

# KIC 012306808

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|---------|--------|-----------------------------|-----------------|------------------------|------------------------|
| 012306808-01 | OBS      | 7521.01 | 37.878464     | 138.128811   | 219541.5    | 10.662           | 13890.0 | 5929.2 | 0.76                        | 5985            | 47.48                  | 15.22                  |
| 012306808-02 | OBS      | No      | 37.878482     | 159.173983   | 169013.5    | 12.421           | 9956.5  | 6360.1 | 0.76                        | 5985            | 45.32                  | 15.22                  |
| 012306808-03 | OBS      | No      | 286.959478    | 220.873763   | 4316.9      | 3.500            | 68.4    | -1.0   | 0.76                        | 5985            | 5.00                   | 1.02                   |
| 012306808-04 | OBS      | 7521.02 | 7.334455      | 137.092240   | 256.2       | 2.678            | 21.8    | 24.1   | 0.76                        | 5985            | 1.97                   | 135.87                 |
| 012306808-05 | OBS      | No      | 308.861042    | 152.279600   | 339.8       | 3.755            | 9.9     | 5.0    | 0.76                        | 5985            | 1.59                   | 0.93                   |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments   |
|--------------|----------|------|-------|---|---|---|---|--|
| 012306808-01 | OBS      | FP   | 0.00  | 0 | 1 | 0 | 0 | MOD_SEC_DV—DEEP_V_SHAPED—HAS_SEC_TCE   |
| 012306808-02 | OBS      | FP   | 0.00  | 1 | 1 | 0 | 0 | IS_SEC_TCE   |
| 012306808-03 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_MARSHALL_SKYE_ZUMA—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_NOFITS |
| 012306808-04 | OBS      | FP   | 0.00  | 0 | 0 | 1 | 0 | CENT_RESOLVED_OFFSET—HALO_GHOST  |
| 012306808-05 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS                         |

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

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

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

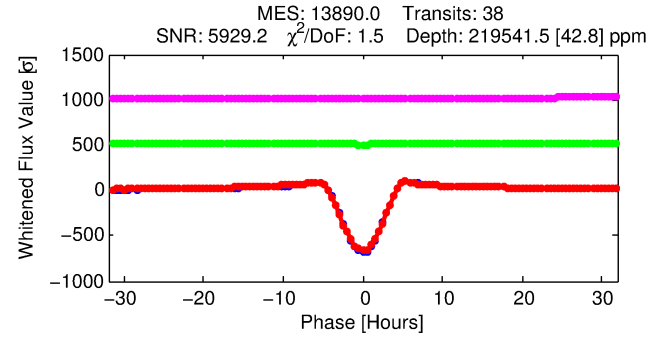
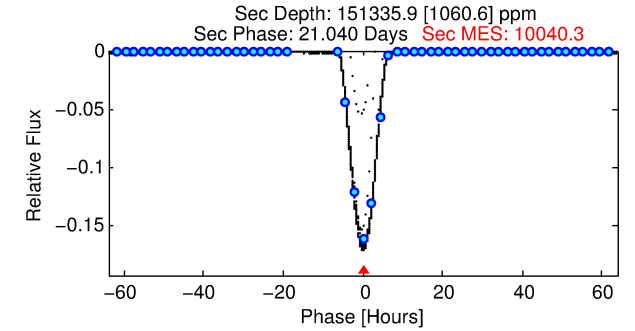
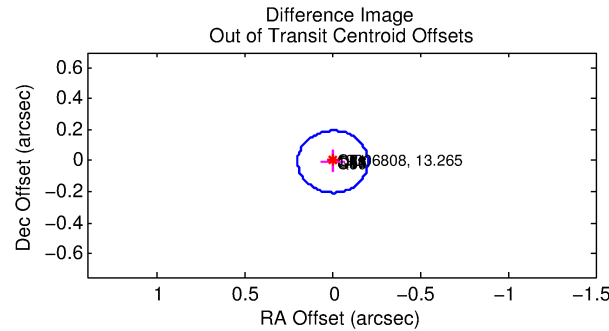
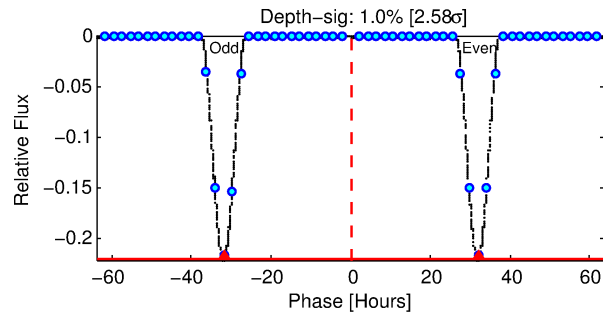
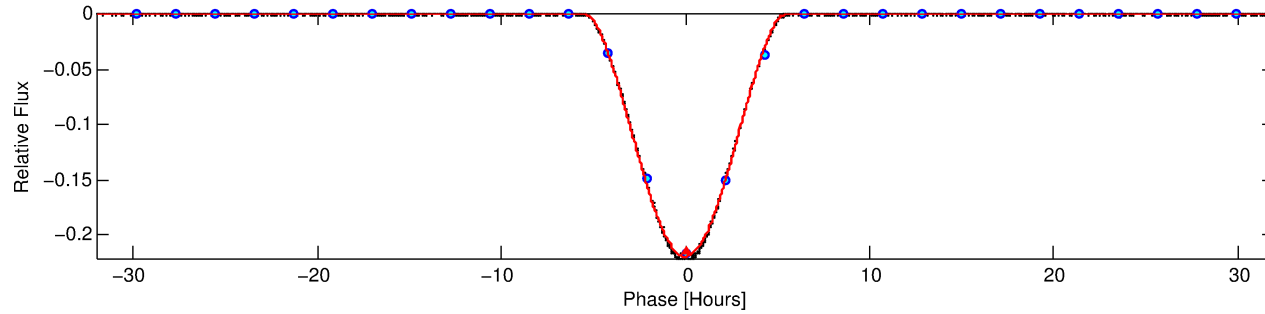
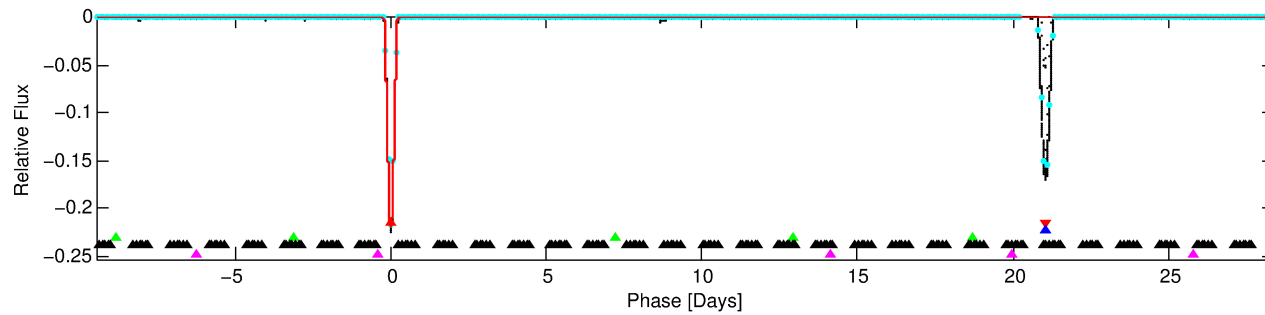
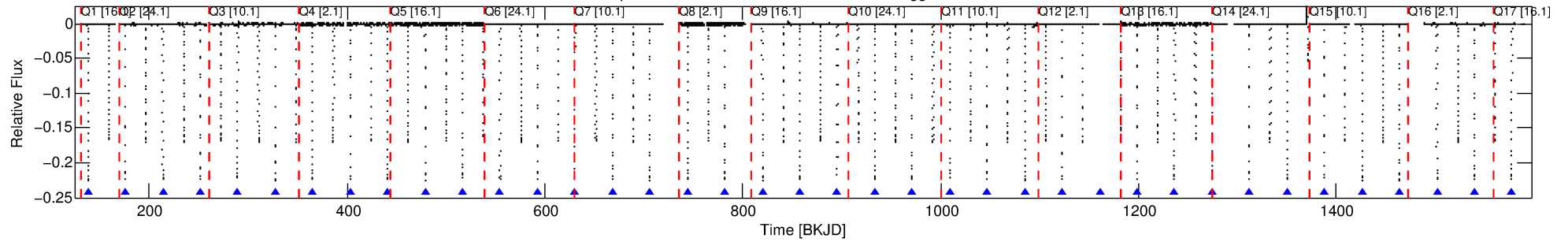
Ephemeris Match Information For 012306808-01

No Significant Match Found

# DV One-Page Summary

KIC: 12306808 Candidate: 1 of 5 Period: 37.878 d  
KOI: K07521.01 Corr: 0.996

Kp: 13.27 R\*: 0.76 Rs Teff: 5985.0 K Logg: 4.60 Fe/H: -0.780



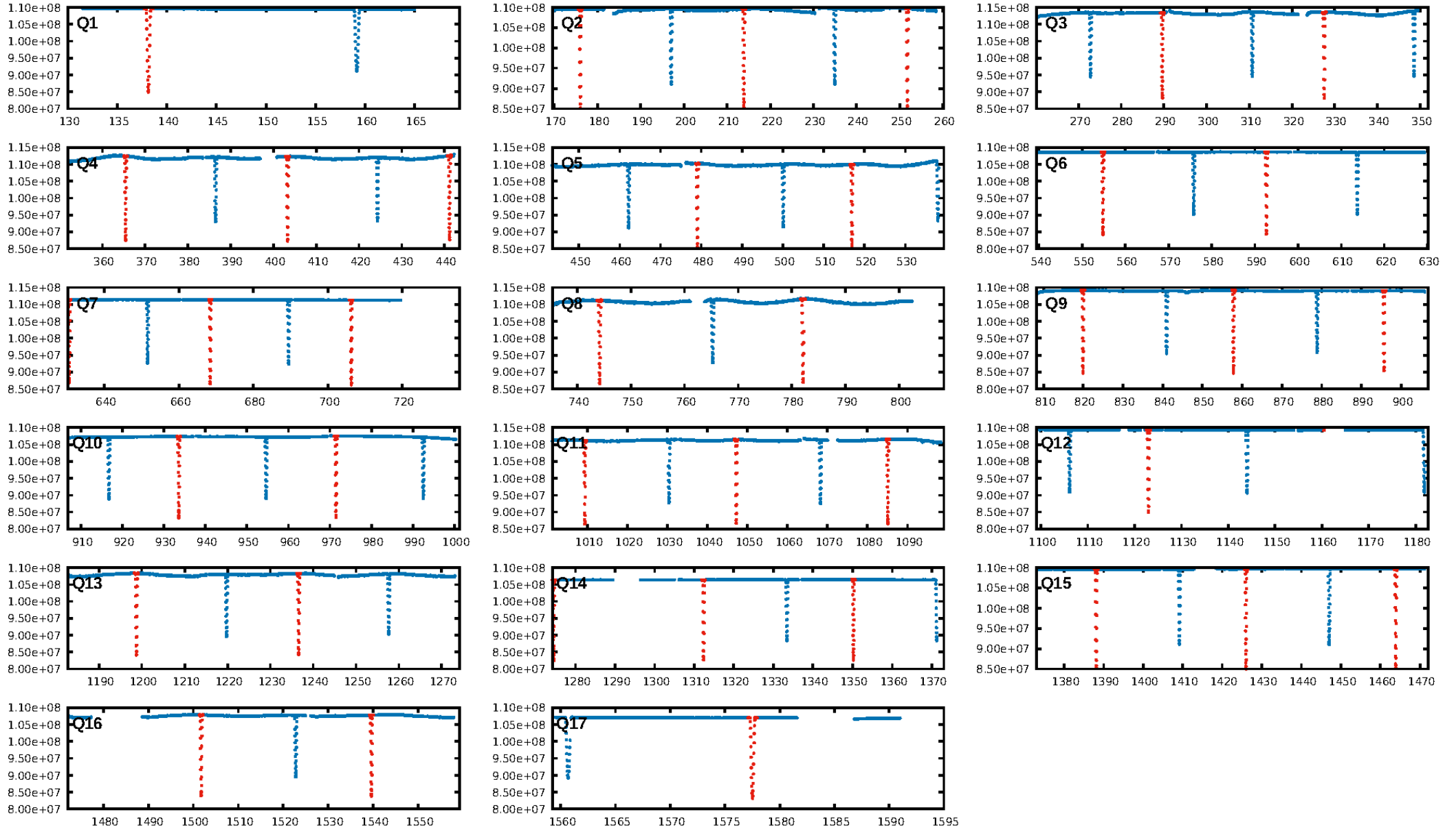
## DV Fit Results:

Period = 37.87846 [0.00000] d  
Epoch = 138.1288 [0.0000] BKJD  
Rp/R\* = 0.5740 [0.0112]  
a/R\* = 36.97 [0.09]  
b = 0.79 [0.02]  
Seff = 15.22 [4.69]  
Teq = 504 [39] K  
Rp = 47.48 [10.69] Re  
a = 0.2083 [0.0404] AU  
Ag = 1602.75 [467.28] [3.43σ]  
Teffp = 4927 [141] K [30.20σ]

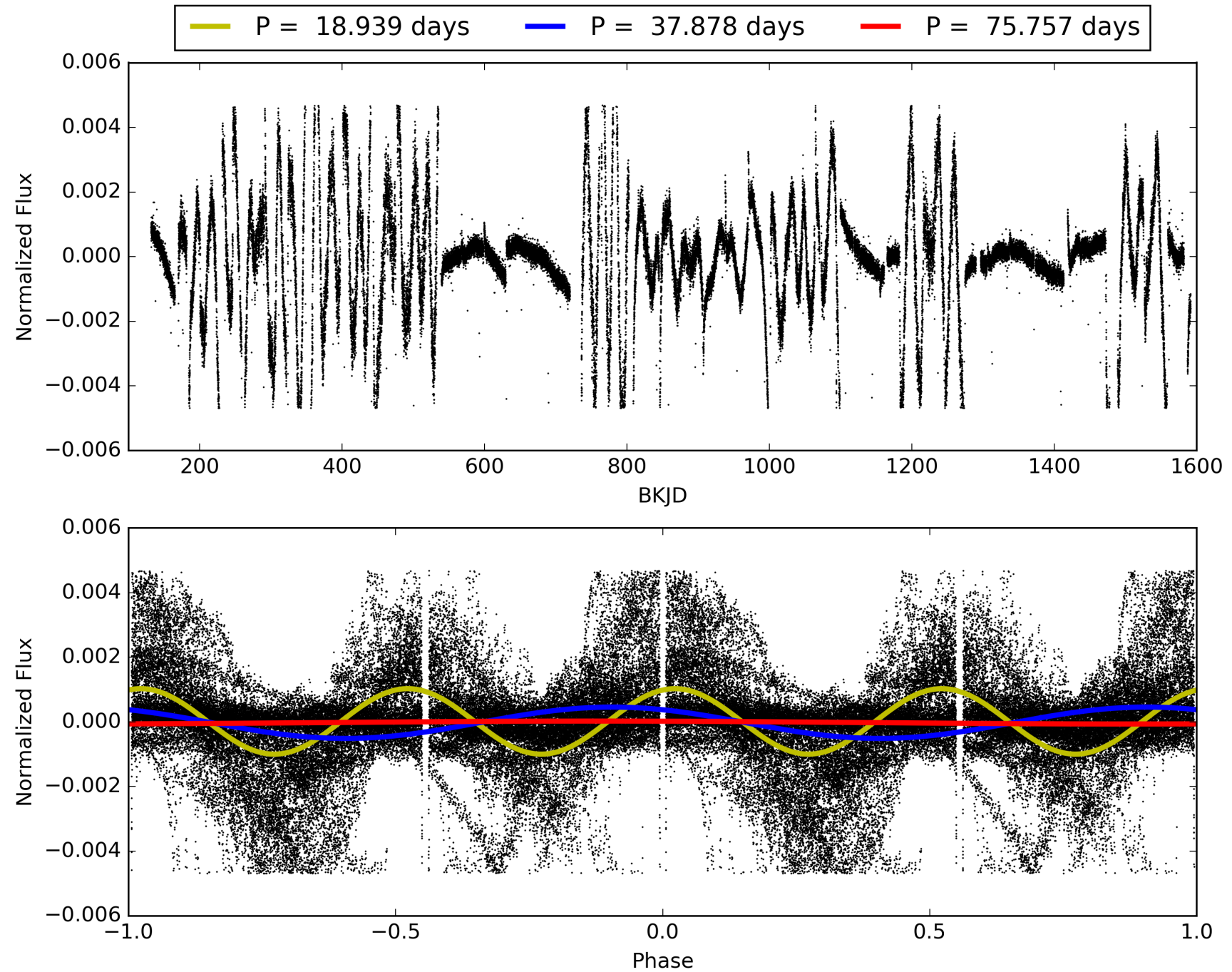
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [66.68σ]  
LongPeriod-sig: 0.0% [0.00σ]  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 0.0%  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [36/36]  
GhostDiagnostic-chr: 4.978  
Centroid-sig: 0.0%  
Centroid-so: 0.173 arcsec [271.44σ]  
OotOffset-rm: 0.006 arcsec [0.10σ]  
KicOffset-rm: 0.129 arcsec [1.91σ]  
OotOffset-st: 4/4/3/5 [16]  
KicOffset-st: 4/4/3/5 [16]  
DiffImageQuality-fgm: 1.00 [16/16]  
DiffImageOverlap-fno: 0.94 [15/16]

# TCE 012306808-01, PDC Light Curves



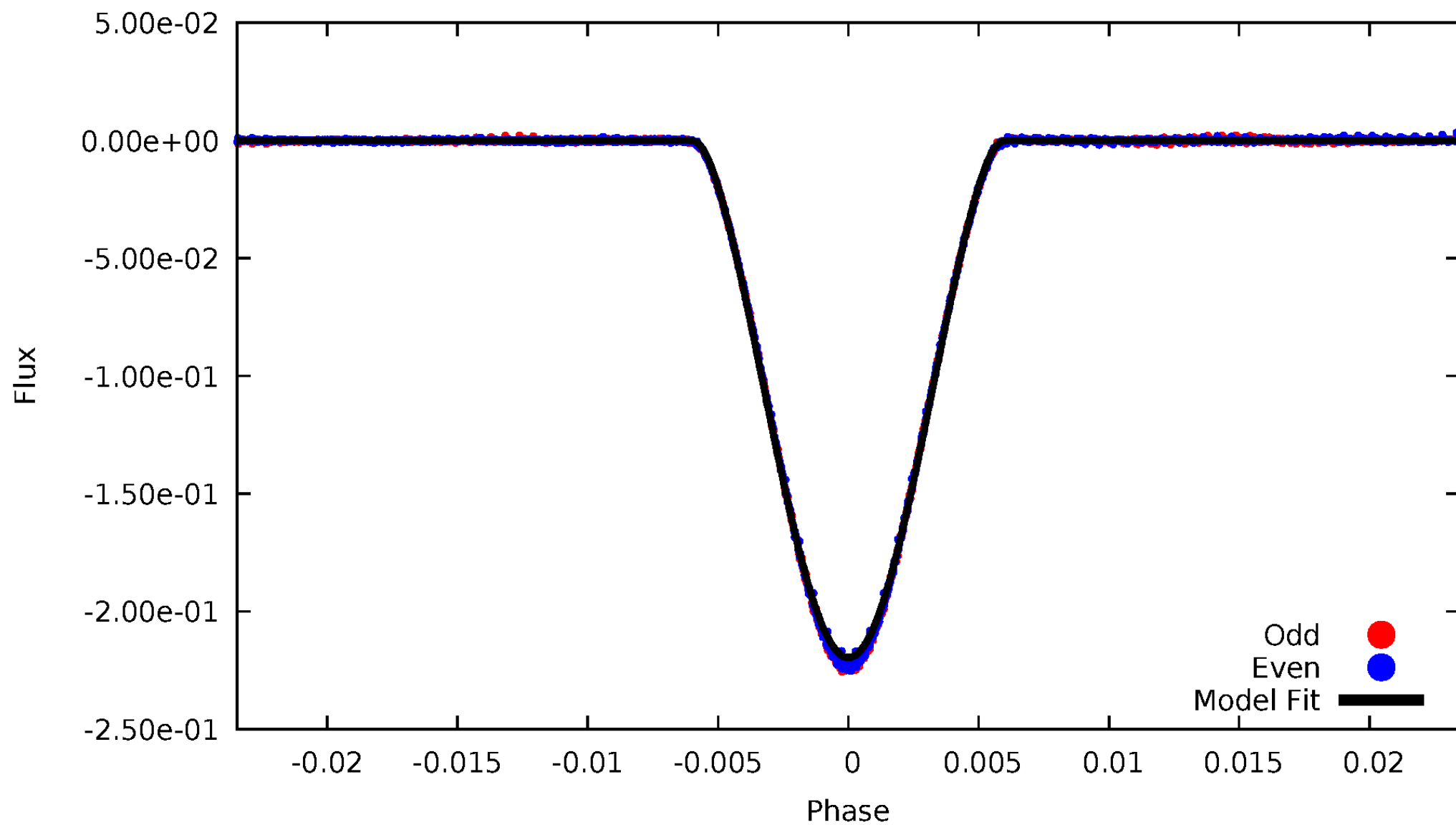
TCE 012306808-01





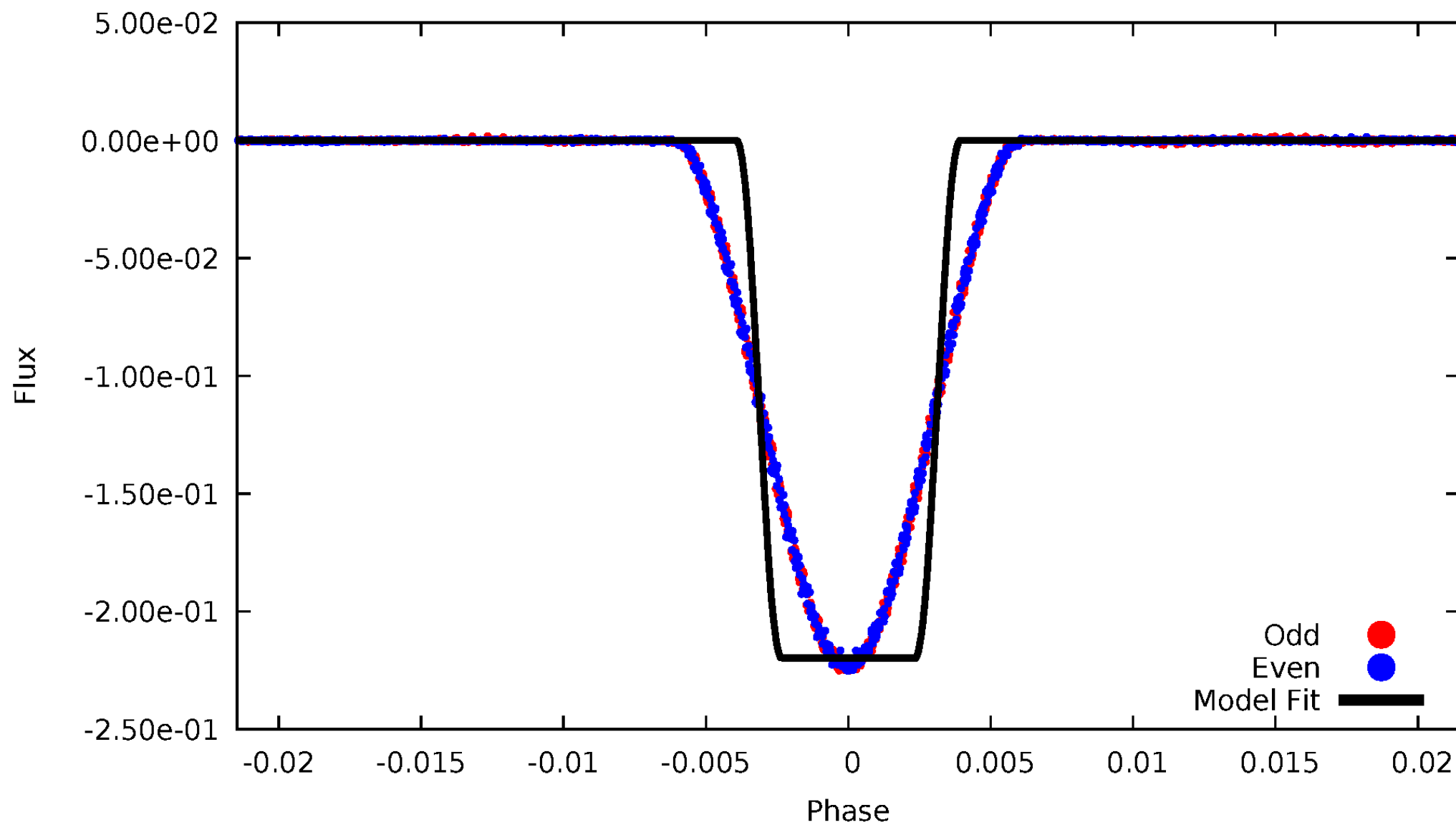
# DV Odd/Even

TCE 012306808-01



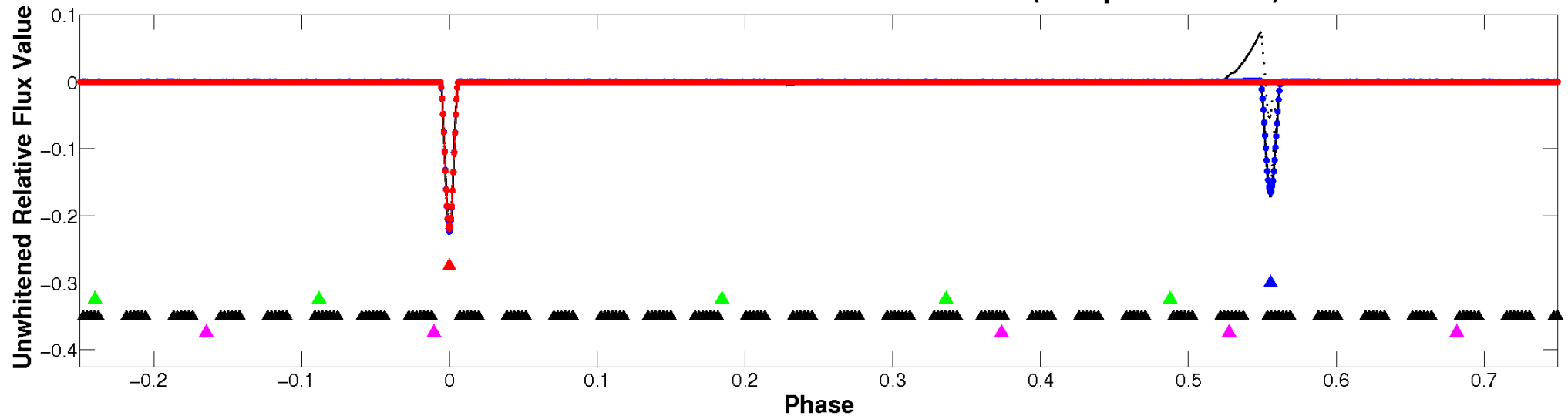
# ALT Odd/Even

TCE 012306808-01

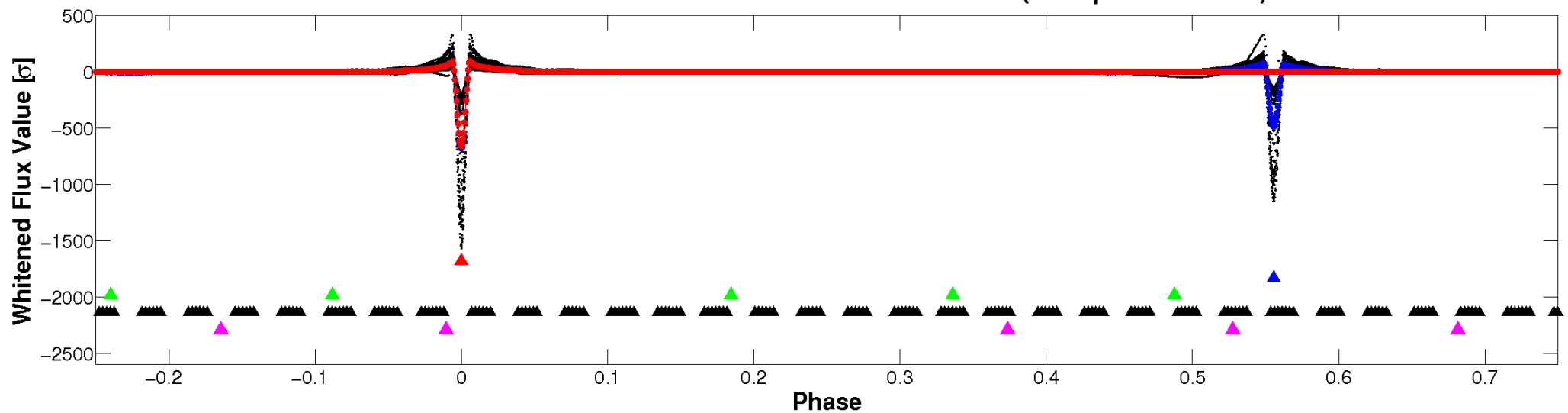


# Non-Whitened Vs. Whitened Light Curve

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

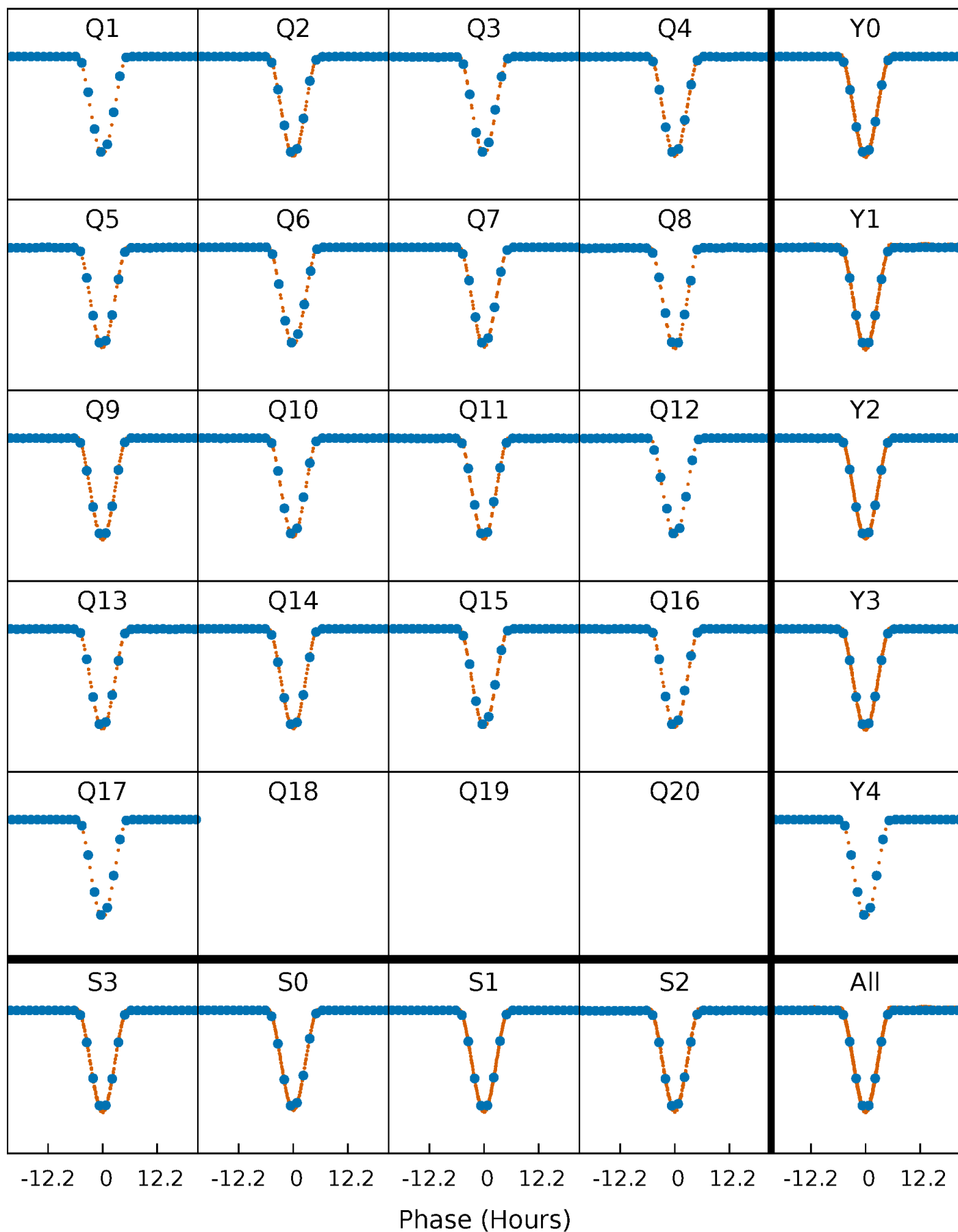


## Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



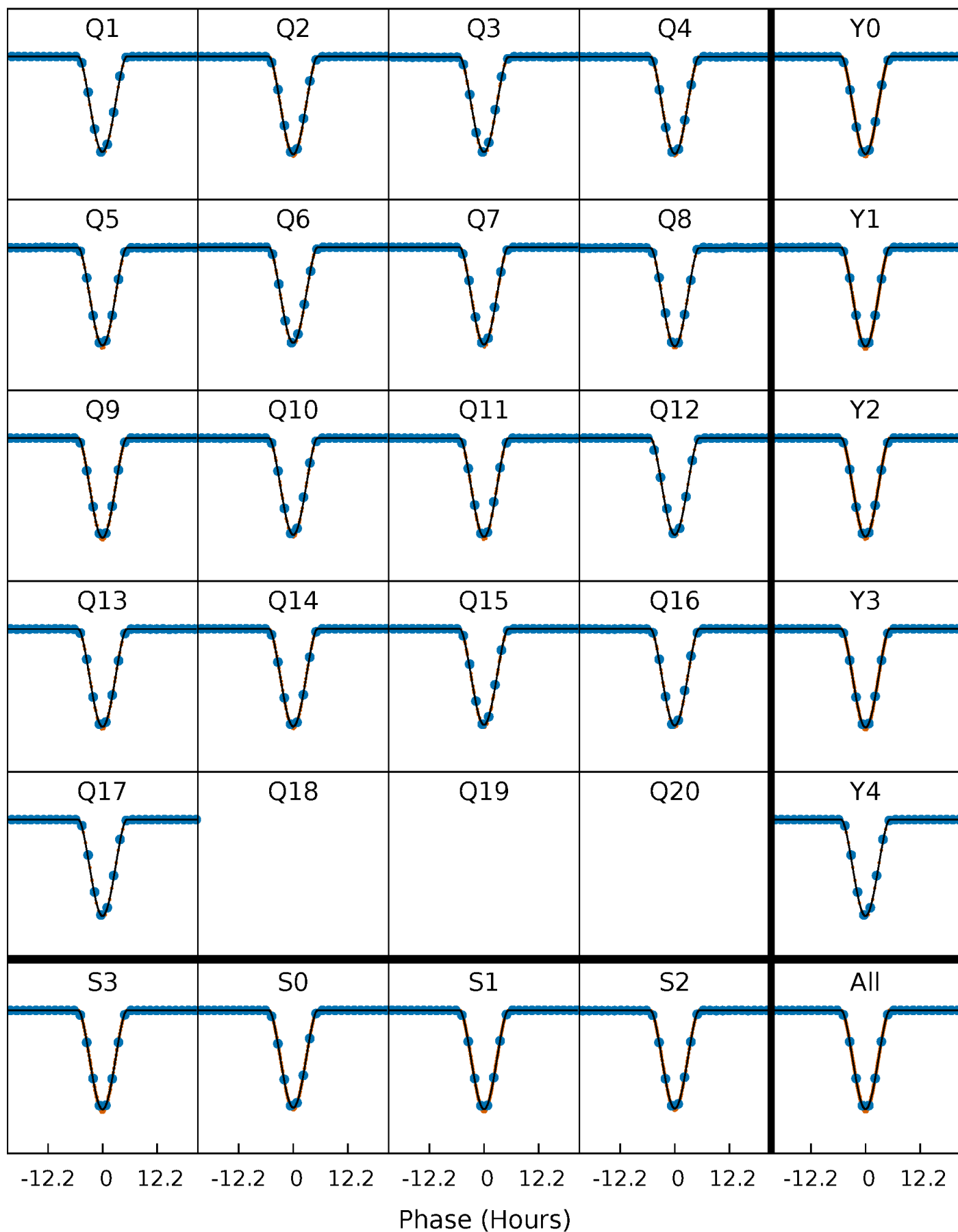
# PDC Quarter-Phased Transit Curves

TCE 012306808-01 P= 37.878464 Days  $T_0=138.128812$  (BKJD)



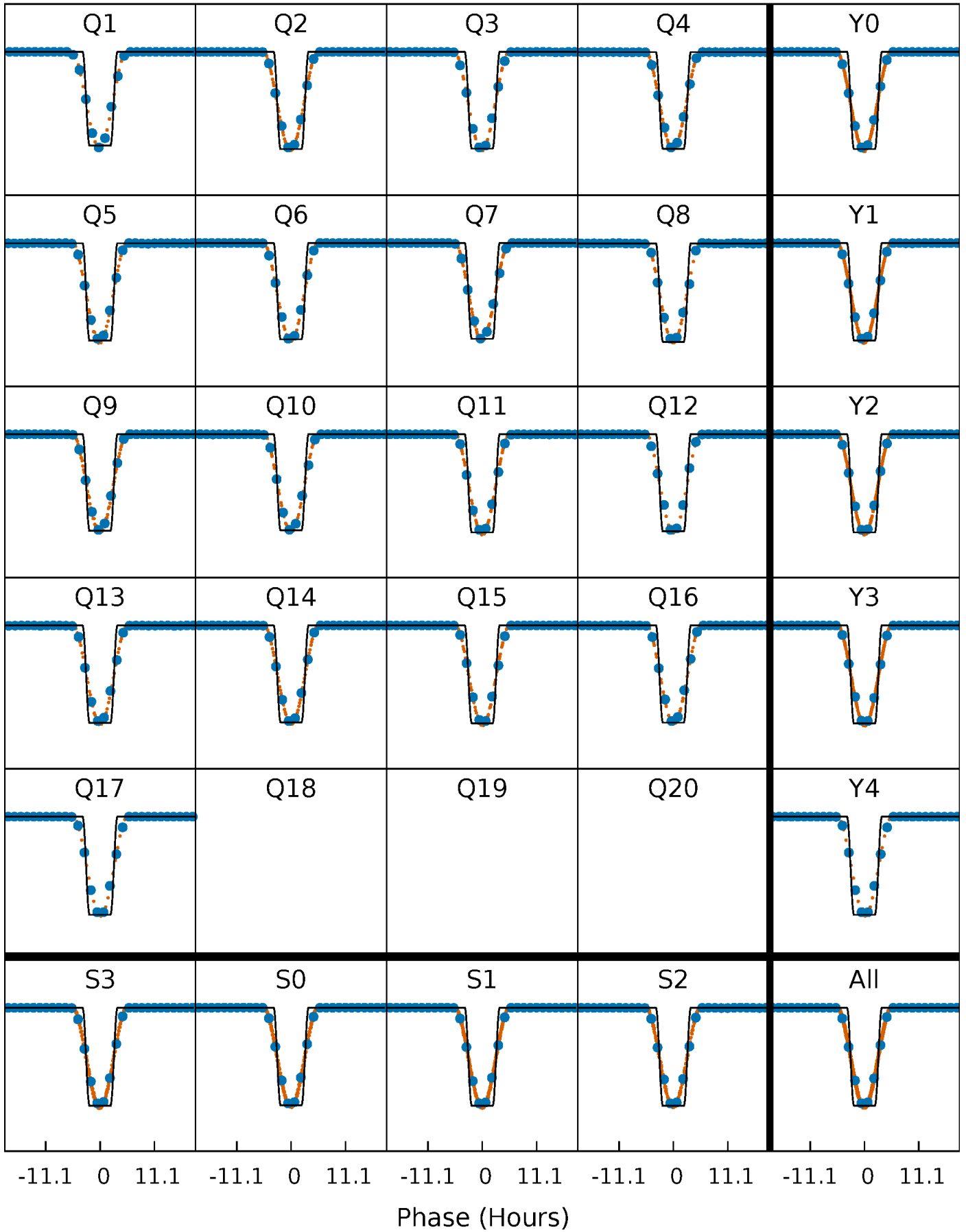
# DV Quarter-Phased Transit Curves

TCE 012306808-01 P= 37.878464 Days  $T_0=138.128812$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 012306808-01   P= 37.878252 Days    $T_0=138.133634$  (BKJD)

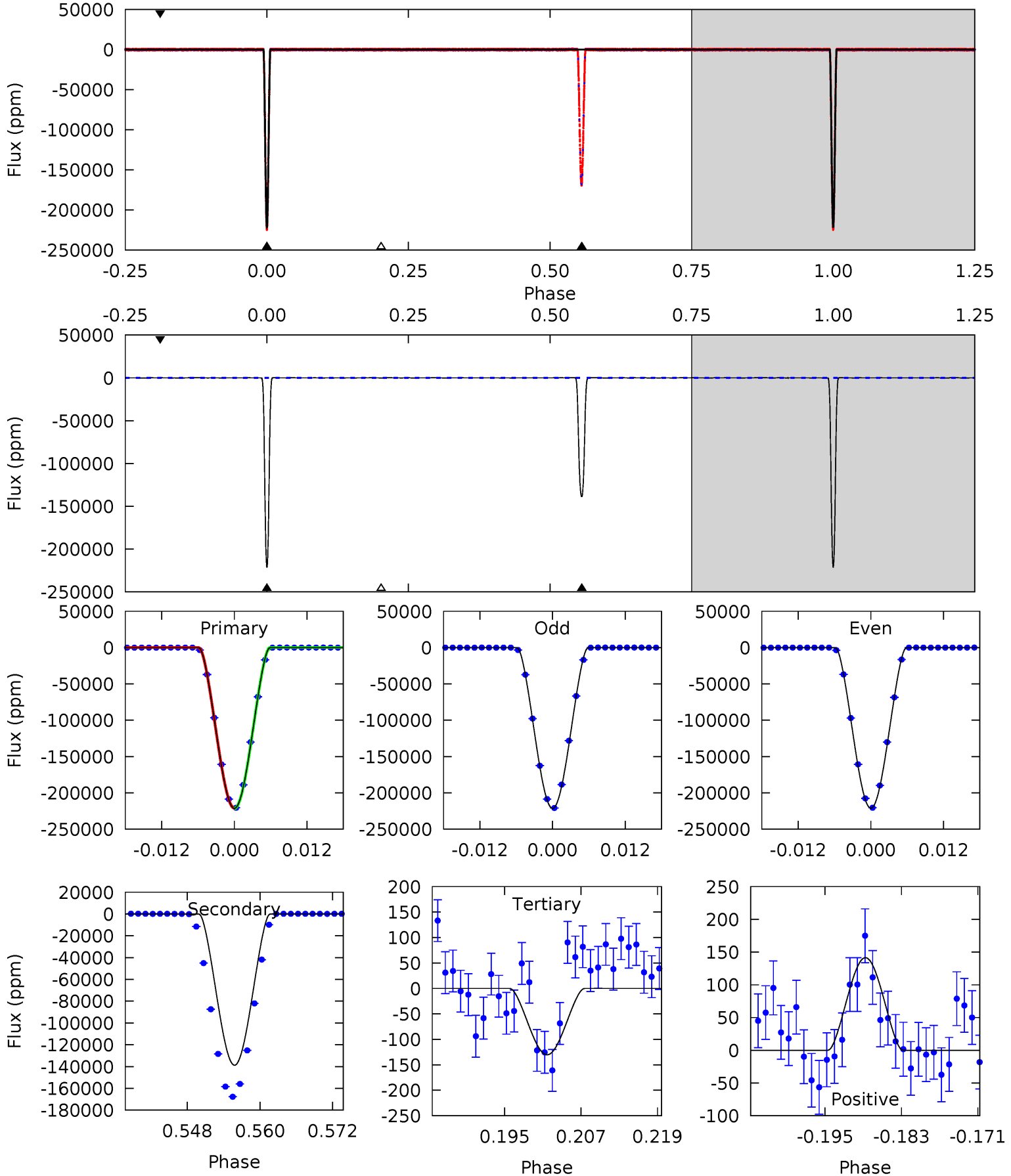




# DV Model-Shift Uniqueness Test

012306808-01, P = 37.878464 Days, E = 100.250348 Days

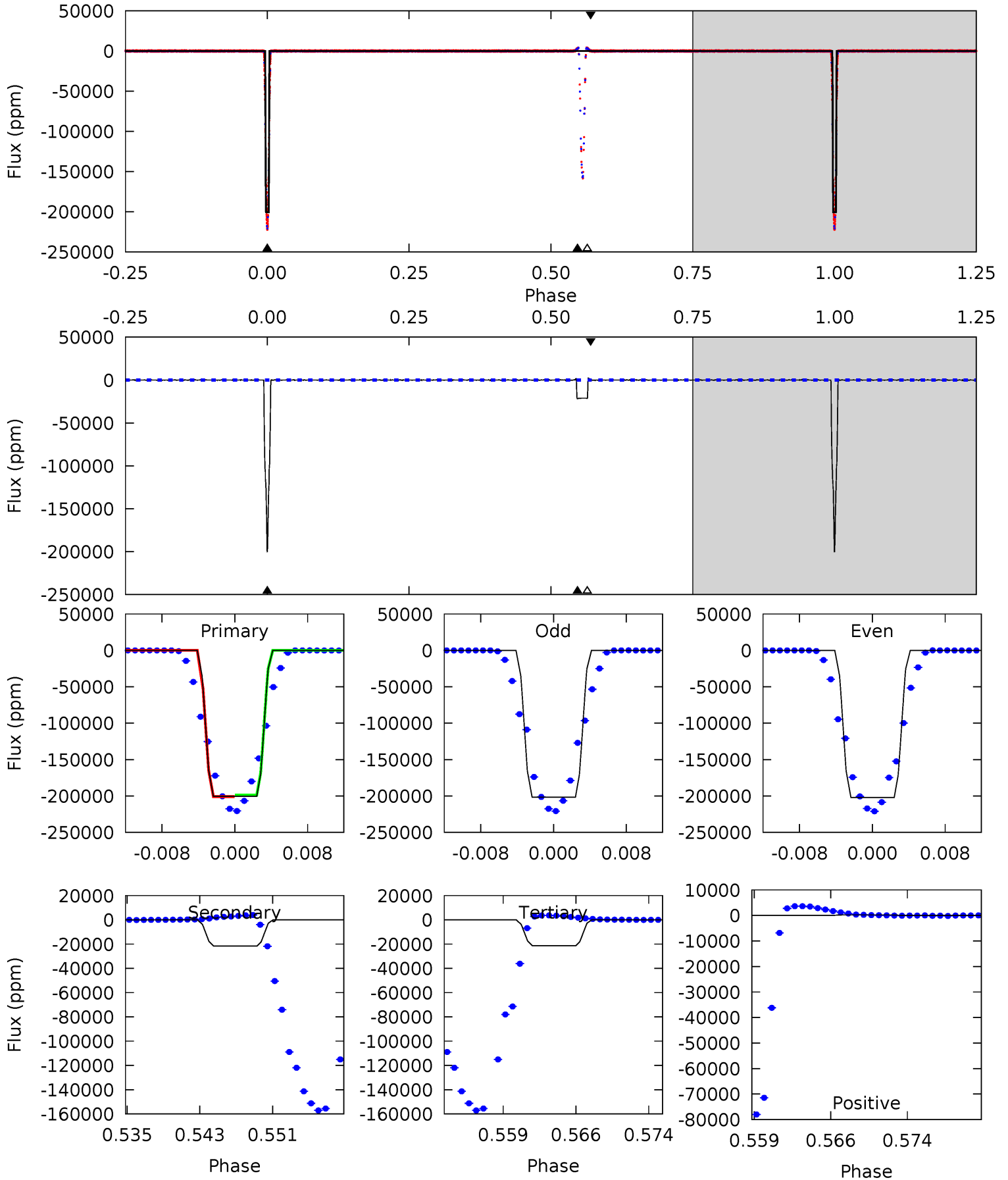
| Pri   | Sec   | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT |
|-------|-------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|-----|
| 17604 | 11040 | 10.4 | 11.3 | 4.99            | 2.51            | 4.42             | 17594   | 17593   | 11030   | 11029   | 8.19    | 1.00 | 0.00  | 0   |



# Alt Model-Shift Uniqueness Test

012306808-01, P = 37.878252 Days, E = 100.255382 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 |
|------|-------|-------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|-----|
| 1245 | 134.5 | 132.6 | 1.29 | 5.07            | 2.66            | 3.77             | 1113    | 1244    | 1.90    | 133.2   | 1.08    | 1.00 | 0.01  | 0   |



### Stellar Parameters For KIC 012306808

|        | $T_{\text{eff}}(K)$  | $\log(g)$                 | [Fe/H]                     | $R$ ( $R_{\odot}$ )       | $M(M_{\odot})$            | $p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ ) |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
|        | $5985^{+143}_{-161}$ | $4.603^{+0.028}_{-0.161}$ | $-0.780^{+0.300}_{-0.300}$ | $0.758^{+0.170}_{-0.057}$ | $0.846^{+0.071}_{-0.087}$ | $2.738^{+0.437}_{-1.226}$                     |
|        | +2%/-3%              | +1%/-3%                   | +38%/-38%                  | +22%/-8%                  | +8%/-10%                  | +16%/-45%                                     |
| Source | PHO1                 | KIC0                      | KIC0                       | DSEP                      |                           |   |

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

### Secondary Eclipse Parameters for KIC 012306808-01 / KOI 7521.01

| Detrend | Depth (ppm)      | $R_p$ ( $R_{\oplus}$ )  | $T_{max}$ (K)     | $T_{obs}$ (K)        | $A_{obs}$            |
|---------|------------------|-------------------------|-------------------|----------------------|----------------------|
| DV      | $-138751 \pm 13$ | $49.47^{+5.77}_{-3.55}$ | $720^{+38}_{-28}$ | $5074^{+120}_{-116}$ | $1574^{+180}_{-300}$ |
| Alt.    | $-21658 \pm 161$ | $39.96^{+4.72}_{-2.55}$ | $718^{+37}_{-28}$ | $3763^{+68}_{-80}$   | $327^{+34}_{-61}$    |

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

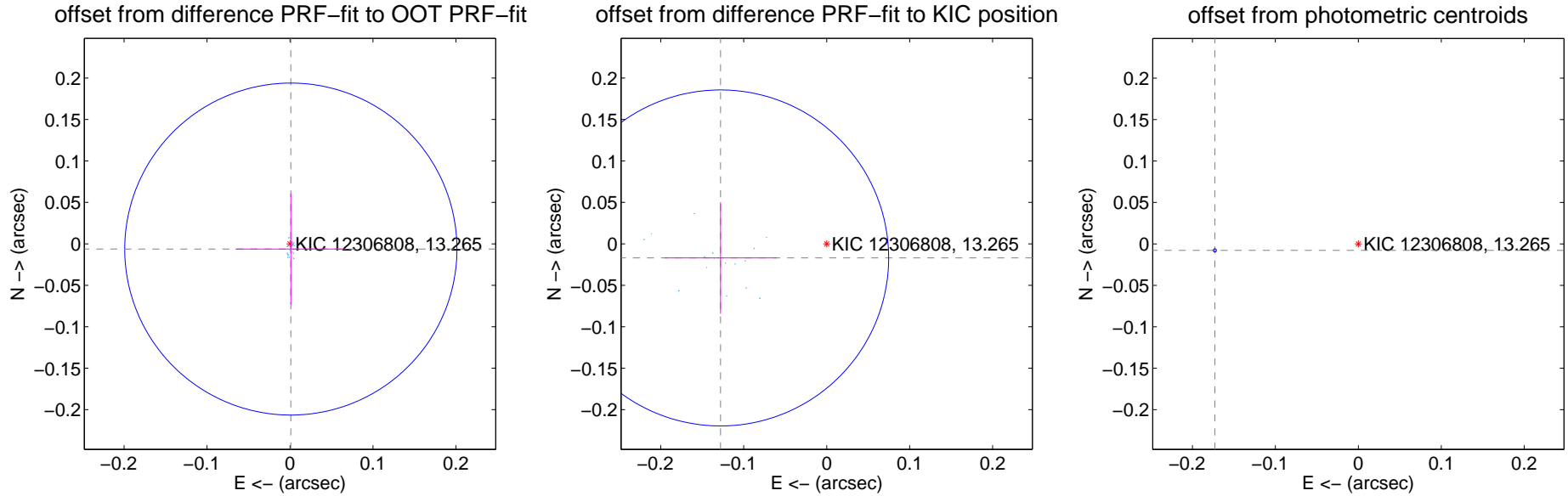
## DV Centroid Data

Supplemental centroid analysis for 012306808-01. Kepler magnitude: 13.27. Transit SNR 5929.16

There are 16 quarters with good PRF difference image offsets

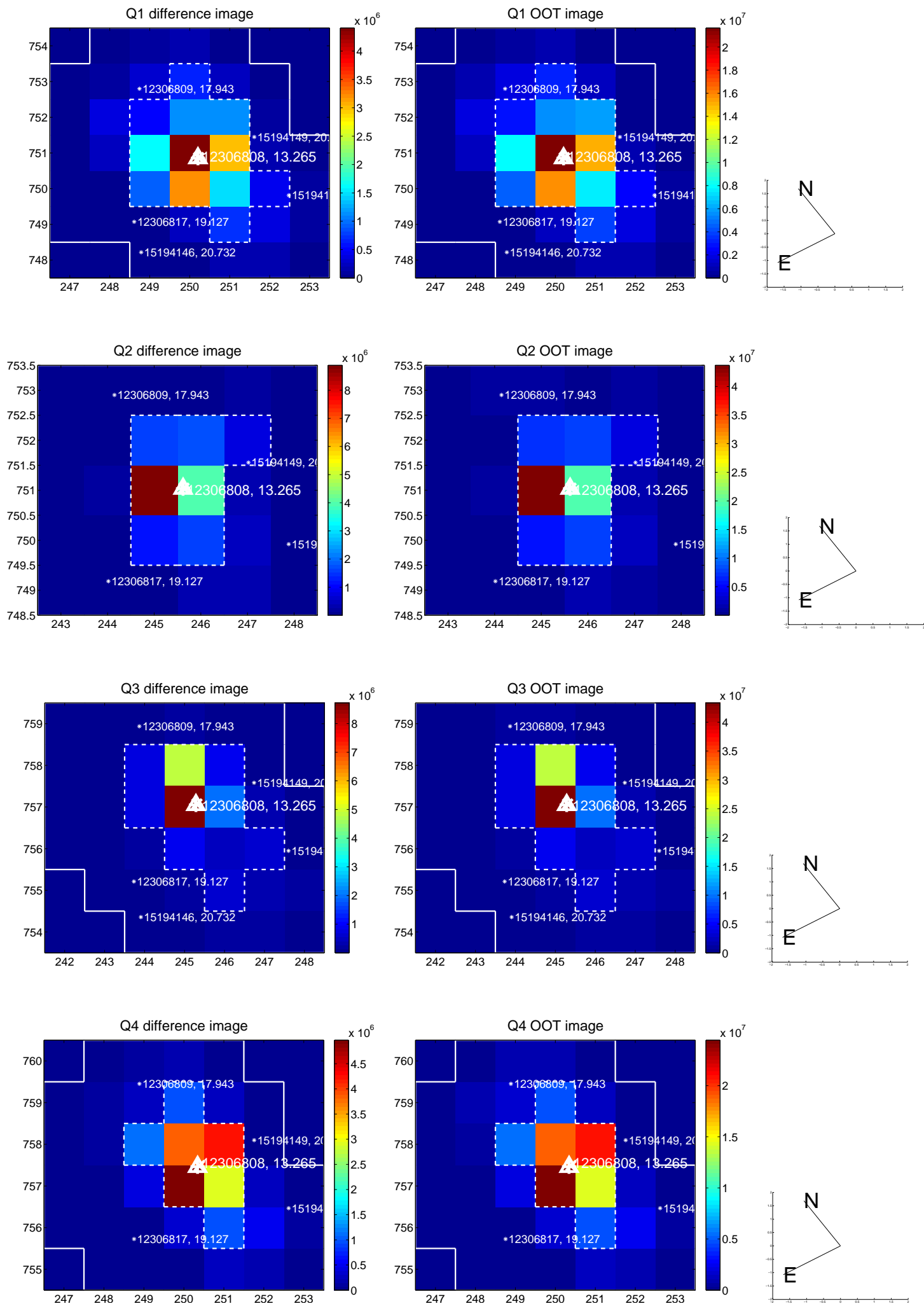
The direct PRF centroid is offset from the target star catalog position by about 0.14 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA        | $\Delta$ Dec       |
|---|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT          | $0.006 \pm 0.067$  | 0.10                | $-0.001 \pm 0.067$ | $-0.006 \pm 0.067$ |
| PRF-fit source offset from KIC position | $0.129 \pm 0.068$  | 1.91                | $0.128 \pm 0.068$  | $-0.017 \pm 0.067$ |
| photometric centroid source offset      | $0.17 \pm 0.00$    | 271.44              | $0.17 \pm 0.00$    | $-0.01 \pm 0.00$   |

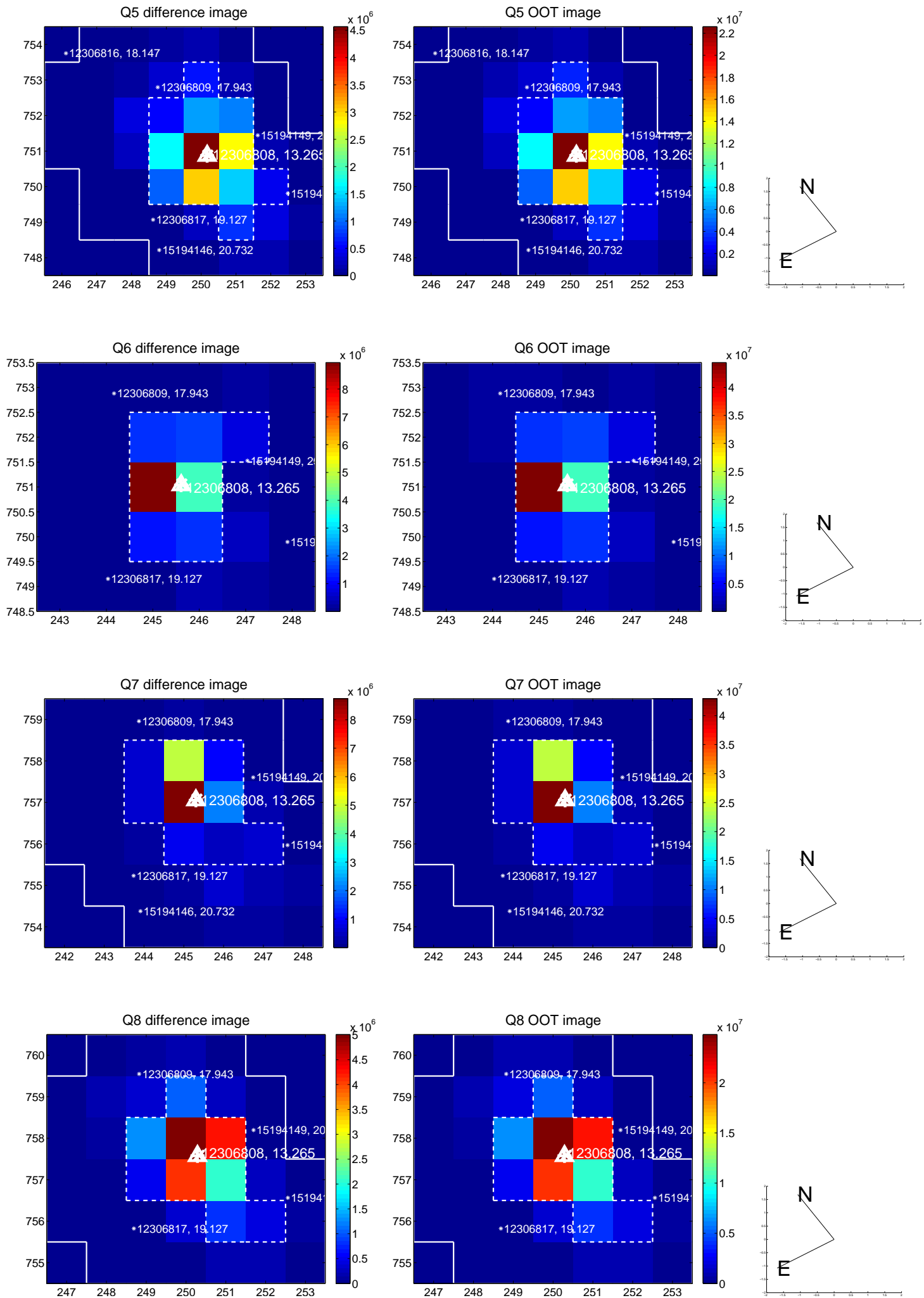


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

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

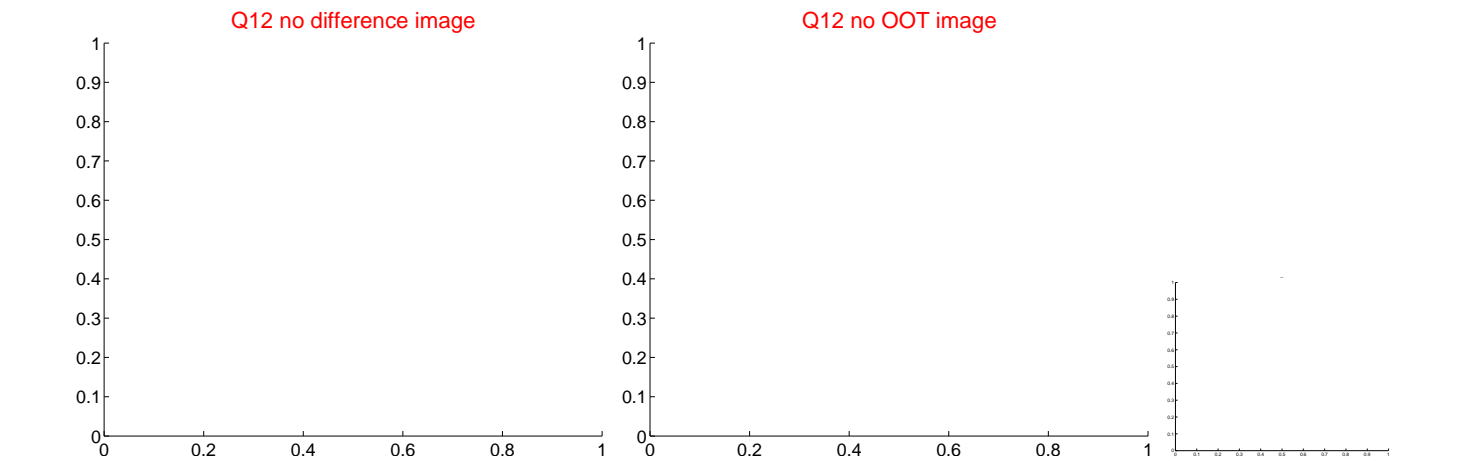
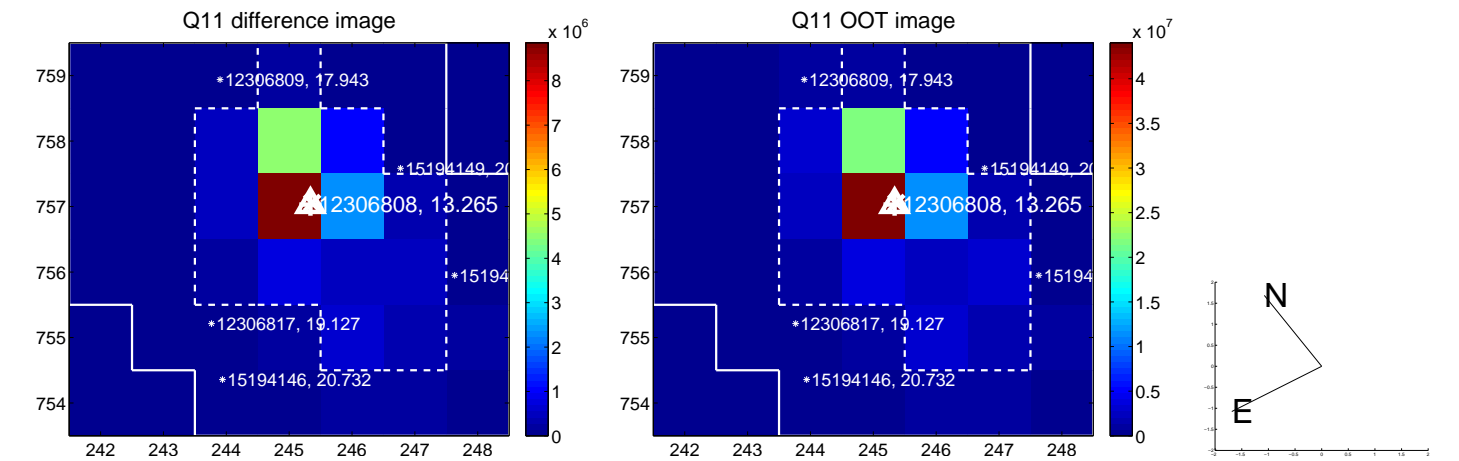
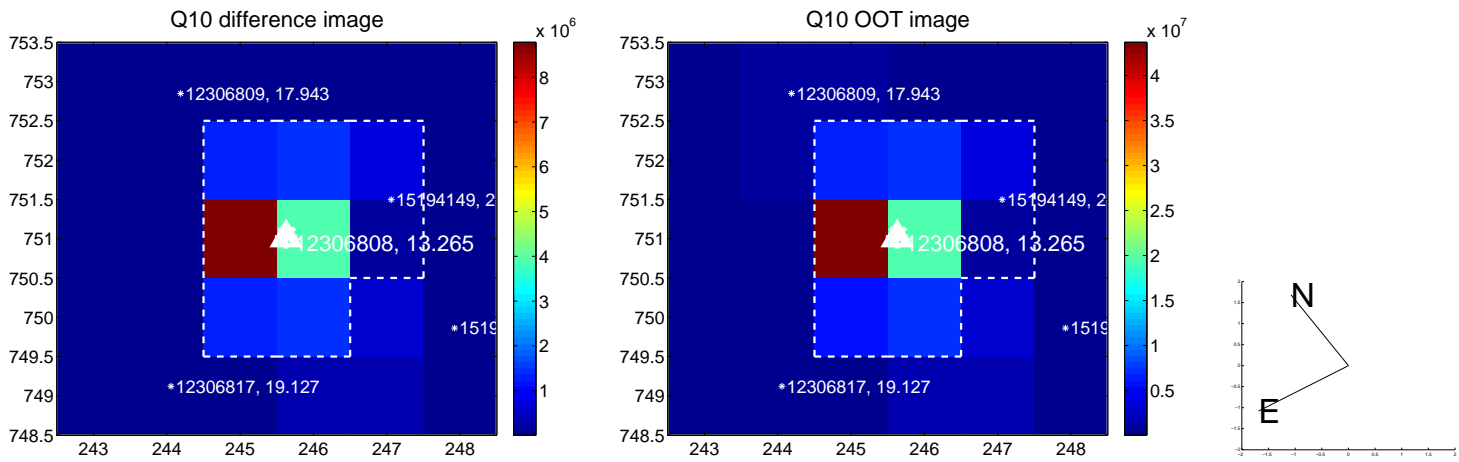
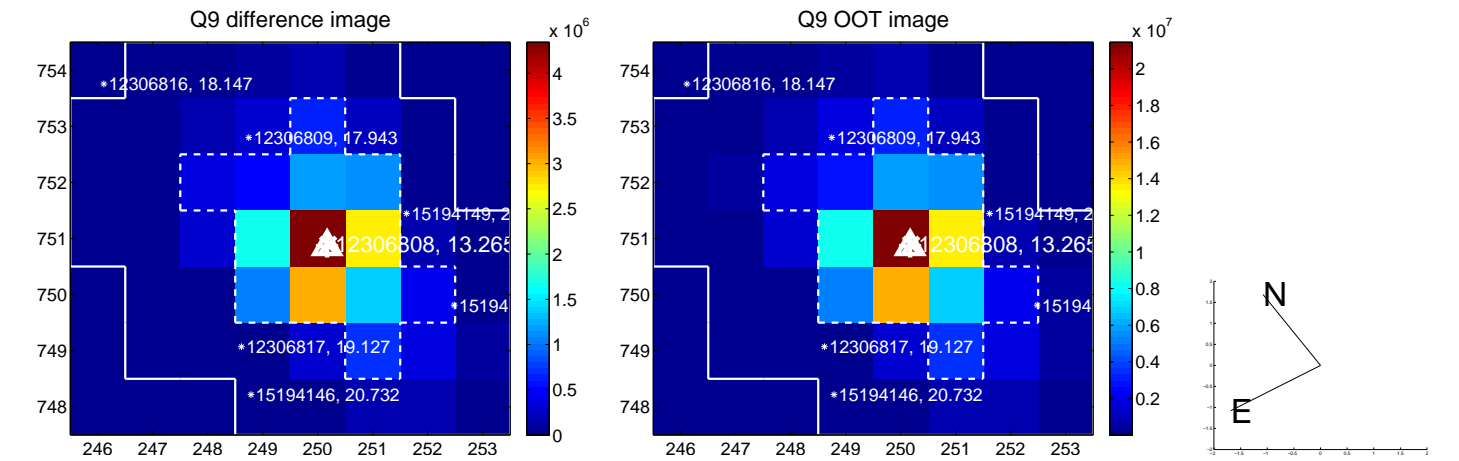


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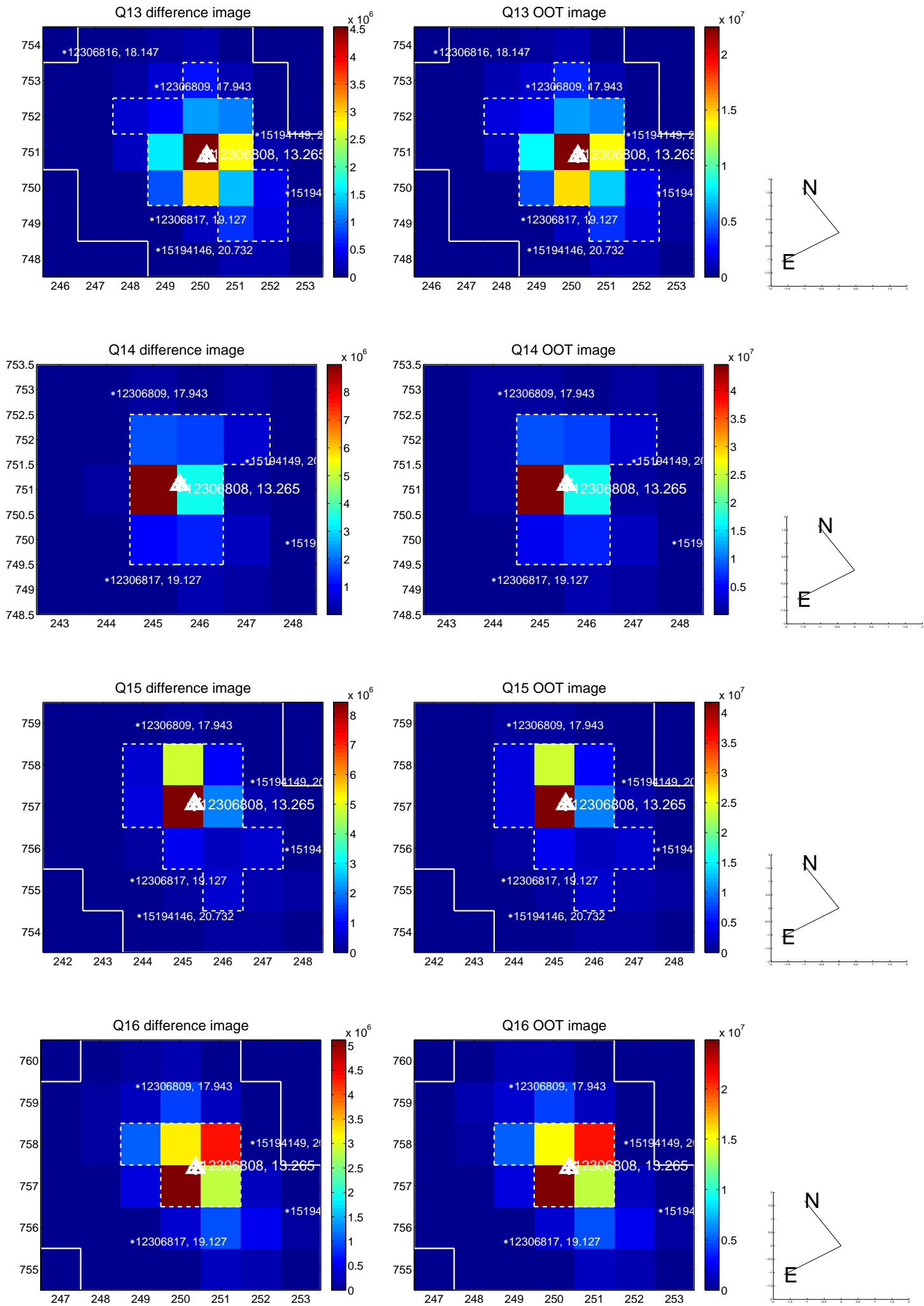




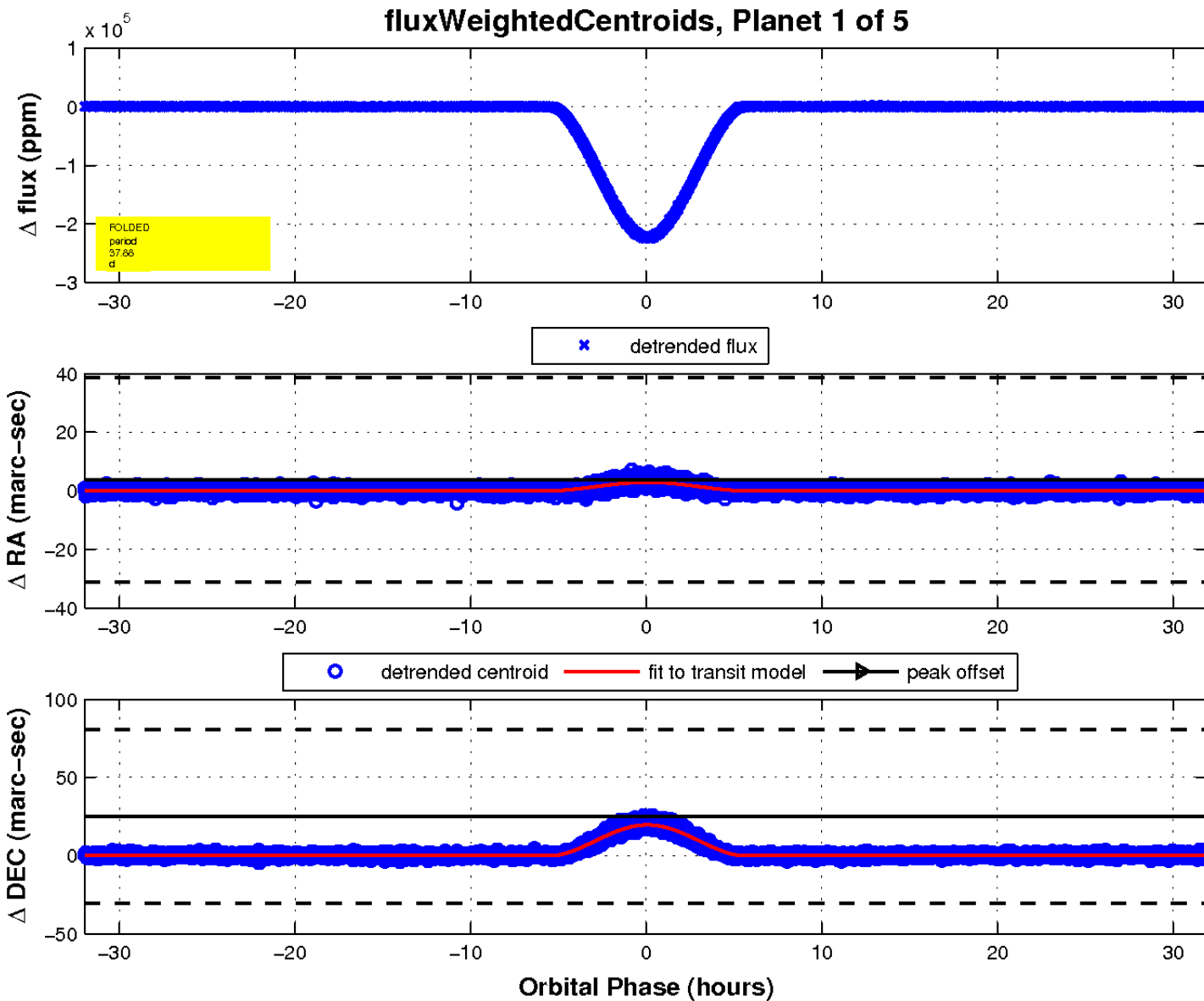
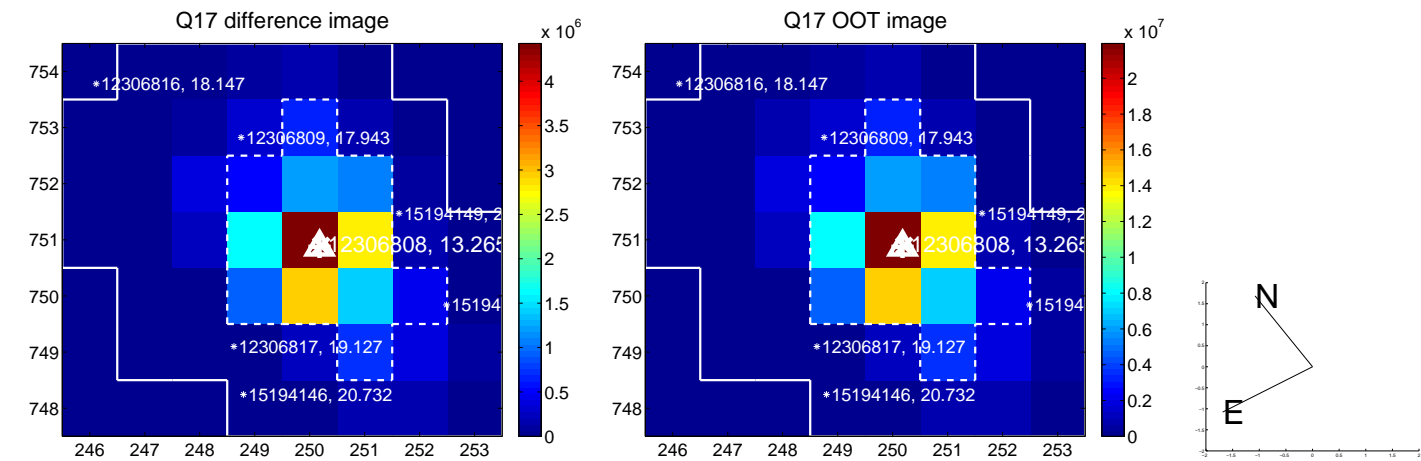
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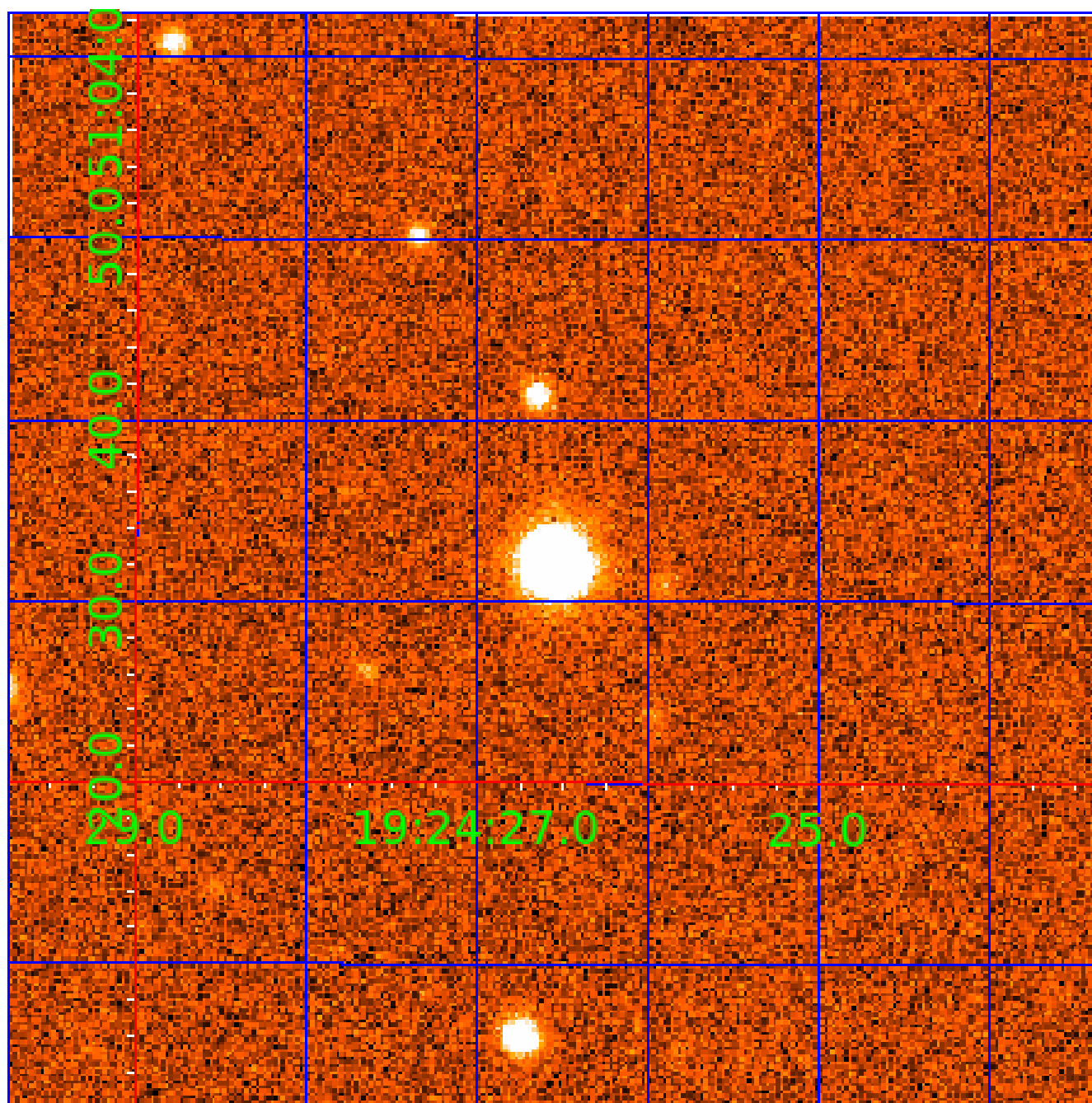


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# UKIRT Image

Declination



# KIC 012306808

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|---------|--------|-----------------------------|-----------------|------------------------|------------------------|
| 012306808-01 | OBS      | 7521.01 | 37.878464     | 138.128811   | 219541.5    | 10.662           | 13890.0 | 5929.2 | 0.76                        | 5985            | 47.48                  | 15.22                  |
| 012306808-02 | OBS      | No      | 37.878482     | 159.173983   | 169013.5    | 12.421           | 9956.5  | 6360.1 | 0.76                        | 5985            | 45.32                  | 15.22                  |
| 012306808-03 | OBS      | No      | 286.959478    | 220.873763   | 4316.9      | 3.500            | 68.4    | -1.0   | 0.76                        | 5985            | 5.00                   | 1.02                   |
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| 012306808-05 | OBS      | No      | 308.861042    | 152.279600   | 339.8       | 3.755            | 9.9     | 5.0    | 0.76                        | 5985            | 1.59                   | 0.93                   |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments   |
|--------------|----------|------|-------|---|---|---|---|--|
| 012306808-01 | OBS      | FP   | 0.00  | 0 | 1 | 0 | 0 | MOD_SEC_DV—DEEP_V_SHAPED—HAS_SEC_TCE   |
| 012306808-02 | OBS      | FP   | 0.00  | 1 | 1 | 0 | 0 | IS_SEC_TCE   |
| 012306808-03 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_MARSHALL_SKYE_ZUMA—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_NOFITS |
| 012306808-04 | OBS      | FP   | 0.00  | 0 | 0 | 1 | 0 | CENT_RESOLVED_OFFSET—HALO_GHOST  |
| 012306808-05 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS                         |

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

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

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

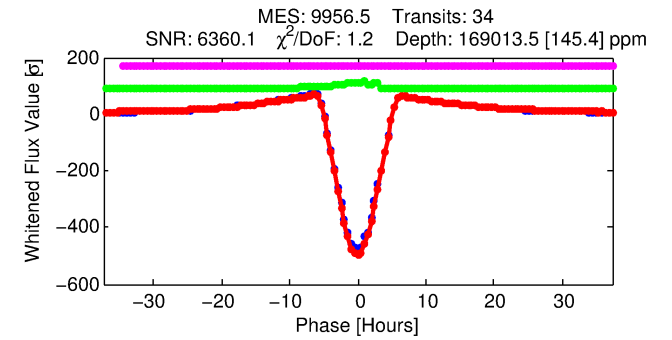
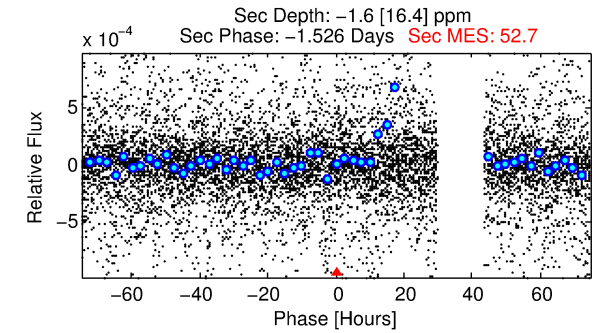
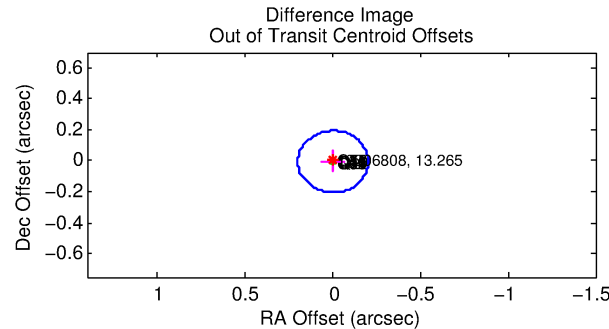
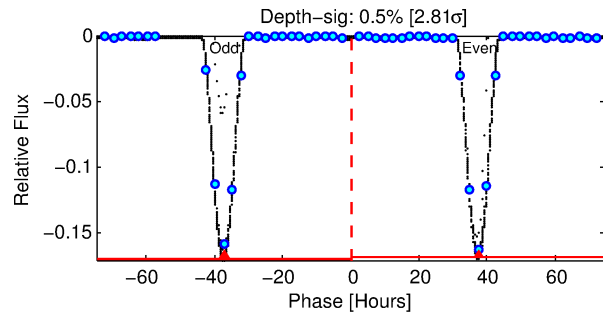
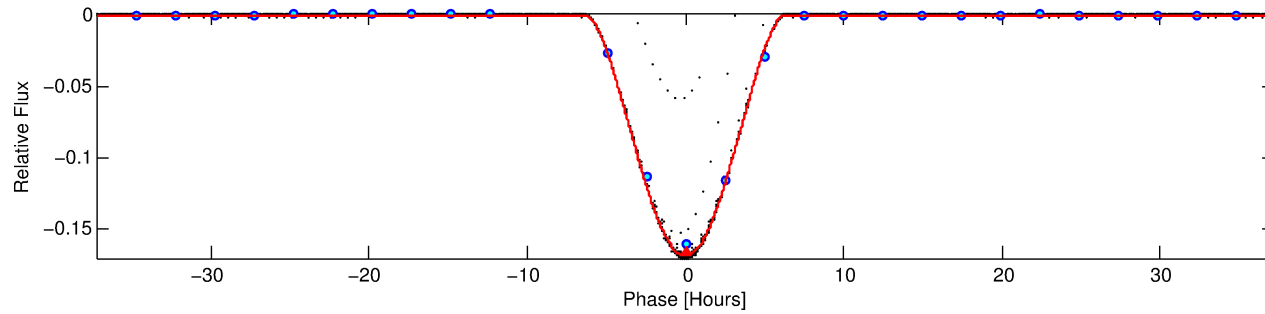
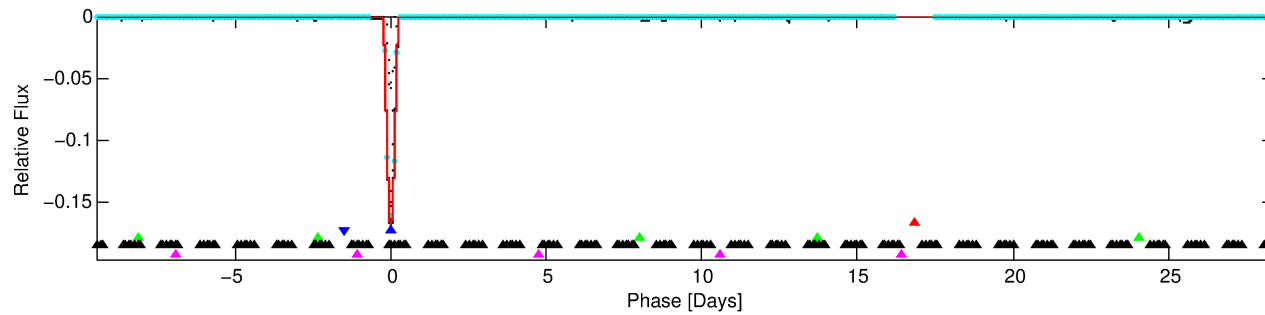
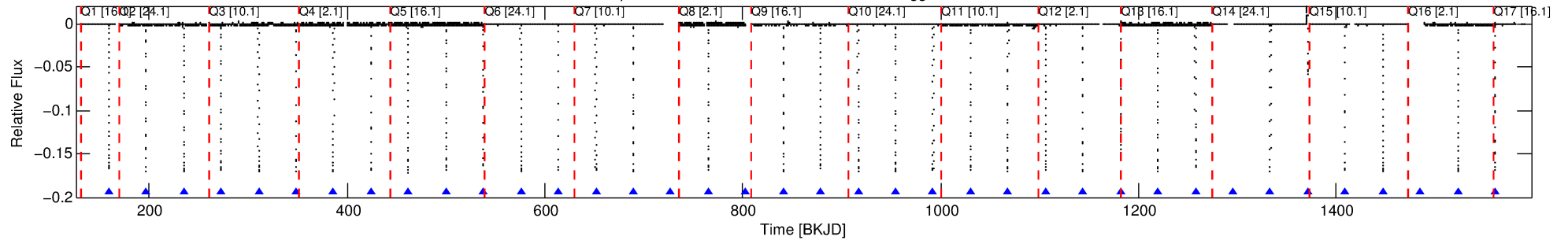
## Ephemeris Match Information For 012306808-02

No Significant Match Found

# DV One-Page Summary

KIC: 12306808 Candidate: 2 of 5 Period: 37.878 d  
KOI: K07521 Corr: No Ephemeris Match

Kp: 13.27 R\*: 0.76 Rs Teff: 5985.0 K Logg: 4.60 Fe/H: -0.780



## DV Fit Results:

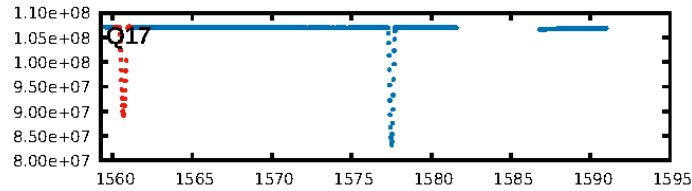
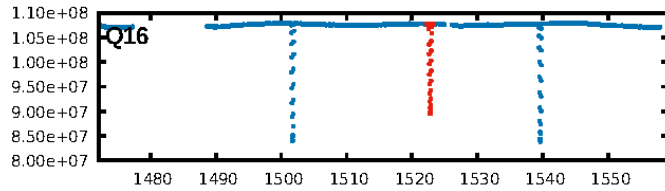
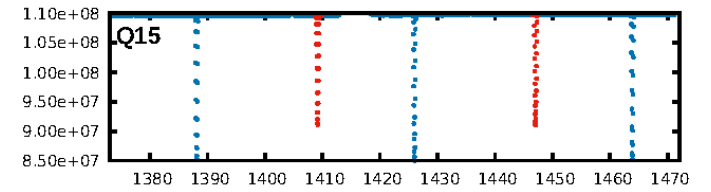
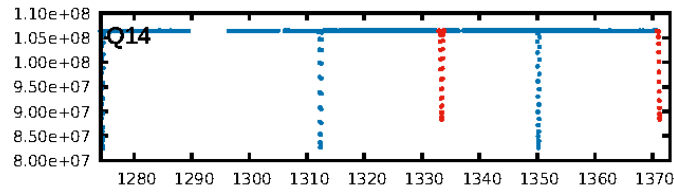
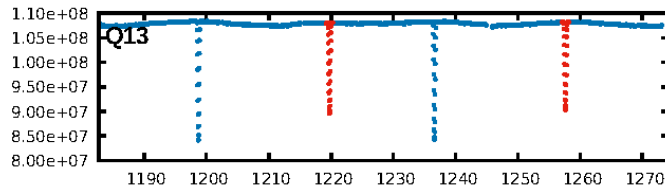
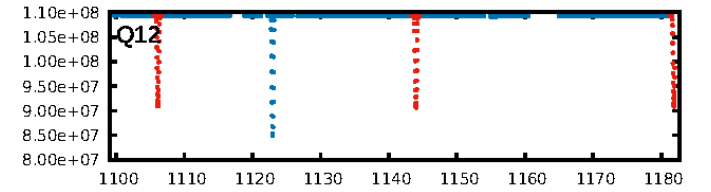
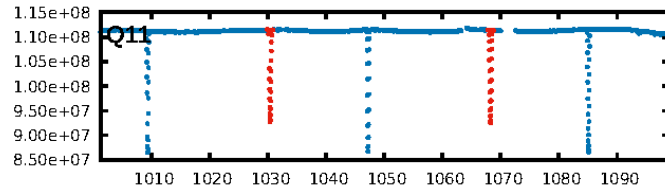
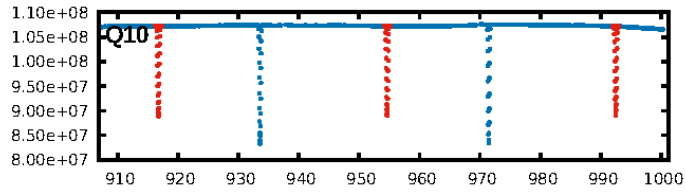
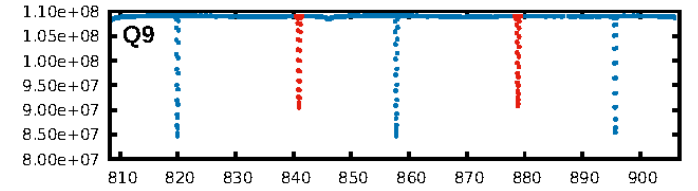
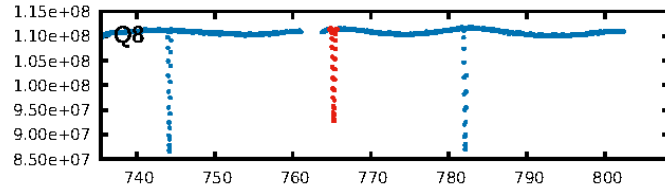
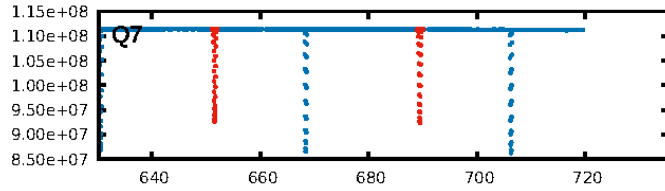
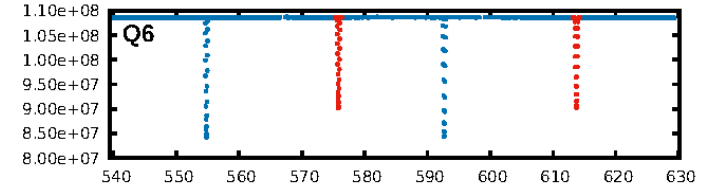
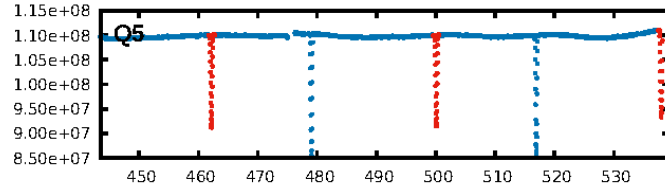
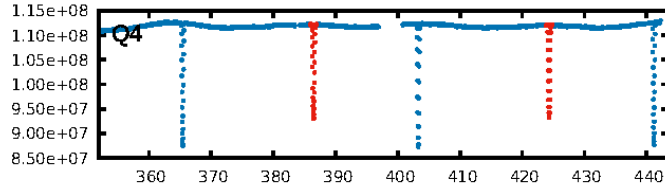
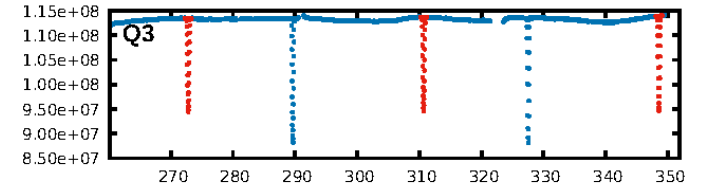
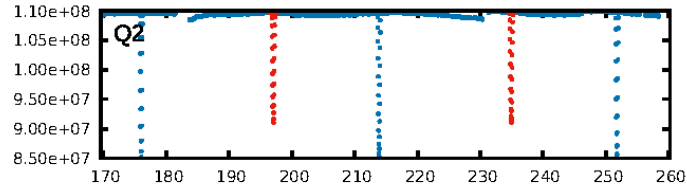
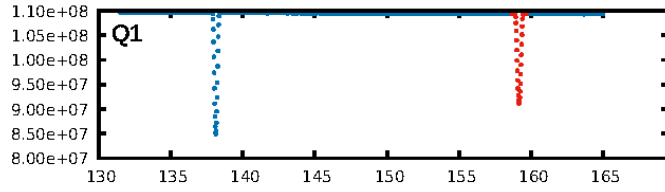
Period = 37.87848 [0.00000] d  
Epoch = 159.1740 [0.0001] BKJD  
Rp/R\* = 0.5479 [0.0368]  
a/R\* = 29.68 [0.22]  
b = 0.88 [0.05]  
Seff = 15.22 [4.69]  
Teq = 504 [39] K  
Rp = 45.32 [10.61] Re  
a = 0.2083 [0.0404] AU  
Ag = N/A  
Teffp = N/A

## DV Diagnostic Results:

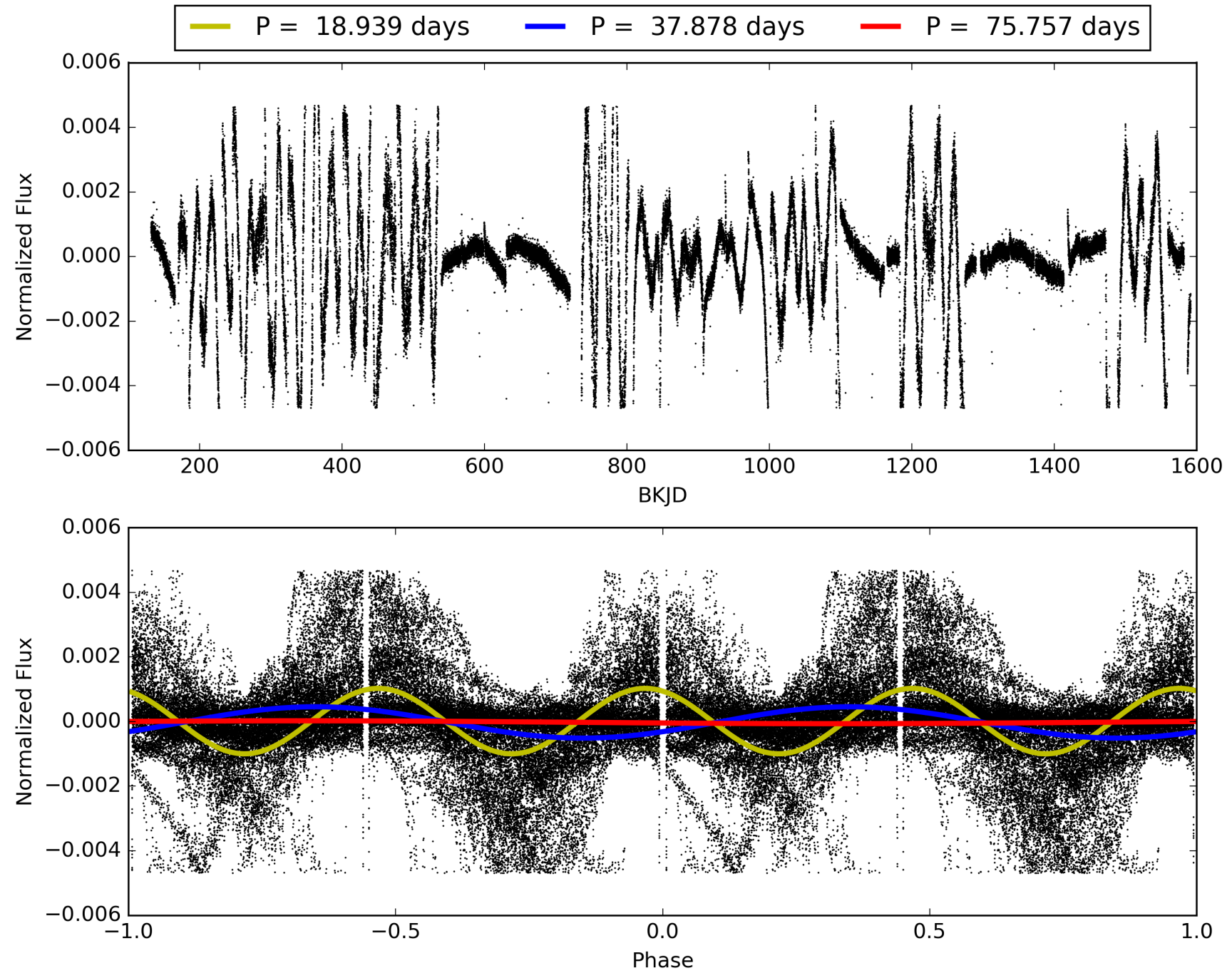
ShortPeriod-sig: 0.0% [0.00σ]  
LongPeriod-sig: 100.0% [463.24σ]  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 0.0%  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [32/32]  
GhostDiagnostic-chr: 5.051  
Centroid-sig: 0.0%  
Centroid-so: 0.175 arcsec [214.11σ]  
OotOffset-rm: 0.006 arcsec [0.10σ]  
KicOffset-rm: 0.127 arcsec [1.88σ]  
OotOffset-st: 4/4/3/4 [15]  
KicOffset-st: 4/4/3/4 [15]  
DiffImageQuality-fgm: 1.00 [15/15]  
DiffImageOverlap-fno: 0.73 [11/15]



# TCE 012306808-02, PDC Light Curves

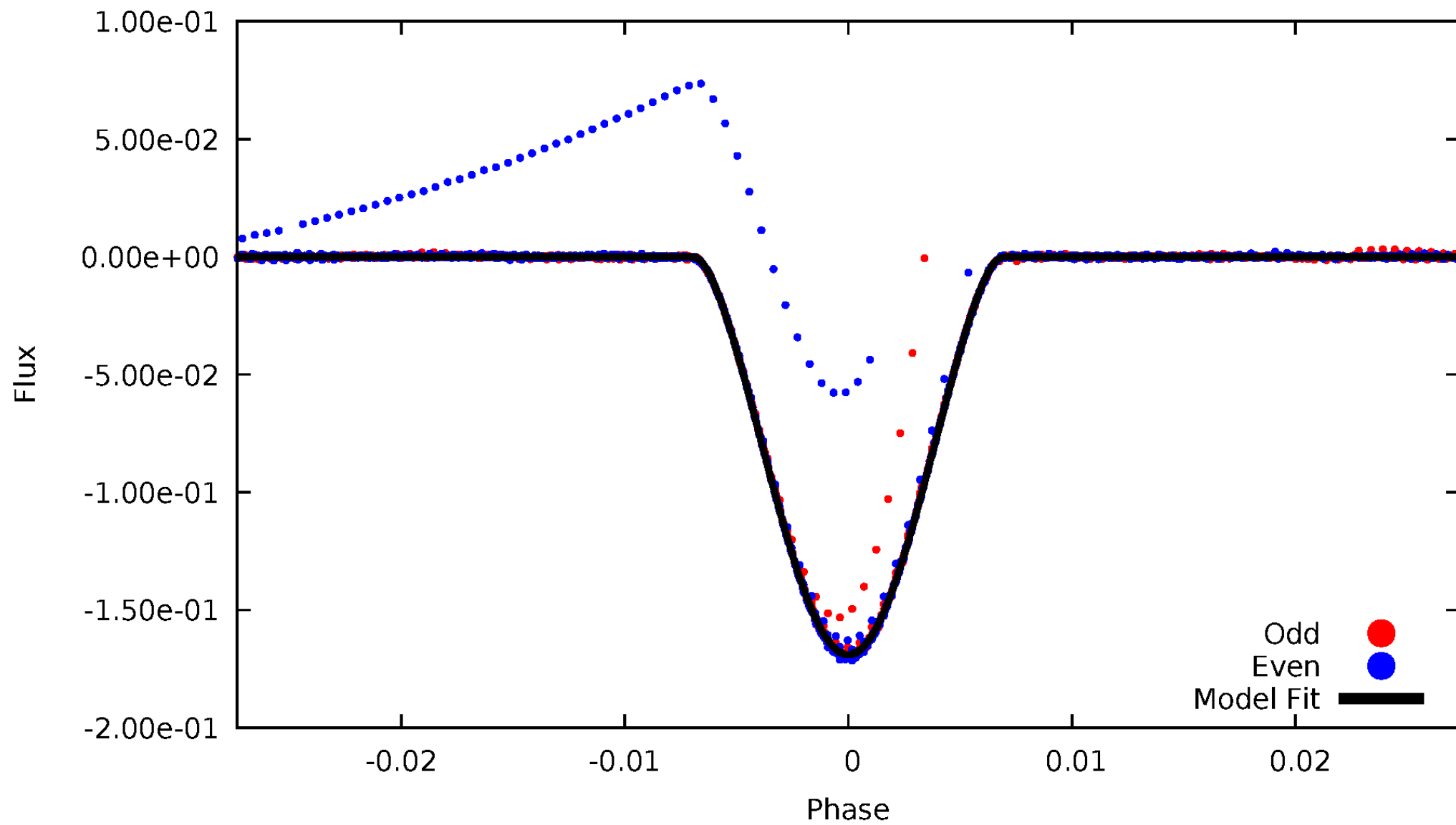


TCE 012306808-02



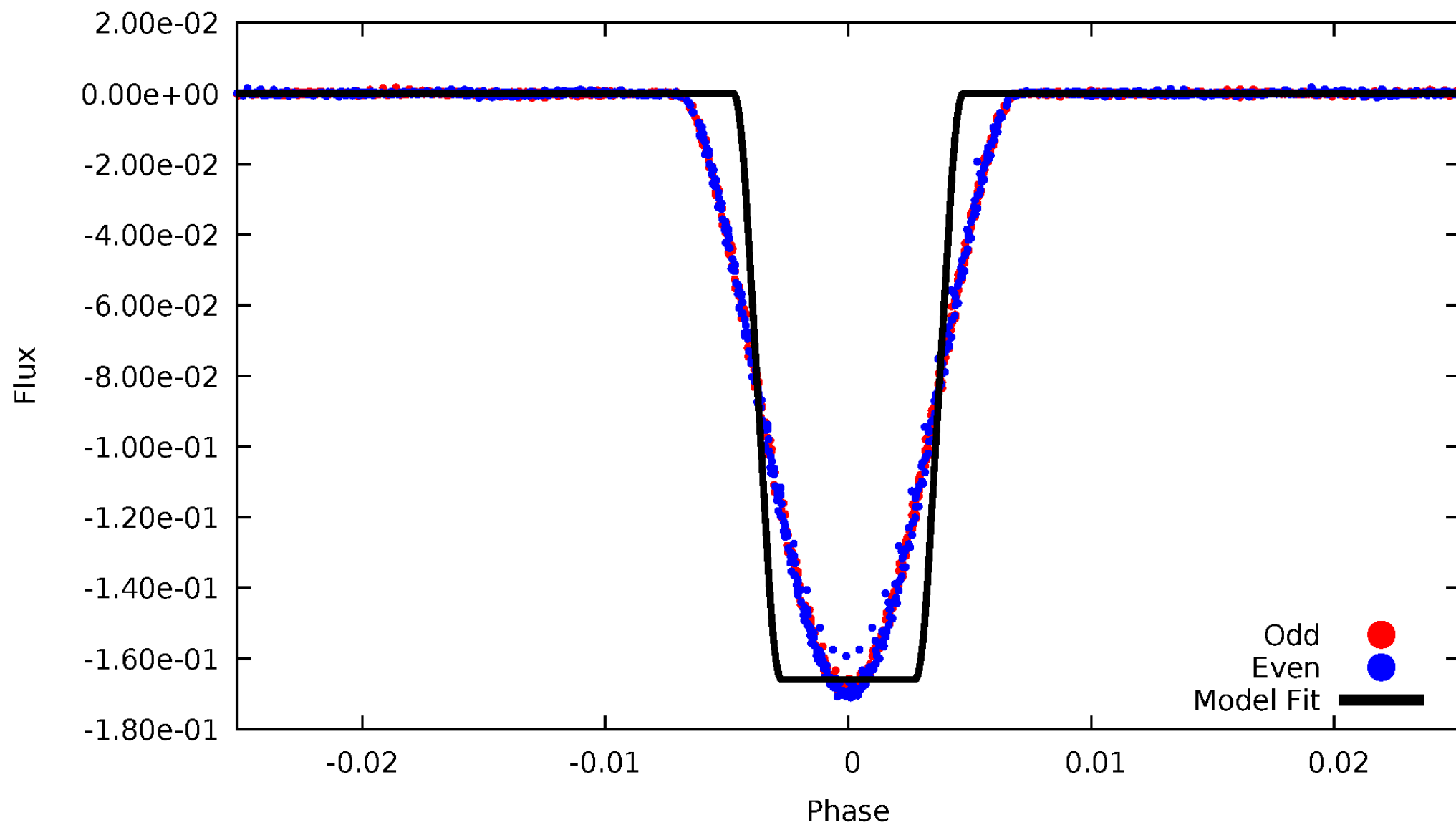
# DV Odd/Even

TCE 012306808-02



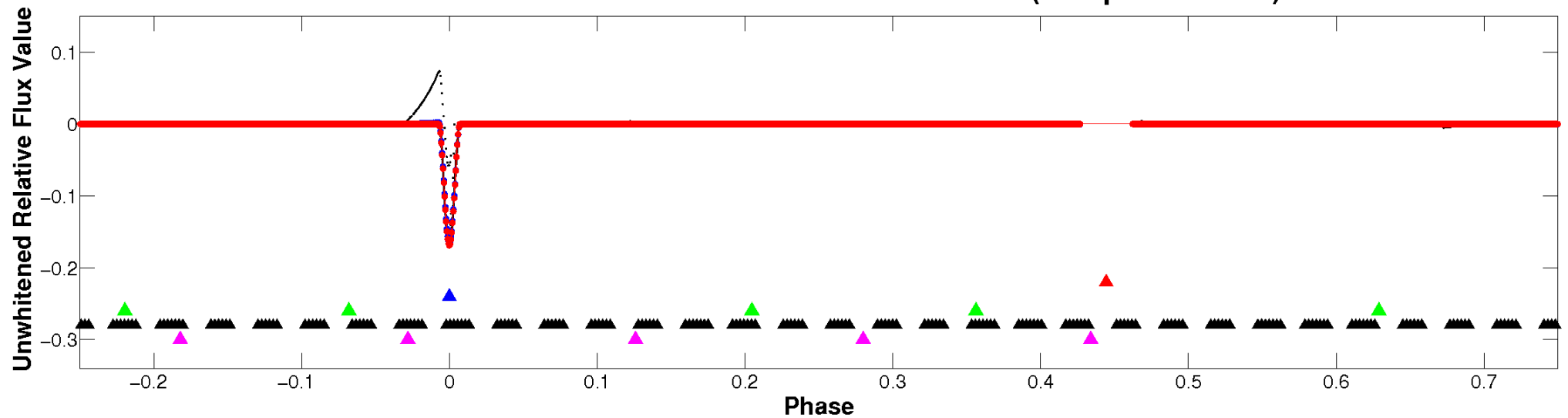
# ALT Odd/Even

TCE 012306808-02

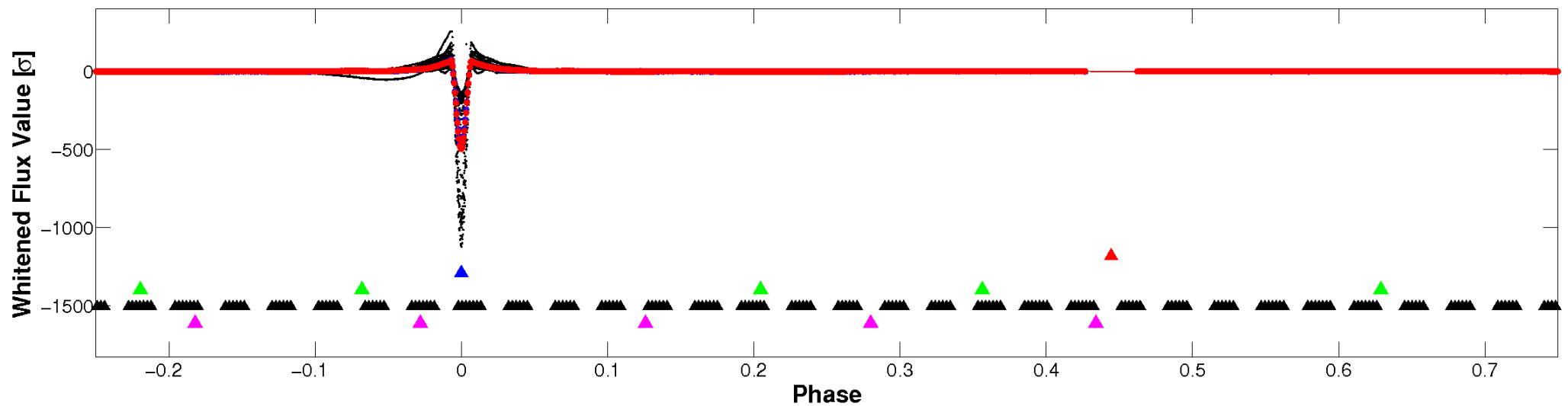


# Non-Whitened Vs. Whitened Light Curve

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

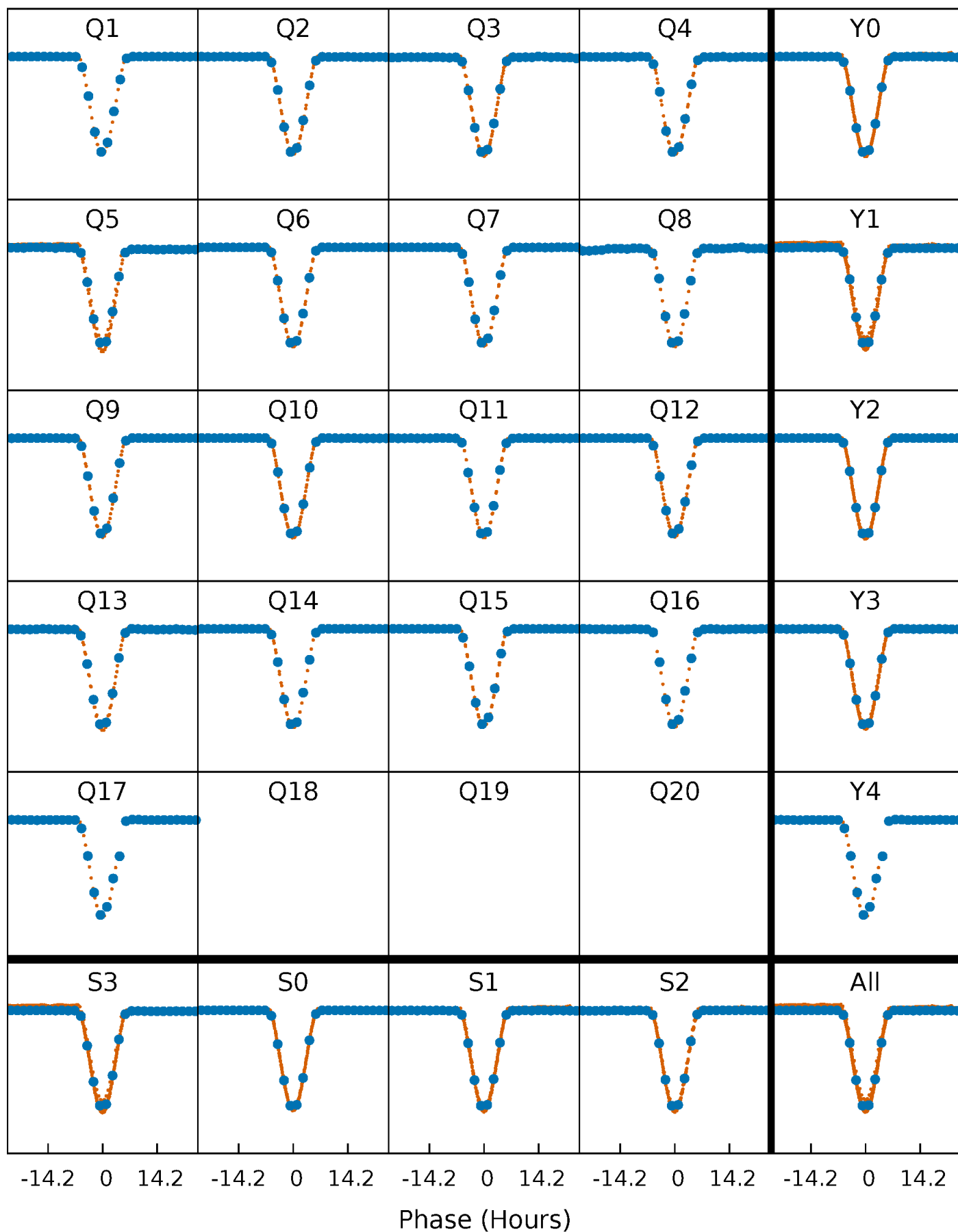


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

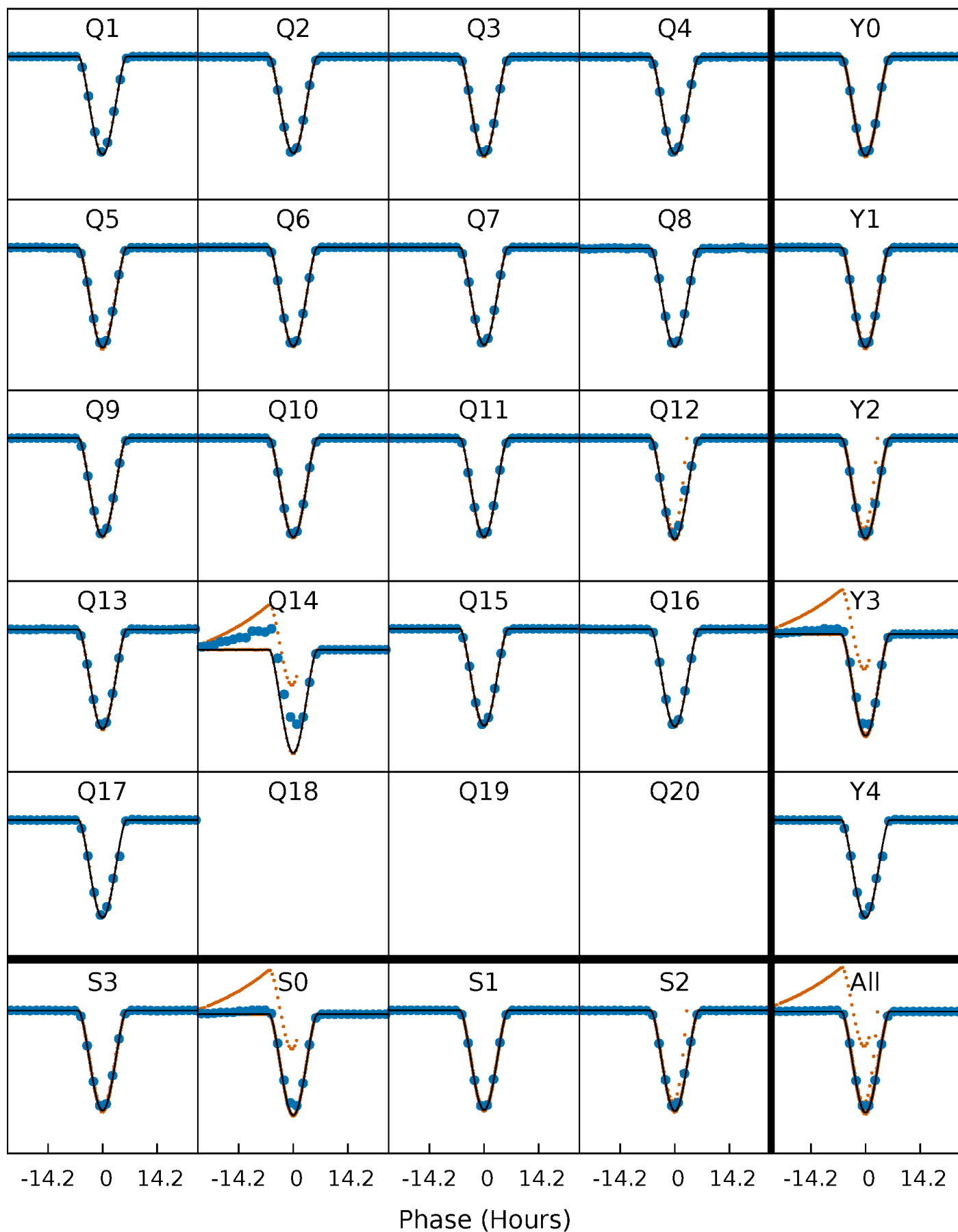
TCE 012306808-02     $P = 37.878482$  Days     $T_0 = 159.173983$  (BKJD)





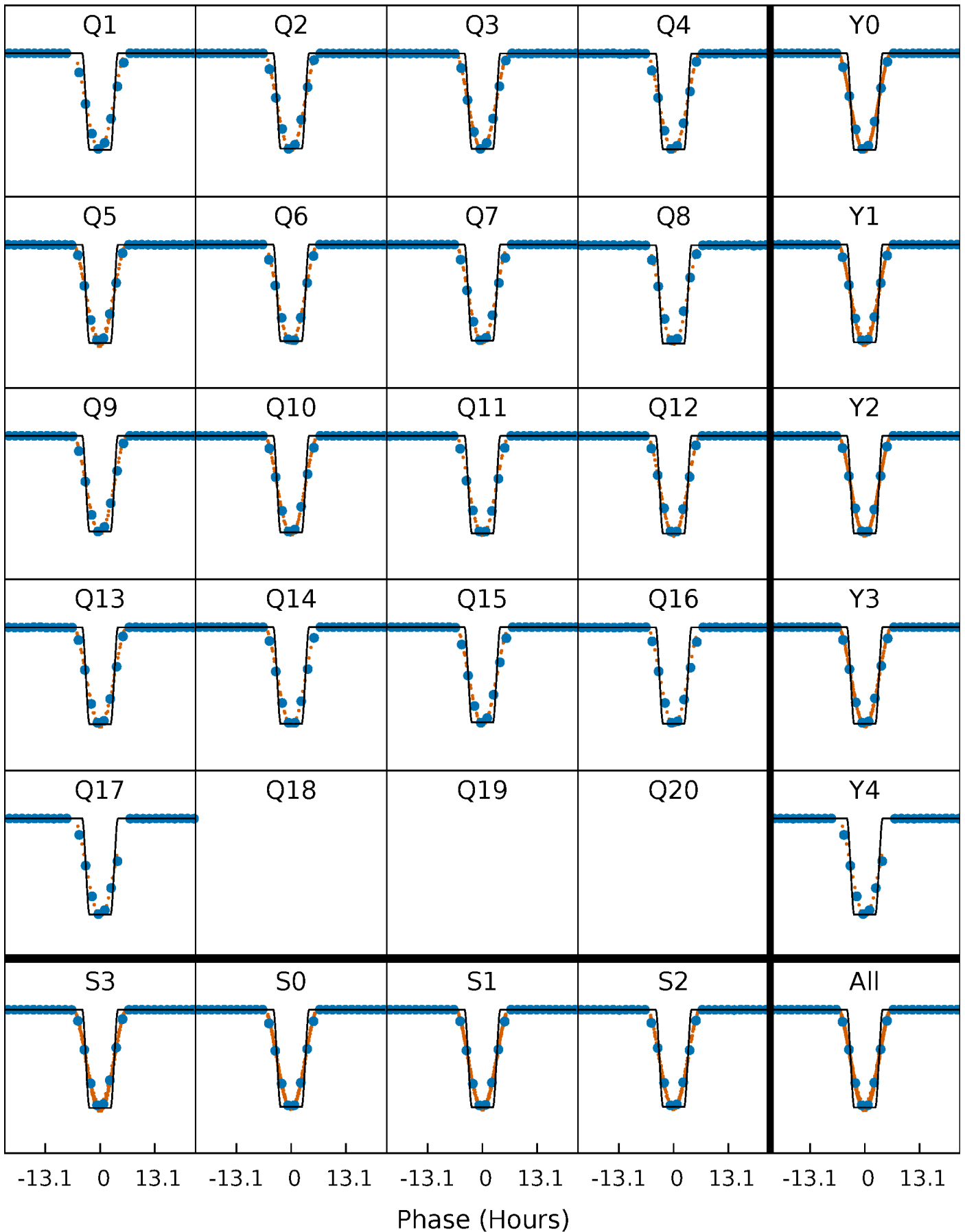
# DV Quarter-Phased Transit Curves

TCE 012306808-02 P= 37.878482 Days  $T_0=159.173983$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

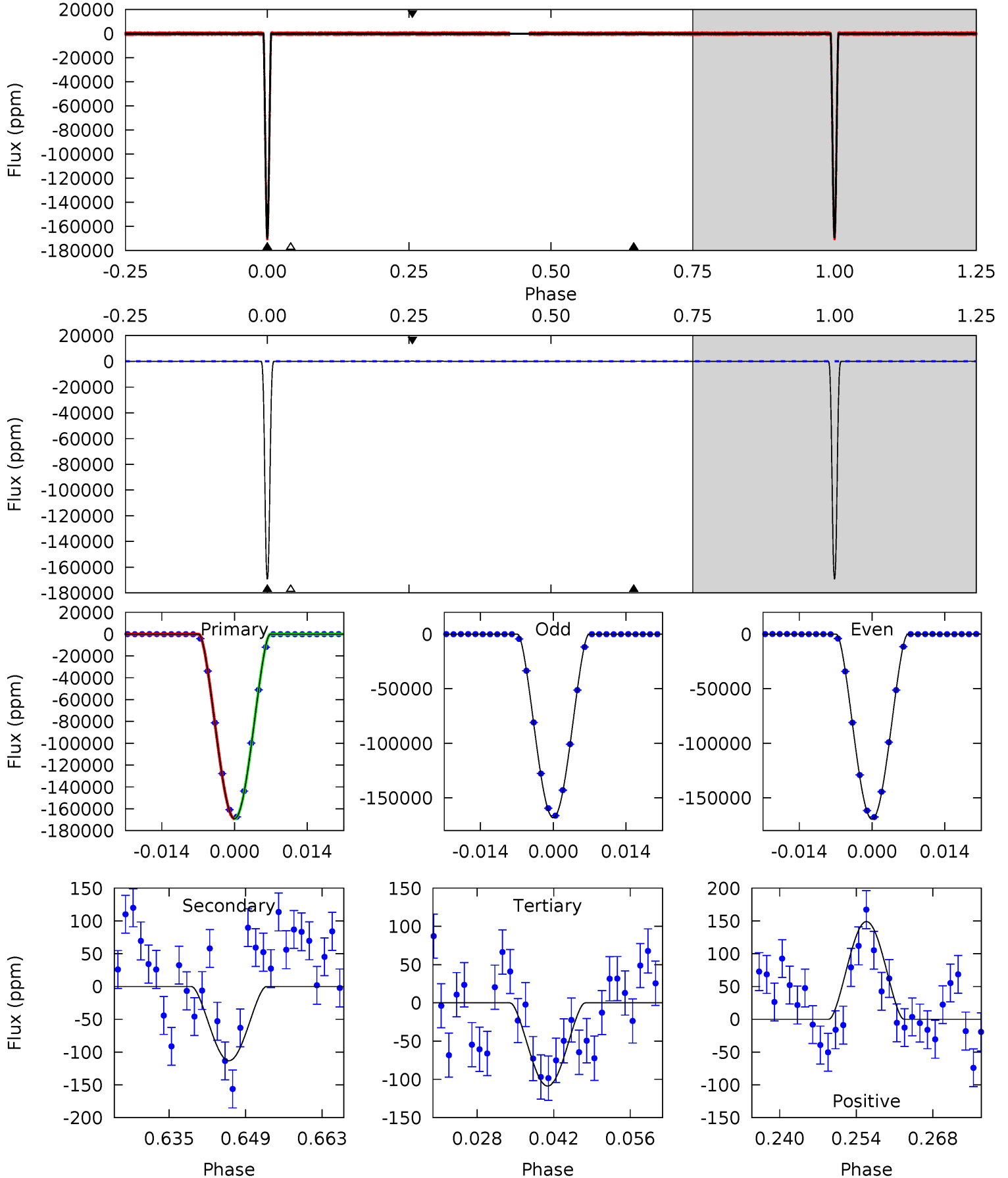
TCE 012306808-02   P= 37.878252 Days    $T_0=159.178587$  (BKJD)



# DV Model-Shift Uniqueness Test

012306808-02, P = 37.878482 Days, E = 121.295501 Days

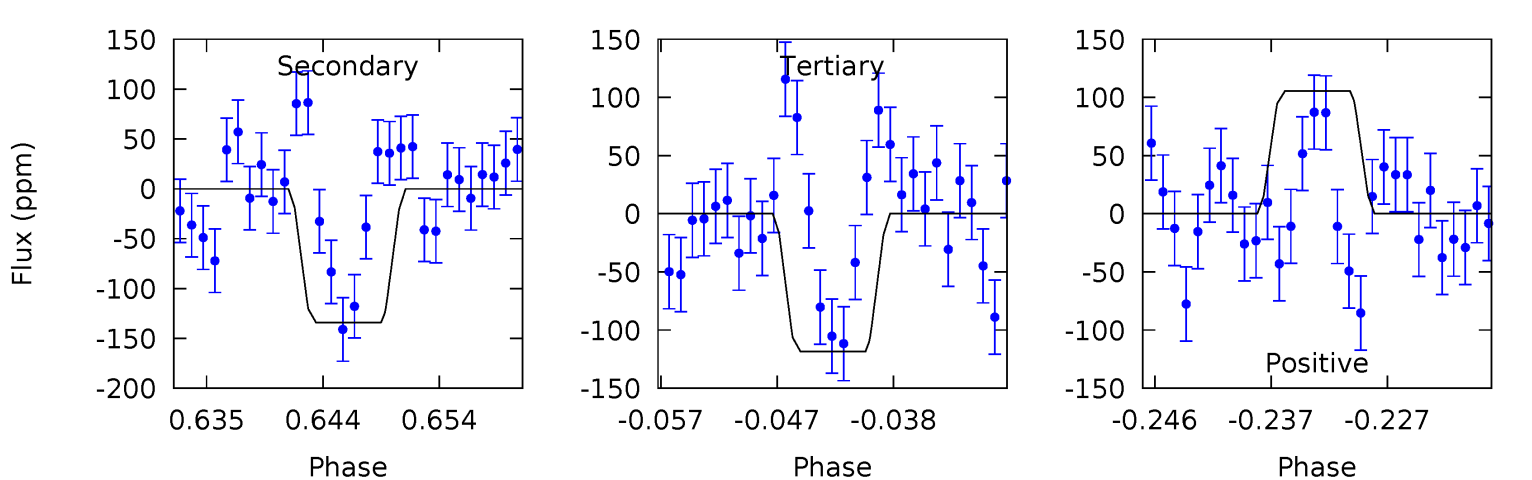
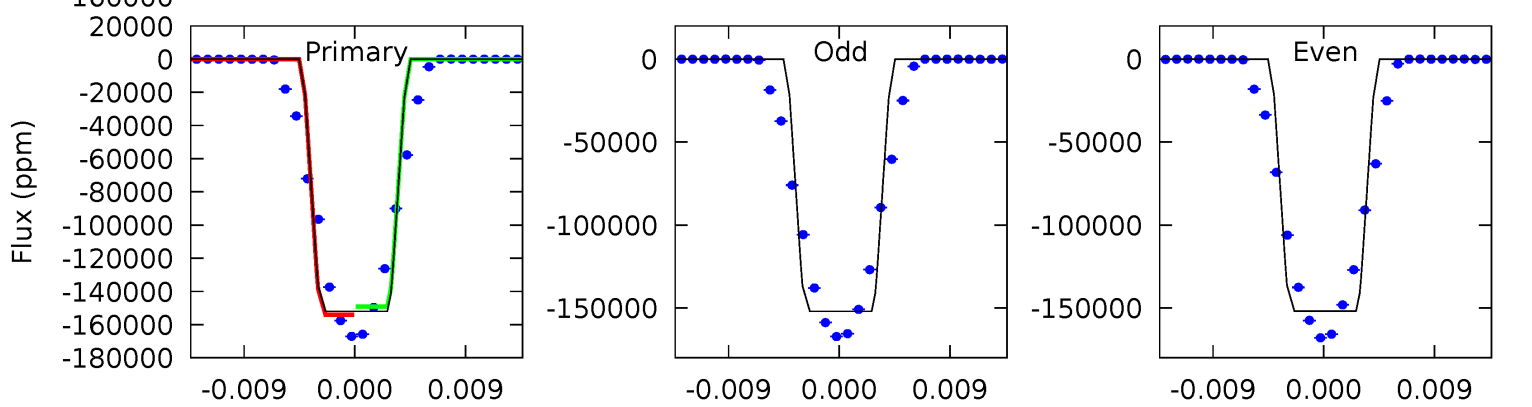
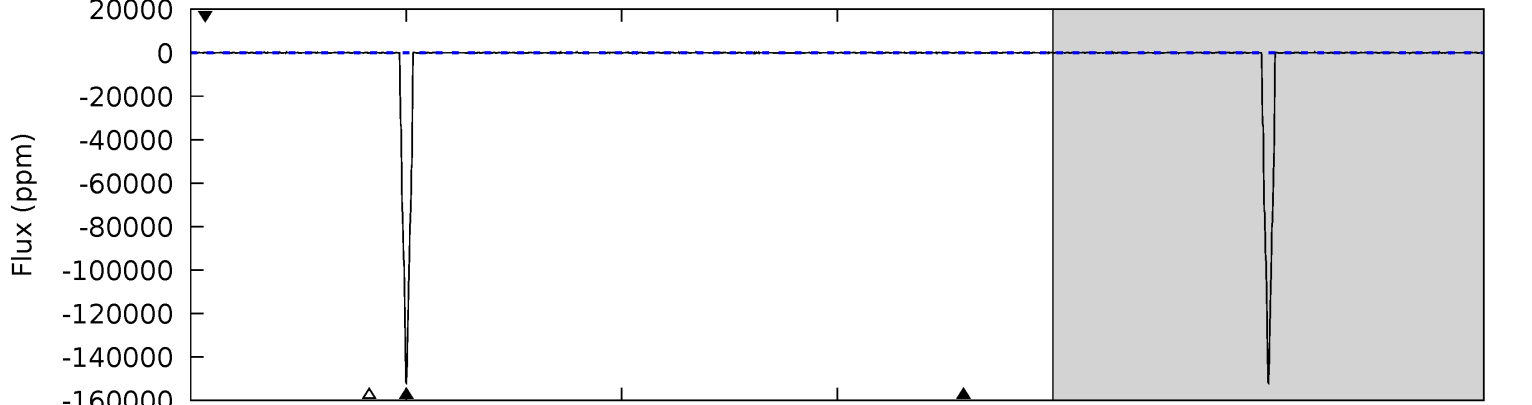
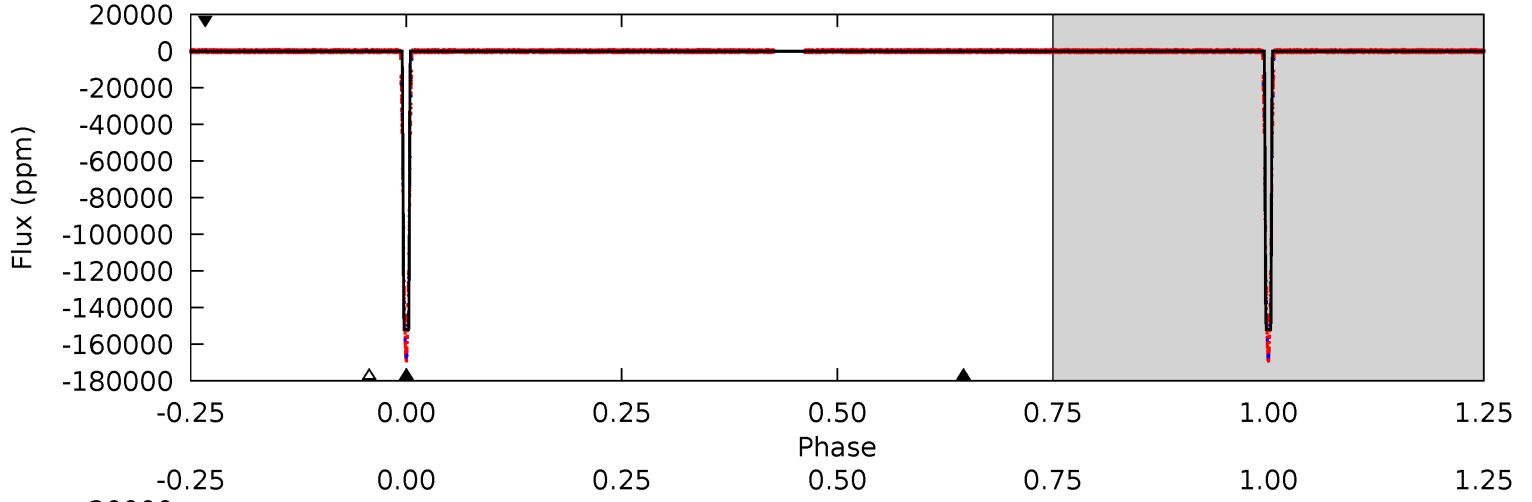
| Pri   | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|-------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 13431 | 8.99 | 8.64 | 11.8 | 4.96            | 2.45            | 3.60             | 13422   | 13419   | 0.35    | -2.84   | 54.2    | 0.97 | 0.00  | 0.78 |



# Alt Model-Shift Uniqueness Test

012306808-02, P = 37.878252 Days, E = 121.300335 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 |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|-----|
| 7356 | 6.49 | 5.73 | 5.10 | 5.04            | 2.59            | 1.60             | 7350    | 7351    | 0.76    | 1.39    | 6.14    | 1.00 | 0.00  | 0   |



### Stellar Parameters For KIC 012306808

|        | $T_{\text{eff}}(K)$  | $\log(g)$                 | [Fe/H]                     | $R (R_{\odot})$           | $M(M_{\odot})$            | $p_{\star} (g \cdot \text{cm}^{-3})$ |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|--------------------------------------|
|        | $5985^{+143}_{-161}$ | $4.603^{+0.028}_{-0.161}$ | $-0.780^{+0.300}_{-0.300}$ | $0.758^{+0.170}_{-0.057}$ | $0.846^{+0.071}_{-0.087}$ | $2.738^{+0.437}_{-1.226}$            |
|        | +2%/-3%              | +1%/-3%                   | +38%/-38%                  | +22%/-8%                  | +8%/-10%                  | +16%/-45%                            |
| Source | PHO1                 | KIC0                      | KIC0                       | DSEP                      |                           |                                      |

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

### Secondary Eclipse Parameters for KIC 012306808-02 / KOI

| Detrend | Depth (ppm)   | $R_p (R_{\oplus})$      | $T_{max} (K)$     | $T_{obs} (K)$      | $A_{obs}$                 |
|---------|---------------|-------------------------|-------------------|--------------------|---------------------------|
| DV      | $-113 \pm 13$ | $47.23^{+5.75}_{-4.50}$ | $718^{+38}_{-26}$ | $1812^{+43}_{-49}$ | $1.200^{+0.278}_{-0.270}$ |
| Alt.    | $-134 \pm 21$ | $35.15^{+4.78}_{-3.83}$ | $719^{+38}_{-27}$ | $1983^{+61}_{-57}$ | $2.531^{+0.798}_{-0.628}$ |

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

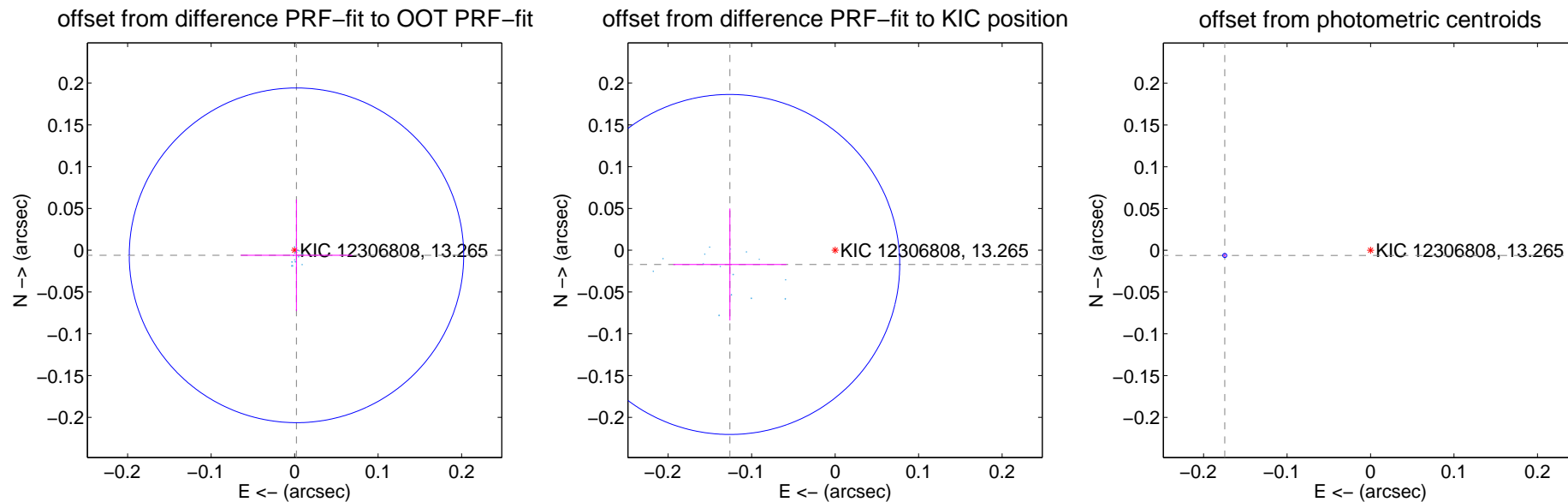
## DV Centroid Data

Supplemental centroid analysis for 012306808-02. Kepler magnitude: 13.27. Transit SNR 6360.12

There are 15 quarters with good PRF difference image offsets

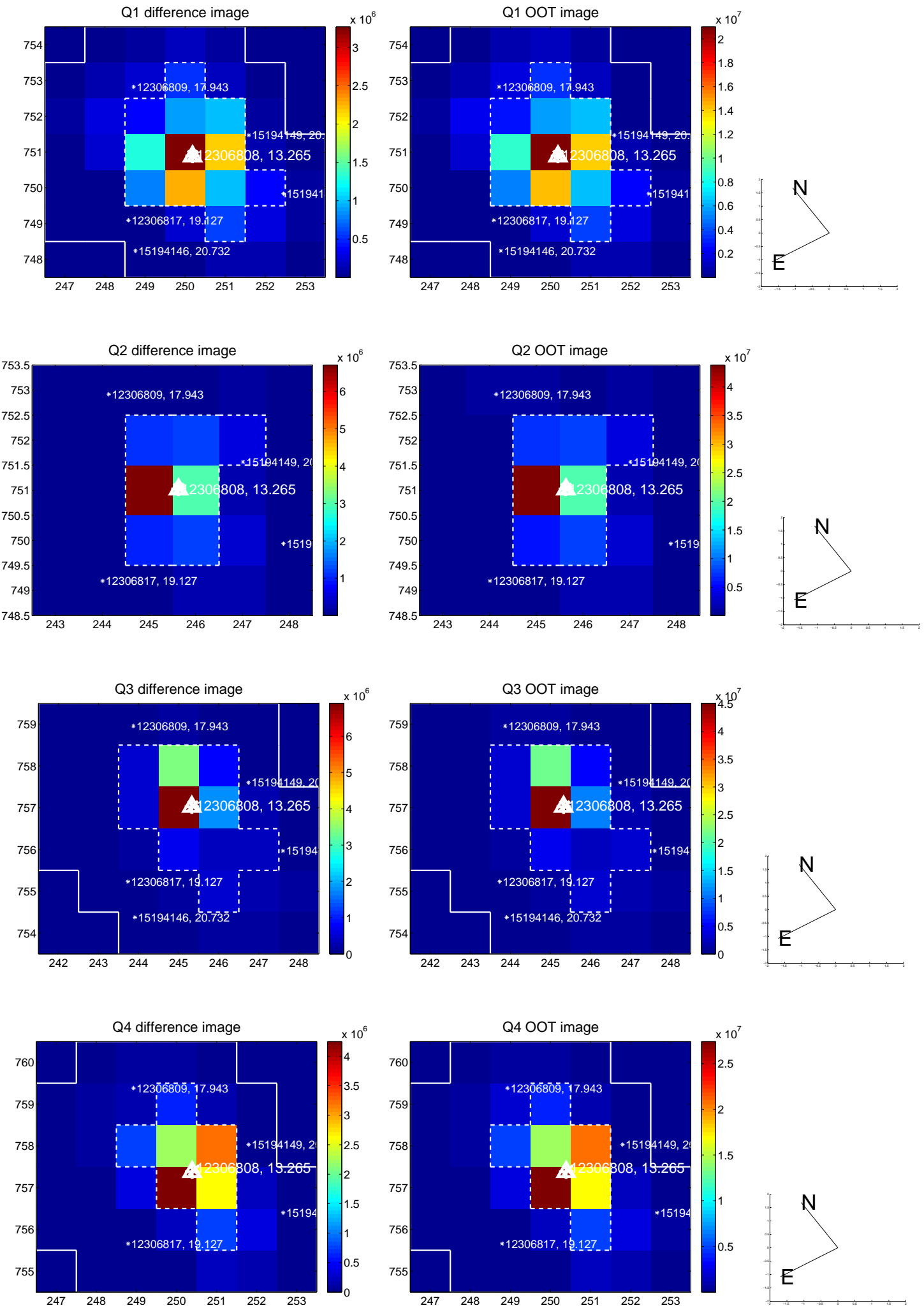
The direct PRF centroid is offset from the target star catalog position by about 0.21 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA        | $\Delta$ Dec       |
|---|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT          | $0.006 \pm 0.067$  | 0.10                | $-0.002 \pm 0.067$ | $-0.006 \pm 0.067$ |
| PRF-fit source offset from KIC position | $0.127 \pm 0.068$  | 1.88                | $0.126 \pm 0.068$  | $-0.017 \pm 0.067$ |
| photometric centroid source offset      | $0.17 \pm 0.00$    | 214.11              | $0.17 \pm 0.00$    | $-0.01 \pm 0.00$   |

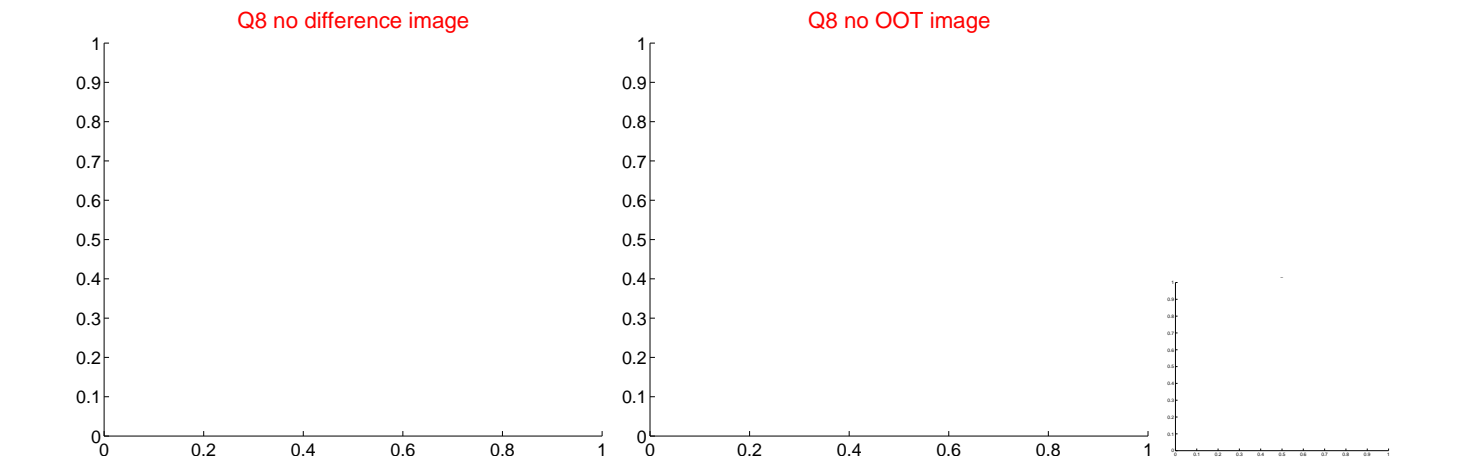
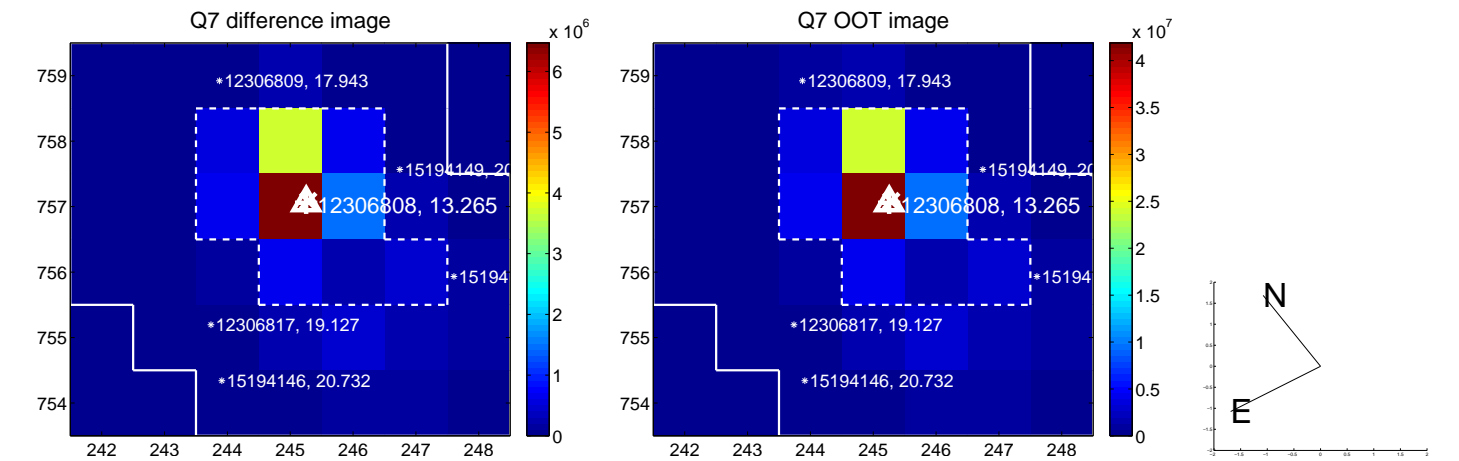
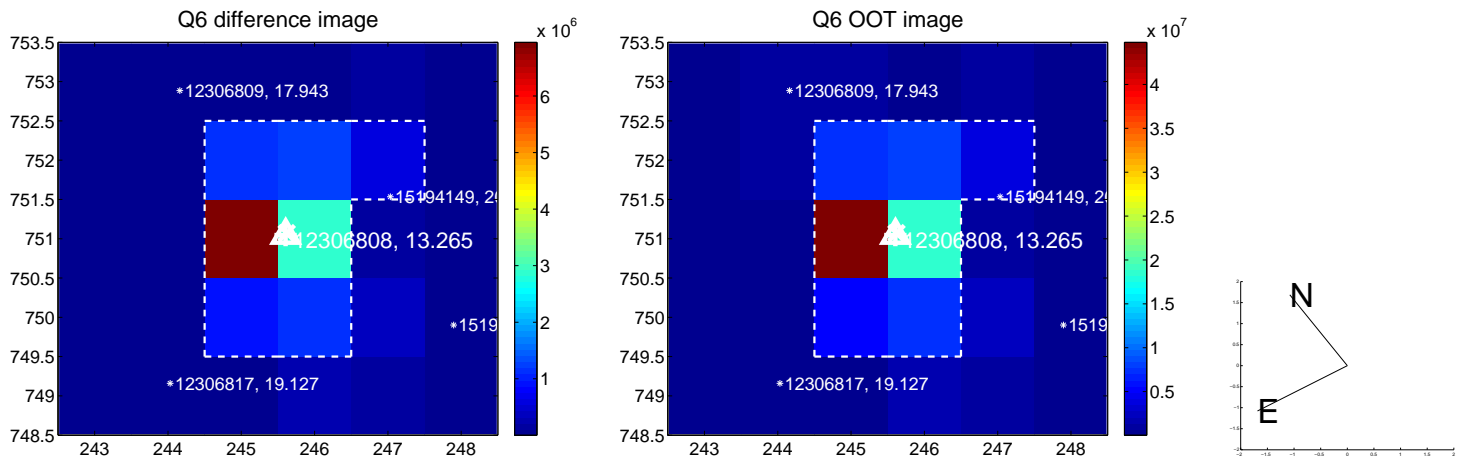
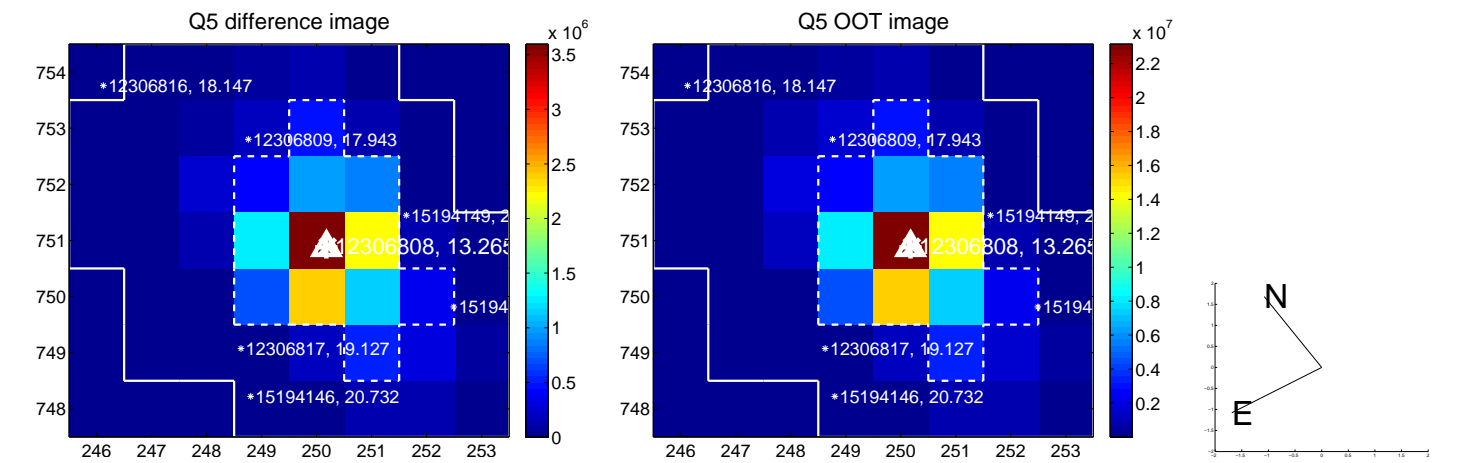


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

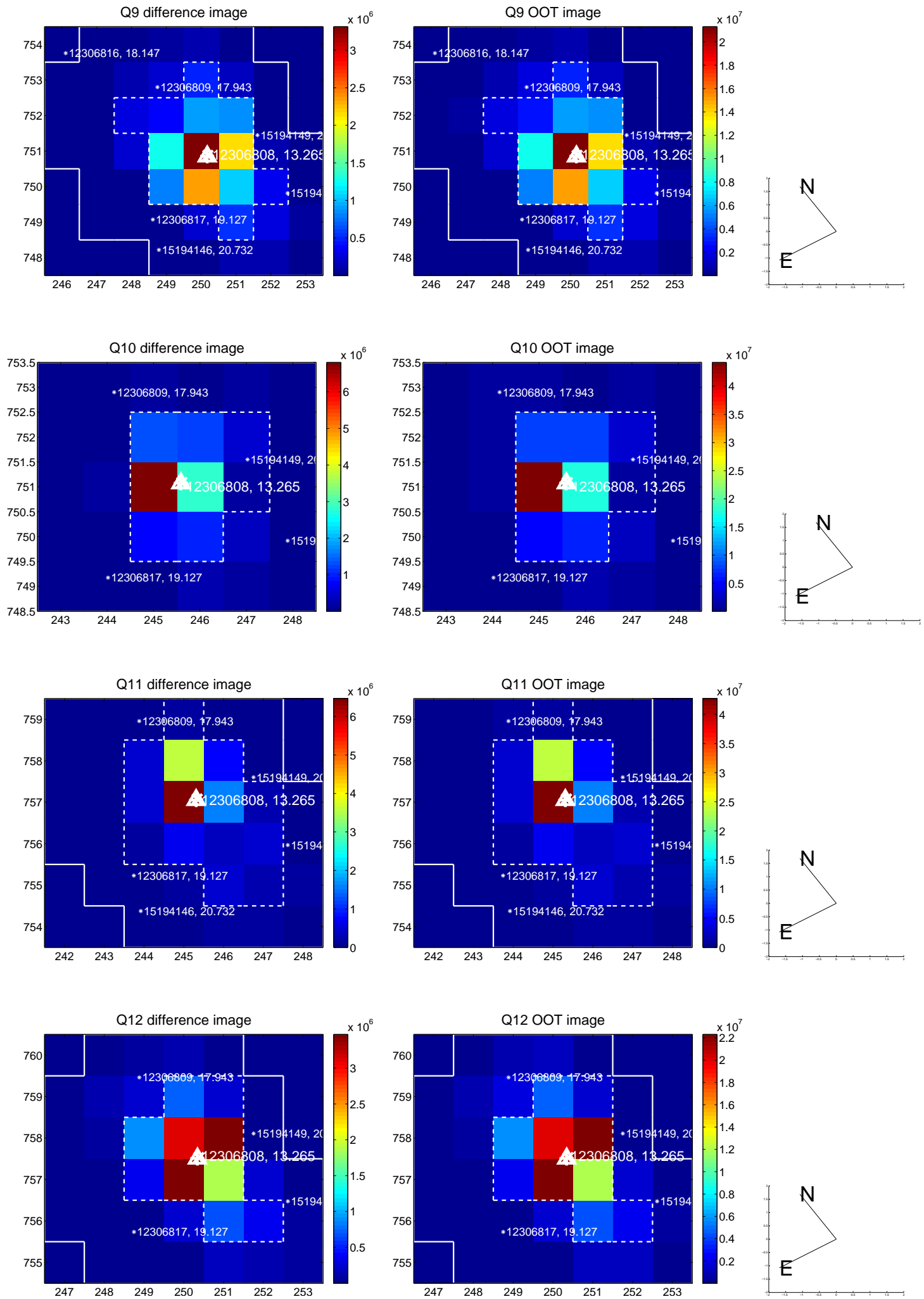


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

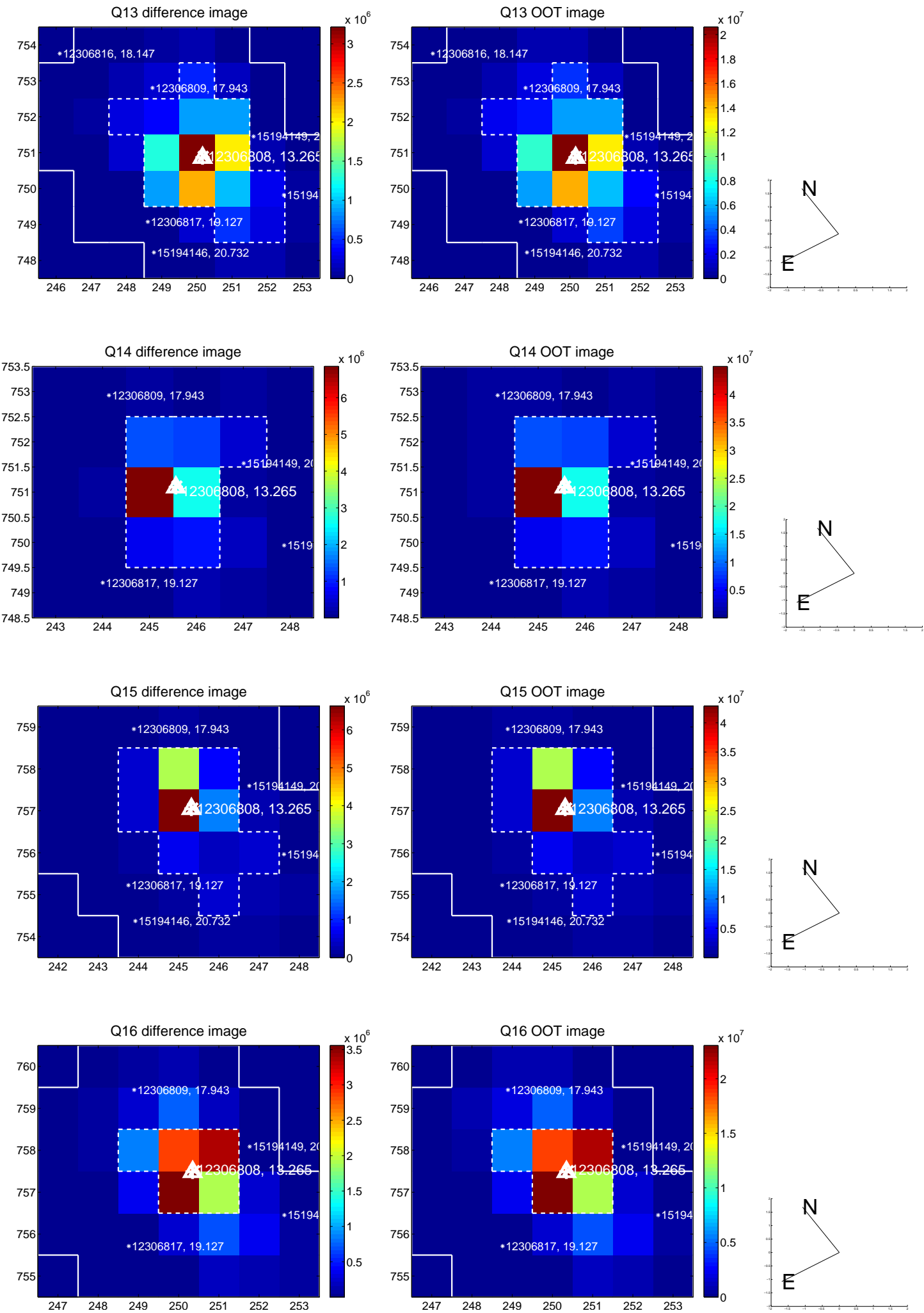




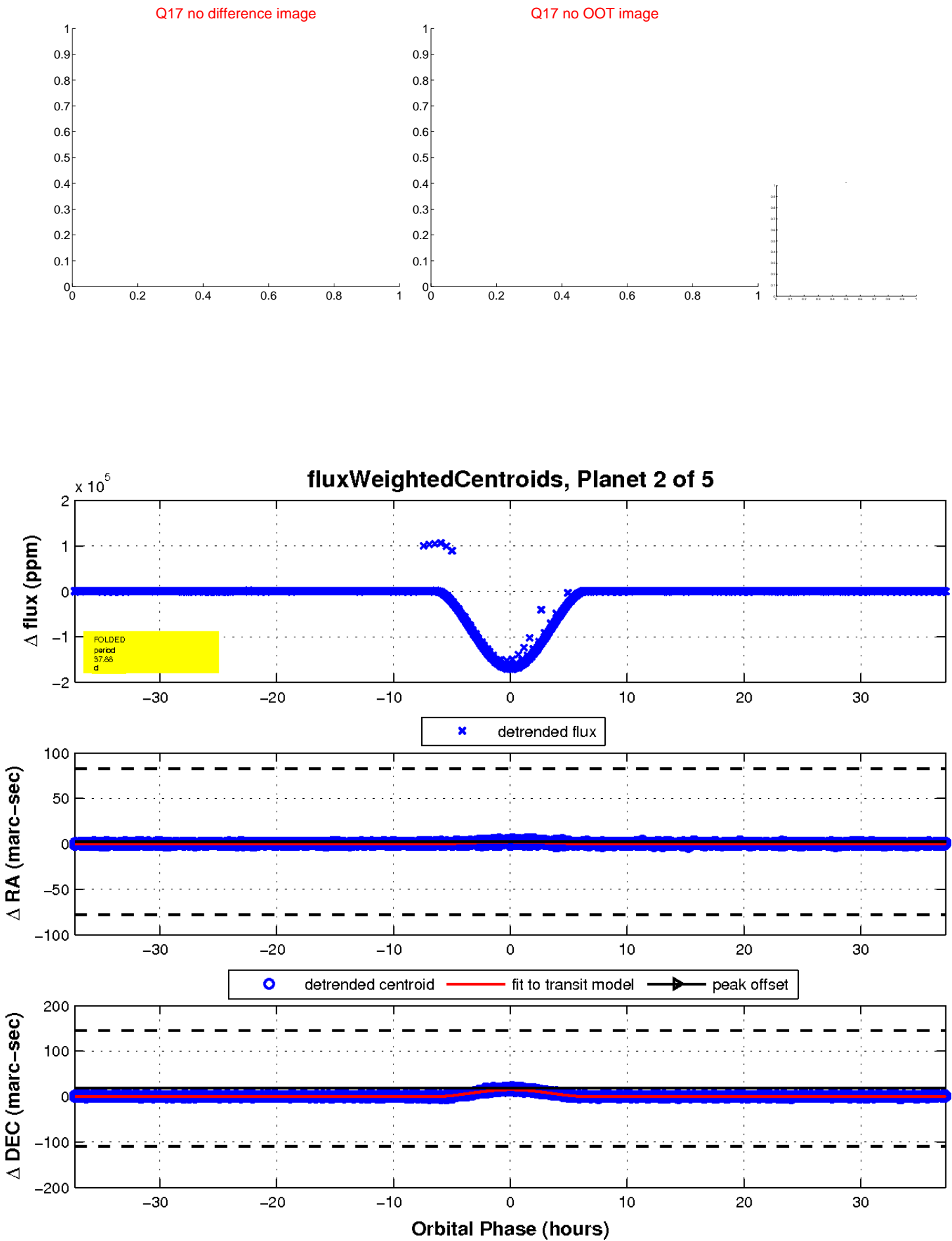
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

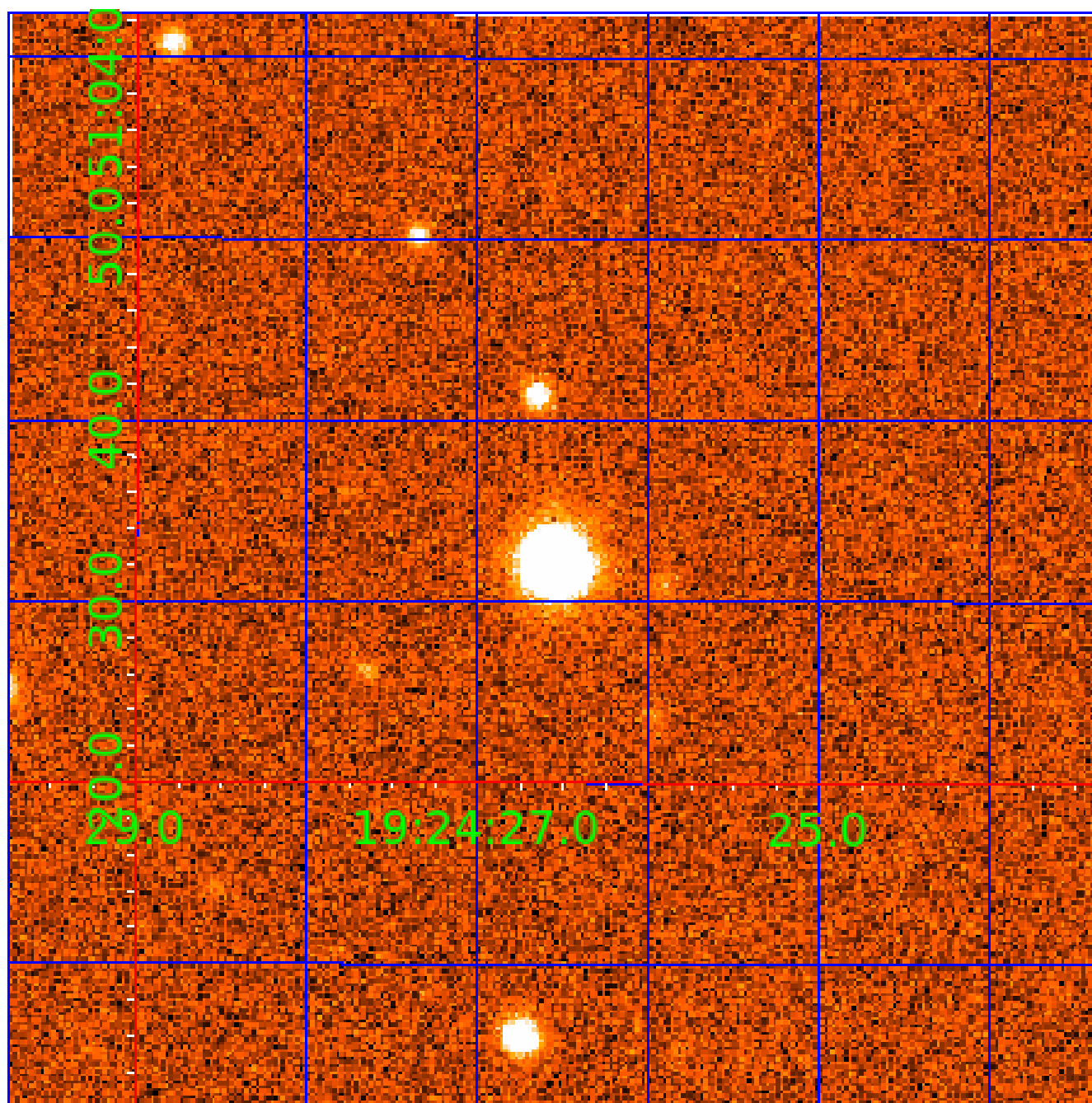


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



# UKIRT Image

Declination



# KIC 012306808

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|---------|--------|-----------------------------|-----------------|------------------------|------------------------|
| 012306808-01 | OBS      | 7521.01 | 37.878464     | 138.128811   | 219541.5    | 10.662           | 13890.0 | 5929.2 | 0.76                        | 5985            | 47.48                  | 15.22                  |
| 012306808-02 | OBS      | No      | 37.878482     | 159.173983   | 169013.5    | 12.421           | 9956.5  | 6360.1 | 0.76                        | 5985            | 45.32                  | 15.22                  |
| 012306808-03 | OBS      | No      | 286.959478    | 220.873763   | 4316.9      | 3.500            | 68.4    | -1.0   | 0.76                        | 5985            | 5.00                   | 1.02                   |
| 012306808-04 | OBS      | 7521.02 | 7.334455      | 137.092240   | 256.2       | 2.678            | 21.8    | 24.1   | 0.76                        | 5985            | 1.97                   | 135.87                 |
| 012306808-05 | OBS      | No      | 308.861042    | 152.279600   | 339.8       | 3.755            | 9.9     | 5.0    | 0.76                        | 5985            | 1.59                   | 0.93                   |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments   |
|--------------|----------|------|-------|---|---|---|---|--|
| 012306808-01 | OBS      | FP   | 0.00  | 0 | 1 | 0 | 0 | MOD_SEC_DV—DEEP_V_SHAPED—HAS_SEC_TCE   |
| 012306808-02 | OBS      | FP   | 0.00  | 1 | 1 | 0 | 0 | IS_SEC_TCE   |
| 012306808-03 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_MARSHALL_SKYE_ZUMA—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_NOFITS |
| 012306808-04 | OBS      | FP   | 0.00  | 0 | 0 | 1 | 0 | CENT_RESOLVED_OFFSET—HALO_GHOST  |
| 012306808-05 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS                         |

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

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

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

## Ephemeris Match Information For 012306808-03

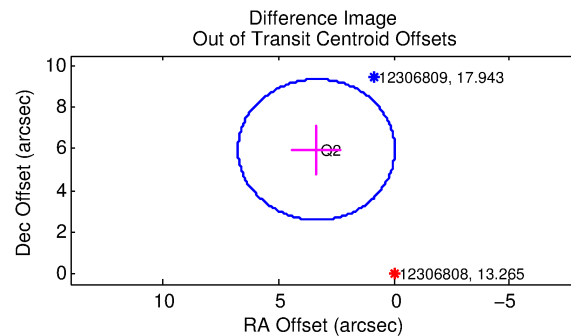
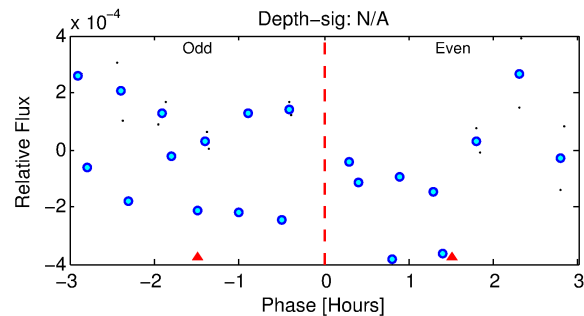
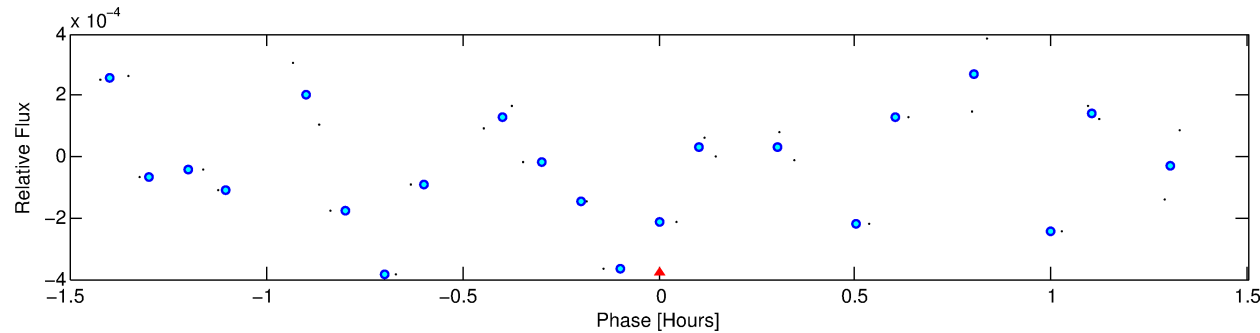
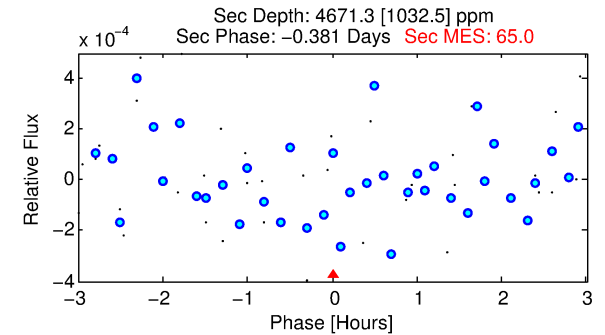
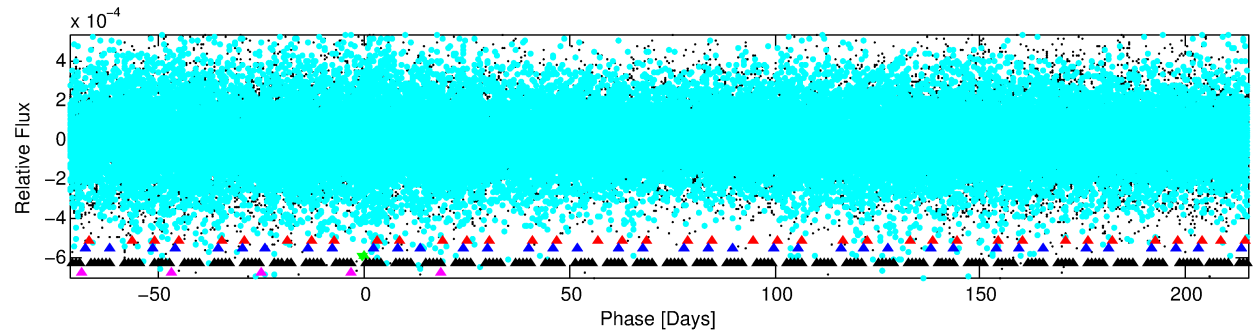
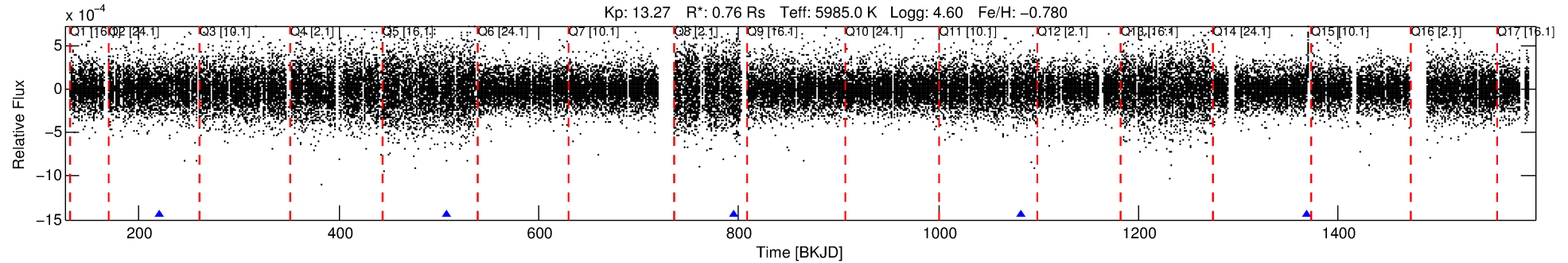
No Significant Match Found

# DV One-Page Summary

KIC: 12306808 Candidate: 3 of 5 Period: 286.959 d

KOI: K07521 Corr: No Ephemeris Match

Kp: 13.27 R\*: 0.76 Rs Teff: 5985.0 K Logg: 4.60 Fe/H: -0.780



## TPS TCE Results:

Period = 286.95948 d  
Epoch = 220.8738 BKJD

**DV fit results are unavailable**

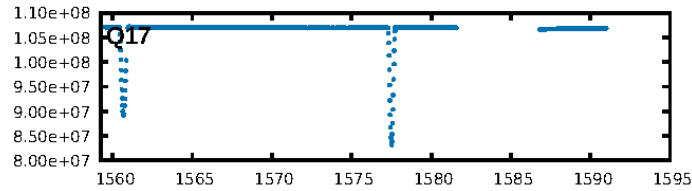
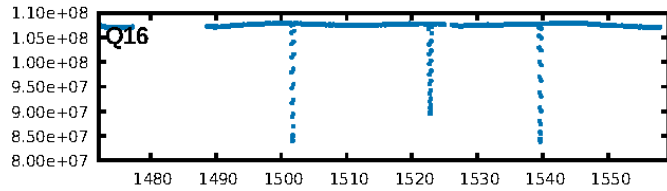
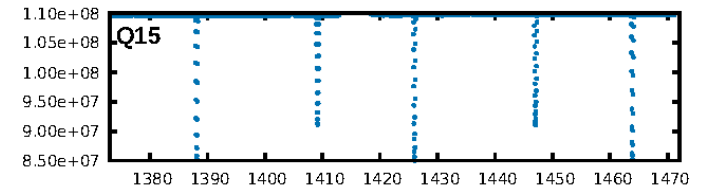
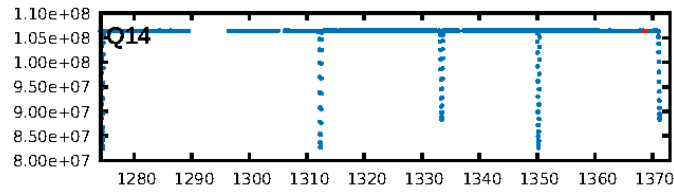
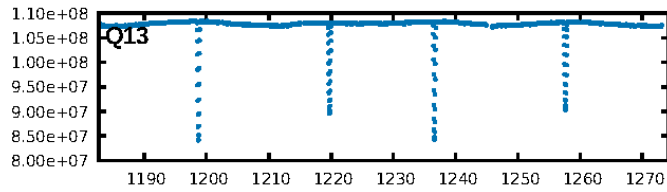
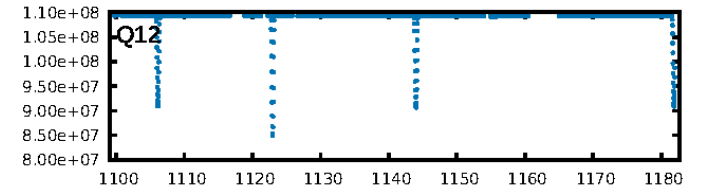
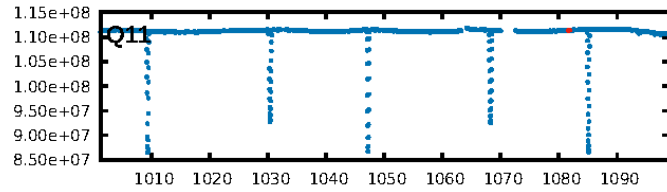
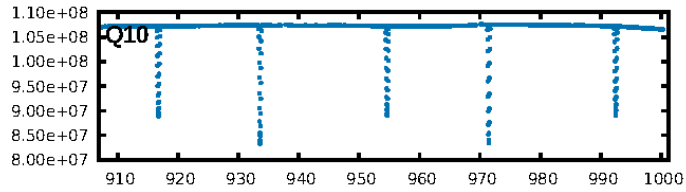
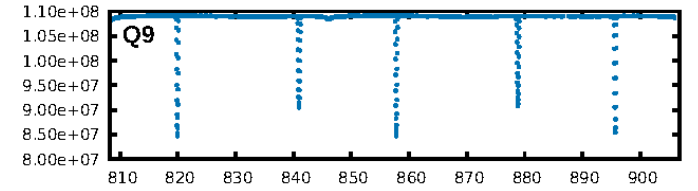
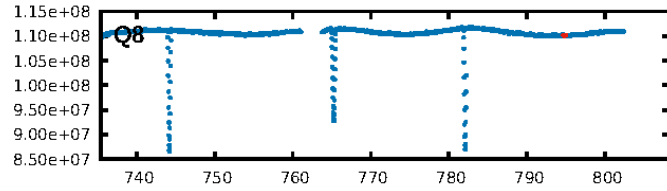
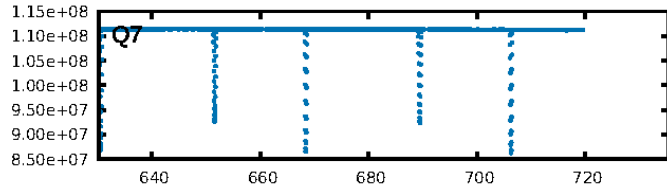
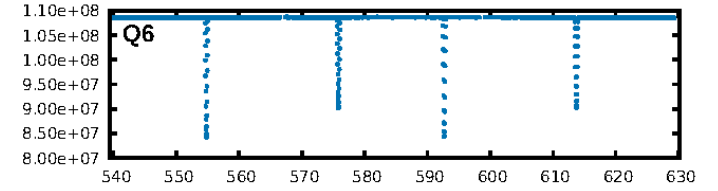
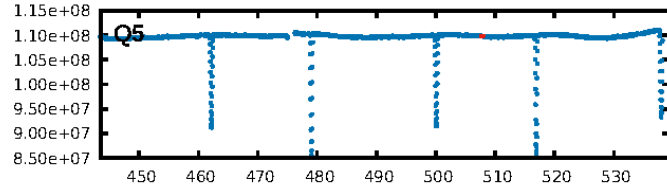
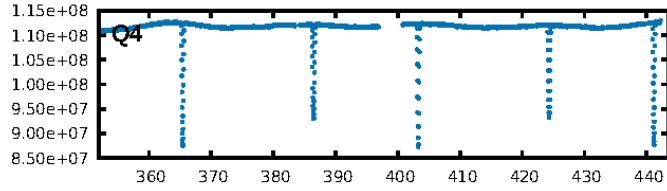
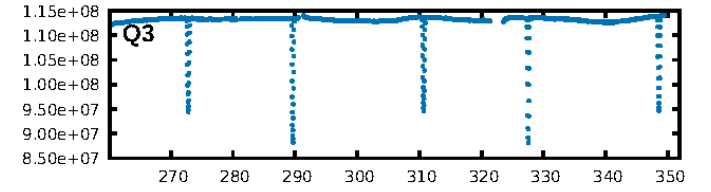
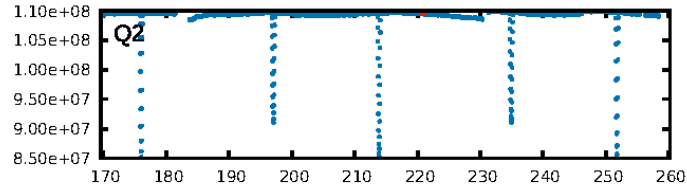
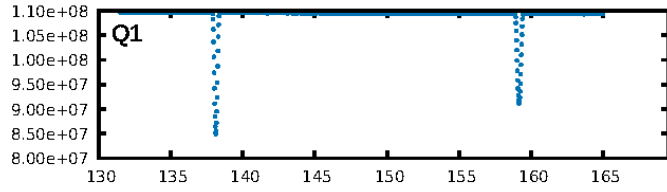
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [463.24σ]  
LongPeriod-sig: 100.0% [102.40σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 9.73e-115  
RollingBand-fgt: 1.00 [5/5]  
GhostDiagnostic-chr: N/A  
Centroid-sig: N/A  
Centroid-so: N/A  
**OotOffset-rm: 6.850 arcsec [6.06σ]**  
**KicOffset-rm: 6.888 arcsec [6.10σ]**  
OotOffset-st: 1/0/0/0 [1]  
KicOffset-st: 1/0/0/0 [1]  
DiffImageQuality-fgm: 0.00 [0/1]  
DiffImageOverlap-fno: 1.00 [4/4]

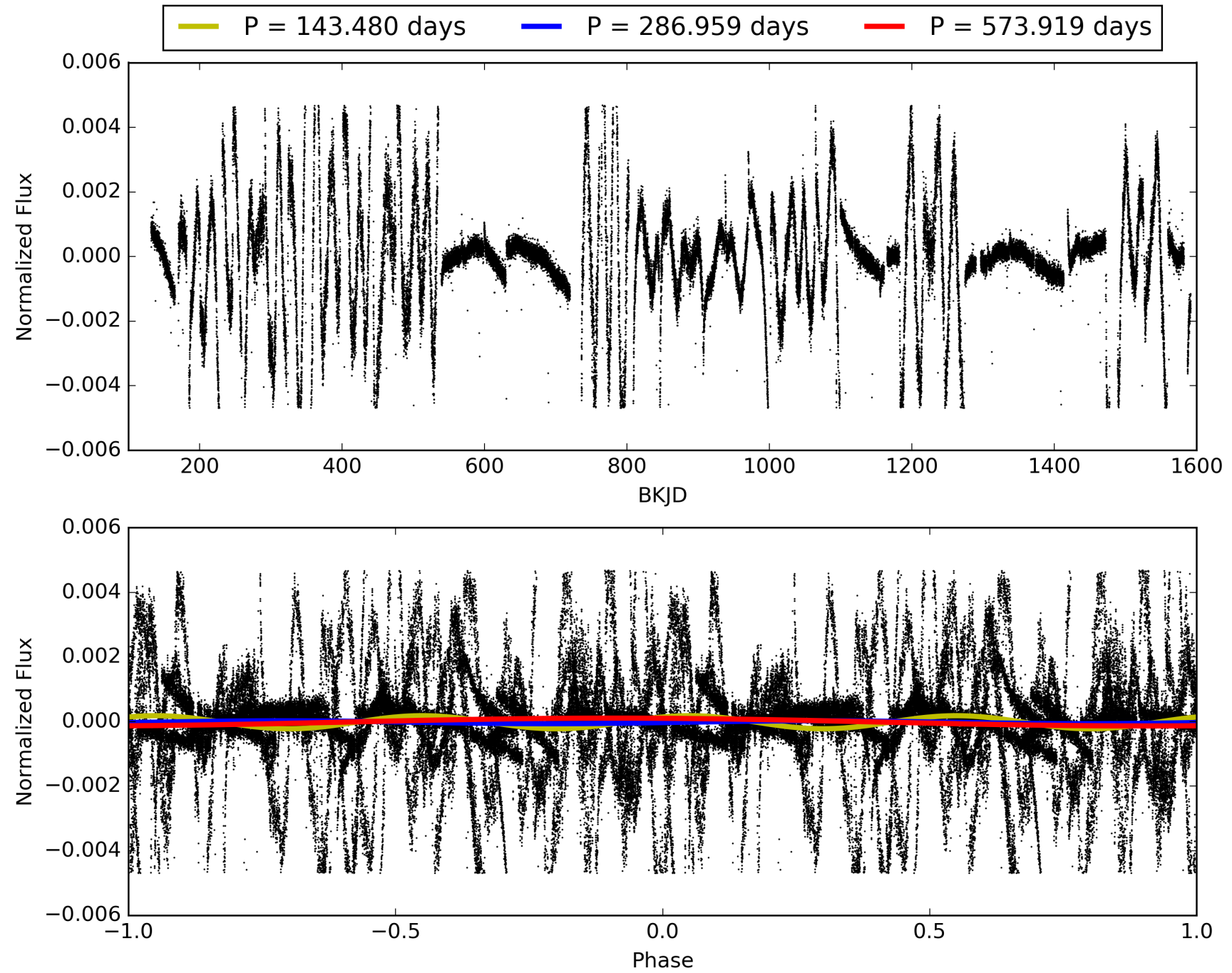
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 06:22:35 Z

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

# TCE 012306808-03, PDC Light Curves



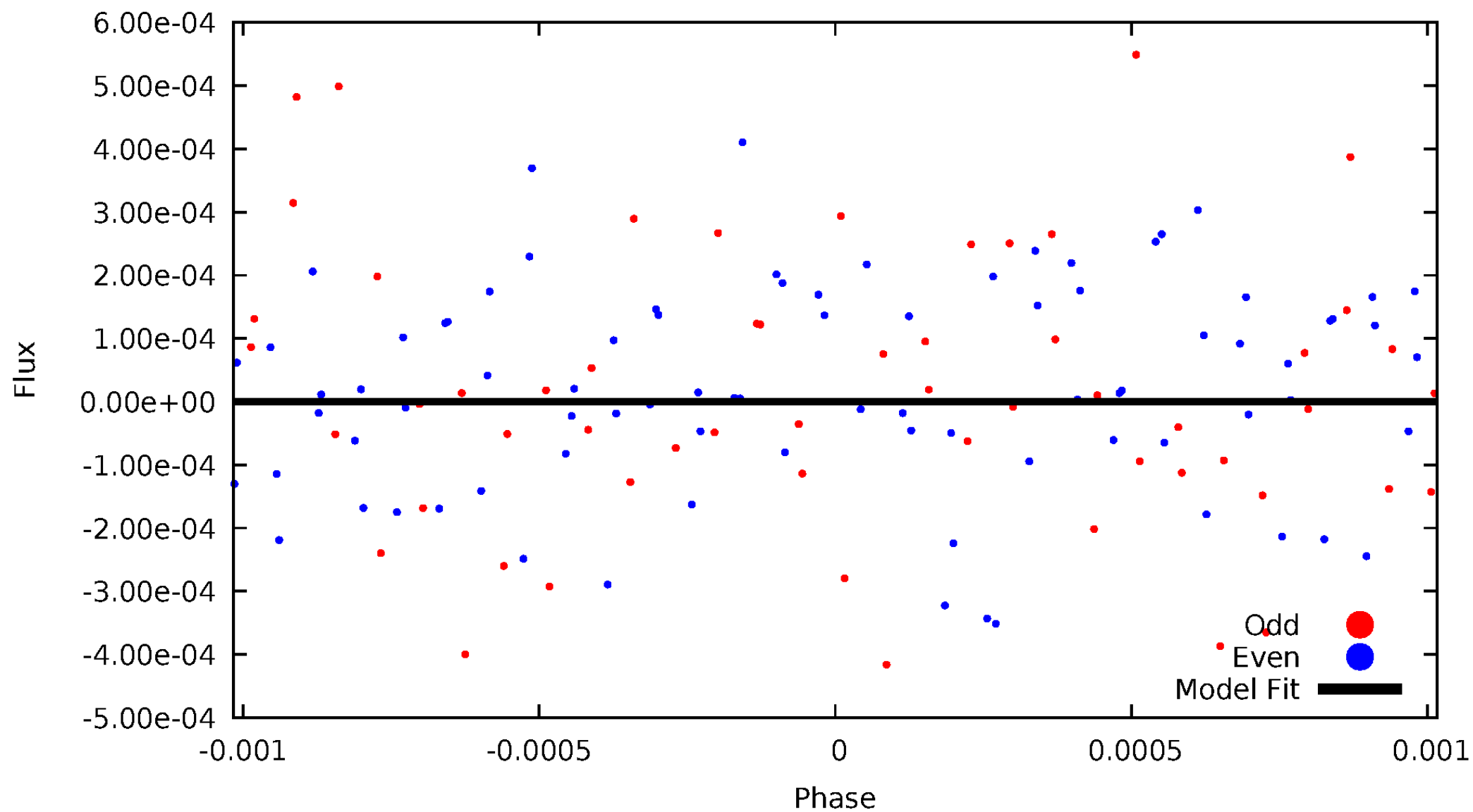
TCE 012306808-03





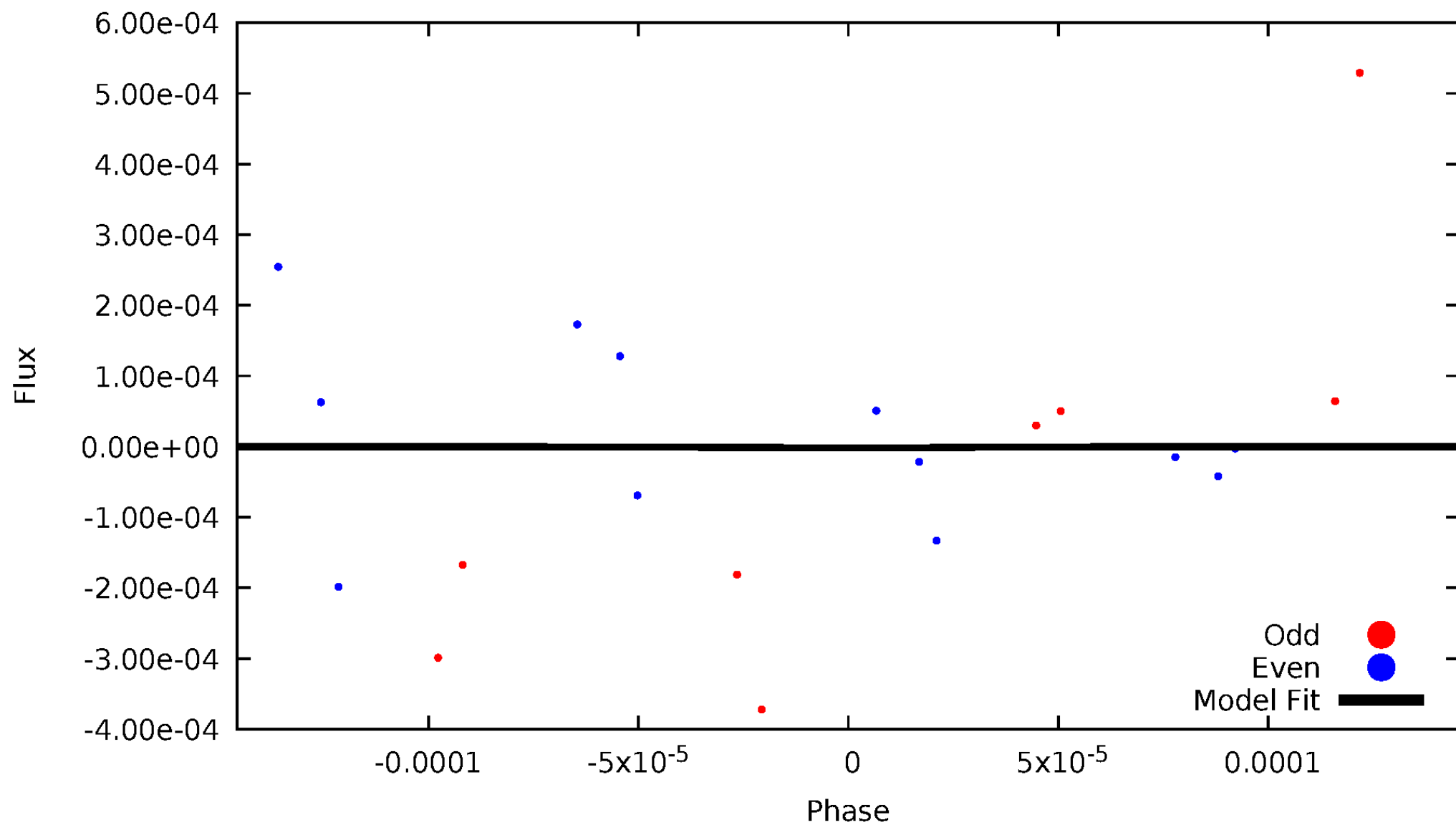
# DV Odd/Even

TCE 012306808-03



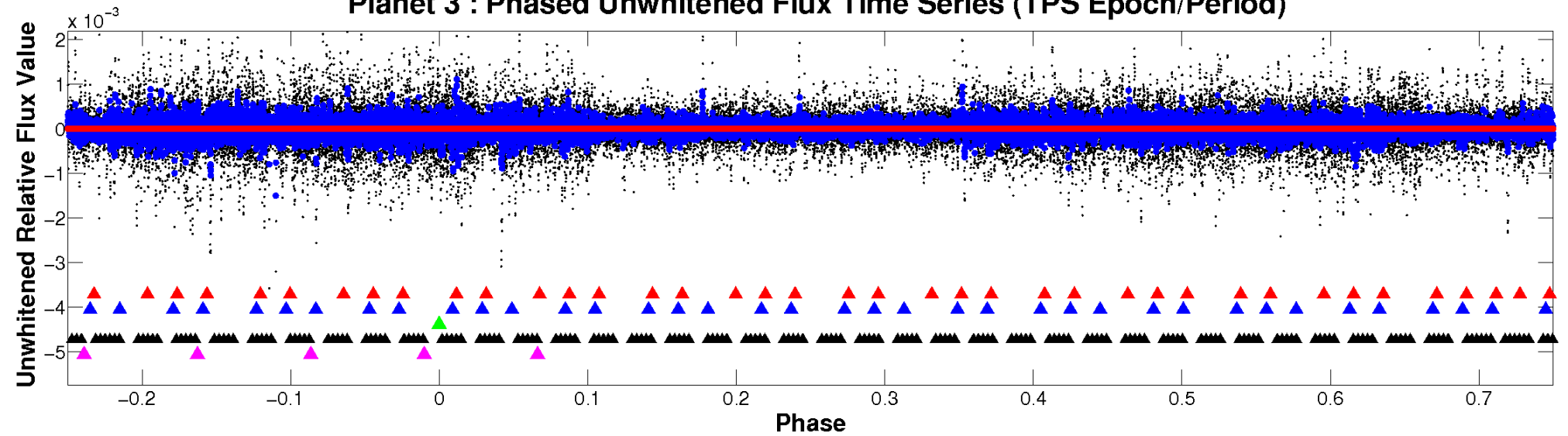
# ALT Odd/Even

TCE 012306808-03

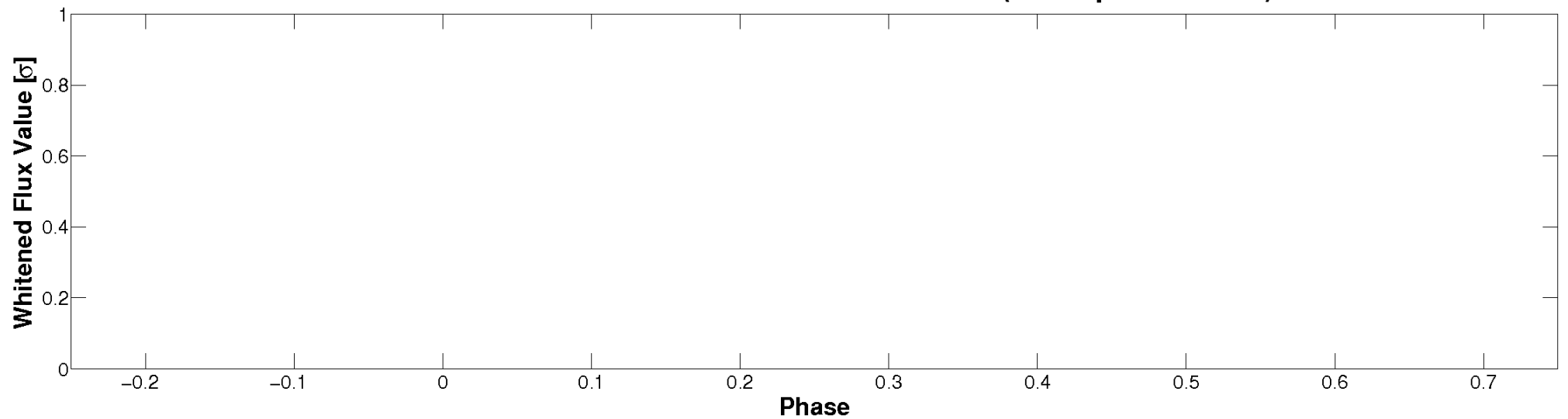


# Non-Whitened Vs. Whitened Light Curve

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

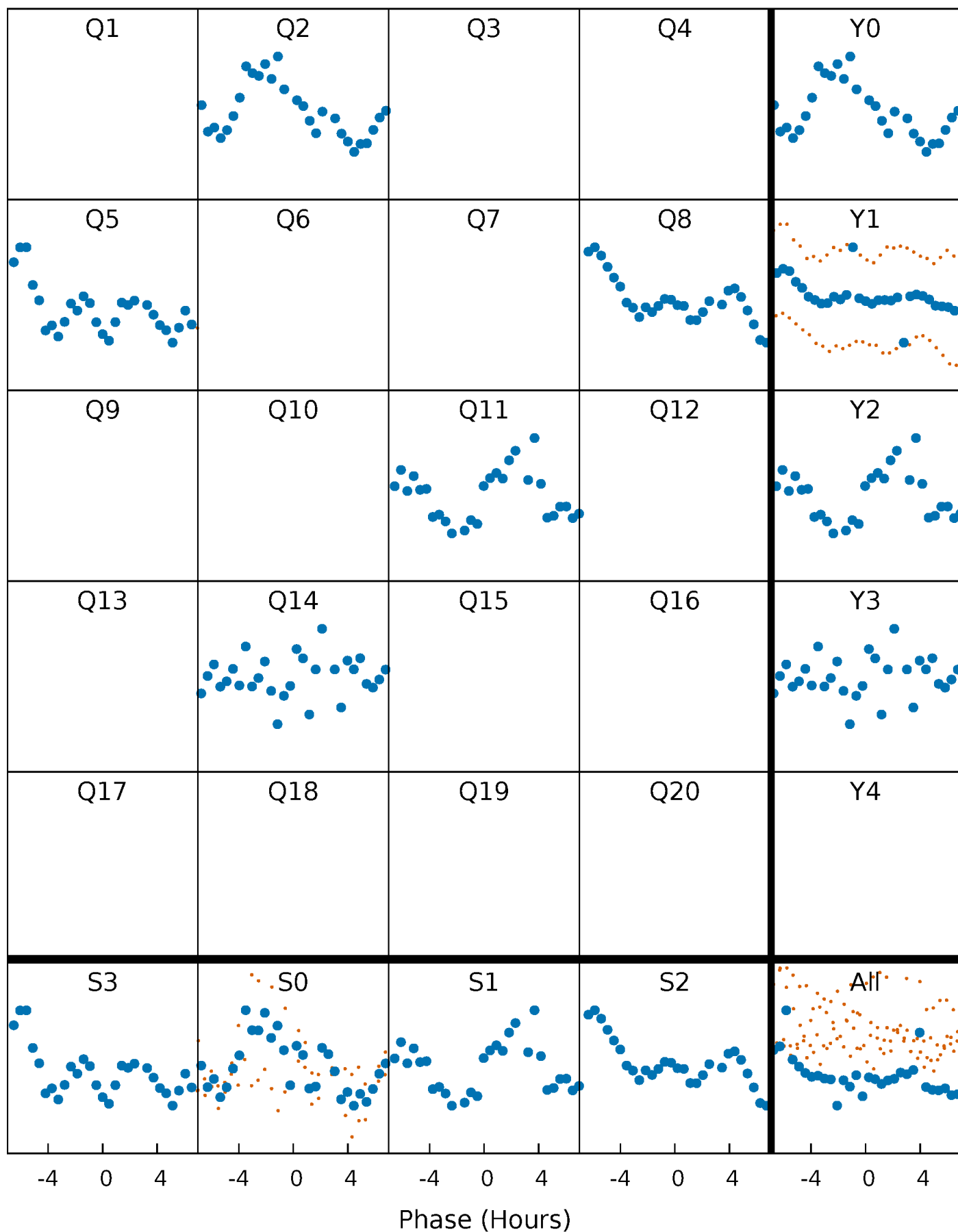


**Planet 3 : Phased Whitened Flux Time Series (TPS Epoch/Period)**



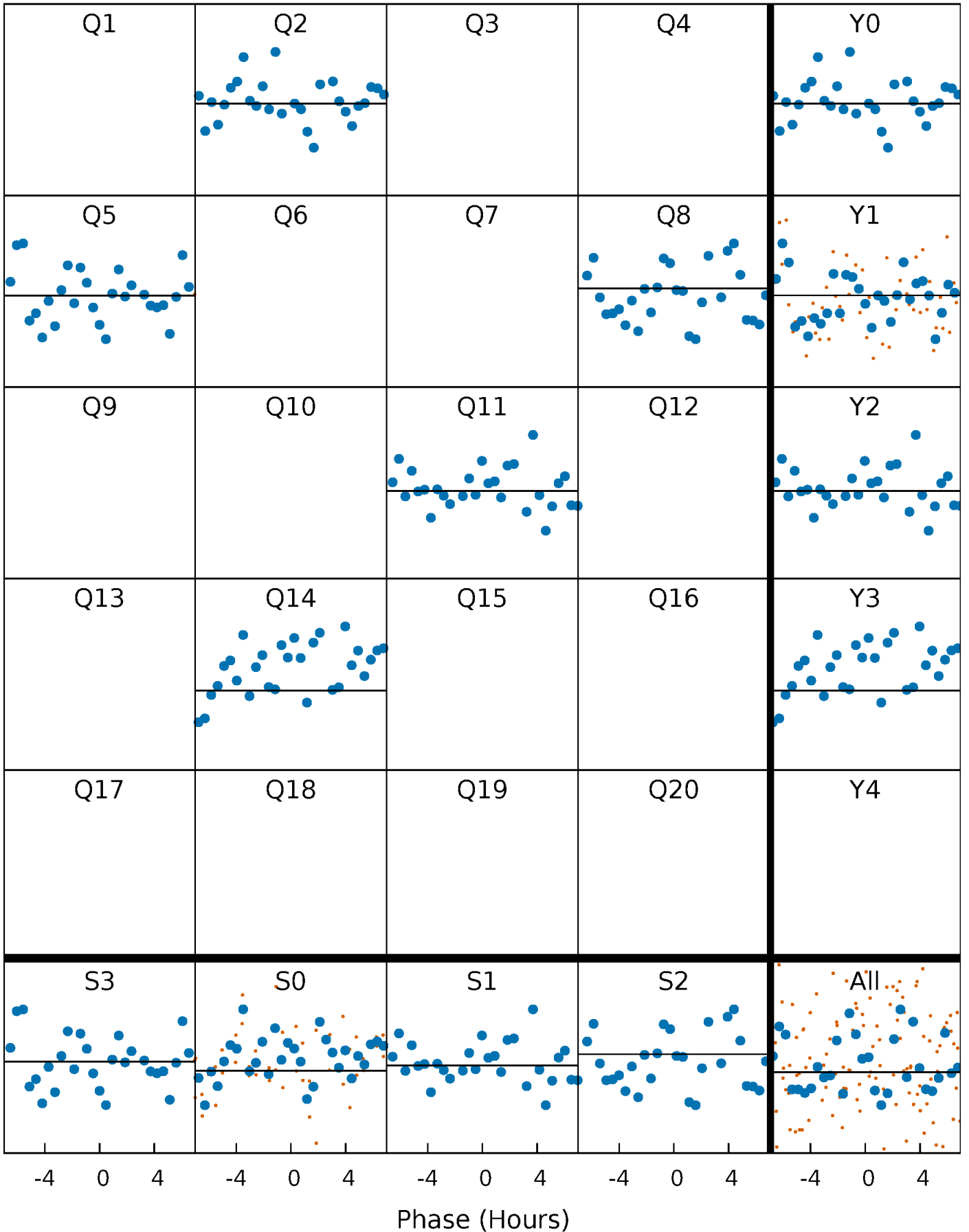
# PDC Quarter-Phased Transit Curves

TCE 012306808-03 P=286.959478 Days  $T_0=220.873763$  (BKJD)



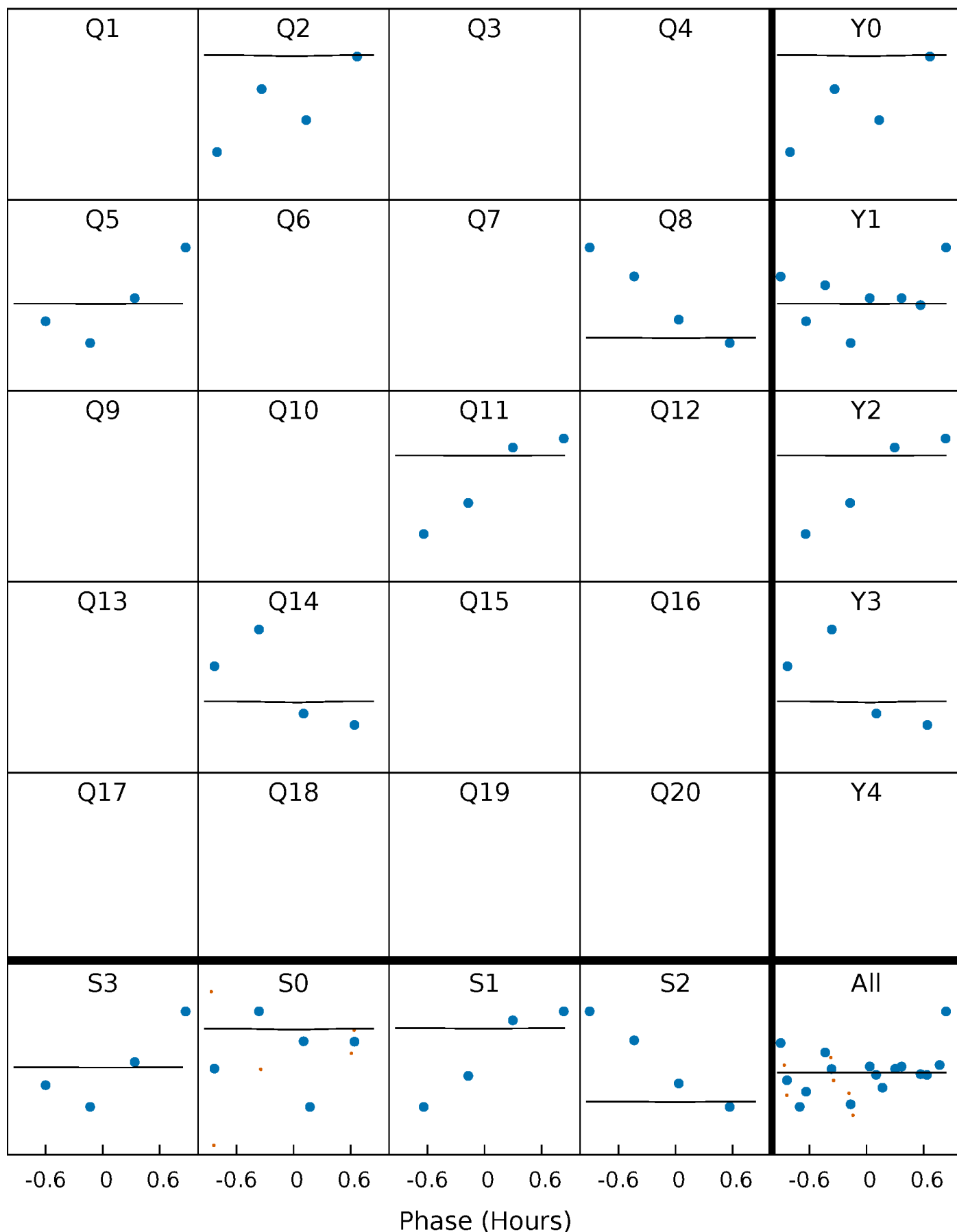
# DV Quarter-Phased Transit Curves

TCE 012306808-03     $P=286.959478$  Days     $T_0=220.873763$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

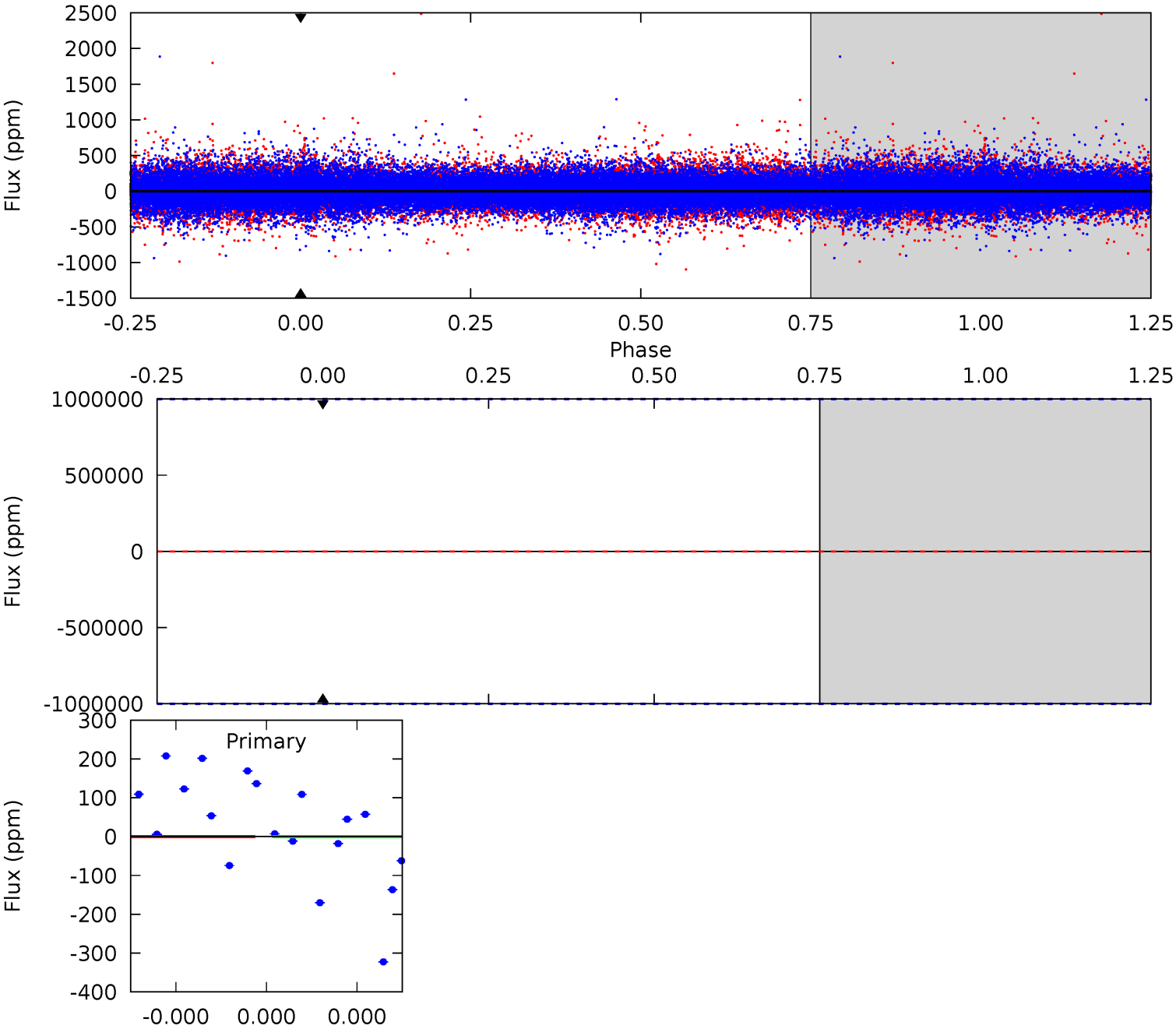
TCE 012306808-03 P=286.959478 Days  $T_0=221.088516$  (BKJD)



# DV Model-Shift Uniqueness Test

012306808-03, P = 286.959478 Days, E = 220.873763 Days

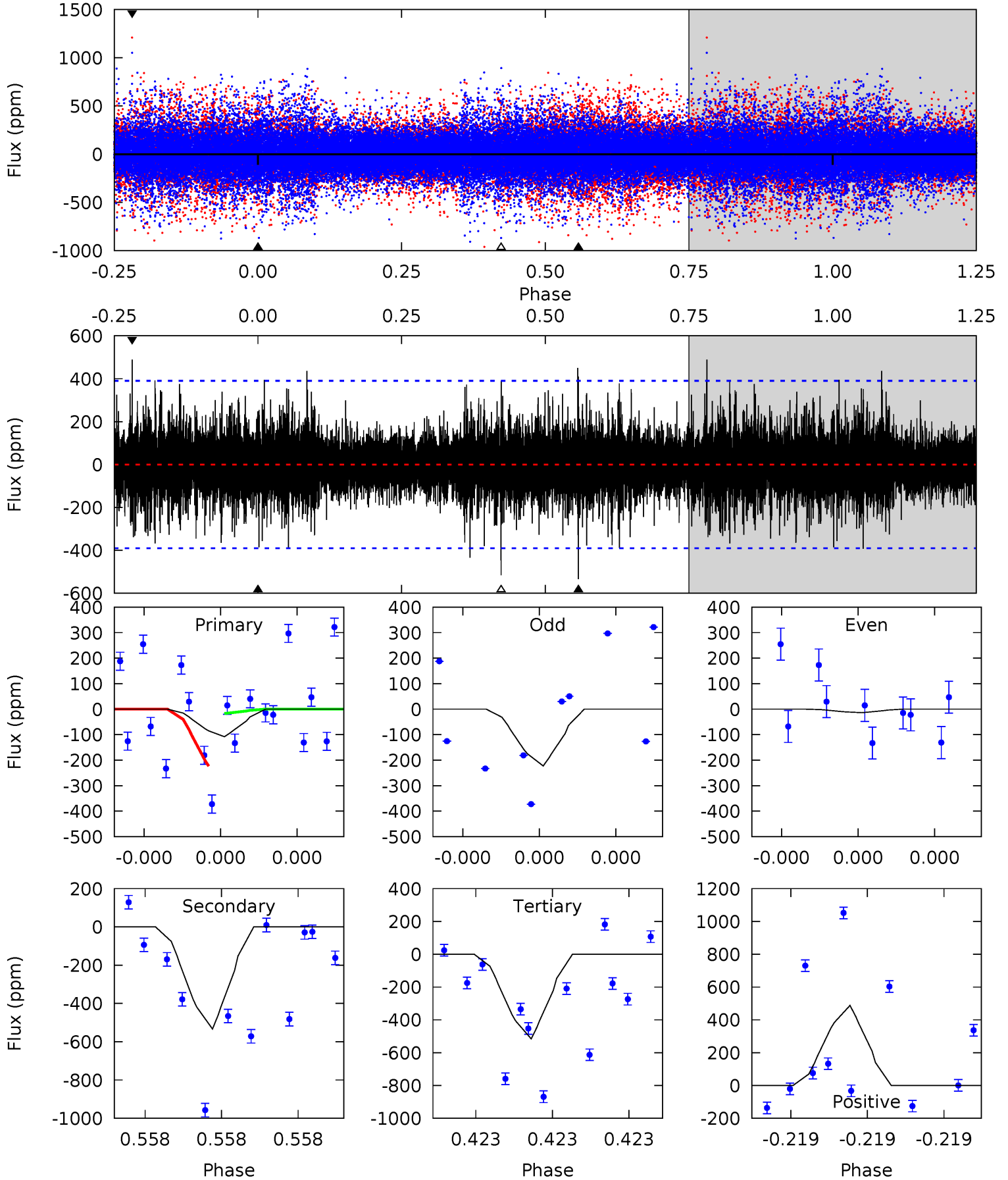
| Pri | Sec | Ter | Pos | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|-----|-----|-----|-----|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|-----|-------|-----|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



# Alt Model-Shift Uniqueness Test

012306808-03, P = 286.959478 Days, E = 221.088516 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  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 1.61 | 7.92 | 7.66 | 7.25 | 5.80            | 3.82            | 1.37             | -6.05   | -5.64   | 0.26    | 0.67    | 1.46    | 0.77 | 0.48  | 1.47 |





### Stellar Parameters For KIC 012306808

|        | $T_{\text{eff}}(K)$  | $\log(g)$                 | [Fe/H]                     | $R (R_{\odot})$           | $M(M_{\odot})$            | $p_{\star} (g \cdot \text{cm}^{-3})$ |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|--------------------------------------|
|        | $5985^{+143}_{-161}$ | $4.603^{+0.028}_{-0.161}$ | $-0.780^{+0.300}_{-0.300}$ | $0.758^{+0.170}_{-0.057}$ | $0.846^{+0.071}_{-0.087}$ | $2.738^{+0.437}_{-1.226}$            |
|        | +2%/-3%              | +1%/-3%                   | +38%/-38%                  | +22%/-8%                  | +8%/-10%                  | +16%/-45%                            |
| Source | PHO1                 | KIC0                      | KIC0                       | DSEP                      |                           |                                      |

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

### Secondary Eclipse Parameters for KIC 012306808-03 / KOI

| Detrend | Depth (ppm)     | $R_p (R_{\oplus})$     | $T_{max} (K)$     | $T_{obs} (K)$             | $A_{obs}$                               |
|---------|-----------------|------------------------|-------------------|---------------------------|---|
| DV      | $0 \pm 1000000$ | $8.32^{+7.76}_{-5.72}$ | $367^{+20}_{-15}$ | $-3532^{+19984}_{-12662}$ | $-3259.595^{+879528.976}_{-761360.065}$ |
| Alt.    | $-533 \pm 67$   | $5.80^{+6.27}_{-4.15}$ | $365^{+20}_{-14}$ | $3870^{+2499}_{-813}$     | $5612^{+58851}_{-4377}$                 |

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

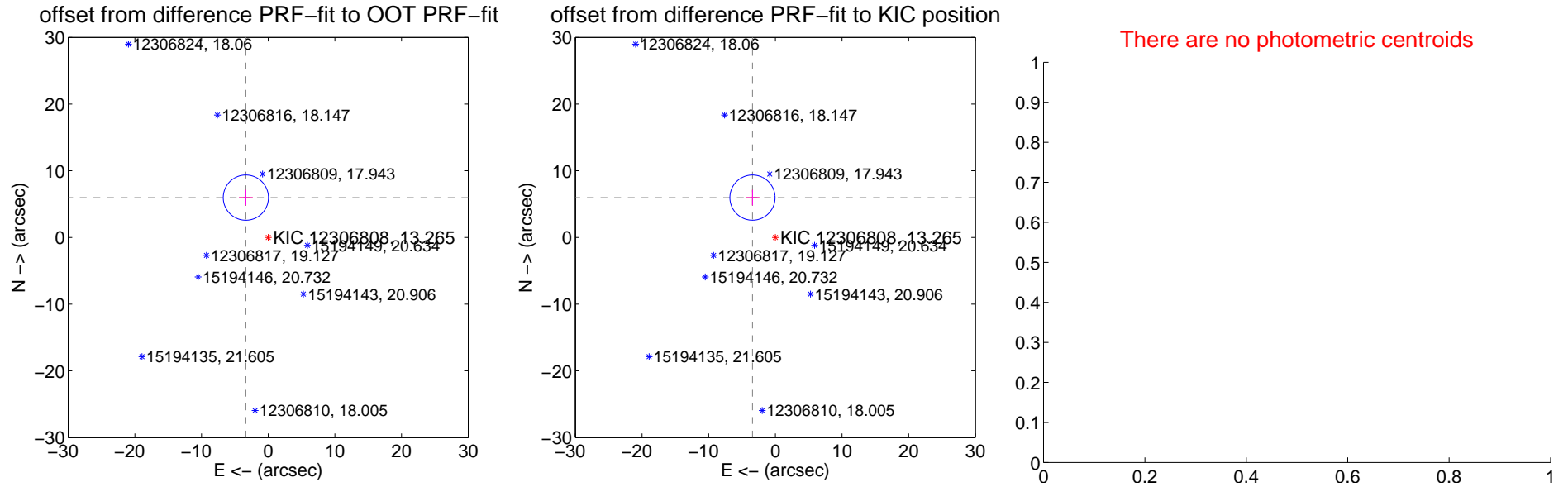
## DV Centroid Data

Supplemental centroid analysis for 012306808-03. Kepler magnitude: 13.27. Transit SNR -1.00

There are 0 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.08 arcsec

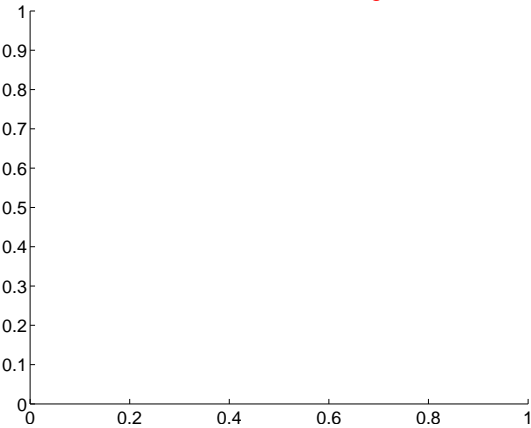
|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA       | $\Delta$ Dec      |
|---|--------------------|---------------------|-------------------|-------------------|
| PRF-fit source offset from OOT          | $6.850 \pm 1.131$  | 6.06                | $3.355 \pm 1.039$ | $5.972 \pm 1.158$ |
| PRF-fit source offset from KIC position | $6.888 \pm 1.130$  | 6.10                | $3.432 \pm 1.039$ | $5.973 \pm 1.158$ |
| photometric centroid source offset      | —                  | —                   | —                 | —                 |



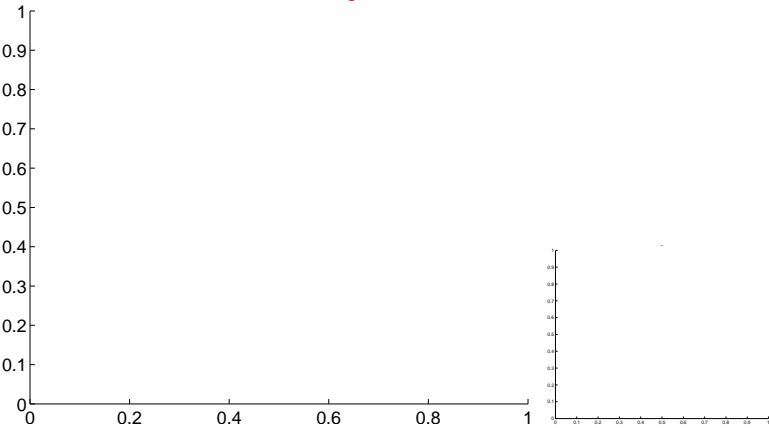
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

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

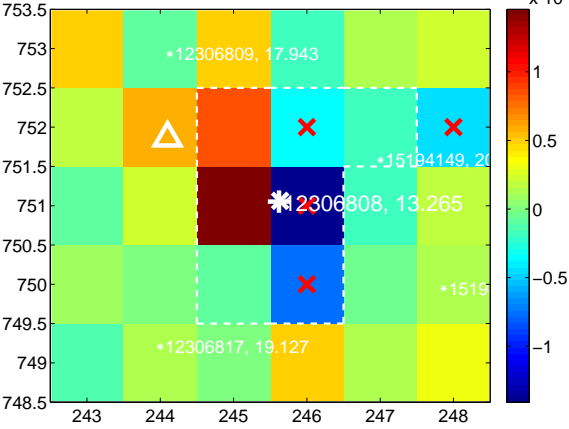
Q1 no difference image



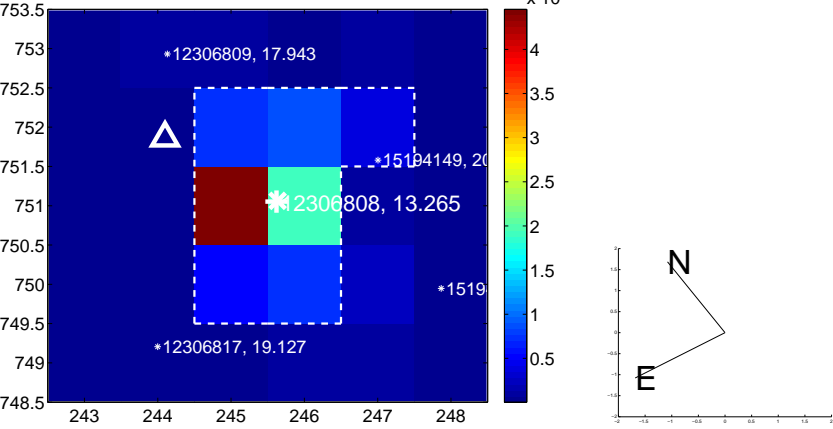
Q1 no OOT image



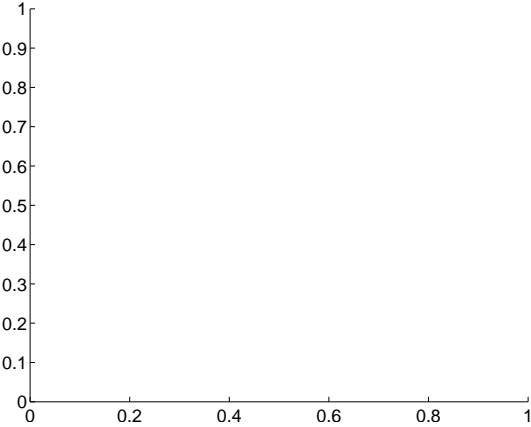
Q2 difference image. Poor Quality



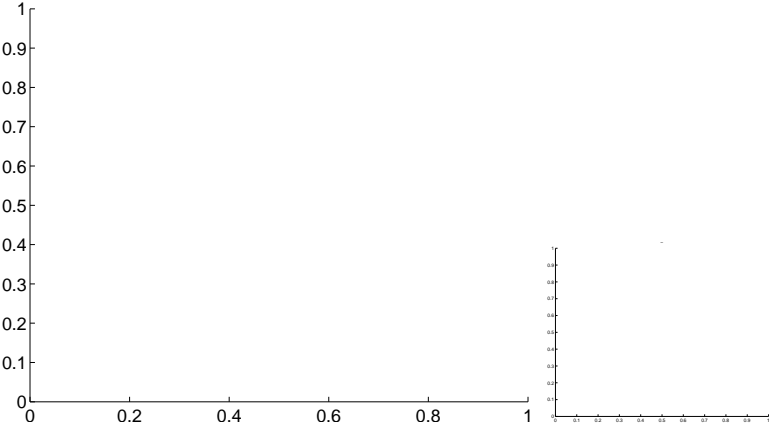
Q2 OOT image



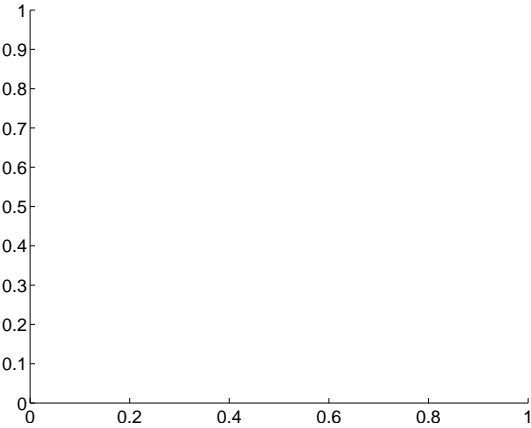
Q3 no difference image



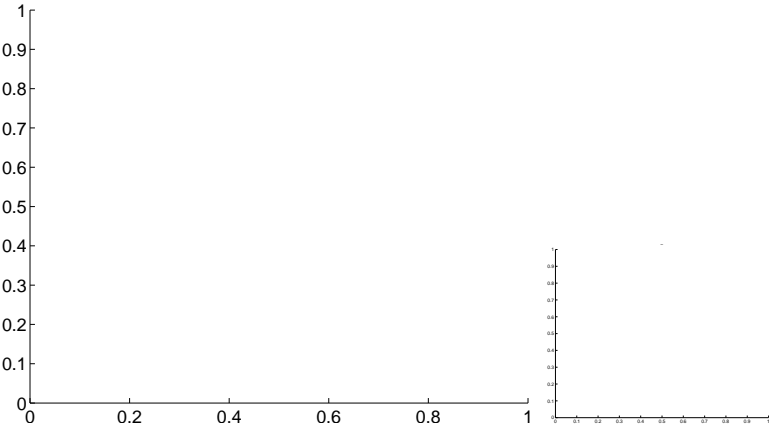
Q3 no OOT image



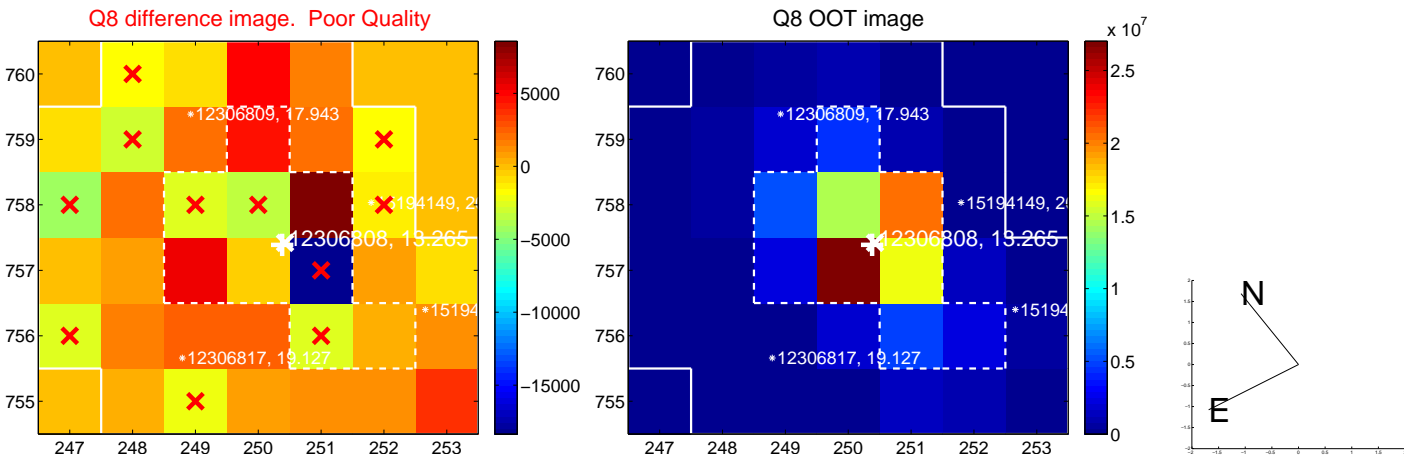
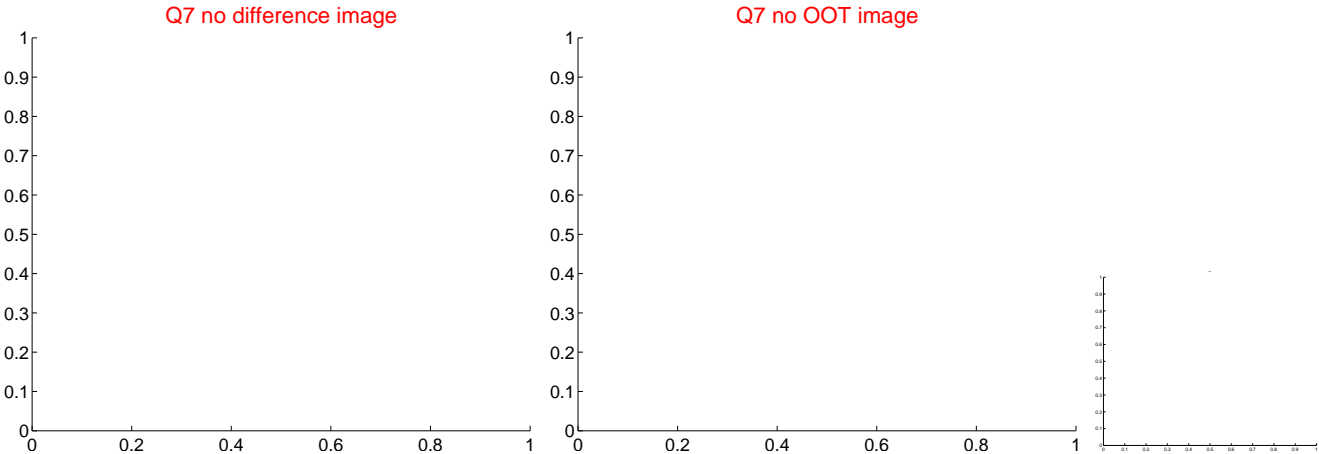
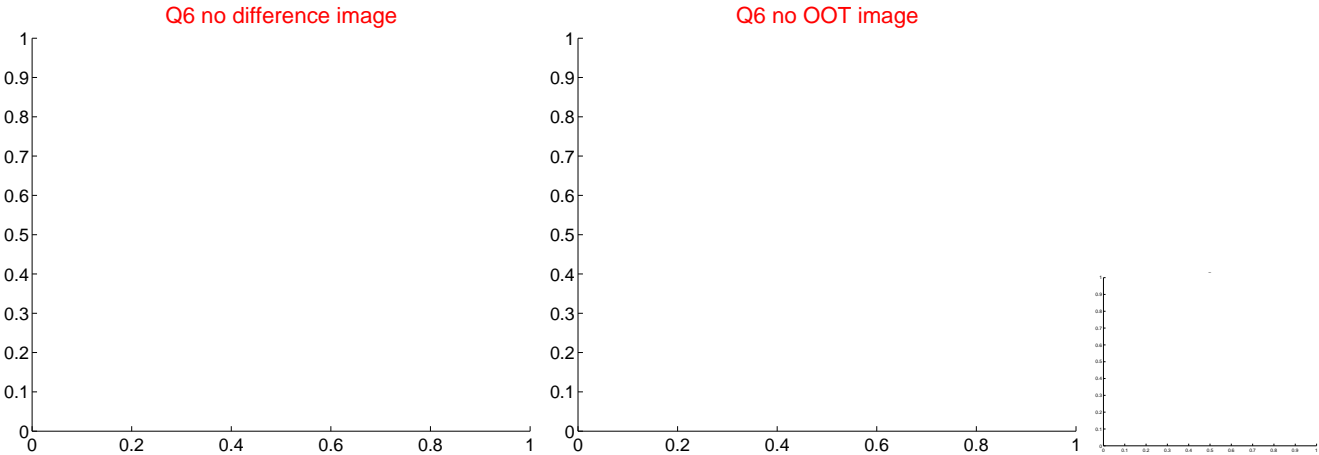
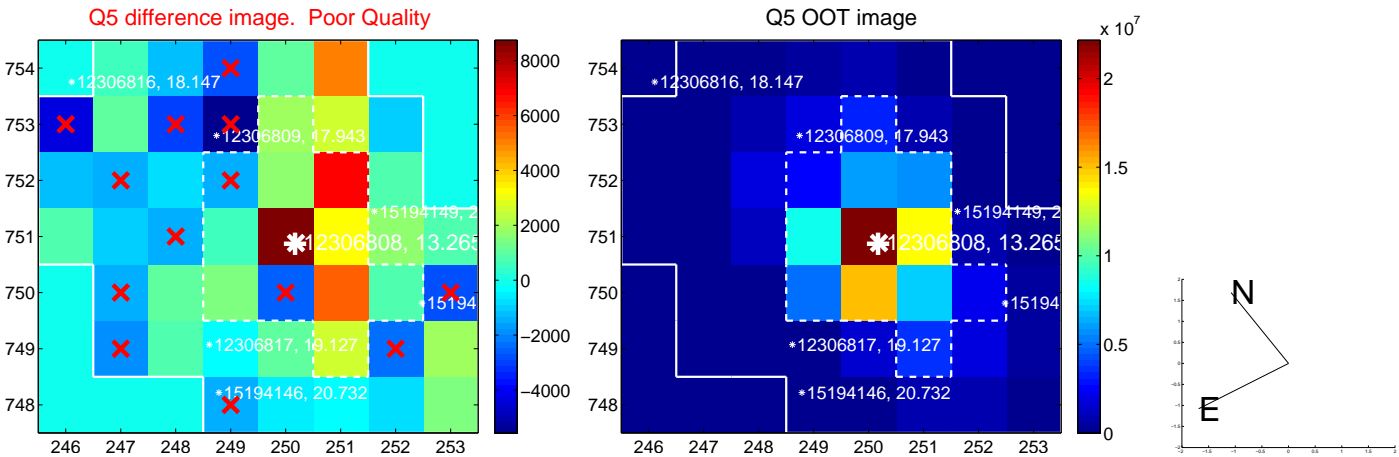
Q4 no difference image



Q4 no OOT image



white ×: KIC target position; +: OOT centroid; △: difference centroid. red ×: large negative pixel value.

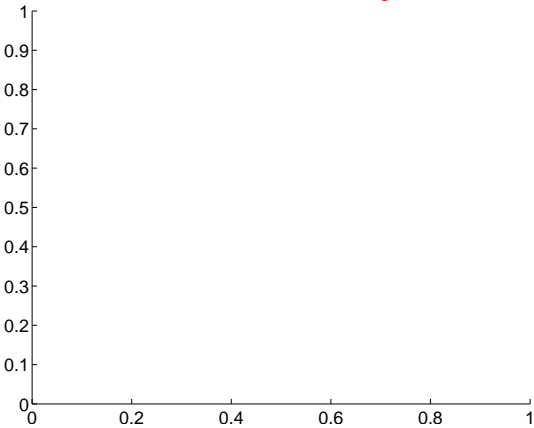


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

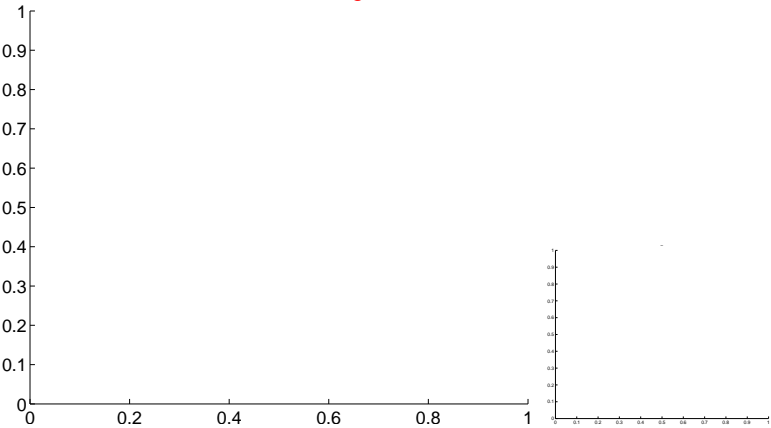


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

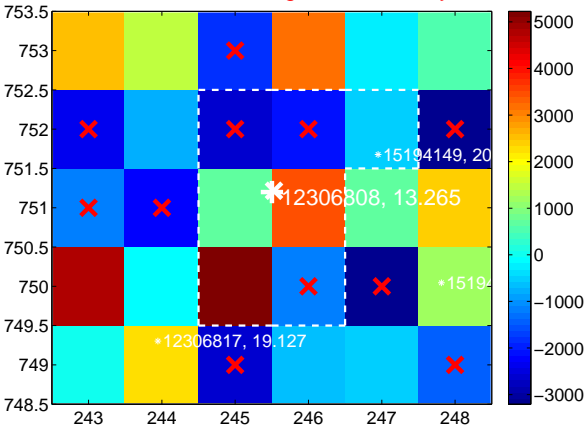
Q13 no difference image



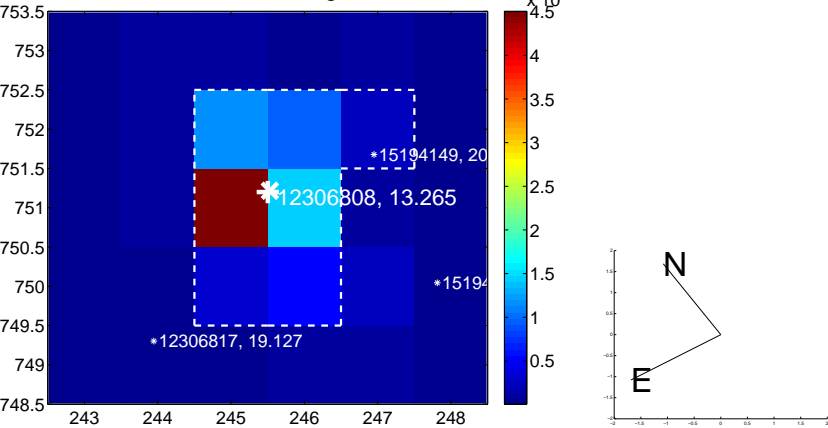
Q13 no OOT image



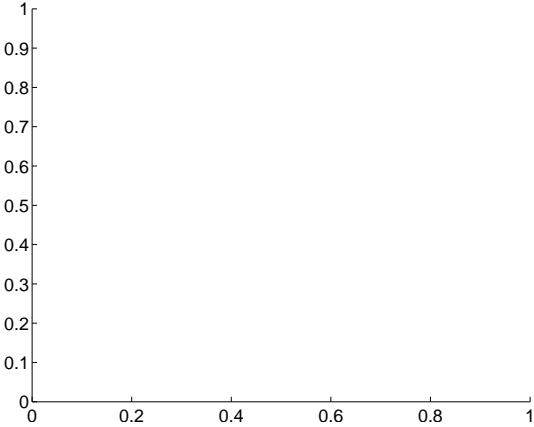
Q14 difference image. Poor Quality



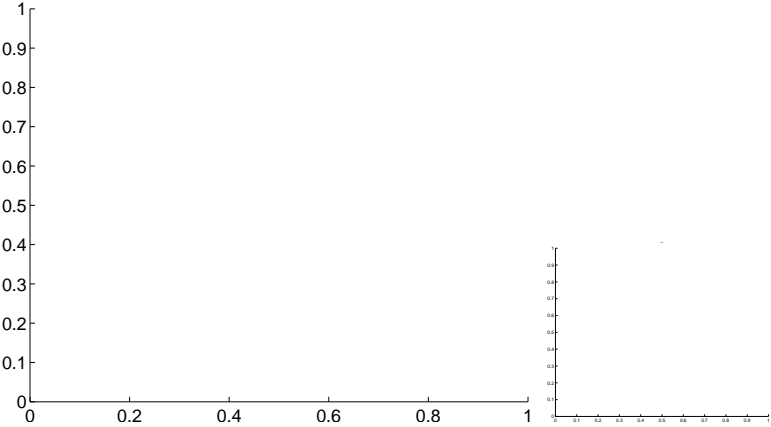
Q14 OOT image



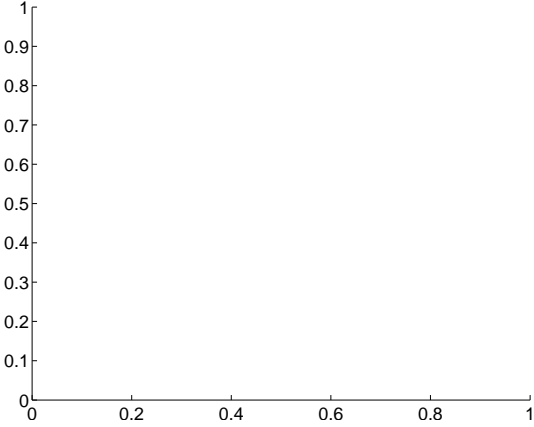
Q15 no difference image



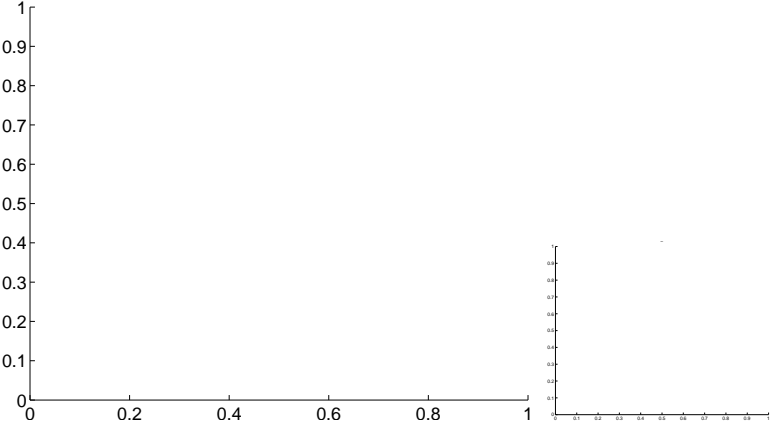
Q15 no OOT image



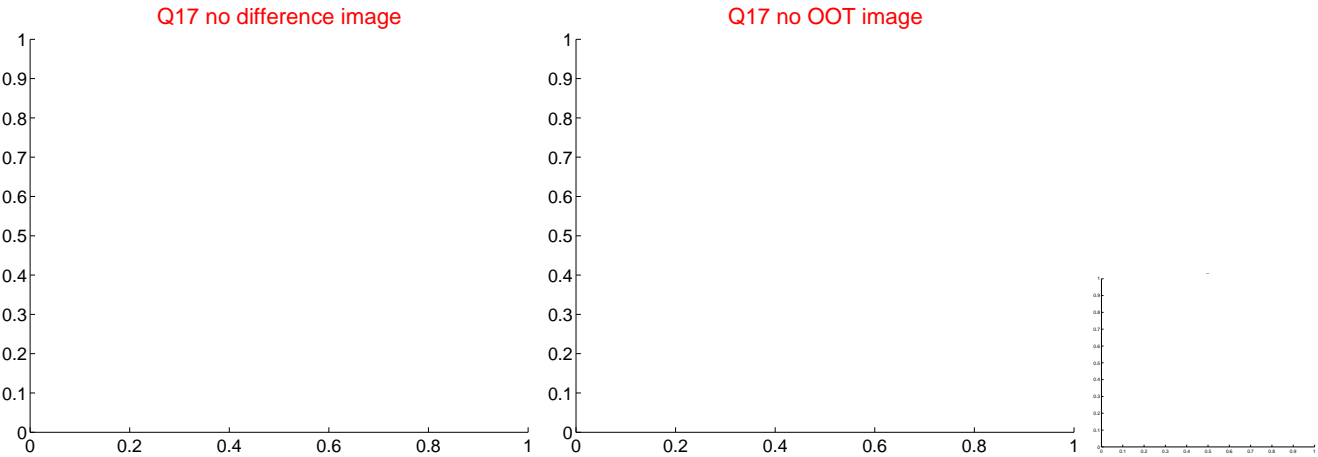
Q16 no difference image



Q16 no OOT image



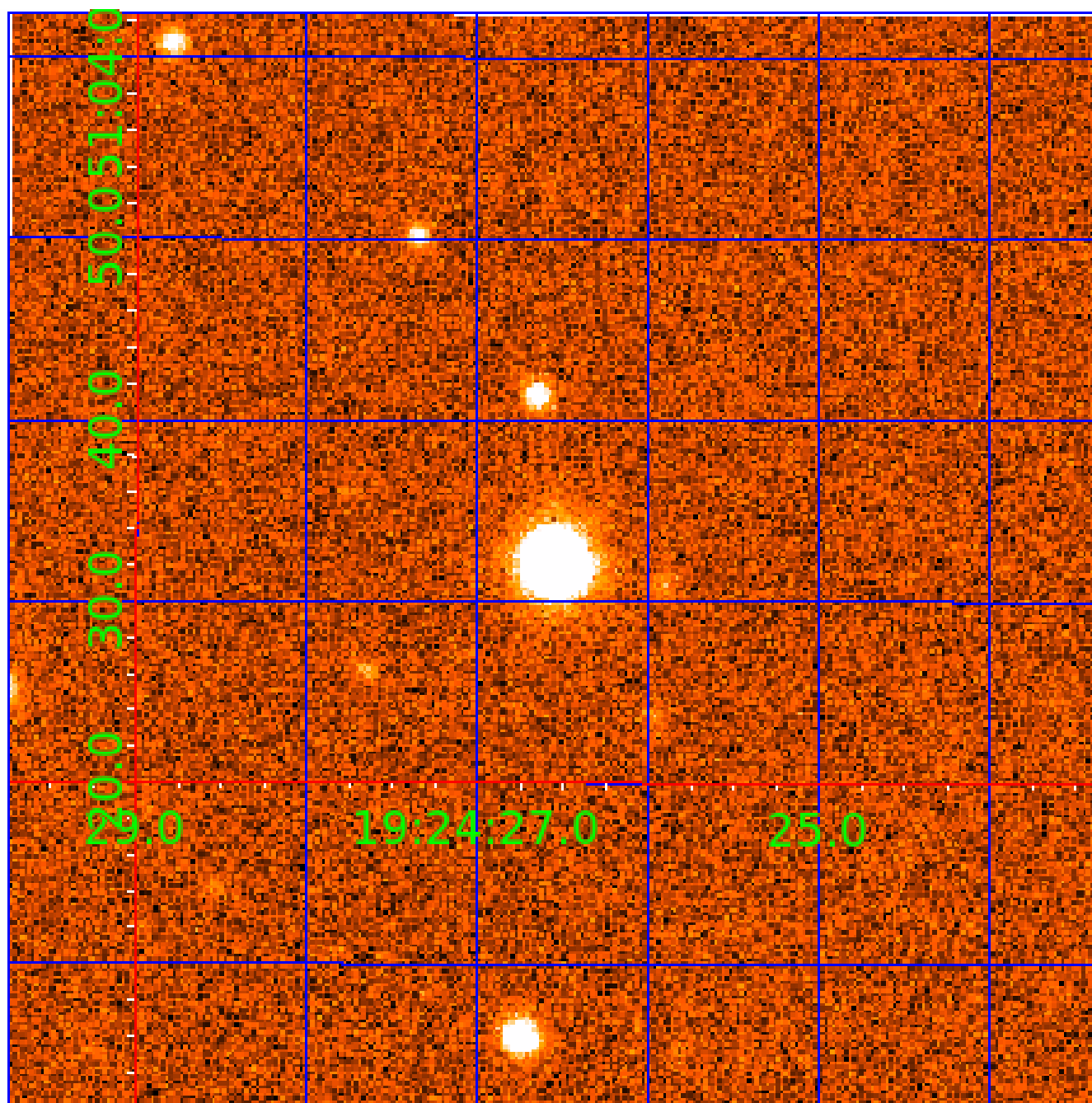
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



folded centroid time series figure for this object.

# UKIRT Image

Declination





# KIC 012306808

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|---------|--------|-----------------------------|-----------------|------------------------|------------------------|
| 012306808-01 | OBS      | 7521.01 | 37.878464     | 138.128811   | 219541.5    | 10.662           | 13890.0 | 5929.2 | 0.76                        | 5985            | 47.48                  | 15.22                  |
| 012306808-02 | OBS      | No      | 37.878482     | 159.173983   | 169013.5    | 12.421           | 9956.5  | 6360.1 | 0.76                        | 5985            | 45.32                  | 15.22                  |
| 012306808-03 | OBS      | No      | 286.959478    | 220.873763   | 4316.9      | 3.500            | 68.4    | -1.0   | 0.76                        | 5985            | 5.00                   | 1.02                   |
| 012306808-04 | OBS      | 7521.02 | 7.334455      | 137.092240   | 256.2       | 2.678            | 21.8    | 24.1   | 0.76                        | 5985            | 1.97                   | 135.87                 |
| 012306808-05 | OBS      | No      | 308.861042    | 152.279600   | 339.8       | 3.755            | 9.9     | 5.0    | 0.76                        | 5985            | 1.59                   | 0.93                   |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments   |
|--------------|----------|------|-------|---|---|---|---|--|
| 012306808-01 | OBS      | FP   | 0.00  | 0 | 1 | 0 | 0 | MOD_SEC_DV—DEEP_V_SHAPED—HAS_SEC_TCE   |
| 012306808-02 | OBS      | FP   | 0.00  | 1 | 1 | 0 | 0 | IS_SEC_TCE   |
| 012306808-03 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_MARSHALL_SKYE_ZUMA—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_NOFITS |
| 012306808-04 | OBS      | FP   | 0.00  | 0 | 0 | 1 | 0 | CENT_RESOLVED_OFFSET—HALO_GHOST  |
| 012306808-05 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS                         |

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

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

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

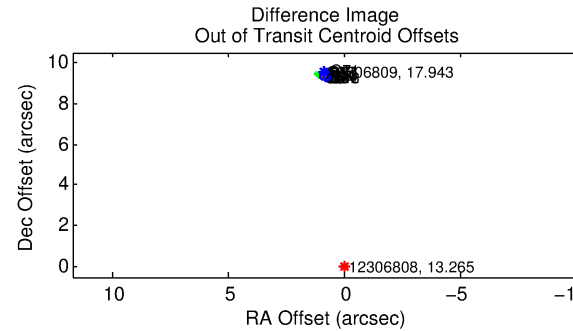
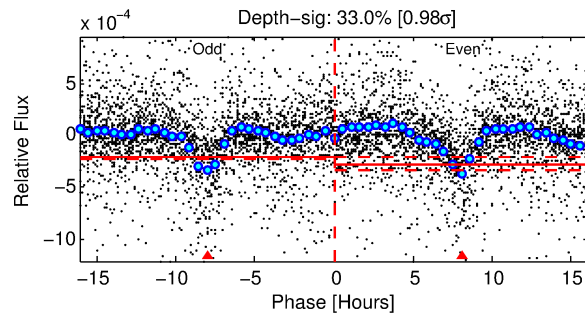
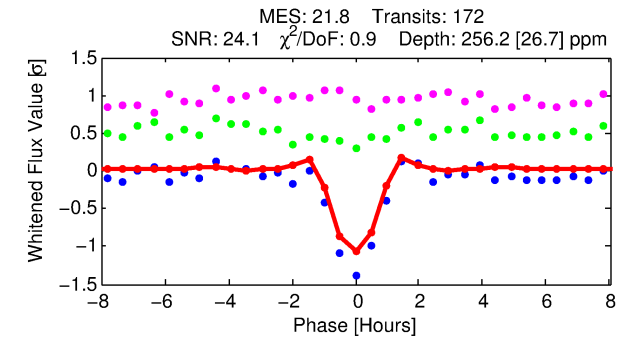
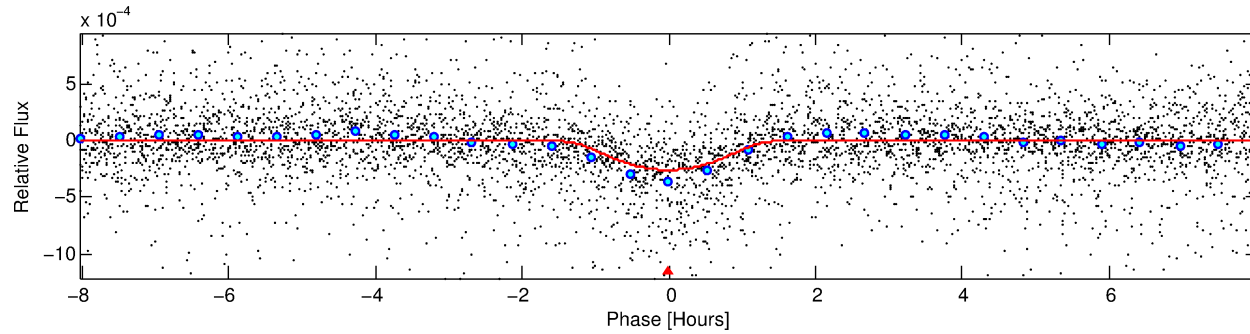
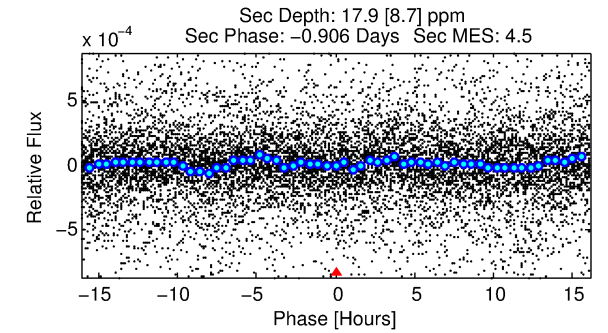
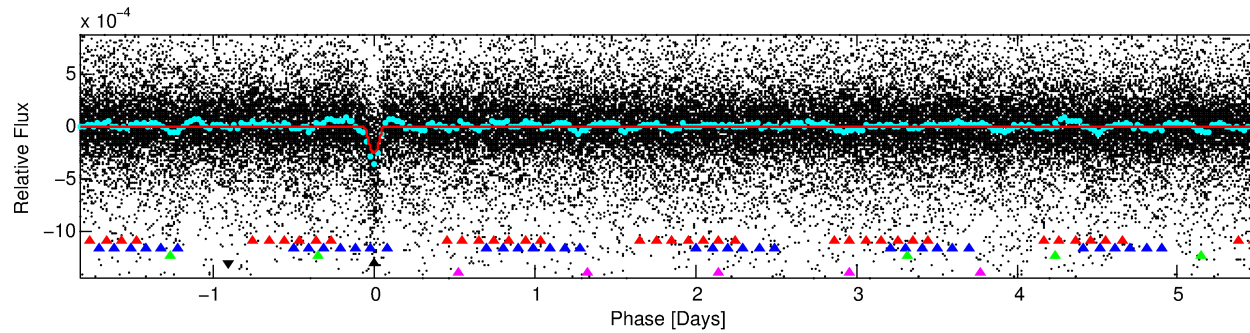
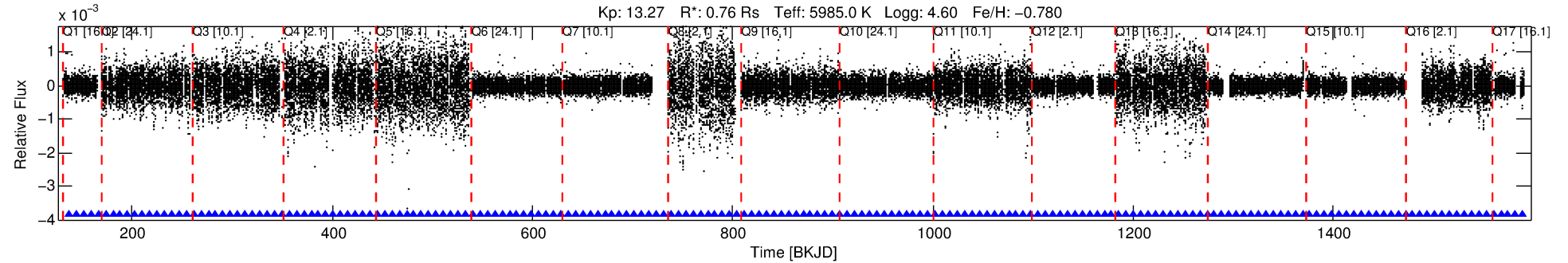
## Ephemeris Match Information For 012306808-04

No Significant Match Found

# DV One-Page Summary

KIC: 12306808 Candidate: 4 of 5 Period: 7.334 d  
KOI: K07521 Corr: No Ephemeris Match

Kp: 13.27 R\*: 0.76 Rs Teff: 5985.0 K Logg: 4.60 Fe/H: -0.780



## DV Fit Results:

Period = 7.33445 [0.00002] d  
Epoch = 137.0922 [0.0027] BKJD  
Rp/R\* = 0.0238 [0.0143]  
a/R\* = 5.47 [1.26]  
b = 0.99 [0.03]  
Seff = 135.86 [41.88]  
Teq = 871 [67] K  
Rp = 1.97 [1.26] Re  
a = 0.0697 [0.0135] AU  
Ag = 12.33 [16.34] [0.69σ]  
Teffp = 2522 [818] K [2.01σ]

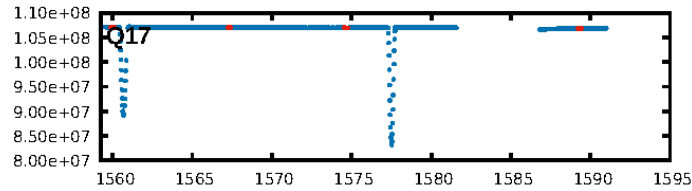
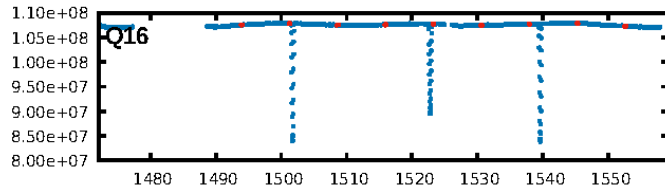
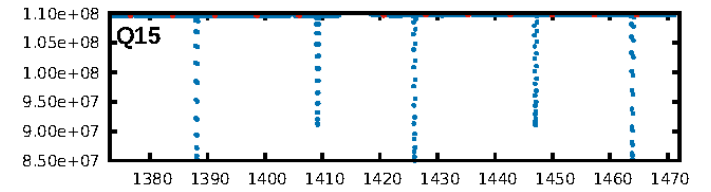
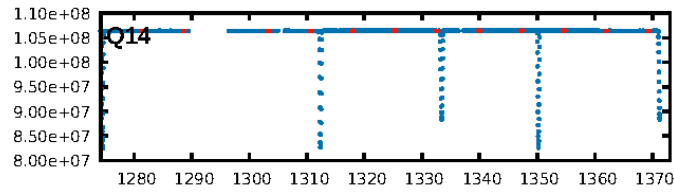
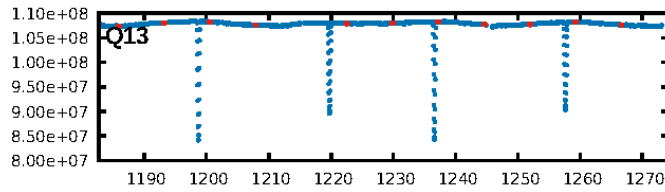
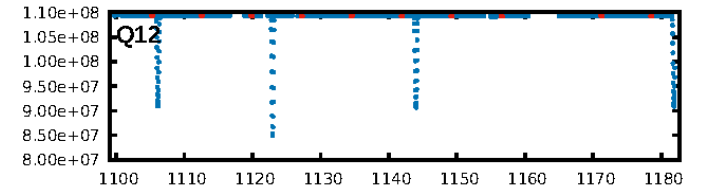
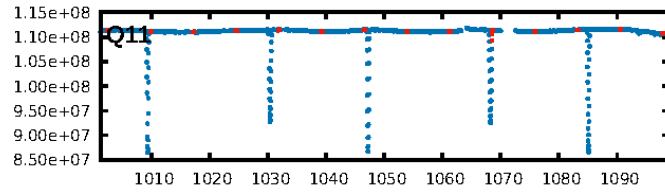
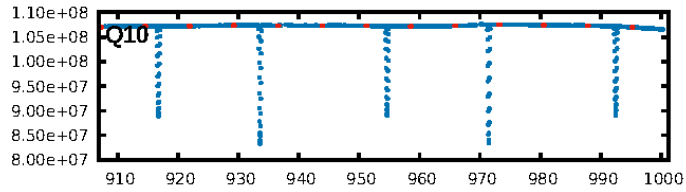
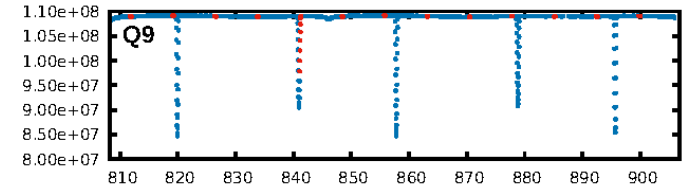
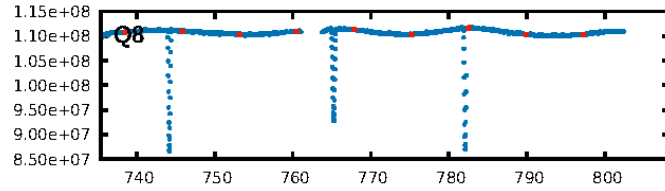
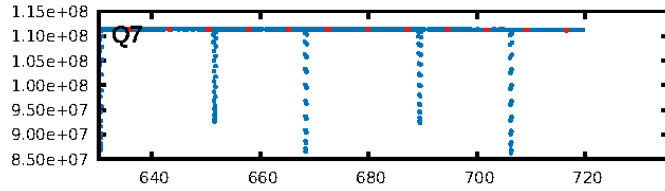
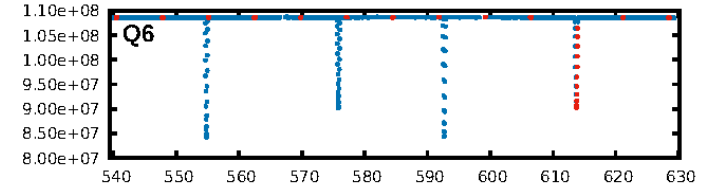
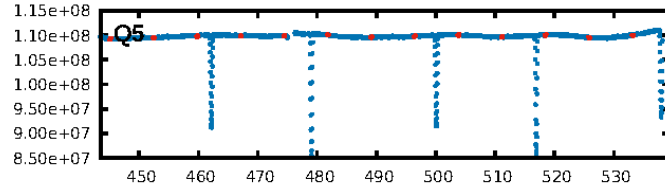
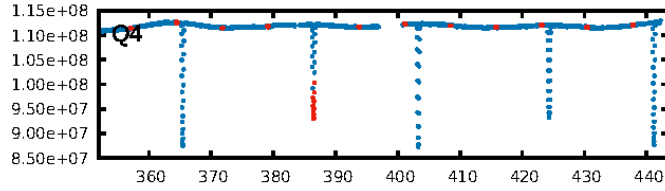
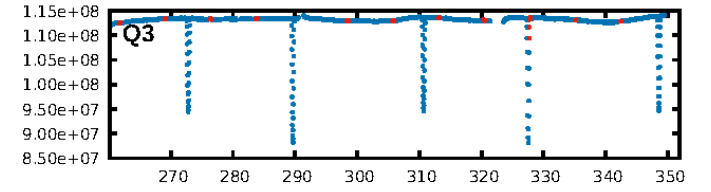
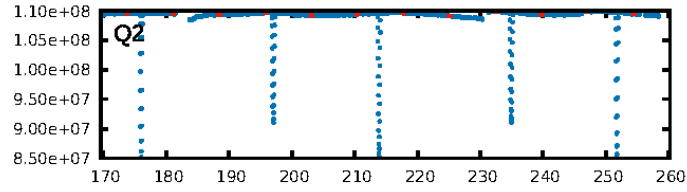
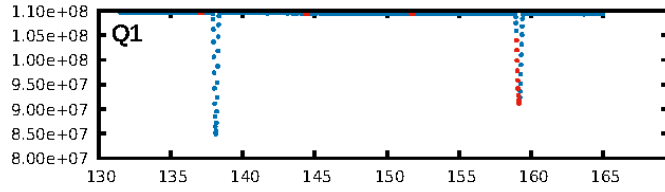
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [66.68σ]  
ModelChiSquare2-sig: 0.1%  
ModelChiSquareGoF-sig: 100.0%  
Bootstrap-pfa: 1.27e-91  
RollingBand-fgt: 1.00 [166/166]  
GhostDiagnostic-chr: -0.215  
Centroid-sig: 0.0%  
Centroid-so: 31.749 arcsec [72.76σ]  
OotOffset-rm: 9.385 arcsec [125.81σ]  
KicOffset-rm: 9.380 arcsec [127.43σ]  
OotOffset-st: 4/3/4/5 [16]  
KicOffset-st: 4/3/4/5 [16]  
DiffImageQuality-fgm: 1.00 [16/16]  
DiffImageOverlap-fno: 1.00 [17/17]

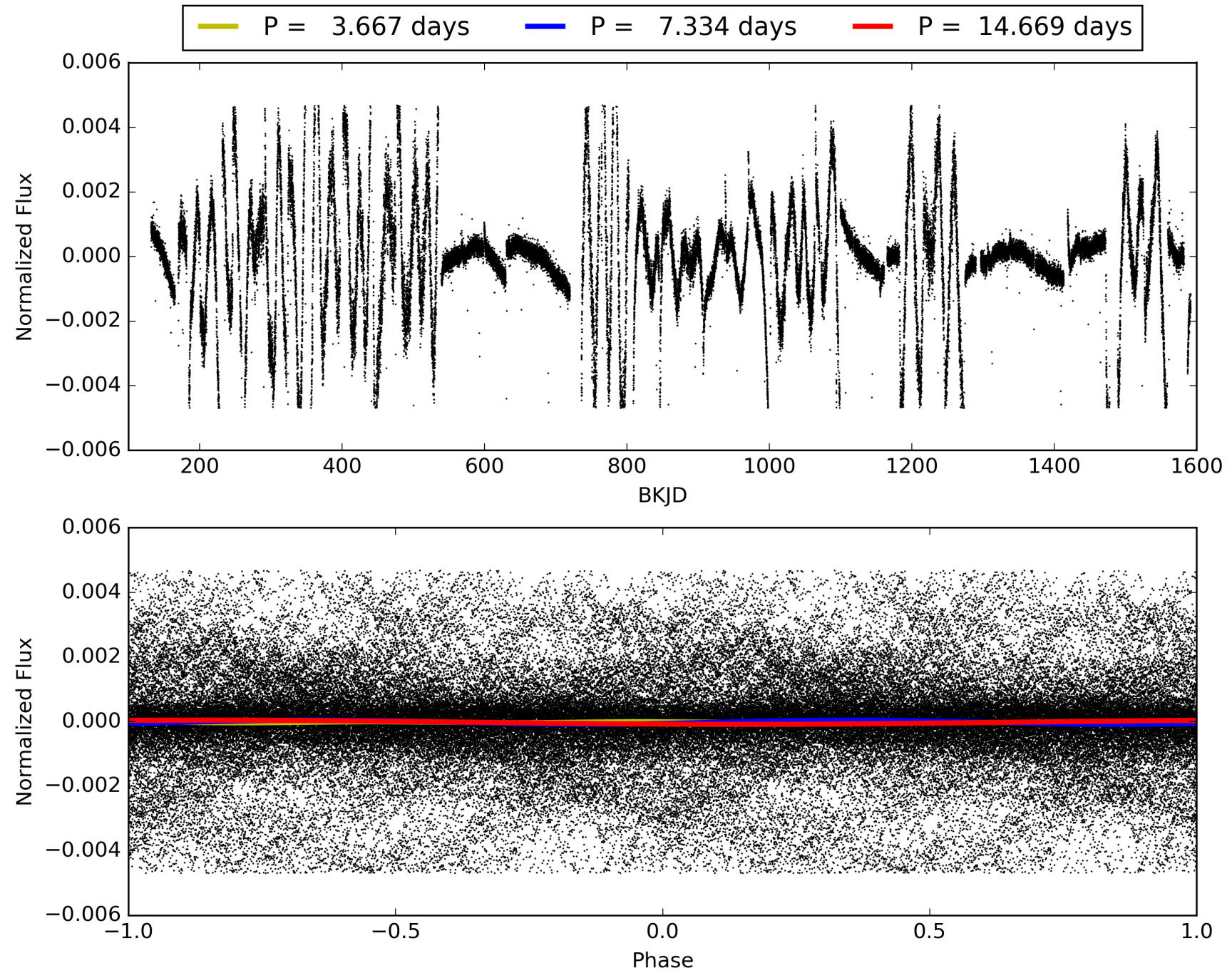
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 06:22:43 Z

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

# TCE 012306808-04, PDC Light Curves

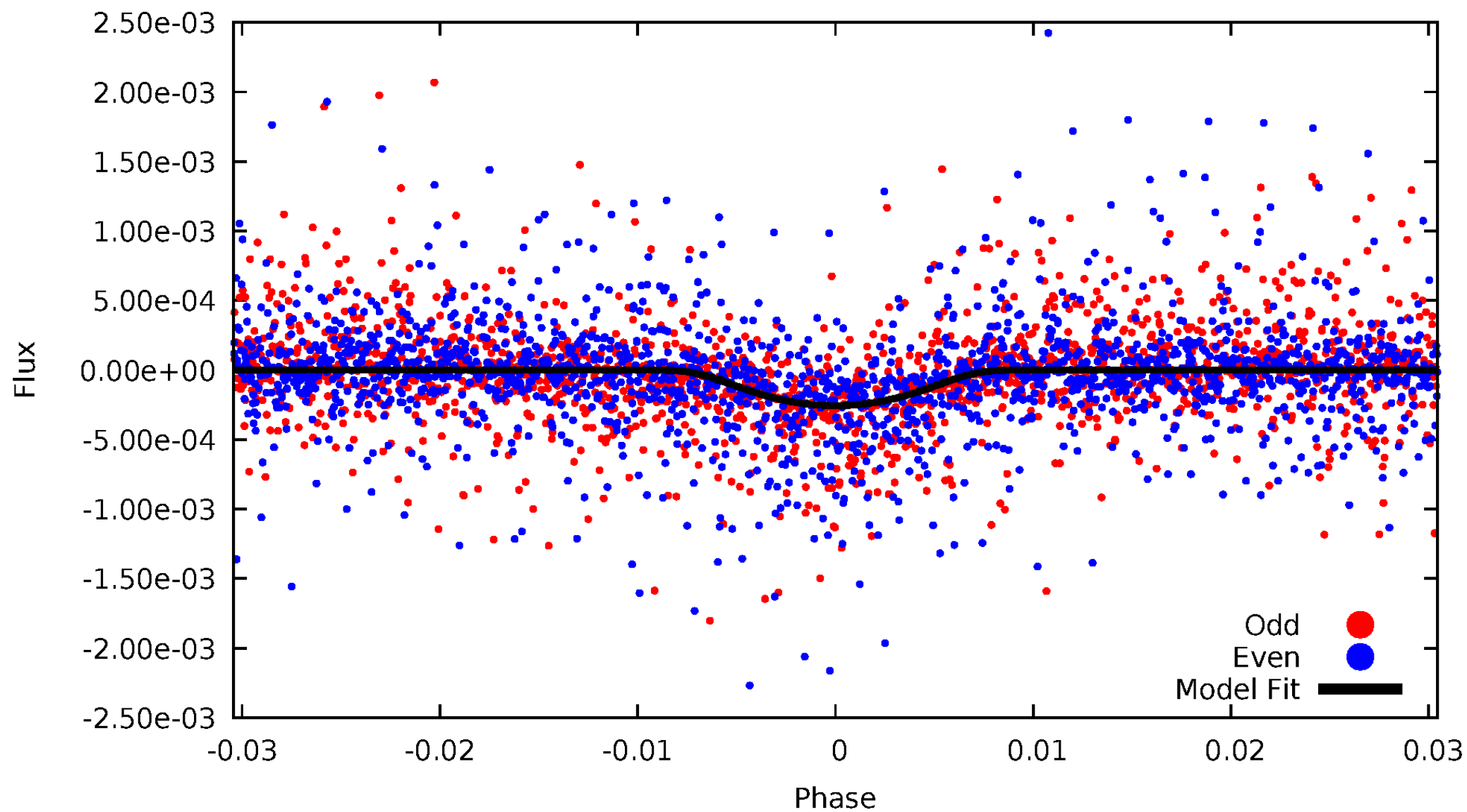


TCE 012306808-04



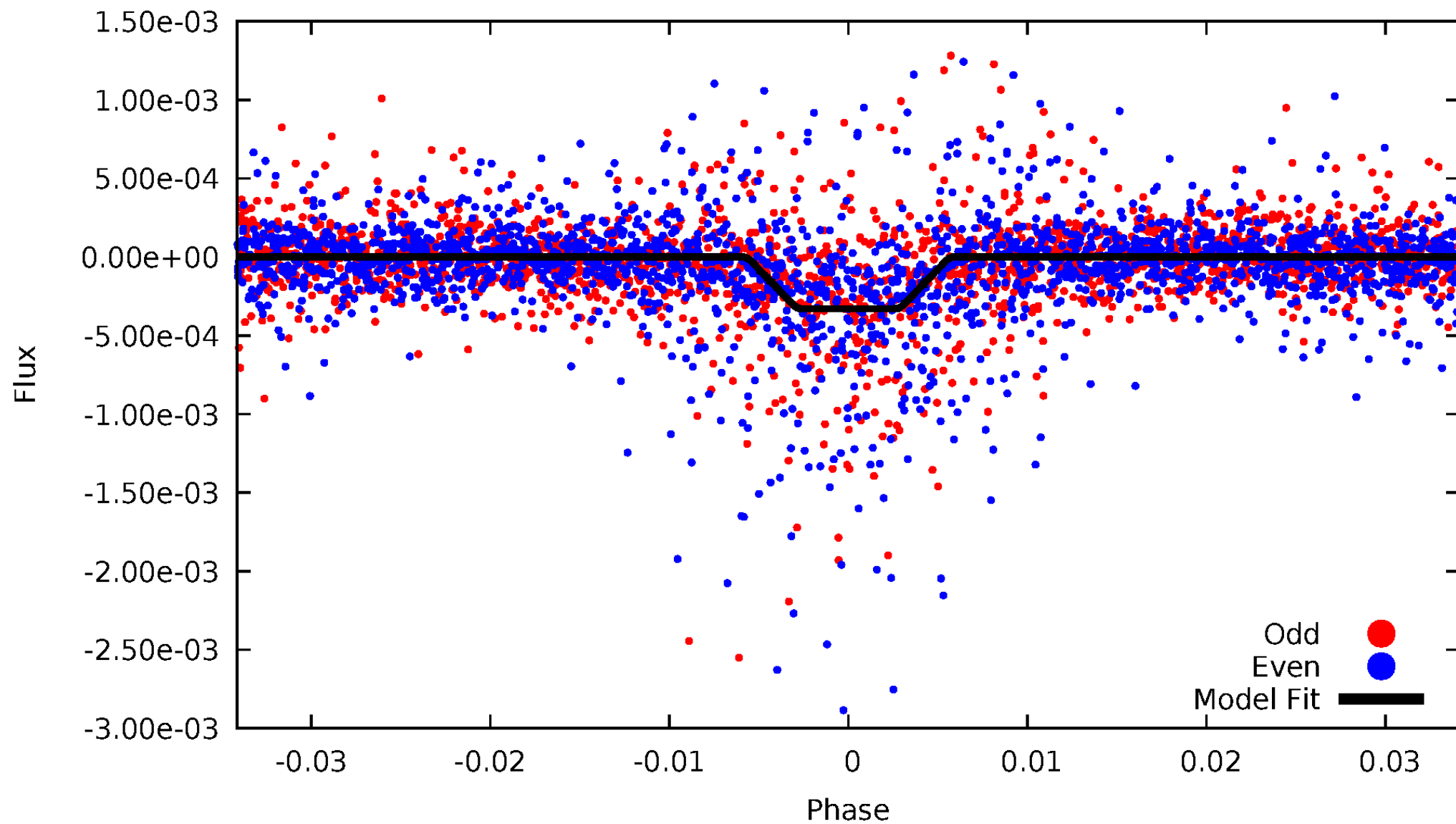
DV Odd/Even

TCE 012306808-04



# ALT Odd/Even

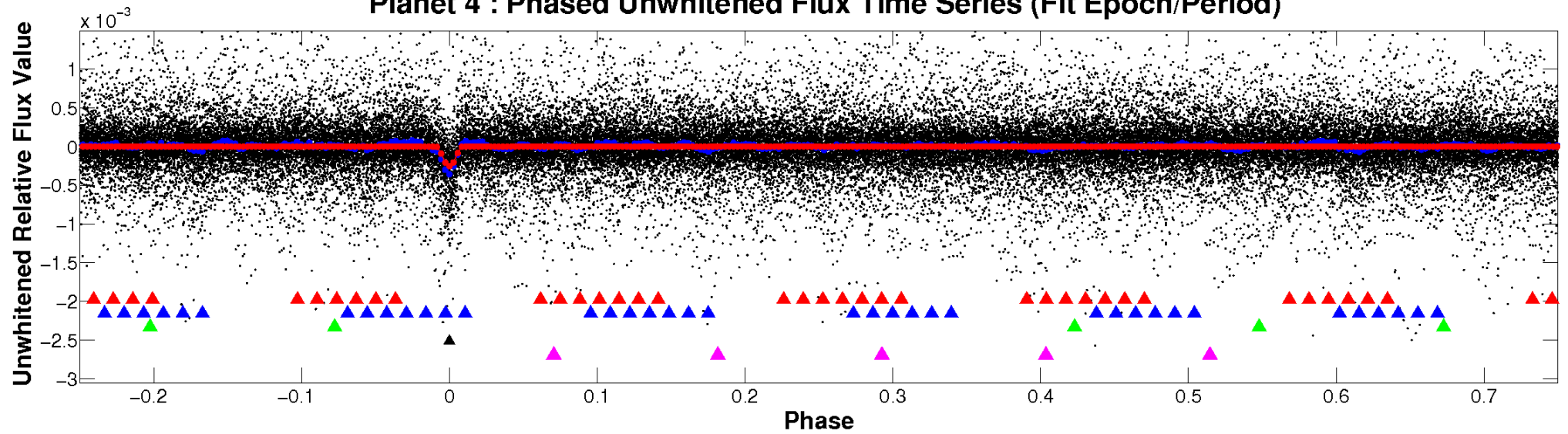
TCE 012306808-04



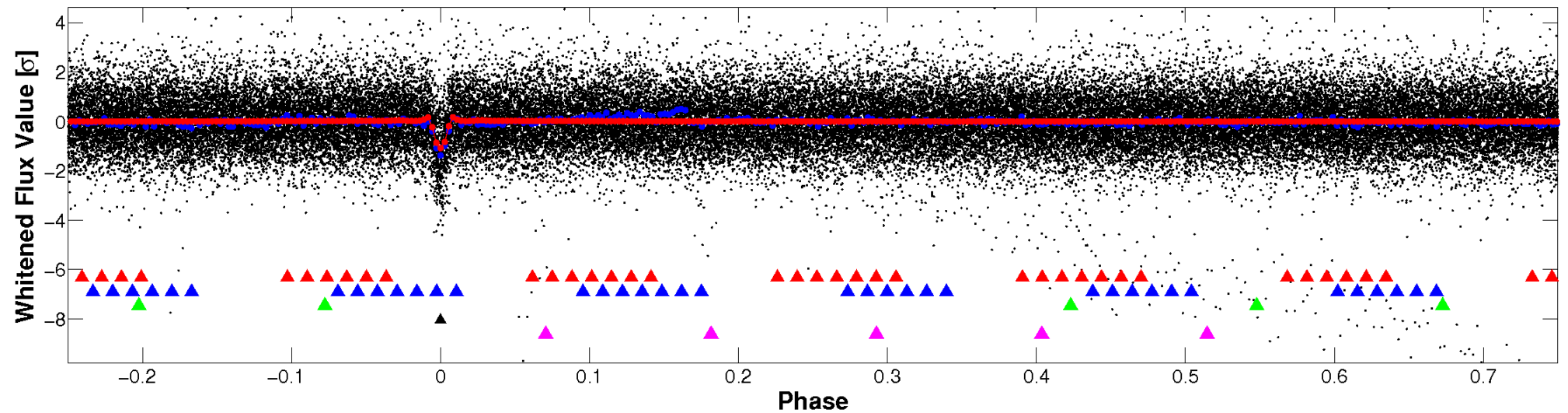


# Non-Whitened Vs. Whitened Light Curve

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

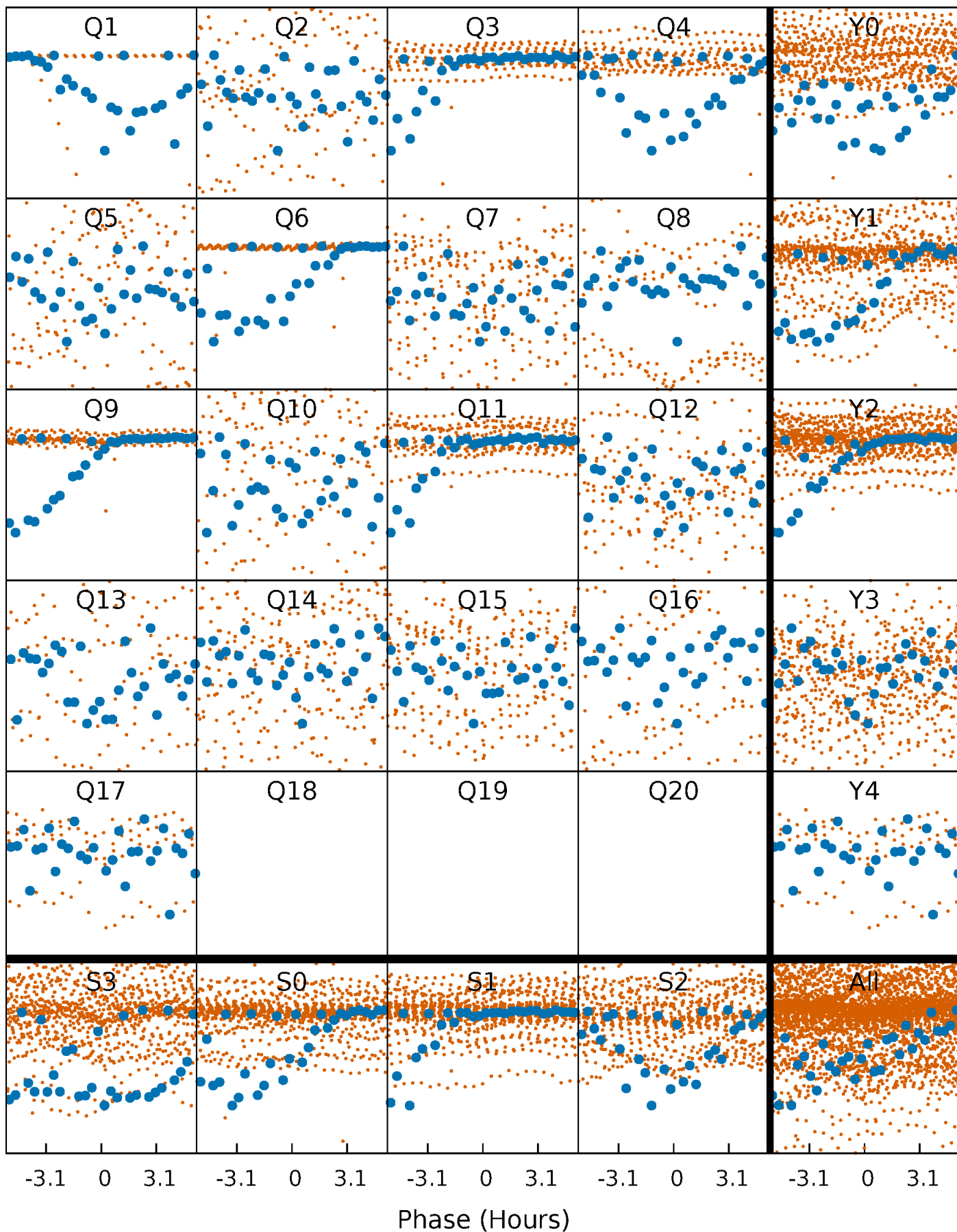


## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

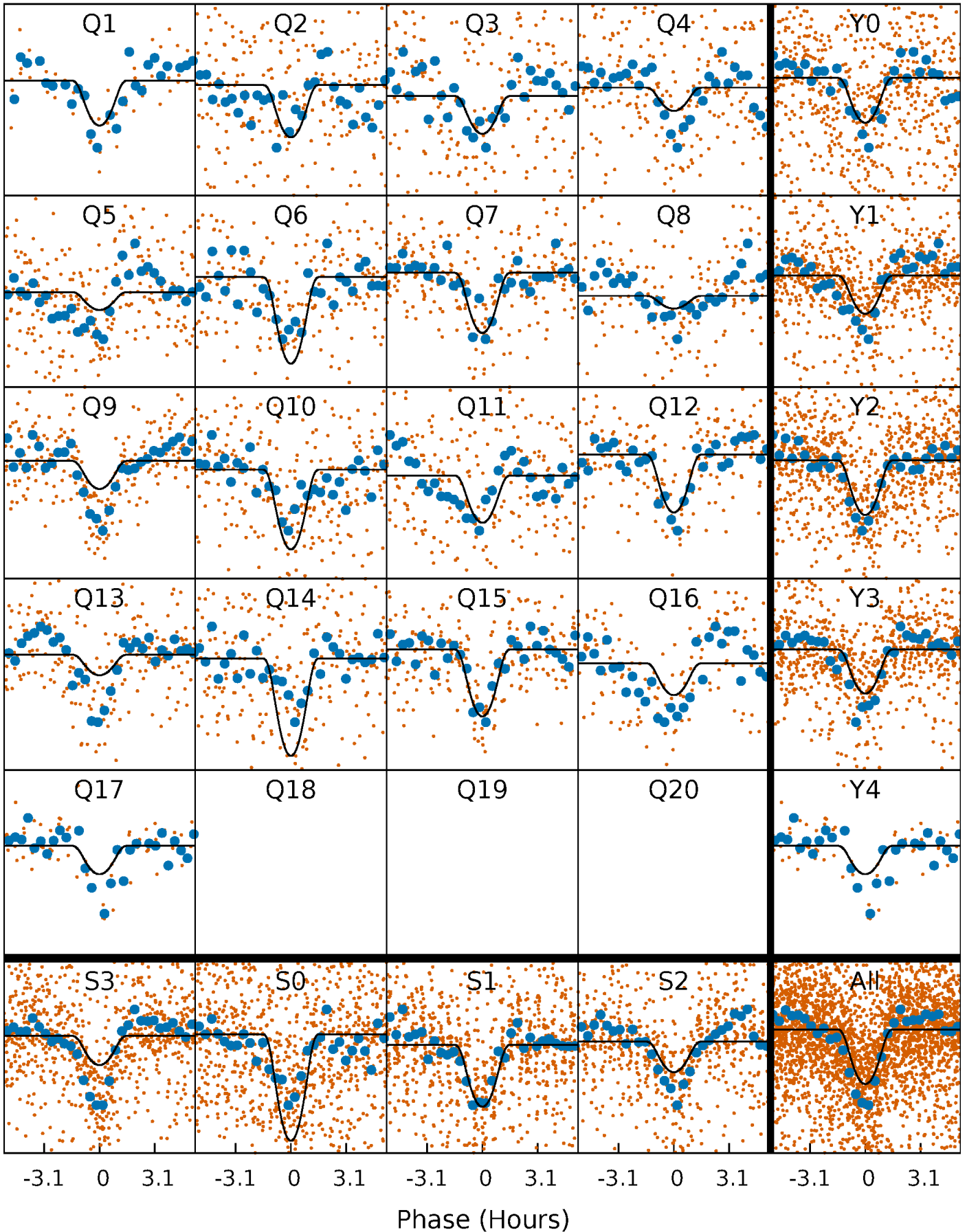
TCE 012306808-04     $P = 7.334455$  Days     $T_0 = 137.092240$  (BKJD)





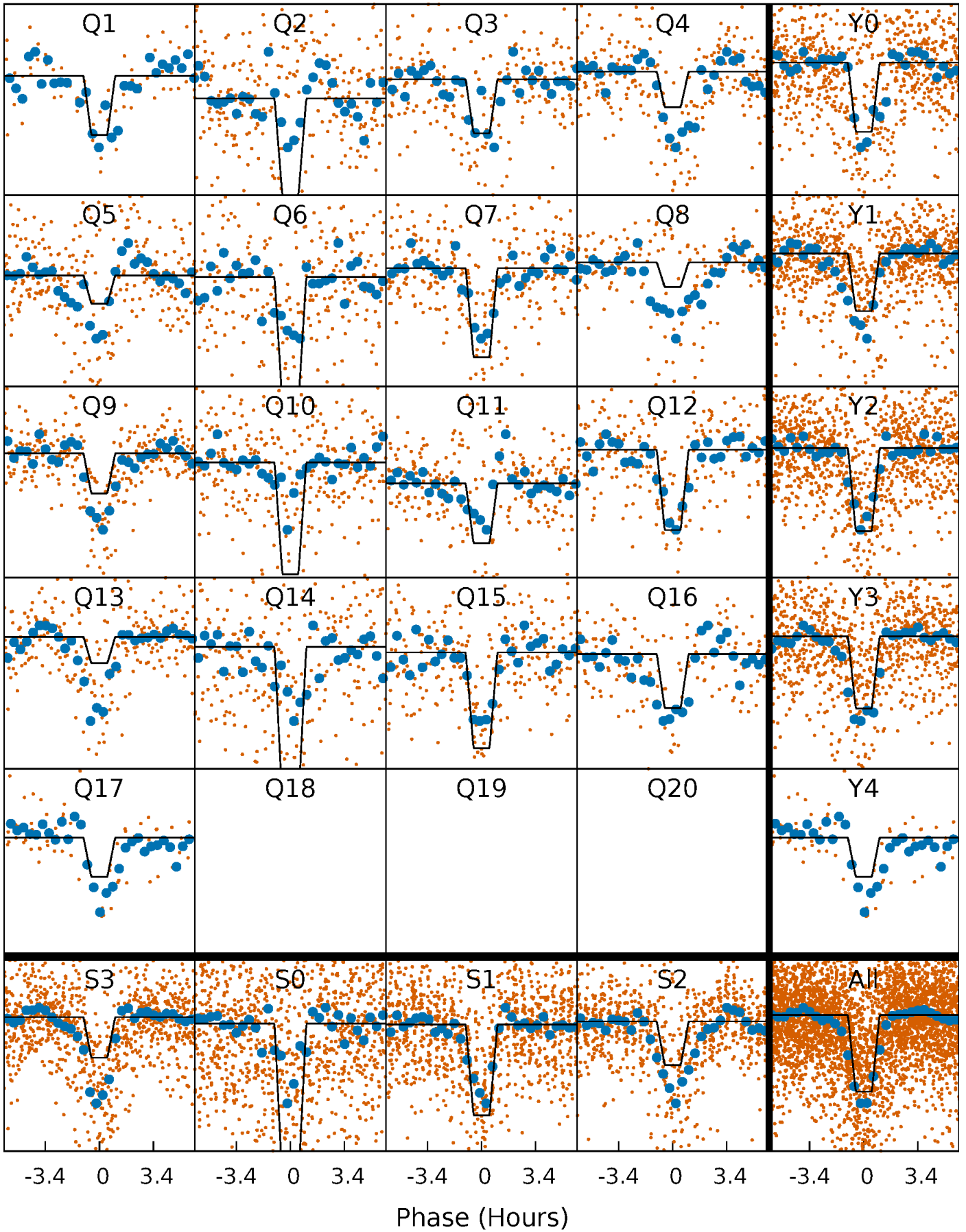
# DV Quarter-Phased Transit Curves

TCE 012306808-04     $P = 7.334455$  Days     $T_0 = 137.092240$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

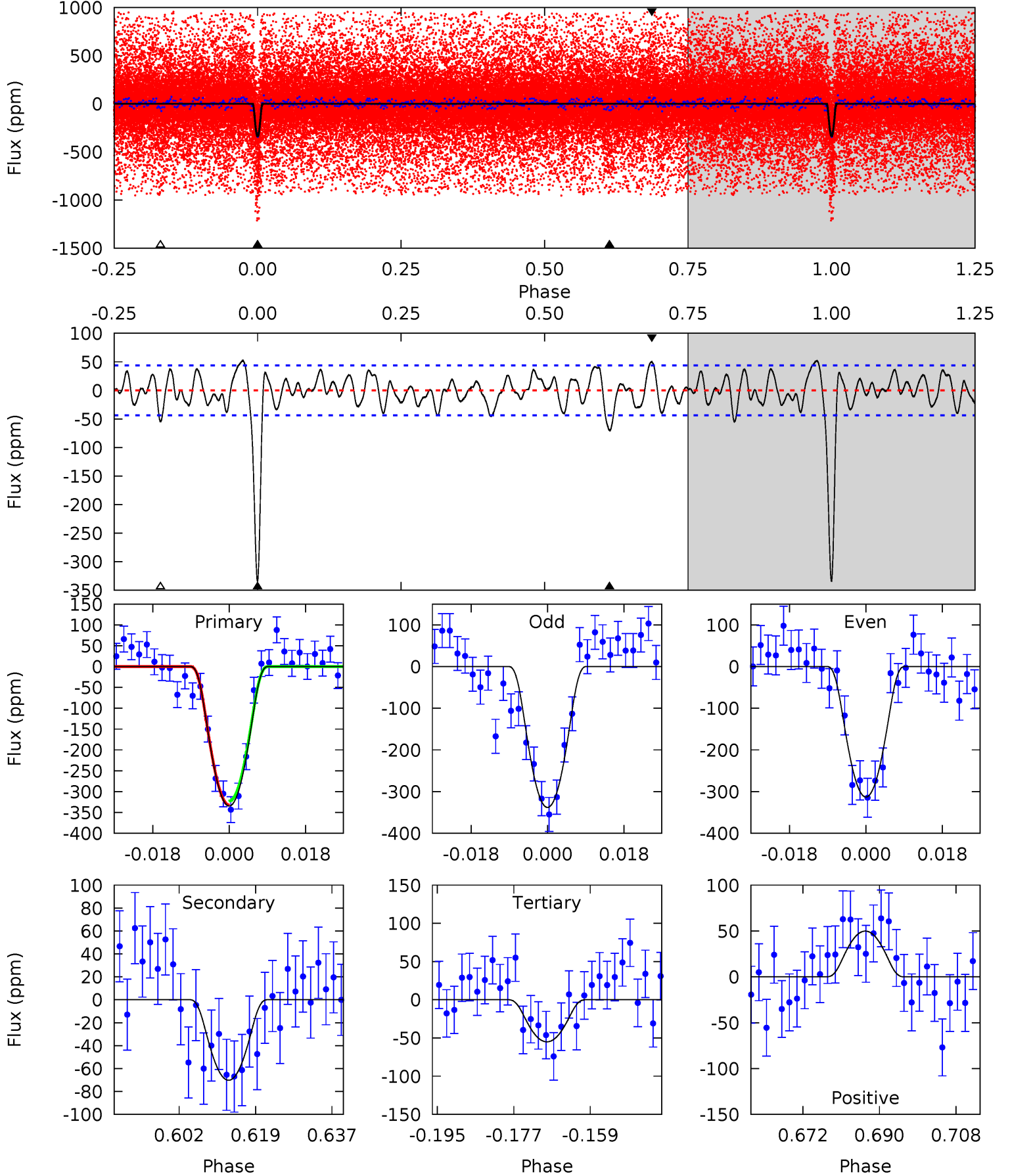
TCE 012306808-04 P= 7.334478 Days  $T_0=137.088579$  (BKJD)



# DV Model-Shift Uniqueness Test

012306808-04, P = 7.334455 Days, E = 129.757785 Days

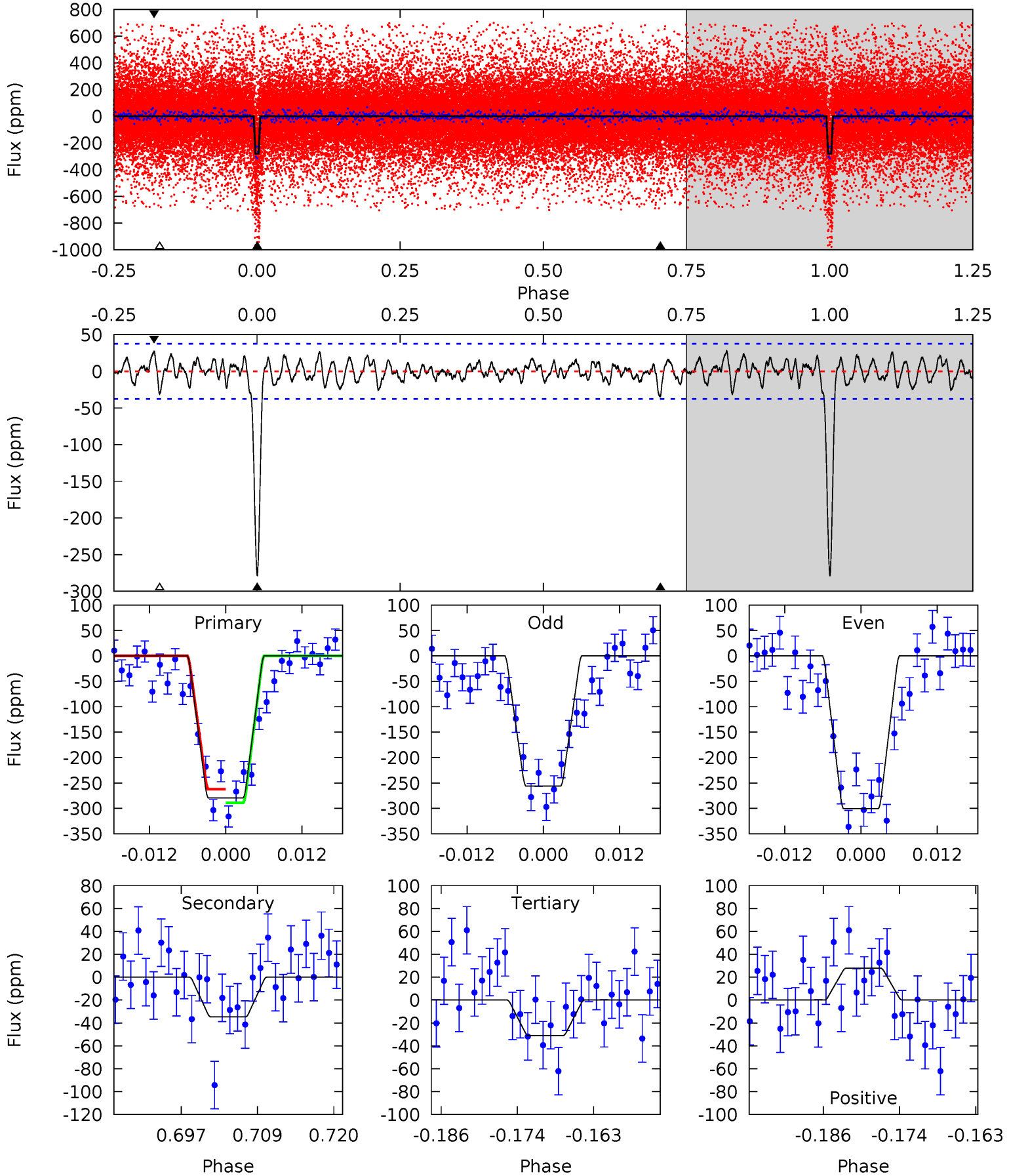
| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 37.5 | 7.88 | 6.18 | 5.60 | 4.92            | 2.37            | 2.35             | 31.4    | 32.0    | 1.70    | 2.29    | 1.42    | 1.32 | 0.13  | 0.55 |



# Alt Model-Shift Uniqueness Test

012306808-04, P = 7.334478 Days, E = 129.754101 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  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 37.0 | 4.62 | 4.12 | 3.69 | 5.00            | 2.52            | 1.36             | 32.9    | 33.4    | 0.49    | 0.92    | 2.98    | 1.42 | 0.09  | 1.79 |



### Stellar Parameters For KIC 012306808

|        | $T_{\text{eff}}(K)$  | $\log(g)$                 | [Fe/H]                     | $R$ ( $R_{\odot}$ )       | $M$ ( $M_{\odot}$ )       | $p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ ) |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
|        | $5985^{+143}_{-161}$ | $4.603^{+0.028}_{-0.161}$ | $-0.780^{+0.300}_{-0.300}$ | $0.758^{+0.170}_{-0.057}$ | $0.846^{+0.071}_{-0.087}$ | $2.738^{+0.437}_{-1.226}$                     |
|        | +2%/-3%              | +1%/-3%                   | +38%/-38%                  | +22%/-8%                  | +8%/-10%                  | +16%/-45%                                     |
| Source | PHO1                 | KIC0                      | KIC0                       | DSEP                      |                           |   |

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

### Secondary Eclipse Parameters for KIC 012306808-04 / KOI 7521.02

| Detrend | Depth (ppm) | $R_p$ ( $R_{\oplus}$ ) | $T_{max}$ (K)      | $T_{obs}$ (K)         | $A_{obs}$         |
|---------|-------------|------------------------|--------------------|-----------------------|-------------------|
| DV      | $-70 \pm 9$ | $2.10^{+1.33}_{-1.11}$ | $1244^{+72}_{-48}$ | $3842^{+1384}_{-523}$ | $41^{+146}_{-26}$ |
| Alt.    | $-35 \pm 8$ | $1.75^{+1.23}_{-0.97}$ | $1241^{+71}_{-50}$ | $3635^{+1426}_{-555}$ | $29^{+130}_{-19}$ |

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

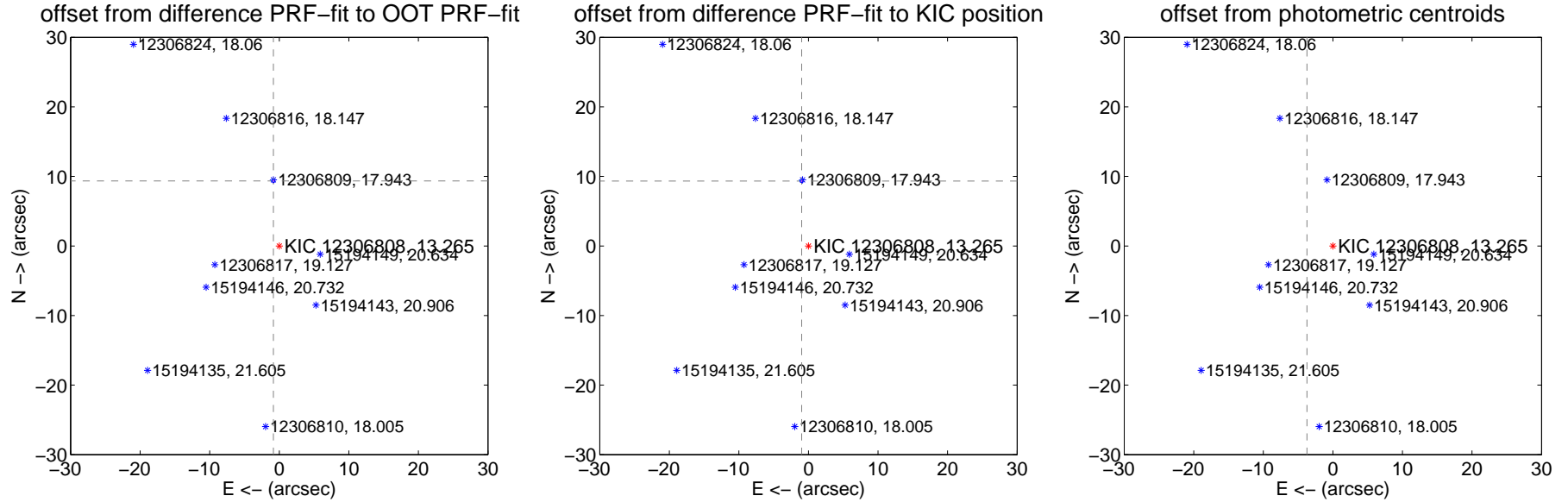
## DV Centroid Data

Supplemental centroid analysis for 012306808-04. Kepler magnitude: 13.27. Transit SNR 24.12

There are 16 quarters with good PRF difference image offsets

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

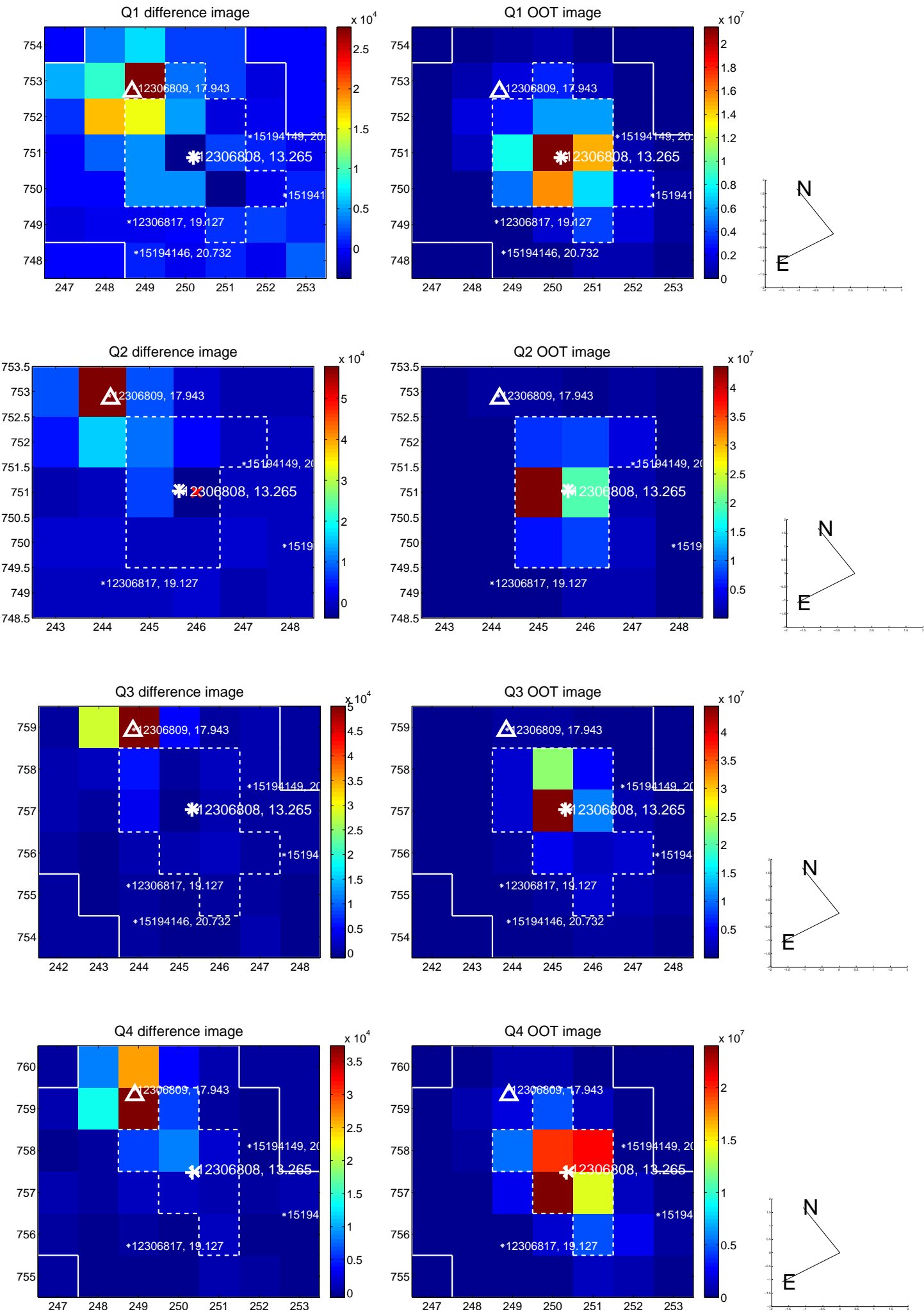
|   | Distance in arcsec                  | Distance / $\sigma$ | $\Delta$ RA       | $\Delta$ Dec      |
|---|-------------------------------------|---------------------|-------------------|-------------------|
| PRF-fit source offset from OOT          | <b>9.385 <math>\pm</math> 0.075</b> | <b>125.81</b>       | 0.844 $\pm$ 0.070 | 9.347 $\pm$ 0.075 |
| PRF-fit source offset from KIC position | <b>9.380 <math>\pm</math> 0.074</b> | <b>127.43</b>       | 0.977 $\pm$ 0.069 | 9.329 $\pm$ 0.074 |
| photometric centroid source offset      | <b>31.75 <math>\pm</math> 0.44</b>  | <b>72.76</b>        | 3.73 $\pm$ 0.38   | 31.53 $\pm$ 0.44  |



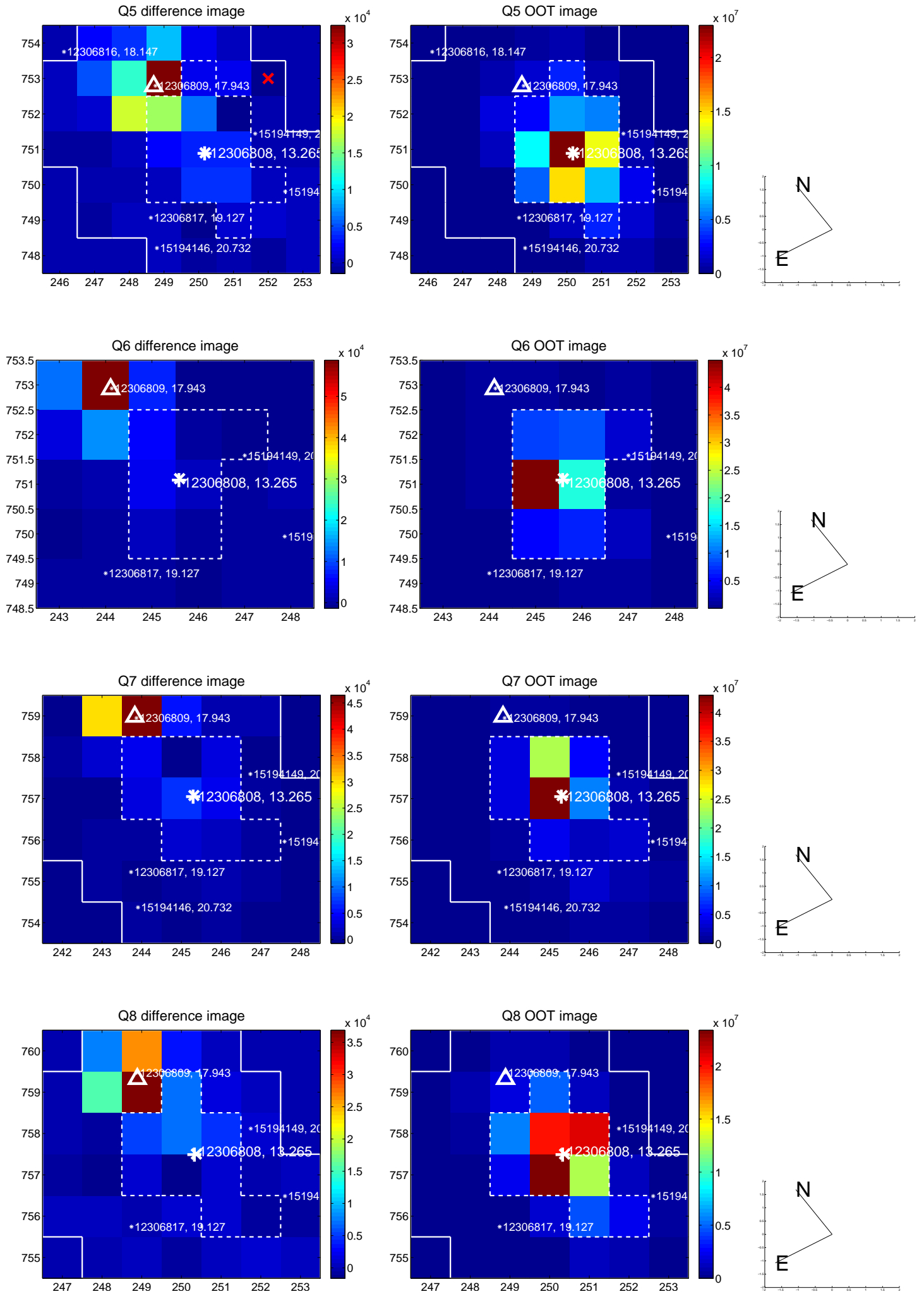
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

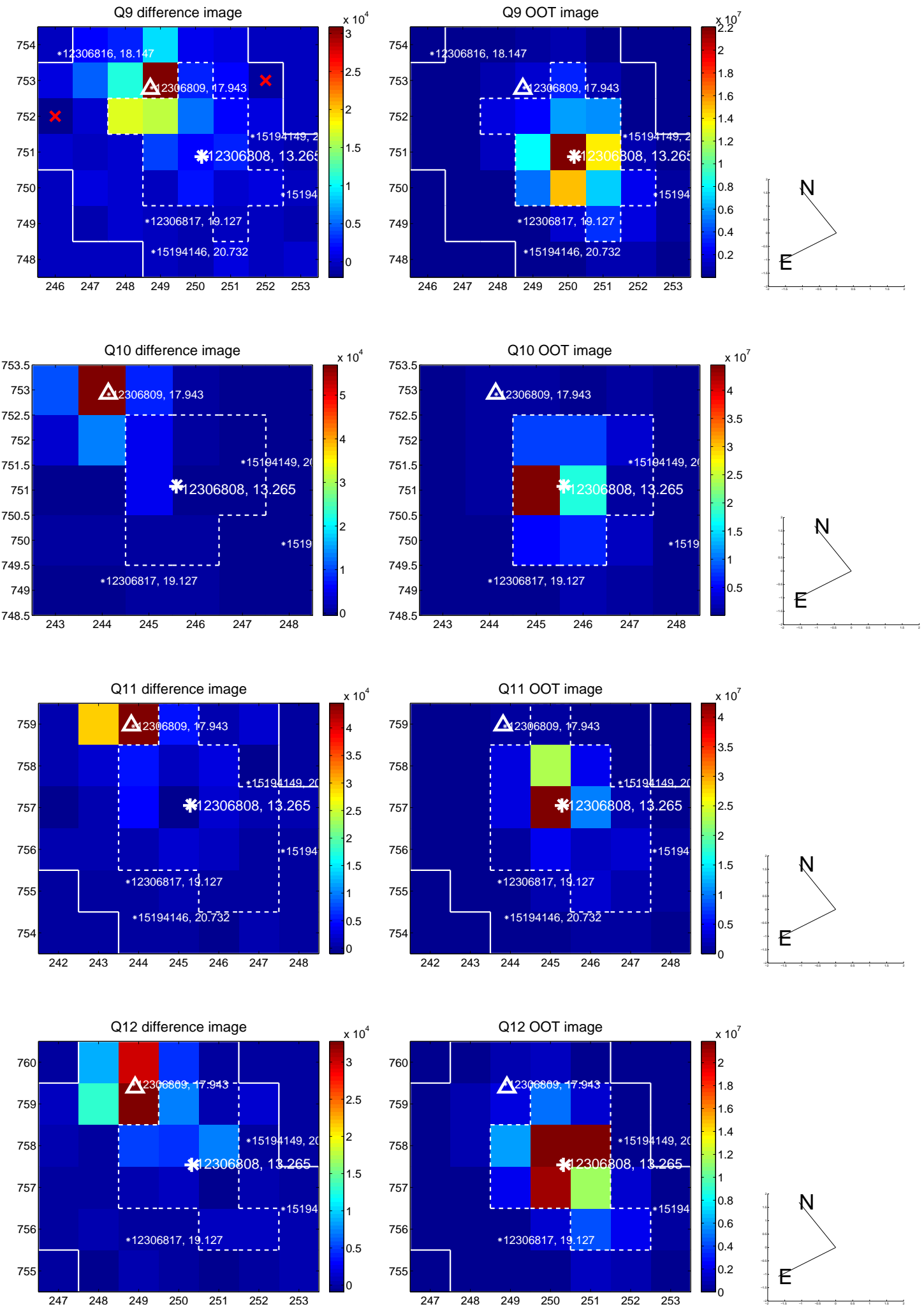


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

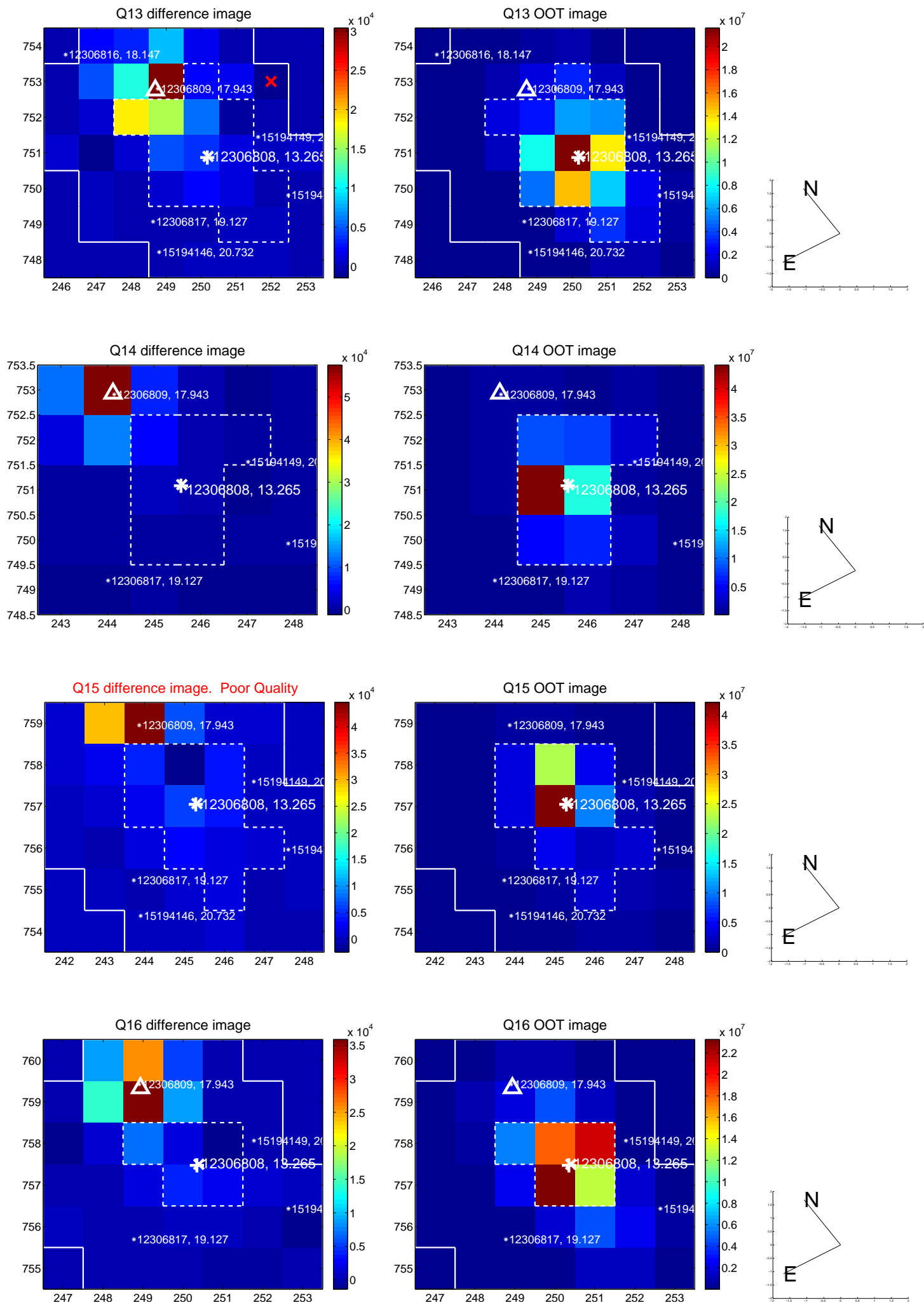




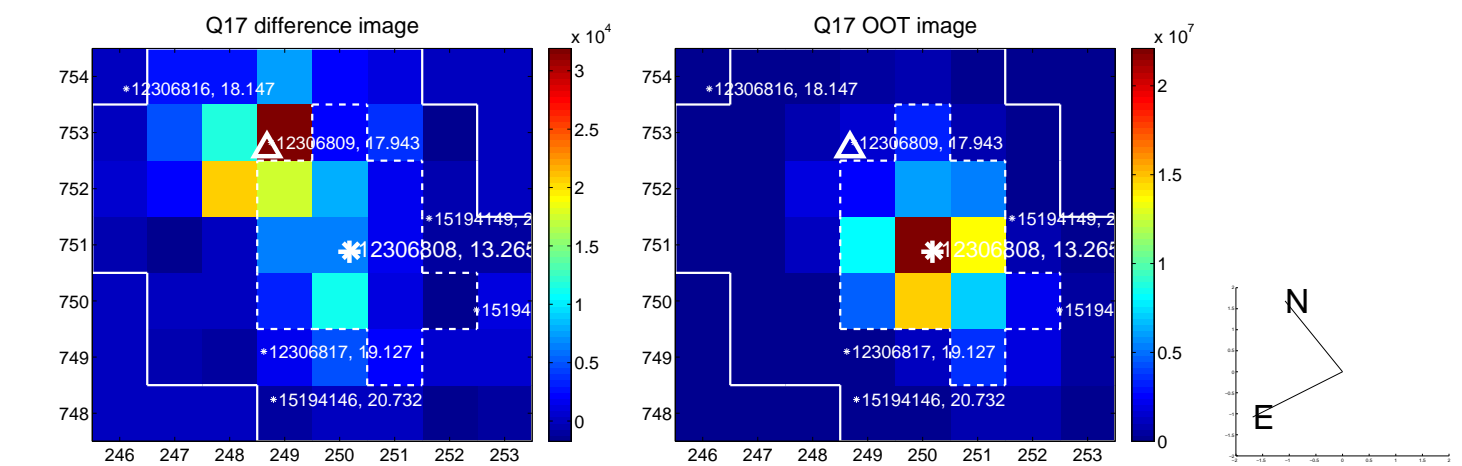
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



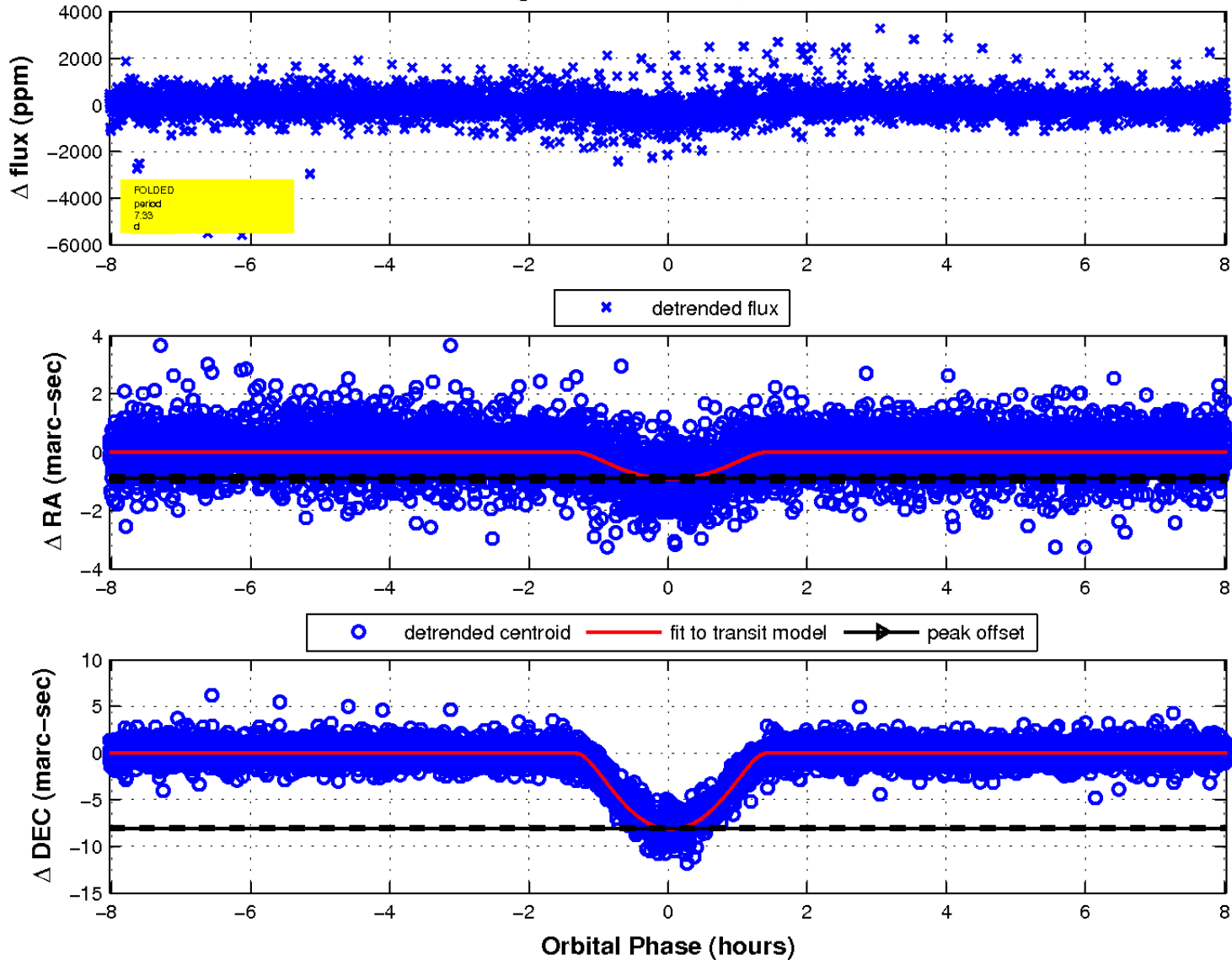
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

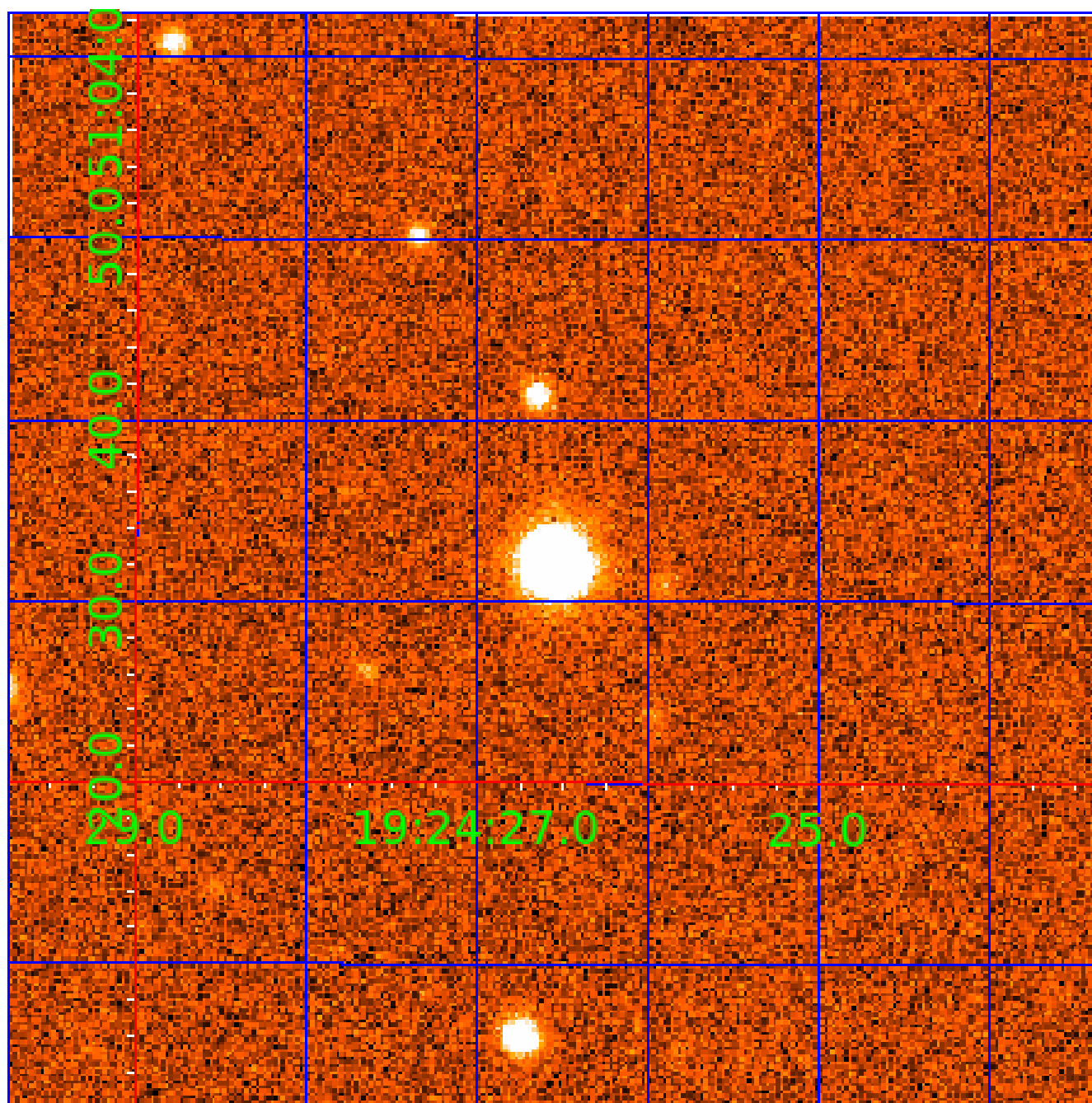


fluxWeightedCentroids, Planet 4 of 5



# UKIRT Image

Declination



# KIC 012306808

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|---------|--------|-----------------------------|-----------------|------------------------|------------------------|
| 012306808-01 | OBS      | 7521.01 | 37.878464     | 138.128811   | 219541.5    | 10.662           | 13890.0 | 5929.2 | 0.76                        | 5985            | 47.48                  | 15.22                  |
| 012306808-02 | OBS      | No      | 37.878482     | 159.173983   | 169013.5    | 12.421           | 9956.5  | 6360.1 | 0.76                        | 5985            | 45.32                  | 15.22                  |
| 012306808-03 | OBS      | No      | 286.959478    | 220.873763   | 4316.9      | 3.500            | 68.4    | -1.0   | 0.76                        | 5985            | 5.00                   | 1.02                   |
| 012306808-04 | OBS      | 7521.02 | 7.334455      | 137.092240   | 256.2       | 2.678            | 21.8    | 24.1   | 0.76                        | 5985            | 1.97                   | 135.87                 |
| 012306808-05 | OBS      | No      | 308.861042    | 152.279600   | 339.8       | 3.755            | 9.9     | 5.0    | 0.76                        | 5985            | 1.59                   | 0.93                   |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments   |
|--------------|----------|------|-------|---|---|---|---|--|
| 012306808-01 | OBS      | FP   | 0.00  | 0 | 1 | 0 | 0 | MOD_SEC_DV—DEEP_V_SHAPED—HAS_SEC_TCE   |
| 012306808-02 | OBS      | FP   | 0.00  | 1 | 1 | 0 | 0 | IS_SEC_TCE   |
| 012306808-03 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_MARSHALL_SKYE_ZUMA—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_NOFITS |
| 012306808-04 | OBS      | FP   | 0.00  | 0 | 0 | 1 | 0 | CENT_RESOLVED_OFFSET—HALO_GHOST  |
| 012306808-05 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS                         |

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

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

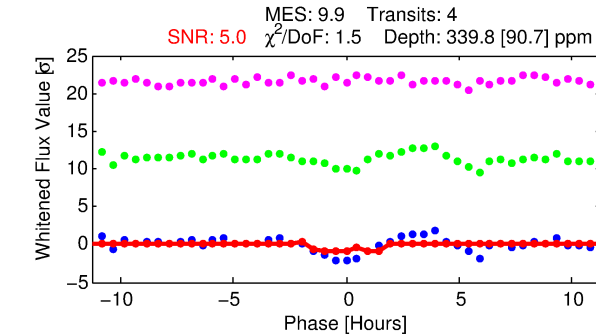
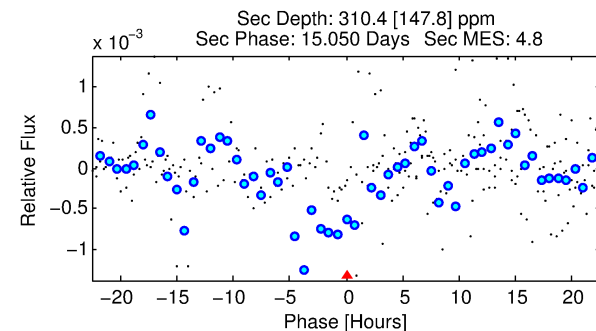
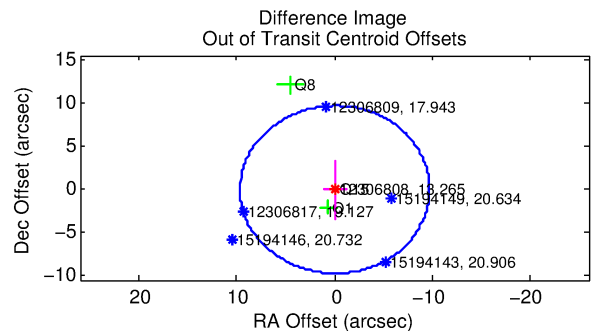
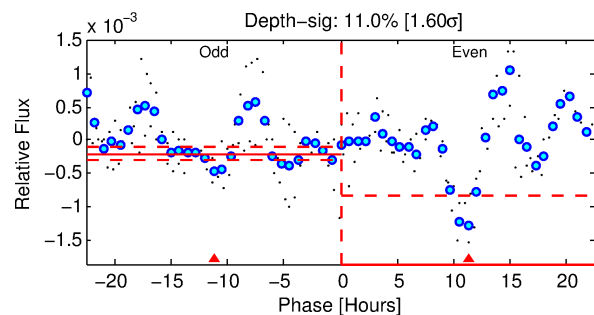
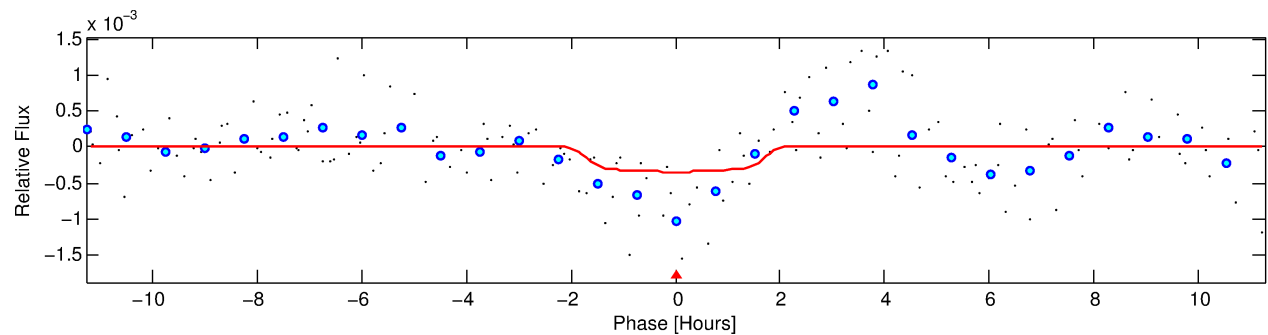
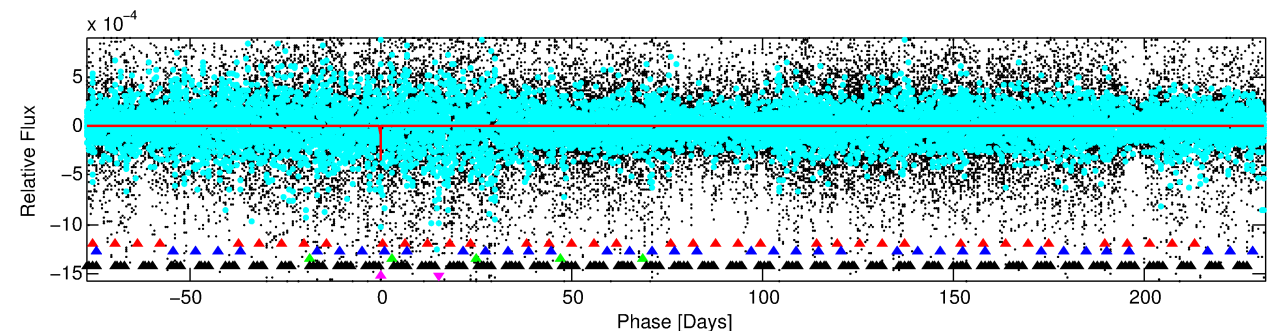
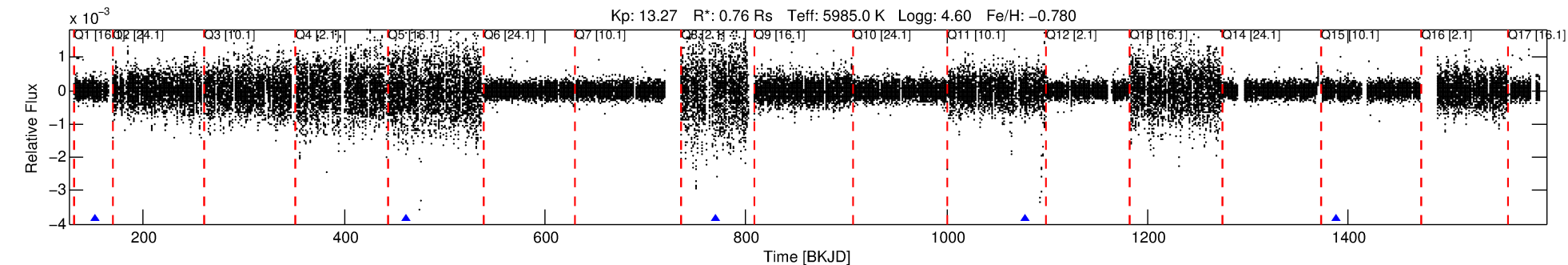
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 012306808-05

No Significant Match Found

# DV One-Page Summary

KIC: 12306808 Candidate: 5 of 5 Period: 308.861 d  
KOI: K07521 Corr: No Ephemeris Match



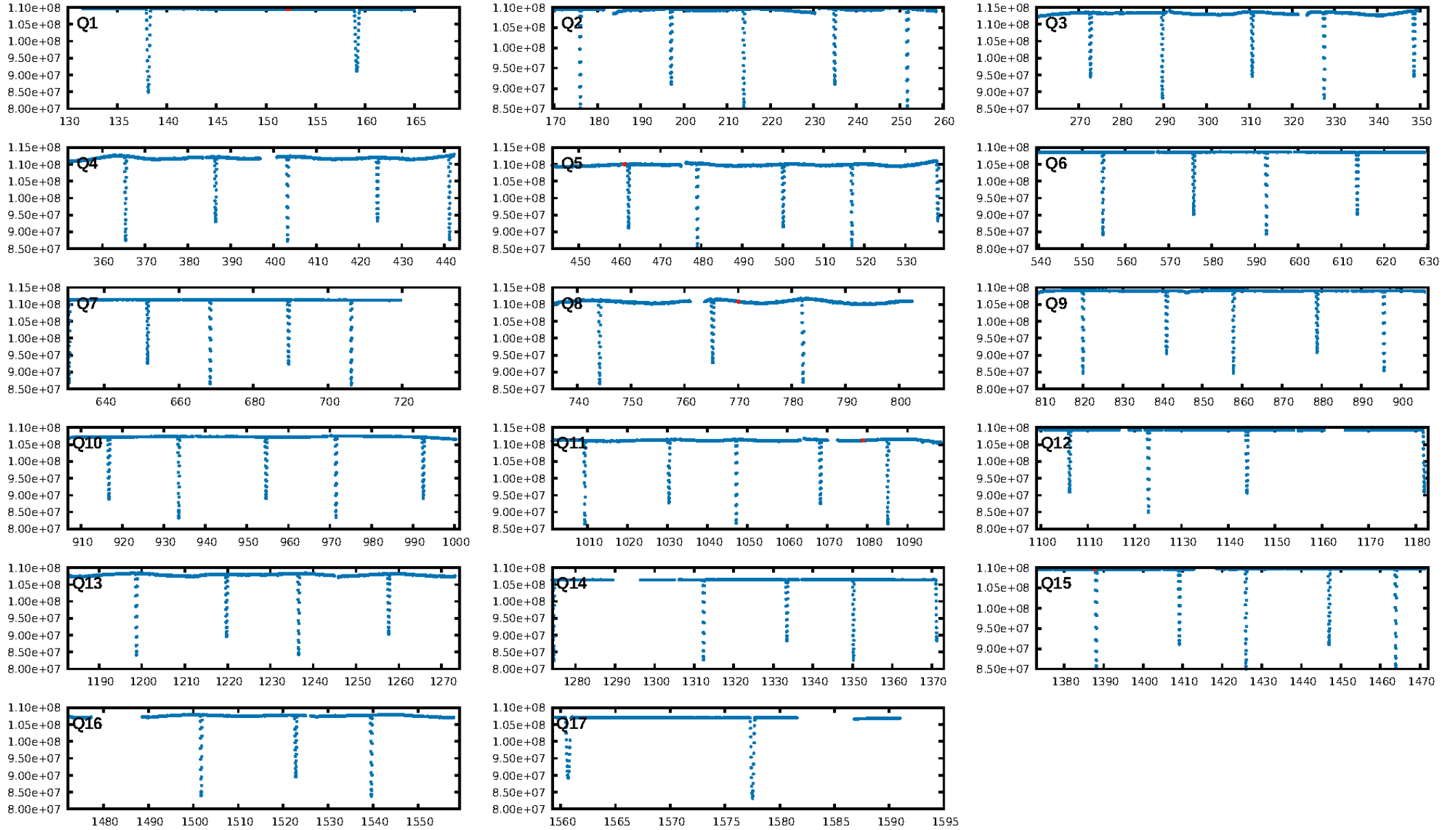
## DV Fit Results:

Period = 308.86104 [0.00657] d  
Epoch = 152.2796 [0.0088] BKJD  
Rp/R\* = 0.0192 [0.0224]  
a/R\* = 345.28 [2185.80]  
b = 0.86 [1.95]  
Seff = 0.93 [0.29]  
Teq = 250 [19] K  
Rp = 1.59 [1.89] Re  
a = 0.8440 [0.1637] AU  
Ag = 48088.43 [115277.30] [0.42 $\sigma$ ]  
Teff = 5729 [3412] K [1.61 $\sigma$ ]

## DV Diagnostic Results:

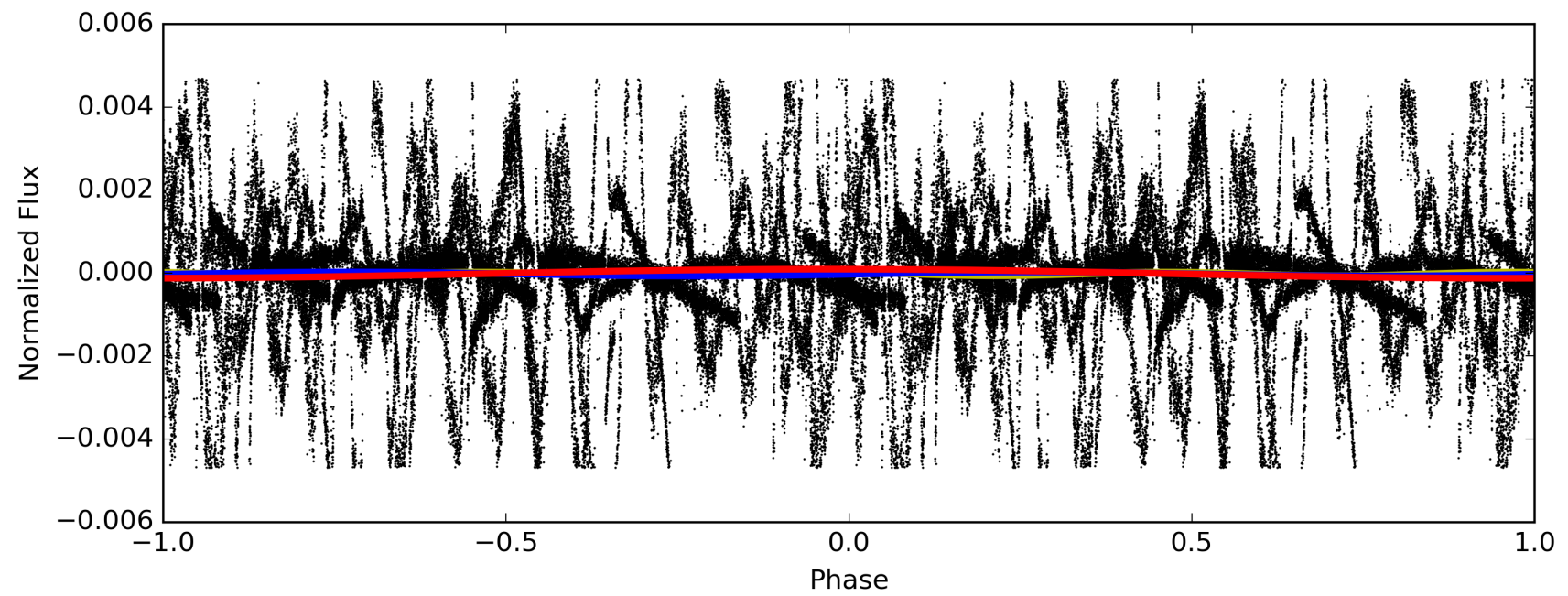
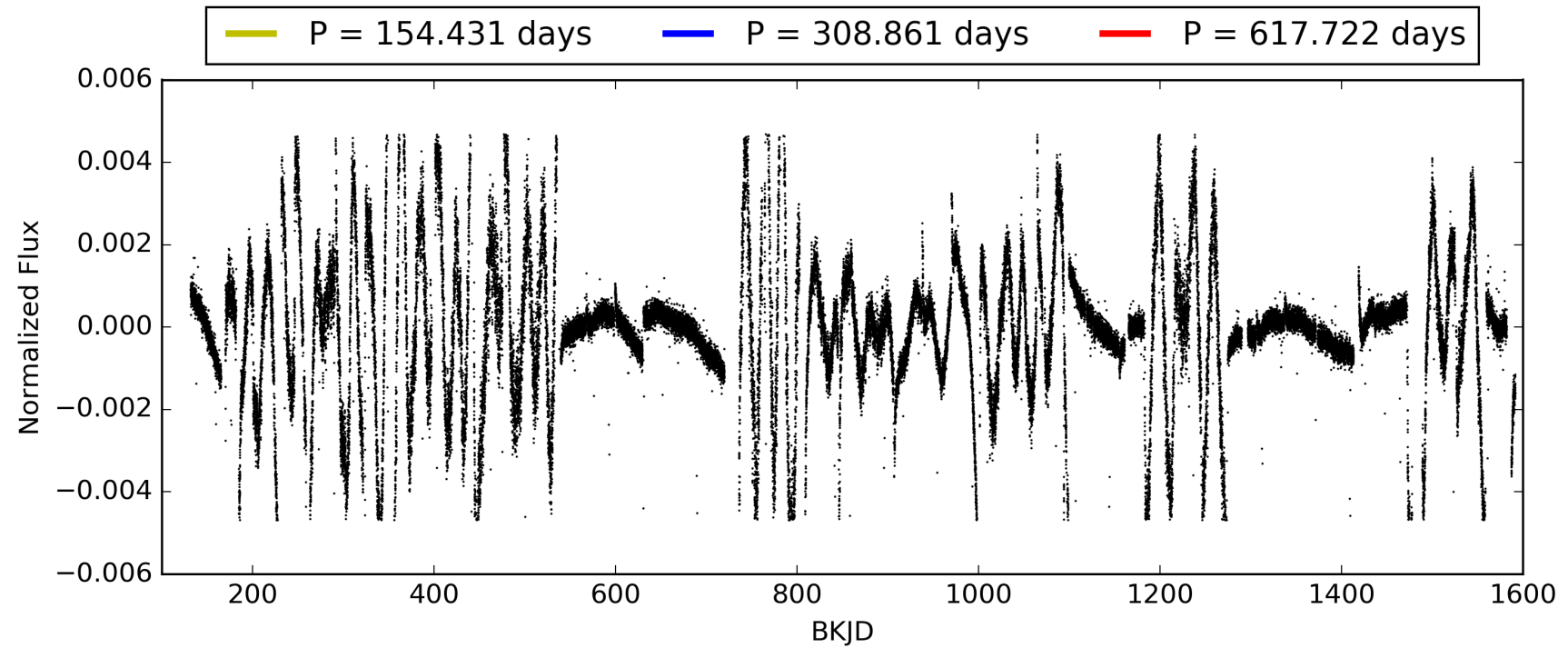
ShortPeriod-sig: 100.0% [102.40 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 66.5%  
Bootstrap-pfa: 1.37e-08  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: -3.119  
Centroid-sig: 6.7%  
Centroid-so: 1.938 arcsec [1.23 $\sigma$ ]  
OotOffset-rm: 0.056 arcsec [0.02 $\sigma$ ]  
KicOffset-rm: 0.157 arcsec [0.09 $\sigma$ ]  
OotOffset-st: 0/1/1/1 [3]  
KicOffset-st: 0/1/1/1 [3]  
DiffImageQuality-fgm: 0.00 [0/3]  
DiffImageOverlap-fno: 0.80 [4/5]

# TCE 012306808-05, PDC Light Curves





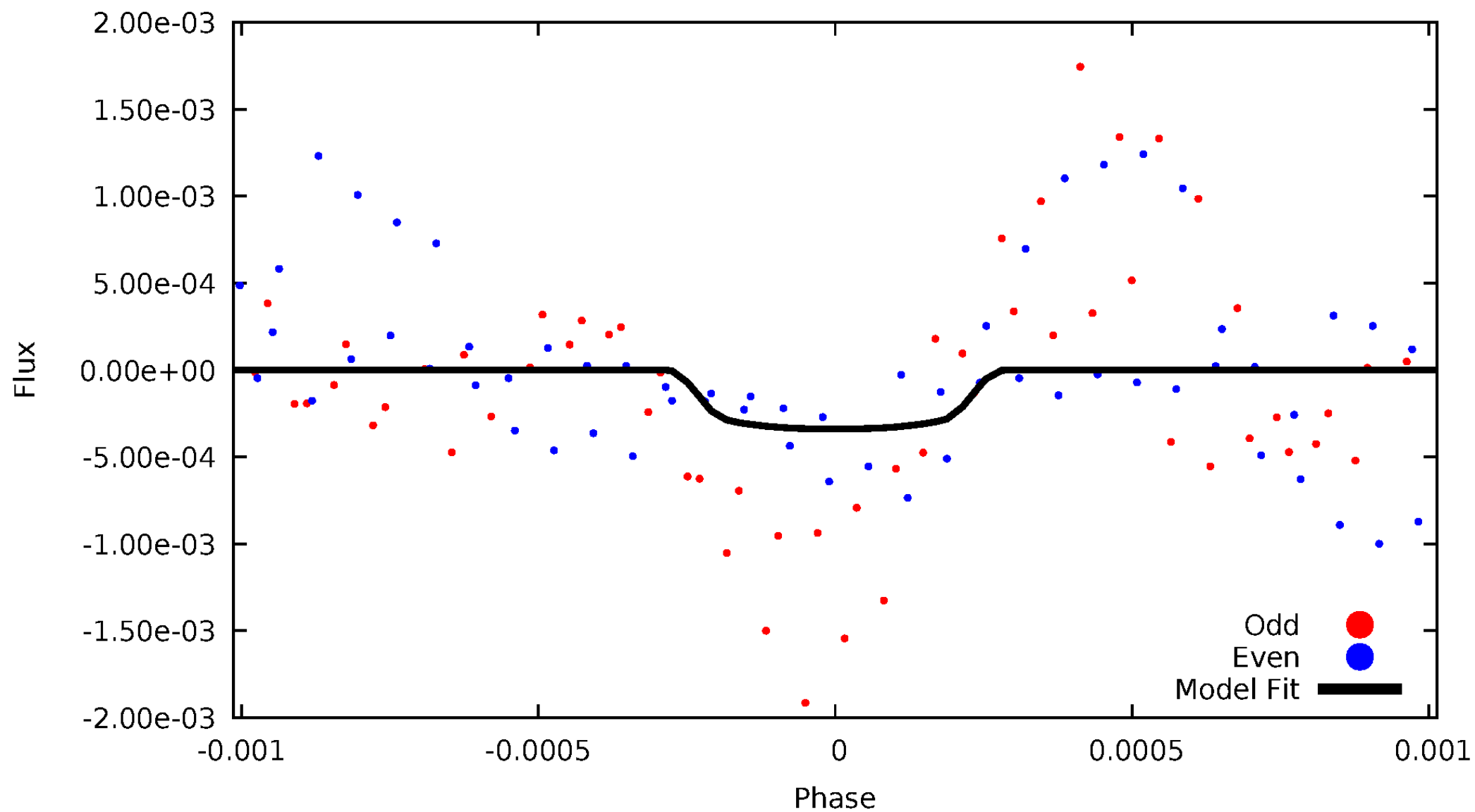
TCE 012306808-05





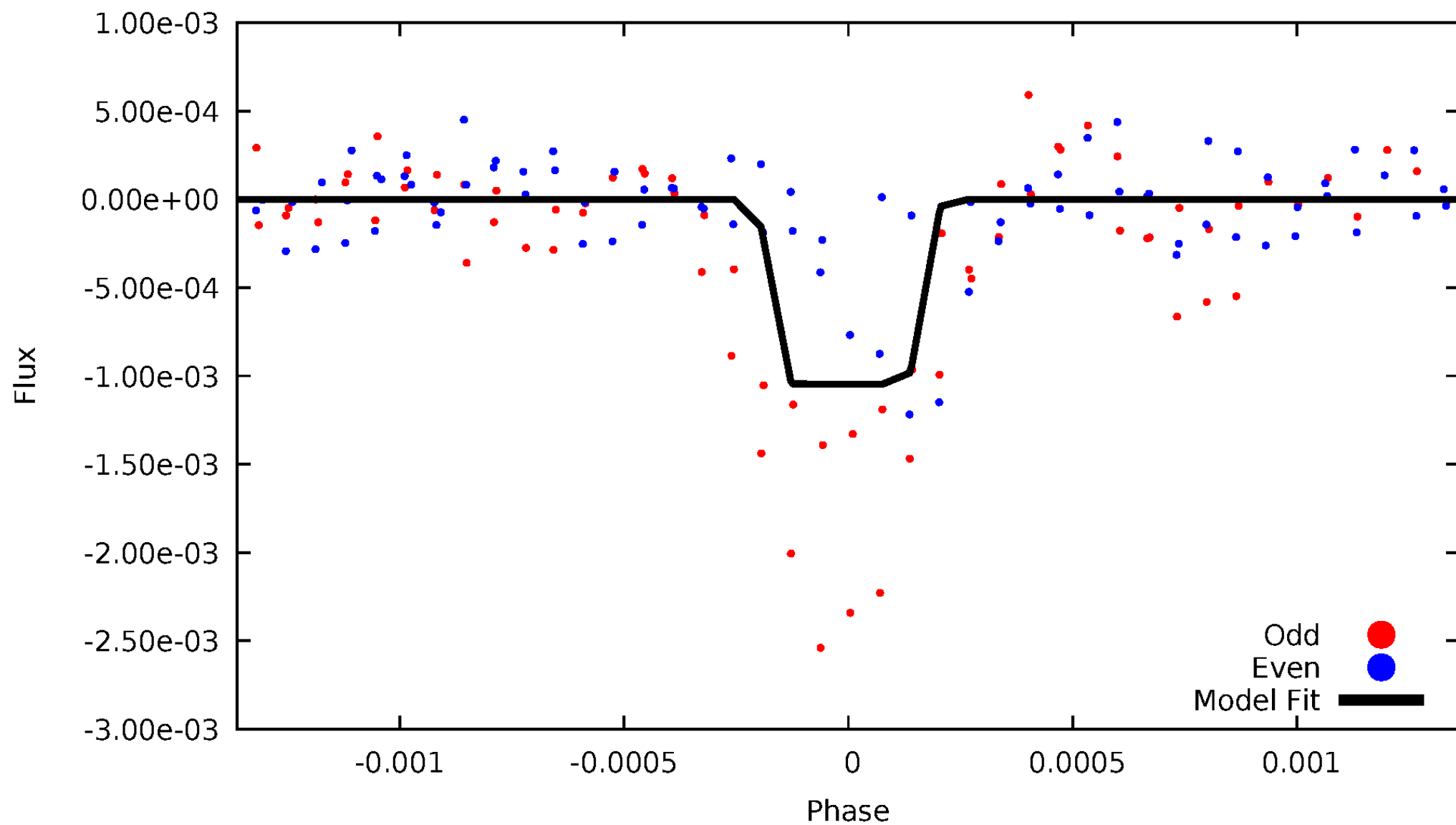
# DV Odd/Even

TCE 012306808-05



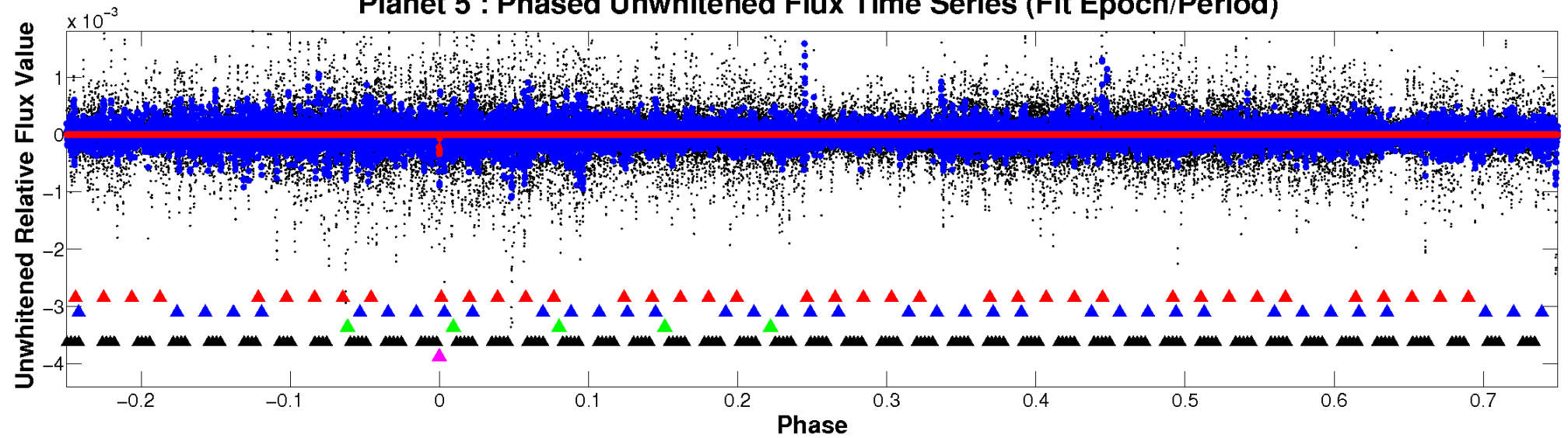
# ALT Odd/Even

TCE 012306808-05

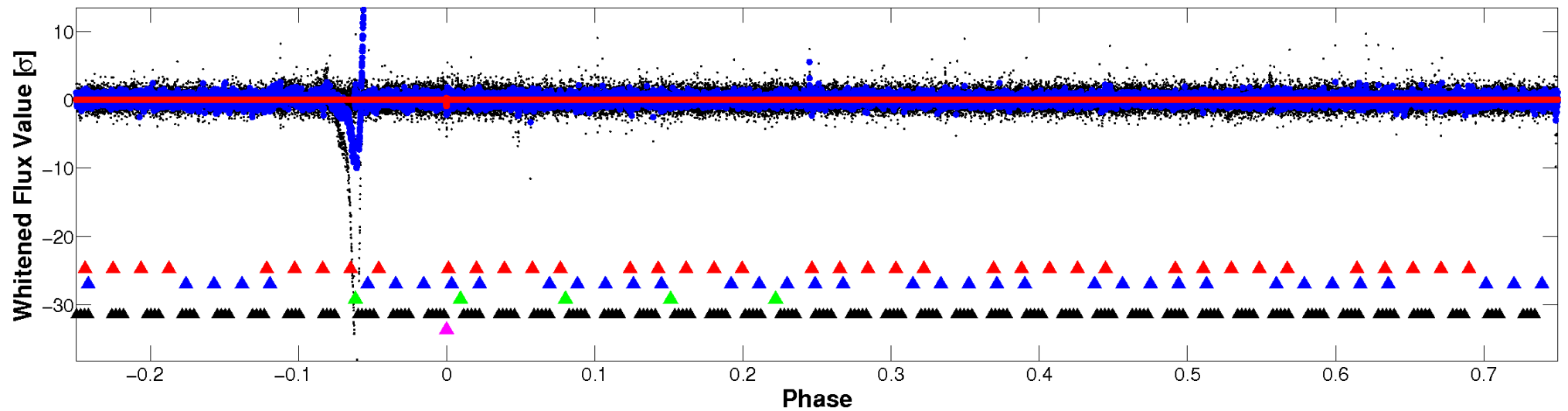


# Non-Whitened Vs. Whitened Light Curve

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

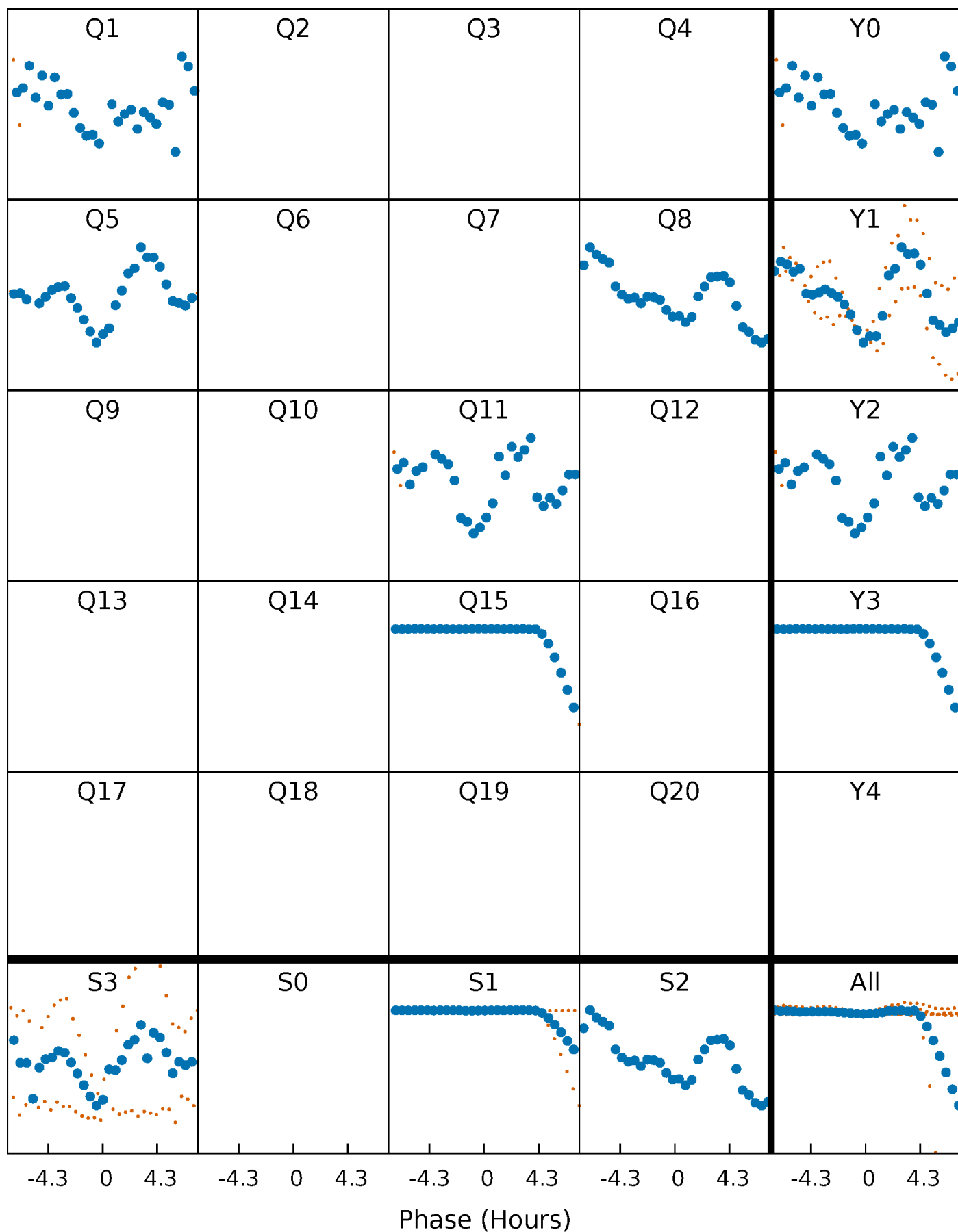


Planet 5 : Phased Whitened Flux Time Series (Fit Epoch/Period)



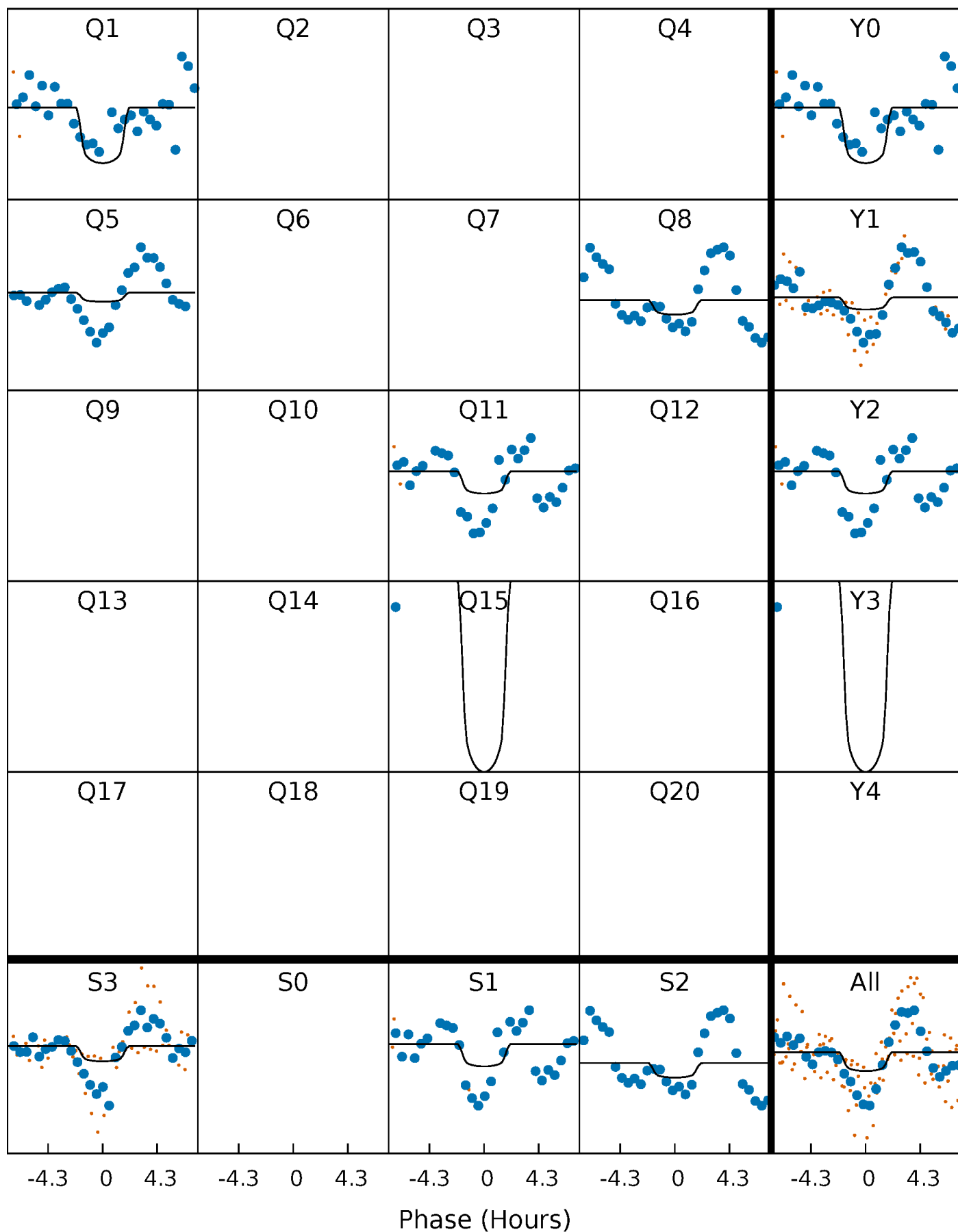
# PDC Quarter-Phased Transit Curves

TCE 012306808-05     $P=308.861042$  Days     $T_0=152.279600$  (BKJD)



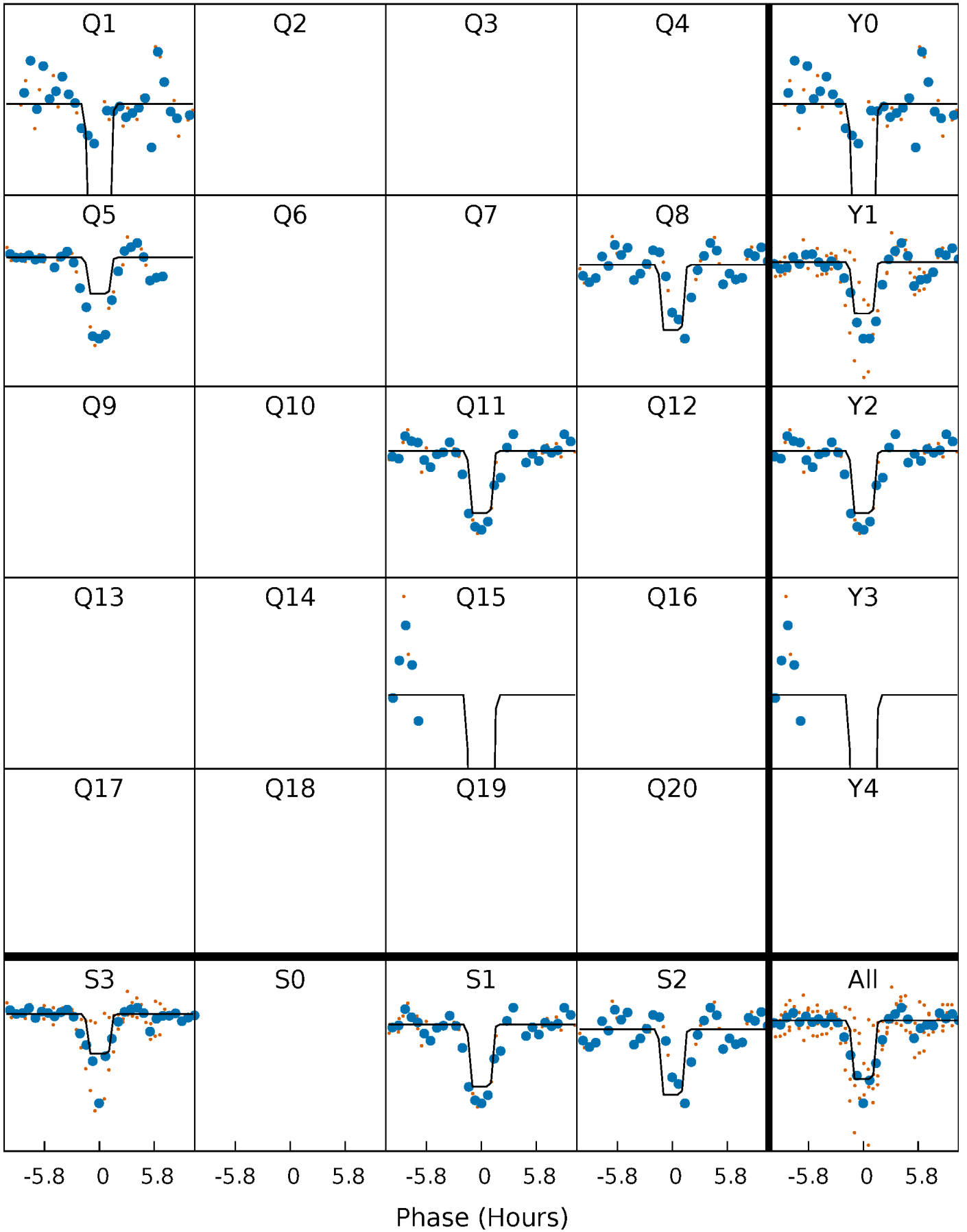
# DV Quarter-Phased Transit Curves

TCE 012306808-05     $P=308.861042$  Days     $T_0=152.279600$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

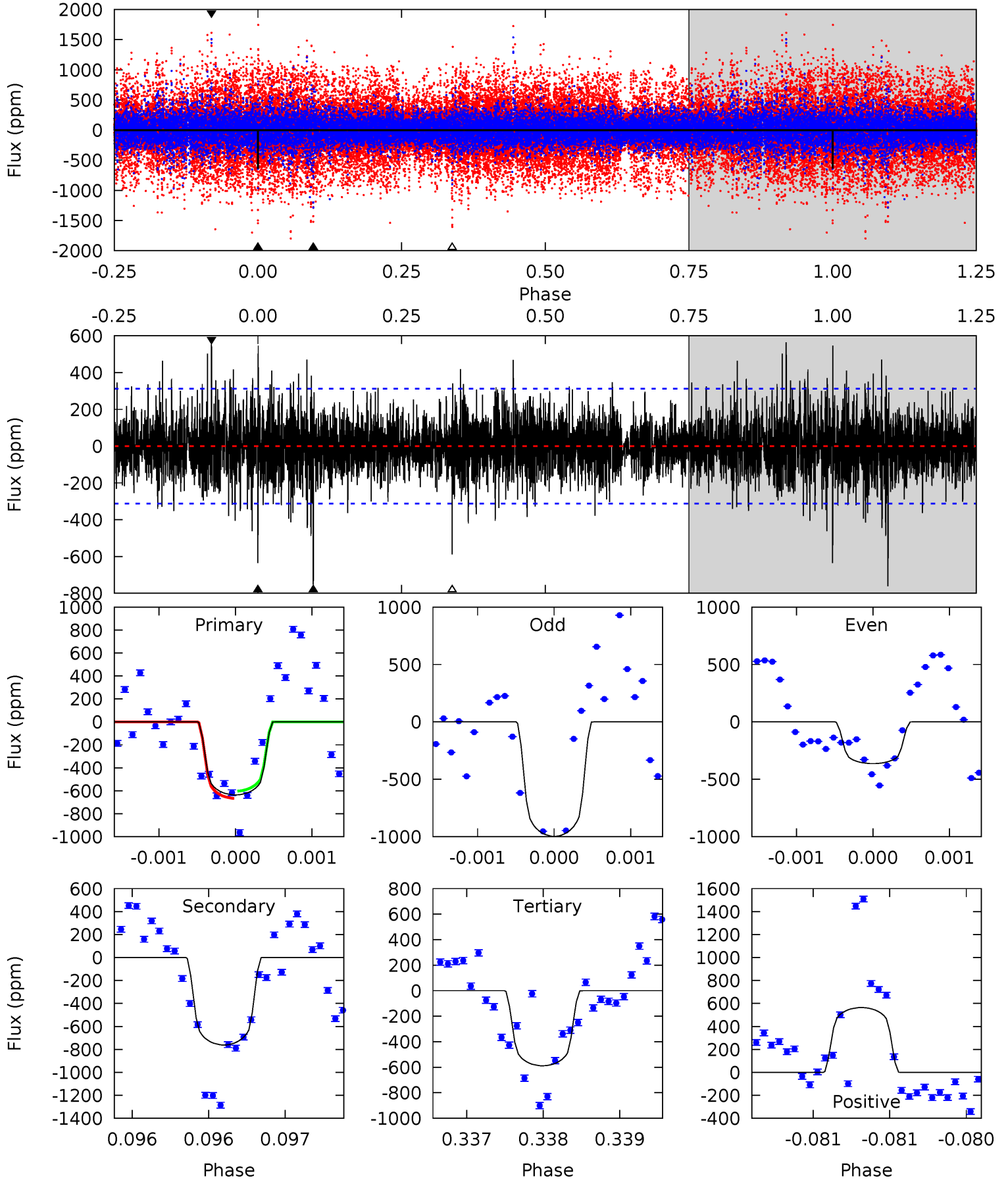
TCE 012306808-05     $P=308.853173$  Days     $T_0=152.291017$  (BKJD)



# DV Model-Shift Uniqueness Test

012306808-05, P = 308.861042 Days, E = 152.279600 Days

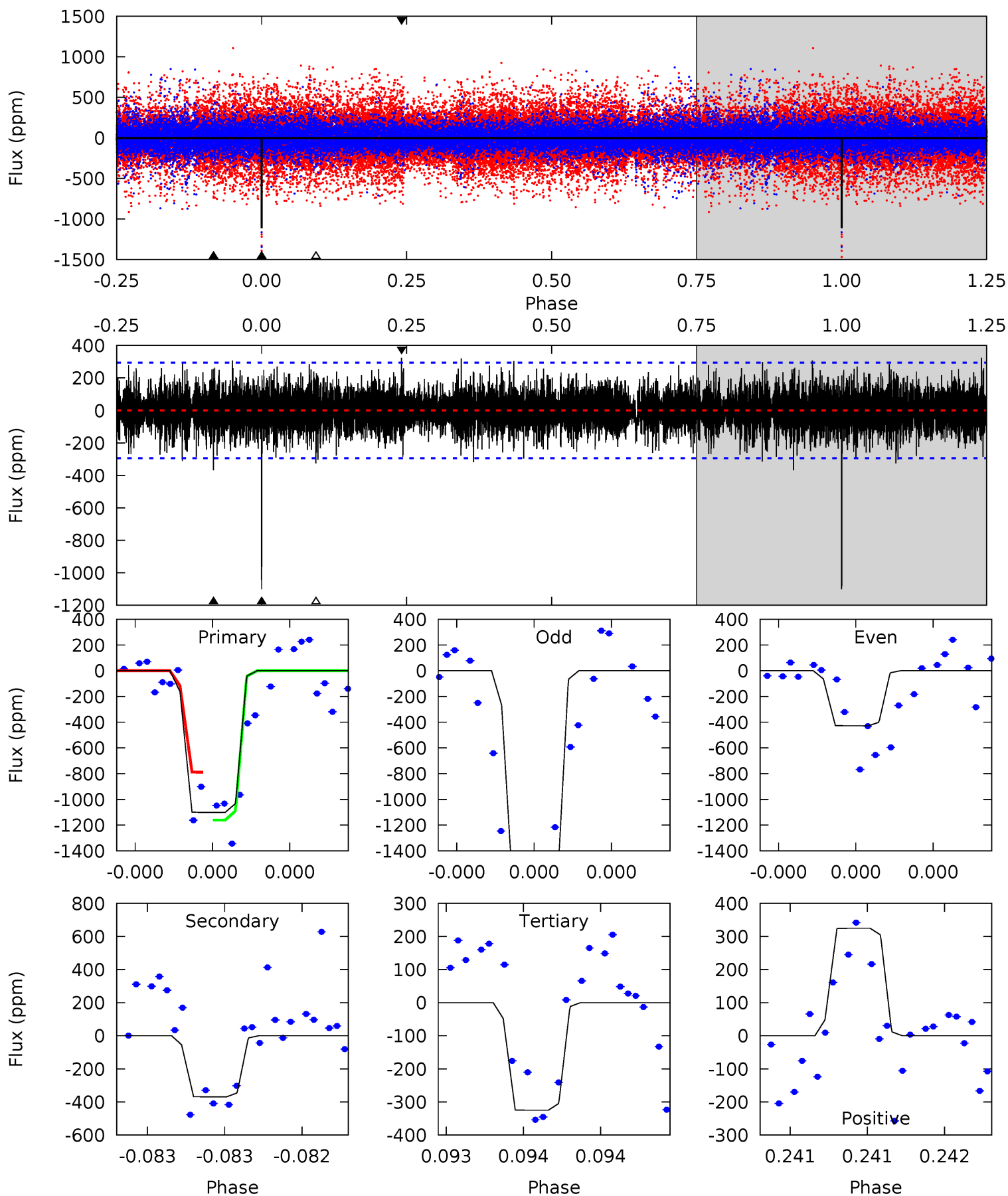
| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 11.3 | 13.5 | 10.4 | 10.0 | 5.55            | 3.44            | 2.06             | 0.84    | 1.27    | 3.07    | 3.50    | 5.08    | 1.13 | 0.43  | 0.56 |



# Alt Model-Shift Uniqueness Test

012306808-05, P = 308.853173 Days, E = 152.291017 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  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 20.9 | 7.00 | 6.17 | 6.16 | 5.59            | 3.50            | 1.49             | 14.7    | 14.7    | 0.83    | 0.84    | 17.0    | 1.11 | 0.23  | 3.48 |





### Stellar Parameters For KIC 012306808

|        | $T_{\text{eff}}(K)$  | $\log(g)$                 | [Fe/H]                     | $R$ ( $R_{\odot}$ )       | $M(M_{\odot})$            | $p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ ) |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
|        | $5985^{+143}_{-161}$ | $4.603^{+0.028}_{-0.161}$ | $-0.780^{+0.300}_{-0.300}$ | $0.758^{+0.170}_{-0.057}$ | $0.846^{+0.071}_{-0.087}$ | $2.738^{+0.437}_{-1.226}$                     |
|        | +2%/-3%              | +1%/-3%                   | +38%/-38%                  | +22%/-8%                  | +8%/-10%                  | +16%/-45%                                     |
| Source | PHO1                 | KIC0                      | KIC0                       | DSEP                      |                           |   |

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

### Secondary Eclipse Parameters for KIC 012306808-05 / KOI

| Detrend | Depth (ppm)   | $R_p$ ( $R_{\oplus}$ ) | $T_{max}$ (K)     | $T_{obs}$ (K)          | $A_{obs}$                  |
|---------|---------------|------------------------|-------------------|------------------------|----------------------------|
| DV      | $-761 \pm 56$ | $2.19^{+1.92}_{-1.41}$ | $358^{+19}_{-14}$ | $6308^{+5788}_{-1571}$ | $62648^{+411733}_{-44928}$ |
| Alt.    | $-369 \pm 53$ | $2.97^{+1.92}_{-1.72}$ | $357^{+20}_{-15}$ | $4605^{+2378}_{-761}$  | $16103^{+76111}_{-10335}$  |

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

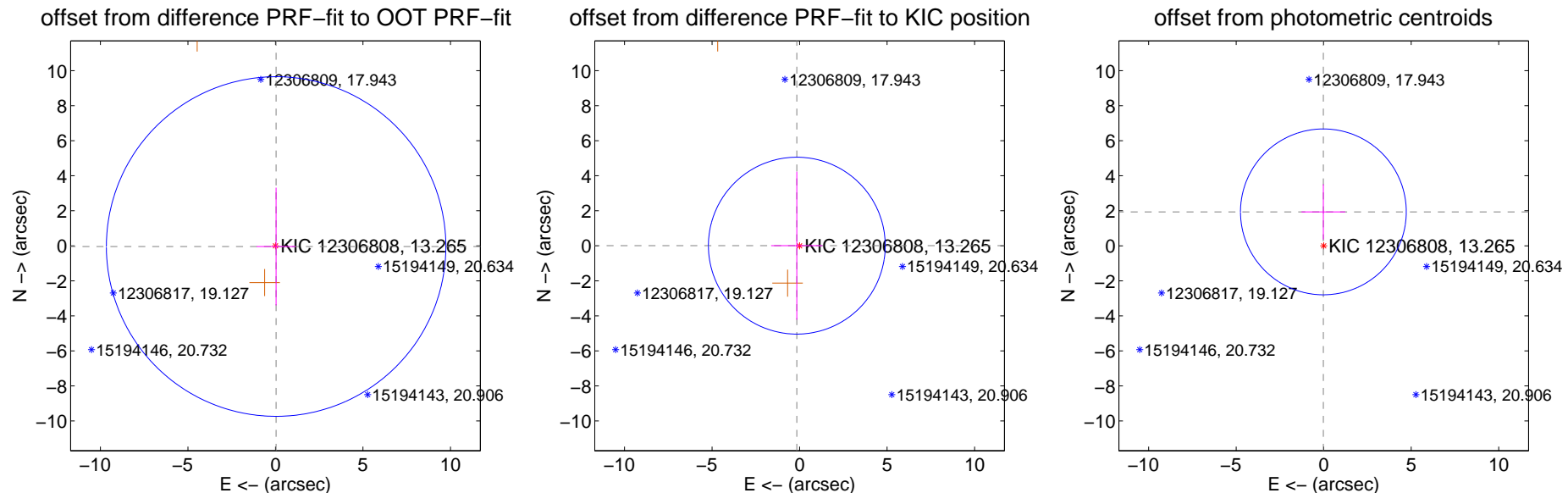
## DV Centroid Data

Supplemental centroid analysis for 012306808-05. Kepler magnitude: 13.27. Transit SNR 5.04

There are 0 quarters with good PRF difference image offsets

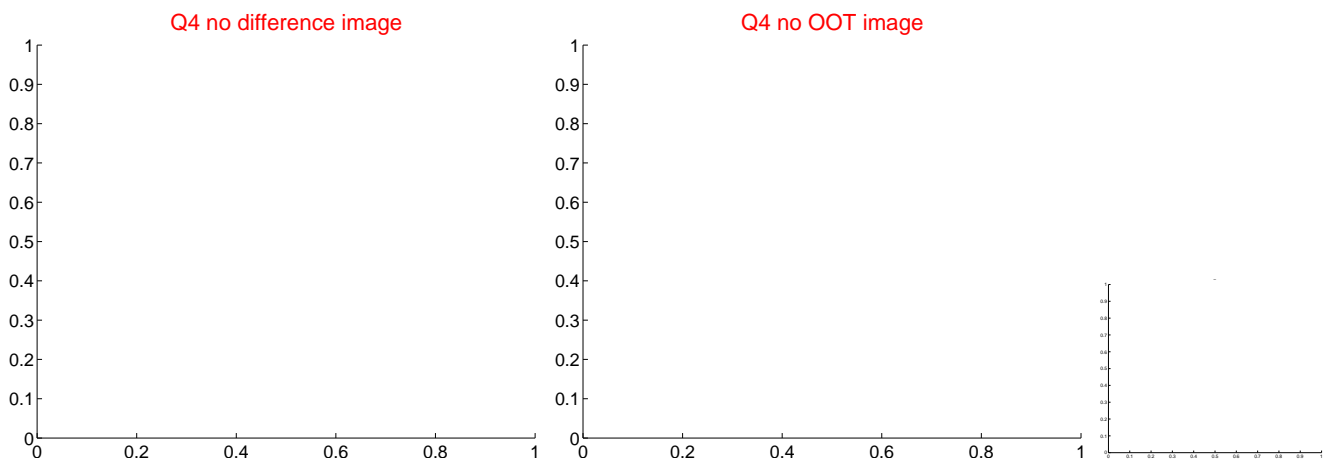
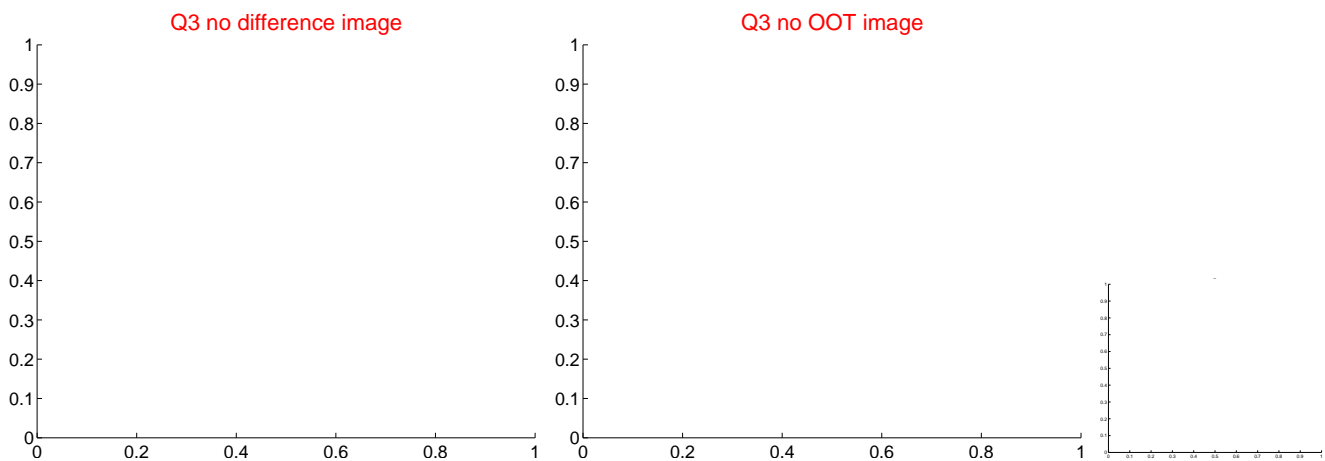
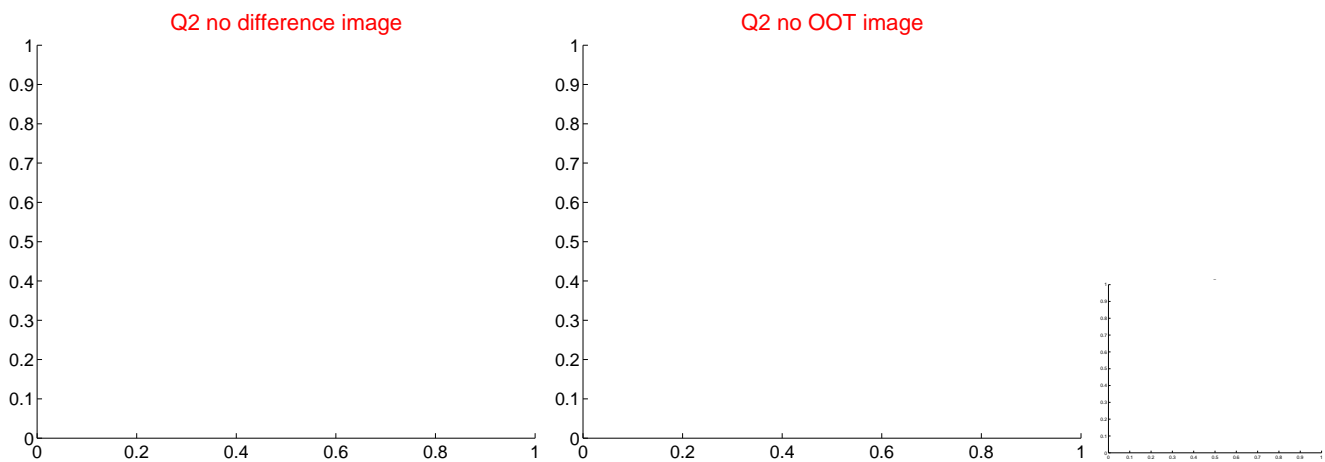
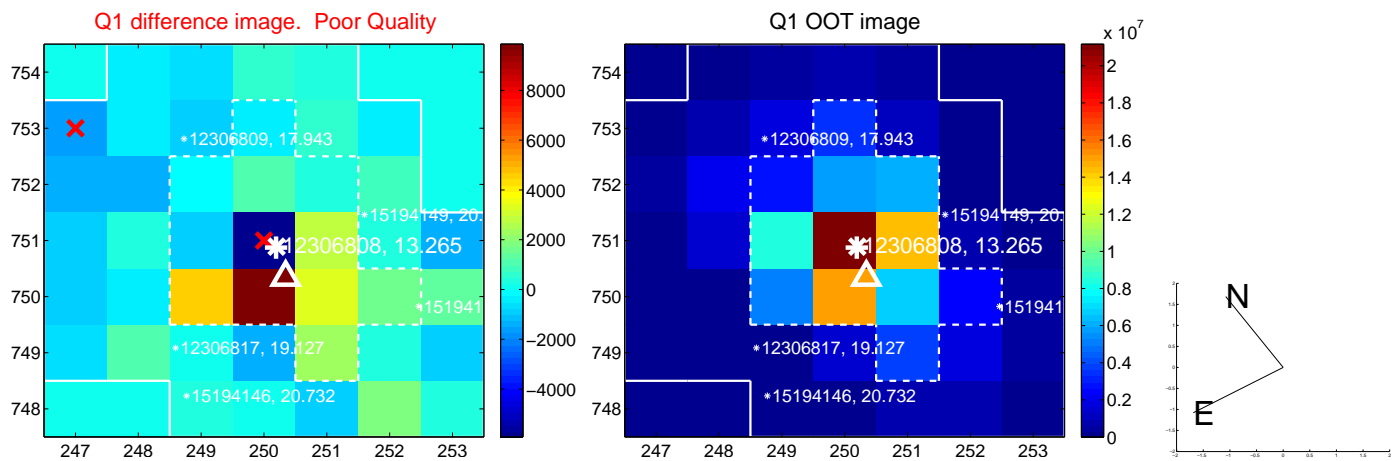
The direct PRF centroid is offset from the target star catalog position by about 0.20 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA        | $\Delta$ Dec       |
|---|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT          | $0.056 \pm 3.233$  | 0.02                | $-0.037 \pm 1.118$ | $-0.041 \pm 3.361$ |
| PRF-fit source offset from KIC position | $0.157 \pm 1.684$  | 0.09                | $0.157 \pm 1.470$  | $0.008 \pm 4.229$  |
| photometric centroid source offset      | $1.94 \pm 1.58$    | 1.23                | $0.02 \pm 1.25$    | $1.94 \pm 1.58$    |

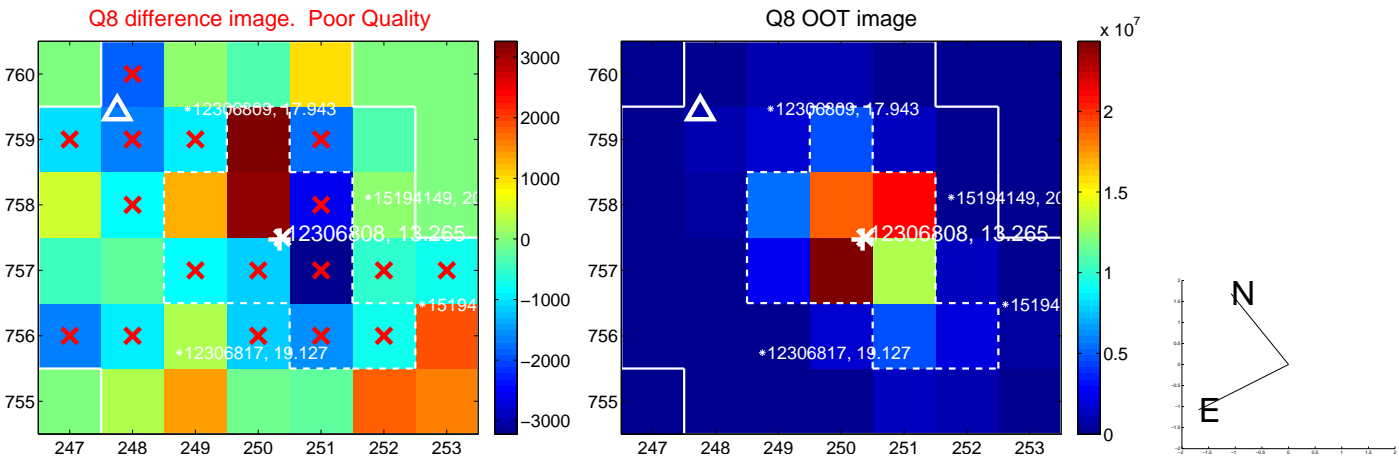
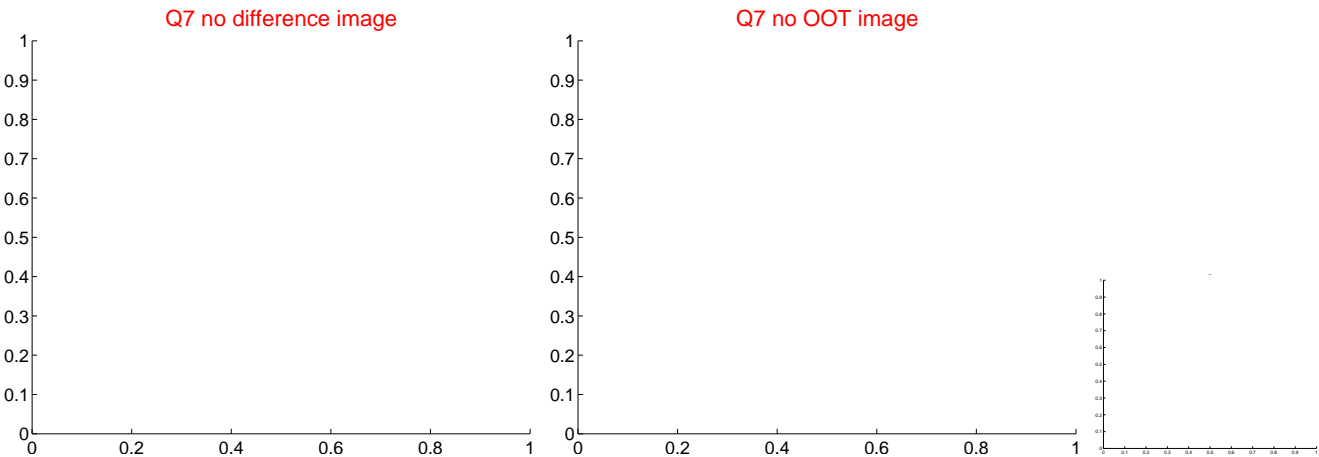
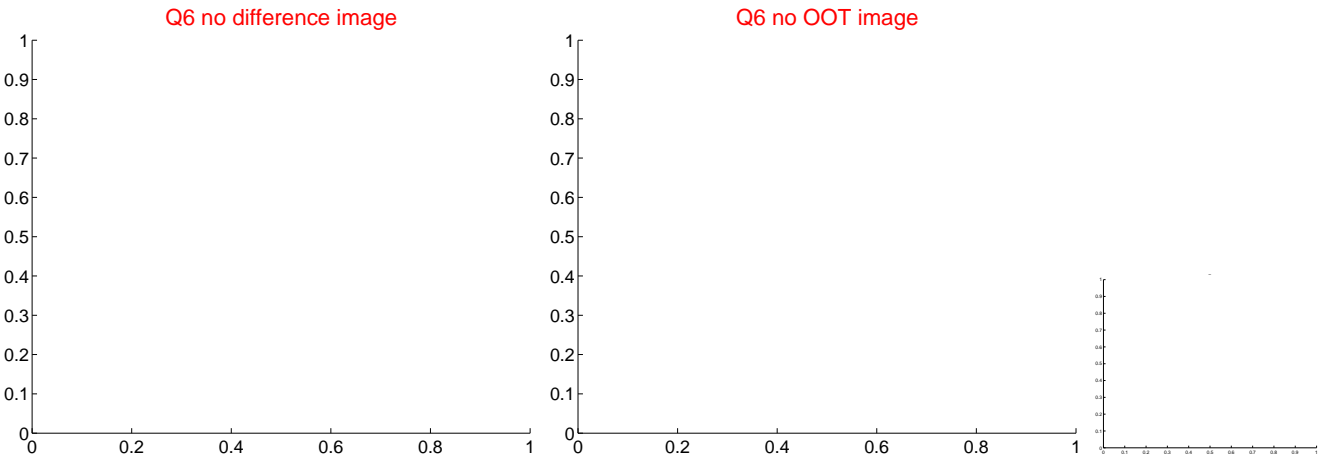
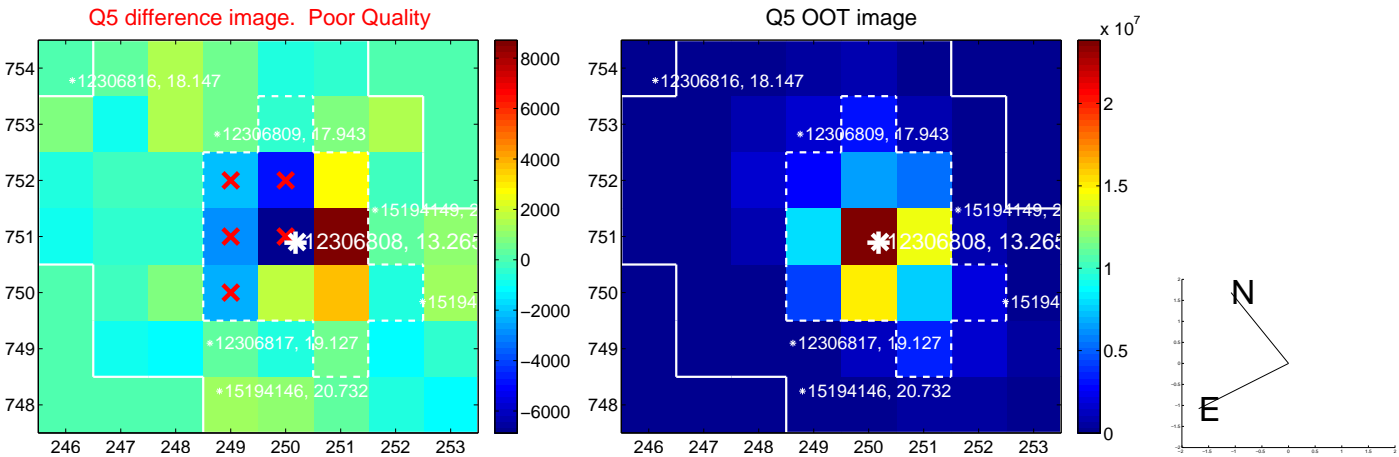


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

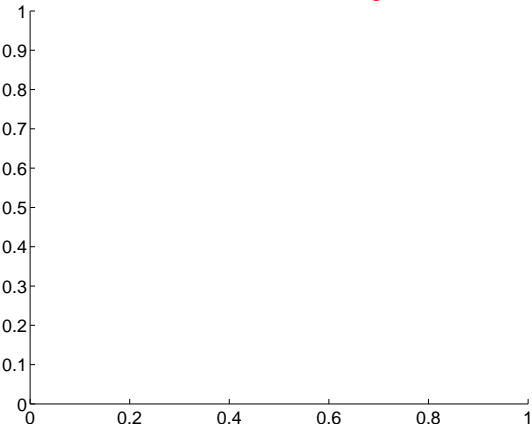


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

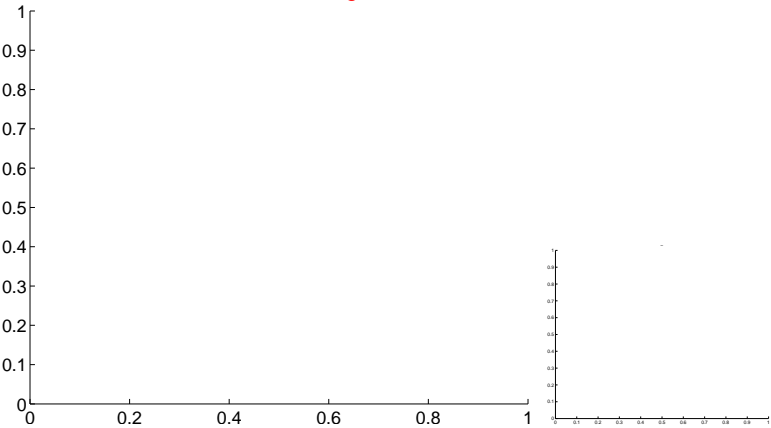


white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.

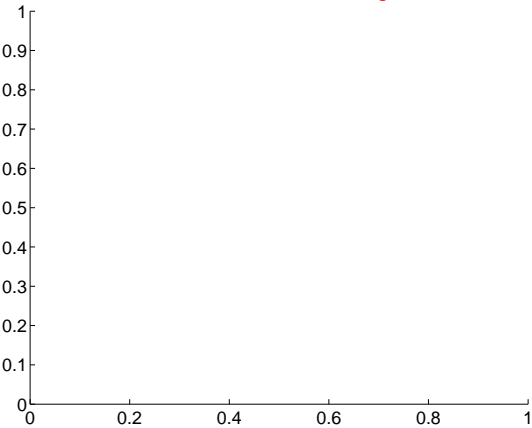
Q9 no difference image



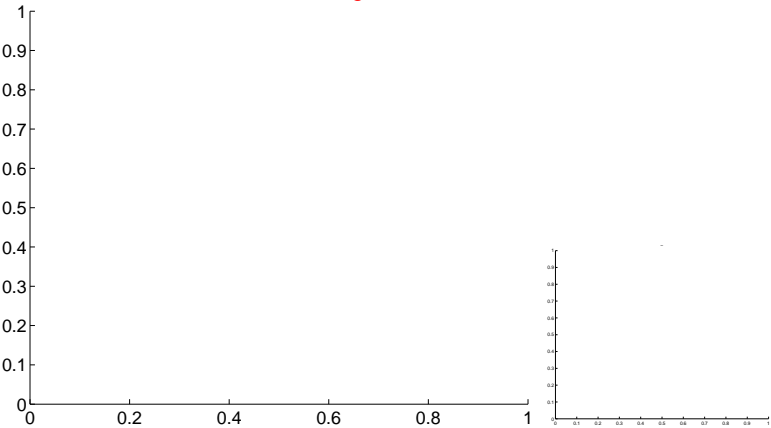
Q9 no OOT image



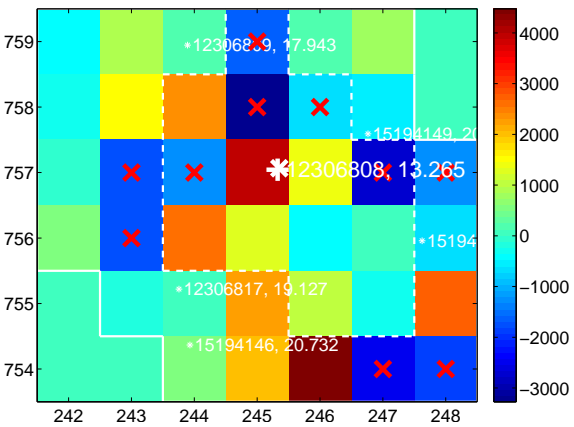
Q10 no difference image



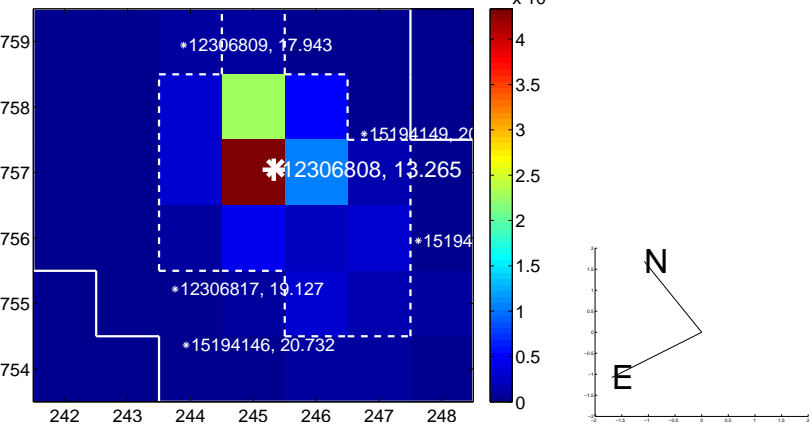
Q10 no OOT image



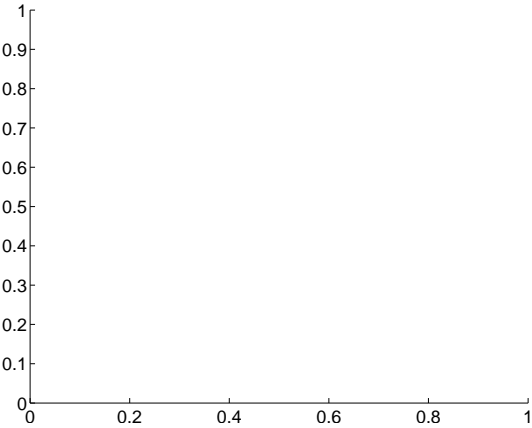
Q11 difference image. Poor Quality



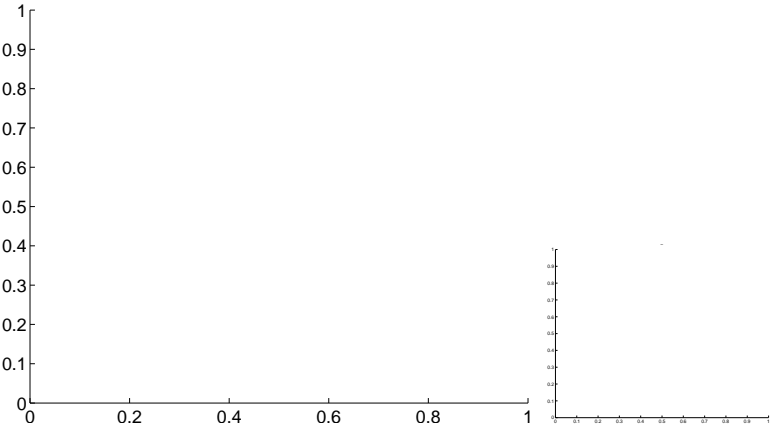
Q11 OOT image



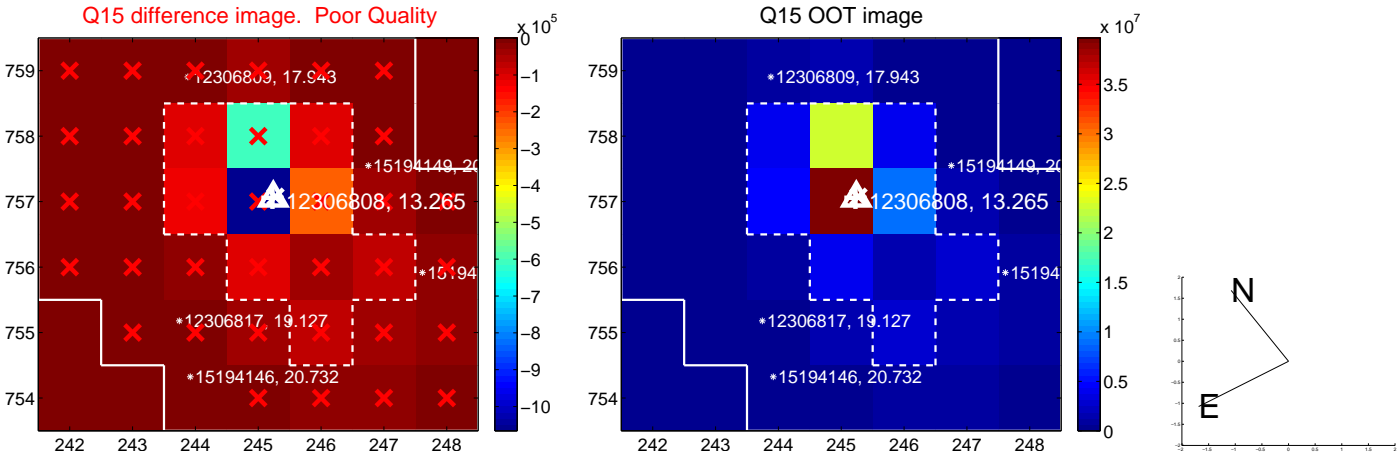
Q12 no difference image



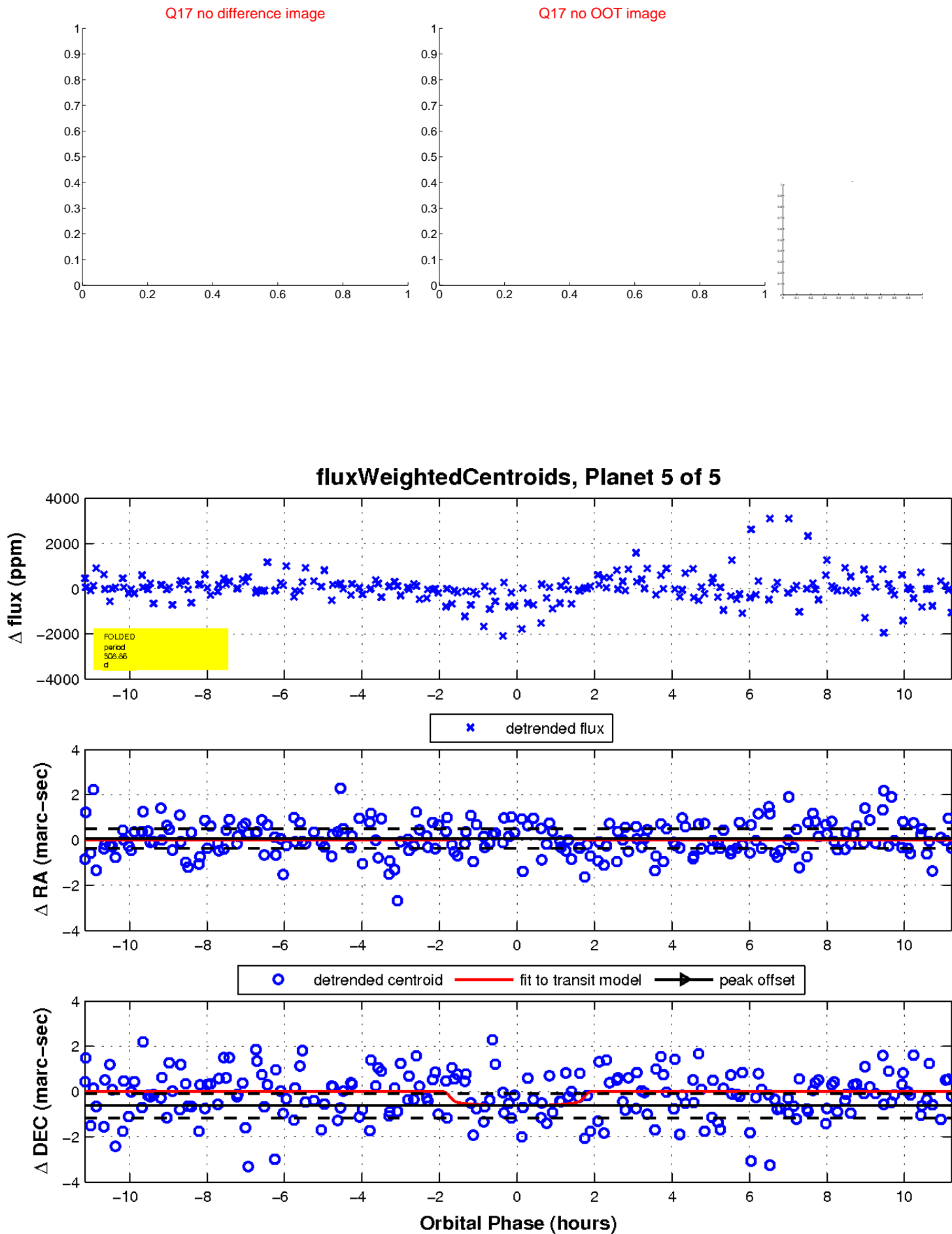
Q12 no OOT image



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



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



# UKIRT Image

Declination

