67P/CG Observer Guide
version 0.1/DRAFT
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A. General Information

1. Guidelines

These are recommended for best use of amateur community data.

A worldwide campaign is necessary to recover the comet from conjunction and follow/monitor its temporal evolution through pre- perihelion and post.-perihelion. We listed useful guidelines, that if satisfied by the images, would be of potential use by professional and amateurs.

i. Observations from the recovery (May 2015?) through post-perihelion are requested (images from earlier epochs and apparitions are also requested).
ii. All data are valuable. For immediate processing, data is preferred in RAW, uncompressed FITS format; other formats also accepted .We request unenhanced images (target, darks and flats, if any). (For interested amateurs: some basic calibration can include bias subtracted and flat-fielded, and if necessary dark corrected). While absolute flux calibrations using calibrators (standard stars) are not required. However, if observers have star fields, then they can be submitted also.
iii. We prefer images should have north up and and east. Other information that is required is provided in the next section. The most important key information is an accurate time of the observation. For images posted in FB, we recommend they include the information requested in Section…, to ensure accuracy and protect the intellectual property of the observer, as internet sharing is rampant.
iv. We prefer, at a minimum, continuum images (UBVRI), but LRGB, or specific narrow band filters (eg OIII) are also acceptable, for studying colours of the comet. We recommend Sloan r' and g' filters for a consistent set of data on dust and gas.
v. We prefer images that are not saturated; if images are saturated, please provide one unsaturated image for comparison.
vi. While there is no minimum or mazimum number of images required, at least two (2) images will be helpful.
vii. Co-authourship will be accorded to all amateur imagers if their data is included any resulting publications.

2. User Agreement Form

The User registration/agreement form can be accessed at

https://docs.google.com/forms/d/1lgEQls6gO1lyVP98dZPAcTt9WpdGxUudSbPWnW7jo6E/edit

and also provided on the JPL website (http://rosetta.jpl.nasa.gov/rosetta-ground-based-campaign), as well as the Facebook group (PACA_Rosetta67p) .

Please fill out the form completely and only once, as the information is archived in a data base common to all media.

Wait for the PSA/Admins to send a welcome email with information regarding user-specific directories, login and and submission of data.

All participants, via the user registration form, agree to share their data with other registered users, and also agree to not download data without the explicit permission/consent of the original observer. All Terms and Conditions will be provided on the website. Facebook group Policies and Procedures will be posted in the group.

3. Data Format and File Nomeclature (Work in Progress)

We request data to be in FITS format for immediate crowdsourcing by professional and amateur observers. These data need to be uploaded to the PSA-Amateur Observations Archive.

Data Format:
The FITS files must contain some specific keywords. An example header is provided in Figure1.

File Nomenclature/Naming Convention
Per file name conventions defined by ESA/PSA, NASA/PDS and will be provided.

More information on FITS files can be found at:
http://fits.gsfc.nasa.gov/fits_home.html
http://fits.gsfc.nasa.gov/fits_verify.html

4. Requested information on the image:
   1. Object: Format:

   2. Date of Observation (Format: YYYYMMDD, eg. 20141231 for Dec 31 2014; 20140101 for Jan 1, 2014)

   3. Time of Observation (Format: 24 hr: HH:MM:SS.S, eg. 03:22:45.6 for 3:22:45.6 am; 18:45:54.5 for 6:45:54.5 pm)

   4. Observer Name (Format: First Last)

   5. Location of Observation

   6. Camera Details

   7.Filter information

   8.Exposure Time (Format: sec)

   9. Plate scale (Format: arc sec/pixel)

   10. Position Angle: (FormatL in degs from North)

   11.Axes (Format: North pointing up; East point left)

   The Observer log form templates are provided (*attach links and hard copies in an appendix)*. Include as much information as possible in the log sheets, including
      a. Observer name, contact information (email address preferred)
      b. Observation date, time (UTC preferred, but please specify local time and timezone otherwise); location
      c. location where observations/exposures were made
      d. what equipment such as telescopes, cameras, lenses, filters were used
      e. exposure length, number of exposures
      f. any digital post-processing (details!!)
      g. if this is a CCD image, should we consider it as a pretty picture or as data?
      h. any additional comments, descriptions,...
- attach your file (HINT: suggested file name YYYYMMDD_XXX where XXX is your initials or observatory code).

5. Instructions for Submission/Uploading Data

We will set up a user-specific password-protected directory (courtesy ESA Planetary Science Archive, PSA) for observers that provide RAW, uncompressed FITS observations for immediate crowdsourcing by registered professional and amateur observers. Instructions will be provided on how to upload data.

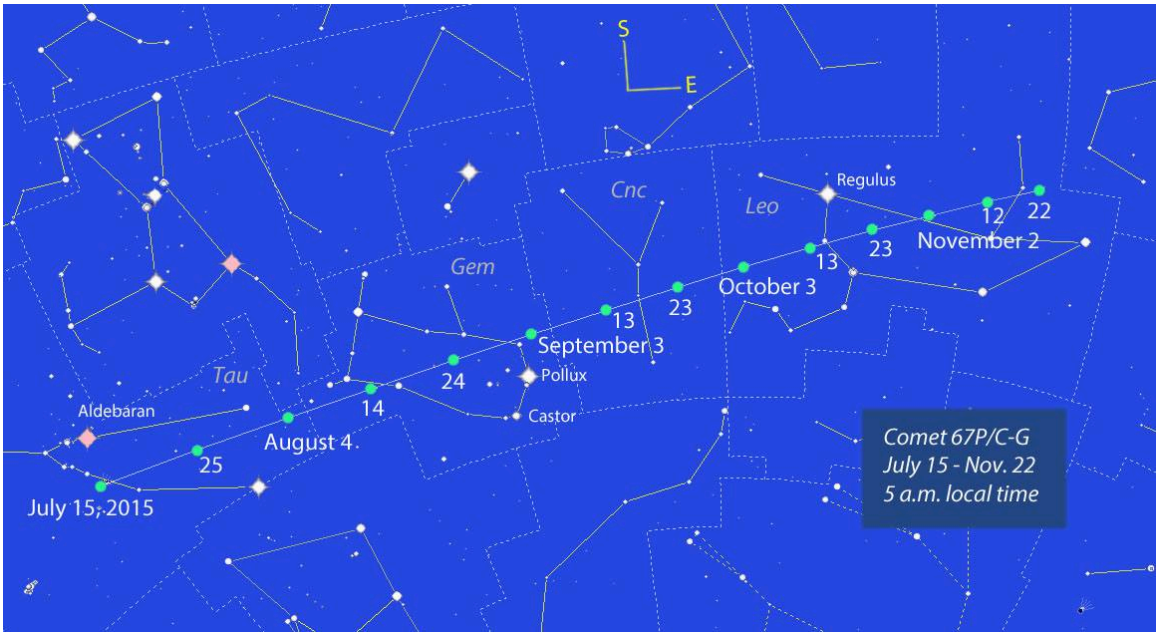
We will also provide brief tutorial and information on FITS format, the preferred FITS keywords for the image headers; how to convert other formats to FITS format.

Observers that take date/images in other formats will be provided user-specific drop-box accounts.

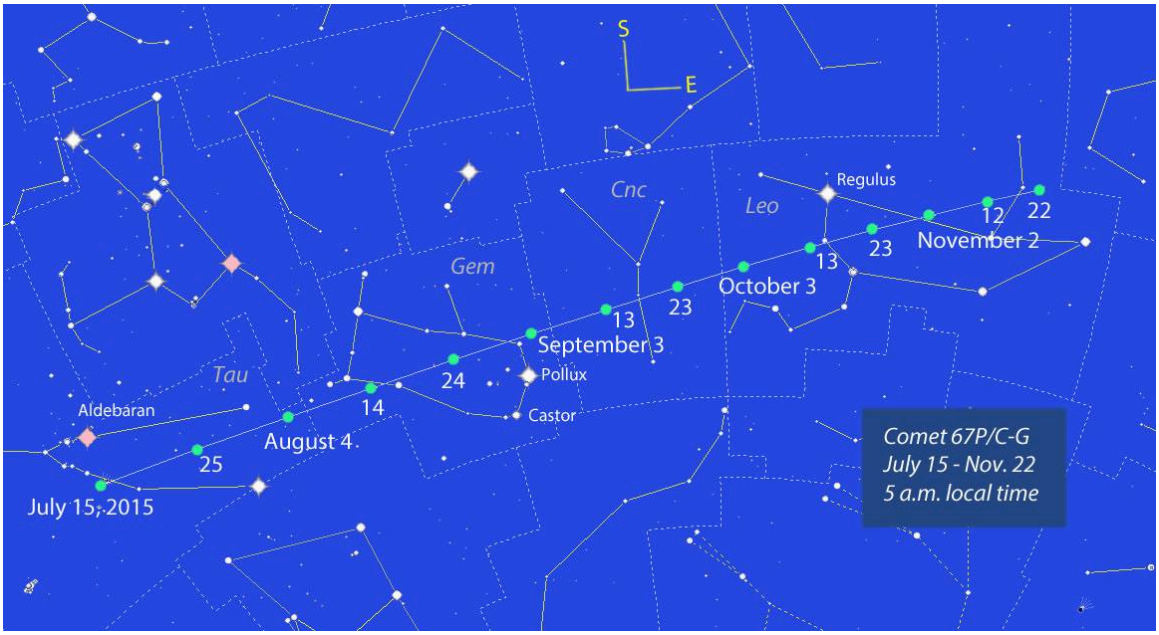
Section II: Observational Tools

1. Finder Charts: Northern Hemisphere from July – December 2015 (provided by Bob King)

Path of 67P in Northern Hemisphere (40Lat; 5am local time)



Path of 67P for Southern Hemisphere



Examples of Local Horizon (via Starry Night 7, courtesy: Vikrant Kumar Agnihotri)

A sample chart indicating planets and comets in the sky on 15 May, 2015. Specific charts for several locations around the world will be provided (and specific charts per request will be created. We are open to suggestions on other software the community uses to create similar charts).

2. Ephemeris

The JPL Horizons Web-interface at http://ssd.jpl.nasa.gov/horizons.cgi , with relevant parameters is recommended.

There are other programs that are used by amateurs. We shall provide, as needed or asked, ephemeris tables for reference locations, to ensure that the amateur community and other members of the public has access to the same information.

For example, the following table is for latitude of 50N and longitude 0, created by Australian amateur observer, Chris Wyatt (also known as Outbackmanyep Chris and Co-Admin of the Facebook group, PACA_Rosetta67p), using Pluto Project 9.0. The period covered is from 1 April – 31 May 2015. (Observers can use other sources for the ephemeris – there is no requirement that they use the one provided here.) The ephemeris provided here will also be available as downloadable PDF files via links provided (Work in progress).

67P/Churyumov-Gerasimenko: Latitude 50N; Longitude: 0E (1 Apr – 31 May, 2015)

Date	RA	declination	r	delta	mag	Elong	Phase	%illu	Alt	Azim	Speed	PA	Sun el
1 Apr 2015	5 23h23m03.01s	-09 03' 43.6"	1.9660	2.8421	16.2	23.4	11.7	99.0	-4.77	98.29	89.74	66.1	-6.8 Aqr
2 Apr 2015	5 23h25m16.27s	-08 49' 04.6"	1.9583	2.8306	16.2	23.8	11.9	98.9	-4.31	98.46	90.16	66.0	-6.5 Aqr
3 Apr 2015	5 23h27m30.03s	-08 34' 19.7"	1.9506	2.8190	16.2	24.2	12.1	98.9	-3.85	98.62	90.58	65.9	-6.1 Aqr
4 Apr 2015	5 23h29m44.27s	-08 19' 28.8"	1.9429	2.8075	16.1	24.6	12.4	98.8	-3.39	98.79	91.01	65.9	-5.8 Aqr
5 Apr 2015	5 23h31m59.02s	-08 04' 32.0"	1.9352	2.7959	16.1	24.9	12.6	98.8	-2.93	98.95	91.44	65.8	-5.4 Aqr
6 Apr 2015	5 23h34m14.28s	-07 49' 29.4"	1.9275	2.7843	16.1	25.3	12.8	98.8	-2.47	99.11	91.88	65.8	-5.1 Aqr
7 Apr 2015	5 23h36m30.07s	-07 34' 20.8"	1.9199	2.7726	16.0	25.6	13.0	98.7	-2.01	99.27	92.32	65.8	-4.7 Aqr
8 Apr 2015	5 23h38m46.38s	-07 19' 06.4"	1.9122	2.7610	16.0	26.0	13.3	98.7	-1.55	99.43	92.76	65.7	-4.4 Aqr
9 Apr 2015	5 23h41m03.23s	-07 03' 46.1"	1.9045	2.7493	16.0	26.4	13.5	98.6	-1.09	99.58	93.21	65.7	-4.1 Aqr

10 Apr 2015 5 23h43m20.63s -06 48' 19.9" 1.8968 2.7376 16.0 26.7 13.7 98.6 -0.63 99.73 93.66 65.6 -3.7 Aqr

11 Apr 2015 5 23h45m38.59s -06 32' 47.9" 1.8892 2.7258 15.9 27.0 14.0 98.5 -0.17 99.88 94.12 65.6 -3.4 Aqr

12 Apr 2015 5 23h47m57.11s -06 17' 10.1" 1.8815 2.7141 15.9 27.4 14.2 98.5 0.29 100.03 94.58 65.6 -3.1 Aqr

13 Apr 2015 5 23h50m16.21s -06 01' 26.5" 1.8739 2.7023 15.9 27.7 14.4 98.4 0.75 100.17 95.04 65.5 -2.8 Aqr

14 Apr 2015 5 23h52m35.89s -05 45' 37.2" 1.8662 2.6906 15.9 28.1 14.6 98.4 1.21 100.32 95.51 65.5 -2.4 Aqr

15 Apr 2015 5 23h54m56.16s -05 29' 42.1" 1.8586 2.6788 15.8 28.4 14.9 98.3 1.67 100.46 95.98 65.5 -2.1 Aqr

16 Apr 2015 5 23h57m17.03s -05 13' 41.3" 1.8510 2.6670 15.8 28.7 15.1 98.3 2.13 100.59 96.45 65.4 -1.8 Psc

17 Apr 2015 5 23h59m38.51s -04 57' 35.0" 1.8434 2.6552 15.8 29.0 15.3 98.2 2.59 100.73 96.92 65.4 -1.5 Psc

18 Apr 2015 5 00h02m00.60s -04 41' 23.0" 1.8357 2.6434 15.7 29.4 15.6 98.2 3.04 100.86 97.40 65.4 -1.2 Psc

19 Apr 2015 5 00h04m23.31s -04 25' 05.4" 1.8281 2.6316 15.7 29.7 15.8 98.1 3.50 100.99 97.87 65.4 -0.9 Psc

20 Apr 2015 5 00h06m46.65s -04 08' 42.4" 1.8206 2.6198 15.7 30.0 16.0 98.1 3.96 101.12 98.35 65.3 -0.6 Psc

21 Apr 2015 5 00h09m10.63s -03 52' 13.8" 1.8130 2.6080 15.7 30.3 16.2 98.0 4.41 101.24 98.84 65.3 -0.3 Psc

22 Apr 2015 5 00h11m35.26s -03 35' 39.9" 1.8054 2.5962 15.6 30.6 16.5 97.9 4.87 101.37 99.32 65.3 0.0 Psc

23 Apr 2015 5 00h14m00.55s -03 19' 00.6" 1.7979 2.5845 15.6 30.9 16.7 97.9 5.32 101.49 99.82 65.3 0.3 Psc

24 Apr 2015 5 00h16m26.51s -03 02' 15.9" 1.7903 2.5727 15.6 31.2 16.9 97.8 5.78 101.60 100.31 65.3 0.6 Psc

25 Apr 2015 5 00h18m53.14s -02 45' 26.0" 1.7828 2.5610 15.6 31.5 17.2 97.8 6.23 101.72 100.81 65.3 0.9 Psc

26 Apr 2015 5 00h21m20.47s -02 28' 30.8" 1.7753 2.5492 15.5 31.8 17.4 97.7 6.68 101.83 101.31 65.3 1.2 Psc

27 Apr 2015 5 00h23m48.50s -02 11' 30.4" 1.7678 2.5375 15.5 32.1 17.6 97.7 7.14 101.94 101.82 65.3 1.4 Psc

28 Apr 2015 5 00h26m17.25s -01 54' 24.9" 1.7603 2.5258 15.5 32.4 17.8 97.6 7.59 102.04 102.33 65.3 1.7 Psc

29 Apr 2015 5 00h28m46.72s -01 37' 14.3" 1.7528 2.5141 15.4 32.7 18.1 97.5 8.04 102.15 102.84 65.3 2.0 Cet

30 Apr 2015 5 00h31m16.93s -01 19' 58.7" 1.7454 2.5025 15.4 32.9 18.3 97.5 8.49 102.25 103.36 65.3 2.2 Cet

1 May 2015 5 00h33m47.90s -01 02' 38.2" 1.7379 2.4908 15.4 33.2 18.5 97.4 8.94 102.34 103.88 65.3 2.5 Cet

2 May 2015 5 00h36m19.63s -00 45' 12.7" 1.7305 2.4793 15.4 33.5 18.7 97.4 9.38 102.44 104.41 65.3 2.7 Cet

3 May 2015 5 00h38m52.14s -00 27' 42.5" 1.7231 2.4677 15.3 33.7 19.0 97.3 9.83 102.53 104.94 65.3 3.0 Cet

4 May 2015 5 00h41m25.45s -00 10' 07.5" 1.7157 2.4562 15.3 34.0 19.2 97.2 10.28 102.62 105.48 65.3 3.2 Cet

5 May 2015 5 00h43m59.56s +00 07' 32.0" 1.7084 2.4447 15.3 34.3 19.4 97.2 10.72 102.70 106.02 65.3 3.5 Cet

6 May 2015 5 00h46m34.50s +00 25' 16.2" 1.7010 2.4332 15.2 34.5 19.6 97.1 11.16 102.78 106.56 65.3 3.7 Cet

7 May 2015 5 00h49m10.27s +00 43' 04.9" 1.6937 2.4218 15.2 34.8 19.9 97.0 11.61 102.86 107.11 65.4 3.9 Cet

8 May 2015 5 00h51m46.89s +01 00' 58.0" 1.6864 2.4105 15.2 35.0 20.1 97.0 12.05 102.93 107.66 65.4 4.2 Cet

9 May 2015 5 00h54m24.37s +01 18' 55.4" 1.6791 2.3991 15.2 35.2 20.3 96.9 12.49 103.00 108.22 65.4 4.4 Cet

10 May 2015 5 00h57m02.72s +01 36' 56.9" 1.6718 2.3878 15.1 35.5 20.5 96.8 12.92 103.07 108.77 65.5 4.6 Cet

11 May 2015 5 00h59m41.97s +01 55' 02.5" 1.6646 2.3766 15.1 35.7 20.7 96.8 13.36 103.14 109.33 65.5 4.8 Cet

12 May 2015 5 01h02m22.11s +02 13' 12.0" 1.6574 2.3654 15.1 35.9 21.0 96.7 13.80 103.20 109.89 65.5 5.0 Cet

13 May 2015 5 01h05m03.17s +02 31' 25.3" 1.6502 2.3543 15.0 36.2 21.2 96.6 14.23 103.25 110.46 65.6 5.2 Cet

14 May 2015 5 01h07m45.15s +02 49' 42.3" 1.6430 2.3432 15.0 36.4 21.4 96.6 14.66 103.30 111.02 65.6 5.4 Psc

15 May 2015 5 01h10m28.06s +03 08' 02.7" 1.6359 2.3322 15.0 36.6 21.6 96.5 15.09 103.35 111.59 65.7 5.6 Psc

16 May 2015 5 01h13m11.93s +03 26' 26.6" 1.6288 2.3213 14.9 36.8 21.8 96.4 15.52 103.40 112.16 65.7 5.8 Psc

17 May 2015 5 01h15m56.75s +03 44' 53.6" 1.6217 2.3104 14.9 37.0 22.1 96.3 15.94 103.44 112.72 65.8 5.9 Psc

18 May 2015 5 01h18m42.54s +04 03' 23.6" 1.6147 2.2995 14.9 37.2 22.3 96.3 16.37 103.48 113.29 65.8 6.1 Psc

19 May 2015 5 01h21m29.31s +04 21' 56.5" 1.6076 2.2887 14.9 37.4 22.5 96.2 16.79 103.51 113.86 65.9 6.3 Psc

20 May 2015 5 01h24m17.07s +04 40' 32.2" 1.6006 2.2780 14.8 37.6 22.7 96.1 17.21 103.54 114.43 66.0 6.4 Psc

21 May 2015 5 01h27m05.84s +04 59' 10.3" 1.5937 2.2674 14.8 37.8 22.9 96.1 17.63 103.57 115.00 66.0 6.6 Psc

22 May 2015 5 01h29m55.62s +05 17' 50.7" 1.5868 2.2568 14.8 38.0 23.1 96.0 18.04 103.59 115.57 66.1 6.7 Psc

23 May 2015 5 01h32m46.44s +05 36' 33.3" 1.5799 2.2463 14.7 38.2 23.3 95.9 18.46 103.61 116.14 66.2 6.9 Psc

24 May 2015 5 01h35m38.30s +05 55' 17.8" 1.5730 2.2359 14.7 38.4 23.6 95.8 18.87 103.62 116.71 66.3 7.0 Psc

25 May 2015 5 01h38m31.22s +06 14' 04.1" 1.5662 2.2256 14.7 38.5 23.8 95.8 19.28 103.63 117.28 66.4 7.1 Psc

26 May 2015 5 01h41m25.20s +06 32' 51.9" 1.5594 2.2153 14.7 38.7 24.0 95.7 19.68 103.63 117.86 66.4 7.2 Psc

27 May 2015 5 01h44m20.28s +06 51' 41.1" 1.5526 2.2052 14.6 38.9 24.2 95.6 20.09 103.63 118.43 66.5 7.4 Psc

28 May 2015 5 01h47m16.45s +07 10' 31.3" 1.5459 2.1951 14.6 39.0 24.4 95.5 20.49 103.63 119.01 66.6 7.5 Psc

29 May 2015 5 01h50m13.74s +07 29' 22.4" 1.5393 2.1851 14.6 39.2 24.6 95.5 20.88 103.62 119.59 66.7 7.6 Psc

30 May 2015 5 01h53m12.15s +07 48' 14.2" 1.5326 2.1752 14.5 39.4 24.8 95.4 21.28 103.61 120.16 66.8 7.7 Psc

31 May 2015 5 01h56m11.70s +08 07' 06.3" 1.5260 2.1653 14.5 39.5 25.0 95.3 21.67 103.59 120.74 67.0 7.8 Psc

3. Observing Log Form

A template will be provided for visible observers, sketchers. It can be used even by imagers to keep a log of their data.

4. Filters for Observing

There is no requirement to purchase specific filters. Images of the comet using UBVRI, LRGB (based on the availability of the individual observer and robotic networks) are acceptable.

We suggest Sloan r' and g' to characterize the dust and gas in the comet, but will accept ALL images.

5. Instructions for Basic Calibration (will be updated shortly)

Section III. Social Media and Discussion