

KIC 010228942

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}) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|--------|--------|-----------------------------|-----------------|------------------------|------------------------|
| 010228942-01 | OBS | 6219.01 | 21.025445 | 148.222677 | 115284.1 | 6.515 | 6291.3 | 4884.8 | 2.44 | 6631 | 121.50 | 376.91 |
| 010228942-02 | OBS | No | 21.024200 | 148.658187 | 347.6 | 37.846 | 10.6 | 15.6 | 2.44 | 6631 | 8.79 | 376.94 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|--|
| 010228942-01 | OBS | FP | 0.00 | 0 | 1 | 0 | 0 | MOD_ODDEVEN_ALT—DEEP_V_SHAPED |
| 010228942-02 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_ZUMA—LPP_DV—MOD_NONUNIQ_DV—RESIDUAL_TCE |

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 for comment definitions.

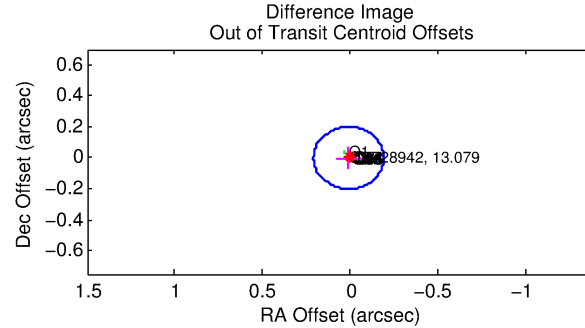
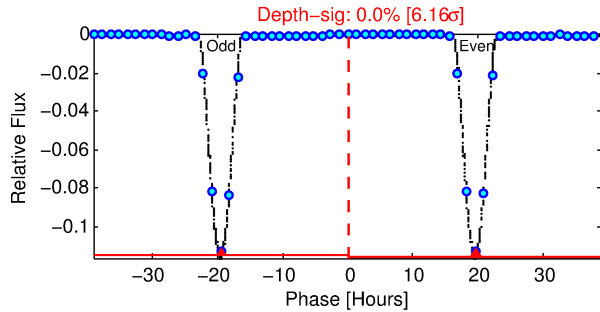
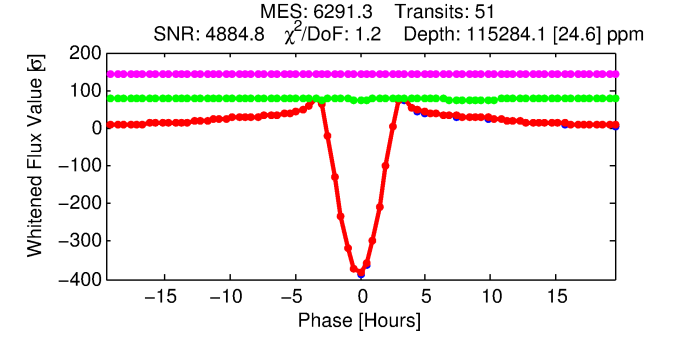
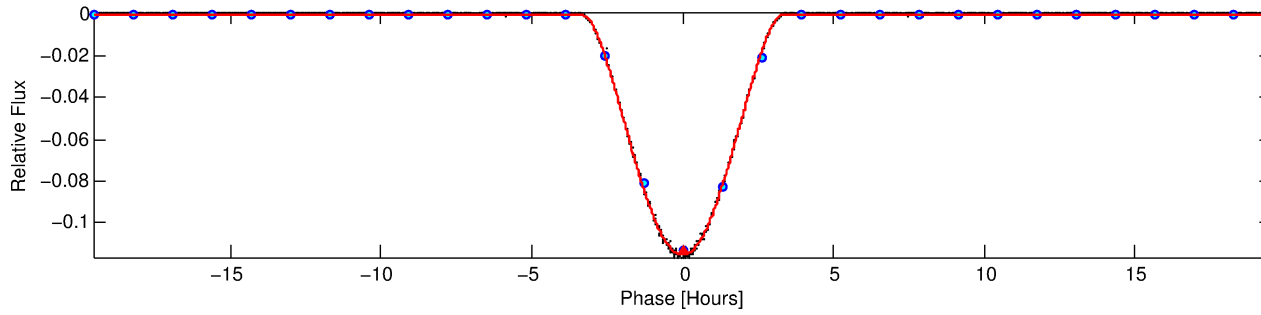
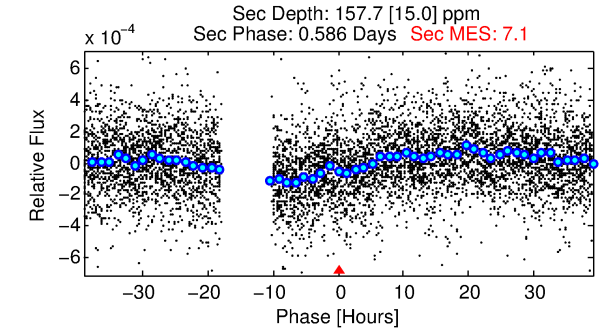
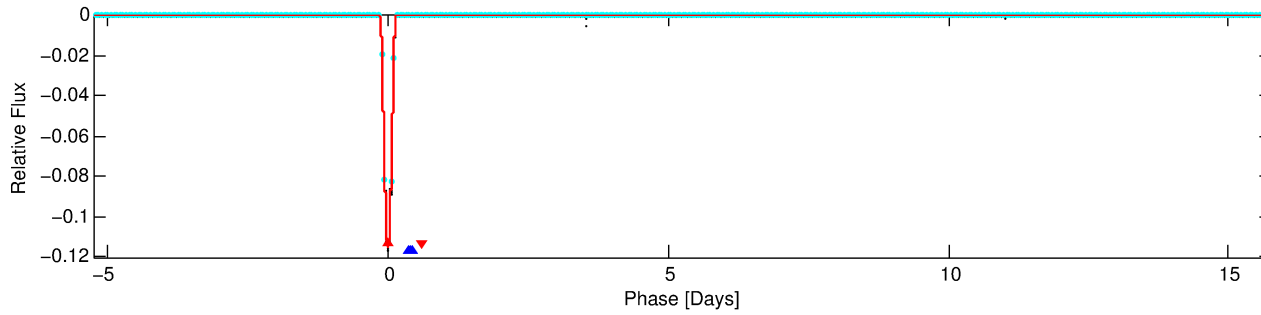
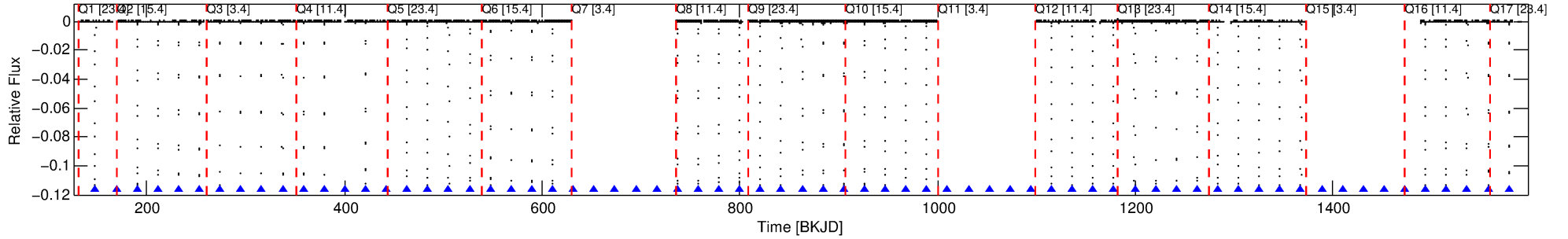
Ephemeris Match Information For 010228942-01

No Significant Match Found

DV One-Page Summary

KIC: 10228942 Candidate: 1 of 2 Period: 21.025 d
KOI: K06219.01 Corr: 0.998

Kp: 13.08 R*: 2.44 Rs Teff: 6631.0 K Logg: 3.80 Fe/H: -0.360



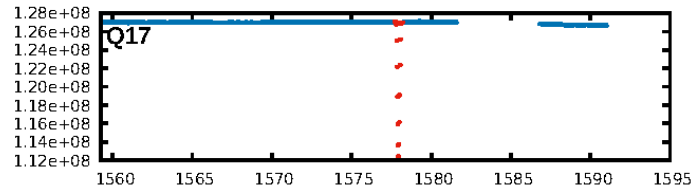
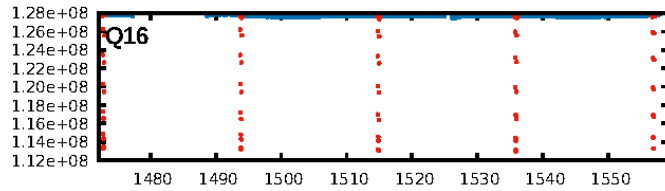
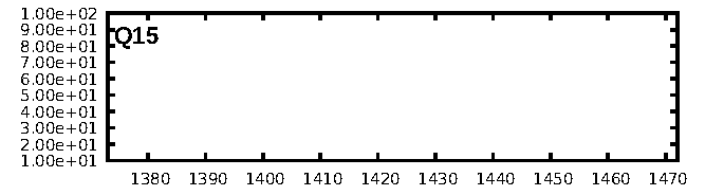
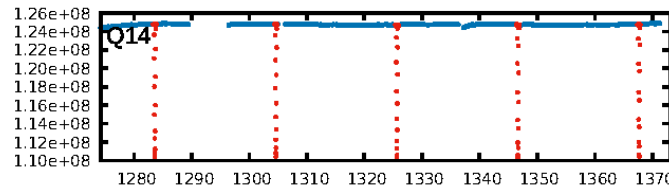
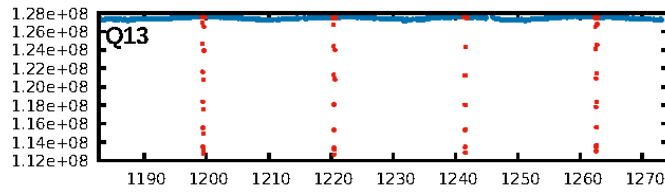
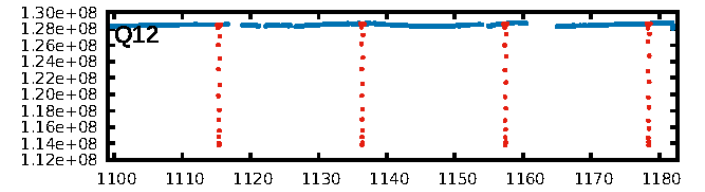
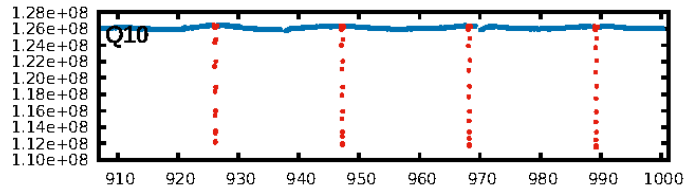
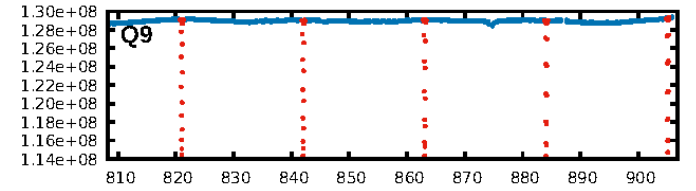
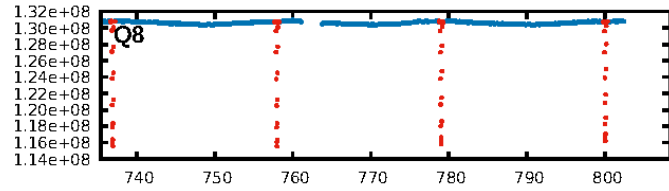
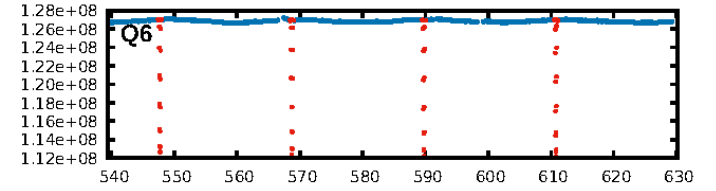
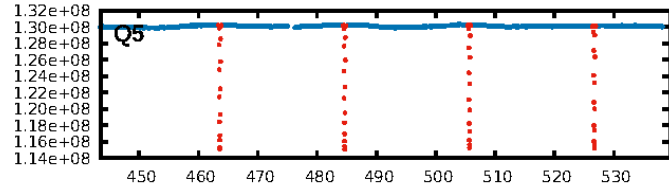
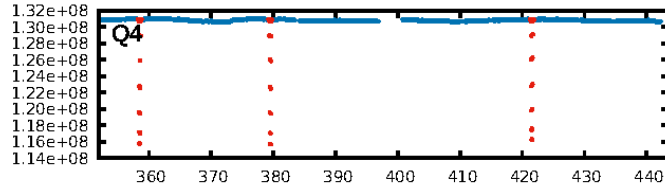
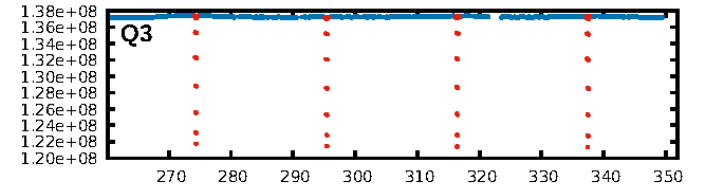
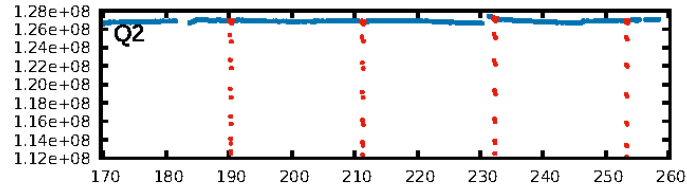
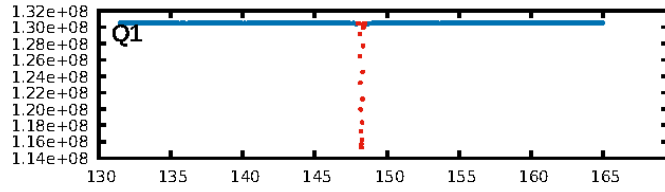
DV Fit Results:

Period = 21.02545 [0.00000] d
Epoch = 148.2227 [0.0000] BKJD
Rp/R* = 0.4567 [0.0070]
a/R* = 28.16 [0.02]
b = 0.91 [0.01]
Seff = 376.91 [216.51]
Teq = 1124 [161] K
Rp = 121.50 [45.39] Re
a = 0.1653 [0.0585] AU
Ag = 0.16 [0.09] [-9.17σ]
Teffp = 1100 [43] K [-0.14σ]

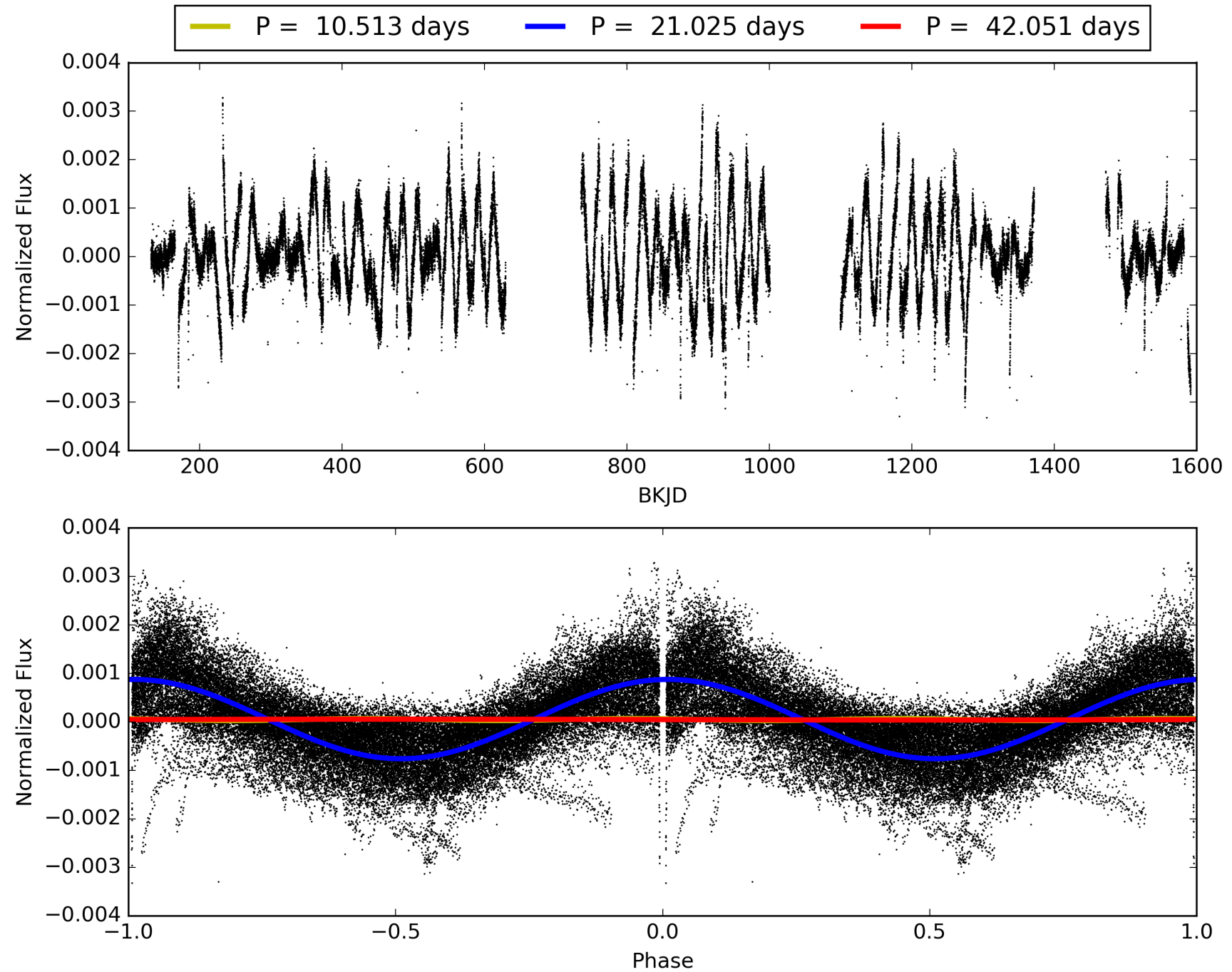
DV Diagnostic Results:

ShortPeriod-sig: 0.1% [0.00σ]
LongPeriod-sig: N/A
ModelChiSquare2-sig: 0.0%
ModelChiSquareGof-sig: 94.1%
Bootstrap-pfa: 0.00e+00
RollingBand-fgt: 1.00 [49/49]
GhostDiagnostic-chr: 5.075
Centroid-sig: 0.0%
Centroid-so: 0.087 arcsec [80.30σ]
OotOffset-rm: 0.010 arcsec [0.15σ]
KicOffset-rm: 0.057 arcsec [0.84σ]
OotOffset-st: 4/1/4/5 [14]
KicOffset-st: 4/1/4/5 [14]
DiffImageQuality-fgm: 1.00 [14/14]
DiffImageOverlap-fno: 0.00 [0/14]

TCE 010228942-01, PDC Light Curves

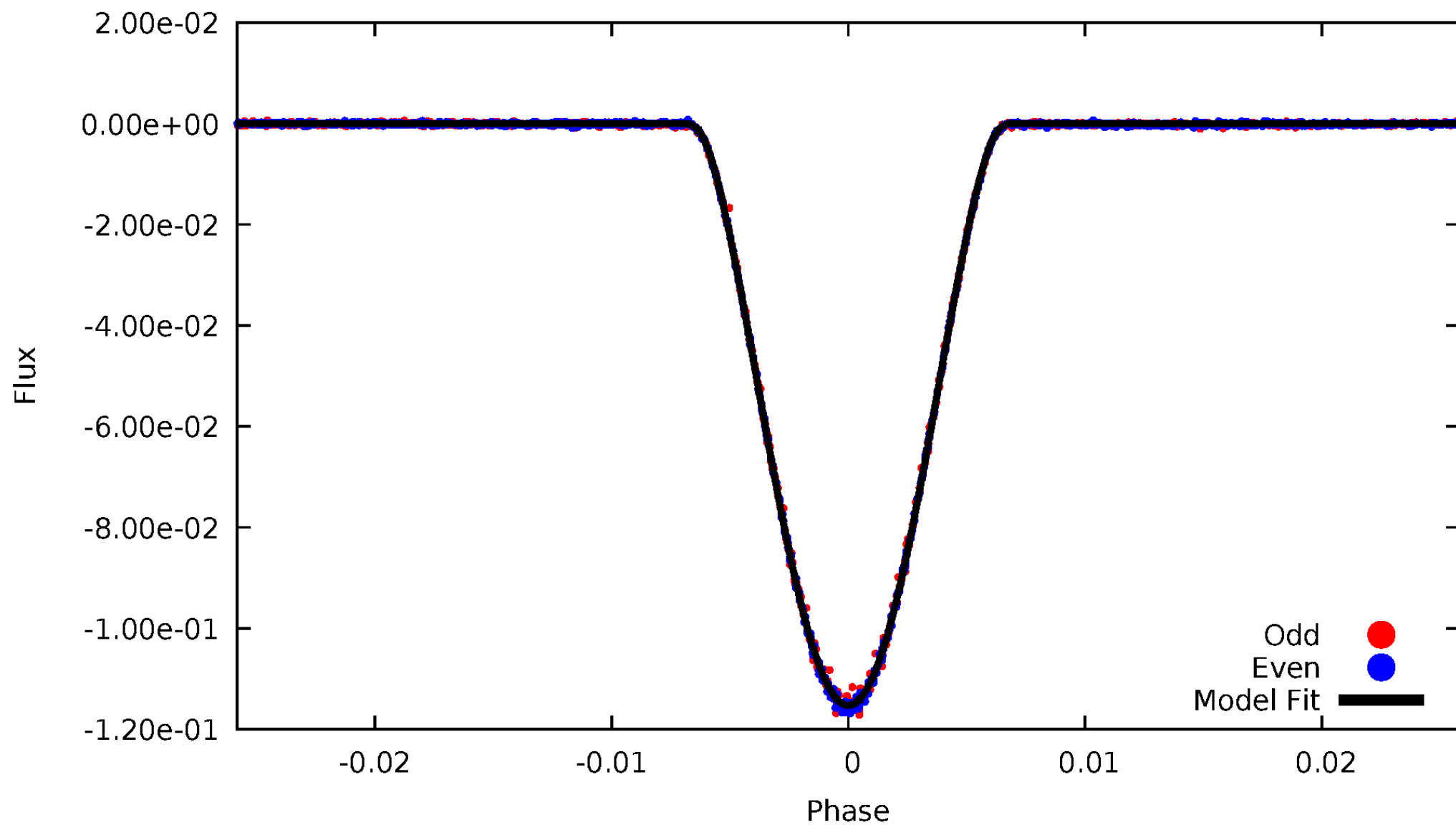


TCE 010228942-01



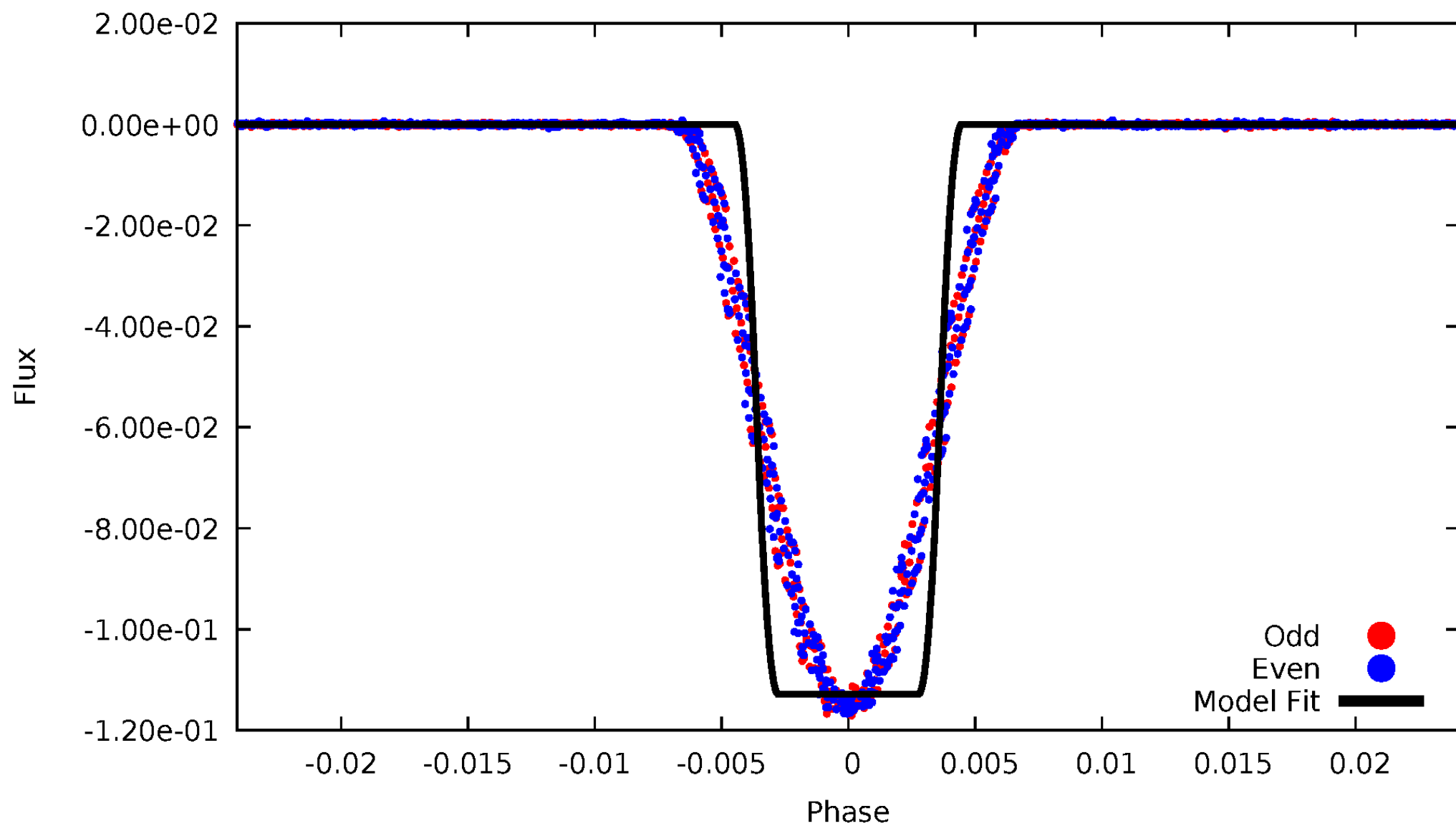
DV Odd/Even

TCE 010228942-01



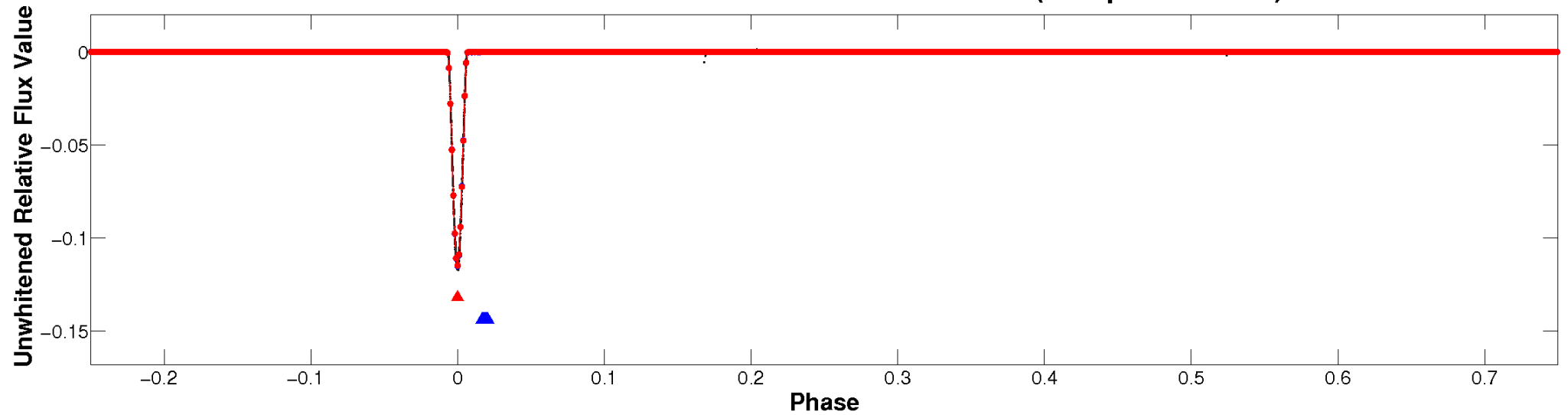
ALT Odd/Even

TCE 010228942-01

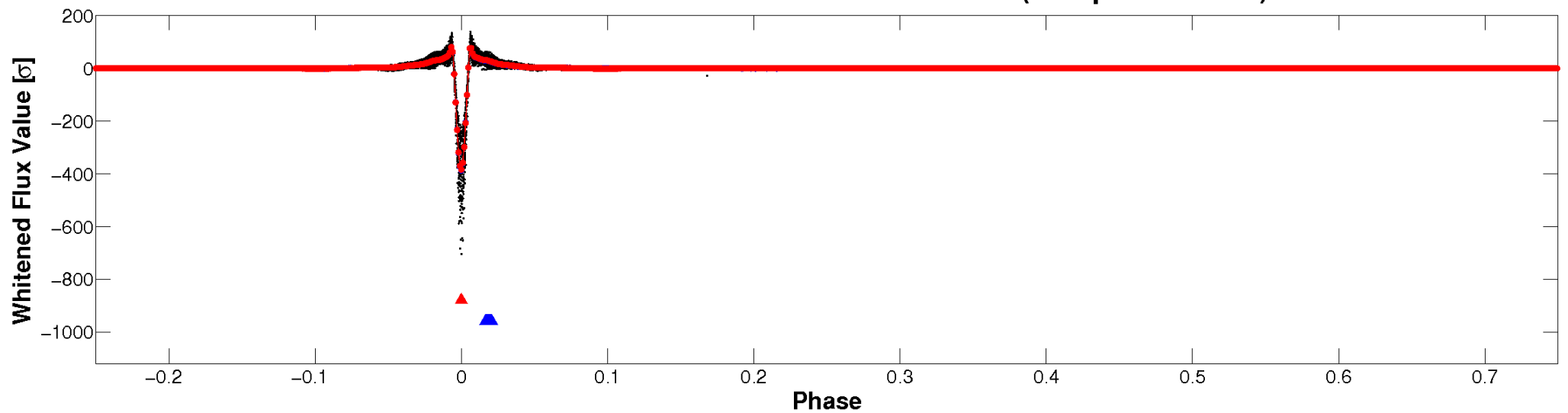


Non-Whitened Vs. Whitened Light Curve

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

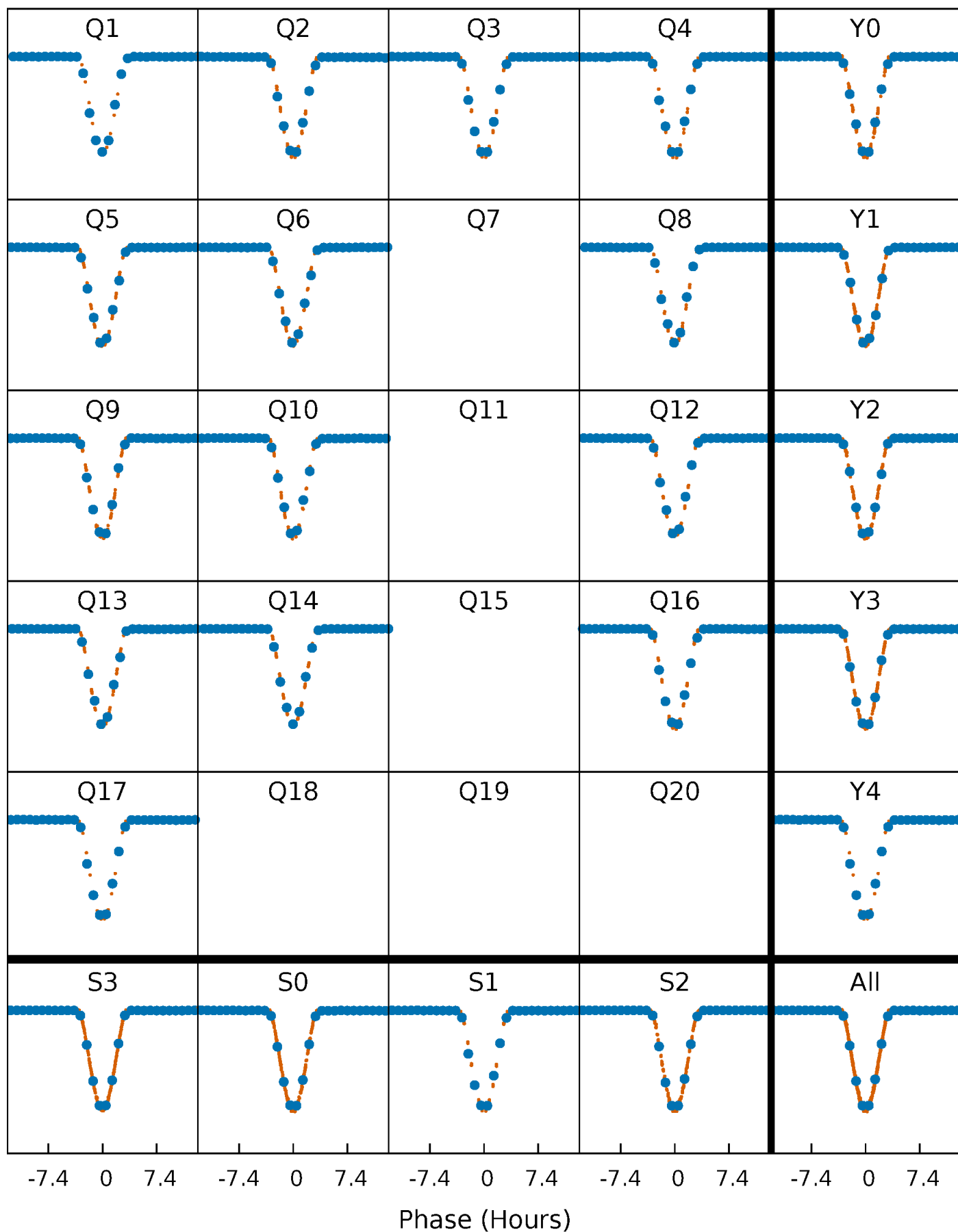


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



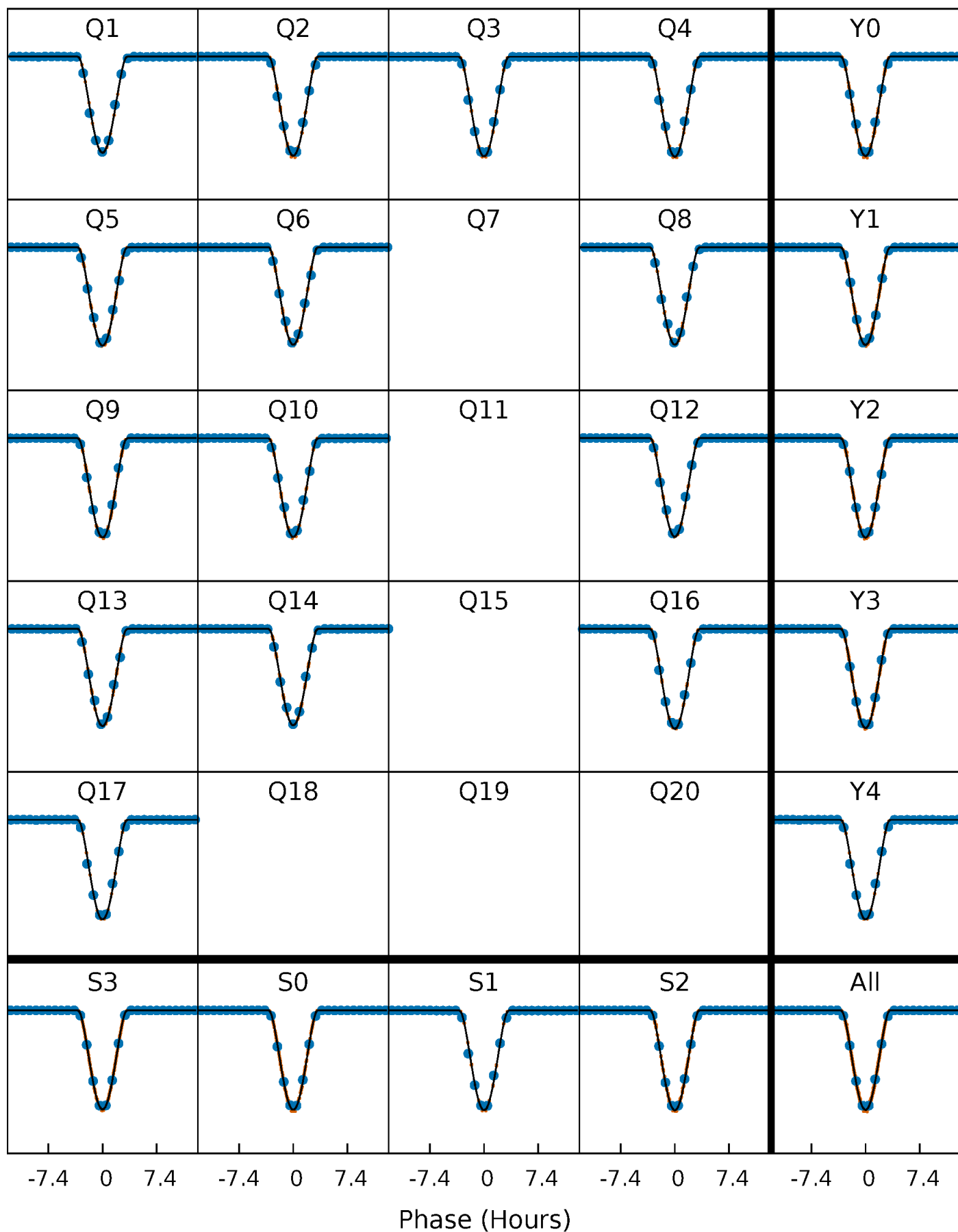
PDC Quarter-Phased Transit Curves

TCE 010228942-01 P= 21.025445 Days $T_0=148.222677$ (BKJD)



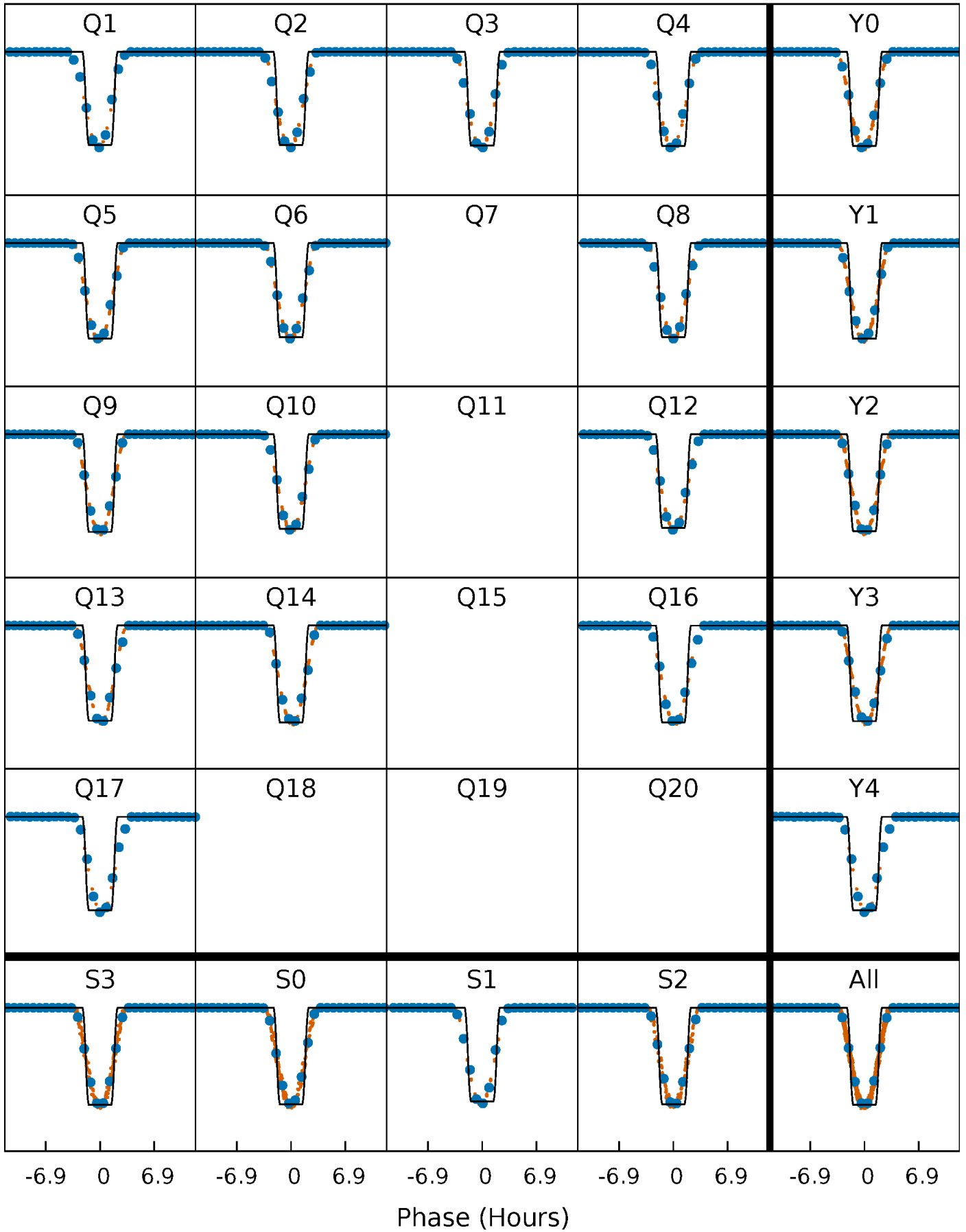
DV Quarter-Phased Transit Curves

TCE 010228942-01 P= 21.025445 Days $T_0=148.222677$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

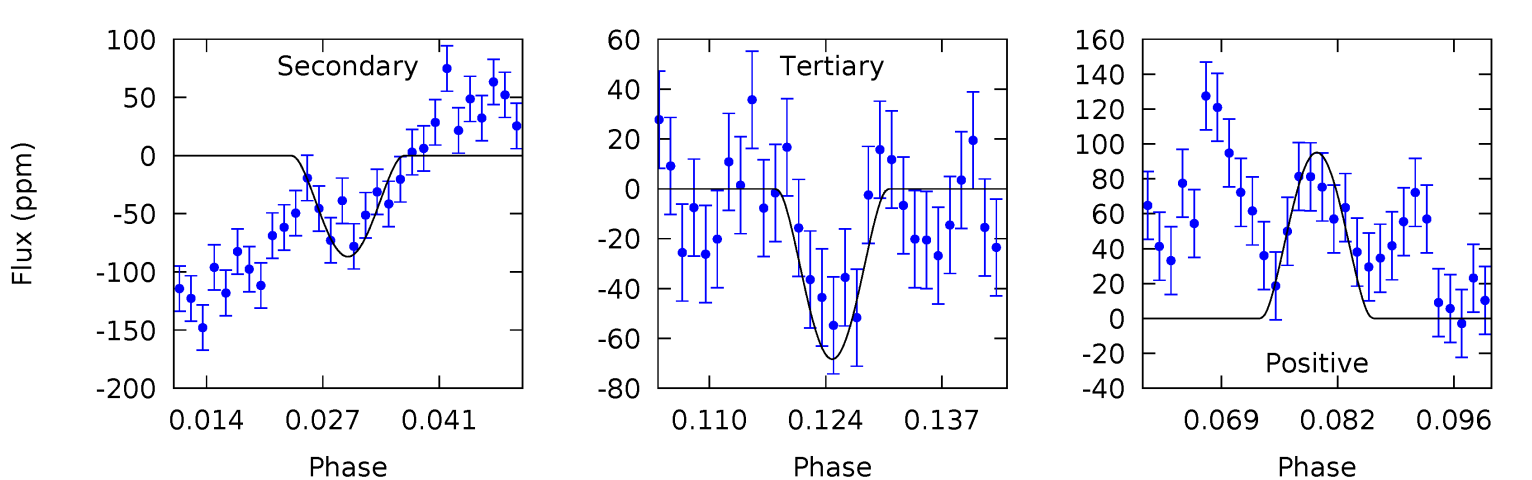
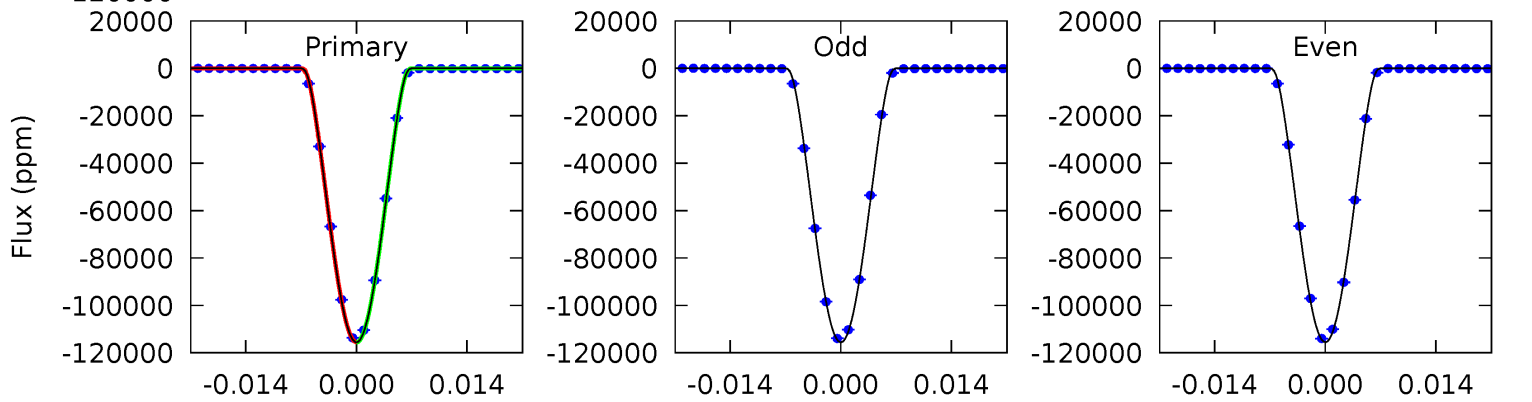
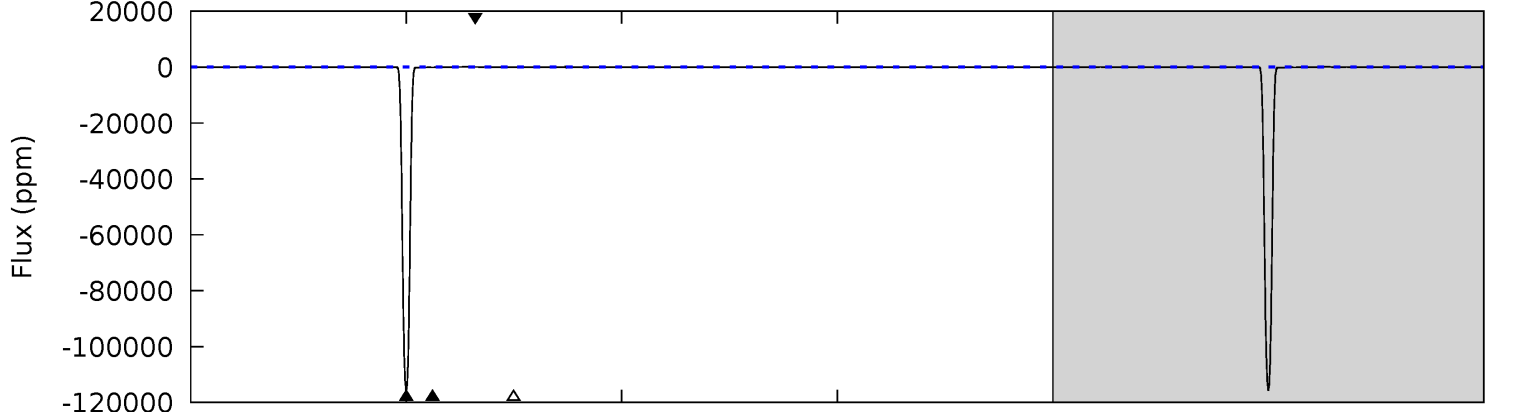
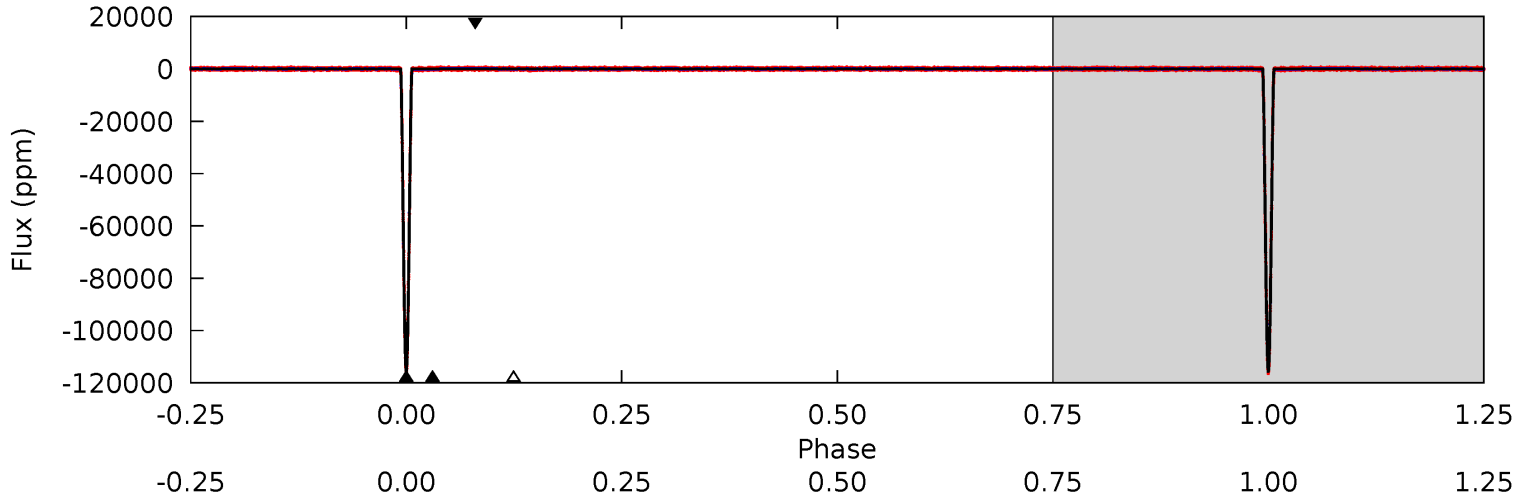
TCE 010228942-01 P= 21.025192 Days $T_0=148.230886$ (BKJD)



DV Model-Shift Uniqueness Test

010228942-01, P = 21.025445 Days, E = 127.197232 Days

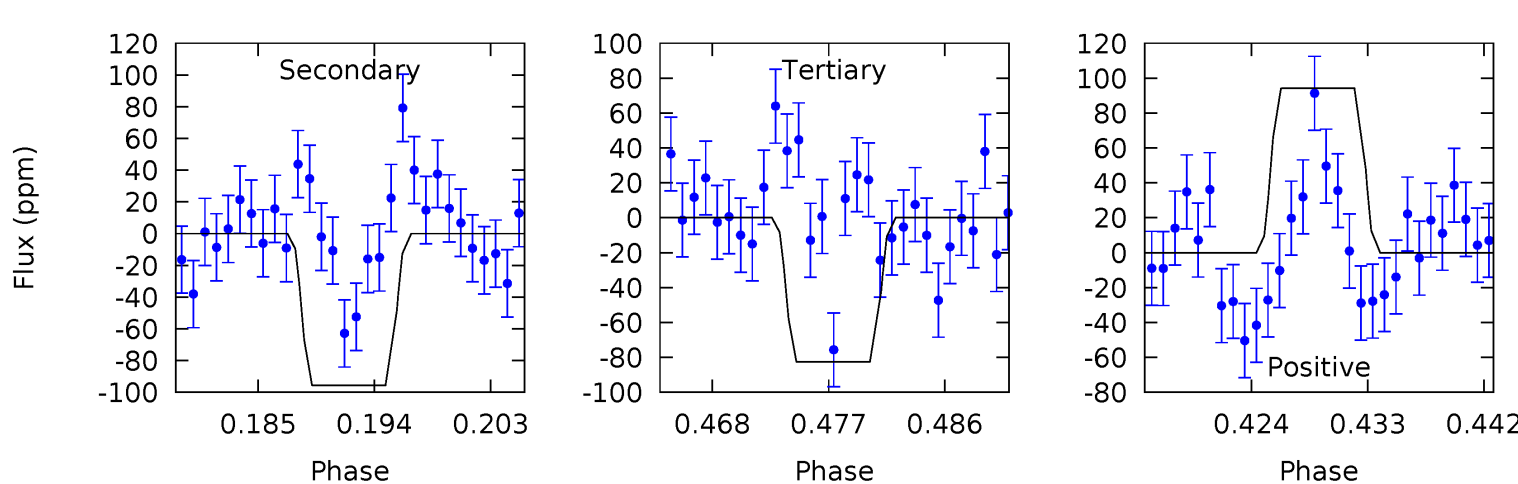
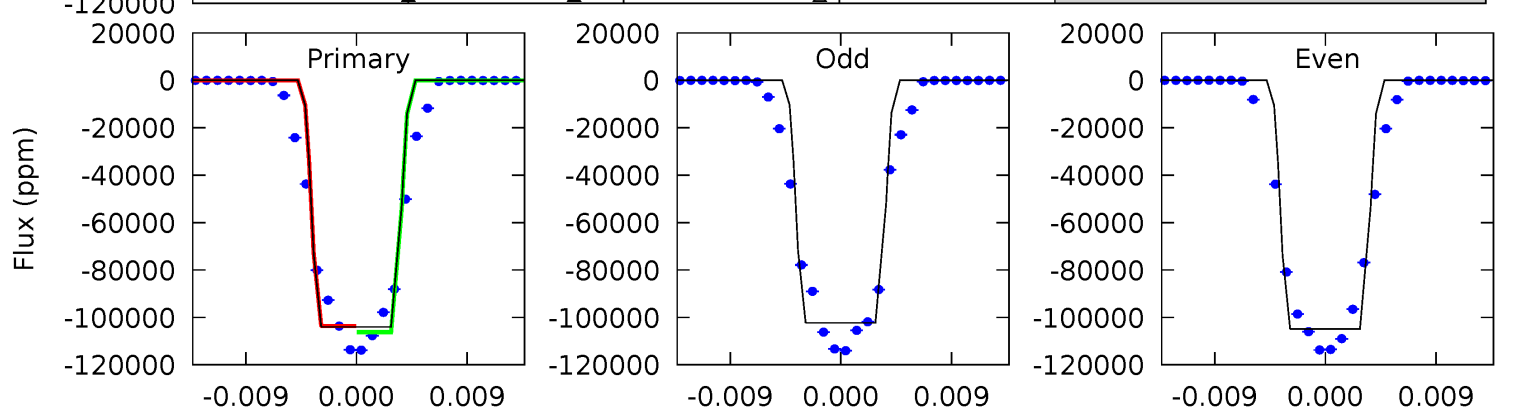
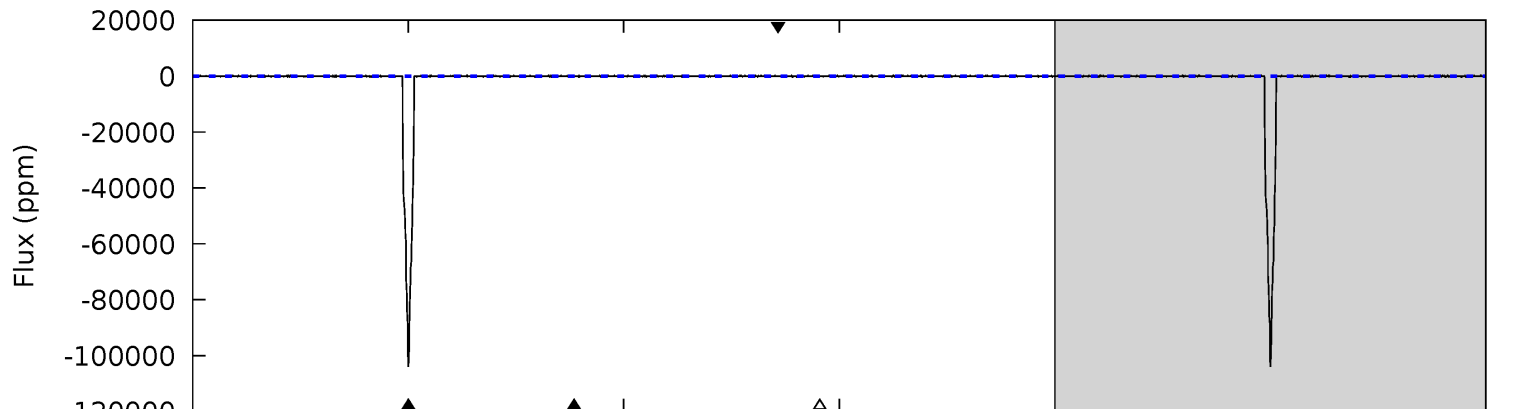
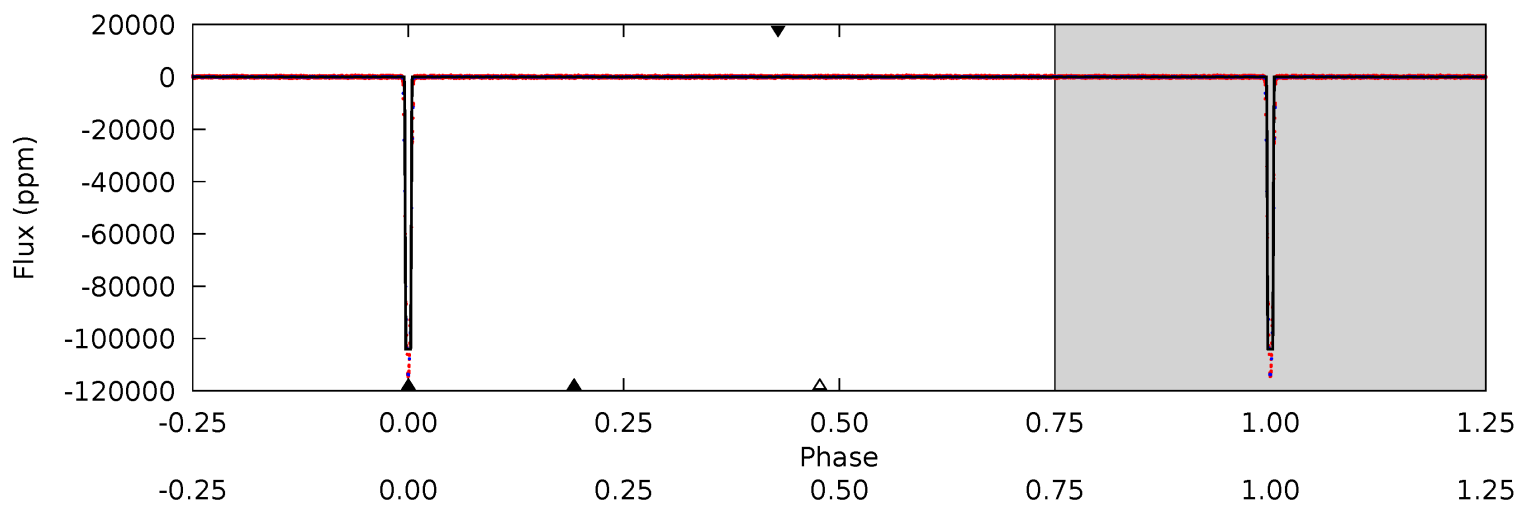
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|-------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 14851 | 11.2 | 8.78 | 12.2 | 4.96 | 2.46 | 3.81 | 14842 | 14839 | 2.39 | -1.05 | 2.27 | 1.00 | 0.00 | 10.2 |



Alt Model-Shift Uniqueness Test

010228942-01, P = 21.025192 Days, E = 127.205694 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 4513 | 4.15 | 3.59 | 4.09 | 5.05 | 2.62 | 1.09 | 4509 | 4509 | 0.56 | 0.06 | 61.9 | 1.00 | 0.00 | 58.3 |



Stellar Parameters For KIC 010228942

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | R (R_{\odot}) | M (M_{\odot}) | p_{\star} ($\text{g}\cdot\text{cm}^{-3}$) |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
| | 6631^{+180}_{-200} | $3.798^{+0.328}_{-0.082}$ | $-0.360^{+0.300}_{-0.250}$ | $2.438^{+0.455}_{-0.910}$ | $1.361^{+0.212}_{-0.259}$ | $0.132^{+0.306}_{-0.041}$ |
| | +3%/-3% | +9%/-2% | +83%/-69% | +19%/-37% | +16%/-19% | +231%/-31% |
| Source | PHO1 | FLK73 | 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 010228942-01 / KOI 6219.01

| Detrend | Depth (ppm) | R_p (R_{\oplus}) | T_{max} (K) | T_{obs} (K) | A_{obs} |
|---------|--------------|----------------------------|---------------------|------------------------|---------------------------|
| DV | -87 ± 8 | $118.11^{+13.17}_{-22.41}$ | 1530^{+96}_{-136} | -2115^{+127}_{-69} | $0.096^{+0.042}_{-0.019}$ |
| Alt. | -96 ± 23 | $84.93^{+11.68}_{-16.33}$ | 1529^{+94}_{-144} | -1964^{+3304}_{-133} | $0.199^{+0.103}_{-0.057}$ |

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 $A_{obs} \gg 1.0$

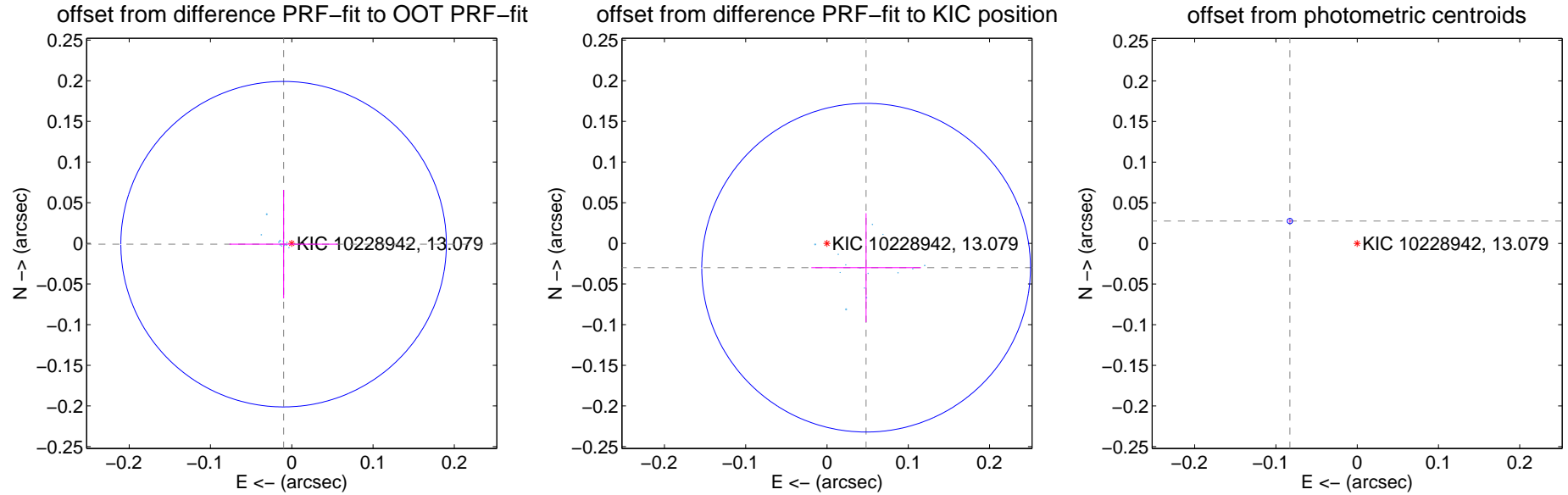
DV Centroid Data

Supplemental centroid analysis for 010228942-01. Kepler magnitude: 13.08. Transit SNR 4884.76

There are 14 quarters with good PRF difference image offsets

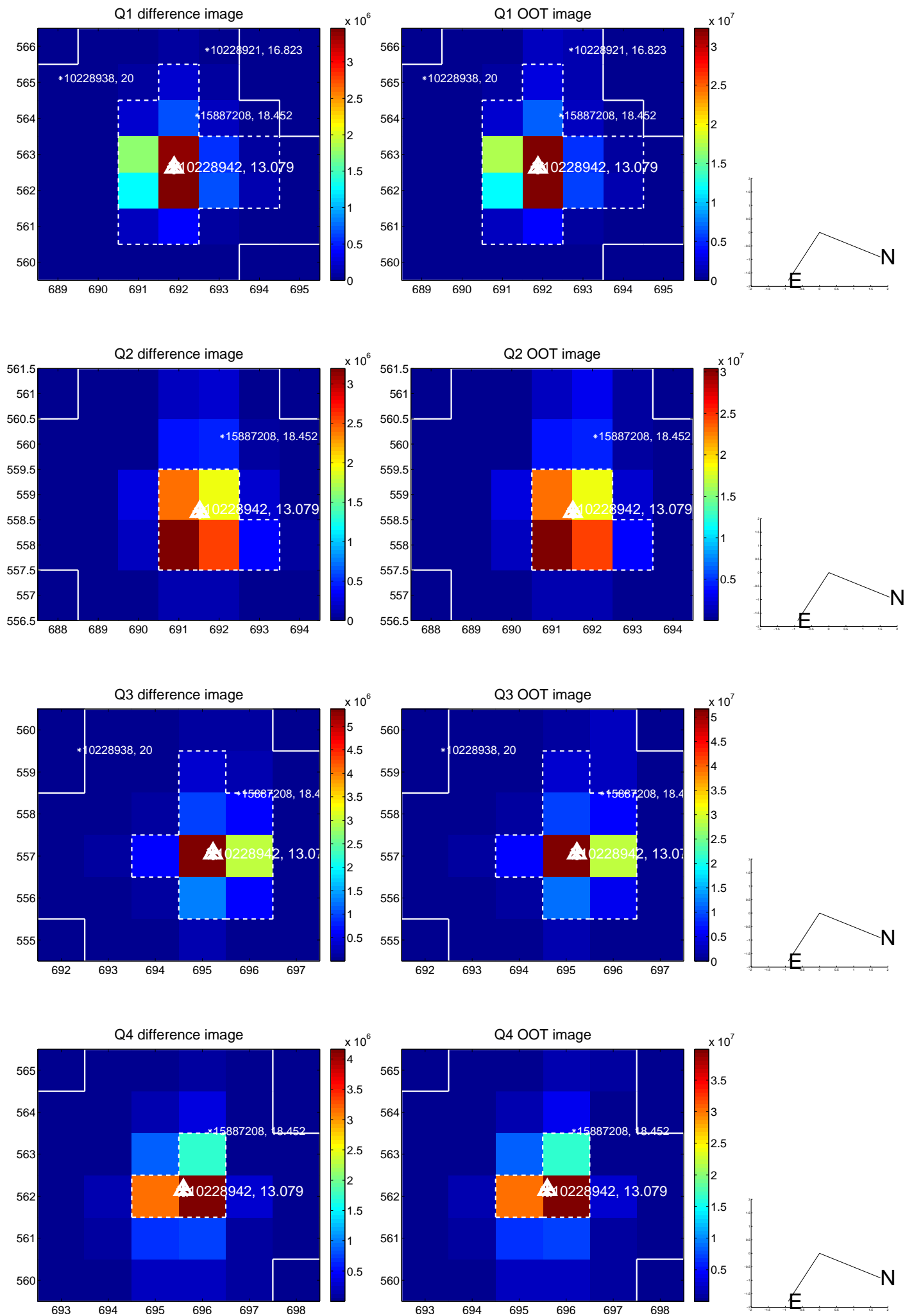
The direct PRF centroid is offset from the target star catalog position by about 0.09 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|---|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT | 0.010 ± 0.067 | 0.15 | 0.010 ± 0.067 | -0.001 ± 0.067 |
| PRF-fit source offset from KIC position | 0.057 ± 0.067 | 0.84 | -0.048 ± 0.067 | -0.030 ± 0.067 |
| photometric centroid source offset | 0.09 ± 0.00 | 80.30 | 0.08 ± 0.00 | 0.03 ± 0.00 |

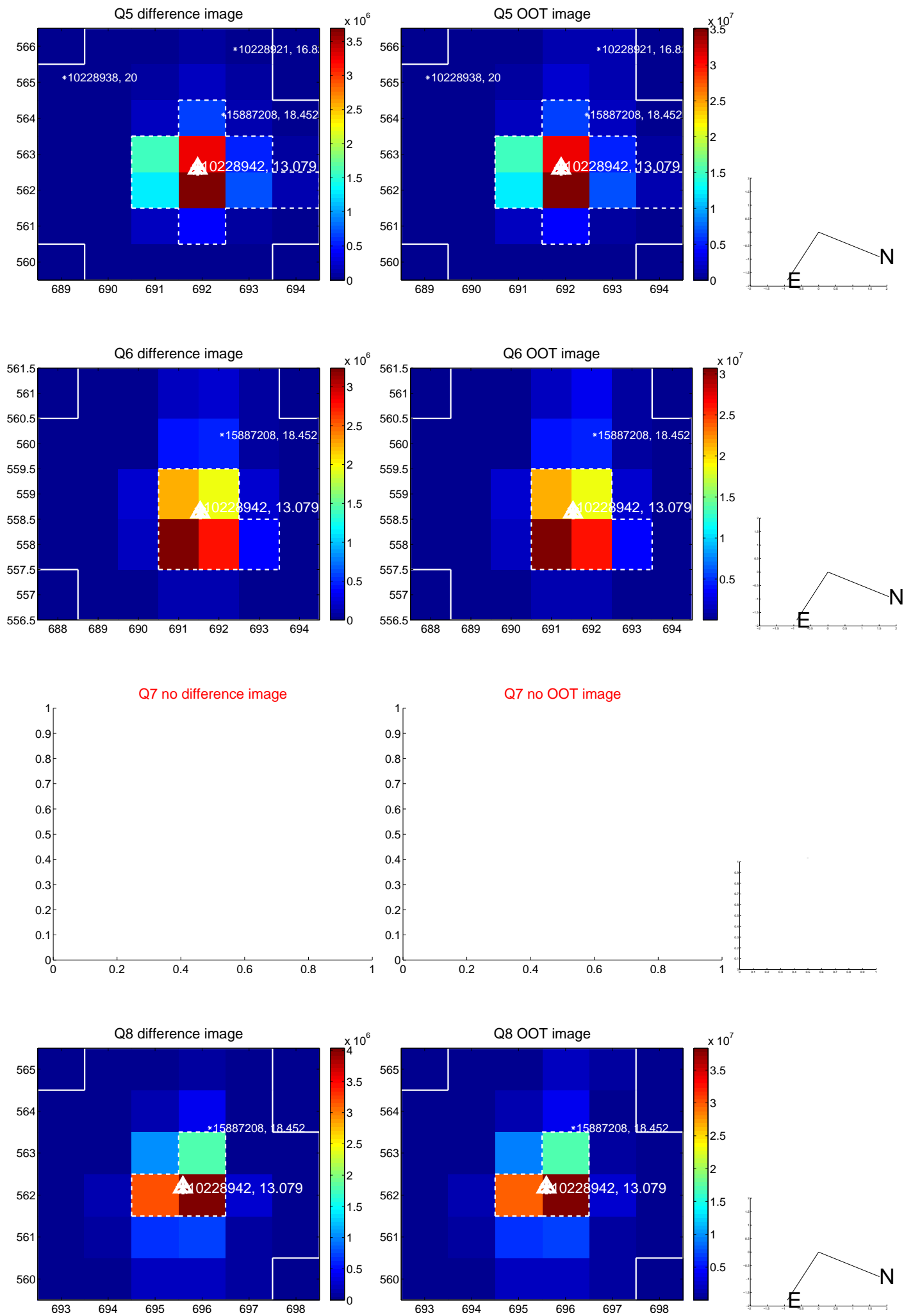


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

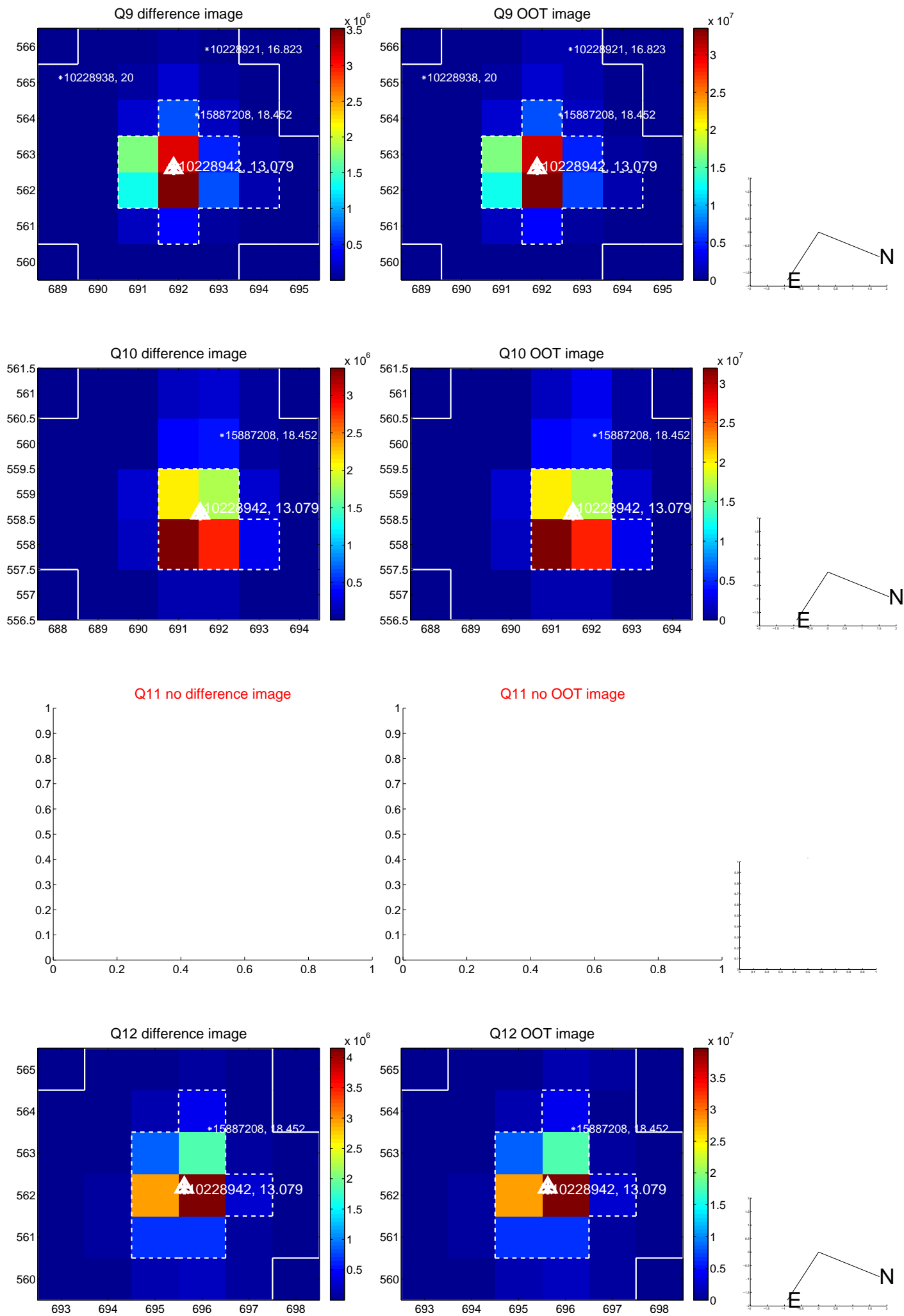
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



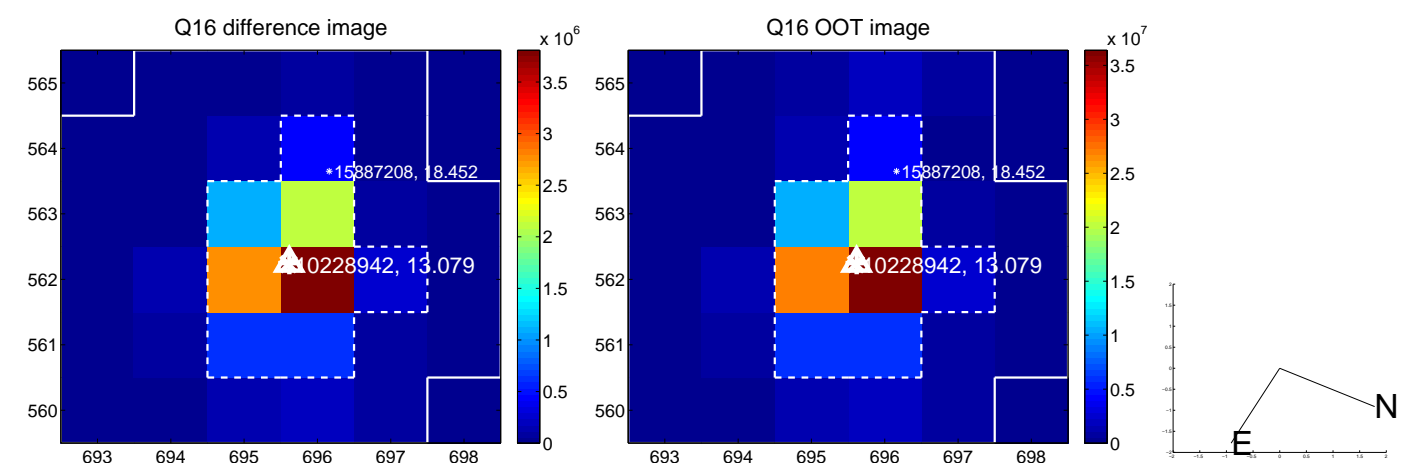
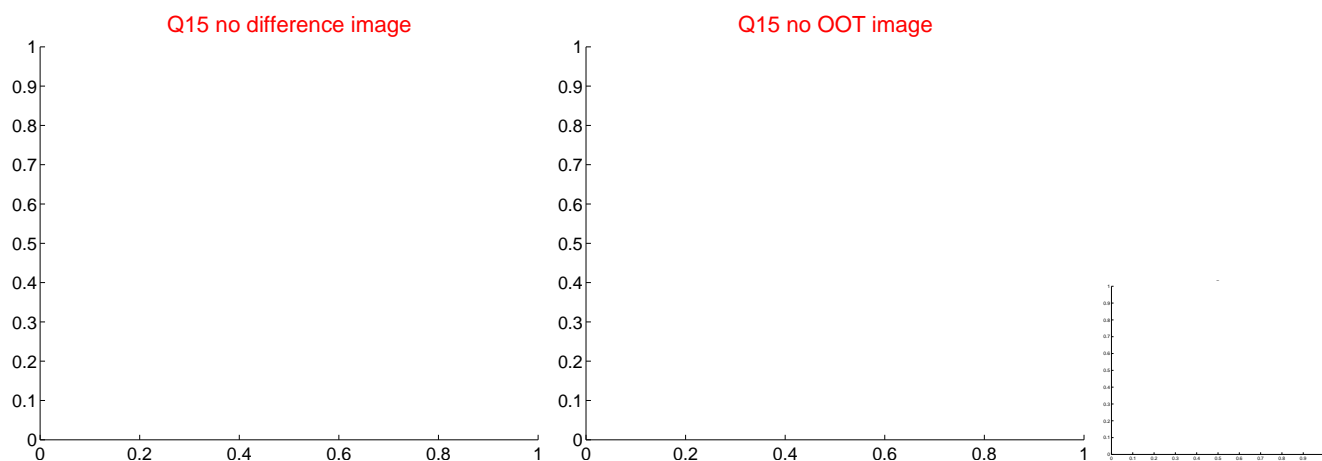
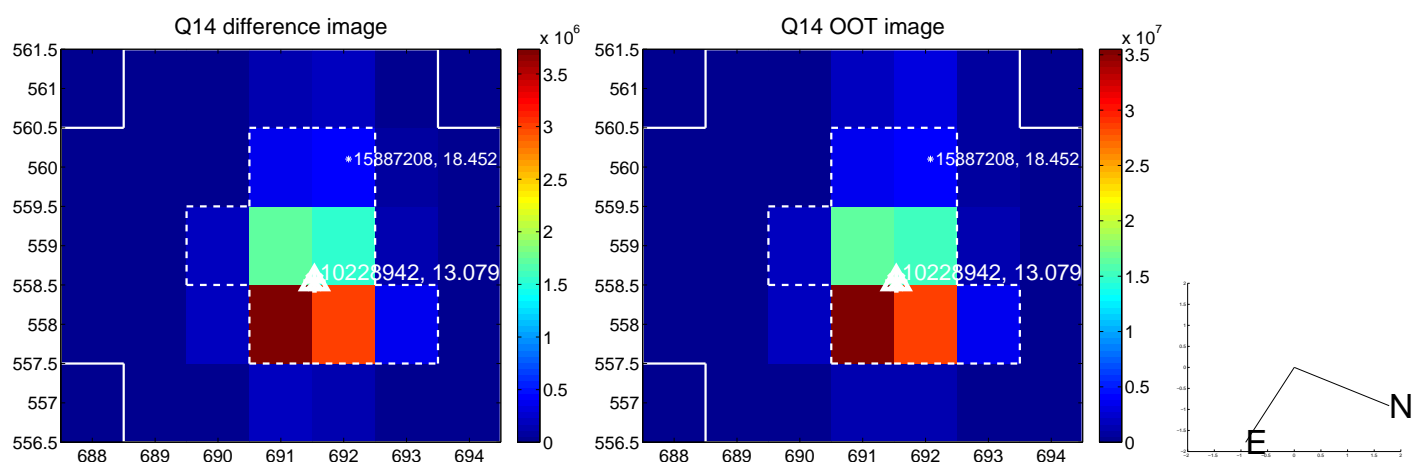
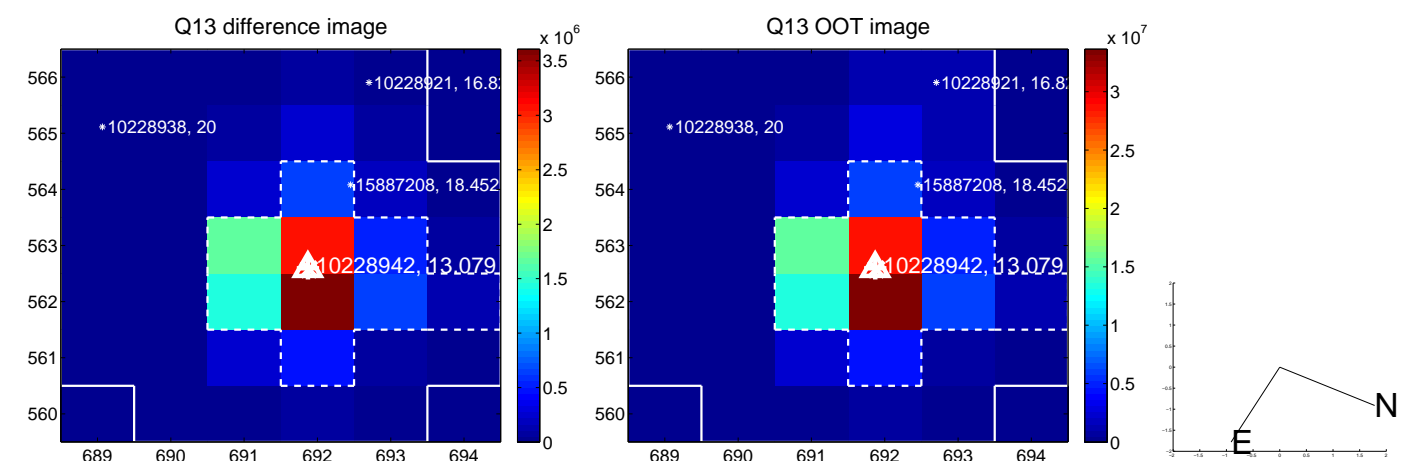
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



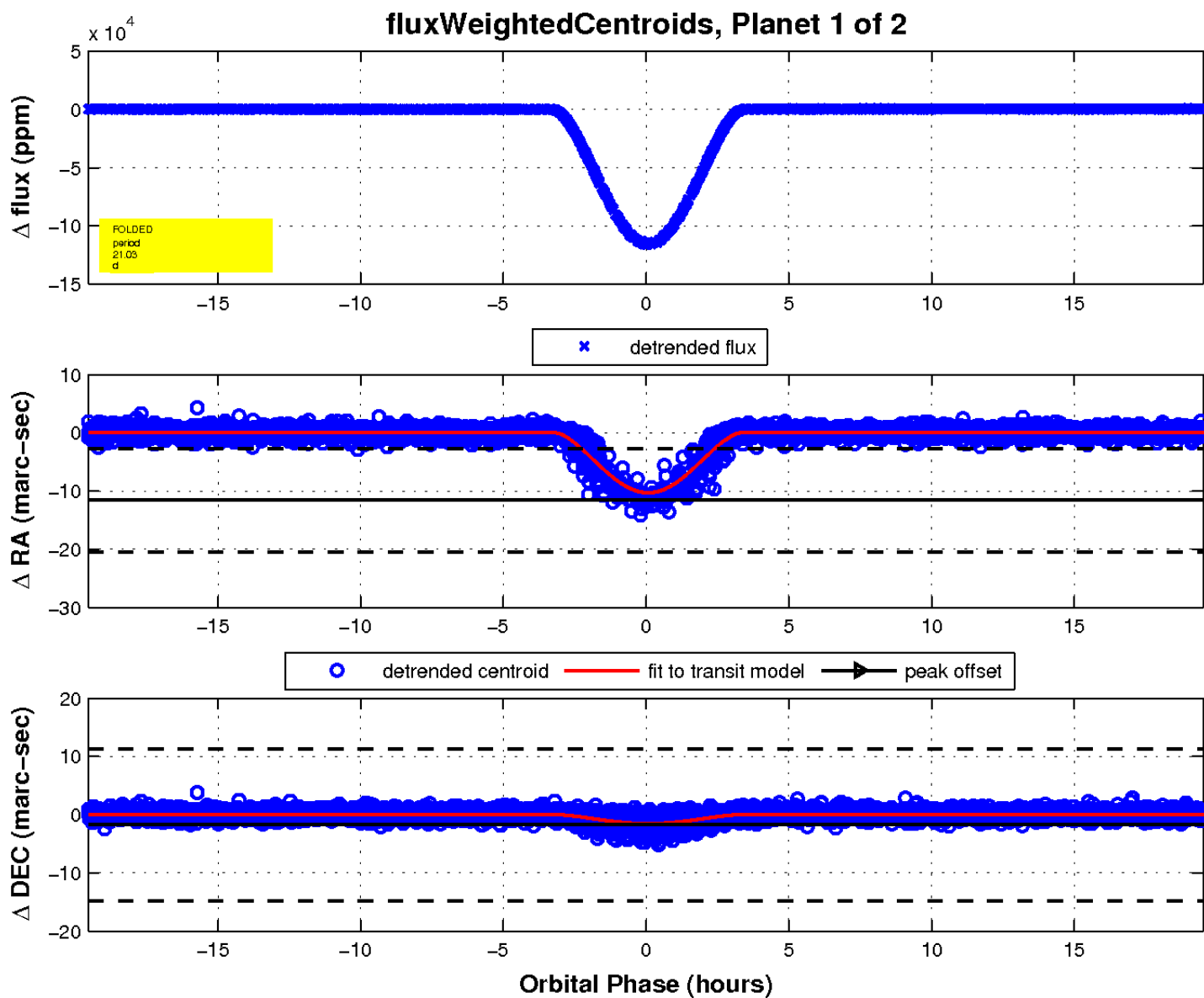
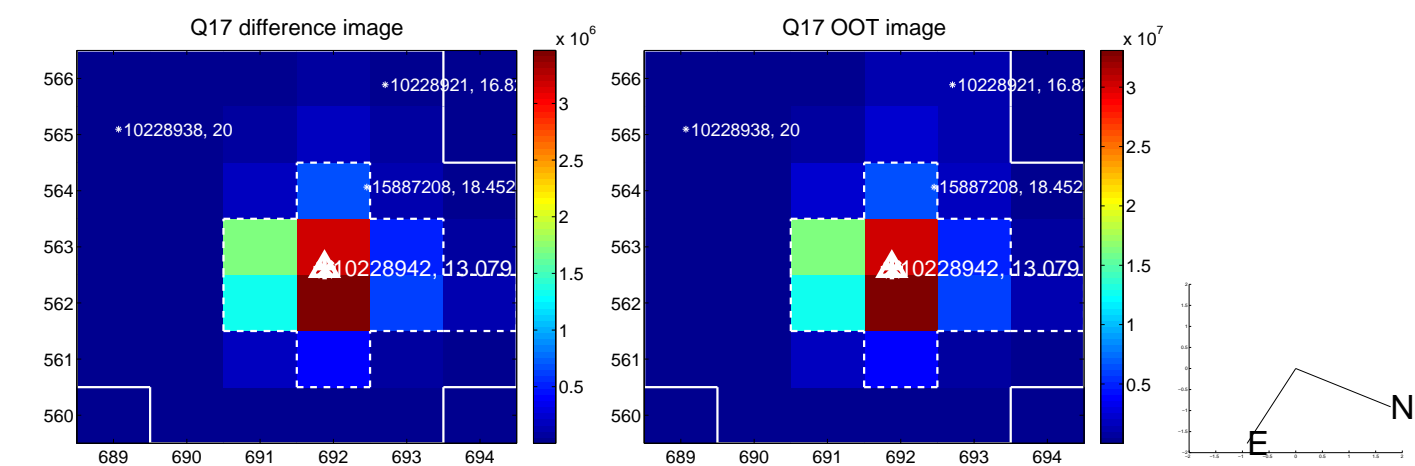
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

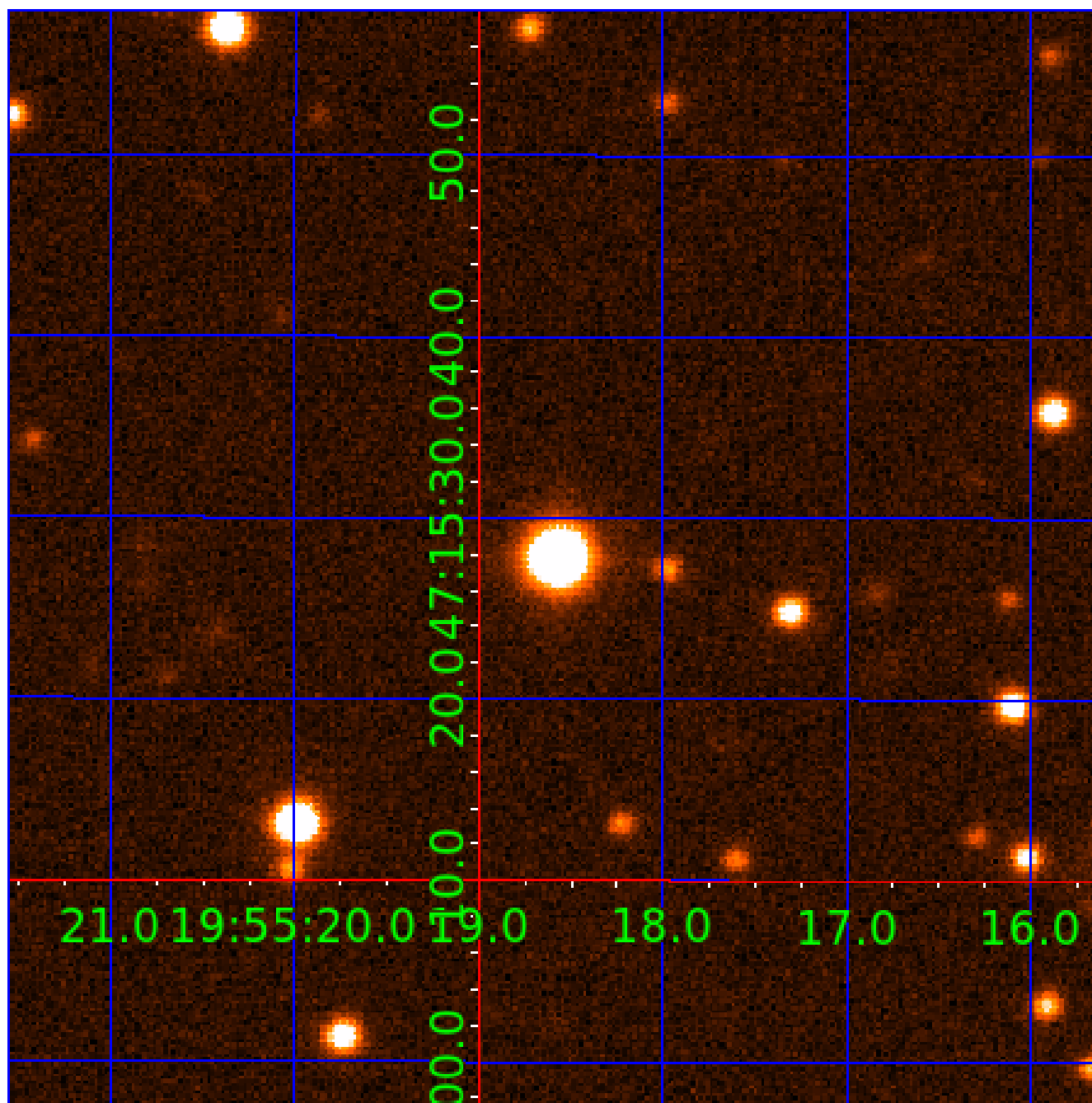


white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



UKIRT Image

Declination



KIC 010228942

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}) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|--------|--------|-----------------------------|-----------------|------------------------|------------------------|
| 010228942-01 | OBS | 6219.01 | 21.025445 | 148.222677 | 115284.1 | 6.515 | 6291.3 | 4884.8 | 2.44 | 6631 | 121.50 | 376.91 |
| 010228942-02 | OBS | No | 21.024200 | 148.658187 | 347.6 | 37.846 | 10.6 | 15.6 | 2.44 | 6631 | 8.79 | 376.94 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|--|
| 010228942-01 | OBS | FP | 0.00 | 0 | 1 | 0 | 0 | MOD_ODDEVEN_ALT—DEEP_V_SHAPED |
| 010228942-02 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_ZUMA—LPP_DV—MOD_NONUNIQ_DV—RESIDUAL_TCE |

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 for comment definitions.

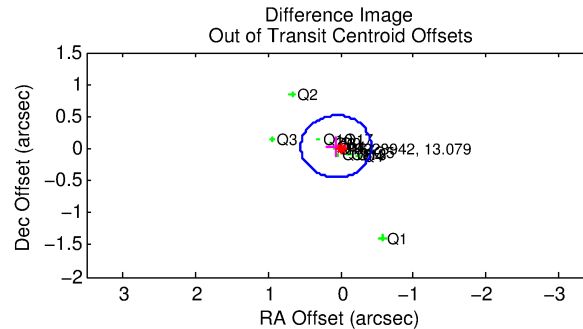
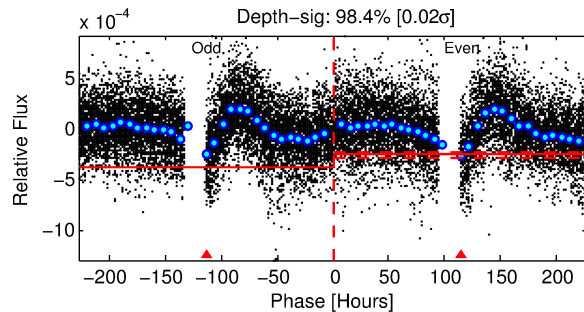
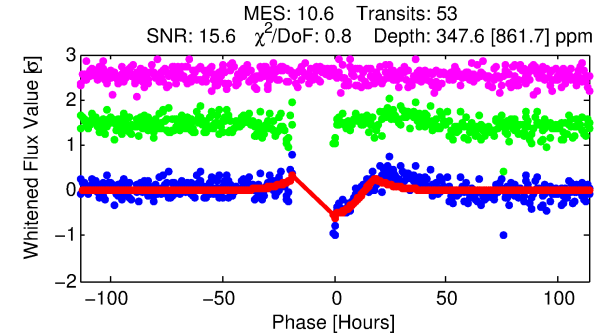
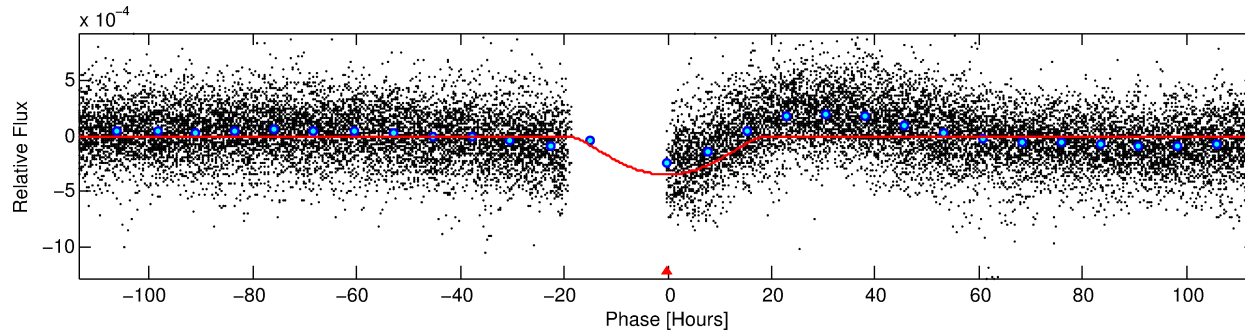
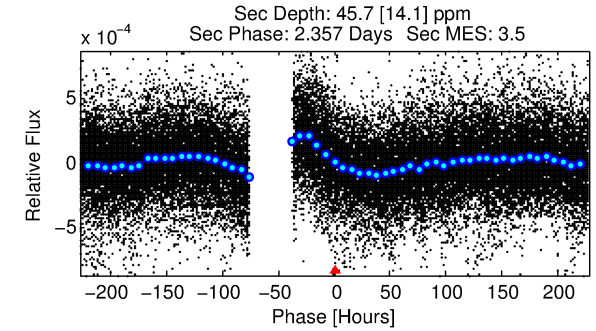
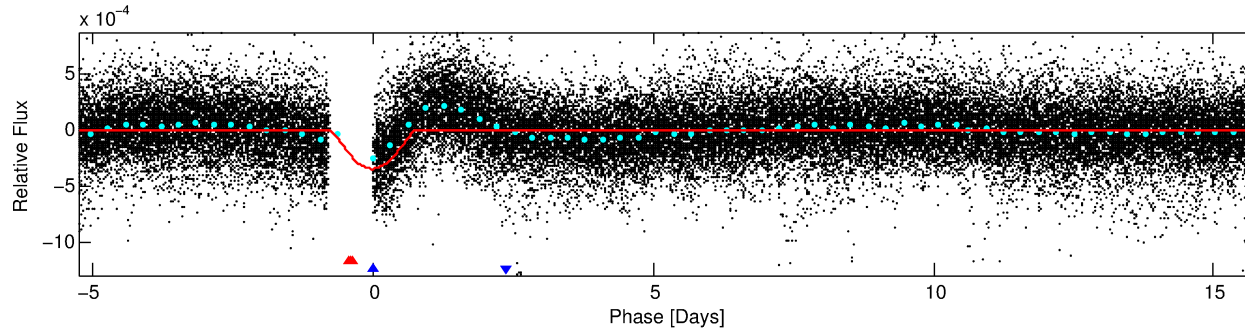
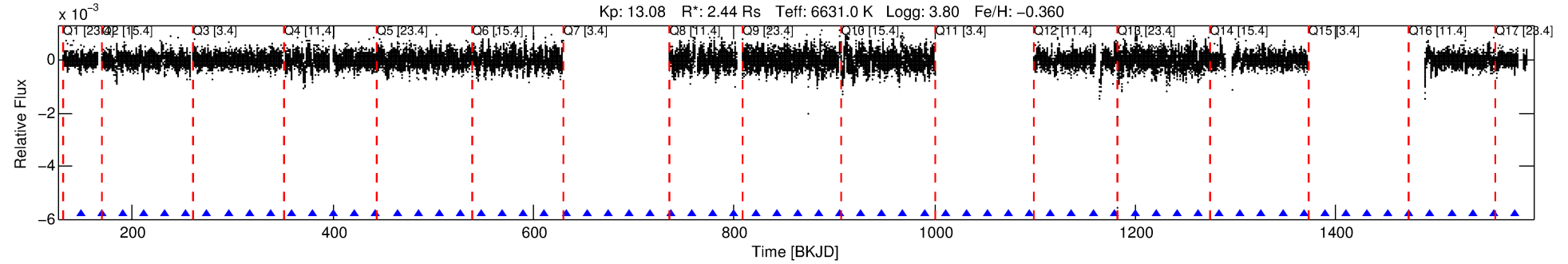
Ephemeris Match Information For 010228942-02

No Significant Match Found

DV One-Page Summary

KIC: 10228942 Candidate: 2 of 2 Period: 21.024 d

KOI: K06219 Corr: No Ephemeris Match



DV Fit Results:

Period = 21.02420 [0.00079] d
Epoch = 148.6582 [0.0378] BKJD
Rp/R* = 0.0331 [0.0354]
a/R* = 1.49 [0.19]
b = 1.00 [0.01]
Seff = 376.94 [216.53]
Teq = 1124 [161] K
Rp = 8.79 [9.97] Re
a = 0.1653 [0.0585] AU
Ag = 8.89 [19.86] [0.40σ]
Teffp = 2999 [1625] K [1.15σ]

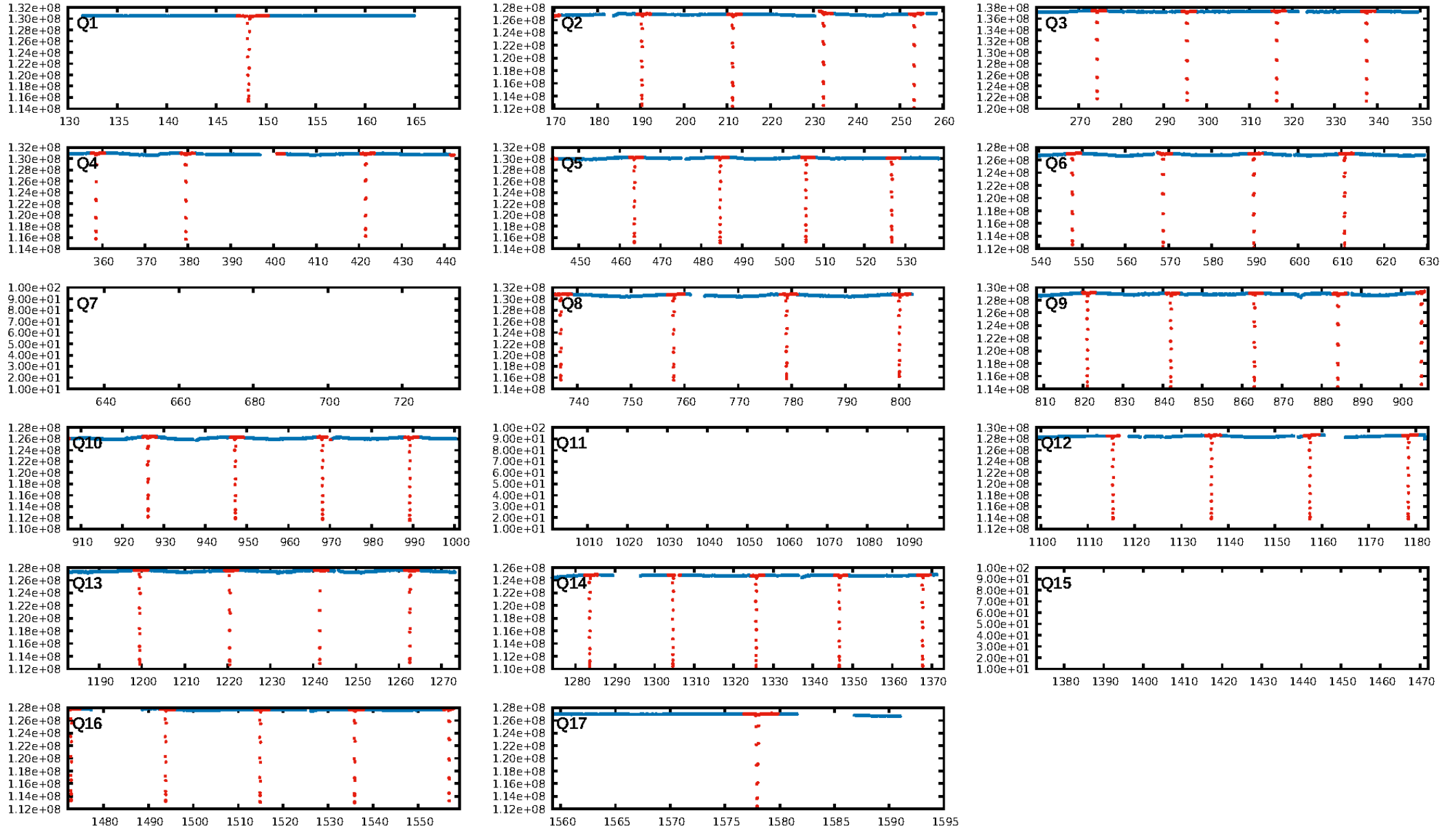
DV Diagnostic Results:

ShortPeriod-sig: N/A
LongPeriod-sig: 0.1% [0.00σ]
ModelChiSquare2-sig: 31.9%
ModelChiSquareGo-sig: 100.0%
Bootstrap-pfa: 5.27e-28
RollingBand-fgt: 1.00 [51/51]
GhostDiagnostic-chr: 2.051
Centroid-sig: 69.7%
Centroid-so: 0.114 arcsec [0.61σ]
OotOffset-rm: 0.070 arcsec [0.43σ]
KicOffset-rm: 0.015 arcsec [0.09σ]
OotOffset-st: 4/1/4/5 [14]
KicOffset-st: 4/1/4/5 [14]
DiffImageQuality-fgm: 1.00 [14/14]
DiffImageOverlap-fno: 0.00 [0/14]

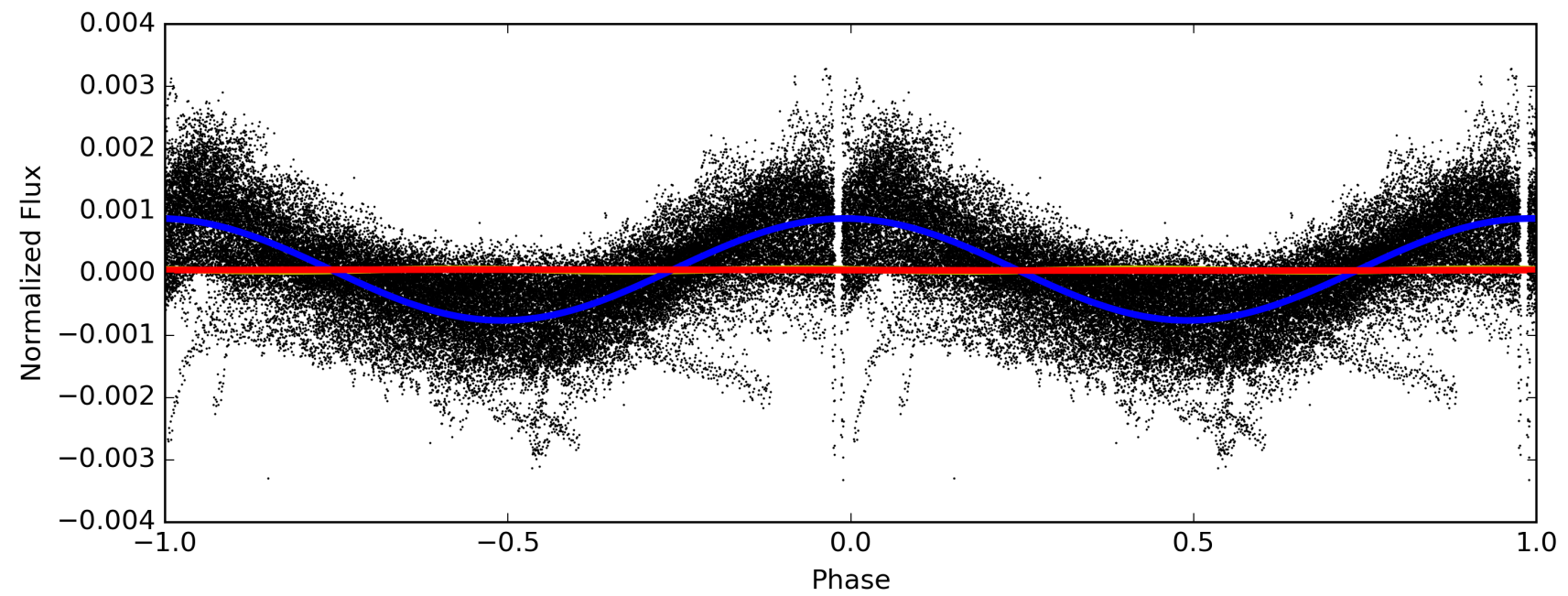
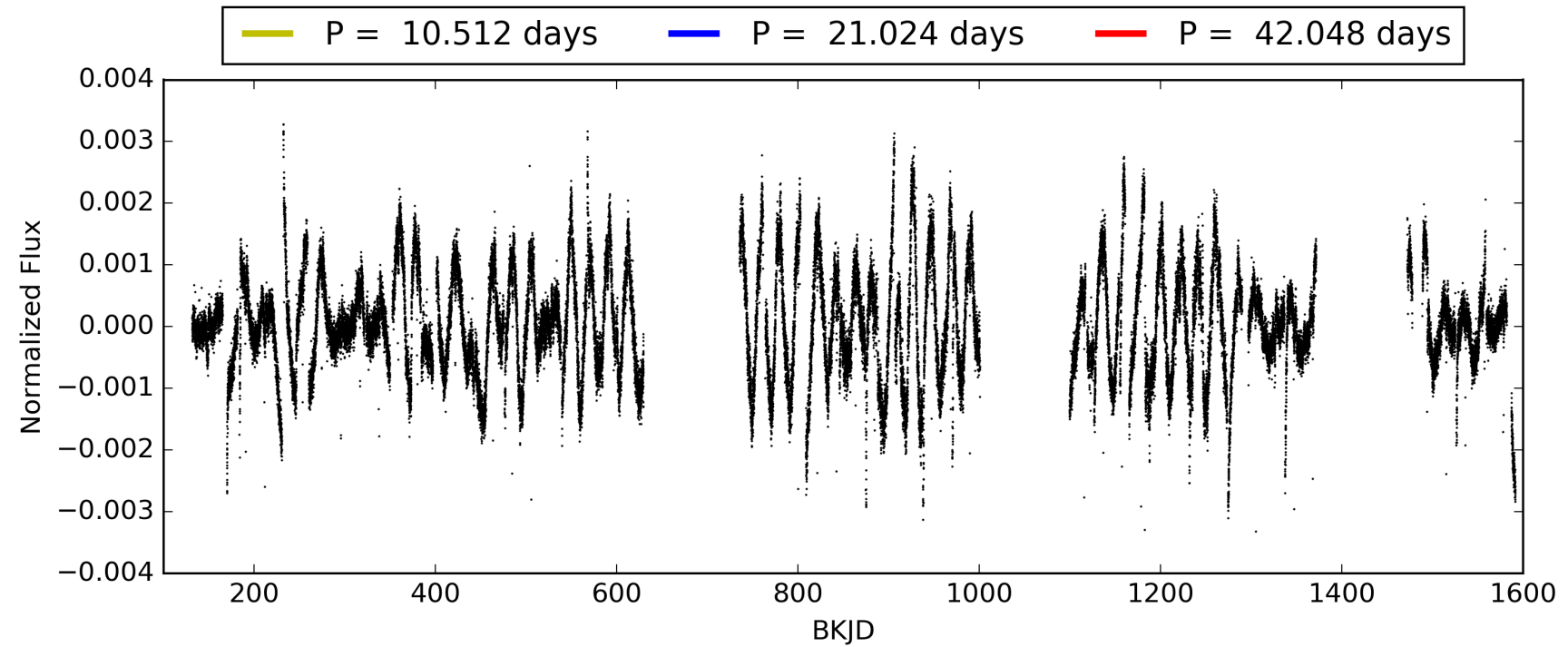
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 17:06:46 Z

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

TCE 010228942-02, PDC Light Curves

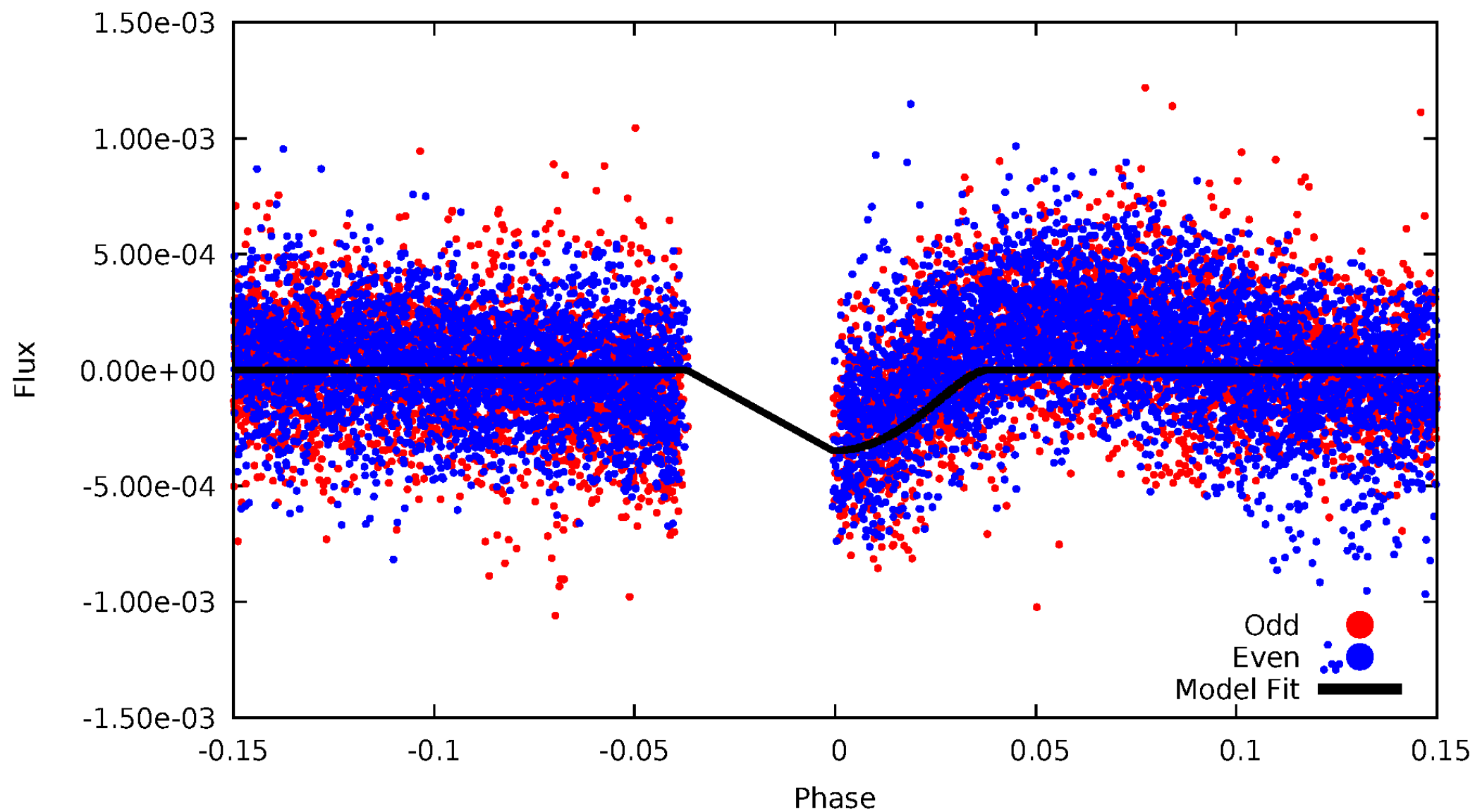


TCE 010228942-02



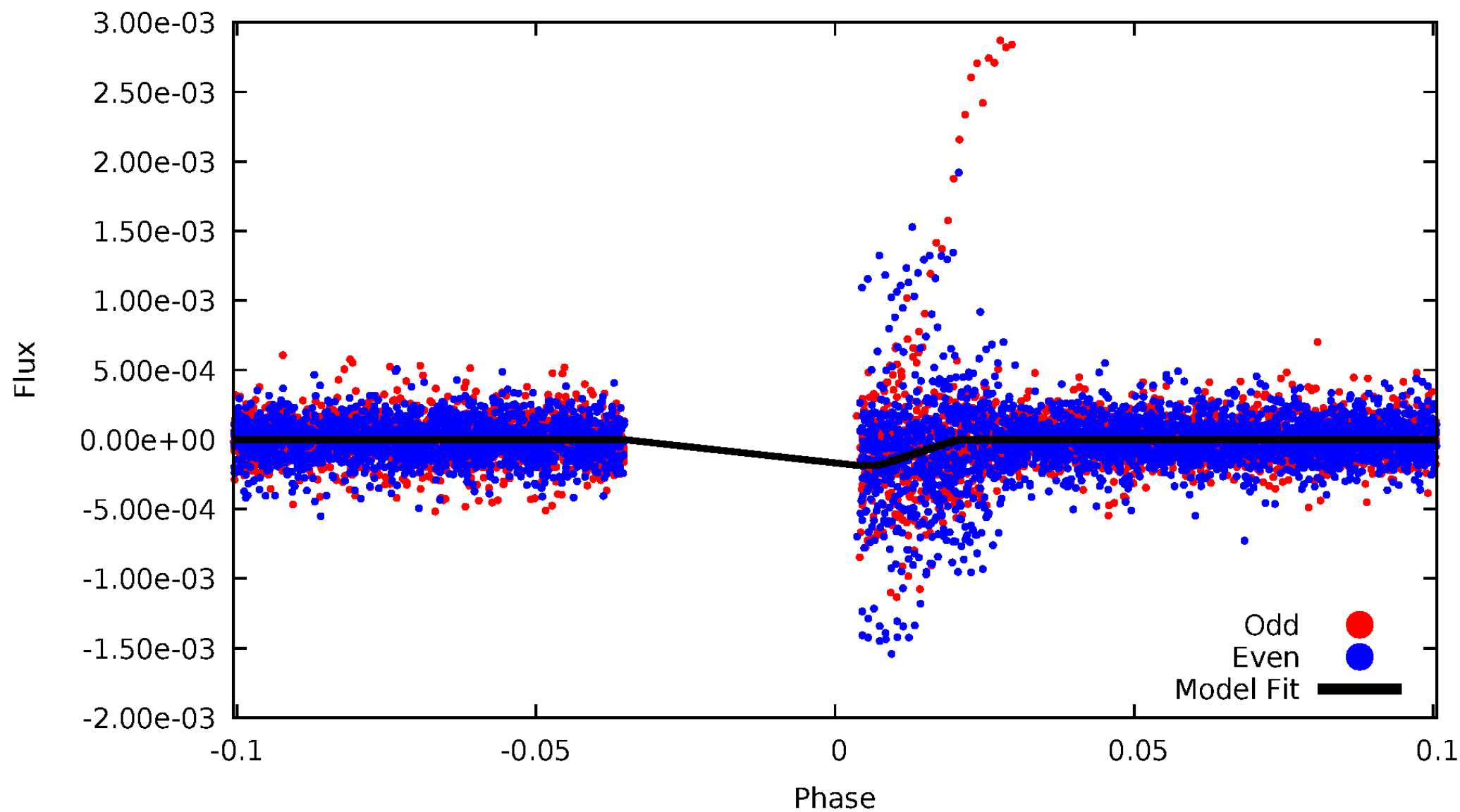
DV Odd/Even

TCE 010228942-02



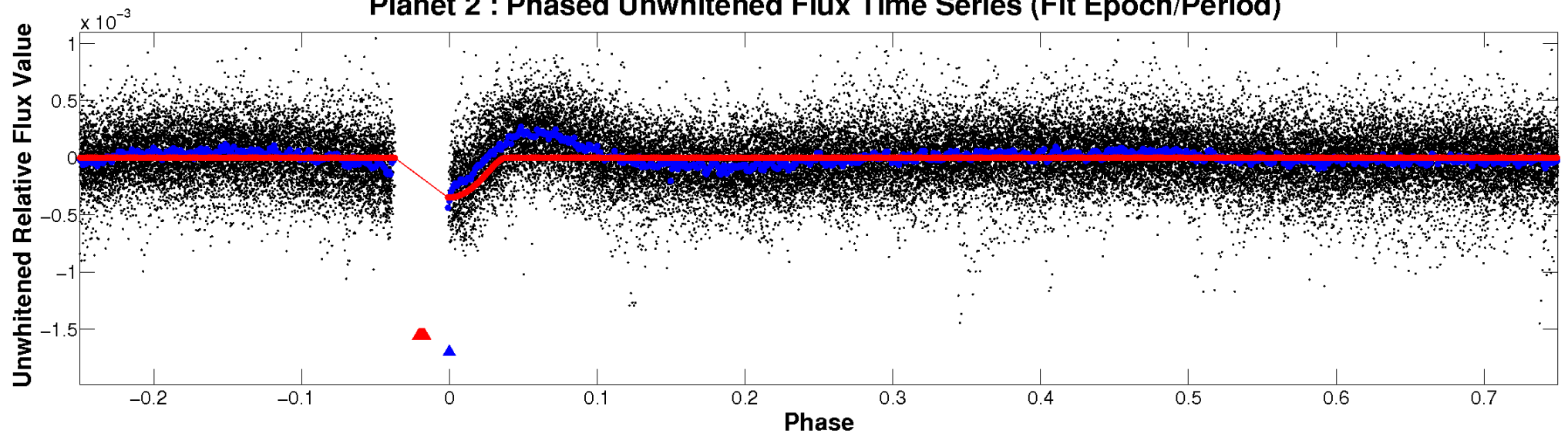
ALT Odd/Even

TCE 010228942-02

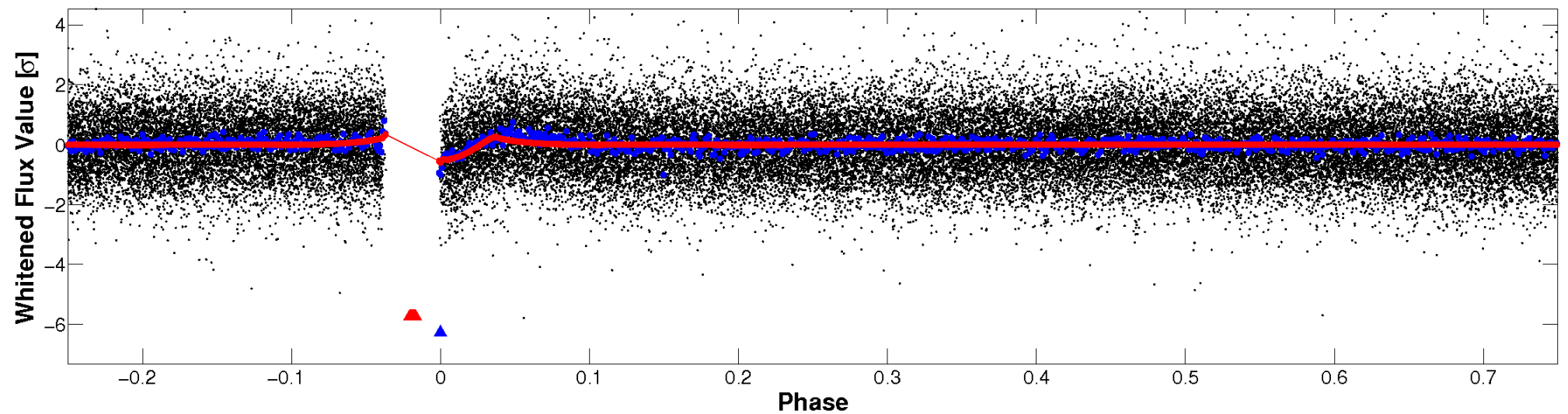


Non-Whitened Vs. Whitened Light Curve

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

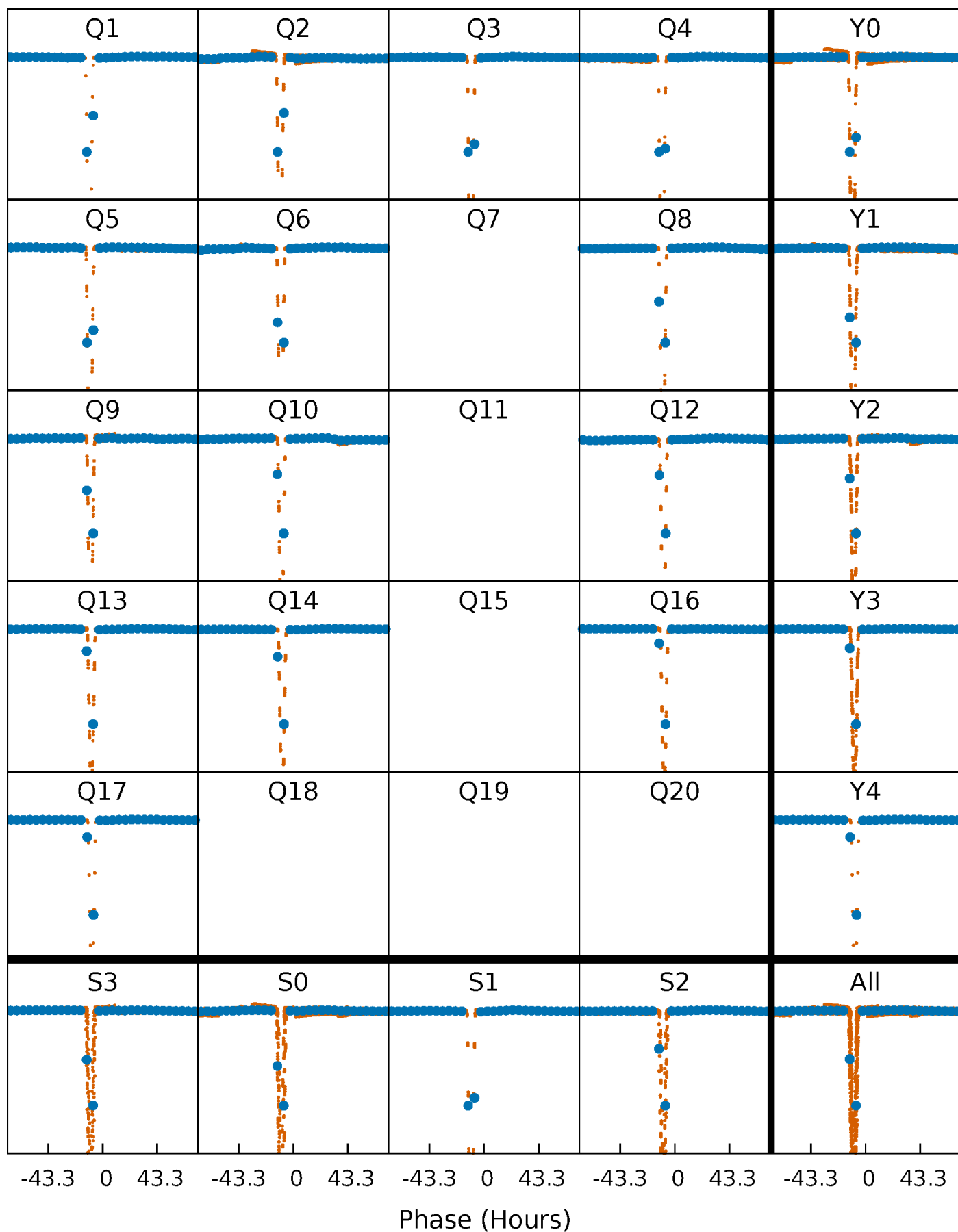


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



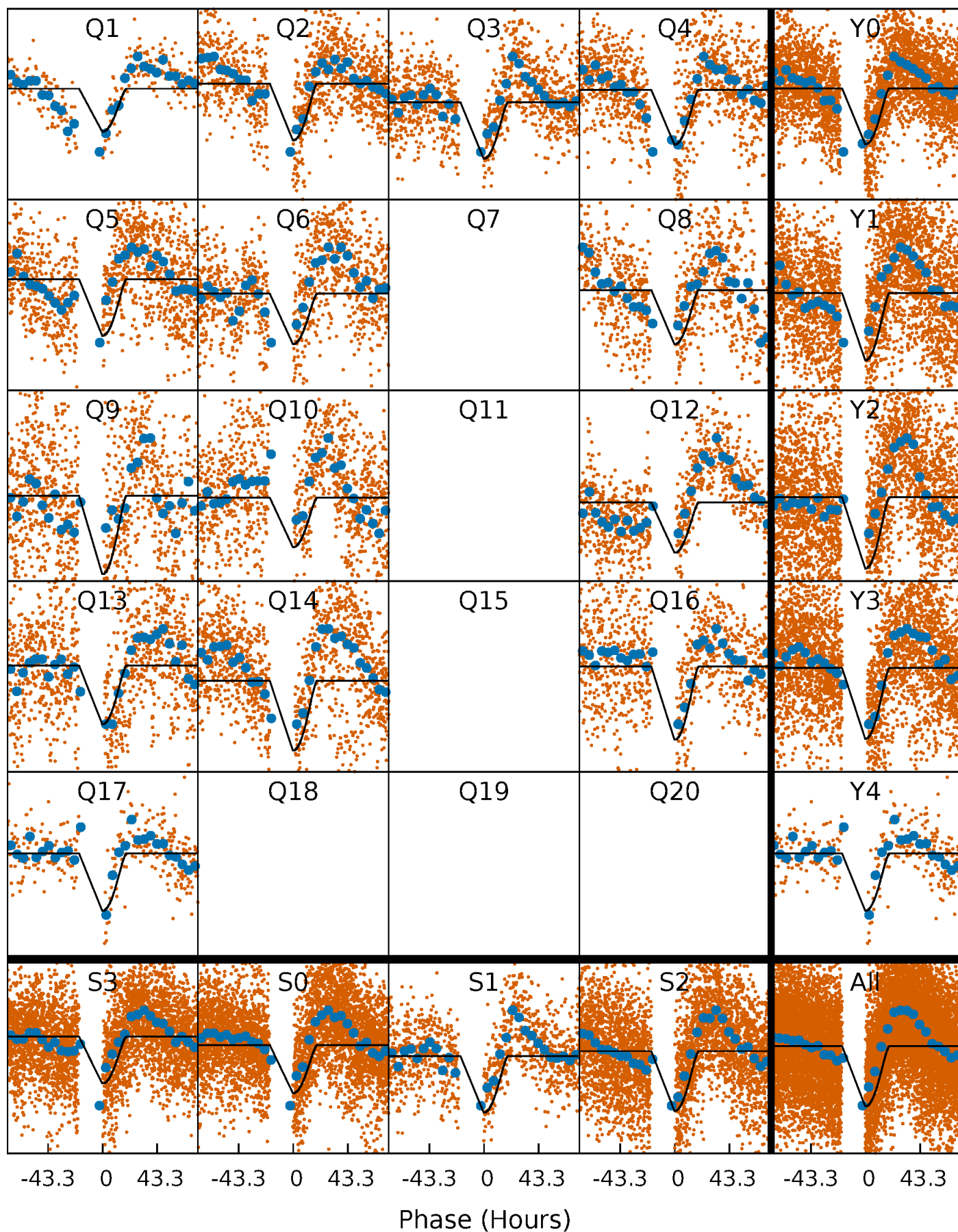
PDC Quarter-Phased Transit Curves

TCE 010228942-02 P= 21.024200 Days $T_0=148.658187$ (BKJD)



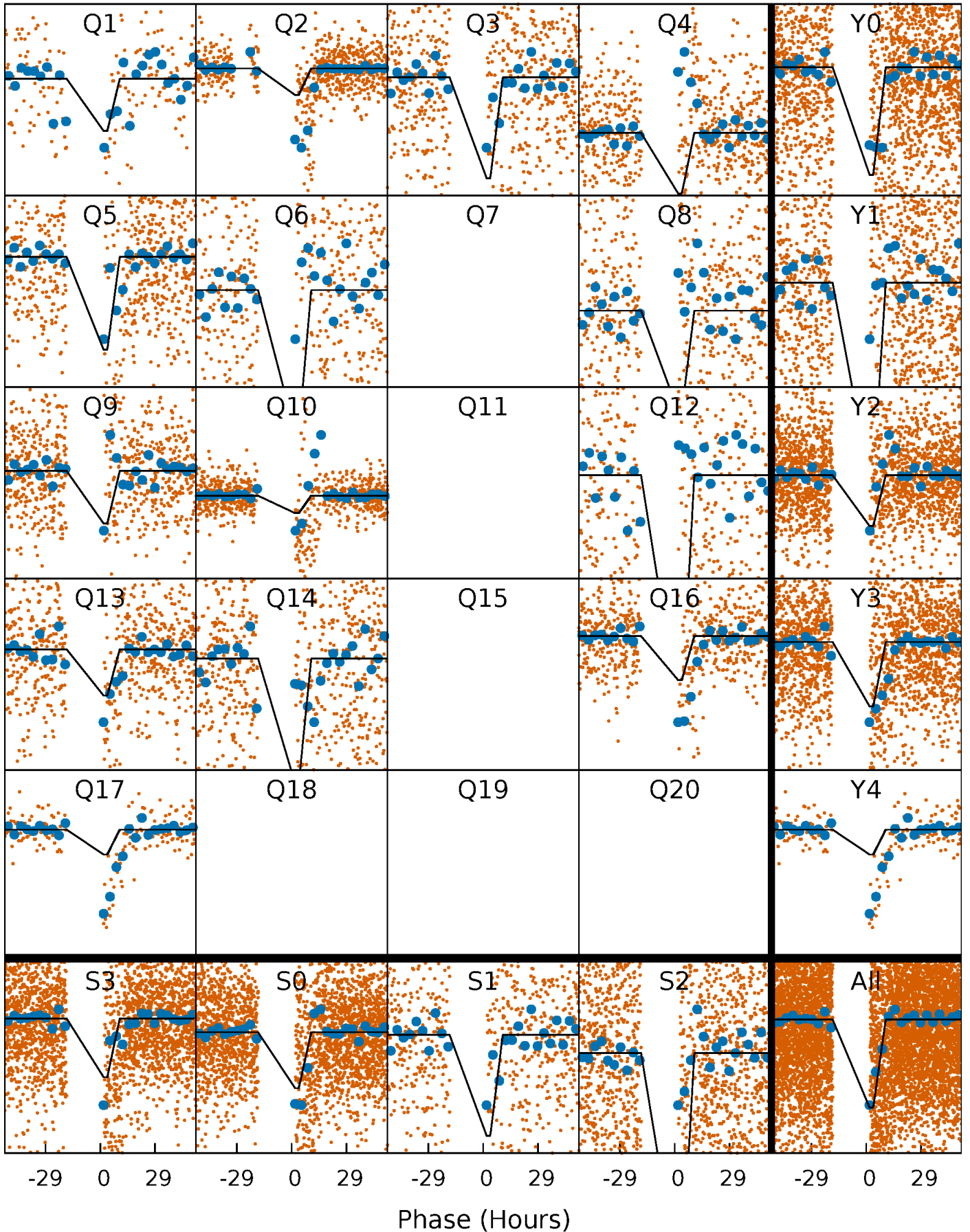
DV Quarter-Phased Transit Curves

TCE 010228942-02 P= 21.024200 Days $T_0=148.658187$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

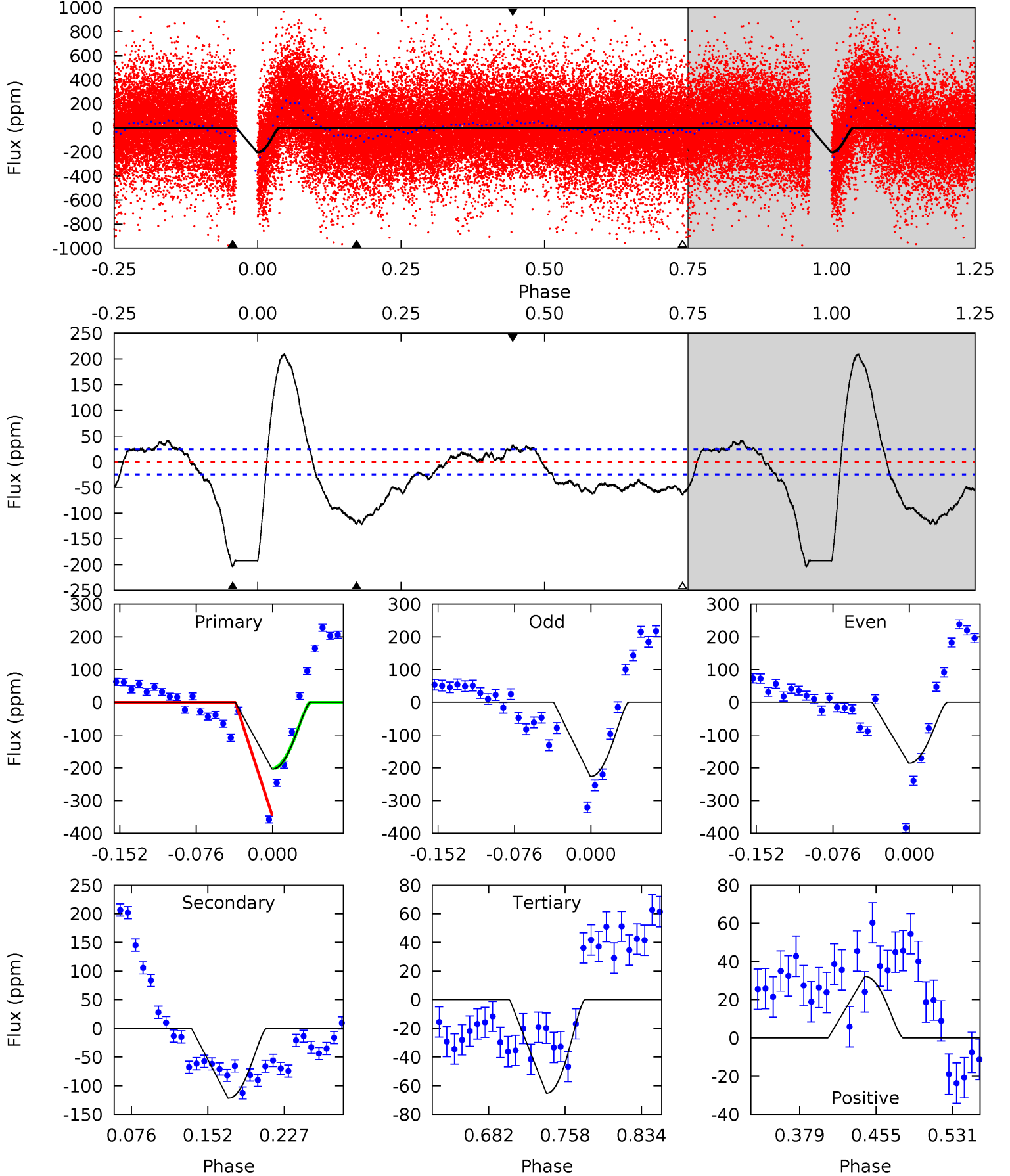
TCE 010228942-02 P= 21.025767 Days $T_0=148.542988$ (BKJD)



DV Model-Shift Uniqueness Test

010228942-02, P = 21.024200 Days, E = 127.633987 Days

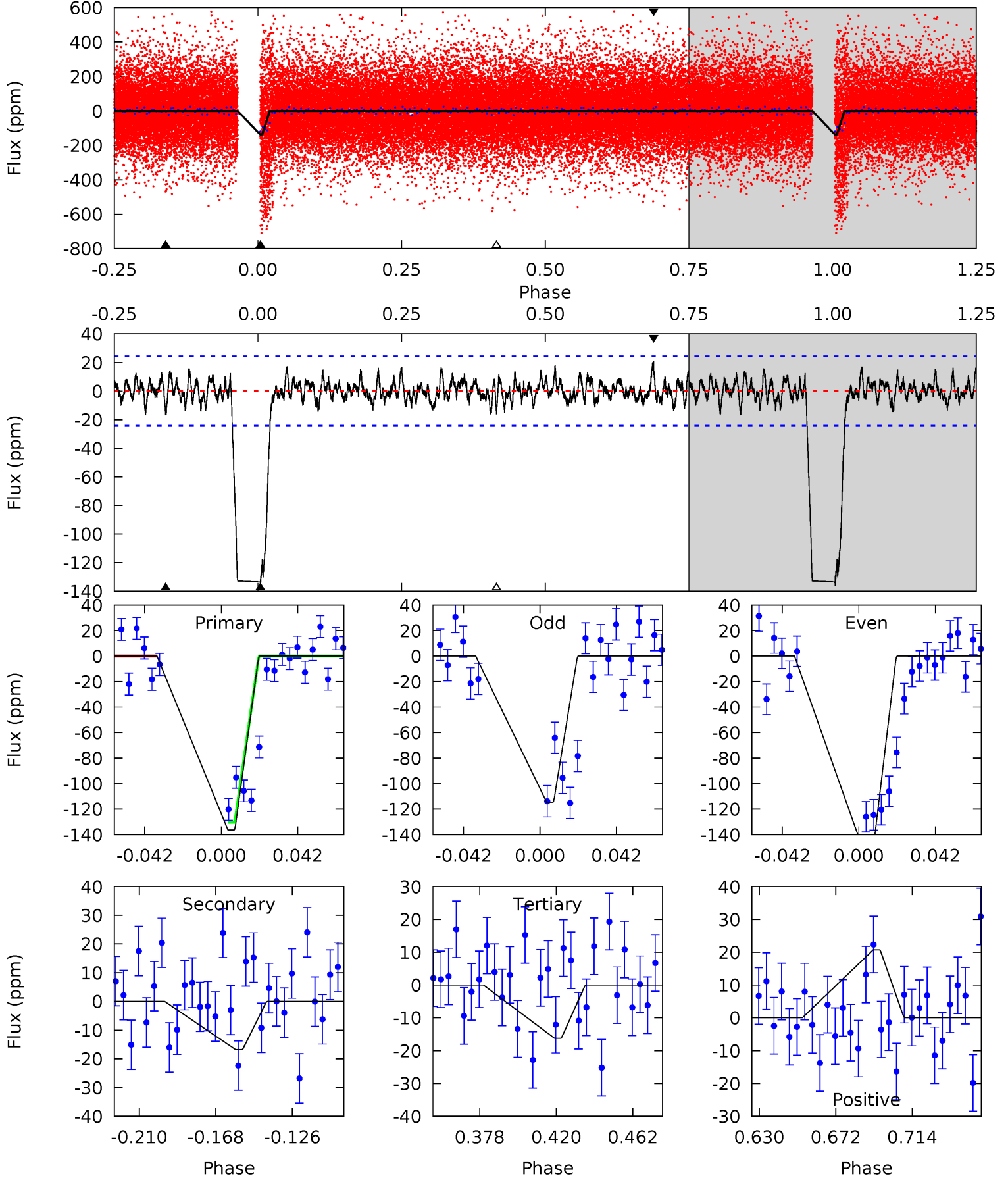
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 38.3 | 22.9 | 12.2 | 6.04 | 4.62 | 1.78 | 10.5 | 26.0 | 32.2 | 10.6 | 16.8 | 3.76 | 0.93 | 0.51 | 2.98 |



Alt Model-Shift Uniqueness Test

010228942-02, P = 21.025767 Days, E = 127.517221 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|-----|
| 26.6 | 3.28 | 3.17 | 4.05 | 4.74 | 2.03 | 1.67 | 23.5 | 22.6 | 0.11 | -0.77 | 4.11 | 1.39 | 0.13 | 0 |



Stellar Parameters For KIC 010228942

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | $R (R_{\odot})$ | $M(M_{\odot})$ | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
| | 6631^{+180}_{-200} | $3.798^{+0.328}_{-0.082}$ | $-0.360^{+0.300}_{-0.250}$ | $2.438^{+0.455}_{-0.910}$ | $1.361^{+0.212}_{-0.259}$ | $0.132^{+0.306}_{-0.041}$ |
| | +3%/-3% | +9%/-2% | +83%/-69% | +19%/-37% | +16%/-19% | +231%/-31% |
| Source | PHO1 | FLK73 | 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 010228942-02 / KOI

| Detrend | Depth (ppm) | $R_p (R_{\oplus})$ | $T_{\text{max}} (K)$ | $T_{\text{obs}} (K)$ | A_{obs} |
|---------|--------------|------------------------|----------------------|-----------------------|----------------------------|
| DV | -122 ± 5 | $9.58^{+8.60}_{-6.28}$ | 1530^{+90}_{-135} | 3865^{+2106}_{-706} | 20^{+152}_{-14} |
| Alt. | -17 ± 5 | $7.48^{+6.91}_{-5.38}$ | 1536^{+91}_{-141} | 3062^{+1645}_{-599} | $4.523^{+53.386}_{-3.416}$ |

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

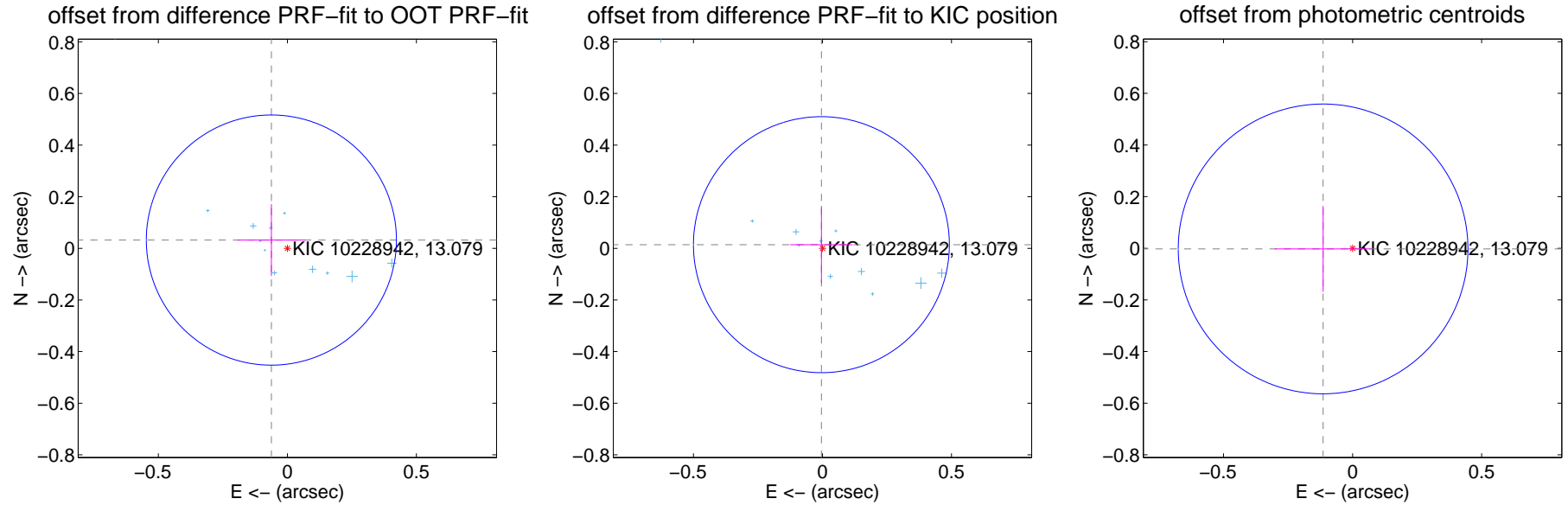
DV Centroid Data

Supplemental centroid analysis for 010228942-02. Kepler magnitude: 13.08. Transit SNR 15.62

There are 14 quarters with good PRF difference image offsets

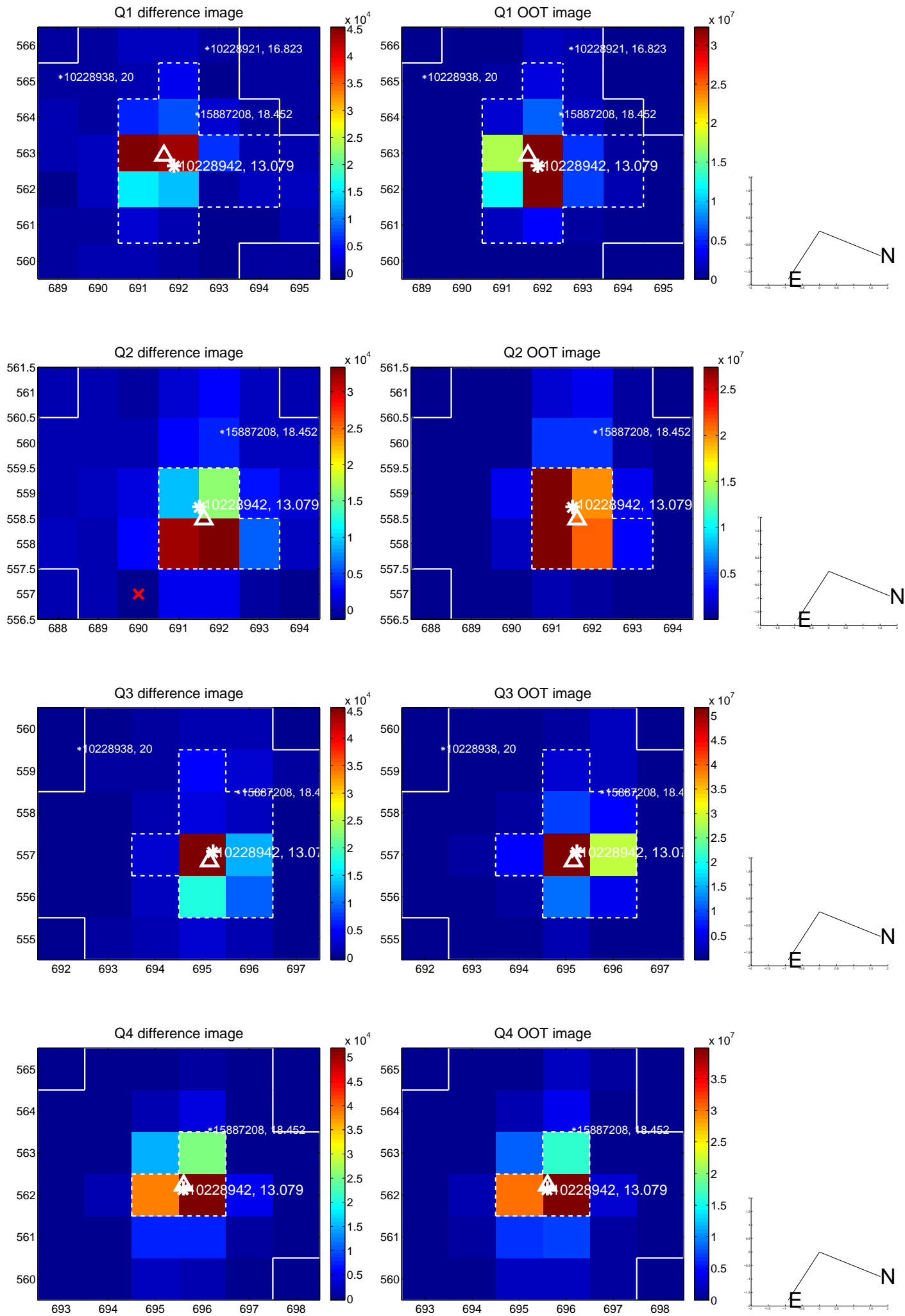
The direct PRF centroid is offset from the target star catalog position by about 0.09 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|---|--------------------|---------------------|-------------------|-------------------|
| PRF-fit source offset from OOT | 0.070 ± 0.162 | 0.43 | 0.062 ± 0.131 | 0.032 ± 0.139 |
| PRF-fit source offset from KIC position | 0.015 ± 0.165 | 0.09 | 0.004 ± 0.121 | 0.014 ± 0.150 |
| photometric centroid source offset | 0.11 ± 0.19 | 0.61 | 0.11 ± 0.19 | -0.00 ± 0.17 |

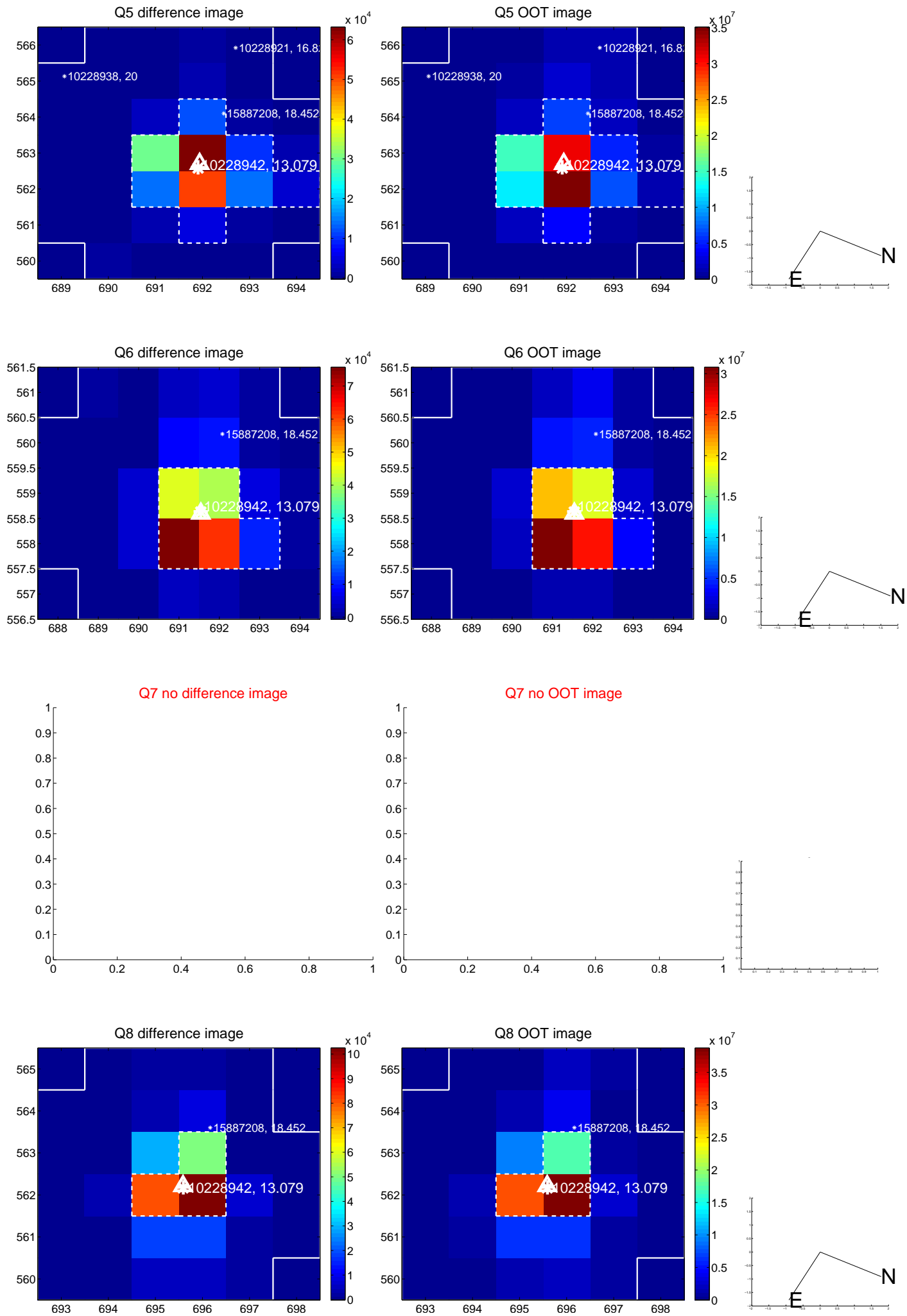


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

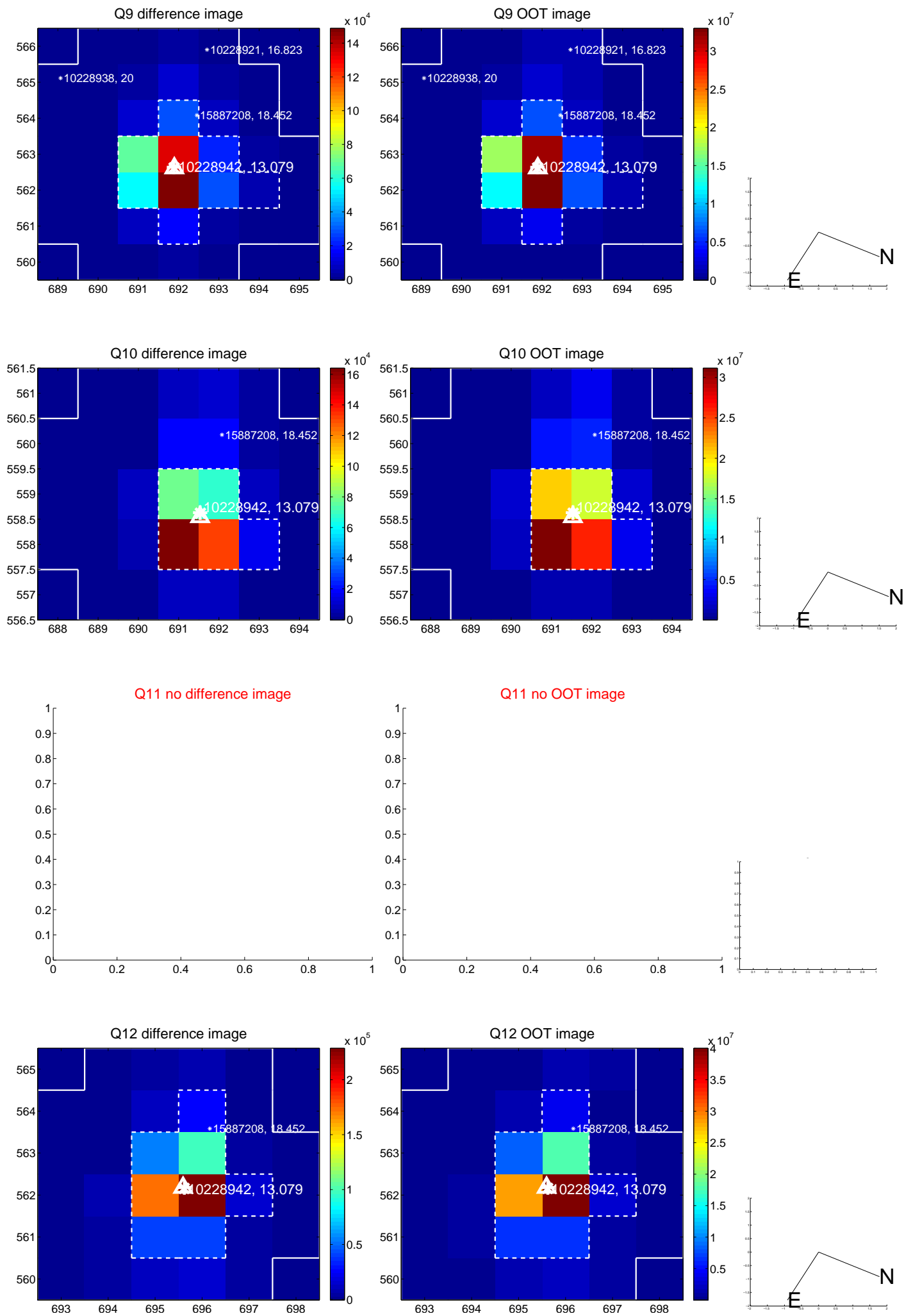
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



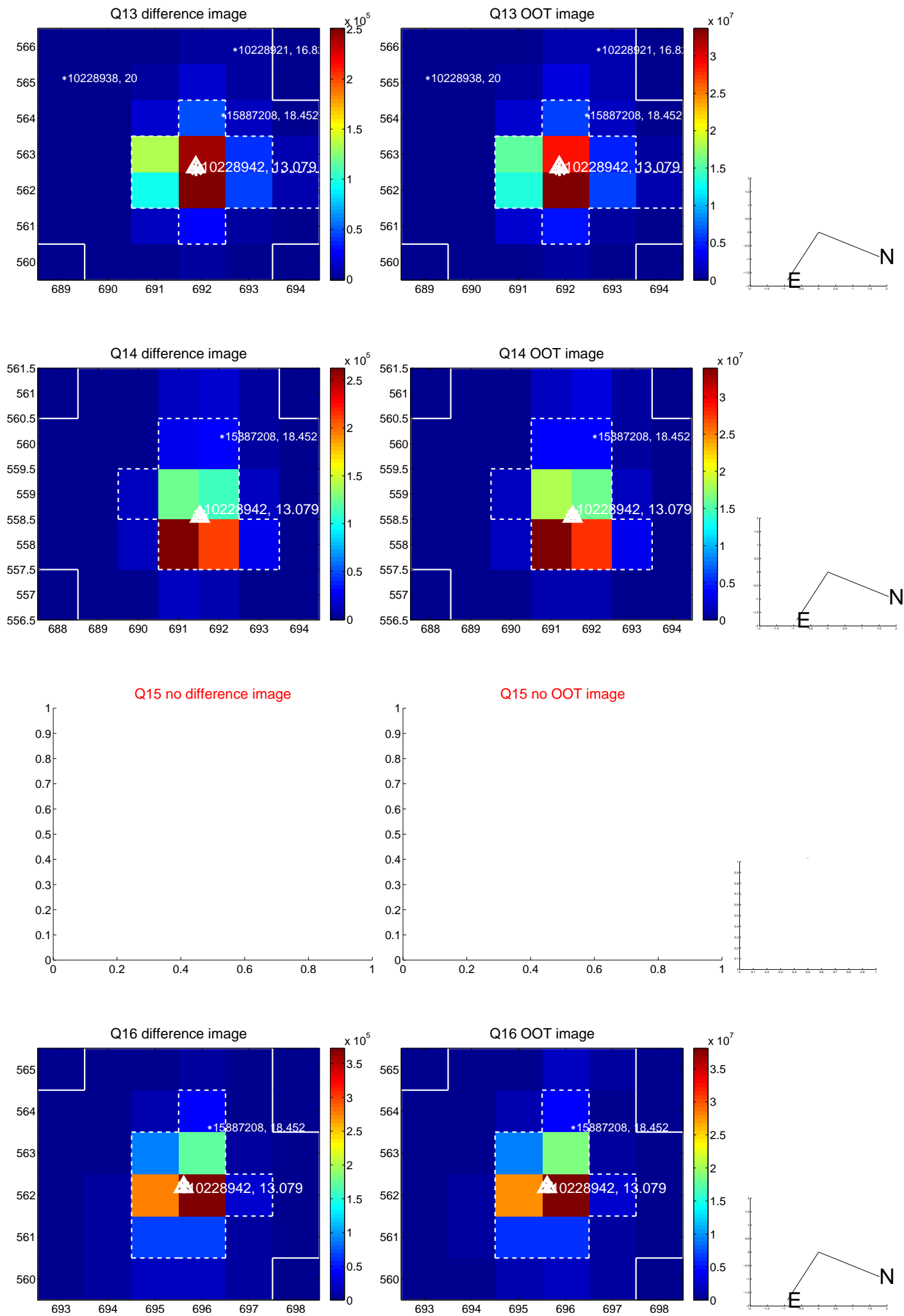
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



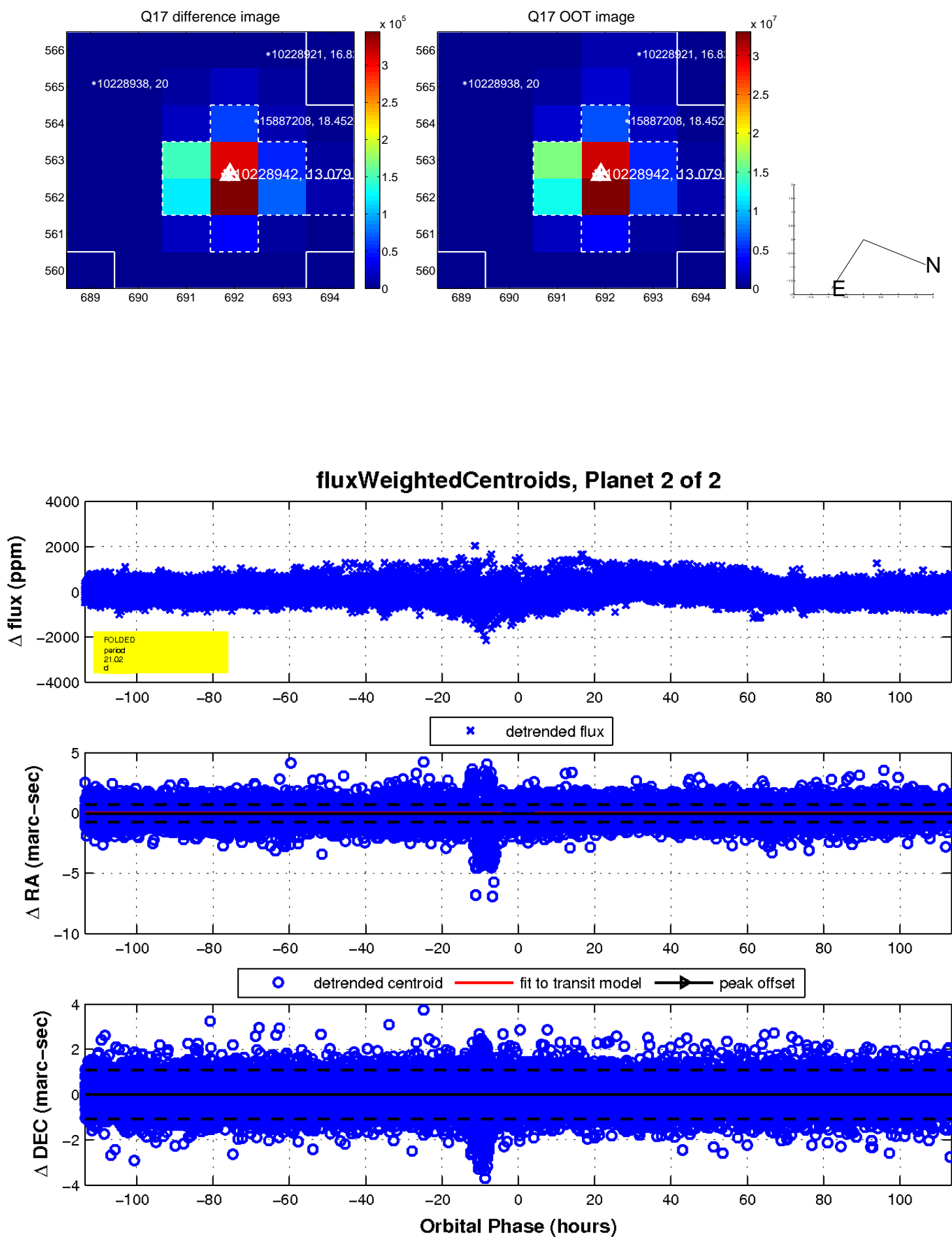
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

