

# KIC 003003991

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|--------|--------|-----------------------------|-----------------|------------------------|------------------------|
| 003003991-01 | OBS      | 6099.01 | 7.244778      | 131.859937   | 98720.3     | 3.410            | 6136.7 | 4117.1 | 0.79                        | 5530            | 25.68                  | 106.03                 |
| 003003991-02 | OBS      | No      | 3.622383      | 131.859213   | 4986.2      | 3.280            | 333.8  | 324.2  | 0.79                        | 5530            | 6.49                   | 267.19                 |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments  |
|--------------|----------|------|-------|---|---|---|---|---|
| 003003991-01 | OBS      | FP   | 0.00  | 0 | 1 | 0 | 0 | MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE—CENT_KIC_POS |
| 003003991-02 | OBS      | FP   | 0.00  | 1 | 1 | 0 | 0 | IS_SEC_TCE—CENT_KIC_POS                         |

**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.

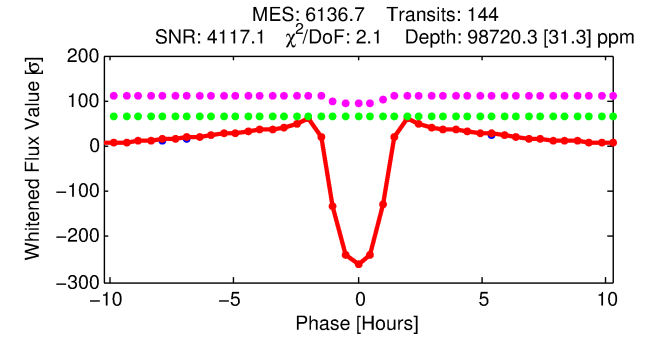
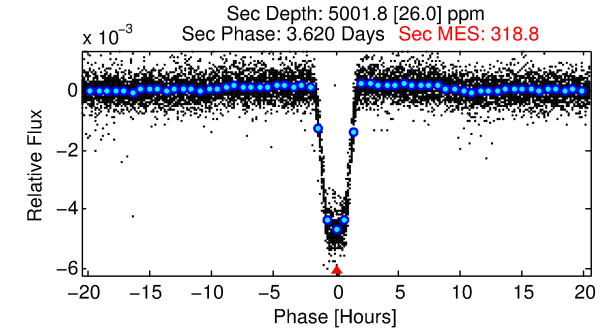
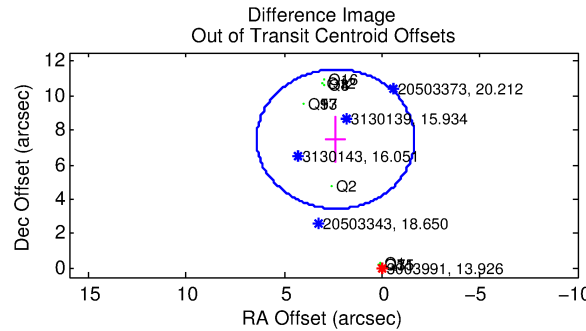
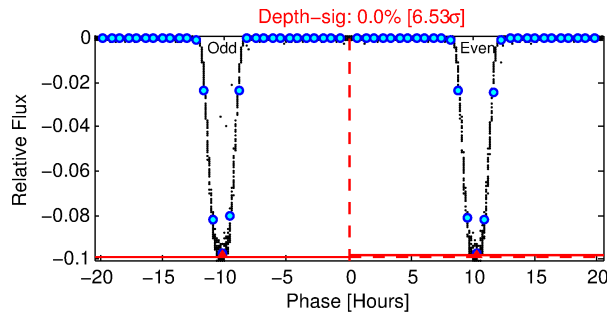
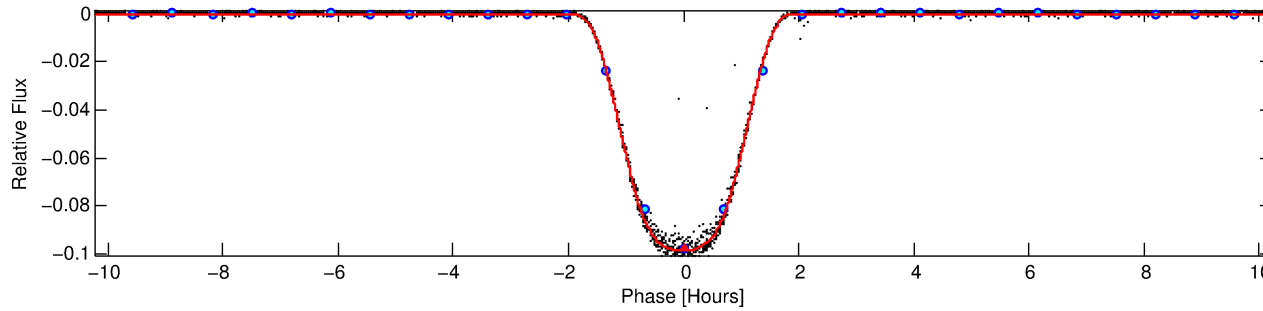
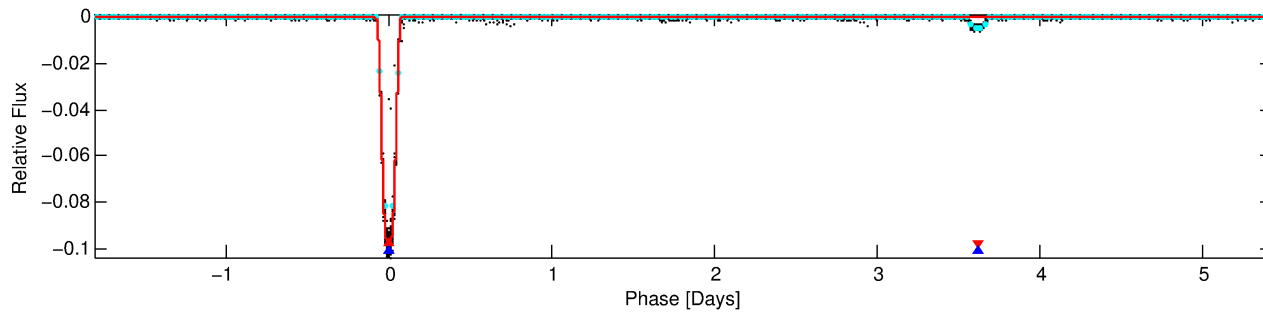
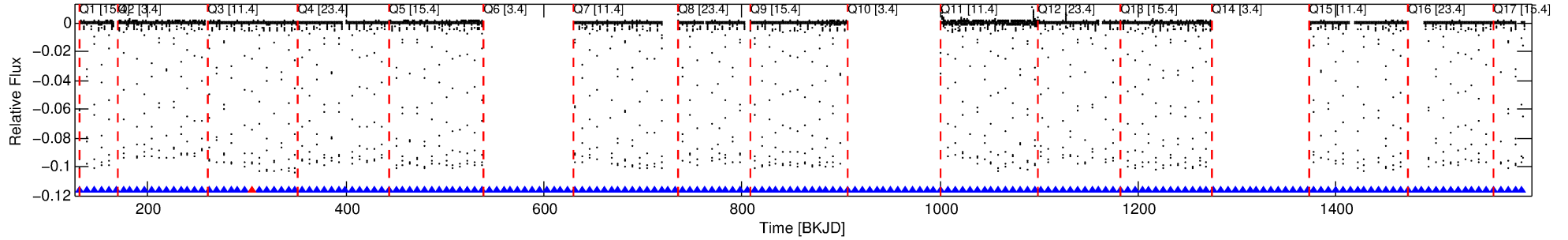
## Ephemeris Match Information For 003003991-01

No Significant Match Found

# DV One-Page Summary

KIC: 3003991 Candidate: 1 of 2 Period: 7.245 d  
KOI: K06099.01 Corr: 0.997

Kp: 13.93 R\*: 0.79 R<sub>s</sub> Teff: 5530.0 K Logg: 4.59 Fe/H: -0.220



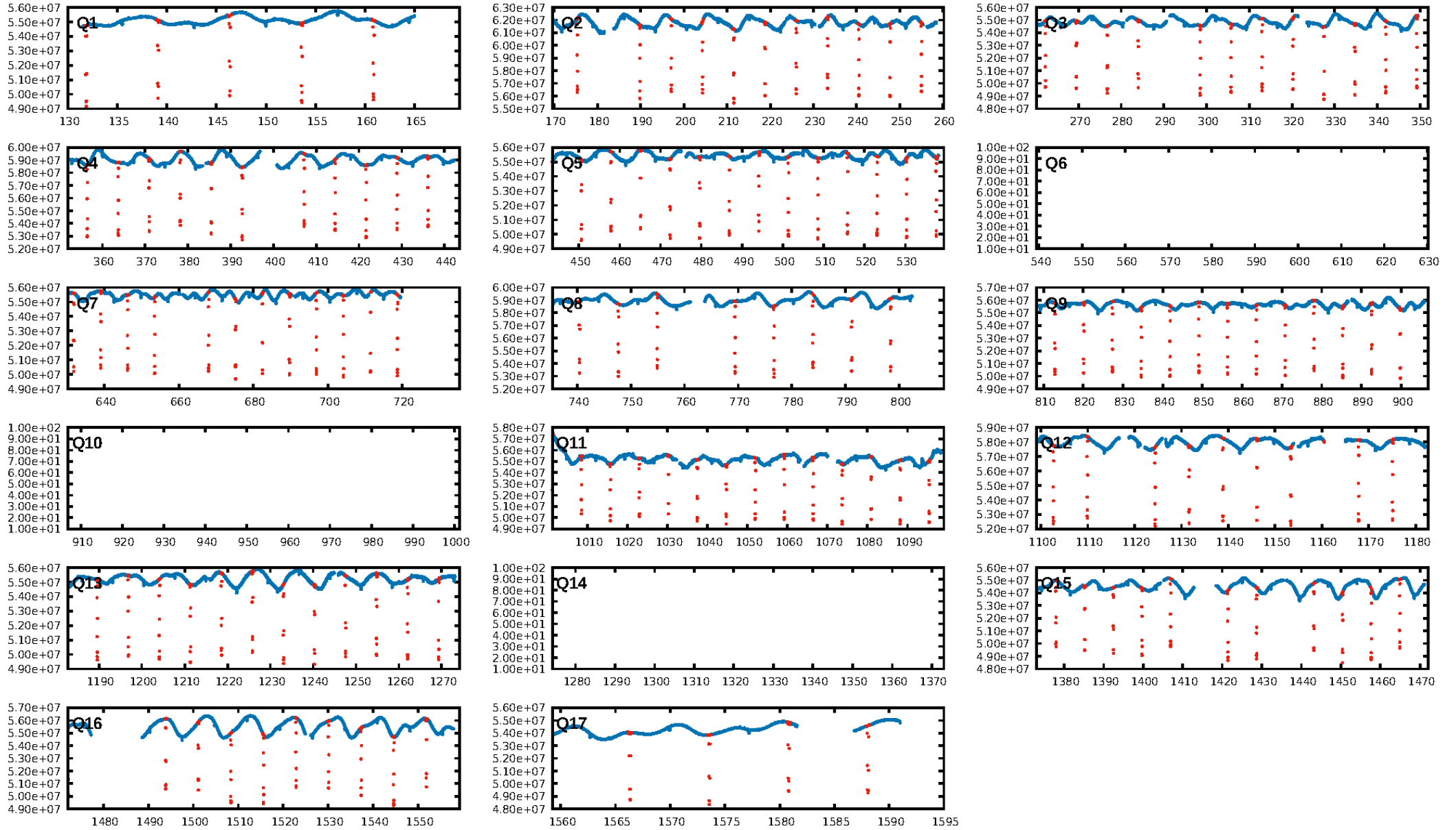
## DV Fit Results:

Period = 7.24478 [0.00000] d  
Epoch = 131.8599 [0.0000] BKJD  
Rp/R\* = 0.2987 [0.0001]  
a/R\* = 19.24 [0.01]  
b = 0.53 [0.00]  
Seff = 106.03 [31.00]  
Teq = 818 [60] K  
Rp = 25.68 [5.74] Re  
a = 0.0700 [0.0130] AU  
Ag = 20.47 [5.46] [3.57σ]  
Teffp = 2691 [81] K [18.62σ]

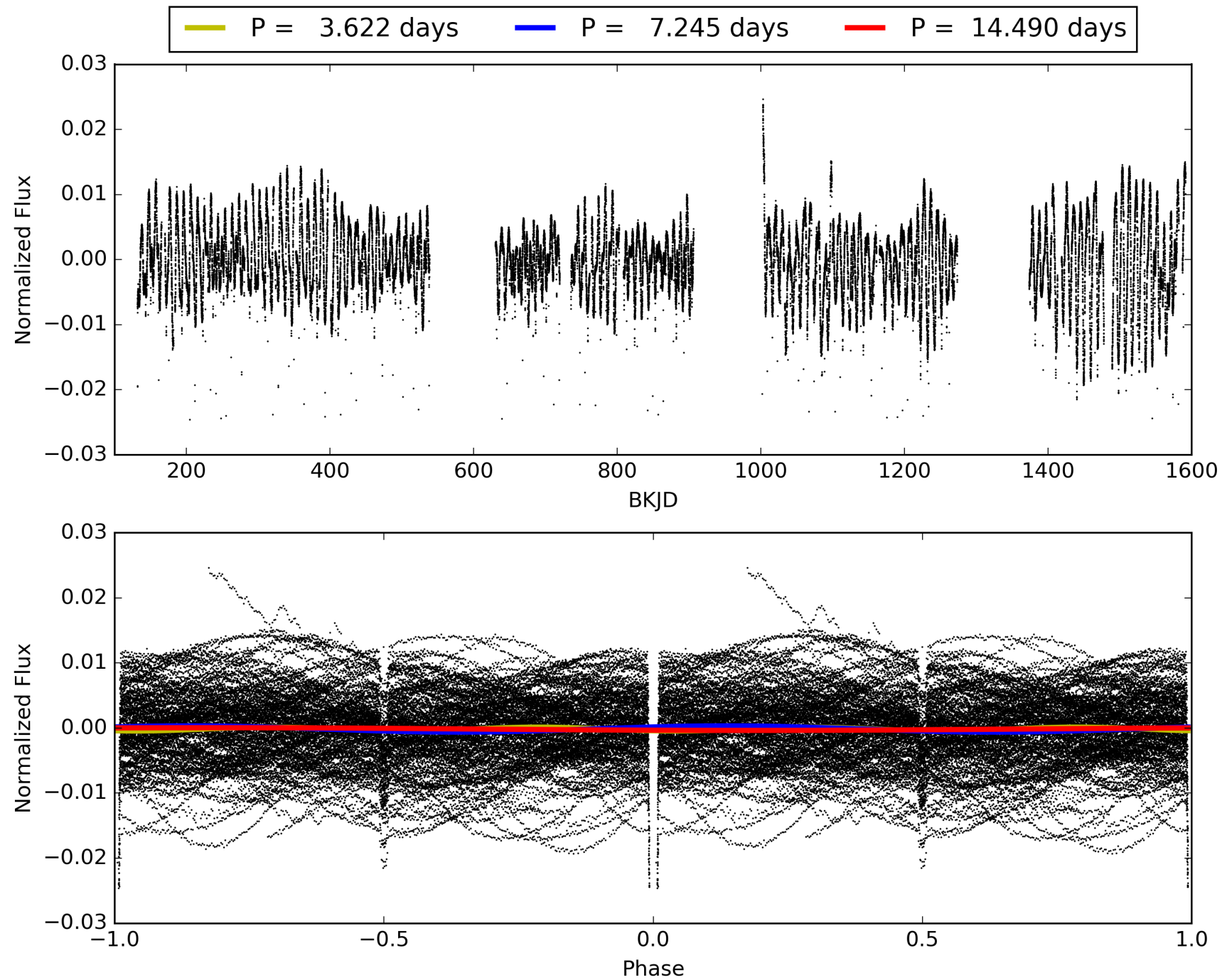
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [18.37σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 0.0%  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 0.99 [134/135]  
GhostDiagnostic-chr: 2.008  
Centroid-sig: 0.0%  
Centroid-so: 1.572 arcsec [464.84σ]  
OotOffset-rm: 7.847 arcsec [5.84σ]  
KicOffset-rm: 0.410 arcsec [5.78σ]  
OotOffset-st: 1/4/4/5 [14]  
KicOffset-st: 1/4/4/5 [14]  
DiffImageQuality-fgm: 1.00 [14/14]  
DiffImageOverlap-fno: 0.00 [0/14]

# TCE 003003991-01, PDC Light Curves

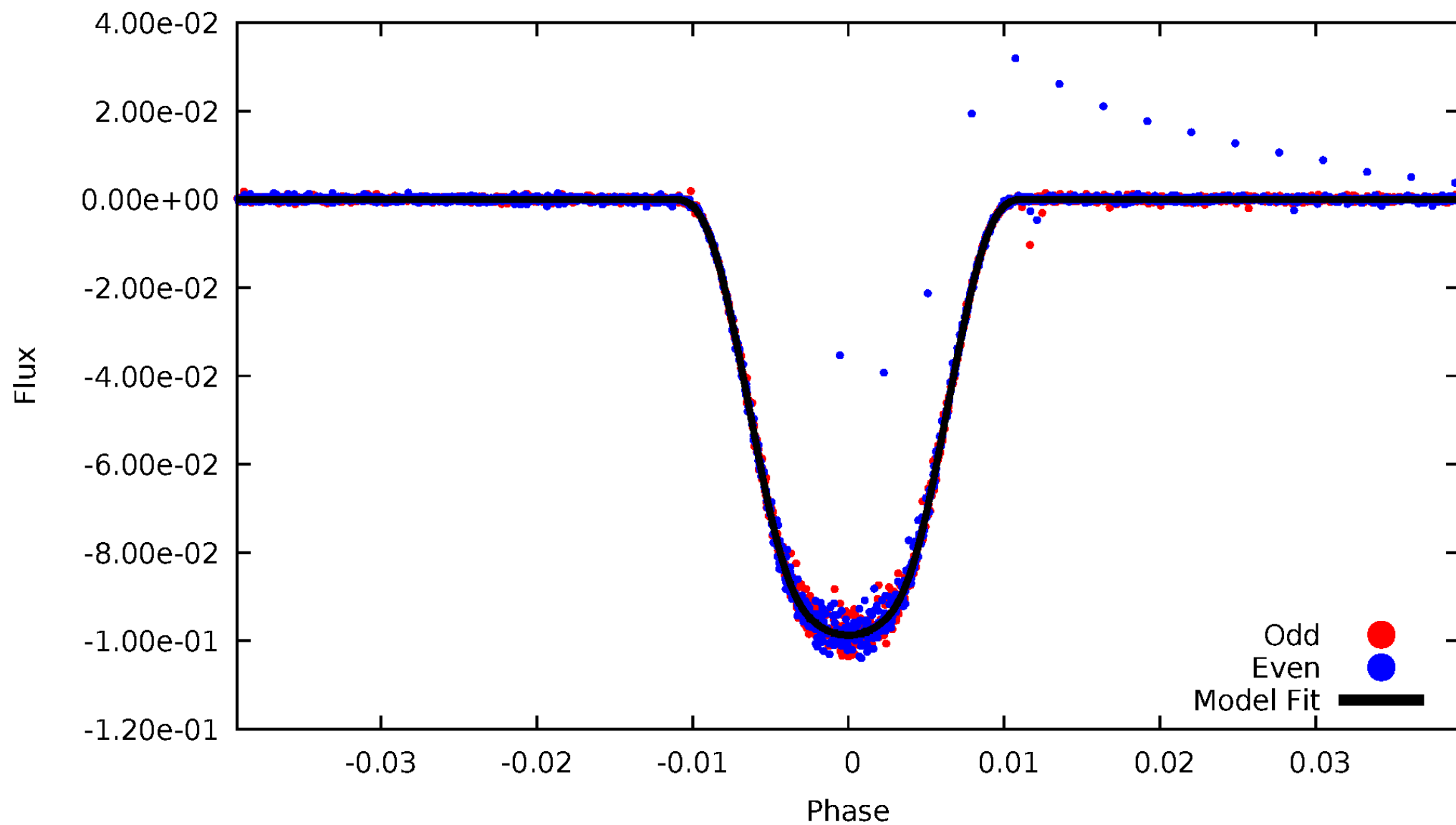


TCE 003003991-01



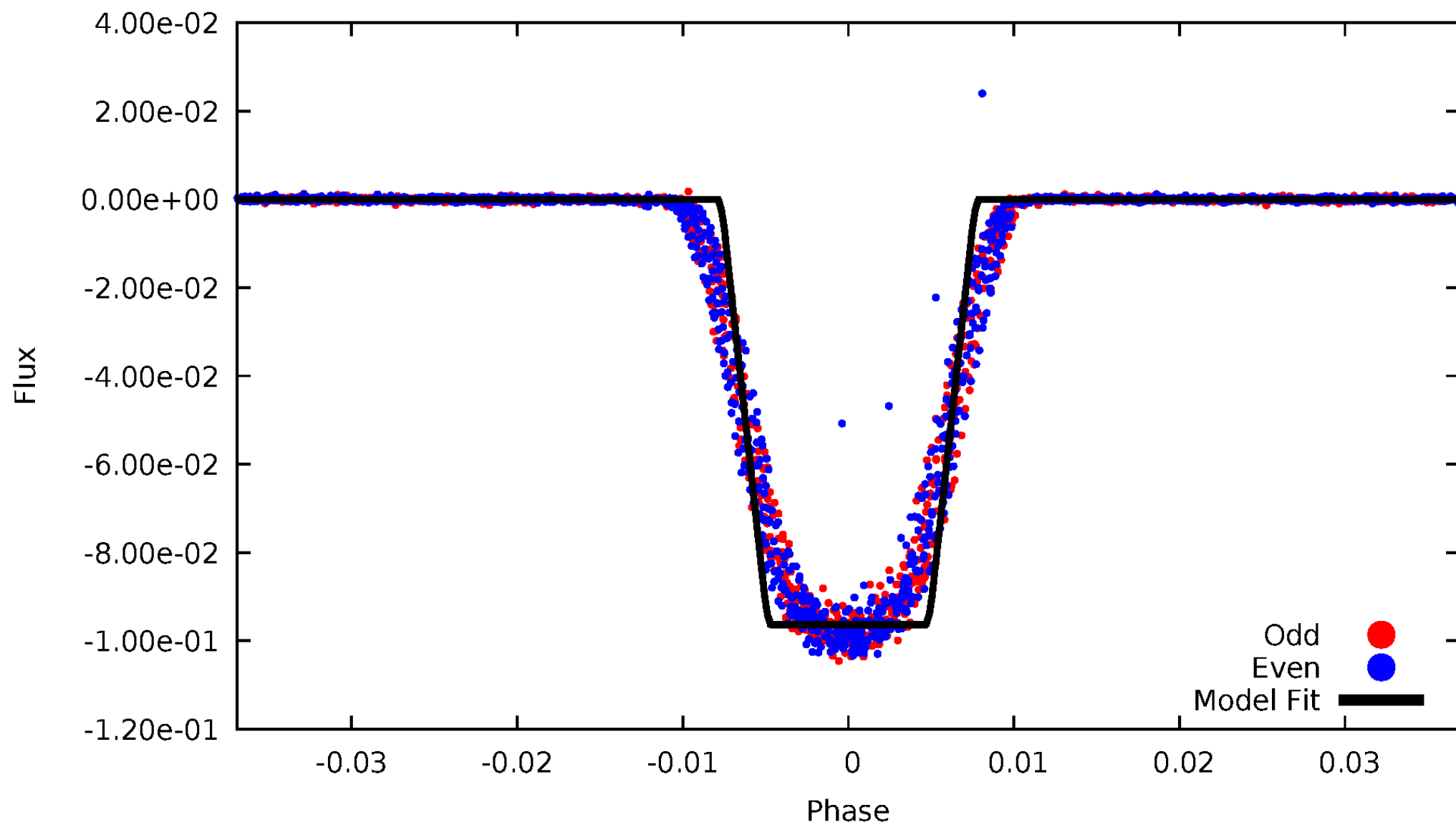
# DV Odd/Even

TCE 003003991-01



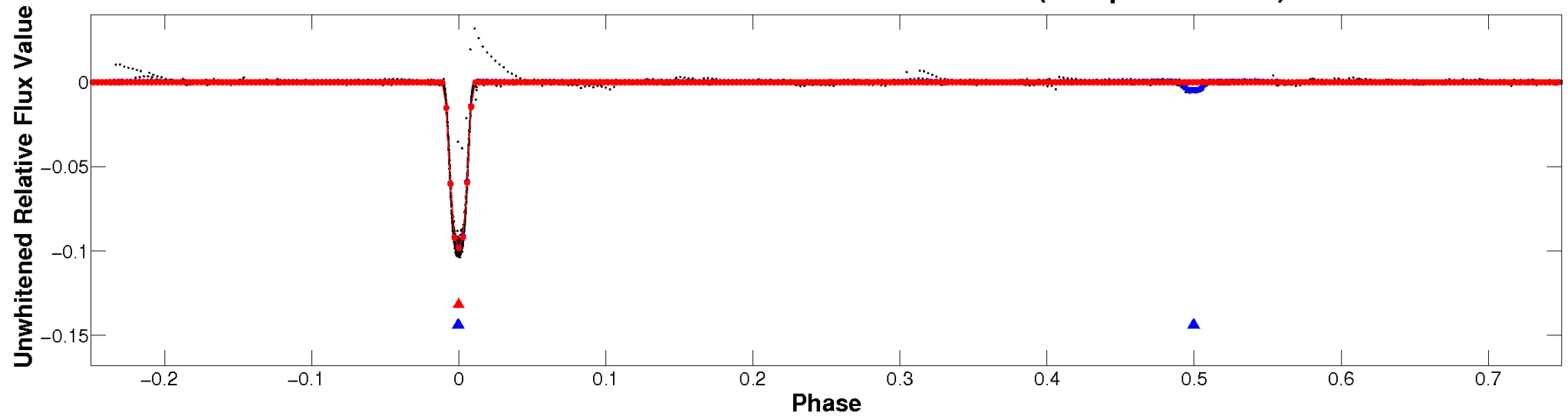
# ALT Odd/Even

TCE 003003991-01

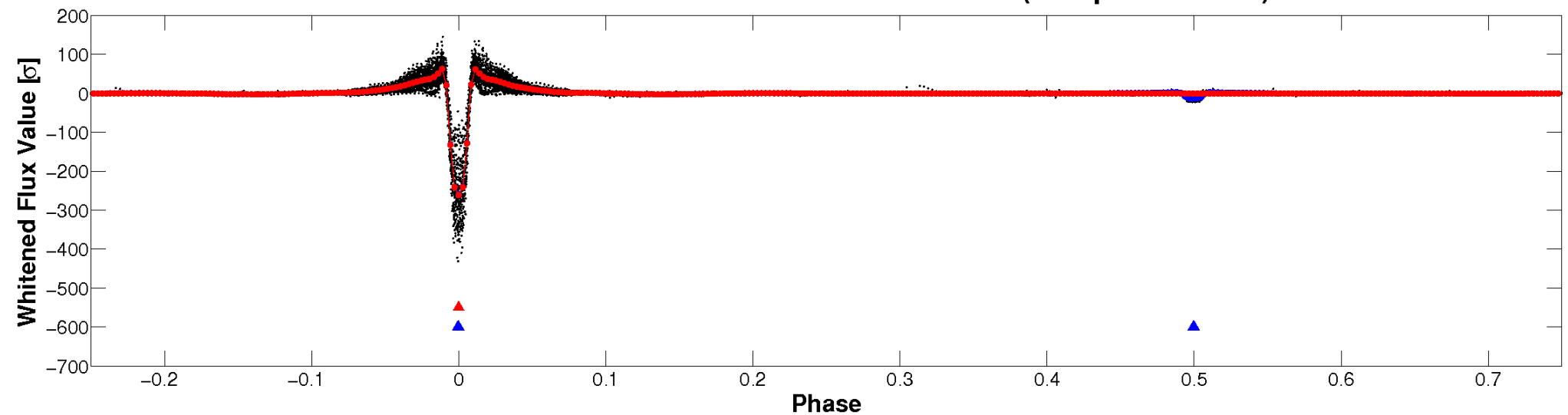


# Non-Whitened Vs. Whitened Light Curve

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

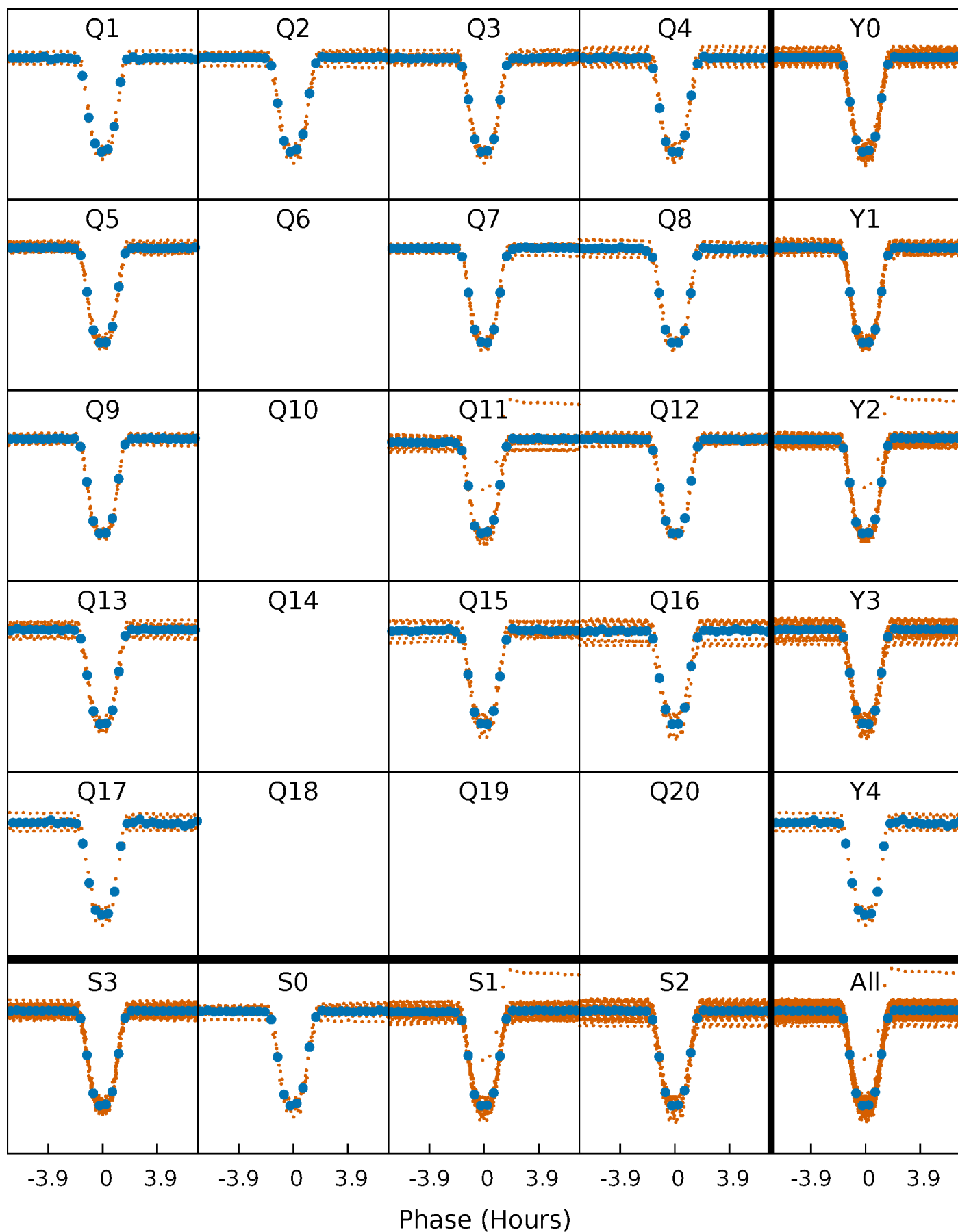


## Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

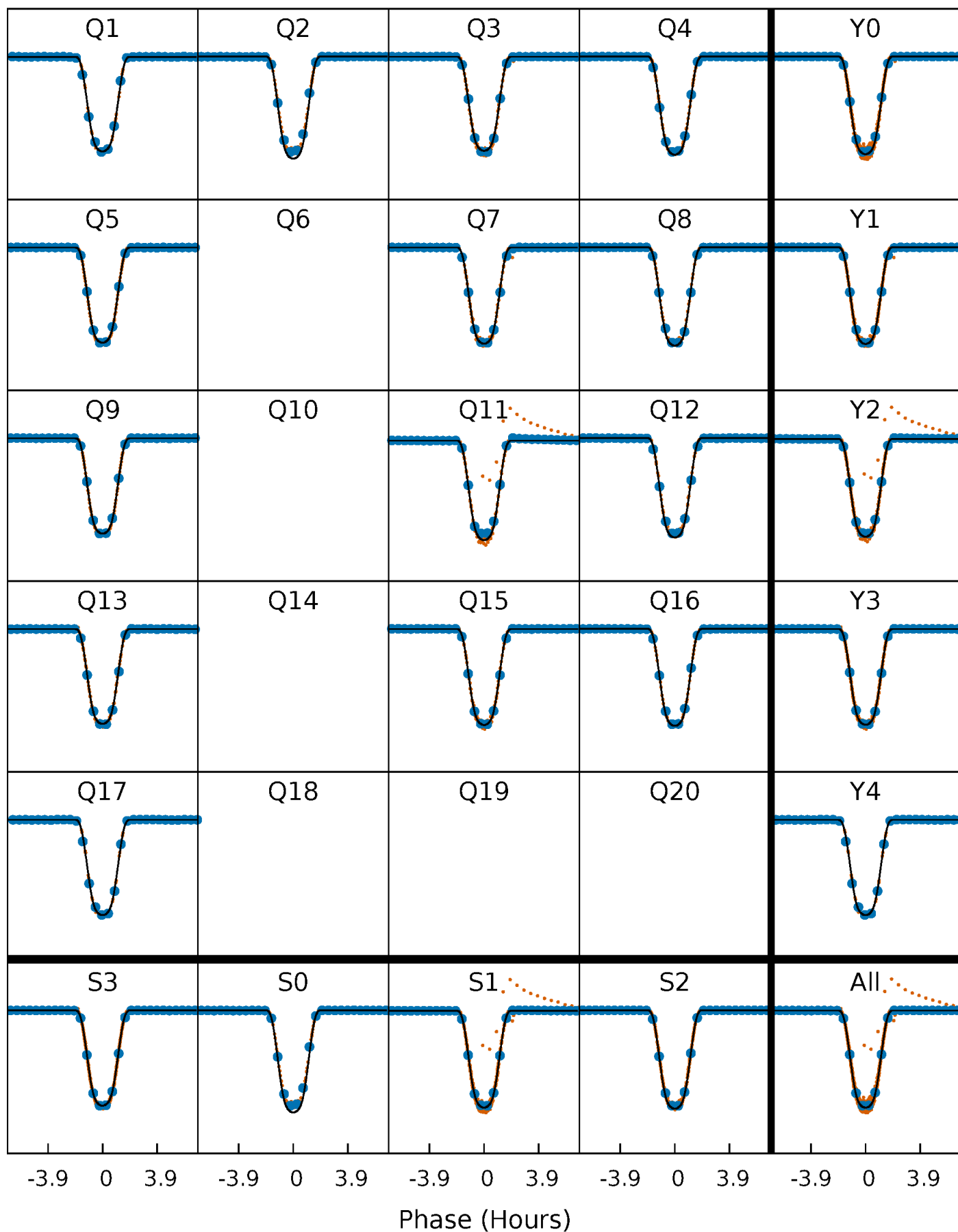
TCE 003003991-01 P= 7.244778 Days  $T_0=131.859937$  (BKJD)





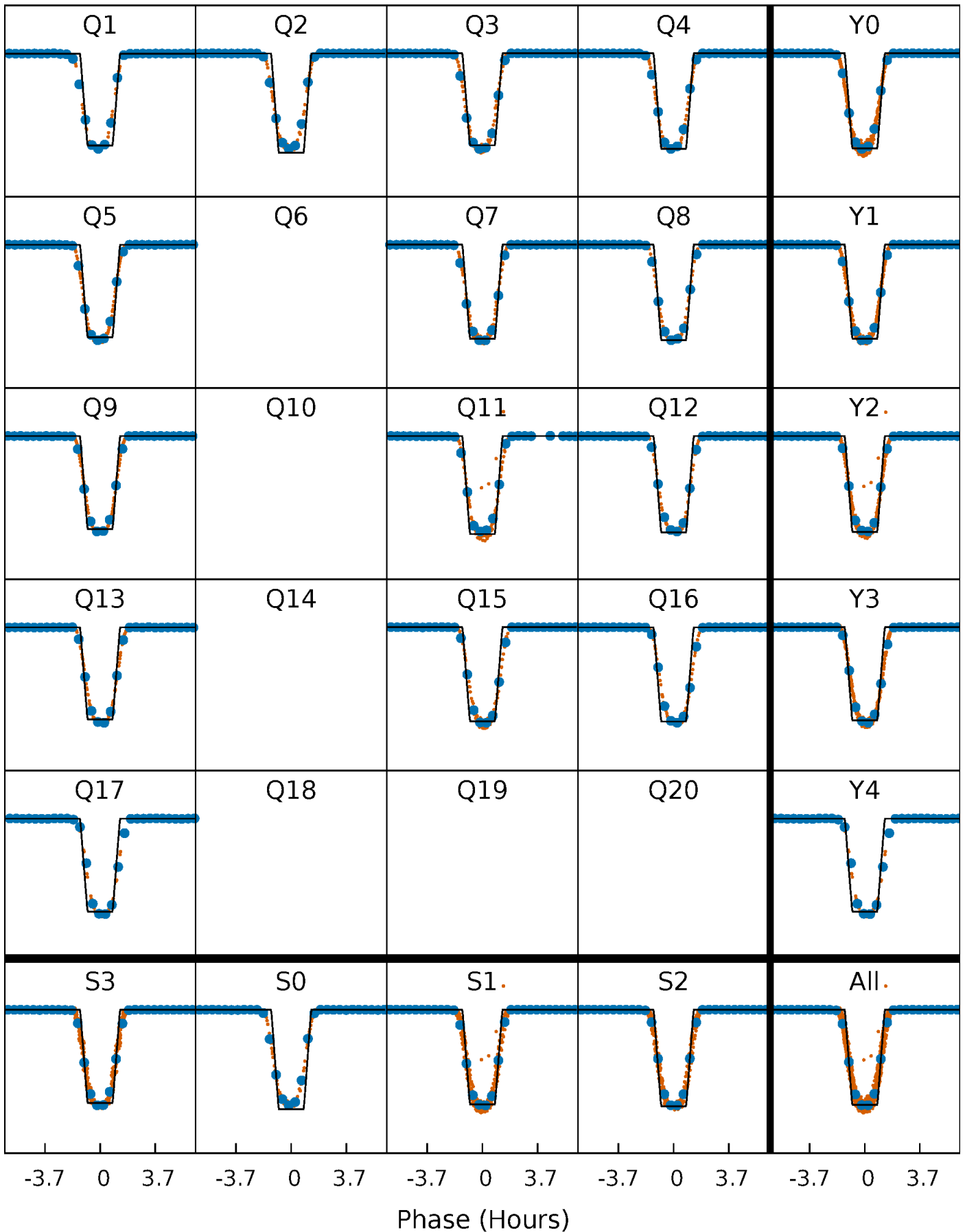
# DV Quarter-Phased Transit Curves

TCE 003003991-01   P= 7.244778 Days    $T_0=131.859937$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

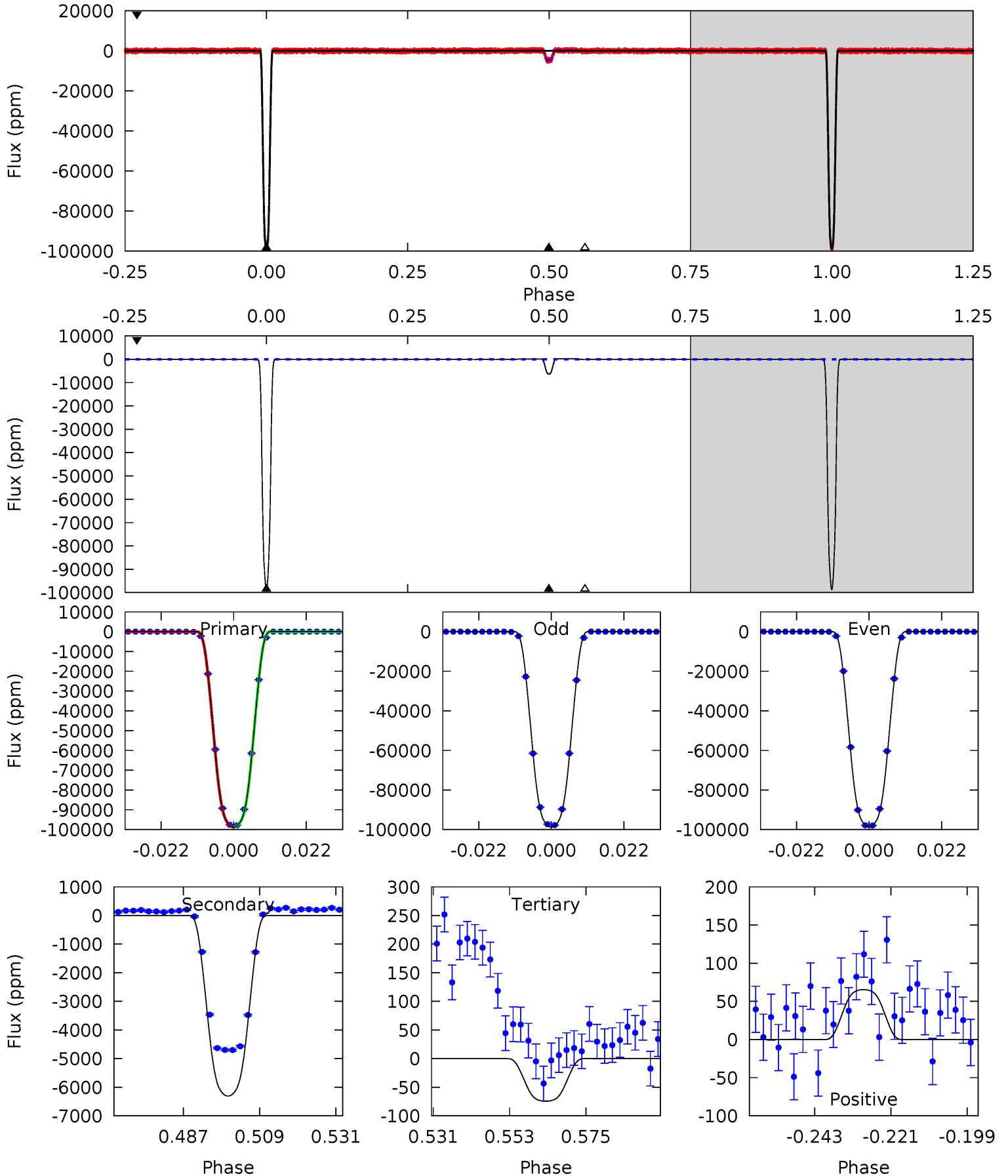
TCE 003003991-01 P= 7.244720 Days  $T_0=131.865699$  (BKJD)



# DV Model-Shift Uniqueness Test

003003991-01, P = 7.244778 Days, E = 124.615159 Days

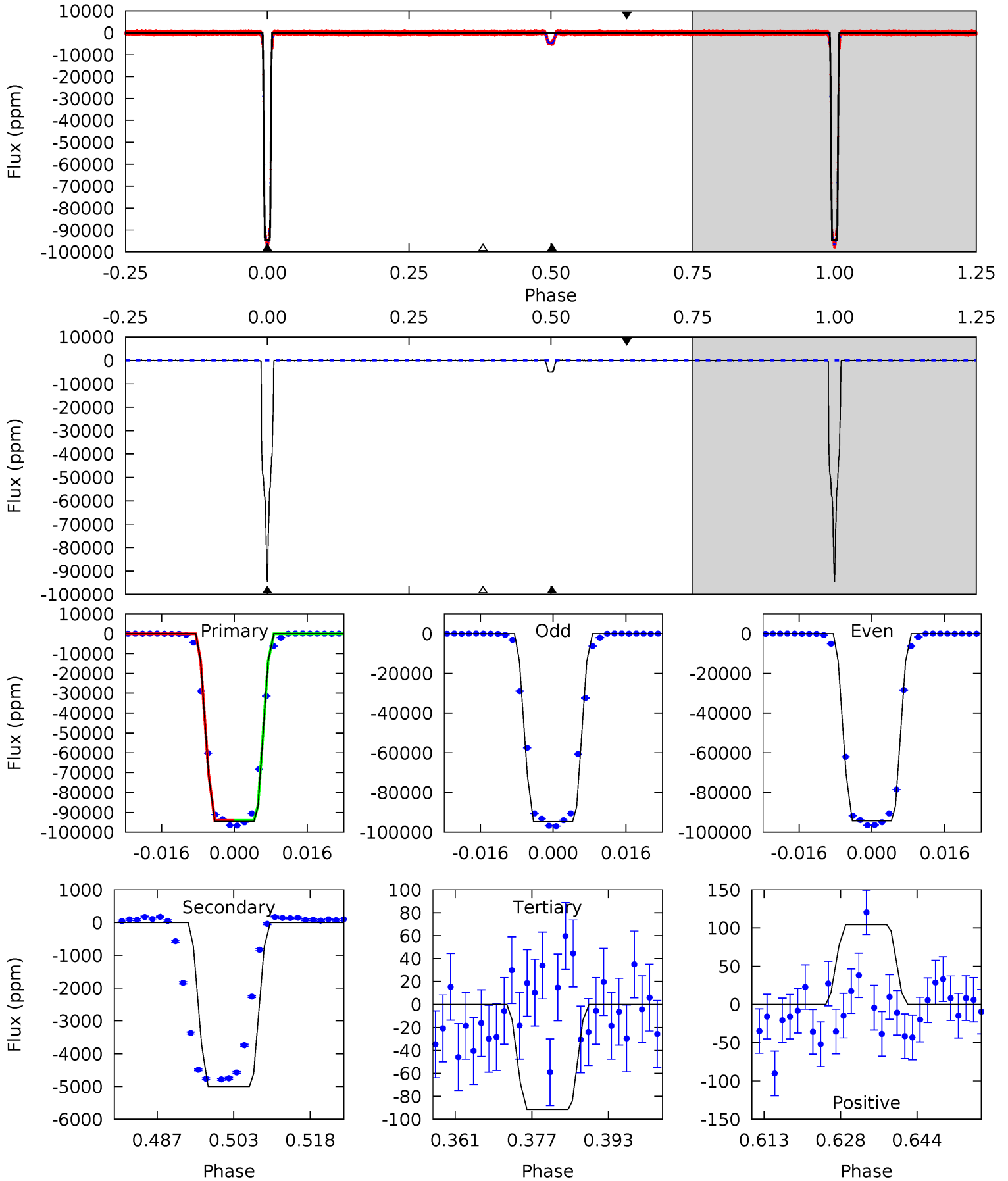
| Pri  | Sec   | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT |
|------|-------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|-----|
| 7855 | 501.9 | 5.94 | 5.21 | 4.87            | 2.29            | 4.21             | 7849    | 7850    | 495.9   | 496.7   | 4.06    | 0.99 | 0.00  | 0   |



# Alt Model-Shift Uniqueness Test

003003991-01, P = 7.244720 Days, E = 124.620979 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  |
|------|-------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 3457 | 182.9 | 3.34 | 3.81 | 4.94            | 2.42            | 1.24             | 3454    | 3454    | 179.5   | 179.1   | 6.66    | 0.99 | 0.00  | 2.35 |



### Stellar Parameters For KIC 003003991

|        | $T_{\text{eff}} (K)$ | $\log(g)$                 | $[\text{Fe}/\text{H}]$     | $R (R_{\odot})$           | $M (M_{\odot})$           | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
|        | $5530^{+166}_{-149}$ | $4.586^{+0.034}_{-0.144}$ | $-0.220^{+0.300}_{-0.300}$ | $0.788^{+0.176}_{-0.059}$ | $0.882^{+0.083}_{-0.102}$ | $2.542^{+0.483}_{-1.036}$                 |
|        | +3%/-3%              | +1%/-3%                   | +136%/-136%                | +22%/-7%                  | +9%/-12%                  | +19%/-41%                                 |
| 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 003003991-01 / KOI 6099.01

| Detrend | Depth (ppm)    | $R_p (R_{\oplus})$      | $T_{\text{max}} (K)$ | $T_{\text{obs}} (K)$ | $A_{\text{obs}}$ |
|---------|----------------|-------------------------|----------------------|----------------------|------------------|
| DV      | $-6309 \pm 13$ | $26.29^{+2.96}_{-1.63}$ | $1166^{+60}_{-48}$   | $3372^{+65}_{-65}$   | $25^{+2}_{-4}$   |
| Alt.    | $-5003 \pm 27$ | $27.47^{+3.48}_{-1.77}$ | $1169^{+69}_{-50}$   | $3213^{+60}_{-63}$   | $18^{+2}_{-3}$   |

$T_{\text{max}}$  = Theoretical Maximum Planetary Temperature

$T_{\text{obs}}$  = Observed Planetary Temperature (Assuming  $A=0.3$ )

$A_{\text{obs}}$  = Observed Albedo (Assuming  $T=0$ )

If a secondary eclipse is present, the system is likely an EB if  $T_{\text{obs}} \gg T_{\text{max}}$  AND  $A_{\text{obs}} \gg 1.0$

## DV Centroid Data

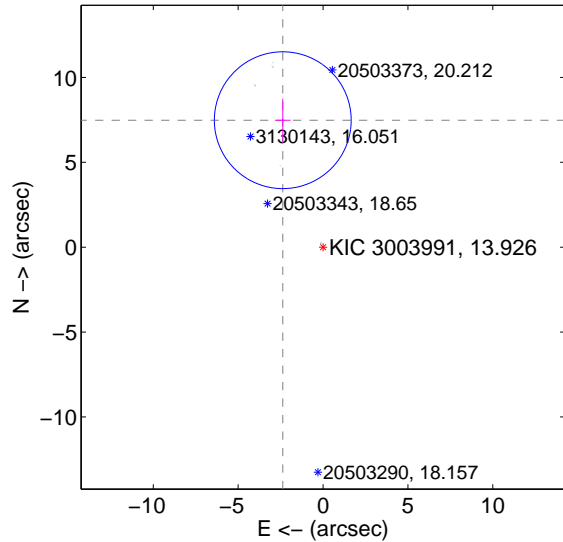
Supplemental centroid analysis for 003003991-01. Kepler magnitude: 13.93. Transit SNR 4117.09

There are 14 quarters with good PRF difference image offsets

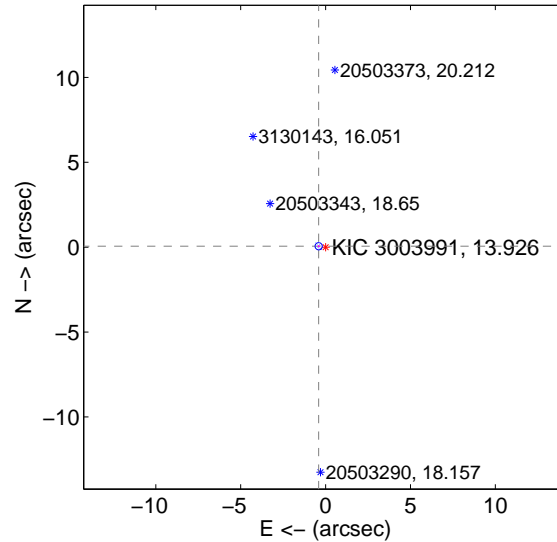
The OOT PRF centroid is offset from the target star catalog position by about 10.03 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA       | $\Delta$ Dec      |
|---|--------------------|---------------------|-------------------|-------------------|
| PRF-fit source offset from OOT          | $7.847 \pm 1.343$  | 5.84                | $2.372 \pm 0.460$ | $7.480 \pm 1.272$ |
| PRF-fit source offset from KIC position | $0.410 \pm 0.071$  | 5.78                | $0.406 \pm 0.070$ | $0.055 \pm 0.072$ |
| photometric centroid source offset      | $1.57 \pm 0.00$    | 464.84              | $0.09 \pm 0.00$   | $-1.57 \pm 0.00$  |

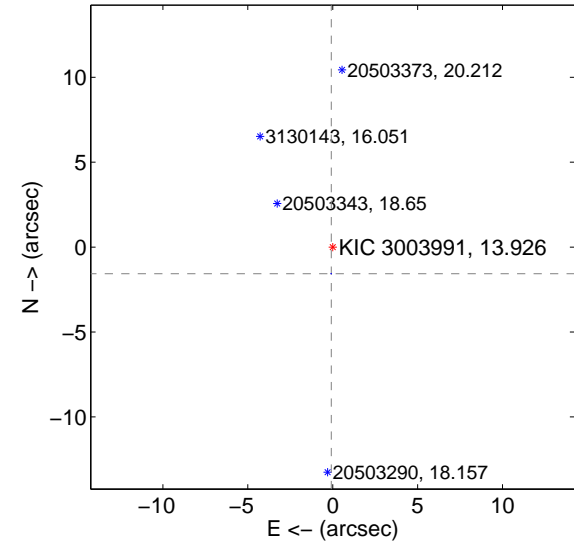
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

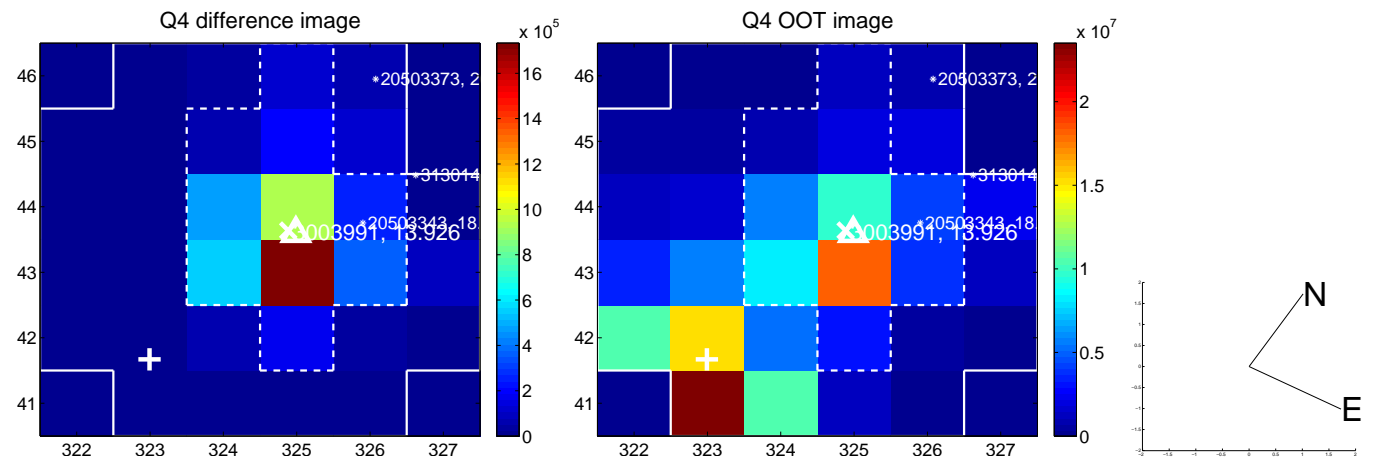
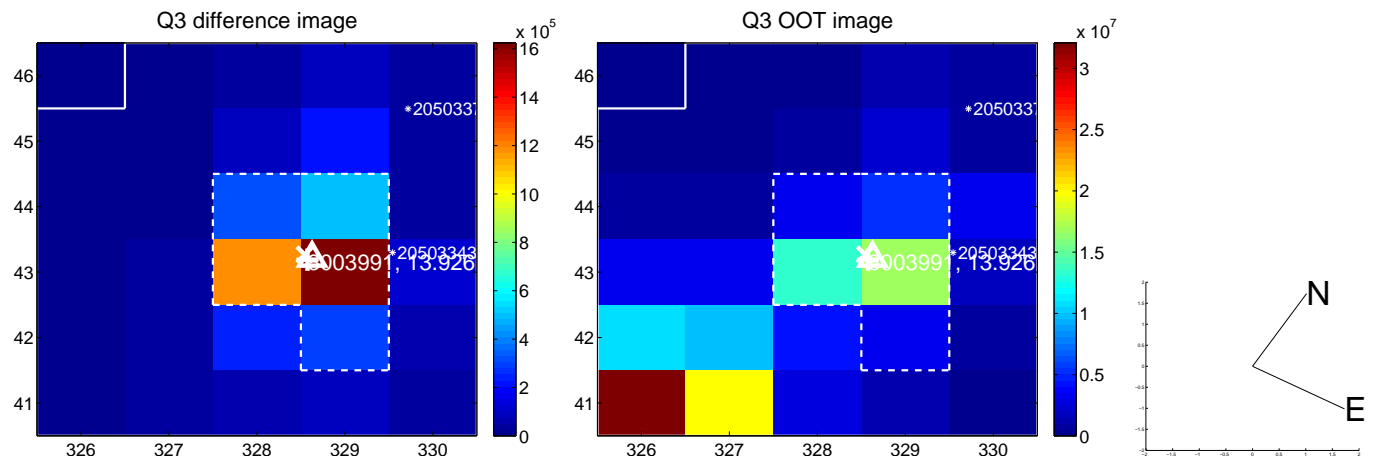
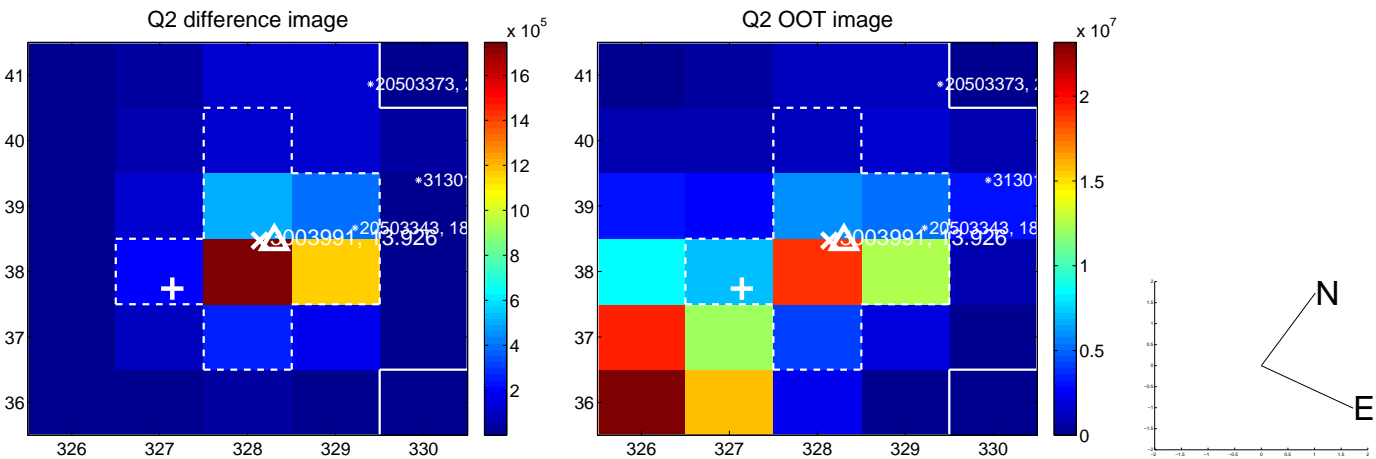
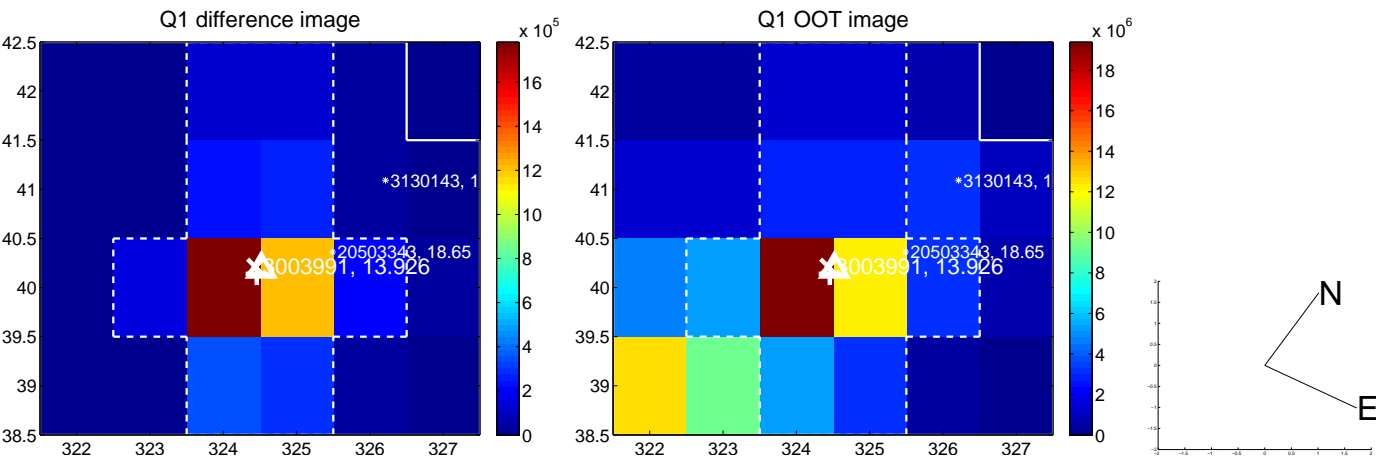


offset from photometric centroids

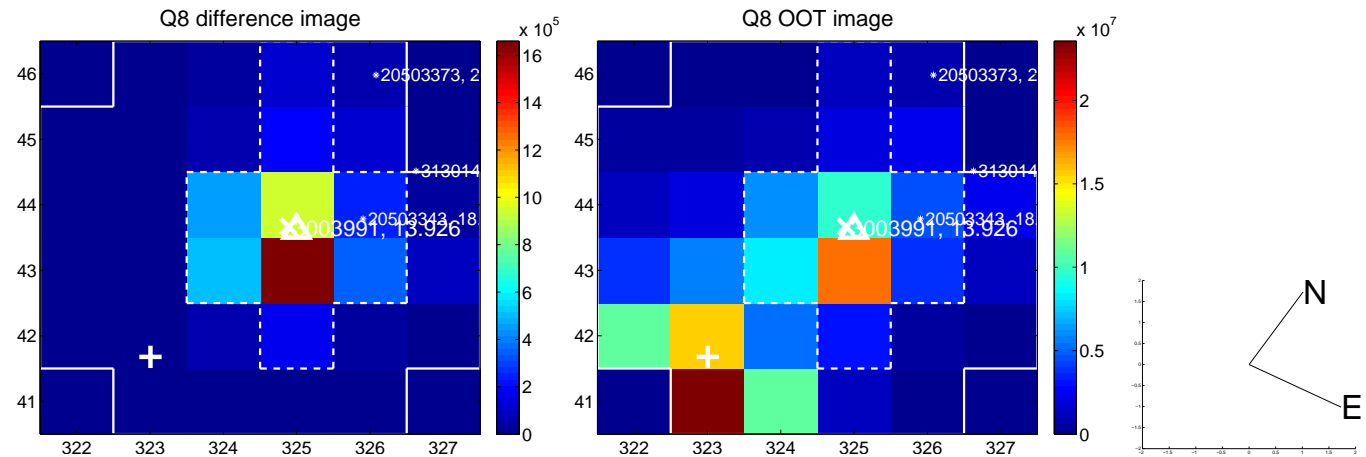
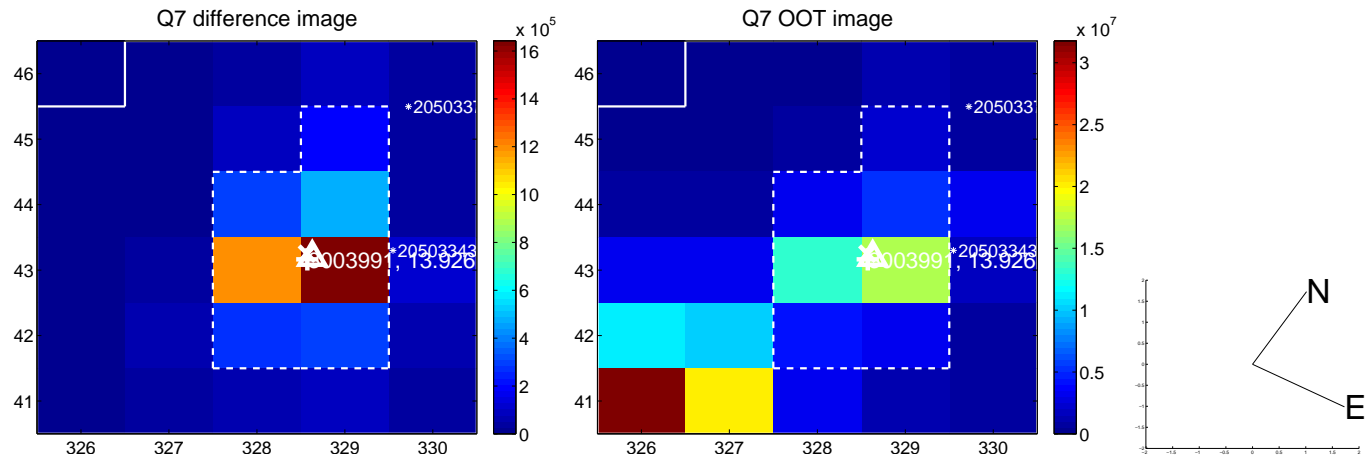
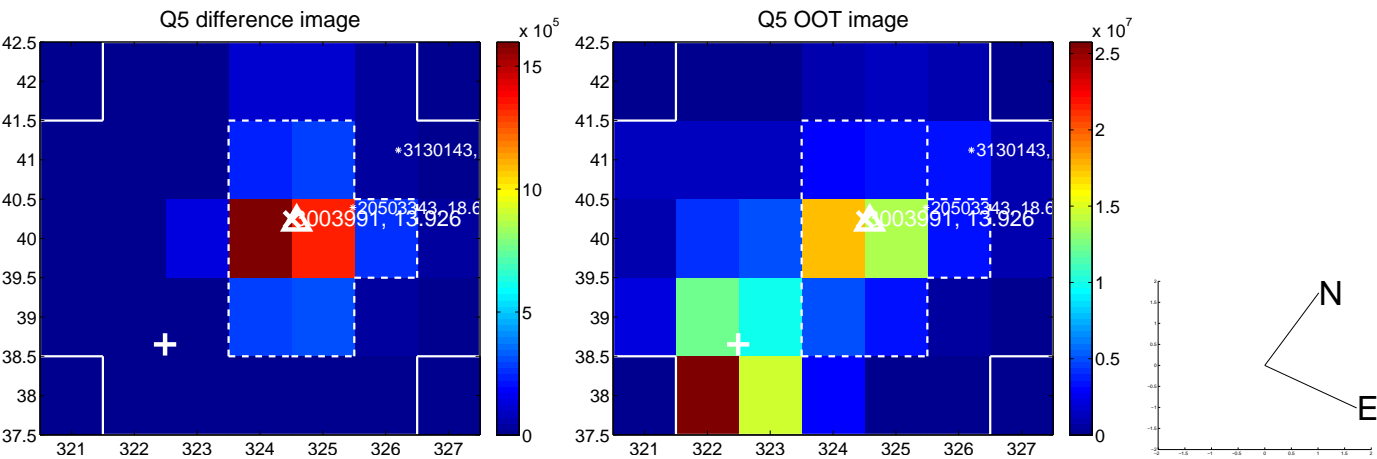


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

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

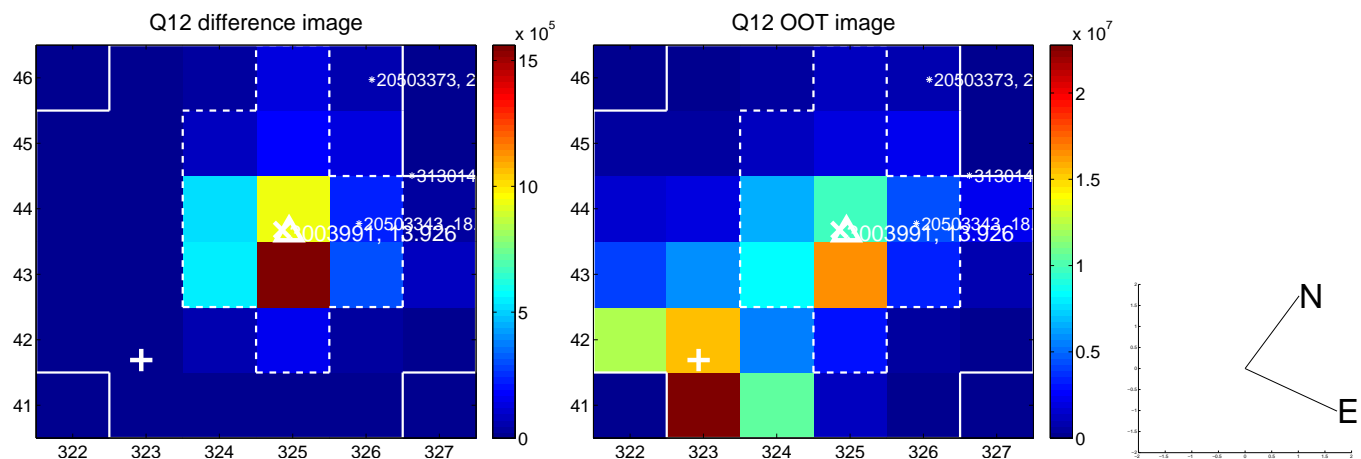
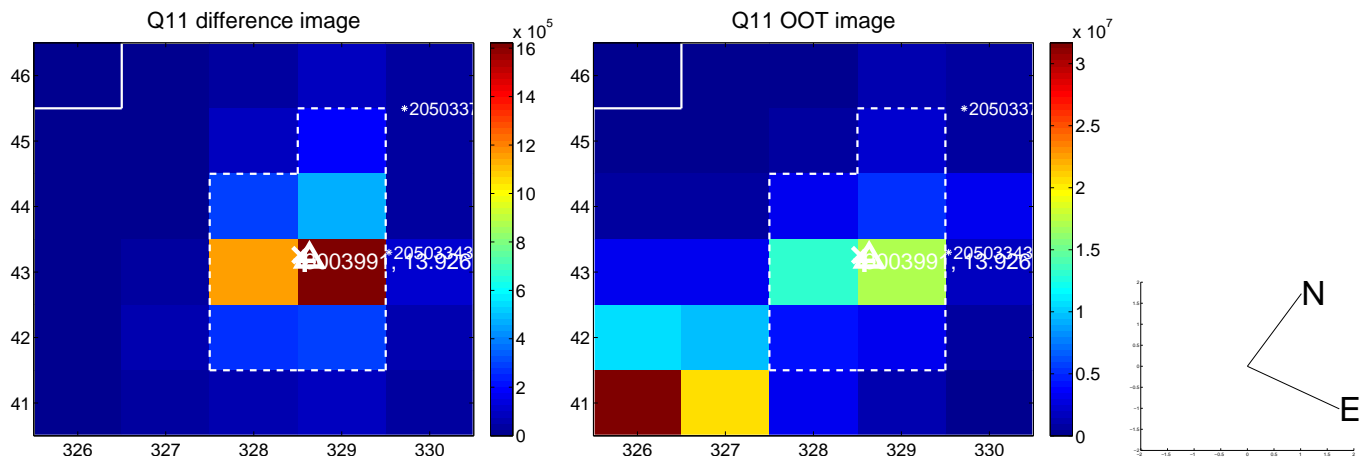
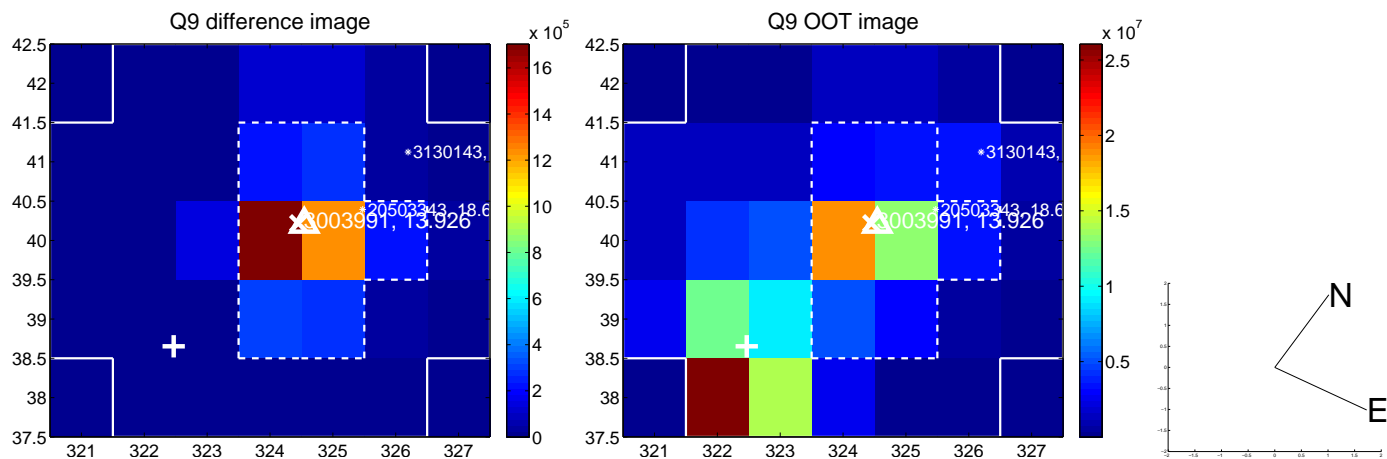


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

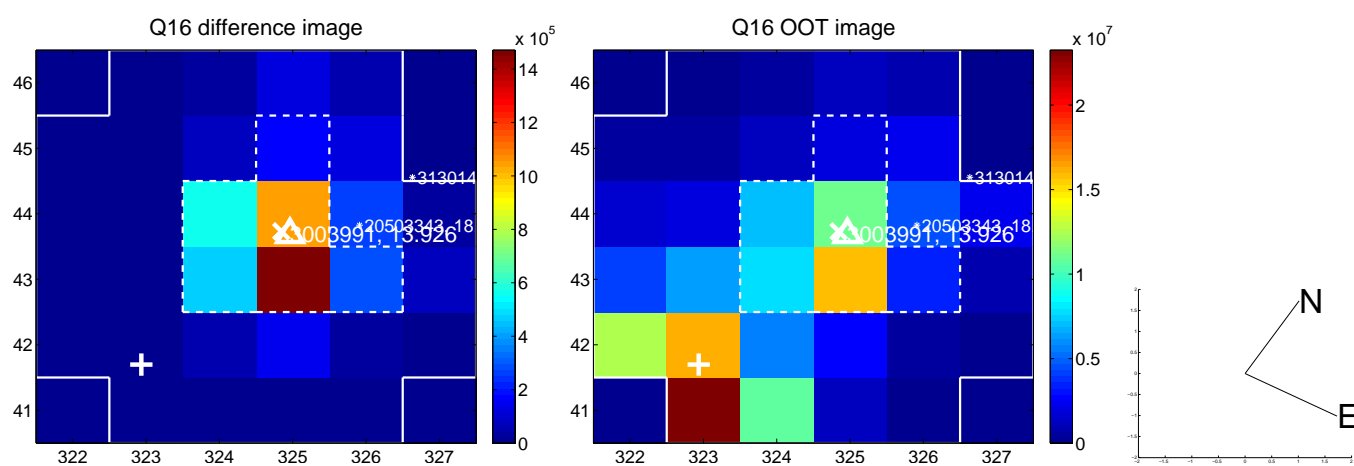
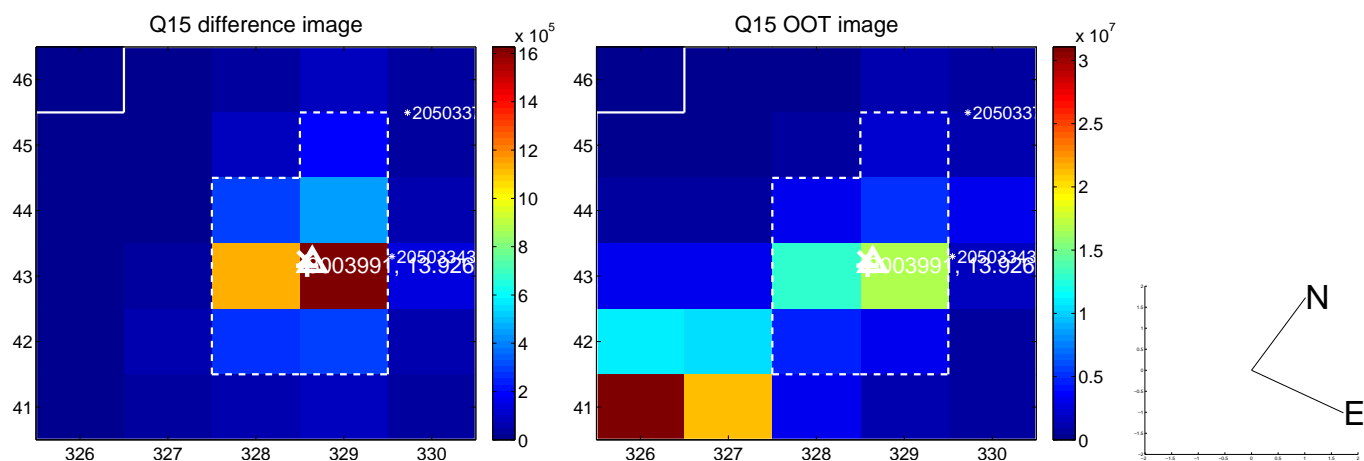
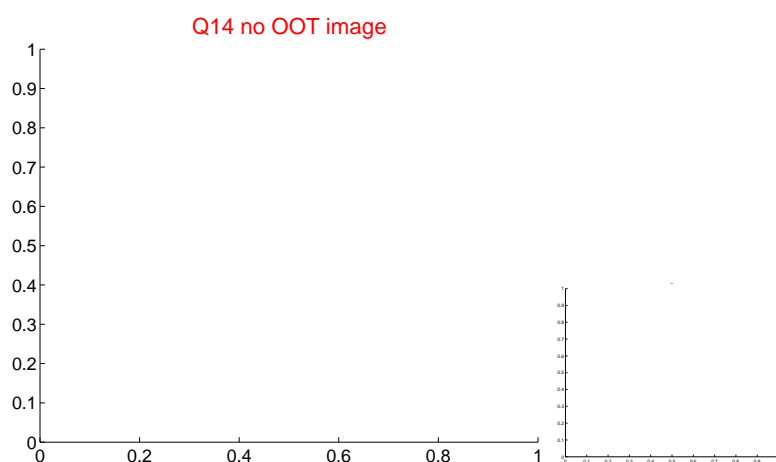
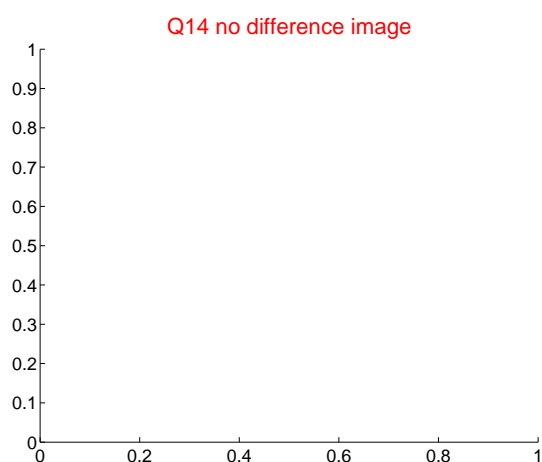
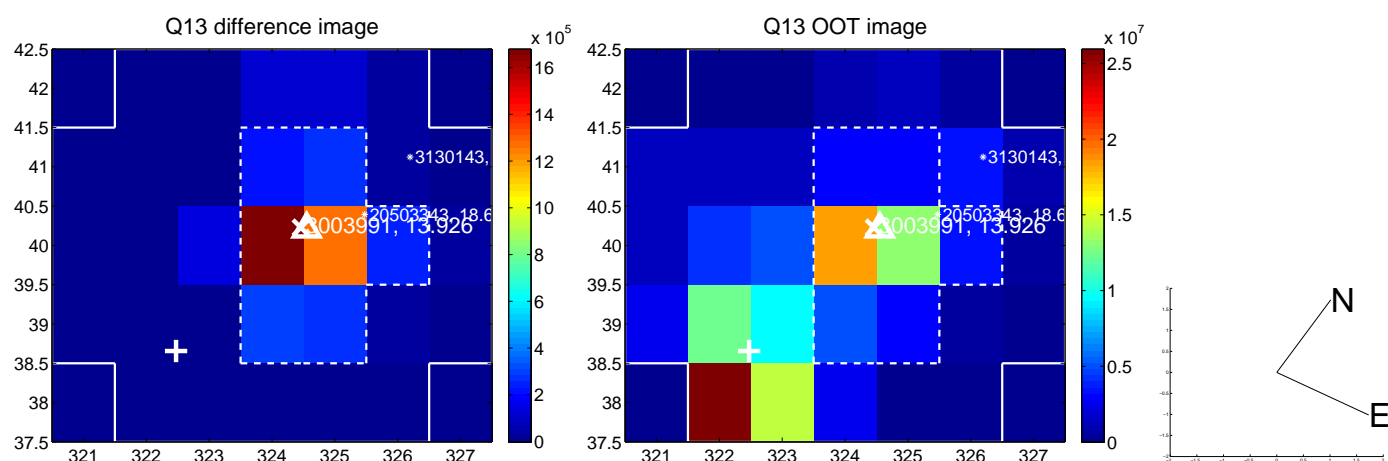




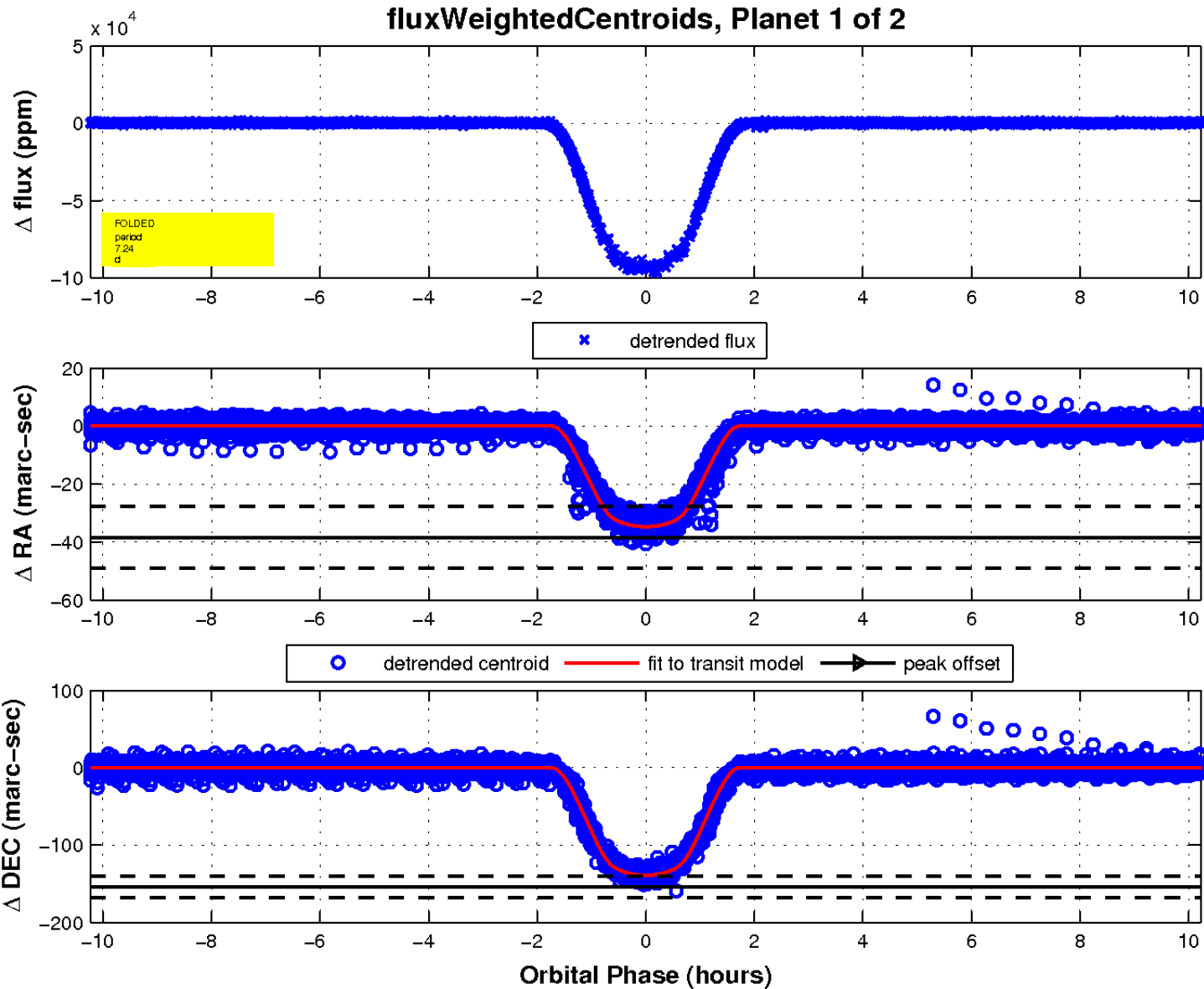
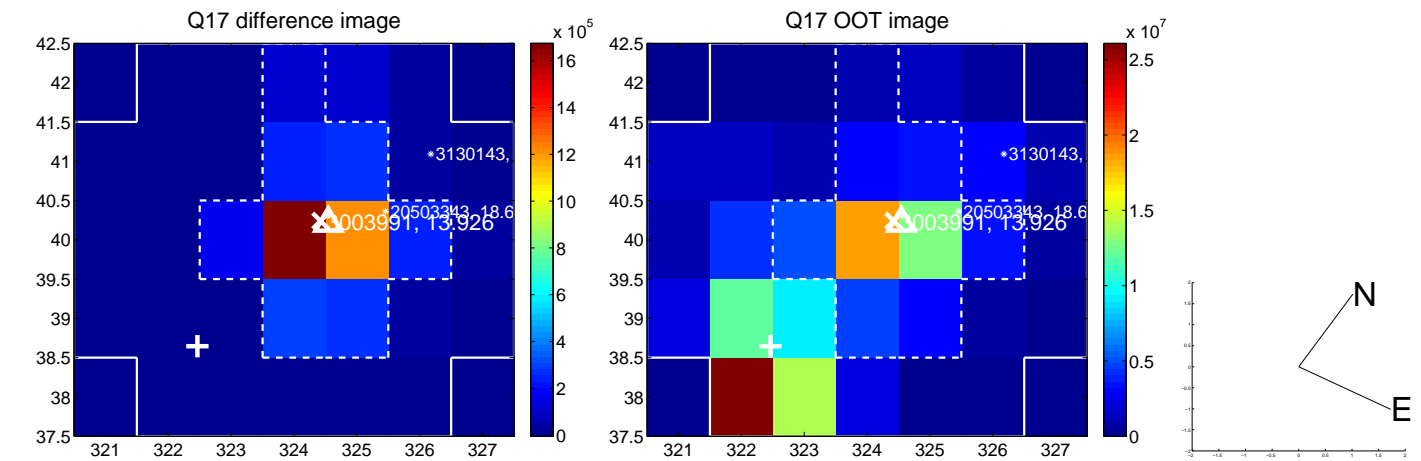
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

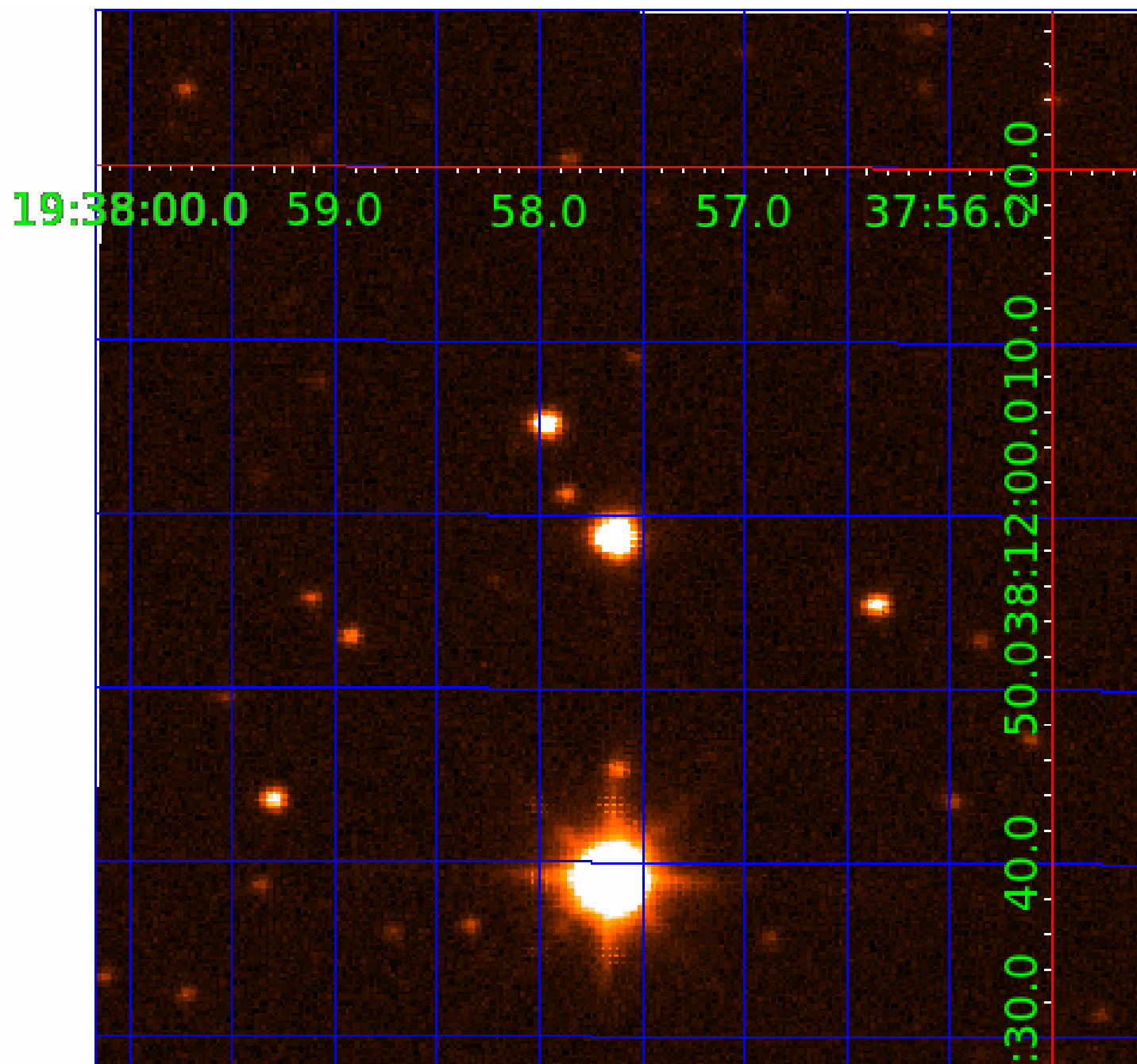


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



# UKIRT Image

Declination



# KIC 003003991

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|--------|--------|-----------------------------|-----------------|------------------------|------------------------|
| 003003991-01 | OBS      | 6099.01 | 7.244778      | 131.859937   | 98720.3     | 3.410            | 6136.7 | 4117.1 | 0.79                        | 5530            | 25.68                  | 106.03                 |
| 003003991-02 | OBS      | No      | 3.622383      | 131.859213   | 4986.2      | 3.280            | 333.8  | 324.2  | 0.79                        | 5530            | 6.49                   | 267.19                 |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments  |
|--------------|----------|------|-------|---|---|---|---|---|
| 003003991-01 | OBS      | FP   | 0.00  | 0 | 1 | 0 | 0 | MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE—CENT_KIC_POS |
| 003003991-02 | OBS      | FP   | 0.00  | 1 | 1 | 0 | 0 | IS_SEC_TCE—CENT_KIC_POS                         |

**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.

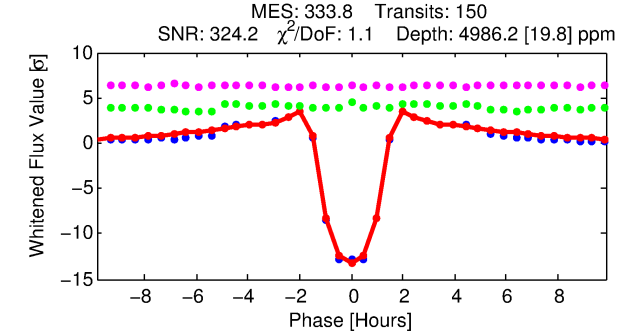
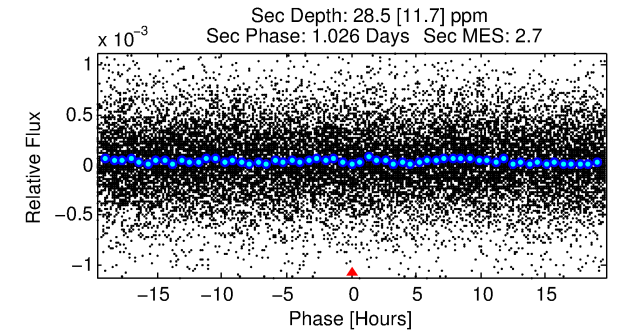
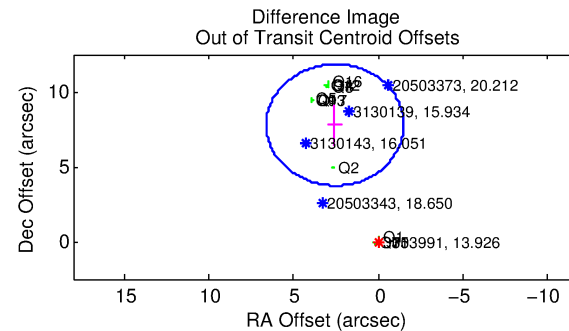
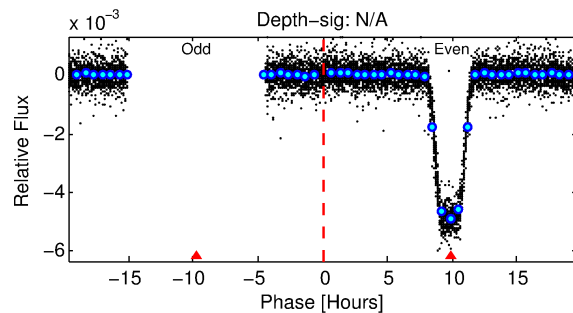
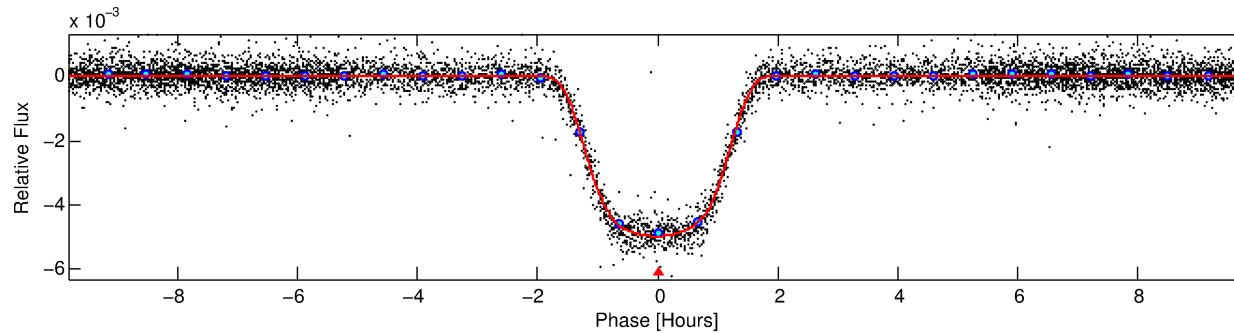
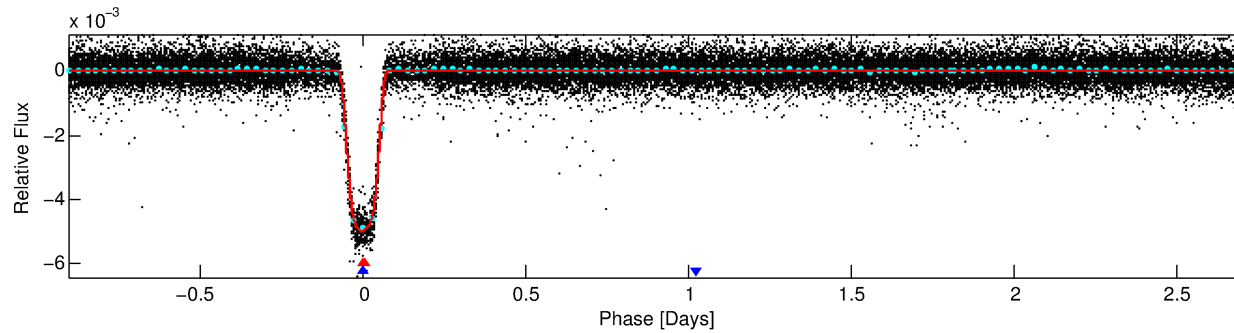
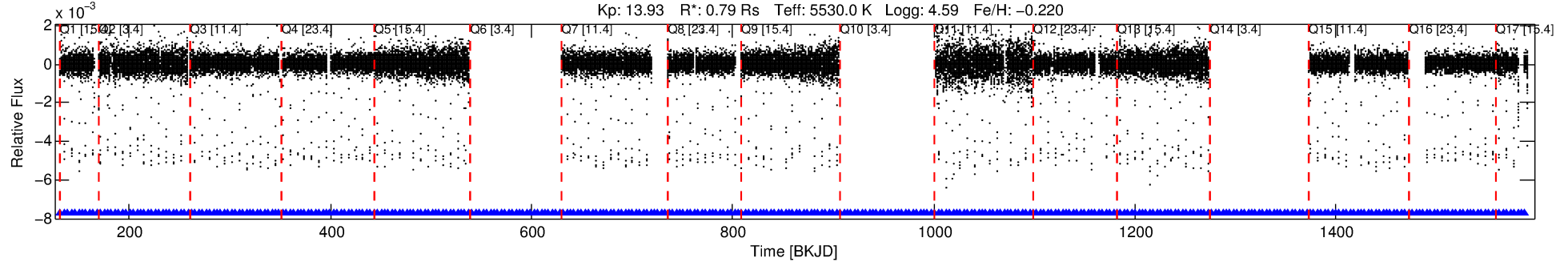
## Ephemeris Match Information For 003003991-02

No Significant Match Found

# DV One-Page Summary

KIC: 3003991 Candidate: 2 of 2 Period: 3.622 d  
KOI: K06099 Corr: No Ephemeris Match

Kp: 13.93 R\*: 0.79 Rs Teff: 5530.0 K Logg: 4.59 Fe/H: -0.220



## DV Fit Results:

Period = 3.62238 [0.00000] d  
Epoch = 131.8592 [0.0002] BKJD  
Rp/R\* = 0.0755 [0.0003]  
a/R\* = 5.43 [0.06]  
b = 0.87 [0.00]  
Seff = 267.19 [78.10]  
Teq = 1031 [75] K  
Rp = 6.49 [1.45] Re  
a = 0.0441 [0.0082] AU  
Ag = 0.72 [0.36] [-0.78σ]  
Teffp = 1471 [157] K [2.52σ]

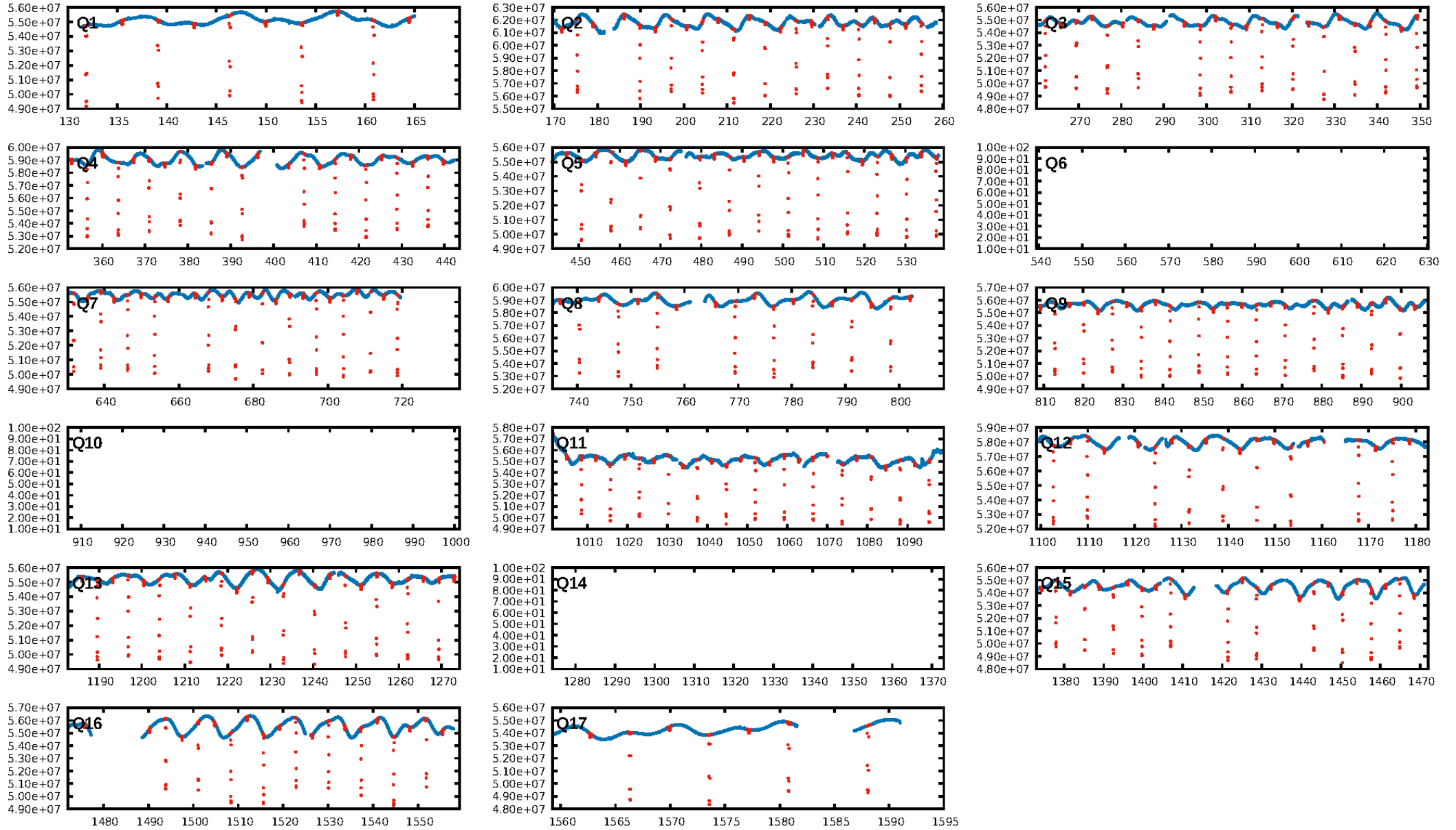
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [18.37σ]  
ModelChiSquare2-sig: 83.7%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [142/142]  
GhostDiagnostic-chr: 3.019  
Centroid-sig: 0.0%  
Centroid-so: 1.504 arcsec [34.06σ]  
OotOffset-rm: 8.195 arcsec [6.07σ]  
KicOffset-rm: 0.423 arcsec [5.19σ]  
OotOffset-st: 1/4/4/5 [14]  
KicOffset-st: 1/4/4/5 [14]  
DiffImageQuality-fgm: 1.00 [14/14]  
DiffImageOverlap-fno: 1.00 [14/14]

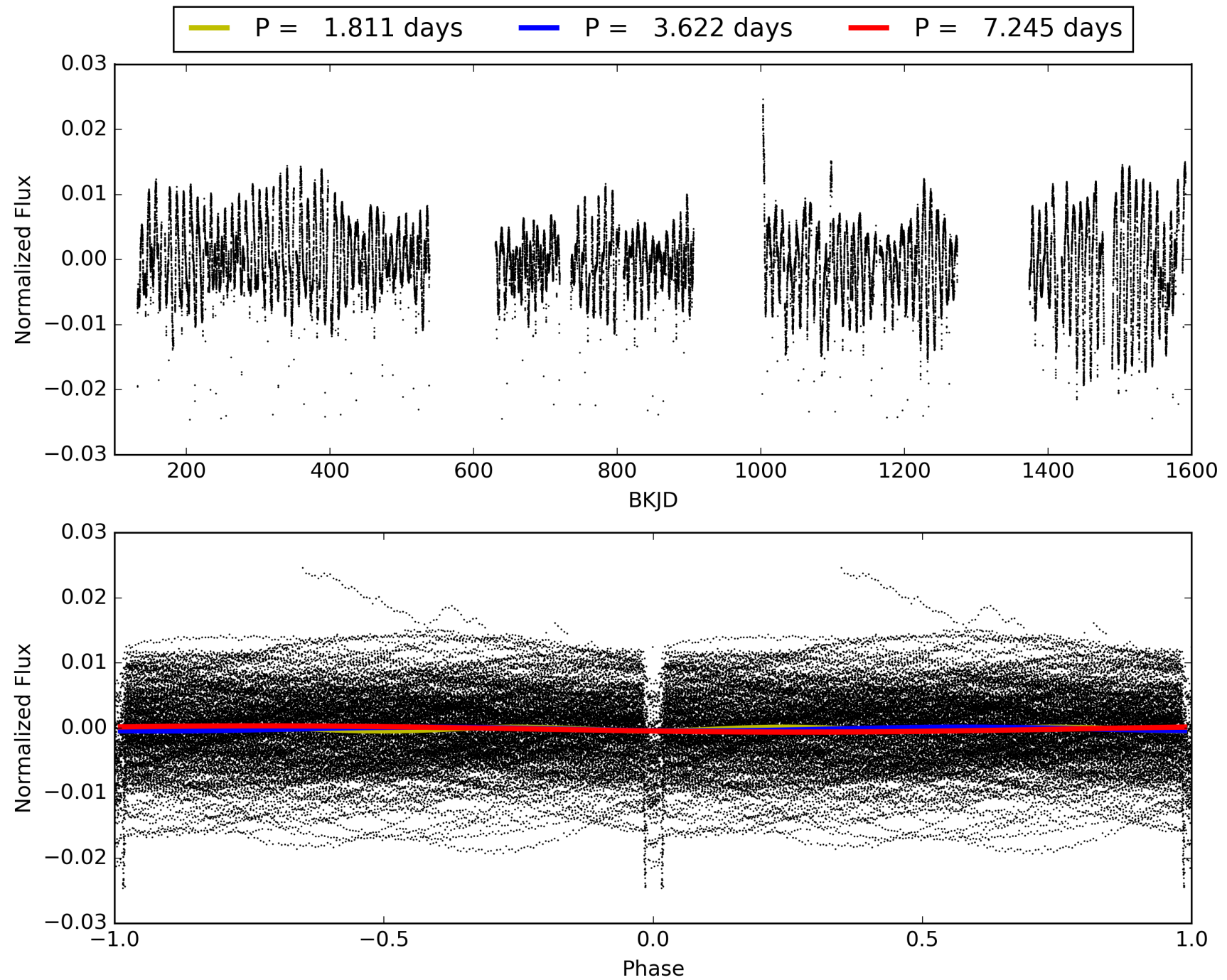
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 13:06:09 Z

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

# TCE 003003991-02, PDC Light Curves



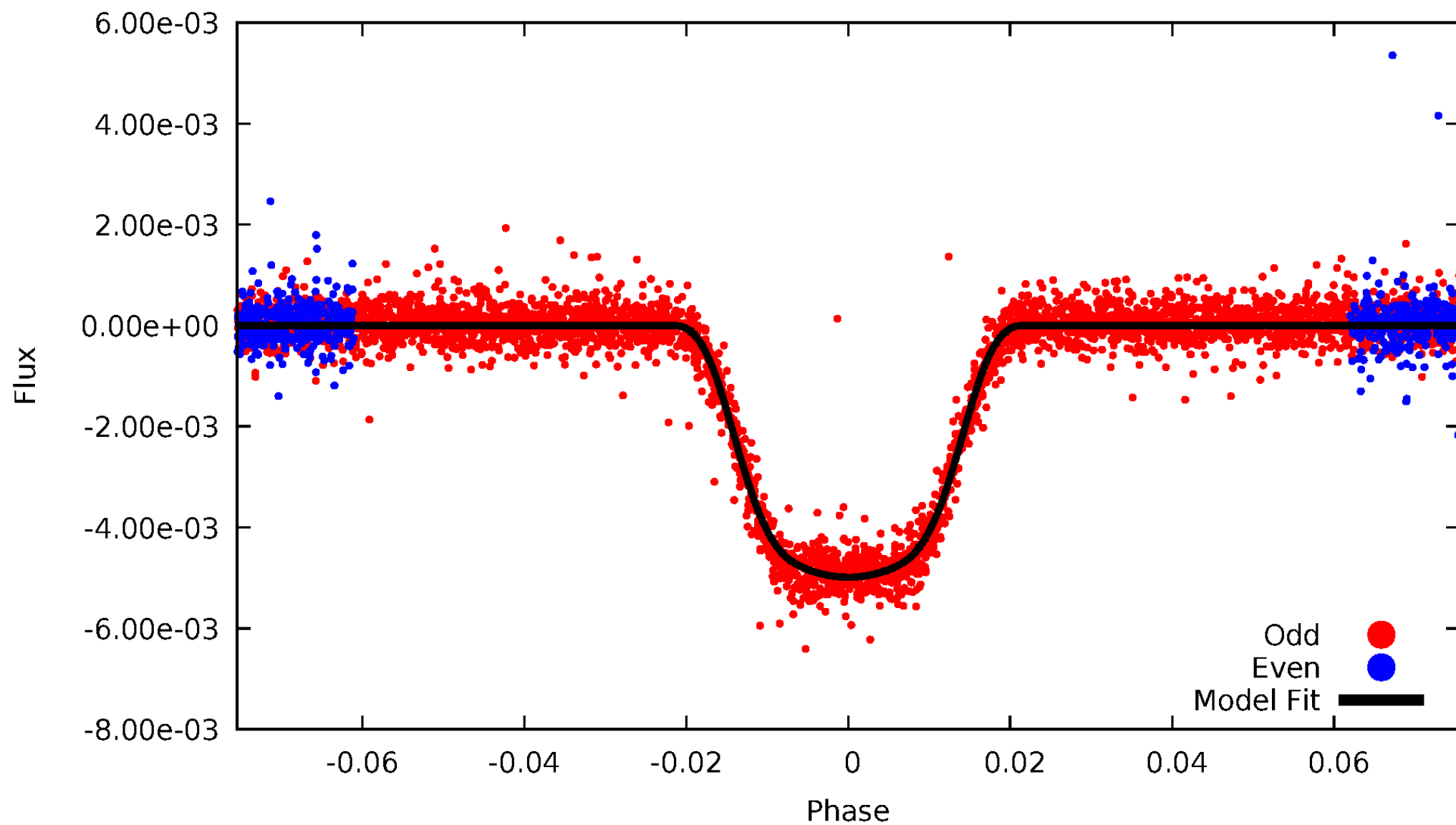
TCE 003003991-02





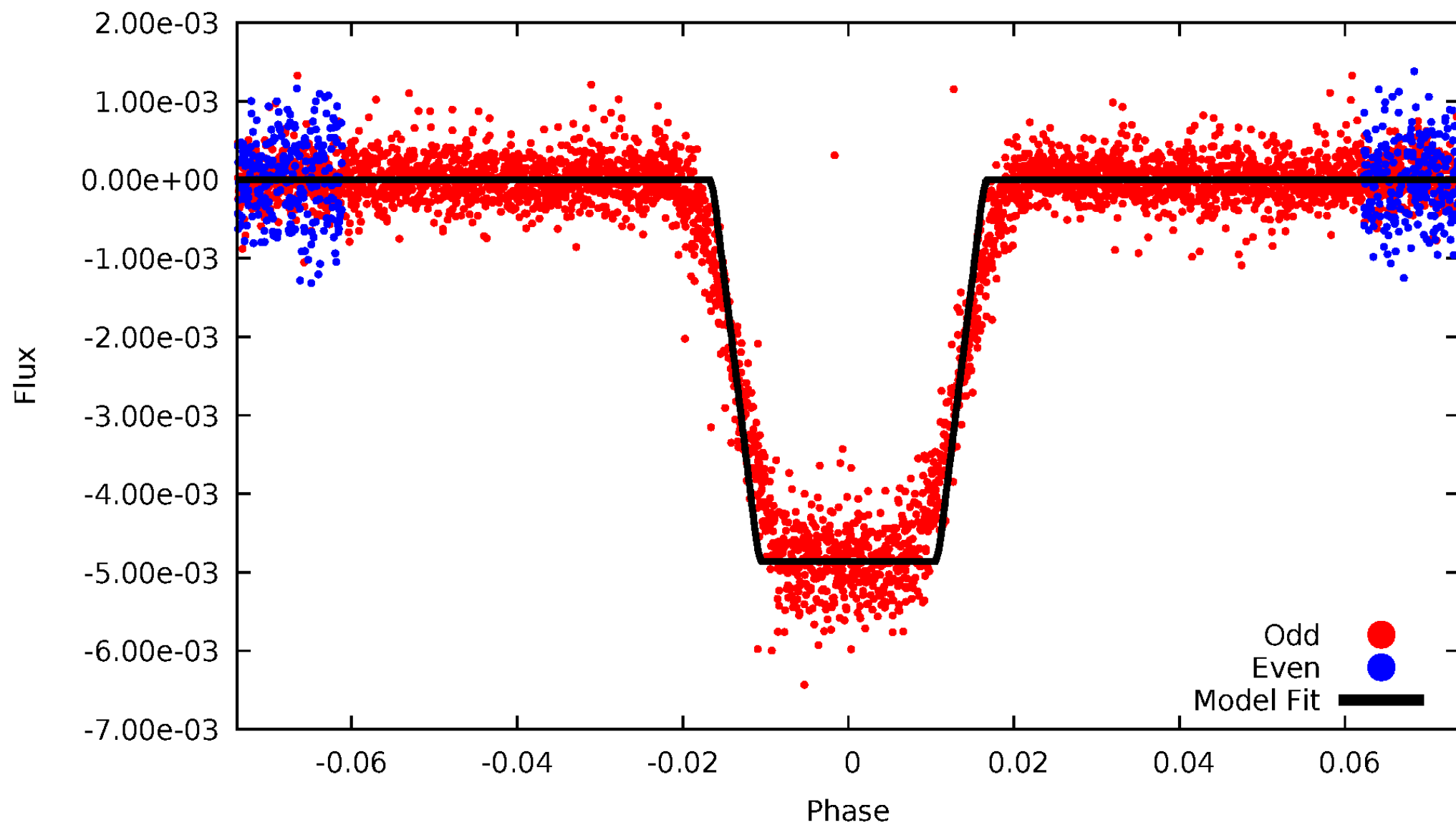
# DV Odd/Even

TCE 003003991-02



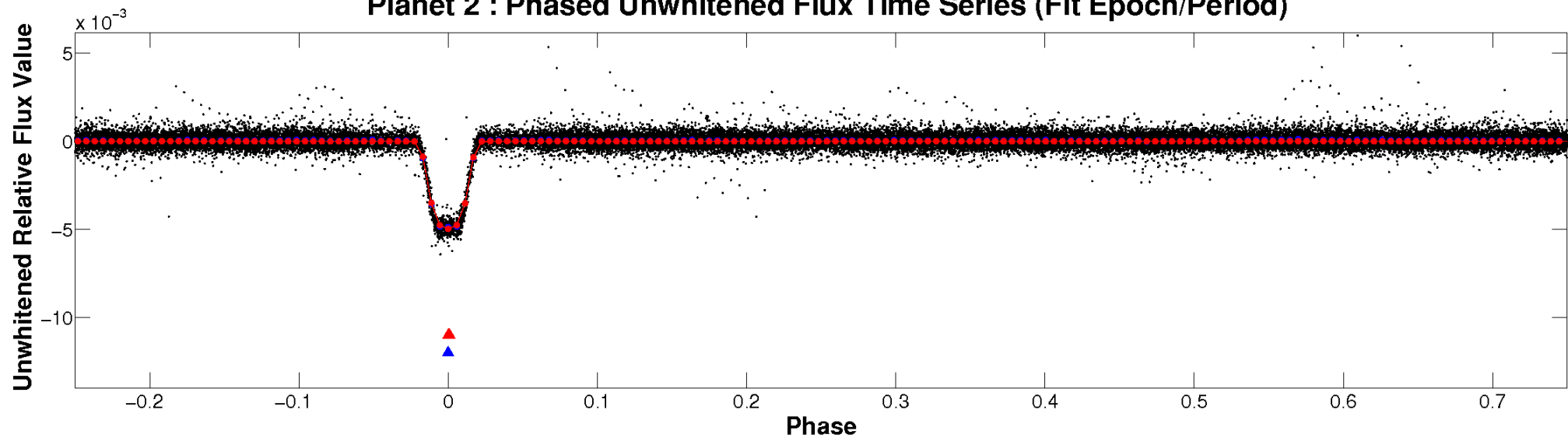
# ALT Odd/Even

TCE 003003991-02

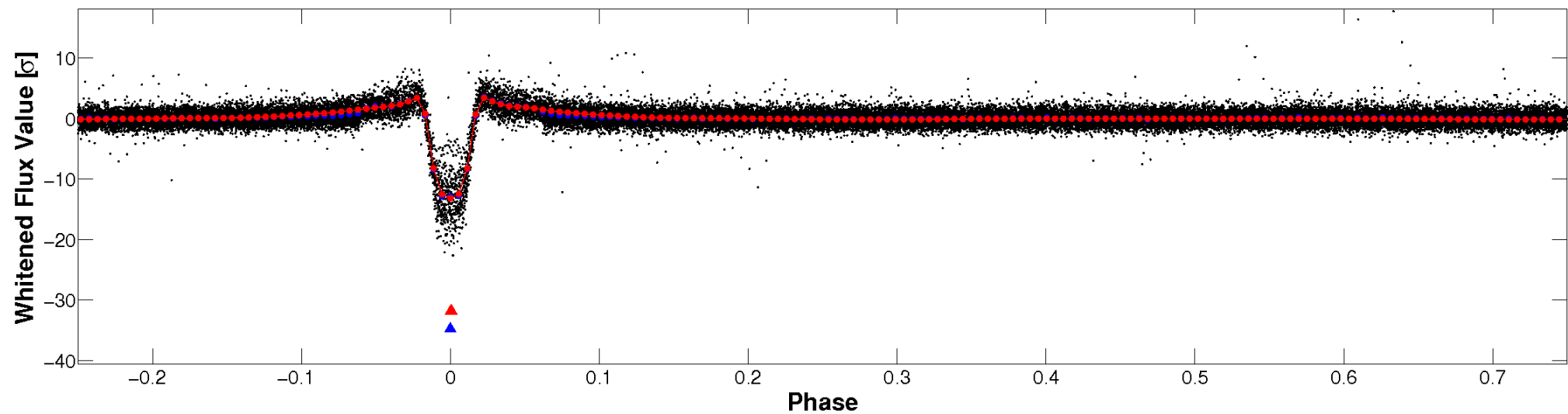


# Non-Whitened Vs. Whitened Light Curve

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

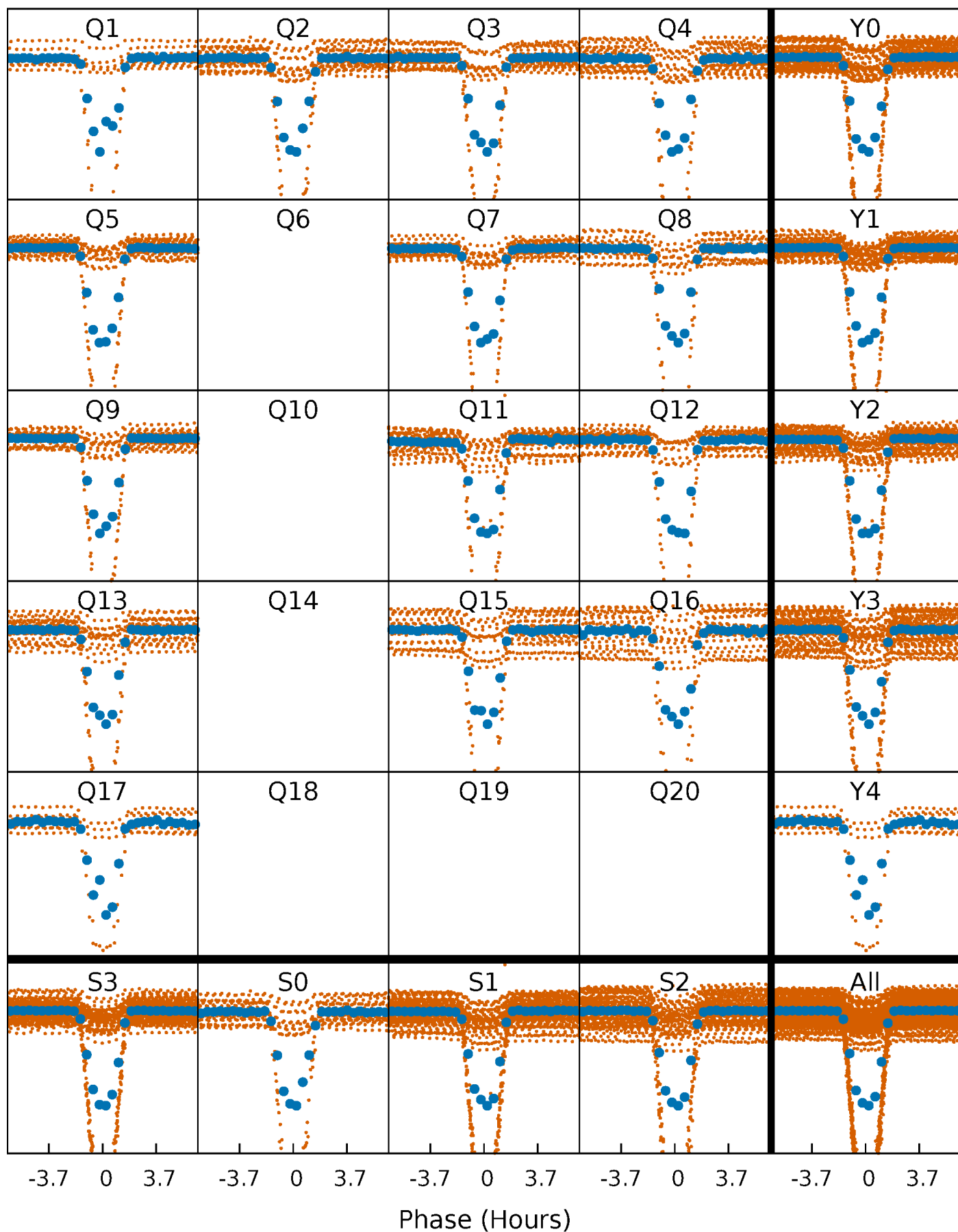


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



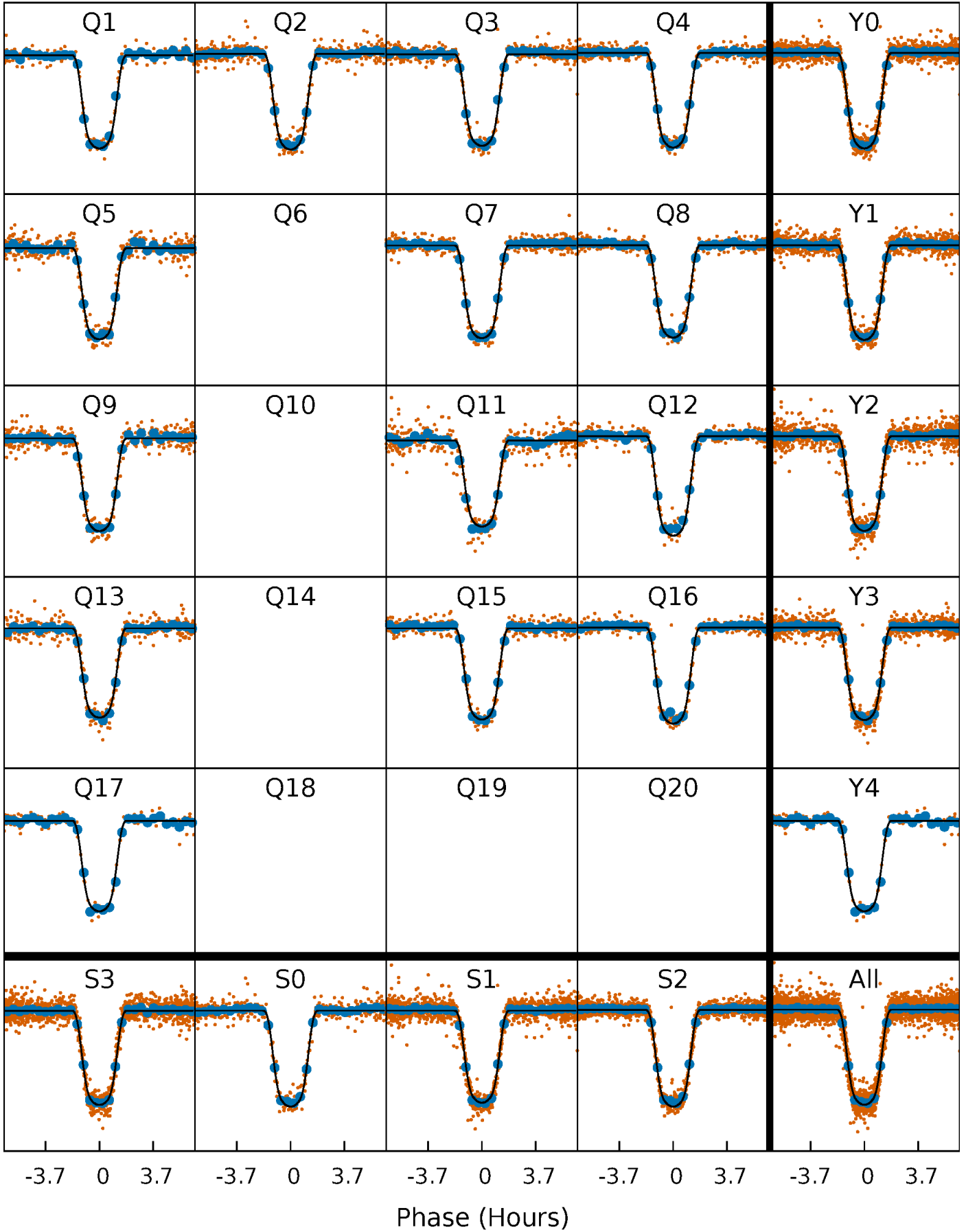
# PDC Quarter-Phased Transit Curves

TCE 003003991-02   P= 3.622383 Days    $T_0=131.859214$  (BKJD)



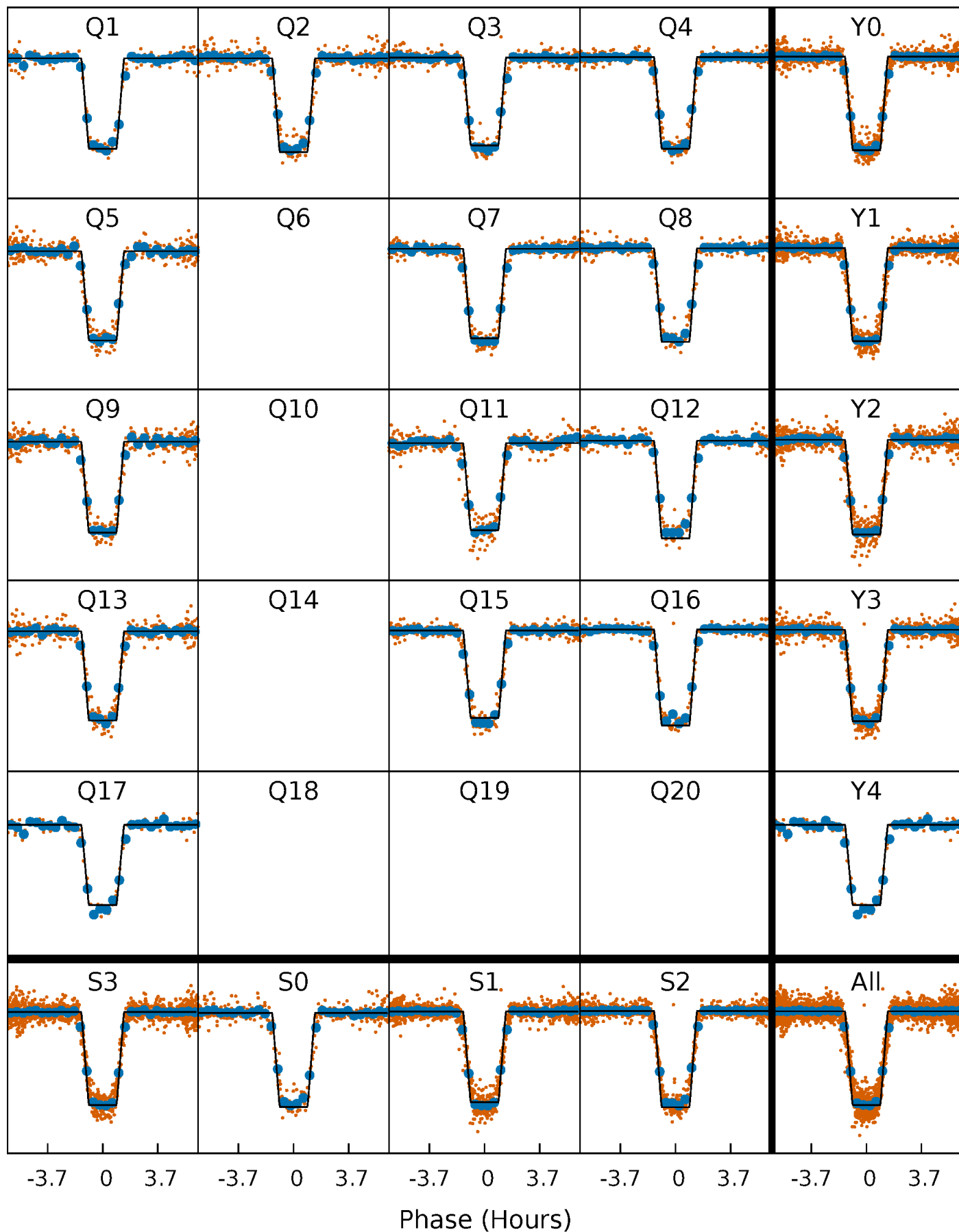
# DV Quarter-Phased Transit Curves

TCE 003003991-02     $P = 3.622383$  Days     $T_0 = 131.859214$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

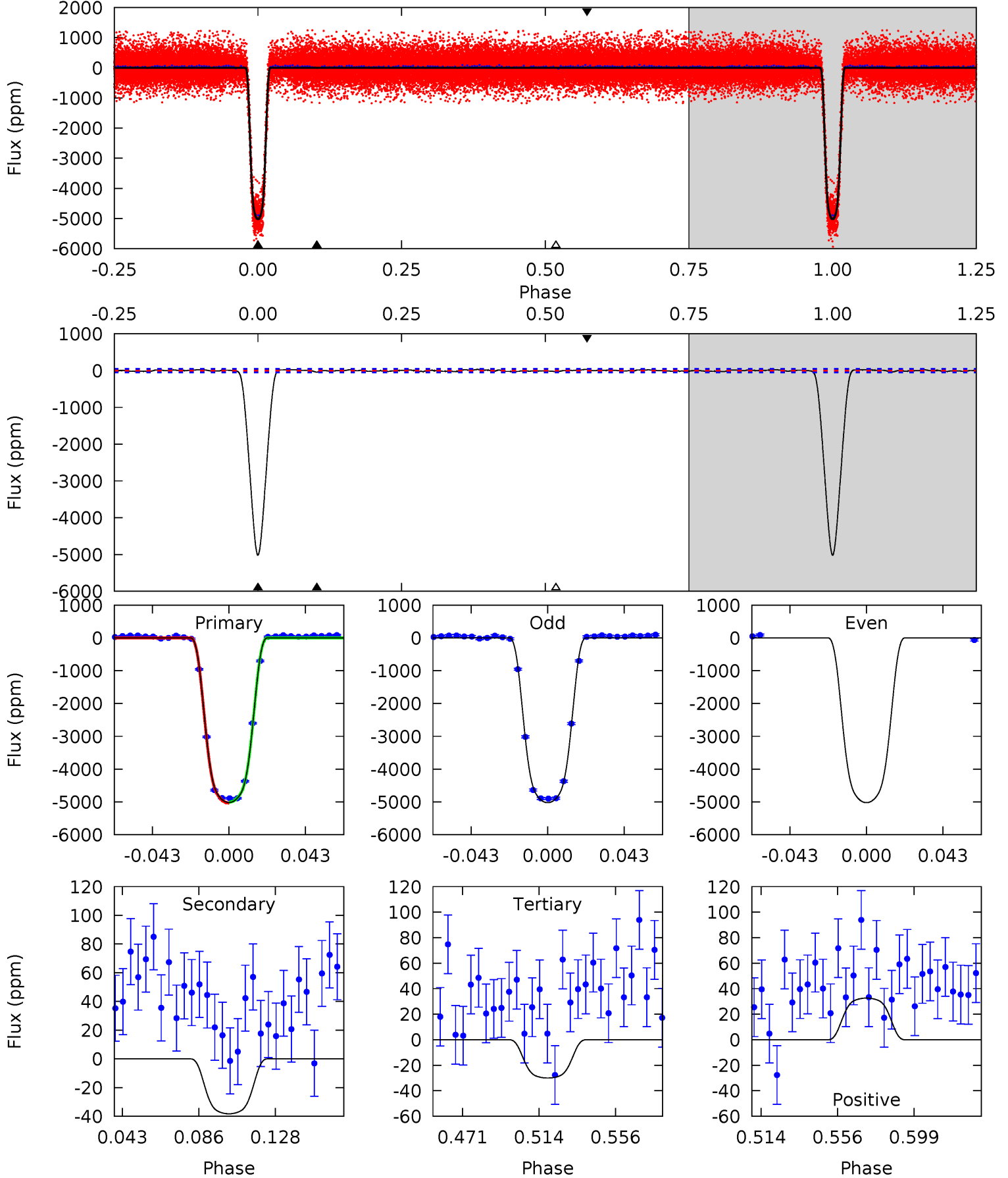
TCE 003003991-02     $P = 3.622390$  Days     $T_0 = 131.857676$  (BKJD)



# DV Model-Shift Uniqueness Test

003003991-02, P = 3.622383 Days, E = 128.236831 Days

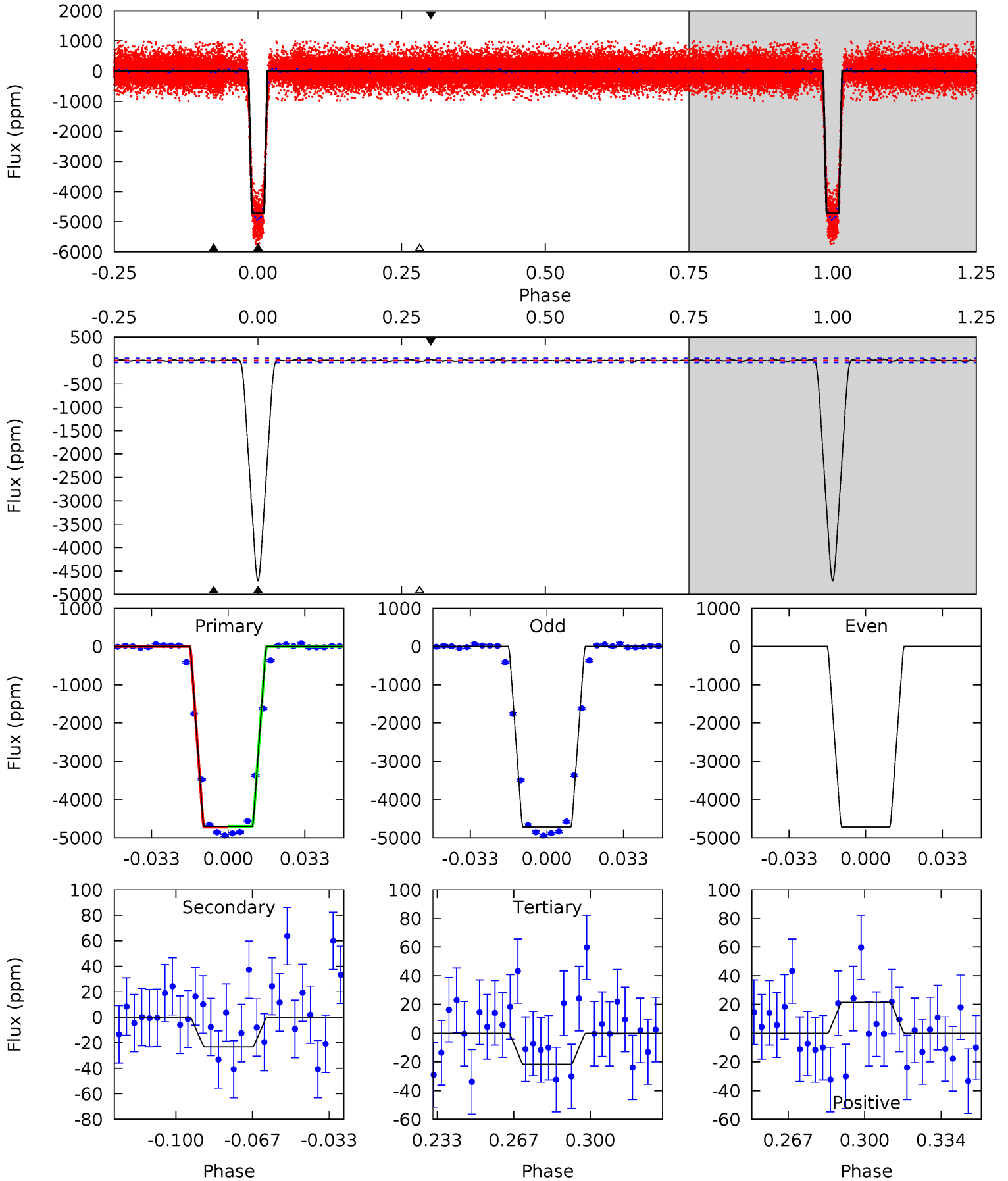
| Pri   | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|-------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 512.3 | 3.91 | 3.06 | 3.33 | 4.74            | 2.03            | 1.48             | 509.2   | 508.9   | 0.84    | 0.58    | 0       | 1.00 | 0.01  | 1.34 |



# Alt Model-Shift Uniqueness Test

003003991-02, P = 3.622390 Days, E = 128.235286 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  |
|-------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 513.4 | 2.54 | 2.36 | 2.36 | 4.79            | 2.13            | 0.88             | 511.0   | 511.0   | 0.18    | 0.18    | 0       | 1.00 | 0.00  | 1.19 |





### Stellar Parameters For KIC 003003991

|        | $T_{\text{eff}} (K)$ | $\log(g)$                 | $[\text{Fe}/\text{H}]$     | $R (R_{\odot})$           | $M (M_{\odot})$           | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
|        | $5530^{+166}_{-149}$ | $4.586^{+0.034}_{-0.144}$ | $-0.220^{+0.300}_{-0.300}$ | $0.788^{+0.176}_{-0.059}$ | $0.882^{+0.083}_{-0.102}$ | $2.542^{+0.483}_{-1.036}$                 |
|        | +3%/-3%              | +1%/-3%                   | +136%/-136%                | +22%/-7%                  | +9%/-12%                  | +19%/-41%                                 |
| 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 003003991-02 / KOI

| Detrend | Depth (ppm)  | $R_p (R_{\oplus})$     | $T_{\text{max}} (K)$ | $T_{\text{obs}} (K)$ | $A_{\text{obs}}$          |
|---------|--------------|------------------------|----------------------|----------------------|---------------------------|
| DV      | $-38 \pm 10$ | $6.65^{+0.72}_{-0.41}$ | $1470^{+73}_{-57}$   | $2338^{+91}_{-144}$  | $0.887^{+0.271}_{-0.265}$ |
| Alt.    | $-23 \pm 9$  | $6.17^{+0.70}_{-0.39}$ | $1471^{+79}_{-63}$   | $2190^{+149}_{-298}$ | $0.625^{+0.275}_{-0.249}$ |

$T_{\text{max}}$  = Theoretical Maximum Planetary Temperature

$T_{\text{obs}}$  = Observed Planetary Temperature (Assuming  $A=0.3$ )

$A_{\text{obs}}$  = Observed Albedo (Assuming  $T=0$ )

If a secondary eclipse is present, the system is likely an EB if  $T_{\text{obs}} \gg T_{\text{max}}$  AND  $A_{\text{obs}} \gg 1.0$

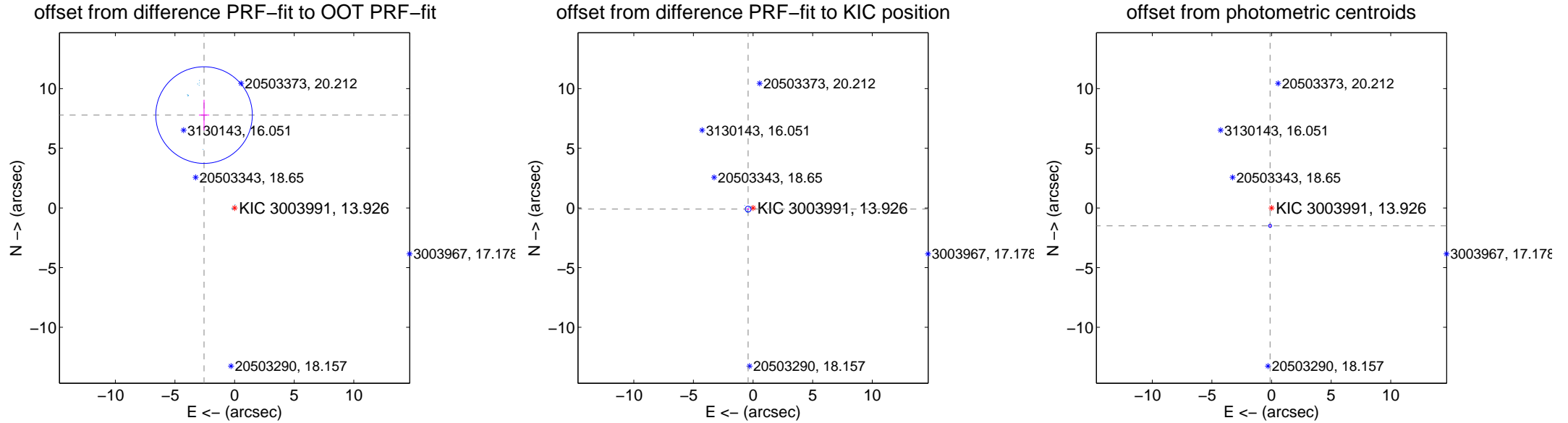
## DV Centroid Data

Supplemental centroid analysis for 003003991-02. Kepler magnitude: 13.93. Transit SNR 324.20

There are 14 quarters with good PRF difference image offsets

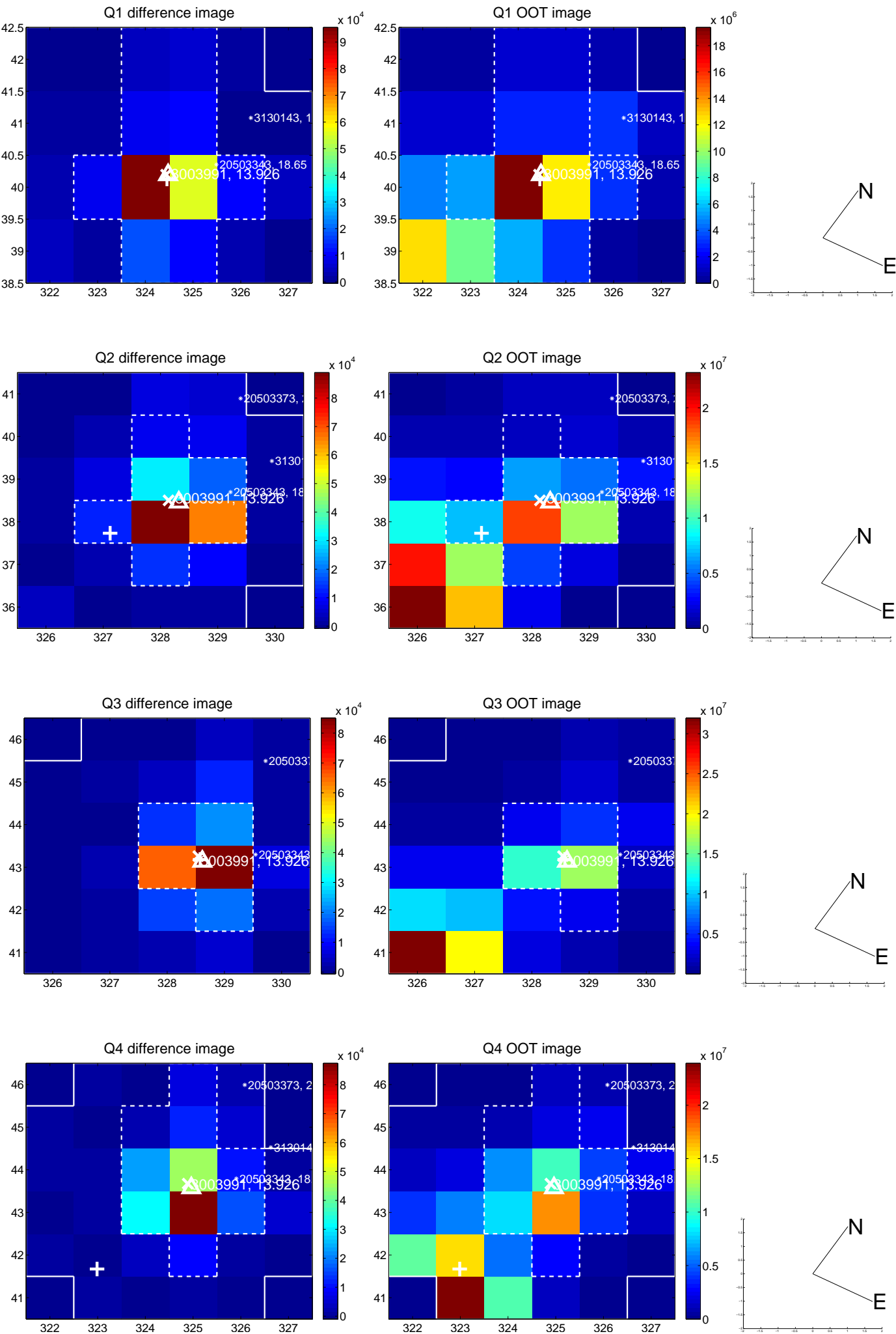
The OOT PRF centroid is offset from the target star catalog position by about 10.01 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA       | $\Delta$ Dec       |
|---|--------------------|---------------------|-------------------|--------------------|
| PRF-fit source offset from OOT          | $8.195 \pm 1.350$  | <b>6.07</b>         | $2.561 \pm 0.433$ | $7.785 \pm 1.288$  |
| PRF-fit source offset from KIC position | $0.423 \pm 0.082$  | <b>5.19</b>         | $0.412 \pm 0.081$ | $-0.097 \pm 0.086$ |
| photometric centroid source offset      | $1.50 \pm 0.04$    | <b>34.06</b>        | $0.12 \pm 0.02$   | $-1.50 \pm 0.04$   |

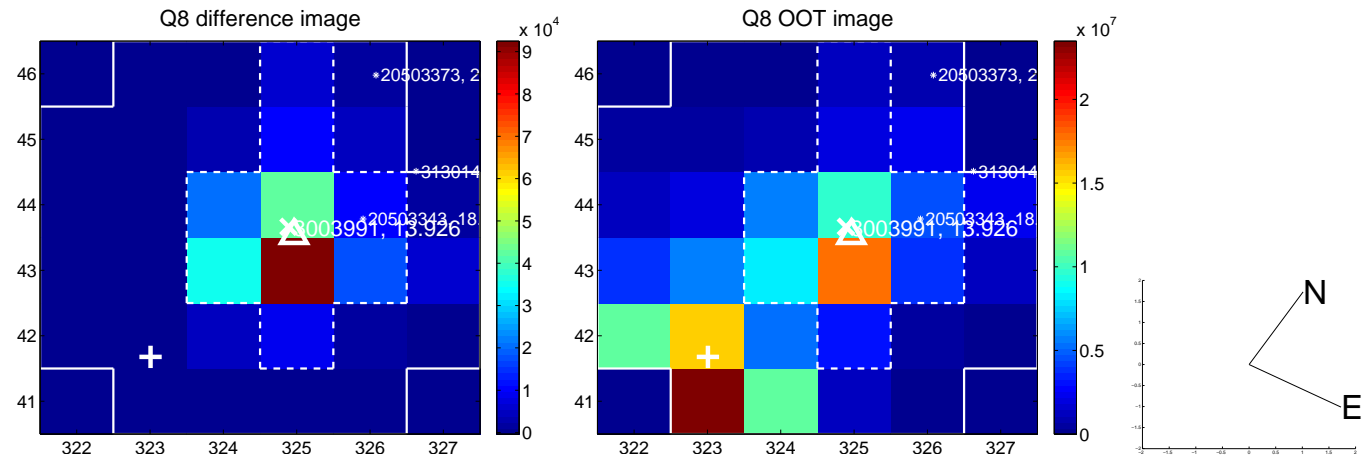
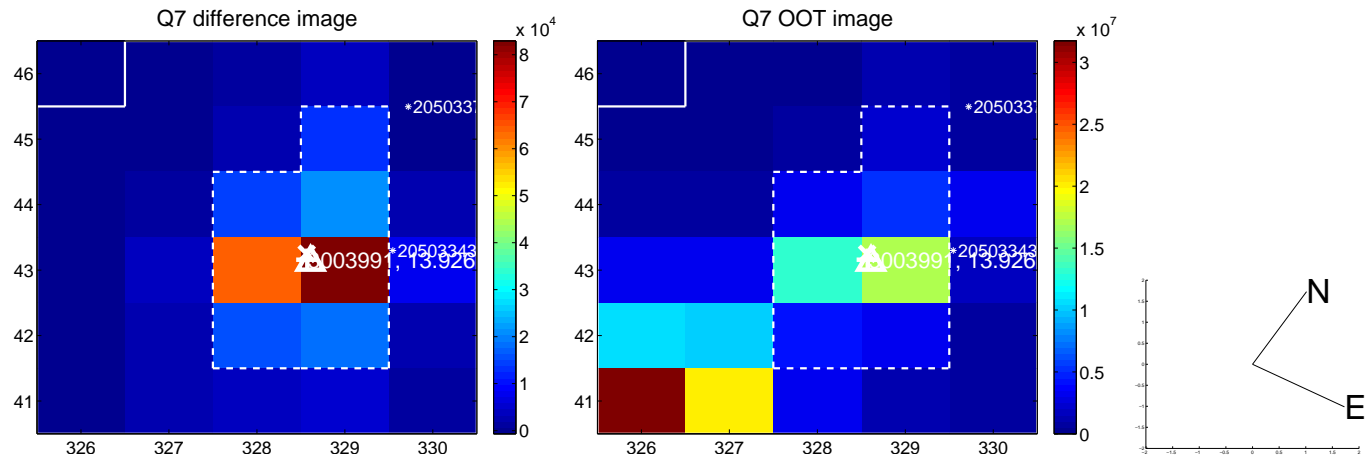
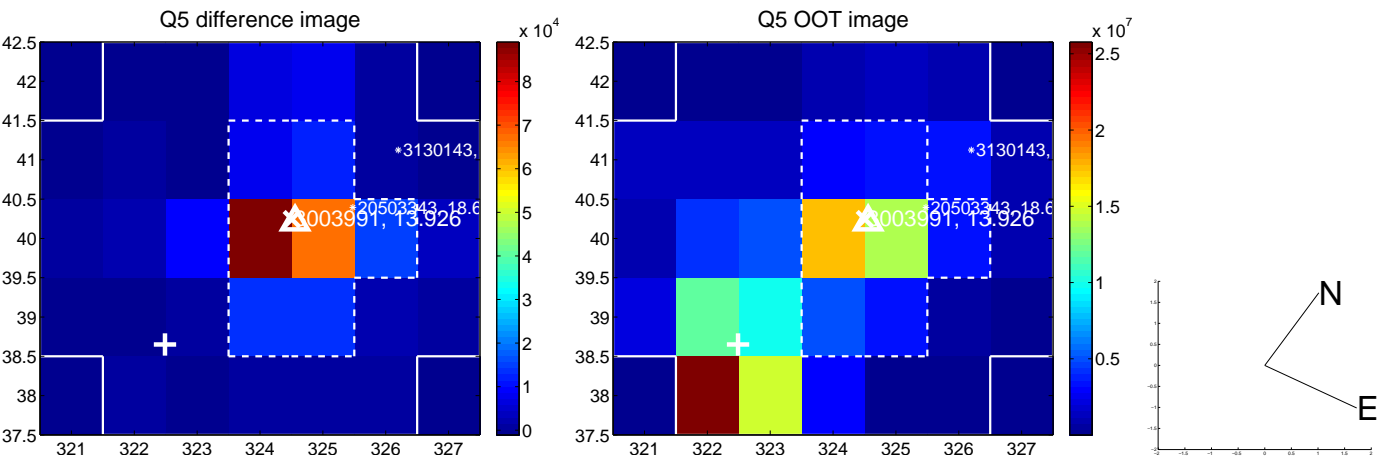


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

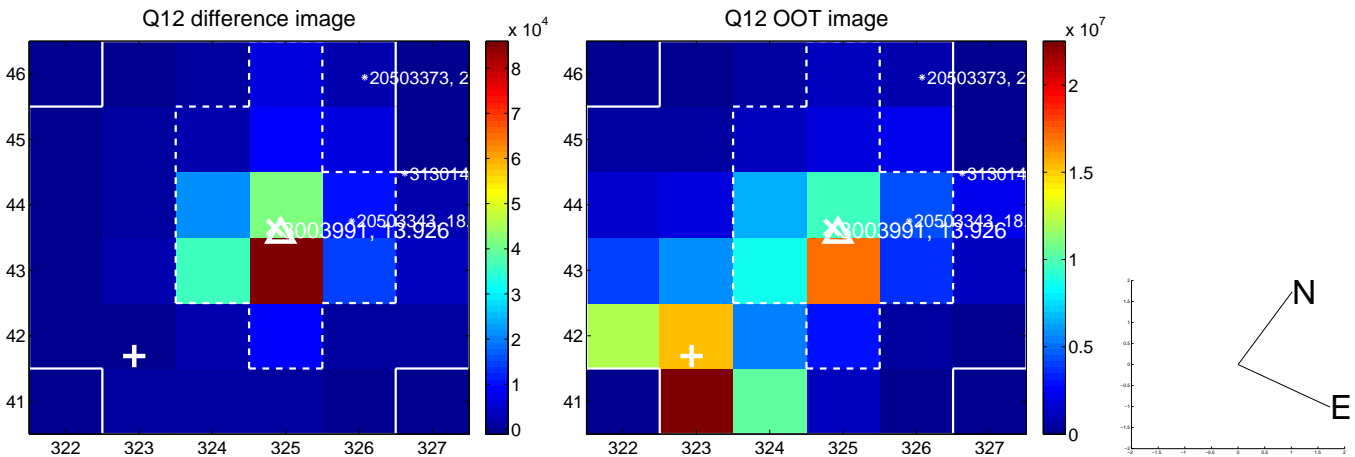
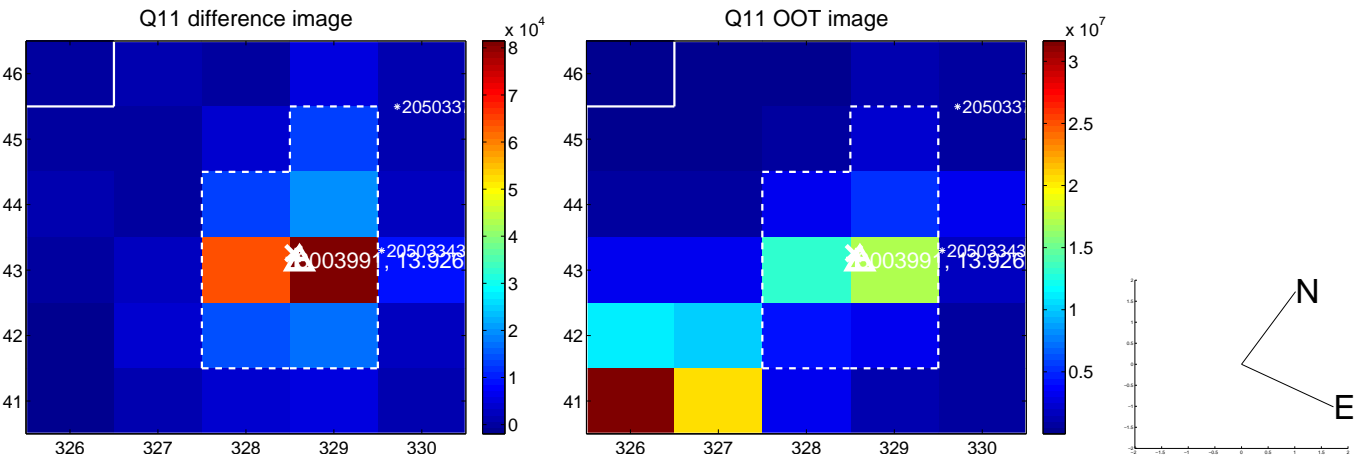
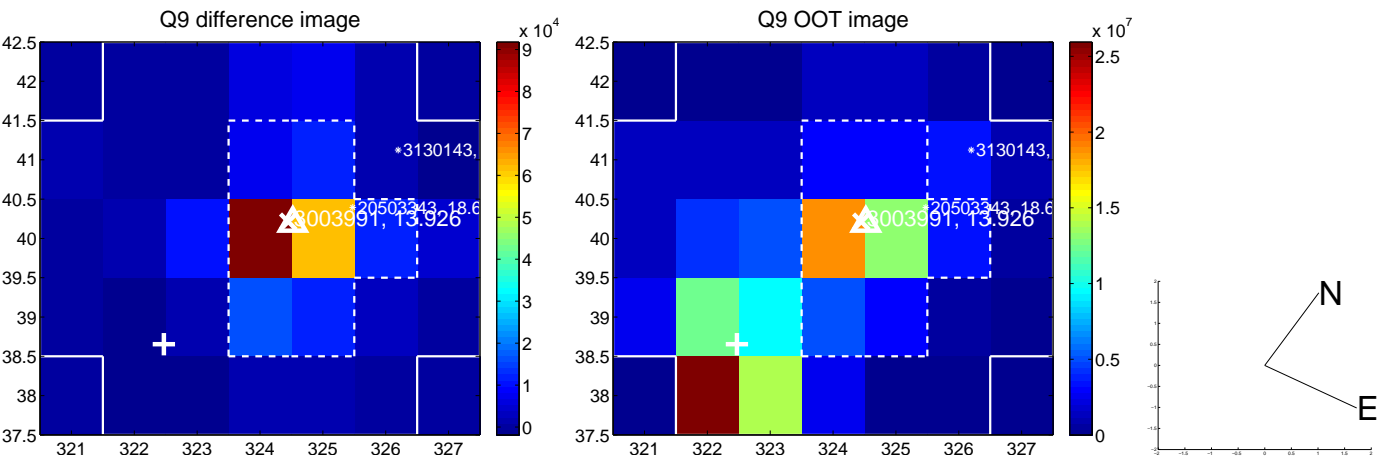
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



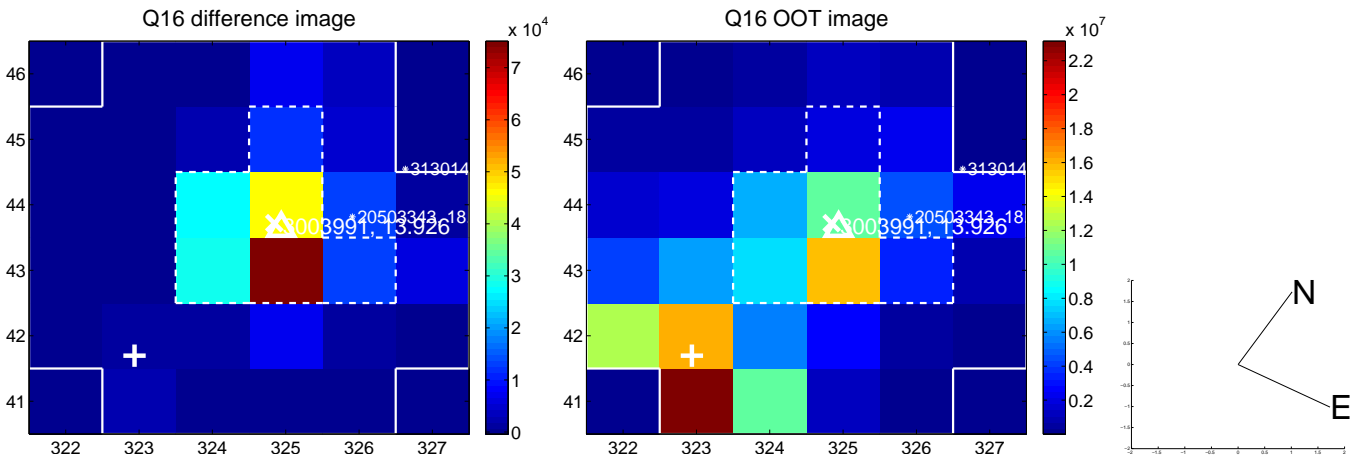
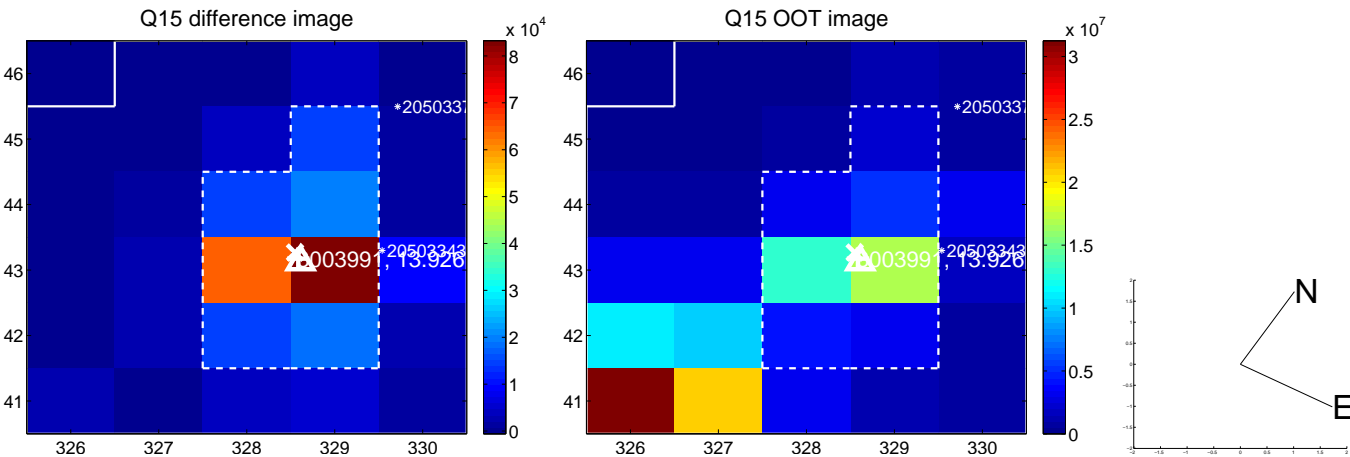
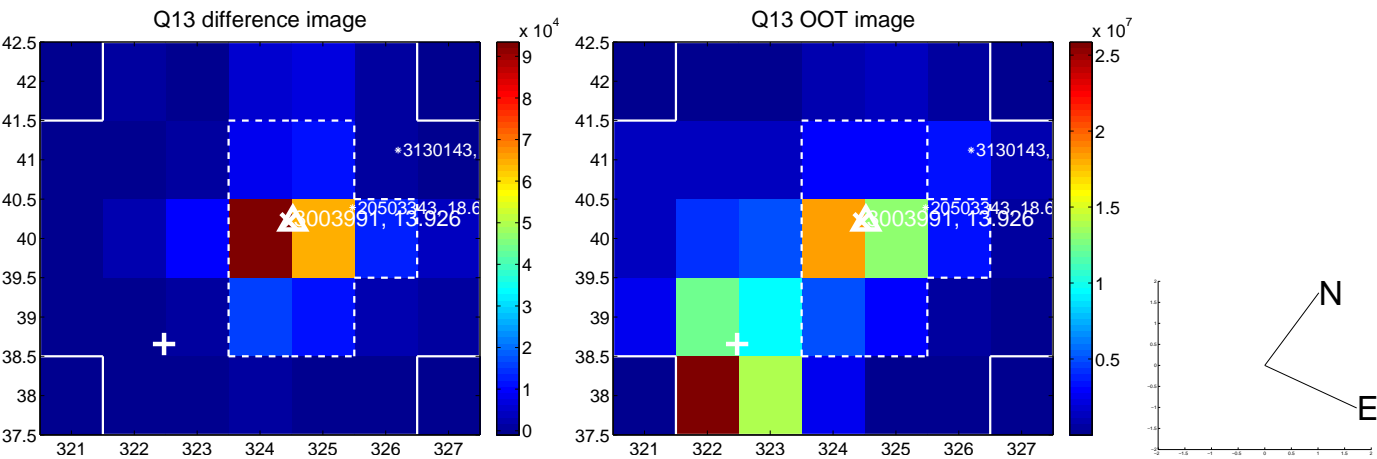
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



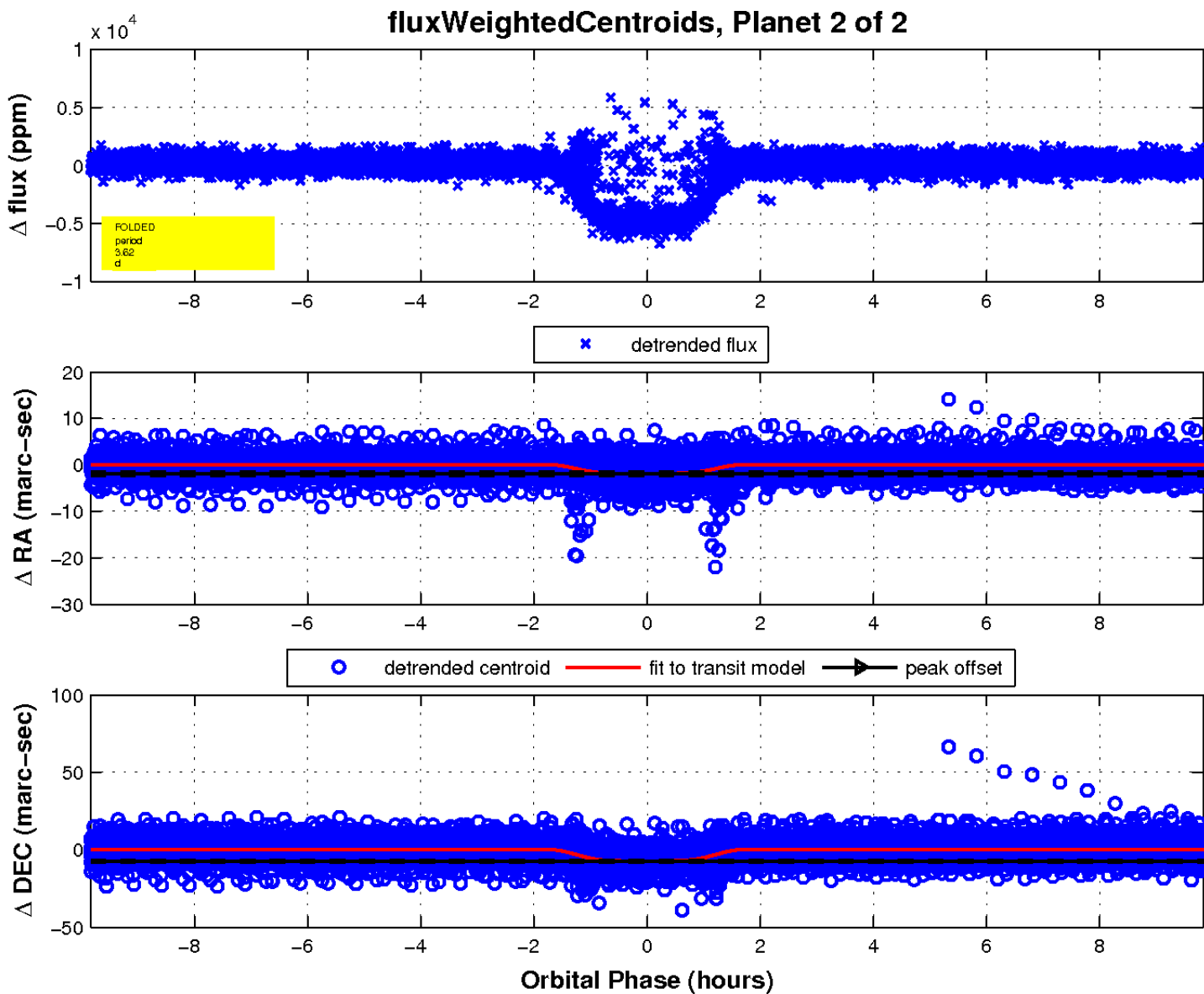
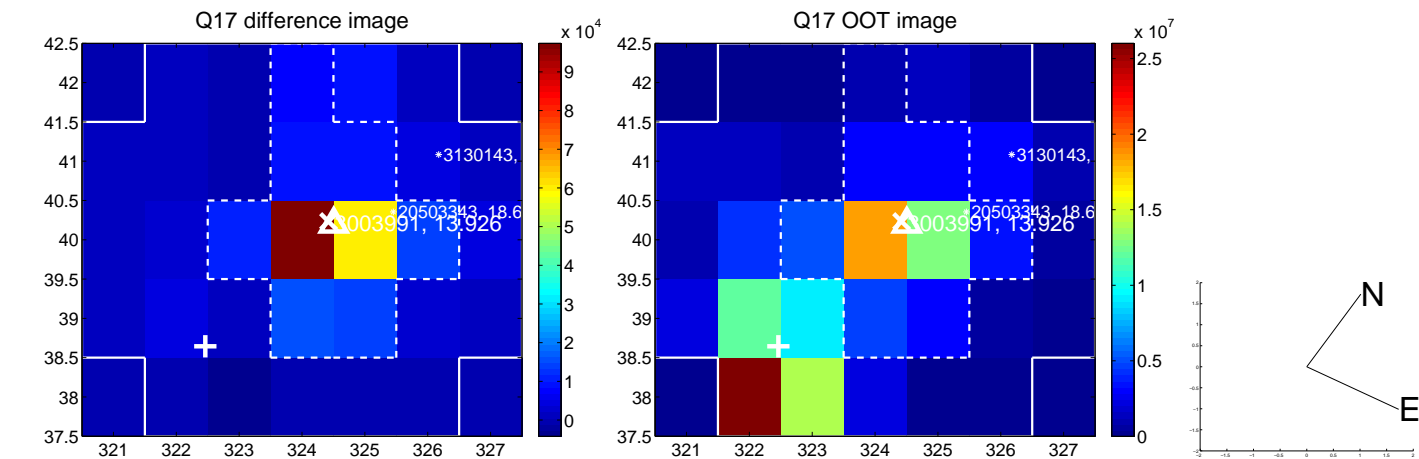
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

