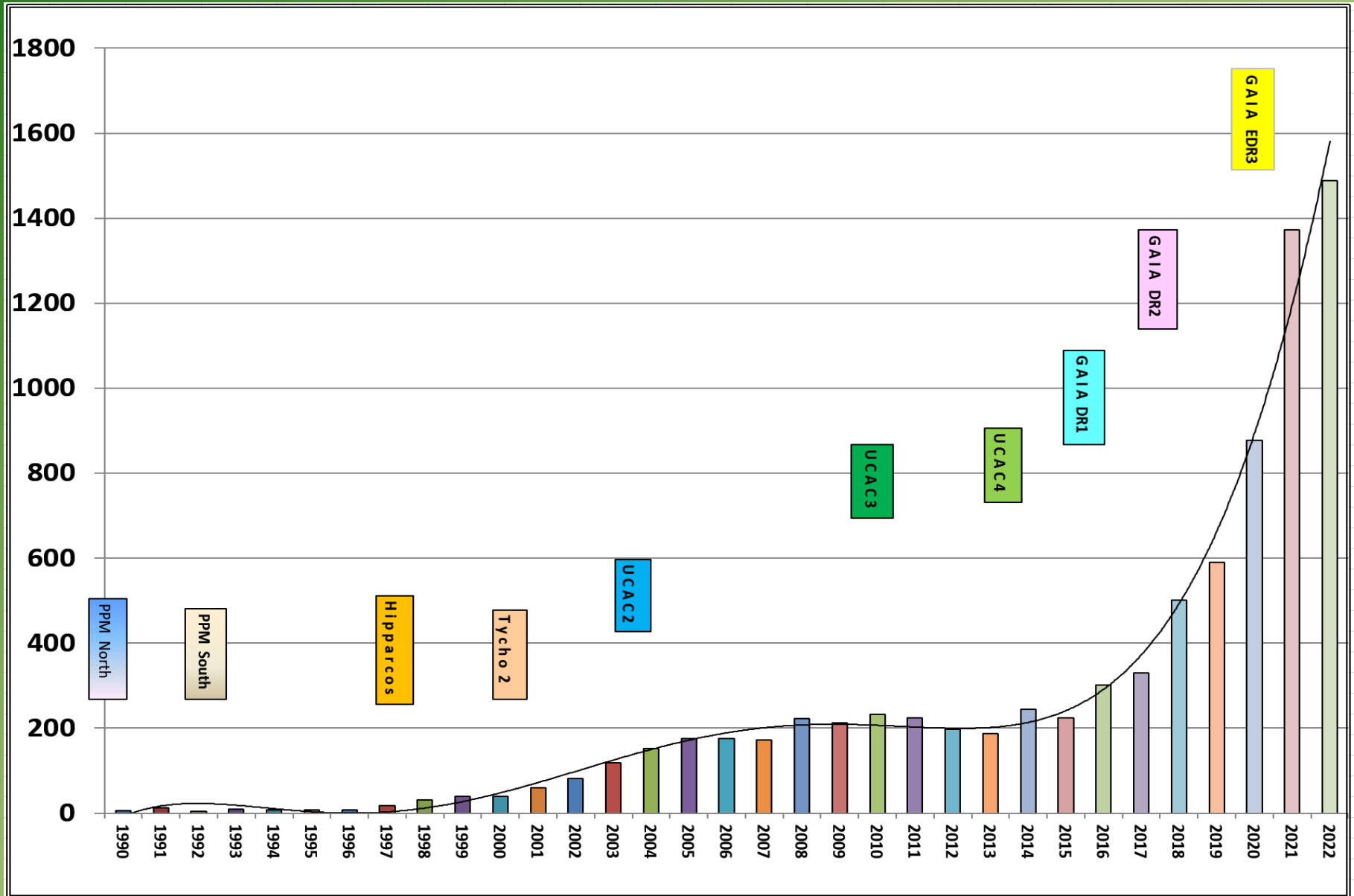


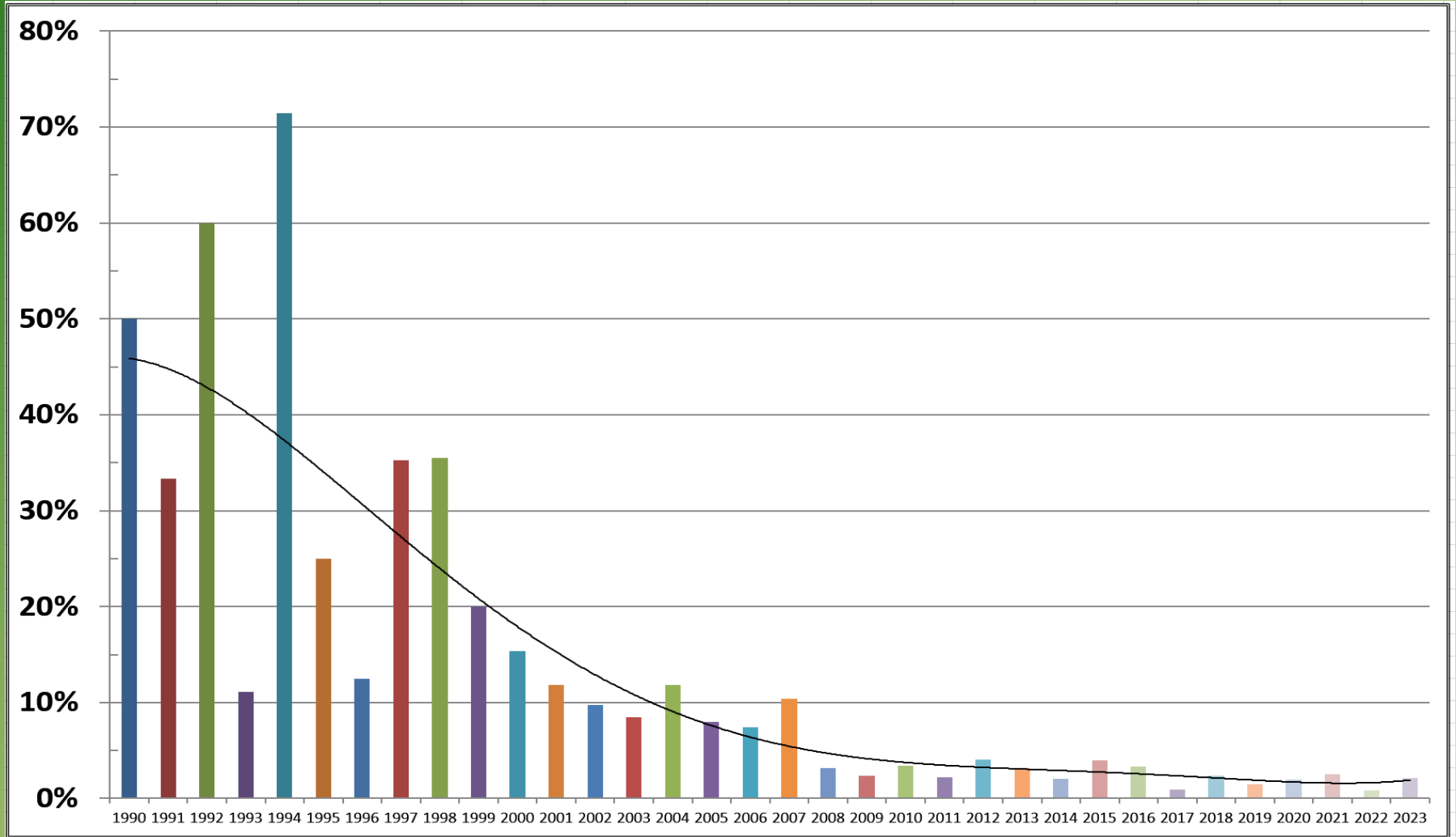
Asteroidal Occultations: Stats, Issues, & Results from 2023

Dave Herald

~1500 events/year, & growing



% Events unusable



World-wide observer group

in 2023

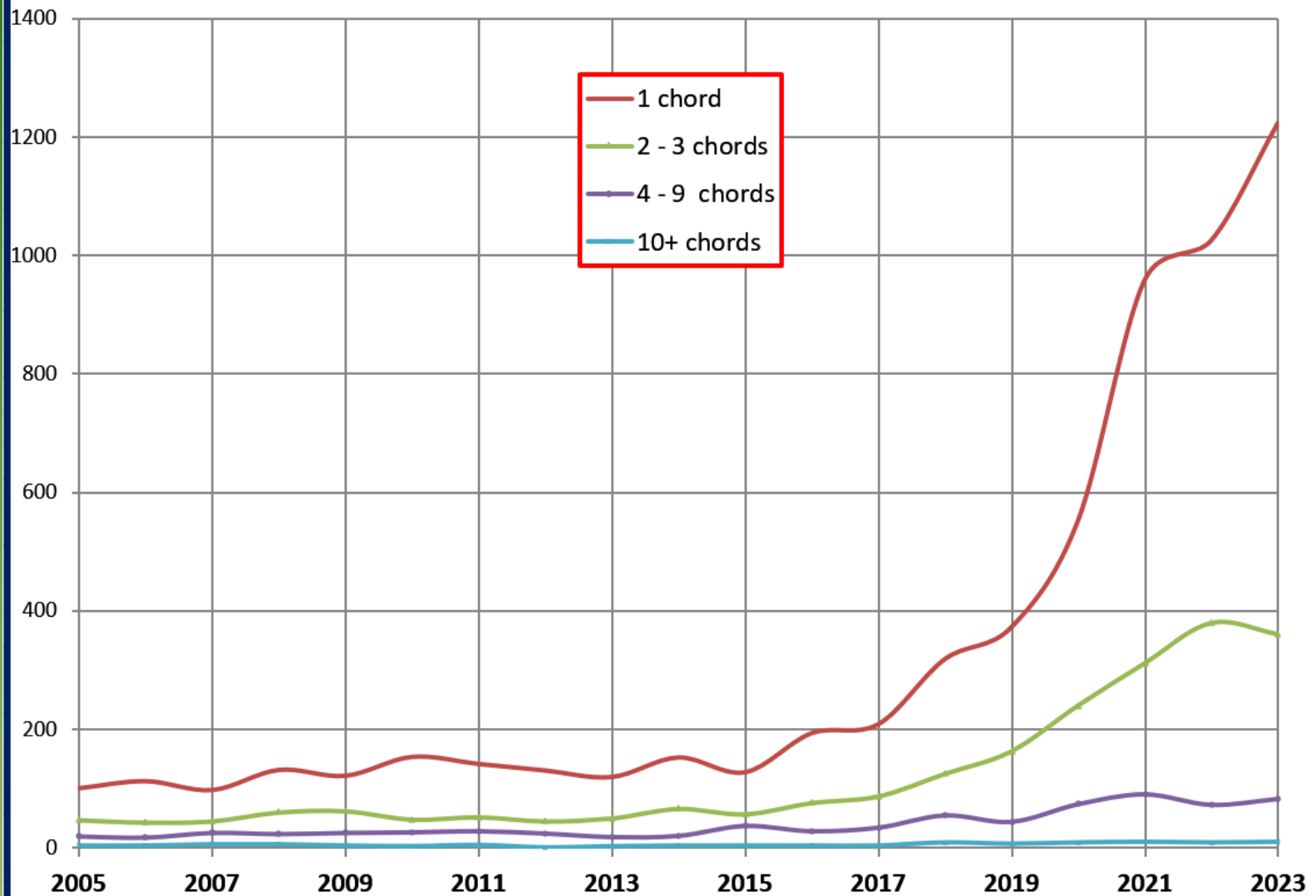
405 observers, who observed:

Region	Total	By asteroid diameter (km)				
		<10km	10-20km	20-50km	50-100km	>100km
Australasia :	364	61	62	99	76	66
Europe :	537	107	90	140	117	83
Japan :	160	7	24	61	34	34
Nth America :	616	112	92	167	136	109
Sth America :	-	-	-	-	-	-

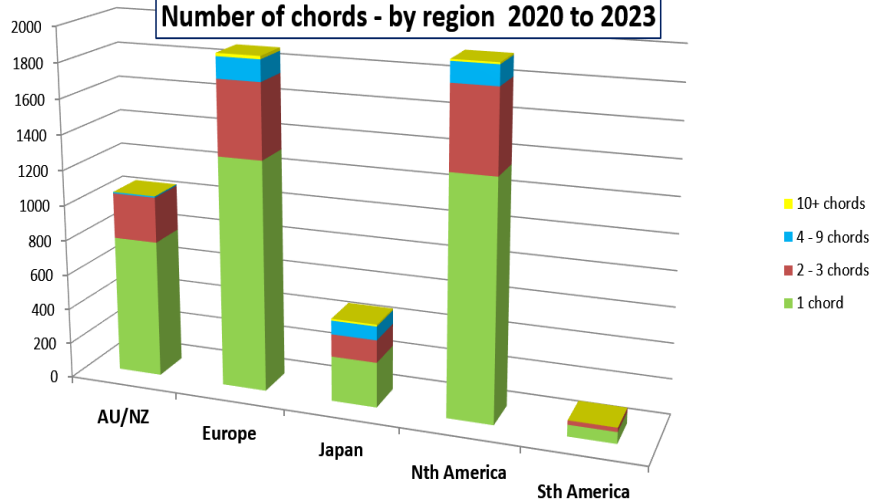
Totals - 2000 to now

<u>Region</u>	<u>Total</u>
Australasia	: 1986
Europe	: 3091
Japan	: 948
Nth America	: 3632
Sth America	: 233
<u>Other</u>	<u>: 29</u>
<u>Total</u>	<u>: 9919</u>

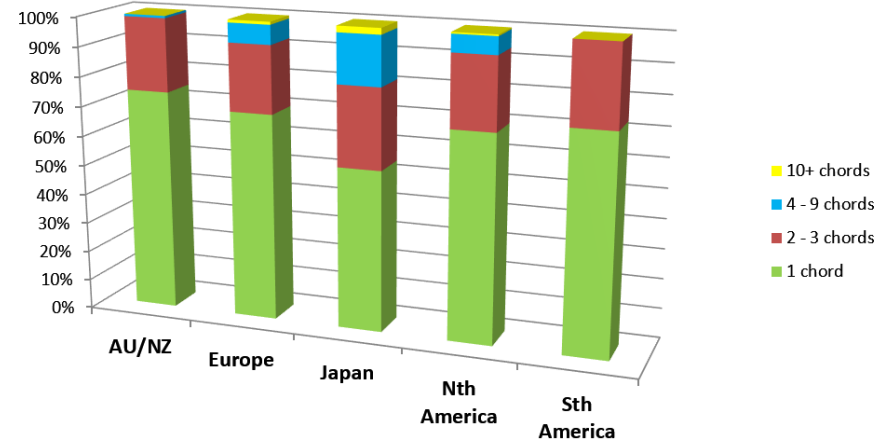
Growth in number of chords



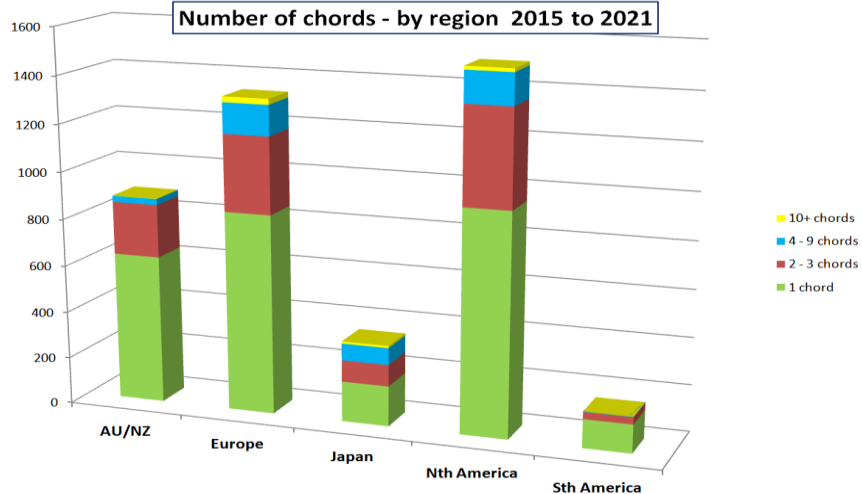
Number of chords - by region 2020 to 2023



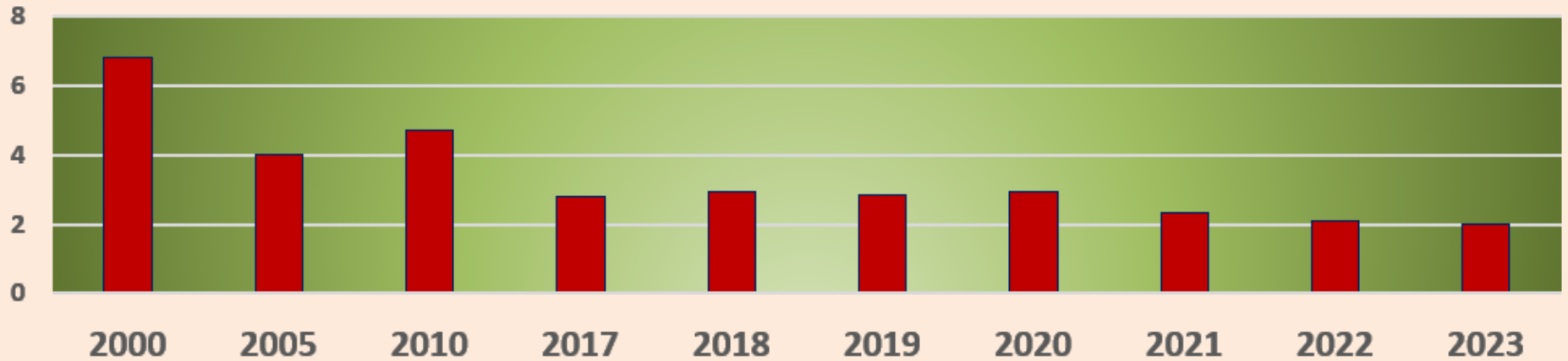
Chord ratios - by region 2020 to 2023



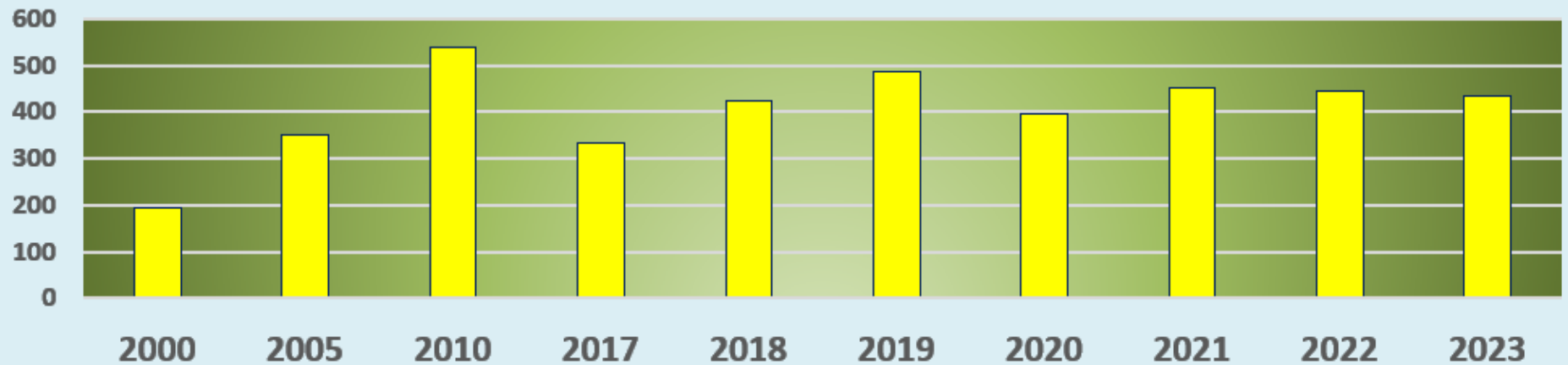
Number of chords - by region 2015 to 2021



Number of Observers per Event



Number of individual observers



Double stars discovered in asteroidal occultations

- New double stars can be discovered in an asteroidal occultation
- Separations are usually in the range 1 to 100 mas {Gaia resolution ~ 100 mas}
- Depending on circumstances, there can be a unique solution, 2, or 4 solutions.
- If several observers, the uncertainty in separation can be less than 1 milli-arcsecond [$<0.001''$]

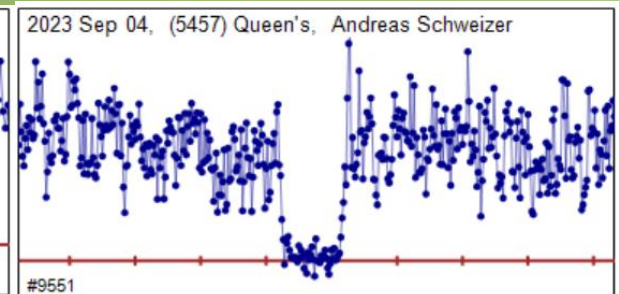
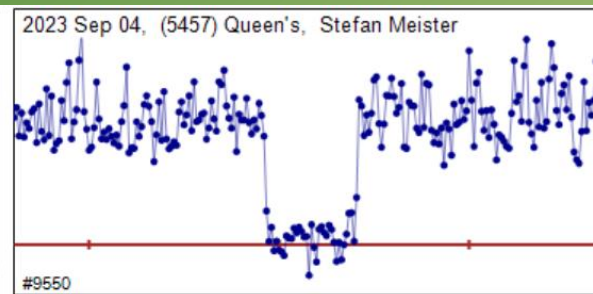
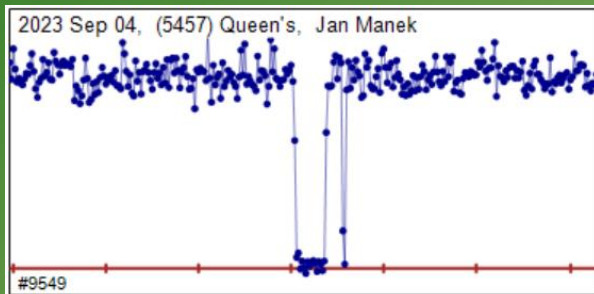
40 double stars discovered in 2023

Cnt	Star number	Soln	Sep (masec)	P.A.	Date	Asteroid
126	Tycho2 0594-00338-1	#1	67.8 ± 0.4	263.5 ± 0.3	2023 Jan 17	469 Argentina
127	Tycho2 0659-00240-1	#1	21.1 ± 1.7	103.9 ± 1.7	2023 Feb 14	95702 2002 JY112
128	UCAC4 300-127677	#1	2.2 ± 5.7	314.8	2023 Mar 2	255 Oppavia
129	UCAC4 491-056923	#1	21.5 ± 1.3	221.9 ± 2.1	2023 Mar 5	401 Ottilia
130	UCAC4 423-084998	#1	12.2 ± 3.1	110.0 ±13.0	2023 Apr 2	246 Asporina
131	UCAC4 402-083153	#1	15.9 ± 9.2	312.2	2023 Apr 8	676 Melitta
132	UCAC4 339-186983	#1	51.1 ± 0.1	232.9	2023 Jun 8	99001 2001 DY49
133	UCAC4 343-087530	#1	3.8	64.0 ± 0.3	2023 Jun 10	774 Armor
134	Tycho2 0866-00746-1	#1	60.5 ± 2.5	24.2 ± 1.7	2023 Jun 18	1 Ceres
135	Tycho2 5134-01820-1	#1	59.7	141.8	2023 Jun 26	1330 Spiridonia
136	Tycho2 6764-01451-1	#2	40.6	105.5	2023 Jul 7	56451 2000 GN81
137	UCAC4 311-181933	#1	44.0 ± 3.9	161.0 ± 6.2	2023 Jul 14	203 Pompeja
138	UCAC4 494-002630	#1	3.6	231.7 ± 0.2	2023 Sep 11	56943 2000 RF76
139	UCAC4 373-185313	#1	7.6 ± 0.1	191.7 ± 0.5	2023 Sep 11	2010 Chebyshev
140	UCAC4 494-002630	#2	6.6	178.4	2023 Sep 11	56943 2000 RF76
141	UCAC4 373-185313	#2	7.6 ± 0.1	322.2 ± 0.5	2023 Sep 11	2010 Chebyshev
142	UCAC4 494-002630	#3	3.5	239.9 ± 0.1	2023 Sep 11	56943 2000 RF76
143	UCAC4 605-044775	#1	25.7	38.6 ±18.8	2023 Sep 12	372 Palma
144	UCAC4 745-083373	#1	1.3 ± 1.2	30.8	2023 Sep 13	1373 Cincinnati
145	UCAC4 333-124316	#1	12.0 ± 2.3	317.0 ±10.7	2023 Sep 16	171 Ophelia
146	UCAC4 468-108835	#1	46.6	183.6	2023 Sep 16	29936 1999 JD49
147	UCAC4 333-124316	#2	36.3 ± 1.7	197.0 ± 4.3	2023 Sep 16	171 Ophelia
148	UCAC4 468-108835	#2	46.1	174.1	2023 Sep 16	29936 1999 JD49
149	UCAC4 333-124316	#3	36.3 ± 1.7	349.4 ± 4.3	2023 Sep 16	171 Ophelia
150	UCAC4 468-108835	#3	46.5 ± 0.1	167.1	2023 Sep 16	29936 1999 JD49
151	UCAC4 333-124316	#4	12.0 ± 2.3	229.4 ±10.7	2023 Sep 16	171 Ophelia
152	UCAC4 568-019267	#1	34.4	277.9	2023 Sep 18	991 McDonalda
153	UCAC4 625-010869	#1	3.9 ± 5.1	152.8 ±15.5	2023 Sep 21	18045 1999 RR100
154	UCAC4 560-045206	#1	10.9 ± 0.1	342.8 ± 0.6	2023 Sep 24	38 Leda
155	UCAC4 577-009260	#1	32.5 ± 0.8	274.8 ± 1.2	2023 Sep 29	154 Bertha
156	UCAC4 569-008474	#1	8.0 ± 2.0	91.9 ± 4.4	2023 Oct 3	5177 Hugowolf
157	UCAC4 455-110377	#1	10.1 ± 0.2	246.9 ± 0.9	2023 Oct 14	163599 2002 TG236
158	UCAC4 614-007135	#1	7.0 ± 1.7	154.5 ± 4.2	2023 Oct 16	3152 Jones
159	UCAC4 591-019634	#1	37.1	328.8 ± 0.1	2023 Nov 7	210 Isabella
160	UCAC4 609-002584	#1	0.7 ± 2.9	213.3	2023 Dec 1	173446 2000 OH9
161	Tycho2 2323-01573-1	#1	19.4 ± 3.3	20.7 ±15.7	2023 Dec 9	132 Aethra
162	Tycho2 0137-01149-1	#1	26.5 ± 1.1	344.9 ± 0.9	2023 Dec 10	258 Tyche
163	UCAC4 636-038632	#1	8.3 ± 1.3	272.6 ± 4.4	2023 Dec 17	1983 Bok
164	UCAC4 512-032445	#1	53.7 ± 0.3	279.5	2023 Dec 23	4902 Thessandrus
165	Tycho2 0261-00346-1	#1	6.9 ± 0.1	233.7 ± 0.6	2023 Dec 29	8200 Souten

Binary Asteroid discoveries

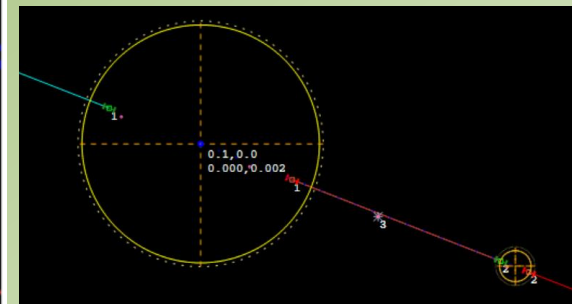
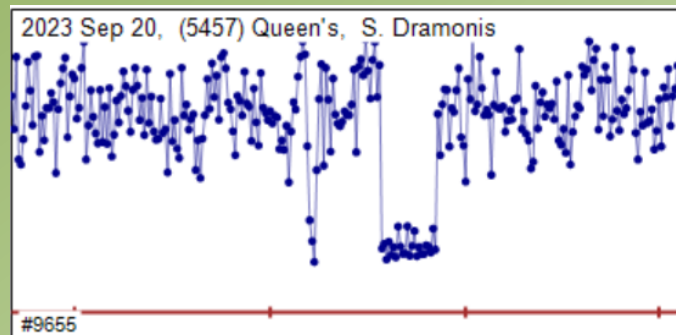
(5457) Queen's

Discovery light curves



Very short event. Is there *certainty* in it being 'real'. Review measurement to ensure no tracking error. [This has happened] Check multiple comparison stars to make sure the drop is unique.

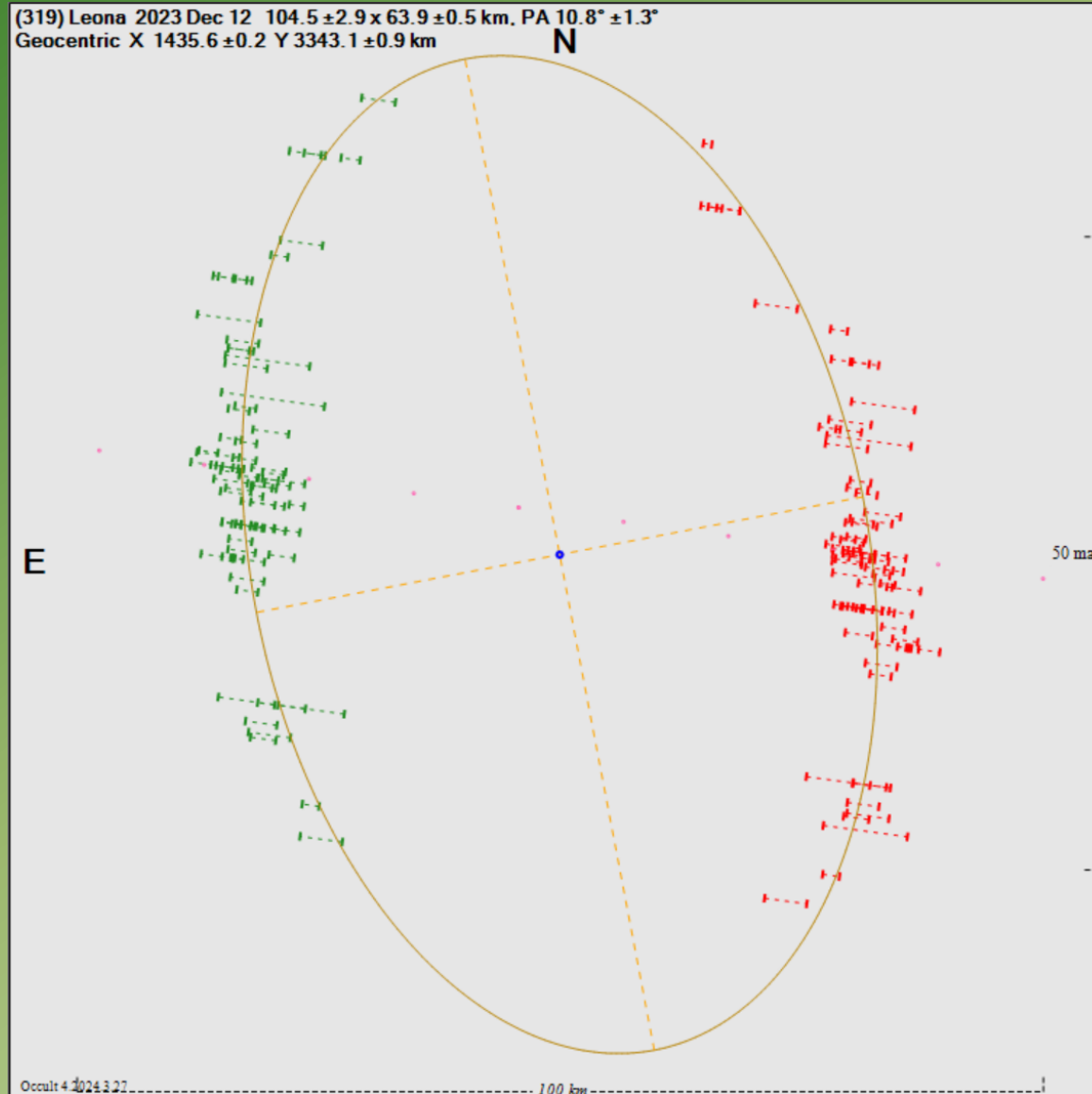
Confirmation light curve

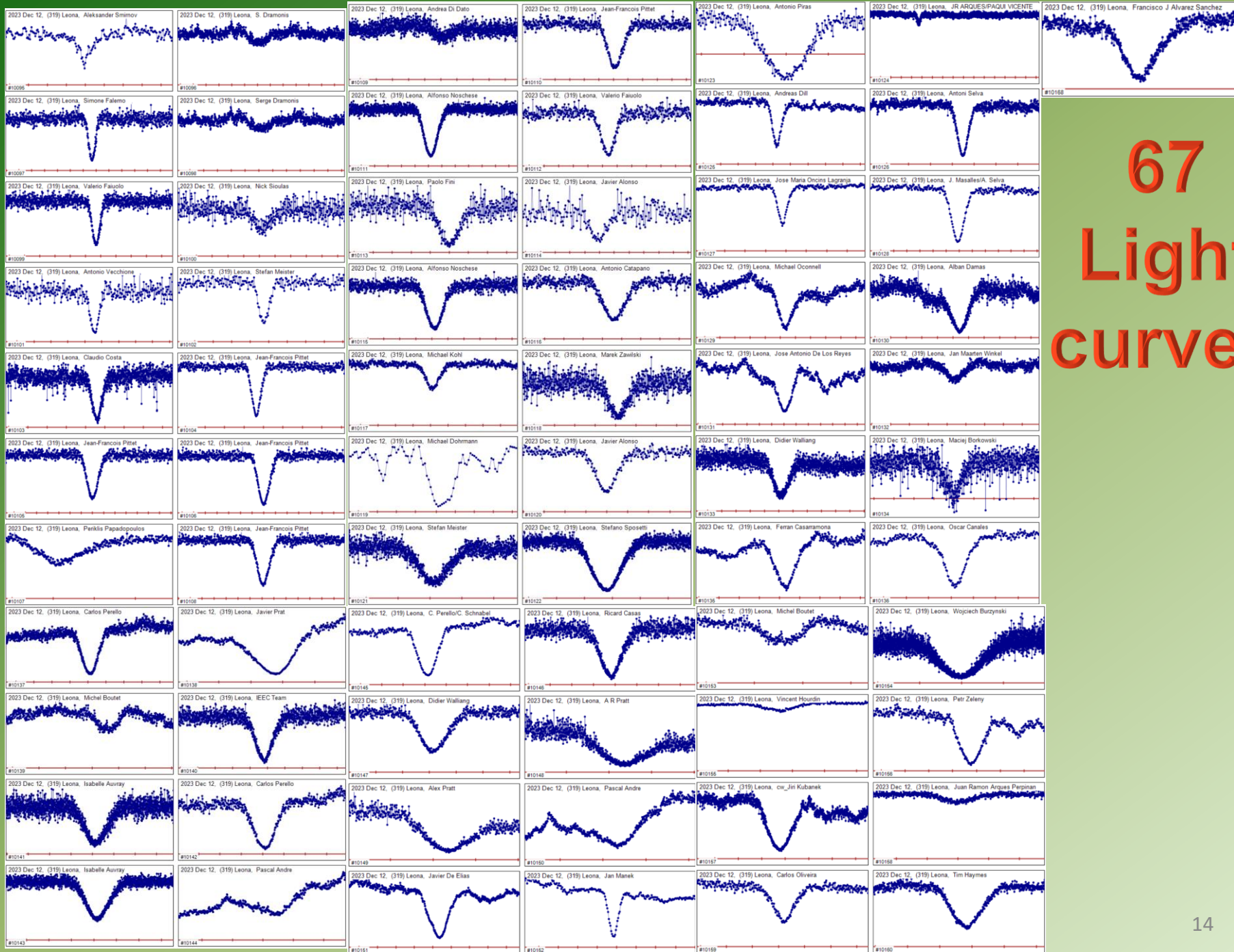


A selection of events
from
the 2nd half of 2023

Betelgeuse - Best event of the year

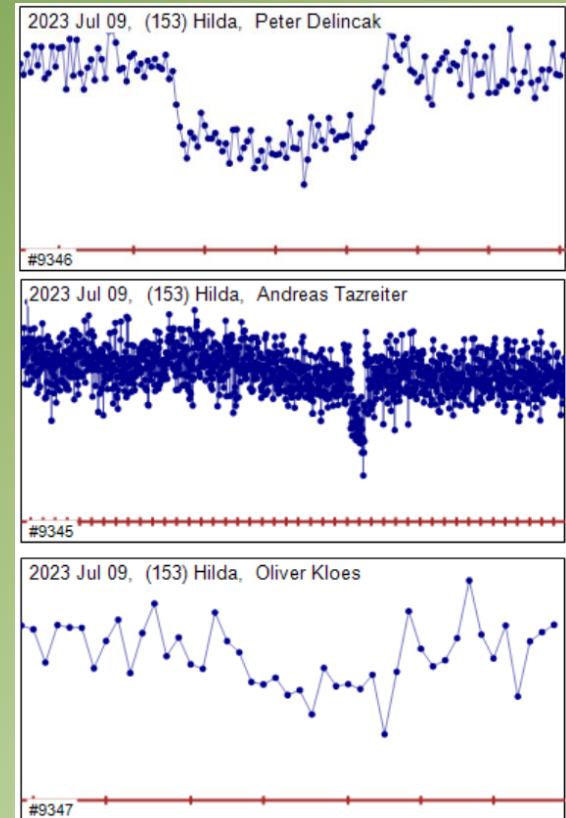
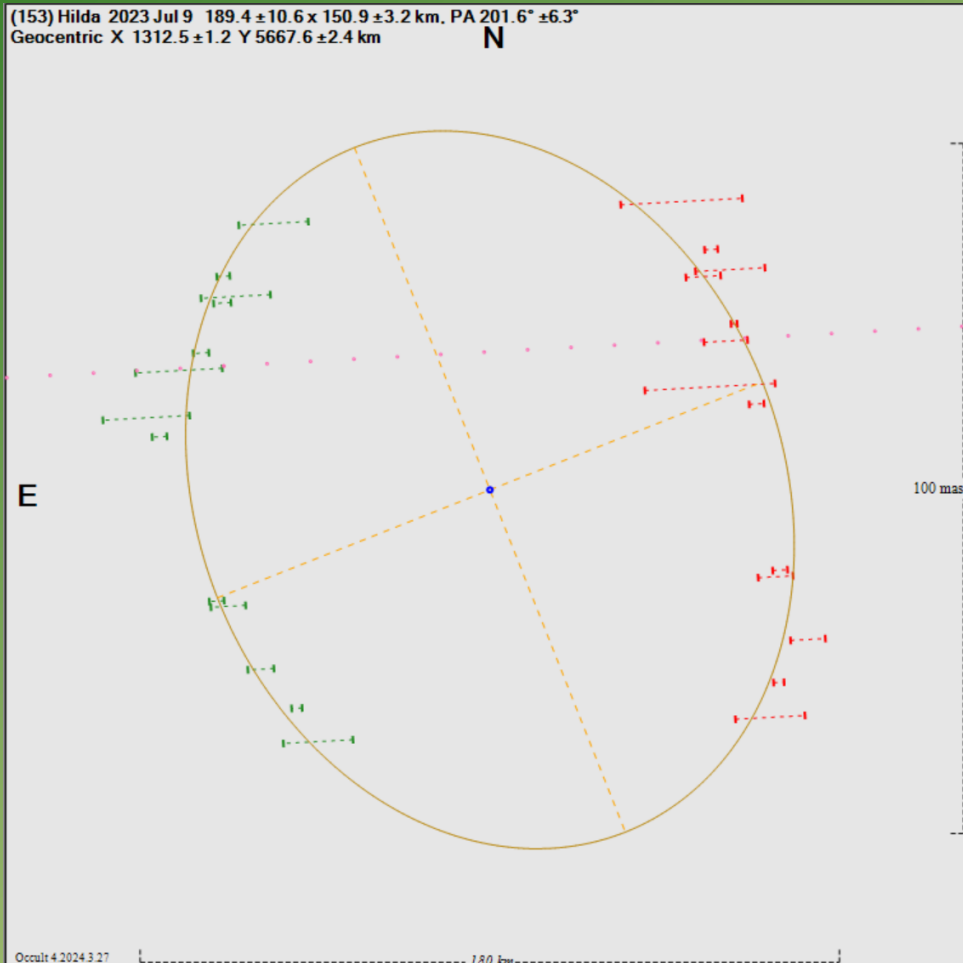
71 chords





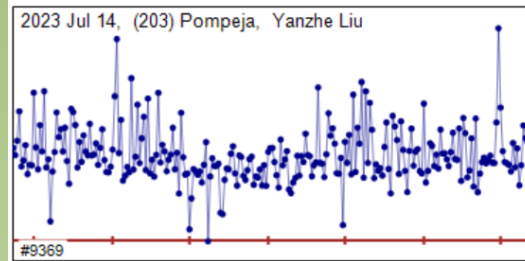
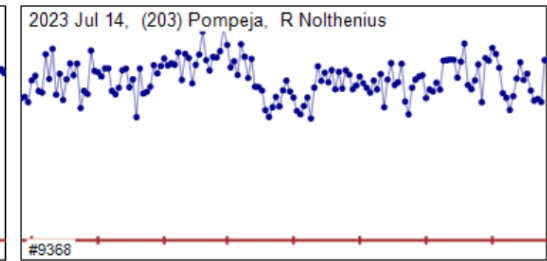
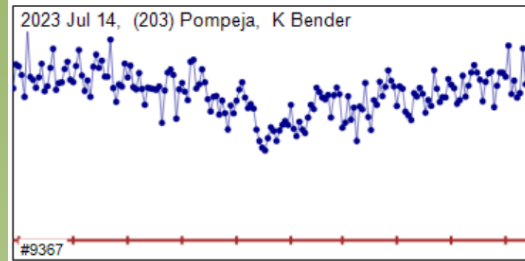
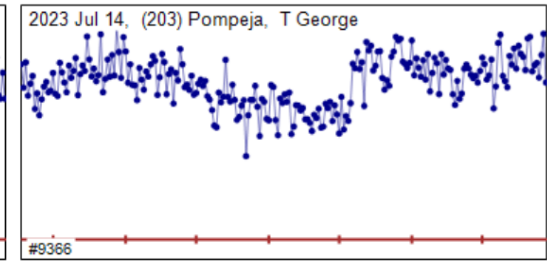
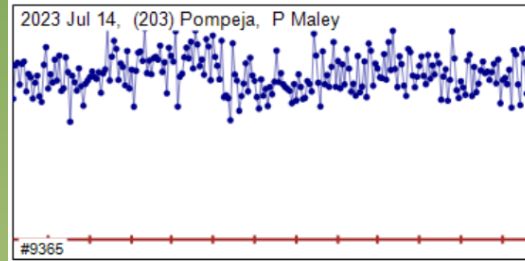
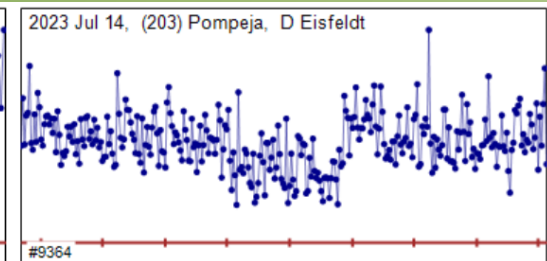
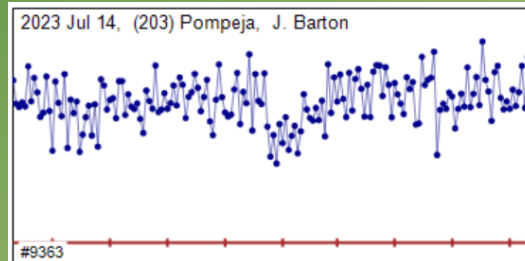
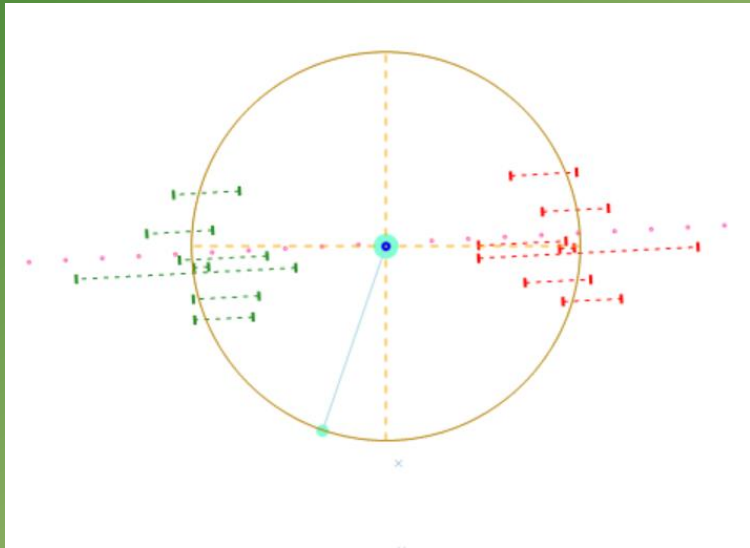
67 Light curves

2023 June 9 - Hilda



2023 July 14 Pompeja

8 chords, one suggesting a double star

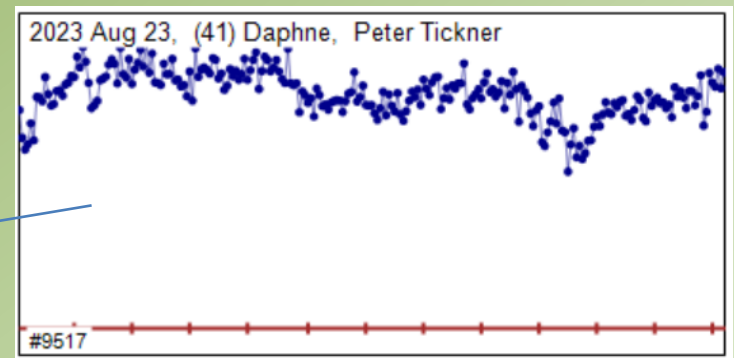
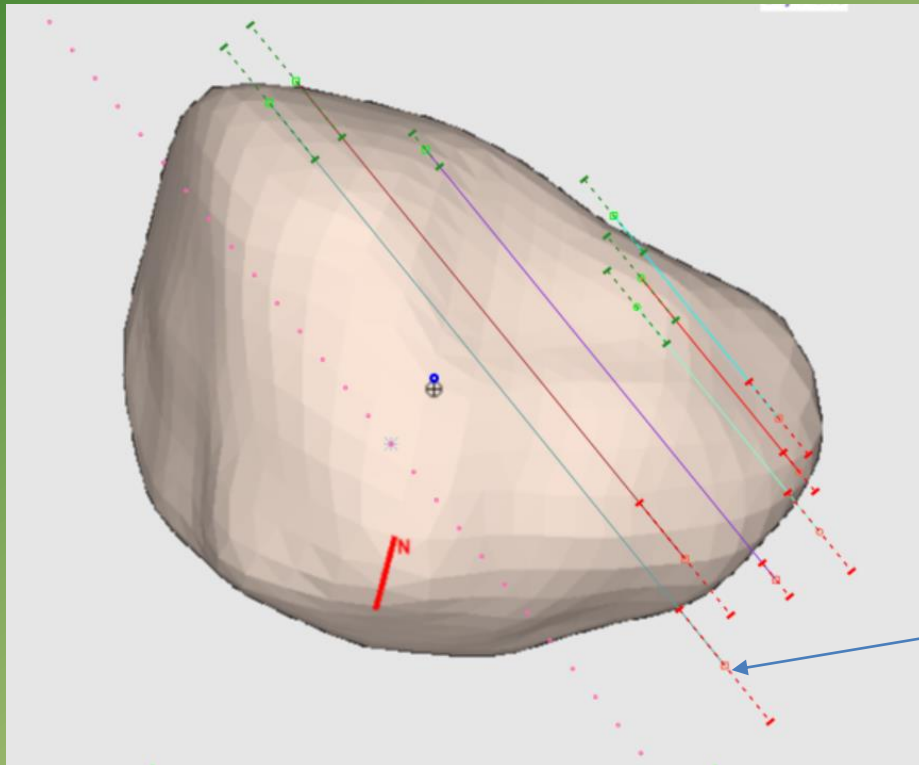


2023 Aug 23 – Daphne

Mag drop 0.2

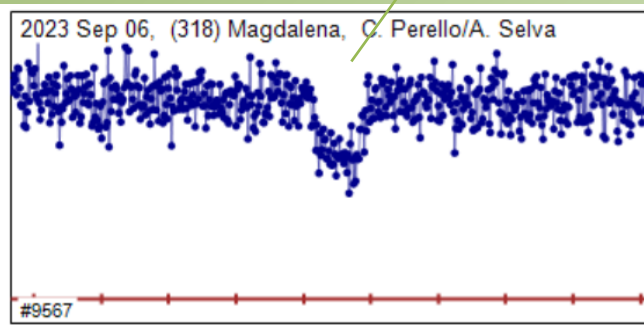
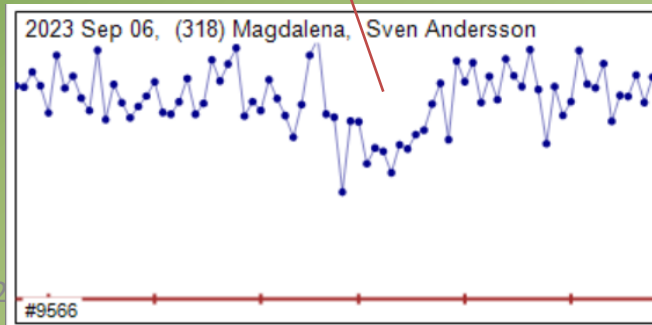
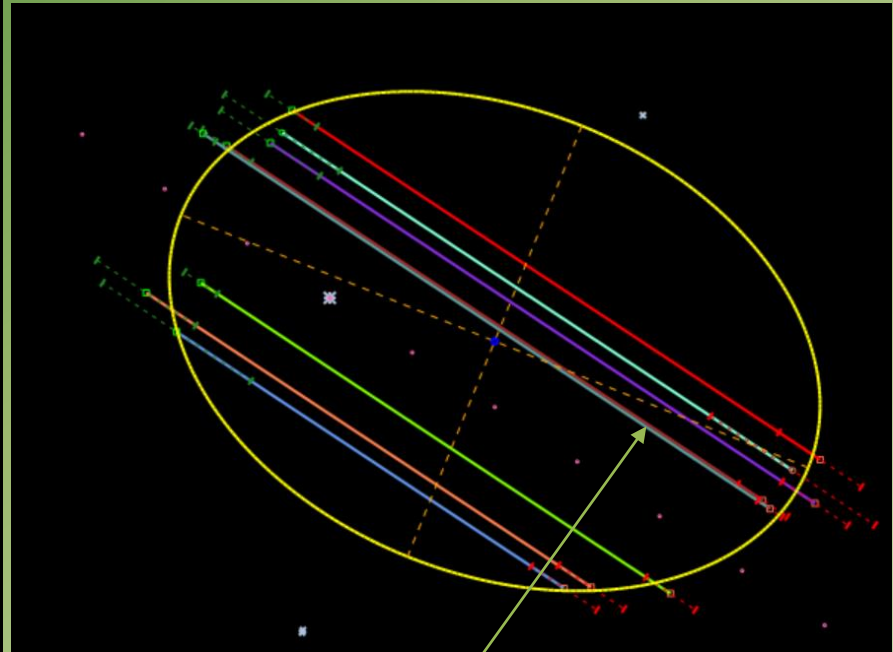
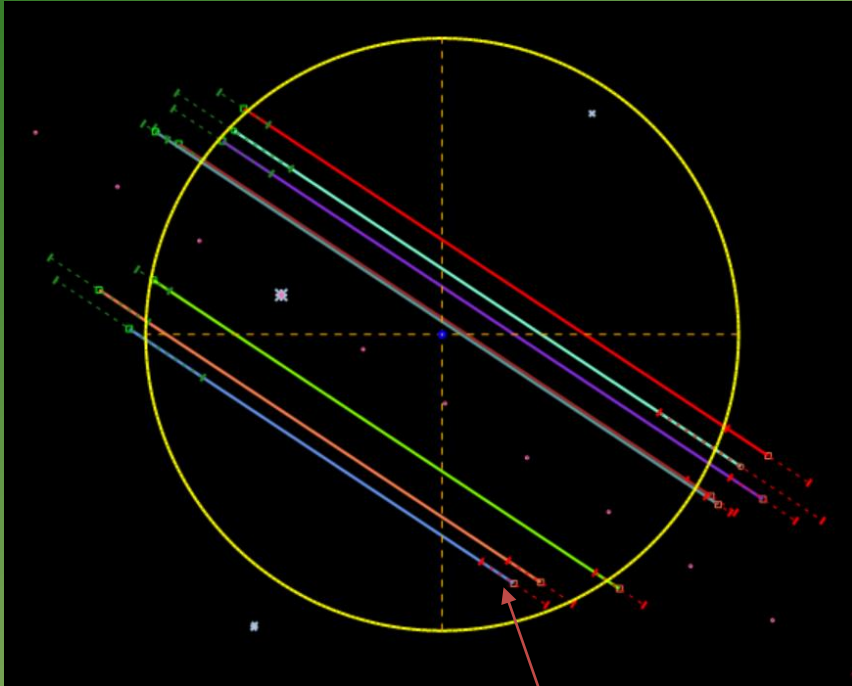
One light curve

How reliable is this observation?

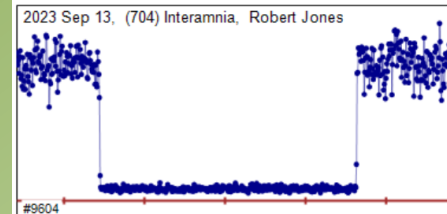
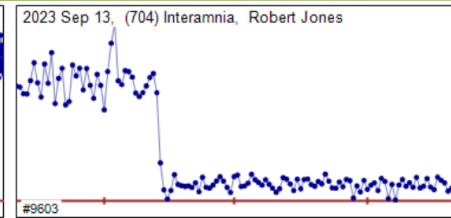
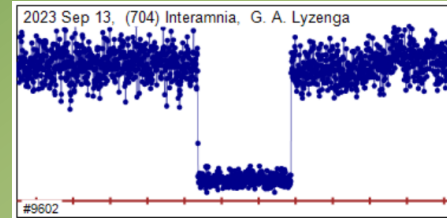
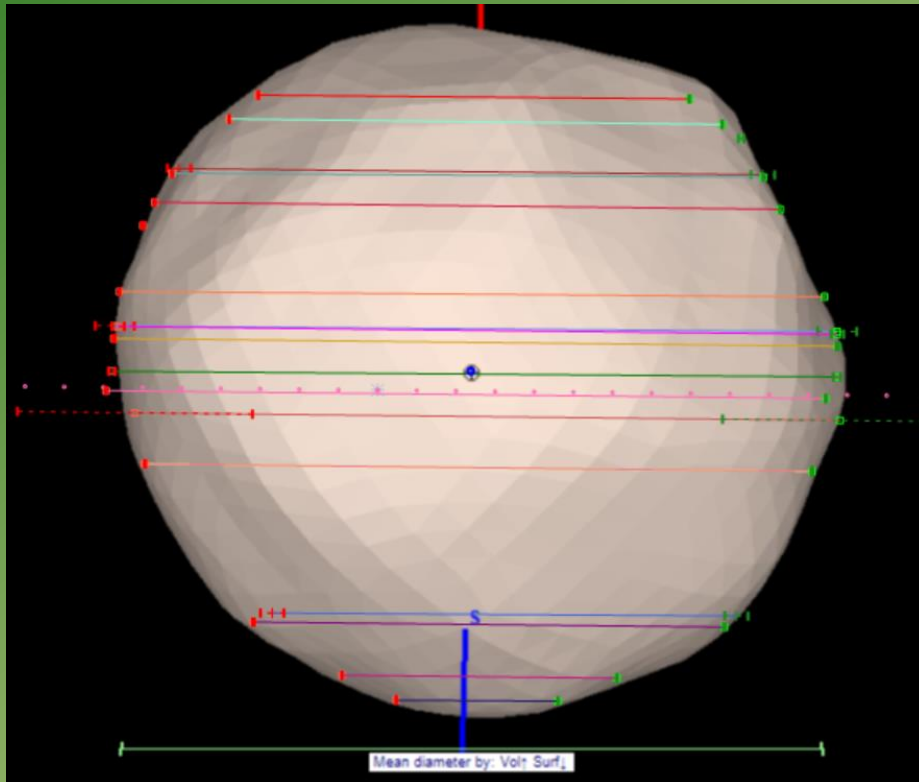


2023 Sep 6 Magdalena

Given the uncertainties, is an ellipse fit justified?



2023 Sep 13 - Interamnia



Any questions?

