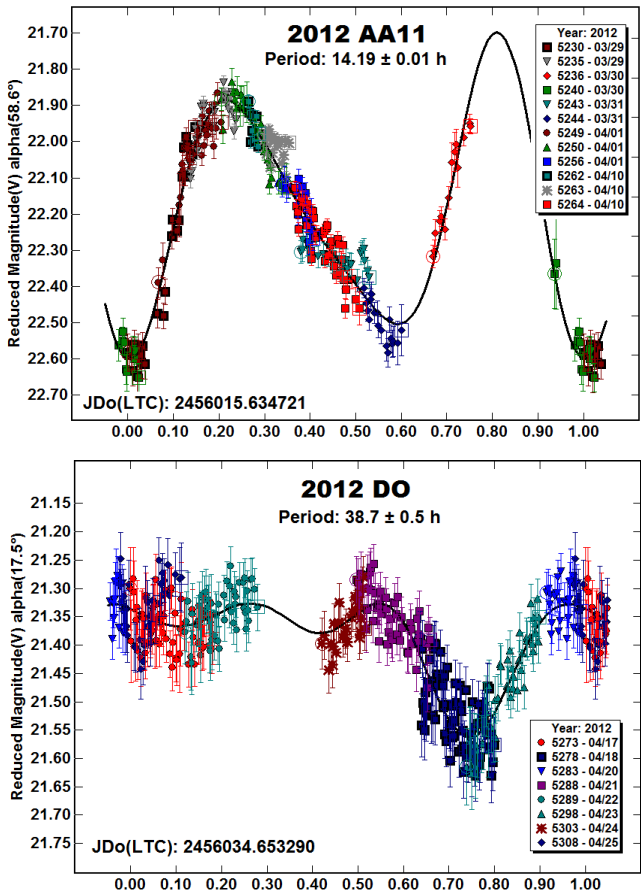




LIGHTCURVE FOR NEA 2012 LZ1

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(Received: 6 July)

Analysis of CCD photometric observations of the near-Earth asteroid 2012 LZ1 during a flyby in 2012 June found a synodic rotation period of  $12.87 \pm 0.01$  h and amplitude  $A = 0.28 \pm 0.03$  mag. The data are being used to supplement analysis of radar and other optical observations obtained at the time.

The near-Earth asteroid 2012 LZ1 was discovered on 2012 June 11 by Rob McNaught at Siding Spring Observatory in Australia. Three days later, it made its closest approach to Earth (about 5.4 million km; roughly 14 times the lunar distance). Sky motion at that time was too extreme for useful photometry. The authors waited until June 16 to begin photometric observations to determine the rotation period of the asteroid. This information would supplement radar and other optical observations to determine physical characteristics of the asteroid. Table I gives basic observer and equipment information

| Observer     | Observatory   | Equipment             |
|--------------|---------------|-----------------------|
| Warner       | Palmer Divide | 0.35-m SCT, STL-1001E |
| Sherrod      | Arkansas Sky  | 0.51-m DK, ST-2000 XM |
| Bacci/Franco | San Marcello  | 0.60-m Newt, Alta U6  |
| Pollock      | PROMPT        | 0.46-m SCT, Alta U47  |

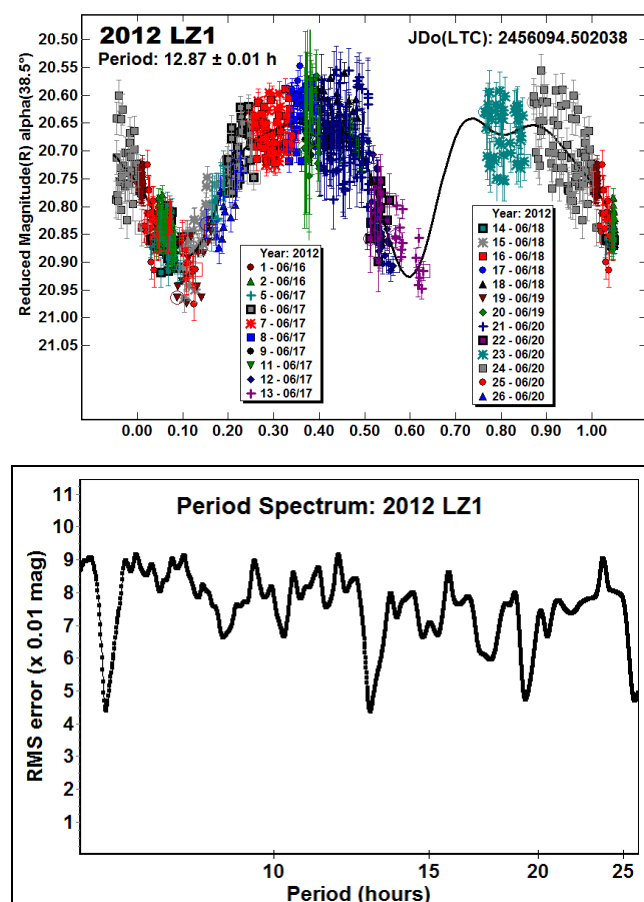
Table I. List of observers and equipment.

All images were unfiltered. The data from the several nights at Palmer Divide were put onto an internal standard system using V magnitudes derived from the 2MASS catalog (Skrutskie *et al.*,

2006; see Warner, 2007; Stephens, 2008). The remaining data were adjusted by moving zero points to provide the best RMS fit.

Warner used *MPO Canopus* to combine the data and do period analysis. The initial observations from the first night at Palmer Divide (June 17) indicated a very short period, on the order of 30 minutes. The same was determined from the first night of data from the PROMPT telescope. However, radar data analysis (Ellen Howell, private communications) indicated a much longer period, on the order of 10 hours. The images from Palmer Divide were re-measured, changing only to brighter comparison stars, to see if the revised data would produce different results. They did. The analysis of the combined data set found a period of  $12.87 \pm 0.01$  h, consistent with the radar data analysis, with amplitude  $A = 0.28 \pm 0.03$  mag.

The period spectrum shows that the solution is unambiguous. A plot using for the solution near 20 hours shows a complex curve with four maximums, which is highly unlikely.



#### Getting Fooled

The initial finding of a very short period from the first night of data demonstrates several important points. First, such provocative results need careful analysis and strong confirmation. Second, “never trust a computer.” Just because the Fourier analysis found such a period does not mean that it’s a valid solution. Harris *et al.* (2012) used data from two wide field surveys to show how the analysis can “latch onto” random noise and give false positives. If the amplitude of the lightcurve is low, as the initial data seemed to show, then it is much easier to be fooled into accepting an incorrect result. This example, and those in the Harris *et al.* paper,

should serve as cautionary tales for all those doing lightcurve period analysis.

#### Acknowledgements

Funding for observations at the Palmer Divide Observatory is provided by NASA grant NNX10AL35G, by National Science Foundation grant AST-1032896. This publication makes use of data products from the Two Micron All Sky Survey, which is a joint project of the University of Massachusetts and the Infrared Processing and Analysis Center/California Institute of Technology, funded by the National Aeronautics and Space Administration and the National Science Foundation.

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