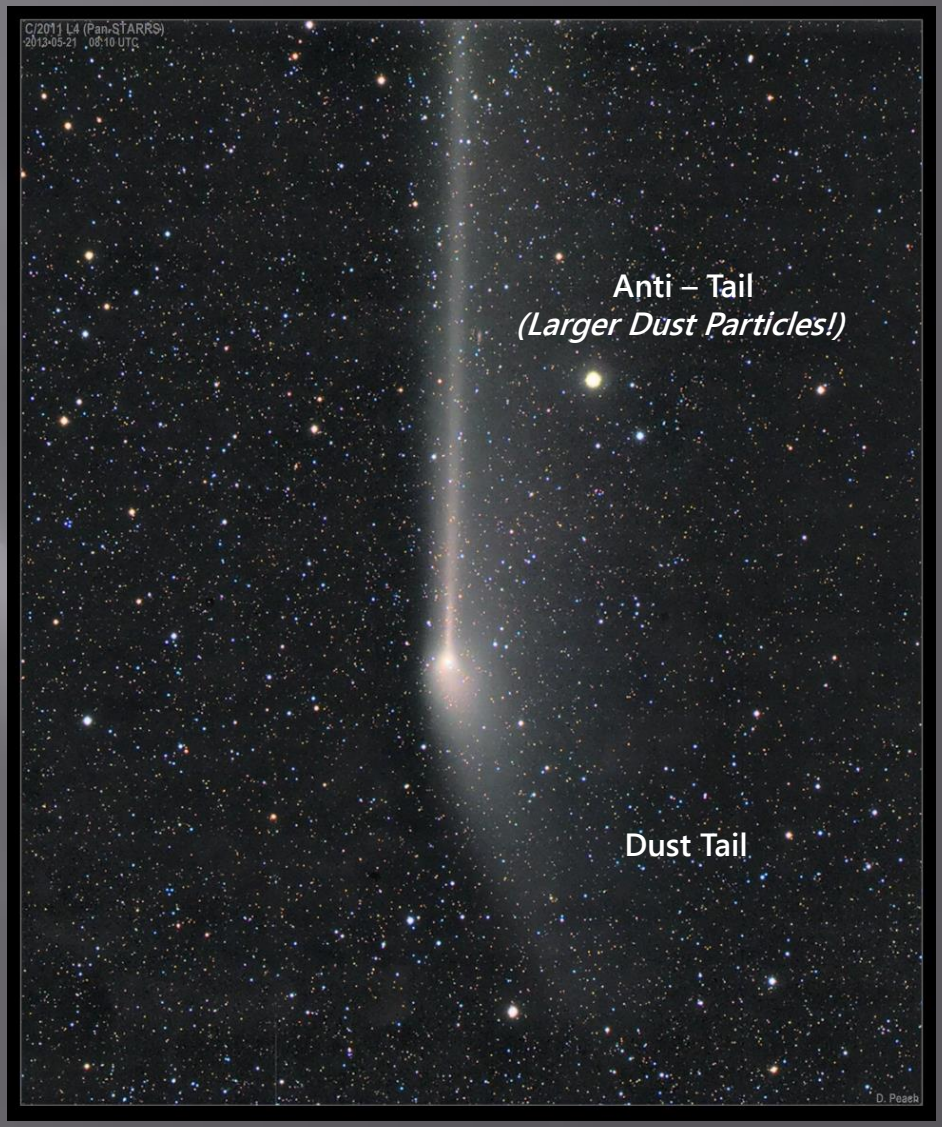
The Professor Comet's Report



Mr. Justin J McCollum (BS, MS Physics)
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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!



(PanSTARRS) C/2011 L4

21 May 2013

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Late Spring – June 2013



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Table of Contents

Table of Observable Comets……..……..3
Ephemeris Terminology……..……4
Degree of Condensation……..……5
Comet Morphology Terminology……..6
Comet Morphology (Diagrams & Images)…….……7 - 8
Synopsis of the Late Spring Comets……..……9
Comets to Watch for this Month…….……10
Finder Charts for C/2012 F6 (LEMMON)……..…11 – 13
Ephemeris Table for C/2012 F6…….……..14
Wide Angle & Multilayer images of C/2012 F6……15
Analysis of the Structure/Anti – Tail of C/2012 F6…….16 – 18
Overhead Sky Map/Orbital path (C/2011 L4)……..…….19
Finder Charts for C/2011 L4 (PanSTARRS)……..…20 - 22
Ephemeris Table for C/2011 L4……..23
Overview of Orbital types…….……..…24
Comet ISON enhanced Hubble Image(End Page)……..……25

The Professor Comet's Report

The Current Status of the Predominant Comets for Late - Spring 2013!

Comets	Designation (IAU – MPC)	Orbital Status	Magnitude Visual	Trend	Observation (Range in Lat.) (Alt. > 10° at zenith)	Constellations (Night Sky Location)	Visibility Period (Month of June) (Alt. ≥ 15°)
LEMMON	C/2012 F6	C	7.2* (4 June)	*Fading Progressively*	*56°N - 38°S	*Progressing N thru the W region of Andromeda and into the W region of Cassiopeia by late June!*	*(11:30 pm – 5:09am) CDT*
PanSTARRS	C/2011 L4	C	8.9* (4 June)	*Fading Gradually, but still has a prominent tail!*	*56°N - 7°N	*Already peaked around maximum northern declination it is now moving S across the 'Little Dipper' until 3 July!*	*Visible All Night!*
Wild 1	63P	P	10.3* (3 June)	**Peaking in Brightness with a recent outburst!**	53°N - 77°S	Heading SE in the NE region of Sextans for most of early June and thru the S dip in Leo thru early July	*(9:21 – 11:00 pm) CDT*
LINEAR	C/2012 L2	C	10.5* (19 May)	Slow, but progressive Brightening!	**75°N - 84°N**	Moving SE thru S and SE regions of the 'Winter Hexagon' thru the end of June!	*Visible only in Antarctica (79 – 84)° S*
LONEOS	C/2006 S3	C	11.0* (3 June)	*Alternating, gradual Brightness at its peak*	*56°N - 90°S	*Moving Westward from Libra to Virgo between retrograde episodes!*	*(9:21 pm – 12:30 am) CDT*
McNaught	C/2011 R1	C	12.9* (12 May)	Gradually Fading *(Semi - alternating pattern)*	*56°N - 60°S	Undergoing a tight retrograde event between the SW region of Boötes & Coma Berenices	*(9:21 pm – 1:40 am) CDT*
LINEAR	C/2010 S1	C	13.0* (17 May)	Alternating, but progressive Fading	*56°N - 46°S	Undergoing retrograde motion in the S wing of Cygnus thru late June 2013 and head W afterwards	*(9:21 pm – 05:09 am) CDT*
Iwamoto	C/2013 E2	C	13.1* (17 May)	Moderate decline in Brightness	54°N - 68°S	*Moving in a general ENE direction between Pisces 'Western Fish' asterism and Pegasus!*	*Visible All Night!*

*Visual Magnitude determined from last known field observation report!

*56° N latitude is the most northerly position during the period of June for which there is only a few hours of night time for astronomical observing between dusk and dawn!

Visibility period are for times 30 minutes before or after the end or beginning of twilight (based on the end of the month).

Comets with visual magnitudes fainter than 13.5 , more suitable for observing in the Southern hemisphere , or in the tropics are not reported on this list!

Late Spring – June 2013

Ephemeris Data Terminology

Ephemeris Term	*Definition (plus additional comments)*
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 {El. (˚)}	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 (Ph.)	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. *(Note M1 values predicted by the Minor Planet Center can differ from actual visual reports obtain in the field!)*
M_{pred}	*The predicted absolute magnitude which is calculated from a series of initial observations upon the discovery or recapture of a periodic comet which can change if the comet gets brighter or fainter as the internal conditions of the comet's nucleus changes during it's close approach around the Sun!*
M2	The nuclear magnitude of the Comet which is also the visual magnitude of the false nucleus. *(Rarely shown on a Comet's ephemeris data spreadsheet unless all values show a visual brightness value above 19th magnitude!)*
"/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. *(P.A. is the same method applied to binary stars with starts at N goes counterclockwise in an easterly direction!)*
Moon Phase	*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*
Foreshortening (% Fore.)	The appearance of the comet's tail due to the geometric orientation between the Earth and a Comet. *(100% means the comet's tail is parallel with the face of the Earth where as 0% means the tail is exactly perpendicular with respect to the face of the Earth!)*
Altitude {Alt. (˚)}	Altitude is the angle of position for any celestial object visible in the night sky with respect to the horizon regardless of cardinal direction . The angle has a range of only (0˚ to 90˚) although (0˚ to -90˚) can be applied to objects not visible. The altitude position will change throughout the sidereal day.
Azimuth {Azi. (˚)}	Azimuth is the establish angle of position for any celestial object visible in the night sky. The range starts at the North (0˚) heading clockwise eastward with the following cardinal positions: *NNE (22.5˚), NE (45˚), ENE (67.5˚), E (90˚), ESE (112.5˚), SE (135˚), SSE (157.5˚), S (180˚), SSW (202.5˚), SW (225˚), WSW (247.5˚), W (270˚), WNW (292.5˚), NW (315˚), & NNW (337.5˚)*

The Professor Comet's Report

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.

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

The Professor Comet's Report

Morphology (Structure) of Comets

6 *As a comet approaches or recedes from the Sun within the planetary domain of the solar system the solar pressure and energy from the Solar Wind & its radiation pressure react with the comet nucleus. This in turn will form a variety of structures to the comet that give it its' distinctive structure thru the processes of sublimation, evaporation, ionization, pressure outflow, etc.*

Structural Component	*Definition of Component*
Nucleus	***Comets are essentially 'dirty snowballs' or asteroids covered in and containing internal cavities (reservoirs) of frozen volatiles (ex.: H20, frozen Oxygen, Carbon compounds, etc.) and originate from outside the solar system from the Kuiper Belt (short to medium period comets) to the Oort Cloud (up to extremely long period comets). The details in composition and overall structure internal and external vary considerably and they range in size from 100m to 40 km across! As of June 2013 there are about 4300 known so far, but they may number in the trillions!***
False Nucleus	***The central brightening of the coma showing the position of the nucleus, but only the extremely 'high pressured' jets are visible containing the escaping volatiles from such internal cavities breaking thru to the surface of the nucleus (the actual nucleus is not visible in most telescopes).***
Coma	***The trace atmosphere of dust particles, icy crystals, evaporated or sublimated molecules, ions, etc.) that surround the nucleus before being pushed away by the radiation pressure and solar wind producing the comet's tails. The re are two sub components (inner and outer comas) differing only by concentration of materials emanating from the nucleus. The most common compounds C2 & C3 (carbon compounds) along with (CN-) cyanogen compounds make the nucleus appear greenish or some combination of blue and green to the human eye.***
Ion Tail (Type I)	***The volatiles that can come from the nucleus are ionized by solar Ultraviolet radiation (UV photons) and the magnetic field of the Sun will drive the particles in a tail away from the Sun (Anti – Solar) direction at speeds up to 500 km/s. The most common ions (CO+) carbon monoxide appears blue to the human eye.***
Dust Tail (Type II)	***Nanoscopic to tiny mesoscopic (up to millimeter sized) dust particles that pushed away from the Coma via pressure from the Solar radiation within the solar wind and can very diffuse structurally and only reradiate back long wavelength or low energy light (appearing white, yellowish, or soft – pink). The particles will spread in individual orbits around the Sun kept away from the Sun's gravity due to its' radiation pressure giving the tail its' curved shape. Dust Tails can extend up to 100 million km (62.1 million mi) from the Nucleus and Coma!***
Sodium Trail (Type III)	***Visible only in very, large telescopes there tails are composed of neutral atoms of Sodium striking out from the coma and not the nucleus possibly from either collisions between dust particles, UV solar erosion of the dust particles, or some unknown mechanism all occurring within the coma. Sodium tails can reach up to 50 million km away from the Sun along a similar path to the ion tail!***
Dust trail (Anti – Tail)	***Larger dust particles that have enough mass to be more attracted to the Sun's gravity and are less likely to be influenced by the Sun's radiation pressure and are geometrically opposite to the Types I & II tails. They will form a dust disk along the orbital path of the comet that only visible from Earth as a spike heading towards the Sun, but only visible when the comet crosses the orbital plane of the Earth!***
Cometary Bow Shock	***Once the solar wind interacts with a comet plunging thru the solar wind a bow shock forms around the outer coma much the same way the magnetic field of a planet forms a bow shock. The solar wind forms a Hydrogen envelope just outside the frontal boundary of the outer coma creating a plasma layer of hydrogen ions that release Lyman – alpha radiation as a byproduct!***

Comet Morphology

Figure 1: Visual Morphological layout of a comet as shown by several diagrams and images!

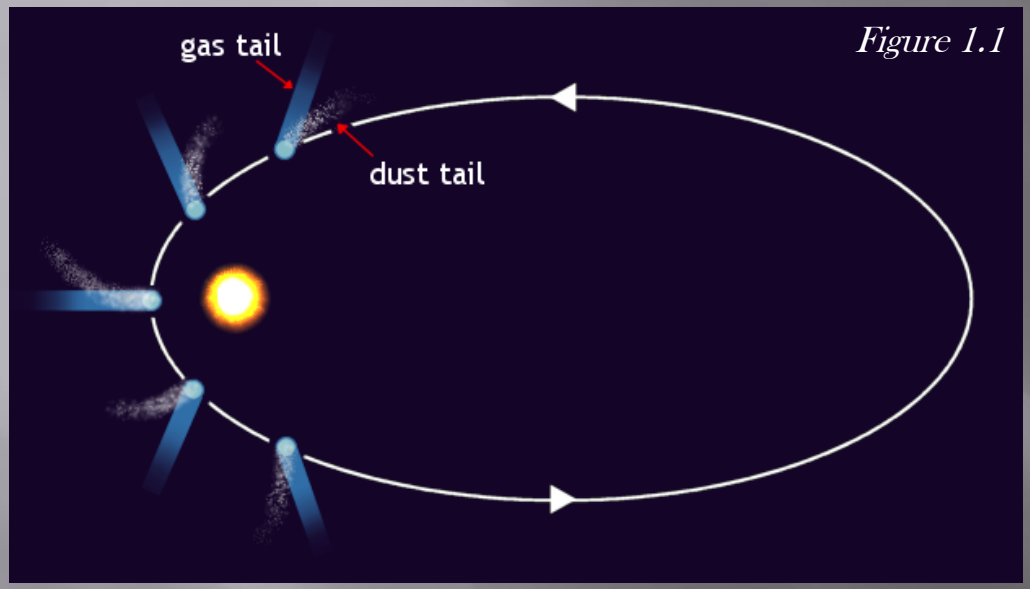


Figure 1.1

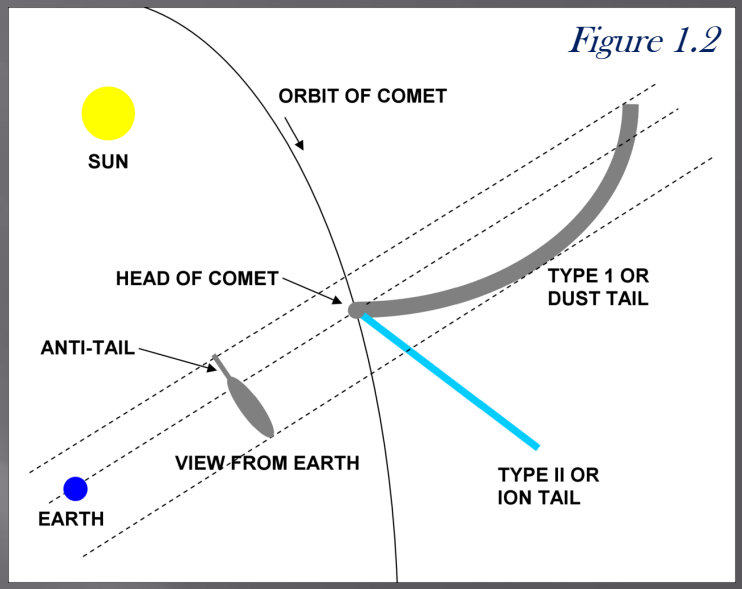


Figure 1.2

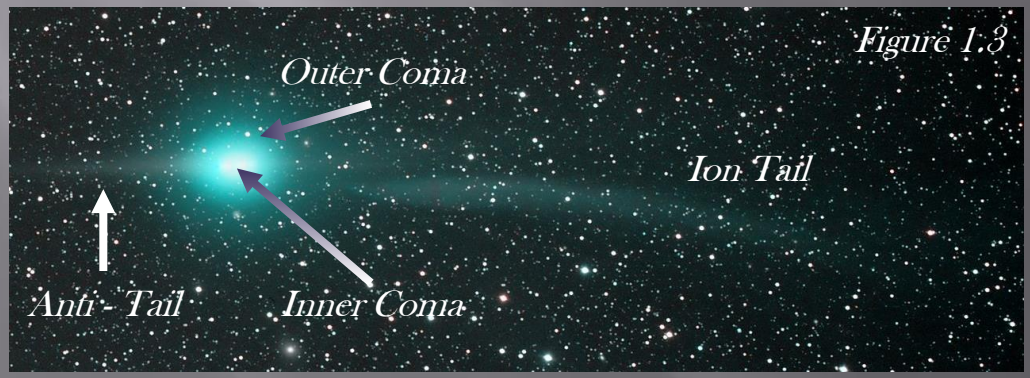


Figure 1.3



Figure 1.4

Comet Morphology

Figure 2: Morphology shown interaction between the Coma and the Solar Wind!

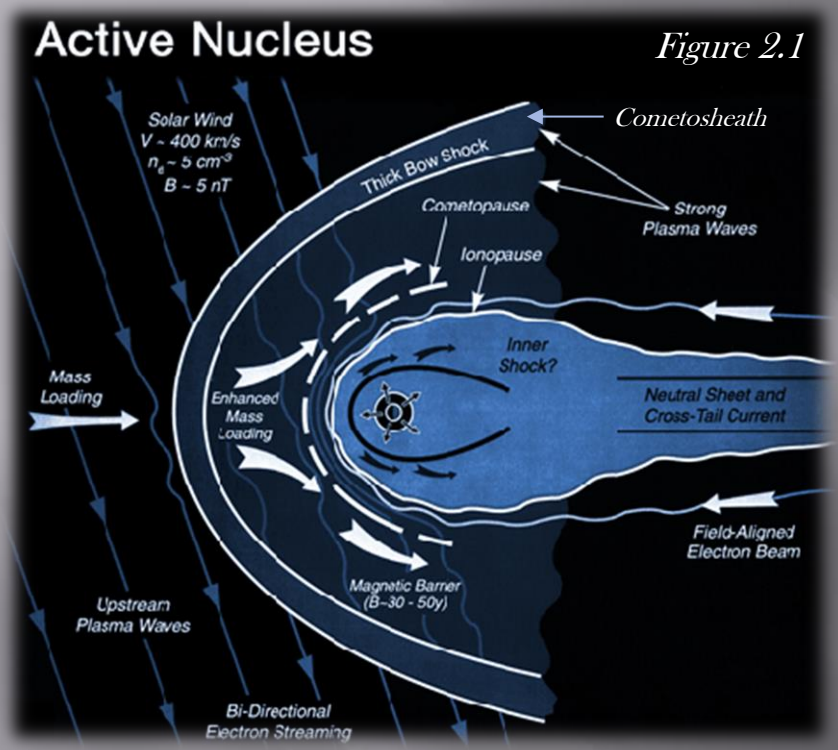


Figure 2.1

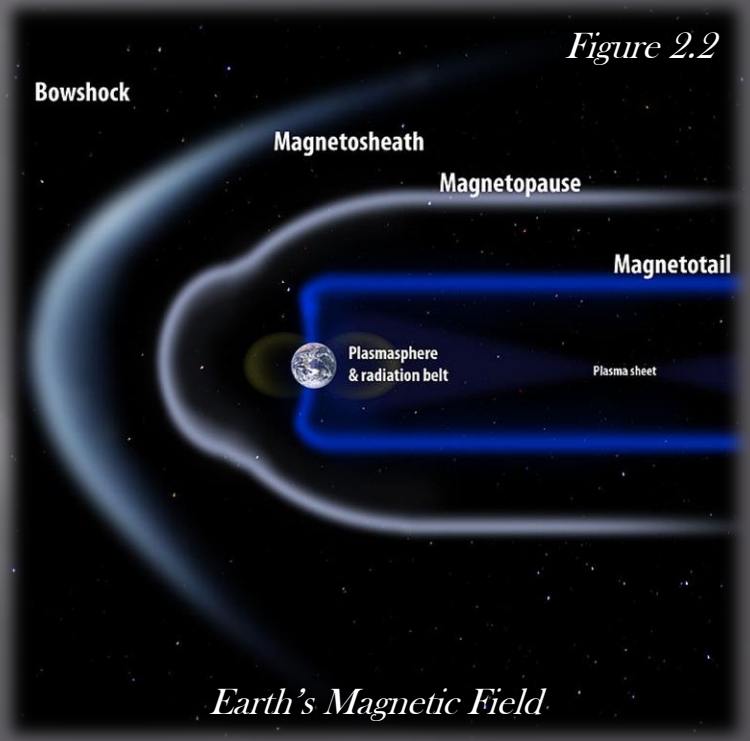


Figure 2.2

Earth's Magnetic Field

It is okay if you don't entirely understand what is going on here; the only important fact are the particles within the solar wind and the comet plunging thru it will force a massive buildup of particles between the bow shock and the cometopause (the boundary of the comet's induced magnetic field) forming the outer boundary of influence for the outer coma! This think bow shock that contains the Hydrogen plasma is also known as the cometosheath and works similar to that of planet's magnetosheath where the influence of the magnetic field is weaken and the behavior of the Sun's magnetic field propagating (moving) thru the solar wind begins to dominate going from the comet or planet outwards towards the solar wind! Figure 2.2 compared to Figure 2.1 shows similarities in the Earth's magnetic field to the behavior of the Coma and induced magnetic field of the Comet as a result of interaction with the charged particles and radiation of the solar wind!

A Short Synopsis of the Predominant Comets for Mid - Spring 2013!

The past few months we have had two predominant comets in the night sky: C/2012 F6 (LEMMON) and C/2011 L4 (PanSTARRS) which have grazed our skies; the earlier of two (PanSTARRS) being bright enough to see with the naked eye and the later one (LEMMON) now showing an interesting orientation as it moves high above the ecliptic on its' way back to Oort Cloud from where it came! In this report I present the various types of information and facts about the current state of the two comets that continue to graze the northern declinations of the our northern celestial heavens thru the end of June and into early Summer. Our two comets are now on similar hyperbolic trajectories high above the plane of the Earth's orbit never to return again for thousands of years. The orbital period for C/2012 F6 (LEMMON) is slated for a return to Earth ~8000 years from now while C/2011 L4 (PanSTARRS) will possibly take the better part of ~106 000 years before it will graze across the nightly heavens of the inner solar system. These two comets will continue to fade in brightness as they continue to move further from the Sun and Earth at nearly equal distances from both the Sun and Earth for both comets thru most of June and slowly the comparative difference between solar and Earth distance for the two objects will diverge with greater notice around early July. The latest reports place comet PanSTARRS grazing along with upper boundary of the 'Little Dipper' asterism for most of June and ending to within a less than 2˚ (1˚ 51' 30") of Kochab, the brightest star in Ursa Minor on the night of 18/19 June 2013 or more precisely 19 June 2013 at 01:12 UTC (8:12 PM, 18 June). PanSTARRS is already between 8th to 9th visual magnitude with two tails already visible; CCD images already have shown the comet's dust tail to span as far as 16˚ of sky (a span equivalent to 16 full Moons! The first tail also a front spike showing the visibility of the 'anti – tail' which spans nearly a full Moon length and only visible when a comet passes thru the orbital path of the Earth and is at a high orbital inclination with respect to the ecliptic! As for the other tail that lies the behind the coma as it plows its' way thru the solar wind back out to the outer solar system with the narrow tail being the 16˚ length only about 8 – 15 arcminutes of it being visible and the visible part of the broader tail (the anti – tail) composed of heavier dust grains having a shorter angular length of 4 – 8 arcminutes! Last reports from comet hunters and observers in the field place the orientations of these two tails behind the coma at 20˚ P.A. for the very narrow tail and 225˚ P.A. for the boarder one. That places the very long, narrow tail to the NNE of the coma and the boarder 'anti – tail' to the SW!

LEMMON comet is now on a similar path to the region of the circumpolar constellations in the northern celestial skies on will maintain a close trek in the western region of Andromeda during the period of late May thru mid June 2013. C/2012 F6 will not obtain the same northern position at comet PanSTARRS given that fact that the orbital inclination of LEMMON is only ~1.6˚ shallower than that of PanSTARRS. This is a very small difference, but due to its' position with respect to the Earth and given the positions of both LEMMON and our planet in their orbits around the Sun the comet at a semi – curved path from Iota Cephei to Alfirk (Beta Cephei) from 21 July thru 5 August. The northerly most position in terms of declination for LEMMON is 70˚ 35' 42" on 10 August while located further westward in its' semi – curved path from Alfirk to Tyl (Eta Draconis) placing it ~14.66˚ further south than PanSTARRS from the north celestial pole. At present the comet is about 1 – 1.5 magnitudes brighter visually than PanSTARRS will also fade in similar matter with nearly equals distances from both the Sun and Earth and then the two distances digress away from each other towards the end of June again in similar behavior to the orbital path of PanSTARRS! The coma size is about 4 arcminutes in angular width much like PanSTARRS, but no visual observations of the tail have been reported only astrophotography images have shown a considerably long tail if visible in telescopes would extend for 3˚ - 5˚ behind the coma!

Comets to Watch for this month!



C/2012 F6 (LEMMON)
(6 February 2013)
© Ignacio Diaz Bobillo,
The Pampas, Buenos Aires,
Argentina

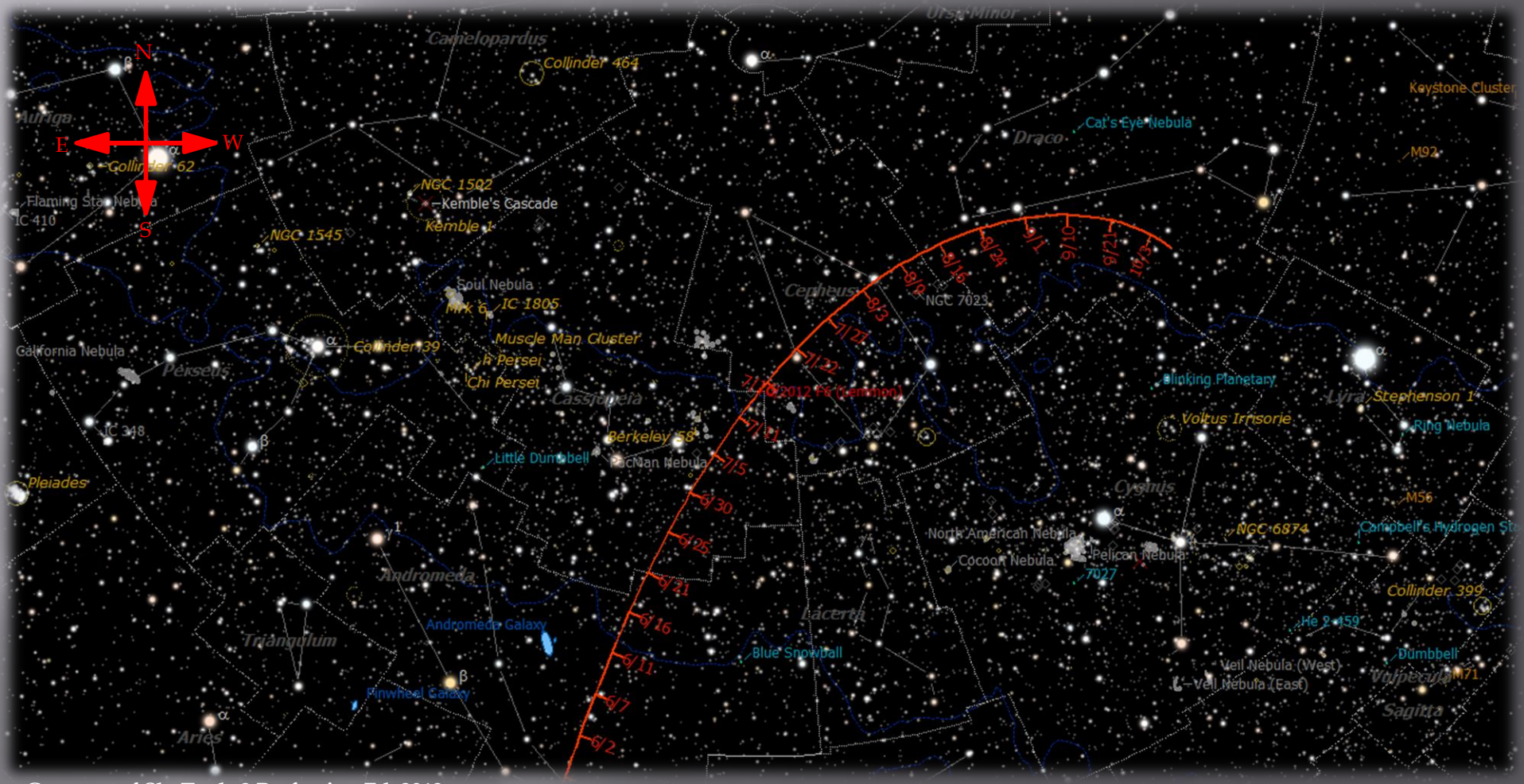


C/2011 L4 (PanSTARRS)
(22 April 2013)
© Rolando Ligustri,
New Mexcio, Itelescope.net

Late Spring – June 2013

C/2012 F6 (LEMMON)

Figure 4: Projected path of C/2012 F6 (LEMMON) towards the northern 'Circumpolar' constellations (1 June – 3 Oct) 2013!



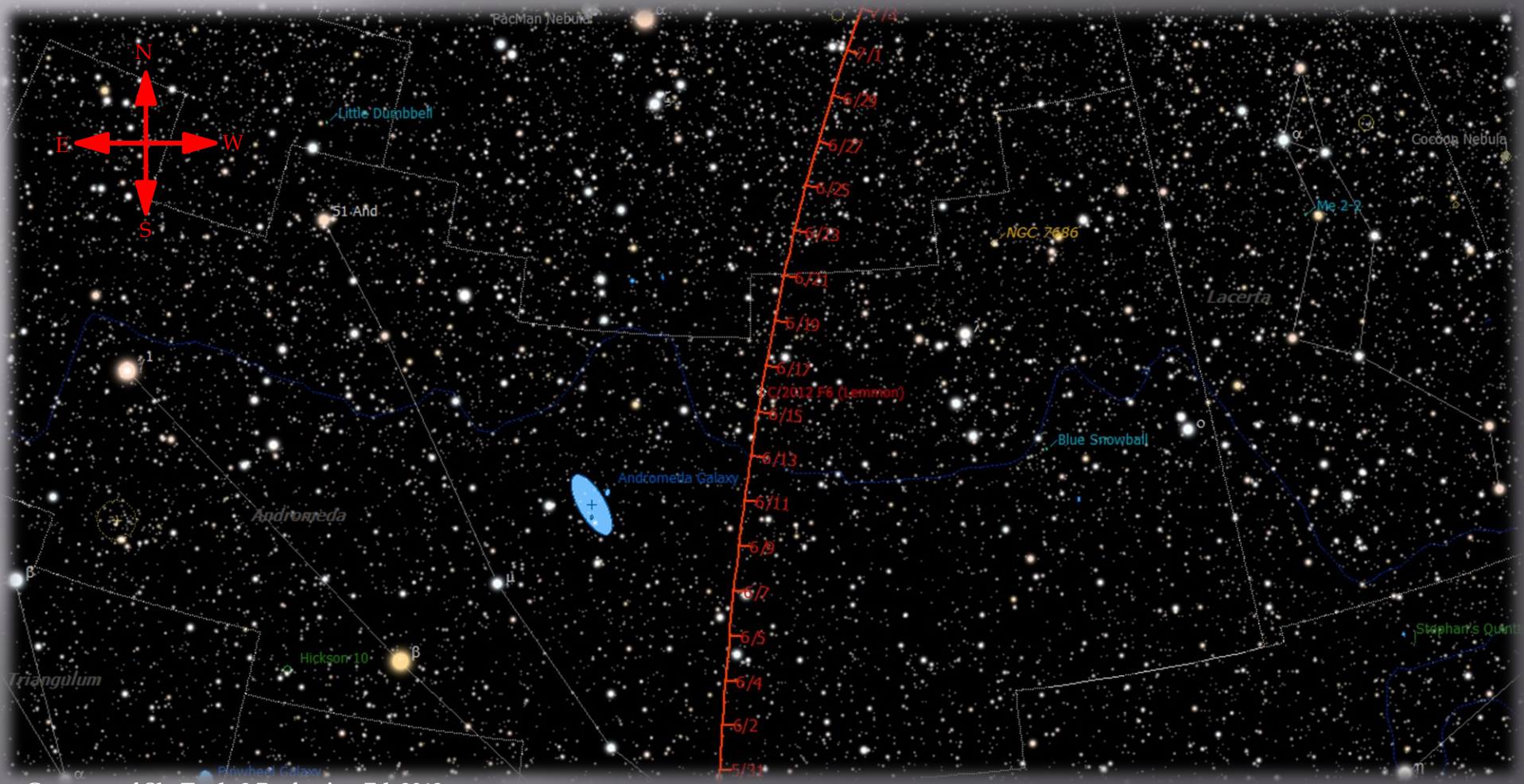
Courtesy of SkyTools 3 Profession Ed, 2012.

Note: Comet C/2012 F6 (LEMMON) is approaching the region of the 'Northern Circumpolar' constellations in a NNW to NW direction rising high above the plane of the ecliptic, but below that of C/2011 L4 (PanSTARRS) reaching a maximum position along the constellation boundary between Cepheus & Draco by mid – August 2013!

Late Spring – June 2013

C/2012 F6 (LEMMON)

Figure 5: Projected path of C/2012 F6 (LEMMON) northwards from Andromeda to W Cassiopeia (1 June – 4 July) 2013!



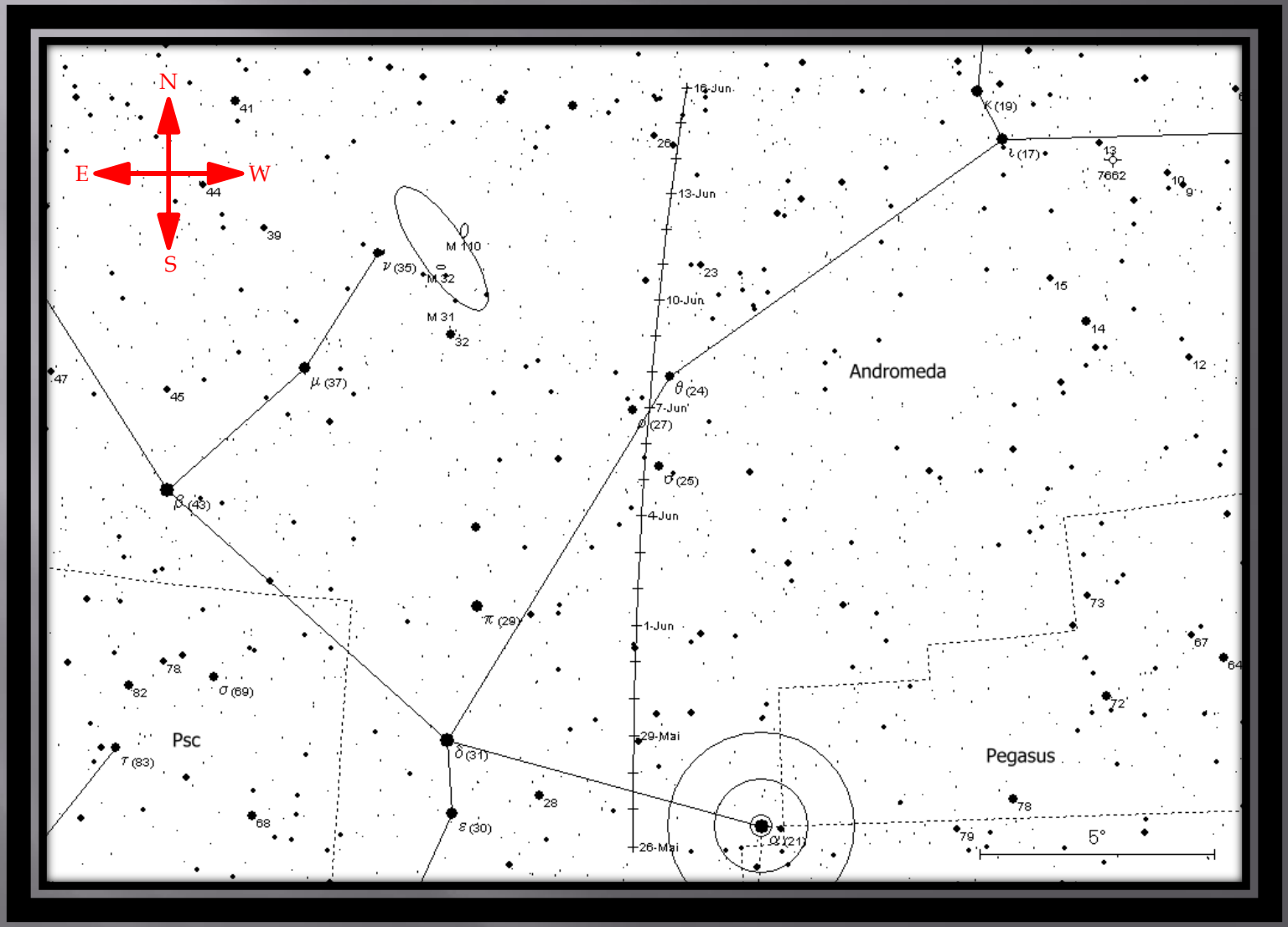
Courtesy of SkyTools 3 Profession Ed, 2012.

Note: Comet C/2012 F6 (LEMMON) is following the path of C/2011 L4 (PanSTARRS) nearly 9 weeks ealier, yet nearly 2x the angular separation from M31 and projected to be fainter than 9th magnitude where as C/2011 L4 was slightly brighter than 4th magnitude with its 'fan – shaped' tail!

Late Spring – June 2013

C/2012 F6 (LEMMON)

Figure 6: Negative star chart of the comet's path at close proximity to M31 from (26 May – 16 Jun) 2013!



© **Winnie's Comet Pages,** http://www.ki.tng.de/~winnie/kometen/aktuell.html, 2013.

IAU MPC Ephemeris data for C/2012 F6 (LEMMON): (1 June – 1 July) 2013

	CDT/CST	Epoch (J2000.0)		Basic Ephemeris						Sky Motion		Moon Phase	Moon Mag.
Date	hh:mm:ss	R.A.	Dec	Delta	R	El. (˚)	Ph.	M_1	% Fore.	"/min	P.A.	(0.00 - 1.00)	(Visual)
1-June -2013	00:00:00	00 20 36.5	33 33 53 N	1.747	1.464	56.9	35.5	8.69	42	1.95	358.4	0.46	-10.82
2-June-2013	00:00:00	00 20 27.7	34 20 27 N	1.748	1.478	57.6	35.4	8.77	42	1.95	358.0	0.35	-10.35
3-June-2013	00:00:00	00 20 17.2	35 06 53 N	1.750	1.492	58.3	35.3	8.84	42	1.94	357.5	0.26	-9.80
4-June-2013	00:00:00	00 20 04.9	35 53 11 N	1.751	1.506	59.0	35.3	8.92	42	1.94	357.1	0.18	-9.14
5-June-2013	00:00:00	00 19 50.7	36 39 22 N	1.753	1.520	59.8	35.2	8.99	42	1.93	356.6	0.11	-8.32
6-June-2013	00:00:00	00 19 34.5	37 25 25 N	1.755	1.535	60.5	35.1	9.07	42	1.93	356.1	0.06	-7.21
7-June-2013	00:00:00	00 19 16.3	38 11 20 N	1.757	1.549	61.2	35.0	9.14	43	1.92	355.7	0.02	-5.55
8-June-2013	00:00:00	00 18 55.9	38 57 06 N	1.759	1.563	61.9	35.0	9.22	43	1.92	355.1	0.00	-2.33
9-June-2013	00:00:00	00 18 33.2	39 42 42 N	1.761	1.577	62.6	34.9	9.29	43	1.91	354.6	0.00	-2.69
10-June-2013	00:00:00	00 18 08.2	40 28 09 N	1.763	1.591	63.3	34.8	9.36	43	1.91	354.1	0.02	-5.69
11-June-2013	00:00:00	00 17 40.7	41 13 25 N	1.765	1.606	64.0	34.7	9.44	43	1.90	353.5	0.06	-7.27
12-June-2013	00:00:00	00 17 10.6	41 58 31 N	1.767	1.620	64.8	34.5	9.51	43	1.89	353.0	0.11	-8.33
13-June-2013	00:00:00	00 16 37.8	42 43 25 N	1.770	1.634	65.4	34.4	9.58	43	1.89	352.4	0.18	-9.13
14-June-2013	00:00:00	00 16 02.2	43 28 08 N	1.772	1.648	66.1	34.3	9.65	44	1.88	351.8	0.26	-9.77
15-June-2013	00:00:00	00 15 23.7	44 12 38 N	1.775	1.662	66.8	34.2	9.72	44	1.88	351.2	0.35	-10.30
16-June-2013	00:00:00	00 14 42.2	44 56 55 N	1.777	1.676	67.5	34.1	9.79	44	1.87	350.5	0.45	-10.76
17-June-2013	00:00:00	00 13 57.4	45 40 58 N	1.780	1.690	68.2	33.9	9.85	44	1.87	349.9	0.55	-11.15
18-June-2013	00:00:00	00 13 09.3	46 24 46 N	1.783	1.704	68.9	33.8	9.92	44	1.86	349.2	0.66	-11.50
19-June-2013	00:00:00	00 12 17.8	47 08 20 N	1.786	1.718	69.5	33.6	9.99	45	1.85	348.5	0.76	-11.79
20-June-2013	00:00:00	00 11 22.6	47 51 37 N	1.789	1.732	70.2	33.5	10.06	45	1.85	347.8	0.85	-12.03
21-June-2013	00:00:00	00 10 23.7	48 34 38 N	1.792	1.746	70.9	33.3	10.12	45	1.84	347.1	0.92	-12.22
22-June-2013	00:00:00	00 09 20.8	49 17 21 N	1.795	1.760	71.5	33.2	10.19	45	1.83	346.4	0.98	-12.35
23-June-2013	00:00:00	00 08 13.8	49 59 45 N	1.799	1.774	72.2	33.0	10.26	45	1.82	345.6	1.00	-12.40
24-June-2013	00:00:00	00 07 02.6	50 41 51 N	1.802	1.788	72.8	32.9	10.32	46	1.82	344.8	0.99	-12.38
25-June-2013	00:00:00	00 05 46.9	51 23 37 N	1.806	1.802	73.4	32.7	10.39	46	1.81	344.0	0.95	-12.28
26-June-2013	00:00:00	00 04 26.6	52 05 01 N	1.810	1.816	74.1	32.6	10.45	46	1.80	343.2	0.89	-12.12
27-June-2013	00:00:00	00 03 01.4	52 46 03 N	1.814	1.830	74.7	32.4	10.52	46	1.79	342.3	0.81	-11.90
28-June-2013	00:00:00	00 01 31.2	53 26 43 N	1.818	1.844	75.3	32.2	10.58	47	1.79	341.4	0.71	-11.63
29-June-2013	00:00:00	23 59 55.6	54 06 58 N	1.822	1.858	75.9	32.1	10.65	47	1.78	340.5	0.61	-11.31
30-June-2013	00:00:00	23 58 14.6	54 46 48 N	1.827	1.872	76.5	31.9	10.71	47	1.96	359.2	0.67	-10.95
1-July-2013	00:00:00	23 56 27.9	55 26 11 N	1.831	1.886	77.1	31.7	10.77	47	1.95	358.8	0.57	-10.53

May 14 onward: $M_1 = 4.5 + 5 \log d + 18.0 \log r$

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

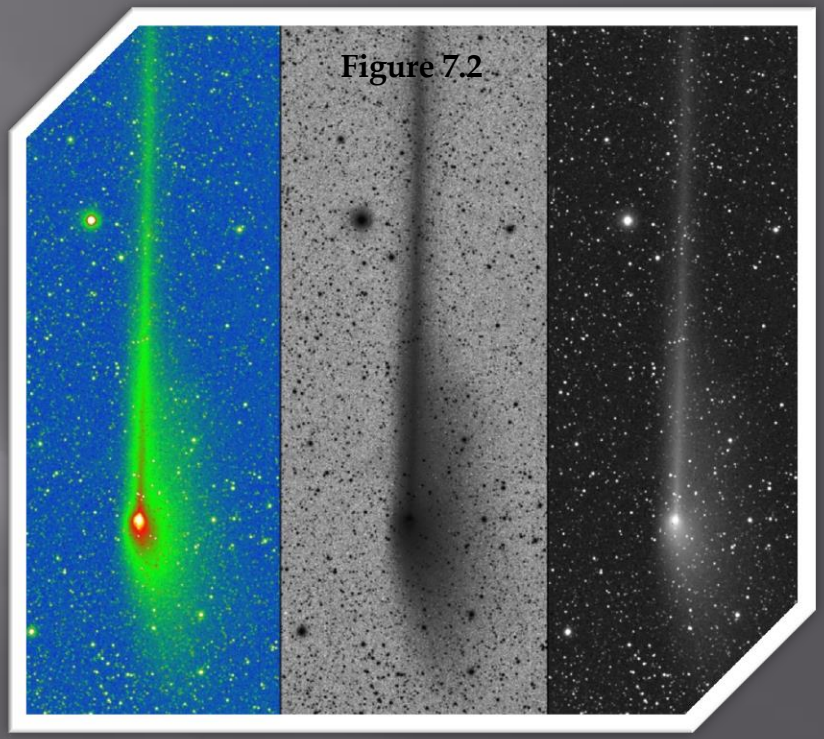
29˚22'30" N, 95˚35'37" W

C/2011 L4 PanSTARRS

Figure 7: A Wide Angle View of the Dust Tail at near – perpendicular orientation with the ecliptic!



(PanSTARRS) comet dust tail has now stretched to a length of up to 16˚ across the sky and in this image the tail spans about 7.5˚!



Beautiful array of the same image: l – r (False Color Enhancement, Negative, Luminescence or Black & White)

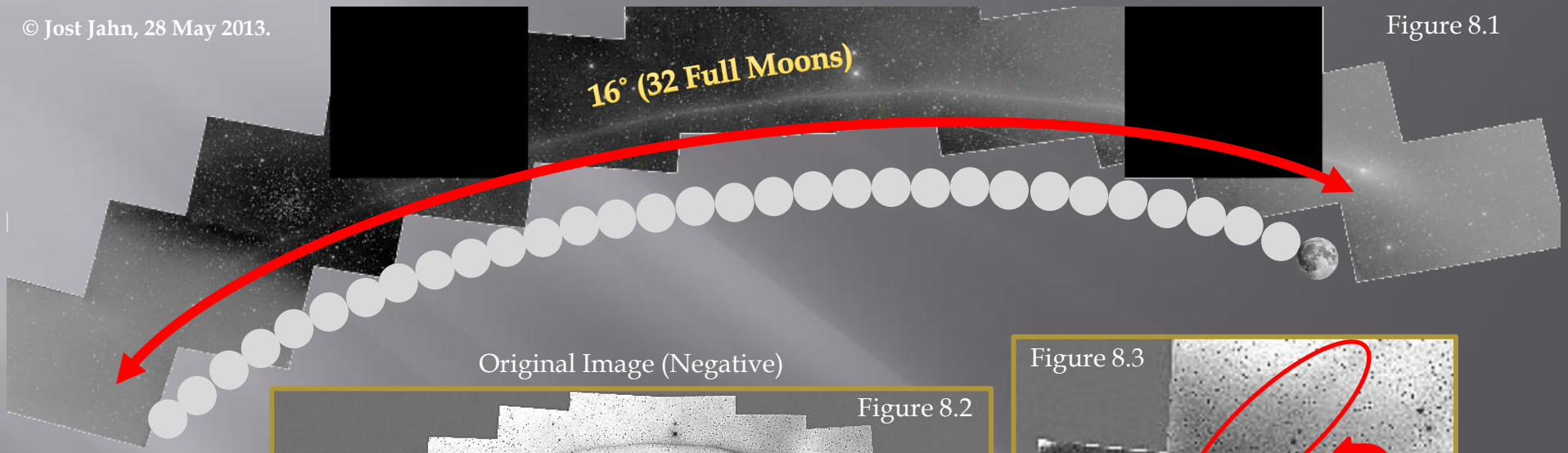
© Michael Jaeger, 28 May 2013.

C/2011 L4 PanSTARRS

Figure 8: An Extreme, Ultra -Wide Angle View of the Dust Tail as it crosses the orbital plane of the Earth!

© Jost Jahn, 28 May 2013.

Figure 8.1



Original Image (Negative)

Figure 8.2

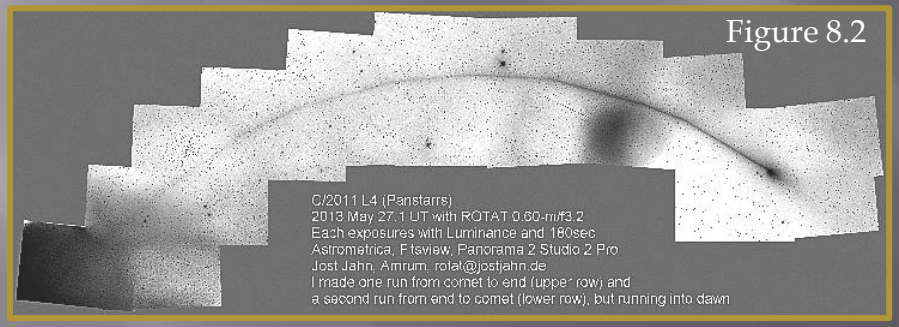
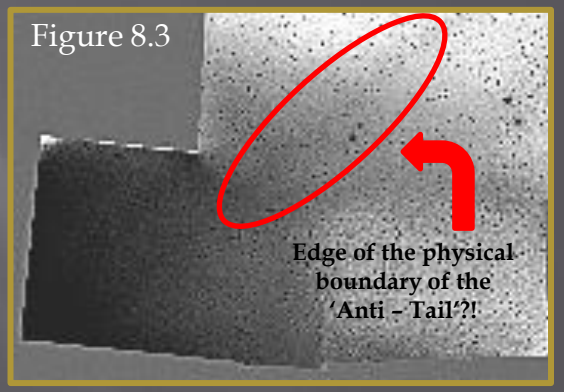


Figure 8.3



(PanSTARRS) comet total dust tail can be observed in the panorama of 11 images taking during the comet's crossing of the orbital plane of the Earth the night of 28 May 2013! The tail stretches an angular length of at least 16° of sky the equivalency of 32 Full Moons placed end to end giving the physical length measurement of 23 million miles (37.5 million km)! However, the tail is not exactly at a perpendicular orientation with the plane of the ecliptic (plane of the Earth's orbit) or 90° with respect to the ecliptic, so the tail foreshortening is below 100% making it likely that the tail is over 1 A.U. in length from the coma center to the homogeneous dissipation at the opposite edge of the tail's sustainable profile!

C/2011 L4 PanSTARRS

Figure 9.1: Side view (Slightly above the plane of the ecliptic)

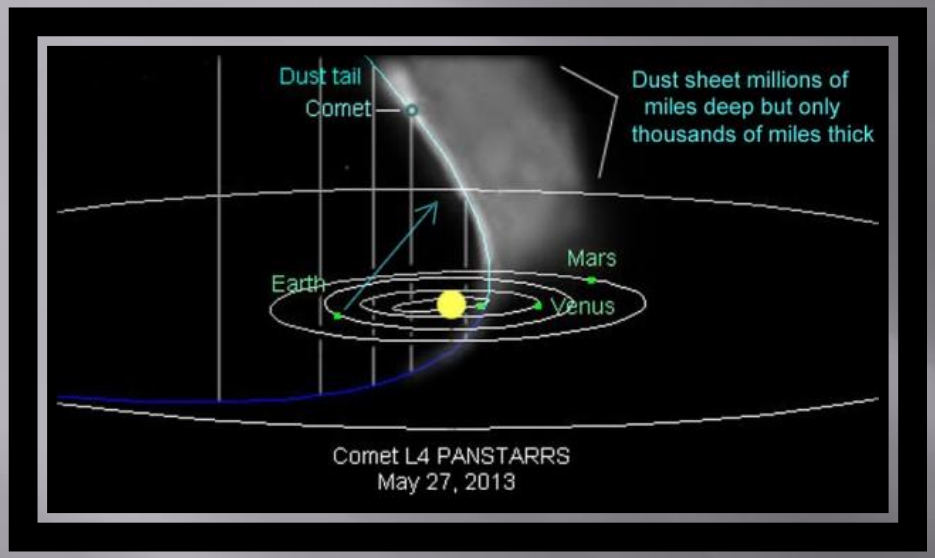


Figure 9.2: Overhead View (towards the north galactic hemisphere)!

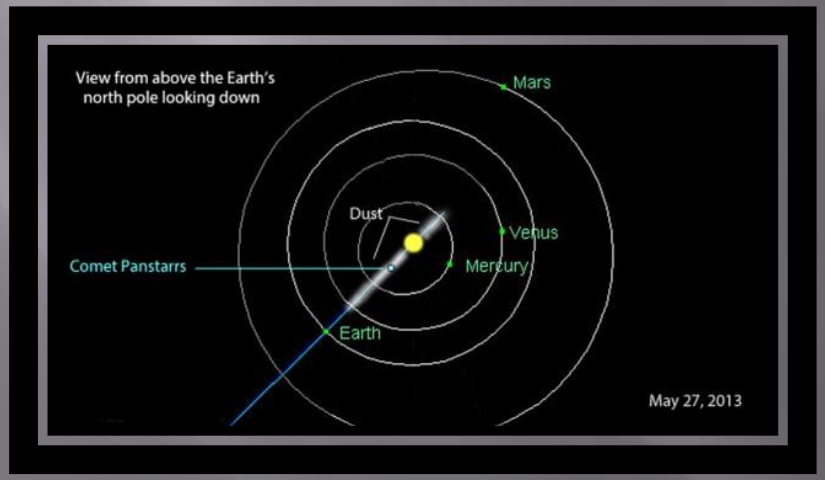


Figure 9.3: Oort Cloud perspective with the planetary solar system!

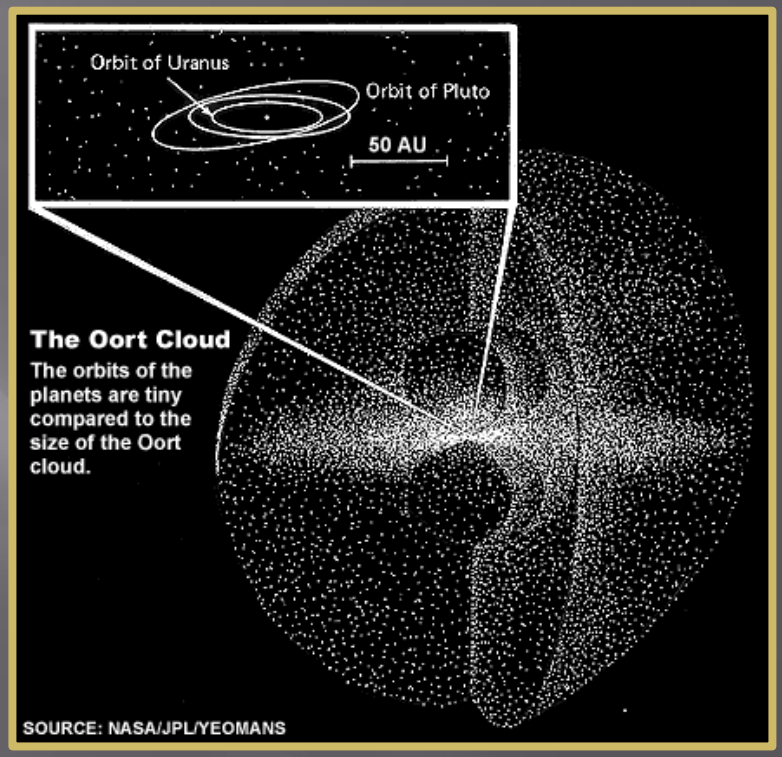


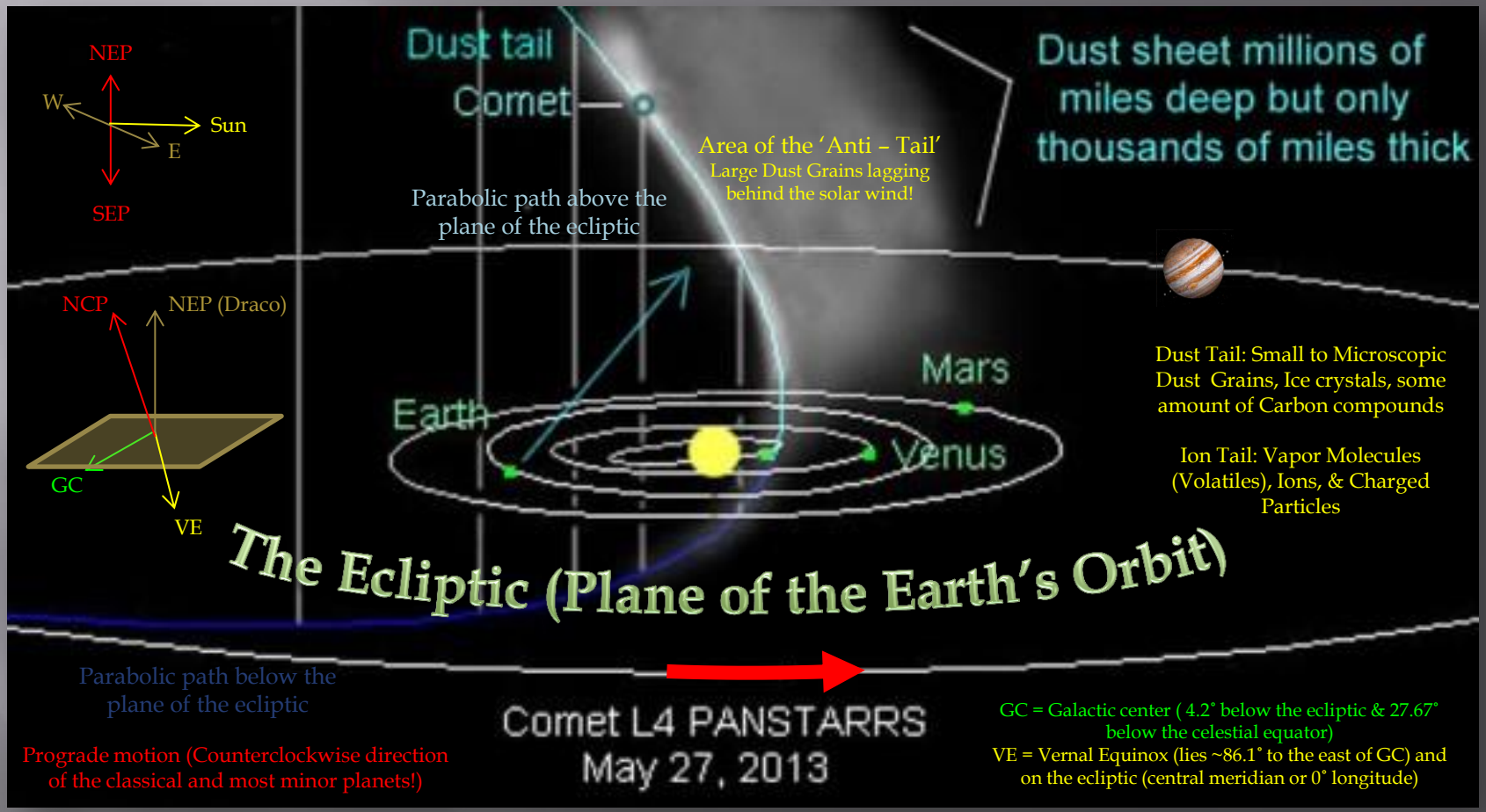
Figure 9.1 shows a side view of the path of Comet PanSTARRS as it recedes away from the Sun towards the northern celestial hemisphere of the Solar System (above the plane of the ecliptic) as it heads towards the inner region of the Oort Cloud (Figure 9.3). The anti – tail stays behind the coma left behind like a trail of 'bread crumbs' spanning millions of miles and wider than any of Earth's continents (5 000 – 10 000 miles in depth). This part of the tail continues to grow as the both the ion and dust tails recede in scale the greater its' solar distance!

Figures 9.1 & 9.2: Courtesy of NASA/JPL/Bob King of Universe Today, http://www.universetoday.com/102299/what-do-comet-panstarrs-and-pinocchio-have-in-common/, 22 May 2013.

Late Spring – June 2013

C/2011 L4 PanSTARRS

Figure 10: Aspects of the semi – side view with respect to the plane of the ecliptic (further terminology)!



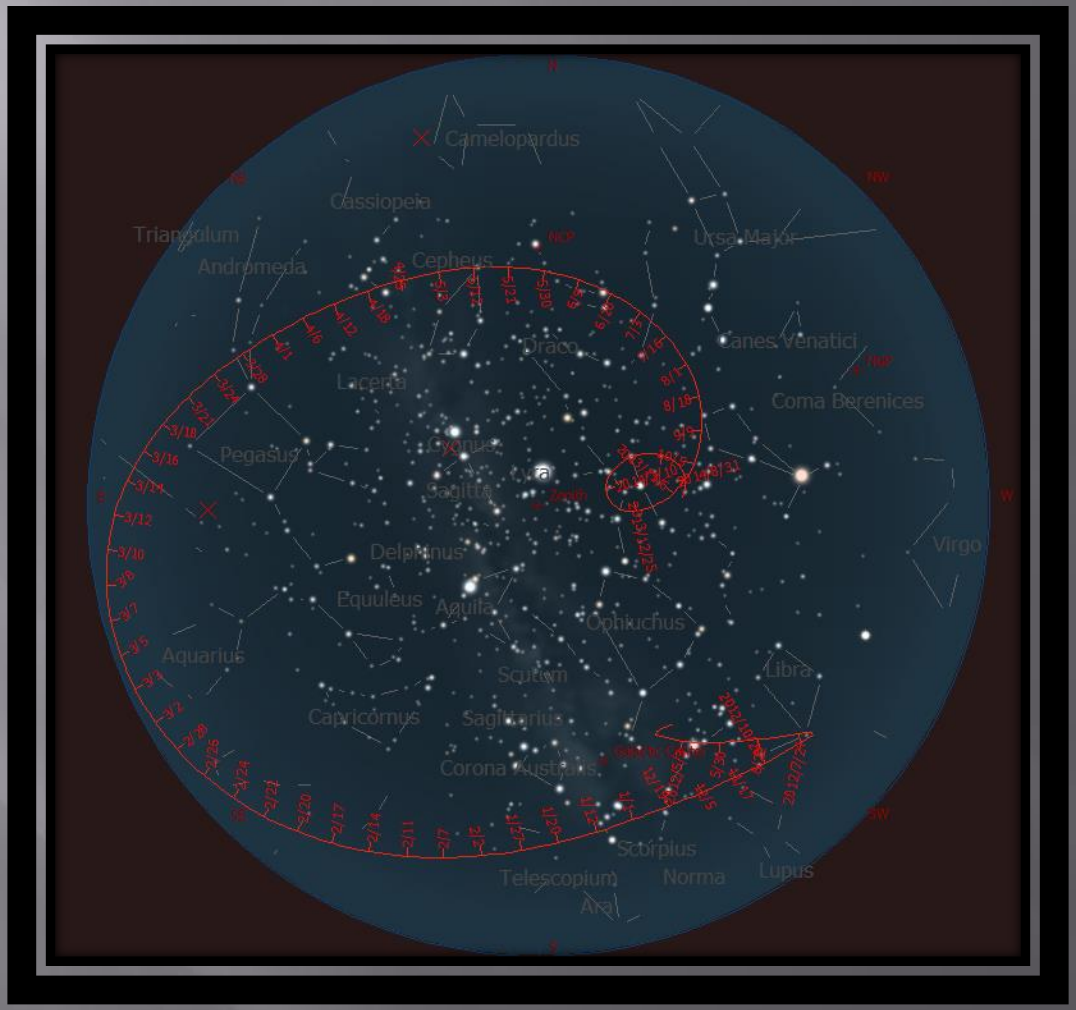
Note: GC is located within the constellation of Sagittarius (WNW of the spout end of the teapot asterism) & VE is located within the constellation of Pisces (ESE of the Circlet asterism which is a circle of stars at its western edge)! The North Galactic Pole is not located on this diagram, but it would be located further to the W in Coma Berenices and ~39.43˚ S from the position of declination for the NEP! Note: In this diagram NEP and SEP (the ecliptic poles) and NCP (North Celestial Pole) is separated by the NEP by angle of 23.44˚ as a consequence of the Earth's axial tilt with respect to the plane of the ecliptic. E is used for prograde direction where as W is used for the retrograde motion!

Courtesy of NASA/JPL/Bob King of Universe Today, 22 May 2013.

Late Spring – June 2013

C/2011 L4 PanSTARRS

Figure 11: Aspects of the orbital path as observed in the night time celestial skies above Earth!



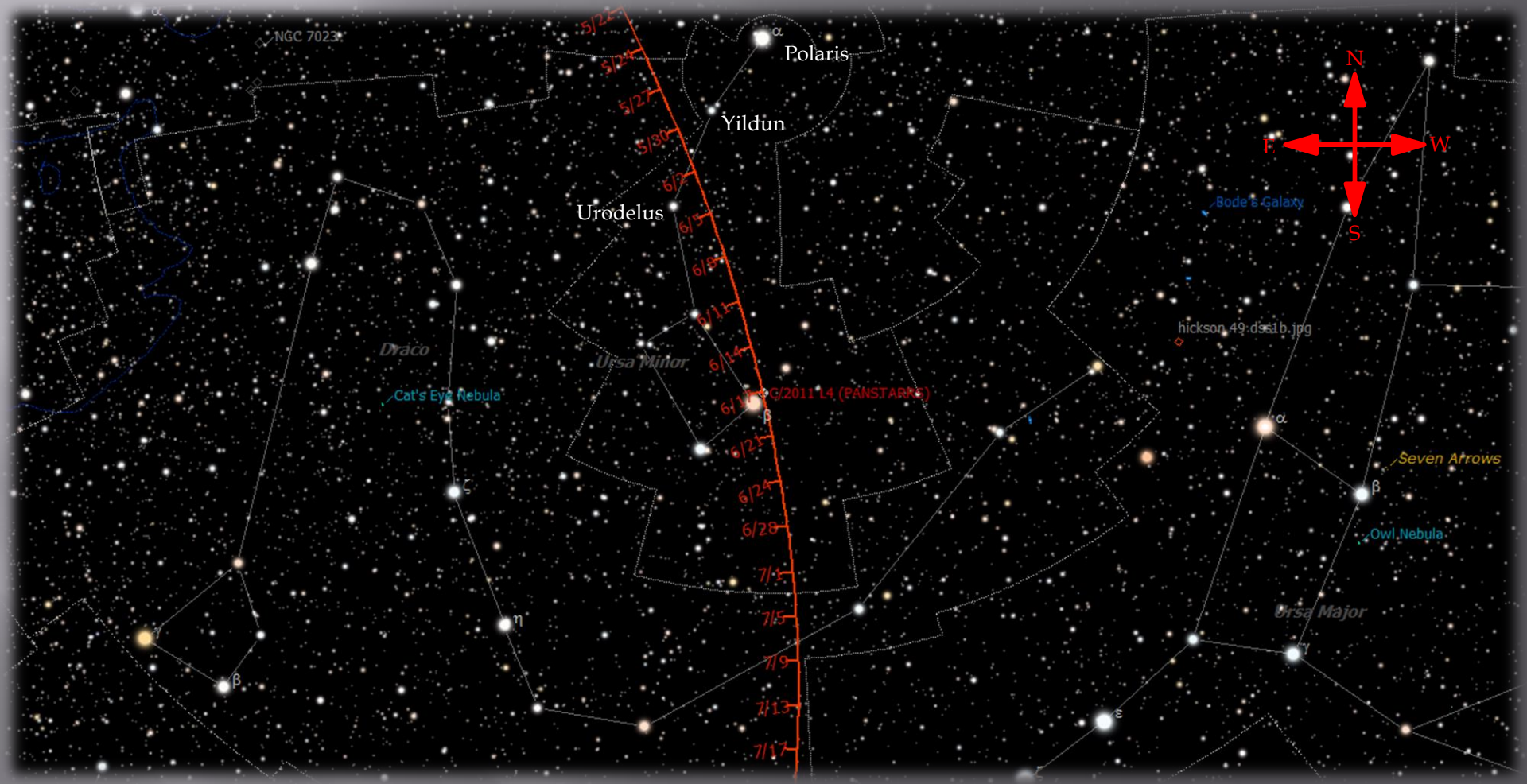
Note: The Positions of the Poles (NGP - North Galactic Pole & NCP) also their locations with respect to the position of the Galactic Center and see their combined orientation with respect to the hyperbolic path of the comet as it moves further from the Sun and noticeably above the ecliptic and celestial equator! The positions of the NEP and Vernal Equinox are not shown on this chart!

Courtesy of SkyTools 3 Profession Ed, 2012.

Late Spring – June 2013

C/2011 L4 PanSTARRS

Figure 12: Projection of the path of comet PanSTARRS across the NCH: (22 May – 17 July) 2013.



Courtesy of SkyTools 3 Profession Ed, 2012.

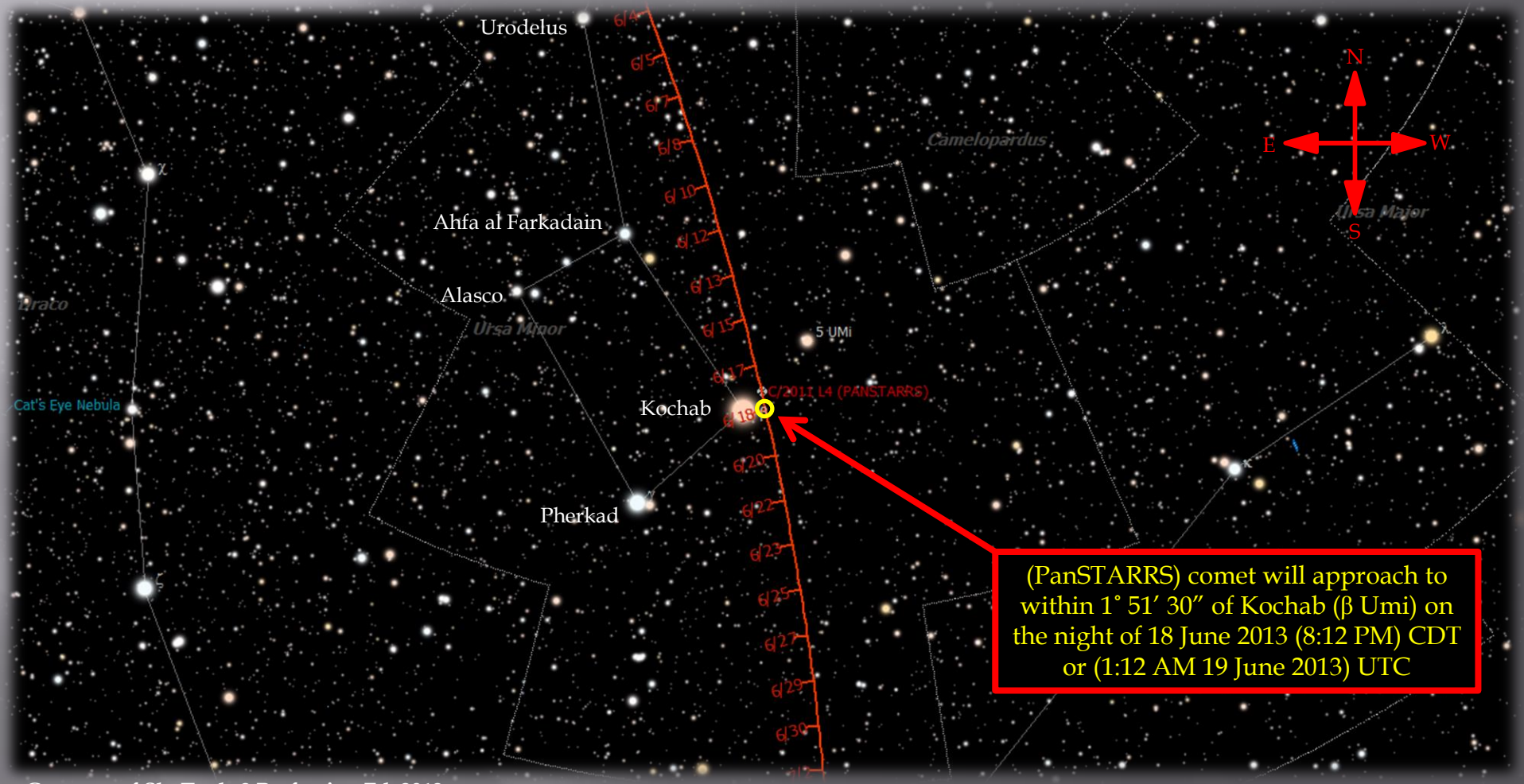
Note: Comet C/2011 L4 (PanSTARRS) has past its' closest angular position with respect to the north celestial pole and Polaris and now moves across the region continuing the circumpolar stars of the northern celestial hemisphere (NCH) with the inevitable crossing into the mid tail region of Draco by 2 – 3 June 2013.

NCH: North Celestial Hemisphere

Late Spring – June 2013

C/2011 L4 PanSTARRS

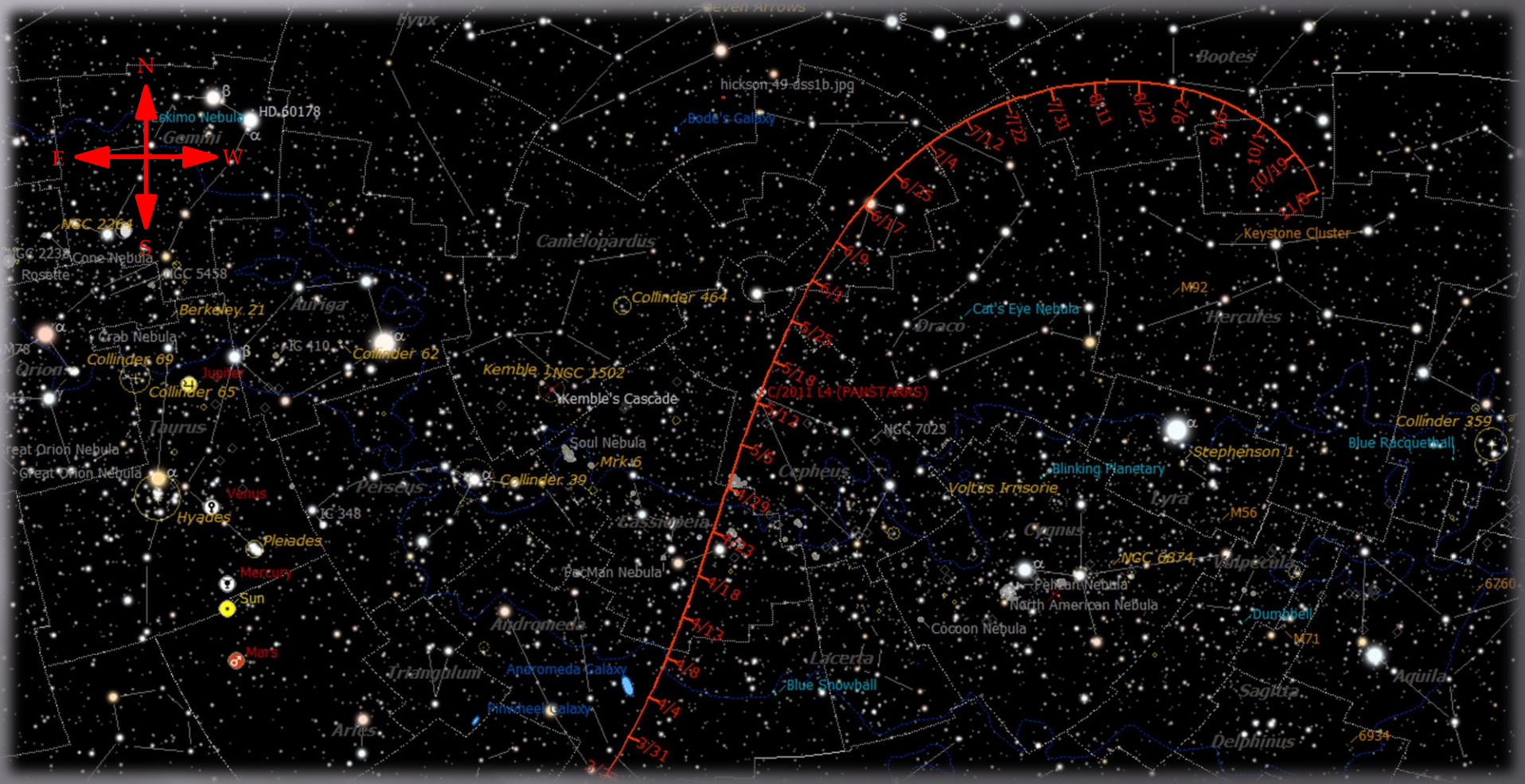
Figure 13: Progression of Comet LEMMON across the upper edge of the 'Little Dippter': (4 June – 1 July) 2013.



Courtesy of SkyTools 3 Profession Ed, 2012.

C/2011 L4 PanSTARRS

Figure 14: The projected path of the PanSTARRS comet towards the circumpolar region: (1 Apr – Early Nov) 2013!



Courtesy of SkyTools 3 Profession Ed, 2012.

Late Spring – June 2013

IAU MPC Ephemeris data for C/2011 L4 (PanSTARRS): (1 June – 1 July) 2013

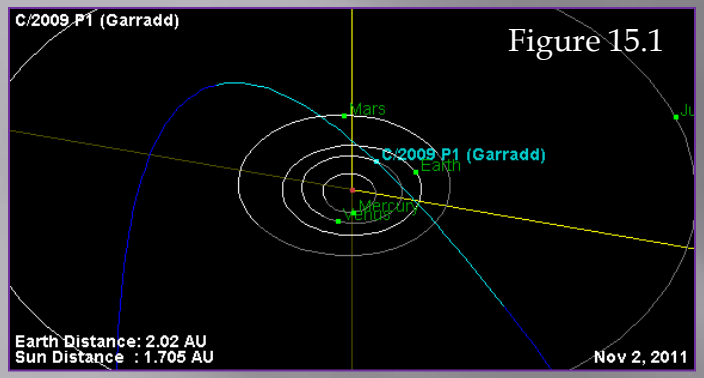
	CDT/CST	Epoch (J2000.0)		Basic Ephemeris						Sky Motion		Moon Phase	Moon Mag.
Date	hh:mm:ss	R.A.	Dec	Delta	R	El. (˚)	Ph.	M_1	% Fore.	"/min	P.A.	(0.00 - 1.00)	(Visual)
1-June -2013	00:00:00	17 15 07.8	84 26 44 N	1.851	1.840	73.4	31.9	8.32	47	1.80	238.8	0.46	-10.82
2-June-2013	00:00:00	16 51 42.6	84 02 09 N	1.864	1.856	73.8	31.6	8.37	47	1.79	232.5	0.35	-10.35
3-June-2013	00:00:00	16 31 43.5	83 34 18 N	1.876	1.873	74.1	31.4	8.41	48	1.78	227.1	0.26	-9.80
4-June-2013	00:00:00	16 14 46.1	83 03 57 N	1.888	1.889	74.4	31.2	8.45	48	1.77	222.5	0.18	-9.14
5-June-2013	00:00:00	16 00 23.8	82 31 40 N	1.901	1.905	74.7	30.9	8.49	49	1.76	218.4	0.11	-8.32
6-June-2013	00:00:00	15 48 11.6	81 57 55 N	1.914	1.921	75.0	30.7	8.54	49	1.74	215.0	0.06	-7.21
7-June-2013	00:00:00	15 37 47.7	81 23 05 N	1.927	1.937	75.3	30.5	8.58	49	1.73	211.9	0.02	-5.55
8-June-2013	00:00:00	15 28 53.8	80 47 25 N	1.940	1.953	75.6	30.2	8.62	50	1.72	209.3	0.00	-2.33
9-June-2013	00:00:00	15 21 14.7	80 11 08 N	1.953	1.969	75.9	30.0	8.66	50	1.71	206.9	0.00	-2.69
10-June-2013	00:00:00	15 14 38.3	79 34 25 N	1.966	1.985	76.1	29.8	8.70	50	1.70	204.8	0.02	-5.69
11-June-2013	00:00:00	15 08 54.5	78 57 23 N	1.980	2.001	76.4	29.5	8.74	51	1.68	202.9	0.06	-7.27
12-June-2013	00:00:00	15 03 55.2	78 20 08 N	1.994	2.017	76.6	29.3	8.78	51	1.67	201.2	0.11	-8.33
13-June-2013	00:00:00	14 59 33.7	77 42 46 N	2.007	2.033	76.8	29.1	8.82	51	1.66	199.6	0.18	-9.13
14-June-2013	00:00:00	14 55 44.5	77 05 21 N	2.021	2.048	77.0	28.9	8.86	52	1.65	198.2	0.26	-9.77
15-June-2013	00:00:00	14 52 23.2	76 27 55 N	2.035	2.064	77.2	28.7	8.90	52	1.63	196.9	0.35	-10.30
16-June-2013	00:00:00	14 49 26.0	75 50 32 N	2.048	2.080	77.4	28.5	8.94	52	1.62	195.7	0.45	-10.76
17-June-2013	00:00:00	14 46 49.8	75 13 14 N	2.064	2.095	77.6	28.3	8.98	53	1.61	194.6	0.55	-11.15
18-June-2013	00:00:00	14 44 31.9	74 36 02 N	2.078	2.111	77.7	28.1	9.02	53	1.60	193.5	0.66	-11.50
19-June-2013	00:00:00	14 42 30.3	73 58 58 N	2.093	2.126	77.9	27.9	9.06	53	1.59	192.5	0.76	-11.79
20-June-2013	00:00:00	14 40 42.9	73 22 05 N	2.108	2.142	78.0	27.7	9.10	54	1.57	191.5	0.85	-12.03
21-June-2013	00:00:00	14 39 08.2	72 45 21 N	2.122	2.157	78.2	27.5	9.14	54	1.56	190.6	0.92	-12.22
22-June-2013	00:00:00	14 37 44.8	72 08 50 N	2.137	2.172	78.3	27.3	9.18	54	1.55	189.8	0.98	-12.35
23-June-2013	00:00:00	14 36 31.5	71 32 31 N	2.152	2.188	78.4	27.1	9.21	54	1.54	189.0	1.00	-12.40
24-June-2013	00:00:00	14 35 27.2	70 56 25 N	2.168	2.203	78.5	26.9	9.25	55	1.52	188.2	0.99	-12.38
25-June-2013	00:00:00	14 34 31.2	70 20 32 N	2.183	2.218	78.6	26.7	9.29	55	1.51	187.4	0.95	-12.28
26-June-2013	00:00:00	14 33 42.6	69 44 54 N	2.199	2.233	78.6	26.5	9.33	55	1.50	186.7	0.89	-12.12
27-June-2013	00:00:00	14 33 00.7	69 09 31 N	2.214	2.248	78.7	26.3	9.36	56	1.49	186.0	0.81	-11.90
28-June-2013	00:00:00	14 32 24.9	68 34 22 N	2.230	2.263	78.8	26.1	9.40	56	1.47	185.3	0.71	-11.63
29-June-2013	00:00:00	14 31 54.8	67 59 29 N	2.246	2.278	78.8	26.0	9.44	56	1.46	184.7	0.61	-11.31
30-June-2013	00:00:00	14 31 29.8	67 24 51 N	2.262	2.293	78.8	25.8	9.48	56	1.45	184.0	0.67	-10.95
1-July-2013	00:00:00	14 31 09.6	66 50 29 N	2.278	2.308	78.9	25.6	9.51	57	1.44	183.4	0.57	-10.53

(10 Nov 2012 – 8 July 2013): $M_1 = 5.0 + 5 \log d + 7.5 \log r$

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

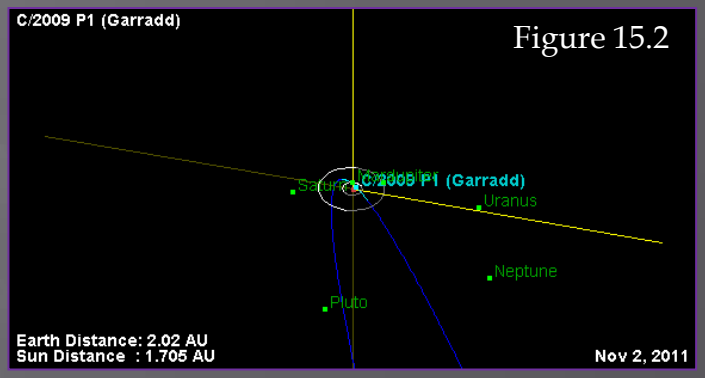
29˚22'30" N, 95˚35'37" W

Overview of the Orbital Differences for Comets!



P – Periodic Comets

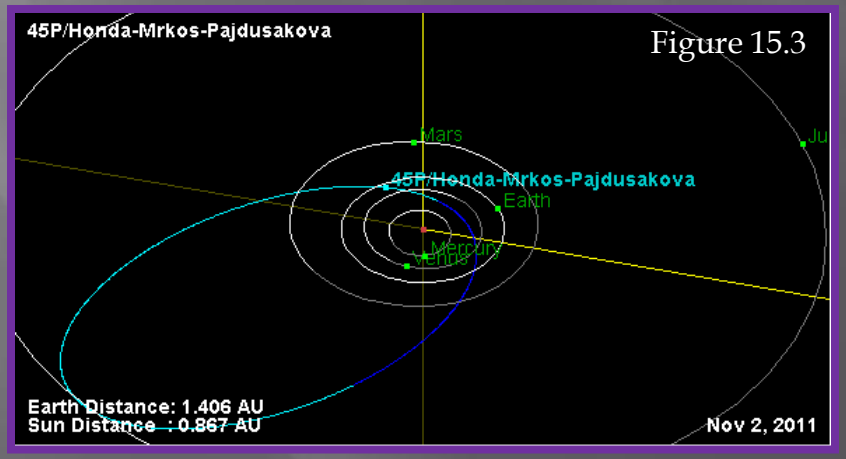
C – Non Periodic Comets



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 15.1 & 15.2 are of Comet C/Garradd 2009 P1 and Figure 15.3 below shows the orbit of 45P.

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



Late Spring
June 2013

GO OUT AND OBSERVE THOSE COMETS!



Courtesy of NASA, ESA, Planetary Science Institute, & STScI (Hubble Imaging Team).

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