TESS Sector 1 Alerts Release Notes

Data Products
The data released for each Alert are the target pixel file, light curve file, and data validation products, including reports. Each is described in the TESS Science Data Products Description Document (SDPDD; https://archive.stsci.edu/missions/tess/doc/EXP-TESS-ARC-ICD-TM-0014.pdf). These data were processed as part of an expedited, early-science pipeline reduction. The archival run of the pipeline may be run with different parameters and/or data anomaly flags. All reported values here are preliminary and subject to change in the final archived products.

Observations
Sector 1 includes two physical orbits of the spacecraft, with a gap of 1.13 days between them for data download. The first orbit is physical orbit #9 and the second orbit is physical orbit #10.

	UTC	TJD*	Cadence #
Time Orbit 9 start:	2018-07-25 19:00:27 UTC	1325.2927799	70443
Time Orbit 9 end:	2018-08-08 00:29:51 UTC	1338.5215299	79968
Time Orbit 10 start:	2018-08-09 03:39:19 UTC	1339.6531040	80782
Time Orbit 10 end:	2018-08-22 16:14:51 UTC	1353.1777799	90520

*TJD = TESS JD = JD - 2,457,000.0

Orbit 9 includes 9,524 two-minute cadences, and Orbit 10 includes 9,736 two-minute cadences.

Momentum dumps
During Sector 1 observations, the reaction wheel speeds were reset to low values every 2.5 days, using the thrusters to remove angular momentum from the reaction wheels. These so-called "momentum dumps" take approximately 5 minutes, during which time the spacecraft is not in Fine Pointing mode, and result in degraded pointing stability. After completing each momentum dump, the spacecraft returns to fine pointing mode, and nominal pointing stability returns after ~10 minutes.

Cadences during these intervals have data quality flags with bit 5 set (Reaction Wheel desaturation Event) and bit 7 set (Manual Exclude)---see the SDPDD section 9. These intervals are summarized in the following table. The 'stop' times include a ~20 minute buffer for the ACS fine pointing mode to resume.

Orbit 9:

UTC	TJD*	Cadence #
start 2018-07-28 08:04:11.379804	1327.83704356	72275
stop 2018-07-28 08:23:30.379275	1327.8492079	72284
start 2018-07-30 20:04:11.540027	1330.33704541	74075
stop 2018-07-30 20:23:30.541975	1330.34920978	74084
start 2018-08-02 08:04:11.828365	1332.83704875	75875

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stop  2018-08-02 08:23:30.830312  1332.84921311  75884
start 2018-08-04 20:04:11.344163  1335.33704314  77675
stop  2018-08-04 20:23:30.339899  1335.34920746  77684
start 2018-08-07 08:04:12.035545  1337.83705114  79475
stop  2018-08-07 08:23:31.035086  1337.84920392  79484
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Orbit 10:

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       UTC                         TJD*       Cadence #
start 2018-08-11 16:19:11.880951  1342.18079935  82602
stop  2018-08-11 16:38:30.880258  1342.19086879  82610
start 2018-08-14 04:19:11.794738  1344.68079835  84402
stop  2018-08-14 04:38:30.794182  1344.69086779  84410
start 2018-08-16 16:19:11.714878  1347.18079743  86202
stop  2018-08-16 16:38:30.714341  1347.19086687 86210
start 2018-08-19 04:19:11.630366  1349.68079645  88002
stop  2018-08-19 04:38:30.629793  1349.69086589  88010
start 2018-08-21 16:22:05.535482  1352.18280924  89804
stop  2018-08-21 16:38:30.534895  1352.19086479  89810
```

*TJD = TESS JD = JD - 2,457,000.0

In addition, the time between approximately 08-16 16:00 UTC and 08-18 16:00 UTC exhibited anomalously high jitter, due to an improperly configured fine pointing mode calibration, and a large fraction of the 2-min cadences in this interval were manually excluded.

Cosmic Ray Mitigation
TESS removes the effects of cosmic rays on pixel data on board in the flight software. Each 2 minute cadence is a coadd of 60 two-second exposures. However, for every pixel, the high and low values in every series of 10 contiguous two-second exposures are discarded. For this reason, the effective exposure time is 80% of the integration time.

Gaps in 2-min Cadences in FITS Files
Gaps in the PDC flux and uncertainties for the 2-min cadence light curve FITS file are represented by 0 while gaps in data for other floating point time series are denoted by NULL values. The PDC values will be set to NULL in the full archival processing. The flags indicating that TESS was pointed toward Earth were not set throughout the entire interval between science data collection periods in orbits 9 and 10. This will also be addressed in the archival processing.

Additional Resources
Information about the TESS Mission can be found in Ricker et al. (2015). The Data products described here were produced by the Science Processing Operations Center (SPOC – Jenkins et al. 2016) at NASA Ames Research Center. The algorithms used for processing the TESS

pixel-level data and searching for the transit-like features are documented in the Kepler Data Processing Handbook (Jenkins 2017), and the Data Validation algorithms are documented in Twicken et al. (2018).

References

Jenkins, J. M., (ed.) 2017. Kepler Data Processing Handbook: KSCI-19081-002

Jenkins, J.M., Twicken, J.D., McCauliff, S., et al. (2016), "The TESS Science Processing Operations Center," Proceedings of the SPIE **9913**, 99133E

Ricker, G. R., Winn, J. N., Vanderspek, R., et al. (2015), "Transiting Exoplanet Survey Satellite (TESS)," *JATIS* **1**, 014003

Twicken, J. D., Catanzarite, J. H., Clarke, B. D., et al. (2018), "Kepler Data Validation I—Architecture, Diagnostic Tests, and Data Products for Vetting Transiting Planet Candidates," *PASP* 130, 064502