Physical studies of near-Earth asteroids at the Terskol Observatory

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In responding to new perspectives for Solar System small bodies' research to be offered by Gaia, comprehensive studies based on observations of potentially hazardous objects from Earth could provide information and answers on specific issues, which require an integrated approach. Since the mid-2000s, spectral and photometric observations of Earth-approaching asteroids have been performed at the Terskol Observatory with the Zeiss-600 telescope equipped with a low resolution spectrograph and UBVR photometric filters. The spectrograph has demonstrated good capabilities of taking spectra of NEAs with V magnitude down to 15 that allows us to determine spectral classes of the objects. In addition, lightcurves of these asteroids have been obtained using the convolution of observed spectra with photometric filters transmission curves. Fainter asteroids (with V magnitudes down to 19) have been observed in the photometric mode with R filter; at the same time, asteroids with a high angular velocity have been observed without filters in order to increase signal-to-noise ratio. On the basis of the lightcurves obtained, rotation periods of asteroids and their shapes have been estimated. Some methods used have demonstrated their ability to determine rotation periods with a high accuracy what was proved by comparison of the results; that allowed us to assess the capabilities of the methods, which are based on phase dispersion minimization, Fourier analysis, and the Lomb normalized periodogram. It was found that the values calculated by using these methods were similar; however, in case of data sets with poor time coverage, Fourier techniques were unusable.

In this paper we present our recent studies of physical properties of some near-Earth asteroids, which were observed at the Terskol Observatory in 2013-2014, including 2005 AY_{28}, 2005 WK_4, 2007 CN_{26}, 2013 ET, and others.