

# KIC 003097331

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|-----|-----------------------------|-----------------|------------------------|------------------------|
| 003097331-01 | OBS      | No   | 468.366690    | 432.617373   | 1387.3      | 4.169            | 12.1 | 6.4 | 0.59                        | 4980            | 2.20                   | 0.20                   |
| 003097331-02 | OBS      | No   | 489.078948    | 414.566850   | 1071.9      | 17.003           | 14.0 | 3.7 | 0.59                        | 4980            | 1.94                   | 0.18                   |
| 003097331-03 | OBS      | No   | 382.669196    | 285.730703   | 1367.3      | 4.468            | 16.3 | 8.2 | 0.59                        | 4980            | 2.21                   | 0.26                   |
| 003097331-04 | OBS      | No   | 506.025469    | 158.006130   | 1052.6      | 3.460            | 11.6 | 5.8 | 0.59                        | 4980            | 1.99                   | 0.18                   |
| 003097331-05 | OBS      | No   | 364.730993    | 242.967867   | 878.4       | 3.690            | 10.5 | 4.7 | 0.59                        | 4980            | 1.83                   | 0.27                   |
| 003097331-06 | OBS      | No   | 524.701079    | 482.439043   | 1284.2      | 4.341            | 13.4 | 6.3 | 0.59                        | 4980            | 2.12                   | 0.17                   |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments   |
|--------------|----------|------|-------|---|---|---|---|--|
| 003097331-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS  |
| 003097331-02 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS  |
| 003097331-03 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_MARSHALL_SKYE—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS |
| 003097331-04 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS   |
| 003097331-05 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS                                   |
| 003097331-06 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—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.

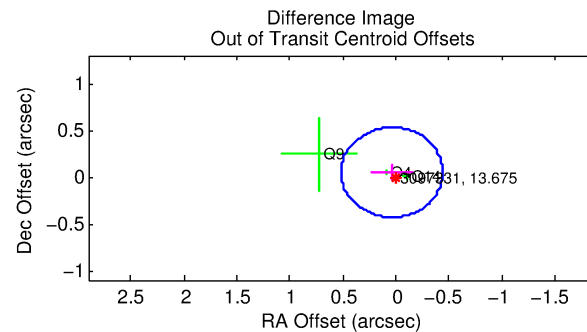
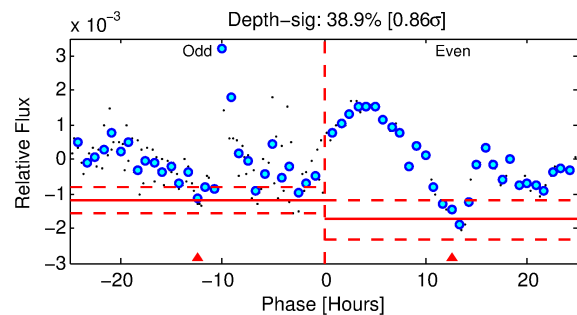
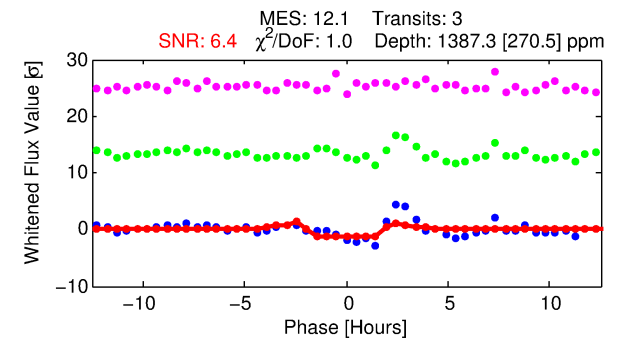
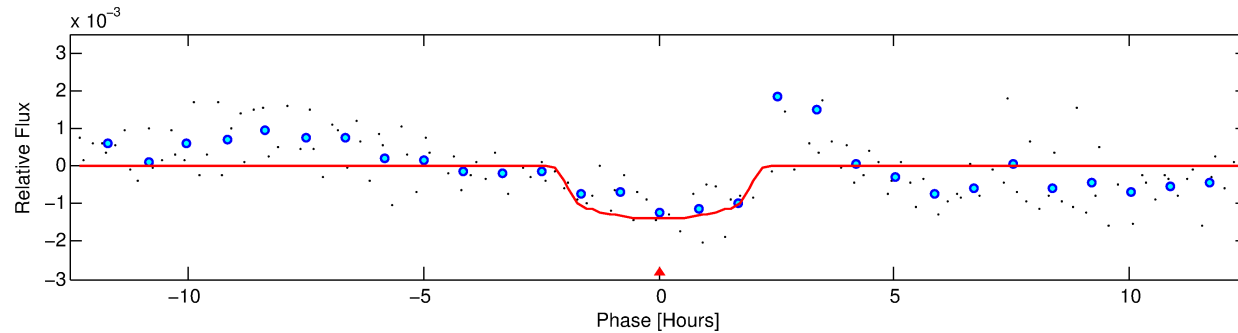
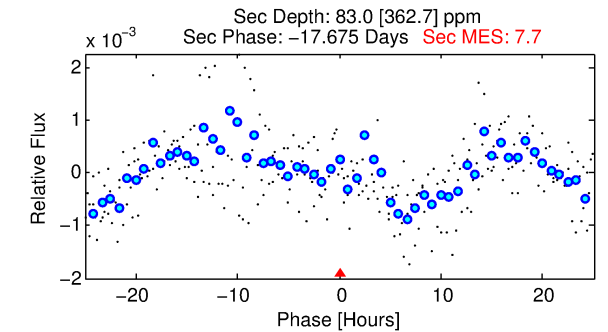
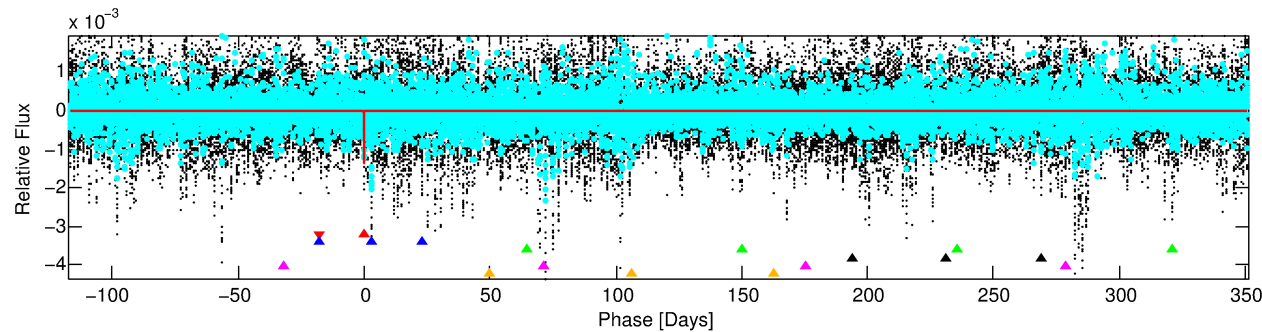
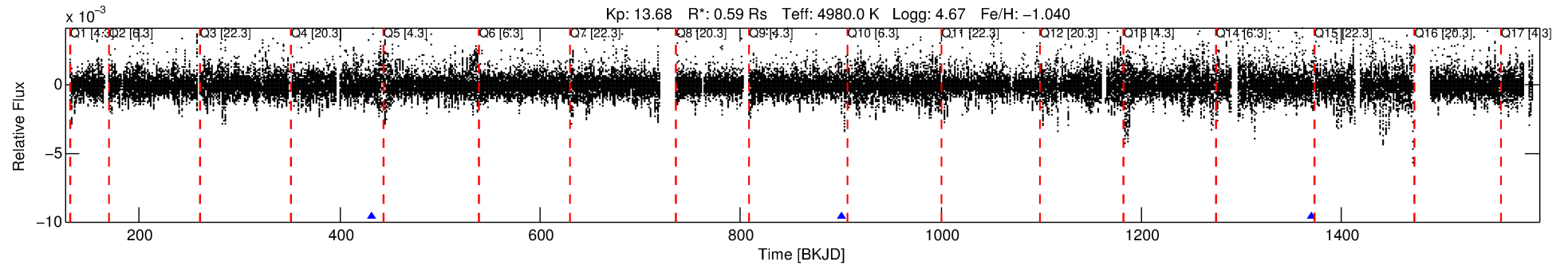
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 003097331-01

No Significant Match Found

# DV One-Page Summary

KIC: 3097331 Candidate: 1 of 6 Period: 468.367 d



## DV Fit Results:

Period = 468.36669 [0.00614] d  
Epoch = 432.6174 [0.0053] BKJD  
Rp/R\* = 0.0343 [0.0578]  
a/R\* = 816.81 [5460.57]  
b = 0.40 [13.96]  
Seff = 0.19 [0.03]  
Teq = 169 [6] K  
Rp = 2.20 [3.72] Re  
a = 0.9904 [0.0641] AU  
Ag = 9246.44 [51032.06] [0.18 $\sigma$ ]  
Teffp = 2569 [3544] K [0.68 $\sigma$ ]

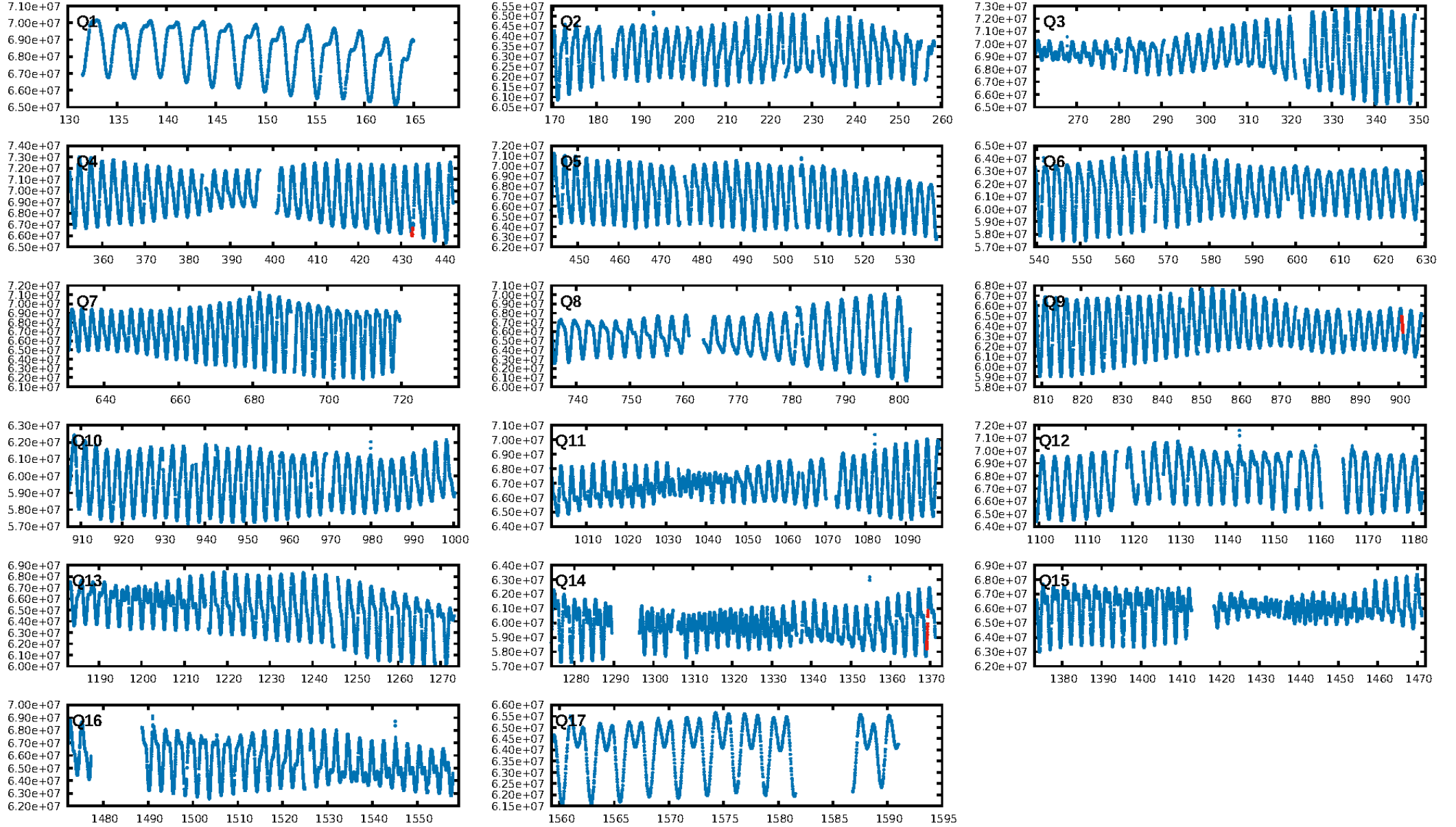
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [336.57 $\sigma$ ]  
LongPeriod-sig: 100.0% [28.39 $\sigma$ ]  
ModelChiSquare2-sig: 85.8%  
ModelChiSquareGof-sig: 83.7%  
**Bootstrap-pfa: 9.75e-10**  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: -1.649  
Centroid-sig: 48.9%  
Centroid-so: 0.714 arcsec [1.03 $\sigma$ ]  
OotOffset-rm: 0.061 arcsec [0.38 $\sigma$ ]  
OotOffset-st: 1/0/1/1 [3]  
KicOffset-rm: 0.182 arcsec [1.26 $\sigma$ ]  
KicOffset-st: 1/0/1/1 [3]  
DiffImageQuality-fgm: 0.67 [2/3]  
DiffImageOverlap-fno: 1.00 [3/3]

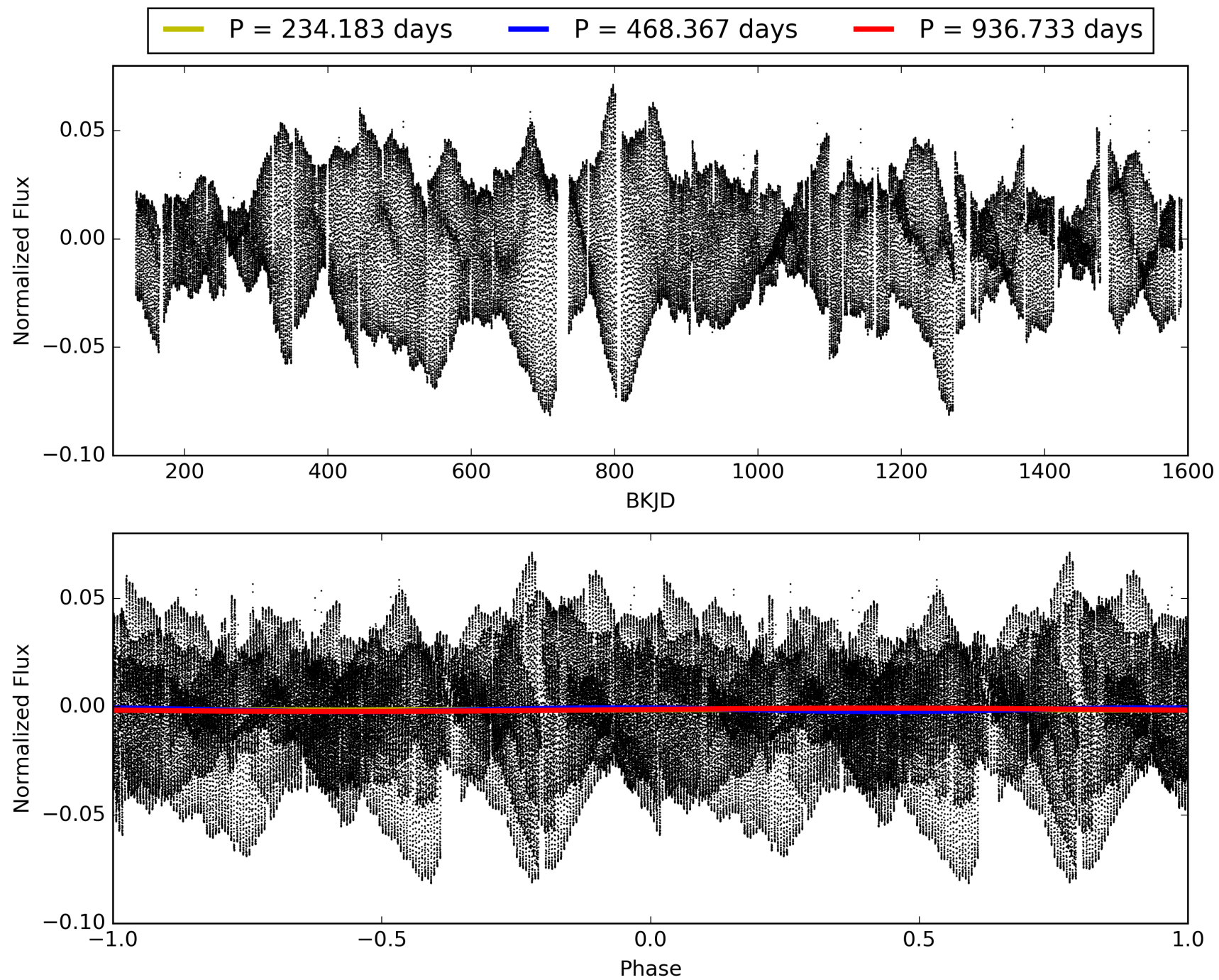
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 02-Feb-2016 01:10:37 Z

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

# TCE 003097331-01, PDC Light Curves



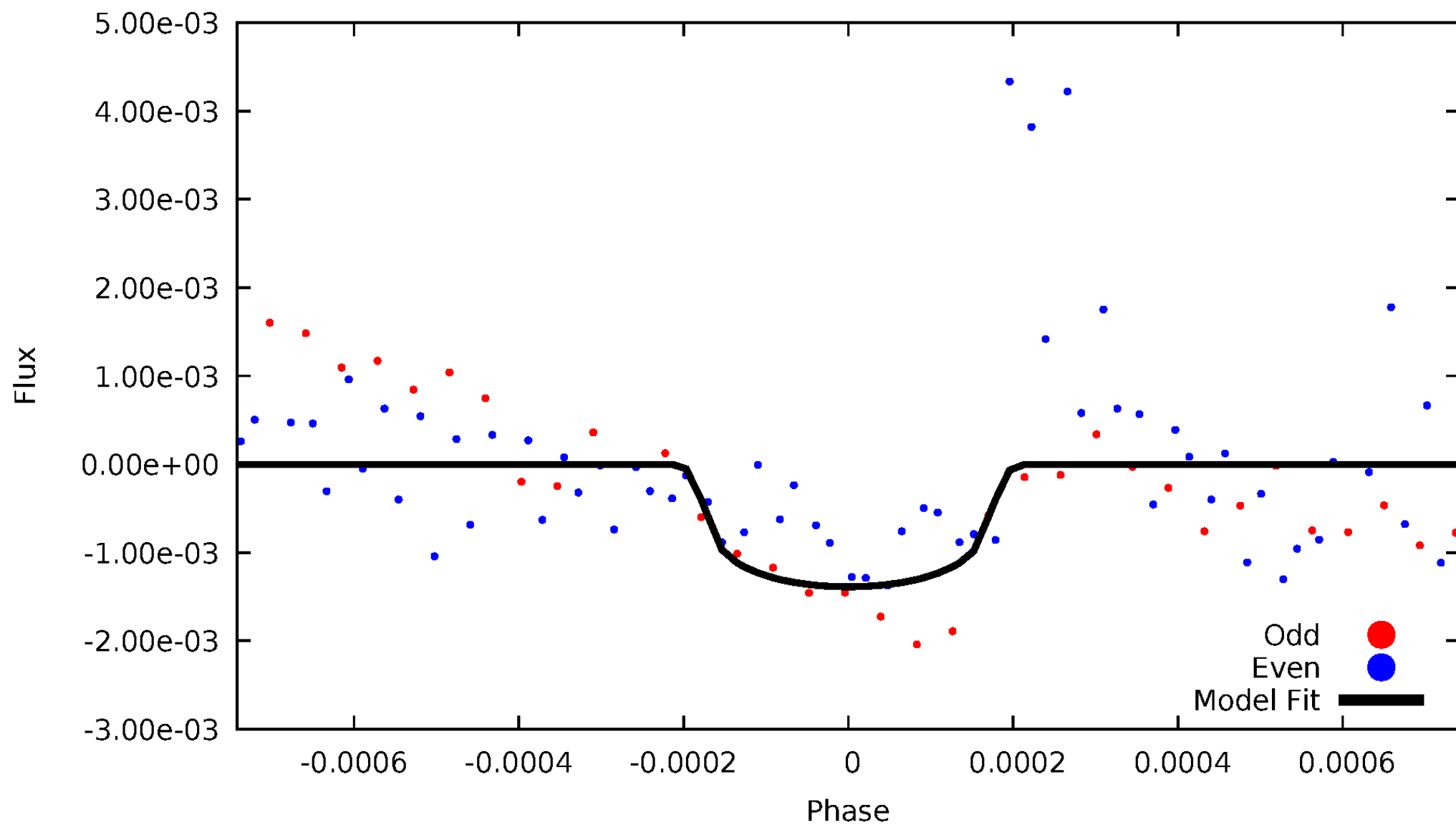
TCE 003097331-01





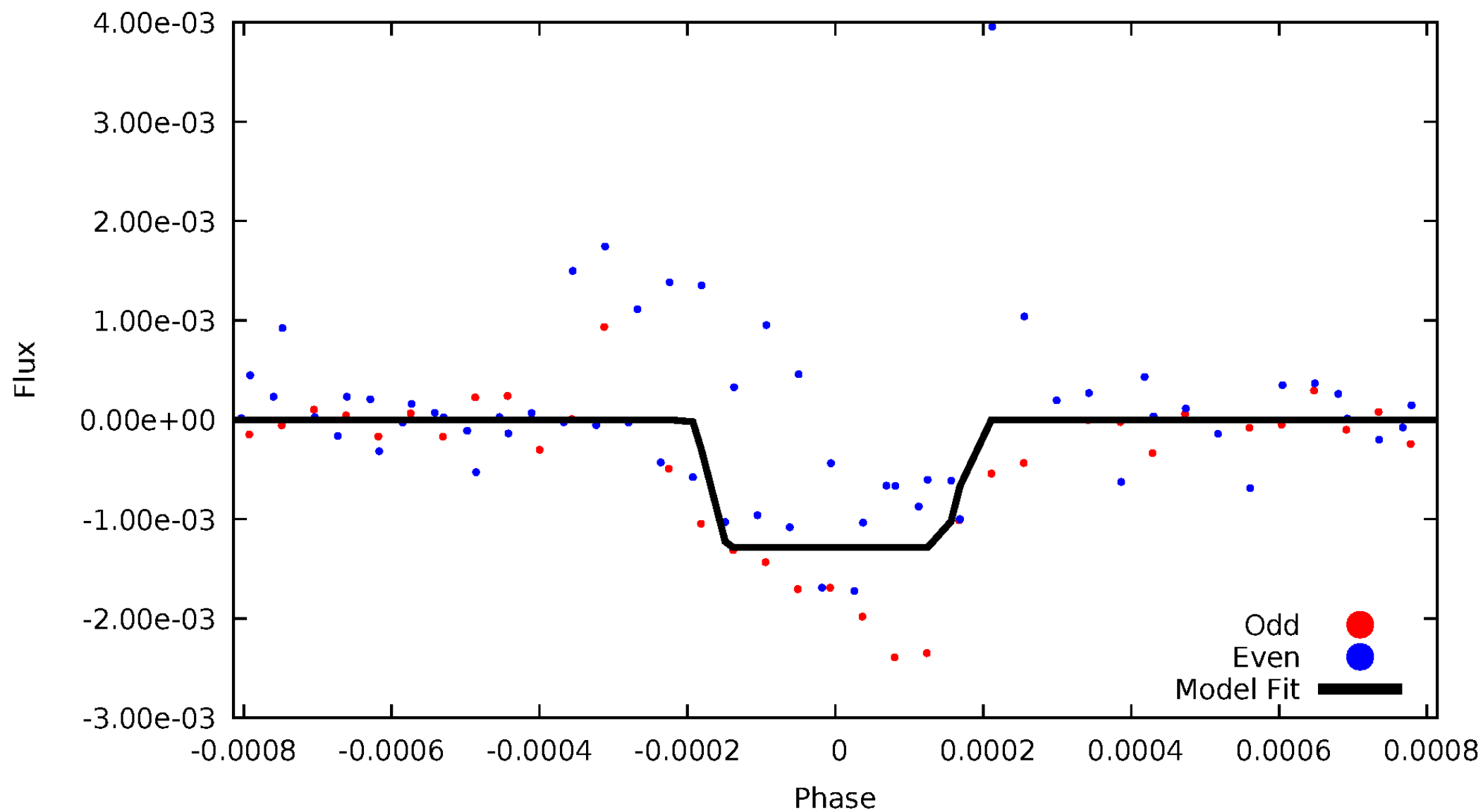
# DV Odd/Even

TCE 003097331-01



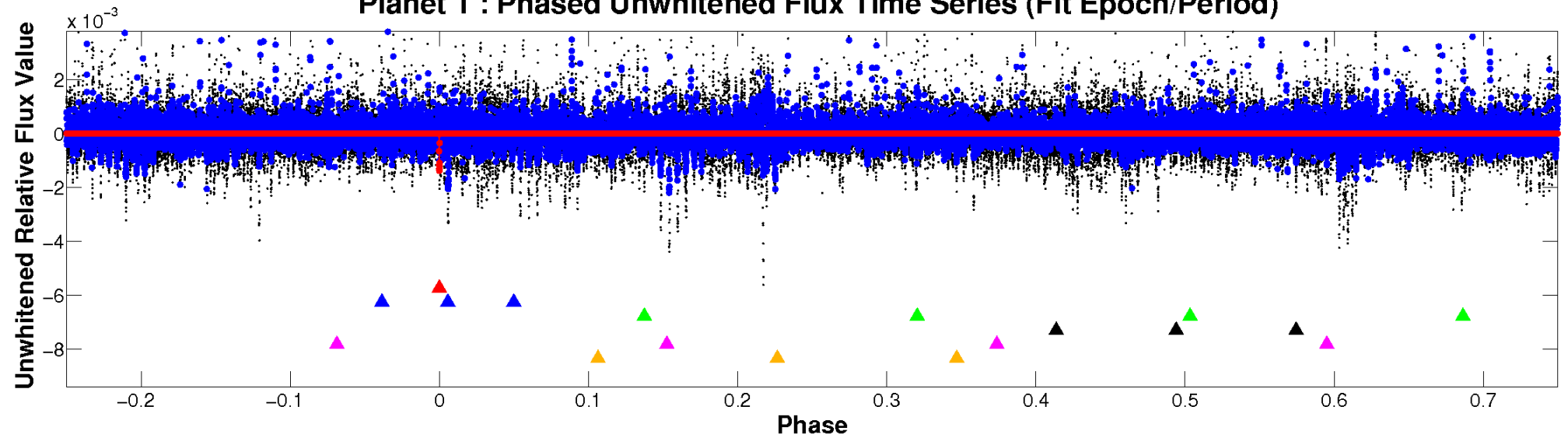
# ALT Odd/Even

TCE 003097331-01

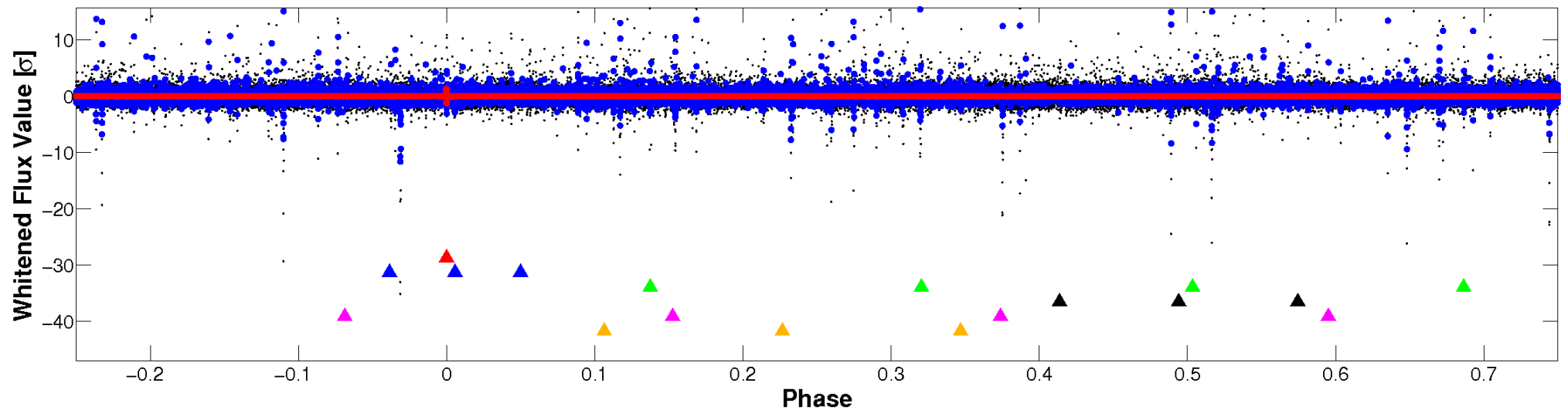


# Non-Whitened Vs. Whitened Light Curve

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

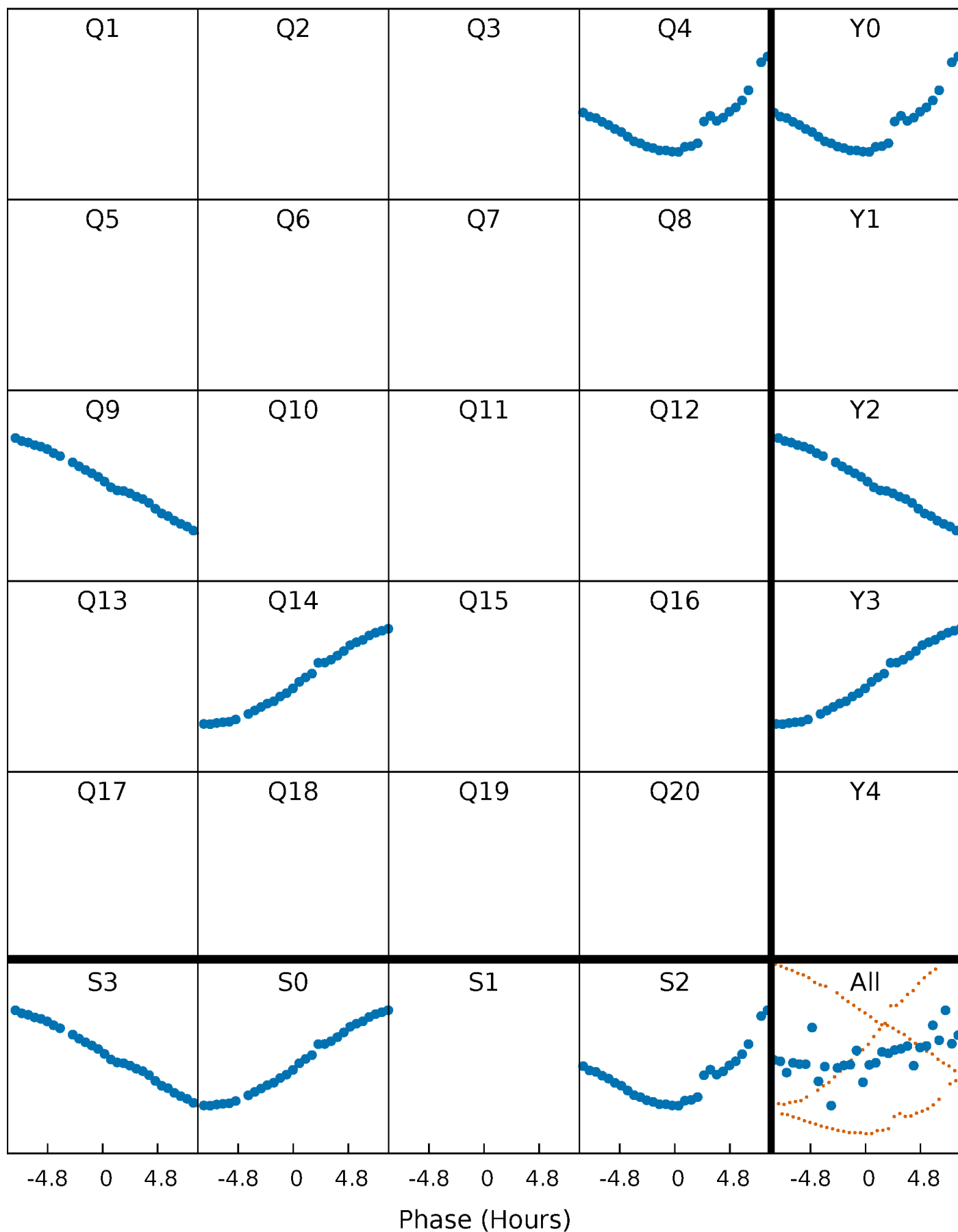


**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

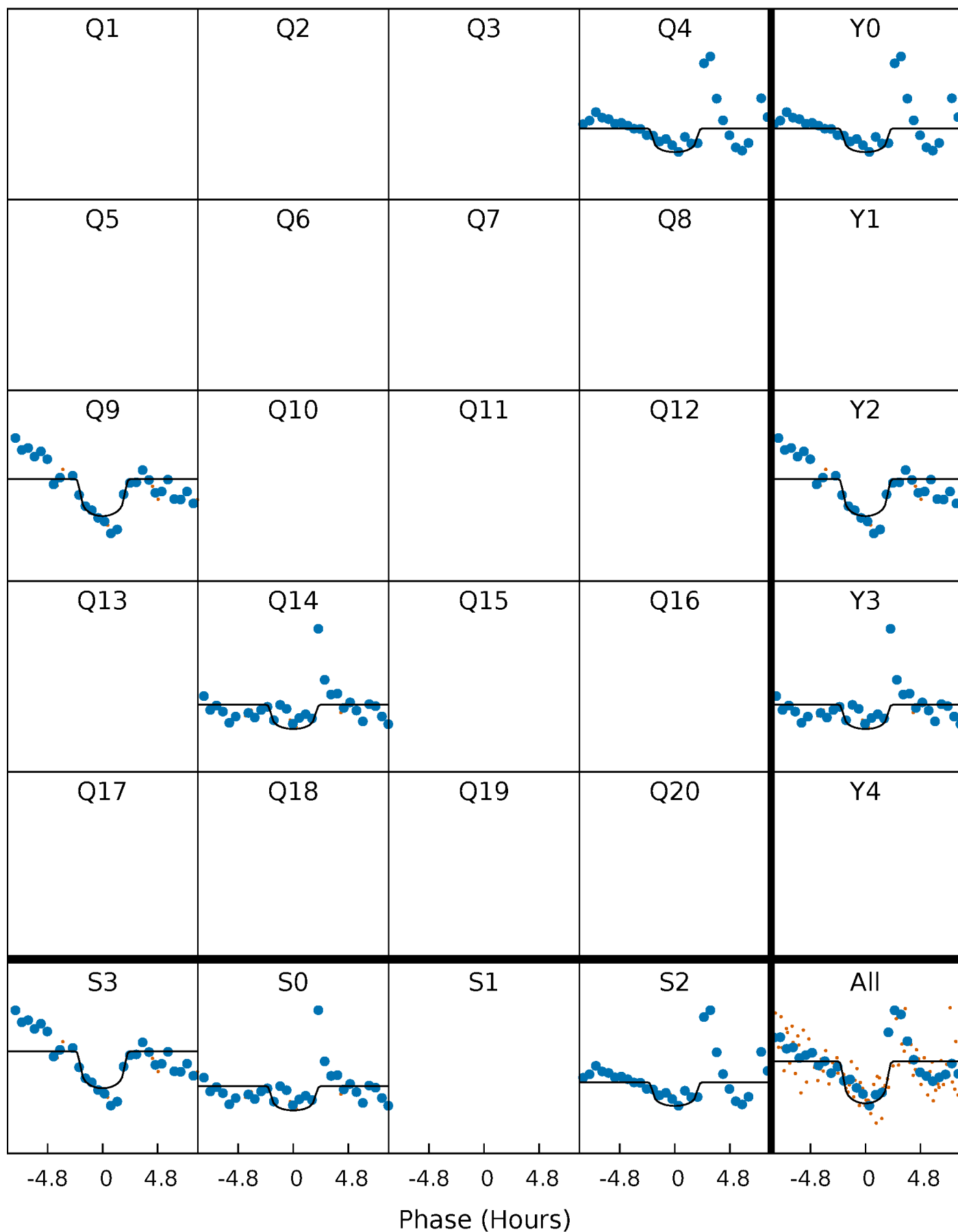
TCE 003097331-01 P=468.366690 Days  $T_0=432.617373$  (BKJD)





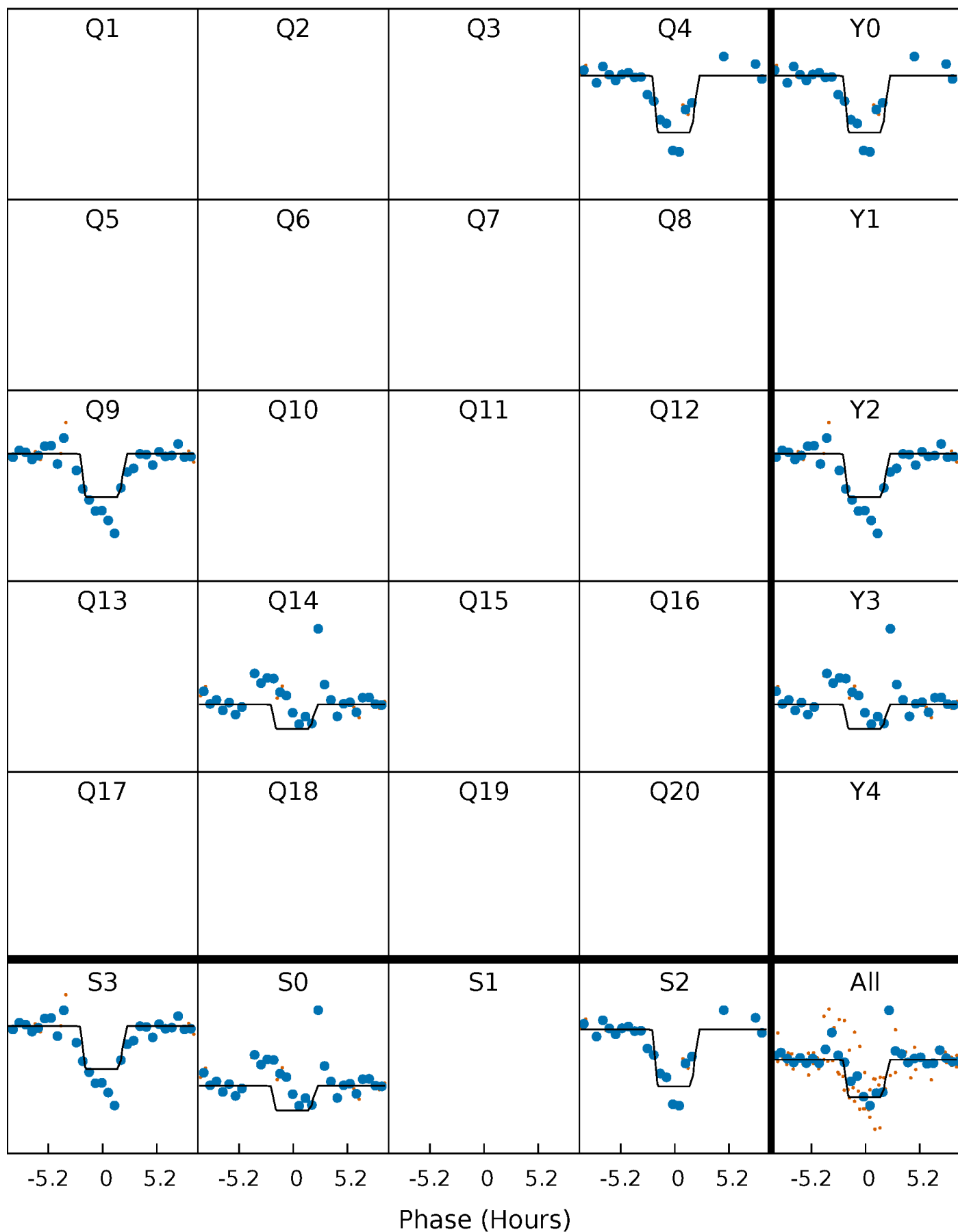
# DV Quarter-Phased Transit Curves

TCE 003097331-01 P=468.366690 Days  $T_0=432.617373$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

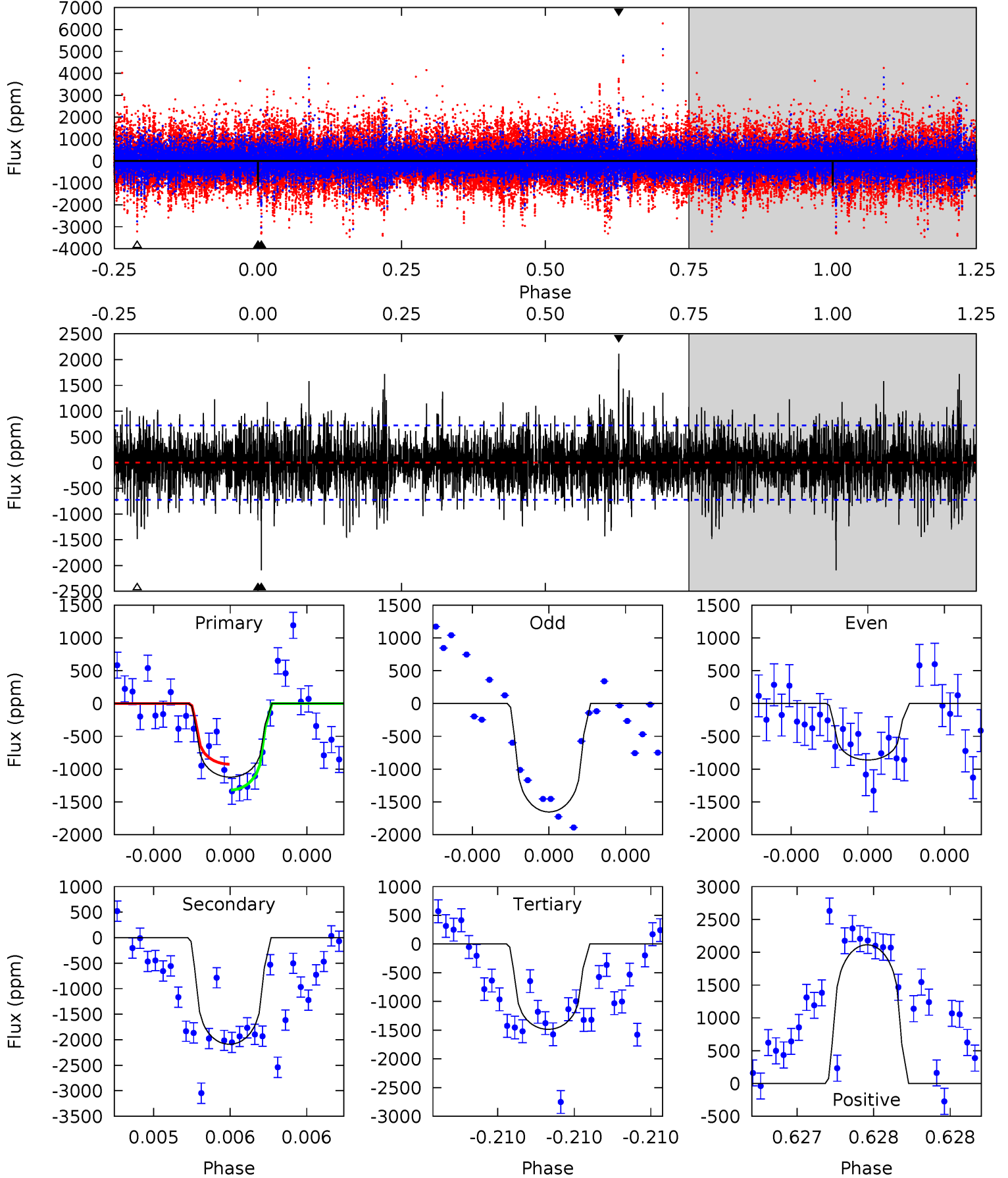
TCE 003097331-01 P=468.357629 Days  $T_0=432.627781$  (BKJD)



# DV Model-Shift Uniqueness Test

003097331-01, P = 468.366690 Days, E = 432.617373 Days

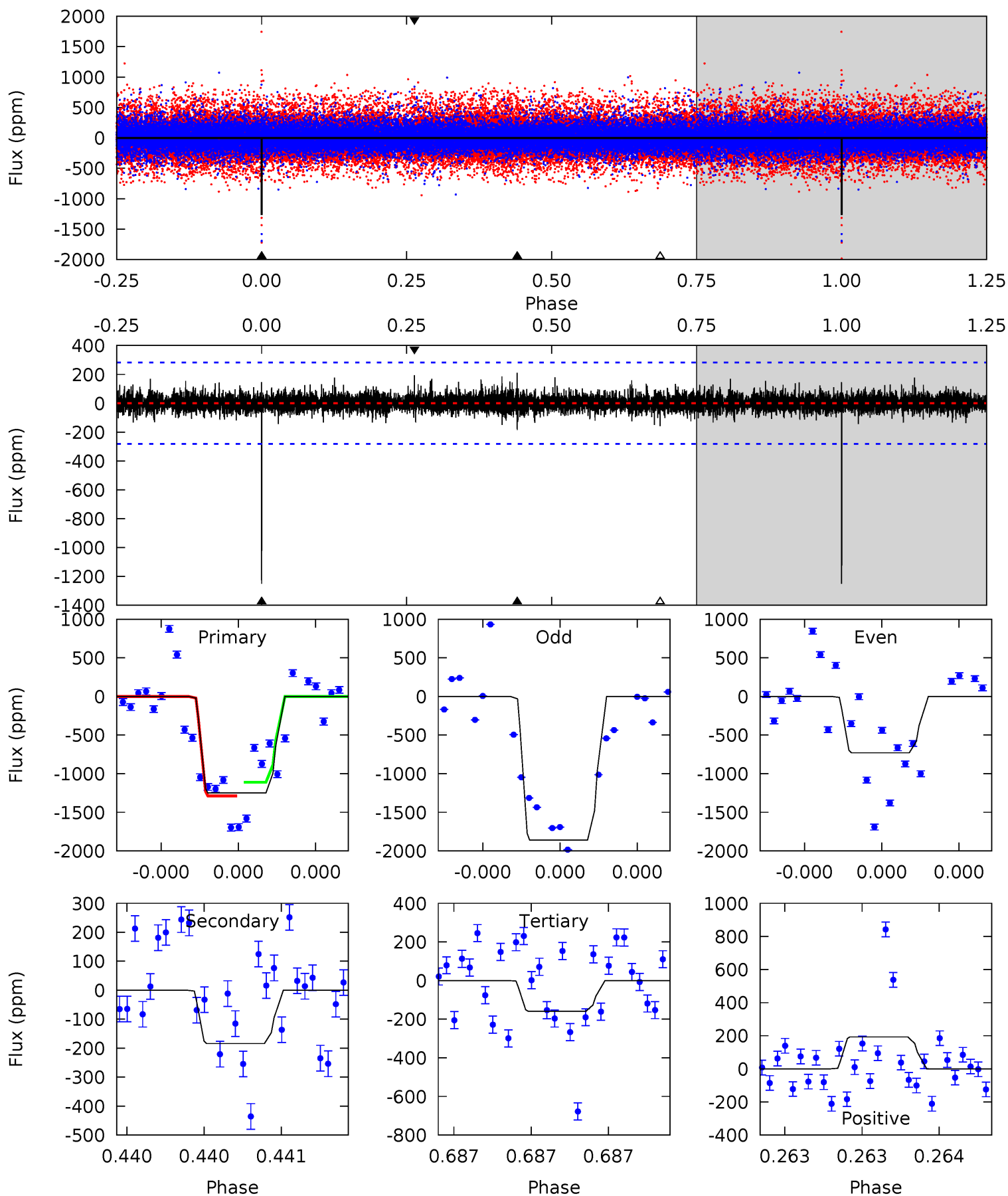
| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 8.73 | 16.2 | 11.6 | 16.4 | 5.62            | 3.54            | 2.87             | -2.82   | -7.70   | 4.70    | -0.19   | 2.70    | 1.14 | 0.50  | 1.54 |



# Alt Model-Shift Uniqueness Test

003097331-01, P = 468.357629 Days, E = 432.627781 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  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 25.0 | 3.68 | 3.17 | 3.85 | 5.64            | 3.58            | 0.67             | 21.8    | 21.1    | 0.51    | -0.17   | 12.3    | 0.93 | 0.14  | 1.83 |





### Stellar Parameters For KIC 003097331

|        | $T_{\text{eff}} (K)$ | $\log(g)$                 | $[\text{Fe}/\text{H}]$     | $R (R_{\odot})$           | $M (M_{\odot})$           | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
|        | $4980^{+149}_{-134}$ | $4.669^{+0.052}_{-0.036}$ | $-1.040^{+0.300}_{-0.300}$ | $0.589^{+0.045}_{-0.037}$ | $0.590^{+0.051}_{-0.022}$ | $4.065^{+0.792}_{-0.552}$                 |
|        | +3%/-3%              | +1%/-1%                   | +29%/-29%                  | +8%/-6%                   | +9%/-4%                   | +19%/-14%                                 |
| 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 003097331-01 / KOI

| Detrend | Depth (ppm)     | $R_p (R_{\oplus})$     | $T_{\text{max}} (K)$ | $T_{\text{obs}} (K)$  | $A_{\text{obs}}$           |
|---------|-----------------|------------------------|----------------------|-----------------------|----------------------------|
| DV      | $-2089 \pm 129$ | $3.57^{+3.28}_{-2.49}$ | $236^{+9}_{-7}$      | $4592^{+3733}_{-931}$ | $87952^{+921592}_{-62780}$ |
| Alt.    | $-184 \pm 50$   | $3.43^{+3.30}_{-2.26}$ | $235^{+9}_{-7}$      | $3106^{+1340}_{-532}$ | $8634^{+67353}_{-6356}$    |

$T_{\text{max}}$  = 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

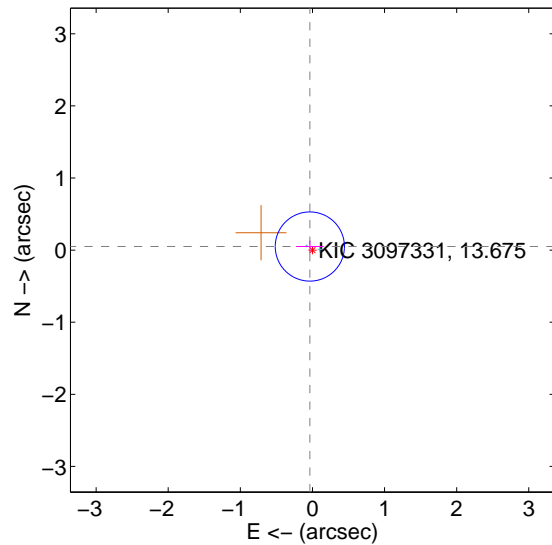
Supplemental centroid analysis for 003097331-01. Kepler magnitude: 13.68. Transit SNR 6.37

There are 2 quarters with good PRF difference image offsets

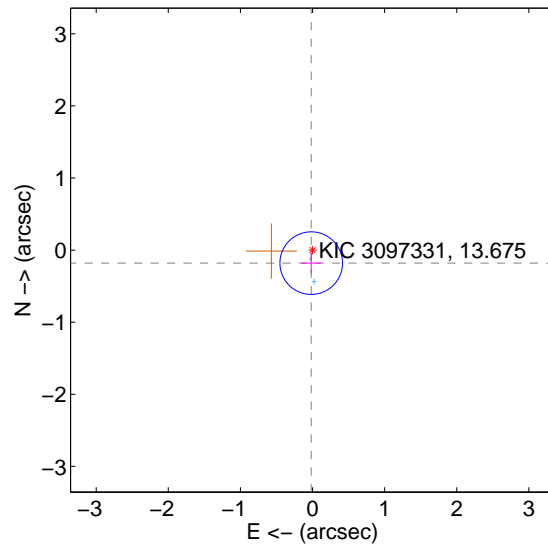
The direct PRF centroid is offset from the target star catalog position by about 0.46 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA       | $\Delta$ Dec       |
|---|--------------------|---------------------|-------------------|--------------------|
| PRF-fit source offset from OOT          | $0.061 \pm 0.160$  | 0.38                | $0.036 \pm 0.190$ | $0.050 \pm 0.084$  |
| PRF-fit source offset from KIC position | $0.182 \pm 0.145$  | 1.26                | $0.018 \pm 0.136$ | $-0.181 \pm 0.145$ |
| photometric centroid source offset      | $0.71 \pm 0.69$    | 1.03                | $0.21 \pm 0.63$   | $-0.68 \pm 0.70$   |

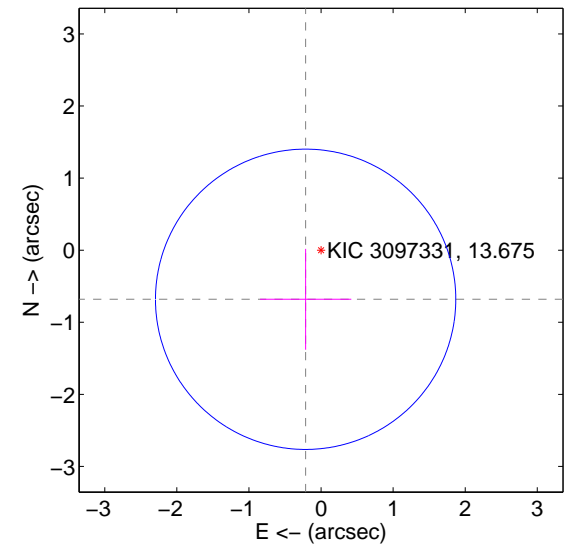
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

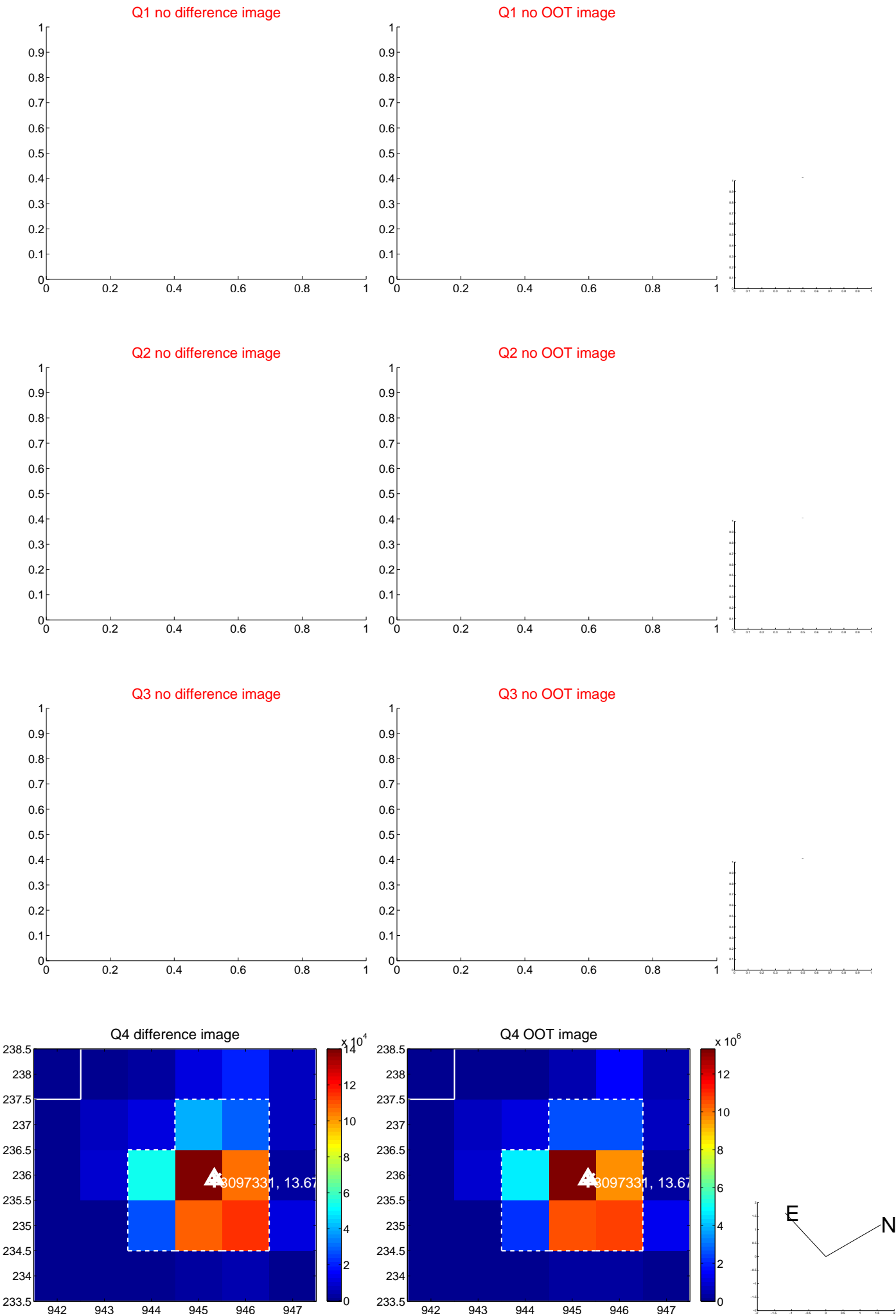


offset from photometric centroids



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.

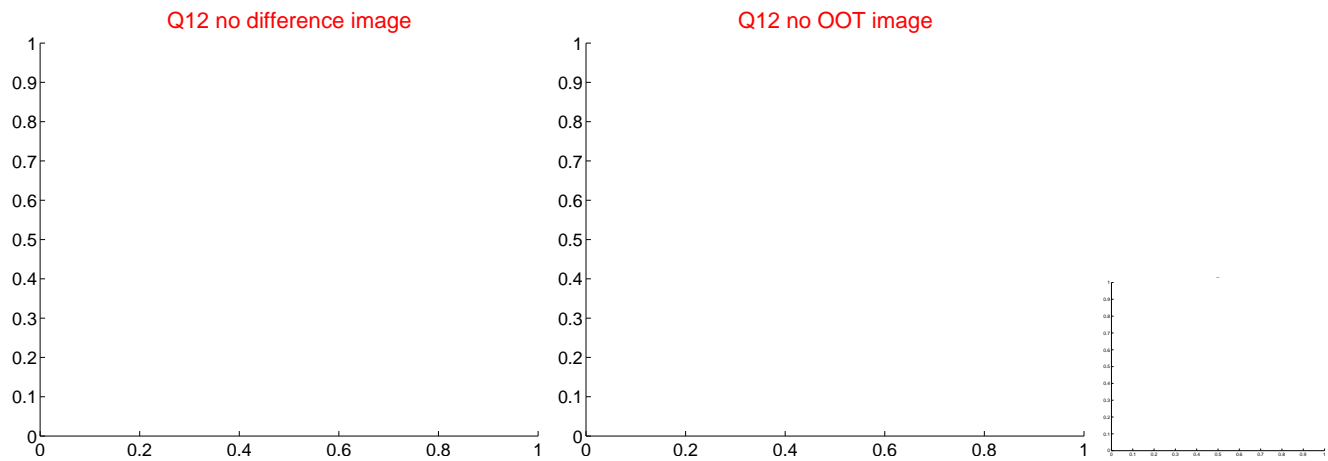
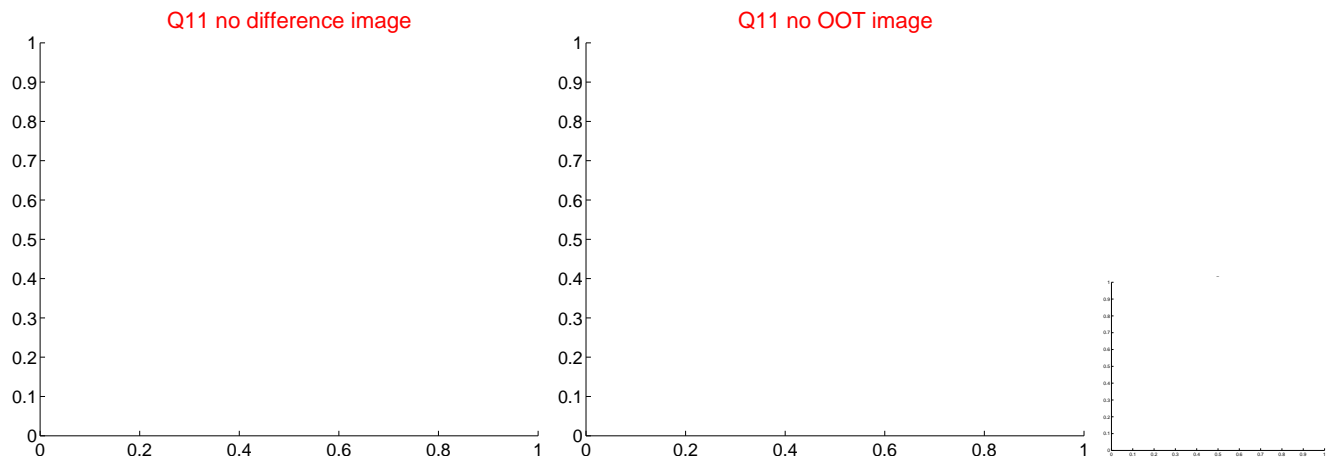
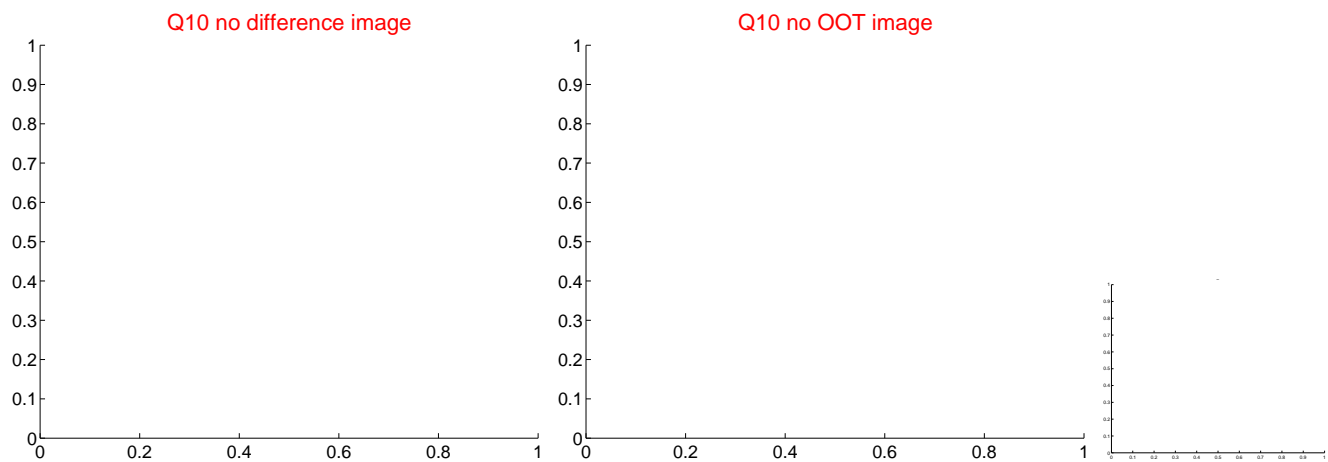
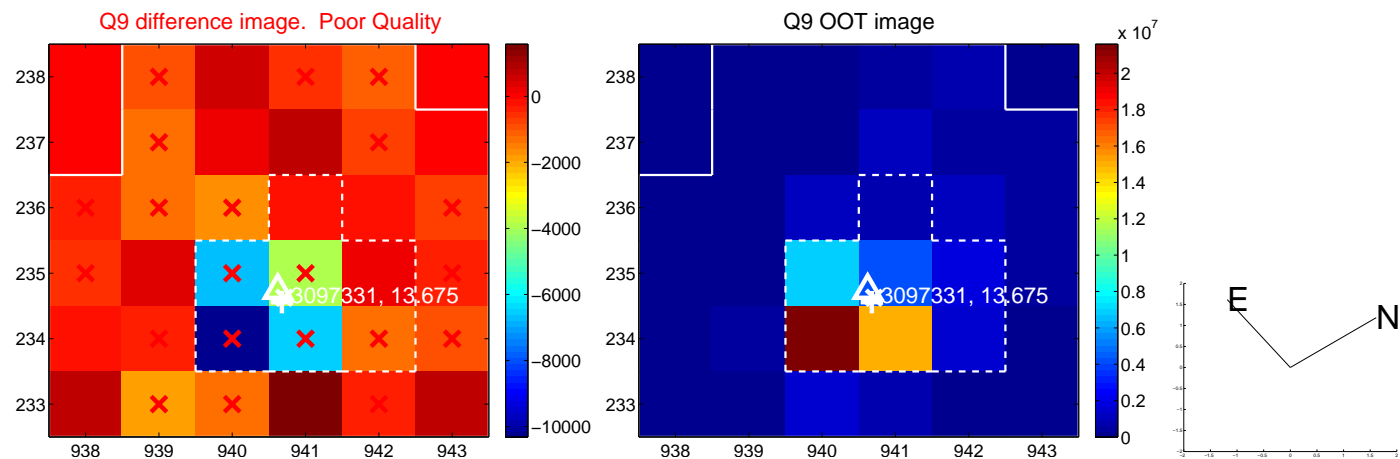


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

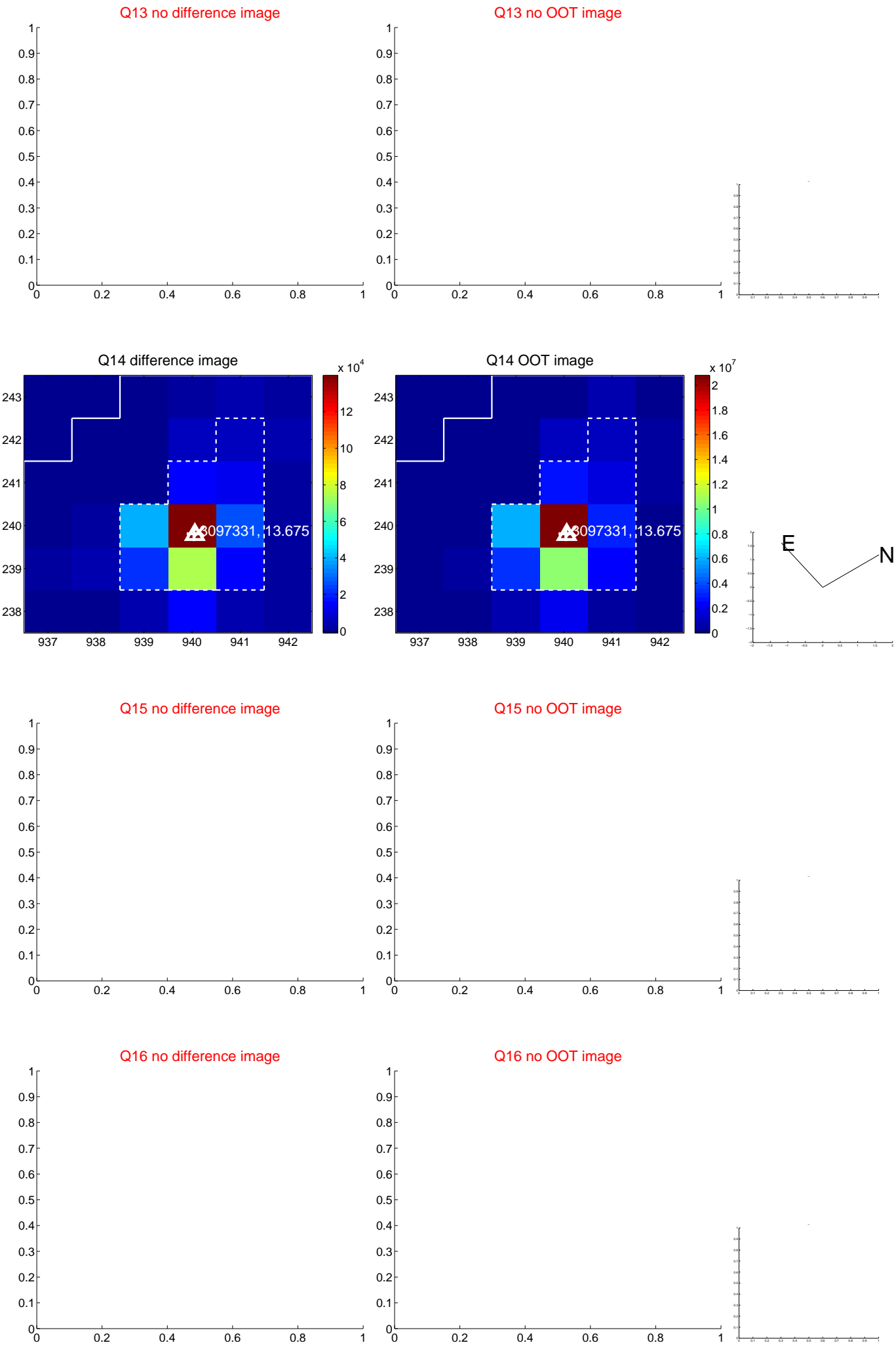




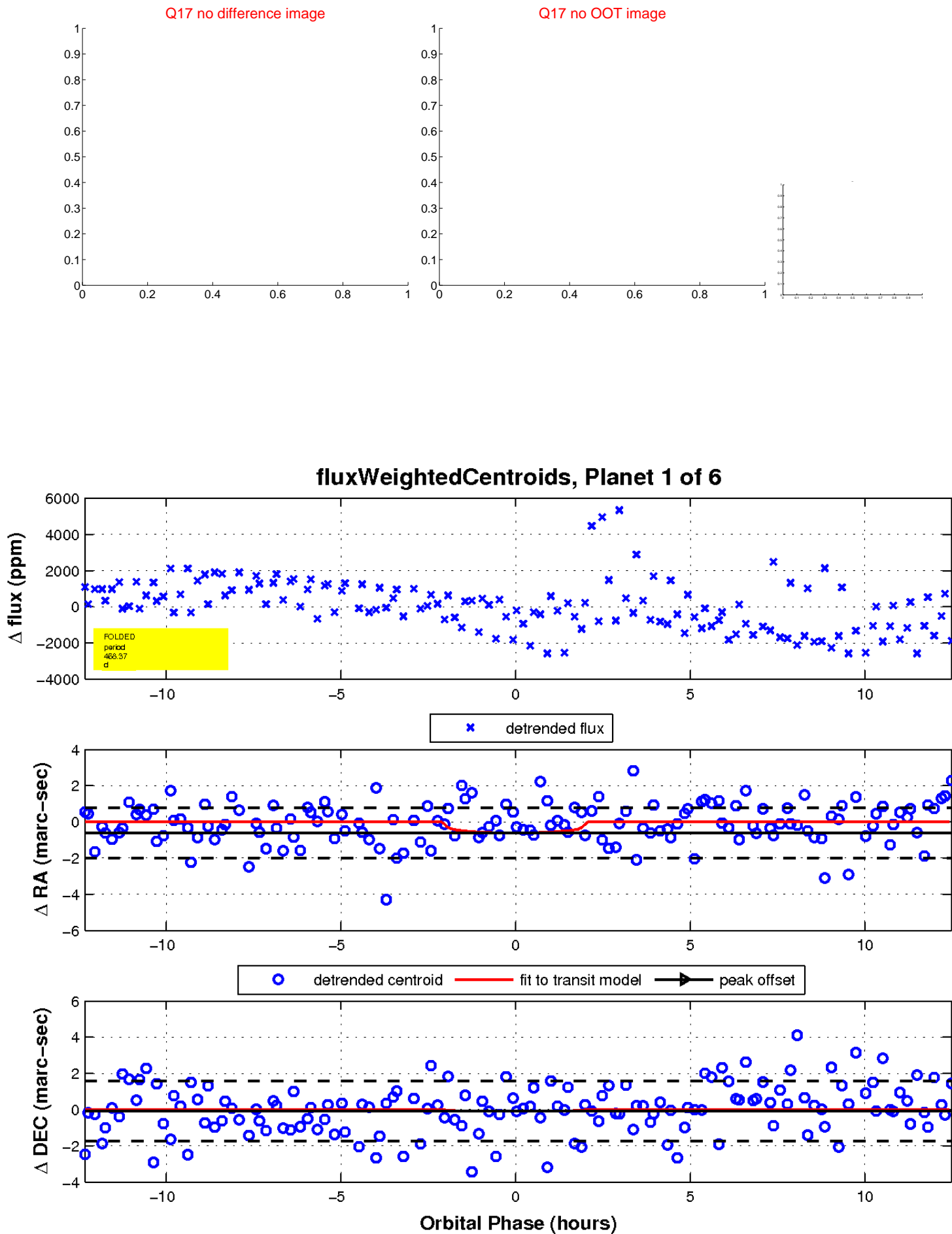
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

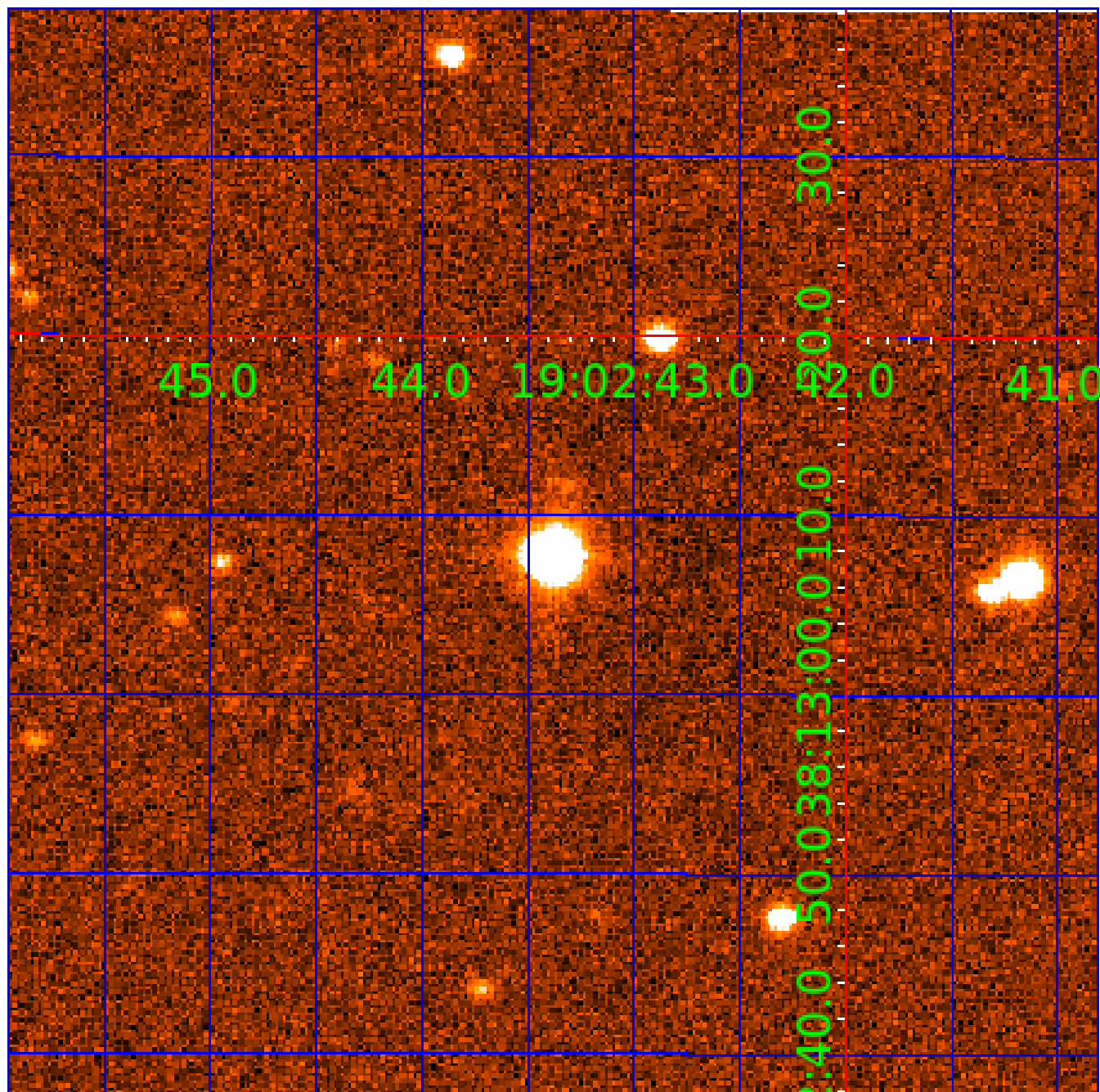


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 003097331

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|-----|-----------------------------|-----------------|------------------------|------------------------|
| 003097331-01 | OBS      | No   | 468.366690    | 432.617373   | 1387.3      | 4.169            | 12.1 | 6.4 | 0.59                        | 4980            | 2.20                   | 0.20                   |
| 003097331-02 | OBS      | No   | 489.078948    | 414.566850   | 1071.9      | 17.003           | 14.0 | 3.7 | 0.59                        | 4980            | 1.94                   | 0.18                   |
| 003097331-03 | OBS      | No   | 382.669196    | 285.730703   | 1367.3      | 4.468            | 16.3 | 8.2 | 0.59                        | 4980            | 2.21                   | 0.26                   |
| 003097331-04 | OBS      | No   | 506.025469    | 158.006130   | 1052.6      | 3.460            | 11.6 | 5.8 | 0.59                        | 4980            | 1.99                   | 0.18                   |
| 003097331-05 | OBS      | No   | 364.730993    | 242.967867   | 878.4       | 3.690            | 10.5 | 4.7 | 0.59                        | 4980            | 1.83                   | 0.27                   |
| 003097331-06 | OBS      | No   | 524.701079    | 482.439043   | 1284.2      | 4.341            | 13.4 | 6.3 | 0.59                        | 4980            | 2.12                   | 0.17                   |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments   |
|--------------|----------|------|-------|---|---|---|---|--|
| 003097331-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS  |
| 003097331-02 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS  |
| 003097331-03 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_MARSHALL_SKYE—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS |
| 003097331-04 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS   |
| 003097331-05 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS                                   |
| 003097331-06 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—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.

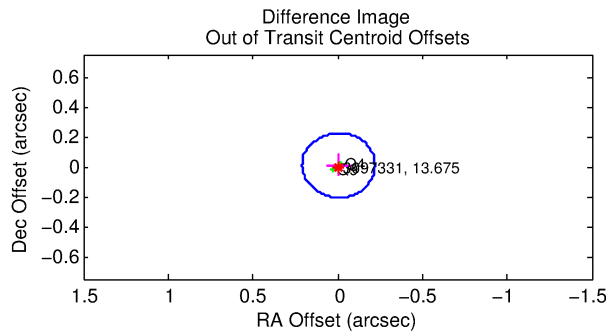
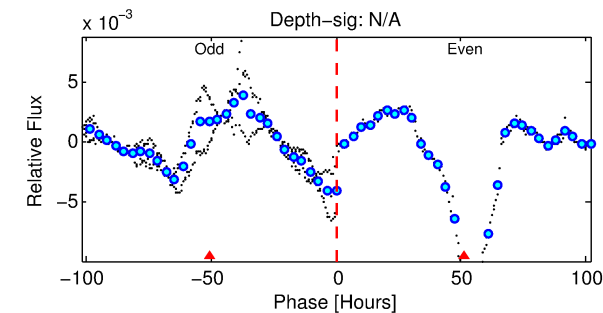
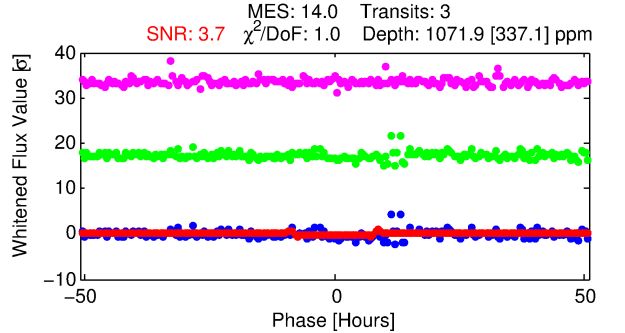
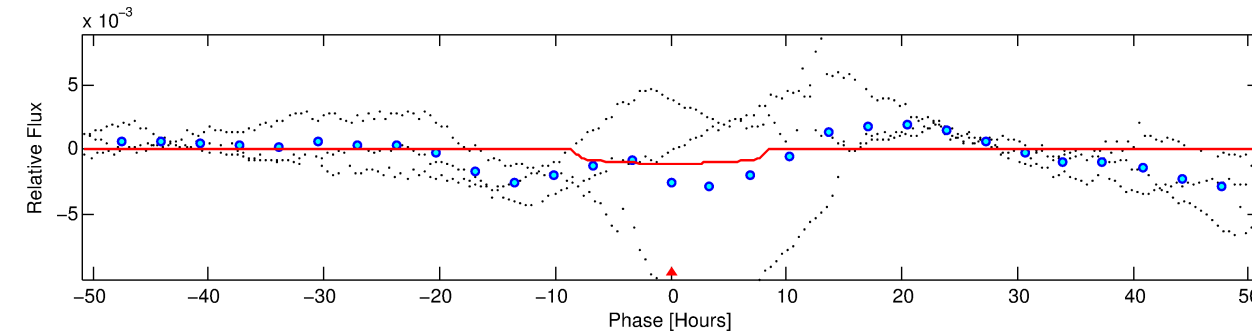
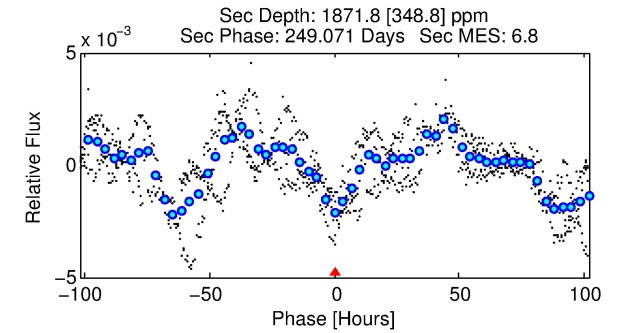
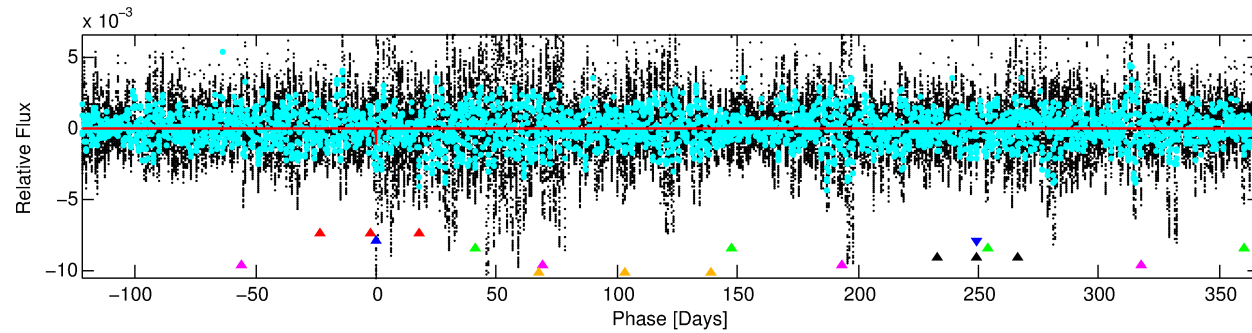
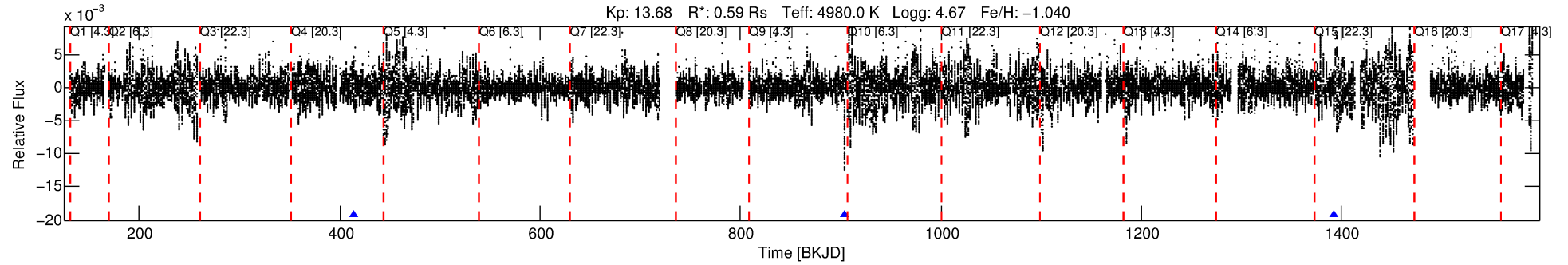
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 003097331-02

No Significant Match Found

# DV One-Page Summary

KIC: 3097331 Candidate: 2 of 6 Period: 489.079 d



## DV Fit Results:

Period = 489.07895 [0.00729] d  
Epoch = 414.5669 [0.0101] BKJD  
Rp/R\* = 0.0301 [0.0113]  
a/R\* = 206.94 [249.43]  
b = 0.42 [2.38]  
Seff = 0.18 [0.03]  
Teq = 167 [6] K  
Rp = 1.94 [0.74] Re  
a = 1.0194 [0.0660] AU  
Ag = 285260.48 [222654.34] [1.28 $\sigma$ ]  
Teffp = 5967 [1169] K [4.96 $\sigma$ ]

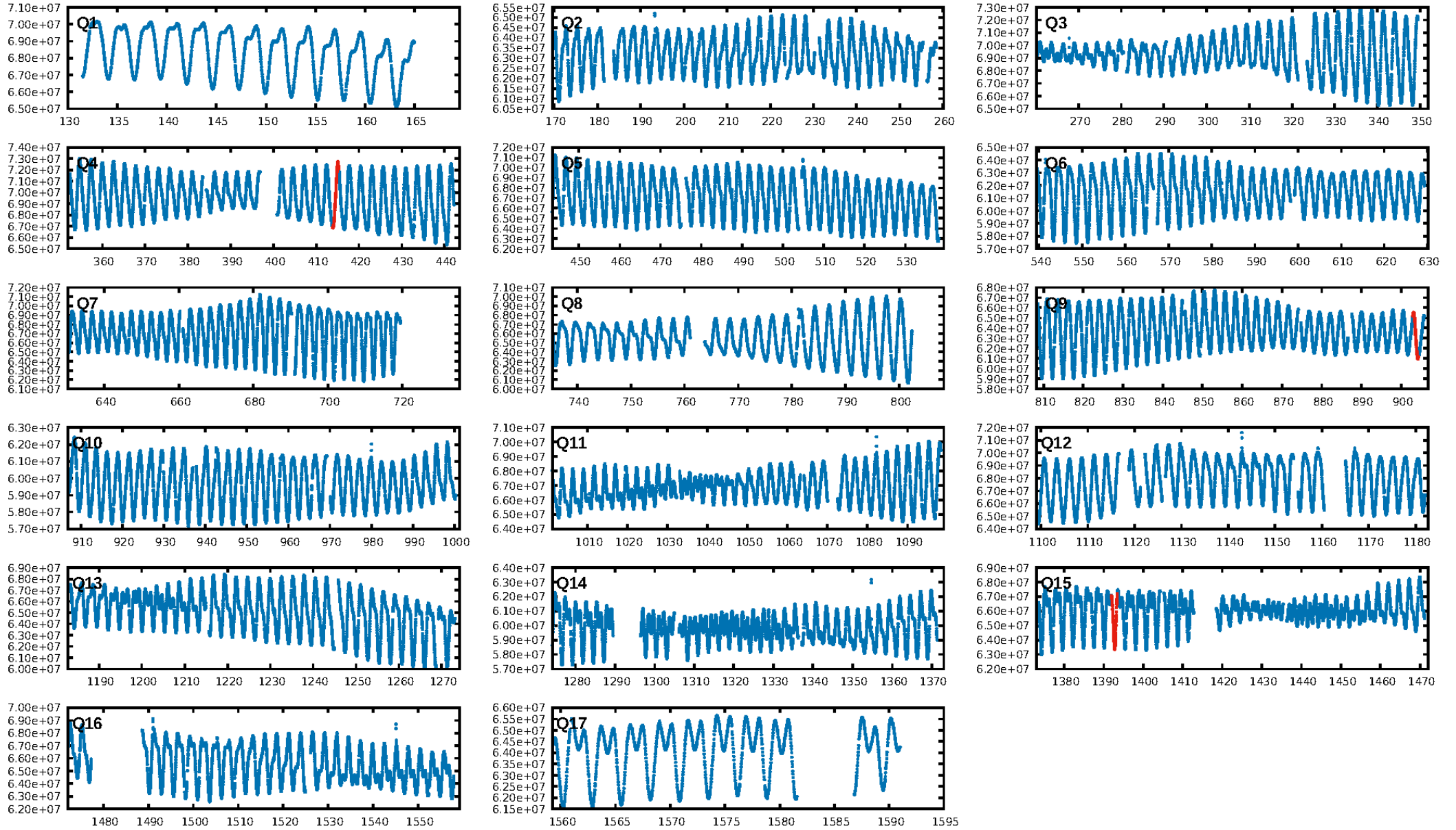
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [28.39 $\sigma$ ]  
LongPeriod-sig: 100.0% [23.44 $\sigma$ ]  
ModelChiSquare2-sig: 0.6%  
ModelChiSquareGof-sig: 82.7%  
**Bootstrap-pfa: 5.77e-12**  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: 0.3821  
Centroid-sig: 20.0%  
Centroid-so: 0.482 arcsec [0.88 $\sigma$ ]  
OotOffset-rm: 0.010 arcsec [0.14 $\sigma$ ]  
OotOffset-st: 0/0/1/1 [2]  
KicOffset-rm: 0.203 arcsec [2.33 $\sigma$ ]  
KicOffset-st: 0/0/1/1 [2]  
DiffImageQuality-fgm: 0.00 [0/2]  
DiffImageOverlap-fno: 1.00 [2/2]

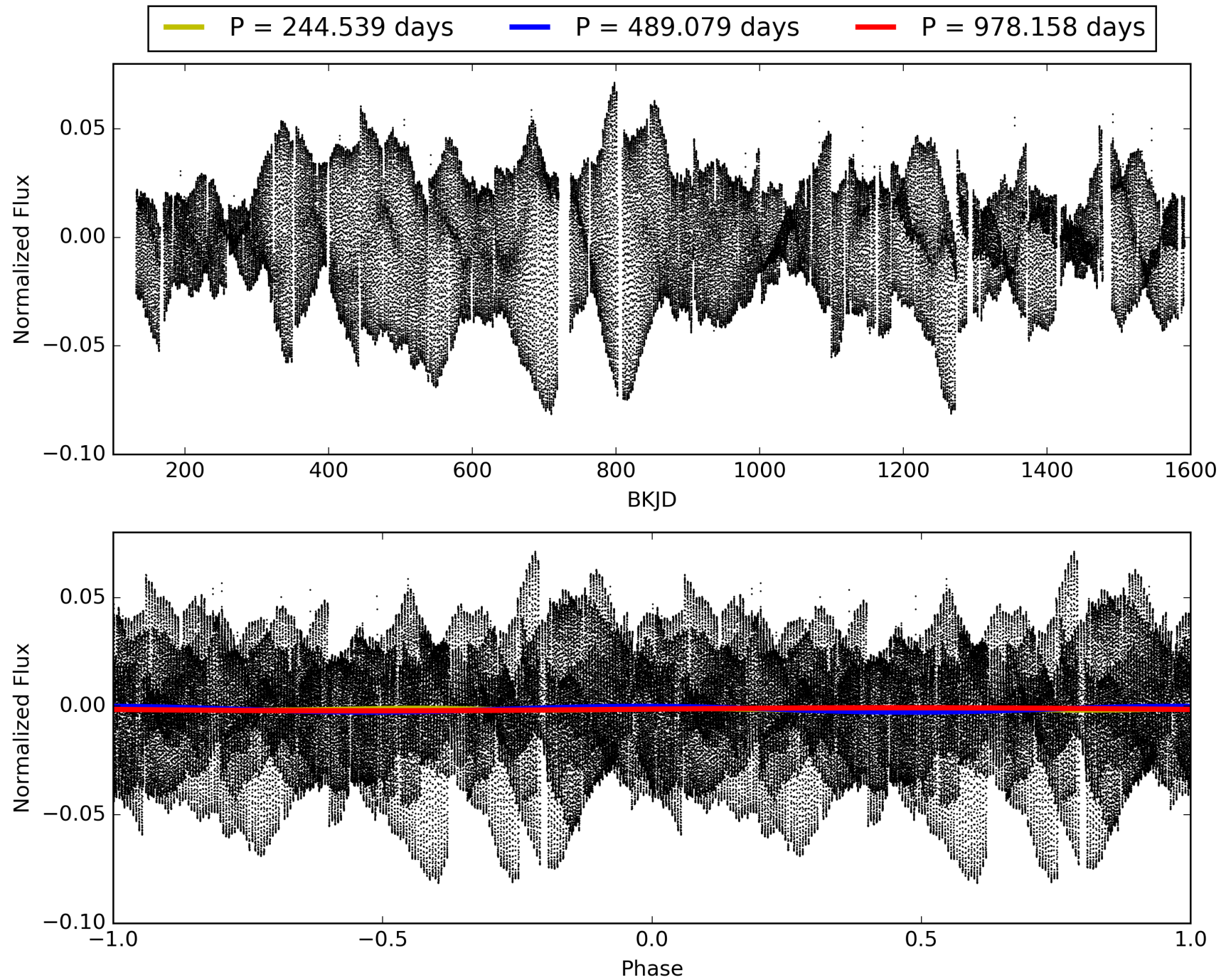
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 02-Feb-2016 01:10:46 Z

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

# TCE 003097331-02, PDC Light Curves

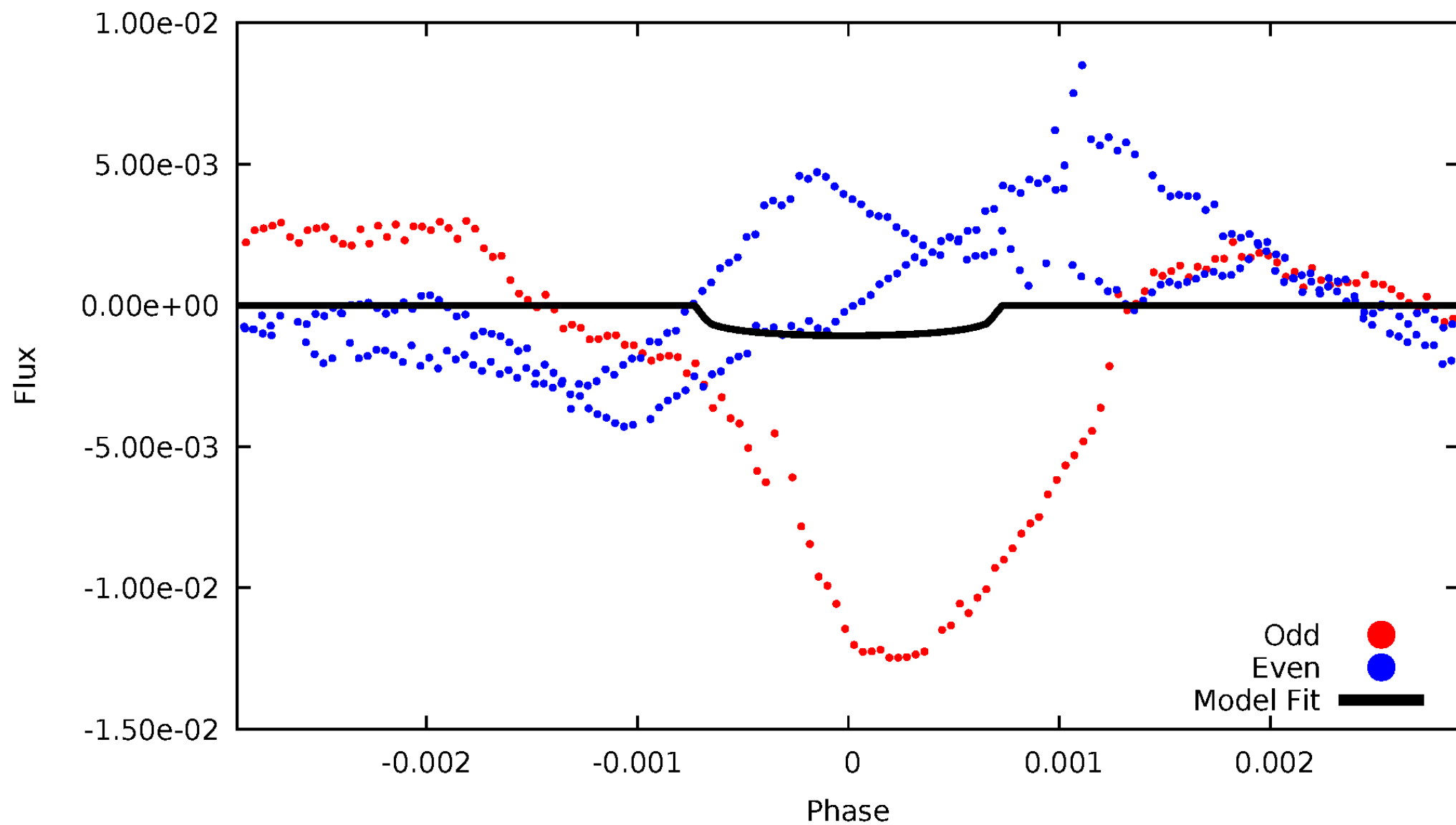


TCE 003097331-02



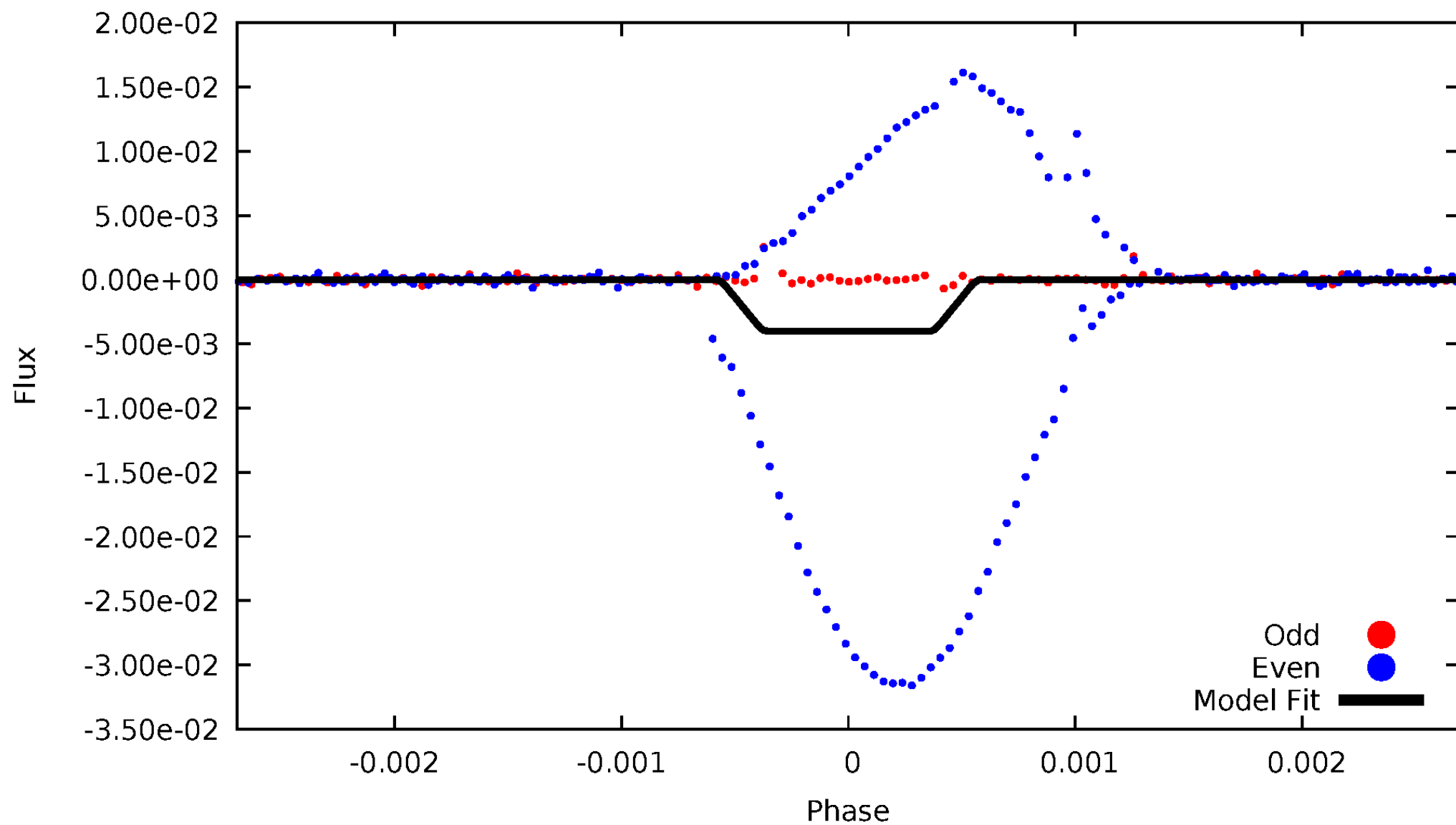
# DV Odd/Even

TCE 003097331-02



# ALT Odd/Even

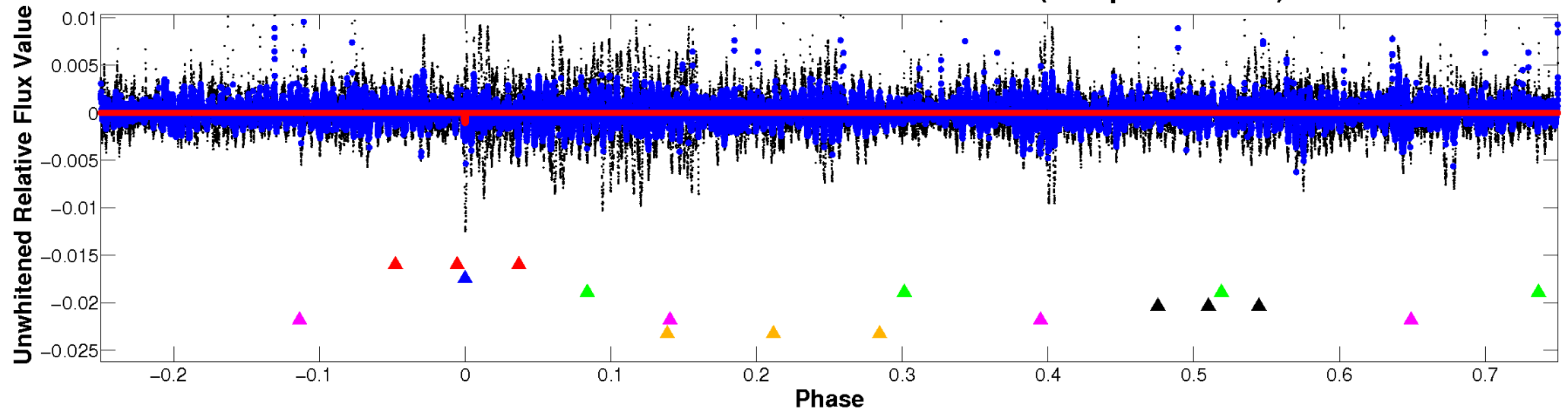
TCE 003097331-02



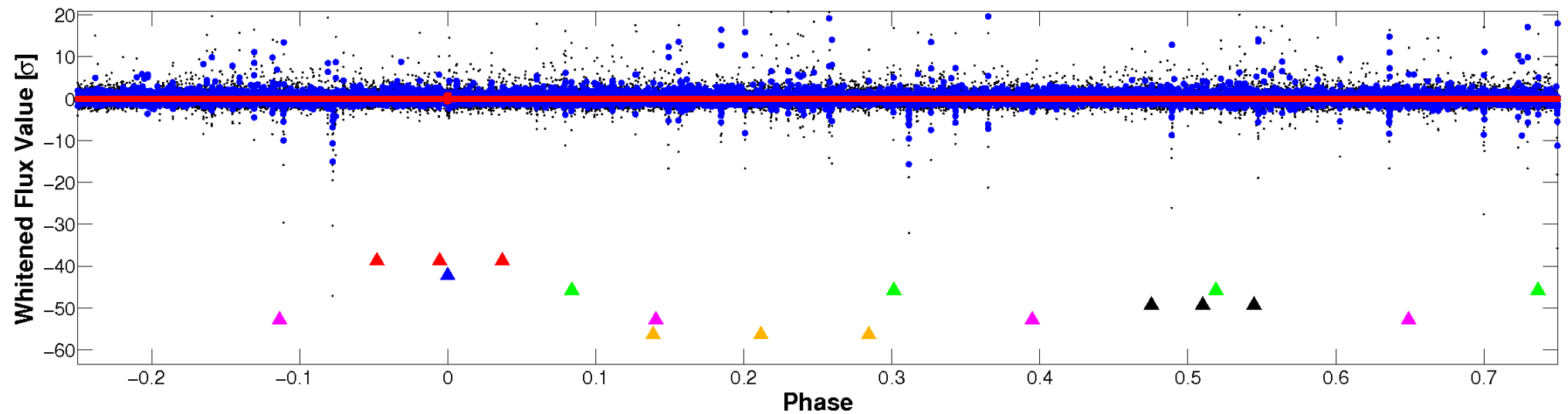


# Non-Whitened Vs. Whitened Light Curve

## Planet 2 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)



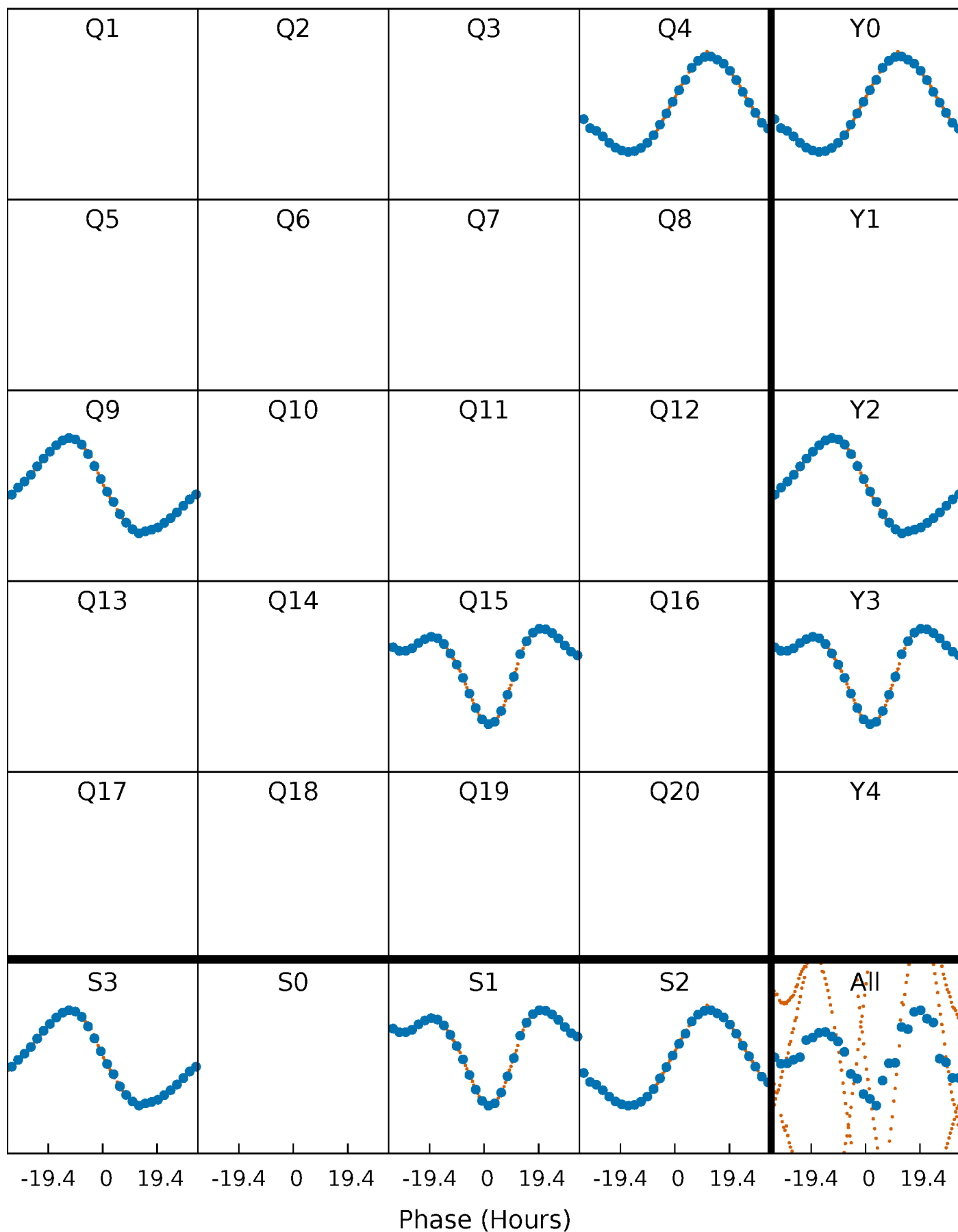
## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)





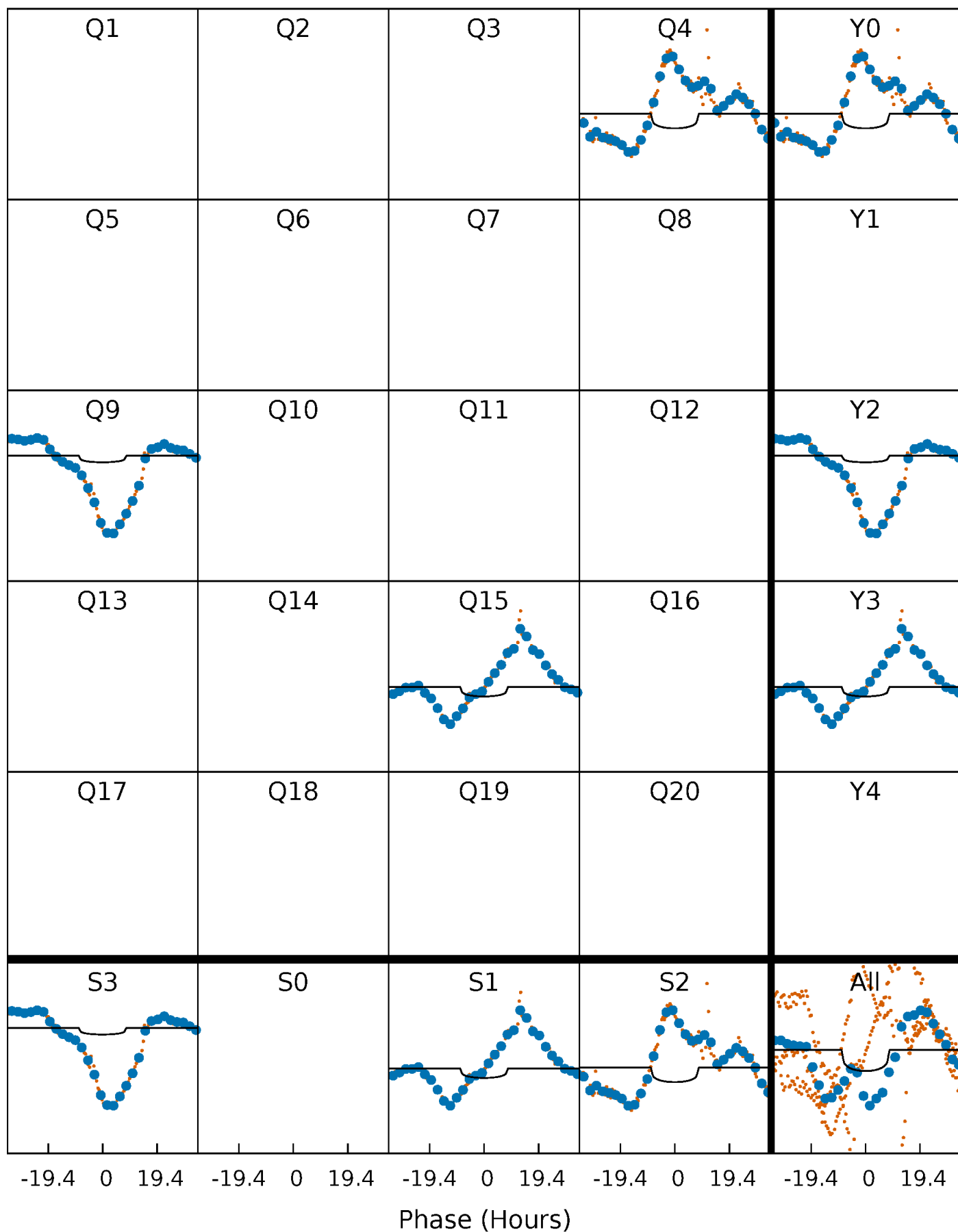
# PDC Quarter-Phased Transit Curves

TCE 003097331-02 P=489.078948 Days  $T_0=414.566850$  (BKJD)



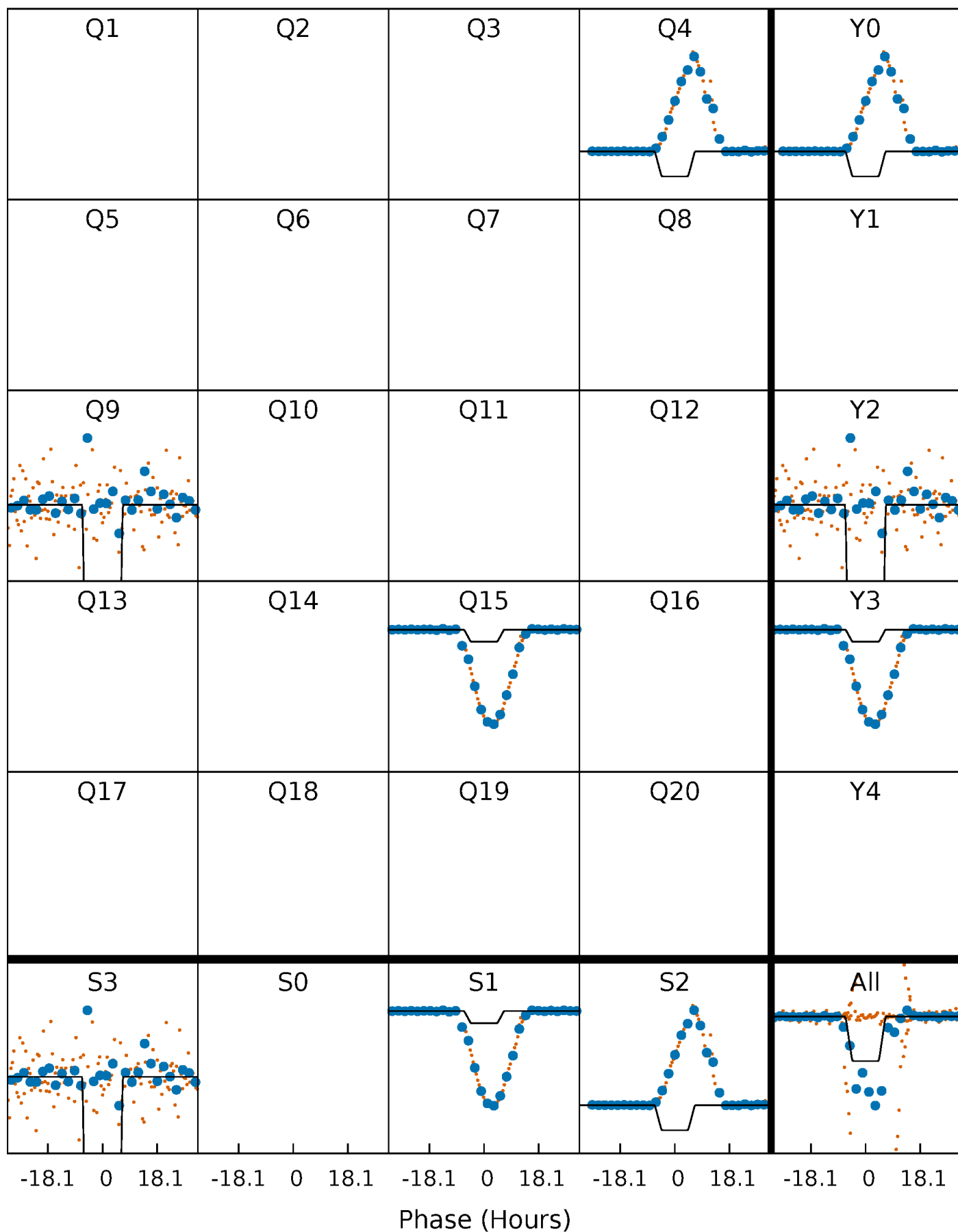
# DV Quarter-Phased Transit Curves

TCE 003097331-02     $P=489.078948$  Days     $T_0=414.566850$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

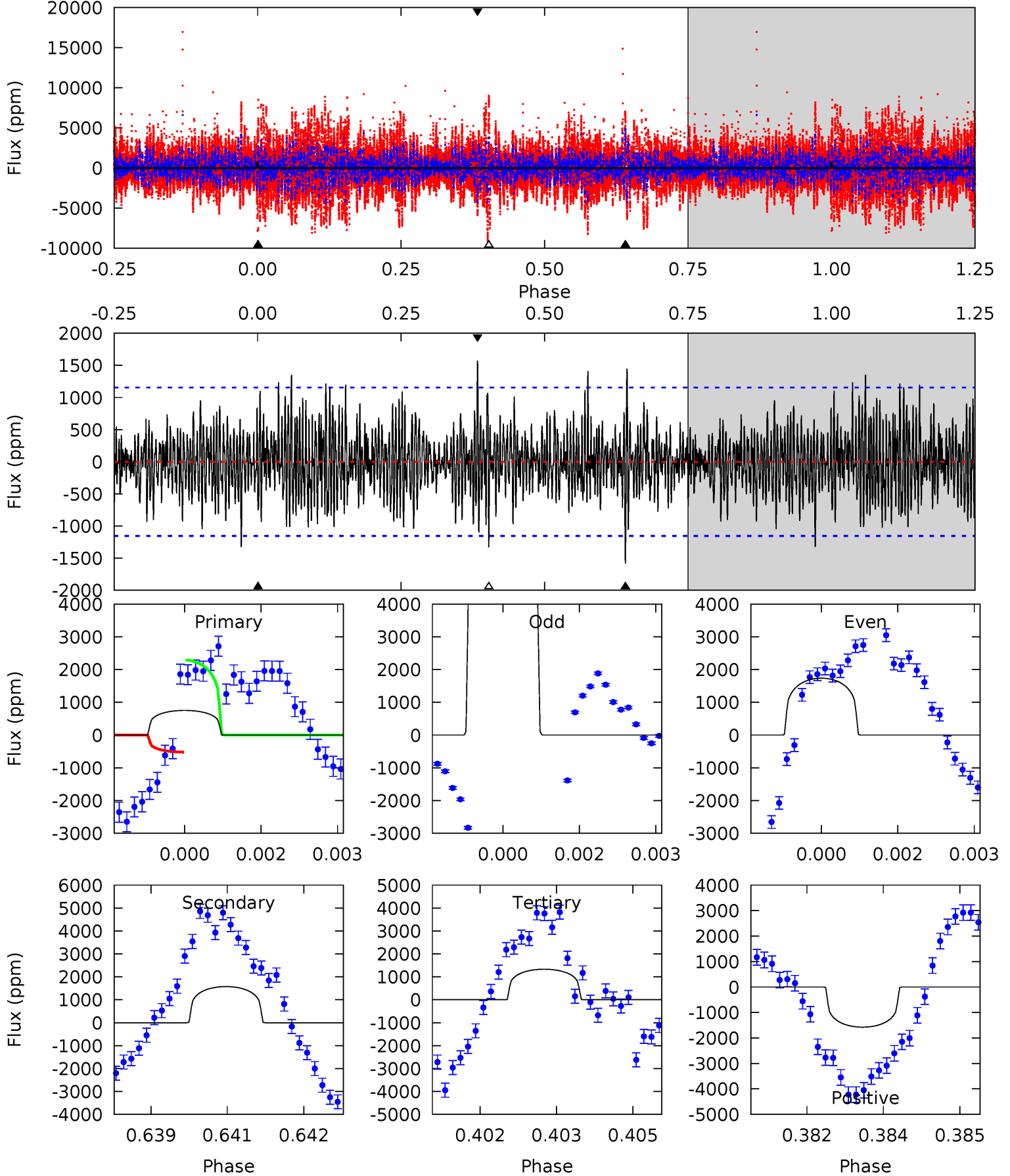
TCE 003097331-02 P=489.104503 Days  $T_0=414.553215$  (BKJD)



# DV Model-Shift Uniqueness Test

003097331-02, P = 489.078948 Days, E = 414.566850 Days

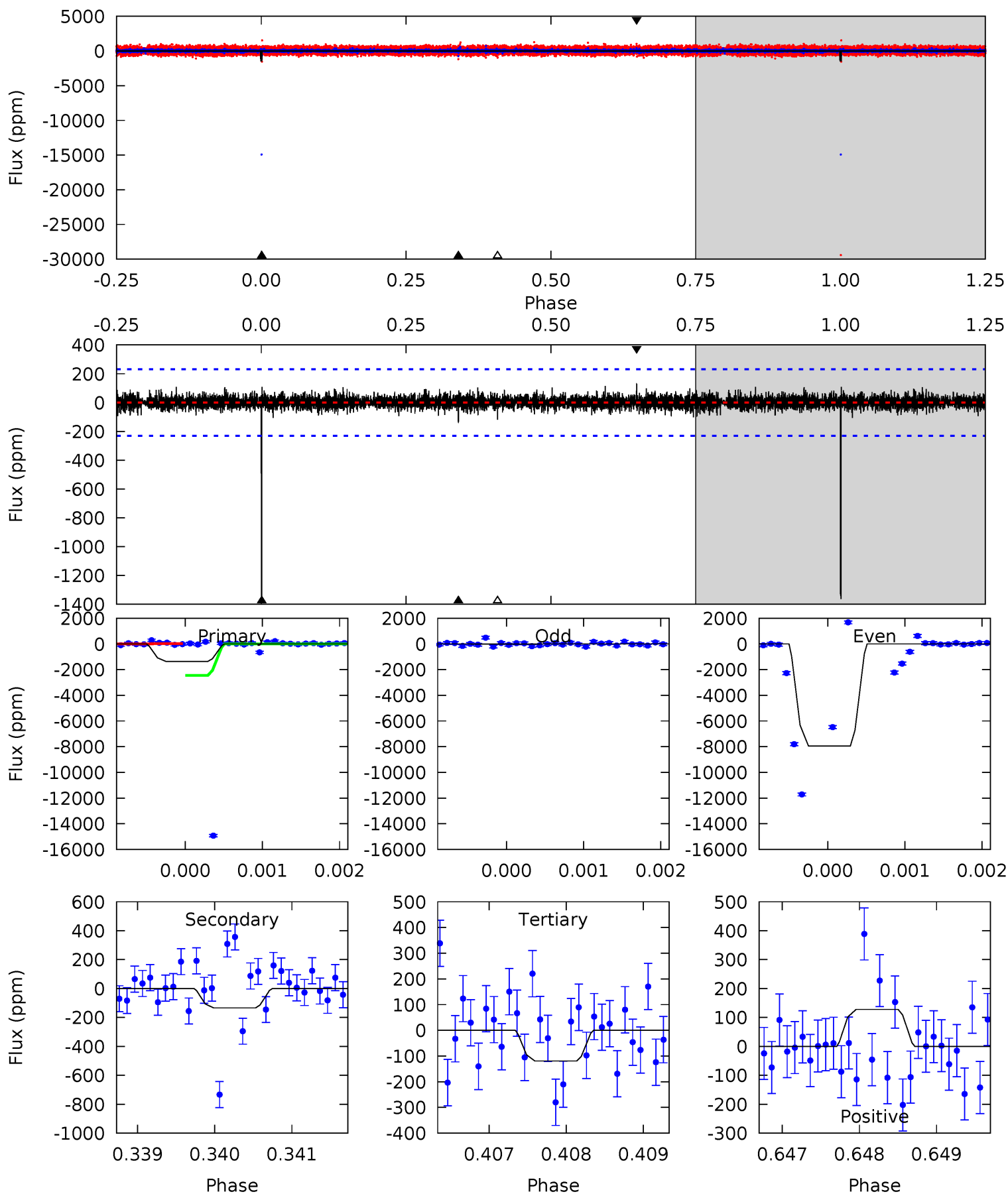
| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM   | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|-------|-------|------|
| 3.50 | 7.33 | 6.20 | 7.33 | 5.38            | 3.17            | 1.89             | -2.69   | -3.83   | 1.13    | -0.00   | 20.1    | -10.2 | 0.50  | 4.01 |



# Alt Model-Shift Uniqueness Test

003097331-02, P = 489.104503 Days, E = 414.553215 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 |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|-------|-------|-----|
| 32.1 | 3.14 | 2.80 | 3.01 | 5.43            | 3.25            | 0.58             | 29.3    | 29.1    | 0.34    | 0.13    | 131.8   | -53.4 | 0.09  | 0   |



### Stellar Parameters For KIC 003097331

|        | $T_{\text{eff}} (K)$ | $\log(g)$                 | [Fe/H]                     | $R (R_{\odot})$           | $M (M_{\odot})$           | $p_{\star} (g \cdot \text{cm}^{-3})$ |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|--------------------------------------|
|        | $4980^{+149}_{-134}$ | $4.669^{+0.052}_{-0.036}$ | $-1.040^{+0.300}_{-0.300}$ | $0.589^{+0.045}_{-0.037}$ | $0.590^{+0.051}_{-0.022}$ | $4.065^{+0.792}_{-0.552}$            |
|        | +3%/-3%              | +1%/-1%                   | +29%/-29%                  | +8%/-6%                   | +9%/-4%                   | +19%/-14%                            |
| 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 003097331-02 / KOI

| Detrend | Depth (ppm)     | $R_p (R_{\oplus})$     | $T_{\text{max}} (K)$ | $T_{\text{obs}} (K)$  | $A_{\text{obs}}$             |
|---------|-----------------|------------------------|----------------------|-----------------------|------------------------------|
| DV      | $-1574 \pm 215$ | $1.92^{+0.71}_{-0.72}$ | $233^{+9}_{-7}$      | $5654^{+1560}_{-784}$ | $249630^{+373644}_{-122055}$ |
| Alt.    | $-133 \pm 43$   | $4.11^{+0.74}_{-0.76}$ | $233^{+7}_{-7}$      | $2824^{+189}_{-187}$  | $4610^{+2948}_{-1869}$       |

$T_{\text{max}}$  = 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  $A_{\text{obs}} \gg 1.0$

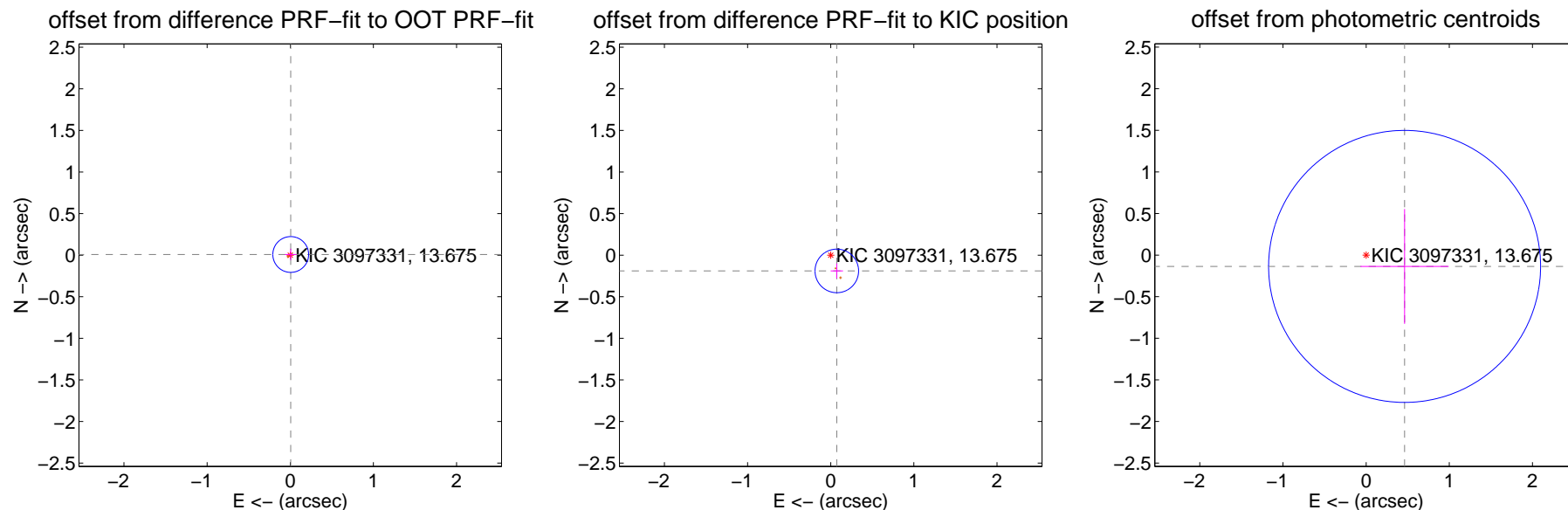
## DV Centroid Data

Supplemental centroid analysis for 003097331-02. Kepler magnitude: 13.68. Transit SNR 3.74

There are 0 quarters with good PRF difference image offsets

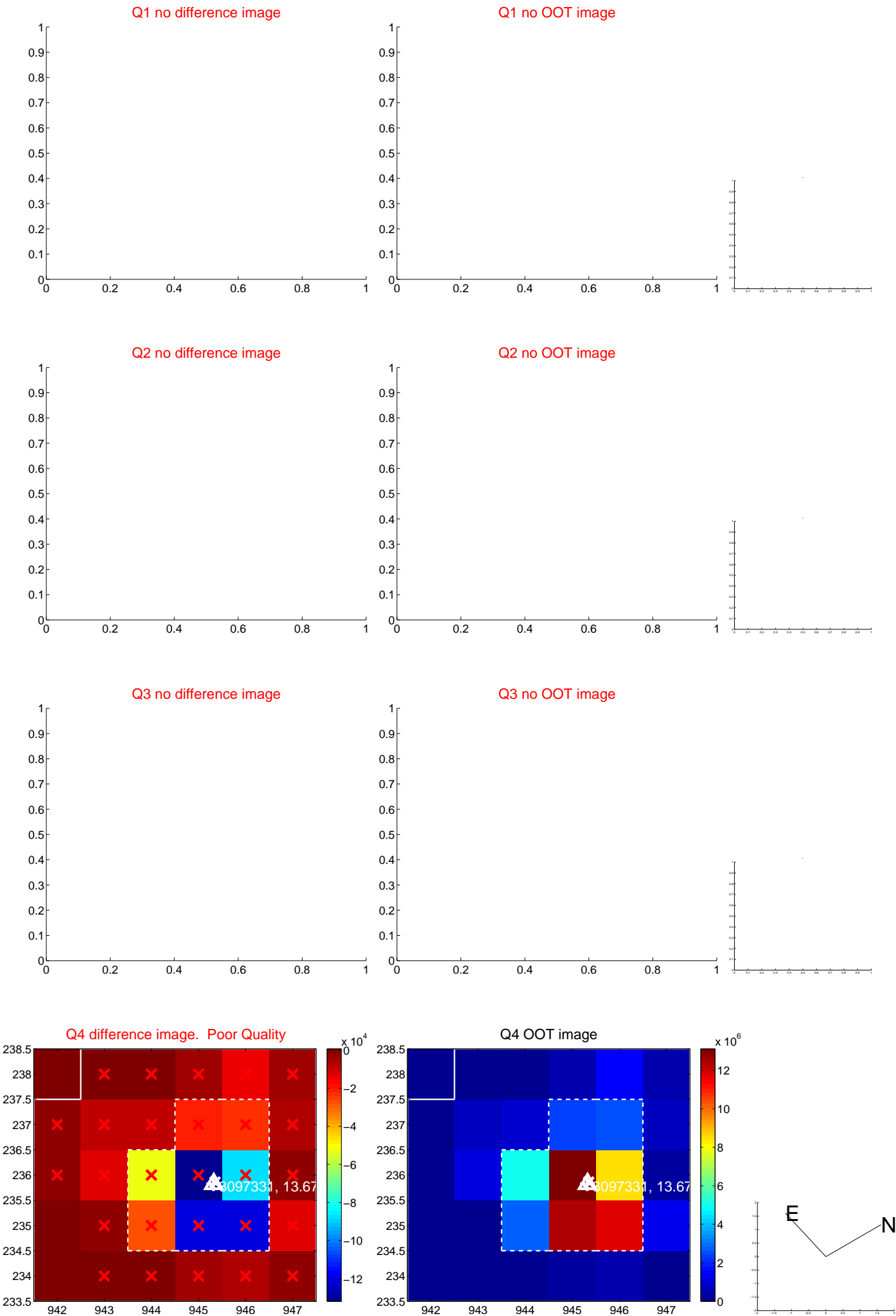
The direct PRF centroid is offset from the target star catalog position by about 0.29 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA        | $\Delta$ Dec       |
|---|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT          | $0.010 \pm 0.072$  | 0.14                | $-0.006 \pm 0.070$ | $0.008 \pm 0.069$  |
| PRF-fit source offset from KIC position | $0.203 \pm 0.087$  | 2.33                | $-0.073 \pm 0.074$ | $-0.189 \pm 0.089$ |
| photometric centroid source offset      | $0.48 \pm 0.54$    | 0.88                | $-0.46 \pm 0.53$   | $-0.14 \pm 0.69$   |



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.

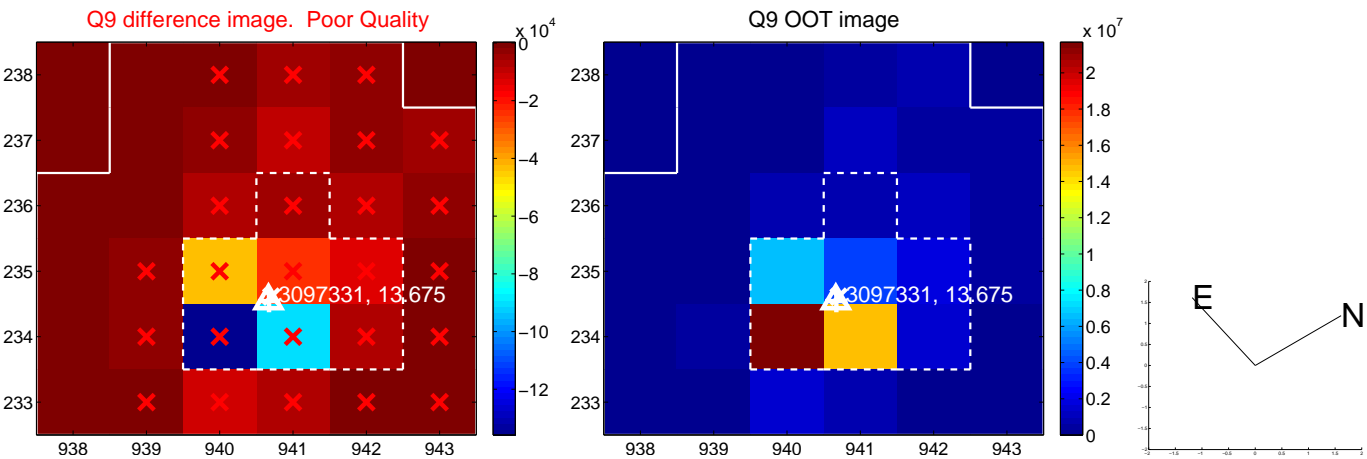




white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



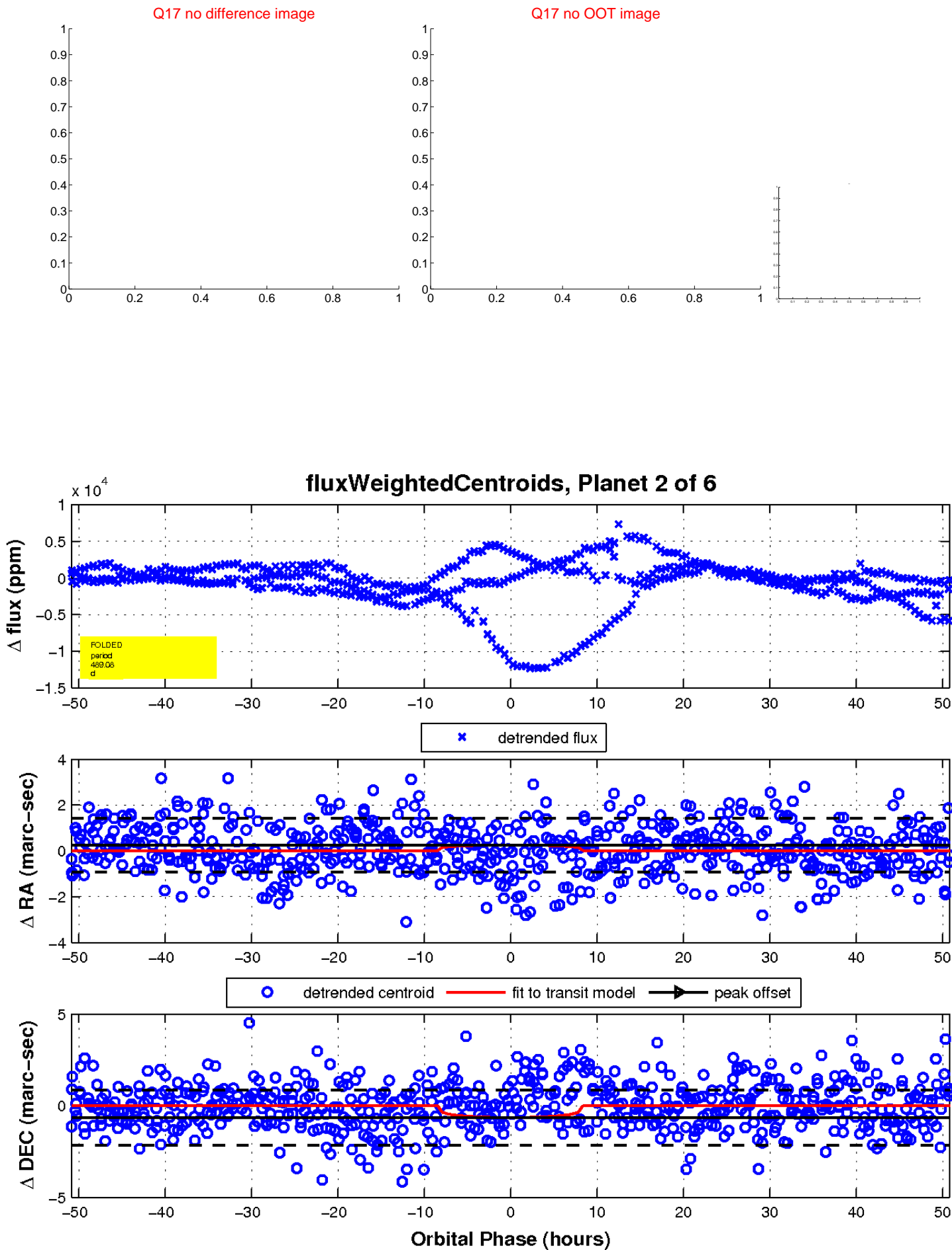
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

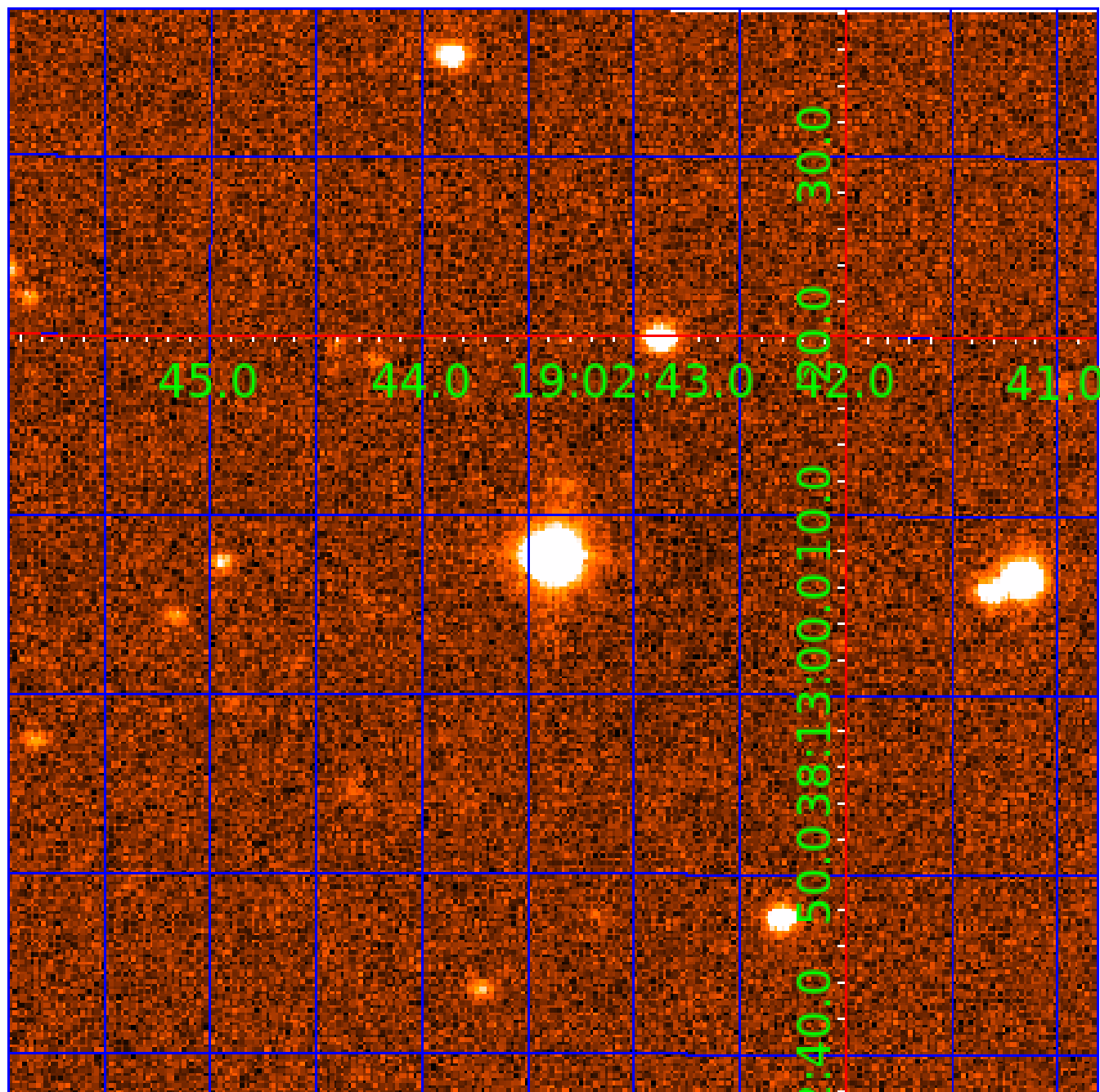


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 003097331

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|-----|-----------------------------|-----------------|------------------------|------------------------|
| 003097331-01 | OBS      | No   | 468.366690    | 432.617373   | 1387.3      | 4.169            | 12.1 | 6.4 | 0.59                        | 4980            | 2.20                   | 0.20                   |
| 003097331-02 | OBS      | No   | 489.078948    | 414.566850   | 1071.9      | 17.003           | 14.0 | 3.7 | 0.59                        | 4980            | 1.94                   | 0.18                   |
| 003097331-03 | OBS      | No   | 382.669196    | 285.730703   | 1367.3      | 4.468            | 16.3 | 8.2 | 0.59                        | 4980            | 2.21                   | 0.26                   |
| 003097331-04 | OBS      | No   | 506.025469    | 158.006130   | 1052.6      | 3.460            | 11.6 | 5.8 | 0.59                        | 4980            | 1.99                   | 0.18                   |
| 003097331-05 | OBS      | No   | 364.730993    | 242.967867   | 878.4       | 3.690            | 10.5 | 4.7 | 0.59                        | 4980            | 1.83                   | 0.27                   |
| 003097331-06 | OBS      | No   | 524.701079    | 482.439043   | 1284.2      | 4.341            | 13.4 | 6.3 | 0.59                        | 4980            | 2.12                   | 0.17                   |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments   |
|--------------|----------|------|-------|---|---|---|---|--|
| 003097331-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS  |
| 003097331-02 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS  |
| 003097331-03 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_MARSHALL_SKYE—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS |
| 003097331-04 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS   |
| 003097331-05 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS                                   |
| 003097331-06 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—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.

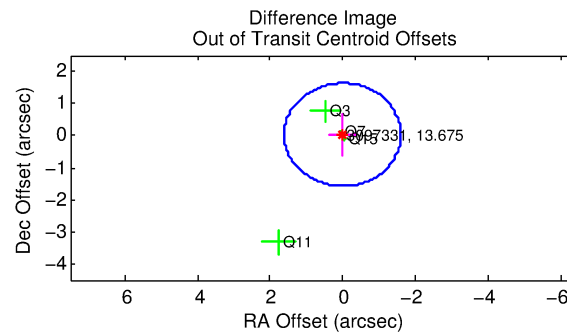
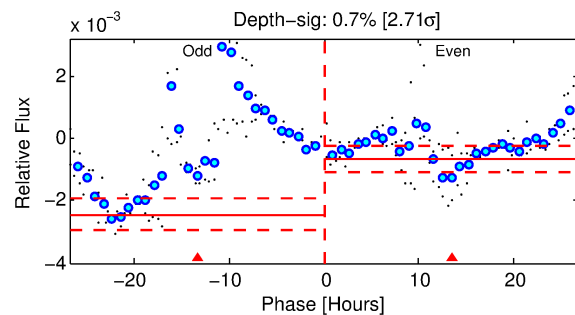
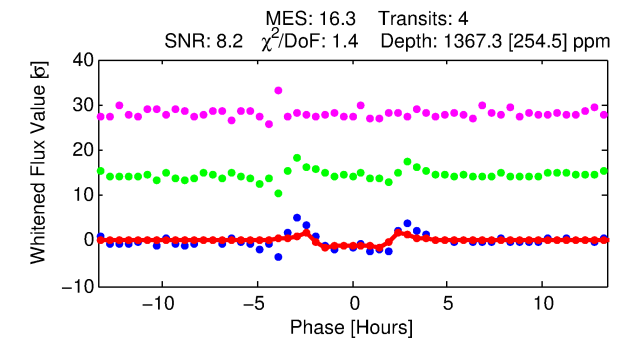
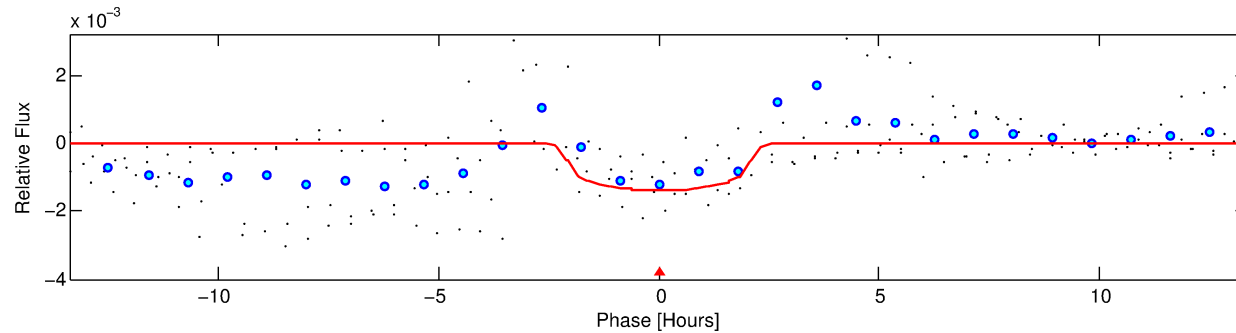
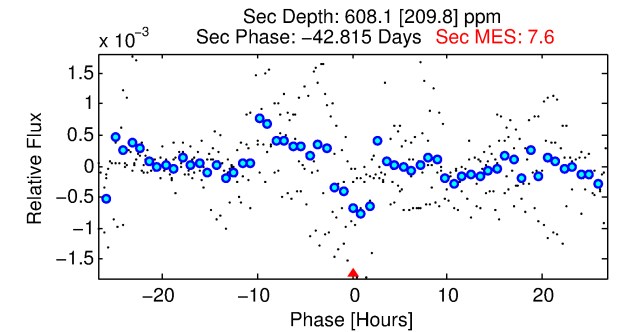
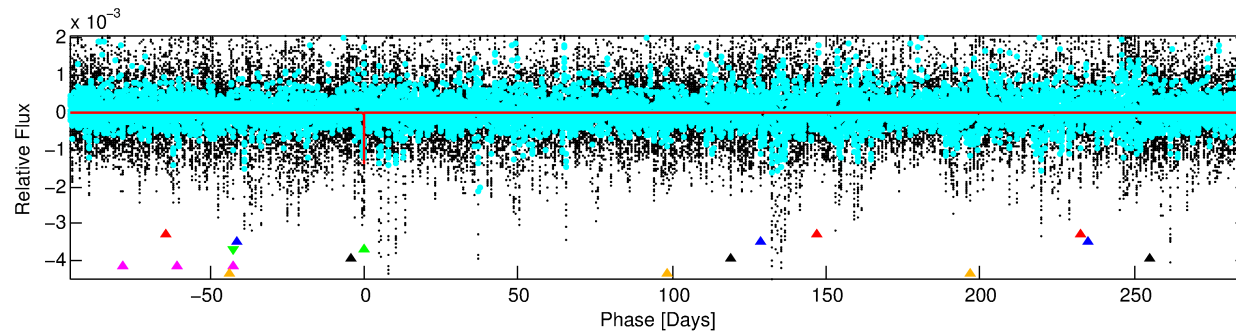
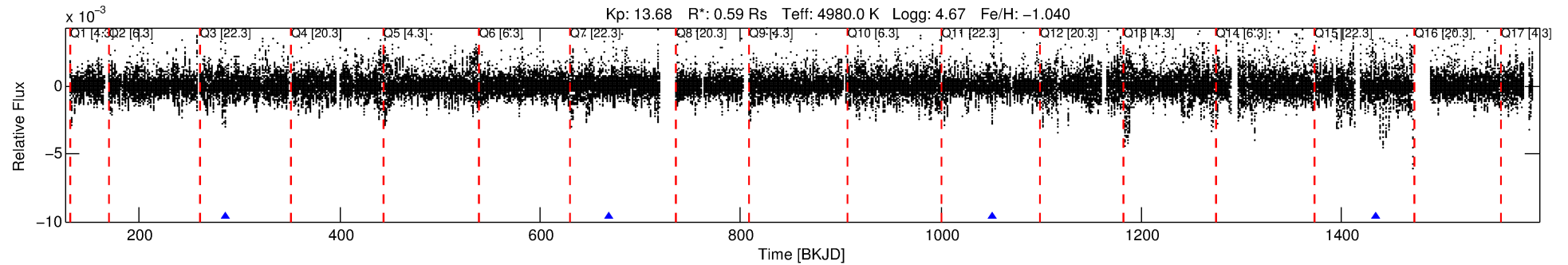
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 003097331-03

No Significant Match Found

# DV One-Page Summary

KIC: 3097331 Candidate: 3 of 6 Period: 382.669 d



## DV Fit Results:

Period = 382.66920 [0.00339] d  
Epoch = 285.7307 [0.0069] BKJD  
Rp/R\* = 0.0345 [0.0375]  
a/R\* = 592.54 [2504.27]  
b = 0.50 [6.42]  
Seff = 0.26 [0.04]  
Teq = 181 [7] K  
Rp = 2.22 [2.42] Re  
a = 0.8656 [0.0560] AU  
Ag = 51079.55 [112649.13] [0.45 $\sigma$ ]  
Teffp = 4212 [2324] K [1.73 $\sigma$ ]

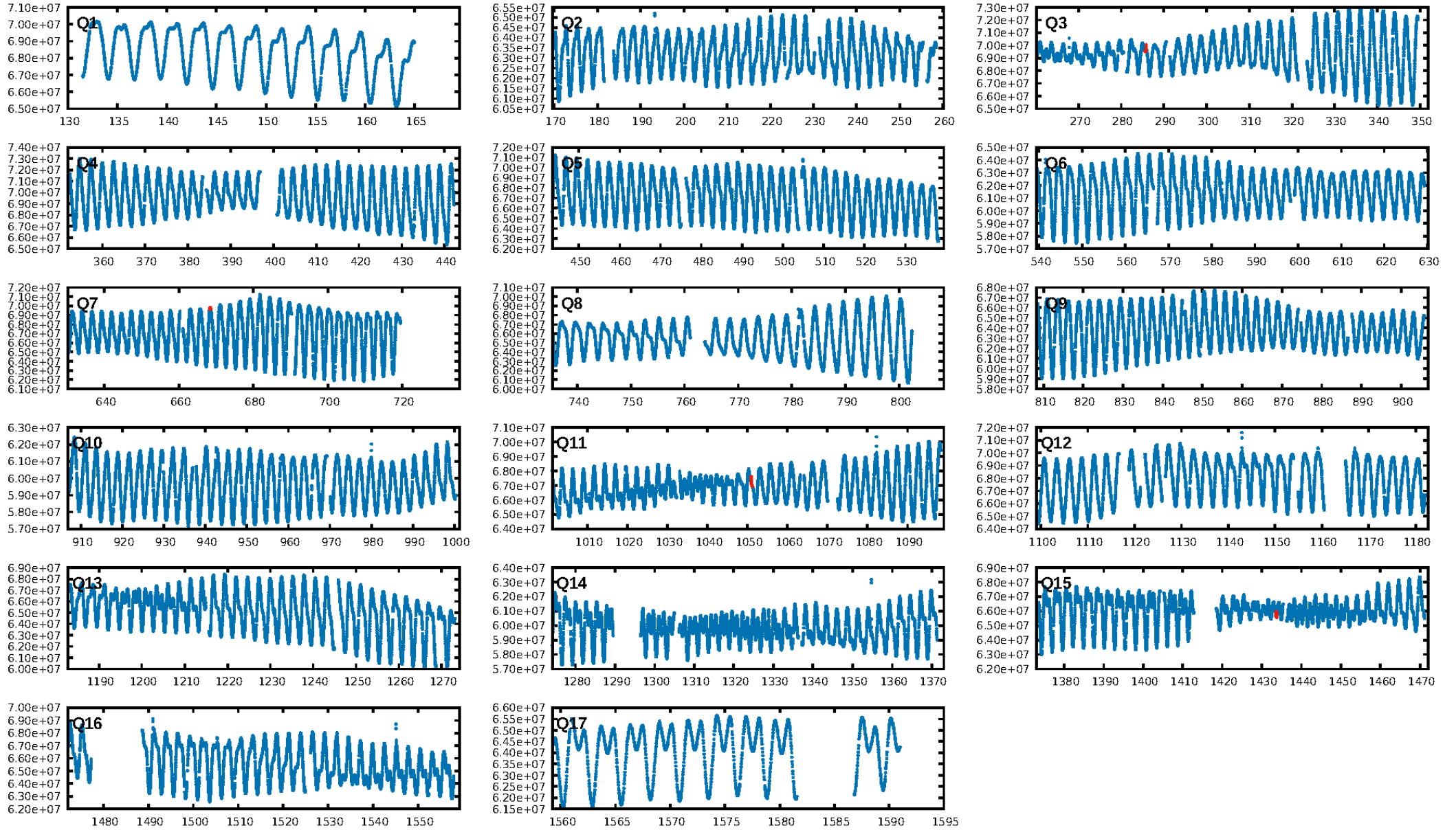
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [74.29 $\sigma$ ]  
LongPeriod-sig: 100.0% [336.57 $\sigma$ ]  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 45.9%  
Bootstrap-pfa: 1.53e-15  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: 1.691  
Centroid-sig: 31.0%  
Centroid-so: 1.171 arcsec [2.26 $\sigma$ ]  
OotOffset-rm: 0.028 arcsec [0.05 $\sigma$ ]  
OotOffset-st: 0/4/0/0 [4]  
KicOffset-rm: 0.239 arcsec [0.26 $\sigma$ ]  
KicOffset-st: 0/4/0/0 [4]  
DiffImageQuality-fgm: 0.50 [2/4]  
DiffImageOverlap-fno: 1.00 [4/4]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 02-Feb-2016 01:11:00 Z

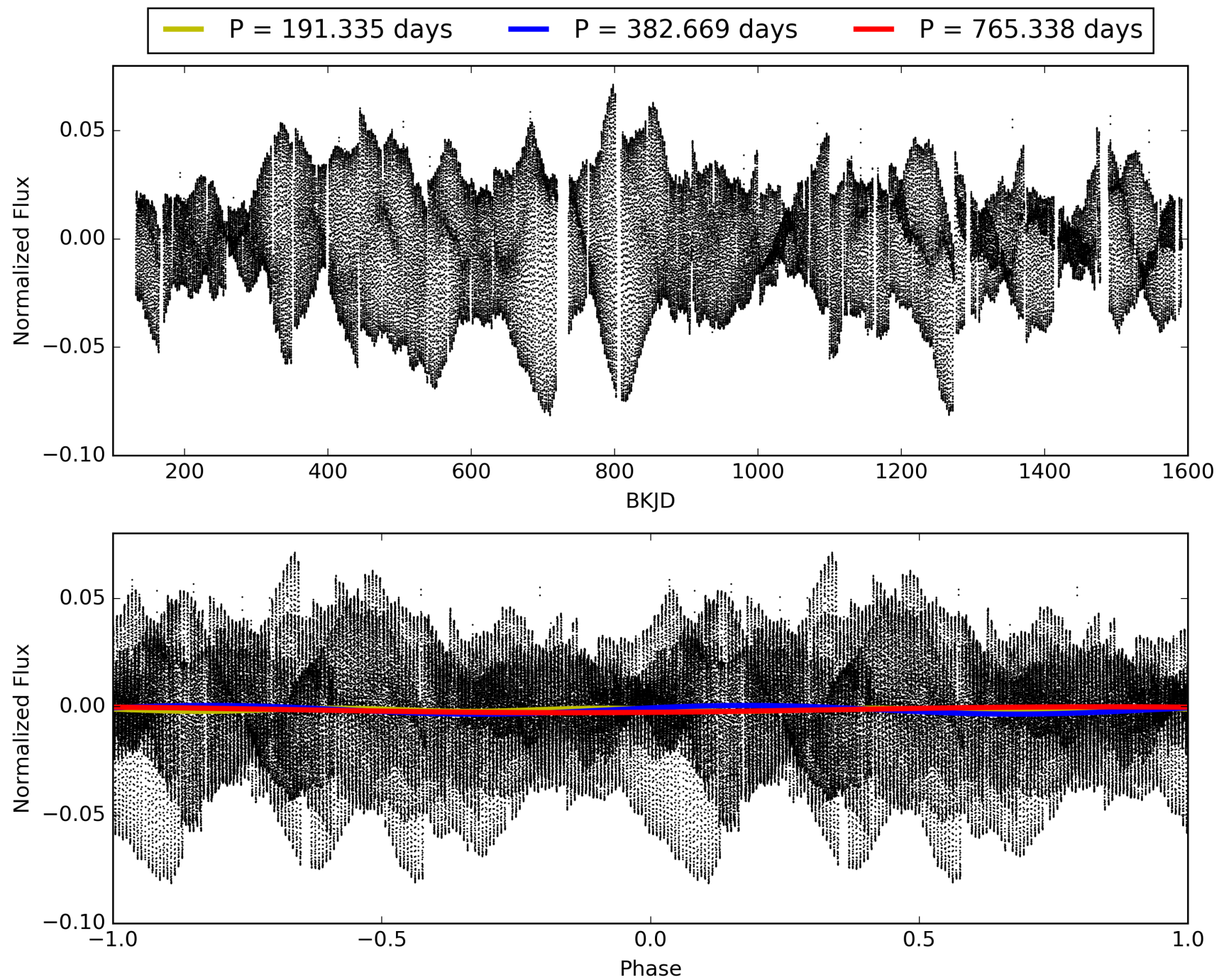
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 003097331-03, PDC Light Curves



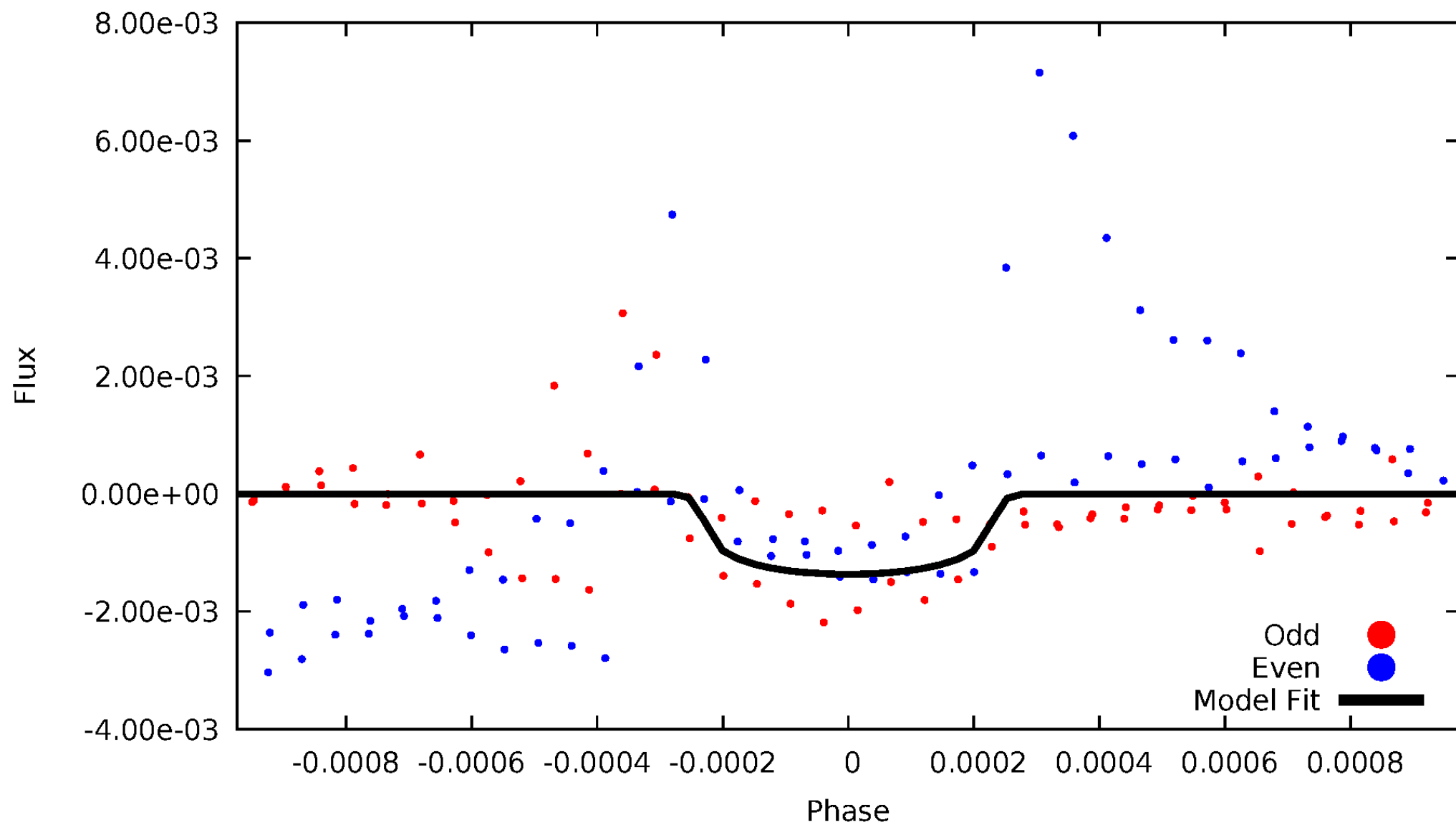


TCE 003097331-03



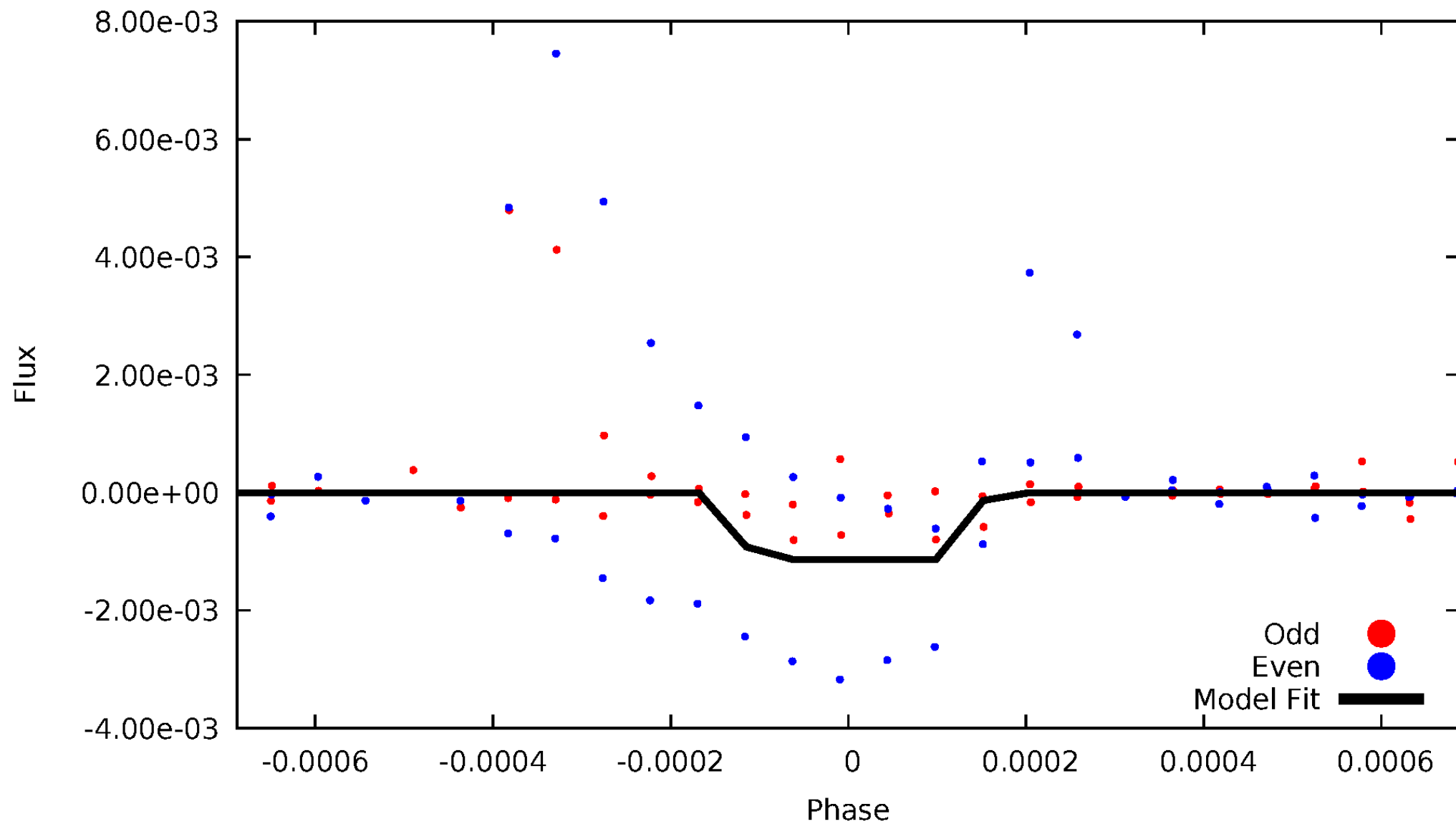
# DV Odd/Even

TCE 003097331-03



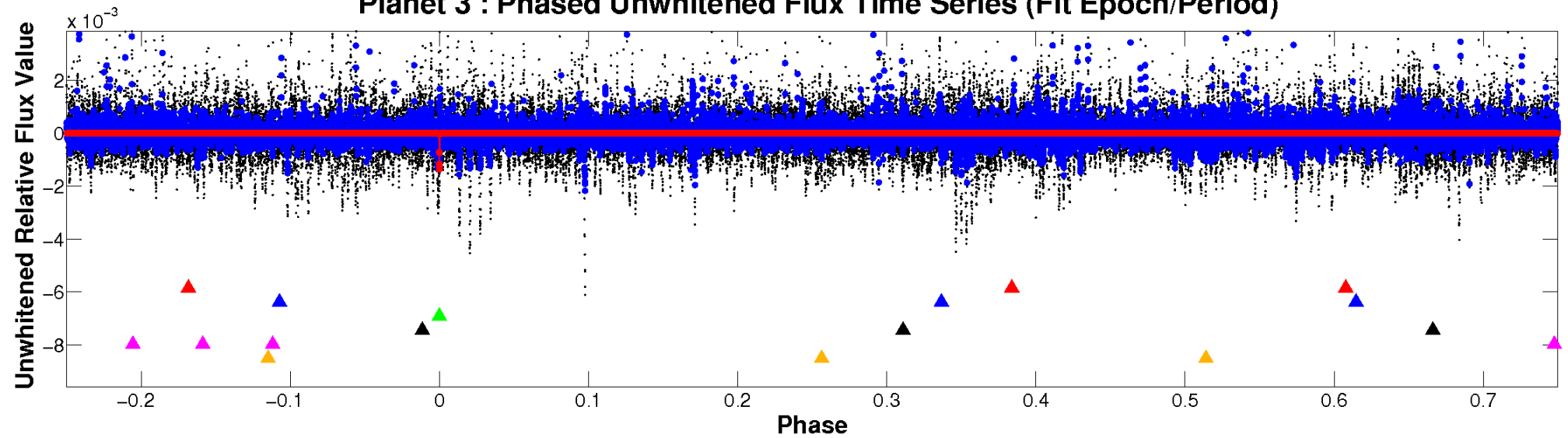
# ALT Odd/Even

TCE 003097331-03

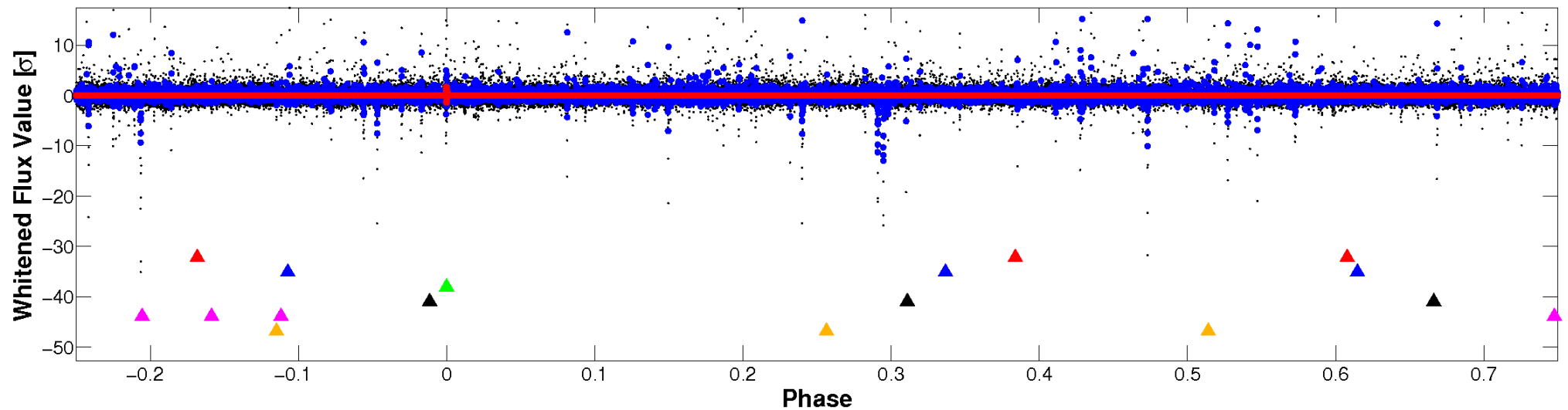


# Non-Whitened Vs. Whitened Light Curve

**Planet 3 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)**

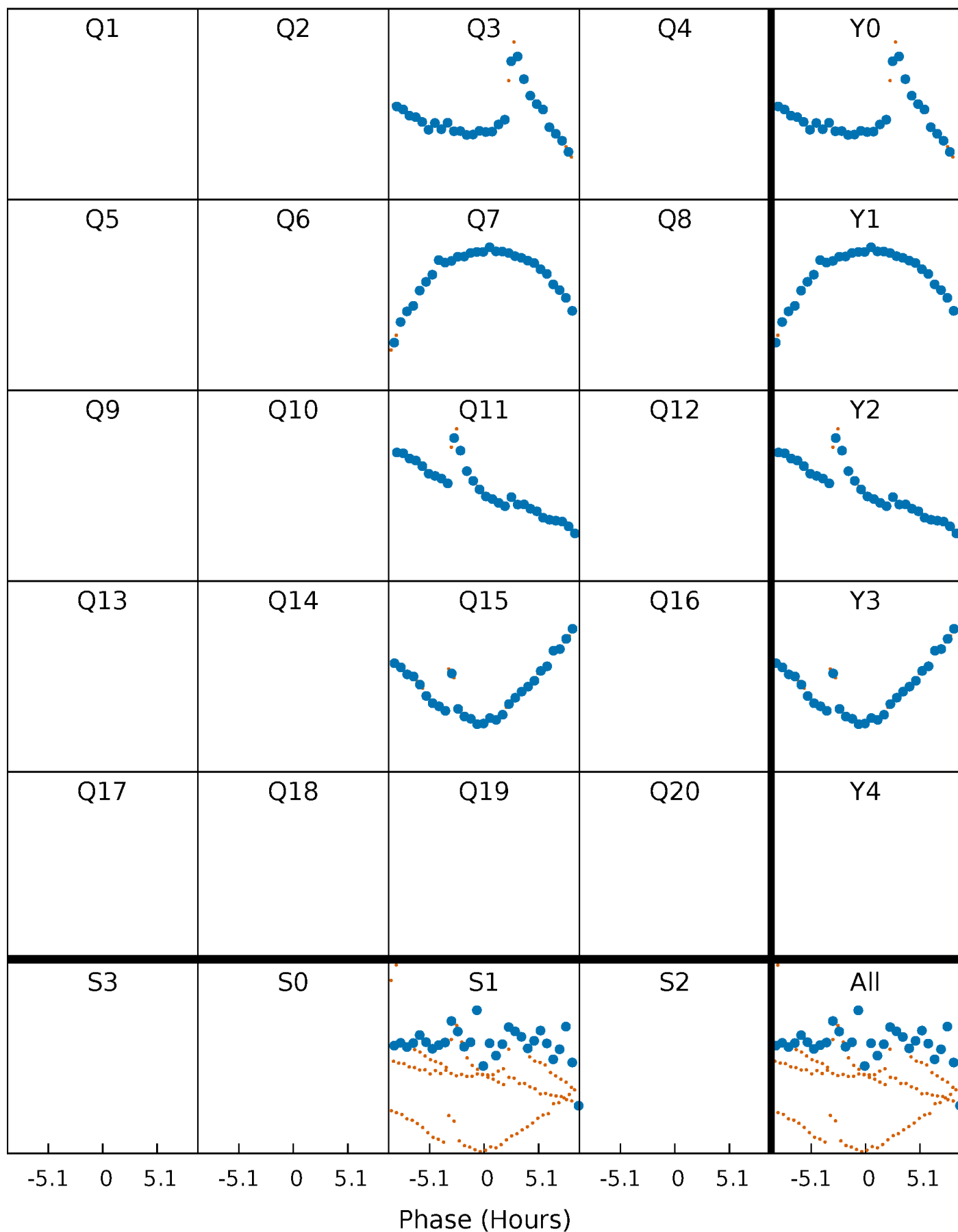


**Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



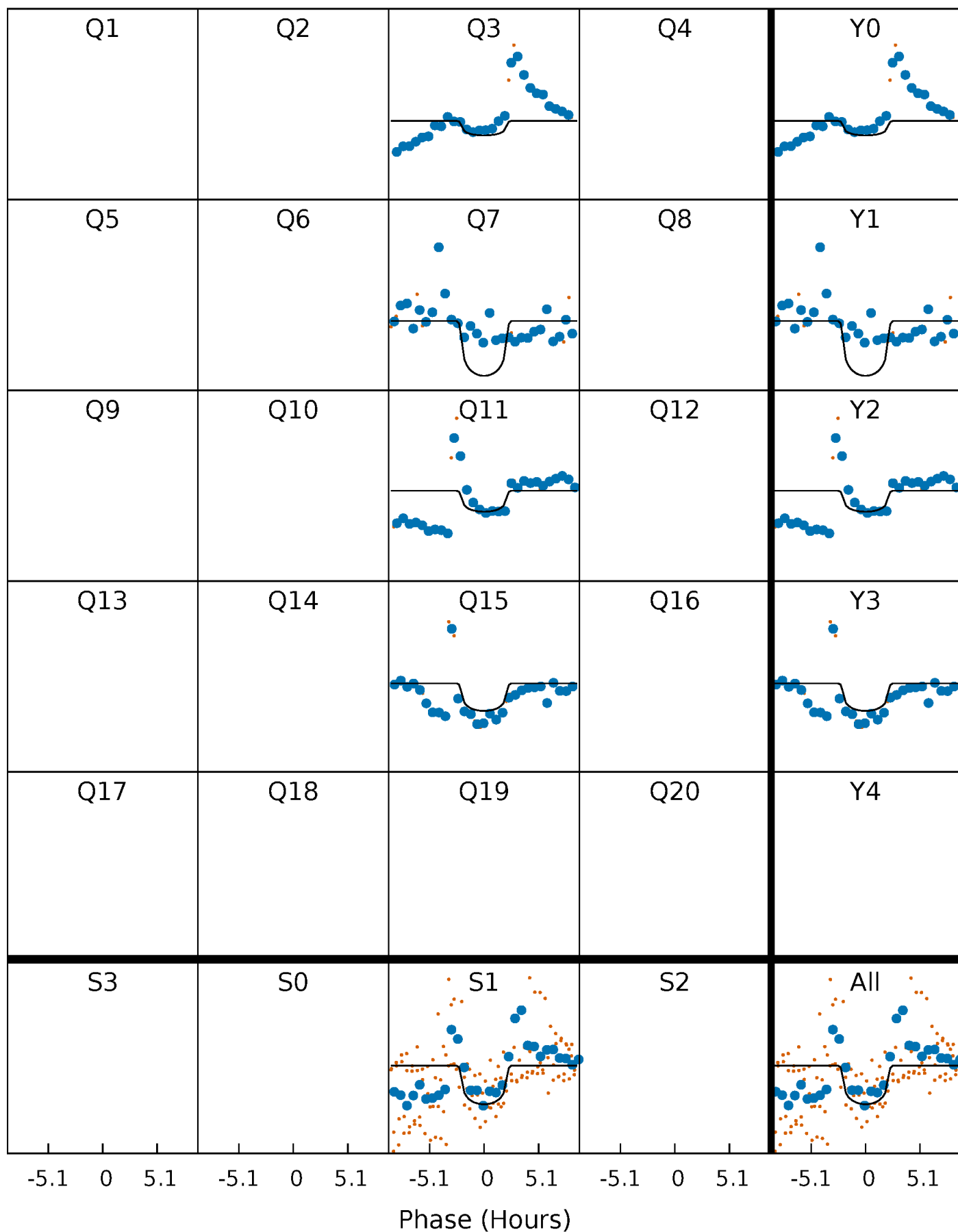
# PDC Quarter-Phased Transit Curves

TCE 003097331-03     $P=382.669196$  Days     $T_0=285.730703$  (BKJD)



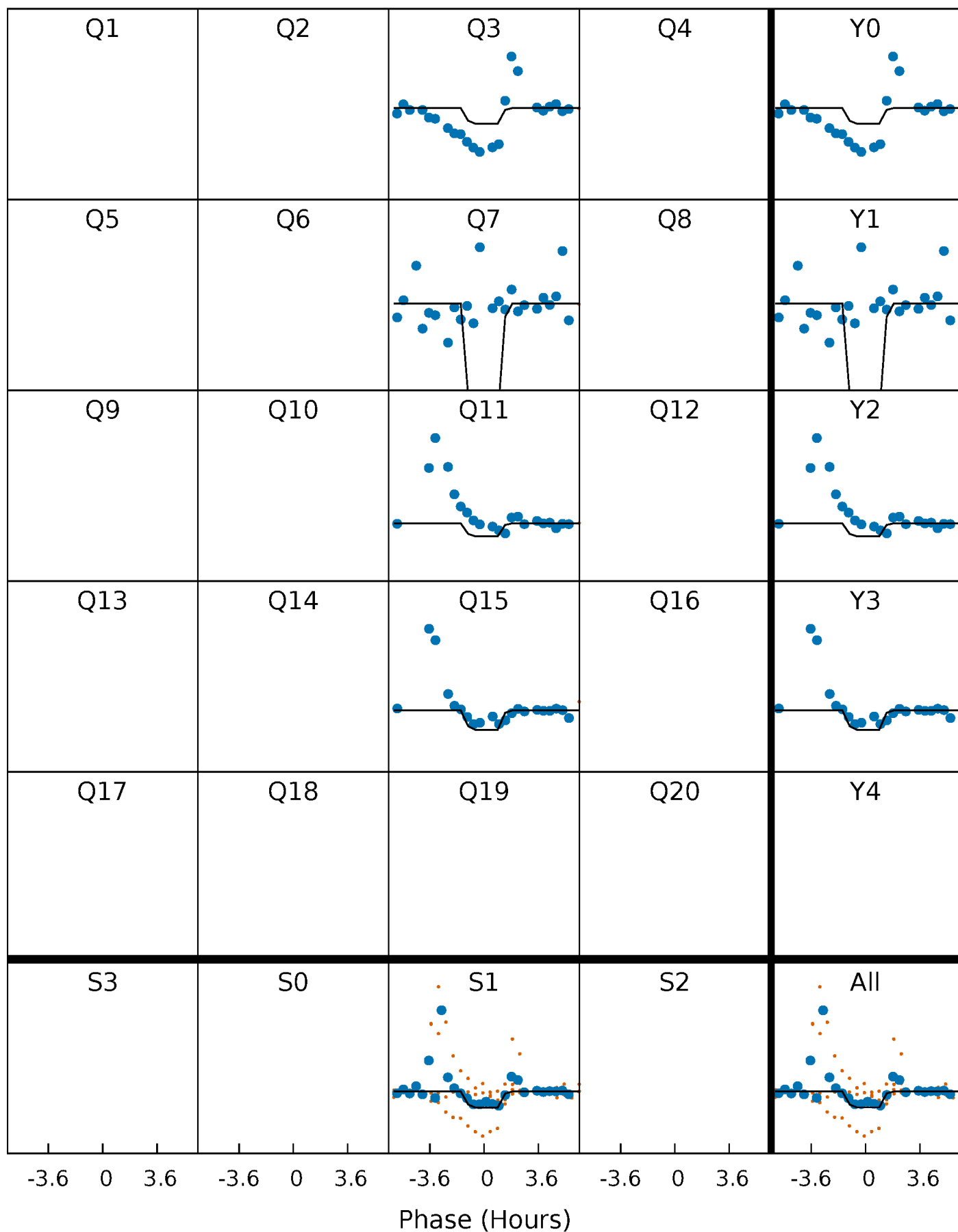
# DV Quarter-Phased Transit Curves

TCE 003097331-03     $P=382.669196$  Days     $T_0=285.730703$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

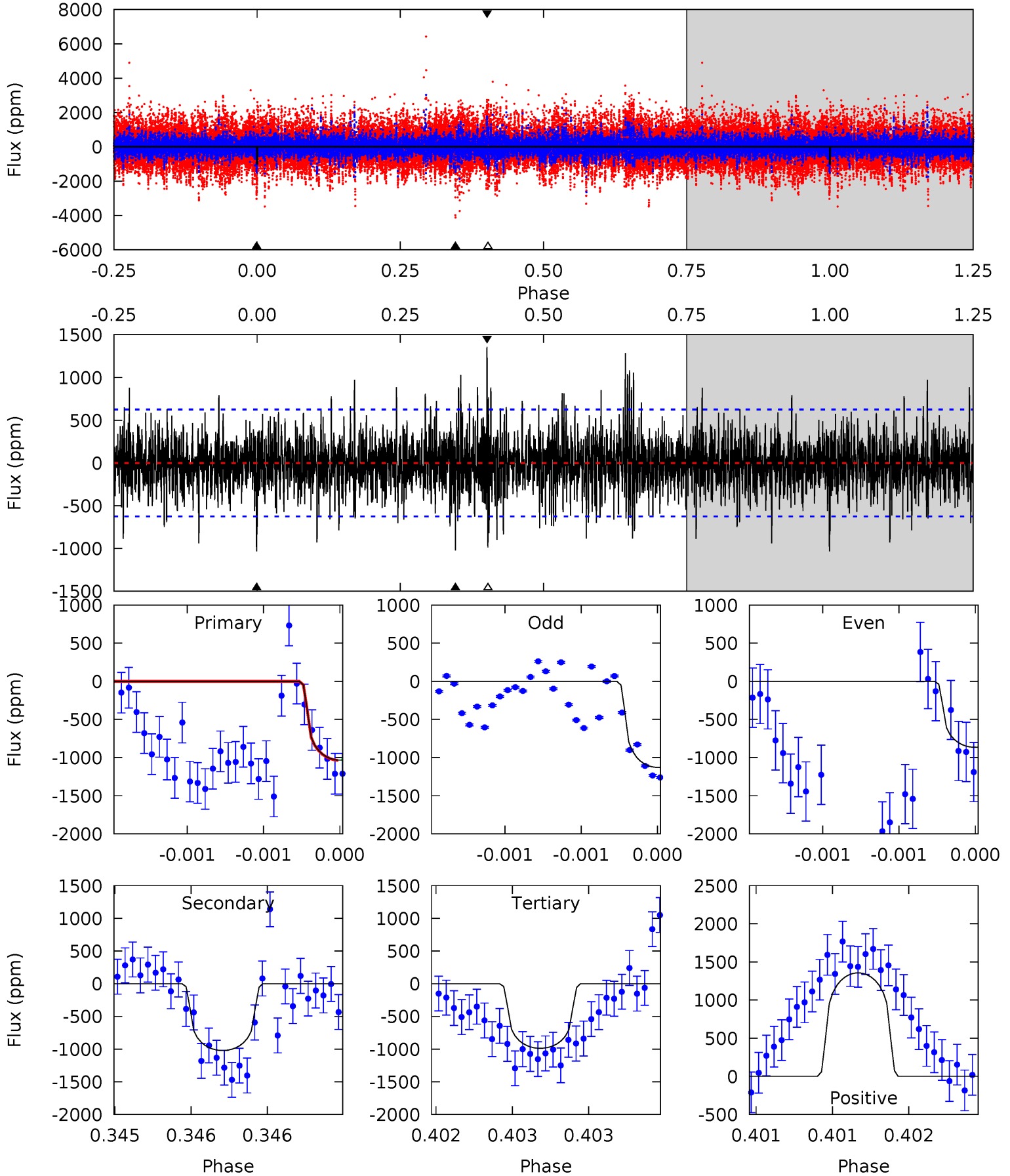
TCE 003097331-03     $P=382.659278$  Days     $T_0=285.769128$  (BKJD)



# DV Model-Shift Uniqueness Test

003097331-03, P = 382.669196 Days, E = 285.730703 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  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 9.19 | 9.09 | 8.79 | 12.1 | 5.56            | 3.46            | 2.30             | 0.40    | -2.87   | 0.30    | -2.97   | 1.08    | 1.17 | 0.57  | 0.03 |

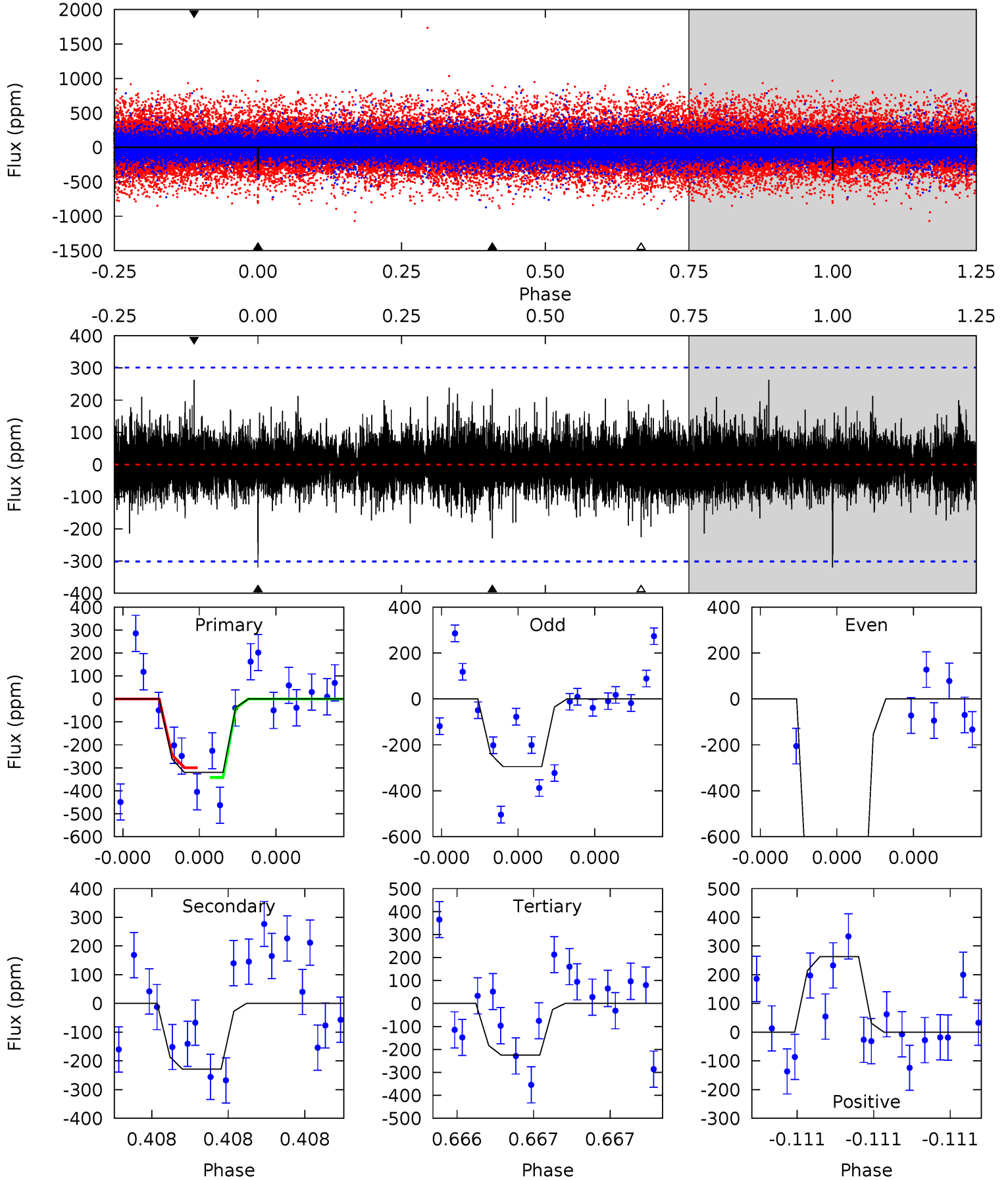




# Alt Model-Shift Uniqueness Test

003097331-03, P = 382.659278 Days, E = 285.769128 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  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 6.00 | 4.29 | 4.22 | 4.94 | 5.65            | 3.60            | 0.88             | 1.78    | 1.06    | 0.08    | -0.64   | 10.6    | 2.60 | 0.45  | 0.39 |



### Stellar Parameters For KIC 003097331

|        | $T_{\text{eff}}(K)$  | $\log(g)$                 | [Fe/H]                     | $R$ ( $R_{\odot}$ )       | $M(M_{\odot})$            | $p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ ) |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
|        | $4980^{+149}_{-134}$ | $4.669^{+0.052}_{-0.036}$ | $-1.040^{+0.300}_{-0.300}$ | $0.589^{+0.045}_{-0.037}$ | $0.590^{+0.051}_{-0.022}$ | $4.065^{+0.792}_{-0.552}$                     |
|        | +3%/-3%              | +1%/-1%                   | +29%/-29%                  | +8%/-6%                   | +9%/-4%                   | +19%/-14%                                     |
| 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 003097331-03 / KOI

| Detrend | Depth (ppm)     | $R_p$ ( $R_{\oplus}$ ) | $T_{max}$ (K)   | $T_{obs}$ (K)         | $A_{obs}$                  |
|---------|-----------------|------------------------|-----------------|-----------------------|----------------------------|
| DV      | $-1021 \pm 112$ | $2.76^{+2.25}_{-1.87}$ | $252^{+9}_{-8}$ | $4403^{+3106}_{-811}$ | $53253^{+488781}_{-35672}$ |
| Alt.    | $-229 \pm 53$   | $2.61^{+2.18}_{-1.67}$ | $253^{+8}_{-8}$ | $3431^{+1644}_{-543}$ | $13414^{+94229}_{-9448}$   |

$T_{max}$  = 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

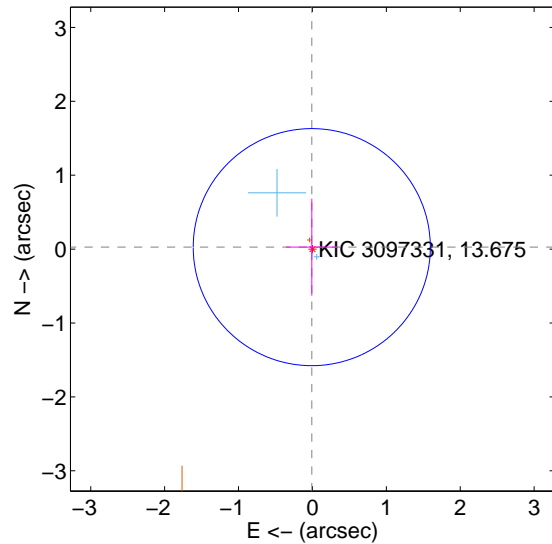
Supplemental centroid analysis for 003097331-03. Kepler magnitude: 13.68. Transit SNR 8.20

There are 2 quarters with good PRF difference image offsets

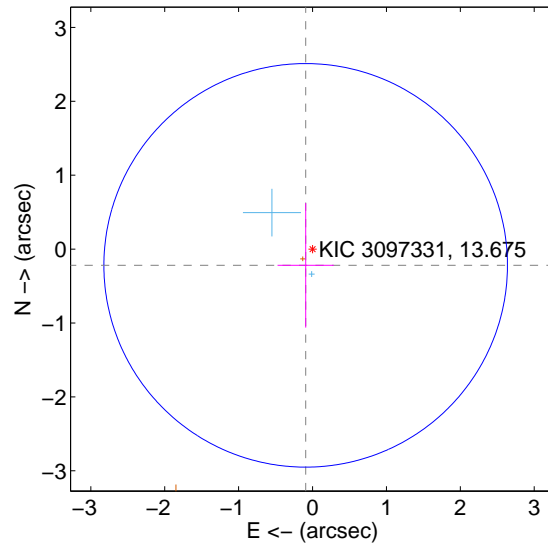
The direct PRF centroid is offset from the target star catalog position by about 0.24 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA       | $\Delta$ Dec       |
|---|--------------------|---------------------|-------------------|--------------------|
| PRF-fit source offset from OOT          | $0.028 \pm 0.535$  | 0.05                | $0.009 \pm 0.349$ | $0.026 \pm 0.657$  |
| PRF-fit source offset from KIC position | $0.239 \pm 0.910$  | 0.26                | $0.093 \pm 0.381$ | $-0.220 \pm 0.842$ |
| photometric centroid source offset      | $1.17 \pm 0.52$    | 2.26                | $-0.53 \pm 0.42$  | $-1.04 \pm 0.54$   |

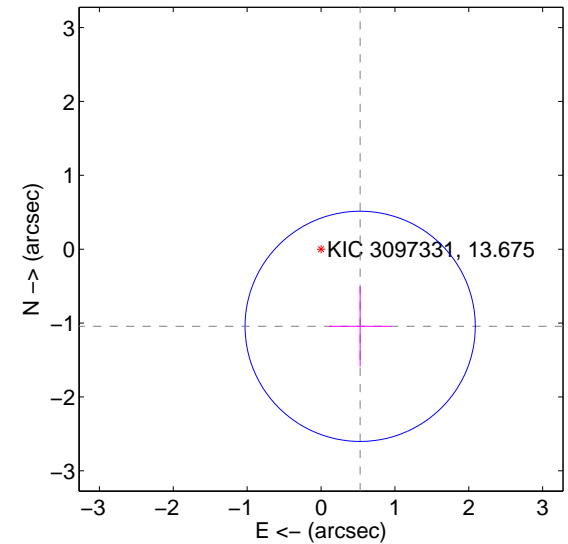
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

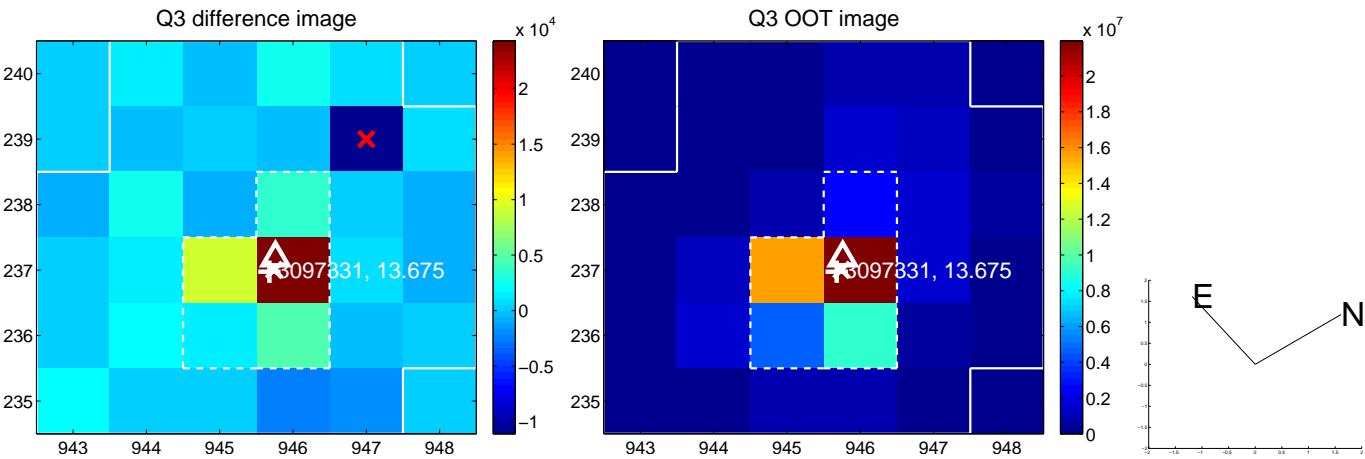
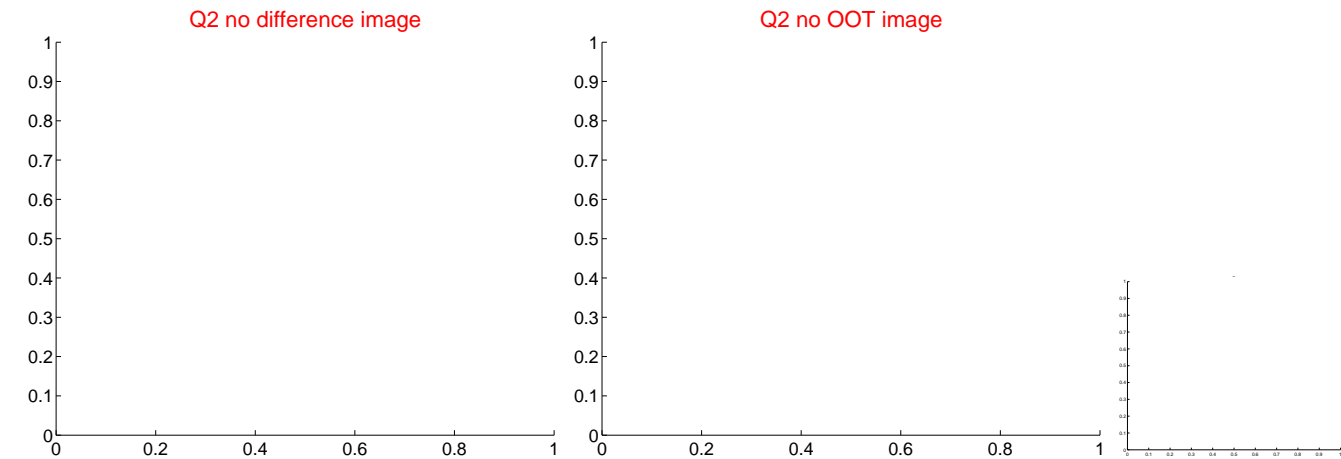


offset from photometric centroids

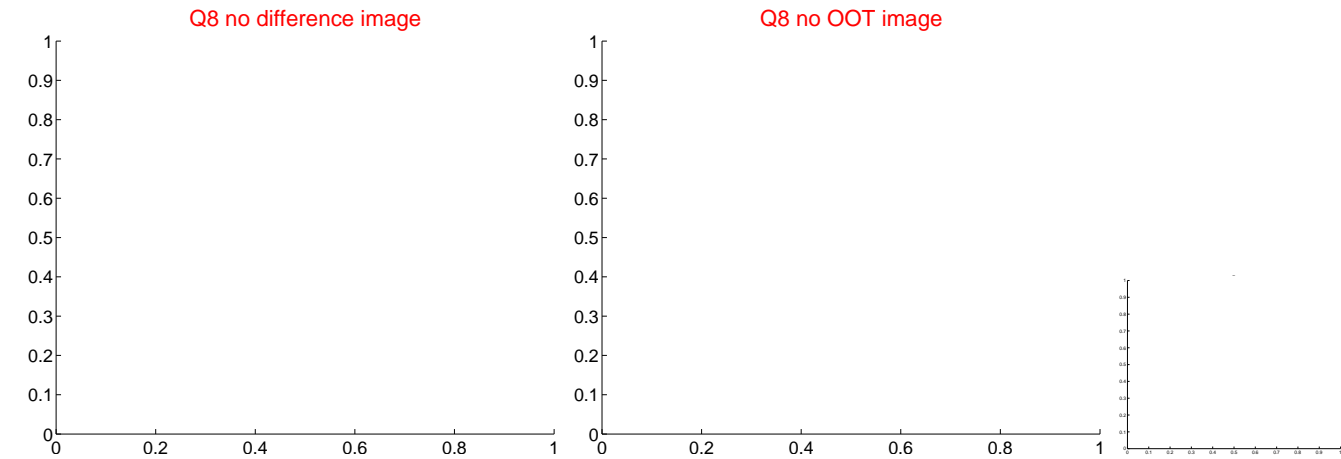
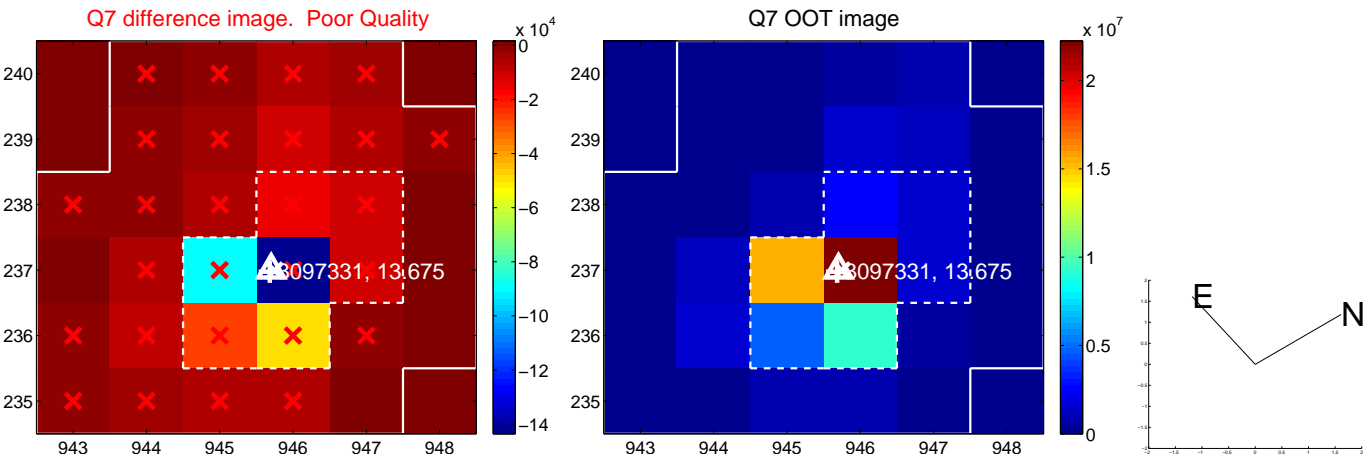
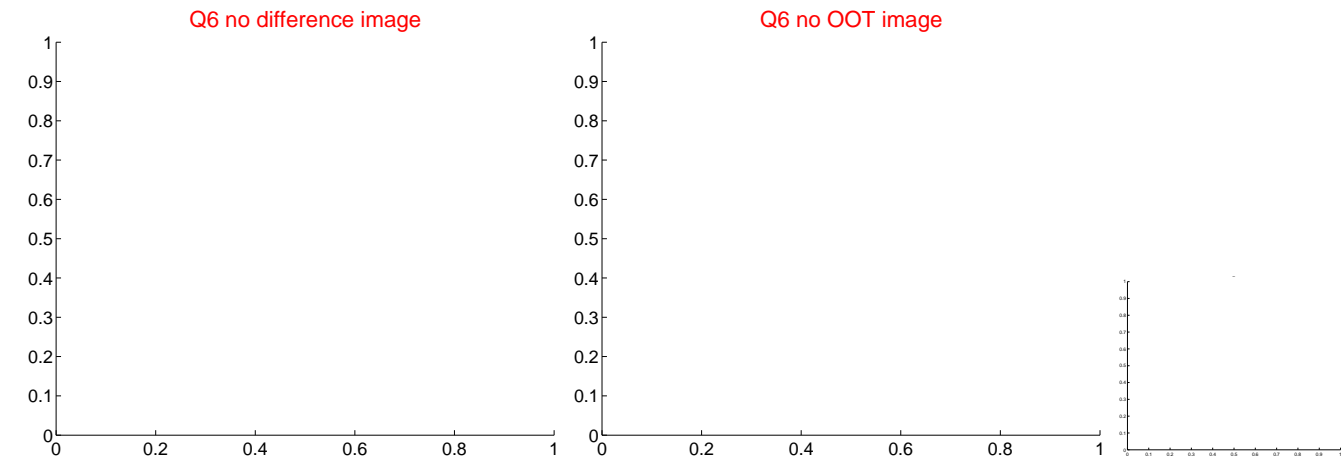


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

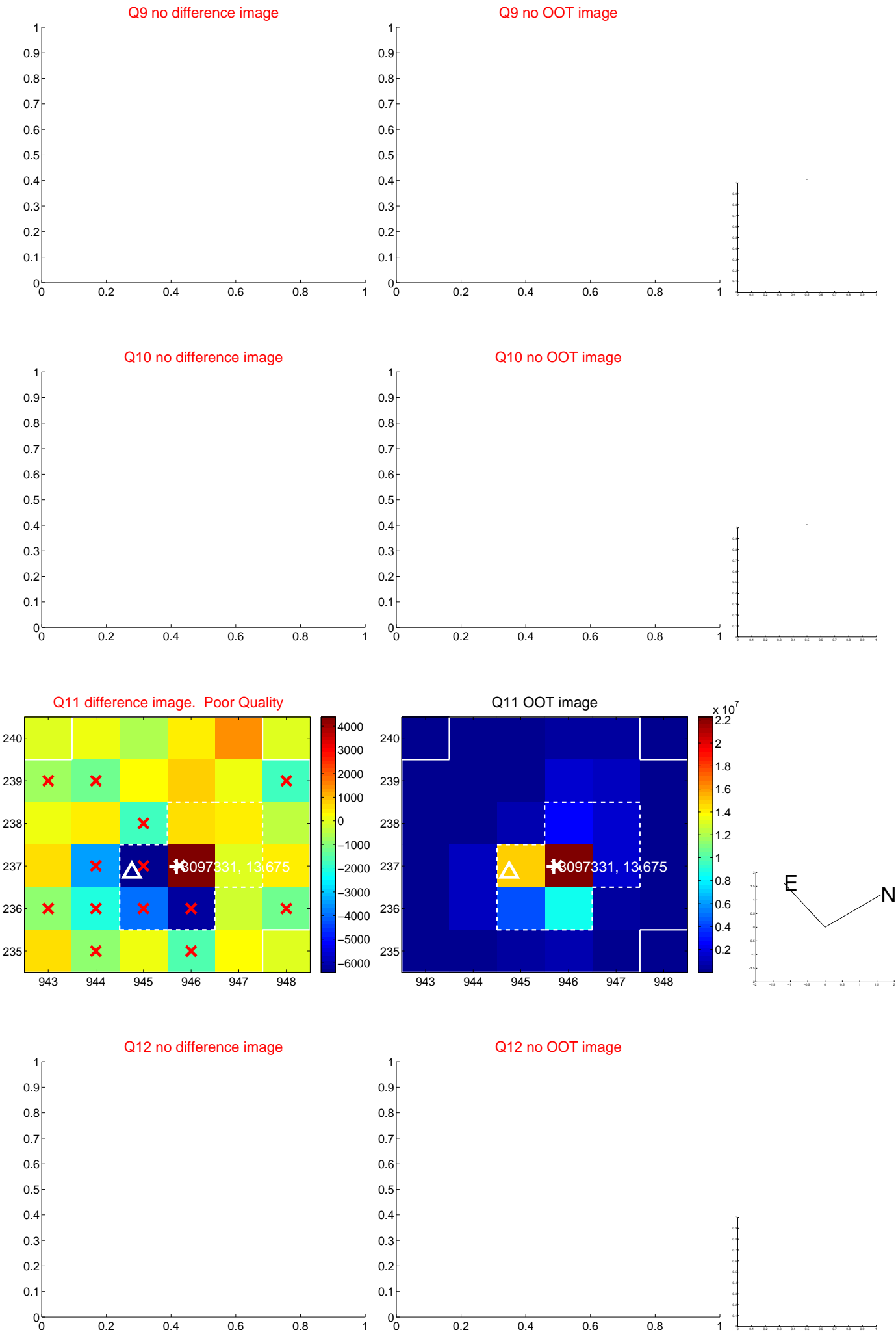
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



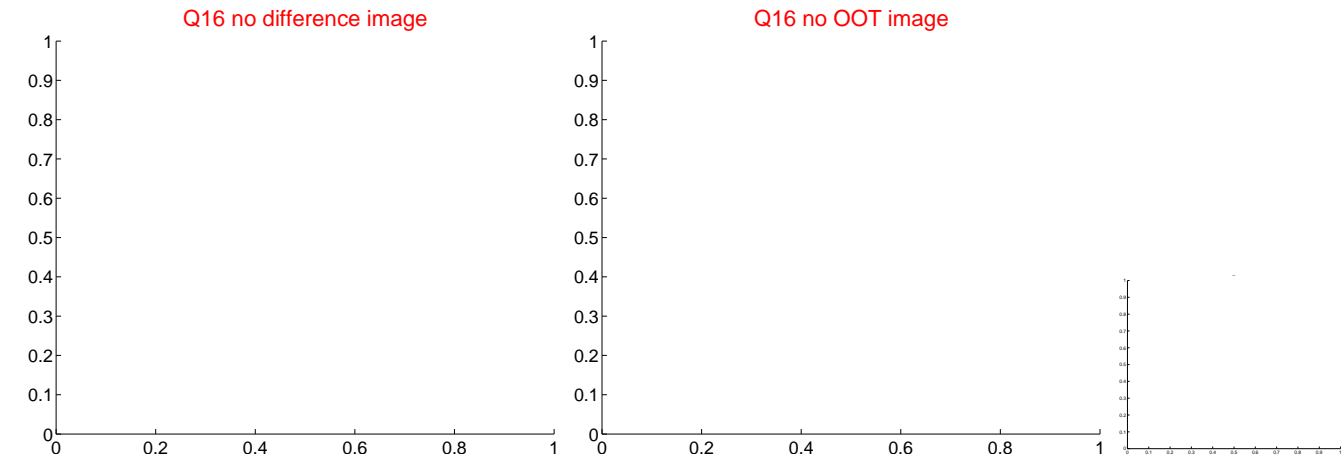
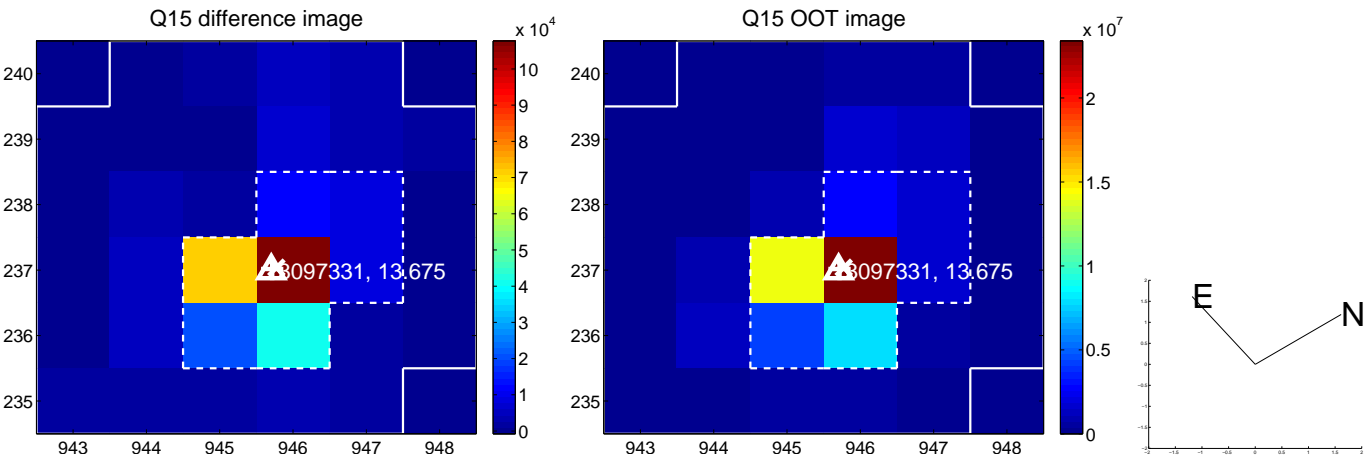
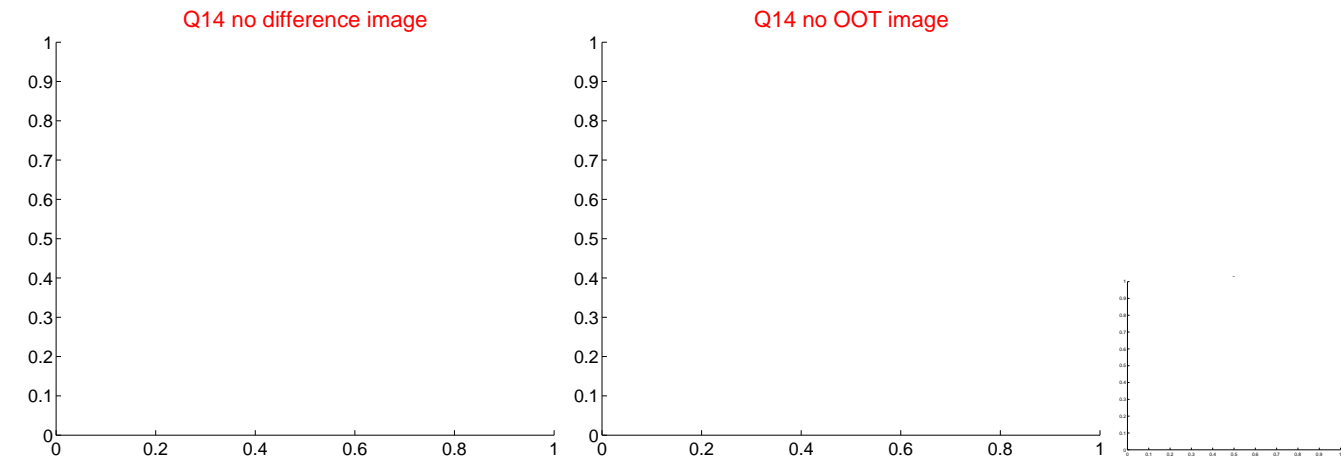
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



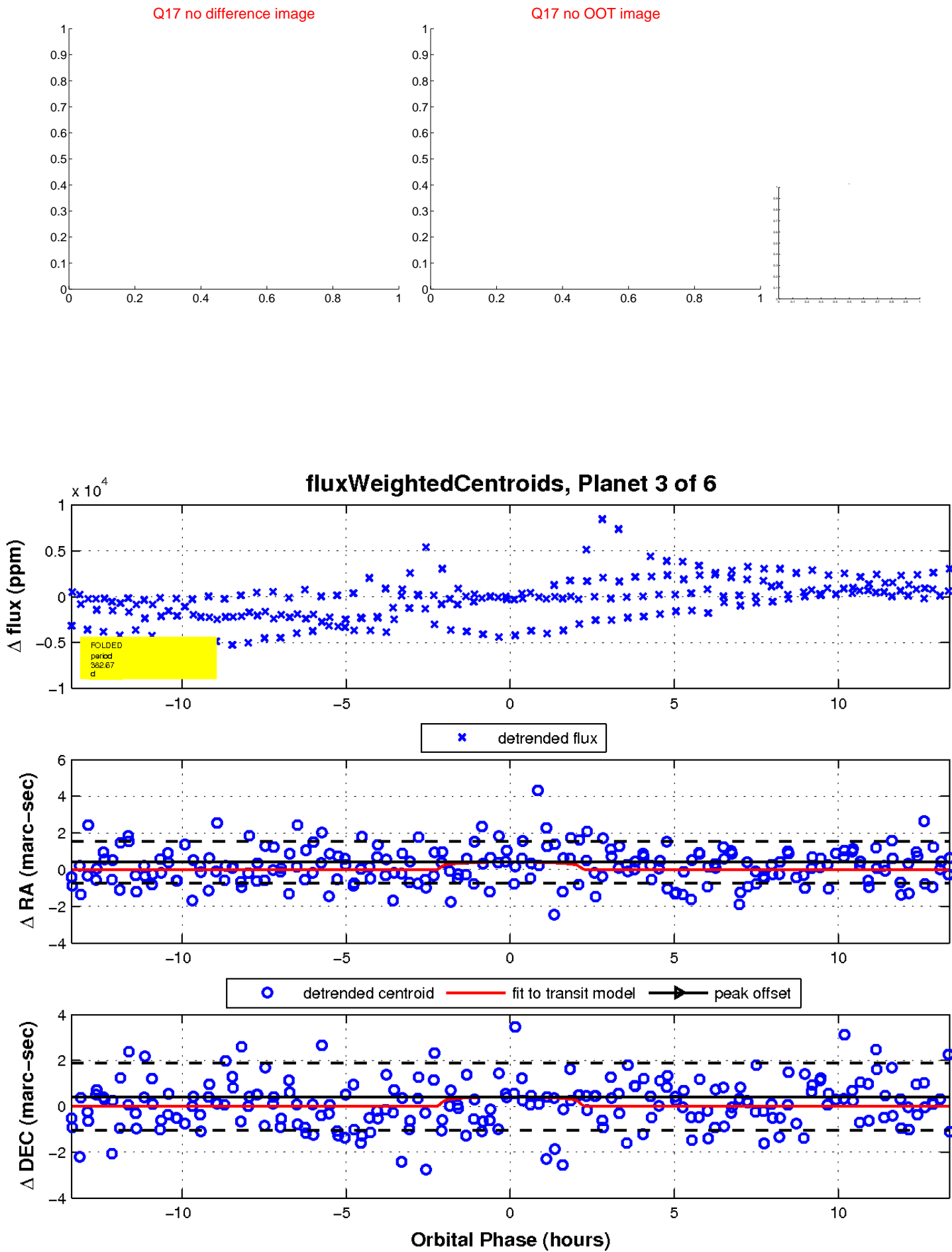
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



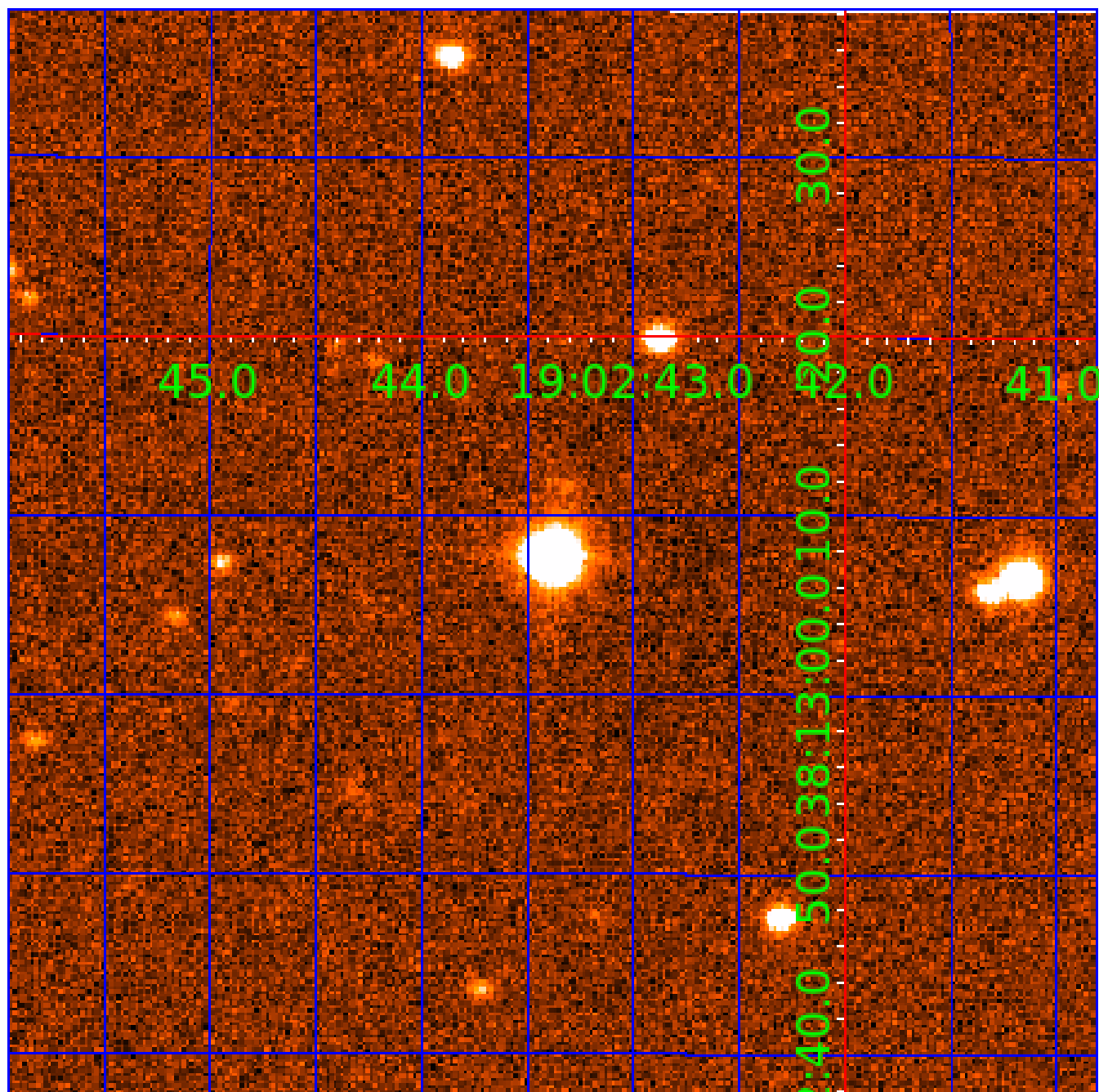
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





UKIRT Image

Declination



# KIC 003097331

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|-----|-----------------------------|-----------------|------------------------|------------------------|
| 003097331-01 | OBS      | No   | 468.366690    | 432.617373   | 1387.3      | 4.169            | 12.1 | 6.4 | 0.59                        | 4980            | 2.20                   | 0.20                   |
| 003097331-02 | OBS      | No   | 489.078948    | 414.566850   | 1071.9      | 17.003           | 14.0 | 3.7 | 0.59                        | 4980            | 1.94                   | 0.18                   |
| 003097331-03 | OBS      | No   | 382.669196    | 285.730703   | 1367.3      | 4.468            | 16.3 | 8.2 | 0.59                        | 4980            | 2.21                   | 0.26                   |
| 003097331-04 | OBS      | No   | 506.025469    | 158.006130   | 1052.6      | 3.460            | 11.6 | 5.8 | 0.59                        | 4980            | 1.99                   | 0.18                   |
| 003097331-05 | OBS      | No   | 364.730993    | 242.967867   | 878.4       | 3.690            | 10.5 | 4.7 | 0.59                        | 4980            | 1.83                   | 0.27                   |
| 003097331-06 | OBS      | No   | 524.701079    | 482.439043   | 1284.2      | 4.341            | 13.4 | 6.3 | 0.59                        | 4980            | 2.12                   | 0.17                   |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments   |
|--------------|----------|------|-------|---|---|---|---|--|
| 003097331-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS  |
| 003097331-02 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS  |
| 003097331-03 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_MARSHALL_SKYE—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS |
| 003097331-04 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS   |
| 003097331-05 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS                                   |
| 003097331-06 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—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.

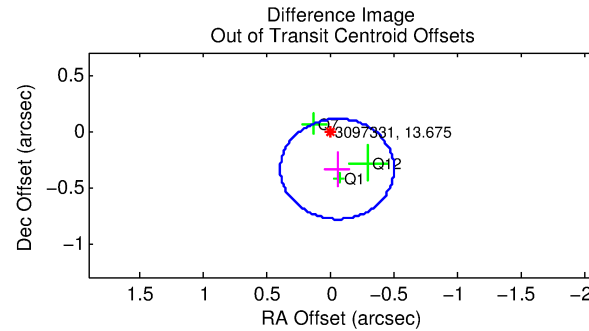
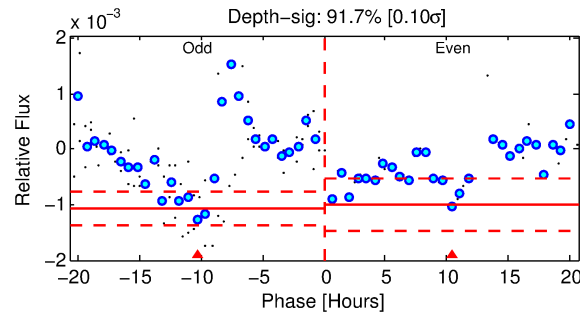
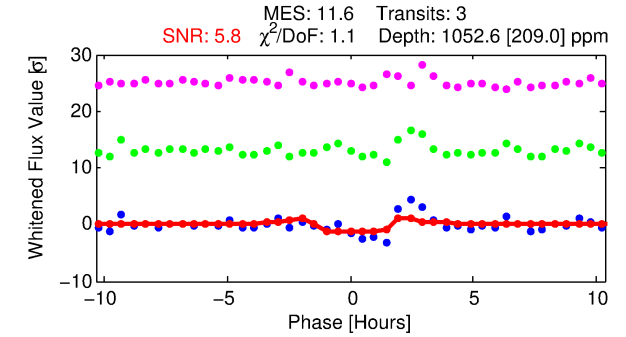
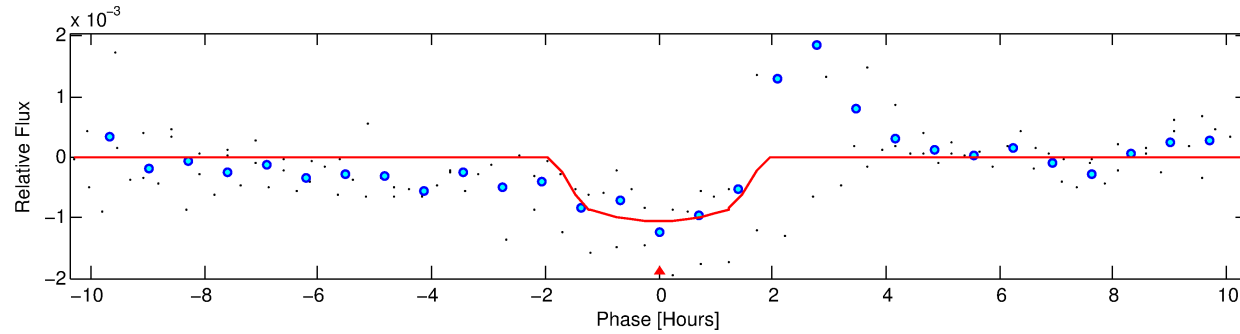
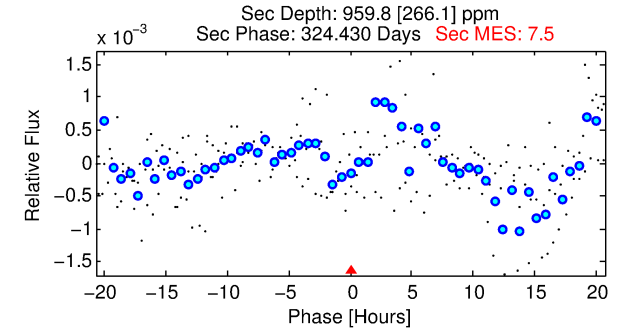
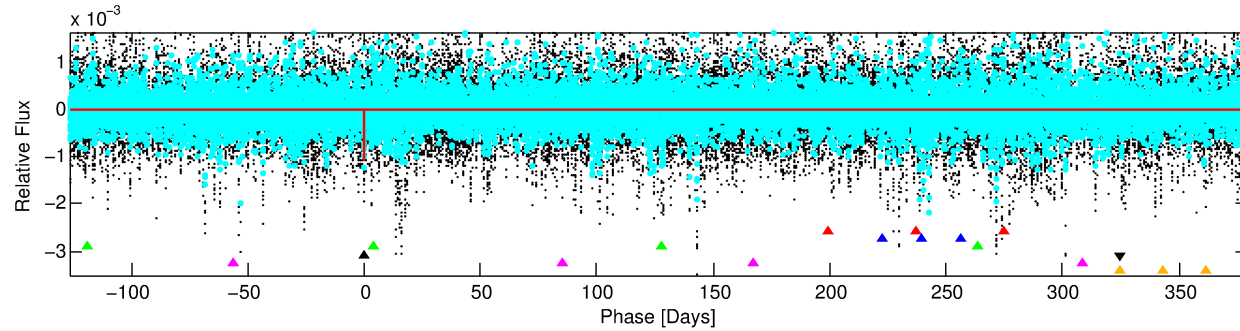
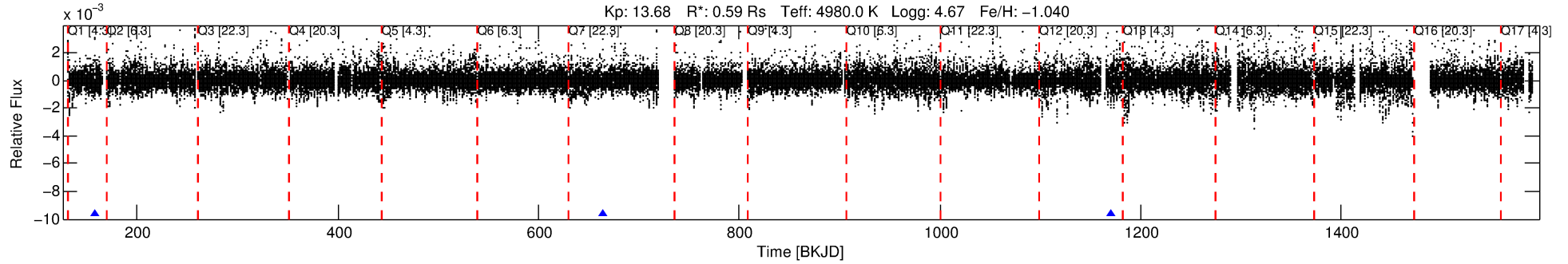
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 003097331-04

No Significant Match Found

# DV One-Page Summary

KIC: 3097331 Candidate: 4 of 6 Period: 506.025 d



## DV Fit Results:

Period = 506.02547 [0.00567] d  
Epoch = 158.0061 [0.0068] BKJD  
Rp/R\* = 0.0309 [0.1829]  
a/R\* = 924.17 [21880.19]  
b = 0.62 [24.21]  
Seff = 0.18 [0.03]  
Teq = 165 [6] K  
Rp = 1.99 [11.76] Re  
a = 1.0429 [0.0675] AU  
Ag = 145122.84 [1715804.01] [0.08 $\sigma$ ]  
Teffp = 4983 [14727] K [0.33 $\sigma$ ]

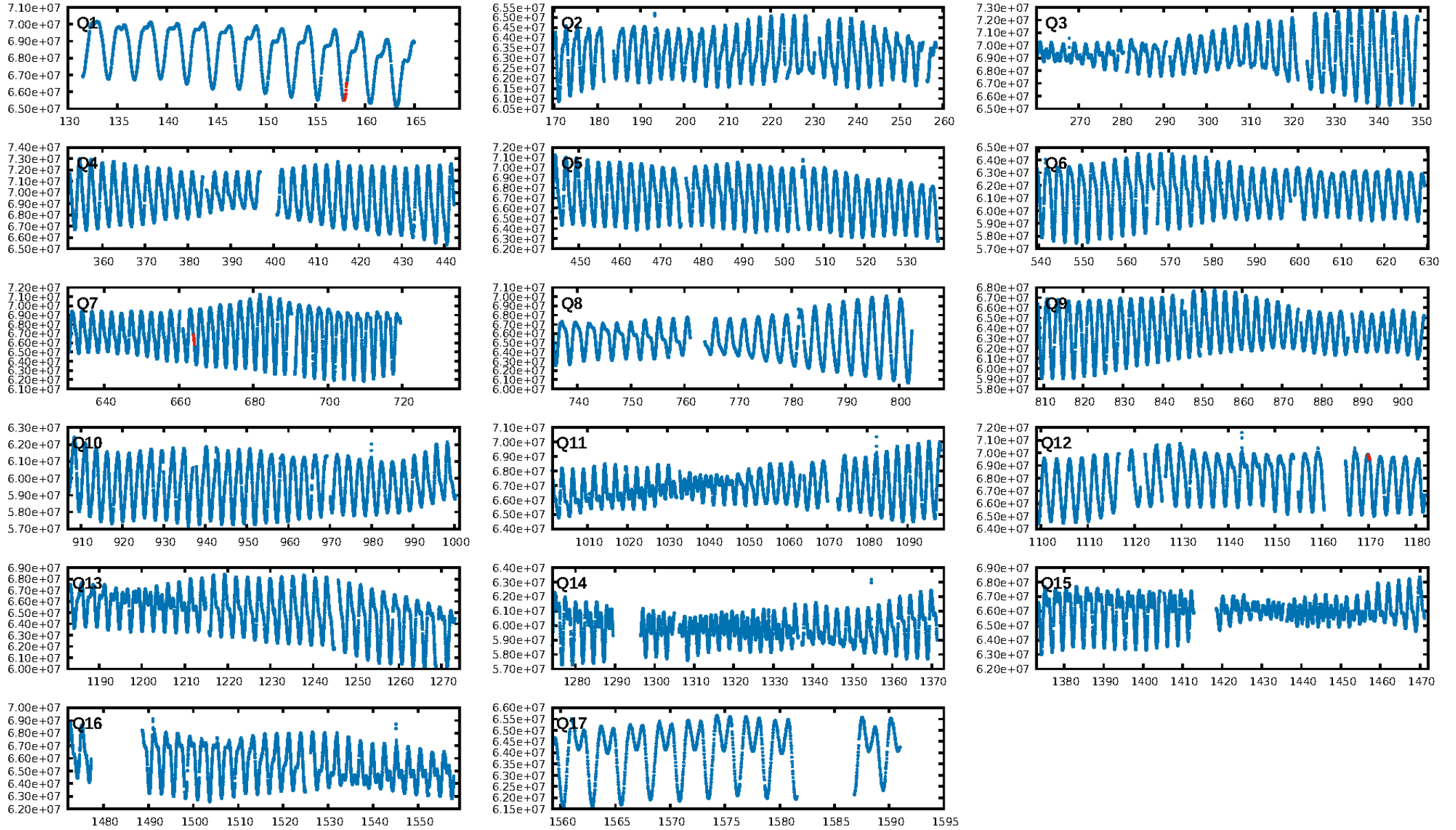
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [23.44 $\sigma$ ]  
LongPeriod-sig: 100.0% [80.75 $\sigma$ ]  
ModelChiSquare2-sig: 28.3%  
ModelChiSquareGof-sig: 77.1%  
**Bootstrap-pfa: 2.19e-09**  
RollingBand-fgt: 1.00 [2/2]  
GhostDiagnostic-chr: 1.596  
Centroid-sig: 51.2%  
Centroid-so: 0.372 arcsec [0.45 $\sigma$ ]  
OotOffset-rm: 0.343 arcsec [2.30 $\sigma$ ]  
**KicOffset-rm: 0.592 arcsec [3.86 $\sigma$ ]**  
OotOffset-st: 0/1/1/1 [3]  
KicOffset-st: 0/1/1/1 [3]  
DiffImageQuality-fgm: 0.33 [1/3]  
DiffImageOverlap-fno: 1.00 [3/3]

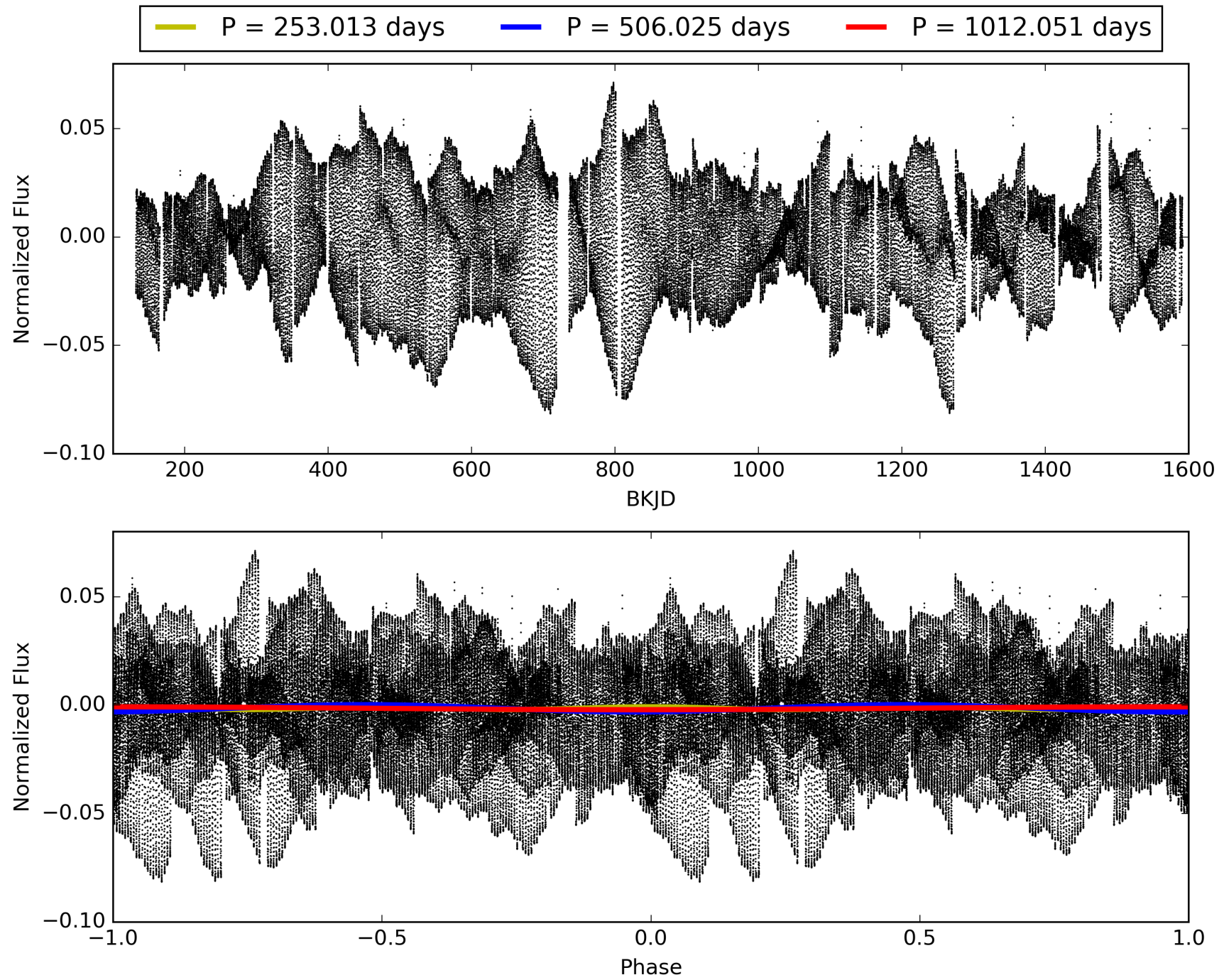
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 02-Feb-2016 01:11:20 Z

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

# TCE 003097331-04, PDC Light Curves

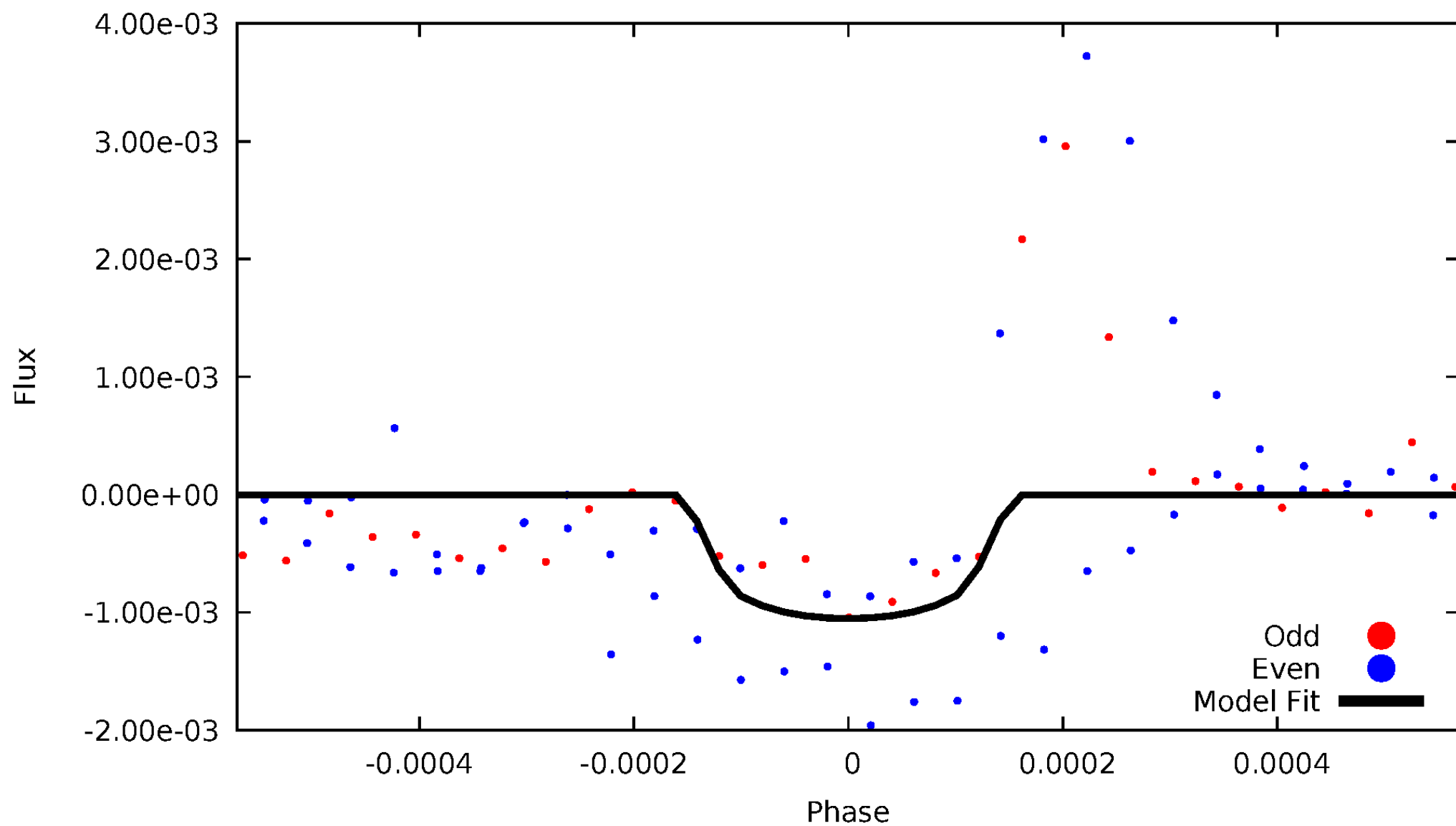


TCE 003097331-04



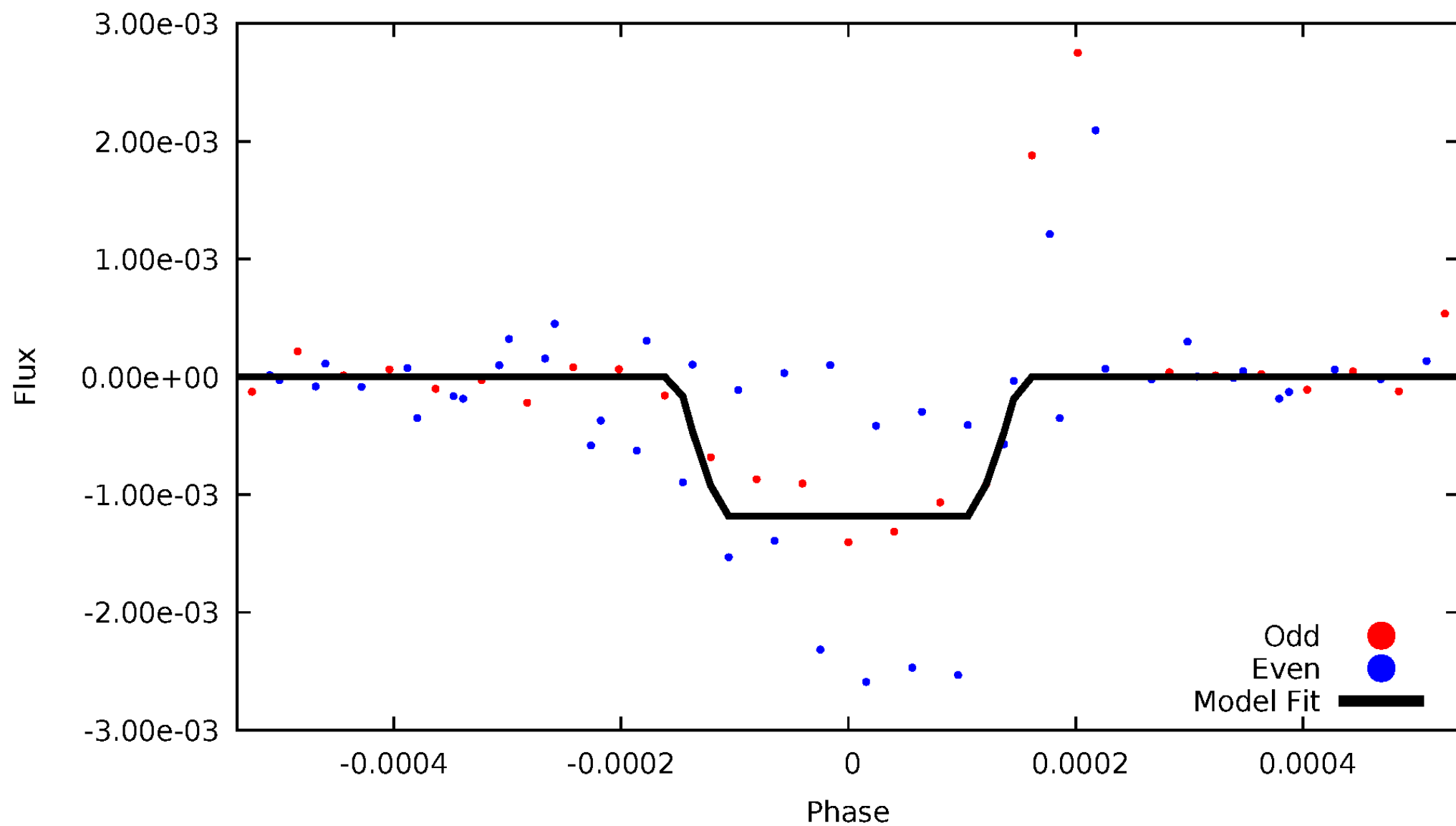
# DV Odd/Even

TCE 003097331-04



# ALT Odd/Even

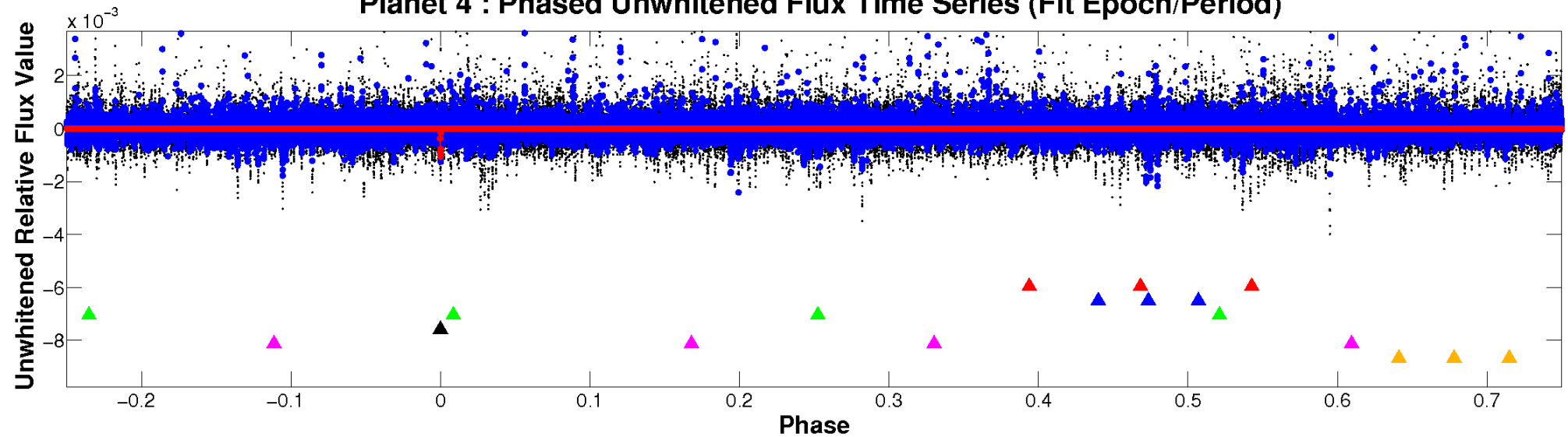
TCE 003097331-04



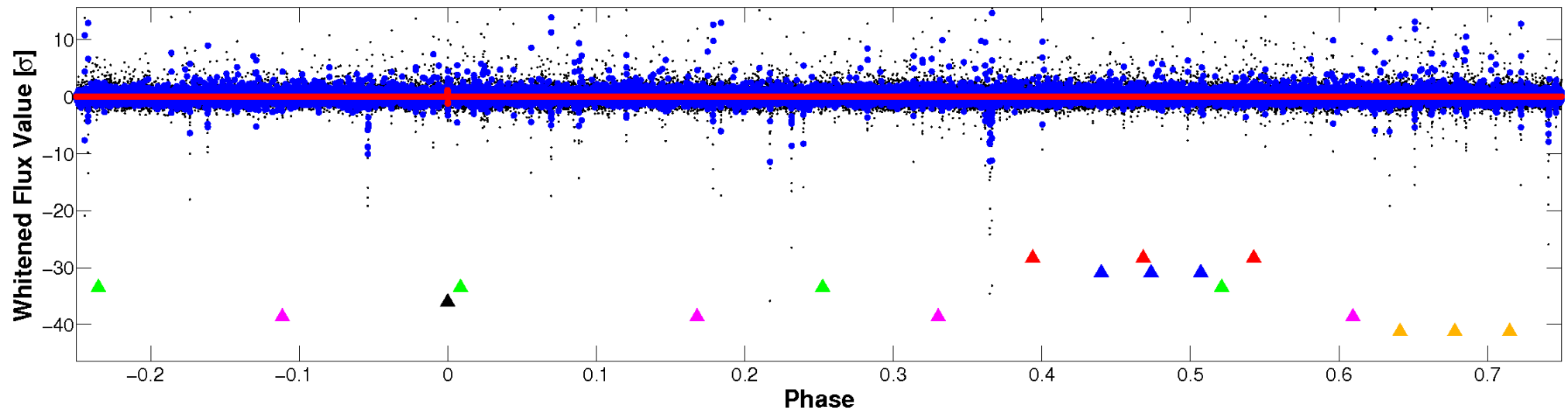


# Non-Whitened Vs. Whitened Light Curve

## Planet 4 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)



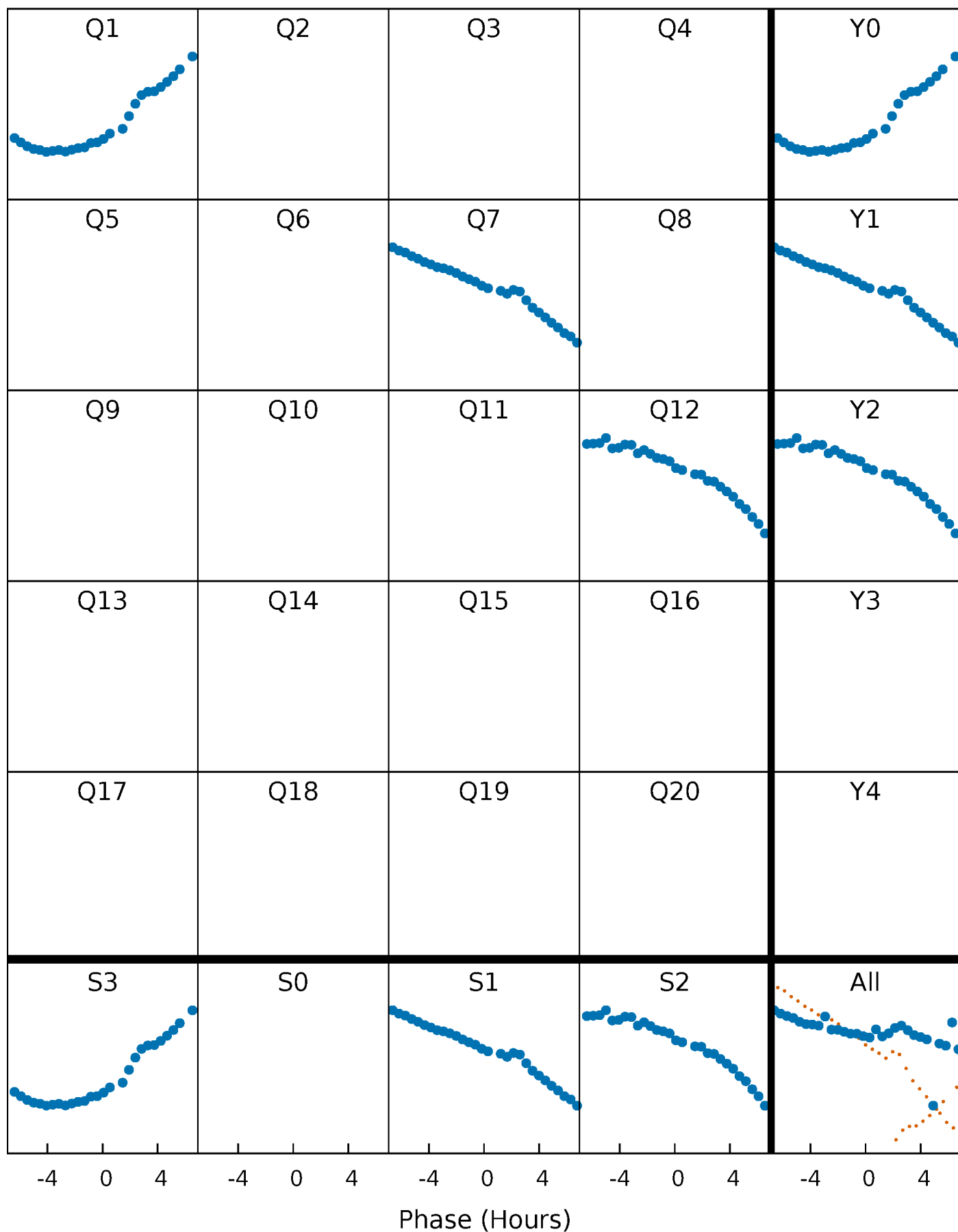
## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)





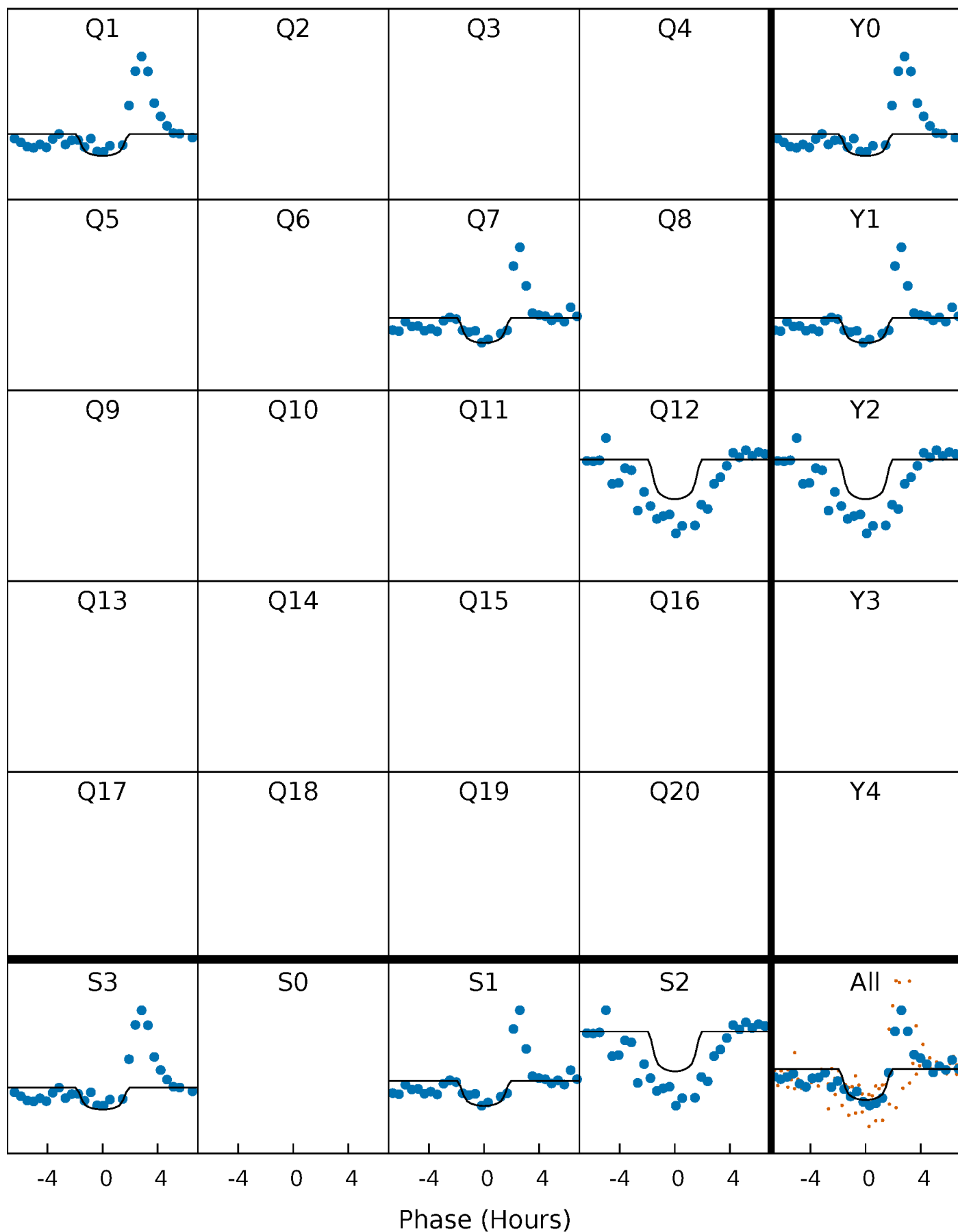
# PDC Quarter-Phased Transit Curves

TCE 003097331-04     $P=506.025469$  Days     $T_0=158.006130$  (BKJD)



# DV Quarter-Phased Transit Curves

TCE 003097331-04   P=506.025469 Days    $T_0=158.006130$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

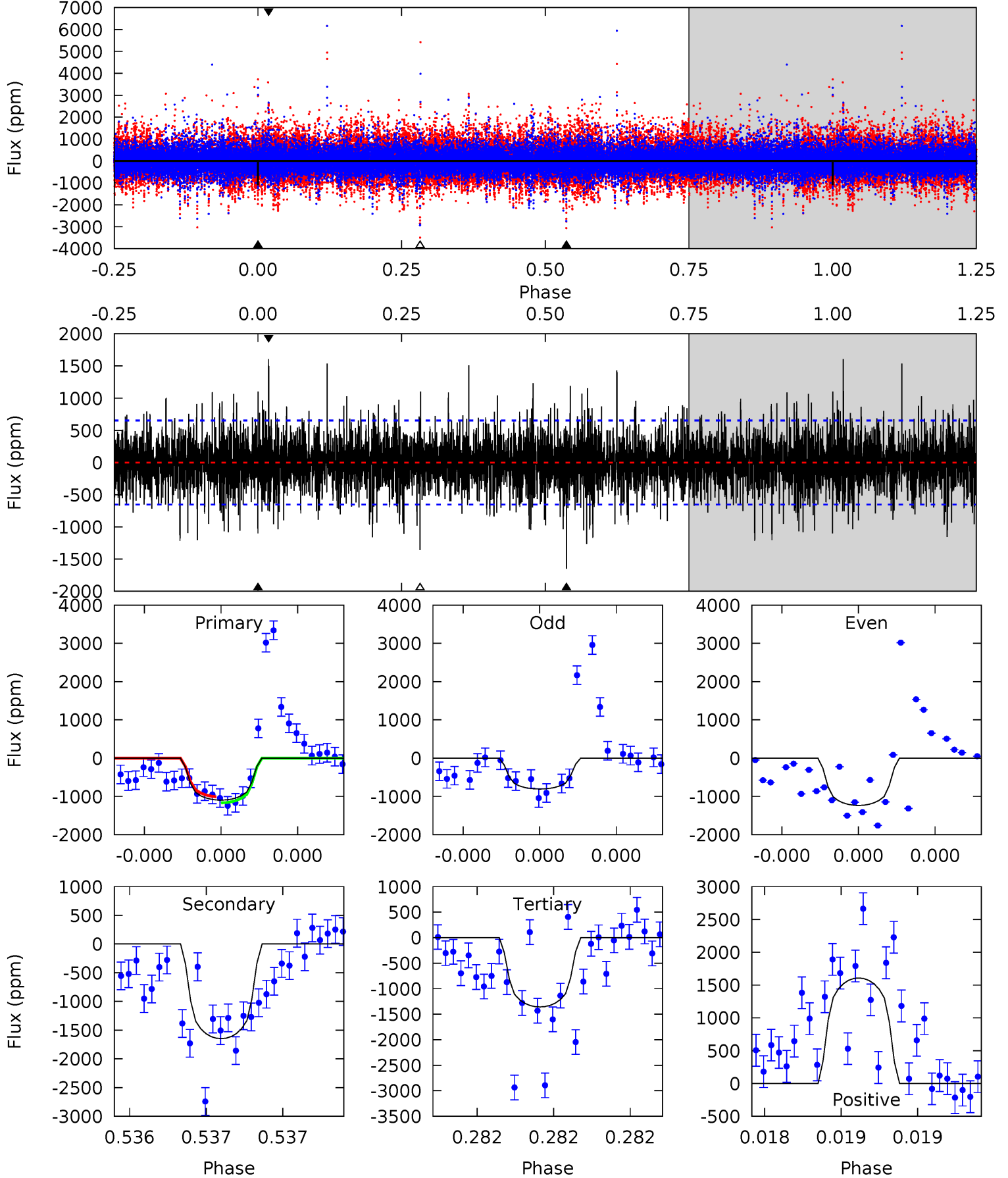
TCE 003097331-04     $P=506.023491$  Days     $T_0=158.008402$  (BKJD)



# DV Model-Shift Uniqueness Test

003097331-04, P = 506.025469 Days, E = 158.006130 Days

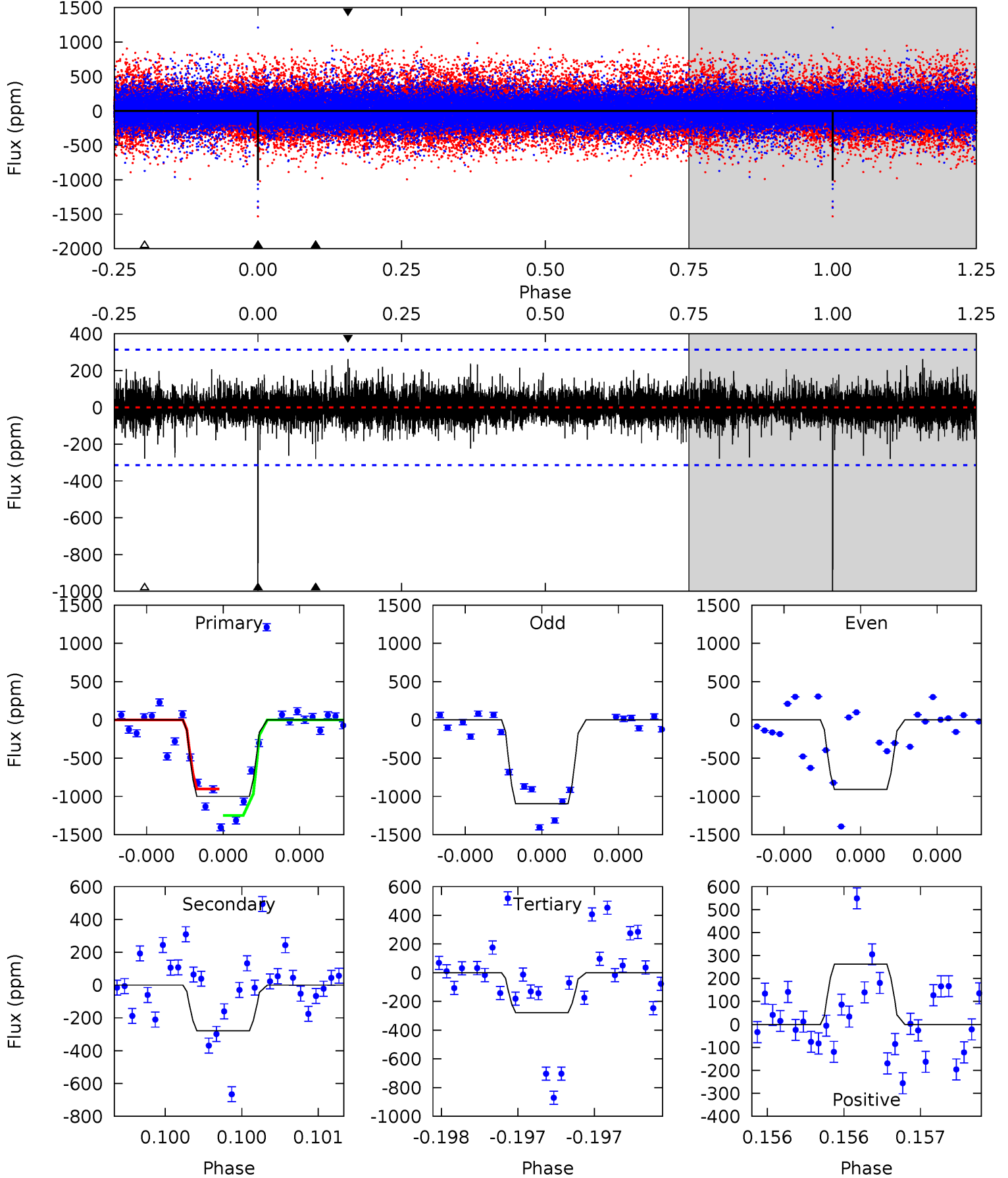
| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 9.52 | 14.3 | 11.8 | 13.9 | 5.66            | 3.61            | 2.60             | -2.26   | -4.43   | 2.52    | 0.35    | 1.55    | 1.36 | 0.49  | 0.69 |



# Alt Model-Shift Uniqueness Test

003097331-04, P = 506.023491 Days, E = 158.008402 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  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 18.0 | 5.03 | 5.01 | 4.73 | 5.66            | 3.61            | 0.85             | 13.0    | 13.3    | 0.02    | 0.30    | 1.90    | 1.04 | 0.21  | 3.01 |



### Stellar Parameters For KIC 003097331

|        | $T_{\text{eff}}(K)$  | $\log(g)$                 | [Fe/H]                     | $R$ ( $R_{\odot}$ )       | $M(M_{\odot})$            | $p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ ) |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
|        | $4980^{+149}_{-134}$ | $4.669^{+0.052}_{-0.036}$ | $-1.040^{+0.300}_{-0.300}$ | $0.589^{+0.045}_{-0.037}$ | $0.590^{+0.051}_{-0.022}$ | $4.065^{+0.792}_{-0.552}$                     |
|        | +3%/-3%              | +1%/-1%                   | +29%/-29%                  | +8%/-6%                   | +9%/-4%                   | +19%/-14%                                     |
| 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 003097331-04 / KOI

| Detrend | Depth (ppm)     | $R_p$ ( $R_{\oplus}$ ) | $T_{max}$ (K)   | $T_{obs}$ (K)         | $A_{obs}$                  |
|---------|-----------------|------------------------|-----------------|-----------------------|----------------------------|
| DV      | $-1648 \pm 115$ | $8.27^{+9.36}_{-5.79}$ | $230^{+8}_{-7}$ | $3318^{+1782}_{-635}$ | $14613^{+155282}_{-11358}$ |
| Alt.    | $-279 \pm 56$   | $8.54^{+9.31}_{-6.28}$ | $230^{+8}_{-8}$ | $2572^{+1160}_{-416}$ | $2326^{+28550}_{-1796}$    |

$T_{max}$  = 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

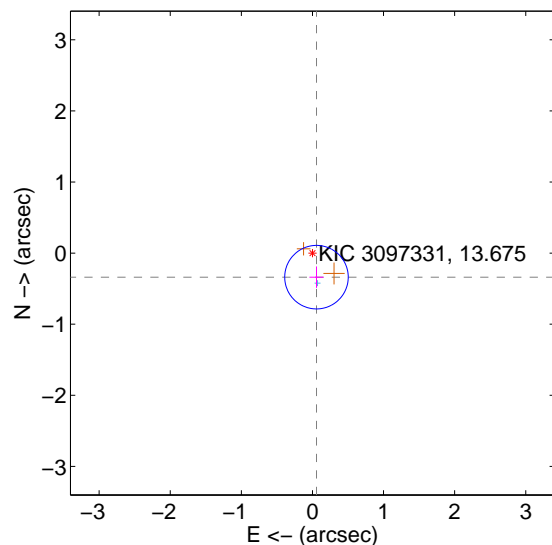
Supplemental centroid analysis for 003097331-04. Kepler magnitude: 13.68. Transit SNR 5.77

There are 1 quarters with good PRF difference image offsets

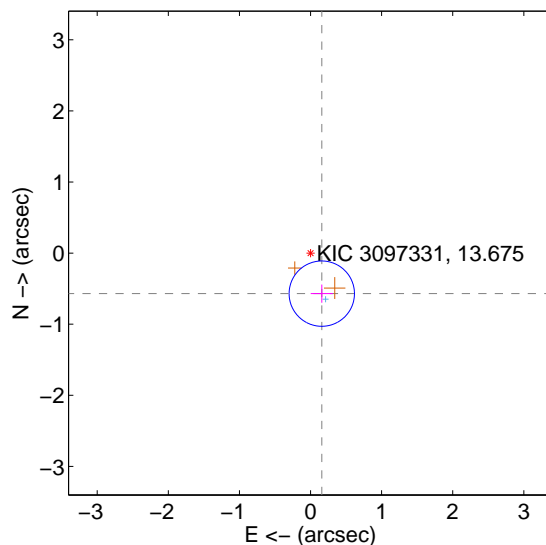
The direct PRF centroid is offset from the target star catalog position by about 0.21 arcsec

|   | Distance in arcsec                  | Distance / $\sigma$ | $\Delta$ RA        | $\Delta$ Dec       |
|---|-------------------------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT          | $0.343 \pm 0.149$                   | 2.30                | $-0.057 \pm 0.099$ | $-0.338 \pm 0.150$ |
| PRF-fit source offset from KIC position | <b><math>0.592 \pm 0.153</math></b> | <b>3.86</b>         | $-0.158 \pm 0.155$ | $-0.570 \pm 0.128$ |
| photometric centroid source offset      | $0.37 \pm 0.82$                     | 0.45                | $0.08 \pm 0.71$    | $-0.36 \pm 0.83$   |

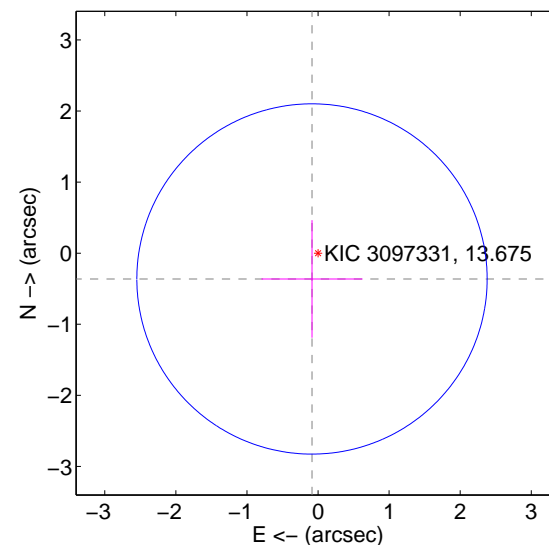
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

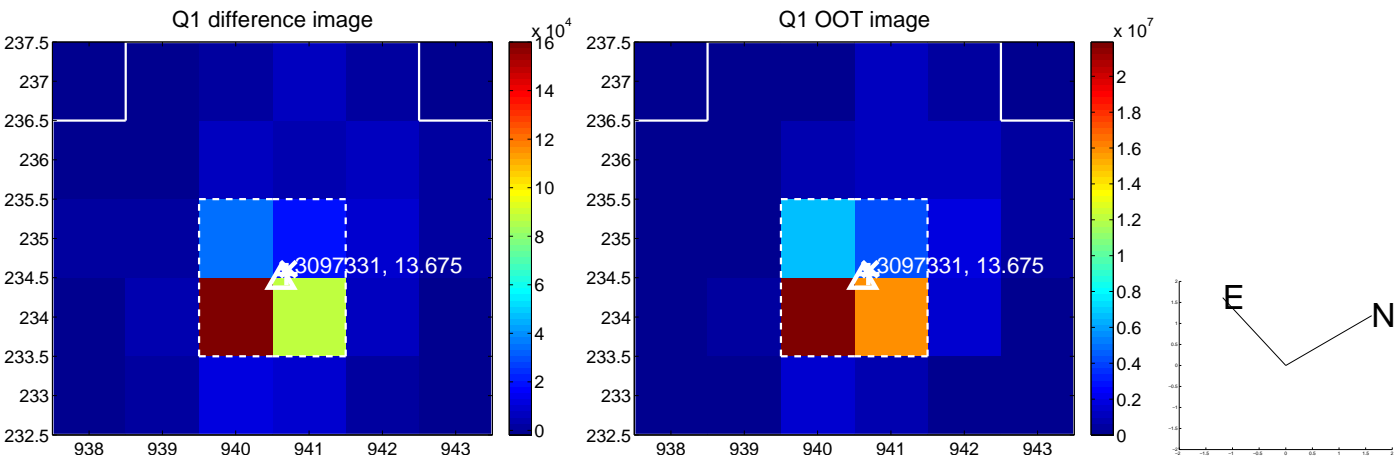


offset from photometric centroids



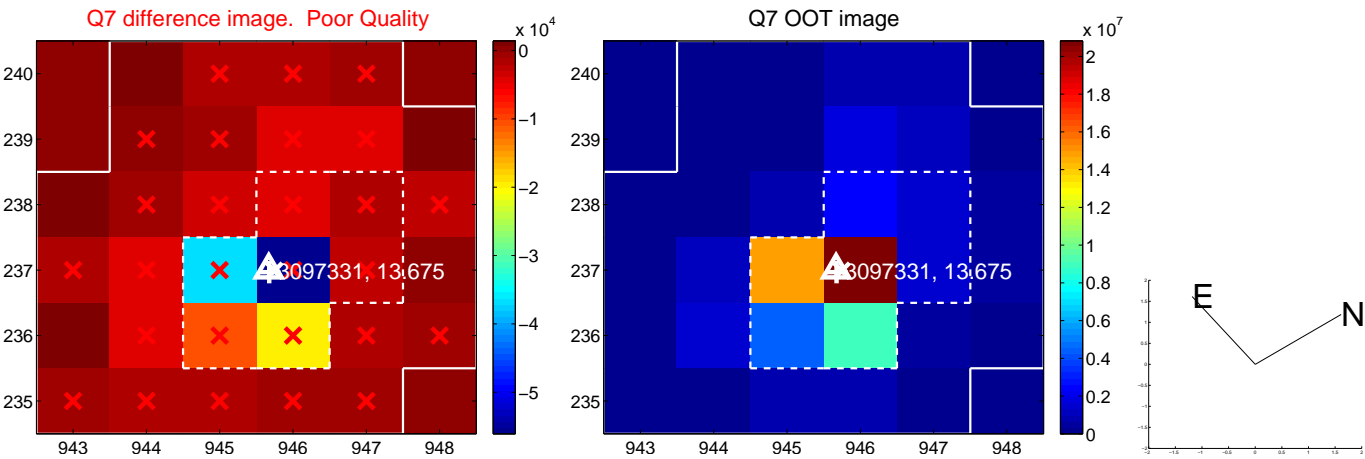
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

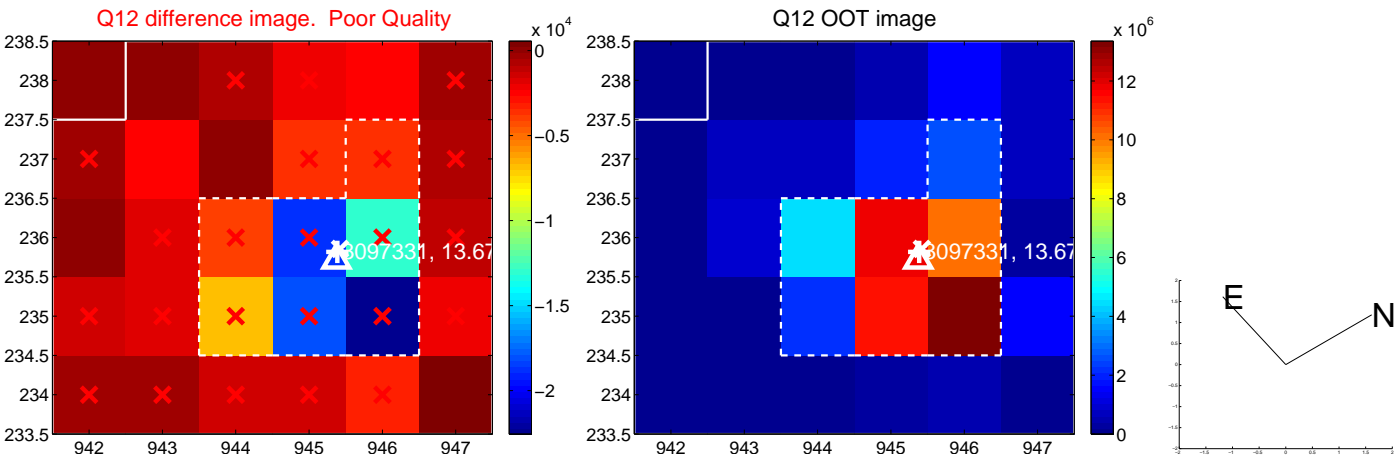




white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



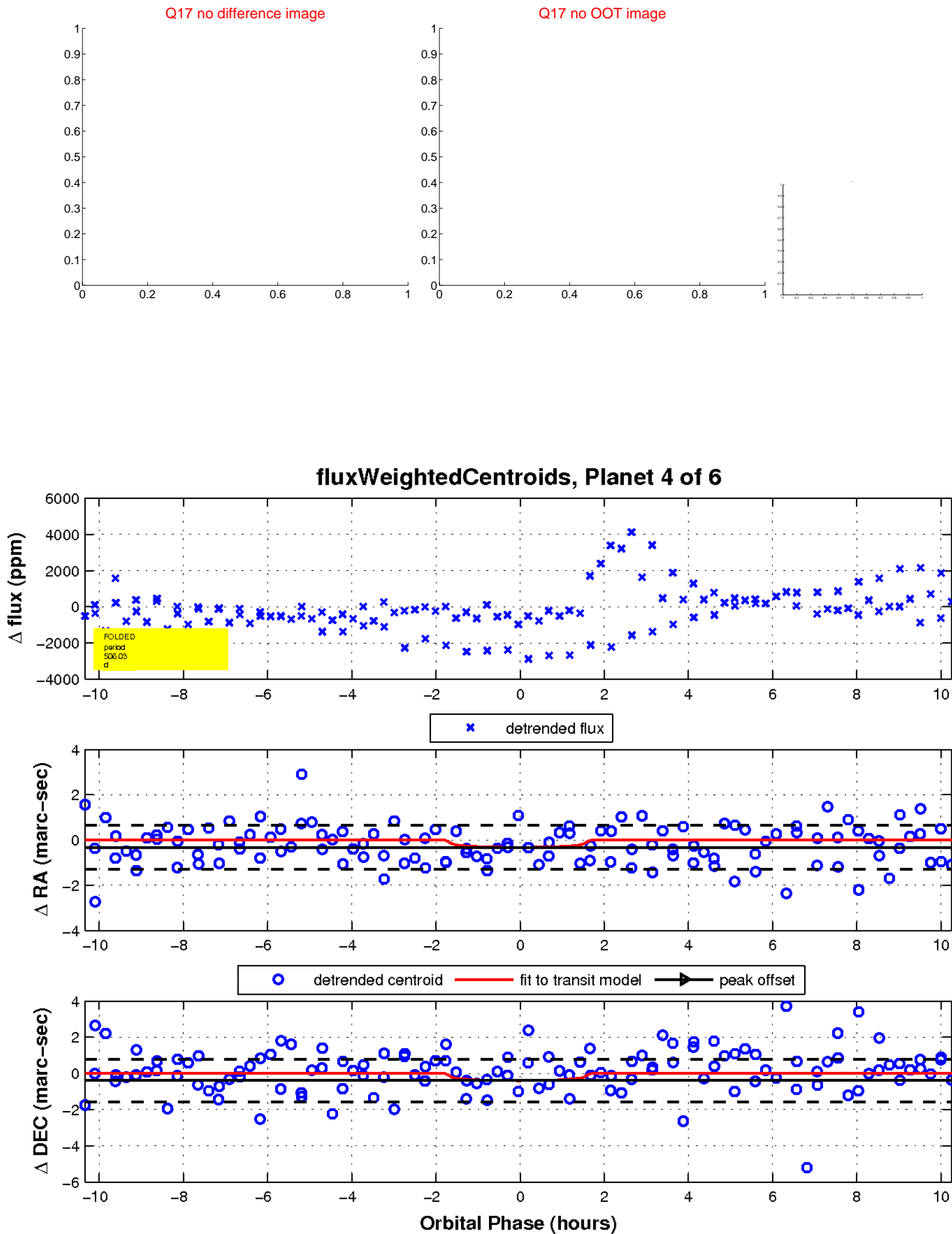
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

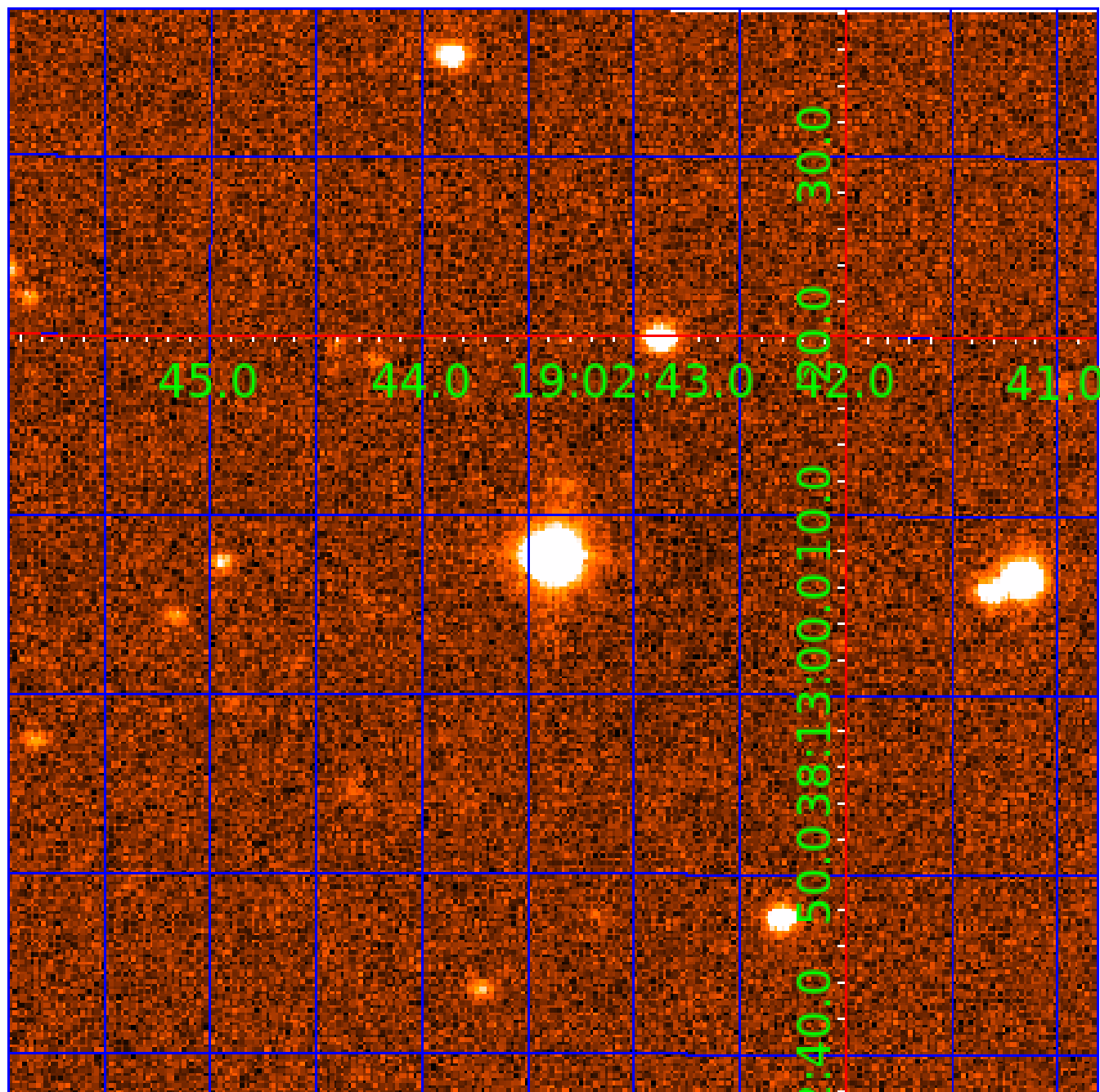


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 003097331

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|-----|-----------------------------|-----------------|------------------------|------------------------|
| 003097331-01 | OBS      | No   | 468.366690    | 432.617373   | 1387.3      | 4.169            | 12.1 | 6.4 | 0.59                        | 4980            | 2.20                   | 0.20                   |
| 003097331-02 | OBS      | No   | 489.078948    | 414.566850   | 1071.9      | 17.003           | 14.0 | 3.7 | 0.59                        | 4980            | 1.94                   | 0.18                   |
| 003097331-03 | OBS      | No   | 382.669196    | 285.730703   | 1367.3      | 4.468            | 16.3 | 8.2 | 0.59                        | 4980            | 2.21                   | 0.26                   |
| 003097331-04 | OBS      | No   | 506.025469    | 158.006130   | 1052.6      | 3.460            | 11.6 | 5.8 | 0.59                        | 4980            | 1.99                   | 0.18                   |
| 003097331-05 | OBS      | No   | 364.730993    | 242.967867   | 878.4       | 3.690            | 10.5 | 4.7 | 0.59                        | 4980            | 1.83                   | 0.27                   |
| 003097331-06 | OBS      | No   | 524.701079    | 482.439043   | 1284.2      | 4.341            | 13.4 | 6.3 | 0.59                        | 4980            | 2.12                   | 0.17                   |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments   |
|--------------|----------|------|-------|---|---|---|---|--|
| 003097331-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS  |
| 003097331-02 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS  |
| 003097331-03 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_MARSHALL_SKYE—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS |
| 003097331-04 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS   |
| 003097331-05 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS                                   |
| 003097331-06 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—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.

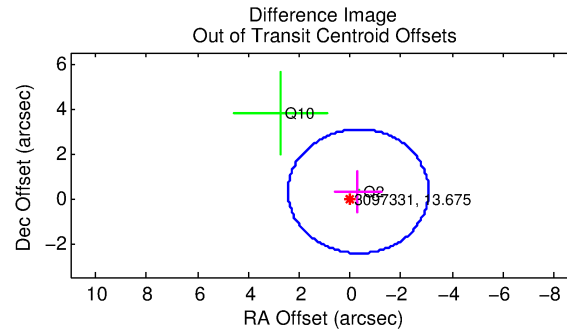
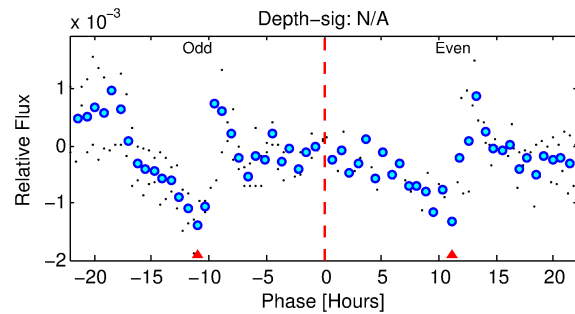
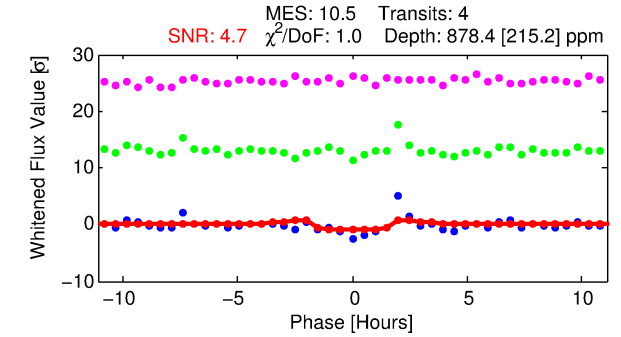
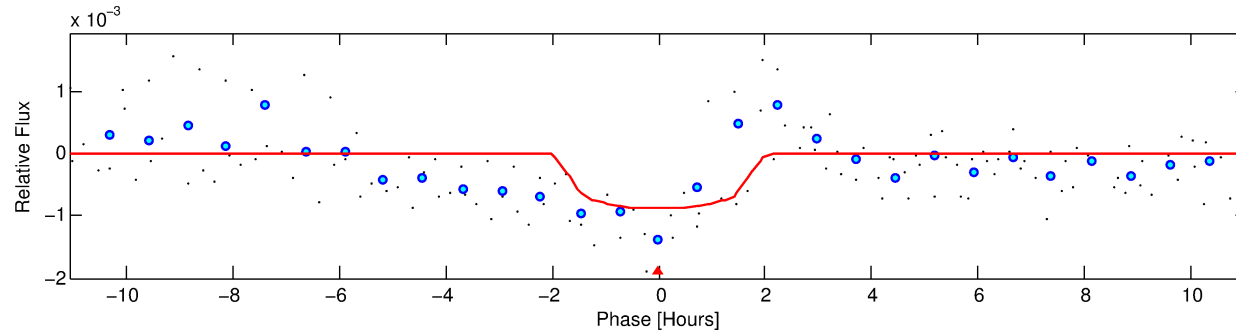
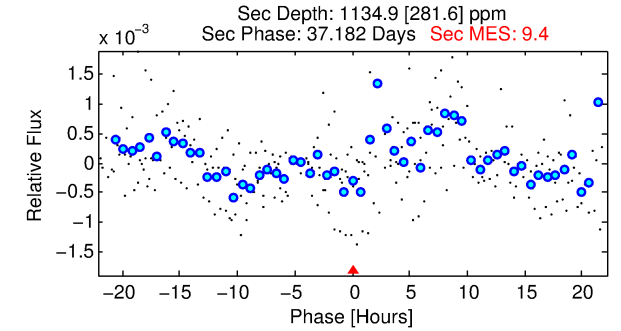
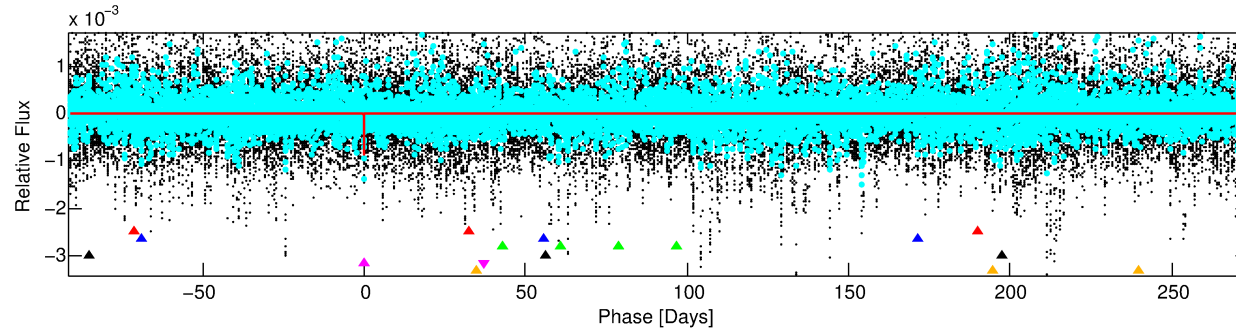
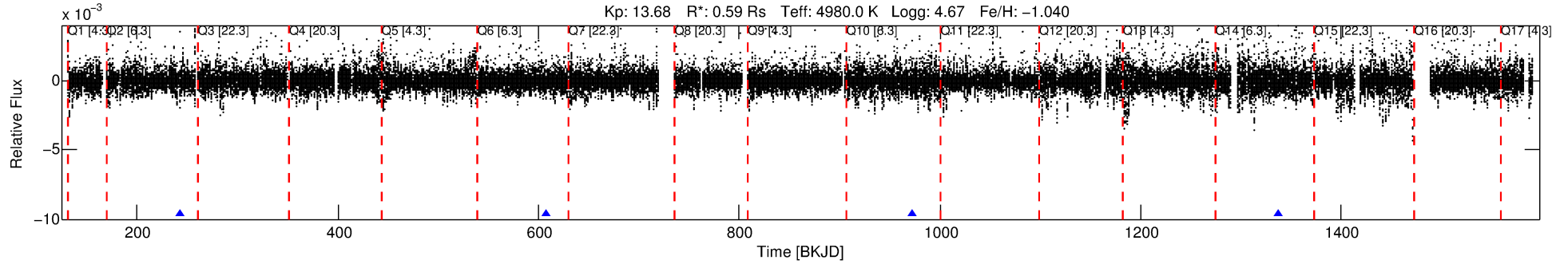
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 003097331-05

No Significant Match Found

# DV One-Page Summary

KIC: 3097331 Candidate: 5 of 6 Period: 364.731 d



## DV Fit Results:

Period = 364.73099 [0.00533] d  
Epoch = 242.9679 [0.0071] BKJD  
Rp/R\* = 0.0286 [0.0495]  
a/R\* = 599.94 [4088.11]  
b = 0.65 [6.08]  
Seff = 0.27 [0.04]  
Teq = 184 [7] K  
Rp = 1.84 [3.19] Re  
a = 0.8383 [0.0542] AU  
Ag = 130315.07 [453317.67] [0.29%]  
Teffp = 5410 [4706] K [1.11%]

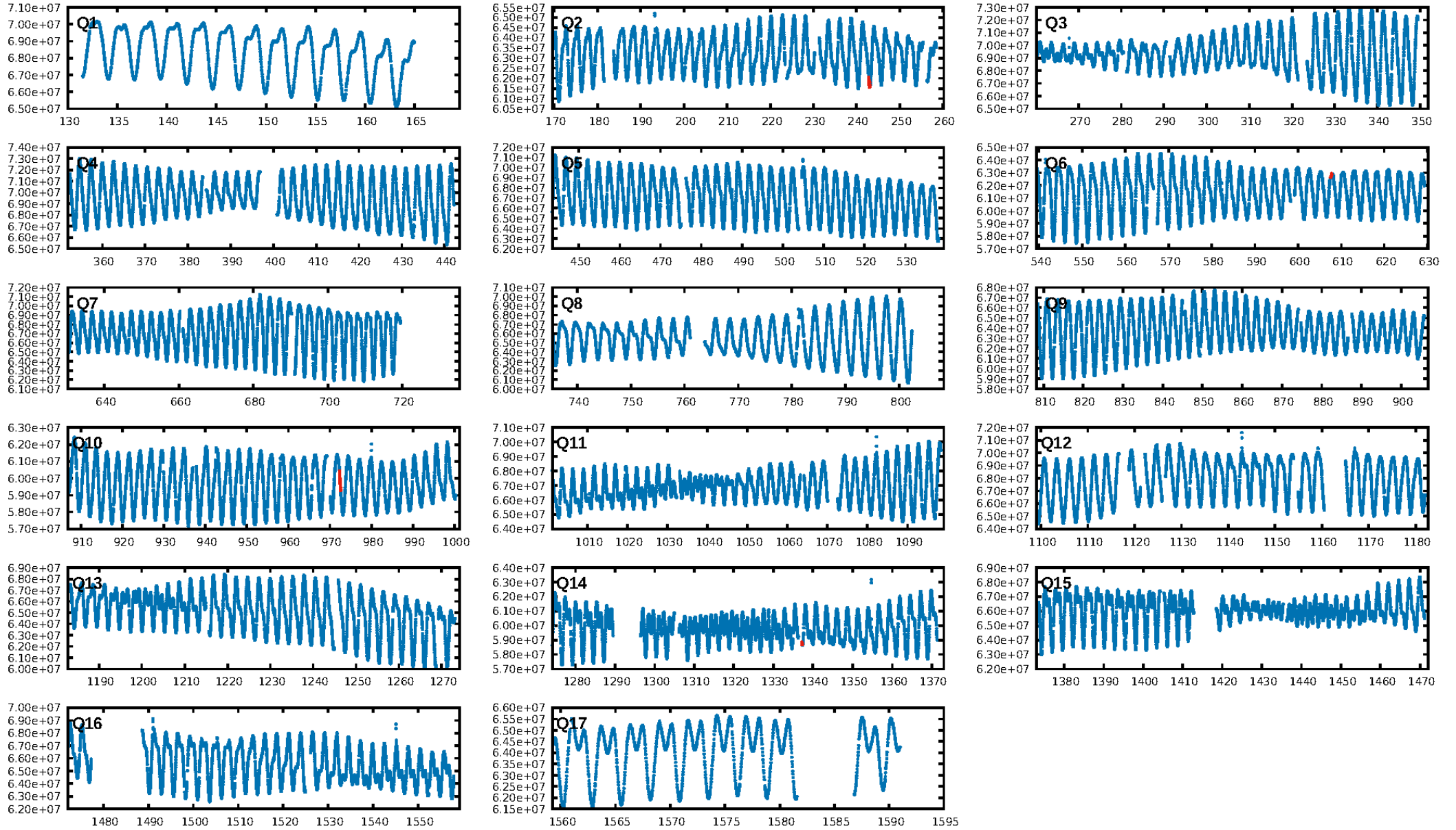
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [74.29%]  
ModelChiSquare2-sig: 2.7%  
ModelChiSquareGof-sig: 99.3%  
Bootstrap-pfa: 9.11e-09  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: 0.8959  
Centroid-sig: 9.9%  
Centroid-so: 1.782 arcsec [1.51%]  
OotOffset-rm: 0.450 arcsec [0.49%]  
OotOffset-st: 2/0/0/0 [2]  
KicOffset-rm: 0.311 arcsec [0.34%]  
KicOffset-st: 2/0/0/0 [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: 02-Feb-2016 01:11:36 Z

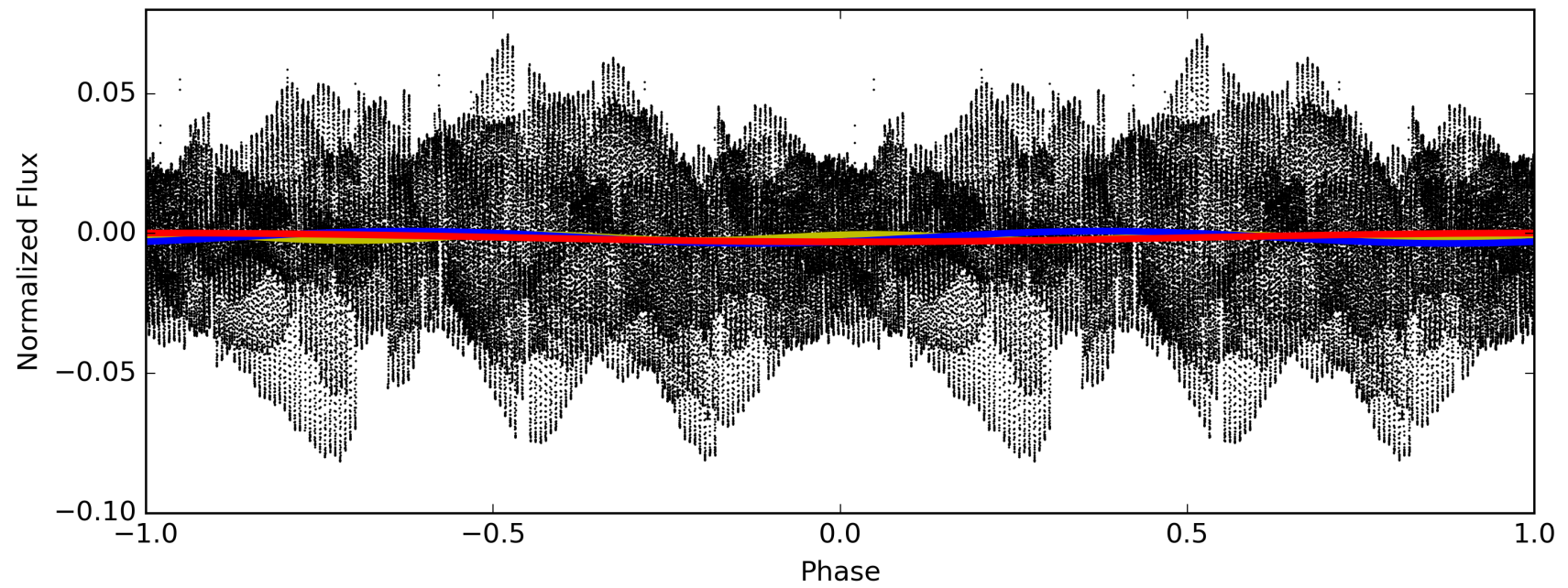
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 003097331-05, PDC Light Curves



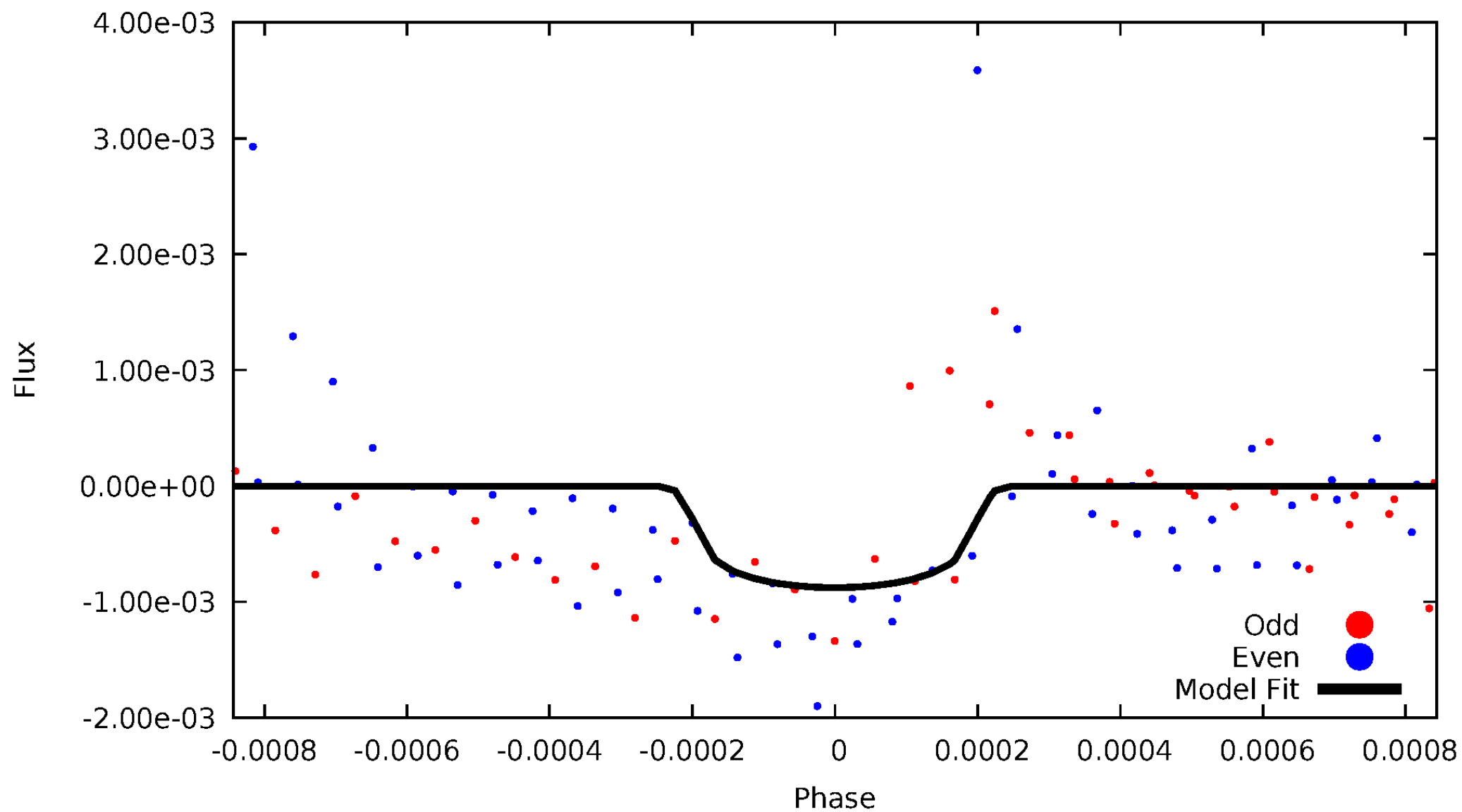


— P = 182.365 days      — P = 364.731 days      — P = 729.462 days



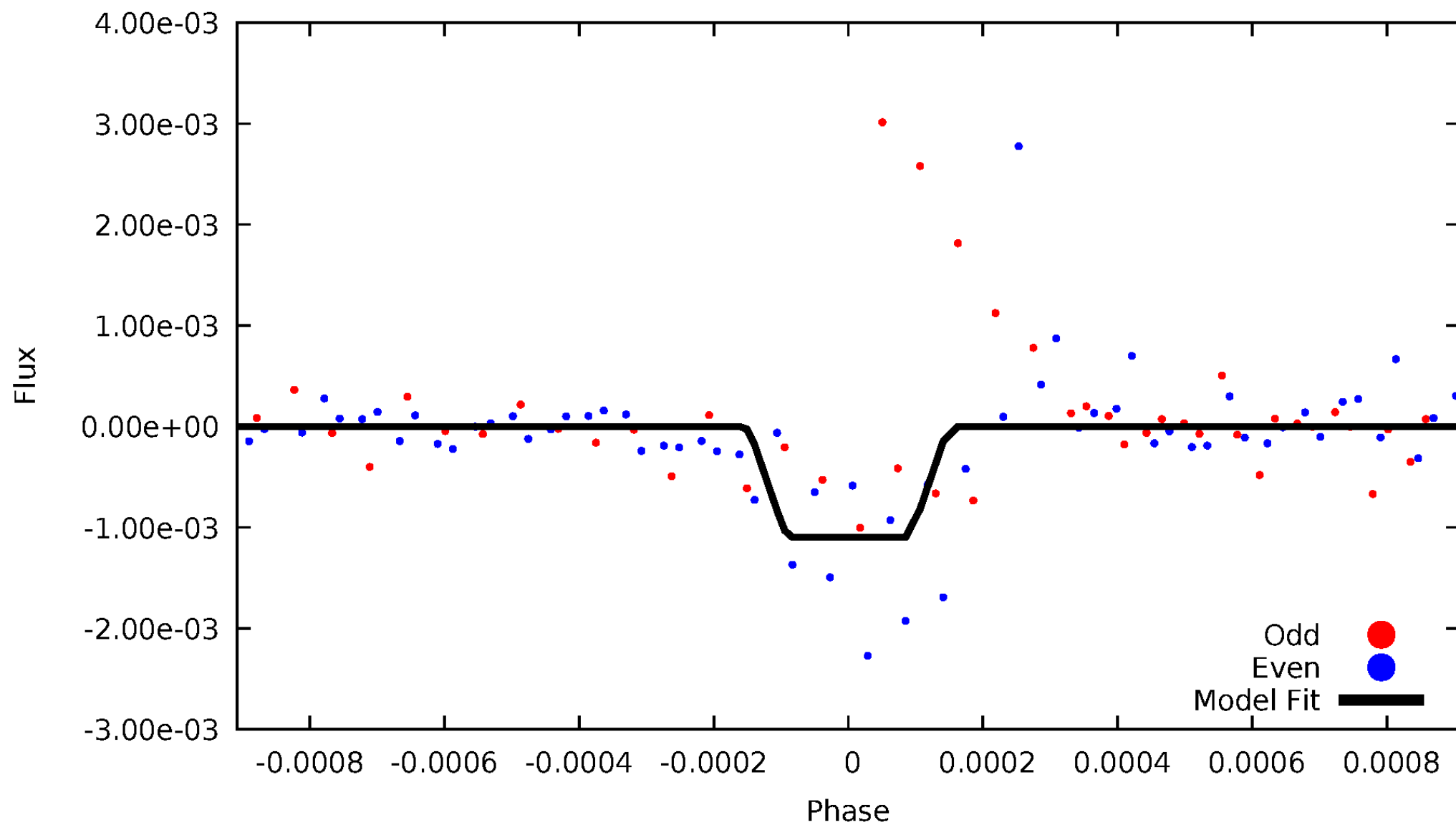
# DV Odd/Even

TCE 003097331-05



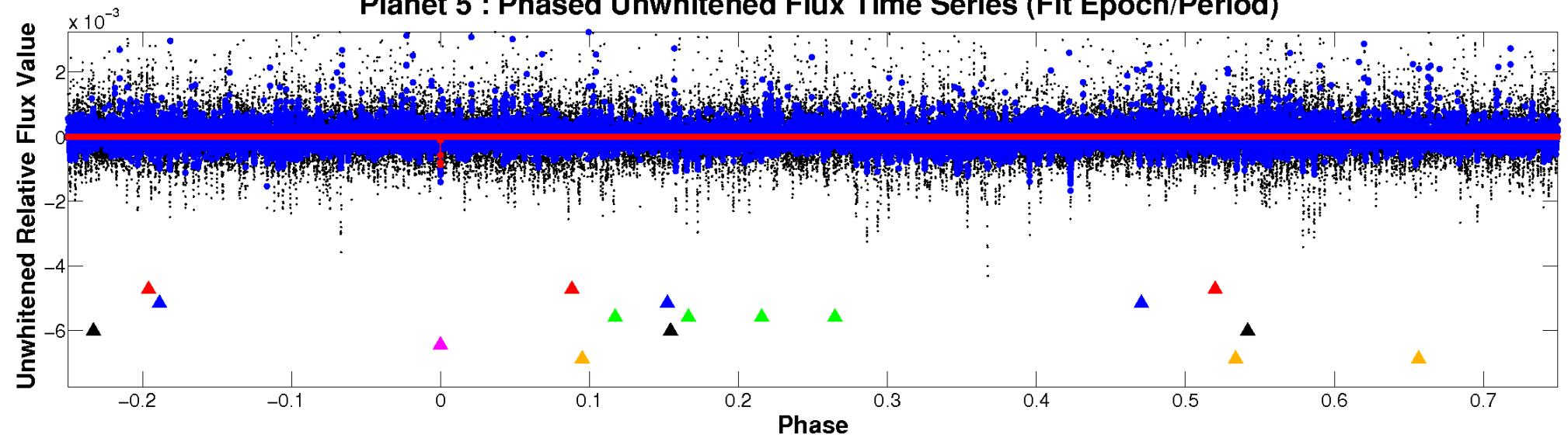
# ALT Odd/Even

TCE 003097331-05

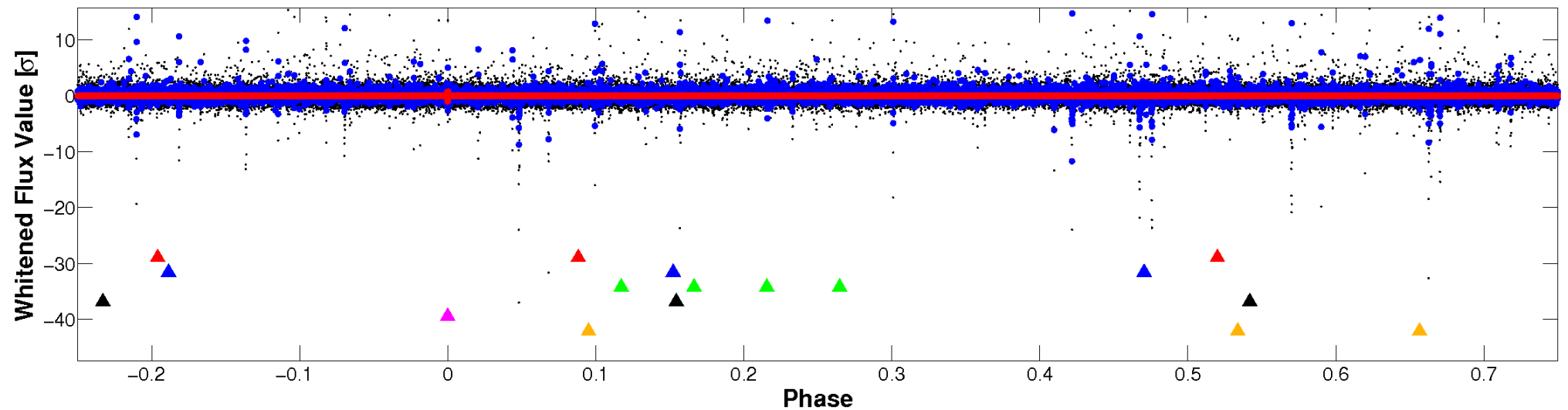


# Non-Whitened Vs. Whitened Light Curve

Planet 5 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

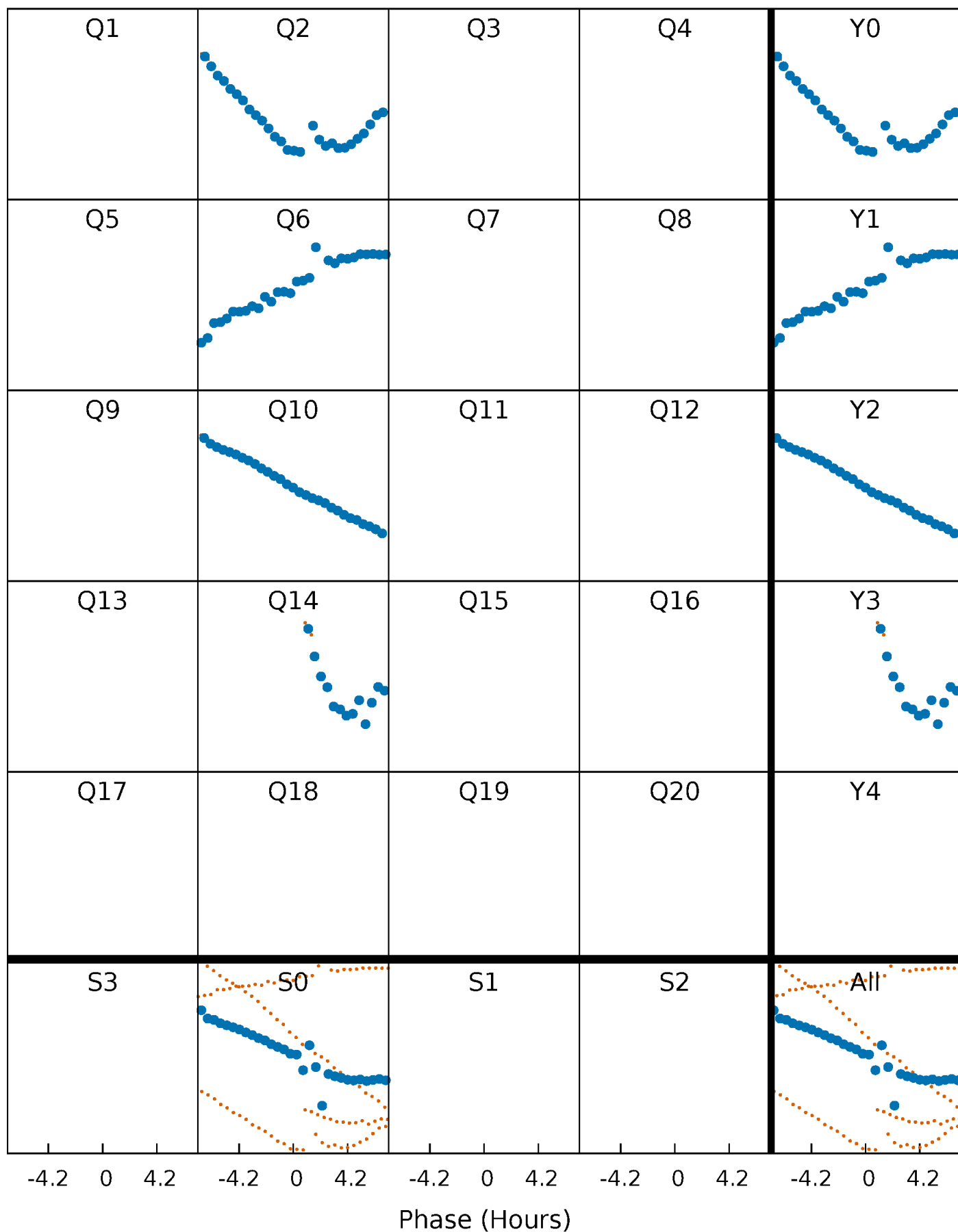


Planet 5 : Phased Whitened Flux Time Series (Fit Epoch/Period)



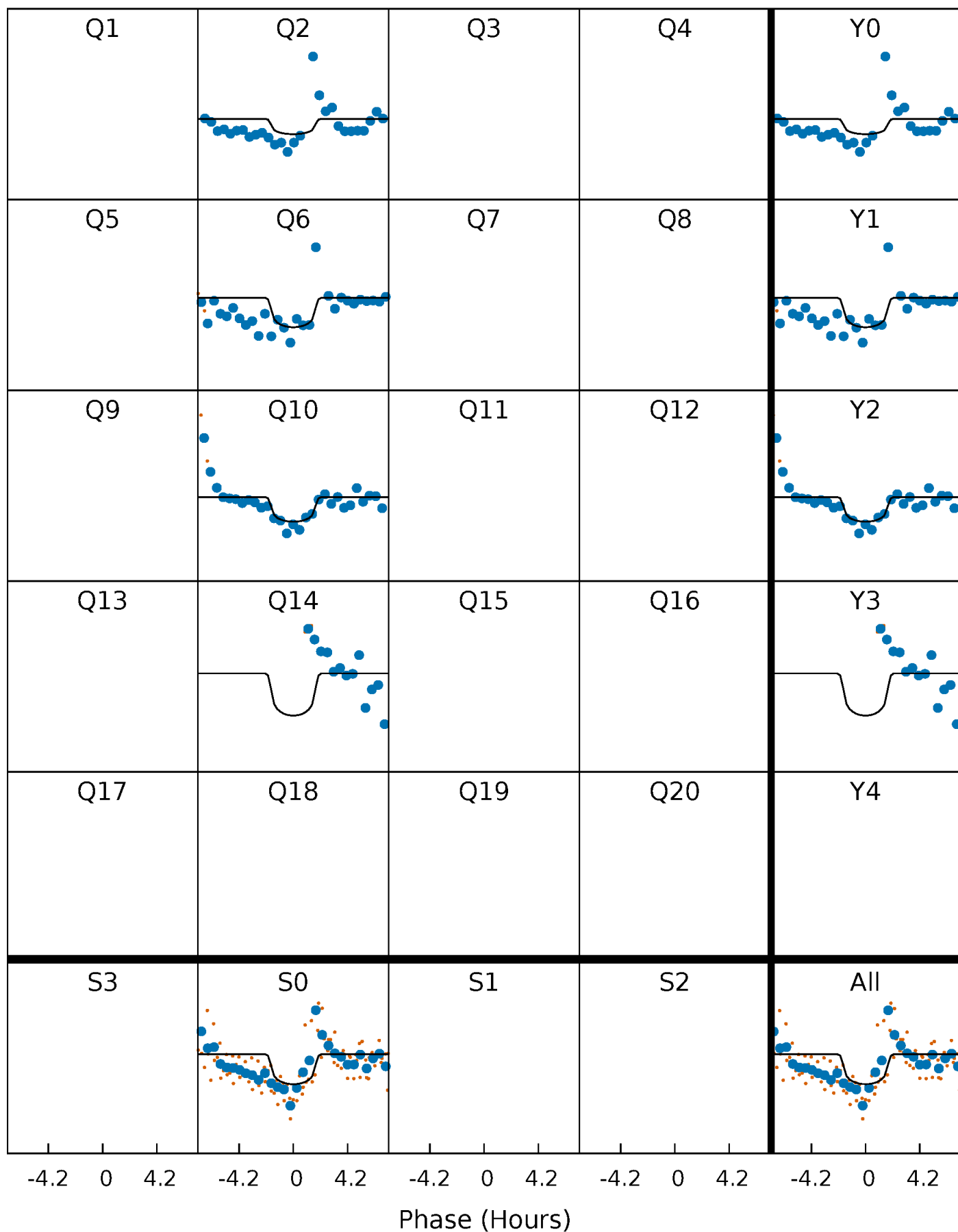
# PDC Quarter-Phased Transit Curves

TCE 003097331-05     $P=364.730993$  Days     $T_0=242.967867$  (BKJD)



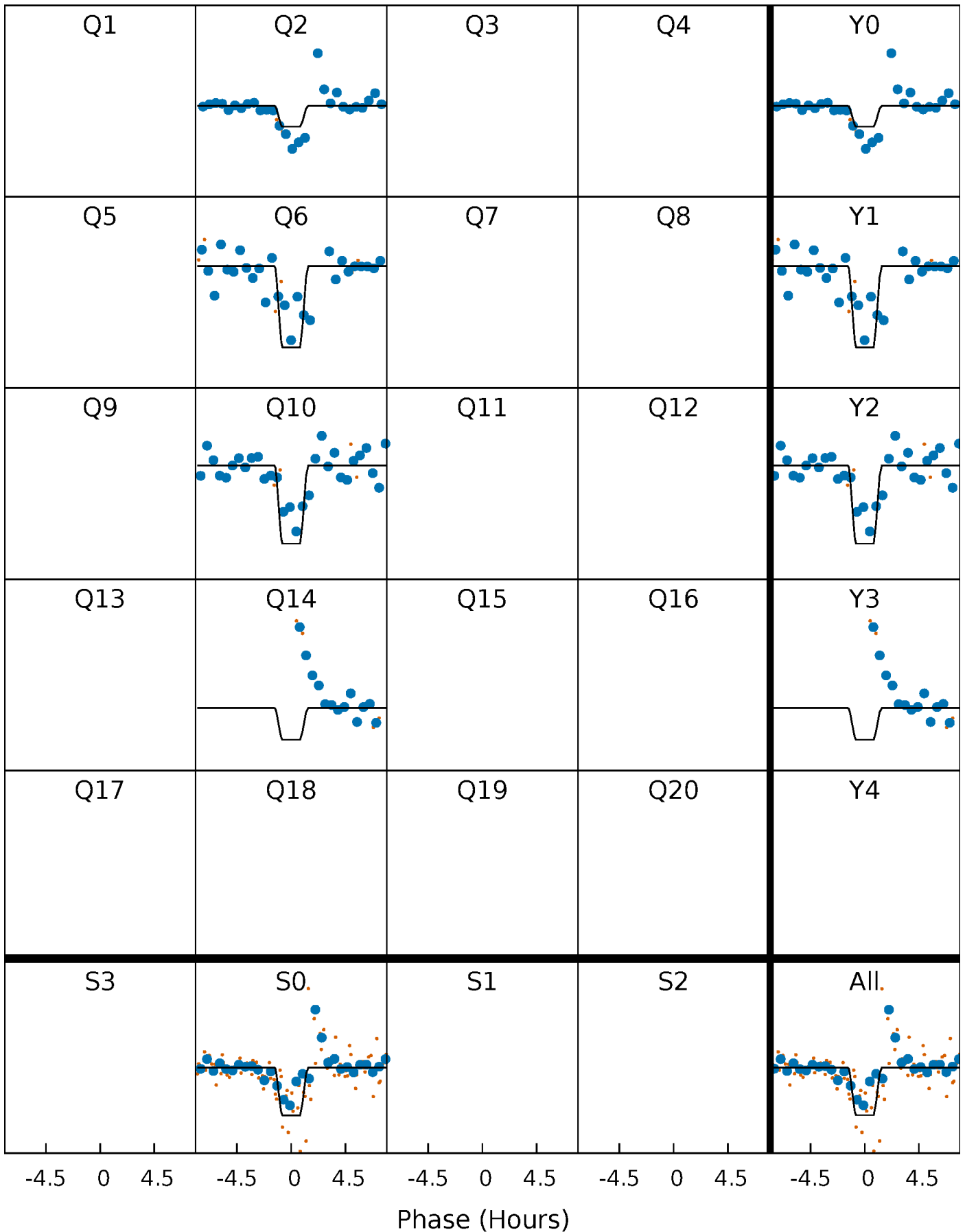
# DV Quarter-Phased Transit Curves

TCE 003097331-05     $P=364.730993$  Days     $T_0=242.967867$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

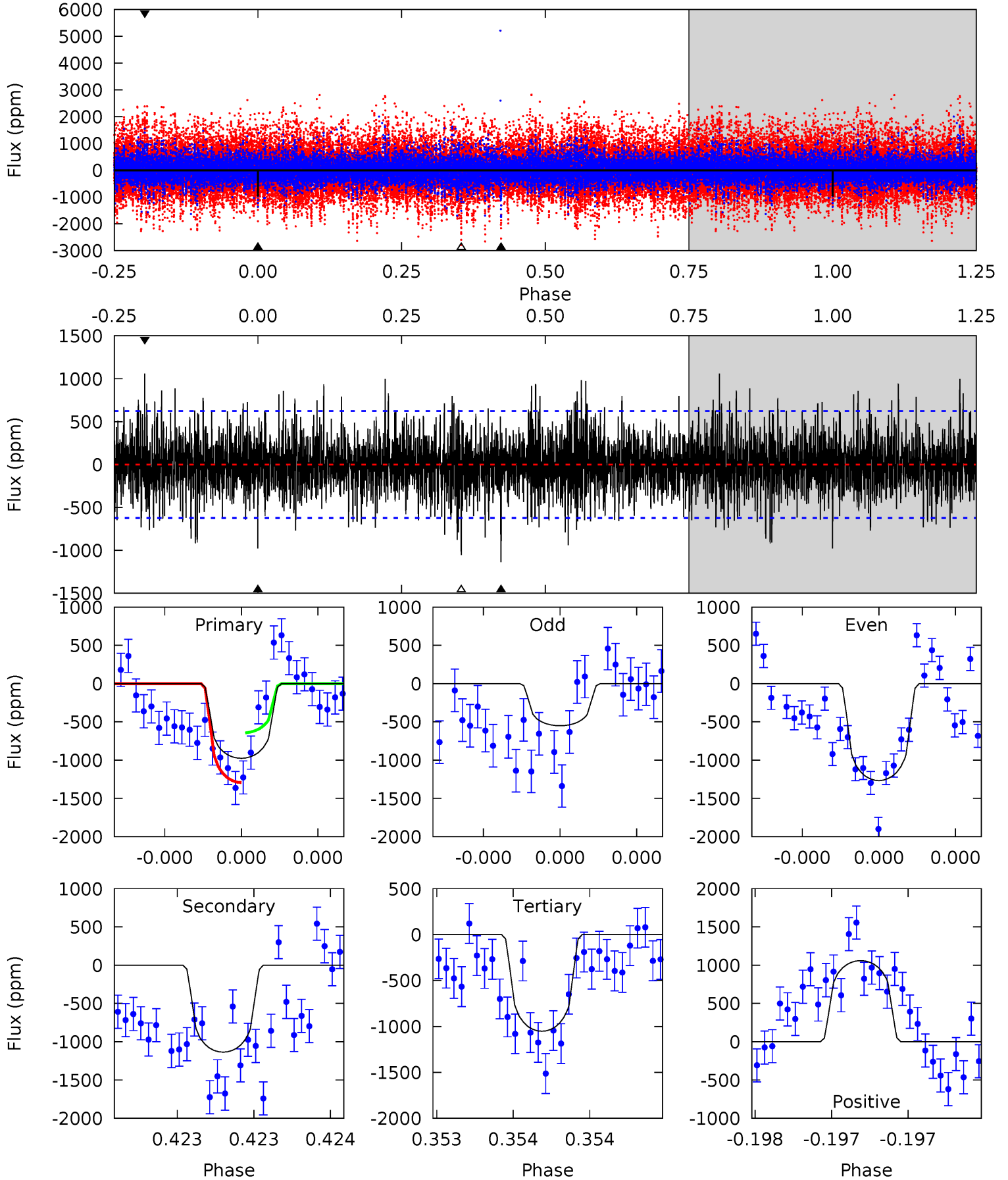
TCE 003097331-05     $P=364.744080$  Days     $T_0=242.948351$  (BKJD)



# DV Model-Shift Uniqueness Test

003097331-05, P = 364.730993 Days, E = 242.967867 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  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 8.74 | 10.2 | 9.43 | 9.49 | 5.58            | 3.50            | 2.23             | -0.69   | -0.75   | 0.75    | 0.69    | 2.92    | 0.53 | 0.48  | 2.93 |

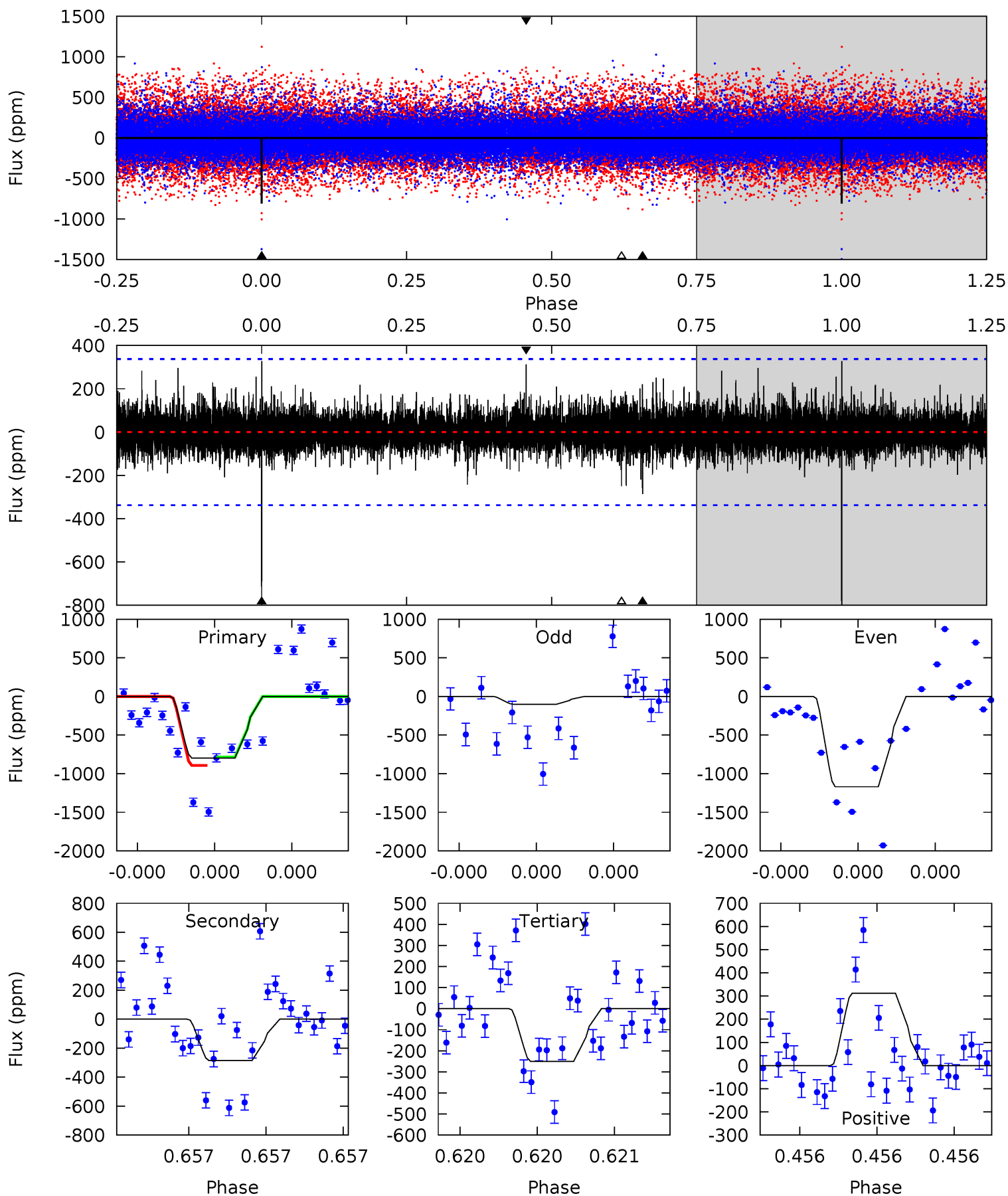




# Alt Model-Shift Uniqueness Test

003097331-05, P = 364.744080 Days, E = 242.948351 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  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|-------|-------|------|
| 13.4 | 4.80 | 4.20 | 5.25 | 5.67            | 3.63            | 0.88             | 9.22    | 8.17    | 0.60    | -0.45   | 9.42    | -0.04 | 0.29  | 0.85 |



### Stellar Parameters For KIC 003097331

|        | $T_{\text{eff}}(K)$  | $\log(g)$                 | [Fe/H]                     | $R$ ( $R_{\odot}$ )       | $M(M_{\odot})$            | $p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ ) |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
|        | $4980^{+149}_{-134}$ | $4.669^{+0.052}_{-0.036}$ | $-1.040^{+0.300}_{-0.300}$ | $0.589^{+0.045}_{-0.037}$ | $0.590^{+0.051}_{-0.022}$ | $4.065^{+0.792}_{-0.552}$                     |
|        | +3%/-3%              | +1%/-1%                   | +29%/-29%                  | +8%/-6%                   | +9%/-4%                   | +19%/-14%                                     |
| 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 003097331-05 / KOI

| Detrend | Depth (ppm)     | $R_p$ ( $R_{\oplus}$ ) | $T_{max}$ (K)   | $T_{obs}$ (K)         | $A_{obs}$                  |
|---------|-----------------|------------------------|-----------------|-----------------------|----------------------------|
| DV      | $-1136 \pm 112$ | $2.90^{+2.81}_{-2.05}$ | $257^{+8}_{-9}$ | $4446^{+3616}_{-943}$ | $53014^{+583216}_{-39340}$ |
| Alt.    | $-285 \pm 59$   | $3.07^{+2.52}_{-1.97}$ | $257^{+8}_{-8}$ | $3428^{+1536}_{-568}$ | $11722^{+79632}_{-8371}$   |

$T_{max}$  = 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  $A_{obs} \gg 1.0$

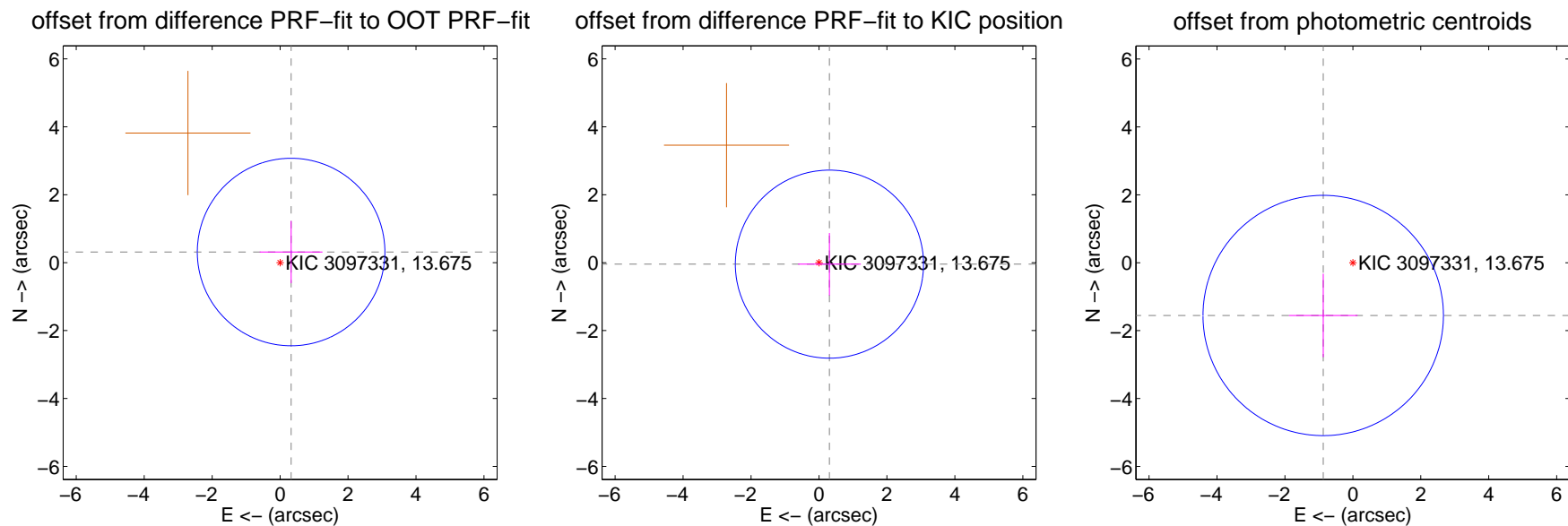
## DV Centroid Data

Supplemental centroid analysis for 003097331-05. Kepler magnitude: 13.68. Transit SNR 4.69

There are 1 quarters with good PRF difference image offsets

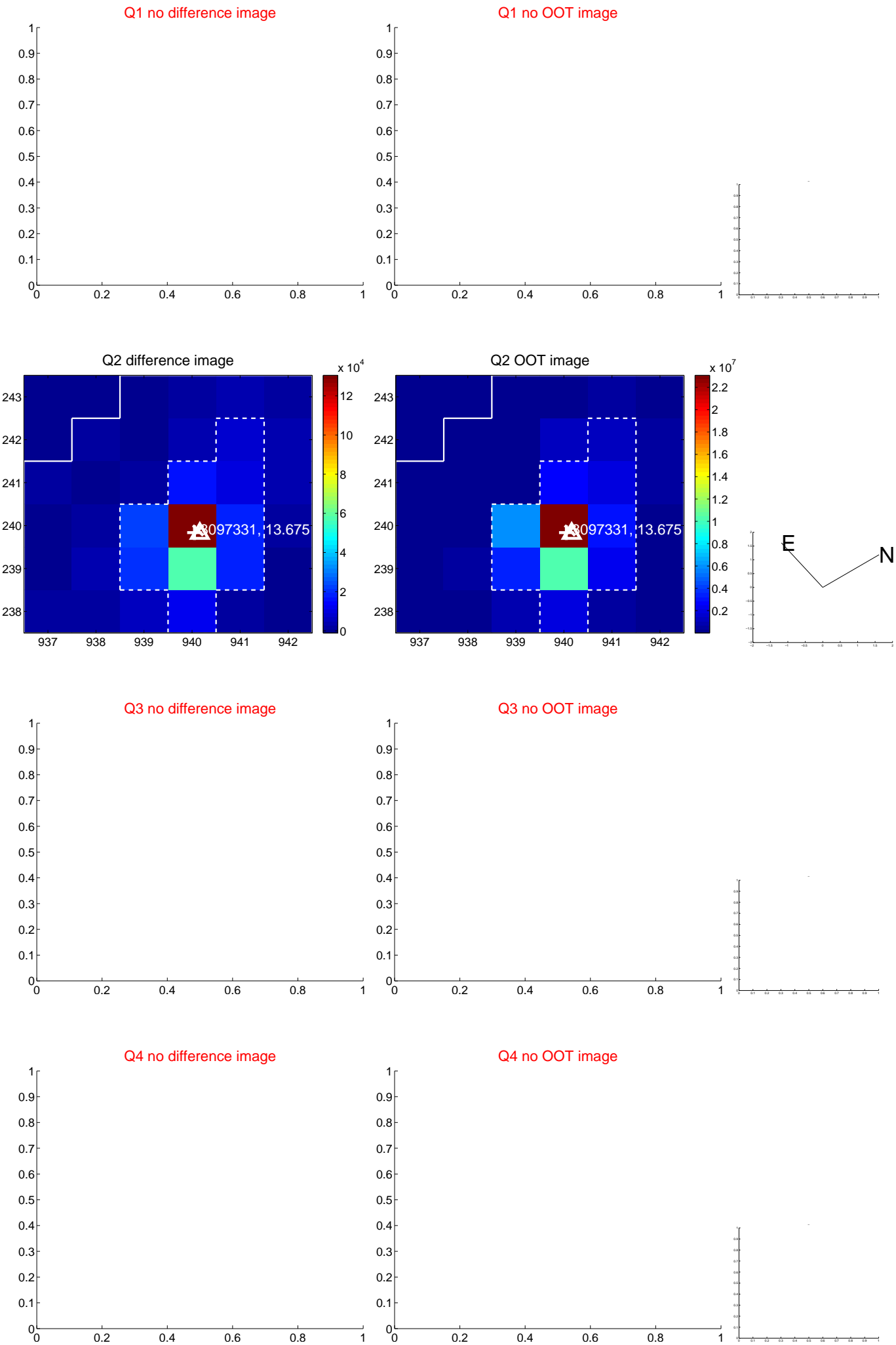
The direct PRF centroid is offset from the target star catalog position by about 0.36 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA        | $\Delta$ Dec       |
|---|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT          | $0.450 \pm 0.920$  | 0.49                | $-0.323 \pm 0.923$ | $0.312 \pm 0.917$  |
| PRF-fit source offset from KIC position | $0.311 \pm 0.923$  | 0.34                | $-0.307 \pm 0.923$ | $-0.044 \pm 0.917$ |
| photometric centroid source offset      | $1.78 \pm 1.18$    | 1.51                | $0.87 \pm 1.01$    | $-1.55 \pm 1.23$   |

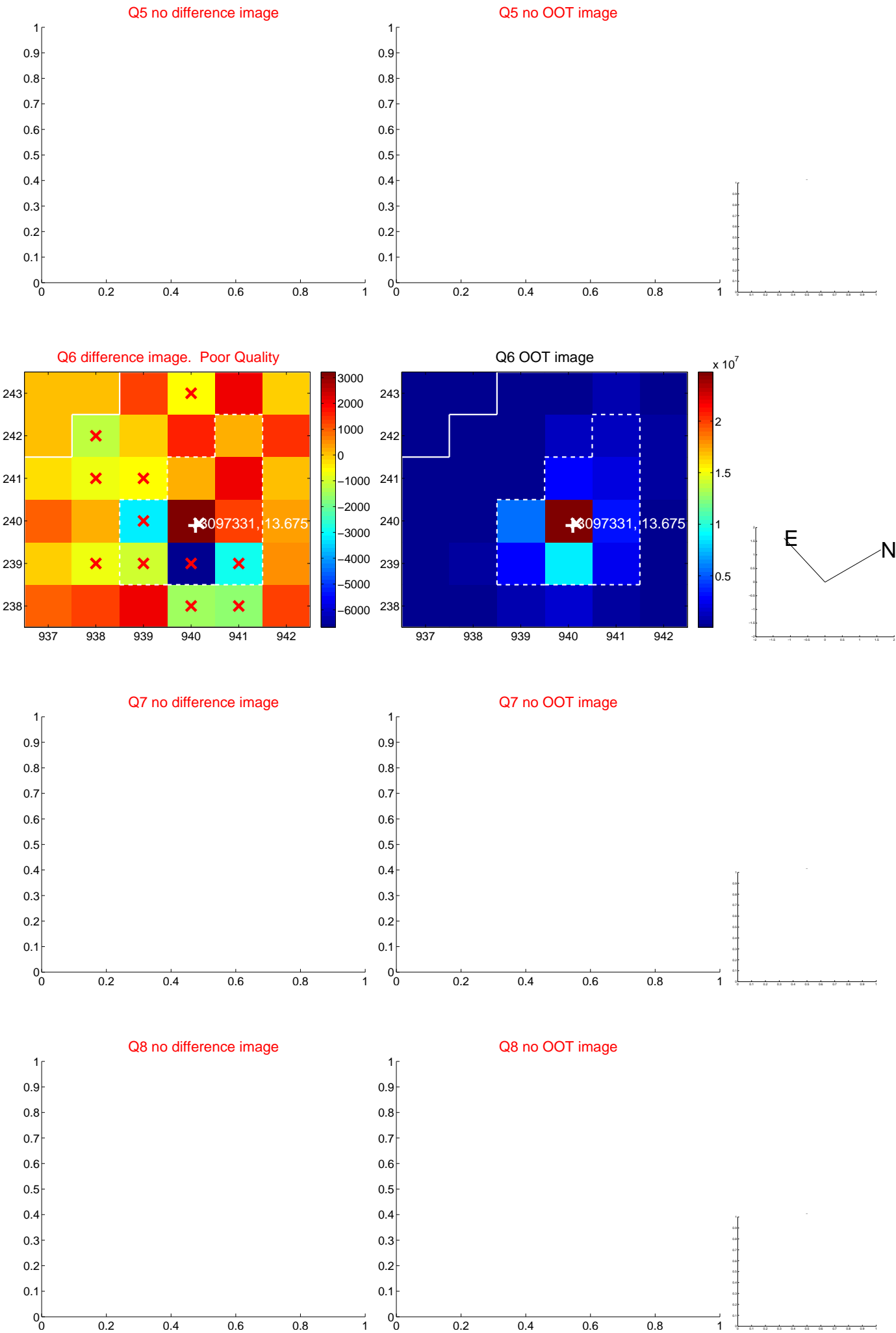


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three- $\sigma$ . 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  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

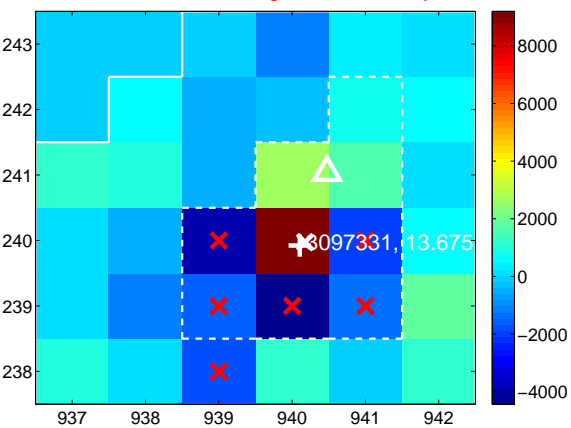
Q9 no difference image



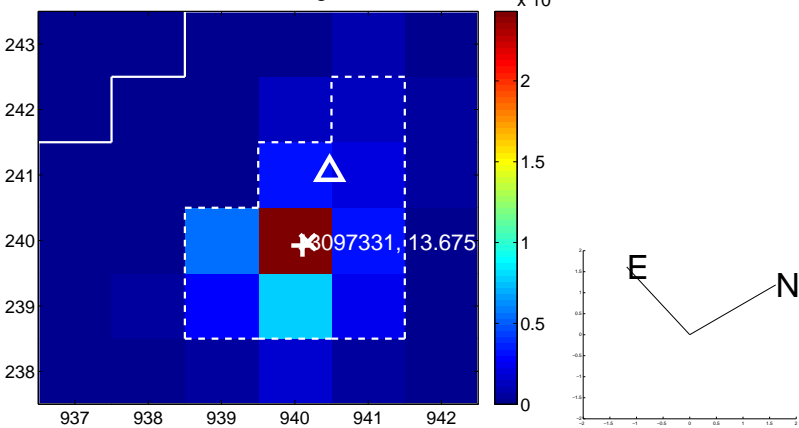
Q9 no OOT image



Q10 difference image. Poor Quality



Q10 OOT image



Q11 no difference image



Q11 no OOT image



Q12 no difference image



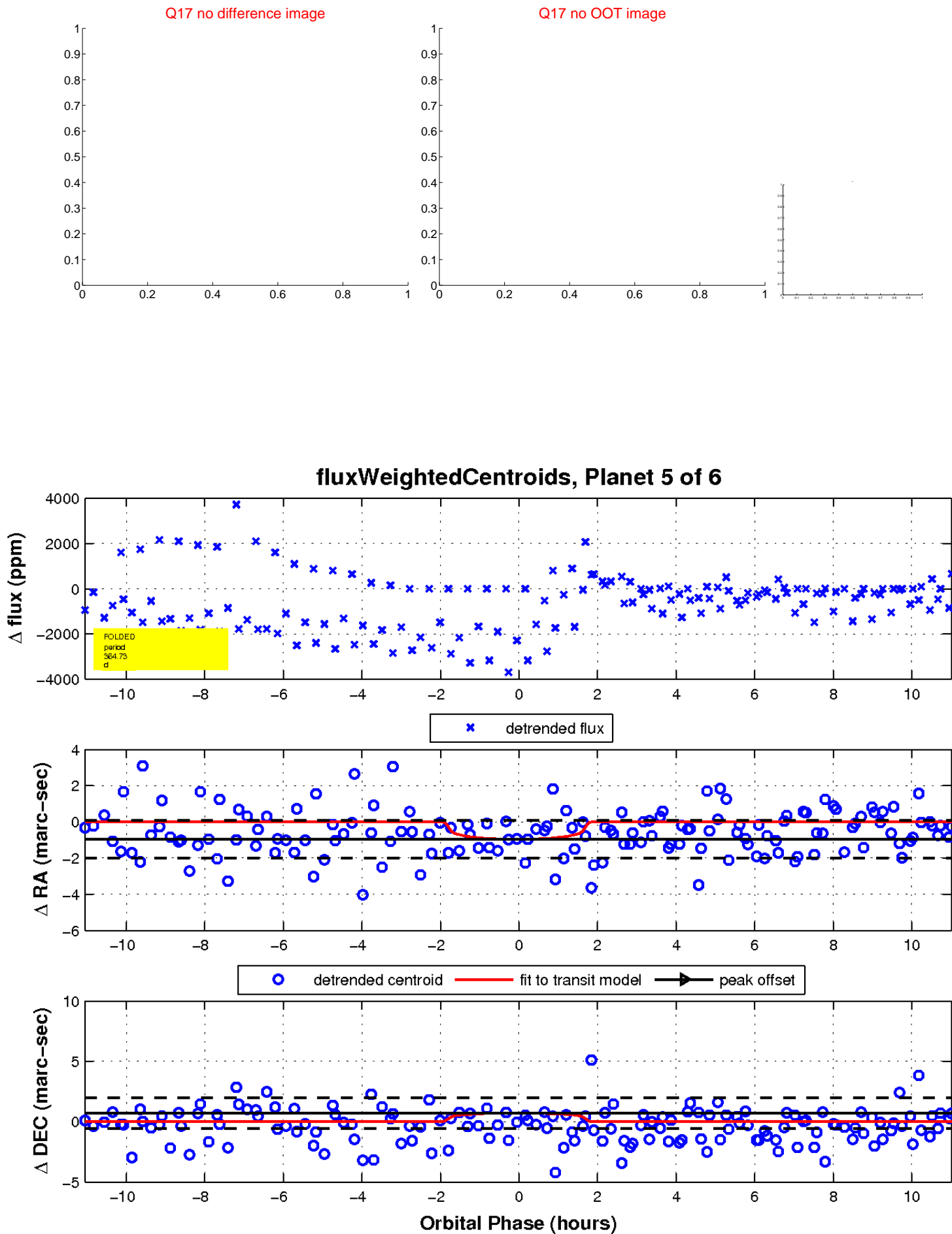
Q12 no OOT image



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



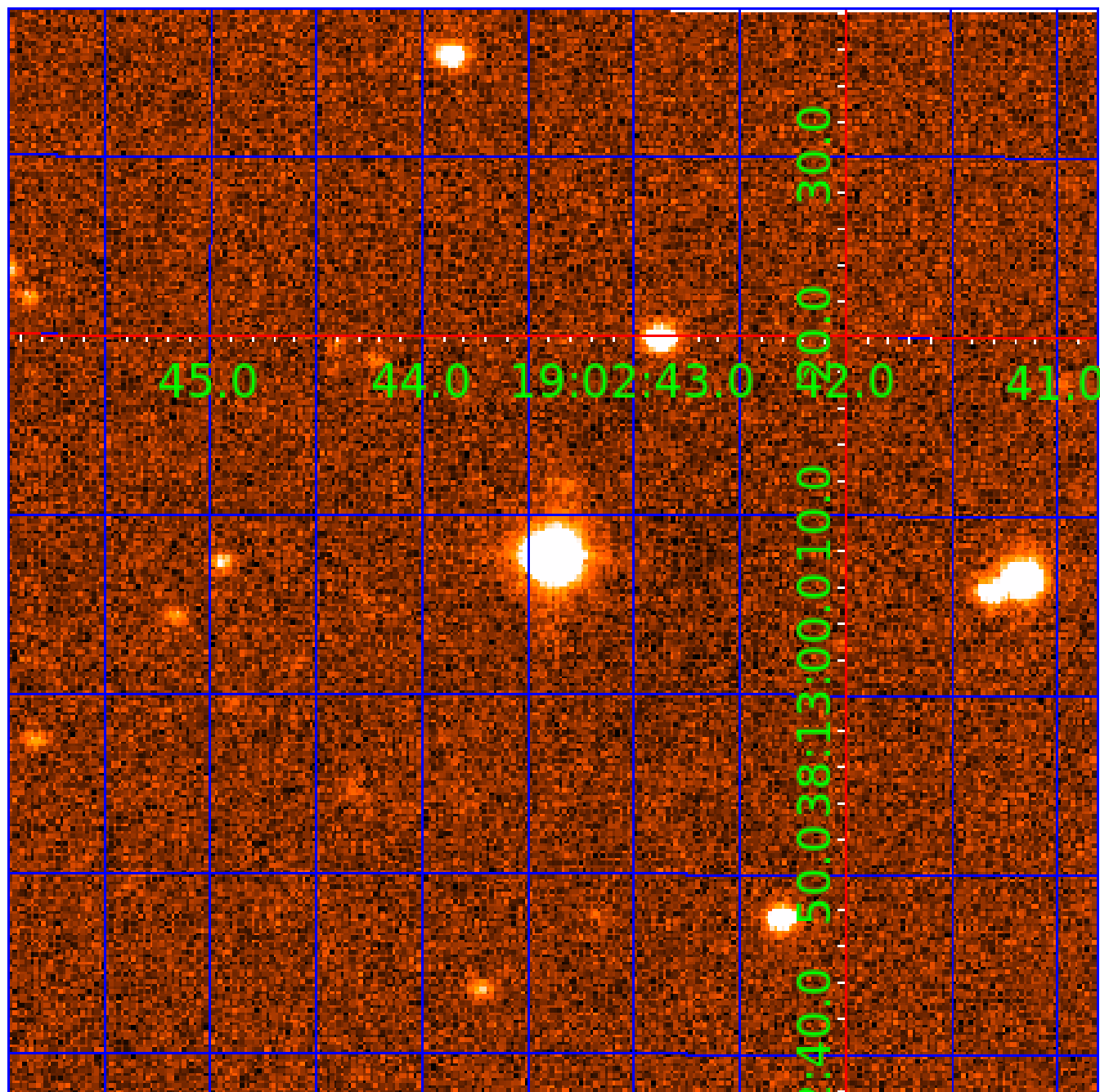
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





UKIRT Image

Declination



# KIC 003097331

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|-----|-----------------------------|-----------------|------------------------|------------------------|
| 003097331-01 | OBS      | No   | 468.366690    | 432.617373   | 1387.3      | 4.169            | 12.1 | 6.4 | 0.59                        | 4980            | 2.20                   | 0.20                   |
| 003097331-02 | OBS      | No   | 489.078948    | 414.566850   | 1071.9      | 17.003           | 14.0 | 3.7 | 0.59                        | 4980            | 1.94                   | 0.18                   |
| 003097331-03 | OBS      | No   | 382.669196    | 285.730703   | 1367.3      | 4.468            | 16.3 | 8.2 | 0.59                        | 4980            | 2.21                   | 0.26                   |
| 003097331-04 | OBS      | No   | 506.025469    | 158.006130   | 1052.6      | 3.460            | 11.6 | 5.8 | 0.59                        | 4980            | 1.99                   | 0.18                   |
| 003097331-05 | OBS      | No   | 364.730993    | 242.967867   | 878.4       | 3.690            | 10.5 | 4.7 | 0.59                        | 4980            | 1.83                   | 0.27                   |
| 003097331-06 | OBS      | No   | 524.701079    | 482.439043   | 1284.2      | 4.341            | 13.4 | 6.3 | 0.59                        | 4980            | 2.12                   | 0.17                   |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments   |
|--------------|----------|------|-------|---|---|---|---|--|
| 003097331-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS  |
| 003097331-02 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS  |
| 003097331-03 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_MARSHALL_SKYE—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS |
| 003097331-04 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS   |
| 003097331-05 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS                                   |
| 003097331-06 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—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.

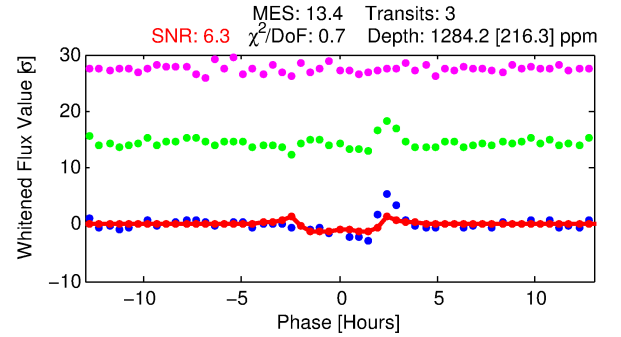
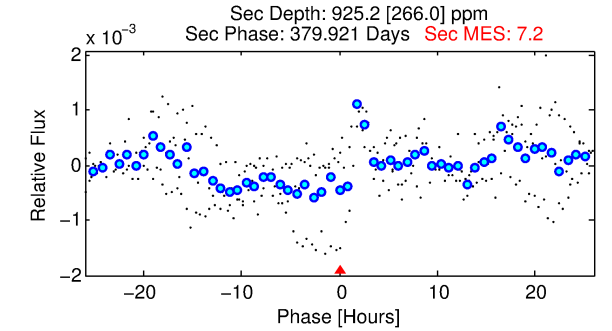
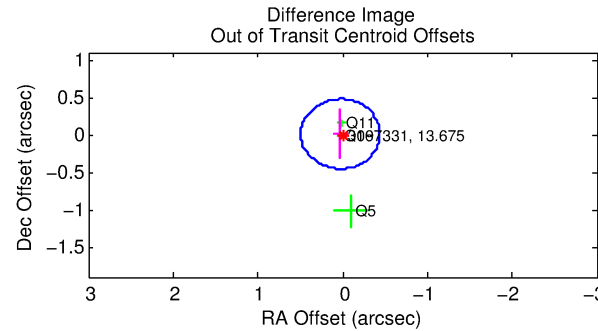
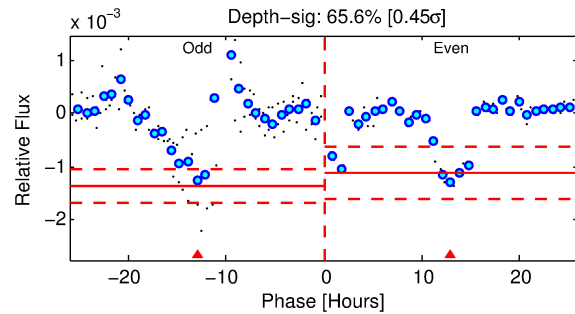
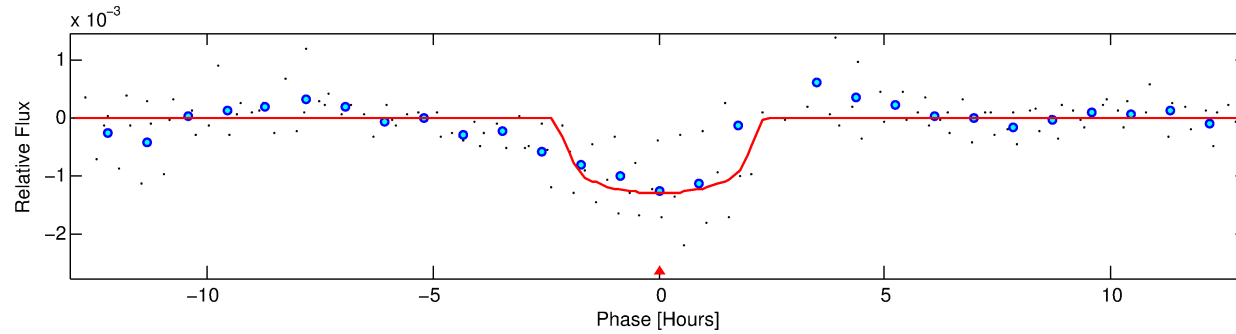
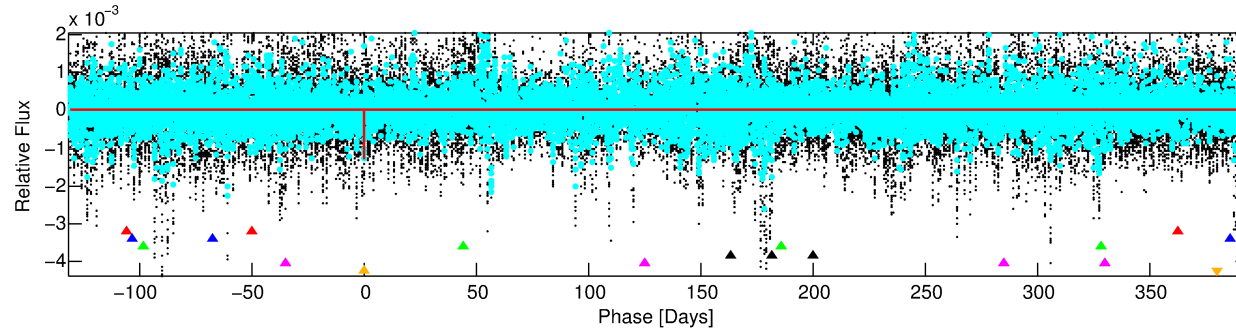
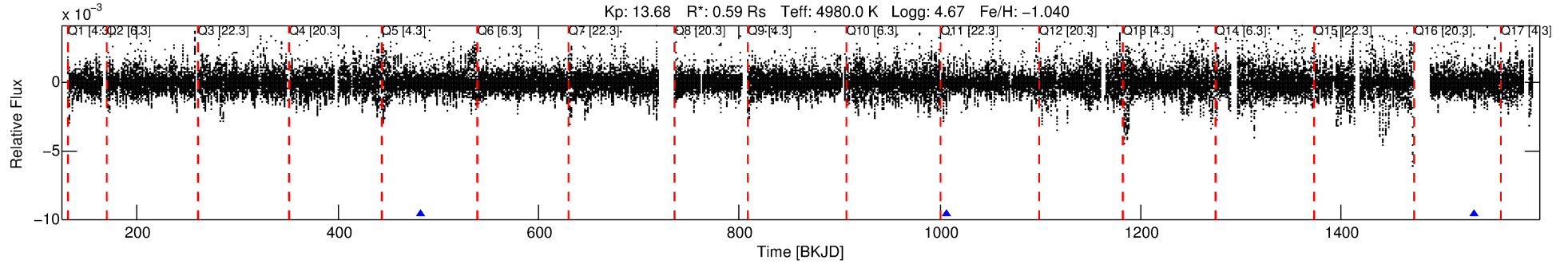
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 003097331-06

No Significant Match Found

# DV One-Page Summary

KIC: 3097331 Candidate: 6 of 6 Period: 524.701 d



## DV Fit Results:

Period = 524.70108 [0.00353] d  
Epoch = 482.4390 [0.0045] BKJD  
Rp/R\* = 0.0330 [0.0370]  
a/R\* = 870.41 [3829.18]  
b = 0.42 [8.64]  
Seff = 0.17 [0.03]  
Teq = 163 [6] K  
Rp = 2.12 [2.39] Re  
a = 1.0684 [0.0691] AU  
Ag = 128956.34 [291948.25] [0.44 $\sigma$ ]  
Teffp = 4779 [2707] K [1.71 $\sigma$ ]

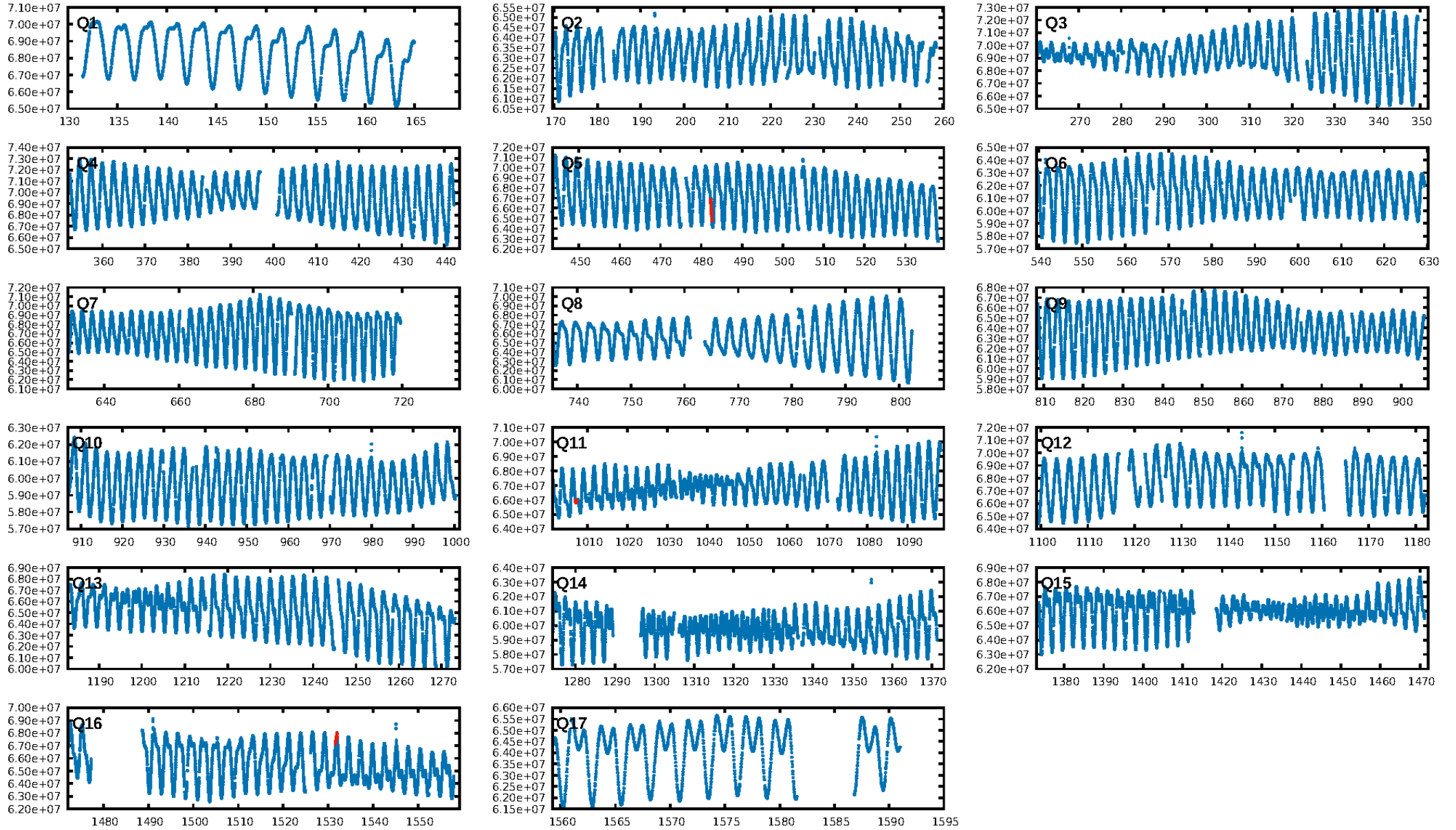
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [80.75 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 99.2%  
ModelChiSquareGof-sig: 99.9%  
**Bootstrap-pfa: 6.65e-11**  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: -0.7212  
Centroid-sig: 75.6%  
Centroid-so: 0.952 arcsec [1.44 $\sigma$ ]  
OotOffset-rm: 0.030 arcsec [0.19 $\sigma$ ]  
OotOffset-st: 0/1/1/1 [3]  
KicOffset-rm: 0.242 arcsec [0.90 $\sigma$ ]  
KicOffset-st: 0/1/1/1 [3]  
DiffImageQuality-fgm: 0.67 [2/3]  
DiffImageOverlap-fno: 1.00 [3/3]

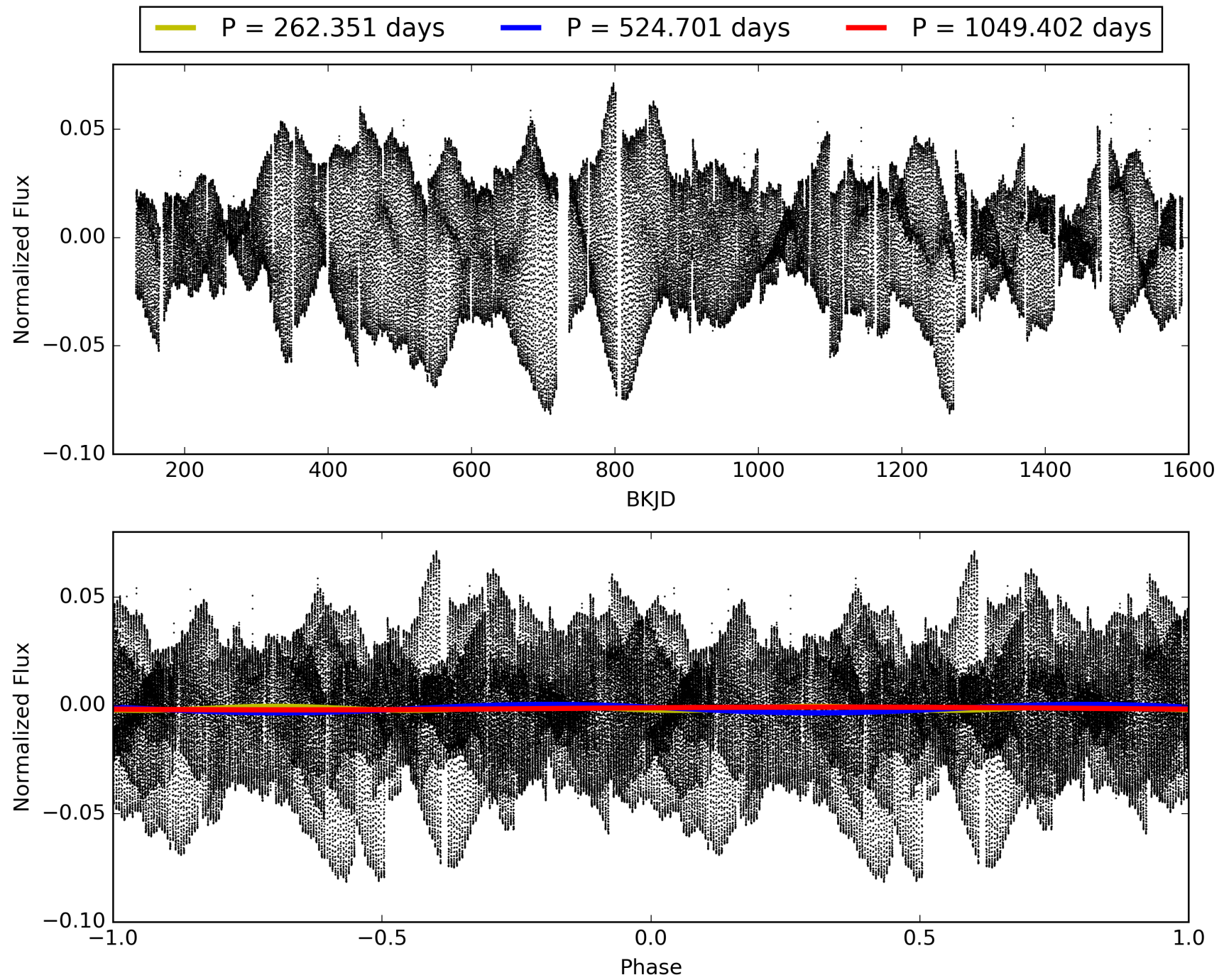
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 02-Feb-2016 01:11:54 Z

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

# TCE 003097331-06, PDC Light Curves

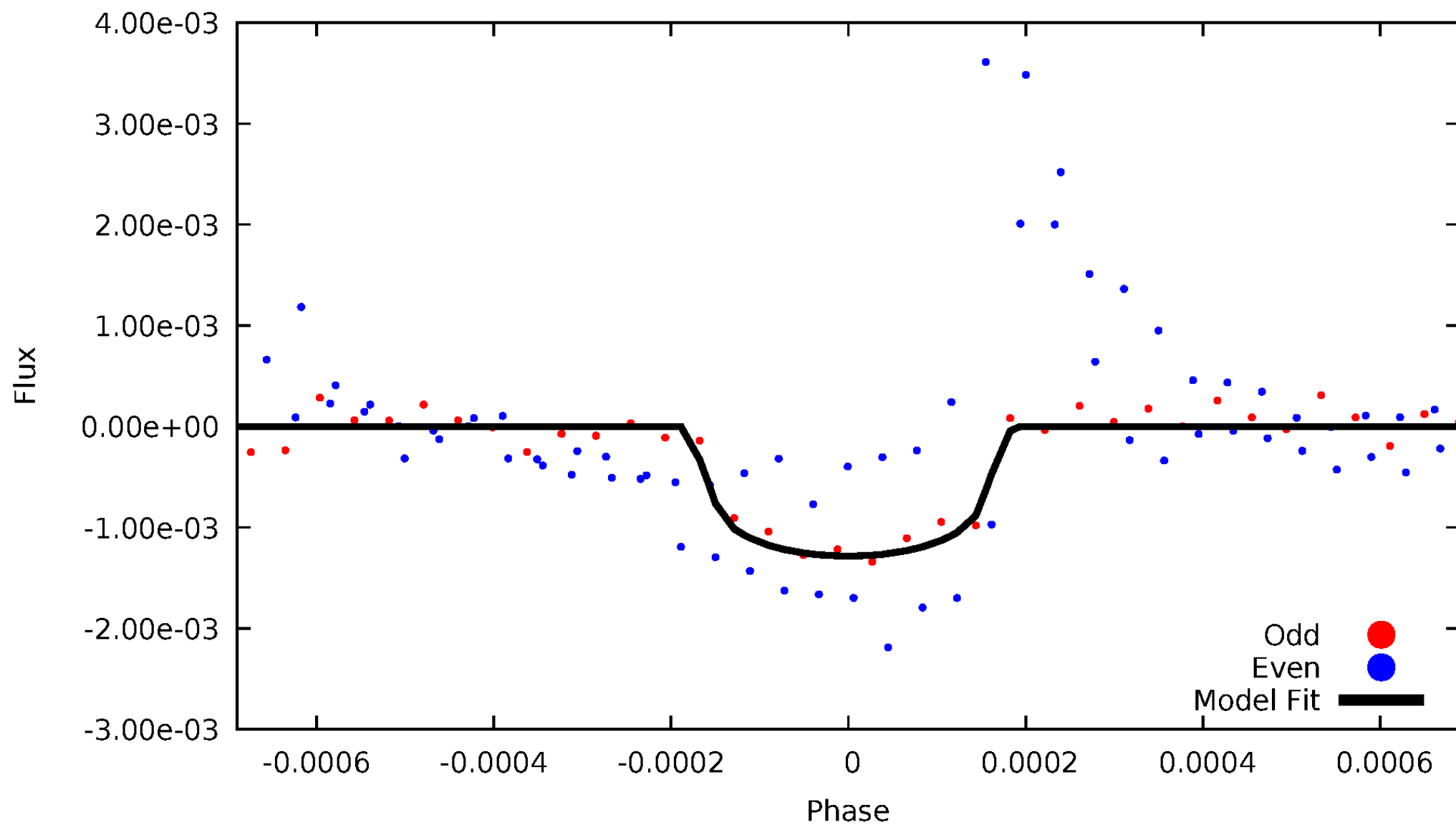


TCE 003097331-06



# DV Odd/Even

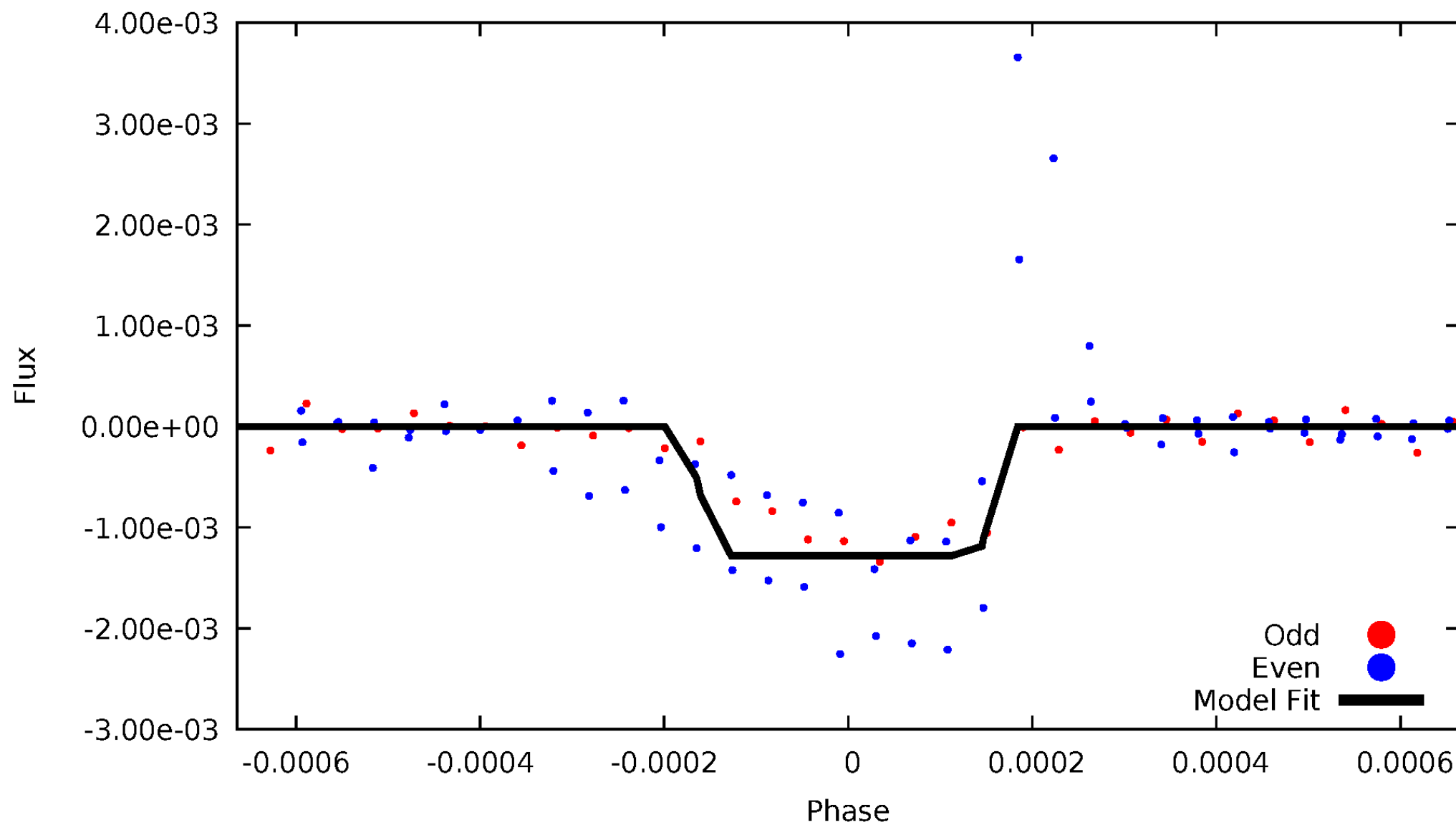
TCE 003097331-06





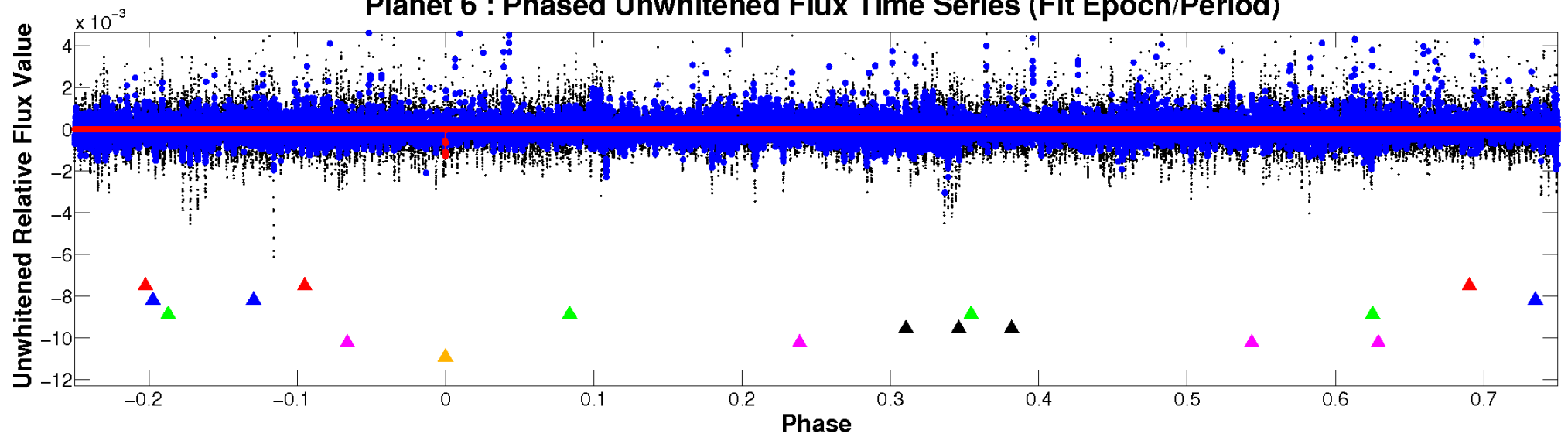
# ALT Odd/Even

TCE 003097331-06

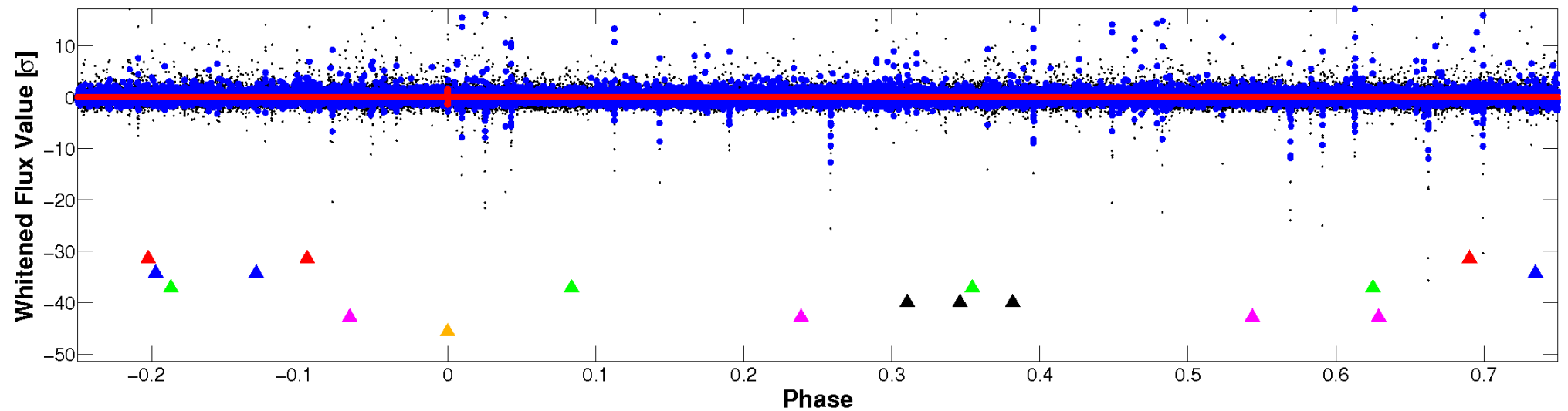


# Non-Whitened Vs. Whitened Light Curve

## Planet 6 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)



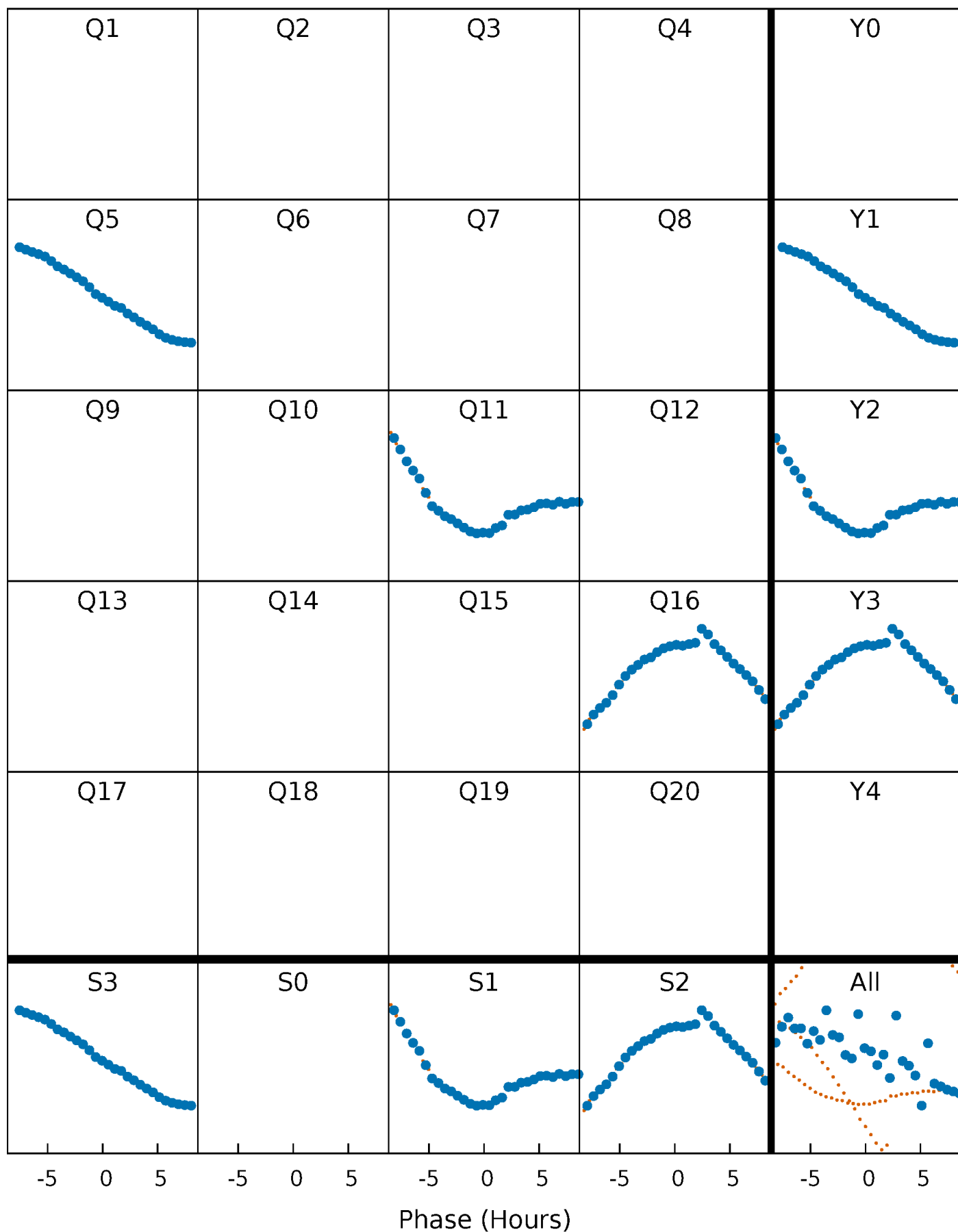
## Planet 6 : Phased Whitened Flux Time Series (Fit Epoch/Period)





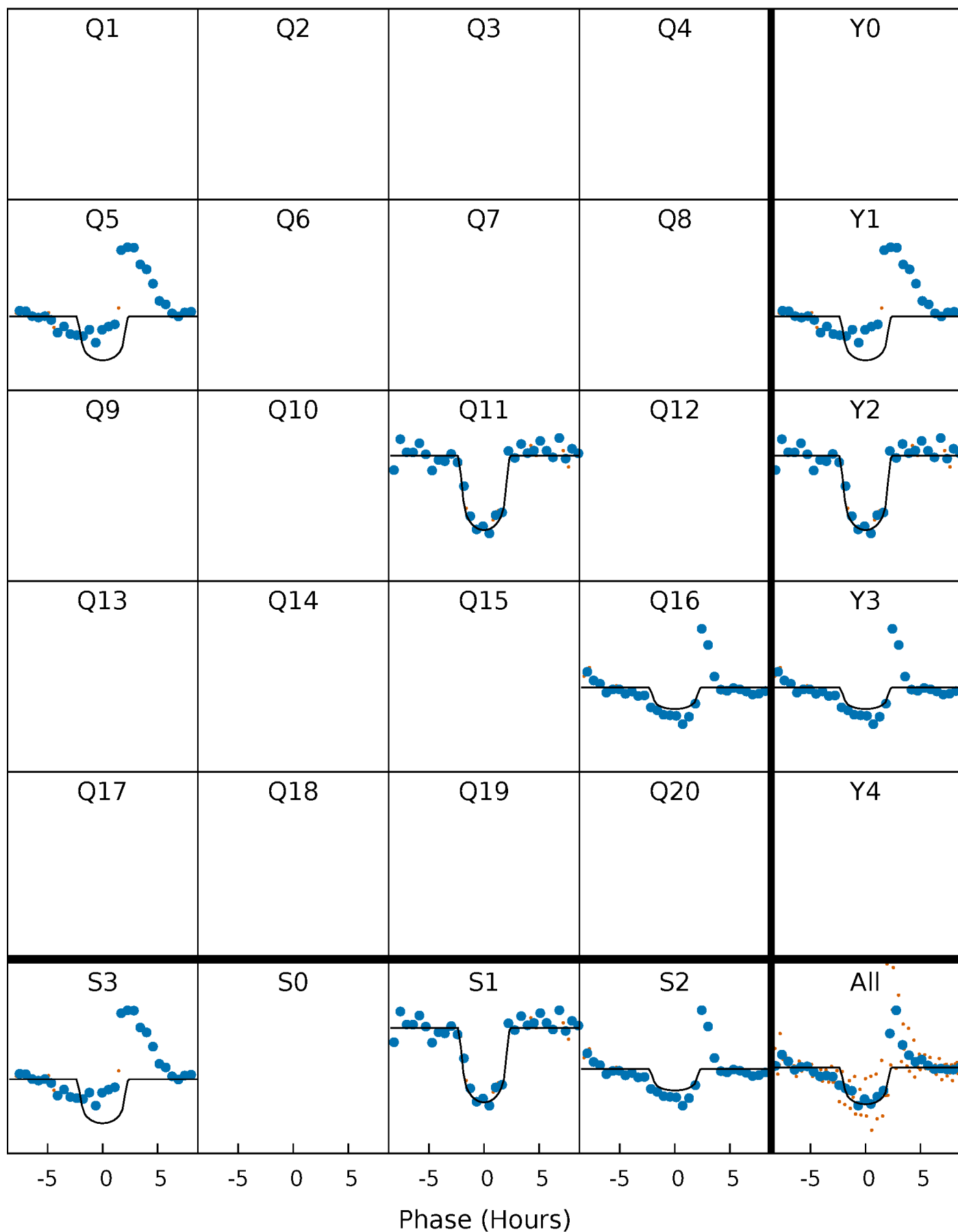
# PDC Quarter-Phased Transit Curves

TCE 003097331-06 P=524.701079 Days  $T_0=482.439043$  (BKJD)



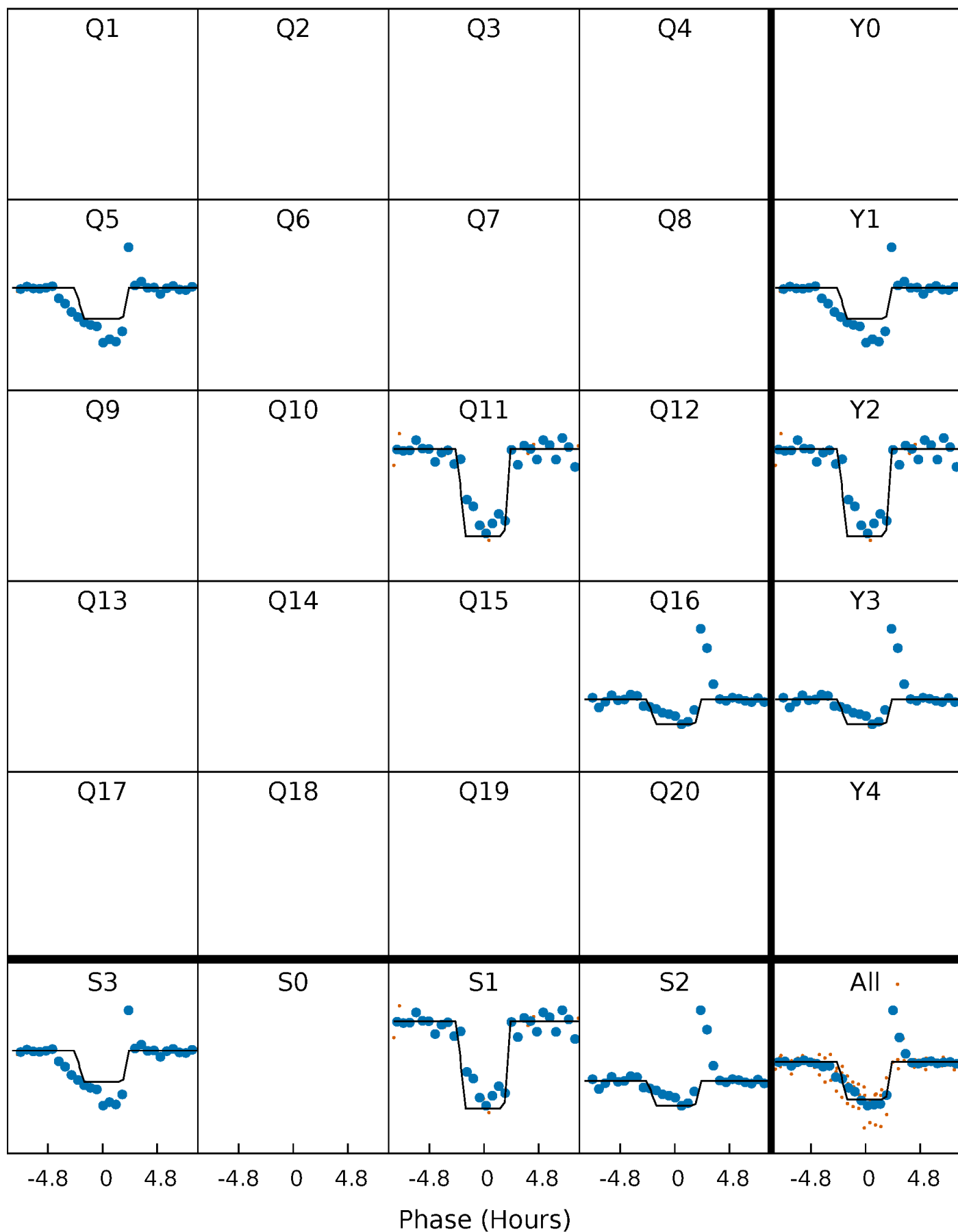
# DV Quarter-Phased Transit Curves

TCE 003097331-06     $P=524.701079$  Days     $T_0=482.439043$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

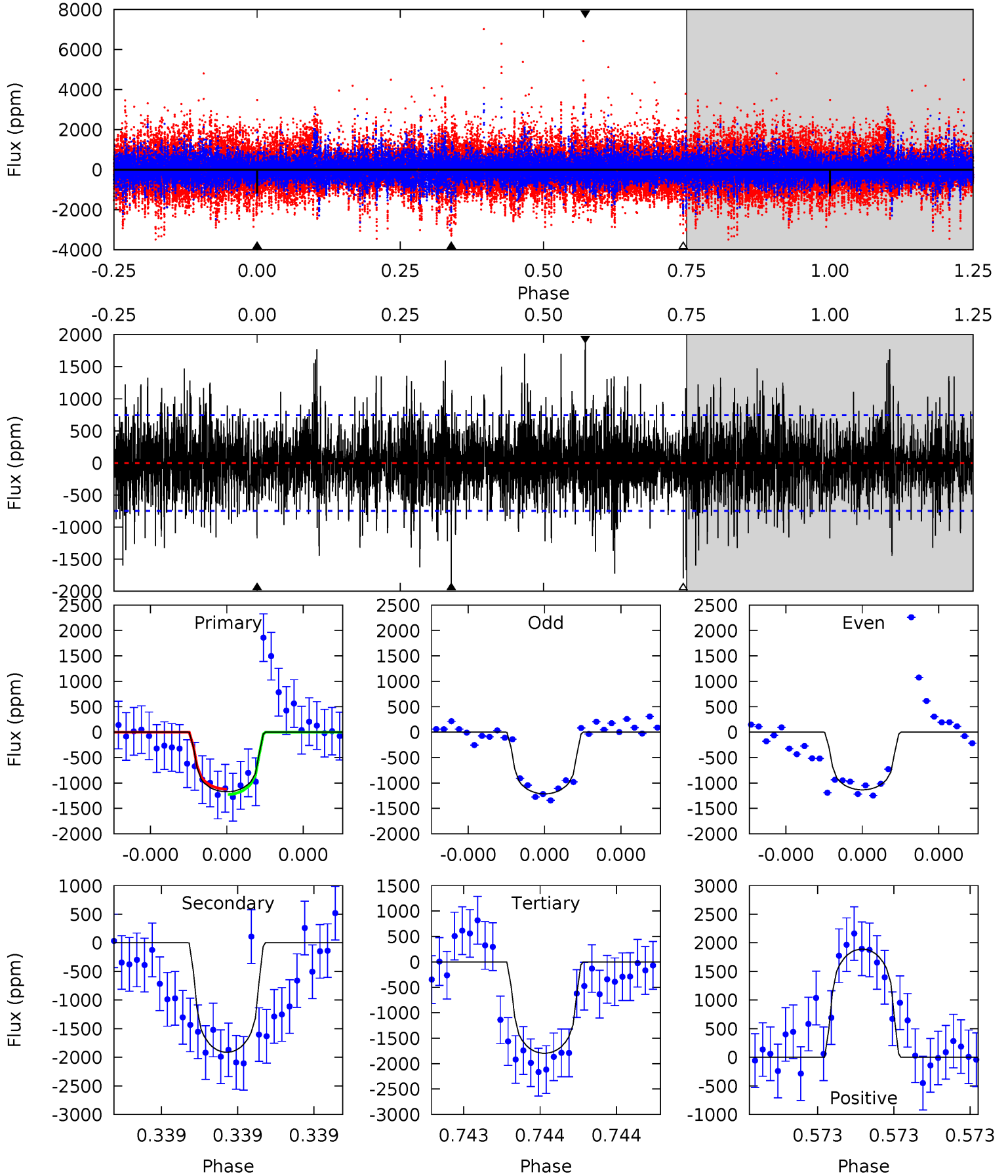
TCE 003097331-06 P=524.713387 Days  $T_0=482.423005$  (BKJD)



# DV Model-Shift Uniqueness Test

003097331-06, P = 524.701079 Days, E = 482.439043 Days

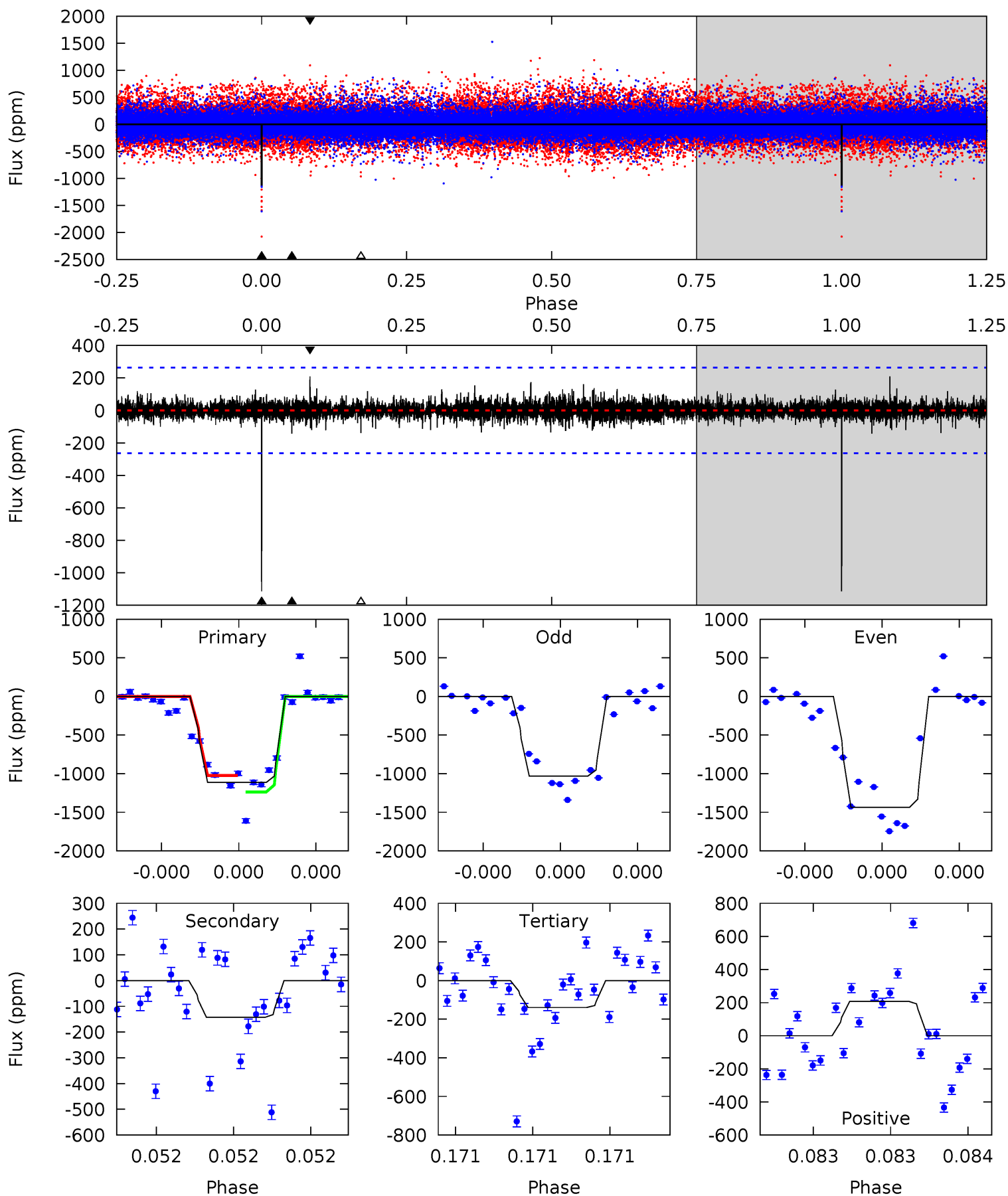
| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 8.81 | 14.4 | 13.5 | 14.2 | 5.62            | 3.55            | 2.96             | -4.69   | -5.40   | 0.87    | 0.17    | 0.26    | 0.88 | 0.50  | 0.40 |



# Alt Model-Shift Uniqueness Test

003097331-06, P = 524.713387 Days, E = 482.423005 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  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 23.9 | 3.06 | 3.00 | 4.47 | 5.65            | 3.60            | 0.63             | 20.9    | 19.4    | 0.07    | -1.41   | 4.26    | 1.24 | 0.16  | 2.27 |



### Stellar Parameters For KIC 003097331

|        | $T_{\text{eff}} (K)$ | $\log(g)$                 | [Fe/H]                     | $R (R_{\odot})$           | $M (M_{\odot})$           | $p_{\star} (g \cdot \text{cm}^{-3})$ |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|--------------------------------------|
|        | $4980^{+149}_{-134}$ | $4.669^{+0.052}_{-0.036}$ | $-1.040^{+0.300}_{-0.300}$ | $0.589^{+0.045}_{-0.037}$ | $0.590^{+0.051}_{-0.022}$ | $4.065^{+0.792}_{-0.552}$            |
|        | +3%/-3%              | +1%/-1%                   | +29%/-29%                  | +8%/-6%                   | +9%/-4%                   | +19%/-14%                            |
| 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 003097331-06 / KOI

| Detrend | Depth (ppm)     | $R_p (R_{\oplus})$     | $T_{\text{max}} (K)$ | $T_{\text{obs}} (K)$   | $A_{\text{obs}}$              |
|---------|-----------------|------------------------|----------------------|------------------------|-------------------------------|
| DV      | $-1913 \pm 133$ | $2.68^{+2.11}_{-1.75}$ | $227^{+8}_{-7}$      | $5052^{+4178}_{-1016}$ | $166750^{+1232747}_{-115057}$ |
| Alt.    | $-143 \pm 47$   | $2.79^{+2.12}_{-1.73}$ | $228^{+8}_{-7}$      | $3164^{+1272}_{-497}$  | $11696^{+69938}_{-8177}$      |

$T_{\text{max}}$  = 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  $A_{\text{obs}} \gg 1.0$

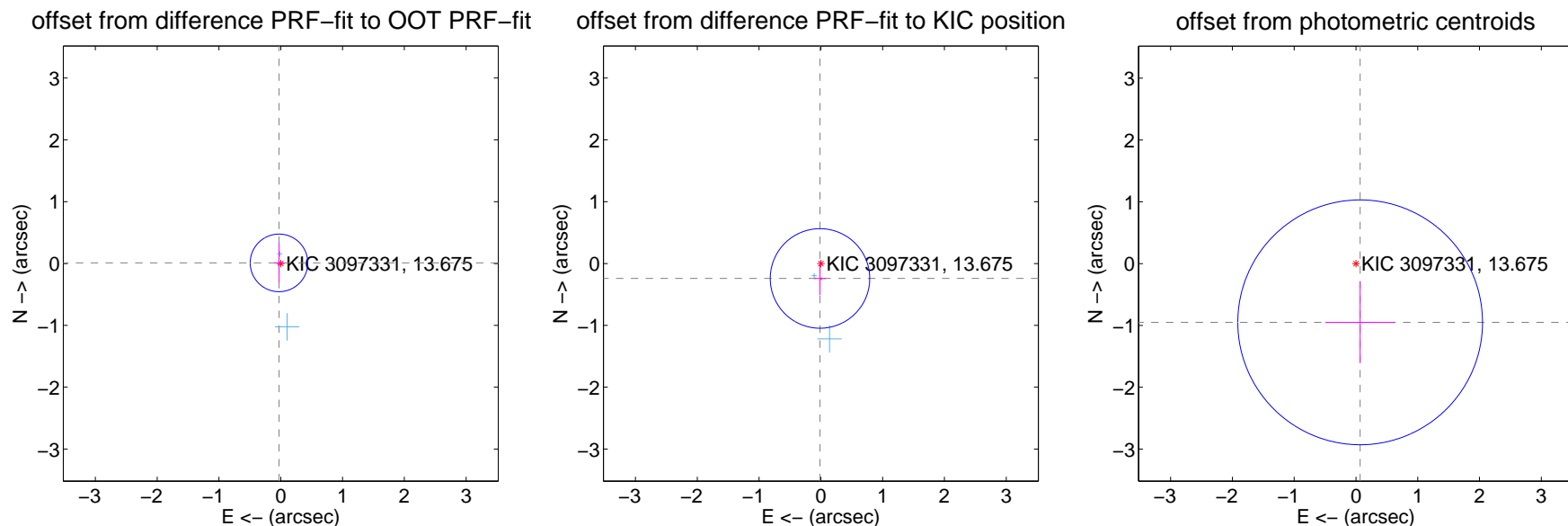
## DV Centroid Data

Supplemental centroid analysis for 003097331-06. Kepler magnitude: 13.68. Transit SNR 6.30

There are 2 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.23 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA       | $\Delta$ Dec       |
|---|--------------------|---------------------|-------------------|--------------------|
| PRF-fit source offset from OOT          | $0.030 \pm 0.155$  | 0.19                | $0.028 \pm 0.076$ | $0.011 \pm 0.315$  |
| PRF-fit source offset from KIC position | $0.242 \pm 0.268$  | 0.90                | $0.014 \pm 0.094$ | $-0.241 \pm 0.272$ |
| photometric centroid source offset      | $0.95 \pm 0.66$    | 1.44                | $-0.07 \pm 0.56$  | $-0.95 \pm 0.66$   |



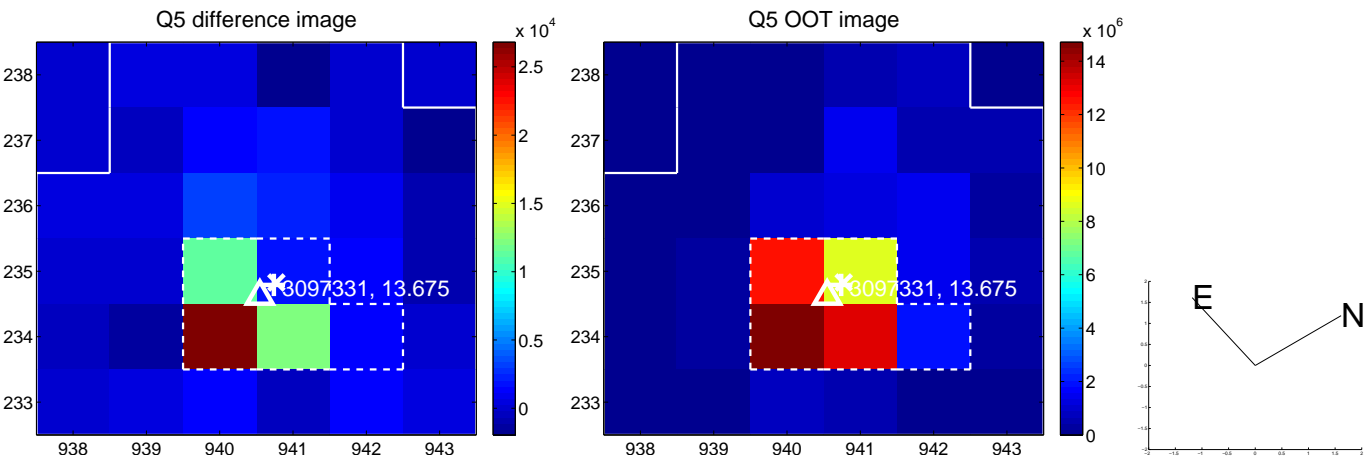
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

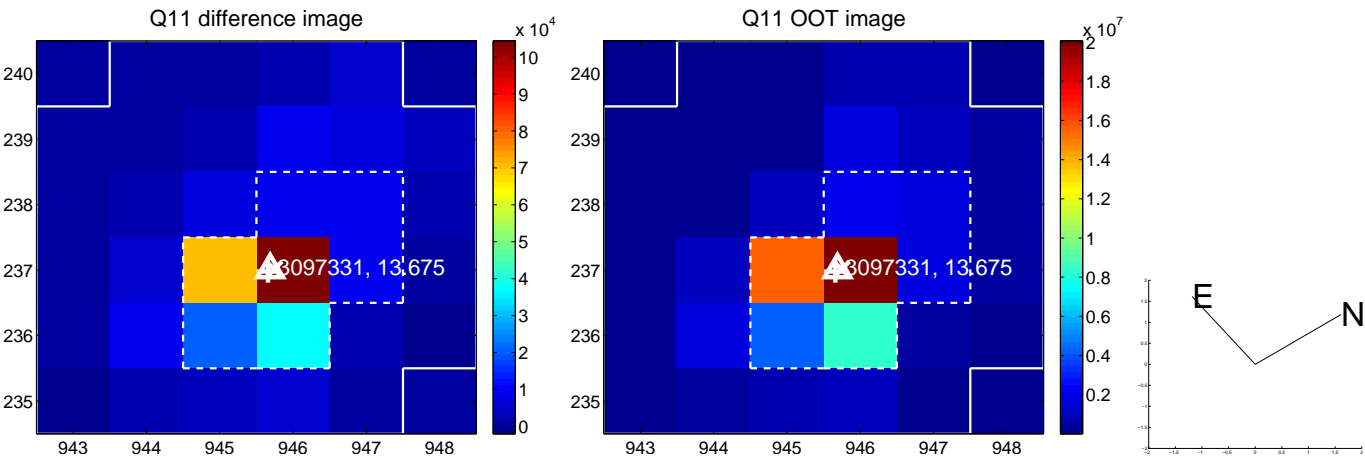




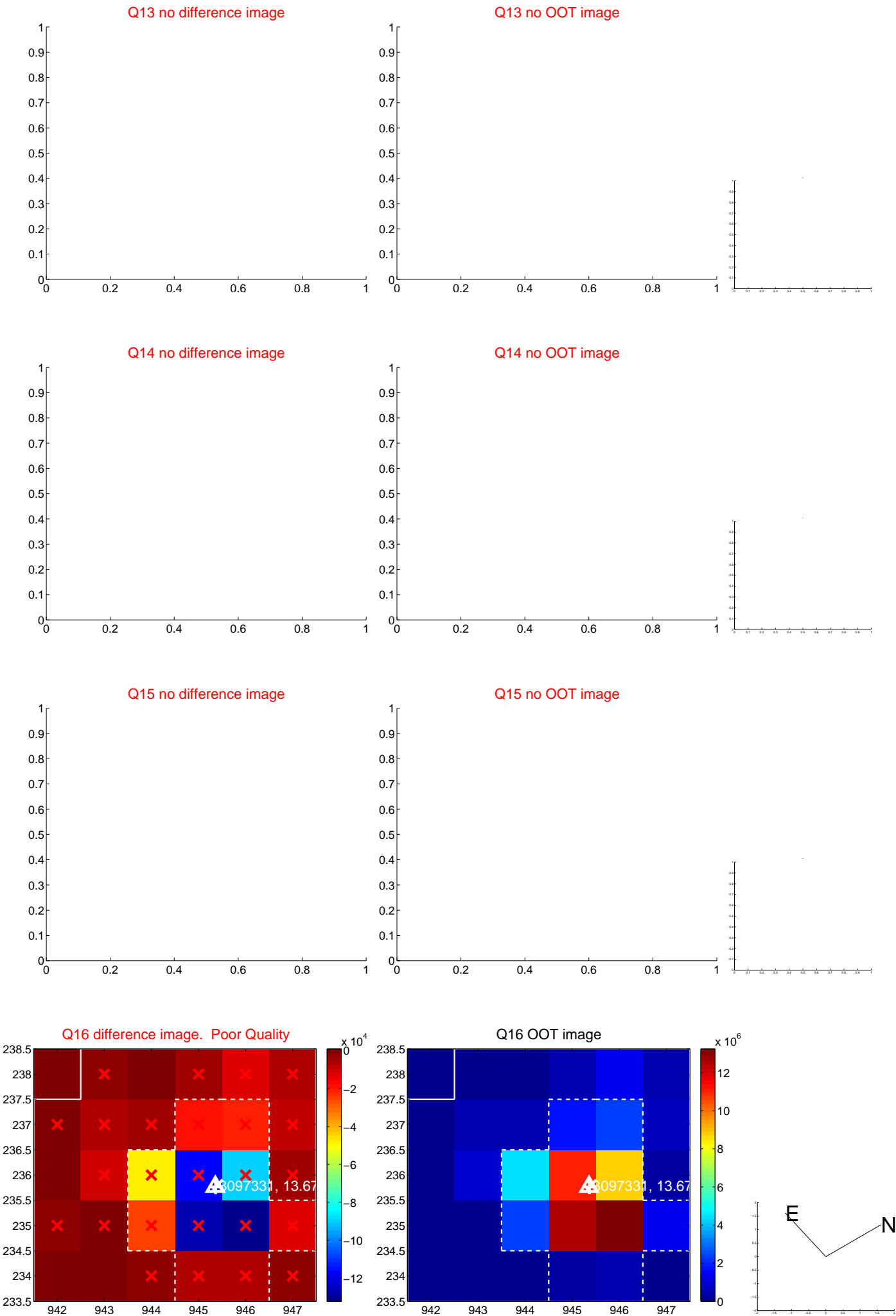
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



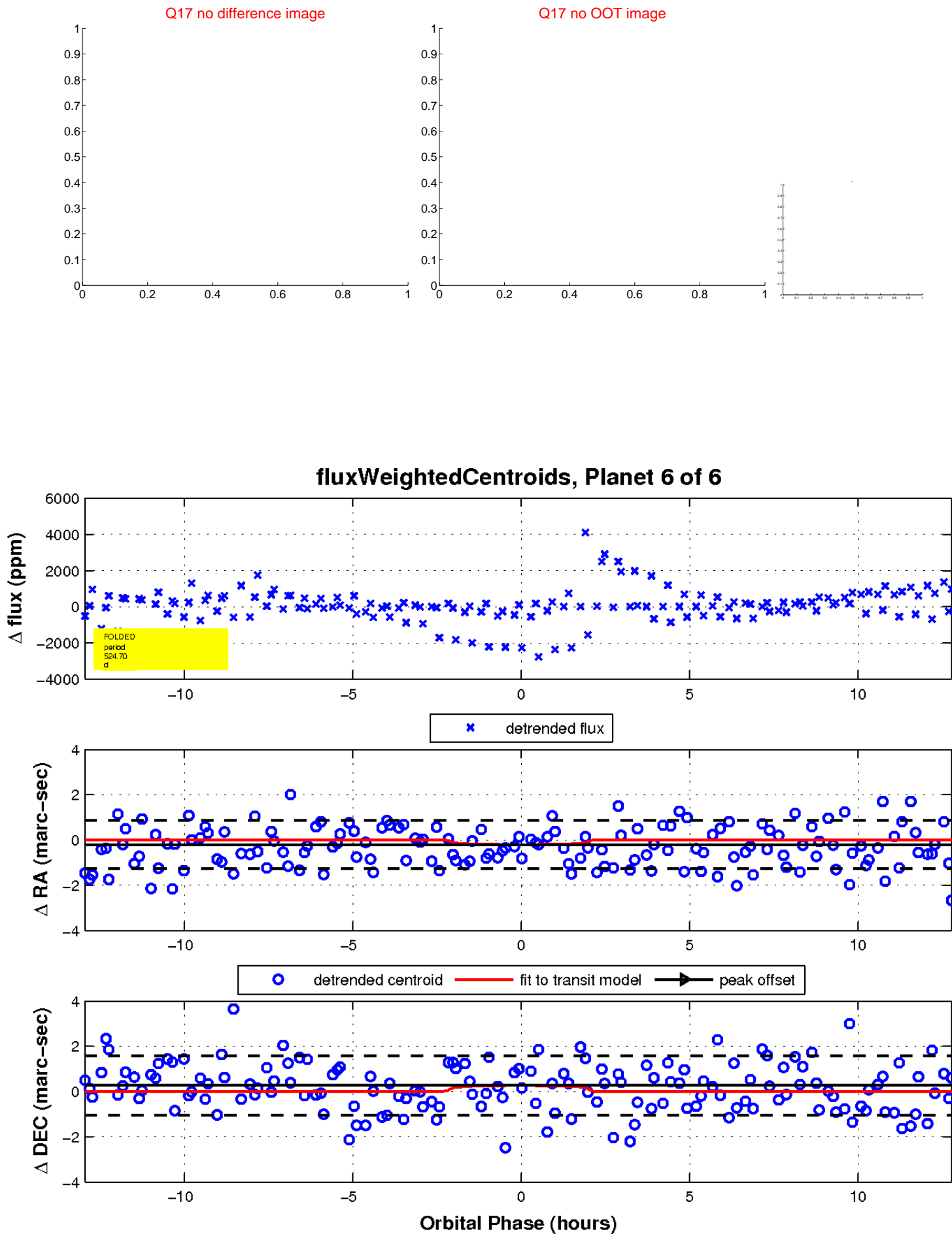
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



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



UKIRT Image

Declination

