

# KIC 010156055

## Q1-17 DR25 TCE Parameters

| TCE          | Run Type | KOI?    | Period (Days) | Epoch (BKJD) | Depth (ppm) | Duration (Hours) | MES  | SNR  | R <sub>★</sub> (R <sub>☉</sub> ) | T <sub>★</sub> (K) | R <sub>p</sub> (R <sub>⊕</sub> ) | S <sub>p</sub> (S <sub>⊕</sub> ) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|------|------|----------------------------------|--------------------|----------------------------------|----------------------------------|
| 010156055-01 | OBS      | 4284.01 | 2.428004      | 133.597224   | 68.1        | 3.670            | 10.9 | 11.9 | 0.97                             | 6609               | 0.93                             | 1251.63                          |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments                                    |
|--------------|----------|------|-------|---|---|---|---|---|
| 010156055-01 | OBS      | FP   | 0.00  | 0 | 0 | 1 | 1 | CENT_RESOLVED_OFFSET—HALO_GHOST—EPHEM_MATCH |

**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.

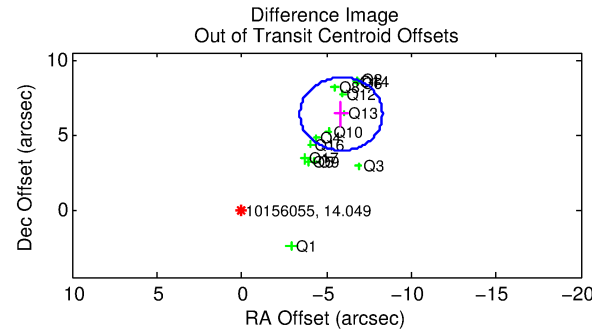
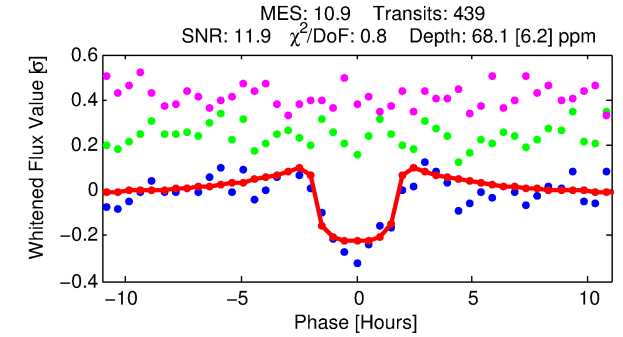
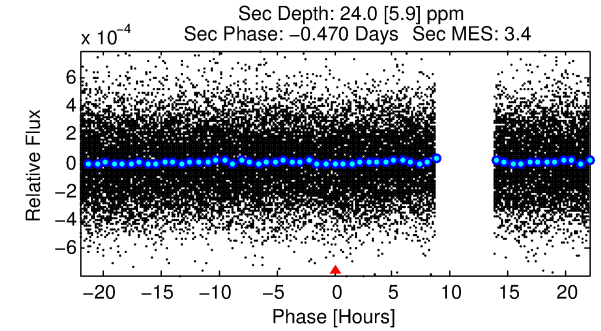
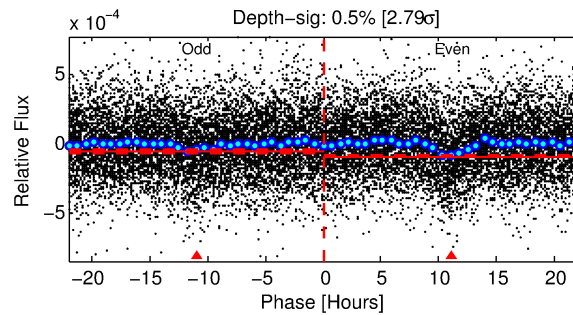
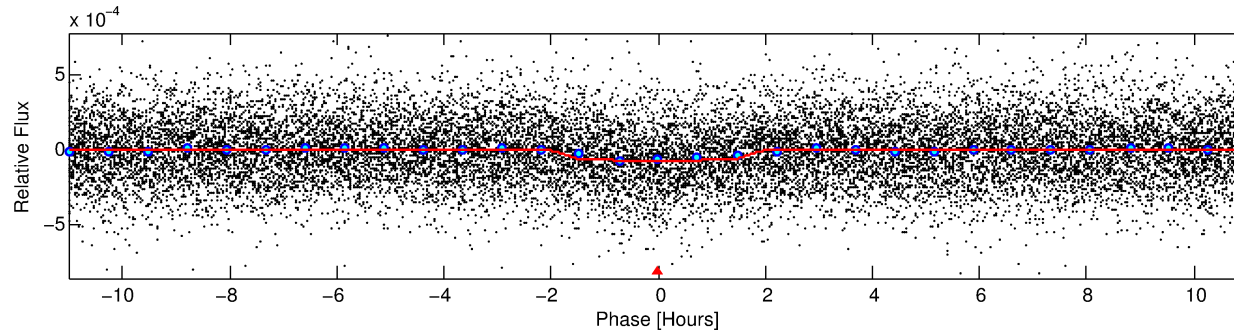
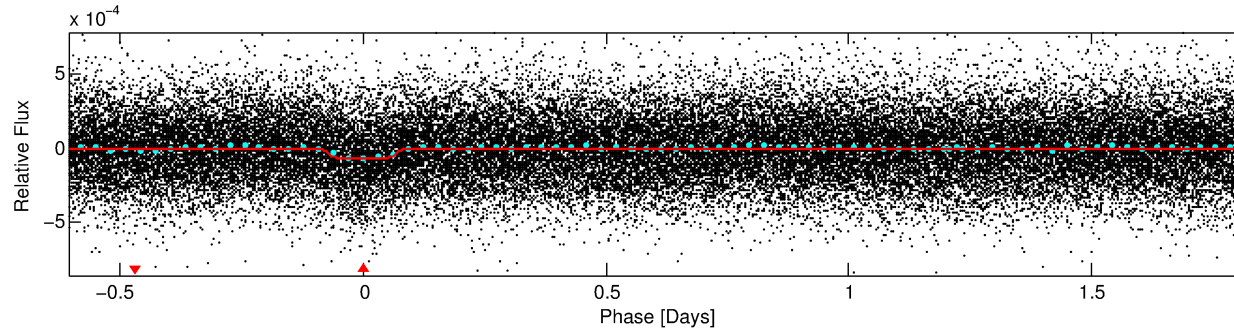
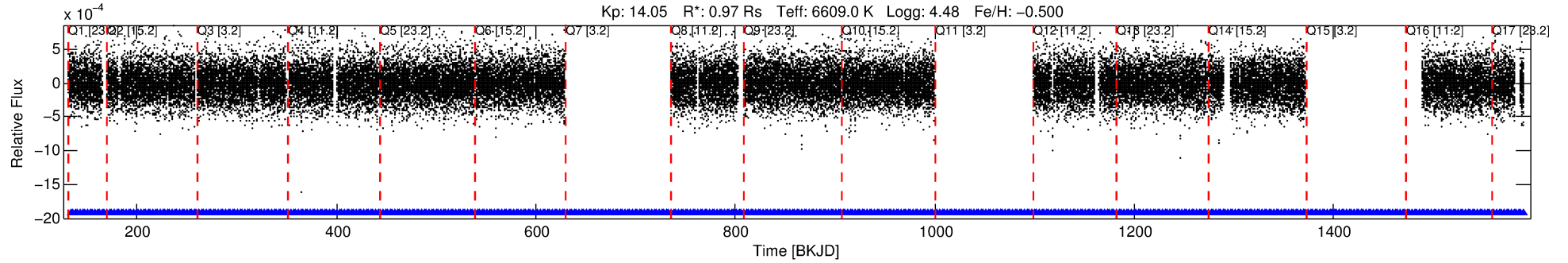
## Ephemeris Match Information For 010156055-01

| TCE (1)      | KIC      | Parent (2)    | Parent KIC | P <sub>1</sub> :P <sub>2</sub> | Dist (″) | ΔRow | ΔCol | m <sub>2</sub> | m <sub>1</sub> | D <sub>2</sub> /D <sub>1</sub> | Mechanism  | Flag | σ <sub>P</sub> | σ <sub>T</sub> |
|--------------|----------|---------------|------------|--------------------------------|----------|------|------|----------------|----------------|--------------------------------|------------|------|----------------|----------------|
| 010156055-01 | 10156055 | 010156064-pri | 10156064   | 1:2                            | 58.1     | -8   | 12   | 10.37          | 14.05          | 1858.80                        | Direct-PRF | 0    | 1.94           | 0.05           |

**Notes:** P<sub>1</sub>:P<sub>2</sub> is the period ratio. Dist is the distance in arcseconds. ΔRow and ΔCol are the number of pixels apart in row and column. m<sub>2</sub> and m<sub>1</sub> are the magnitudes of the parent and child. D<sub>2</sub>/D<sub>1</sub> is the parent's transit depth divided by the child's. σ<sub>P</sub> and σ<sub>T</sub> are the significance of the match in period and epoch. For a match to be considered significant σ<sub>P</sub> < 5.0 and σ<sub>T</sub> < 5.0. Matches which have σ<sub>P</sub> and σ<sub>T</sub> very close to this cutoff should receive extra scrutiny, especially if the period ratio is very large.

# DV One-Page Summary

KIC: 10156055 Candidate: 1 of 1 Period: 2.428 d  
KOI: K04284.01 Corr: 0.919



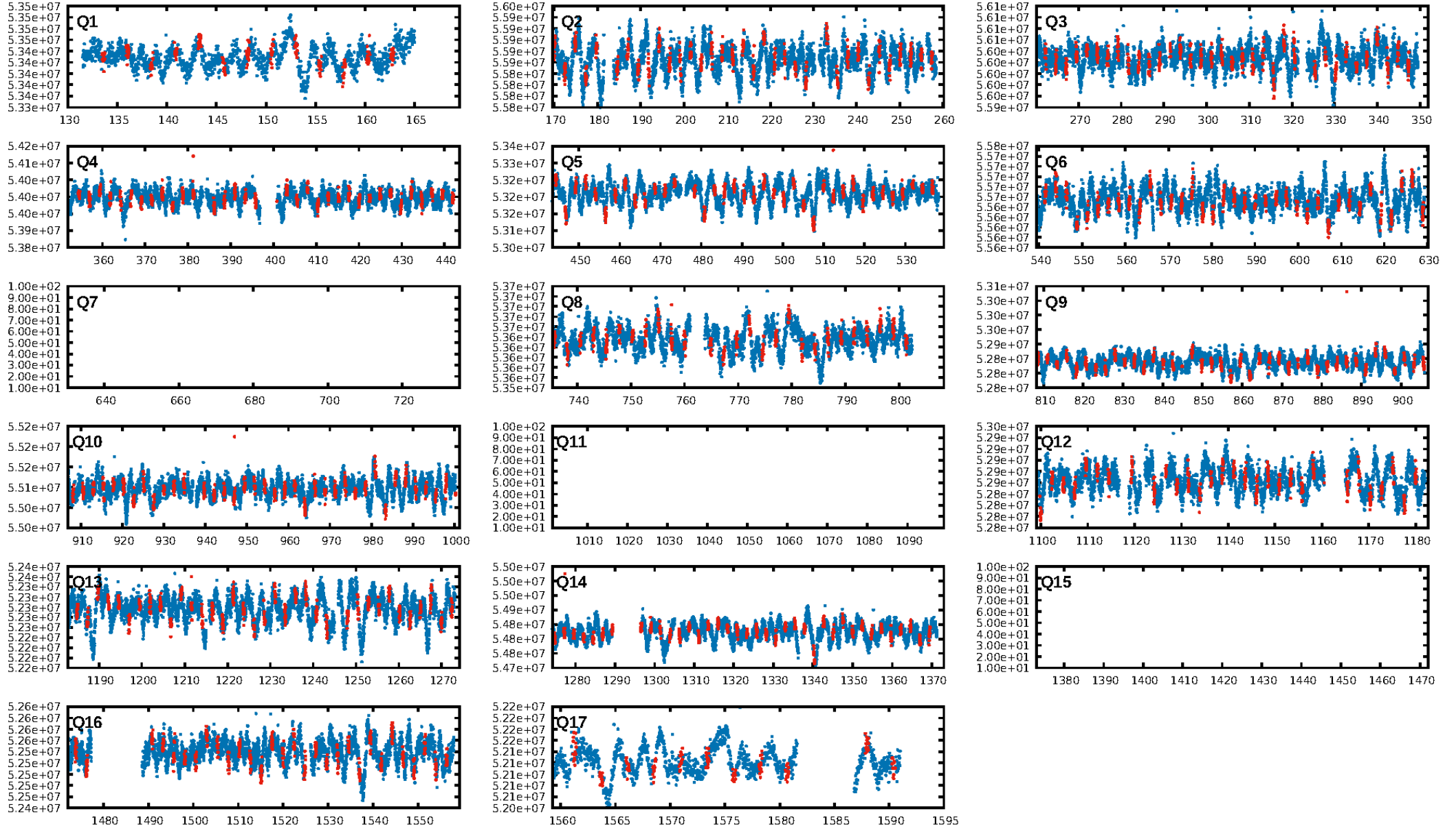
## DV Fit Results:

Period = 2.42800 [0.00001] d  
Epoch = 133.5972 [0.0031] BKJD  
Rp/R\* = 0.0088 [0.0028]  
a/R\* = 2.56 [4.07]  
b = 0.89 [0.44]  
Seff = 1251.63 [485.49]  
Teq = 1517 [147] K  
Rp = 0.93 [0.40] Re  
a = 0.0360 [0.0090] AU  
Ag = 19.75 [15.39] [1.22 $\sigma$ ]  
Teffp = 4944 [861] K [3.92 $\sigma$ ]

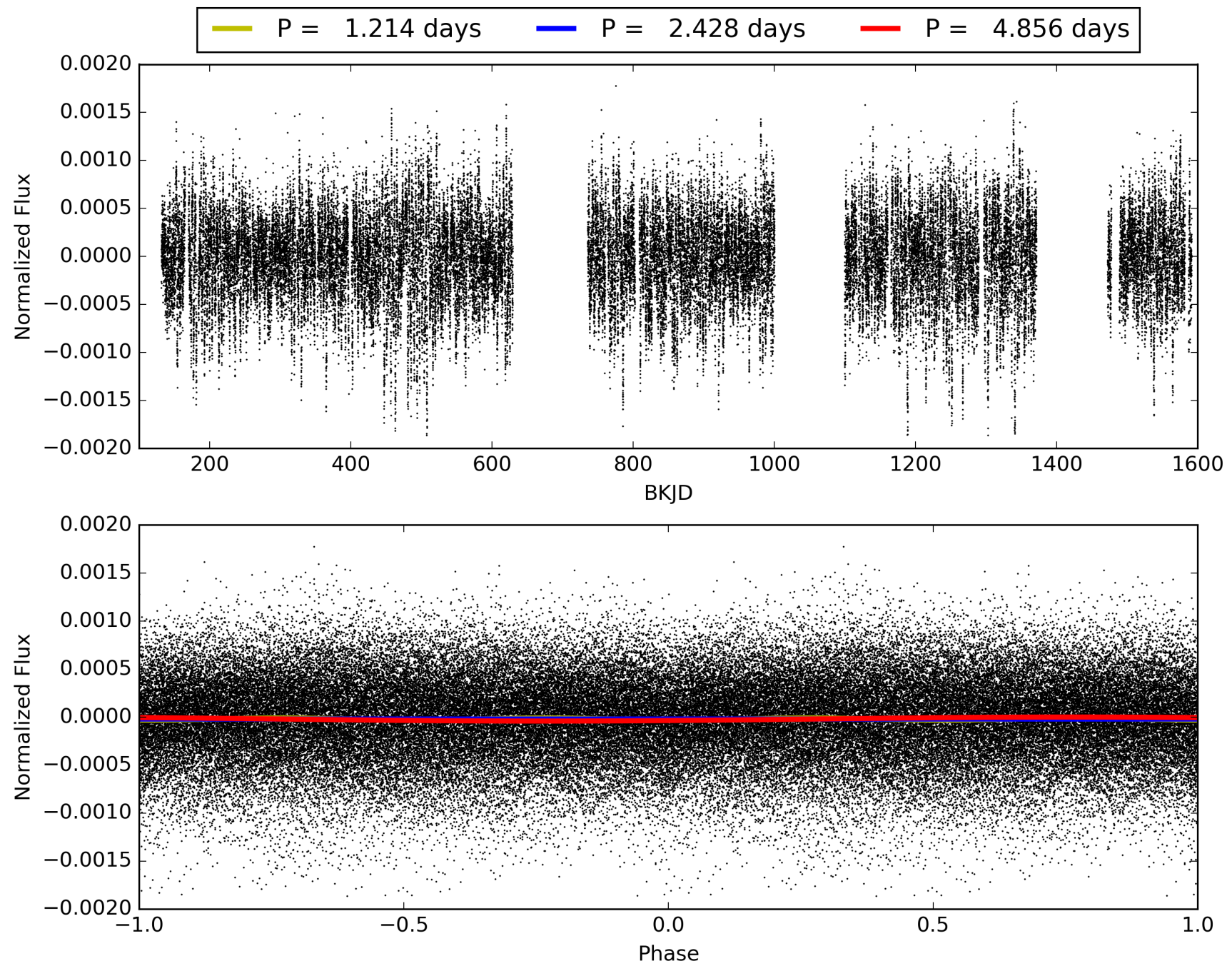
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 9.23e-28  
RollingBand-fgt: 1.00 [415/415]  
GhostDiagnostic-chr: -0.02053  
Centroid-sig: 0.0%  
Centroid-so: 5.947 arcsec [7.61 $\sigma$ ]  
OotOffset-rm: 8.674 arcsec [10.66 $\sigma$ ]  
KicOffset-rm: 8.786 arcsec [11.30 $\sigma$ ]  
OotOffset-st: 4/1/4/5 [14]  
KicOffset-st: 4/1/4/5 [14]  
DiffImageQuality-fgm: 0.07 [1/14]  
DiffImageOverlap-fno: 1.00 [14/14]

# TCE 010156055-01, PDC Light Curves

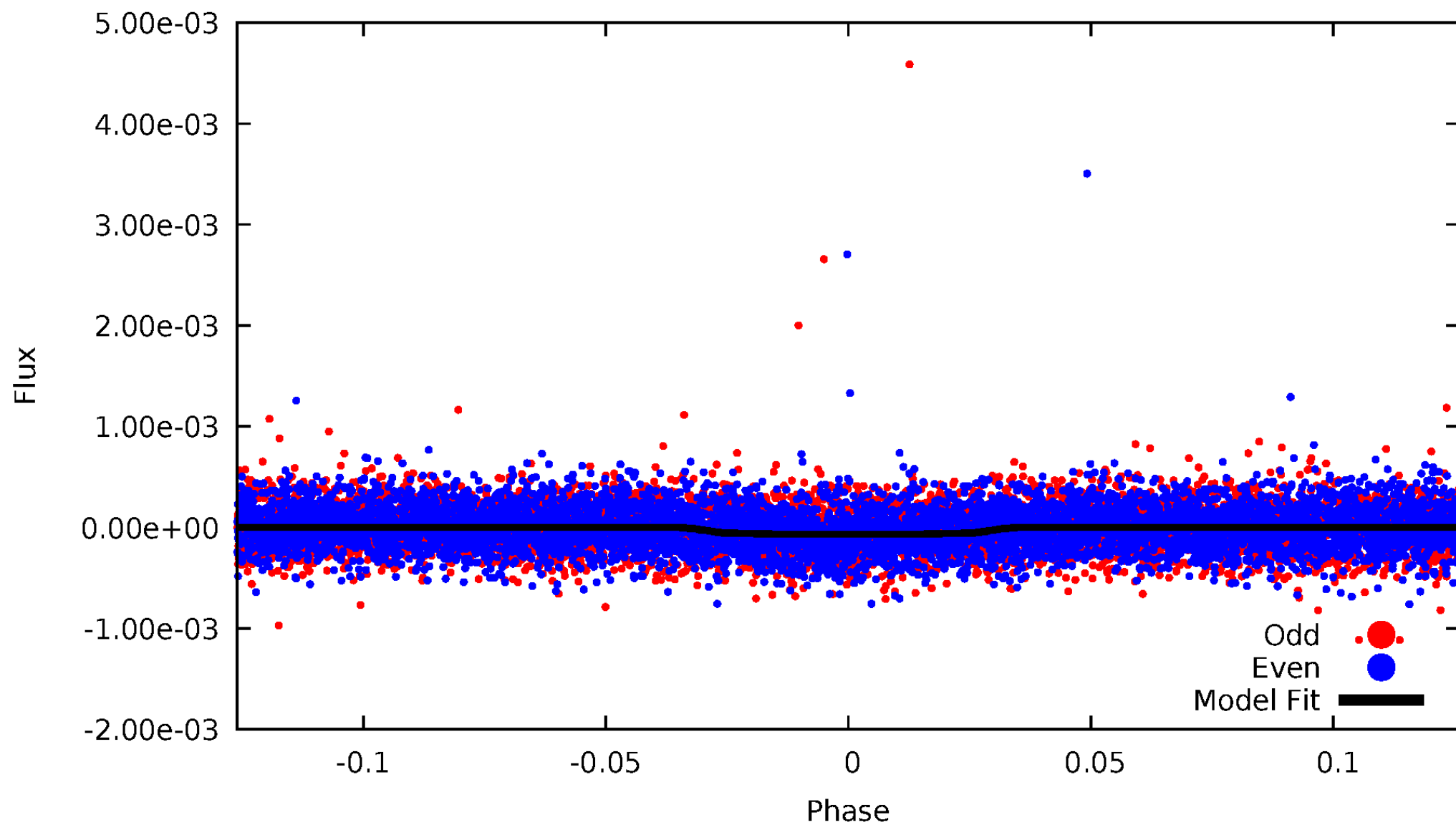


TCE 010156055-01



# DV Odd/Even

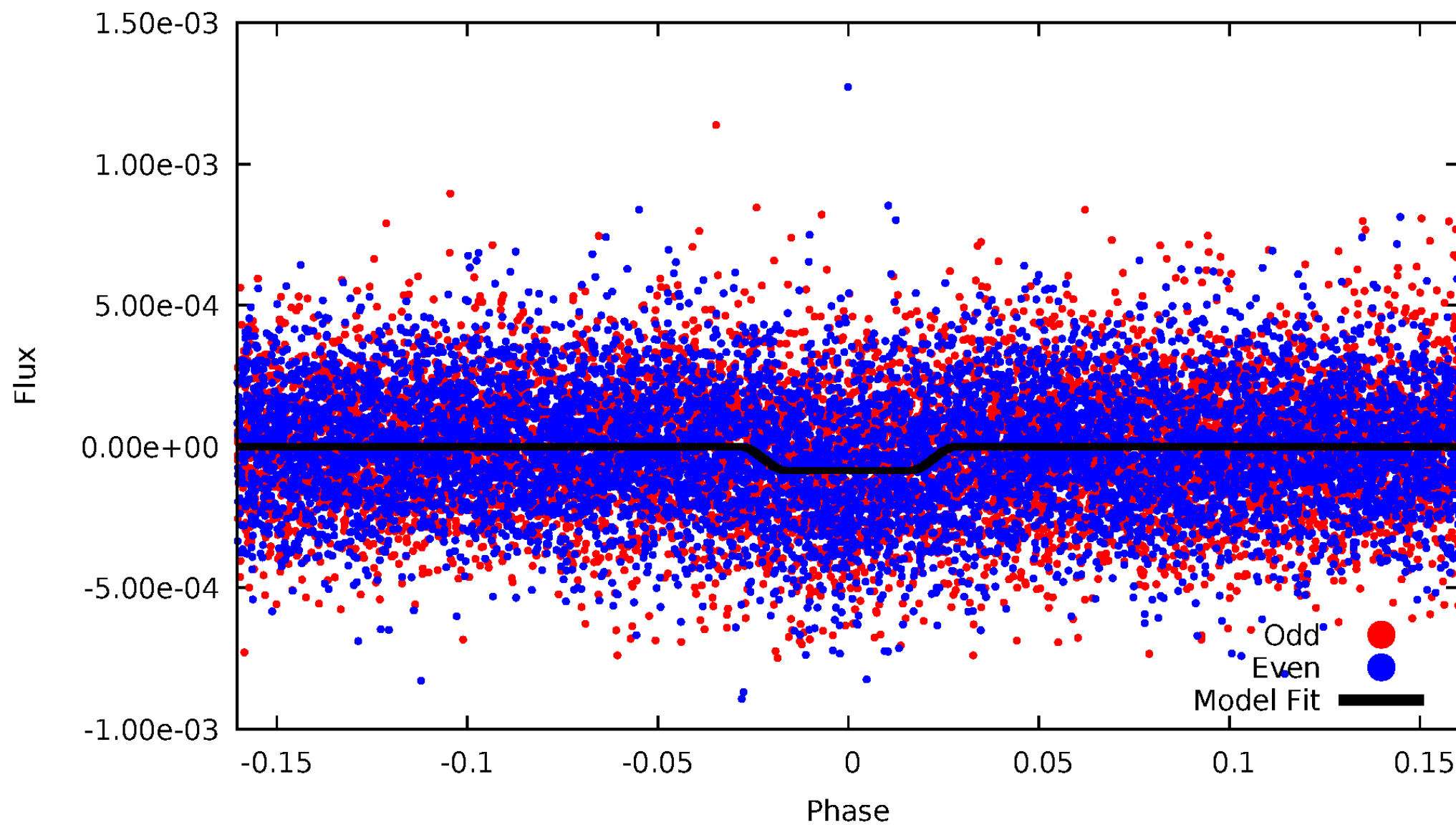
TCE 010156055-01



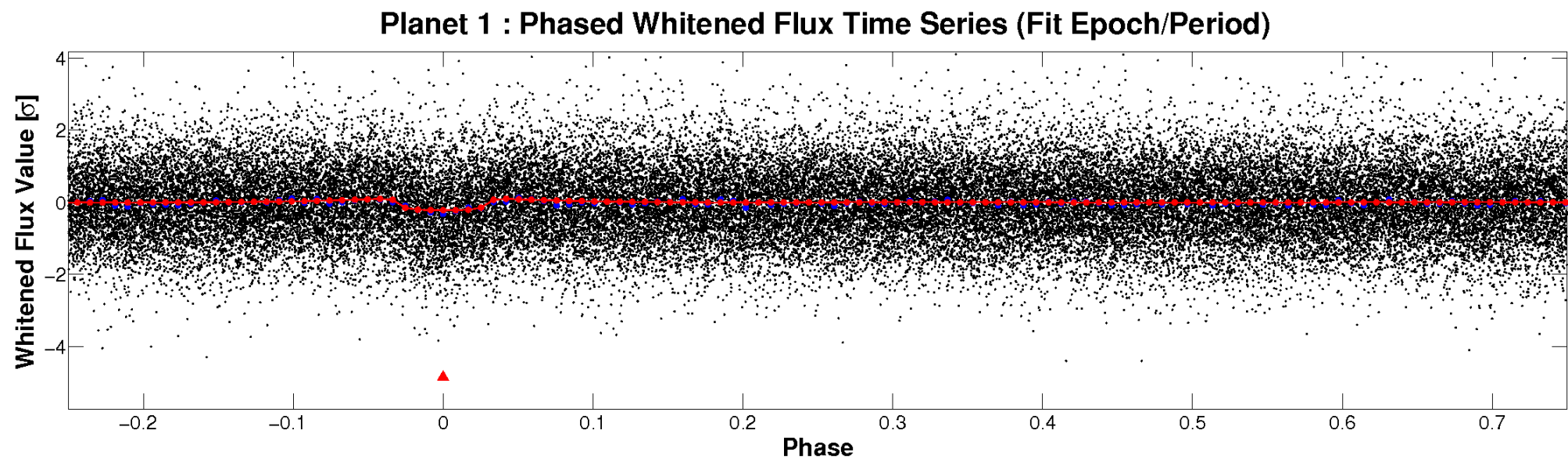
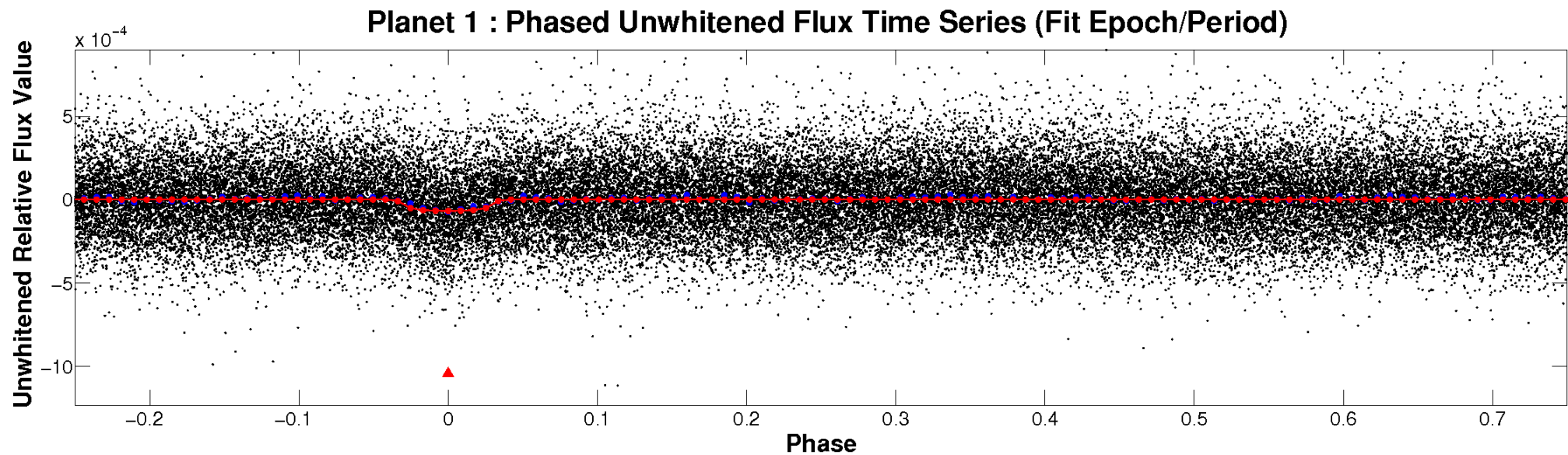


# ALT Odd/Even

TCE 010156055-01

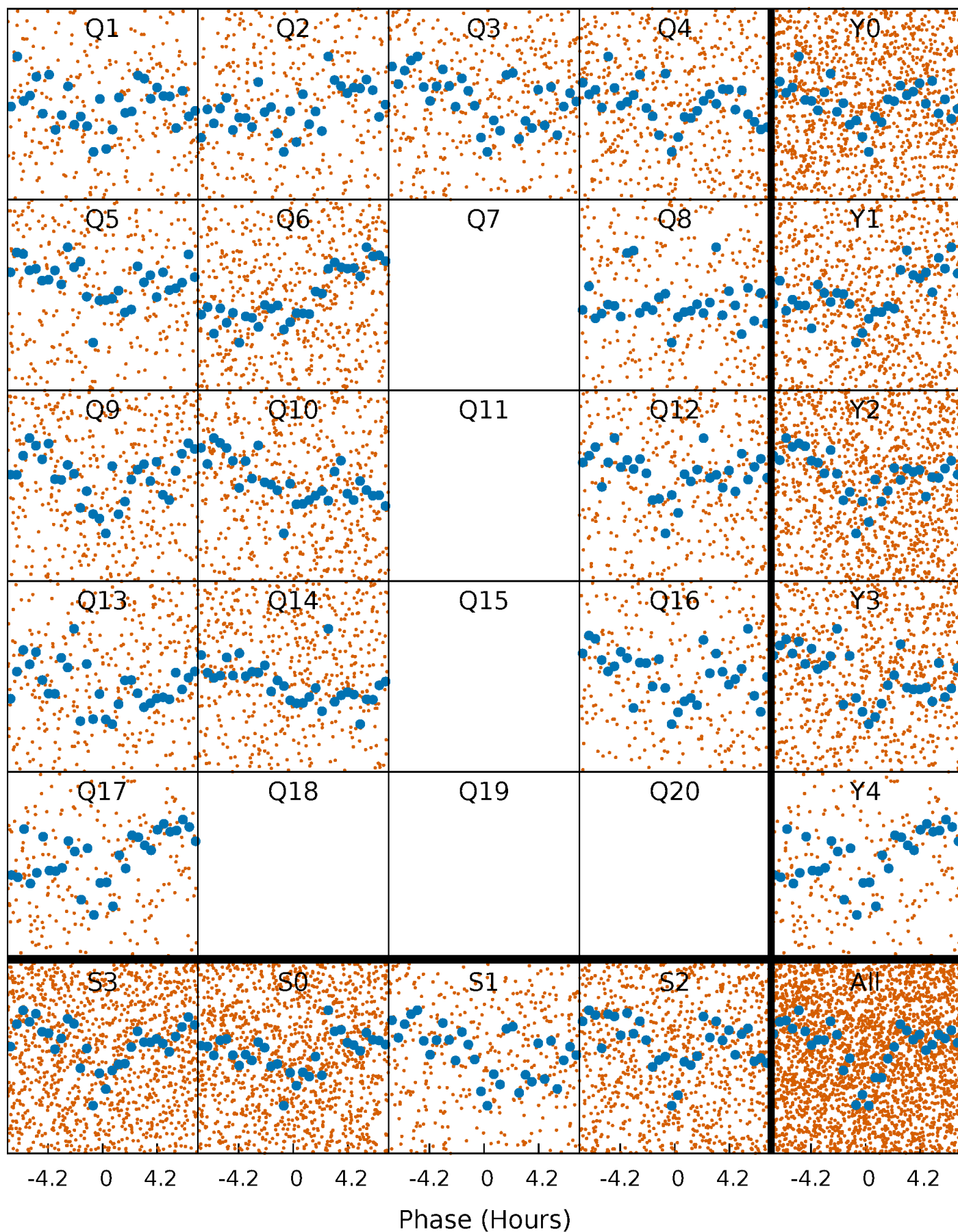


# Non-Whitened Vs. Whitened Light Curve



# PDC Quarter-Phased Transit Curves

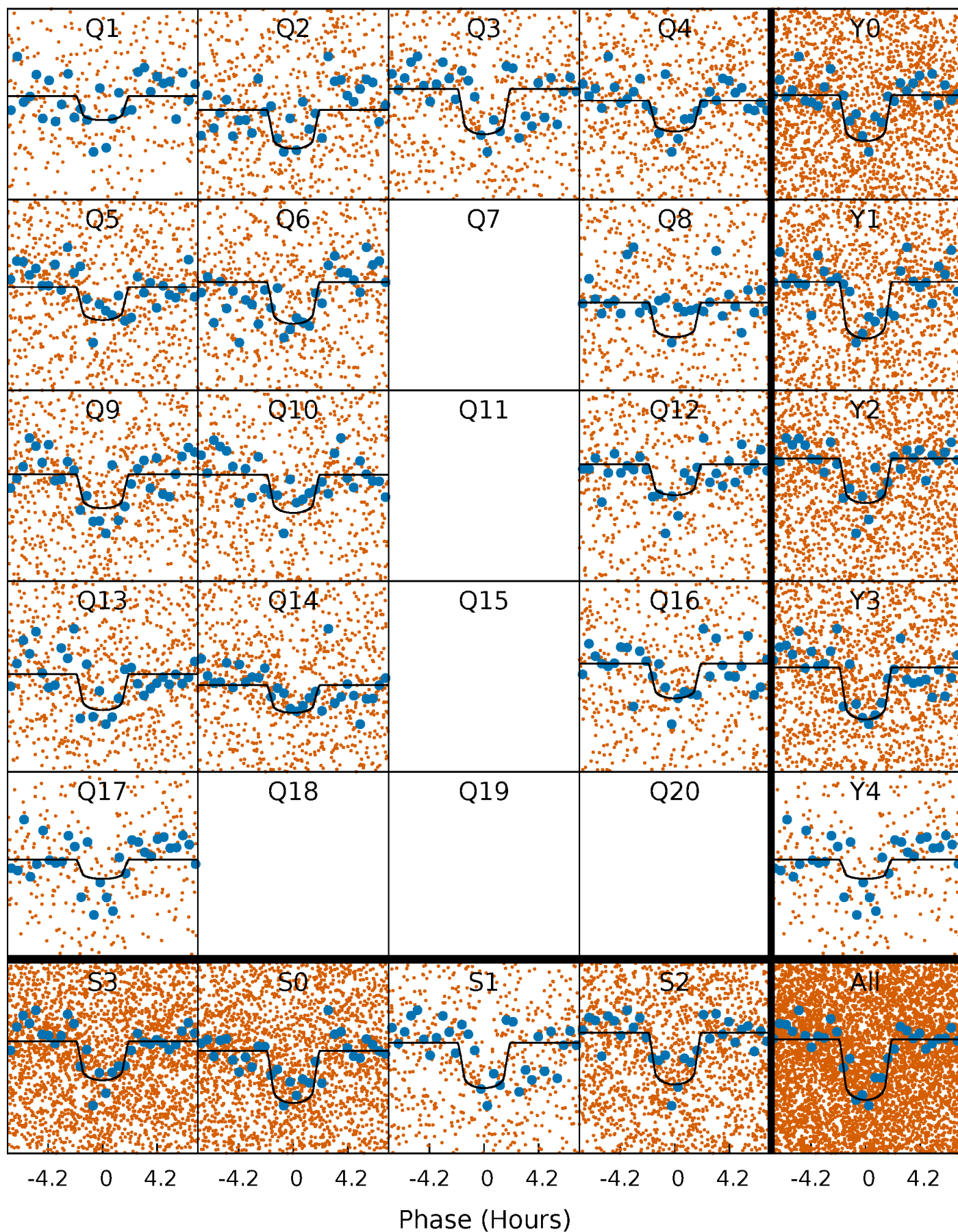
TCE 010156055-01 P= 2.428004 Days  $T_0=133.597224$  (BKJD)





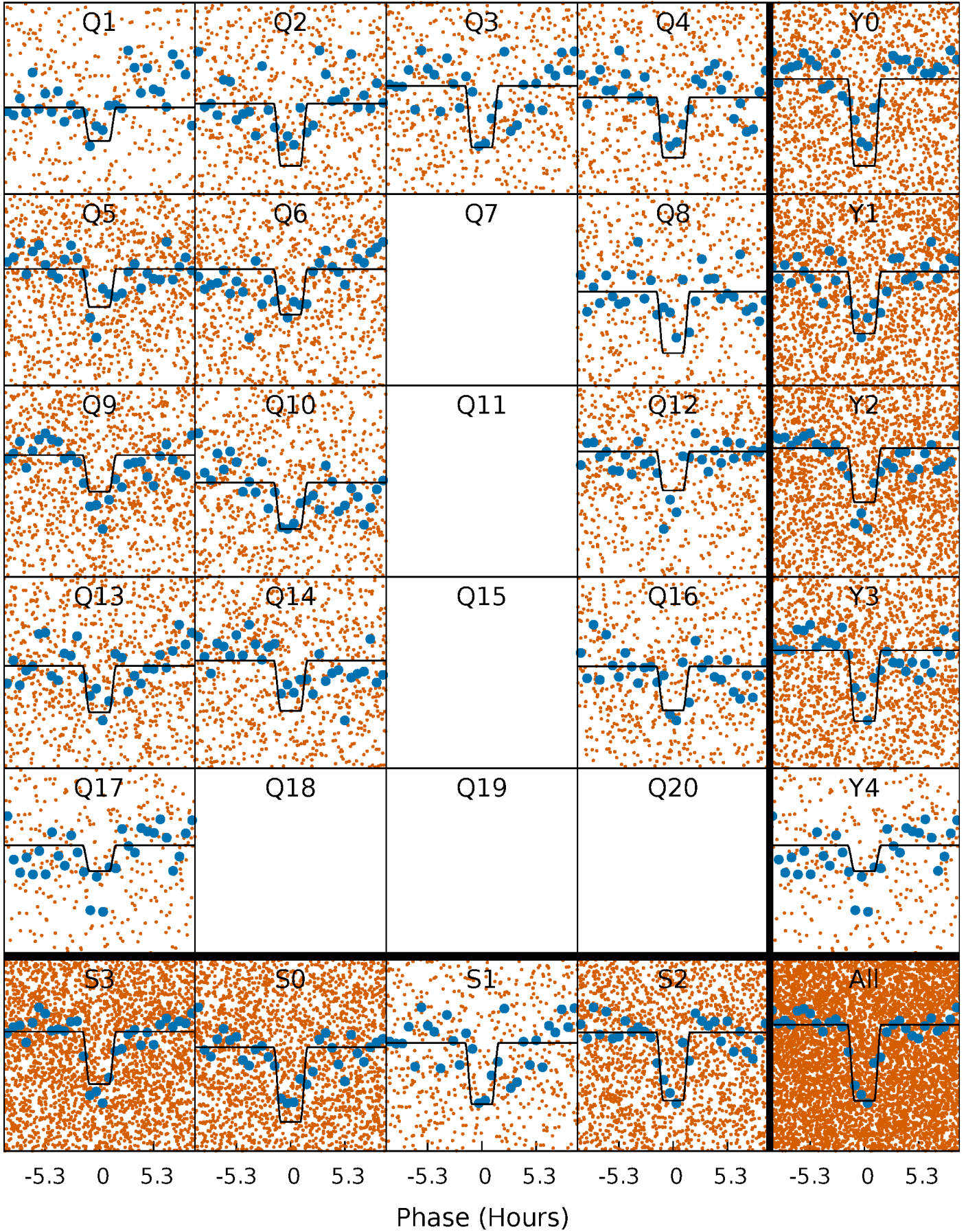
# DV Quarter-Phased Transit Curves

TCE 010156055-01 P= 2.428004 Days  $T_0=133.597224$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

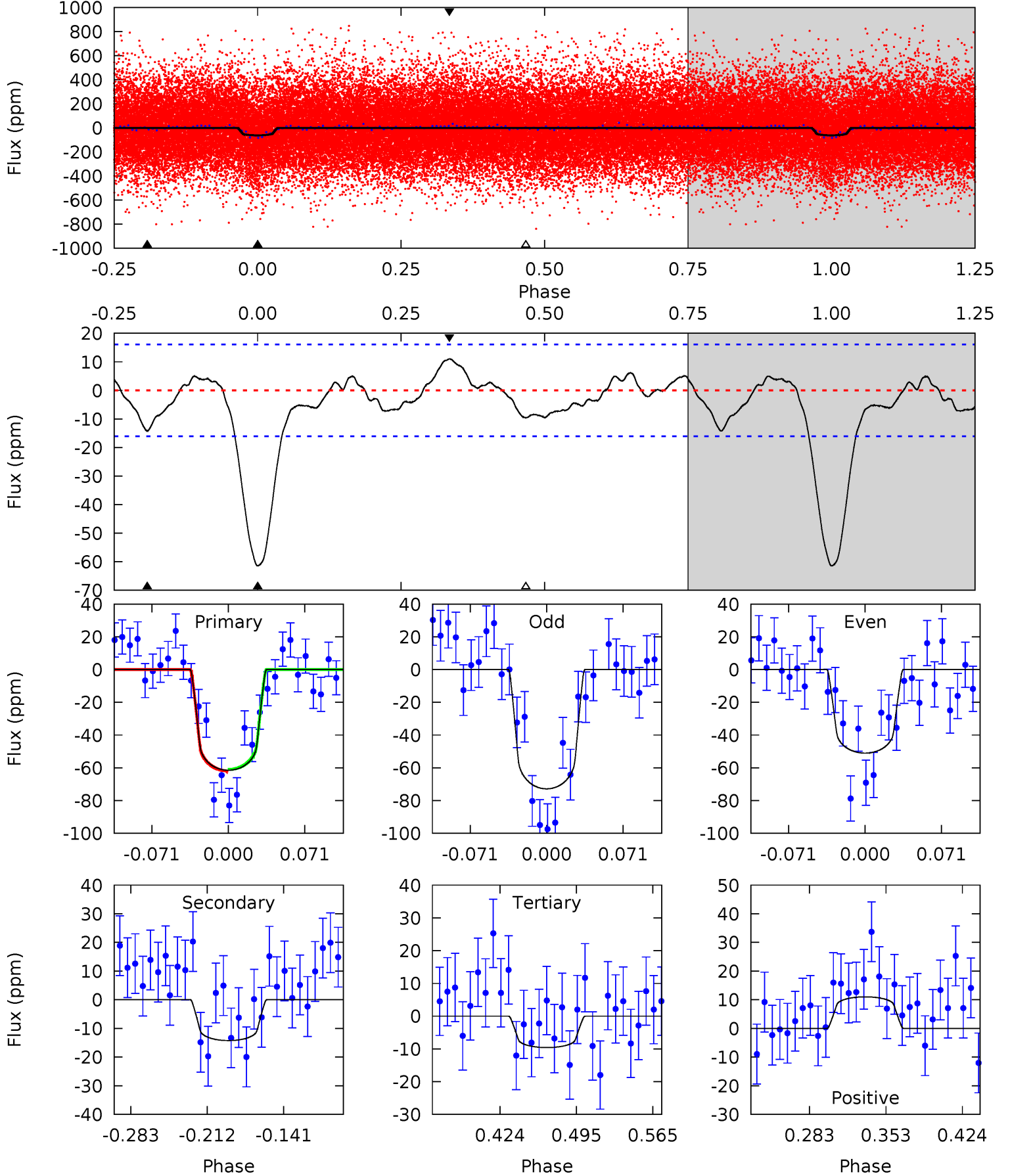
TCE 010156055-01 P= 2.428009 Days  $T_0=133.596926$  (BKJD)



# DV Model-Shift Uniqueness Test

010156055-01, P = 2.428004 Days, E = 131.169220 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  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 17.8 | 4.11 | 2.77 | 3.18 | 4.64            | 1.81            | 1.46             | 15.0    | 14.6    | 1.34    | 0.93    | 3.17    | 1.02 | 0.15  | 0.14 |

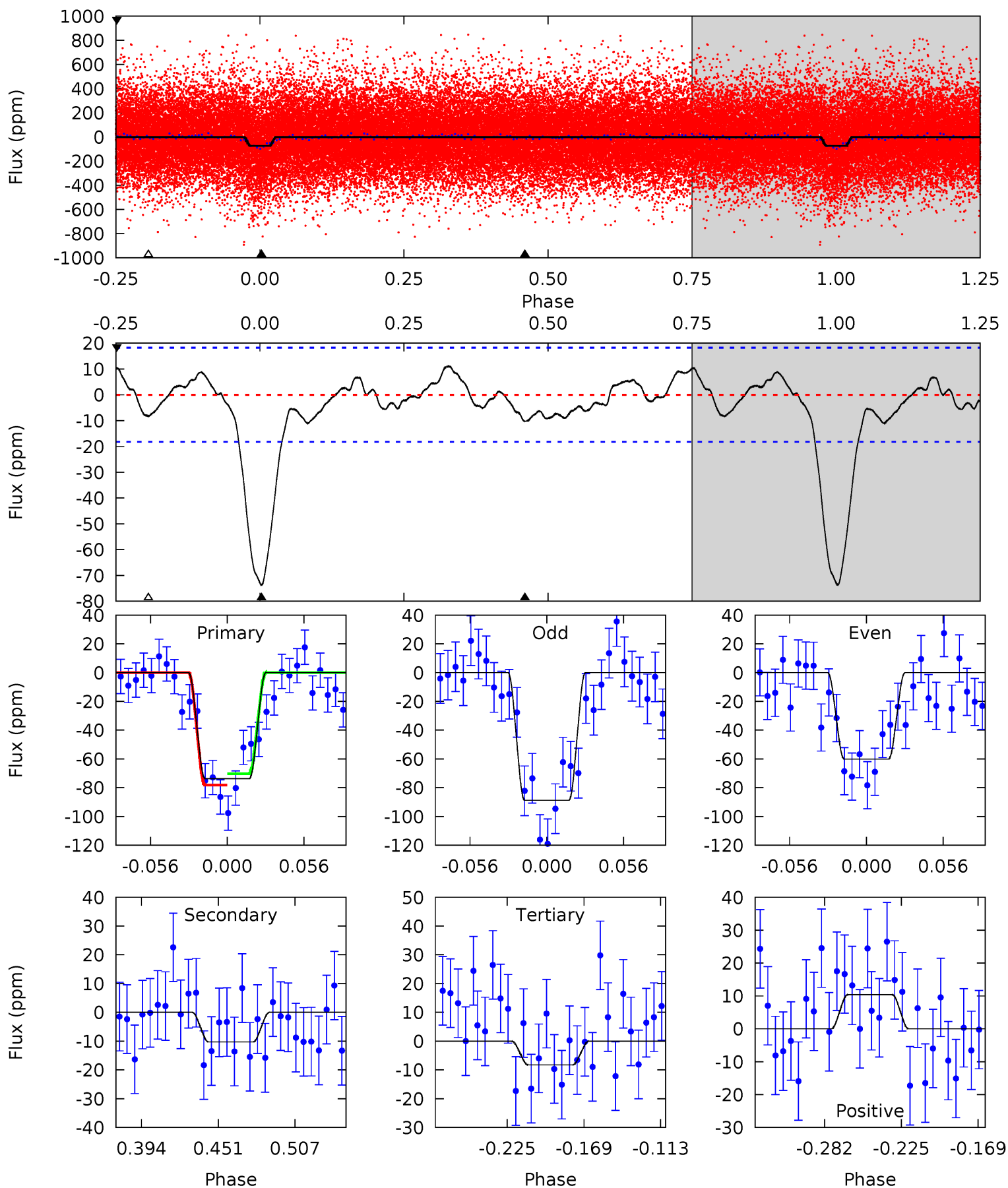




# Alt Model-Shift Uniqueness Test

010156055-01, P = 2.428009 Days, E = 131.168917 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  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 18.9 | 2.64 | 2.12 | 2.67 | 4.68            | 1.91            | 1.37             | 16.8    | 16.3    | 0.52    | -0.02   | 3.67    | 1.04 | 0.13  | 1.01 |





### Stellar Parameters For KIC 010156055

|        | $T_{\text{eff}}(K)$  | $\log(g)$                 | [Fe/H]                     | $R (R_{\odot})$           | $M(M_{\odot})$            | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
|        | $6609^{+157}_{-196}$ | $4.484^{+0.036}_{-0.204}$ | $-0.500^{+0.300}_{-0.300}$ | $0.974^{+0.286}_{-0.076}$ | $1.073^{+0.125}_{-0.125}$ | $1.638^{+0.328}_{-0.847}$                 |
|        | +2%/-3%              | +1%/-5%                   | +60%/-60%                  | +29%/-8%                  | +12%/-12%                 | +20%/-52%                                 |
| 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 010156055-01 / KOI 4284.01

| Detrend | Depth (ppm) | $R_p (R_{\oplus})$     | $T_{max} (K)$       | $T_{obs} (K)$        | $A_{obs}$                  |
|---------|-------------|------------------------|---------------------|----------------------|----------------------------|
| DV      | $-14 \pm 3$ | $0.98^{+0.40}_{-0.31}$ | $2172^{+139}_{-95}$ | $4436^{+873}_{-505}$ | $9.790^{+13.518}_{-4.910}$ |
| Alt.    | $-10 \pm 4$ | $1.03^{+0.36}_{-0.31}$ | $2168^{+136}_{-88}$ | $4080^{+694}_{-457}$ | $6.518^{+7.024}_{-3.306}$  |

$T_{max}$  = Theoretical Maximum Planetary Temperature

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

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

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

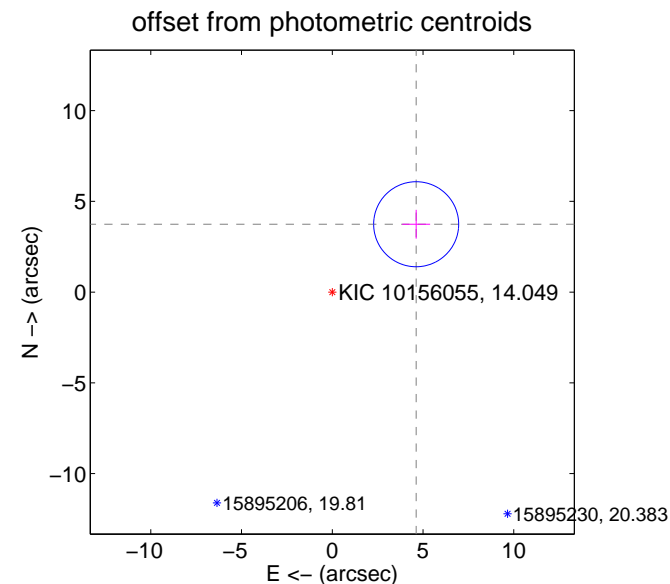
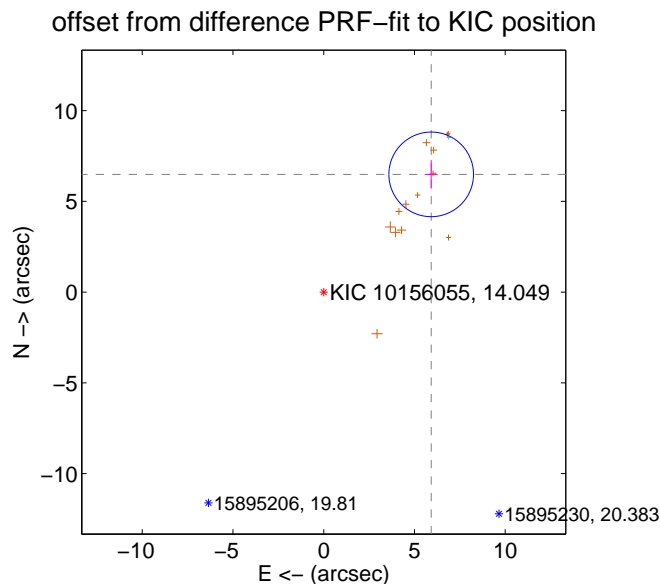
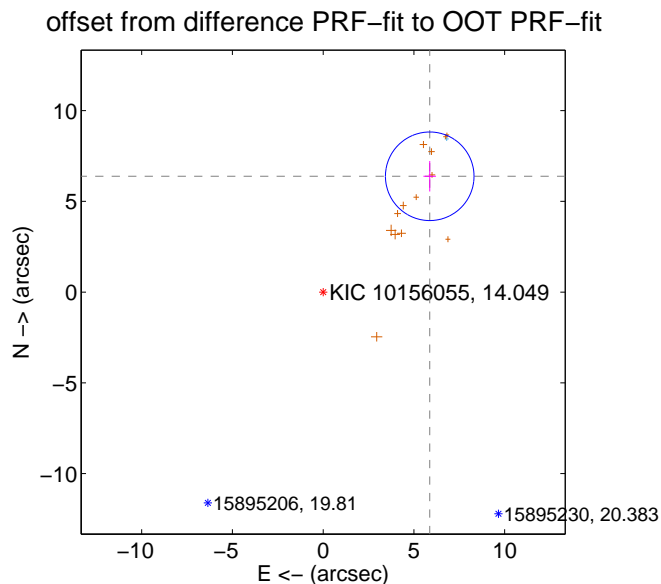
## DV Centroid Data

Supplemental centroid analysis for 010156055-01. Kepler magnitude: 14.05. Transit SNR 11.91

There are 1 quarters with good PRF difference image offsets

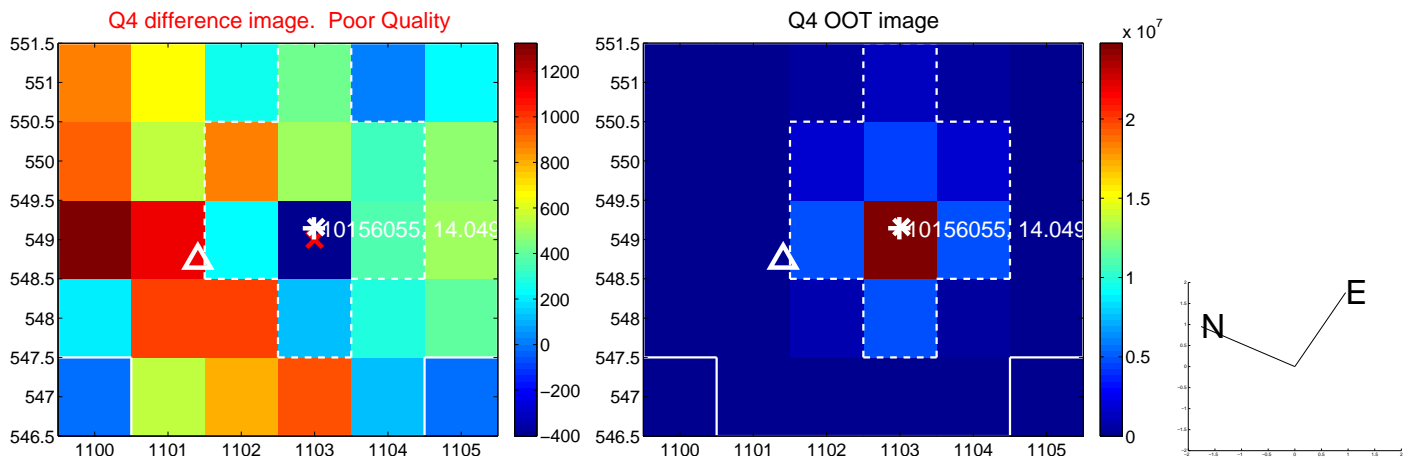
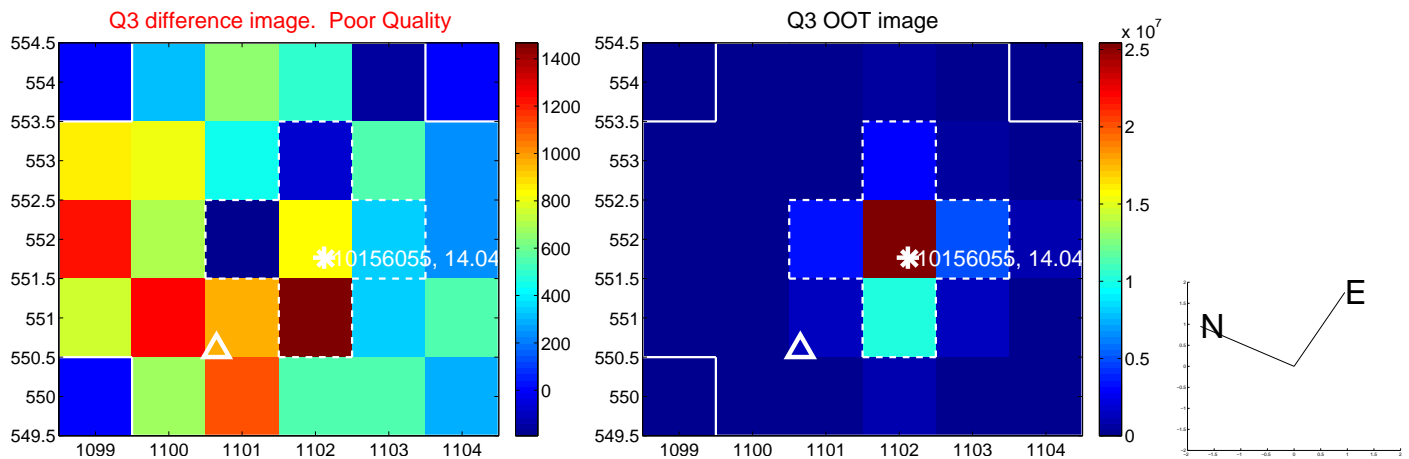
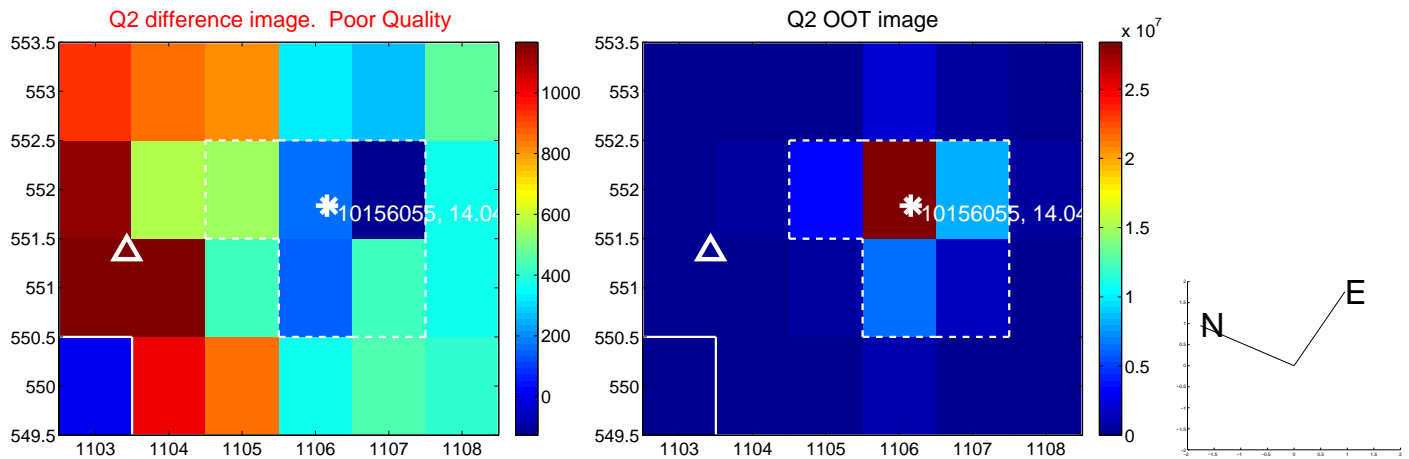
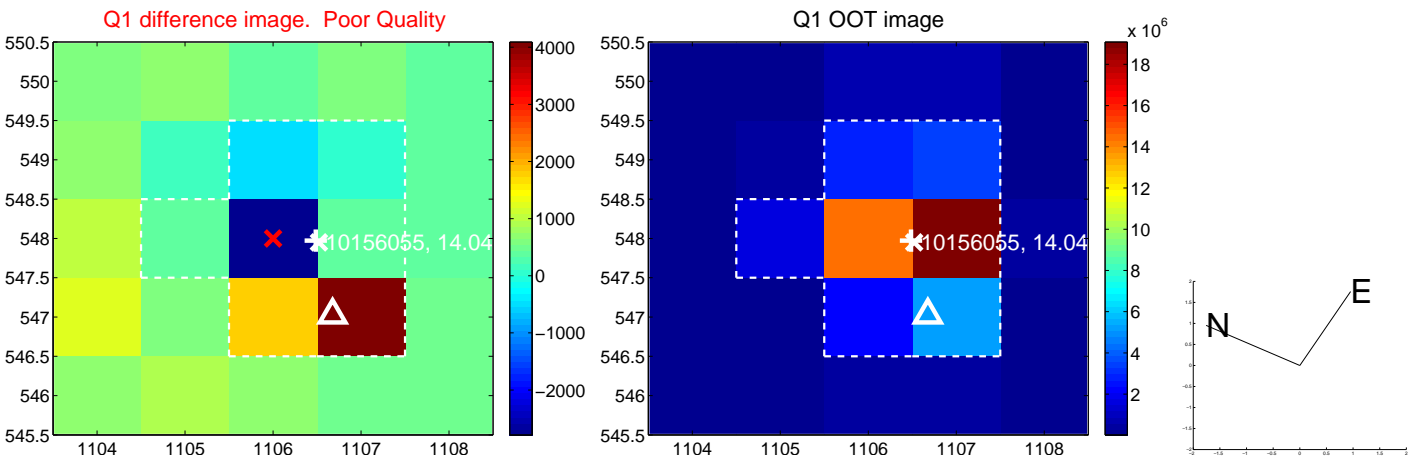
The direct PRF centroid is offset from the target star catalog position by about 0.20 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA        | $\Delta$ Dec      |
|---|--------------------|---------------------|--------------------|-------------------|
| PRF-fit source offset from OOT          | $8.674 \pm 0.814$  | 10.66               | $-5.873 \pm 0.344$ | $6.384 \pm 0.838$ |
| PRF-fit source offset from KIC position | $8.786 \pm 0.777$  | 11.30               | $-5.923 \pm 0.357$ | $6.489 \pm 0.785$ |
| photometric centroid source offset      | $5.95 \pm 0.78$    | 7.61                | $-4.62 \pm 0.77$   | $3.74 \pm 0.79$   |

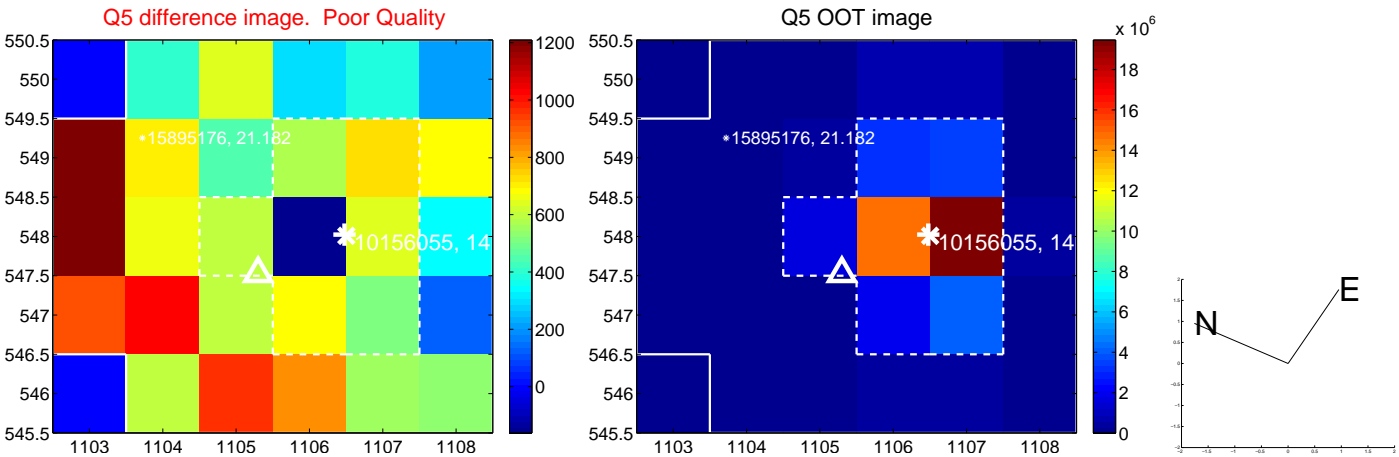


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three- $\sigma$ . 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.

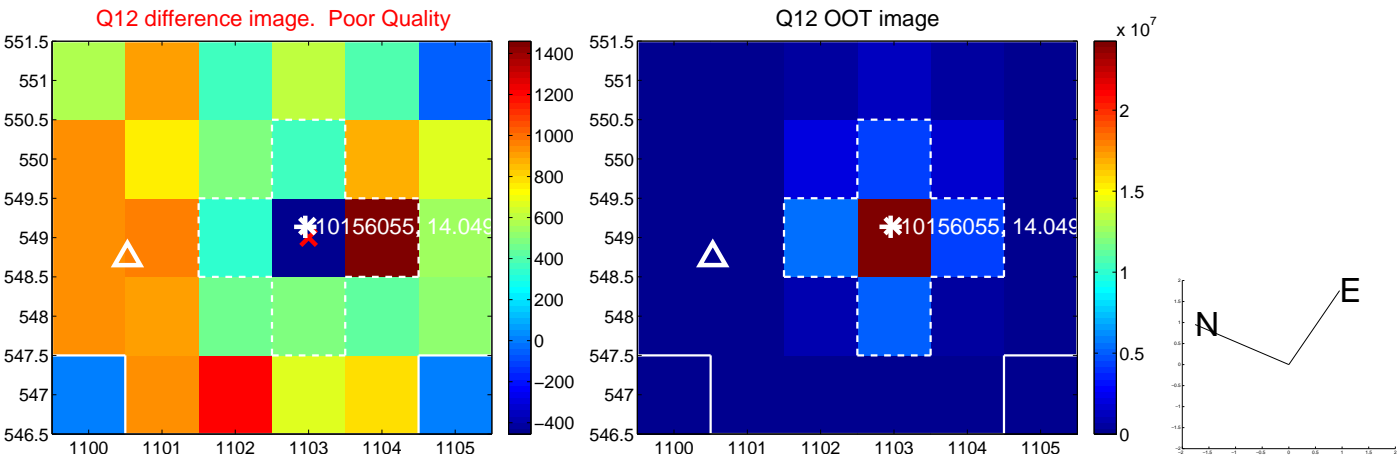
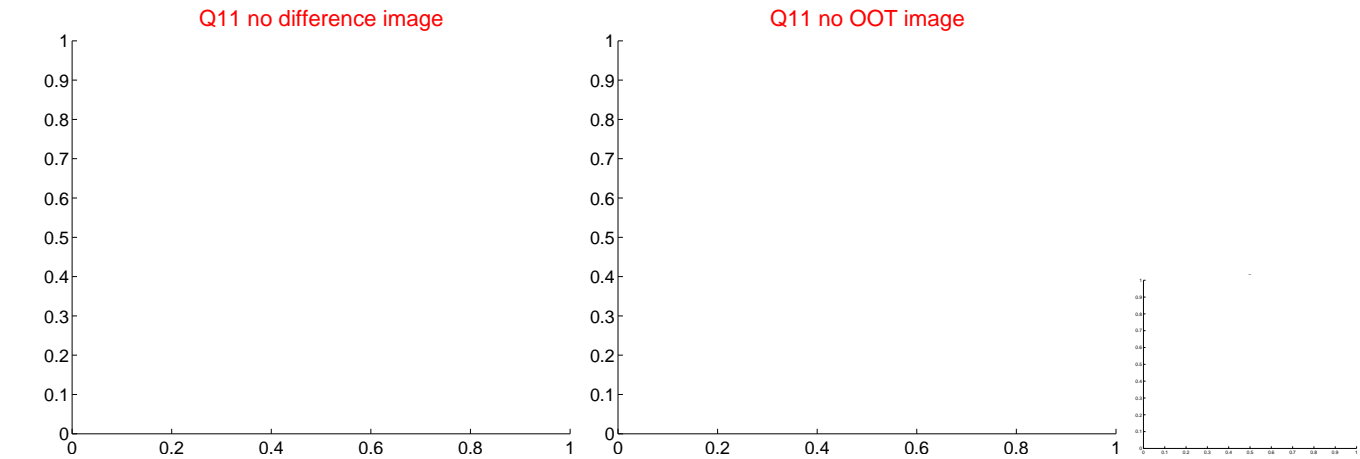
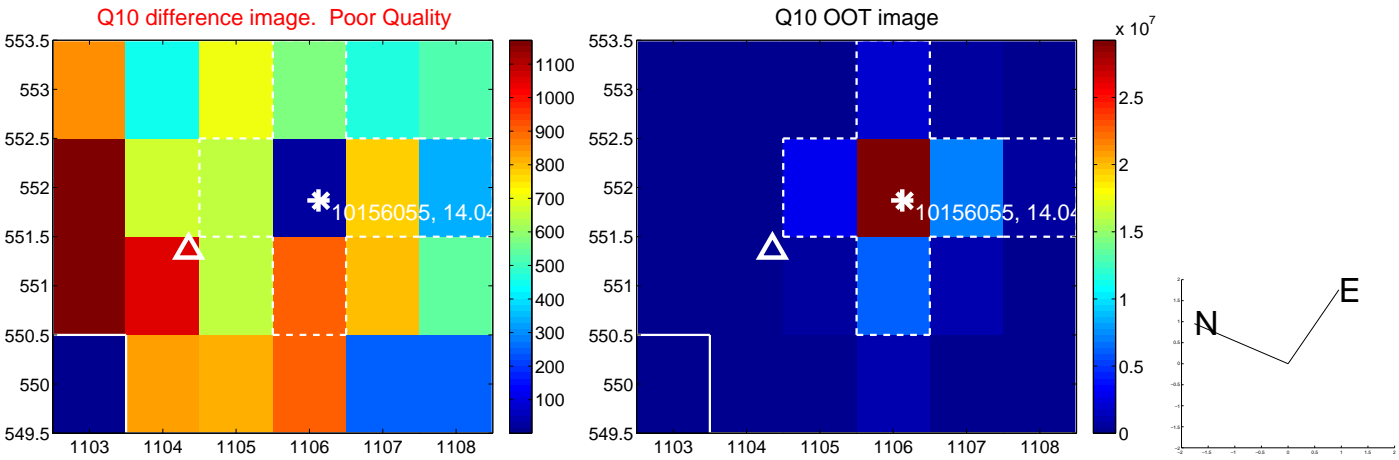
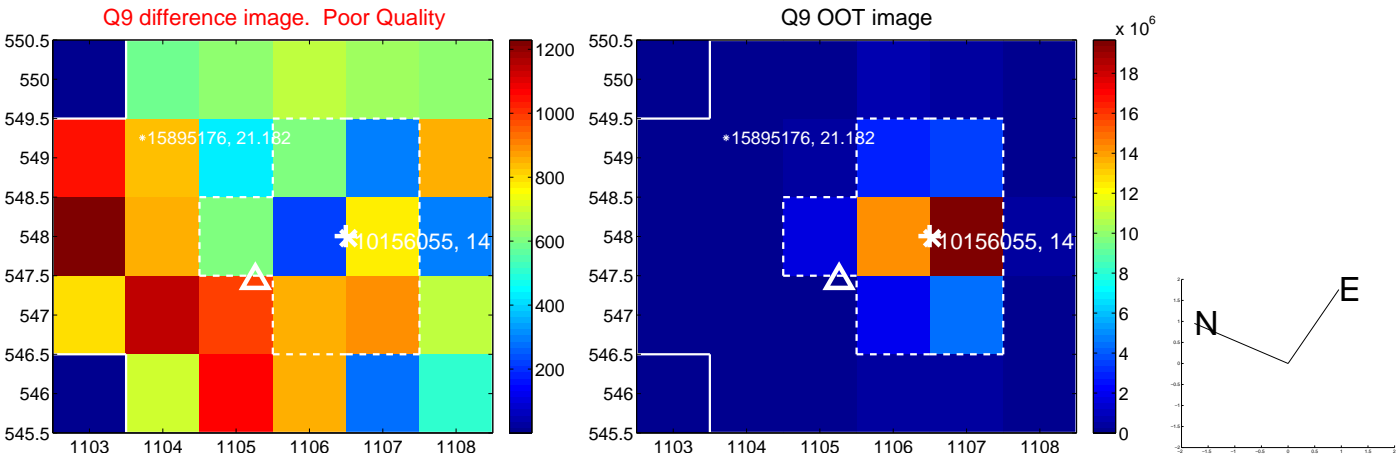


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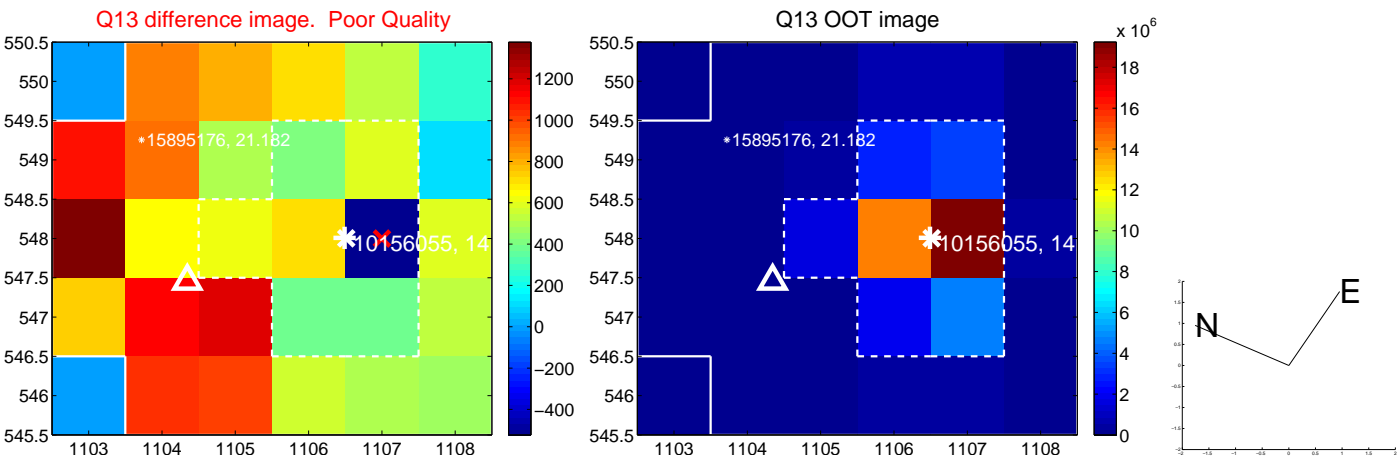




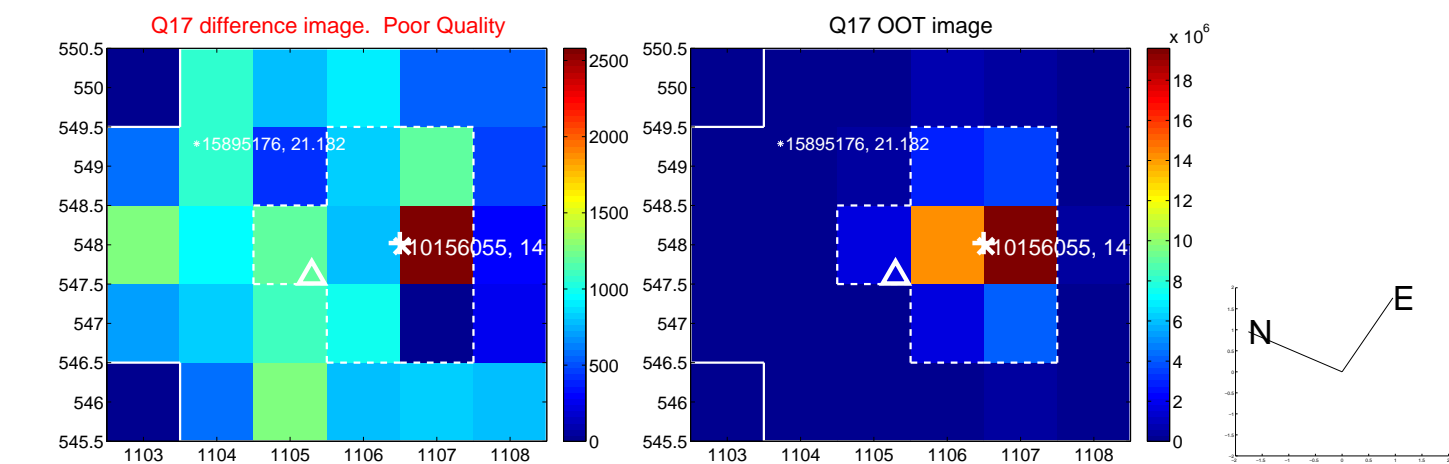
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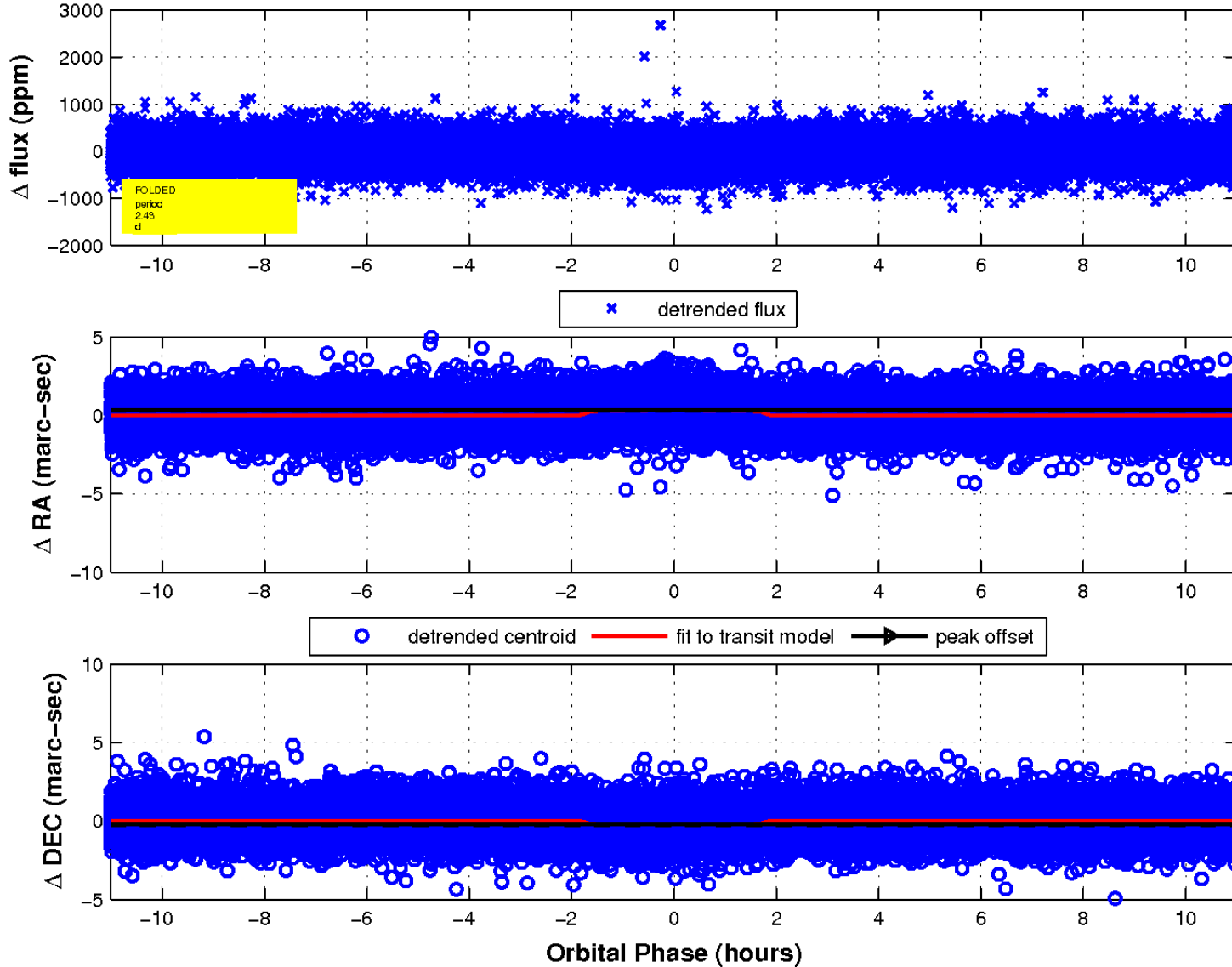
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



fluxWeightedCentroids, Planet 1 of 1



UKIRT Image

Declination

