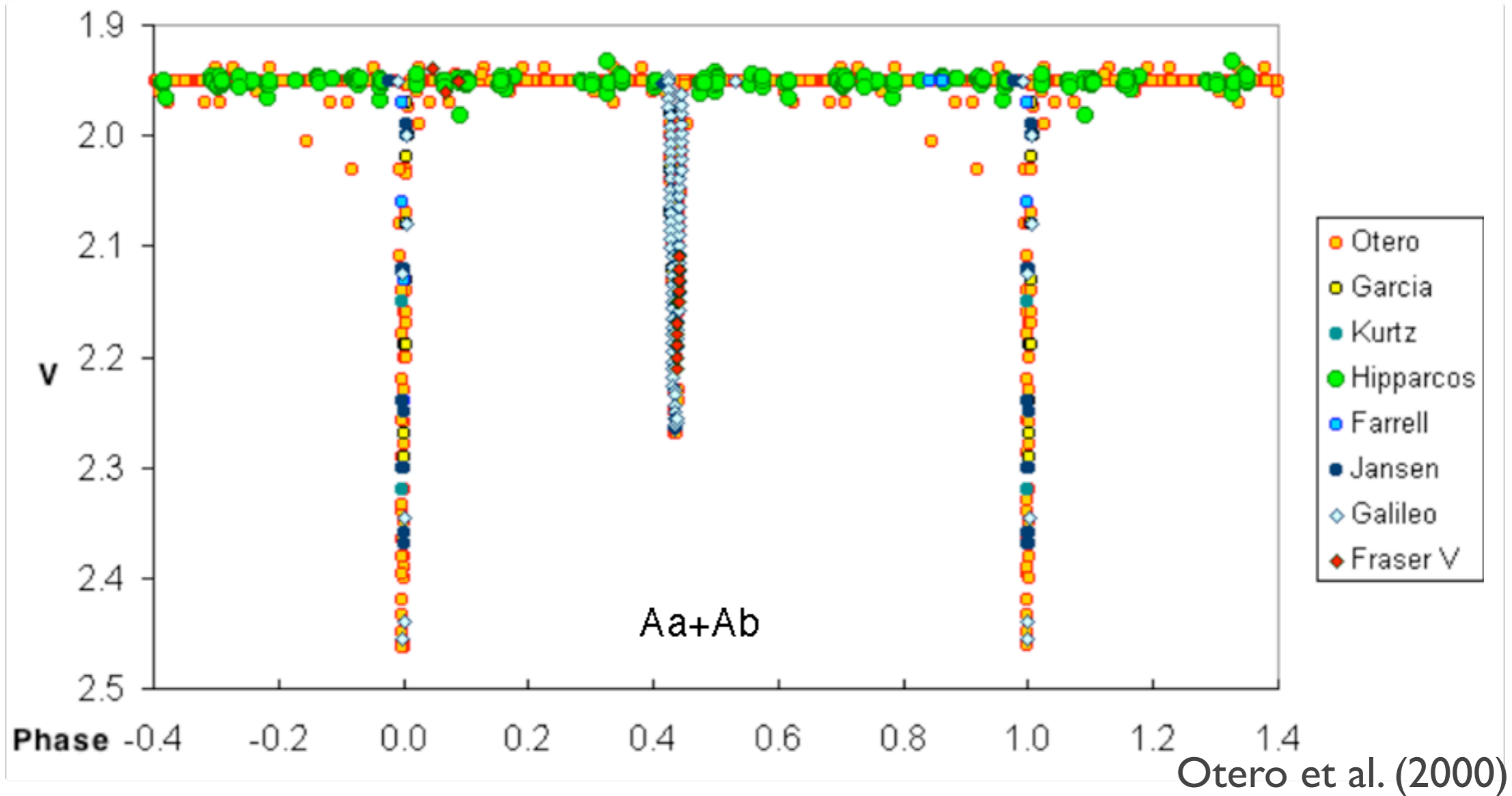
(1) Paris Observatory,
(2) ESO, (3) Slovak Academy of Sciences

Basic properties

- $V = 1.96$, early A type spectrum, some IR excess
- $d = 24.4 \pm 0.2$ pc (Hipparcos)
- member of a (multiple) visual system
- just another early type star...

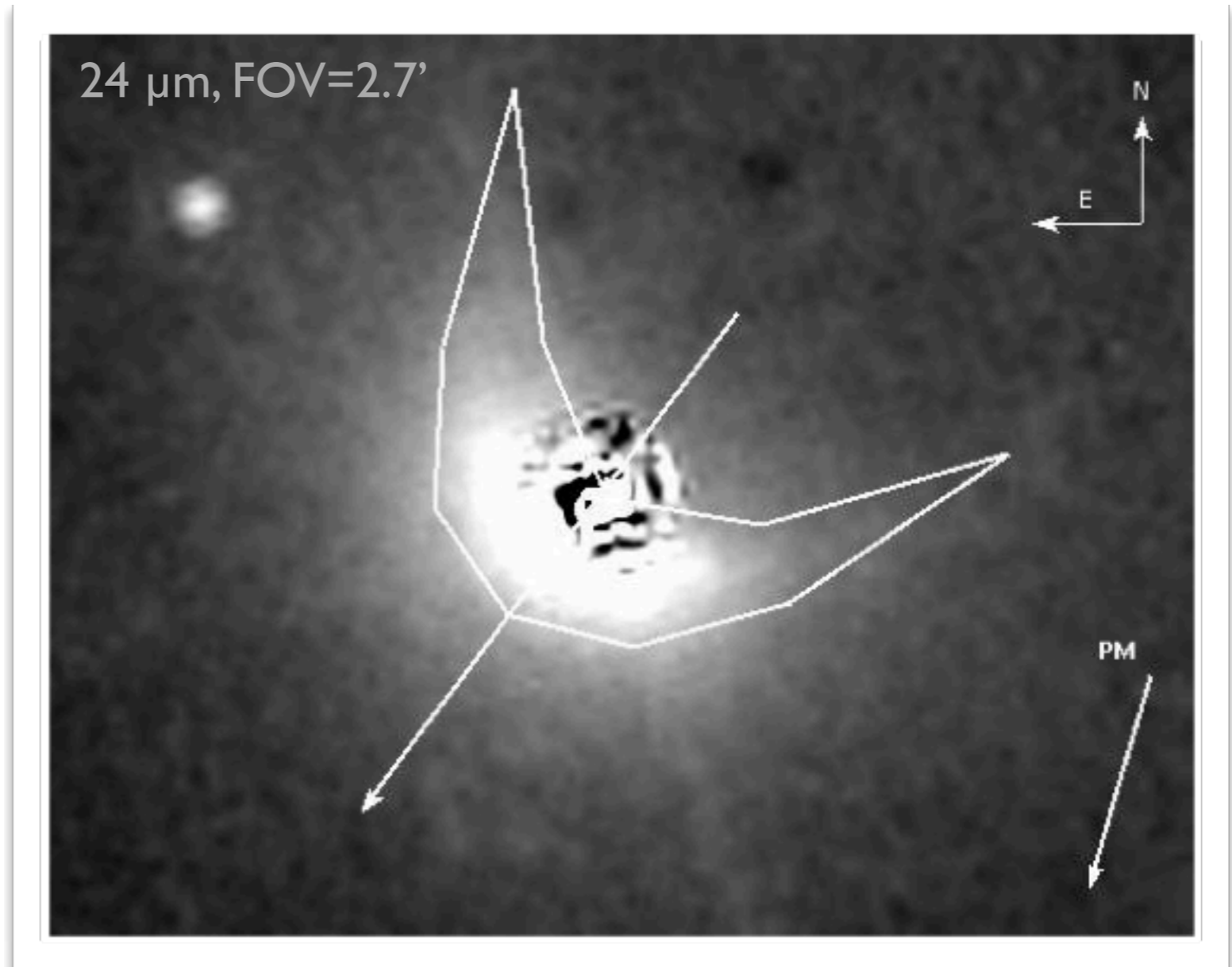


The δ Vel surprise



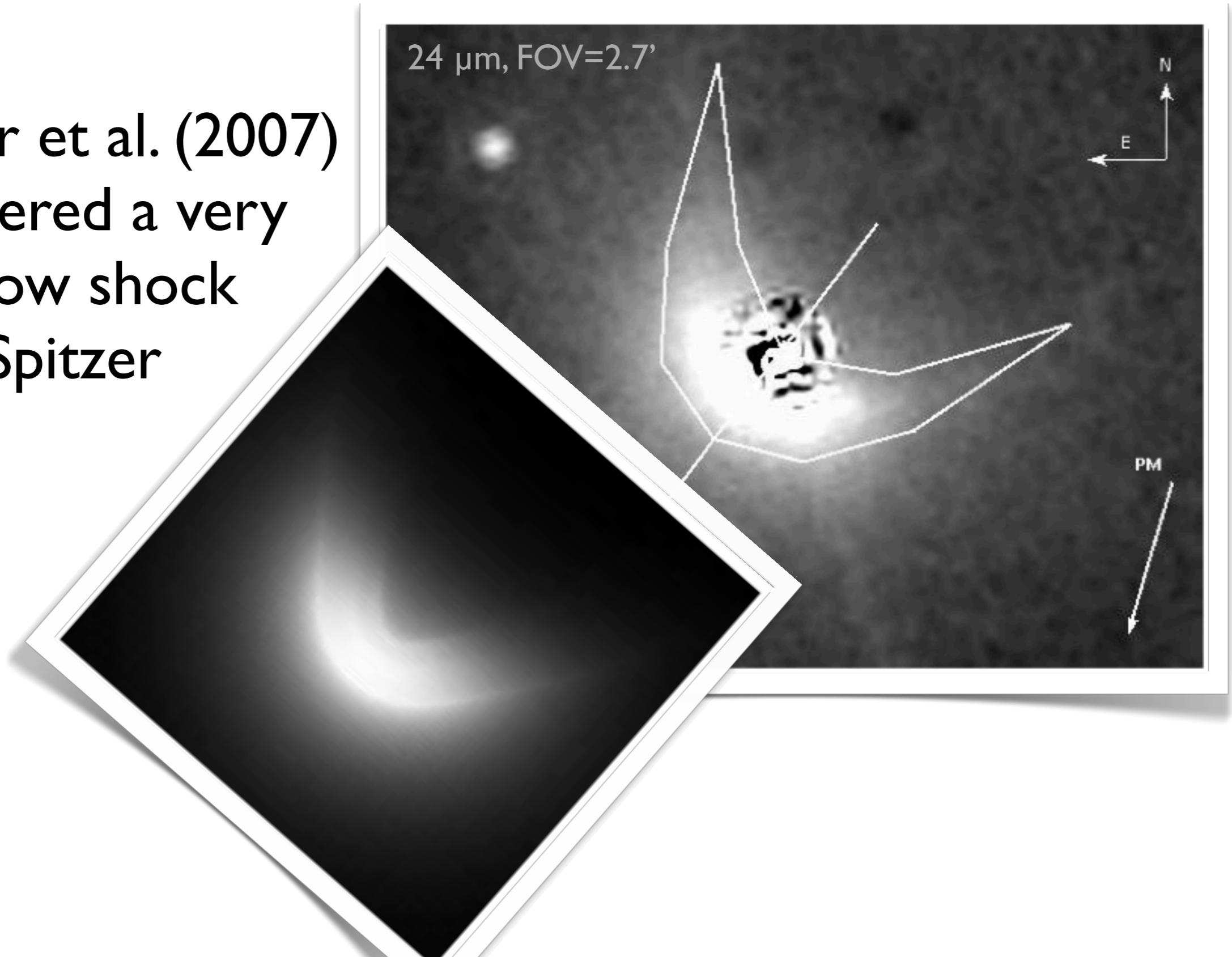
And another...

- Gaspar et al. (2007) discovered a very nice bow shock using Spitzer

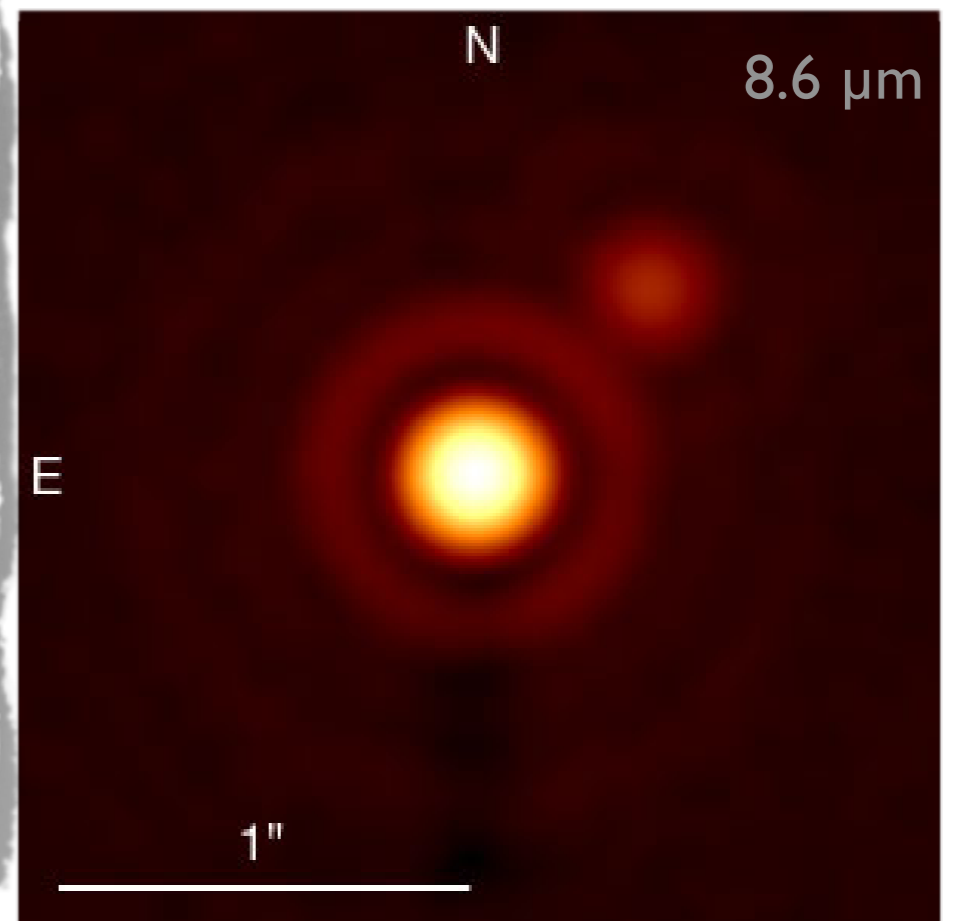
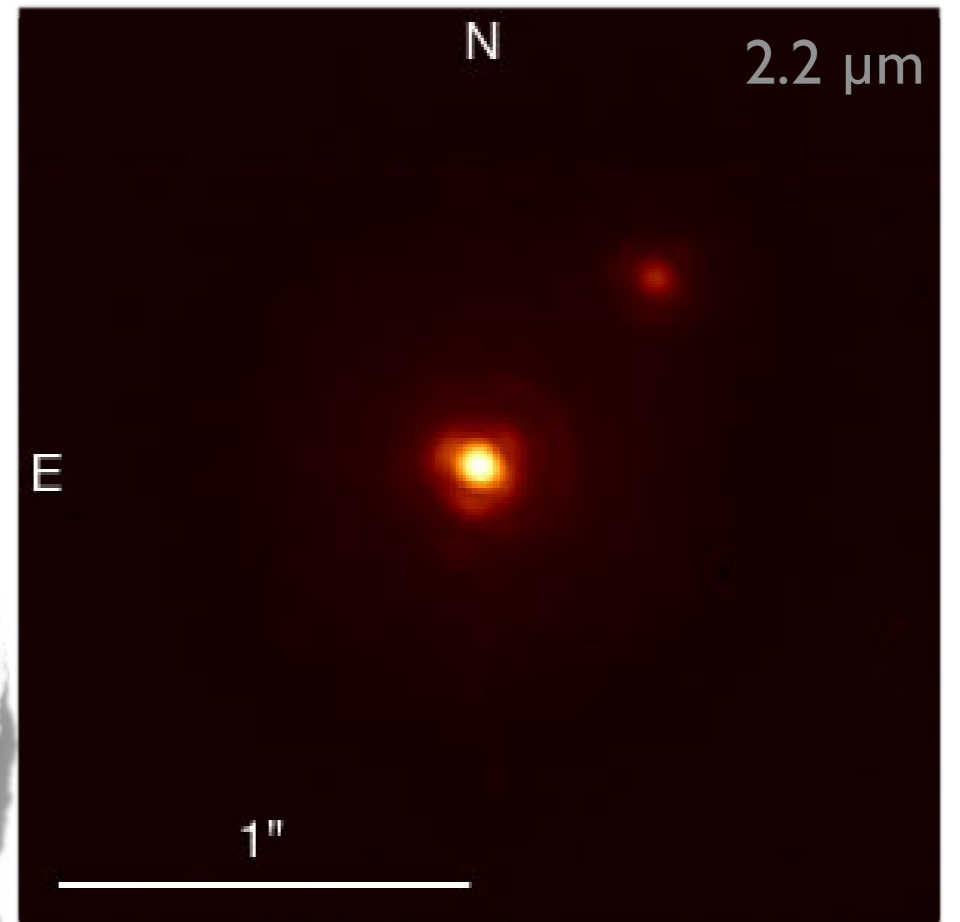
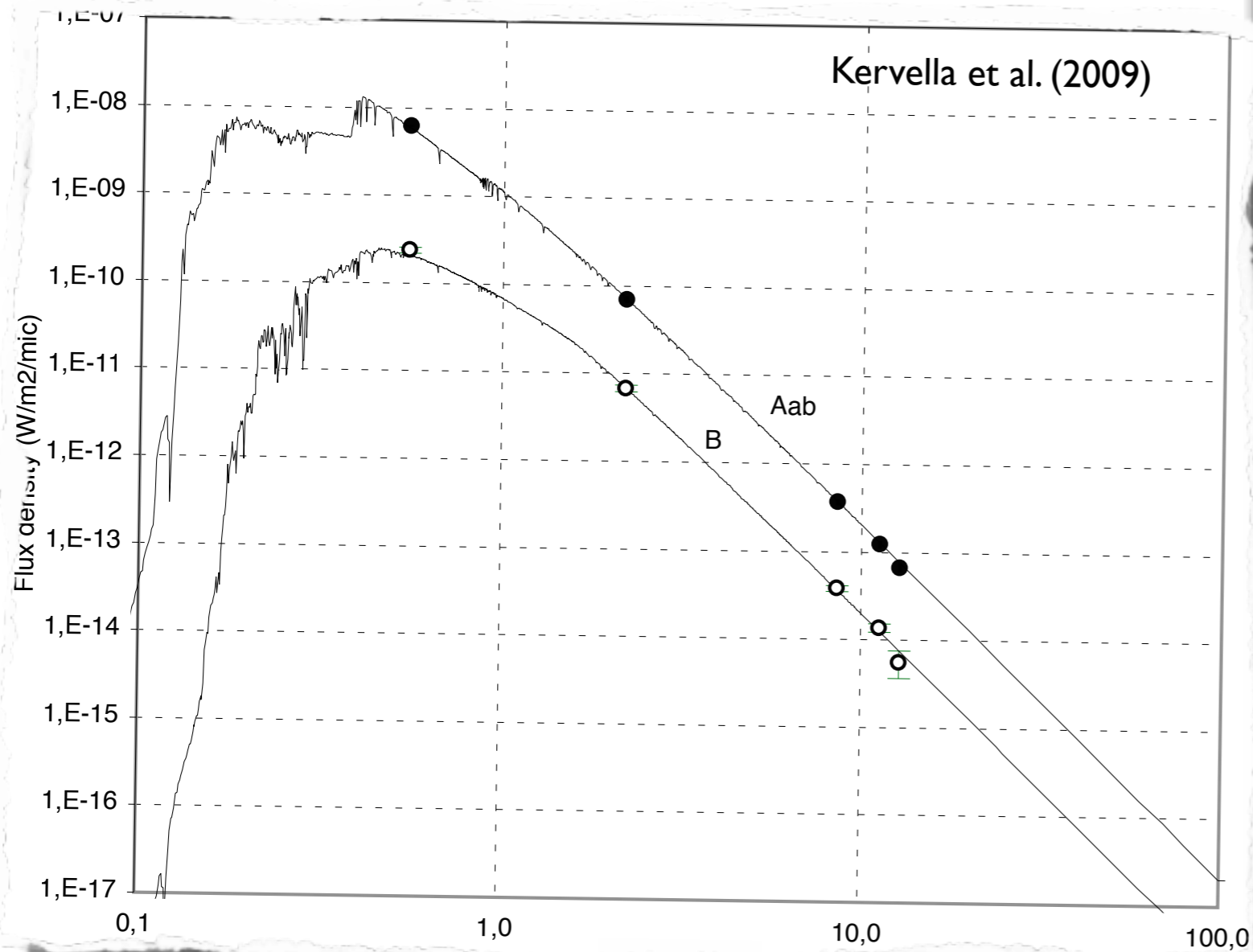


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Circumstellar IR excess ?

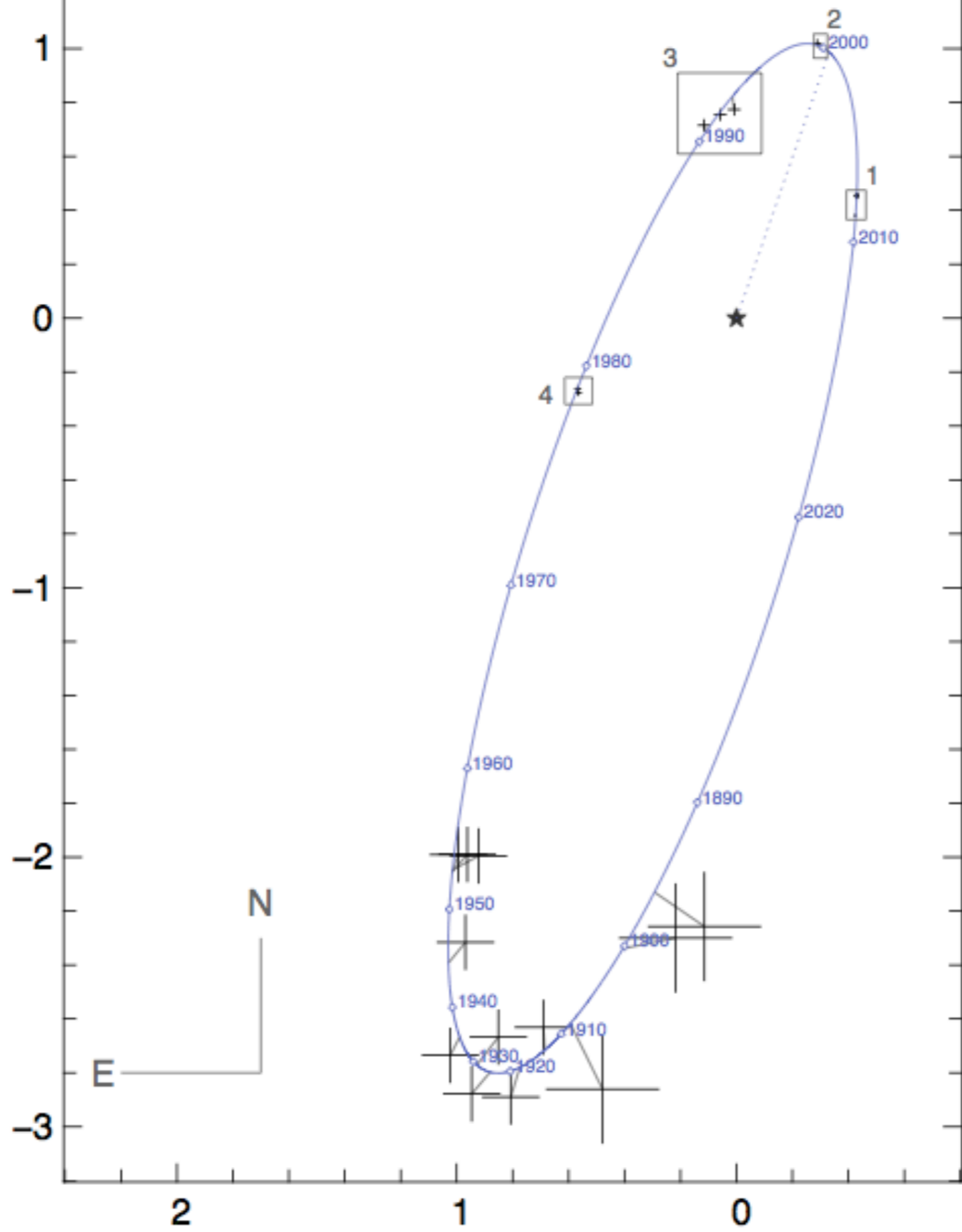


A-B orbit

- Long period, visual orbit
- Archival + NACO astrometry
- No radial velocities (at present)

Mérand et al. (2011)

δ dec (arcsec)



Mérand et al. (2011)

δ dec (arcsec)

1
0
-1
-2
-3

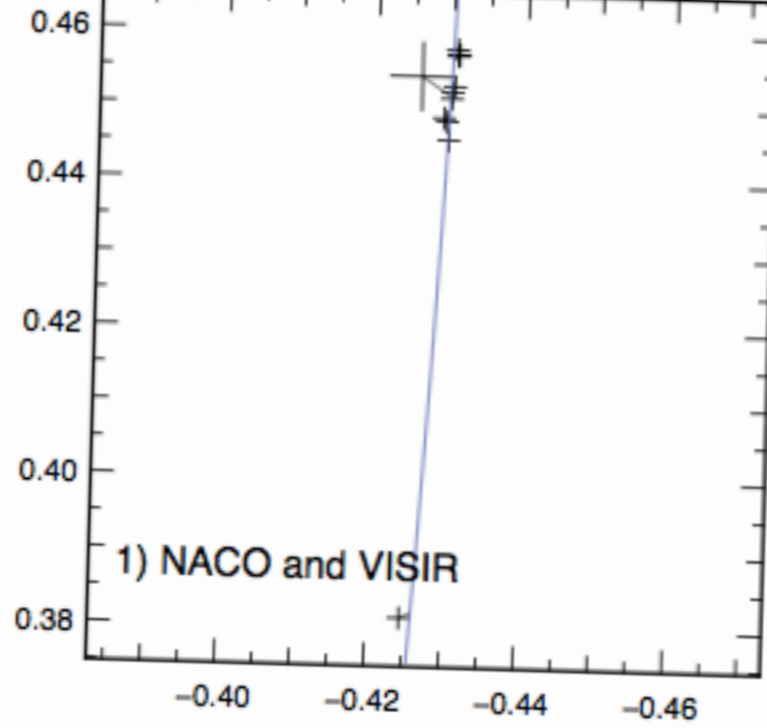
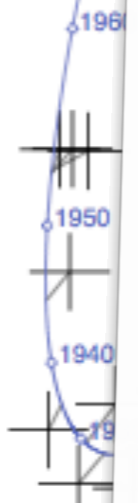
2

1

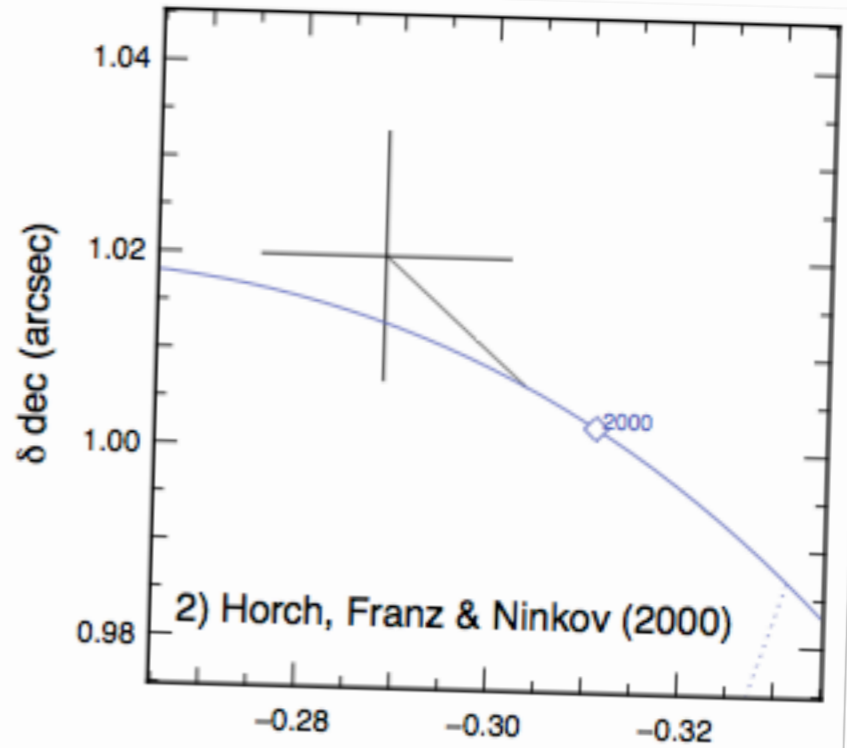
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E

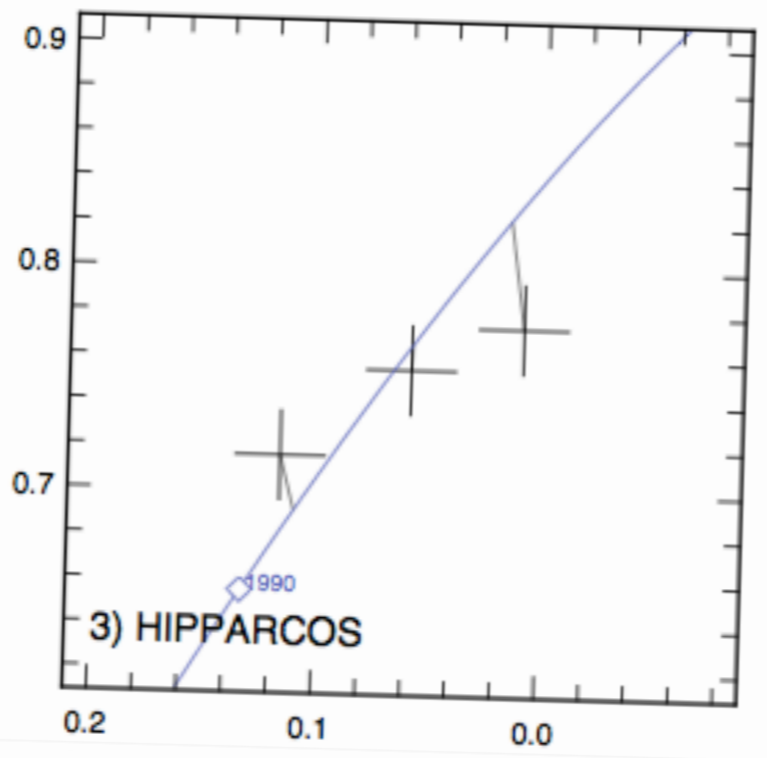
N



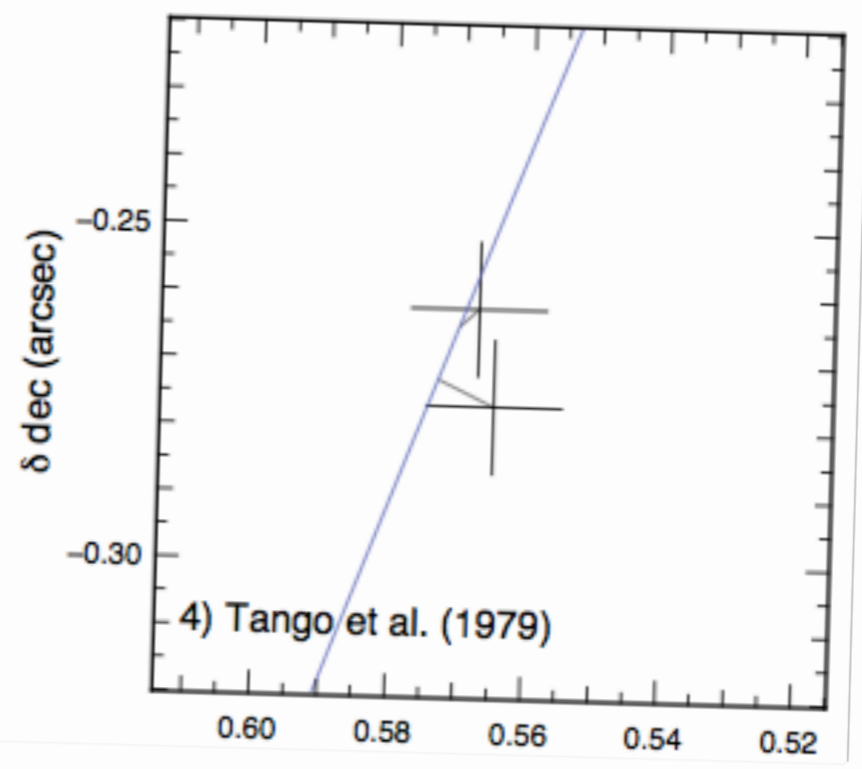
1) NACO and VISIR



2) Horch, Franz & Ninkov (2000)



3) HIPPARCOS



4) Tango et al. (1979)

A-B orbital parameters

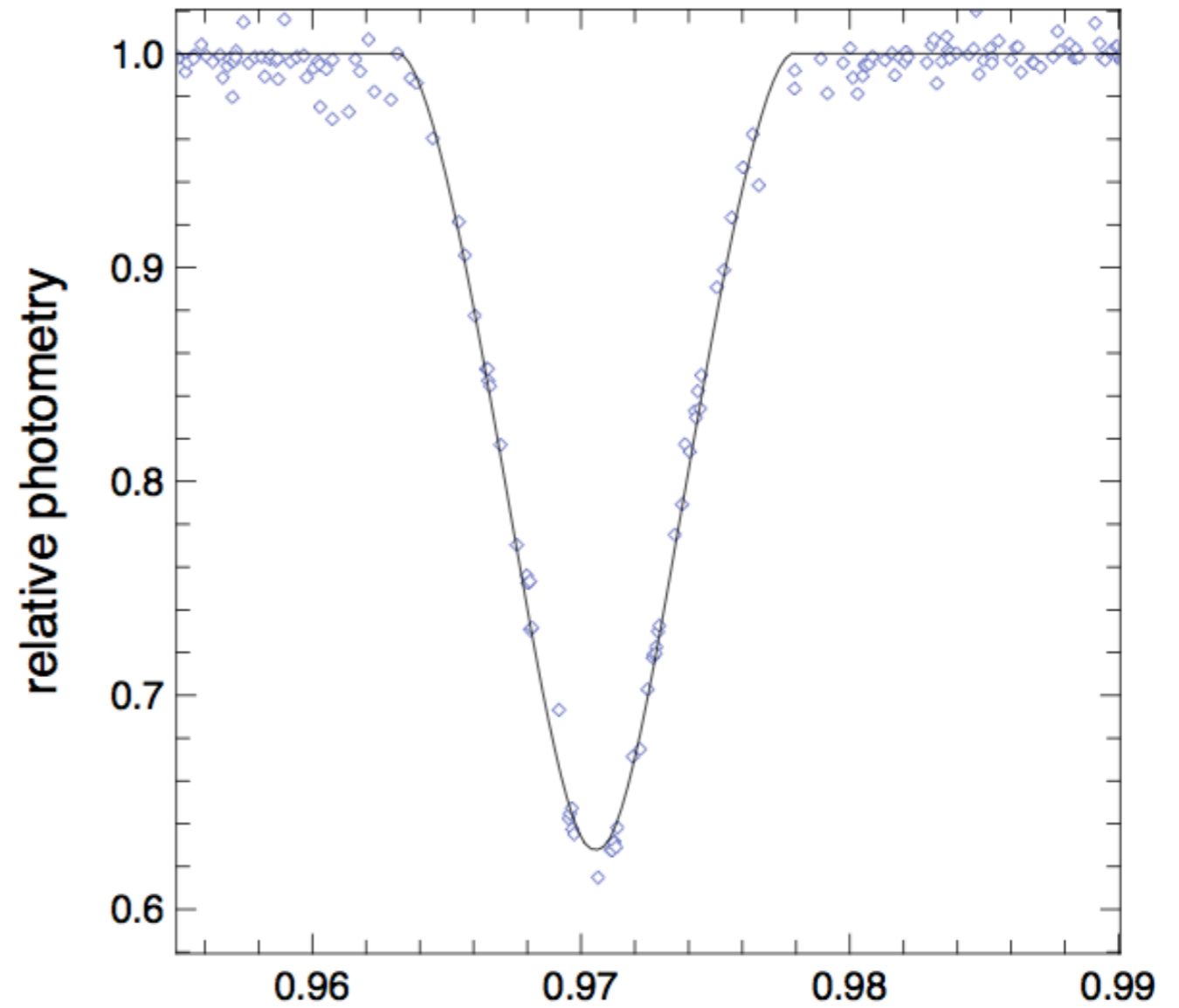
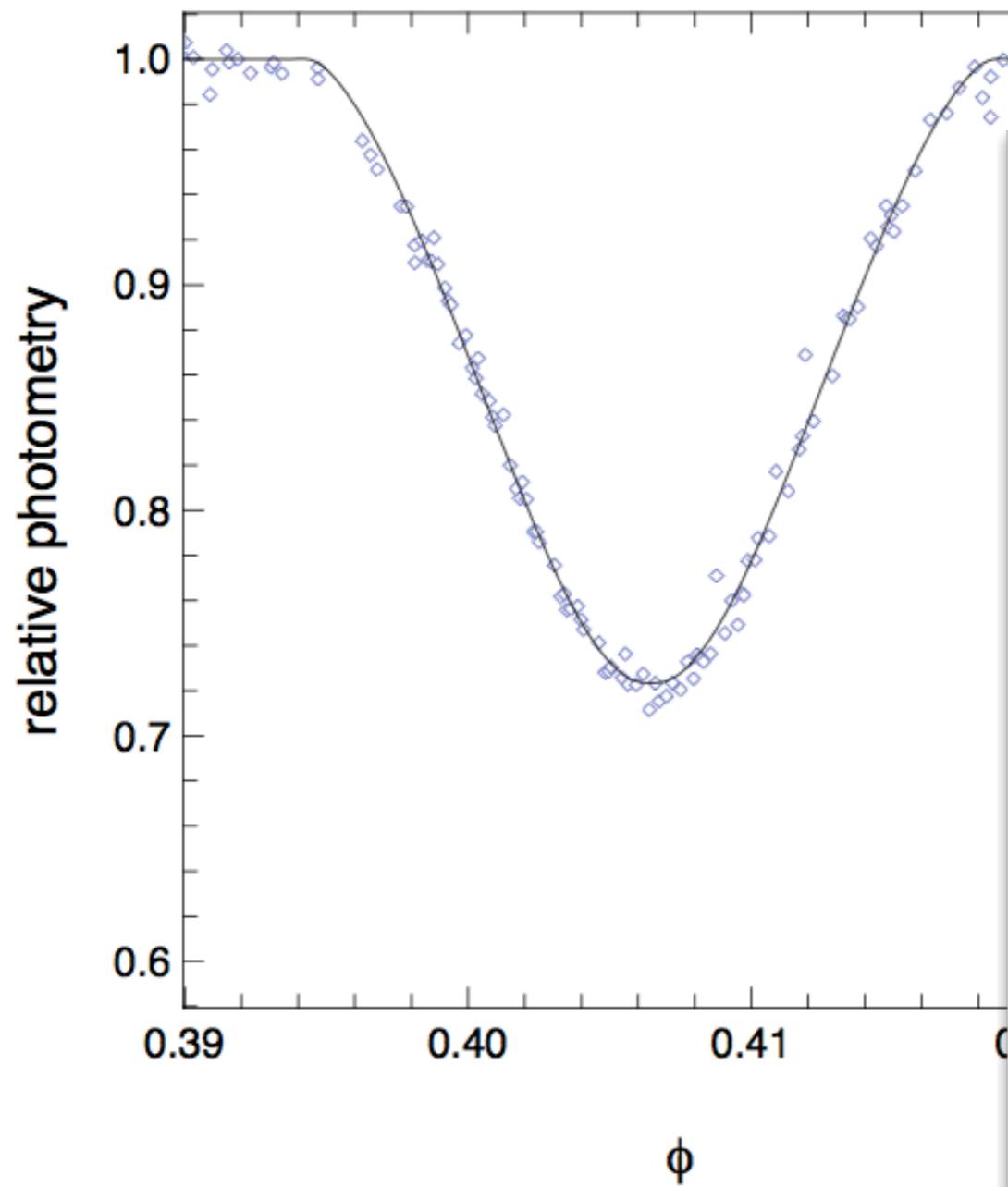
parameter	this work	Argyle et al. (2002)
a (")	1.996 ± 0.012	1.990 ± 0.020
e	0.475 ± 0.003	0.470 ± 0.020
Period (yr)	143.2 ± 1.2	142 ± 13
MJD ₀	51774 ± 430	51836.80 ± 584
i (deg)	105.1 ± 0.2	105.20 ± 2.20
Ω (deg)	286.6 ± 0.36	287.00 ± 1.30
ω (deg)	187.4 ± 0.6	188.00 ± 14.00
$M(\text{Aab} + \text{B}) (M_{\odot})$	6.15 ± 0.23	5.88 ± 1.17

Total mass to 3.7% (Hipparcos parallax)

Aa-Ab EB orbit

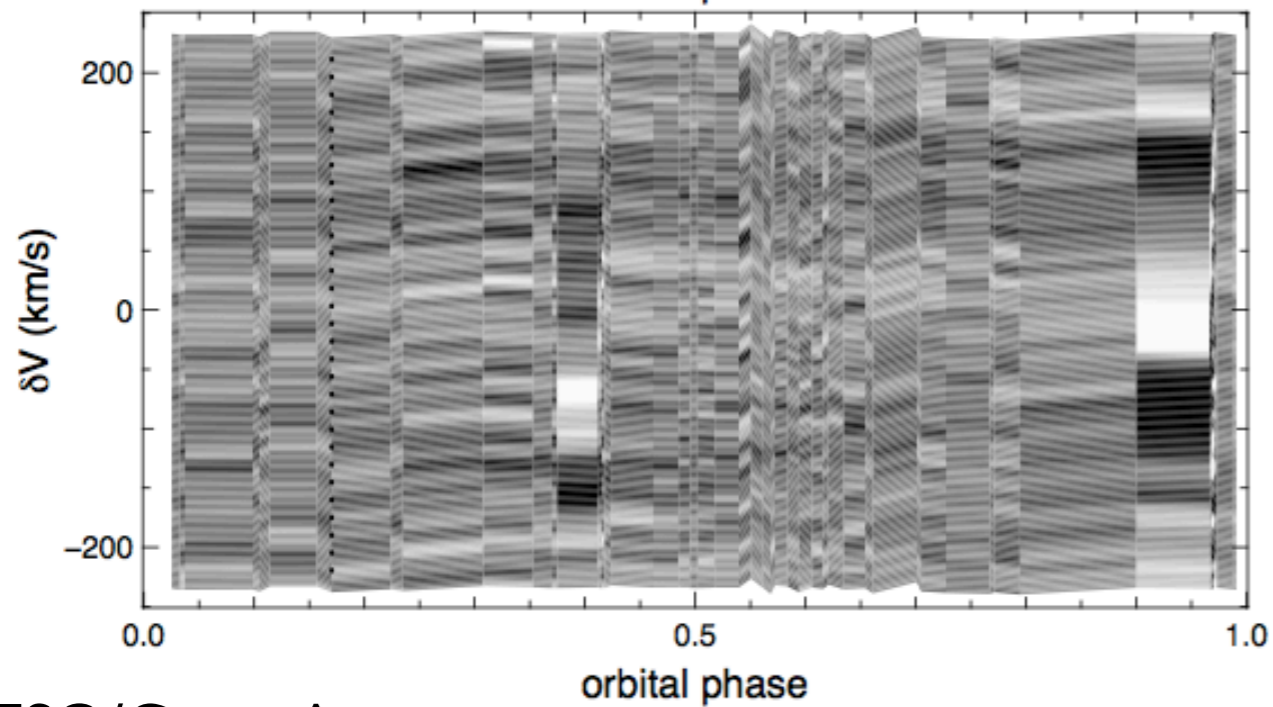
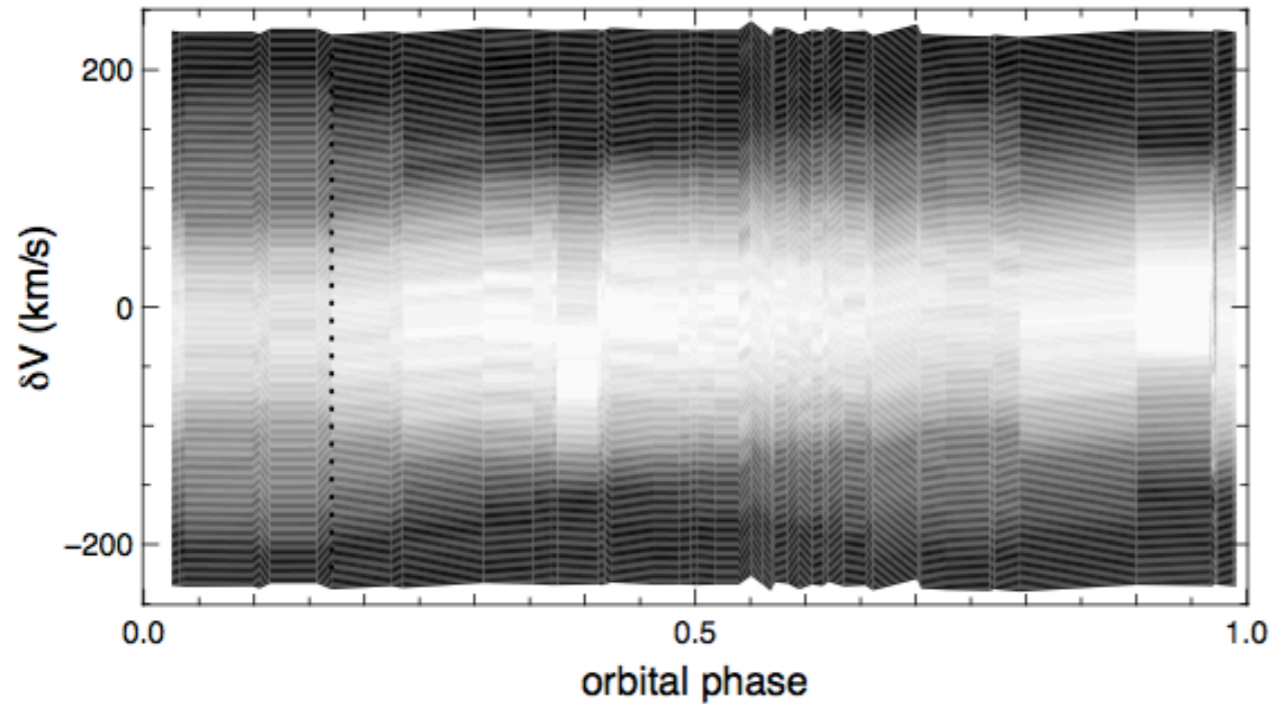
- Spectral disentangling
- Photometry from SMEI
- Interferometry from AMBER

Photometry from SMEI



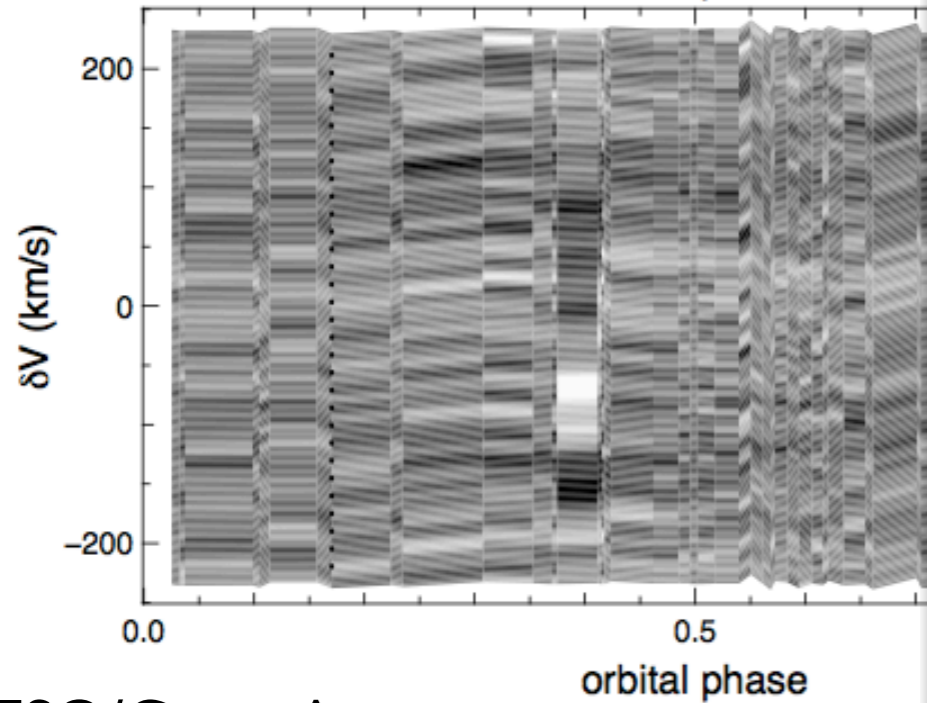
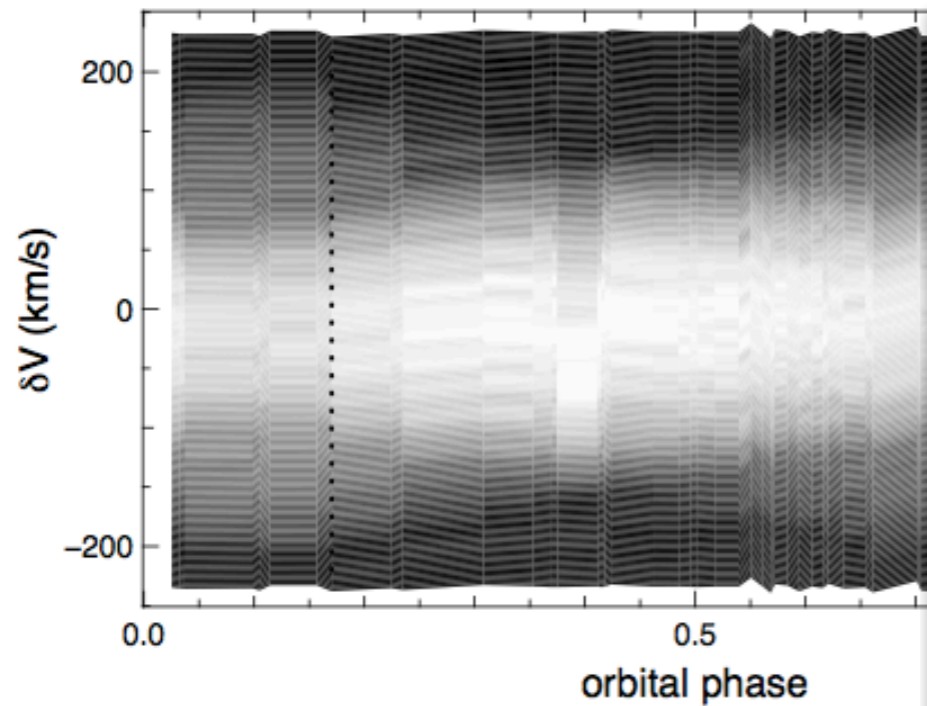
ϕ Pribulla et al. (2011)

Spectral disentangling

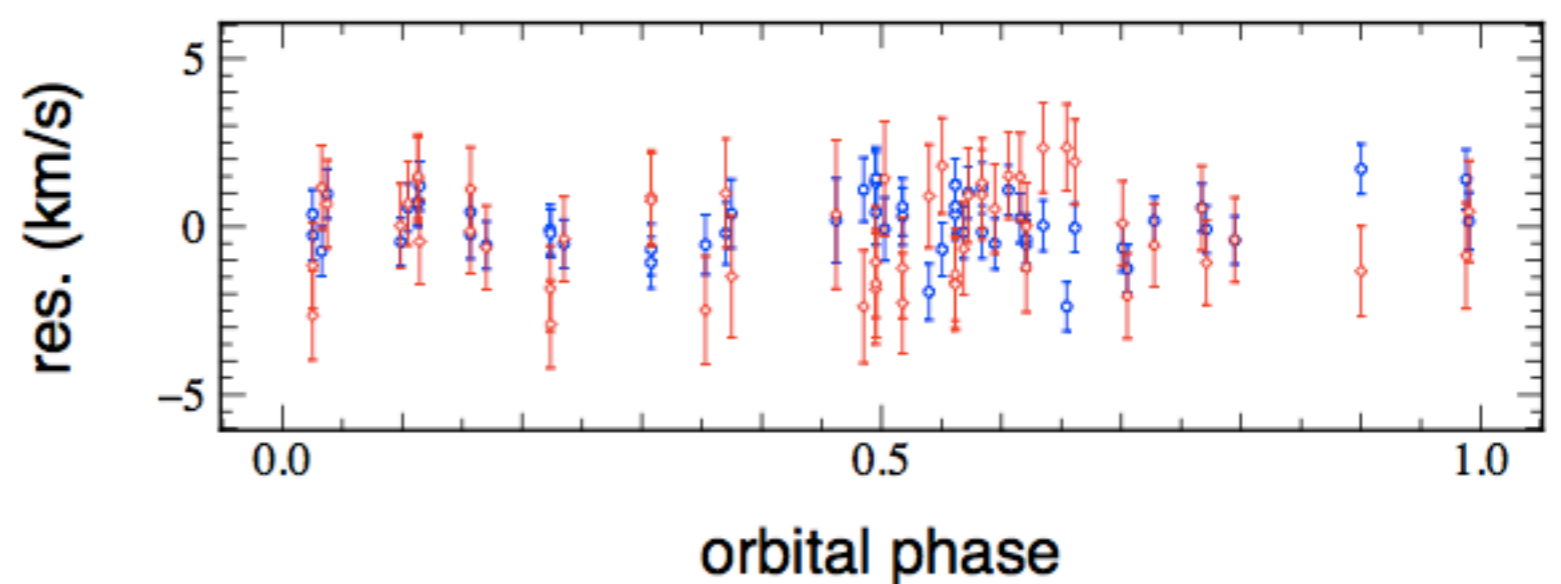
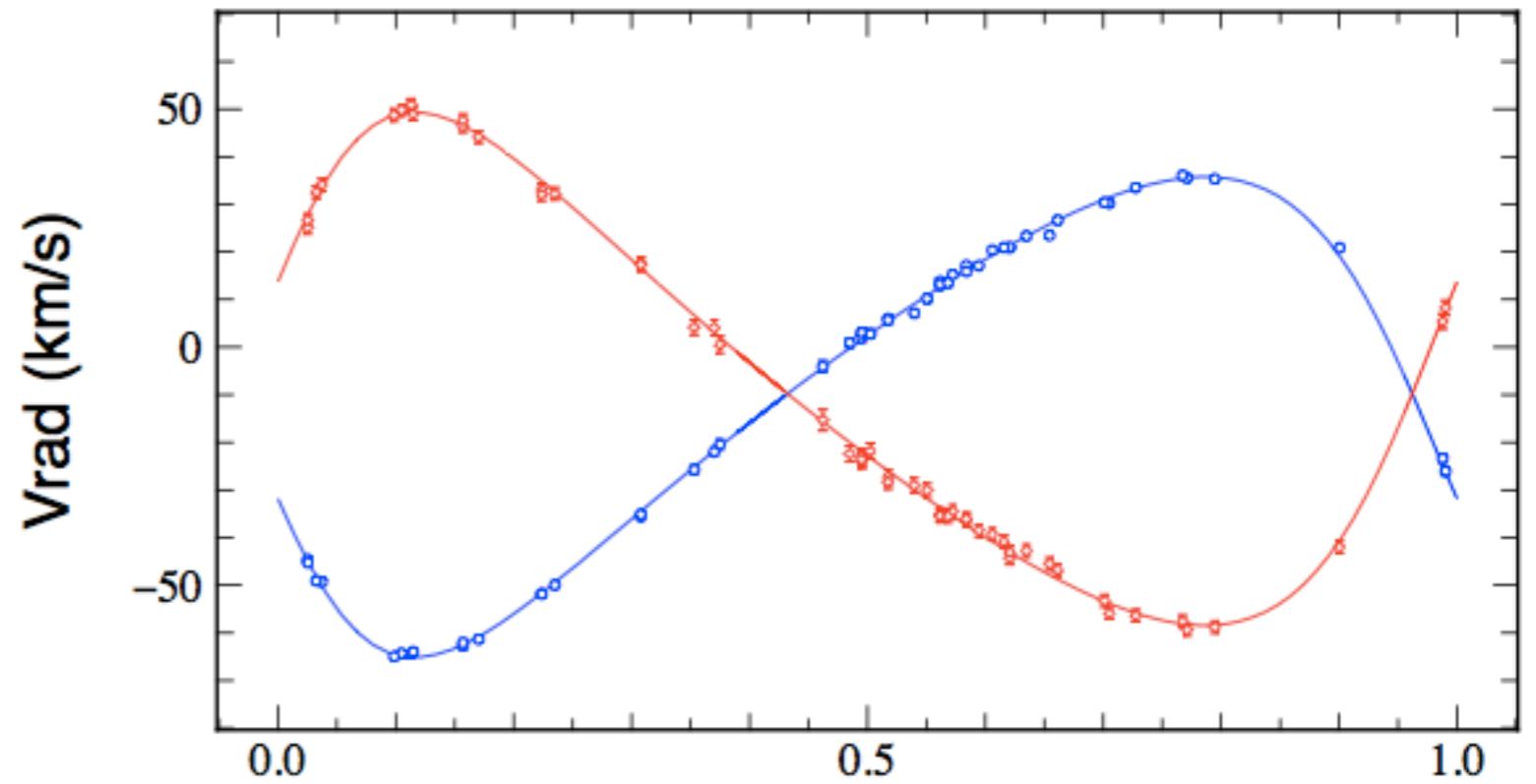


BESO/Cerro Armazones spectra

Spectral disentangling

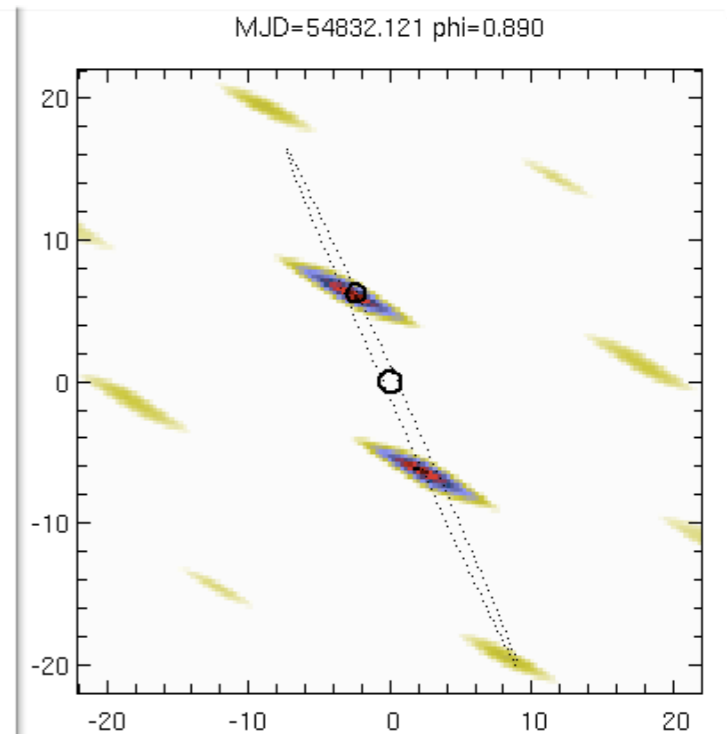
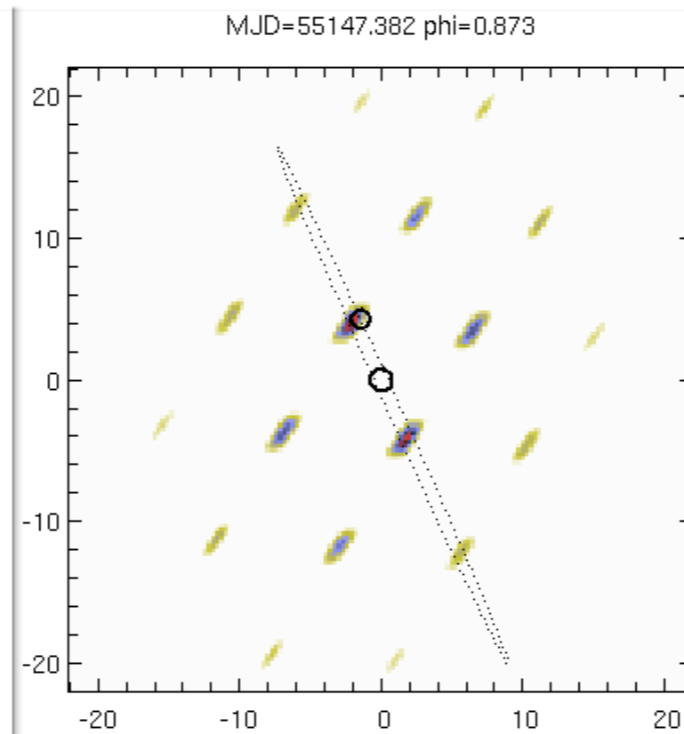
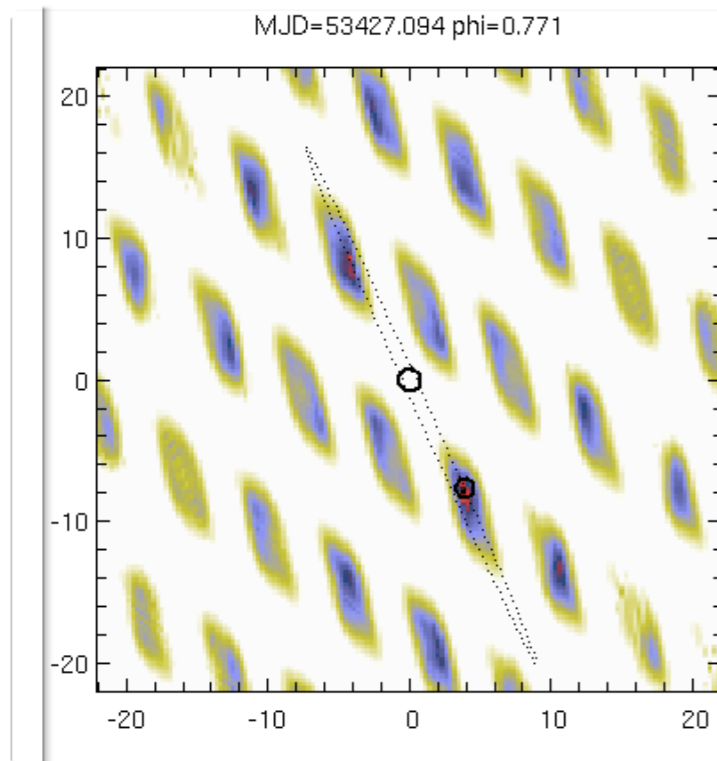


BESO/Cerro Armazones spectra

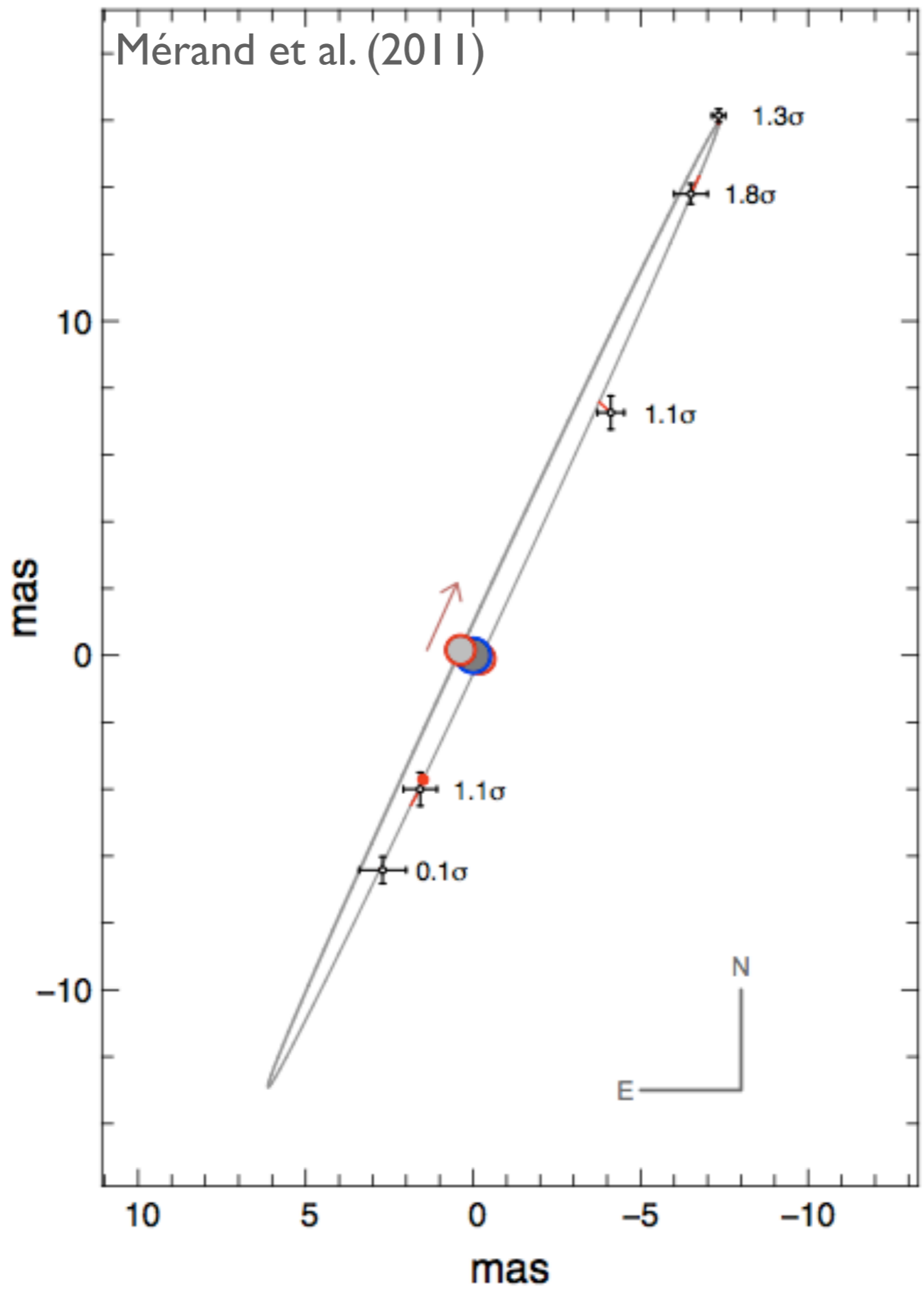


Interferometry

- 3-telescope observations with the VLTI/AMBER instrument



Mérand et al. (2011)

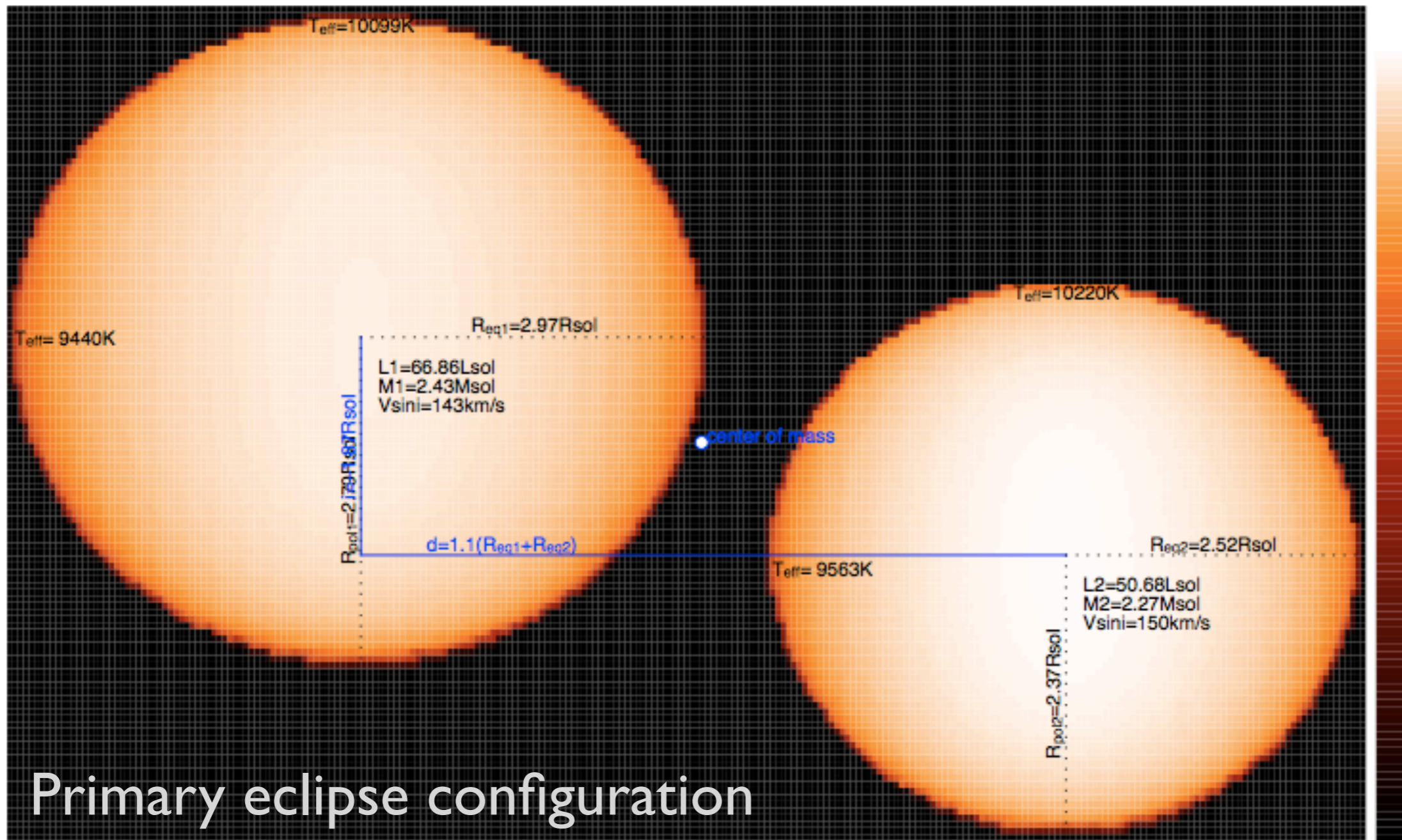


Properties of the EB

	unit	δ Vel Aa	δ Vel Ab	Vega
Mass	M_{\odot}	2.43 ± 0.02	2.27 ± 0.02	2.3 ± 0.2
Luminosity	L_{\odot}	67 ± 3	51 ± 2	37 ± 3
Polar Radius	R_{\odot}	2.79 ± 0.04	2.37 ± 0.02	2.26 ± 0.07
Equ. Radius	R_{\odot}	2.97 ± 0.02	2.52 ± 0.03	2.78 ± 0.02
Polar T_{eff}	K	10100	10120	10150
Equ. T_{eff}	K	9700	9560	7900
Avg. T_{eff}	K	9450	9830	9100
$\omega/\omega_{\text{crit}}$		0.61	0.60	0.91
Polar $\log(g)$	cm s^{-2}	3.90	4.10	4.10 ± 0.1
Eq. $\log(g)$	cm s^{-2}	3.78	3.99	3.65 ± 0.1
i	deg	~ 90	~ 90	4.7 ± 0.3
rotation rate	1/d	0.95	1.17	1.90
metallicity	[M/H]	-0.33^1	-0.33^1	-0.5^2

Measured parallax $\pi = 39.8 \pm 0.4$ mas

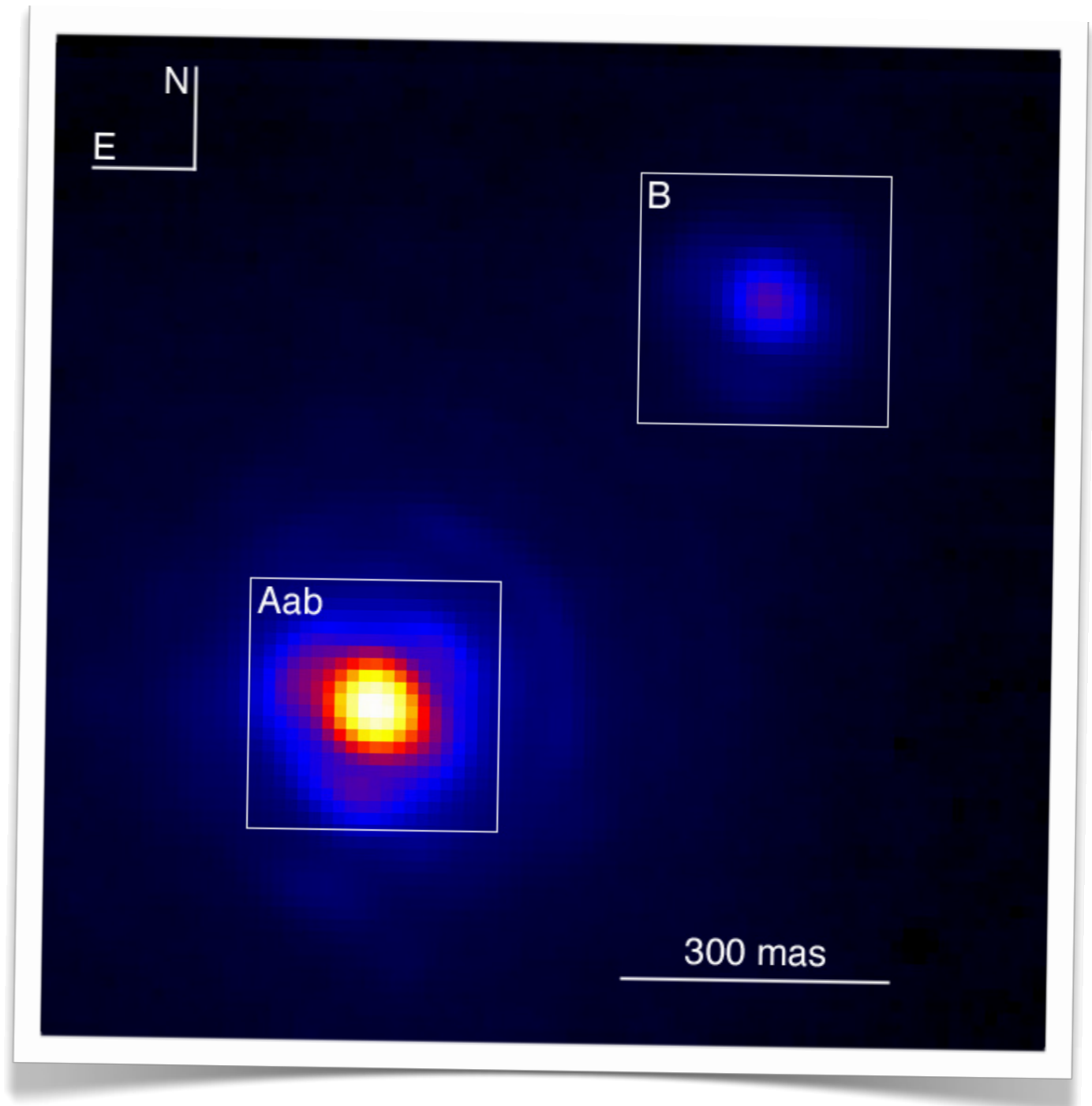
Hipparcos $\pi = 40.5 \pm 0.4$ mas



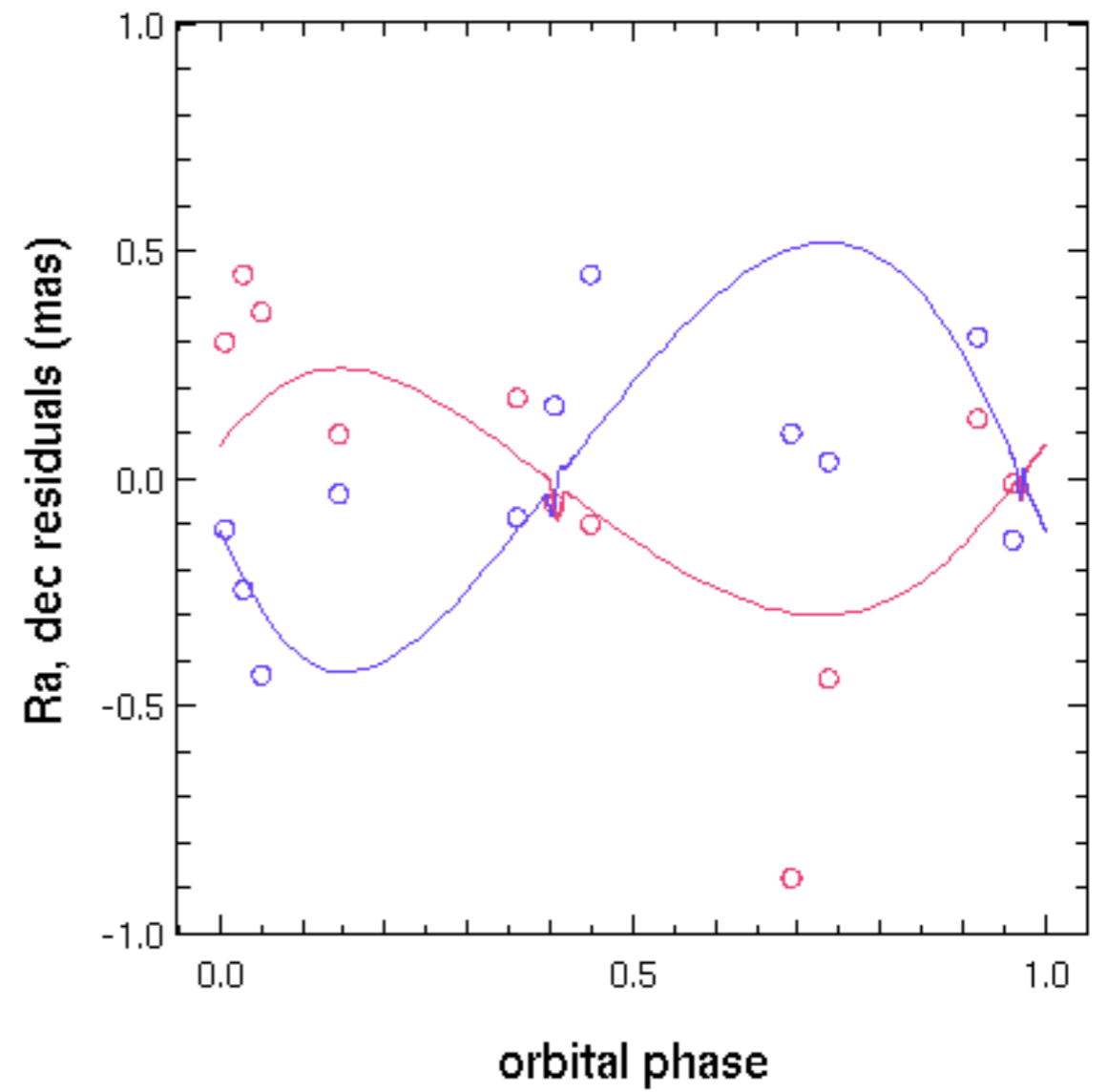
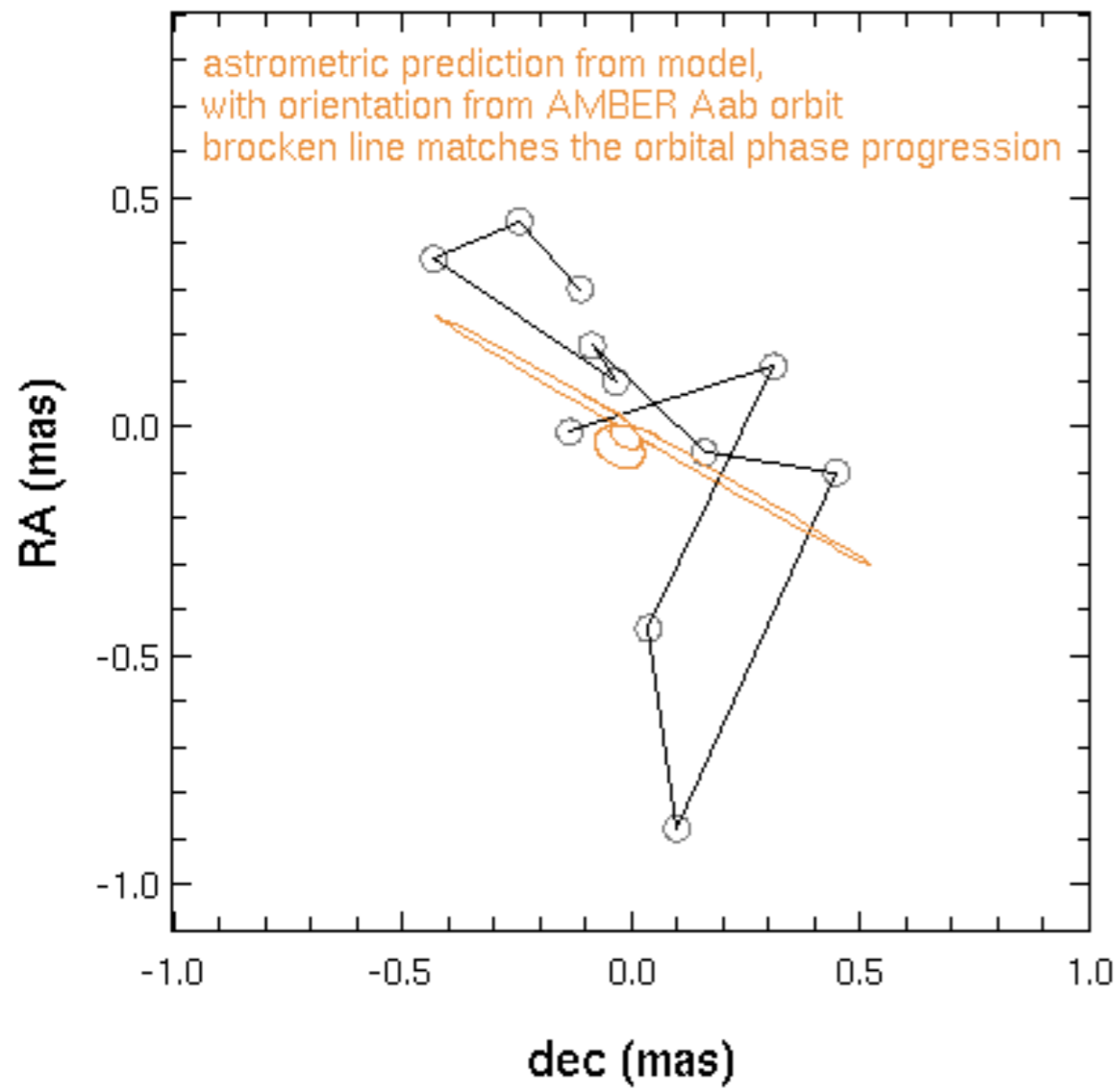
Primary eclipse configuration

Differential astrometry

- NACO differential astrometry within the isoplanetic patch
- Differential position estimated using cross-correlation



NaCo residuals (micro astrometry)



Kervella et al. (in prep.)

