

# KIC 004380951

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|-----|-----|-----------------------------|-----------------|------------------------|------------------------|
| 004380951-01 | OBS      | No   | 1.329873      | 131.714534   | 3.1         | 8.483            | 8.7 | 1.6 | 1.69                        | 6987            | 0.30                   | 8437.91                |
| 004380951-02 | OBS      | No   | 38.804254     | 144.305723   | 217.6       | 2.933            | 8.7 | 9.3 | 1.69                        | 6987            | 2.87                   | 93.93                  |
| 004380951-03 | OBS      | No   | 329.705651    | 198.955327   | 267.4       | 3.373            | 8.0 | 8.3 | 1.69                        | 6987            | 3.18                   | 5.42                   |
| 004380951-04 | OBS      | No   | 22.246372     | 142.363914   | 177.5       | 2.213            | 7.9 | 9.0 | 1.69                        | 6987            | 2.65                   | 197.23                 |
| 004380951-05 | OBS      | No   | 39.076285     | 162.919519   | 278.8       | 2.808            | 7.9 | 9.5 | 1.69                        | 6987            | 3.15                   | 93.06                  |
| 004380951-06 | OBS      | No   | 41.434921     | 134.573939   | 114.5       | 3.708            | 7.6 | 6.3 | 1.69                        | 6987            | 2.10                   | 86.06                  |
| 004380951-07 | OBS      | No   | 37.357923     | 153.030015   | 155.1       | 2.085            | 8.5 | 5.7 | 1.69                        | 6987            | 2.60                   | 98.81                  |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments  |
|--------------|----------|------|-------|---|---|---|---|---|
| 004380951-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—MOD_NONUNIQ_DV   |
| 004380951-02 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT  |
| 004380951-03 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_CHASES_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS |
| 004380951-04 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT                                      |
| 004380951-05 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT                                      |
| 004380951-06 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT                                |
| 004380951-07 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT—CENT_FEW_MEAS                         |

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

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

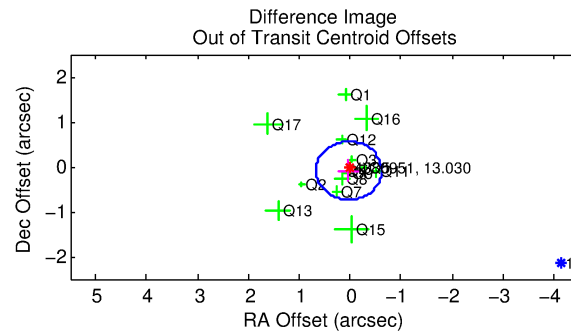
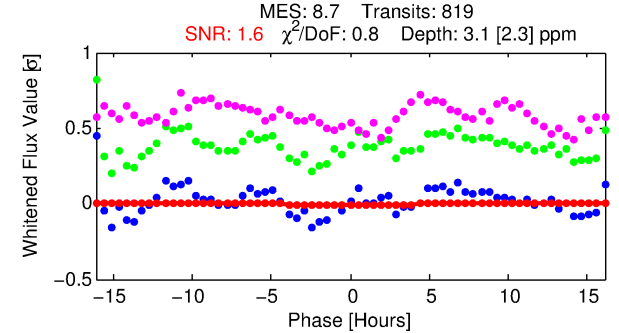
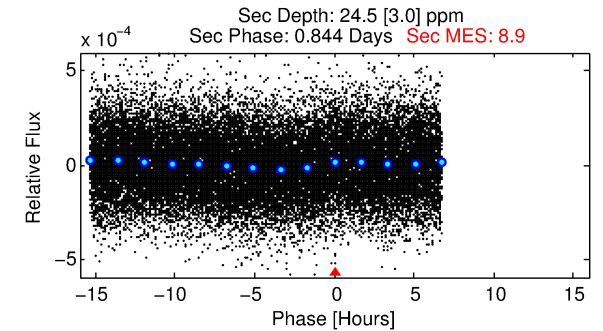
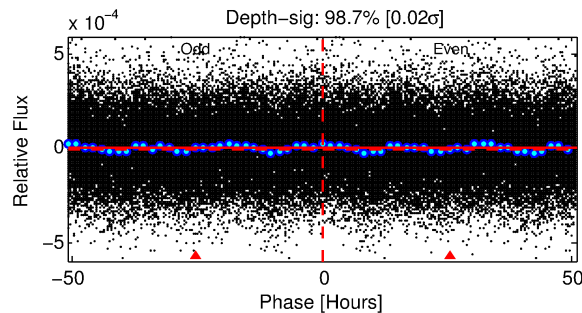
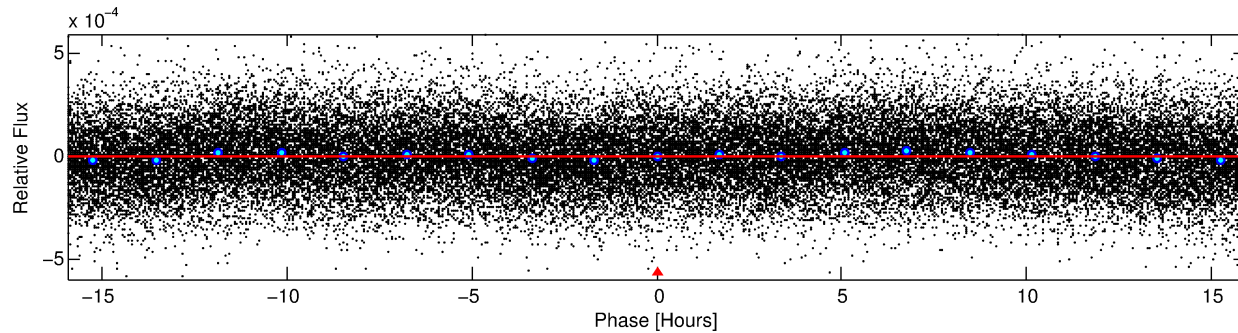
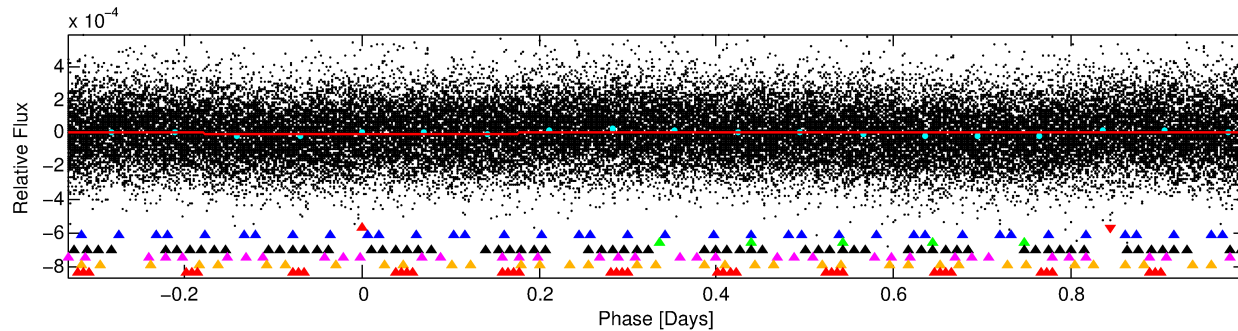
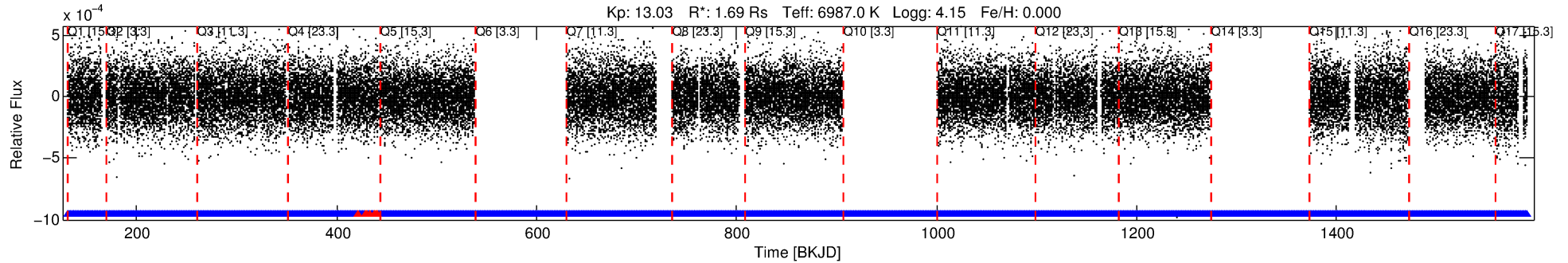
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 004380951-01

No Significant Match Found

# DV One-Page Summary

KIC: 4380951 Candidate: 1 of 7 Period: 1.330 d



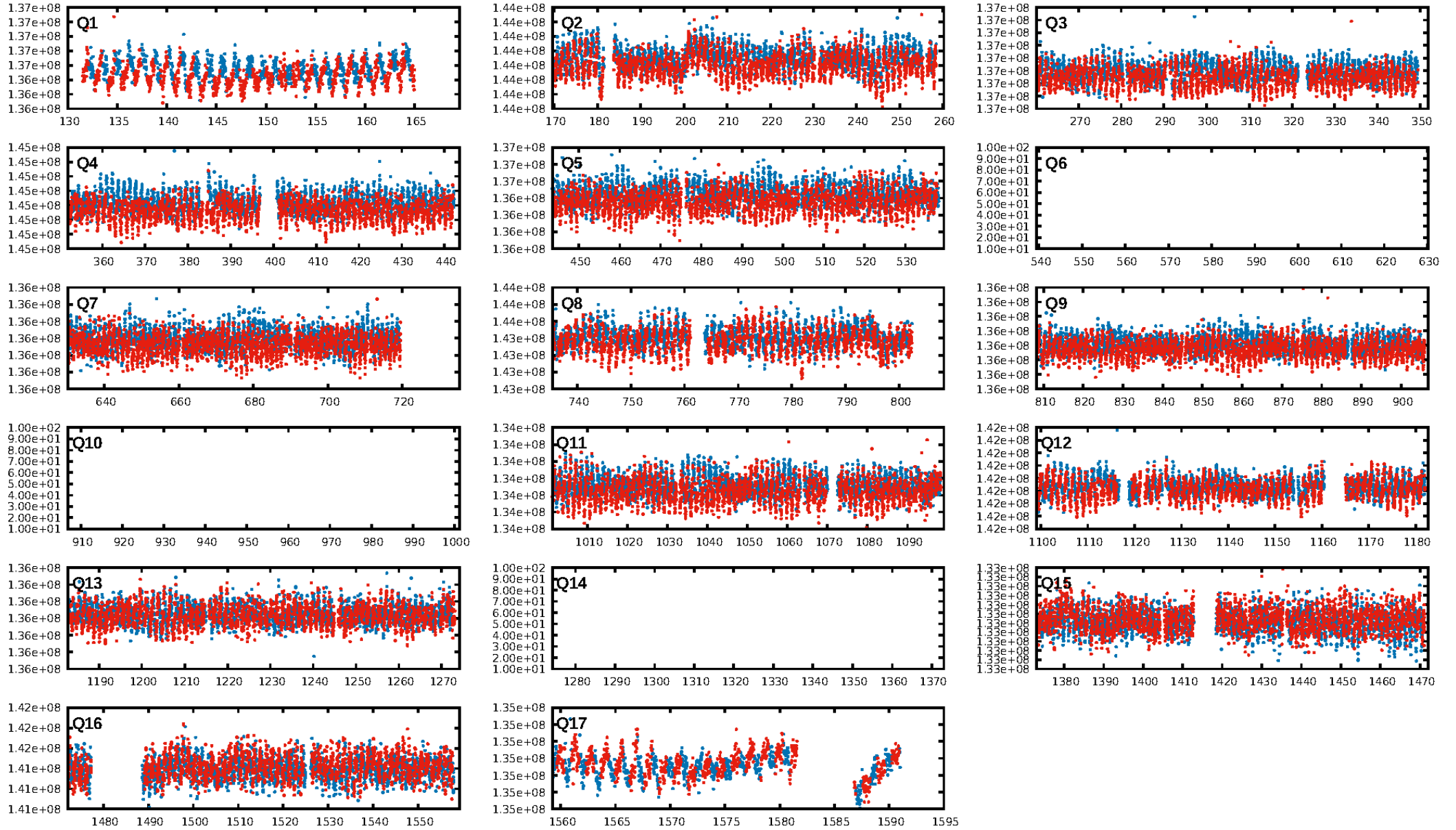
## DV Fit Results:

Period = 1.32987 [0.00013] d  
Epoch = 131.7145 [0.0385] BKJD  
Rp/R\* = 0.0016 [0.0080]  
a/R\* = 1.35 [17.15]  
b = 0.02 [1353.22]  
Seff = 8437.91 [2031.75]  
Teq = 2444 [147] K  
Rp = 0.30 [1.48] Re  
a = 0.0269 [0.0044] AU  
Ag = 108.23 [1063.51] [0.10σ]  
Teffp = 12187 [29932] K [0.33σ]

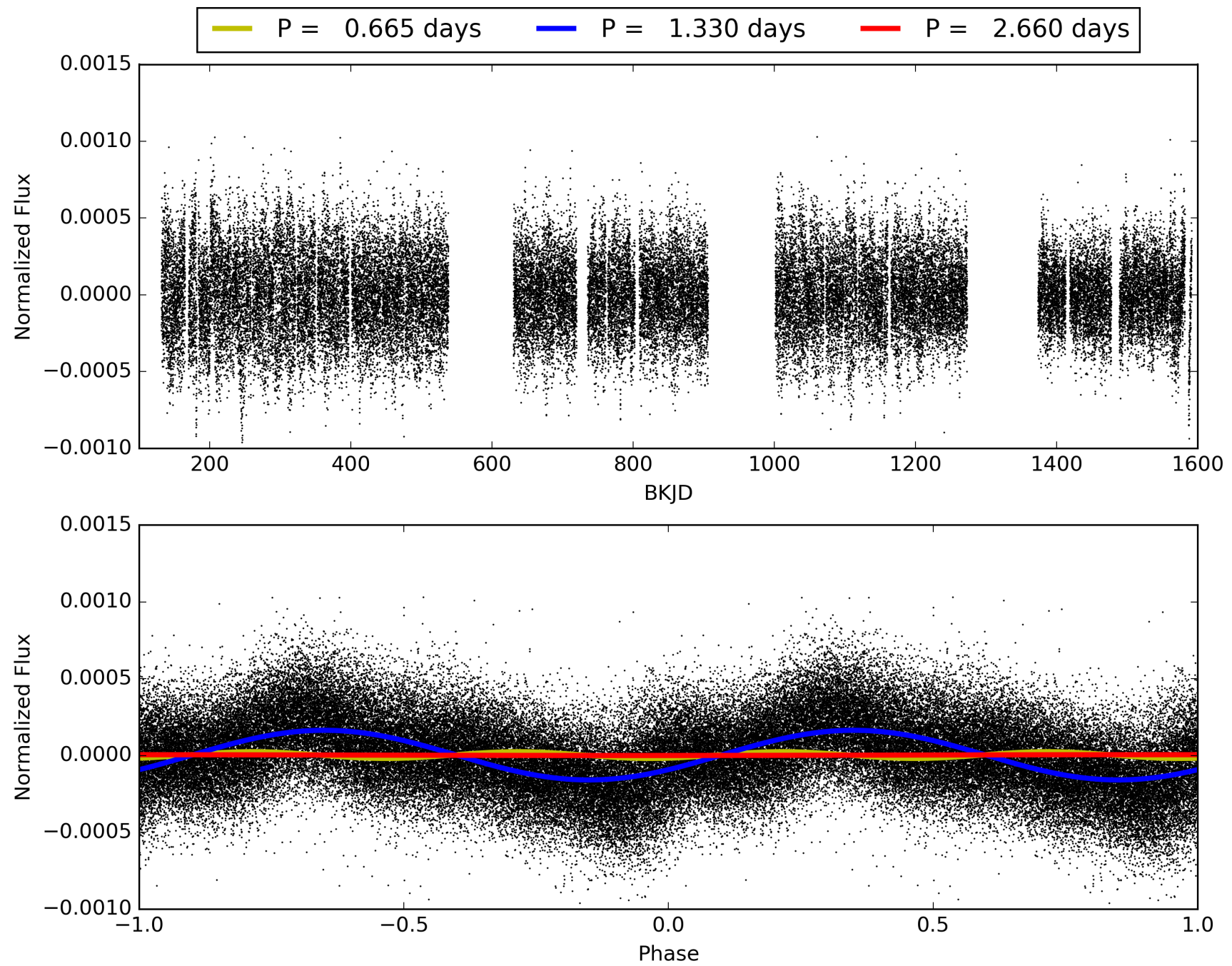
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [57.26σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 3.42e-10  
RollingBand-fgt: 0.99 [766/773]  
GhostDiagnostic-chr: N/A  
Centroid-sig: N/A  
Centroid-so: N/A  
OotOffset-rm: 0.094 arcsec [0.44σ]  
KicOffset-rm: 0.075 arcsec [0.43σ]  
OotOffset-st: 1/4/4/5 [14]  
KicOffset-st: 1/4/4/5 [14]  
DiffImageQuality-fgm: 0.79 [11/14]  
DiffImageOverlap-fno: 1.00 [14/14]

# TCE 004380951-01, PDC Light Curves



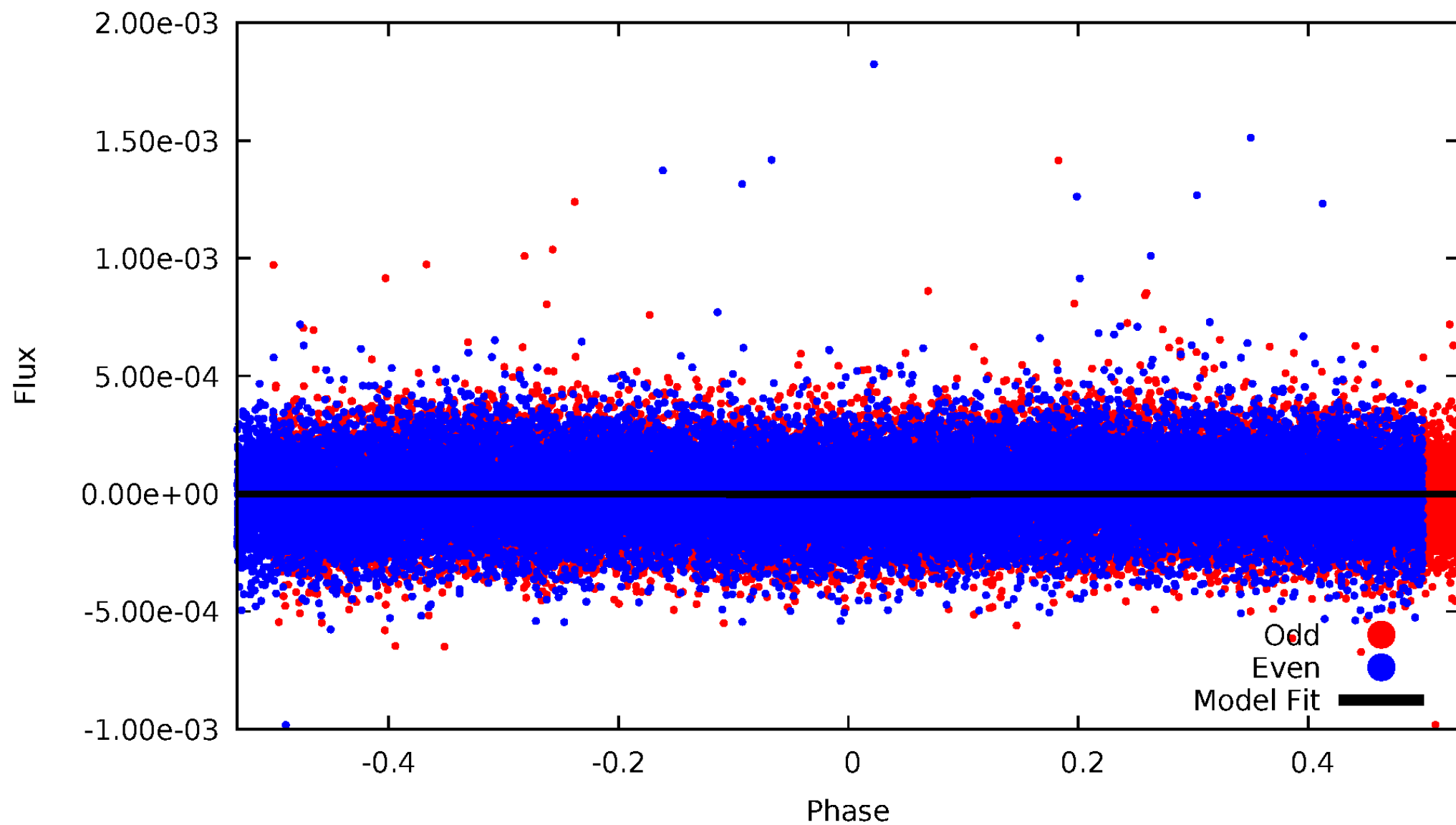
TCE 004380951-01





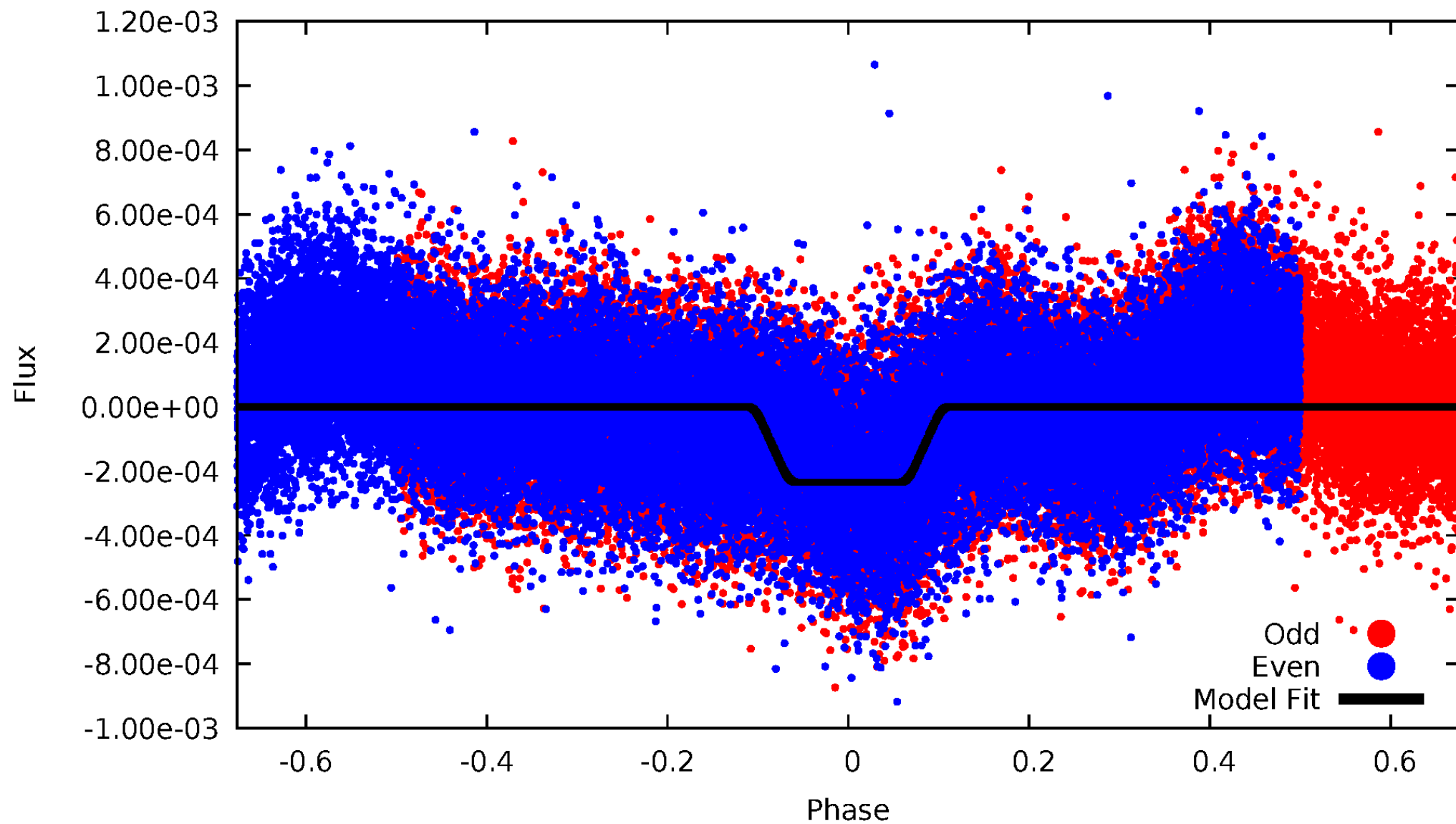
# DV Odd/Even

TCE 004380951-01

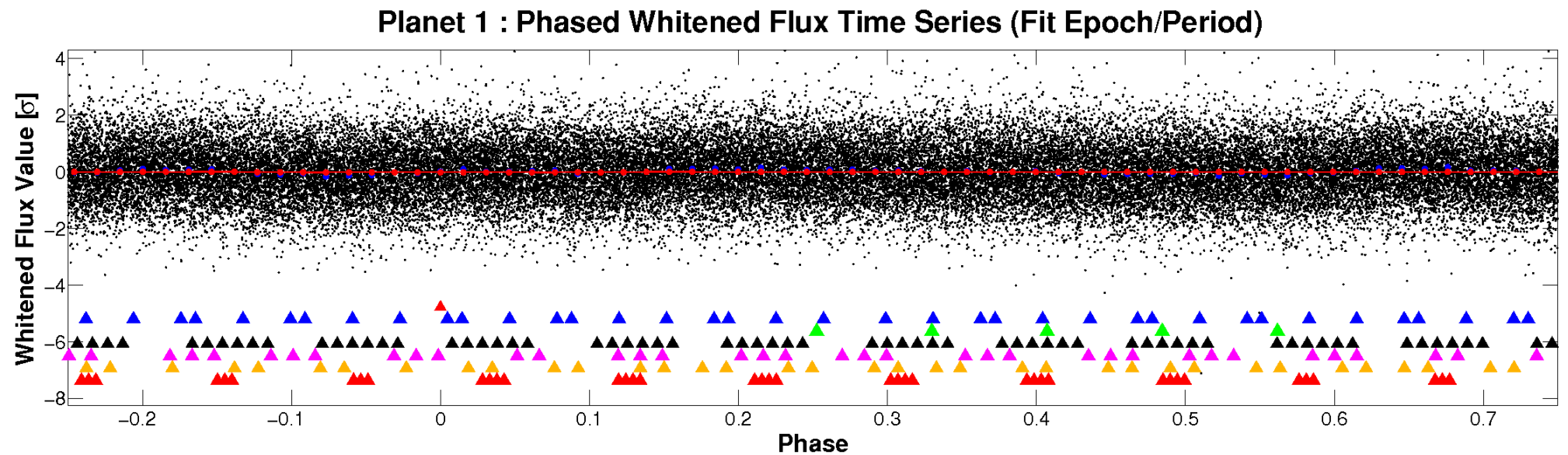
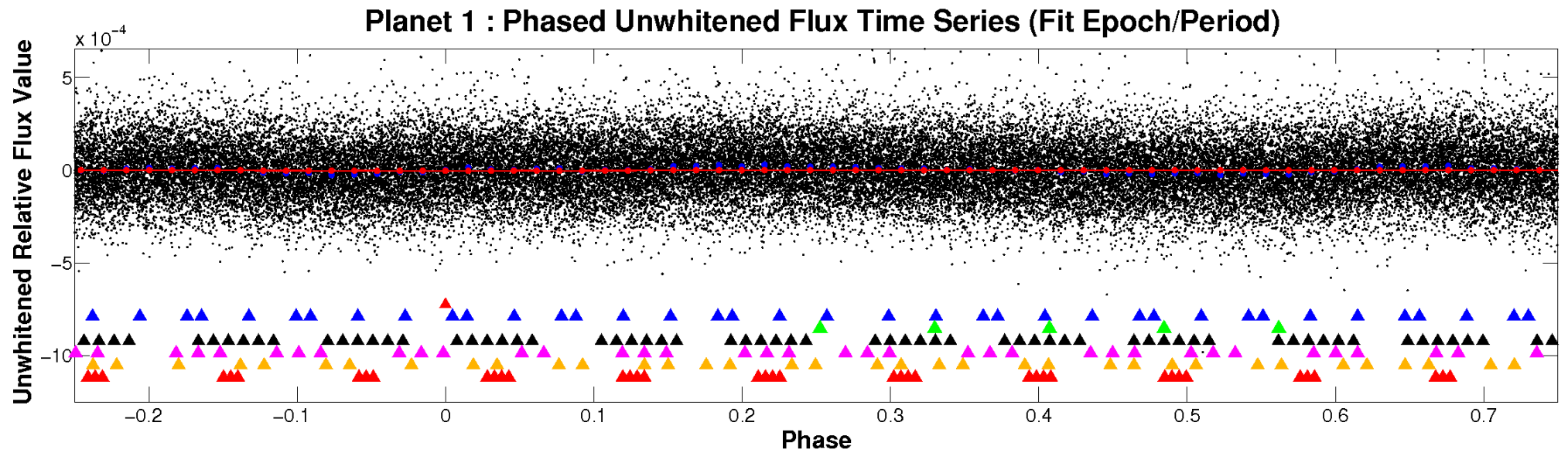


# ALT Odd/Even

TCE 004380951-01

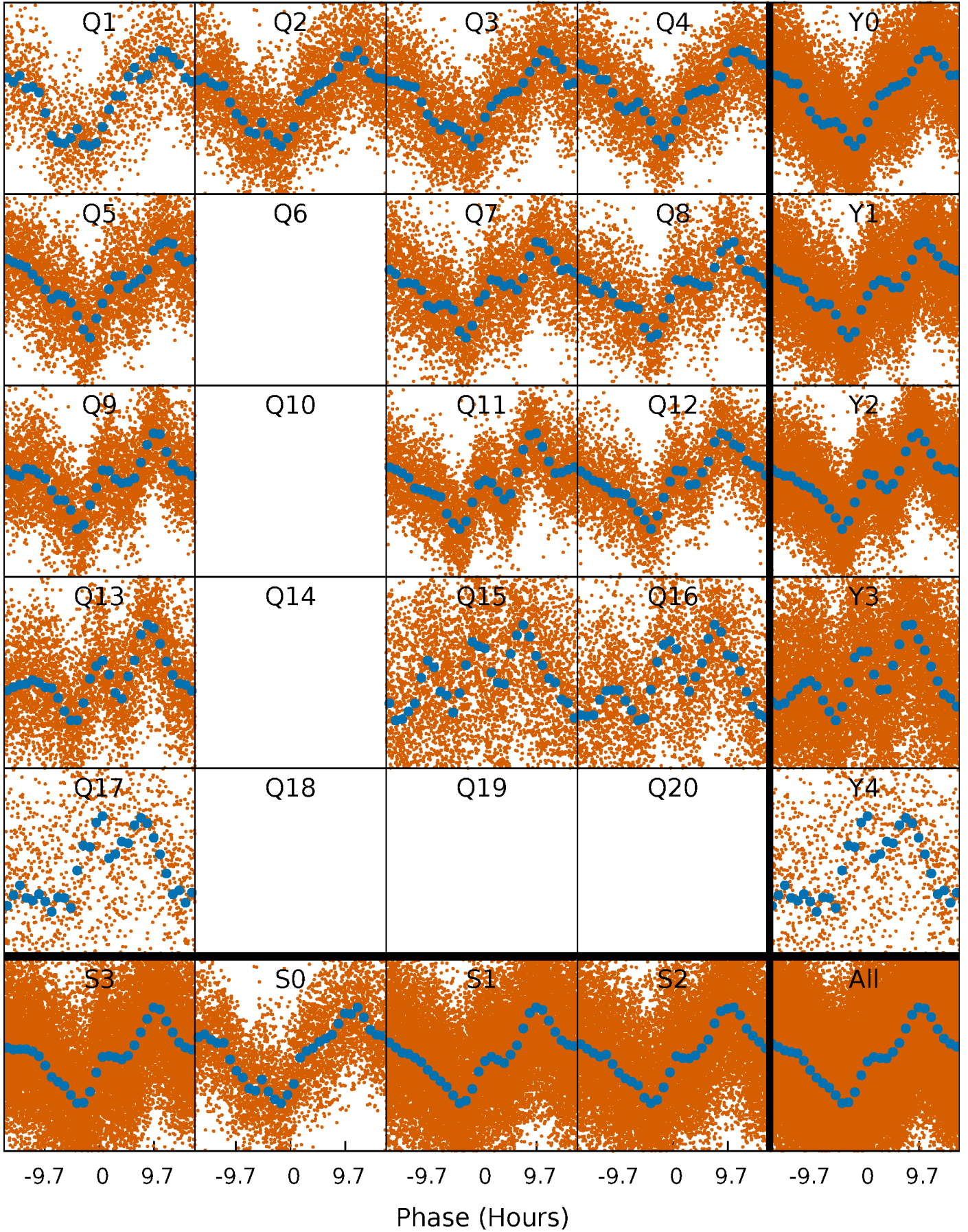


# Non-Whitened Vs. Whitened Light Curve



# PDC Quarter-Phased Transit Curves

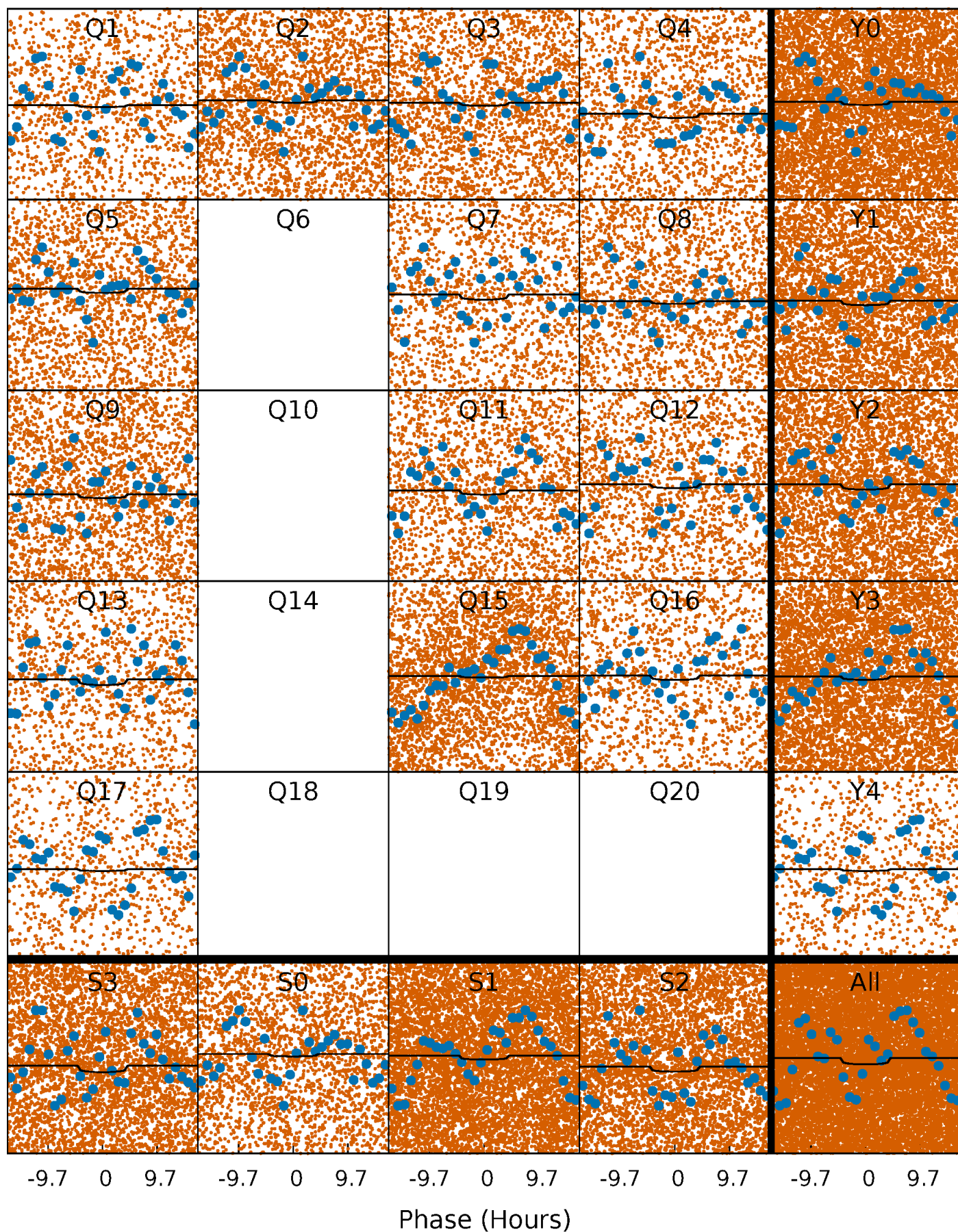
TCE 004380951-01 P= 1.329873 Days  $T_0=131.714534$  (BKJD)





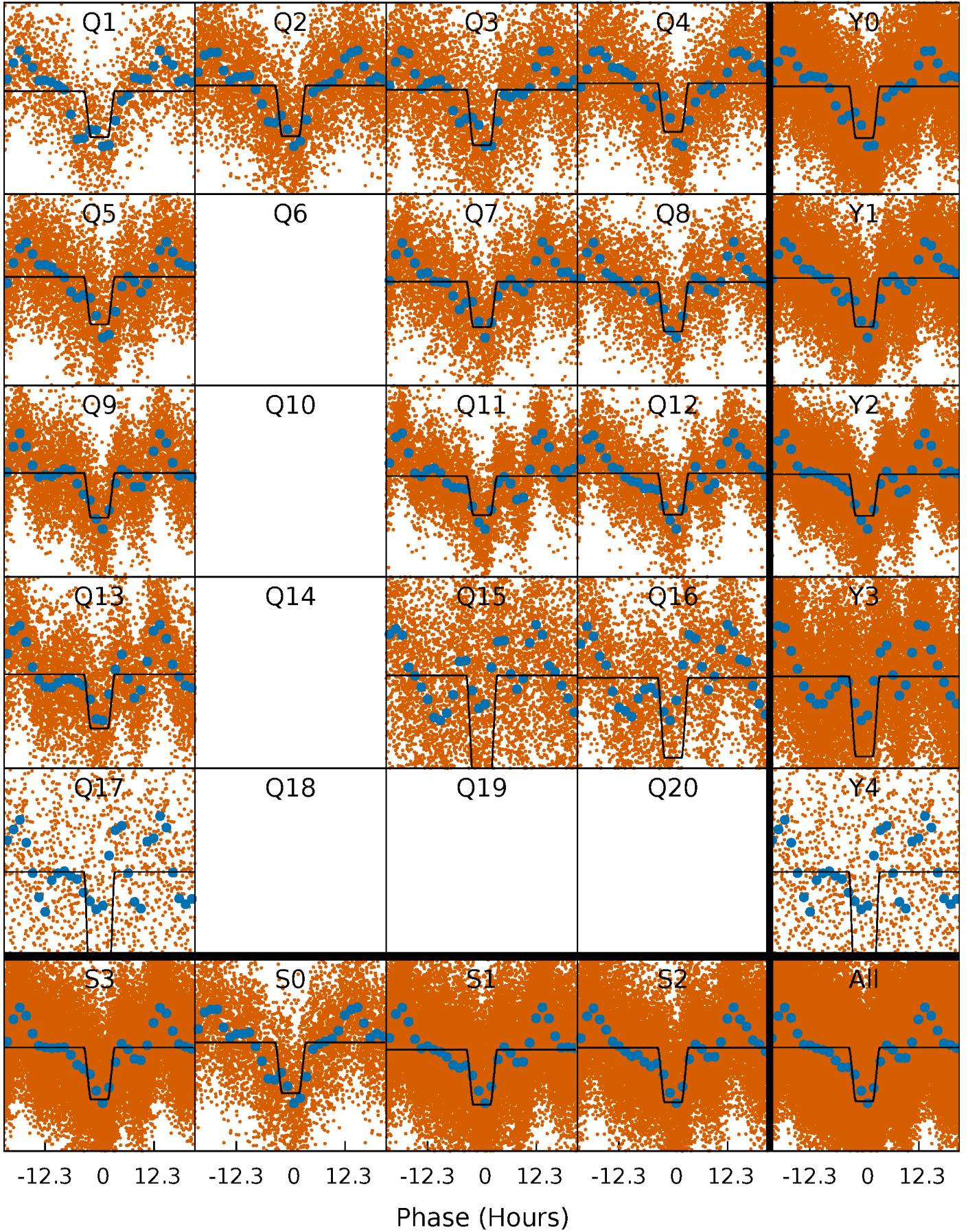
# DV Quarter-Phased Transit Curves

TCE 004380951-01 P= 1.329873 Days  $T_0=131.714534$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

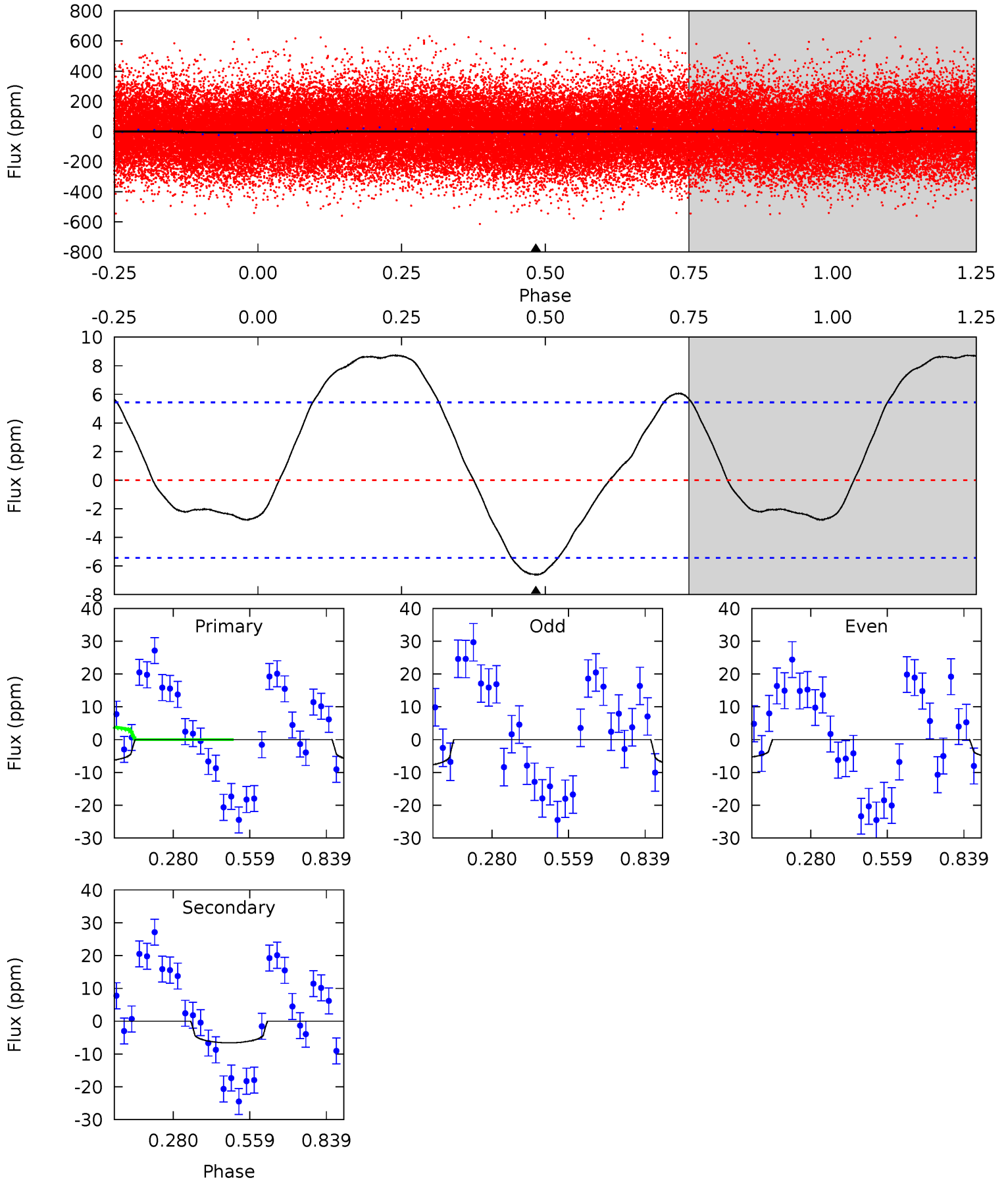
TCE 004380951-01   P= 1.329776 Days    $T_0=131.600556$  (BKJD)



# DV Model-Shift Uniqueness Test

004380951-01, P = 1.329873 Days, E = 130.384661 Days

| Pri  | Sec  | Ter | Pos | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|-----|-----|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 5.28 | 5.28 | 0   | 0   | 4.34            | 1.08            | 3.27             | 5.28    | 5.28    | 5.28    | 5.28    | 1.01    | 0.71 | 0.57  | 5.48 |

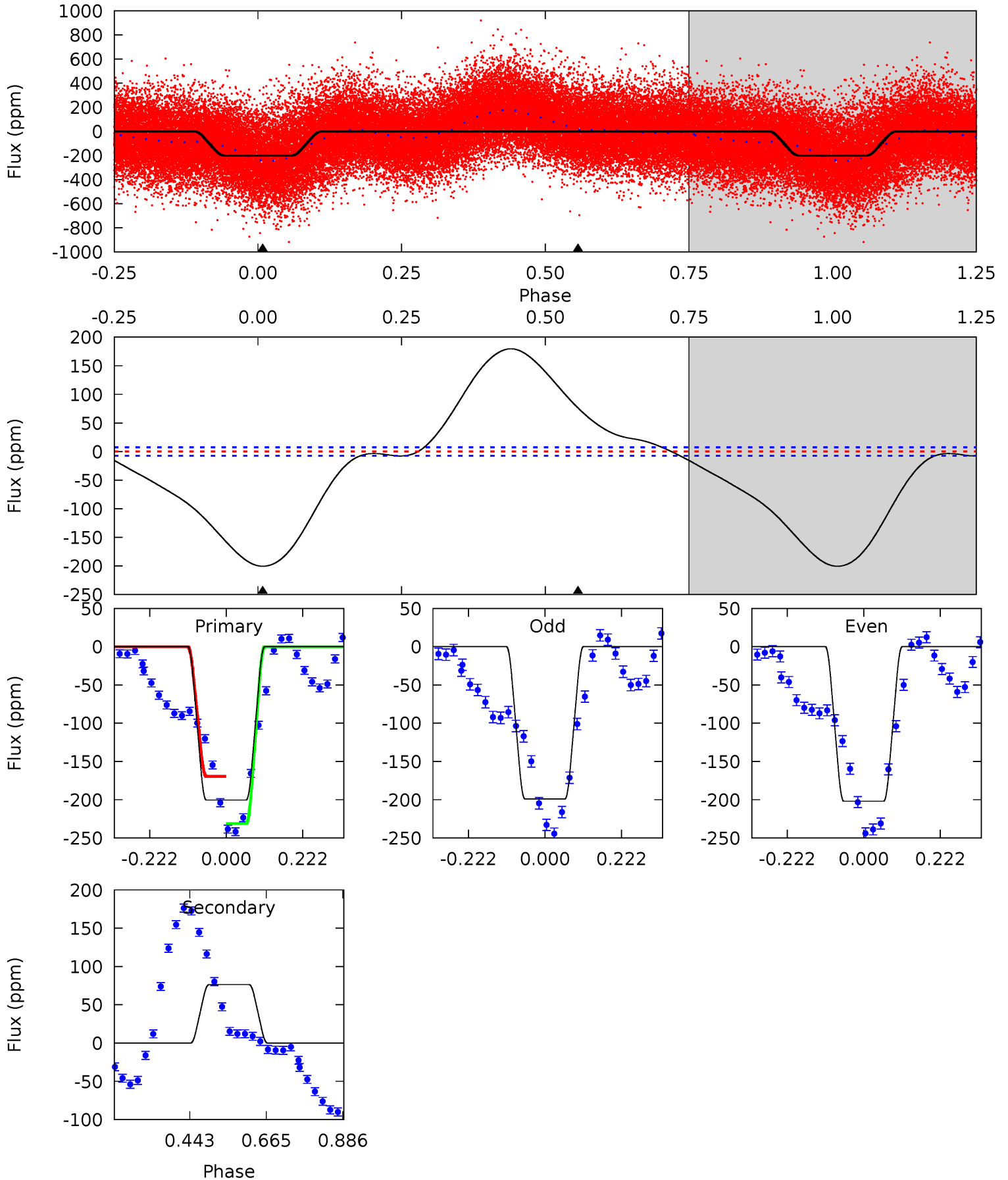




# Alt Model-Shift Uniqueness Test

004380951-01, P = 1.329776 Days, E = 130.270780 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  |
|-------|-------|-----|-----|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 120.3 | -45.8 | 0   | 0   | 4.39            | 1.22            | 14.5             | 120.3   | 120.3   | -45.8   | -45.8   | 0.87    | 0.99 | 0.47  | 18.7 |





### Stellar Parameters For KIC 004380951

|        | $T_{\text{eff}}(K)$ | $\log(g)$                 | [Fe/H]                    | $R (R_{\odot})$           | $M(M_{\odot})$            | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|---------------------|---------------------------|---------------------------|---------------------------|---------------------------|---|
|        | $6987^{+73}_{-94}$  | $4.148^{+0.073}_{-0.126}$ | $0.000^{+0.150}_{-0.150}$ | $1.690^{+0.337}_{-0.181}$ | $1.470^{+0.115}_{-0.094}$ | $0.429^{+0.155}_{-0.170}$                 |
|        | +1%/-1%             | +2%/-3%                   | +inf%/-inf%               | +20%/-11%                 | +8%/-6%                   | +36%/-40%                                 |
| Source | SPE68               | SPE68                     | SPE68                     | DSEP                      |                           |   |

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

### Secondary Eclipse Parameters for KIC 004380951-01 / KOI

| Detrend | Depth (ppm) | $R_p (R_{\oplus})$     | $T_{\text{max}} (K)$ | $T_{\text{obs}} (K)$   | $A_{\text{obs}}$            |
|---------|-------------|------------------------|----------------------|------------------------|-----------------------------|
| DV      | $-7 \pm 1$  | $1.12^{+1.21}_{-0.77}$ | $3431^{+157}_{-114}$ | $4579^{+3781}_{-1534}$ | $2.109^{+18.938}_{-1.659}$  |
| Alt.    | $76 \pm 2$  | $2.91^{+1.54}_{-1.43}$ | $3428^{+154}_{-107}$ | $-5355^{+763}_{-2039}$ | $-3.659^{+2.141}_{-10.430}$ |

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

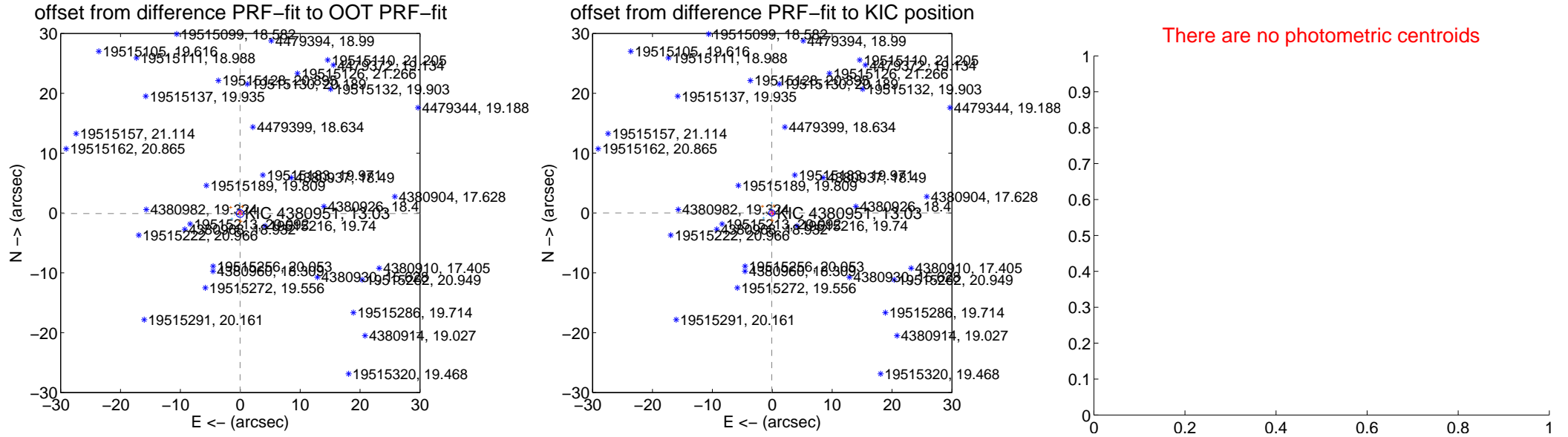
## DV Centroid Data

Supplemental centroid analysis for 004380951-01. Kepler magnitude: 13.03. Transit SNR 1.64

There are 11 quarters with good PRF difference image offsets

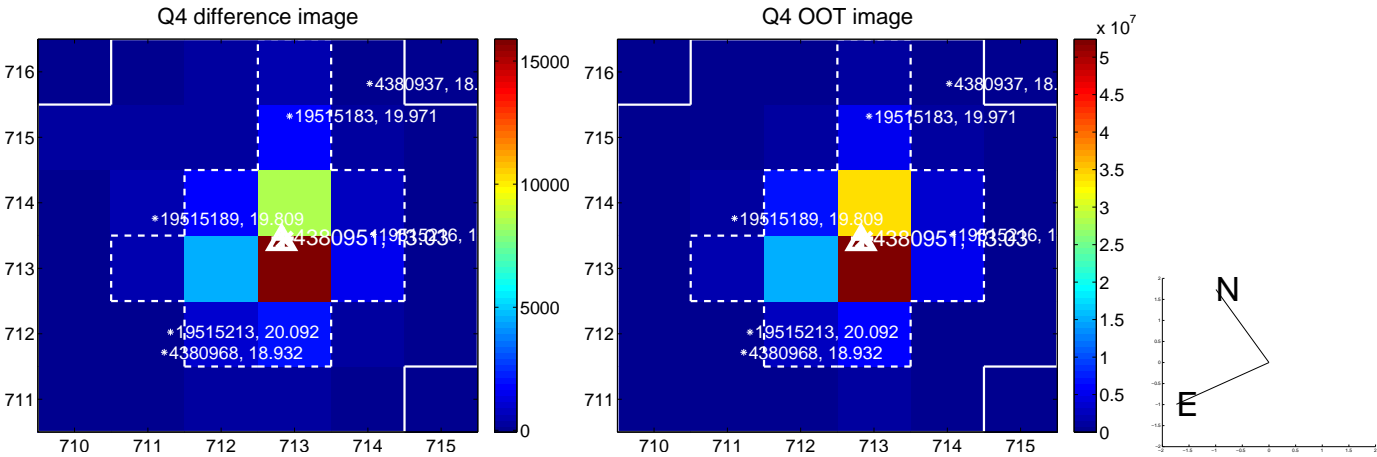
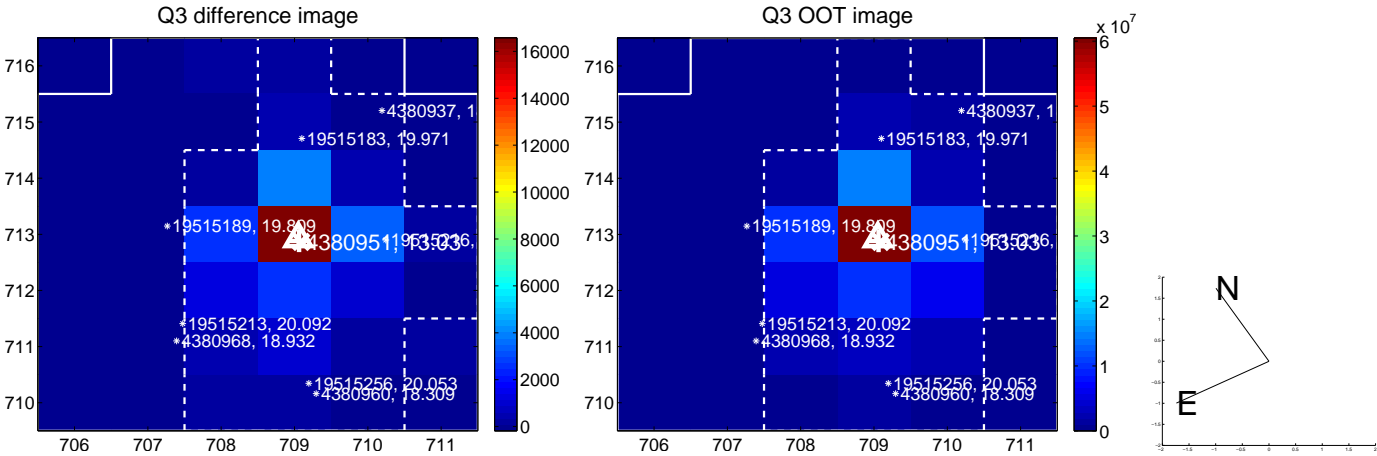
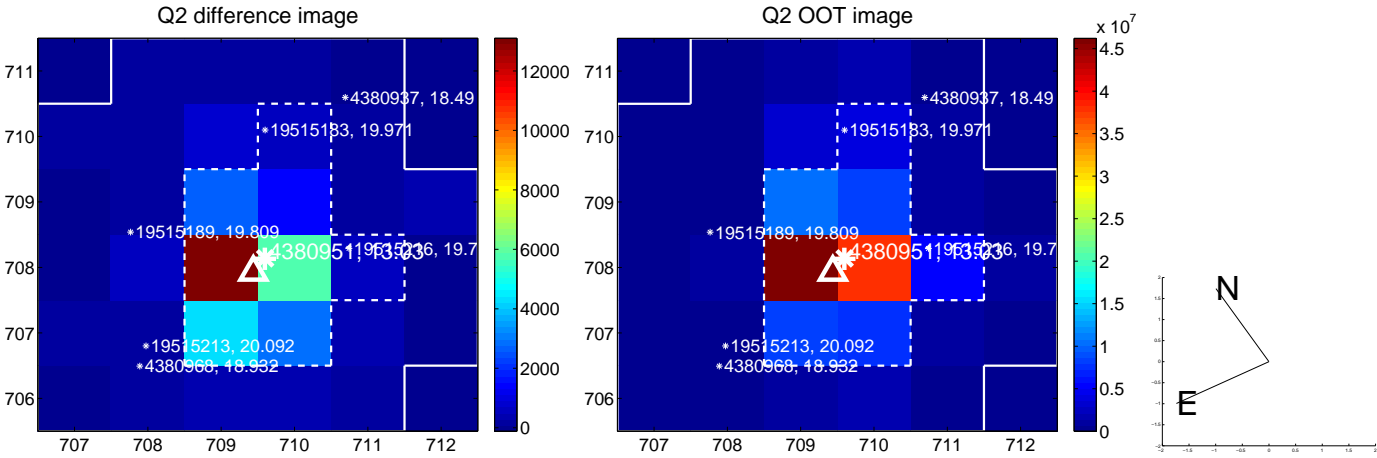
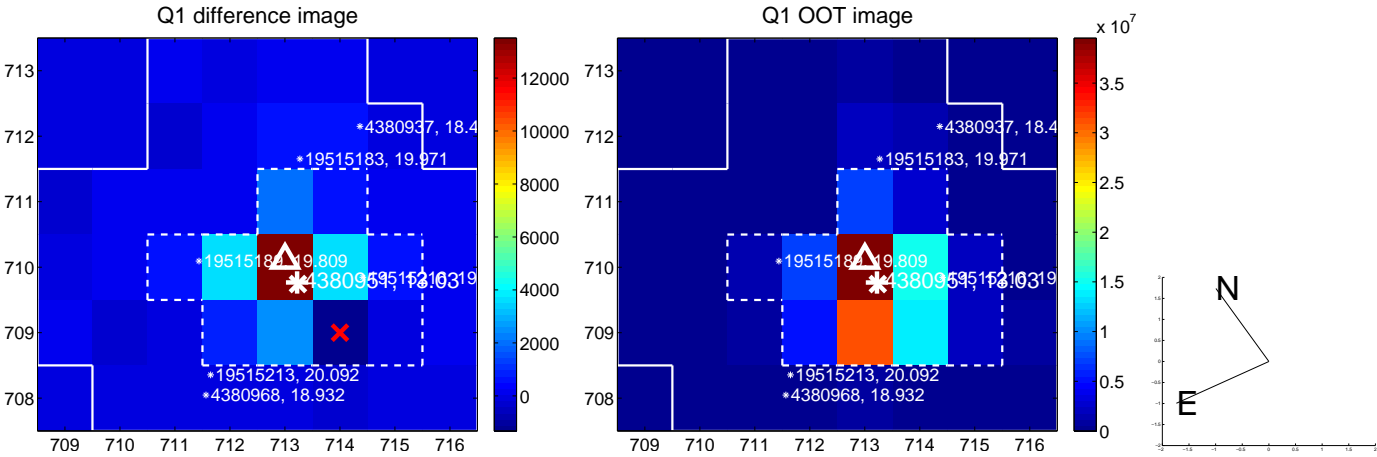
The direct PRF centroid is offset from the target star catalog position by about 0.16 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA       | $\Delta$ Dec       |
|---|--------------------|---------------------|-------------------|--------------------|
| PRF-fit source offset from OOT          | $0.094 \pm 0.216$  | 0.44                | $0.030 \pm 0.192$ | $-0.089 \pm 0.214$ |
| PRF-fit source offset from KIC position | $0.075 \pm 0.173$  | 0.43                | $0.074 \pm 0.178$ | $0.012 \pm 0.214$  |
| photometric centroid source offset      | —                  | —                   | —                 | —                  |

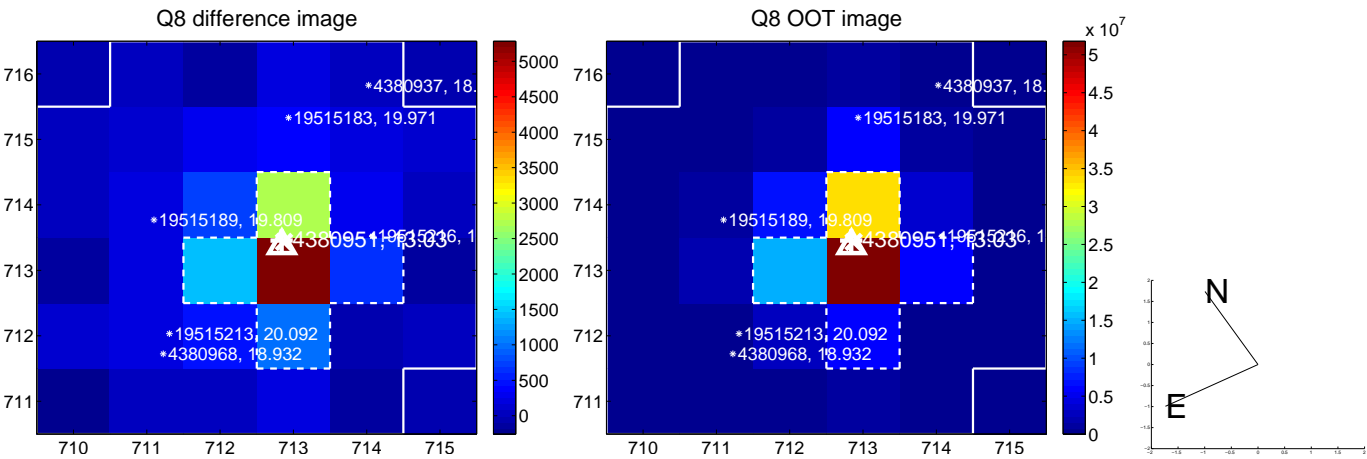
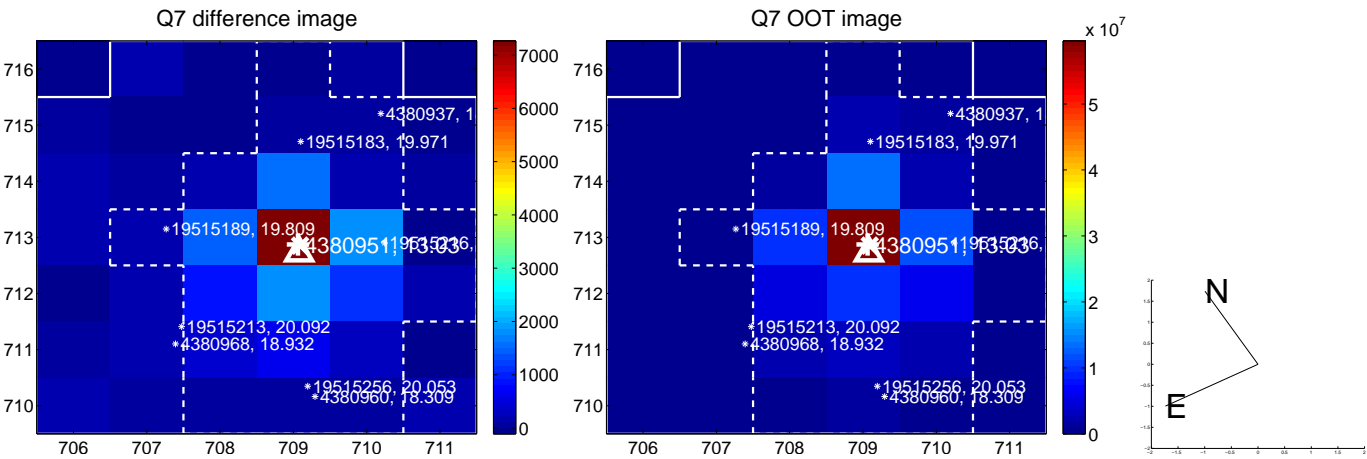
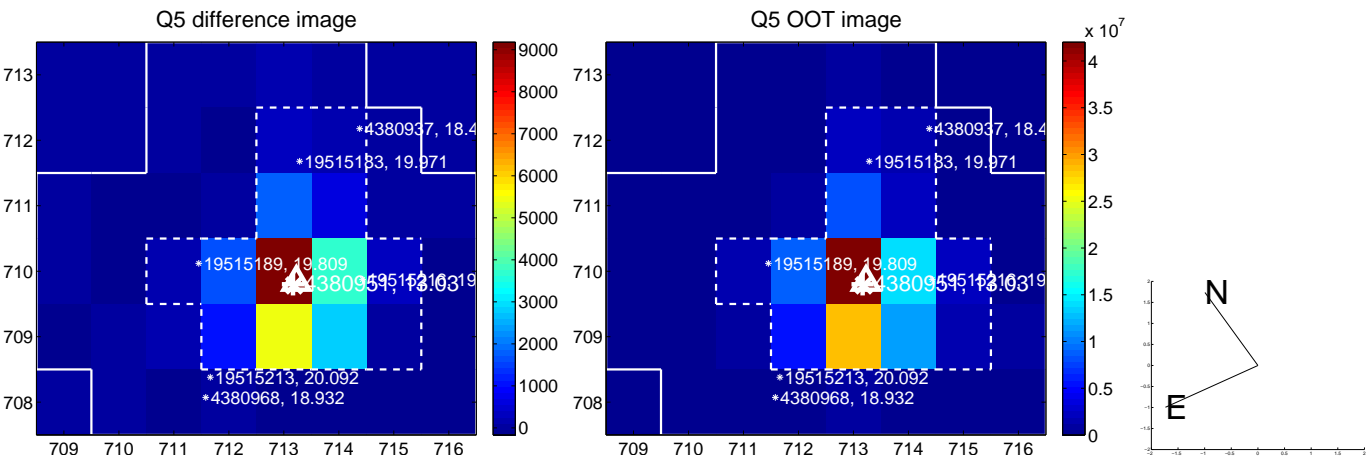


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

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

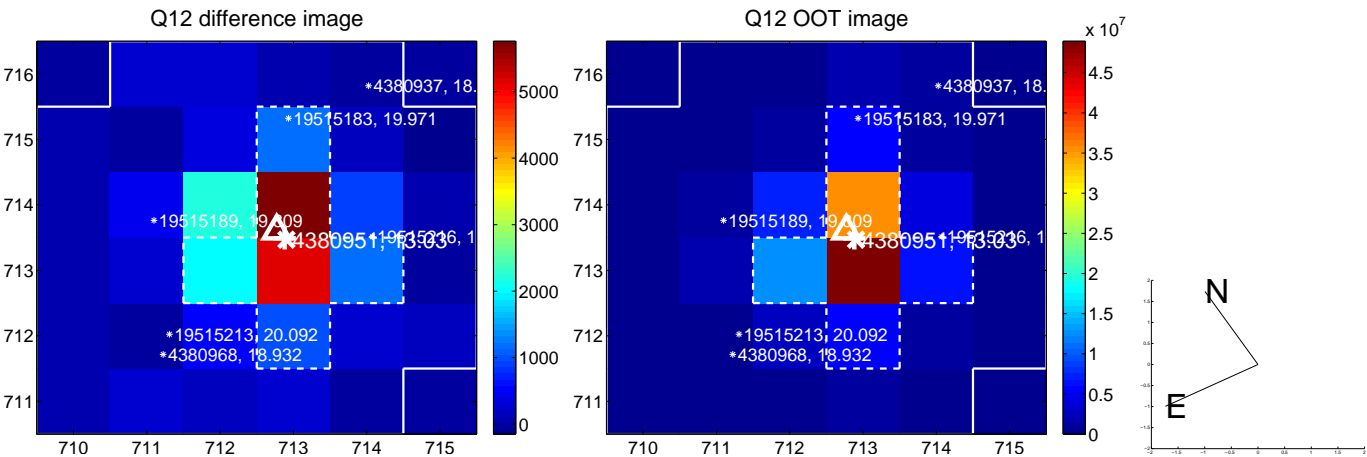
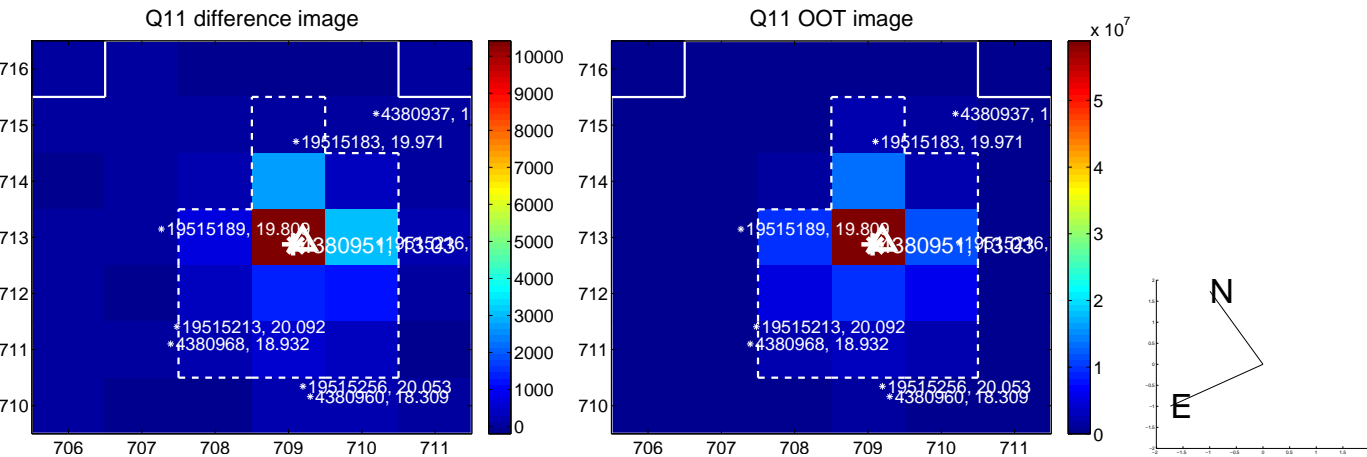
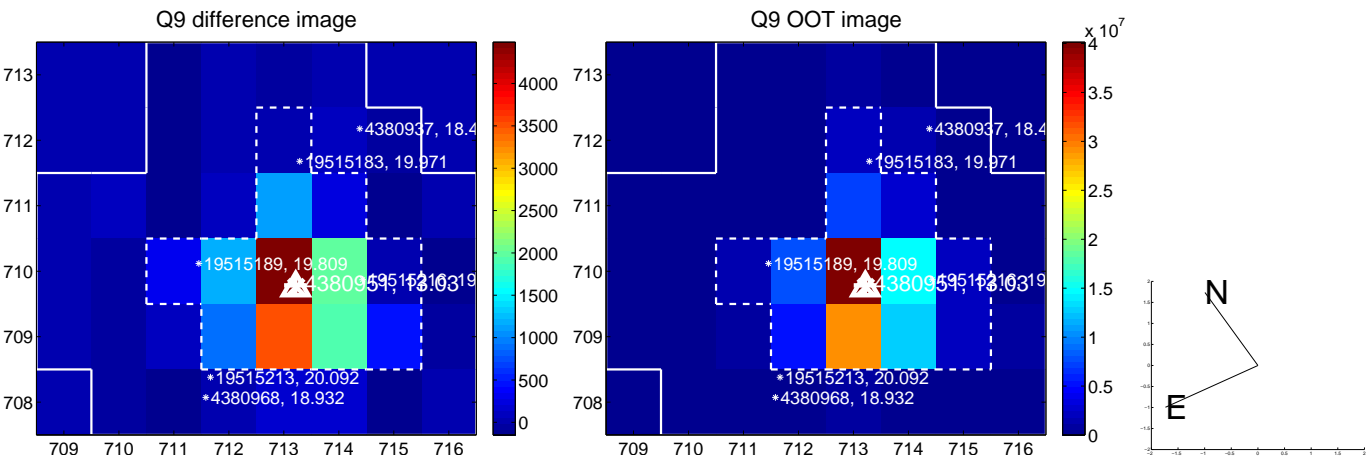


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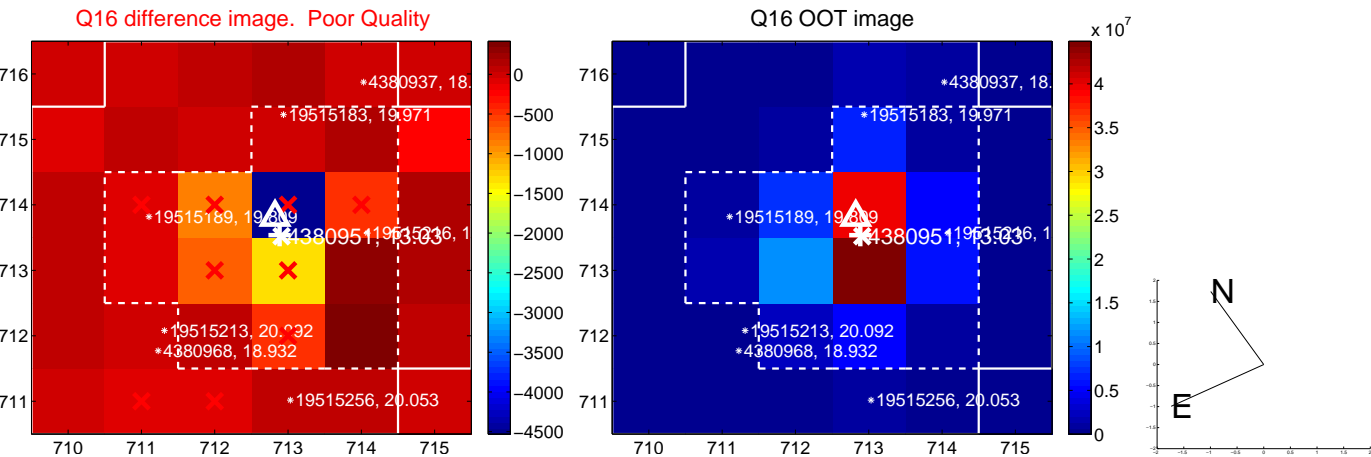
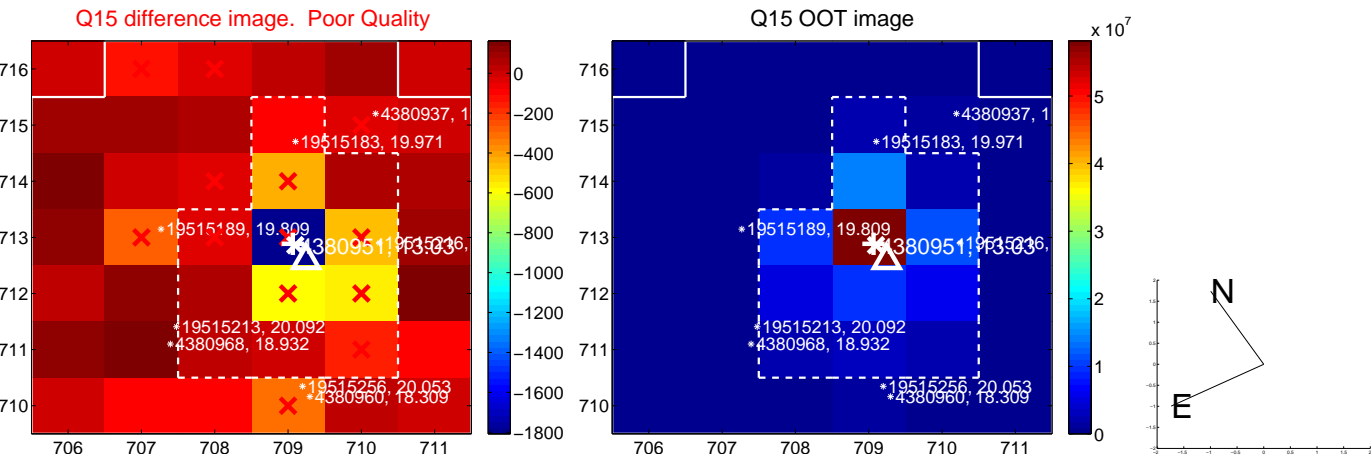
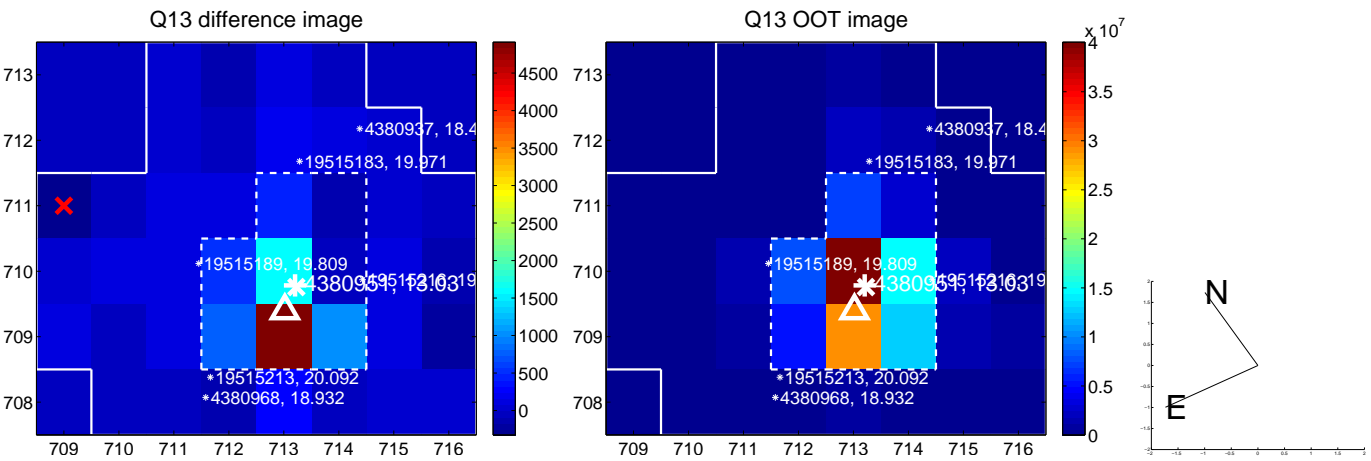




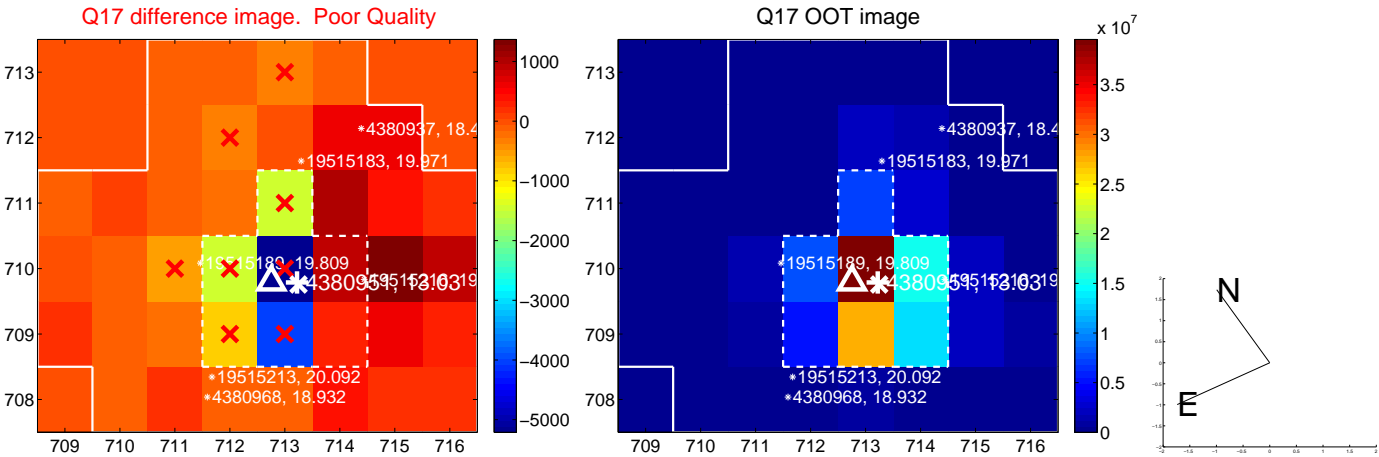
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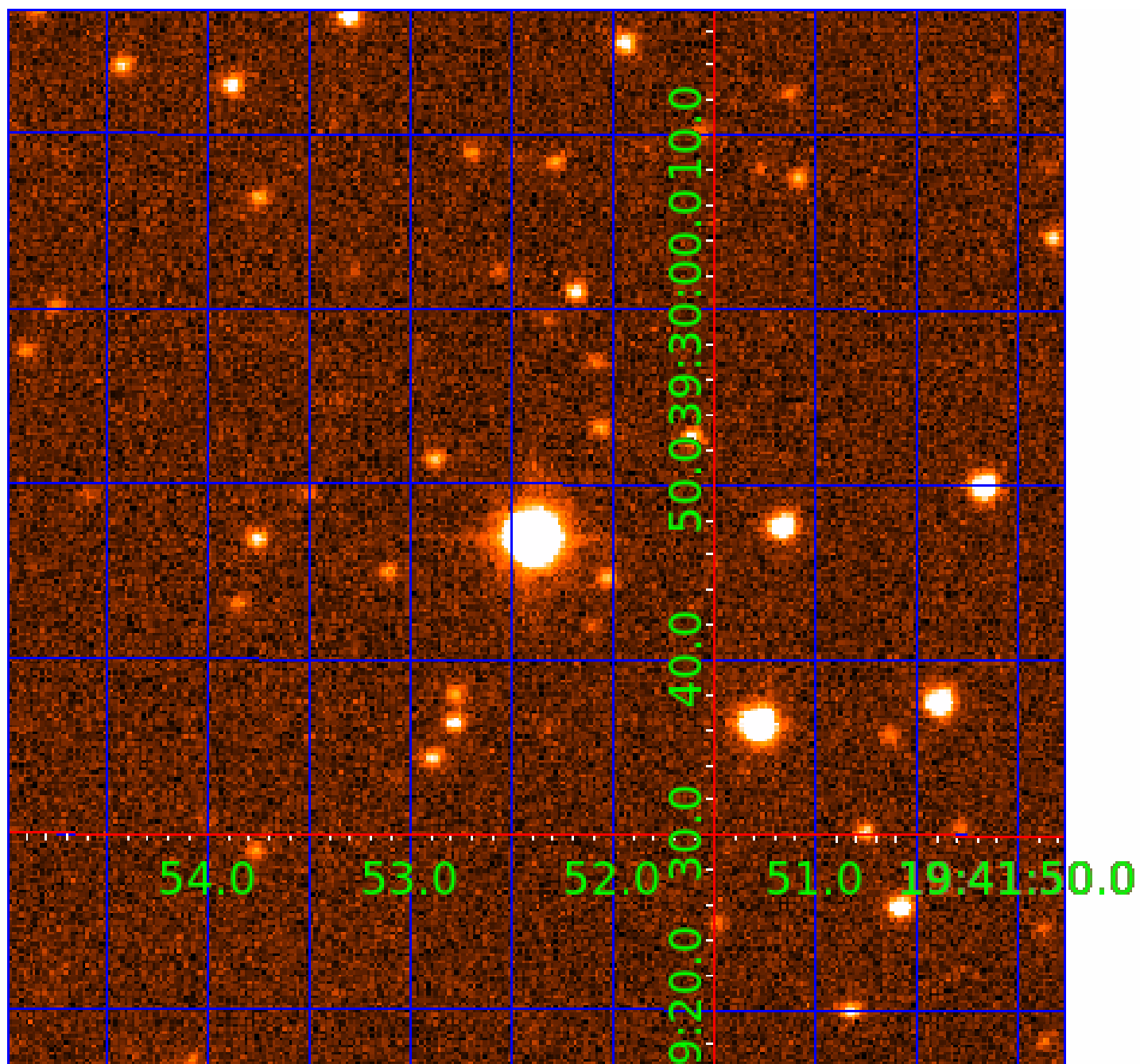
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folded centroid time series figure for this object.

UKIRT Image

Declination





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## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
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| 004380951-03 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_CHASES_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS |
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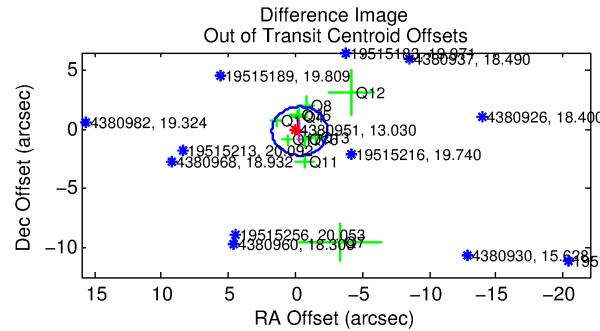
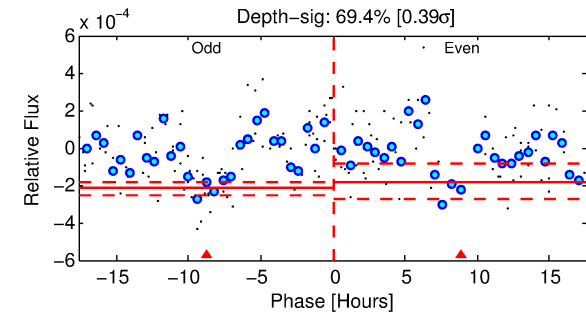
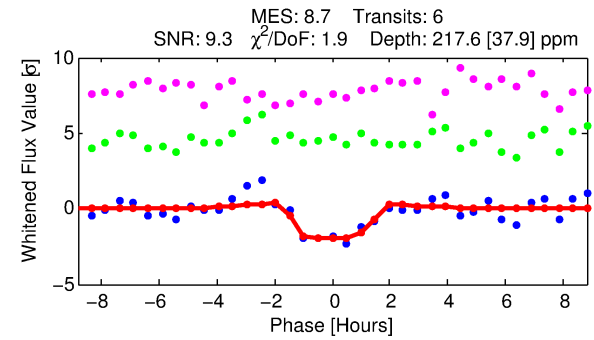
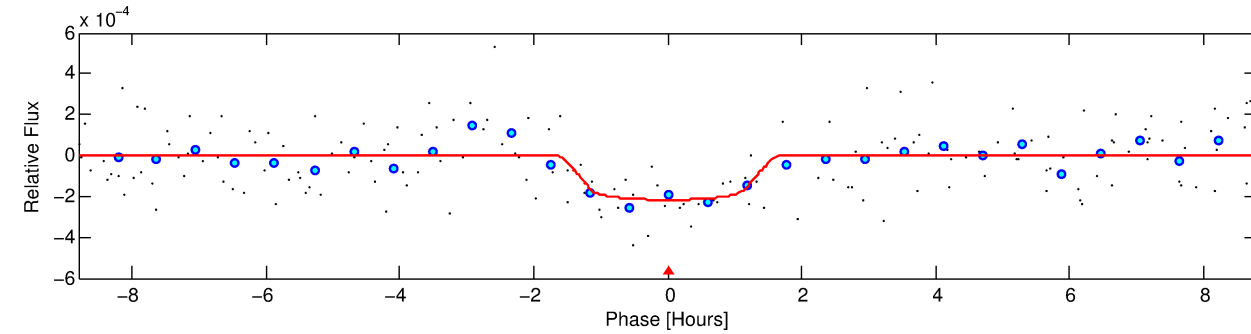
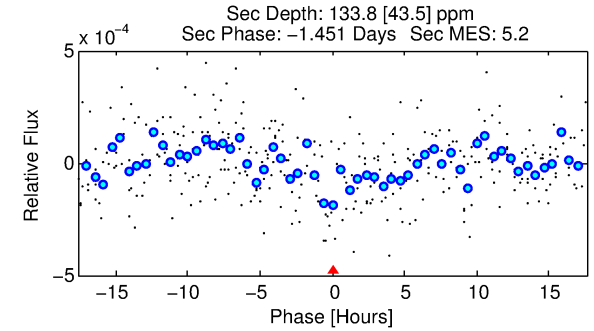
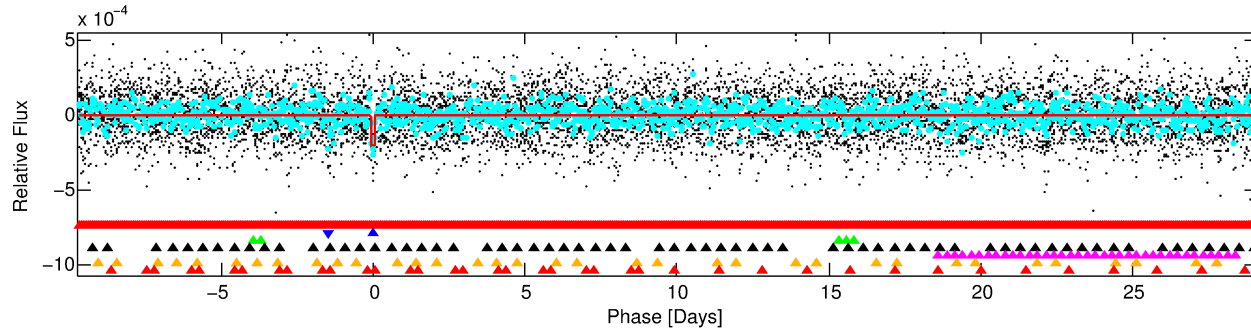
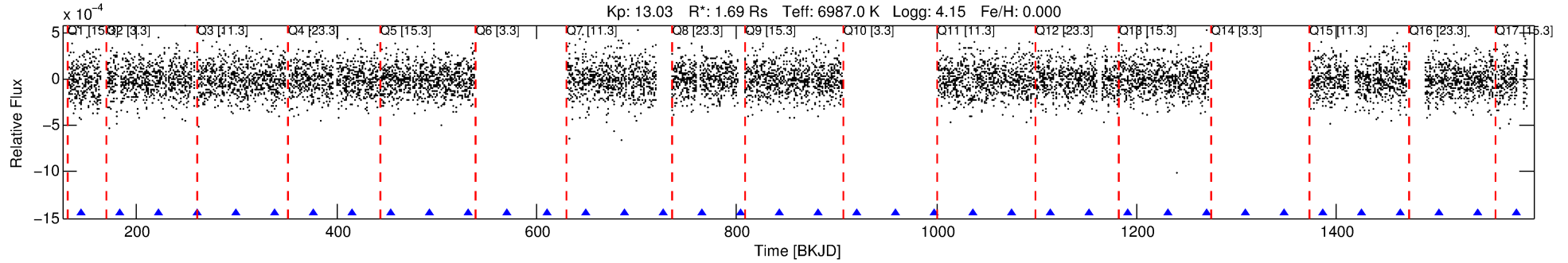
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 004380951-02

No Significant Match Found

# DV One-Page Summary

KIC: 4380951 Candidate: 2 of 7 Period: 38.804 d



## DV Fit Results:

Period = 38.80425 [0.00035] d  
Epoch = 144.3057 [0.0085] BKJD  
Rp/R\* = 0.0156 [0.0118]  
a/R\* = 50.18 [229.01]  
b = 0.89 [1.12]  
Seff = 93.93 [22.62]  
Teff = 794 [48] K  
Rp = 2.87 [2.24] Re  
a = 0.2548 [0.0419] AU  
Ag = 580.38 [907.31] [0.64σ]  
Teffp = 6024 [2329] K [2.25σ]

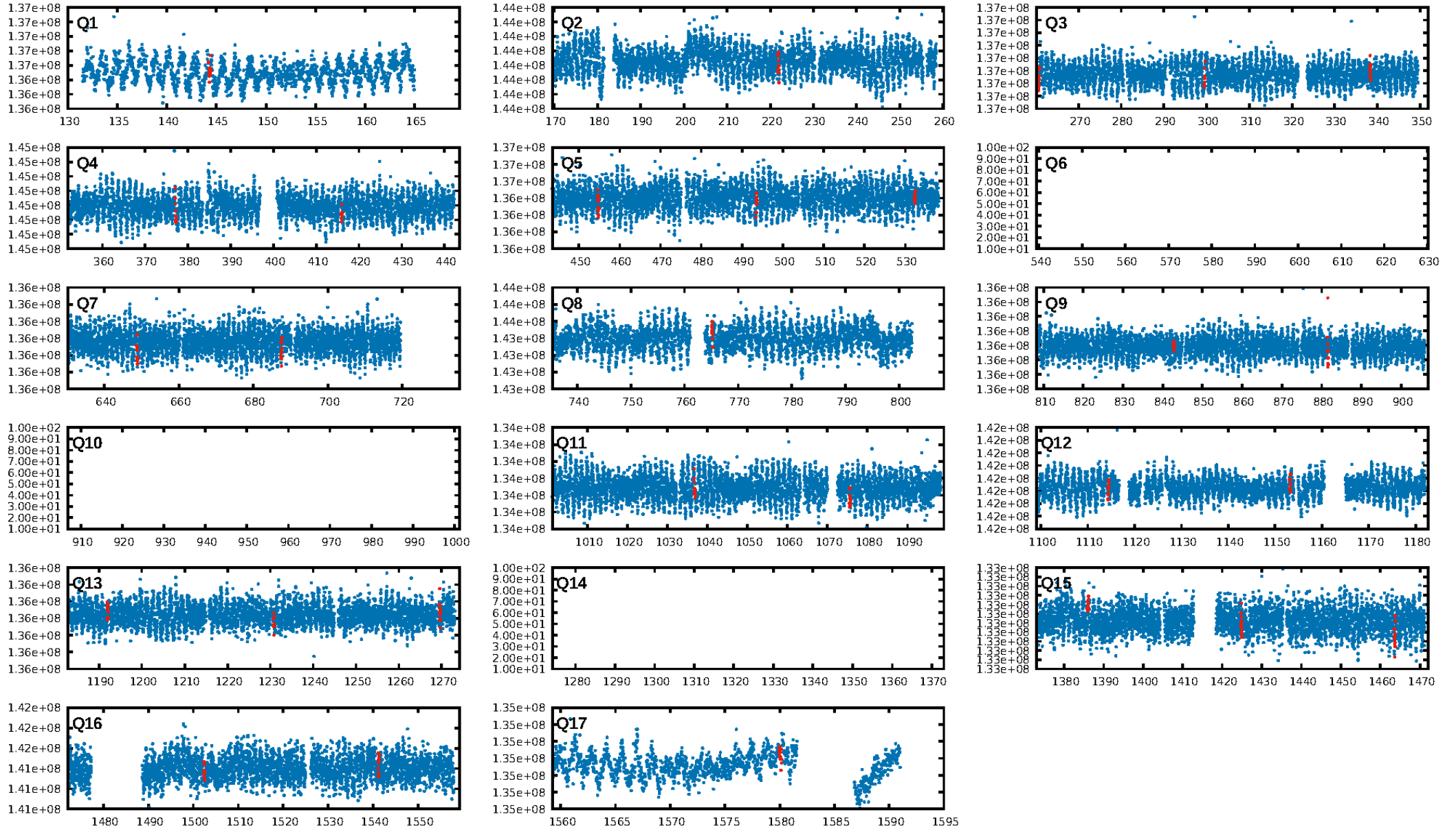
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [9.65σ]  
LongPeriod-sig: 89.2% [1.61σ]  
ModelChiSquare2-sig: 68.5%  
ModelChiSquareGof-sig: 82.2%  
**Bootstrap-pfa: 3.83e-09**  
RollingBand-fgt: 1.00 [5/5]  
GhostDiagnostic-chr: -0.3136  
Centroid-sig: 4.8%  
Centroid-so: 1.060 arcsec [1.48σ]  
OotOffset-rm: 0.335 arcsec [0.49σ]  
KicOffset-rm: 0.218 arcsec [0.49σ]  
OotOffset-st: 0/3/4/3 [10]  
KicOffset-st: 0/3/4/3 [10]  
DiffImageQuality-fgm: 0.50 [5/10]  
DiffImageOverlap-fno: 0.29 [4/14]

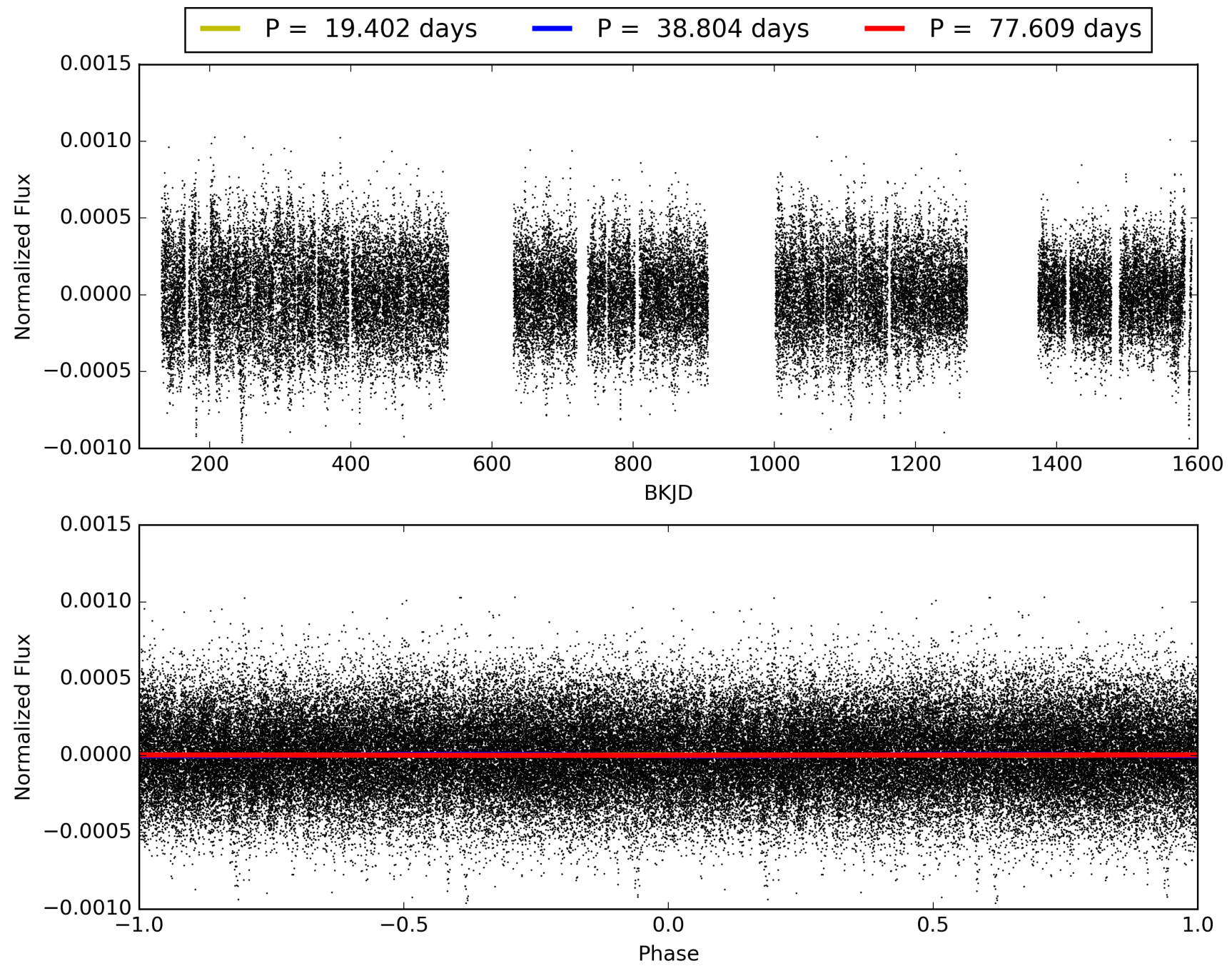
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 16:46:34 Z

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

# TCE 004380951-02, PDC Light Curves

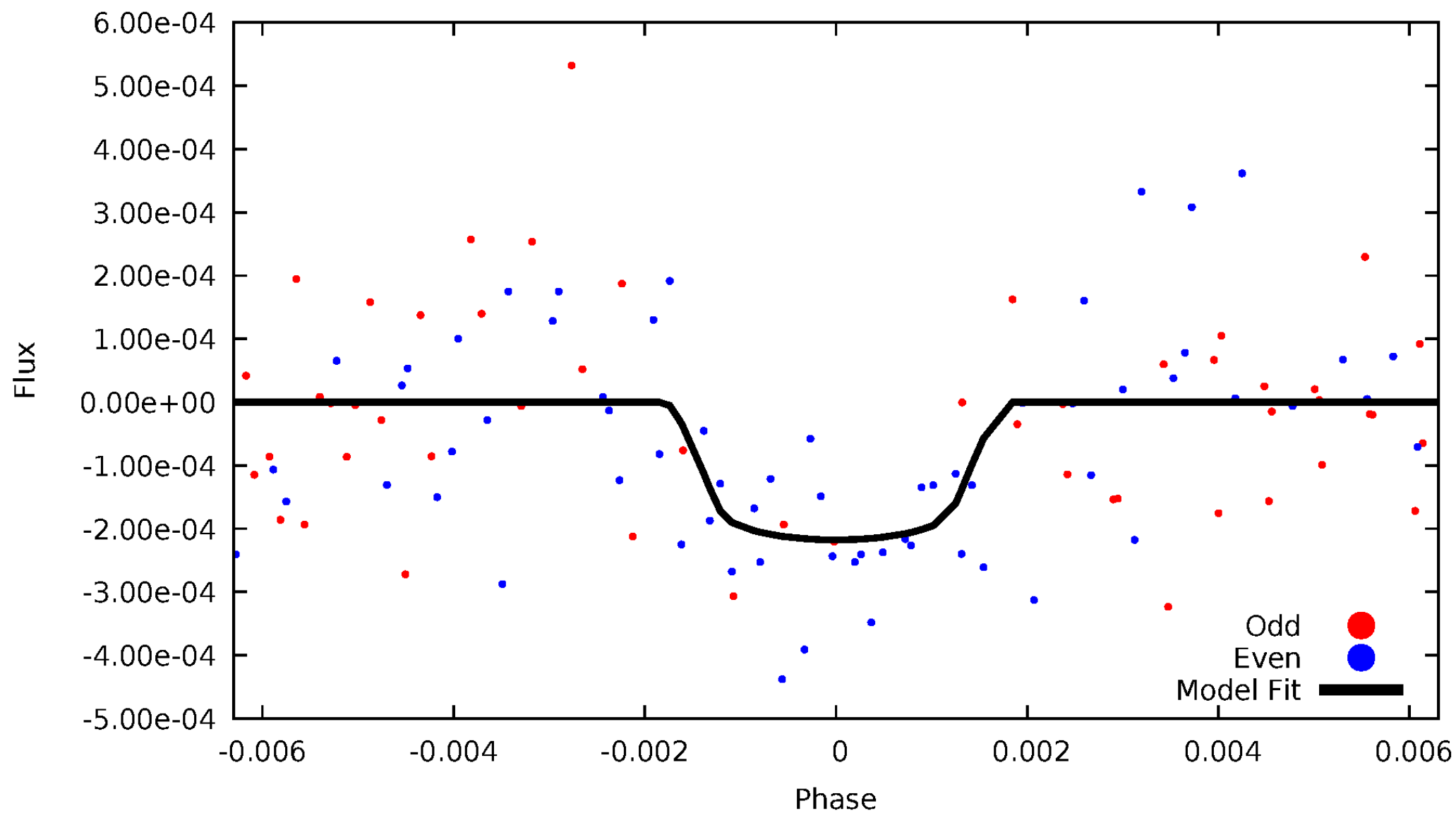


TCE 004380951-02



# DV Odd/Even

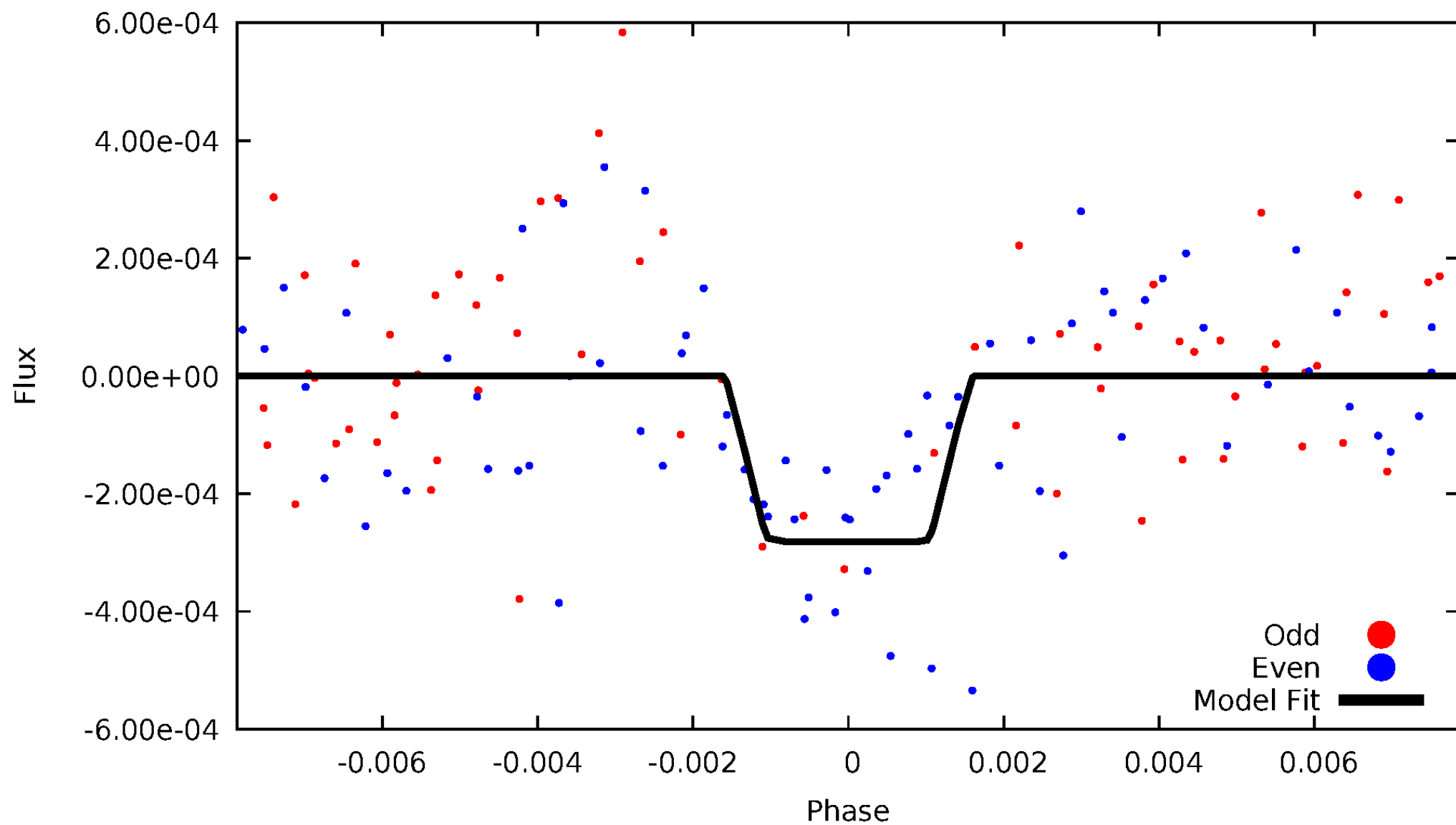
TCE 004380951-02





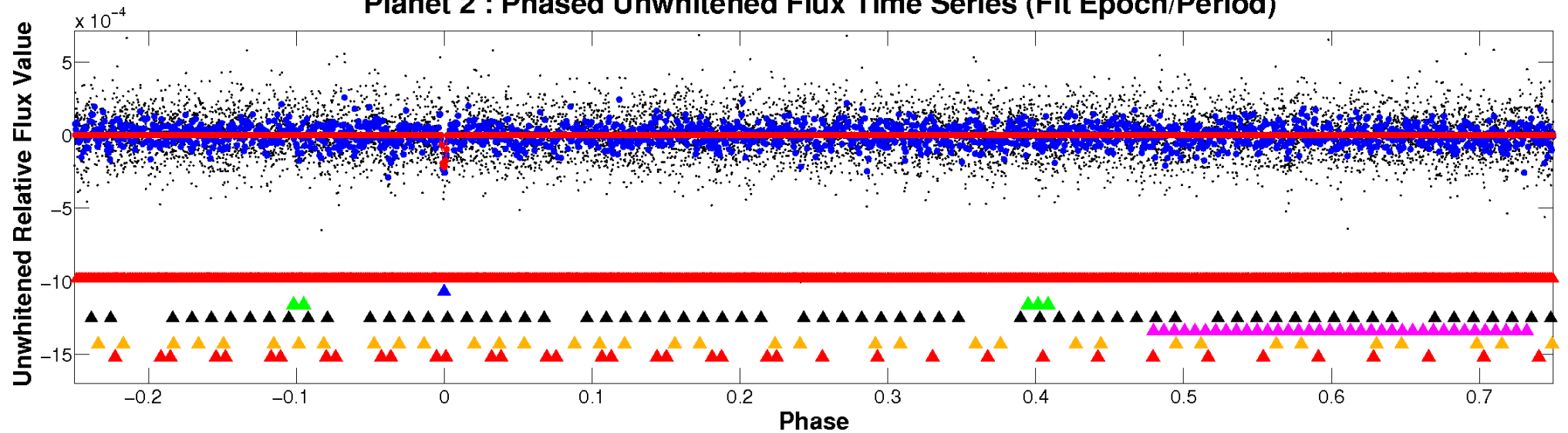
# ALT Odd/Even

TCE 004380951-02

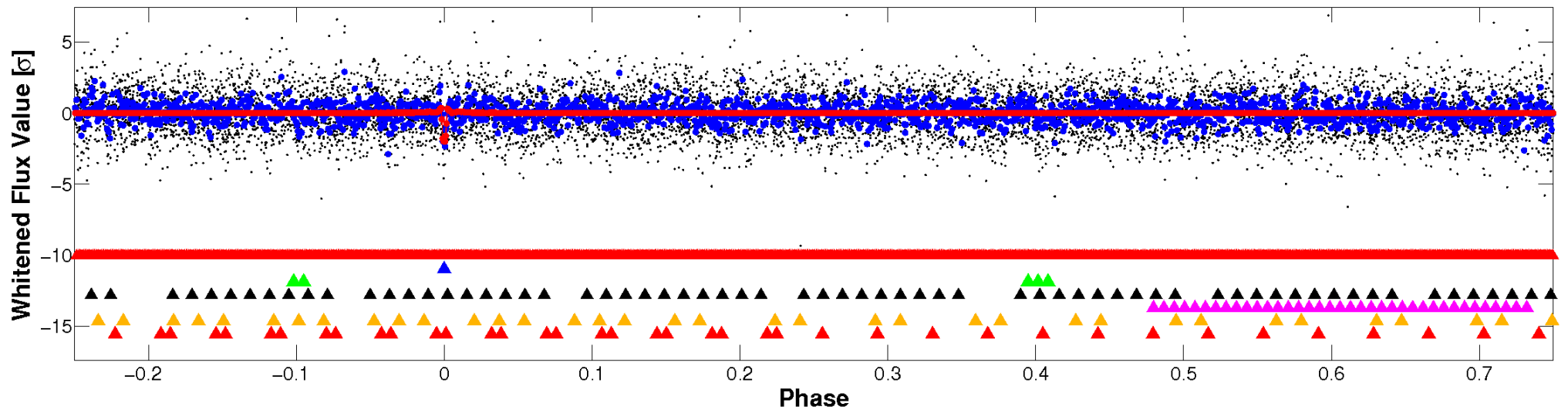


# Non-Whitened Vs. Whitened Light Curve

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

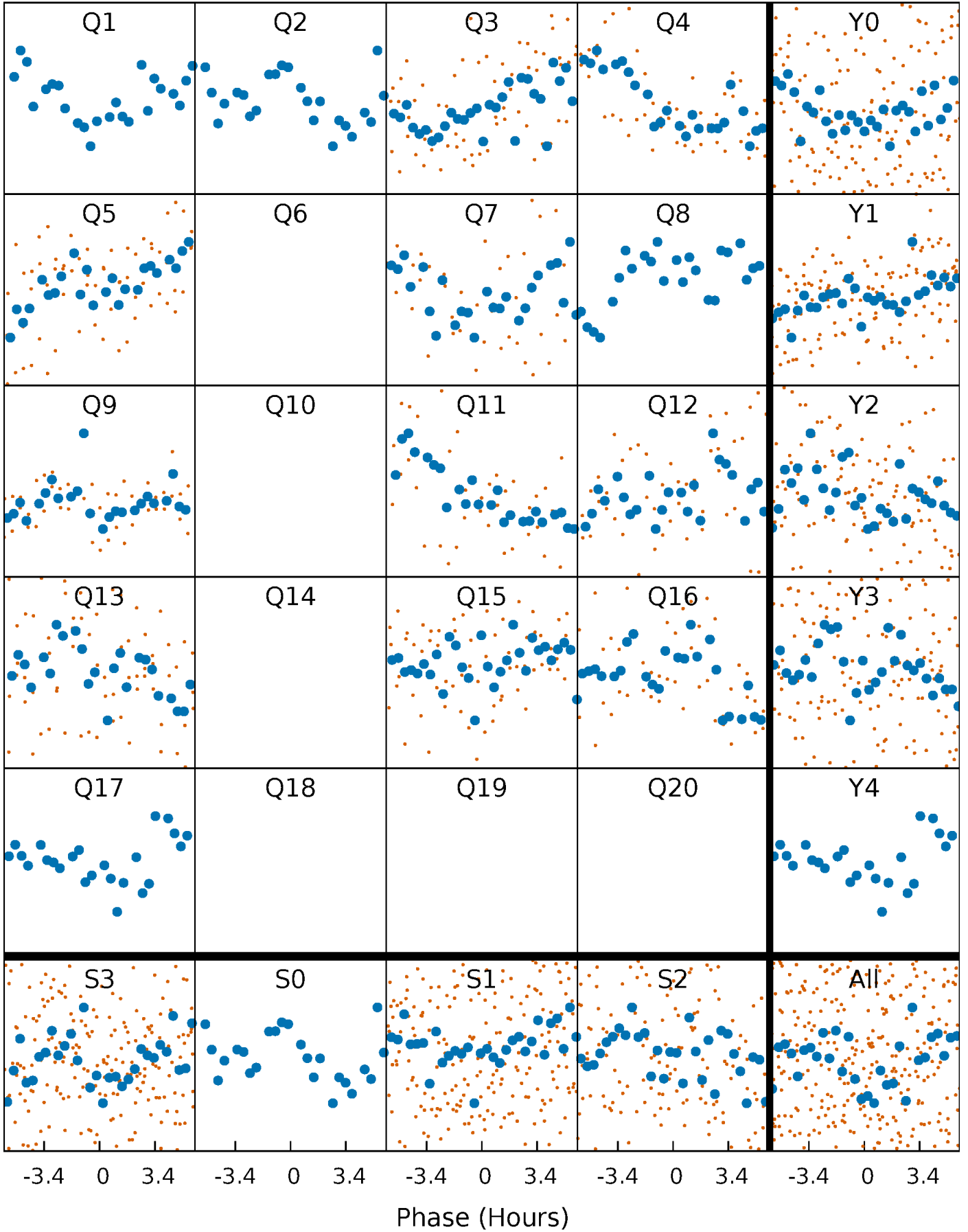


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



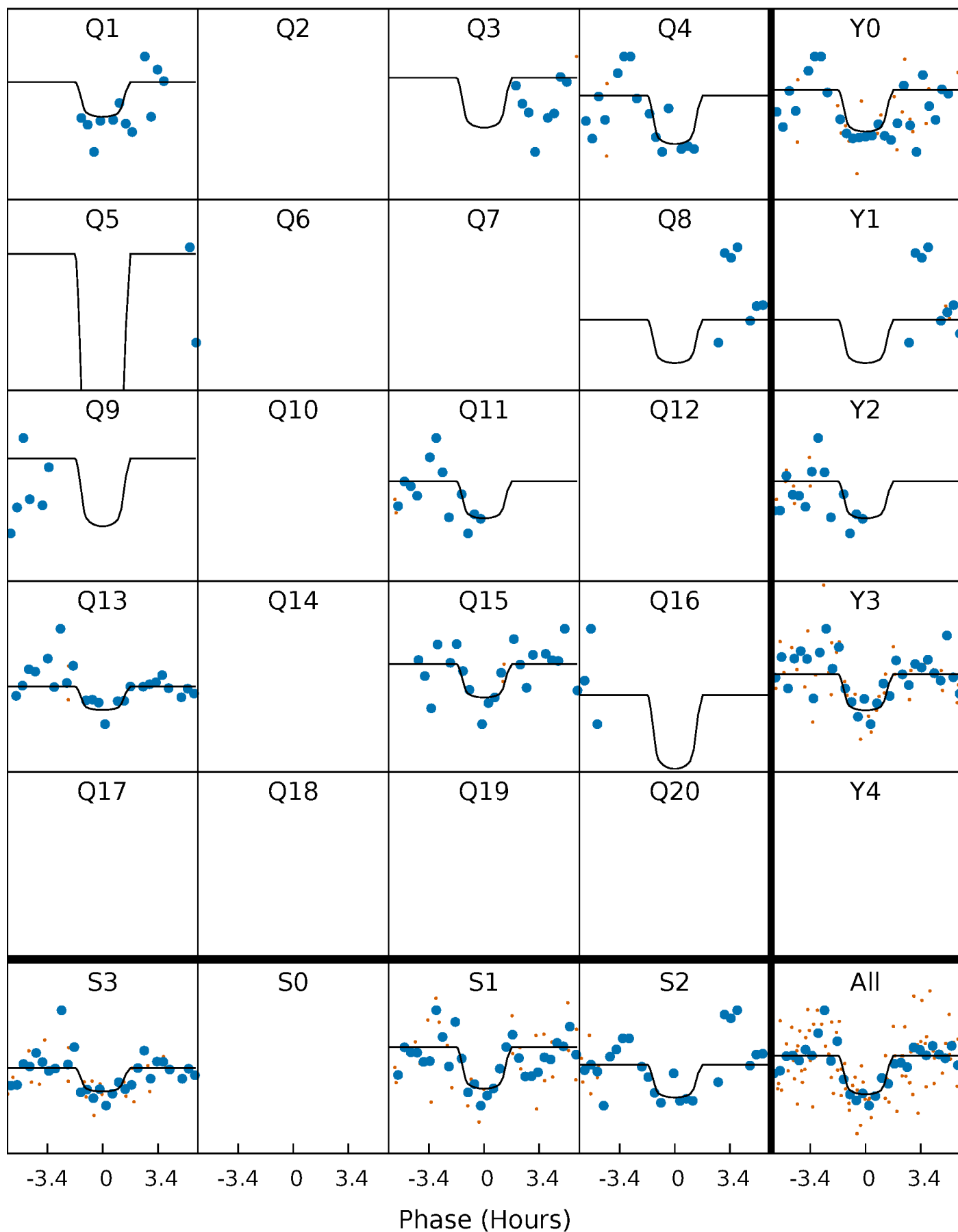
# PDC Quarter-Phased Transit Curves

TCE 004380951-02   P= 38.804254 Days    $T_0=144.305723$  (BKJD)



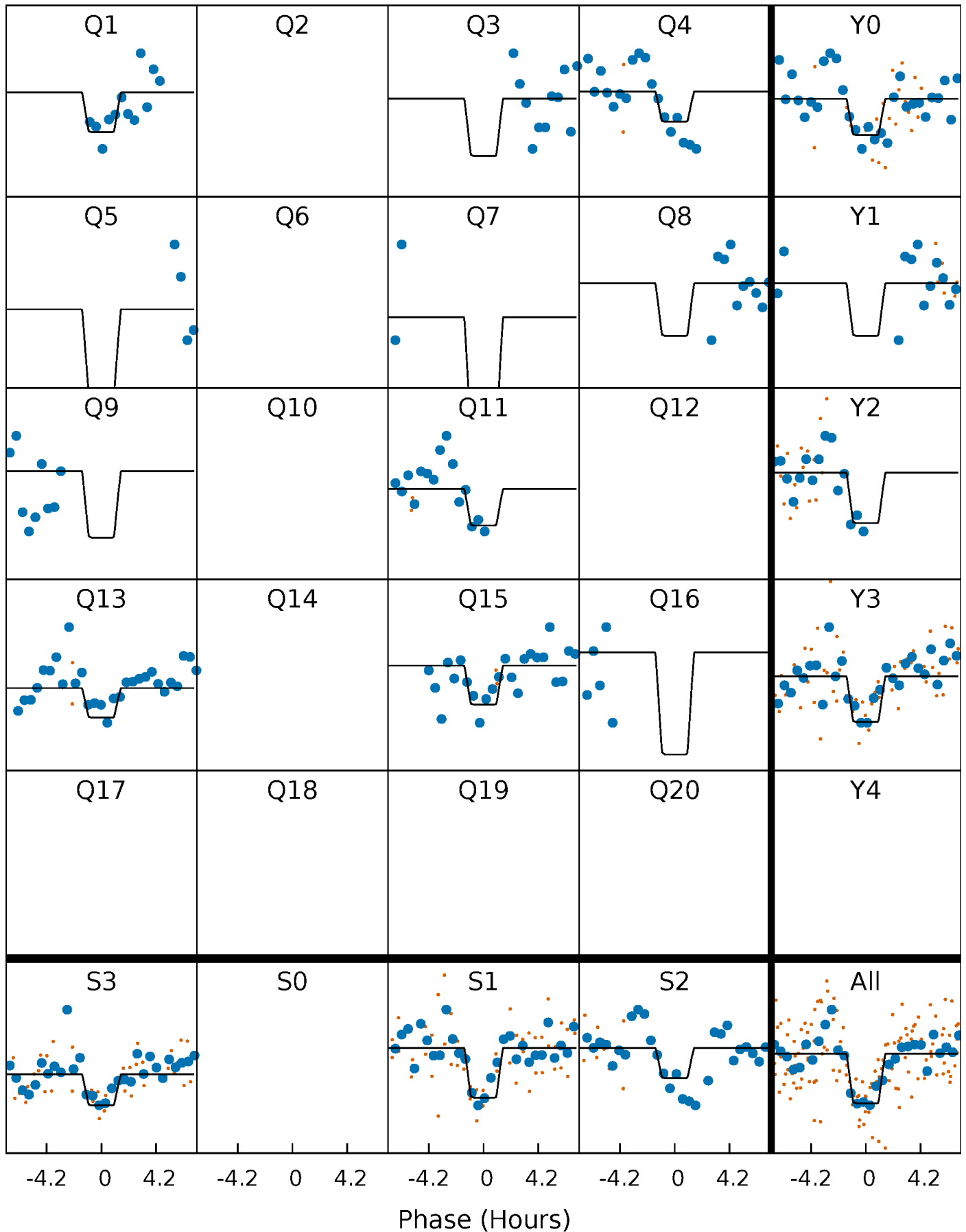
# DV Quarter-Phased Transit Curves

TCE 004380951-02   P= 38.804254 Days    $T_0=144.305723$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 004380951-02     $P = 38.804974$  Days     $T_0 = 144.290343$  (BKJD)

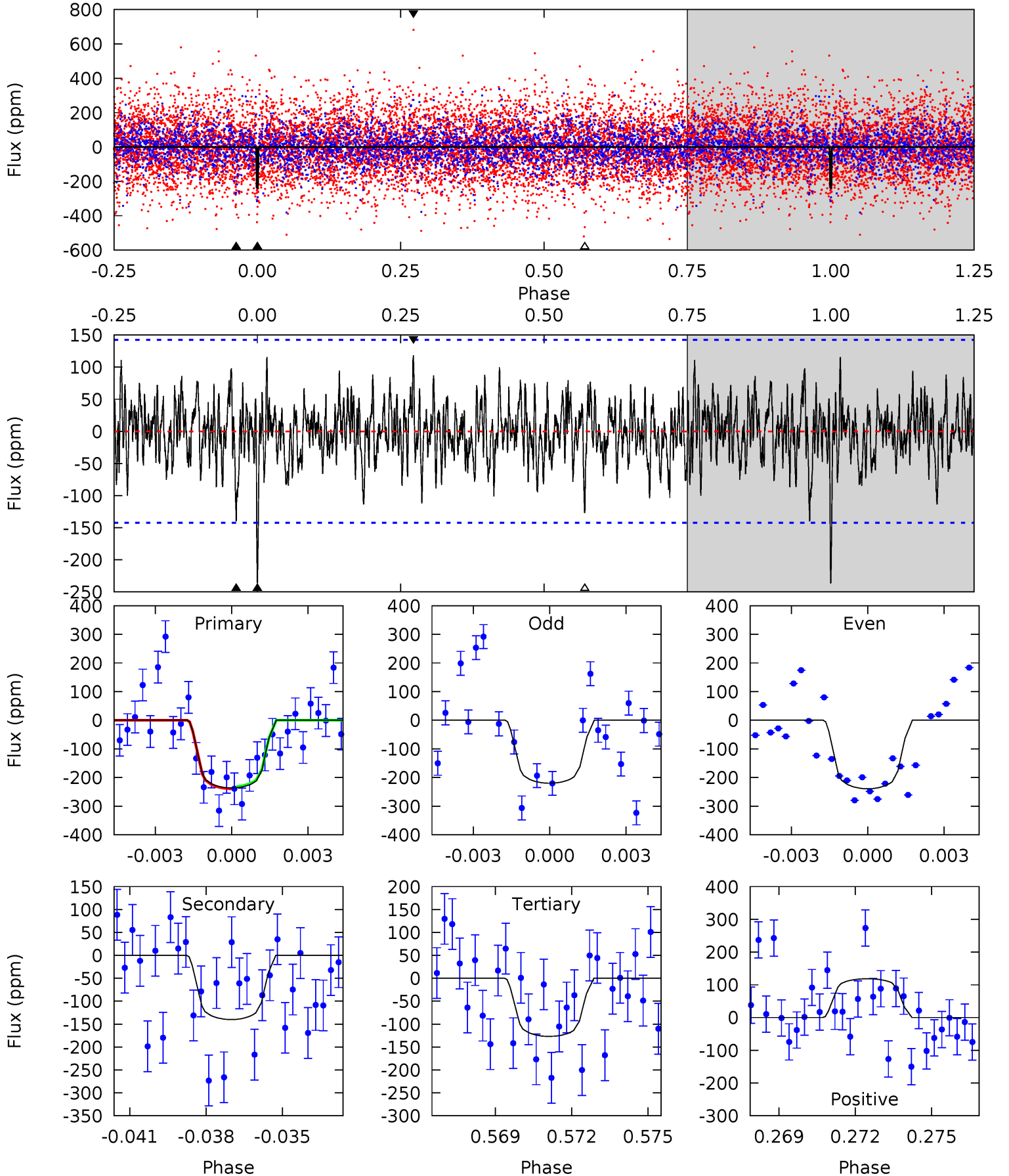




# DV Model-Shift Uniqueness Test

004380951-02,  $P = 38.804254$  Days,  $E = 105.501469$  Days

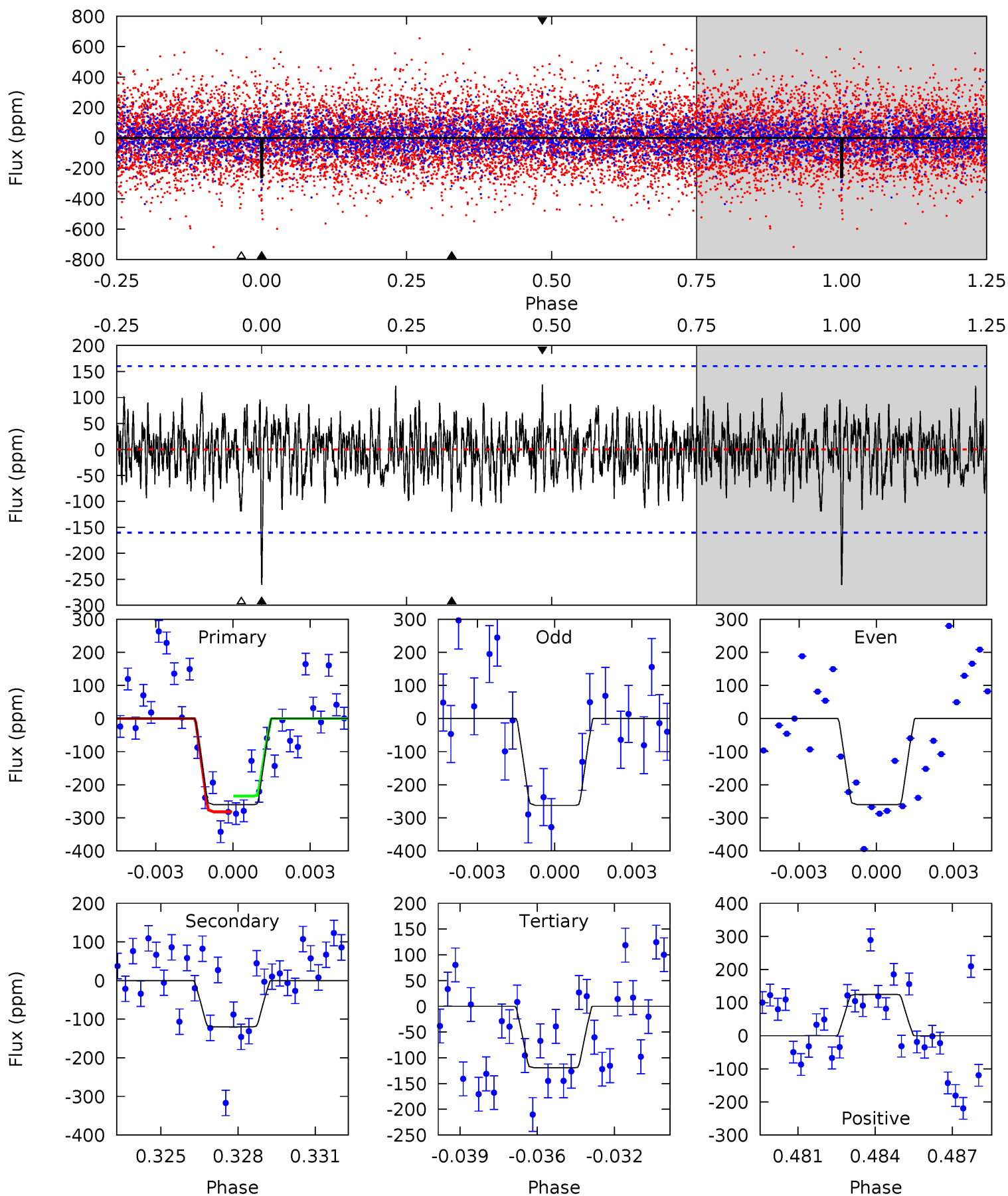
| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 8.71 | 5.16 | 4.67 | 4.36 | 5.24            | 2.95            | 1.41             | 4.03    | 4.34    | 0.48    | 0.79    | 0.27    | 1.00 | 0.33  | 0.13 |



# Alt Model-Shift Uniqueness Test

004380951-02, P = 38.804974 Days, E = 105.485369 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  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 8.51 | 3.91 | 3.90 | 4.08 | 5.24            | 2.94            | 1.28             | 4.61    | 4.43    | 0.01    | -0.17   | 0.03    | 1.05 | 0.32  | 0.78 |



### Stellar Parameters For KIC 004380951

|        | $T_{\text{eff}}(K)$ | $\log(g)$                 | [Fe/H]                    | $R (R_{\odot})$           | $M(M_{\odot})$            | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|---------------------|---------------------------|---------------------------|---------------------------|---------------------------|---|
|        | $6987^{+73}_{-94}$  | $4.148^{+0.073}_{-0.126}$ | $0.000^{+0.150}_{-0.150}$ | $1.690^{+0.337}_{-0.181}$ | $1.470^{+0.115}_{-0.094}$ | $0.429^{+0.155}_{-0.170}$                 |
|        | +1%/-1%             | +2%/-3%                   | +inf%/-inf%               | +20%/-11%                 | +8%/-6%                   | +36%/-40%                                 |
| Source | SPE68               | SPE68                     | SPE68                     | DSEP                      |                           |   |

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

### Secondary Eclipse Parameters for KIC 004380951-02 / KOI

| Detrend | Depth (ppm)   | $R_p (R_{\oplus})$     | $T_{max} (K)$      | $T_{obs} (K)$          | $A_{obs}$            |
|---------|---------------|------------------------|--------------------|------------------------|----------------------|
| DV      | $-140 \pm 27$ | $3.27^{+2.23}_{-1.71}$ | $1112^{+54}_{-34}$ | $5731^{+2960}_{-1167}$ | $471^{+1579}_{-313}$ |
| Alt.    | $-120 \pm 31$ | $3.27^{+2.28}_{-1.78}$ | $1113^{+53}_{-34}$ | $5454^{+3059}_{-1069}$ | $380^{+1674}_{-252}$ |

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

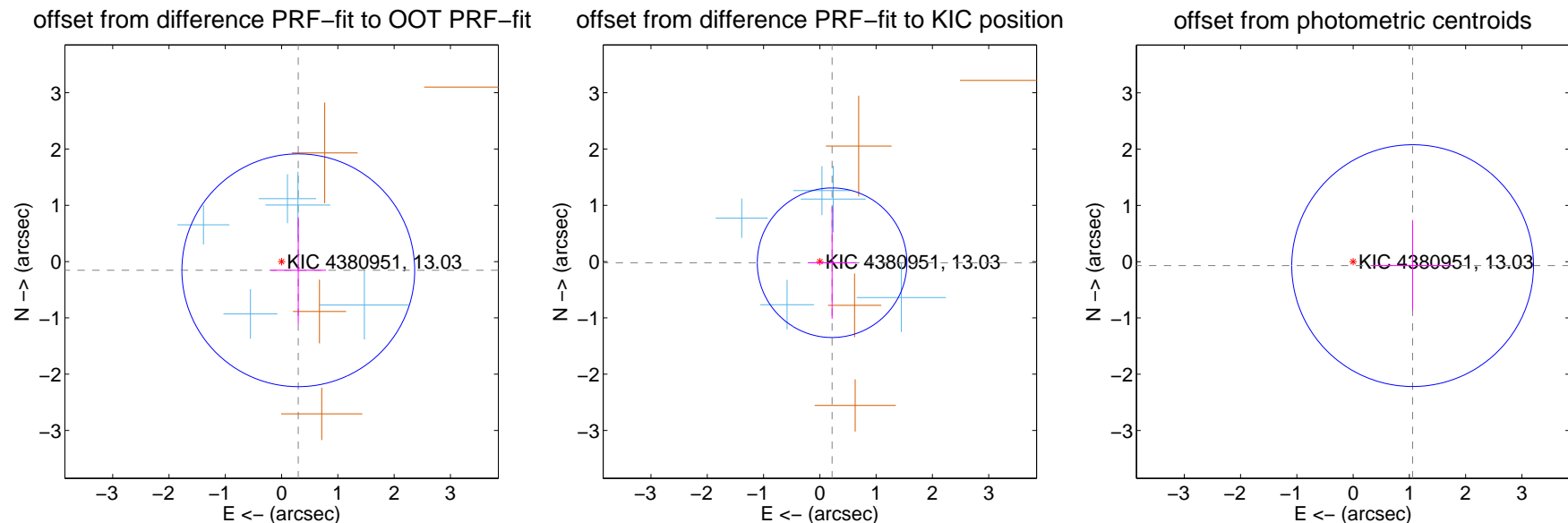
## DV Centroid Data

Supplemental centroid analysis for 004380951-02. Kepler magnitude: 13.03. Transit SNR 9.32

There are 5 quarters with good PRF difference image offsets

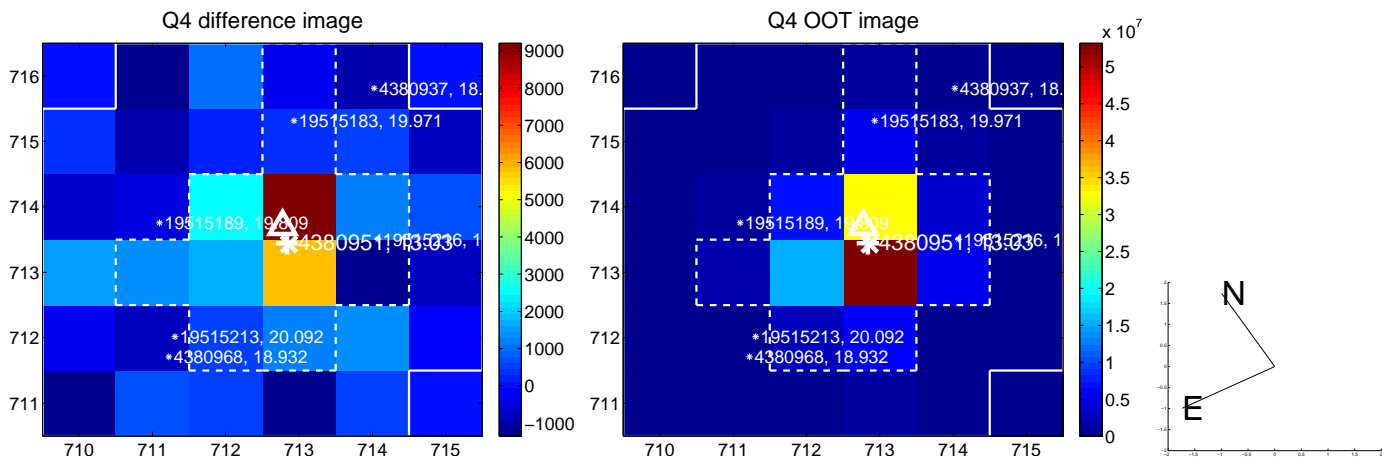
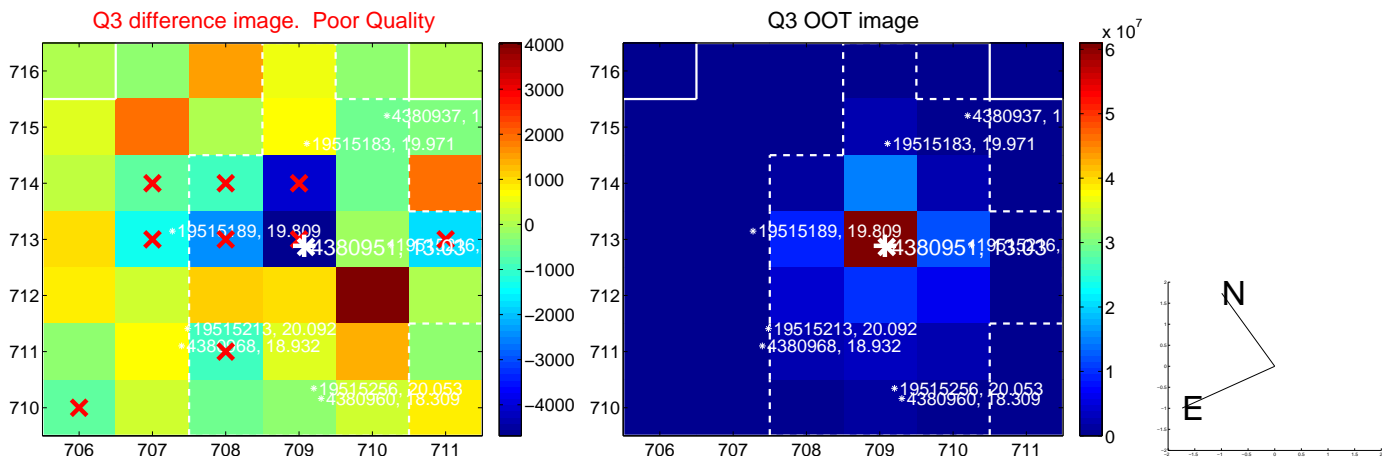
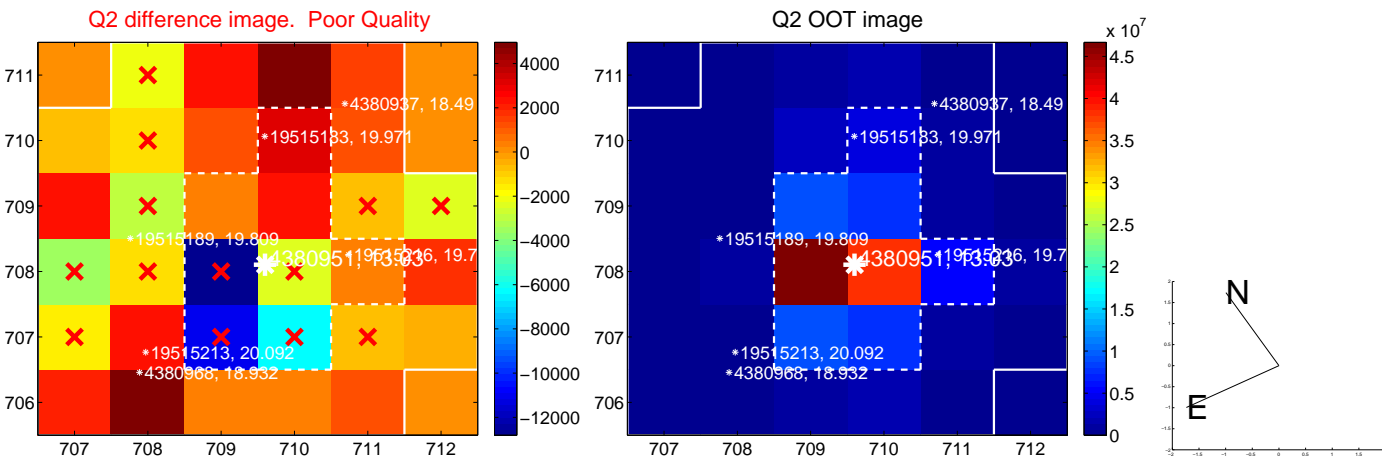
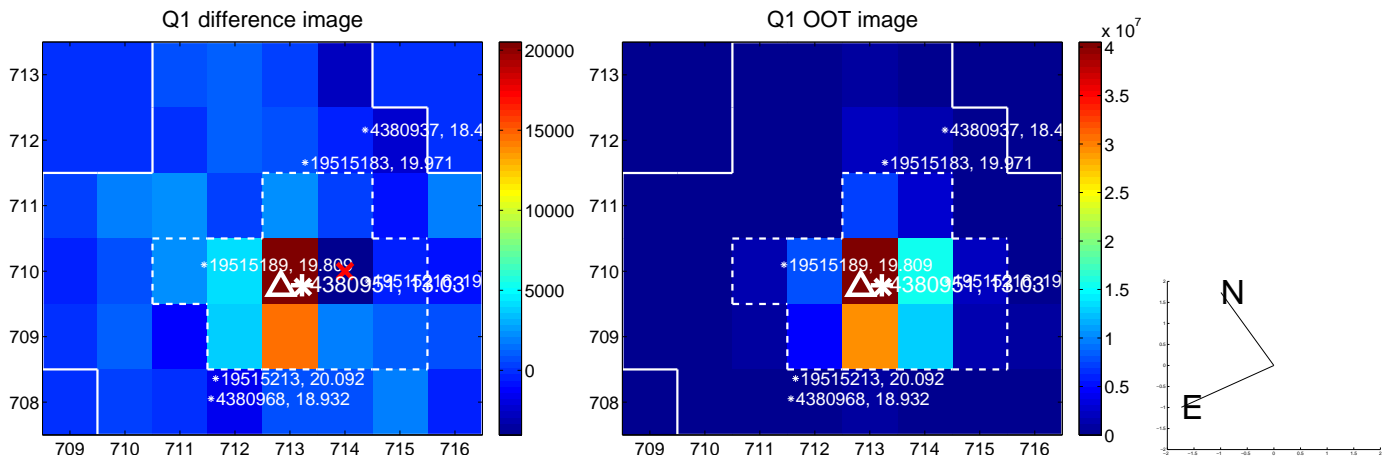
The direct PRF centroid is offset from the target star catalog position by about 0.17 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA        | $\Delta$ Dec       |
|---|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT          | $0.335 \pm 0.689$  | 0.49                | $-0.297 \pm 0.492$ | $-0.154 \pm 0.941$ |
| PRF-fit source offset from KIC position | $0.218 \pm 0.443$  | 0.49                | $-0.217 \pm 0.420$ | $-0.020 \pm 0.994$ |
| photometric centroid source offset      | $1.06 \pm 0.72$    | 1.48                | $-1.06 \pm 0.72$   | $-0.07 \pm 0.79$   |



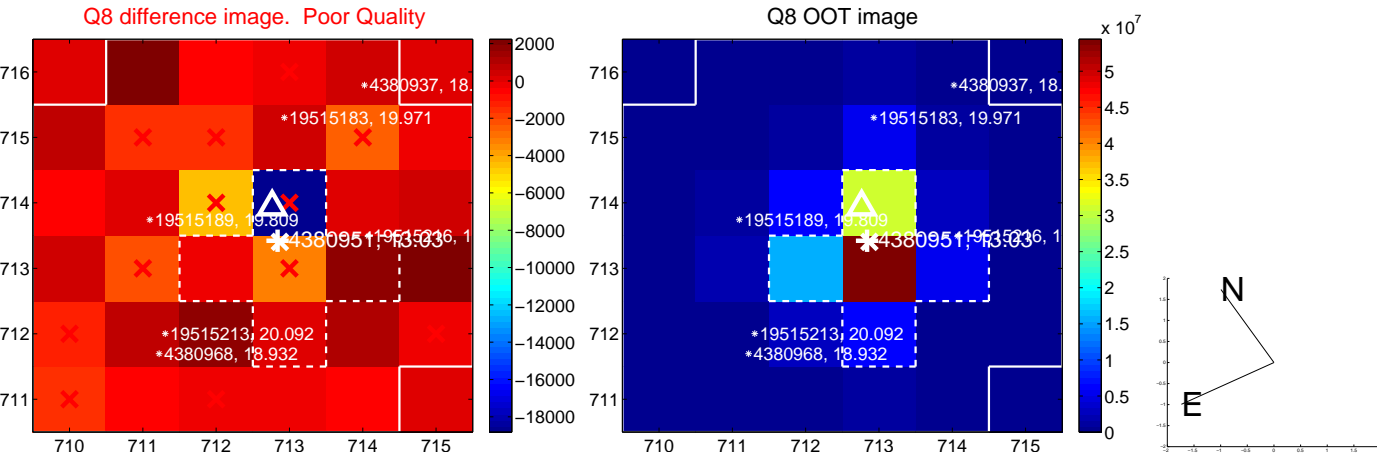
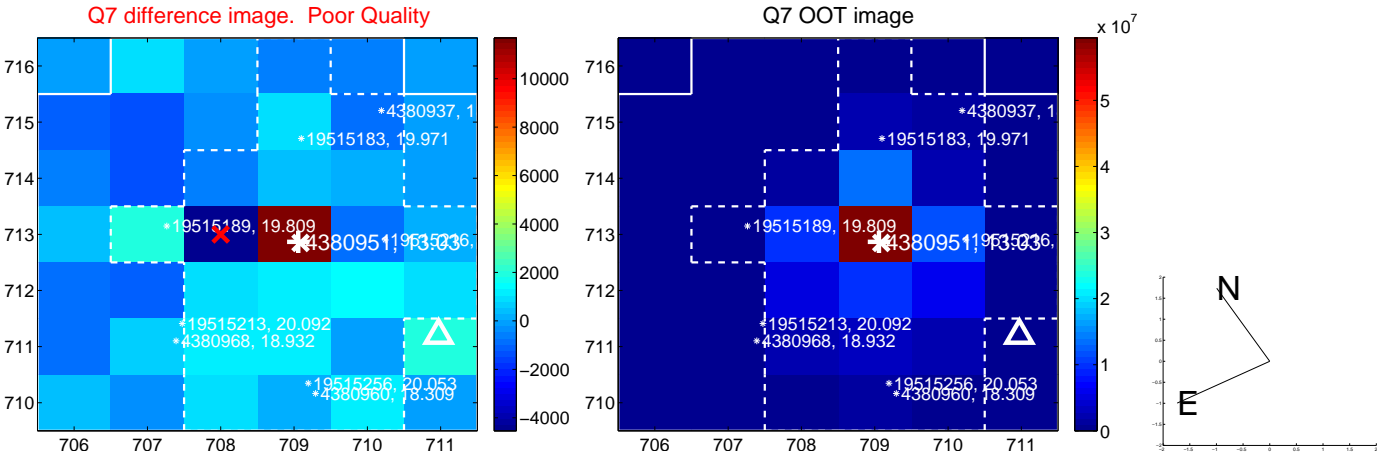
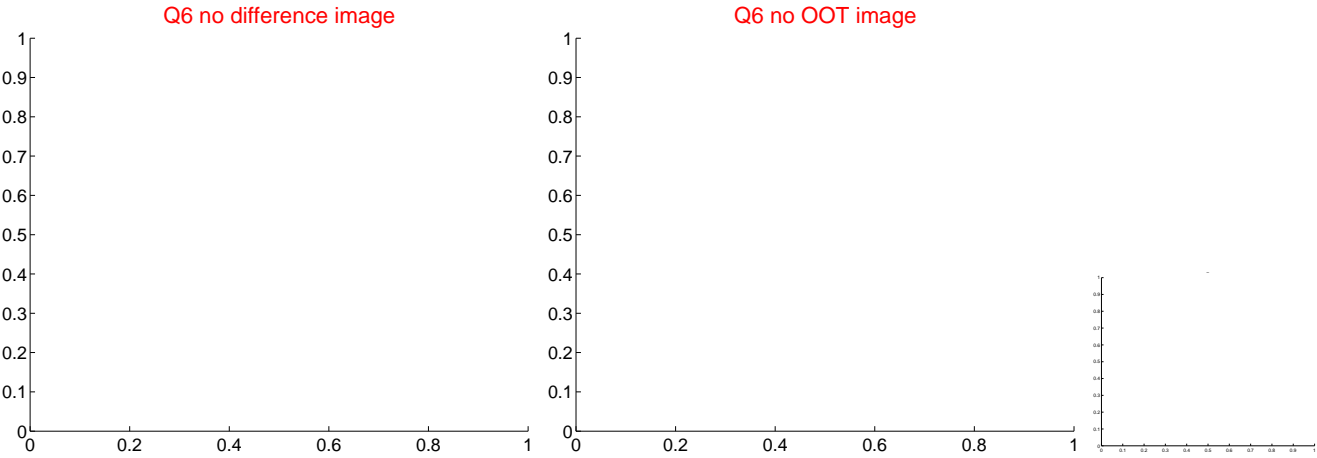
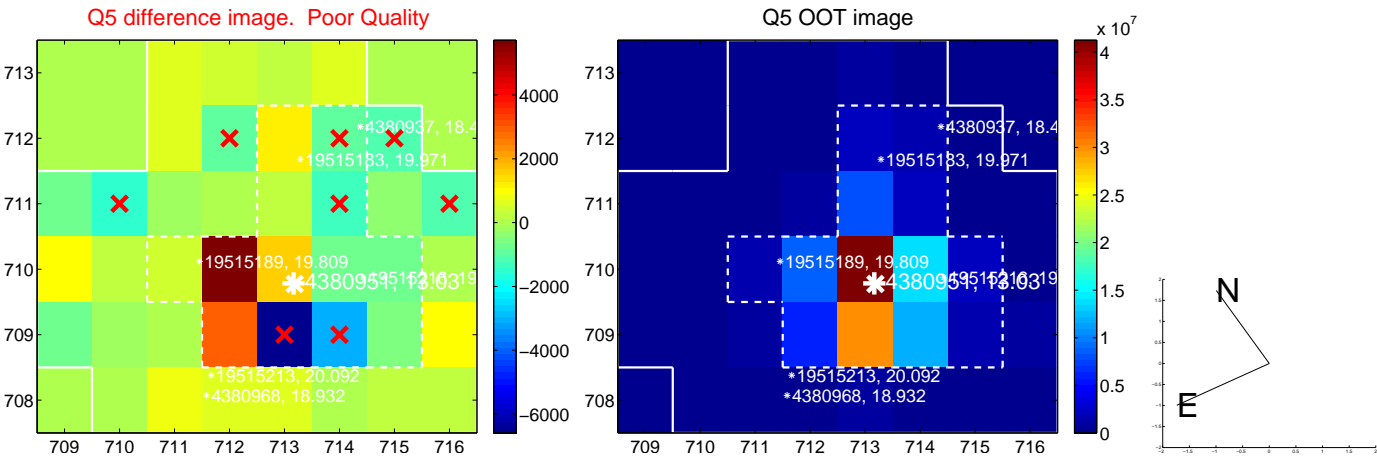
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

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

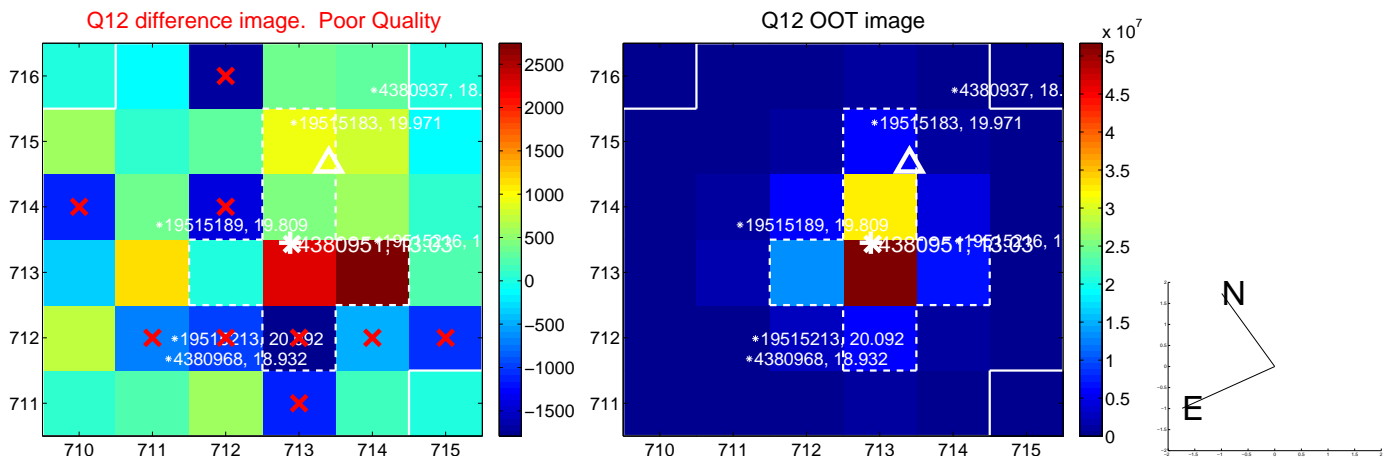
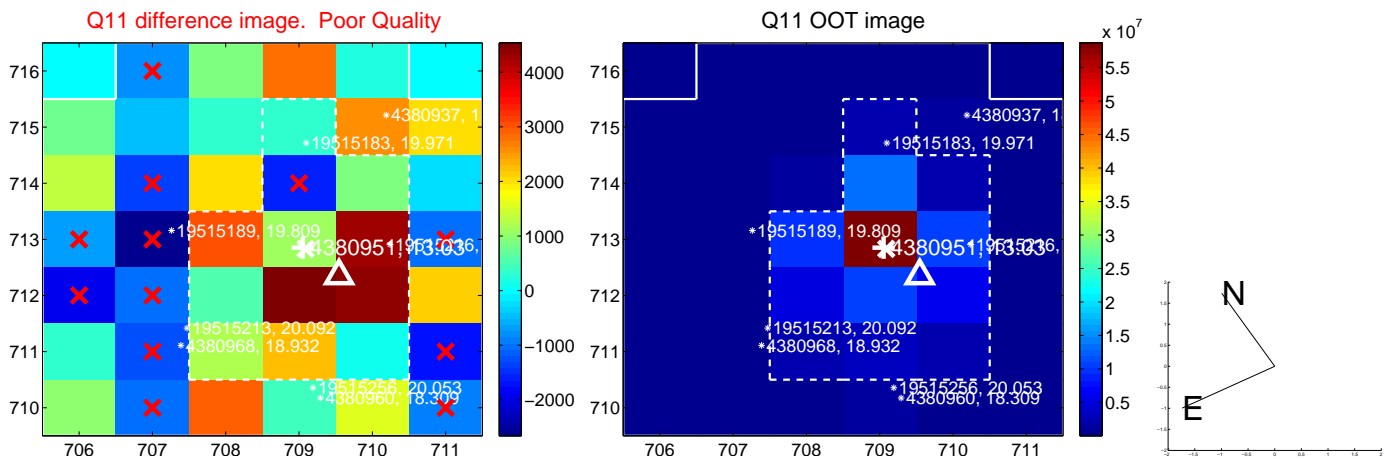
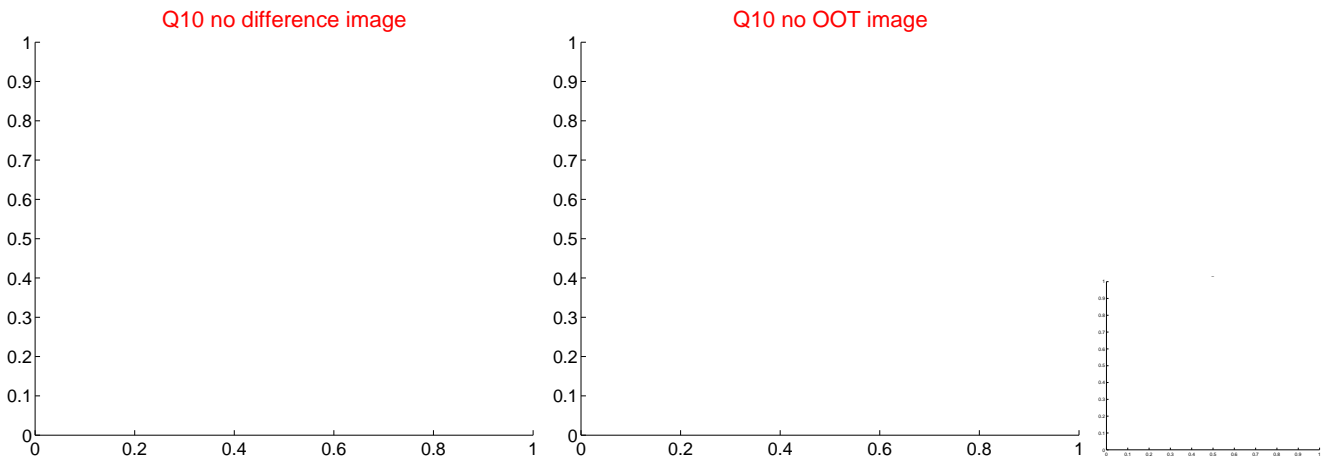
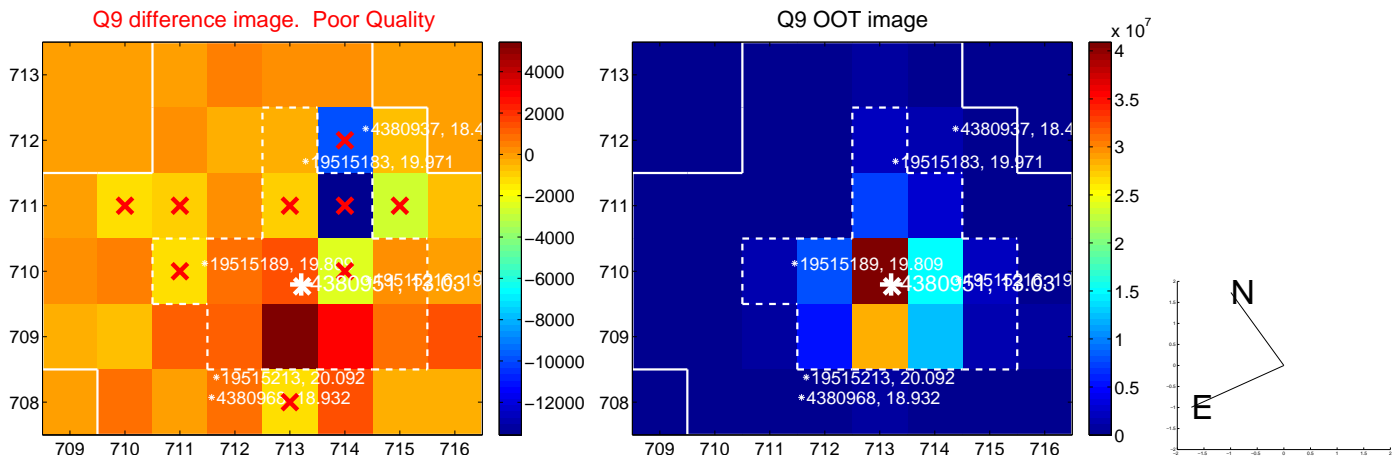




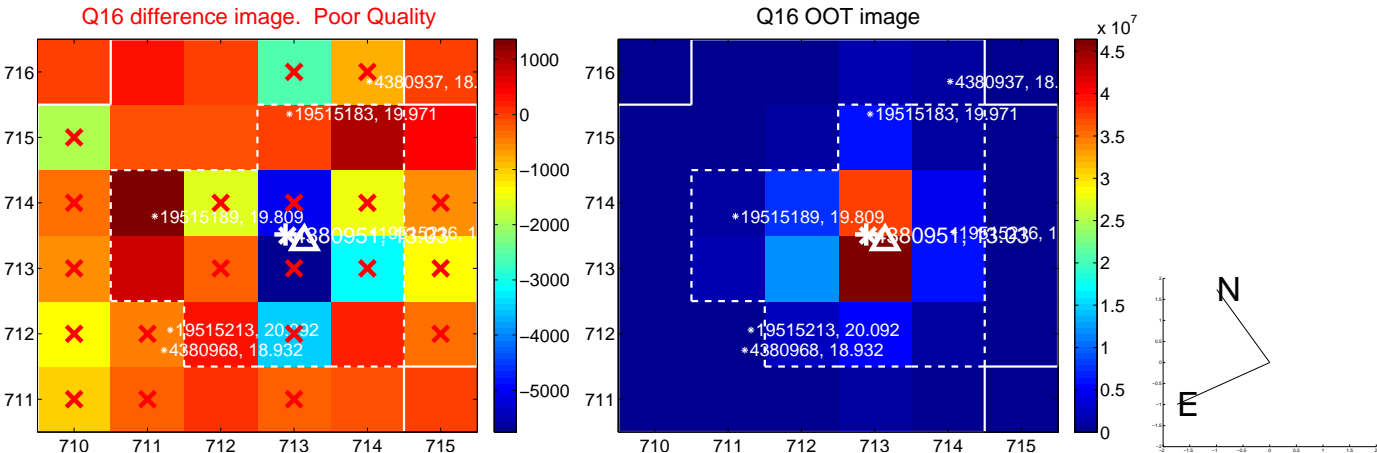
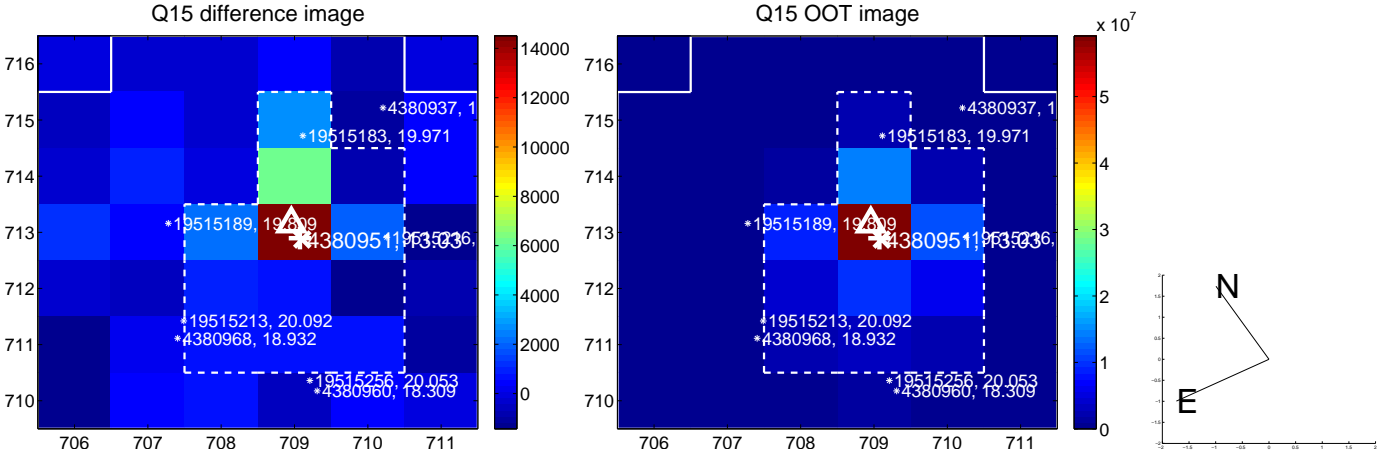
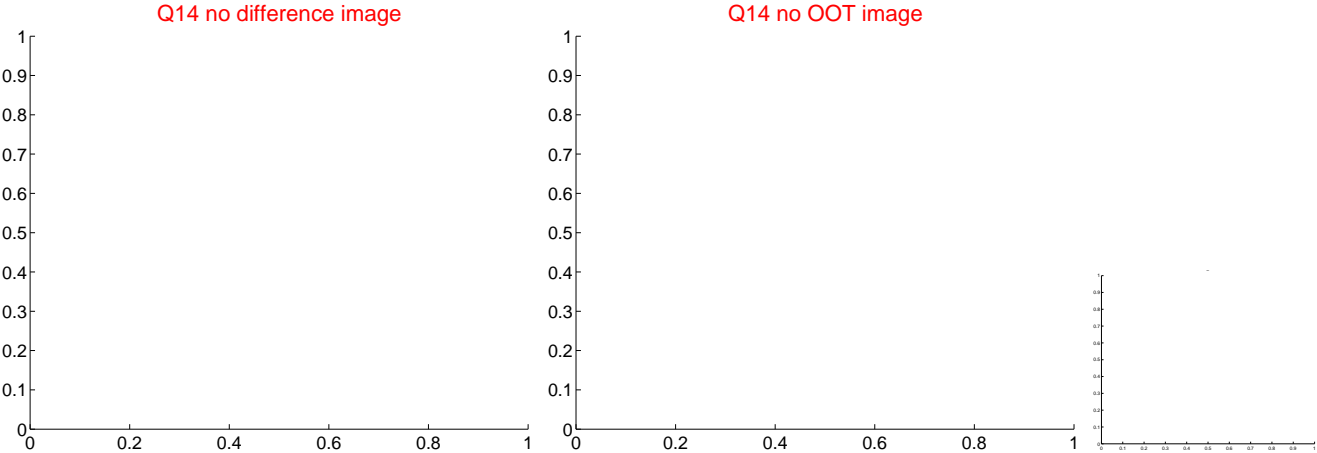
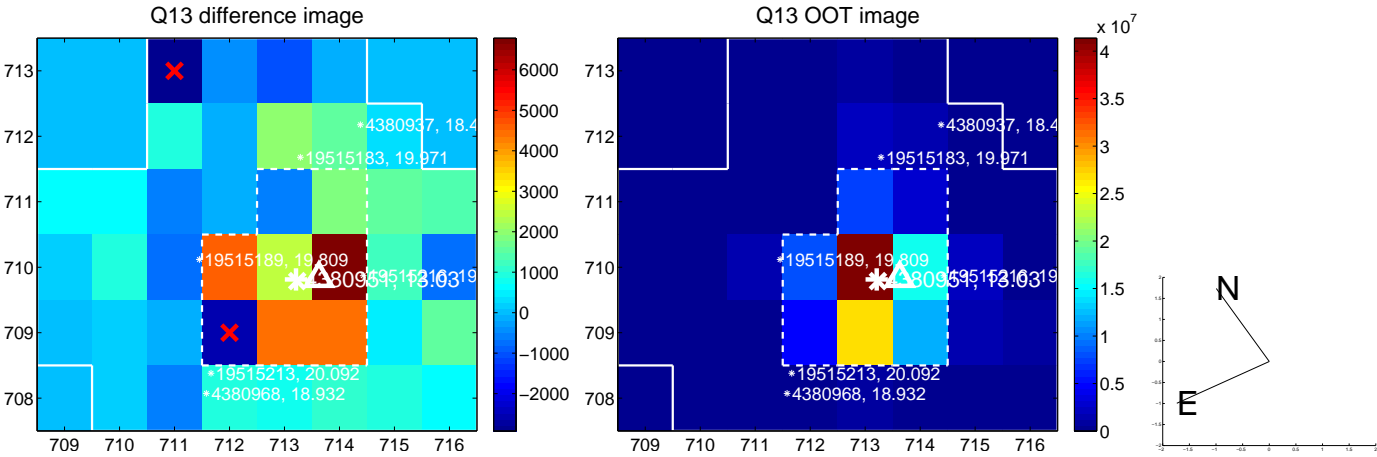
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



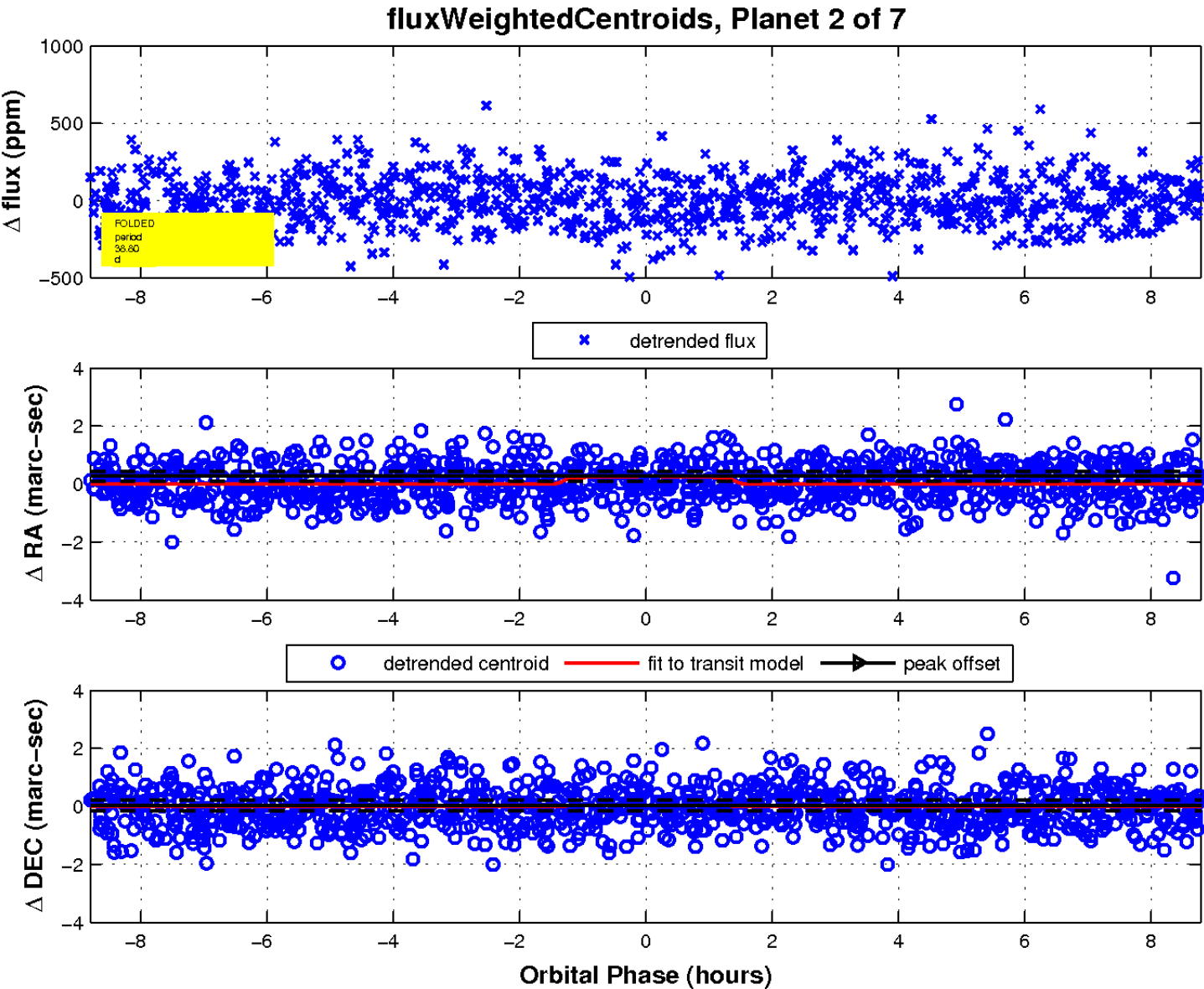
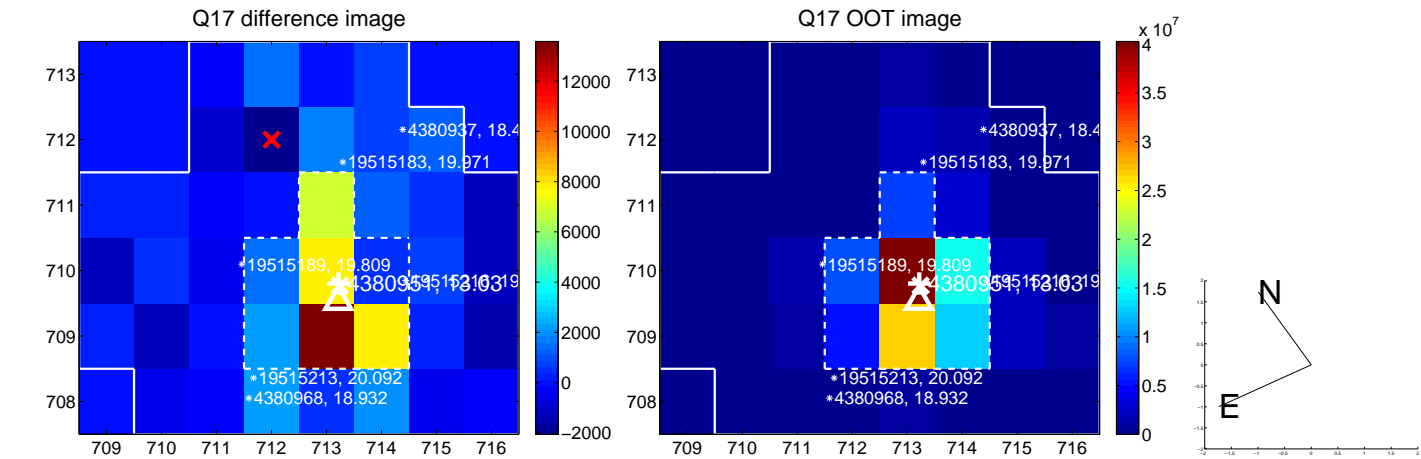
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

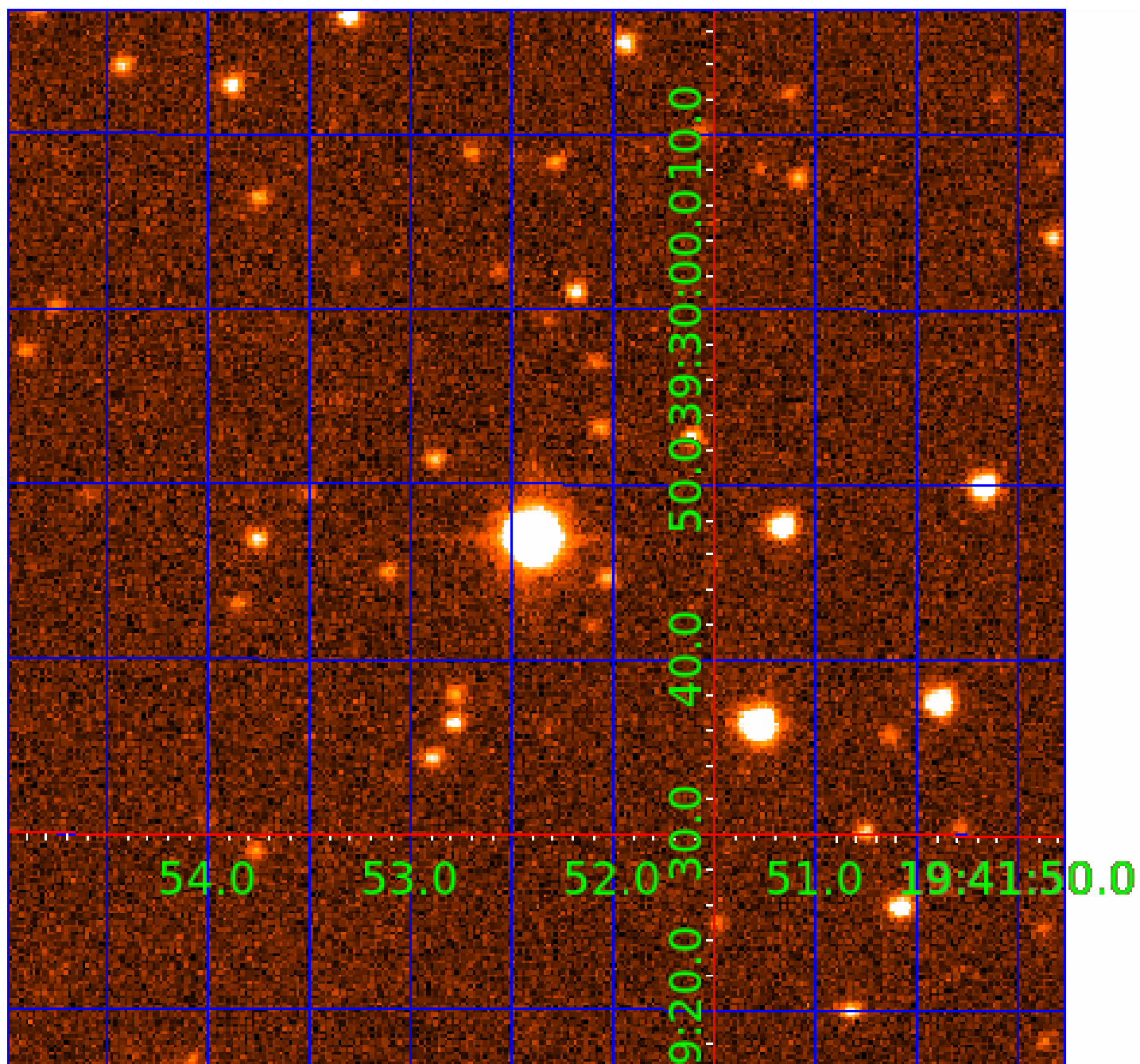


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 004380951

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|-----|-----|-----------------------------|-----------------|------------------------|------------------------|
| 004380951-01 | OBS      | No   | 1.329873      | 131.714534   | 3.1         | 8.483            | 8.7 | 1.6 | 1.69                        | 6987            | 0.30                   | 8437.91                |
| 004380951-02 | OBS      | No   | 38.804254     | 144.305723   | 217.6       | 2.933            | 8.7 | 9.3 | 1.69                        | 6987            | 2.87                   | 93.93                  |
| 004380951-03 | OBS      | No   | 329.705651    | 198.955327   | 267.4       | 3.373            | 8.0 | 8.3 | 1.69                        | 6987            | 3.18                   | 5.42                   |
| 004380951-04 | OBS      | No   | 22.246372     | 142.363914   | 177.5       | 2.213            | 7.9 | 9.0 | 1.69                        | 6987            | 2.65                   | 197.23                 |
| 004380951-05 | OBS      | No   | 39.076285     | 162.919519   | 278.8       | 2.808            | 7.9 | 9.5 | 1.69                        | 6987            | 3.15                   | 93.06                  |
| 004380951-06 | OBS      | No   | 41.434921     | 134.573939   | 114.5       | 3.708            | 7.6 | 6.3 | 1.69                        | 6987            | 2.10                   | 86.06                  |
| 004380951-07 | OBS      | No   | 37.357923     | 153.030015   | 155.1       | 2.085            | 8.5 | 5.7 | 1.69                        | 6987            | 2.60                   | 98.81                  |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments  |
|--------------|----------|------|-------|---|---|---|---|---|
| 004380951-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—MOD_NONUNIQ_DV   |
| 004380951-02 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT  |
| 004380951-03 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_CHASES_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS |
| 004380951-04 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT                                      |
| 004380951-05 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT                                      |
| 004380951-06 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT                                |
| 004380951-07 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT—CENT_FEW_MEAS                         |

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

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

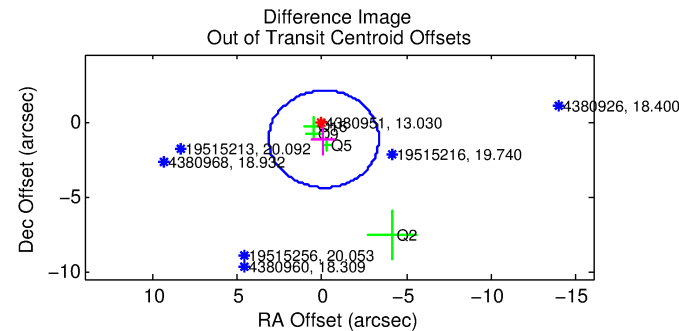
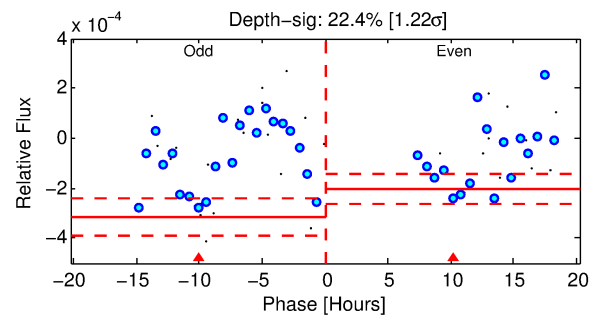
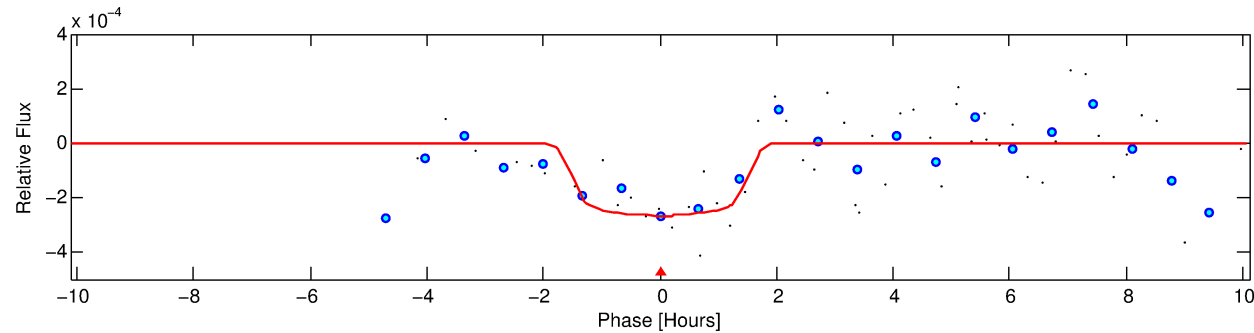
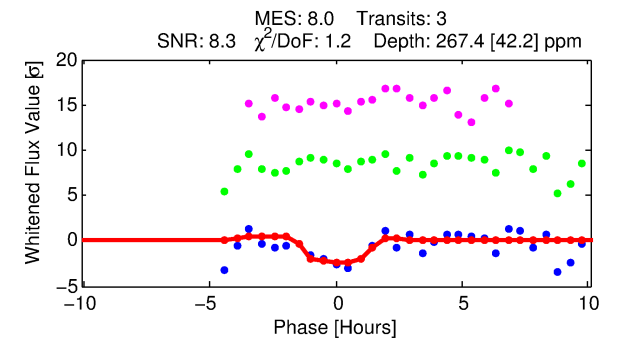
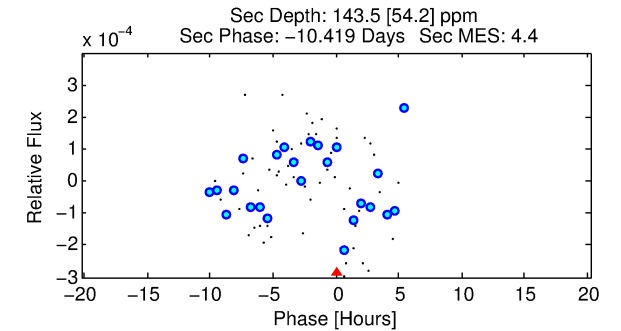
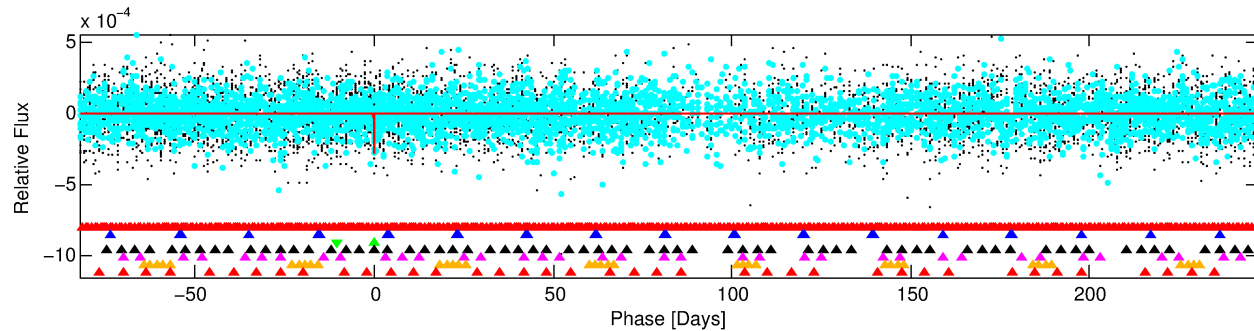
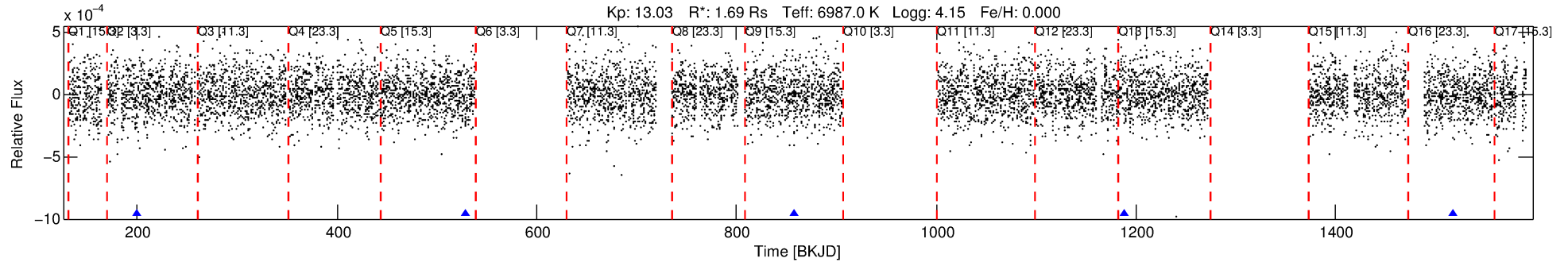
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 004380951-03

No Significant Match Found

# DV One-Page Summary

KIC: 4380951 Candidate: 3 of 7 Period: 329.706 d



## DV Fit Results:

Period = 329.70565 [0.01145] d  
Epoch = 198.9553 [0.0128] BKJD  
Rp/R\* = 0.0172 [0.0126]  
a/R\* = 376.48 [1637.32]  
b = 0.88 [1.10]  
Seff = 5.42 [1.30]  
Teq = 389 [23] K  
Rp = 3.18 [2.41] Re  
a = 1.0610 [0.1744] AU  
Ag = 8811.64 [13506.71] [0.65σ]  
Teffp = 5828 [2208] K [2.46σ]

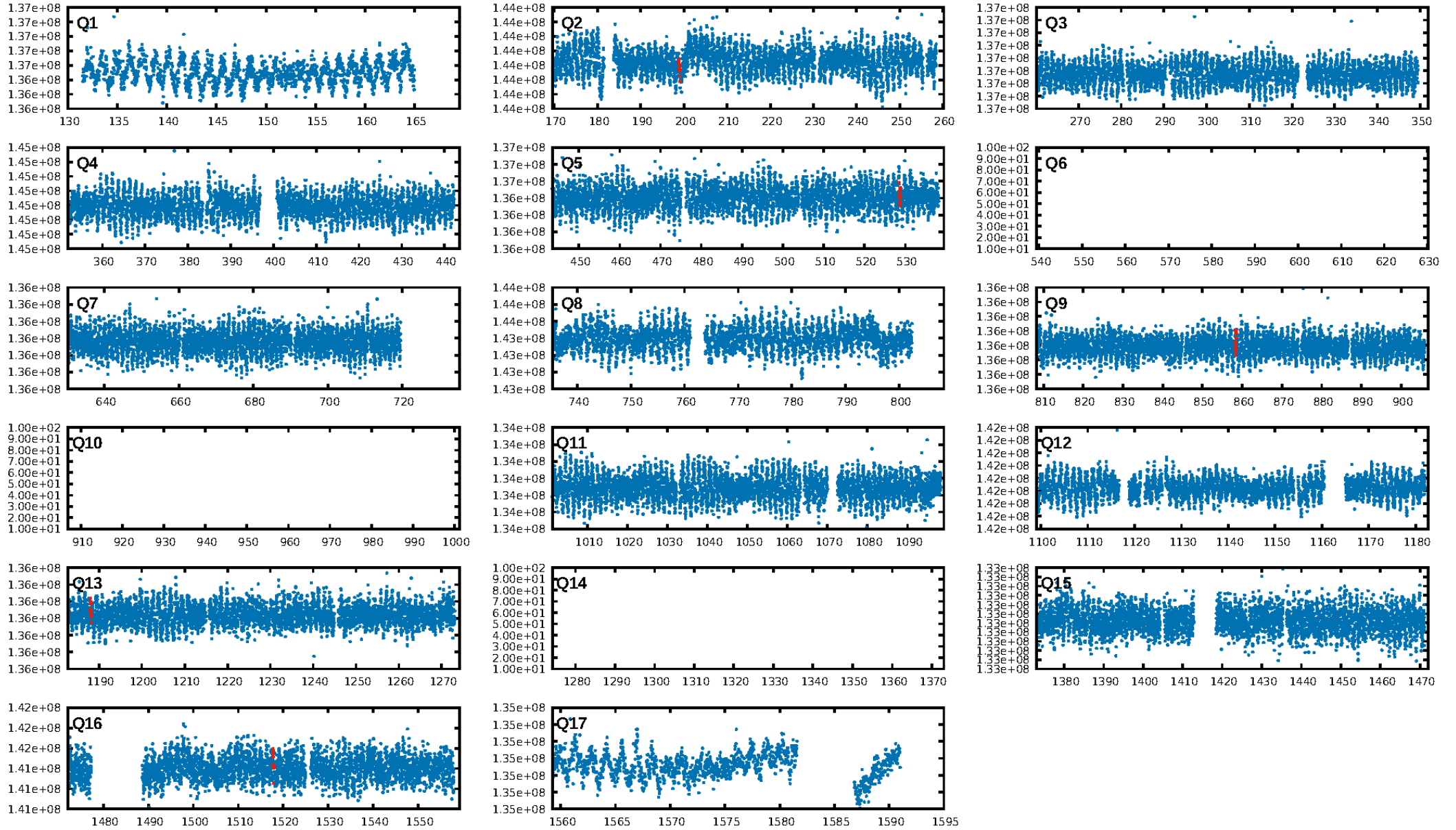
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [1380.22σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 22.9%  
ModelChiSquareGof-sig: 99.8%  
**Bootstrap-pfa: 1.23e-08**  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: 3.766  
Centroid-sig: 90.9%  
Centroid-so: 0.255 arcsec [0.17σ]  
OotOffset-rm: 1.161 arcsec [1.07σ]  
OotOffset-st: 1/0/1/2 [4]  
KicOffset-rm: 1.055 arcsec [0.79σ]  
KicOffset-st: 1/0/1/2 [4]  
DiffImageQuality-fgm: 0.50 [2/4]  
DiffImageOverlap-fno: 0.75 [3/4]

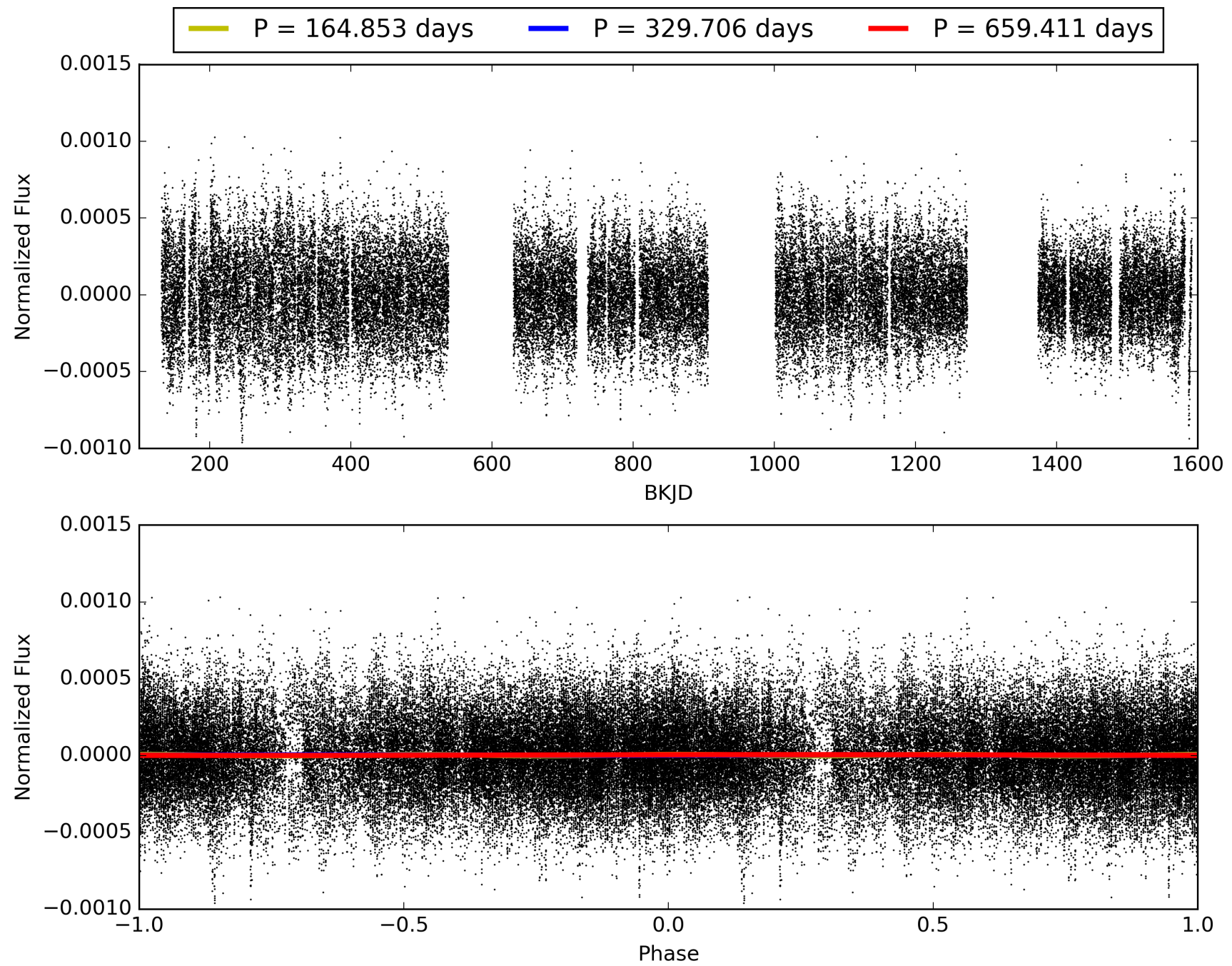
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 16:46:39 Z

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

# TCE 004380951-03, PDC Light Curves

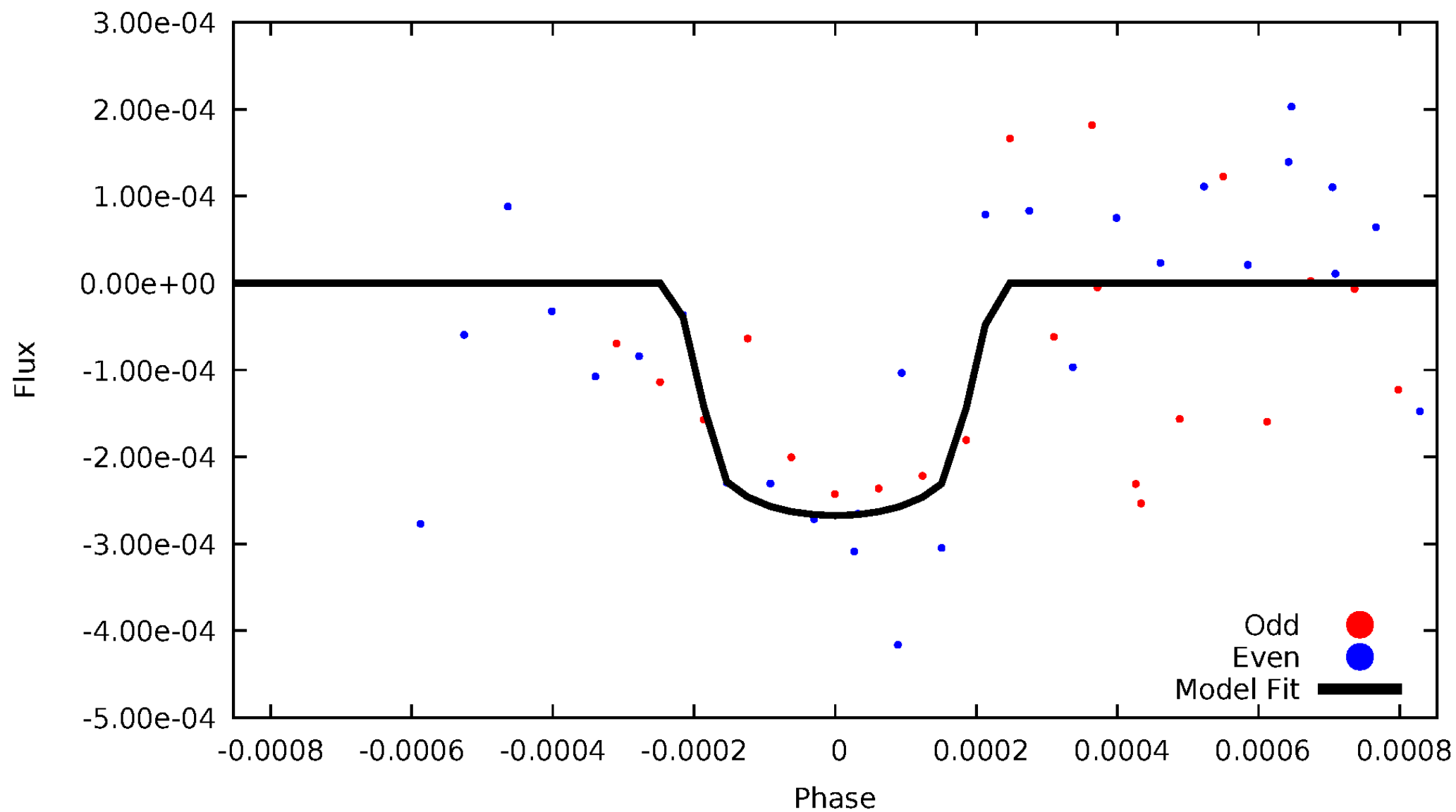


TCE 004380951-03



# DV Odd/Even

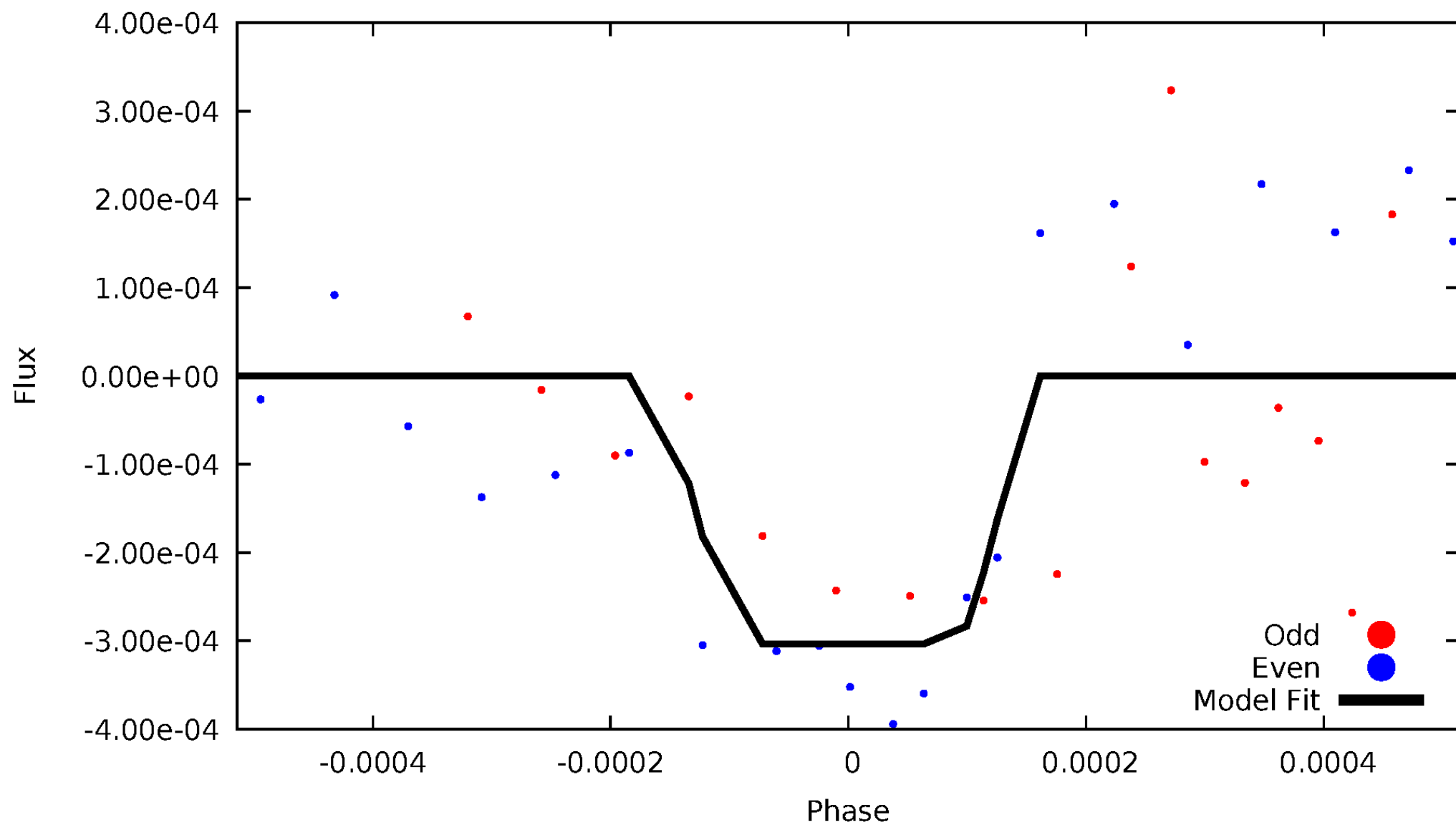
TCE 004380951-03





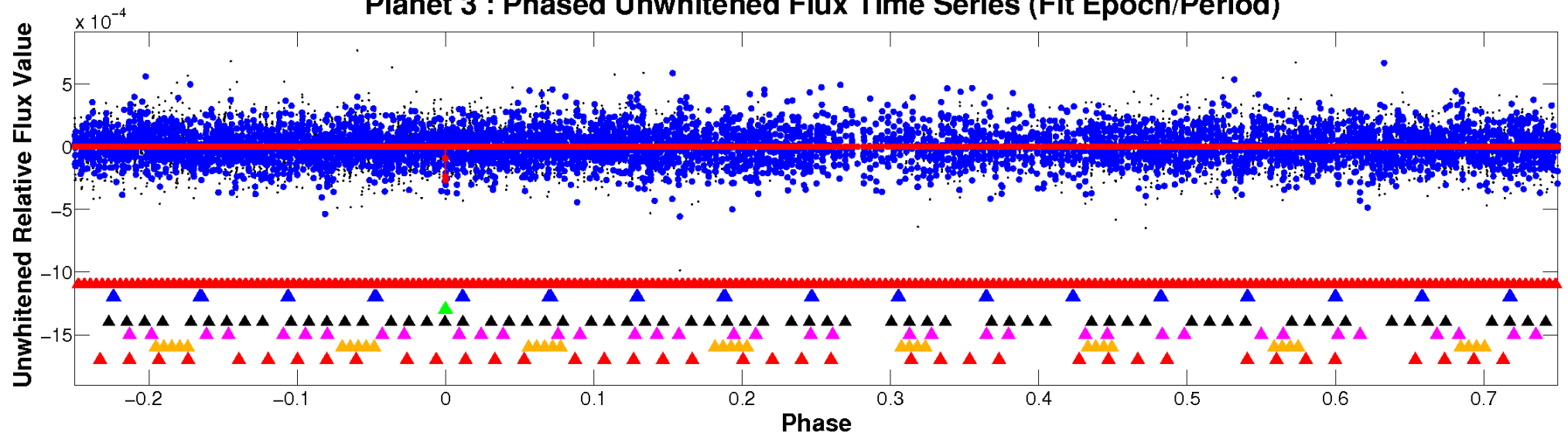
# ALT Odd/Even

TCE 004380951-03

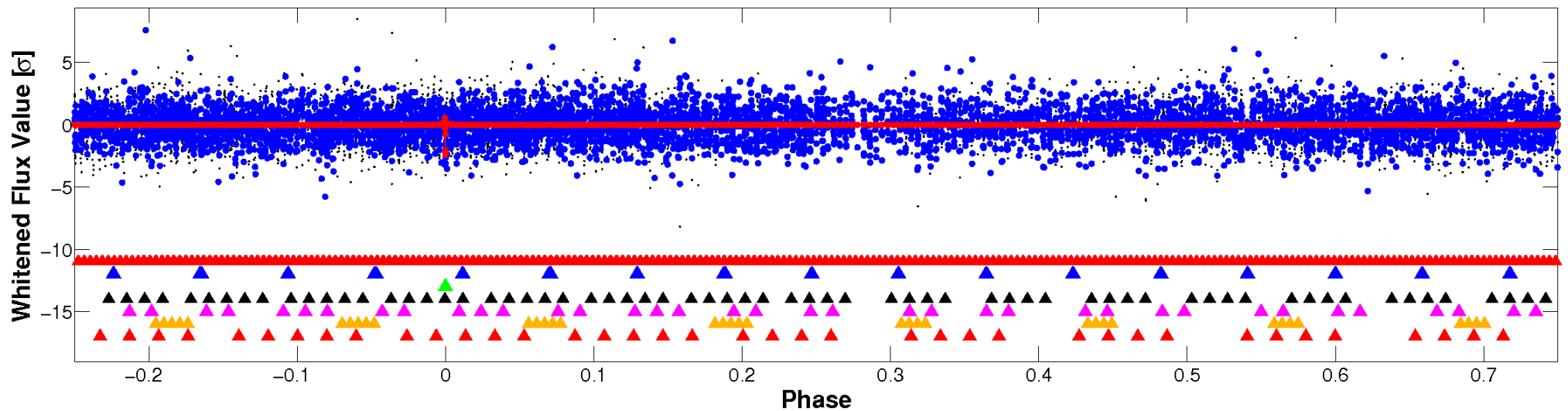


# Non-Whitened Vs. Whitened Light Curve

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

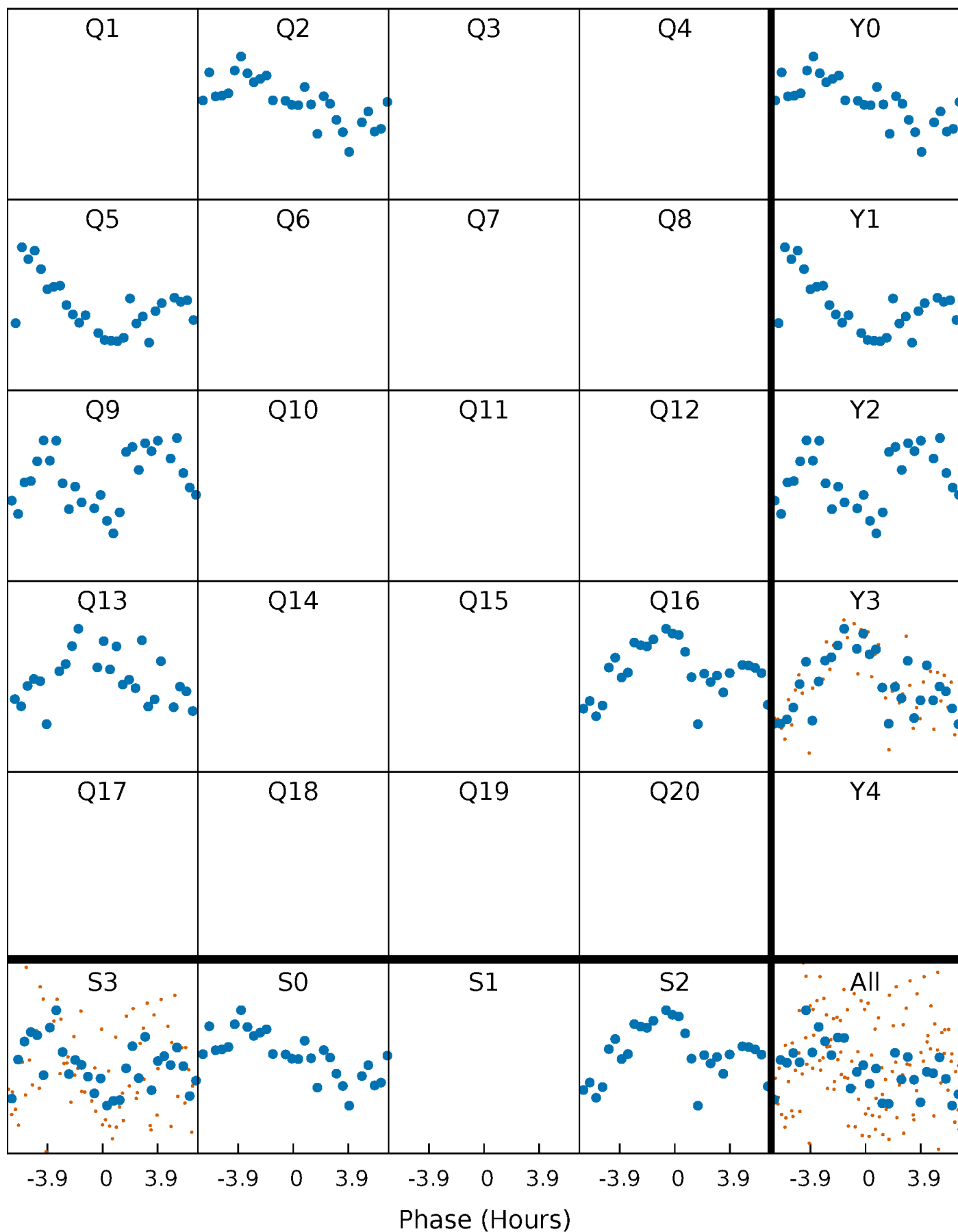


## Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



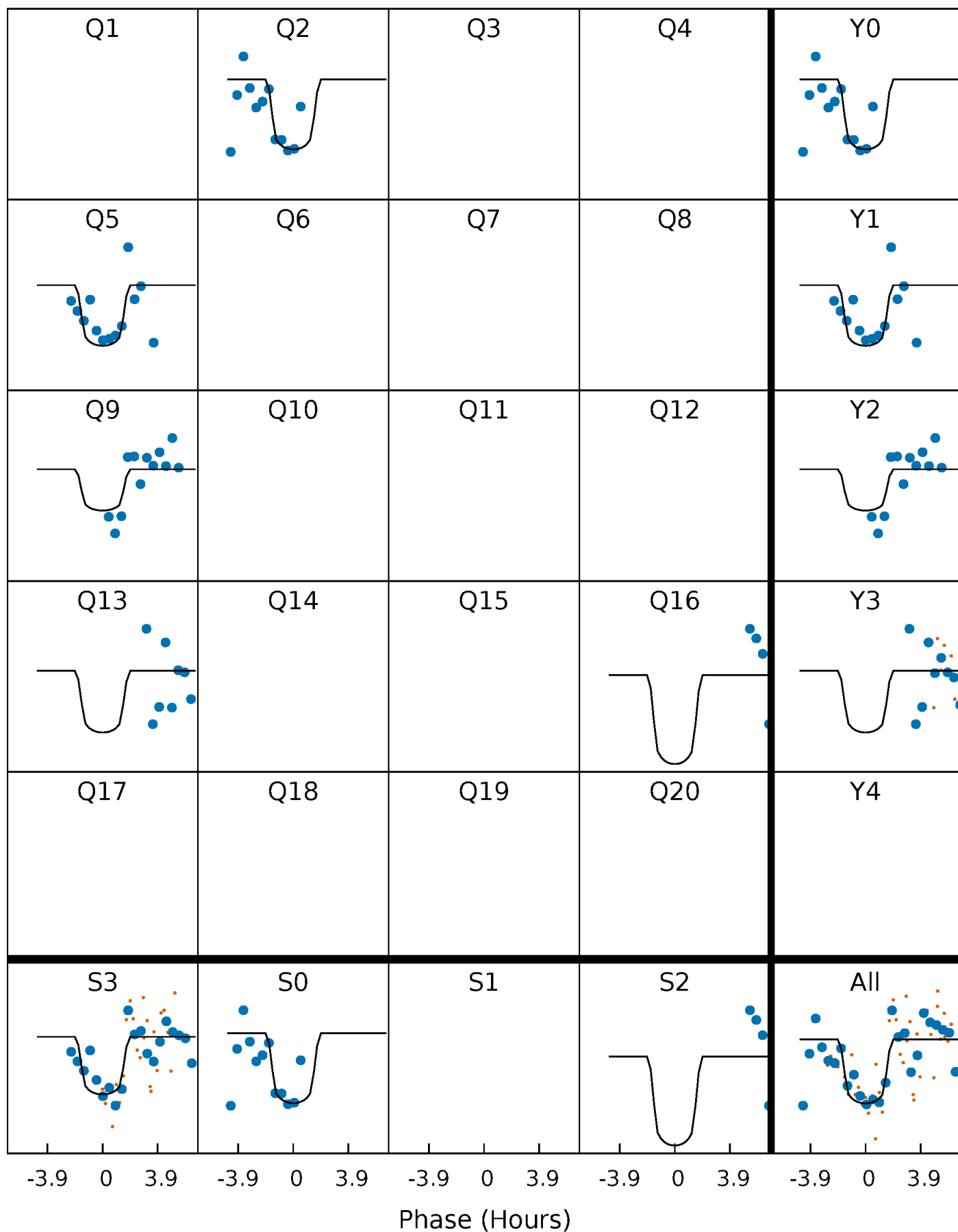
# PDC Quarter-Phased Transit Curves

TCE 004380951-03     $P=329.705651$  Days     $T_0=198.955327$  (BKJD)



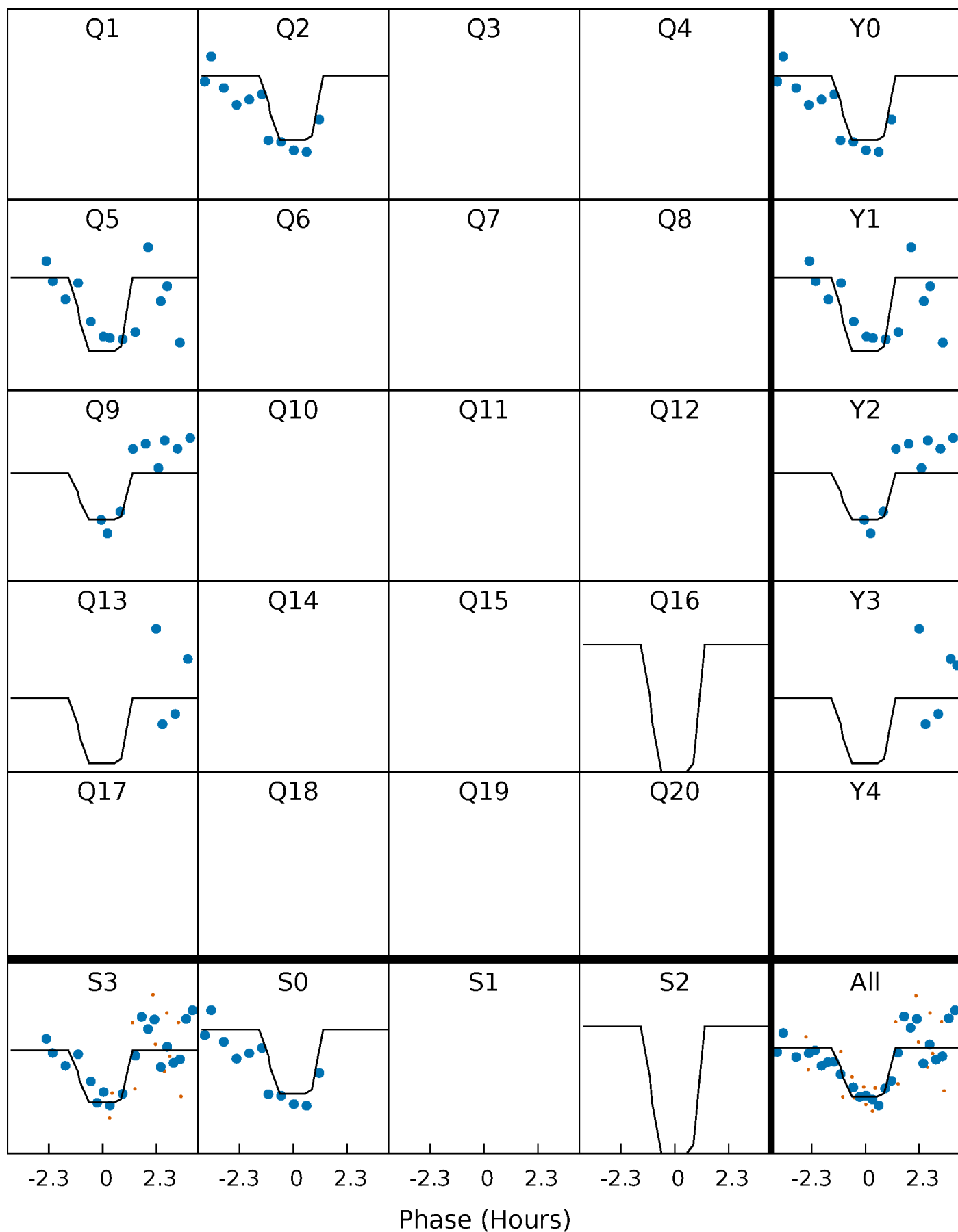
# DV Quarter-Phased Transit Curves

TCE 004380951-03 P=329.705651 Days  $T_0=198.955327$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

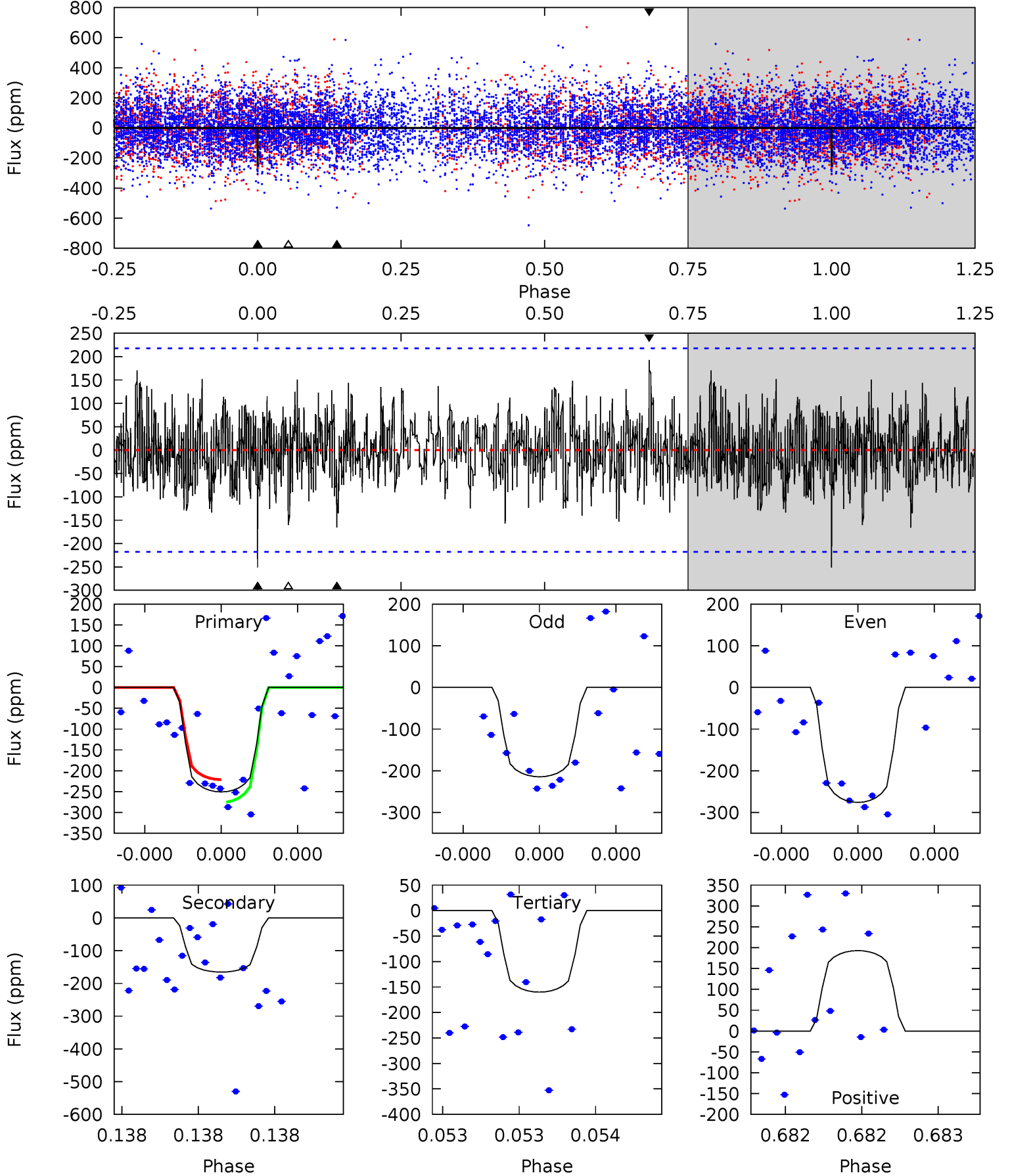
TCE 004380951-03 P=329.719251 Days  $T_0=198.945016$  (BKJD)



# DV Model-Shift Uniqueness Test

004380951-03, P = 329.705651 Days, E = 198.955327 Days

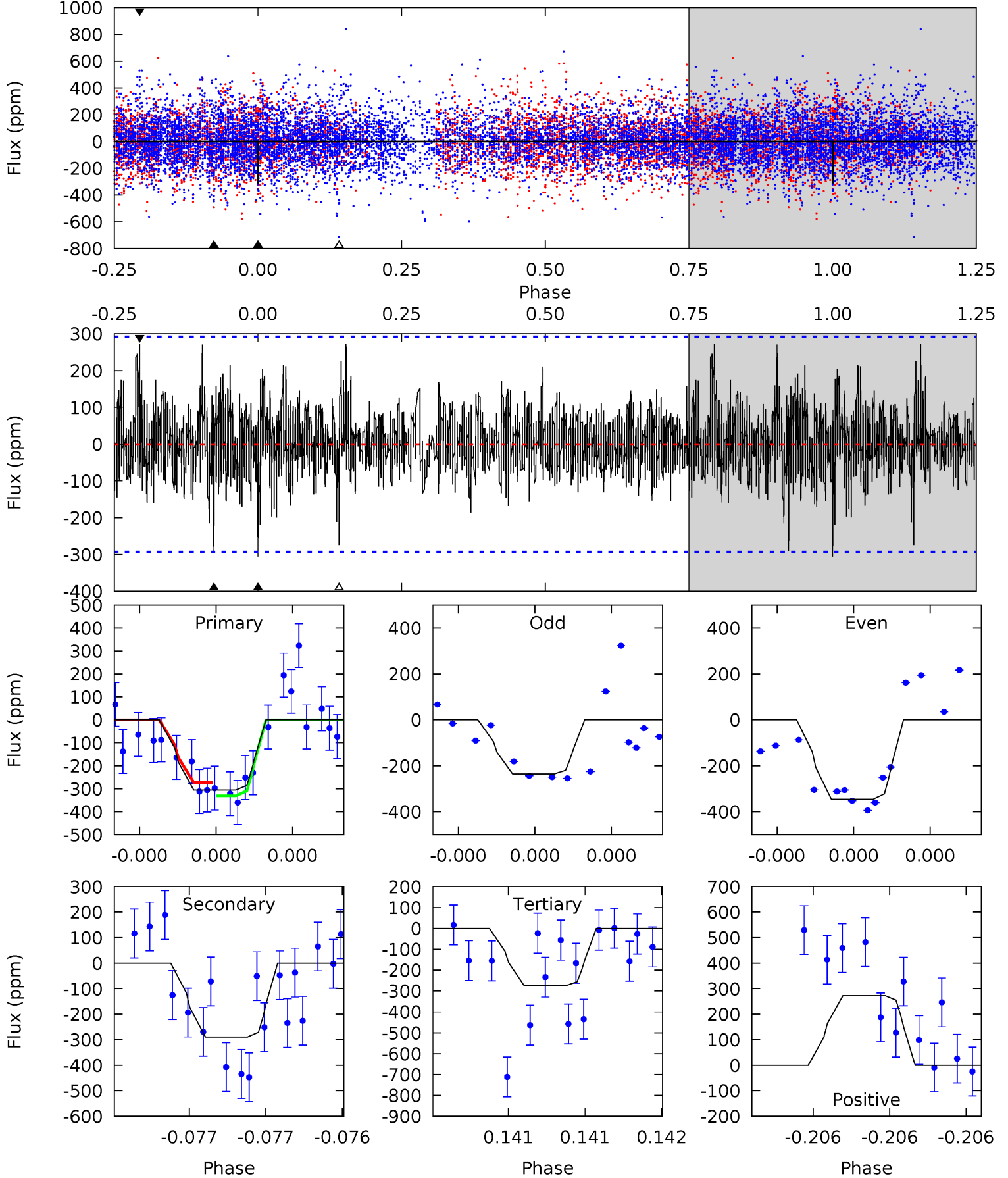
| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 6.47 | 4.26 | 4.12 | 4.97 | 5.61            | 3.54            | 1.30             | 2.34    | 1.49    | 0.14    | -0.71   | 0.79    | 1.16 | 0.43  | 0.69 |



# Alt Model-Shift Uniqueness Test

004380951-03, P = 329.719251 Days, E = 198.945016 Days

| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 5.95 | 5.64 | 5.33 | 5.33 | 5.69            | 3.66            | 1.25             | 0.61    | 0.62    | 0.31    | 0.32    | 1.05    | 0.94 | 0.47  | 0.56 |





### Stellar Parameters For KIC 004380951

|        | $T_{\text{eff}}(K)$ | $\log(g)$                 | [Fe/H]                    | $R (R_{\odot})$           | $M(M_{\odot})$            | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|---------------------|---------------------------|---------------------------|---------------------------|---------------------------|---|
|        | $6987^{+73}_{-94}$  | $4.148^{+0.073}_{-0.126}$ | $0.000^{+0.150}_{-0.150}$ | $1.690^{+0.337}_{-0.181}$ | $1.470^{+0.115}_{-0.094}$ | $0.429^{+0.155}_{-0.170}$                 |
|        | +1%/-1%             | +2%/-3%                   | +inf%/-inf%               | +20%/-11%                 | +8%/-6%                   | +36%/-40%                                 |
| Source | SPE68               | SPE68                     | SPE68                     | DSEP                      |                           |   |

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

### Secondary Eclipse Parameters for KIC 004380951-03 / KOI

| Detrend | Depth (ppm)   | $R_p (R_{\oplus})$     | $T_{max} (K)$     | $T_{obs} (K)$          | $A_{obs}$                 |
|---------|---------------|------------------------|-------------------|------------------------|---------------------------|
| DV      | $-165 \pm 39$ | $3.41^{+2.25}_{-1.88}$ | $545^{+22}_{-18}$ | $5819^{+3185}_{-1162}$ | $8873^{+31658}_{-5686}$   |
| Alt.    | $-290 \pm 51$ | $3.38^{+2.27}_{-1.97}$ | $546^{+26}_{-17}$ | $6787^{+5261}_{-1538}$ | $16123^{+71836}_{-10535}$ |

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

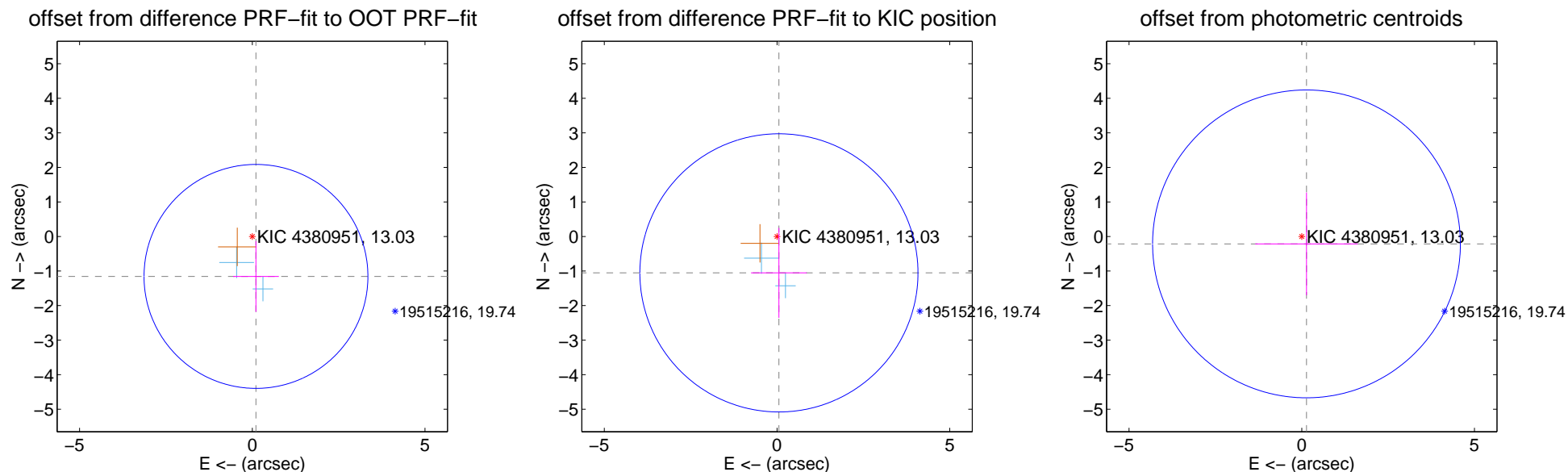
## DV Centroid Data

Supplemental centroid analysis for 004380951-03. Kepler magnitude: 13.03. Transit SNR 8.26

There are 2 quarters with good PRF difference image offsets

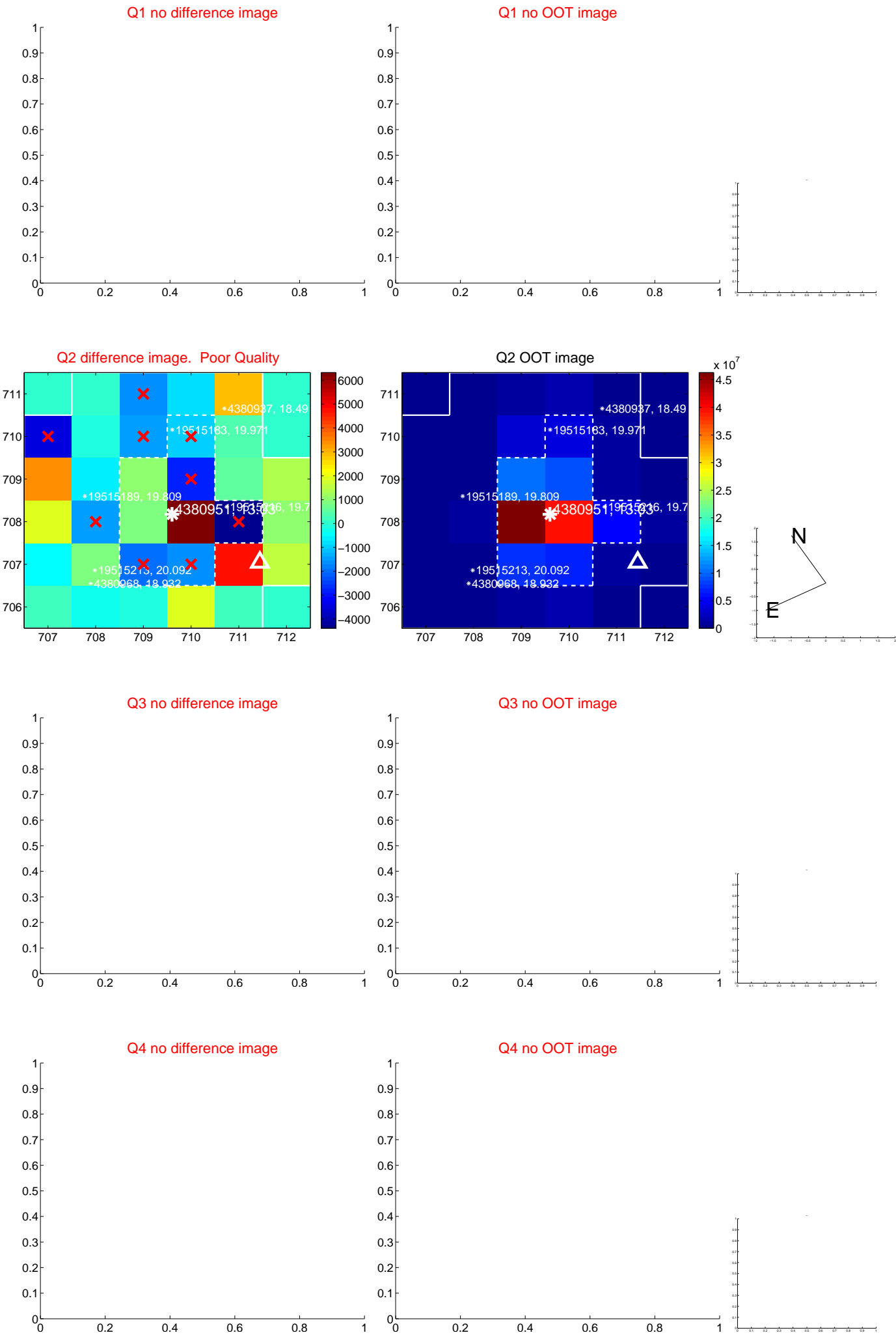
The direct PRF centroid is offset from the target star catalog position by about 0.12 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA        | $\Delta$ Dec       |
|---|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT          | $1.161 \pm 1.080$  | 1.07                | $-0.107 \pm 0.662$ | $-1.156 \pm 1.025$ |
| PRF-fit source offset from KIC position | $1.055 \pm 1.342$  | 0.79                | $-0.055 \pm 0.807$ | $-1.053 \pm 1.302$ |
| photometric centroid source offset      | $0.25 \pm 1.49$    | 0.17                | $-0.14 \pm 1.48$   | $-0.21 \pm 1.49$   |

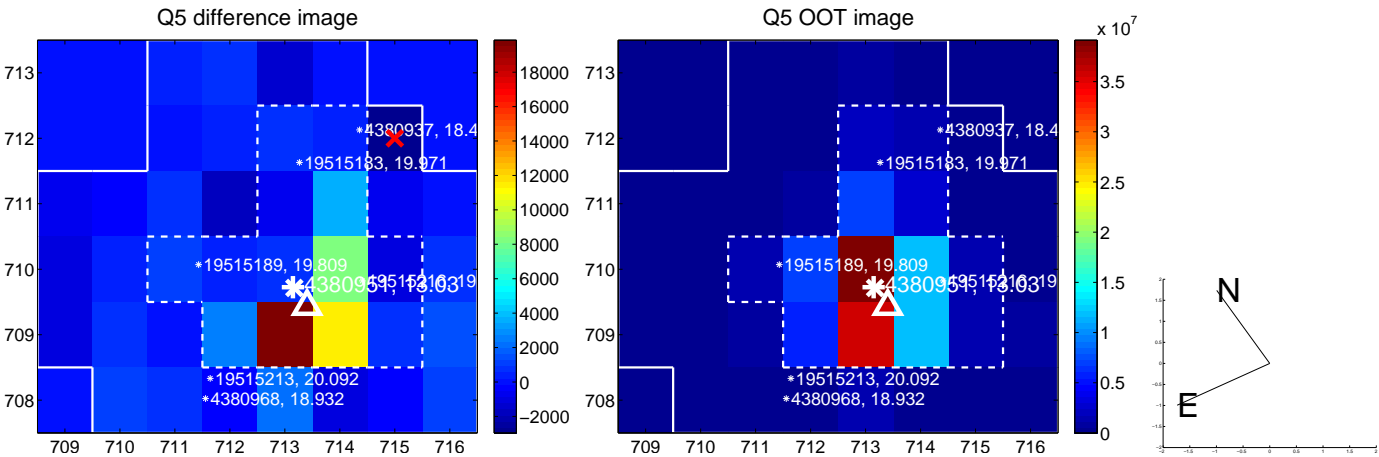


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

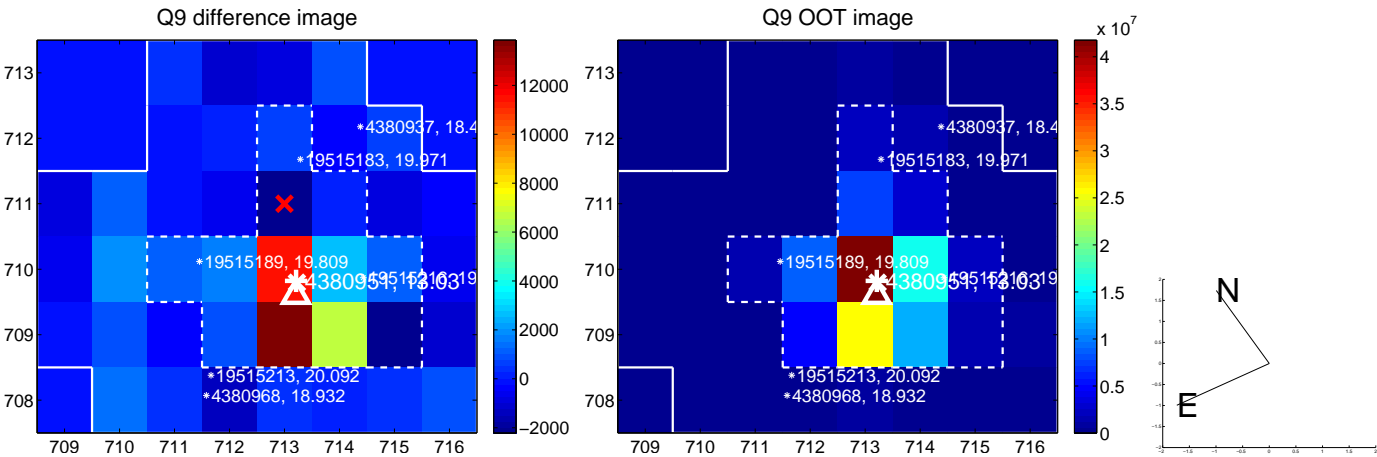
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



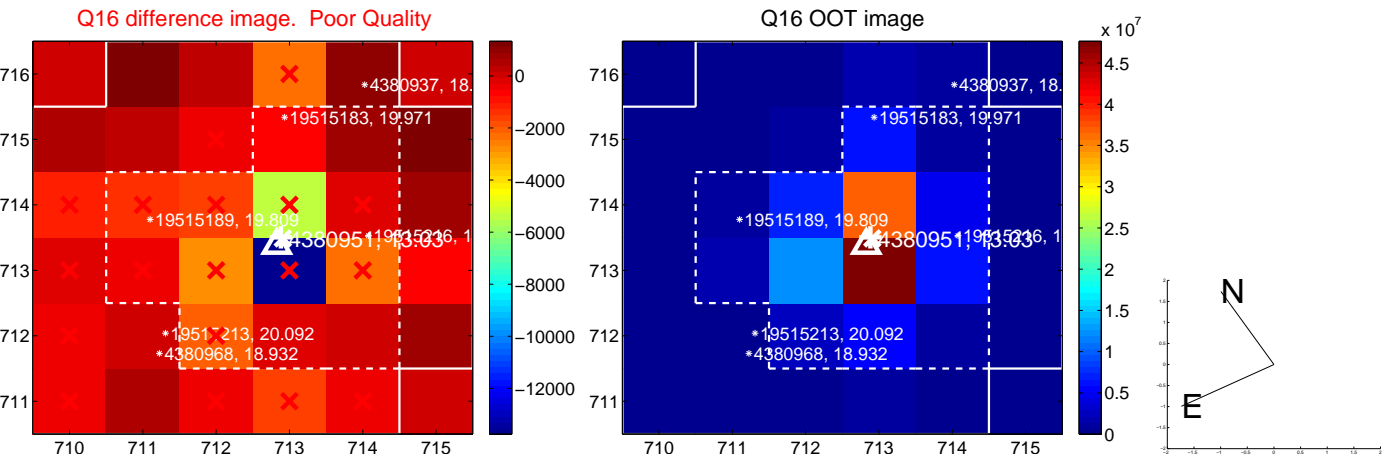
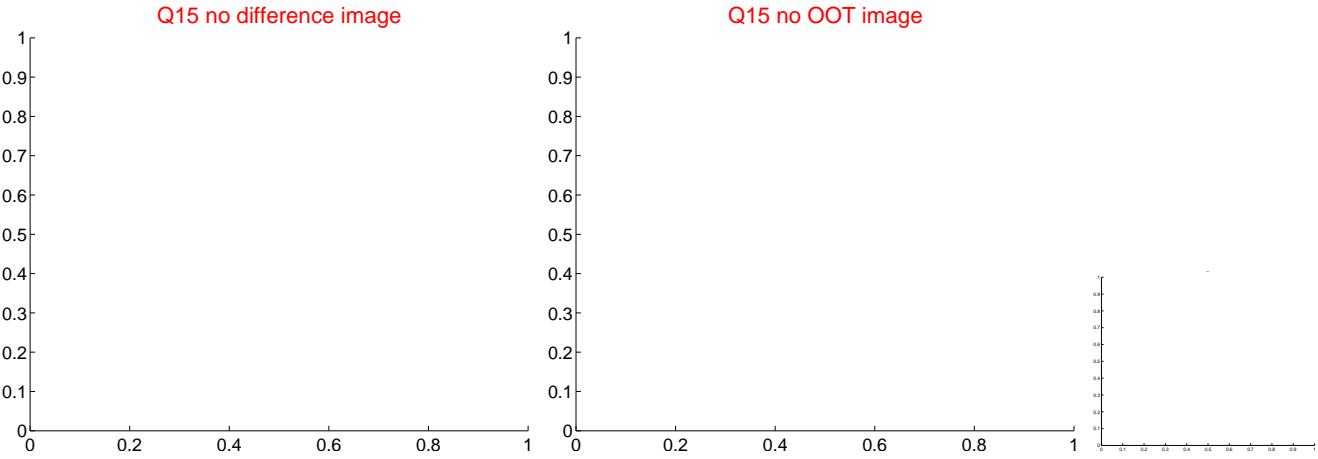
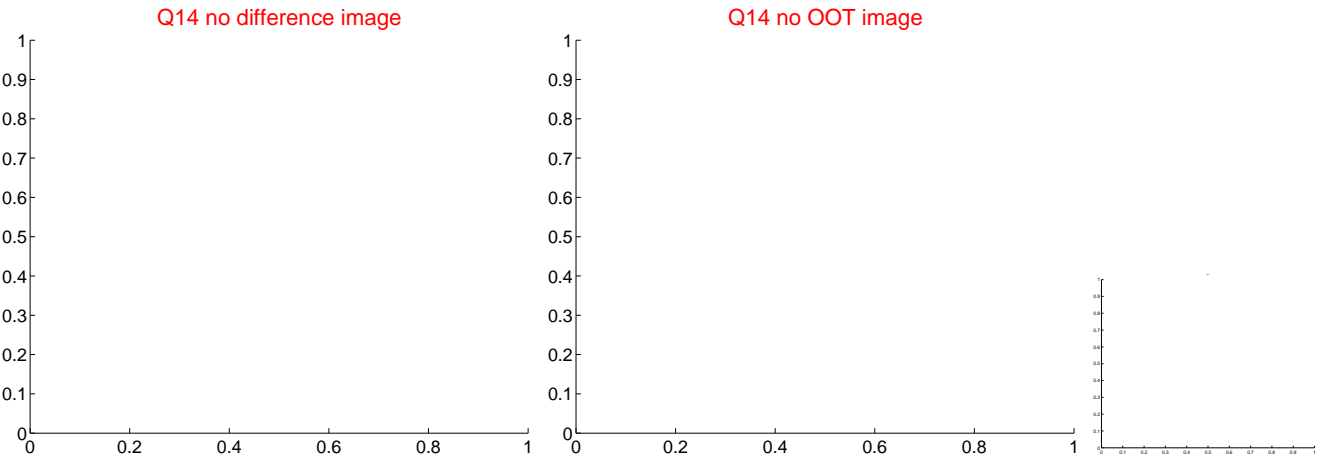
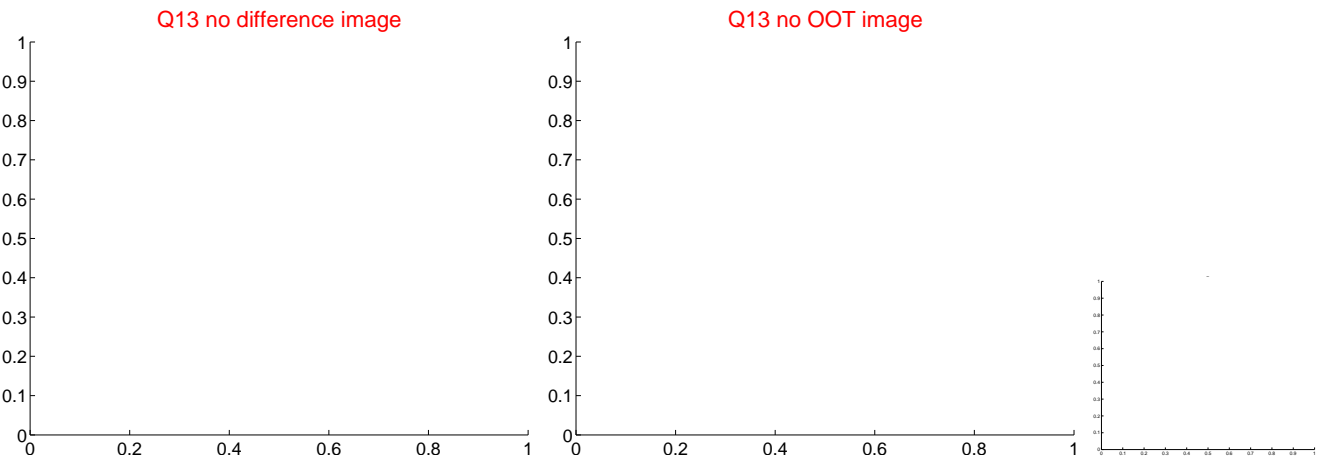
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



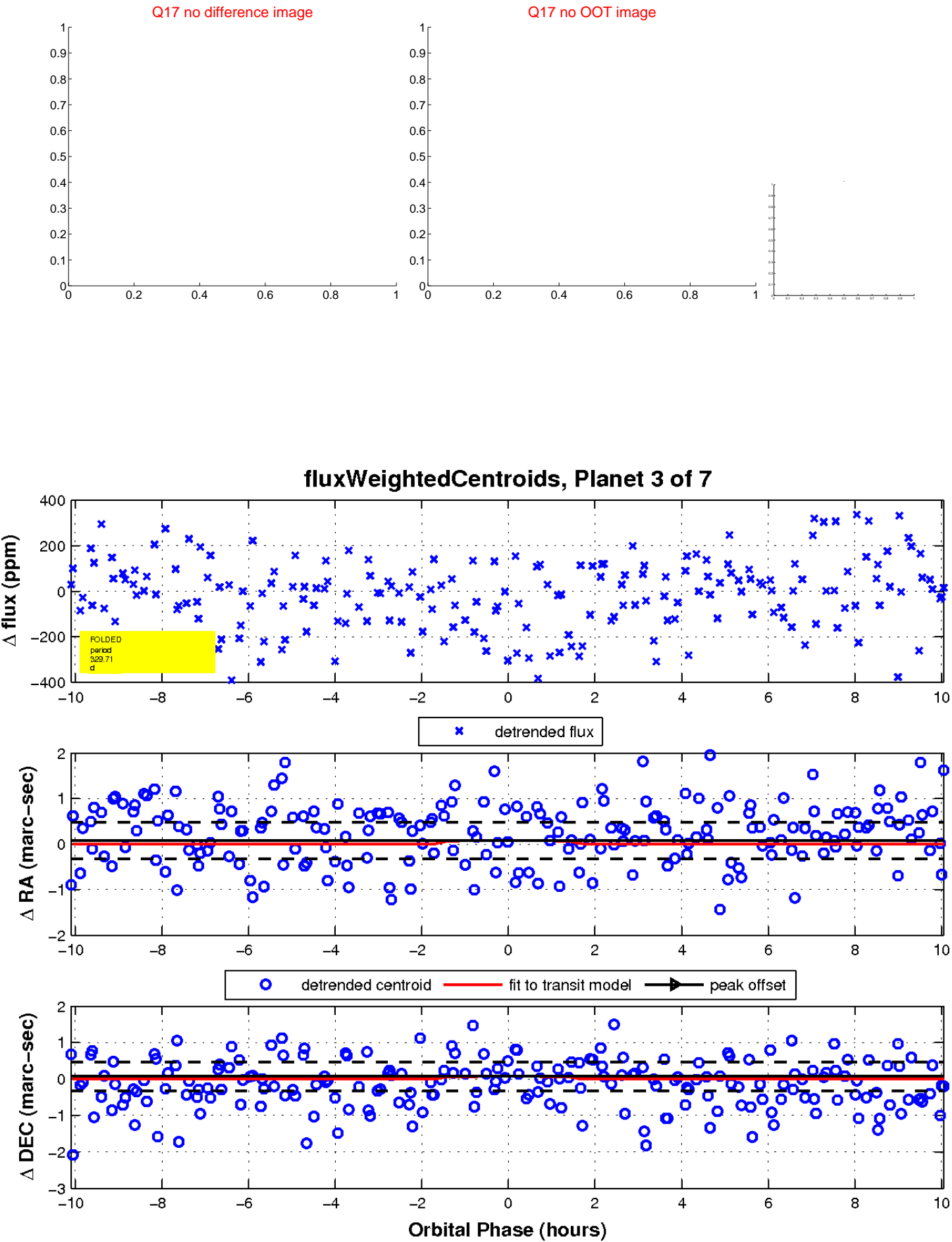
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



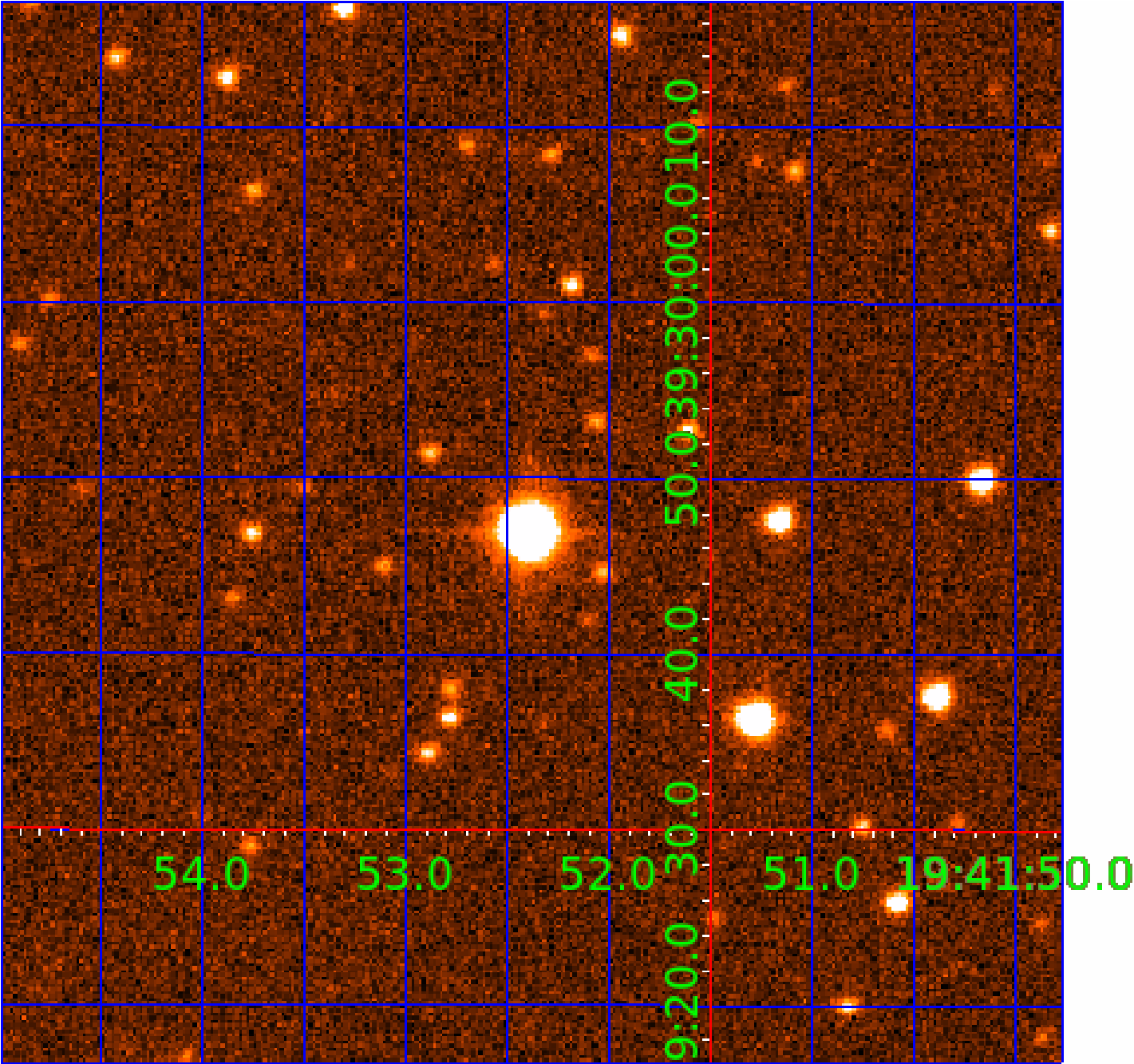
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





UKIRT Image

Declination



# KIC 004380951

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|-----|-----|-----------------------------|-----------------|------------------------|------------------------|
| 004380951-01 | OBS      | No   | 1.329873      | 131.714534   | 3.1         | 8.483            | 8.7 | 1.6 | 1.69                        | 6987            | 0.30                   | 8437.91                |
| 004380951-02 | OBS      | No   | 38.804254     | 144.305723   | 217.6       | 2.933            | 8.7 | 9.3 | 1.69                        | 6987            | 2.87                   | 93.93                  |
| 004380951-03 | OBS      | No   | 329.705651    | 198.955327   | 267.4       | 3.373            | 8.0 | 8.3 | 1.69                        | 6987            | 3.18                   | 5.42                   |
| 004380951-04 | OBS      | No   | 22.246372     | 142.363914   | 177.5       | 2.213            | 7.9 | 9.0 | 1.69                        | 6987            | 2.65                   | 197.23                 |
| 004380951-05 | OBS      | No   | 39.076285     | 162.919519   | 278.8       | 2.808            | 7.9 | 9.5 | 1.69                        | 6987            | 3.15                   | 93.06                  |
| 004380951-06 | OBS      | No   | 41.434921     | 134.573939   | 114.5       | 3.708            | 7.6 | 6.3 | 1.69                        | 6987            | 2.10                   | 86.06                  |
| 004380951-07 | OBS      | No   | 37.357923     | 153.030015   | 155.1       | 2.085            | 8.5 | 5.7 | 1.69                        | 6987            | 2.60                   | 98.81                  |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments  |
|--------------|----------|------|-------|---|---|---|---|---|
| 004380951-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—MOD_NONUNIQ_DV   |
| 004380951-02 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT  |
| 004380951-03 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_CHASES_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS |
| 004380951-04 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT                                      |
| 004380951-05 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT                                      |
| 004380951-06 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT                                |
| 004380951-07 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT—CENT_FEW_MEAS                         |

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

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

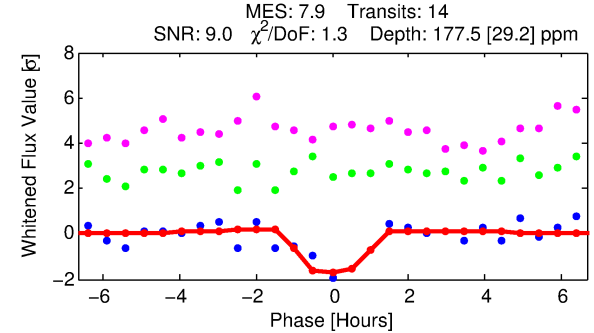
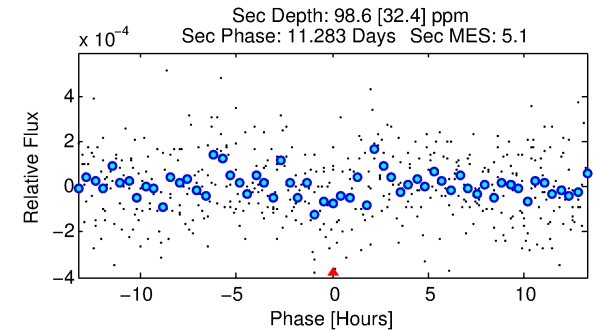
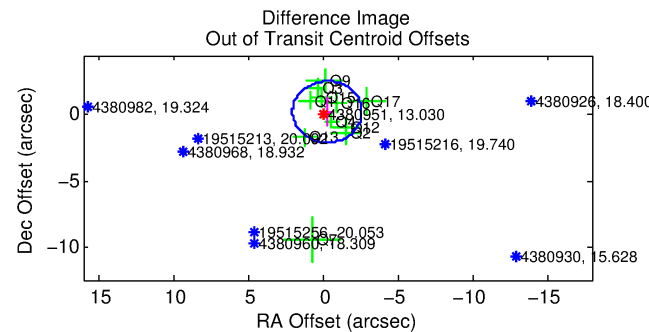
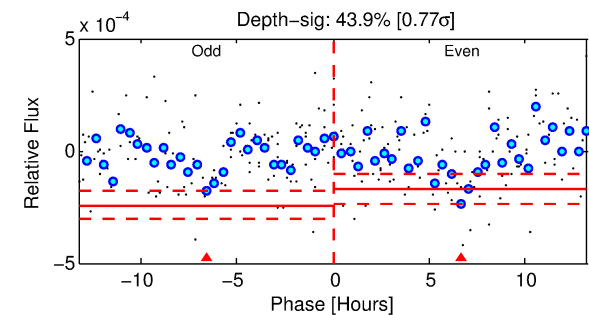
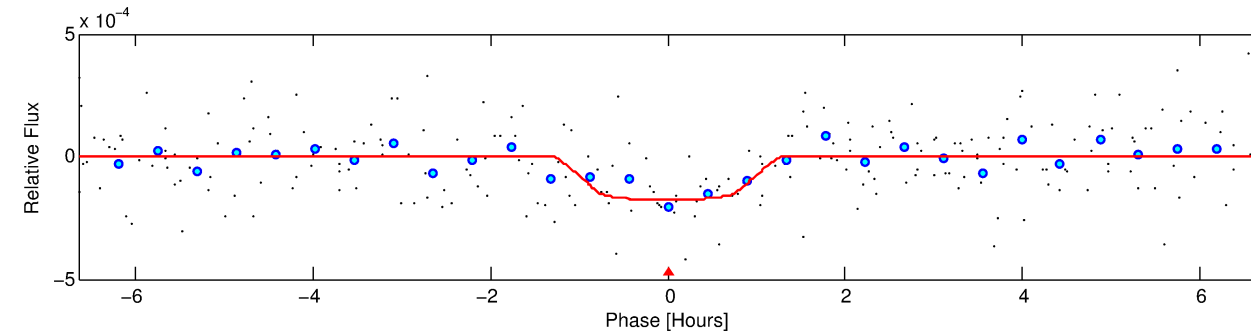
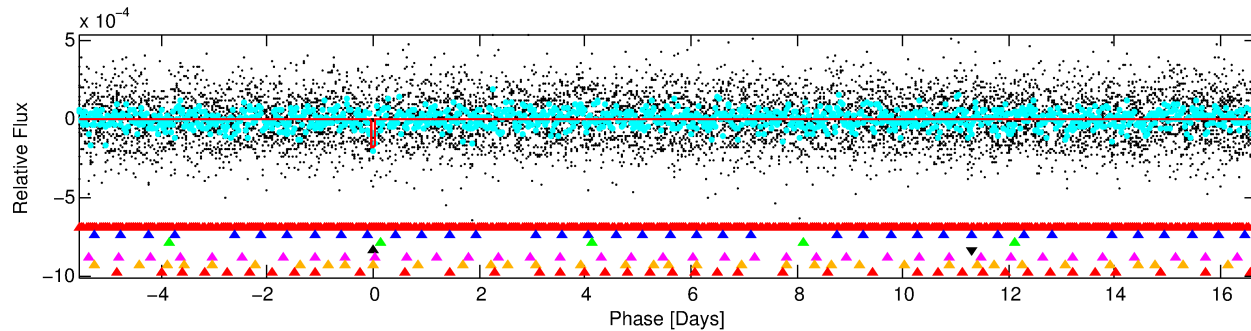
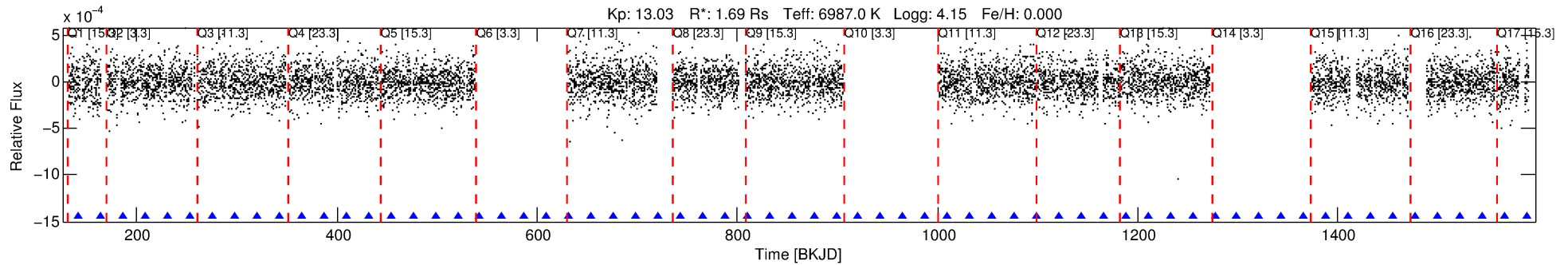
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 004380951-04

No Significant Match Found

# DV One-Page Summary

KIC: 4380951 Candidate: 4 of 7 Period: 22.246 d



## DV Fit Results:

Period = 22.24637 [0.00023] d  
Epoch = 142.3639 [0.0094] BKJD  
Rp/R\* = 0.0144 [0.0110]  
a/R\* = 33.71 [156.55]  
b = 0.91 [0.84]  
Seff = 197.23 [47.49]  
Teq = 956 [58] K  
Rp = 2.65 [2.09] Re  
a = 0.1758 [0.0289] AU  
Ag = 238.60 [376.69] [0.63σ]  
Teffp = 5807 [2268] K [2.14σ]

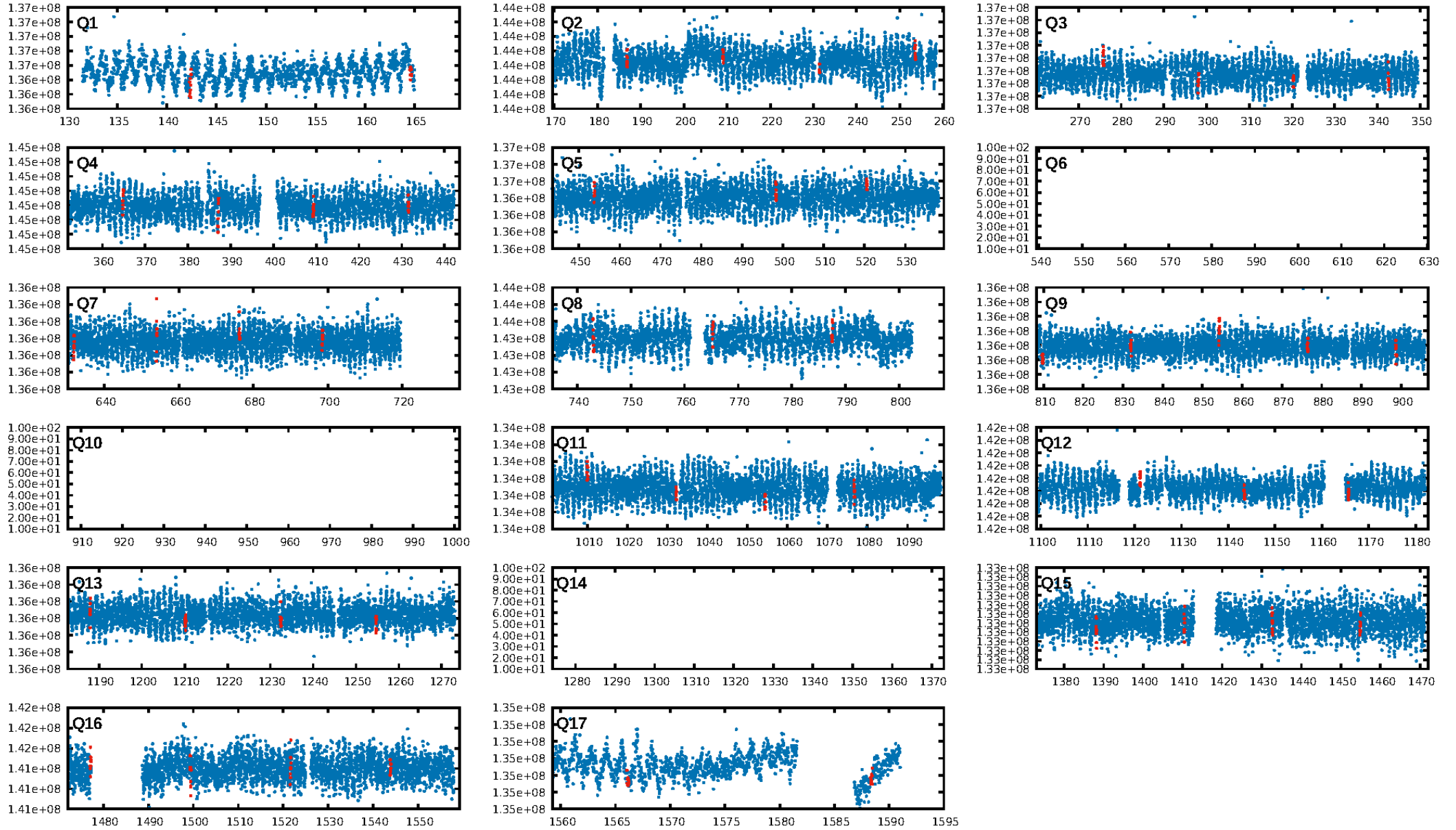
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [57.26σ]  
LongPeriod-sig: 100.0% [119.27σ]  
ModelChiSquare2-sig: 88.6%  
ModelChiSquareGof-sig: 100.0%  
**Bootstrap-pfa: 9.99e-08**  
RollingBand-fgt: 1.00 [13/13]  
GhostDiagnostic-chr: 2.897  
Centroid-sig: 1.0%  
Centroid-so: 1.600 arcsec [1.96σ]  
OotOffset-rm: 0.377 arcsec [0.49σ]  
KicOffset-rm: 0.409 arcsec [0.47σ]  
OotOffset-st: 1/3/3/4 [11]  
KicOffset-st: 1/3/3/4 [11]  
DiffImageQuality-fgm: 0.55 [6/11]  
DiffImageOverlap-fno: 0.79 [11/14]

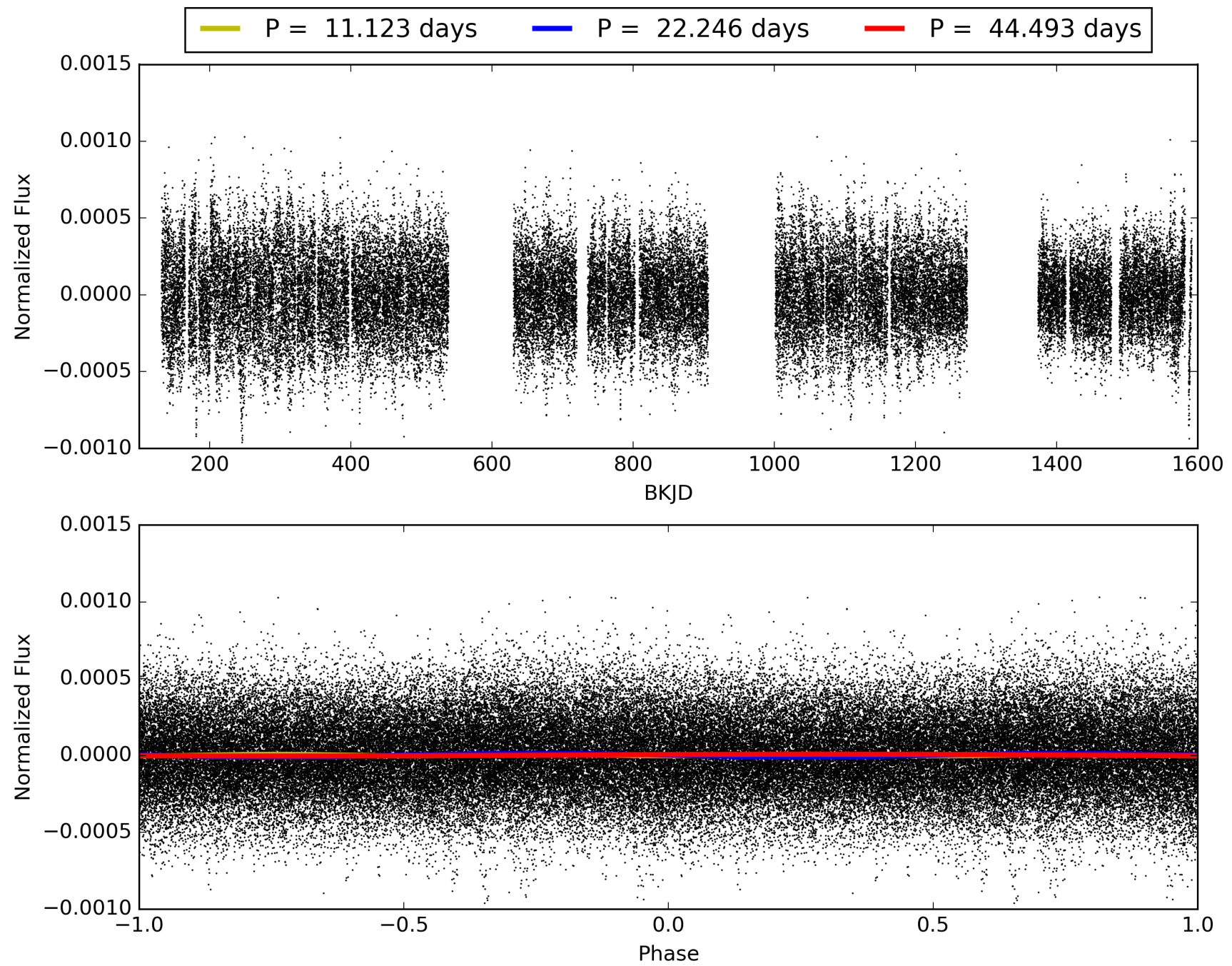
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 16:46:43 Z

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

# TCE 004380951-04, PDC Light Curves

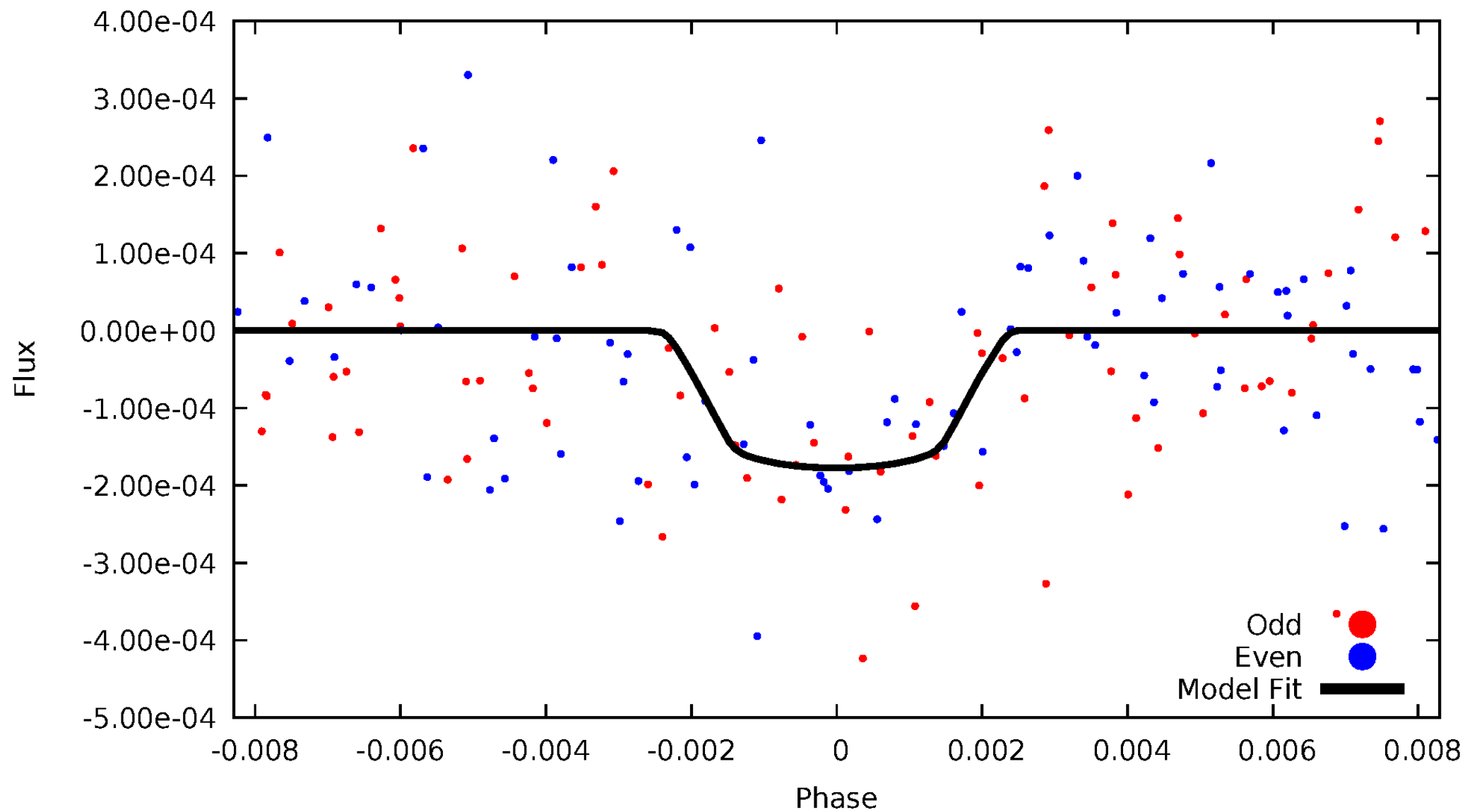


TCE 004380951-04



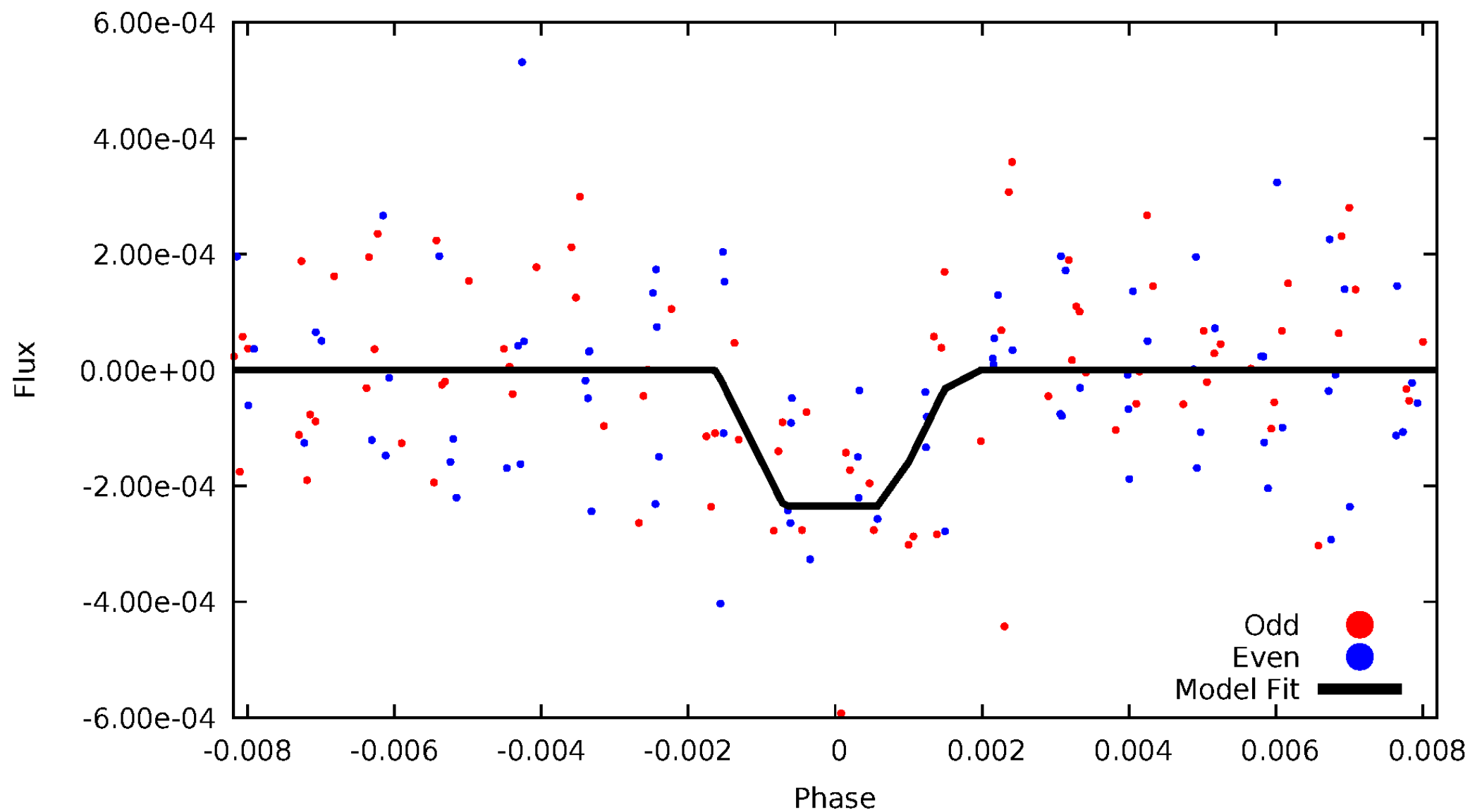
# DV Odd/Even

TCE 004380951-04



# ALT Odd/Even

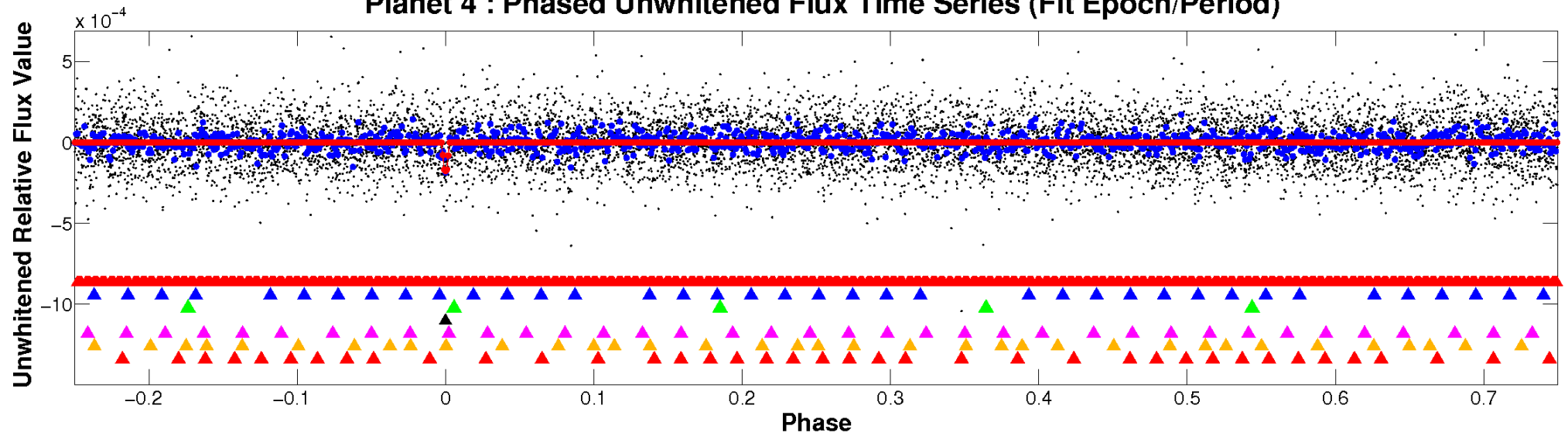
TCE 004380951-04



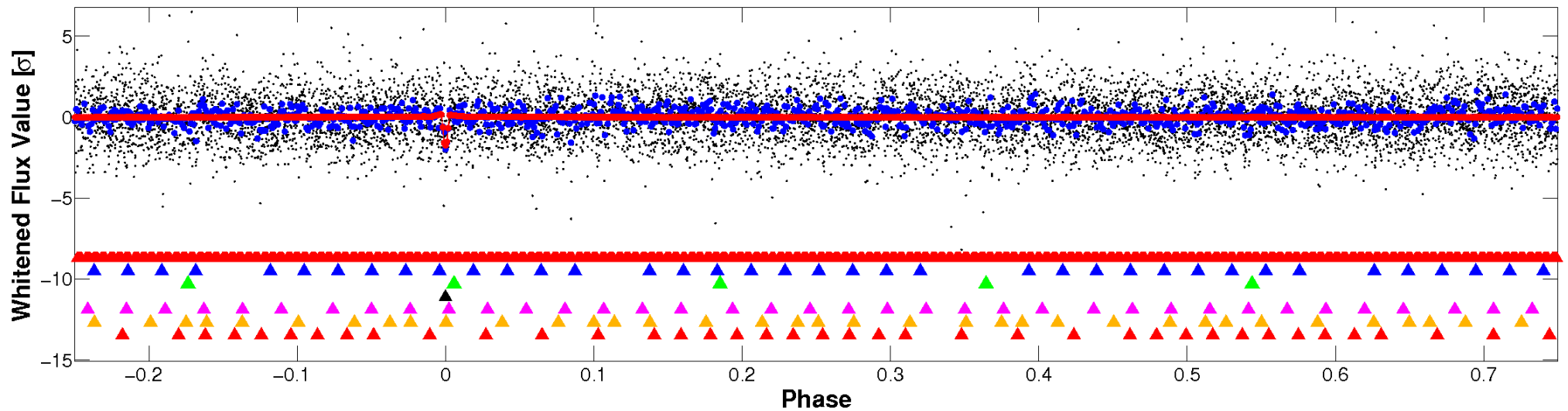


# Non-Whitened Vs. Whitened Light Curve

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

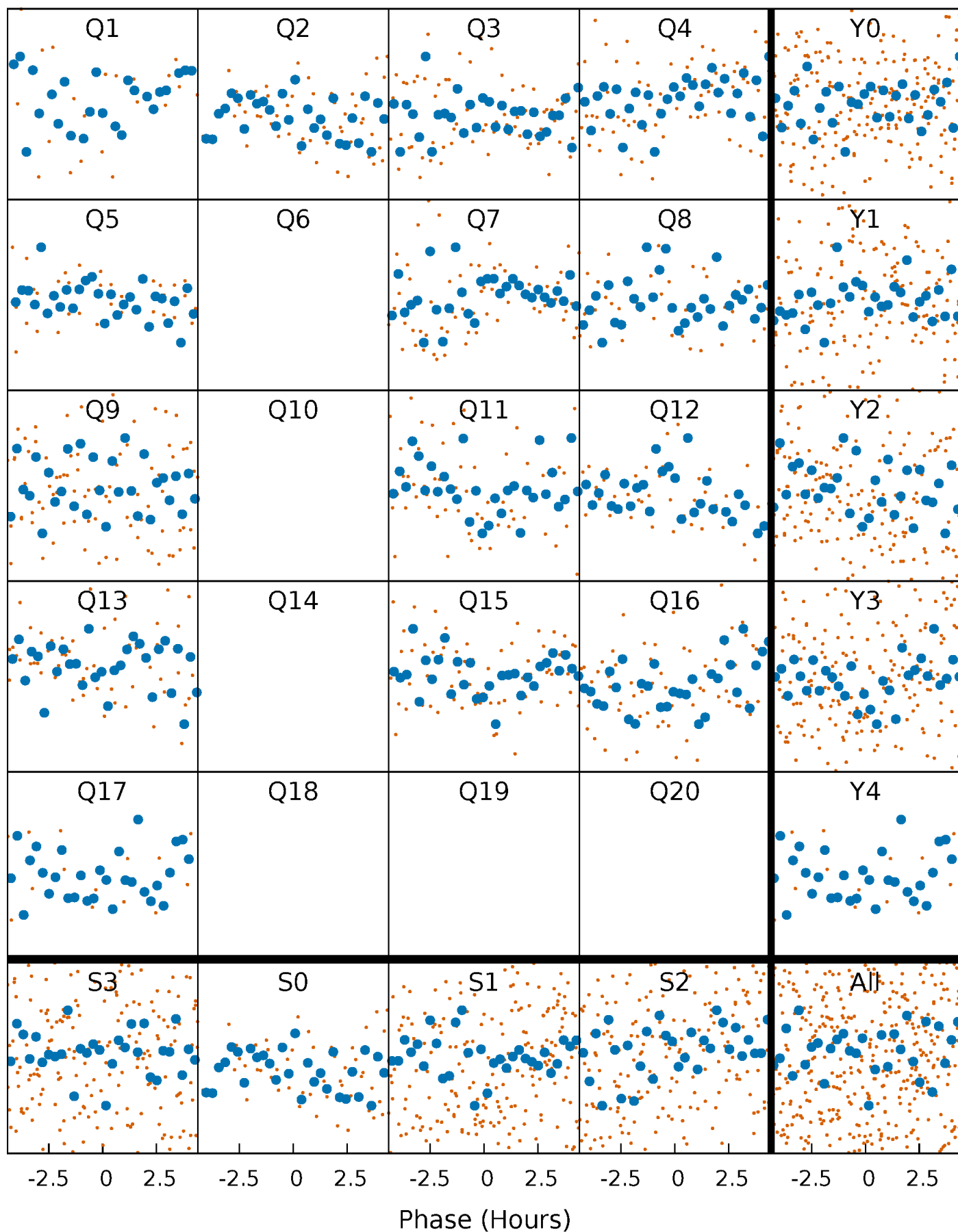


**Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



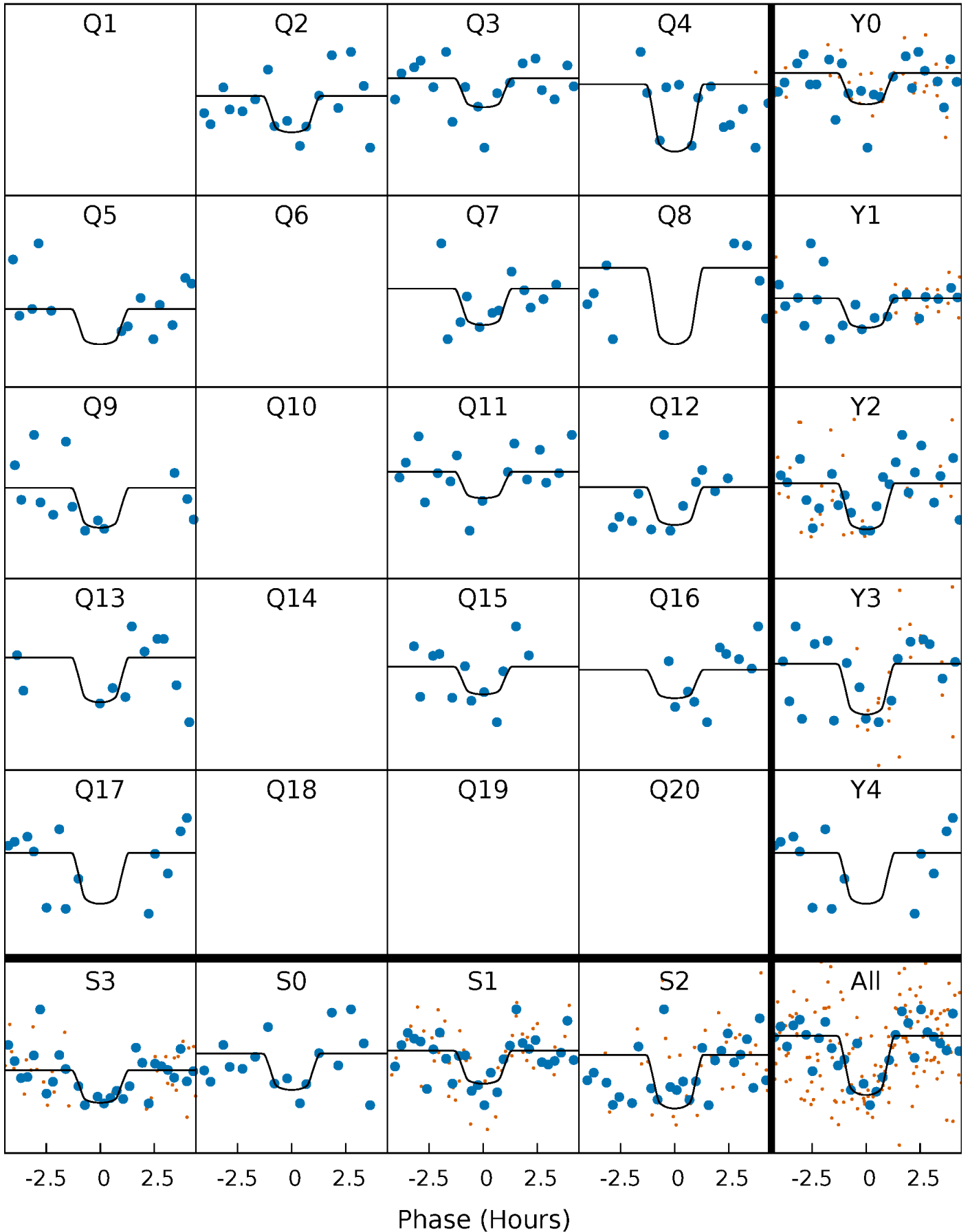
# PDC Quarter-Phased Transit Curves

TCE 004380951-04 P= 22.246372 Days  $T_0=142.363914$  (BKJD)



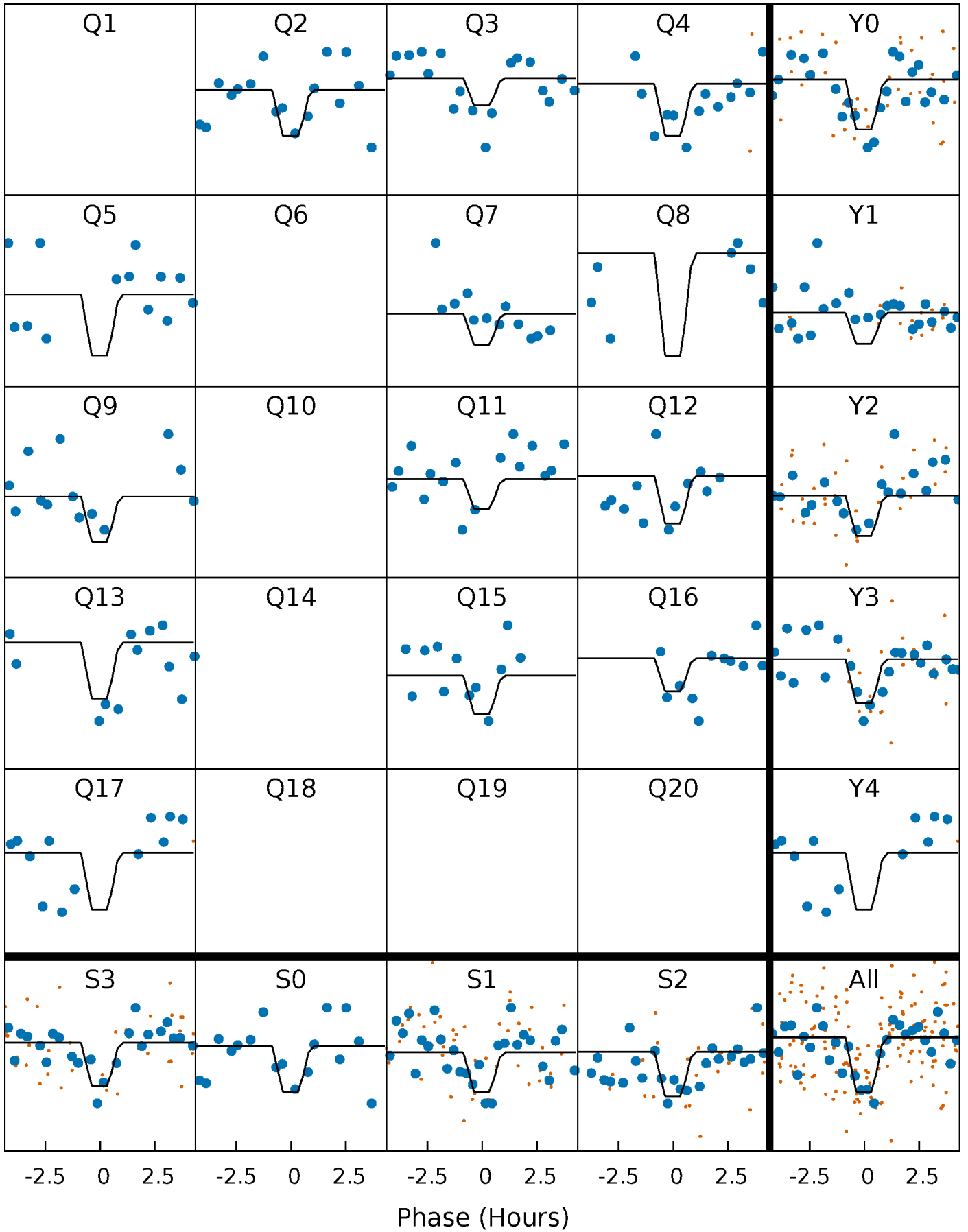
# DV Quarter-Phased Transit Curves

TCE 004380951-04     $P = 22.246372$  Days     $T_0 = 142.363914$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

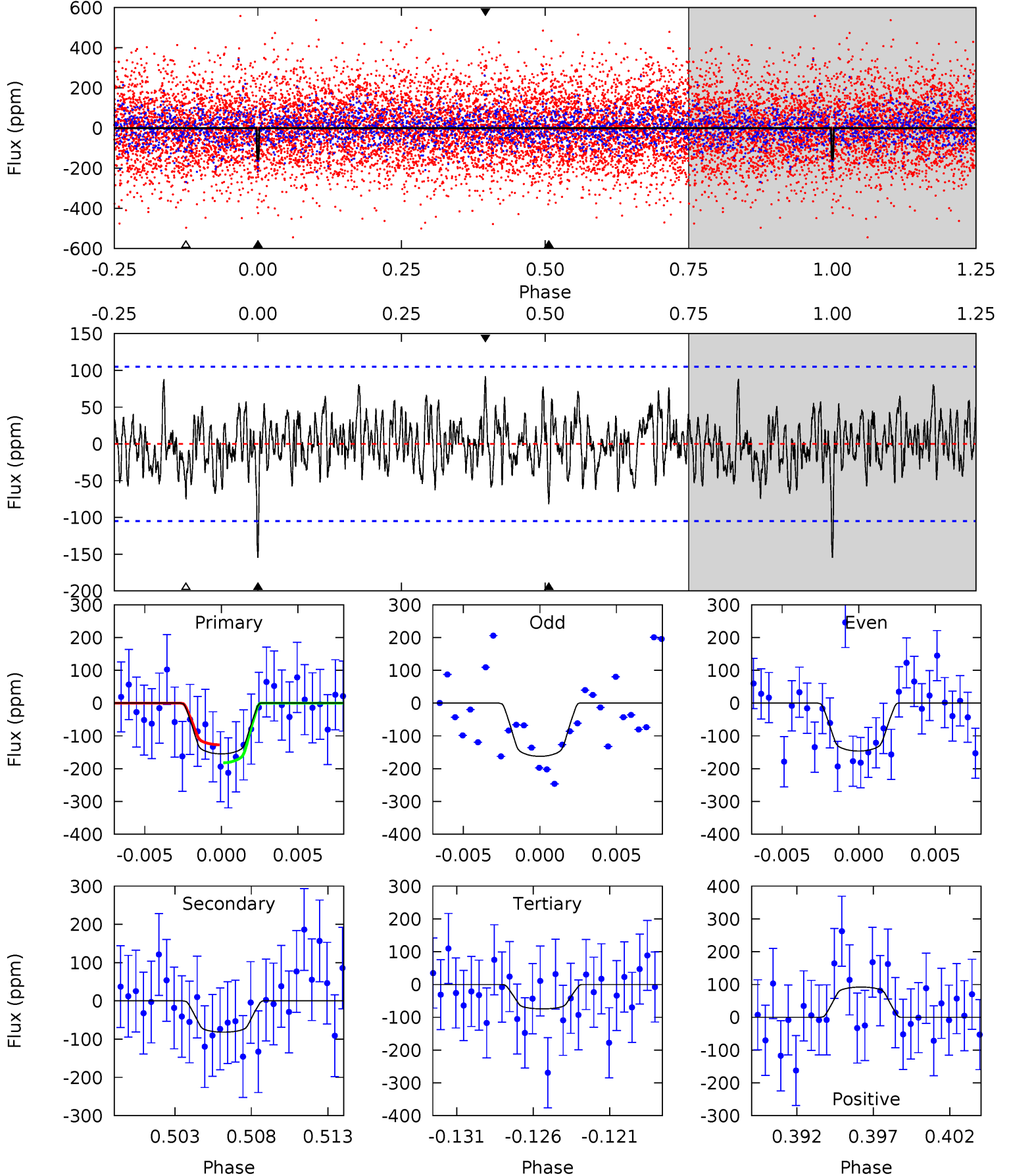
TCE 004380951-04   P= 22.246499 Days    $T_0=142.368905$  (BKJD)



# DV Model-Shift Uniqueness Test

004380951-04,  $P = 22.246372$  Days,  $E = 120.117542$  Days

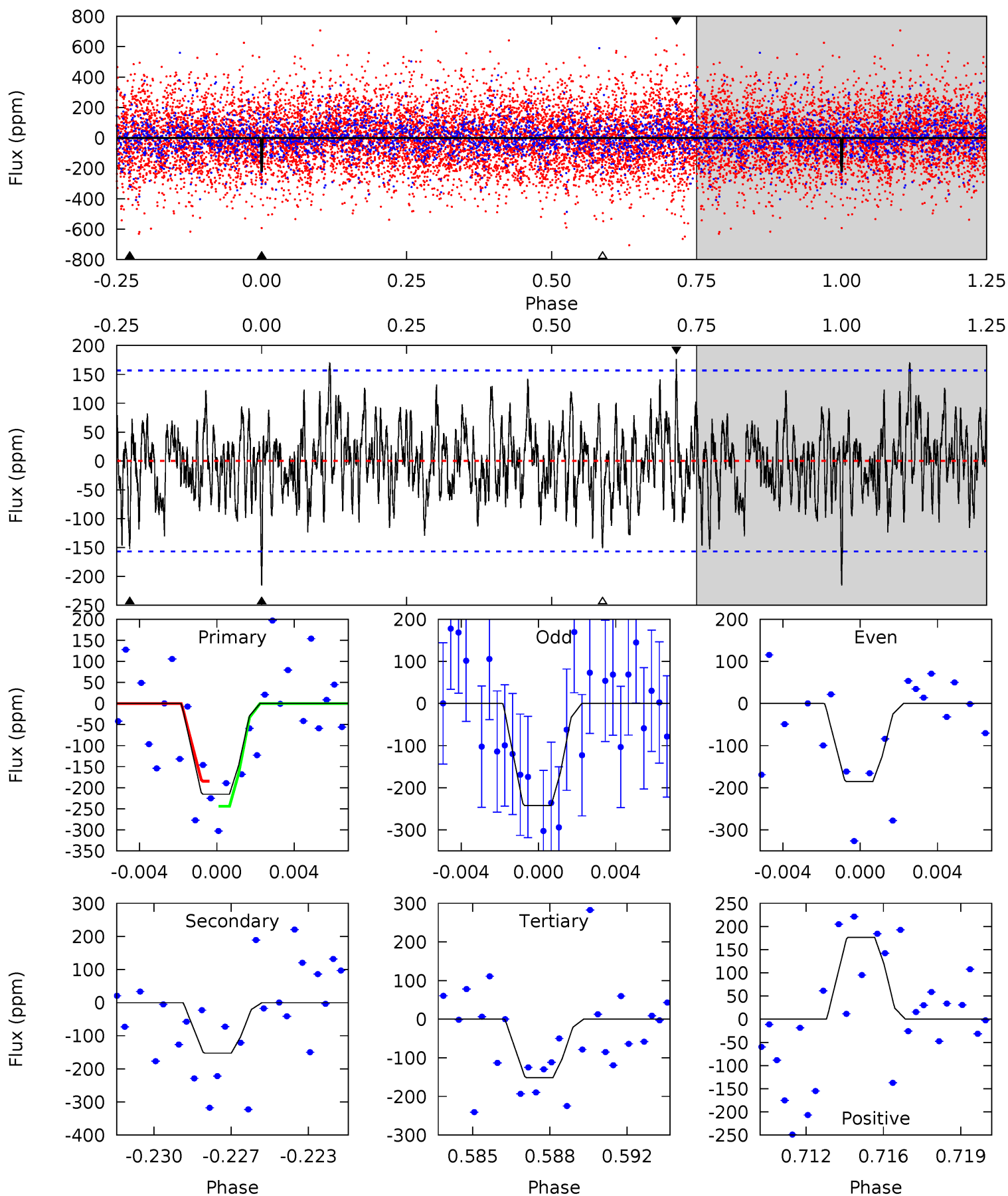
| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 7.62 | 4.02 | 3.66 | 4.54 | 5.16            | 2.82            | 1.39             | 3.96    | 3.08    | 0.36    | -0.51   | 0.40    | 0.93 | 0.37  | 1.36 |



# Alt Model-Shift Uniqueness Test

004380951-04, P = 22.246499 Days, E = 120.122406 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  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 7.18 | 5.08 | 5.03 | 5.88 | 5.22            | 2.92            | 1.73             | 2.14    | 1.30    | 0.05    | -0.80   | 0.95    | 1.14 | 0.45  | 0.99 |





### Stellar Parameters For KIC 004380951

|        | $T_{\text{eff}}(K)$ | $\log(g)$                 | [Fe/H]                    | $R (R_{\odot})$           | $M(M_{\odot})$            | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|---------------------|---------------------------|---------------------------|---------------------------|---------------------------|---|
|        | $6987^{+73}_{-94}$  | $4.148^{+0.073}_{-0.126}$ | $0.000^{+0.150}_{-0.150}$ | $1.690^{+0.337}_{-0.181}$ | $1.470^{+0.115}_{-0.094}$ | $0.429^{+0.155}_{-0.170}$                 |
|        | +1%/-1%             | +2%/-3%                   | +inf%/-inf%               | +20%/-11%                 | +8%/-6%                   | +36%/-40%                                 |
| Source | SPE68               | SPE68                     | SPE68                     | DSEP                      |                           |   |

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

### Secondary Eclipse Parameters for KIC 004380951-04 / KOI

| Detrend | Depth (ppm)   | $R_p (R_{\oplus})$     | $T_{max} (K)$      | $T_{obs} (K)$          | $A_{obs}$            |
|---------|---------------|------------------------|--------------------|------------------------|----------------------|
| DV      | $-82 \pm 20$  | $2.92^{+1.94}_{-1.67}$ | $1341^{+63}_{-45}$ | $5316^{+3206}_{-1051}$ | $157^{+752}_{-102}$  |
| Alt.    | $-153 \pm 30$ | $3.11^{+2.12}_{-1.78}$ | $1341^{+63}_{-43}$ | $5961^{+3960}_{-1191}$ | $268^{+1230}_{-170}$ |

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

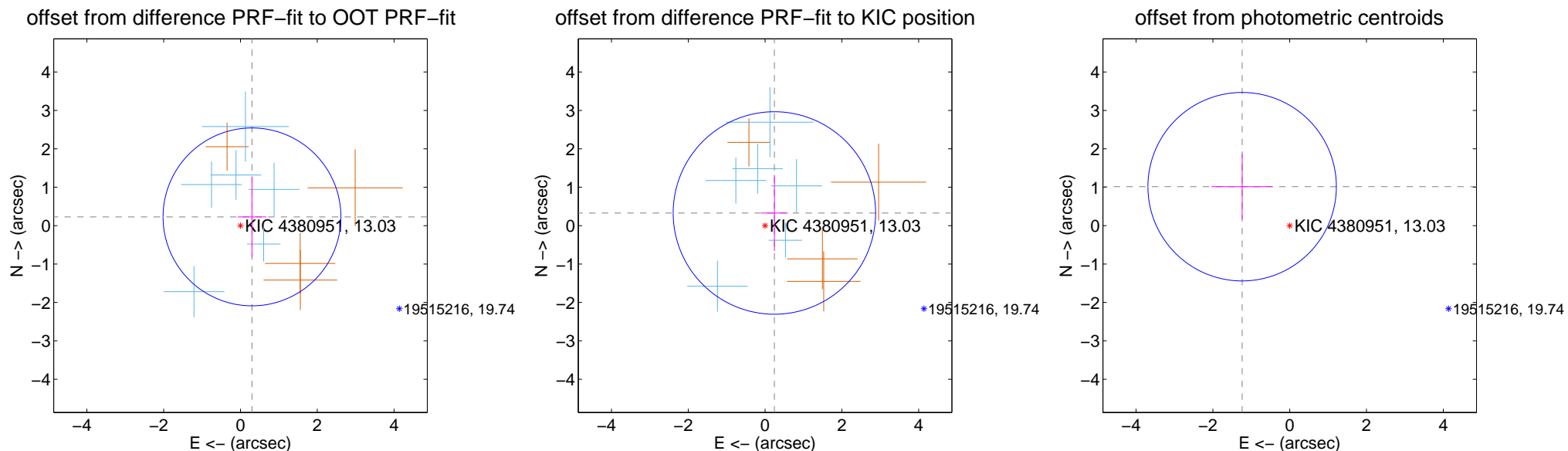
## DV Centroid Data

Supplemental centroid analysis for 004380951-04. Kepler magnitude: 13.03. Transit SNR 9.01

There are 6 quarters with good PRF difference image offsets

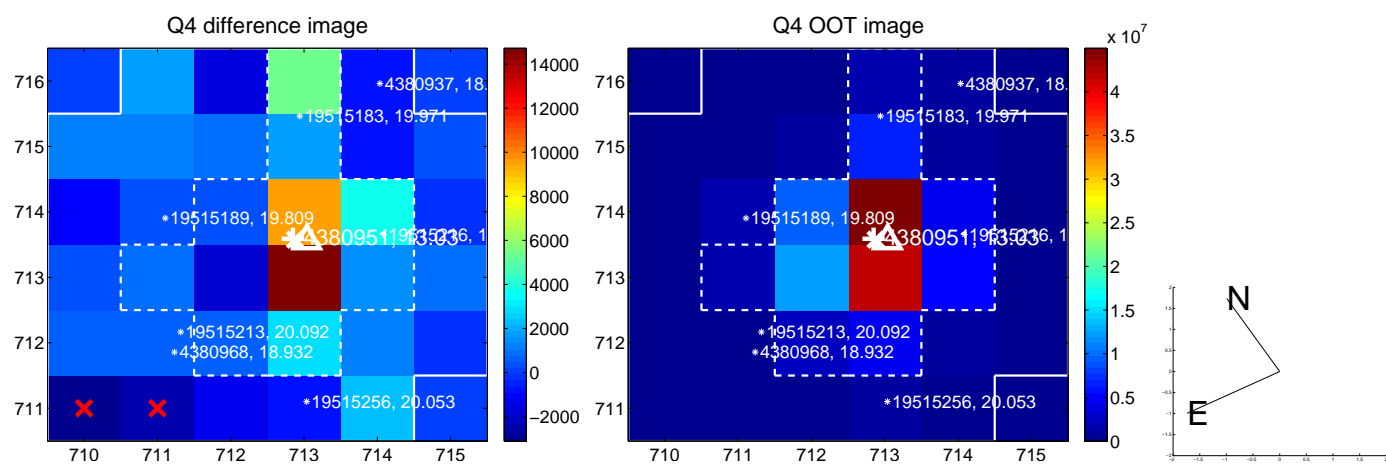
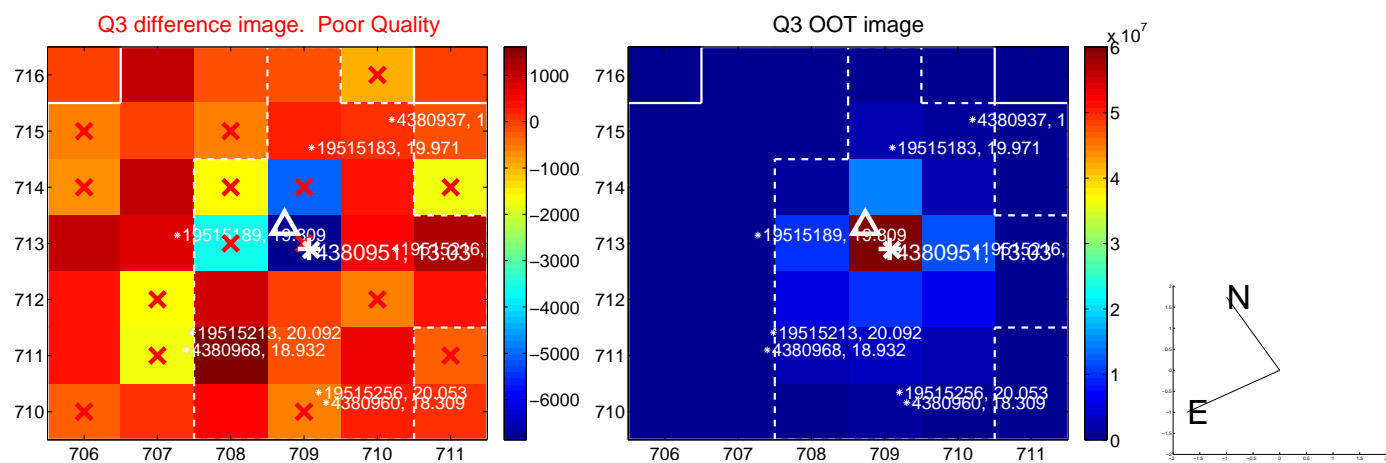
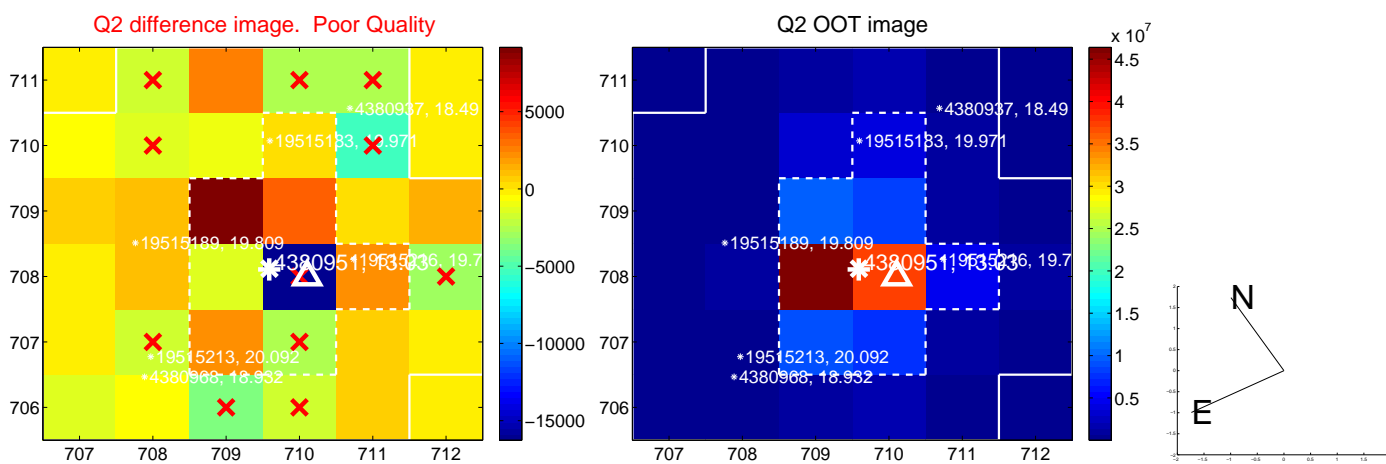
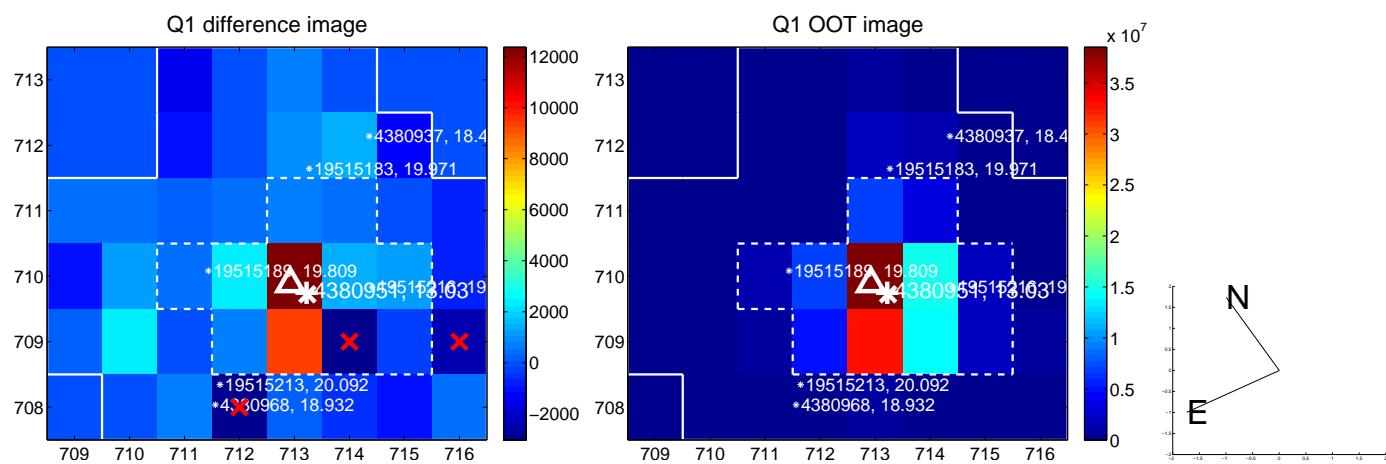
The direct PRF centroid is offset from the target star catalog position by about 0.15 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA        | $\Delta$ Dec      |
|---|--------------------|---------------------|--------------------|-------------------|
| PRF-fit source offset from OOT          | $0.377 \pm 0.772$  | 0.49                | $-0.300 \pm 0.376$ | $0.228 \pm 1.051$ |
| PRF-fit source offset from KIC position | $0.409 \pm 0.879$  | 0.47                | $-0.243 \pm 0.345$ | $0.329 \pm 0.990$ |
| photometric centroid source offset      | $1.60 \pm 0.82$    | 1.96                | $1.24 \pm 0.79$    | $1.01 \pm 0.85$   |

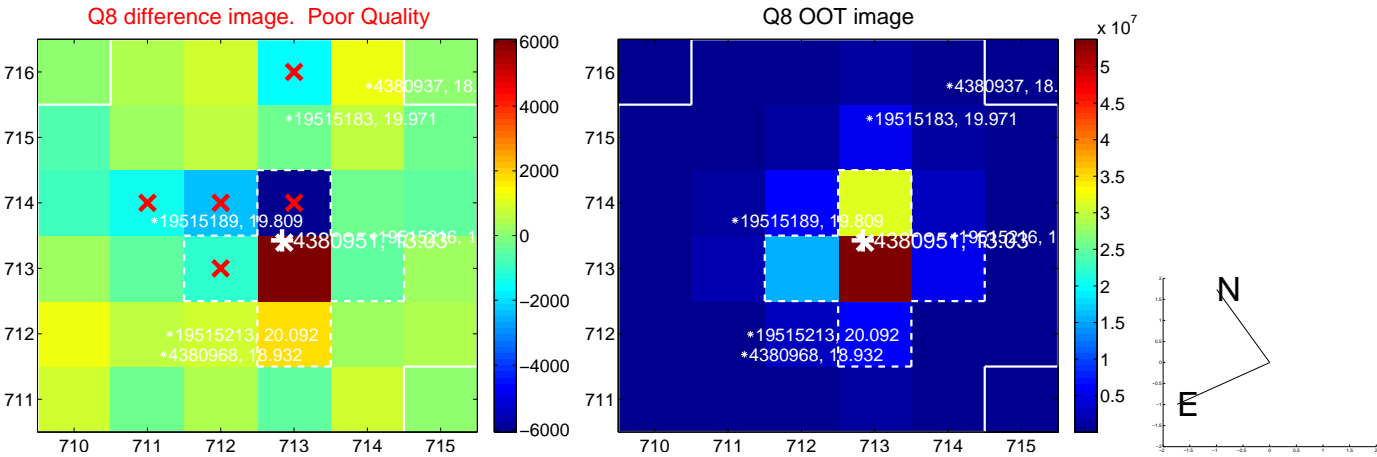
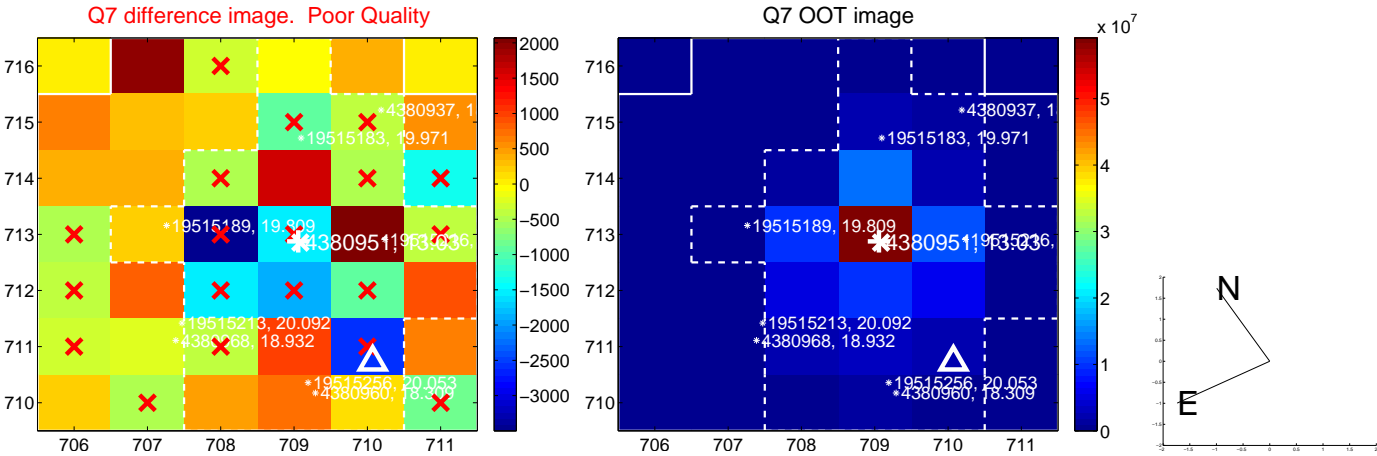
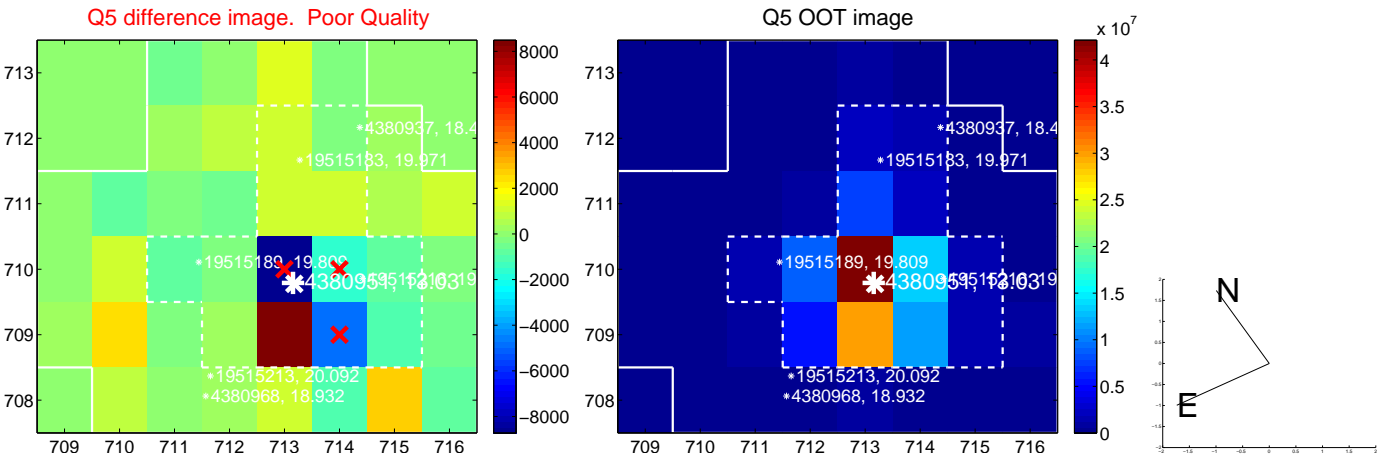


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

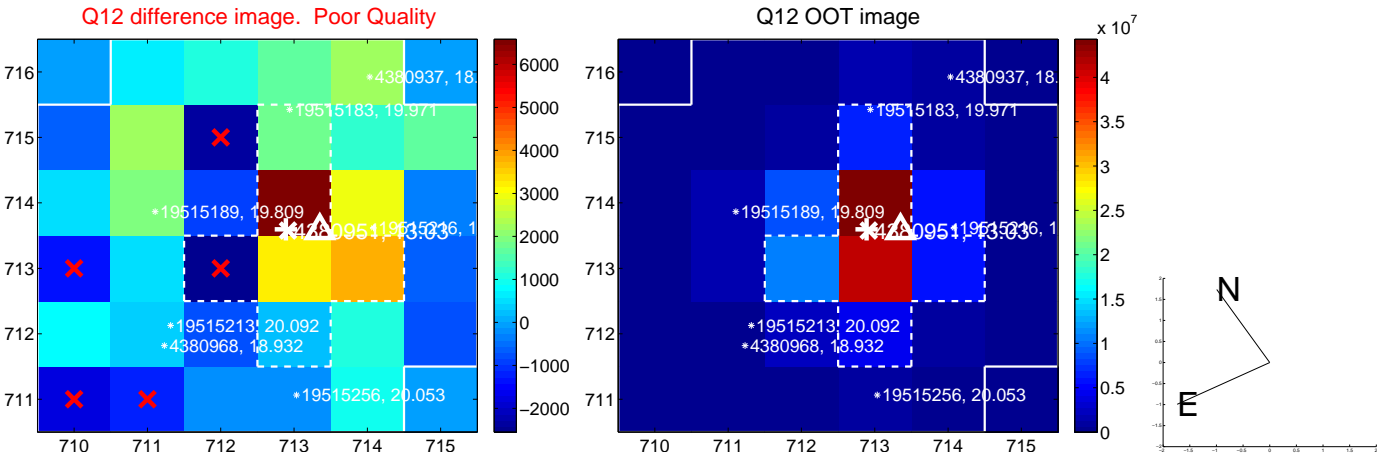
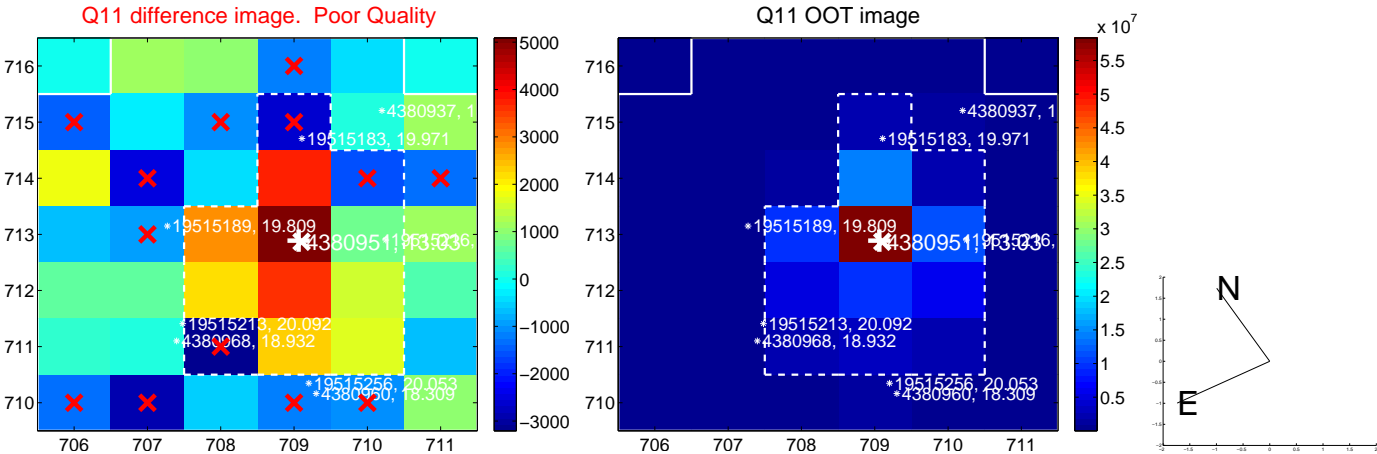
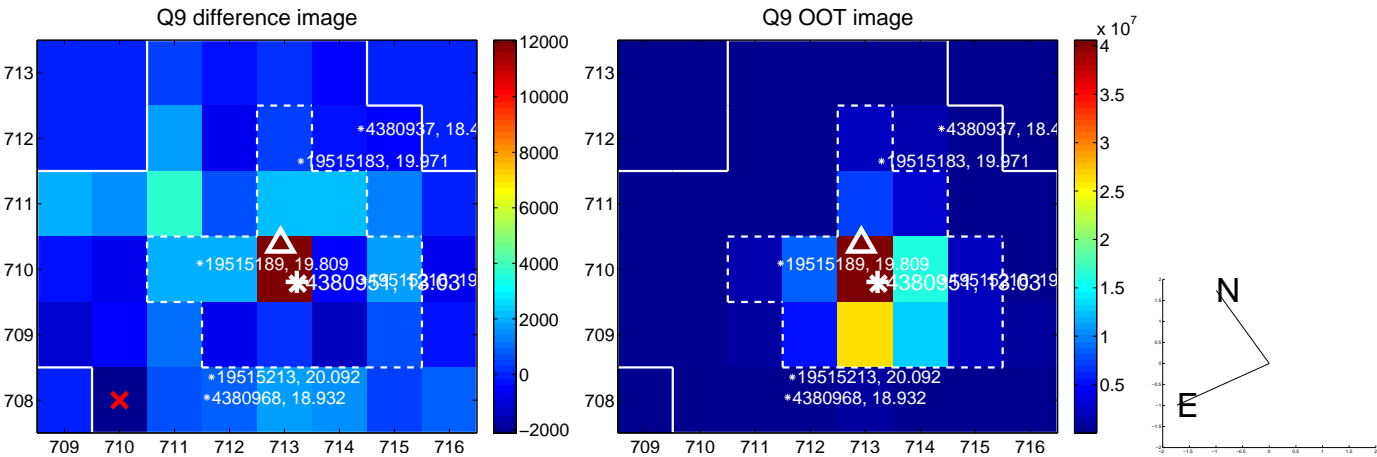
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



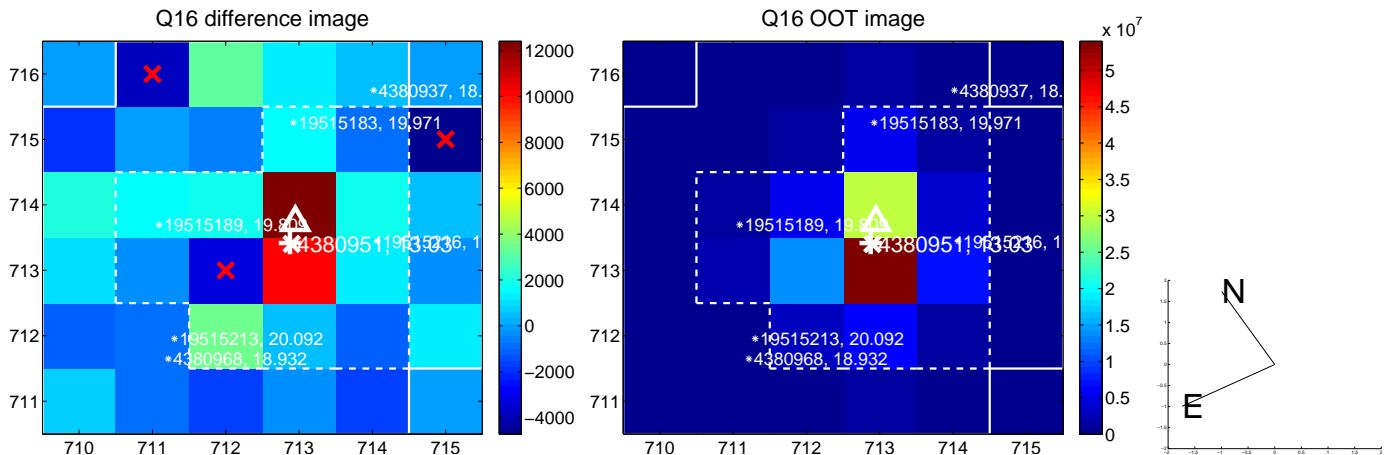
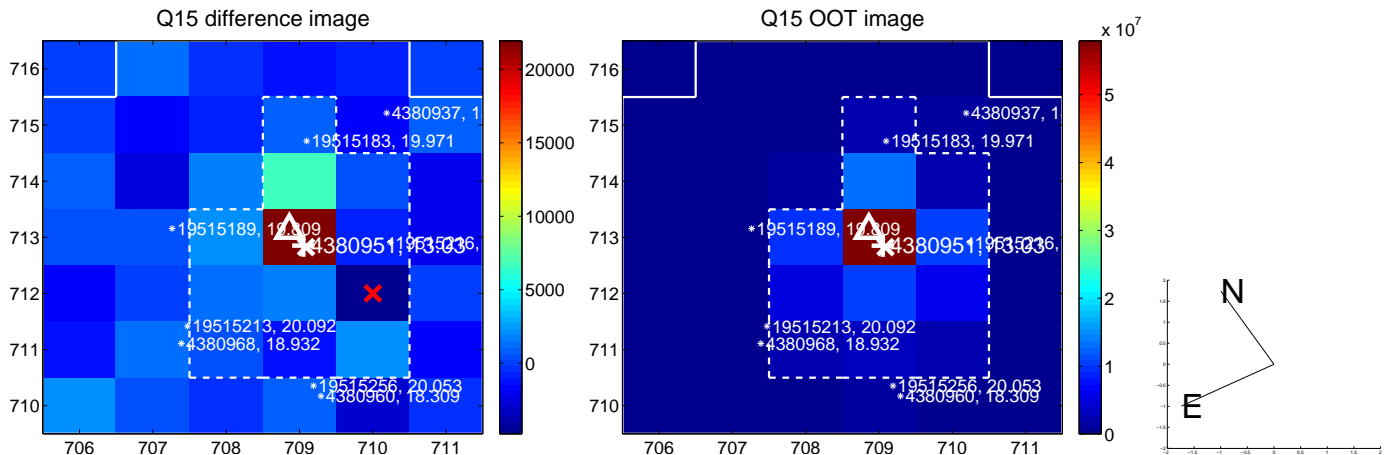
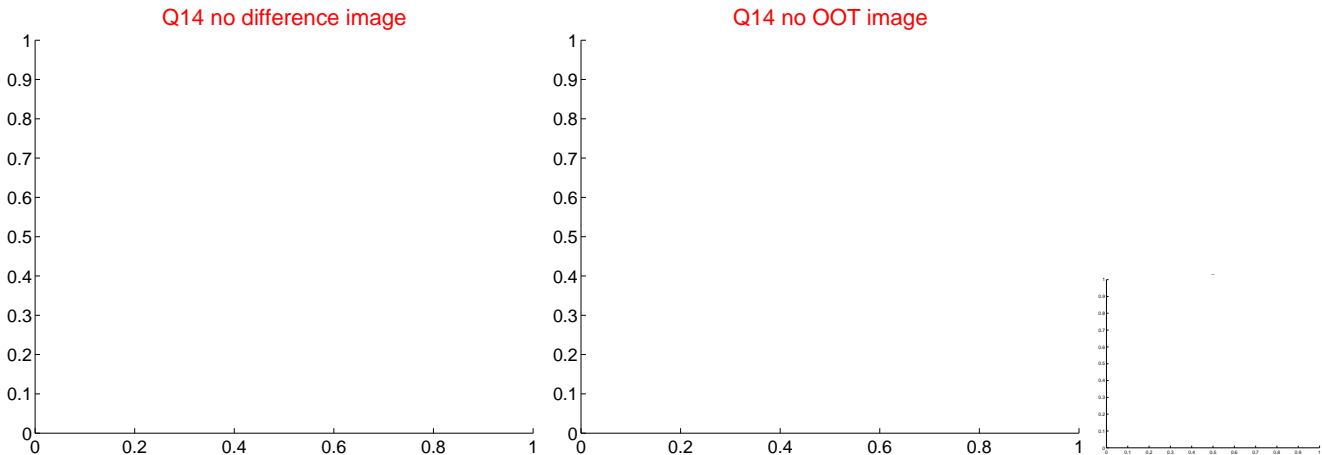
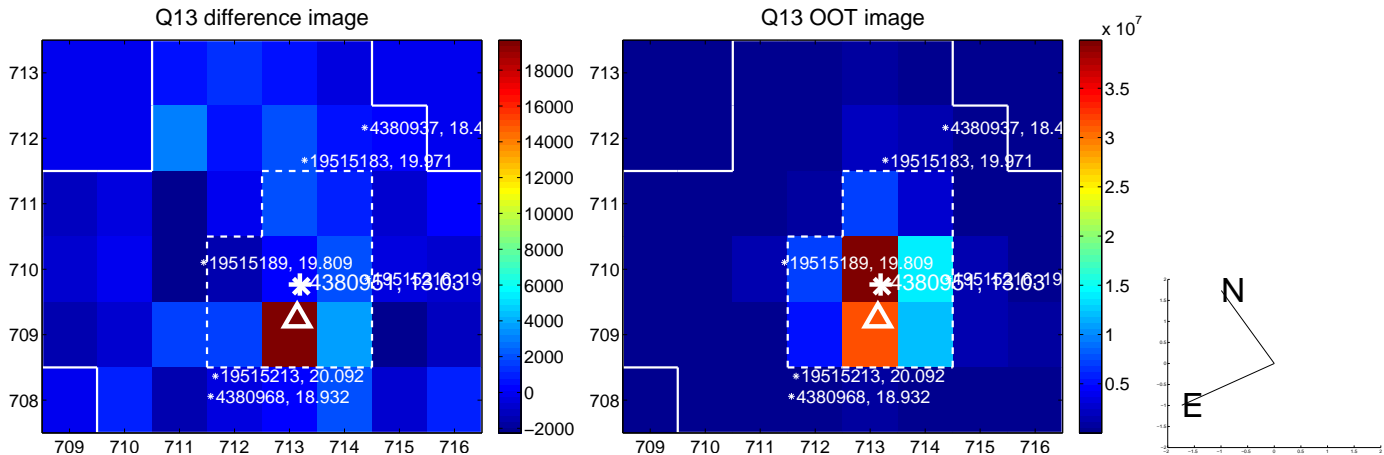
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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.

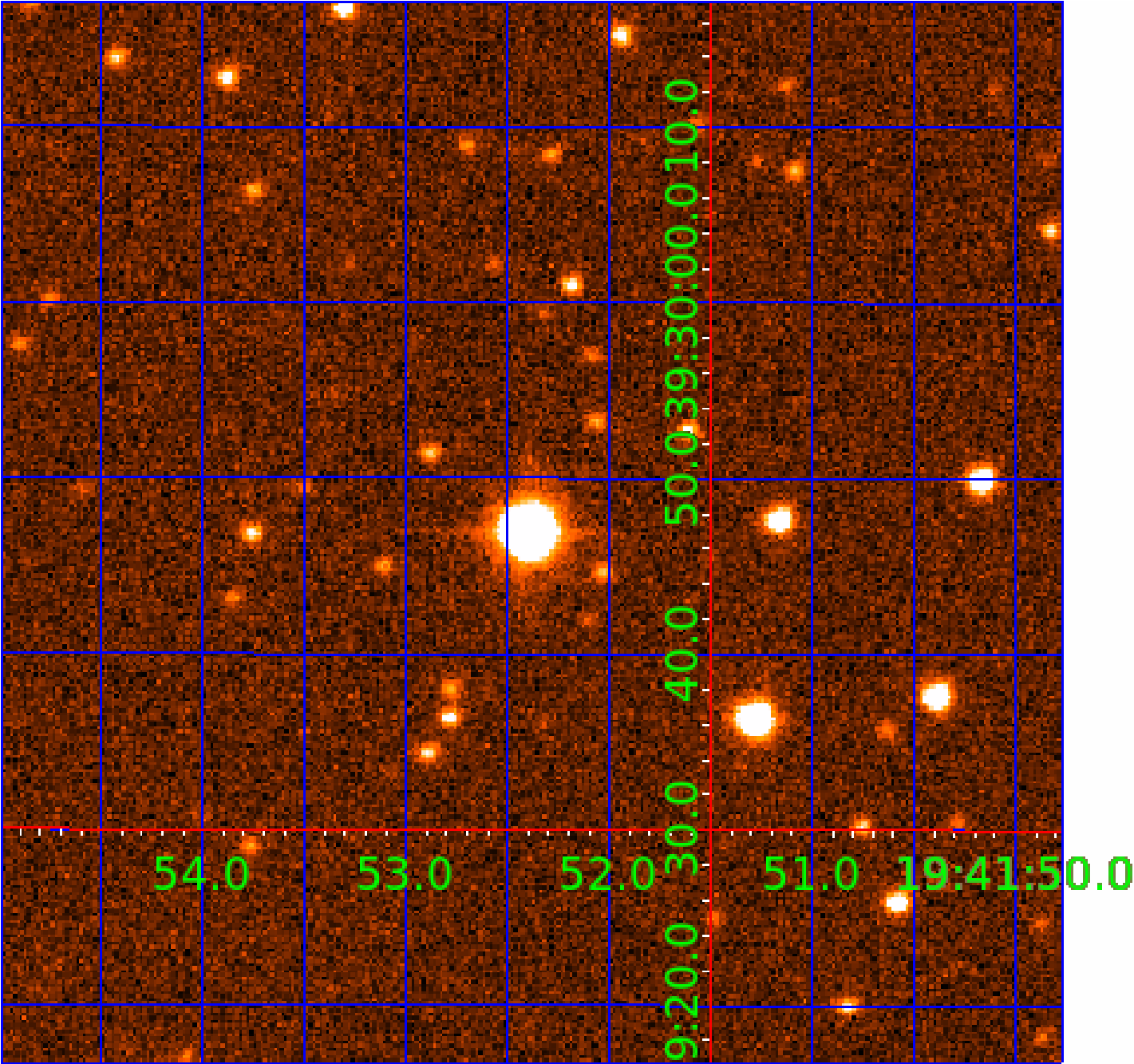






UKIRT Image

Declination



# KIC 004380951

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|-----|-----|-----------------------------|-----------------|------------------------|------------------------|
| 004380951-01 | OBS      | No   | 1.329873      | 131.714534   | 3.1         | 8.483            | 8.7 | 1.6 | 1.69                        | 6987            | 0.30                   | 8437.91                |
| 004380951-02 | OBS      | No   | 38.804254     | 144.305723   | 217.6       | 2.933            | 8.7 | 9.3 | 1.69                        | 6987            | 2.87                   | 93.93                  |
| 004380951-03 | OBS      | No   | 329.705651    | 198.955327   | 267.4       | 3.373            | 8.0 | 8.3 | 1.69                        | 6987            | 3.18                   | 5.42                   |
| 004380951-04 | OBS      | No   | 22.246372     | 142.363914   | 177.5       | 2.213            | 7.9 | 9.0 | 1.69                        | 6987            | 2.65                   | 197.23                 |
| 004380951-05 | OBS      | No   | 39.076285     | 162.919519   | 278.8       | 2.808            | 7.9 | 9.5 | 1.69                        | 6987            | 3.15                   | 93.06                  |
| 004380951-06 | OBS      | No   | 41.434921     | 134.573939   | 114.5       | 3.708            | 7.6 | 6.3 | 1.69                        | 6987            | 2.10                   | 86.06                  |
| 004380951-07 | OBS      | No   | 37.357923     | 153.030015   | 155.1       | 2.085            | 8.5 | 5.7 | 1.69                        | 6987            | 2.60                   | 98.81                  |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments  |
|--------------|----------|------|-------|---|---|---|---|---|
| 004380951-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—MOD_NONUNIQ_DV   |
| 004380951-02 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT  |
| 004380951-03 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_CHASES_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS |
| 004380951-04 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT                                      |
| 004380951-05 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT                                      |
| 004380951-06 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT                                |
| 004380951-07 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT—CENT_FEW_MEAS                         |

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

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

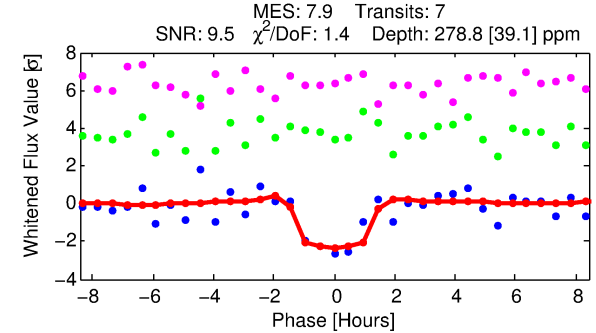
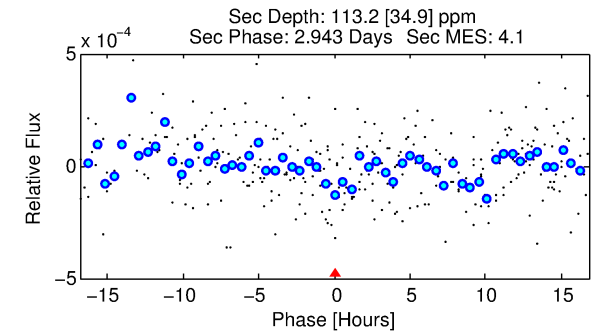
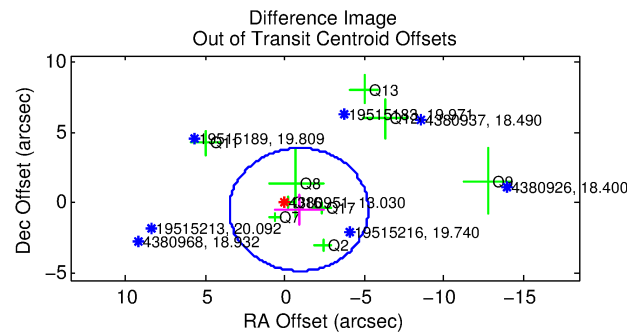
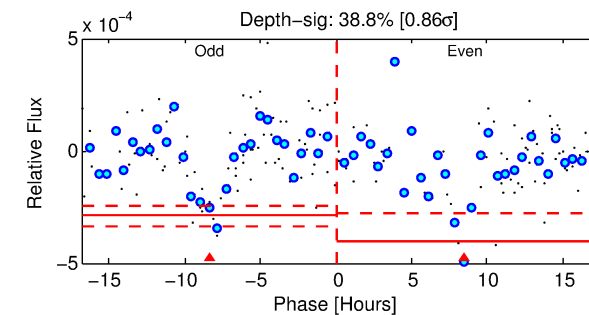
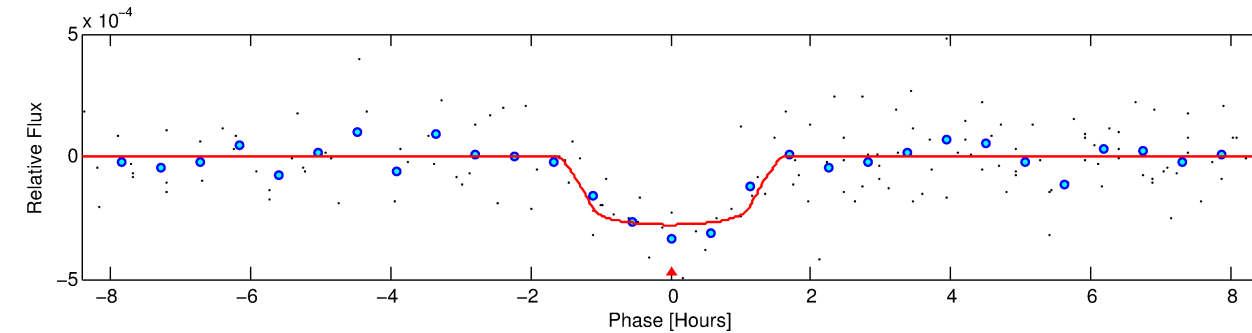
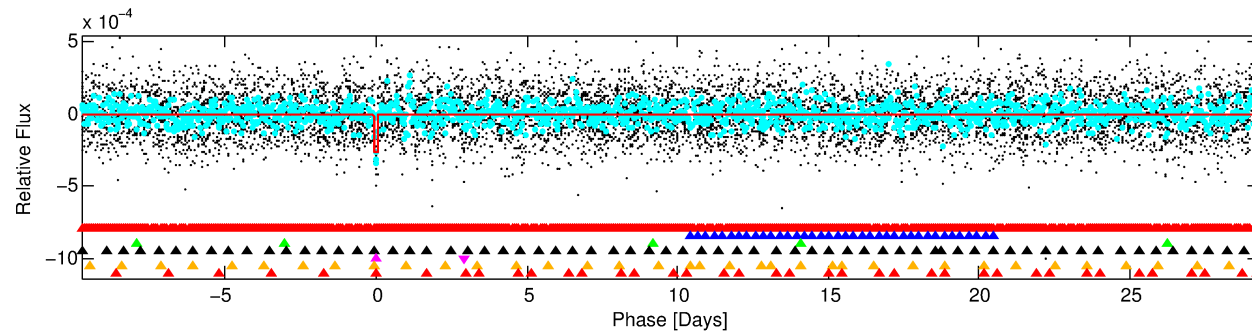
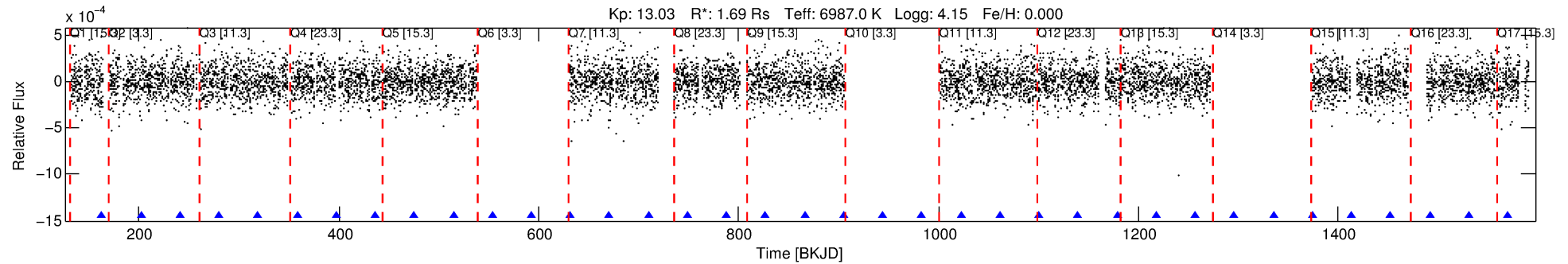
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 004380951-05

No Significant Match Found

# DV One-Page Summary

KIC: 4380951 Candidate: 5 of 7 Period: 39.076 d



## DV Fit Results:

Period = 39.07628 [0.00032] d  
Epoch = 162.9195 [0.0065] BKJD  
Rp/R\* = 0.0171 [0.0170]  
a/R\* = 62.63 [379.37]  
b = 0.83 [2.30]  
Seff = 93.06 [22.41]  
Teq = 792 [48] K  
Rp = 3.15 [3.20] Re  
a = 0.2560 [0.0421] AU  
Ag = 410.81 [834.46] [0.49 $\sigma$ ]  
Teff = 5513 [2782] K [1.70 $\sigma$ ]

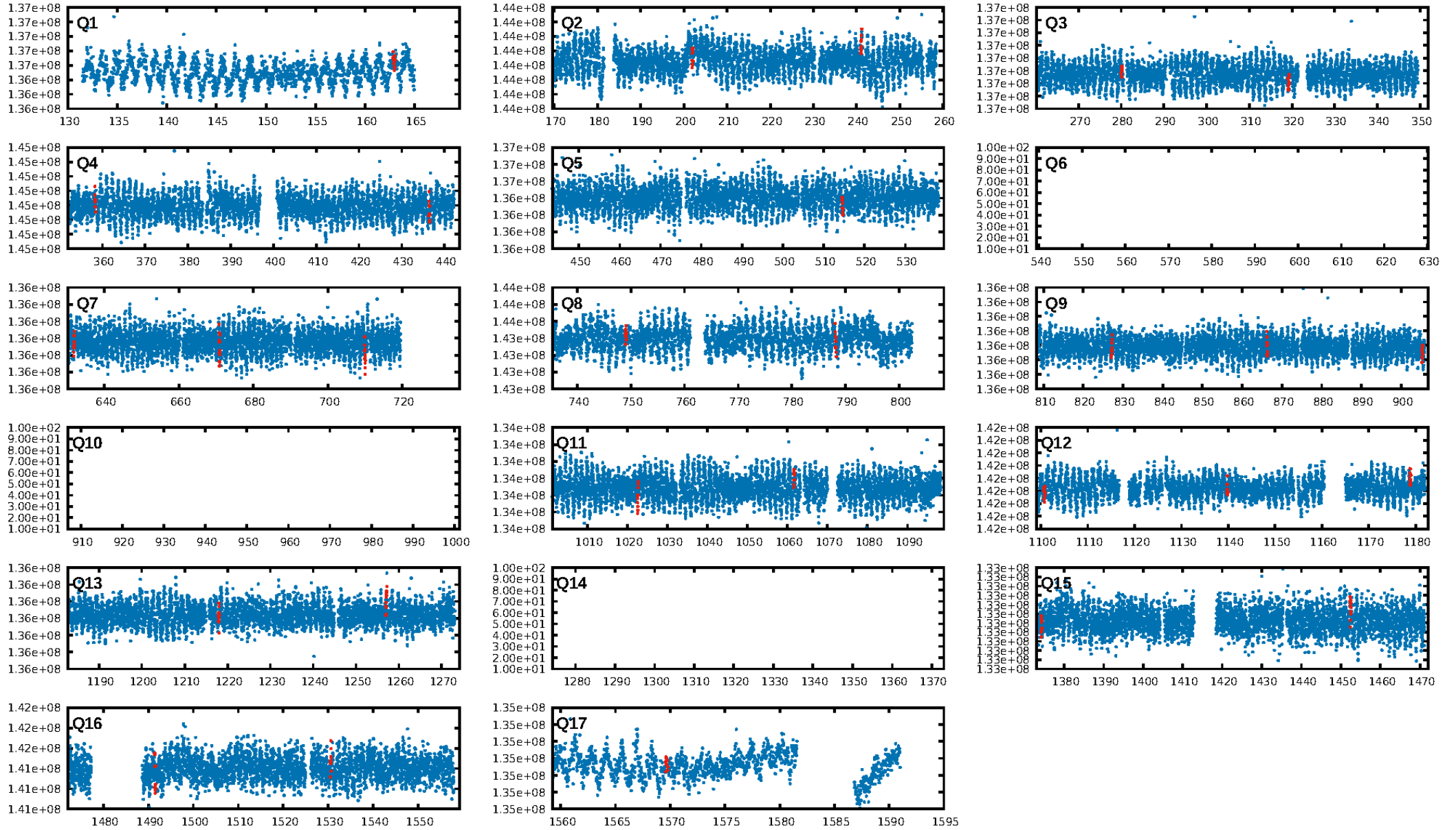
## DV Diagnostic Results:

ShortPeriod-sig: 89.2% [1.61 $\sigma$ ]  
LongPeriod-sig: 100.0% [12.17 $\sigma$ ]  
ModelChiSquare2-sig: 57.0%  
ModelChiSquareGof-sig: 100.0%  
**Bootstrap-pfa: 7.11e-08**  
RollingBand-fgt: 1.00 [6/6]  
GhostDiagnostic-chr: 26.2  
Centroid-sig: 67.6%  
Centroid-so: 0.420 arcsec [0.68 $\sigma$ ]  
OotOffset-rm: 1.005 arcsec [0.69 $\sigma$ ]  
OotOffset-st: 1/2/3/3 [9]  
KicOffset-rm: 0.904 arcsec [0.64 $\sigma$ ]  
KicOffset-st: 1/2/3/3 [9]  
DiffImageQuality-fgm: 0.22 [2/9]  
DiffImageOverlap-fno: 0.43 [6/14]

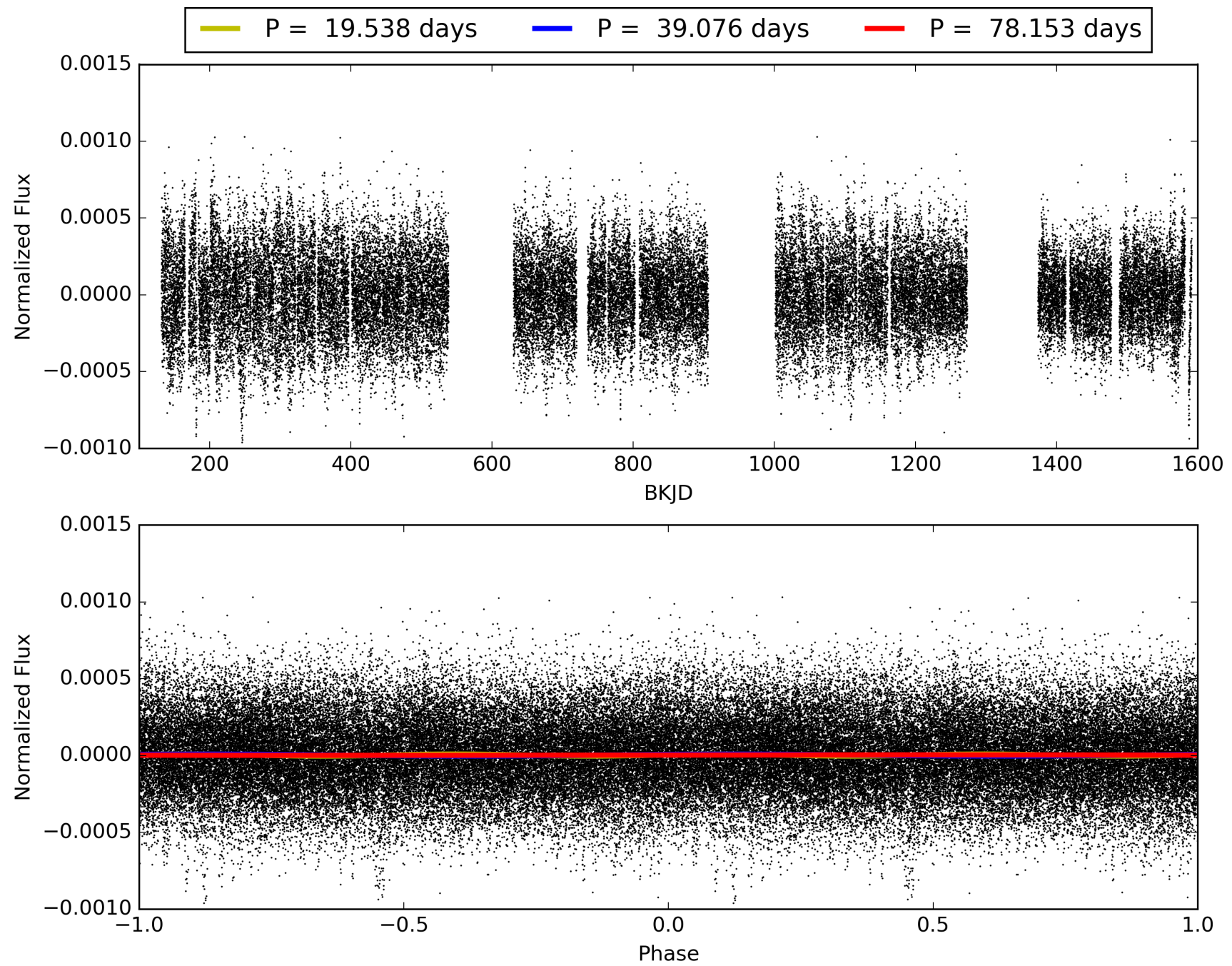
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 16:46:46 Z

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

# TCE 004380951-05, PDC Light Curves

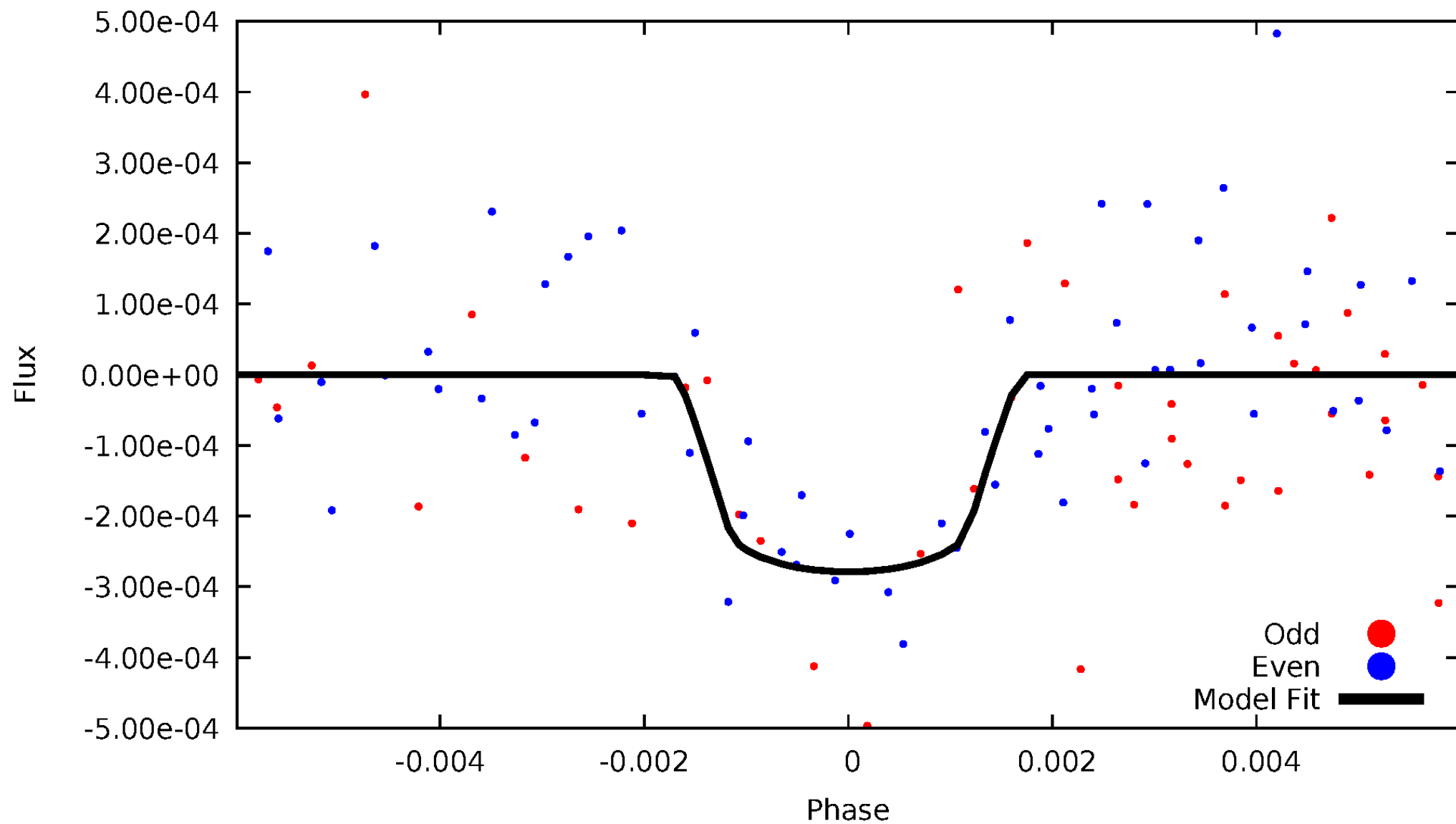


TCE 004380951-05



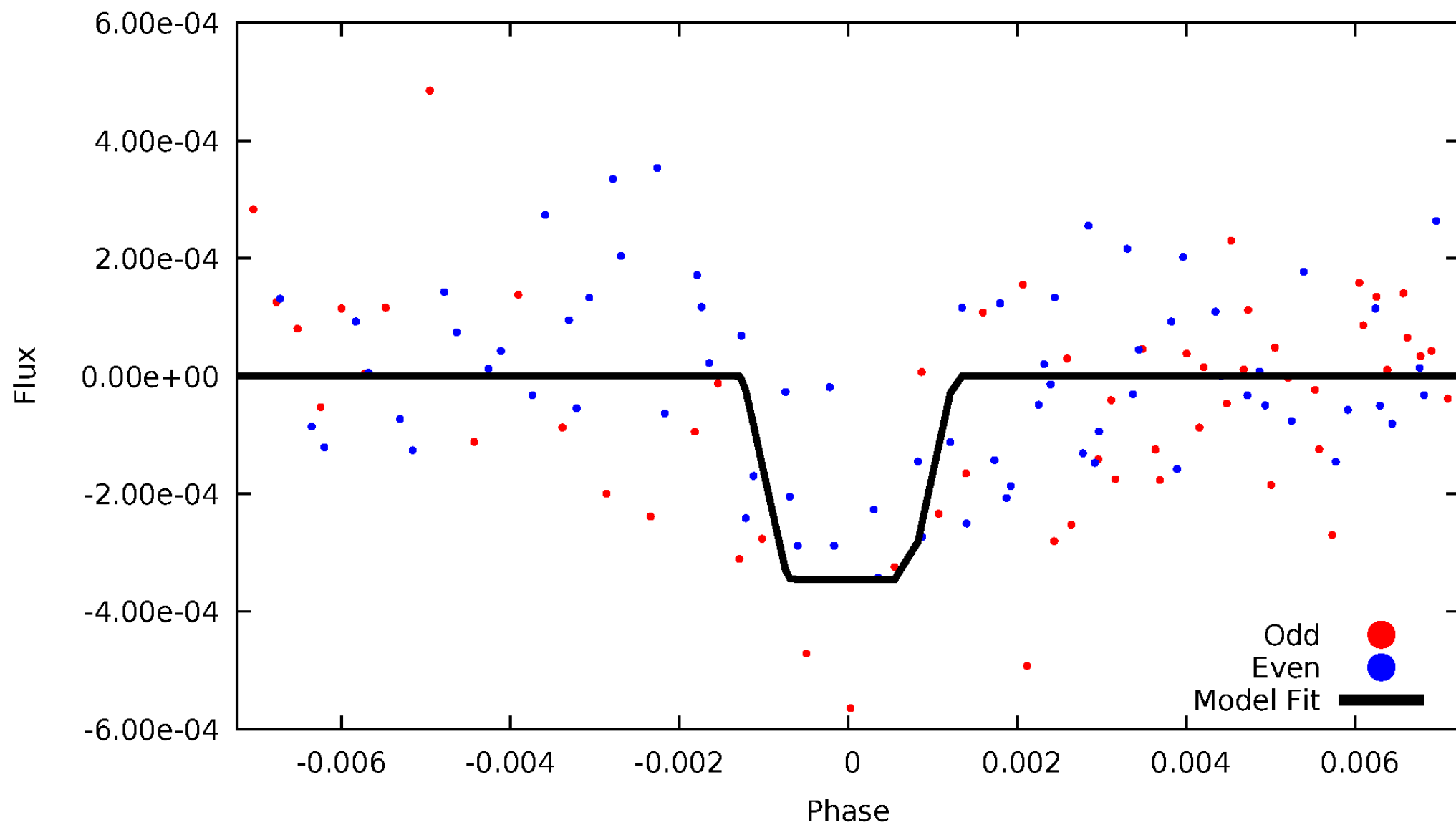
# DV Odd/Even

TCE 004380951-05



# ALT Odd/Even

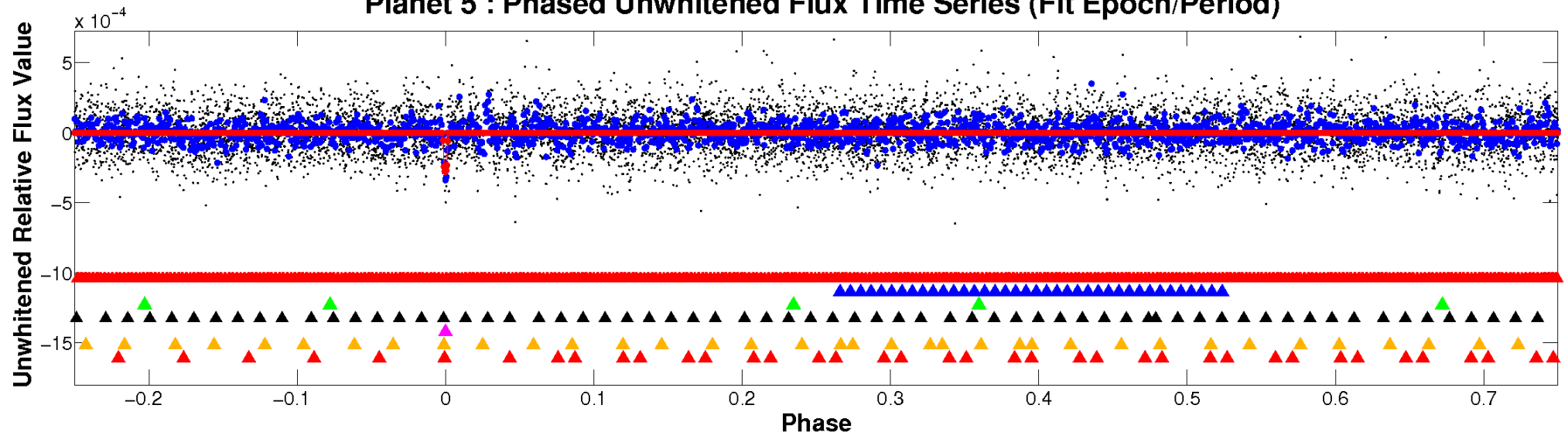
TCE 004380951-05



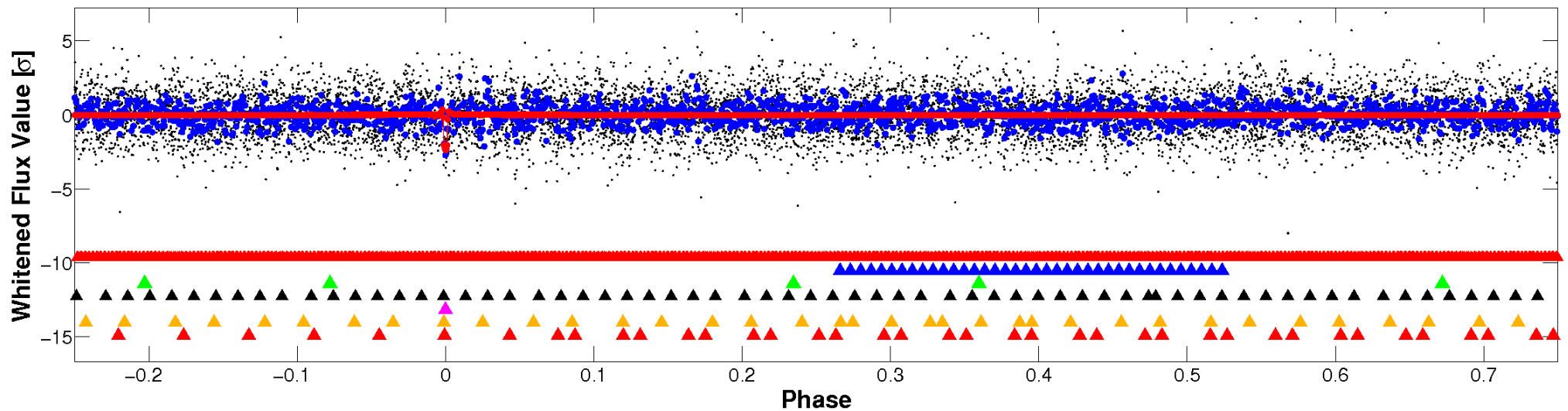


# Non-Whitened Vs. Whitened Light Curve

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

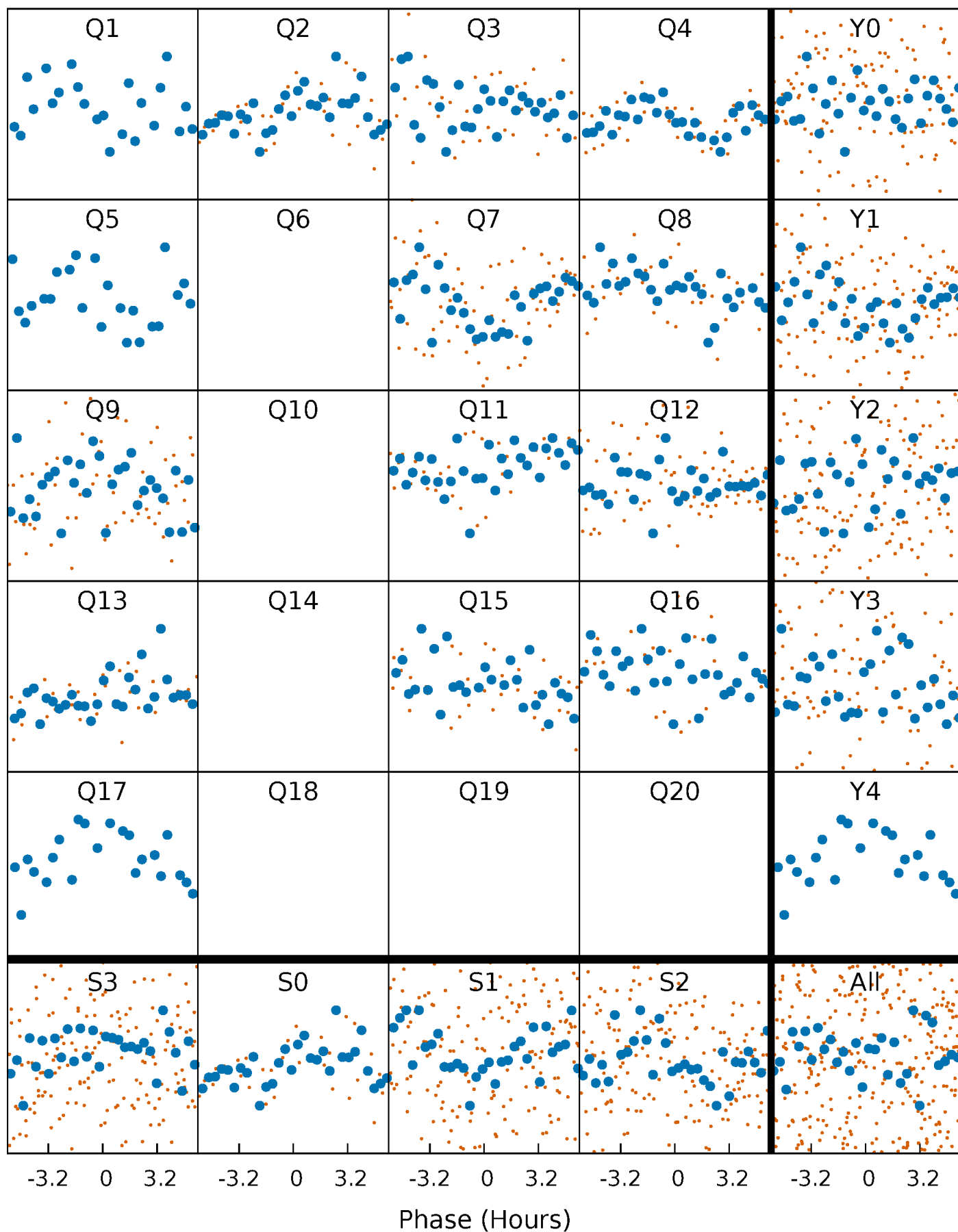


## Planet 5 : Phased Whitened Flux Time Series (Fit Epoch/Period)



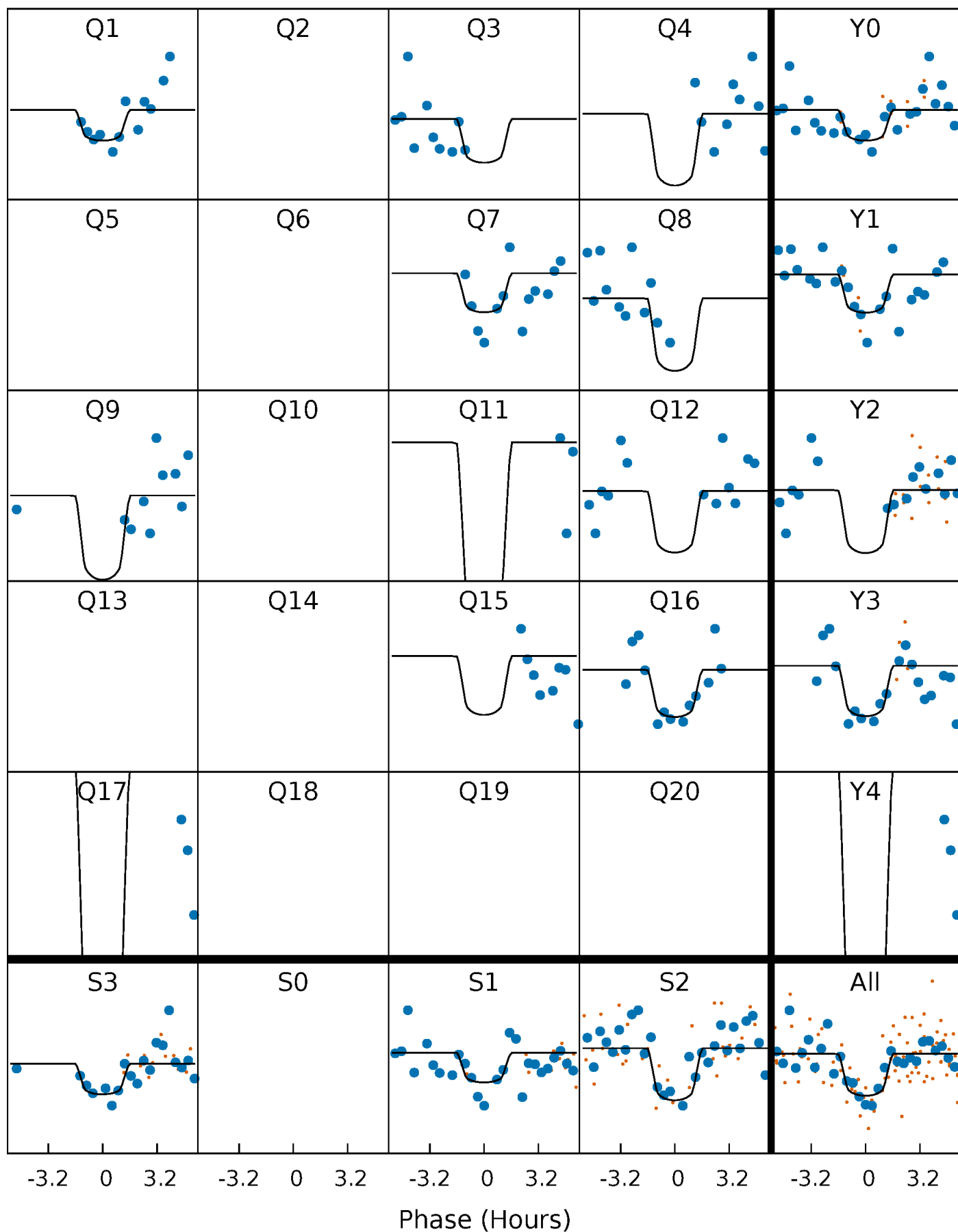
# PDC Quarter-Phased Transit Curves

TCE 004380951-05   P= 39.076285 Days    $T_0=162.919519$  (BKJD)



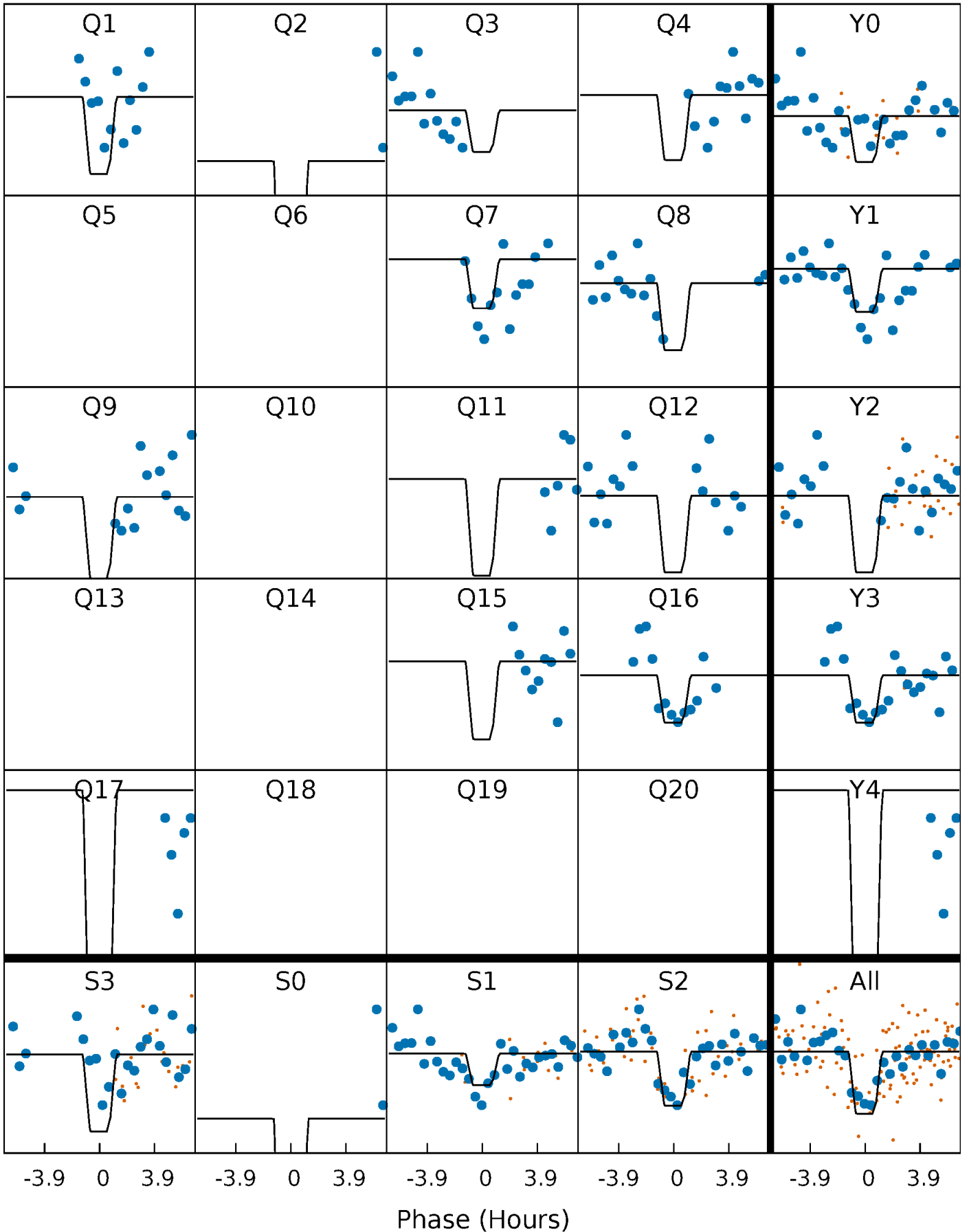
# DV Quarter-Phased Transit Curves

TCE 004380951-05     $P = 39.076285$  Days     $T_0 = 162.919519$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

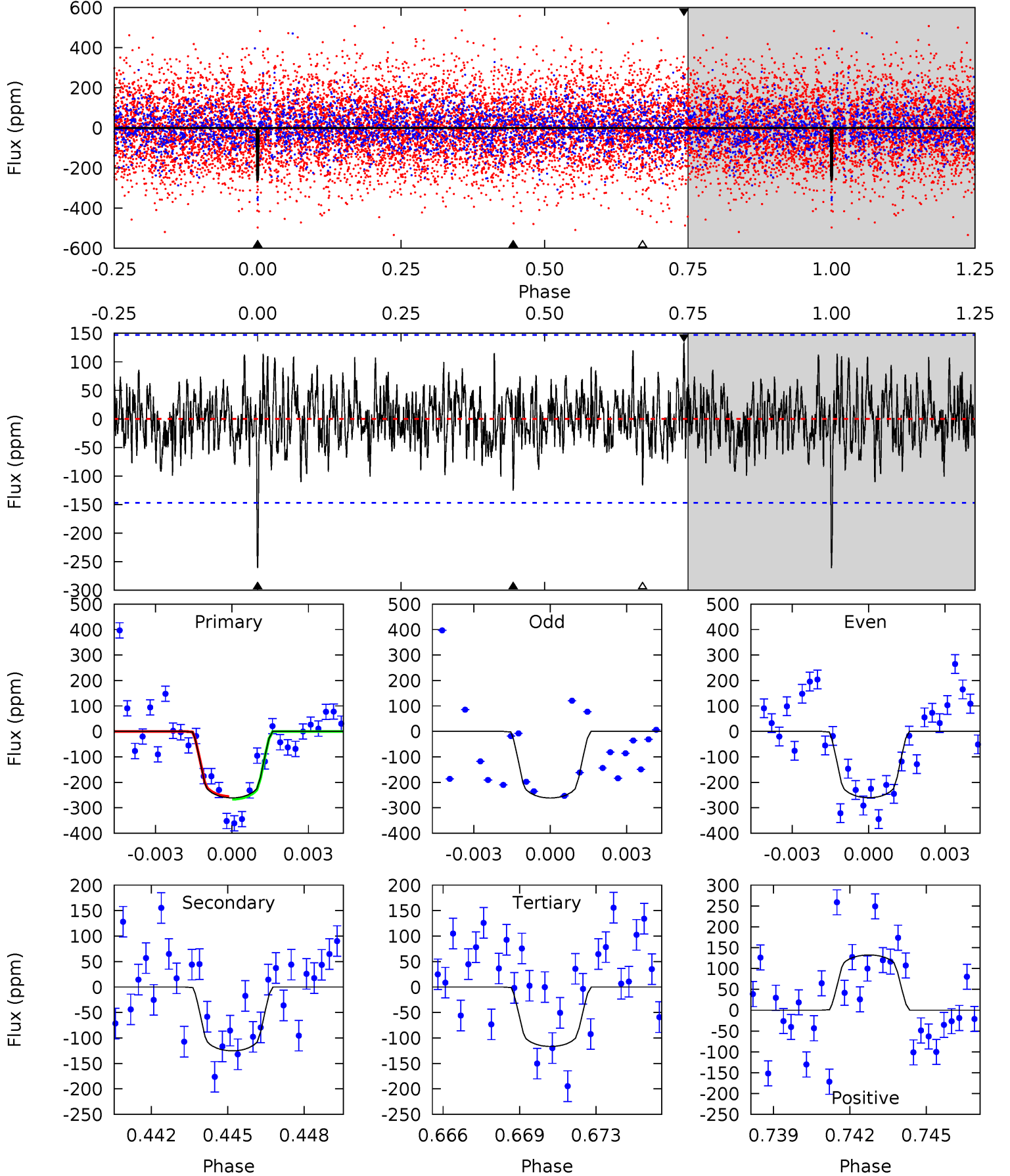
TCE 004380951-05     $P = 39.076059$  Days     $T_0 = 162.928733$  (BKJD)



# DV Model-Shift Uniqueness Test

004380951-05,  $P = 39.076285$  Days,  $E = 123.843234$  Days

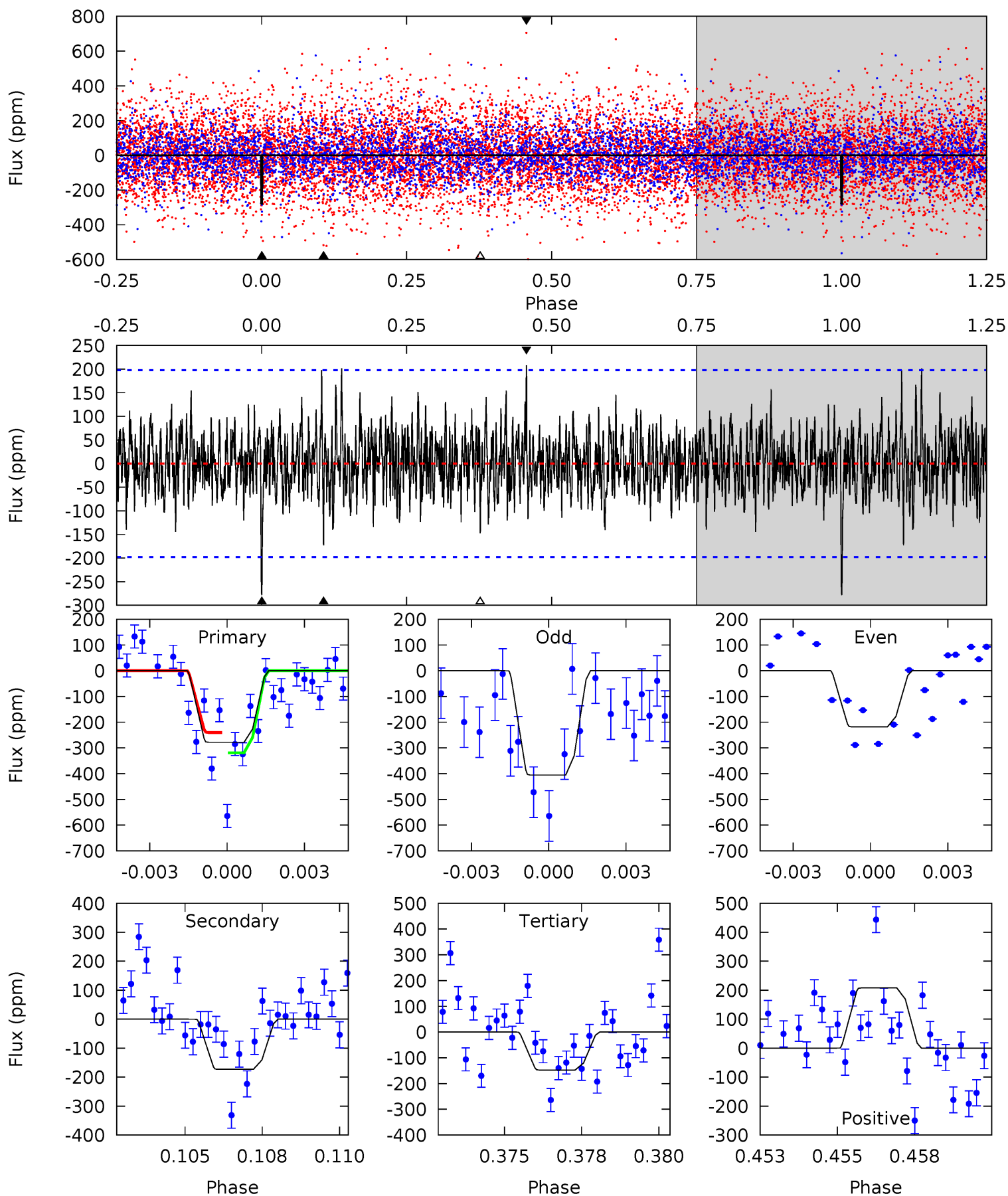
| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 9.30 | 4.46 | 4.16 | 4.72 | 5.24            | 2.94            | 1.36             | 5.15    | 4.58    | 0.31    | -0.25   | 0.02    | 0.75 | 0.34  | 0.18 |



# Alt Model-Shift Uniqueness Test

004380951-05, P = 39.076059 Days, E = 123.852674 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  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 7.43 | 4.62 | 3.95 | 5.56 | 5.29            | 3.02            | 1.39             | 3.49    | 1.88    | 0.68    | -0.93   | 2.37    | 0.98 | 0.43  | 1.04 |



### Stellar Parameters For KIC 004380951

|        | $T_{\text{eff}}(K)$ | $\log(g)$                 | [Fe/H]                    | $R (R_{\odot})$           | $M(M_{\odot})$            | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|---------------------|---------------------------|---------------------------|---------------------------|---------------------------|---|
|        | $6987^{+73}_{-94}$  | $4.148^{+0.073}_{-0.126}$ | $0.000^{+0.150}_{-0.150}$ | $1.690^{+0.337}_{-0.181}$ | $1.470^{+0.115}_{-0.094}$ | $0.429^{+0.155}_{-0.170}$                 |
|        | +1%/-1%             | +2%/-3%                   | +inf%/-inf%               | +20%/-11%                 | +8%/-6%                   | +36%/-40%                                 |
| Source | SPE68               | SPE68                     | SPE68                     | DSEP                      |                           |   |

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

### Secondary Eclipse Parameters for KIC 004380951-05 / KOI

| Detrend | Depth (ppm)   | $R_p (R_{\oplus})$     | $T_{max} (K)$      | $T_{obs} (K)$          | $A_{obs}$            |
|---------|---------------|------------------------|--------------------|------------------------|----------------------|
| DV      | $-125 \pm 28$ | $4.05^{+2.72}_{-2.49}$ | $1110^{+52}_{-36}$ | $5064^{+3439}_{-937}$  | $277^{+1751}_{-182}$ |
| Alt.    | $-173 \pm 37$ | $4.14^{+3.00}_{-2.49}$ | $1112^{+51}_{-36}$ | $5356^{+3486}_{-1066}$ | $346^{+1896}_{-227}$ |

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



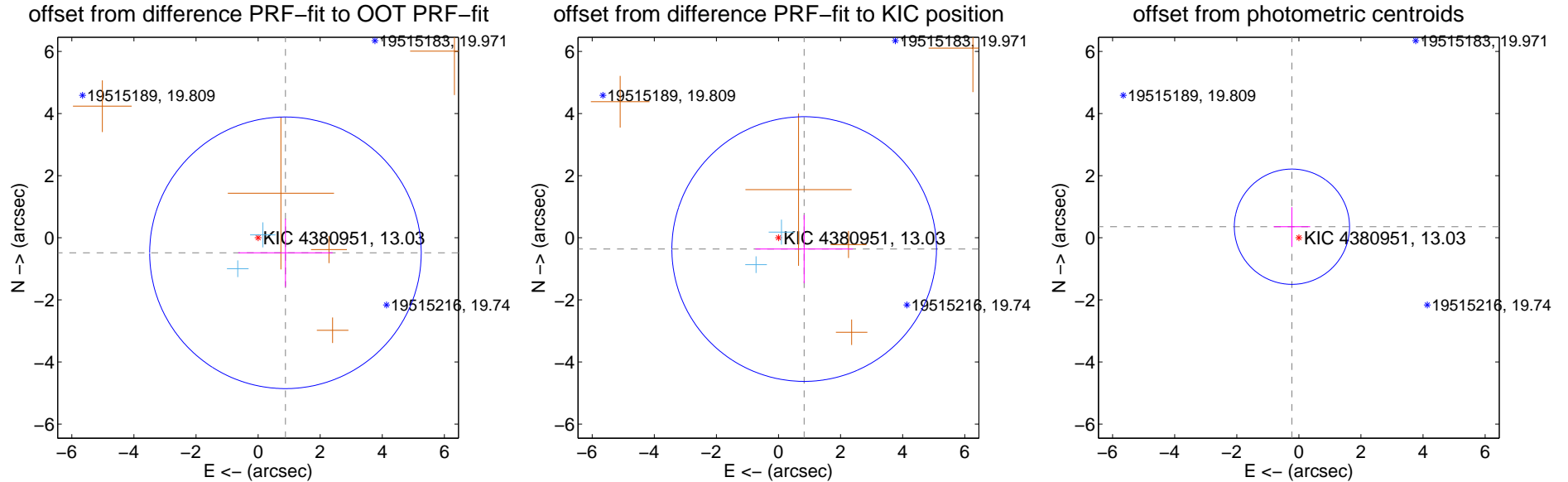
## DV Centroid Data

Supplemental centroid analysis for 004380951-05. Kepler magnitude: 13.03. Transit SNR 9.50

There are 2 quarters with good PRF difference image offsets

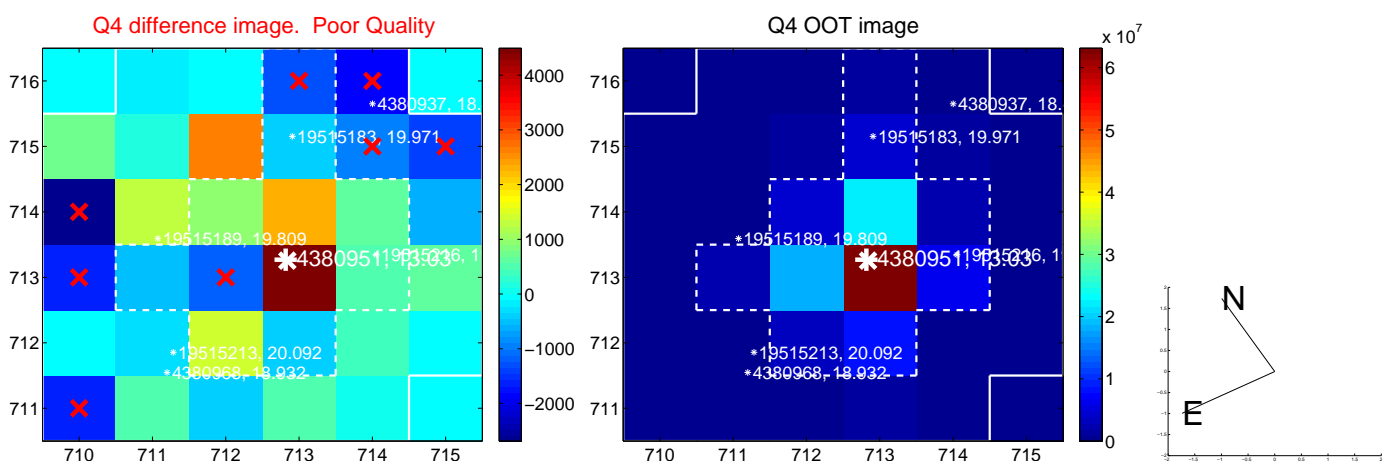
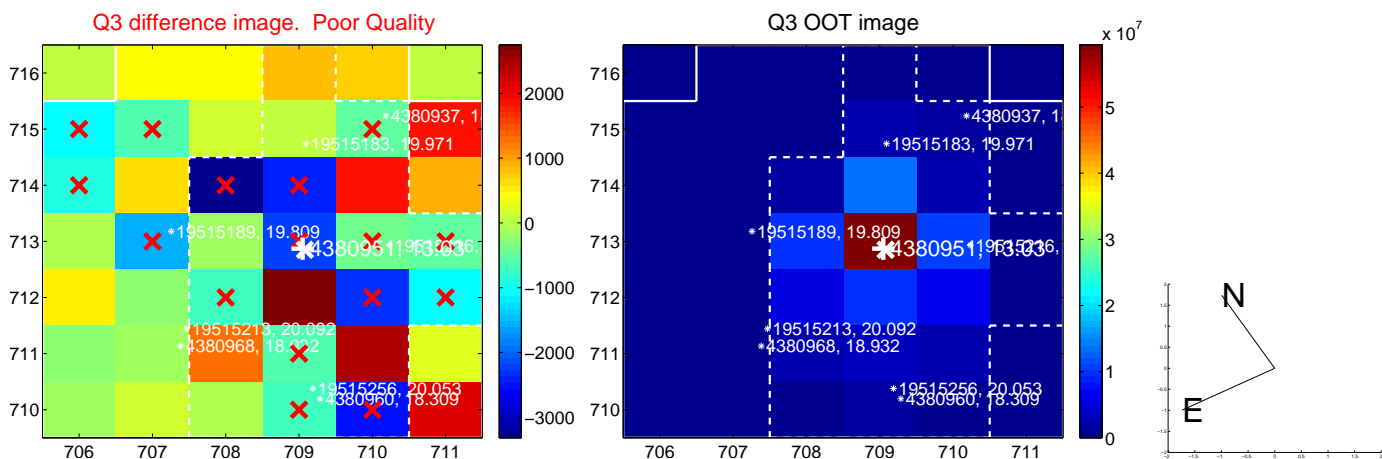
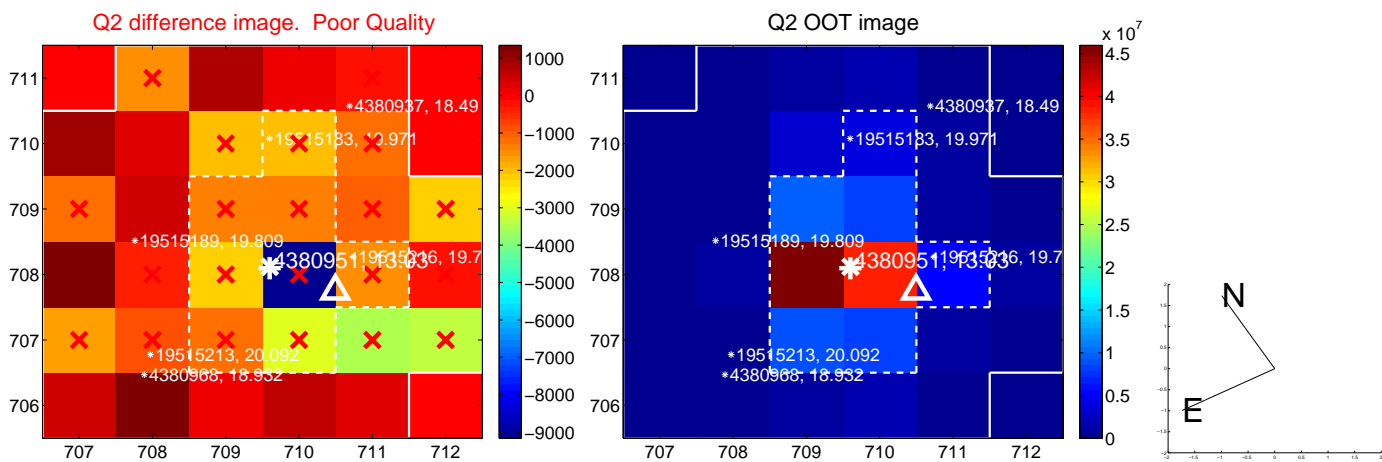
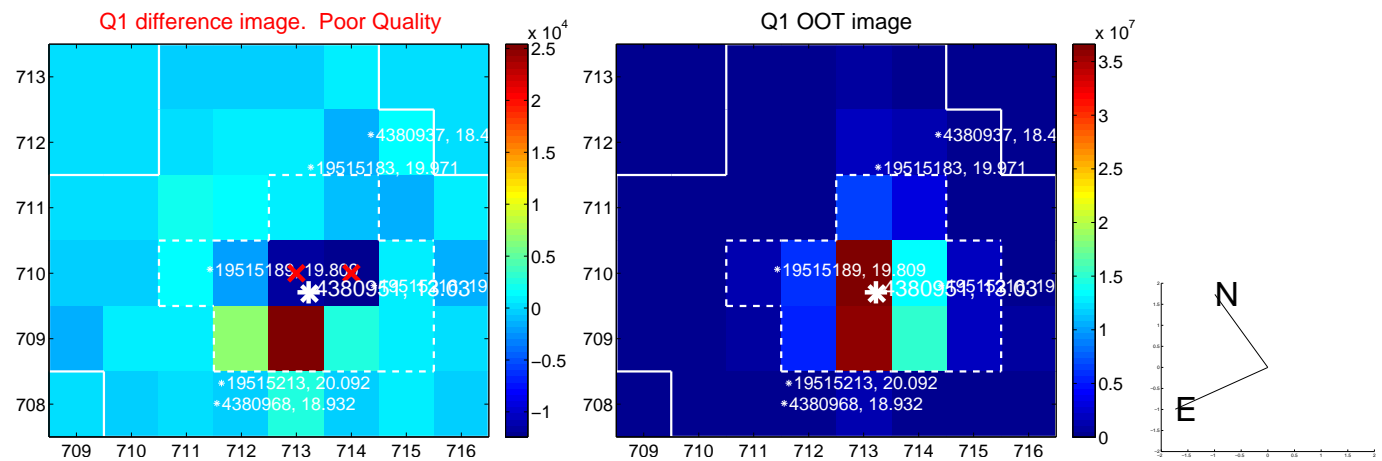
The direct PRF centroid is offset from the target star catalog position by about 0.17 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA        | $\Delta$ Dec       |
|---|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT          | $1.005 \pm 1.457$  | 0.69                | $-0.881 \pm 1.521$ | $-0.484 \pm 1.097$ |
| PRF-fit source offset from KIC position | $0.904 \pm 1.420$  | 0.64                | $-0.827 \pm 1.572$ | $-0.363 \pm 1.098$ |
| photometric centroid source offset      | $0.42 \pm 0.62$    | 0.68                | $0.22 \pm 0.59$    | $0.36 \pm 0.63$    |

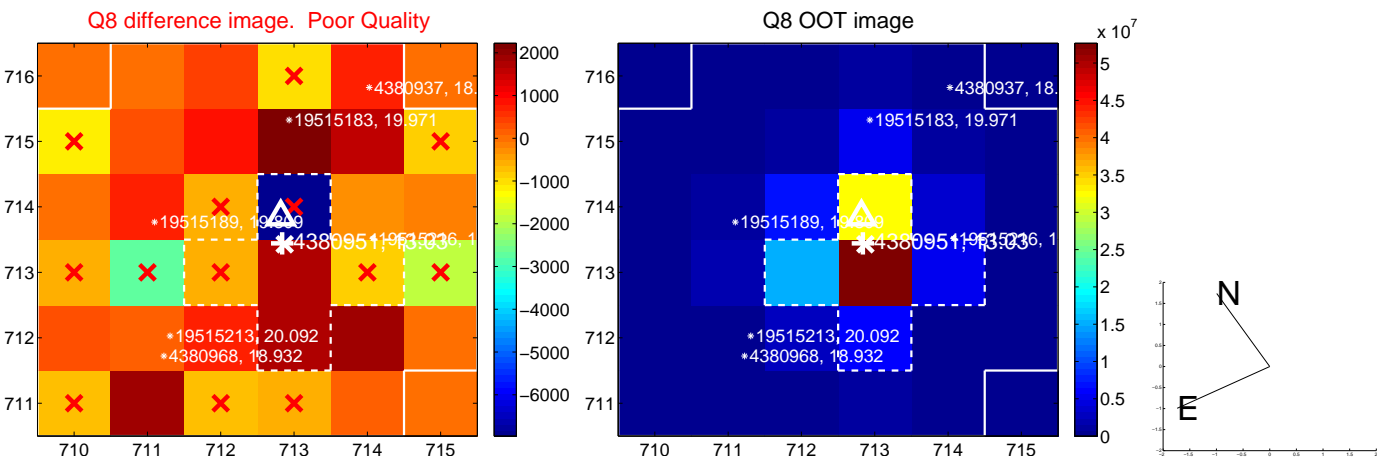
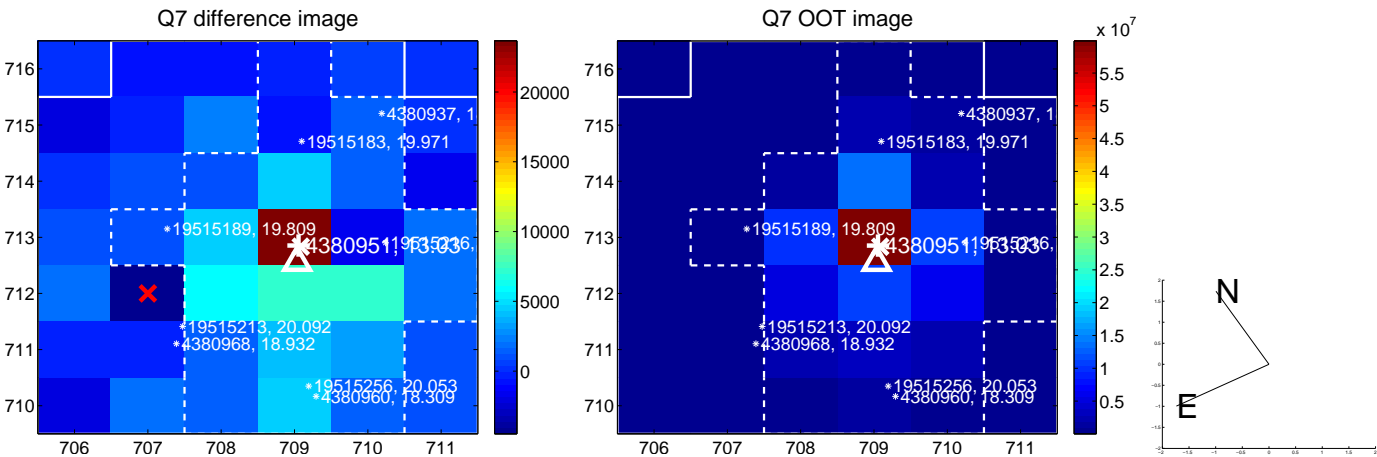
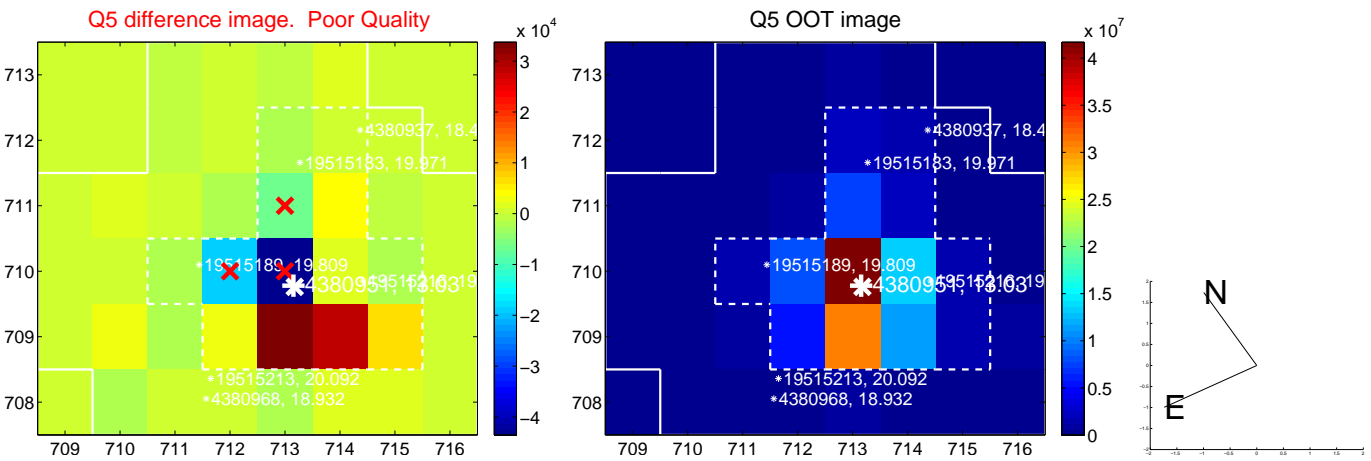


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

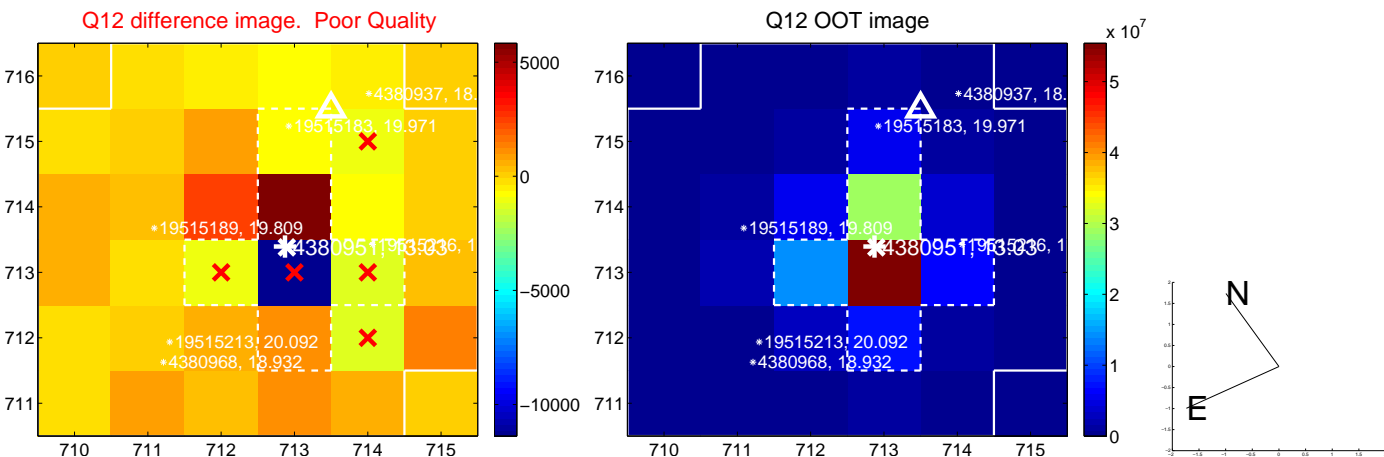
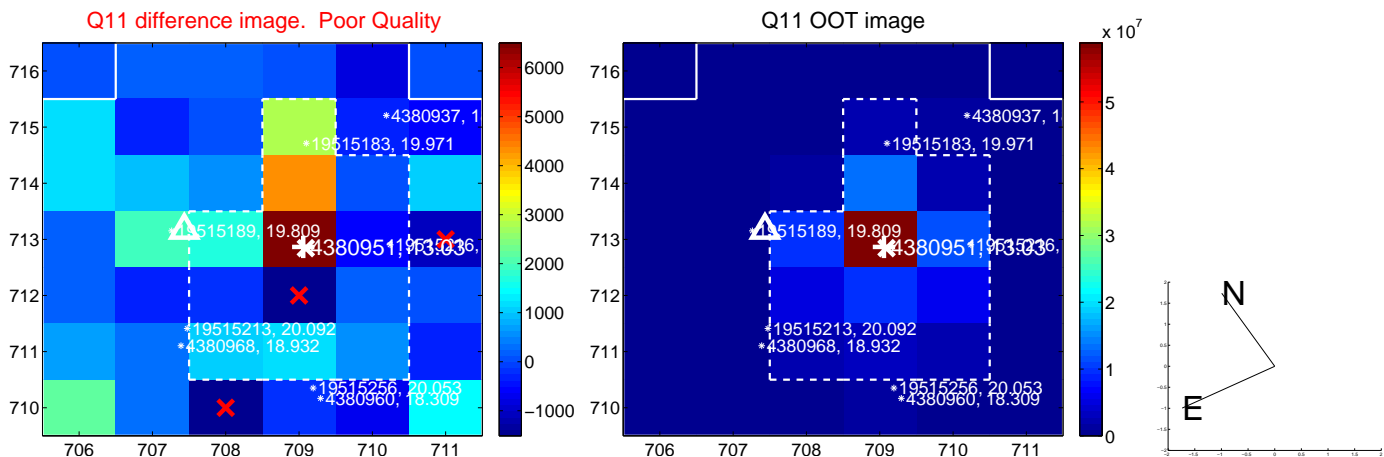
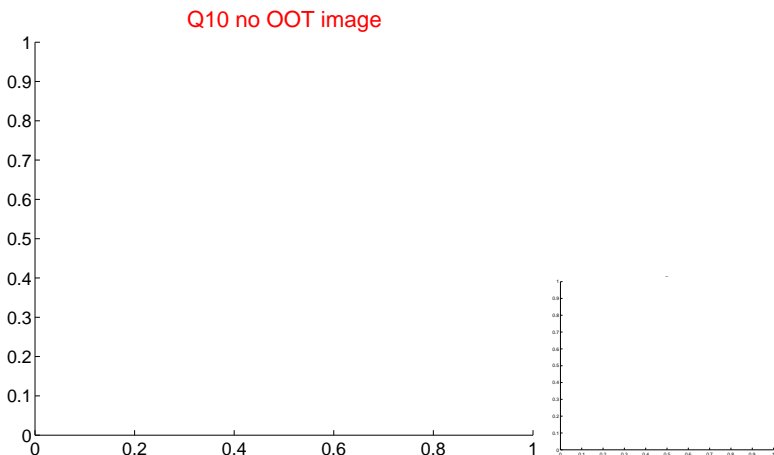
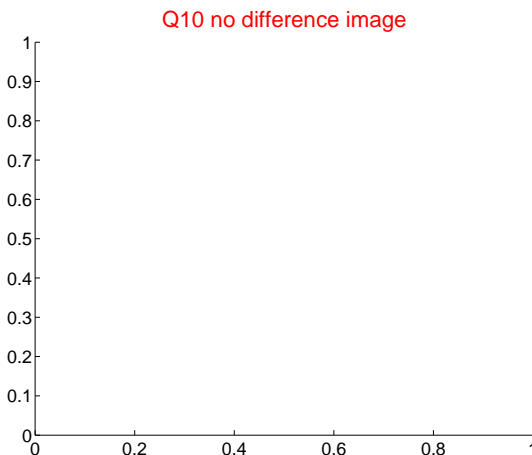
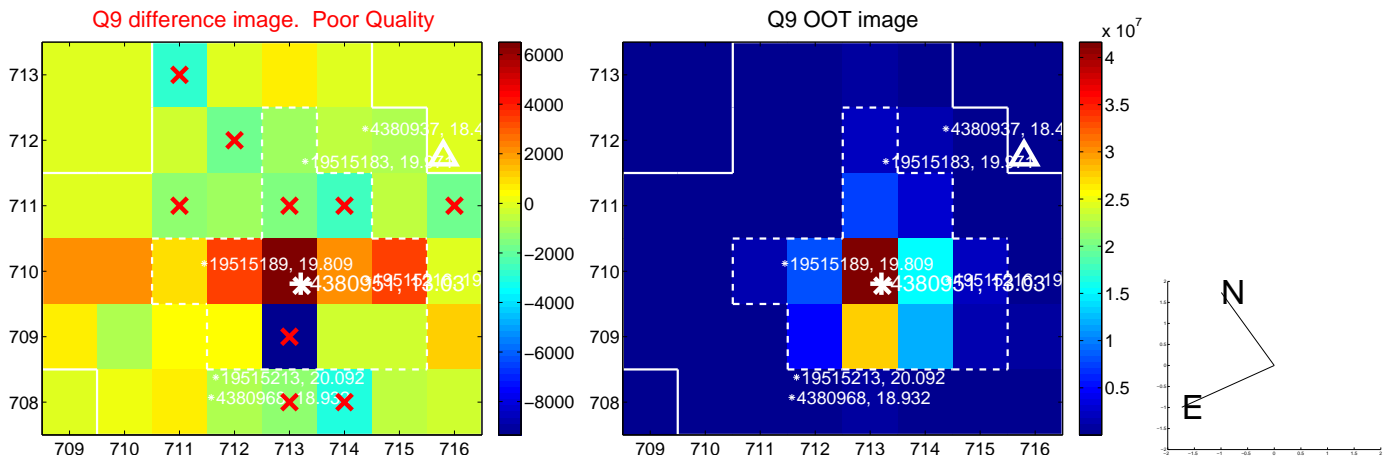
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



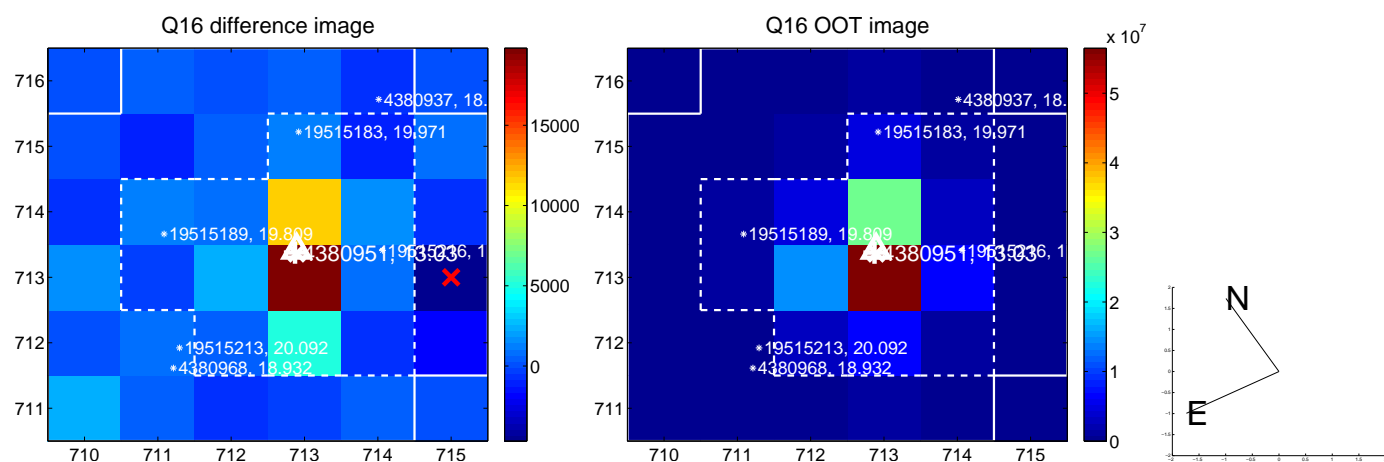
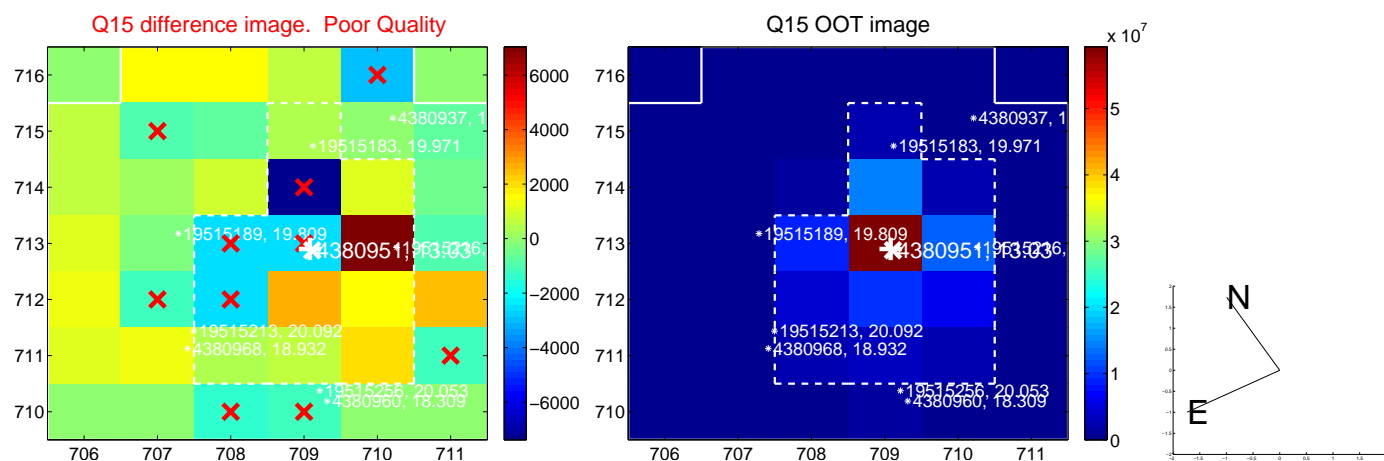
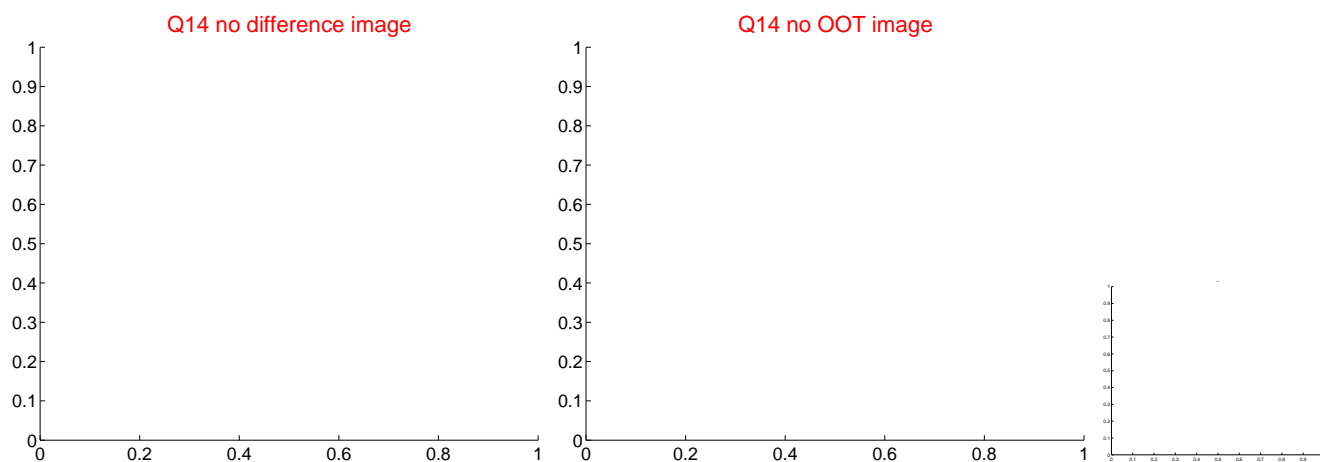
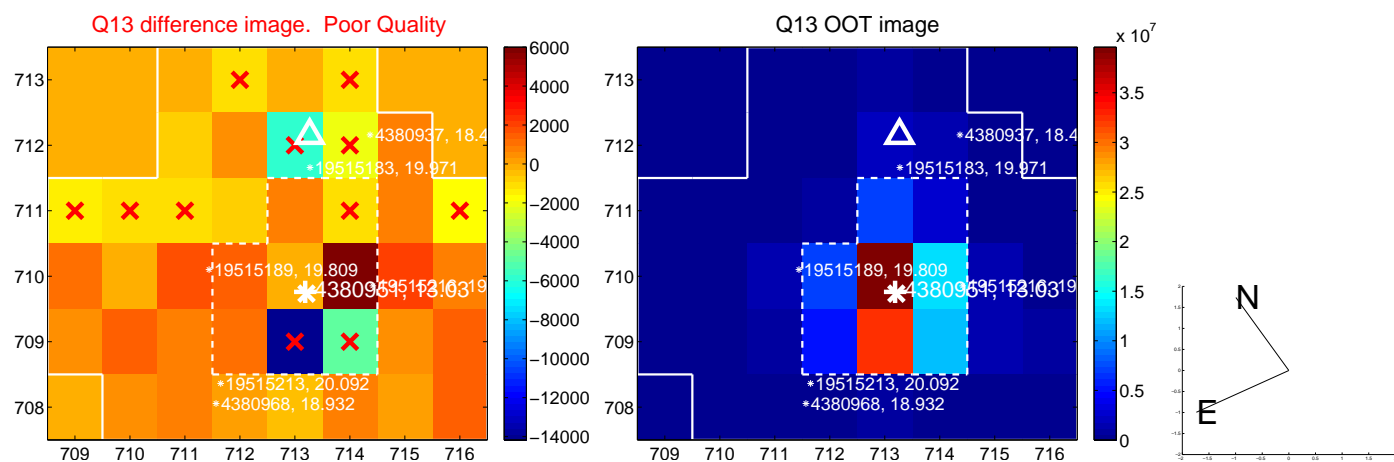
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



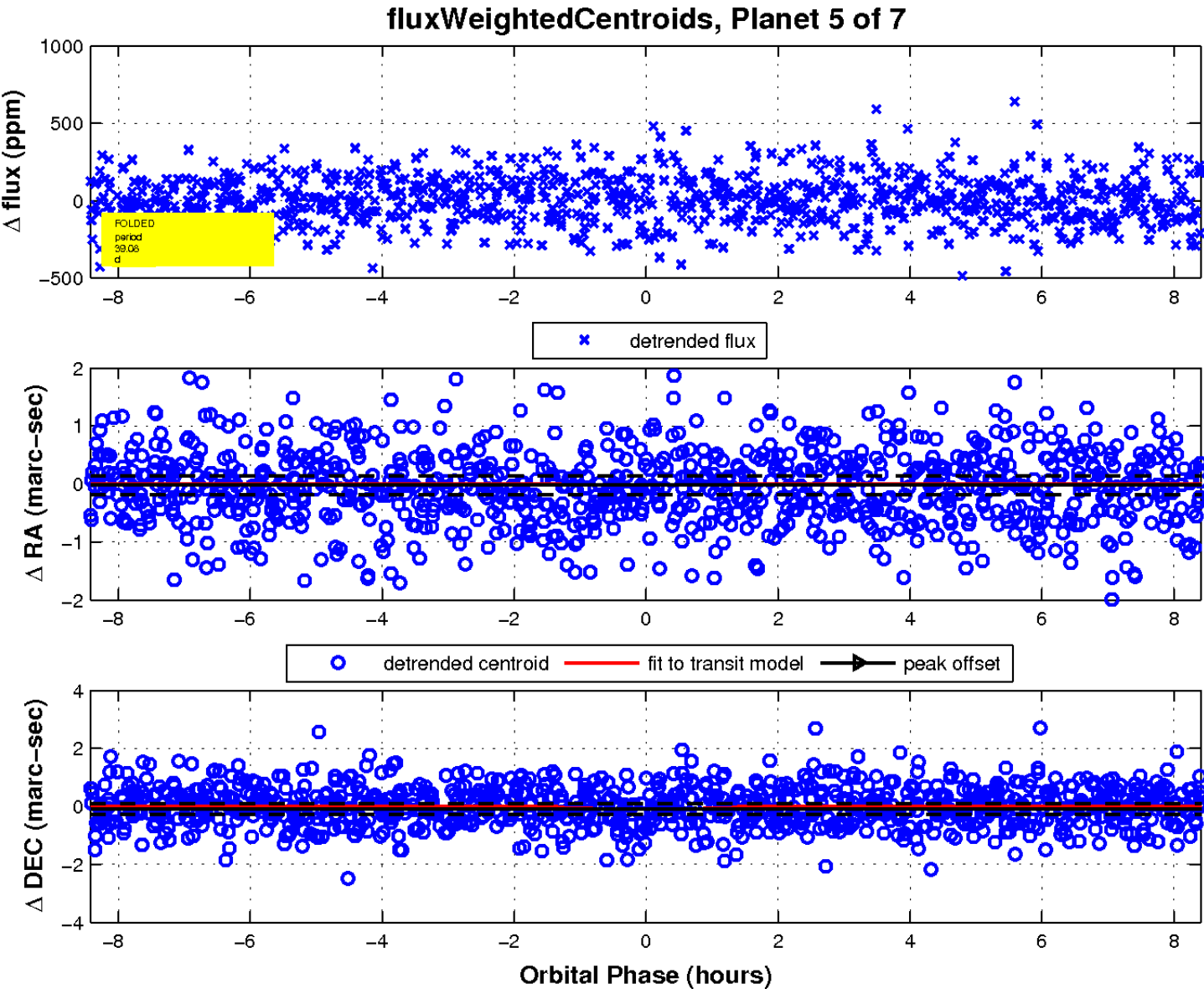
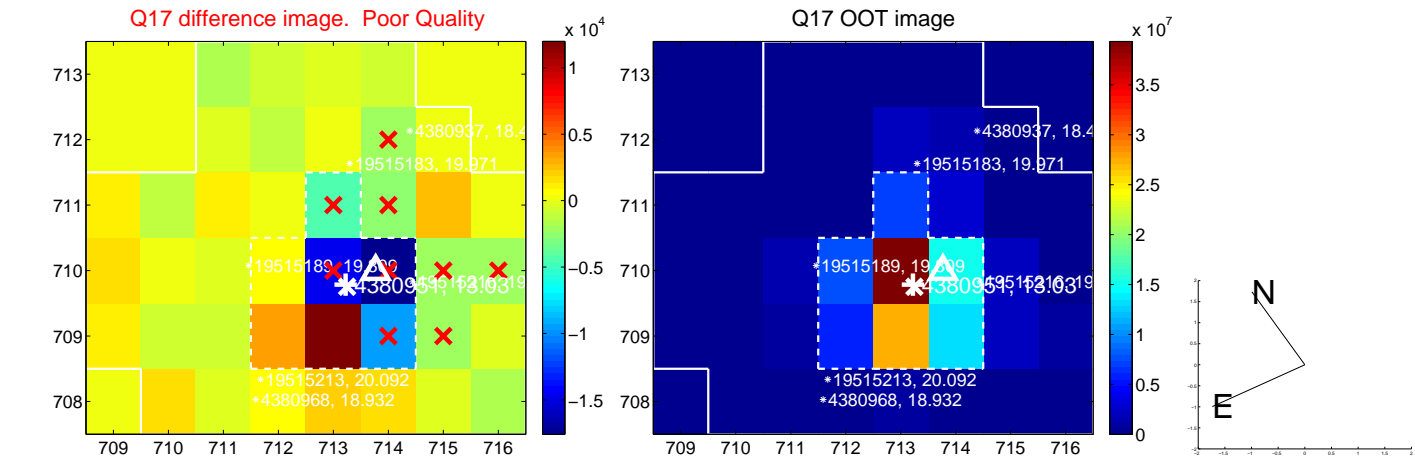
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

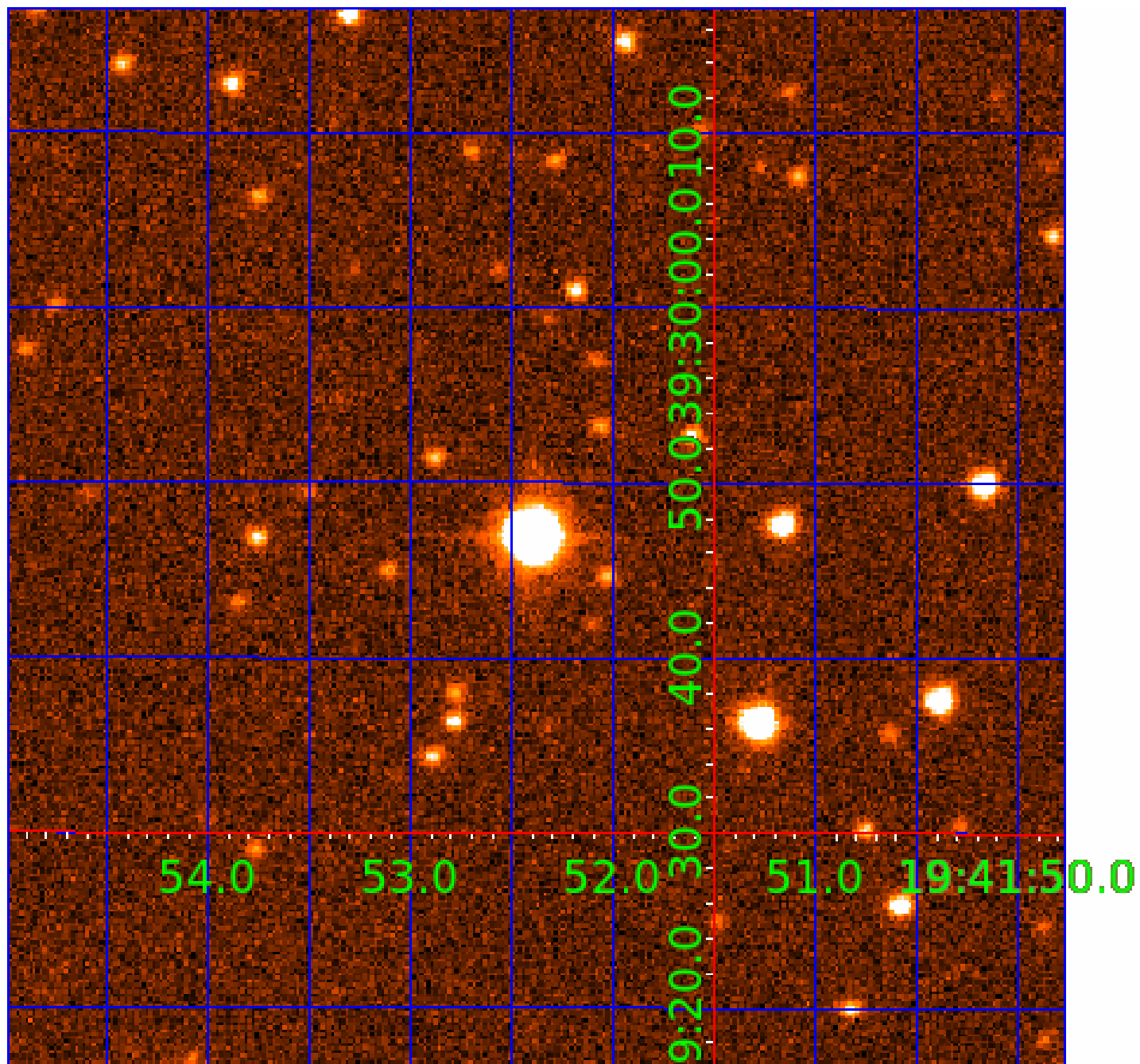


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 004380951

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|-----|-----|-----------------------------|-----------------|------------------------|------------------------|
| 004380951-01 | OBS      | No   | 1.329873      | 131.714534   | 3.1         | 8.483            | 8.7 | 1.6 | 1.69                        | 6987            | 0.30                   | 8437.91                |
| 004380951-02 | OBS      | No   | 38.804254     | 144.305723   | 217.6       | 2.933            | 8.7 | 9.3 | 1.69                        | 6987            | 2.87                   | 93.93                  |
| 004380951-03 | OBS      | No   | 329.705651    | 198.955327   | 267.4       | 3.373            | 8.0 | 8.3 | 1.69                        | 6987            | 3.18                   | 5.42                   |
| 004380951-04 | OBS      | No   | 22.246372     | 142.363914   | 177.5       | 2.213            | 7.9 | 9.0 | 1.69                        | 6987            | 2.65                   | 197.23                 |
| 004380951-05 | OBS      | No   | 39.076285     | 162.919519   | 278.8       | 2.808            | 7.9 | 9.5 | 1.69                        | 6987            | 3.15                   | 93.06                  |
| 004380951-06 | OBS      | No   | 41.434921     | 134.573939   | 114.5       | 3.708            | 7.6 | 6.3 | 1.69                        | 6987            | 2.10                   | 86.06                  |
| 004380951-07 | OBS      | No   | 37.357923     | 153.030015   | 155.1       | 2.085            | 8.5 | 5.7 | 1.69                        | 6987            | 2.60                   | 98.81                  |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments  |
|--------------|----------|------|-------|---|---|---|---|---|
| 004380951-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—MOD_NONUNIQ_DV   |
| 004380951-02 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT  |
| 004380951-03 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_CHASES_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS |
| 004380951-04 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT                                      |
| 004380951-05 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT                                      |
| 004380951-06 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT                                |
| 004380951-07 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT—CENT_FEW_MEAS                         |

**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.

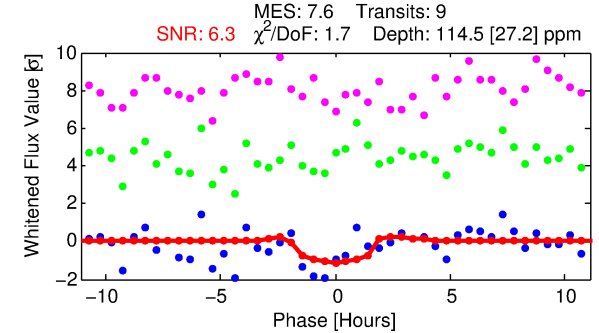
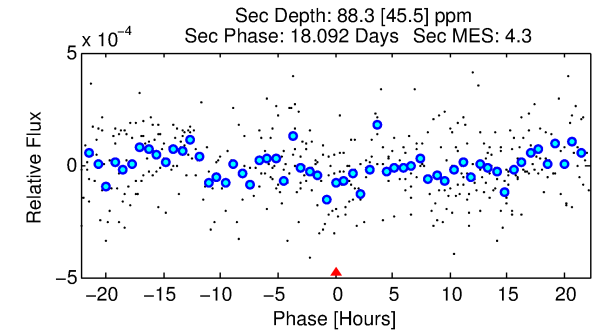
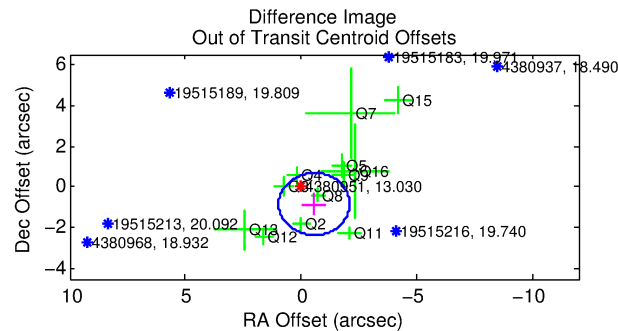
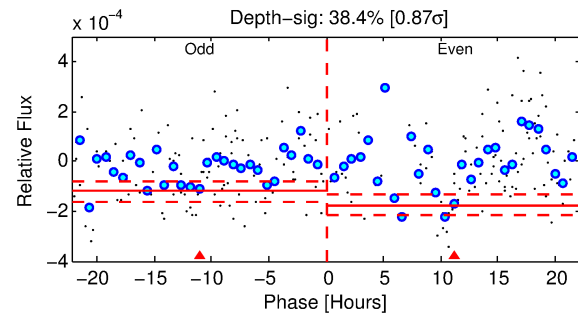
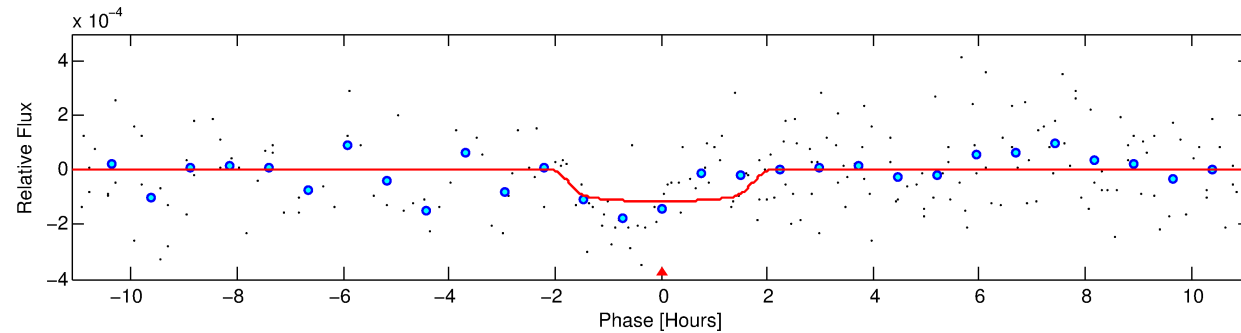
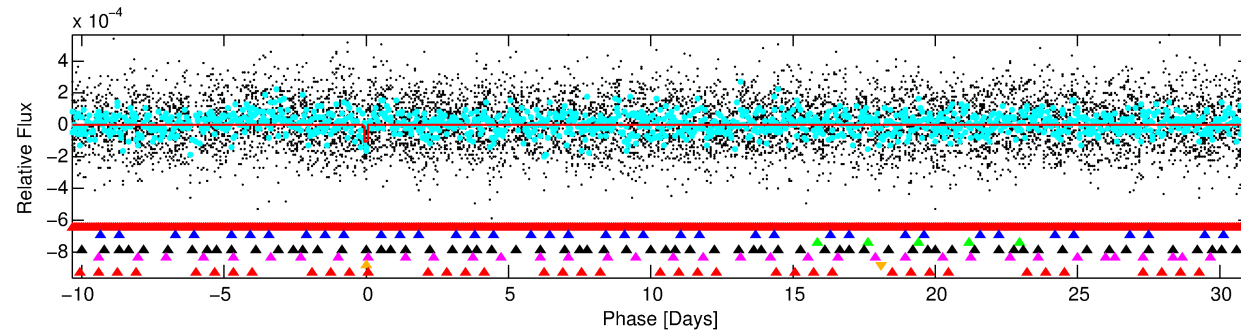
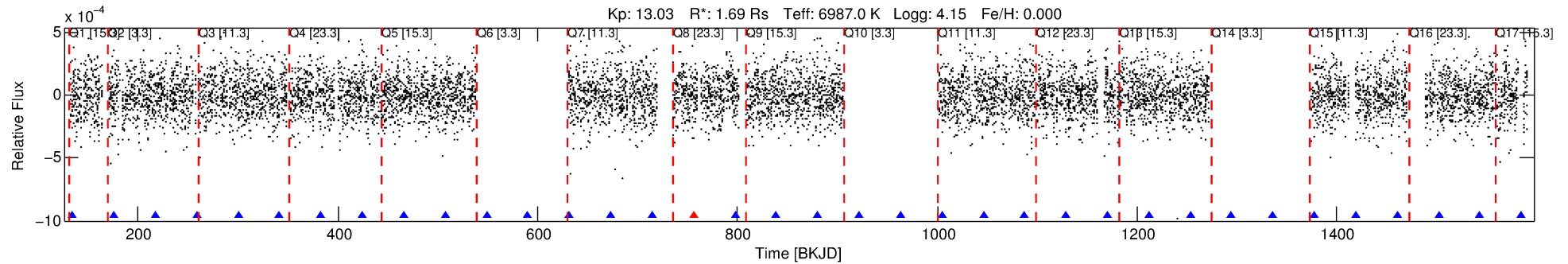
Ephemeris Match Information For 004380951-06

No Significant Match Found



# DV One-Page Summary

KIC: 4380951 Candidate: 6 of 7 Period: 41.435 d



## DV Fit Results:

Period = 41.43492 [0.00070] d  
Epoch = 134.5739 [0.0142] BKJD  
Rp/R\* = 0.0114 [0.0103]  
a/R\* = 39.08 [216.54]  
b = 0.90 [1.15]  
Seff = 86.06 [20.72]  
Teq = 777 [47] K  
Rp = 2.11 [1.95] Re  
a = 0.2662 [0.0438] AU  
Ag = 776.85 [1472.16] [0.53 $\sigma$ ]  
Teffp = 6340 [2981] K [1.87 $\sigma$ ]

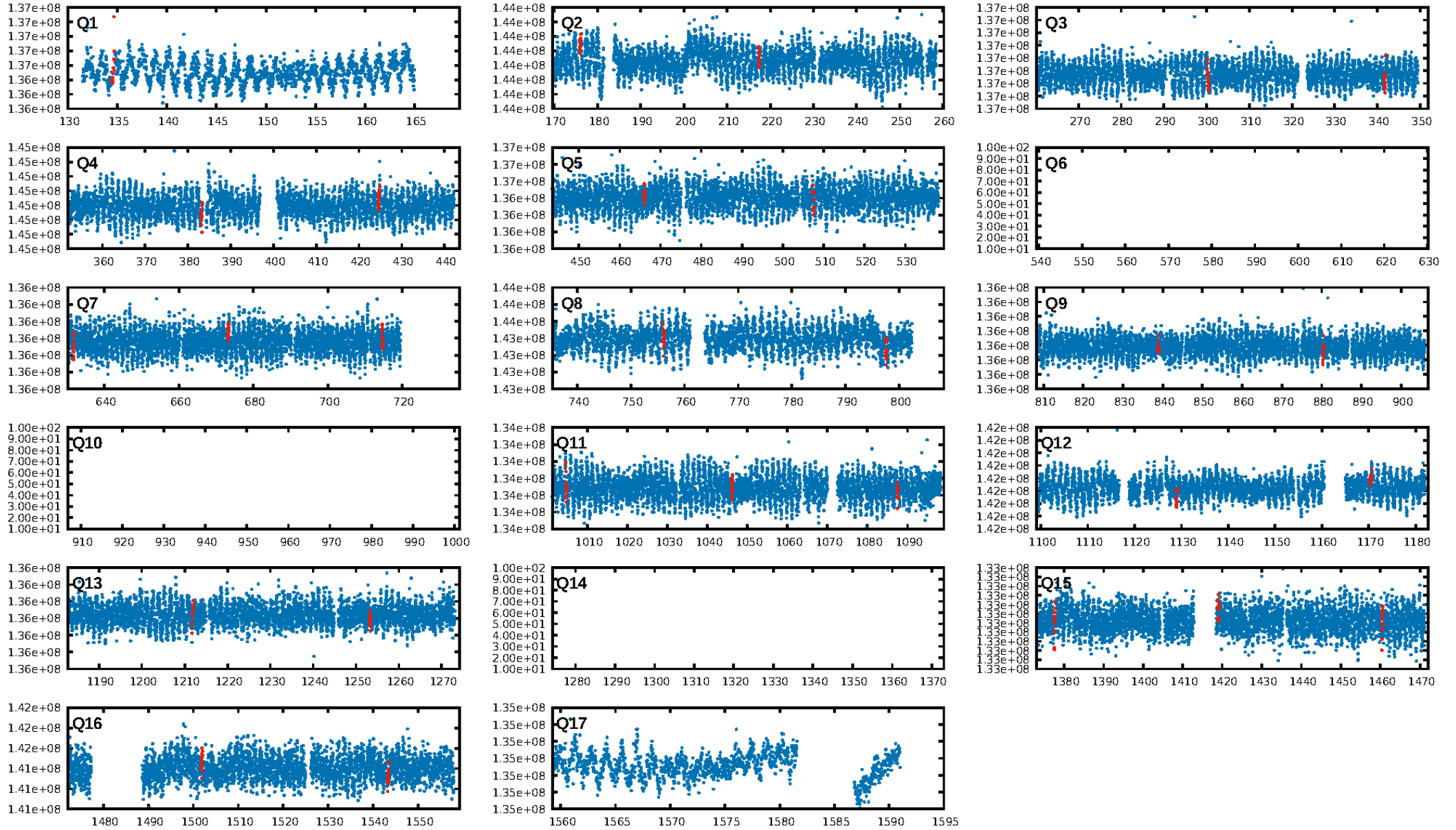
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [12.17 $\sigma$ ]  
LongPeriod-sig: 100.0% [1380.22 $\sigma$ ]  
ModelChiSquare2-sig: 20.1%  
ModelChiSquareGof-sig: 99.6%  
**Bootstrap-pfa: 3.56e-07**  
RollingBand-fgt: 0.89 [8/9]  
GhostDiagnostic-chr: 3.229  
Centroid-sig: 38.3%  
Centroid-so: 1.040 arcsec [0.78 $\sigma$ ]  
OotOffset-rm: 1.007 arcsec [1.98 $\sigma$ ]  
OotOffset-st: 1/4/4/3 [12]  
KicOffset-rm: 0.896 arcsec [1.76 $\sigma$ ]  
KicOffset-st: 1/4/4/3 [12]  
DiffImageQuality-fgm: 0.67 [8/12]  
DiffImageOverlap-fno: 0.38 [5/13]

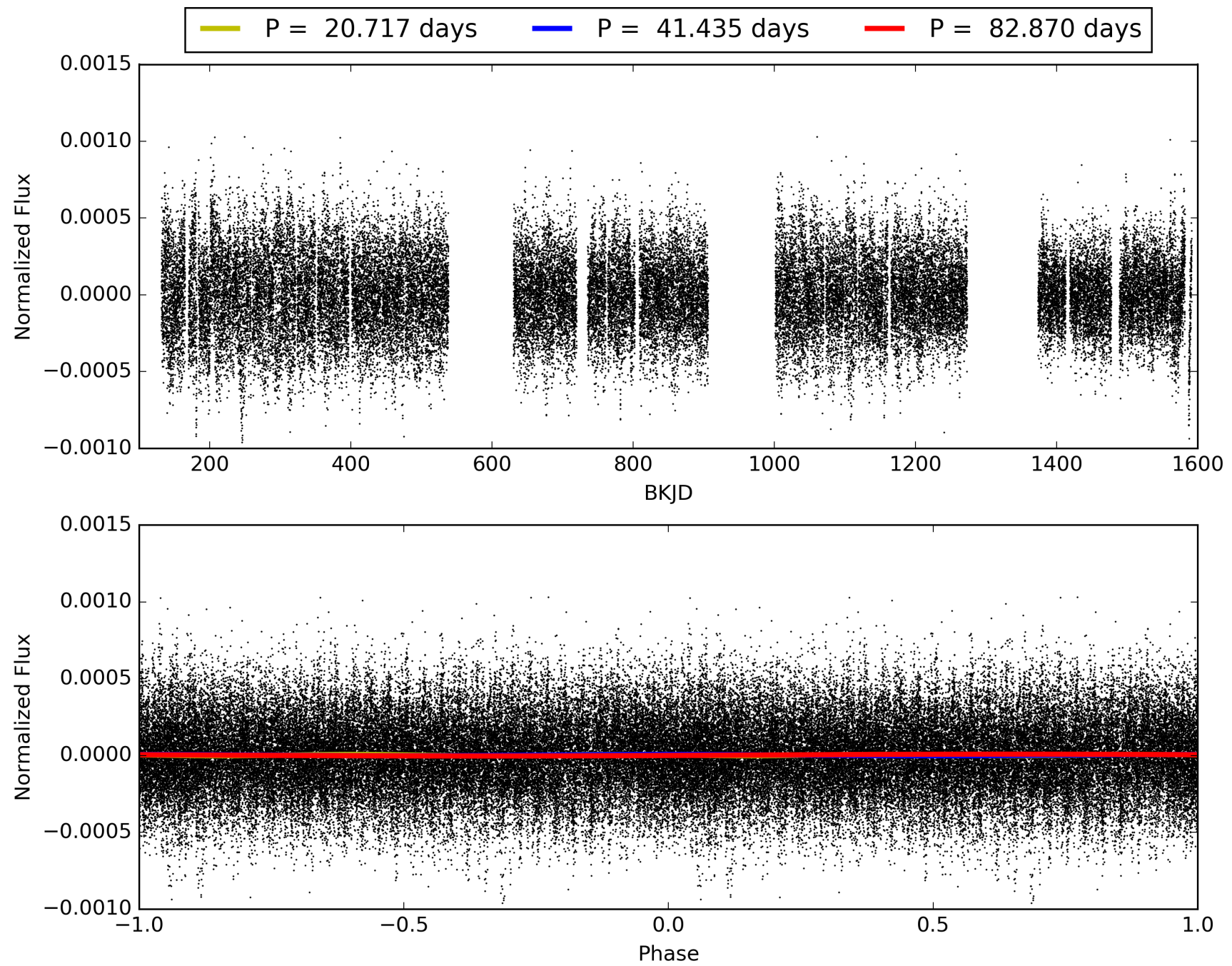
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 16:46:50 Z

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

# TCE 004380951-06, PDC Light Curves

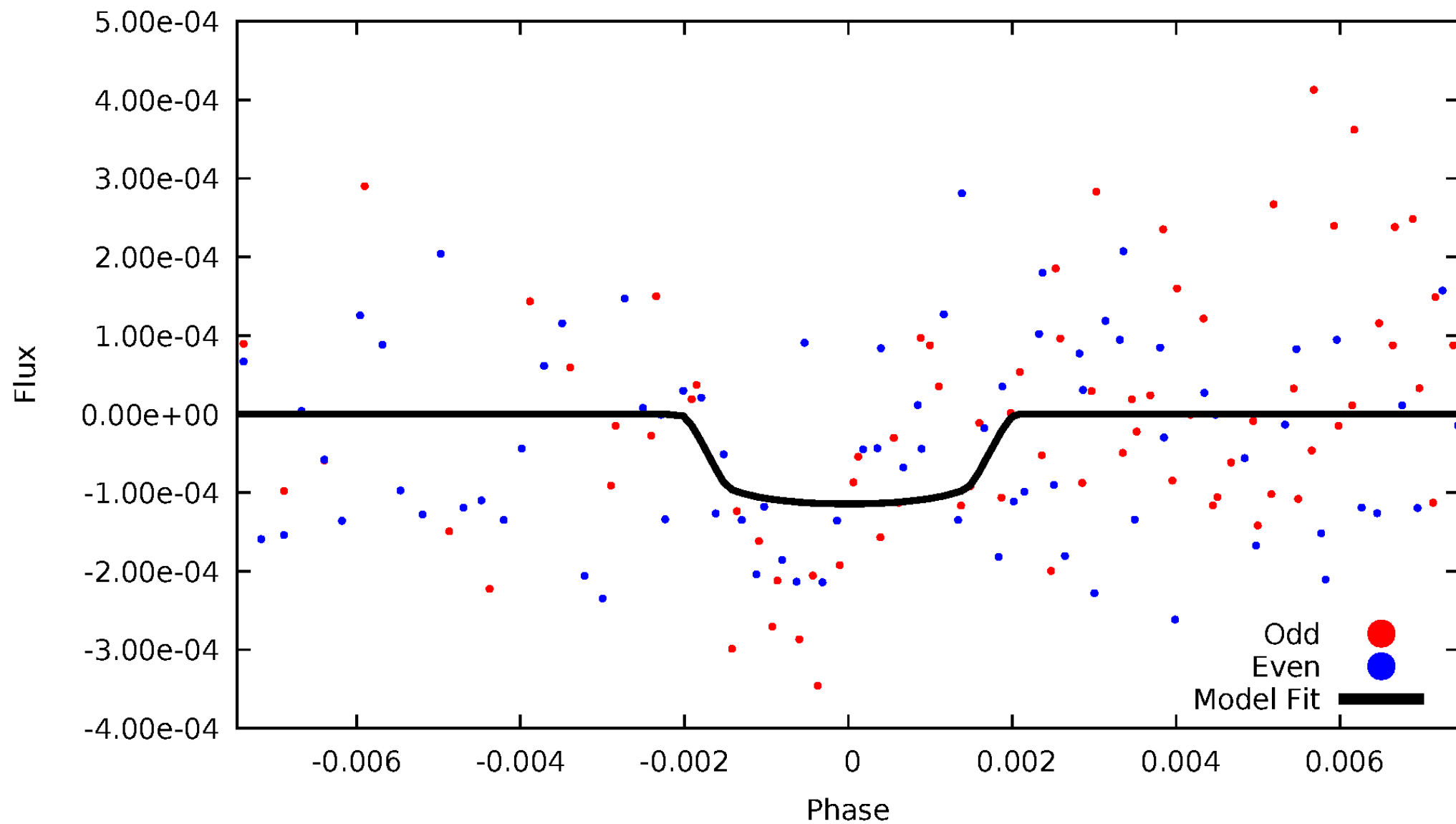


TCE 004380951-06



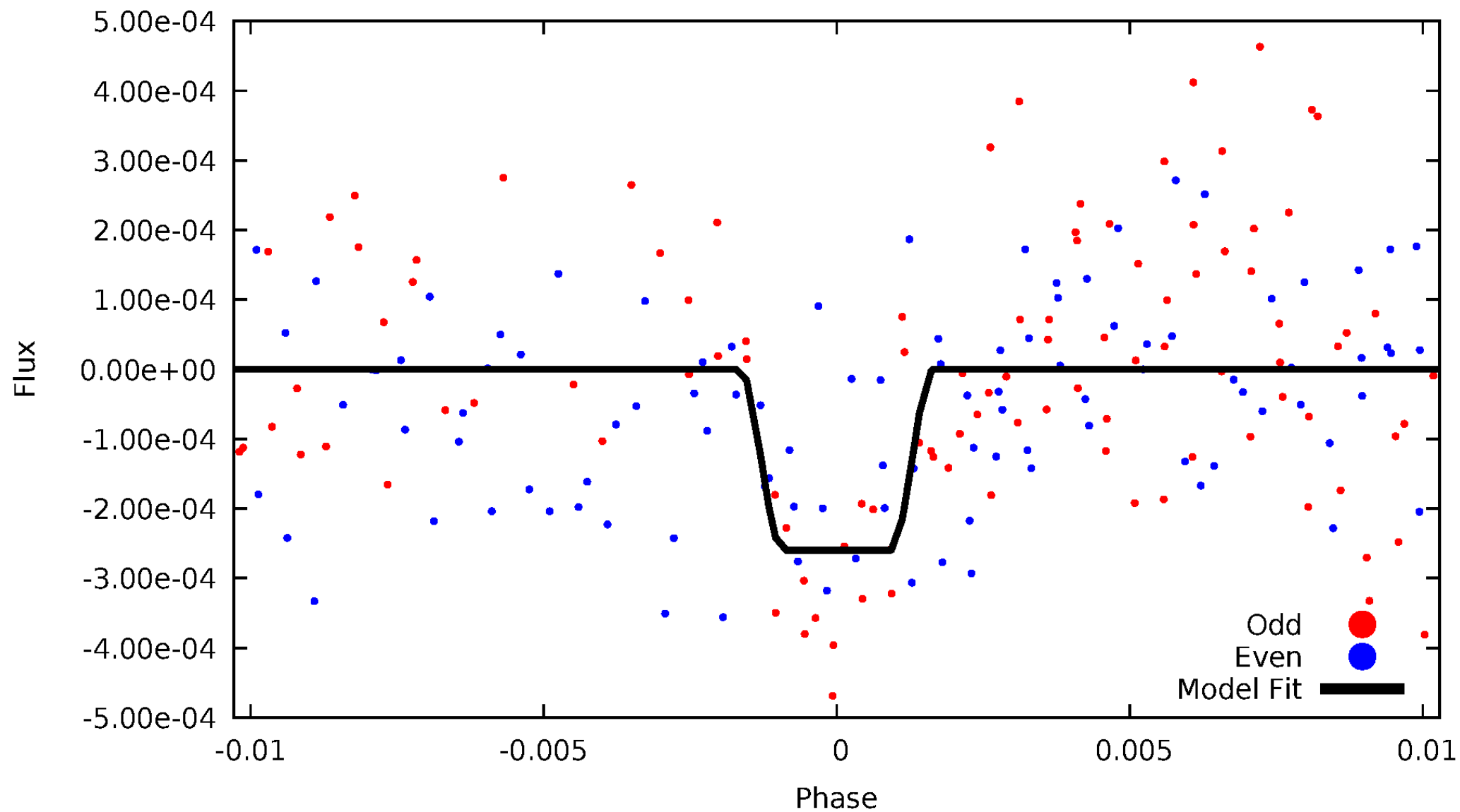
# DV Odd/Even

TCE 004380951-06



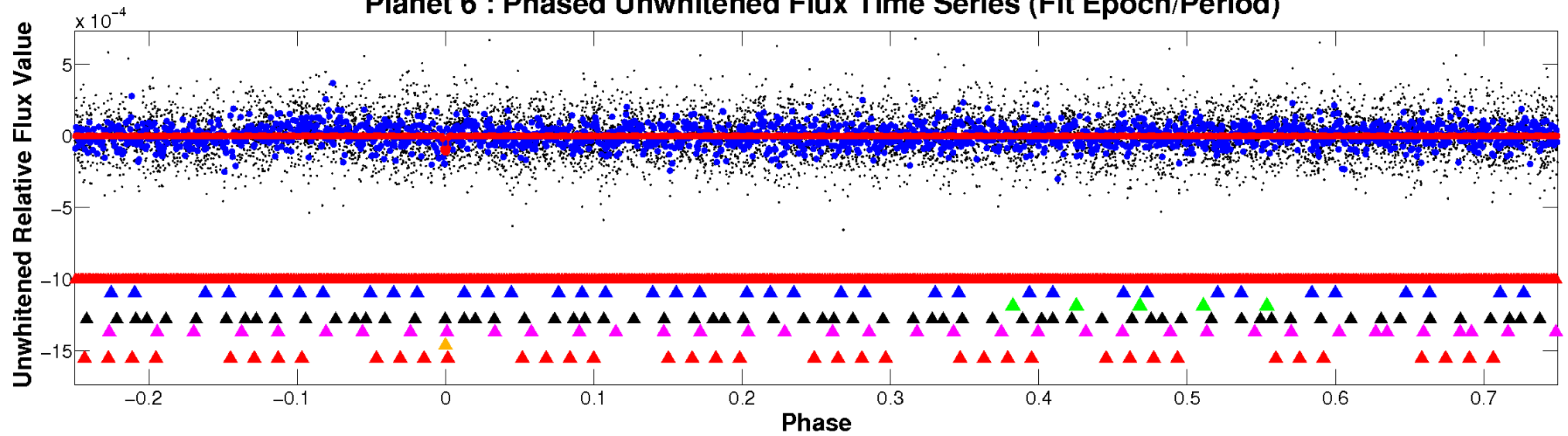
# ALT Odd/Even

TCE 004380951-06

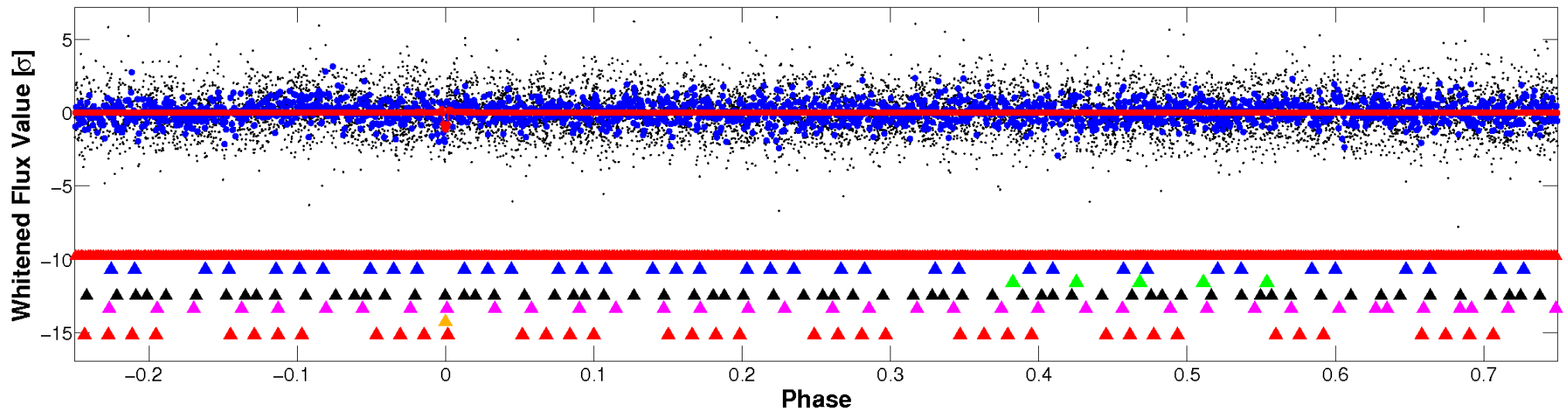


# Non-Whitened Vs. Whitened Light Curve

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



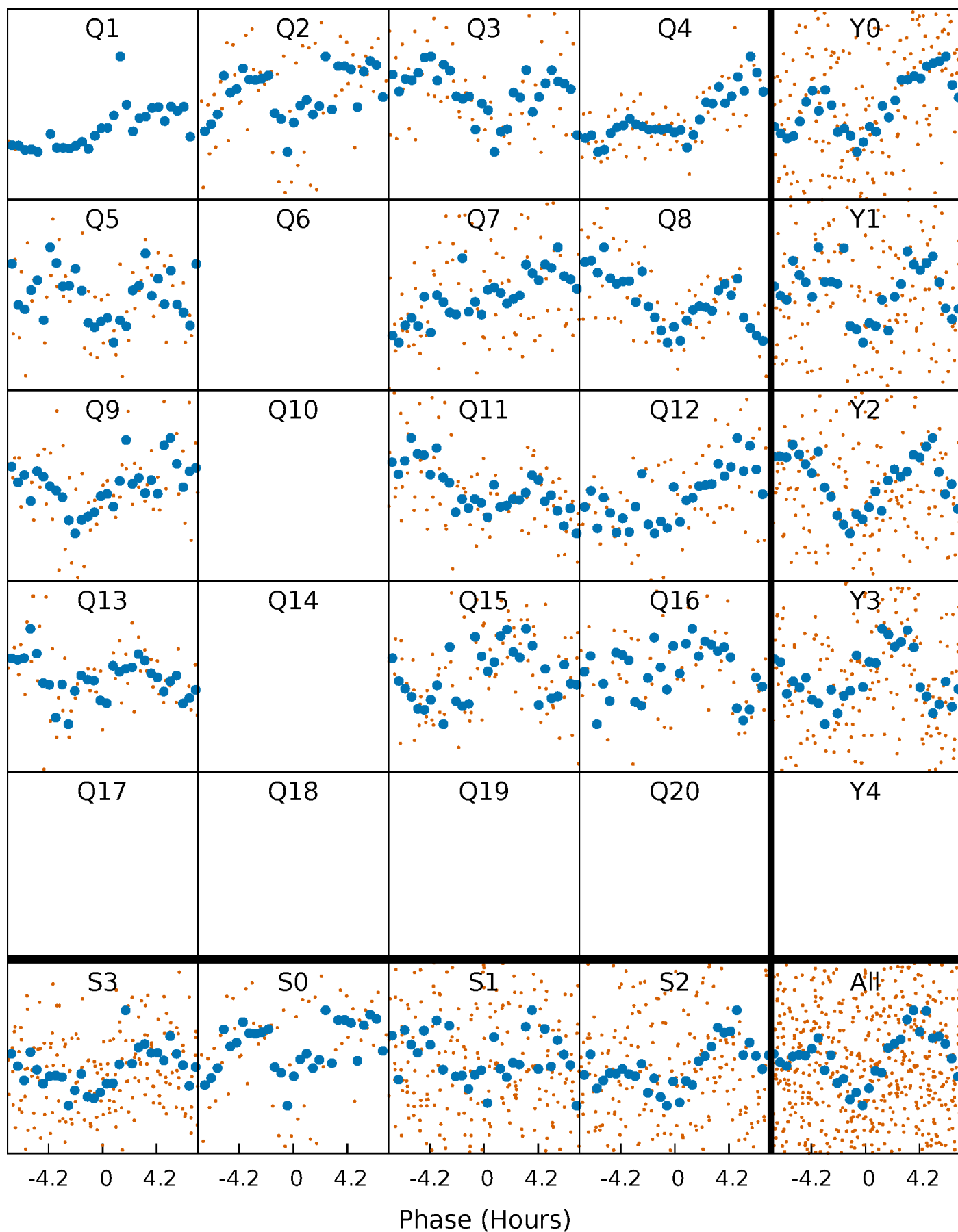
## Planet 6 : Phased Whitened Flux Time Series (Fit Epoch/Period)





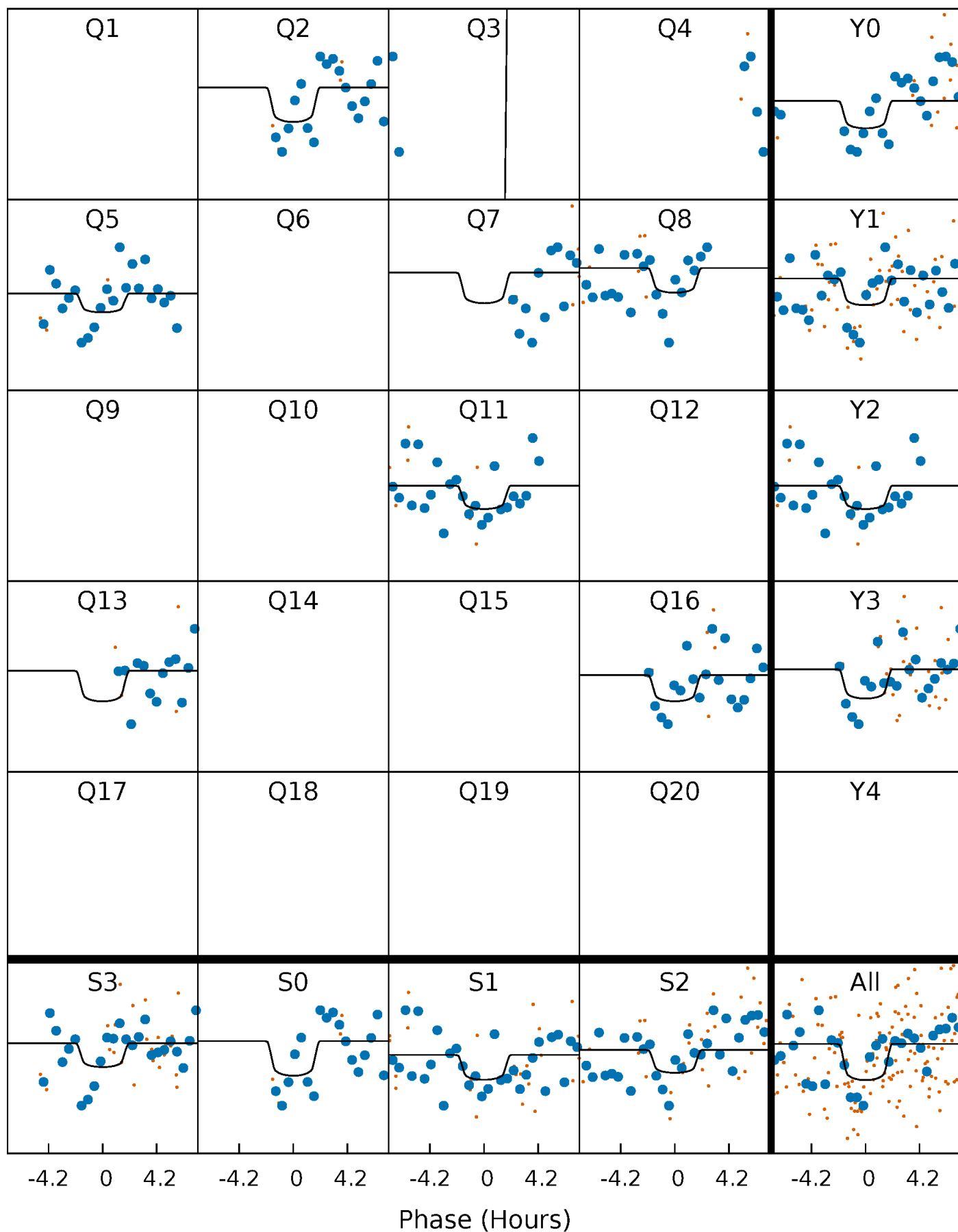
# PDC Quarter-Phased Transit Curves

TCE 004380951-06 P= 41.434921 Days  $T_0=134.573939$  (BKJD)



# DV Quarter-Phased Transit Curves

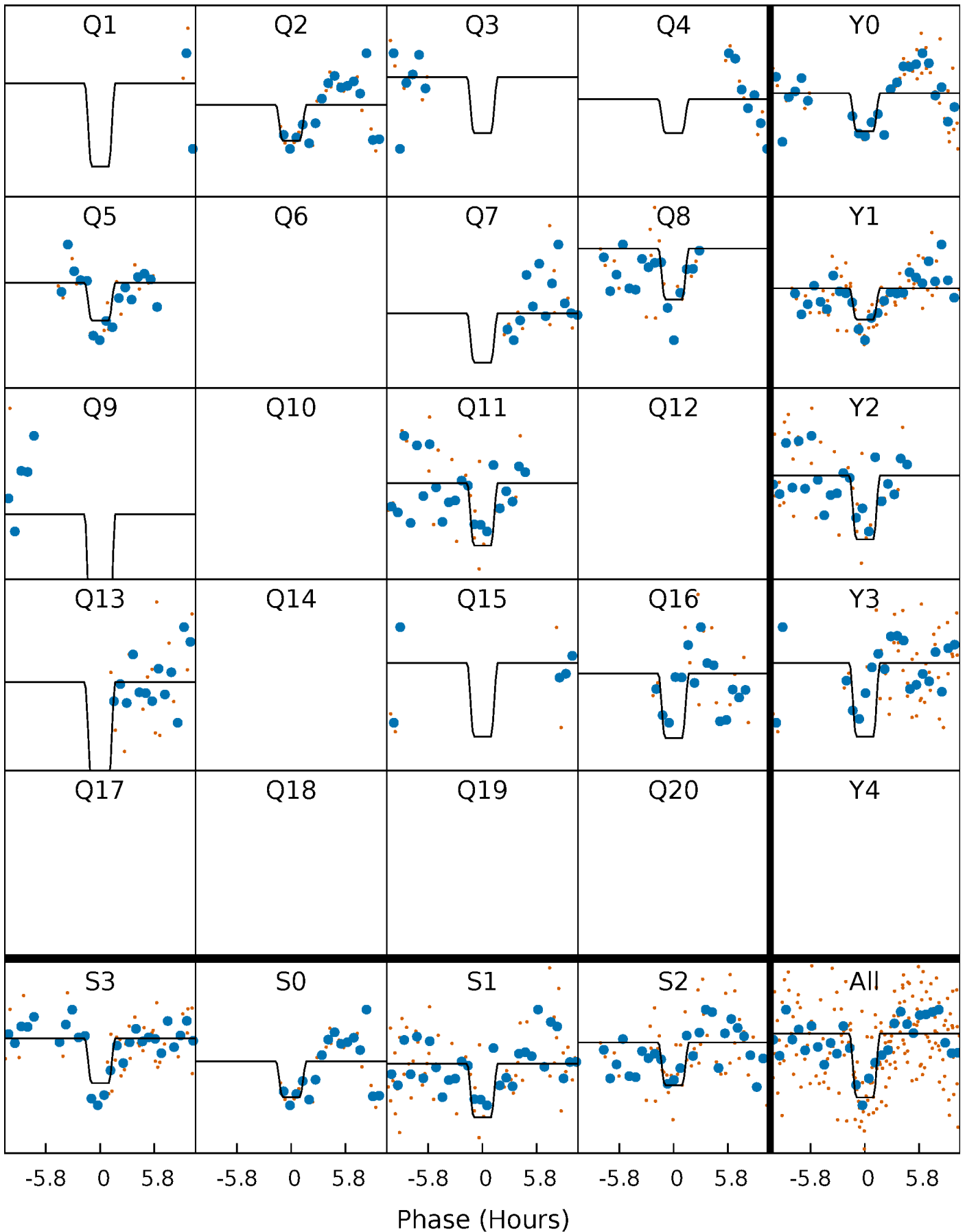
TCE 004380951-06 P= 41.434921 Days  $T_0=134.573939$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

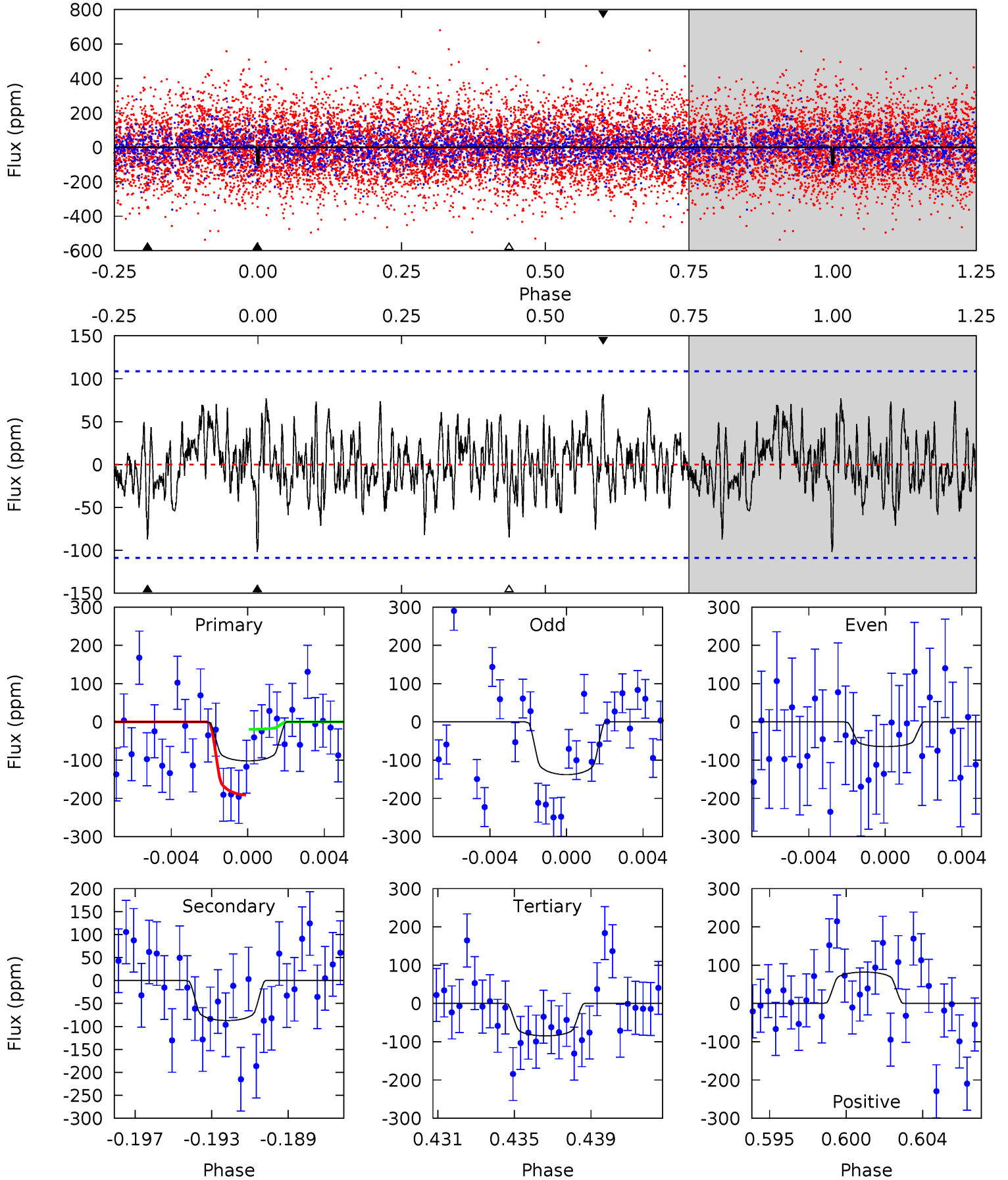
TCE 004380951-06   P= 41.435421 Days    $T_0=134.553710$  (BKJD)



# DV Model-Shift Uniqueness Test

004380951-06, P = 41.434921 Days, E = 93.139018 Days

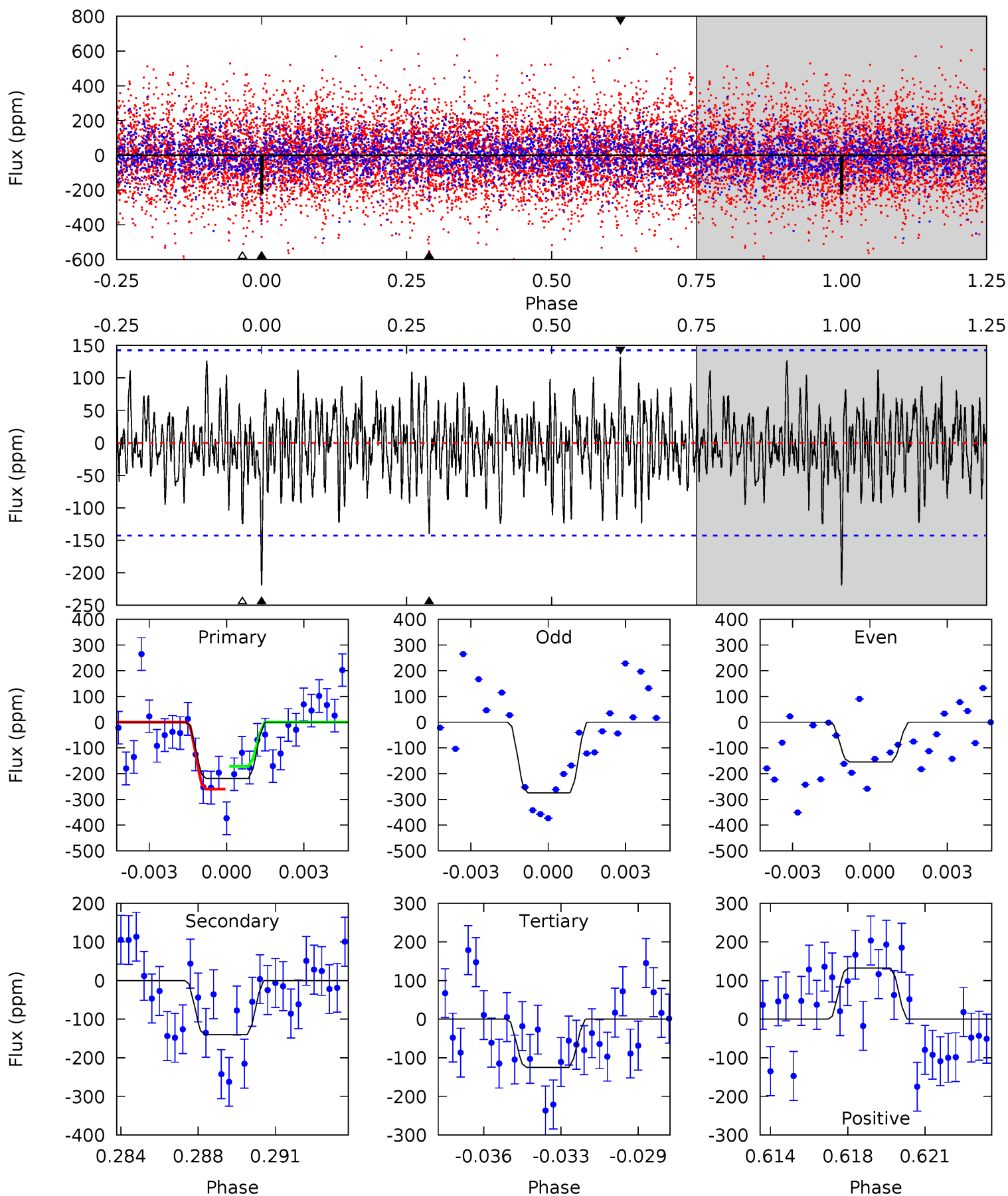
| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 4.87 | 4.16 | 4.04 | 3.91 | 5.19            | 2.87            | 1.34             | 0.83    | 0.96    | 0.12    | 0.25    | 1.75    | 0.68 | 0.45  | 4.09 |



# Alt Model-Shift Uniqueness Test

004380951-06, P = 41.435421 Days, E = 93.118289 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  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 8.04 | 5.14 | 4.59 | 4.87 | 5.24            | 2.94            | 1.62             | 3.45    | 3.17    | 0.55    | 0.28    | 2.23    | 0.81 | 0.38  | 1.63 |



### Stellar Parameters For KIC 004380951

|        | $T_{\text{eff}}(K)$ | $\log(g)$                 | [Fe/H]                    | $R (R_{\odot})$           | $M(M_{\odot})$            | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|---------------------|---------------------------|---------------------------|---------------------------|---------------------------|---|
|        | $6987^{+73}_{-94}$  | $4.148^{+0.073}_{-0.126}$ | $0.000^{+0.150}_{-0.150}$ | $1.690^{+0.337}_{-0.181}$ | $1.470^{+0.115}_{-0.094}$ | $0.429^{+0.155}_{-0.170}$                 |
|        | +1%/-1%             | +2%/-3%                   | +inf%/-inf%               | +20%/-11%                 | +8%/-6%                   | +36%/-40%                                 |
| Source | SPE68               | SPE68                     | SPE68                     | DSEP                      |                           |   |

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

### Secondary Eclipse Parameters for KIC 004380951-06 / KOI

| Detrend | Depth (ppm)   | $R_p (R_{\oplus})$     | $T_{max} (K)$      | $T_{obs} (K)$          | $A_{obs}$            |
|---------|---------------|------------------------|--------------------|------------------------|----------------------|
| DV      | $-87 \pm 21$  | $2.62^{+1.75}_{-1.64}$ | $1093^{+51}_{-37}$ | $5651^{+4629}_{-1151}$ | $467^{+3171}_{-303}$ |
| Alt.    | $-140 \pm 27$ | $3.14^{+1.89}_{-1.76}$ | $1090^{+45}_{-36}$ | $5800^{+3419}_{-1067}$ | $538^{+2298}_{-330}$ |

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

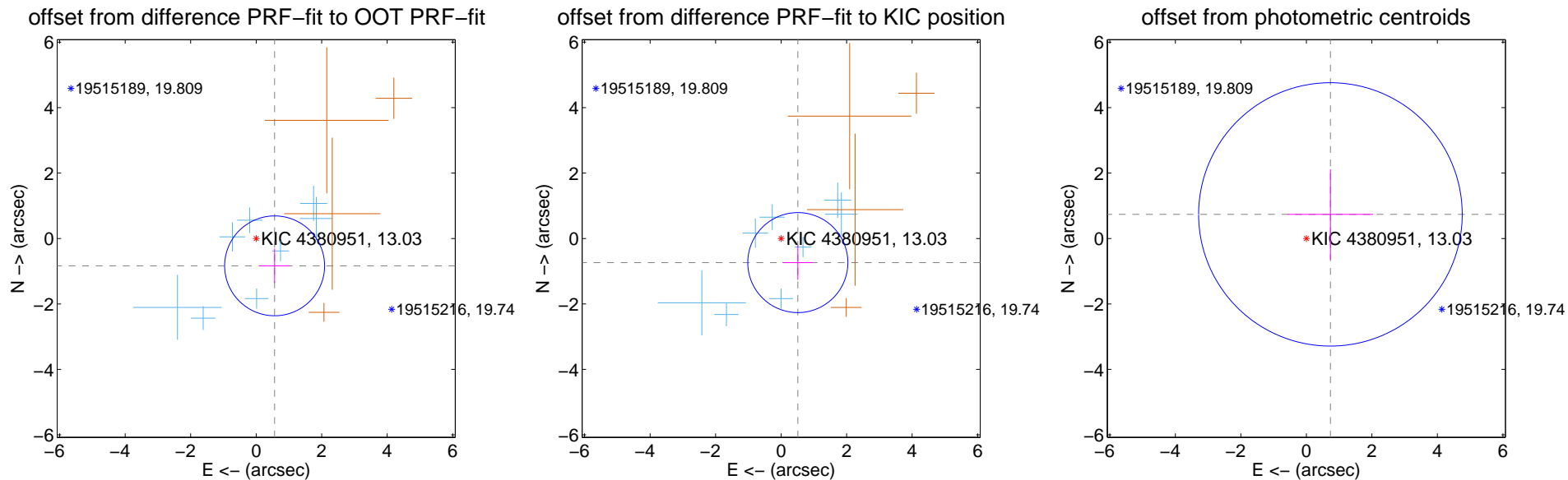
## DV Centroid Data

Supplemental centroid analysis for 004380951-06. Kepler magnitude: 13.03. Transit SNR 6.30

There are 8 quarters with good PRF difference image offsets

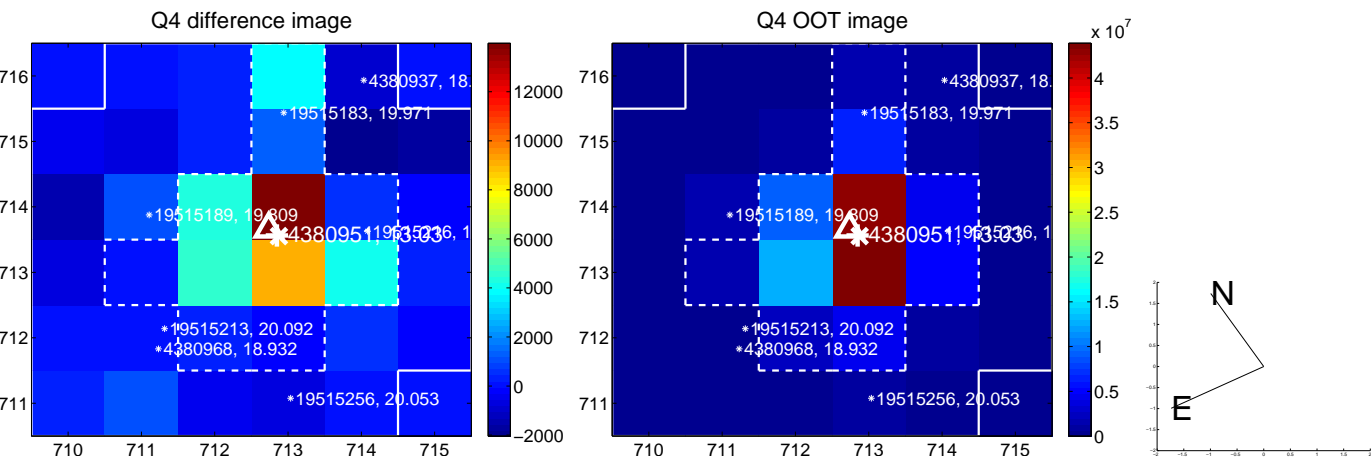
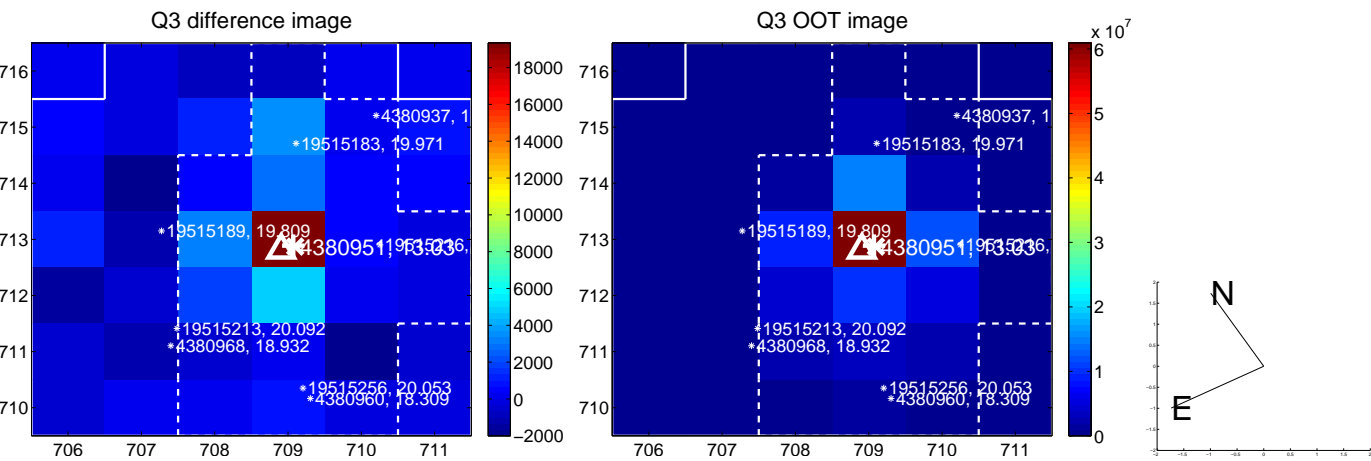
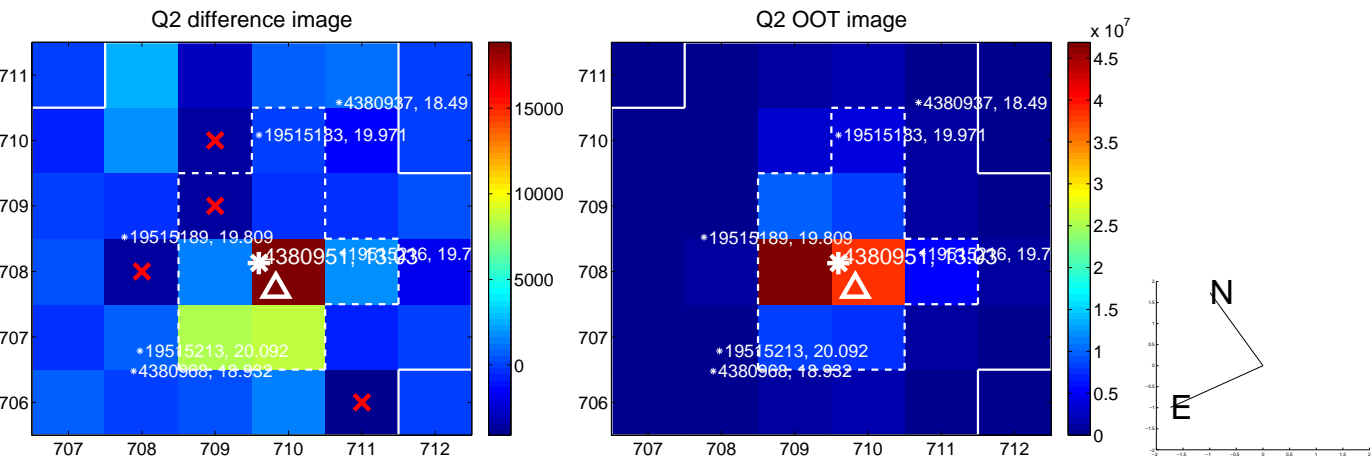
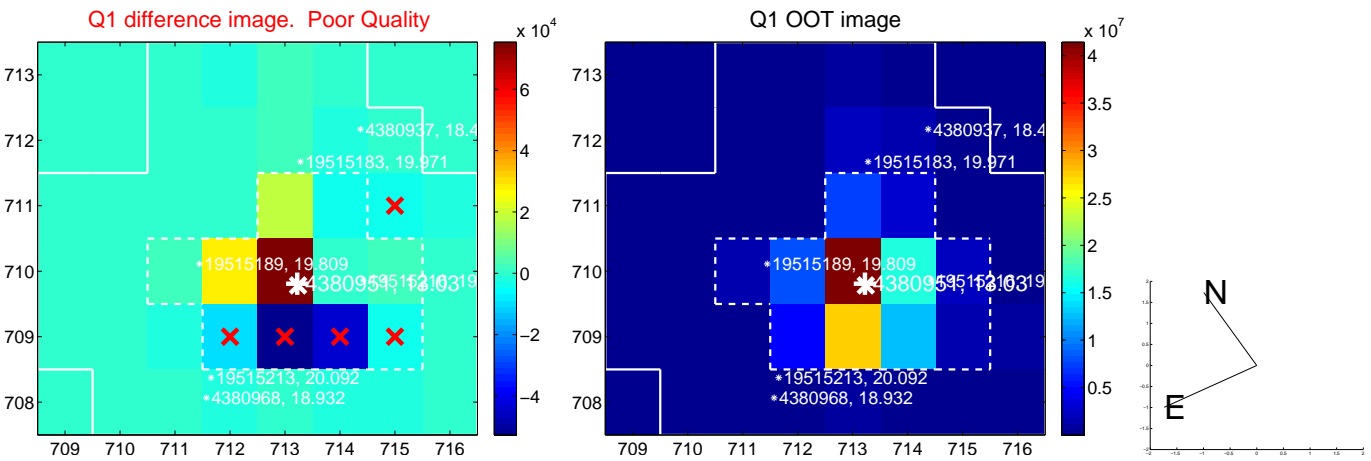
The direct PRF centroid is offset from the target star catalog position by about 0.14 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA        | $\Delta$ Dec       |
|---|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT          | $1.007 \pm 0.508$  | 1.98                | $-0.563 \pm 0.468$ | $-0.835 \pm 0.526$ |
| PRF-fit source offset from KIC position | $0.896 \pm 0.509$  | 1.76                | $-0.510 \pm 0.467$ | $-0.736 \pm 0.528$ |
| photometric centroid source offset      | $1.04 \pm 1.34$    | 0.78                | $-0.73 \pm 1.30$   | $0.74 \pm 1.38$    |

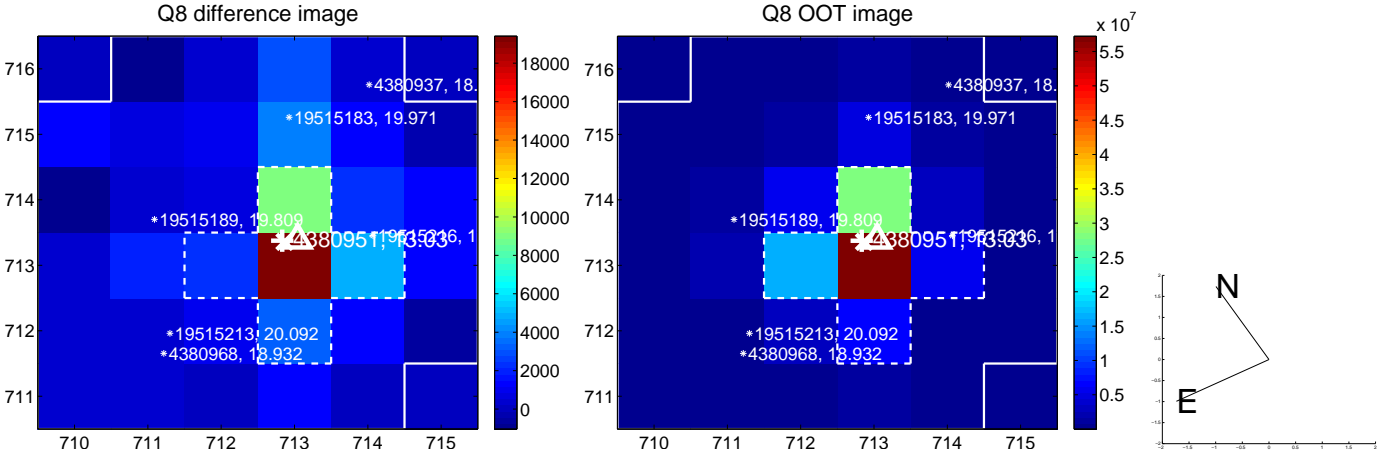
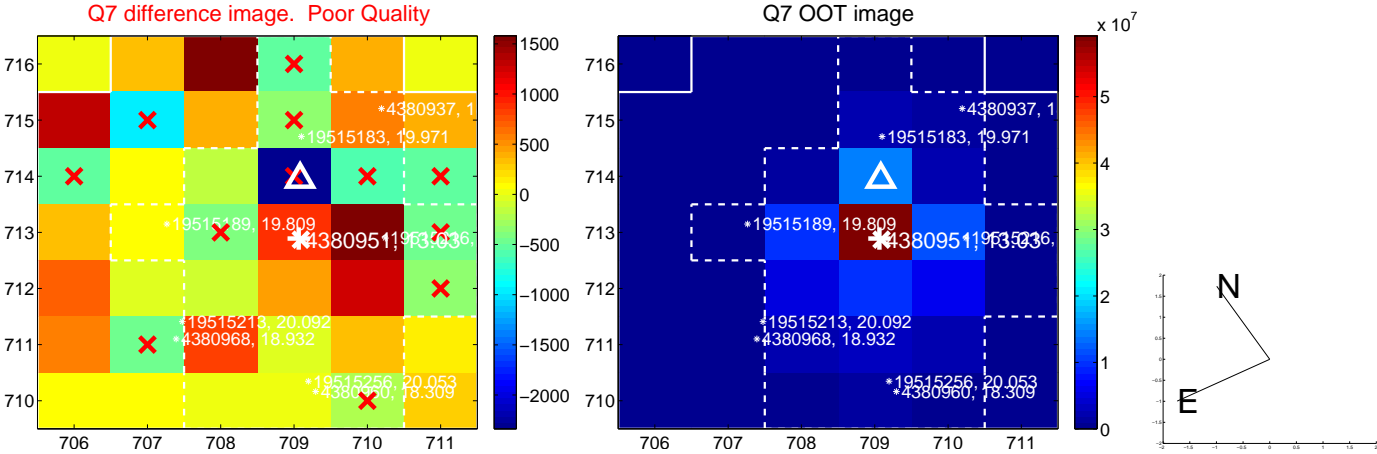
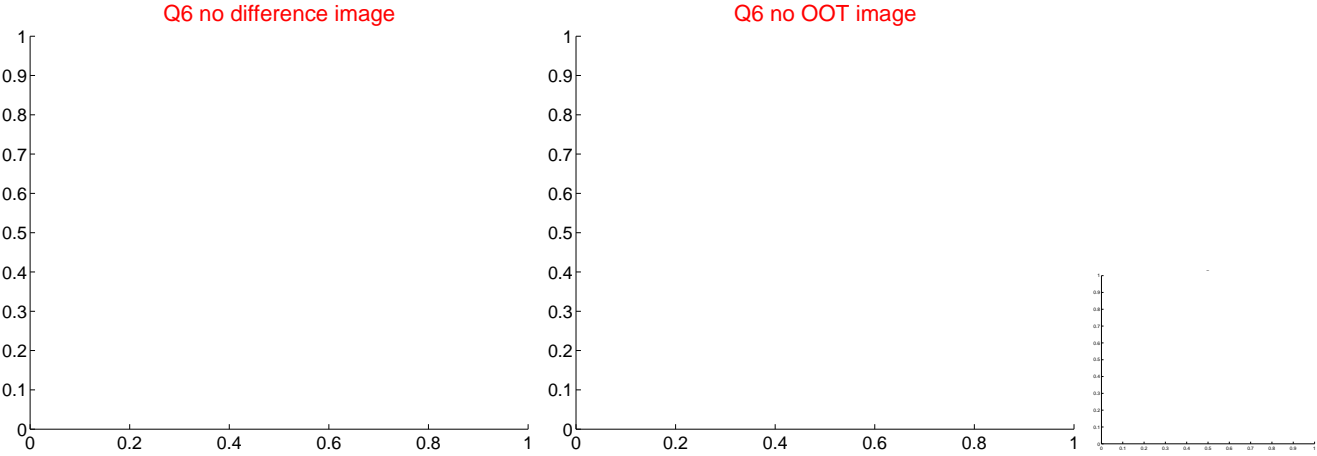
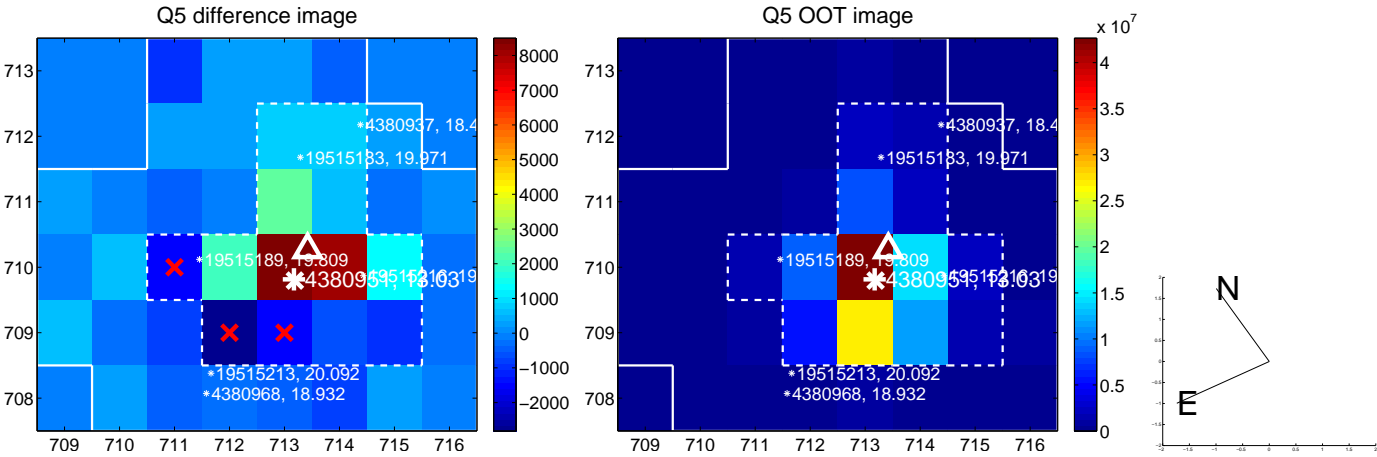


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

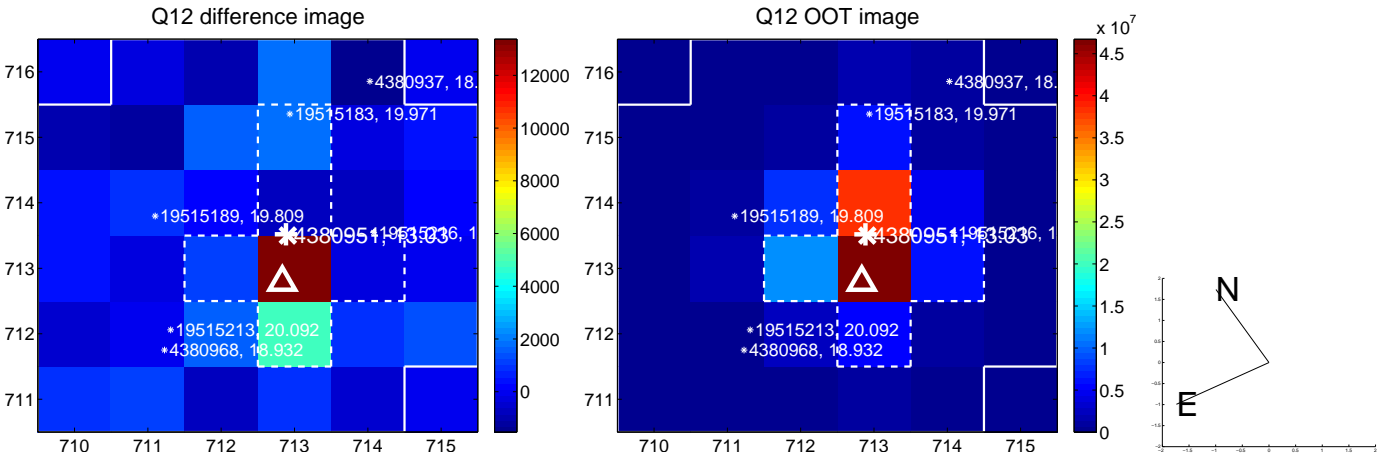
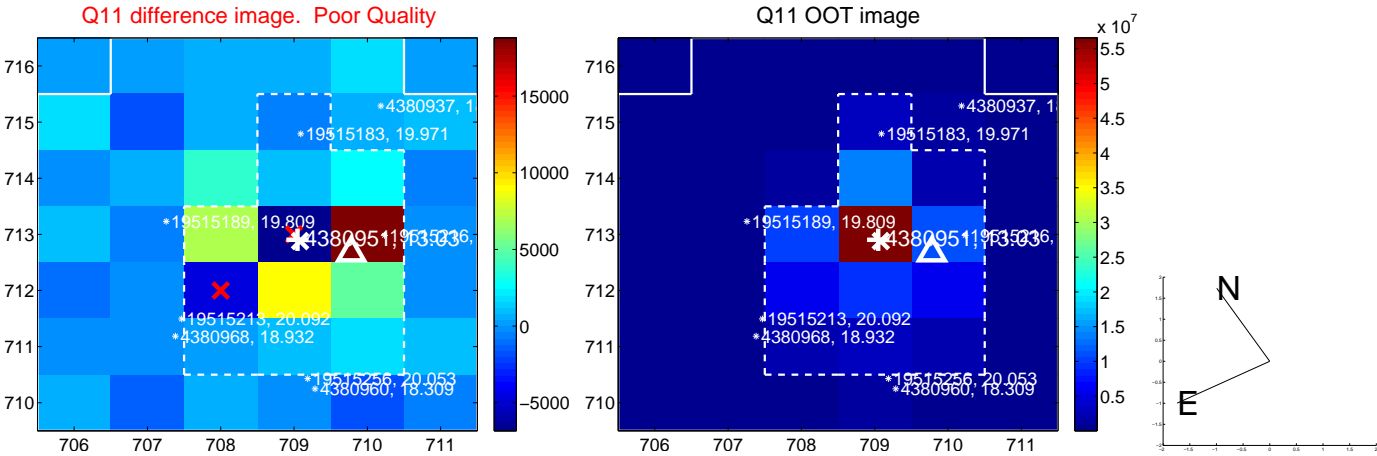
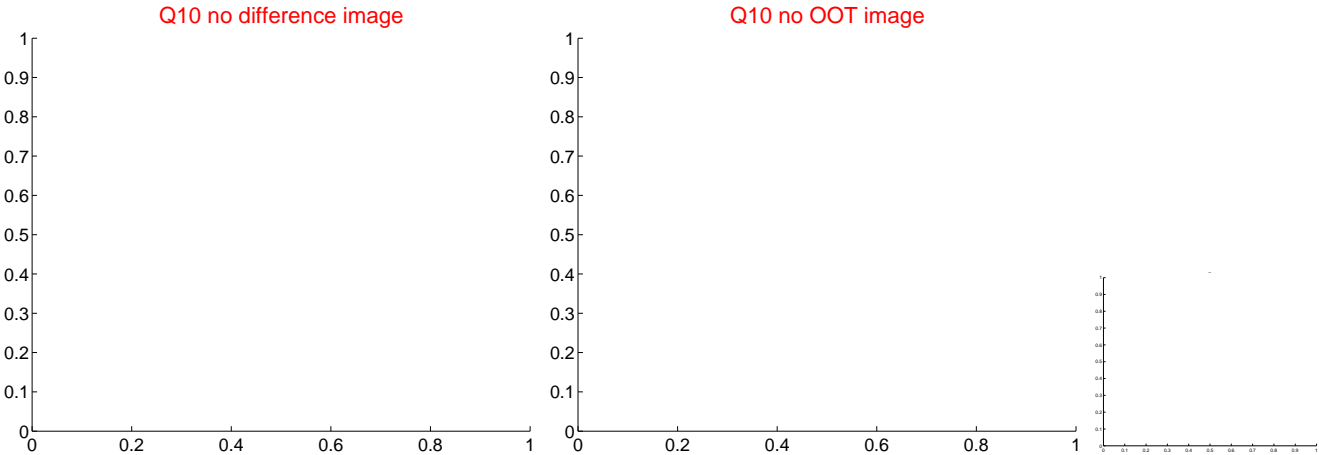
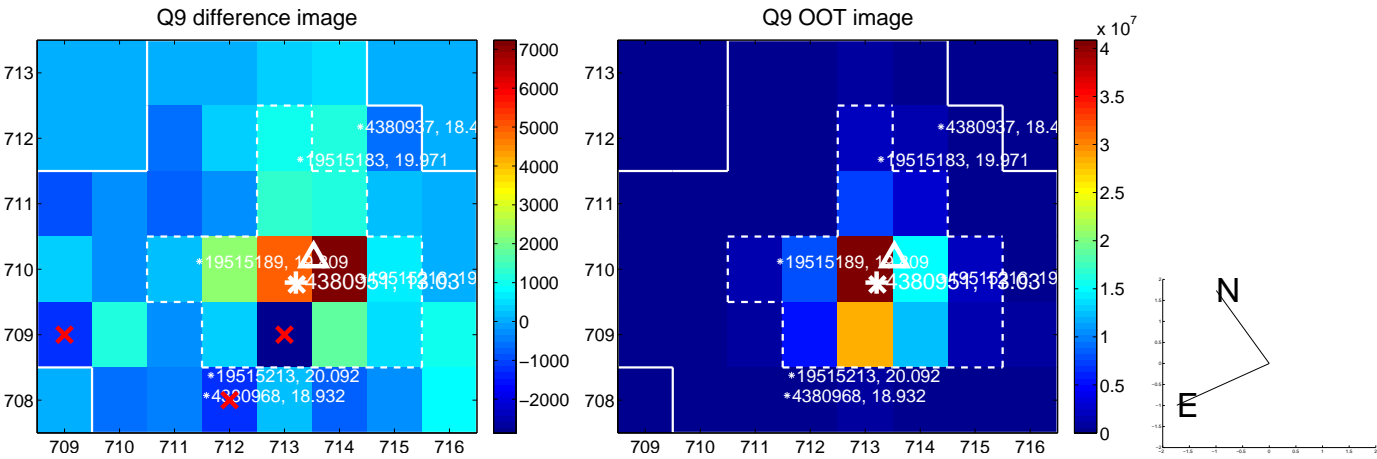
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

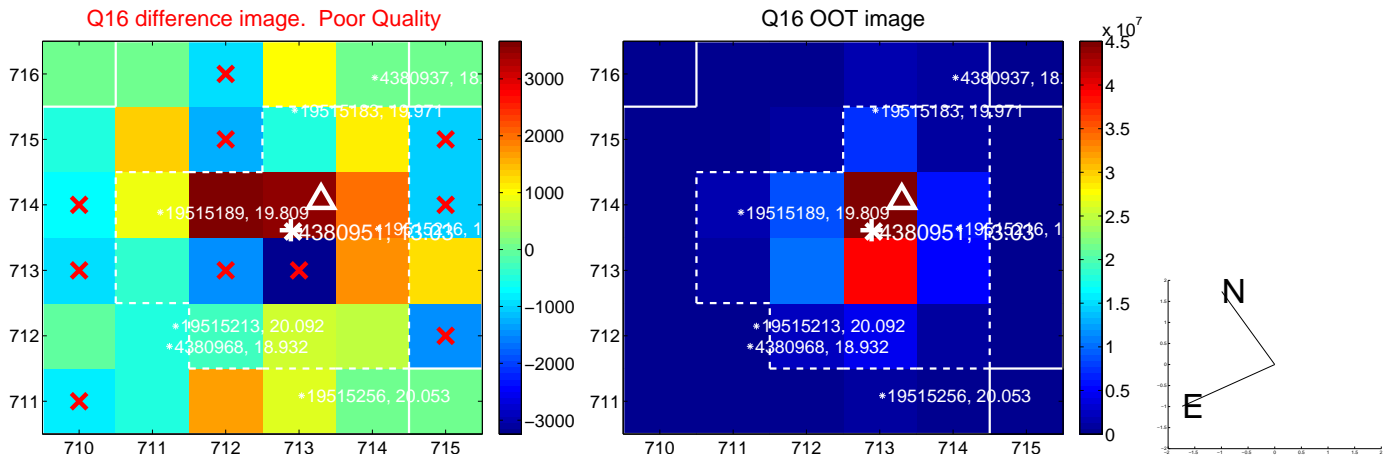
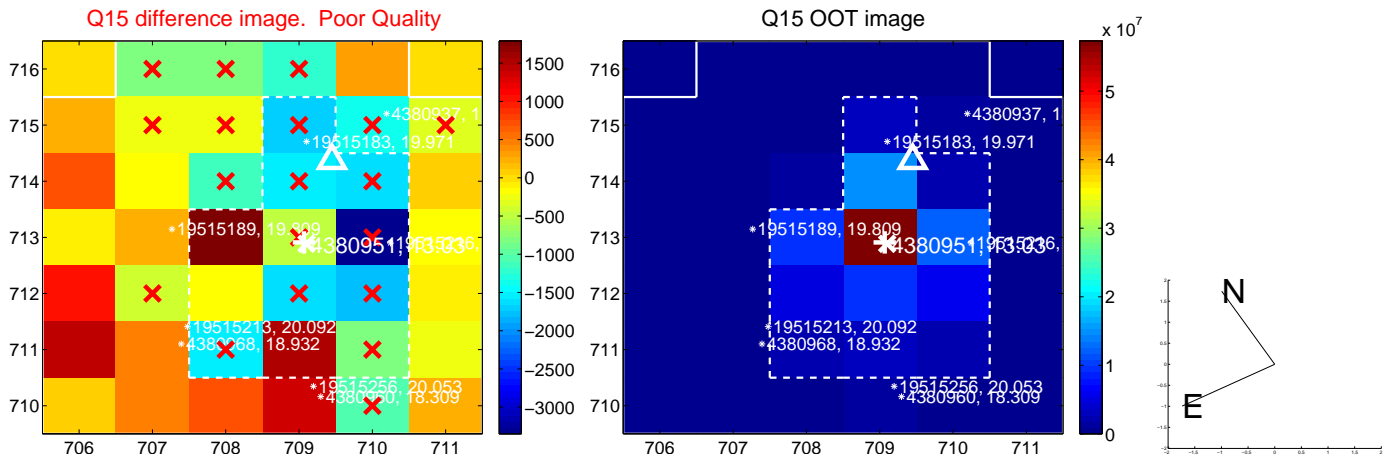
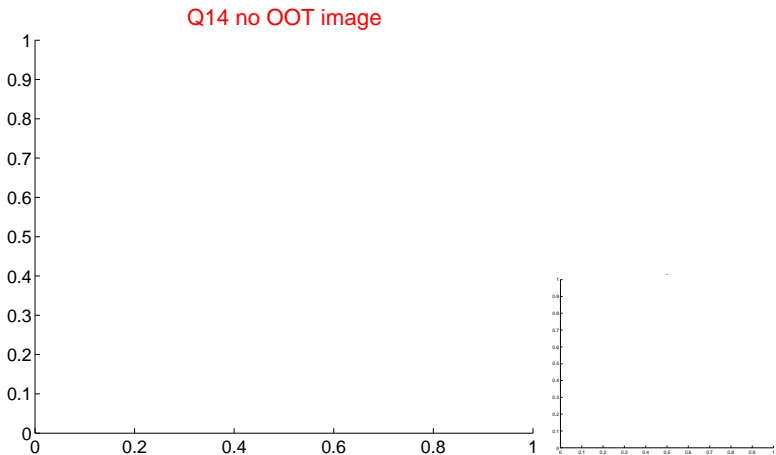
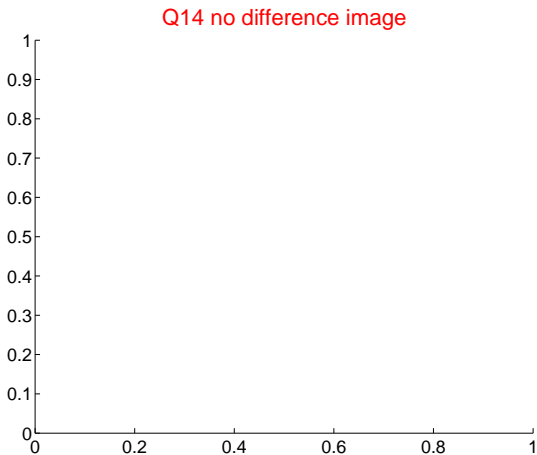
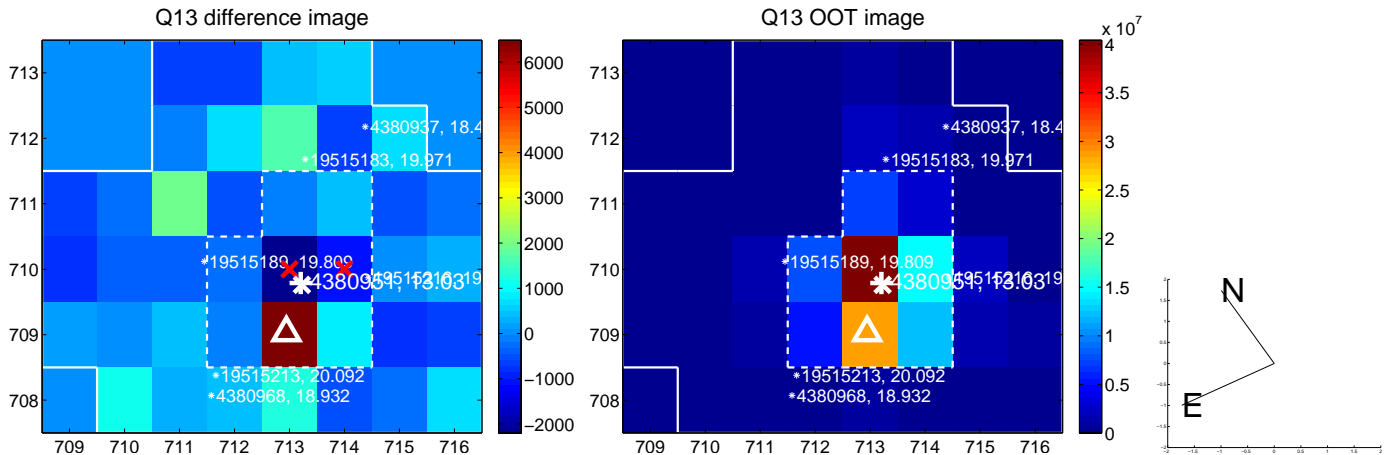


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

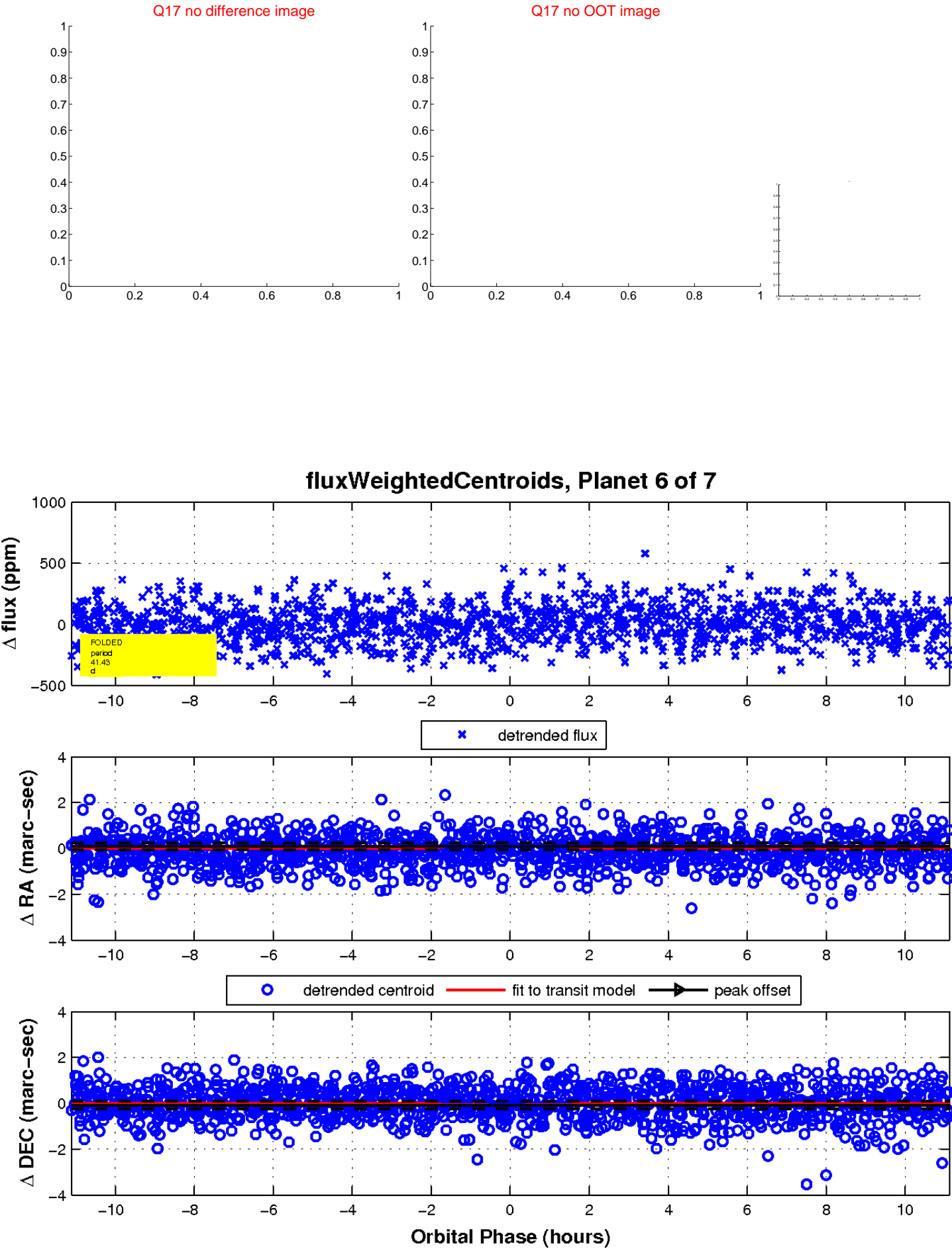




white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

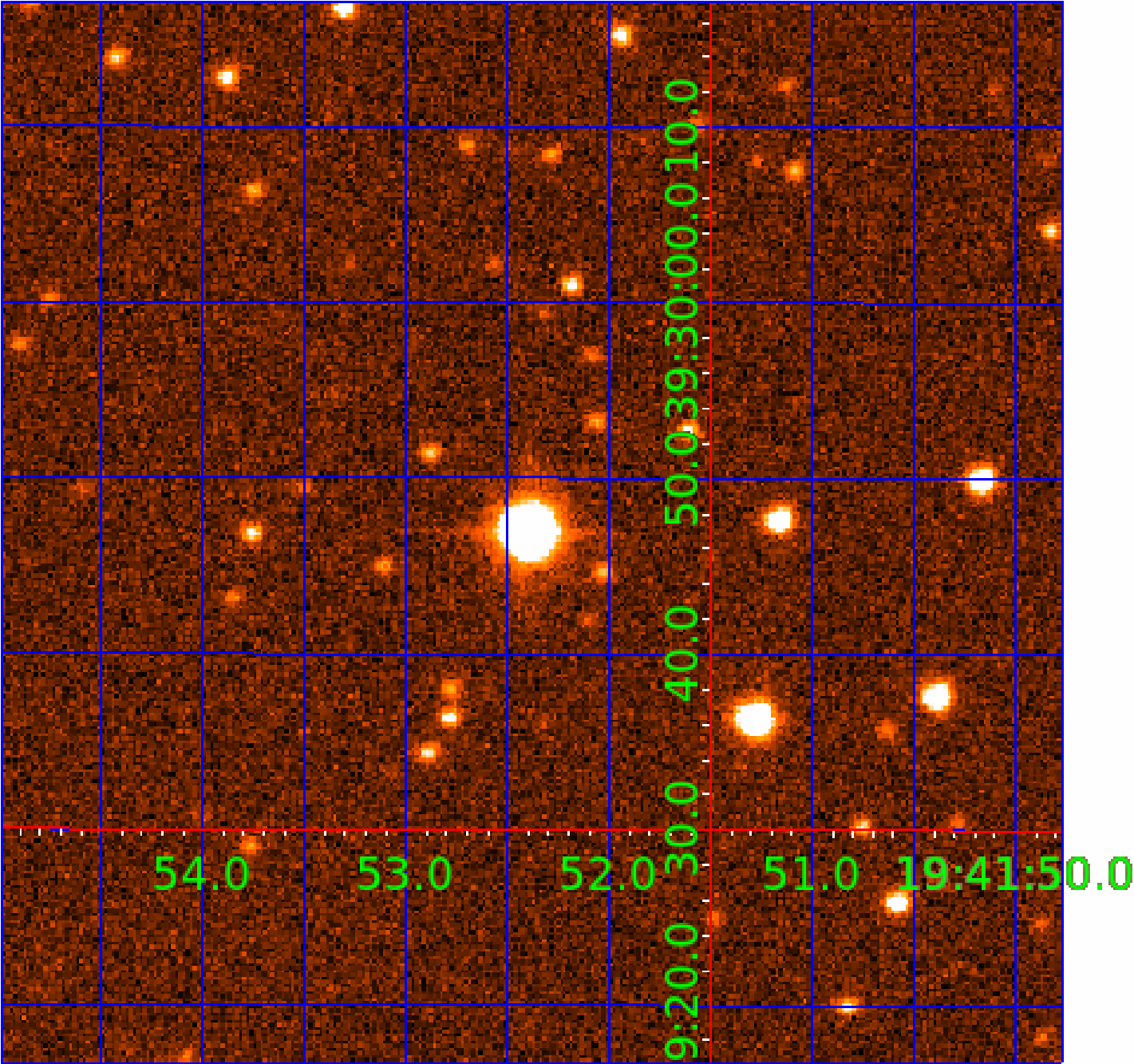


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 004380951

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|-----|-----|-----------------------------|-----------------|------------------------|------------------------|
| 004380951-01 | OBS      | No   | 1.329873      | 131.714534   | 3.1         | 8.483            | 8.7 | 1.6 | 1.69                        | 6987            | 0.30                   | 8437.91                |
| 004380951-02 | OBS      | No   | 38.804254     | 144.305723   | 217.6       | 2.933            | 8.7 | 9.3 | 1.69                        | 6987            | 2.87                   | 93.93                  |
| 004380951-03 | OBS      | No   | 329.705651    | 198.955327   | 267.4       | 3.373            | 8.0 | 8.3 | 1.69                        | 6987            | 3.18                   | 5.42                   |
| 004380951-04 | OBS      | No   | 22.246372     | 142.363914   | 177.5       | 2.213            | 7.9 | 9.0 | 1.69                        | 6987            | 2.65                   | 197.23                 |
| 004380951-05 | OBS      | No   | 39.076285     | 162.919519   | 278.8       | 2.808            | 7.9 | 9.5 | 1.69                        | 6987            | 3.15                   | 93.06                  |
| 004380951-06 | OBS      | No   | 41.434921     | 134.573939   | 114.5       | 3.708            | 7.6 | 6.3 | 1.69                        | 6987            | 2.10                   | 86.06                  |
| 004380951-07 | OBS      | No   | 37.357923     | 153.030015   | 155.1       | 2.085            | 8.5 | 5.7 | 1.69                        | 6987            | 2.60                   | 98.81                  |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments  |
|--------------|----------|------|-------|---|---|---|---|---|
| 004380951-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—MOD_NONUNIQ_DV   |
| 004380951-02 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT  |
| 004380951-03 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_CHASES_MARSHALL—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS |
| 004380951-04 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT                                      |
| 004380951-05 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT                                      |
| 004380951-06 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT                                |
| 004380951-07 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT—CENT_FEW_MEAS                         |

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

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

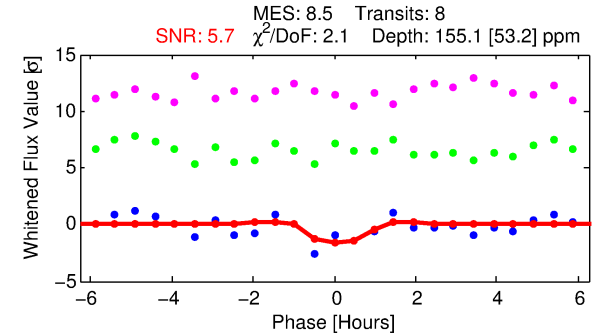
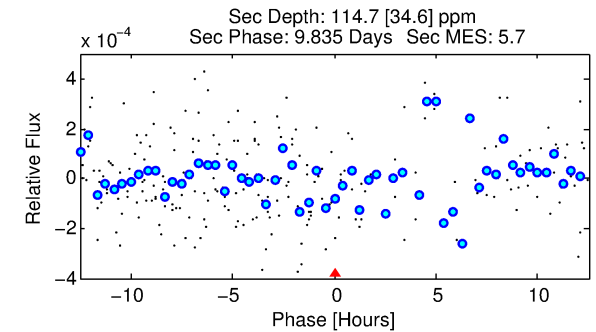
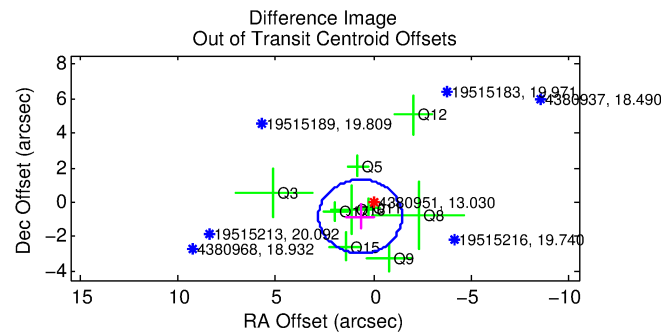
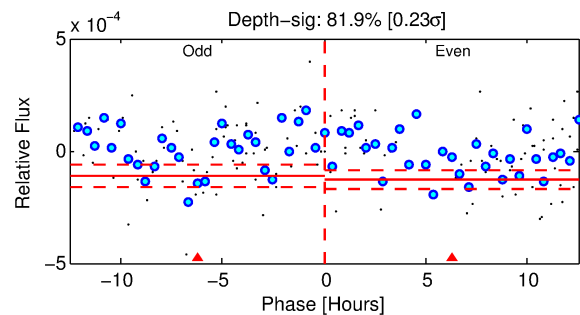
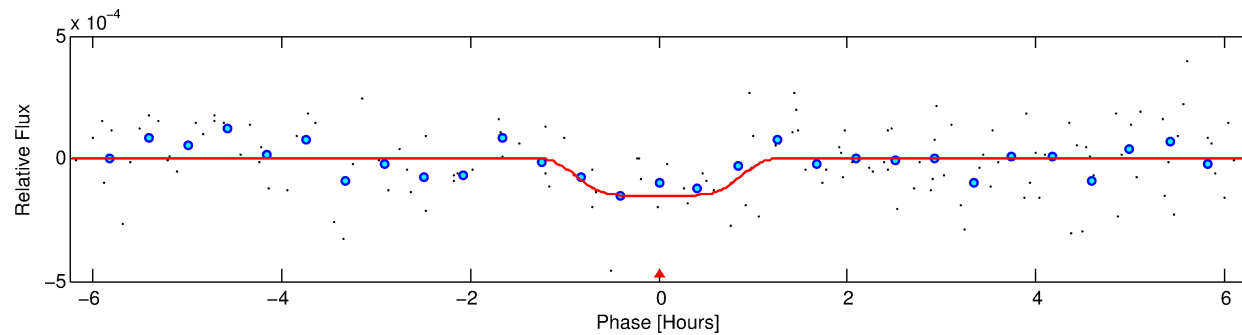
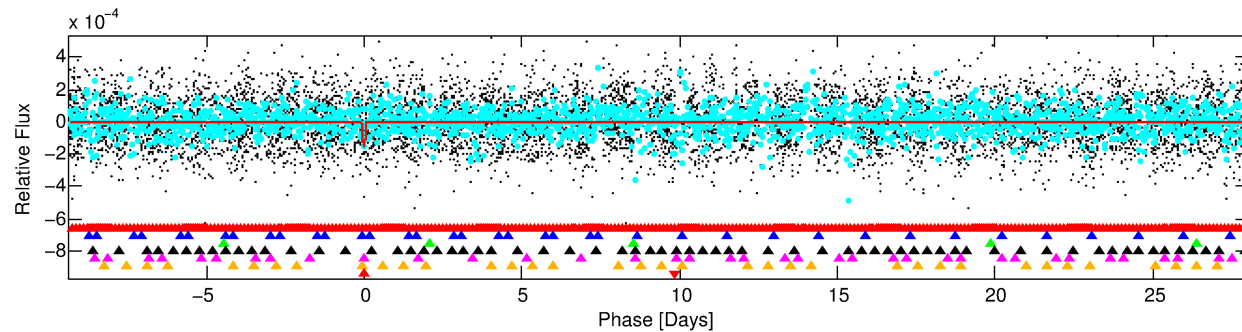
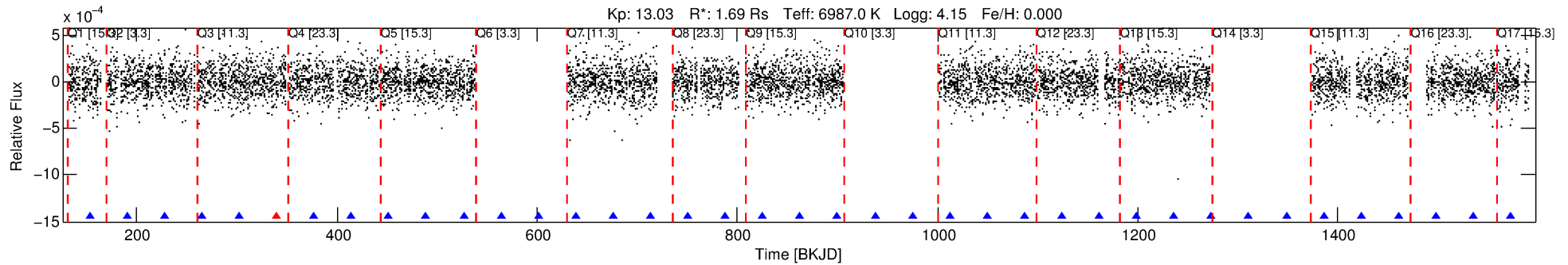
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 004380951-07

No Significant Match Found

# DV One-Page Summary

KIC: 4380951 Candidate: 7 of 7 Period: 37.358 d



## DV Fit Results:

Period = 37.35792 [0.00057] d  
Epoch = 153.0300 [0.0144] BKJD  
Rp/R\* = 0.0141 [0.0090]  
a/R\* = 47.06 [177.03]  
b = 0.95 [0.36]  
Seff = 98.81 [23.79]  
Teq = 804 [48] K  
Rp = 2.60 [1.74] Re  
a = 0.2484 [0.0408] AU  
Ag = 577.36 [772.01] [0.75 $\sigma$ ]  
Teffp = 6093 [2007] K [2.63 $\sigma$ ]

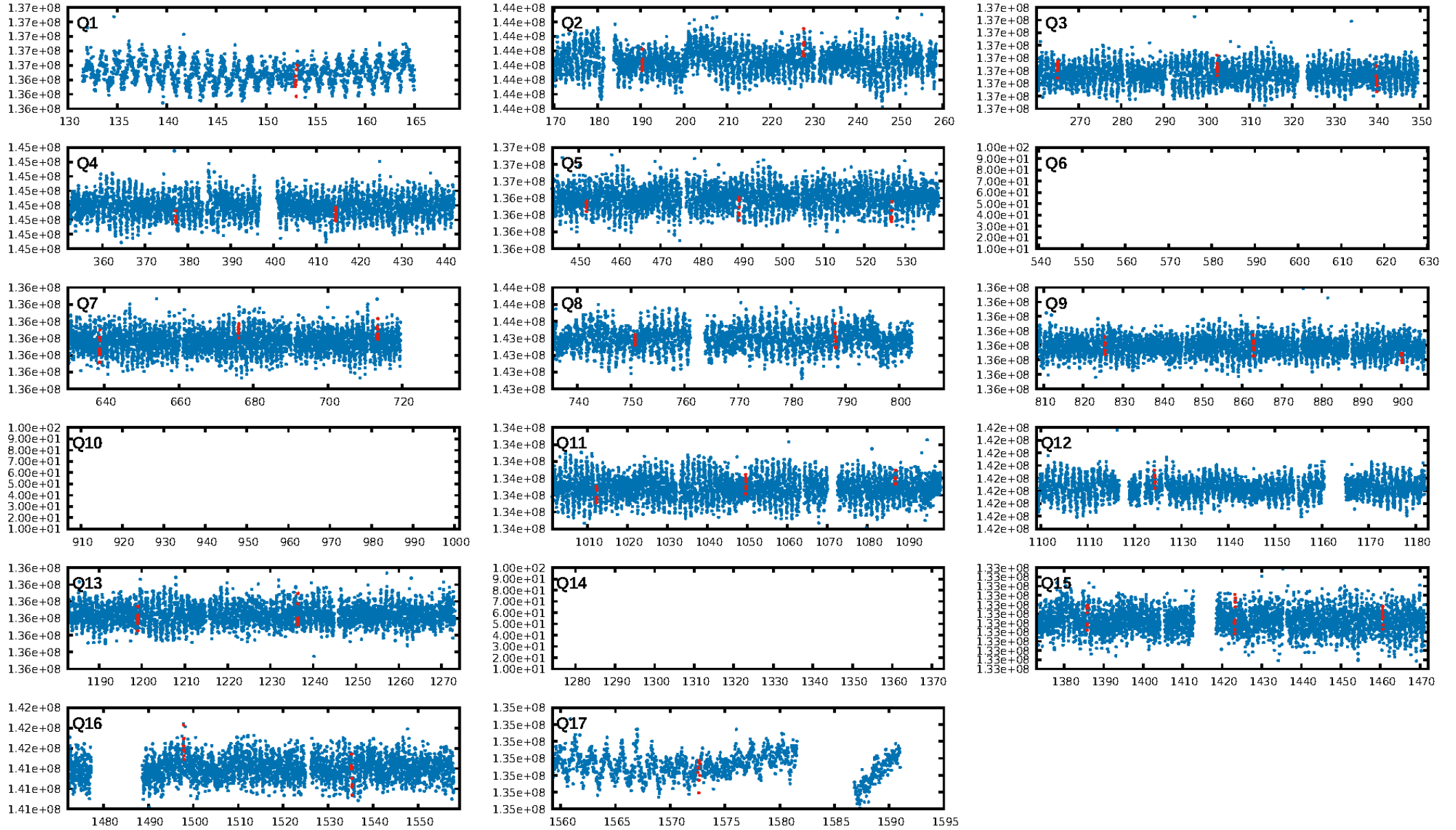
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [119.27 $\sigma$ ]  
LongPeriod-sig: 100.0% [9.65 $\sigma$ ]  
ModelChiSquare2-sig: 28.1%  
ModelChiSquareGof-sig: 82.9%  
Bootstrap-pfa: 1.03e-13  
RollingBand-fgt: 0.86 [6/7]  
GhostDiagnostic-chr: -34.17  
Centroid-sig: 41.3%  
Centroid-so: 0.814 arcsec [0.62 $\sigma$ ]  
OotOffset-rm: 1.079 arcsec [1.52 $\sigma$ ]  
OotOffset-st: 0/3/3 [9]  
KicOffset-rm: 1.006 arcsec [1.21 $\sigma$ ]  
KicOffset-st: 0/3/3 [9]  
DiffImageQuality-fgm: 0.33 [3/9]  
DiffImageOverlap-fno: 0.64 [9/14]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 16:46:53 Z

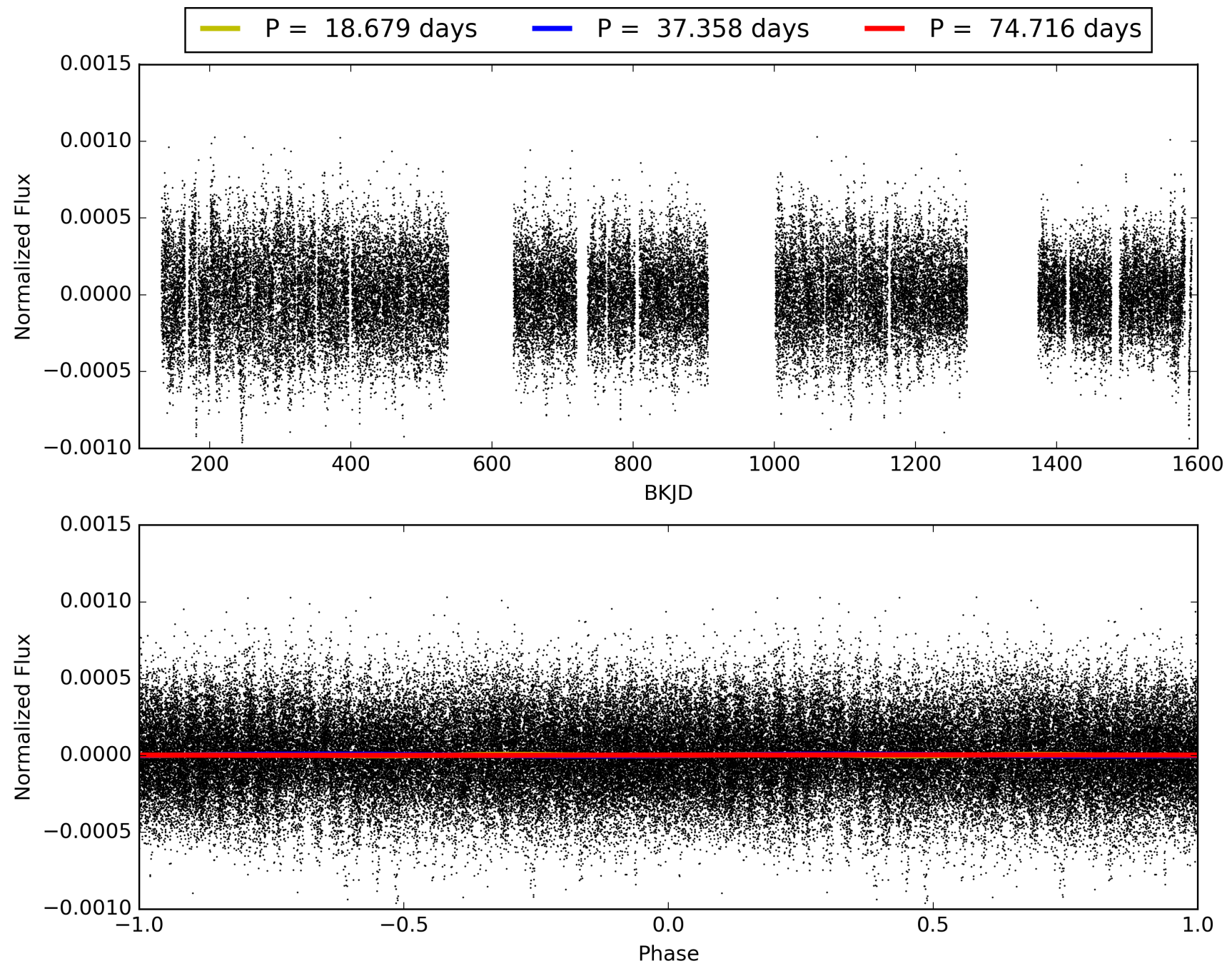
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 004380951-07, PDC Light Curves



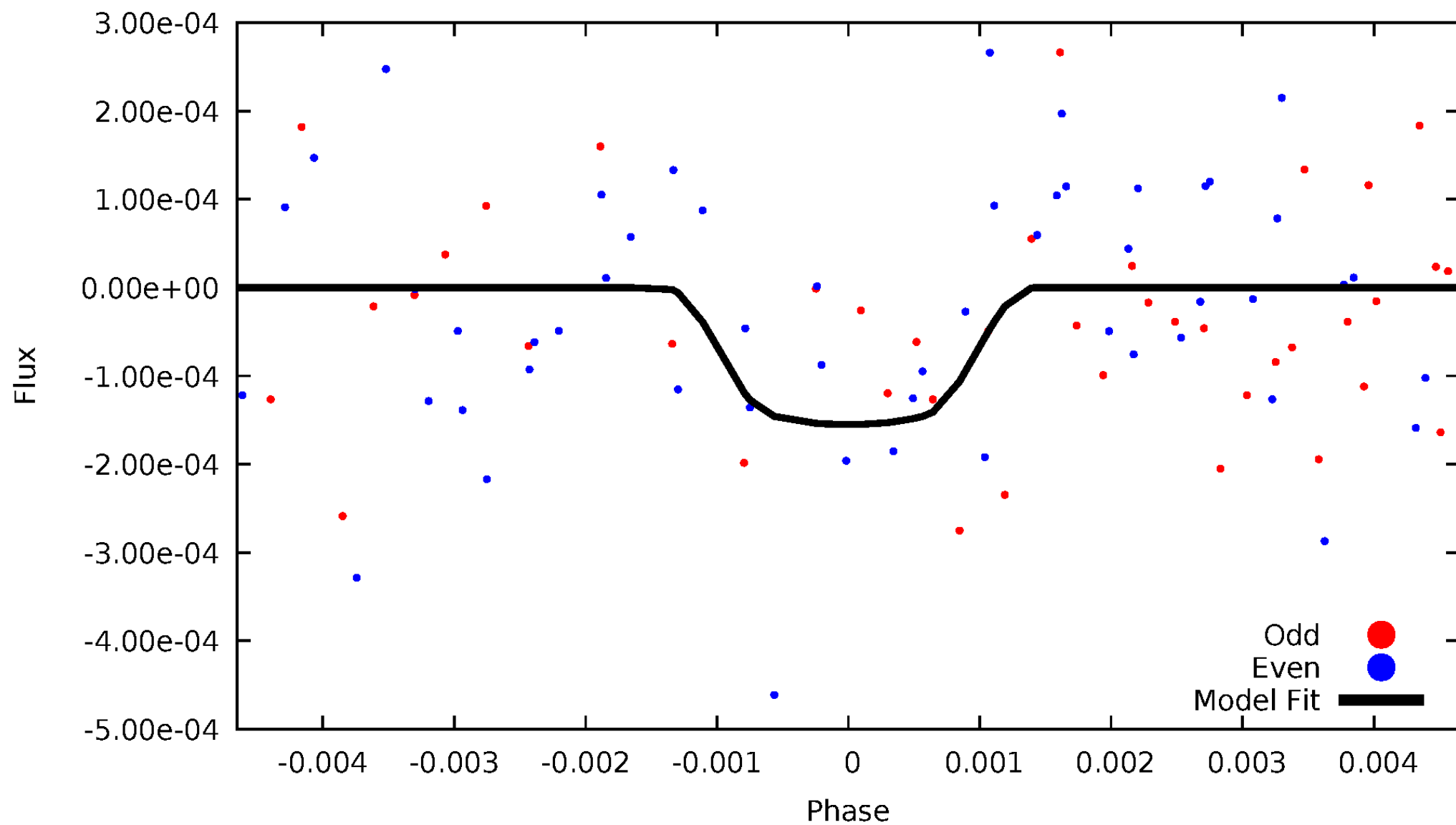


TCE 004380951-07



# DV Odd/Even

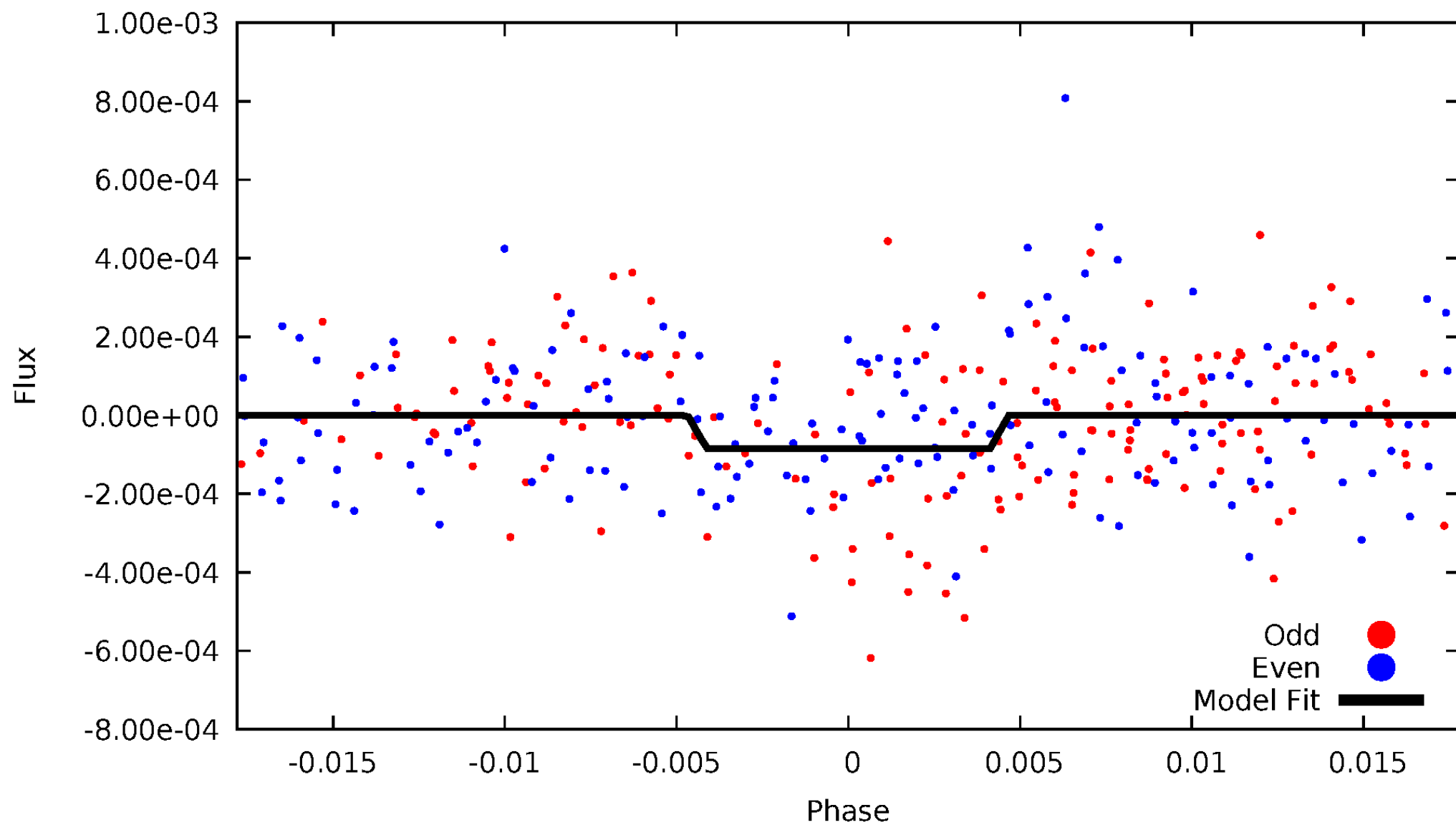
TCE 004380951-07





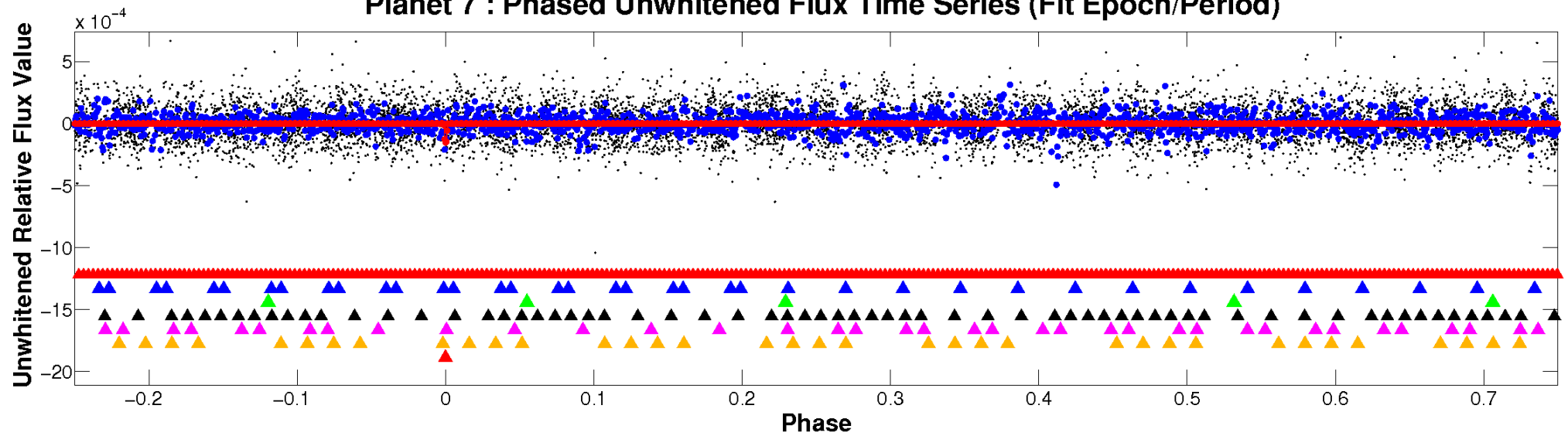
# ALT Odd/Even

TCE 004380951-07

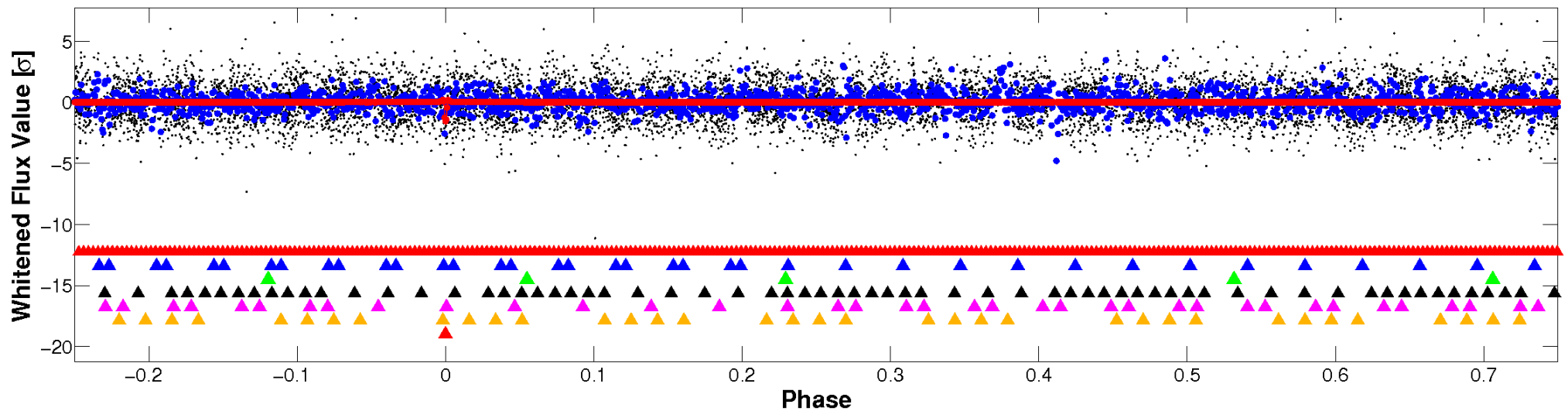


# Non-Whitened Vs. Whitened Light Curve

## Planet 7 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

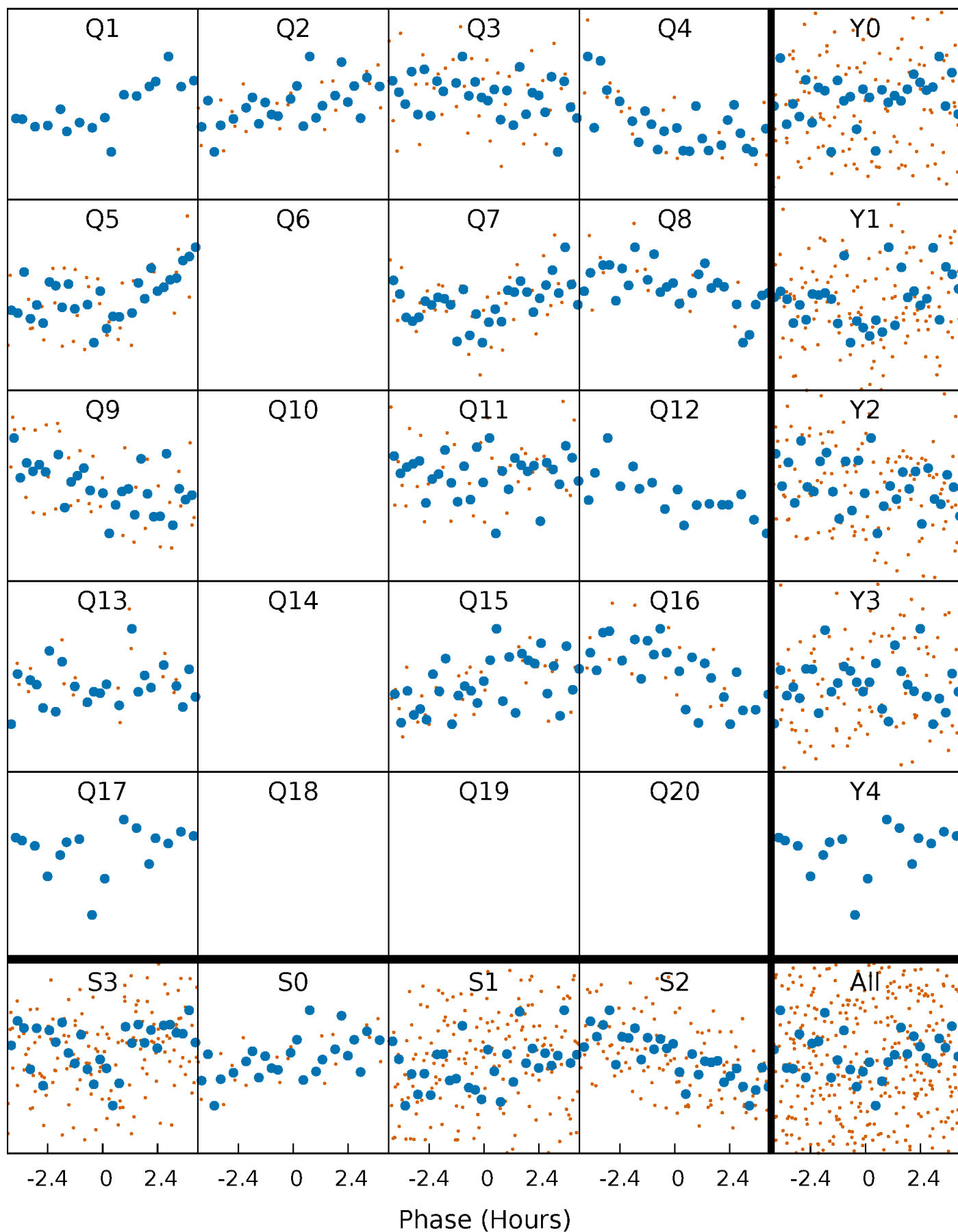


## Planet 7 : Phased Whitened Flux Time Series (Fit Epoch/Period)



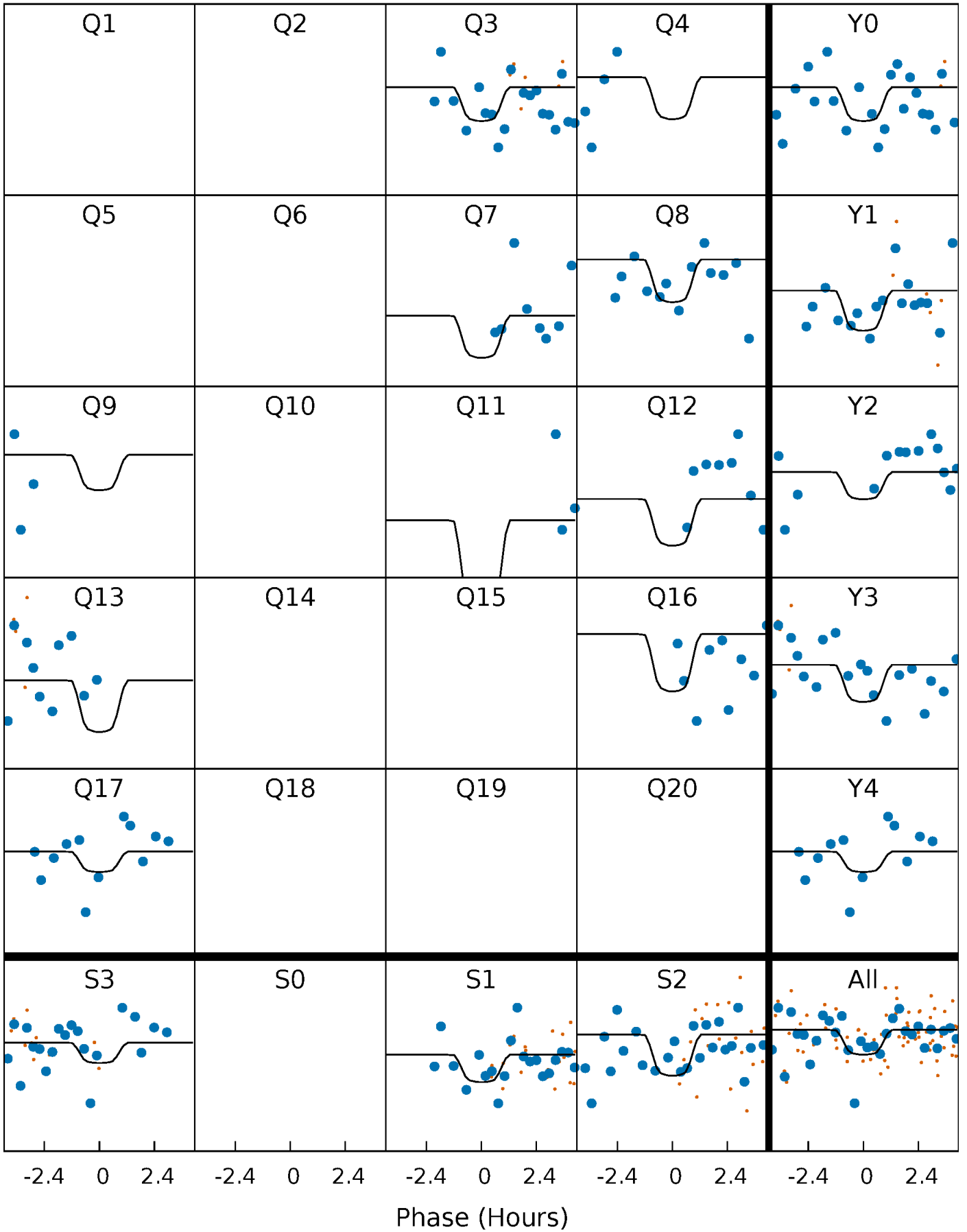
# PDC Quarter-Phased Transit Curves

TCE 004380951-07 P= 37.357923 Days  $T_0=153.030015$  (BKJD)



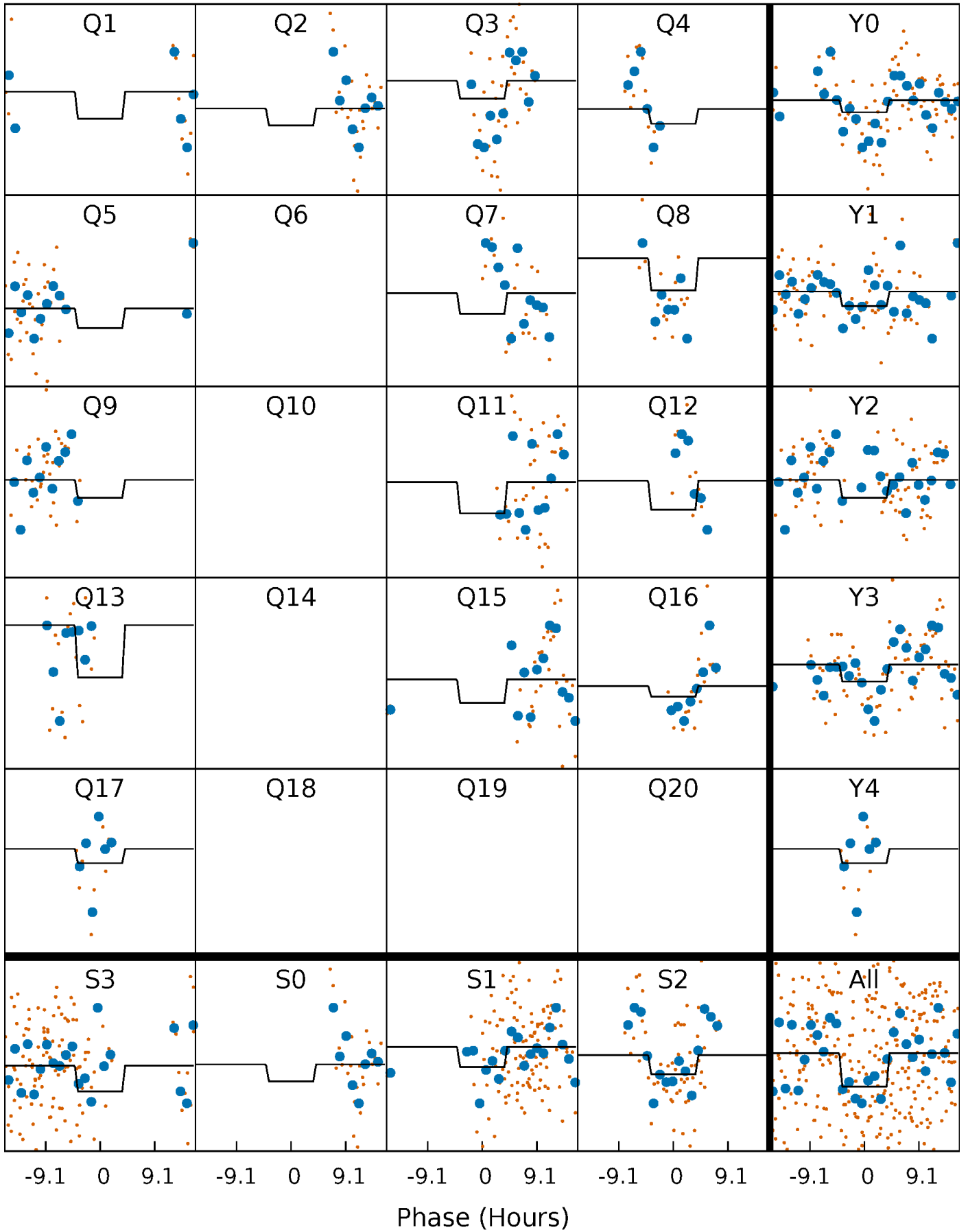
# DV Quarter-Phased Transit Curves

TCE 004380951-07     $P = 37.357923$  Days     $T_0 = 153.030015$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

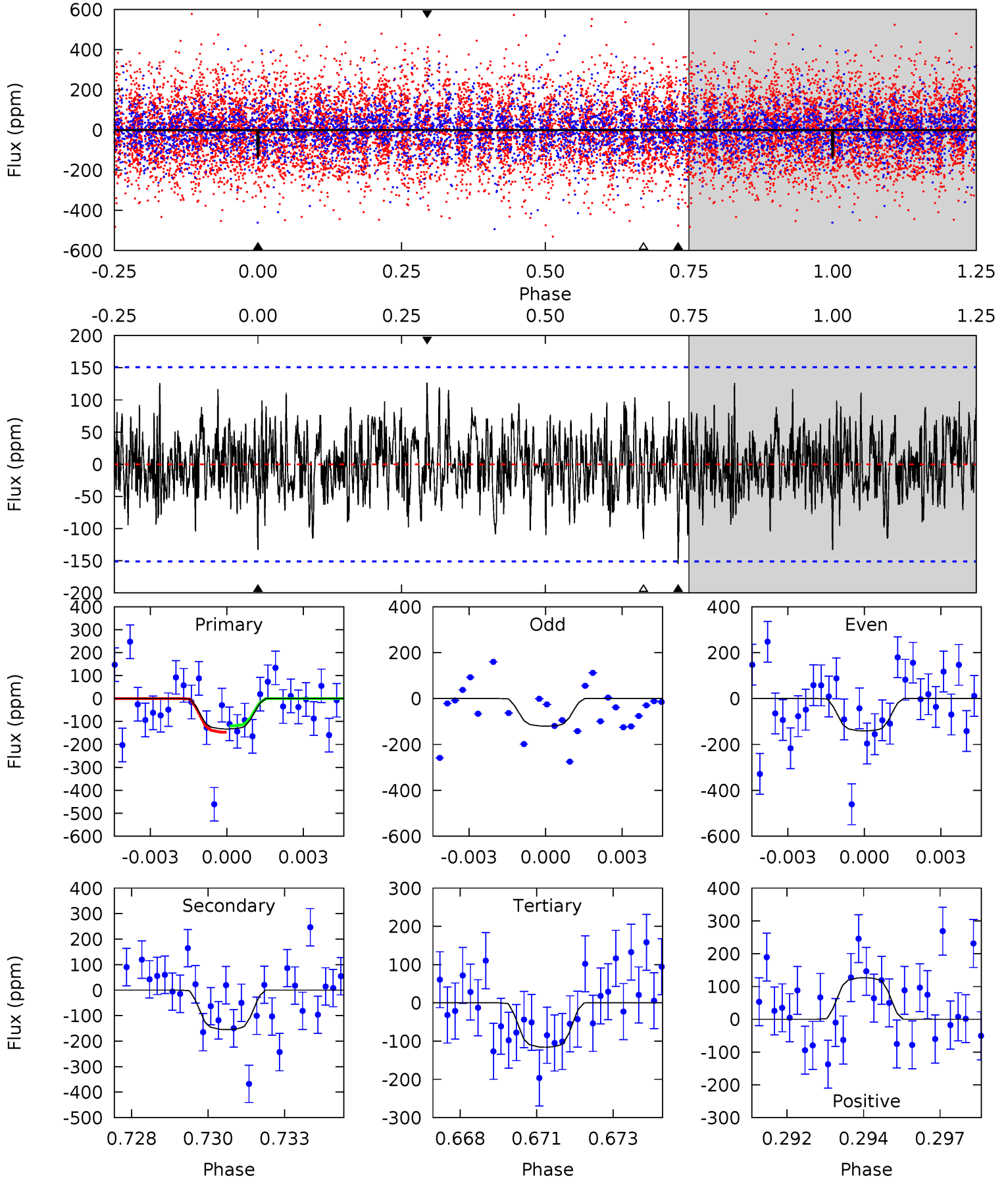
TCE 004380951-07   P= 37.358934 Days    $T_0=153.032222$  (BKJD)



# DV Model-Shift Uniqueness Test

004380951-07,  $P = 37.357923$  Days,  $E = 115.672092$  Days

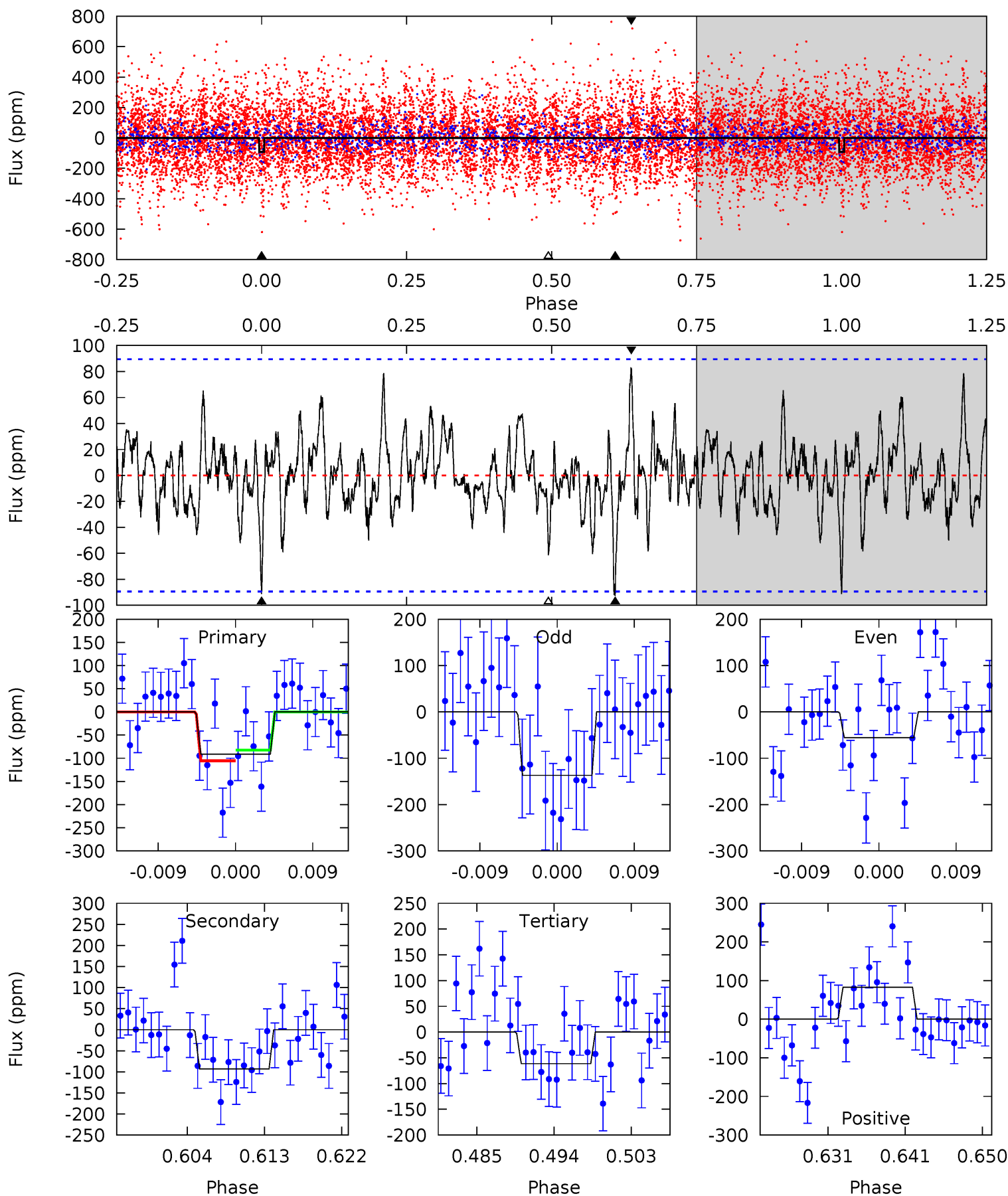
| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 4.64 | 5.41 | 4.05 | 4.43 | 5.27            | 3.00            | 1.35             | 0.59    | 0.21    | 1.36    | 0.98    | 0.35    | 1.08 | 0.45  | 0.47 |



# Alt Model-Shift Uniqueness Test

004380951-07, P = 37.358934 Days, E = 115.673288 Days

| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 5.15 | 5.23 | 3.46 | 4.67 | 5.04            | 2.61            | 1.34             | 1.69    | 0.48    | 1.77    | 0.56    | 2.29    | 1.07 | 0.47  | 0.64 |



### Stellar Parameters For KIC 004380951

|        | $T_{\text{eff}}(K)$ | $\log(g)$                 | [Fe/H]                    | $R (R_{\odot})$           | $M(M_{\odot})$            | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|---------------------|---------------------------|---------------------------|---------------------------|---------------------------|---|
|        | $6987^{+73}_{-94}$  | $4.148^{+0.073}_{-0.126}$ | $0.000^{+0.150}_{-0.150}$ | $1.690^{+0.337}_{-0.181}$ | $1.470^{+0.115}_{-0.094}$ | $0.429^{+0.155}_{-0.170}$                 |
|        | +1%/-1%             | +2%/-3%                   | +inf%/-inf%               | +20%/-11%                 | +8%/-6%                   | +36%/-40%                                 |
| Source | SPE68               | SPE68                     | SPE68                     | DSEP                      |                           |   |

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

### Secondary Eclipse Parameters for KIC 004380951-07 / KOI

| Detrend | Depth (ppm)   | $R_p (R_{\oplus})$     | $T_{max} (K)$      | $T_{obs} (K)$          | $A_{obs}$            |
|---------|---------------|------------------------|--------------------|------------------------|----------------------|
| DV      | $-155 \pm 29$ | $2.75^{+1.63}_{-1.56}$ | $1129^{+48}_{-39}$ | $6396^{+4285}_{-1318}$ | $684^{+2970}_{-425}$ |
| Alt.    | $-93 \pm 18$  | $2.05^{+1.57}_{-1.28}$ | $1127^{+52}_{-38}$ | $6553^{+5790}_{-1585}$ | $761^{+4569}_{-514}$ |

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



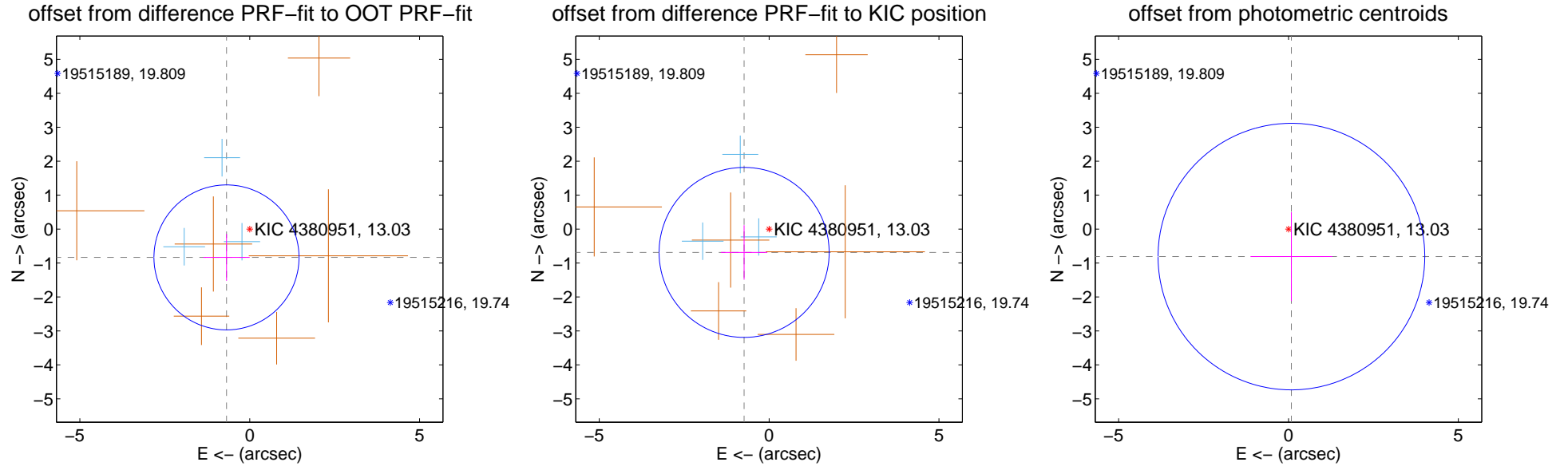
## DV Centroid Data

Supplemental centroid analysis for 004380951-07. Kepler magnitude: 13.03. Transit SNR 5.70

There are 3 quarters with good PRF difference image offsets

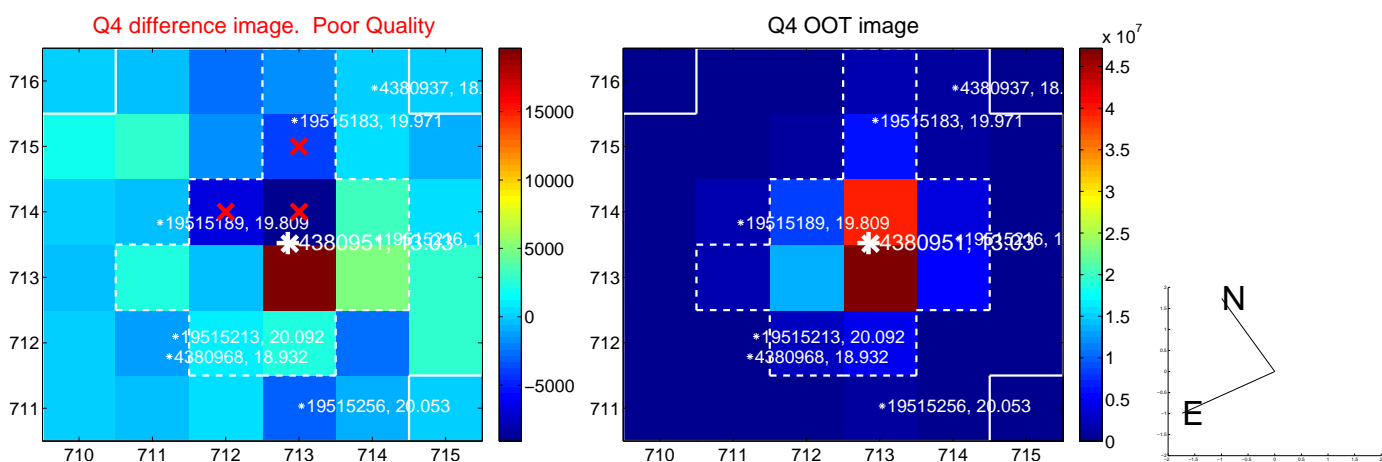
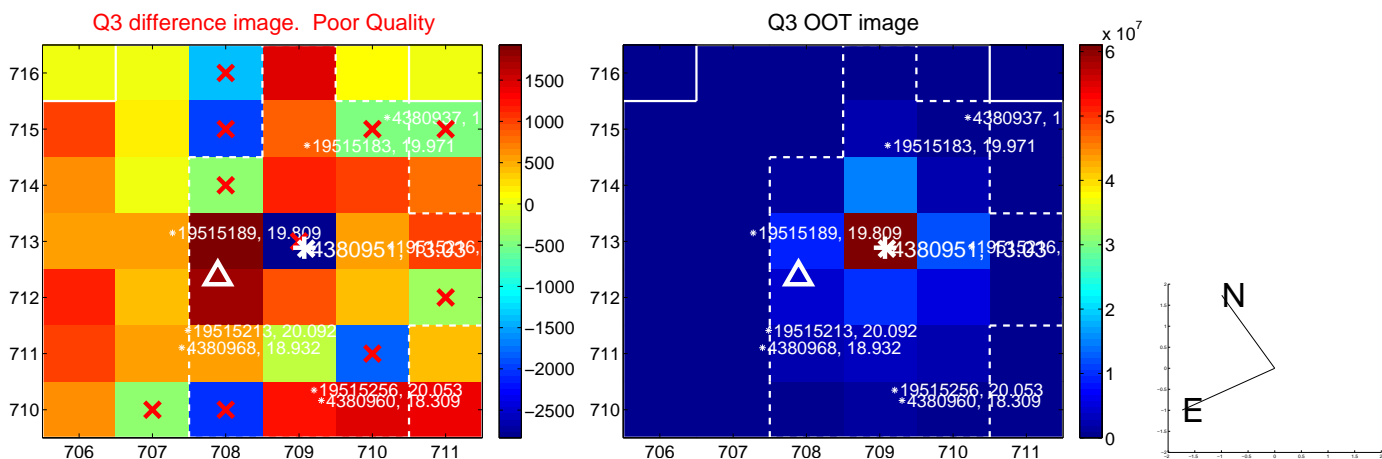
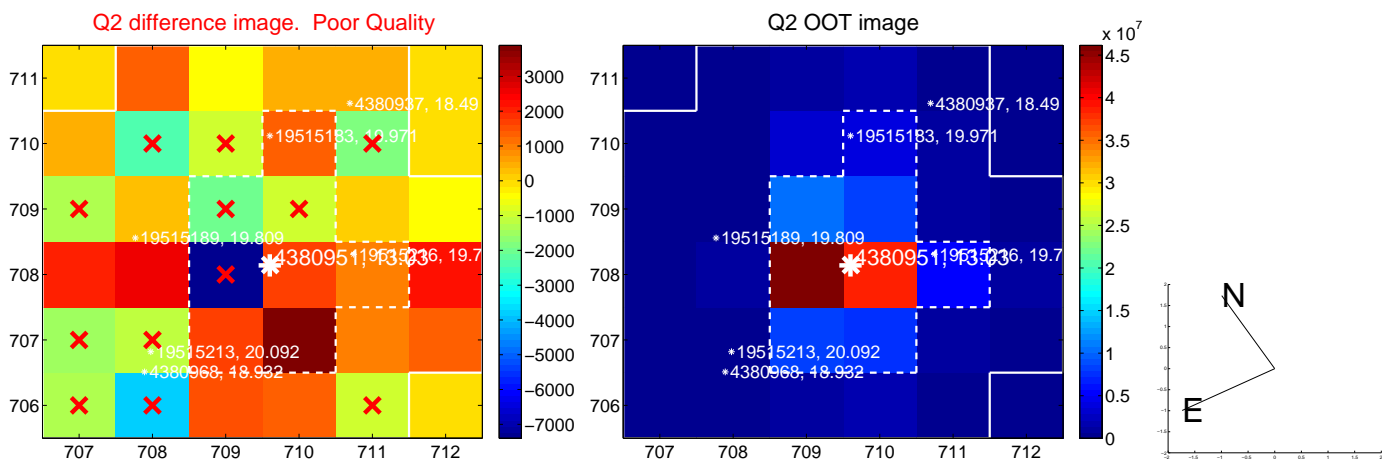
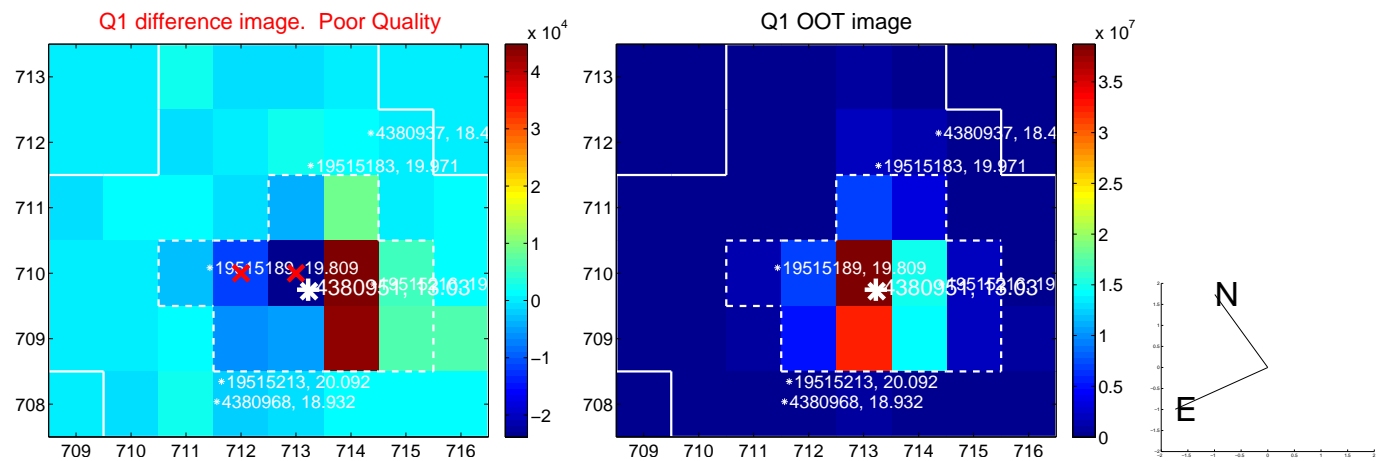
The direct PRF centroid is offset from the target star catalog position by about 0.17 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA       | $\Delta$ Dec       |
|---|--------------------|---------------------|-------------------|--------------------|
| PRF-fit source offset from OOT          | $1.079 \pm 0.712$  | 1.52                | $0.684 \pm 0.682$ | $-0.834 \pm 0.689$ |
| PRF-fit source offset from KIC position | $1.006 \pm 0.834$  | 1.21                | $0.735 \pm 0.682$ | $-0.687 \pm 0.803$ |
| photometric centroid source offset      | $0.81 \pm 1.31$    | 0.62                | $-0.09 \pm 1.20$  | $-0.81 \pm 1.31$   |

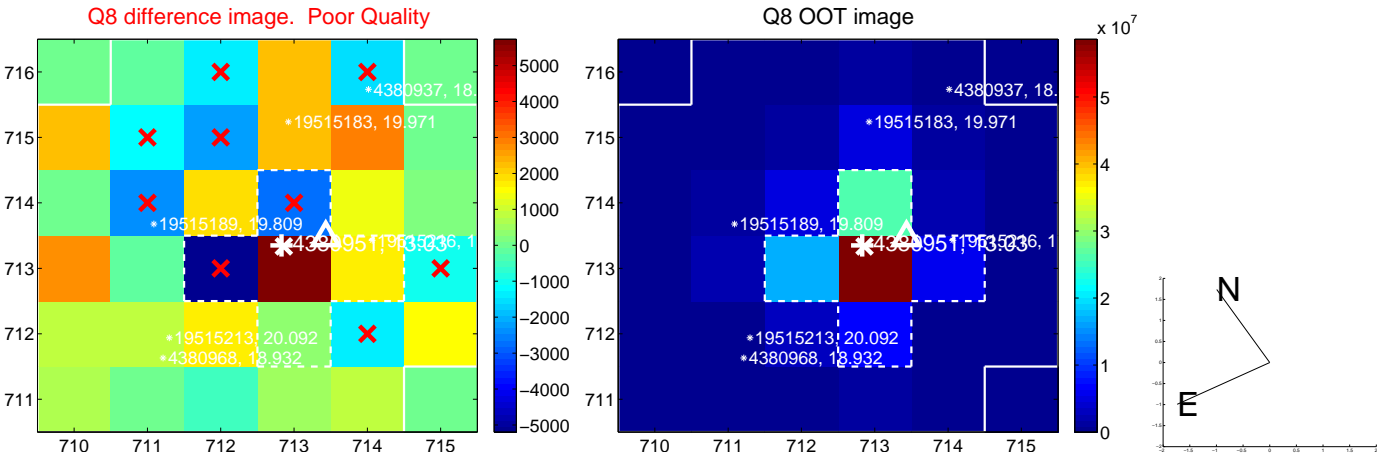
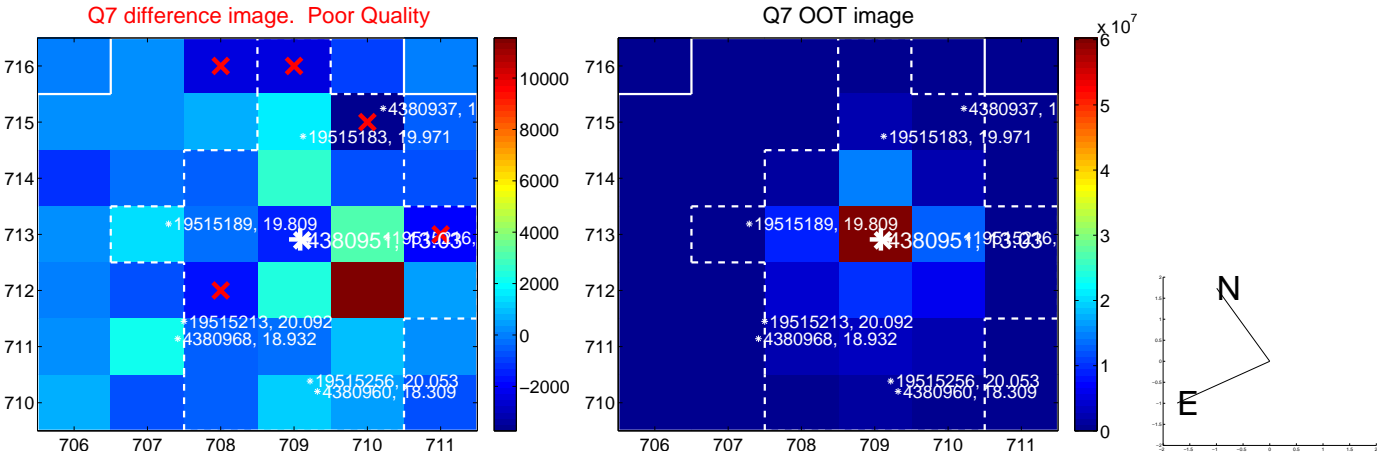
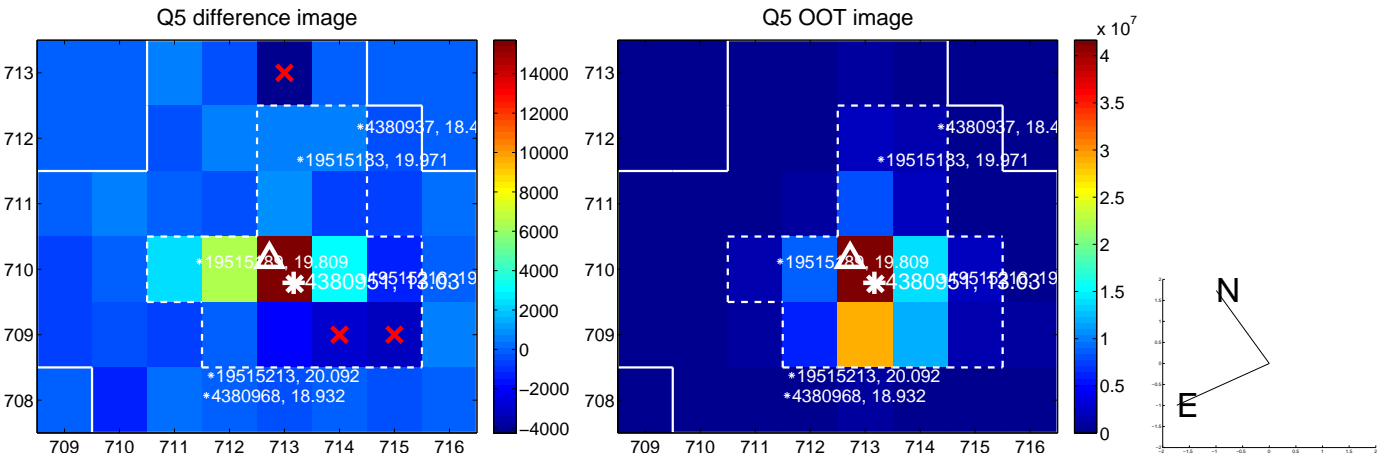


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

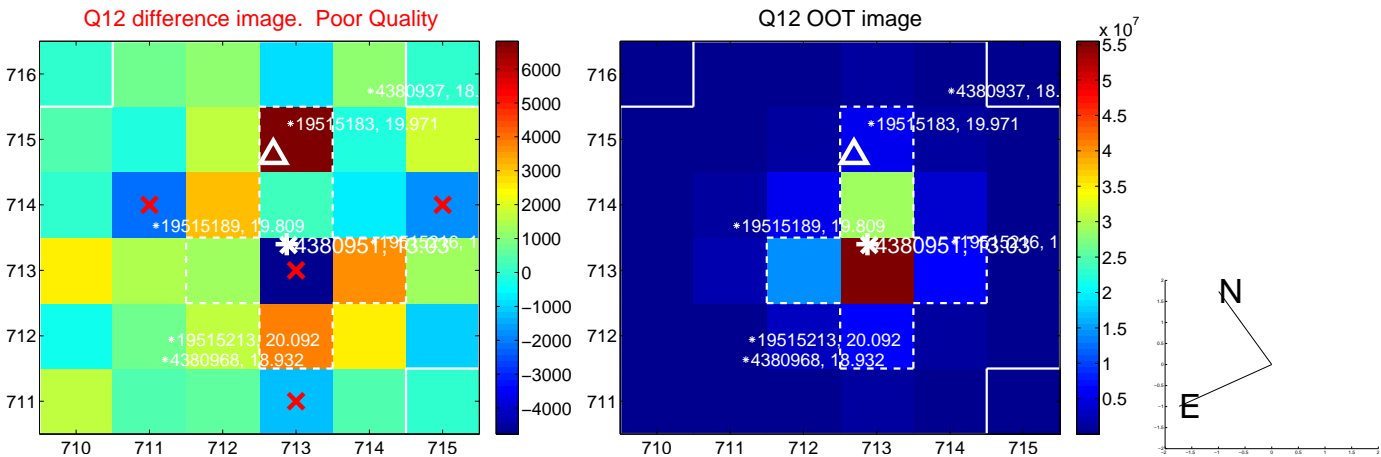
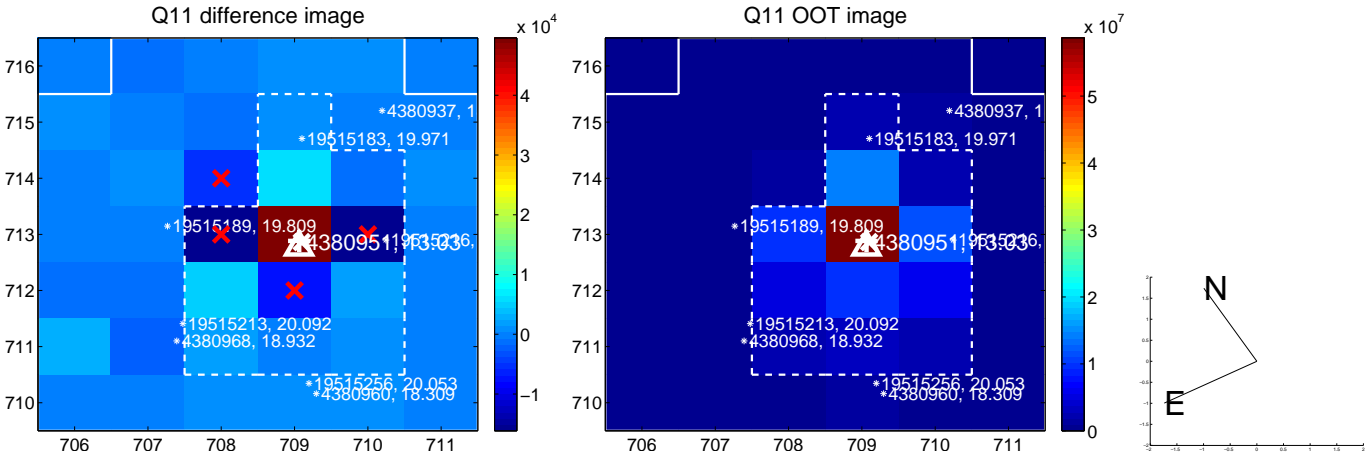
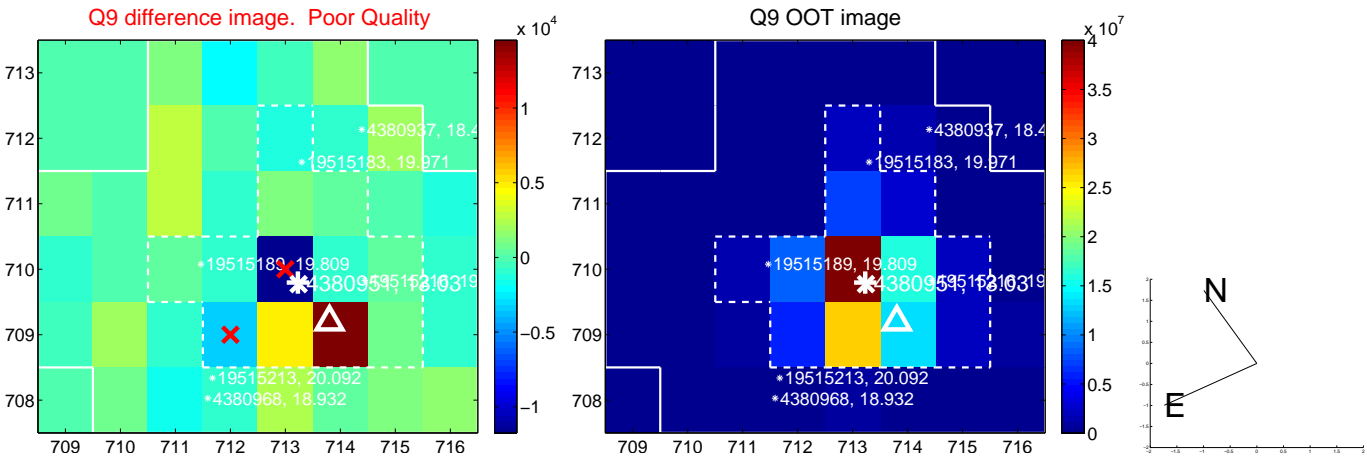
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



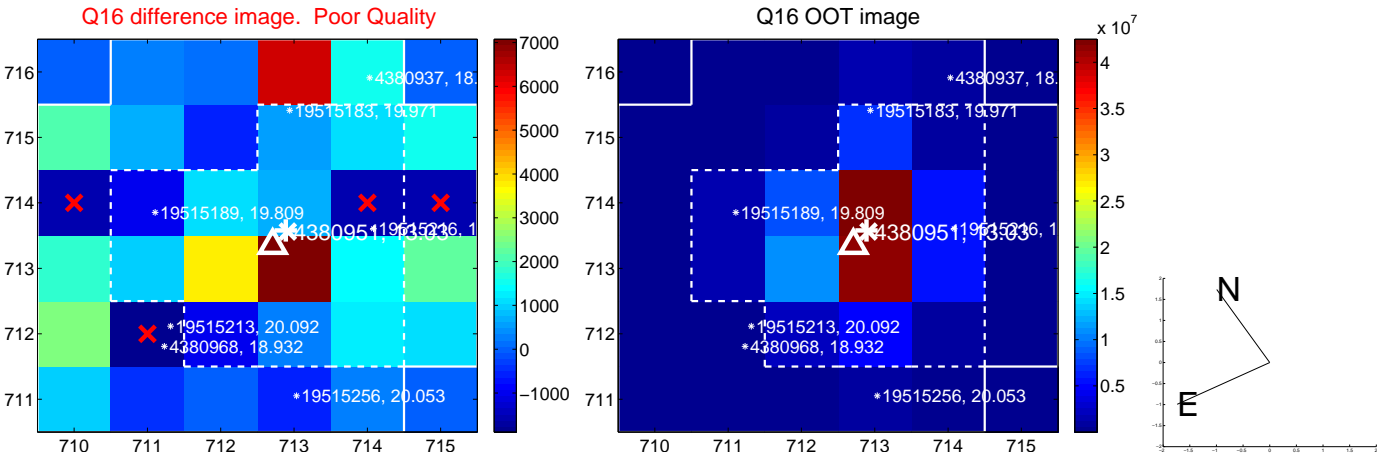
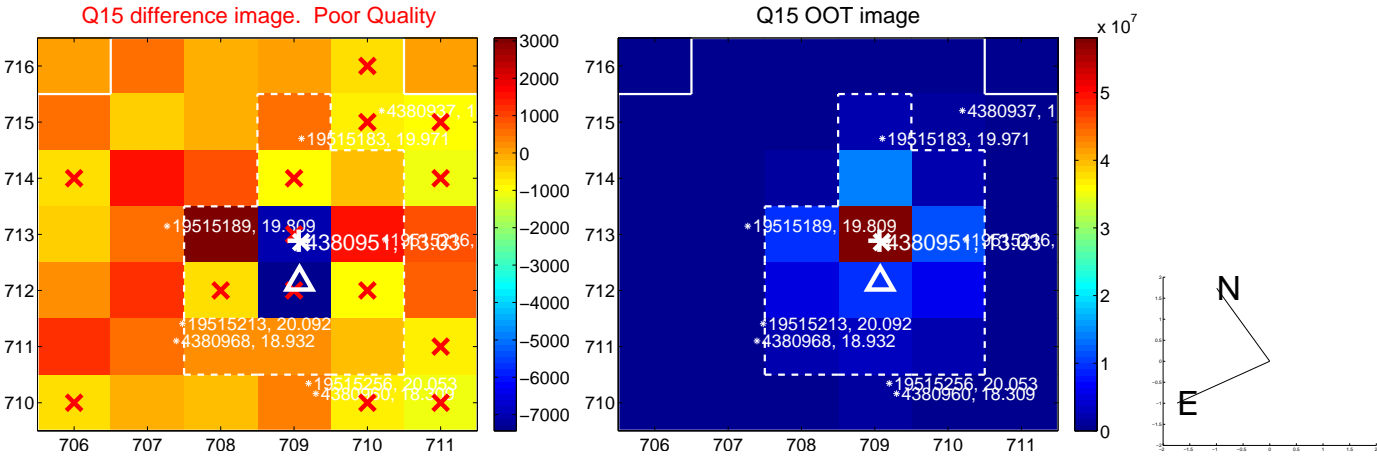
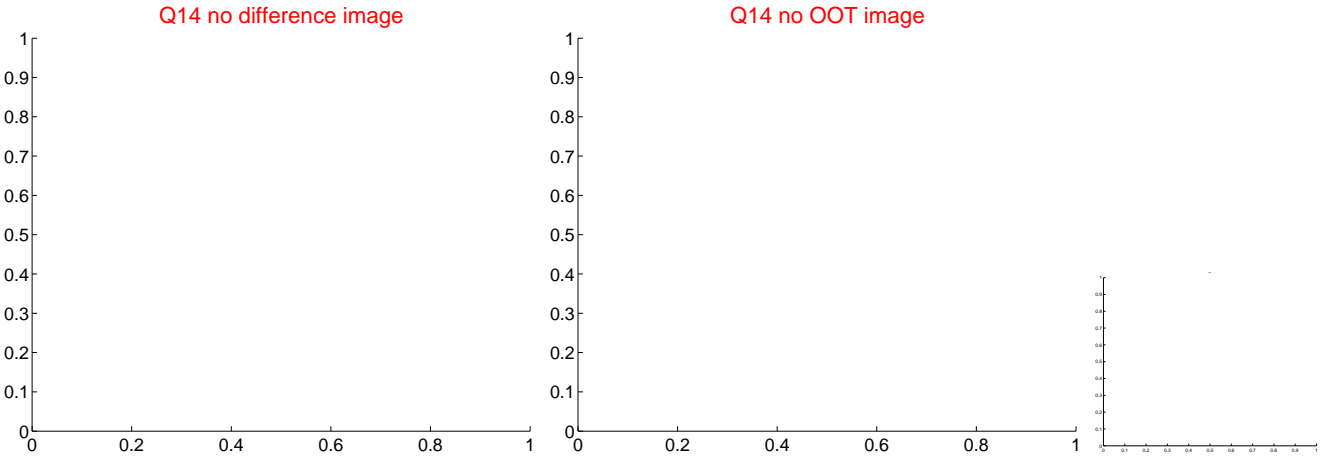
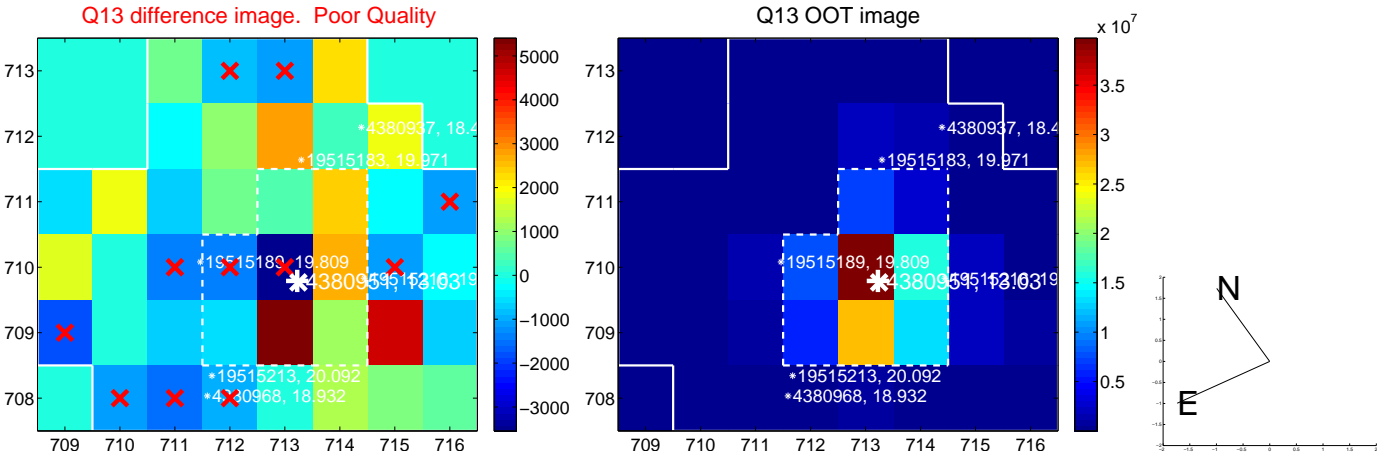
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



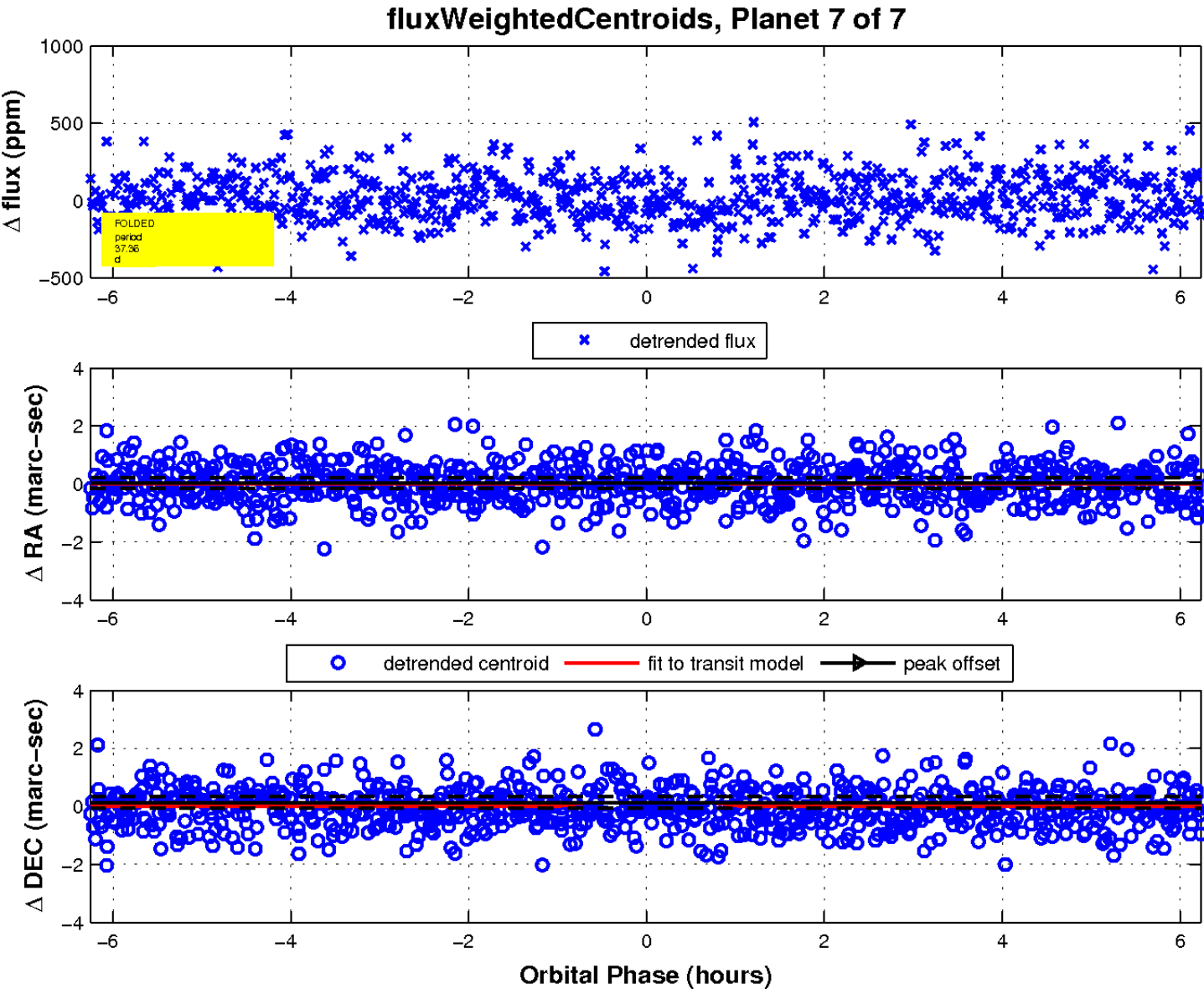
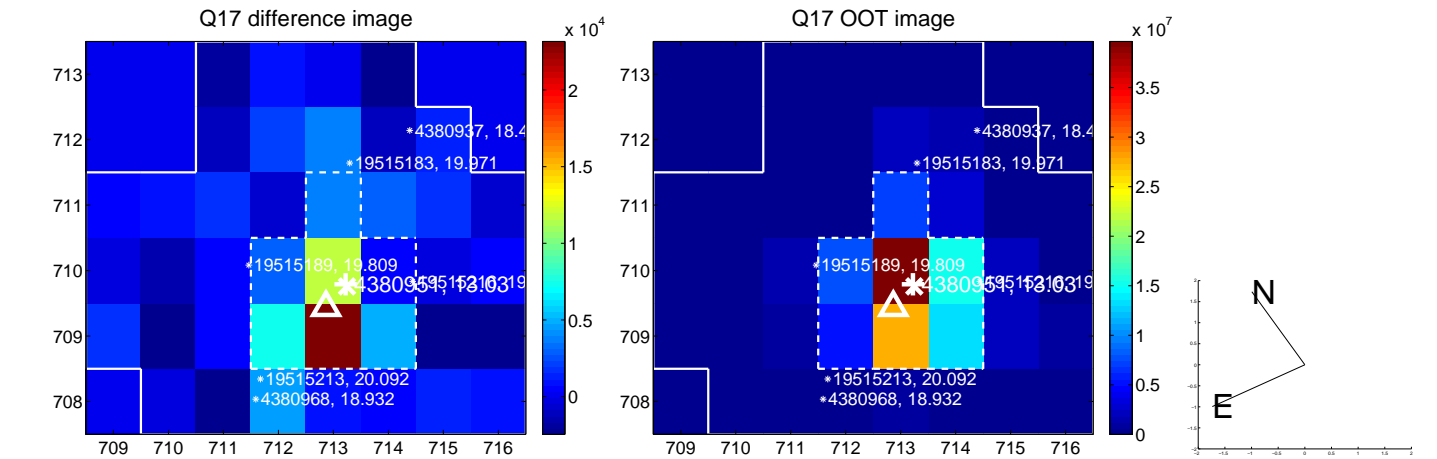
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

