

KIC 004645174

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}) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 004645174-01 | OBS | 3437.01 | 15.032938 | 131.908391 | 131.0 | 5.882 | 12.4 | 13.6 | 1.60 | 5849 | 2.17 | 175.96 |
| 004645174-02 | OBS | 3437.02 | 34.750015 | 158.684249 | 190.9 | 3.468 | 9.6 | 10.0 | 1.60 | 5849 | 2.53 | 57.57 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|--------------|
| 004645174-01 | OBS | PC | 0.99 | 0 | 0 | 0 | 0 | CENT_KIC_POS |
| 004645174-02 | OBS | PC | 1.00 | 0 | 0 | 0 | 0 | CENT_KIC_POS |

Notes: OBS = Observed. INJ = Injected. INV = Inverted. SCR = Scrambled.

N = Not Transit-Like. S = Stellar Eclipse. C = Centroid Offset. E = Ephemeris Match.

See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

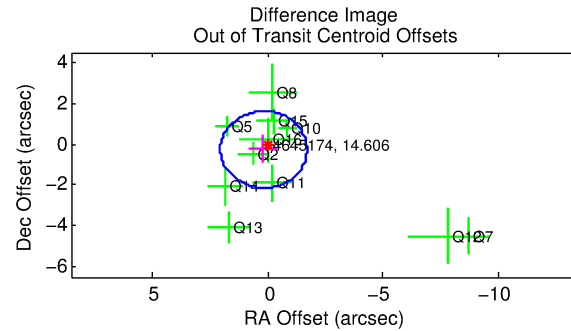
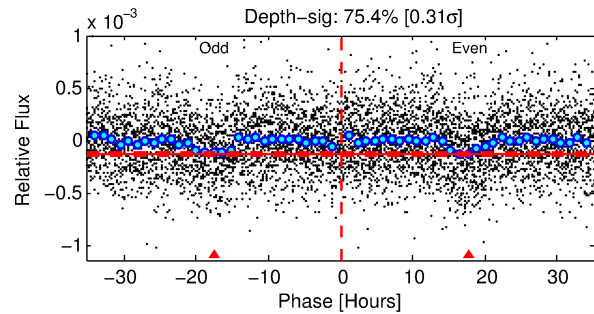
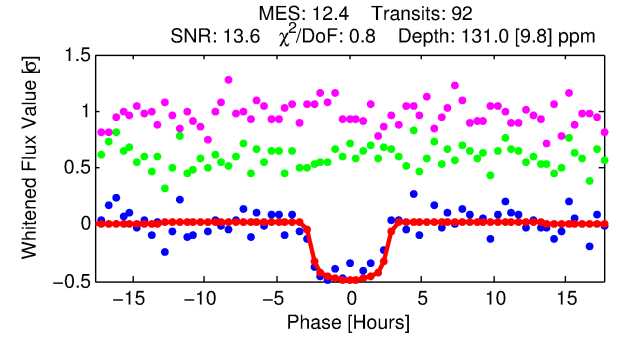
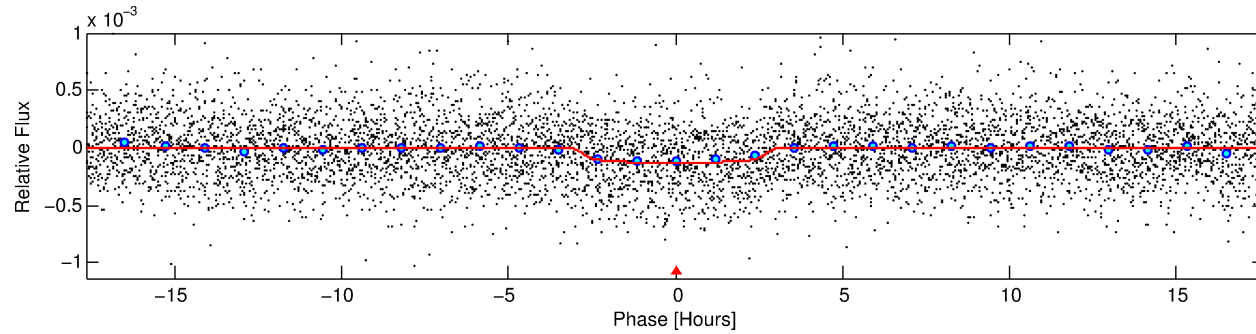
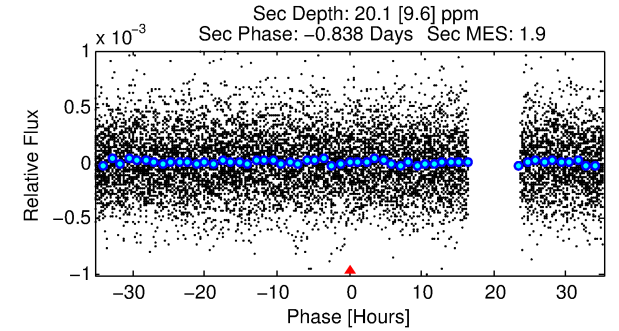
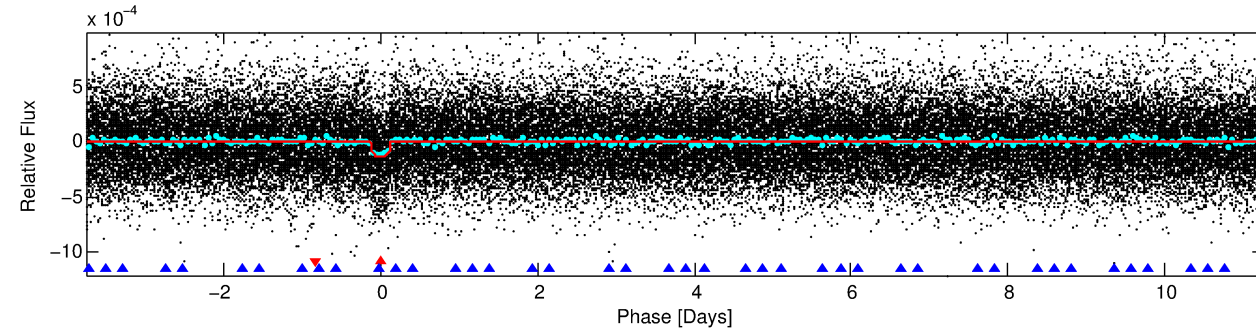
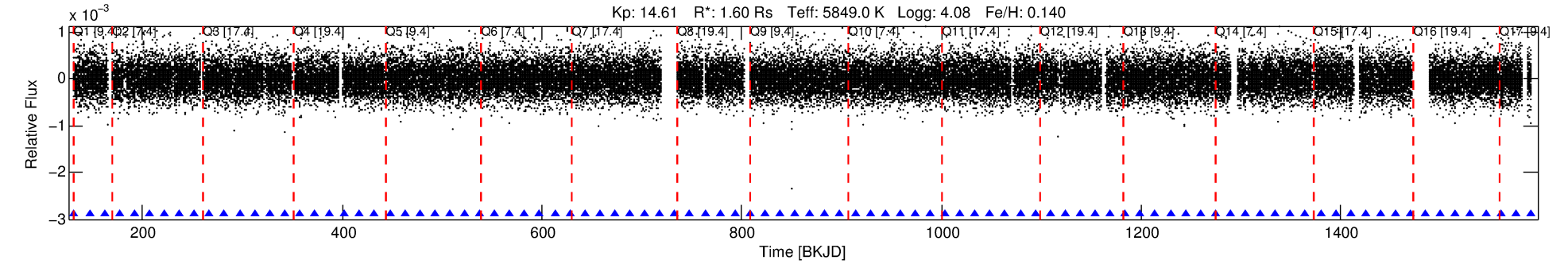
Ephemeris Match Information For 004645174-01

No Significant Match Found

DV One-Page Summary

KIC: 4645174 Candidate: 1 of 2 Period: 15.033 d

KOI: K03437.01 Corr: 0.960



DV Fit Results:

Period = 15.03294 [0.00015] d
Epoch = 131.9084 [0.0084] BKJD
Rp/R* = 0.0124 [0.0035]
a/R* = 9.20 [12.37]
b = 0.90 [0.30]
Seff = 175.96 [56.46]
Teff = 929 [74] K
Rp = 2.17 [0.78] Re
a = 0.1236 [0.0252] AU
Ag = 35.85 [28.79] [1.21σ]
Teffp = 3514 [650] K [3.95σ]

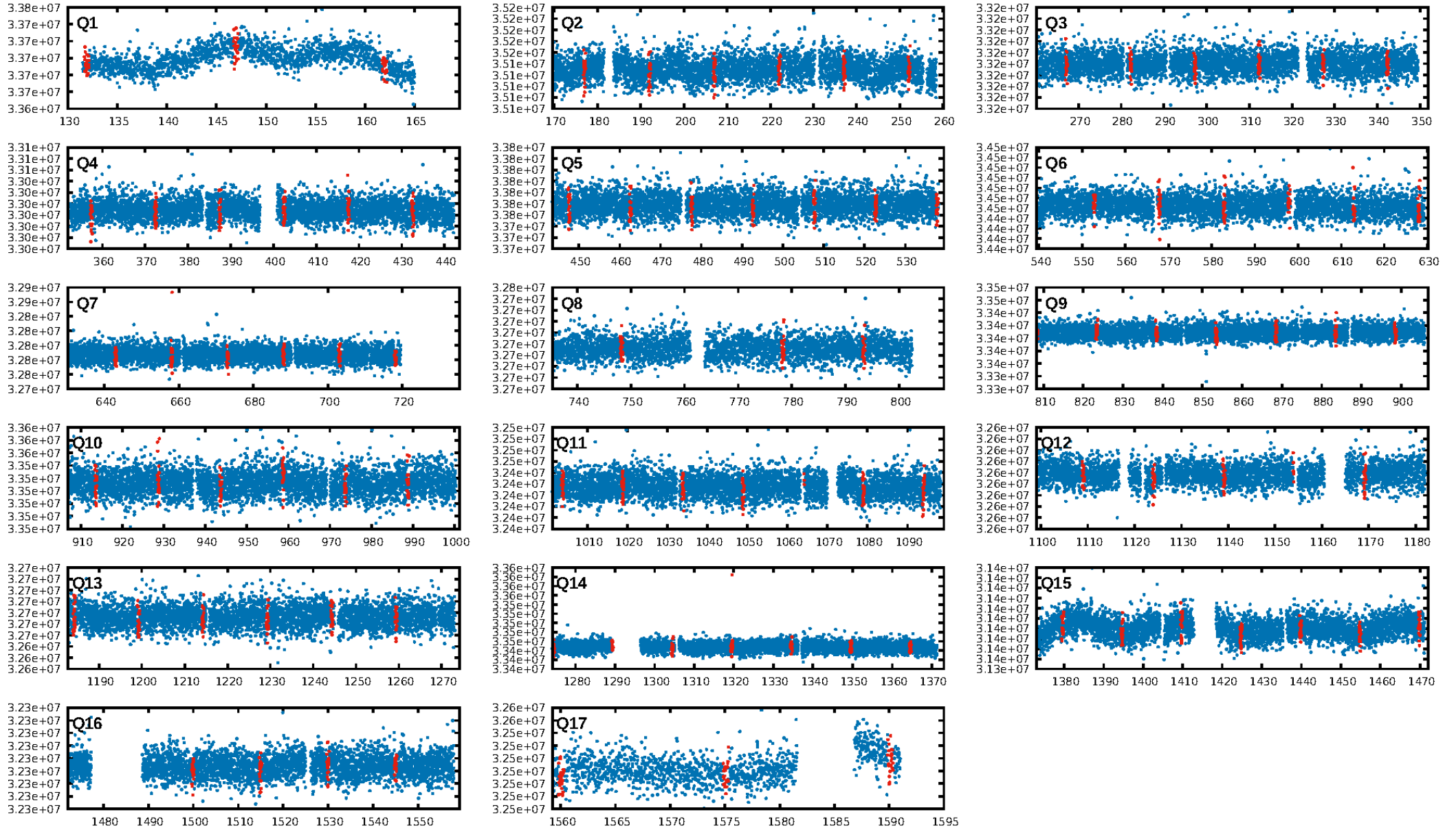
DV Diagnostic Results:

ShortPeriod-sig: N/A
LongPeriod-sig: 100.0% [69.30σ]
ModelChiSquare2-sig: 99.9%
ModelChiSquareGof-sig: 100.0%
Bootstrap-pfa: 6.29e-35
RollingBand-fgt: 1.00 [86/86]
GhostDiagnostic-chr: 1.251
Centroid-sig: 14.8%
Centroid-so: 1.242 arcsec [1.21σ]
OotOffset-rm: 0.310 arcsec [0.50σ]
KicOffset-rm: 0.541 arcsec [0.59σ]
OotOffset-st: 3/3/3/2 [11]
KicOffset-st: 3/3/3/2 [11]
DiffImageQuality-fgm: 0.55 [6/11]
DiffImageOverlap-fno: 1.00 [17/17]

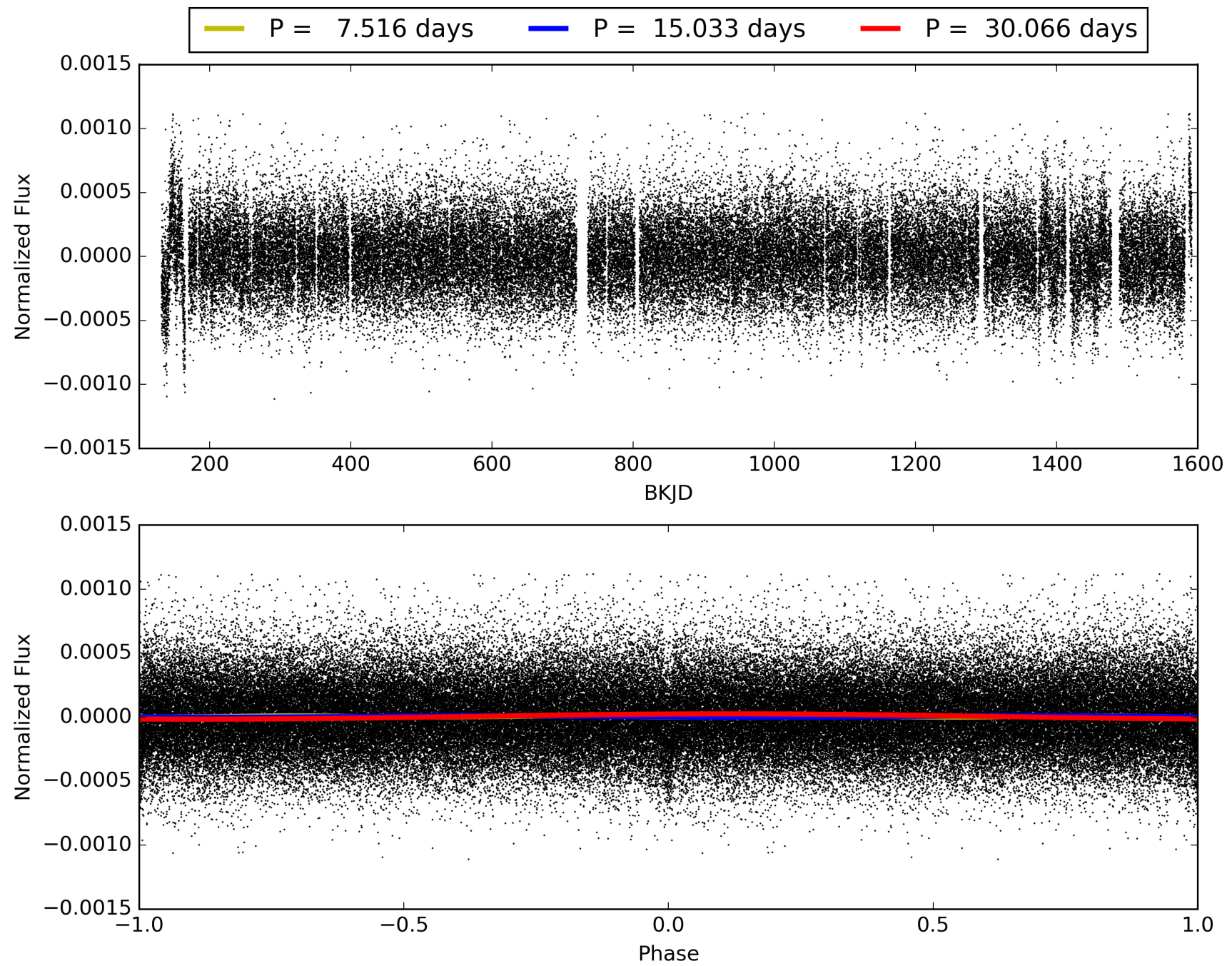
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 18:41:07 Z

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

TCE 004645174-01, PDC Light Curves

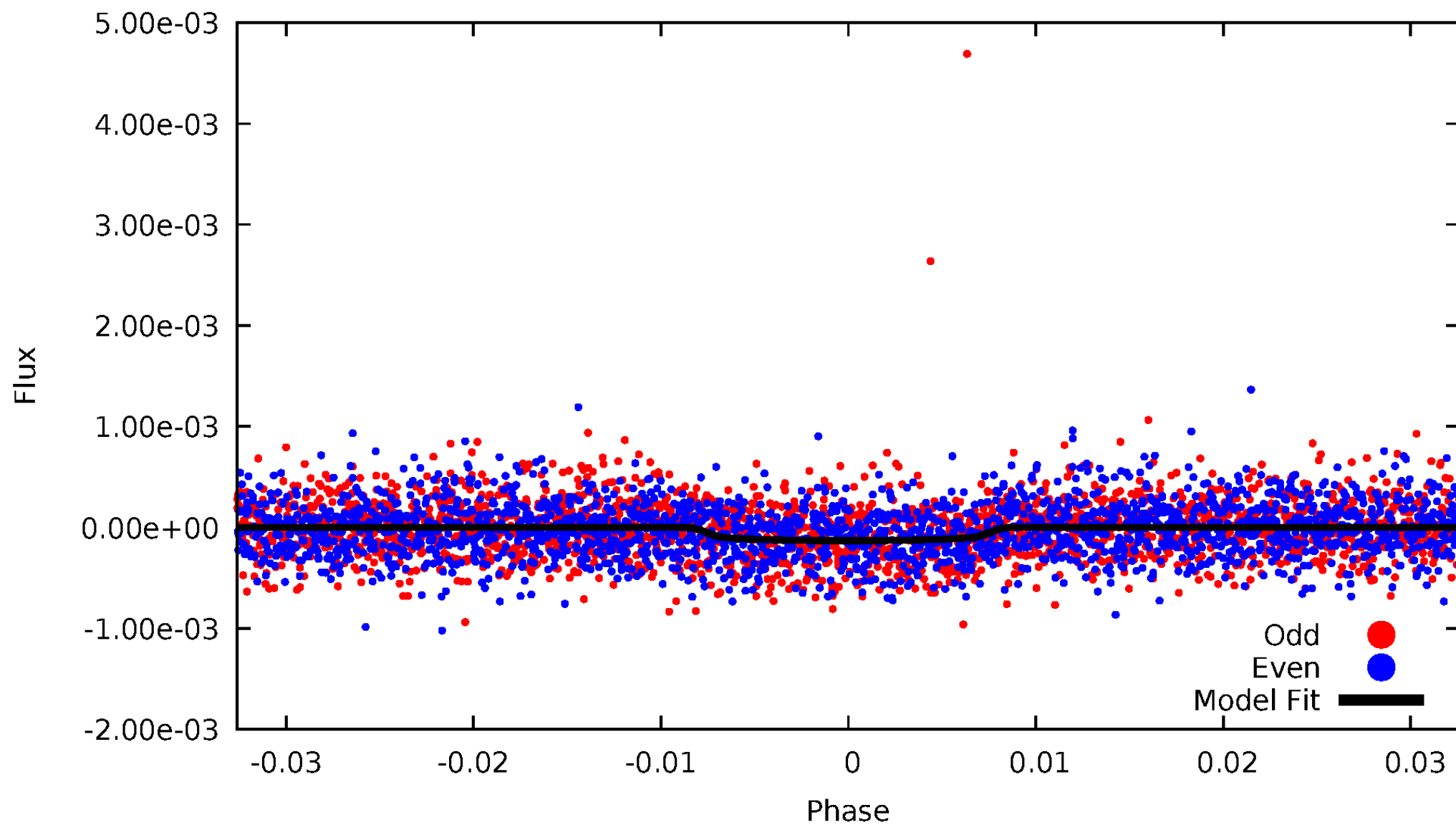


TCE 004645174-01



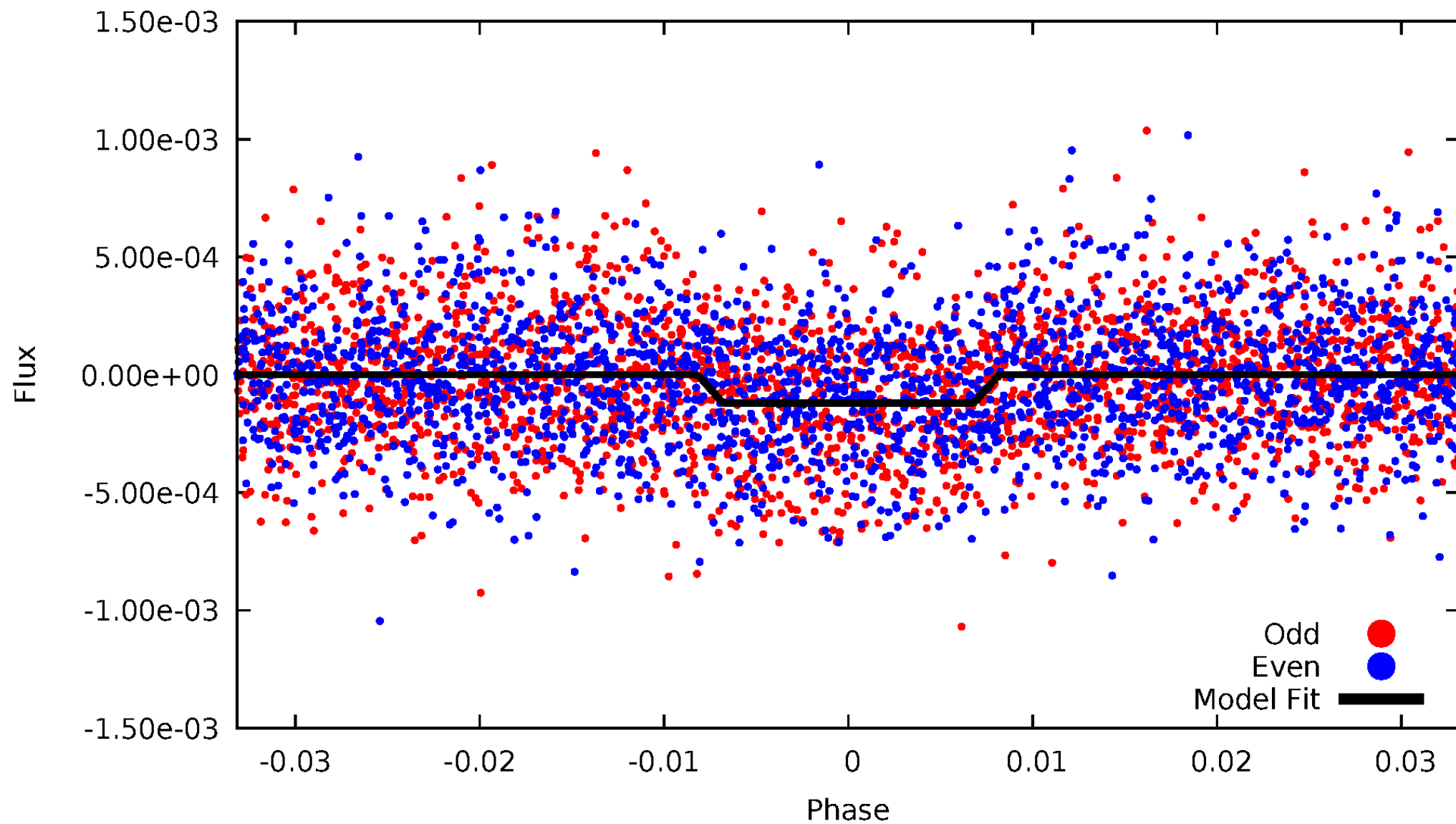
DV Odd/Even

TCE 004645174-01

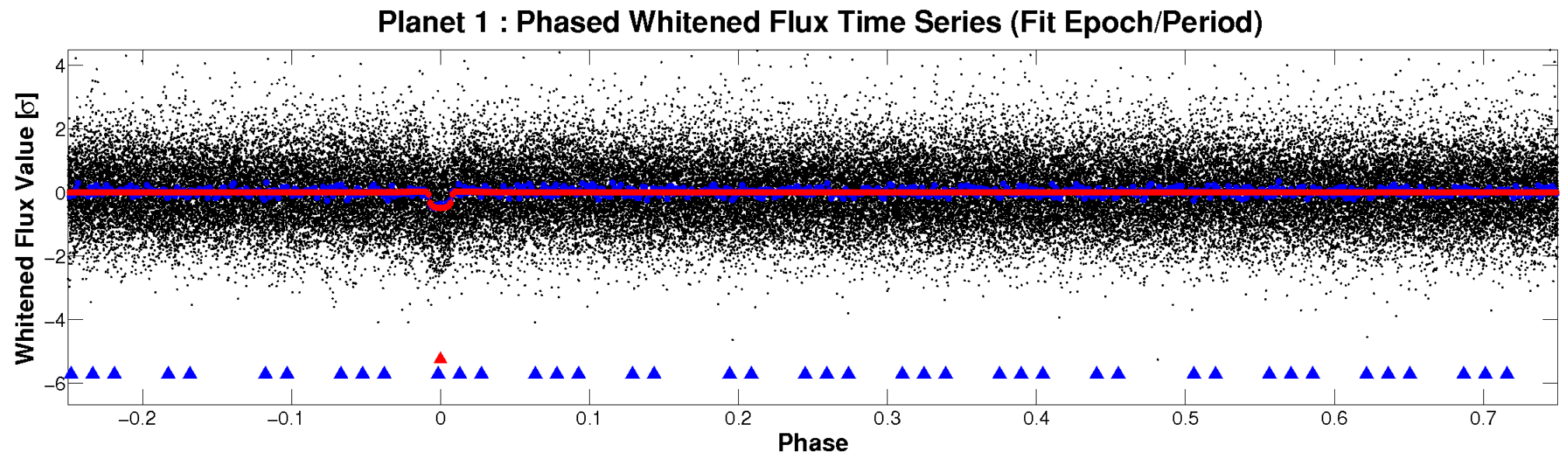
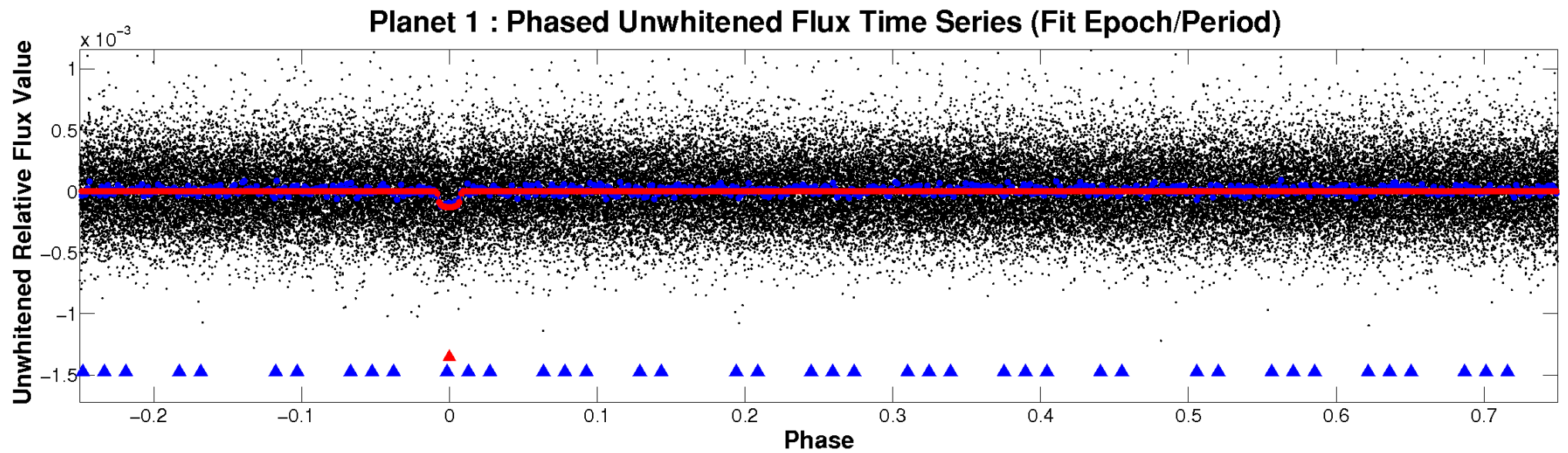


ALT Odd/Even

TCE 004645174-01

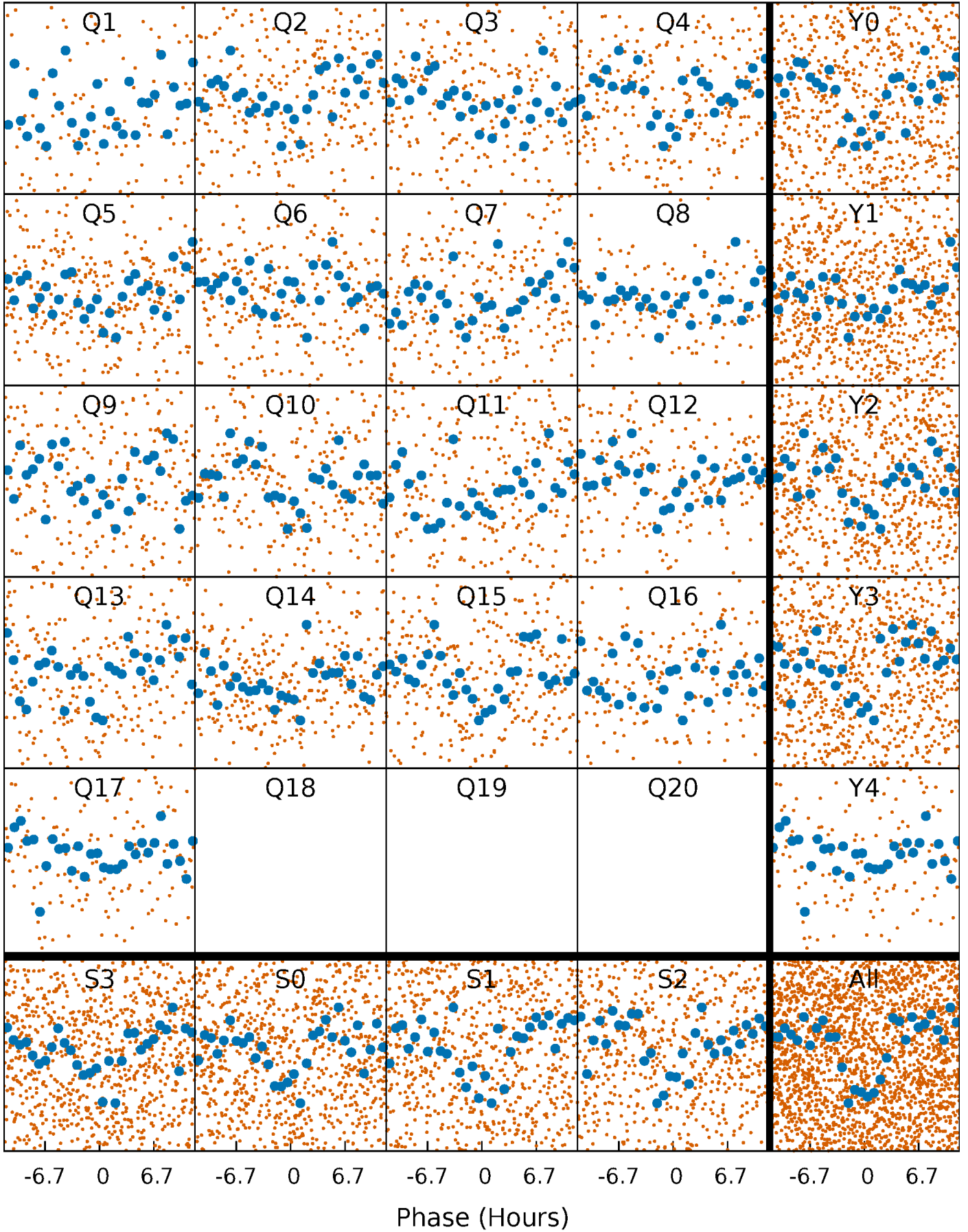


Non-Whitened Vs. Whitened Light Curve



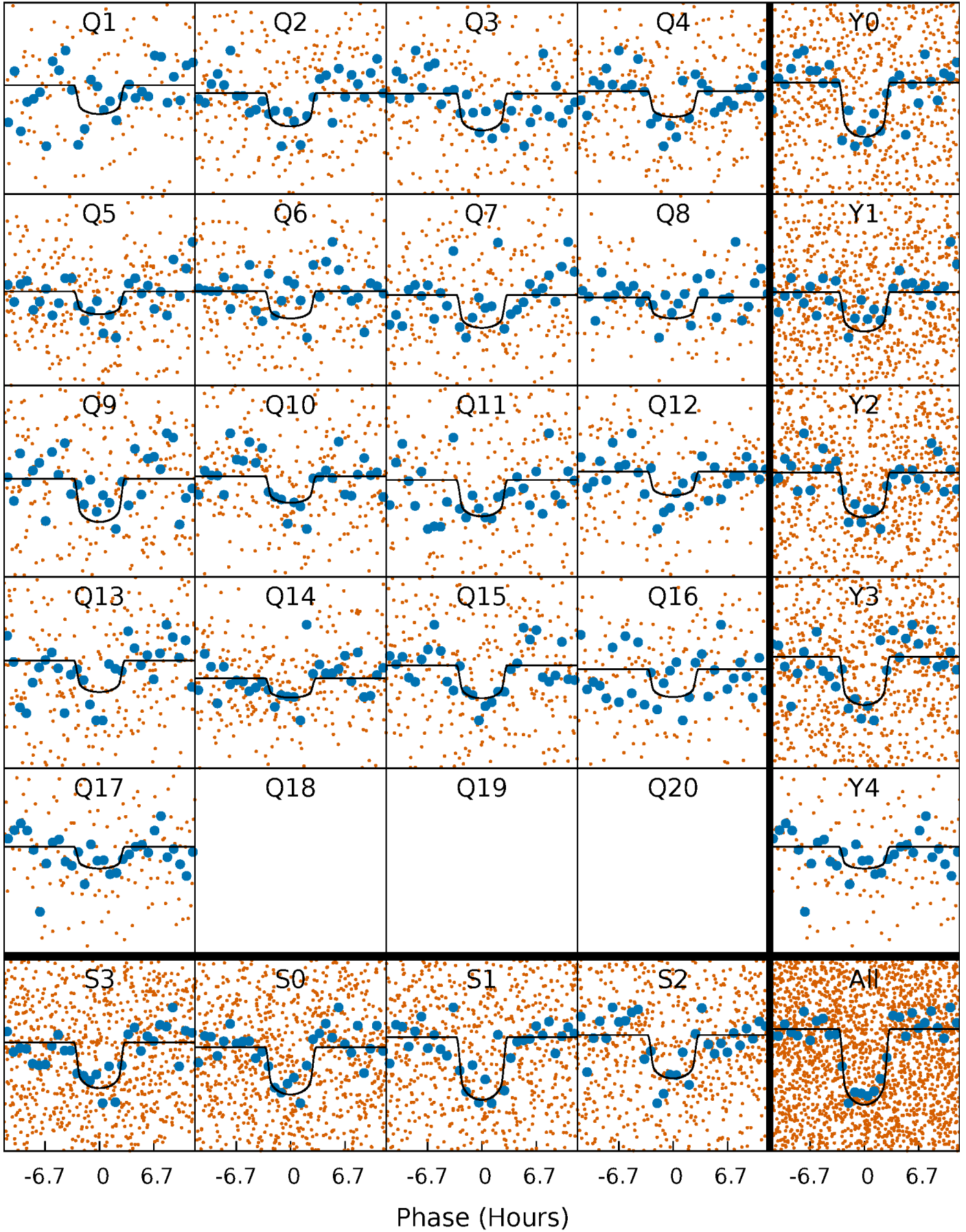
PDC Quarter-Phased Transit Curves

TCE 004645174-01 P= 15.032938 Days $T_0=131.908391$ (BKJD)



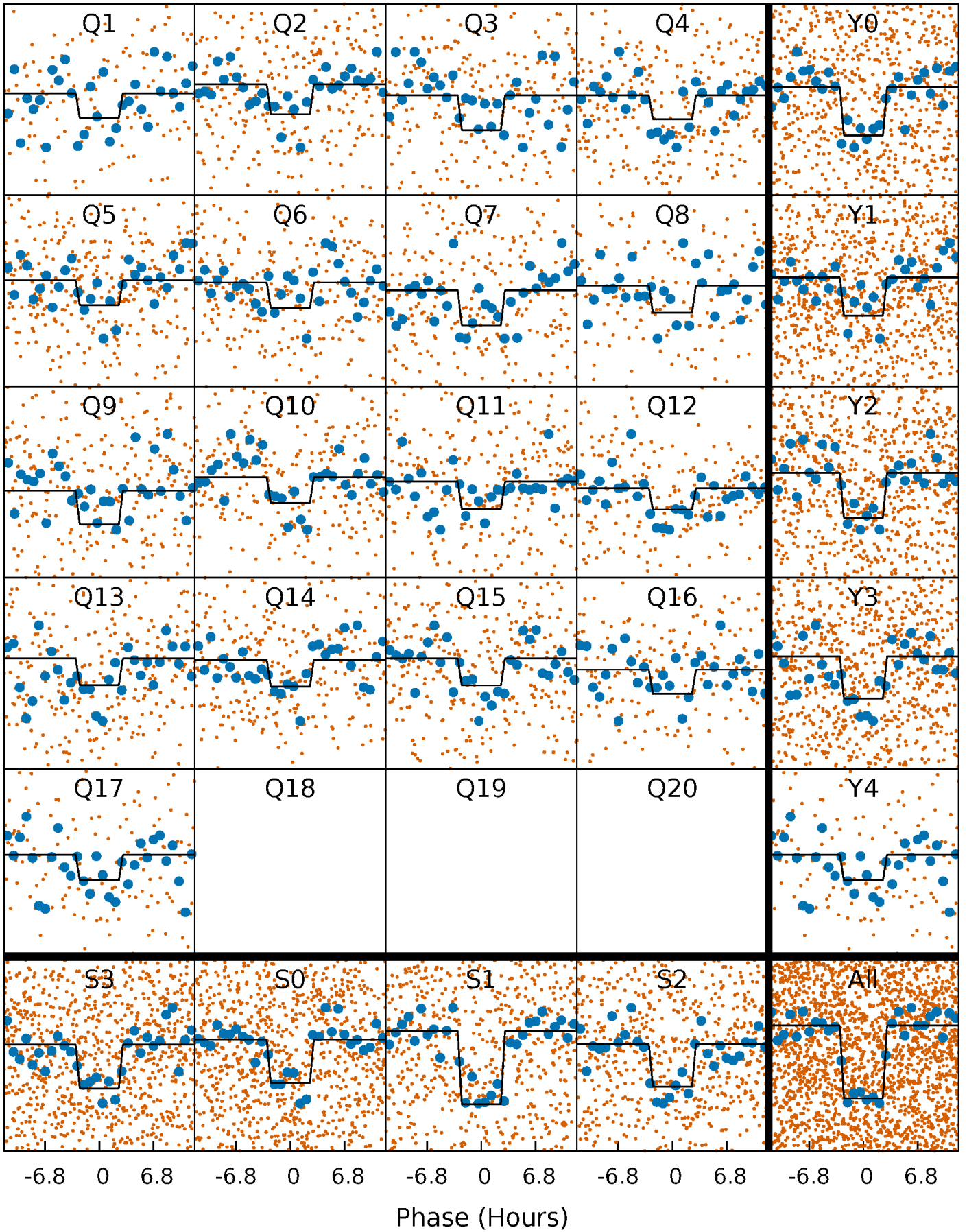
DV Quarter-Phased Transit Curves

TCE 004645174-01 P= 15.032938 Days $T_0=131.908391$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

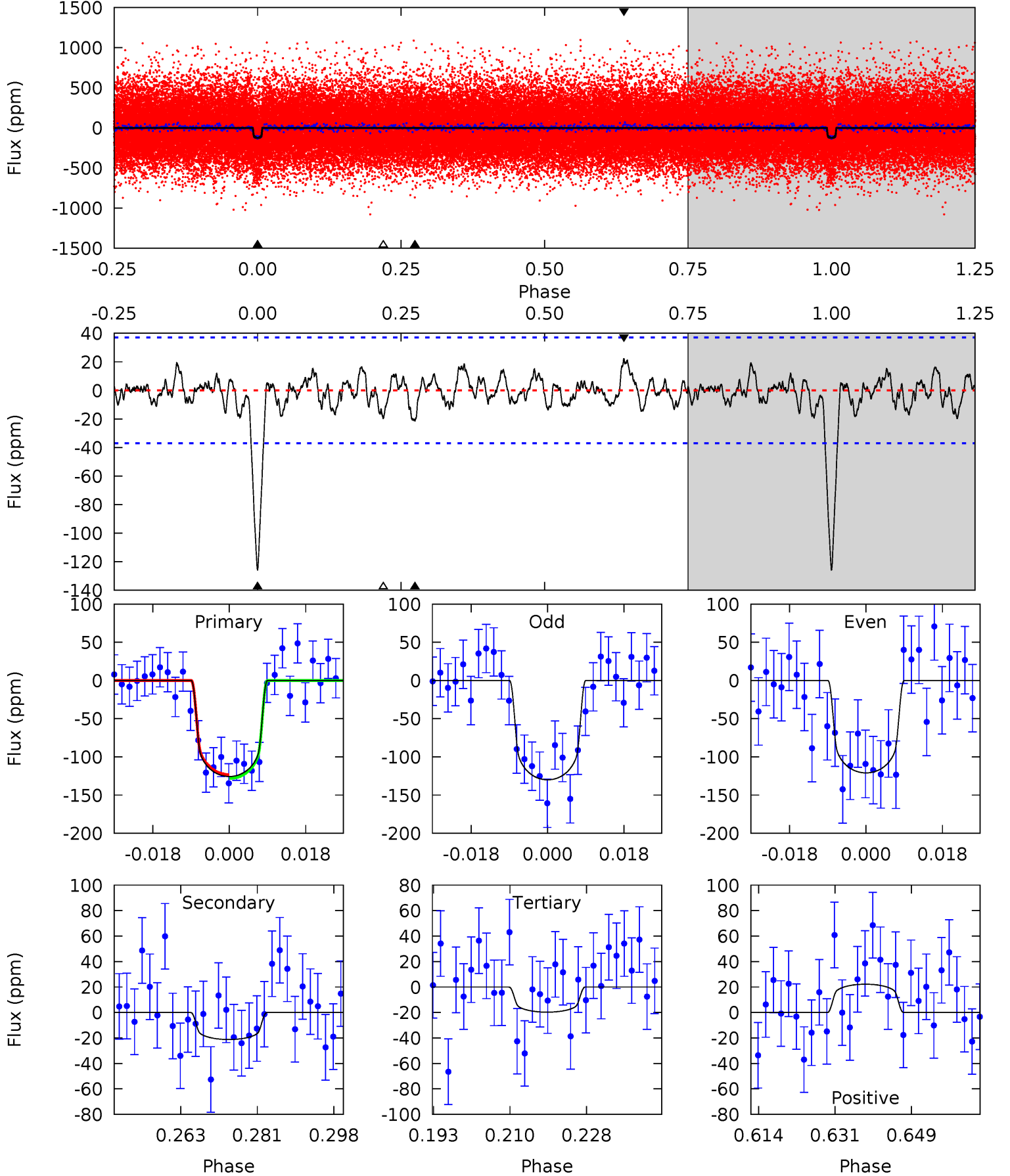
TCE 004645174-01 P= 15.032830 Days $T_0=131.911364$ (BKJD)



DV Model-Shift Uniqueness Test

004645174-01, $P = 15.032938$ Days, $E = 116.875453$ Days

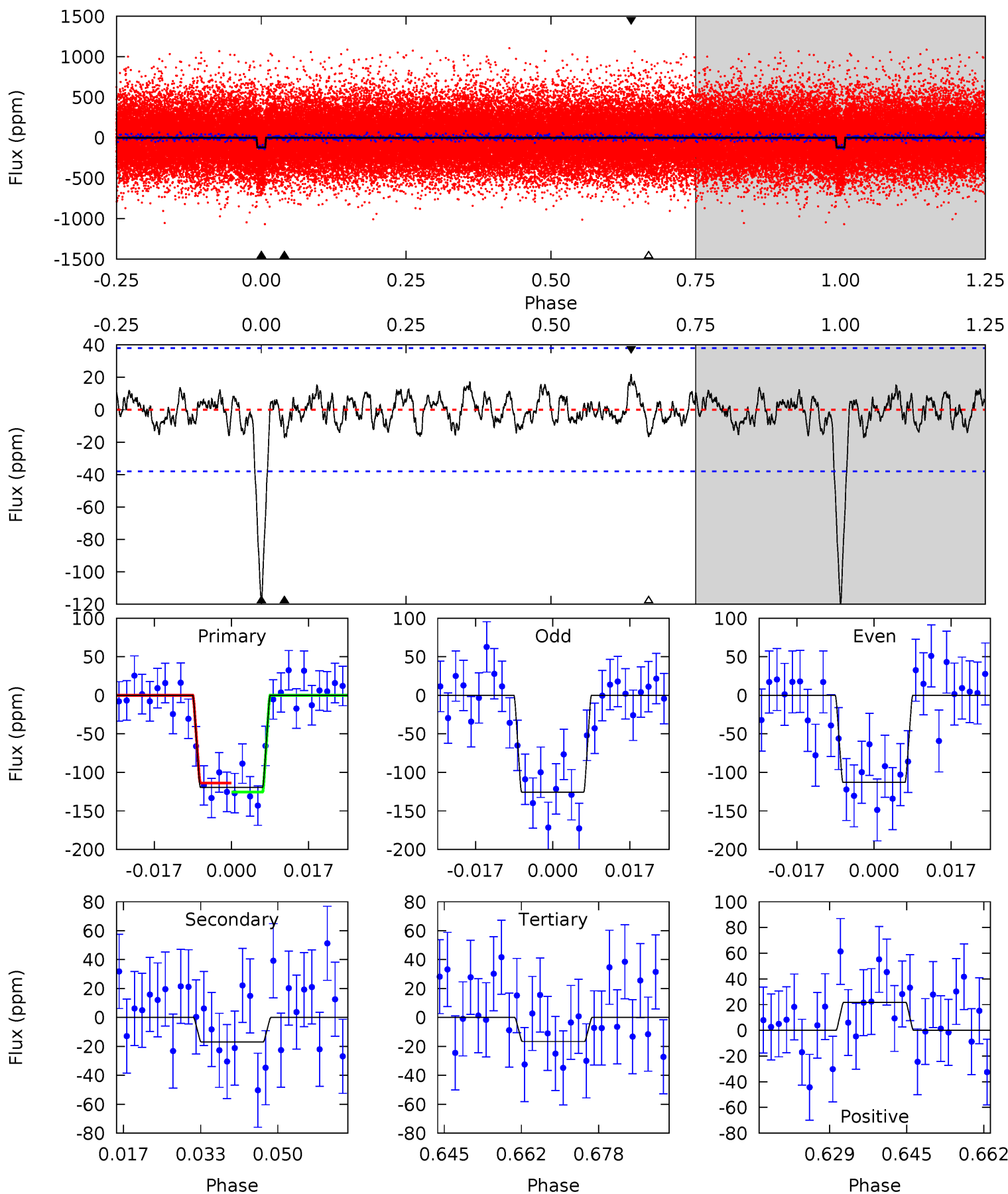
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 16.7 | 2.82 | 2.62 | 2.95 | 4.92 | 2.38 | 1.03 | 14.1 | 13.7 | 0.20 | -0.13 | 0.60 | 1.10 | 0.15 | 0.32 |



Alt Model-Shift Uniqueness Test

004645174-01, P = 15.032830 Days, E = 116.878534 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 15.5 | 2.19 | 2.16 | 2.82 | 4.93 | 2.40 | 0.93 | 13.4 | 12.7 | 0.04 | -0.63 | 0.82 | 1.11 | 0.15 | 0.75 |



Stellar Parameters For KIC 004645174

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | $R (R_{\odot})$ | $M(M_{\odot})$ | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|---------------------|---------------------------|---------------------------|---------------------------|---------------------------|---|
| | 5849^{+70}_{-79} | $4.076^{+0.182}_{-0.098}$ | $0.140^{+0.150}_{-0.150}$ | $1.601^{+0.237}_{-0.356}$ | $1.114^{+0.119}_{-0.095}$ | $0.383^{+0.370}_{-0.117}$ |
| | +1%/-1% | +4%/-2% | +107%/-107% | +15%/-22% | +11%/-9% | +97%/-31% |
| Source | SPE90 | SPE90 | SPE90 | DSEP | | |

KIC = Kepler Input Catalog; PHO = Photometry; SPE = Spectroscopy; AST = Asteroseismology
 TRA = Transits; DESP = Dartmouth Models; MULT = Multiple Models

Secondary Eclipse Parameters for KIC 004645174-01 / KOI 3437.01

| Detrend | Depth (ppm) | $R_p (R_{\oplus})$ | $T_{max} (K)$ | $T_{obs} (K)$ | A_{obs} |
|---------|-------------|------------------------|--------------------|----------------------|------------------|
| DV | -21±8 | $2.16^{+0.67}_{-0.75}$ | 1290^{+56}_{-72} | 3899^{+601}_{-422} | 40^{+48}_{-20} |
| Alt. | -17±8 | $1.85^{+0.67}_{-0.58}$ | 1287^{+56}_{-74} | 3878^{+628}_{-479} | 39^{+53}_{-22} |

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 $A_{obs} \gg 1.0$

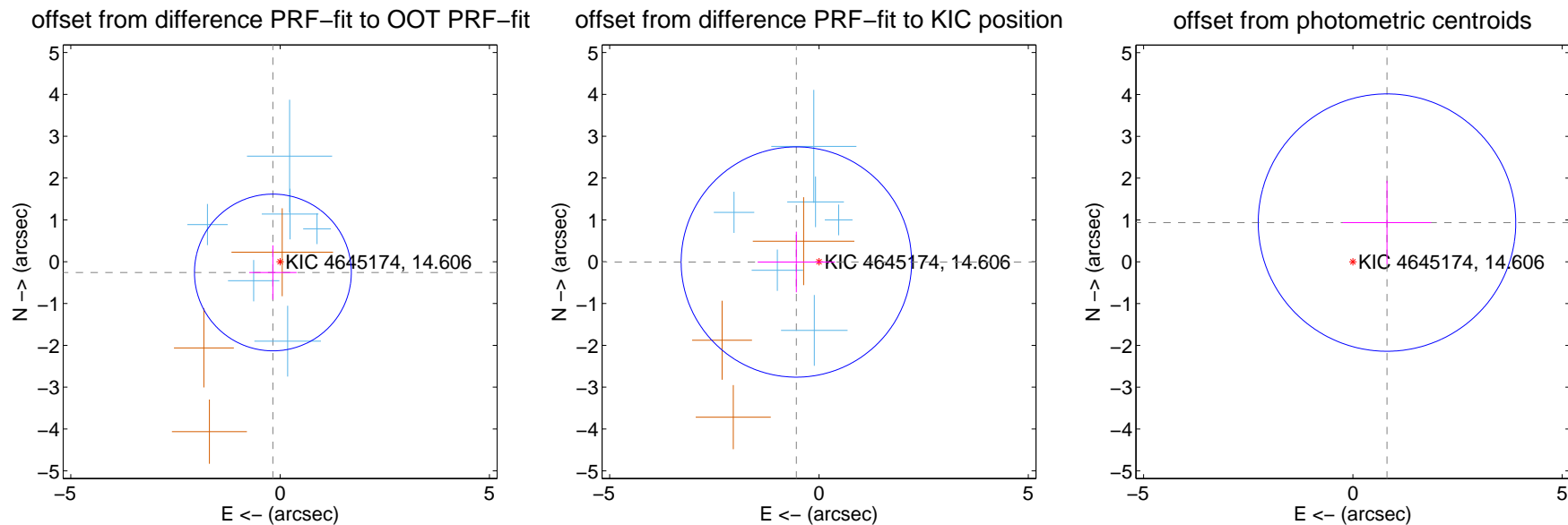
DV Centroid Data

Supplemental centroid analysis for 004645174-01. Kepler magnitude: 14.61. Transit SNR 13.57

There are 6 quarters with good PRF difference image offsets

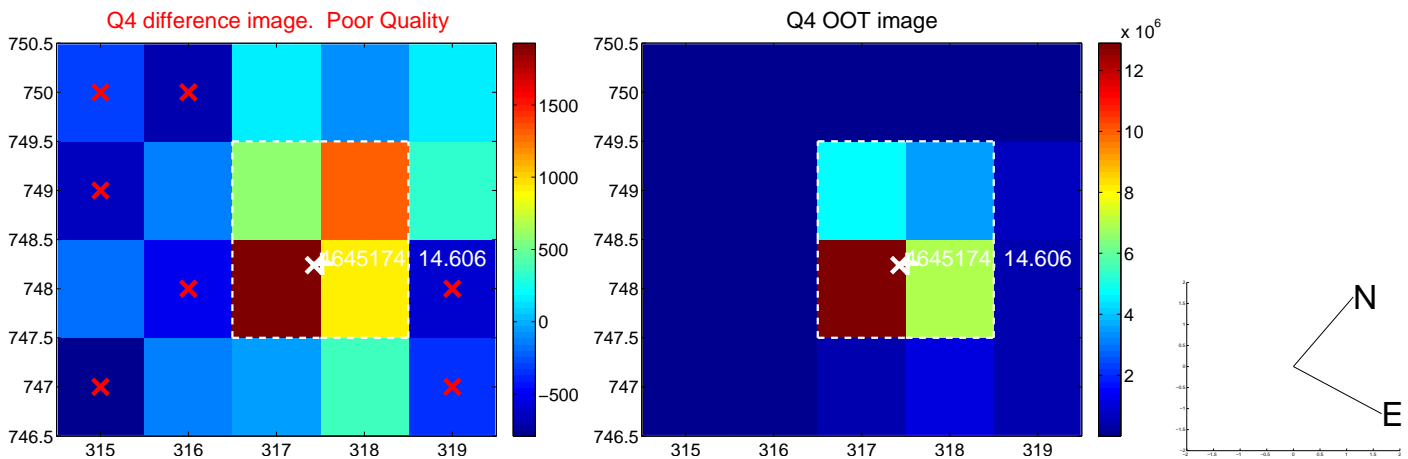
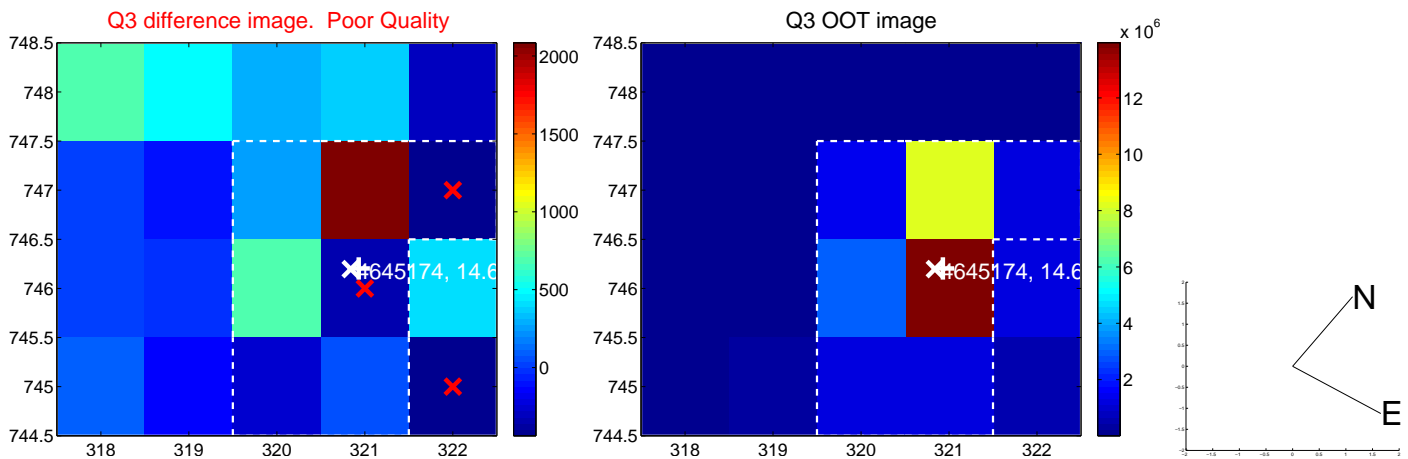
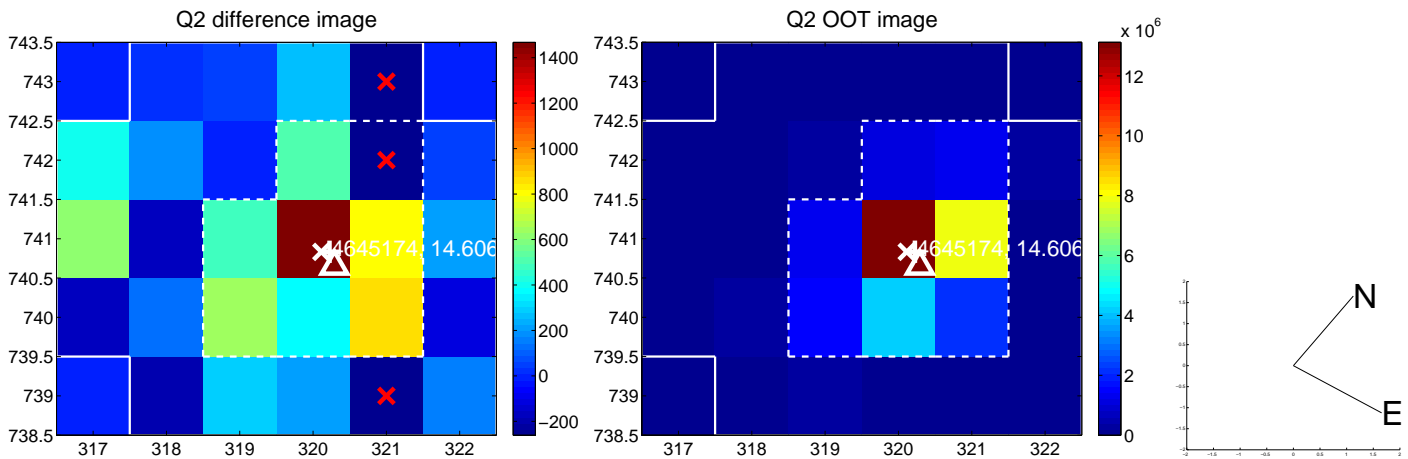
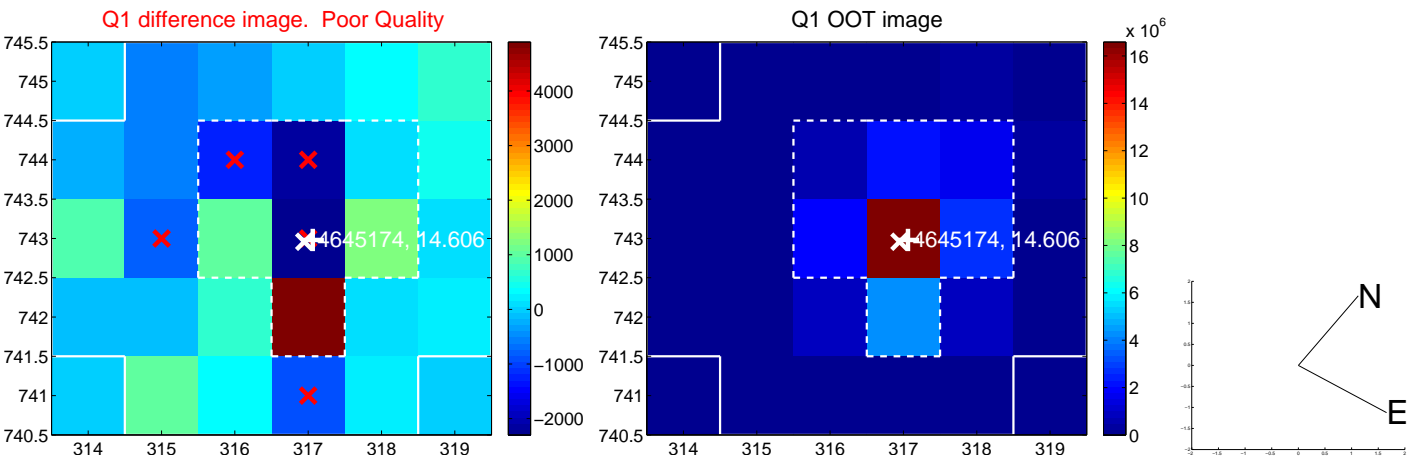
The direct PRF centroid is offset from the target star catalog position by about 0.50 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|---|--------------------|---------------------|-------------------|--------------------|
| PRF-fit source offset from OOT | 0.310 ± 0.625 | 0.50 | 0.172 ± 0.566 | -0.258 ± 0.649 |
| PRF-fit source offset from KIC position | 0.541 ± 0.918 | 0.59 | 0.541 ± 0.924 | -0.008 ± 0.725 |
| photometric centroid source offset | 1.24 ± 1.03 | 1.21 | -0.82 ± 1.06 | 0.94 ± 1.00 |

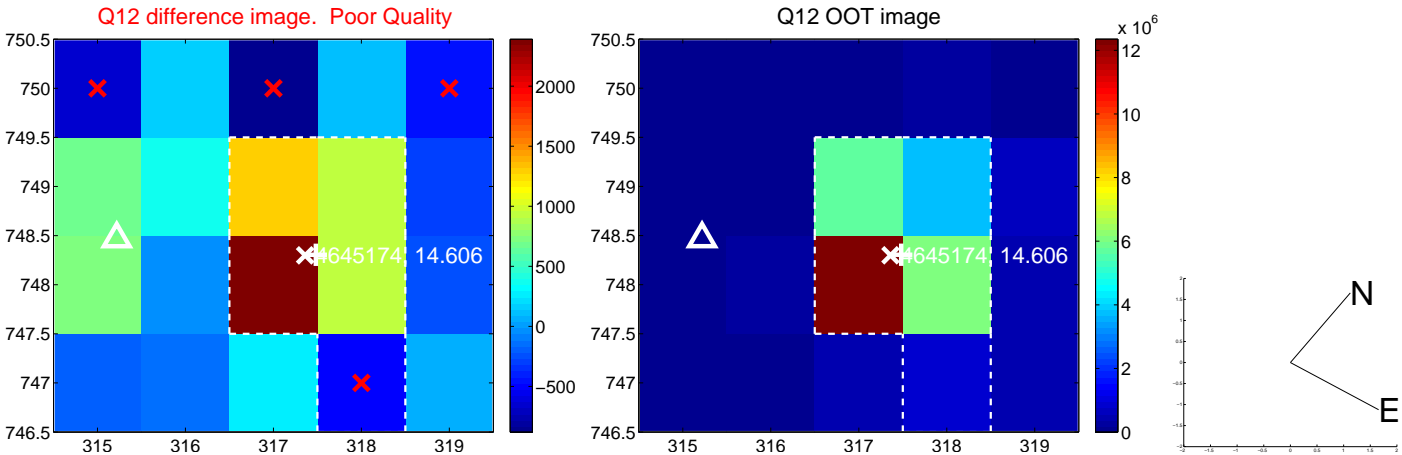
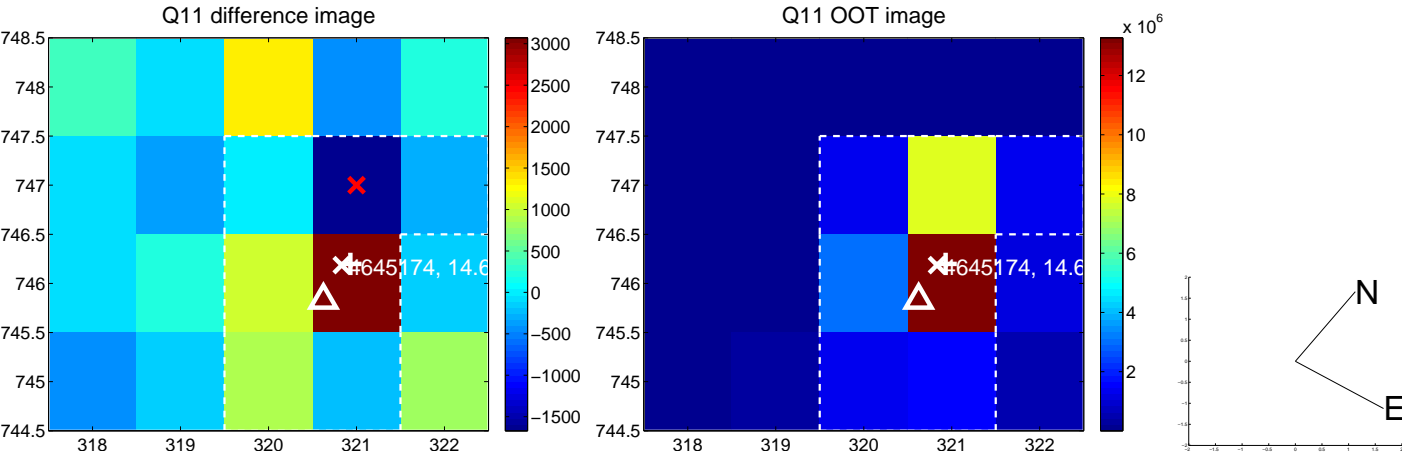
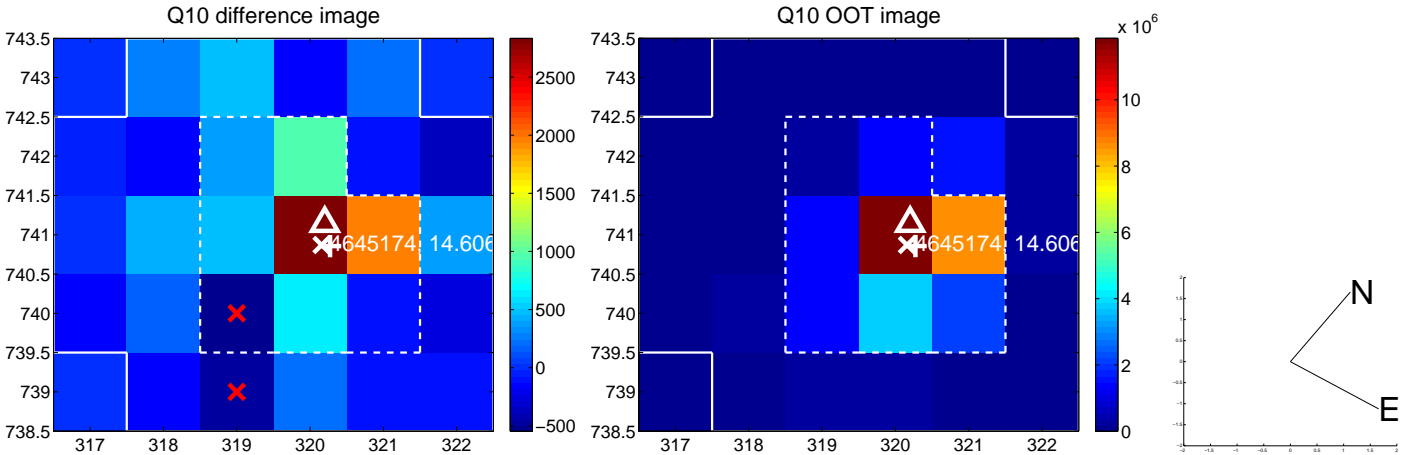
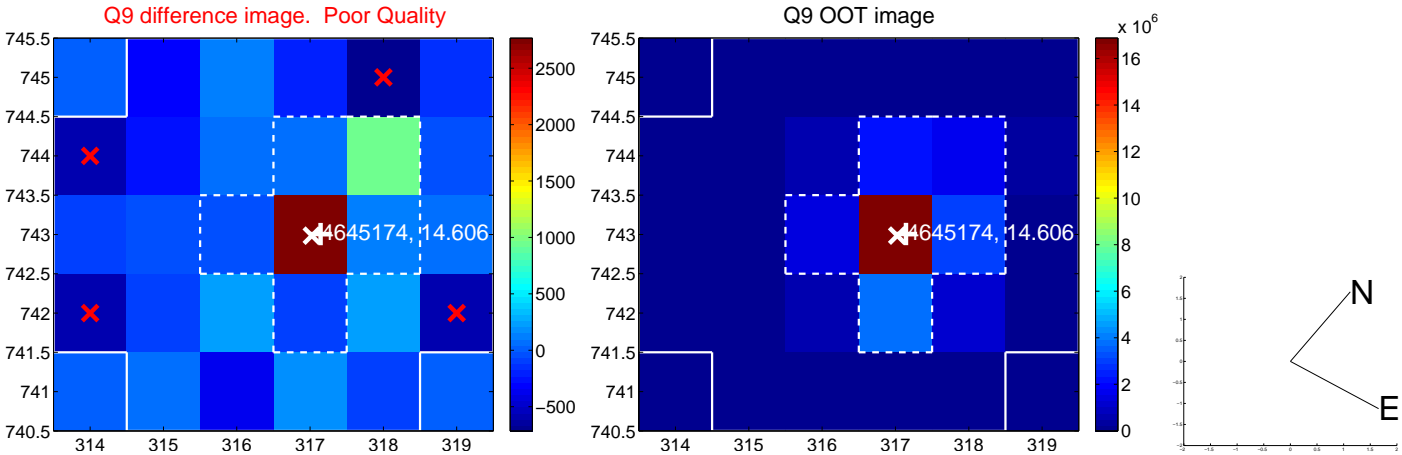


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

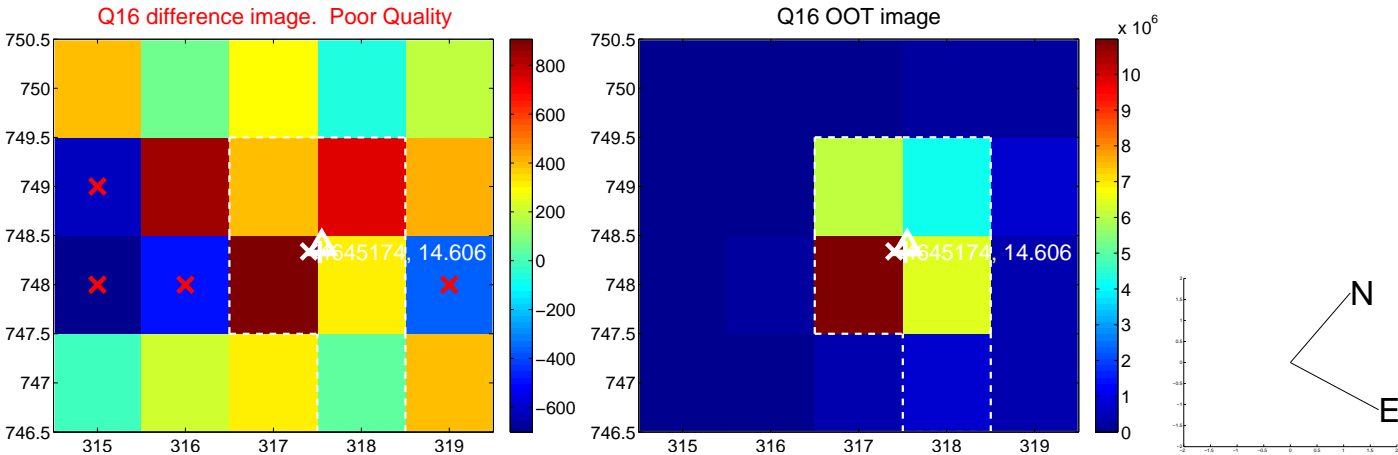
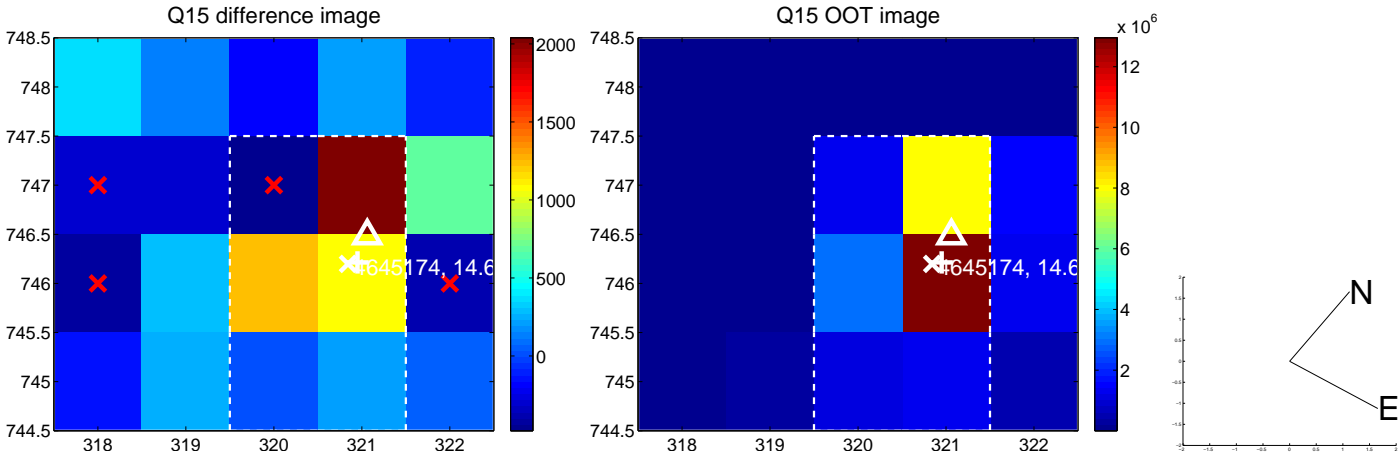
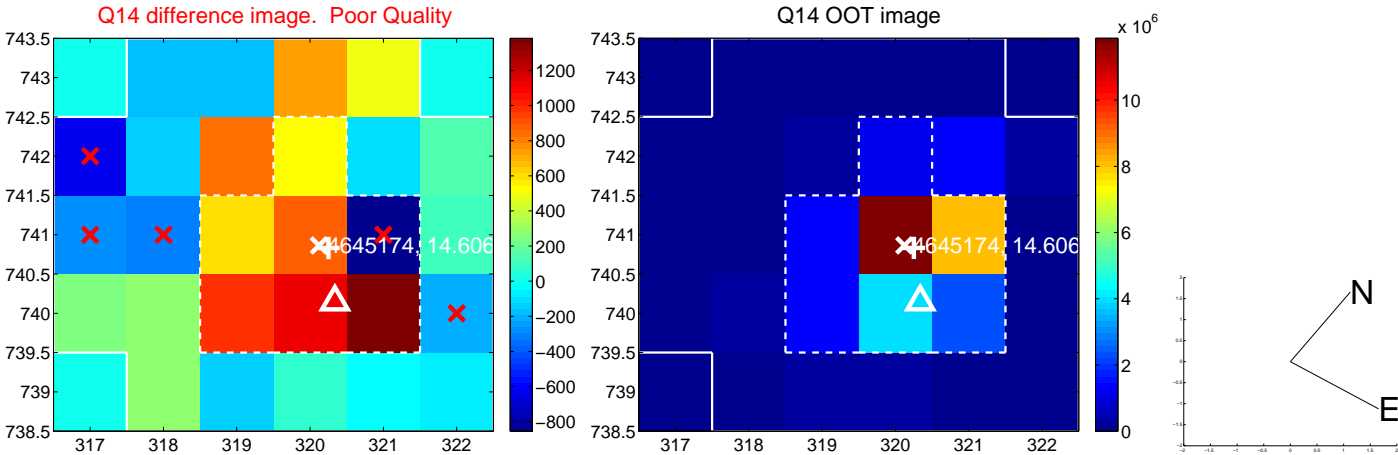
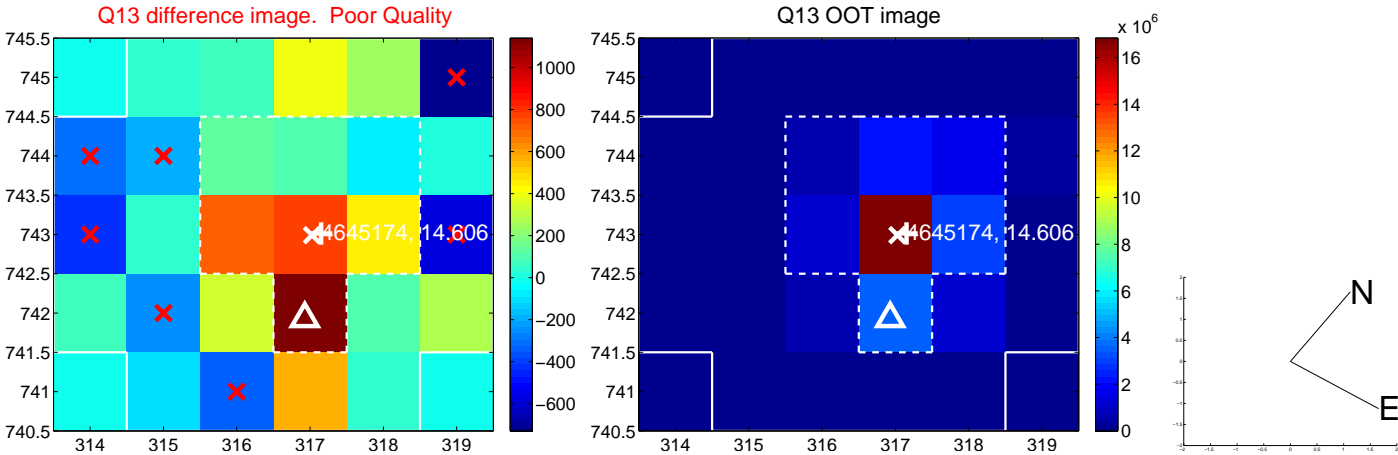
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



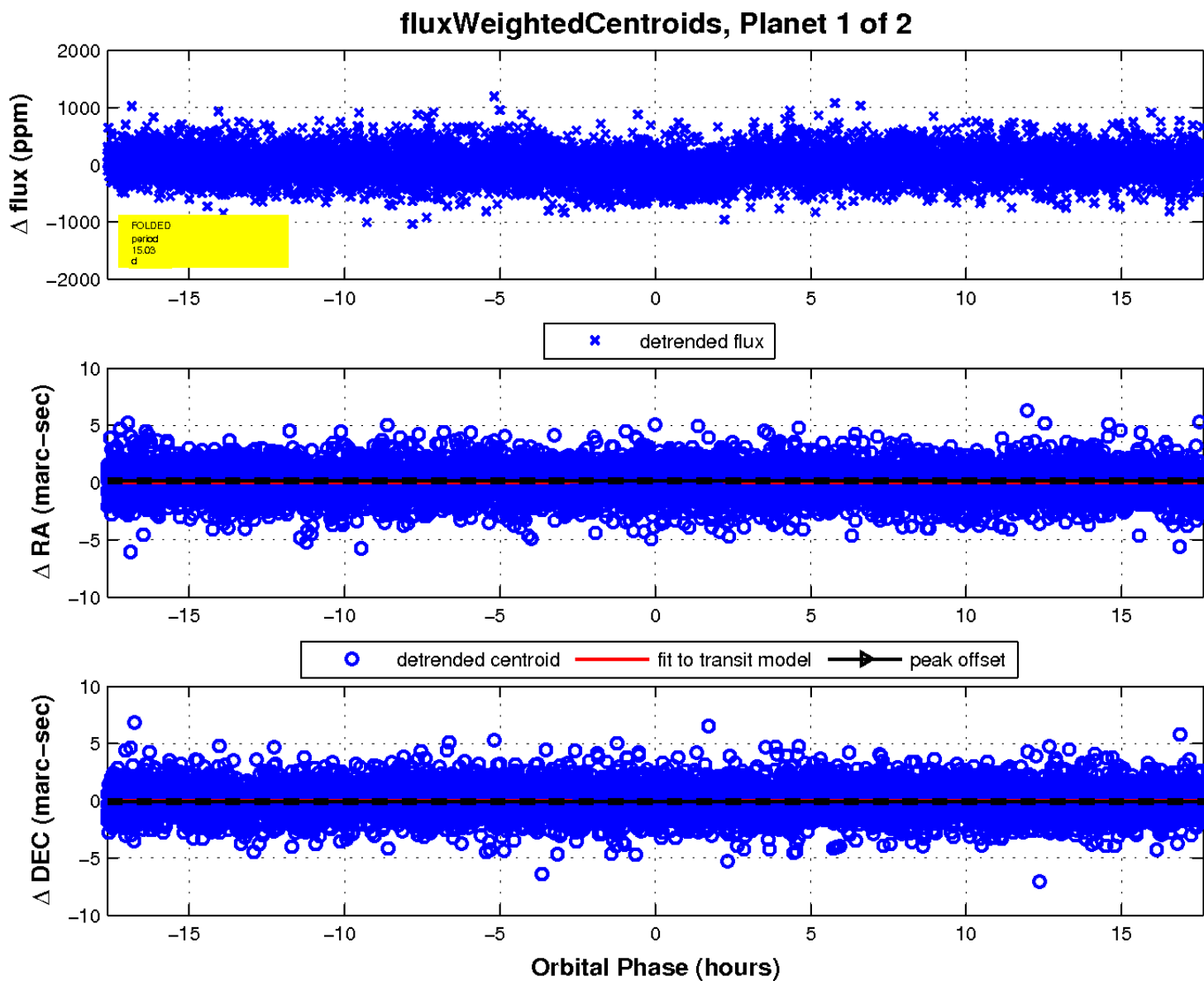
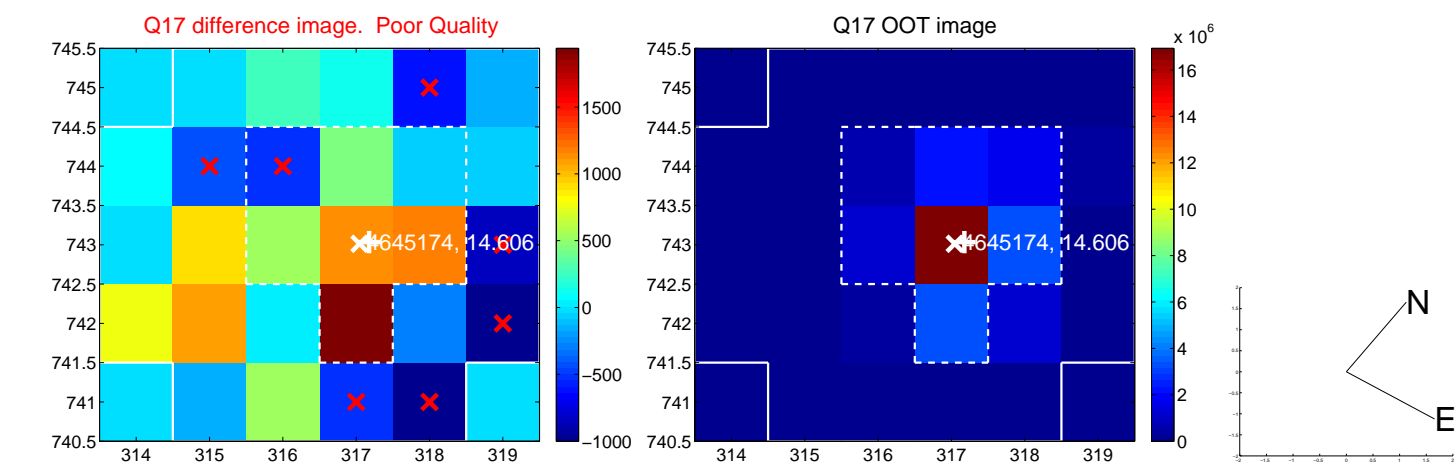
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

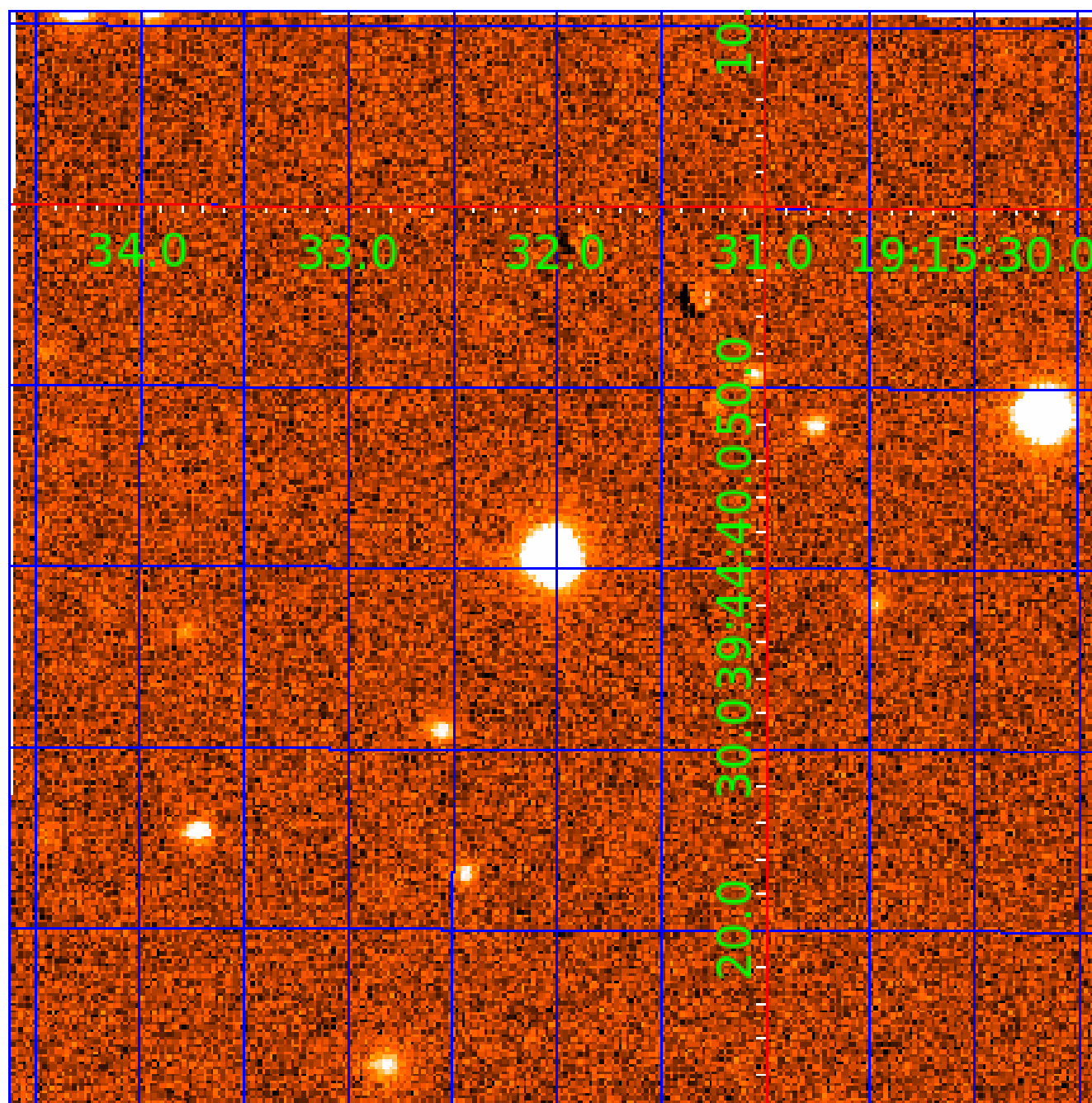


white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



UKIRT Image

Declination



KIC 004645174

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}) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 004645174-01 | OBS | 3437.01 | 15.032938 | 131.908391 | 131.0 | 5.882 | 12.4 | 13.6 | 1.60 | 5849 | 2.17 | 175.96 |
| 004645174-02 | OBS | 3437.02 | 34.750015 | 158.684249 | 190.9 | 3.468 | 9.6 | 10.0 | 1.60 | 5849 | 2.53 | 57.57 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|--------------|
| 004645174-01 | OBS | PC | 0.99 | 0 | 0 | 0 | 0 | CENT_KIC_POS |
| 004645174-02 | OBS | PC | 1.00 | 0 | 0 | 0 | 0 | CENT_KIC_POS |

Notes: OBS = Observed. INJ = Injected. INV = Inverted. SCR = Scrambled.

N = Not Transit-Like. S = Stellar Eclipse. C = Centroid Offset. E = Ephemeris Match.

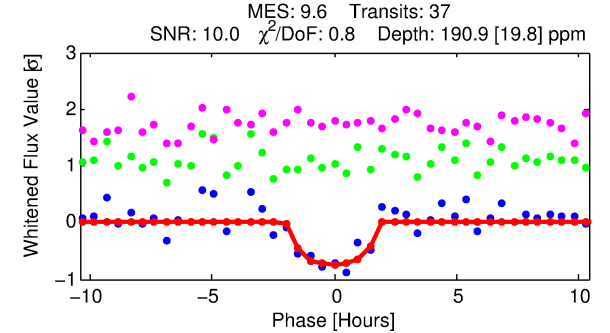
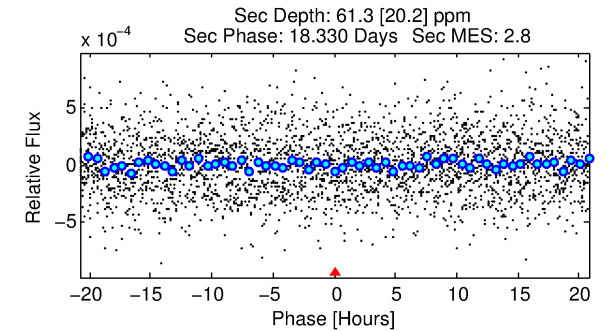
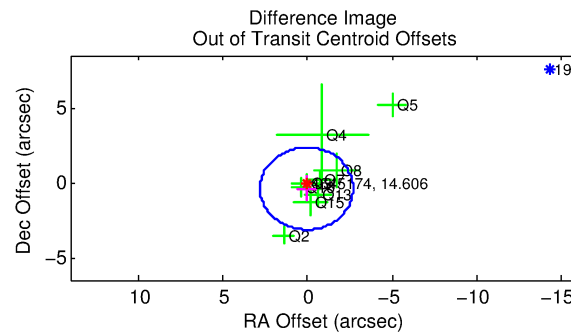
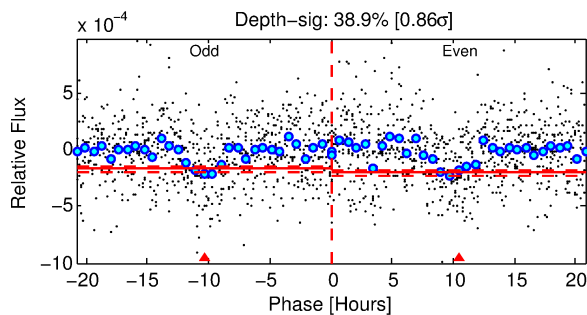
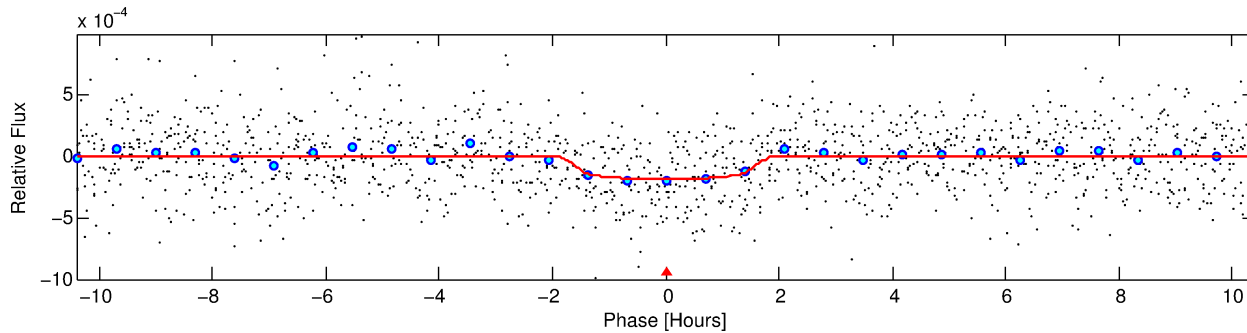
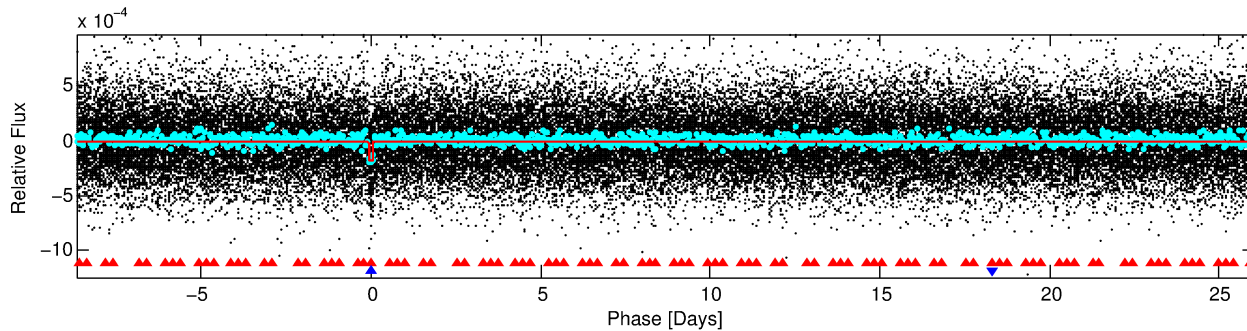
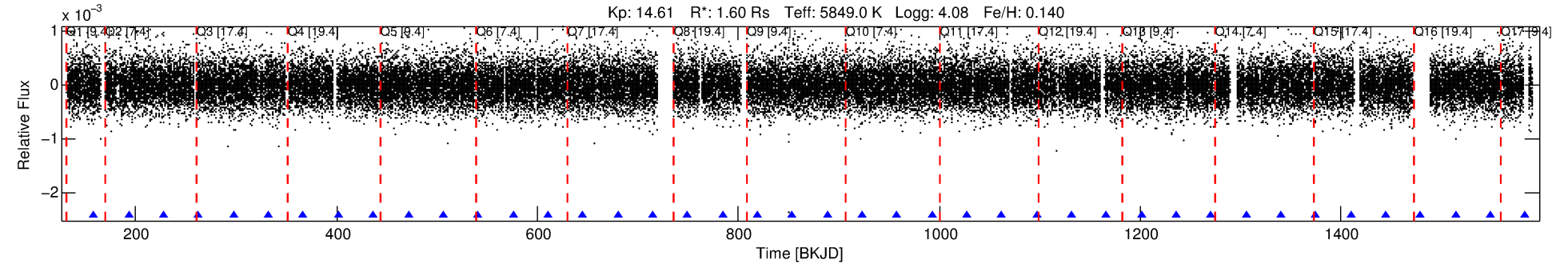
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 004645174-02

No Significant Match Found

DV One-Page Summary

KIC: 4645174 Candidate: 2 of 2 Period: 34.750 d
KOI: K03437.02 Corr: 0.952



DV Fit Results:

Period = 34.75002 [0.00037] d
Epoch = 158.6842 [0.0081] BKJD
Rp/R* = 0.0145 [0.0114]
a/R* = 42.09 [154.40]
b = 0.85 [1.20]
Seff = 57.57 [18.47]
Teq = 702 [56] K
Rp = 2.53 [2.07] Re
a = 0.2161 [0.0440] AU
Ag = 246.03 [403.28] [0.61 σ]
Teffp = 4301 [1730] K [2.08 σ]

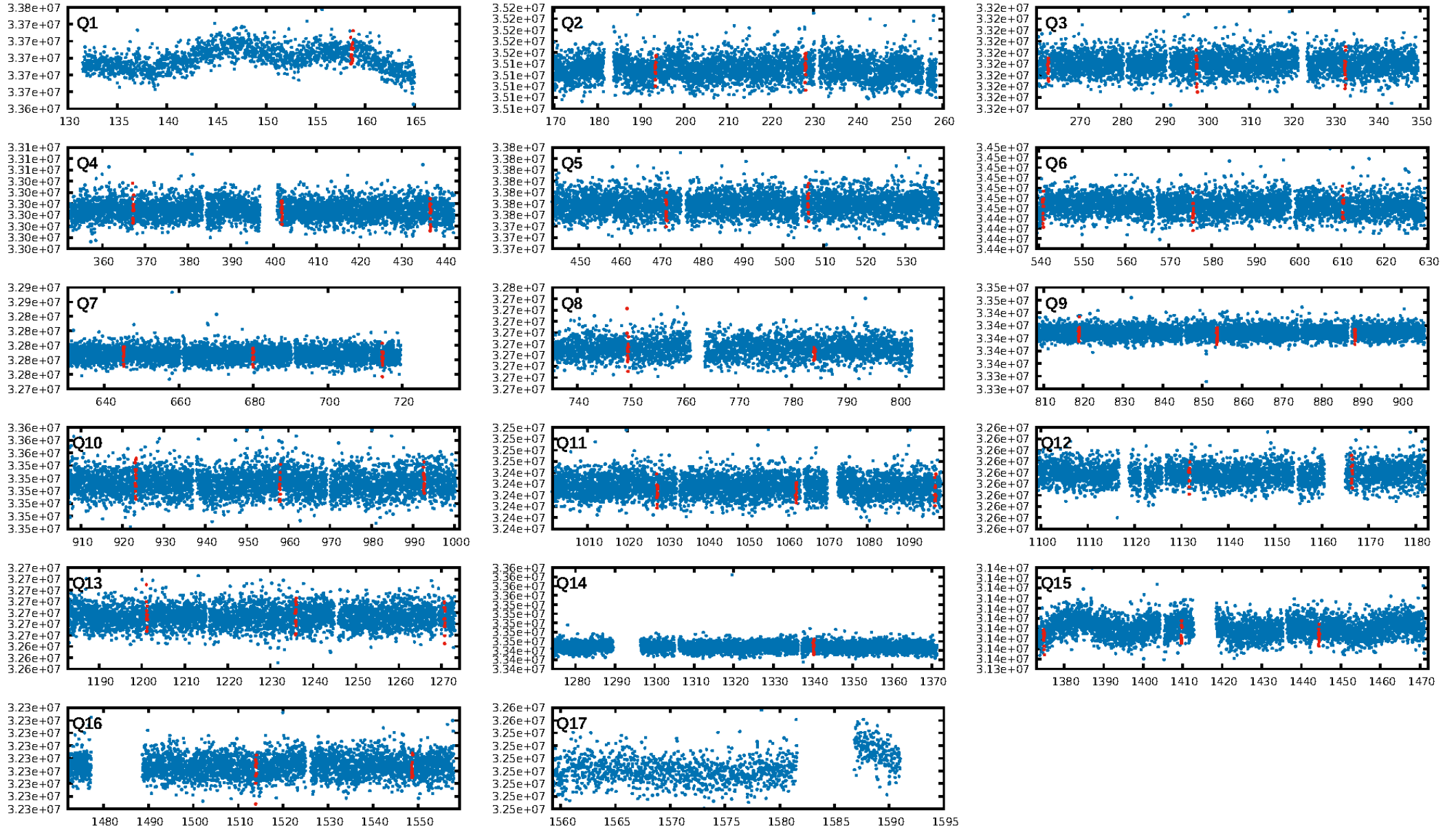
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [69.30 σ]
LongPeriod-sig: N/A
ModelChiSquare2-sig: 99.4%
ModelChiSquareGof-sig: 100.0%
Bootstrap-pfa: 1.59e-22
RollingBand-fgt: 1.00 [36/36]
GhostDiagnostic-chr: -2.703
Centroid-sig: 5.9%
Centroid-so: 1.541 arcsec [1.13 σ]
OotOffset-rm: 0.409 arcsec [0.45 σ]
KicOffset-rm: 0.419 arcsec [0.66 σ]
OotOffset-st: 1/3/3/2 [9]
KicOffset-st: 1/3/3/2 [9]
DiffImageQuality-fgm: 0.67 [6/9]
DiffImageOverlap-fno: 1.00 [16/16]

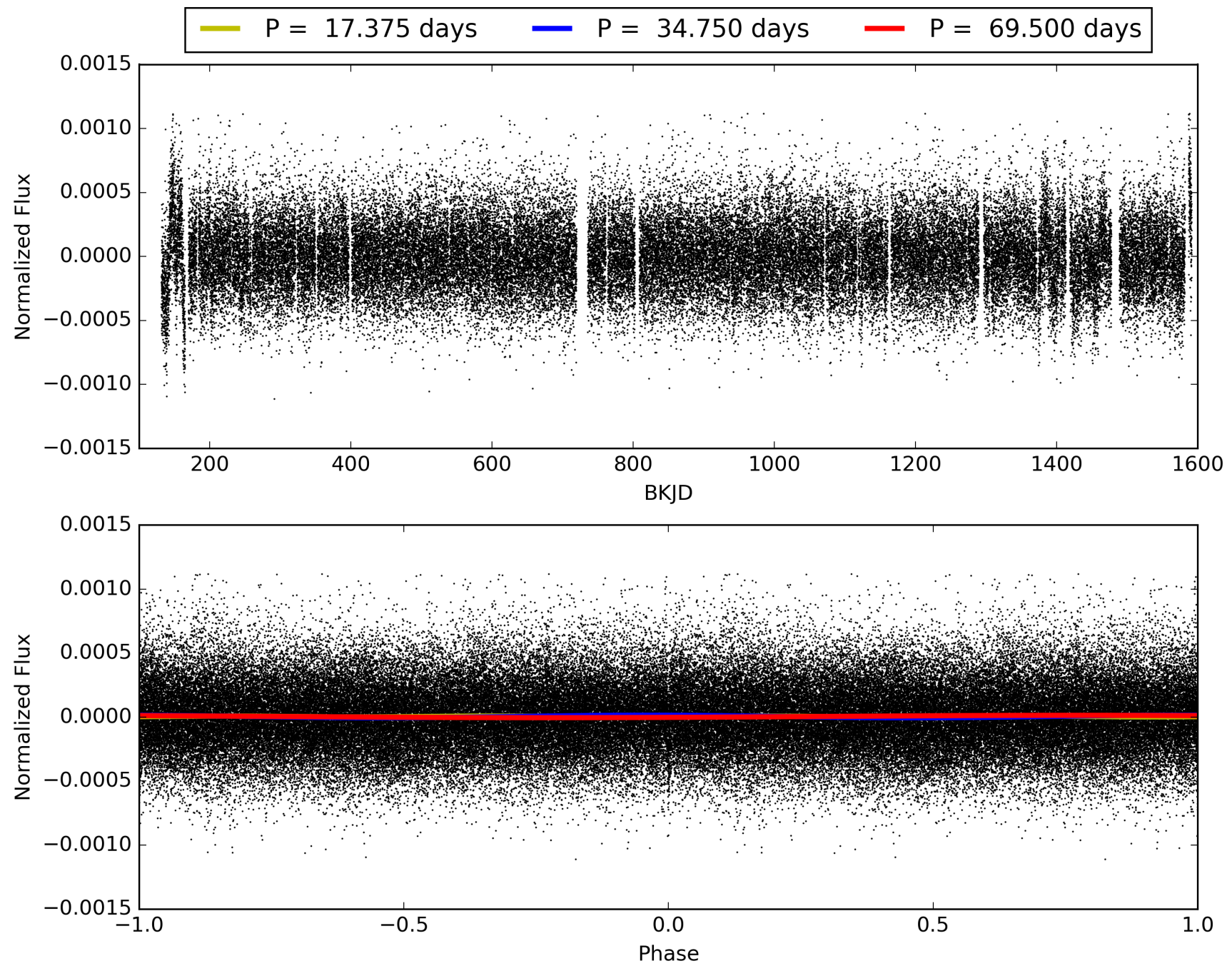
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 18:41:20 Z

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

TCE 004645174-02, PDC Light Curves

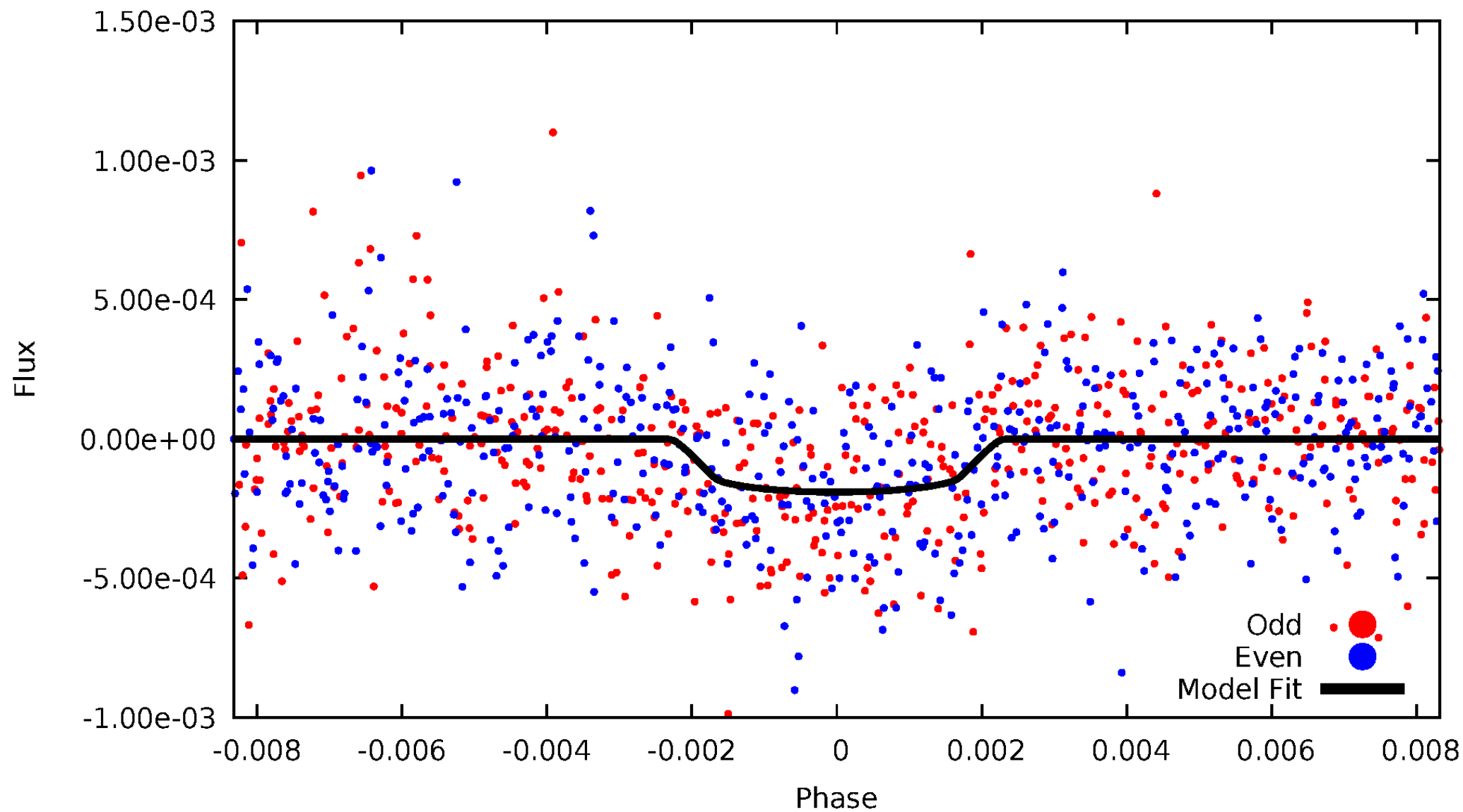


TCE 004645174-02



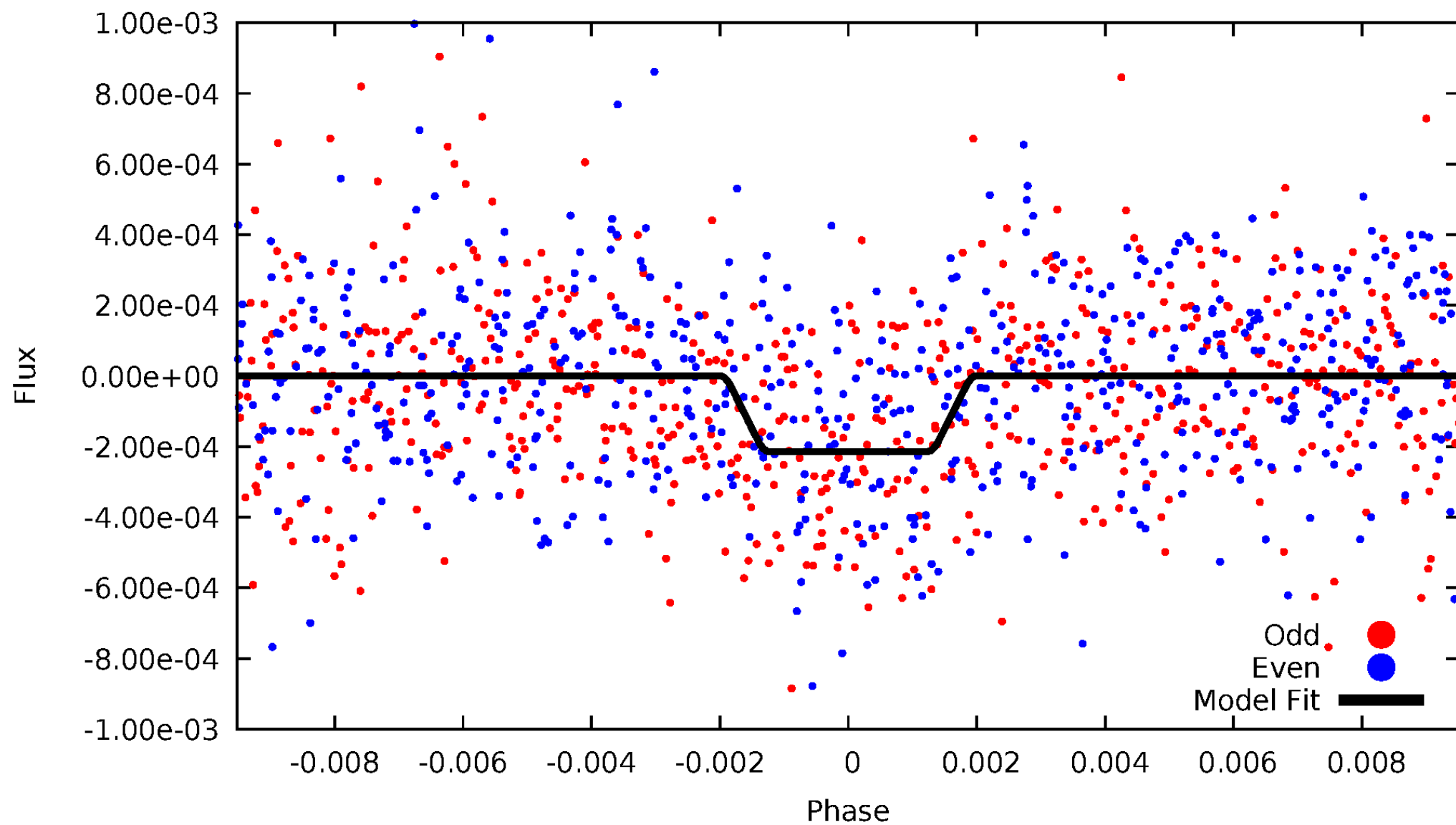
DV Odd/Even

TCE 004645174-02



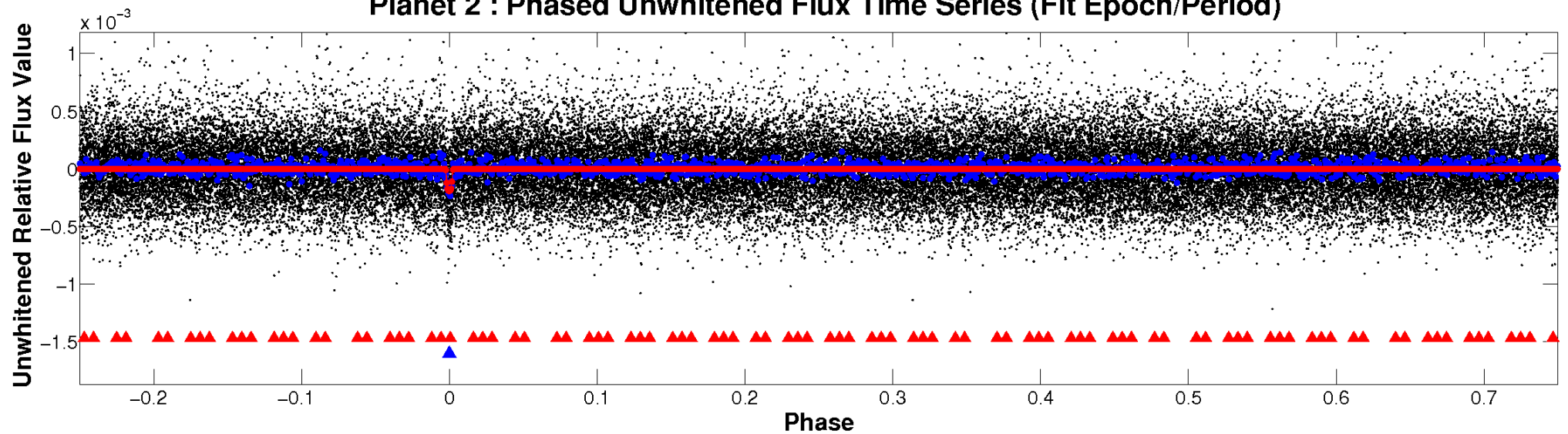
ALT Odd/Even

TCE 004645174-02

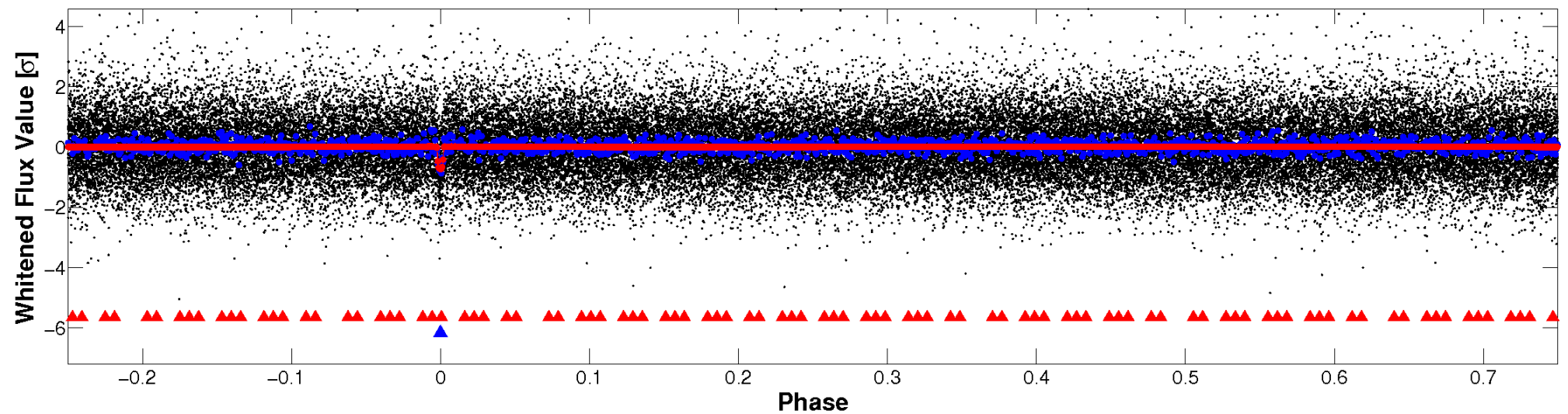


Non-Whitened Vs. Whitened Light Curve

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

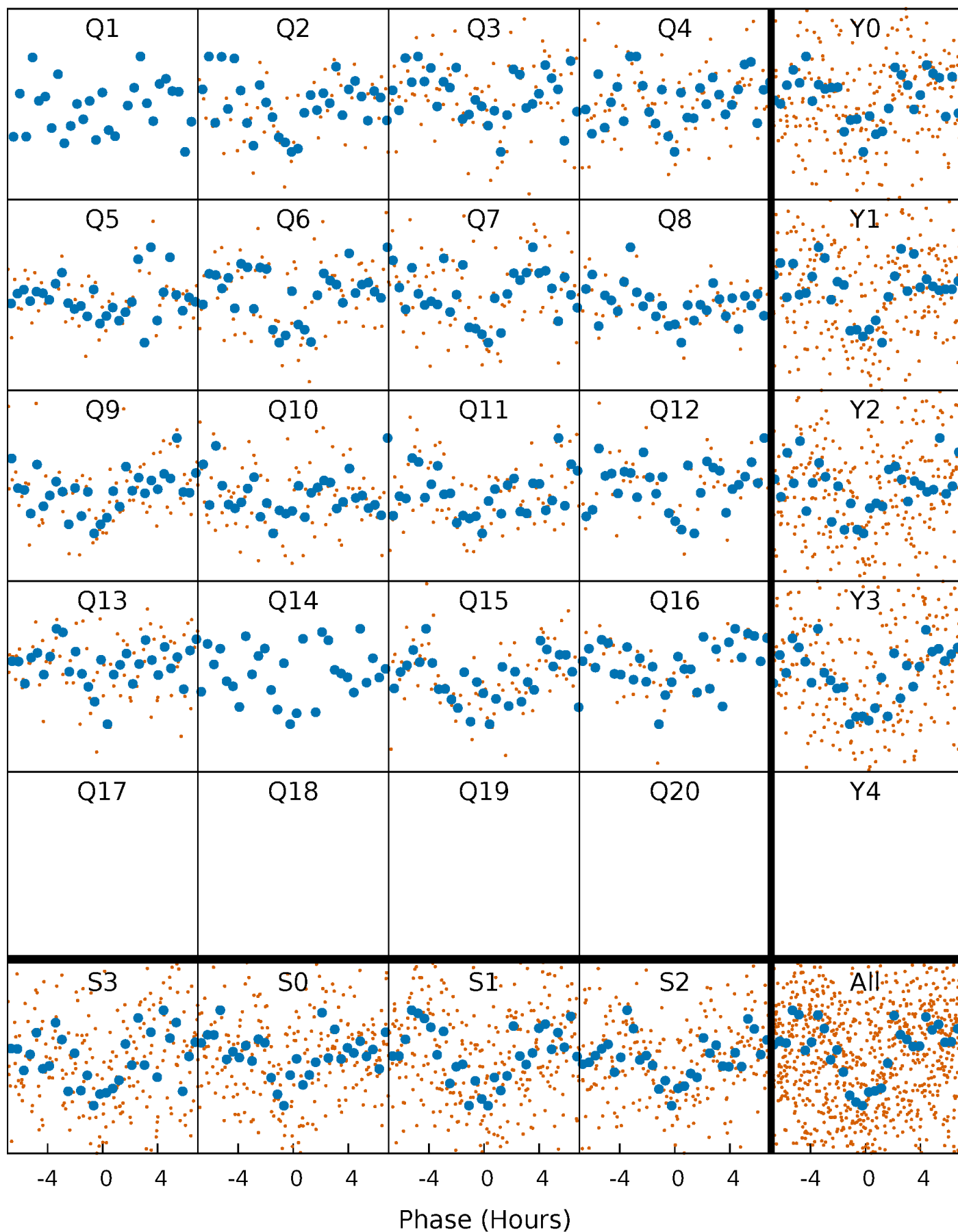


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



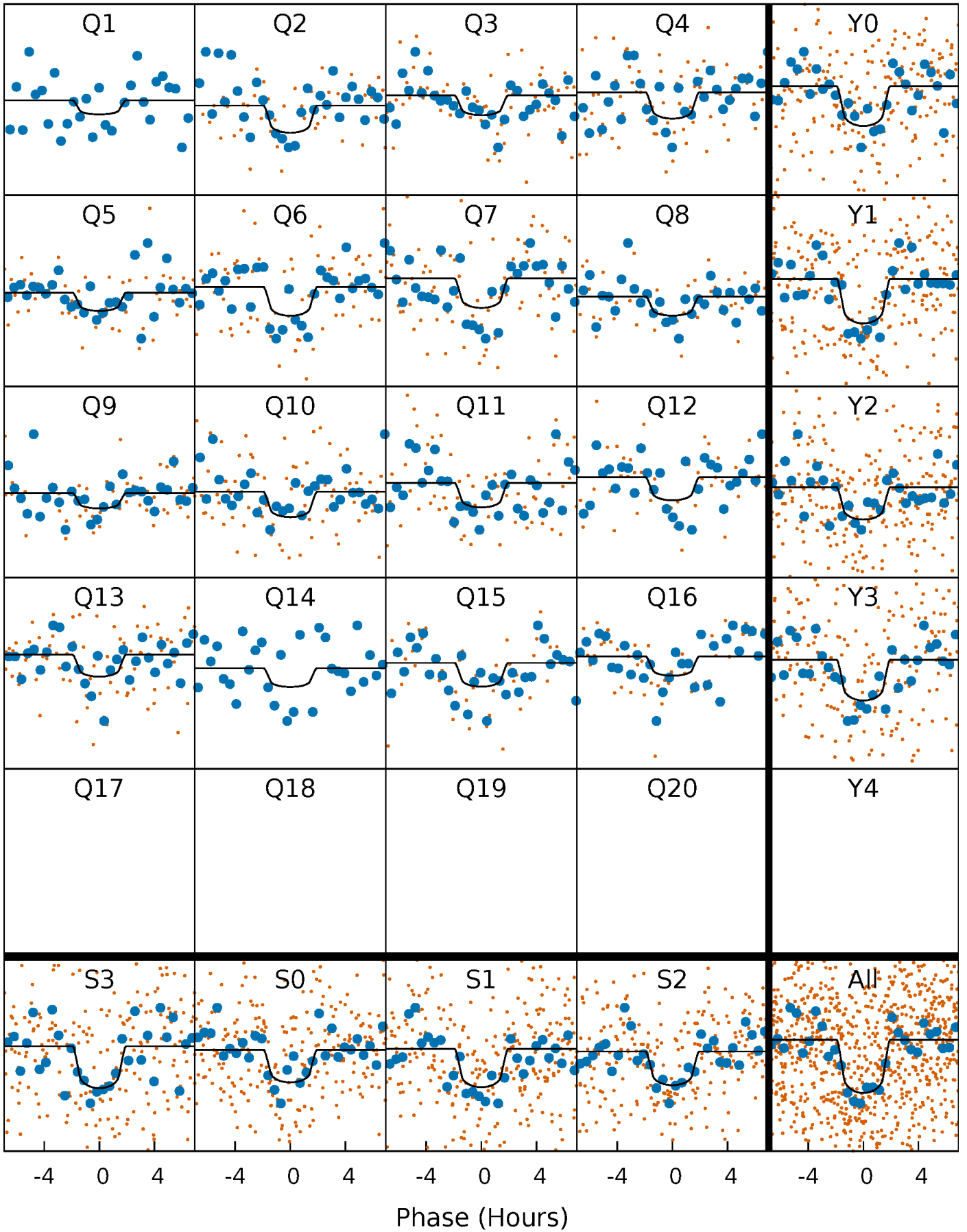
PDC Quarter-Phased Transit Curves

TCE 004645174-02 P= 34.750015 Days $T_0=158.684249$ (BKJD)



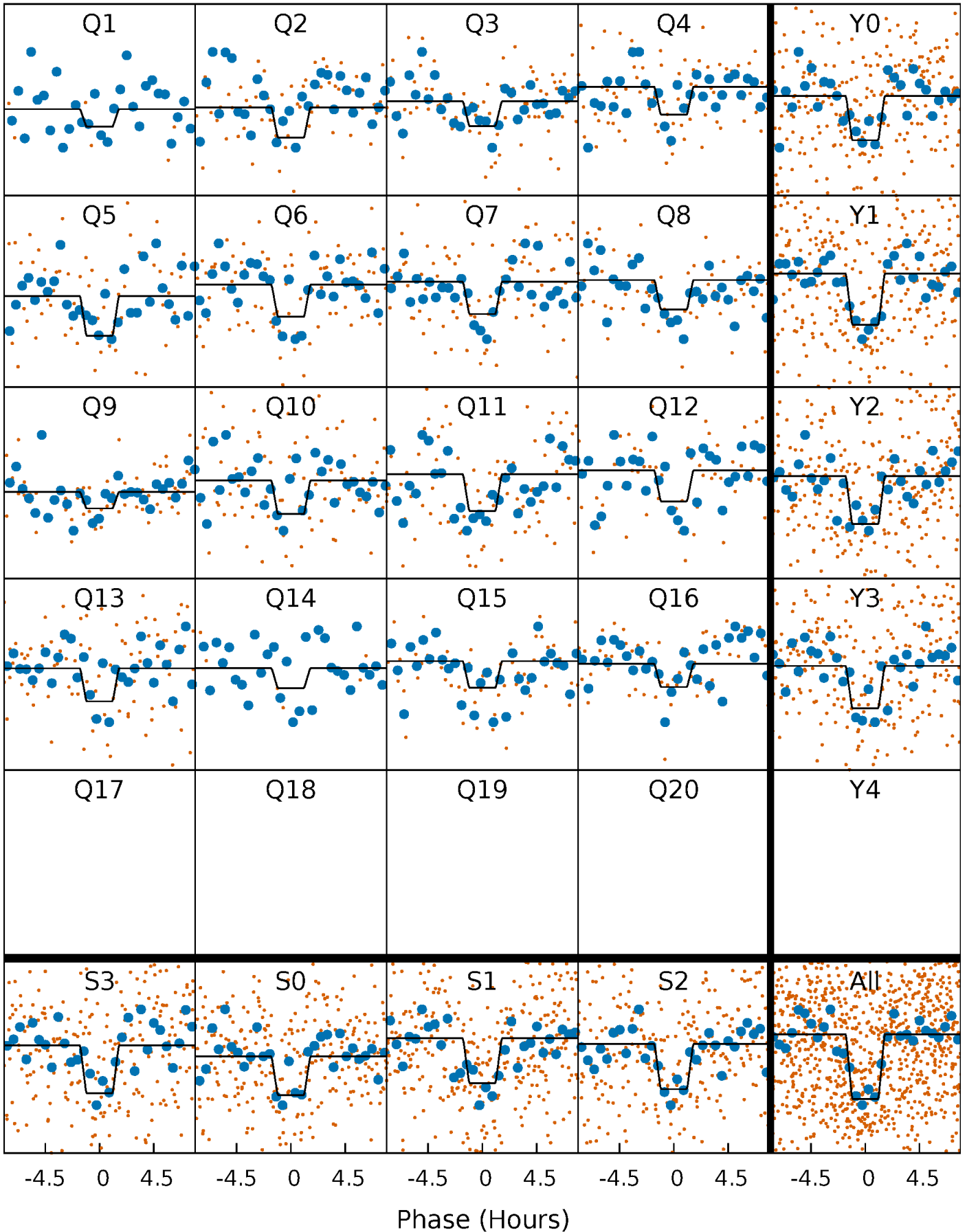
DV Quarter-Phased Transit Curves

TCE 004645174-02 P= 34.750015 Days $T_0=158.684249$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

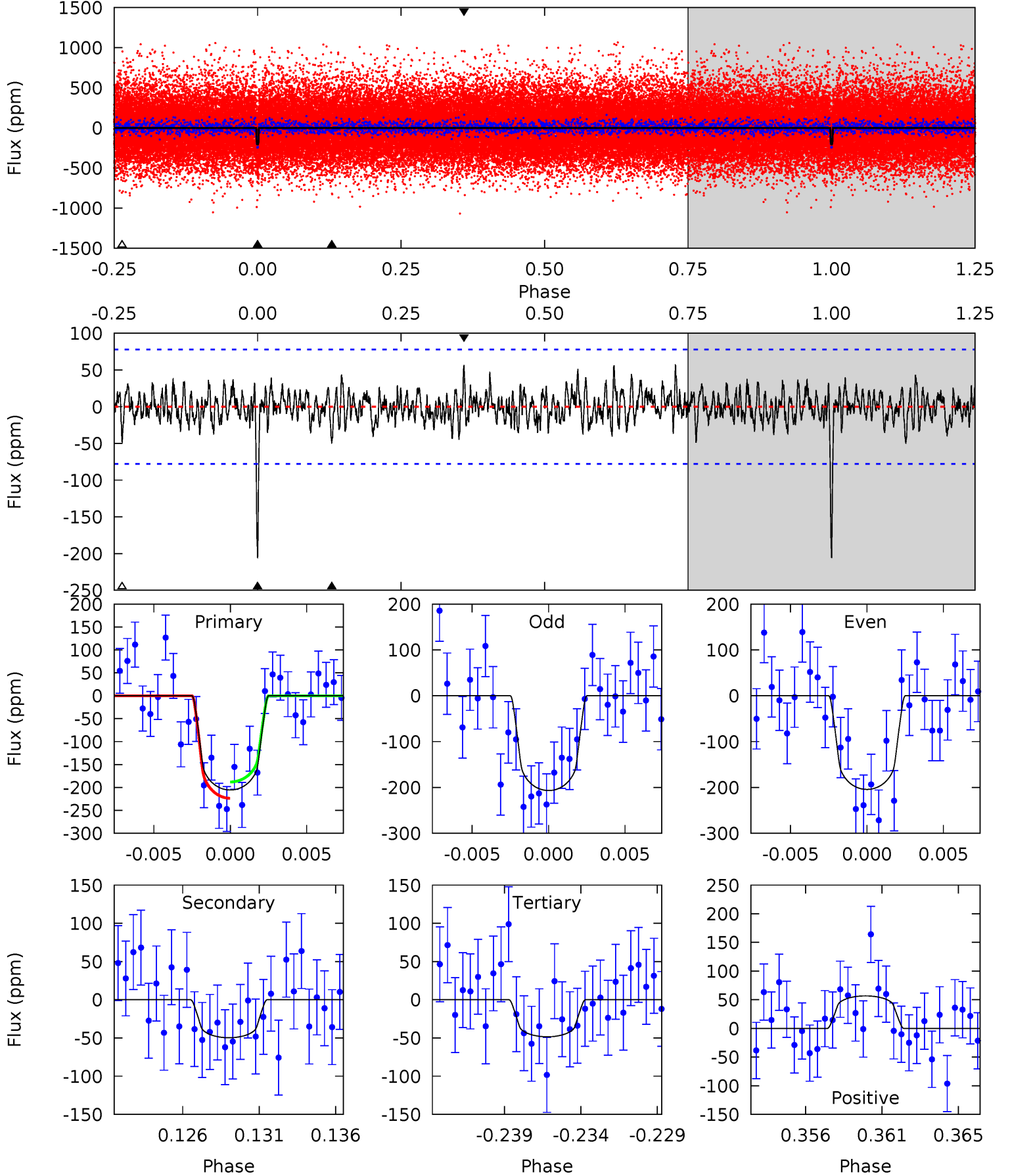
TCE 004645174-02 P= 34.749123 Days $T_0=158.697725$ (BKJD)



DV Model-Shift Uniqueness Test

004645174-02, P = 34.750015 Days, E = 123.934234 Days

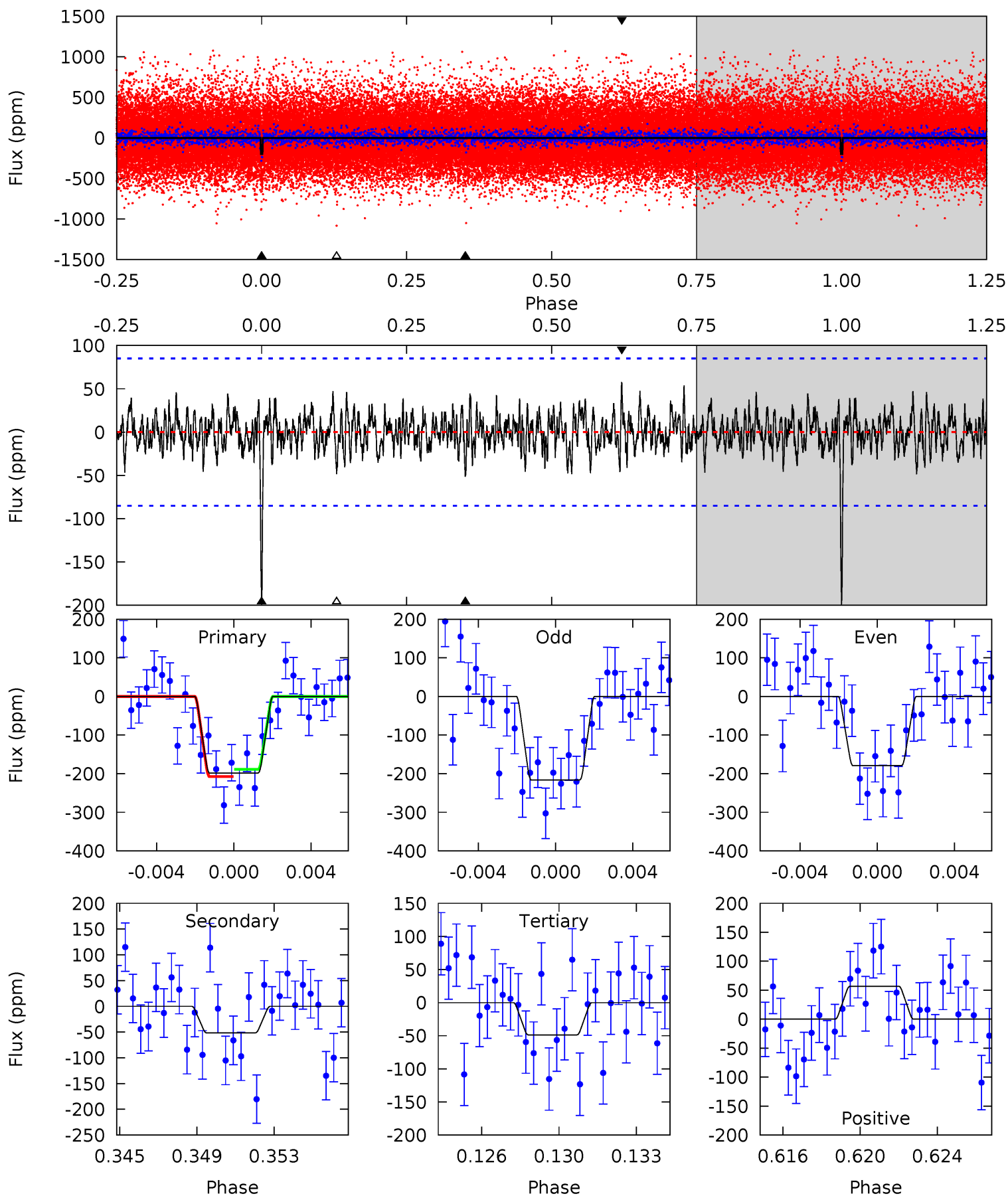
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 13.6 | 3.30 | 3.21 | 3.76 | 5.17 | 2.83 | 1.10 | 10.4 | 9.88 | 0.08 | -0.46 | 0.08 | 0.94 | 0.22 | 1.18 |



Alt Model-Shift Uniqueness Test

004645174-02, P = 34.749123 Days, E = 123.948602 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 12.1 | 3.16 | 2.98 | 3.48 | 5.20 | 2.88 | 1.04 | 9.15 | 8.65 | 0.18 | -0.32 | 1.14 | 0.97 | 0.22 | 0.56 |



Stellar Parameters For KIC 004645174

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | $R (R_{\odot})$ | $M(M_{\odot})$ | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|---------------------|---------------------------|---------------------------|---------------------------|---------------------------|---|
| | 5849^{+70}_{-79} | $4.076^{+0.182}_{-0.098}$ | $0.140^{+0.150}_{-0.150}$ | $1.601^{+0.237}_{-0.356}$ | $1.114^{+0.119}_{-0.095}$ | $0.383^{+0.370}_{-0.117}$ |
| | +1%/-1% | +4%/-2% | +107%/-107% | +15%/-22% | +11%/-9% | +97%/-31% |
| Source | SPE90 | SPE90 | SPE90 | DSEP | | |

KIC = Kepler Input Catalog; PHO = Photometry; SPE = Spectroscopy; AST = Asteroseismology
 TRA = Transits; DESP = Dartmouth Models; MULT = Multiple Models

Secondary Eclipse Parameters for KIC 004645174-02 / KOI 3437.02

| Detrend | Depth (ppm) | $R_p (R_{\oplus})$ | $T_{max} (K)$ | $T_{obs} (K)$ | A_{obs} |
|---------|--------------|------------------------|-------------------|-----------------------|---------------------|
| DV | -50 ± 15 | $2.71^{+1.84}_{-1.59}$ | 978^{+40}_{-56} | 4136^{+2034}_{-706} | 171^{+948}_{-116} |
| Alt. | -52 ± 16 | $2.78^{+1.96}_{-1.59}$ | 977^{+41}_{-51} | 4112^{+1769}_{-691} | 161^{+731}_{-105} |

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 $A_{obs} \gg 1.0$

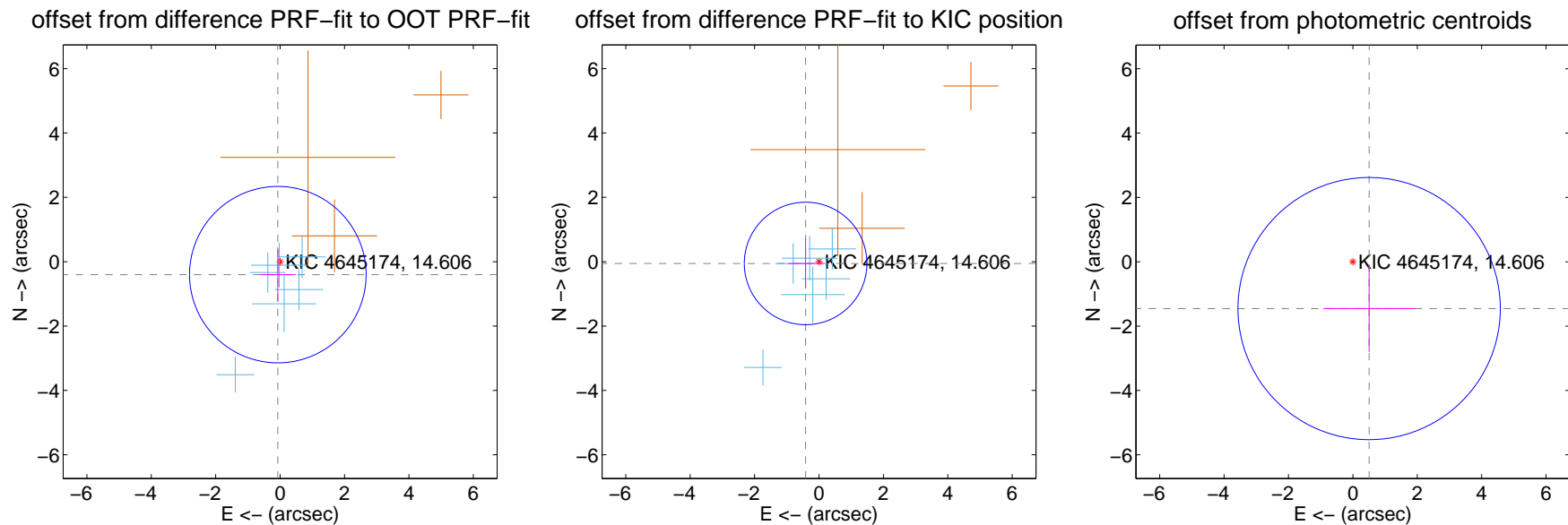
DV Centroid Data

Supplemental centroid analysis for 004645174-02. Kepler magnitude: 14.61. Transit SNR 10.01

There are 6 quarters with good PRF difference image offsets

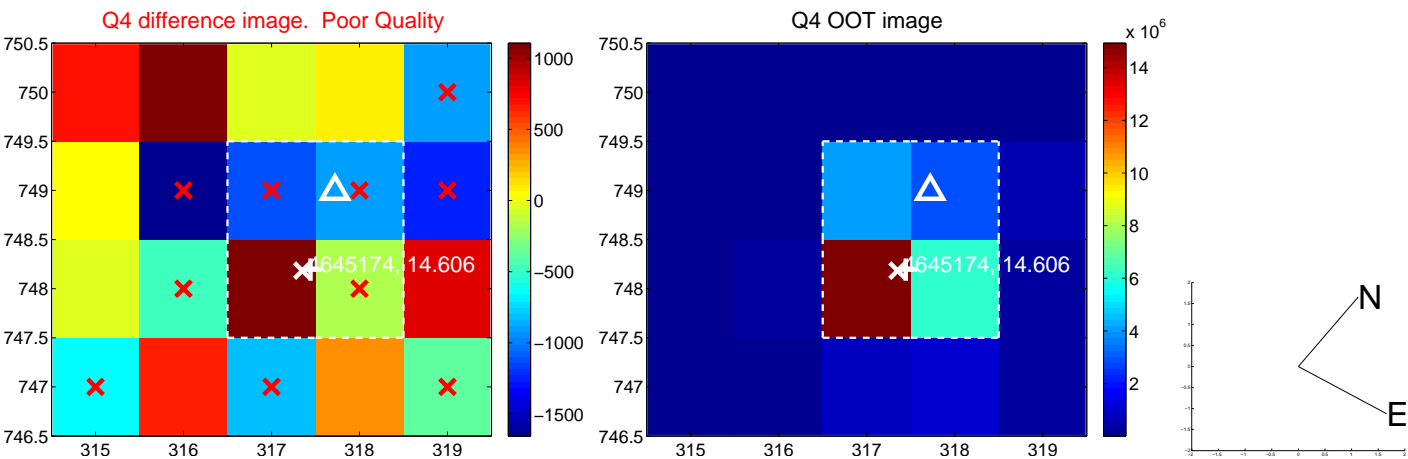
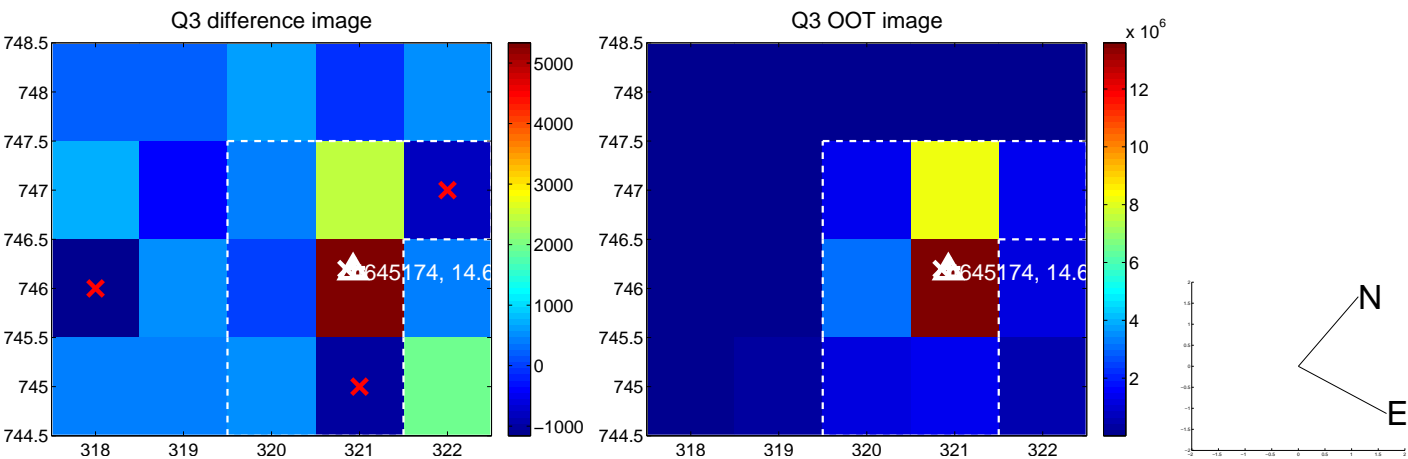
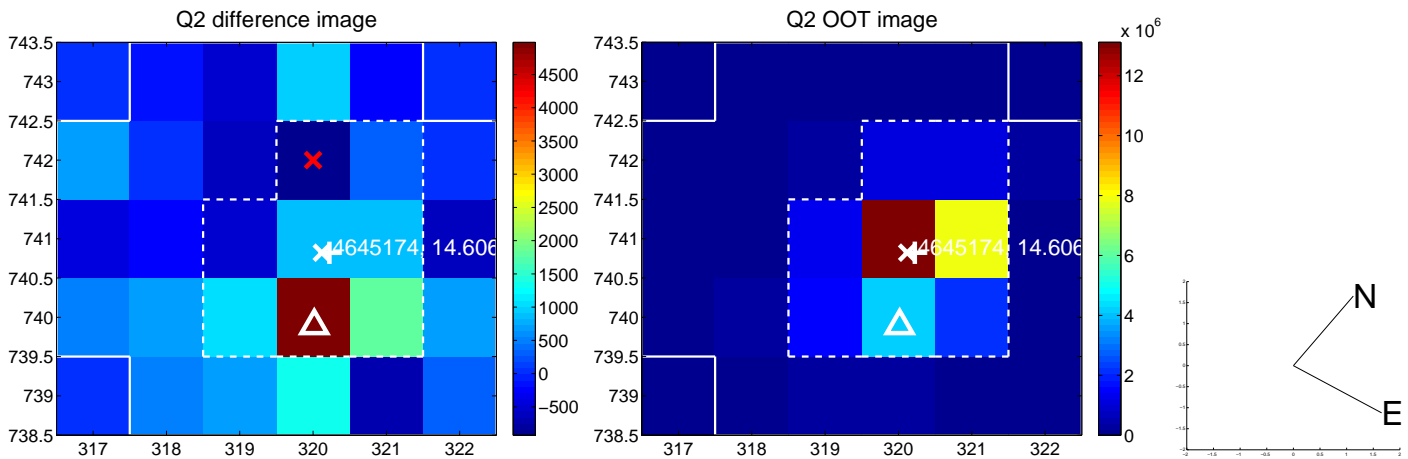
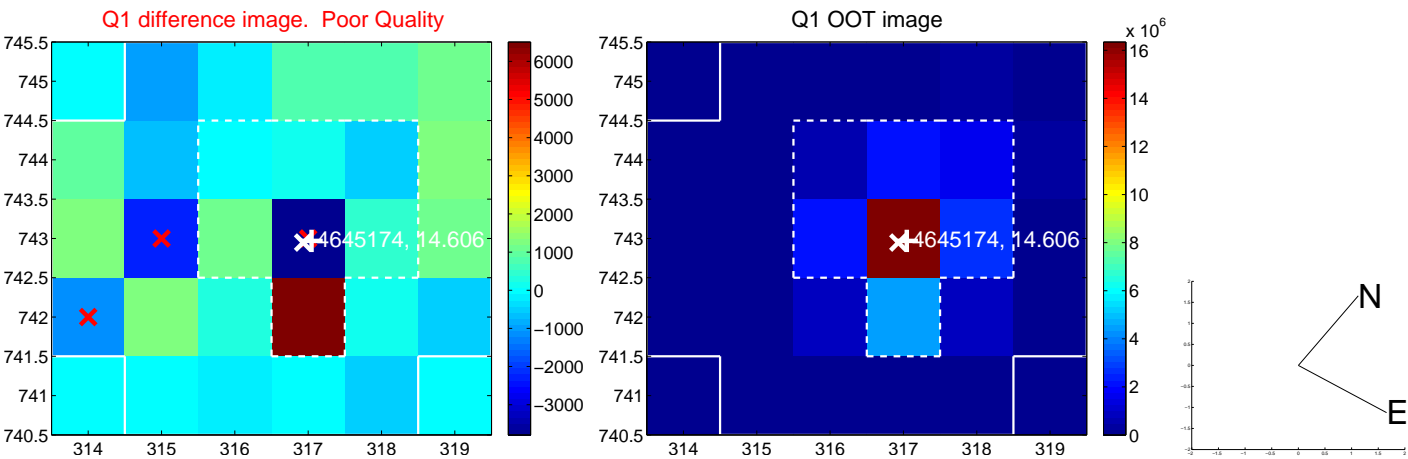
The direct PRF centroid is offset from the target star catalog position by about 0.50 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|---|--------------------|---------------------|-------------------|--------------------|
| PRF-fit source offset from OOT | 0.409 ± 0.914 | 0.45 | 0.071 ± 0.547 | -0.403 ± 0.842 |
| PRF-fit source offset from KIC position | 0.419 ± 0.635 | 0.66 | 0.415 ± 0.549 | -0.055 ± 0.779 |
| photometric centroid source offset | 1.54 ± 1.36 | 1.13 | -0.51 ± 1.43 | -1.46 ± 1.35 |

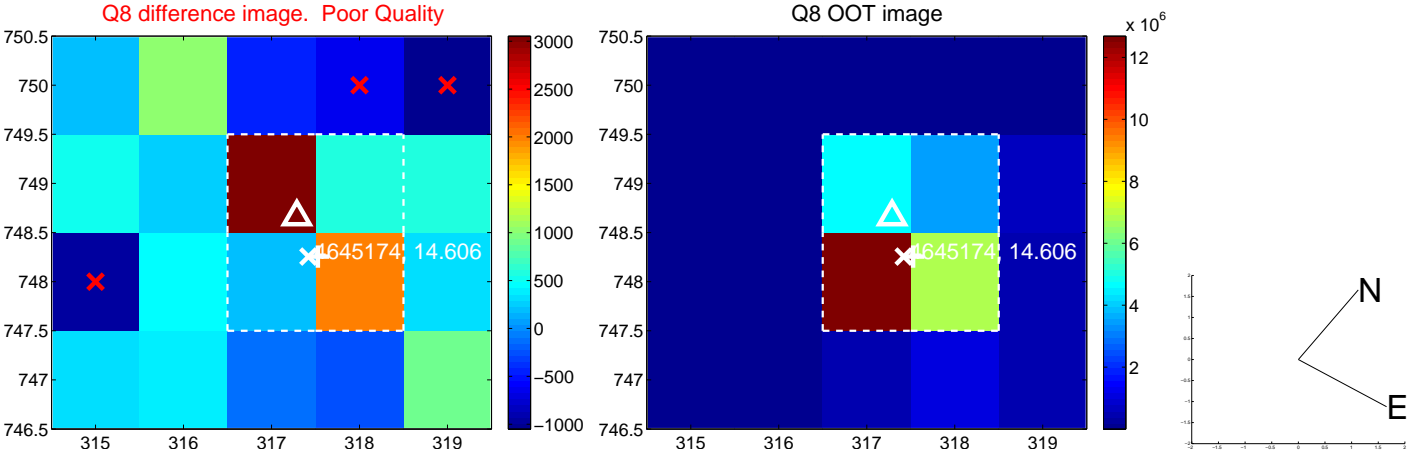
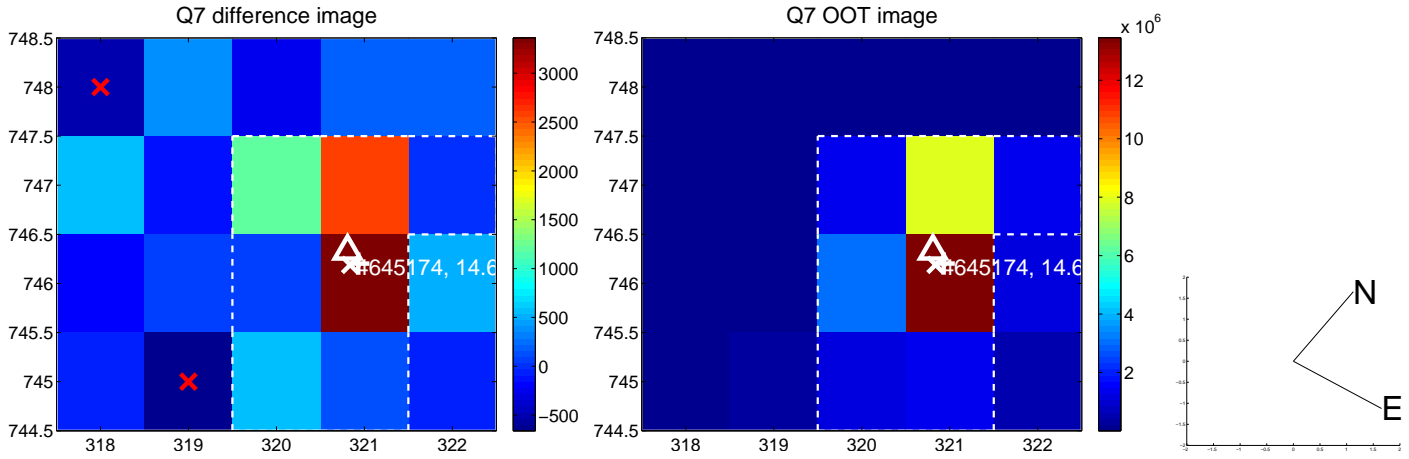
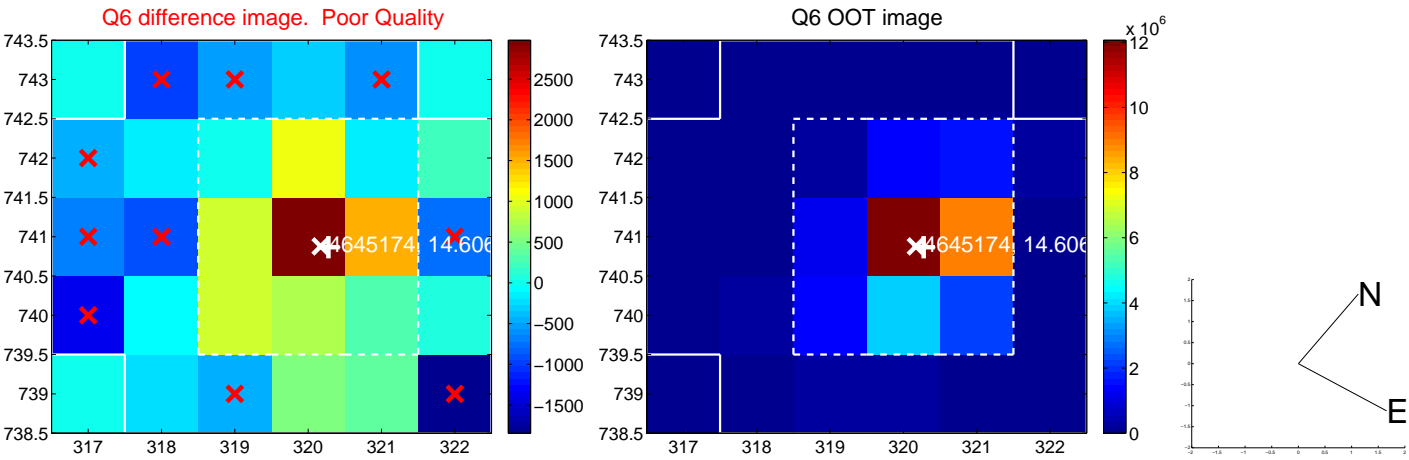
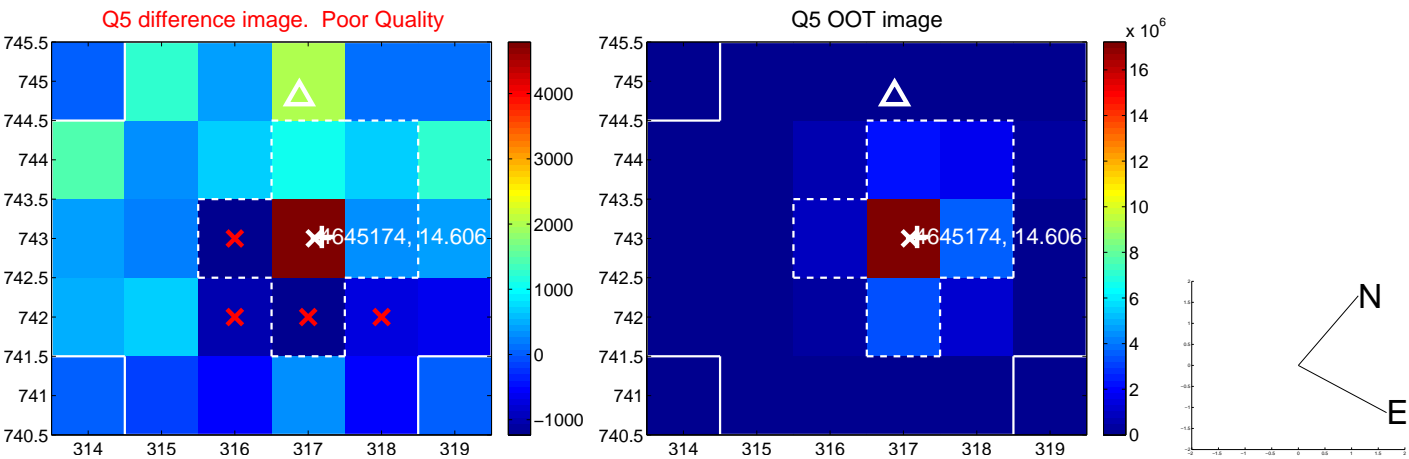


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

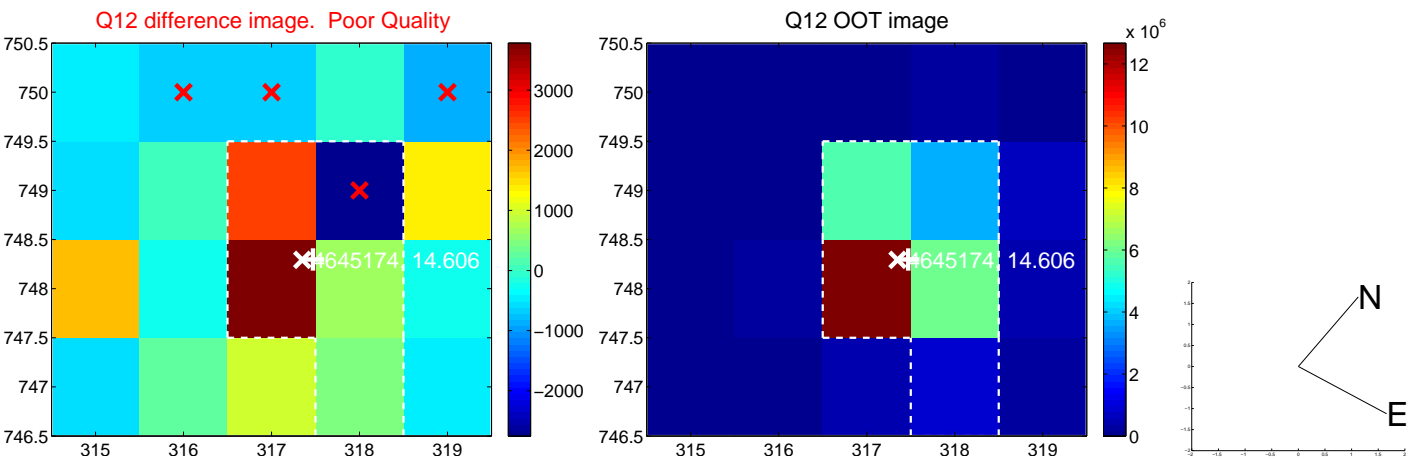
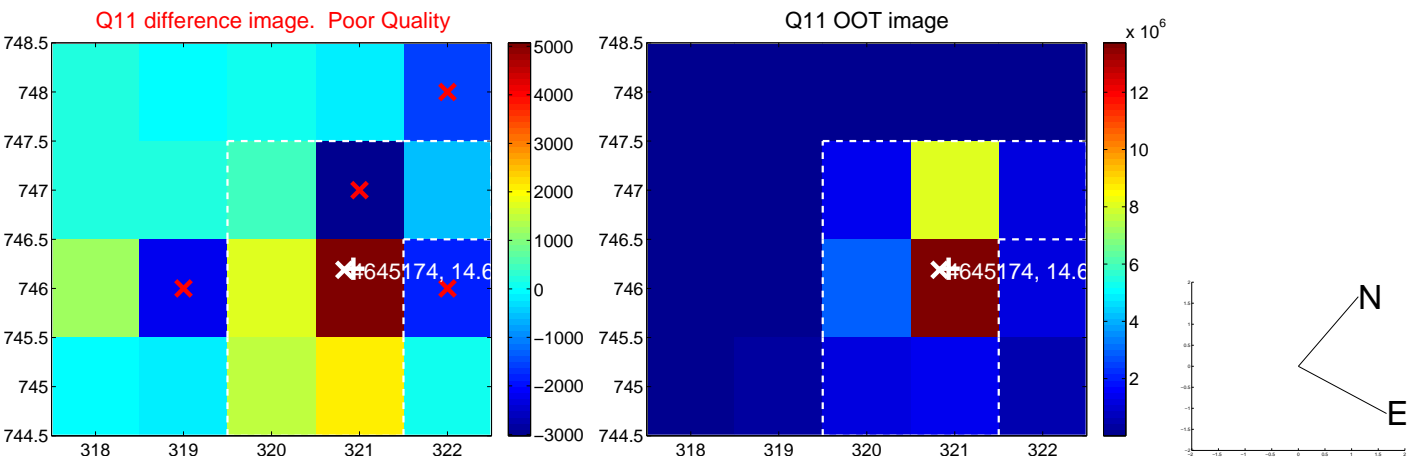
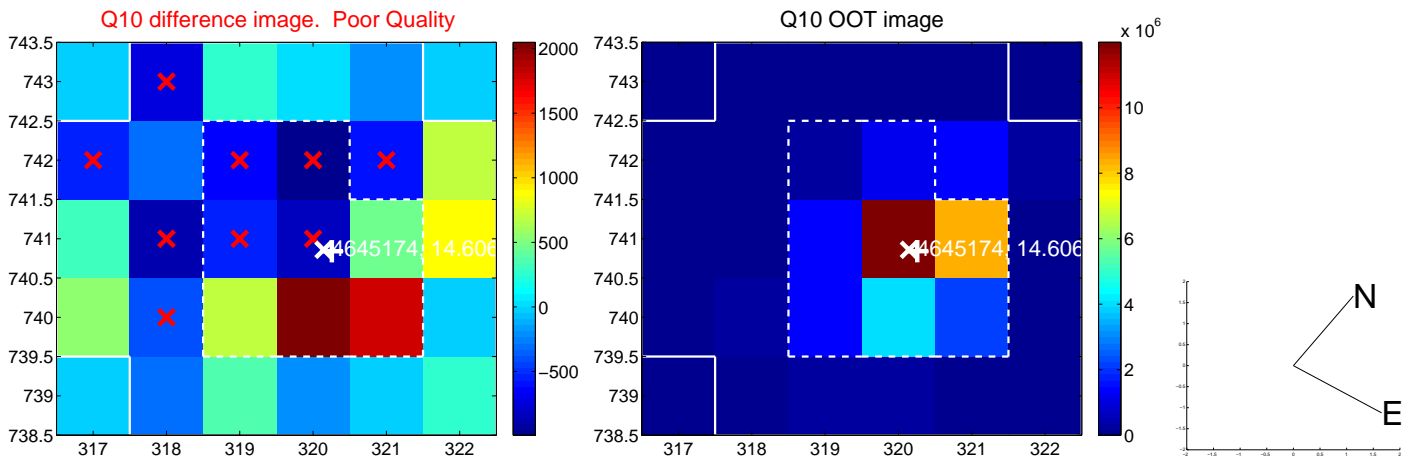
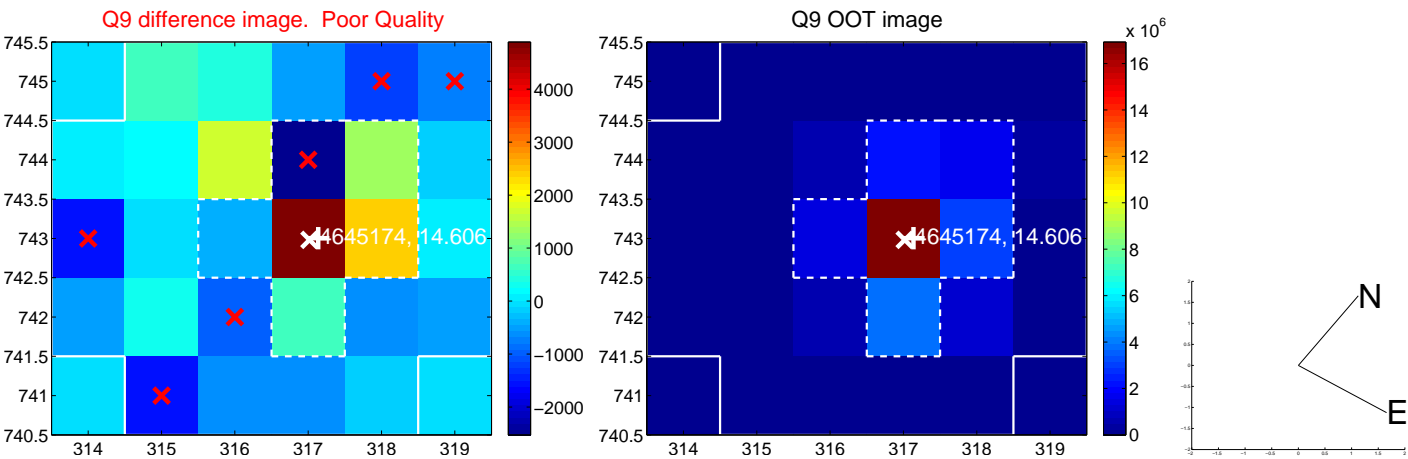
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



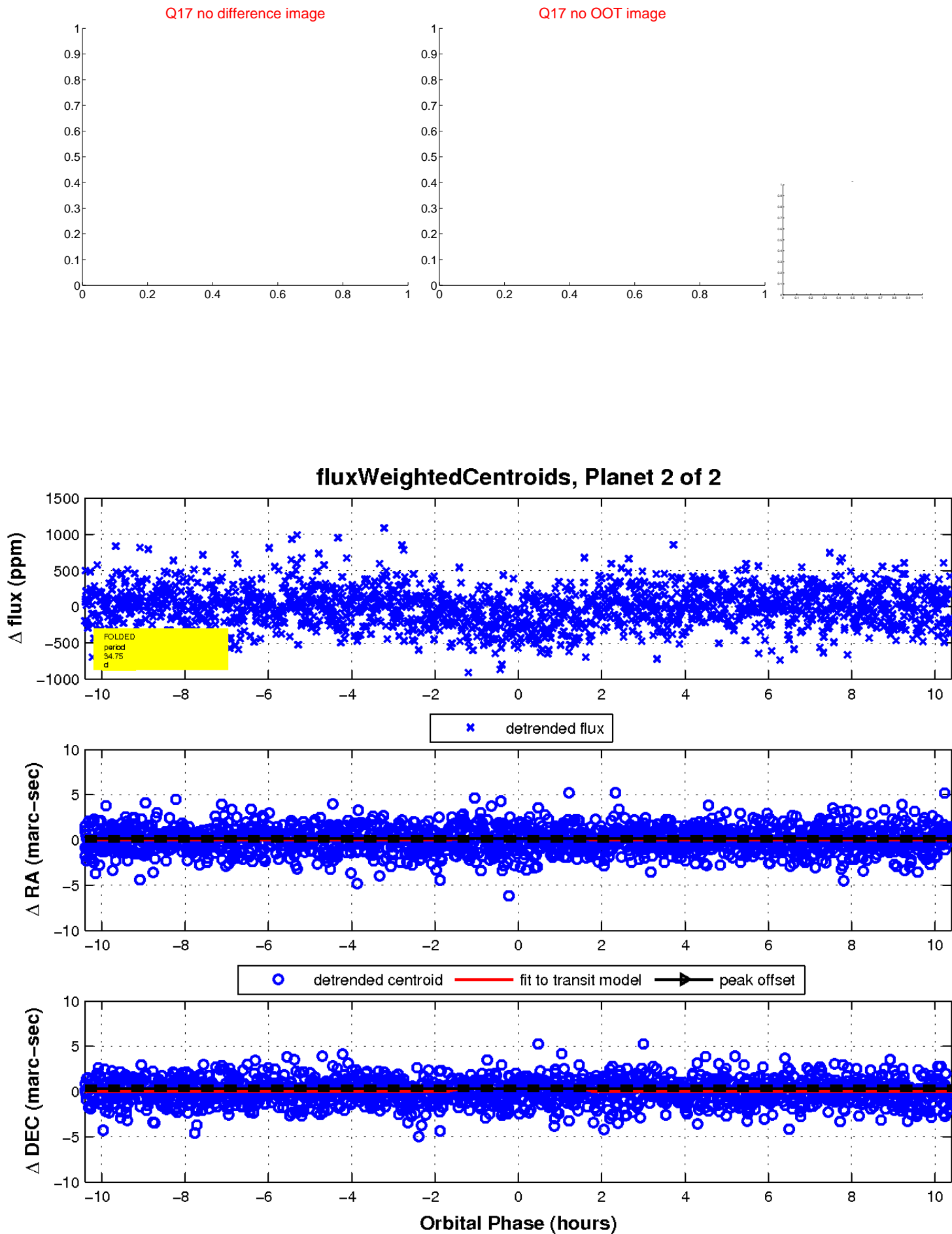
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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.



UKIRT Image

Declination

