

# KIC 006451658

## Q1-17 DR25 TCE Parameters

| TCE          | Run Type | KOI? | Period (Days) | Epoch (BKJD) | Depth (ppm) | Duration (Hours) | MES | SNR | $R_{\star}$ ( $R_{\odot}$ ) | $T_{\star}$ (K) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|-----|-----|-----------------------------|-----------------|------------------------|------------------------|
| 006451658-01 | OBS      | No   | 472.317474    | 378.633114   | 546.7       | 4.792            | 8.9 | 7.6 | 1.05                        | 6165            | 3.25                   | 0.95                   |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments  |
|--------------|----------|------|-------|---|---|---|---|---|
| 006451658-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_SKYE_ZUMA—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—<br>INCONSISTENT_TRANS—CENT_FEW_DIFFS |

**Notes:** OBS = Observed. INJ = Injected. INV = Inverted. SCR = Scrambled.

N = Not Transit-Like. S = Stellar Eclipse. C = Centroid Offset. E = Ephemeris Match.

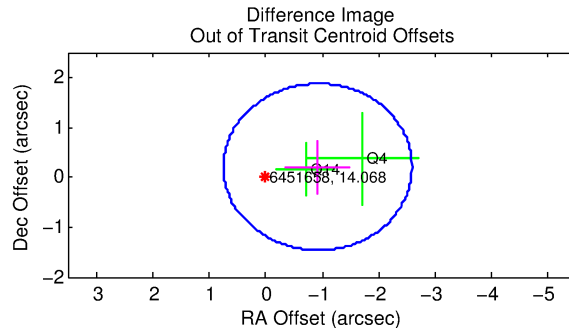
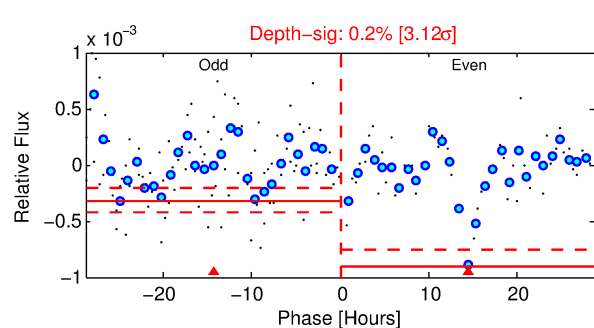
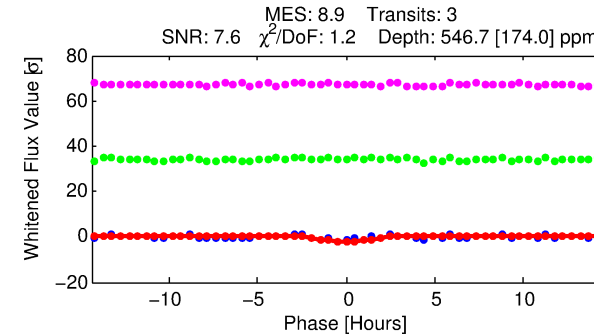
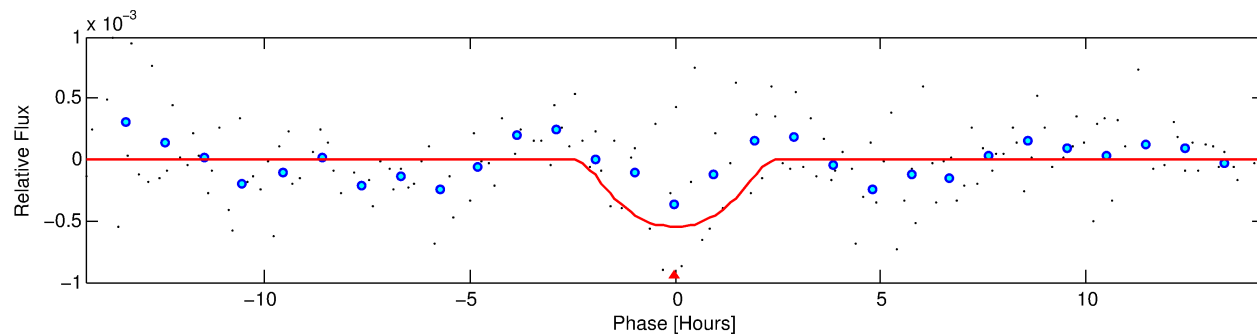
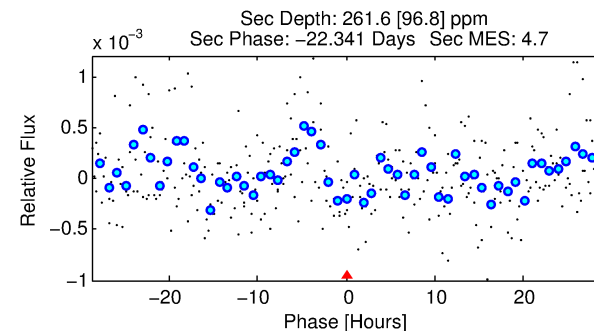
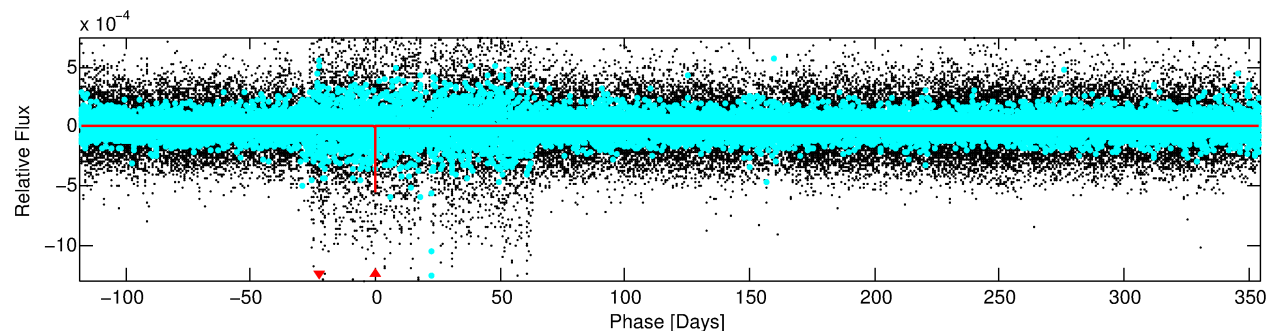
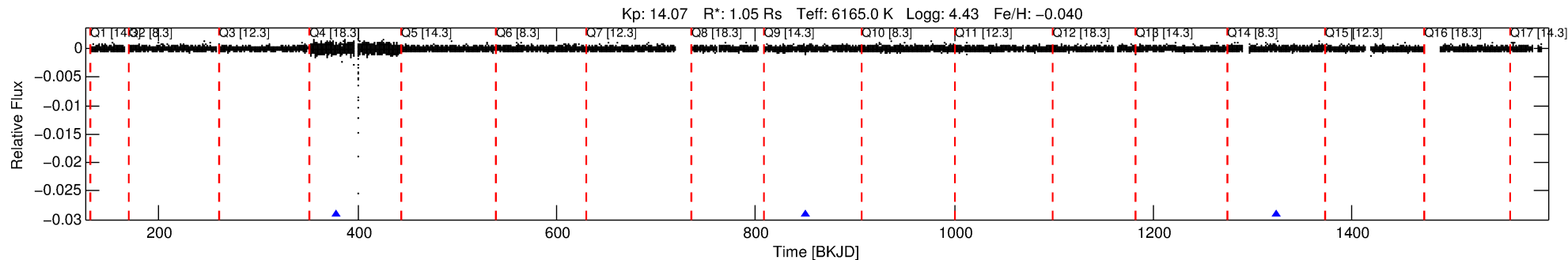
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 006451658-01

No Significant Match Found

# DV One-Page Summary

KIC: 6451658 Candidate: 1 of 1 Period: 472.317 d



## DV Fit Results:

Period = 472.31747 [0.01300] d  
Epoch = 378.6331 [0.0188] BKJD  
Rp/R\* = 0.0283 [0.0072]  
a/R\* = 252.87 [82.81]  
b = 0.97 [0.03]  
Seff = 0.95 [0.42]  
Teq = 252 [27] K  
Rp = 3.25 [1.38] Re  
a = 1.2227 [0.3485] AU  
Ag = 20412.07 [15369.27] [1.33 $\sigma$ ]  
Teff = 4658 [751] K [5.86 $\sigma$ ]

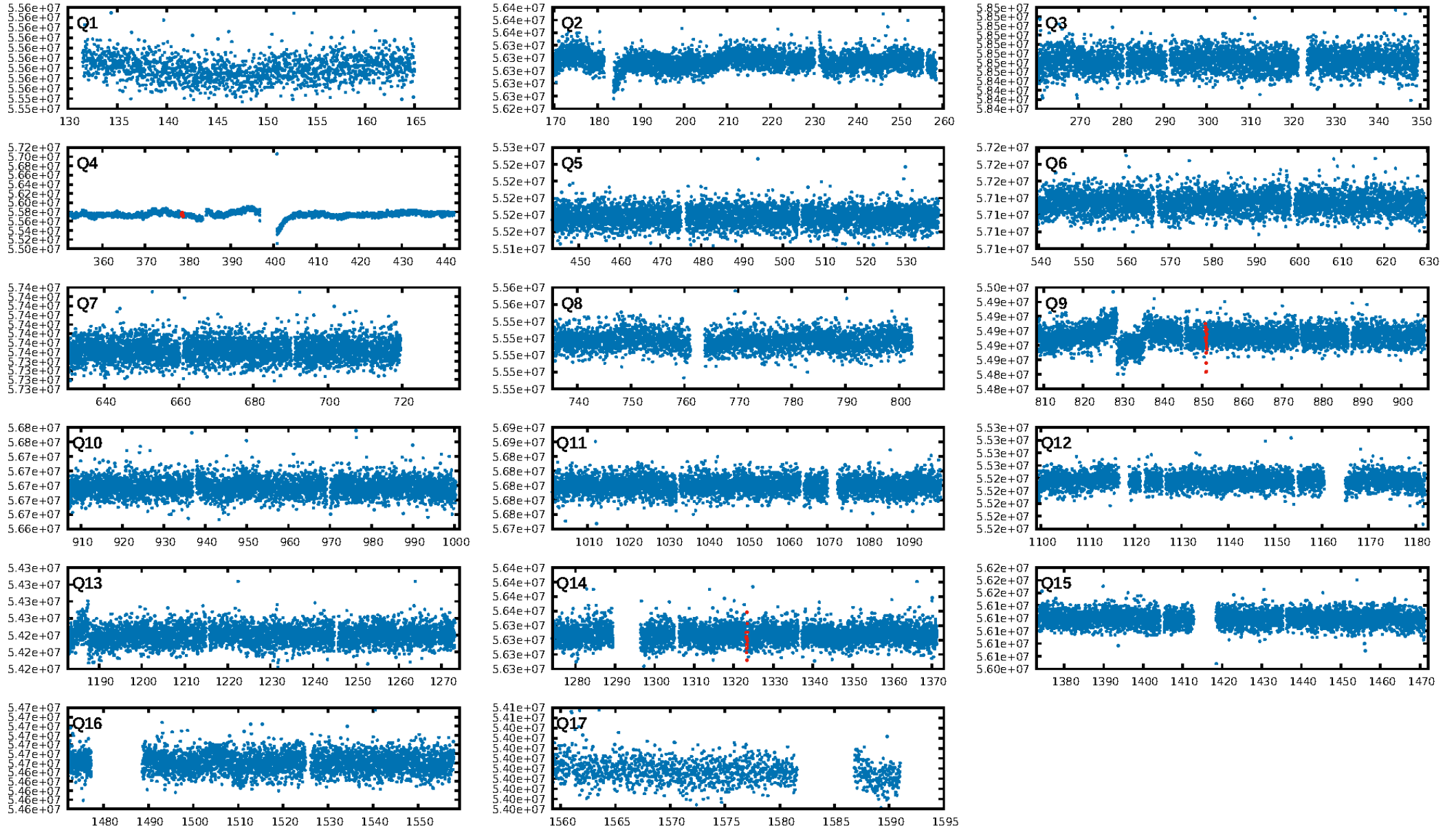
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 0.5%  
ModelChiSquareGof-sig: 81.6%  
Bootstrap-pfa: 6.86e-19  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: -5.064  
Centroid-sig: 73.2%  
Centroid-so: 0.420 arcsec [0.26 $\sigma$ ]  
OotOffset-rm: 0.945 arcsec [1.70 $\sigma$ ]  
KicOffset-rm: 1.092 arcsec [1.96 $\sigma$ ]  
OotOffset-st: 1/0/1/0 [2]  
KicOffset-st: 1/0/1/0 [2]  
DiffImageQuality-fgm: 0.50 [1/2]  
DiffImageOverlap-fno: 1.00 [3/3]

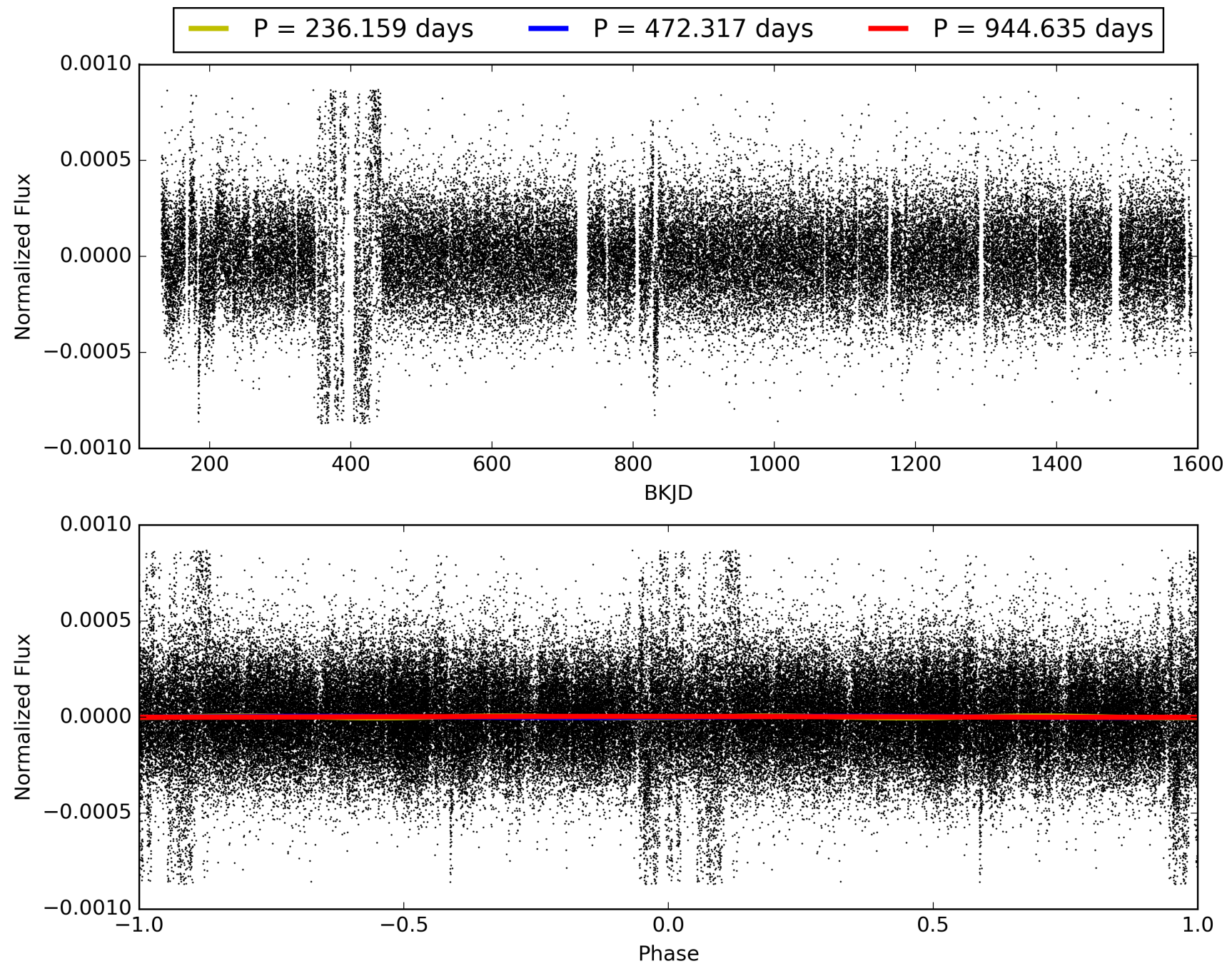
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 17:19:56 Z

This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 006451658-01, PDC Light Curves

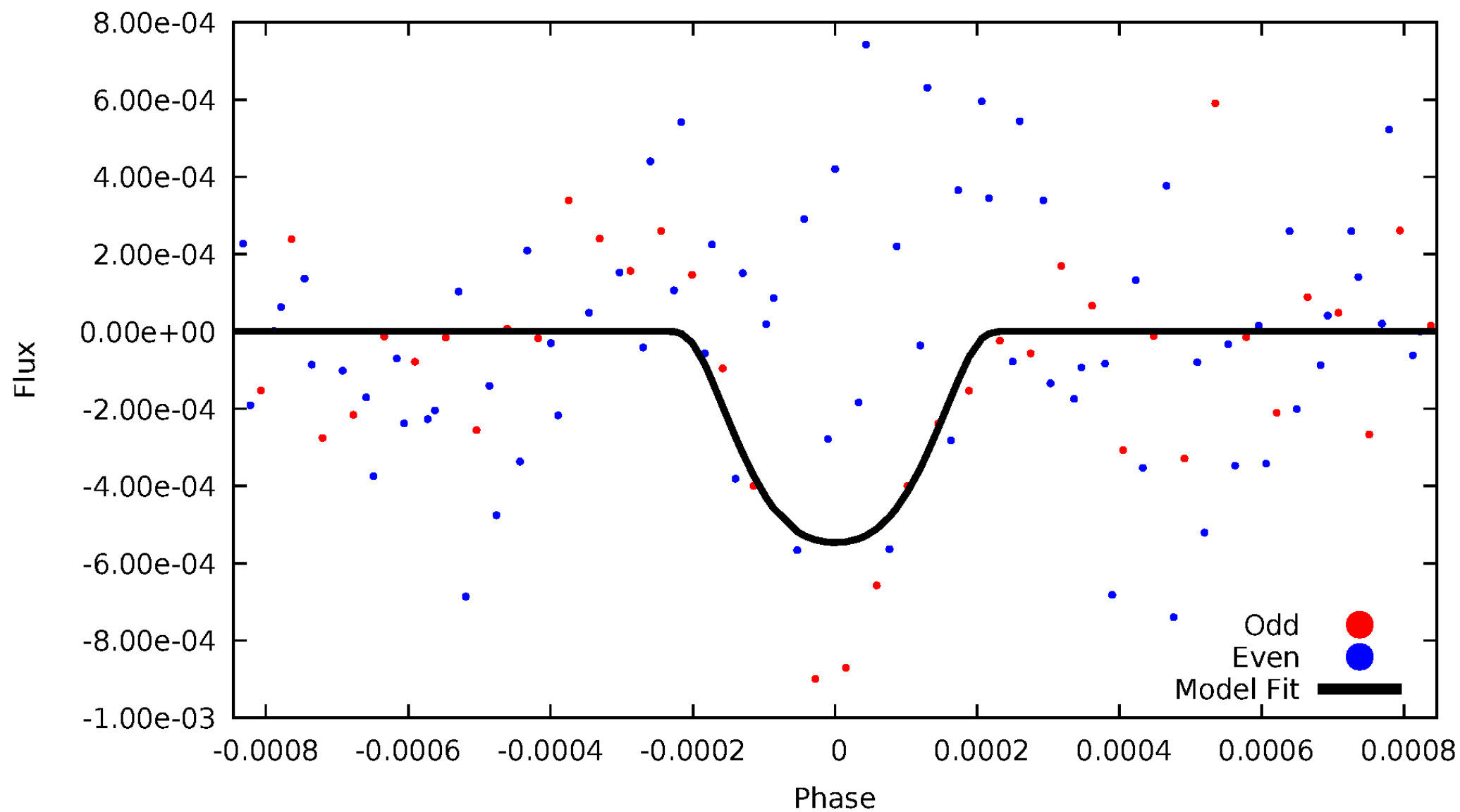


TCE 006451658-01



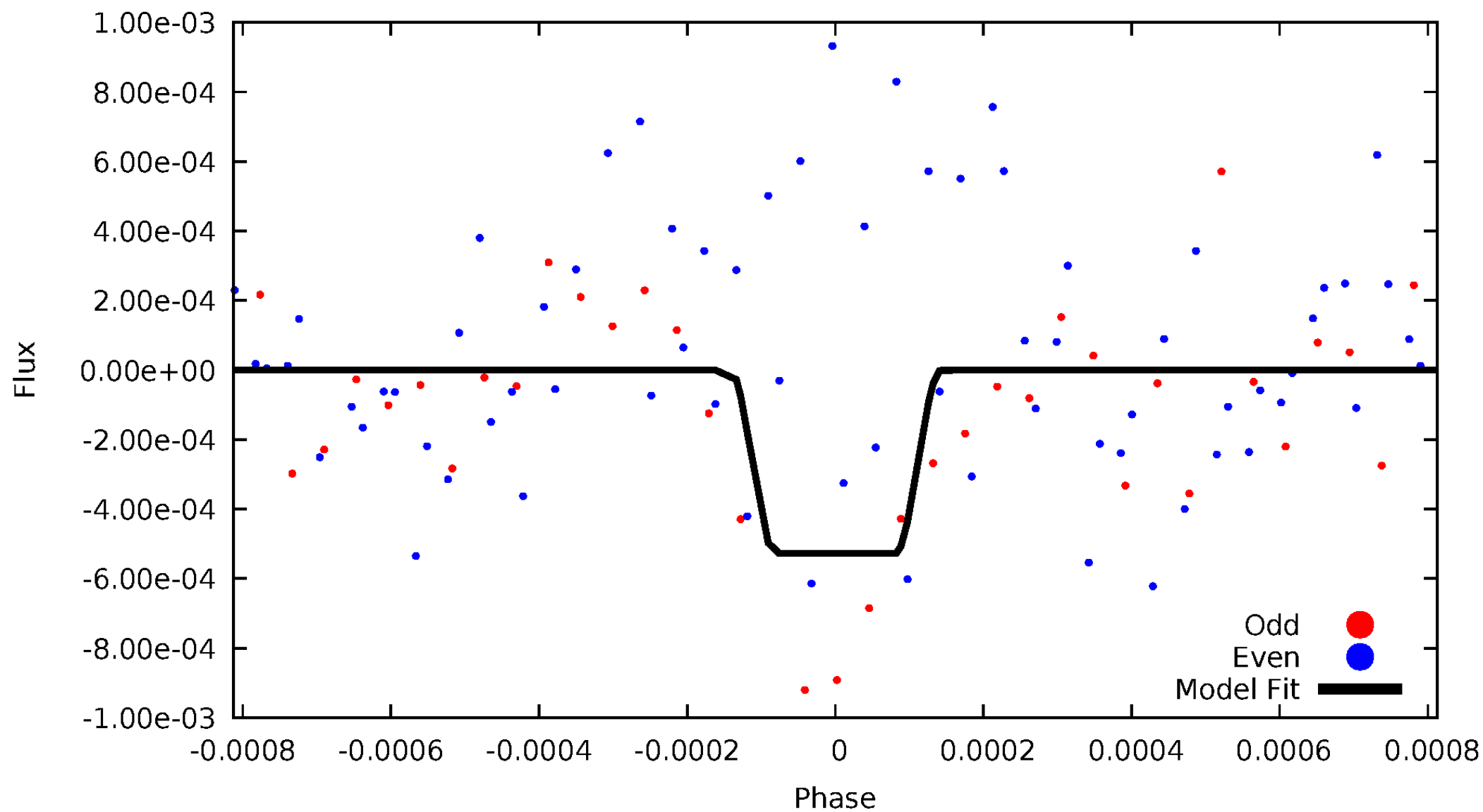
# DV Odd/Even

TCE 006451658-01



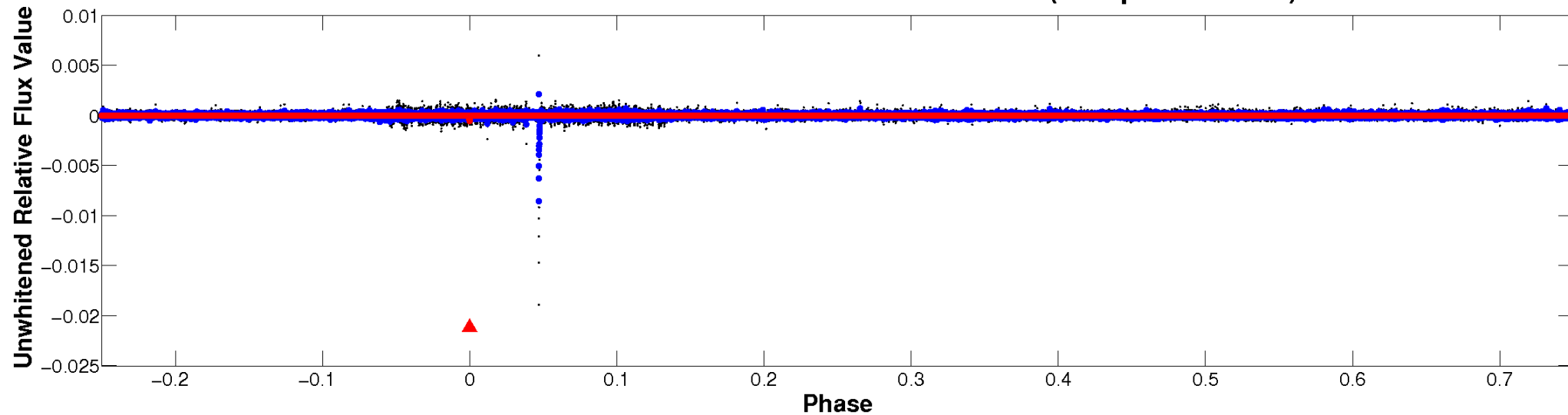
# ALT Odd/Even

TCE 006451658-01

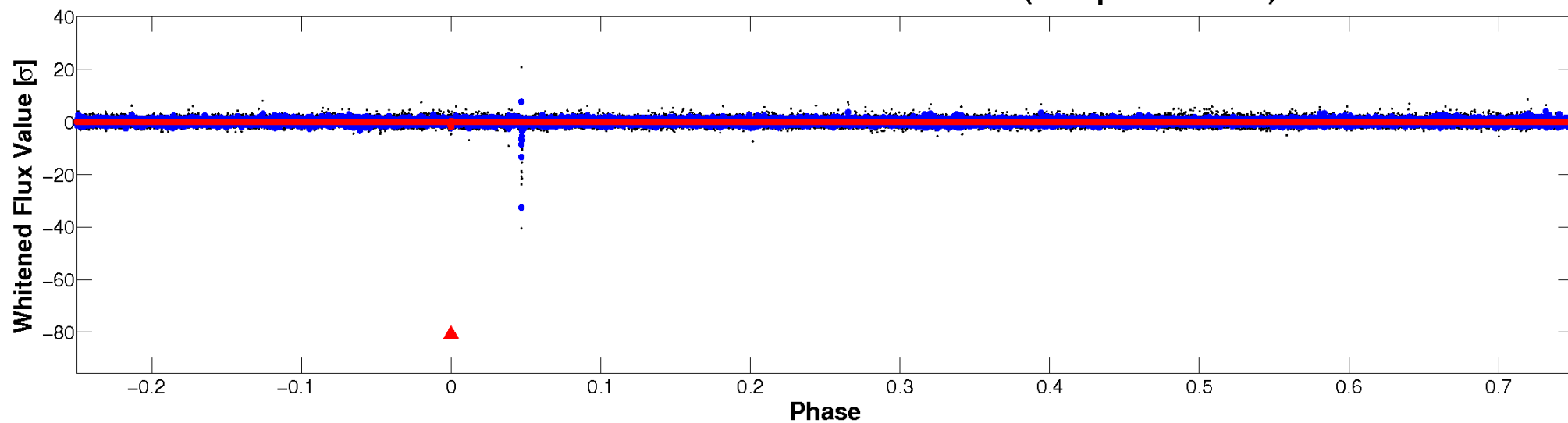


# Non-Whitened Vs. Whitened Light Curve

**Planet 1 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)**

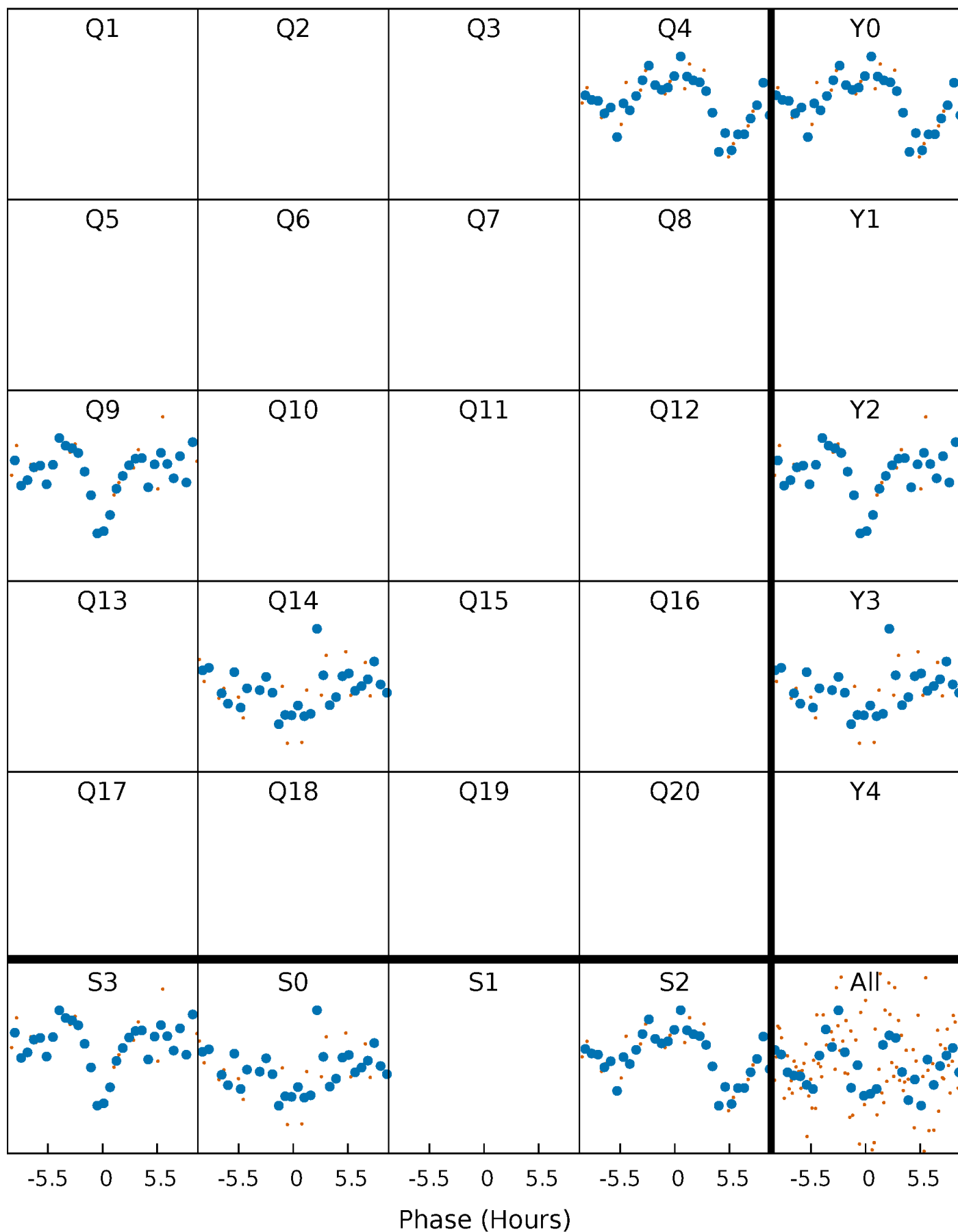


**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

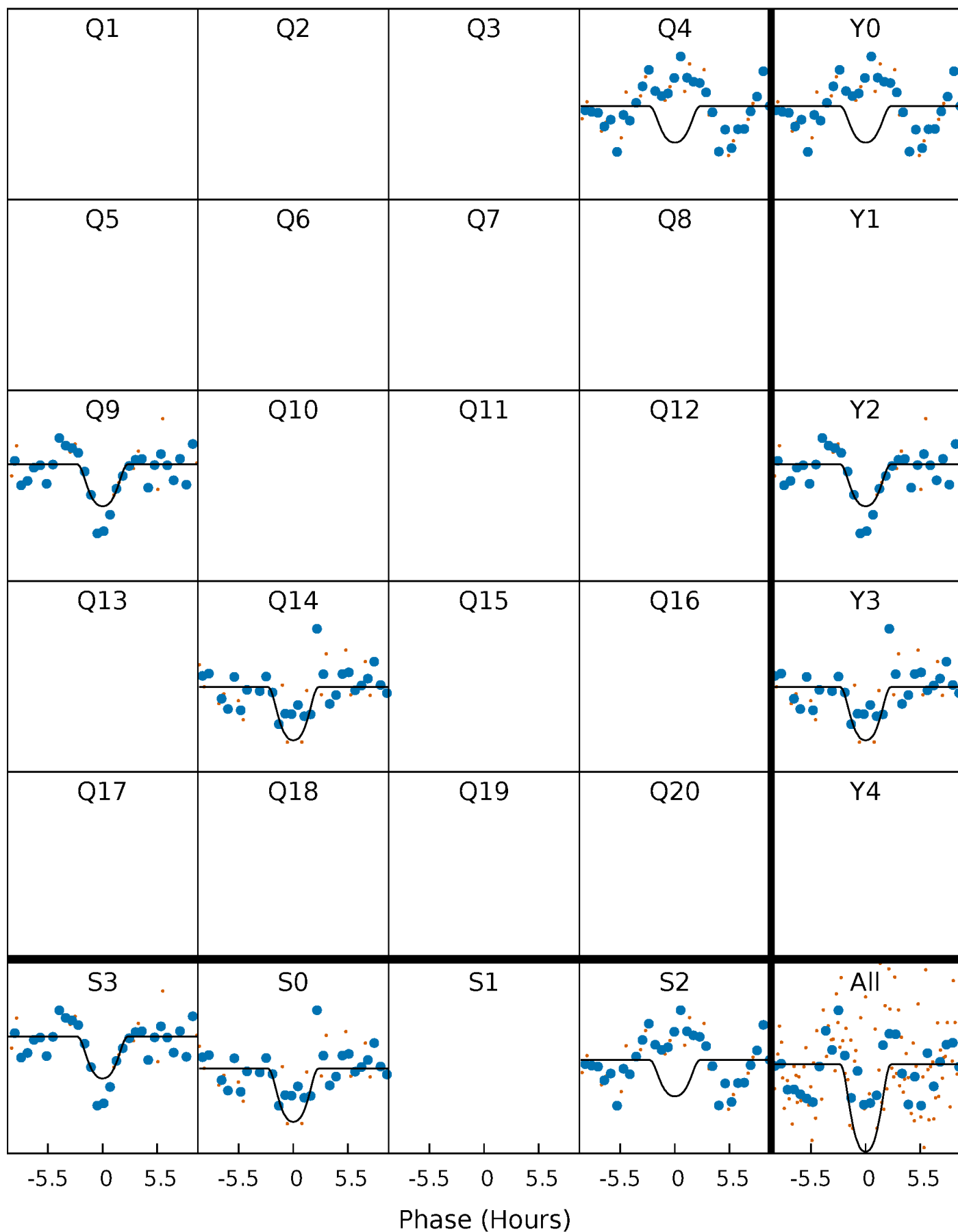
TCE 006451658-01 P=472.317474 Days  $T_0=378.633114$  (BKJD)





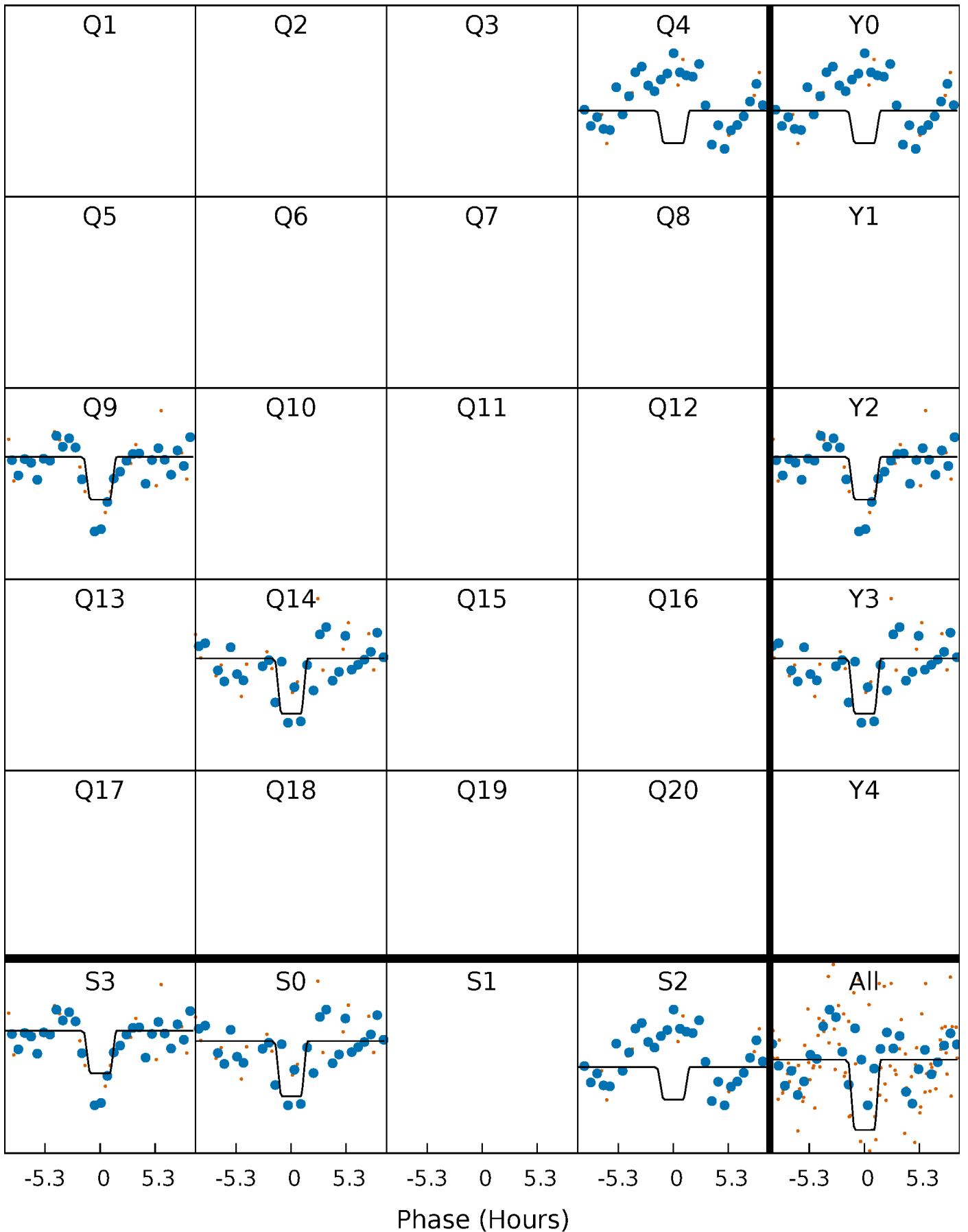
# DV Quarter-Phased Transit Curves

TCE 006451658-01 P=472.317474 Days  $T_0=378.633114$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

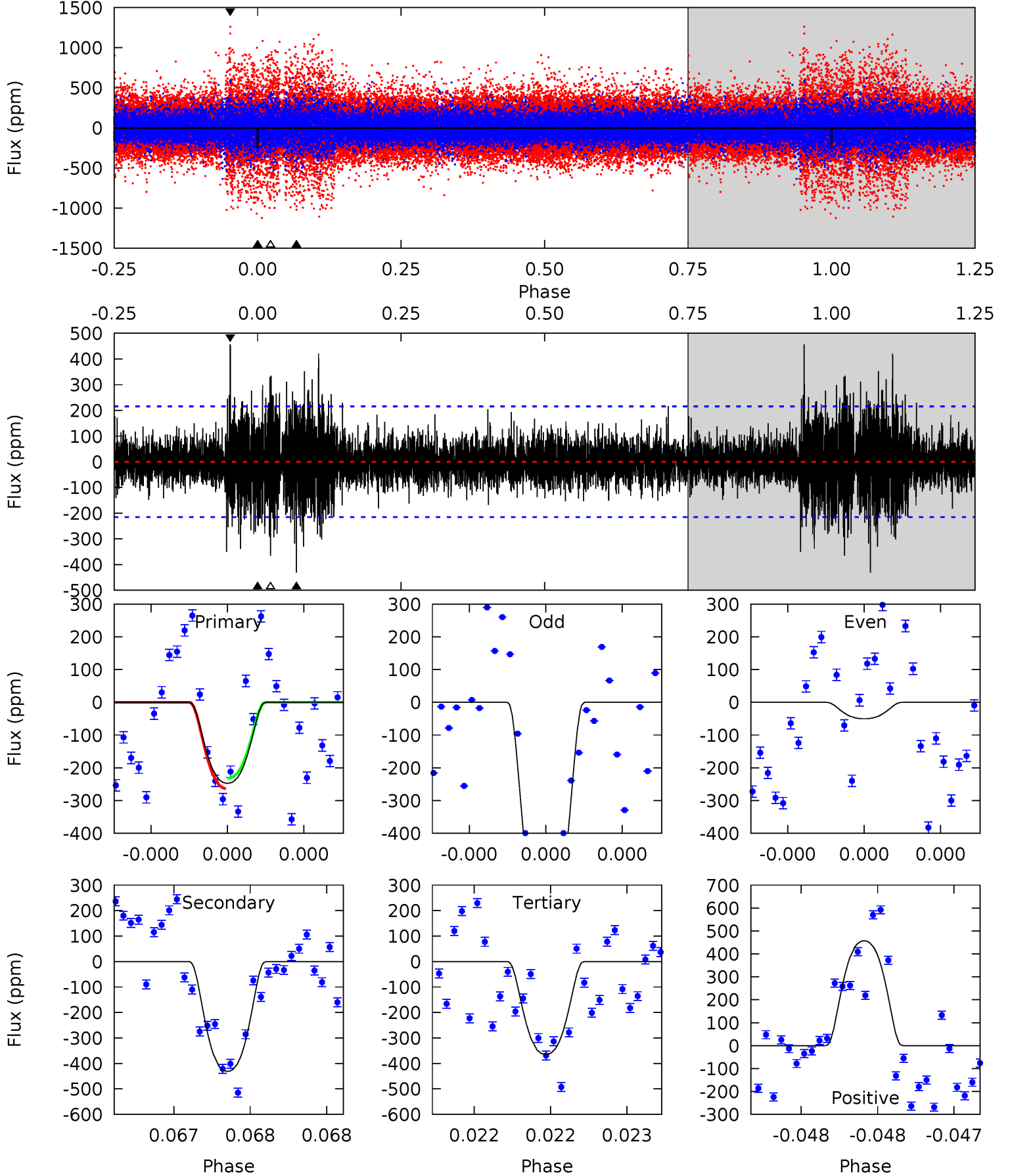
TCE 006451658-01 P=472.301306 Days  $T_0=378.655438$  (BKJD)



# DV Model-Shift Uniqueness Test

006451658-01, P = 472.317474 Days, E = 378.633114 Days

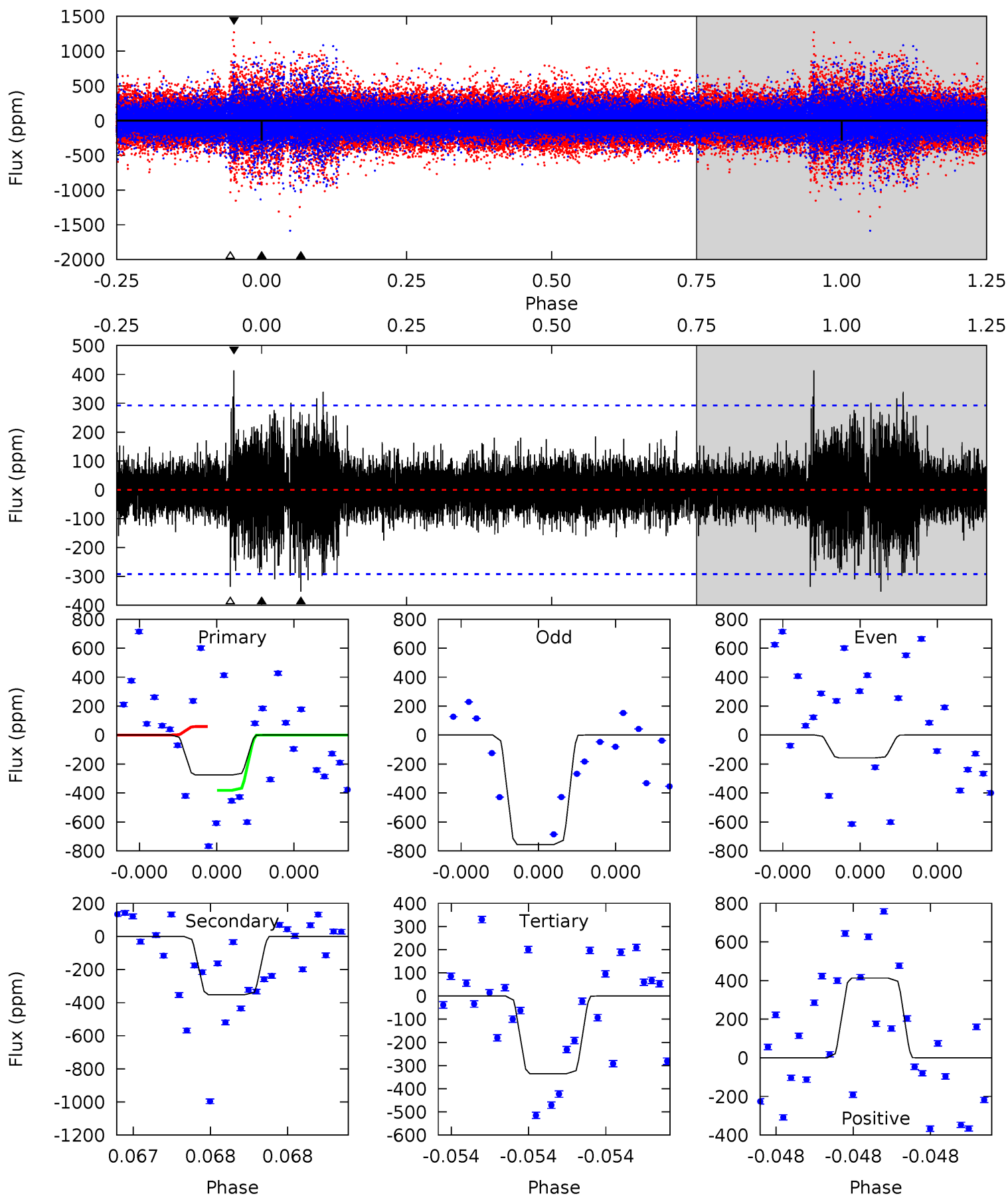
| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 6.43 | 11.2 | 9.48 | 11.9 | 5.59            | 3.50            | 1.77             | -3.05   | -5.45   | 1.72    | -0.68   | 8.50    | 0.60 | 0.51  | 0.42 |



# Alt Model-Shift Uniqueness Test

006451658-01, P = 472.301306 Days, E = 378.655438 Days

| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|-----|
| 5.36 | 6.84 | 6.51 | 8.02 | 5.68            | 3.64            | 1.21             | -1.16   | -2.66   | 0.32    | -1.18   | 6.04    | 0.40 | 0.54  | 0   |



### Stellar Parameters For KIC 006451658

|        | $T_{\text{eff}}(K)$  | $\log(g)$                 | [Fe/H]                     | $R (R_{\odot})$           | $M(M_{\odot})$            | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
|        | $6165^{+171}_{-214}$ | $4.434^{+0.070}_{-0.224}$ | $-0.040^{+0.250}_{-0.300}$ | $1.050^{+0.358}_{-0.119}$ | $1.086^{+0.166}_{-0.135}$ | $1.324^{+0.409}_{-0.740}$                 |
|        | +3%/-3%              | +2%/-5%                   | +625%/-750%                | +34%/-11%                 | +15%/-12%                 | +31%/-56%                                 |
| Source | PHO1                 | KIC0                      | KIC0                       | DSEP                      |                           |   |

KIC = Kepler Input Catalog; PHO = Photometry; SPE = Spectroscopy; AST = Asteroseismology  
 TRA = Transits; DESP = Dartmouth Models; MULT = Multiple Models

### Secondary Eclipse Parameters for KIC 006451658-01 / KOI

| Detrend | Depth (ppm)   | $R_p (R_{\oplus})$     | $T_{\text{max}} (K)$ | $T_{\text{obs}} (K)$  | $A_{\text{obs}}$          |
|---------|---------------|------------------------|----------------------|-----------------------|---------------------------|
| DV      | $-431 \pm 38$ | $3.38^{+1.02}_{-0.88}$ | $358^{+29}_{-19}$    | $5324^{+767}_{-524}$  | $30733^{+24885}_{-12491}$ |
| Alt.    | $-352 \pm 51$ | $2.79^{+1.05}_{-0.97}$ | $358^{+28}_{-19}$    | $5504^{+1312}_{-619}$ | $35629^{+47649}_{-16114}$ |

$T_{\text{max}}$  = Theoretical Maximum Planetary Temperature

$T_{\text{obs}}$  = Observed Planetary Temperature (Assuming A=0.3)

$A_{\text{obs}}$  = Observed Albedo (Assuming T=0)

If a secondary eclipse is present, the system is likely an EB if  $T_{\text{obs}} \gg T_{\text{max}}$  AND  $A_{\text{obs}} \gg 1.0$

## DV Centroid Data

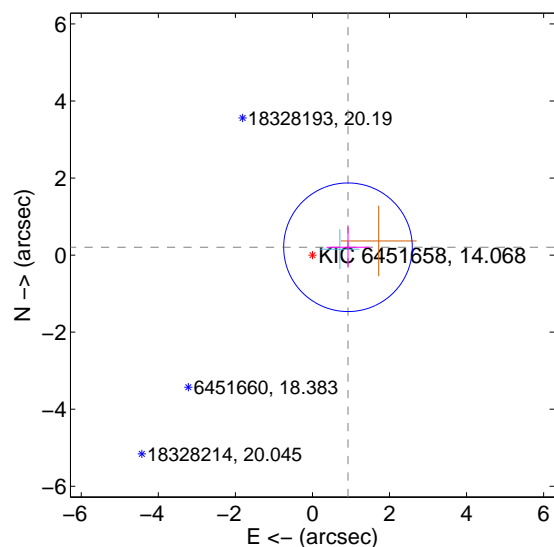
Supplemental centroid analysis for 006451658-01. Kepler magnitude: 14.07. Transit SNR 7.59

There are 1 quarters with good PRF difference image offsets

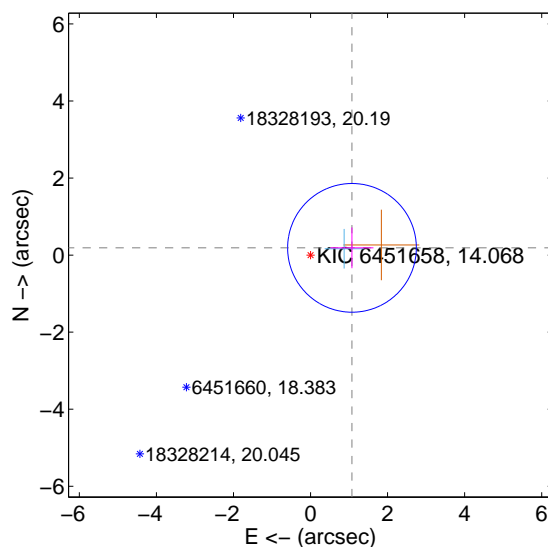
The direct PRF centroid is offset from the target star catalog position by about 0.16 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA        | $\Delta$ Dec      |
|---|--------------------|---------------------|--------------------|-------------------|
| PRF-fit source offset from OOT          | $0.945 \pm 0.556$  | 1.70                | $-0.922 \pm 0.558$ | $0.204 \pm 0.529$ |
| PRF-fit source offset from KIC position | $1.092 \pm 0.557$  | 1.96                | $-1.076 \pm 0.558$ | $0.188 \pm 0.529$ |
| photometric centroid source offset      | $0.42 \pm 1.60$    | 0.26                | $0.42 \pm 1.60$    | $0.00 \pm 1.28$   |

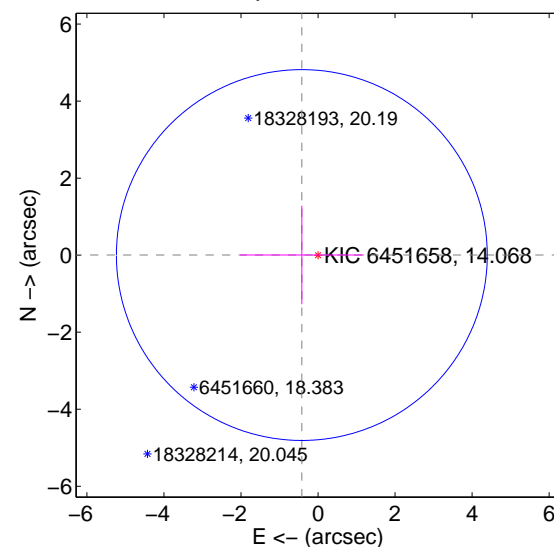
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

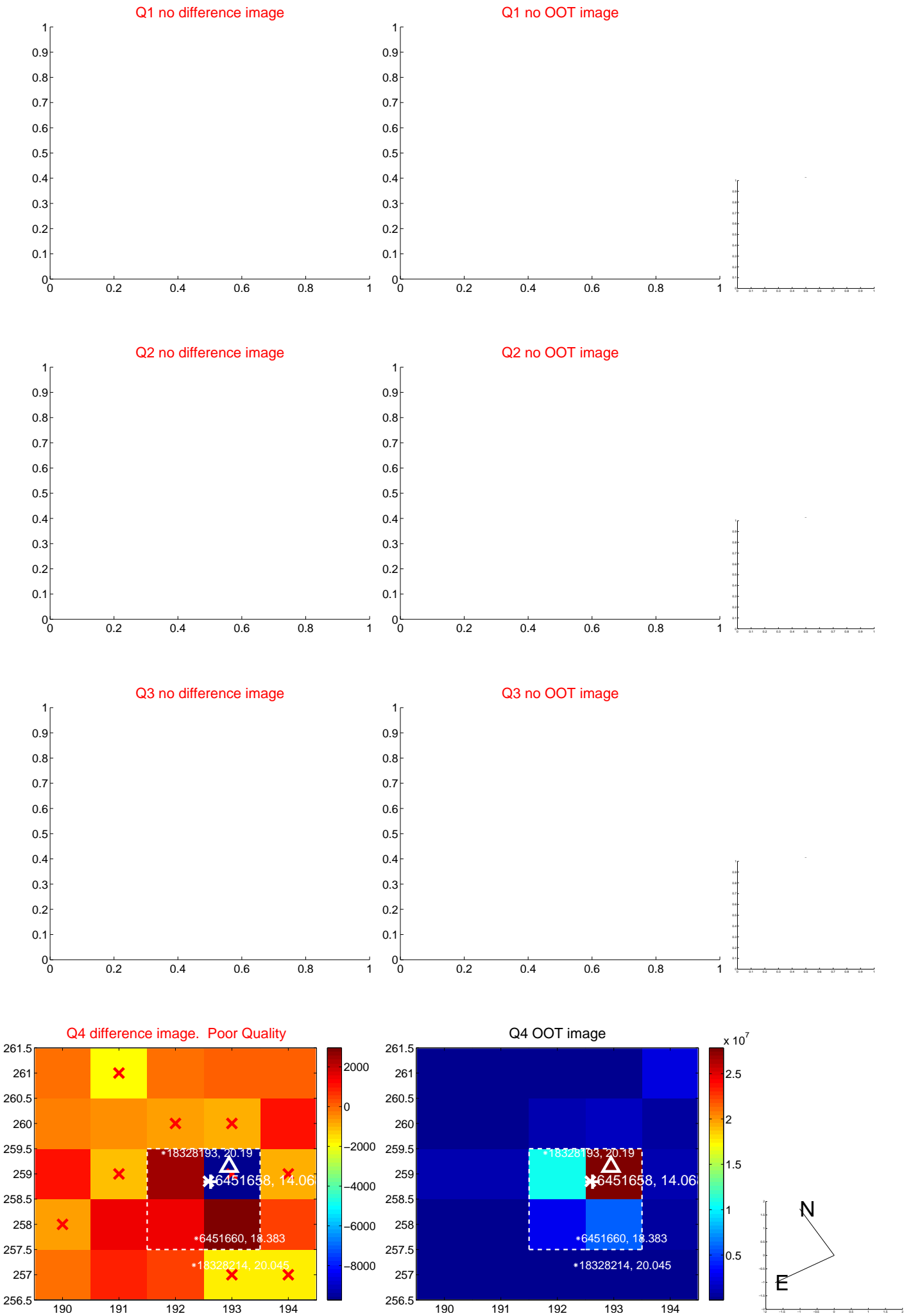


offset from photometric centroids



Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three- $\sigma$ . Red \*: target star. Blue \*: Other stars. Text next to a star gives its KIC ID and kepmag. KIC IDs > 15,000,000 are from the UKIRT catalog.

white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

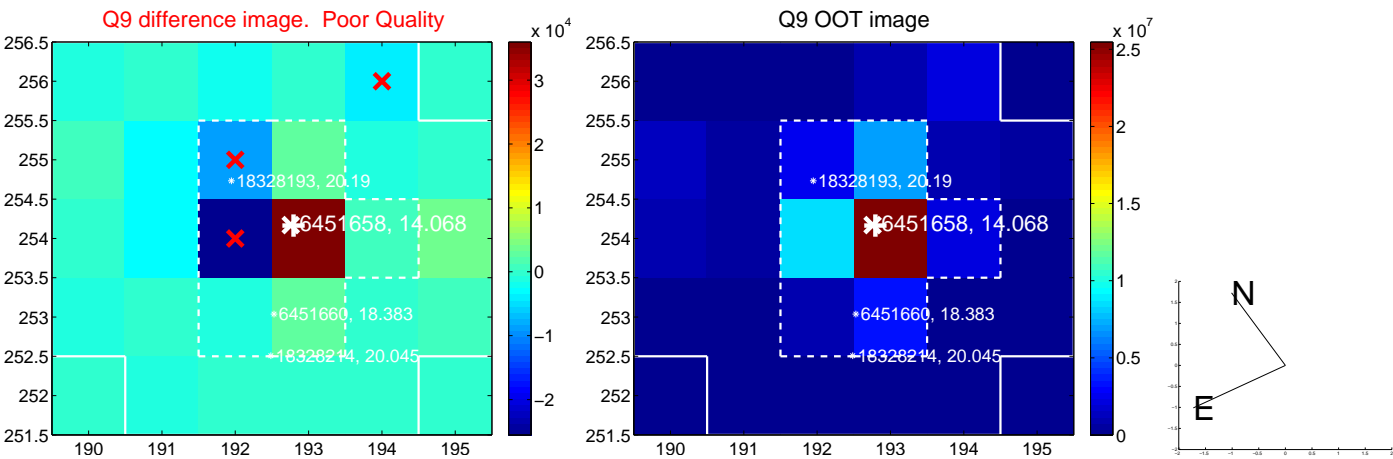


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

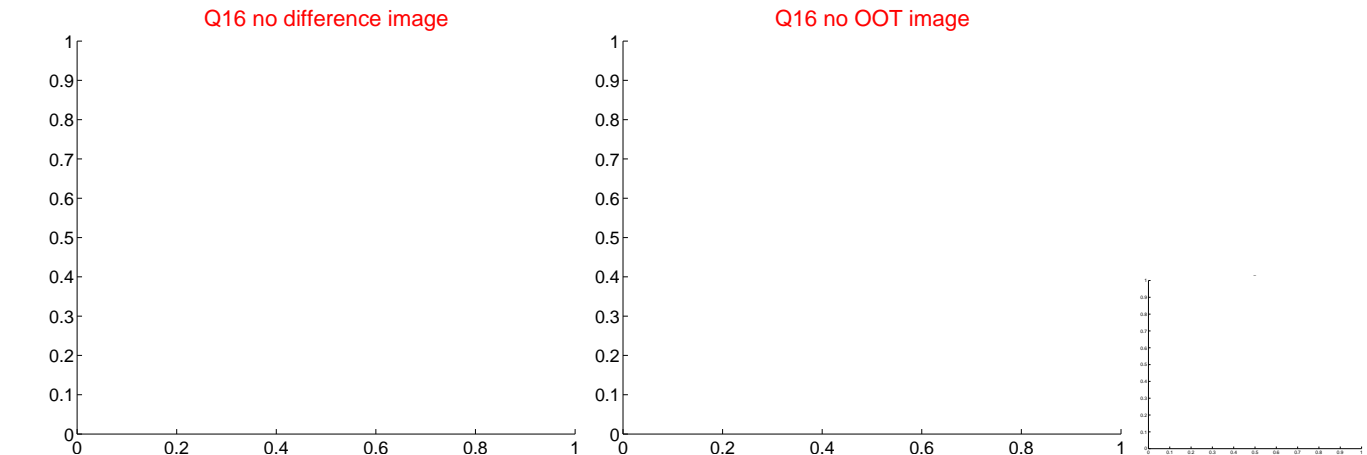
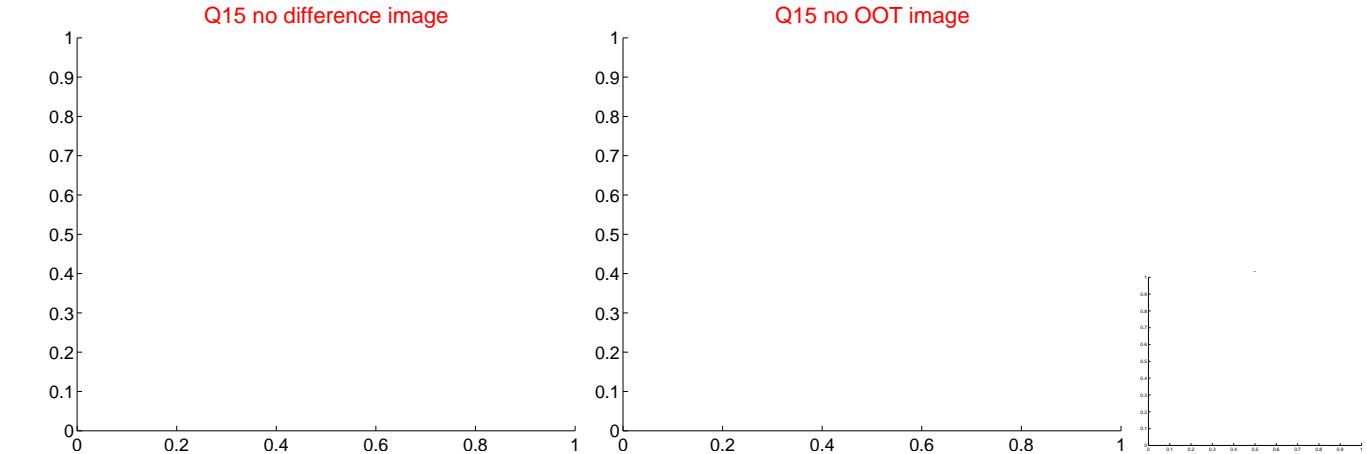
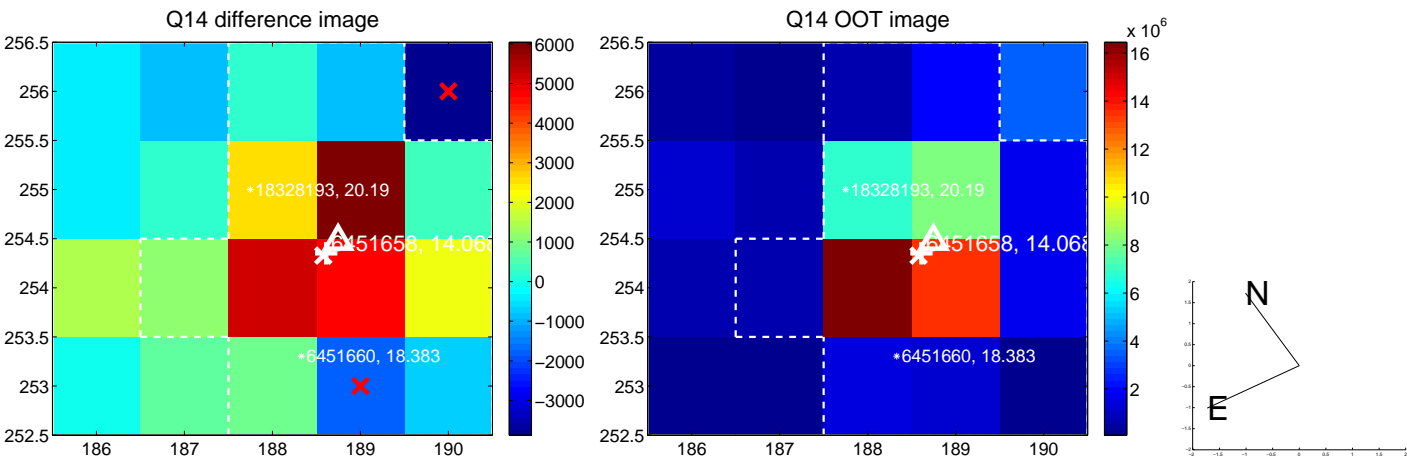
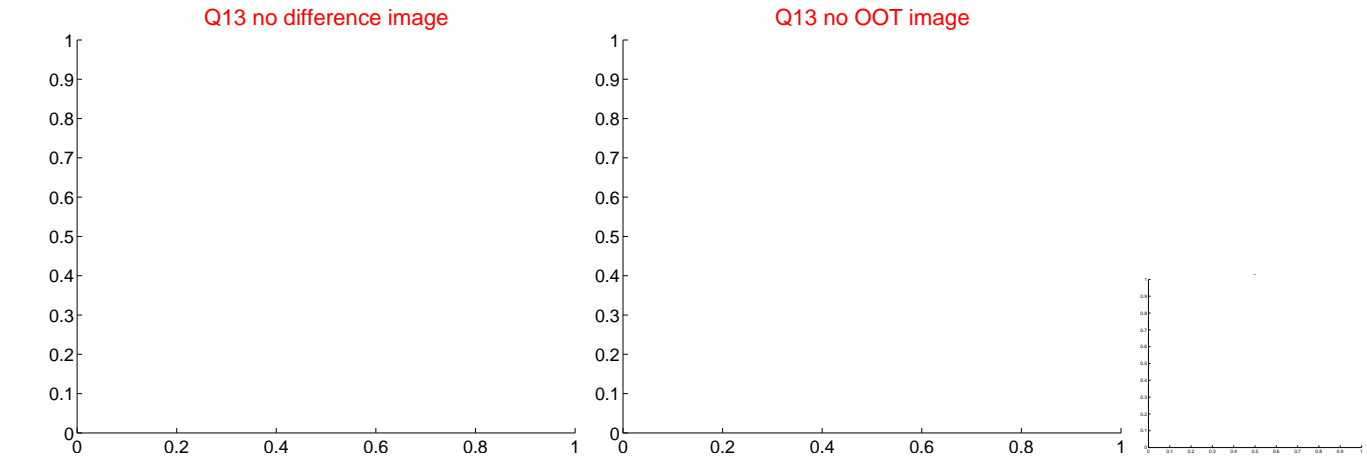




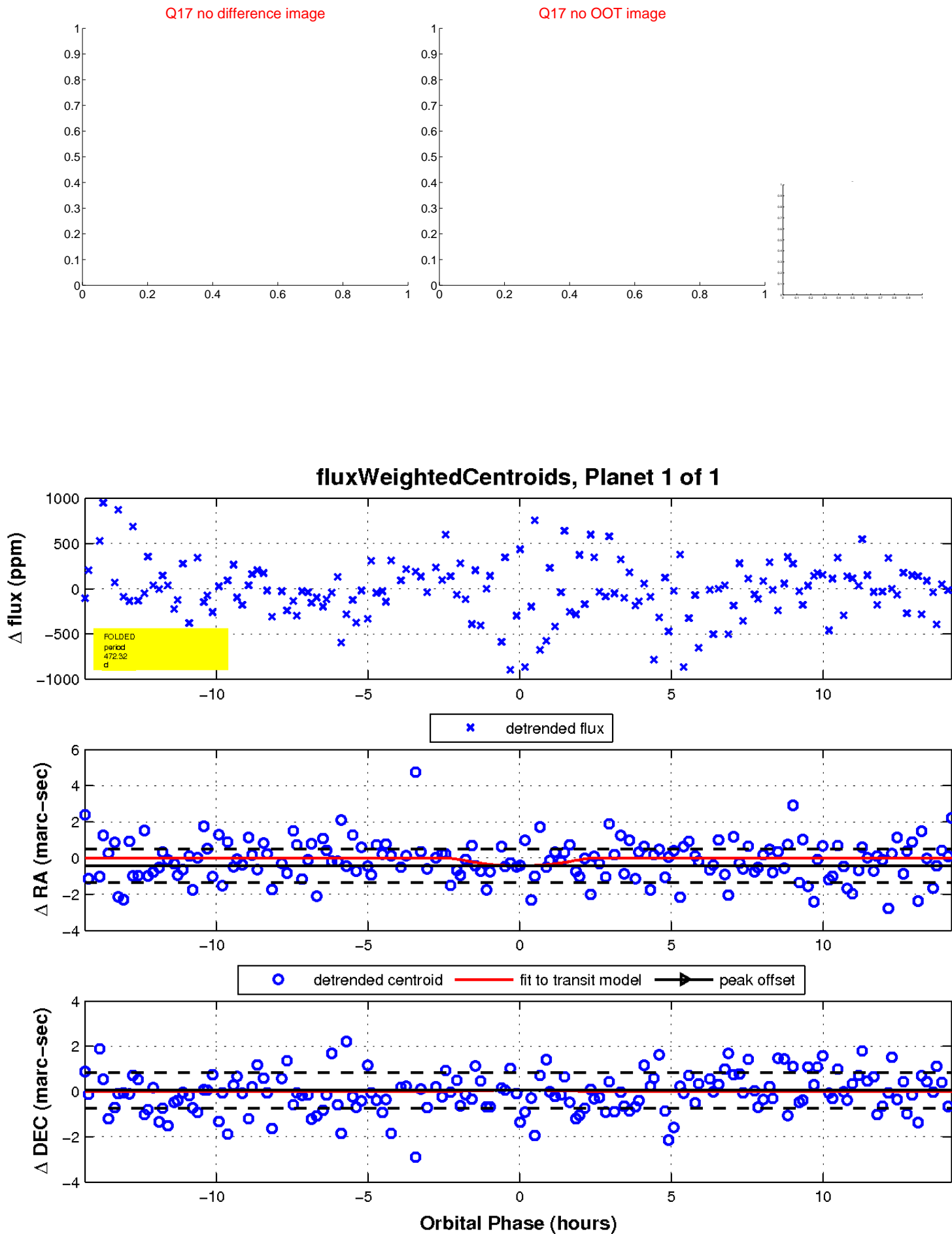
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.



white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination

