

KIC 011044770

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}) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 011044770-01 | OBS | 0170.01 | 15.608666 | 144.297761 | 298.7 | 6.066 | 35.8 | 37.3 | 2.43 | 8014 | 5.79 | 959.86 |
| 011044770-02 | OBS | No | 15.608665 | 139.923977 | 100.6 | 3.674 | 12.9 | 12.9 | 2.43 | 8014 | 2.77 | 959.86 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|--|
| 011044770-01 | OBS | FP | 0.00 | 0 | 1 | 1 | 1 | MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE—CENT_RESOLVED_OFFSET—HALO_GHOST—EPHEM_MATCH |
| 011044770-02 | OBS | FP | 0.00 | 1 | 1 | 1 | 1 | IS_SEC_TCE—CENT_RESOLVED_OFFSET—HALO_GHOST—EPHEM_MATCH |

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 011044770-01

| TCE (1) | KIC | Parent (2) | Parent KIC | $P_1:P_2$ | Dist ($''$) | Δ Row | Δ Col | m_2 | m_1 | D_2/D_1 | Mechanism | Flag | σ_P | σ_T |
|--------------|----------|------------|------------|-----------|---------------|--------------|--------------|-------|-------|-----------|------------|------|------------|------------|
| 011044770-01 | 11044770 | 3327.01 | 11044779 | 1:1 | 11.0 | 2 | 0 | 15.47 | 13.38 | 121.08 | Direct-PRF | 0 | 0.10 | 0.14 |

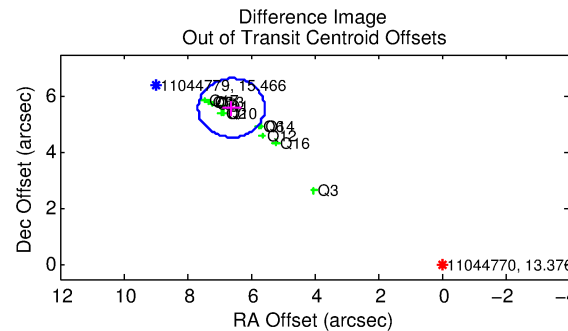
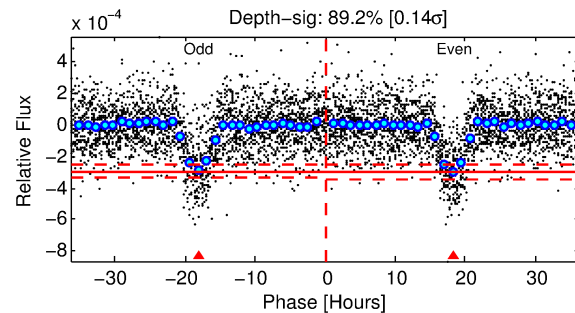
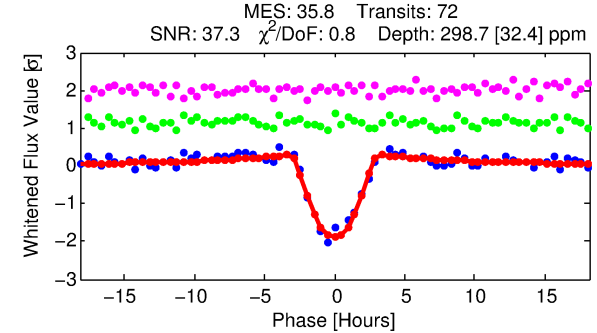
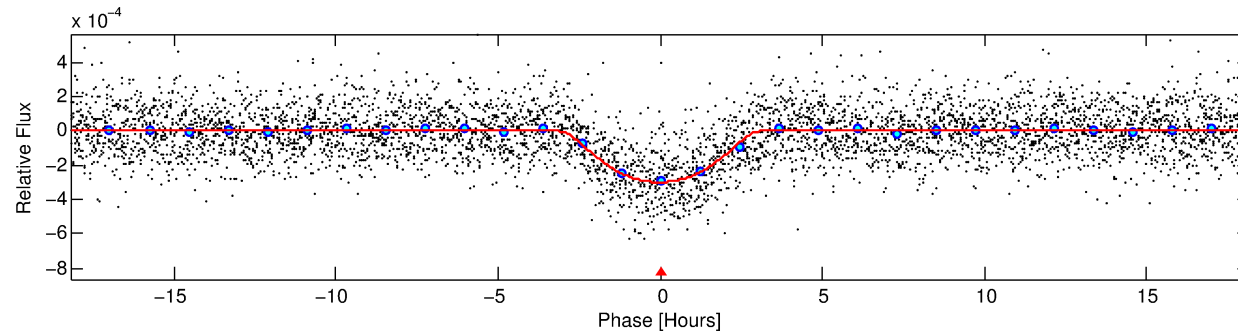
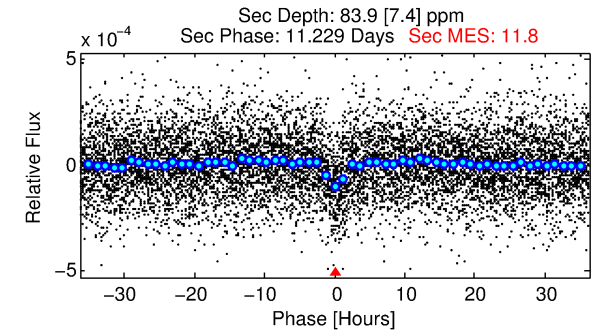
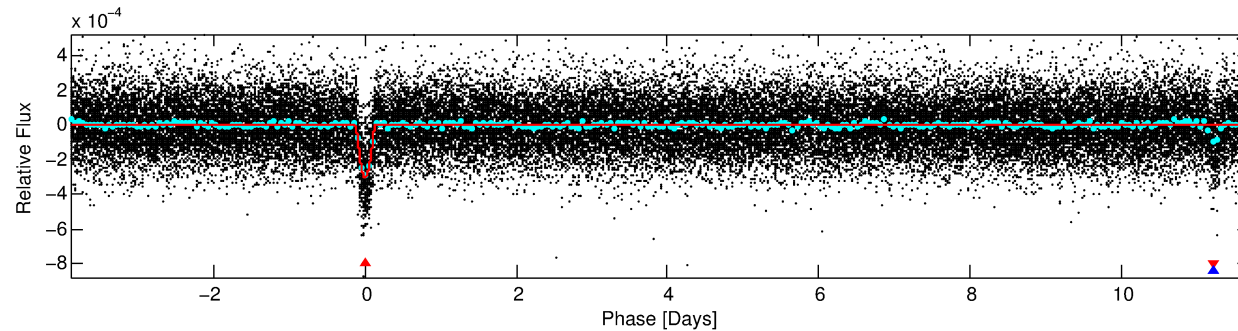
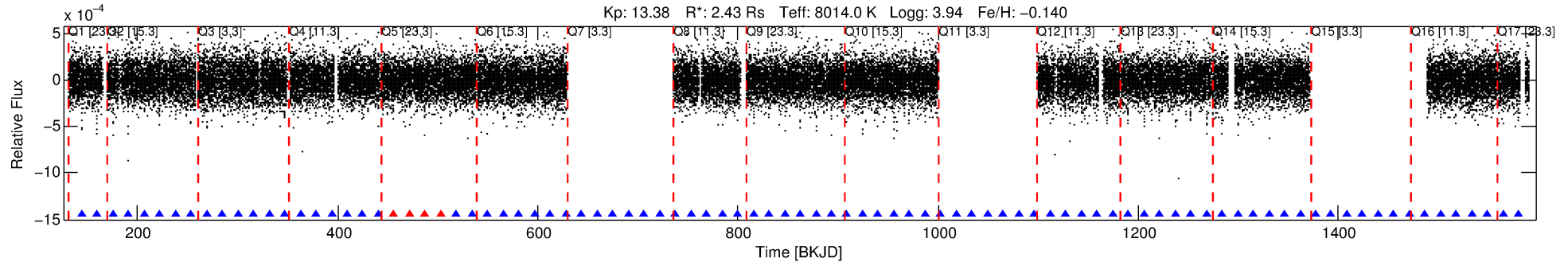
Notes: $P_1:P_2$ is the period ratio. Dist is the distance in arcseconds. Δ Row and Δ Col are the number of pixels apart in row and column. m_2 and m_1 are the magnitudes of the parent and child. D_2/D_1 is the parent's transit depth divided by the child's. σ_P and σ_T are the significance of the match in period and epoch. For a match to be considered significant $\sigma_P < 5.0$ and $\sigma_T < 5.0$. Matches which have σ_P and σ_T very close to this cutoff should receive extra scrutiny, especially if the period ratio is very large.

DV One-Page Summary

KIC: 11044770 Candidate: 1 of 2 Period: 15.609 d

KOI: K00170.01 Corr: 0.992

Kp: 13.38 R*: 2.43 Rs Teff: 8014.0 K Logg: 3.94 Fe/H: -0.140



DV Fit Results:

Period = 15.60867 [0.00006] d
Epoch = 144.2978 [0.0033] BKJD
Rp/R* = 0.0218 [0.0028]
a/R* = 5.53 [0.47]
b = 0.98 [0.01]
Seff = 959.86 [485.73]
Teq = 1419 [180] K
Rp = 5.79 [2.25] Re
a = 0.1508 [0.0479] AU
Ag = 31.27 [17.16] [1.76σ]
Teffp = 5189 [421] K [8.24σ]

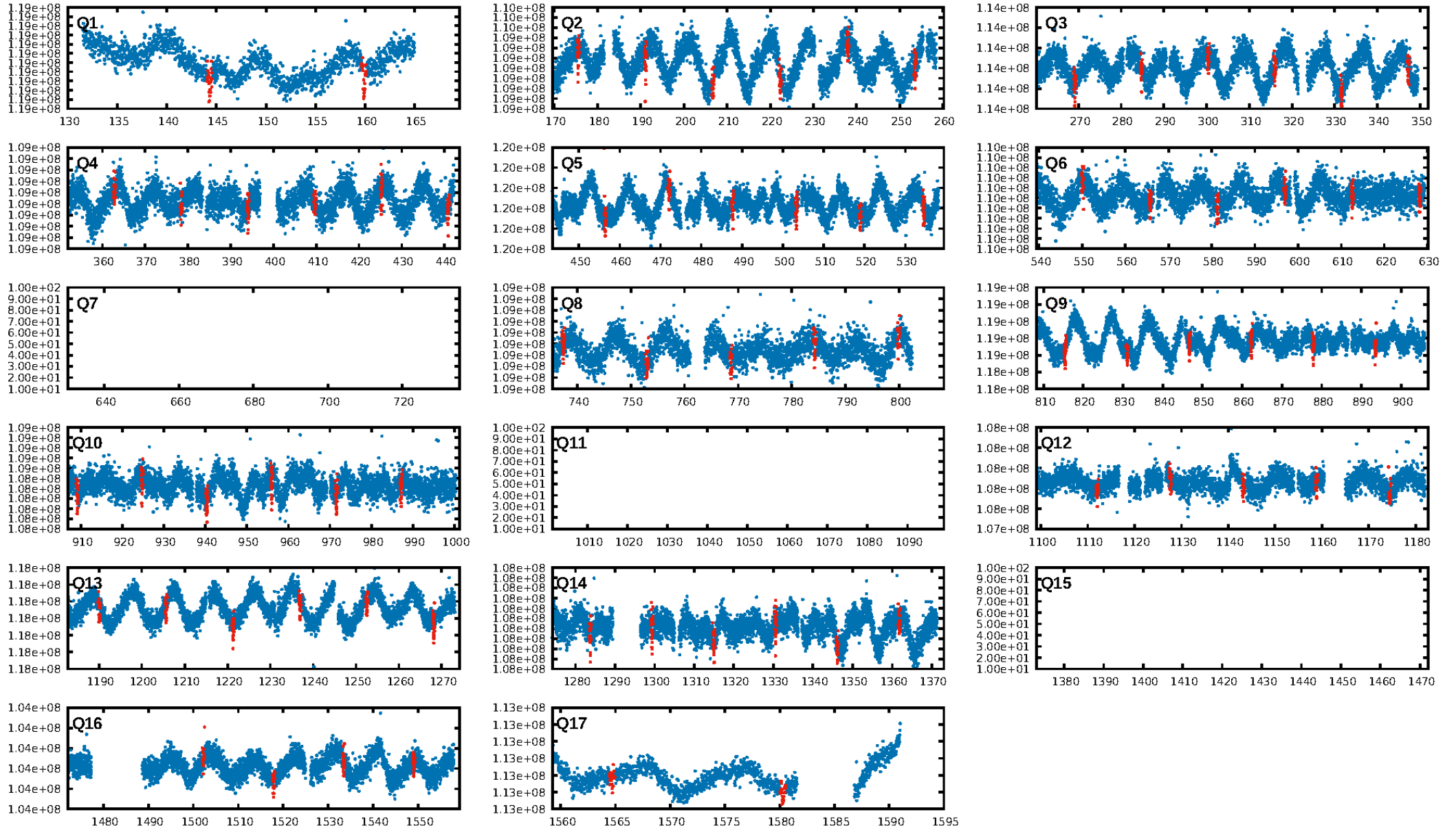
DV Diagnostic Results:

ShortPeriod-sig: 0.0% [0.00σ]
LongPeriod-sig: N/A
ModelChiSquare2-sig: 0.3%
ModelChiSquareGof-sig: 100.0%
Bootstrap-pfa: 5.37e-268
RollingBand-fgt: 0.94 [64/68]
GhostDiagnostic-chr: -0.223
Centroid-sig: 0.0%
Centroid-so: 16.095 arcsec [32.73σ]
OotOffset-rm: 8.657 arcsec [24.80σ]
KicOffset-rm: 8.483 arcsec [22.19σ]
OotOffset-st: 4/1/2/5 [12]
KicOffset-st: 4/1/2/5 [12]
DiffImageQuality-fgm: 1.00 [12/12]
DiffImageOverlap-fno: 1.00 [14/14]

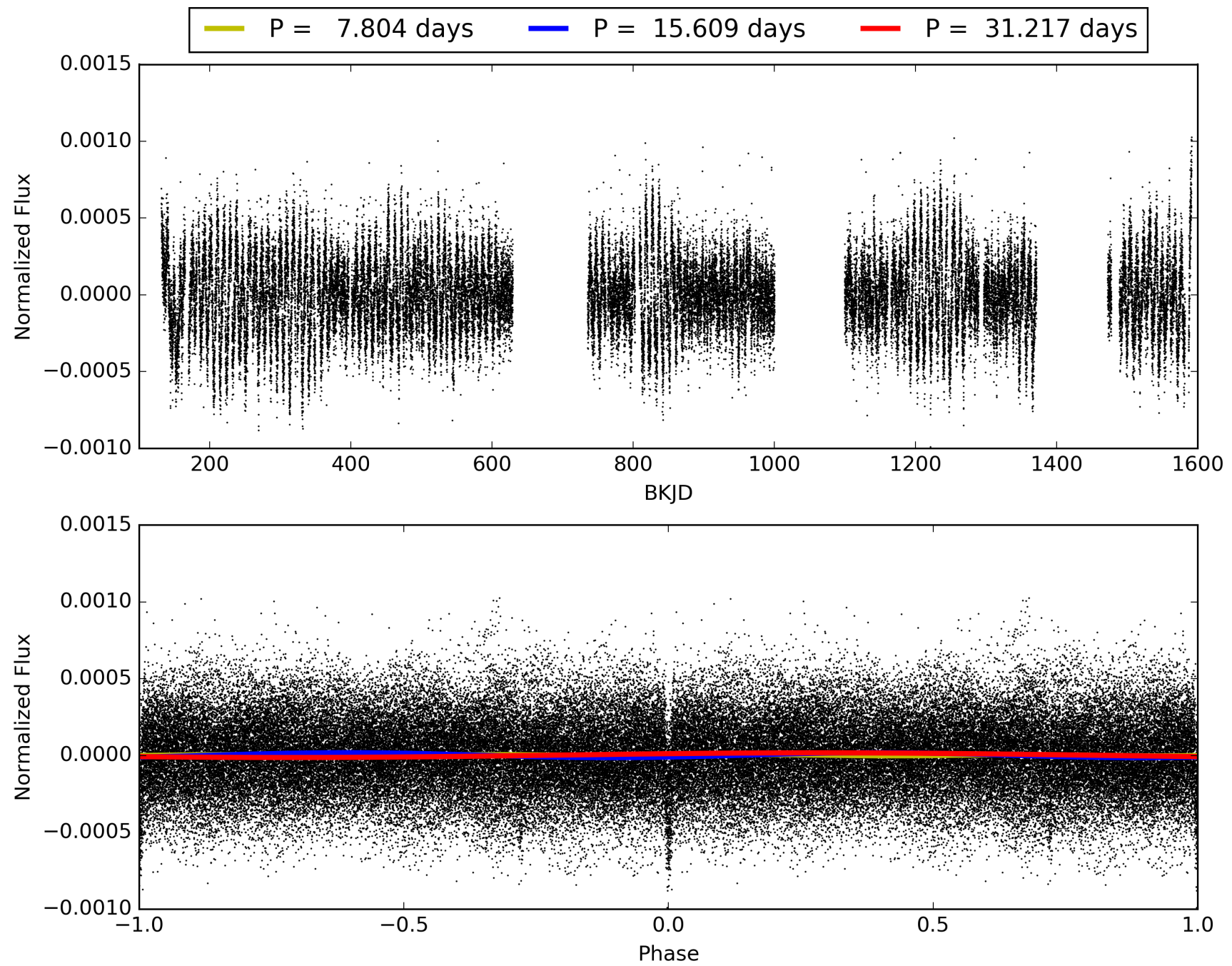
Software Revision: svn-ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 05:58:39 Z

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

TCE 011044770-01, PDC Light Curves

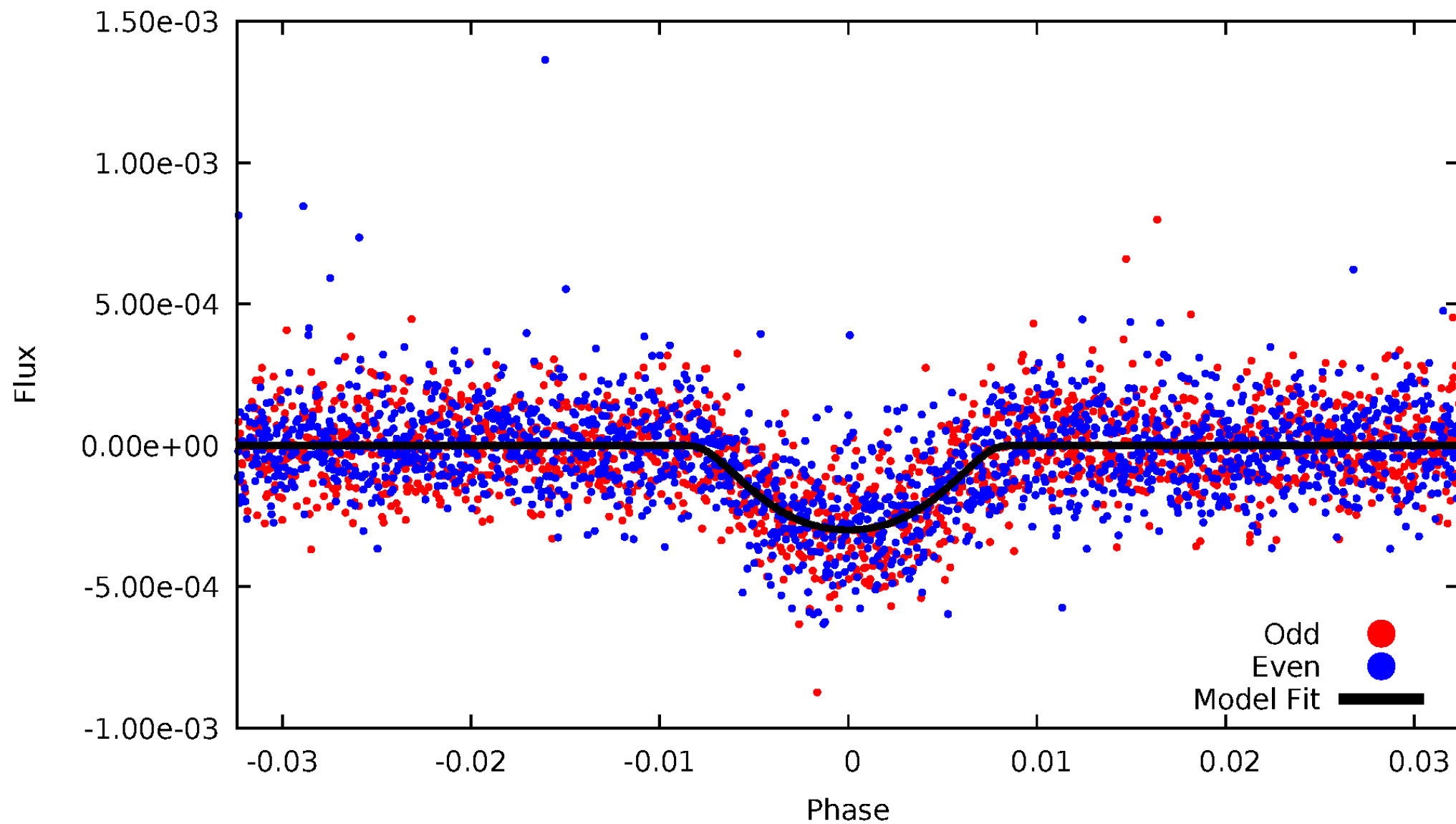


TCE 011044770-01



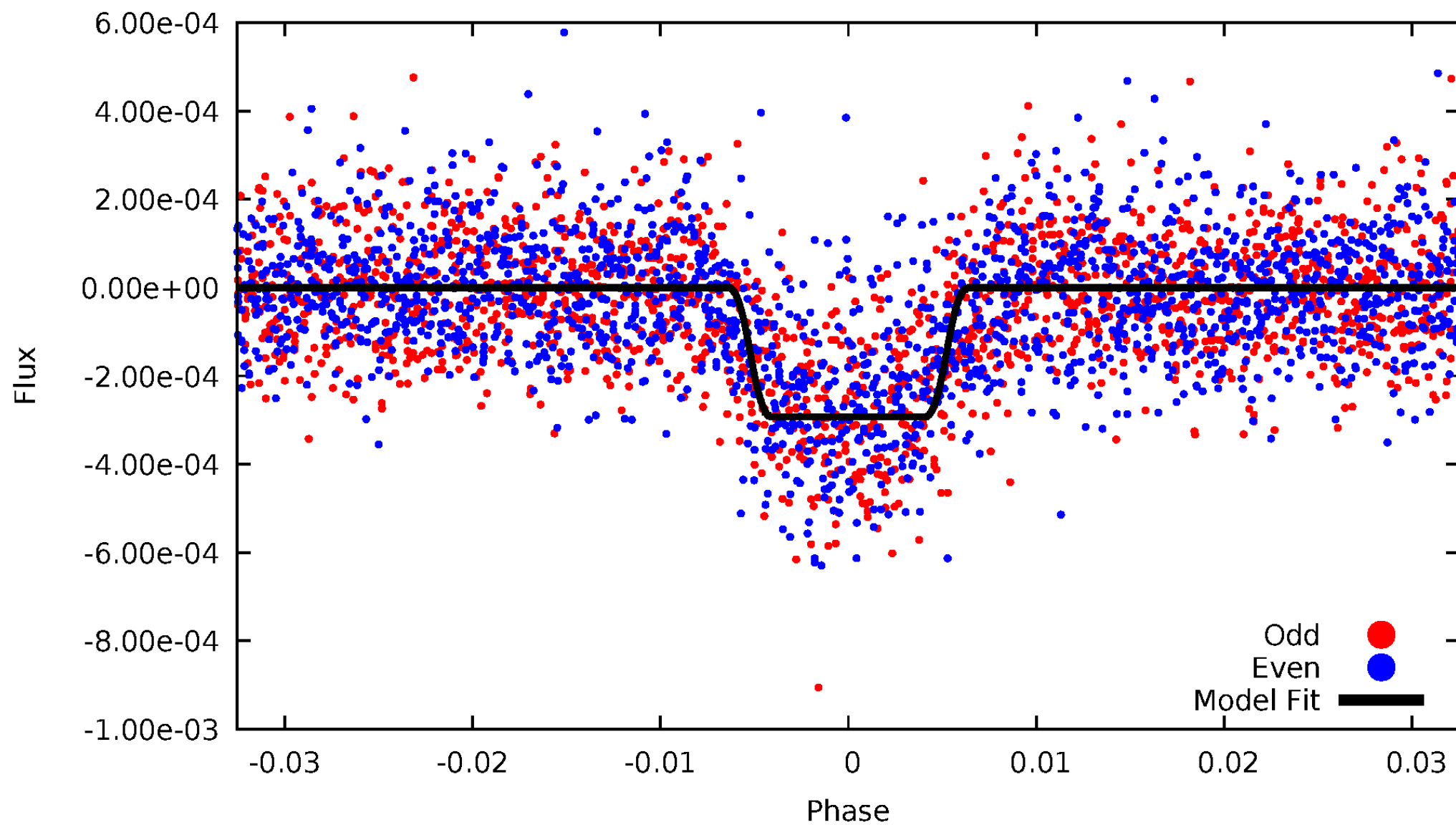
DV Odd/Even

TCE 011044770-01



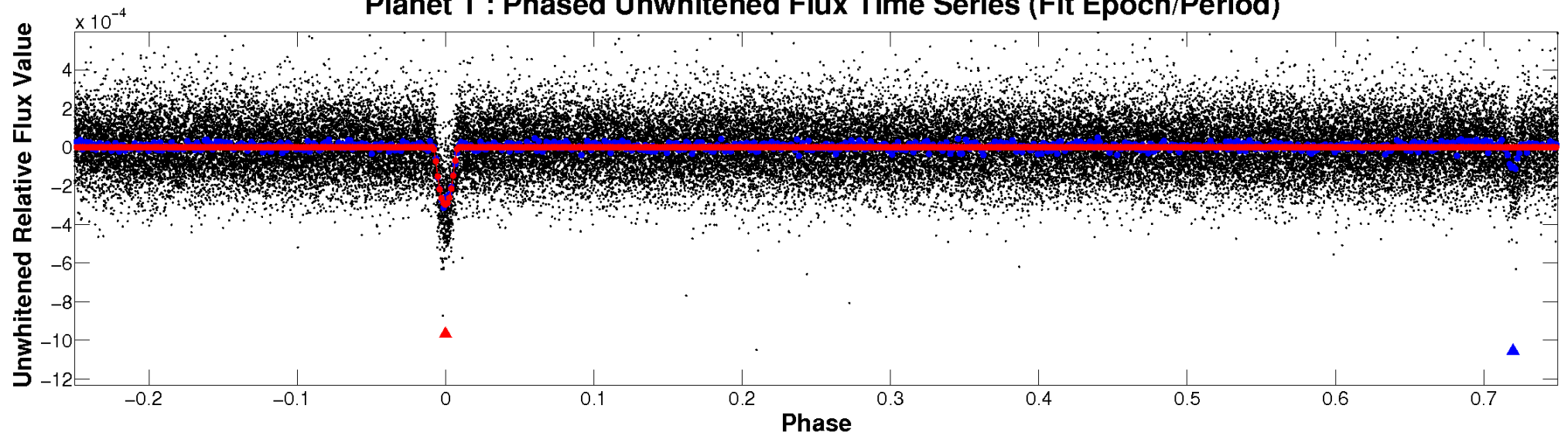
ALT Odd/Even

TCE 011044770-01

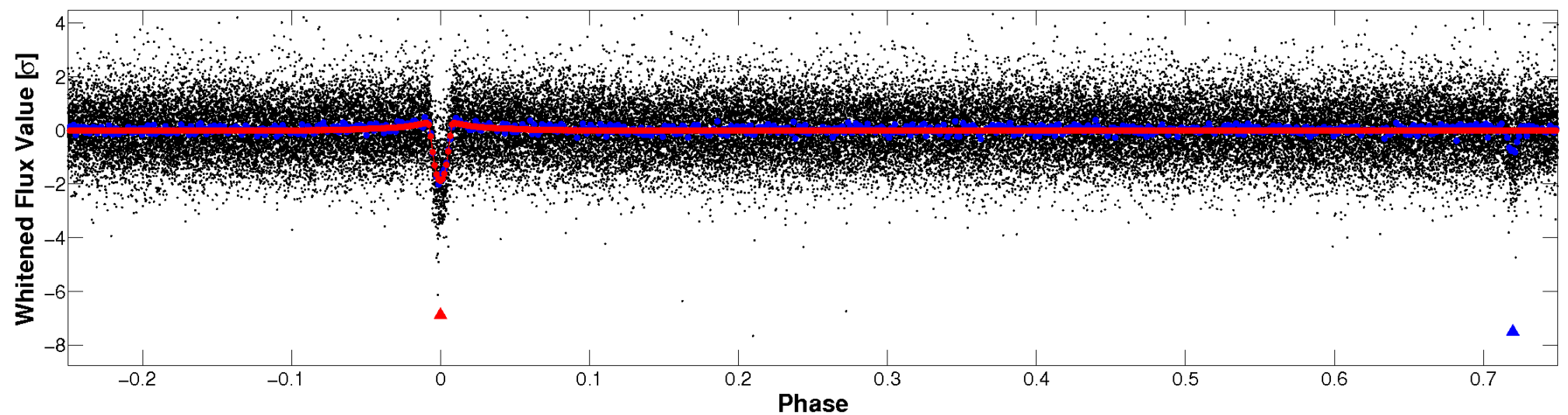


Non-Whitened Vs. Whitened Light Curve

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

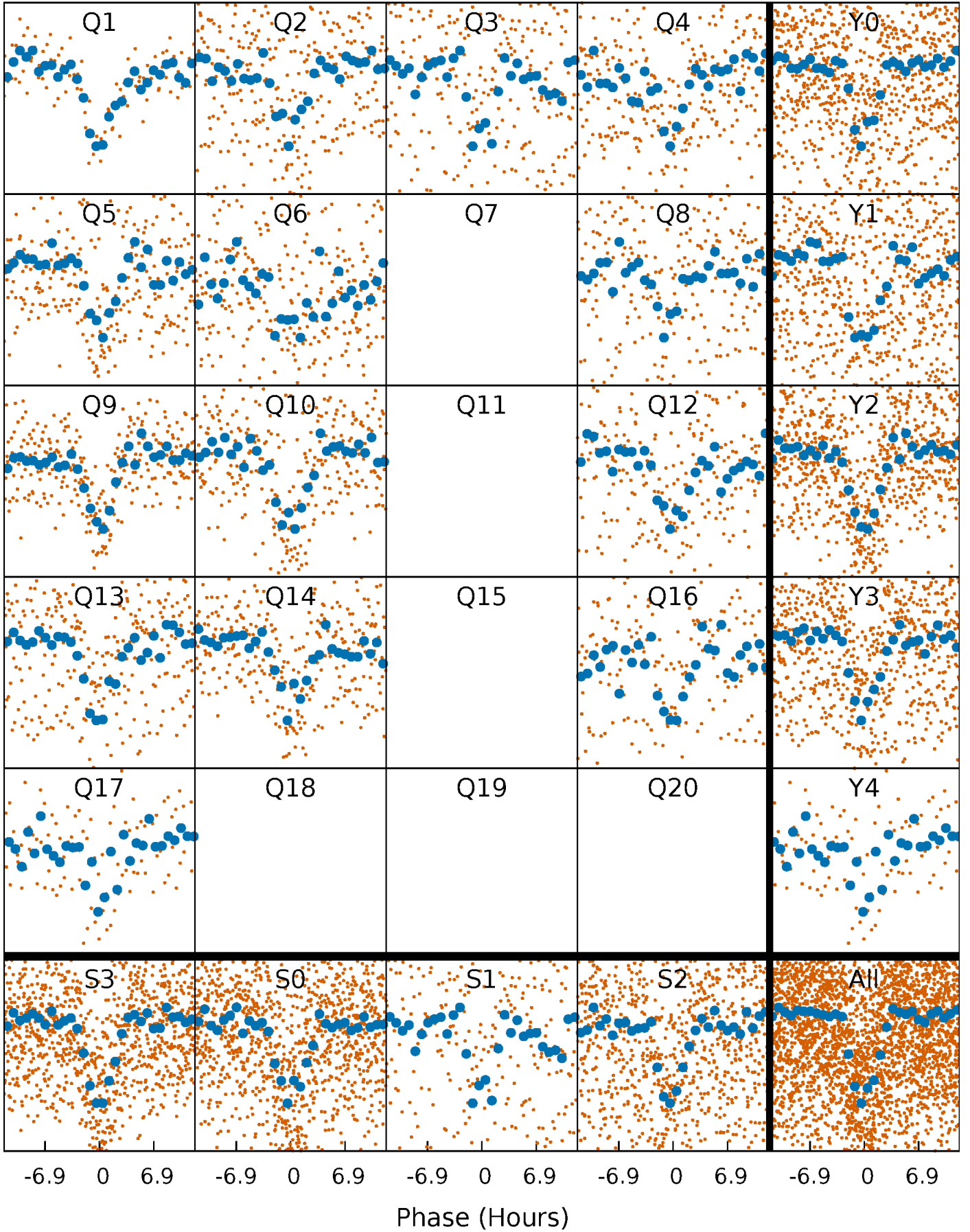


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



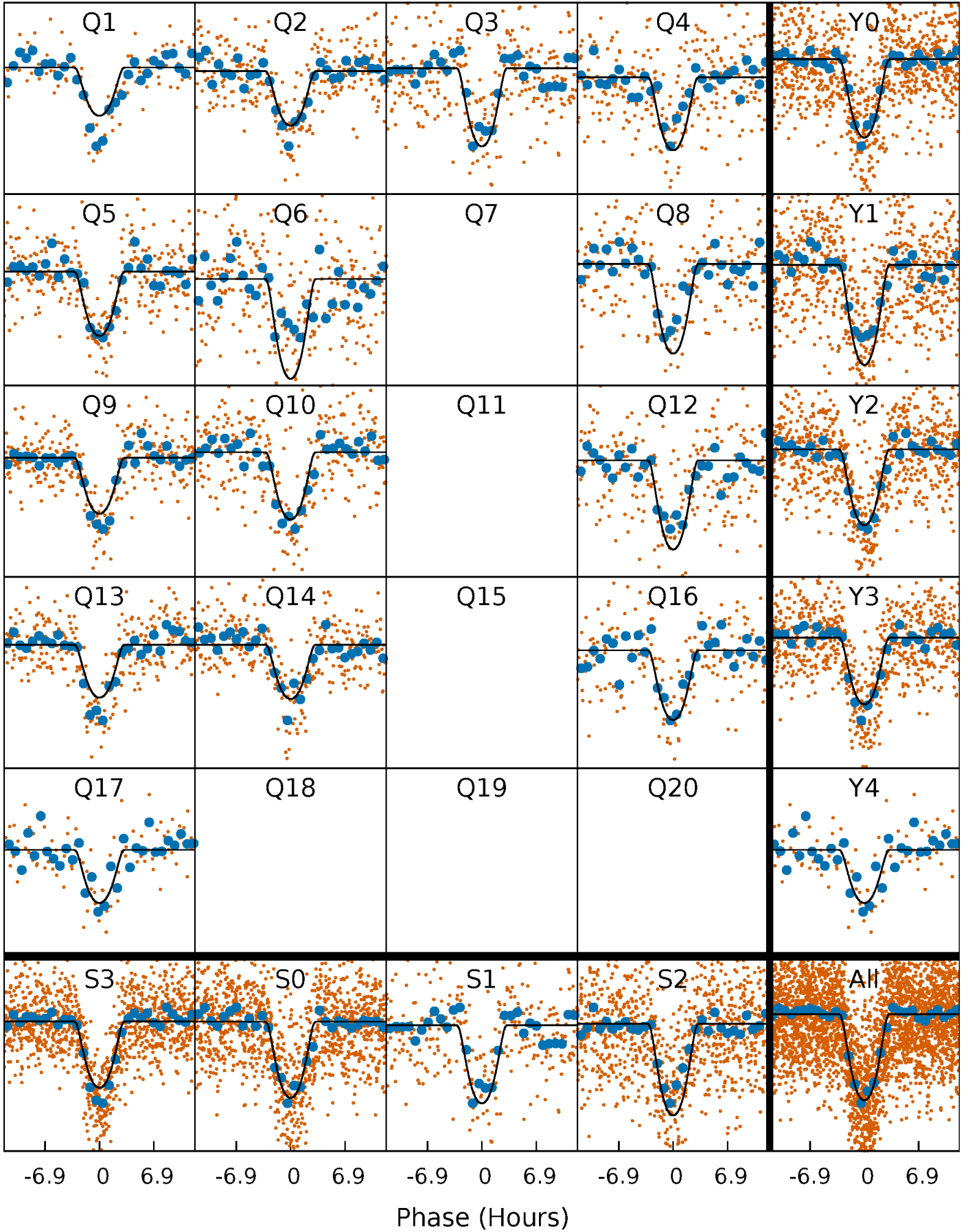
PDC Quarter-Phased Transit Curves

TCE 011044770-01 P= 15.608666 Days $T_0=144.297761$ (BKJD)



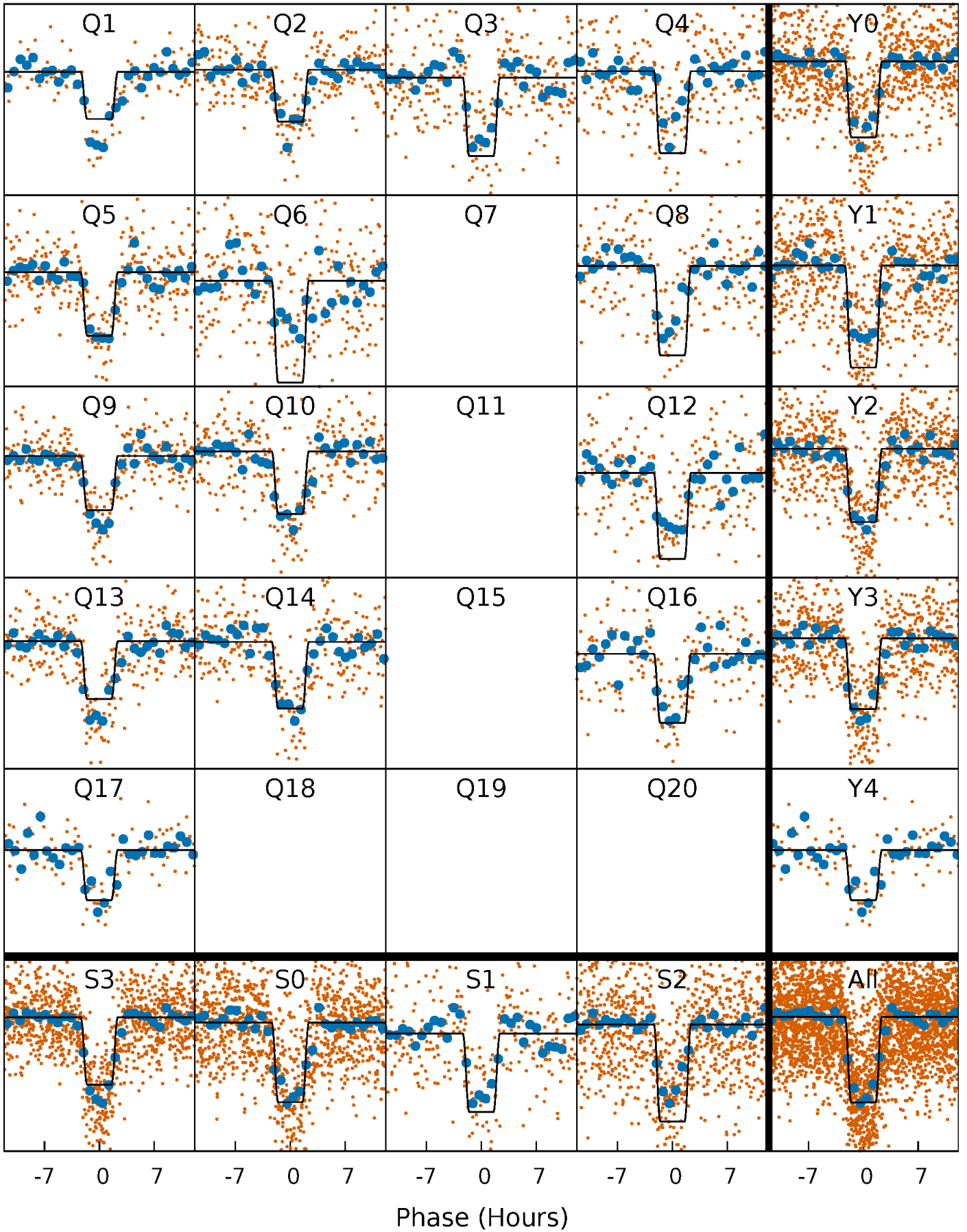
DV Quarter-Phased Transit Curves

TCE 011044770-01 P= 15.608666 Days $T_0=144.297761$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

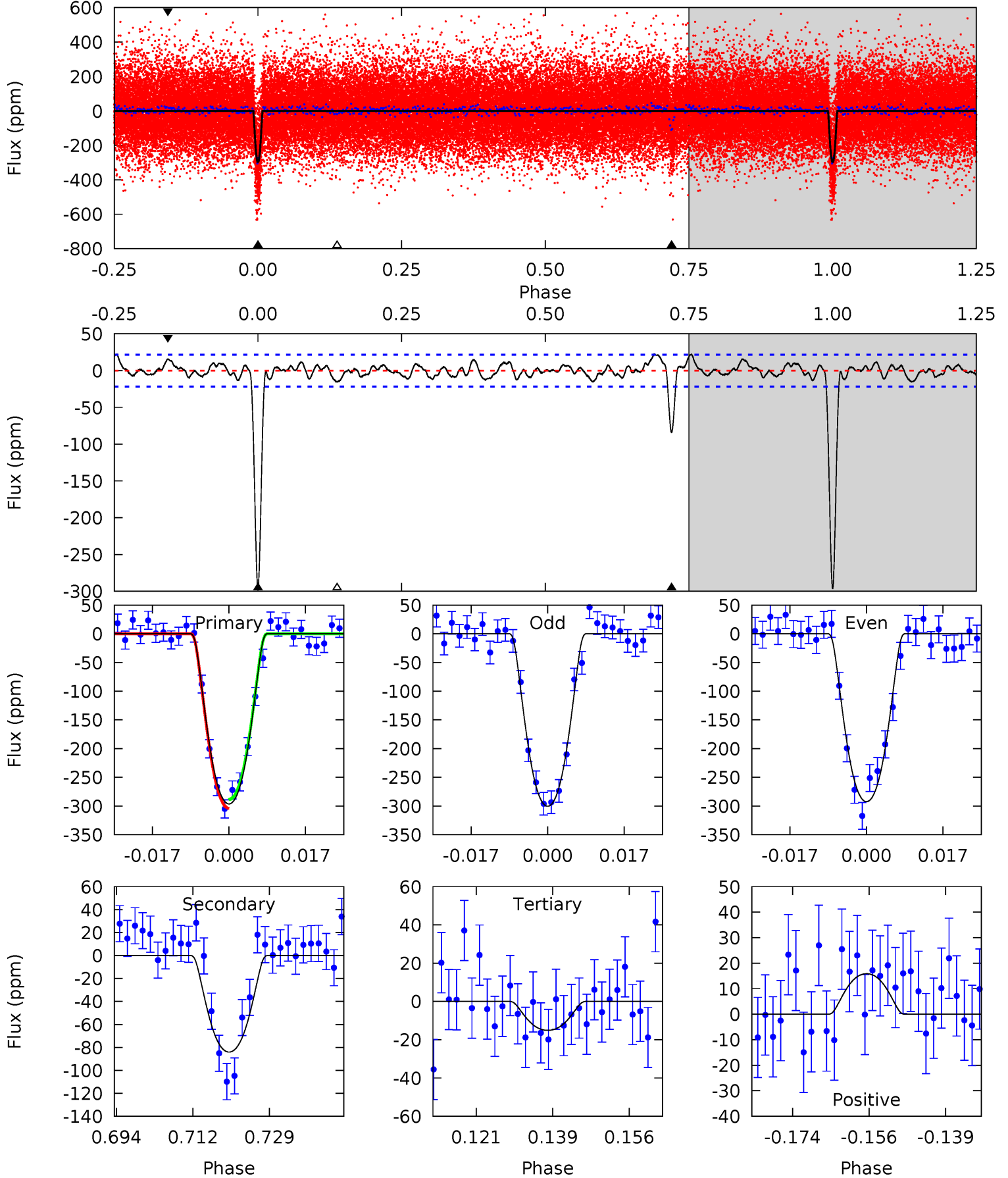
TCE 011044770-01 P= 15.608720 Days $T_0=144.296694$ (BKJD)



DV Model-Shift Uniqueness Test

011044770-01, P = 15.608666 Days, E = 128.689095 Days

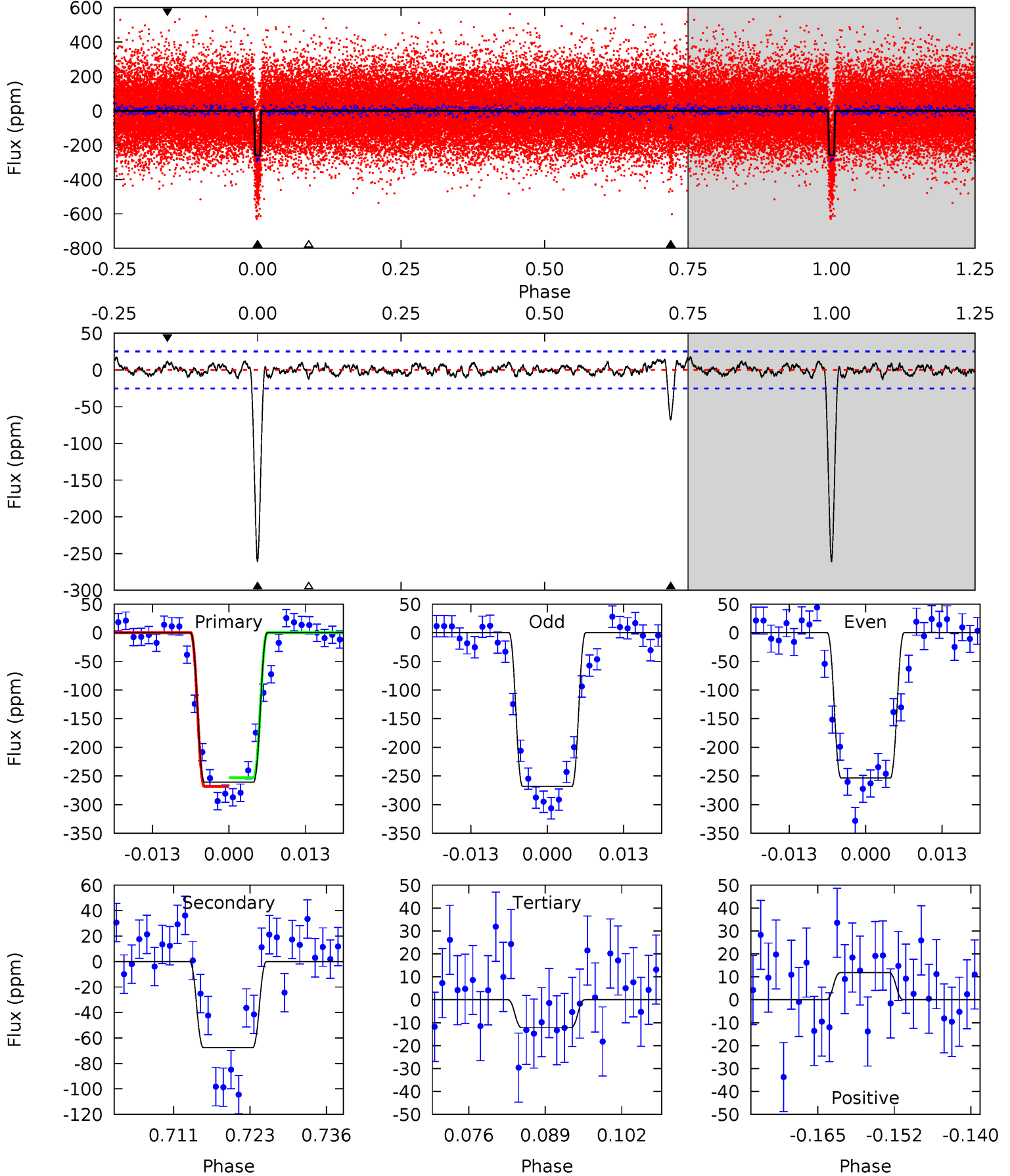
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 67.3 | 19.1 | 3.42 | 3.60 | 4.92 | 2.38 | 1.66 | 63.8 | 63.7 | 15.7 | 15.5 | 0.91 | 1.00 | 0.07 | 1.74 |



Alt Model-Shift Uniqueness Test

011044770-01, $P = 15.608720$ Days, $E = 128.687974$ Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 51.6 | 13.4 | 2.42 | 2.34 | 4.98 | 2.49 | 1.03 | 49.2 | 49.3 | 11.0 | 11.1 | 1.45 | 0.98 | 0.06 | 1.49 |



Stellar Parameters For KIC 011044770

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | $R (R_{\odot})$ | $M(M_{\odot})$ | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
| | 8014^{+221}_{-347} | $3.940^{+0.266}_{-0.114}$ | $-0.140^{+0.200}_{-0.350}$ | $2.430^{+0.380}_{-0.888}$ | $1.874^{+0.079}_{-0.419}$ | $0.184^{+0.329}_{-0.065}$ |
| | +3%/-4% | +7%/-3% | +143%/-250% | +16%/-37% | +4%/-22% | +179%/-35% |
| Source | KIC0 | 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 011044770-01 / KOI 0170.01

| Detrend | Depth (ppm) | $R_p (R_{\oplus})$ | $T_{max} (K)$ | $T_{obs} (K)$ | A_{obs} |
|---------|-------------|------------------------|----------------------|----------------------|------------------|
| DV | -84 ± 4 | $5.57^{+1.01}_{-1.18}$ | 1956^{+128}_{-172} | 5121^{+332}_{-330} | 33^{+19}_{-10} |
| Alt. | -68 ± 5 | $4.33^{+1.10}_{-1.00}$ | 1960^{+125}_{-160} | 5381^{+583}_{-359} | 44^{+28}_{-15} |

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 $A_{obs} \gg 1.0$

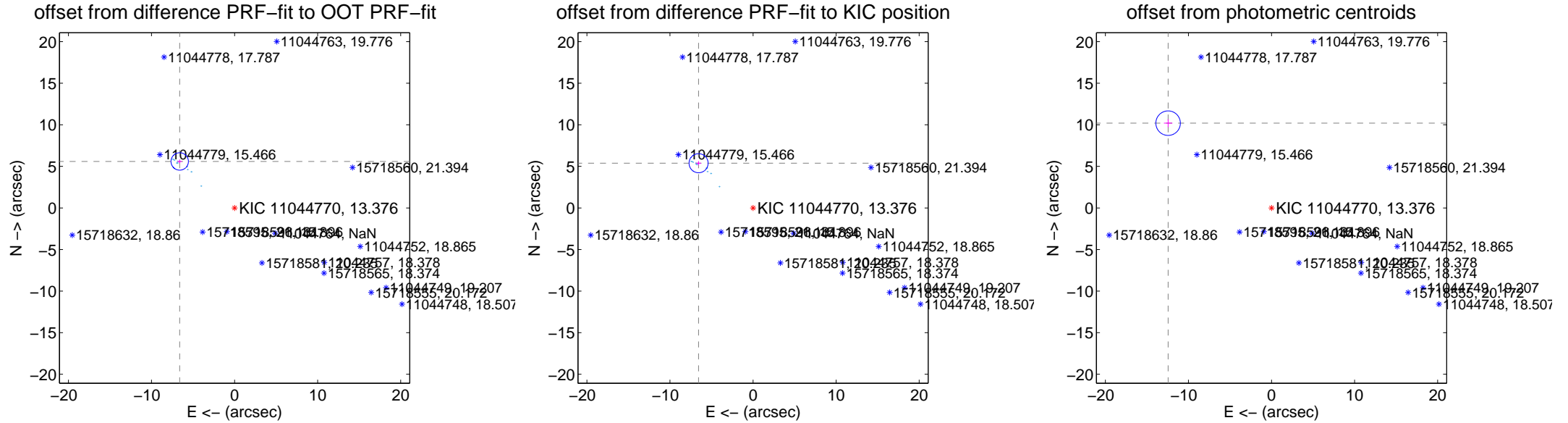
DV Centroid Data

Supplemental centroid analysis for 011044770-01. Kepler magnitude: 13.38. Transit SNR 37.29

There are 12 quarters with good PRF difference image offsets

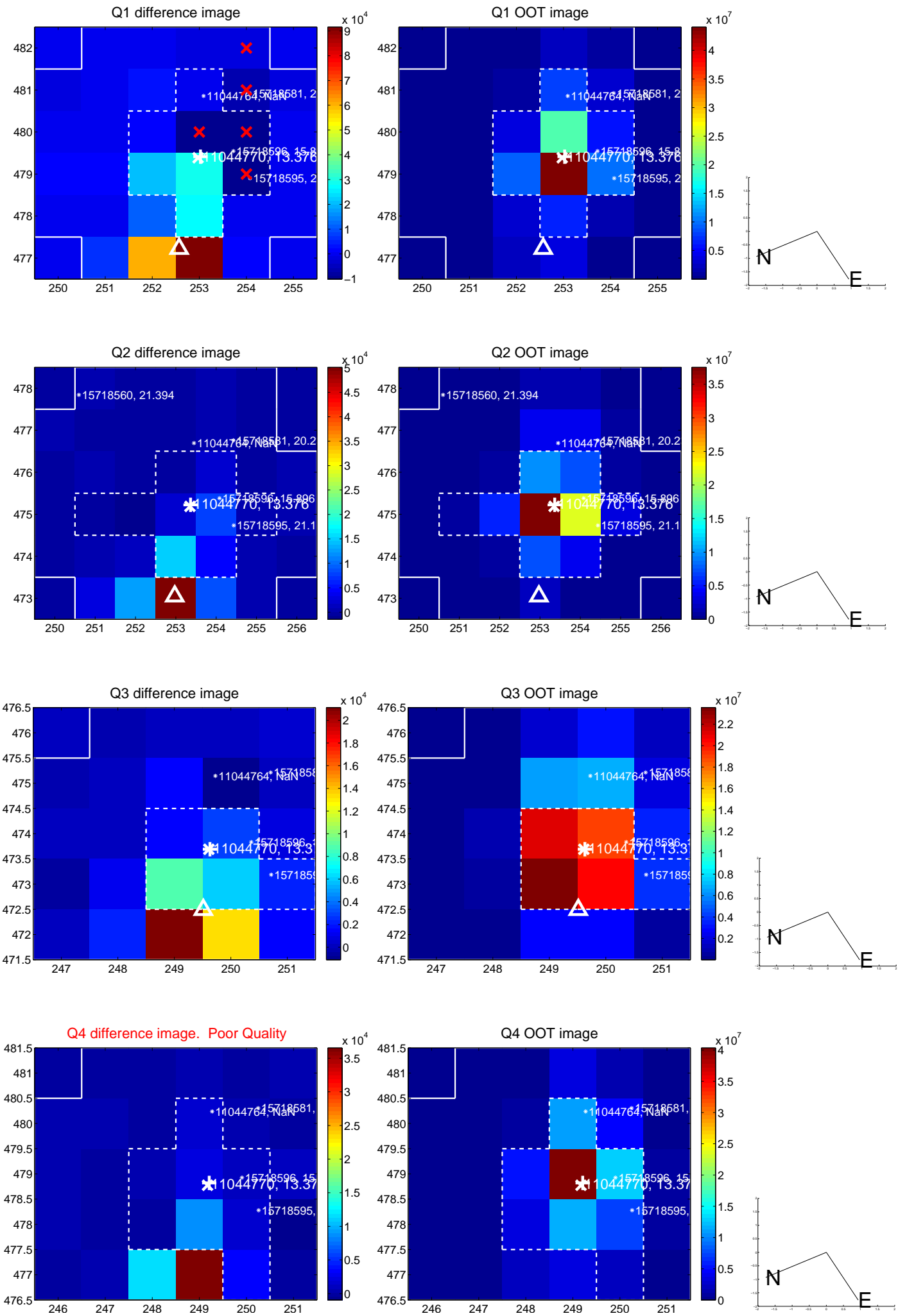
The direct PRF centroid is offset from the target star catalog position by about 0.27 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|---|--------------------|---------------------|-------------------|-------------------|
| PRF-fit source offset from OOT | 8.657 \pm 0.349 | 24.80 | 6.607 \pm 0.270 | 5.594 \pm 0.237 |
| PRF-fit source offset from KIC position | 8.483 \pm 0.382 | 22.19 | 6.558 \pm 0.305 | 5.381 \pm 0.248 |
| photometric centroid source offset | 16.09 \pm 0.49 | 32.74 | 12.45 \pm 0.51 | 10.20 \pm 0.47 |

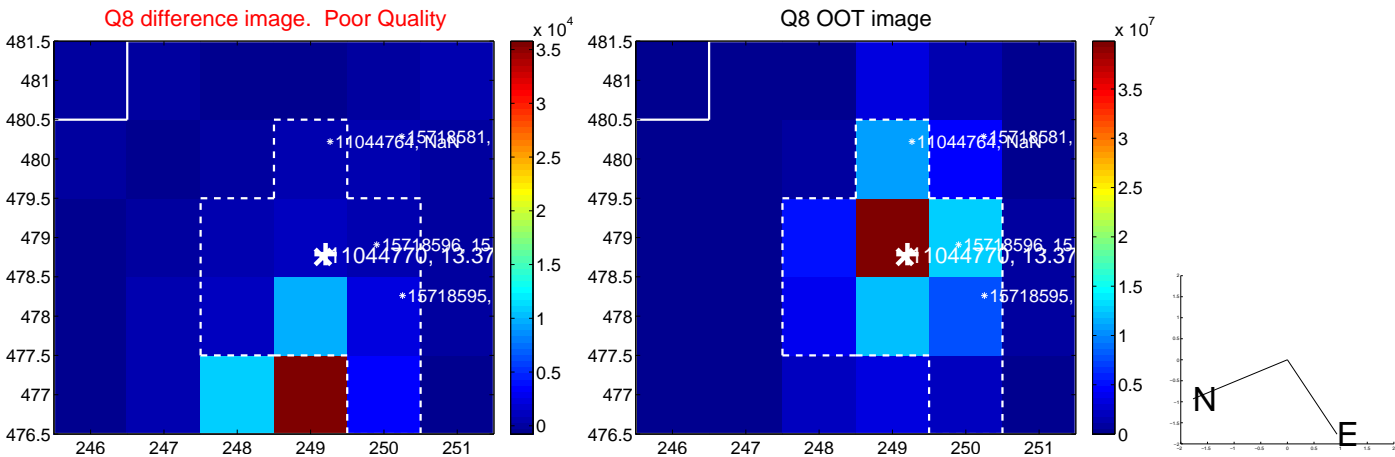
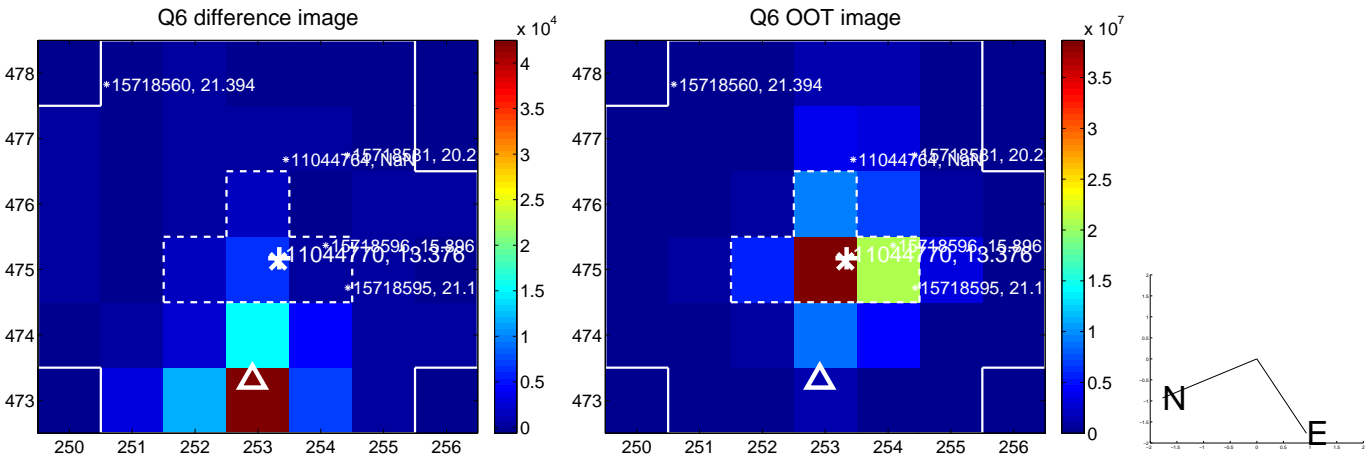
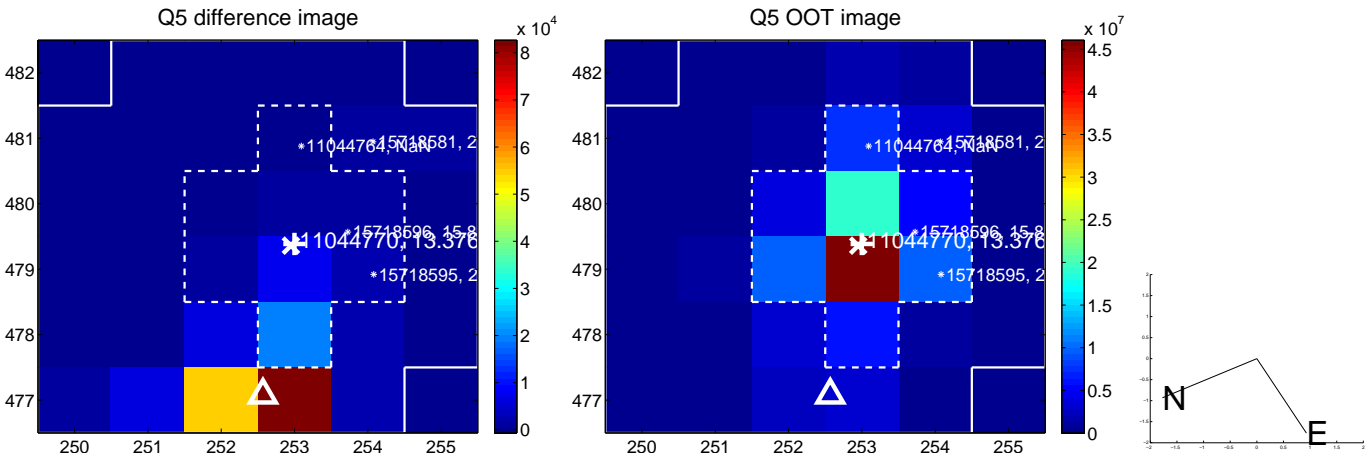


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three- σ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

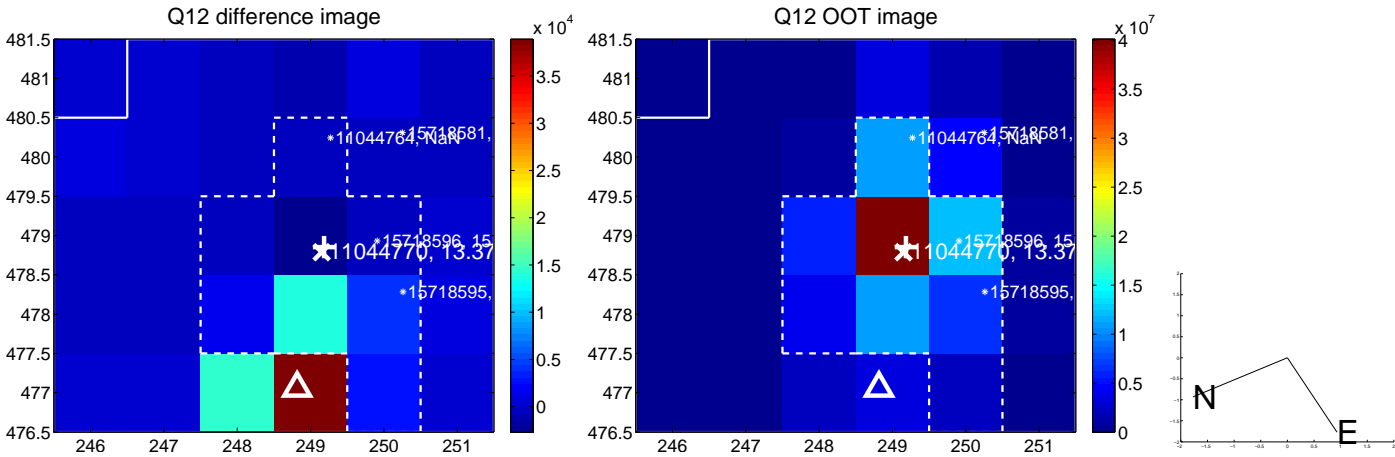
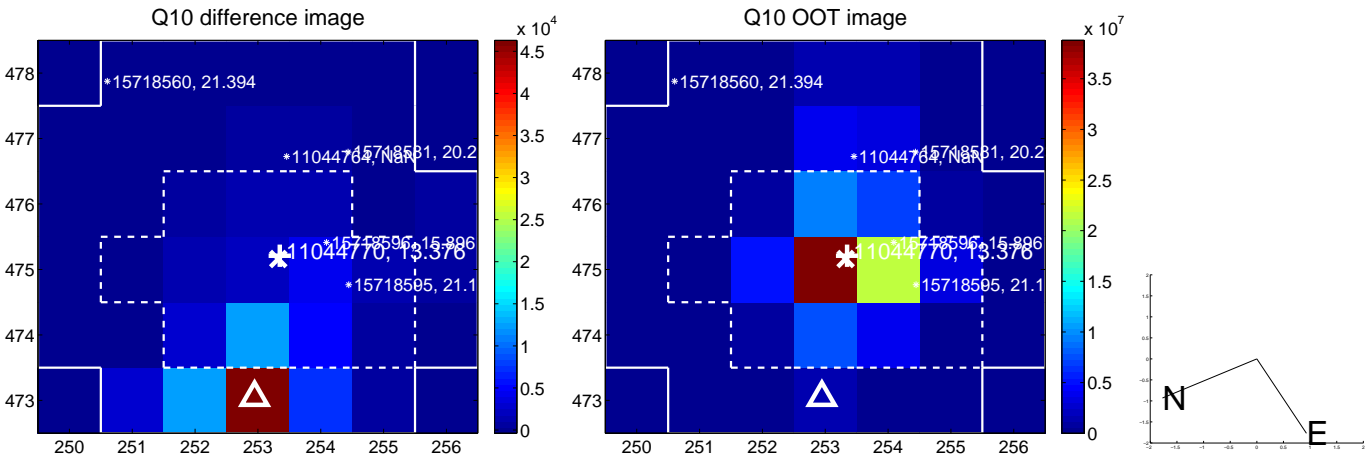
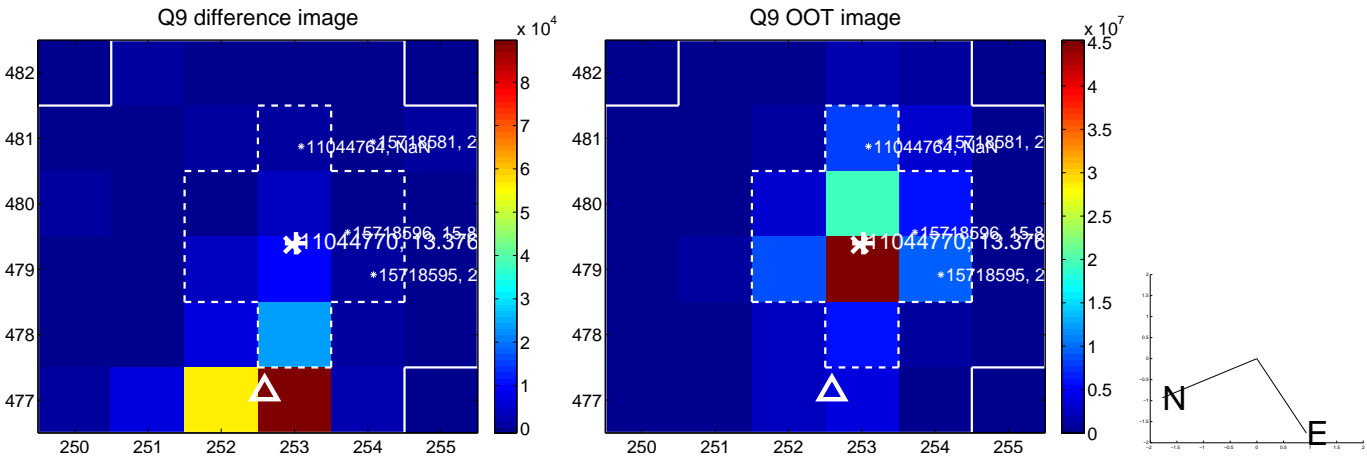
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



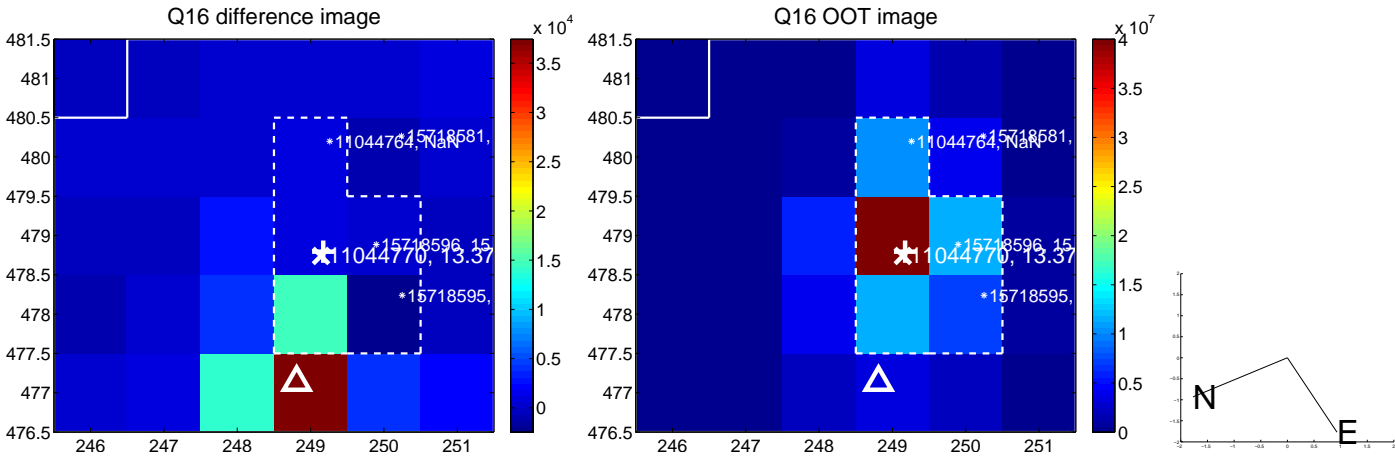
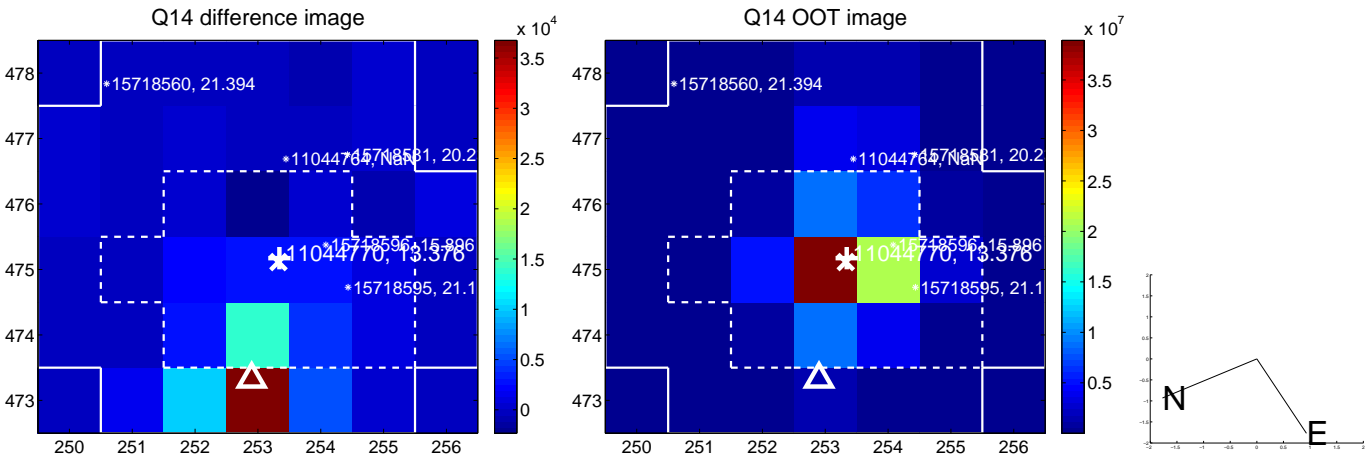
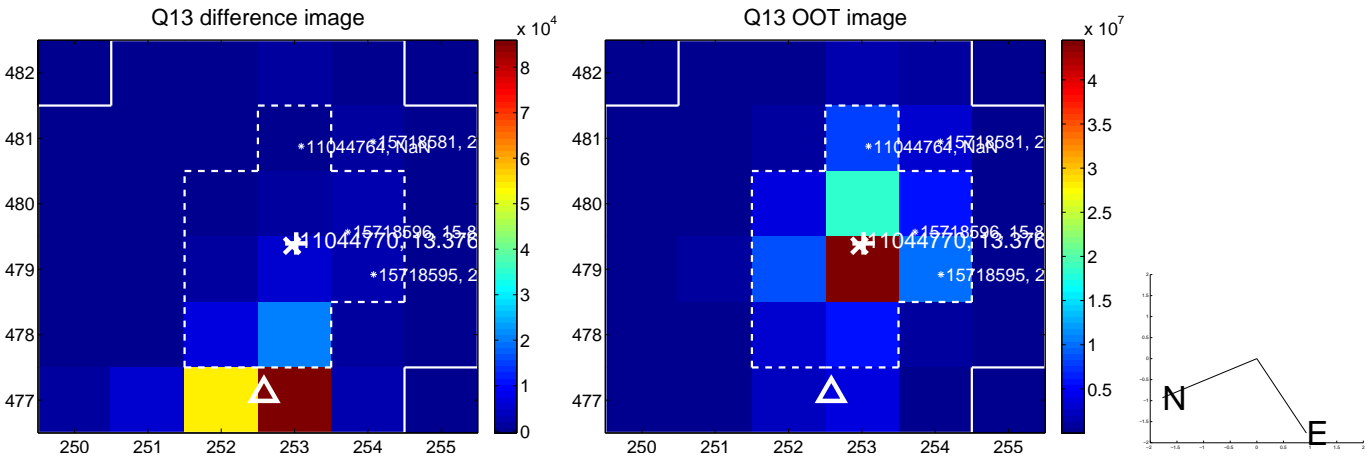
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



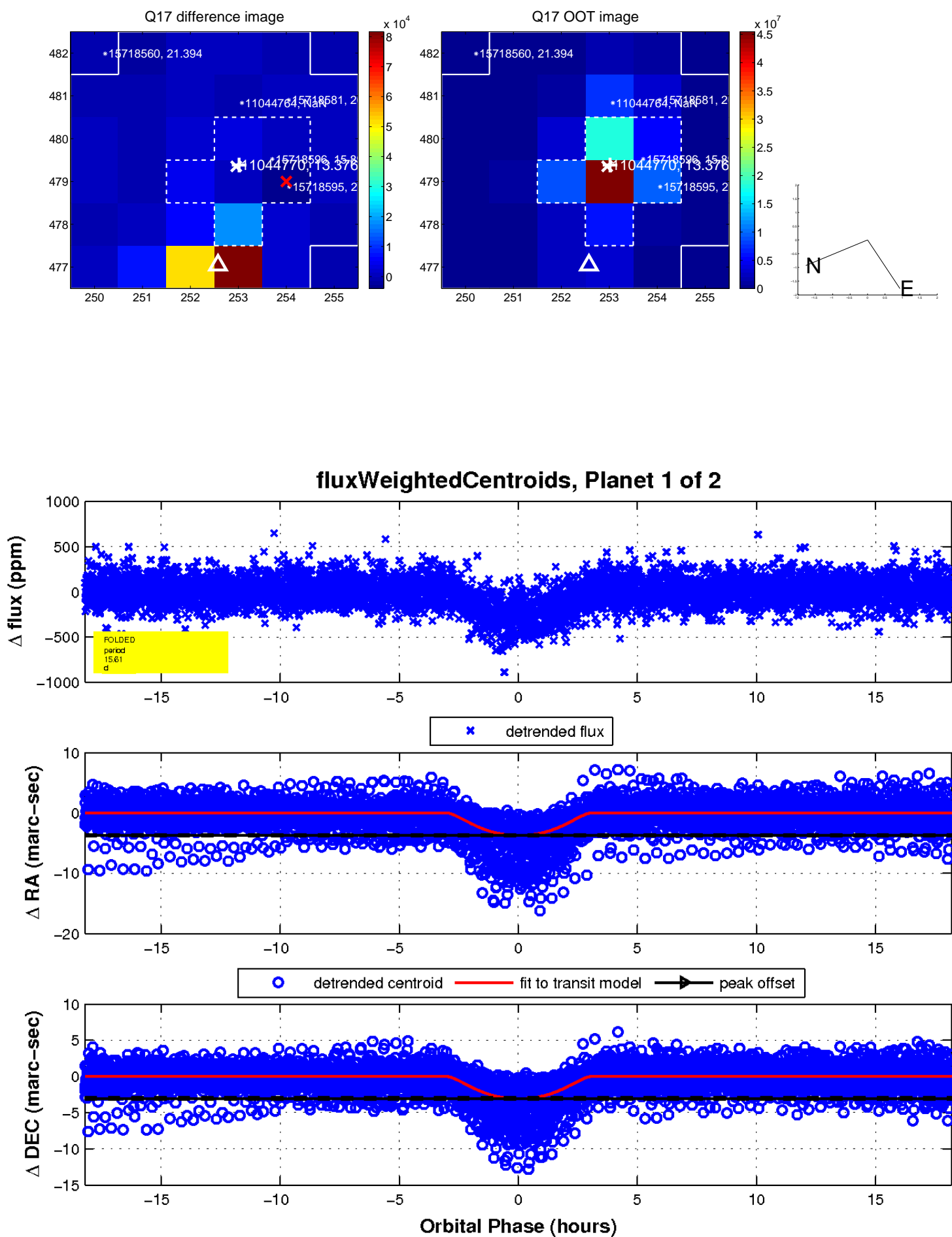
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



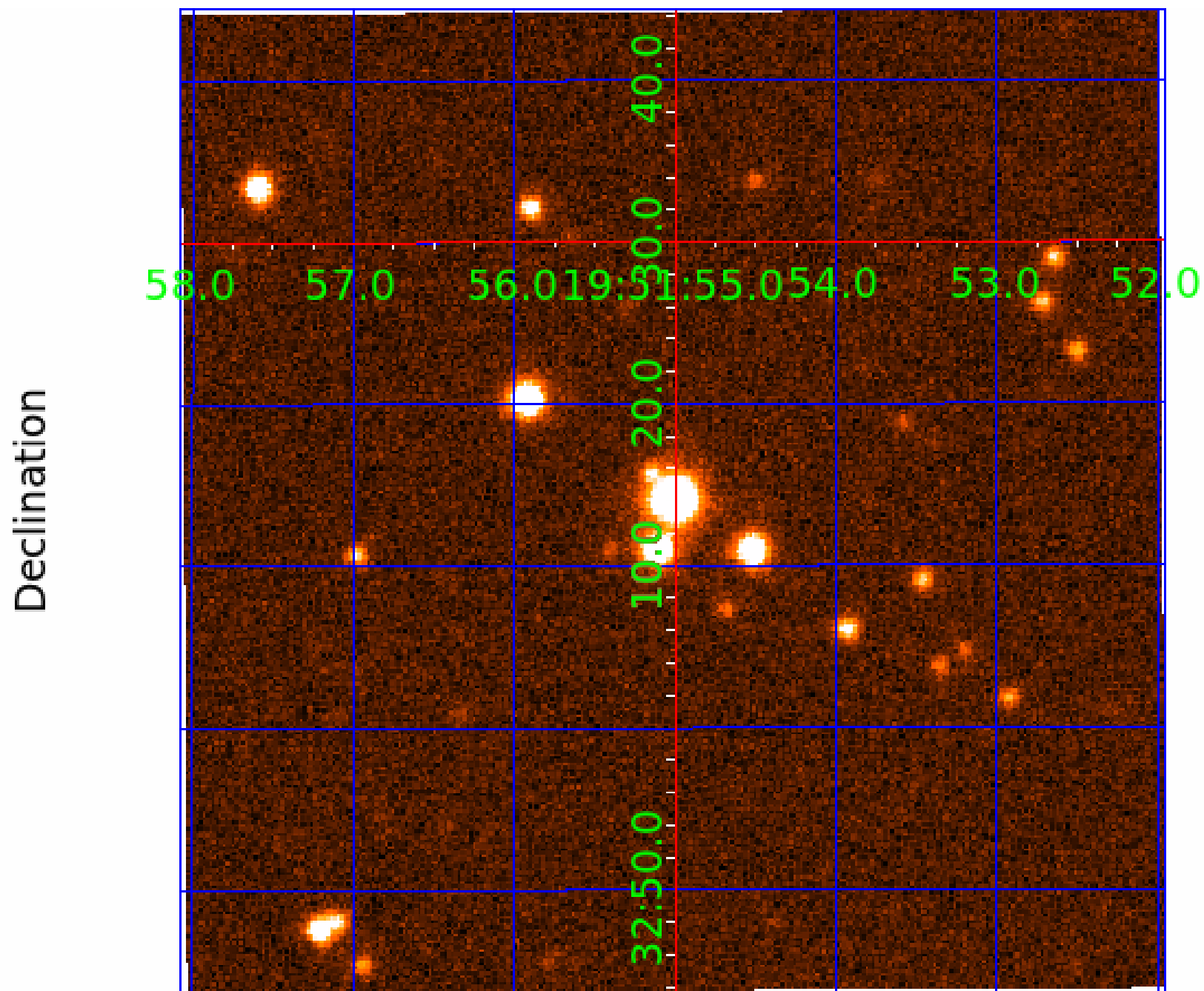
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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



UKIRT Image



KIC 011044770

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}) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 011044770-01 | OBS | 0170.01 | 15.608666 | 144.297761 | 298.7 | 6.066 | 35.8 | 37.3 | 2.43 | 8014 | 5.79 | 959.86 |
| 011044770-02 | OBS | No | 15.608665 | 139.923977 | 100.6 | 3.674 | 12.9 | 12.9 | 2.43 | 8014 | 2.77 | 959.86 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|--|
| 011044770-01 | OBS | FP | 0.00 | 0 | 1 | 1 | 1 | MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE—CENT_RESOLVED_OFFSET—HALO_GHOST—EPHEM_MATCH |
| 011044770-02 | OBS | FP | 0.00 | 1 | 1 | 1 | 1 | IS_SEC_TCE—CENT_RESOLVED_OFFSET—HALO_GHOST—EPHEM_MATCH |

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 011044770-02

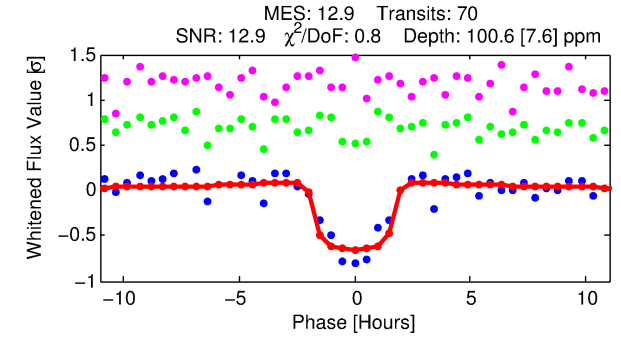
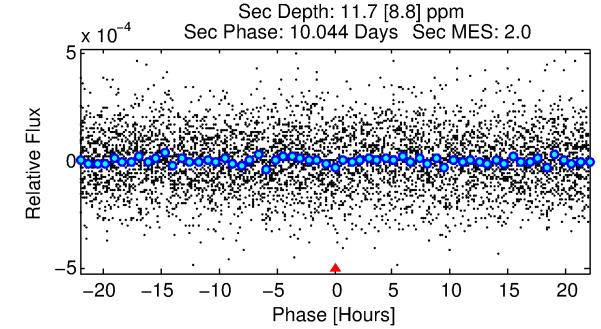
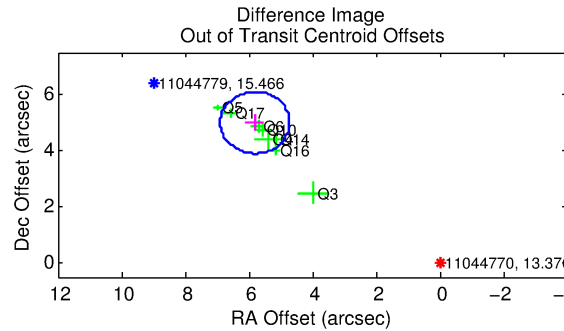
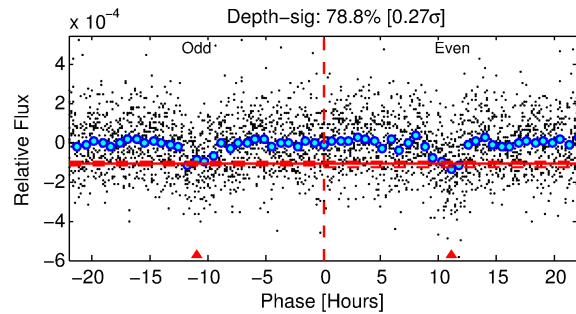
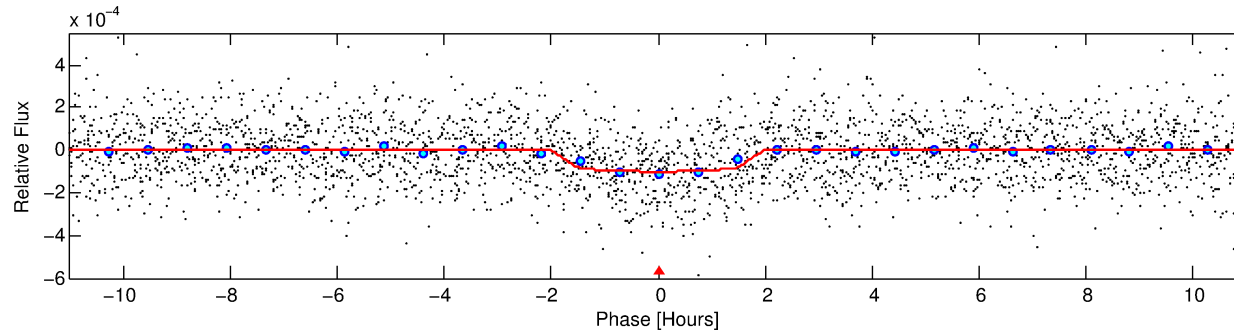
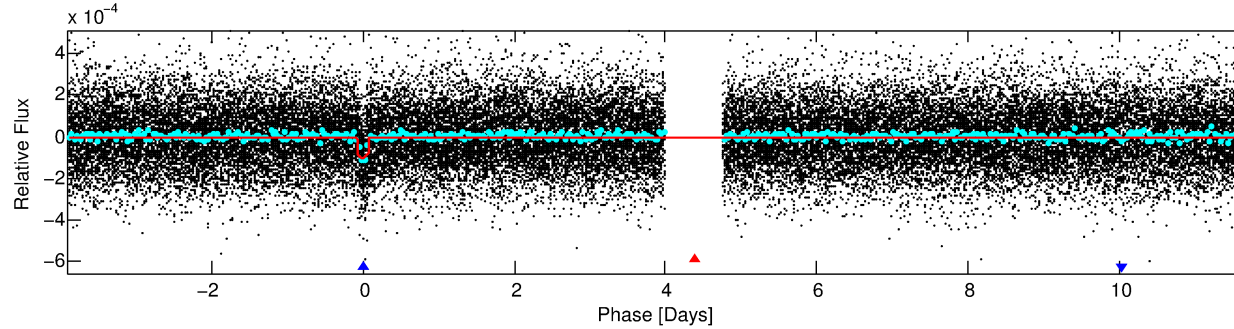
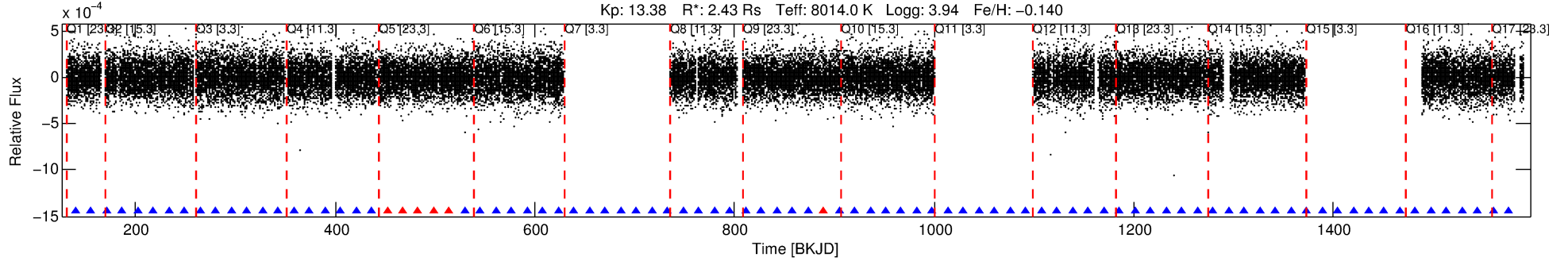
| TCE (1) | KIC | Parent (2) | Parent KIC | $P_1:P_2$ | Dist (μ) | Δ Row | Δ Col | m_2 | m_1 | D_2/D_1 | Mechanism | Flag | σ_P | σ_T |
|--------------|----------|--------------|------------|-----------|----------------|--------------|--------------|-------|-------|-----------|------------|------|------------|------------|
| 011044770-02 | 11044770 | 011044779-02 | 11044779 | 1:1 | 11.0 | 2 | 0 | 15.47 | 13.38 | 112.93 | Direct-PRF | 0 | 0.11 | 0.02 |

Notes: $P_1:P_2$ is the period ratio. Dist is the distance in arcseconds. Δ Row and Δ Col are the number of pixels apart in row and column. m_2 and m_1 are the magnitudes of the parent and child. D_2/D_1 is the parent's transit depth divided by the child's. σ_P and σ_T are the significance of the match in period and epoch. For a match to be considered significant $\sigma_P < 5.0$ and $\sigma_T < 5.0$. Matches which have σ_P and σ_T very close to this cutoff should receive extra scrutiny, especially if the period ratio is very large.

DV One-Page Summary

KIC: 11044770 Candidate: 2 of 2 Period: 15.609 d

KOI: K00170 Corr: No Ephemeris Match



DV Fit Results:

Period = 15.60867 [0.00011] d
Epoch = 139.9240 [0.0052] BKJD
Rp/R* = 0.0105 [0.0041]
a/R* = 16.93 [39.65]
b = 0.87 [0.69]
Seff = 959.86 [485.73]
Teq = 1419 [180] K
Rp = 2.77 [1.48] Re
a = 0.1508 [0.0479] AU
Ag = 19.04 [22.54] [0.80 σ]
Teffp = 4584 [1258] K [2.49 σ]

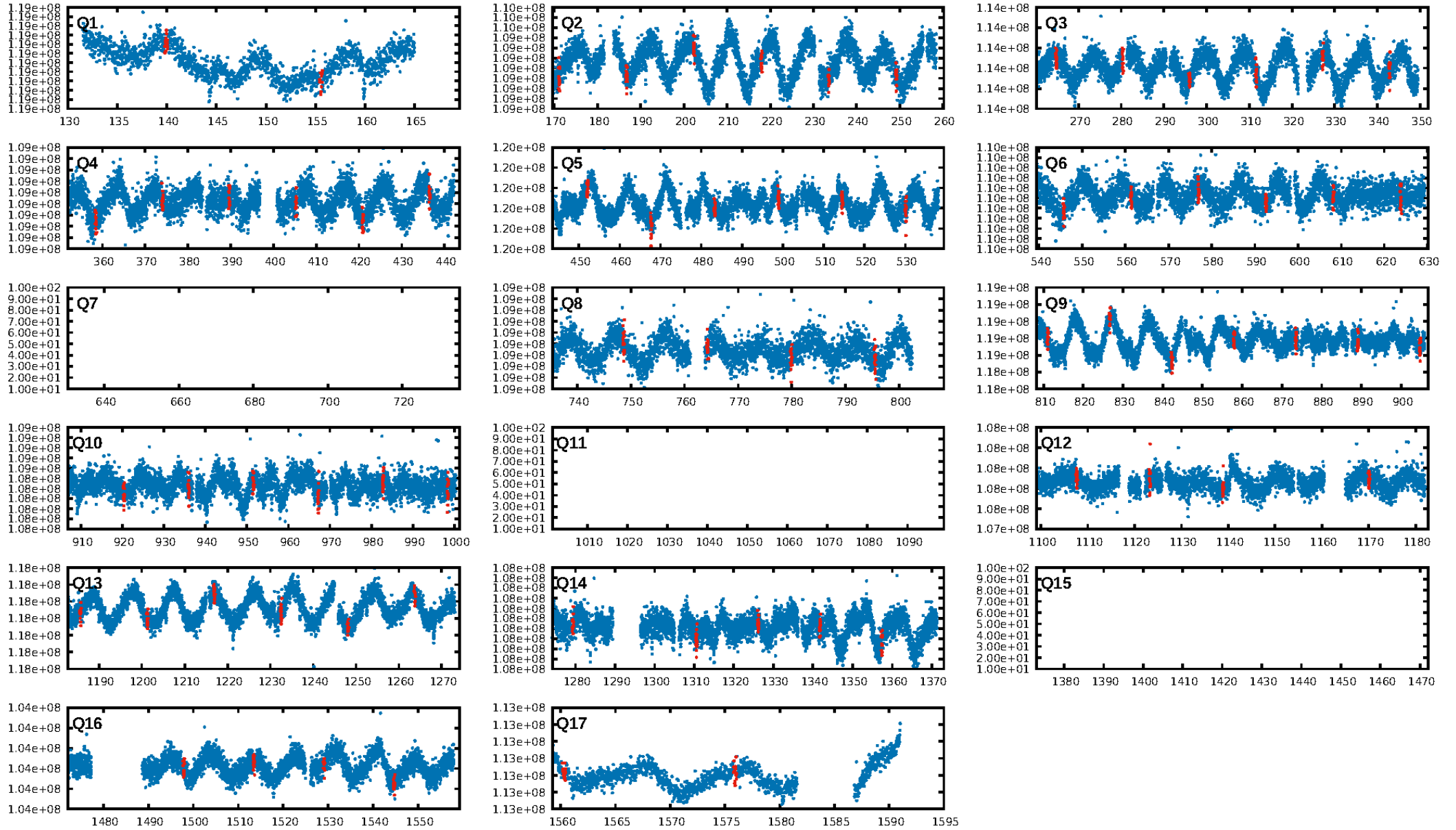
DV Diagnostic Results:

ShortPeriod-sig: N/A
LongPeriod-sig: 0.0% [0.00 σ]
ModelChiSquare2-sig: 95.7%
ModelChiSquareGof-sig: 100.0%
Bootstrap-pfa: 2.97e-36
RollingBand-fgt: 0.91 [60/66]
GhostDiagnostic-chr: -0.1447
Centroid-sig: 0.0%
Centroid-so: 12.235 arcsec [8.99 σ]
OotOffset-rm: 7.658 arcsec [20.94 σ]
KicOffset-rm: 7.378 arcsec [21.32 σ]
OotOffset-st: 3/1/2/2 [8]
KicOffset-st: 3/1/2/2 [8]
DiffImageQuality-fgm: 0.88 [7/8]
DiffImageOverlap-fno: 1.00 [14/14]

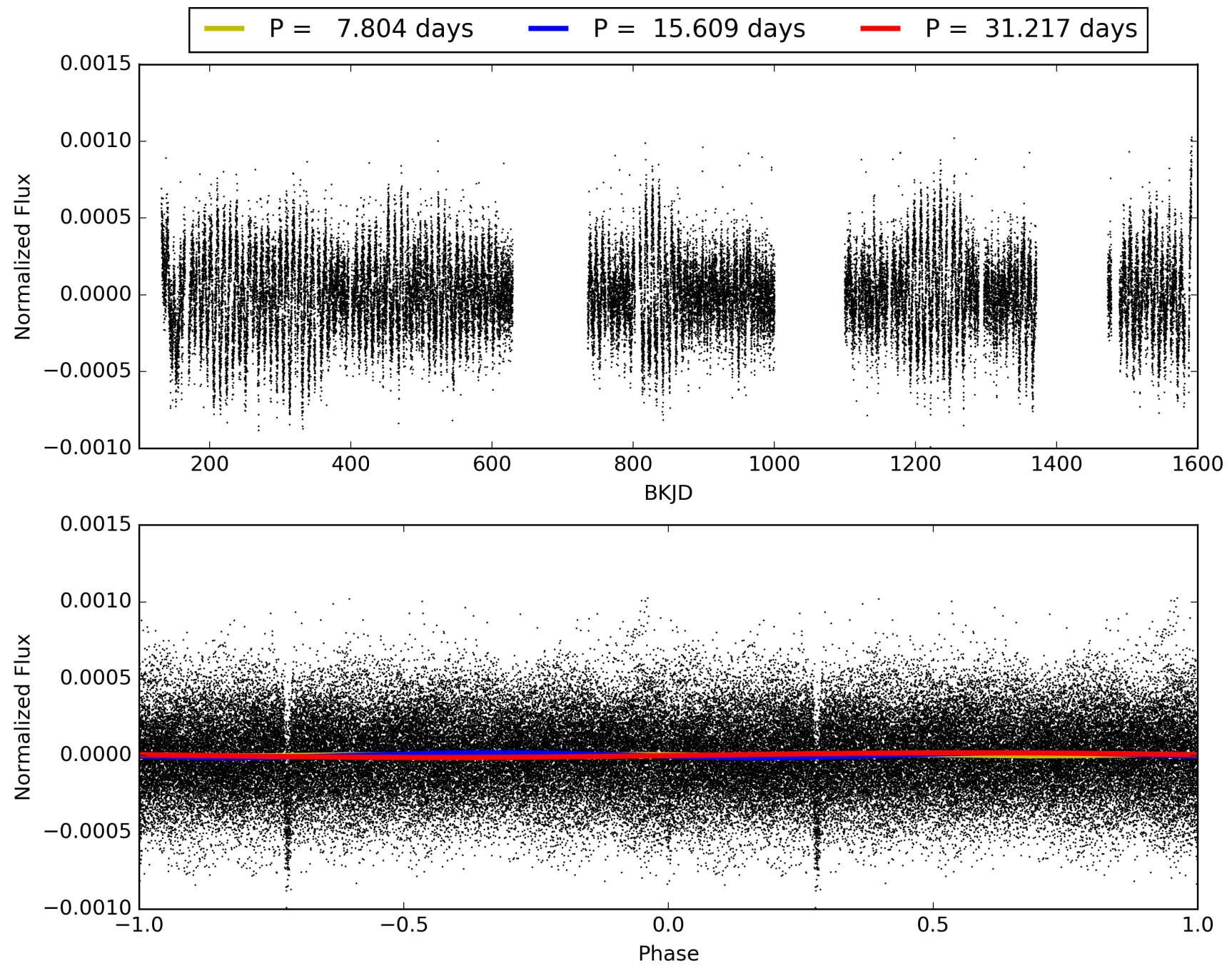
Software Revision: svn-ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 05:58:45 Z

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

TCE 011044770-02, PDC Light Curves

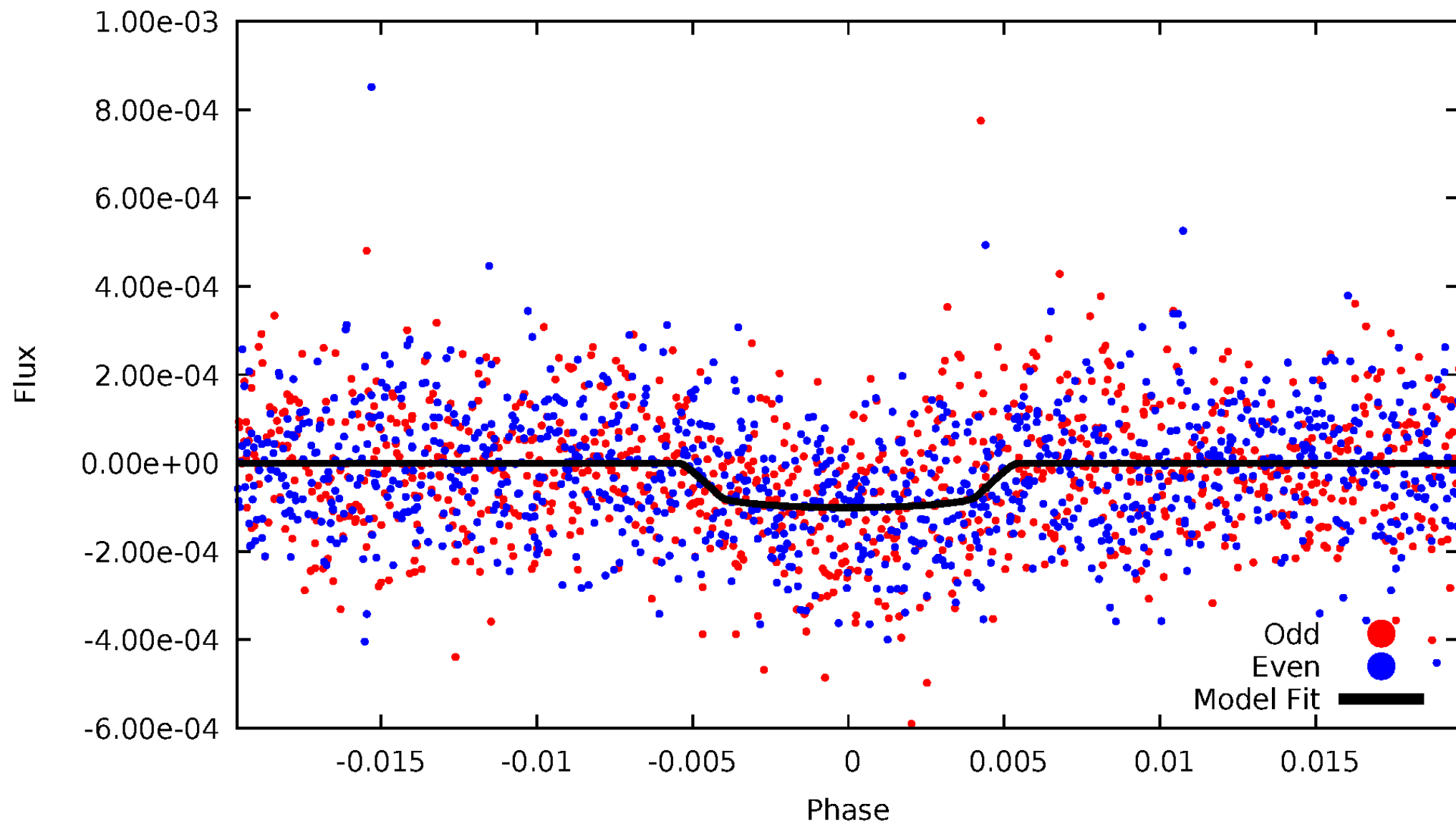


TCE 011044770-02



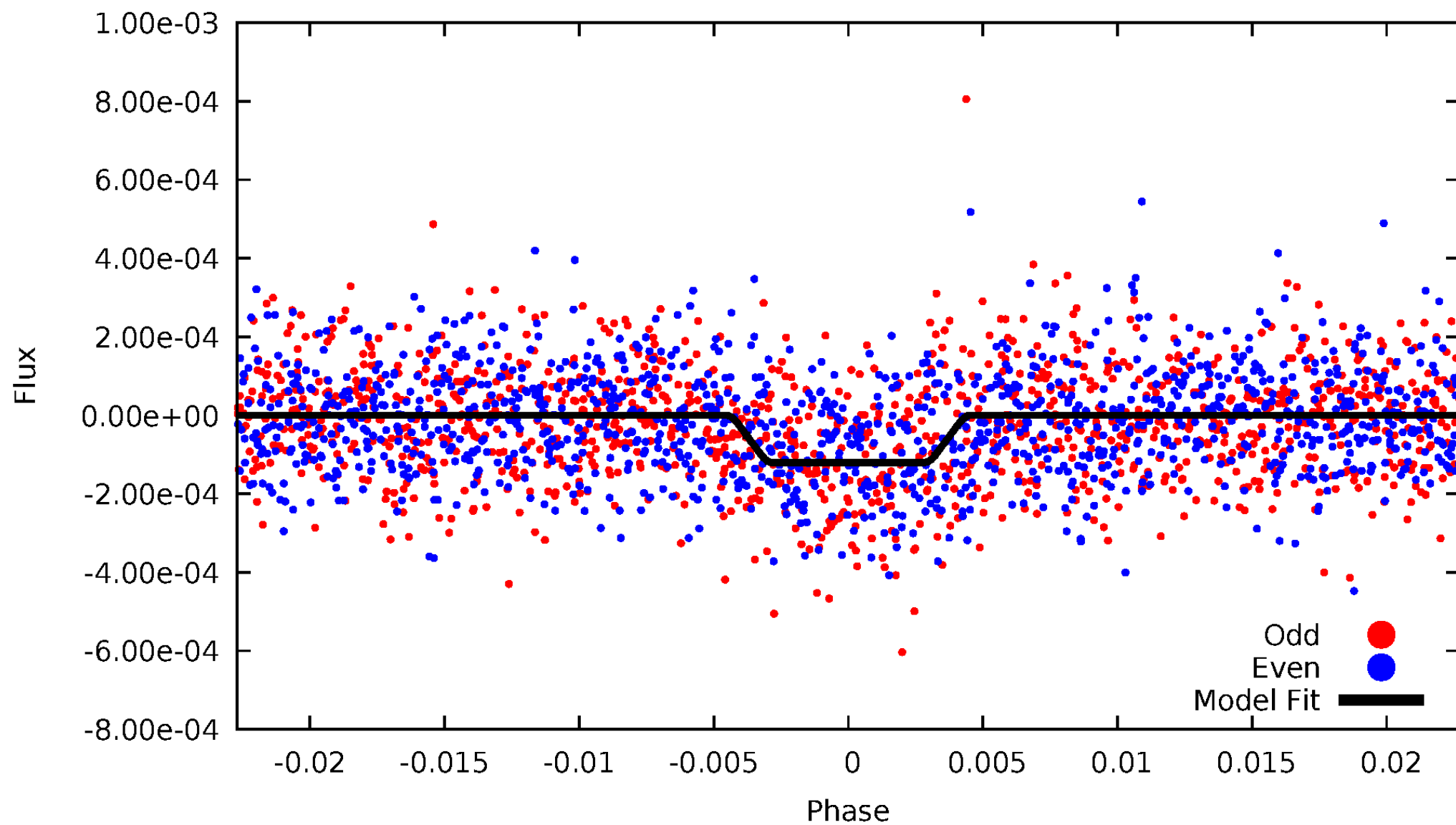
DV Odd/Even

TCE 011044770-02



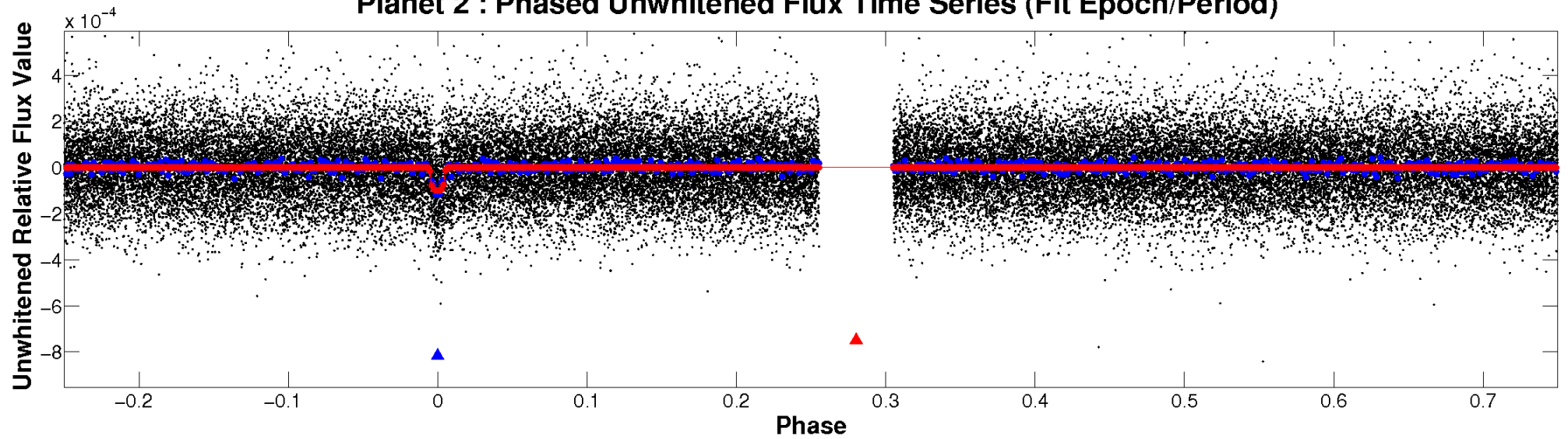
ALT Odd/Even

TCE 011044770-02

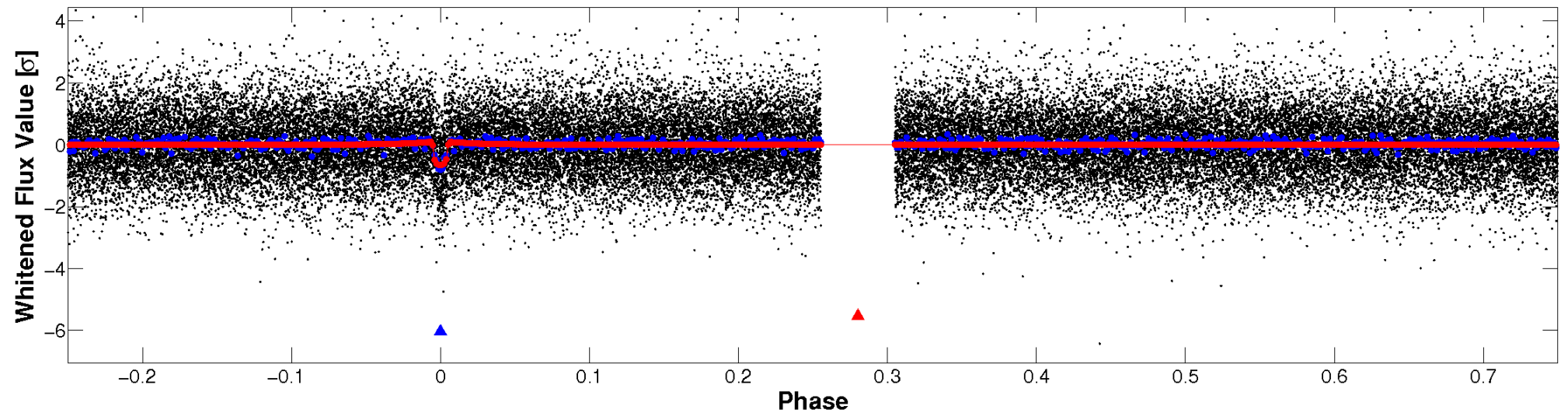


Non-Whitened Vs. Whitened Light Curve

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

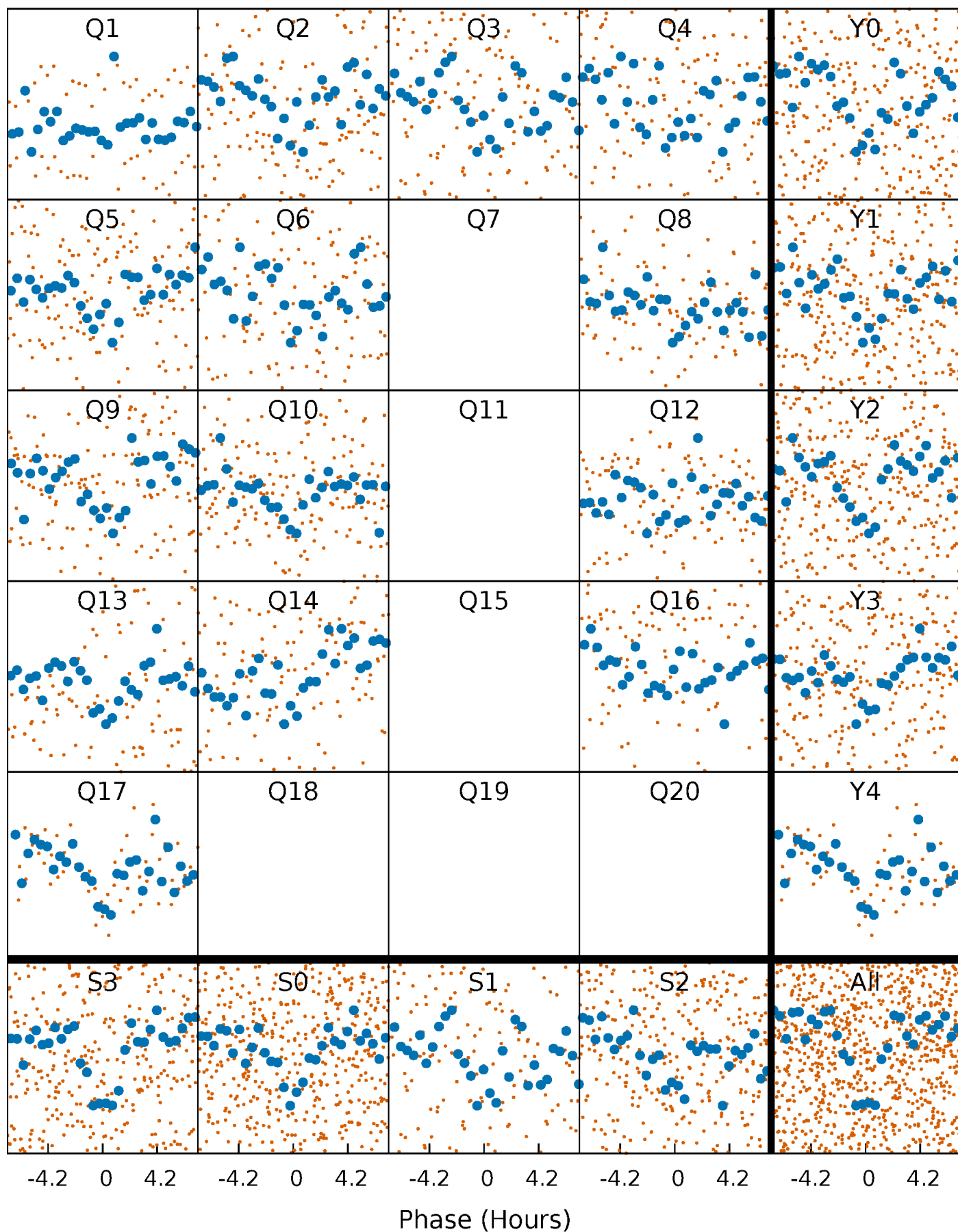


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



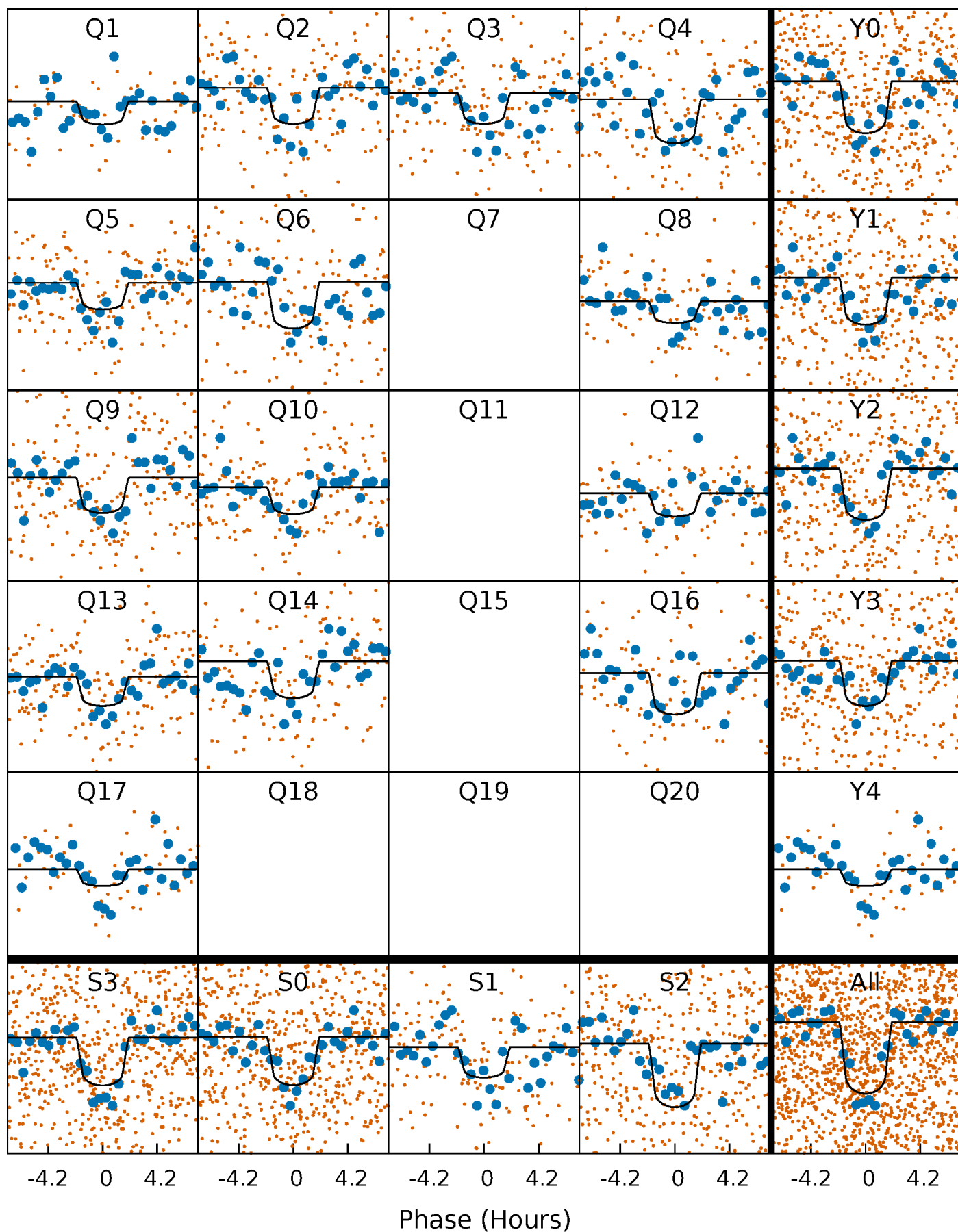
PDC Quarter-Phased Transit Curves

TCE 011044770-02 P= 15.608665 Days $T_0=139.923977$ (BKJD)



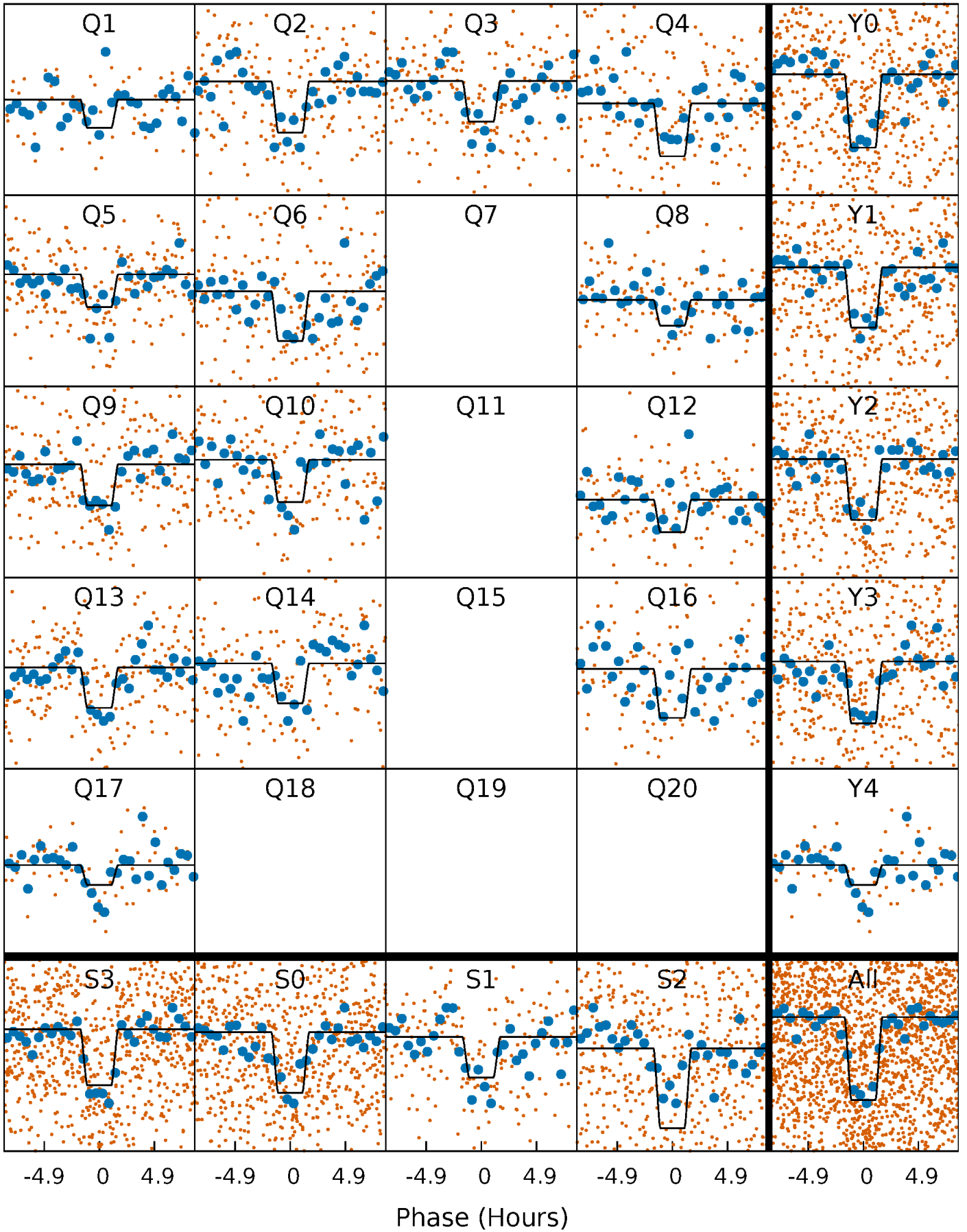
DV Quarter-Phased Transit Curves

TCE 011044770-02 P= 15.608665 Days $T_0=139.923977$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

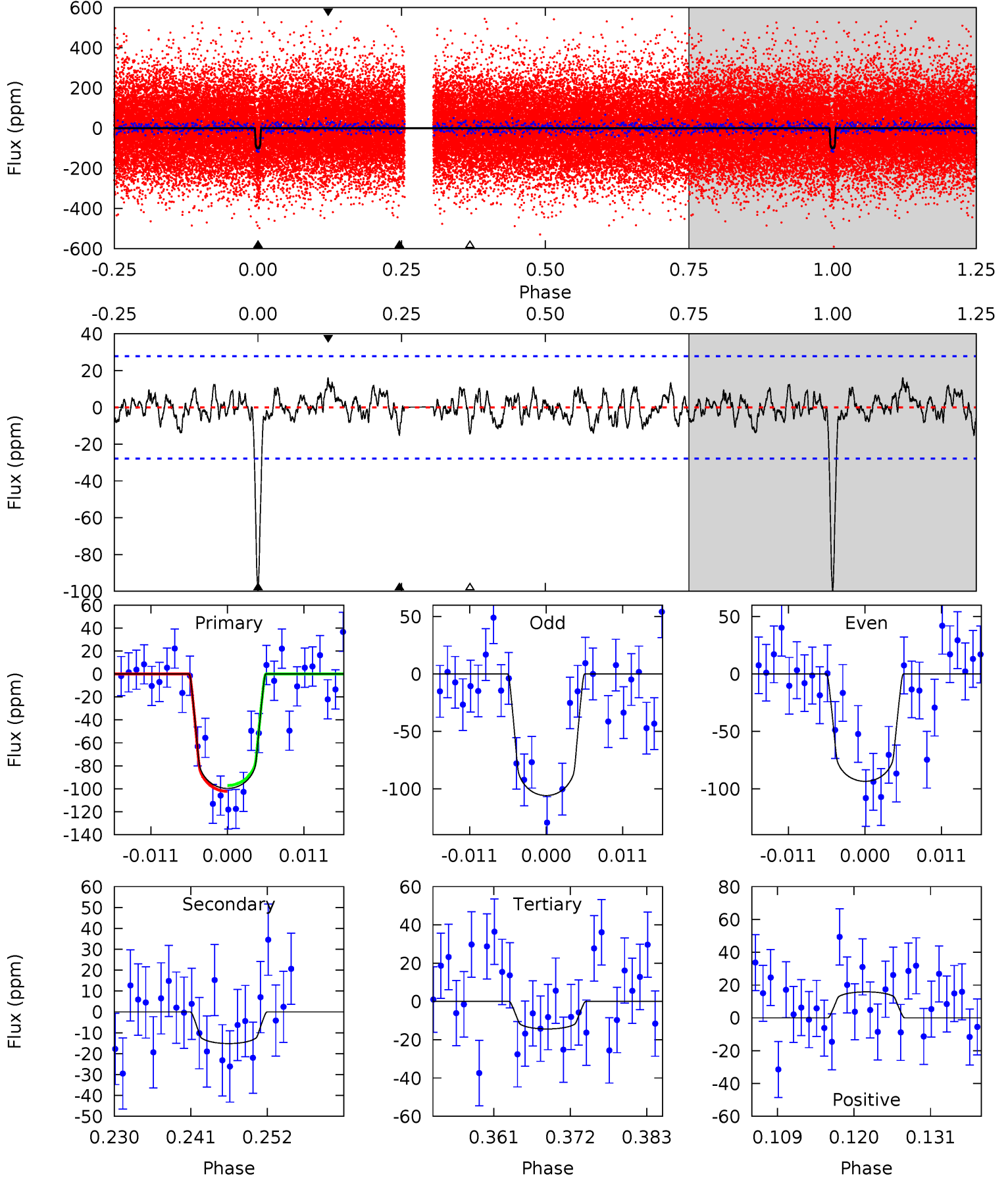
TCE 011044770-02 P= 15.608600 Days $T_0=139.926013$ (BKJD)



DV Model-Shift Uniqueness Test

011044770-02, P = 15.608665 Days, E = 124.315312 Days

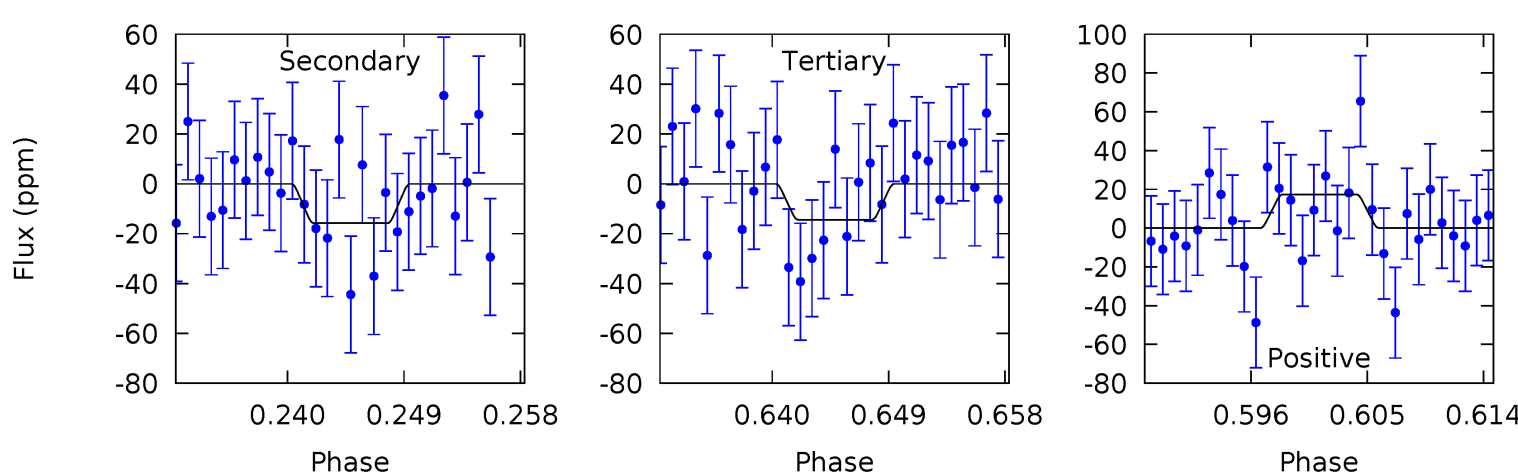
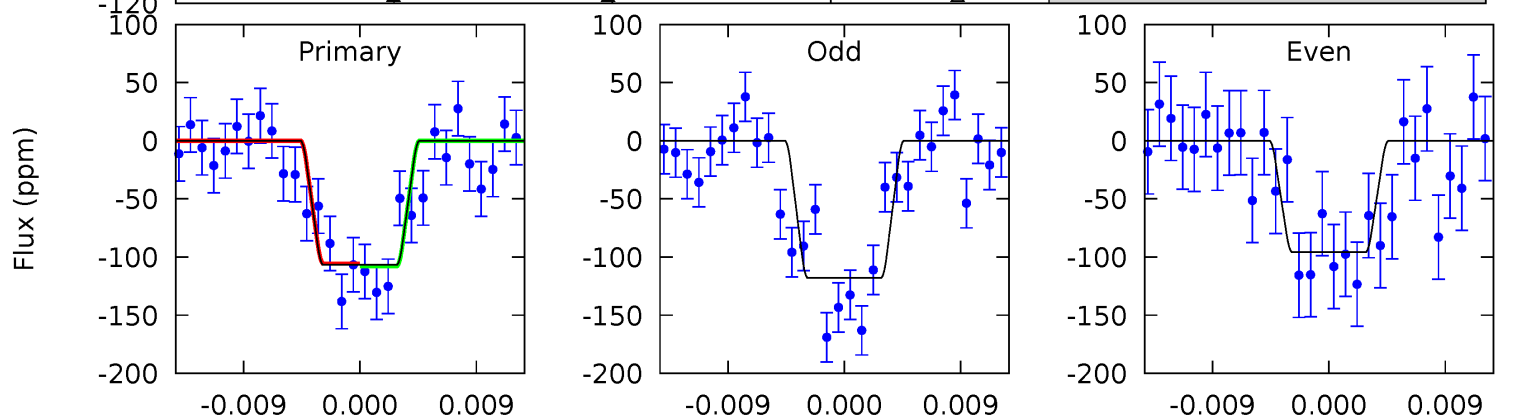
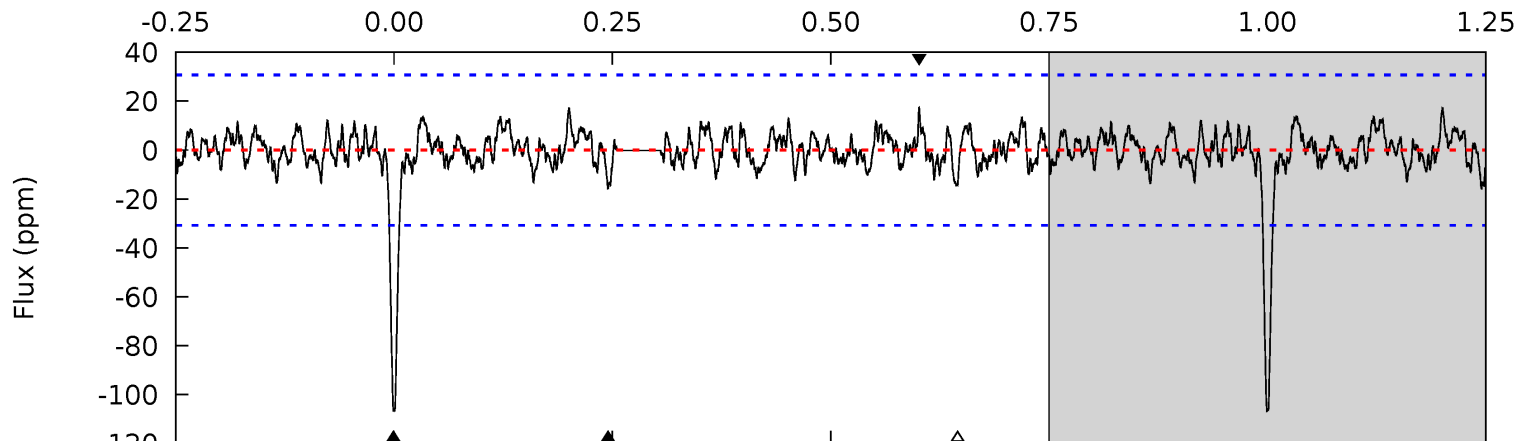
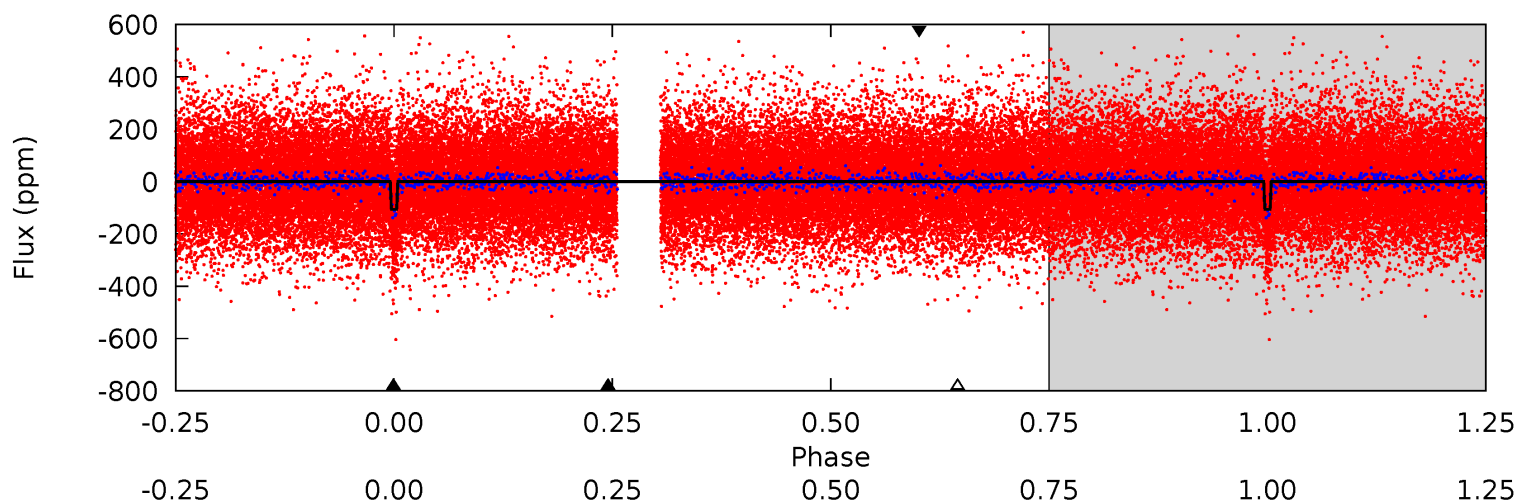
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 17.9 | 2.73 | 2.59 | 2.85 | 5.01 | 2.54 | 1.02 | 15.4 | 15.1 | 0.14 | -0.12 | 1.12 | 1.00 | 0.14 | 0.46 |



Alt Model-Shift Uniqueness Test

011044770-02, P = 15.608600 Days, E = 124.317413 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 17.5 | 2.60 | 2.37 | 2.86 | 5.05 | 2.62 | 0.95 | 15.1 | 14.7 | 0.23 | -0.26 | 1.81 | 1.03 | 0.14 | 0.19 |



Stellar Parameters For KIC 011044770

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | $R (R_{\odot})$ | $M(M_{\odot})$ | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
| | 8014^{+221}_{-347} | $3.940^{+0.266}_{-0.114}$ | $-0.140^{+0.200}_{-0.350}$ | $2.430^{+0.380}_{-0.888}$ | $1.874^{+0.079}_{-0.419}$ | $0.184^{+0.329}_{-0.065}$ |
| | +3%/-4% | +7%/-3% | +143%/-250% | +16%/-37% | +4%/-22% | +179%/-35% |
| Source | KIC0 | 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 011044770-02 / KOI

| Detrend | Depth (ppm) | $R_p (R_{\oplus})$ | $T_{max} (K)$ | $T_{obs} (K)$ | A_{obs} |
|---------|-------------|------------------------|----------------------|-----------------------|------------------|
| DV | -15 ± 6 | $2.66^{+1.19}_{-1.07}$ | 1945^{+133}_{-169} | 4765^{+1159}_{-688} | 25^{+43}_{-15} |
| Alt. | -16 ± 6 | $2.74^{+1.15}_{-1.10}$ | 1955^{+141}_{-164} | 4779^{+1124}_{-746} | 25^{+43}_{-14} |

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 $A_{obs} \gg 1.0$

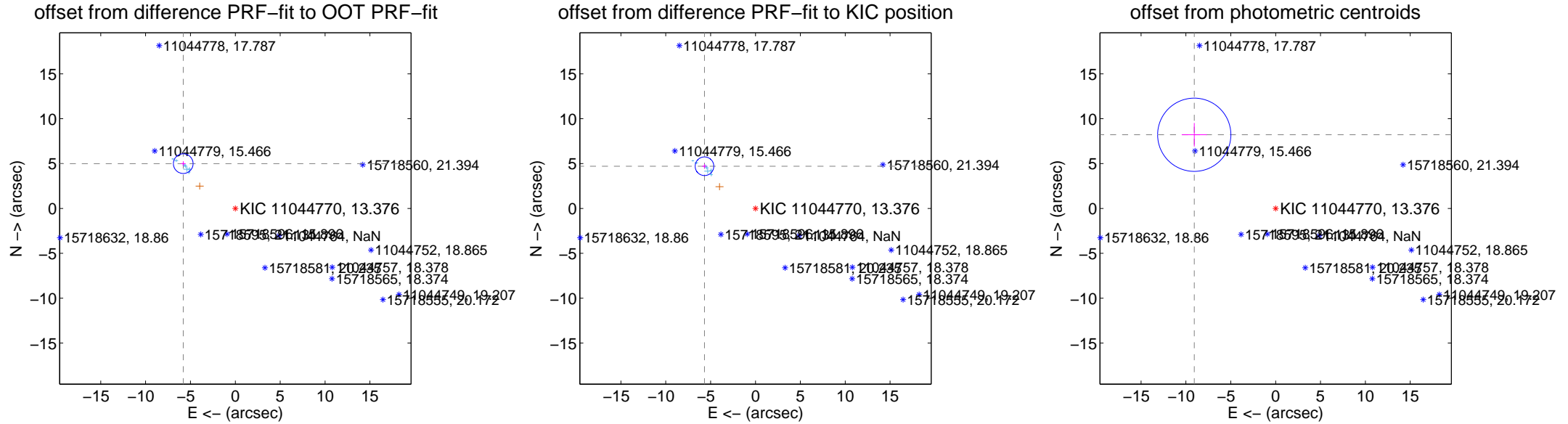
DV Centroid Data

Supplemental centroid analysis for 011044770-02. Kepler magnitude: 13.38. Transit SNR 12.86

There are 7 quarters with good PRF difference image offsets

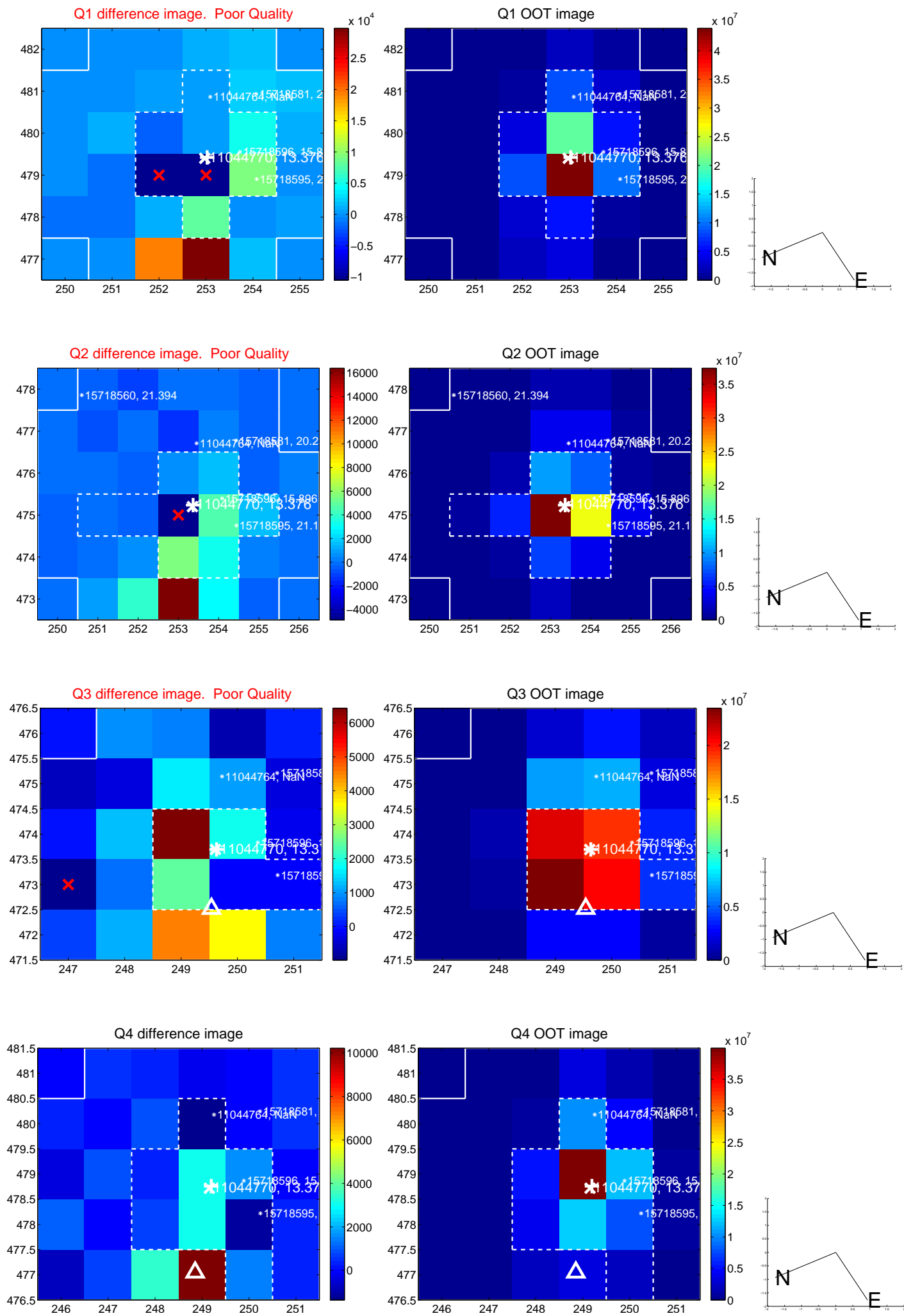
The direct PRF centroid is offset from the target star catalog position by about 0.26 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|---|-------------------------------------|---------------------|-------------------|-------------------|
| PRF-fit source offset from OOT | 7.658 ± 0.366 | 20.94 | 5.806 ± 0.269 | 4.993 ± 0.265 |
| PRF-fit source offset from KIC position | 7.378 ± 0.346 | 21.32 | 5.684 ± 0.262 | 4.703 ± 0.249 |
| photometric centroid source offset | 12.23 ± 1.36 | 8.99 | 9.07 ± 1.40 | 8.21 ± 1.31 |

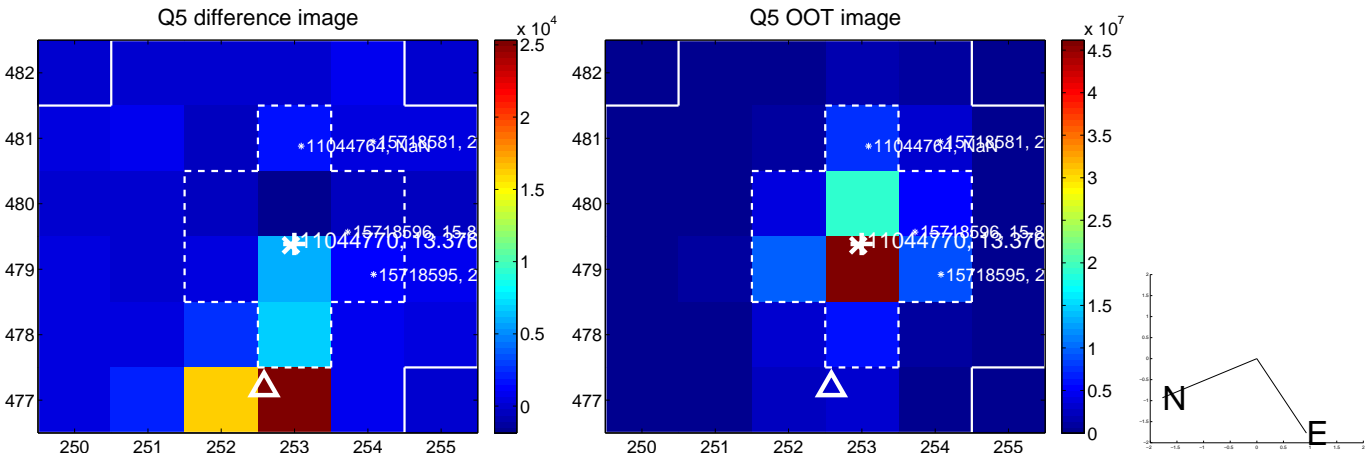


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

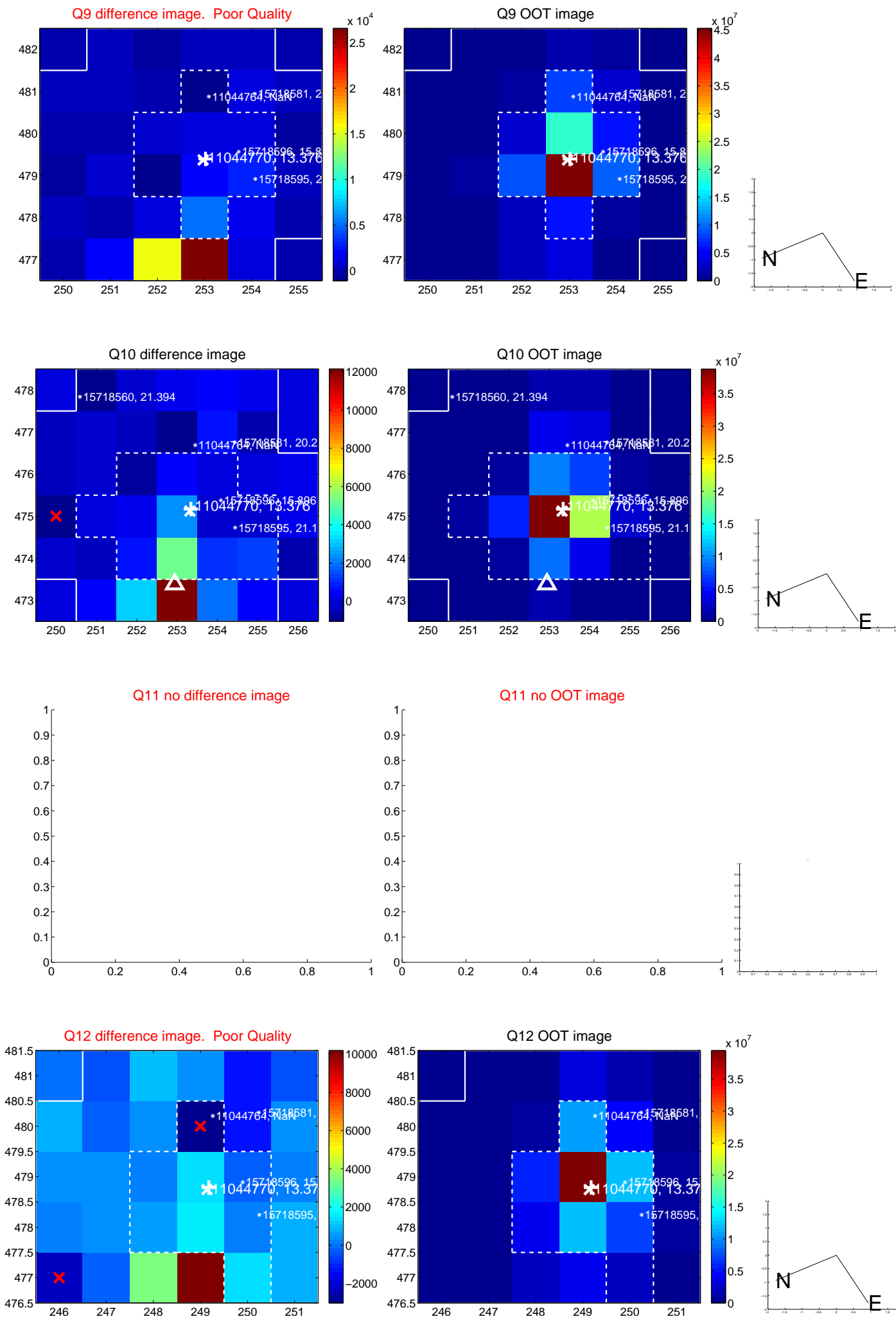
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



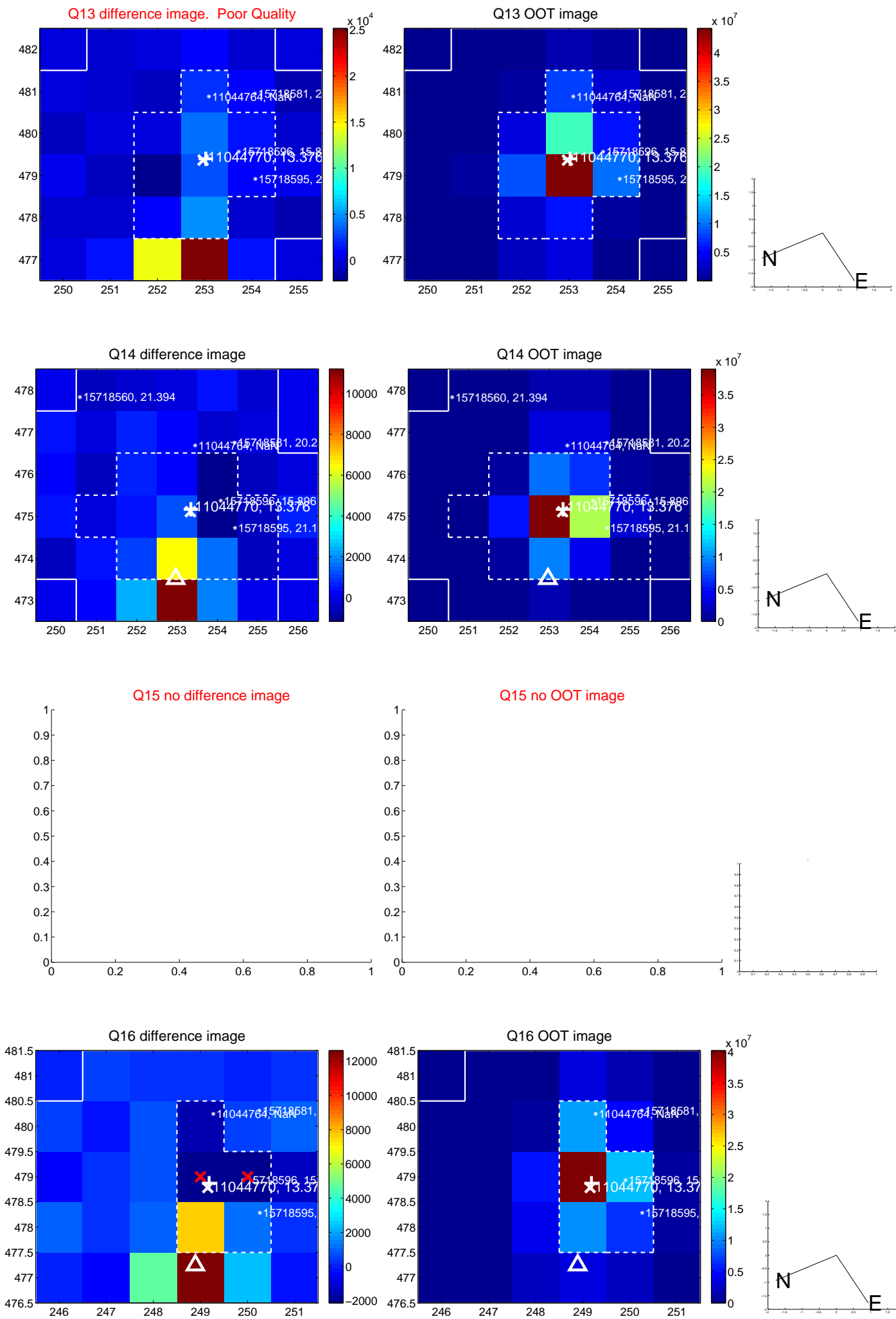
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



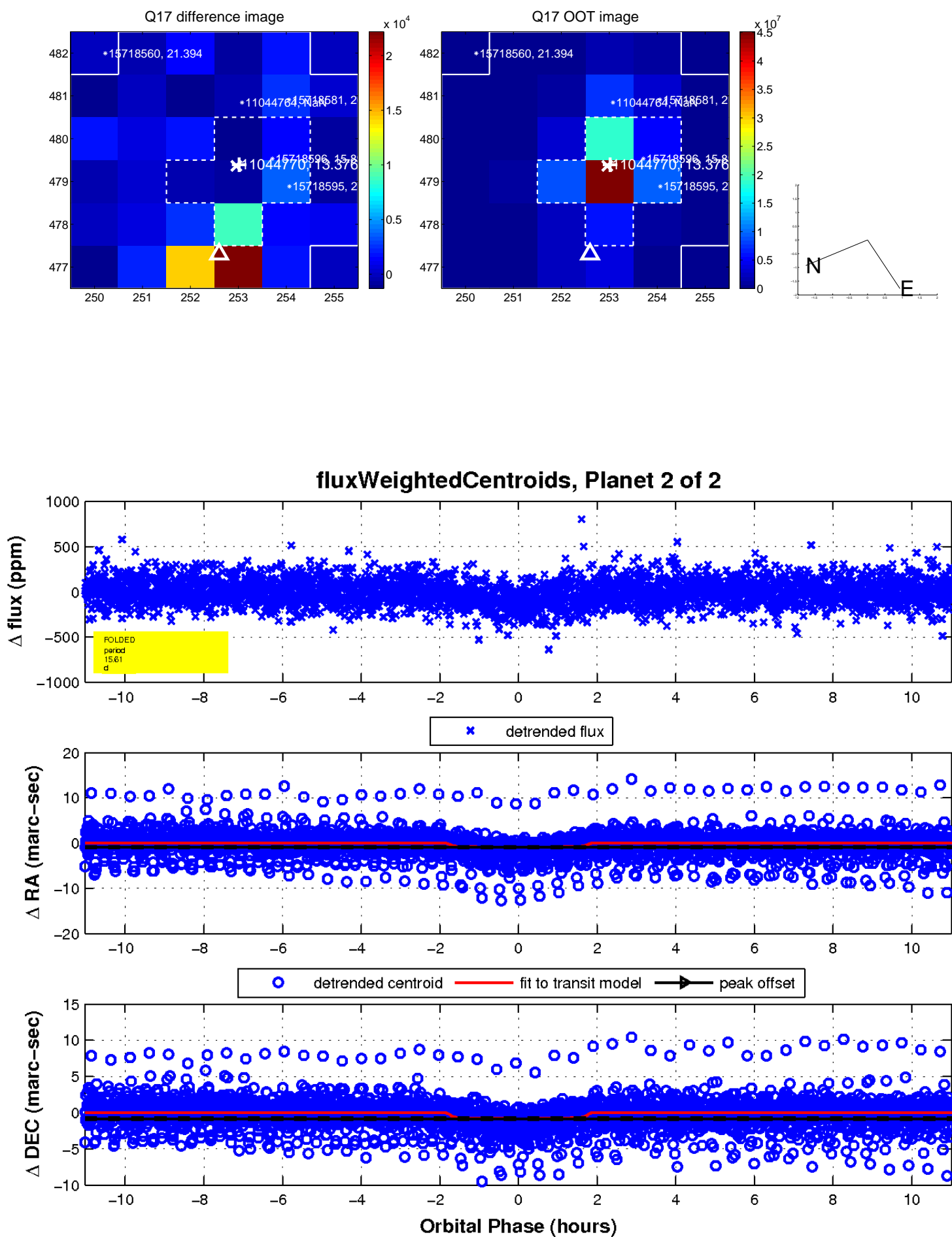
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.



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.



UKIRT Image

