

# KIC 010190777

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 010190777-01 | OBS      | 1937.01 | 1.411225      | 132.644547   | 282.4       | 1.422            | 46.5 | 68.5 | 0.74                        | 4575            | 1.54                   | 435.15                 |
| 010190777-02 | OBS      | No      | 1.411495      | 132.255102   | 16.6        | 2.189            | 7.3  | 5.0  | 0.74                        | 4575            | 0.37                   | 435.04                 |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments                     |
|--------------|----------|------|-------|---|---|---|---|------------------------------|
| 010190777-01 | OBS      | PC   | 0.97  | 0 | 0 | 0 | 0 | NO_COMMENT                   |
| 010190777-02 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | RESIDUAL_TCE--CENT_FEW_DIFFS |

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

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

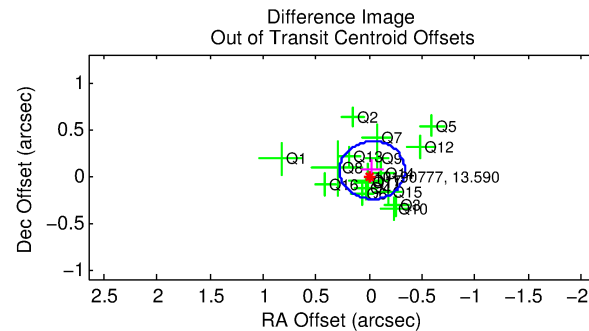
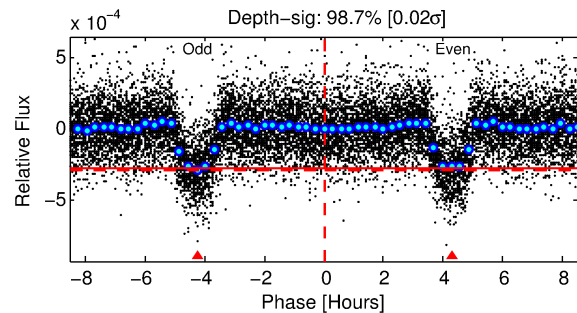
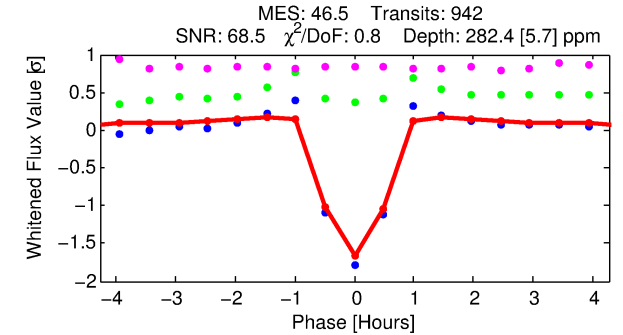
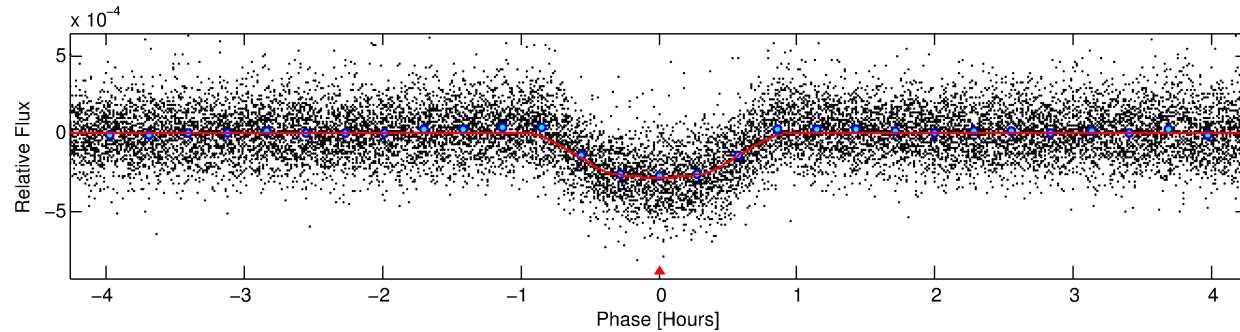
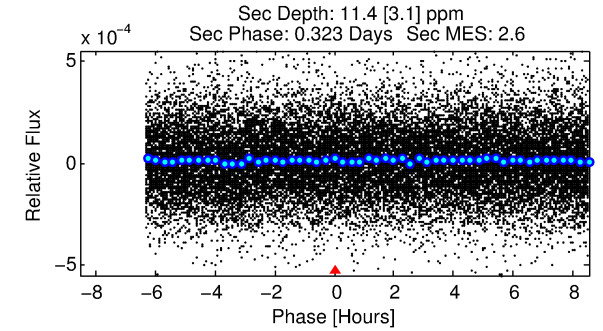
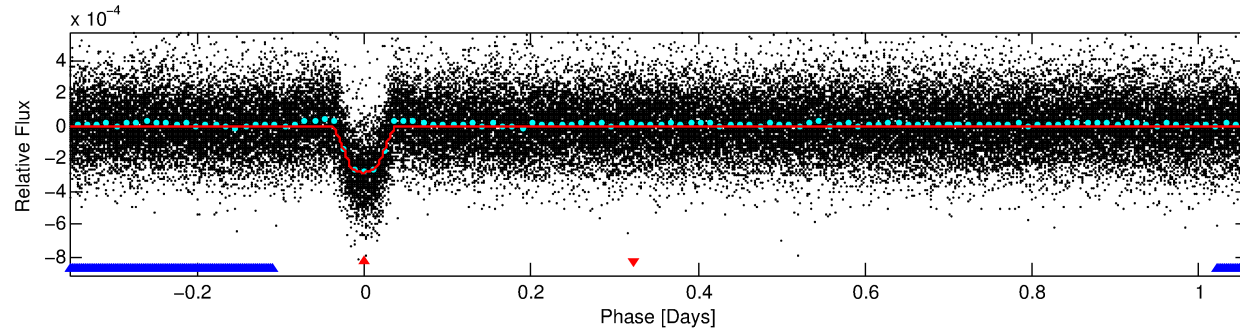
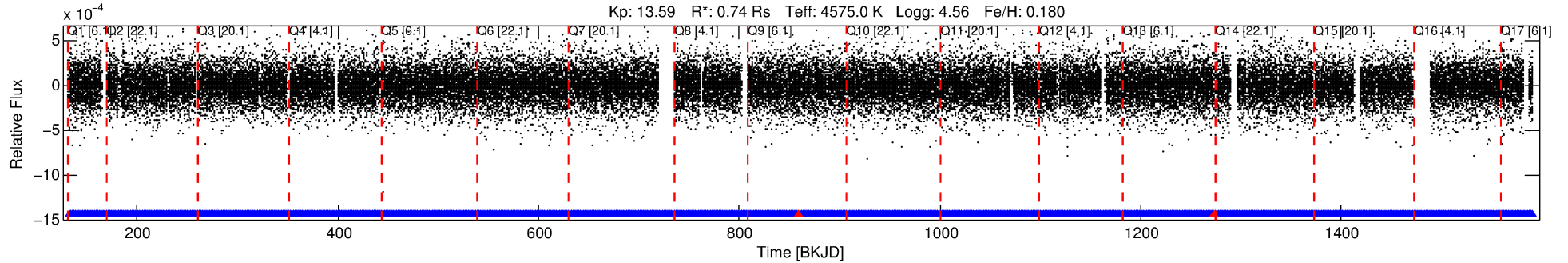
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 010190777-01

No Significant Match Found

# DV One-Page Summary

KIC: 10190777 Candidate: 1 of 2 Period: 1.411 d  
KOI: K01937.01 Corr: 0.975



## DV Fit Results:

Period = 1.41122 [0.00000] d  
Epoch = 132.6445 [0.0003] BKJD  
Rp/R\* = 0.0191 [0.0028]  
a/R\* = 3.75 [1.85]  
b = 0.90 [0.12]  
Seff = 435.15 [49.20]  
Teq = 1165 [33] K  
Rp = 1.54 [0.24] Re  
a = 0.0221 [0.0012] AU  
Ag = 1.29 [0.53] [0.56σ]  
Teffp = 1921 [195] K [3.82σ]

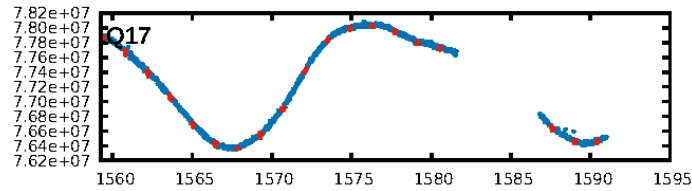
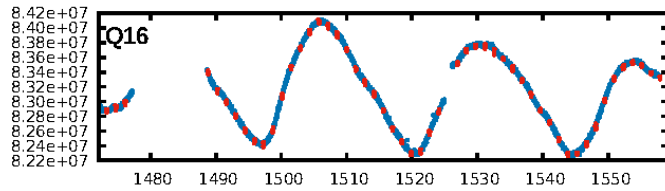
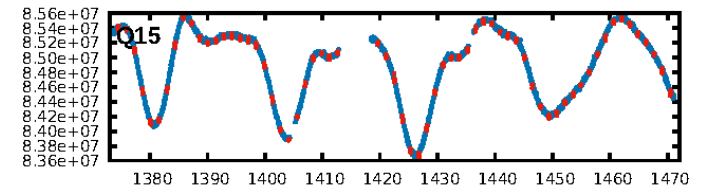
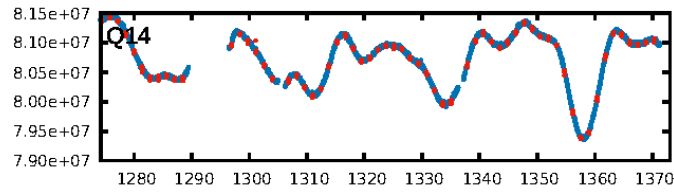
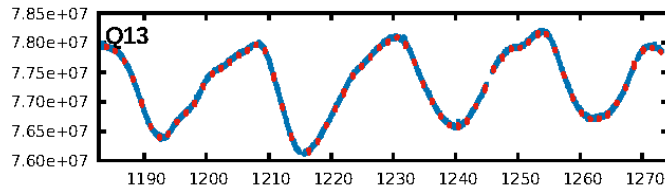
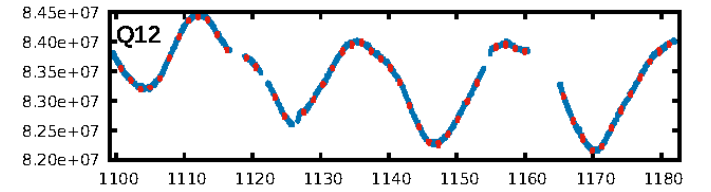
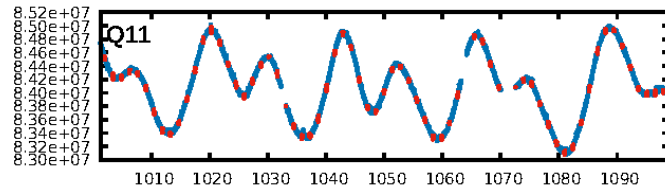
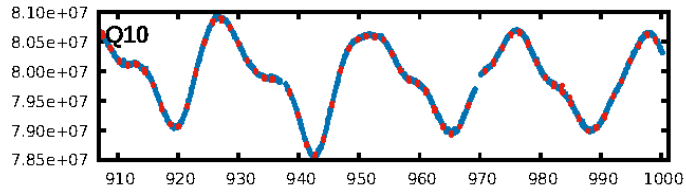
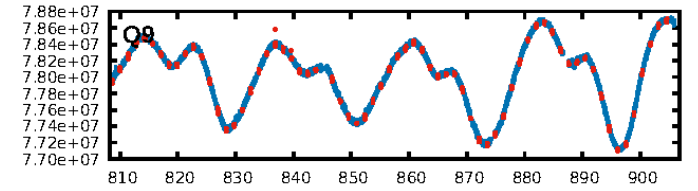
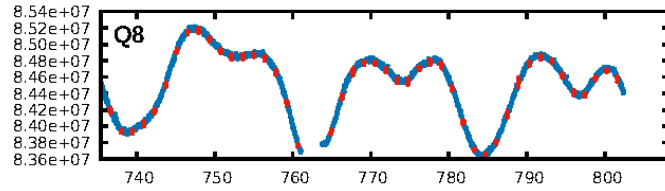
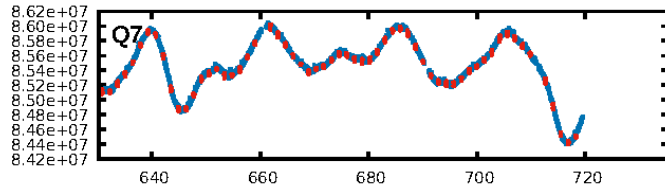
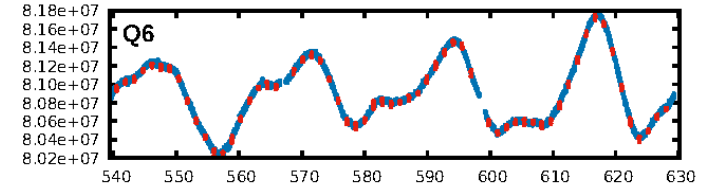
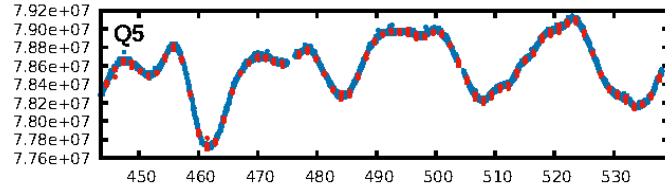
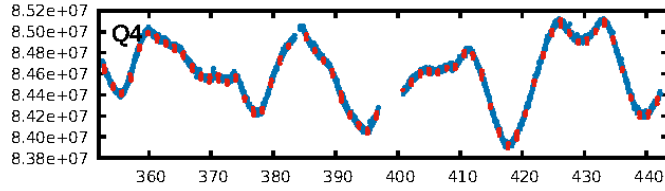
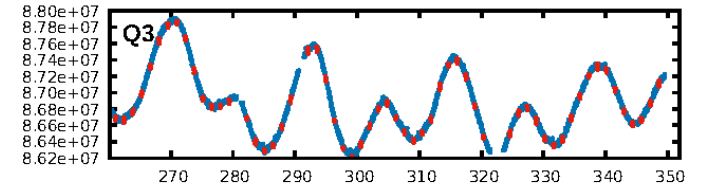
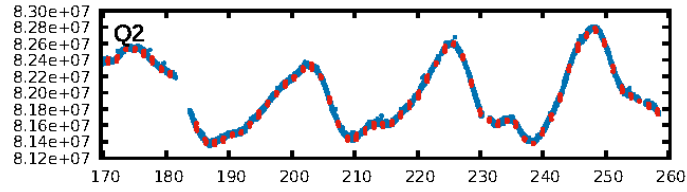
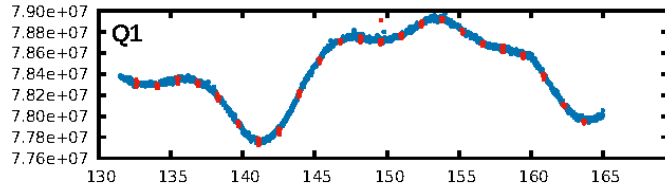
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.2% [0.00σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [898/900]  
GhostDiagnostic-chr: 4.675  
Centroid-sig: 0.0%  
Centroid-so: 0.515 arcsec [3.30σ]  
OotOffset-rm: 0.068 arcsec [0.66σ]  
KicOffset-rm: 0.080 arcsec [0.79σ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 1.00 [17/17]  
DiffImageOverlap-fno: 0.47 [8/17]

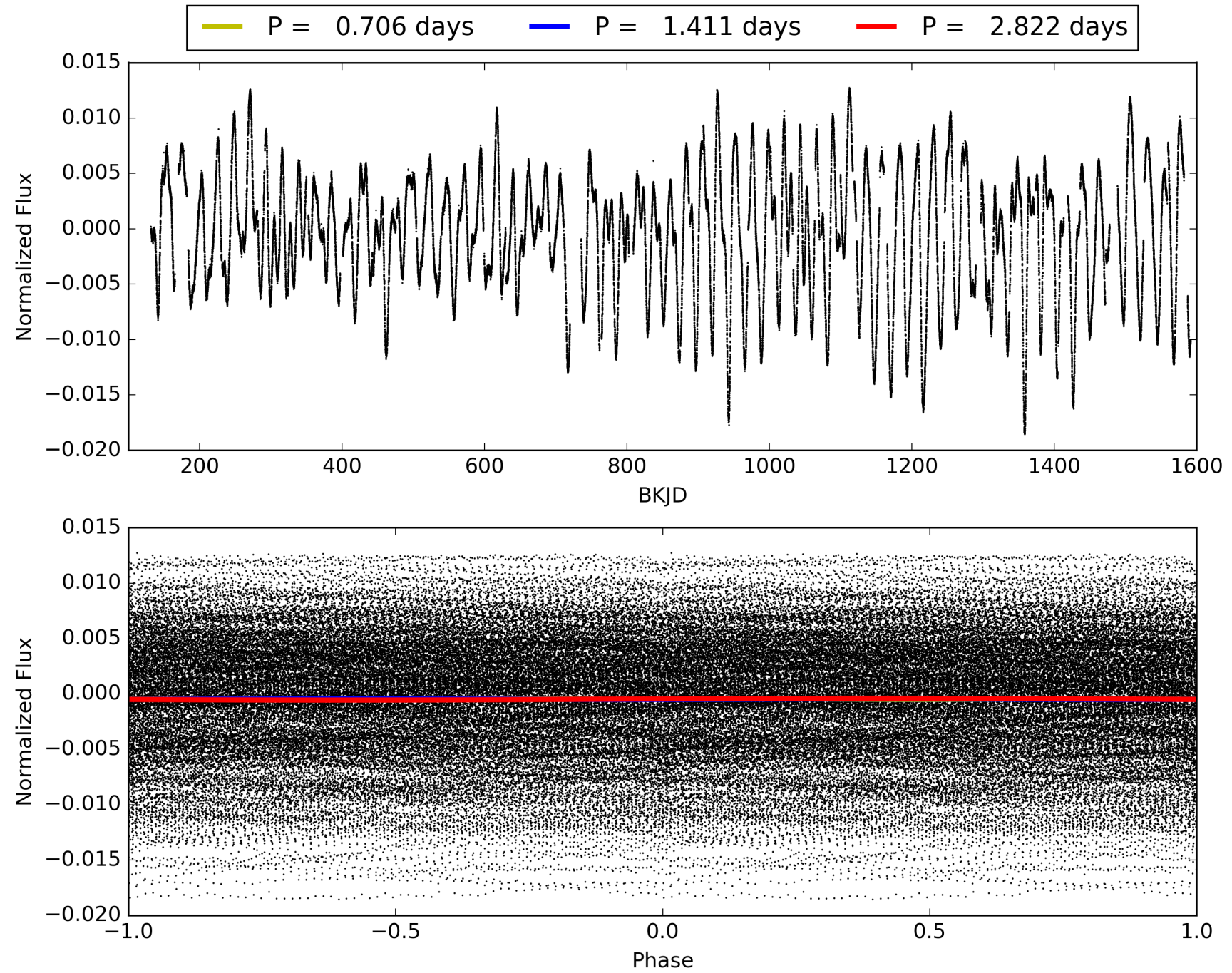
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 07:40:05 Z

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

# TCE 010190777-01, PDC Light Curves

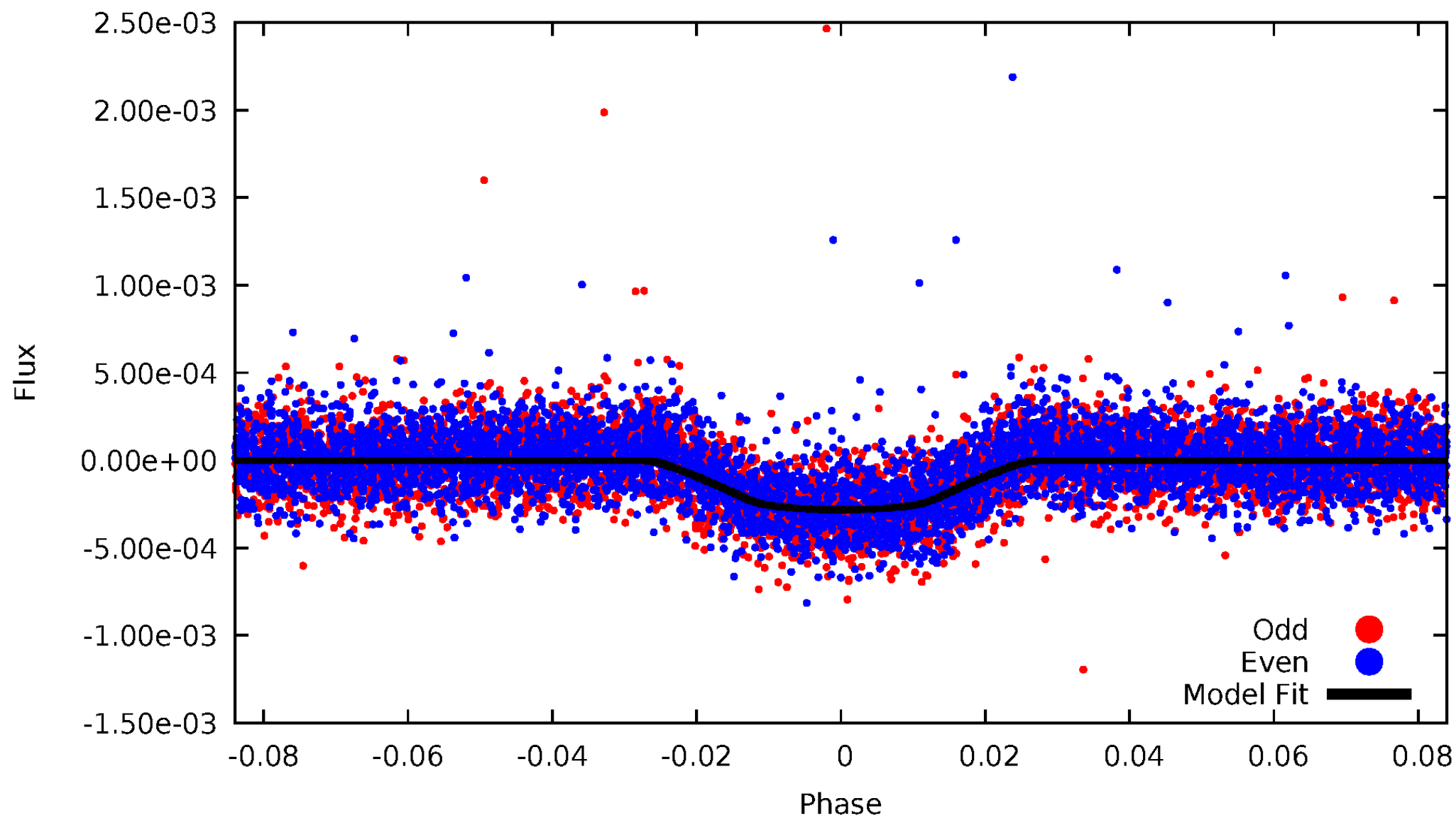


# TCE 010190777-01



# DV Odd/Even

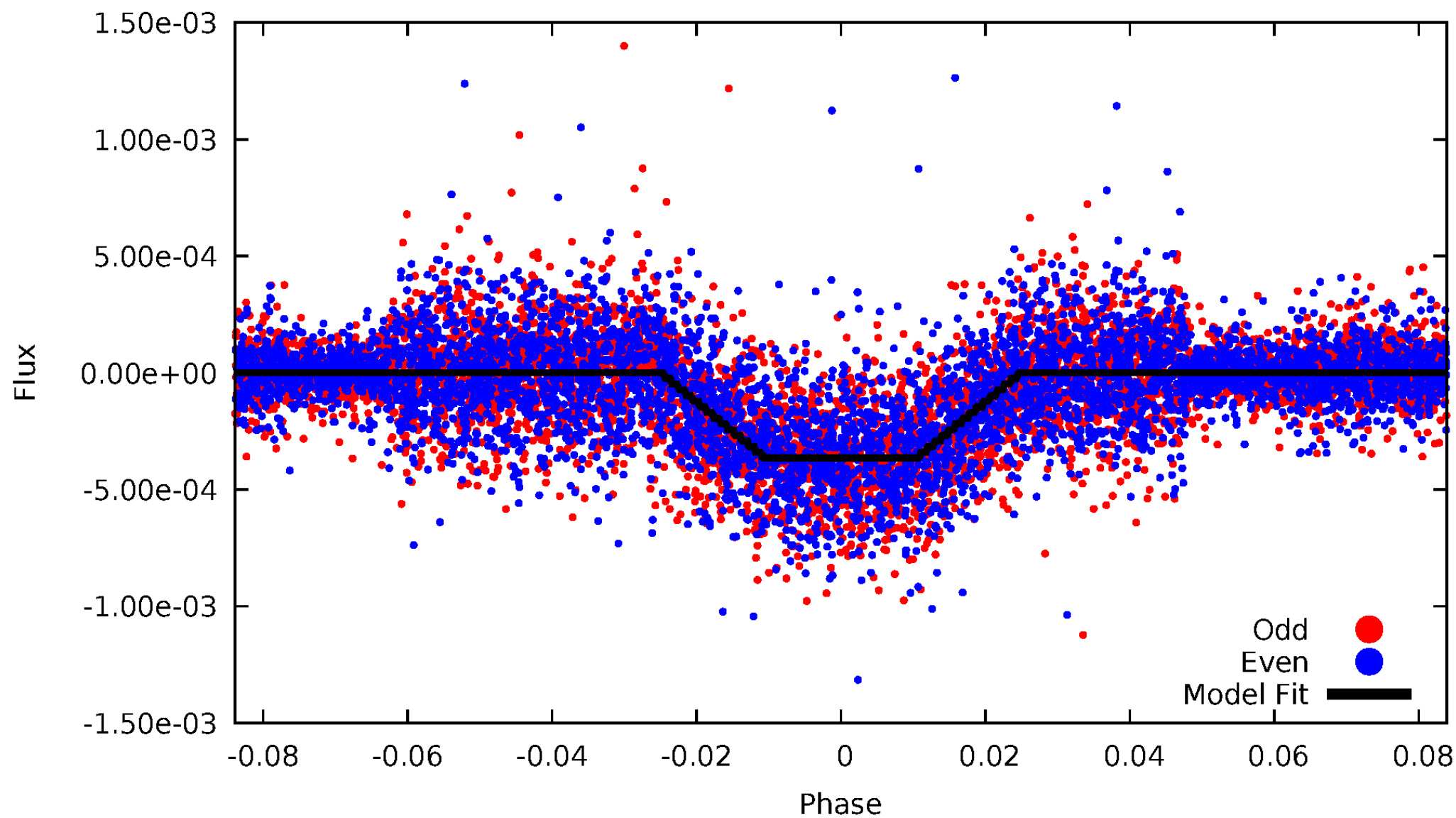
TCE 010190777-01



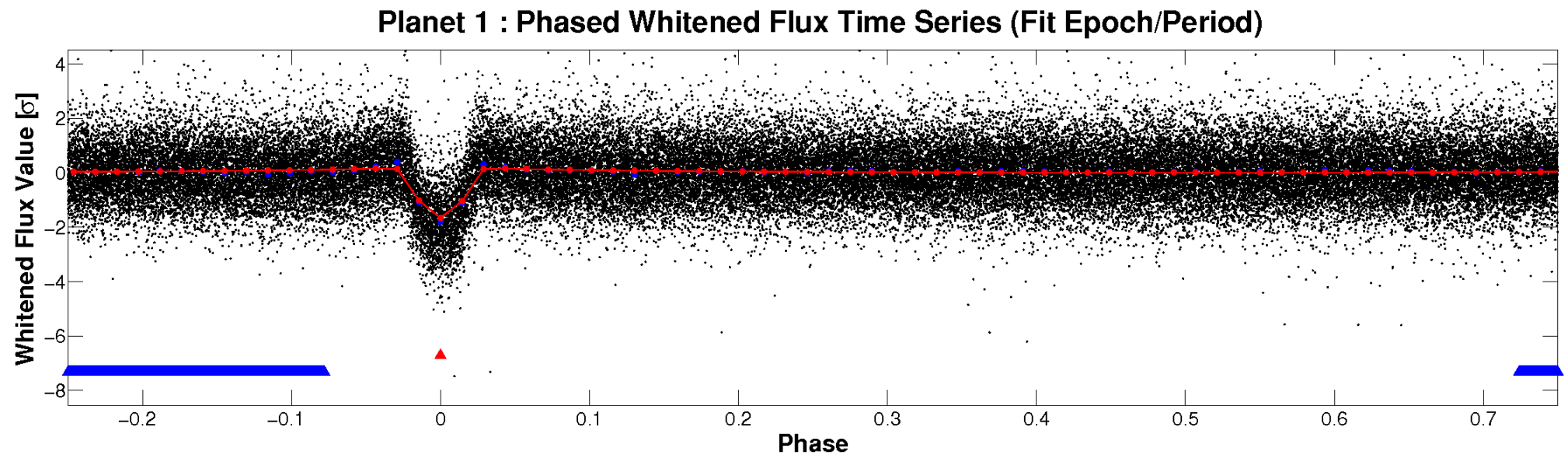
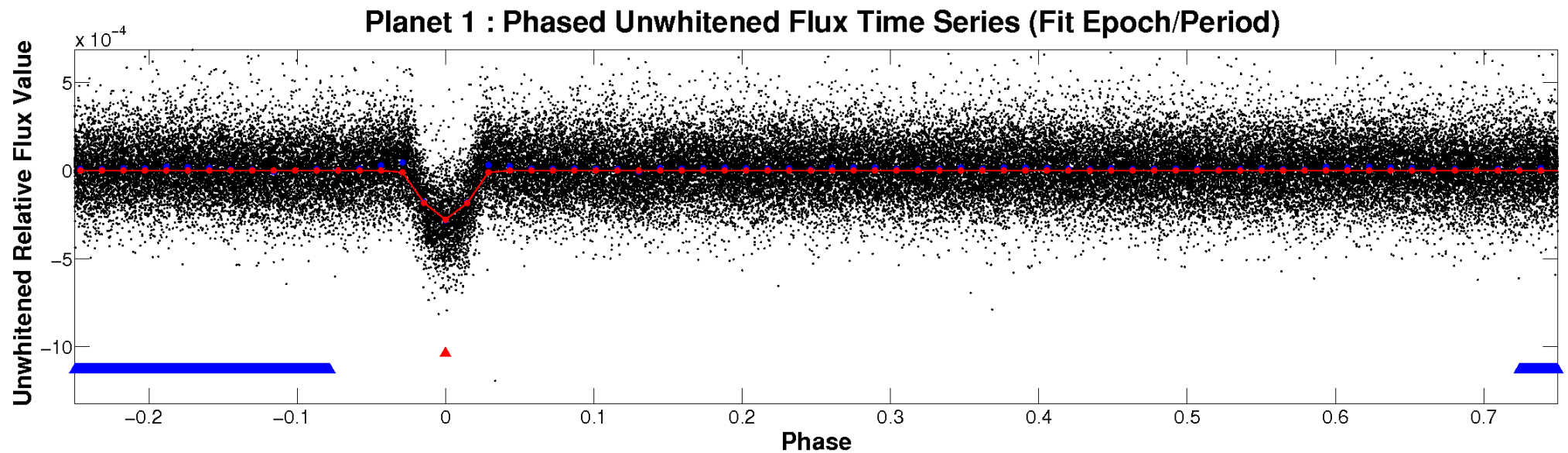


# ALT Odd/Even

TCE 010190777-01

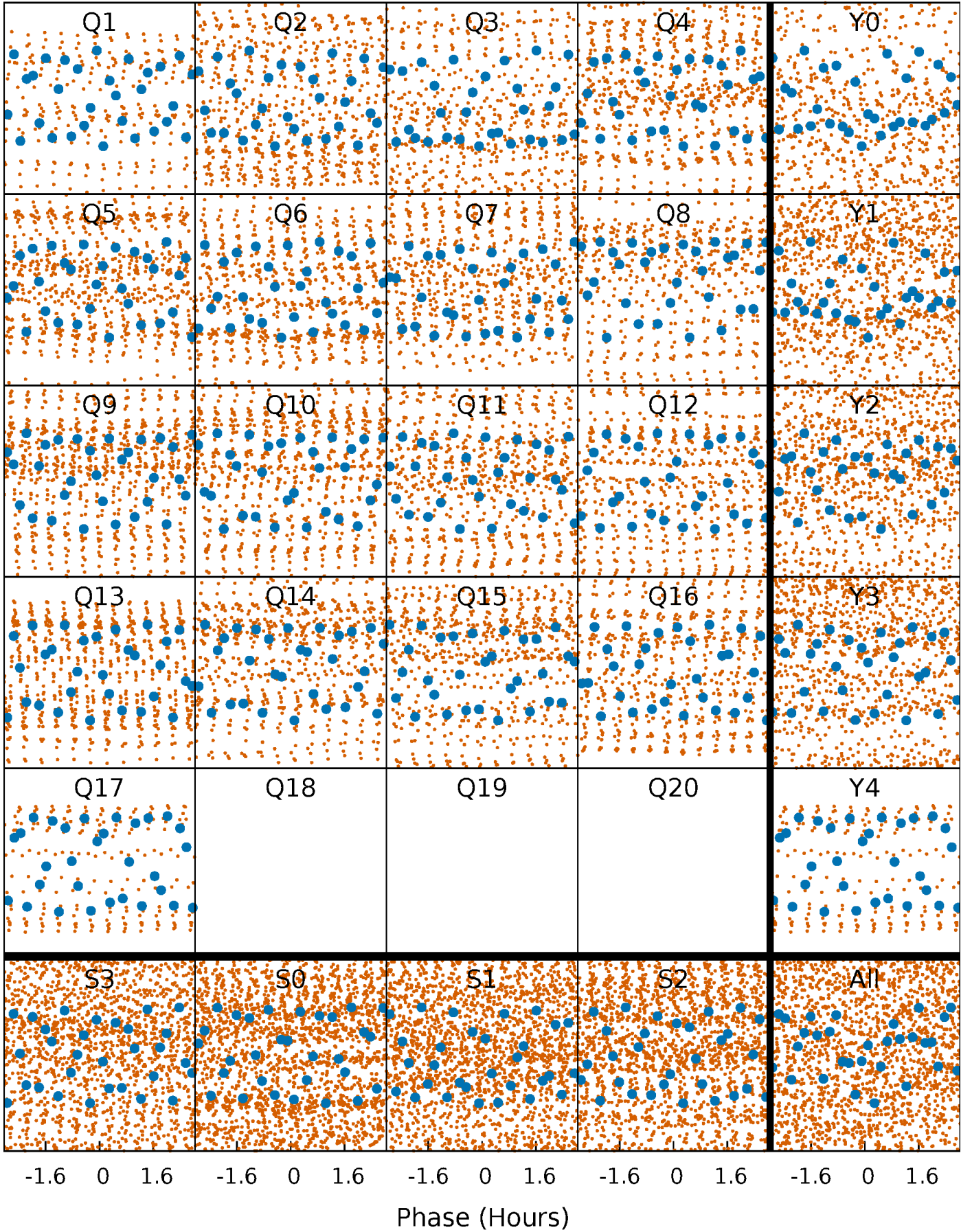


# Non-Whitened Vs. Whitened Light Curve



# PDC Quarter-Phased Transit Curves

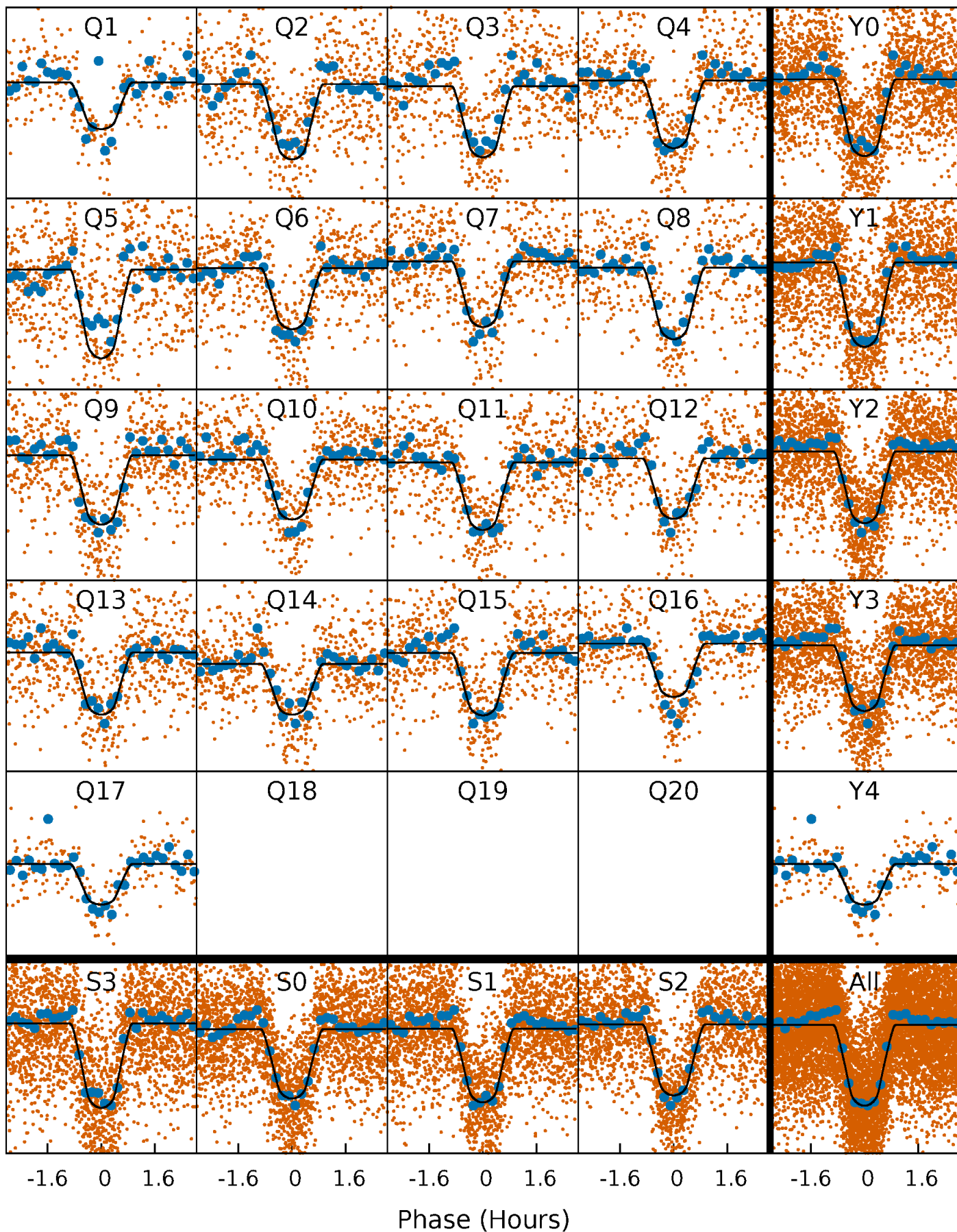
TCE 010190777-01     $P = 1.411225$  Days     $T_0 = 132.644547$  (BKJD)





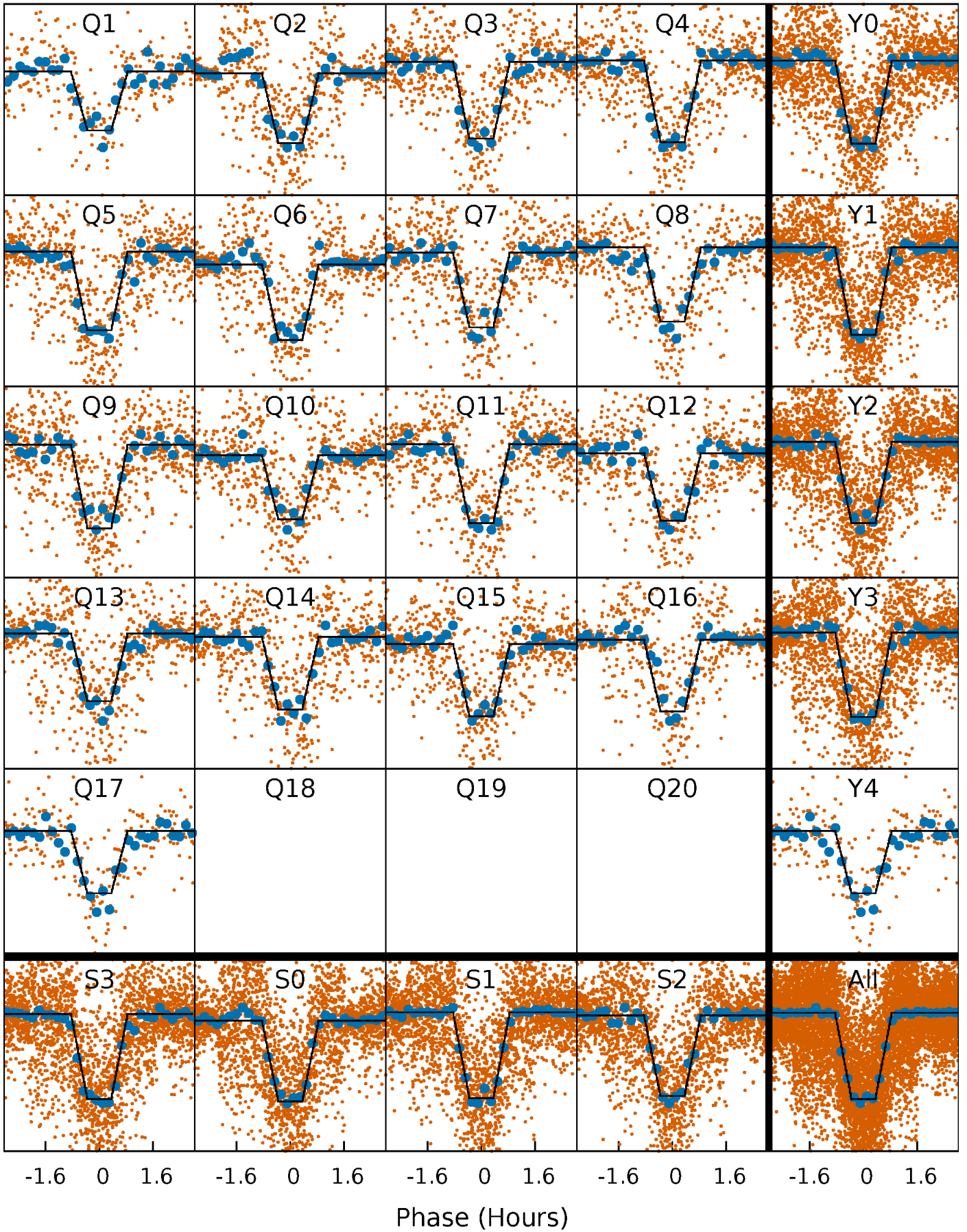
# DV Quarter-Phased Transit Curves

TCE 010190777-01 P= 1.411225 Days  $T_0=132.644547$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

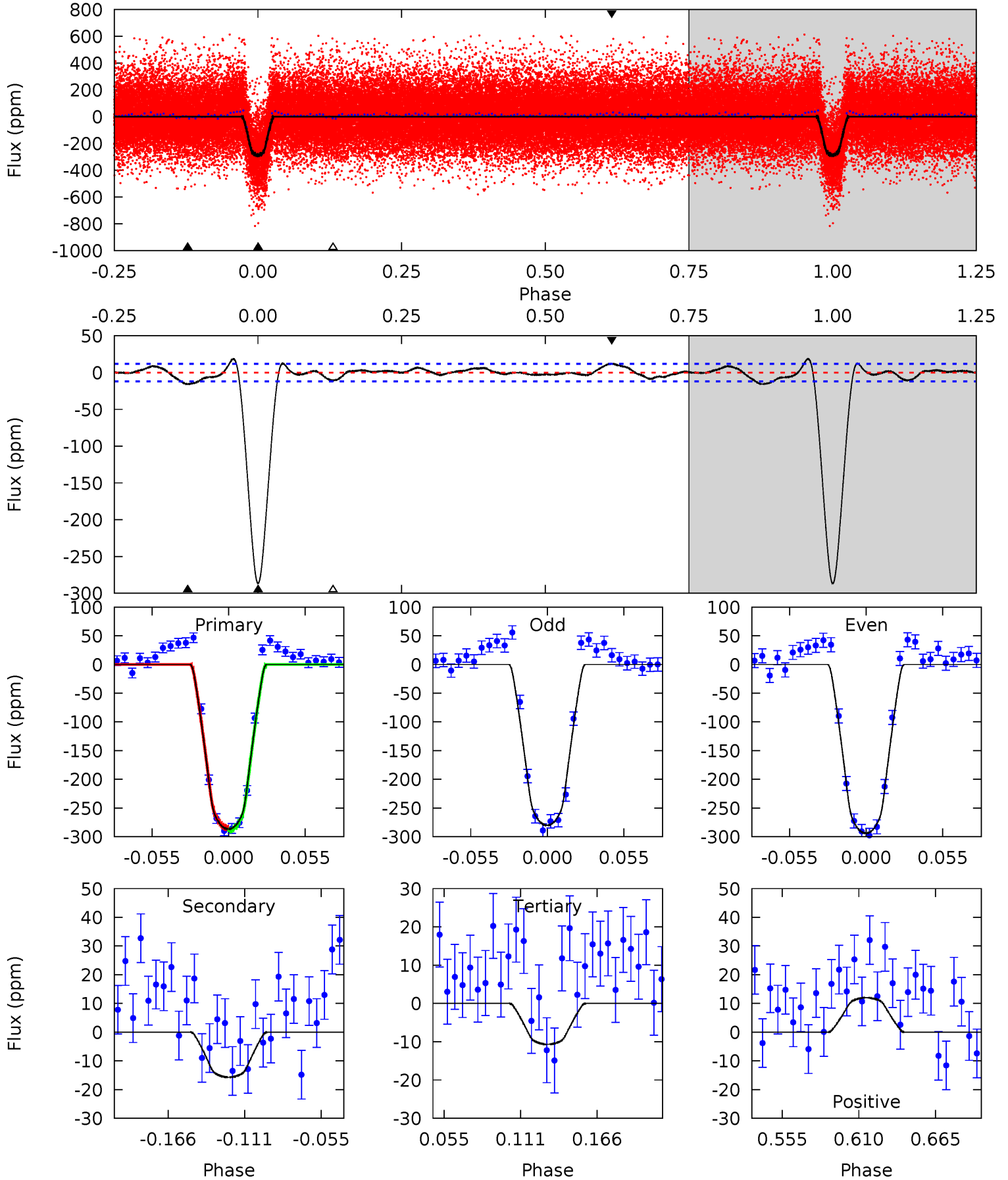
TCE 010190777-01 P= 1.411225 Days  $T_0=132.644560$  (BKJD)



# DV Model-Shift Uniqueness Test

010190777-01, P = 1.411225 Days, E = 131.233322 Days

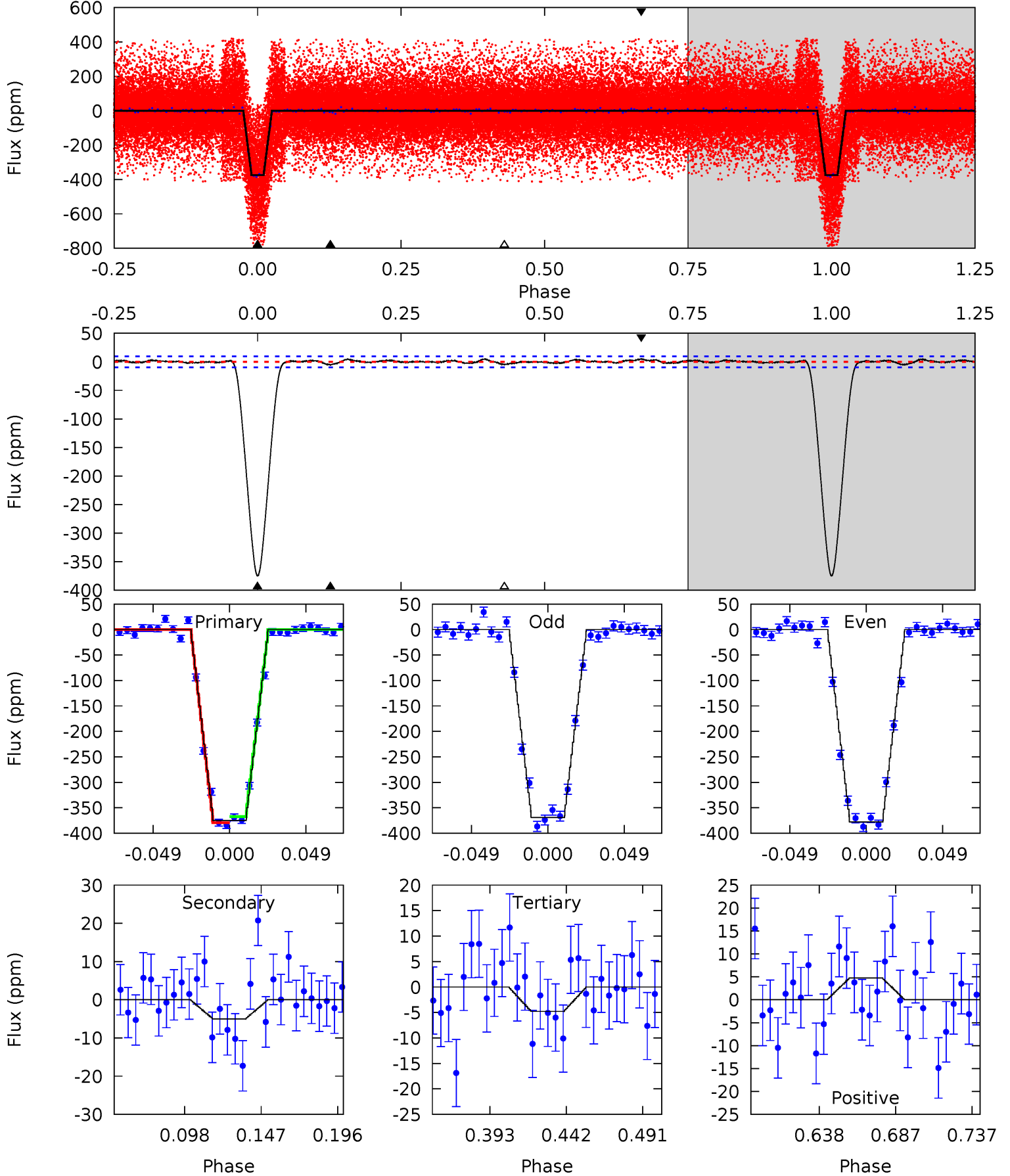
| Pri   | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|-------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 113.1 | 6.20 | 4.21 | 4.73 | 4.69            | 1.92            | 1.69             | 108.9   | 108.3   | 1.99    | 1.47    | 2.71    | 0.98 | 0.06  | 0.89 |



# Alt Model-Shift Uniqueness Test

010190777-01, P = 1.411225 Days, E = 131.233335 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  |
|-------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 185.0 | 2.47 | 2.36 | 2.35 | 4.71            | 1.97            | 0.84             | 182.7   | 182.7   | 0.11    | 0.12    | 2.27    | 0.99 | 0.01  | 2.98 |



### Stellar Parameters For KIC 010190777

|        | $T_{\text{eff}}(K)$ | $\log(g)$                 | $[\text{Fe}/\text{H}]$    | $R (R_{\odot})$           | $M(M_{\odot})$            | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|---------------------|---------------------------|---------------------------|---------------------------|---------------------------|---|
|        | $4575^{+73}_{-82}$  | $4.564^{+0.051}_{-0.012}$ | $0.180^{+0.150}_{-0.150}$ | $0.737^{+0.020}_{-0.043}$ | $0.726^{+0.039}_{-0.027}$ | $2.553^{+0.480}_{-0.142}$                 |
|        | +2%/-2%             | +1%/-0%                   | +83%/-83%                 | +3%/-6%                   | +5%/-4%                   | +19%/-6%                                  |
| Source | SPE90               | SPE90                     | SPE90                     | DSEP                      |                           |   |

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

### Secondary Eclipse Parameters for KIC 010190777-01 / KOI 1937.01

| Detrend | Depth (ppm) | $R_p (R_{\oplus})$     | $T_{\text{max}} (K)$ | $T_{\text{obs}} (K)$ | $A_{\text{obs}}$          |
|---------|-------------|------------------------|----------------------|----------------------|---------------------------|
| DV      | $-16 \pm 3$ | $1.52^{+0.25}_{-0.24}$ | $1614^{+38}_{-35}$   | $2705^{+154}_{-149}$ | $1.868^{+0.800}_{-0.555}$ |
| Alt.    | $-5 \pm 2$  | $1.52^{+0.20}_{-0.23}$ | $1615^{+30}_{-37}$   | $2202^{+213}_{-388}$ | $0.586^{+0.354}_{-0.243}$ |

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



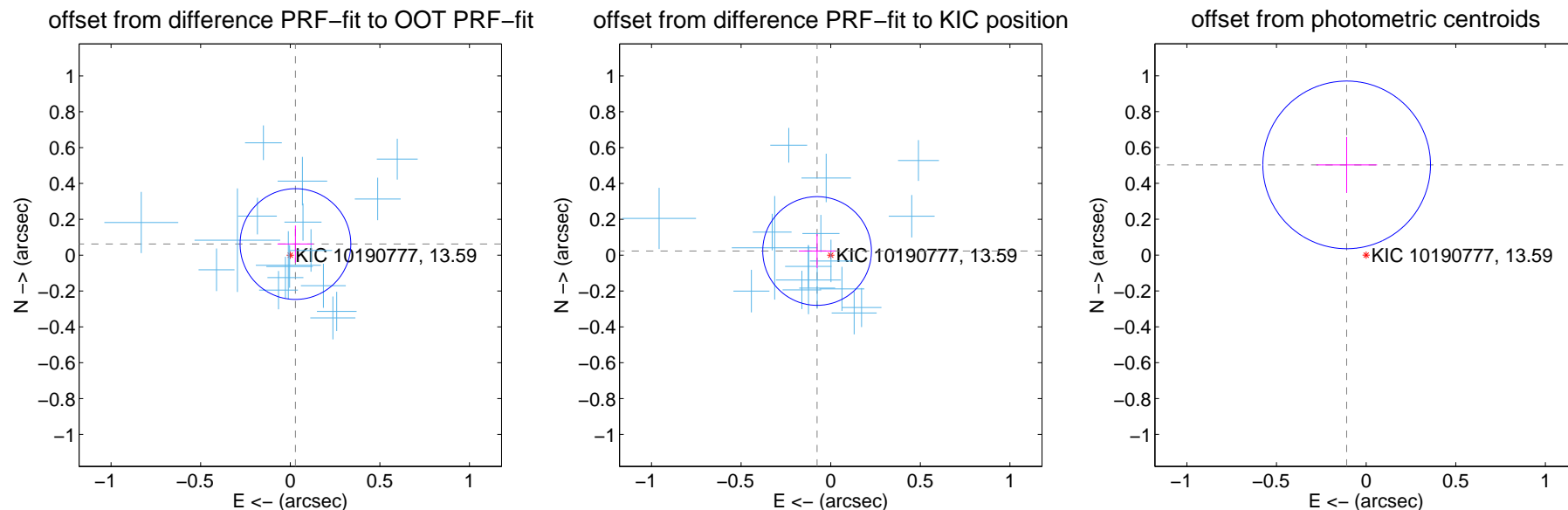
## DV Centroid Data

Supplemental centroid analysis for 010190777-01. Kepler magnitude: 13.59. Transit SNR 68.46

There are 17 quarters with good PRF difference image offsets

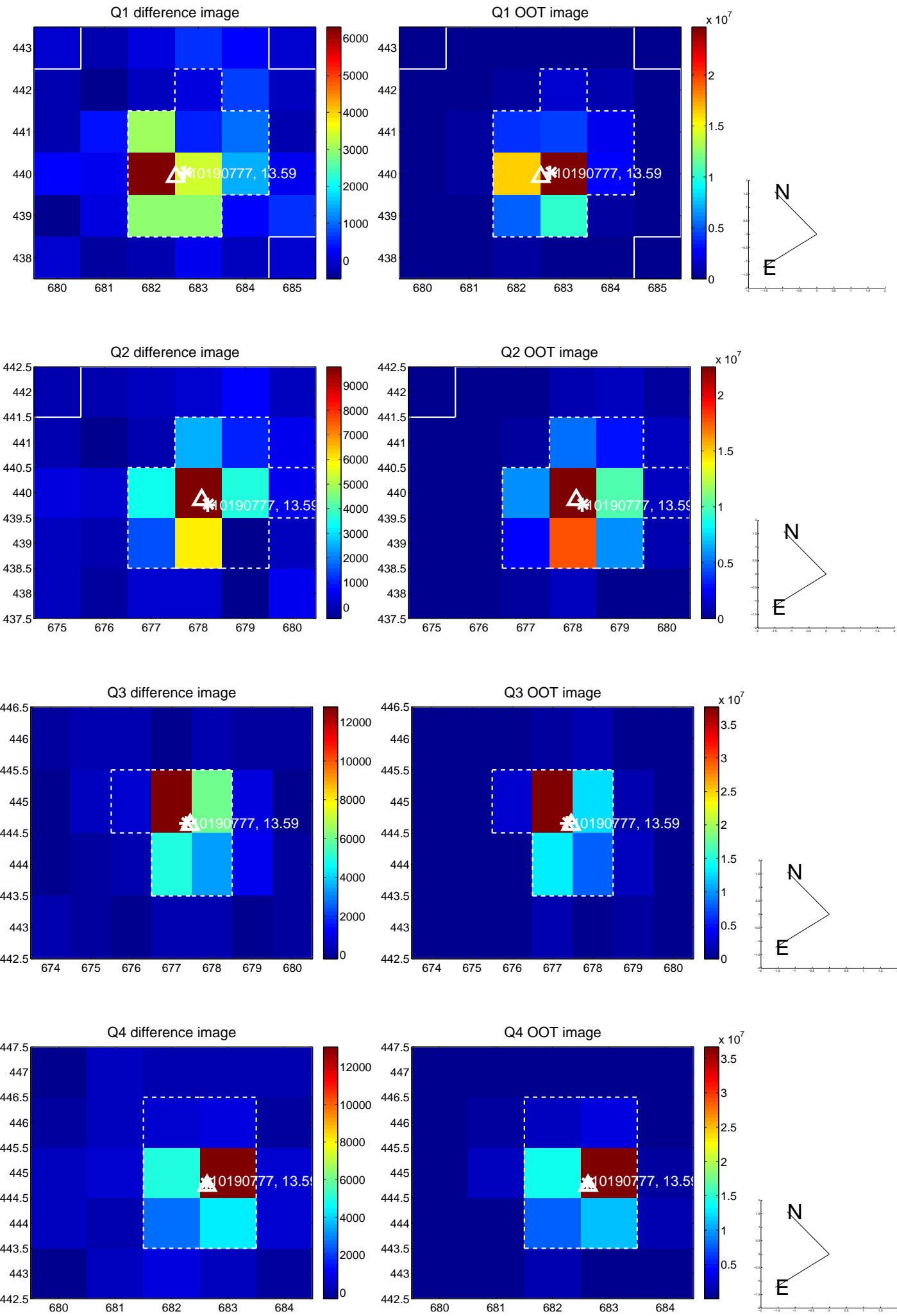
The direct PRF centroid is offset from the target star catalog position by about 0.14 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA        | $\Delta$ Dec      |
|---|--------------------|---------------------|--------------------|-------------------|
| PRF-fit source offset from OOT          | $0.068 \pm 0.103$  | 0.66                | $-0.029 \pm 0.100$ | $0.062 \pm 0.104$ |
| PRF-fit source offset from KIC position | $0.080 \pm 0.101$  | 0.79                | $0.076 \pm 0.102$  | $0.023 \pm 0.095$ |
| photometric centroid source offset      | $0.51 \pm 0.16$    | 3.30                | $0.11 \pm 0.17$    | $0.50 \pm 0.16$   |

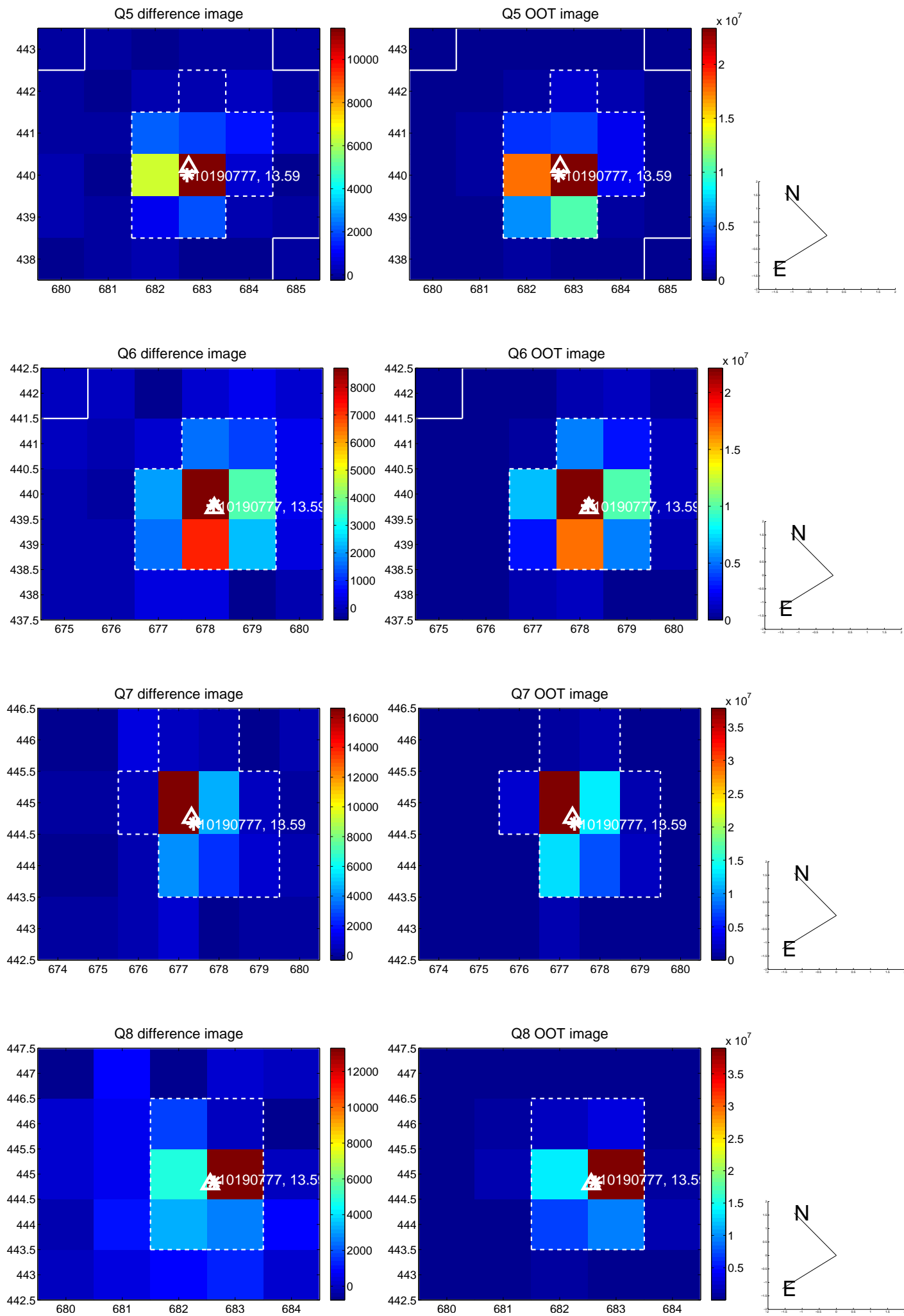


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

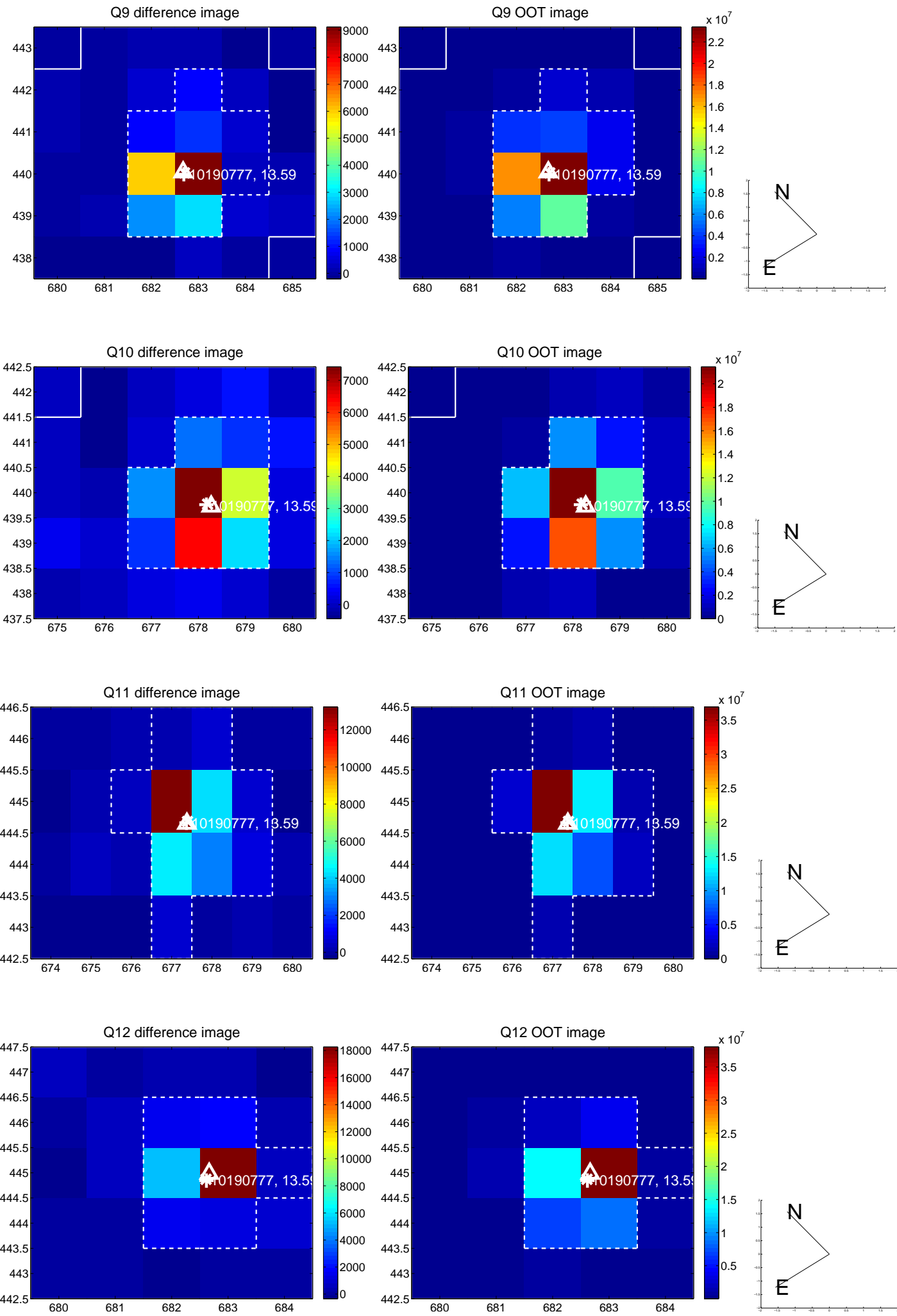
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



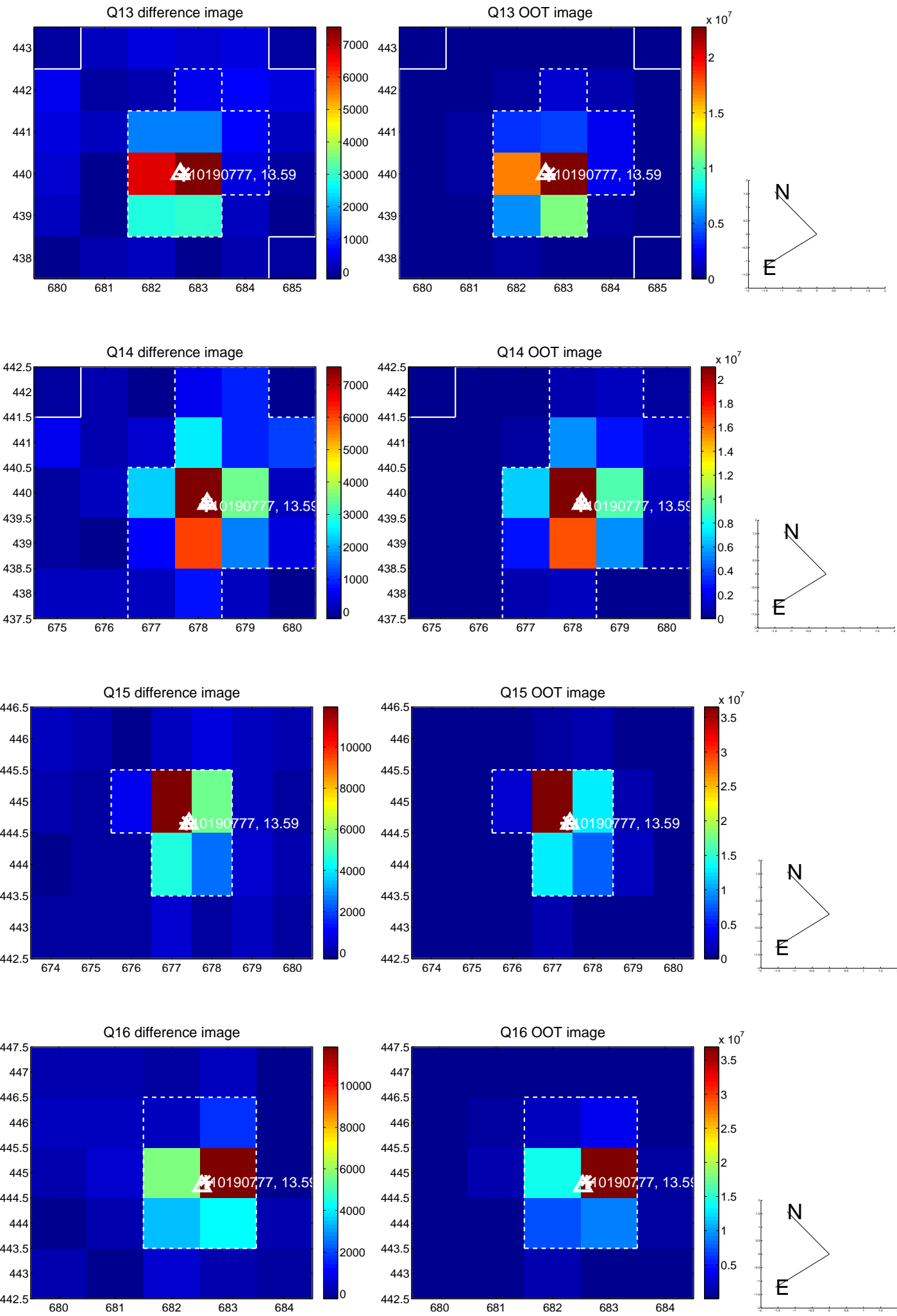
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

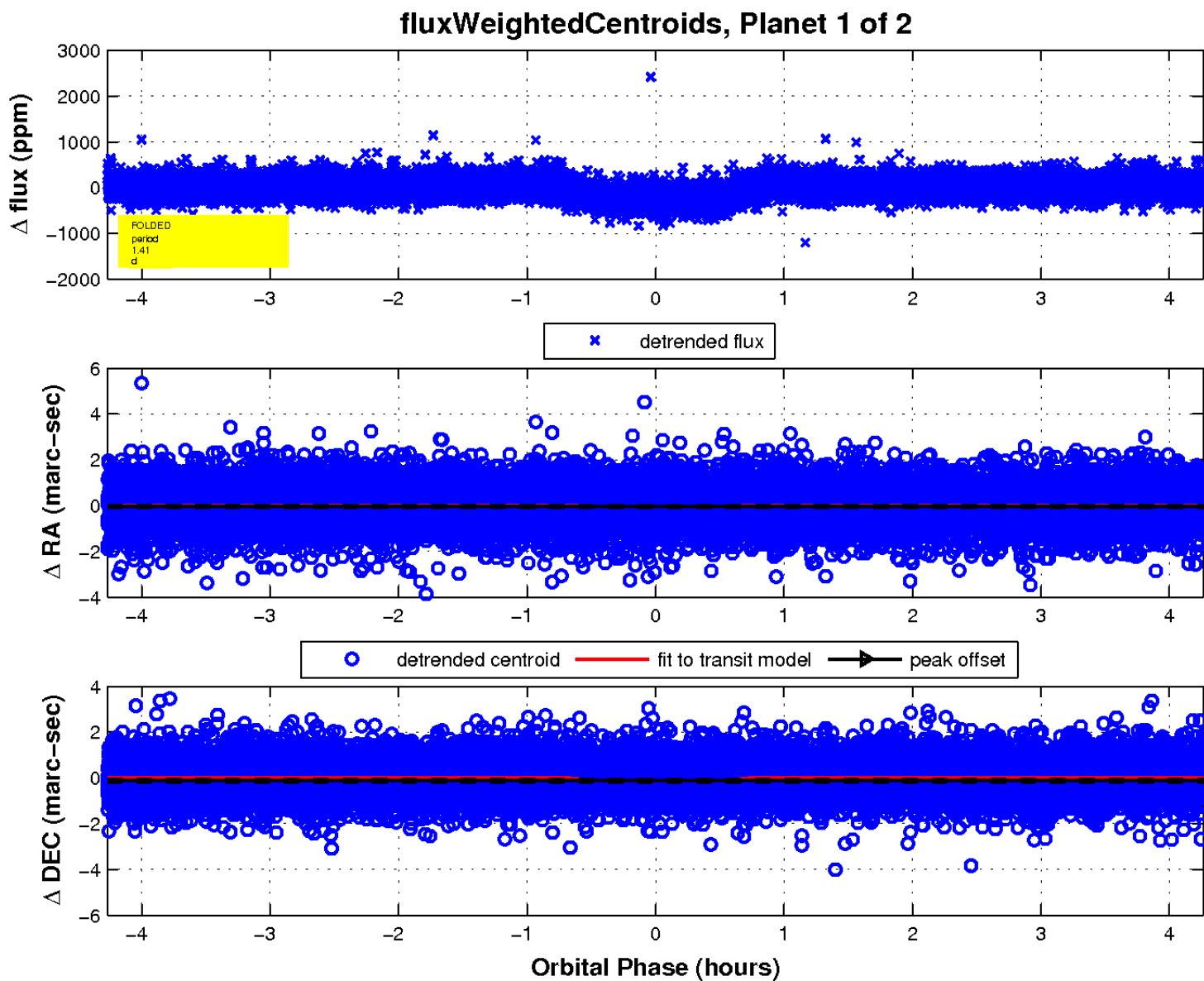
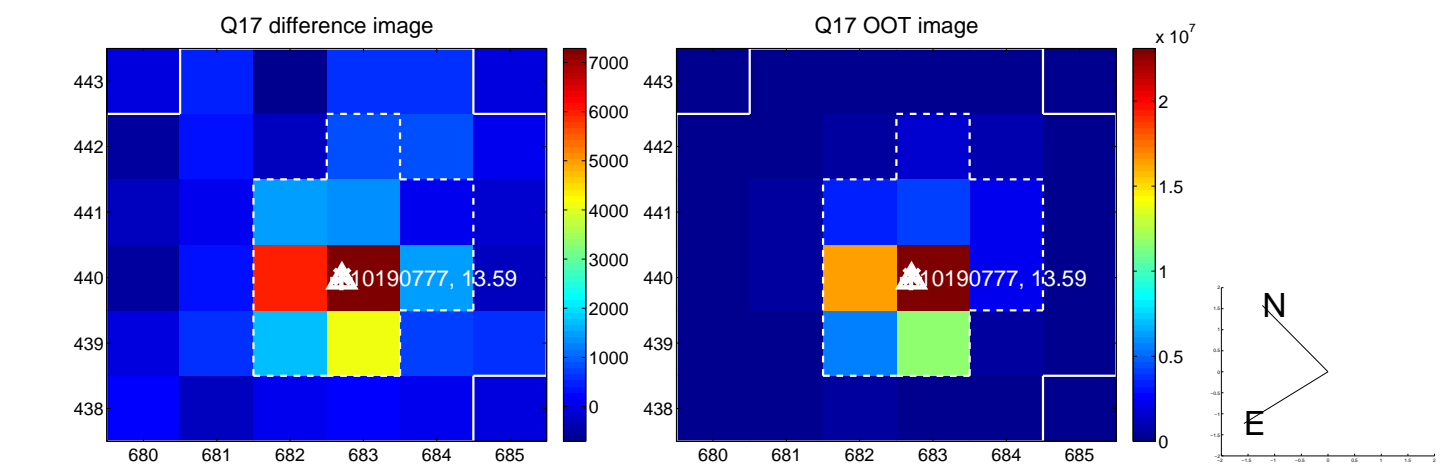


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



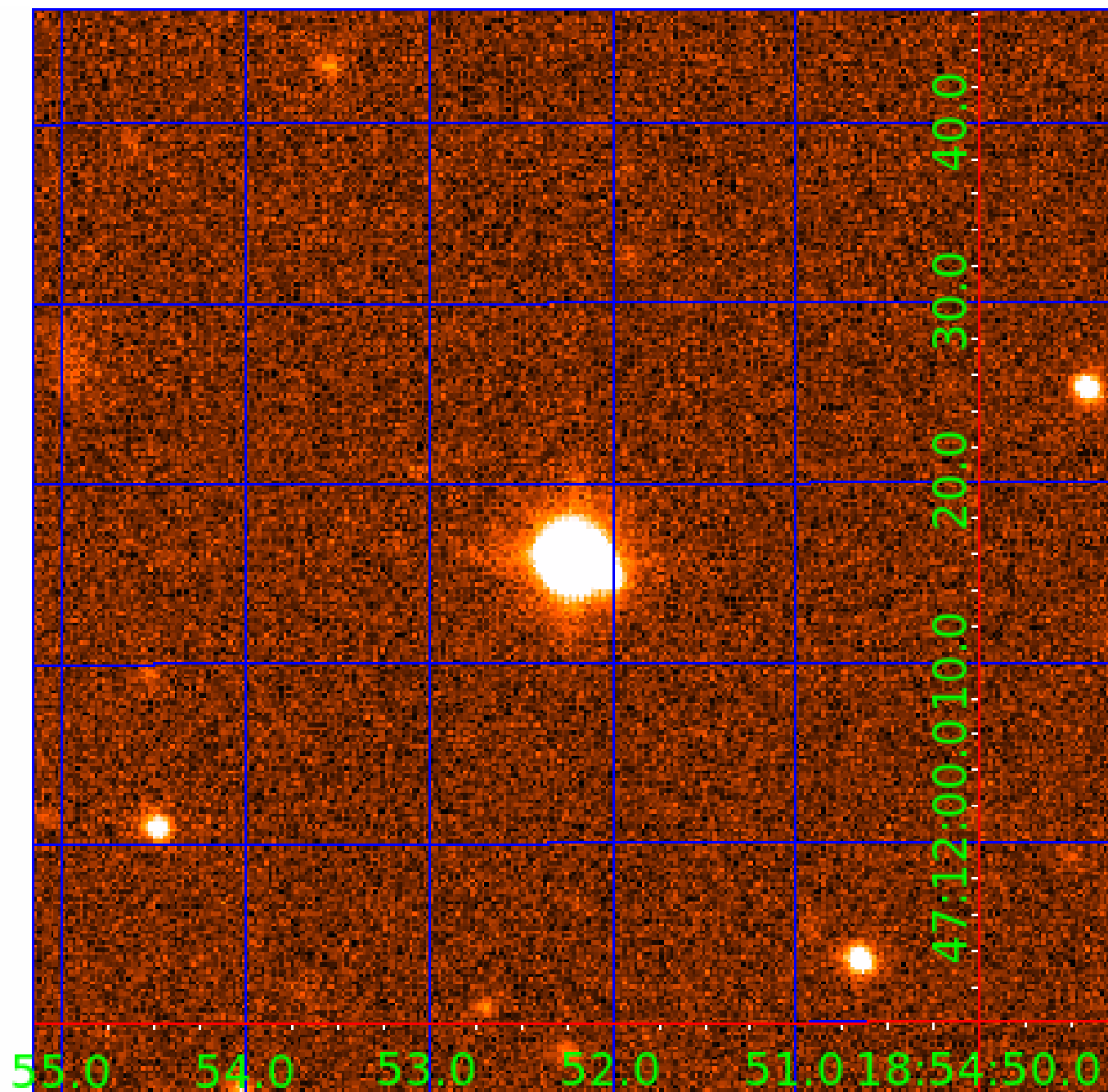


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 010190777

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 010190777-01 | OBS      | 1937.01 | 1.411225      | 132.644547   | 282.4       | 1.422            | 46.5 | 68.5 | 0.74                        | 4575            | 1.54                   | 435.15                 |
| 010190777-02 | OBS      | No      | 1.411495      | 132.255102   | 16.6        | 2.189            | 7.3  | 5.0  | 0.74                        | 4575            | 0.37                   | 435.04                 |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments                     |
|--------------|----------|------|-------|---|---|---|---|------------------------------|
| 010190777-01 | OBS      | PC   | 0.97  | 0 | 0 | 0 | 0 | NO_COMMENT                   |
| 010190777-02 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | RESIDUAL_TCE--CENT_FEW_DIFFS |

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

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

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

## Ephemeris Match Information For 010190777-02

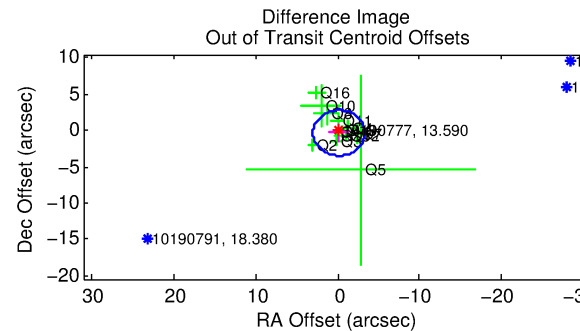
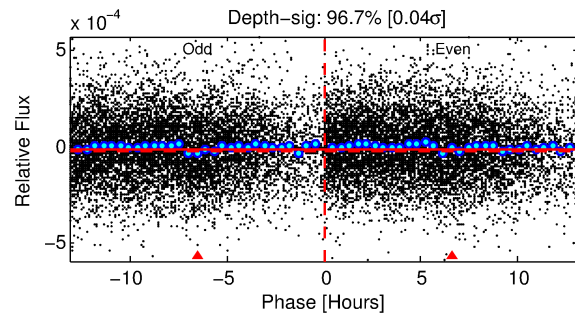
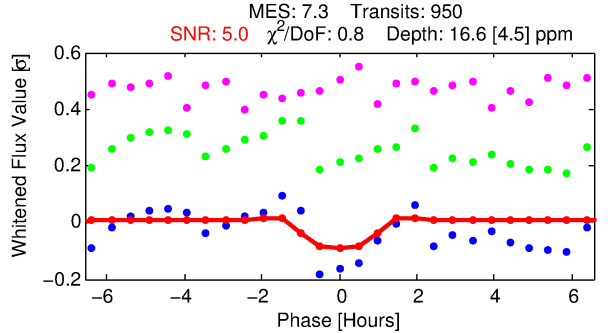
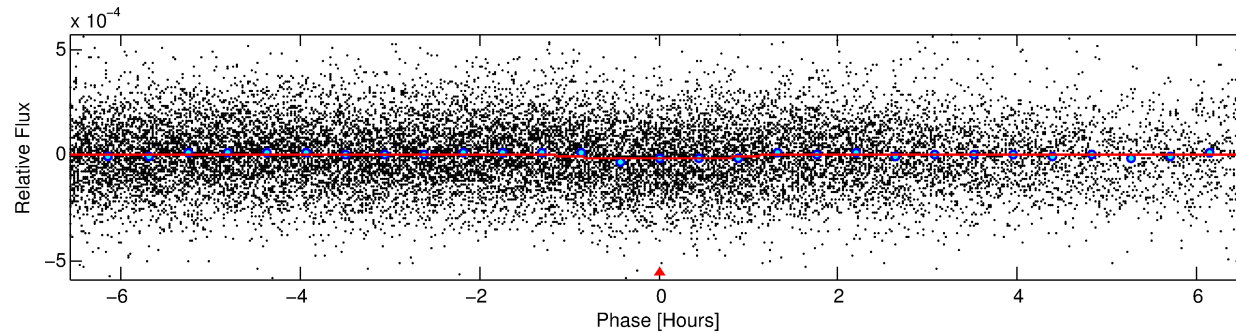
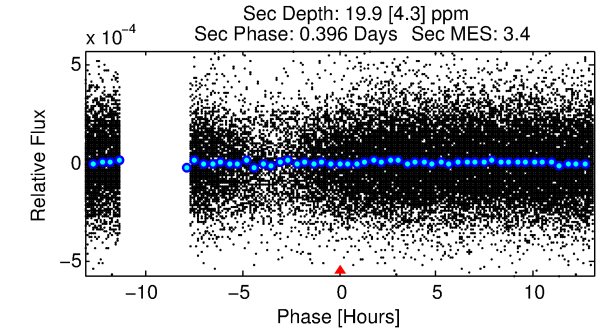
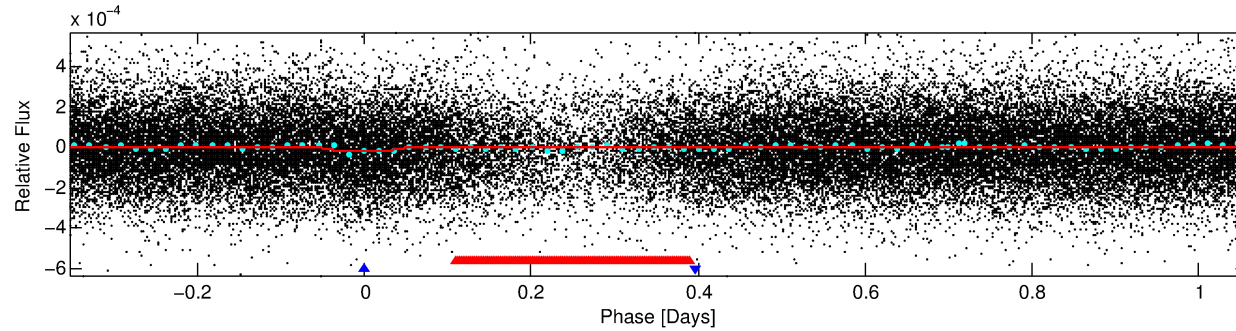
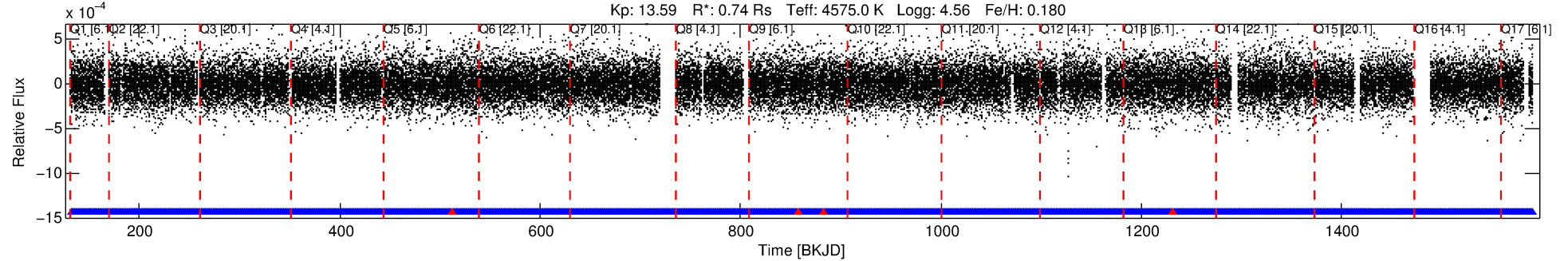
No Significant Match Found

# DV One-Page Summary

KIC: 10190777 Candidate: 2 of 2 Period: 1.411 d

KOI: K01937 Corr: No Ephemeris Match

Kp: 13.59 R\*: 0.74 Rs Teff: 4575.0 K Logg: 4.56 Fe/H: 0.180



## DV Fit Results:

Period = 1.41149 [0.00003] d  
Epoch = 132.2551 [0.0062] BKJD  
Rp/R\* = 0.0046 [0.0047]  
a/R\* = 2.37 [7.41]  
b = 0.90 [0.81]  
Seff = 435.04 [49.18]  
Teff = 1165 [33] K  
Rp = 0.37 [0.38] Re  
a = 0.0221 [0.0012] AU  
Ag = 38.68 [78.77] [0.48σ]  
Teffp = 4490 [2286] K [1.45σ]

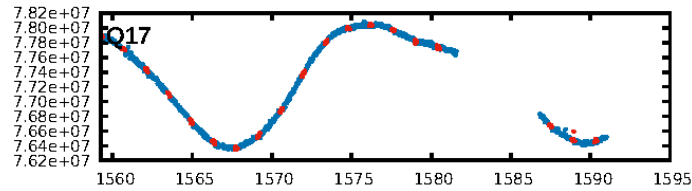
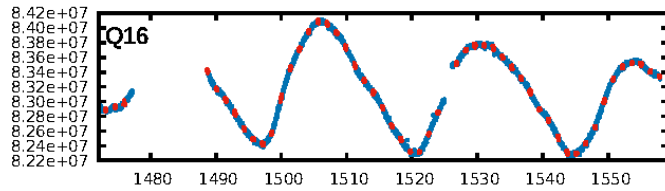
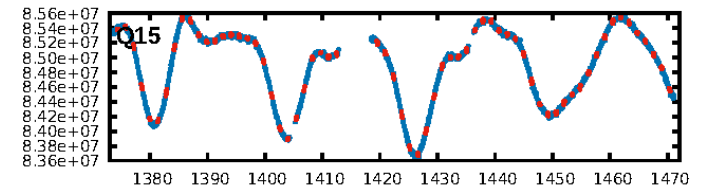
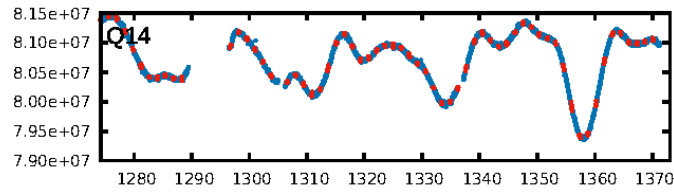
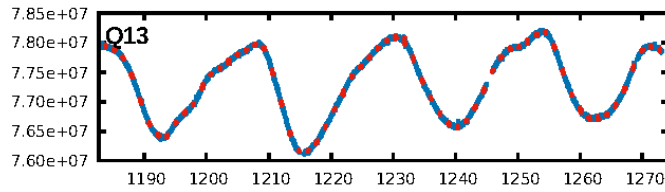
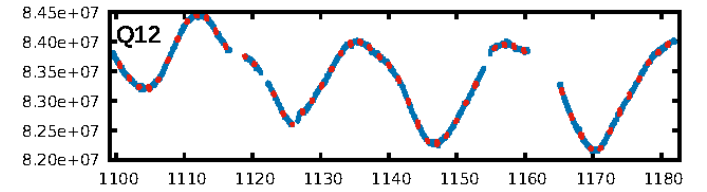
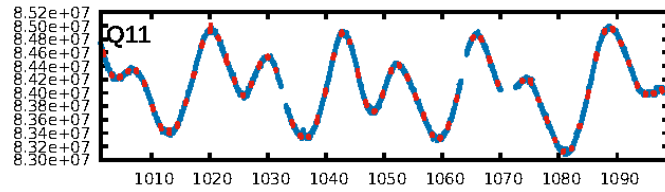
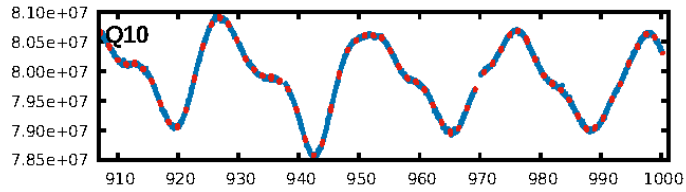
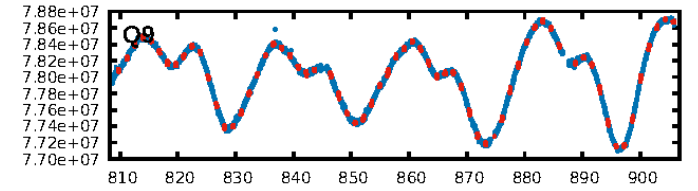
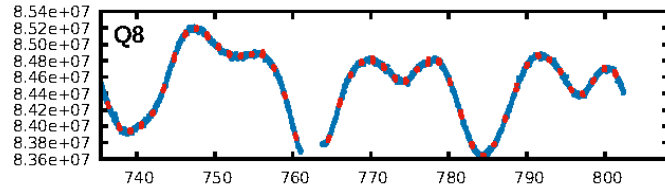
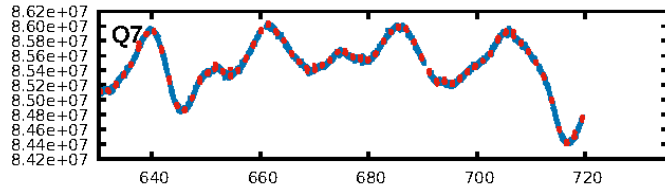
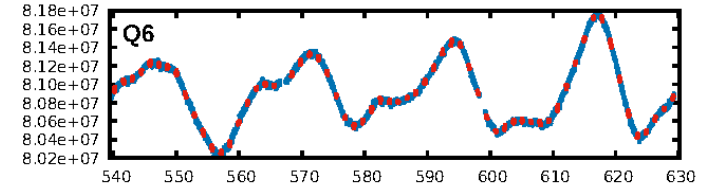
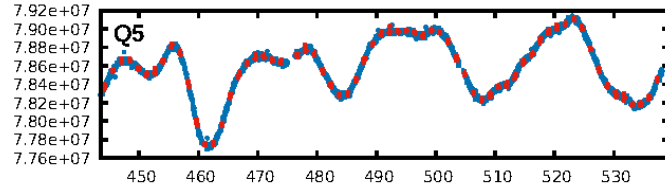
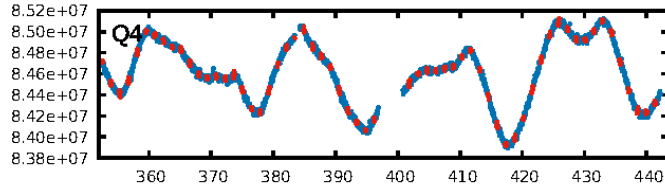
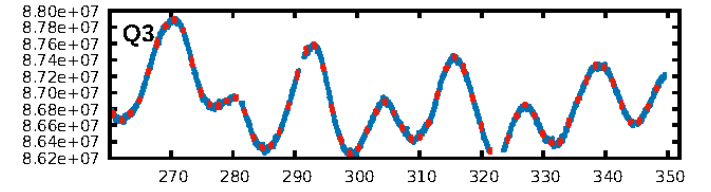
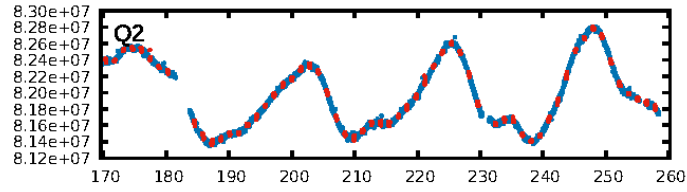
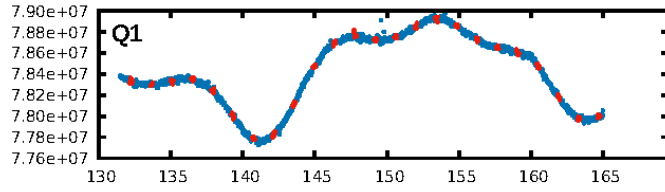
## DV Diagnostic Results:

ShortPeriod-sig: 0.2% [0.00σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 6.62e-13  
RollingBand-fgt: 1.00 [903/907]  
GhostDiagnostic-chr: 0.501  
Centroid-sig: 10.6%  
Centroid-so: 2.533 arcsec [1.22σ]  
OotOffset-rm: 0.366 arcsec [0.35σ]  
KicOffset-rm: 0.406 arcsec [0.39σ]  
OotOffset-st: 3/4/4/2 [13]  
KicOffset-st: 3/4/4/2 [13]  
DiffImageQuality-fgm: 0.31 [4/13]  
DiffImageOverlap-fno: 0.41 [7/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 07:40:13 Z

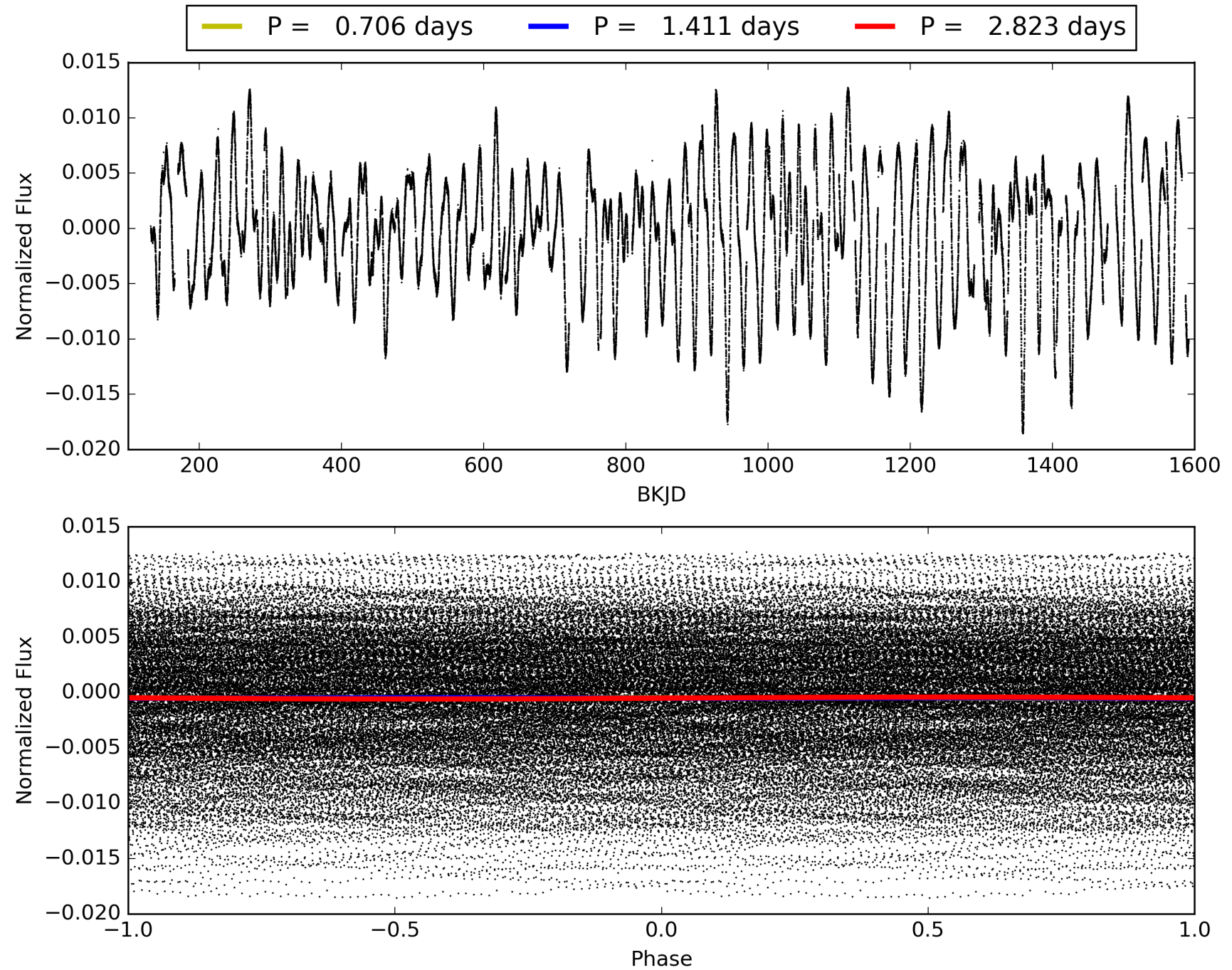
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 010190777-02, PDC Light Curves



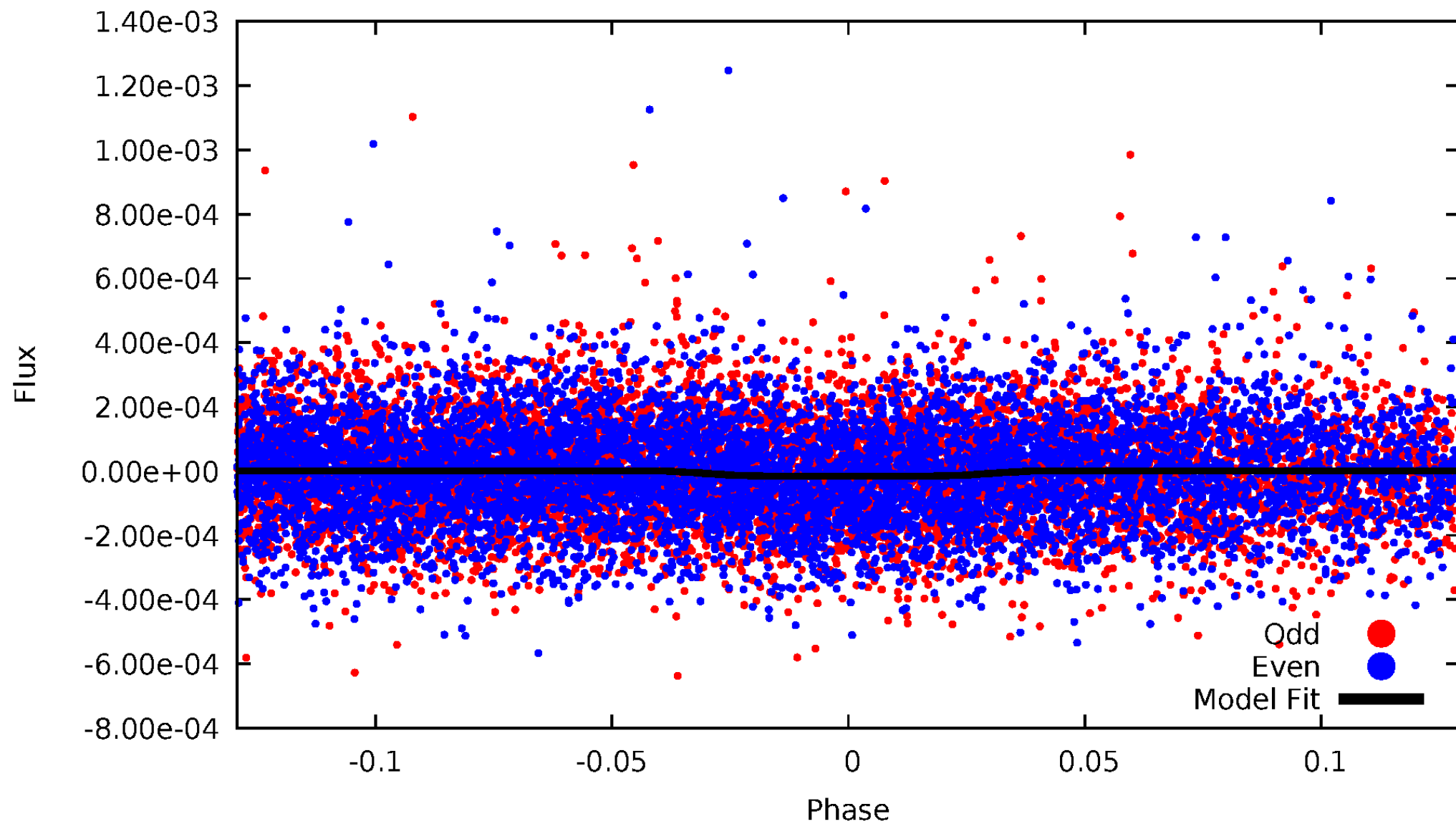


# TCE 010190777-02



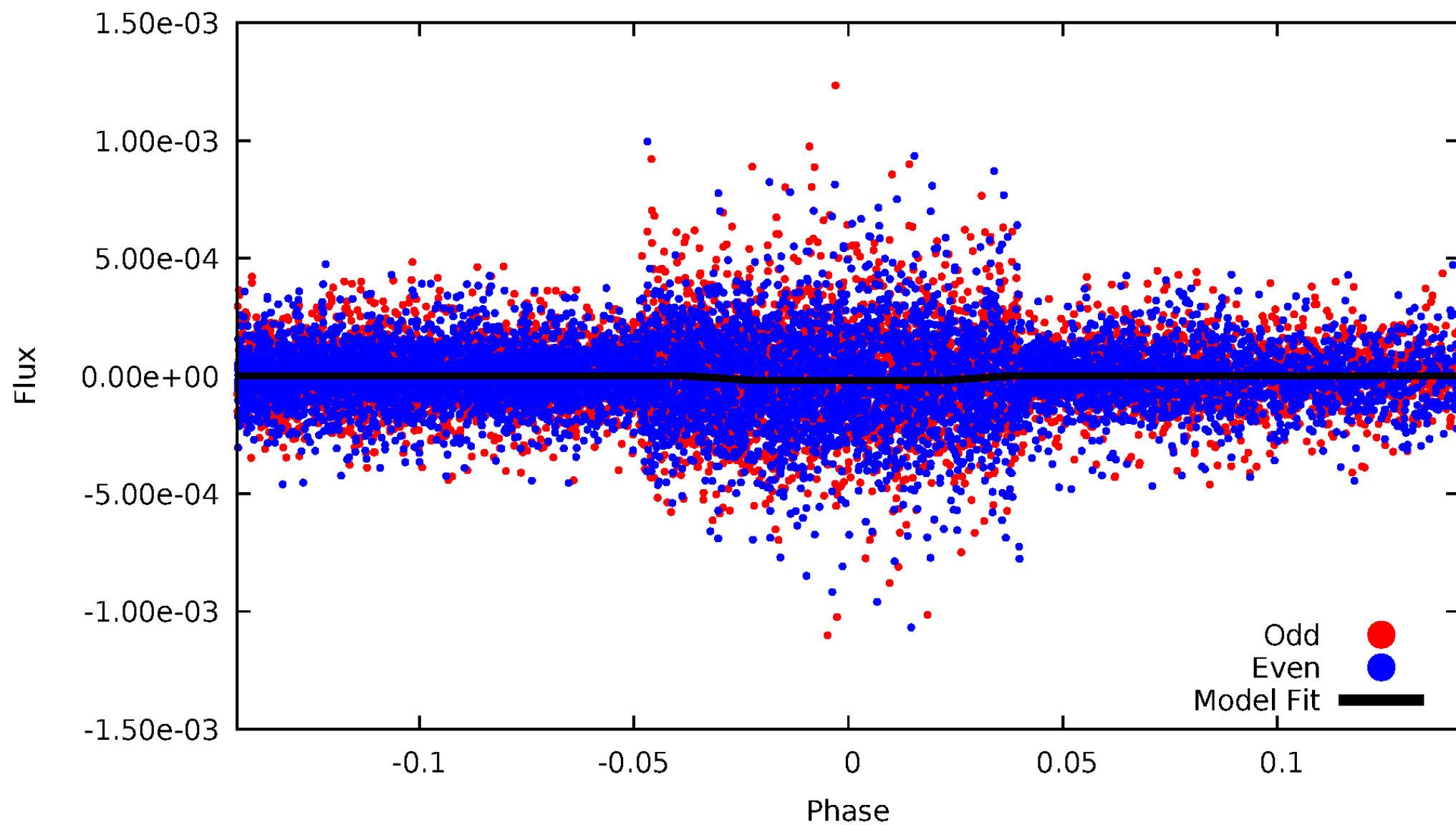
# DV Odd/Even

TCE 010190777-02



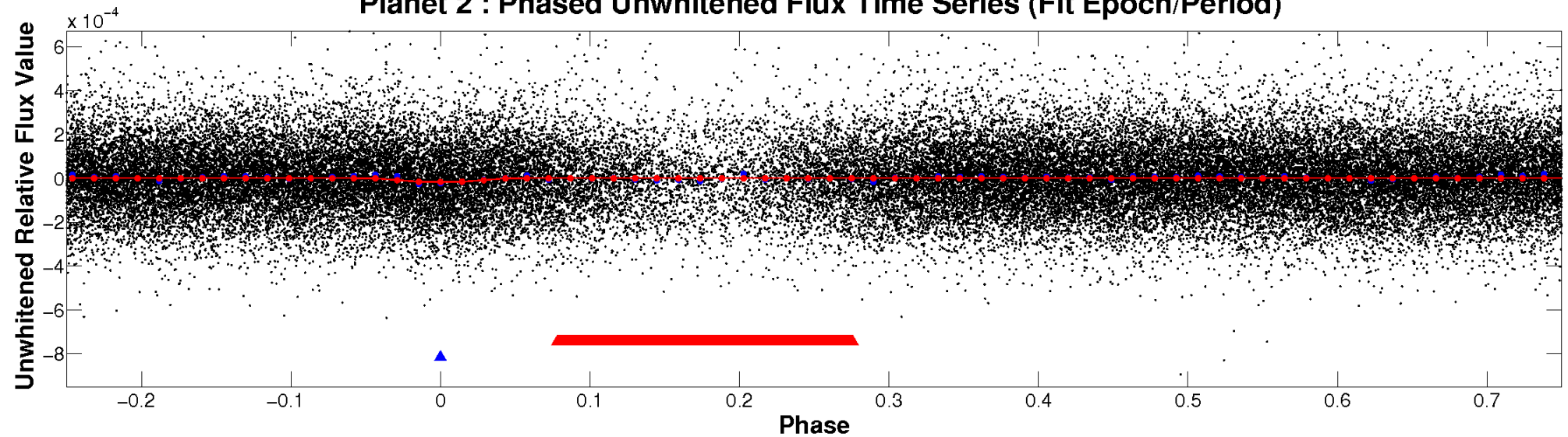
ALT Odd/Even

TCE 010190777-02

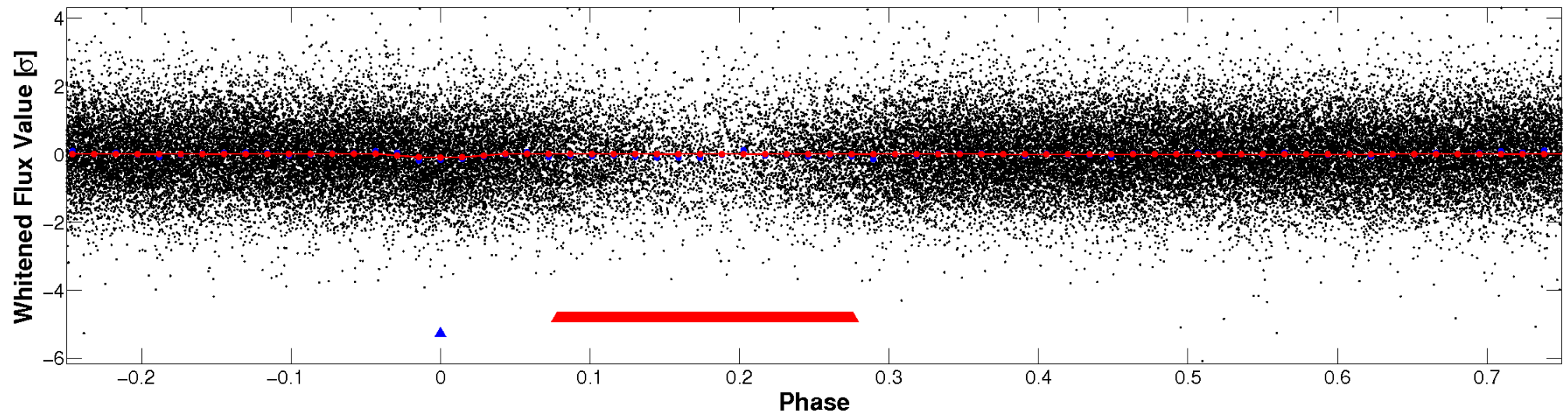


# Non-Whitened Vs. Whitened Light Curve

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



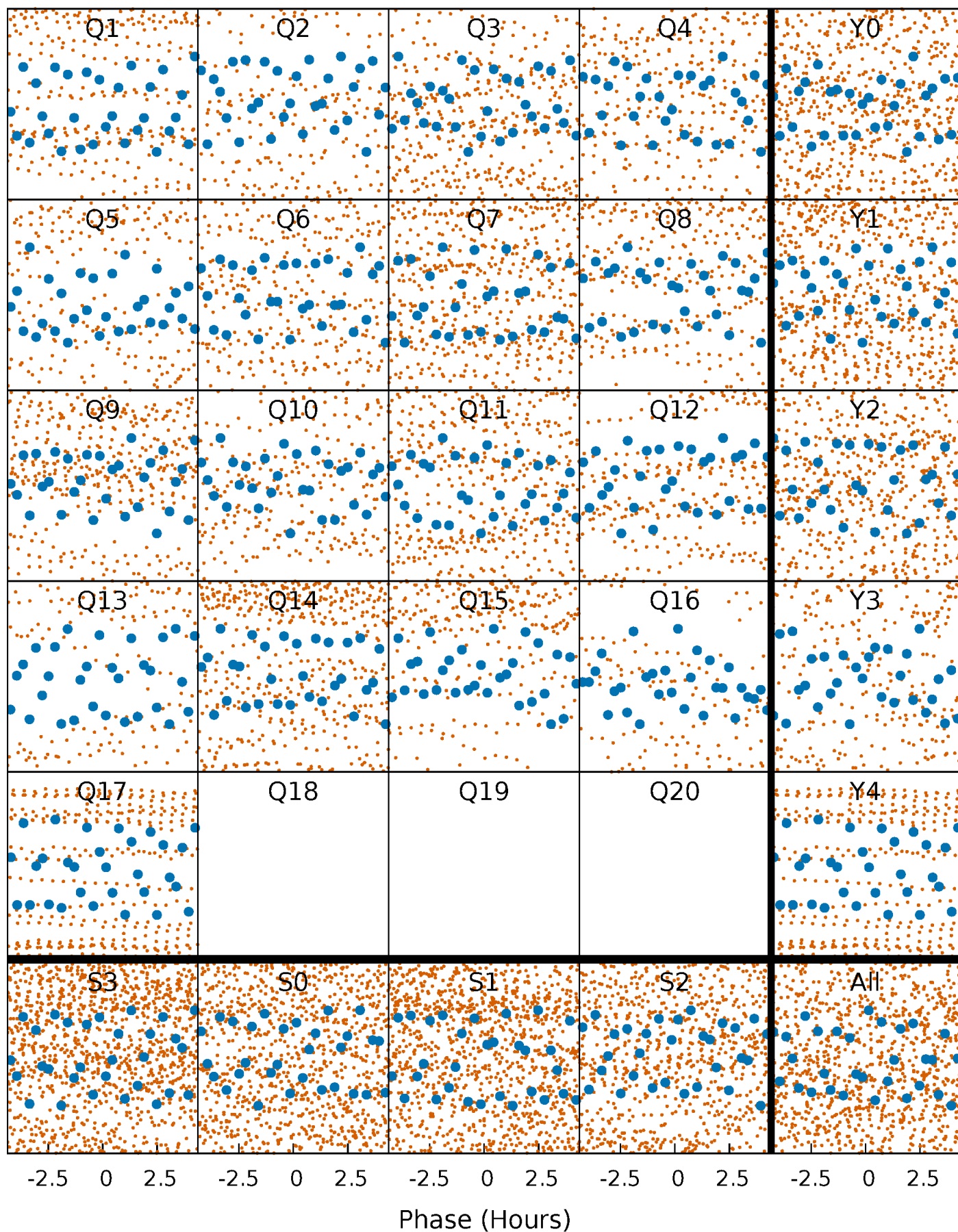
## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)





# PDC Quarter-Phased Transit Curves

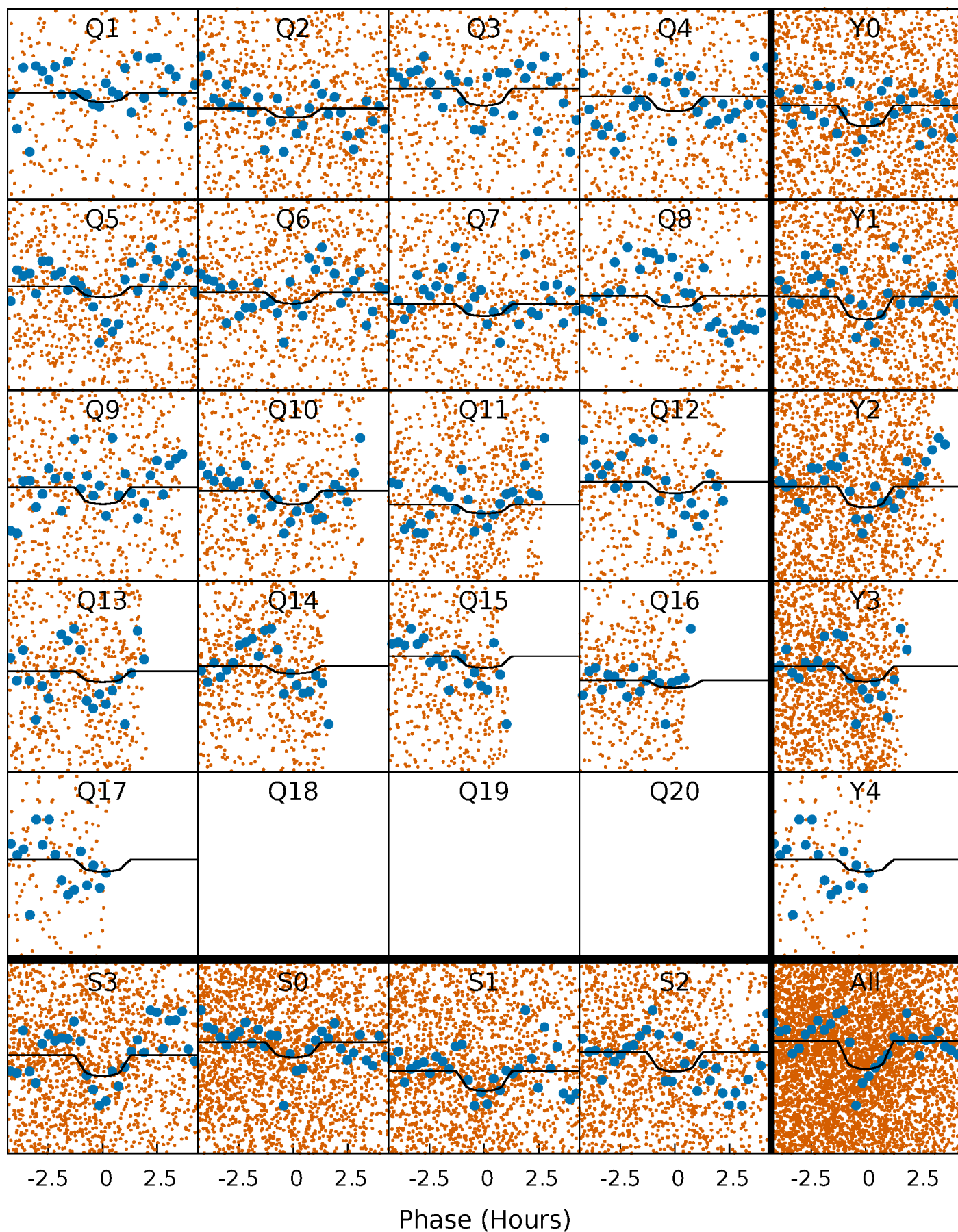
TCE 010190777-02 P= 1.411495 Days  $T_0=132.255102$  (BKJD)





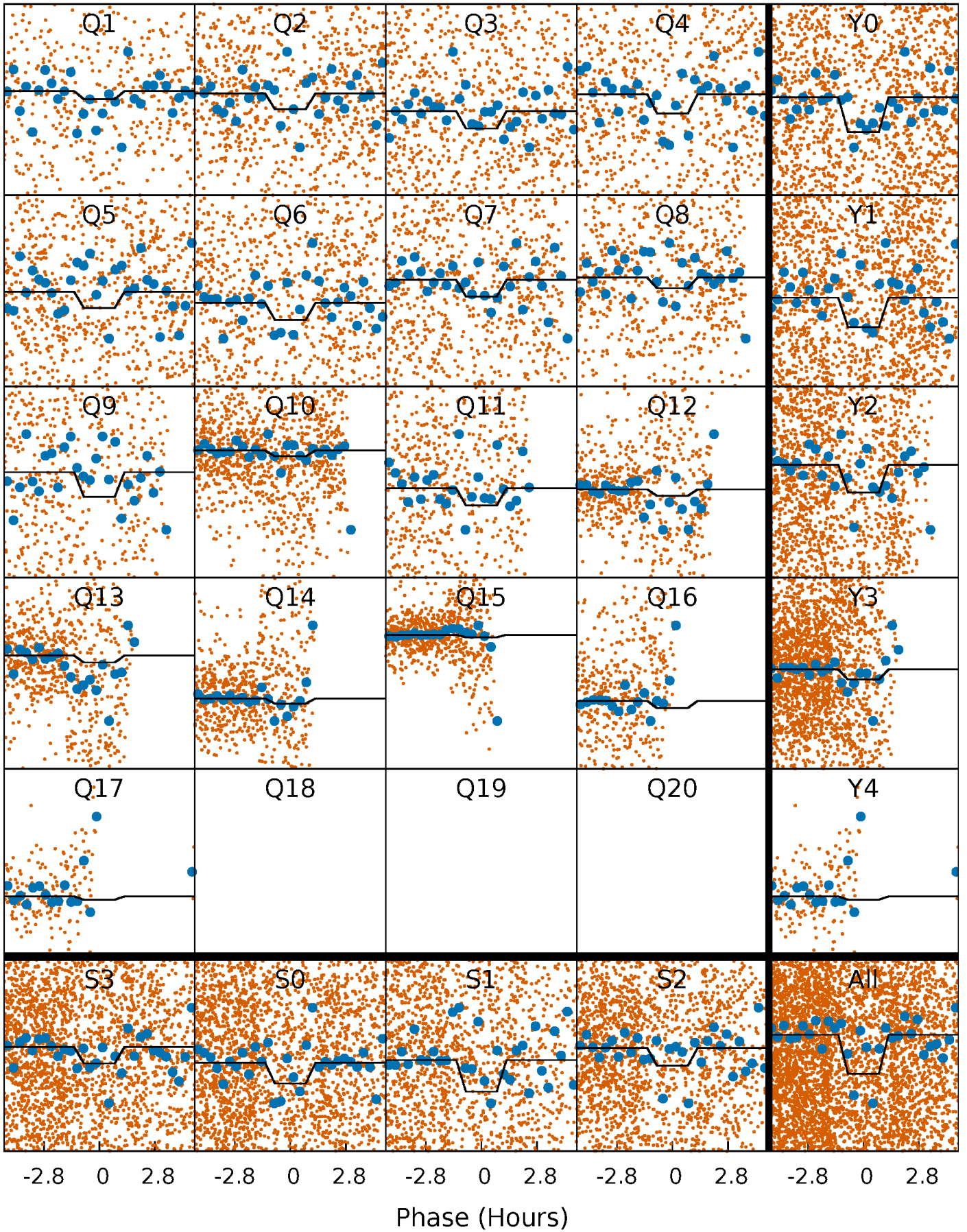
# DV Quarter-Phased Transit Curves

TCE 010190777-02 P= 1.411495 Days  $T_0=132.255102$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

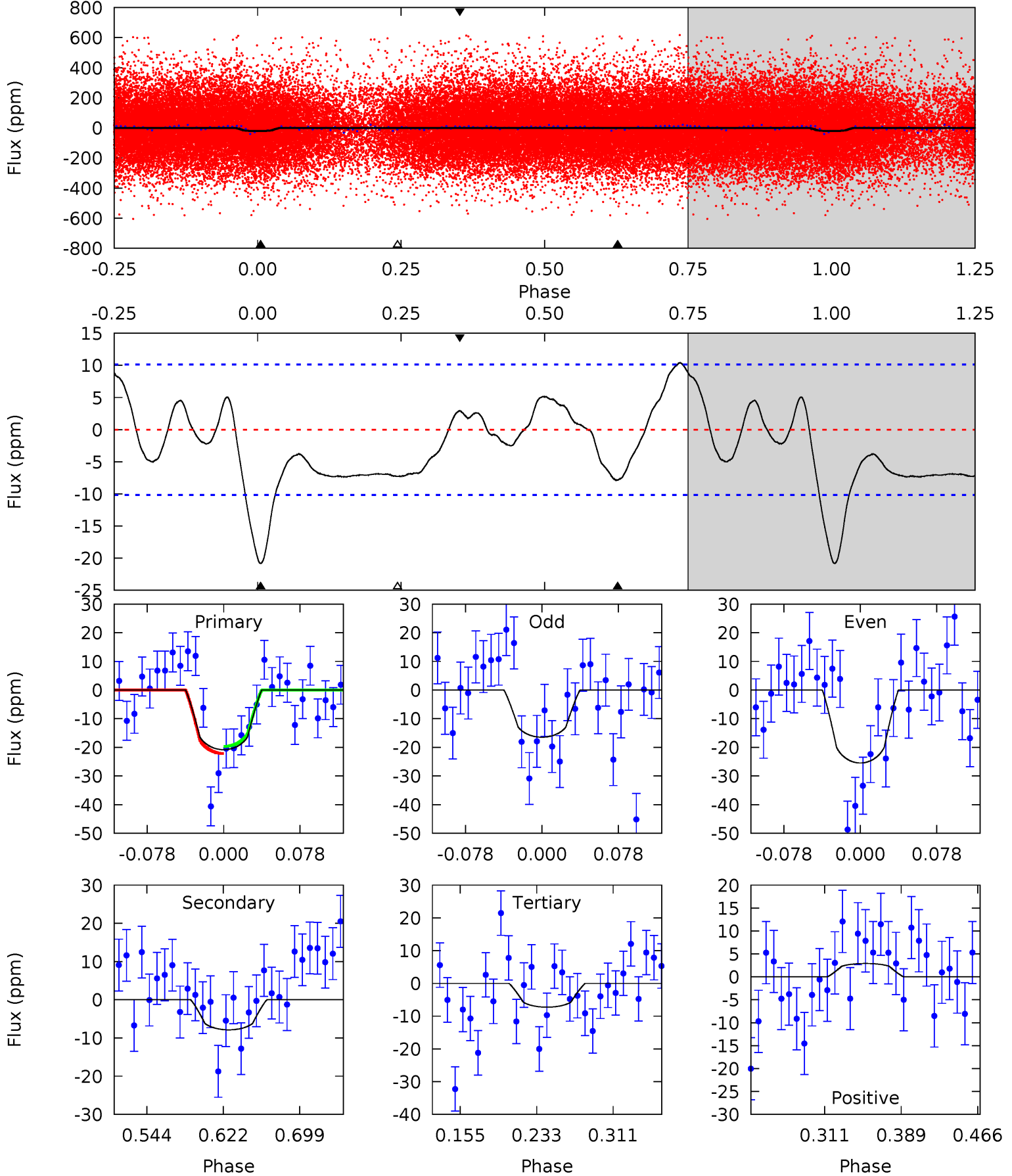
TCE 010190777-02 P= 1.411515 Days  $T_0=132.254386$  (BKJD)



# DV Model-Shift Uniqueness Test

010190777-02, P = 1.411495 Days, E = 130.843607 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  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 9.48 | 3.58 | 3.31 | 1.33 | 4.62            | 1.76            | 2.16             | 6.17    | 8.15    | 0.28    | 2.26    | 2.05    | 1.03 | 0.33  | 0.56 |

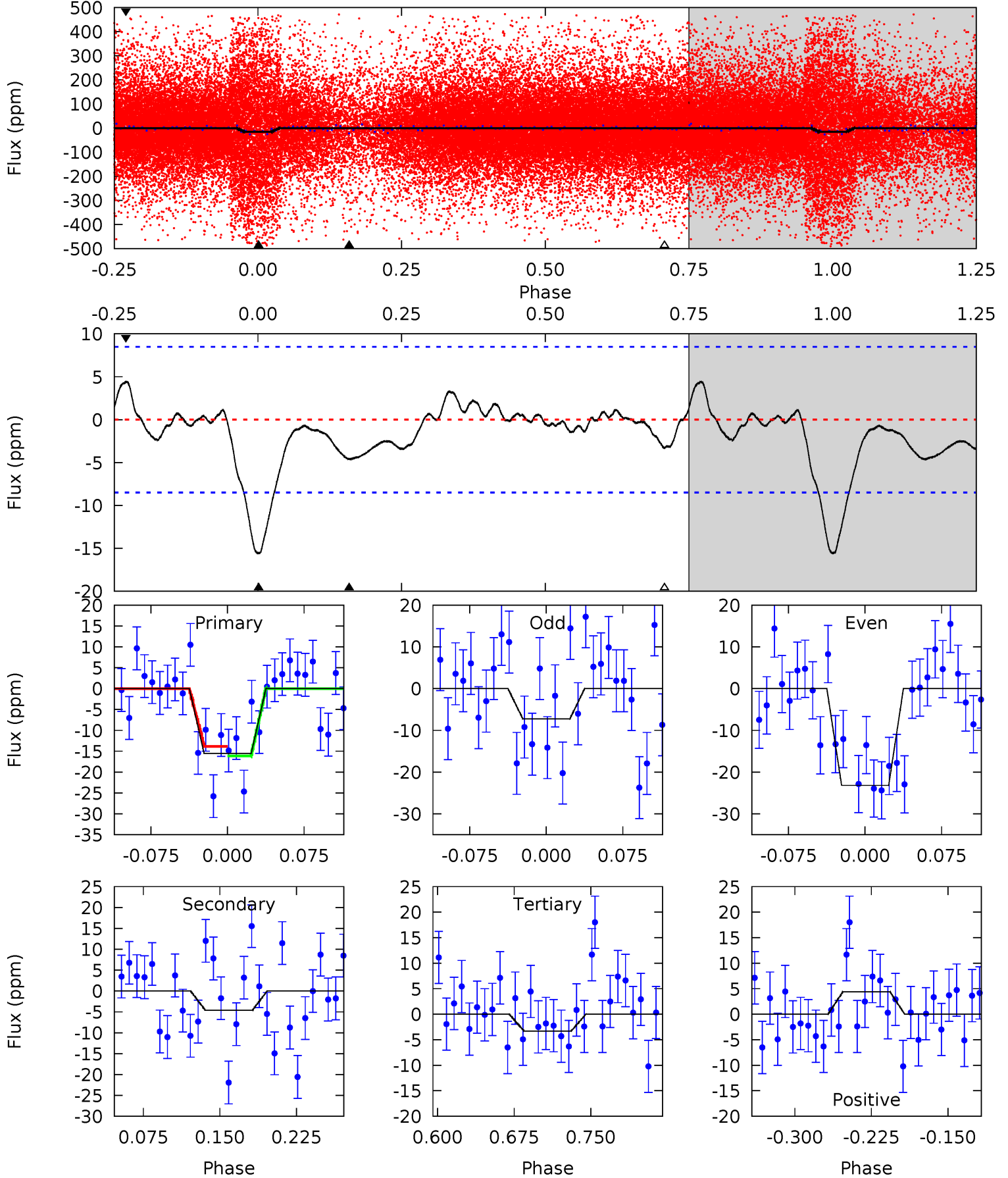




# Alt Model-Shift Uniqueness Test

010190777-02, P = 1.411515 Days, E = 130.842871 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  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 8.48 | 2.52 | 1.80 | 2.41 | 4.62            | 1.78            | 0.83             | 6.67    | 6.07    | 0.71    | 0.11    | 4.35    | 1.30 | 0.22  | 0.61 |



### Stellar Parameters For KIC 010190777

|        | $T_{\text{eff}}(K)$ | $\log(g)$                 | $[\text{Fe}/\text{H}]$    | $R (R_{\odot})$           | $M(M_{\odot})$            | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|---------------------|---------------------------|---------------------------|---------------------------|---------------------------|---|
|        | $4575^{+73}_{-82}$  | $4.564^{+0.051}_{-0.012}$ | $0.180^{+0.150}_{-0.150}$ | $0.737^{+0.020}_{-0.043}$ | $0.726^{+0.039}_{-0.027}$ | $2.553^{+0.480}_{-0.142}$                 |
|        | +2%/-2%             | +1%/-0%                   | +83%/-83%                 | +3%/-6%                   | +5%/-4%                   | +19%/-6%                                  |
| Source | SPE90               | SPE90                     | SPE90                     | DSEP                      |                           |   |

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

### Secondary Eclipse Parameters for KIC 010190777-02 / KOI

| Detrend | Depth (ppm) | $R_p (R_{\oplus})$     | $T_{\text{max}} (K)$ | $T_{\text{obs}} (K)$  | $A_{\text{obs}}$           |
|---------|-------------|------------------------|----------------------|-----------------------|----------------------------|
| DV      | $-8 \pm 2$  | $0.44^{+0.34}_{-0.29}$ | $1617^{+31}_{-36}$   | $3581^{+1740}_{-650}$ | $11^{+80}_{-8}$            |
| Alt.    | $-5 \pm 2$  | $0.44^{+0.32}_{-0.30}$ | $1616^{+30}_{-38}$   | $3262^{+1601}_{-611}$ | $6.456^{+49.314}_{-4.856}$ |

$T_{\text{max}}$  = 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

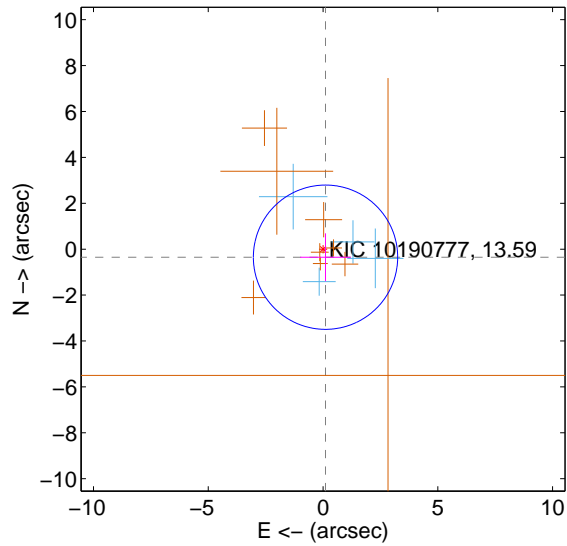
Supplemental centroid analysis for 010190777-02. Kepler magnitude: 13.59. Transit SNR 4.97

There are 4 quarters with good PRF difference image offsets

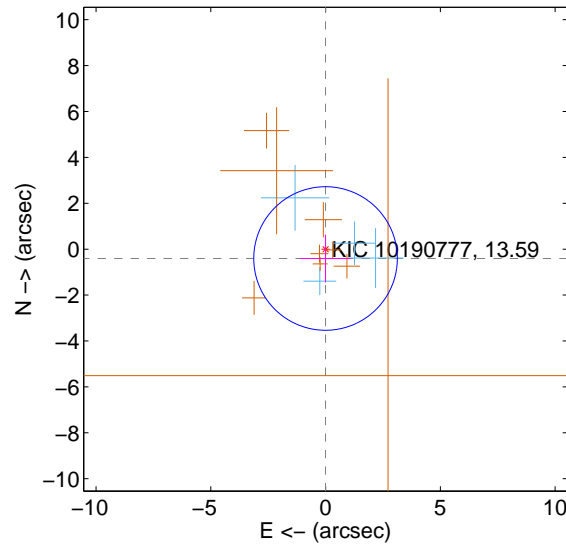
The direct PRF centroid is offset from the target star catalog position by about 0.11 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA        | $\Delta$ Dec       |
|---|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT          | $0.366 \pm 1.048$  | 0.35                | $-0.108 \pm 1.102$ | $-0.350 \pm 1.043$ |
| PRF-fit source offset from KIC position | $0.406 \pm 1.043$  | 0.39                | $0.002 \pm 1.102$  | $-0.406 \pm 1.043$ |
| photometric centroid source offset      | $2.53 \pm 2.08$    | 1.22                | $1.22 \pm 2.25$    | $-2.22 \pm 2.03$   |

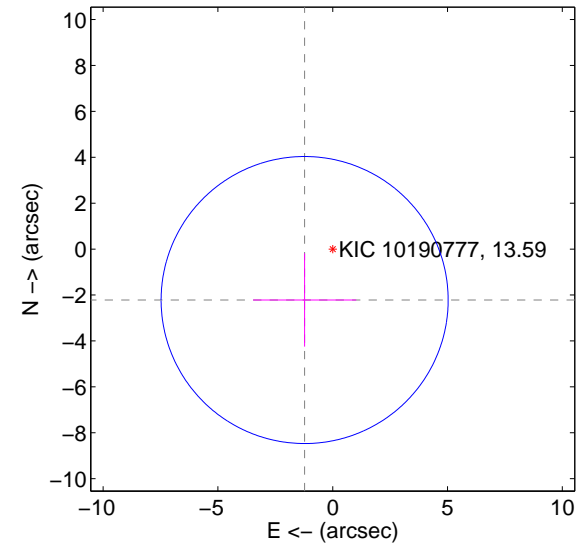
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position



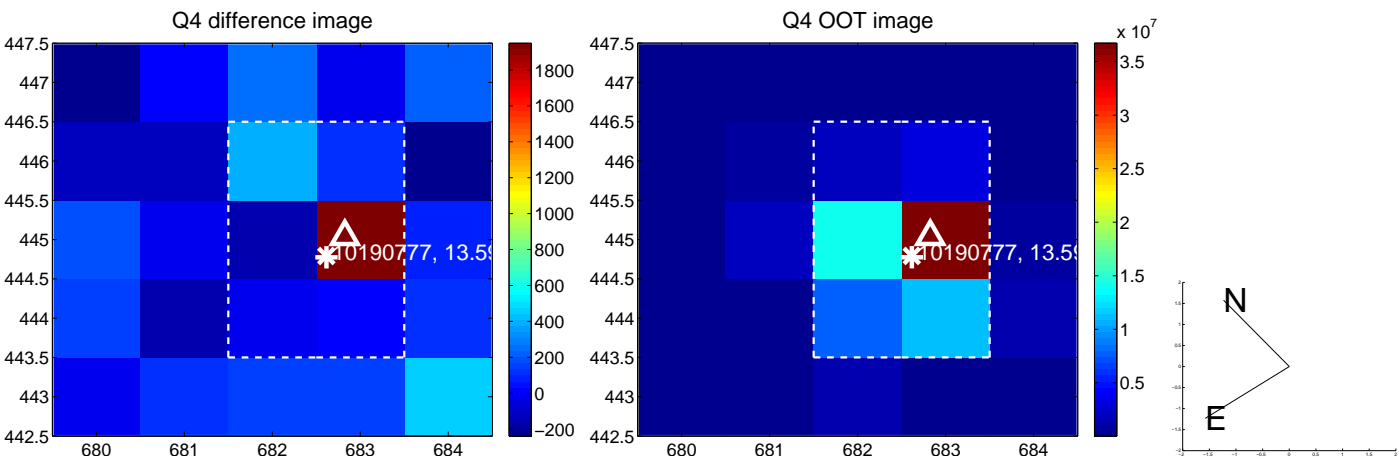
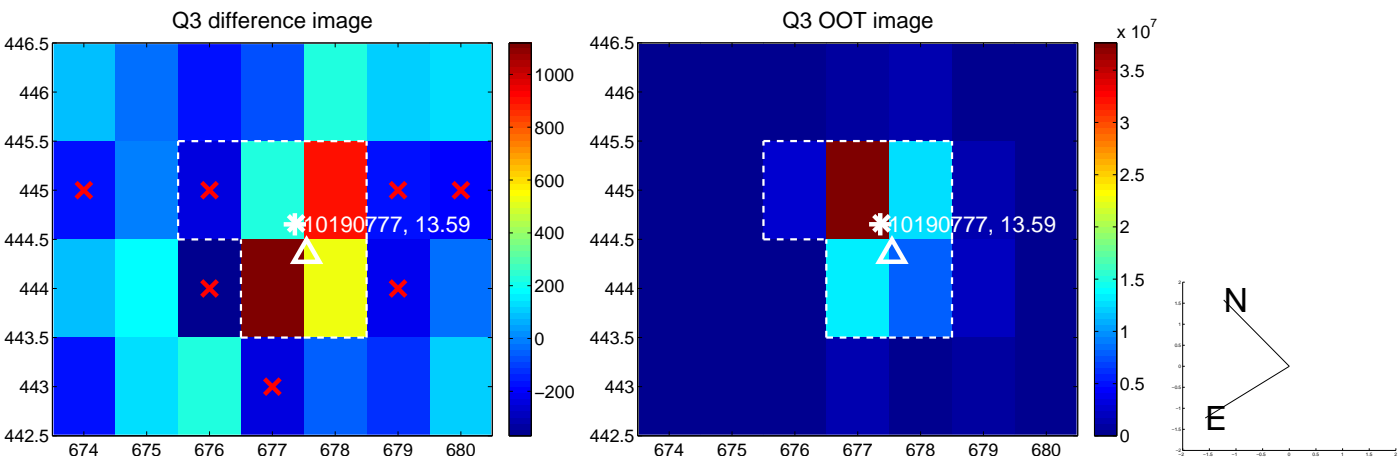
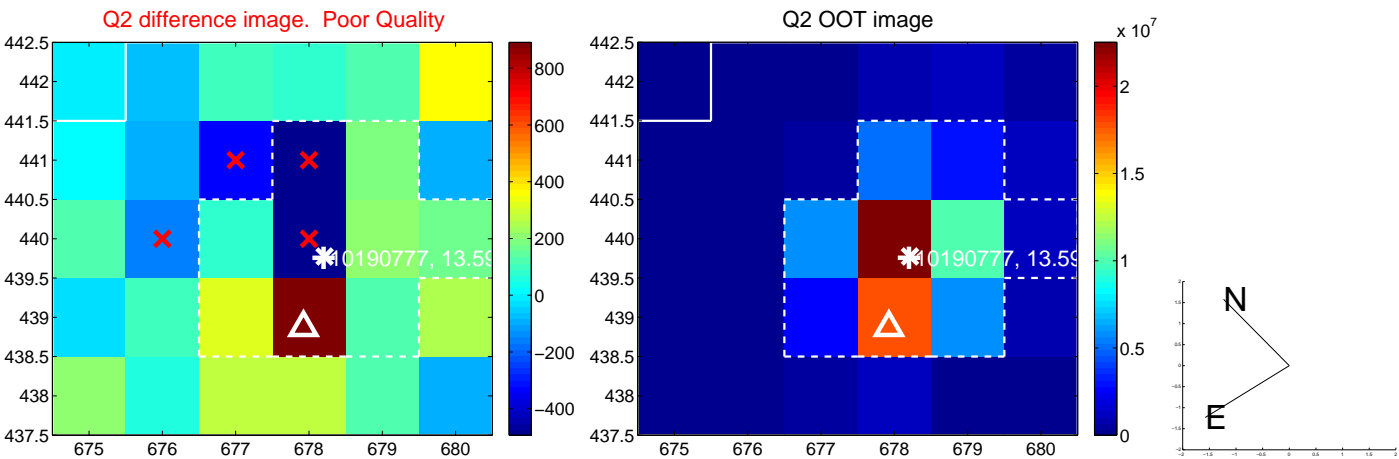
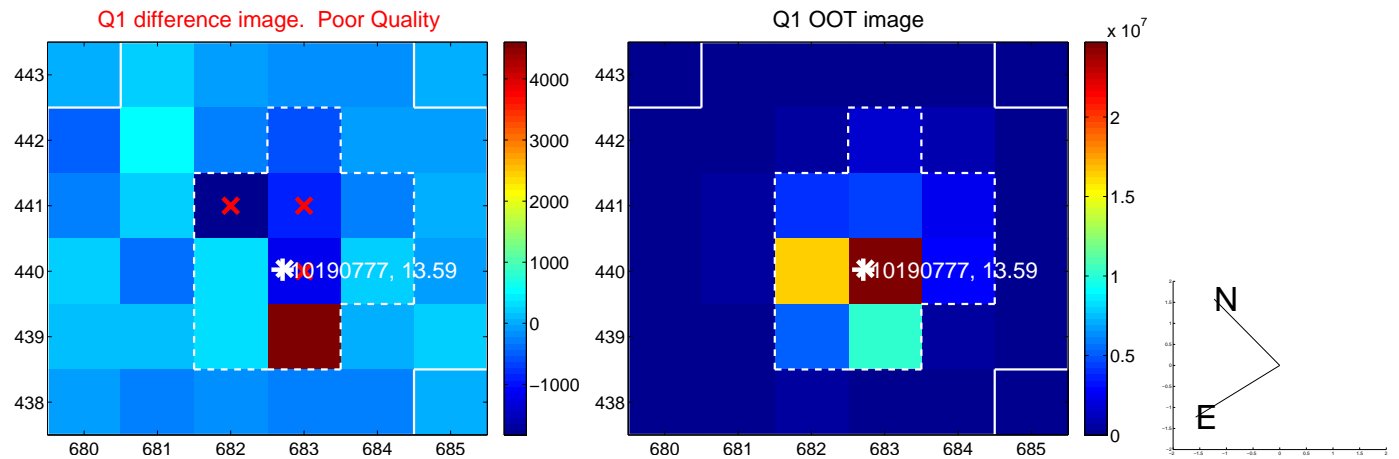
offset from photometric centroids



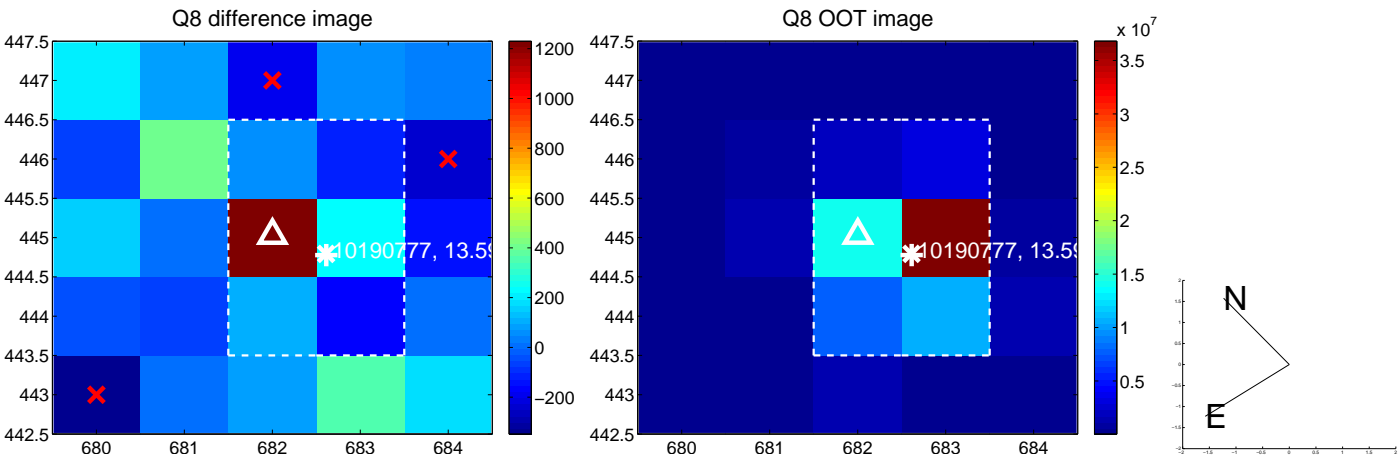
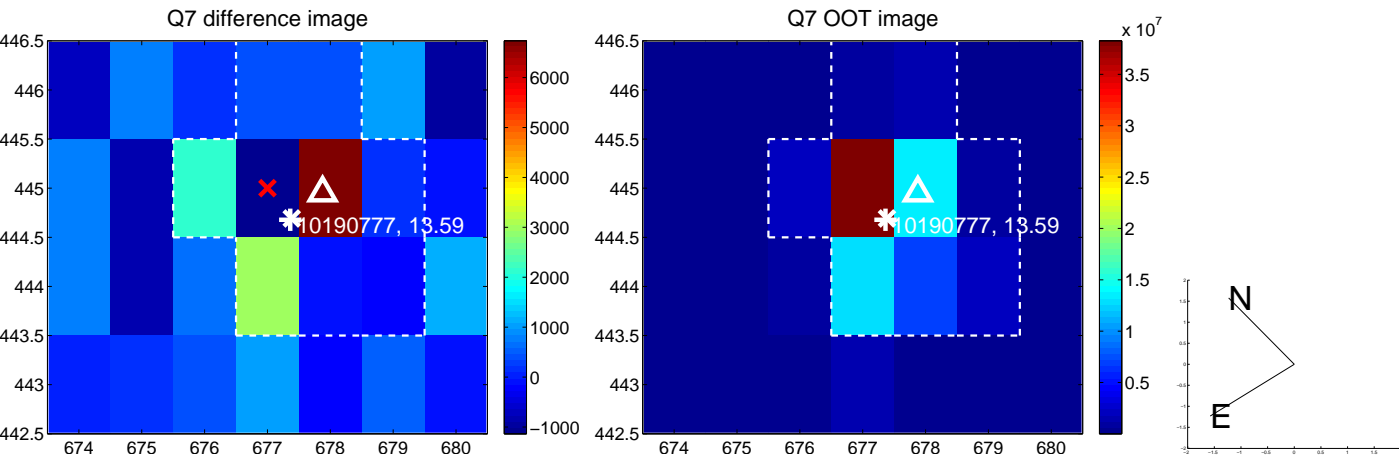
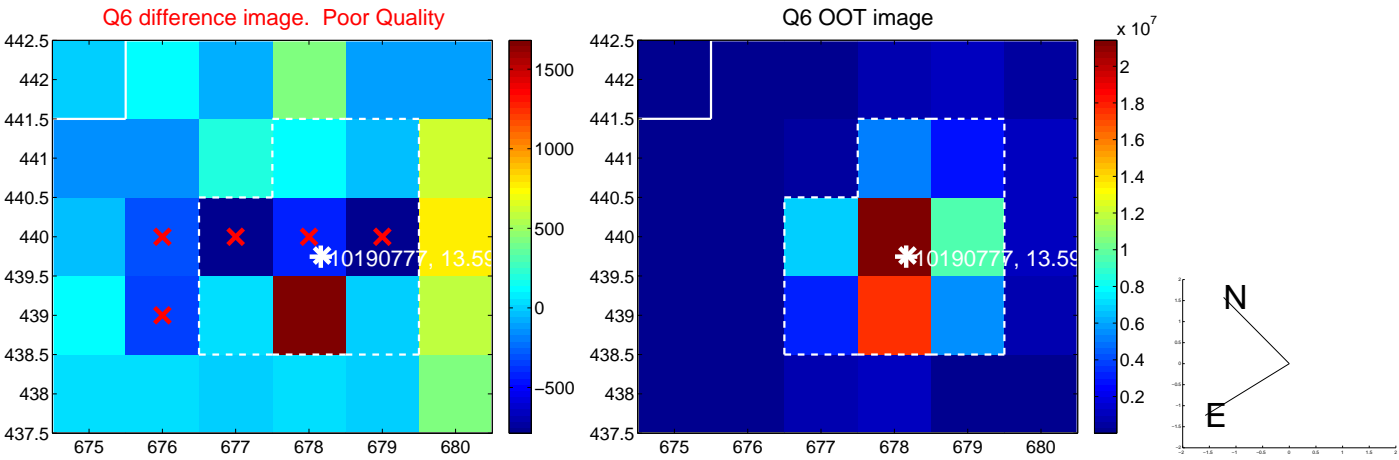
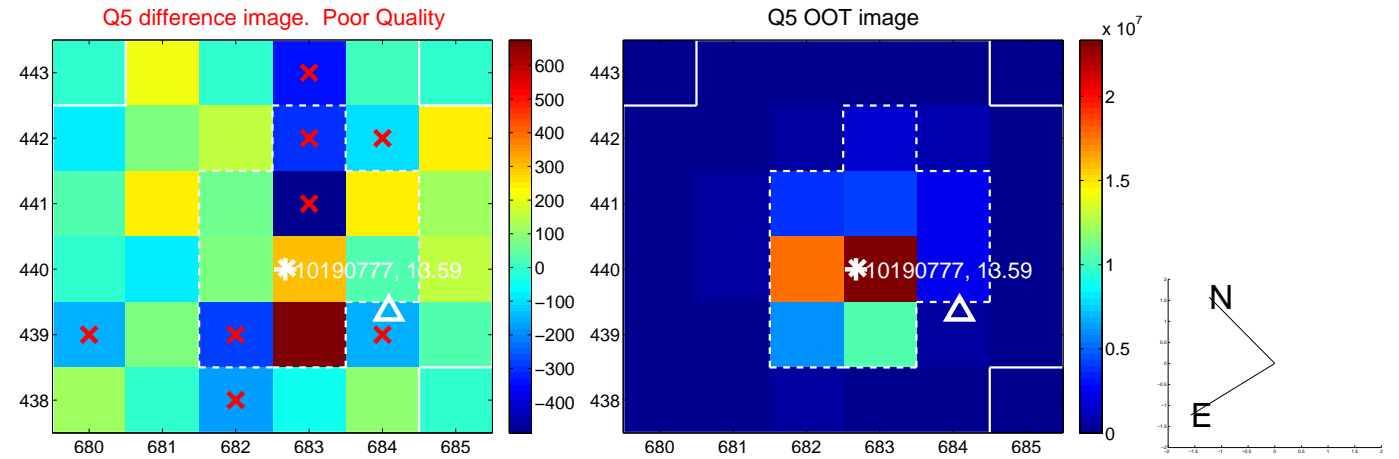
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets**; **Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



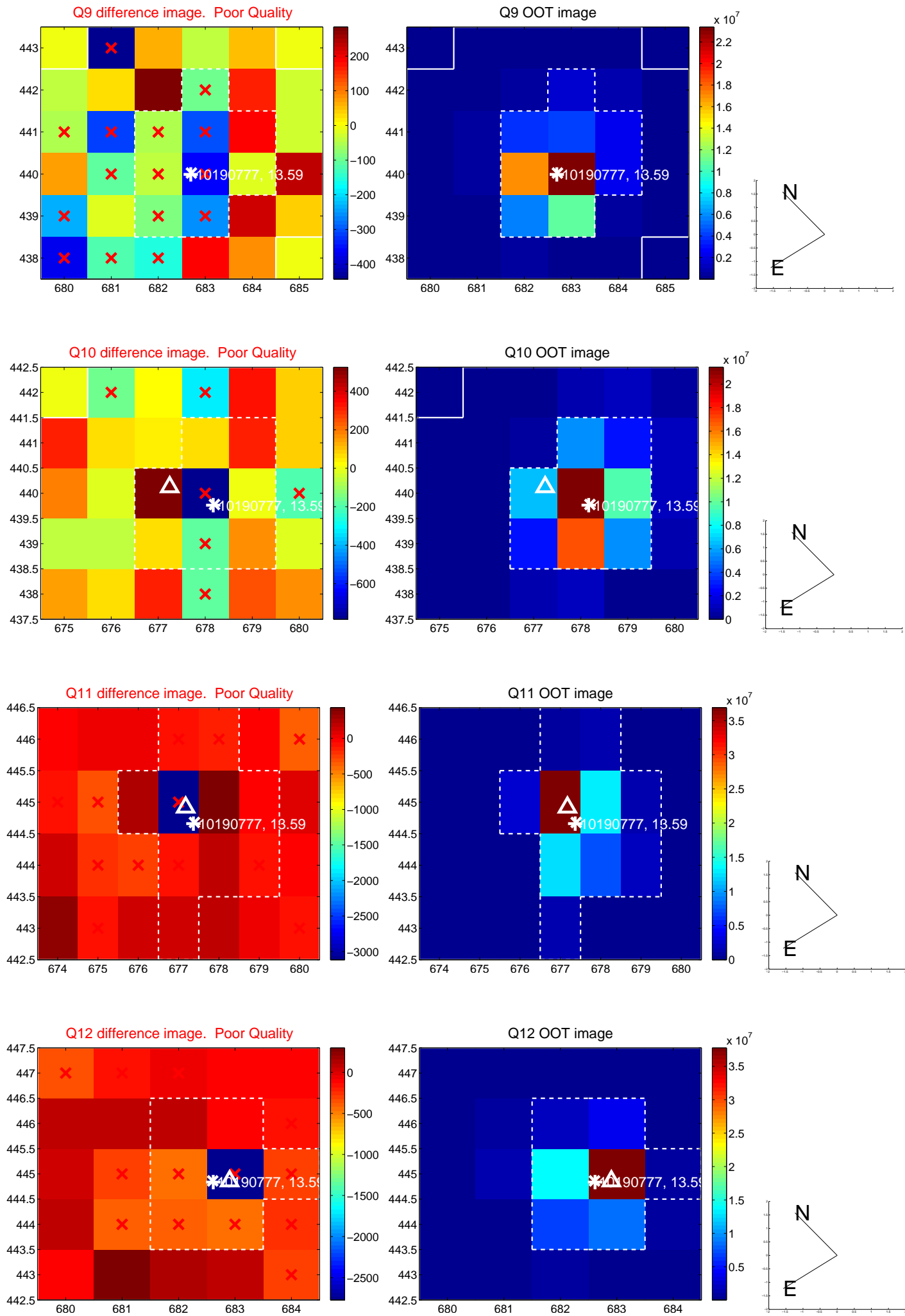
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



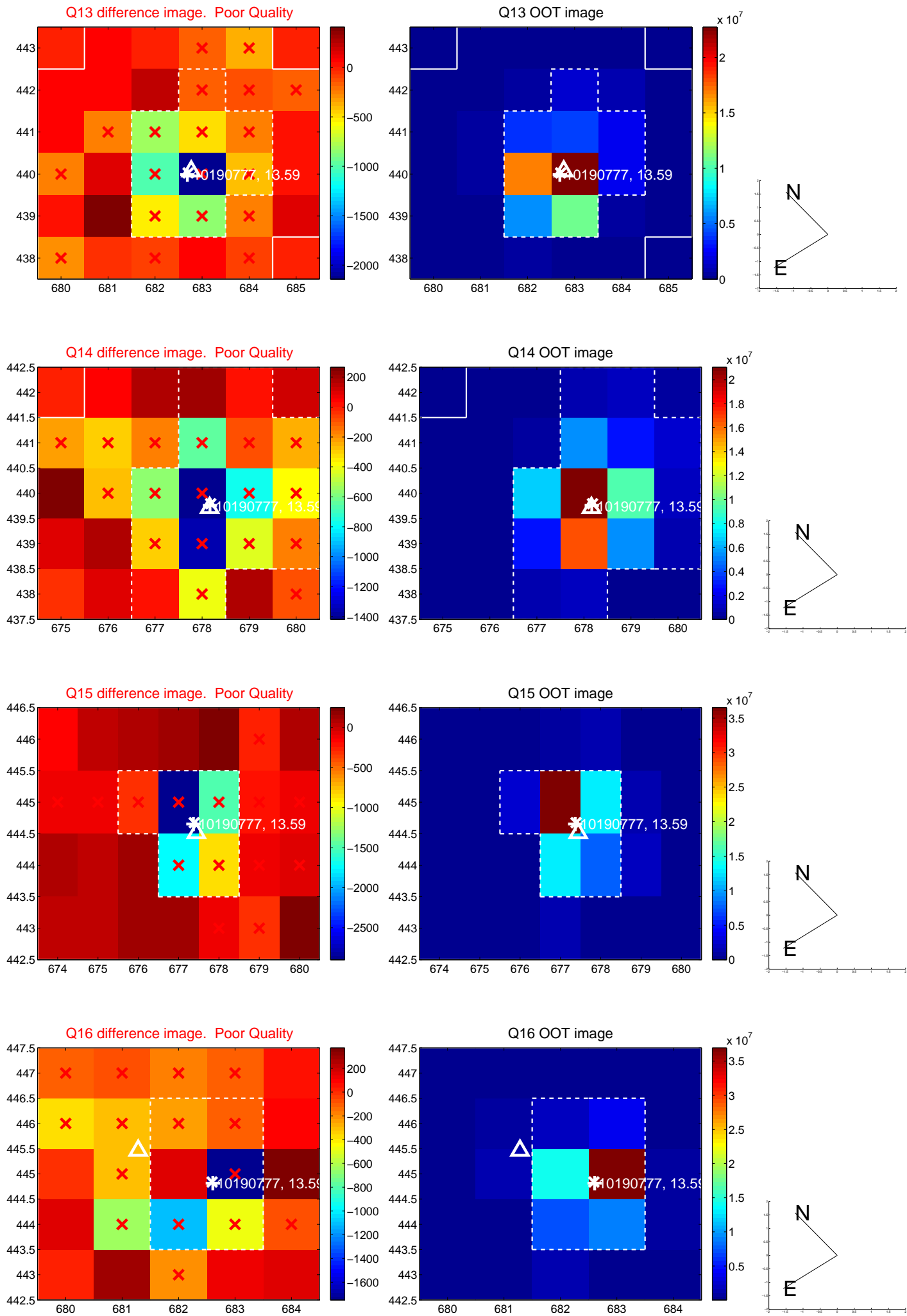
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



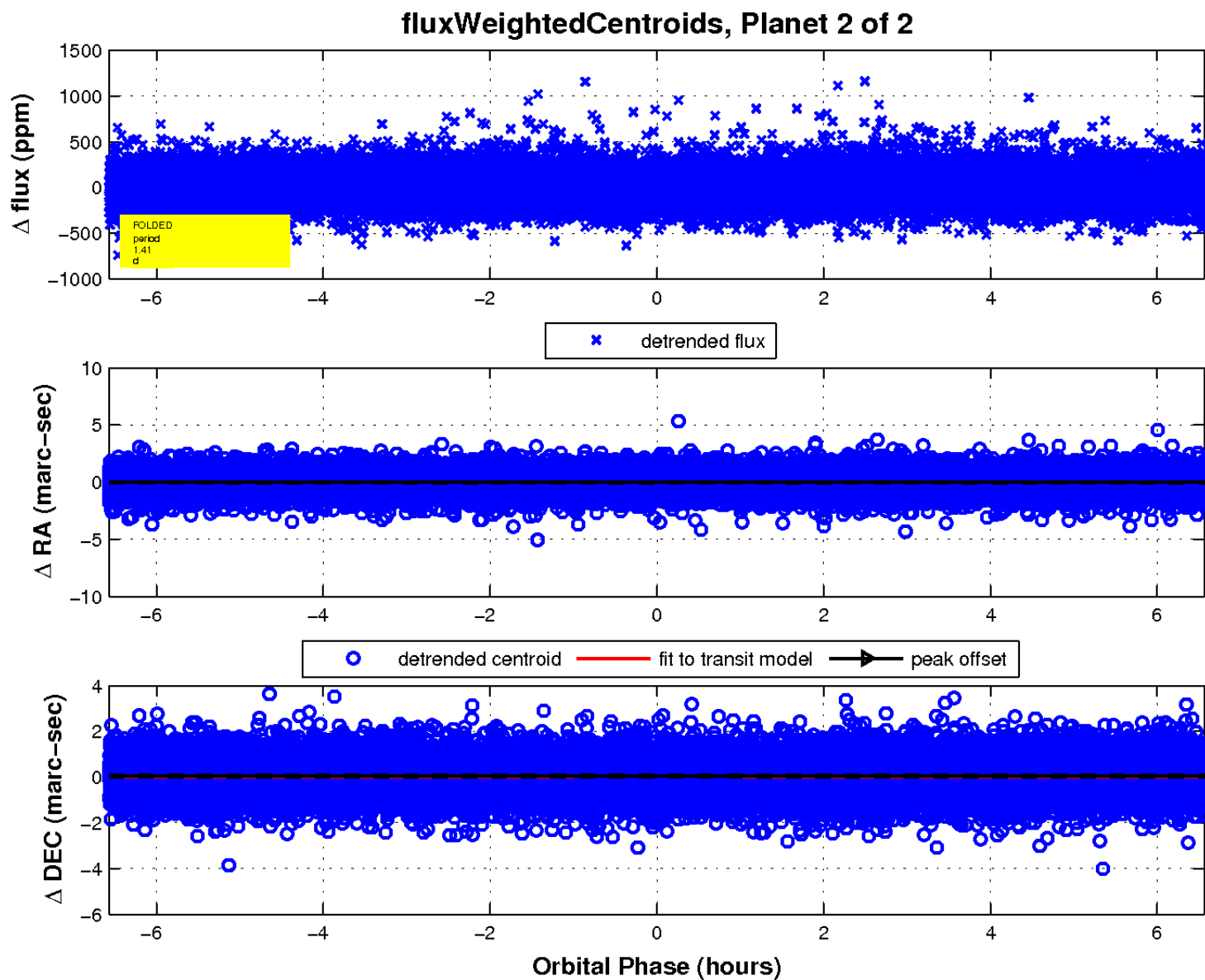
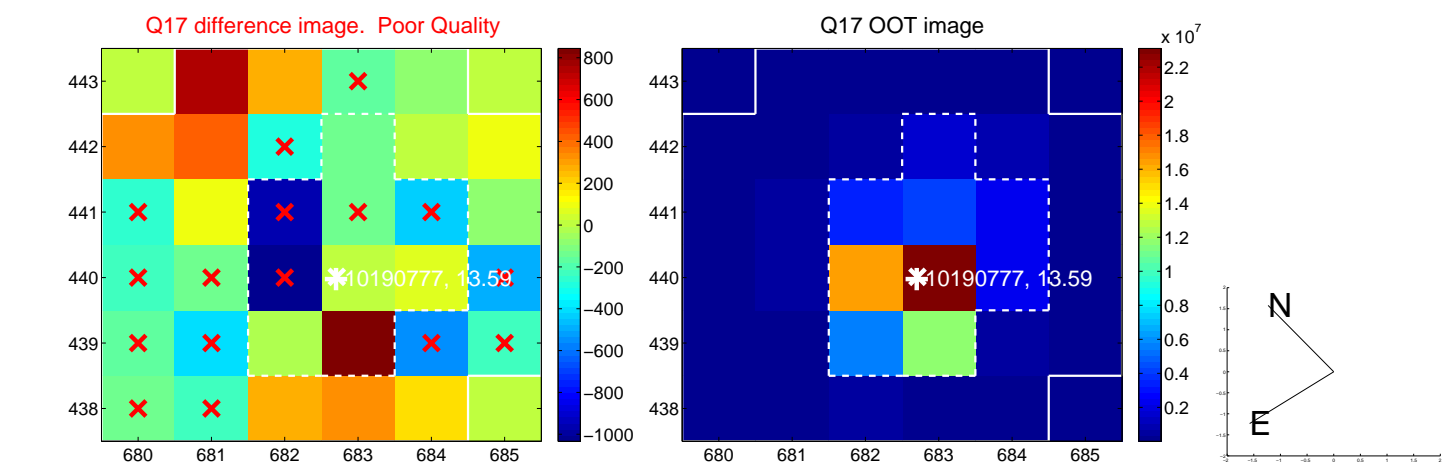
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



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



UKIRT Image

Declination

