

PSLS version 1.2 – release note

The new features are the following:

- new tables for systematic errors (Systematic/Version=1):
 - up-to-date systematic errors table for the P5 sample (with mask updates)
 - systematic errors table with fixed aperture masks (no mask updates during the quarter);
 - systematic errors table for the P1 sample
- random noise can vary with mask shapes and mask updates (when systematic is enabled, Systematic/Version>0 and RandomNoise/Type = PLATO_SIMU)
- amplitude of the drift can be controlled by the parameter Systematic/DriftLevel (if Systematic/Version>0)
- mask updates are now flagged

The package comes with the following new systematic tables:

- PLATO_systematics_EOL_V1.npy: End Of Life (EOL) systematic errors (aperture mask, P5 sample)
- PLATO_systematics_BOL_V1.npy: Beginning Of Life (BOL) systematic errors (aperture mask, P5 sample)
- PLATO_systematics_[EOL/BOL]_FixedMask_V1.npy: fixed aperture masks (P5 sample)
- PLATO_systematics_[EOL/BOL]_P1_V1.npy: systematic errors representative for the P1 sample (based on the PSF fitting method)
- Old systematic errors tables are given for compatibility:
PLATO_systematics_[BOL/EOL]_V0.npy: old tables (version 0)

The new tables were built on the basis of up-to-date simulations, which now include charge diffusion and stellar contaminations (using Gaia DR2 catalogue). These tables do not yet include the IPRNU because for the time being my model of IPRNU is too approximate and also too pessimistic.

When systematic errors are enabled, PSLs picks from the table the systematic error parameters (see Samadi et al 2019) of the stars with magnitude close to the magnitude specified by the user and with a drift amplitude in a given range (low: 0-0.4 px/90days, medium: 0.4-0.8 px/90days, and high: >0.8 pix/90days).

Note that stars with different contamination ratios are mixed together.

The random noise can now be controlled in three different ways:

- 'User' the NSR value is specified by the user
- 'PLATO_SCALING': the NSR value is obtained by interpolating, at the given magnitude, the NSR scaling relation expected for PLATO
- 'PLATO_SIMU': the NSR is taken from realistic simulated light-curves (stored in the systematics error table) and vary with the mask shapes and updates

All these new features are now integrated into PSLs and enable one to generate more realistic LCs for a long duration and for 24 cameras.

With the new table named PLATO_systematics_[EOL/BOL]_P1_V1.npy it is also now possible to generate realistic LCs for the P1 sample, since these table were derived on the basis of the PSF fitting method.

Here attached some illustrations showing the residual LCs (systematic) generated for two quarters:

- figure 1: with mask update, NSR consistent with the mask shapes (and updates)

- figure 2: no mask update, NSR consistent with the mask shapes
- figure 3: PSF fitting method (imajettes, P1 sample)

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PS: note the previous improvements from version 1.1 (03/02/20):

- Some Python3 compatibility issues corrected.
- New option "-m" to generate merged light-curves
- New option -M to perform Monte-Carlo simulations

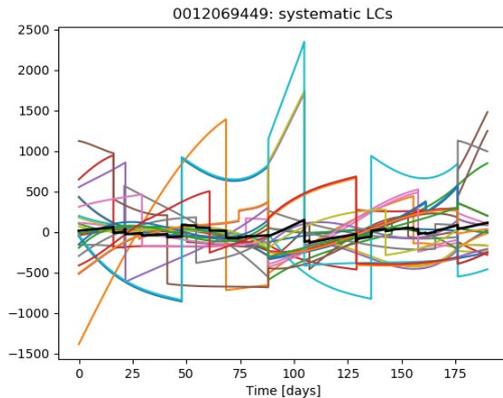


Illustration 1: individual residual light-curves (systematic errors) based on optimal binary masks (P5 sample) and with mask updates. The tick black line corresponds to the average over 24 cameras

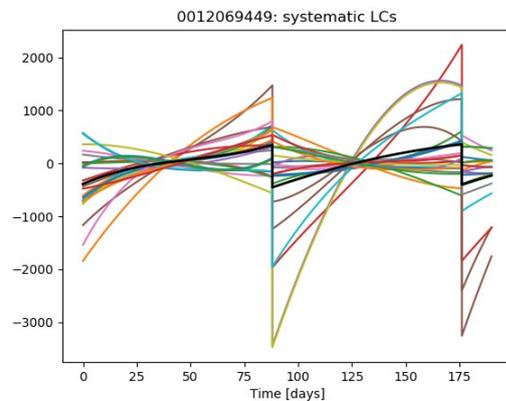


Illustration 2: individual residual light-curves (systematic errors) based on optimal binary masks (P5 sample) and with fixed mask. The tick black line corresponds to the average over 24 cameras

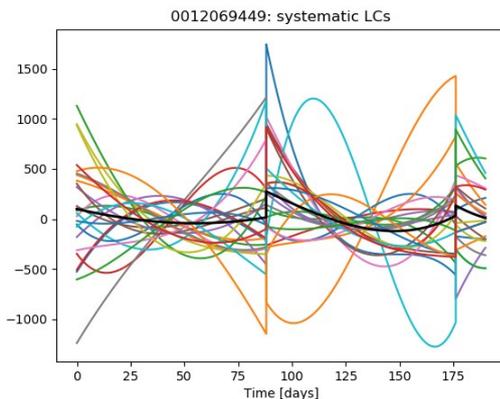


Illustration 3: individual residual light-curves (systematic errors) based on the PSF fitting method (P1 sample). The tick black line corresponds to the average over 24 cameras