



Annual Report



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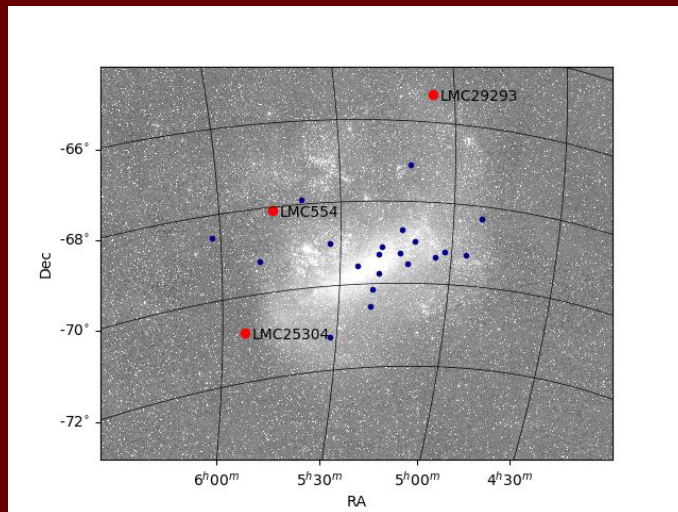
The systems and the Data

3 Late-type, long-period binaries from LMC

- LMC25304
- LMC29293
- LMC554

Data

- I and V band OGLE IV light curves.
- MIKE, HARPS and UVES spectra.



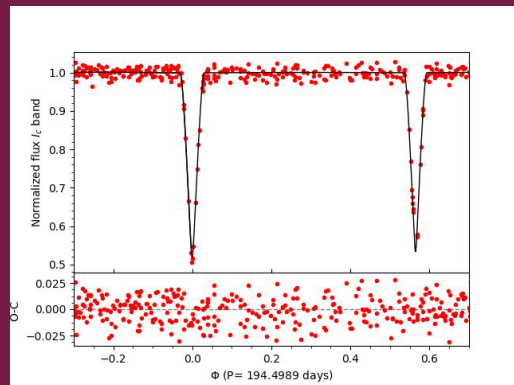
Location of the sources over LMC projection

	LMC29293	LMC25304	LMC554
R.A. (J2000)	05:05:37.37	05:54:19.44	05:47:08.27
Decl. (J2000)	-65:17:13.4	-70:50:24.0	-68:04:12.0
Period (days)	123.17	194.517	133.17
T_0 (HJD-2450000)	5573.83022	7146.40980	5565.68789
V^a (mag)	16.904	16.520	16.605
I^a (mag)	15.971	15.527	16.149
J^b (mag)	15.365 ± 0.025	14.870 ± 0.026	15.235 ± 0.045
H^b (mag)	14.895 ± 0.032	14.361 ± 0.029	14.905 ± 0.074
K^b (mag)	14.818 ± 0.044	14.290 ± 0.038	14.588 ± 0.109

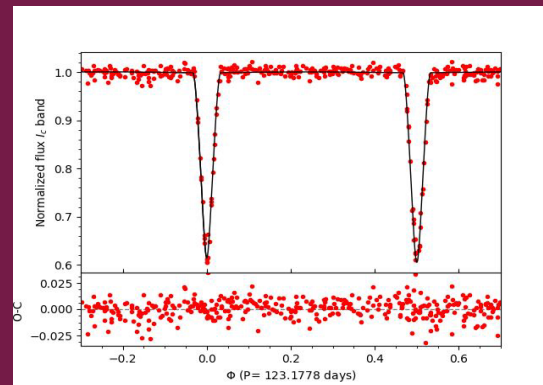
Magnitudes from the OGLE Collection of Variable Stars (Pawlak et al. (2016))
Infrared magnitudes from 2MASS 6X Point Source Working Database (Cutri et al. (2012))



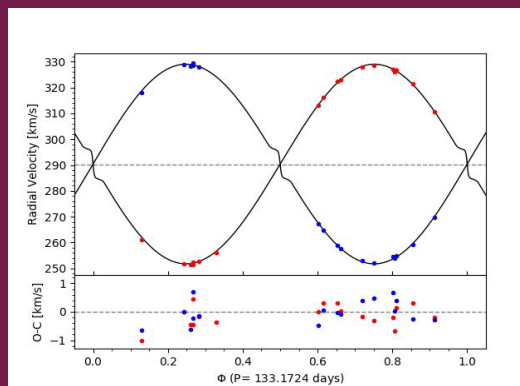
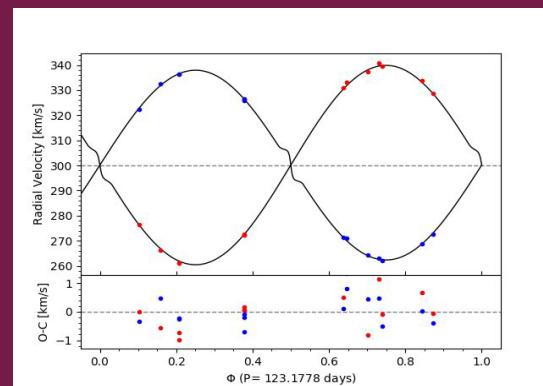
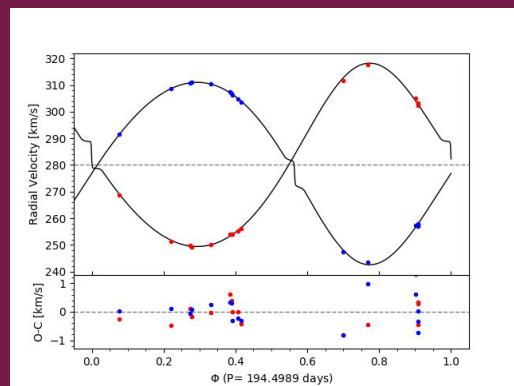
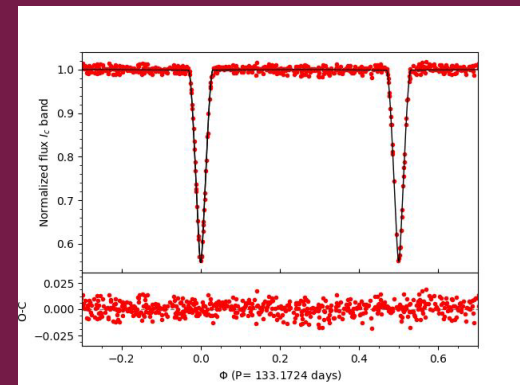
LMC25304



LMC29293



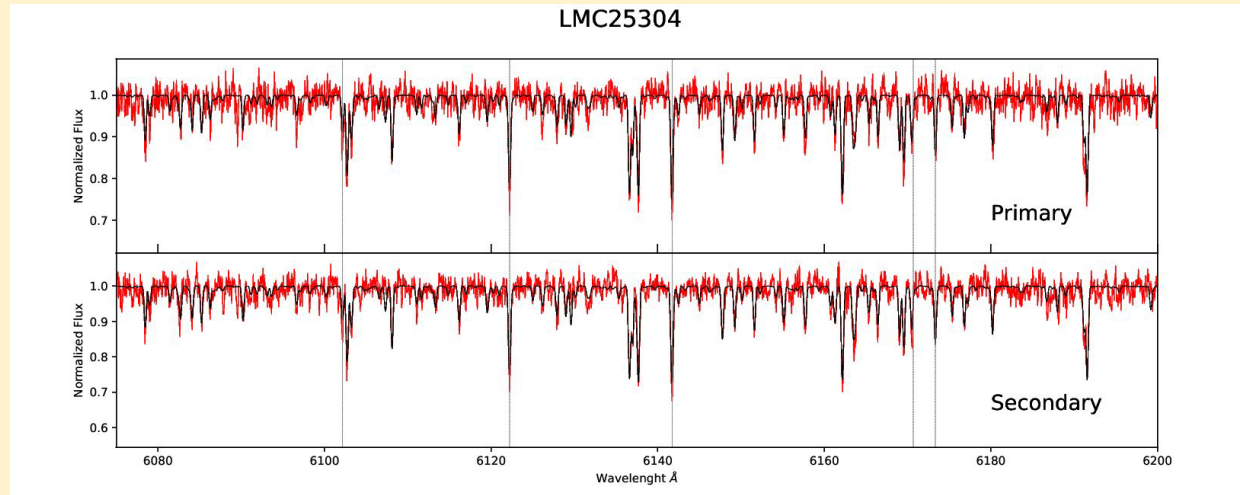
LMC554



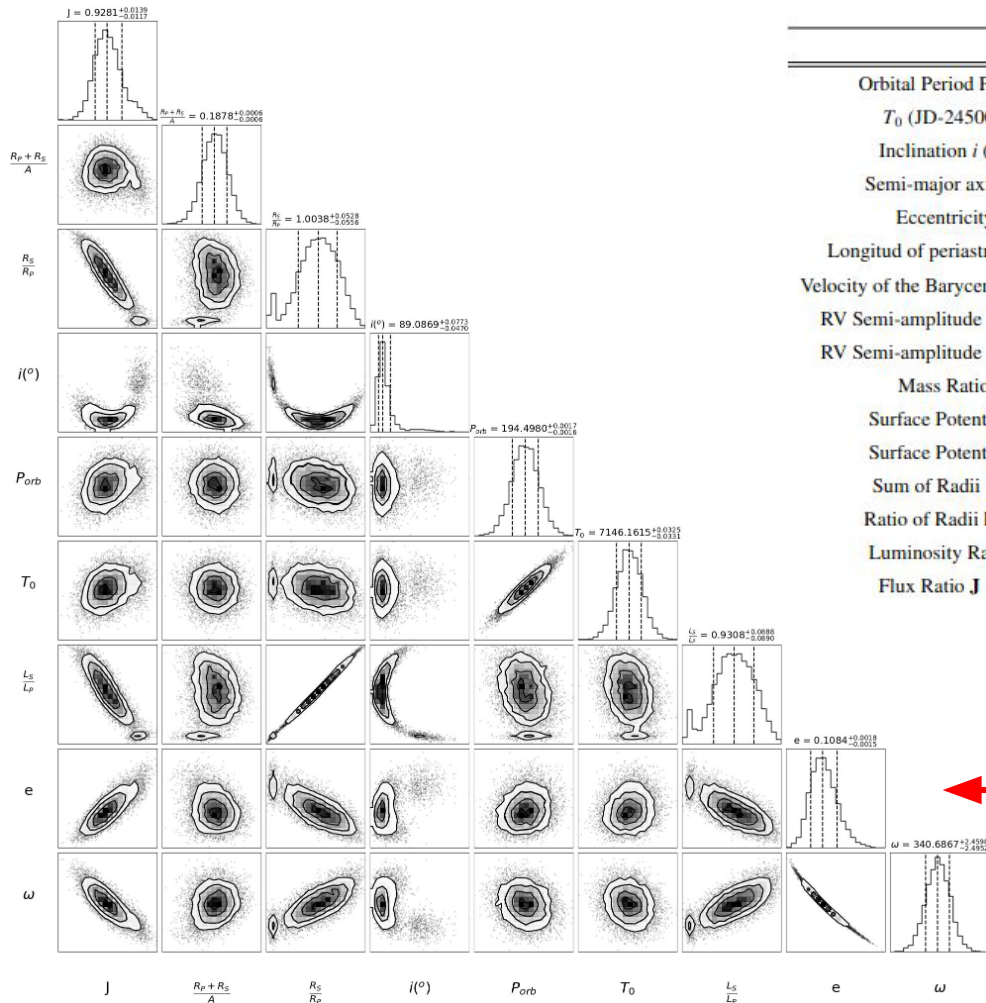
Atmospheric Analysis

- **Grid Search in Stellar Parameters (GSSP)**
A. Tkachenko 2015
- **SynthV LTE-based radiative transfer code by Tsymbal (1996).**

LLModels (Shulyak et al. (2004))
MARCS (Gustafsson et al. (2008))



	LMC29293		LMC25304		LMC554	
	Primary	Secondary	Primary	Secondary	Primary	Secondary
T_{eff} (K)	5153^{+183}_{-191}	5125^{+272}_{-273}	5155^{+222}_{-222}	5080^{+186}_{-186}	5517^{+396}_{-396}	5415^{+301}_{-257}
[M/H] (dex)	$-0.42^{+0.16}_{-0.18}$	$-0.27^{+0.23}_{-0.23}$	$-0.58^{+0.24}_{-0.23}$	$-0.62^{+0.20}_{-0.19}$	$-0.35^{+0.22}_{-0.22}$	$-0.55^{+0.22}_{-0.28}$
ξ (km s ⁻¹)	$1.36^{+0.85}_{-0.85}$	$3.09^{+1.5}_{-1.15}$	$2.16^{+0.97}_{-0.84}$	$1.81^{+0.69}_{-0.73}$	$2.6^{+0.88}_{-0.79}$	$2.01^{+1.2}_{-1.0}$
$v \sin i$ (km s ⁻¹)	$9.334^{+3.111}_{-3.225}$	$8.421^{+4.011}_{-4.917}$	$7.538^{+3.3}_{-3.3}$	$8.368^{+2.63}_{-2.73}$	$7.77^{+3.9}_{-3.7}$	$8.43^{+4.0}_{-3.8}$



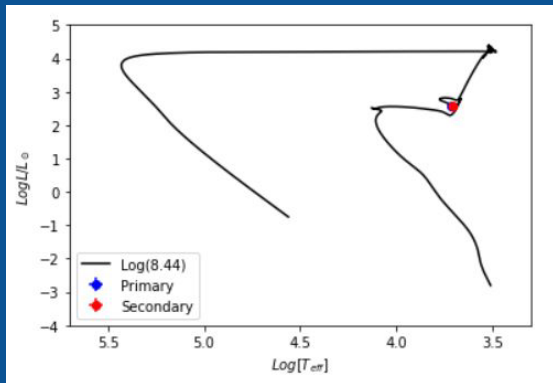
	LMC29293	LMC25304	LMC554
Orbital Period P (days) ^a	123.17494 ± 0.00258	194.4976 ± 0.0015	133.1728605 ± 0.00087
T_0 (JD-2450000) ^a	5573.818327 ± 0.01999	7146.154713 ± 0.03007	6497.7461979 ± 0.00393
Inclination i (deg) ^a	87.198783 ± 0.4974	89.99 ± 0.1280	88.7427818 ± 0.06075
Semi-major axis $(R_{\odot})^b$	188.864 ± 0.603	262.755 ± 0.831	203.1680 ± 0.382442
Eccentricity e^a	0.0050 ± 0.0048	0.1108 ± 0.0014	0.0 (fixed)
Longitude of periastron ω (deg) ^a	271.98045 ± 2.55037	337.313 ± 1.828	N.A.
Velocity of the Barycenter γ (km s ⁻¹) ^b	300.130 ± 0.101	280.29 ± 0.085	290.2950 ± 0.0638
RV Semi-amplitude K_1 (km s ⁻¹) ^b	39.732	34.4602	38.7117
RV Semi-amplitude K_2 (km s ⁻¹) ^b	37.7972	34.2792	38.4568
Mass Ratio q^b	1.050970 ± 0.0008	1.00528 ± 0.00086	1.0067 ± 0.0003
Surface Potential Ω_1^b	9.9517 ± 0.0782	12.37458 ± 0.0079	11.8781 ± 0.0027
Surface Potential Ω_2^b	12.3685 ± 0.0719	11.827406 ± 0.00779	11.3406 ± 0.0027
Sum of Radii $\frac{R_p + R_s}{A}$	0.20706 ± 0.00116	0.1843709 ± 0.00055	0.190086 ± 0.00052
Ratio of Radii $k = \frac{R_s}{R_p}$ ^a	1.1185 (fixed)	1.0591 ± 0.0099	1.01802 ± 0.029210
Luminosity Ratio $\frac{L_s}{L_p}$ ^a	1.25799 ± 0.00649	1.05086 ± 0.0153	1.0320672 ± 0.059001
Flux Ratio $J = \frac{F_s}{F_p}$ ^a	1.04383 ± 0.01325	0.941169 ± 0.00804	0.935680 ± 0.0292

Corner plot from MC algorithm implemented in JKTEBOP code for **statistical errors.**

Southworth et al. (2005), Southworth et al. (2004)

Evolutionary stage

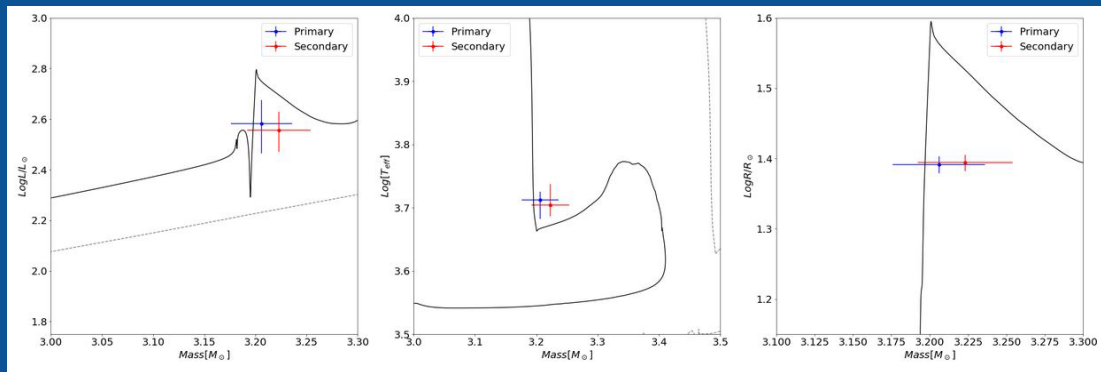
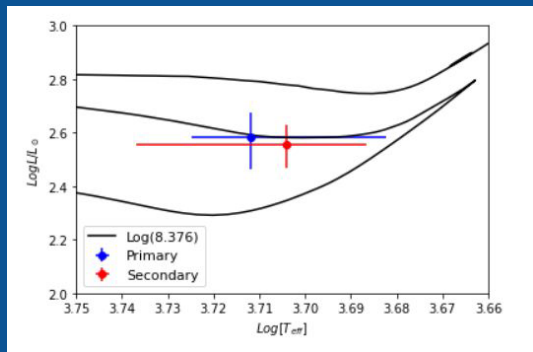
MESA Isochrones and Stellar Tracks (MIST) (Choi et al. (2016) and Dotter (2016))



LMC 25304 237.6 Myrs

LMC 29293 380.1 Myrs

LMC 554 301.9 Myrs



Other Activities

- Observation at Cerro Murphy Observatory with optical 0.8m telescope.
- Contributed talk at EAS 2023, Kraków, Poland
- Part of the time domain group of Wide field spectroscopic telescope (WST)
- Orbyts Volunteer, partnered with LICEO MULTICULTURAL CLAUDIO FLORES SOTO, Cerro Alto, Chile.