

Krittee Chesdachai, Korrawe Karunratanakul, Manus Poothawee(6<sup>th</sup>)  
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### **Abstract**

We search for variable stars in the Large Magellanic Cloud (LMC) using data from the Robotic Optical Transient Search Experiment (ROTSE) telescope between September 2005 and May 2006. Our search process utilizes the blink comparison between images from each month and verify variable star candidate against the SIMBAD astronomical database. We have found five long period variable stars with periods on the order of few months. They are different from short period variable stars which take for only a few days. One of five variable stars which we discover is new one that nobody has found it before. Our search is sensitive to a minimum variability of 0.62 magnitude, limiting magnitude of 18.5, and the variability period of less than three years.

### **Researching Method**

Take the data acquired from the ROTSE camera of the same coordinates and swap the image by using the DS9 software. Locate the object with altering illuminance, and then adjust the coordinates of each image to correspond in the World Coordinate System (WCS), the standard used in referencing all the coordinate system; the other system specified under this coordinate system are called sub-coordinate system, having no limit to quantity and very useful in creating, editing, or specifying object movements as stipulating relationship of movement sequence order are easier done. Verify the coordinate of the suspicious bodies when found.

Analyze the data acquired by the Photometry process, using the Maxim DL software. Five suspicious bodies were found in the image folder. When verified as true variable stars, confirm the coordinates in SIMBAD (<http://simbad.u-strasbg.fr/simbad>), a database of infrared ray-radiating bodies. The variable stars were also checked by the IRAS satellite if they had already been found and studied.

### **Data Analysis**

The exploring of the variable stars was done by ‘blinking’ the images of the sky taken by the ROTSE camera. By taking the images of the same area with big difference of the time taken, only long-period variable stars can be located, whilst locating short-period variable stars can be done by ‘blinking’ the images with time-taken difference no greater than 1 week to verify if the illuminance is constant. If inconstant, flashes of light will be seen, different to those of other stars with little illuminance changes possibly due to each day’s weather.

‘Blinking’ the images allowed us to discover 5 variable stars. When verified with SIMBAD (<http://simbad.u-strasbg.fr/simbad>) The five variable stars appeared to be:

- 1) GRRV 40: a long-period variable star
- 2) GRV 0537-6740 : a cepheid variable star
- 3) GRV 0530-6623: an irregular variable star

- 4) The new-founded variable star: a pulsating variable stars
- 5) GRRV 37 a long-period variable star

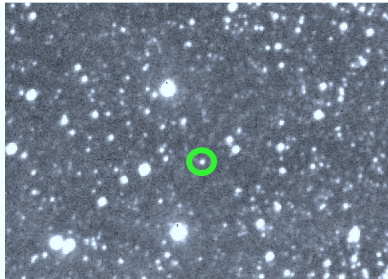


Image 1: The 4<sup>th</sup> variable star  
Date: 07/09/05

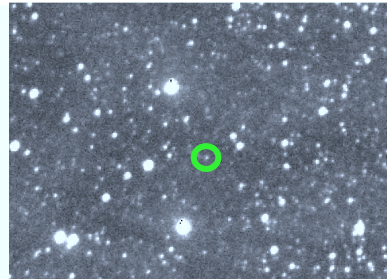


Image 2: The 4<sup>th</sup> variable star  
Date: 17/05/06

Coordinate: RA 05h 33m 53s Dec -67° 17'52''

The study of the fourth star by creating a graph comparing it with three nearby referencing stars with the magnitude of 15.1-15.3, 15.0-15.2 and 15.0-15.2 accordingly. The illuminance of the three stars alter not more than 0.2 magnitude, while the fourth variable star altered its illuminance of 14.6 magnitude down to 15.4 magnitude in 3 months. Subsequently, the illuminance will increase up to 14.6 magnitude, using about 3 months, as shown in Image 3.

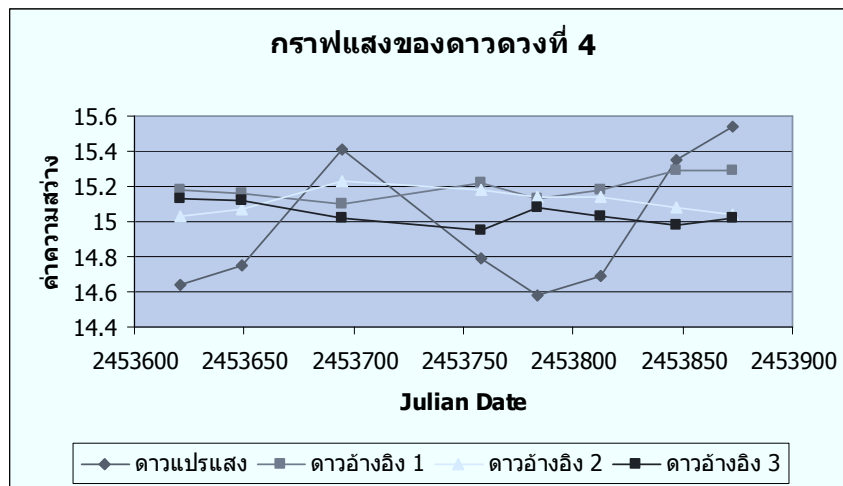


Image 3: Graph of magnitude alteration of the fourth variable star

### Conclusion

The analysis of the period folding of the variable stars in the Large Magellanic Cloud discerned from the ROTSE camera data revealed the characteristic of all the five variable stars to be long-period -- variability takes months, years, or decades -- differing to the short-period ones, taking only days; one of them a variable star which has not yet before been discovered. The locatable star must also have no less than 0.62 magnitude of amplitude and brighter than 18.5 magnitude with no more than three years of period folding

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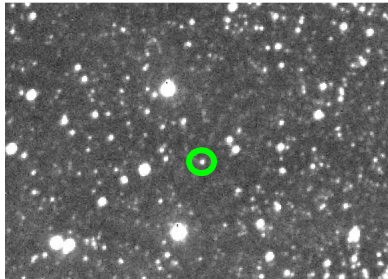


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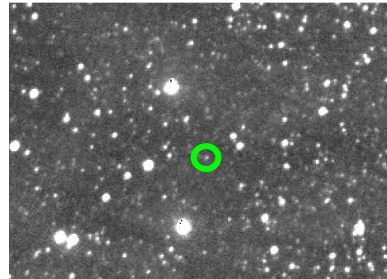


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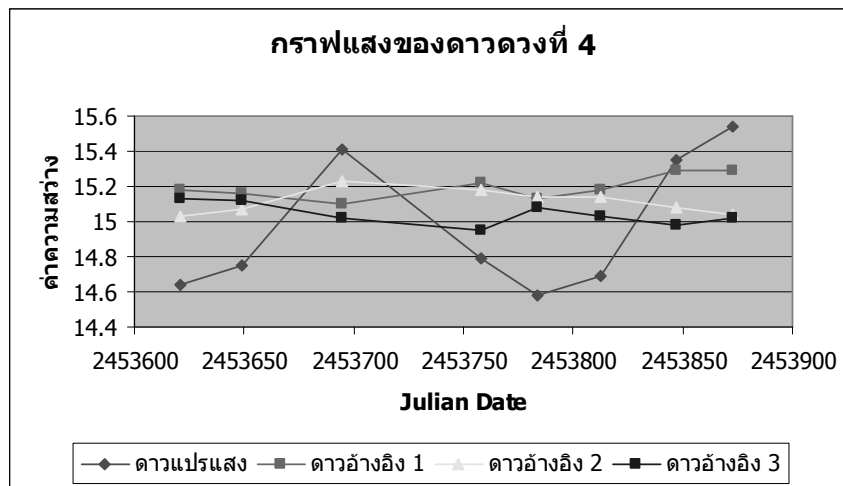


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