CCD OBSERVATIONS AND MODELING OF 4492 DEBUSSY ECLIPSING ASTEROID.

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Introduction: 4429 Debussy belongs to the group of asteroids which are known as synchronous binary systems. It was discovered as a binary body on the basis of CCD photometric observations obtained in October-December 2002, March-May 2004 and April 2005 (Behrend et al., 2004). The lightcurve shows features typical for the eclipsing binaries - the amplitude of light changes (of about 0.5 mag) associated with the rotation of two nonspherical bodies, and two minima (of about 0.6 mag in depth) due to their mutual eclipses. The period of brightness change was estimated as 26.606 $\pm$ 0.001 h.

Observations: In 2006 Debussy was observed in two observatories: SAAO (South Africa) and Pic du Midi (France). The data are presented in the Fig. 1 (top panel). The lightcurve obtained from this observations contains more than half of the rotational period, but with evident eclipsing minimum, of about 0.6 mag. The rotational period deduced from this data was 26.576 $\pm$ 0.005 h, which is slightly shorter than value already presented in the paper by Behrend et al. (2004).

4429 Debussy was also observed at four observatories (Prompt, Chile; Pic du Midi, France; Lick, USA; LNA, Brazil) in November and December 2007 (during its fifth apparition). The second panel of Fig. 1 shows the results for December observations. Two eclipse events are visible on lightcurve.

This asteroid was observed with the Spitzer telescope and its spectrometer IRS in low resolution mode (R=100-600) in the thermal wavelength range (5-38 μm) on Nov. 4 2007 at 11:15 UT (Program 40164). Based on this lightcurve survey, we can derive that the Spitzer observation occurred at a phase of 0.38, so when the two components were well separated. Marchis et al., (2008a) derived an effective radius R_{eff}= 8.61 km, corresponding to a bulk density of 1.3 g/cm^3, remarkably similar to the ones derived for 90 Antiope, 87 Sylvia, 121 Hermione, and other C-type asteroids (Marchis et al., 2008b)

The asteroid was observed during its five oppositions, with ecliptic longitudes evenly distributed along the orbit. All data present lightcurves with minima which are caused by mutual eclipses. This suggests that the edge of the orbit of the binary system is turned to the observer. Therefore it is more likely that future observations will also show eclipses.

From presently gathered data we are able to obtain model of this binary system and predict its future lightcurves.

References: BEHREND R. ET AL (2006), Four new binary minor planets: (854) Frostia, (1089) Tama, (1313) Berna, (4492) Debussy, *A&A* **446**, 1177–1184.

MARCHIS F. ET AL. (2008a), Survey of Binary Asteroids with Spitzer/IRS, *ACM 2008*

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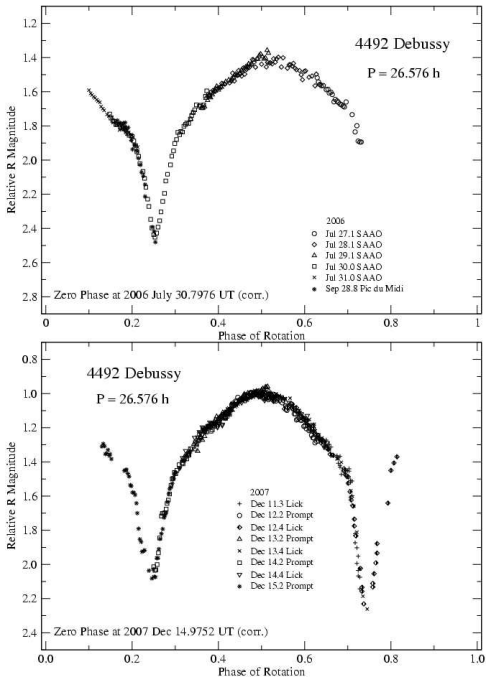

Figure 1: Composite lightcurves of 4429 Debussy in July/September 2006 and December 2007, respectively.