**Abstract**

The Science Processing Operations Center is in the process of testing and deploying Release 4.0 of the codebase in the March 2019 timeframe. This paper describes the new features of the software and their likely impact on the quality of the TESS science data products. The major goals of Release 4.0 are to improve the extraction of photometry from the pixels in light of the non-uniform pointing performance and the identification of instrumental signatures from the light curves. We also describe modifications to the FFI pipeline to allow the generation of FFI light curves, correction of the instrumental systematics therein, and planet searches, primarily for the purpose of validating the 2-min pipeline against the FFI pipeline, but also to be able to provide cotrending basis vectors (CBVs) derived directly from the FFIs to the public to aid them in their extraction and correction of photometry. We also discuss the improvements in photometric performance of the pipeline and its various components.

The lapse in funding experienced between 22 December 2018 and 27 January 2019 significantly delayed our ability to conduct integration testing as planned for late December/early January, delaying the start of V&V by one month to the end of February 2019.

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**New Features in SPOC 4.0**

1. Use of quaternions in photometry and centroiding.
2. Use of quaternions to identify high-motion cadences and exclude same.
3. Use of the TPS detections to deemphasize pathological cadences ("skyline flattening").
4. Improved CAL calculations for black and smear correction.
5. PA brightness metric calculation improvements (reduce crowding in calculation).
6. Improved PDC spike goodness metric.
7. Improved handling of gaps and momentum drifts in PDC.
8. Improved tuning of PDC.
9. Improved attitude tweak correction in PDC.
10. Improvements in PDC introduced noise and correlation goodness metrics.
11. Using the improved spike goodness metric to minimize overfitting in the spike remover.
12. Enable FFI processing through planet search.
13. DV mini-reports archived to MAST.
14. Streamlining data retrieval and persistence to database.
15. Improved management of jobs on the NAS Pleiades supercomputer.

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**Variable Pointing Performance**

Variable pointing performance, especially during the early science sectors, made many of the development features in SPOC 4.0. However, it can greatly exceed 1-pixel pointing performance in more recent sectors (it is much better behaved, but is still variable over time. This variable pointing performance reduces many of the SPOC 4.0 features.

**Reconstruction of the Instantaneous Pixel Response Function (PRF)**

SPOC 4.0 allows us to reconstruct an instantaneous Pixel Response Function (PRF) that can be used for photometry and centroiding to reduce systematic errors in these quantities.