

# KIC 008561063

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 008561063-01 | OBS      | 0961.01 | 1.213765      | 131.645975   | 1416.1      | 0.669            | 70.8 | 89.9 | 0.15                        | 3292            | 0.69                   | 18.00                  |
| 008561063-02 | OBS      | 0961.03 | 1.865108      | 131.928621   | 992.7       | 0.600            | 33.1 | 49.3 | 0.15                        | 3292            | 0.48                   | 10.15                  |
| 008561063-03 | OBS      | 0961.02 | 0.906561      | 132.064027   | 294.4       | 0.667            | 10.5 | 20.8 | 0.15                        | 3292            | 0.26                   | 26.57                  |
| 008561063-04 | OBS      | No      | 0.906577      | 131.610994   | 1483.1      | 1.500            | 10.0 | -1.0 | 0.15                        | 3292            | 0.57                   | 26.57                  |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments  |
|--------------|----------|------|-------|---|---|---|---|---|
| 008561063-01 | OBS      | PC   | 1.00  | 0 | 0 | 0 | 0 | CENT_KIC_POS                                    |
| 008561063-02 | OBS      | PC   | 1.00  | 0 | 0 | 0 | 0 | CENT_KIC_POS                                    |
| 008561063-03 | OBS      | FP   | 0.00  | 0 | 1 | 0 | 0 | MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE—CENT_KIC_POS |
| 008561063-04 | OBS      | FP   | 0.00  | 1 | 1 | 0 | 0 | IS_SEC_TCE—CENT_NOFITS                          |

**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.

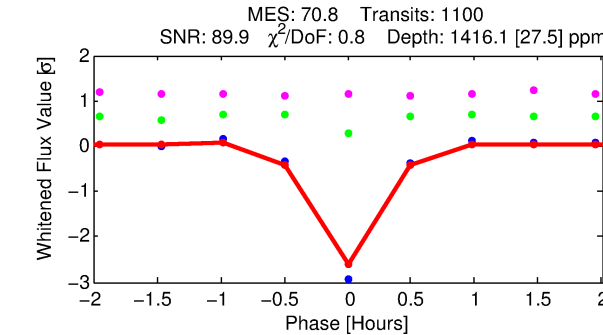
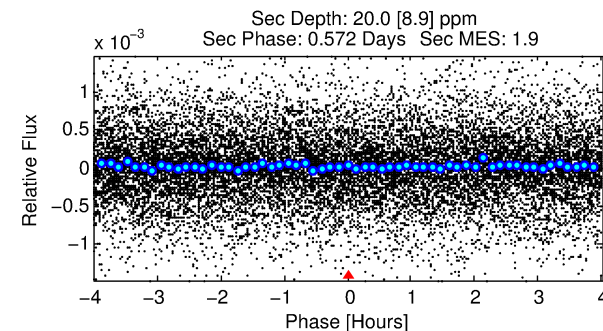
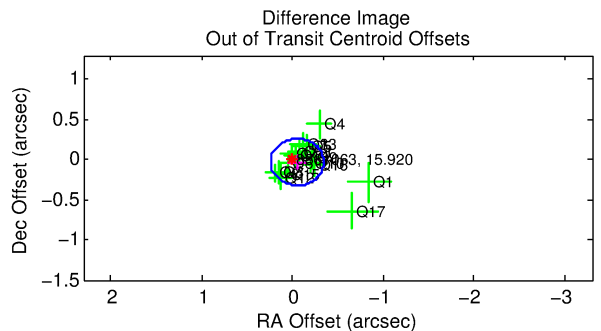
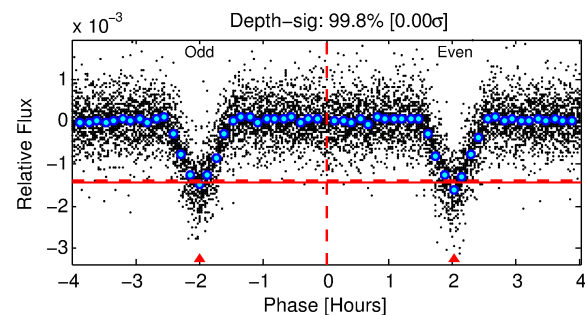
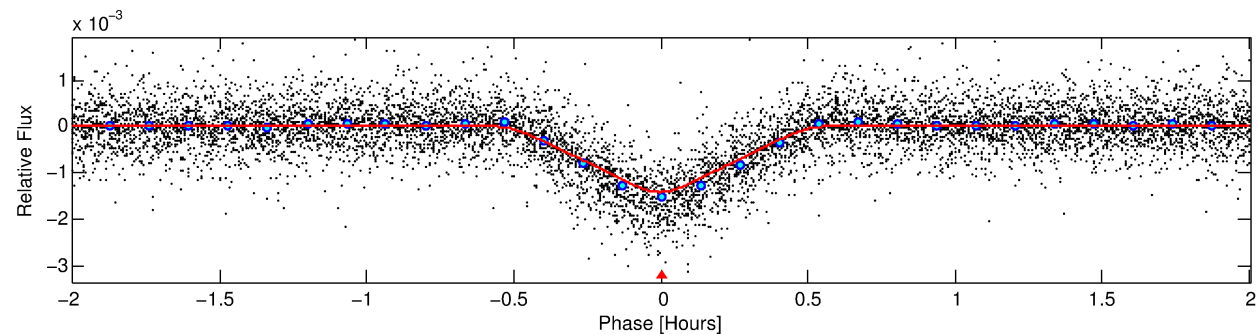
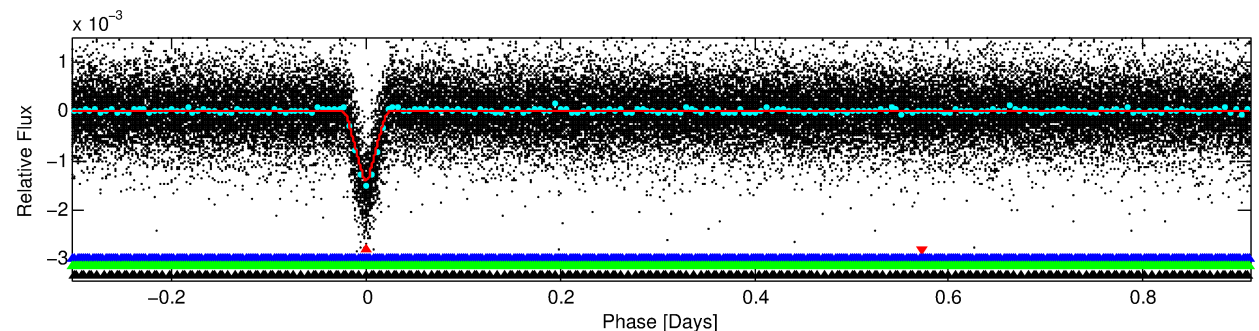
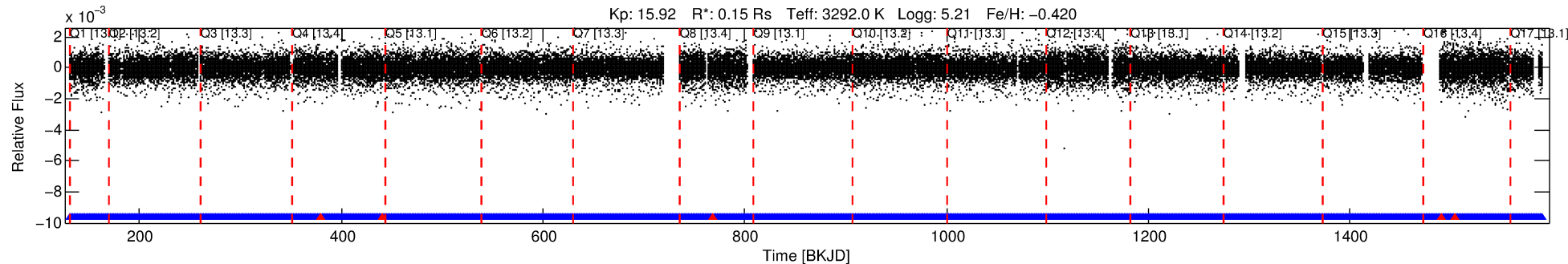
Ephemeris Match Information For 008561063-01

No Significant Match Found

# DV One-Page Summary

KIC: 8561063 Candidate: 1 of 4 Period: 1.214 d  
KOI: K00961.01 Name: Kepler-42b Corr: 0.894

Kp: 15.92 R\*: 0.15 Rs Teff: 3292.0 K Logg: 5.21 Fe/H: -0.420



## DV Fit Results:

Period = 1.21377 [0.00000] d  
Epoch = 131.6460 [0.0001] BKJD  
Rp/R\* = 0.0425 [0.0032]  
a/R\* = 7.36 [2.02]  
b = 0.90 [0.06]  
Seff = 18.01 [4.27]  
Teq = 525 [31] K  
Rp = 0.69 [0.19] Re  
a = 0.0113 [0.0022] AU  
Ag = 3.00 [1.56] [1.28σ]  
Teffp = 1069 [126] K [4.19σ]

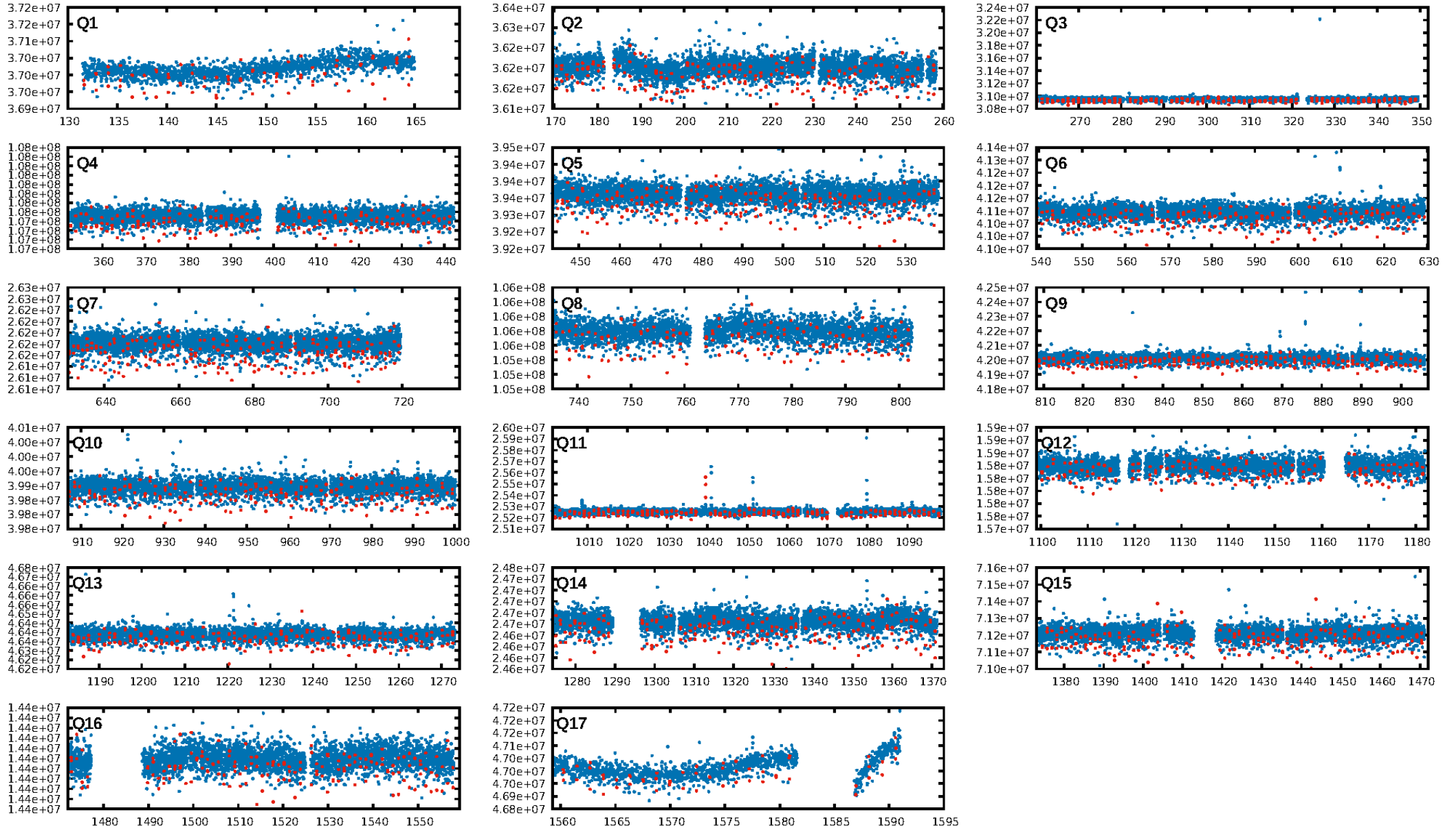
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [4.49σ]  
LongPeriod-sig: 100.0% [17.40σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [1045/1050]  
GhostDiagnostic-chr: 2.344  
Centroid-sig: 0.0%  
Centroid-so: 4.565 arcsec [40.65σ]  
OotOffset-rm: 0.061 arcsec [0.63σ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-rm: 4.908 arcsec [29.52σ]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 1.00 [17/17]  
DiffImageOverlap-fno: 0.00 [0/17]

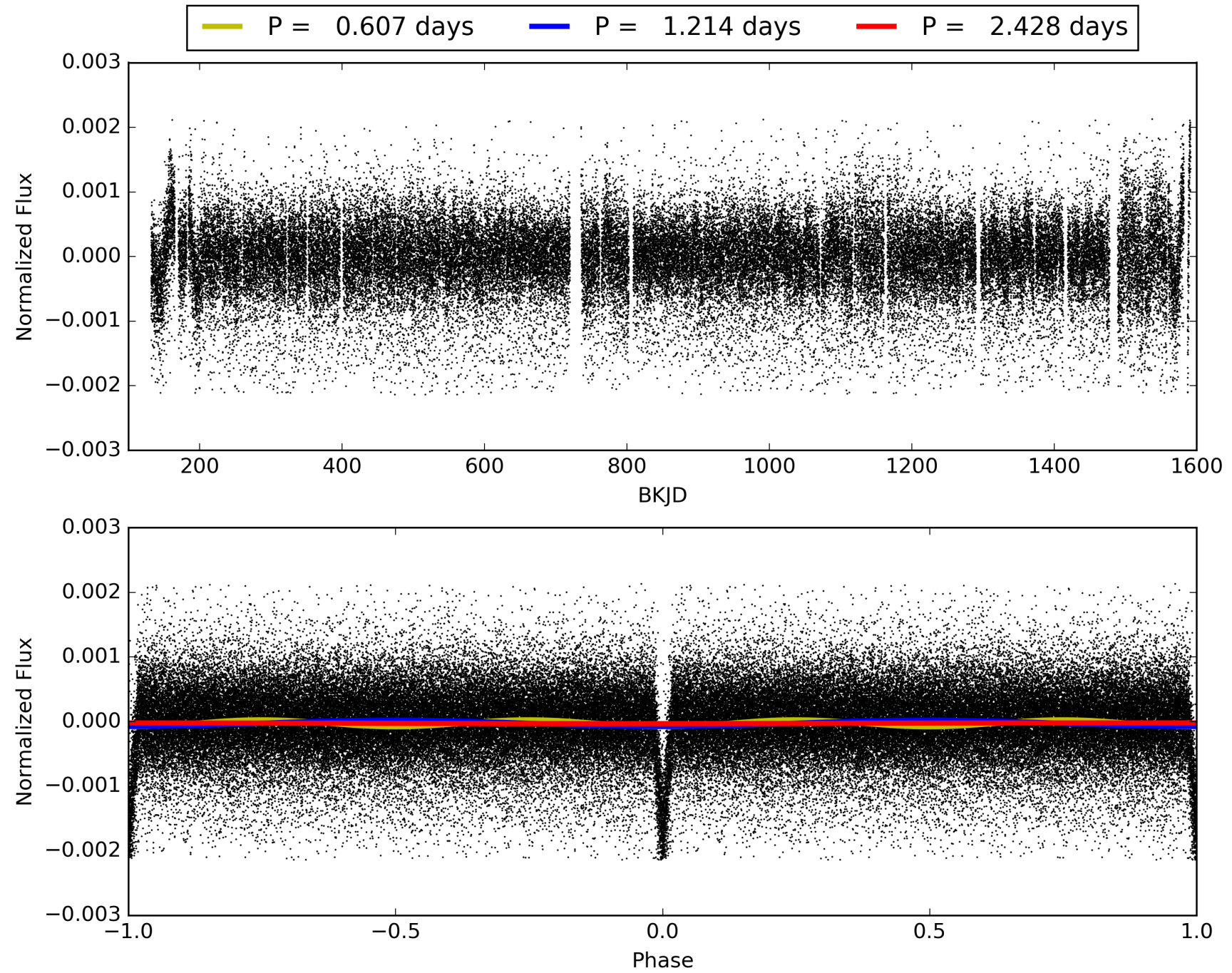
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 14:31:33 Z

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

# TCE 008561063-01, PDC Light Curves



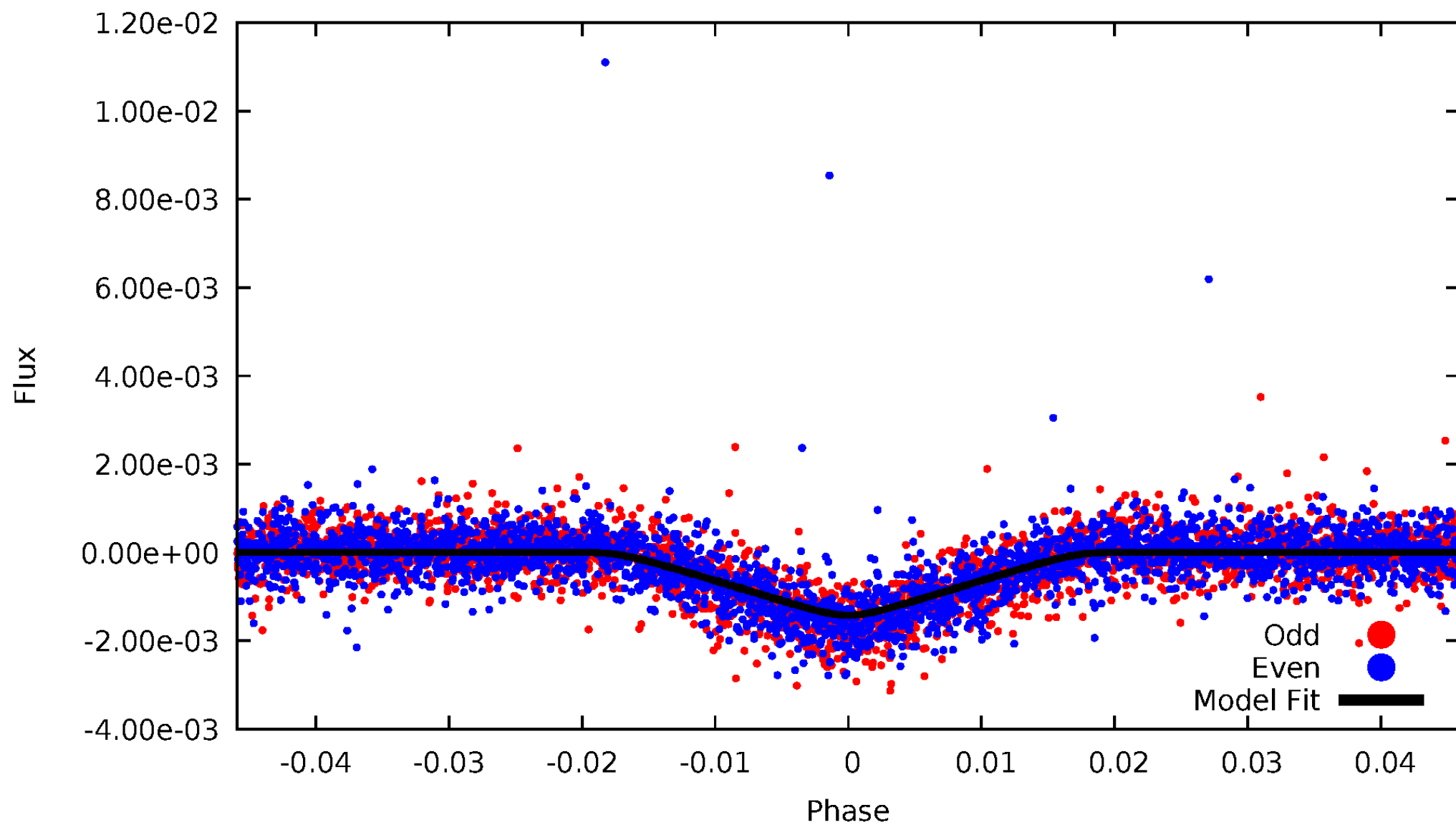
TCE 008561063-01





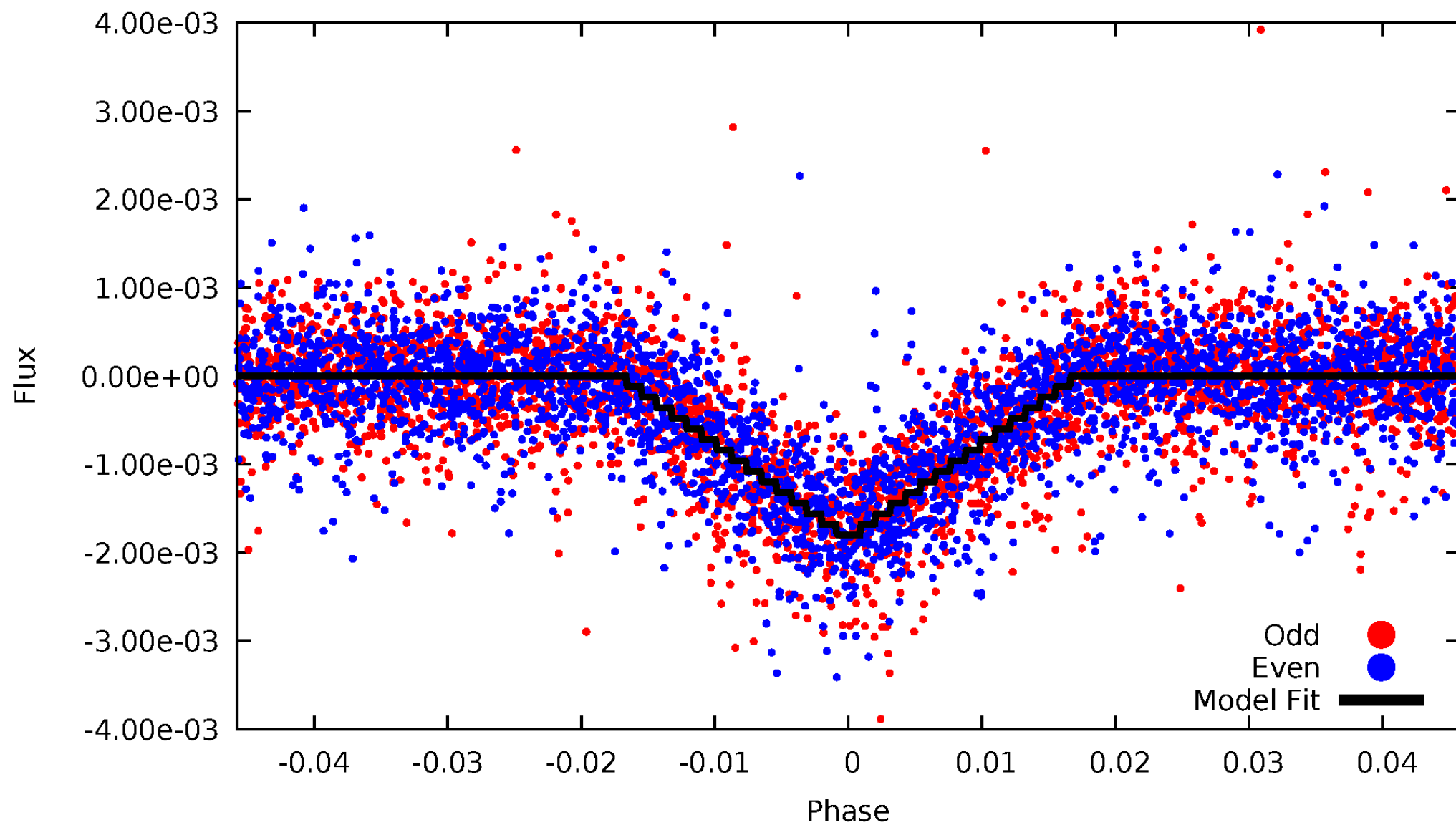
# DV Odd/Even

TCE 008561063-01



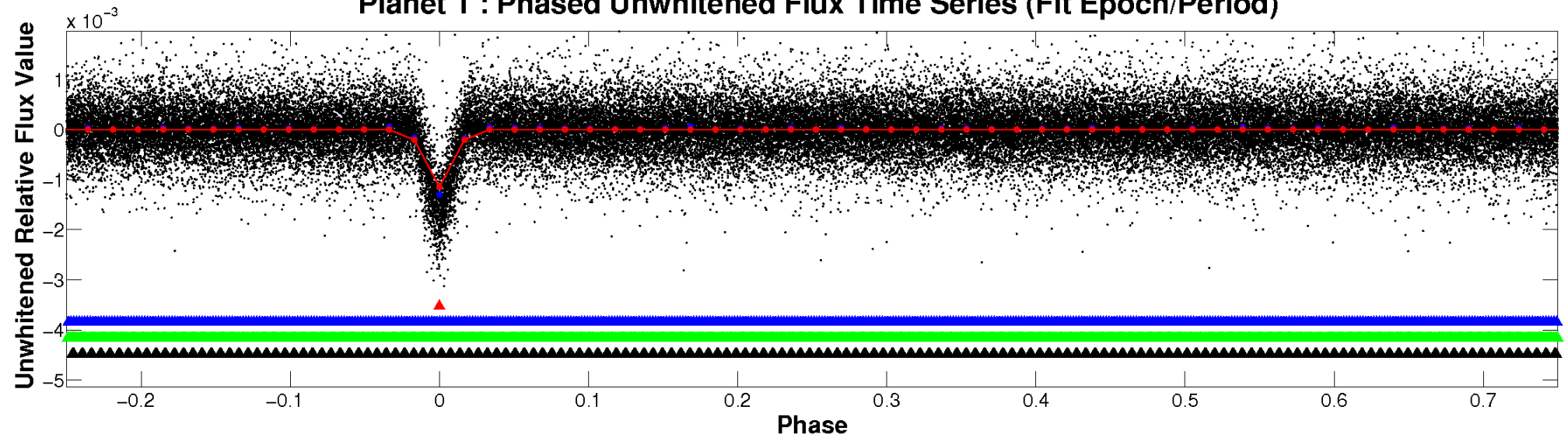
# ALT Odd/Even

TCE 008561063-01

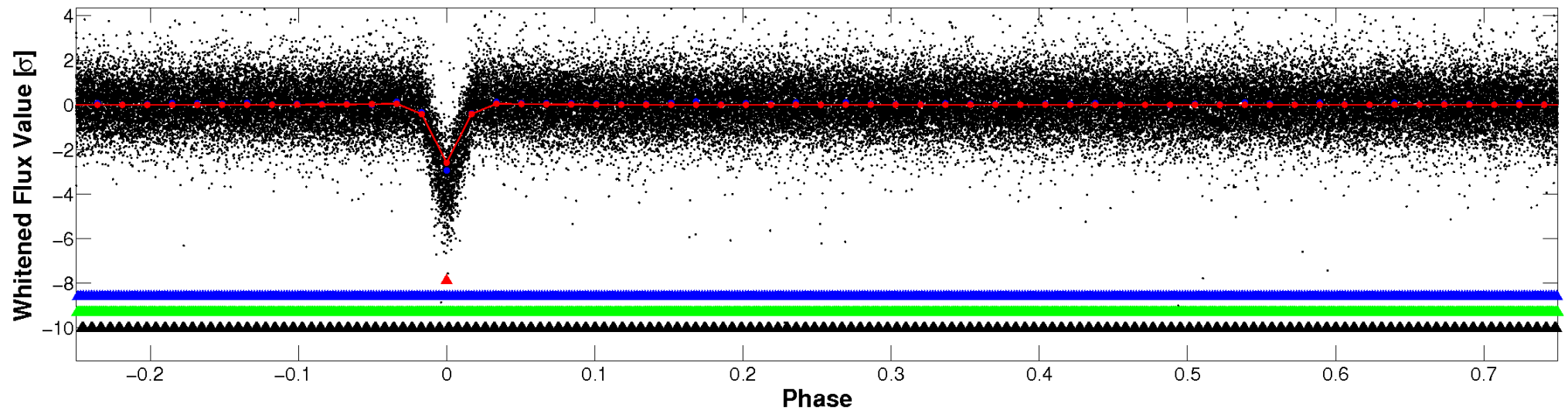


# Non-Whitened Vs. Whitened Light Curve

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

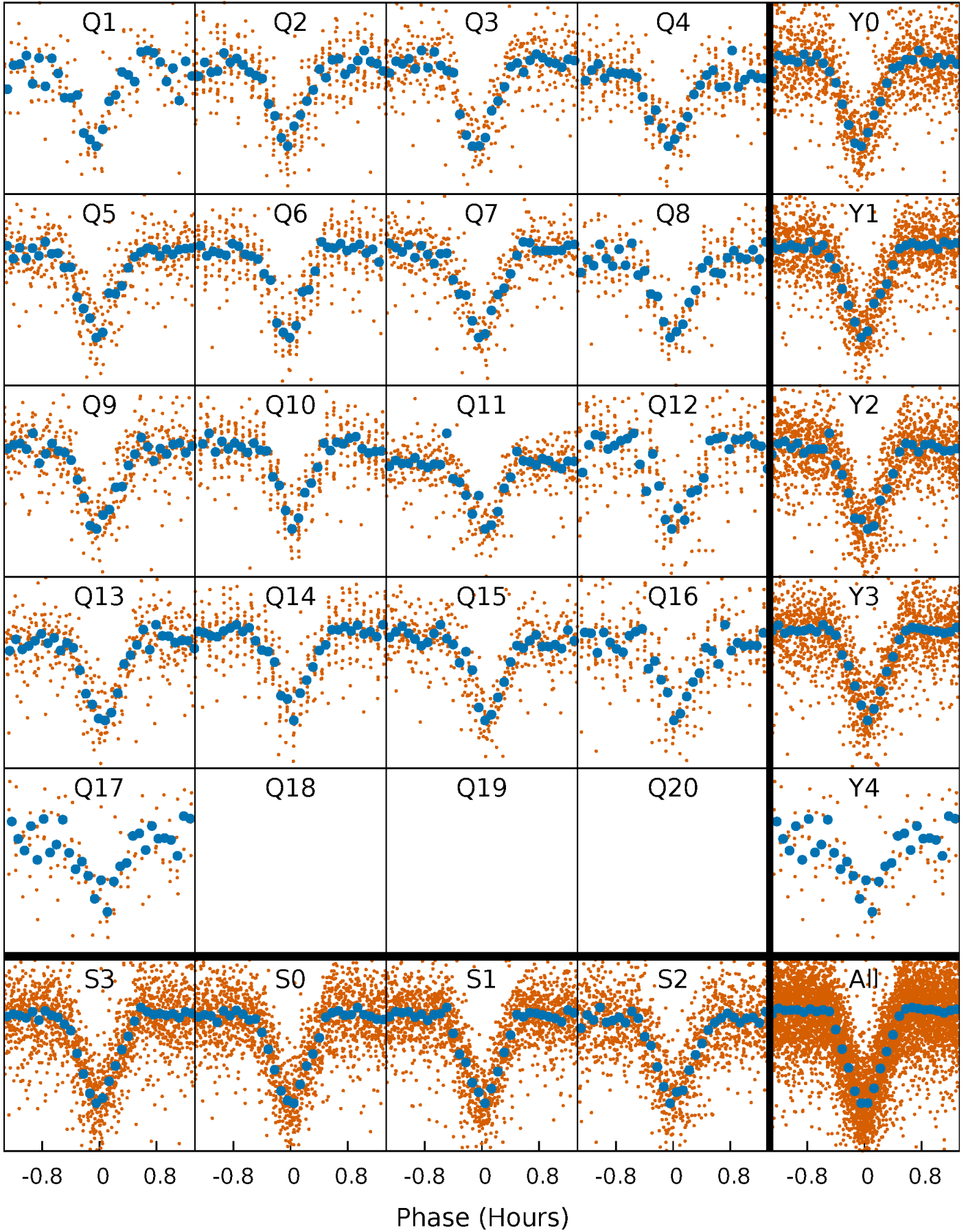


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

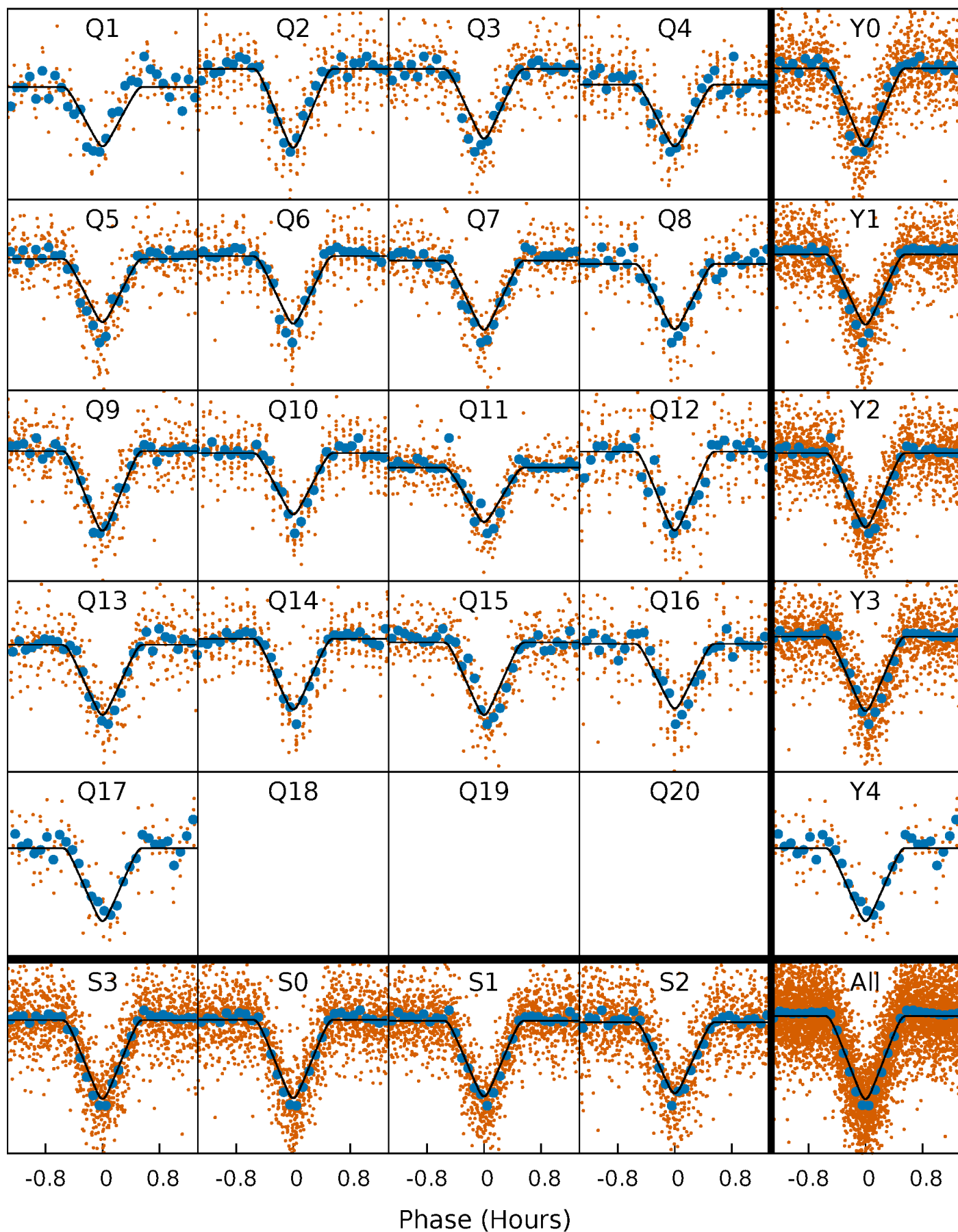
TCE 008561063-01   P= 1.213765 Days    $T_0=131.645975$  (BKJD)





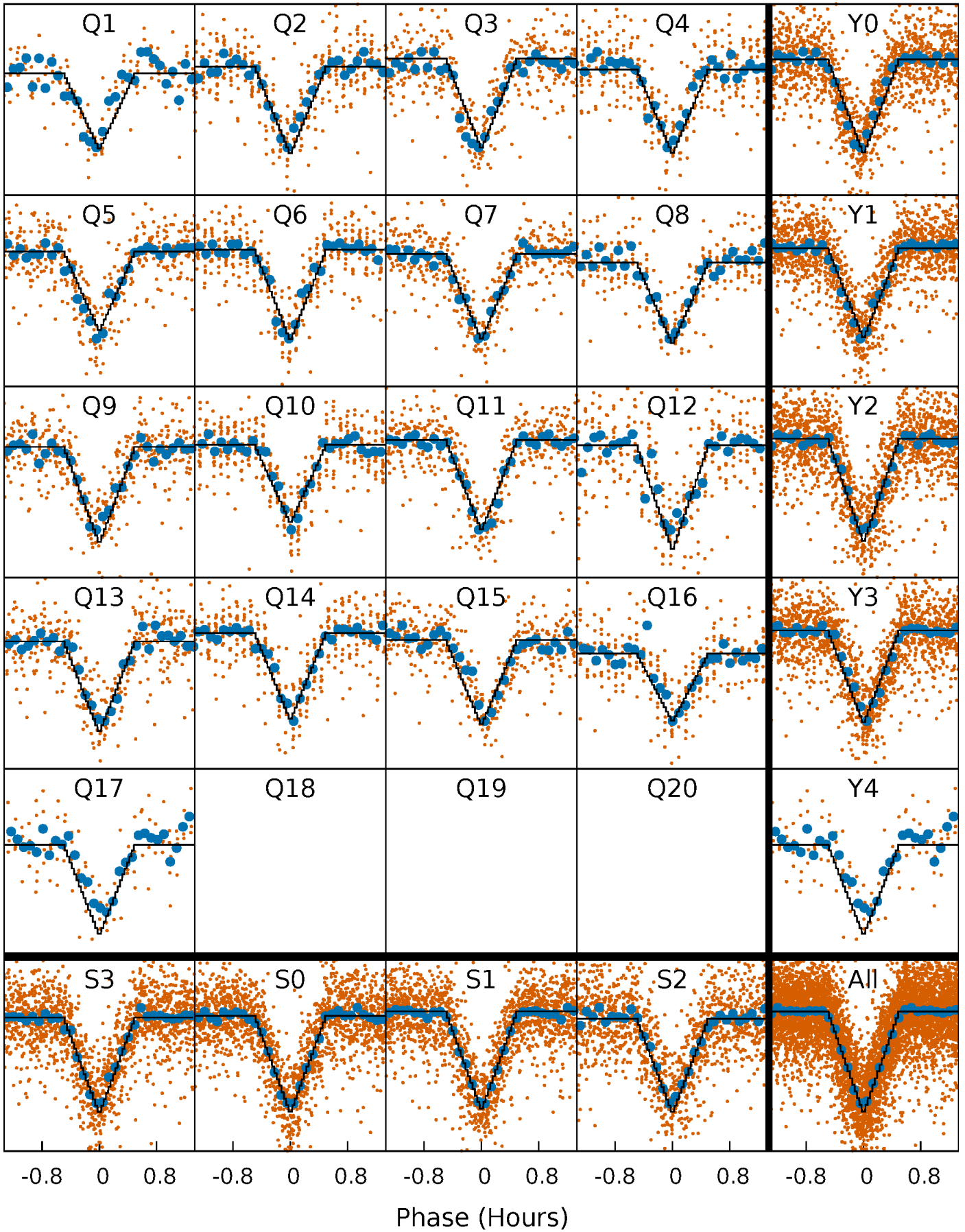
# DV Quarter-Phased Transit Curves

TCE 008561063-01 P= 1.213765 Days  $T_0=131.645975$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

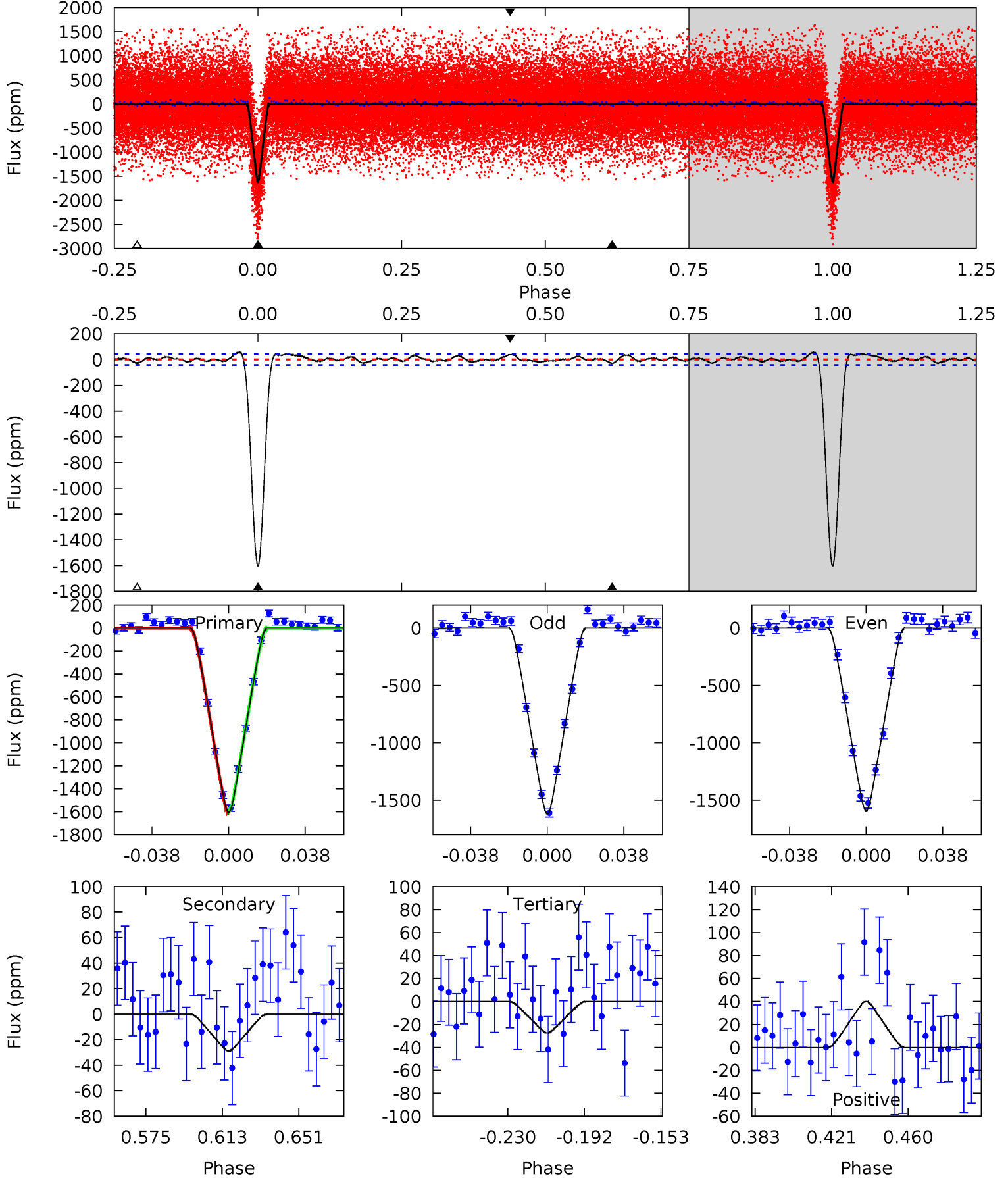
TCE 008561063-01 P= 1.213765 Days  $T_0=131.645979$  (BKJD)



# DV Model-Shift Uniqueness Test

008561063-01, P = 1.213765 Days, E = 130.432210 Days

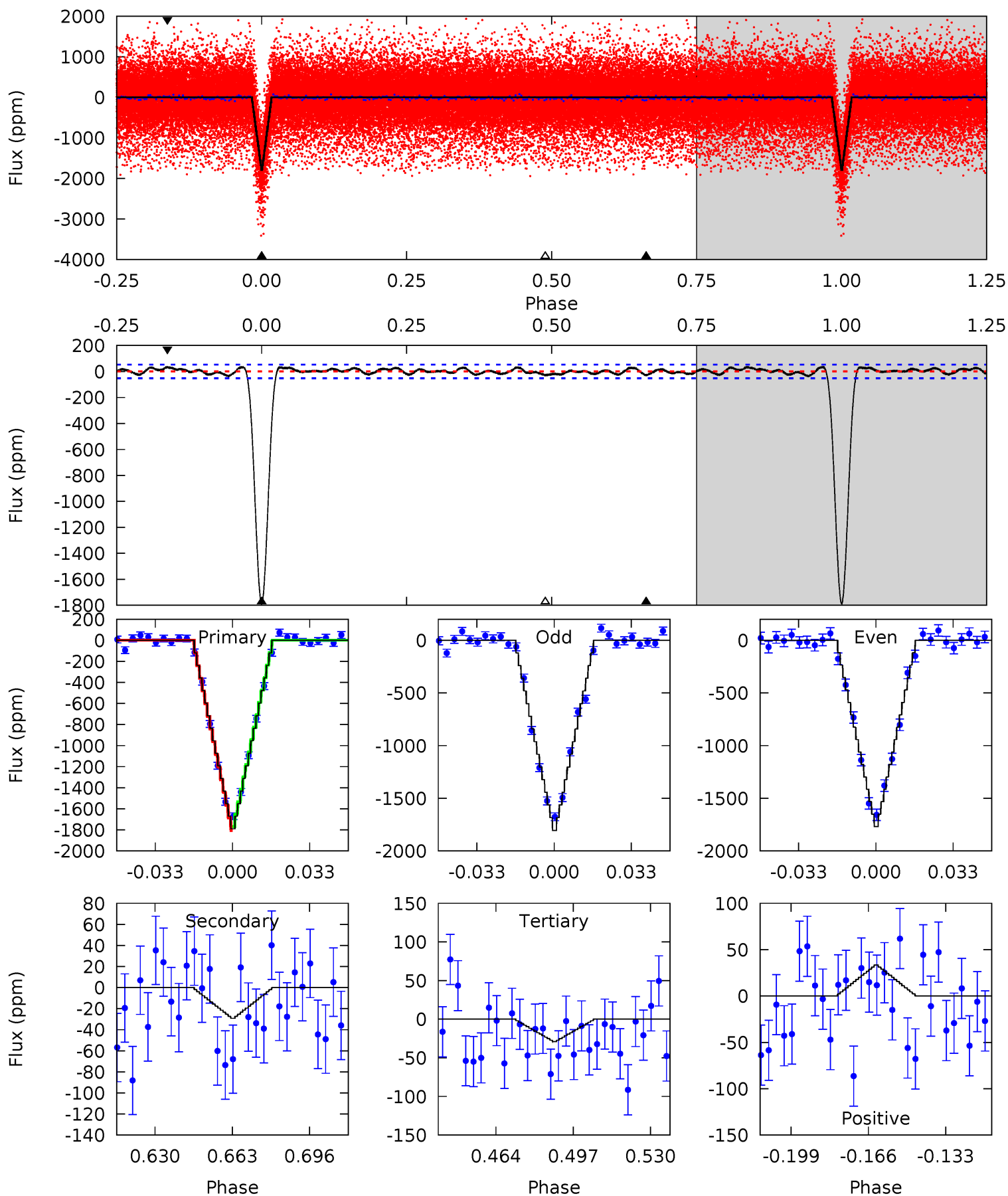
| Pri   | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|-------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 181.5 | 3.25 | 3.09 | 4.55 | 4.76            | 2.07            | 1.67             | 178.4   | 176.9   | 0.16    | -1.29   | 1.50    | 1.00 | 0.03  | 1.11 |



# Alt Model-Shift Uniqueness Test

008561063-01, P = 1.213765 Days, E = 130.432214 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  |
|-------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 164.4 | 2.69 | 2.67 | 3.07 | 4.79            | 2.13            | 1.41             | 161.7   | 161.3   | 0.01    | -0.39   | 1.68    | 1.00 | 0.02  | 1.75 |





### Stellar Parameters For KIC 008561063

|        | $T_{\text{eff}}(K)$ | $\log(g)$                 | [Fe/H]                     | $R (R_{\odot})$           | $M(M_{\odot})$            | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|---------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
|        | $3292^{+44}_{-24}$  | $5.215^{+0.053}_{-0.098}$ | $-0.420^{+0.150}_{-0.150}$ | $0.148^{+0.039}_{-0.017}$ | $0.132^{+0.039}_{-0.013}$ | $56.740^{+15.410}_{-20.380}$              |
|        | +1%/-1%             | +1%/-2%                   | +36%/-36%                  | +26%/-11%                 | +30%/-10%                 | +27%/-36%                                 |
| Source | SPE70               | PHO41                     | SPE70                      | DSEP                      |                           |   |

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

### Secondary Eclipse Parameters for KIC 008561063-01 / KOI 0961.01

| Detrend | Depth (ppm)  | $R_p (R_{\oplus})$     | $T_{max} (K)$     | $T_{obs} (K)$      | $A_{obs}$                 |
|---------|--------------|------------------------|-------------------|--------------------|---------------------------|
| DV      | $-29 \pm 9$  | $0.70^{+0.10}_{-0.07}$ | $741^{+30}_{-21}$ | $1964^{+71}_{-91}$ | $4.019^{+1.714}_{-1.465}$ |
| Alt.    | $-29 \pm 11$ | $0.70^{+0.10}_{-0.07}$ | $741^{+31}_{-20}$ | $1964^{+87}_{-89}$ | $4.092^{+1.948}_{-1.595}$ |

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

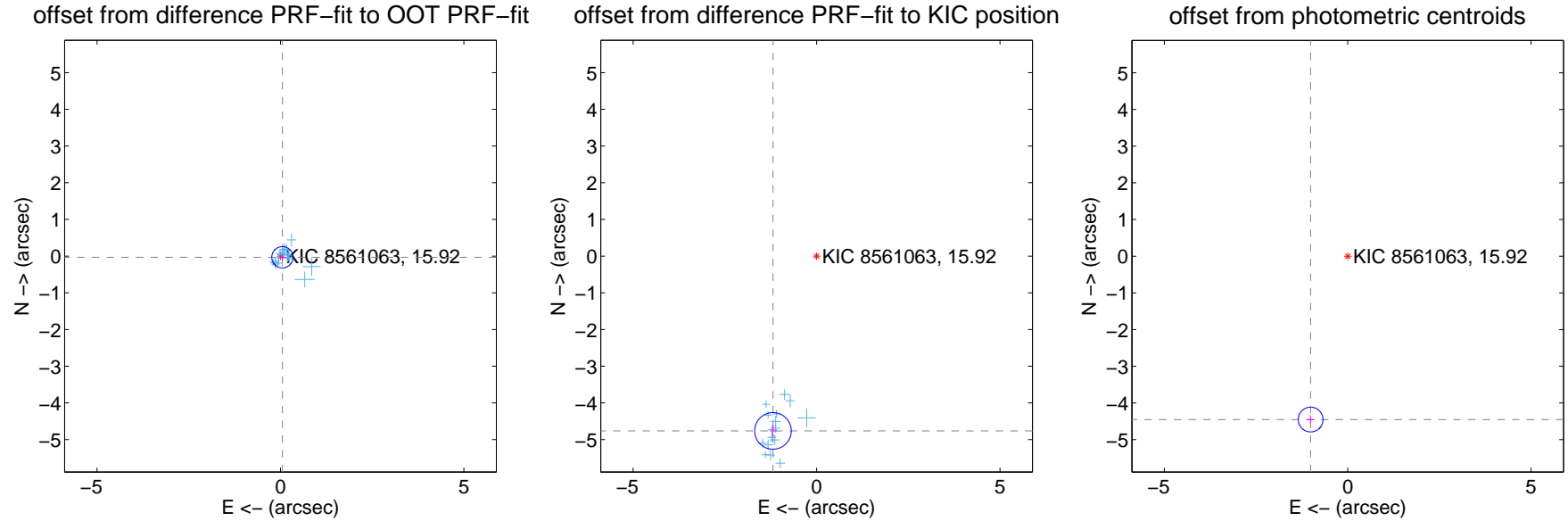
## DV Centroid Data

Supplemental centroid analysis for 008561063-01. Kepler magnitude: 15.92. Transit SNR 89.91

There are 17 quarters with good PRF difference image offsets

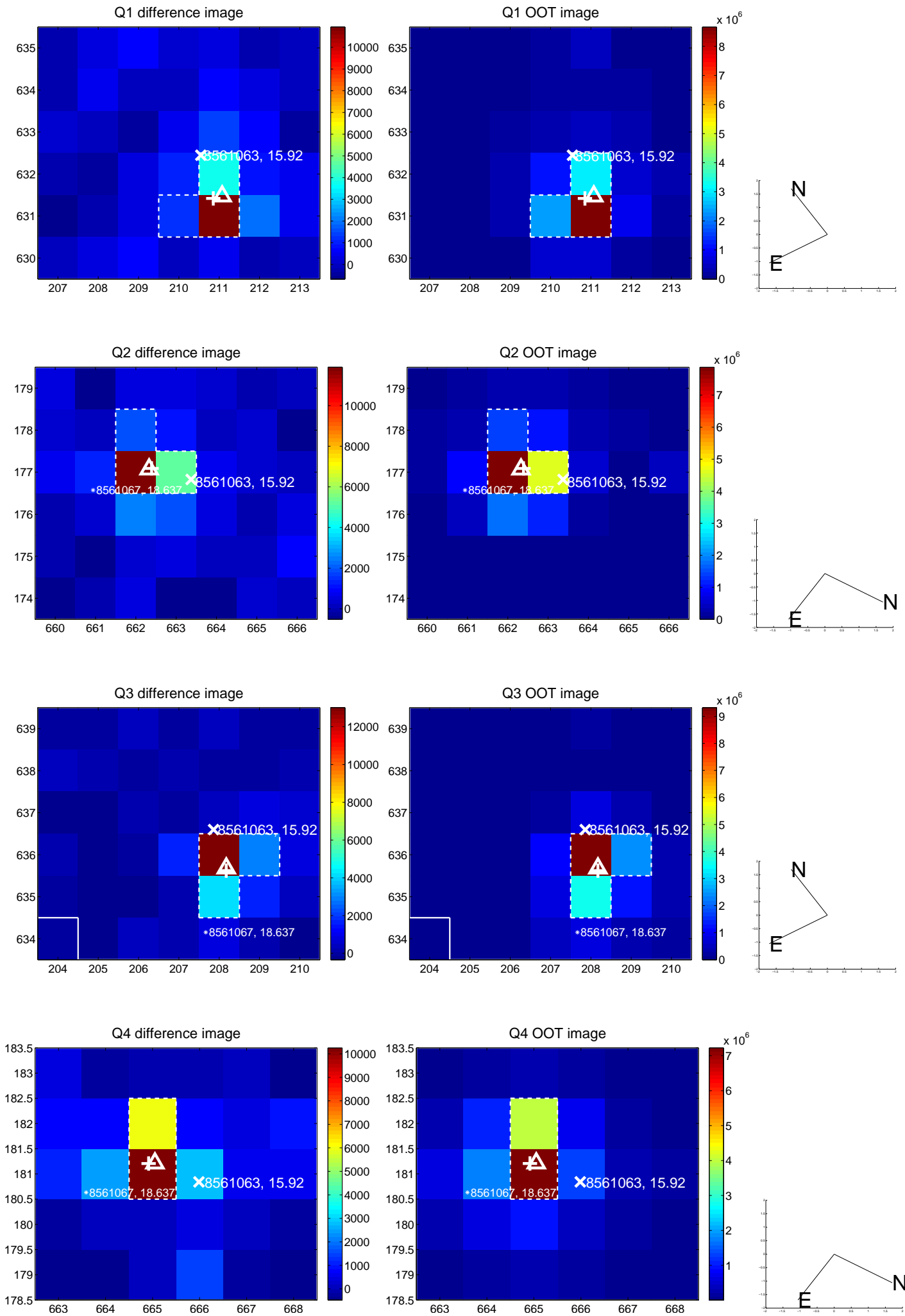
The OOT PRF centroid is offset from the target star catalog position by about 5.88 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA        | $\Delta$ Dec       |
|---|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT          | $0.061 \pm 0.097$  | 0.63                | $-0.053 \pm 0.094$ | $-0.031 \pm 0.088$ |
| PRF-fit source offset from KIC position | $4.908 \pm 0.166$  | 29.52               | $1.188 \pm 0.089$  | $-4.762 \pm 0.170$ |
| photometric centroid source offset      | $4.57 \pm 0.11$    | 40.65               | $1.01 \pm 0.11$    | $-4.45 \pm 0.11$   |

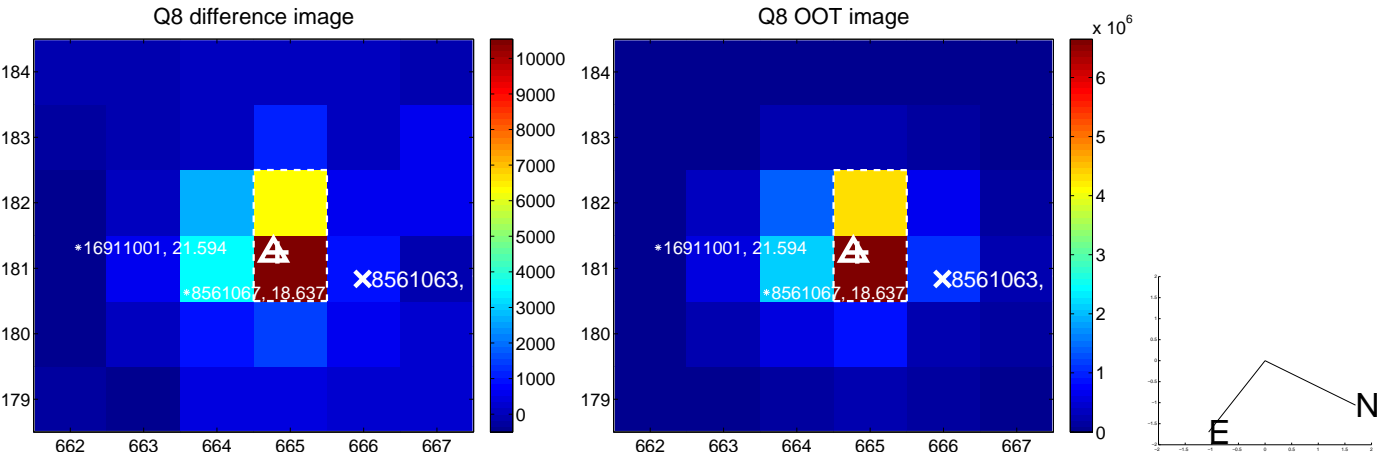
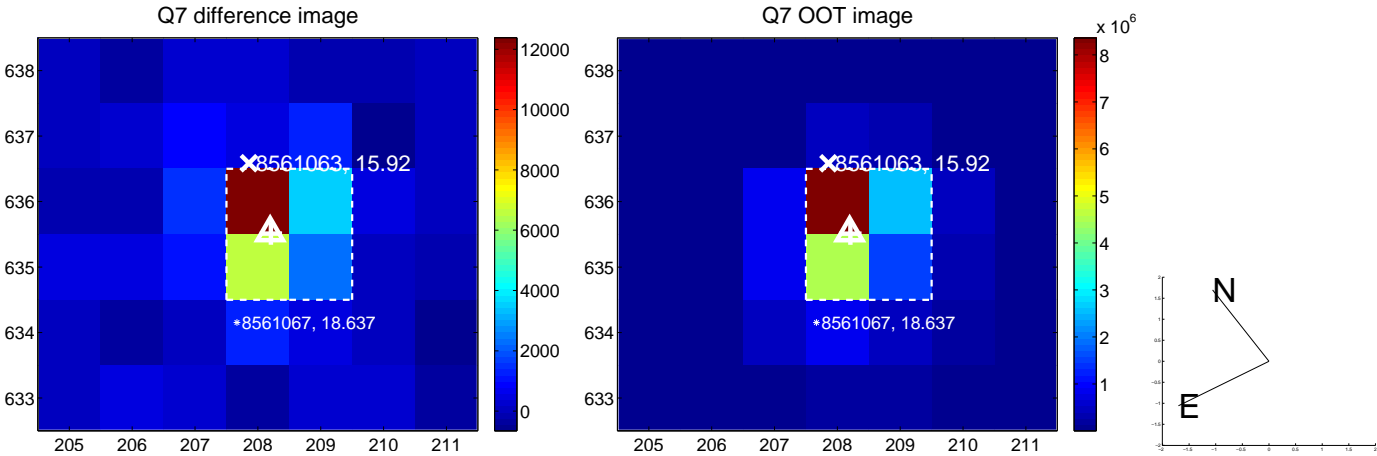
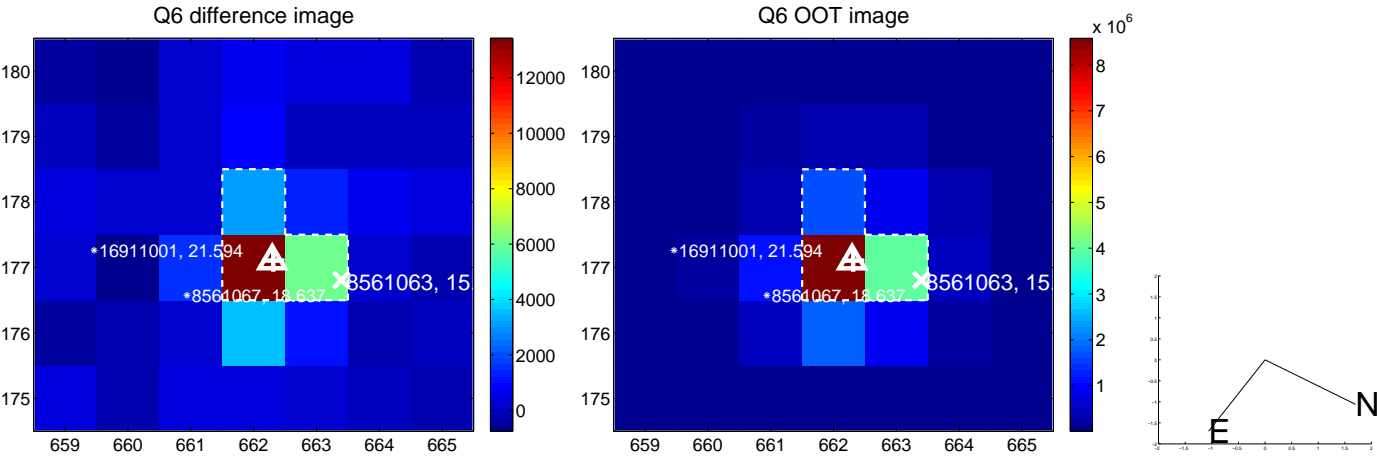
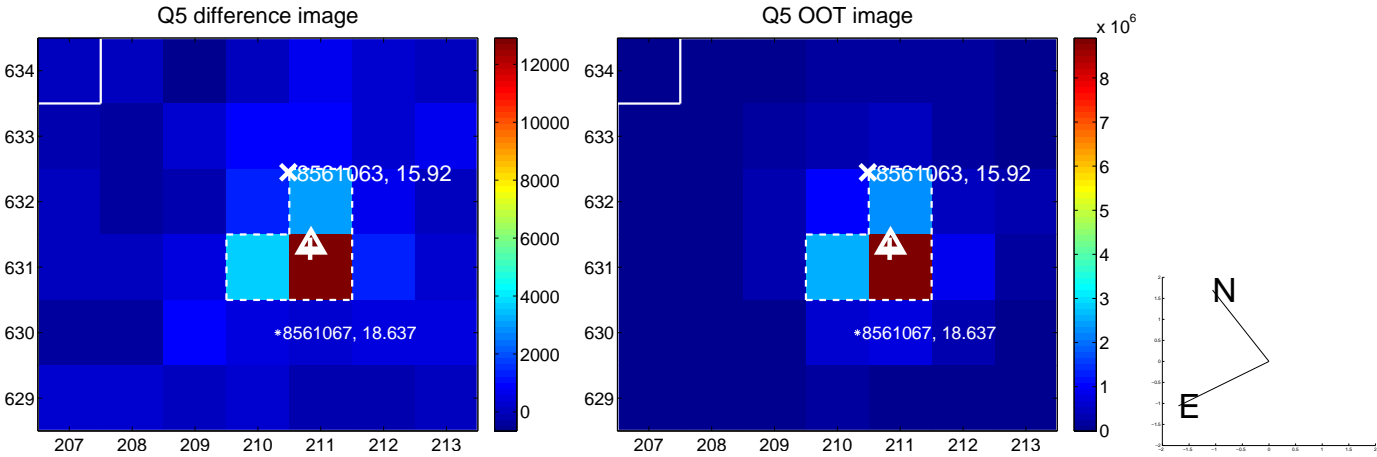


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

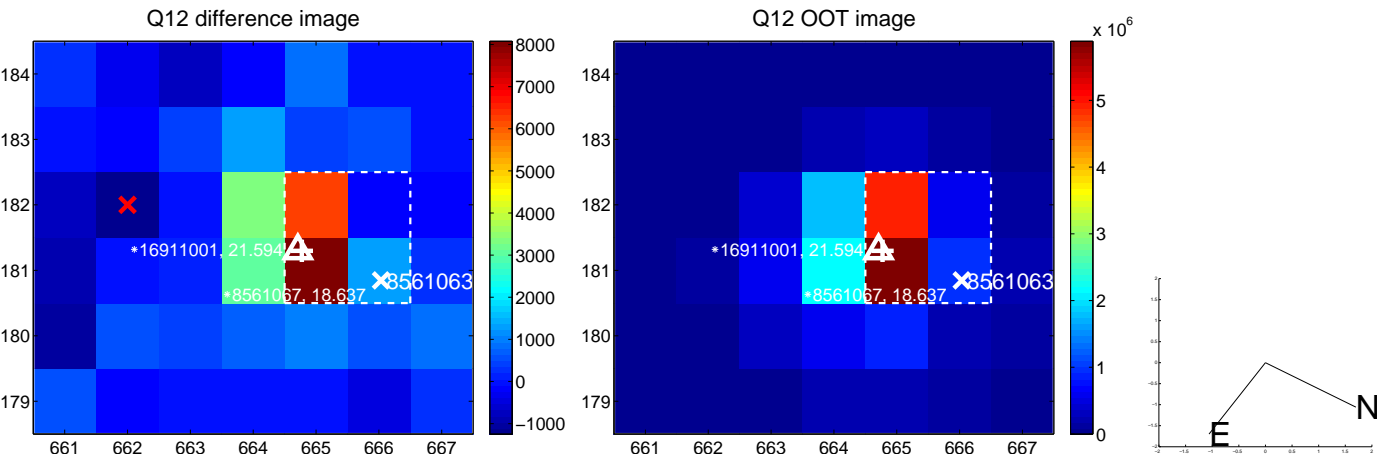
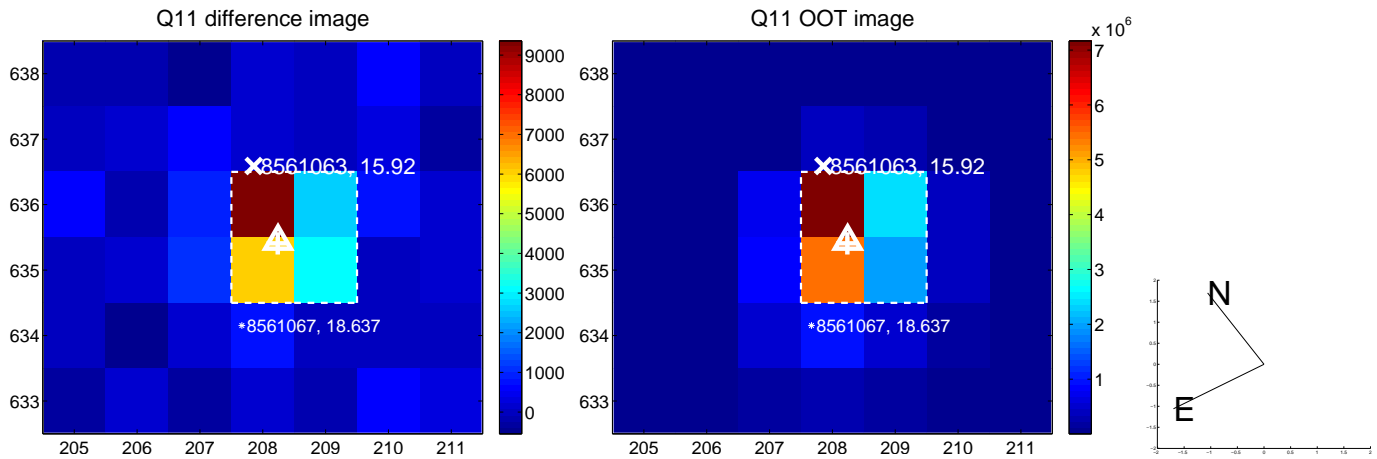
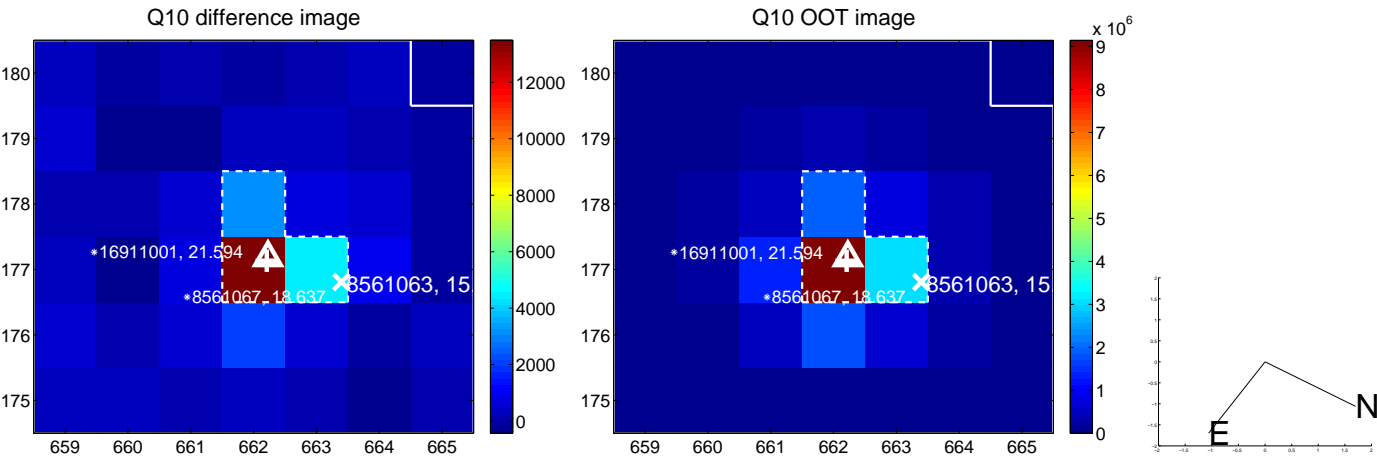
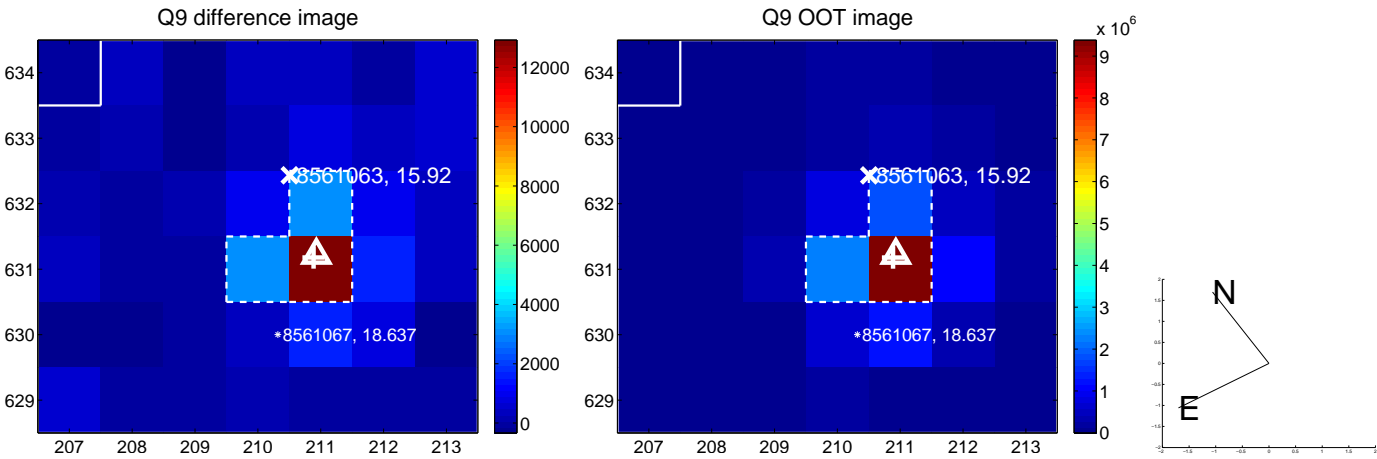


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

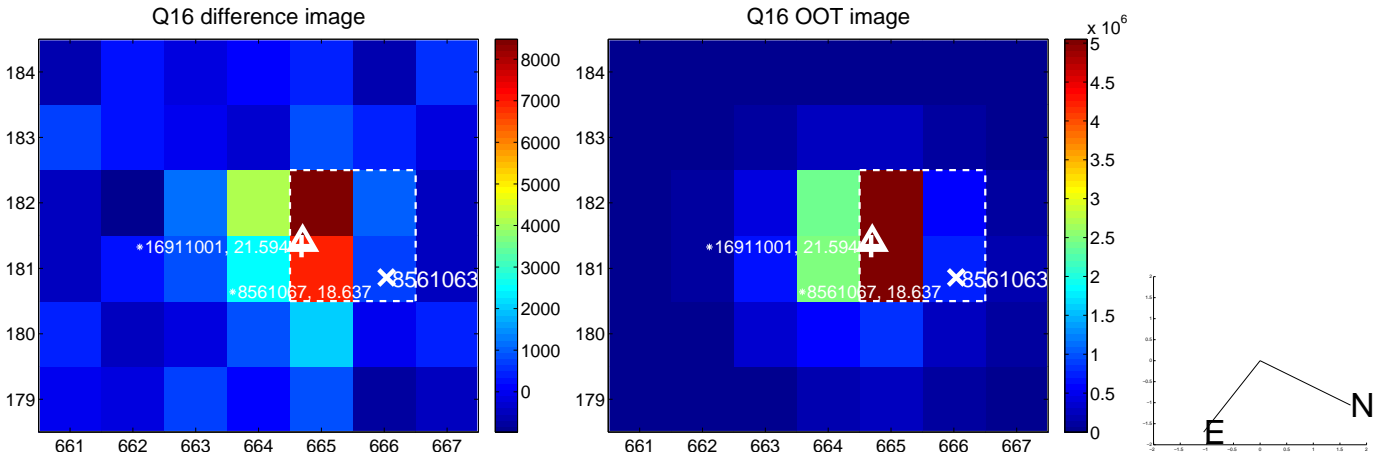
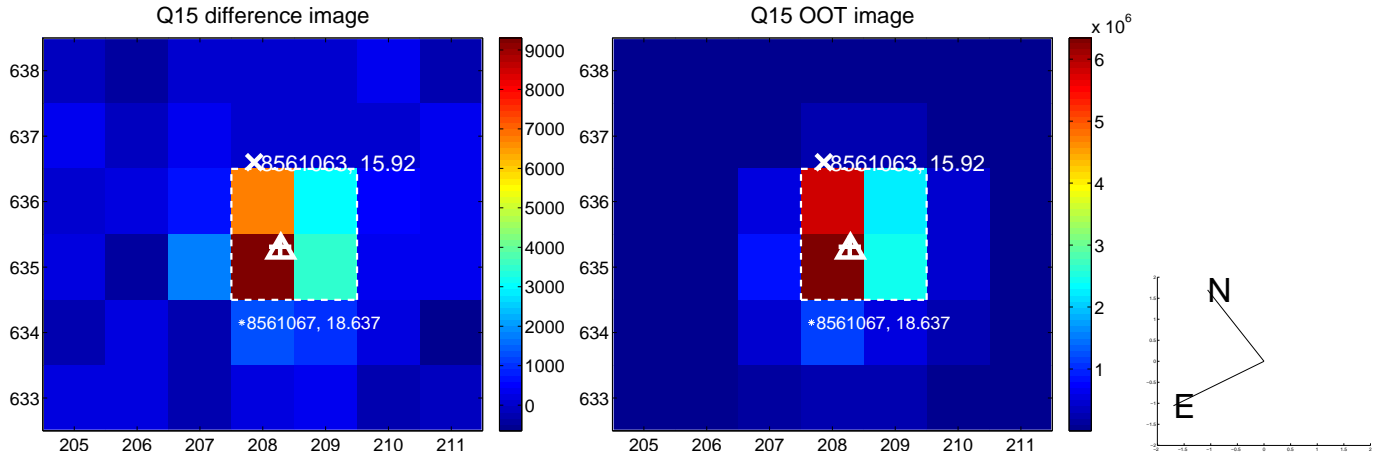
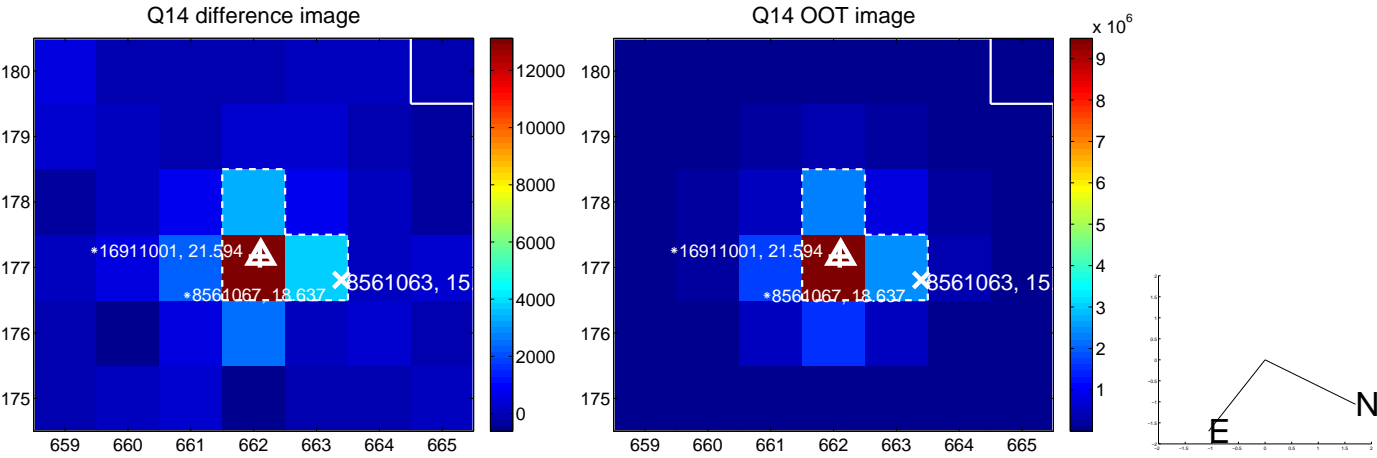
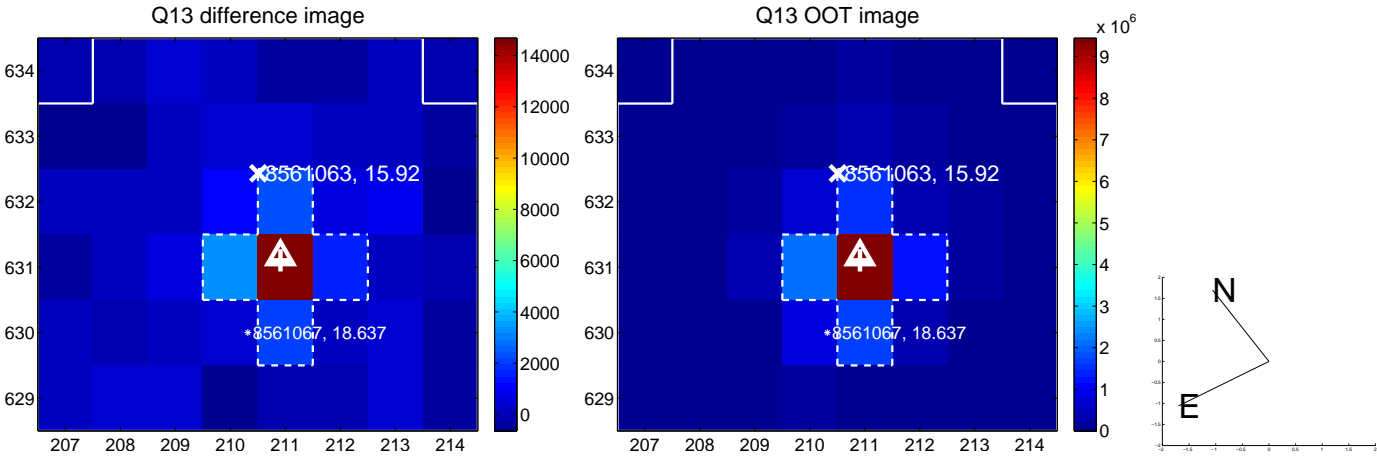




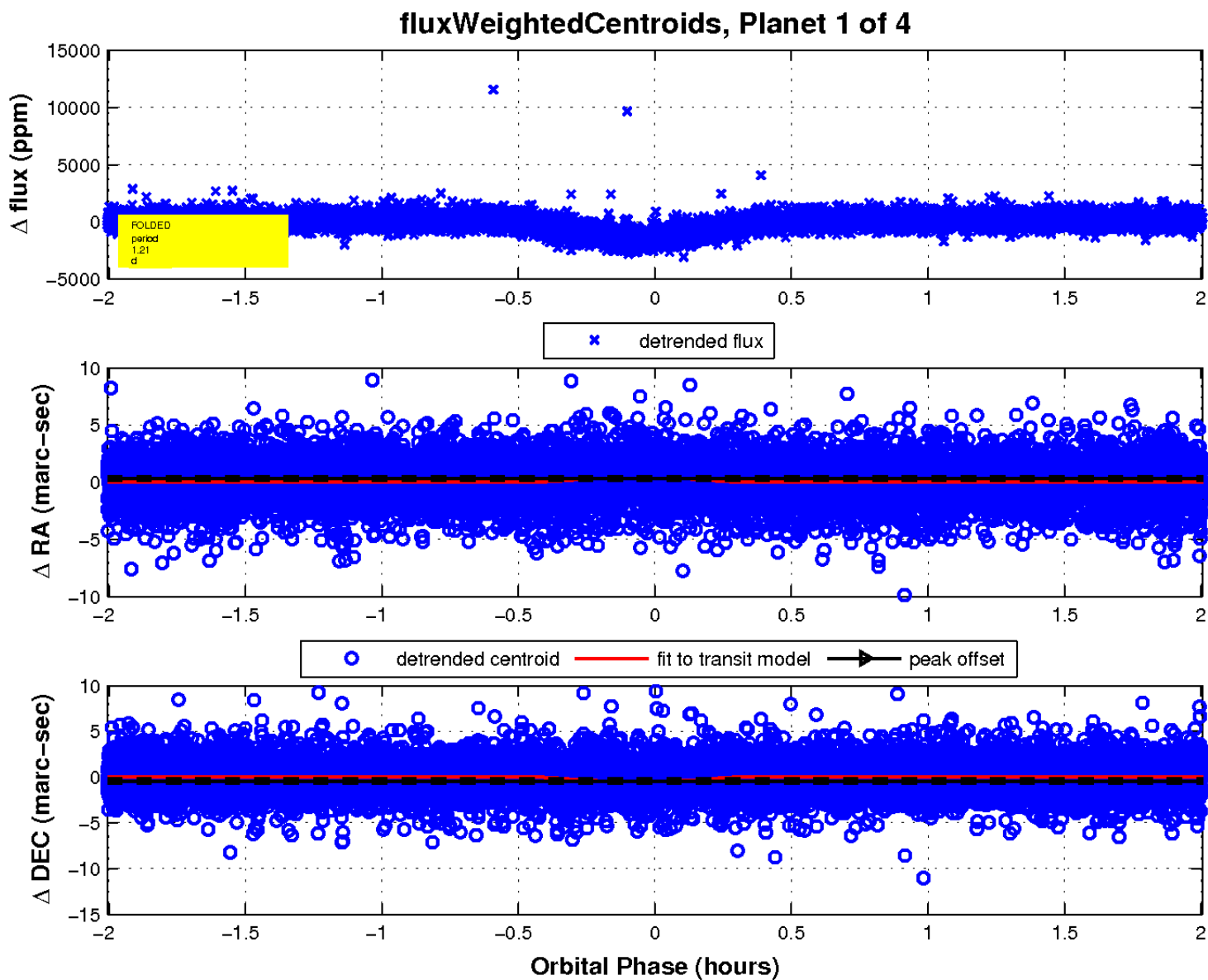
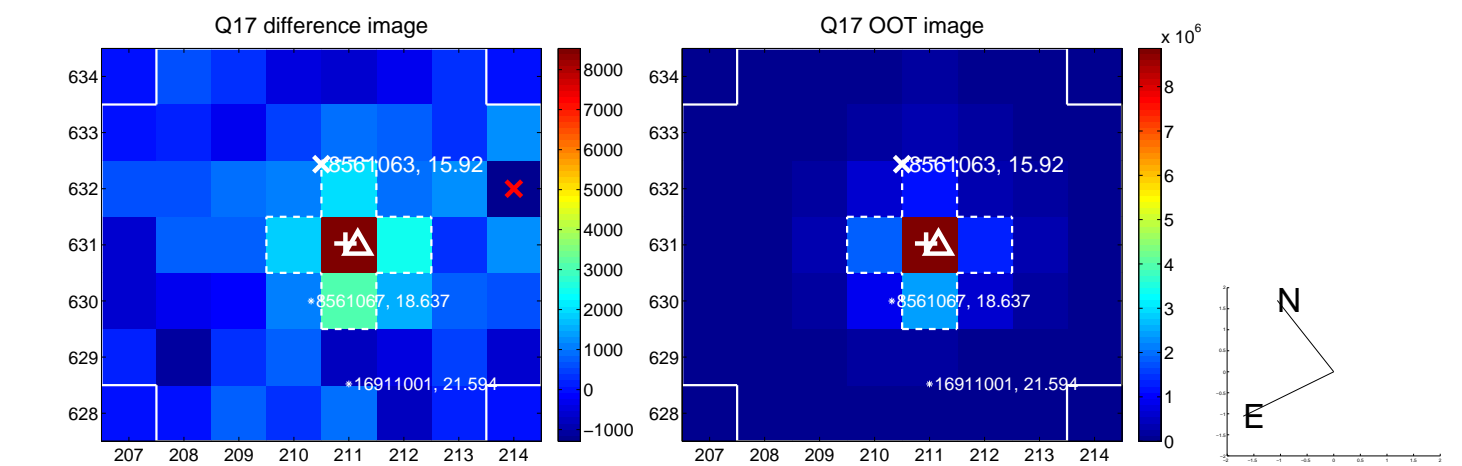
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

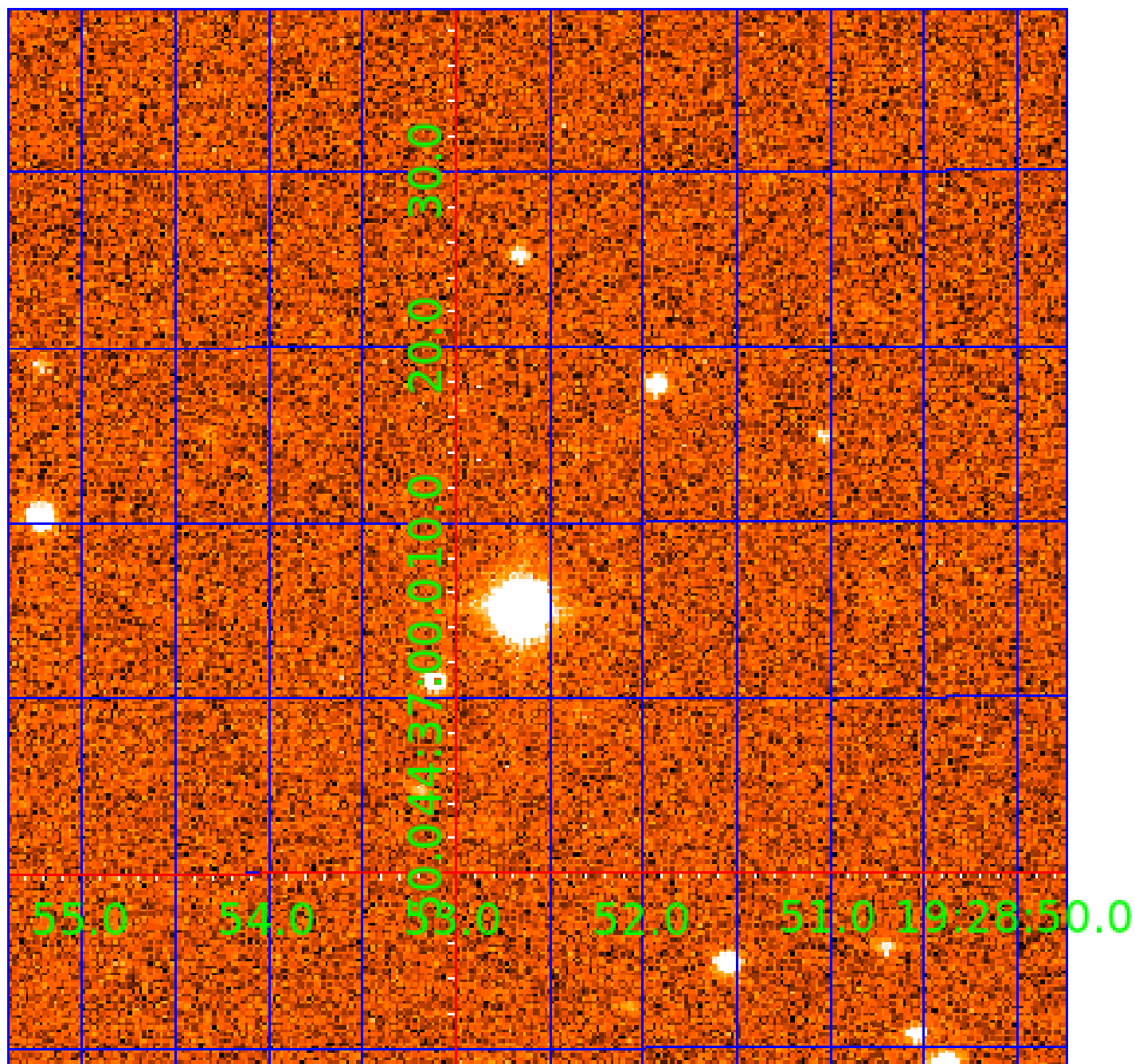


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 008561063

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 008561063-01 | OBS      | 0961.01 | 1.213765      | 131.645975   | 1416.1      | 0.669            | 70.8 | 89.9 | 0.15                        | 3292            | 0.69                   | 18.00                  |
| 008561063-02 | OBS      | 0961.03 | 1.865108      | 131.928621   | 992.7       | 0.600            | 33.1 | 49.3 | 0.15                        | 3292            | 0.48                   | 10.15                  |
| 008561063-03 | OBS      | 0961.02 | 0.906561      | 132.064027   | 294.4       | 0.667            | 10.5 | 20.8 | 0.15                        | 3292            | 0.26                   | 26.57                  |
| 008561063-04 | OBS      | No      | 0.906577      | 131.610994   | 1483.1      | 1.500            | 10.0 | -1.0 | 0.15                        | 3292            | 0.57                   | 26.57                  |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments  |
|--------------|----------|------|-------|---|---|---|---|---|
| 008561063-01 | OBS      | PC   | 1.00  | 0 | 0 | 0 | 0 | CENT_KIC_POS                                    |
| 008561063-02 | OBS      | PC   | 1.00  | 0 | 0 | 0 | 0 | CENT_KIC_POS                                    |
| 008561063-03 | OBS      | FP   | 0.00  | 0 | 1 | 0 | 0 | MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE—CENT_KIC_POS |
| 008561063-04 | OBS      | FP   | 0.00  | 1 | 1 | 0 | 0 | IS_SEC_TCE—CENT_NOFITS                          |

**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.

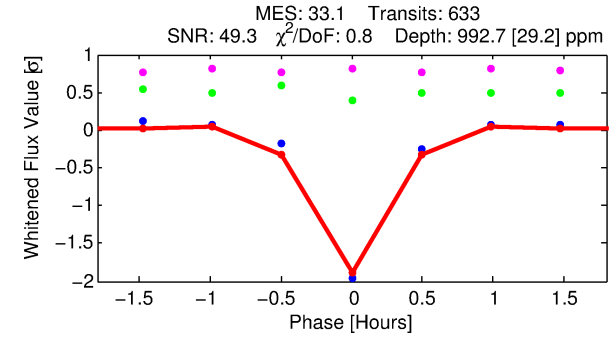
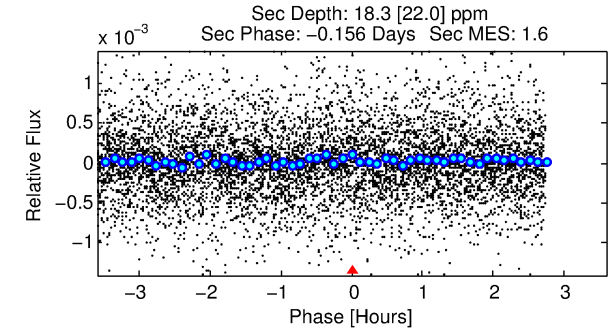
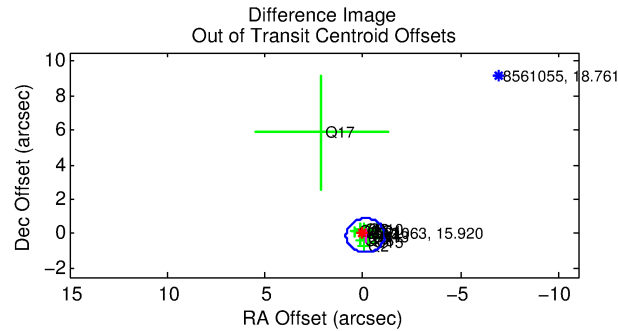
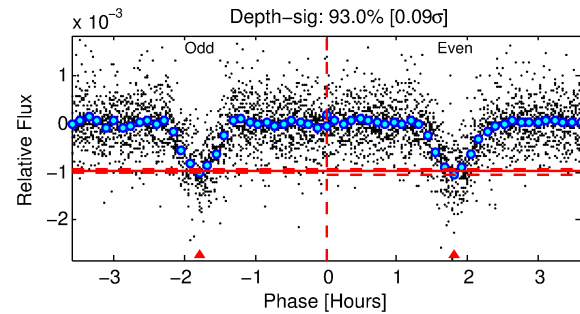
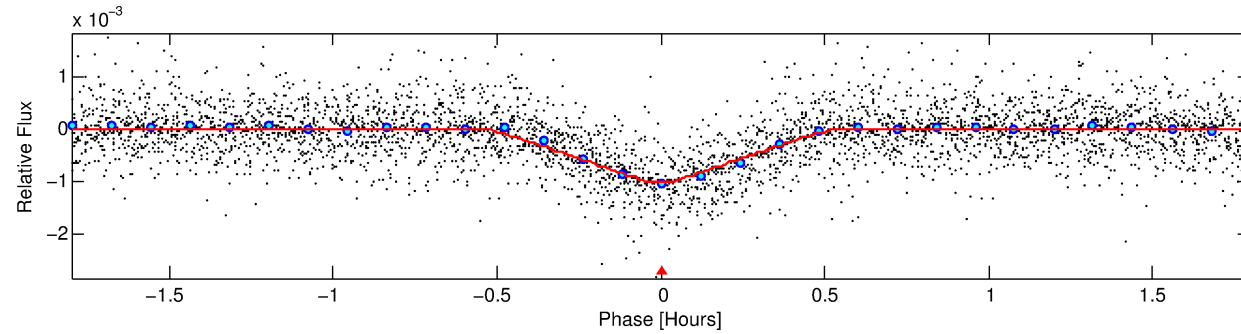
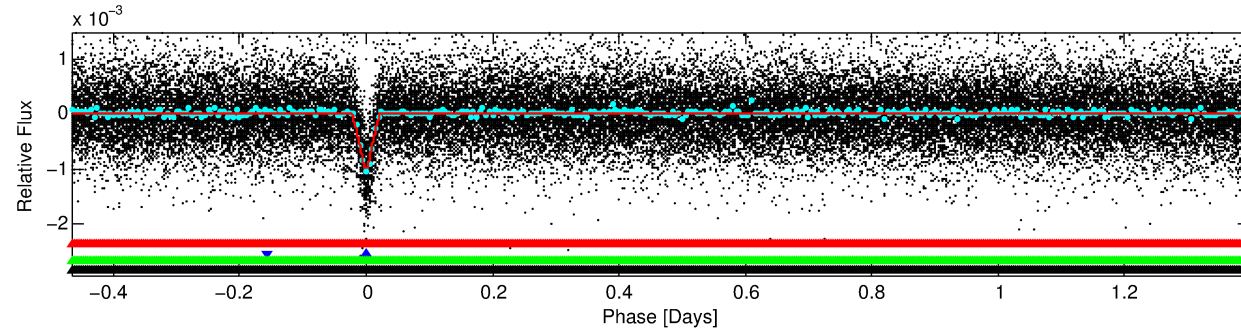
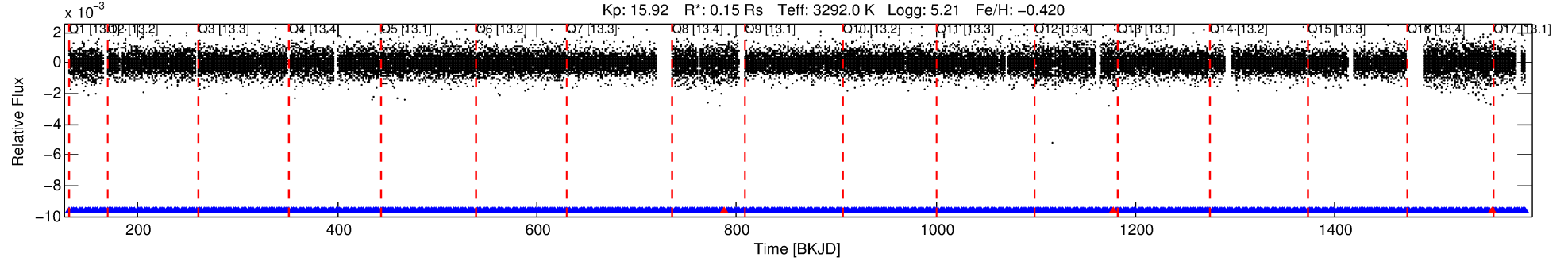
## Ephemeris Match Information For 008561063-02

No Significant Match Found

# DV One-Page Summary

KIC: 8561063 Candidate: 2 of 4 Period: 1.865 d  
KOI: K00961.03 Name: Kepler-42d Corr: 0.814

Kp: 15.92 R\*: 0.15 Rs Teff: 3292.0 K Logg: 5.21 Fe/H: -0.420



## DV Fit Results:

Period = 1.86511 [0.00000] d  
Epoch = 131.9286 [0.0003] BKJD  
Rp/R\* = 0.0299 [0.0050]  
a/R\* = 23.41 [19.25]  
b = 0.30 [2.50]  
Seff = 10.15 [2.41]  
Teq = 455 [27] K  
Rp = 0.48 [0.15] Re  
a = 0.0151 [0.0029] AU  
Ag = 9.79 [12.40] [0.71σ]  
Teffp = 1245 [388] K [2.03σ]

## DV Diagnostic Results:

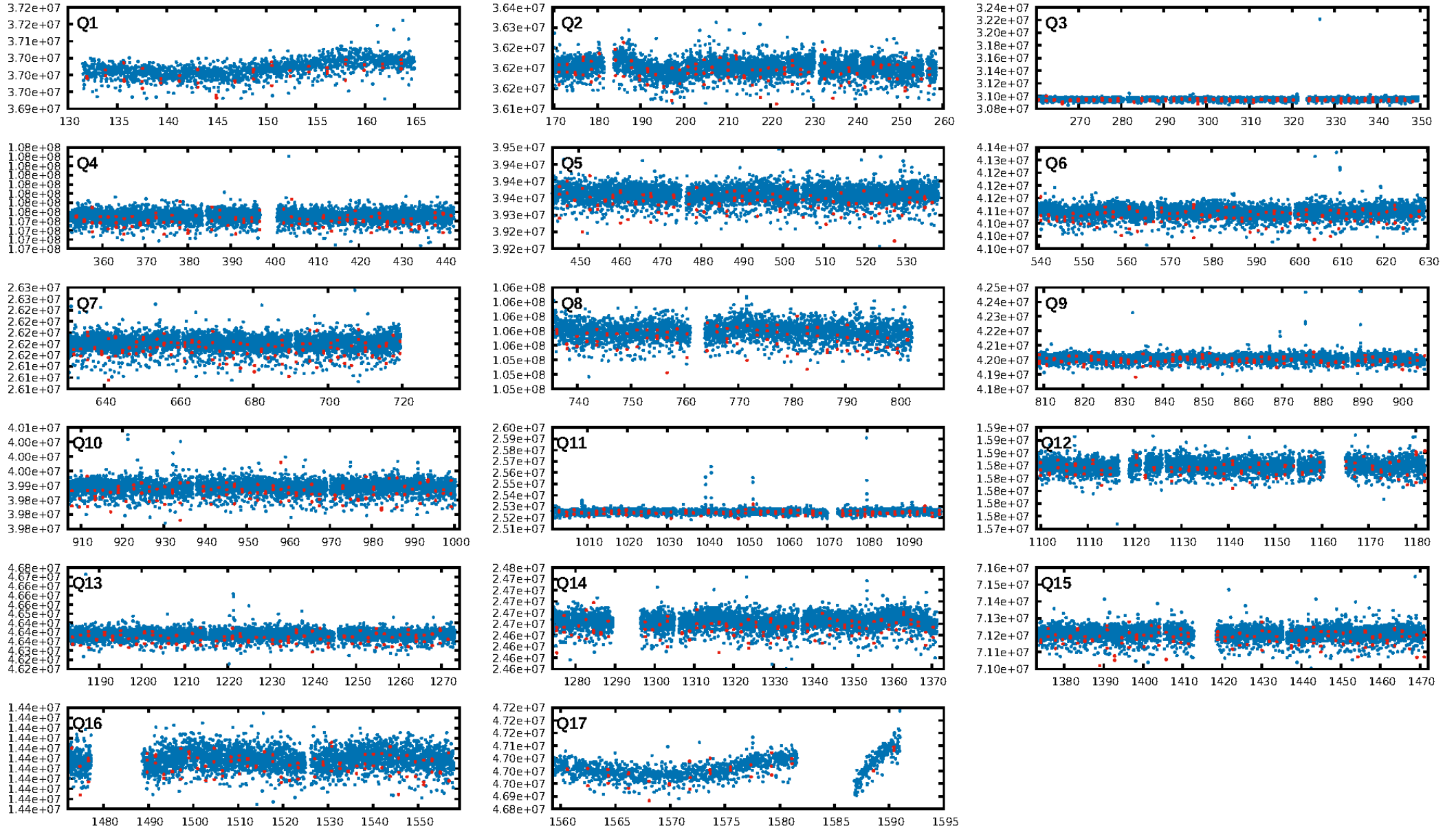
ShortPeriod-sig: 100.0% [17.40σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 9.77e-229  
RollingBand-fgt: 1.00 [602/605]  
GhostDiagnostic-chr: 3.229  
Centroid-sig: 0.5%  
Centroid-so: 4.609 arcsec [25.37σ]  
OotOffset-rm: 0.155 arcsec [0.47σ]  
KicOffset-rm: 4.892 arcsec [17.38σ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 0.94 [16/17]  
DiffImageOverlap-fno: 0.00 [0/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 14:31:41 Z

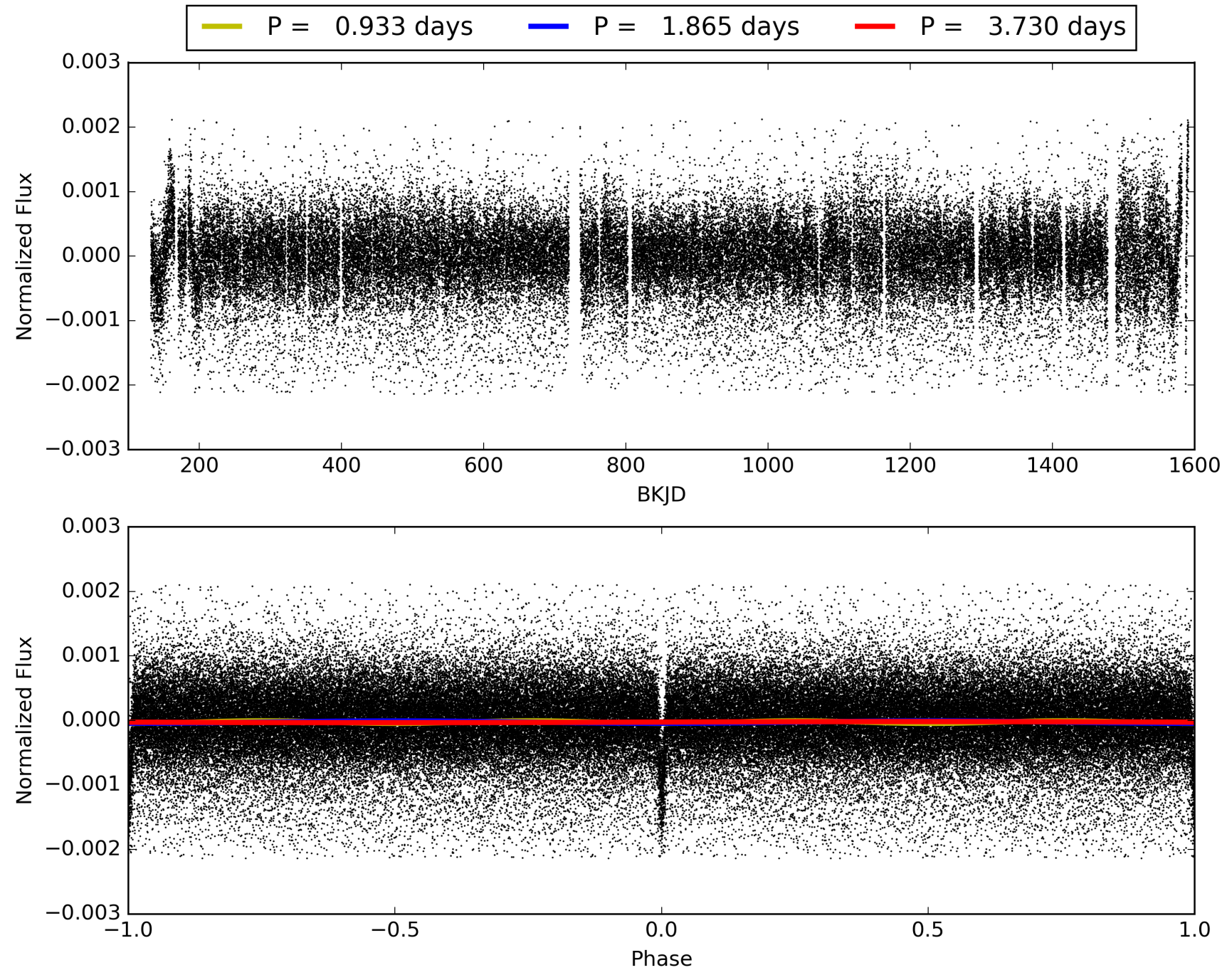
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center



# TCE 008561063-02, PDC Light Curves

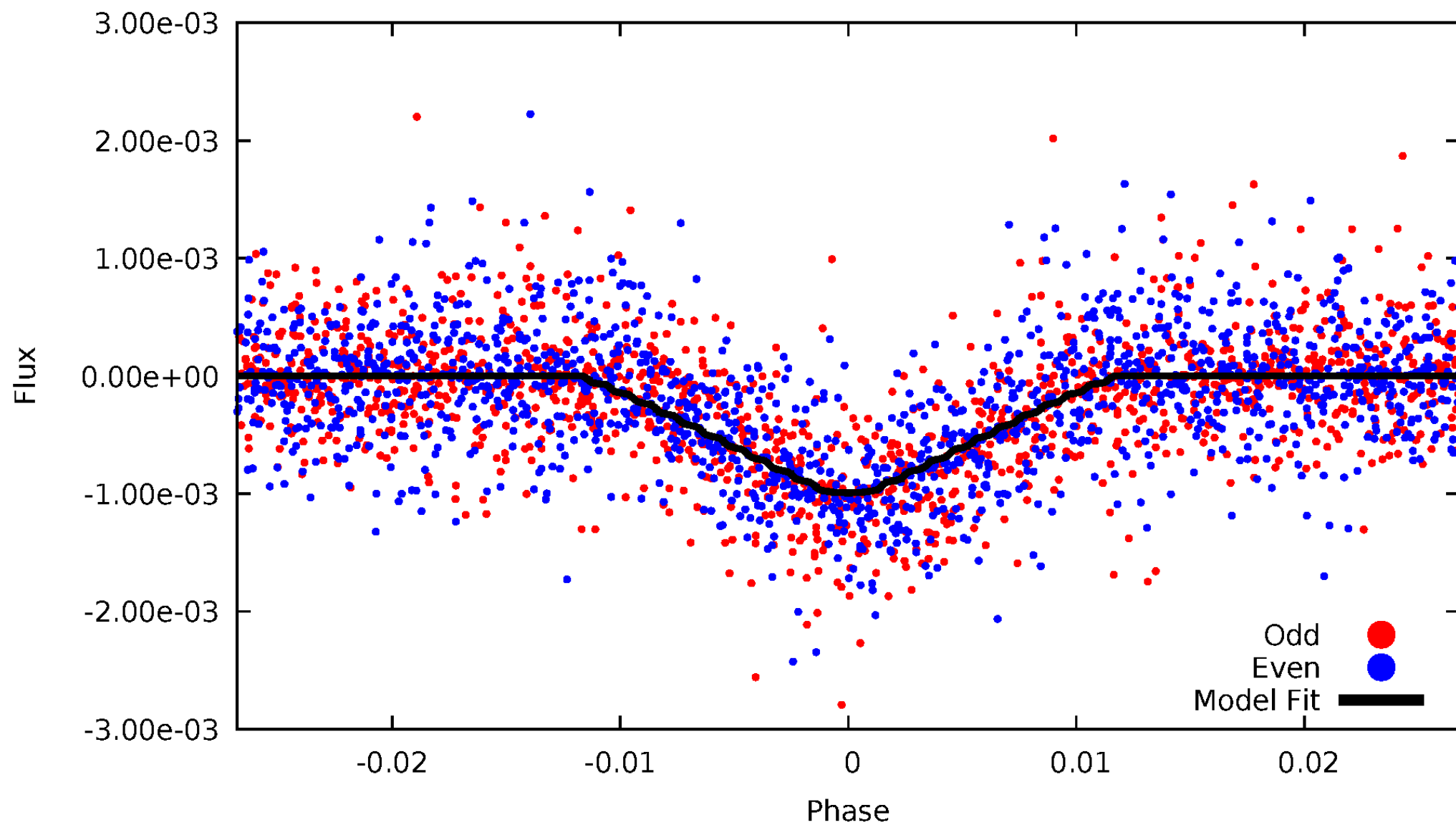


# TCE 008561063-02



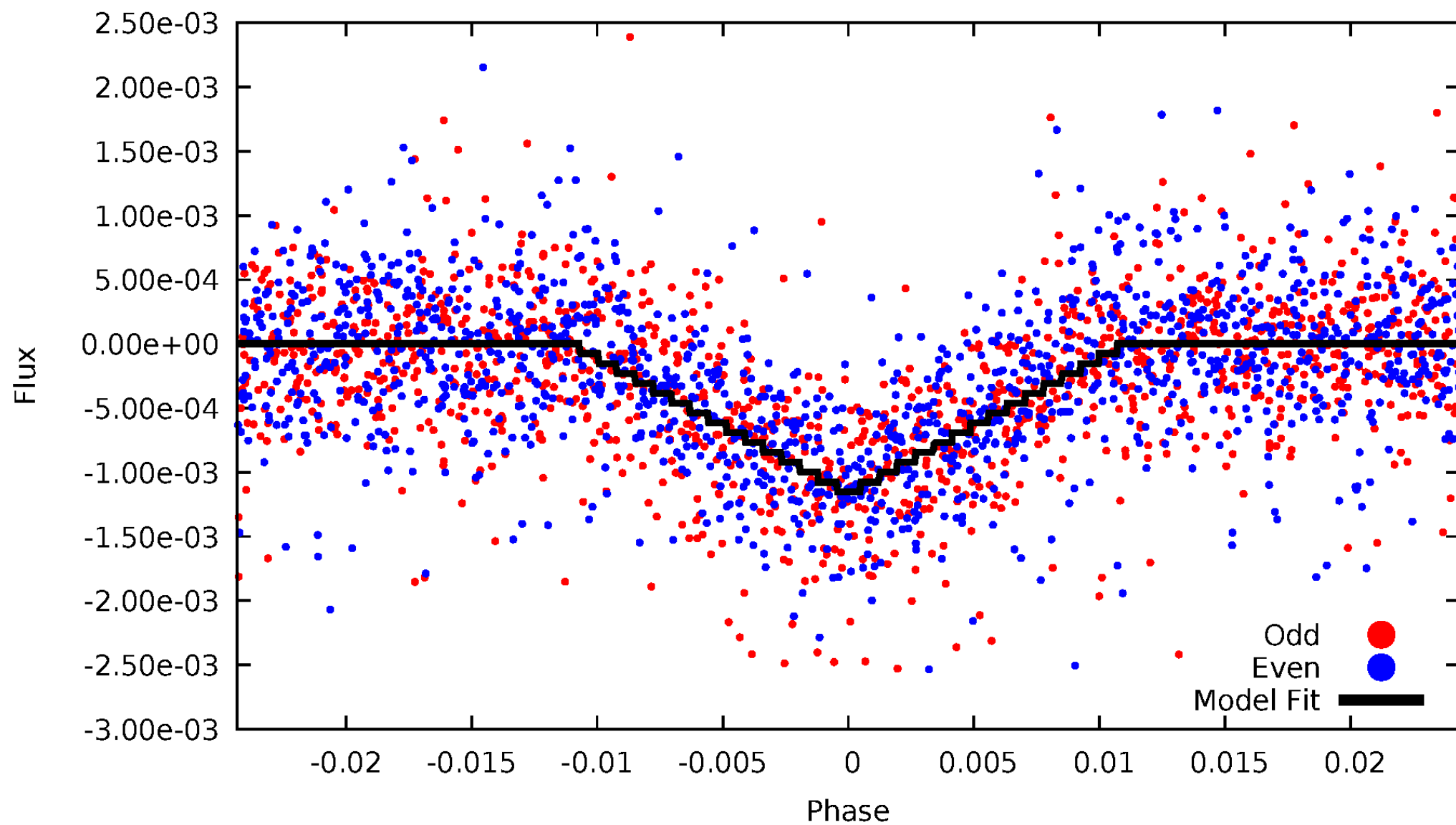
DV Odd/Even

TCE 008561063-02



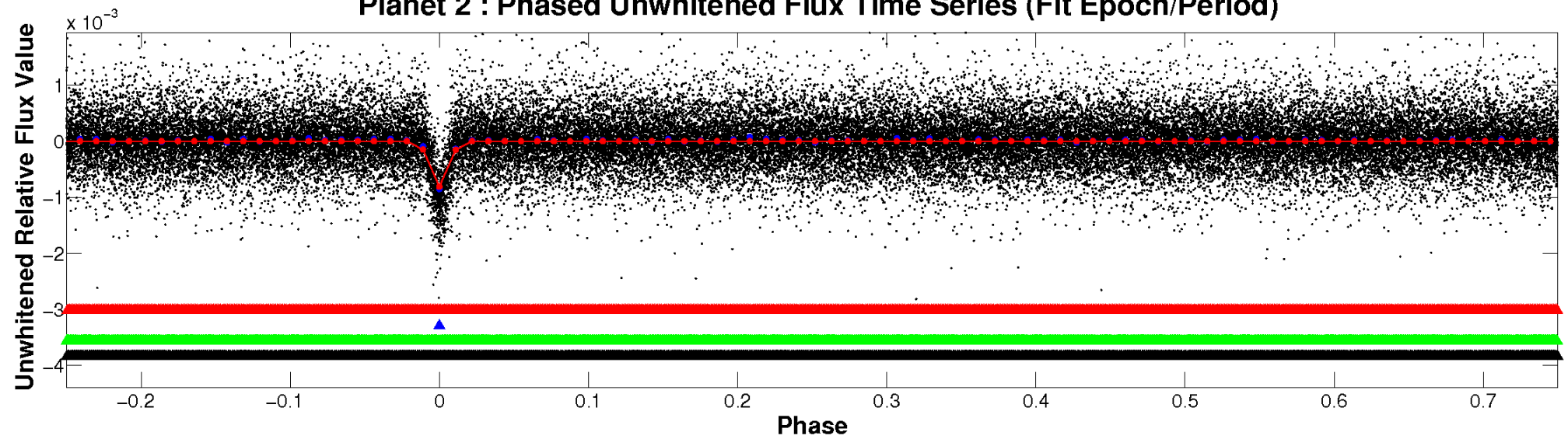
# ALT Odd/Even

TCE 008561063-02

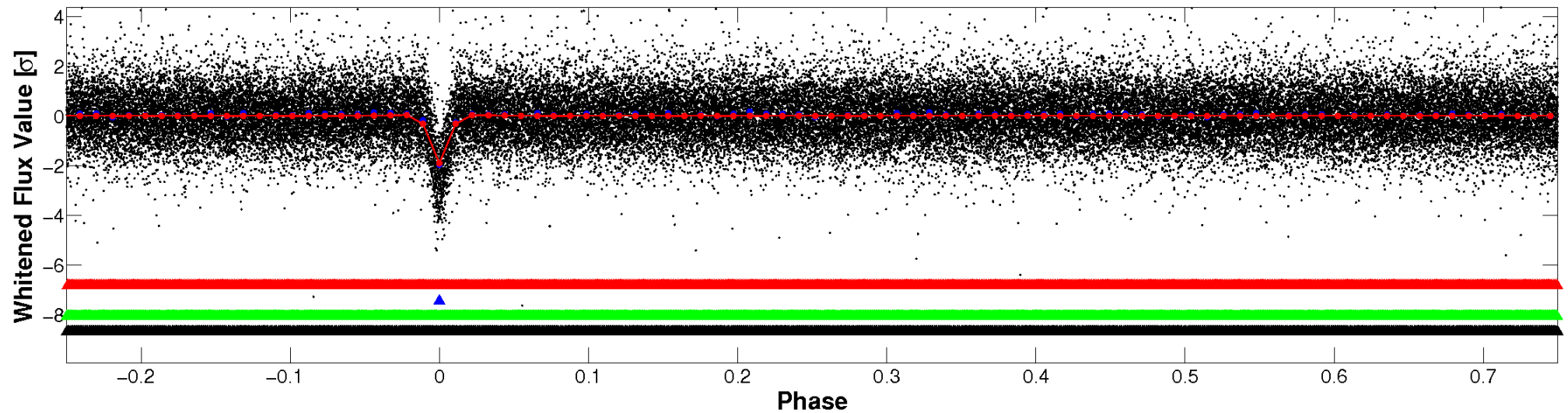


# Non-Whitened Vs. Whitened Light Curve

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



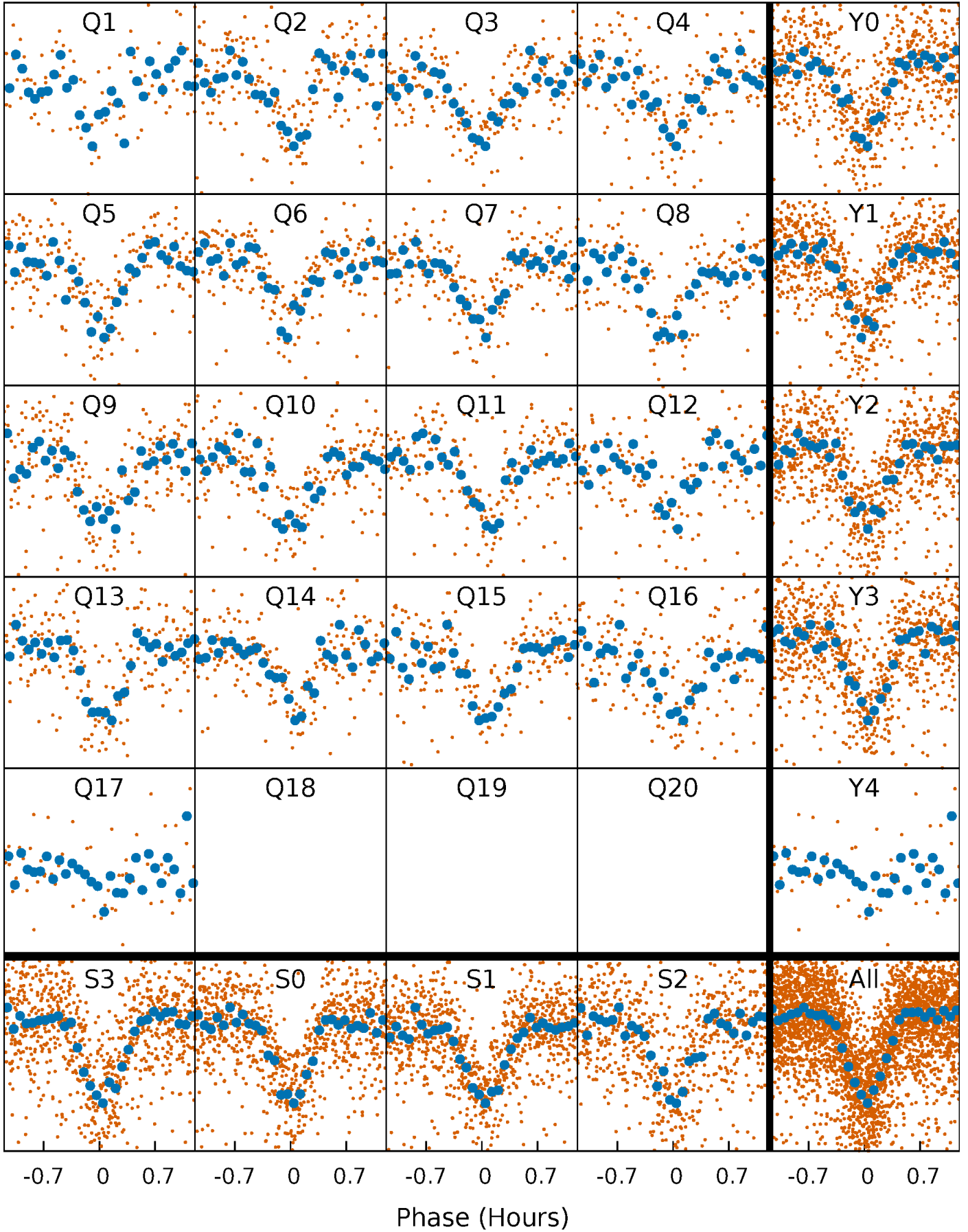
## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)





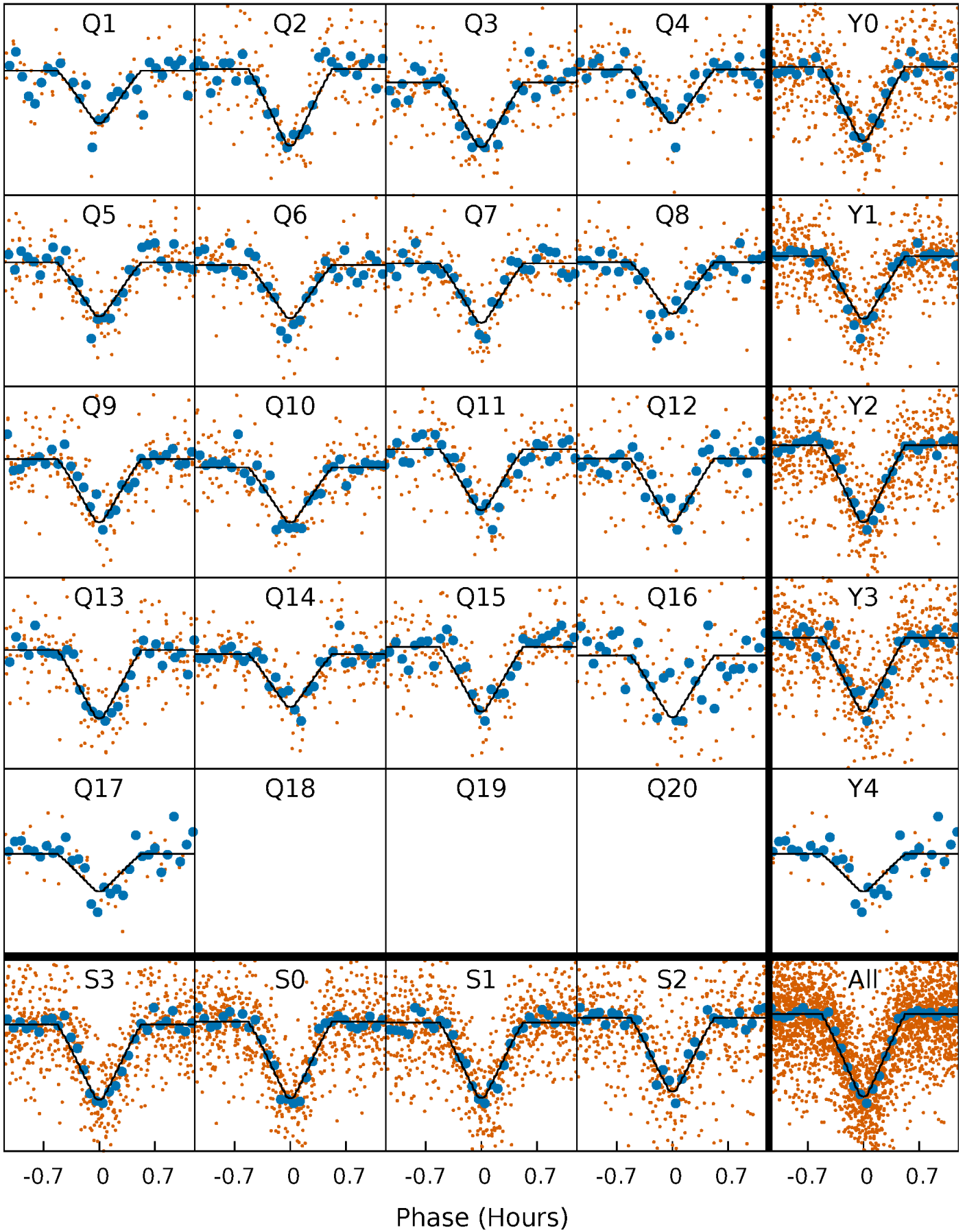
# PDC Quarter-Phased Transit Curves

TCE 008561063-02 P= 1.865108 Days  $T_0=131.928621$  (BKJD)



# DV Quarter-Phased Transit Curves

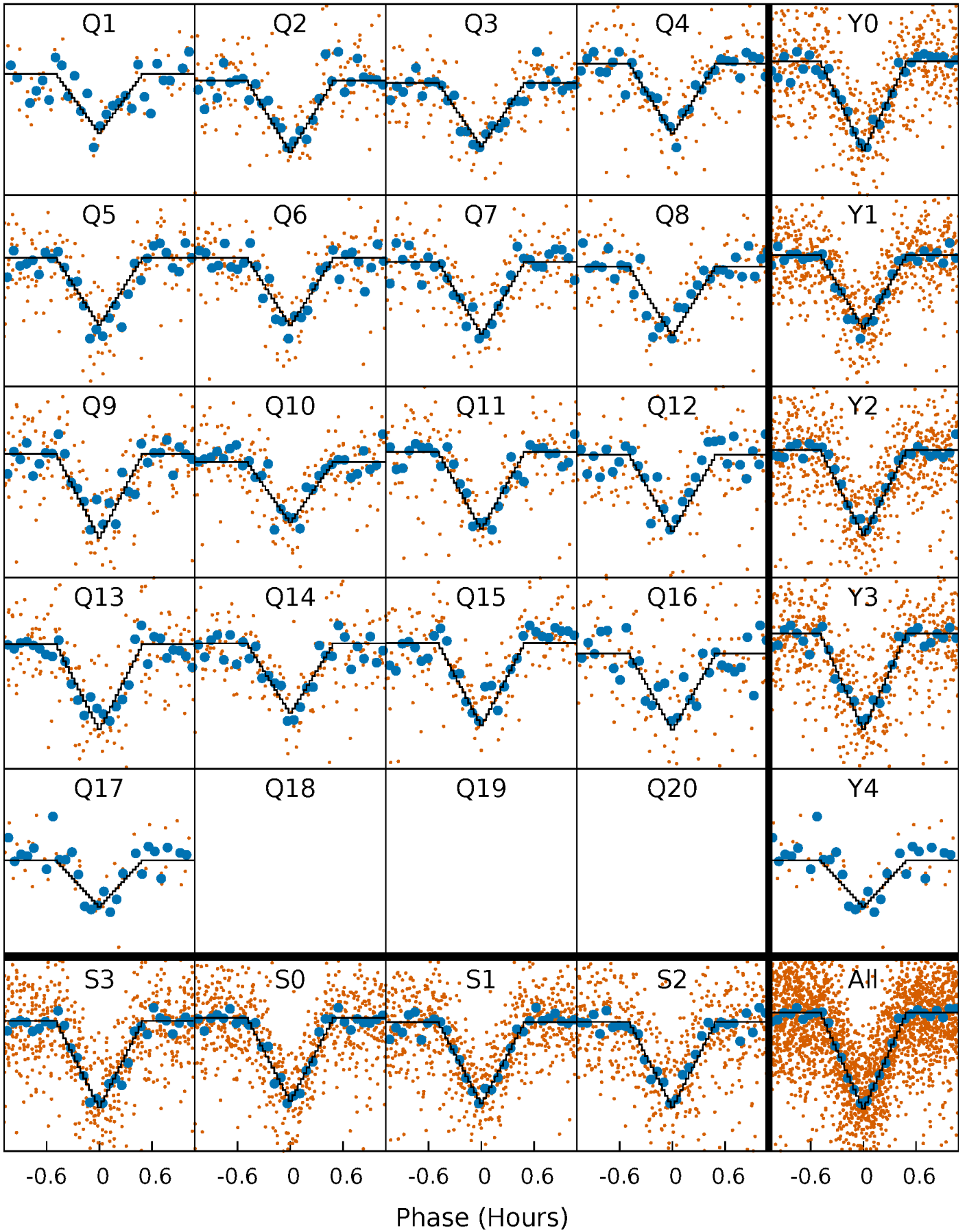
TCE 008561063-02 P= 1.865108 Days  $T_0=131.928621$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

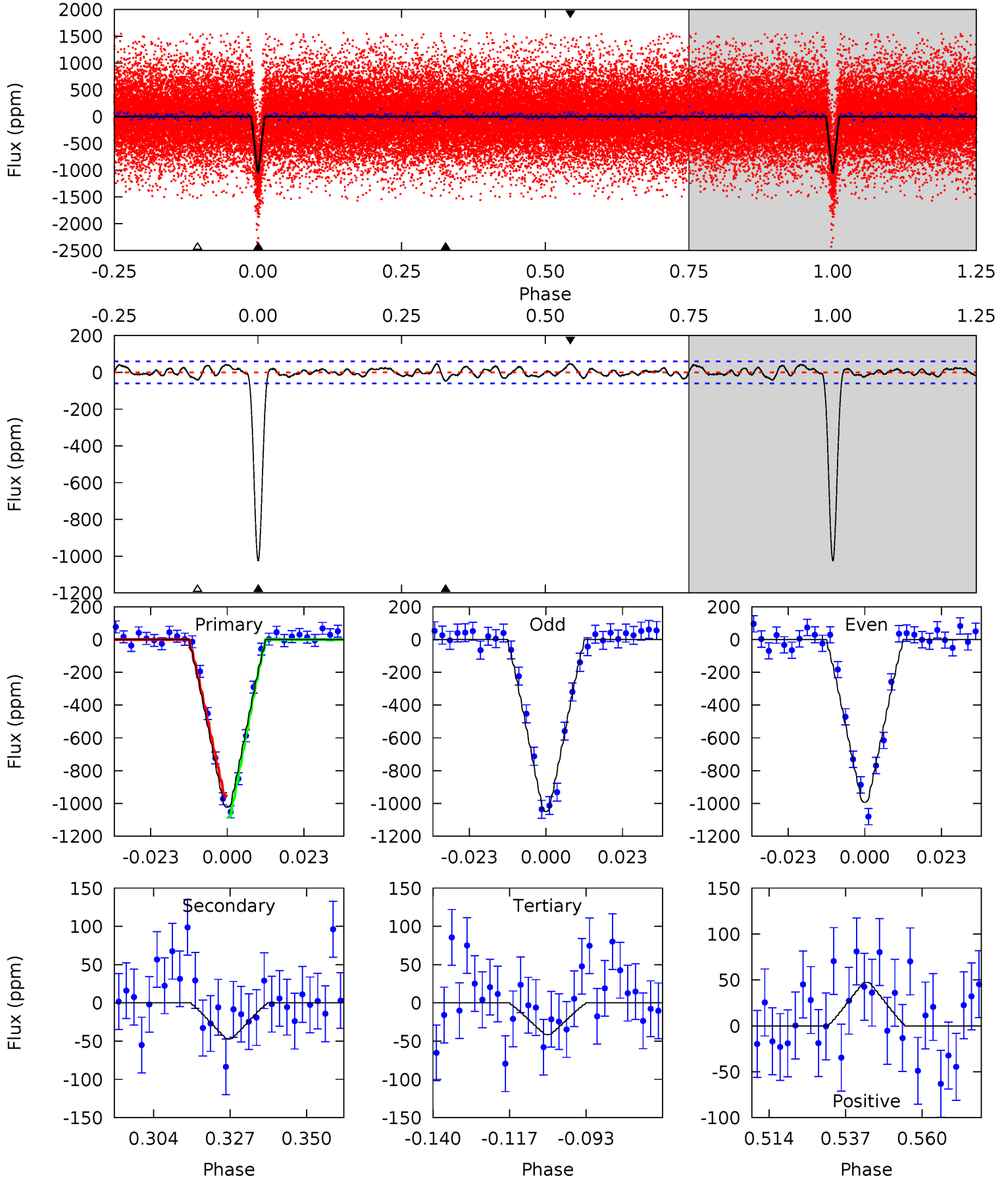
TCE 008561063-02   P= 1.865114 Days    $T_0=131.927105$  (BKJD)



# DV Model-Shift Uniqueness Test

008561063-02, P = 1.865108 Days, E = 130.063513 Days

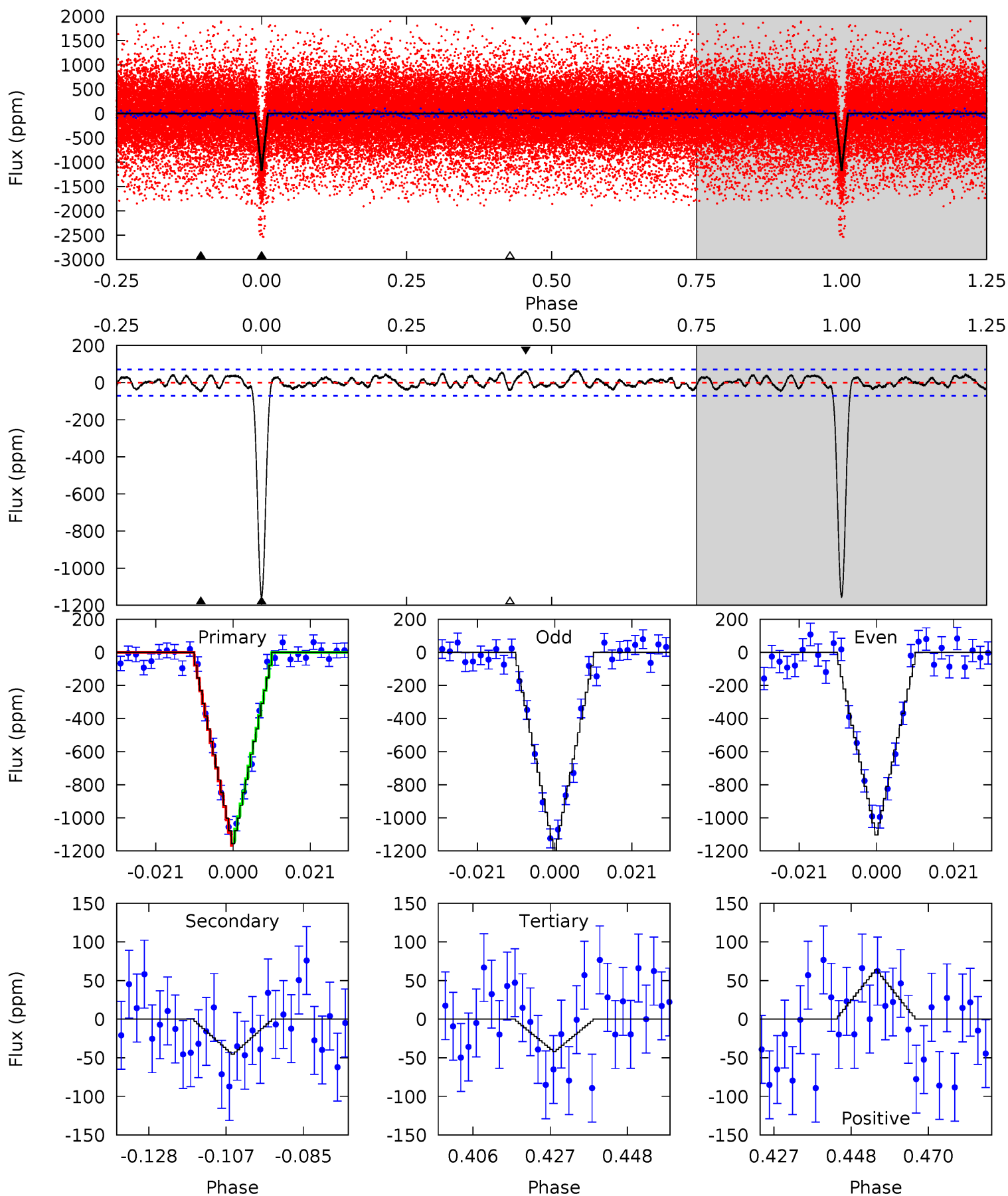
| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 83.5 | 3.83 | 3.37 | 3.86 | 4.86            | 2.27            | 1.45             | 80.1    | 79.6    | 0.45    | -0.03   | 2.29    | 1.01 | 0.04  | 5.25 |



# Alt Model-Shift Uniqueness Test

008561063-02, P = 1.865114 Days, E = 130.061991 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  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 79.1 | 3.11 | 2.88 | 4.37 | 4.88            | 2.30            | 1.54             | 76.2    | 74.7    | 0.23    | -1.26   | 3.58    | 1.01 | 0.05  | 0.77 |



### Stellar Parameters For KIC 008561063

|        | $T_{\text{eff}}(K)$ | $\log(g)$                 | [Fe/H]                     | $R (R_{\odot})$           | $M(M_{\odot})$            | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|---------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
|        | $3292^{+44}_{-24}$  | $5.215^{+0.053}_{-0.098}$ | $-0.420^{+0.150}_{-0.150}$ | $0.148^{+0.039}_{-0.017}$ | $0.132^{+0.039}_{-0.013}$ | $56.740^{+15.410}_{-20.380}$              |
|        | +1%/-1%             | +1%/-2%                   | +36%/-36%                  | +26%/-11%                 | +30%/-10%                 | +27%/-36%                                 |
| Source | SPE70               | PHO41                     | SPE70                      | DSEP                      |                           |   |

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

### Secondary Eclipse Parameters for KIC 008561063-02 / KOI 0961.03

| Detrend | Depth (ppm)  | $R_p (R_{\oplus})$     | $T_{max} (K)$     | $T_{obs} (K)$        | $A_{obs}$       |
|---------|--------------|------------------------|-------------------|----------------------|-----------------|
| DV      | $-47 \pm 12$ | $0.50^{+0.10}_{-0.09}$ | $643^{+27}_{-18}$ | $2248^{+128}_{-106}$ | $24^{+15}_{-9}$ |
| Alt.    | $-45 \pm 15$ | $0.56^{+0.11}_{-0.09}$ | $641^{+28}_{-16}$ | $2166^{+108}_{-108}$ | $18^{+9}_{-7}$  |

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

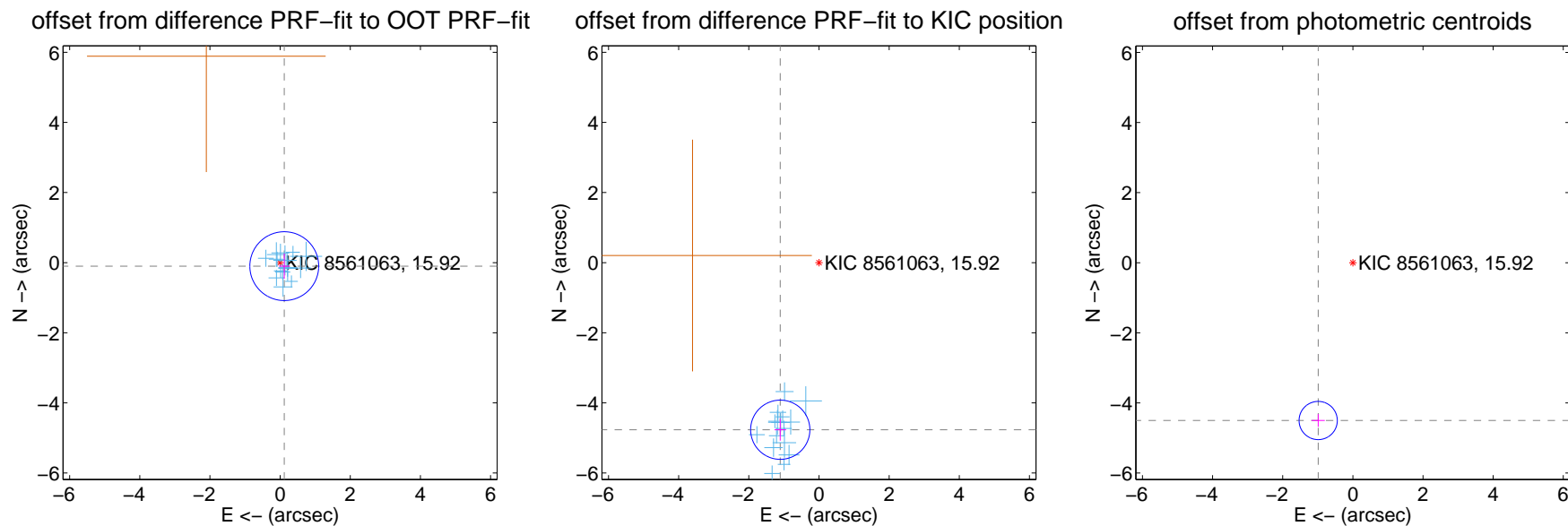
## DV Centroid Data

Supplemental centroid analysis for 008561063-02. Kepler magnitude: 15.92. Transit SNR 49.28

There are 16 quarters with good PRF difference image offsets

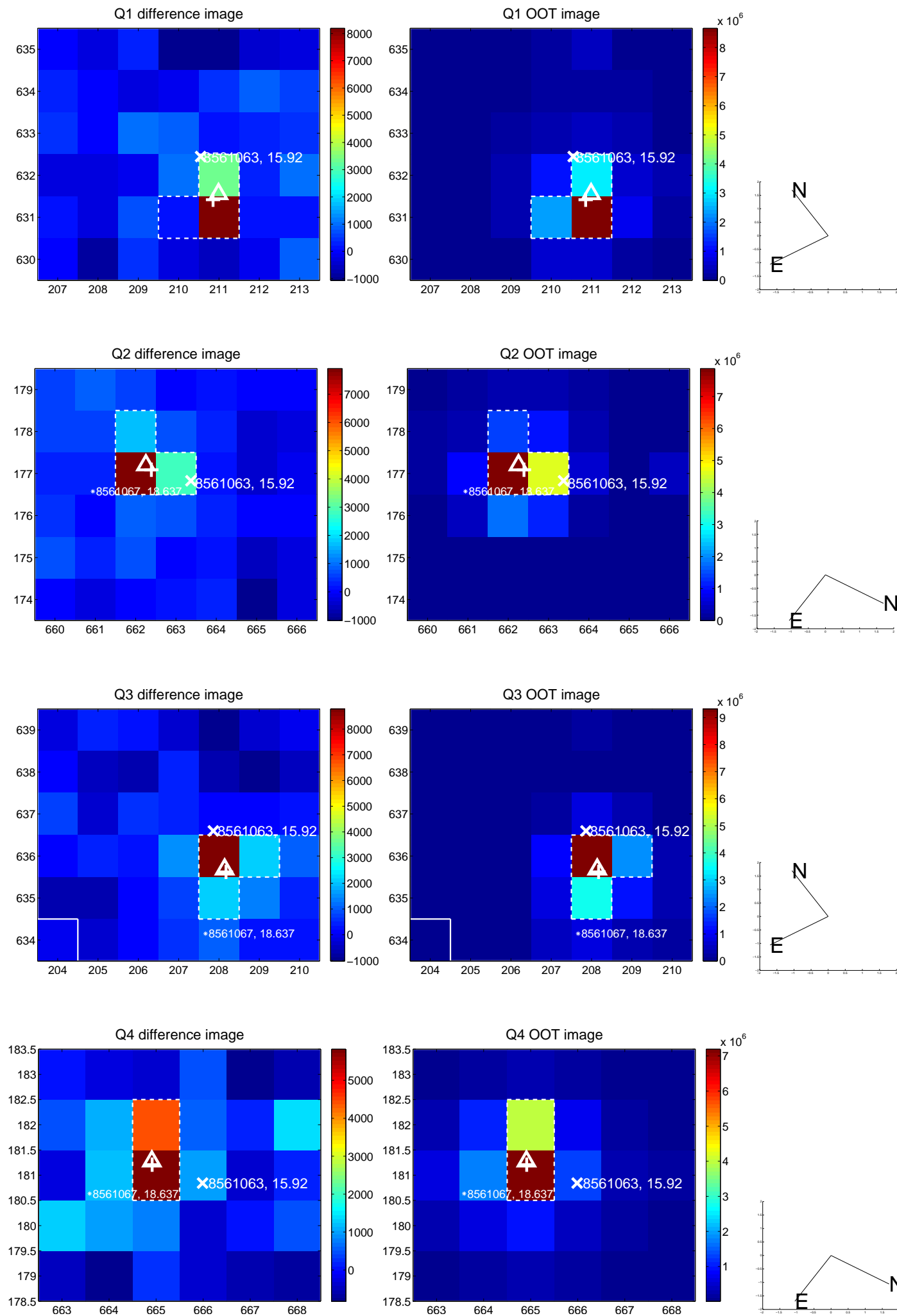
The OOT PRF centroid is offset from the target star catalog position by about 5.88 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA        | $\Delta$ Dec       |
|---|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT          | $0.155 \pm 0.327$  | 0.47                | $-0.118 \pm 0.150$ | $-0.100 \pm 0.358$ |
| PRF-fit source offset from KIC position | $4.892 \pm 0.281$  | 17.38               | $1.104 \pm 0.166$  | $-4.766 \pm 0.312$ |
| photometric centroid source offset      | $4.61 \pm 0.18$    | 25.37               | $0.99 \pm 0.19$    | $-4.50 \pm 0.18$   |

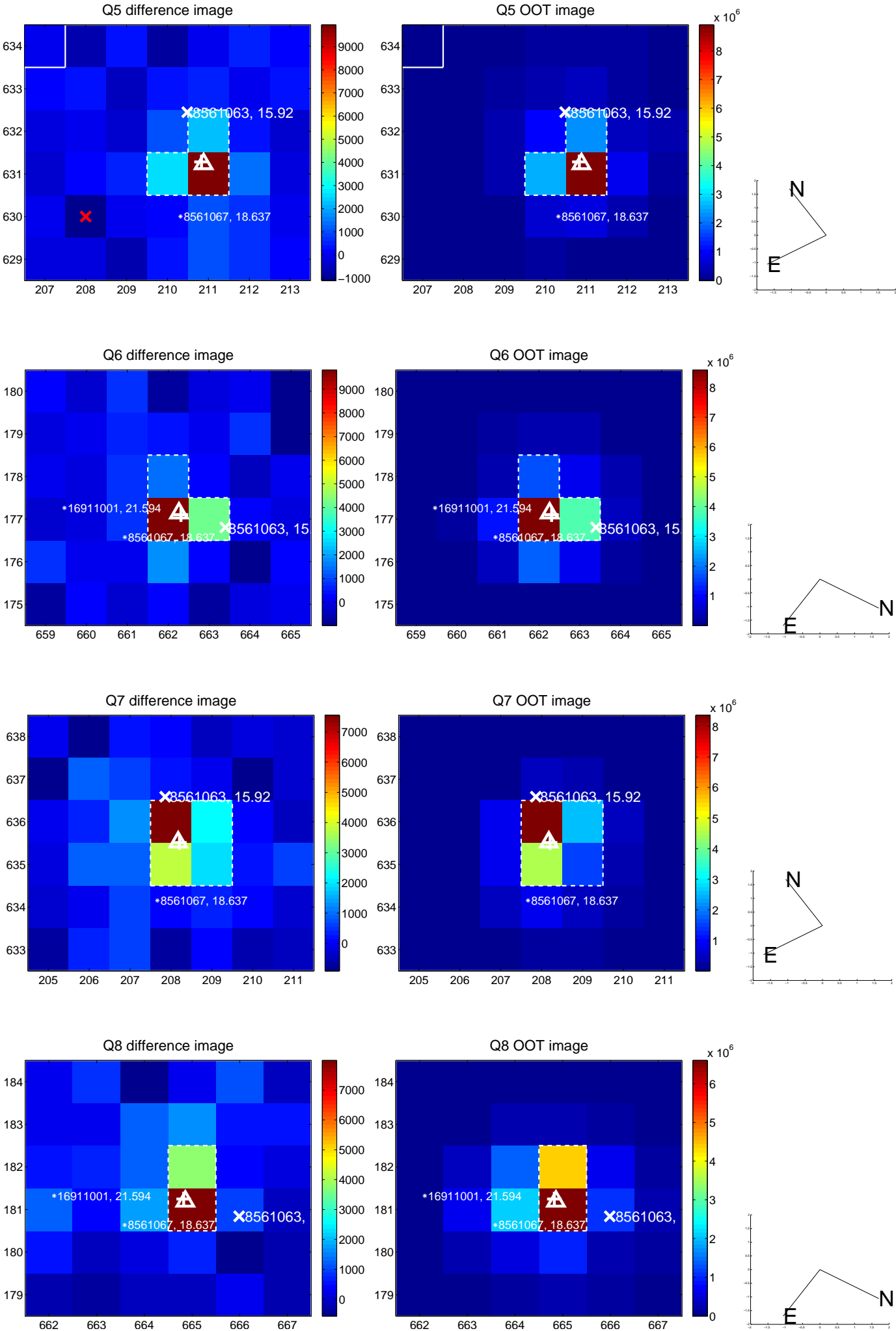


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

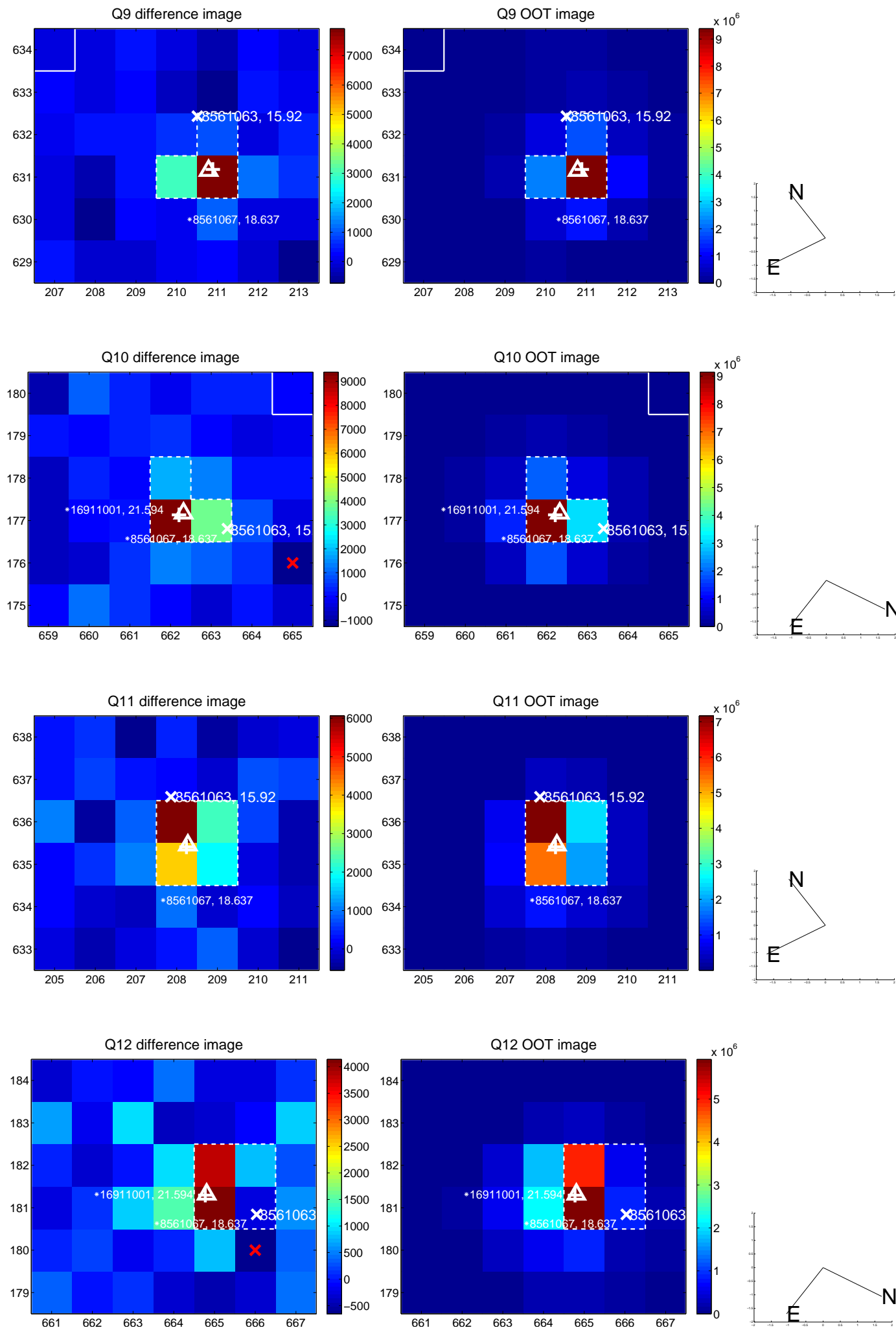


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

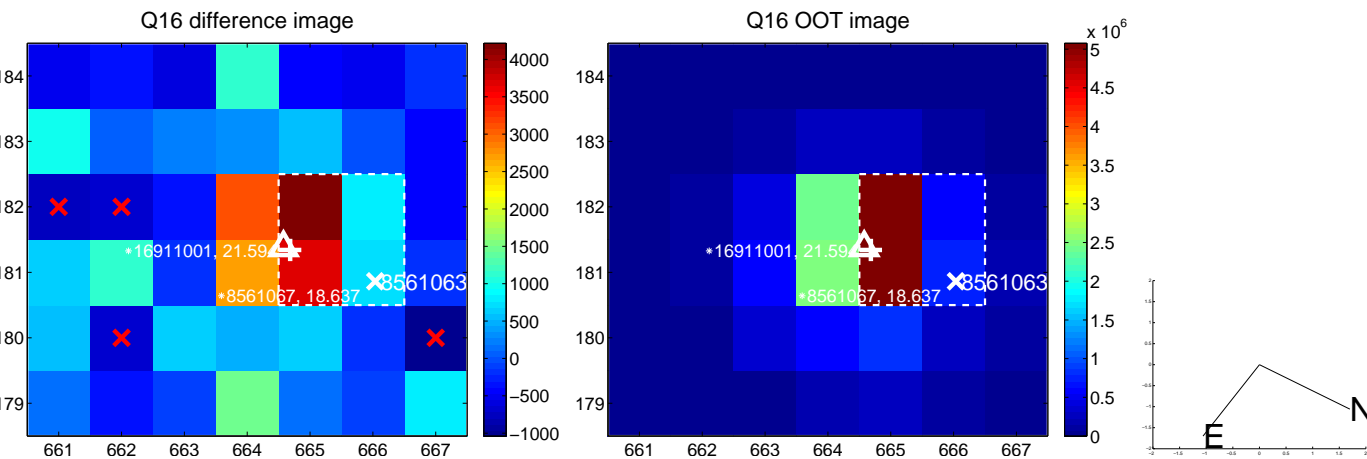
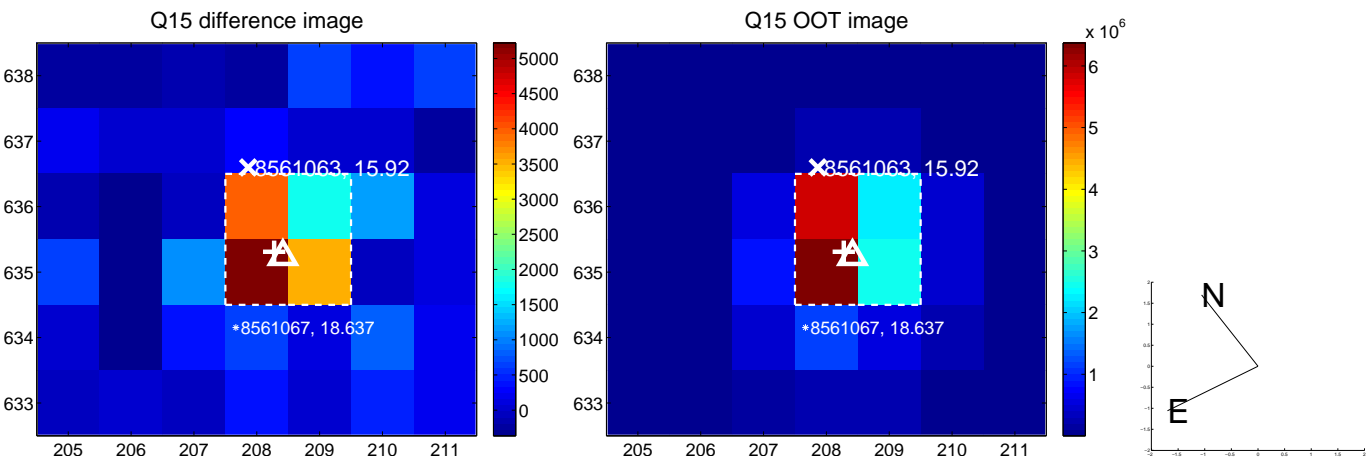
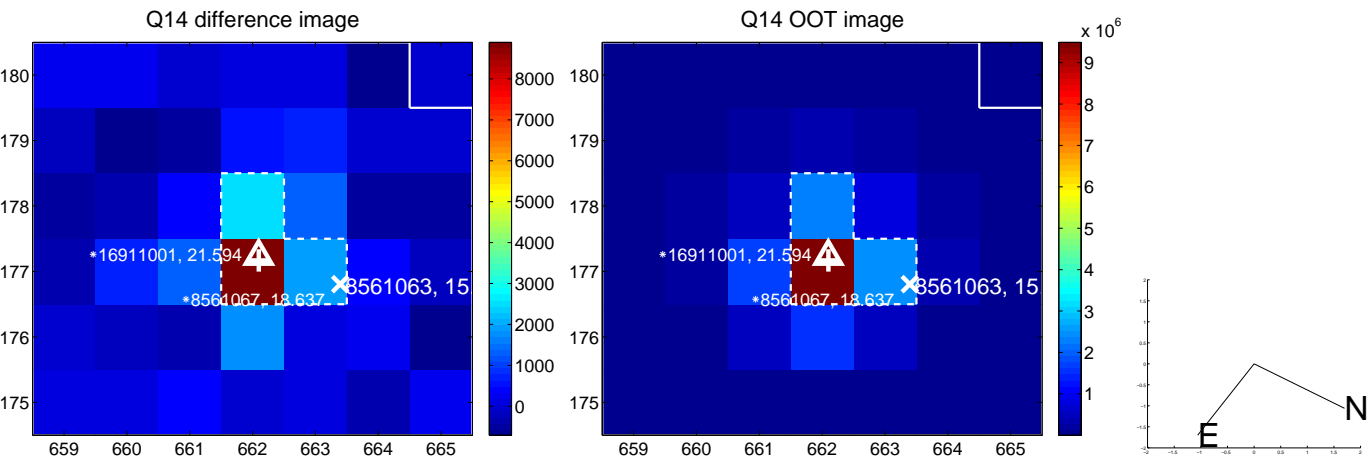
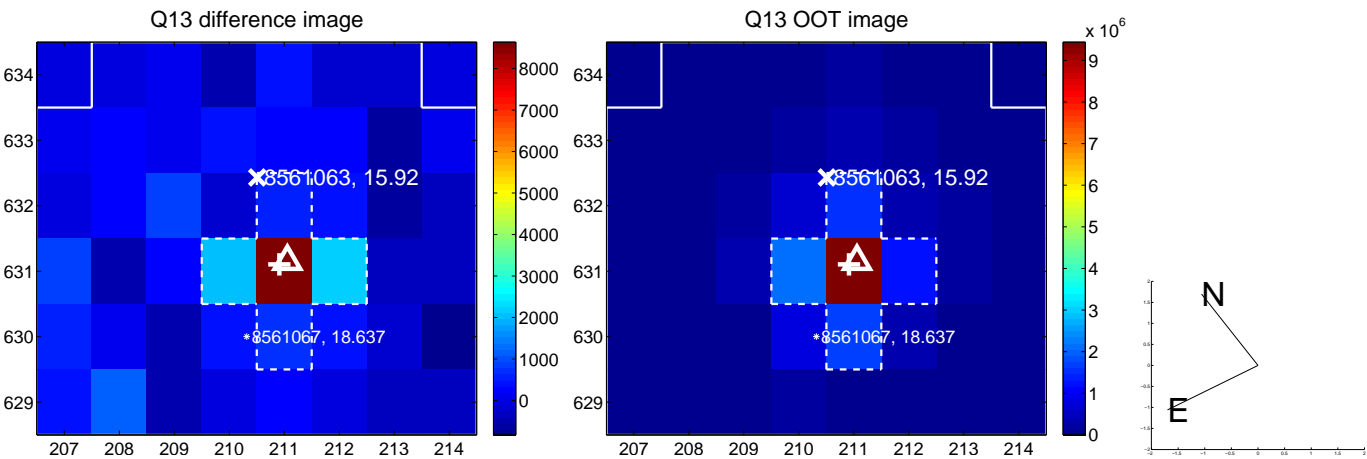




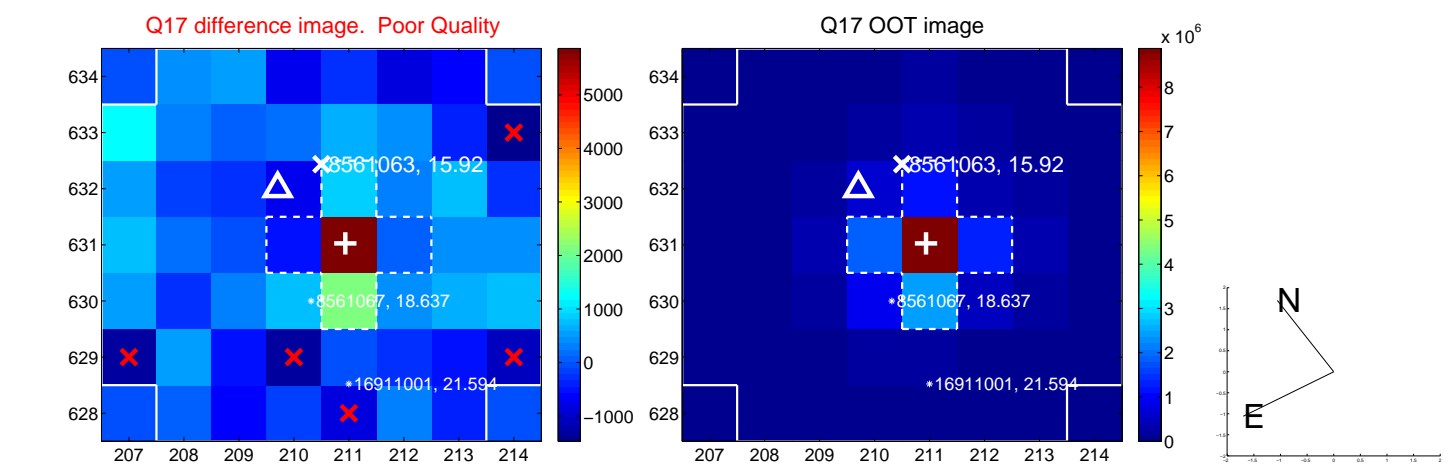
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



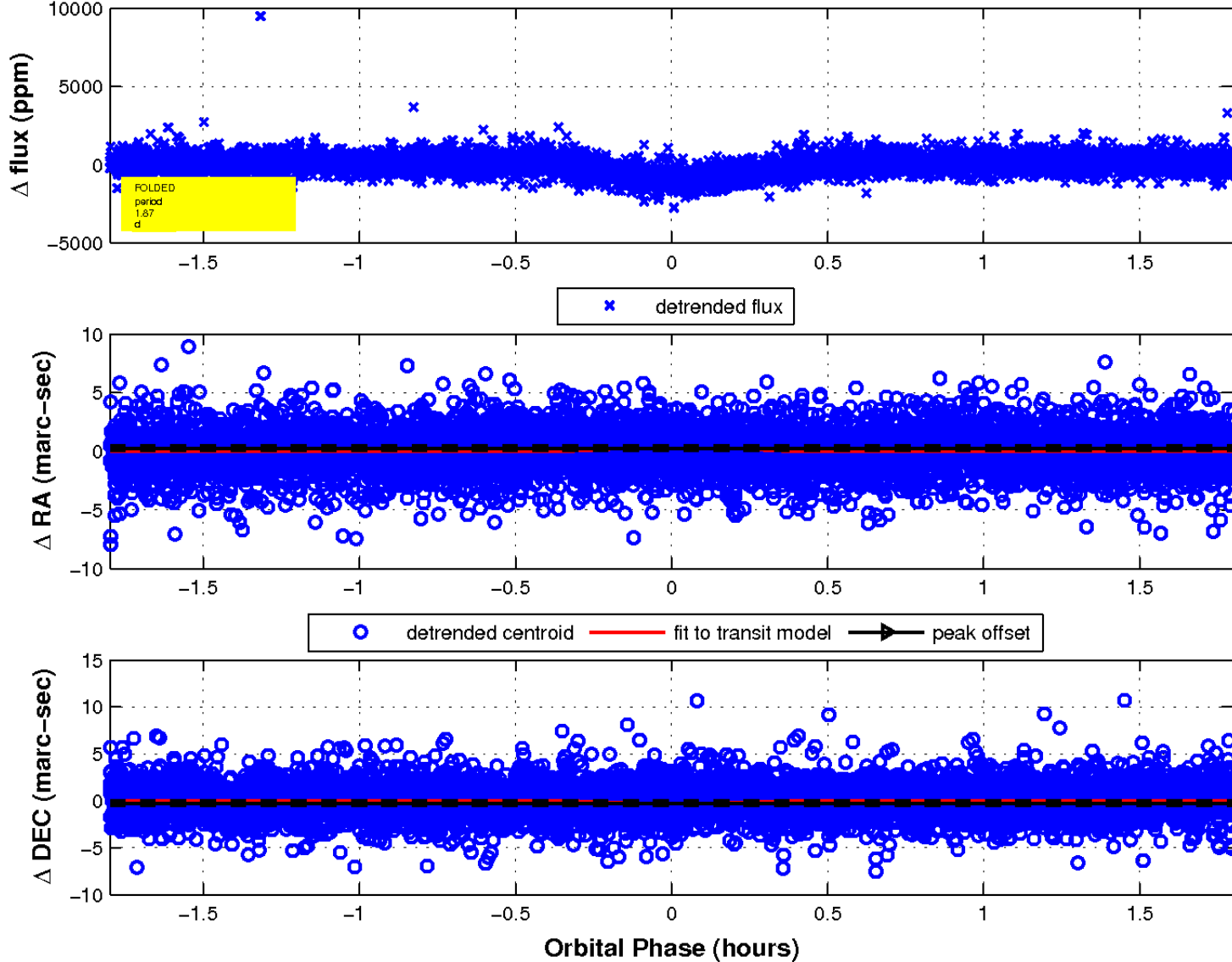
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

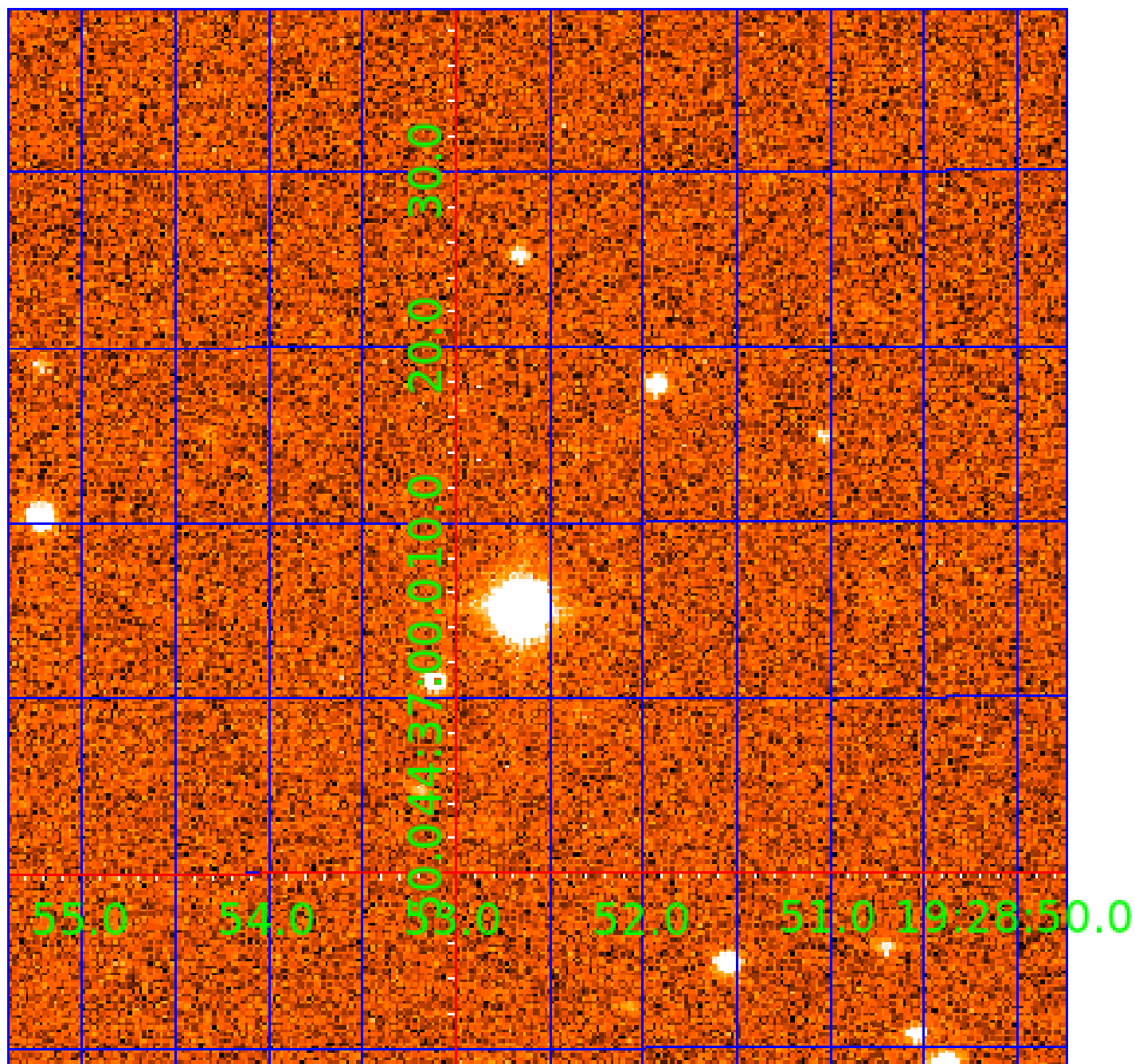


fluxWeightedCentroids, Planet 2 of 4



UKIRT Image

Declination



# KIC 008561063

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 008561063-01 | OBS      | 0961.01 | 1.213765      | 131.645975   | 1416.1      | 0.669            | 70.8 | 89.9 | 0.15                        | 3292            | 0.69                   | 18.00                  |
| 008561063-02 | OBS      | 0961.03 | 1.865108      | 131.928621   | 992.7       | 0.600            | 33.1 | 49.3 | 0.15                        | 3292            | 0.48                   | 10.15                  |
| 008561063-03 | OBS      | 0961.02 | 0.906561      | 132.064027   | 294.4       | 0.667            | 10.5 | 20.8 | 0.15                        | 3292            | 0.26                   | 26.57                  |
| 008561063-04 | OBS      | No      | 0.906577      | 131.610994   | 1483.1      | 1.500            | 10.0 | -1.0 | 0.15                        | 3292            | 0.57                   | 26.57                  |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments  |
|--------------|----------|------|-------|---|---|---|---|---|
| 008561063-01 | OBS      | PC   | 1.00  | 0 | 0 | 0 | 0 | CENT_KIC_POS                                    |
| 008561063-02 | OBS      | PC   | 1.00  | 0 | 0 | 0 | 0 | CENT_KIC_POS                                    |
| 008561063-03 | OBS      | FP   | 0.00  | 0 | 1 | 0 | 0 | MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE—CENT_KIC_POS |
| 008561063-04 | OBS      | FP   | 0.00  | 1 | 1 | 0 | 0 | IS_SEC_TCE—CENT_NOFITS                          |

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

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

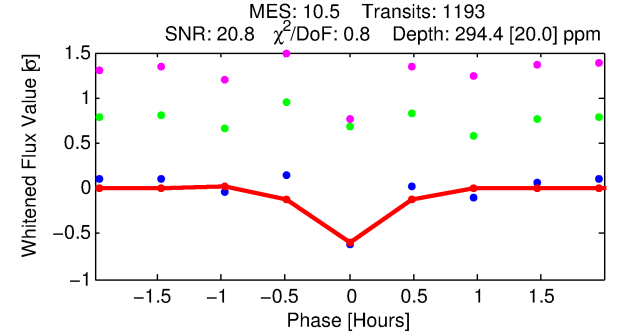
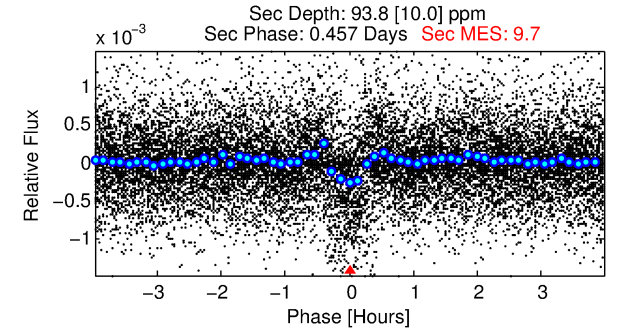
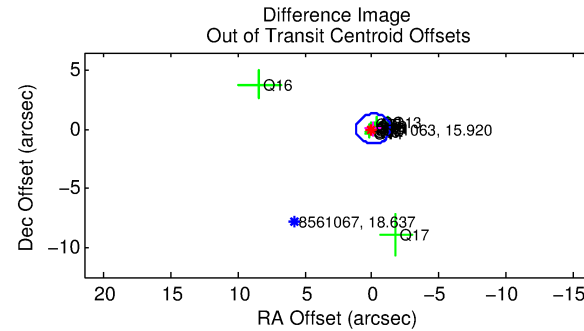
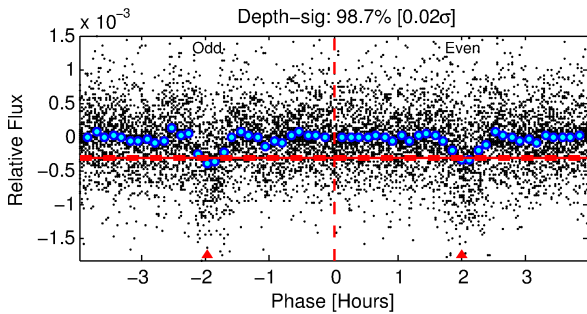
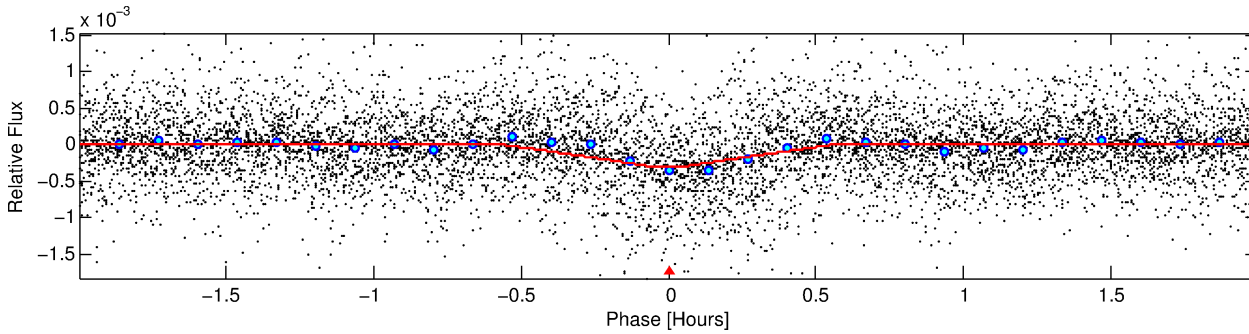
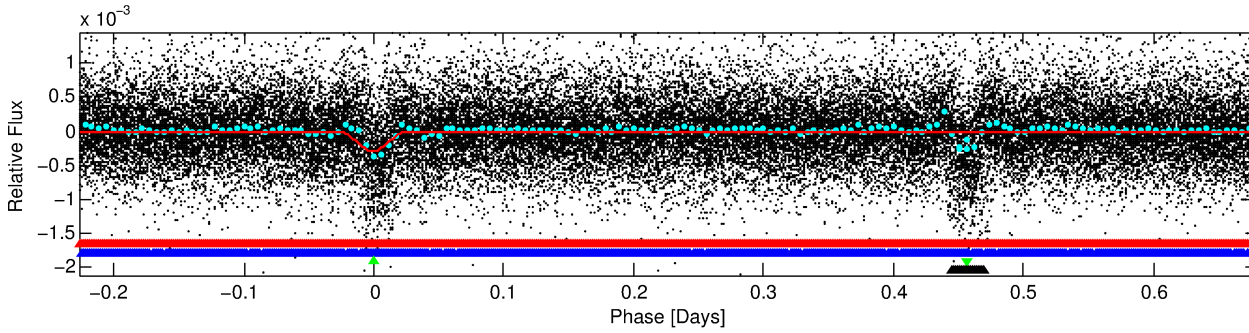
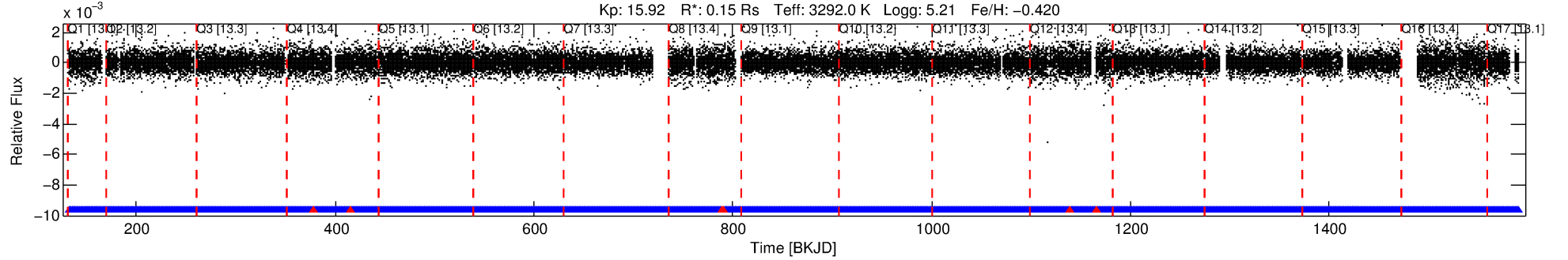
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 008561063-03

No Significant Match Found

# DV One-Page Summary

KIC: 8561063 Candidate: 3 of 4 Period: 0.907 d  
KOI: K00961 Name: Kepler-42 Corr: No Ephemeris Match



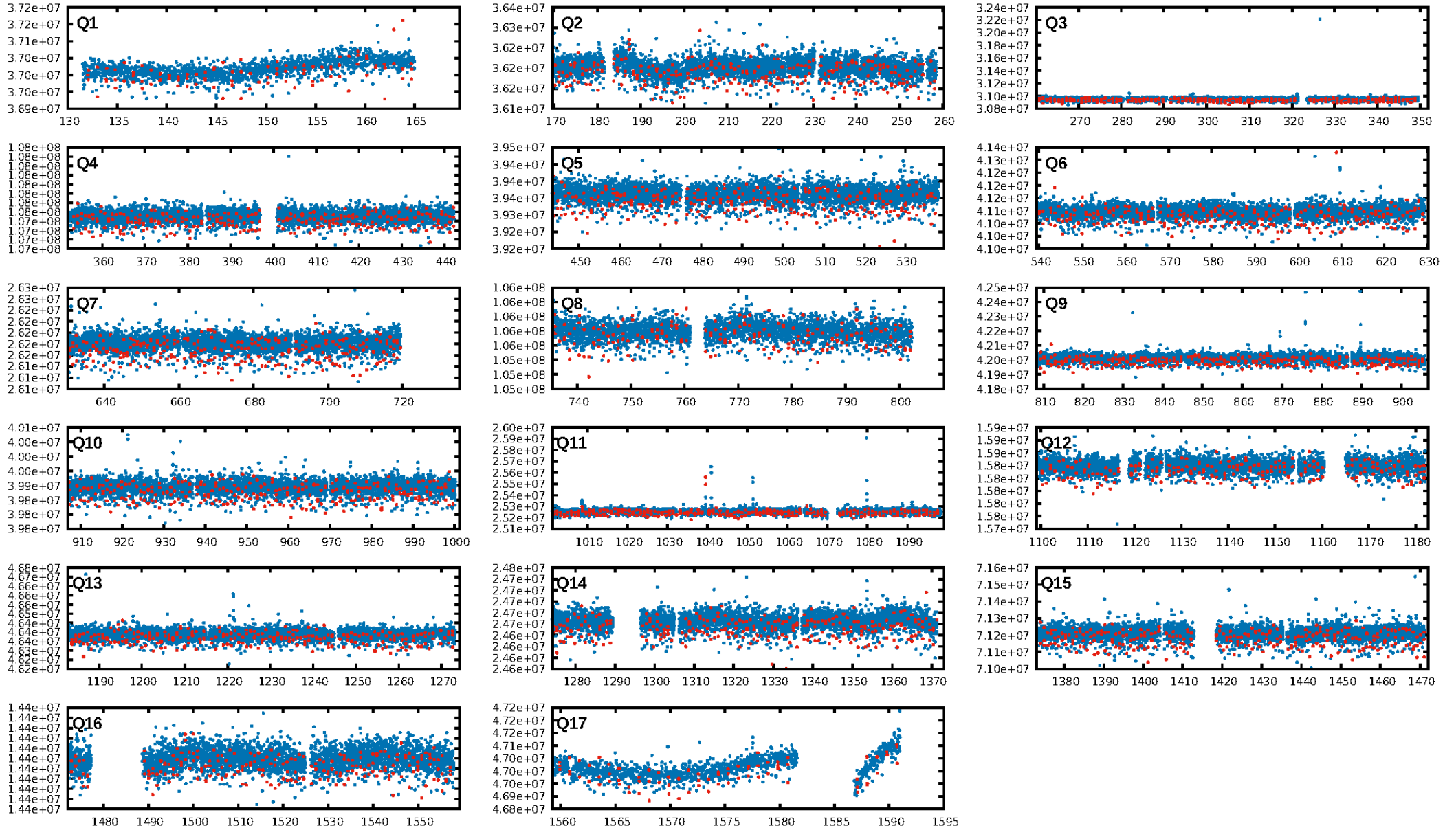
## DV Fit Results:

Period = 0.90656 [0.00000] d  
Epoch = 132.0640 [0.0006] BKJD  
Rp/R\* = 0.0162 [0.0086]  
a/R\* = 10.08 [26.08]  
b = 0.31 [7.66]  
Seff = 26.57 [6.31]  
Teq = 579 [34] K  
Rp = 0.26 [0.16] Re  
a = 0.0093 [0.0018] AU  
Ag = 65.66 [71.91] [0.90σ]  
Teffp = 2548 [683] K [2.88σ]

## DV Diagnostic Results:

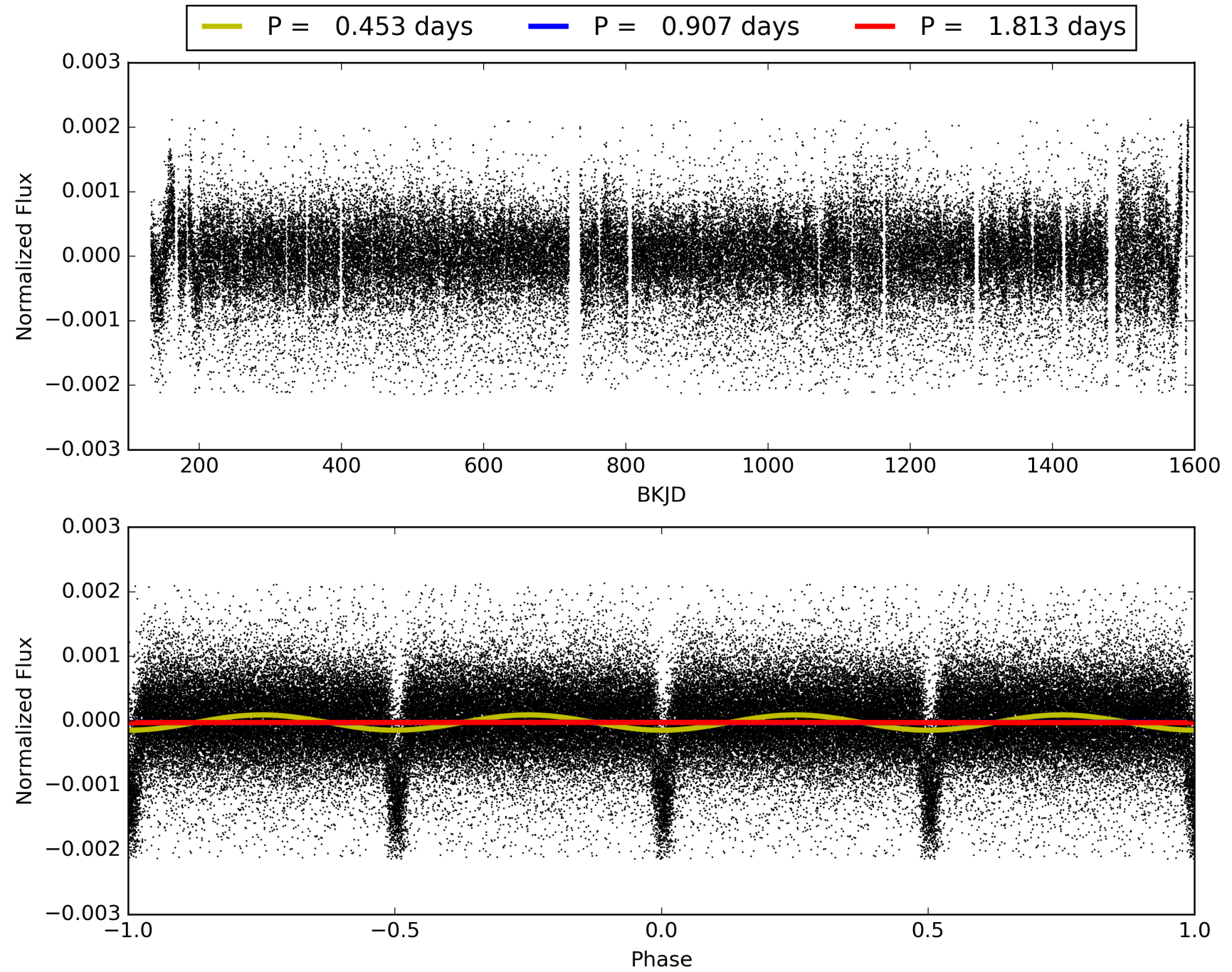
ShortPeriod-sig: N/A  
LongPeriod-sig: 0.0% [0.00σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 1.11e-29  
RollingBand-fgt: 0.99 [1133/1139]  
GhostDiagnostic-chr: 0.6507  
Centroid-sig: 0.0%  
Centroid-so: 3.846 arcsec [9.07σ]  
OotOffset-rm: 0.090 arcsec [0.21σ]  
KicOffset-rm: 4.723 arcsec [8.28σ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 0.88 [15/17]  
DiffImageOverlap-fno: 1.00 [17/17]

# TCE 008561063-03, PDC Light Curves



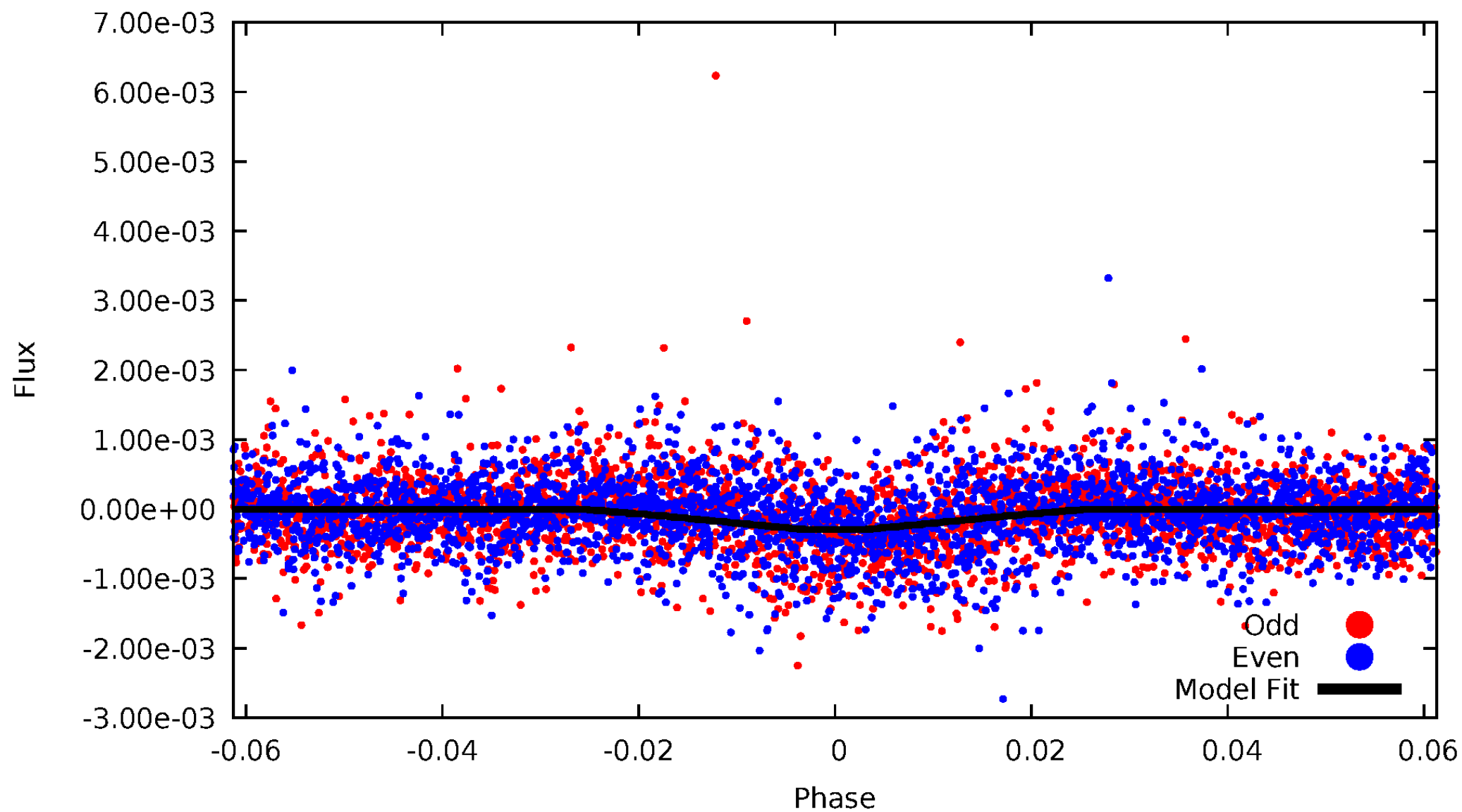


# TCE 008561063-03



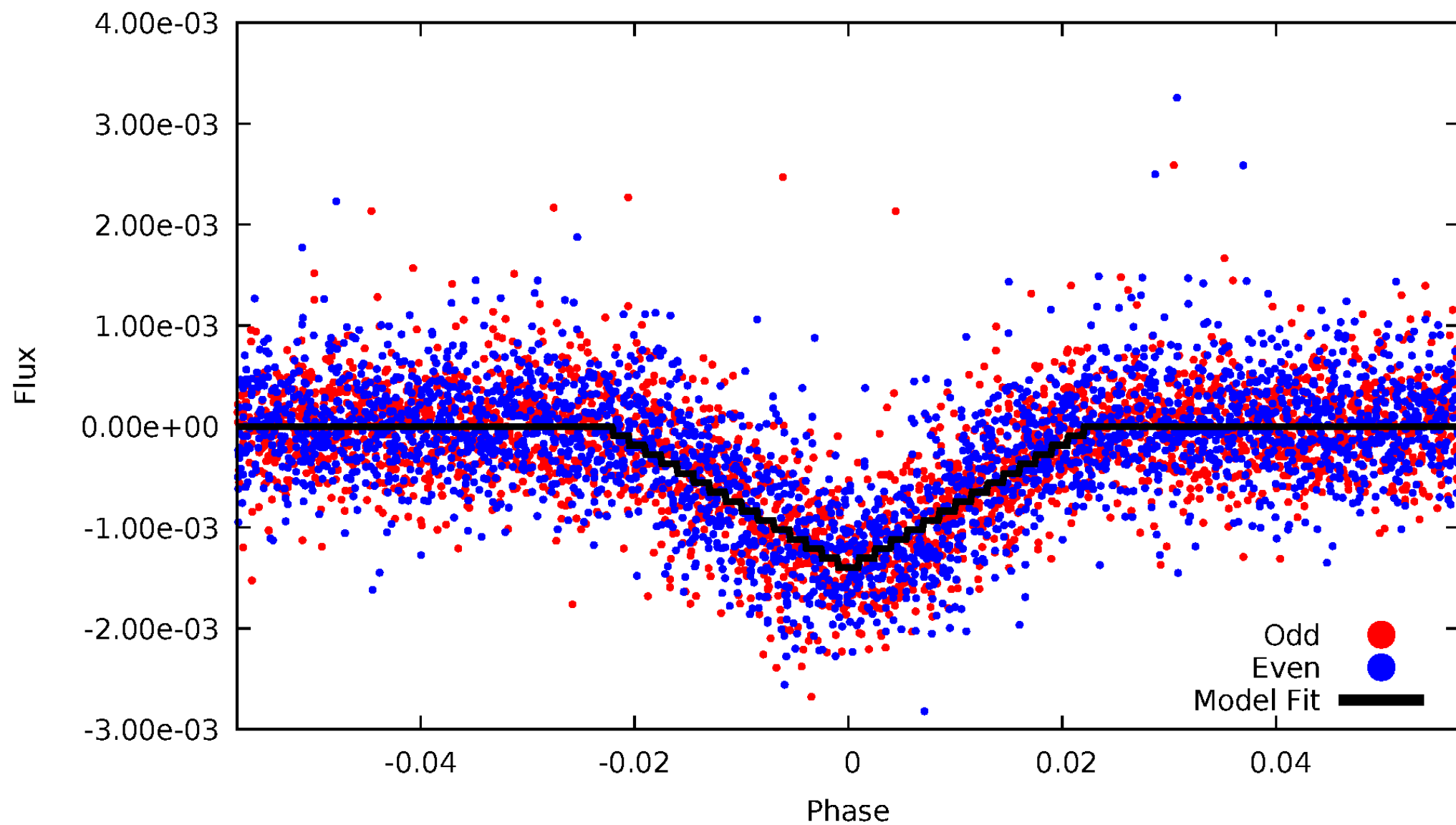
# DV Odd/Even

TCE 008561063-03



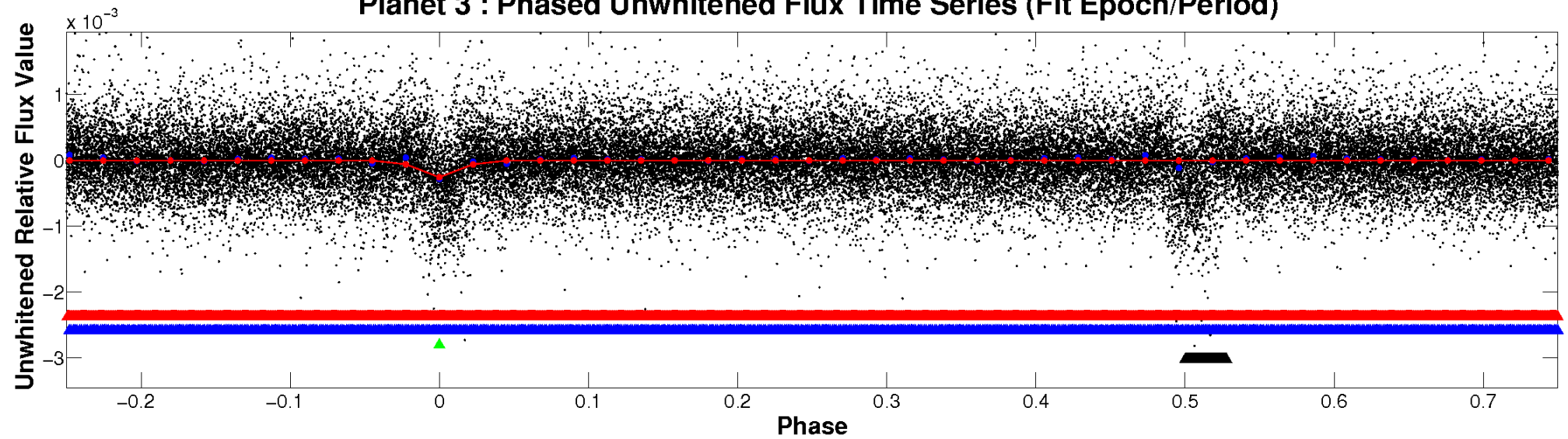
# ALT Odd/Even

TCE 008561063-03

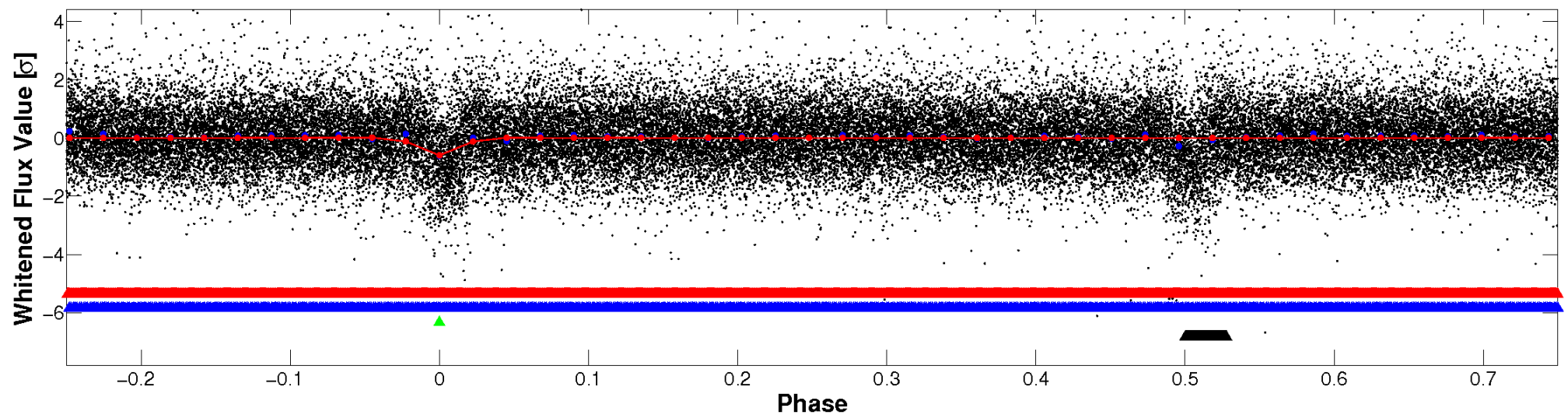


# Non-Whitened Vs. Whitened Light Curve

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



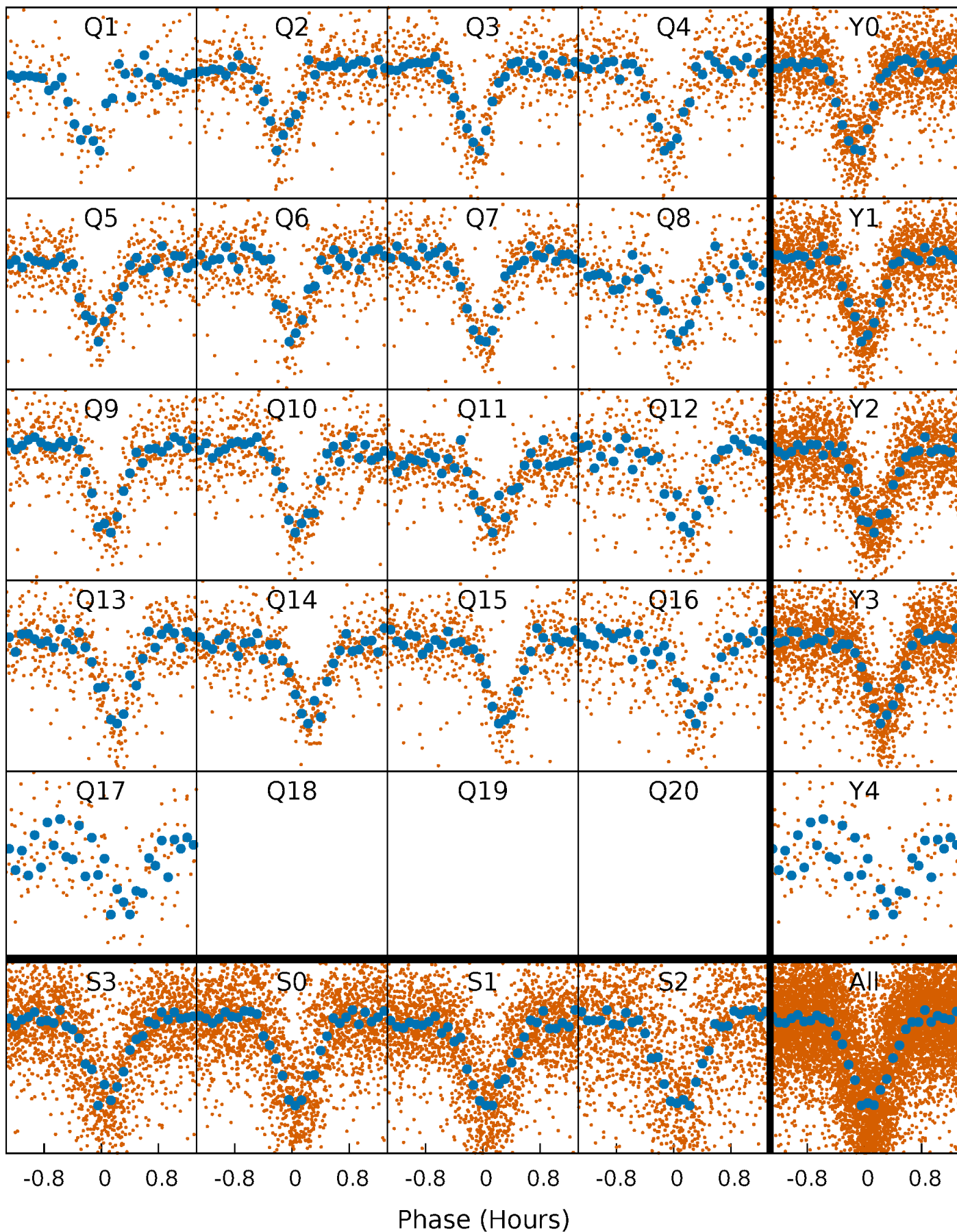
## Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)





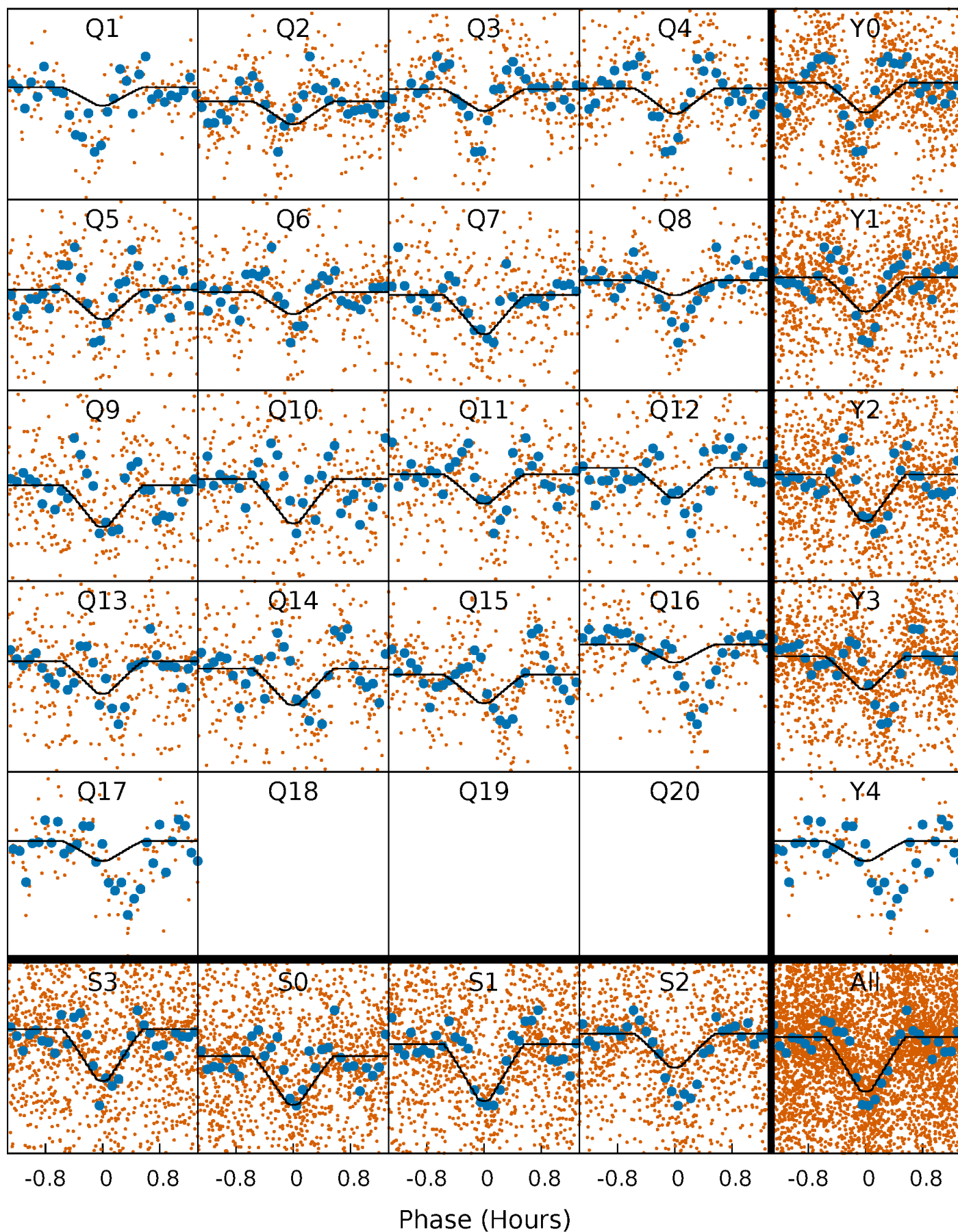
# PDC Quarter-Phased Transit Curves

TCE 008561063-03 P= 0.906561 Days  $T_0=132.064027$  (BKJD)



# DV Quarter-Phased Transit Curves

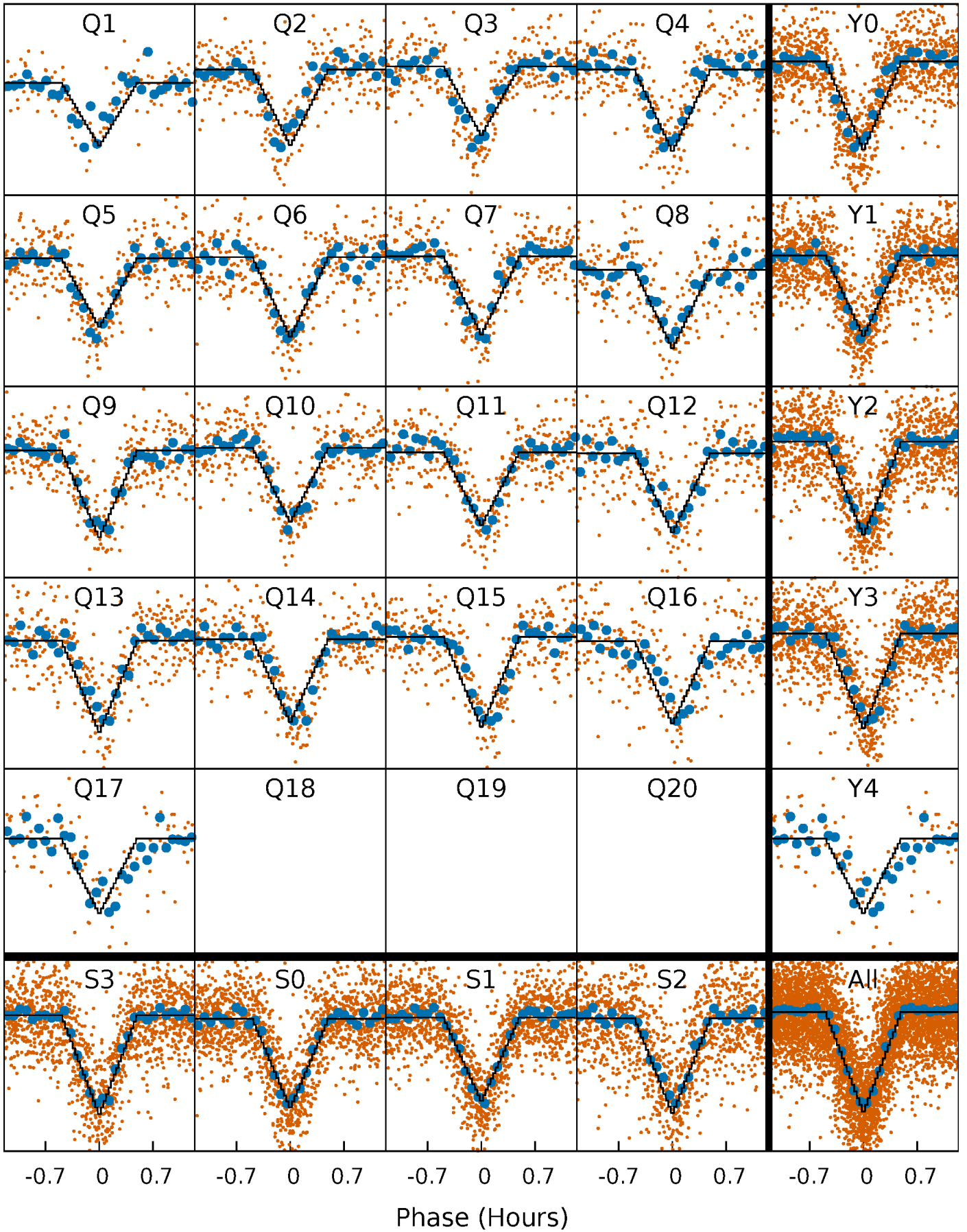
TCE 008561063-03 P= 0.906561 Days  $T_0=132.064027$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

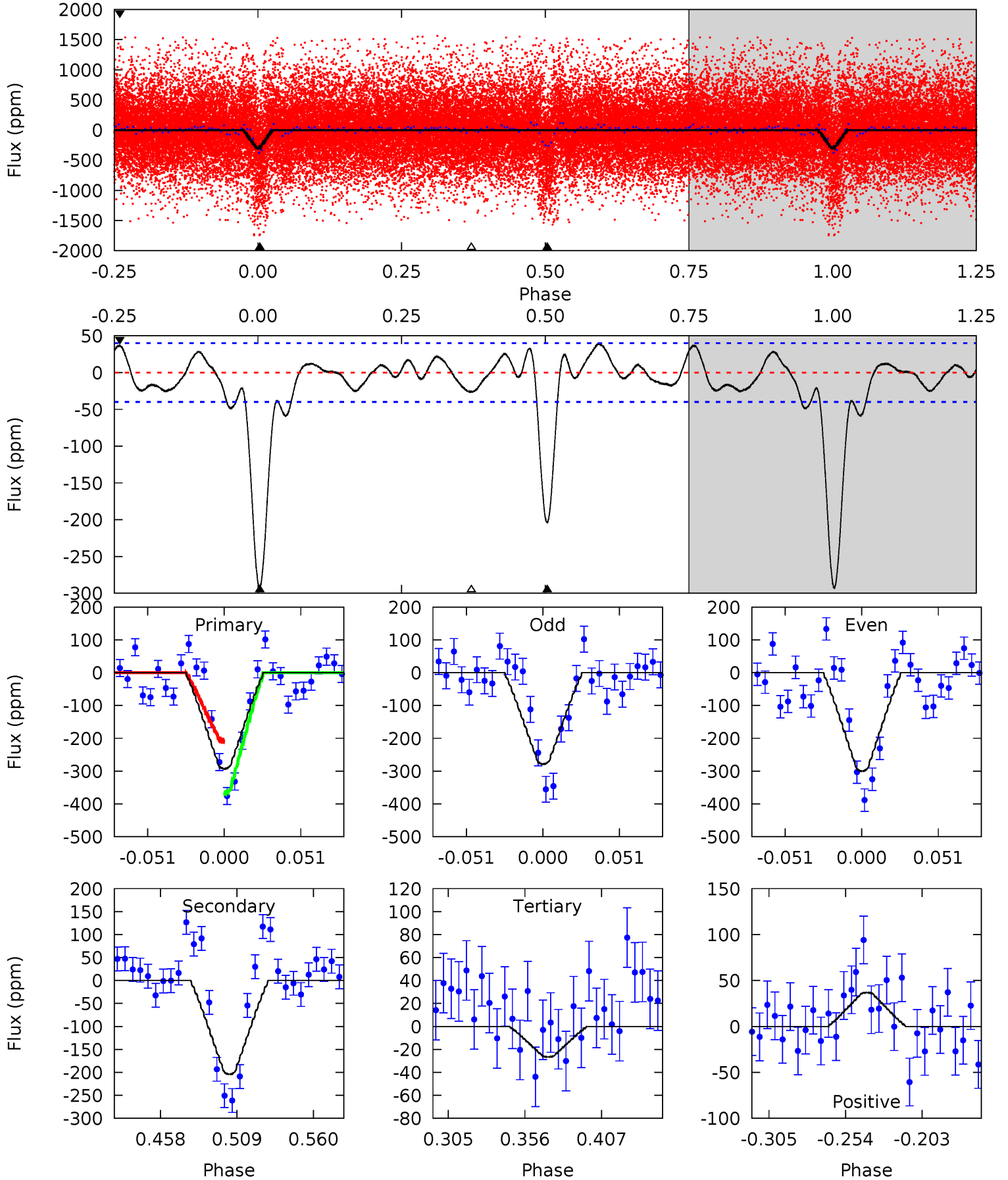
TCE 008561063-03   P= 0.906569 Days    $T_0=132.061154$  (BKJD)



# DV Model-Shift Uniqueness Test

008561063-03, P = 0.906561 Days, E = 131.157466 Days

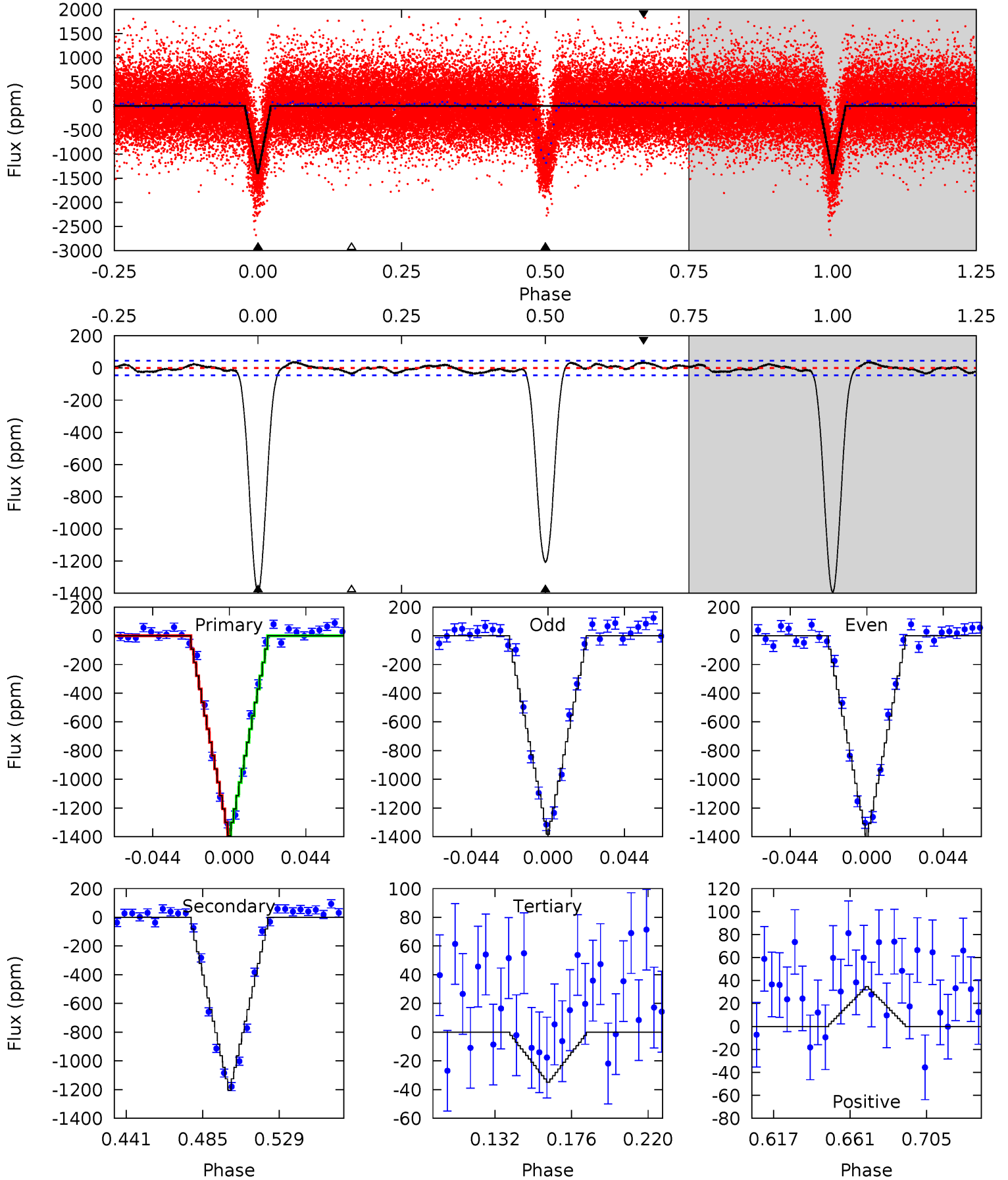
| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 34.5 | 24.0 | 3.12 | 4.33 | 4.70            | 1.95            | 2.02             | 31.4    | 30.2    | 20.9    | 19.7    | 1.28    | 0.98 | 0.12  | 9.42 |



# Alt Model-Shift Uniqueness Test

008561063-03, P = 0.906569 Days, E = 131.154585 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  |
|-------|-------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 144.9 | 125.4 | 3.64 | 3.60 | 4.73            | 2.01            | 1.75             | 141.2   | 141.3   | 121.7   | 121.8   | 0.93    | 1.00 | 0.03  | 0.14 |



### Stellar Parameters For KIC 008561063

|        | $T_{\text{eff}}(K)$ | $\log(g)$                 | [Fe/H]                     | $R (R_{\odot})$           | $M(M_{\odot})$            | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|---------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
|        | $3292^{+44}_{-24}$  | $5.215^{+0.053}_{-0.098}$ | $-0.420^{+0.150}_{-0.150}$ | $0.148^{+0.039}_{-0.017}$ | $0.132^{+0.039}_{-0.013}$ | $56.740^{+15.410}_{-20.380}$              |
|        | +1%/-1%             | +1%/-2%                   | +36%/-36%                  | +26%/-11%                 | +30%/-10%                 | +27%/-36%                                 |
| Source | SPE70               | PHO41                     | SPE70                      | DSEP                      |                           |   |

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

### Secondary Eclipse Parameters for KIC 008561063-03 / KOI 0961.02

| Detrend | Depth (ppm)    | $R_p (R_{\oplus})$     | $T_{\text{max}} (K)$ | $T_{\text{obs}} (K)$ | $A_{\text{obs}}$   |
|---------|----------------|------------------------|----------------------|----------------------|--------------------|
| DV      | $-204 \pm 8$   | $0.27^{+0.15}_{-0.13}$ | $818^{+35}_{-25}$    | $3208^{+769}_{-364}$ | $140^{+434}_{-80}$ |
| Alt.    | $-1205 \pm 10$ | $0.62^{+0.16}_{-0.14}$ | $820^{+33}_{-25}$    | $3235^{+267}_{-184}$ | $153^{+102}_{-54}$ |

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

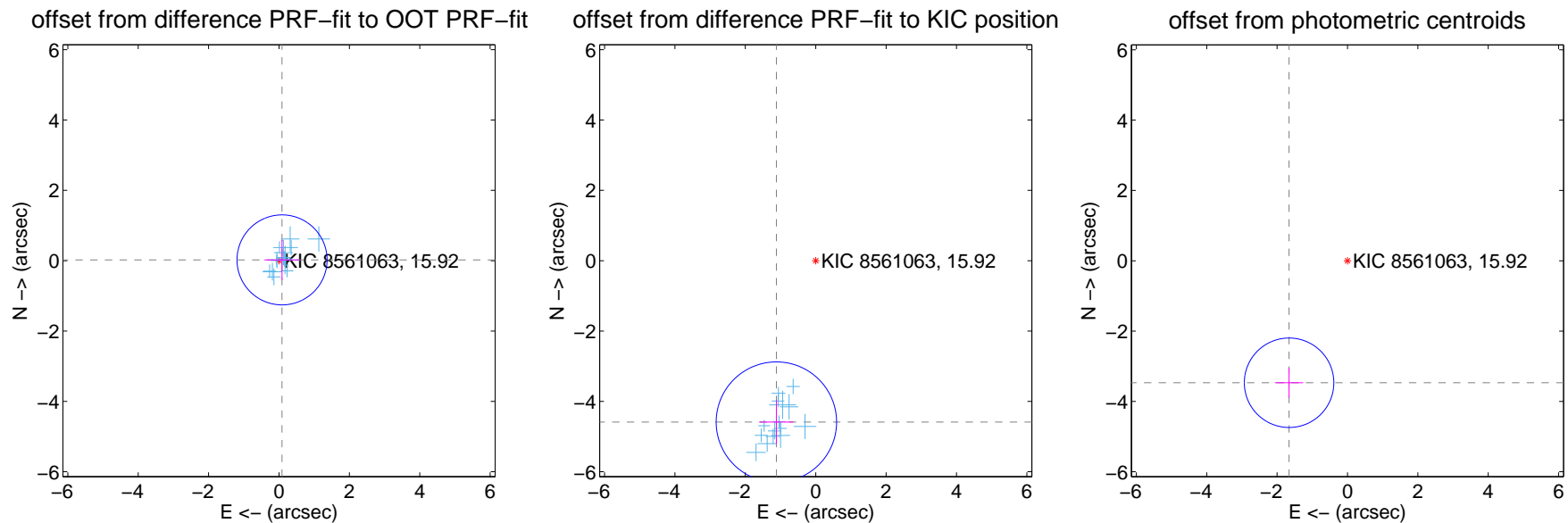
## DV Centroid Data

Supplemental centroid analysis for 008561063-03. Kepler magnitude: 15.92. Transit SNR 20.80

There are 15 quarters with good PRF difference image offsets

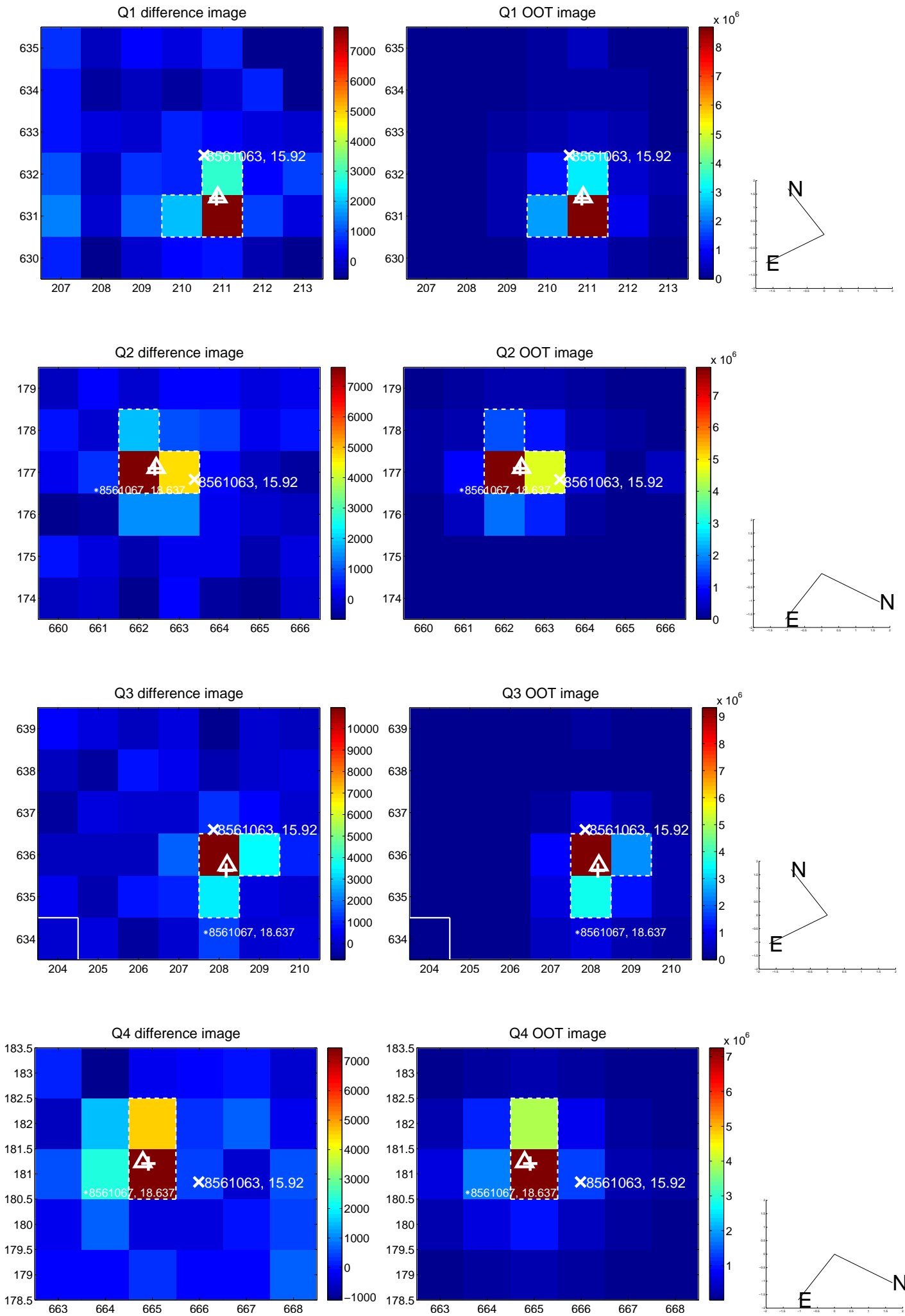
The OOT PRF centroid is offset from the target star catalog position by about 5.88 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA        | $\Delta$ Dec       |
|---|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT          | $0.090 \pm 0.427$  | 0.21                | $-0.087 \pm 0.500$ | $0.023 \pm 0.568$  |
| PRF-fit source offset from KIC position | $4.723 \pm 0.570$  | 8.28                | $1.118 \pm 0.484$  | $-4.589 \pm 0.626$ |
| photometric centroid source offset      | $3.85 \pm 0.42$    | 9.07                | $1.66 \pm 0.40$    | $-3.47 \pm 0.43$   |

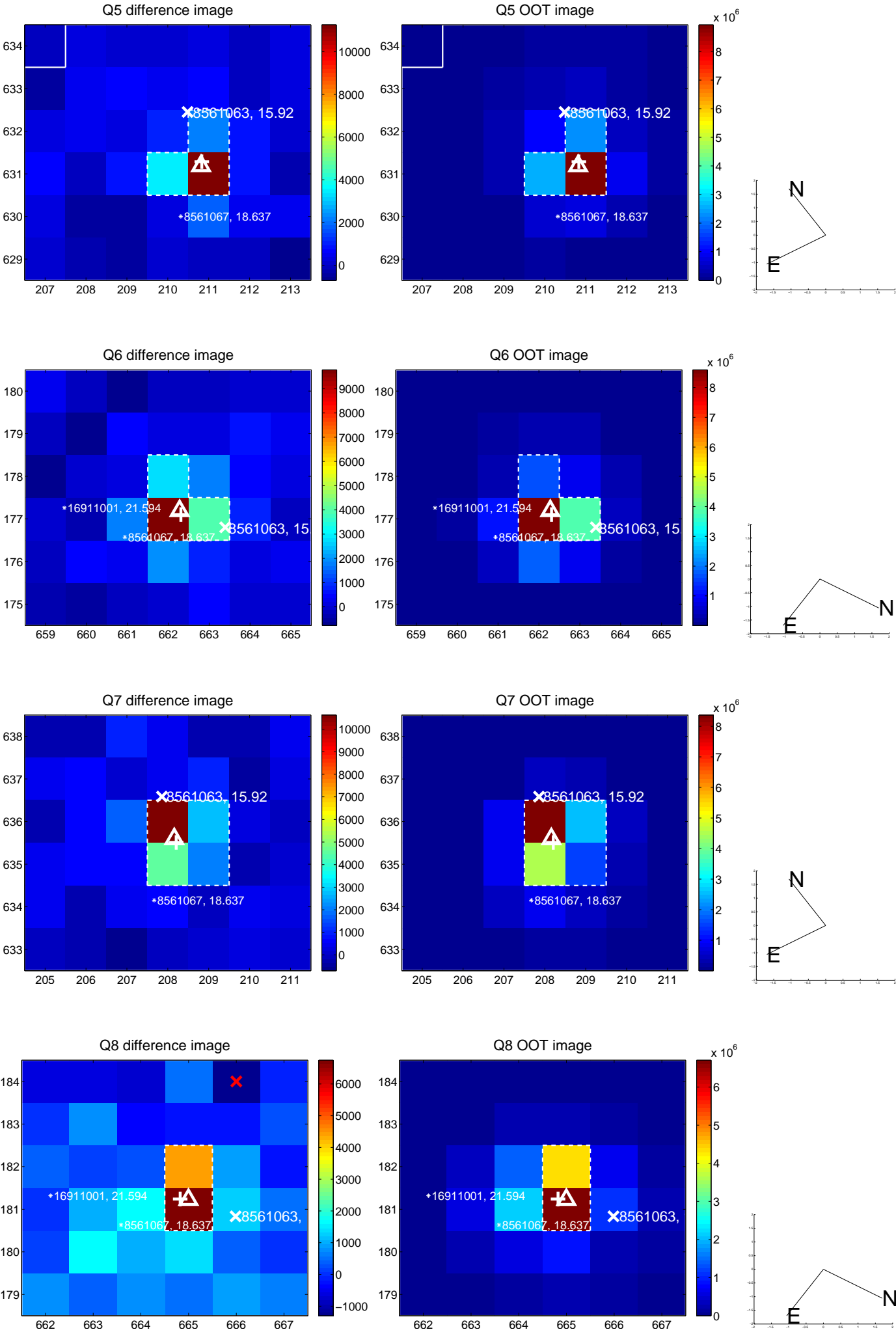


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

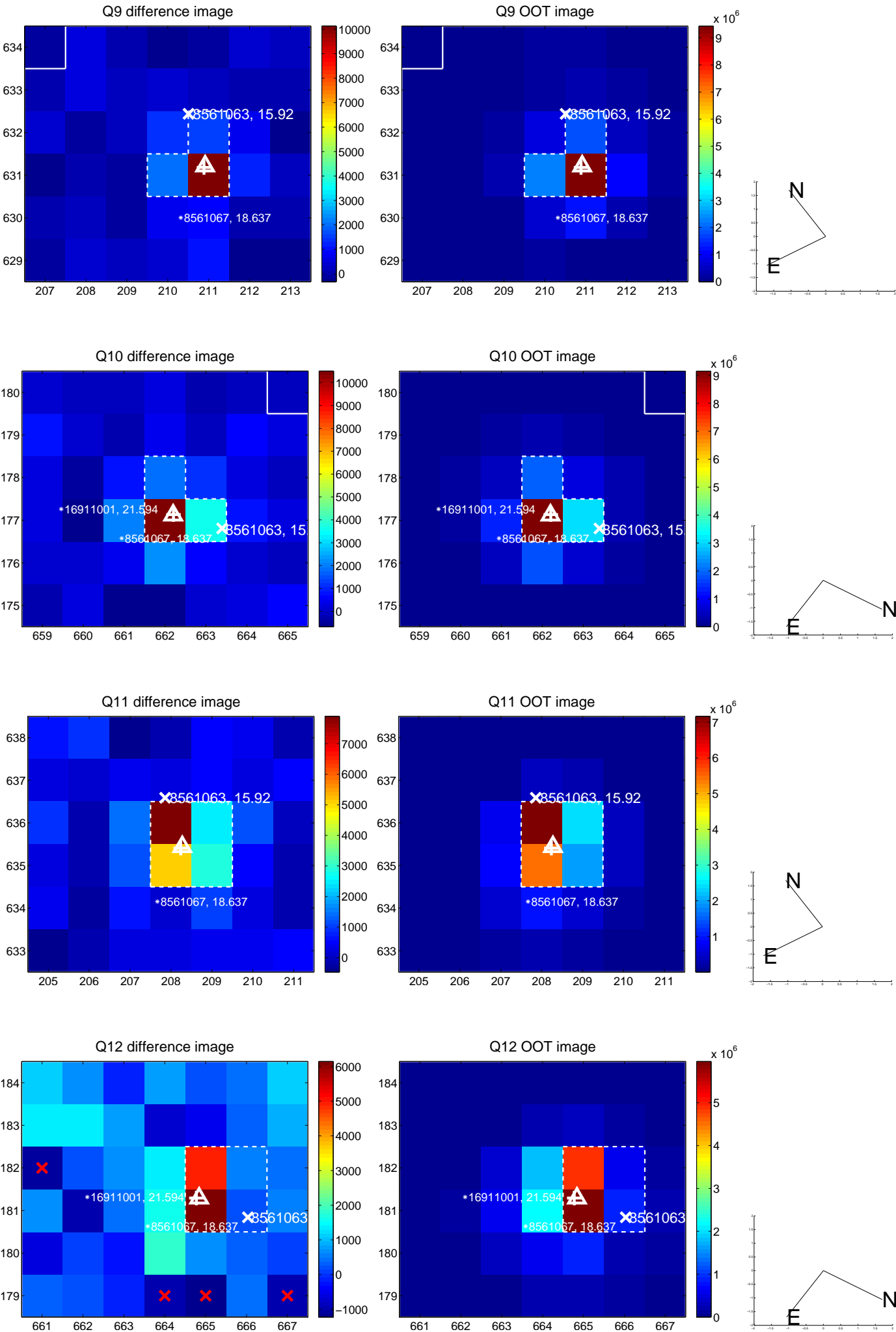


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

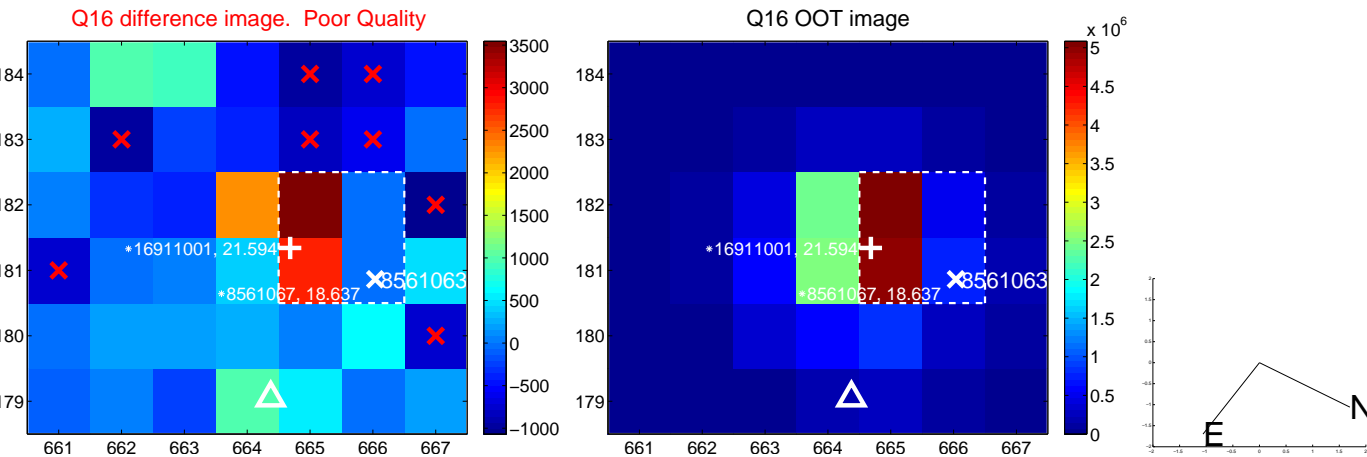
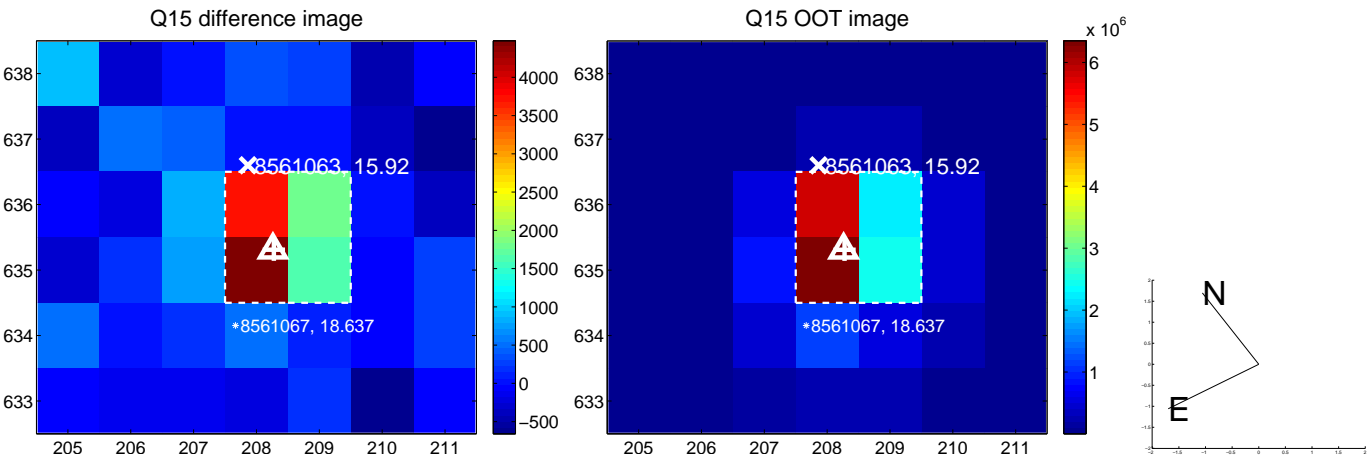
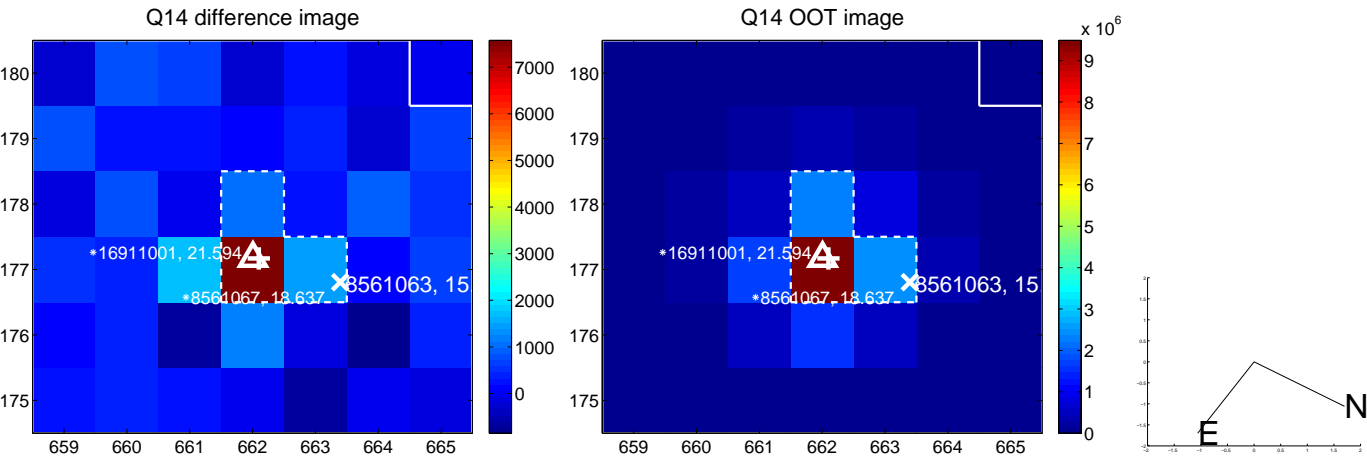
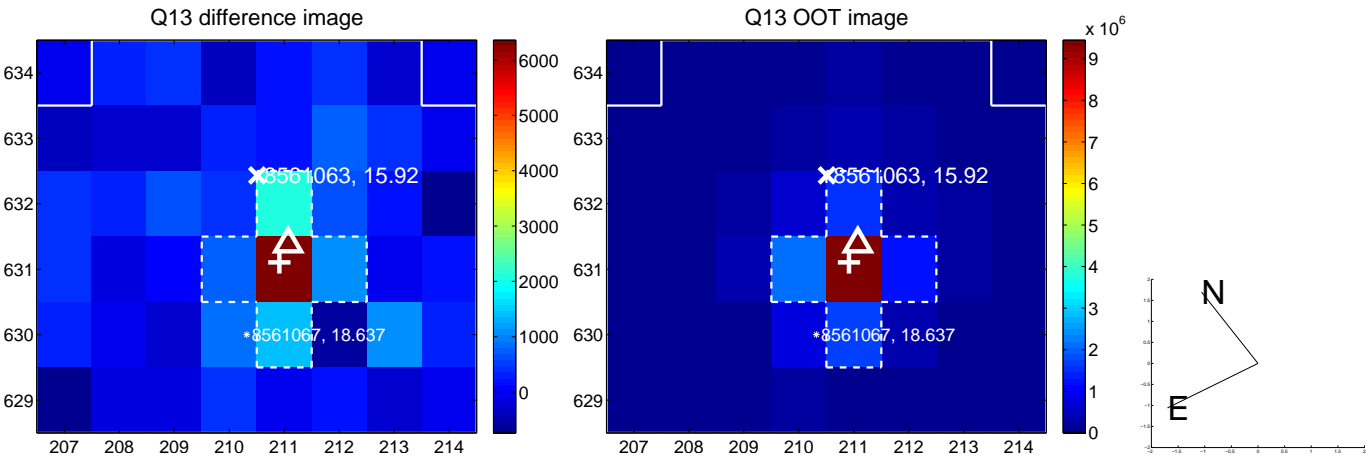




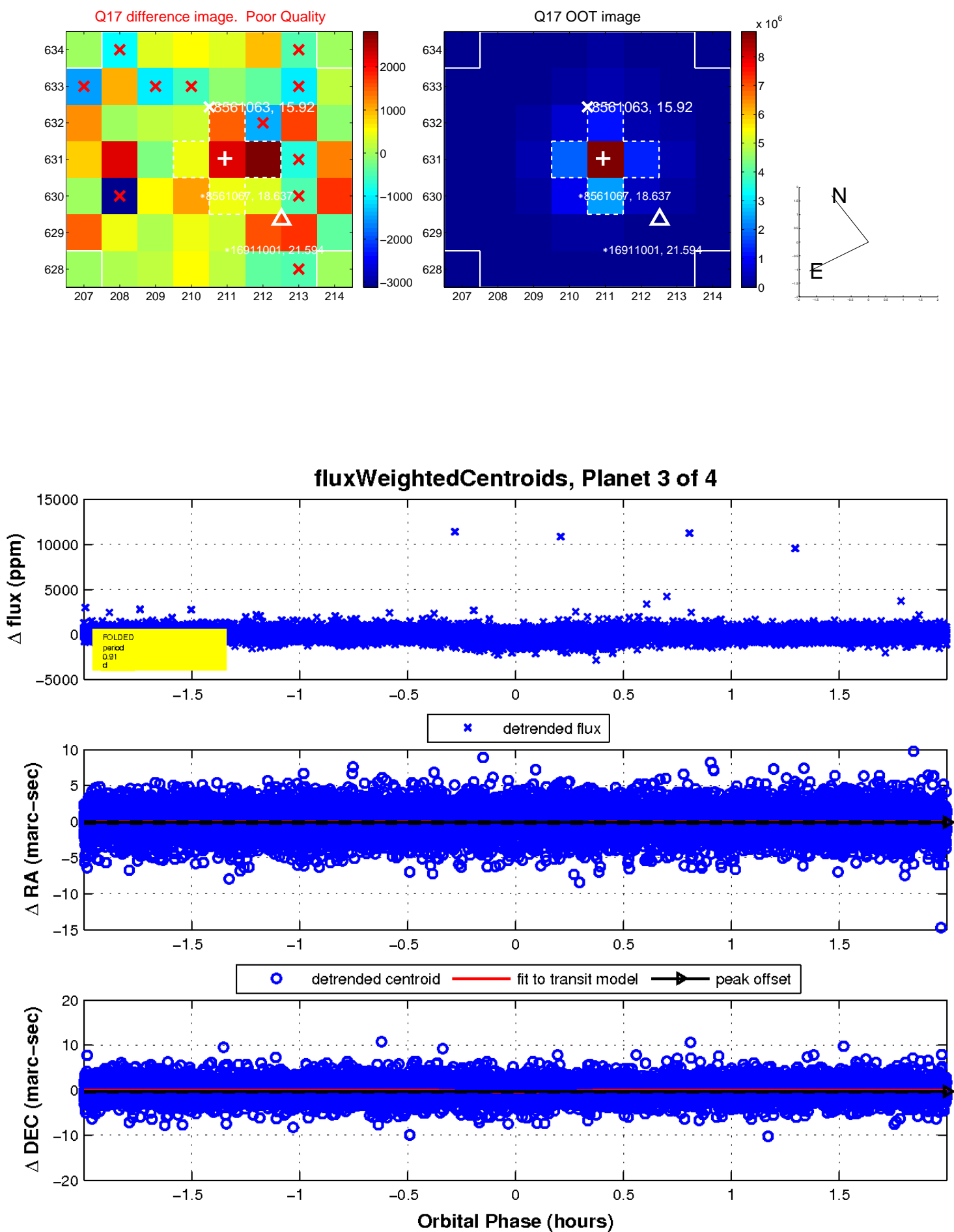
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

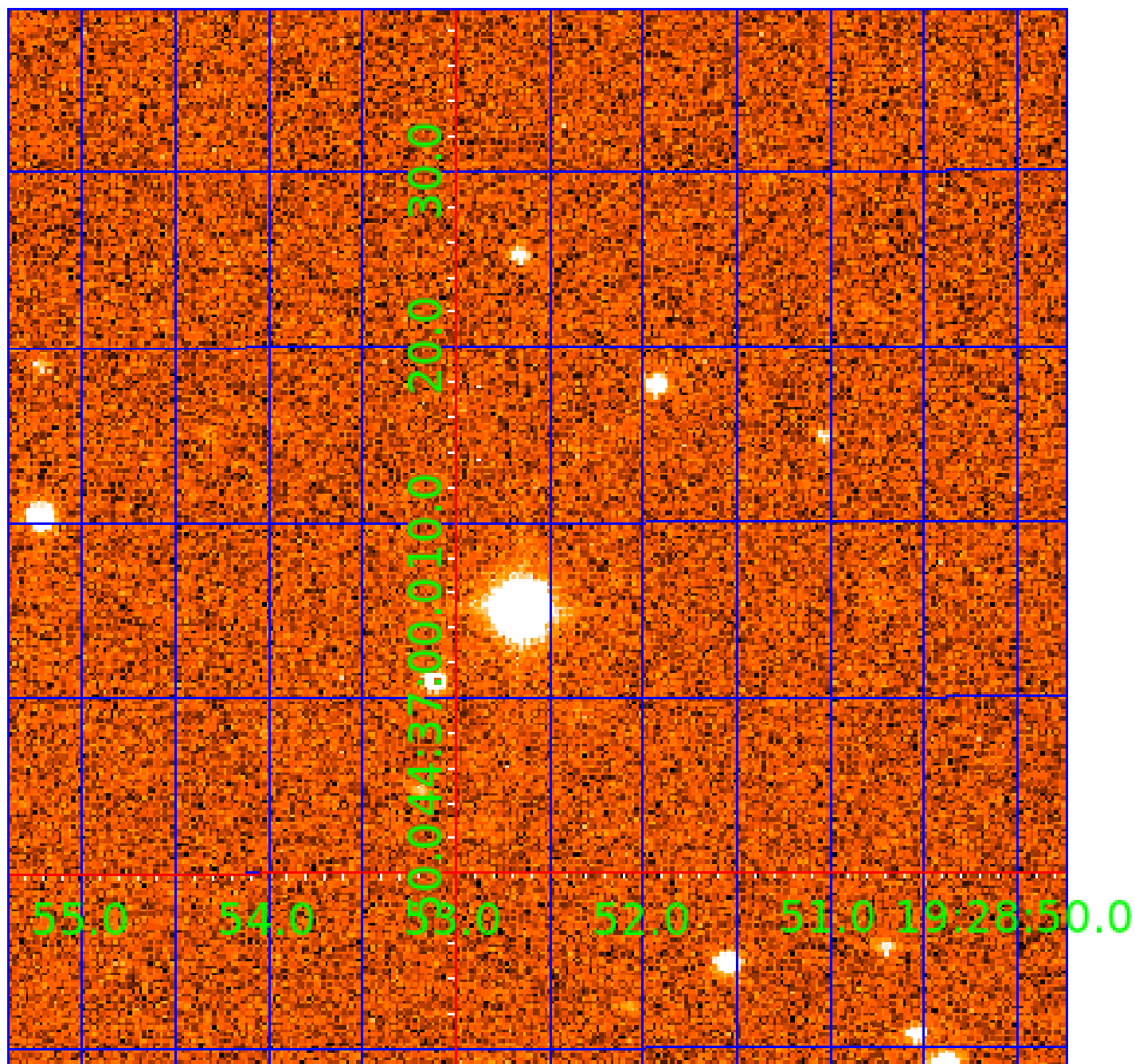


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 008561063

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 008561063-01 | OBS      | 0961.01 | 1.213765      | 131.645975   | 1416.1      | 0.669            | 70.8 | 89.9 | 0.15                        | 3292            | 0.69                   | 18.00                  |
| 008561063-02 | OBS      | 0961.03 | 1.865108      | 131.928621   | 992.7       | 0.600            | 33.1 | 49.3 | 0.15                        | 3292            | 0.48                   | 10.15                  |
| 008561063-03 | OBS      | 0961.02 | 0.906561      | 132.064027   | 294.4       | 0.667            | 10.5 | 20.8 | 0.15                        | 3292            | 0.26                   | 26.57                  |
| 008561063-04 | OBS      | No      | 0.906577      | 131.610994   | 1483.1      | 1.500            | 10.0 | -1.0 | 0.15                        | 3292            | 0.57                   | 26.57                  |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments  |
|--------------|----------|------|-------|---|---|---|---|---|
| 008561063-01 | OBS      | PC   | 1.00  | 0 | 0 | 0 | 0 | CENT_KIC_POS                                    |
| 008561063-02 | OBS      | PC   | 1.00  | 0 | 0 | 0 | 0 | CENT_KIC_POS                                    |
| 008561063-03 | OBS      | FP   | 0.00  | 0 | 1 | 0 | 0 | MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE—CENT_KIC_POS |
| 008561063-04 | OBS      | FP   | 0.00  | 1 | 1 | 0 | 0 | IS_SEC_TCE—CENT_NOFITS                          |

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

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

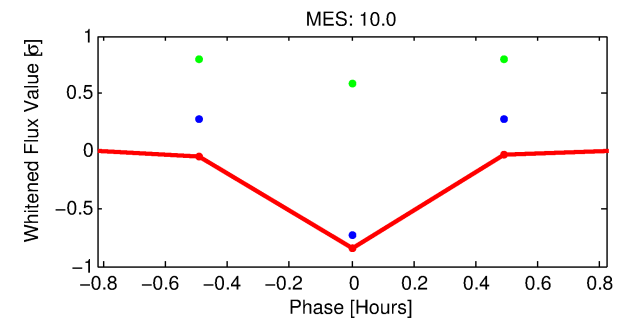
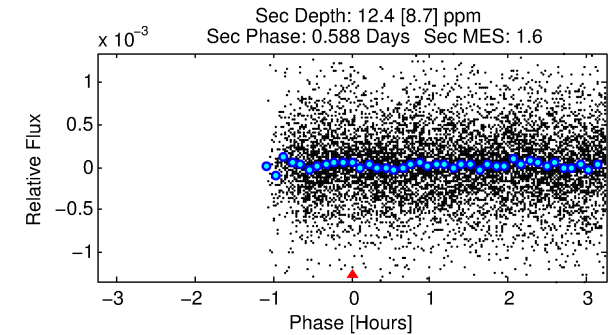
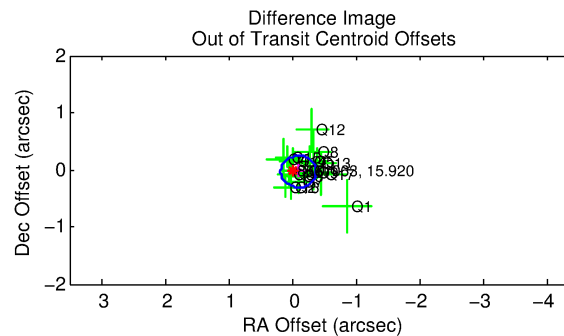
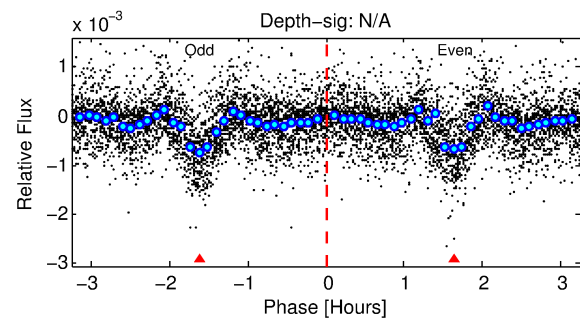
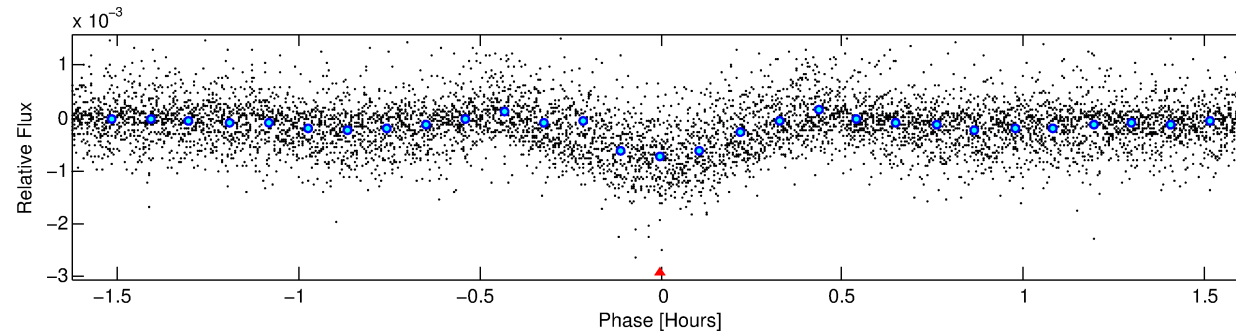
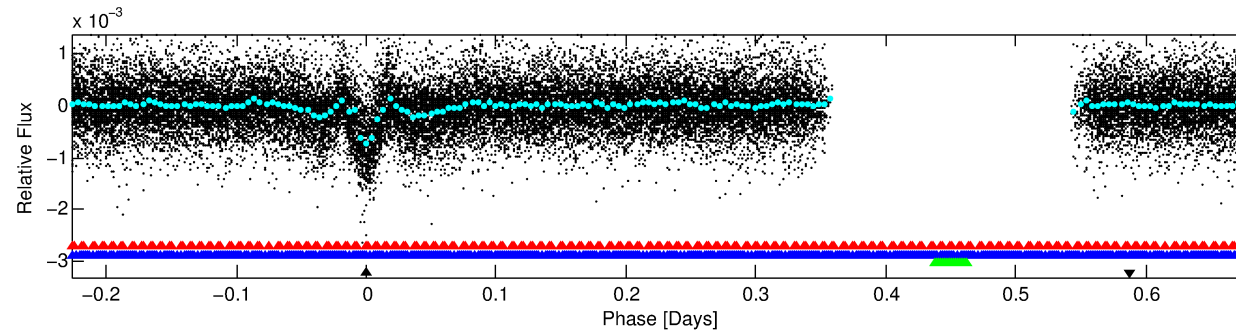
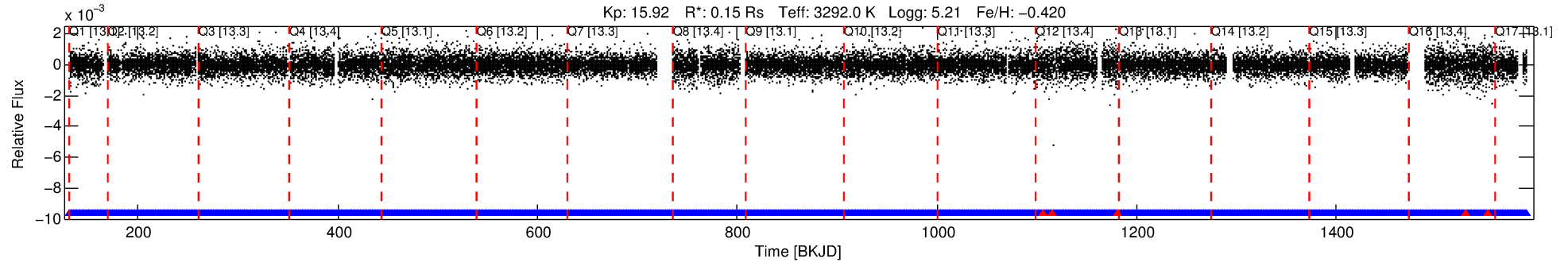
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 008561063-04

No Significant Match Found

# DV One-Page Summary

KIC: 8561063 Candidate: 4 of 4 Period: 0.907 d  
KOI: K00961 Name: Kepler-42 Corr: No Ephemeris Match



TPS TCE Results:

Period = 0.90658 d  
Epoch = 131.6110 BKJD

DV fit results are unavailable

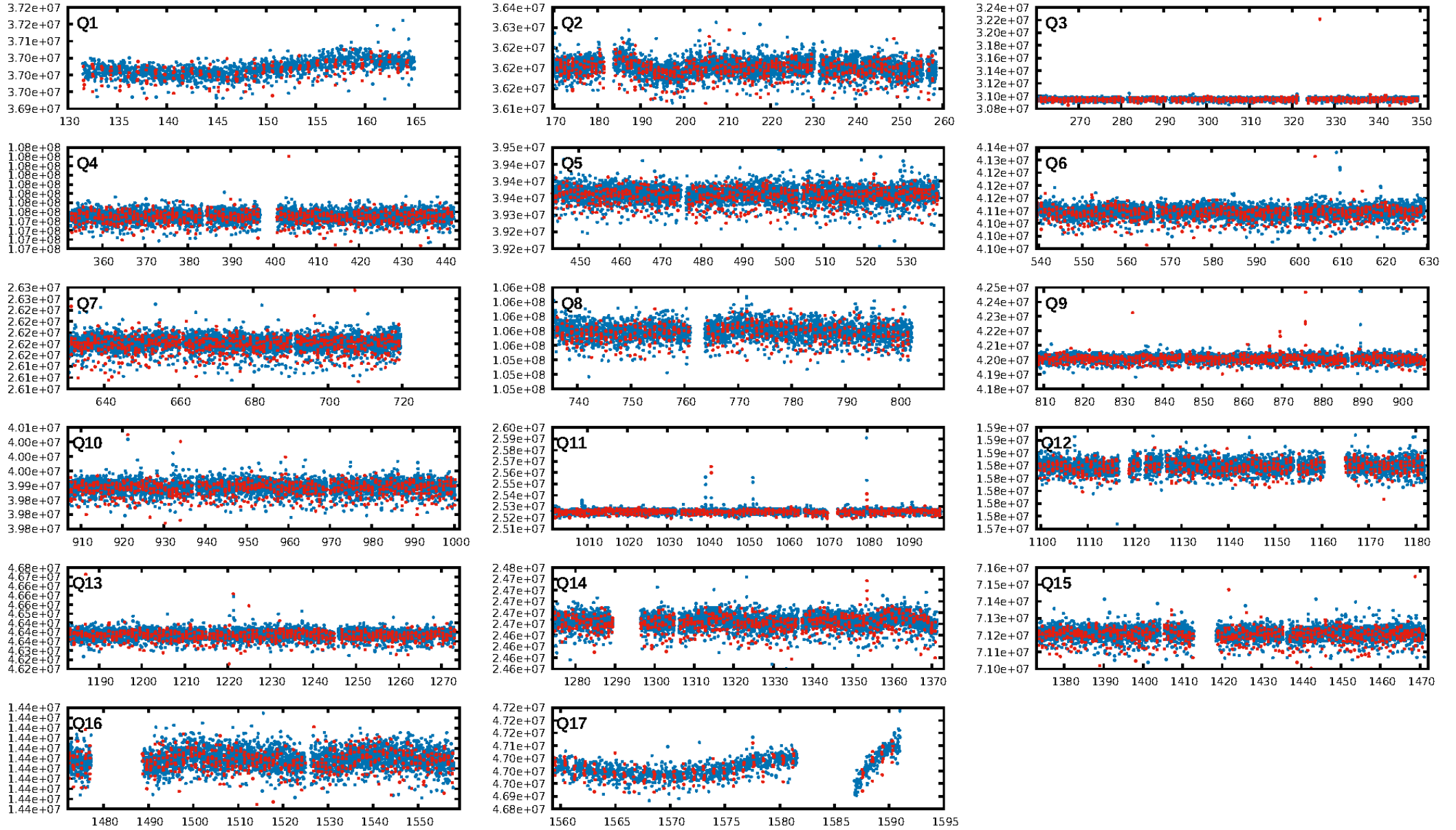
DV Diagnostic Results:

ShortPeriod-sig: 0.0% [0.00σ]  
LongPeriod-sig: 100.0% [4.49σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 1.70e-27  
RollingBand-fgt: 1.00 [1137/1142]  
GhostDiagnostic-chr: 0.6758  
Centroid-sig: 0.0%  
Centroid-so: 5.176 arcsec [52.55σ]  
OotOffset-rm: 0.102 arcsec [1.10σ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-rm: 4.830 arcsec [33.80σ]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 1.00 [17/17]  
DiffImageOverlap-fno: 1.00 [17/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 14:31:54 Z

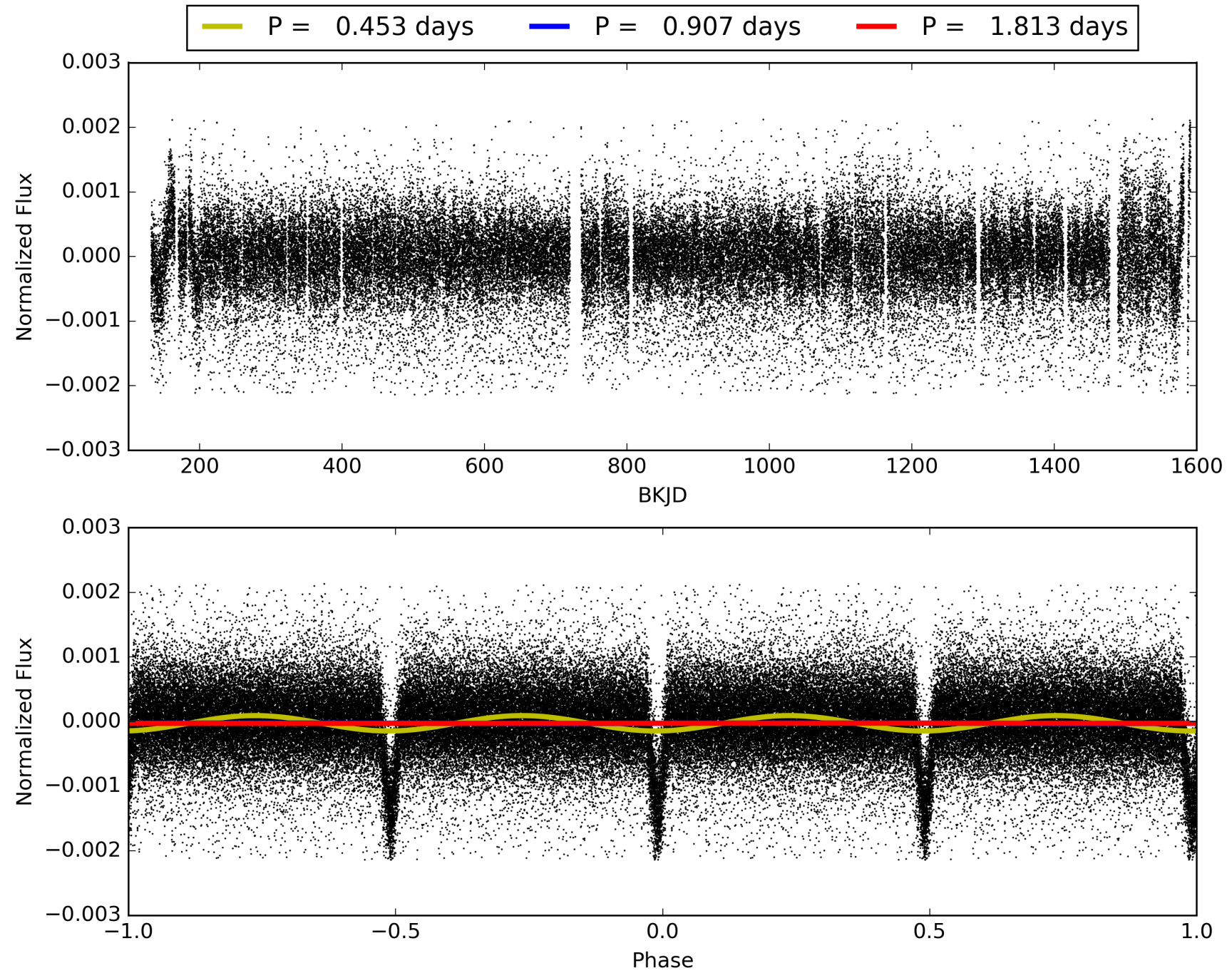
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 008561063-04, PDC Light Curves



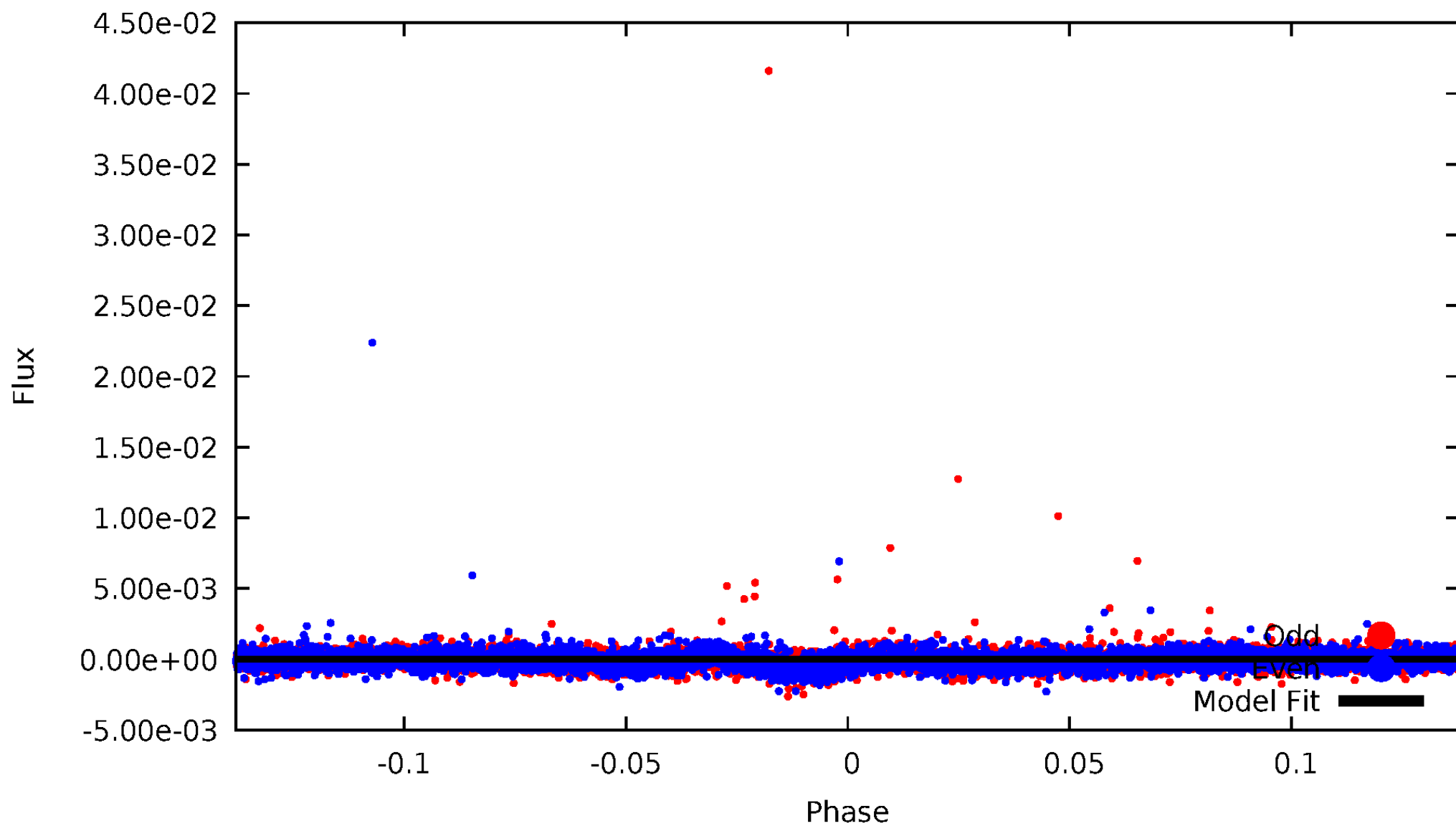


TCE 008561063-04



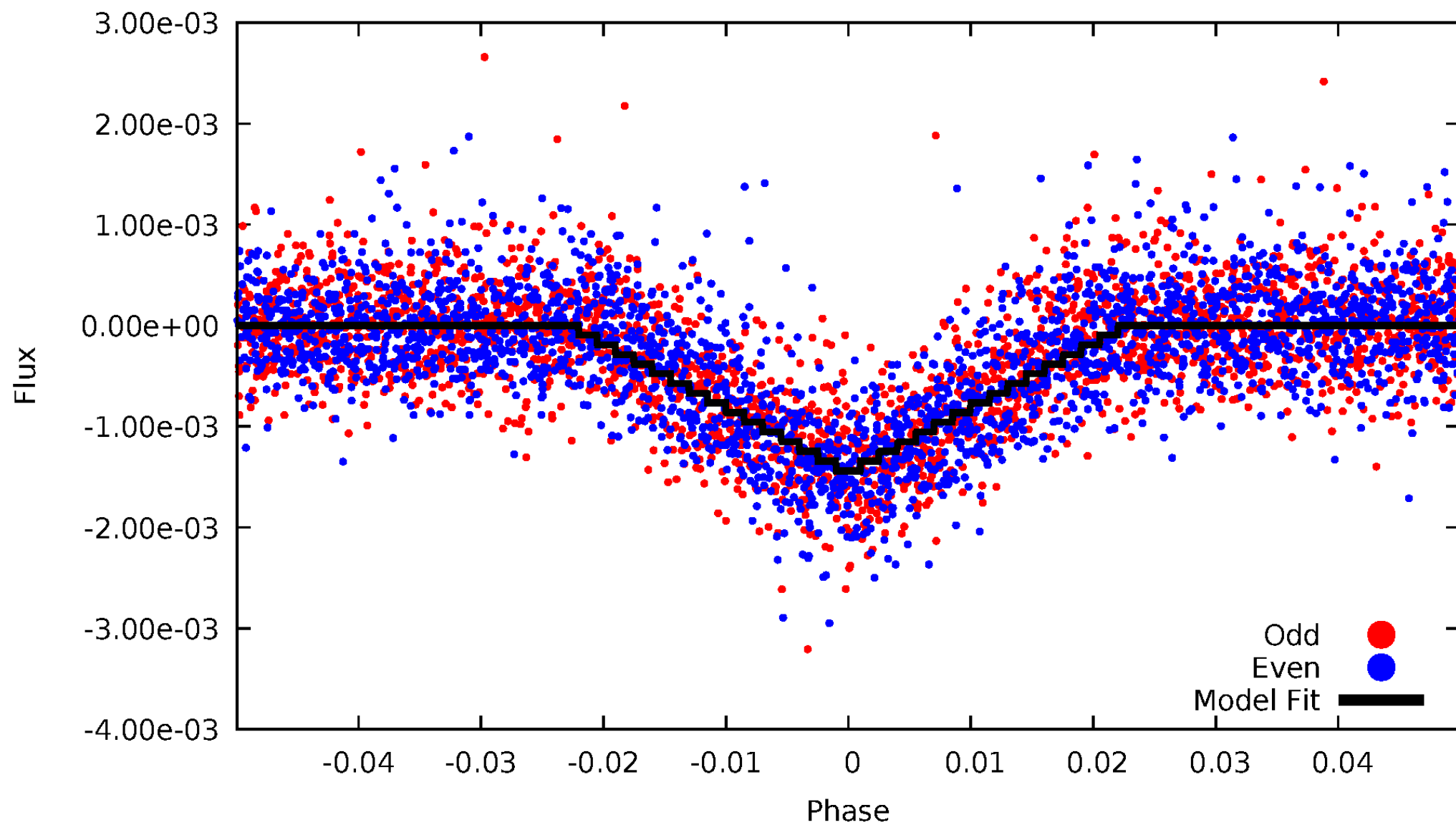
# DV Odd/Even

TCE 008561063-04



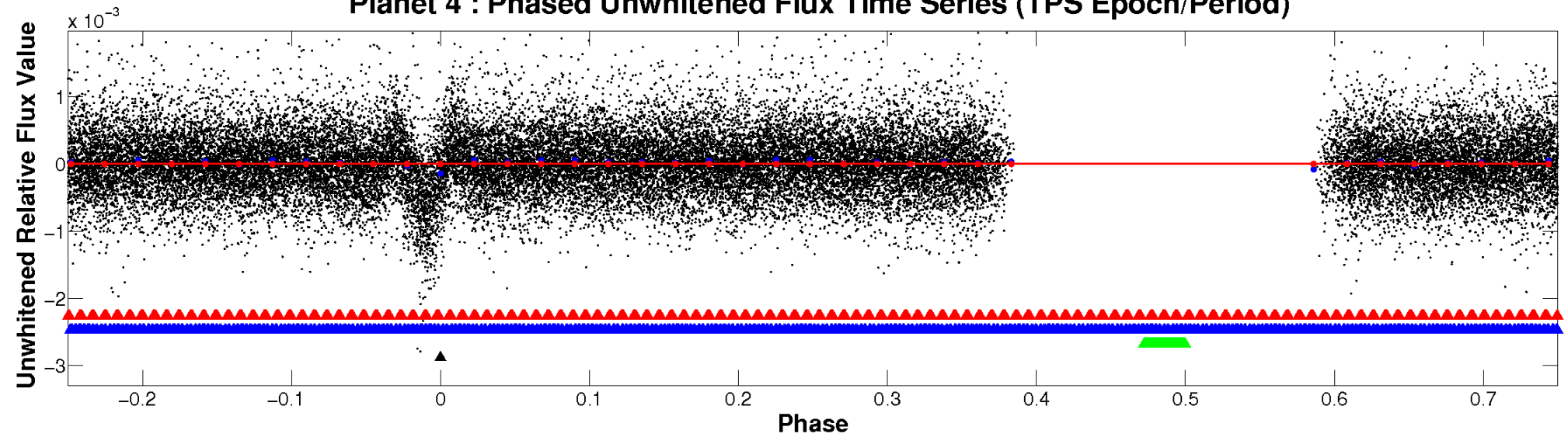
# ALT Odd/Even

TCE 008561063-04

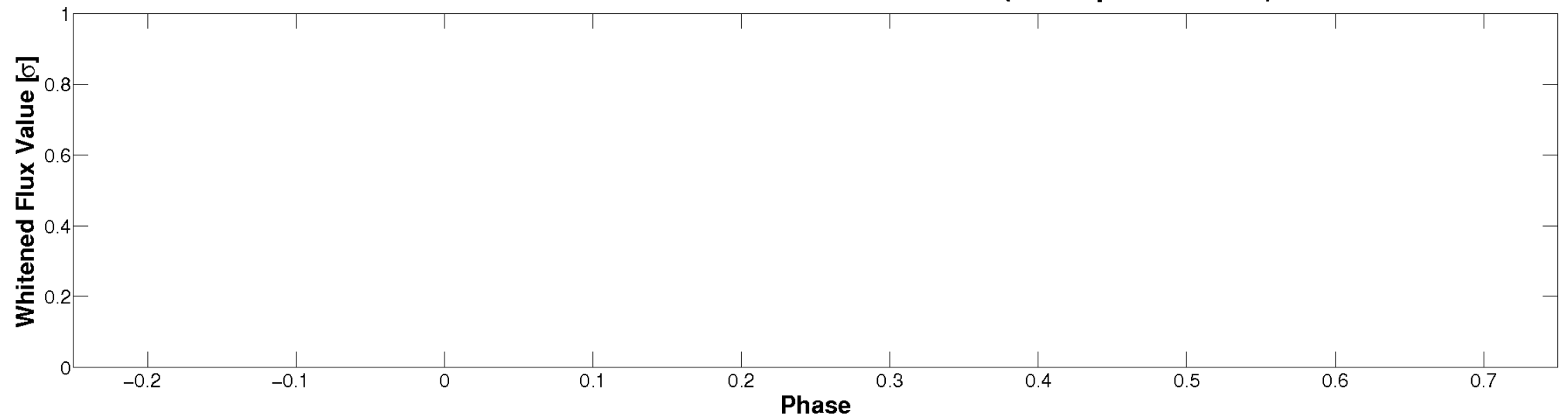


# Non-Whitened Vs. Whitened Light Curve

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

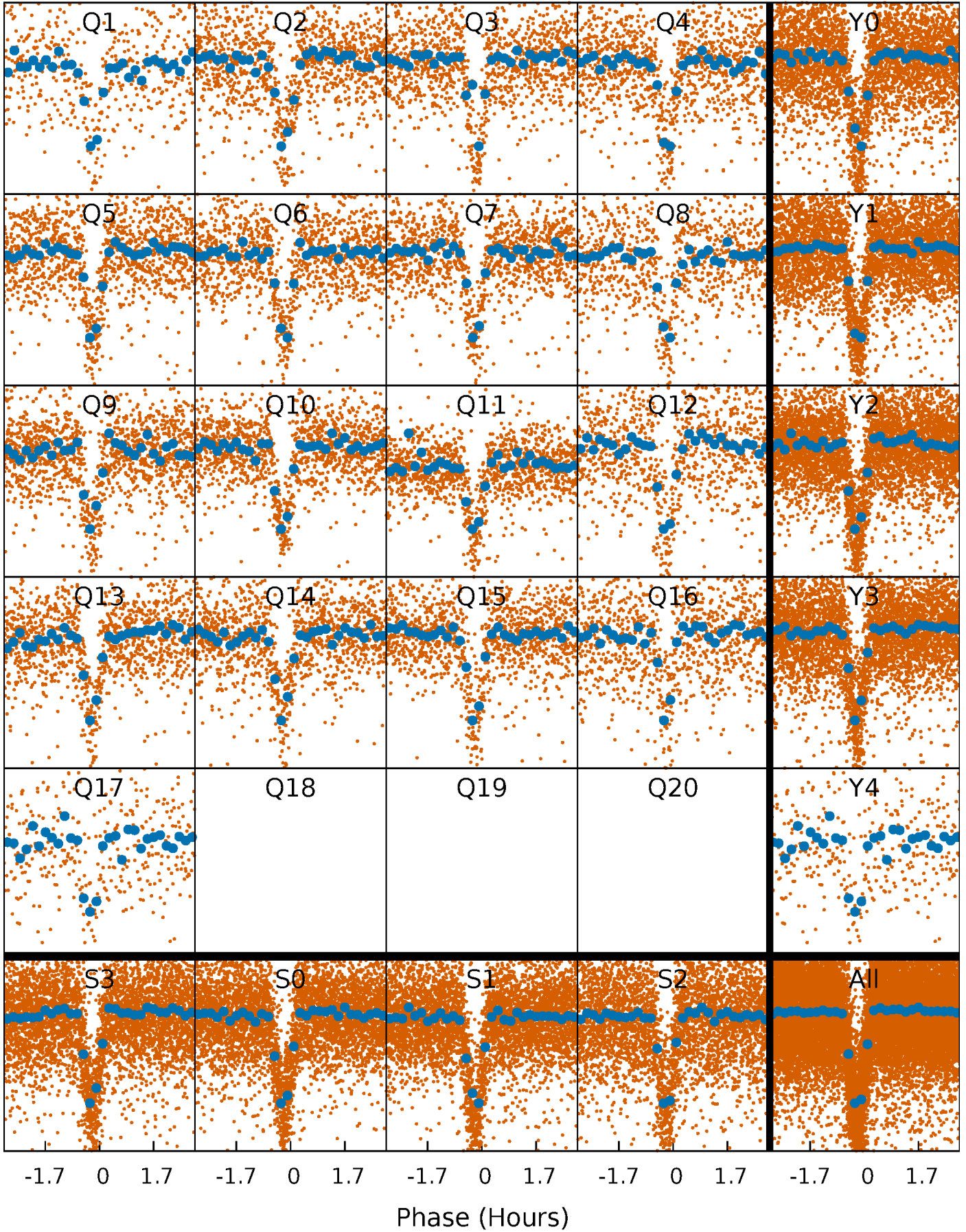


**Planet 4 : Phased Whitened Flux Time Series (TPS Epoch/Period)**



# PDC Quarter-Phased Transit Curves

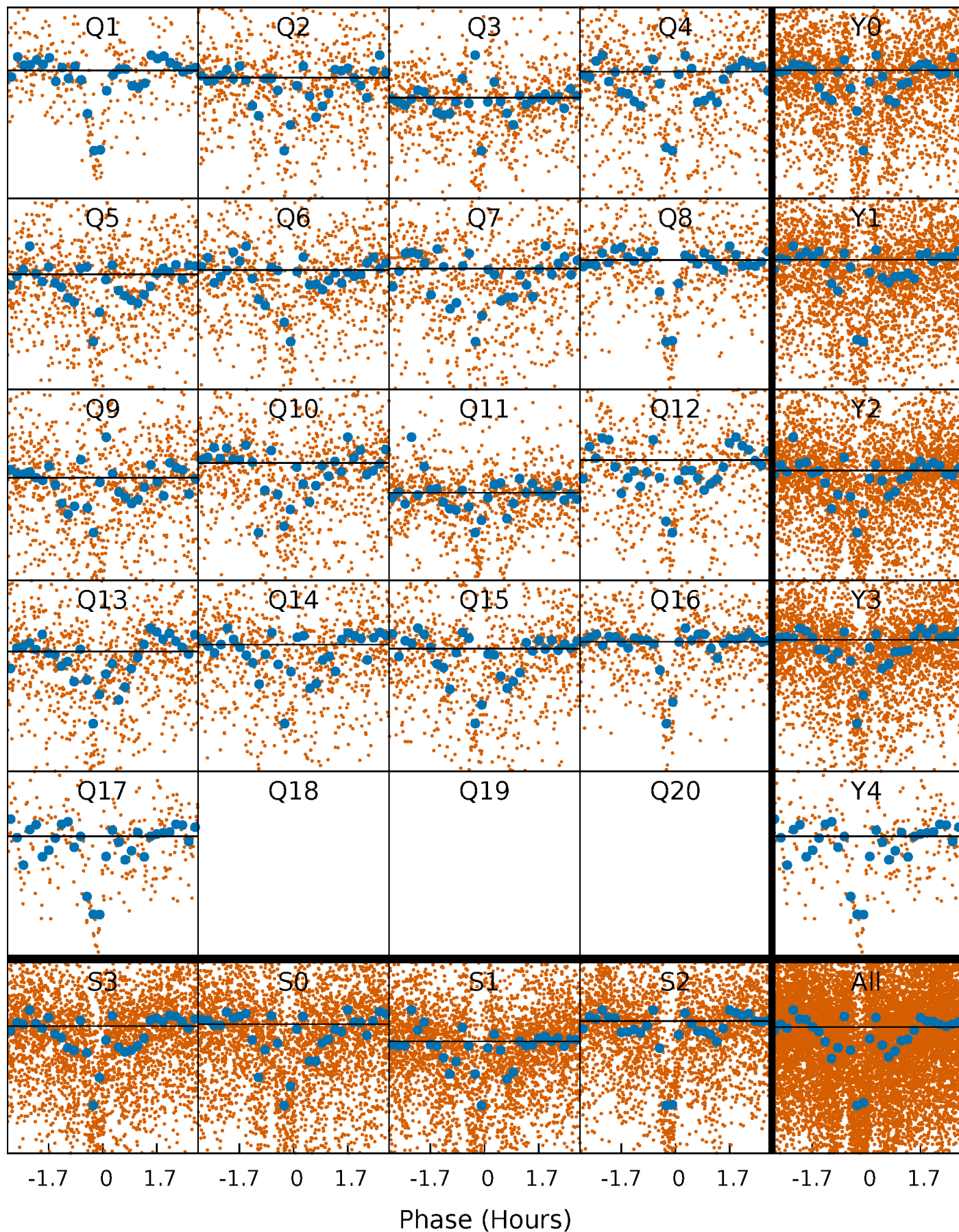
TCE 008561063-04   P= 0.906577 Days    $T_0=131.610994$  (BKJD)





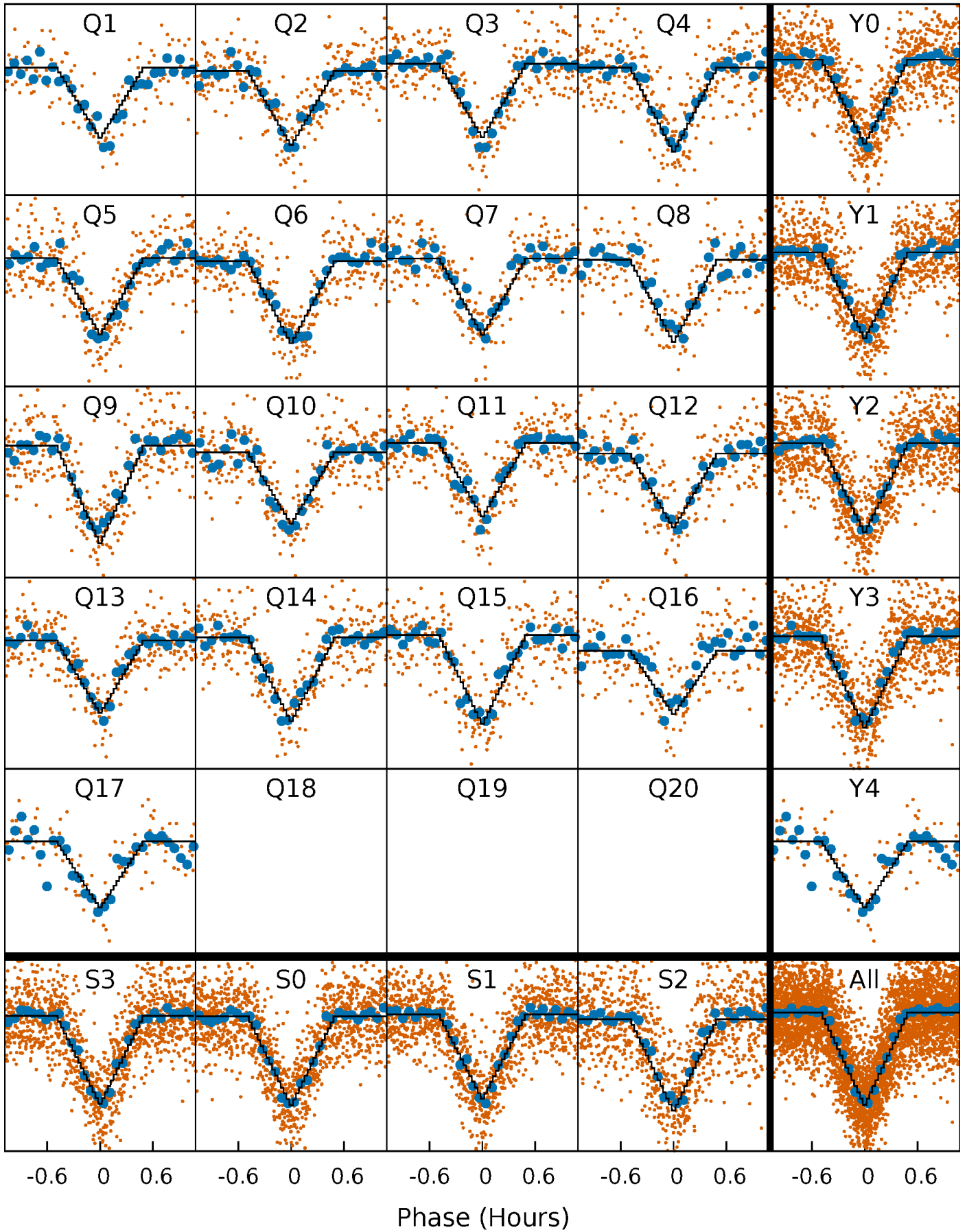
# DV Quarter-Phased Transit Curves

TCE 008561063-04 P= 0.906577 Days  $T_0=131.610994$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 008561063-04   P= 0.906577 Days    $T_0=131.601773$  (BKJD)

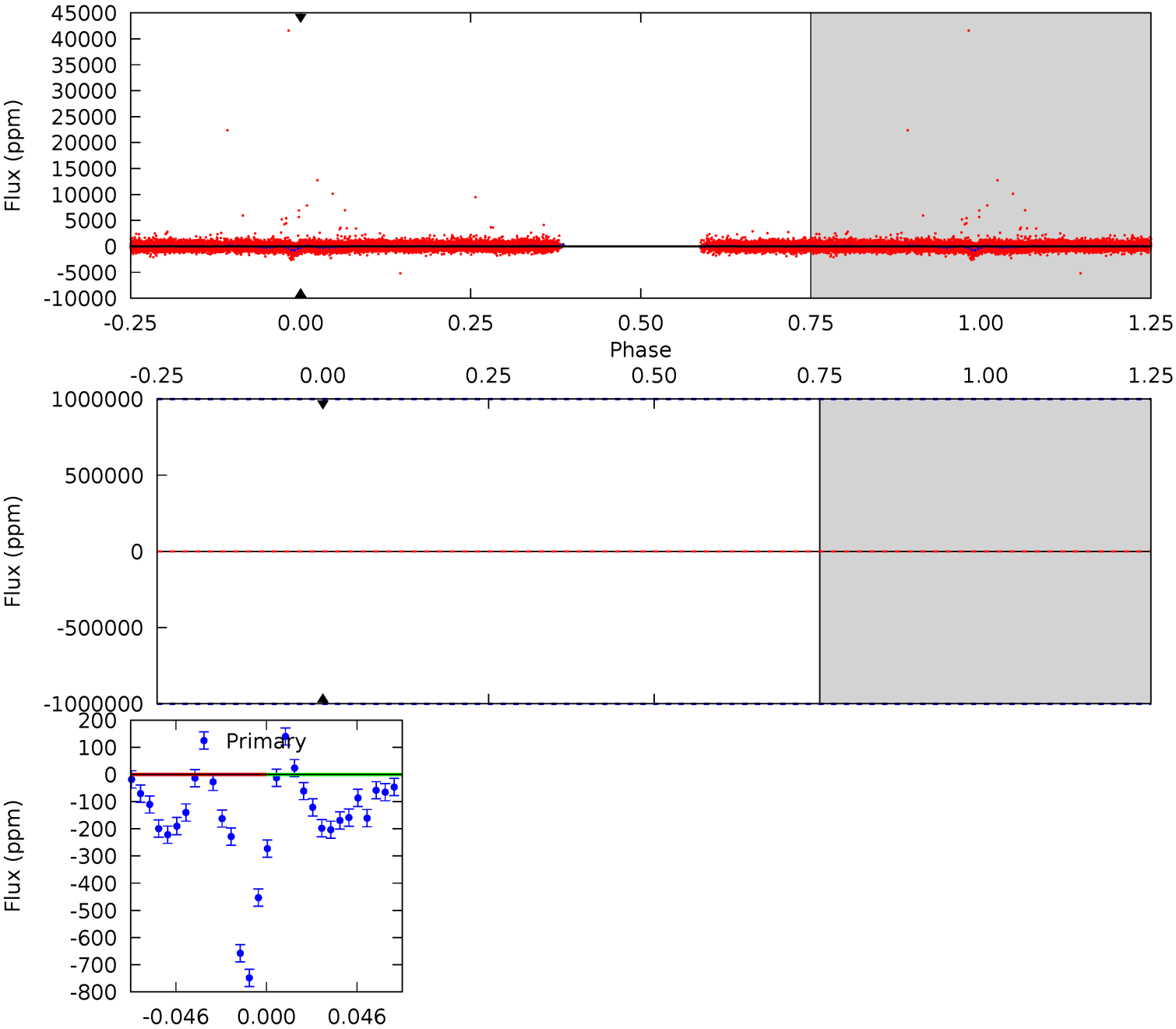




# DV Model-Shift Uniqueness Test

008561063-04, P = 0.906577 Days, E = 130.704417 Days

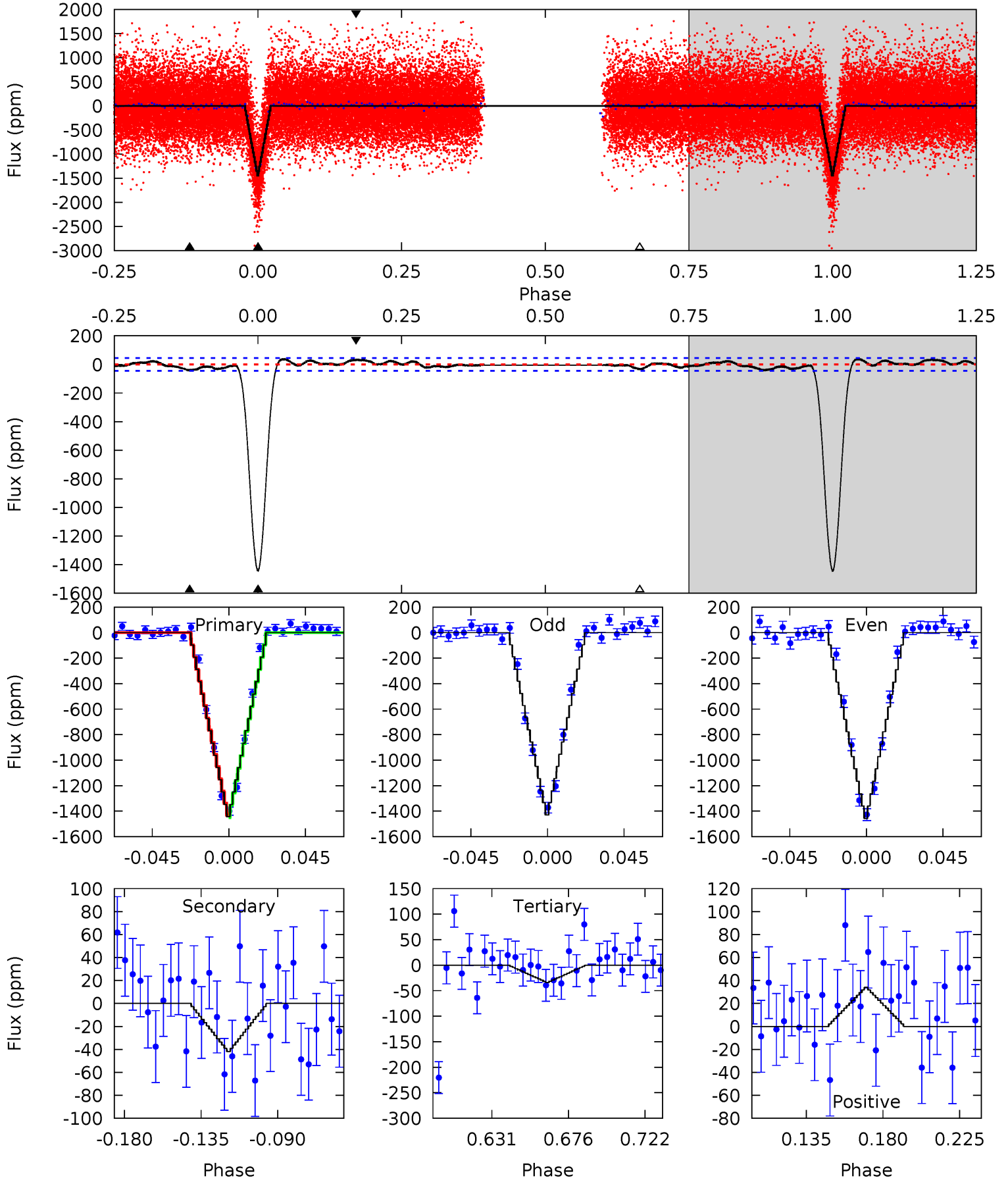
| Pri | Sec | Ter | Pos | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|-----|-----|-----|-----|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|-----|-------|-----|
| 0   | 0   | 0   | 0   | 1.00            | 1.00            | 1.00             | 0       | 0       | 0       | 0       | 0       | 0   | 0     | 0   |



# Alt Model-Shift Uniqueness Test

008561063-04, P = 0.906577 Days, E = 130.695196 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  |
|-------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 152.7 | 4.43 | 3.59 | 3.60 | 4.73            | 2.00            | 1.66             | 149.1   | 149.1   | 0.85    | 0.83    | 1.49    | 0.98 | 0.03  | 0.87 |



### Stellar Parameters For KIC 008561063

|        | $T_{\text{eff}}(K)$ | $\log(g)$                 | [Fe/H]                     | $R$ ( $R_{\odot}$ )       | $M$ ( $M_{\odot}$ )       | $p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ ) |
|--------|---------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
|        | $3292^{+44}_{-24}$  | $5.215^{+0.053}_{-0.098}$ | $-0.420^{+0.150}_{-0.150}$ | $0.148^{+0.039}_{-0.017}$ | $0.132^{+0.039}_{-0.013}$ | $56.740^{+15.410}_{-20.380}$                  |
|        | +1%/-1%             | +1%/-2%                   | +36%/-36%                  | +26%/-11%                 | +30%/-10%                 | +27%/-36%                                     |
| Source | SPE70               | PHO41                     | SPE70                      | DSEP                      |                           |   |

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

### Secondary Eclipse Parameters for KIC 008561063-04 / KOI

| Detrend | Depth (ppm)     | $R_p$ ( $R_{\oplus}$ ) | $T_{\text{max}}$ (K) | $T_{\text{obs}}$ (K)    | $A_{\text{obs}}$                  |
|---------|-----------------|------------------------|----------------------|-------------------------|-----------------------------------|
| DV      | $0 \pm 1000000$ | $1.32^{+1.36}_{-0.89}$ | $817^{+33}_{-23}$    | $-2716^{+8923}_{-3588}$ | $-44.288^{+4606.230}_{-4716.969}$ |
| Alt.    | $-42 \pm 9$     | $1.43^{+1.13}_{-0.97}$ | $817^{+34}_{-24}$    | $1723^{+513}_{-2899}$   | $0.955^{+8.222}_{-0.659}$         |

$T_{\text{max}}$  = 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

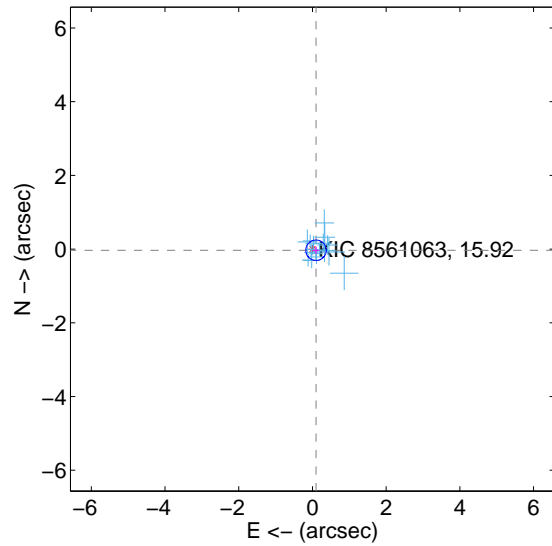
Supplemental centroid analysis for 008561063-04. Kepler magnitude: 15.92. Transit SNR -1.00

There are 17 quarters with good PRF difference image offsets

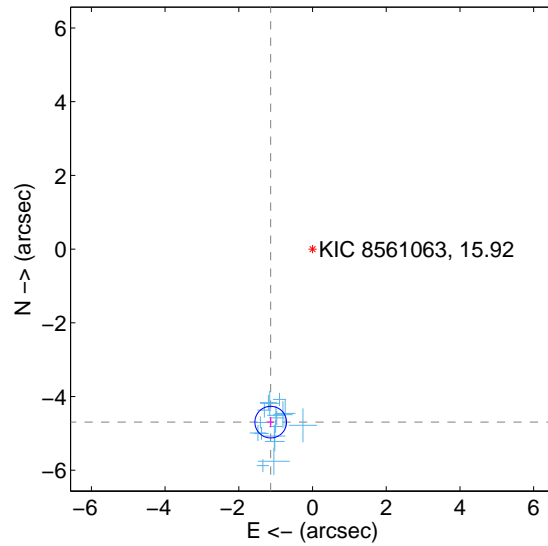
The OOT PRF centroid is offset from the target star catalog position by about 5.88 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA        | $\Delta$ Dec       |
|---|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT          | $0.102 \pm 0.092$  | 1.10                | $-0.097 \pm 0.090$ | $-0.031 \pm 0.098$ |
| PRF-fit source offset from KIC position | $4.830 \pm 0.143$  | 33.80               | $1.135 \pm 0.095$  | $-4.695 \pm 0.142$ |
| photometric centroid source offset      | $5.18 \pm 0.10$    | 52.55               | $1.02 \pm 0.09$    | $-5.07 \pm 0.10$   |

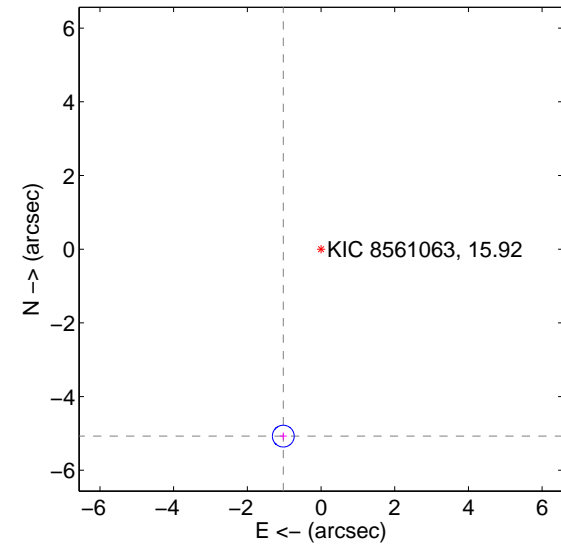
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

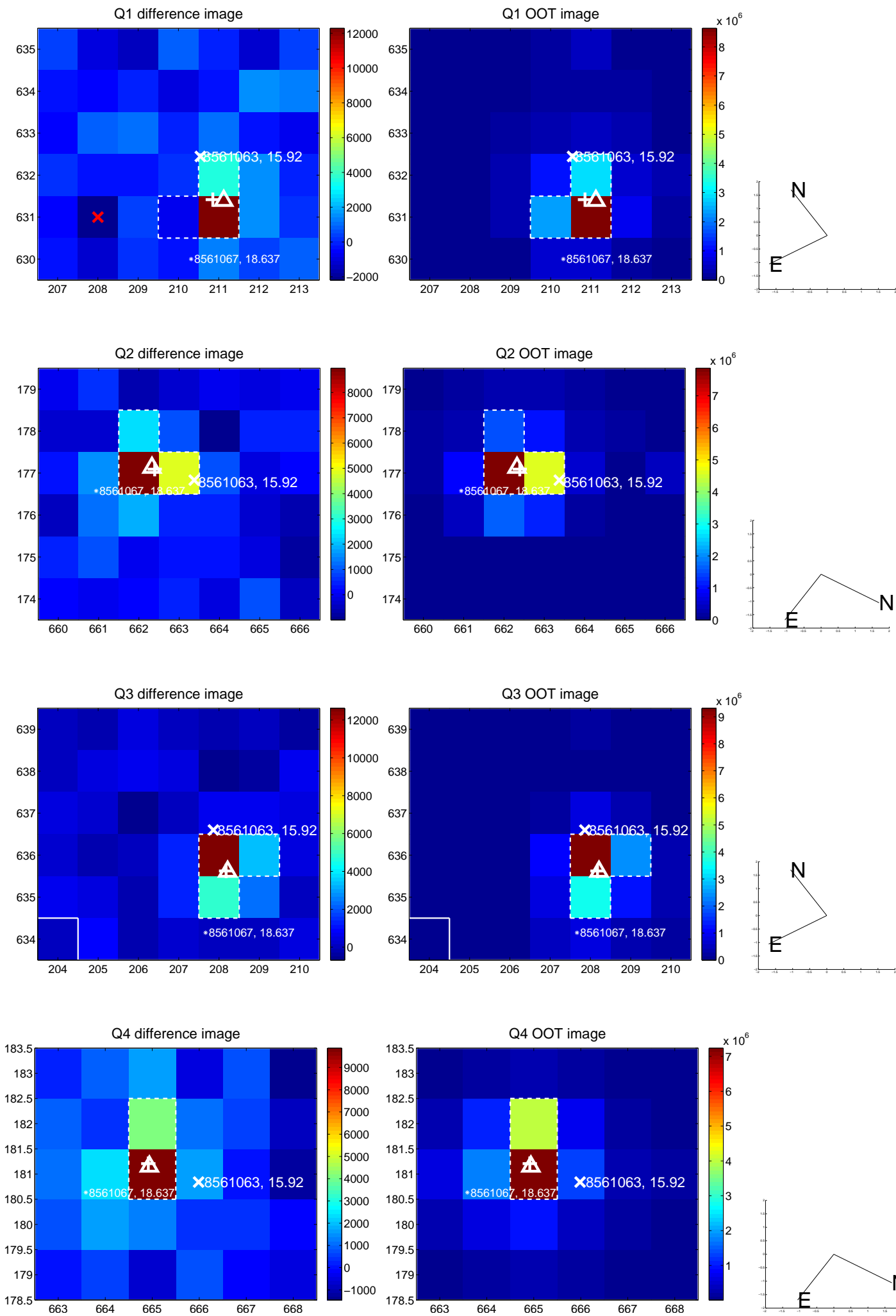


offset from photometric centroids

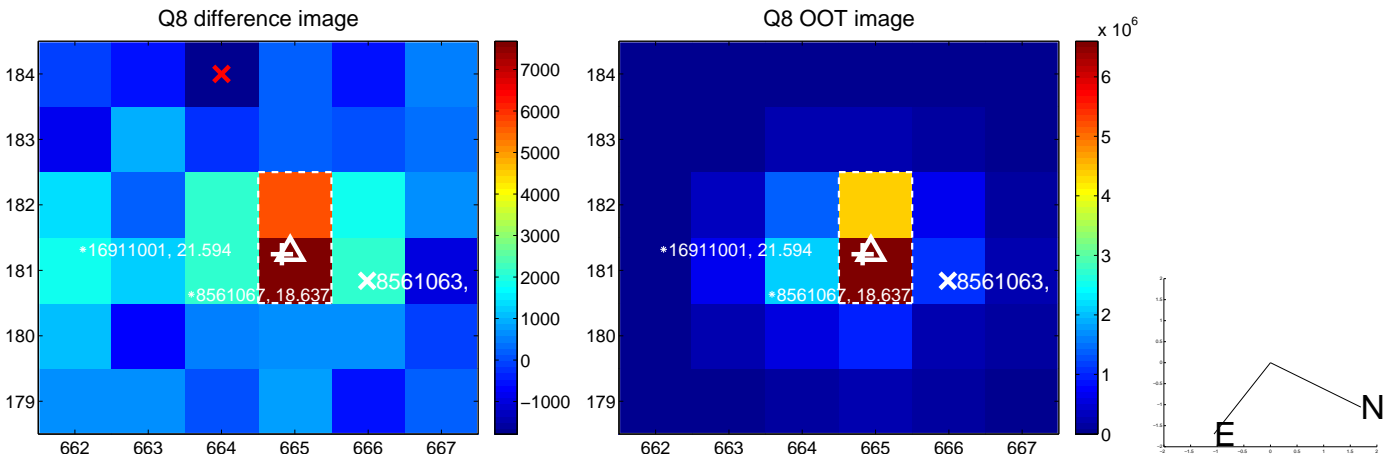
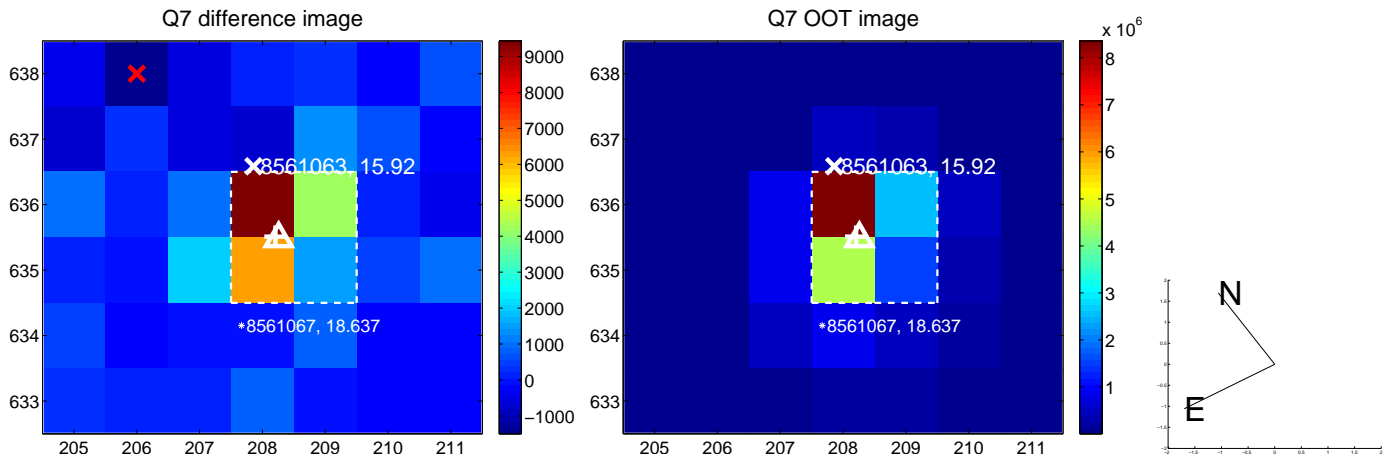
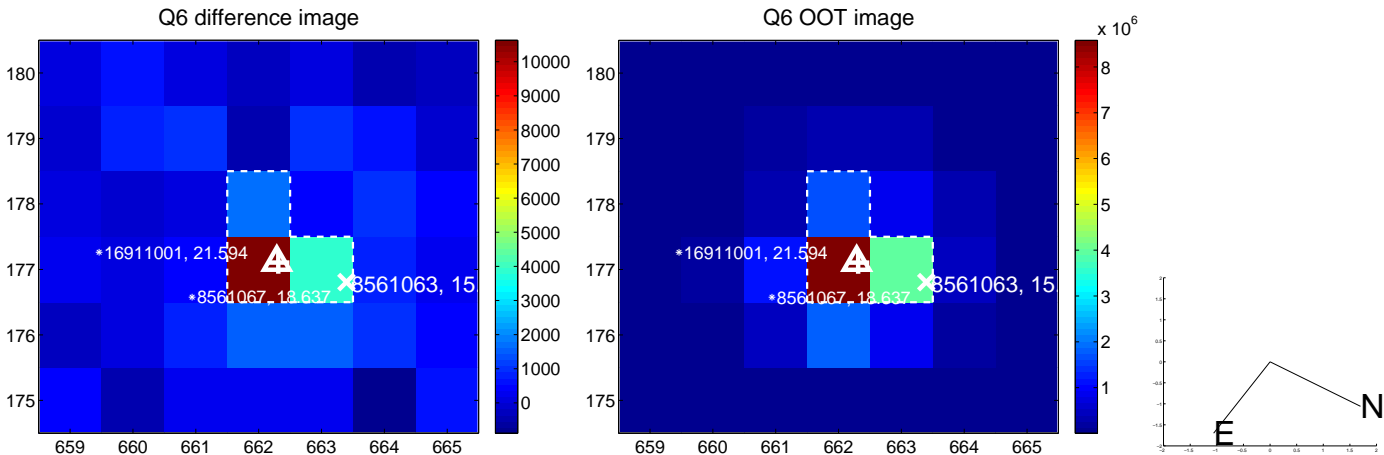
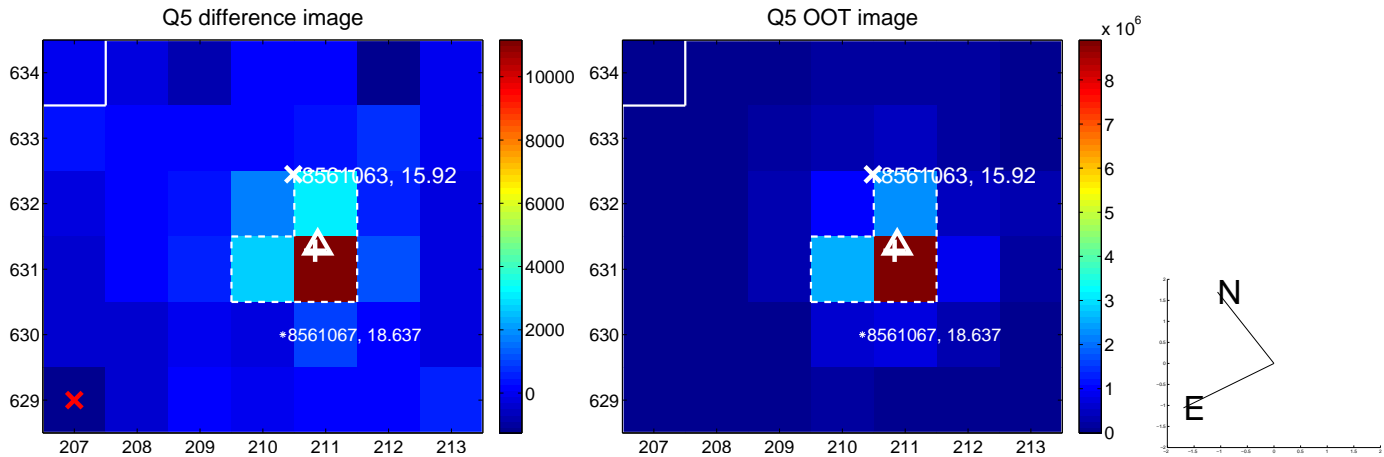


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

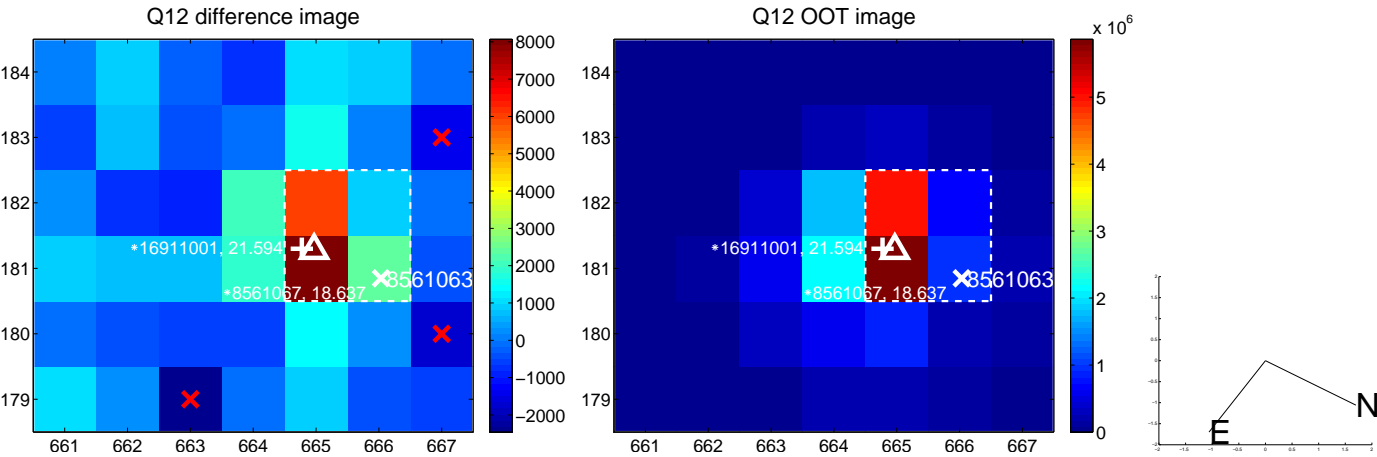
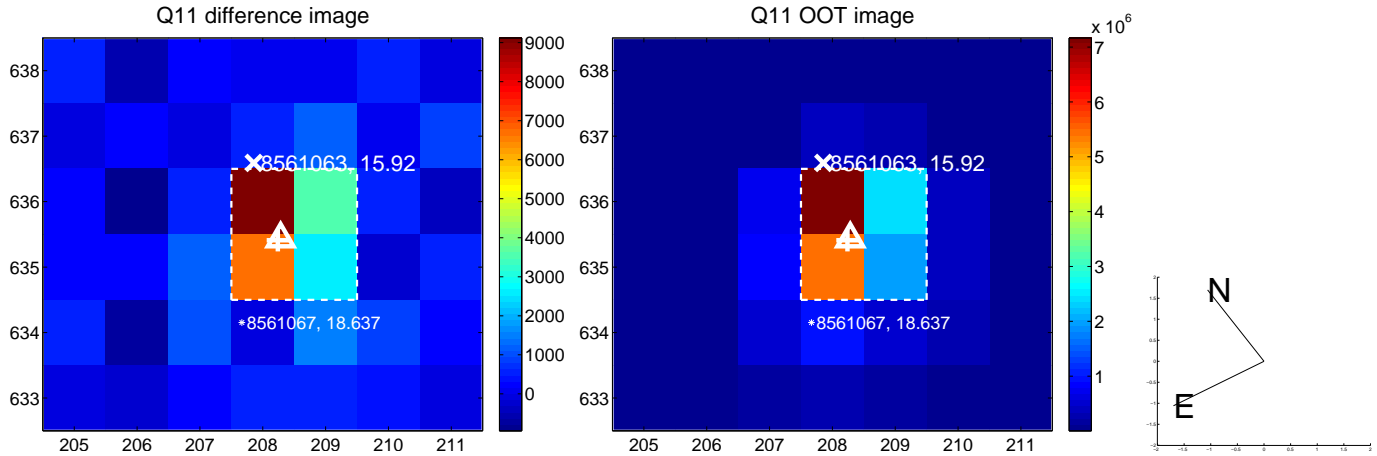
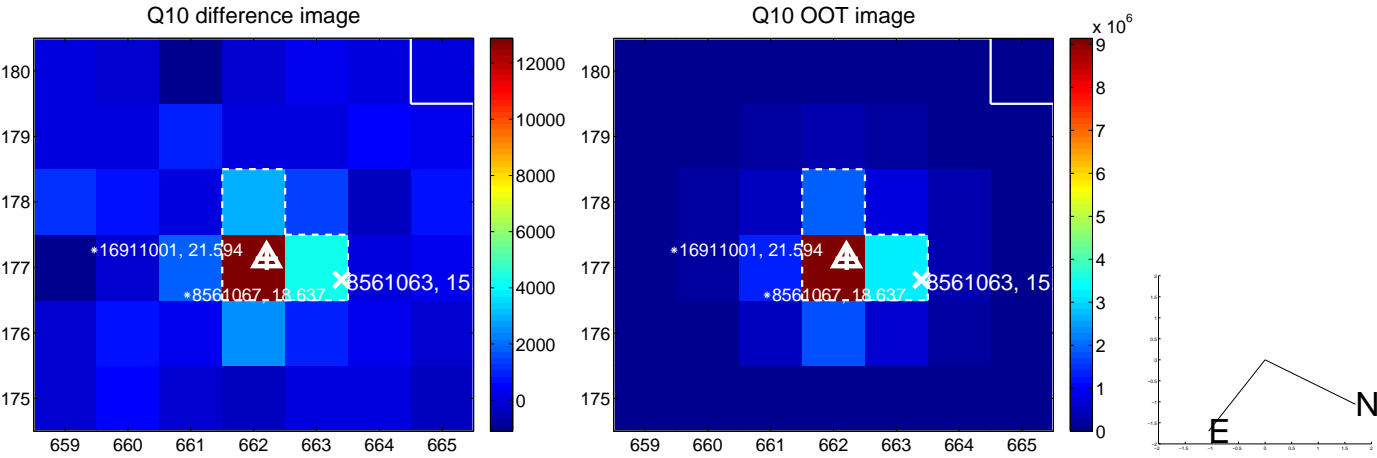
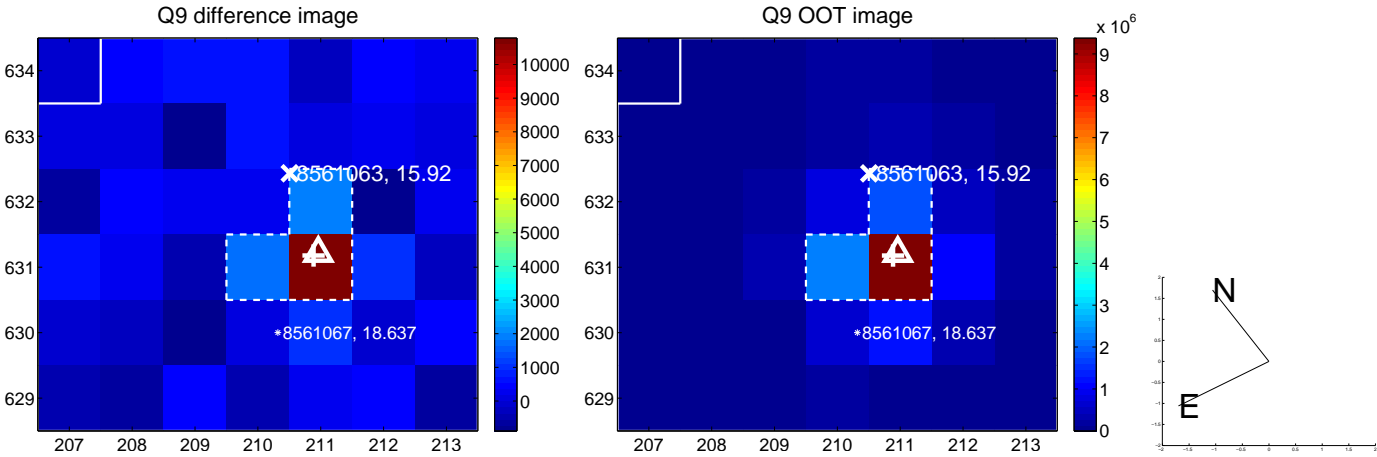


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

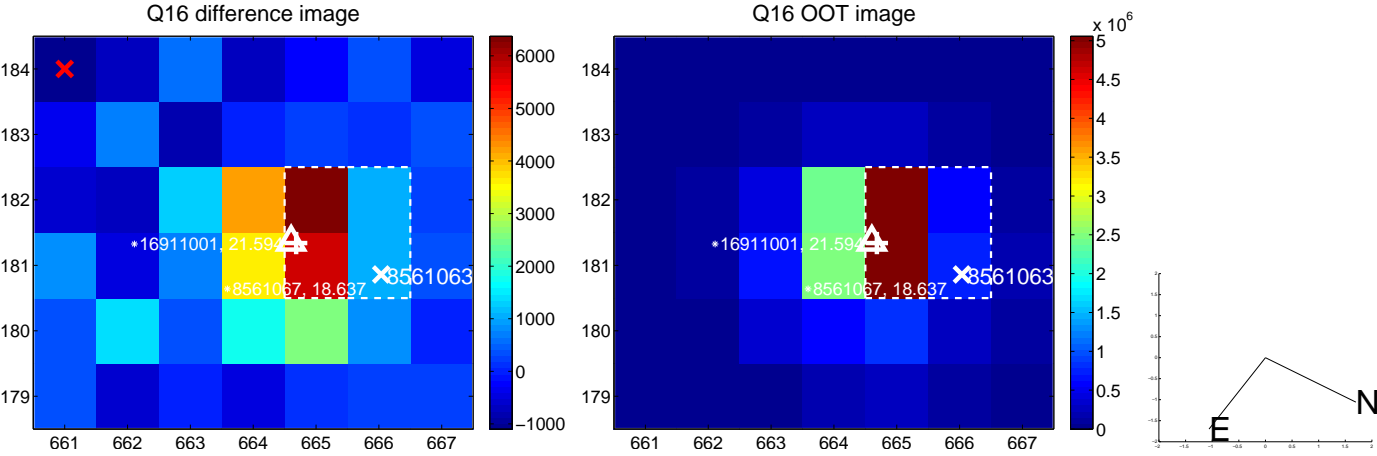
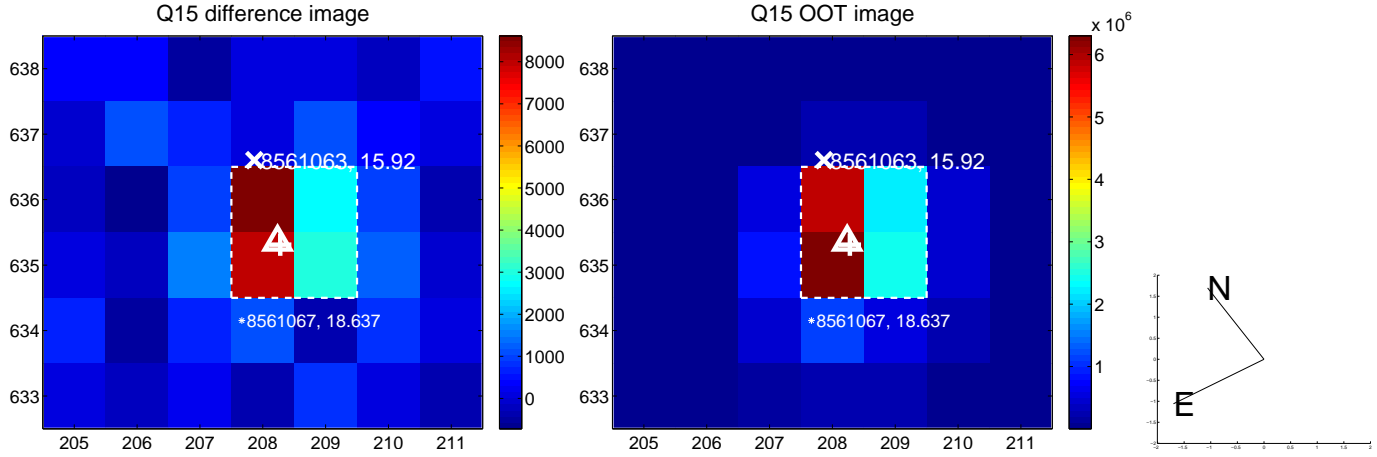
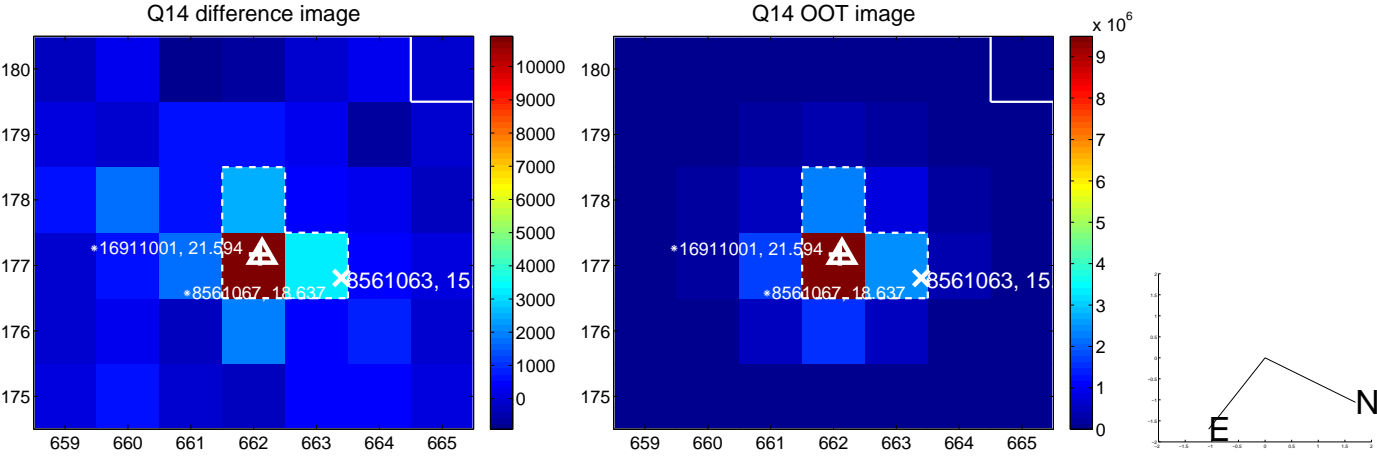
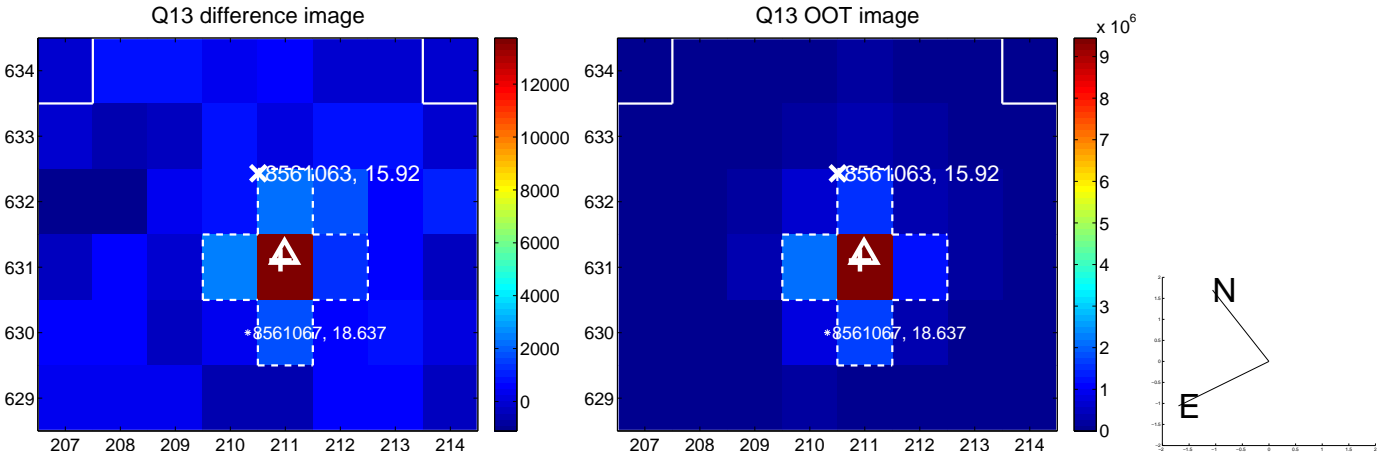




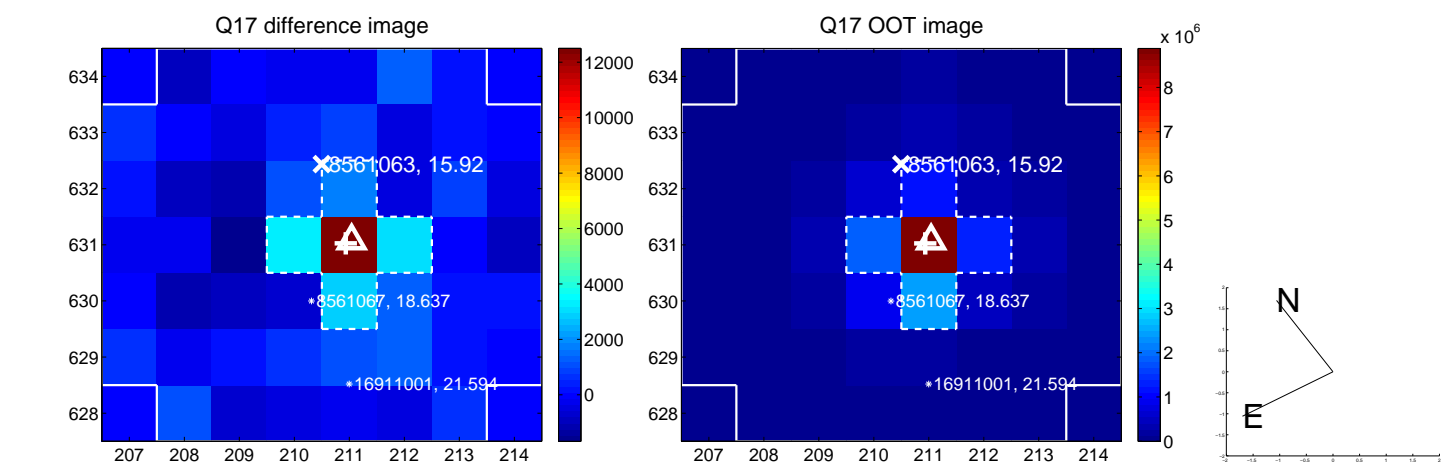
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



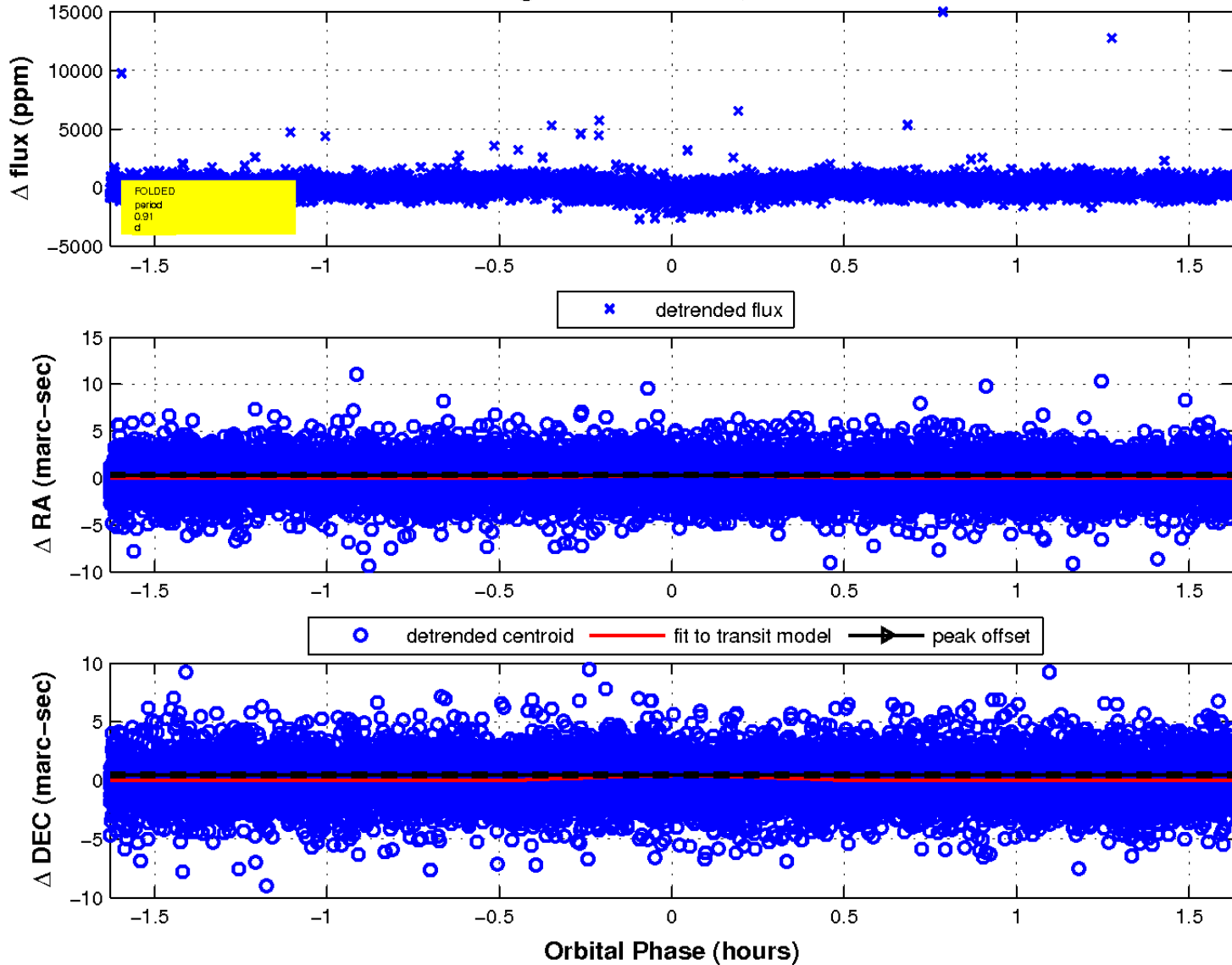
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



fluxWeightedCentroids, Planet 4 of 4



UKIRT Image

Declination

