

The Professor Comet's Report ¹



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Welcome to the comet report which is a monthly article on the observations of comets by the amateur astronomy community and comet hunters from around the world! This article is dedicated to the latest reports of available comets for observations, current state of those comets, future predictions, & projections for observations in comet astronomy!

Mid Autumn – November 2011

The Current Status of the Predominant Comets for Oct 2011!

Comets	Designation (IAU - MPC)	Orbital Status	Magnitude Visual	Trend	Observation (Range in Lat.)	Constellations (Night Sky Location)	Visibility Period
Garradd	2009 P1	C	7.0	Getting Brighter	85°N - 40°S	SE region of Hercules (Soon to be moving Northward)	Best Evening
Honda - Mrkos - Pajdusakova	45P	P	9.0	Fading quickly!	65°N - 15°S	Southern region of Virgo (Rest of 2011 and Jan 2012)	Early Morning
LINEAR	2011 M1	C	10.5	Fading	50°N - 0°N	Between Crater & Corvus (Heading southward!)	Early Morning
Gibbs	2011 A3	C	10.5	Steady	N/A	Poor Elongation!	N/A
Elenin	2010 X1	C	11.5	Fading	85°N - 40°S	<i>Tail remnants moving west between Auriga and Taurus!</i>	Best Morning
Hill	2010 G2	C	11	Fading	85°N - 15°S	Moving SW across Auriga and towards W region of Taurus	Best Morning
Gehrels 2	78P	P	11.5	Bright	65°N - 60°S	<i>Western Pisces (Undergoing retrograde motion in 'The Circlet')</i>	Best Evening
SWAN	2011 Q4	P	12	Fading	N/A	Undergoing Solar Conjunction!	N/A
Van Ness	213P/2009 B3	P	12.5	Fading	65°N - 55°S	Eastern Aquarius thru NW region of Pisces (Currently under Retrograde motion!)	Best Evening

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Ephemeris Data Terminology

<i>Ephemeris Term</i>	<i>Definition (plus additional comments)</i>
Date	Month and Year using the standard Gregorian calendar.
TT	Terrestrial Time (Day of the Month) as a substitute for the astronomical Julian date.
RA (2000)	Right Ascension based on the Epoch J2000 (longitudinal coordinate for the celestial sky) measured in hours, minutes, and seconds.
Dec (2000)	Declination based on the Epoch J2000 (latitudinal coordinate for the night sky) measured in degrees, arcminutes, and arcseconds.
Delta	The distance from Earth measured in AUs (1 AU = 1 Astronomical Unit = 92 955 807 mi = 149 597 871 km as the mean distance between the Earth and Sun).
R	The solar distance measured in AUs (the distance between the comet or comet - like body and the Sun)!
Elongation	Solar elongation which is the angle of separation between the observed object and the Sun as measured across the night sky as measured in degrees.
Phase	Phase angle between the Sun, the celestial object, and the observer on the surface of the Earth. Also known as the Sun - Object - Observer angle.
M1	M1: The visual magnitude of the celestial object as observed on the surface of the Earth at sea level. <i>(Note M1 values predicted by the Minor Planet Center can differ from actual visual reports obtain in the field!)</i>
M2	The nuclear magnitude of the Comet which is also the visual magnitude of the false nucleus.
"/min	The progression or motion across the sky as measured in arcseconds per minute.
P.A.	Position angle while undergoing motion in the celestial sky. <i>(P.A. is the same method applied to binary stars with starts at N goes counterclockwise in an easterly direction!)</i>
Moon Phase	<i>A Numerical value for designating the phases of the Moon on a scale of (0.00 - 1.00): A New Moon = 0.00, Waxing or Waning Crescent = (0.01 - 0.49), Half Moon (1st or Last Quarter = 0.50), Waxing or Waning Gibbous = (0.50 - 0.99), & Full Moon = 1.00</i>

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Degree of Condensation (DC)

All observations of comets are broken down into three factors: estimating magnitudes for light curves to predict future brightness, coma observations, and observations that concern with a comet's tail(s). For the coma or a comet's head there two characteristic features that are important for study: Degree of condensation (DC) and coma size measured in arcminutes. The classification system for determining the DC is based on a positive integer system from 0 to 9 as shown below.

<i>DC value</i>	<i>Definition to numerical DC designation</i>
0	<i>Diffuse coma of uniform brightness</i>
1	<i>Diffuse coma with slight brightening towards center</i>
2	<i>Diffuse coma with definite brightening towards center</i>
3	<i>Centre of coma much brighter than edges, though still diffuse</i>
4	<i>Diffuse condensation at centre of coma</i>
5	<i>Condensation appears as a diffuse spot at centre of coma – described as moderately condensed</i>
6	<i>Condensation appears as a bright diffuse spot at centre of coma</i>
7	<i>Condensation appears like a star that cannot be focused – described as strongly condensed</i>
8	<i>Coma virtually invisible</i>
9	<i>Stellar or disk like in appearance</i>

A Synopsis of the Predominant Comets for Autumn 2011!

The autumn season is here and comet Garradd appears to have peaked in its brightness and presence in the evening, western skies within the constellational region of Hercules. 2009 P1 Garradd is still bright with the latest visual magnitudes ranging between 6.5 – 7.5 with the coma becoming more elliptical in shape from my recent observations and I personally give it a DC value of 6; with an ever diffusing coma resulting in the 6th visual magnitude inner coma becoming more prominent against the fading outer coma. The size of the coma has shrunk in size to about 6' – 8' across making it a mere 4% - 8% the size of an average full Moon! Observations of comet Garradd are possible using an 8x50 viewfinder or a good pair of binoculars of similar capabilities as it more favorable to observe in the SE and E regions of Hercules away from the stellar cluster of the Milky Way band. The fan – shaped tail of the comet is much harder to see and has faded to below 8th visual magnitude making it difficult for more detail inspections at sky altitudes below 30°. Garradd's Tail has stretched out to become more elongated, but the tail even in most astrophotos show it to be presently no more than 0.5° in size (equivalent to an average full Moon). Possibilities for this comet to remain at an overall average visual magnitude close to or above 6.5 will remain high through the rest of 2011 and into early Spring 2012.

C/2009 P1 Garradd is currently moving westward through the SE region of Hercules into early November at a declining rate from 61.2"/hr on 1 October to a slow crawl (11.4"/hr) during the nights of 13 – 16 November and then will make a gradual progression northward from a PA of 326.1° on 17 Nov to PA of 0° the night of 10/11 December. Expect the comet to then graze thru the eastern region of Hercules as it moves northward, but distinctly east of the Keystone (the central asterism of Hercules) while maintaining a general PA of 0° between the dates of 10 – 22 December. Around this time and overlapping with the dates of 20 – 27 December, Garradd will reach perihelion with a distance of 1.551 AU (231.8 million km or 144.1 million mi) from the Sun. Therefore the comet will only get as close to the Sun roughly equal to the average distance the planet Mars is from our mother star! Further data analysis of the orbital elements of comet Garradd place its' perigee with the Earth at 1.266 AU (117.6 million mi or 189.2 million km) on the nights of 4 – 6 March 2012 when it is predicted by the IAU minor planet center to remain at a visual magnitude of 7.1. Continued gathering of photometry data and comparison with the light curve of C/2009 P1 from the previous months of 2011 still predicts a continuation of the comet's brightness well into the Spring 2012. The original prediction of the comet reaching maximum visual brightness during the period of 11 – 24 February 2012 is still set, but with only a small change of the comet getting half a magnitude brighter for the coma then the original value set at 7.0. Note that Hercules will soon be lost in the daytime glare of the Sun by early December making it impossible to observe the comet as it makes its northerly march through the eastern region of Hercules east of the 'Keystone' towards the constellation of Draco. However, Garradd will appear again in the morning night skies by early Jan still in Hercules as it moves northward towards Draco and thru that constellation during the nights of 12 – 29 February and on to Ursa Minor (The Little Dipper) during the time when Garradd approaches perigee with the Earth!

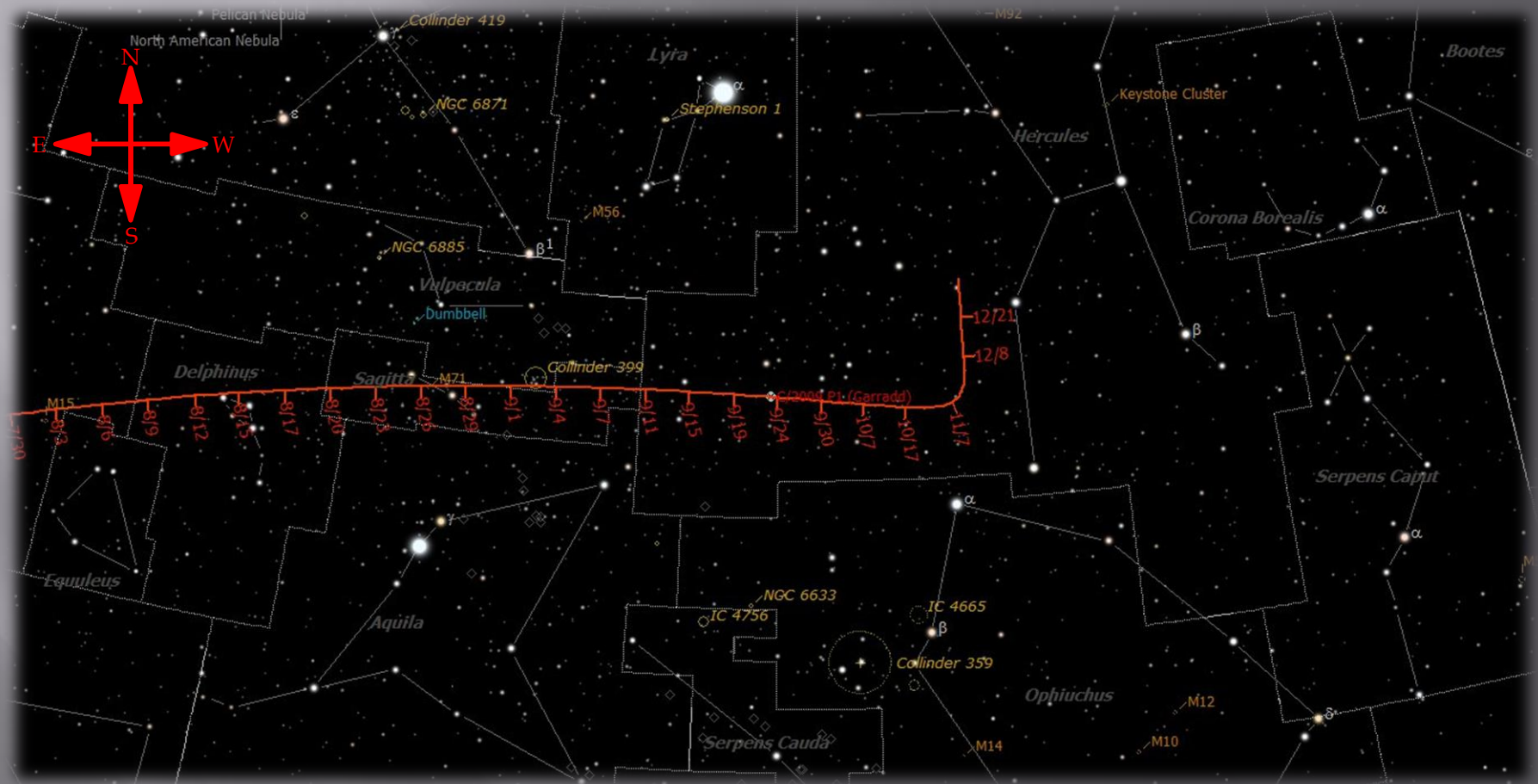
A Synopsis of the Predominant Comets for Summer 2011!

Comet 45P/Honda-Mrkos-Pajdusakova is becoming another great surprise with the latest visual observations from the field have reported visual magnitude values between 6.4 – 7.0 as the comet progresses westward from southern region of Leo towards the southern areas of Virgo. In particular 45P will be positioned in the general location very close to the planet Saturn between the stars of Spica and Porrima between the nights of 26 November thru 4 December when the constellations of Leo and Virgo will become more visible in the earlier hours of the morning night skies once the Sun begins its track thru the constellation of Sagittarius. Currently the comet is only visible during the mid morning hours close to dawn with the DC reported at 6 – 7, an angular diameter of 3' – 4' (1% - 2% the size of the full Moon), and a very dispersed tail between 0.4° - 0.6° in length at a currently fixed PA of 290°. It is best to see the comet now as it is expected to get fainter already past both perihelion and perigee during the summer/autumn seasons of this year. The expectation for Comet Honda is to dim below 10th visual magnitude by mid-October and fade further to mid-16th magnitude by the time it is expected to graze by Saturn on its northern edge! All other comets currently present in the night sky right now are expected to remain below 10th magnitude (barring some unforeseen discoveries or unexpected outbursts) for the remaining months of 2011 and possibly well into the late Winter/Early to Mid Spring 2012!

Note of interest in regards to Comet C/2010 X1 Elenin. The doomsday comet that has the heart of interest for the 2012 gloom and doom predictors has completely disintegrated in terms of its central nucleus. Since it is established that most comets are a loose conglomeration of low – density rock, ices, and volatiles it is possible that the amount of solar radiation/energy Elenin received from the Sun gave it's volatile gases and ices enough internal, vapor pressure to shatter the small 2 km (1.2 mi) size nucleus into small fragmentary debris which is the official death nail for any comet. Comet Elenin was not discovered until 10 December 2010 by amateur astronomer Leonid Elenin using the International Scientific Optical Network's robotic observatory near Mayhill, New Mexico, USA! Only the remnants of this comet remain in the tail – like, debris trail which is still visible, but just barely so in amateur telescopes around mid-11th magnitude. Scientific analysis of it's orbital elements under the 1950.0 Epoch had originally placed this comet with it's origin coming from the Oort Cloud with a chaotic, barycentric orbit of about 5.7 million Earth years with a aphelion distance calculated at 63 800 AUs (5.927 Trillion mi, 9.537 Trillion km, or 1.01 lys). A more recent approach using updated orbital elements from the Aug 2011 Epoch gives it a chaotic, heliocentric orbit of 600,000 yrs and a semi-major axis of 518 AU (48.122 billion km or 29.884 billion mi). The comet reached perihelion on 10 Sept 2011 at a distance of 0.4824 AU and a perigee of 0.2238 AU on 16 Oct 2011 at a relative velocity of 86 000 km/hr or Mach 70.2. Interesting note: during the morning of 8 Oct 2011, Comet Elenin was at it's closest apparent path with comet 45P/Honda were the paths of the orbits intersected in the southern region of Leo. Observe this comet remnant telescopically under very dark skies while you still can since the what is left of the tail will eventually be dispersed by the gravitational and solar wind influences within our Solar System!

C/2009 P1 Garradd

Figure 1: Garradd P1 projected path during the Autumn Season of 2011!

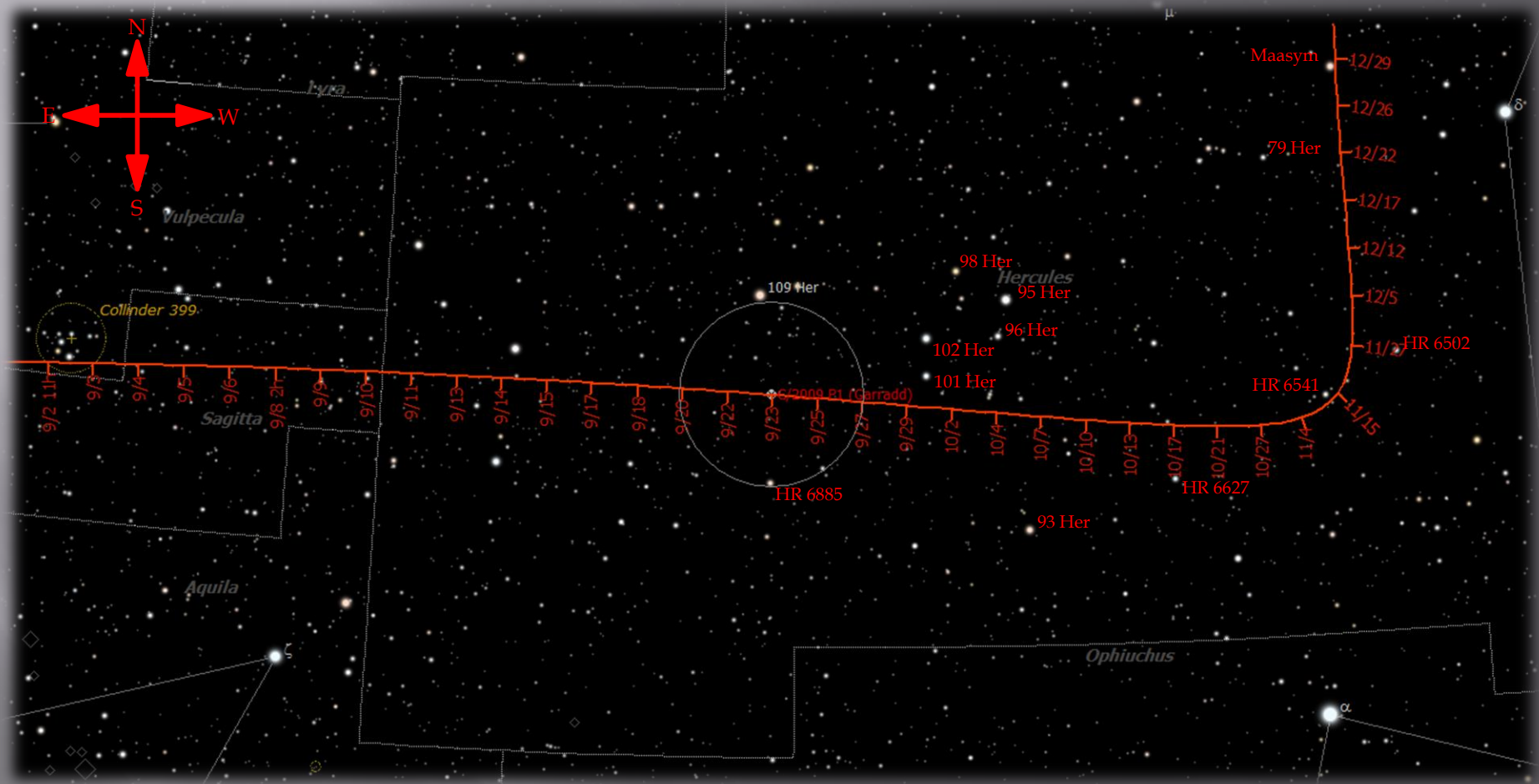


Courtesy of SkyTools 3 Profession Ed, 2011.

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C/2009 P1 Garradd

Figure 2: Close up of Garradd P1 projected path from 2 Sept - 30 Dec 2011!



Courtesy of SkyTools 3 Profession Ed, 2011.

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Bright Stars in Hercules along the Autumnal/Winter path of Comet Garradd

Star	Common Designations	Vis. Mag	Classification	Stellar Attributes	R.A. (2000)	Dec (2000)	Distance (lys)
109 Her	HR 6895, HD 169414	3.84	K2.5 III	Binary/ Suspected Variable	18h 23m 42.1s	+21°46'08"	130
102 Her	HR 6787, HD 166182	4.35	B2 IV	None	18h 8m 45.5s	+20°48'52"	1500
101 Her	HR 6794, HD 166230	5.10	A6 III	None	18h 8m 52.9s	+20°02'43"	320
98 Her	HR 6765, HD 165625	4.96	M3 IIIa	Suspected Variable	18h 6m 1.9s	+22°13'08"	620
96 Her	V820 Her, HR 6738, HD 164852	5.22	B3 IV	Variable (Spectroscopic Binary)	18h 2m 23.0s	+20°50'01"	1000
95 Her	HR 6729, HD 164668	4.96/5.18	A5 III/G8 III	Multiple Star System	18h 1m 30.0s	+21°35'44"	470
93 Her	HR 6713, HD 164349	4.67	K0 III	None	18h 0m 3.4s	+16°45'03"	660
79 Her	HR 6571, HD 160181	5.76	A2 Vn	Multiple Star System	17h 37m 31.1s	+24°18'36"	240
HR 6885	HD 169191, TYC 01572 - 2438 1	5.25	K3III	None	18h 22m 49.1s	+17°49'36"	440
HR 6627	HD 161833, TYC 01556 - 1341 1	5.61/5.72	F2 V/A1 V	Multiple Star System	17h 47m 8.1s	+17°41'49"	370
HR 6541	HD 159332, TYC 01546 - 0208 1	5.65	F6V	Variable	17h 33m 22.8s	+19°15'23"	120
HR 6502	HD 158148, TYC 01545 - 2527 1	5.52	B5 V	None	17h 26m 49.1s	+20°04'52"	470
Maasym	λ Her, HR 6526, HD 158899	4.41	K3.5 III	Suspected Variable	17h 30m 44.3s	+26°06'39"	370

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The Orbital elements of Comet Garradd

C/2009 P1 (Garradd)

Epoch 2011 Dec. 25.0 TT = JDT 2455920.5

T 2011 Dec. 23.6767 TT

MPC

q	1.550535	(2000.0)	P	Q	
z	-0.000685	Peri.	90.7475	-0.1666100	-0.8269119
	+/-0.000000	Node	325.9977	-0.5871976	+0.5207849
e	1.001062	Incl.	106.1775	+0.7921112	+0.2121317

From 2360 observations 2009 Aug. 13-2011 Aug. 26, mean residual 0".4.

q = Perihelion distance (minimal distance from the Sun in AUs)

z = Reciprocal semimajor axis (in 1/AU)

e = orbital eccentricity (range in values: 0 to 1) with 0 = perfectly circular orbit & 1 = straight path somewhat hyperbolic

Peri. = Argument of perihelion (J2000 Epoch) in degrees.

Node = Longitude of the ascending node (J2000 Epoch) in degrees

Incl. = Inclination (J2000 Epoch) in degrees

P and Q = are mathematical representations for the orbital elements Peri.,Node, and Incl. in an alternative form.

NOTE: What is important is that one does not need to understand the orbital elements! Simply input these values in a good quality astronomy/planetarium program and the orbit of the comet will be displayed by its predicted path and motion across a simulation of the night sky. This can be used in preparing for a particular time period selected for future night sky observations or astrophotography sessions!

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IAU MPC Ephemeris data for C/2009 P1 Garradd (August 2011):

Date	CDT/CST	R.A. (J2000)	Decl.	Delta	r	El.	Ph.	M1	*M2	Sky Motion	Moon Phase	Moon Mag.	
	h m s									"/min	P.A.	(0.00 - 1.00)	(Visual)
2011 11 01	190000	17 36 42.3	+18 46 00	2.019	1.706	57.5	29.4	7.8	-	0.29	279.0	0.41	-10.79
2011 11 02	190000	17 36 15.0	+18 47 07	2.026	1.700	56.9	29.3	7.8	-	0.28	280.9	0.51	-11.13
2011 11 03	190000	17 35 49.2	+18 48 24	2.033	1.695	56.2	29.1	7.8	-	0.27	282.9	0.61	-11.39
2011 11 04	190000	17 35 24.6	+18 49 52	2.039	1.689	55.5	28.9	7.8	-	0.26	285.1	0.70	-11.61
2011 11 05	190000	17 35 01.4	+18 51 31	2.046	1.684	54.9	28.8	7.8	-	0.25	287.5	0.79	-11.79
2011 11 06	190000	17 34 39.4	+18 53 20	2.052	1.679	54.3	28.6	7.8	-	0.24	290.1	0.86	-11.93
2011 11 07	190000	17 34 18.6	+18 55 20	2.058	1.674	53.7	28.5	7.8	-	0.23	292.8	0.92	-12.04
2011 11 08	190000	17 33 58.9	+18 57 32	2.064	1.669	53.1	28.3	7.8	-	0.22	295.7	0.96	-12.02
2011 11 09	190000	17 33 40.4	+18 59 55	2.069	1.664	52.5	28.2	7.8	-	0.22	298.8	0.99	-12.17
2011 11 10	190000	17 33 23.0	+19 02 29	2.074	1.659	52.0	28.0	7.8	-	0.21	302.0	1.00	-12.18
2011 11 11	190000	17 33 06.6	+19 05 14	2.079	1.654	51.4	27.9	7.8	-	0.21	305.3	0.99	-12.16
2011 11 12	190000	17 32 51.2	+19 08 11	2.083	1.649	50.9	27.8	7.8	-	0.21	308.6	0.97	-12.10
2011 11 13	190000	17 32 36.8	+19 11 20	2.088	1.645	50.4	27.6	7.8	-	0.20	312.0	0.92	-12.01
2011 11 14	190000	17 32 23.3	+19 14 40	2.092	1.640	49.9	27.5	7.8	-	0.20	315.5	0.86	-11.88
2011 11 15	190000	17 32 10.7	+19 18 13	2.095	1.636	49.5	27.4	7.7	-	0.20	318.8	0.78	-11.72
2011 11 16	190000	17 31 59.0	+19 21 58	2.099	1.632	49.1	27.2	7.7	-	0.21	322.2	0.69	-11.51
2011 11 17	190000	17 31 48.1	+19 25 55	2.102	1.627	48.6	27.1	7.7	-	0.21	325.4	0.59	-11.24
2011 11 18	190000	17 31 38.1	+19 30 05	2.105	1.623	48.2	27.0	7.7	-	0.21	328.5	0.48	-10.90
2011 11 19	190000	17 31 28.8	+19 34 27	2.107	1.619	47.9	26.9	7.7	-	0.21	331.4	0.37	-10.47
2011 11 20	190000	17 31 20.3	+19 39 03	2.109	1.615	47.5	26.8	7.7	-	0.22	334.2	0.27	-9.90
2011 11 21	190000	17 31 12.5	+19 43 51	2.111	1.612	47.2	26.7	7.7	-	0.22	336.7	0.17	-9.13
2011 11 22	190000	17 31 05.4	+19 48 53	2.113	1.608	46.9	26.6	7.7	-	0.23	339.1	0.09	-8.01
2011 11 23	190000	17 30 58.9	+19 54 09	2.114	1.604	46.6	26.6	7.7	-	0.24	341.4	0.03	-6.18
2011 11 24	190000	17 30 53.0	+19 59 38	2.115	1.601	46.3	26.5	7.7	-	0.24	343.4	0.00	-1.45
2011 11 25	190000	17 30 47.8	+20 05 21	2.116	1.598	46.1	26.4	7.7	-	0.25	345.2	0.00	-4.31
2011 11 26	190000	17 30 43.0	+20 11 19	2.116	1.594	45.8	26.4	7.7	-	0.26	346.9	0.03	-7.05
2011 11 27	190000	17 30 38.9	+20 17 31	2.116	1.591	45.6	26.3	7.6	-	0.27	348.4	0.09	-8.45
2011 11 28	190000	17 30 35.2	+20 23 57	2.116	1.588	45.5	26.3	7.6	-	0.28	349.8	0.16	-9.35
2011 11 29	190000	17 30 31.9	+20 30 39	2.115	1.585	45.3	26.3	7.6	-	0.29	351.0	0.25	-10.00
2011 11 30	190000	17 30 29.1	+20 37 35	2.114	1.582	45.2	26.2	7.6	-	0.30	352.1	0.34	-10.49
2011 12 01	190000	17 30 26.7	+20 44 47	2.113	1.580	45.1	26.2	7.6	-	0.31	353.0	0.44	-10.88

All ephemeris data is calculated based on the Geographical location of the George Observatory, SE Texas, United States.

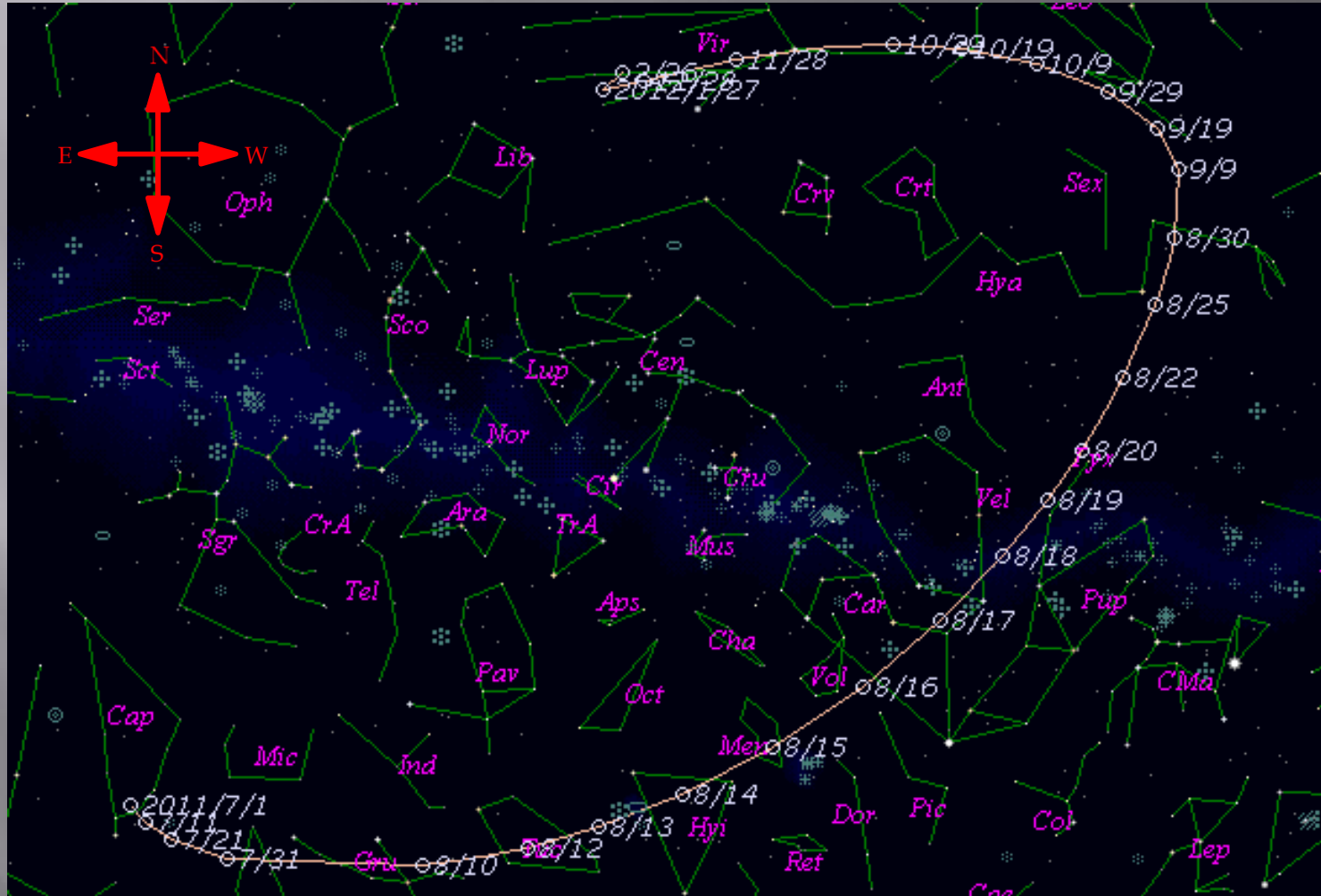
*M2 values are not shown if values are fainter than 19th magnitude!

29°22'30" N, 95°35'37" W

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45P/Honda - Mrkos - Pajdusakova

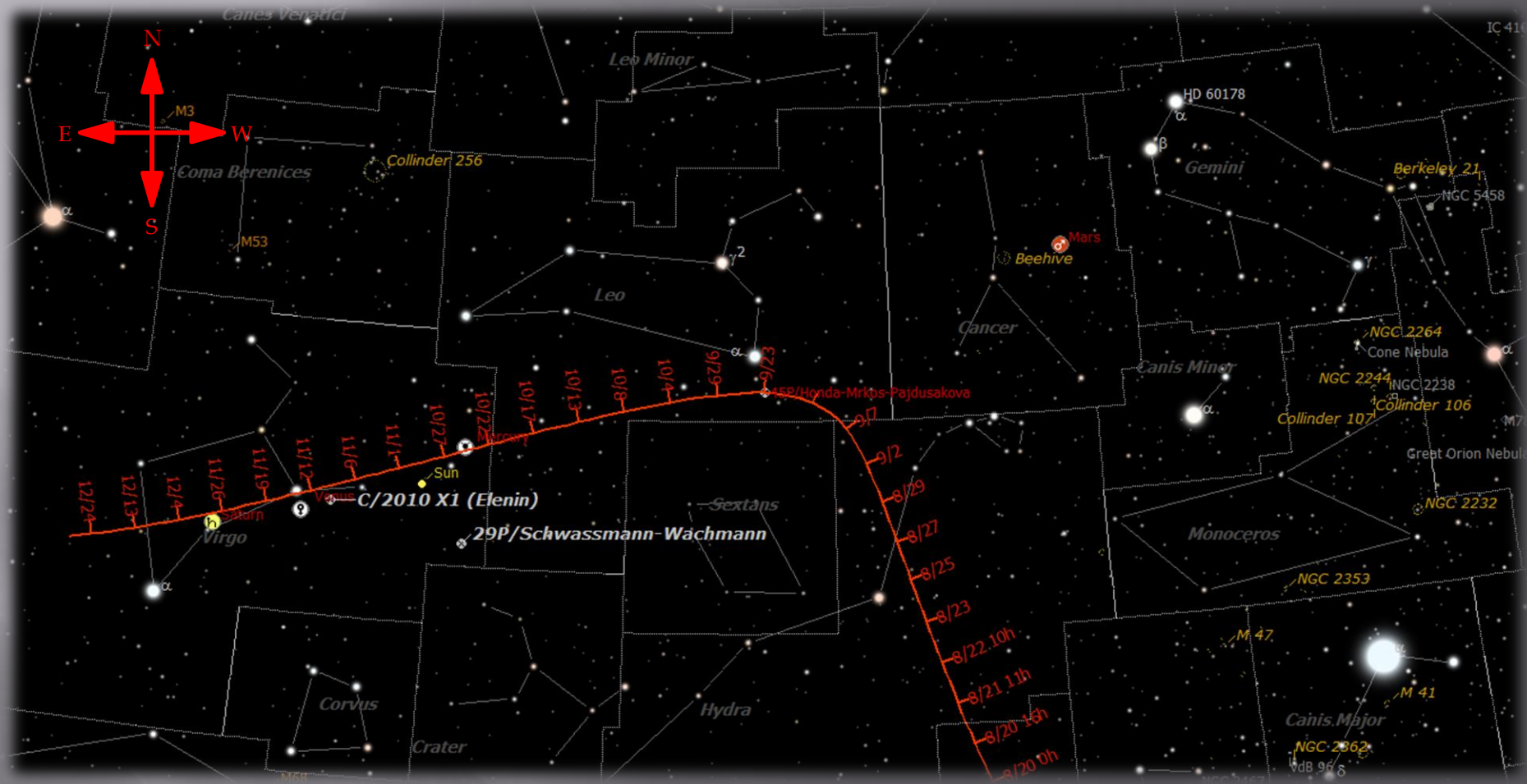
Figure 3: The projected path and wide retrograde action of Comet 45P for 2011!



Courtesy of www.aerith.net: Seiichi Yoshida's Comet Page!

45P/Honda - Mrkos - Pajdusakova

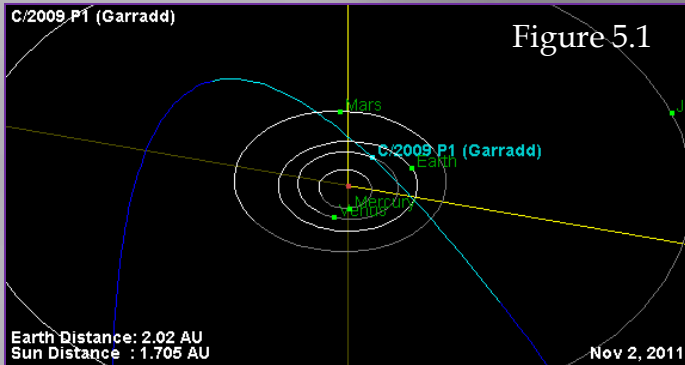
Figure 4: A Up-close projected path for Comet 45P across the Late Winter/Early Spring Sky!



Courtesy of SkyTools 3 Profession Ed, 2011.

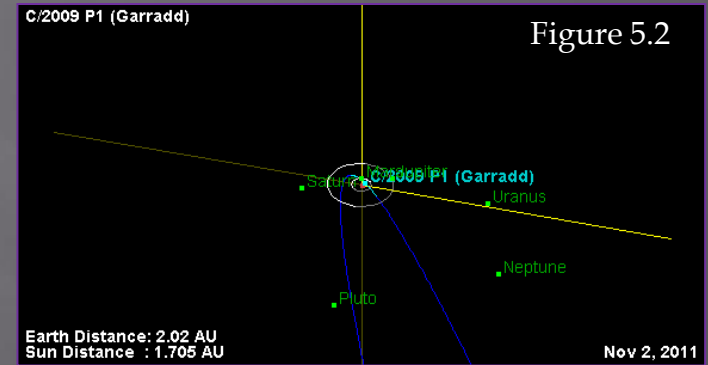
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Overview of the Orbital Differences for Comets!



P - Periodic Comets

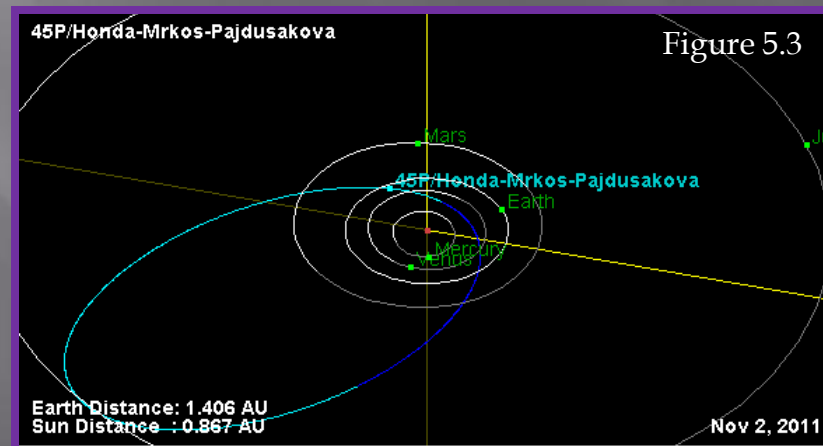
C - Non Periodic Comets



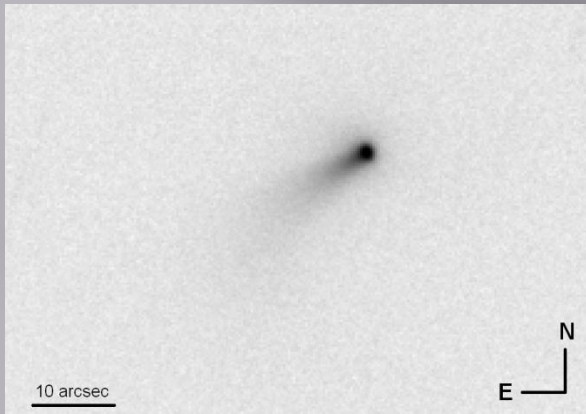
Comet Garradd is the perfect example of a non - periodic comet! The path is hyperbolic in nature. Comet 45P/Honda - Mrkos - Pajdusakova however is the perfect example of a periodic comet which is elliptical in nature.

Figures 5.1 & 5.2 are of Comet C/Garradd 2009 P1 and Figure 5.3 below is off 45P.

All images were obtained from the JPL Solar System Dynamics/Small Body Database Browser .
Courtesy of NASA/JPL/CalTech



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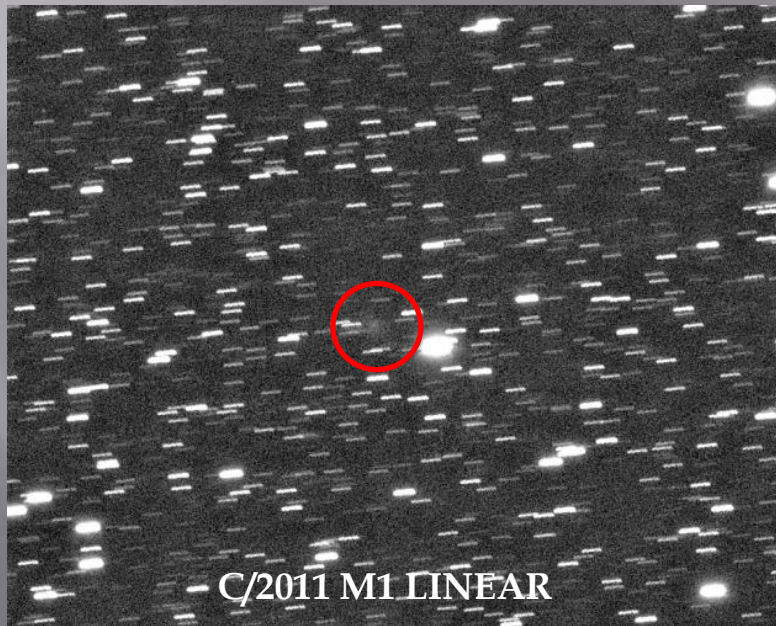
45P/Honda-Mrkos-Pajdusakova



C/2010 G2 Hill



78P/Gehrels 2



C/2011 M1 LINEAR



213P/Van Ness

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