

KIC 009834257

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}) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 009834257-01 | OBS | 3457.01 | 15.651269 | 138.726000 | 1494.5 | 5.636 | 92.5 | 75.1 | 3.29 | 6552 | 23.66 | 900.26 |
| 009834257-02 | OBS | No | 15.651336 | 132.814681 | 519.2 | 6.149 | 76.9 | 32.0 | 3.29 | 6552 | 9.60 | 900.25 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|--|
| 009834257-01 | OBS | FP | 0.00 | 0 | 1 | 1 | 1 | MOD_SEC_DV—MOD_SEC_ALT—DEEP_V_SHAPED—HAS_SEC_TCE—CENT_RESOLVED_OFFSET—HALO_GHOST—EPHEM_MATCH |
| 009834257-02 | 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 009834257-01

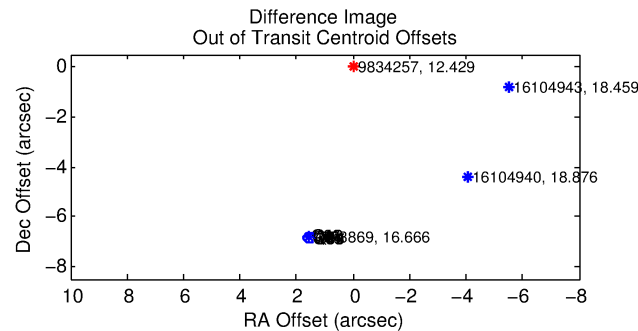
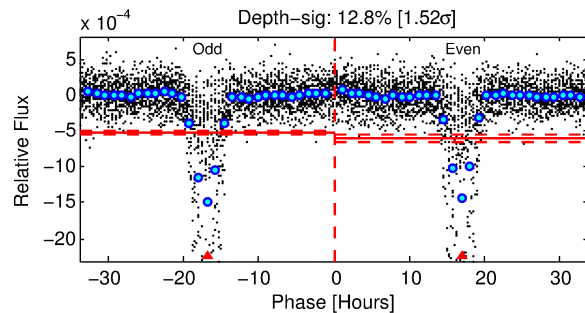
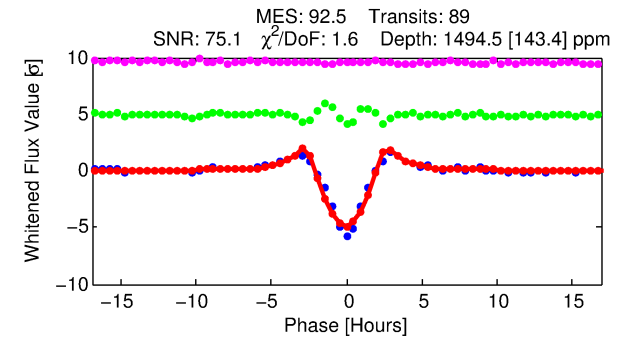
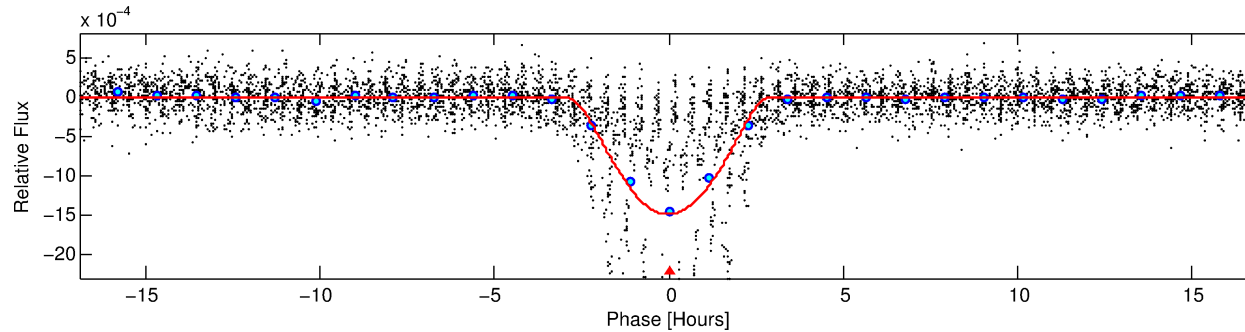
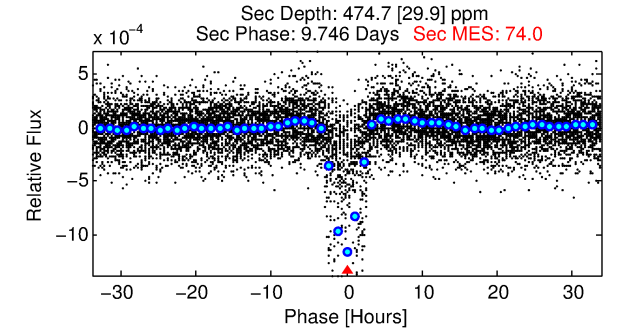
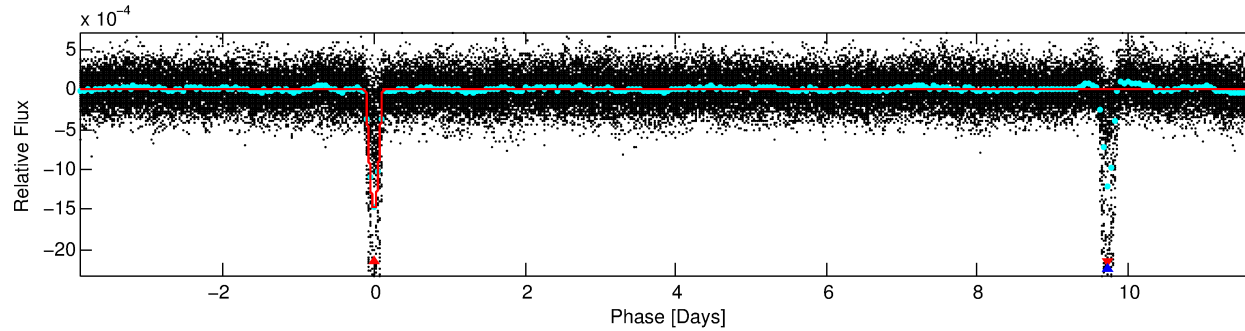
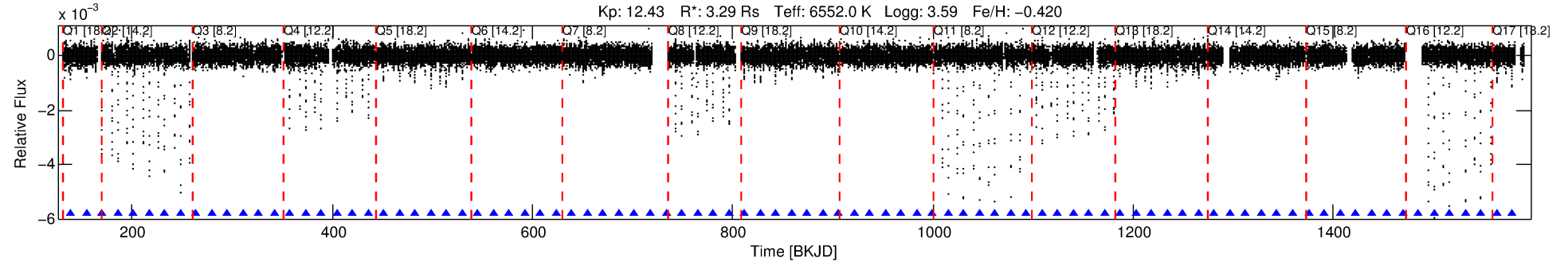
| TCE (1) | KIC | Parent (2) | Parent KIC | $P_1:P_2$ | Dist ($''$) | Δ Row | Δ Col | m_2 | m_1 | D_2/D_1 | Mechanism | Flag | σ_P | σ_T |
|--------------|---------|--------------|------------|-----------|---------------|--------------|--------------|-------|-------|-----------|------------|------|------------|------------|
| 009834257-01 | 9834257 | 009773869-01 | 9773869 | 1:1 | 7.0 | 0 | -1 | 16.67 | 12.43 | 327.07 | Direct-PRF | 0 | 0.05 | 0.04 |

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: 9834257 Candidate: 1 of 2 Period: 15.651 d
KOI: K03457 Corr: No Ephemeris Match

Kp: 12.43 R*: 3.29 Rs Teff: 6552.0 K Logg: 3.59 Fe/H: -0.420



DV Fit Results:

Period = 15.65127 [0.00002] d
Epoch = 138.7260 [0.0013] BKJD
Rp/R* = 0.0659 [0.0177]
a/R* = 7.90 [0.48]
b = 1.00 [0.02]
Seff = 900.26 [525.28]
Teq = 1397 [204] K
Rp = 23.66 [11.45] Re
a = 0.1409 [0.0520] AU
Ag = 9.26 [7.29] [1.13σ]
Teff = 3767 [519] K [4.25σ]

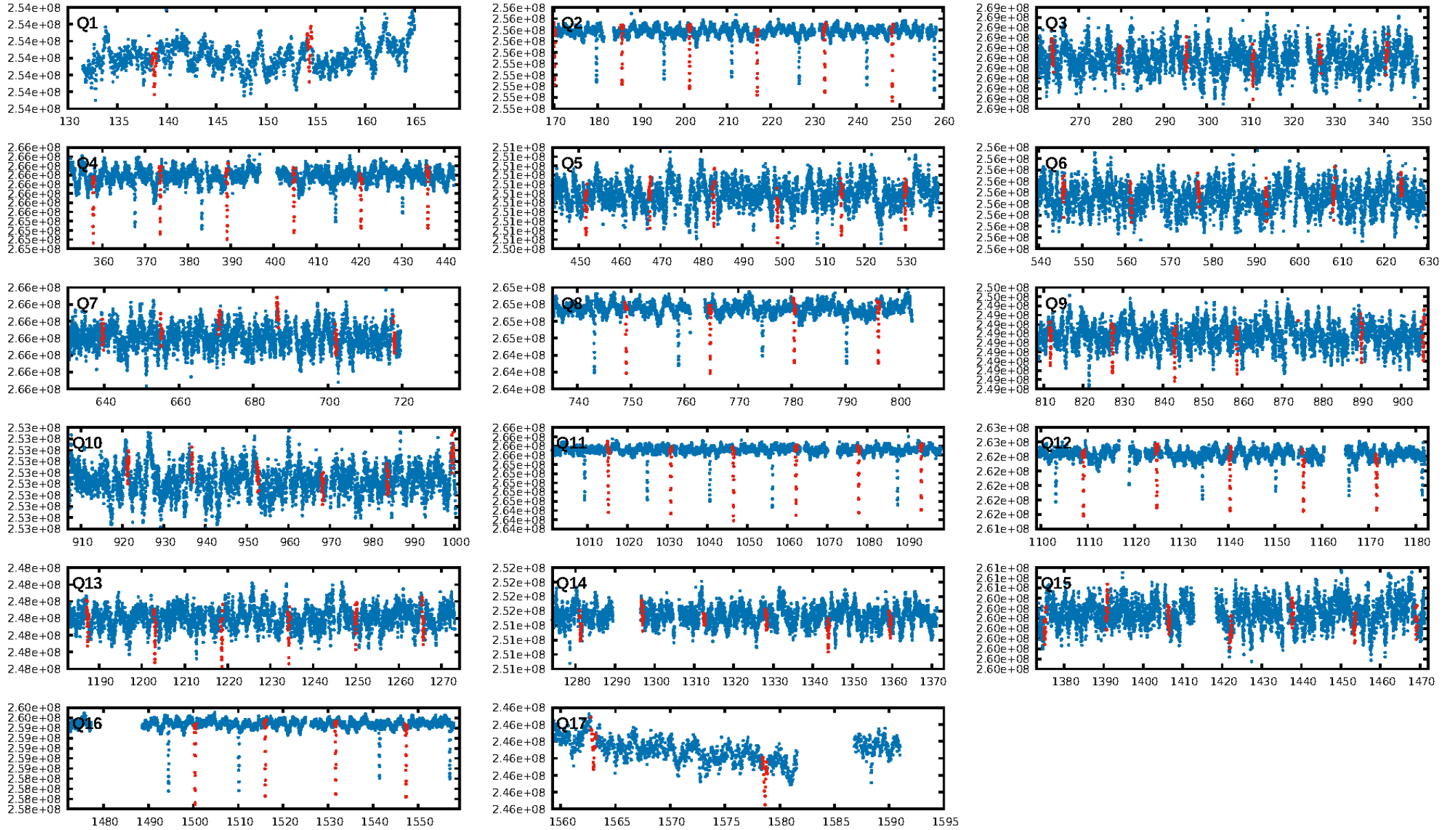
DV Diagnostic Results:

ShortPeriod-sig: N/A
LongPeriod-sig: 0.0% [0.00σ]
ModelChiSquare2-sig: 0.0%
ModelChiSquareGoF-sig: 0.6%
Bootstrap-pfa: 0.00e+00
RollingBand-fgt: 1.00 [85/85]
GhostDiagnostic-chr: -0.1615
Centroid-sig: 0.0%
Centroid-so: 19.191 arcsec [605.95σ]
OotOffset-rm: 7.033 arcsec [103.51σ]
KicOffset-rm: 7.153 arcsec [106.19σ]
OotOffset-st: 4/4/4/5 [17]
KicOffset-st: 4/4/4/5 [17]
DiffImageQuality-fgm: 1.00 [17/17]
DiffImageOverlap-fno: 1.00 [17/17]

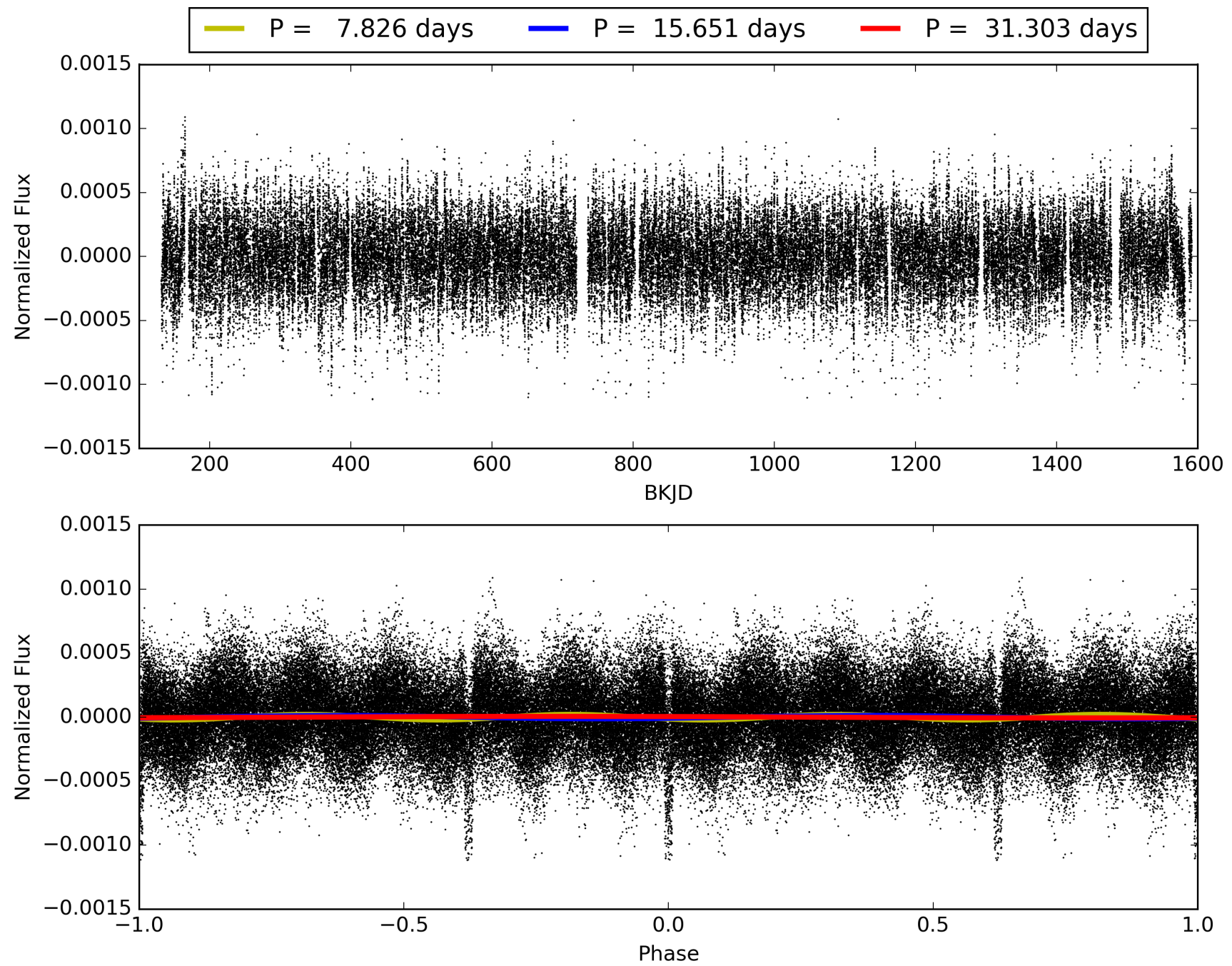
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 16:04:22 Z

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

TCE 009834257-01, PDC Light Curves

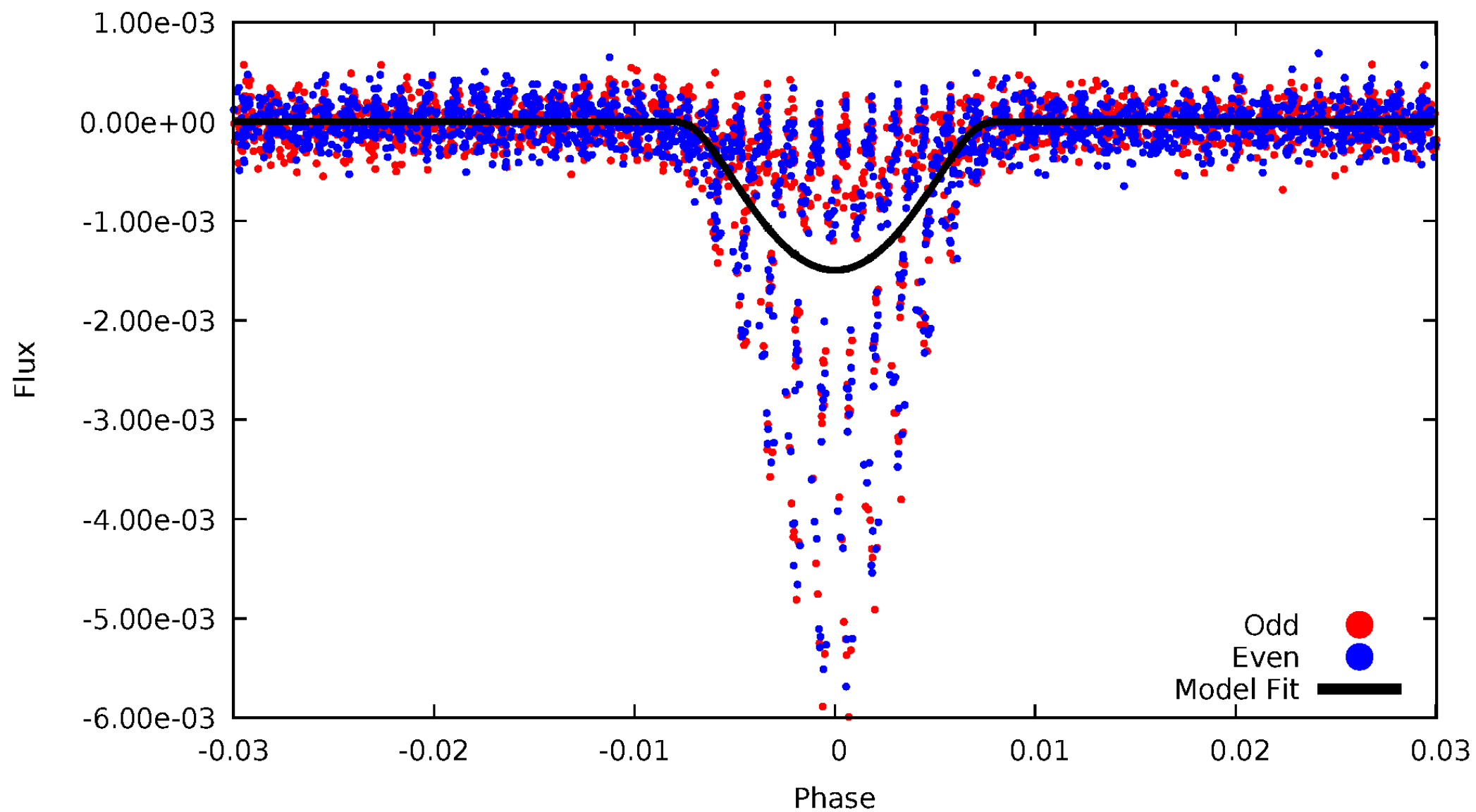


TCE 009834257-01



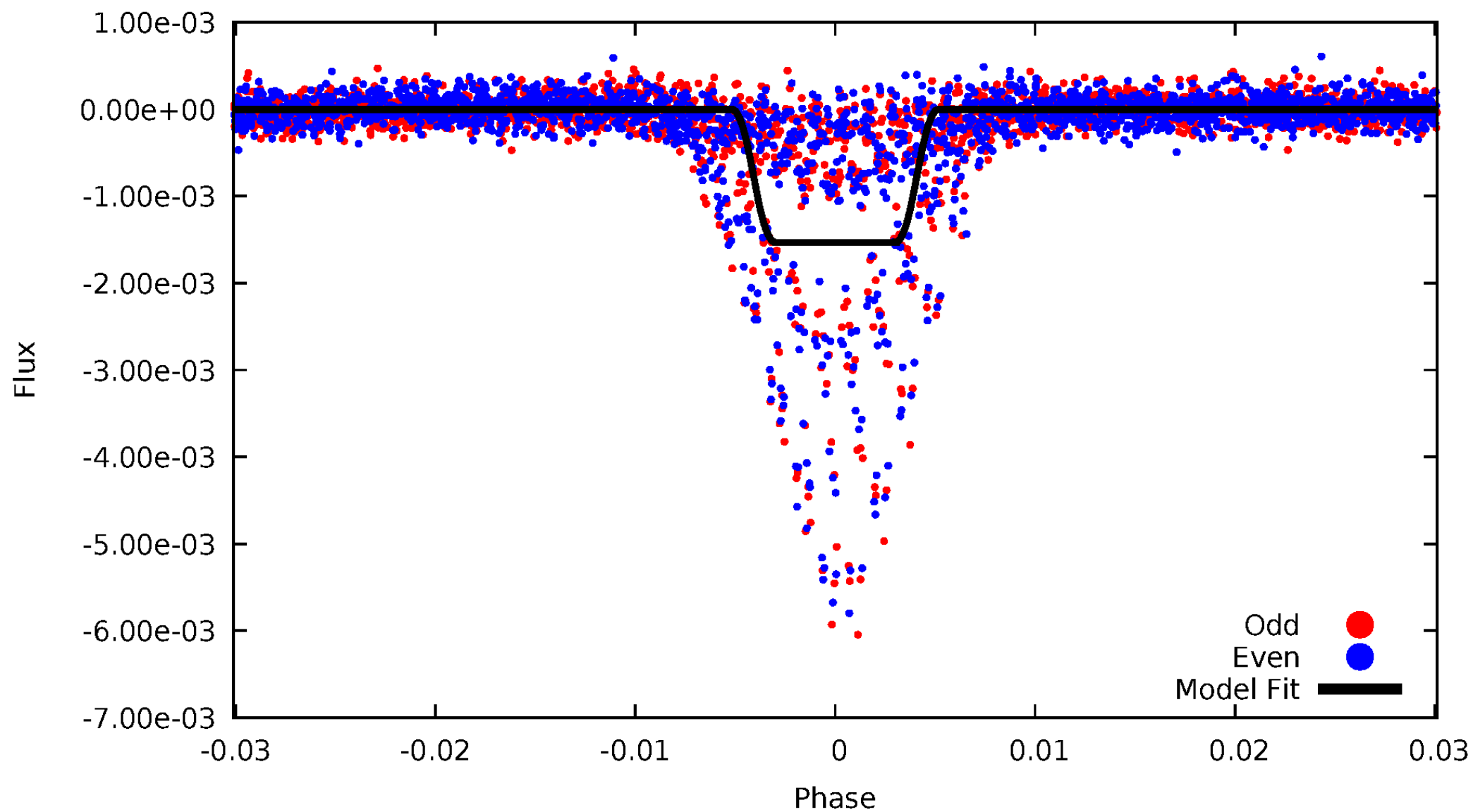
DV Odd/Even

TCE 009834257-01



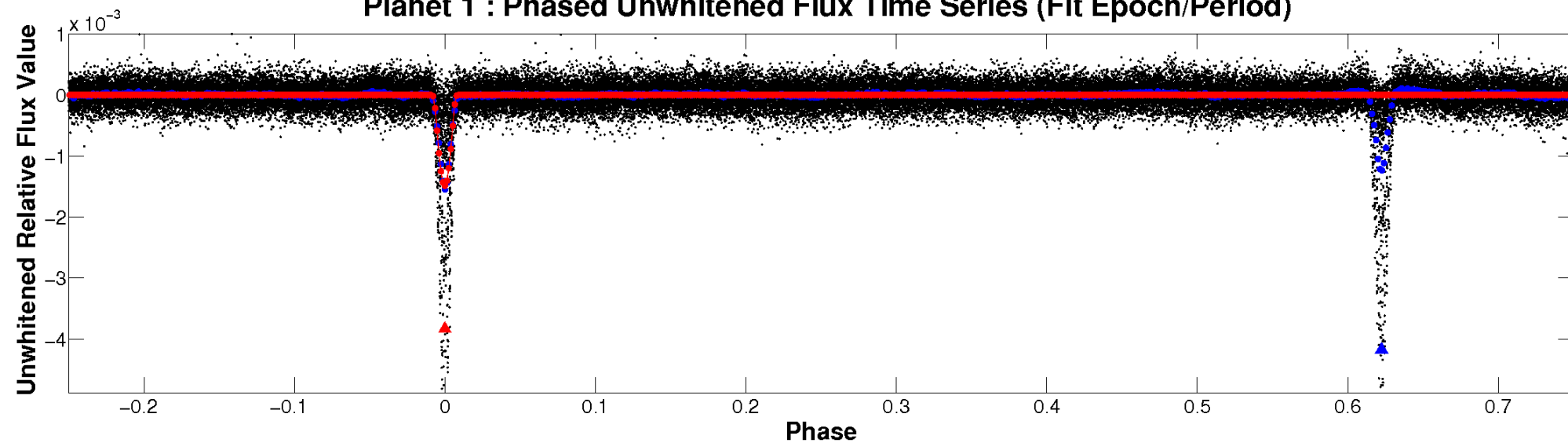
ALT Odd/Even

TCE 009834257-01

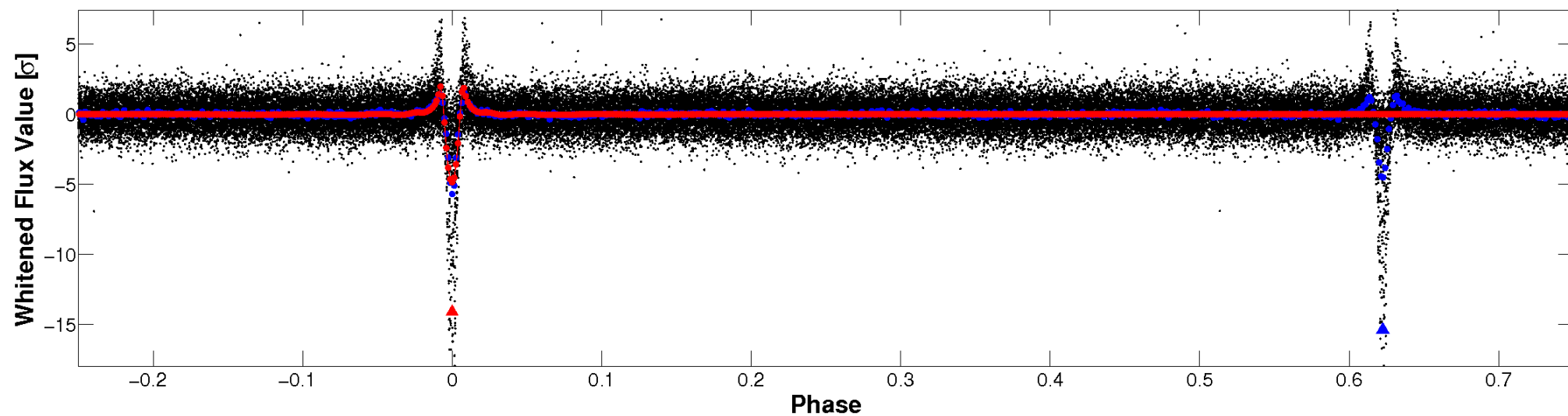


Non-Whitened Vs. Whitened Light Curve

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

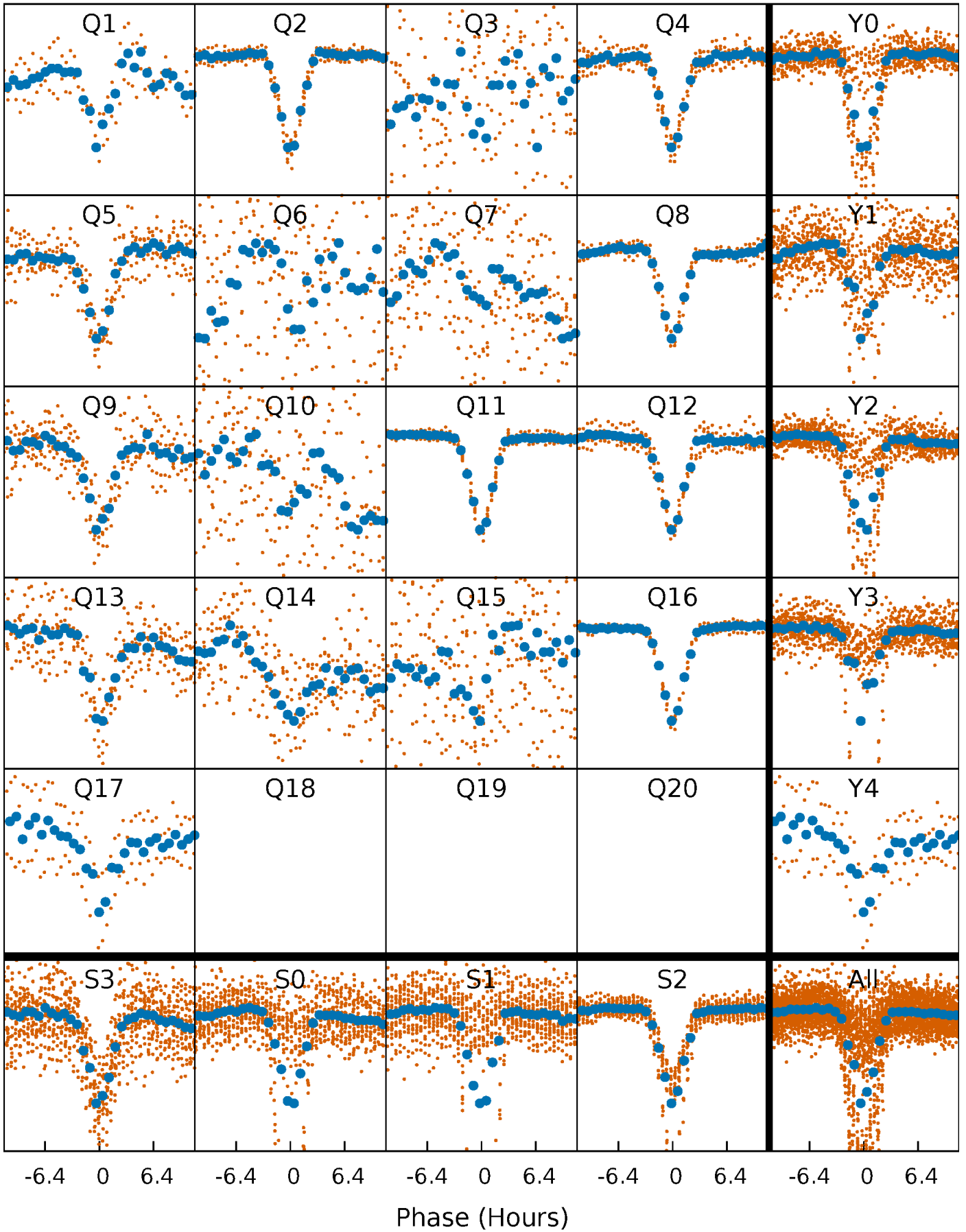


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



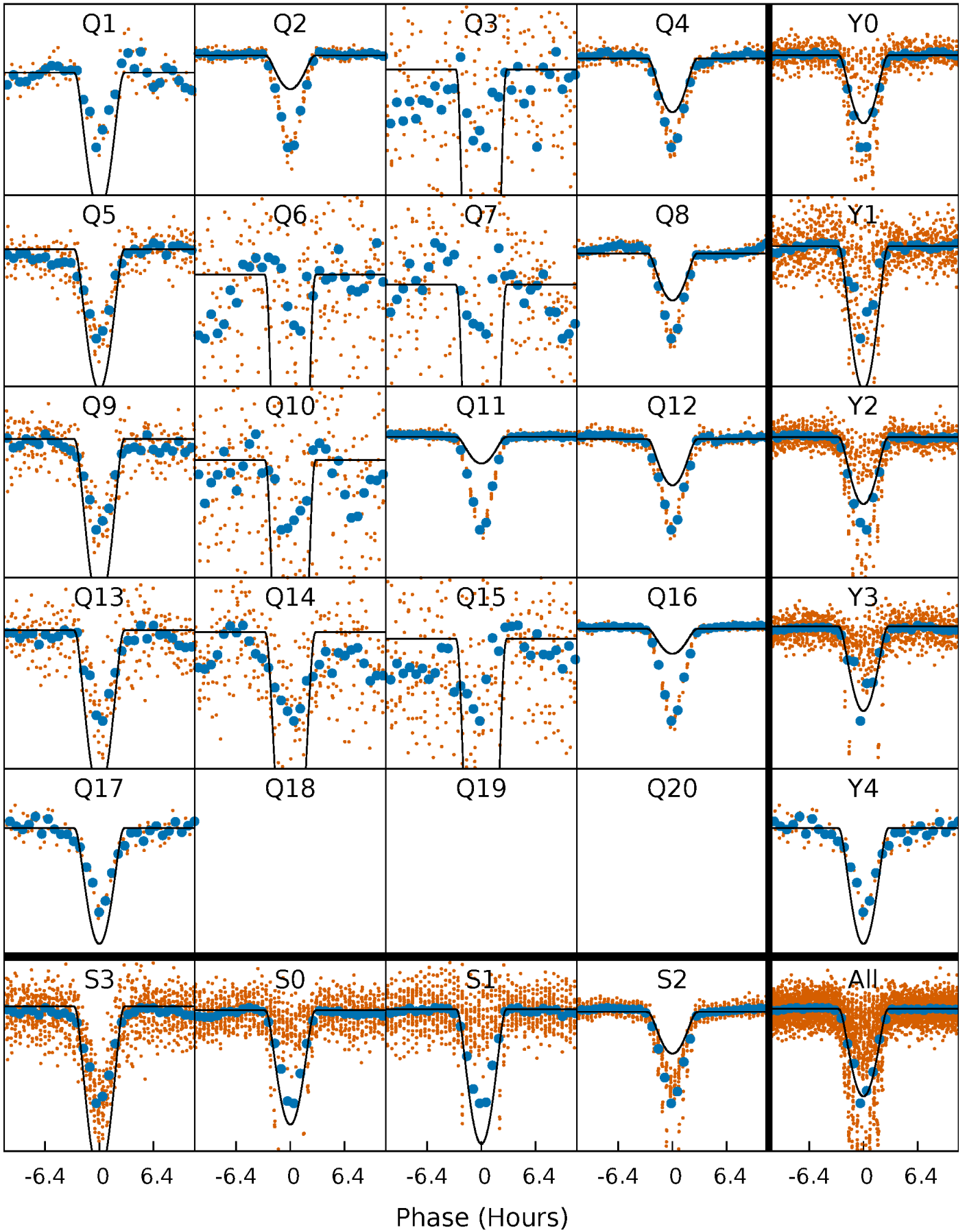
PDC Quarter-Phased Transit Curves

TCE 009834257-01 P= 15.651269 Days $T_0=138.726000$ (BKJD)



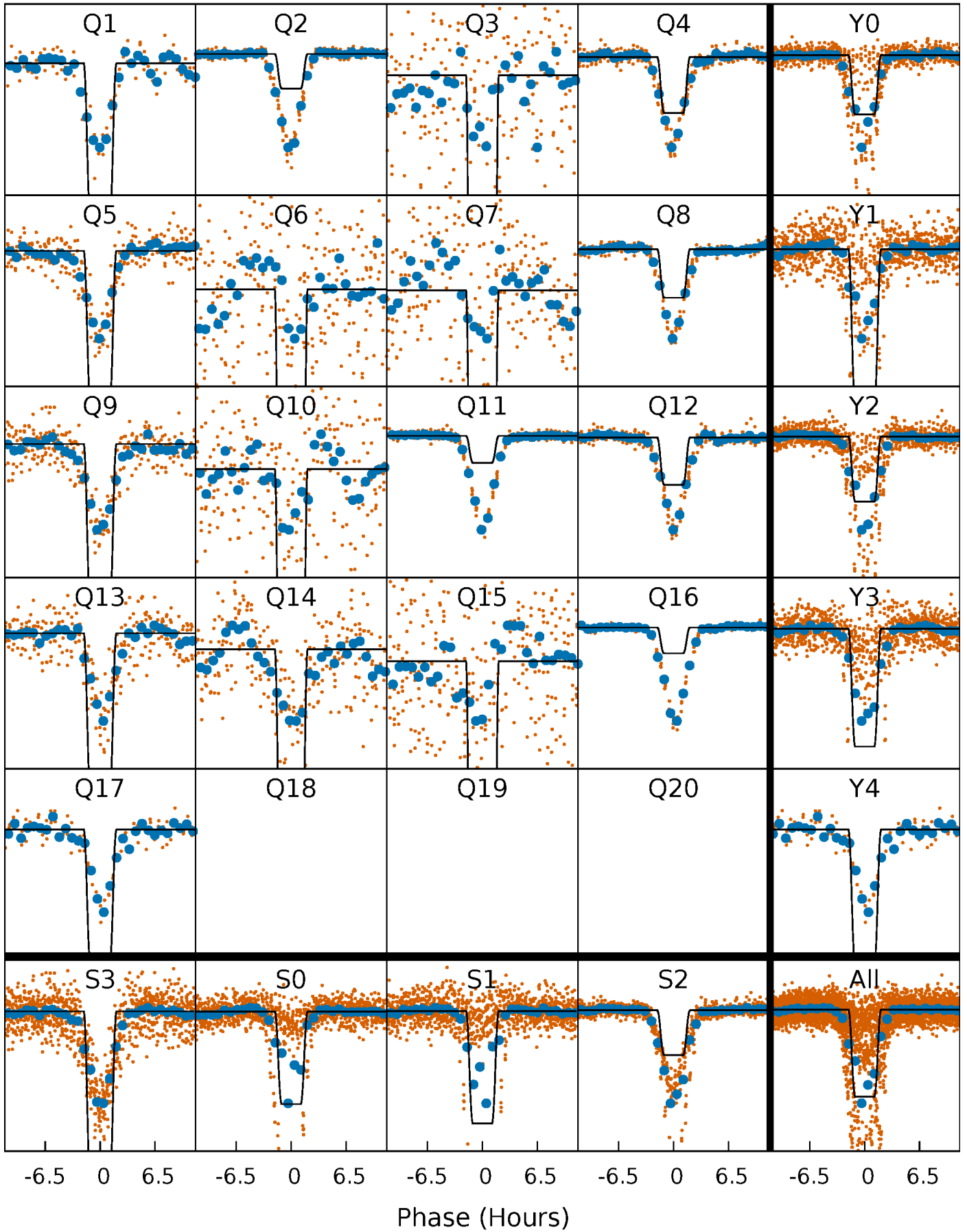
DV Quarter-Phased Transit Curves

TCE 009834257-01 P= 15.651269 Days $T_0=138.726000$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

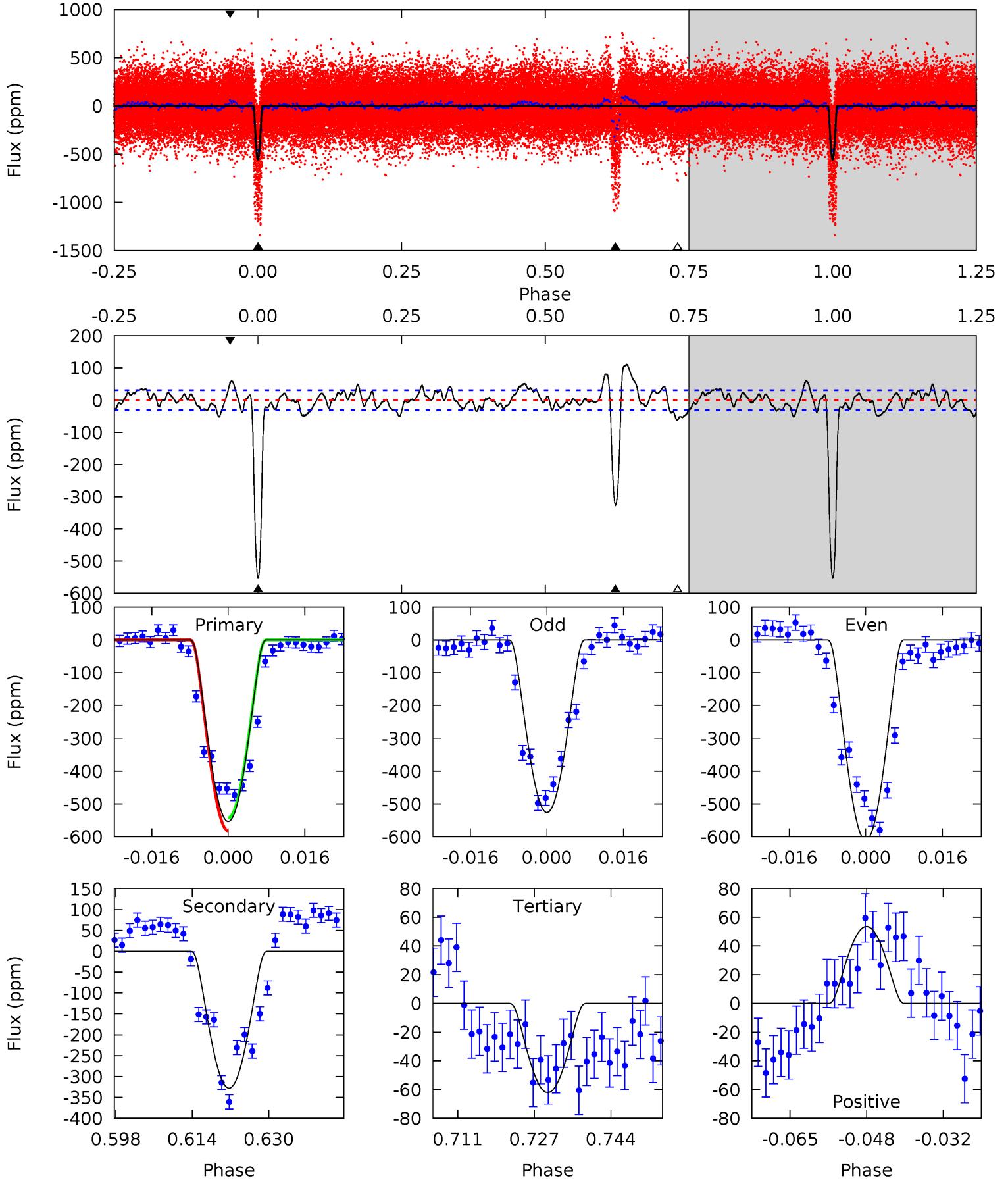
TCE 009834257-01 P= 15.651109 Days $T_0=138.732968$ (BKJD)



DV Model-Shift Uniqueness Test

009834257-01, P = 15.651269 Days, E = 123.074731 Days

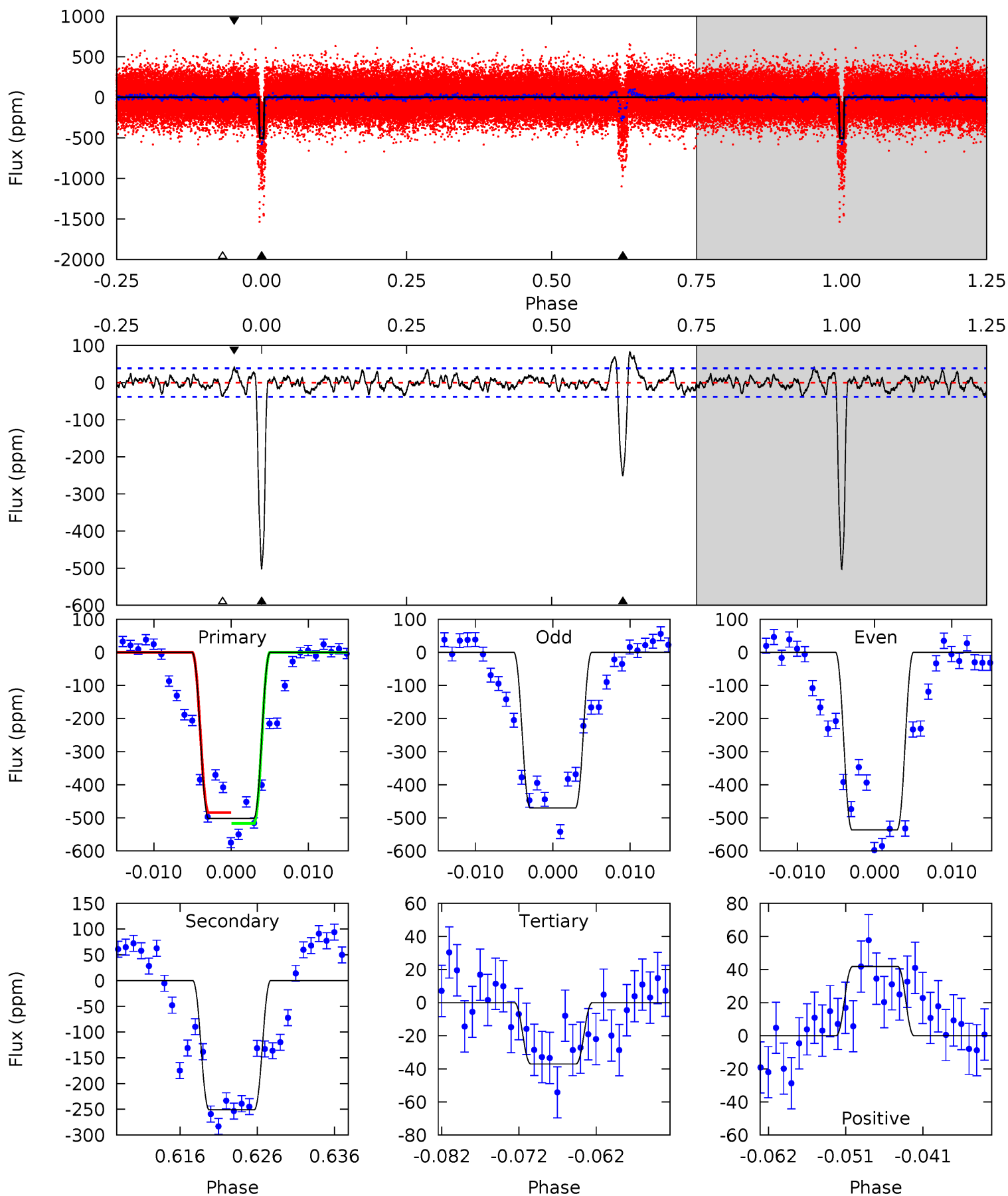
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 87.6 | 51.9 | 9.83 | 8.48 | 4.93 | 2.41 | 4.25 | 77.8 | 79.1 | 42.0 | 43.4 | 6.68 | 1.84 | 0.17 | 3.00 |



Alt Model-Shift Uniqueness Test

009834257-01, P = 15.651109 Days, E = 123.081859 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 65.8 | 32.9 | 4.86 | 5.48 | 5.02 | 2.57 | 2.18 | 61.0 | 60.4 | 28.0 | 27.4 | 4.22 | 1.90 | 0.14 | 2.08 |



Stellar Parameters For KIC 009834257

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | R (R_{\odot}) | $M(M_{\odot})$ | p_{\star} ($\text{g}\cdot\text{cm}^{-3}$) |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
| | 6552^{+178}_{-178} | $3.586^{+0.330}_{-0.110}$ | $-0.420^{+0.350}_{-0.300}$ | $3.289^{+0.441}_{-1.324}$ | $1.521^{+0.237}_{-0.355}$ | $0.060^{+0.160}_{-0.017}$ |
| | +3%/-3% | +9%/-3% | +83%/-71% | +13%/-40% | +16%/-23% | +266%/-28% |
| 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 009834257-01 / KOI 3457.01

| Detrend | Depth (ppm) | R_p (R_{\oplus}) | T_{max} (K) | T_{obs} (K) | A_{obs} |
|---------|--------------|-------------------------|----------------------|-----------------------|---------------------------|
| DV | -328 ± 6 | $22.54^{+7.54}_{-7.08}$ | 1932^{+103}_{-183} | 3804^{+417}_{-323} | $7.216^{+7.502}_{-3.127}$ |
| Alt. | -251 ± 8 | $13.37^{+6.57}_{-6.23}$ | 1935^{+103}_{-179} | 4373^{+1261}_{-580} | 15^{+38}_{-8} |

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 $A_{\text{obs}} \gg 1.0$

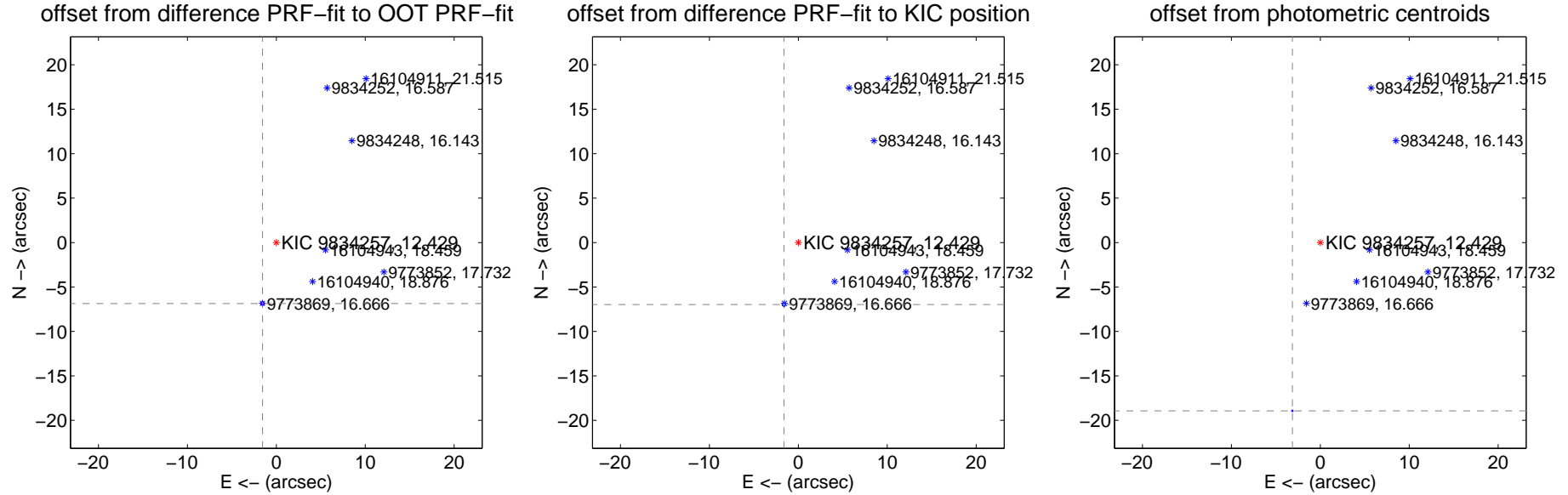
DV Centroid Data

Supplemental centroid analysis for 009834257-01. Kepler magnitude: 12.43. Transit SNR 75.06

There are 17 quarters with good PRF difference image offsets

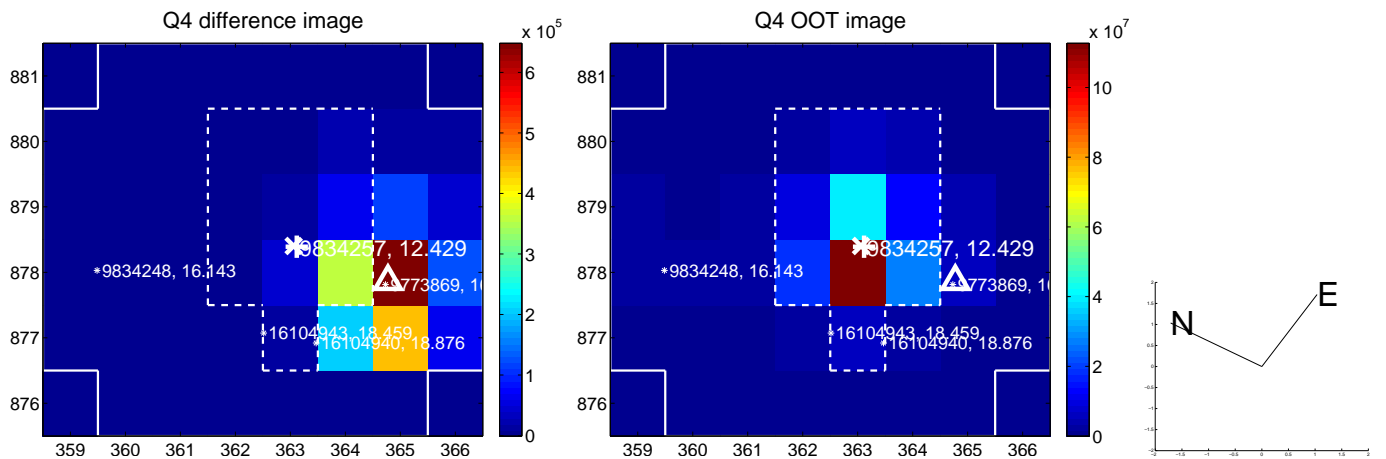
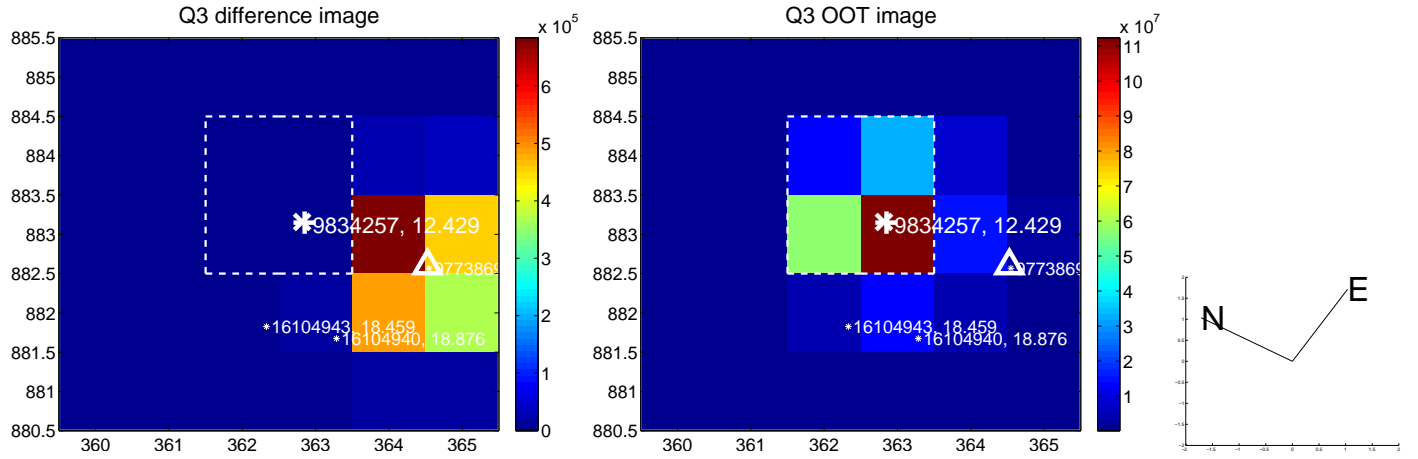
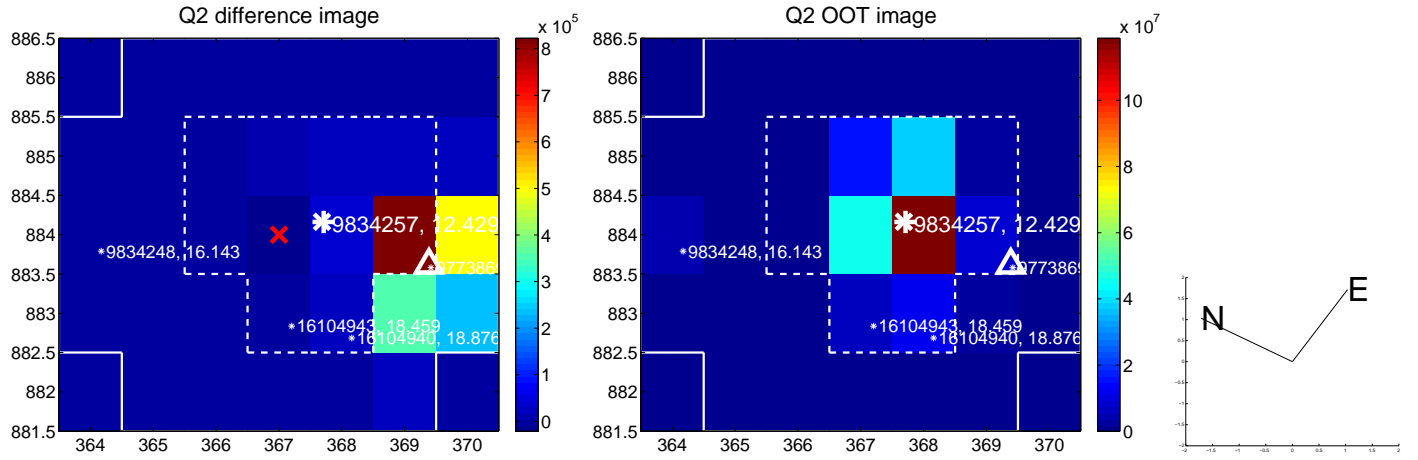
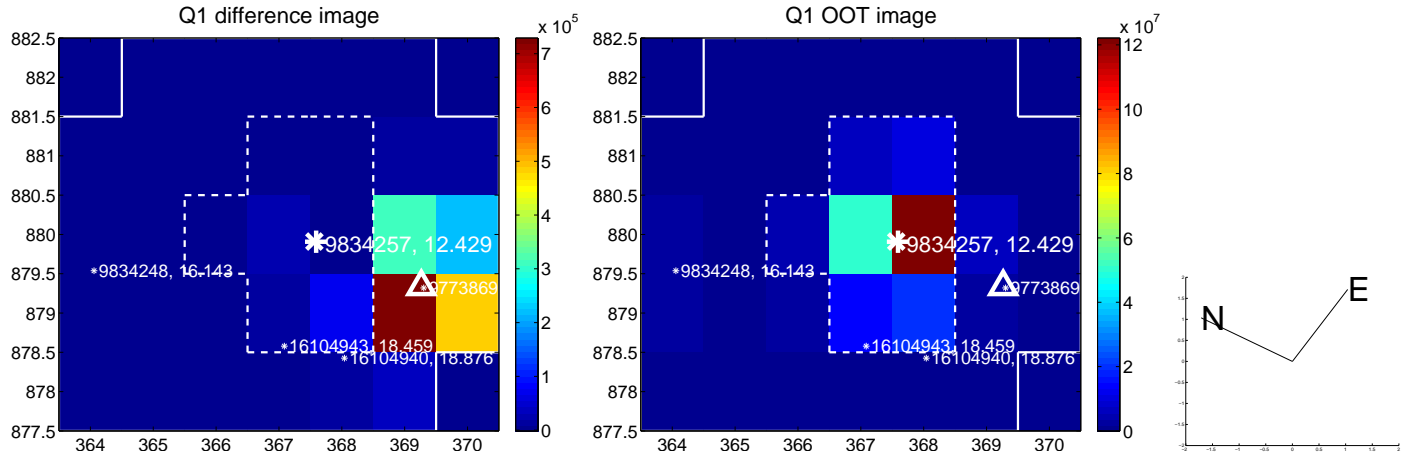
The direct PRF centroid is offset from the target star catalog position by about 0.14 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|---|-------------------------------------|---------------------|-------------------|--------------------|
| PRF-fit source offset from OOT | 7.033 \pm 0.068 | 103.51 | 1.554 \pm 0.067 | -6.859 \pm 0.068 |
| PRF-fit source offset from KIC position | 7.153 \pm 0.067 | 106.19 | 1.615 \pm 0.069 | -6.969 \pm 0.067 |
| photometric centroid source offset | 19.19 \pm 0.03 | 605.95 | 3.14 \pm 0.03 | -18.93 \pm 0.03 |

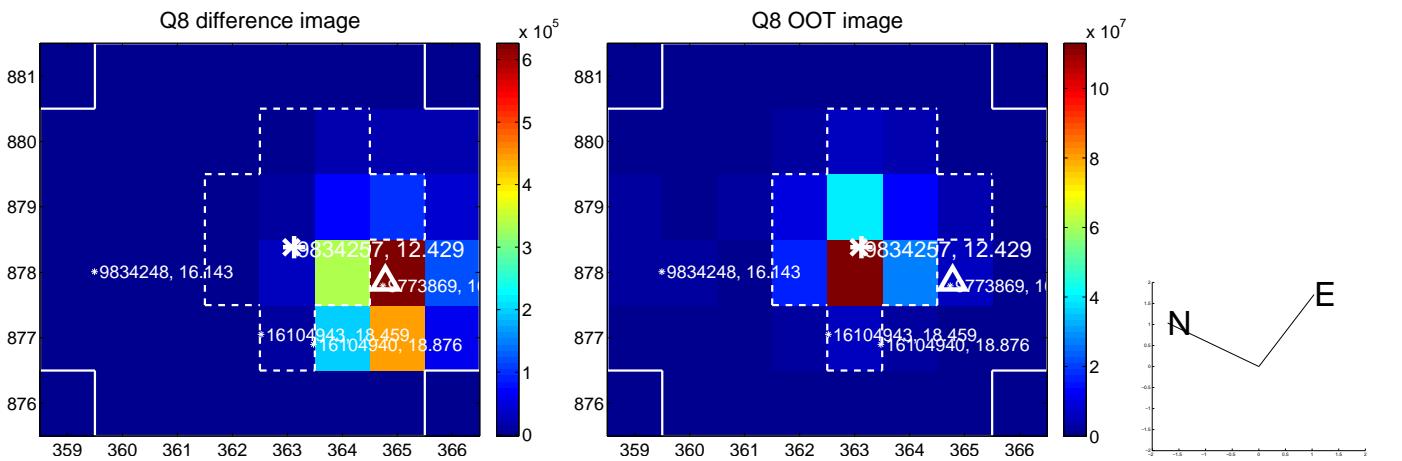
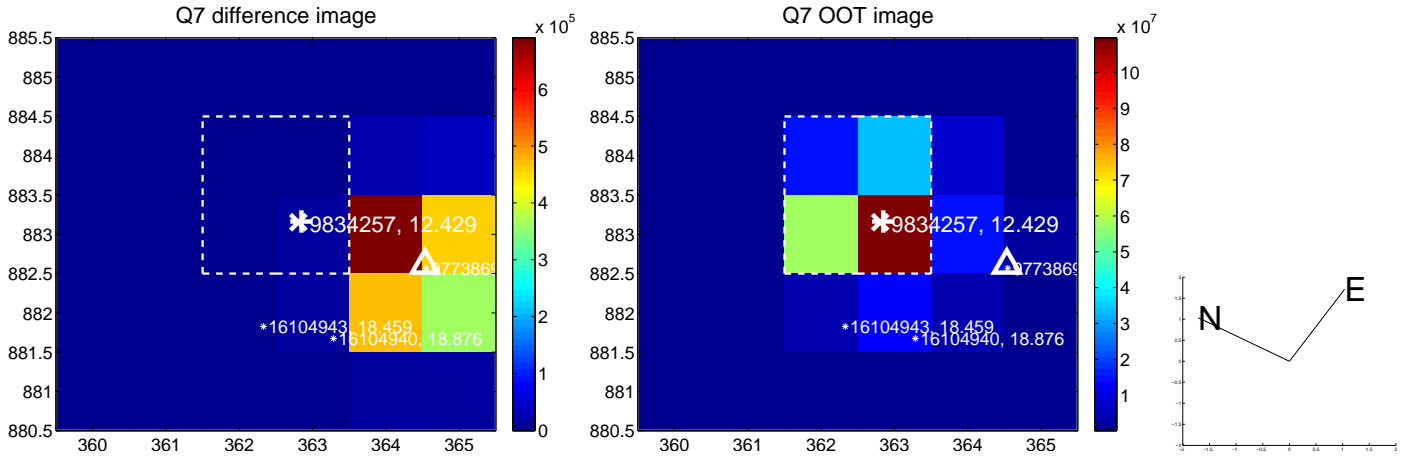
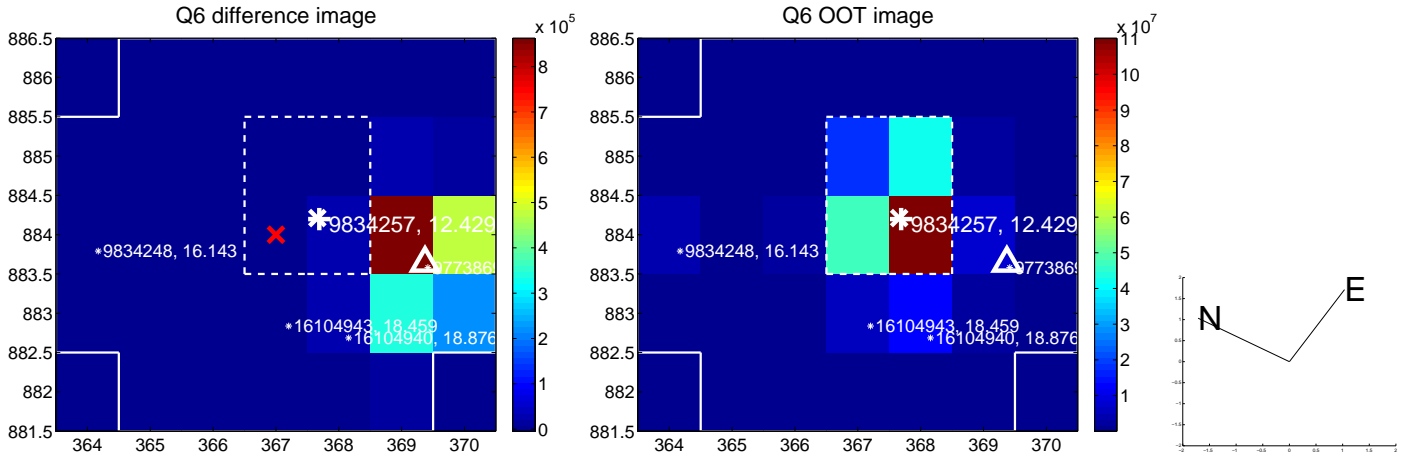
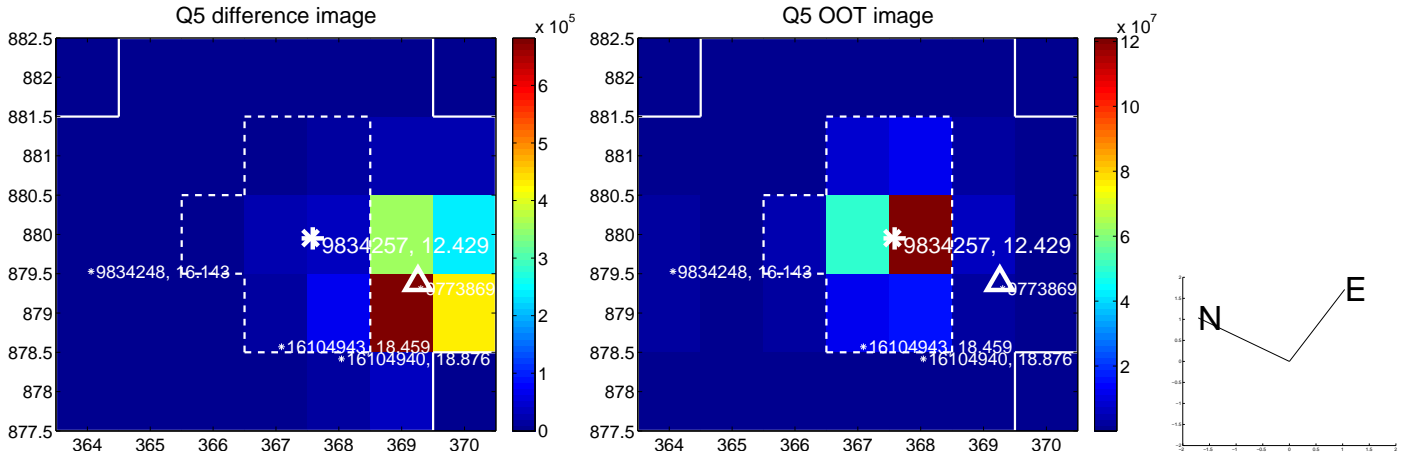


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

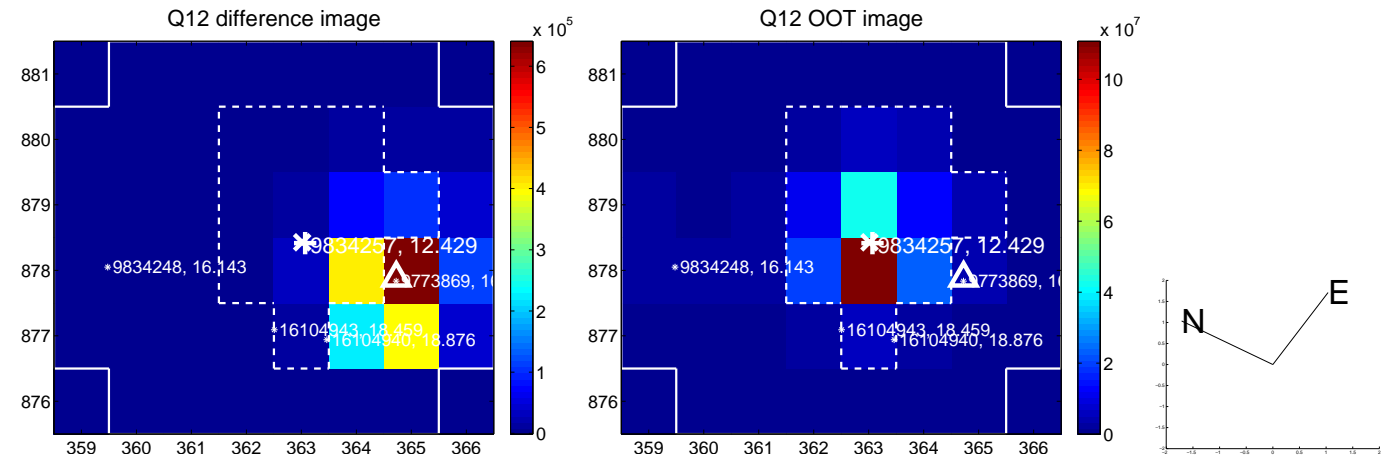
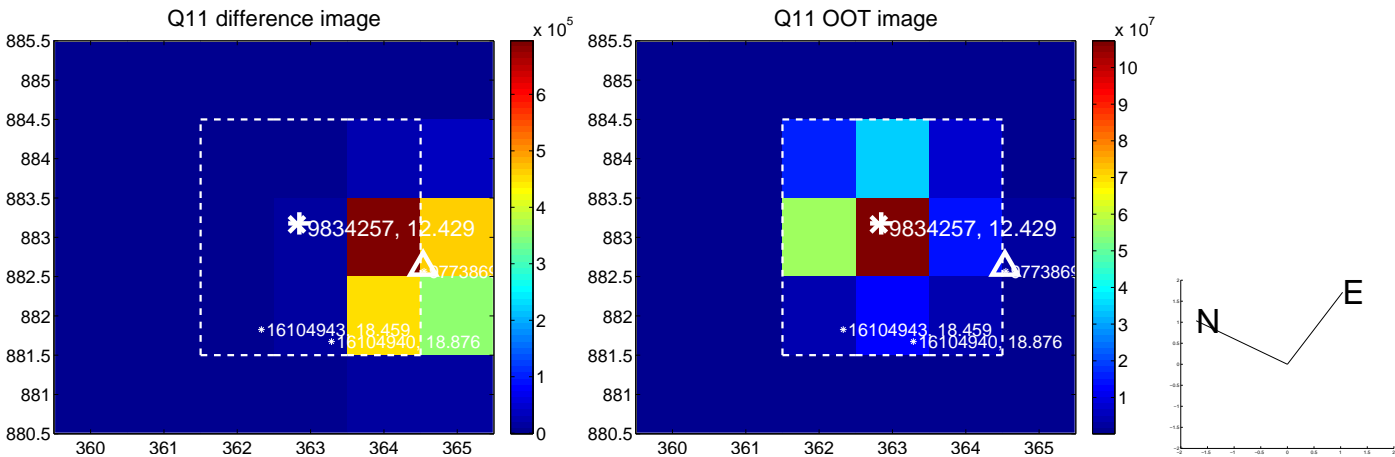
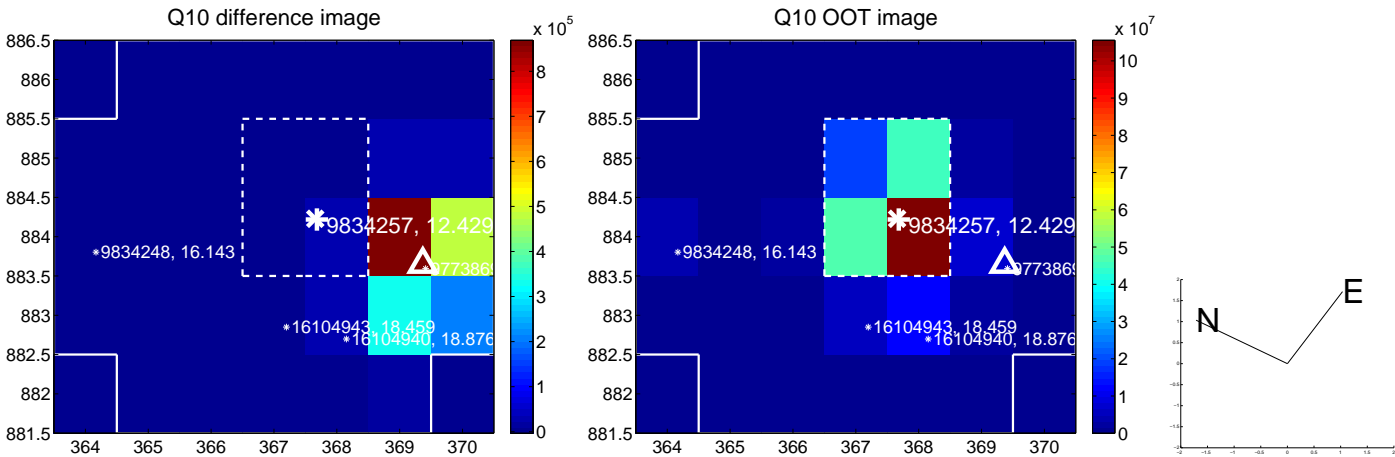
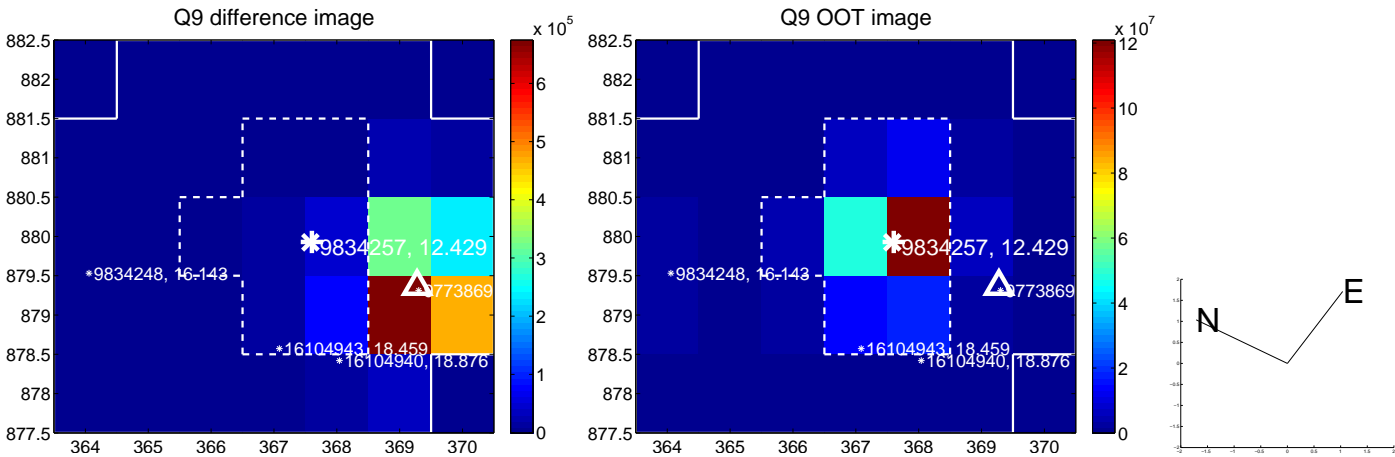
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



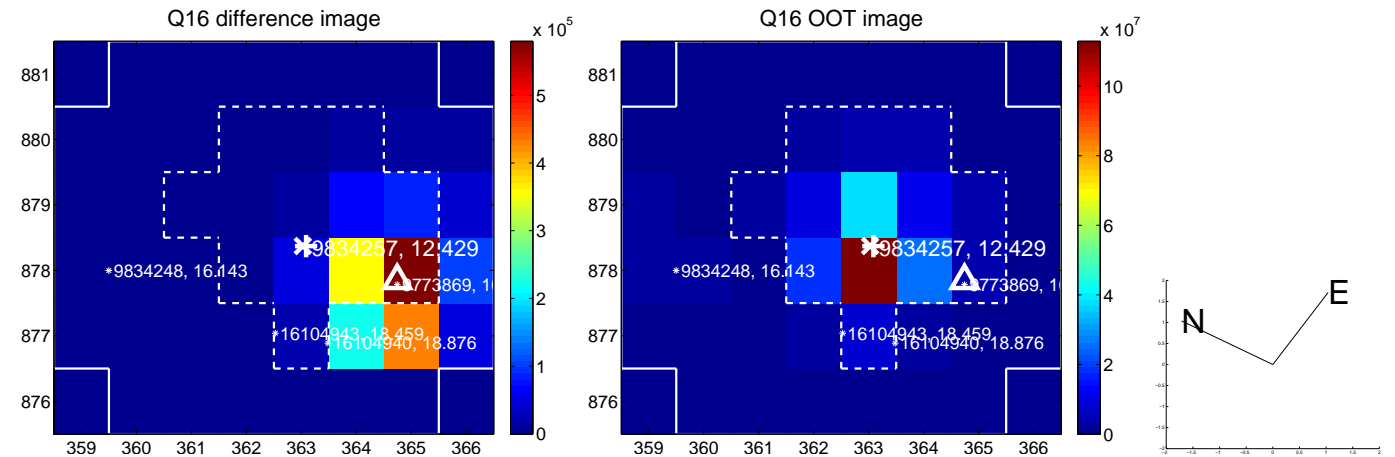
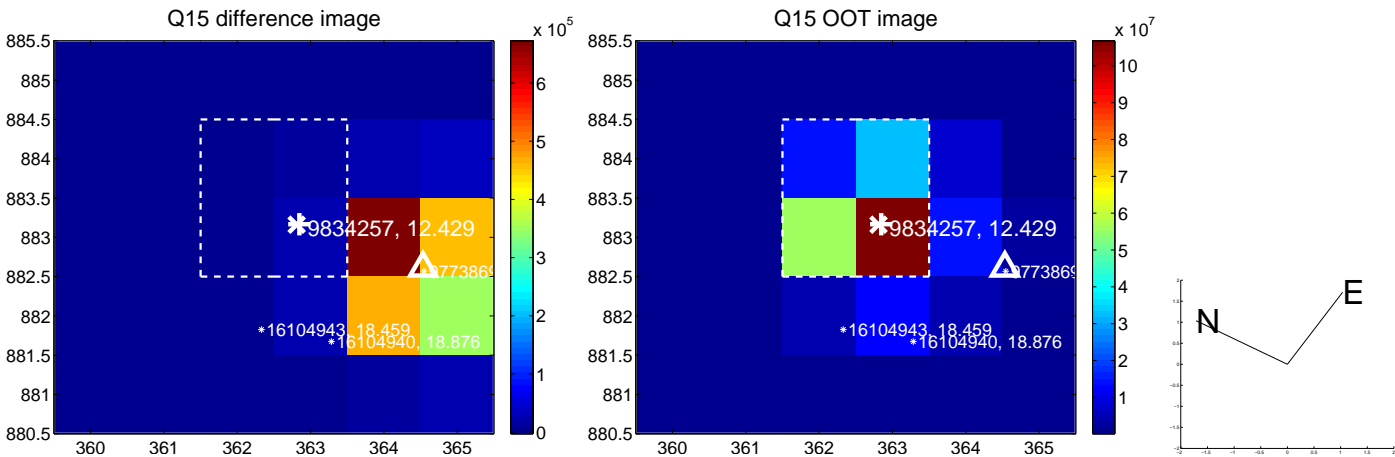
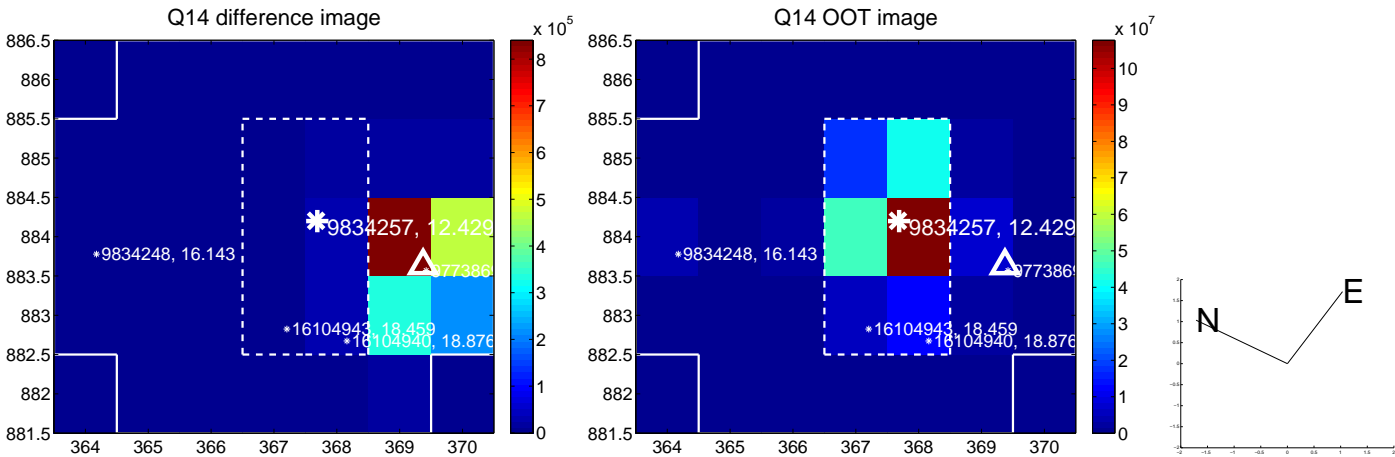
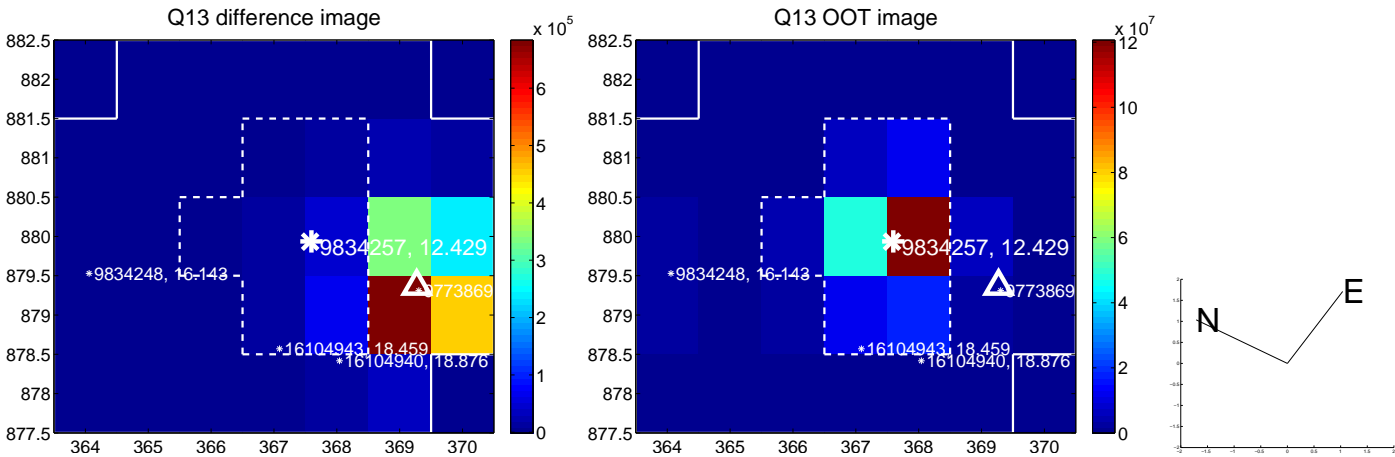
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



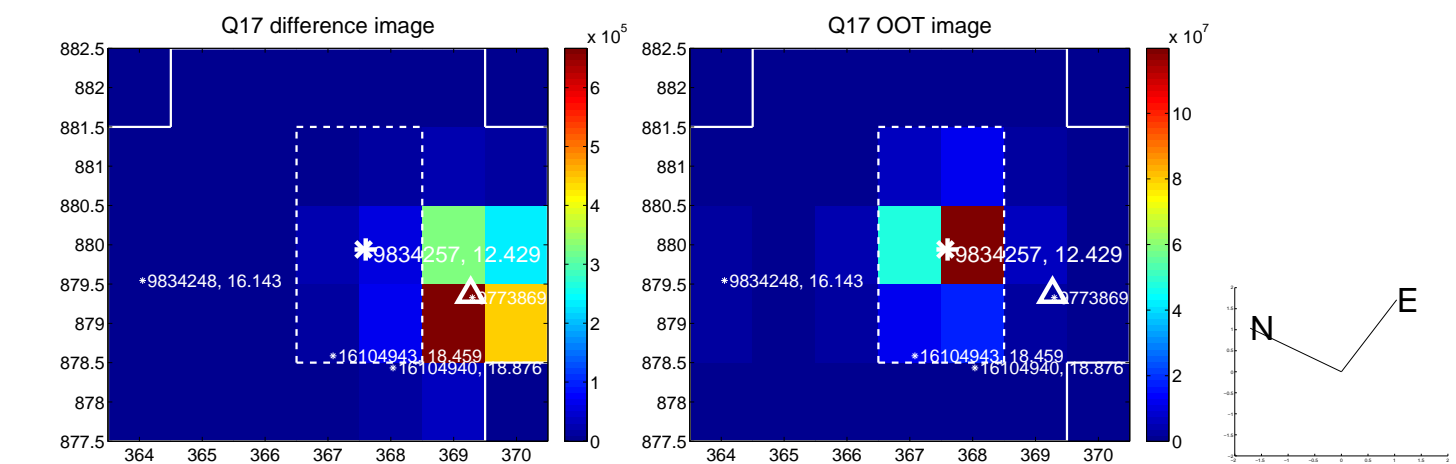
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



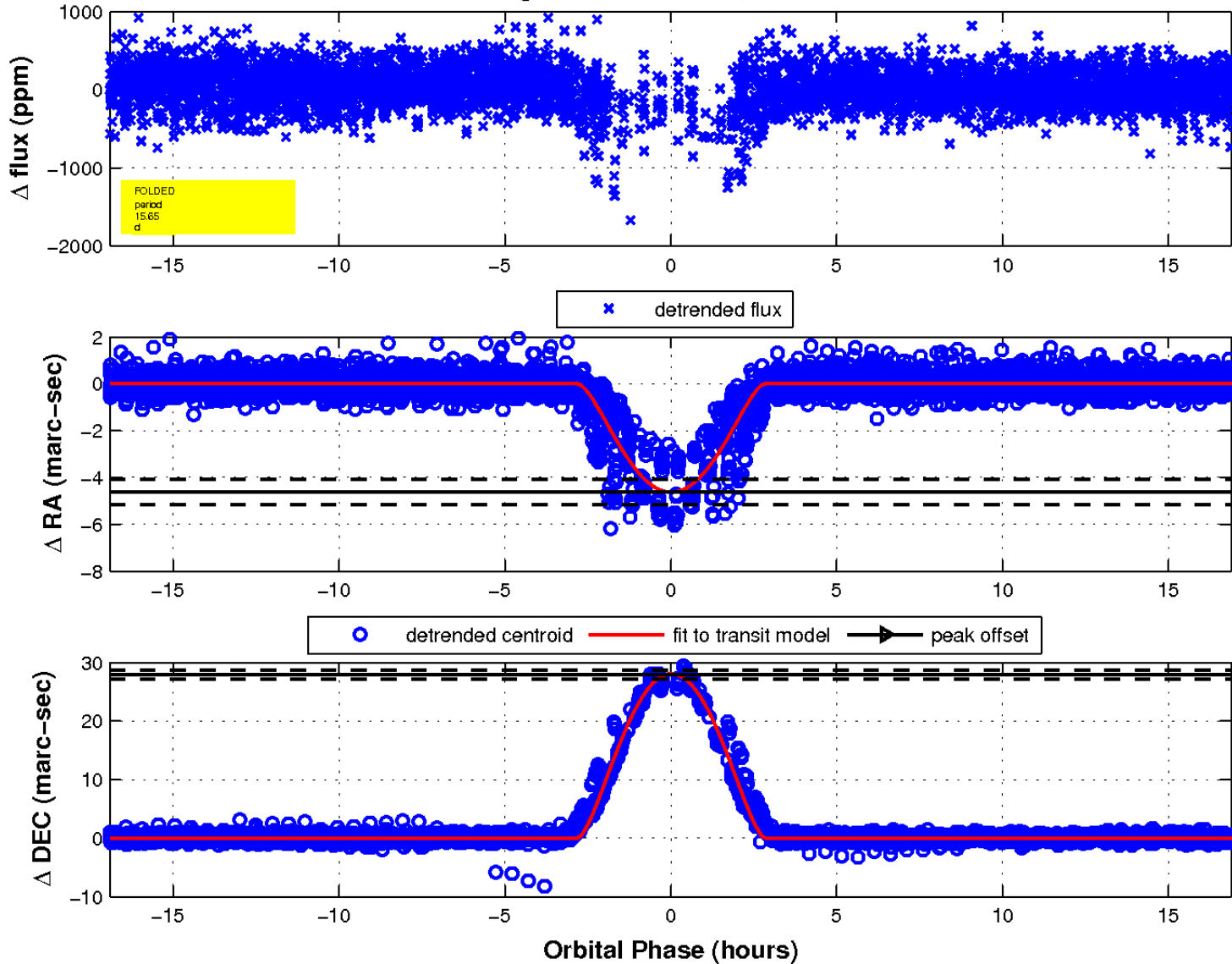
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

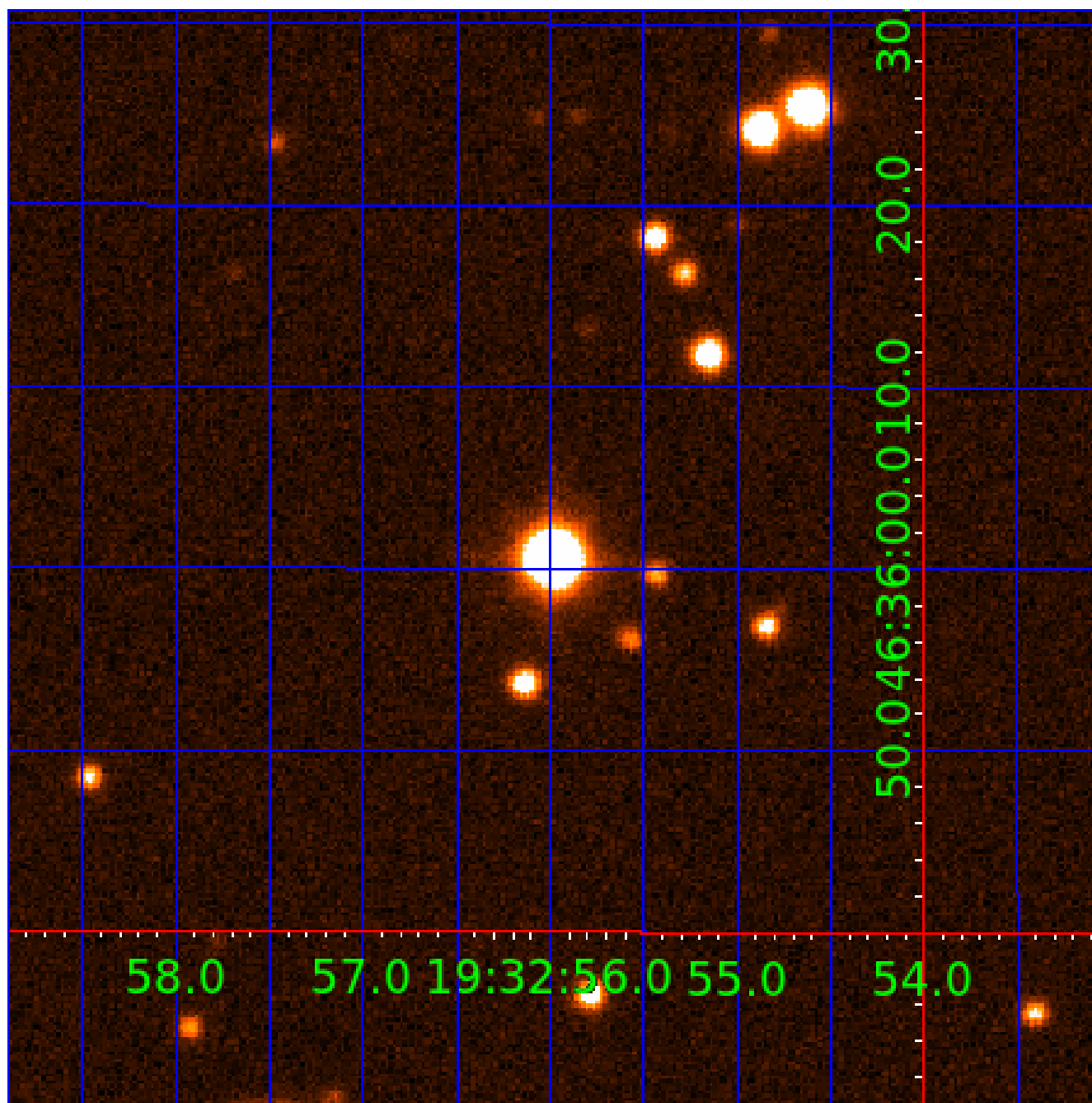


fluxWeightedCentroids, Planet 1 of 2



UKIRT Image

Declination



KIC 009834257

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}) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 009834257-01 | OBS | 3457.01 | 15.651269 | 138.726000 | 1494.5 | 5.636 | 92.5 | 75.1 | 3.29 | 6552 | 23.66 | 900.26 |
| 009834257-02 | OBS | No | 15.651336 | 132.814681 | 519.2 | 6.149 | 76.9 | 32.0 | 3.29 | 6552 | 9.60 | 900.25 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|--|
| 009834257-01 | OBS | FP | 0.00 | 0 | 1 | 1 | 1 | MOD_SEC_DV—MOD_SEC_ALT—DEEP_V_SHAPED—HAS_SEC_TCE—CENT_RESOLVED_OFFSET—HALO_GHOST—EPHEM_MATCH |
| 009834257-02 | 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 009834257-02

| 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 |
|--------------|---------|------------|------------|-----------|---------------|--------------|--------------|-------|-------|-----------|------------|------|------------|------------|
| 009834257-02 | 9834257 | 3568.01 | 9773869 | 1:1 | 7.0 | 0 | -1 | 16.67 | 12.43 | 824.12 | Direct-PRF | 0 | 0.10 | 0.02 |

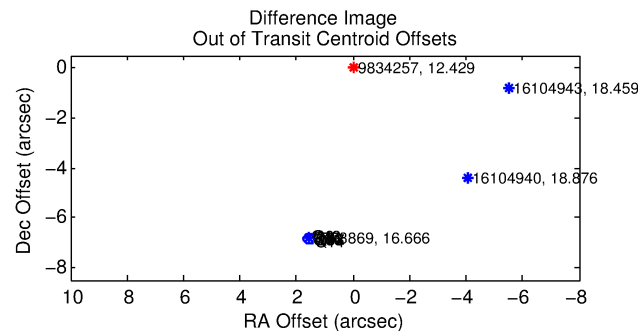
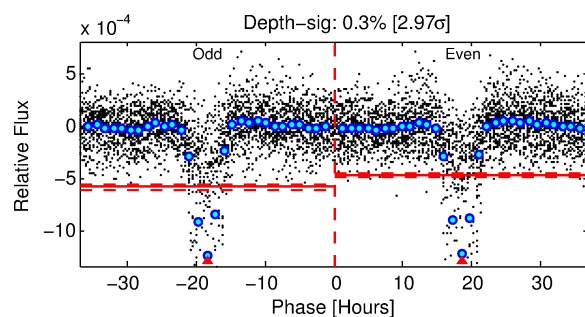
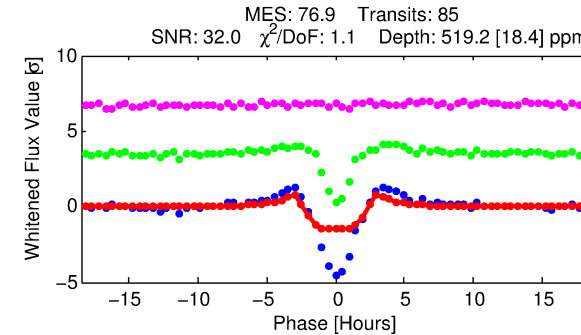
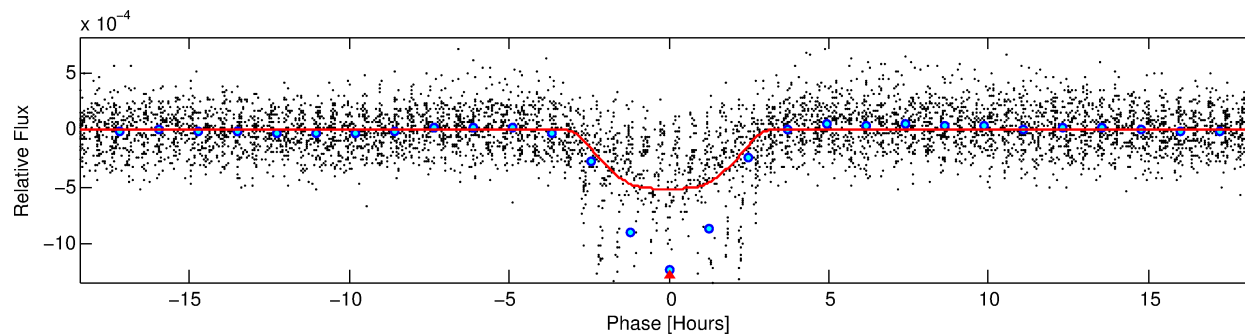
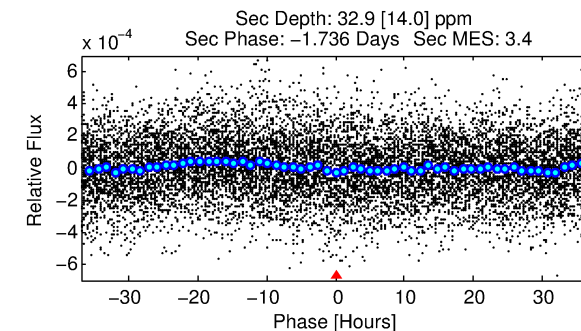
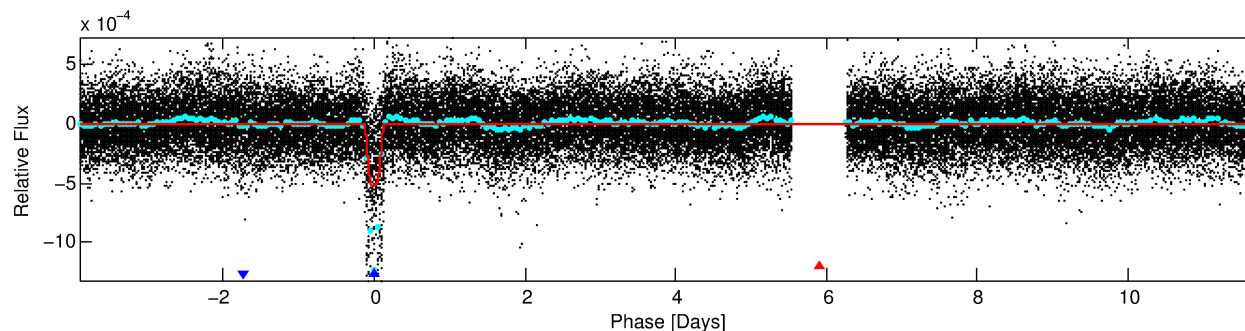
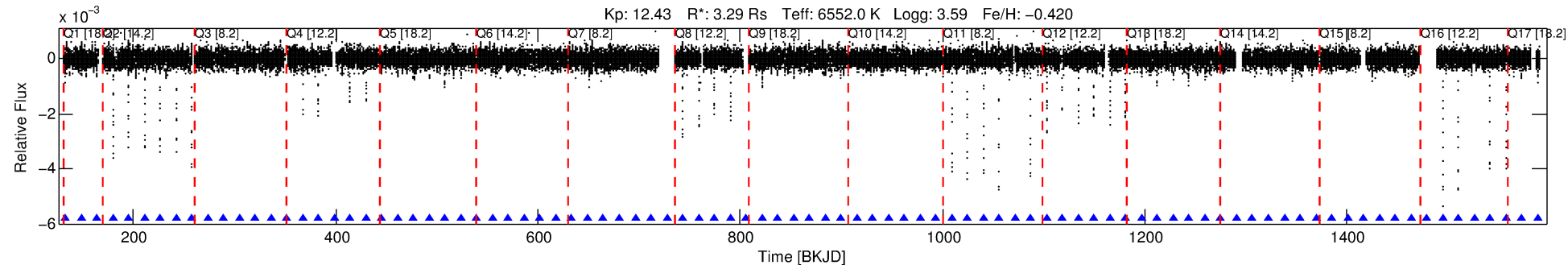
Notes: $P_1:P_2$ is the period ratio. Dist is the distance in arcseconds. Δ Row and Δ Col are the number of pixels apart in row and column. m_2 and m_1 are the magnitudes of the parent and child. D_2/D_1 is the parent's transit depth divided by the child's. σ_P and σ_T are the significance of the match 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: 9834257 Candidate: 2 of 2 Period: 15.651 d

KOI: K03457.01 Corr: 0.993

Kp: 12.43 R*: 3.29 Rs Teff: 6552.0 K Logg: 3.59 Fe/H: -0.420



DV Fit Results:

Period = 15.65134 [0.00005] d
Epoch = 132.8147 [0.0028] BKJD
Rp/R* = 0.0268 [0.0005]
a/R* = 6.71 [0.20]
b = 0.97 [0.00]
Seff = 900.25 [525.27]
Teq = 1397 [204] K
Rp = 9.60 [3.87] Re
a = 0.1409 [0.0520] AU
Ag = 3.89 [2.79] [1.04σ]
Teff = 3033 [335] K [4.17σ]

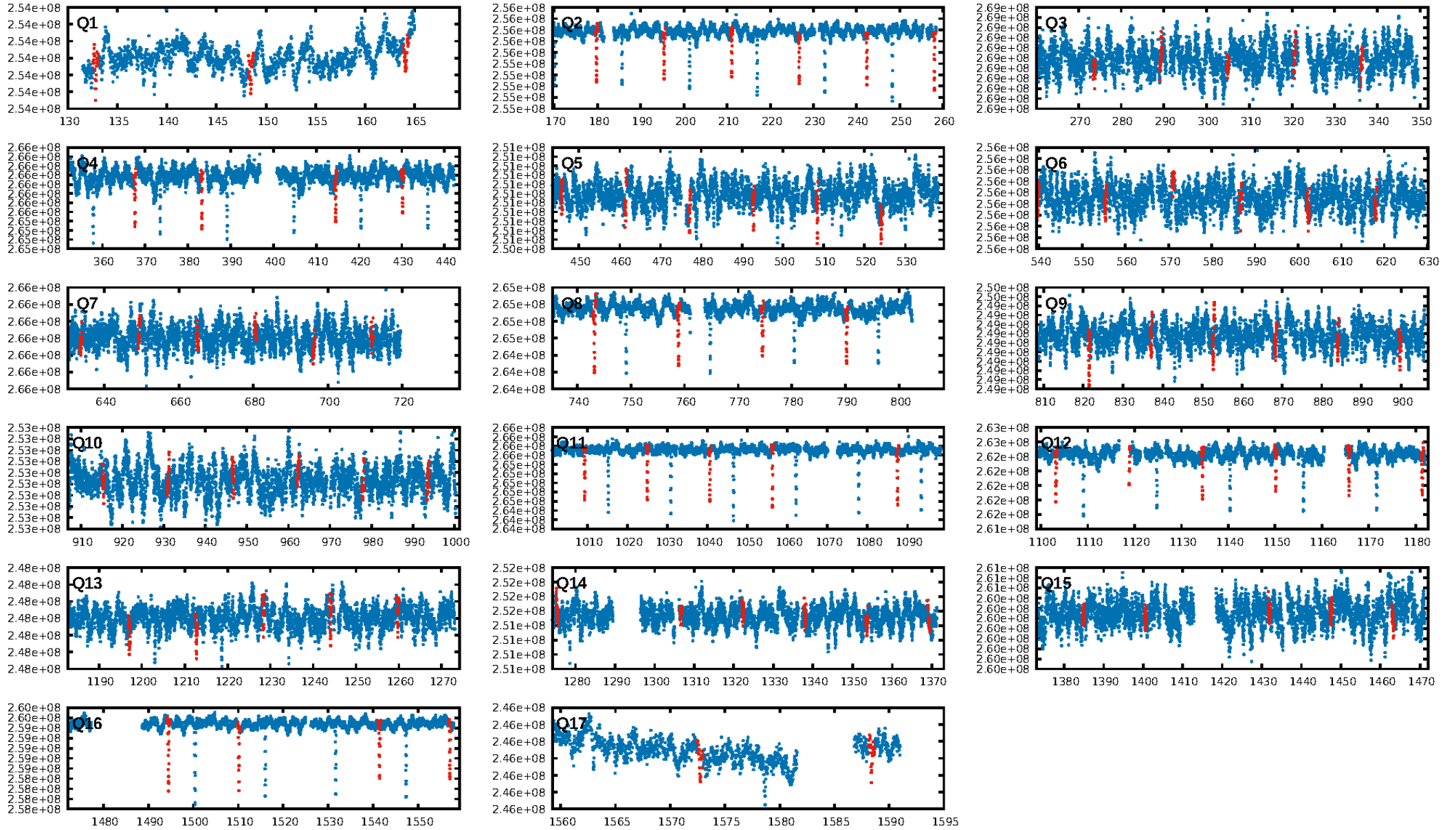
DV Diagnostic Results:

ShortPeriod-sig: 0.0% [0.00σ]
LongPeriod-sig: N/A
ModelChiSquare2-sig: 0.0%
ModelChiSquareGoF-sig: 100.0%
Bootstrap-pfa: 0.00e+00
RollingBand-fgt: 1.00 [80/80]
GhostDiagnostic-chr: -0.1377
Centroid-sig: 0.0%
Centroid-so: 41.515 arcsec [503.58σ]
OotOffset-rm: 7.035 arcsec [103.14σ]
KicOffset-rm: 7.155 arcsec [106.41σ]
OotOffset-st: 4/4/4/5 [17]
KicOffset-st: 4/4/4/5 [17]
DiffImageQuality-fgm: 1.00 [17/17]
DiffImageOverlap-fno: 1.00 [17/17]

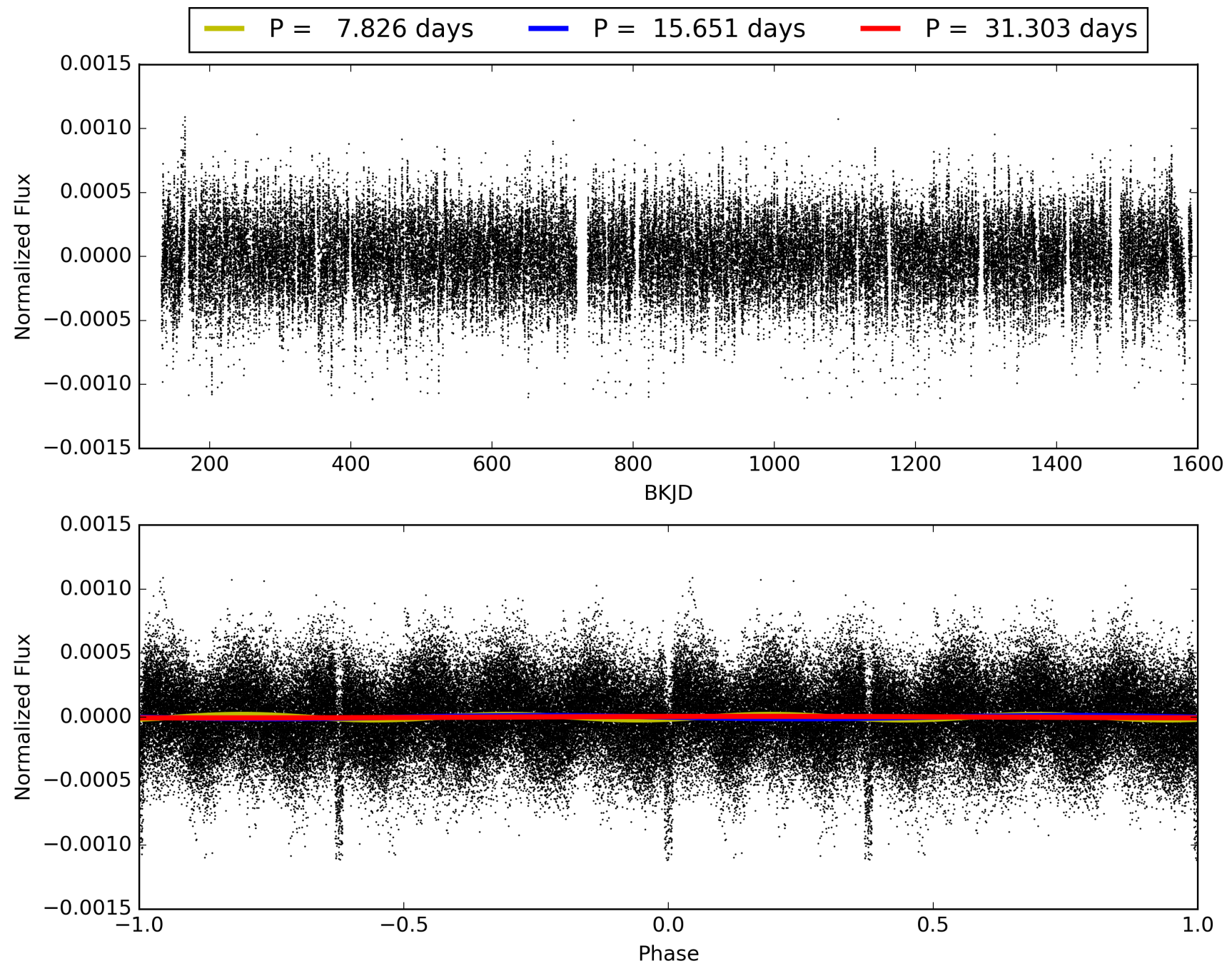
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 16:04:29 Z

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

TCE 009834257-02, PDC Light Curves

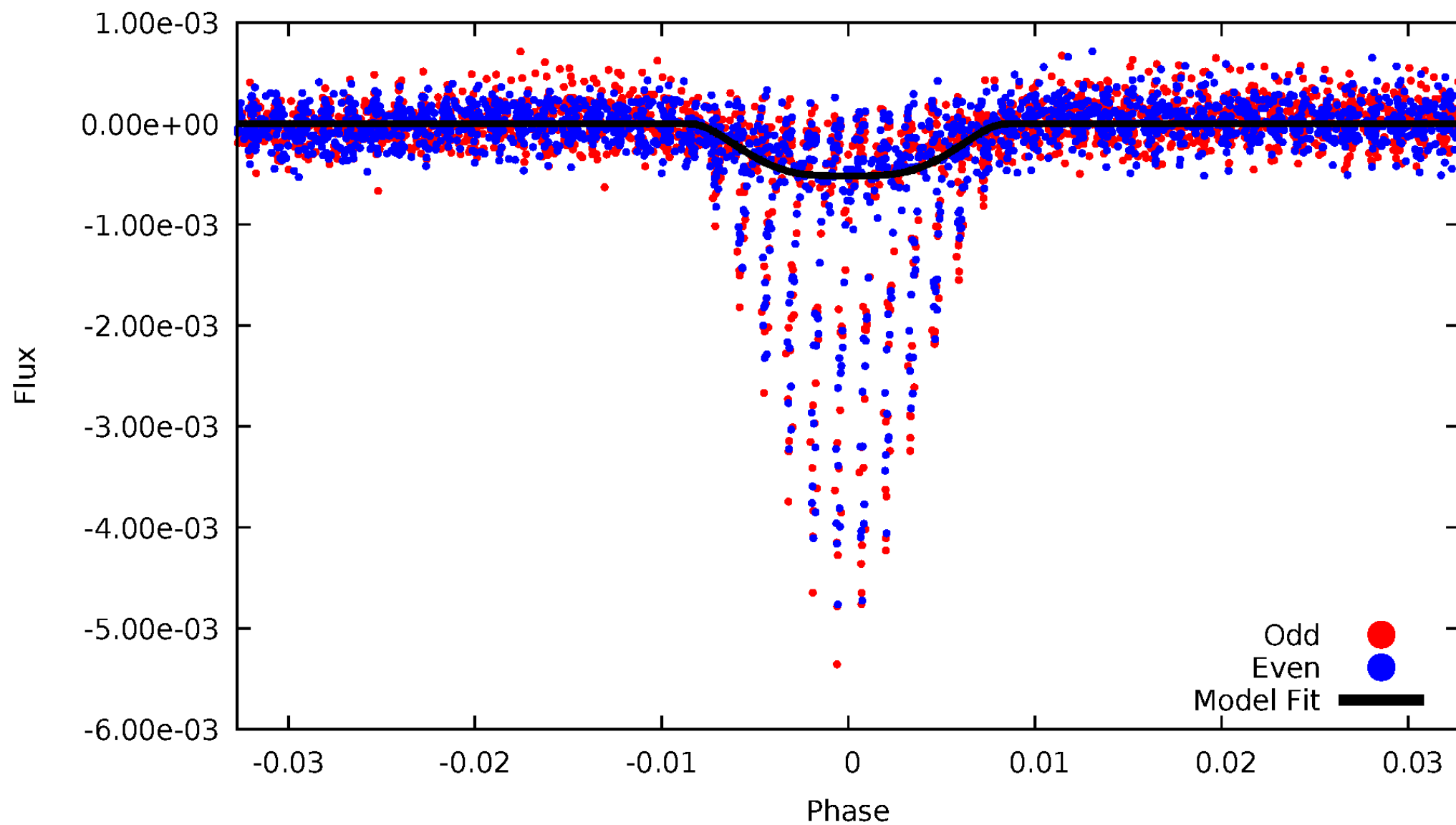


TCE 009834257-02



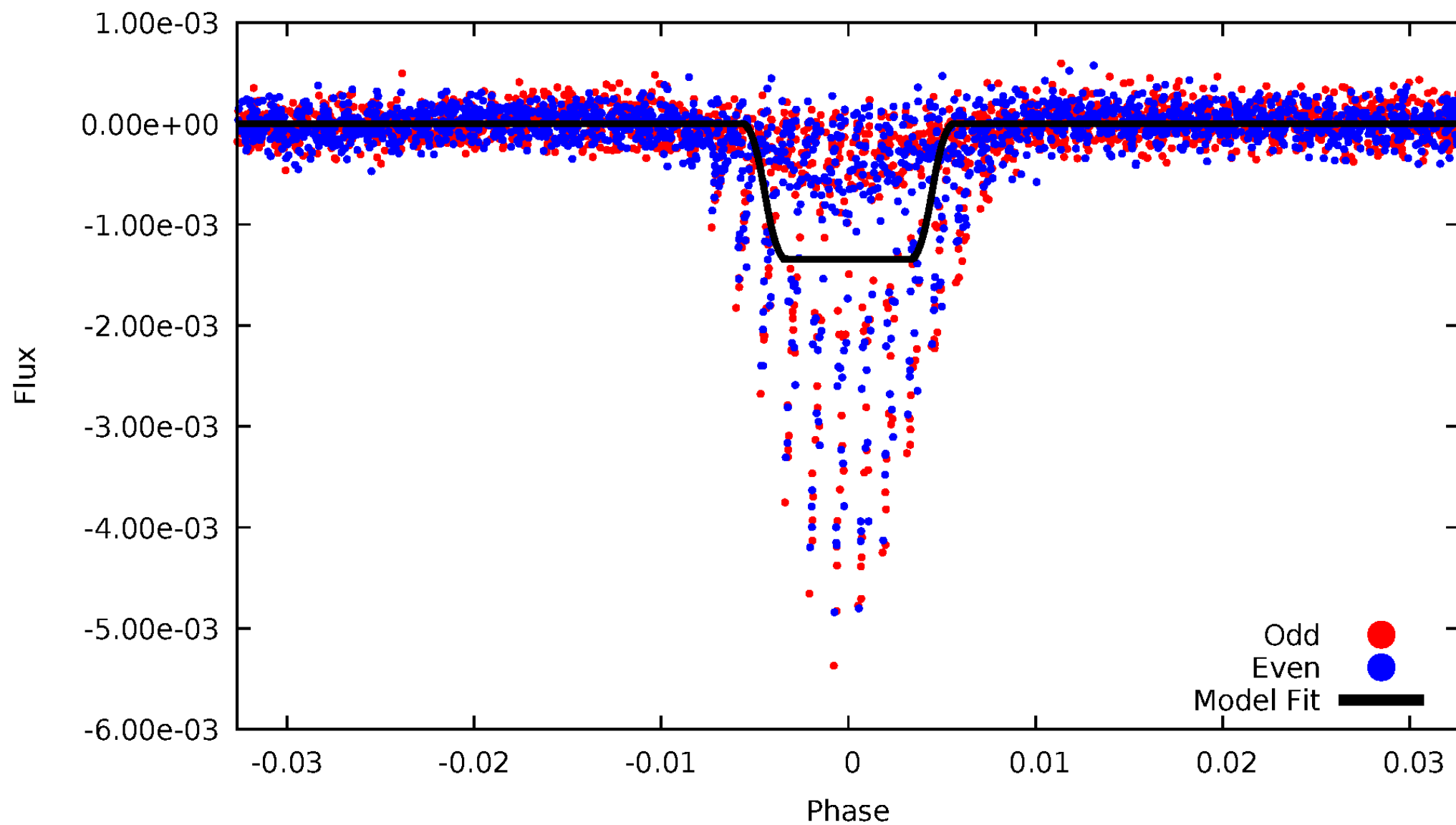
DV Odd/Even

TCE 009834257-02



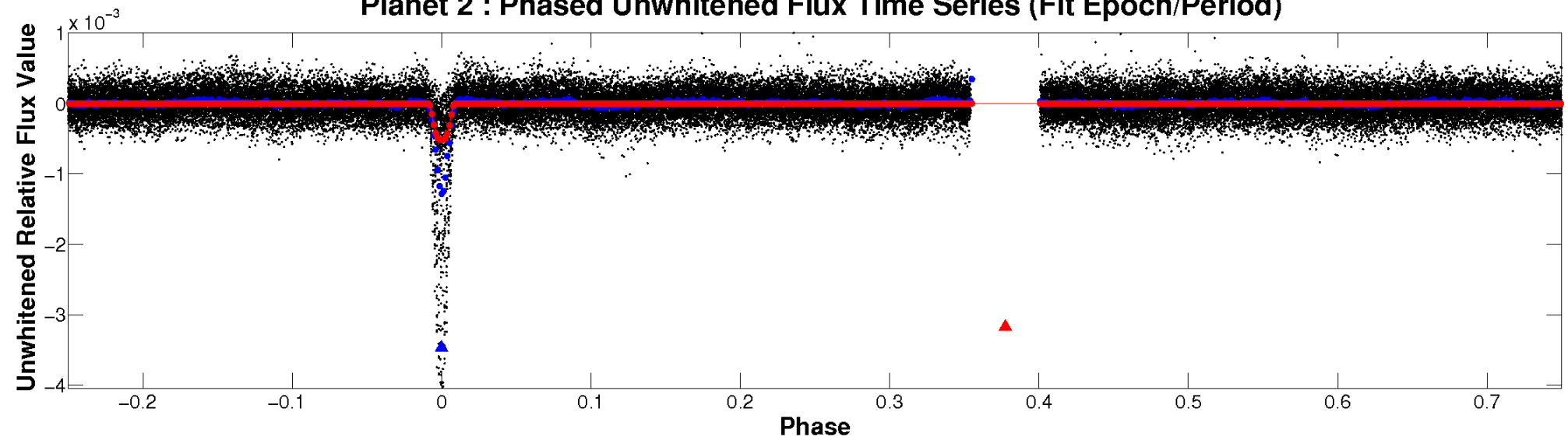
ALT Odd/Even

TCE 009834257-02

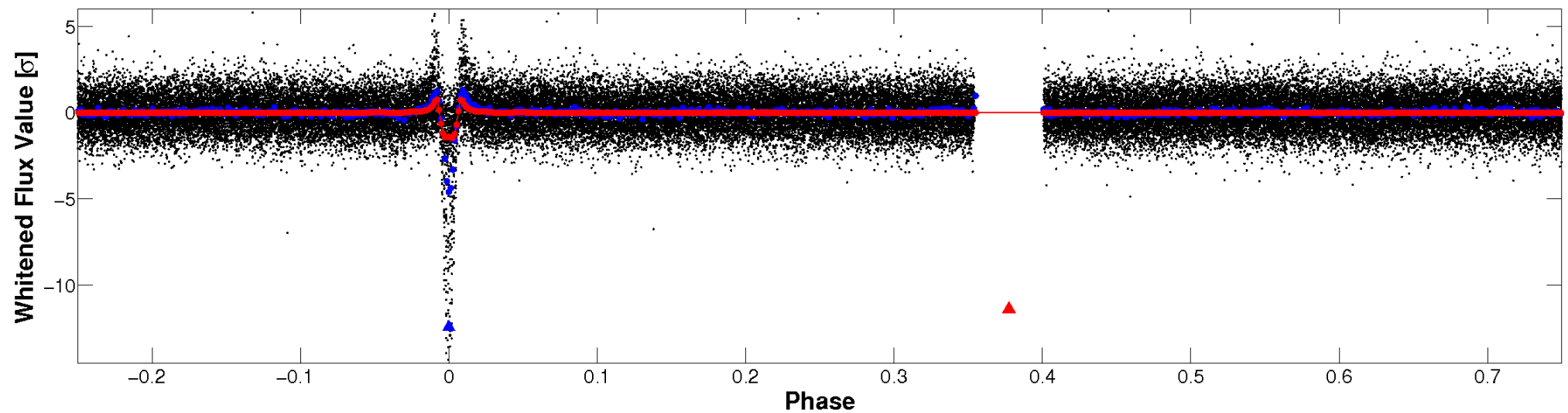


Non-Whitened Vs. Whitened Light Curve

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

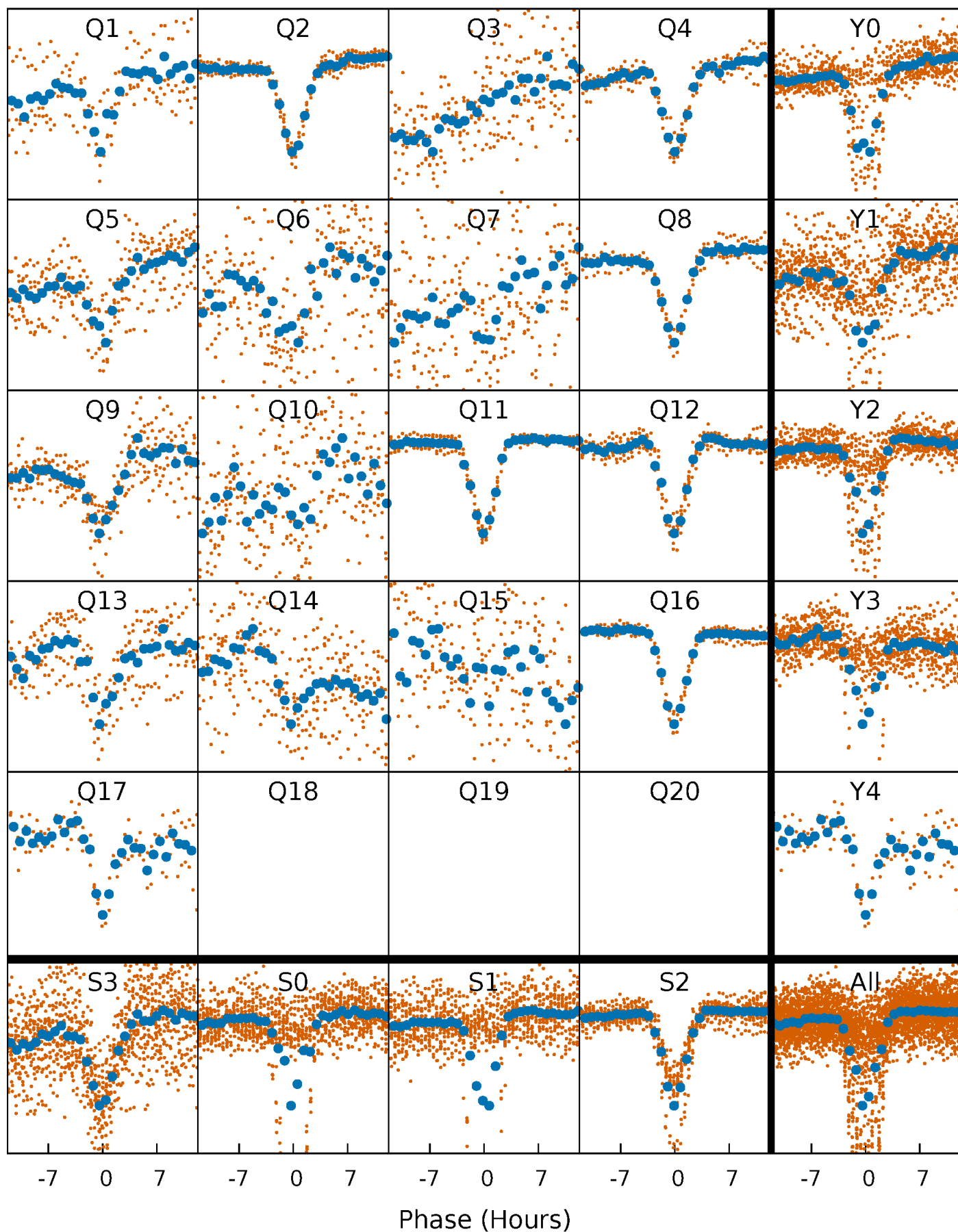


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



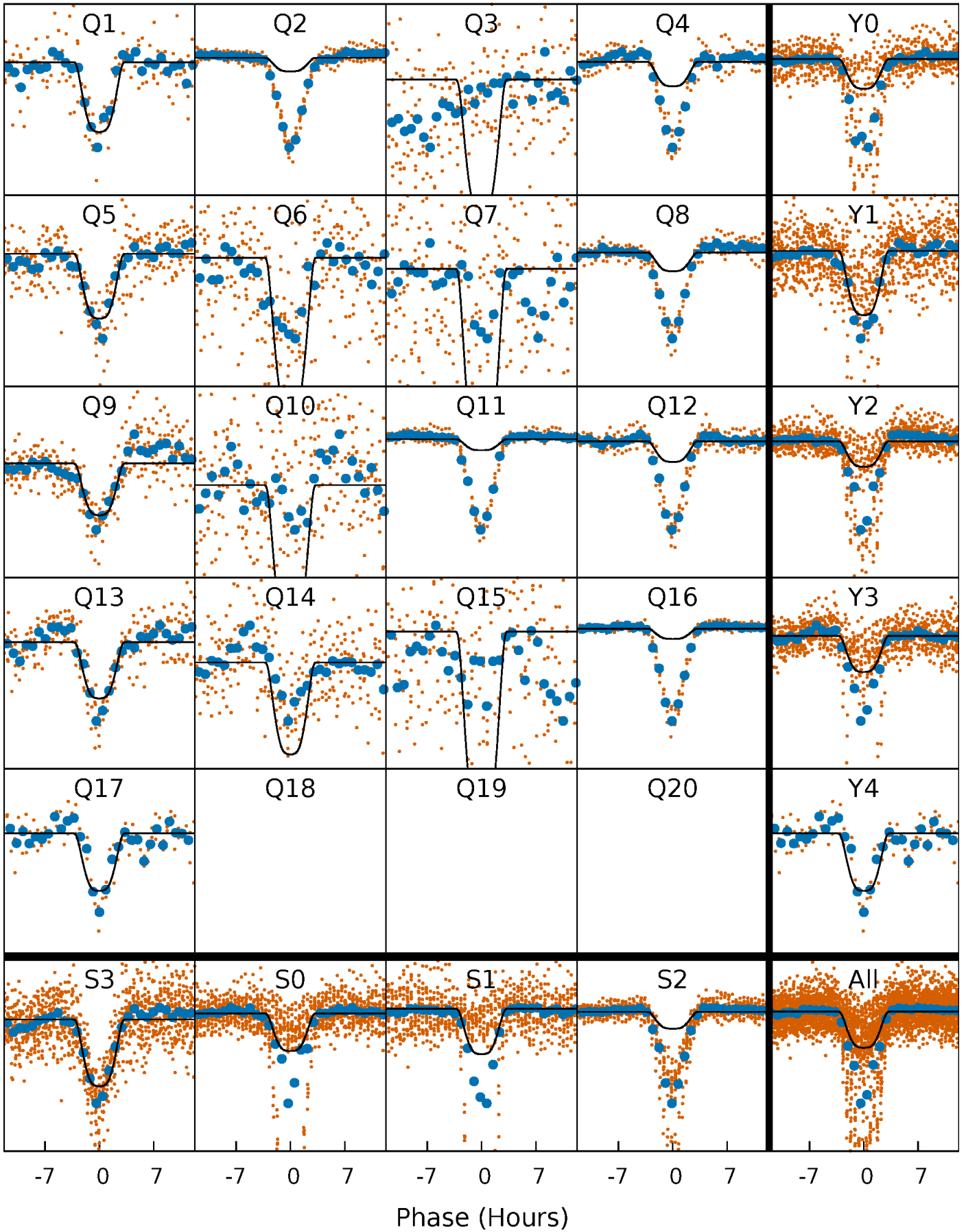
PDC Quarter-Phased Transit Curves

TCE 009834257-02 P= 15.651336 Days $T_0=132.814681$ (BKJD)



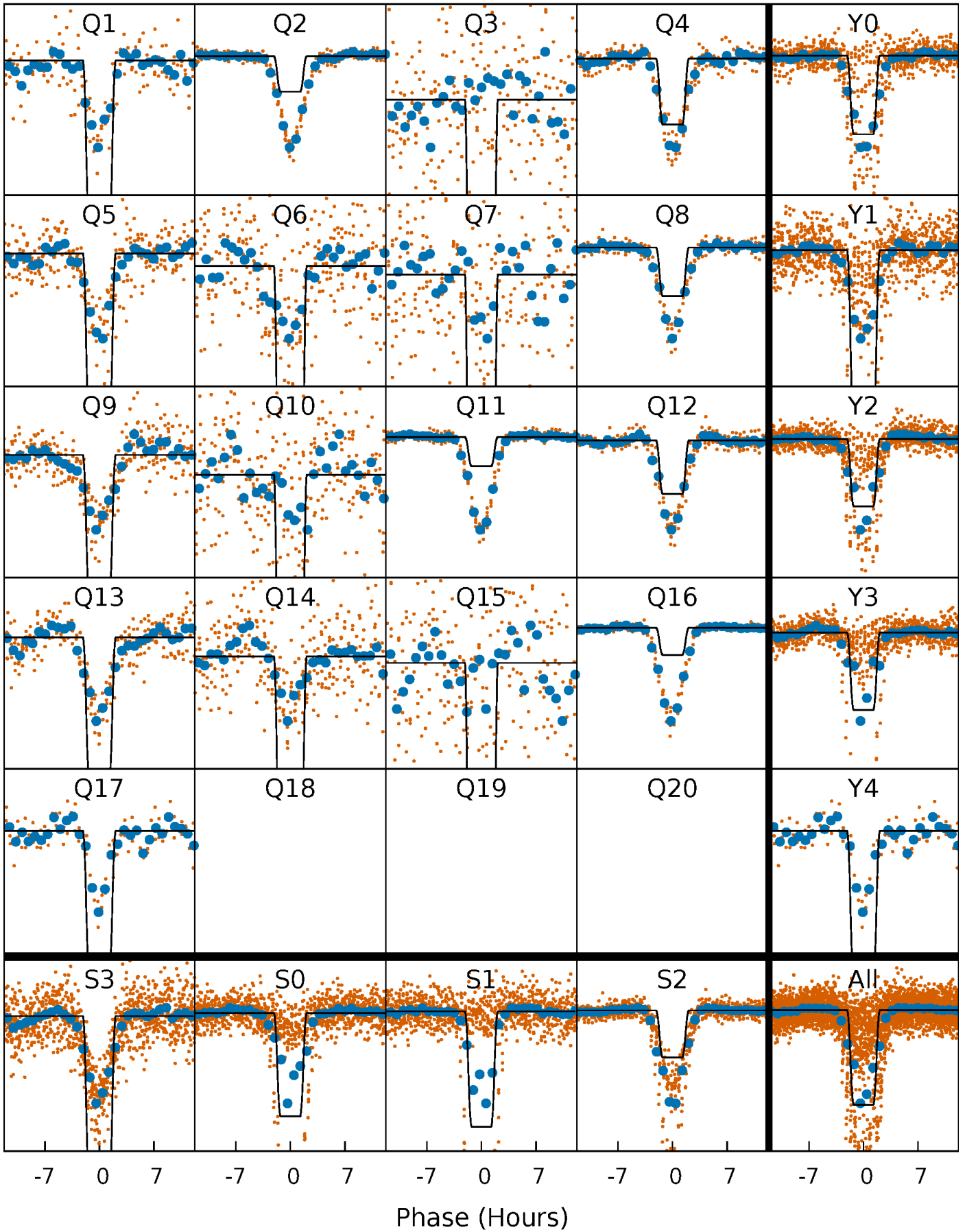
DV Quarter-Phased Transit Curves

TCE 009834257-02 P= 15.651336 Days $T_0=132.814681$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

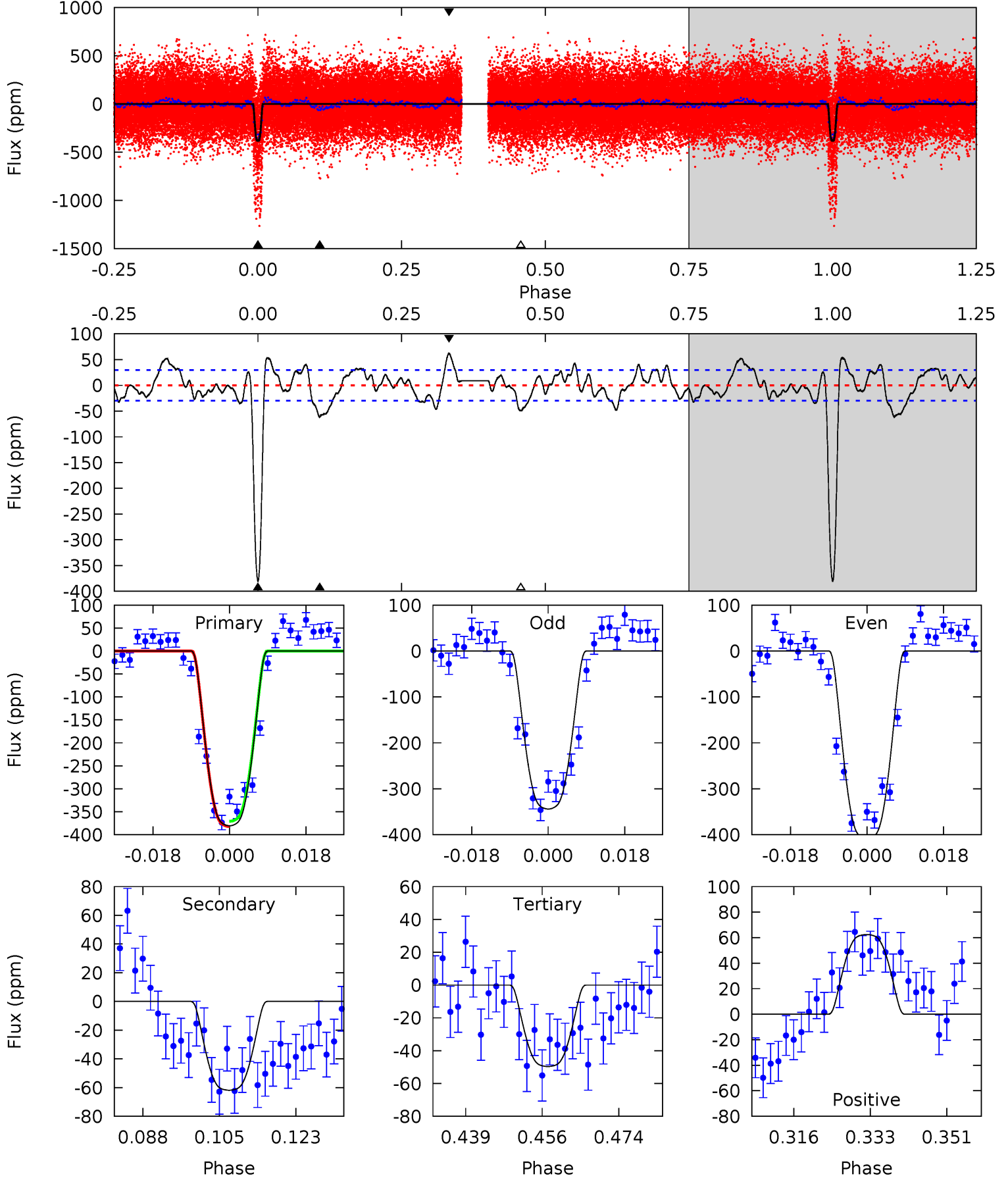
TCE 009834257-02 P= 15.651419 Days $T_0=132.810176$ (BKJD)



DV Model-Shift Uniqueness Test

009834257-02, P = 15.651336 Days, E = 117.163345 Days

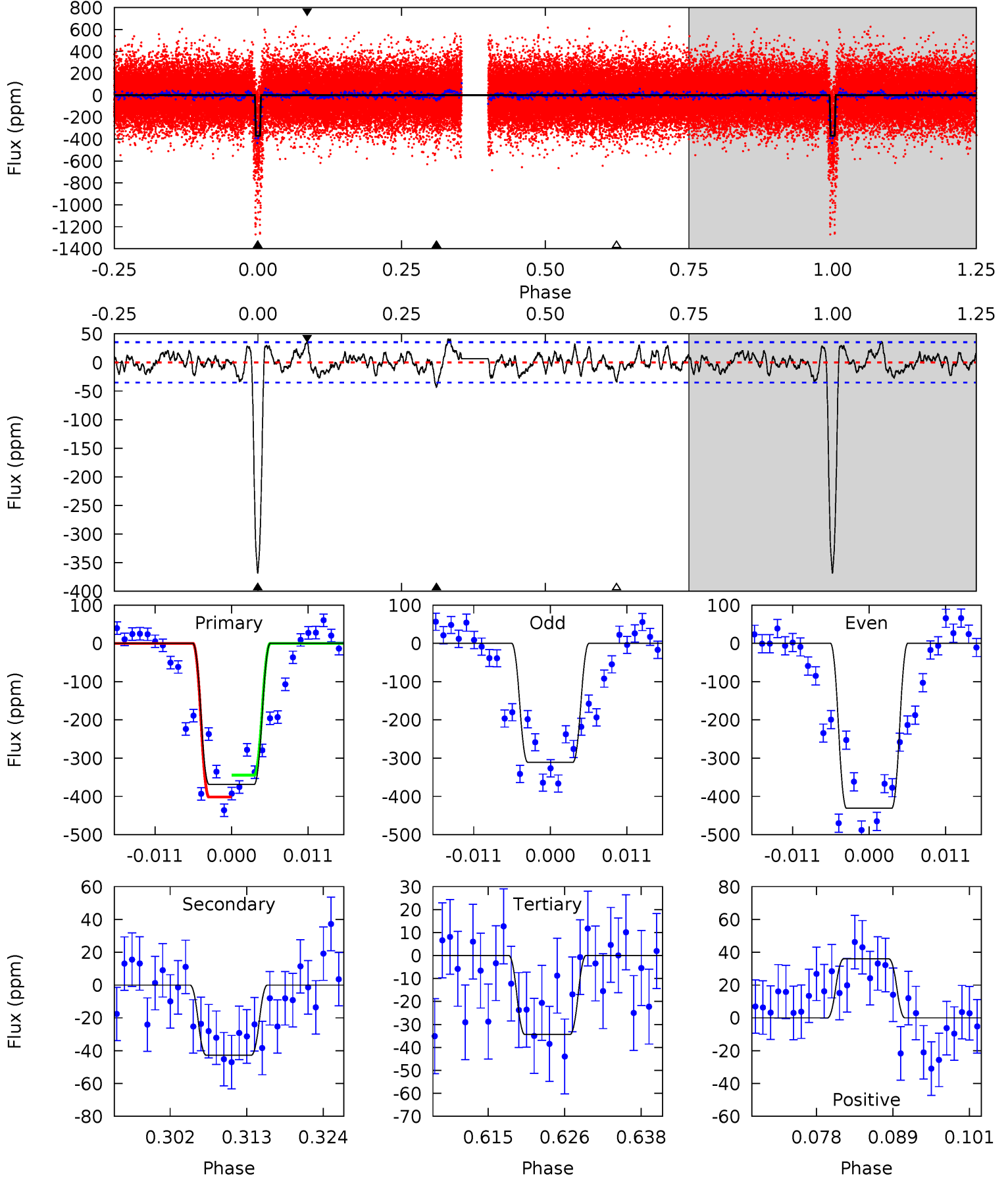
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 62.9 | 10.2 | 8.20 | 10.3 | 4.92 | 2.38 | 3.74 | 54.7 | 52.6 | 2.02 | -0.09 | 5.33 | 2.17 | 0.14 | 0.93 |



Alt Model-Shift Uniqueness Test

009834257-02, P = 15.651419 Days, E = 117.158757 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 52.3 | 6.07 | 4.87 | 5.10 | 5.00 | 2.54 | 1.87 | 47.4 | 47.2 | 1.19 | 0.97 | 8.39 | 2.23 | 0.10 | 4.04 |



Stellar Parameters For KIC 009834257

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | R (R_{\odot}) | M (M_{\odot}) | p_{\star} ($\text{g}\cdot\text{cm}^{-3}$) |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
| | 6552^{+178}_{-178} | $3.586^{+0.330}_{-0.110}$ | $-0.420^{+0.350}_{-0.300}$ | $3.289^{+0.441}_{-1.324}$ | $1.521^{+0.237}_{-0.355}$ | $0.060^{+0.160}_{-0.017}$ |
| | +3%/-3% | +9%/-3% | +83%/-71% | +13%/-40% | +16%/-23% | +266%/-28% |
| 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 009834257-02 / KOI

| Detrend | Depth (ppm) | R_p (R_{\oplus}) | T_{max} (K) | T_{obs} (K) | A_{obs} |
|---------|-------------|-------------------------|----------------------|----------------------|---------------------------|
| DV | -62 ± 6 | $9.62^{+0.87}_{-2.03}$ | 1932^{+110}_{-181} | 3876^{+104}_{-104} | $7.613^{+3.622}_{-1.465}$ |
| Alt. | -43 ± 7 | $13.13^{+1.31}_{-2.74}$ | 1930^{+117}_{-183} | 3258^{+107}_{-117} | $2.802^{+1.418}_{-0.687}$ |

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 $A_{obs} \gg 1.0$

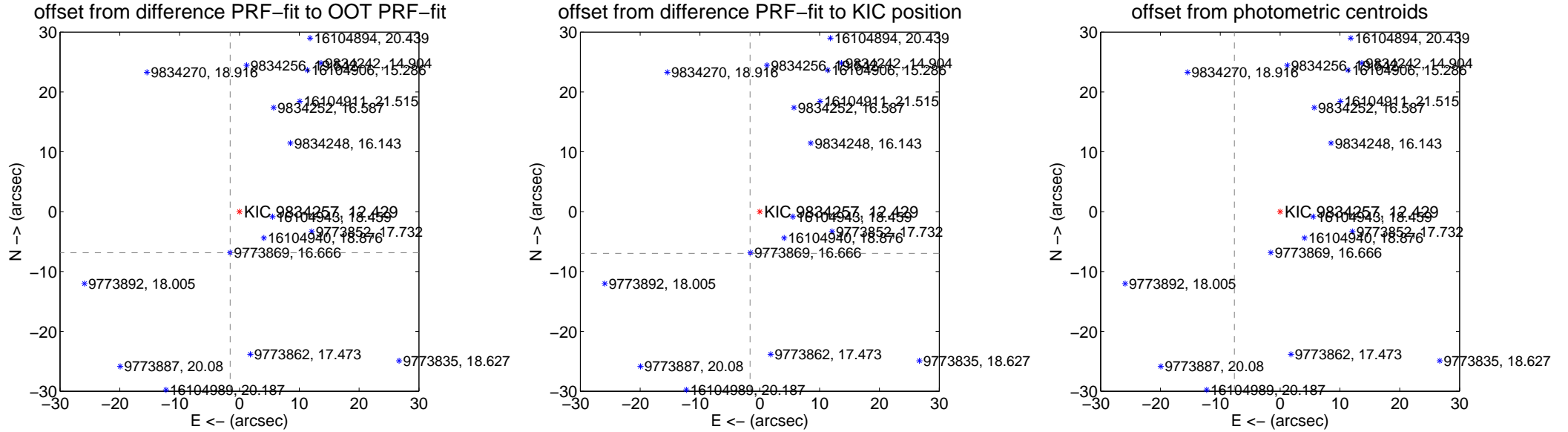
DV Centroid Data

Supplemental centroid analysis for 009834257-02. Kepler magnitude: 12.43. Transit SNR 32.04

There are 17 quarters with good PRF difference image offsets

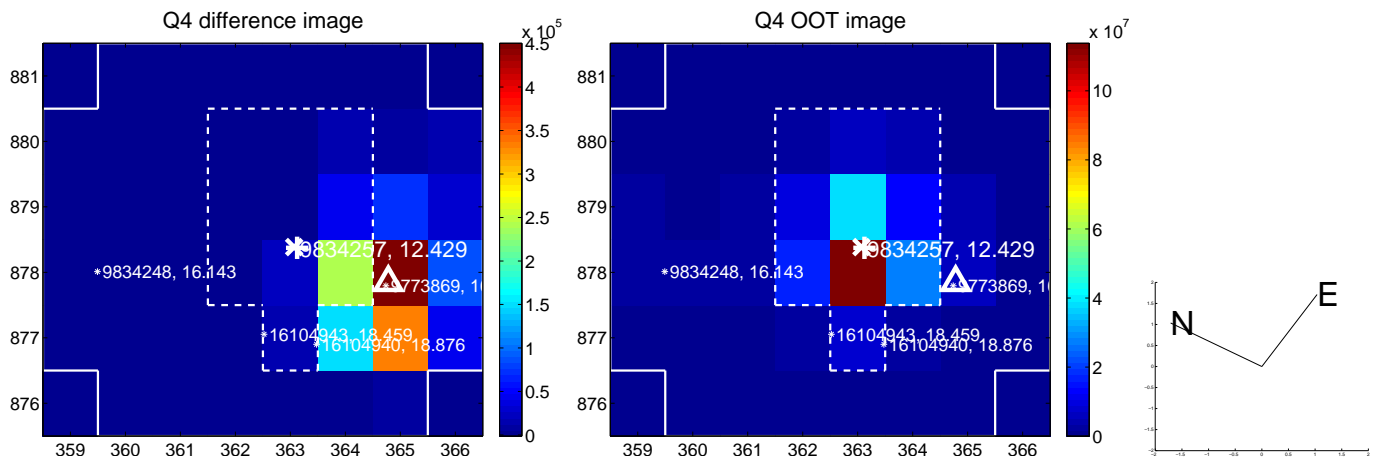
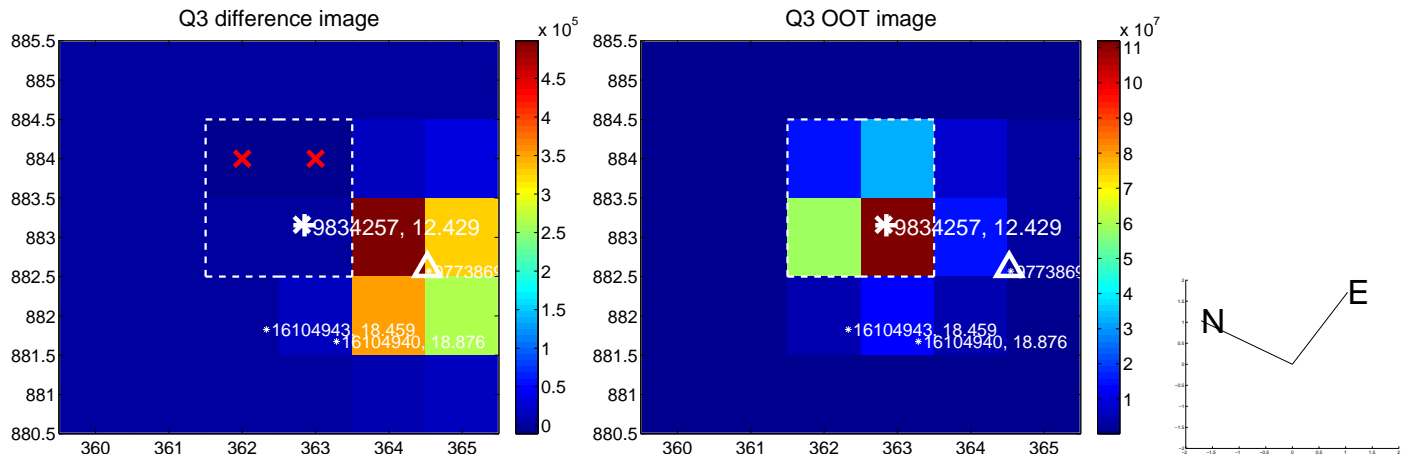
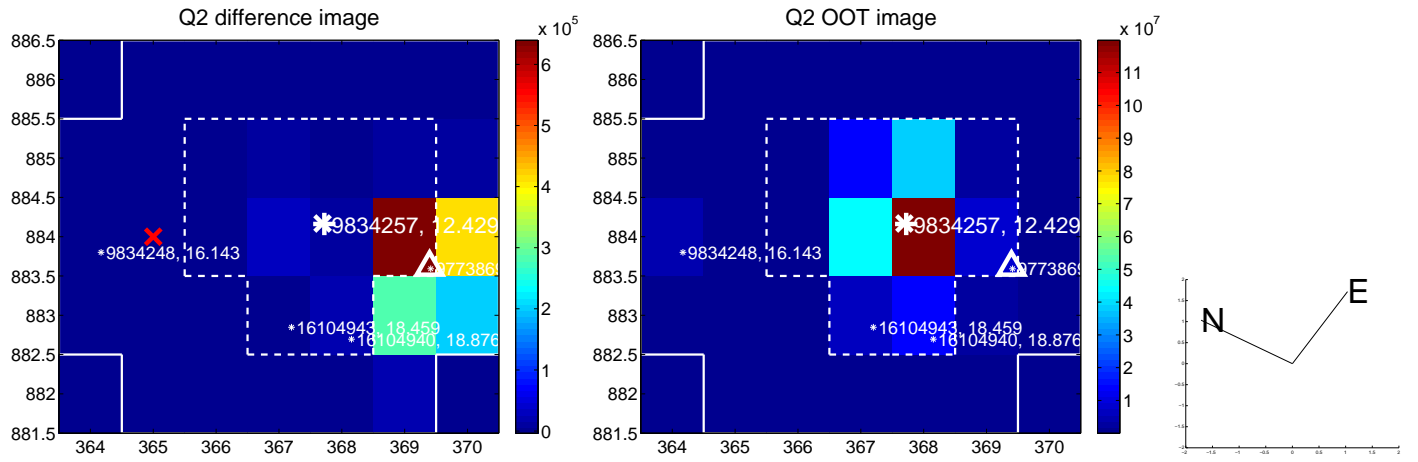
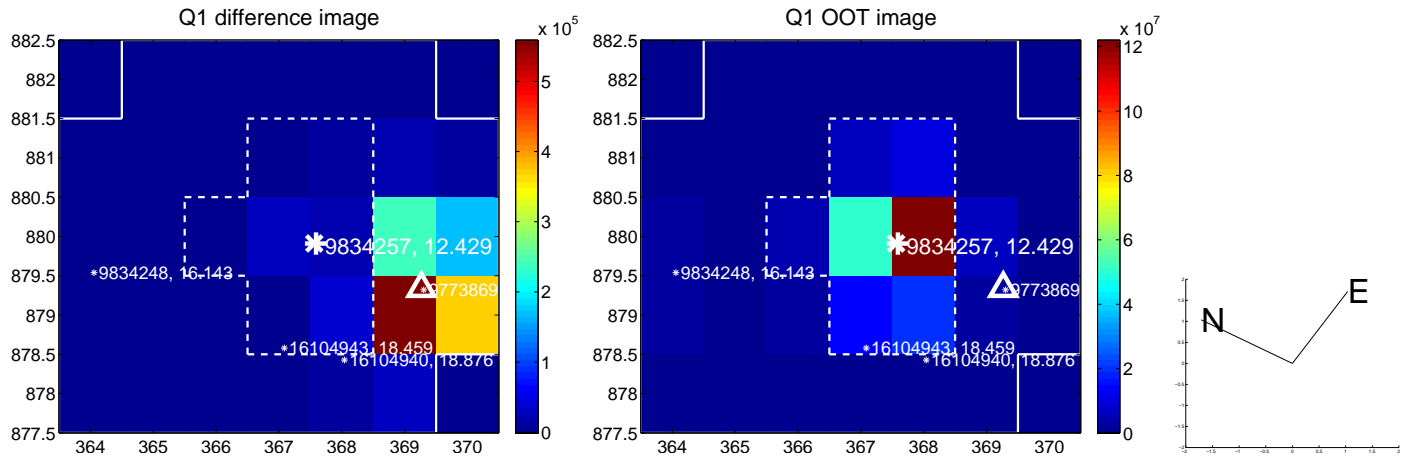
The direct PRF centroid is offset from the target star catalog position by about 0.13 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|---|--------------------|---------------------|-------------------|--------------------|
| PRF-fit source offset from OOT | 7.035 \pm 0.068 | 103.14 | 1.559 \pm 0.067 | -6.860 \pm 0.068 |
| PRF-fit source offset from KIC position | 7.155 \pm 0.067 | 106.41 | 1.621 \pm 0.068 | -6.969 \pm 0.067 |
| photometric centroid source offset | 41.51 \pm 0.08 | 503.58 | 7.65 \pm 0.08 | -40.80 \pm 0.08 |

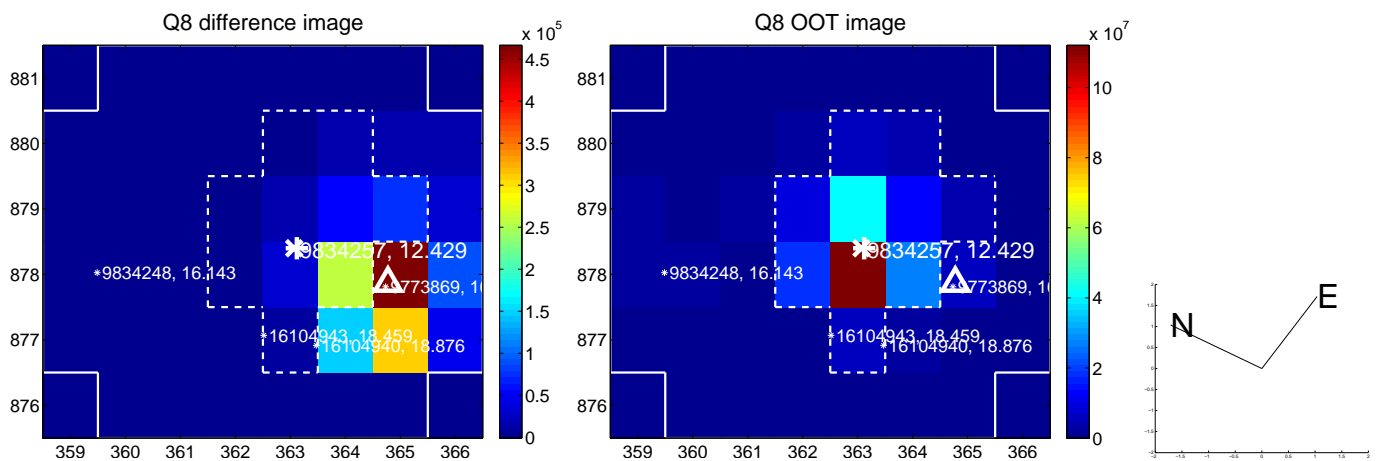
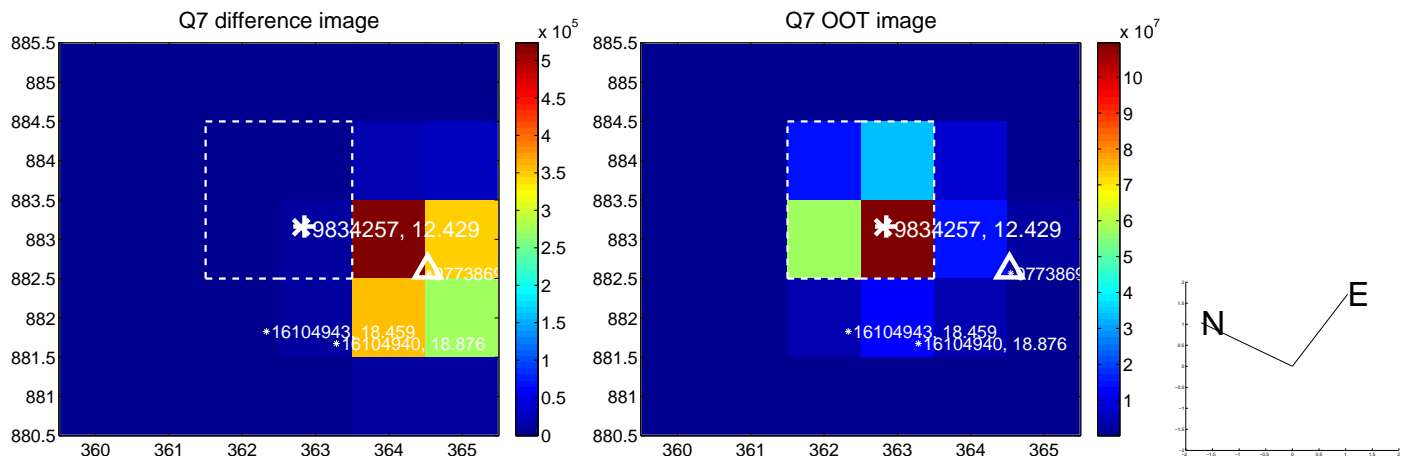
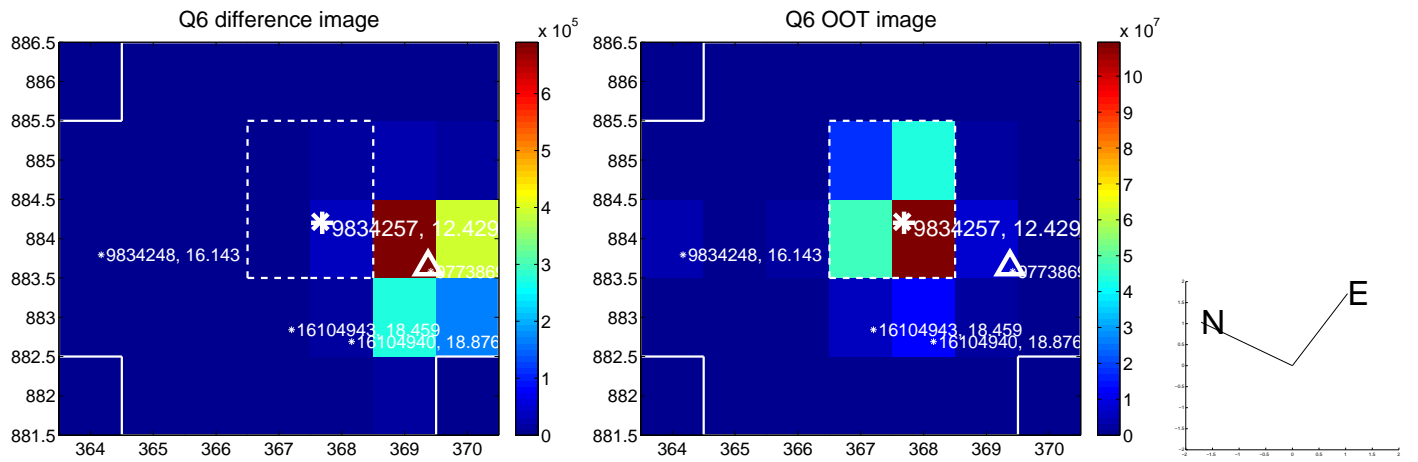
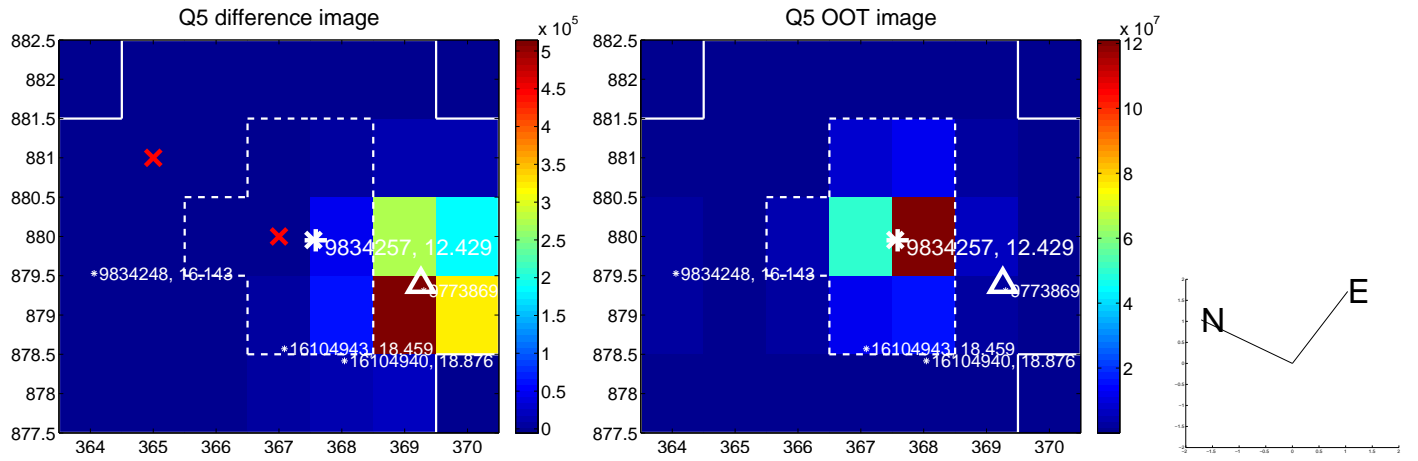


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

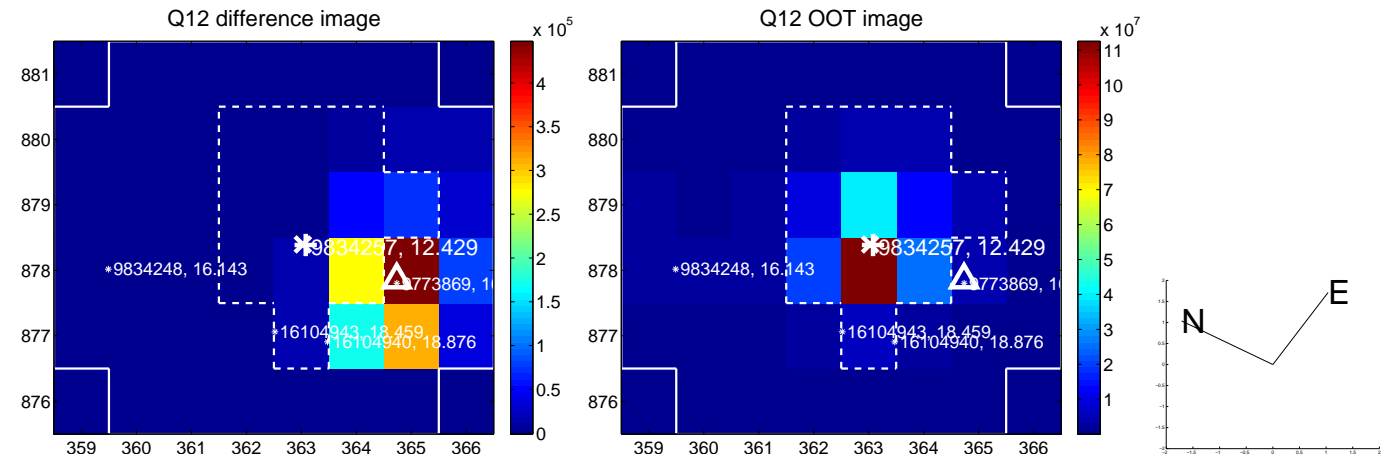
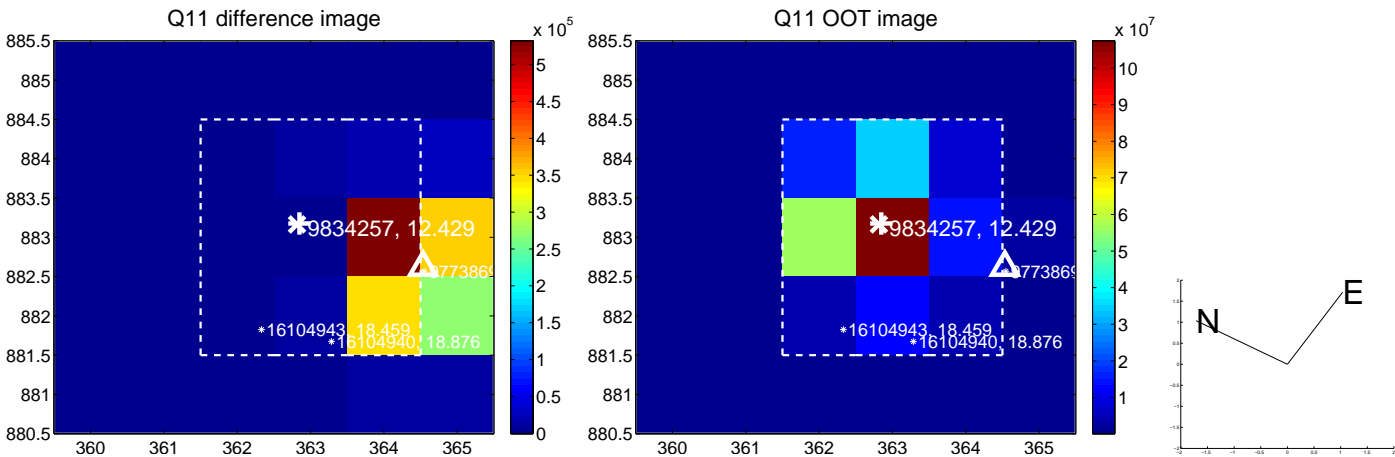
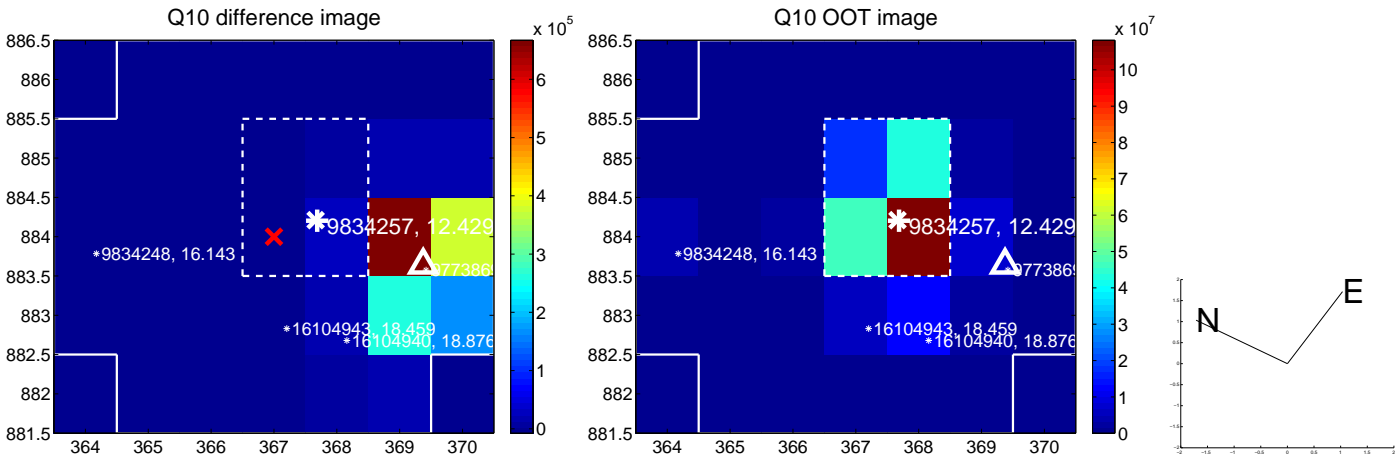
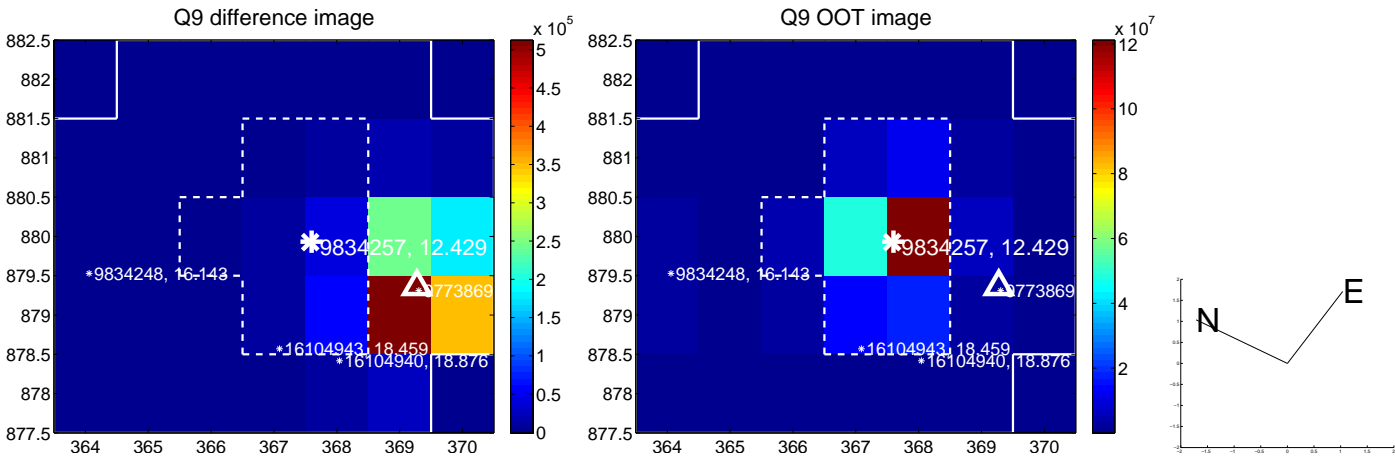
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



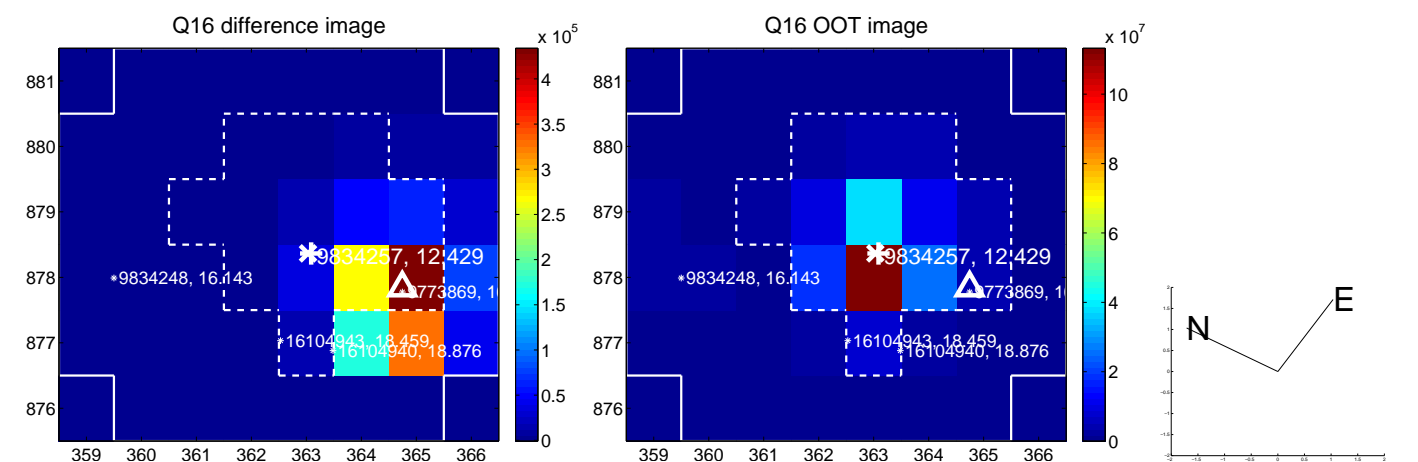
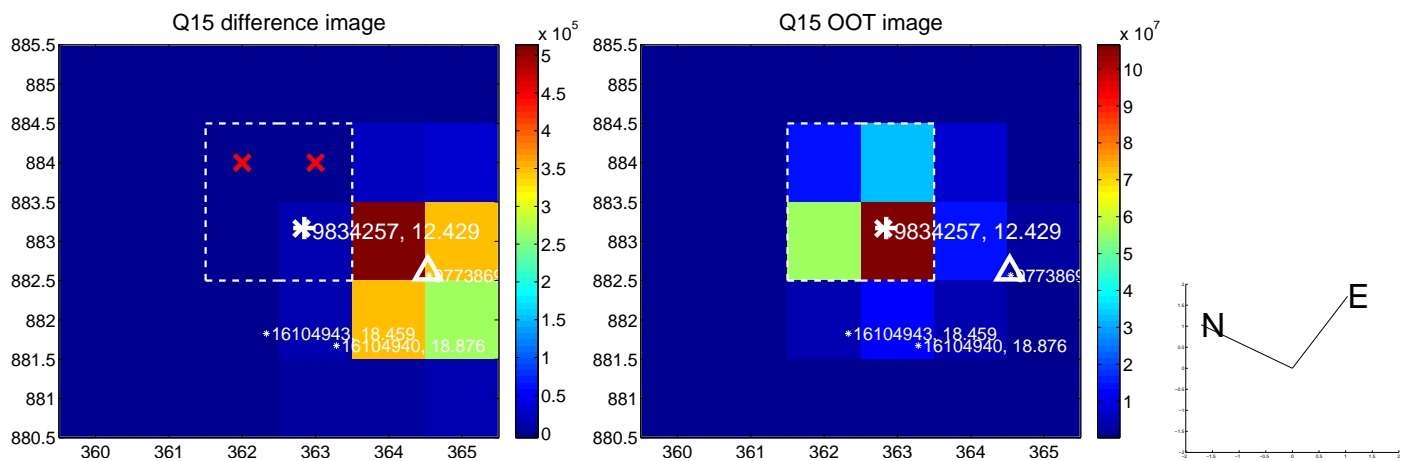
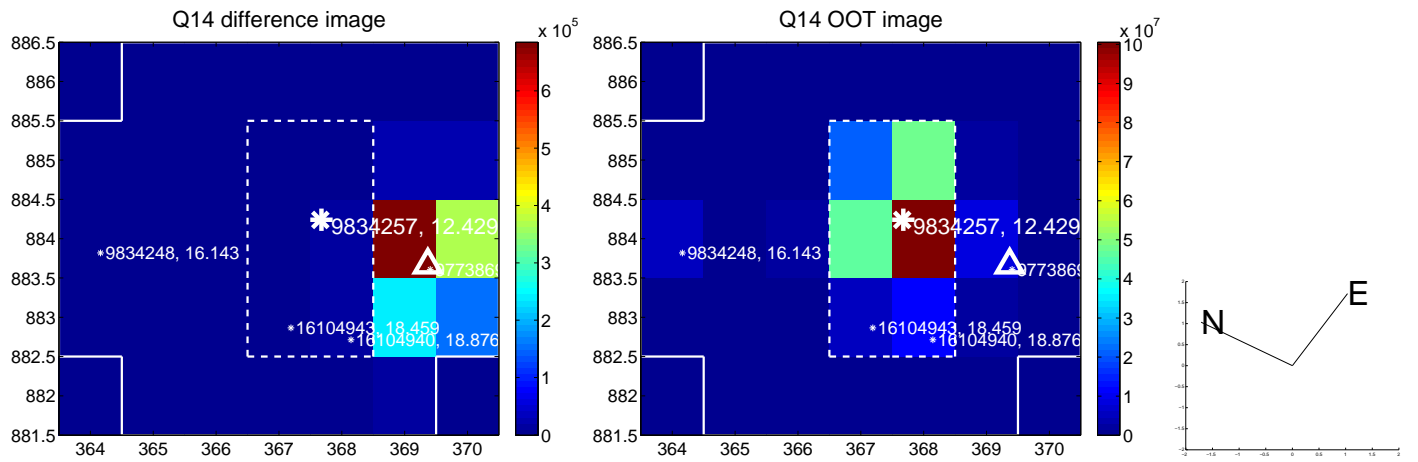
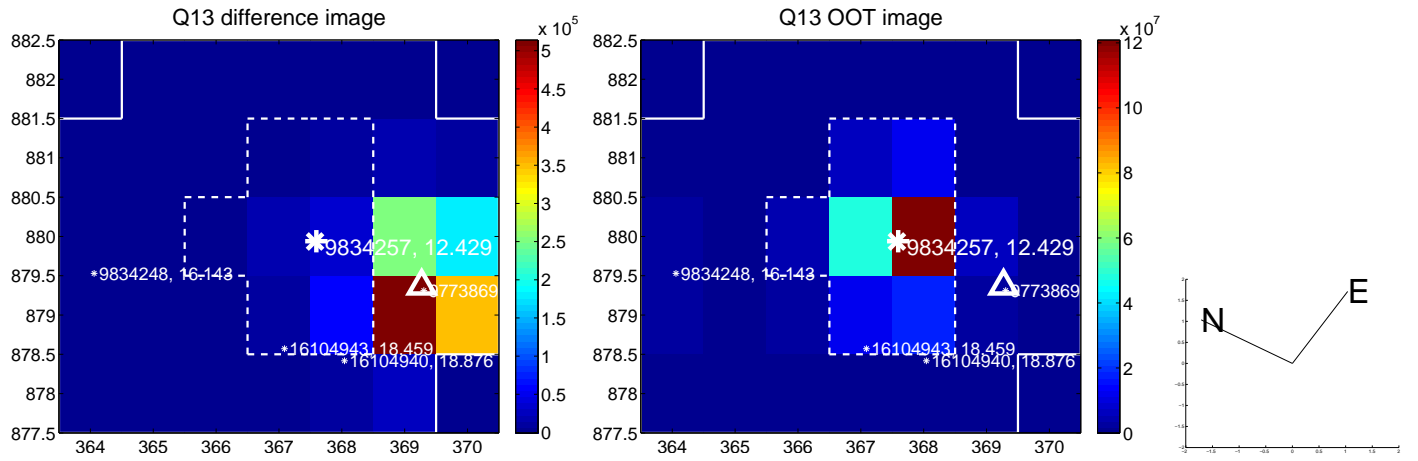
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



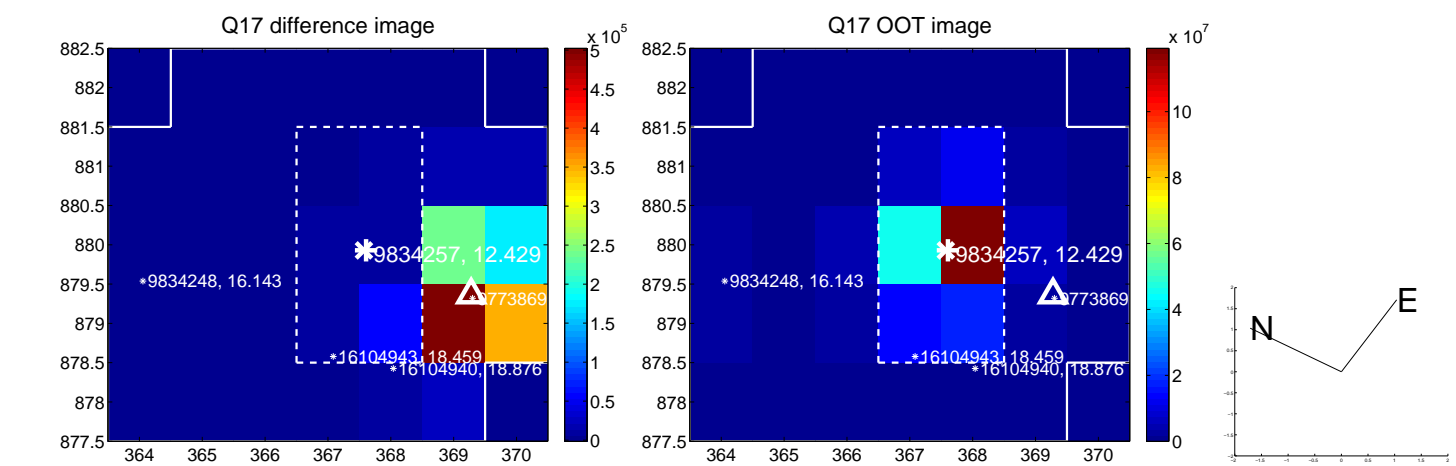
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



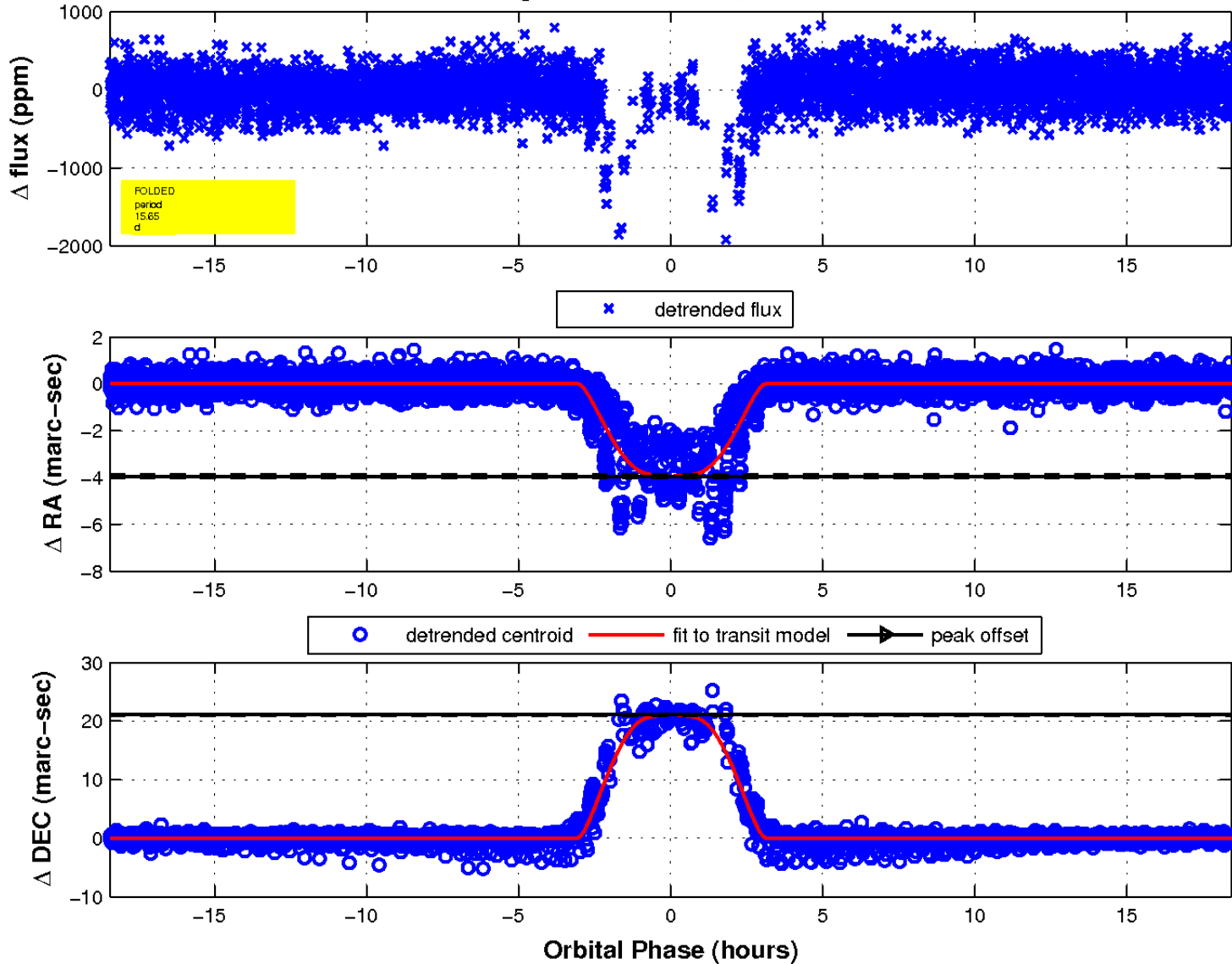
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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



fluxWeightedCentroids, Planet 2 of 2



UKIRT Image

Declination

