
32 Observation of the 2007 Outburst of Comet 17/P Holmes

Lertchon Tanasugarn(12th), Pornbhud Sarredeelerd, and Busara Songtanin(8th)
Demonstration School of Chulalongkorn University, Bangkok, Thailand.

Abstract

The coma diameter and volume of Holmes Comet at different time points was measured from digital photographs that had been taken on the ROTSE telescope. From 30 October to 7 November 2007 the coma of Holmes Comet appeared to increase linearly from 3.51×10^5 km to 6.83×10^5 km in diameter.

Background

Comets consist of loose collections of ice, dust, and small solid particles that orbit the Sun. When a comet gets close to the Sun, solar radiation impinging on the nucleus of the comet causes a visible coma and often a tail. Holmes, a periodic comet in our solar system, was discovered by a British amateur astronomer Edwin Holmes in 1892. The diameter of Holmes' nucleus was estimated to be 3.4 km. (1)

Motivation of the Study

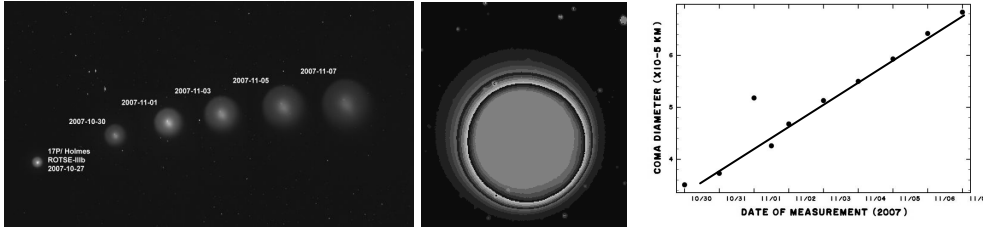
In only 42 hours around 23-24 October 2007, Holmes Comet was reported to brighten from a magnitude of about 17 to about 2.8, representing the largest known outburst by a comet. (2) At the end of October 2007, the coma of Holmes was seen to enlarge. (3) We were curious to see whether we could measure any change in the size of the coma surrounding the nucleus of Holmes during that period from the ROTSE photographs. We also wanted to study whether any type of relationship existed in the time course of coma diameter. Such knowledge would then allow us to calculate the time course of coma volume, coma density, etc. We also want to monitor the change in the brightness profile along the diameter of the coma (if any).

Material and Method

Orbit information of Holmes Comet was downloaded from NASA Jet Propulsion Laboratory (<http://ssd.jpl.nasa.gov/sbdb.cgi?sstr=17P&orb=1>). Digital photographs of Holmes Comet taken through a 45 cm third-generation robotic optical telescope in Namibia in the ROTSE (Robotic Optical Transient Search Experiment) network (<http://www.rotse.net>) were accessed with the help of our advisor, Mr. Rujopakarn. Staircase thresholding was performed with the aid of the SAOImage DS9 Astronomical Data Visualization Application (Window version 5.1) downloaded from the High Energy Astrophysics Division at the Harvard-Smithsonian Center for Astrophysics (<http://hea-www.harvard.edu/saord/ds9/>). Calculations were made using MicroSoft Excel spreadsheet and plotted using Plot software (<http://plot.micw.edu>).

Result

From 30 October through 7 November 2007, the size of Holmes coma was found to increase from 298 to 582 arcsec, corresponding to 3.51×10^5 km to 6.83×10^5 km in diameter, which is almost a doubling in size. Correspondingly, the volume of the coma increased almost 8 folds, from 2.27×10^{16} km³ to 1.67×10^{17} km³.



Left Figure: Raw images of Holmes obtained from ROTSE from 27 October through 7 November 2007, showing the visible expansion of coma.
Middle Figure: The intensity of a raw coma image was quantized into staircase profile by the use of SAOImage DS9 Astronomical Data Visualizaiton Application software.
Right Figure: Time course of coma diameter (x10-5 km) during the expansion period. Except for one datapoint on 1 November 2007, the coma showed a linear time course.

When the coma diameter was plotted as a function of time in the right figure shown above, a linear relationship was found during the observation period (except for one stray data point).

Discussion

The measured size of Holmes coma is in the same range as reported values of between 3.3 and 13 arcminutes (4). The change in coma diameter as computed agree well with the coma size visible to the naked eyes (See left figure).

Currently, the authors are in the process of expanding the time course of observation and computing related parameters such as the density of the coma to find whether there is any relationship with time.

End Note and References

- (1) measured by Chris Peterson as reviewed in the Wikipedia Encyclopedia (http://en.wikipedia.org/wiki/Comet_Holmes#_note-cloudbt) accessed in January 2008.
- (2) as reviewed in the Wikipedia Encyclopedia, op.cit.
- (3) as reviewed in the Wikipedia Encyclopedia, op.cit.
- (4) measured at Cloudbait Observatory in Guffey, Colorado as reviewed in the Wikipedia Encyclopedia, op. cit.

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