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**VARIABLE STARS FROM THE LINEAR SURVEY**

PALAVERSA, L.<sup>1</sup>; SESAR, B.<sup>2</sup>; IVEZIĆ, Ž.<sup>3,4</sup>

<sup>1</sup> Observatoire astronomique de l'Université de Genève, 51 chemin des Maillettes, CH-1290 Sauverny, Switzerland

<sup>2</sup> Division of Physics, Mathematics and Astronomy, Caltech, Pasadena, CA 91125, USA

<sup>3</sup> University of Washington, Department of Astronomy, P.O. Box 351580, Seattle, WA 98195-1580, USA

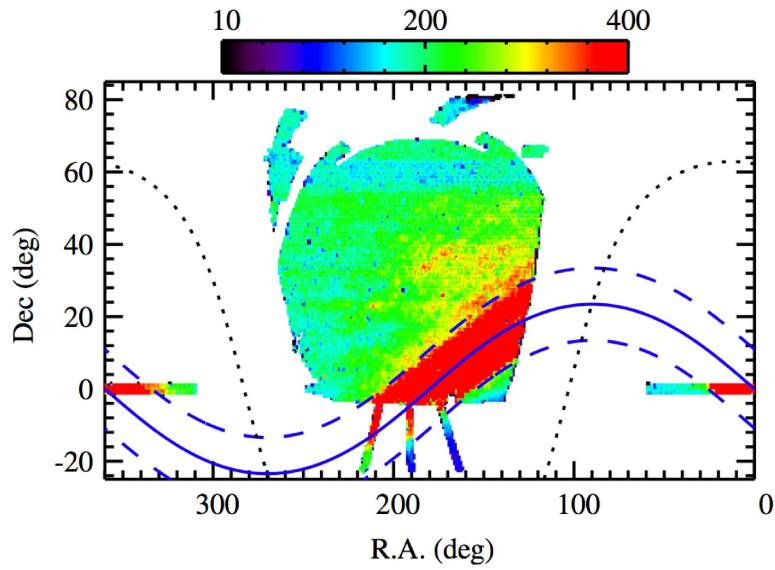
<sup>4</sup> Konkoly Observatory, Research Centre for Astronomy and Earth Sciences, Hungarian Academy of Sciences, Budapest, Hungary

We announce publication of a catalog of 7,194 variable stars extracted from the LINEAR asteroid survey across 10,000 sq. deg. of northern sky (corresponding approximately to SDSS north Galactic cap; see Sesar et al. 2011 for details). The sample flux limit is several magnitudes fainter than for most other wide-angle surveys; the photometric errors range from about 0<sup>m</sup>03 at  $V=15$  to 0<sup>m</sup>20 at  $V=18$ . Light curves include on average 250 data points (see Fig. 1), collected over about a decade with dense temporal sampling (see Fig. 2), and are visually confirmed and classified using phased light curves and additional attributes such as SDSS, 2MASS and WISE photometry and light curve statistics. The reliability and uniformity of visual classification across eight human classifiers was calibrated and tested using a catalog of variable stars from the SDSS Stripe 82 region, and verified using unsupervised machine learning approach. The resulting sample is dominated by 3,900 RR Lyrae stars and 2,700 eclipsing binary stars of all subtypes (see Fig. 3 for examples of light curves), and includes small fractions of relatively rare populations such as asymptotic giant branch stars and SX Phoenicis stars. The distribution of these mostly uncataloged variables in various diagrams constructed with optical-to-infrared SDSS, 2MASS and WISE photometry, and with LINEAR light curve features, is discussed in Palaversa et al. (2013). This large sample of robustly classified variable stars can enable detailed statistical studies of Galactic structure (see Sesar et al. 2013 for analysis of RR Lyrae stars) and physics of binary and other stars.

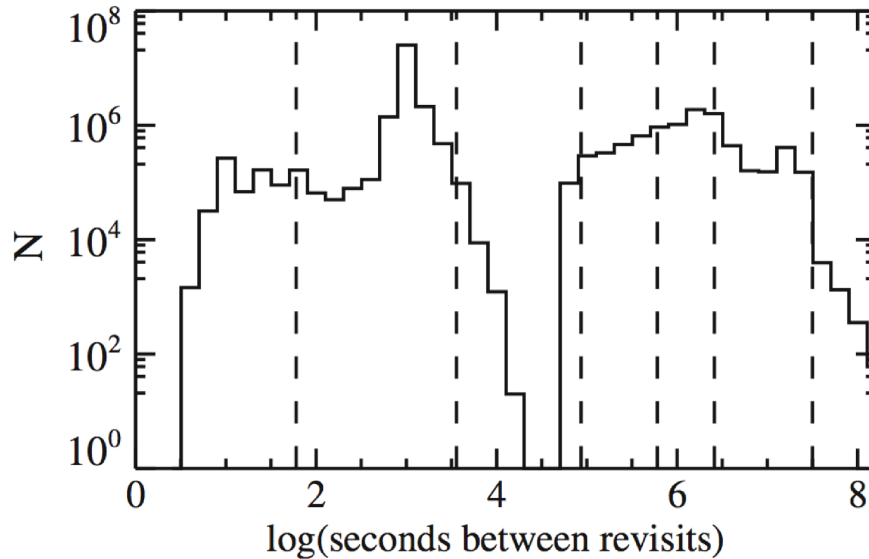
This catalog and all light curves are publicly available<sup>1</sup>. The catalog lists SDSS positions, variability type, median SDSS *ugriz* photometry, 2MASS and WISE photometry as well as the number of LINEAR observations, period and amplitude estimates, and some low-order statistics derived from light curves. We note that light curves for the full LINEAR sample of about 20 million objects are also publicly available through the SkyDOT Web site (<https://astroweb.lanl.gov/lineardb/>).

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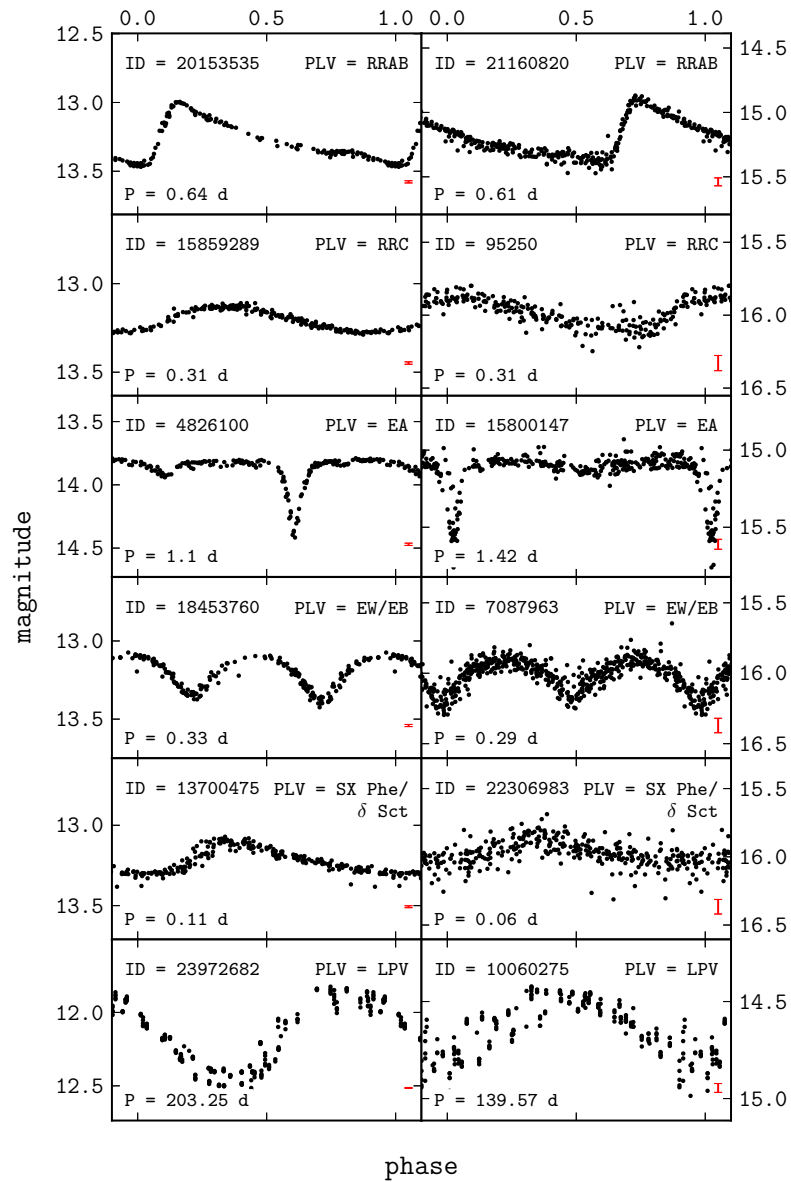
<sup>1</sup>At the IBVS website and <http://www.astro.washington.edu/users/ivezic/linear/PaperIII/PLV.html>



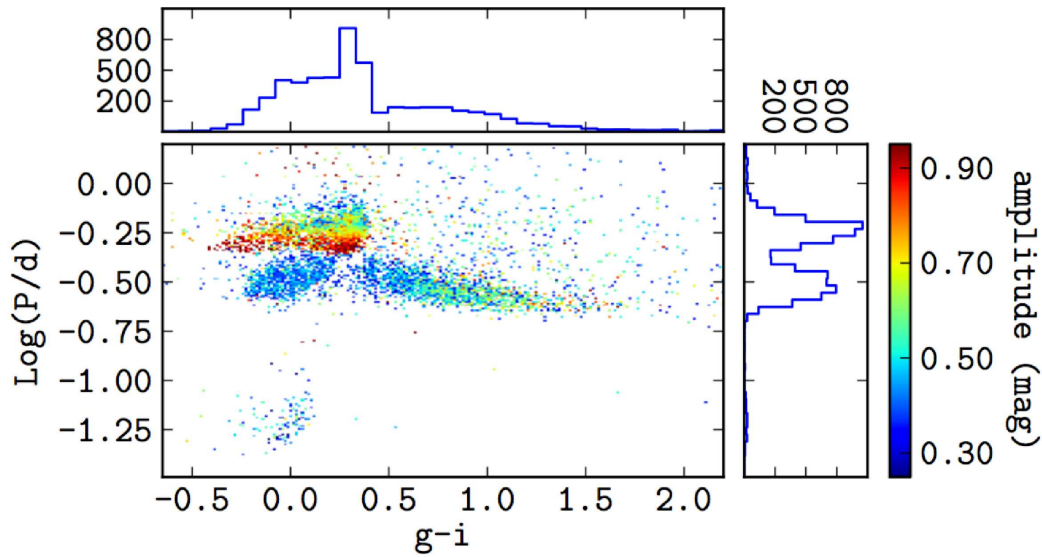
**Figure 1.** Median number of LINEAR observations per object as a function of equatorial coordinates. The values are color-coded according to the legend, with values outside the range saturating. The dashed lines show a 20 degree wide band around the Ecliptic plane (solid line) and the Galactic plane is shown as a dotted line. The average number of observations per object within 10 degrees from the Ecliptic plane is about 460, and about 200 elsewhere. Adapted from Fig. 10 in Sesar et al. (2011).



**Figure 2.** Cadence of LINEAR observations measured as the time between revisits of the same patch of sky. From left to right, the dashed lines show 1 minute, 1 hr, 1 day, 1 week, 1 month, and 1 year cadences. The LINEAR temporal coverage is fairly uniform, with a peak at  $\sim 1000$  sec corresponding to the main 15 minute cadence (optimized for asteroid observations). Adapted from Fig. 2 in Sesar et al. (2011).



**Figure 3.** LINEAR light curve examples. Each row shows examples of light curves from most significant classes (bright examples on the left and faint examples on the right side of the figure)



**Figure 4.** The distribution of periodic LINEAR variables in the period-color diagram. Bins are color coded by the median value of light curve amplitude according to the legend on the right. The two histograms show marginal distributions of the period and the  $g - i$  color. Adapted from Fig. 8 in Palaversa et al. (2013).

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