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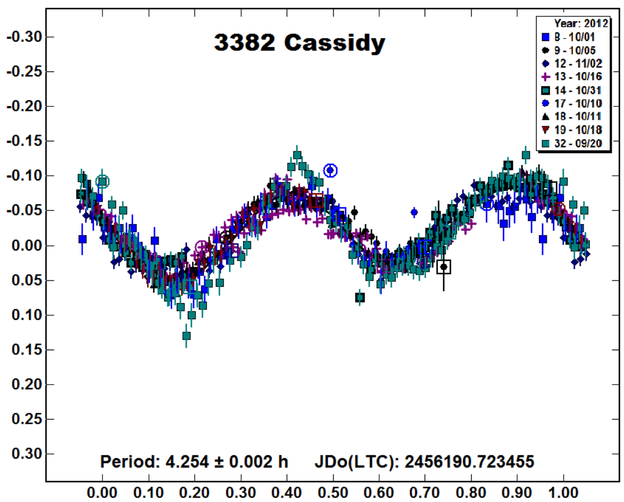

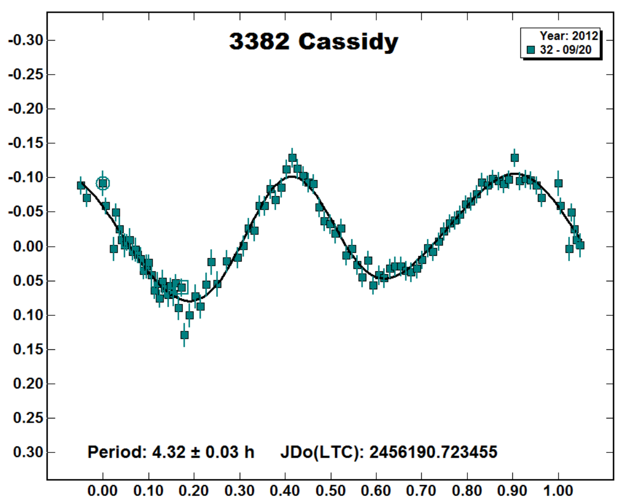

ROTATION PERIOD DETERMINATION FOR 273 ATROPOS: ANOTHER TRIUMPH OF GLOBAL COLLABORATION

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(Received: 11 January)

Previous observations indicated a rotation period for 273 Atropos which was almost identical to Earth's rotation period, but which showed only partial phase coverage. A consortium of observers widely distributed in longitude collaborated to obtain full phase coverage with a synodic rotation period 23.924 ± 0.001 hours, amplitude 0.52 ± 0.03 magnitudes. Observations with BVRI filters at Simeiz provide B-V = 0.90 ± 0.07, V-R = 0.39 ± 0.035, R-I = 0.32 ± 0.045.

All previous reports of rotation periods for 273 Atropos were based on lightcurves with only partial phase coverage and the reported periods cannot be considered secure. These are by Tedesco (1979, fragmentary, 20 hours), Warner (2007, 30% phase coverage, 23.852 hours), and Behrend (2007, 75% phase coverage, 23.928 hours), all with amplitude near 0.60 magnitudes. For an object believed to have period almost equal to that of Earth it is necessary to obtain observations from several widely distributed longitudes for full lightcurve coverage because each participating observatory samples the same segment of the lightcurve on all nights. The several authors from Australia, Europe, North America, and South America agreed to participate in this collaboration. Observations from a total of 24 sessions 2012 Sept. 30 – Dec. 24 provide 100%

phase coverage to a somewhat asymmetric bimodal lightcurve with period 23.924 ± 0.001 hours, amplitude 0.52 ± 0.03 magnitudes. A combination of several considerations enables us to claim that our period of 23.924 hours is secure, that there are no feasible alias periods, and that the rotation period of this difficult object is solved definitively. No realistic shape model except an elongated one can produce a lightcurve with an amplitude as large as 0.52 magnitudes, and the lightcurve produced by such a shape is necessarily bimodal. The two minima are distinctly different in shape, and this rules out a monomodal lightcurve with half of our claimed period. There is excellent consistency among separate sessions covering the same part of the lightcurve, including those in the overlap sections covered by two observers. This not only testifies to the reliability of the overall result but also rules out significant tumbling.

Observations by Yu. Krugly with the 1 meter telescope at Simeiz 2012 Nov. 11 – 12 were made with Bessel B, V, R, I filters and provide color indices B-R = 1.29 ± 0.07, V-R = 0.39 ± 0.035, and R-I = 0.32 ± 0.045. From these data we compute B-V = 0.90 ± 0.07.

The observing cadences by EA at Observatorio Los Algarrobos and by FP at Organ Mesa Observatory are such that a much larger number of data points were acquired there than at any of the other collaborating observatories. To make more legible the large number of data points in the segments of the lightcurve included in the Los Algarrobos and Organ Mesa observations, they have been binned in sets of three points with a maximum of five minutes between points.

The following tables provide observer codes, MPC observatory code and equipment, and details of the individual sessions, respectively. The sessions are listed in temporal sequence of observations times, which is not the sequence of sessions numbers representing their receipt by the first author. Column headings refer to: Obs: Observer code; MPC, Minor Planet Center observatory code; Sess, session number; Date in calendar year 2012; UT of first and last observations of the session; Data Pts, number of data points in session.

Observer code

EA	Eduardo Alvarez
AF	Andrea Ferrero
RI	Raguli Inasaridze, Otar Kvaratskhelia
YK	Yurij Krugly
JO	Julian Oey
FP	Frederick Pilcher
LS	Luca Pietro Strabla, U. Quadri, R. Girelli

Observer equipment

Obs.	MPC	Telescope	CCD
EA	I38	0.3m f/6.9 S-C	QSI 516wsg 2x2
AF	B88	0.3m f/8 RC	SBIG ST9
RI	119	0.7m Maksutov	FLI IMG6063E
YK	094	1.0m at Simeiz	FLI PL09000
JO	E19	0.25m f/11 S-C	SBIG ST-9XE
FP	G50	0.35m f/11 S-C	SBIG STL-1001E
LS	565	0.32m f/3.1 S-C	Starlight HX-516

Session Data

Obs	Sess	Date	UT	Data Pts
FP	17	Sep 30	7:52 - 12:22	233
FP	18	Oct 1	7:39 - 12:21	234
FP	19	Oct 2	6:44 - 12:23	284
RI	187	Oct 13-14	22:04 - 1:48	49
JO	80	Oct 14	13:45 - 17:11	39
RI	188	Oct 14-15	22:16 - 1:48	46
LS	70	Oct 16-17	23:56 - 1:58	31
YK	189	Oct 17-18	21:11 - 2:58	109
JO	81	Oct 20	13:37 - 16:50	33
JO	82	Oct 21	12:50 - 18:20	56
LS	85	Oct 23-24	23:44 - 1:34	48
FP	86	Oct 25	5:23 - 12:31	370
JO	162	Nov 1	13:32 - 15:54	27
AF	99	Nov 6-7	23:36 - 4:36	73
FP	98	Nov 7	4:28 - 12:36	408
JO	163	Nov 11	11:10 - 13:21	50
YK	190	Nov 11-12	20:04 - 0:11	51
JO	164	Nov 25	10:35 - 13:31	28
AF	152	Dec 3	20:07 - 23:22	45
JO	165	Dec 4	12:43 - 16:14	44
JO	167	Dec 5	10:06 - 13:06	33
JO	166	Dec 5	16:01 - 17:39	41
EA	170	Dec 9-10	23:53 - 6:45	249
EA	180	Dec 23-24	23:46 - 6:41	236

Acknowledgment

The first author thanks Alan Harris for helpful insights to explain how our 23.924 hour period may be considered secure.

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