

$$D_{(km)} = \frac{1329}{\sqrt{p_v}} 10^{-0.2H_v} \quad (1)$$

Unfortunately, there are no V values at small phase angles, near 0° , which are necessary for an optimal fit and so the uncertainty is still relatively high. However, our values agree well with those reported in the JPL Small-Body Database Browser (JPL, 2011): $H_V = 11.30$ and $D = 18$ km.

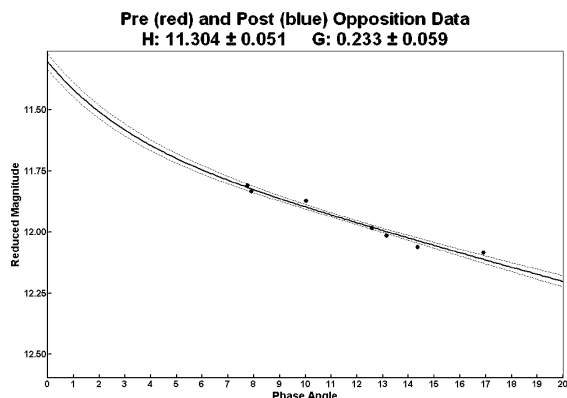


Figure 4. Visual reduced magnitude vs. phase angle for $H_V = 11.30 \pm 0.05$ and $G = 0.23 \pm 0.06$.

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PHOTOMETRIC OBSERVATIONS OF 321 FLORENTINA

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The minor planet 321 Florentina was observed during its oppositions of 2001 and 2011. The lightcurve of 2011 February displays a 0.52 ± 0.02 mag amplitude in R filter and a synodic rotation period consistent with the 2.870 ± 0.001 h value already known.

The Koronis dynamical family member 321 Florentina was discovered in 1891 by Johann Palisa. Since 1955, photometric investigations of this S-class, 28 km diameter asteroid include those by van Houten-Groeneveld and van Houten (1958), Pilcher (1983), Slivan and Binzel (1996), Thizy (1999, unpublished data; see Behrend, 2011), Frey (2000), Slivan *et al.* (2003), Tungalag *et al.* (2003), and Warner (2006). These authors reported lightcurve amplitudes ranging from 0.31 to 0.61 mag and a synodic rotation period of 2.870 ± 0.001 h. Slivan *et al.* (2003) used lightcurve inversion methods to derive a 3D morphological model and estimate the orientation of the rotation pole of the object. The data presented in this paper are the result of observations performed in 2001 and 2011.

Observations on 2001 March 20 and 21 were carried out from the astronomical station of Château-Renard (Saint-Véran, French Alps; longitude: $6^\circ 54' 24''$ E; latitude: $44^\circ 41' 52''$ N; altitude: 2930 m), a facility operated by Paris-Meudon Observatory and by AstroQueyras, an amateur association. At that time, Florentina was at solar phase angle $\alpha \sim 11.7^\circ$ and $V \sim 14.5$ mag. Images were taken at 2×2 binning with a 14-bit Hi-SIS 22 CCD camera attached to a 0.62-m Cassegrain telescope. A 0.33x Optec telecompressor was used to obtain a working focal ratio of $f/3$. The integration time of each image was 60 s. No filter was used and the effective wavelength of the observations approximately matched the $V + R$ band.

On 2011 February 25 and 26, the 0.6-m $f/3.5$ Newtonian telescope of Pic du Midi Observatory (French Pyrénées; longitude: $0^\circ 08' 32''$ E; latitude: $42^\circ 56' 12''$ N; altitude: 2861 m) was used. Florentina was at phase angle $\alpha \sim 4.7^\circ$ $V \sim 14.1$ mag. Images were obtained at 3×3 binning with an SBIG STL-6303E CCD camera and R filter. The integration time of each image was 120 s.

All CCD images were reduced with *Iris* version 5.55 software developed by Buil (2011). Scientific frames were corrected for bias, dark and flat-field effects. Flux measurements were performed by synthetic aperture photometry, i.e., by integrating the counts in a circular diaphragm; a concentric annulus was used for

computing and extracting the median value of the sky background. Only differential magnitudes were computed. During the observational runs, some images were taken with a V filter. This permitted estimating the color indices of the field stars and so use only non-variable comparison stars that had a color similar to that of Florentina. We carefully checked that the extinction effects were negligible, thus the lightcurves were not affected – within a ± 0.01 mag range – by differential colors. In both runs, the typical one-sigma uncertainty of the differential magnitudes was estimated to be ± 0.01 mag, which was in agreement with the dispersion of the measurements of the local comparison stars.

The phased lightcurves of 321 Florentina obtained in 2001 March and 2011 February are presented in Figures 1 and 2, respectively. The composite lightcurves are based on and consistent with the previous rotation period of 2.870 ± 0.001 h. The 2001 March lightcurve includes only one-third of the rotation period and displays a 0.47 ± 0.02 mag unfiltered amplitude. In 2011 February, the R amplitude was 0.52 ± 0.02 mag. According to Josef Ďurech (private communication), these new lightcurves confirm the previous model established by Slivan *et al.* (2003). The updated model and our lightcurves are available in DAMIT (Ďurech, 2011).

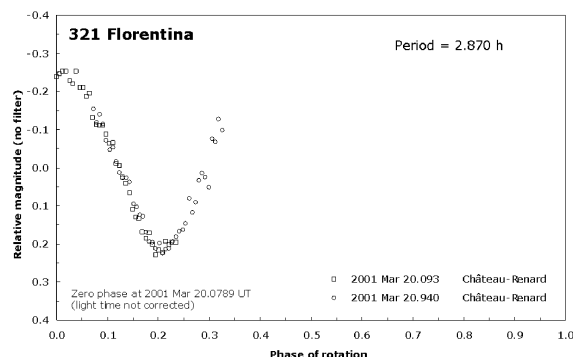


Figure 1. Composite lightcurve of 321 Florentina for March 2001.

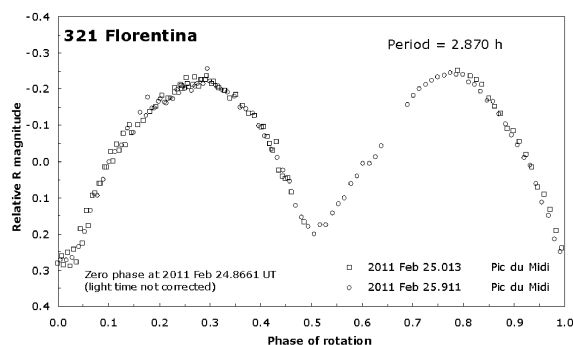


Figure 2. Composite lightcurve of 321 Florentina for February 2011.

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