The third body in the eclipsing binary AV CMi: Hot Jupiter or brown dwarf?

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Aims

- Derivation of the absolute parameters of the eclipsing components

- Observations of transits for an accurate period and shape determination

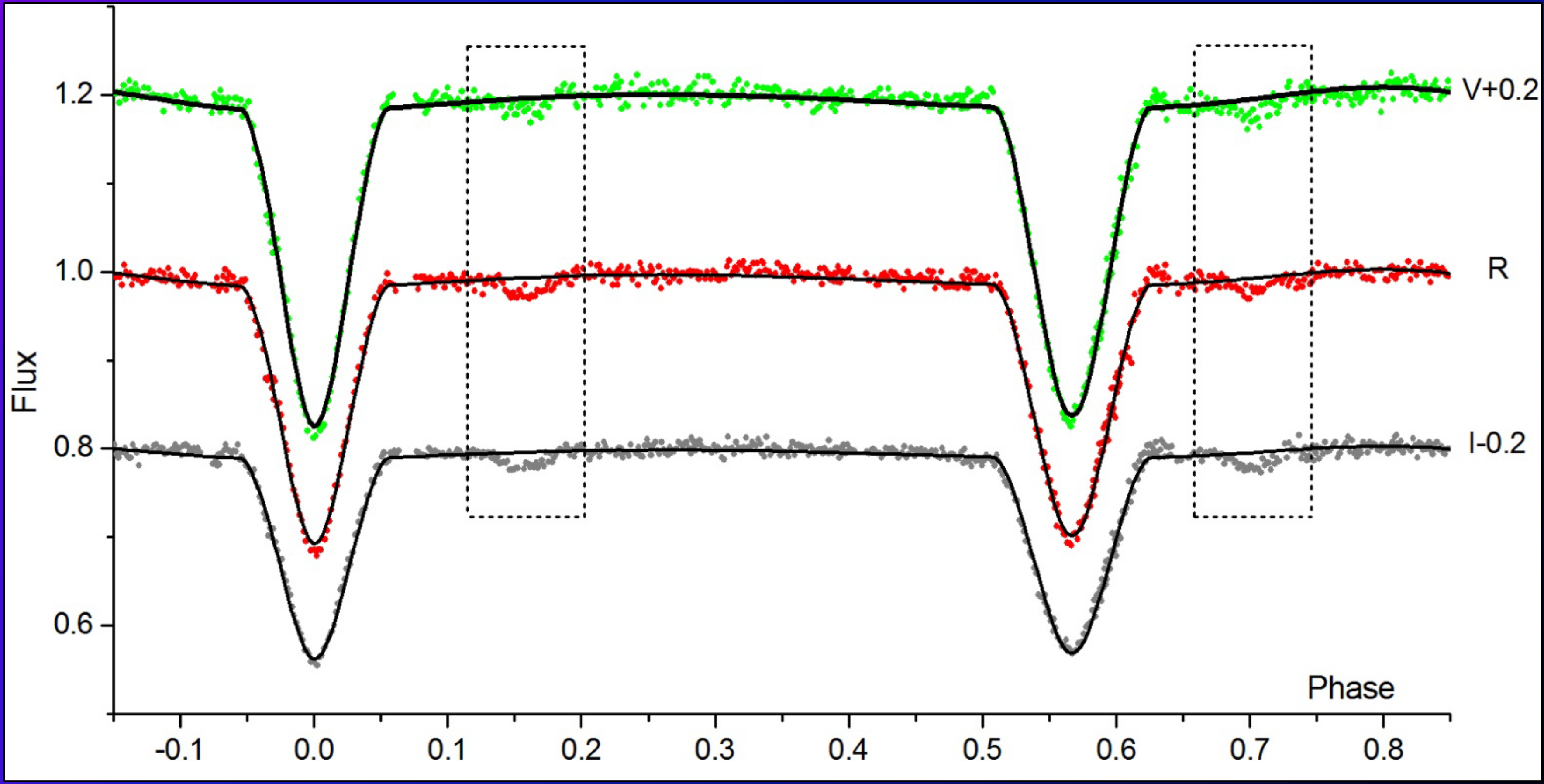
- Discussion about the nature of the third component

Observations & data reduction

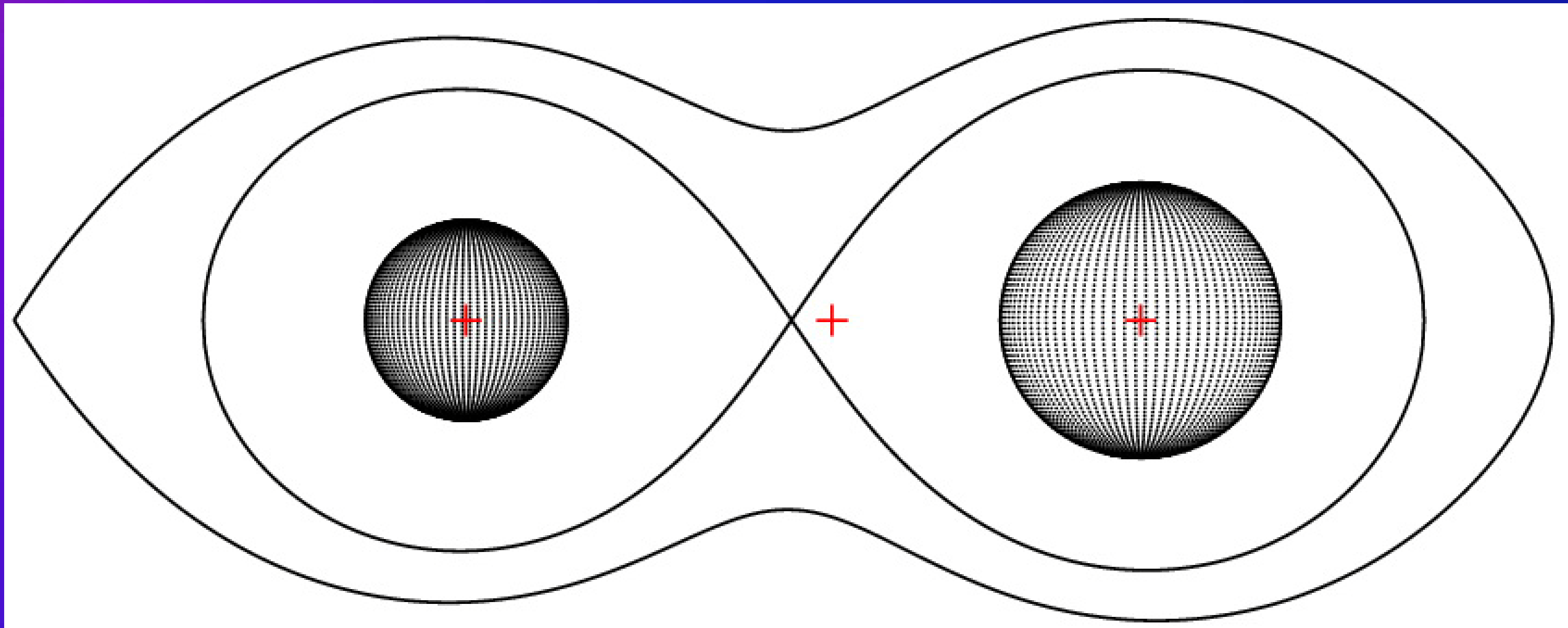
- **Telescope:** 40 cm Cassegrain
- **CCD:** ST-10 XME – VRI photometric filters (Bessell)
- **Location:** University of Athens Observatory
- **Method of reduction:** Differential aperture photometry
- **Duration:** 2007-2011

Light curve analysis

Method: Wilson & Devinney code – PHOEBE software

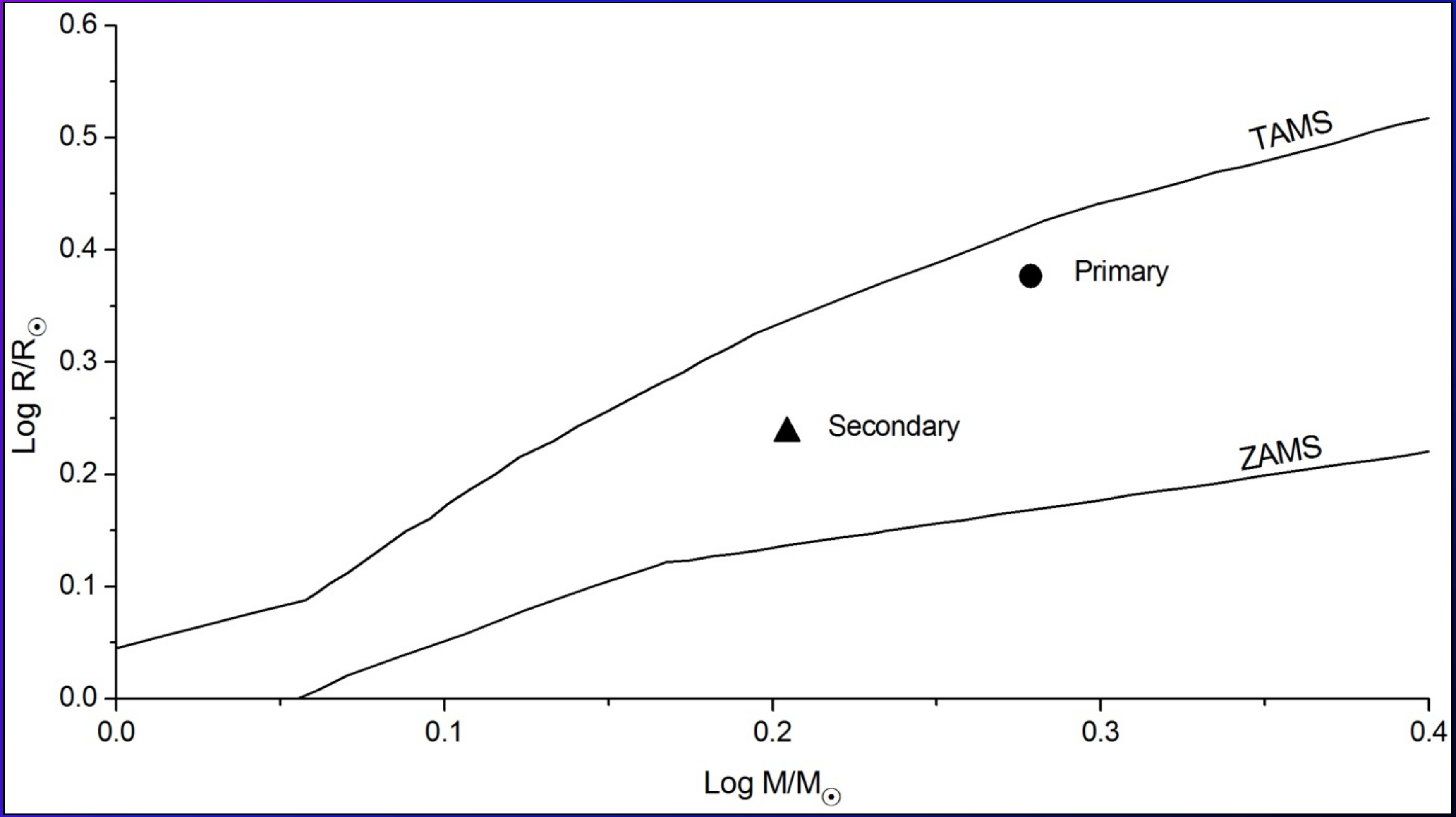


3D Model & Absolute parameters

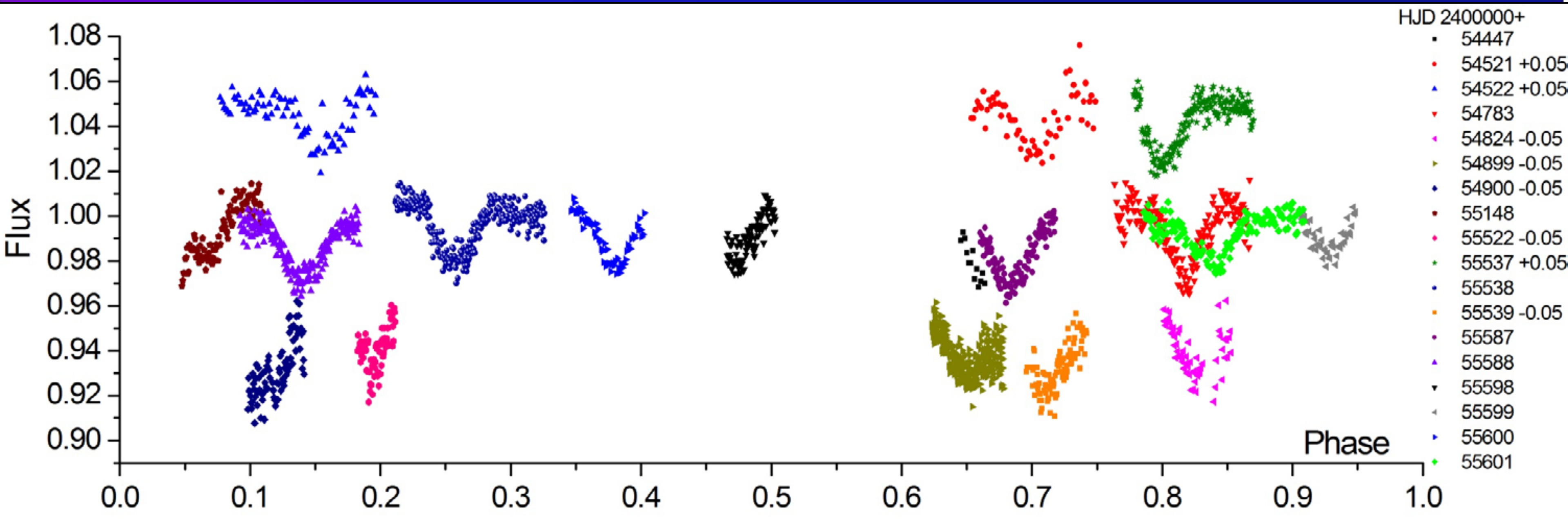


M [$M_\odot$]	1.60 (1)	1.90
R [$R_\odot$]	1.72 (4)	2.38 (5)
T [K]	7897 (8)	7900
L [$L_\odot$]	10.3 (4)	19.8 (8)
a [$R_\odot$]	6.2 (1)	5.2 (2)
log g [cm/s^2]	4.17 (2)	3.96 (2)

Position of the components in the M-R diagram



Transit light curves



Transit analysis

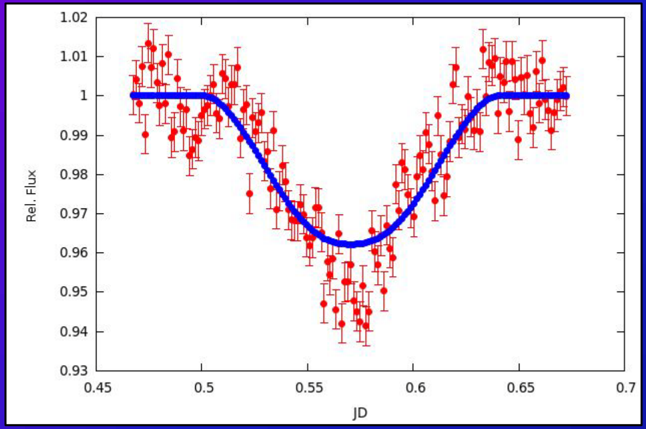
- PhoS-T software

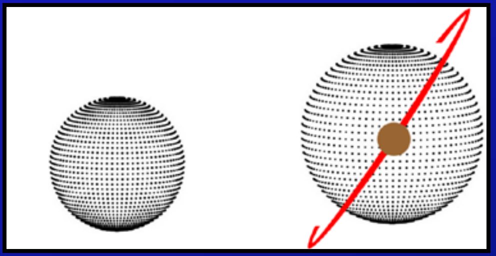
- We don’t know which eclipsing component the third body transits

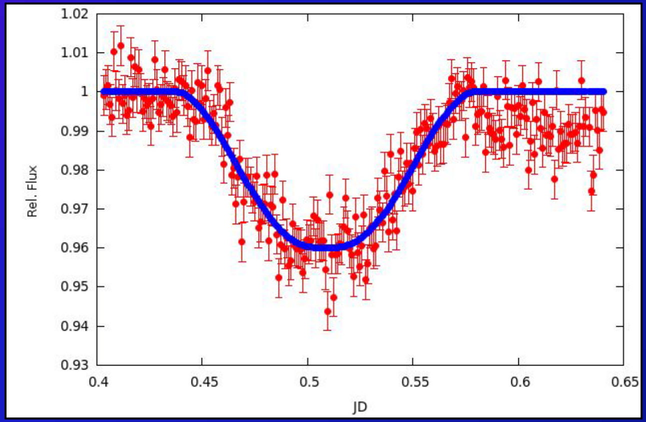
CASE A: The third body orbits the primary component

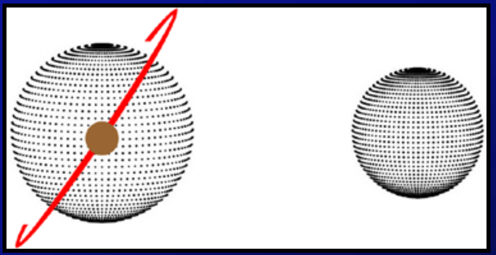
CASE B: The third body orbits the secondary component

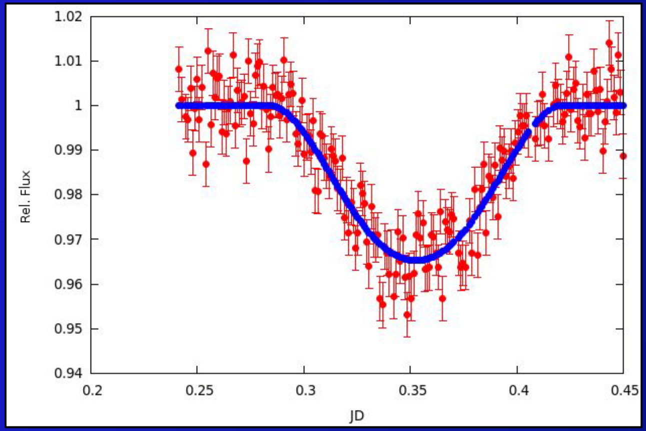
Fit on transits for Case A

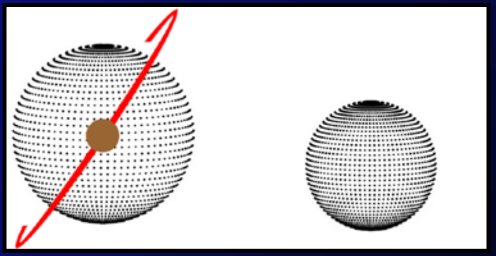




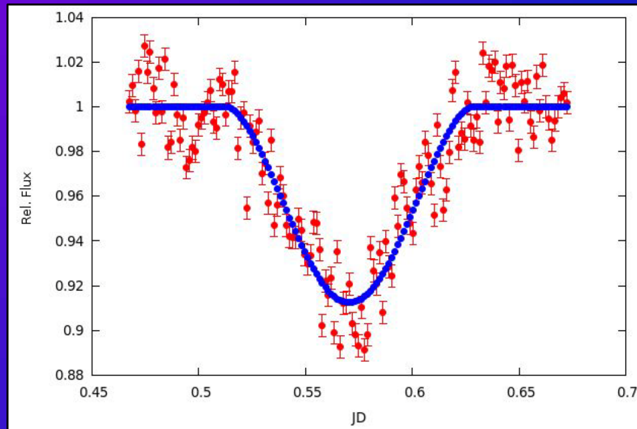


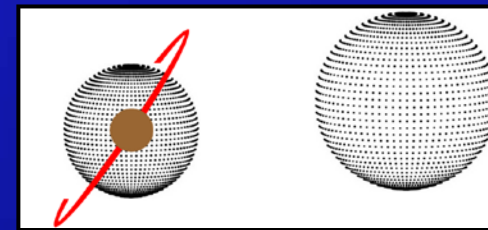


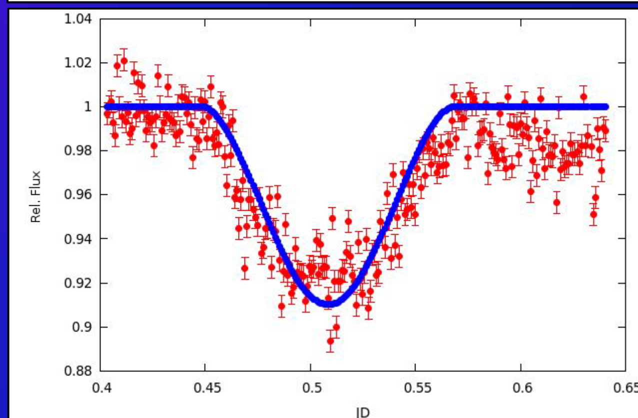


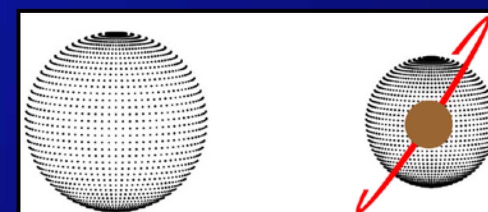


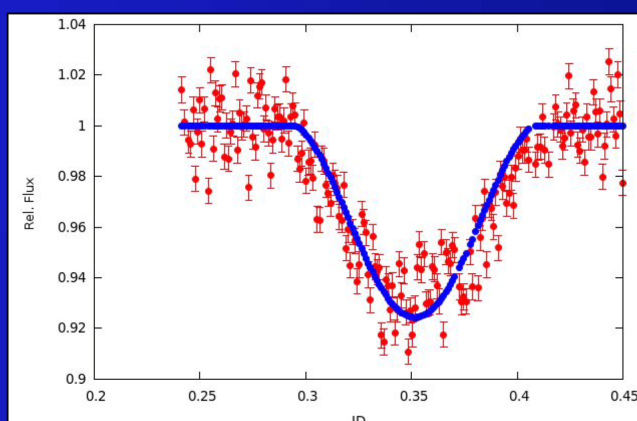
Fit on transits for Case B

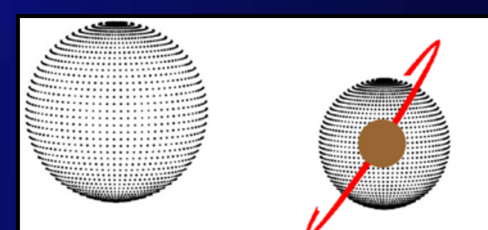












Conclusions

- The eclipsing components are MS stars in eccentric orbits
- Updated ephemeris: **$T_{transit}$ = HJD 2454899.354 (1) + 0.519215 (1)^{d} ×E**
- The shape of the transits differs from time to time which affect the derived parameters of the third body
- A mean radius value of 4.4 (3) R_{Jup} and 6.4 (6) R_{Jup} for cases A and B was calculated
- According to χ^2 value the solution of case A was found more realistic
- The system's LC can be solved either with (~2%) or without a third light
- The "Hot Jupiter" scenario seems to fail due to the big value of the radius., therefore the "Brown dwarf" hypothesis seems that marginally satisfies the results