

KIC 004547480

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}) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|-------|-------|-----------------------------|-----------------|------------------------|------------------------|
| 004547480-01 | OBS | 6116.01 | 4.426940 | 133.564724 | 2836.3 | 1.612 | 110.1 | 117.3 | 0.75 | 5511 | 5.17 | 199.60 |
| 004547480-02 | OBS | No | 4.426954 | 135.776235 | 1045.4 | 1.645 | 36.9 | 44.2 | 0.75 | 5511 | 3.30 | 199.60 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|------------------------------------|
| 004547480-01 | OBS | FP | 0.00 | 0 | 1 | 0 | 0 | MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE |
| 004547480-02 | OBS | FP | 0.00 | 1 | 1 | 0 | 0 | IS_SEC_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 004547480-01

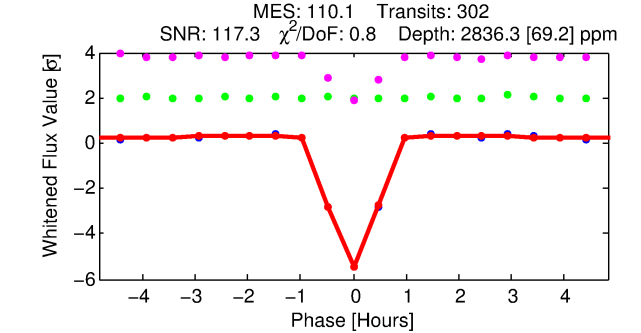
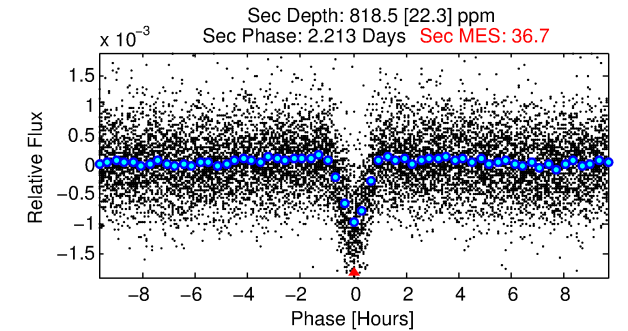
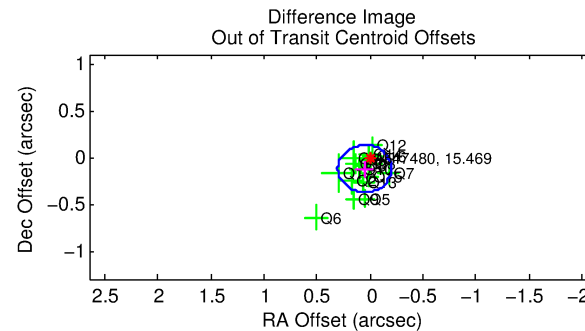
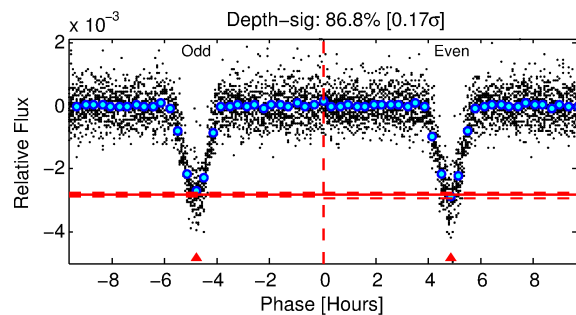
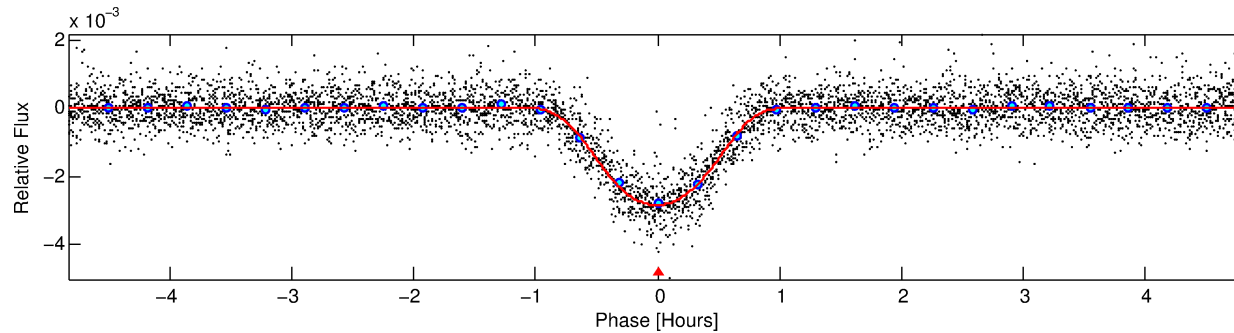
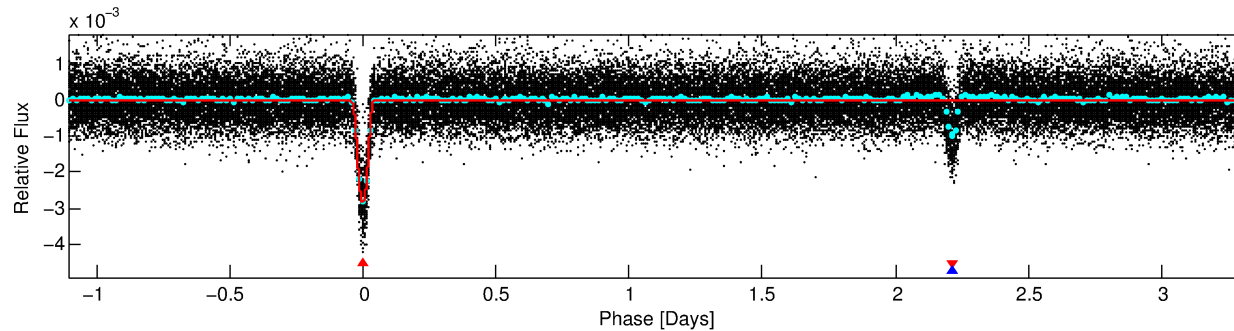
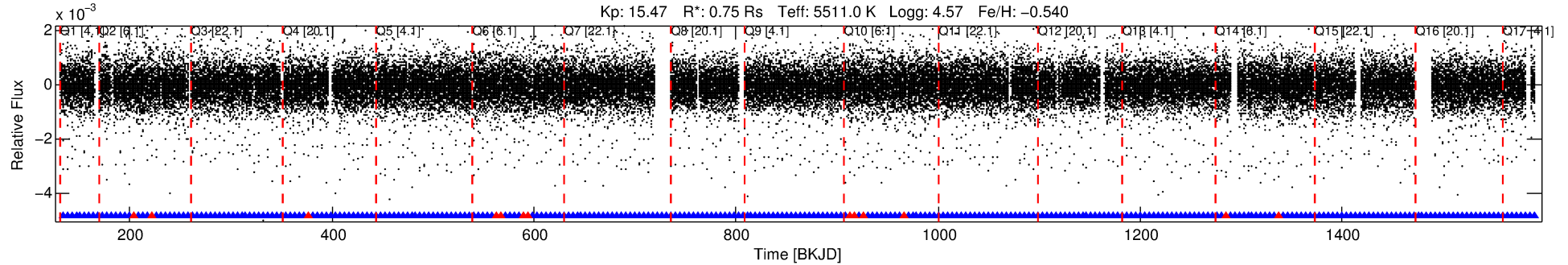
No Significant Match Found

DV One-Page Summary

KIC: 4547480 Candidate: 1 of 2 Period: 4.427 d

KOI: K06116.01 Corr: 0.993

Kp: 15.47 R*: 0.75 Rs Teff: 5511.0 K Logg: 4.57 Fe/H: -0.540



DV Fit Results:

Period = 4.42694 [0.00000] d
Epoch = 133.5647 [0.0003] BKJD
Rp/R* = 0.0635 [0.0039]
a/R* = 10.36 [0.53]
b = 0.94 [0.01]
Seff = 199.60 [45.37]
Teq = 958 [54] K
Rp = 5.17 [0.94] Re
a = 0.0480 [0.0065] AU
Ag = 38.79 [8.69] [4.35σ]
Teffp = 3698 [167] K [15.59σ]

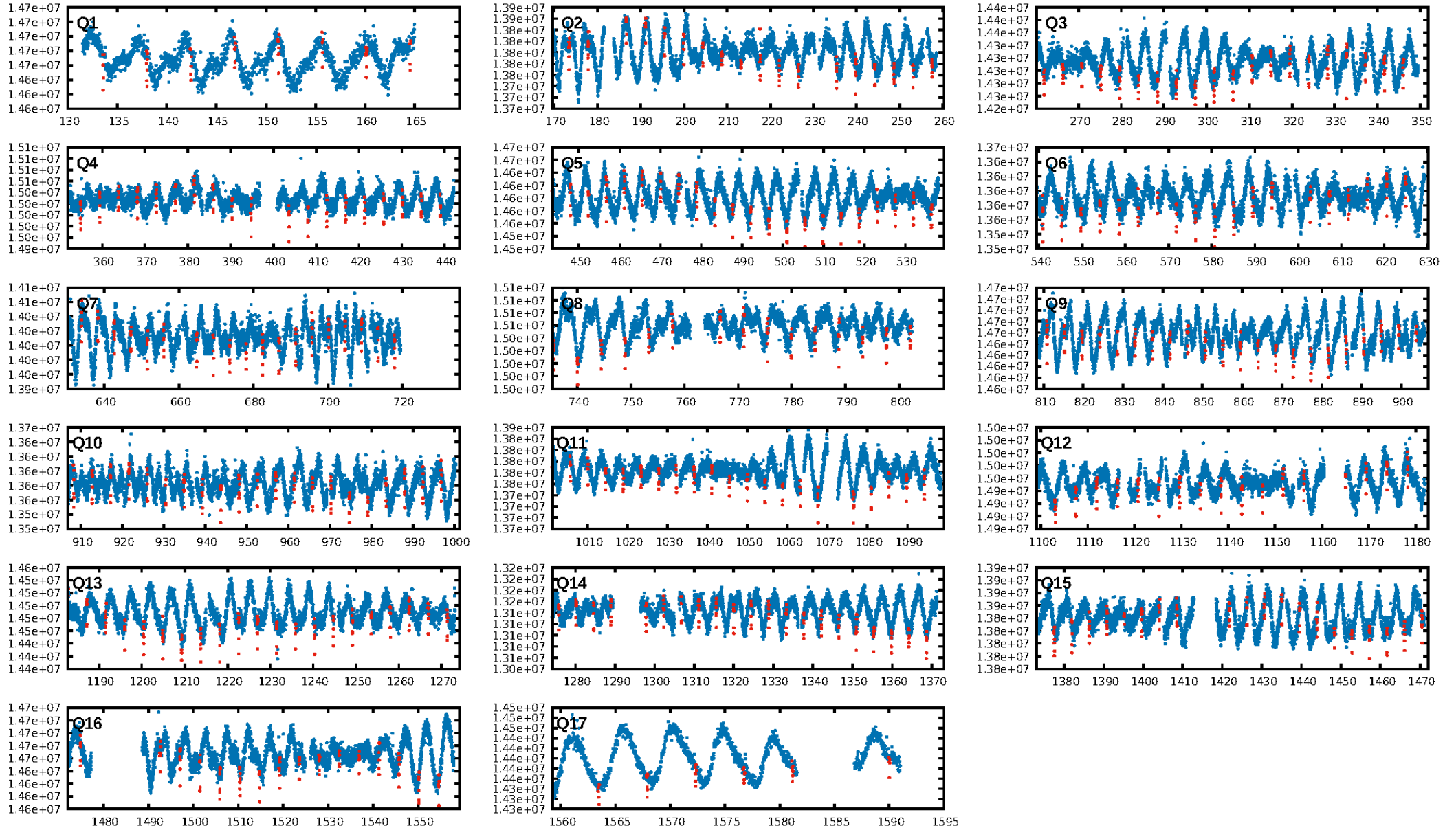
DV Diagnostic Results:

ShortPeriod-sig: N/A
LongPeriod-sig: 0.0% [0.00σ]
ModelChiSquare2-sig: N/A
ModelChiSquareGof-sig: N/A
Bootstrap-pfa: 0.00e+00
RollingBand-fgt: 0.95 [275/288]
GhostDiagnostic-chr: 3.572
Centroid-sig: 2.9%
Centroid-so: 0.152 arcsec [1.46σ]
OotOffset-rm: 0.133 arcsec [1.58σ]
OotOffset-st: 4/4/4/5 [17]
KicOffset-rm: 0.324 arcsec [3.97σ]
KicOffset-st: 4/4/4/5 [17]
DiffImageQuality-fgm: 1.00 [17/17]
DiffImageOverlap-fno: 1.00 [17/17]

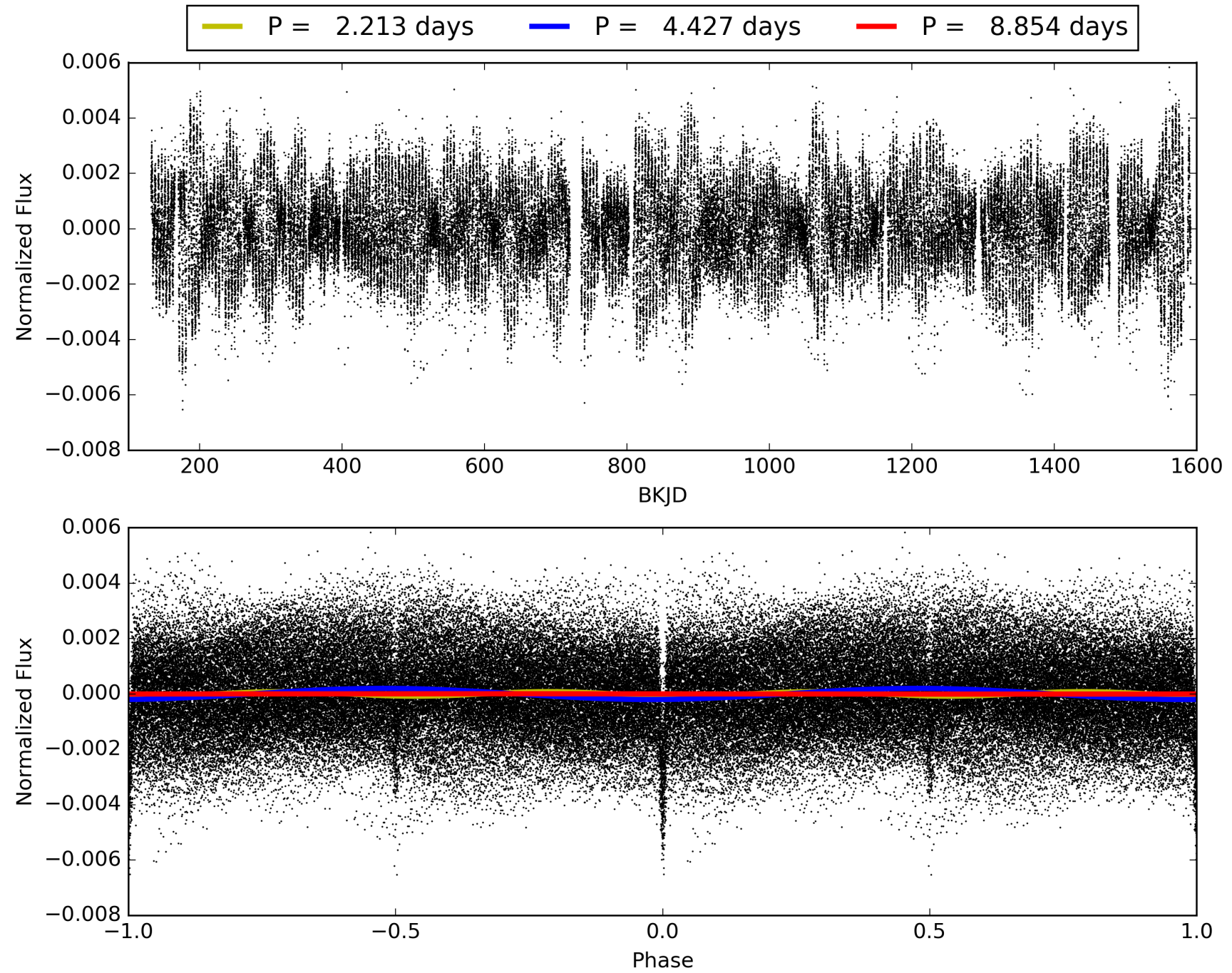
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 08:34:36 Z

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

TCE 004547480-01, PDC Light Curves

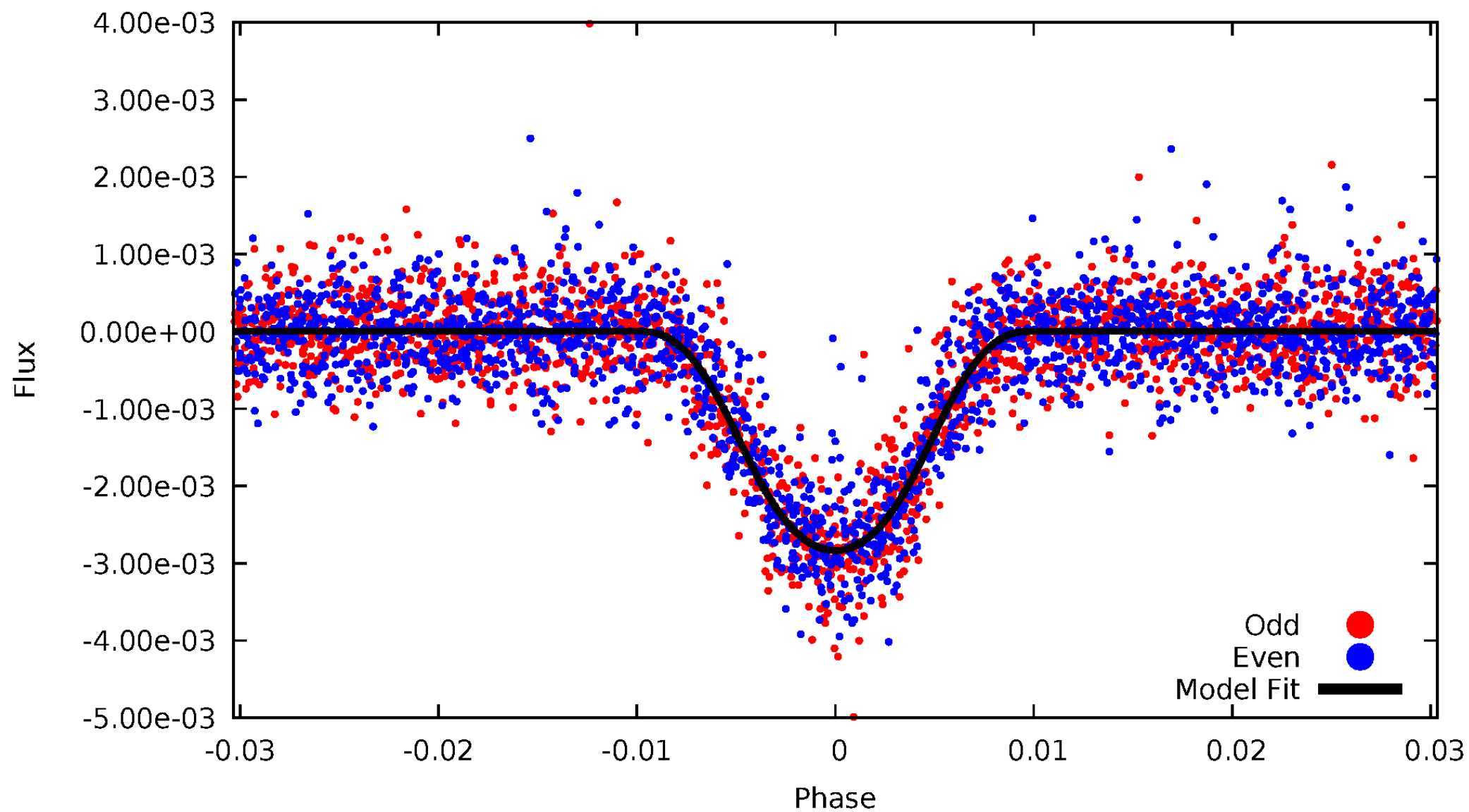


TCE 004547480-01



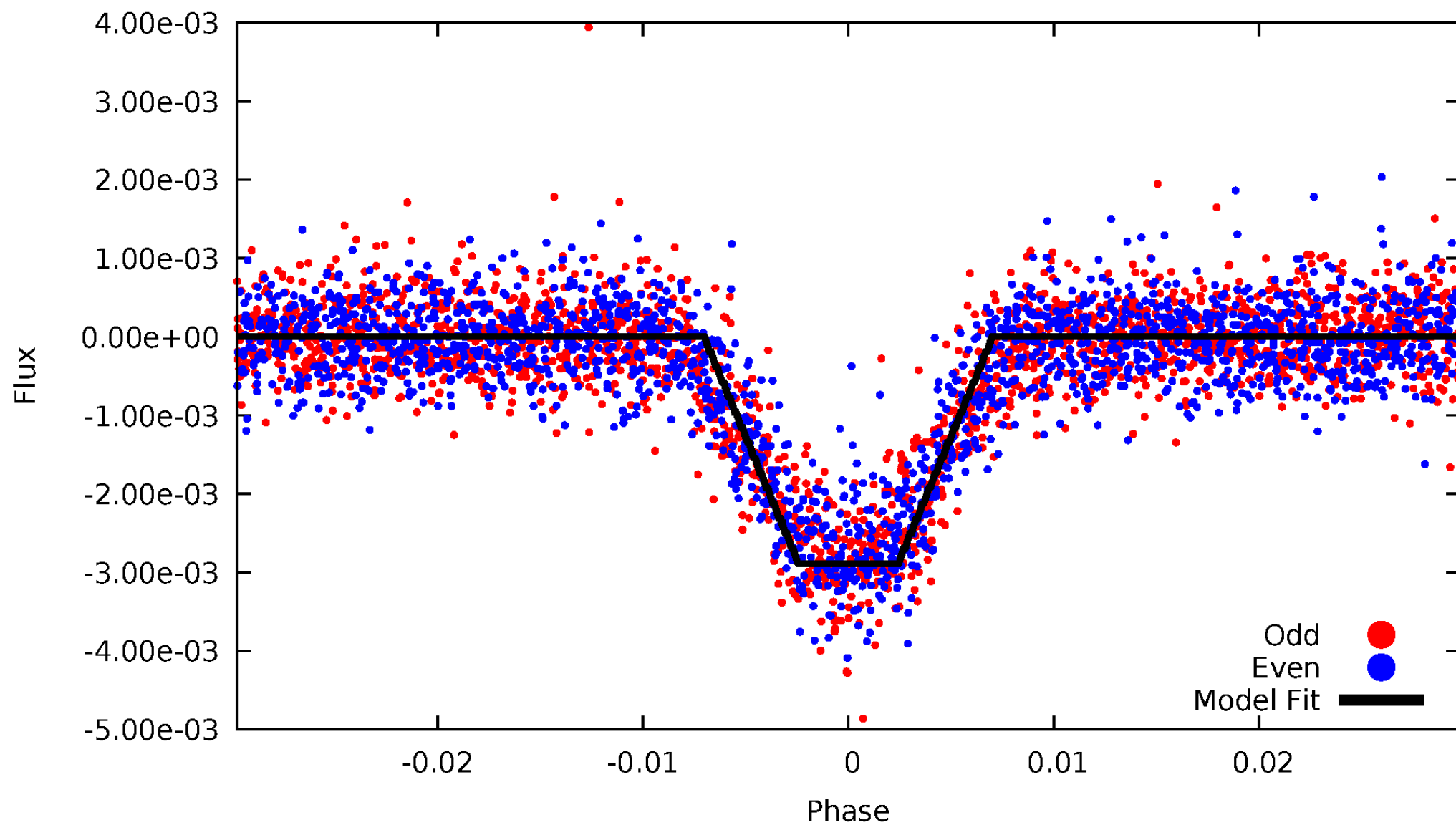
DV Odd/Even

TCE 004547480-01



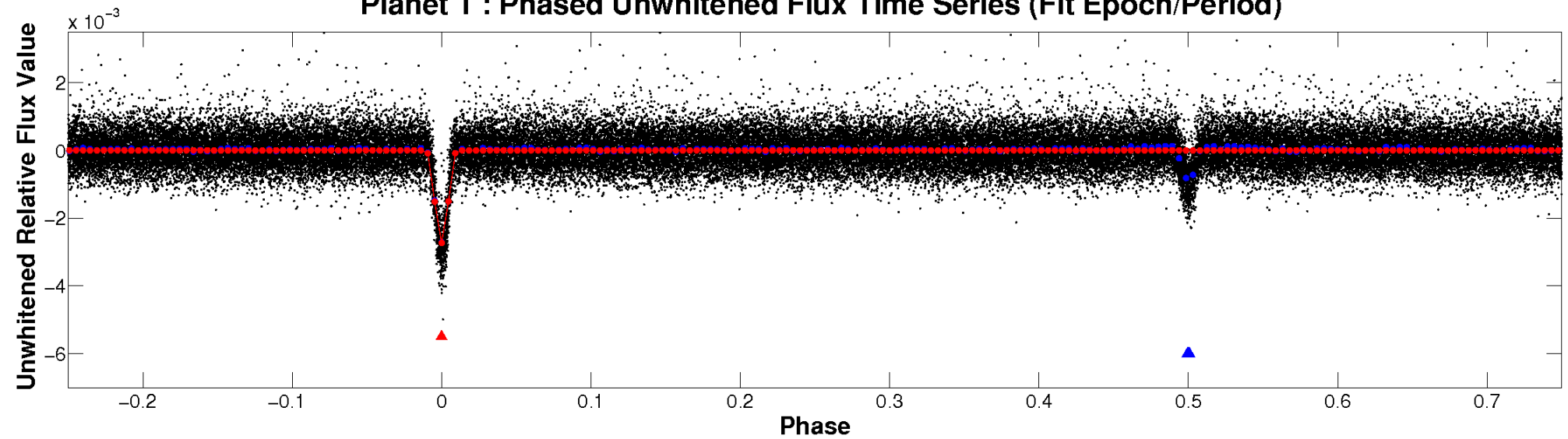
ALT Odd/Even

TCE 004547480-01

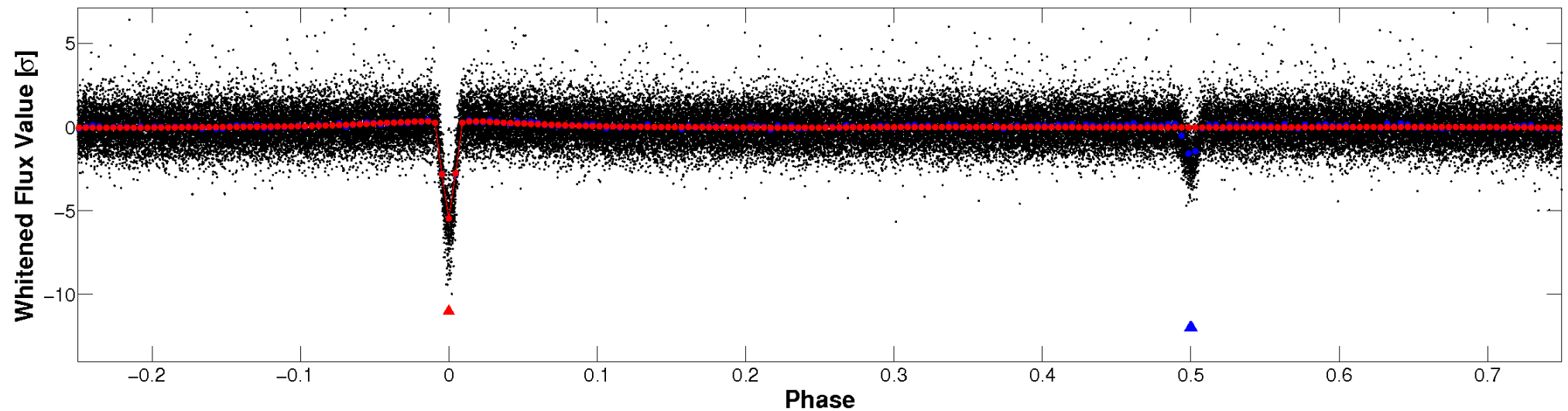


Non-Whitened Vs. Whitened Light Curve

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

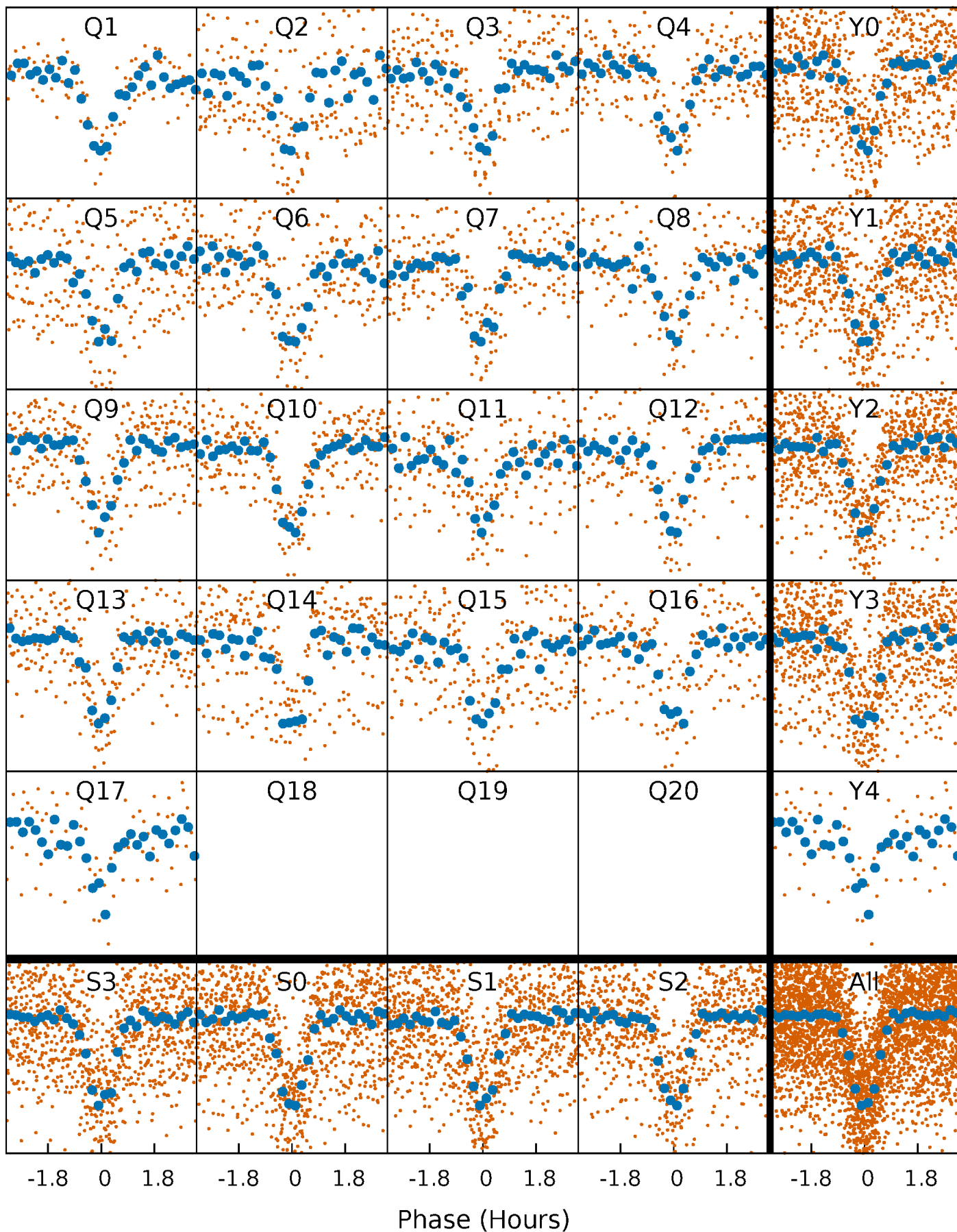


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



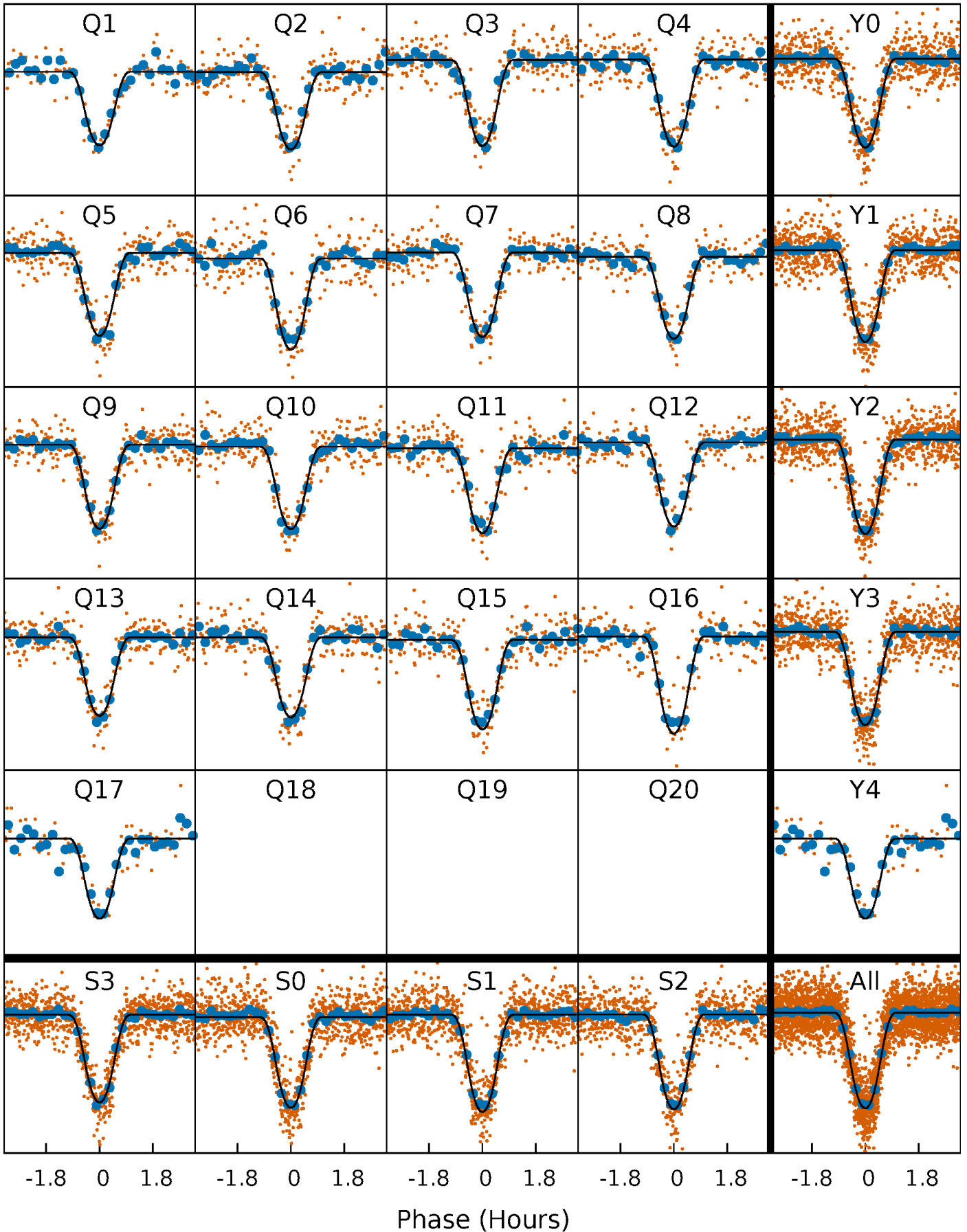
PDC Quarter-Phased Transit Curves

TCE 004547480-01 P= 4.426940 Days $T_0=133.564724$ (BKJD)



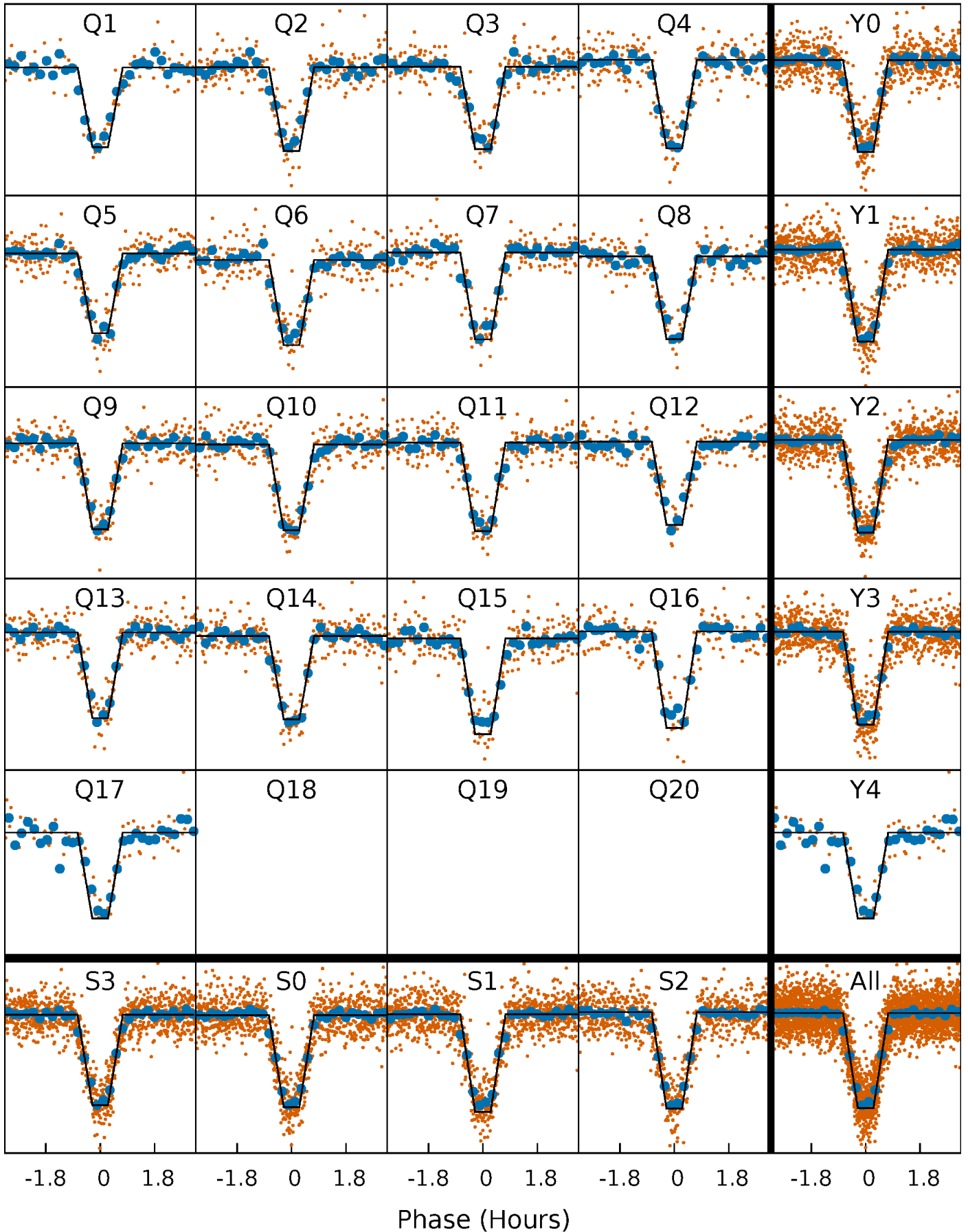
DV Quarter-Phased Transit Curves

TCE 004547480-01 P= 4.426940 Days $T_0=133.564724$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

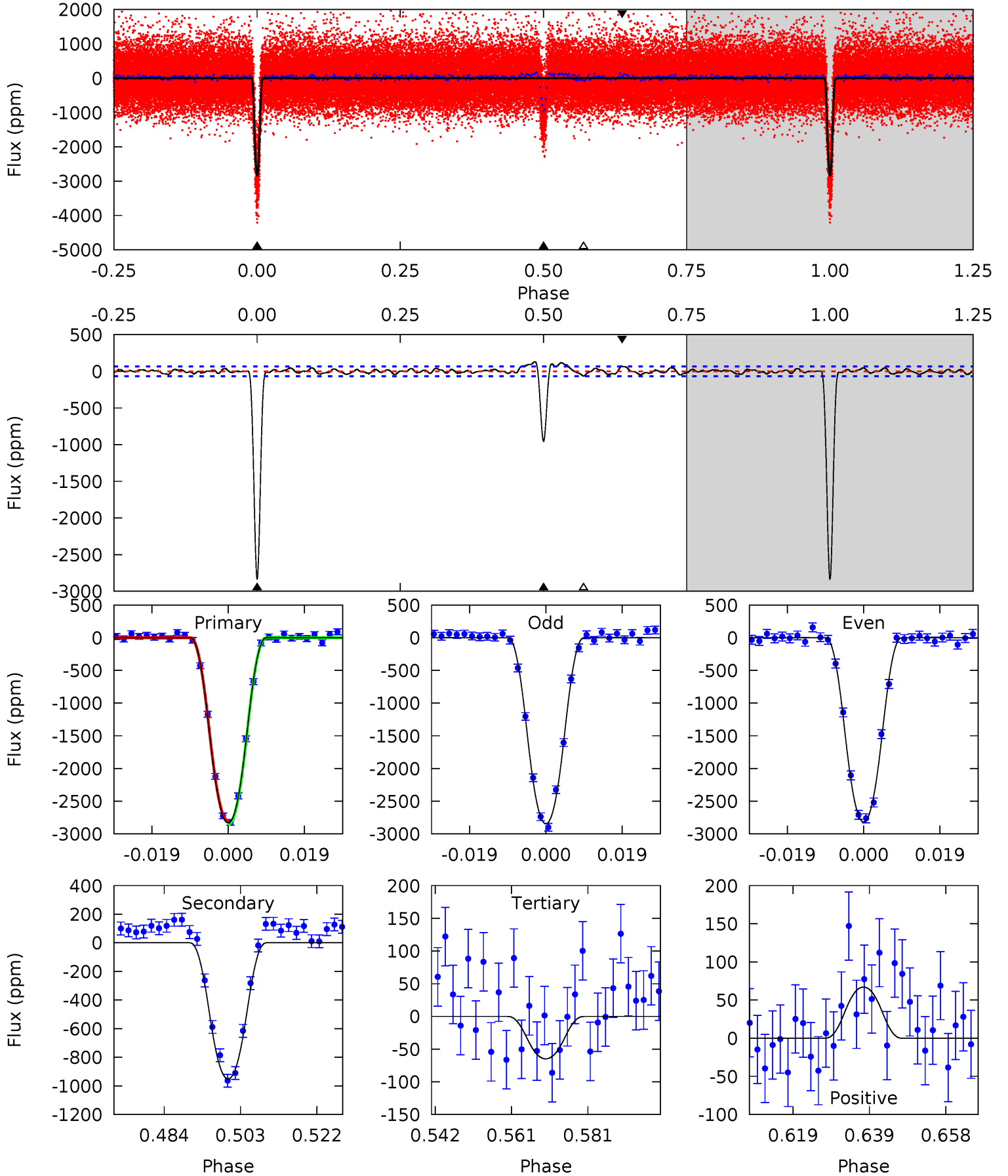
TCE 004547480-01 P= 4.426933 Days $T_0=133.565970$ (BKJD)



DV Model-Shift Uniqueness Test

004547480-01, P = 4.426940 Days, E = 129.137784 Days

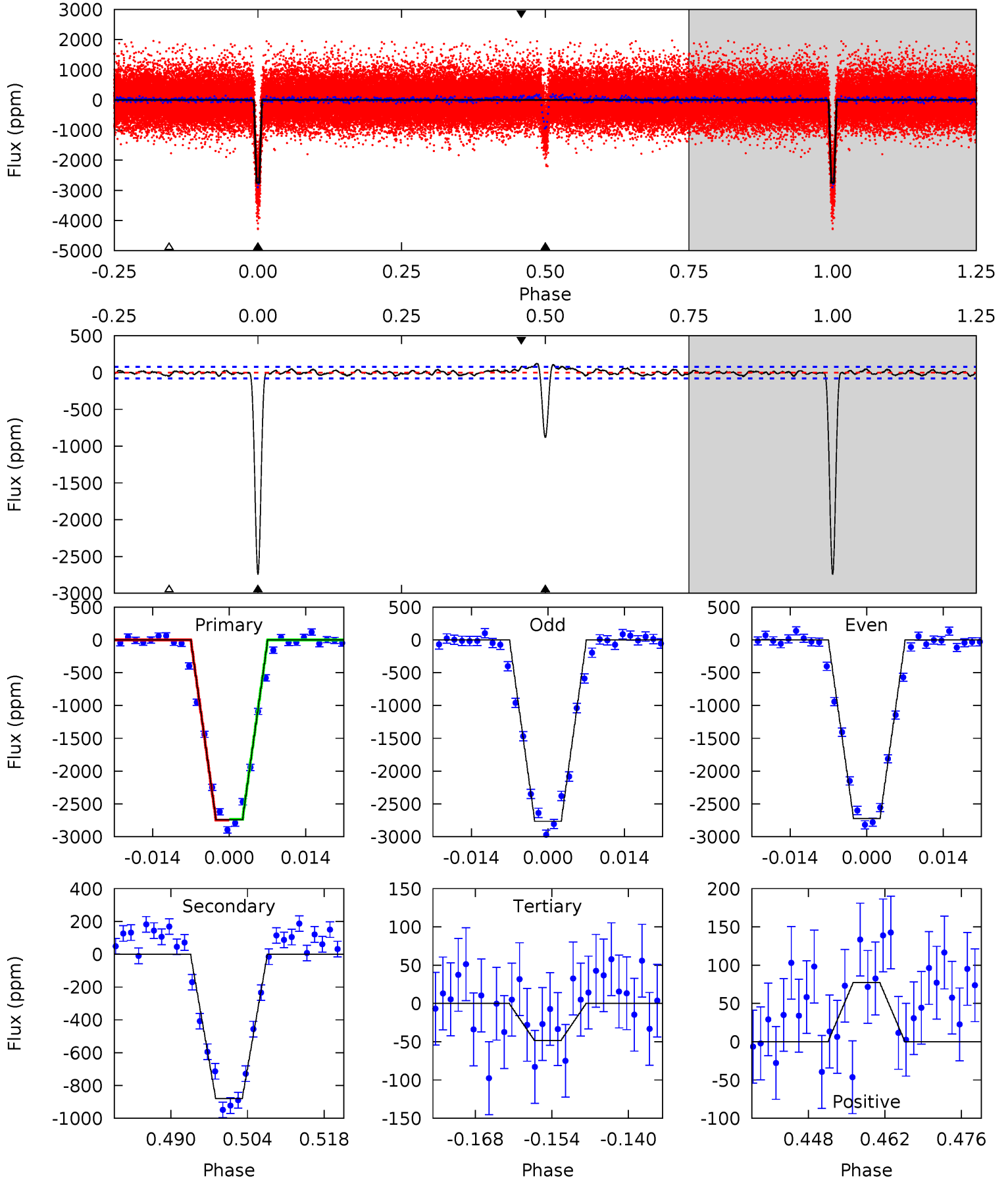
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|-------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 206.9 | 69.5 | 4.74 | 4.89 | 4.90 | 2.34 | 2.14 | 202.1 | 202.0 | 64.7 | 64.6 | 1.06 | 1.00 | 0.04 | 1.68 |



Alt Model-Shift Uniqueness Test

004547480-01, P = 4.426933 Days, E = 129.139037 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|-------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 173.7 | 55.8 | 3.07 | 4.91 | 4.96 | 2.46 | 1.80 | 170.7 | 168.8 | 52.7 | 50.9 | 1.39 | 0.99 | 0.04 | 0.45 |



Stellar Parameters For KIC 004547480

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | R (R_{\odot}) | M (M_{\odot}) | p_{\star} ($\text{g}\cdot\text{cm}^{-3}$) |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
| | 5511^{+180}_{-163} | $4.569^{+0.056}_{-0.096}$ | $-0.540^{+0.350}_{-0.300}$ | $0.746^{+0.127}_{-0.068}$ | $0.753^{+0.096}_{-0.052}$ | $2.553^{+0.724}_{-0.798}$ |
| | +3%/-3% | +1%/-2% | +65%/-56% | +17%/-9% | +13%/-7% | +28%/-31% |
| 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 004547480-01 / KOI 6116.01

| Detrend | Depth (ppm) | R_p (R_{\oplus}) | T_{max} (K) | T_{obs} (K) | A_{obs} |
|---------|---------------|------------------------|--------------------|----------------------|------------------|
| DV | -952 ± 14 | $5.24^{+0.52}_{-0.45}$ | 1351^{+63}_{-58} | 4121^{+138}_{-142} | 44^{+8}_{-7} |
| Alt. | -880 ± 16 | $4.43^{+0.51}_{-0.41}$ | 1347^{+67}_{-53} | 4307^{+170}_{-157} | 57^{+12}_{-11} |

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 $A_{obs} \gg 1.0$

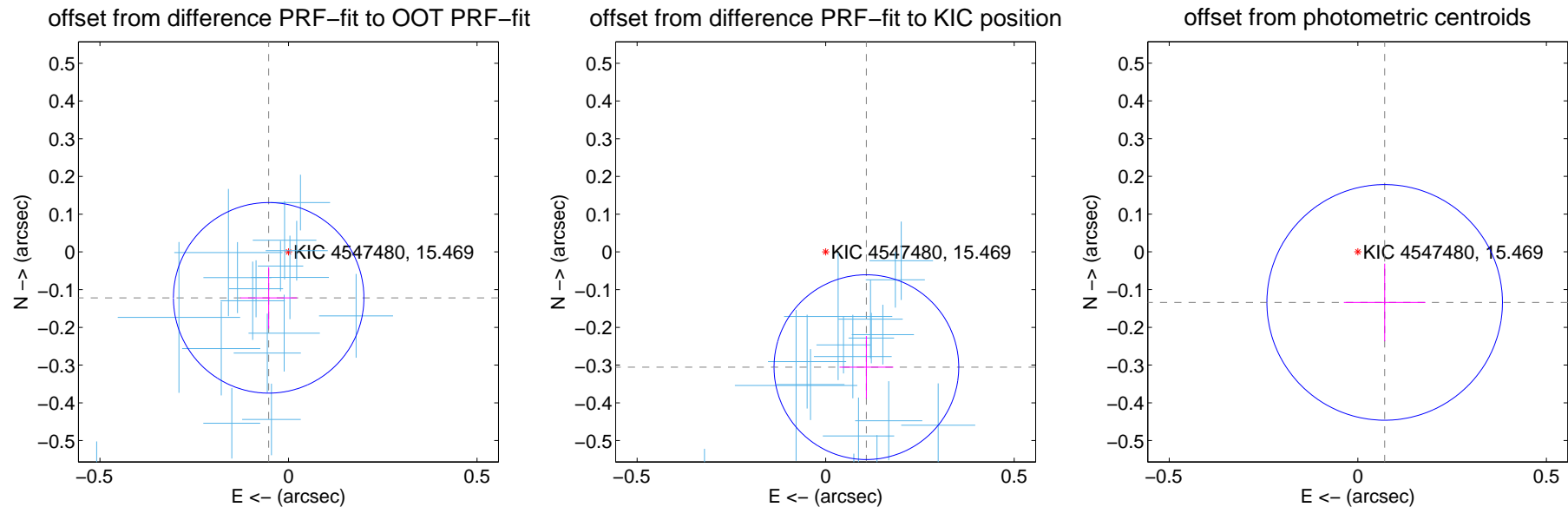
DV Centroid Data

Supplemental centroid analysis for 004547480-01. Kepler magnitude: 15.47. Transit SNR 117.33

There are 17 quarters with good PRF difference image offsets

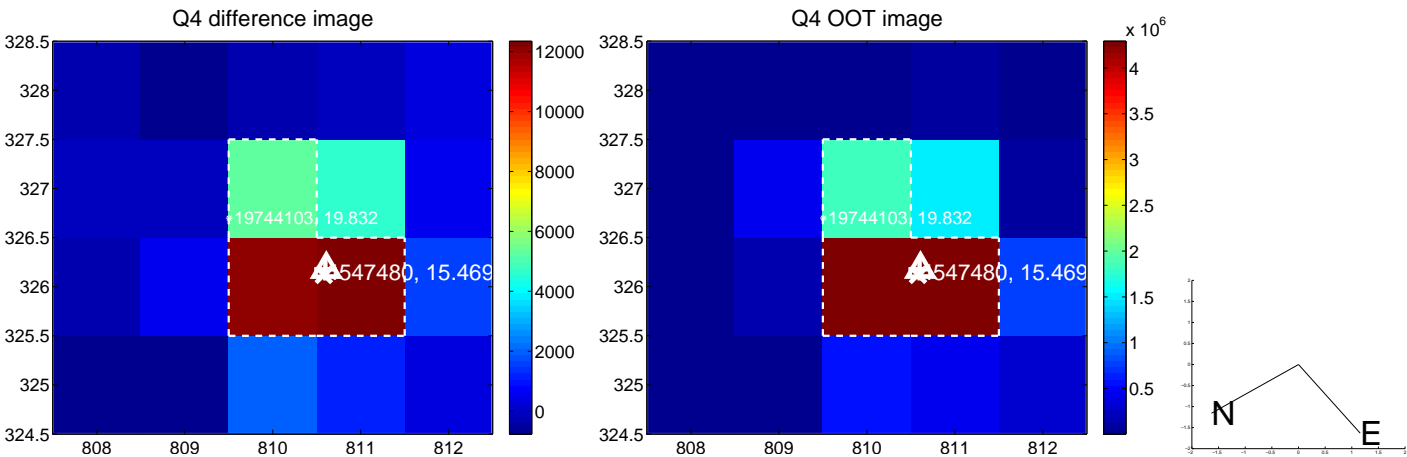
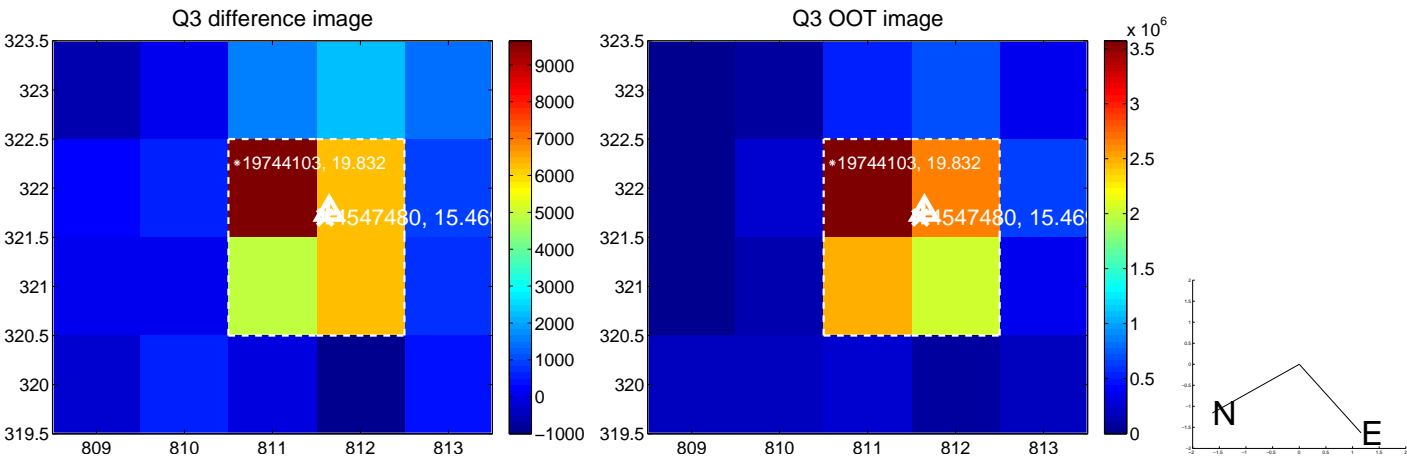
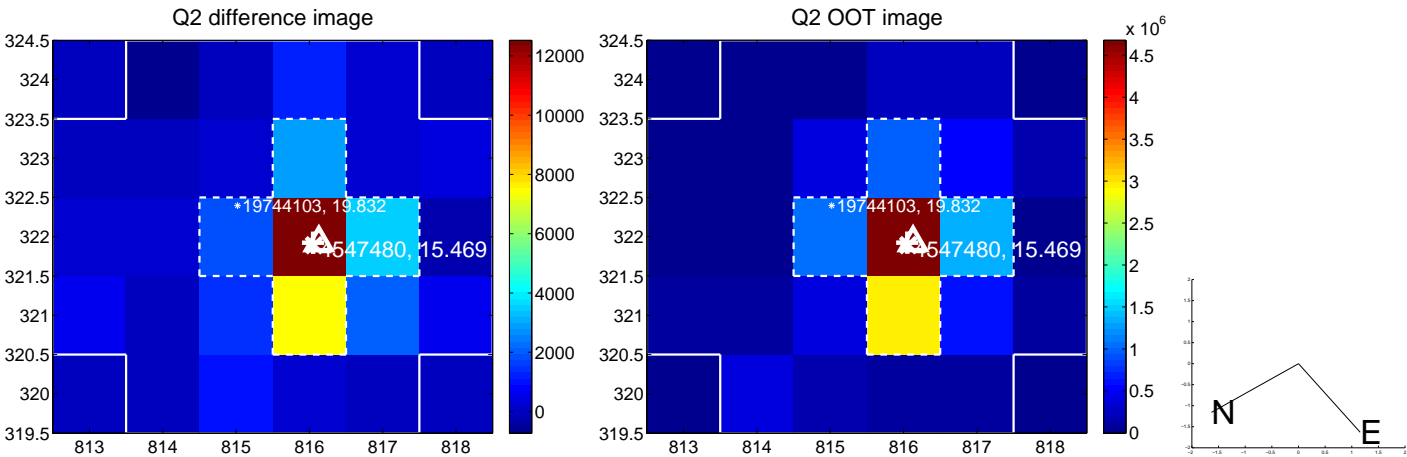
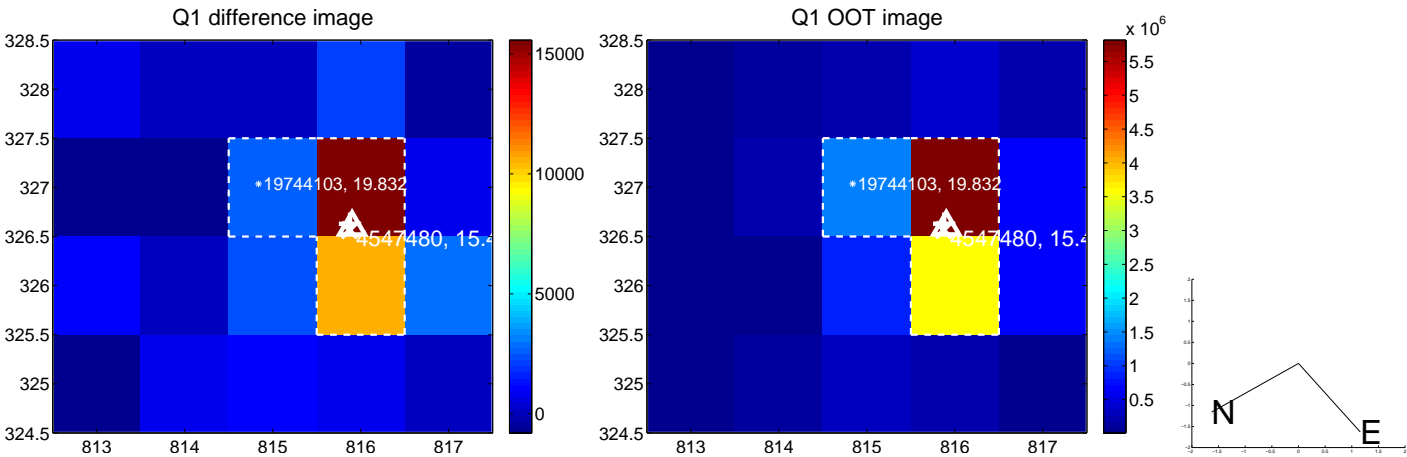
The direct PRF centroid is offset from the target star catalog position by about 0.28 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|---|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT | 0.133 ± 0.084 | 1.58 | 0.053 ± 0.075 | -0.122 ± 0.081 |
| PRF-fit source offset from KIC position | 0.324 ± 0.082 | 3.97 | -0.108 ± 0.071 | -0.305 ± 0.083 |
| photometric centroid source offset | 0.15 ± 0.10 | 1.46 | -0.07 ± 0.11 | -0.13 ± 0.10 |

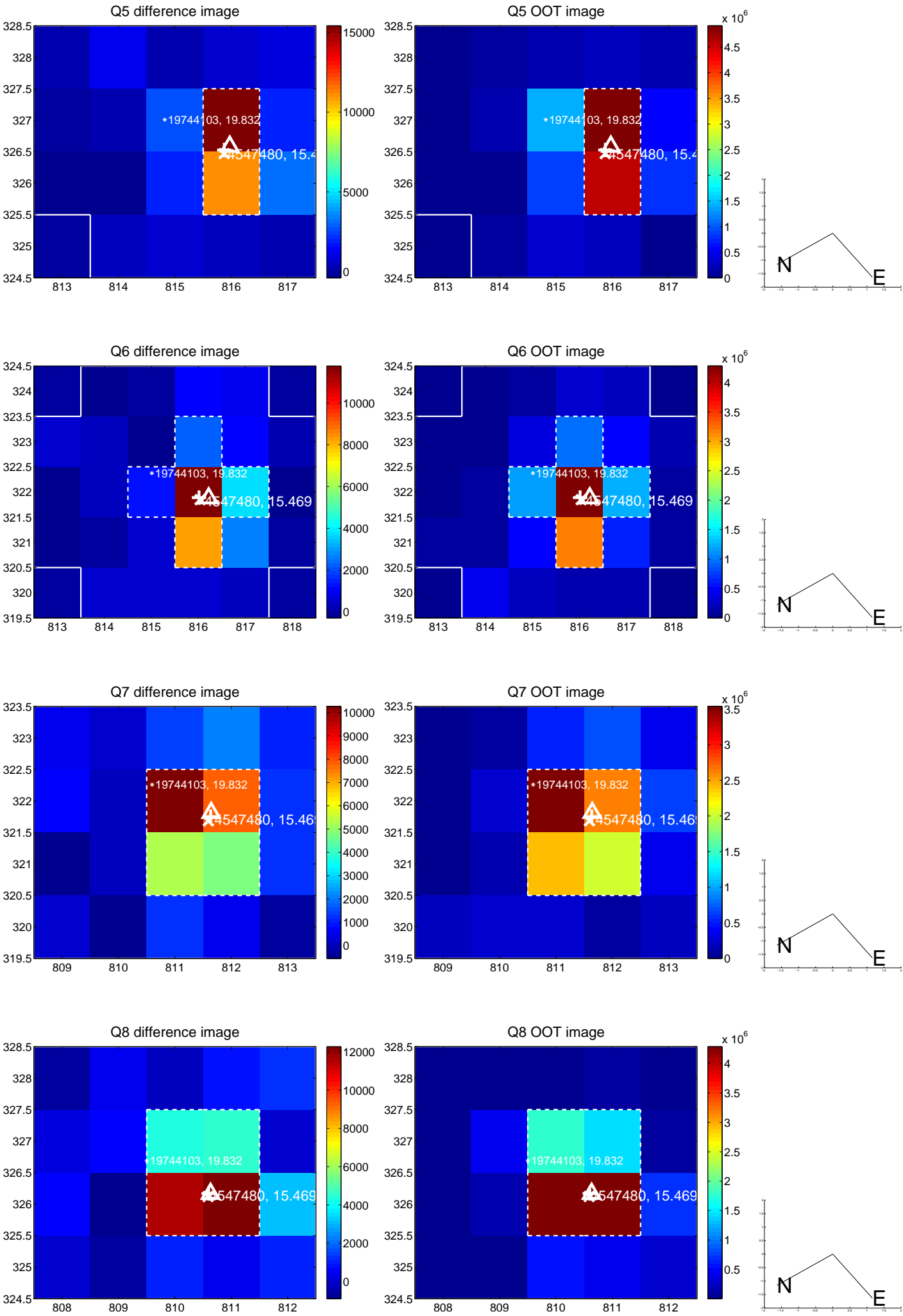


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

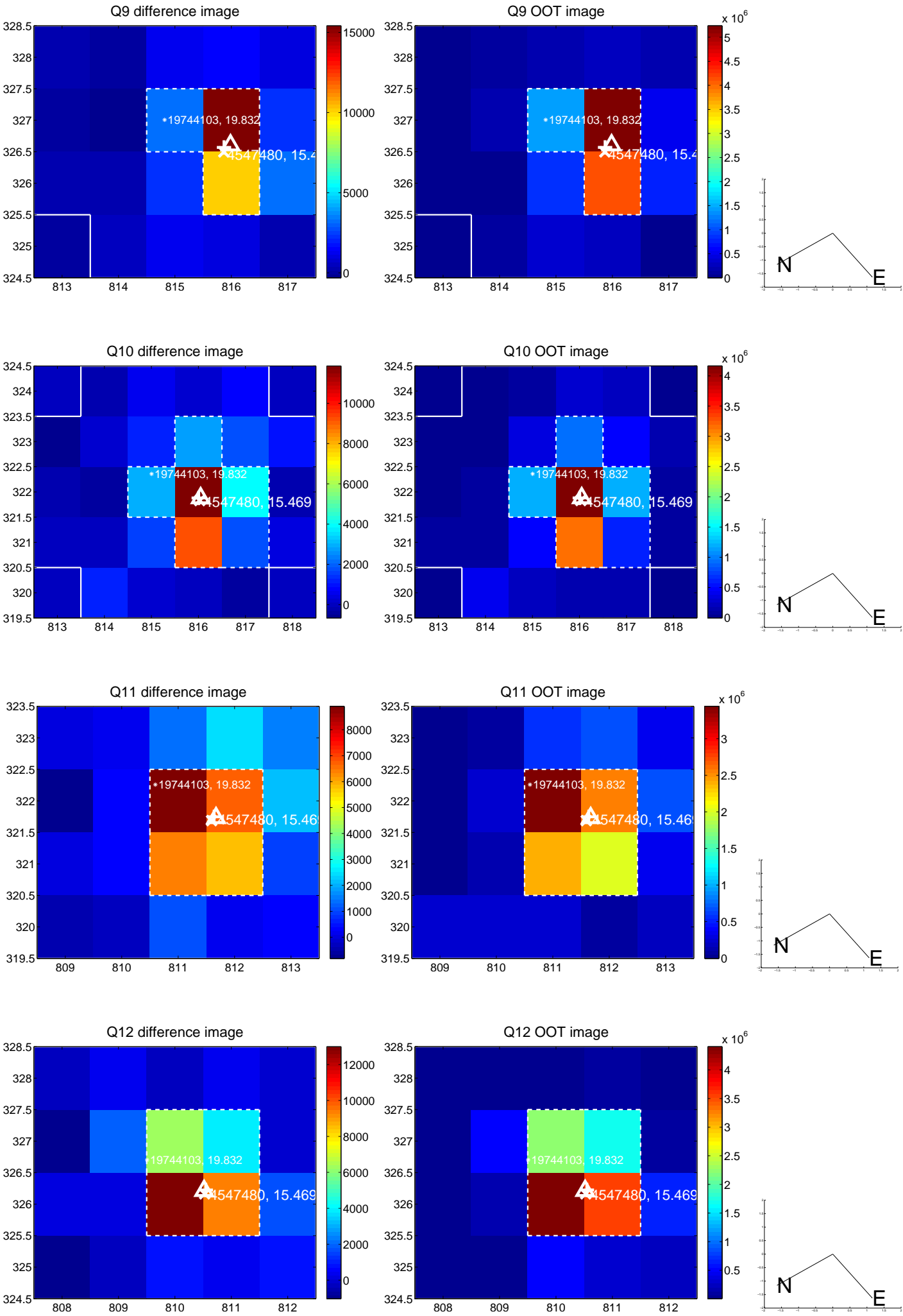
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



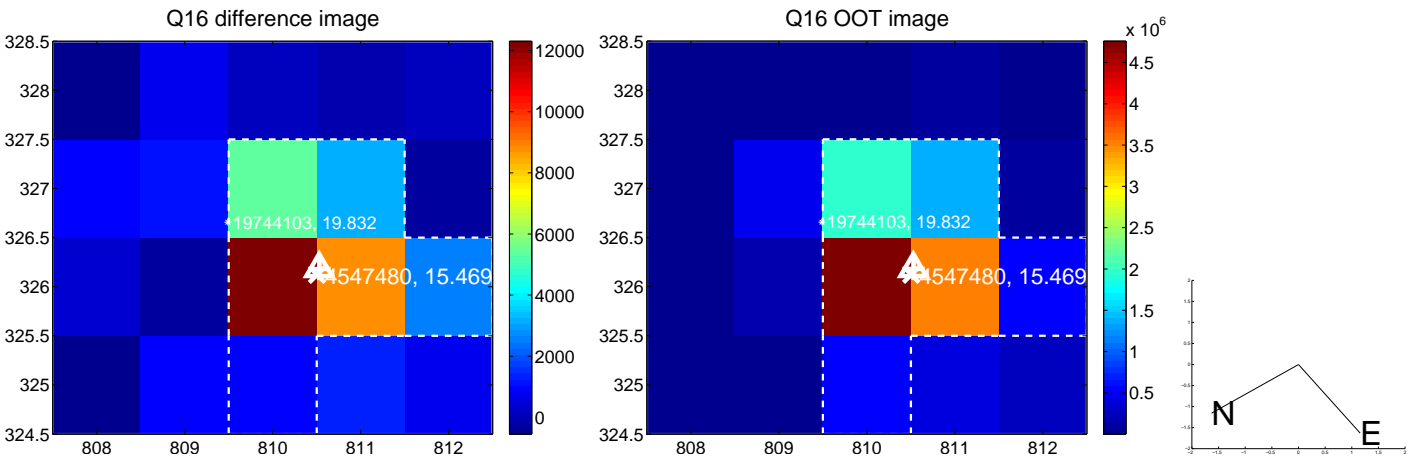
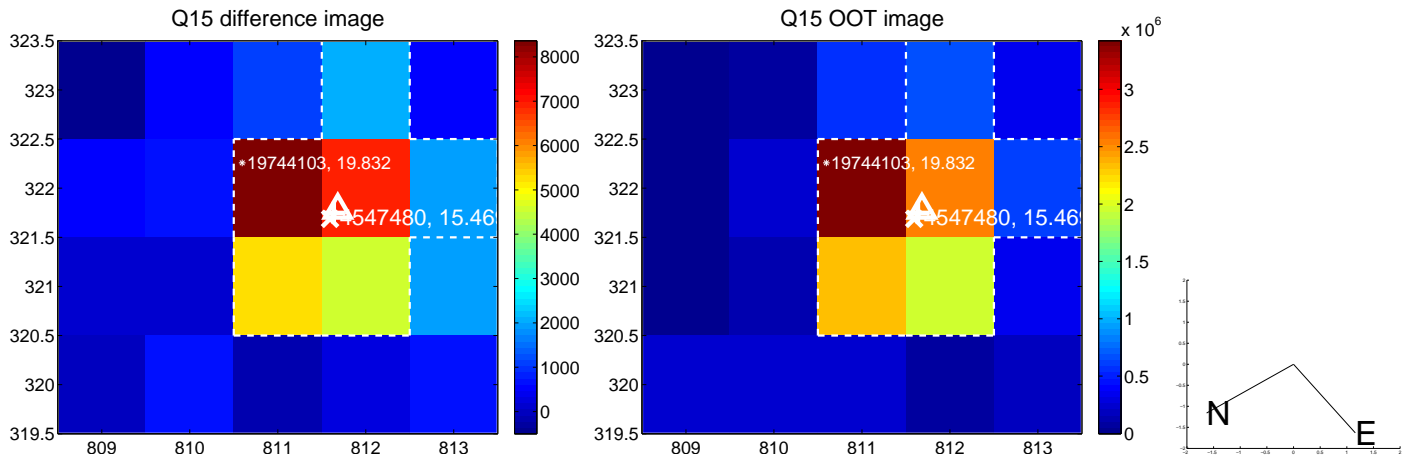
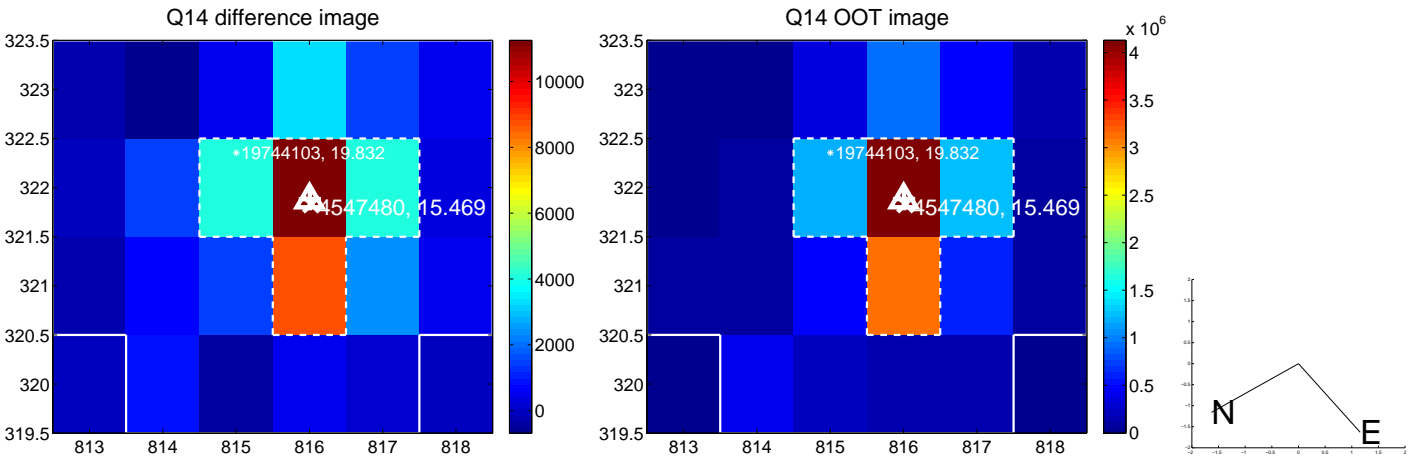
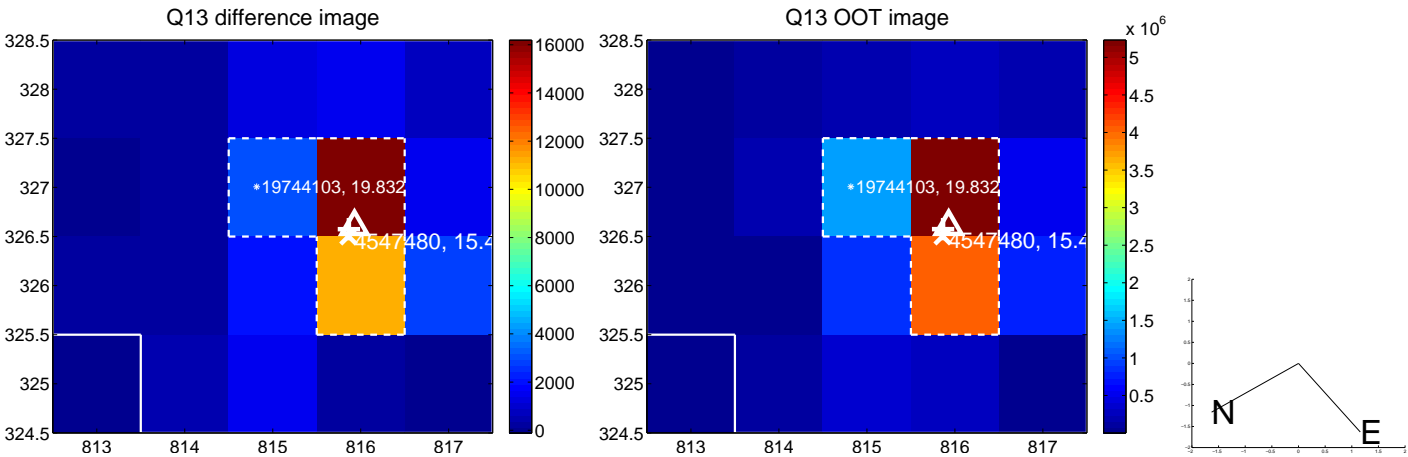
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



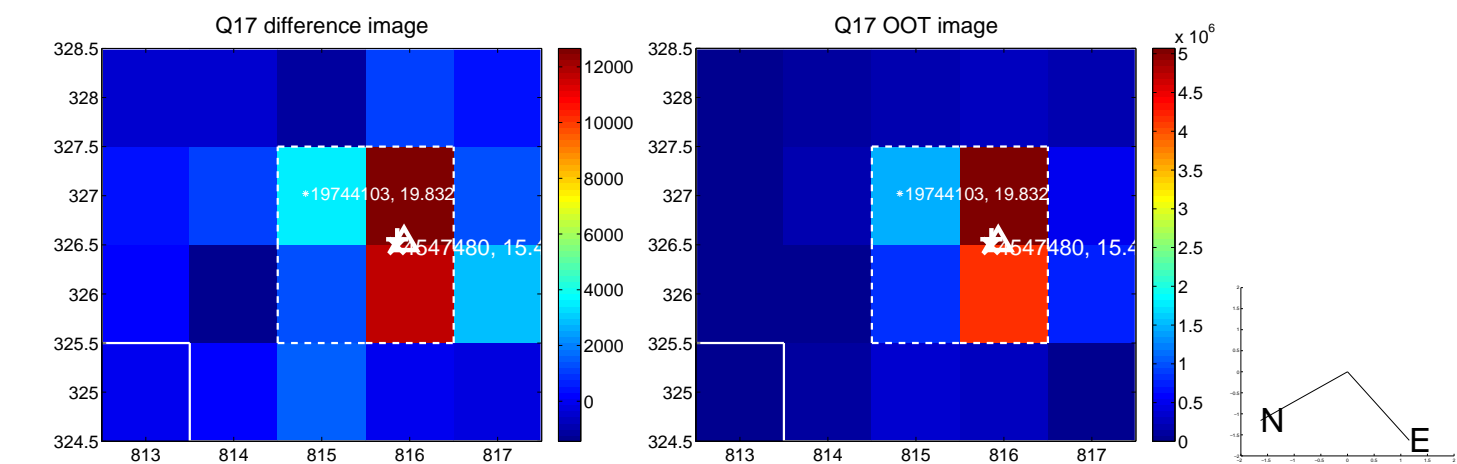
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



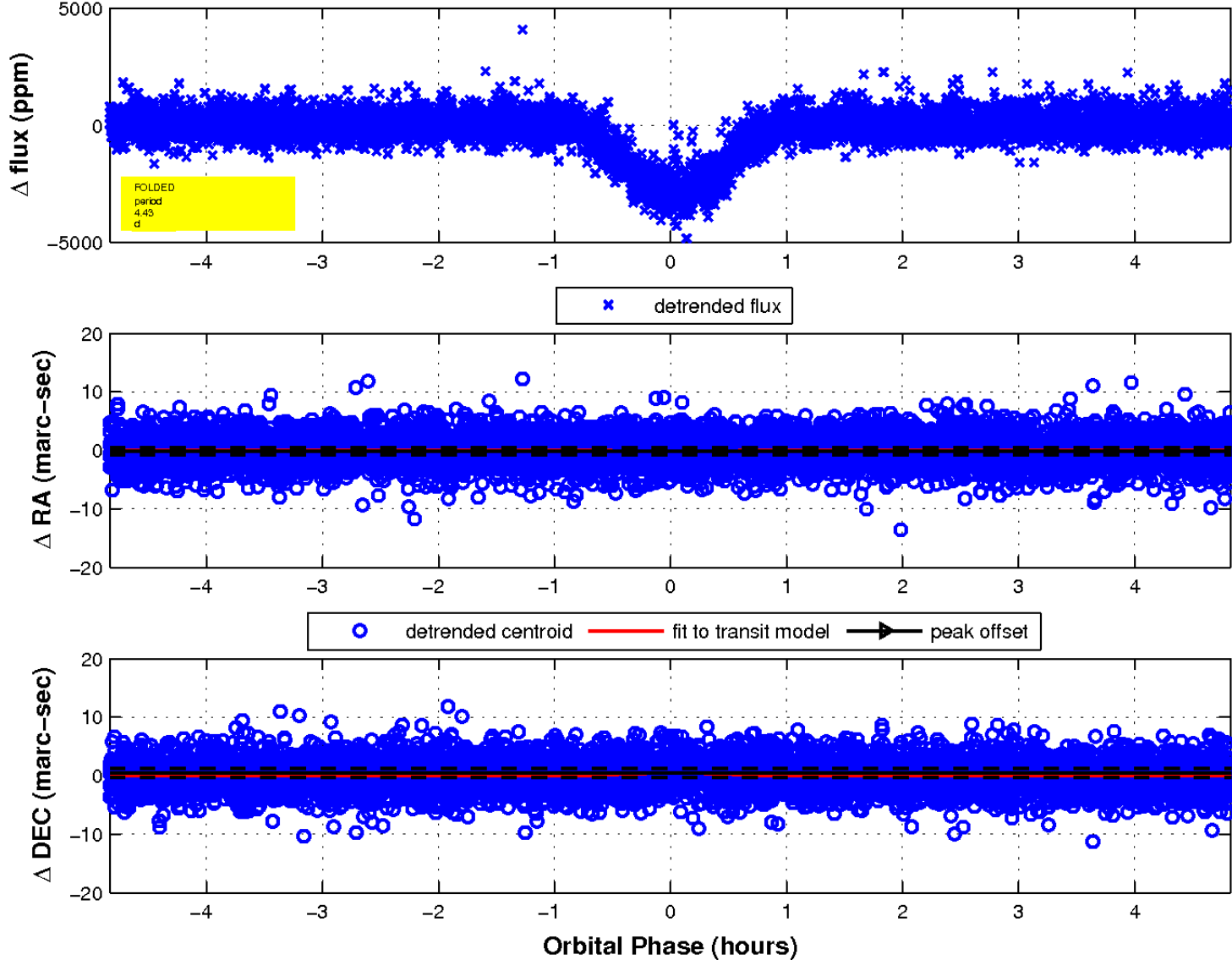
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

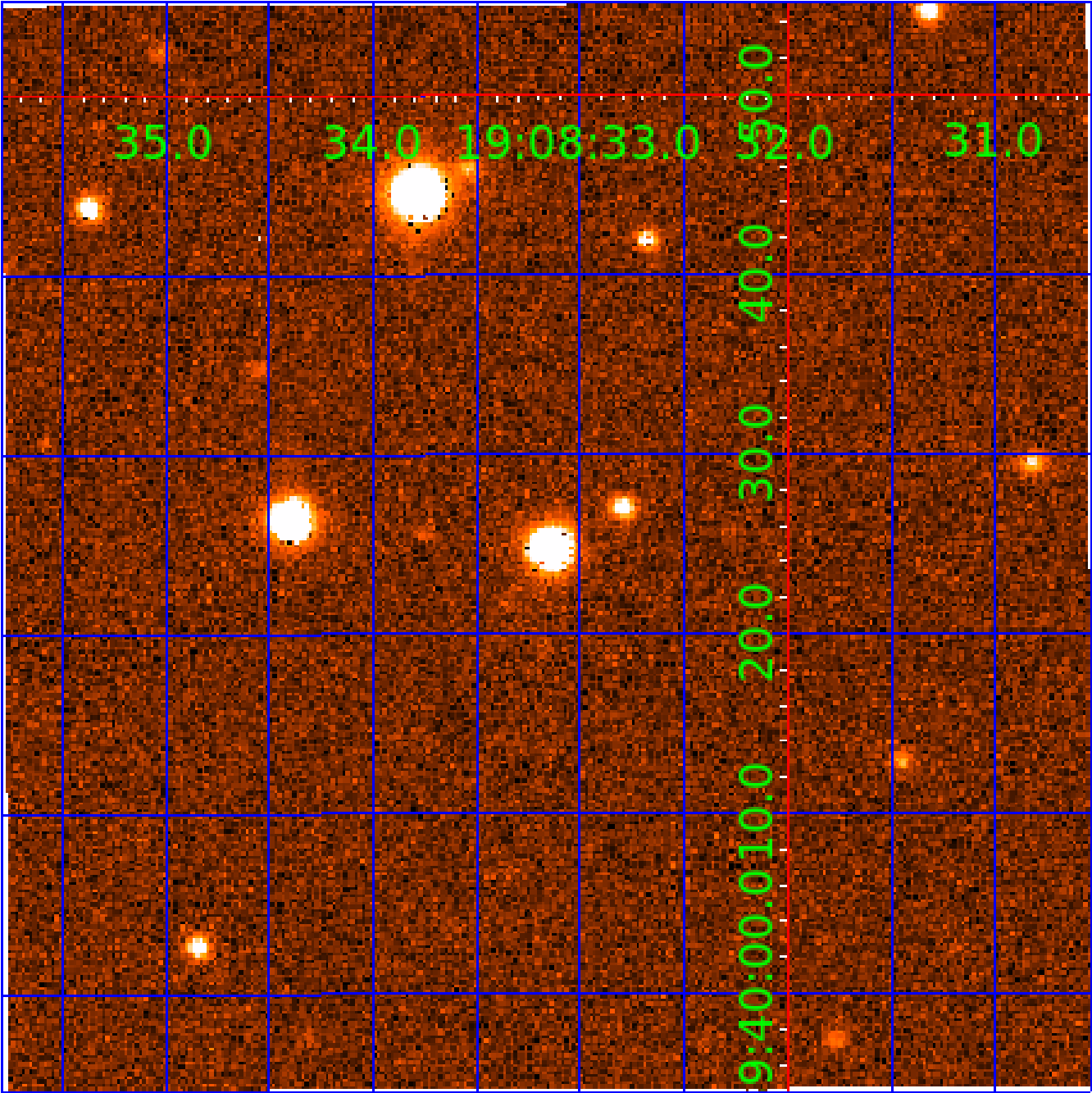


fluxWeightedCentroids, Planet 1 of 2



UKIRT Image

Declination



KIC 004547480

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}) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|-------|-------|-----------------------------|-----------------|------------------------|------------------------|
| 004547480-01 | OBS | 6116.01 | 4.426940 | 133.564724 | 2836.3 | 1.612 | 110.1 | 117.3 | 0.75 | 5511 | 5.17 | 199.60 |
| 004547480-02 | OBS | No | 4.426954 | 135.776235 | 1045.4 | 1.645 | 36.9 | 44.2 | 0.75 | 5511 | 3.30 | 199.60 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|------------------------------------|
| 004547480-01 | OBS | FP | 0.00 | 0 | 1 | 0 | 0 | MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE |
| 004547480-02 | OBS | FP | 0.00 | 1 | 1 | 0 | 0 | IS_SEC_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.

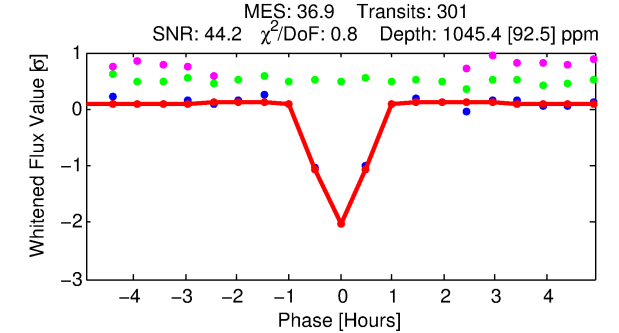
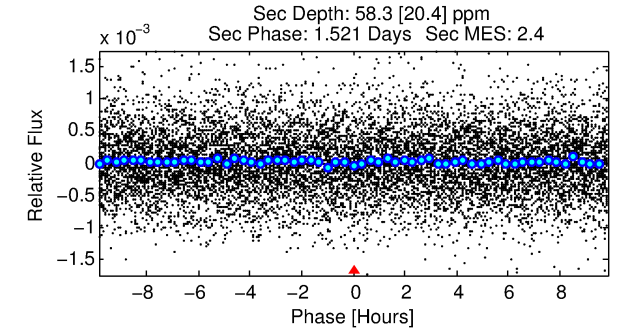
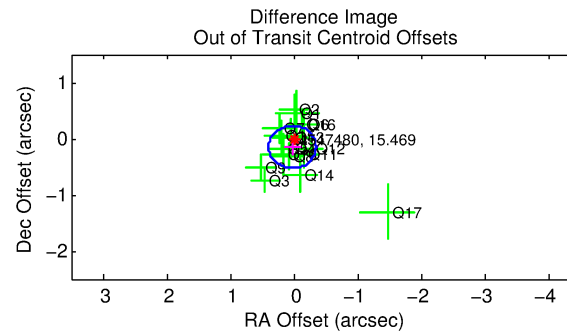
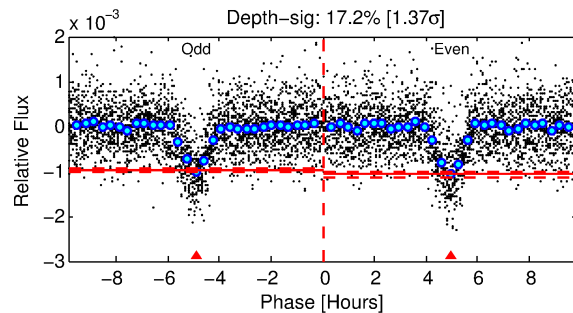
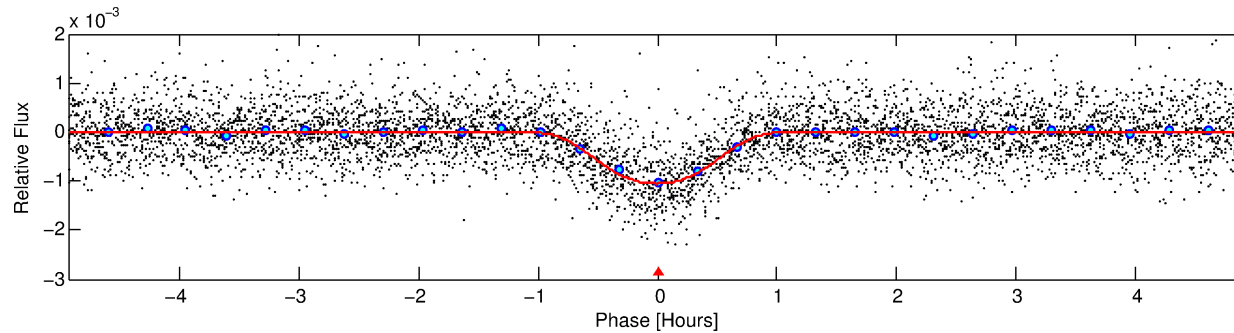
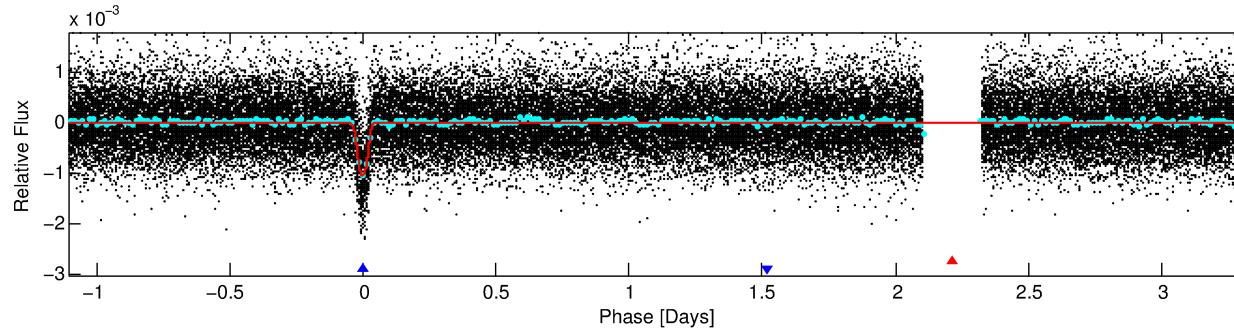
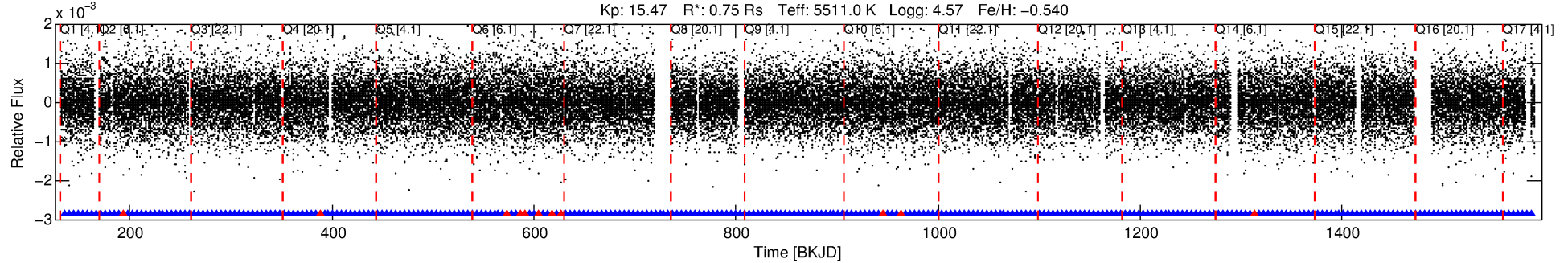
Ephemeris Match Information For 004547480-02

No Significant Match Found

DV One-Page Summary

KIC: 4547480 Candidate: 2 of 2 Period: 4.427 d
KOI: K06116 Corr: No Ephemeris Match

Kp: 15.47 R*: 0.75 Rs Teff: 5511.0 K Logg: 4.57 Fe/H: -0.540



DV Fit Results:

Period = 4.42695 [0.00000] d
Epoch = 135.7762 [0.0007] BKJD
Rp/R* = 0.0406 [0.0075]
a/R* = 8.03 [1.15]
b = 0.97 [0.02]
Seff = 199.60 [45.37]
Teq = 958 [54] K
Rp = 3.30 [0.83] Re
a = 0.0480 [0.0065] AU
Ag = 6.78 [3.67] [1.58σ]
Teffp = 2391 [314] K [4.50σ]

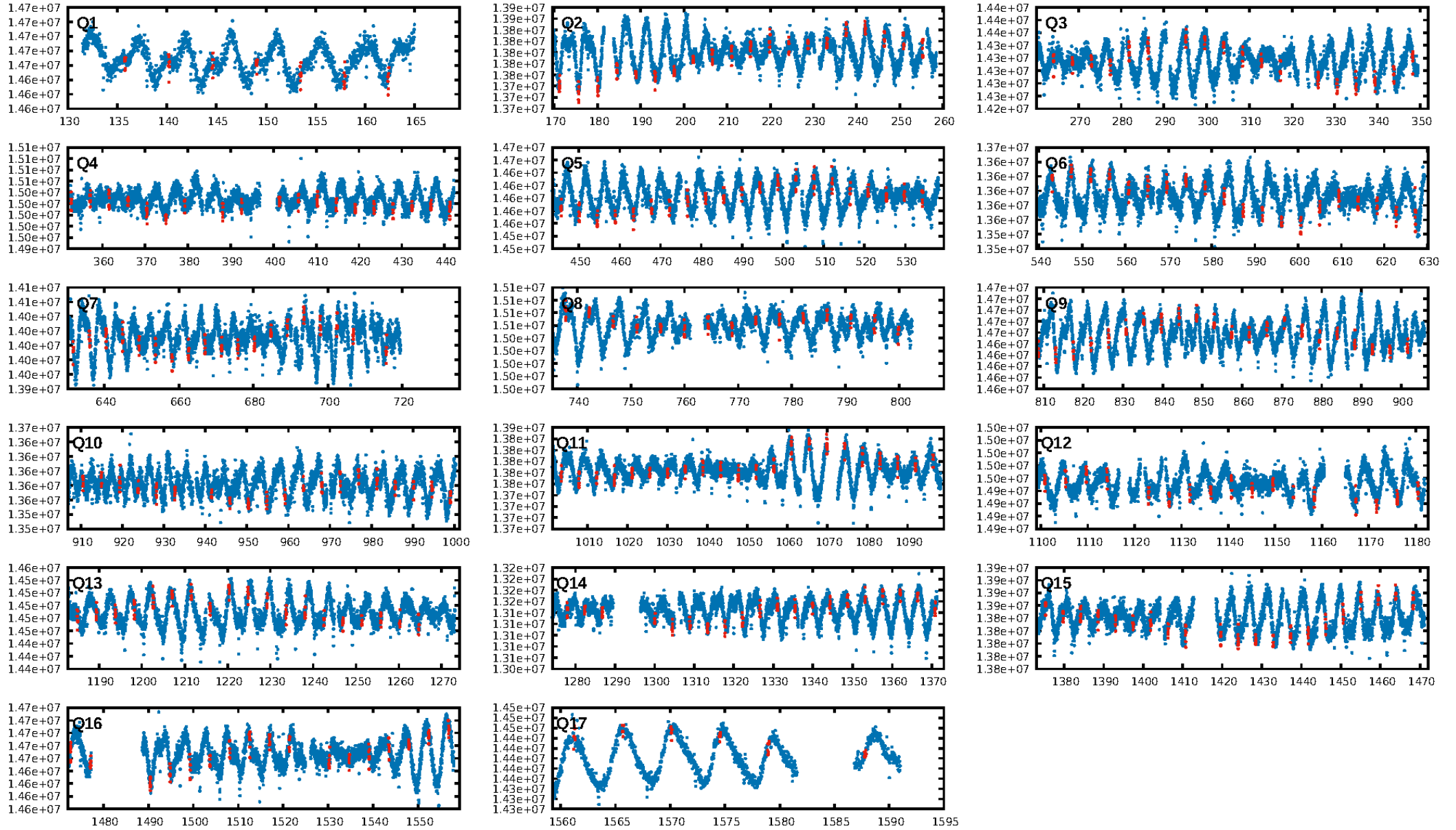
DV Diagnostic Results:

ShortPeriod-sig: 0.0% [0.00σ]
LongPeriod-sig: N/A
ModelChiSquare2-sig: N/A
ModelChiSquareGof-sig: N/A
Bootstrap-pfa: 2.14e-286
RollingBand-fgt: 0.96 [277/288]
GhostDiagnostic-chr: 3.882
Centroid-sig: 1.4%
Centroid-so: 0.454 arcsec [1.64σ]
OotOffset-rm: 0.150 arcsec [1.20σ]
KicOffset-rm: 0.360 arcsec [2.47σ]
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]

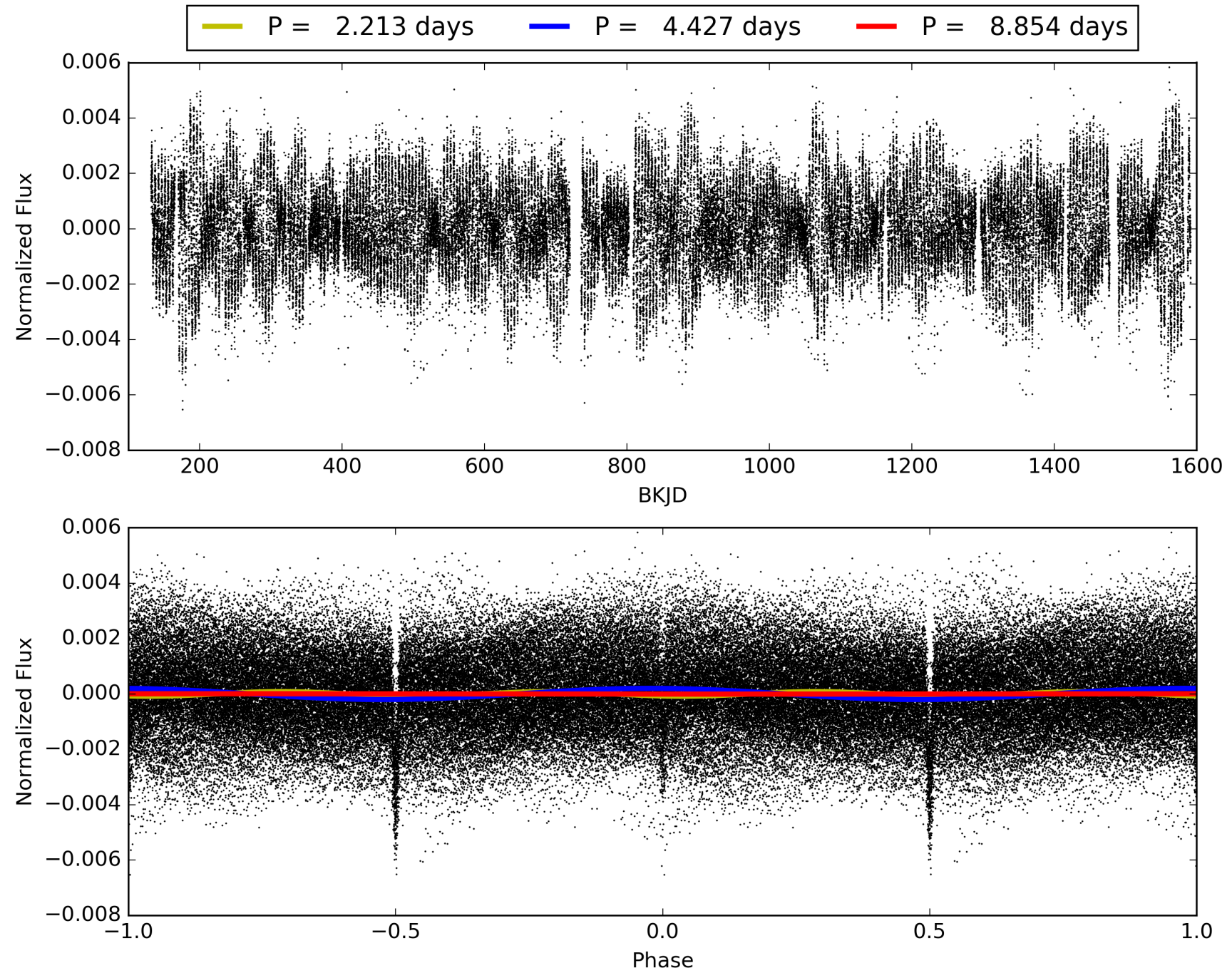
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 08:34:43 Z

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

TCE 004547480-02, PDC Light Curves

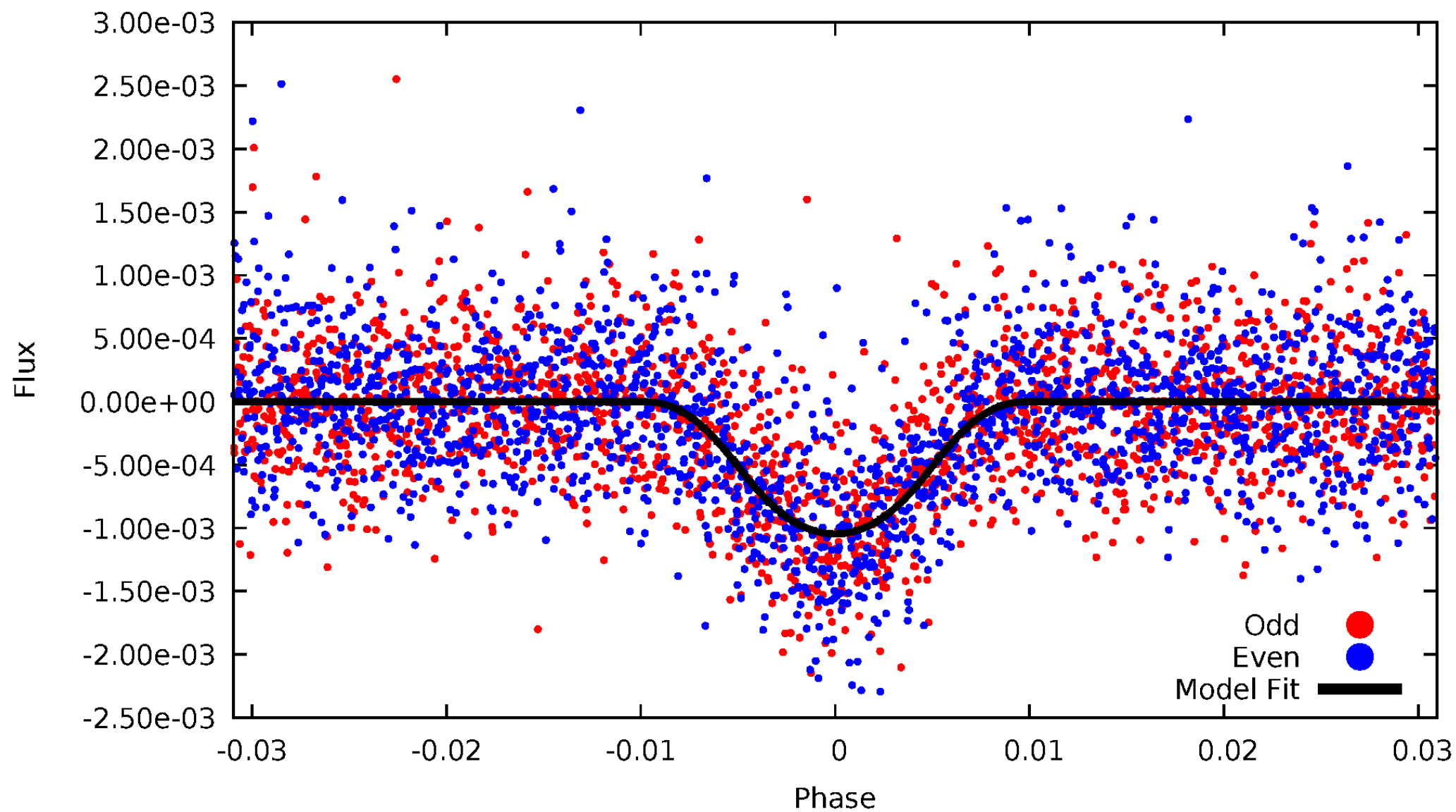


TCE 004547480-02



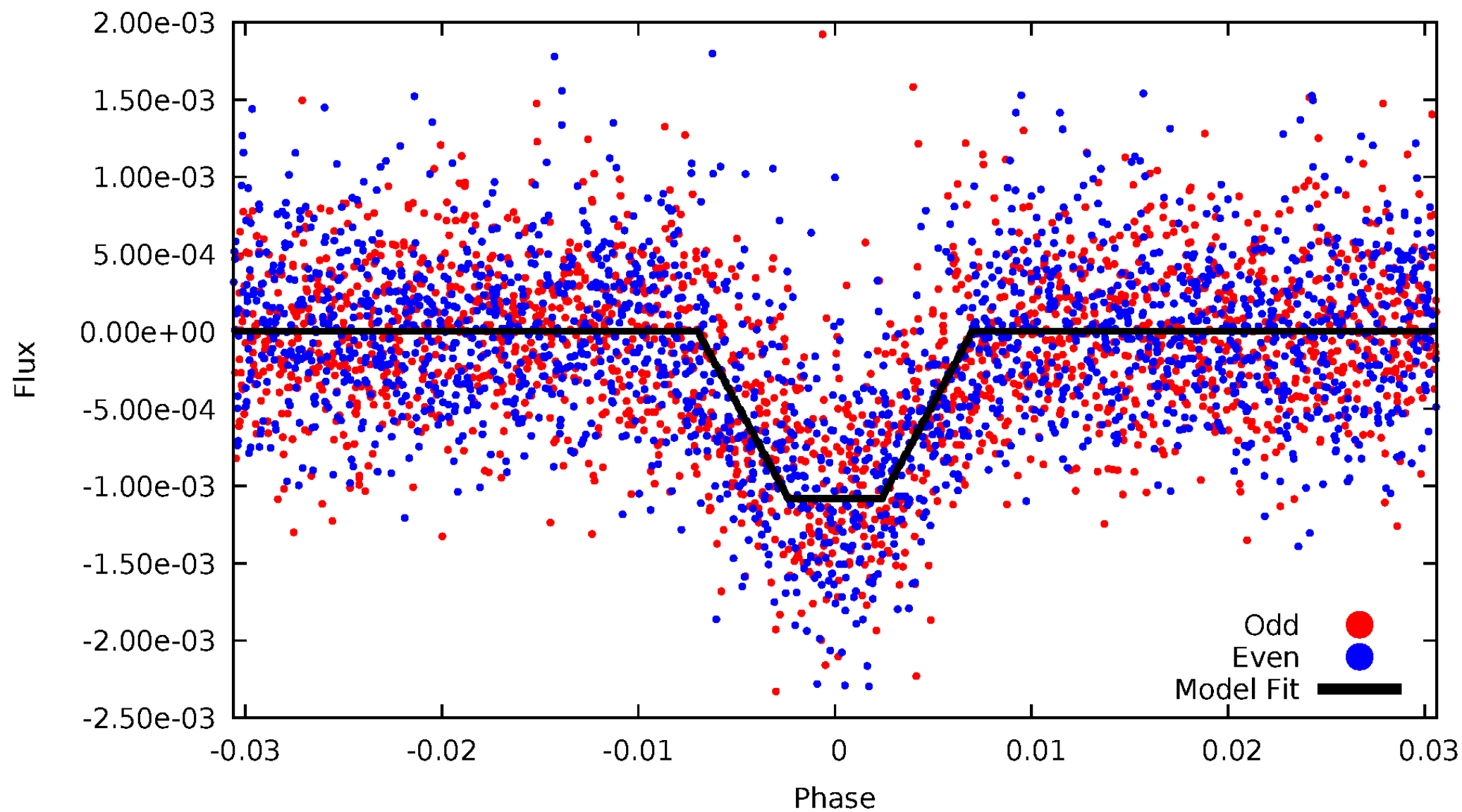
DV Odd/Even

TCE 004547480-02



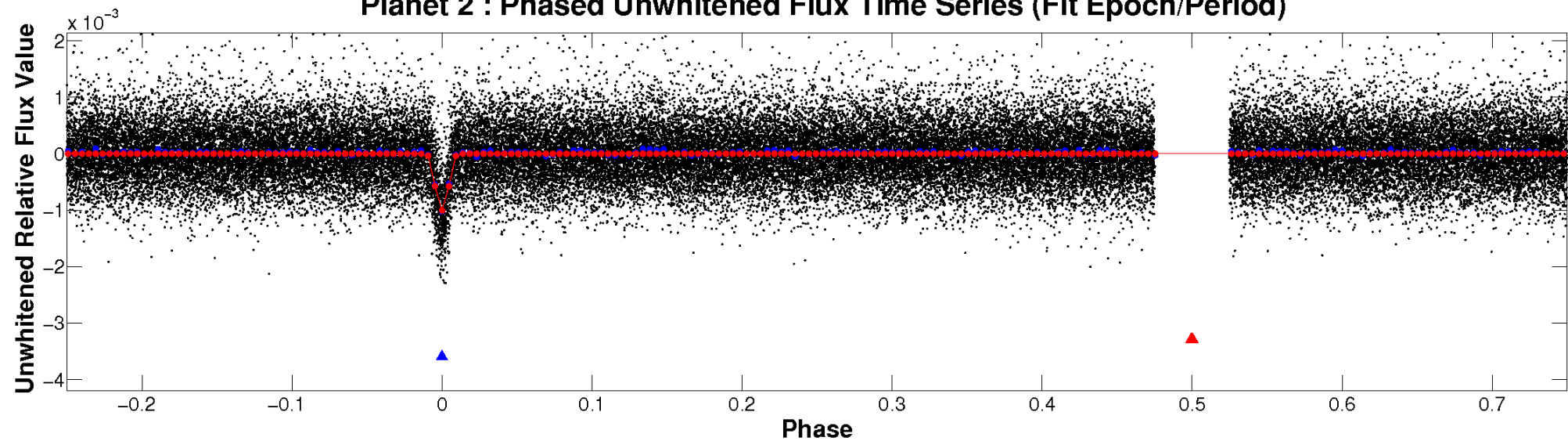
ALT Odd/Even

TCE 004547480-02

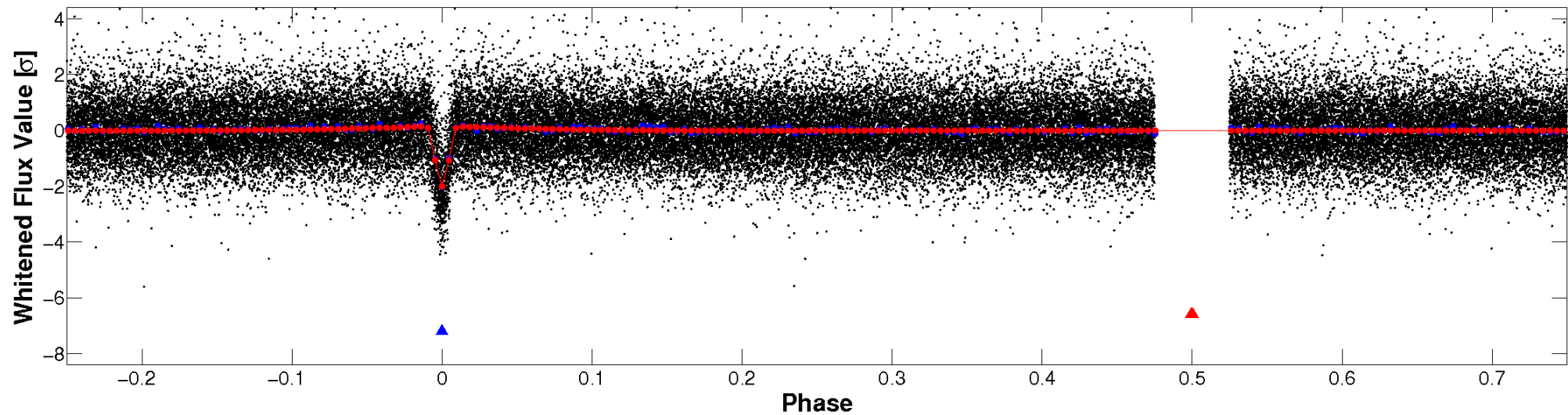


Non-Whitened Vs. Whitened Light Curve

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

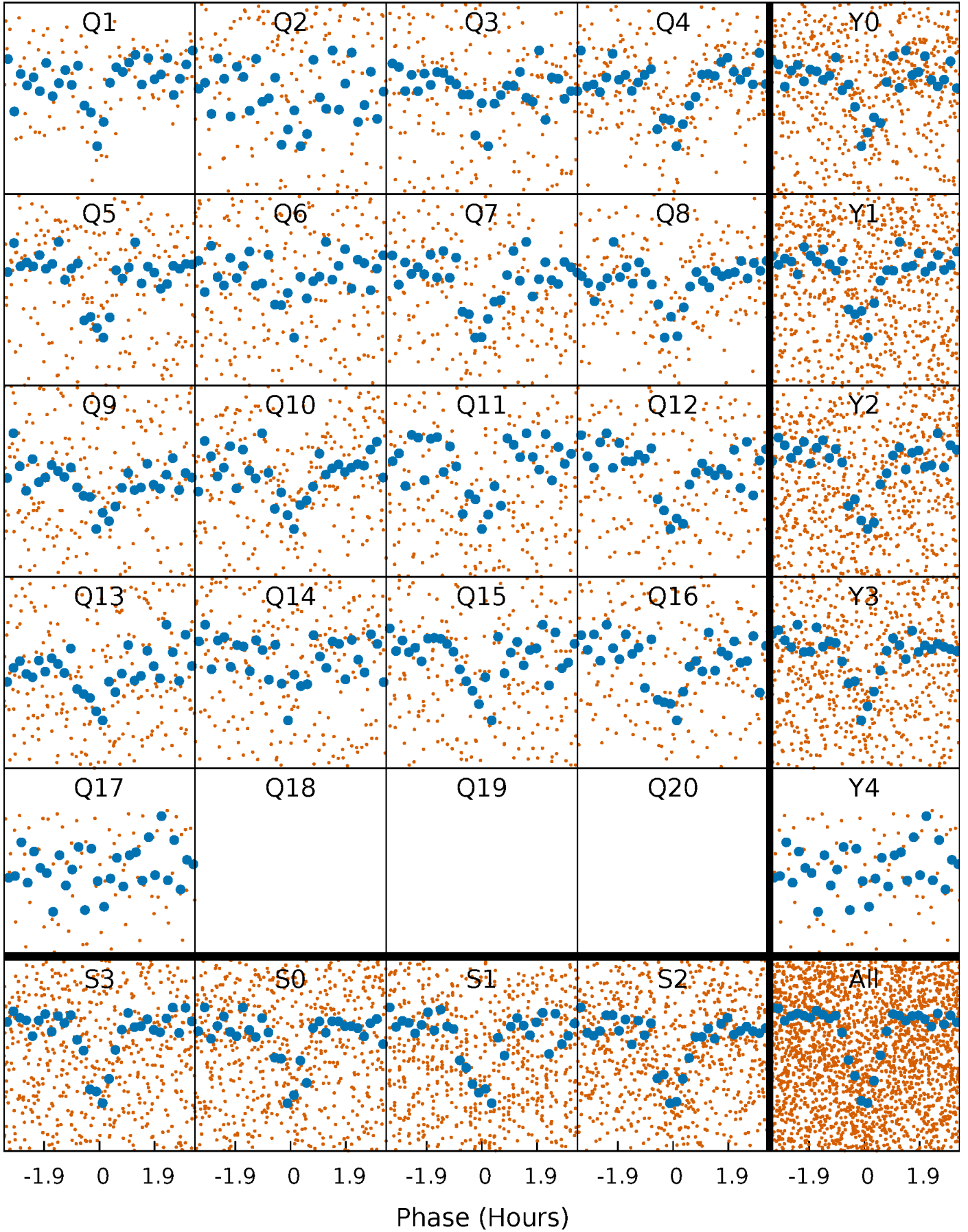


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



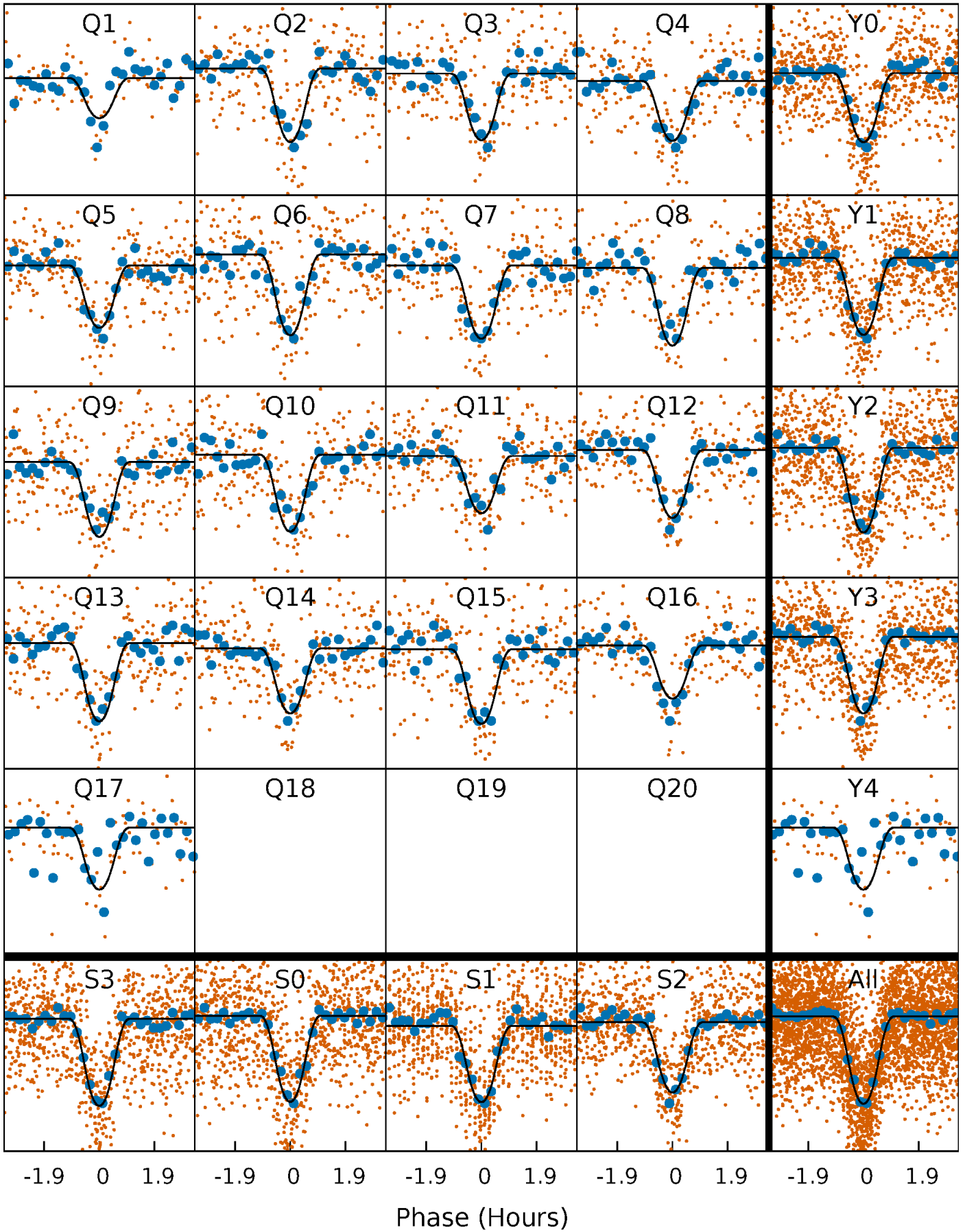
PDC Quarter-Phased Transit Curves

TCE 004547480-02 P= 4.426955 Days $T_0=135.776235$ (BKJD)



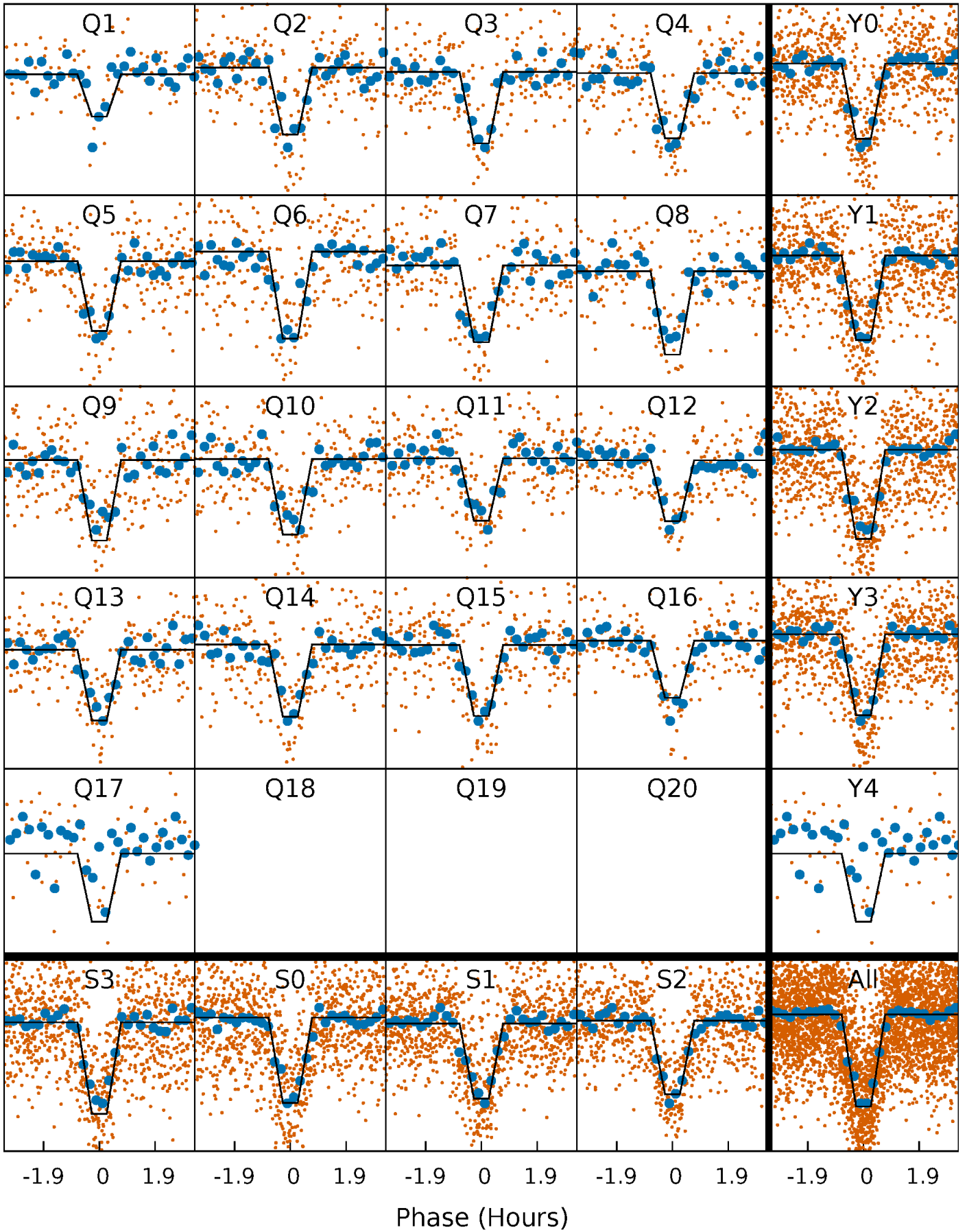
DV Quarter-Phased Transit Curves

TCE 004547480-02 $P = 4.426955$ Days $T_0 = 135.776235$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

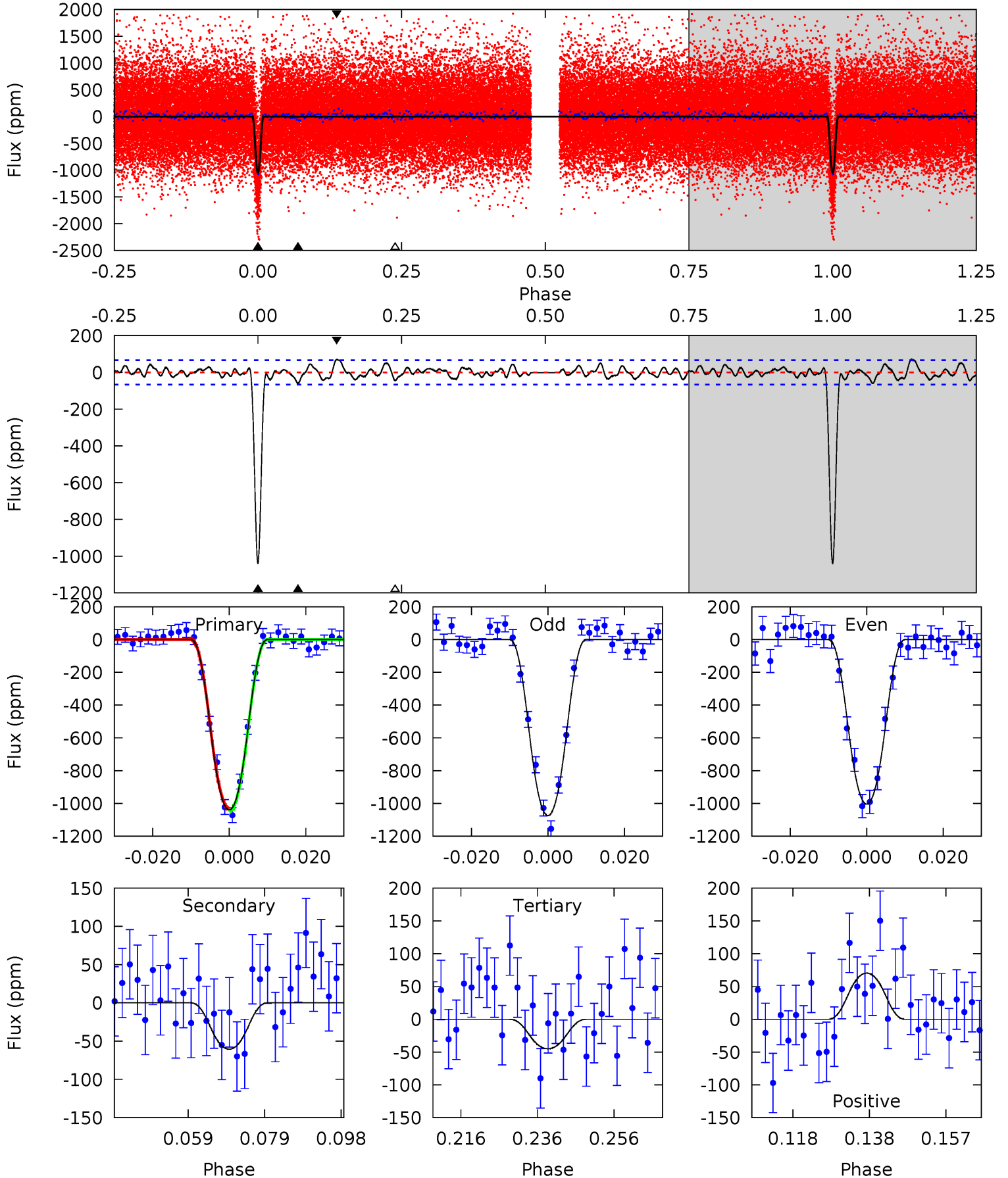
TCE 004547480-02 $P = 4.426933$ Days $T_0 = 135.779524$ (BKJD)



DV Model-Shift Uniqueness Test

004547480-02, P = 4.426955 Days, E = 131.349280 Days

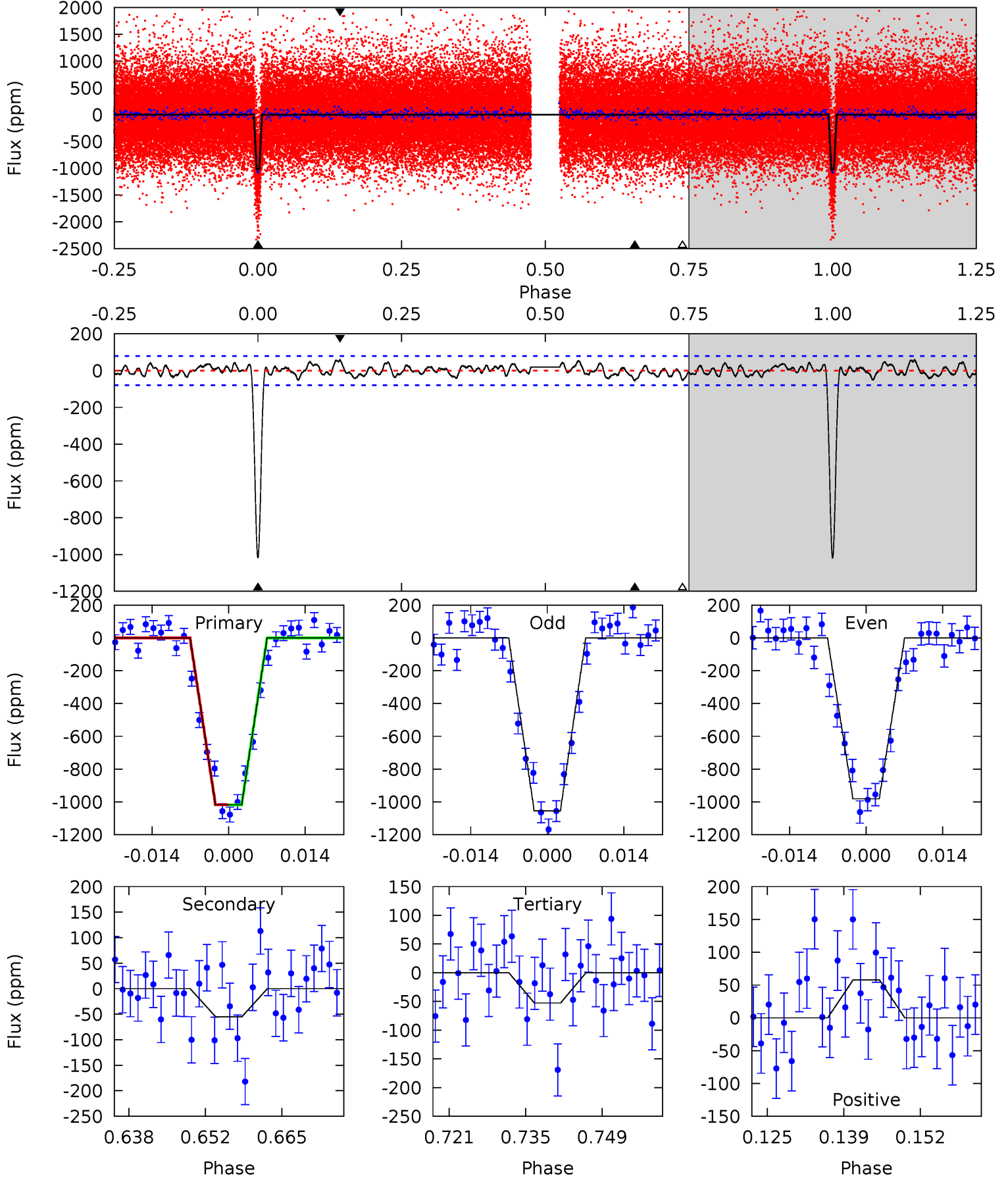
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 76.9 | 4.48 | 3.33 | 5.21 | 4.89 | 2.33 | 1.57 | 73.6 | 71.7 | 1.15 | -0.73 | 2.59 | 0.98 | 0.06 | 0.67 |



Alt Model-Shift Uniqueness Test

004547480-02, P = 4.426933 Days, E = 131.352591 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 63.8 | 3.45 | 3.30 | 3.63 | 4.96 | 2.46 | 1.37 | 60.5 | 60.1 | 0.15 | -0.19 | 2.28 | 1.01 | 0.05 | 0.03 |



Stellar Parameters For KIC 004547480

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | R (R_{\odot}) | M (M_{\odot}) | p_{\star} ($\text{g}\cdot\text{cm}^{-3}$) |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
| | 5511^{+180}_{-163} | $4.569^{+0.056}_{-0.096}$ | $-0.540^{+0.350}_{-0.300}$ | $0.746^{+0.127}_{-0.068}$ | $0.753^{+0.096}_{-0.052}$ | $2.553^{+0.724}_{-0.798}$ |
| | +3%/-3% | +1%/-2% | +65%/-56% | +17%/-9% | +13%/-7% | +28%/-31% |
| 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 004547480-02 / KOI

| Detrend | Depth (ppm) | R_p (R_{\oplus}) | T_{max} (K) | T_{obs} (K) | A_{obs} |
|---------|--------------|------------------------|----------------------|----------------------|---------------------------|
| DV | -61 ± 14 | $3.35^{+0.69}_{-0.71}$ | 1345^{+68}_{-53} | 3034^{+248}_{-193} | $6.868^{+4.449}_{-2.492}$ |
| Alt. | -55 ± 16 | $2.69^{+0.67}_{-0.63}$ | 1351^{+59}_{-59} | 3193^{+307}_{-234} | $9.499^{+8.729}_{-3.868}$ |

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

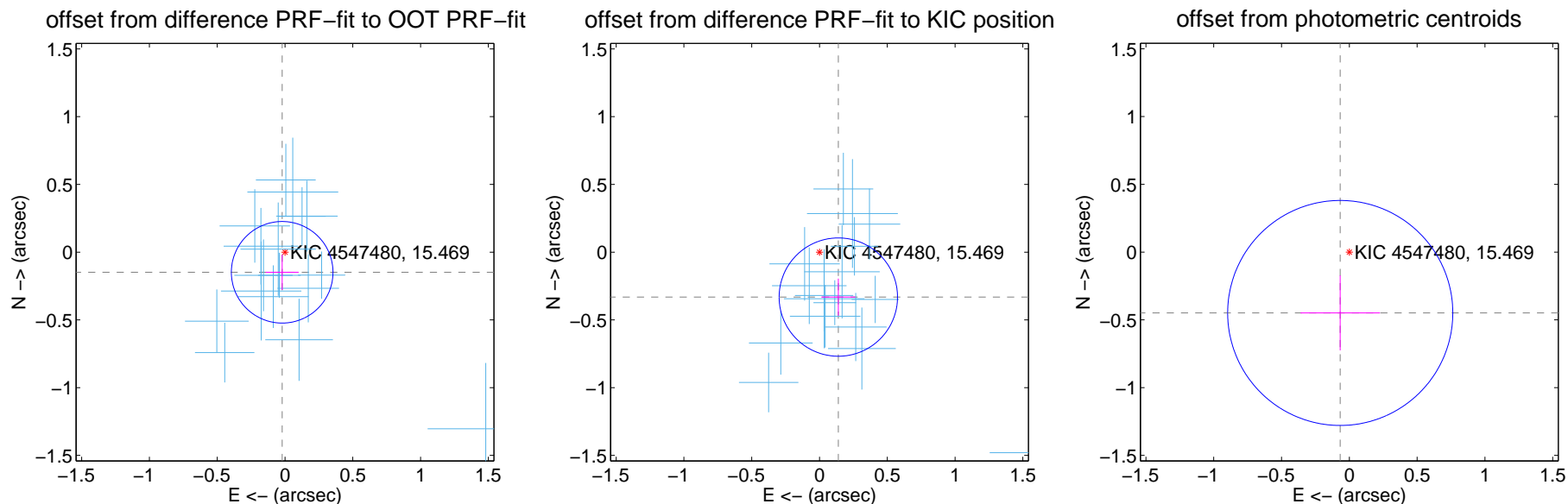
DV Centroid Data

Supplemental centroid analysis for 004547480-02. Kepler magnitude: 15.47. Transit SNR 44.16

There are 17 quarters with good PRF difference image offsets

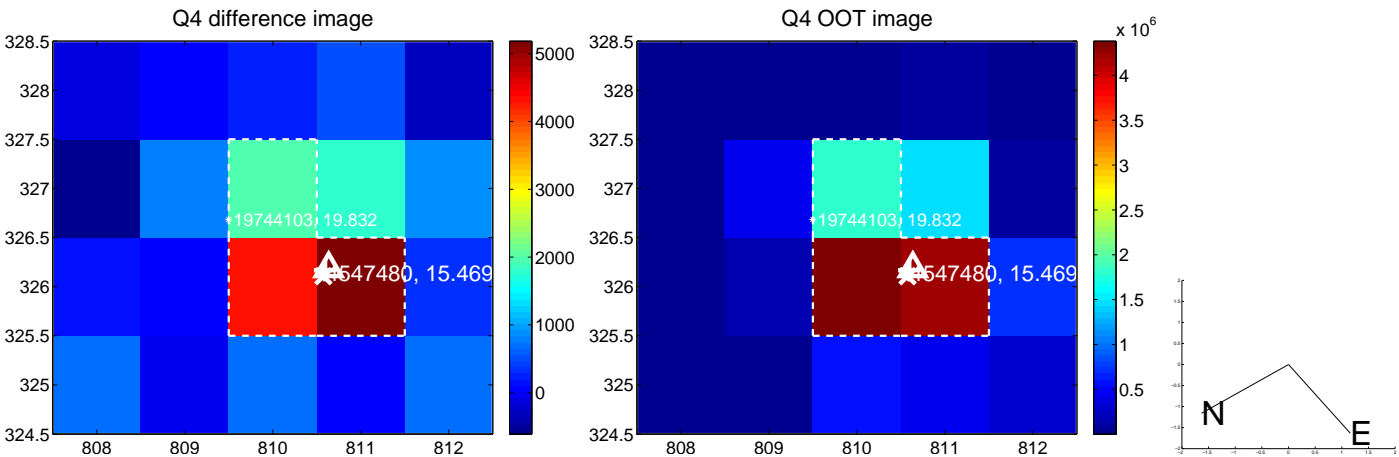
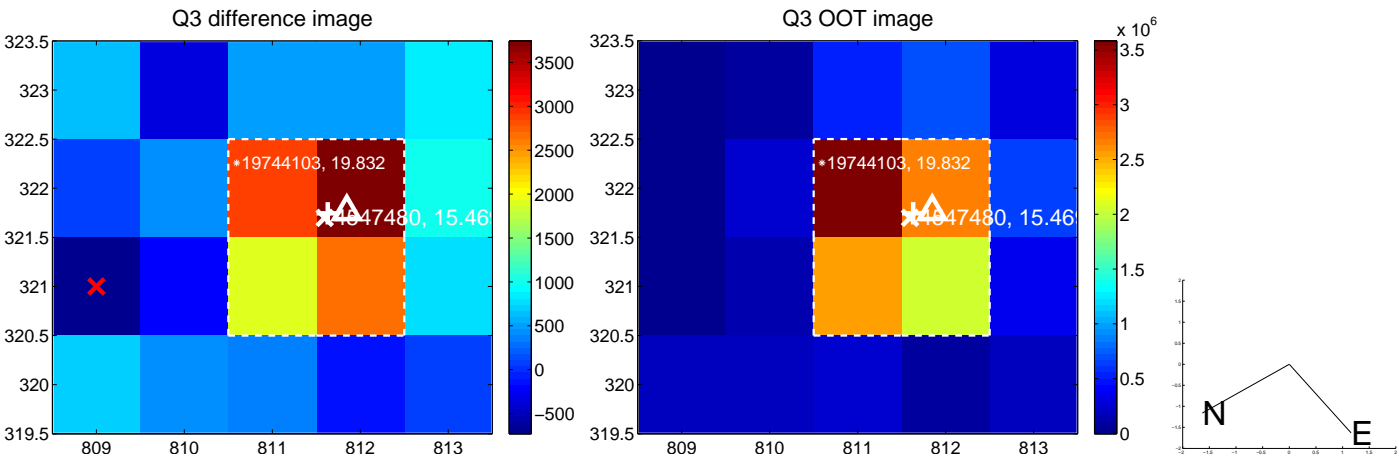
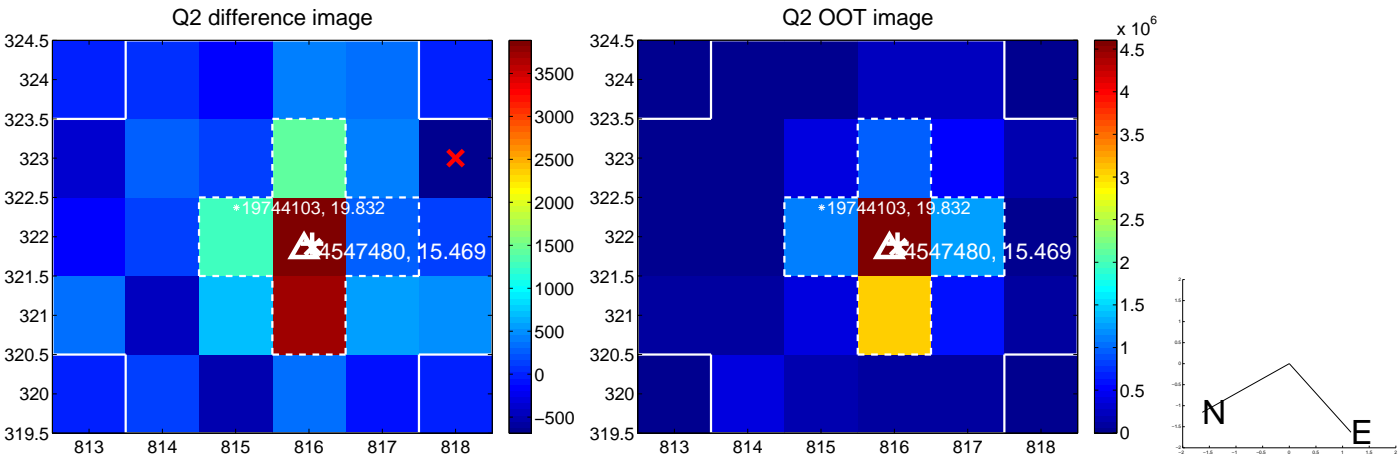
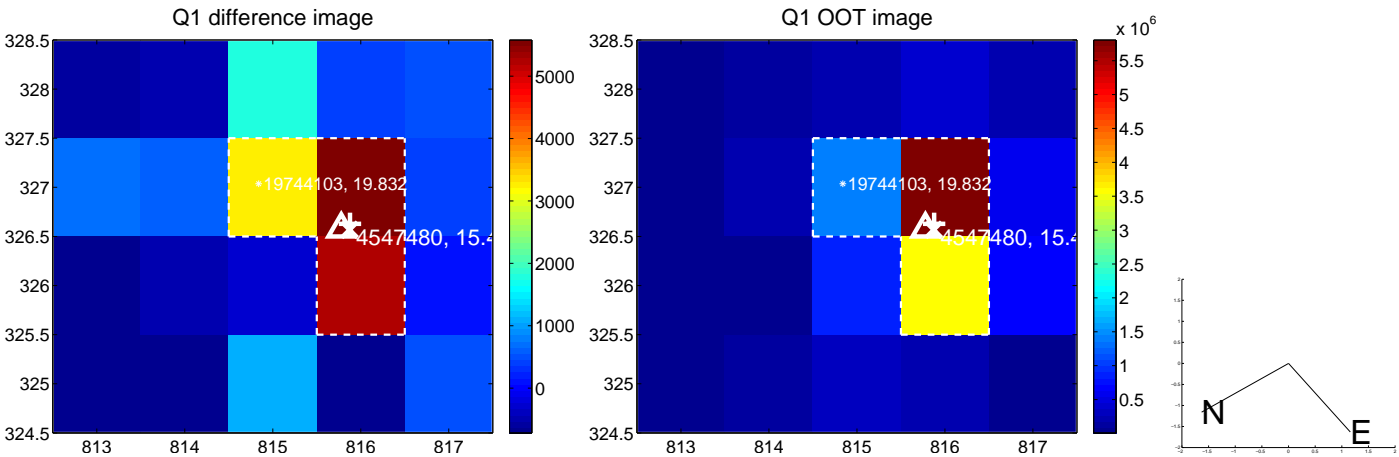
The direct PRF centroid is offset from the target star catalog position by about 0.27 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|---|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT | 0.150 ± 0.125 | 1.20 | 0.021 ± 0.122 | -0.149 ± 0.130 |
| PRF-fit source offset from KIC position | 0.360 ± 0.146 | 2.47 | -0.139 ± 0.126 | -0.332 ± 0.137 |
| photometric centroid source offset | 0.45 ± 0.28 | 1.64 | 0.07 ± 0.29 | -0.45 ± 0.28 |

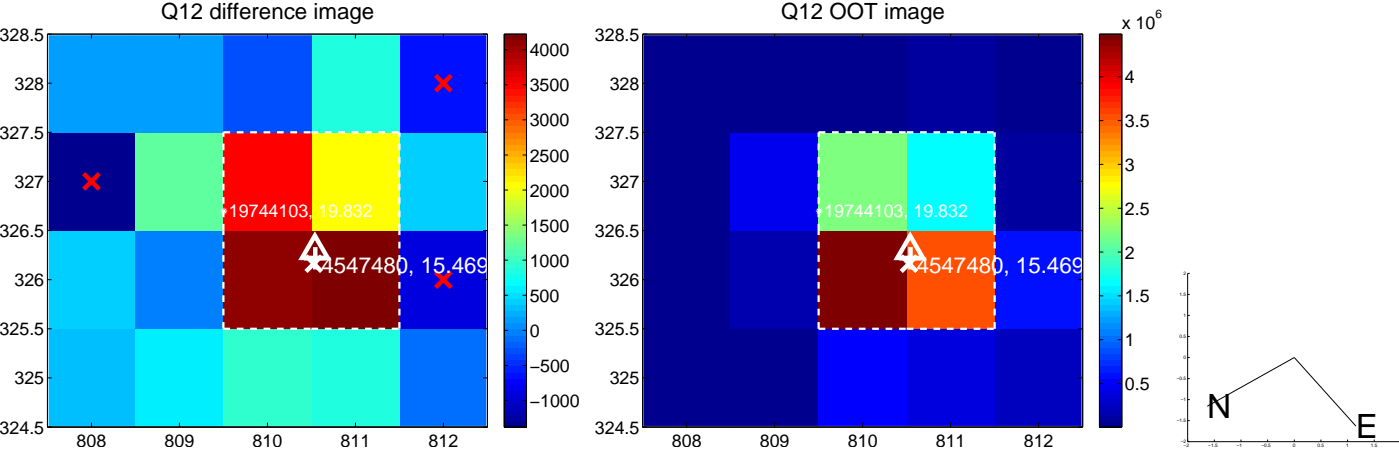
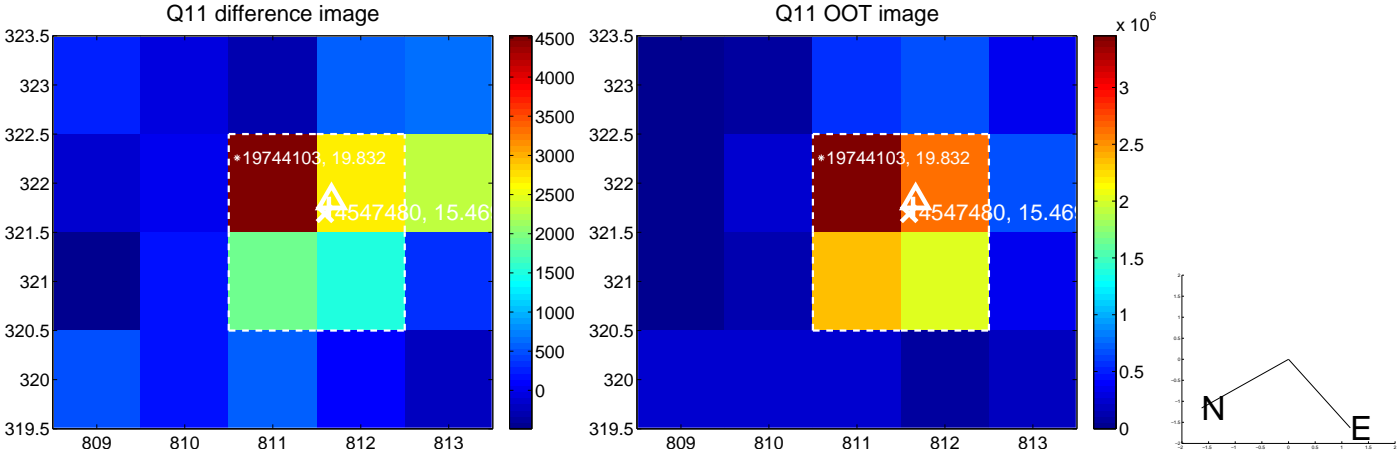
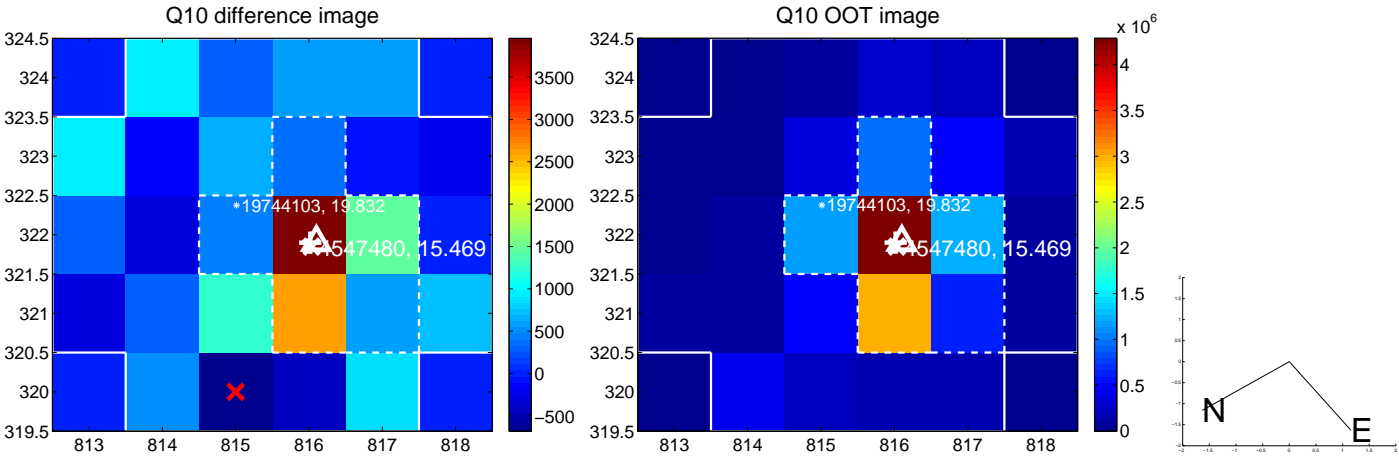
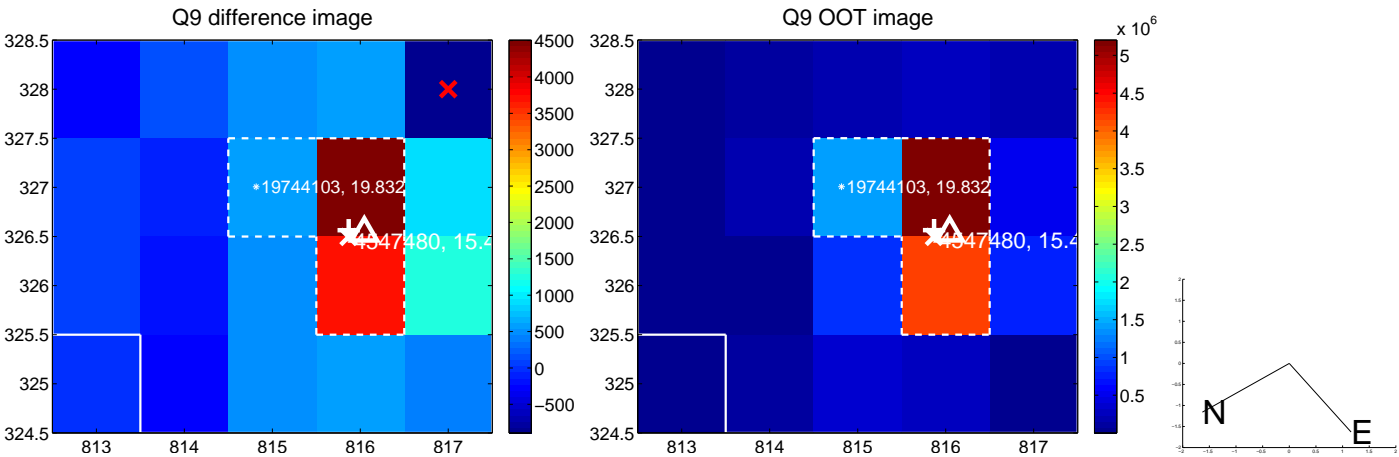


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

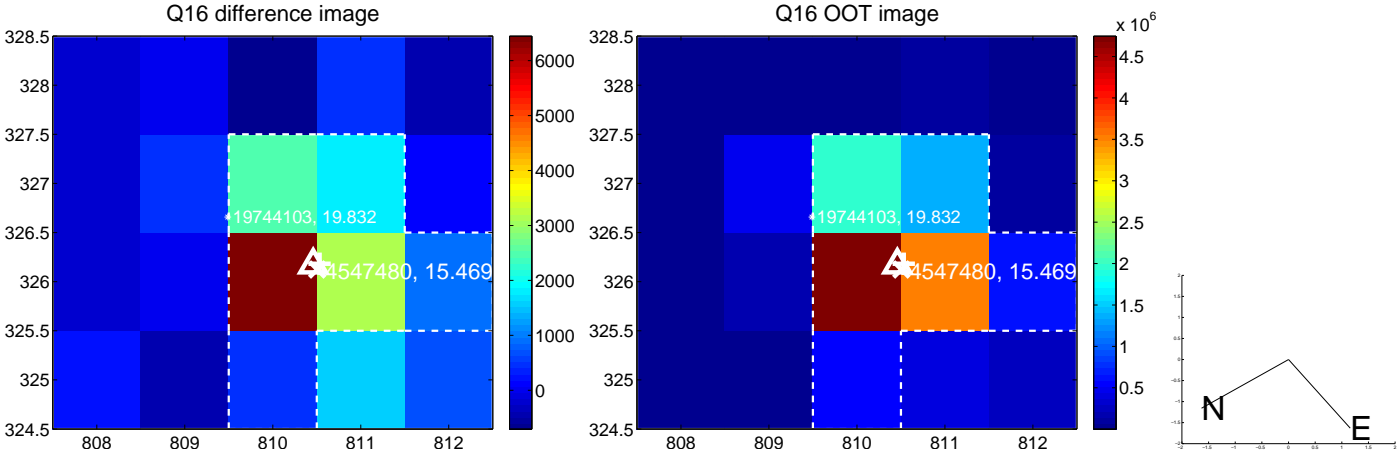
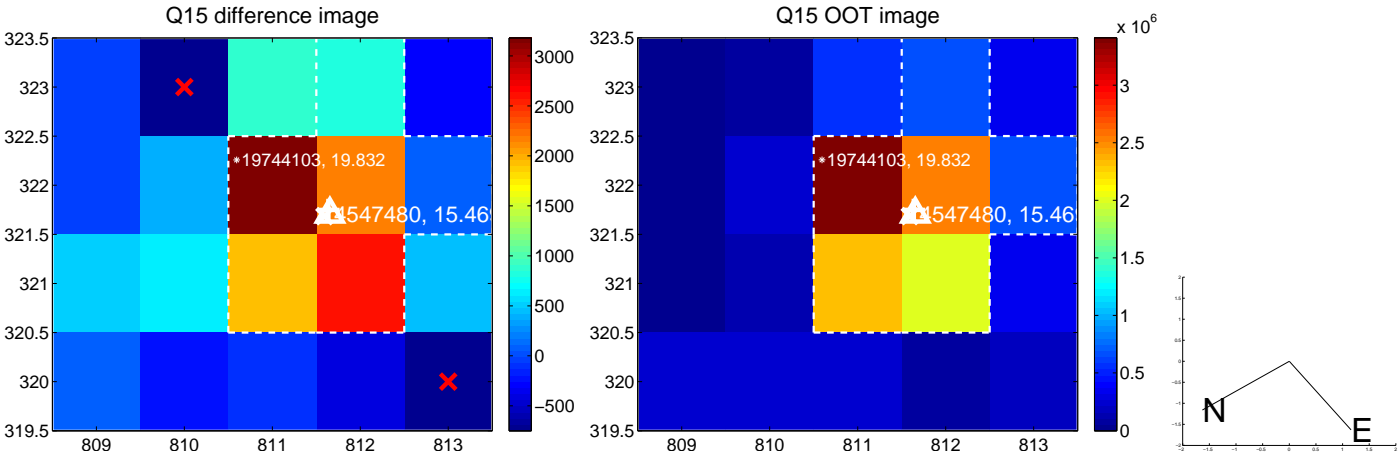
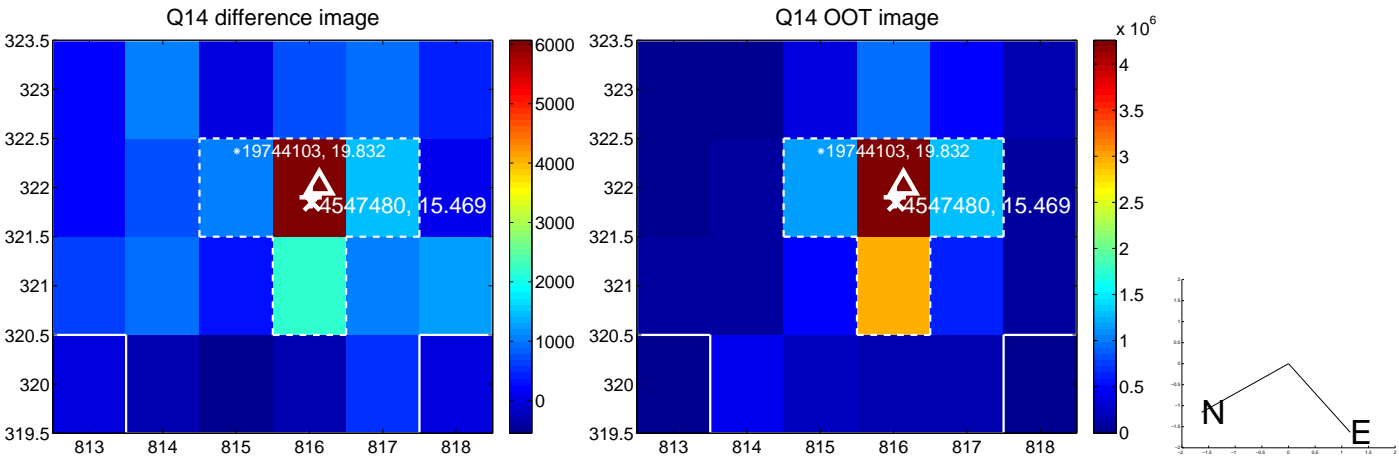
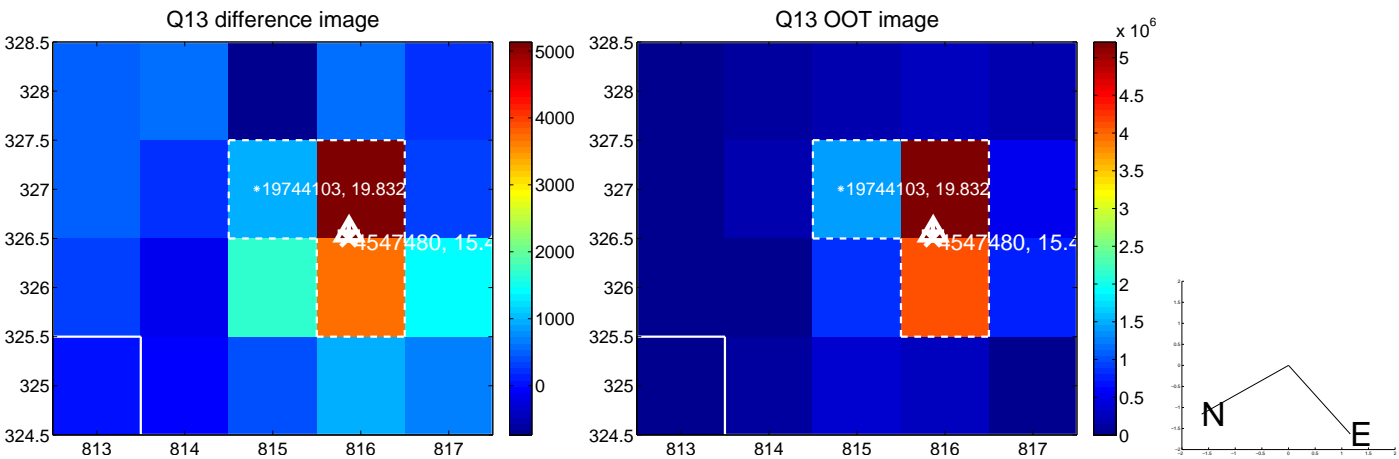
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



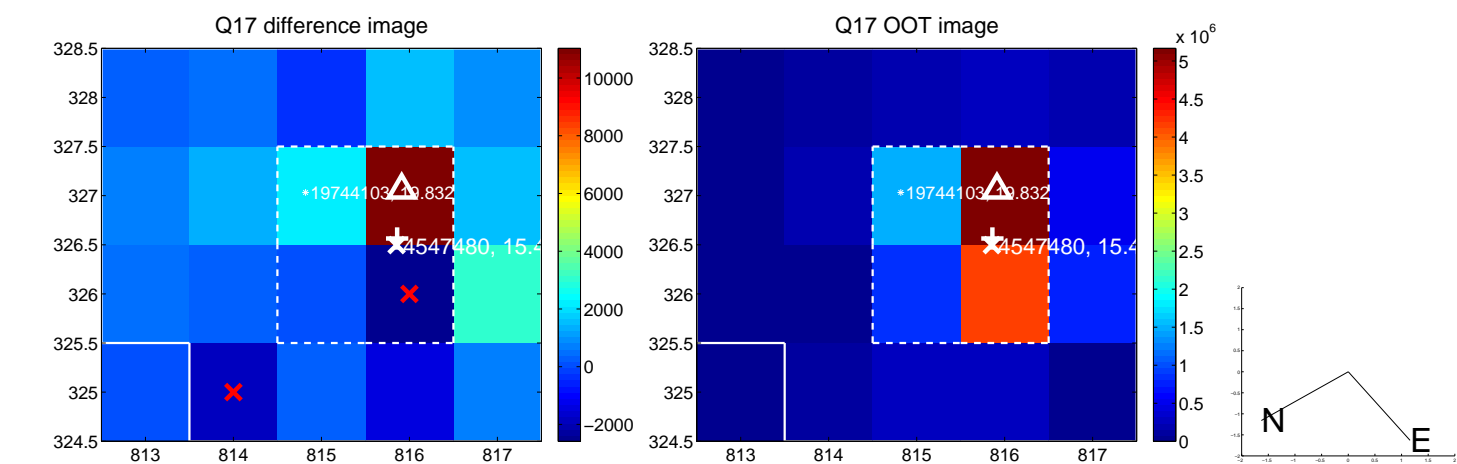
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



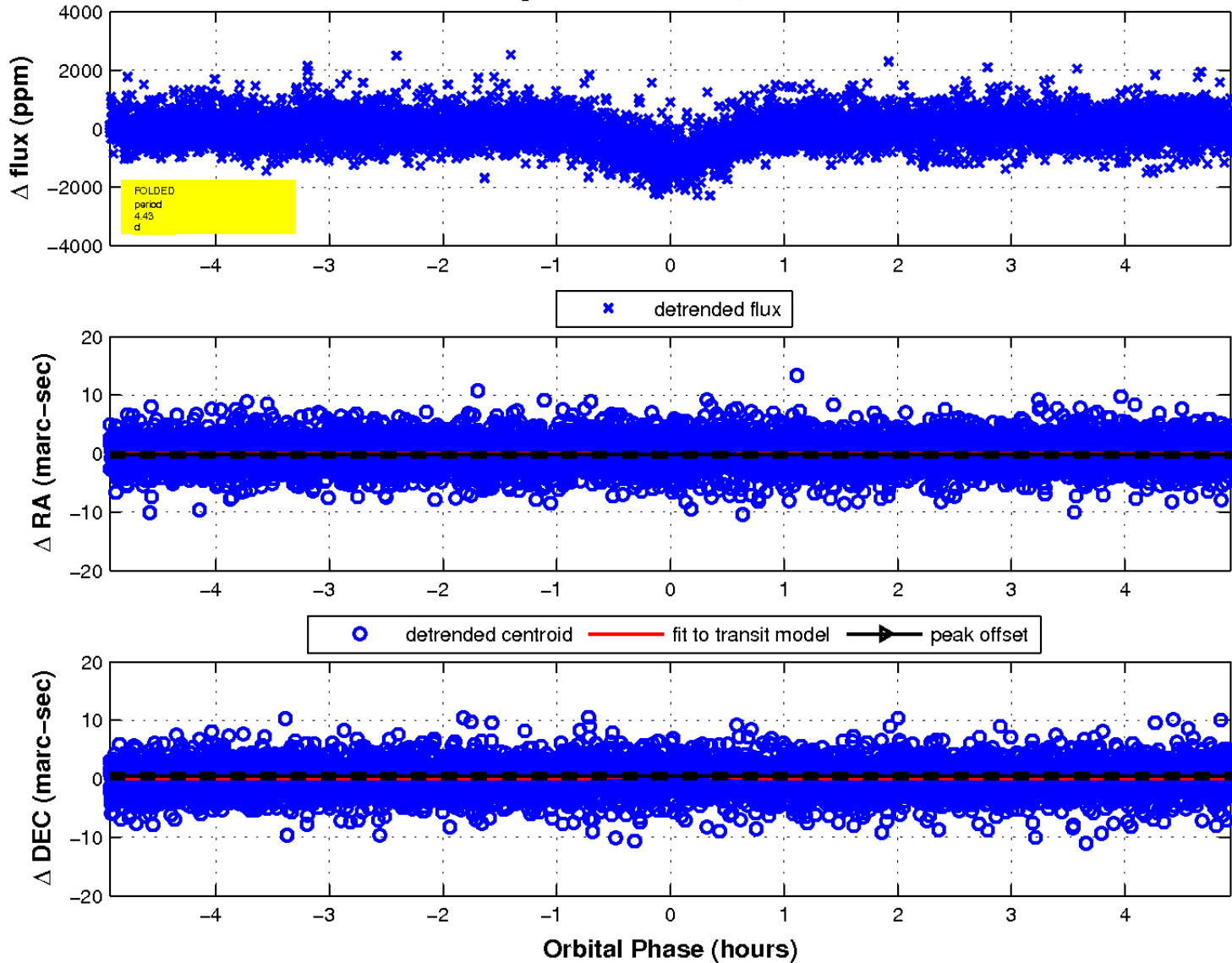
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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



fluxWeightedCentroids, Planet 2 of 2



UKIRT Image

Declination

