VARIABLES FROM SDSS STRIPE 82 REGION

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We wish to draw attention of the variable star community to a catalog of 67,507 candidate variable point sources selected from SDSS stripe 82 (|Dec| <1°.266 and R.A. in the range 20^h34^m to 4^h00^m; about 300 sq.deg.). Details about the construction and testing of the catalog are described in Ivezić et al. (2007). Briefly, the selection criteria are:

1. unresolved source in imaging data, and at least one band with photometric error below $0^m.05$,

2. SDSS processing flags BRIGHT, SATUR, BLENDED, or EDGE are not set,

3. at least 10 observations in the g and r bands are available,

4. the median g band magnitude brighter than 20.5,

5. "most likely variable": the root-mean-square scatter greater than $0^m.05$, and $\chi^2_{dof} > 3$ in both g and r bands.

The distribution of selected objects in SDSS color-magnitude and color-color diagrams is shown in Fig. 1. This catalog and all light curves are publicly available[1]. The catalog lists SDSS positions, median $ugriz$ photometry, number of observations, and some low-order statistics derived from light curves (including preliminary period estimates). The median number of observations per band is about 30. On average, the objects were most often re-observed every two days (the SDSS-II SN Survey cadence), followed by 5-day, 10-day, and yearly re-observations (see Fig. 1 in Sesar et al. 2010). Examples of light curves for objects at the faint end of the sample are shown in Fig. 2.

This dataset has not been fully explored yet. Initial analysis can be found in Sesar et al. (2007, 2010). As discussed there, this variable source catalog includes both stars and quasars (about 10,000; for detailed analysis, see MacLeod et al. 2010). Among the stellar sample, RR Lyrae stars (about 500) are an especially useful probe of the Galactic structure (Sesar et al. 2010). Except for the analysis of low-mass subsample by Becker et al. (2011), we are not aware of any other published detailed statistical analysis of eclipsing binary stars listed in this catalog. An M dwarf binary with extremely short period was analyzed in detail by Davenport et al. (2013).

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[1] At the IBVS website and `http://www.astro.washington.edu/users/ivezic/sdss/catalogs/S82variables.html`
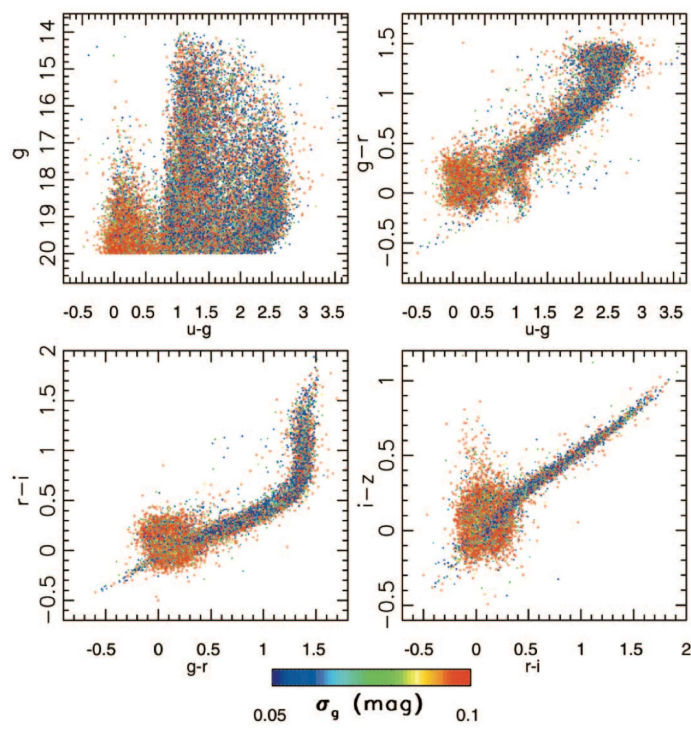
Figure 1. Color-magnitude and color-color distributions of candidate variables from SDSS Stripe 82. The dots are color-coded according to the observed rms scatter in the g band (see the legend). Objects with $u - g < 0.6$ are dominated by quasars. Adapted from Fig. 3 in Ivezić et al. (2007).

We note that, in addition to the catalog of variable sources from Stripe 82, a catalog of about million non-variable stars from the same sky region is also publicly available[2]. Thanks to averaging of multiple SDSS observations, the random photometric errors are below $0^{\mathrm{m}}01$ for stars brighter than 19.5, 20.5, 20.5, 20, 18.5 magnitudes in *ugriz*, respectively (about twice as good as for individual SDSS runs). The spatial variation of photometric zeropoints is not larger than $0^{\mathrm{m}}01$ (rms). For more details, please see Ivezić et al. (2007).
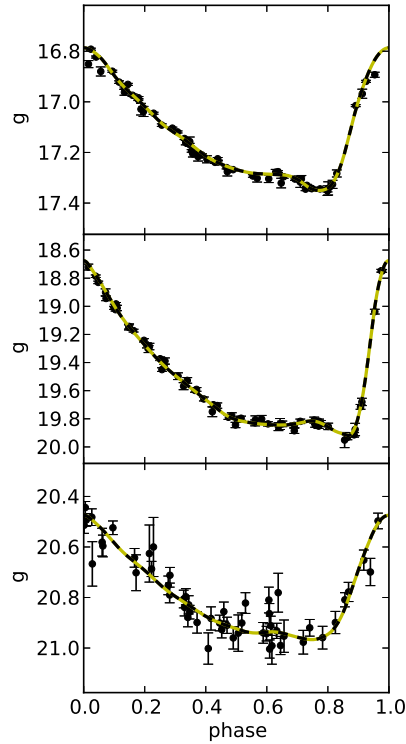

Figure 2. Examples of *g*-band light curves for three RR Lyrae stars (with catalog IDs equal to 4099, 74260, and 260984, from the top to the bottom panel, respectively) with brightness ranging from the bright to the faint end of the sample. The solid lines show the best-fit templates from Sesar et al. (2010).

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[2]http://www.astro.washington.edu/users/ivezic/sdss/catalogs/stripe82.html