

KIC 004456940

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}) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 004456940-01 | OBS | No | 1.963287 | 131.796203 | 20.4 | 9.075 | 11.4 | 8.5 | 1.31 | 6537 | 0.60 | 2646.15 |
| 004456940-02 | OBS | No | 314.767037 | 234.597095 | 289.4 | 5.087 | 17.5 | 8.2 | 1.31 | 6537 | 2.68 | 3.04 |
| 004456940-03 | OBS | No | 3.925970 | 133.621186 | 58.3 | 26.742 | 10.2 | 10.6 | 1.31 | 6537 | 1.03 | 1050.34 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|---|
| 004456940-01 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | SWEET_NTL—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT |
| 004456940-02 | OBS | FP | 0.00 | 1 | 0 | 1 | 0 | INDIV_TRANS_RUBBLE_MARSHALL_SKYE—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT— INCONSISTENT_TRANS—CENT_FEW_DIFFS—HALO_GHOST |
| 004456940-03 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_SKYE_ZUMA—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD |

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

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

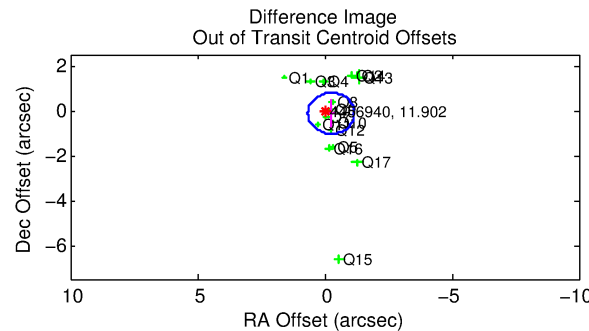
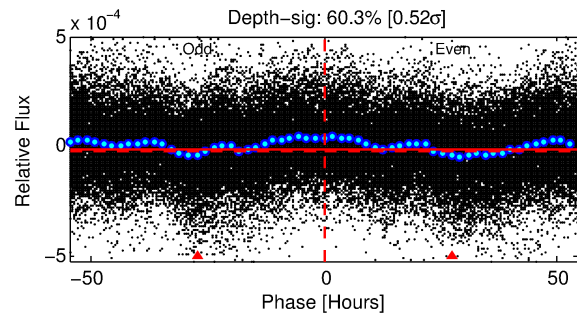
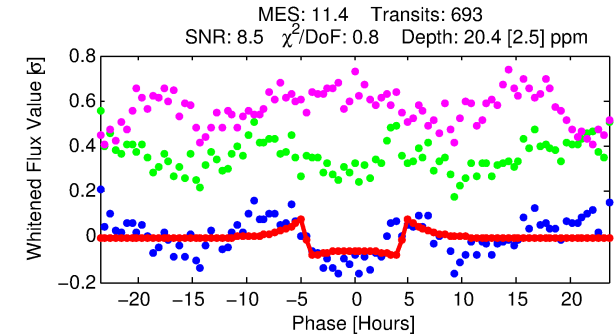
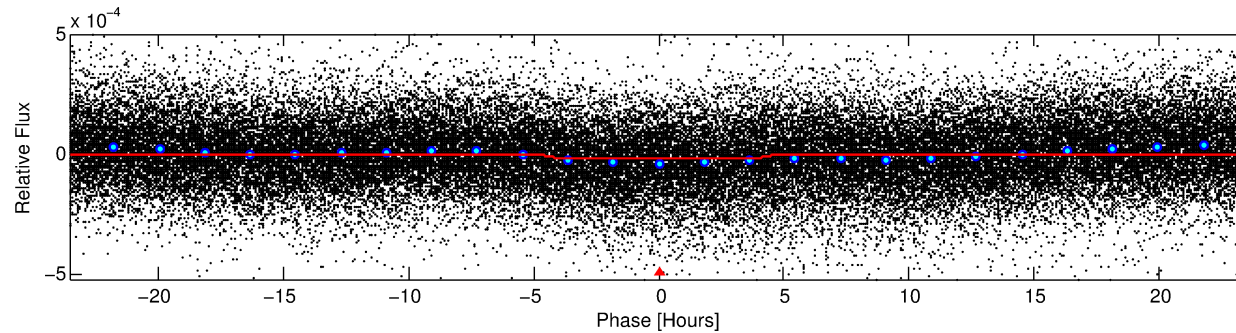
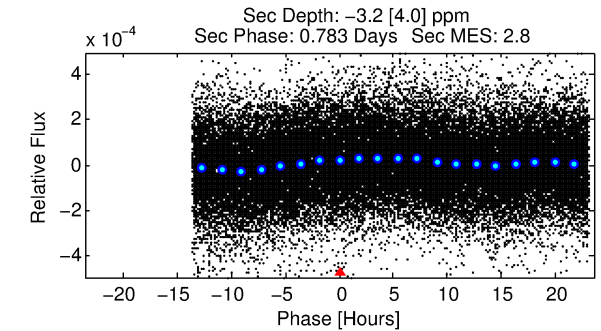
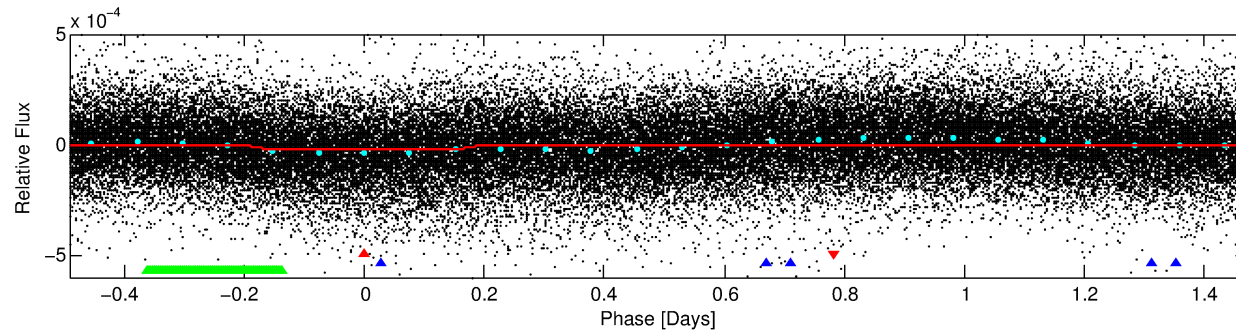
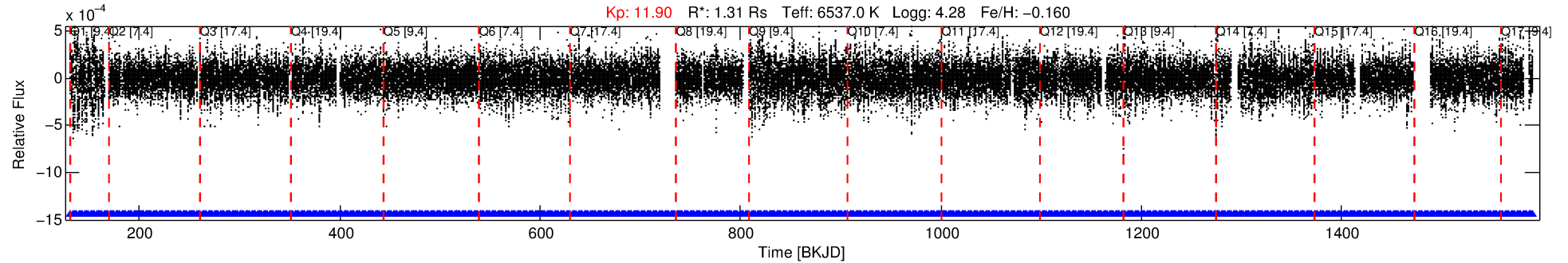
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 004456940-01

No Significant Match Found

DV One-Page Summary

KIC: 4456940 Candidate: 1 of 3 Period: 1.963 d



DV Fit Results:

Period = 1.96329 [0.00002] d
Epoch = 131.7962 [0.0041] BKJD
Rp/R* = 0.0042 [0.0016]
a/R* = 1.68 [2.14]
b = 0.38 [4.48]
Seff = 2646.15 [1061.98]
Teq = 1829 [183] K
Rp = 0.60 [0.29] Re
a = 0.0325 [0.0084] AU
Ag = N/A
Teffp = N/A

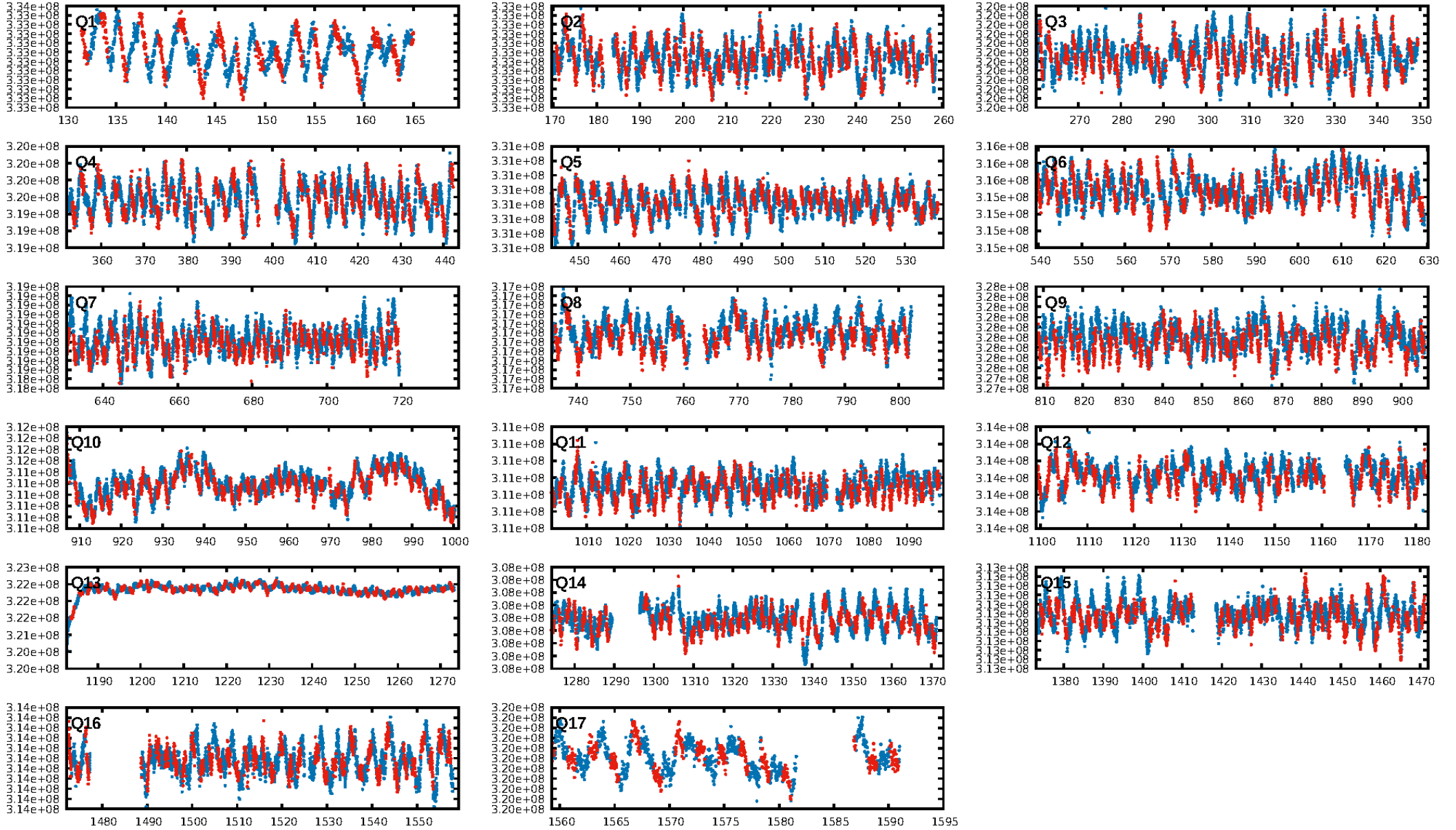
DV Diagnostic Results:

ShortPeriod-sig: N/A
LongPeriod-sig: 90.5% [1.67σ]
ModelChiSquare2-sig: N/A
ModelChiSquareGof-sig: N/A
Bootstrap-pfa: N/A
RollingBand-fgt: 1.00 [661/661]
GhostDiagnostic-chr: 0.7014
Centroid-sig: 47.5%
Centroid-so: 0.392 arcsec [0.73σ]
OotOffset-rm: 0.278 arcsec [0.91σ]
KicOffset-rm: 0.262 arcsec [0.73σ]
OotOffset-st: 3/4/4/5 [16]
KicOffset-st: 3/4/4/5 [16]
DiffImageQuality-fgm: 0.69 [11/16]
DiffImageOverlap-fno: 1.00 [17/17]

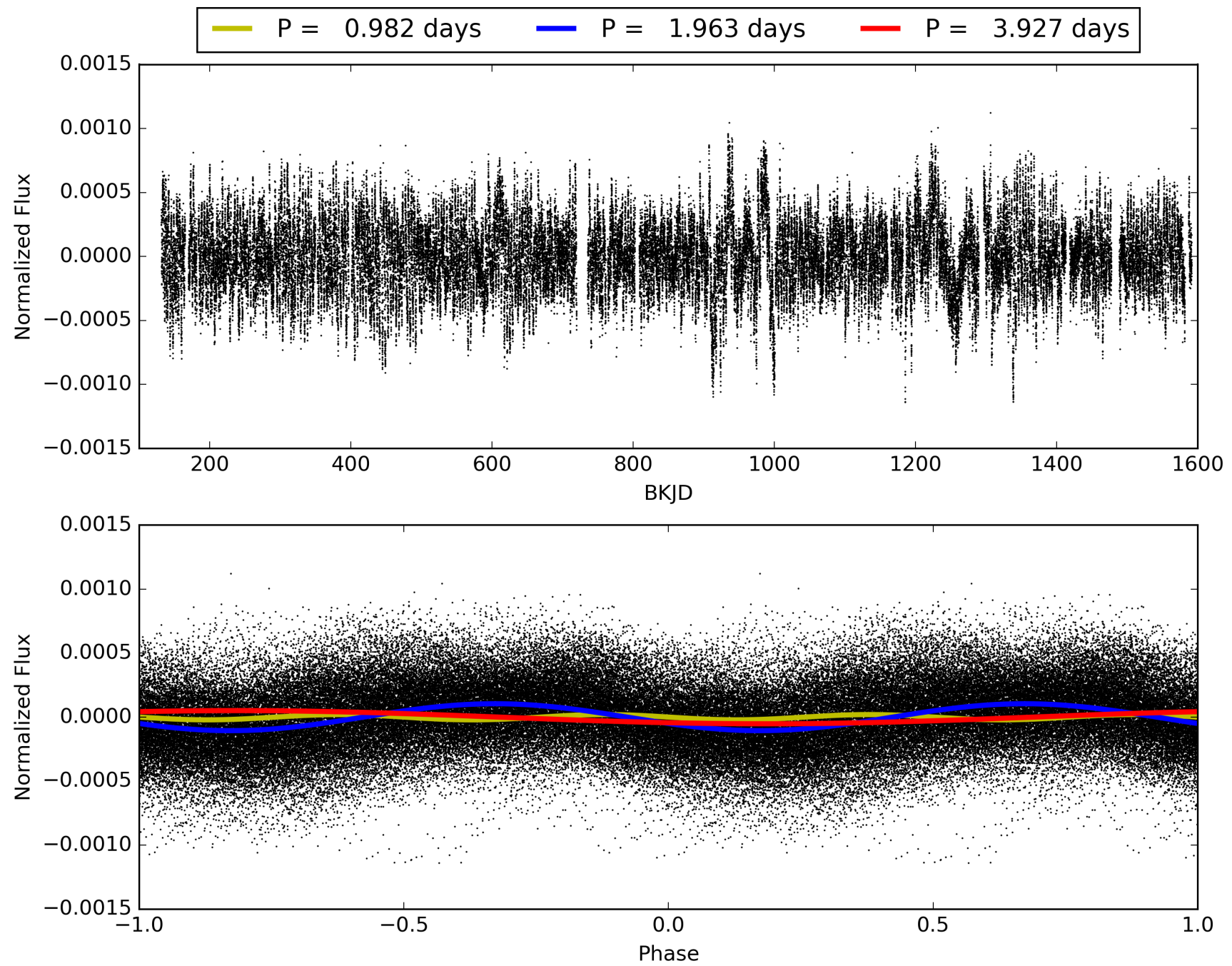
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 03:33:42 Z

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

TCE 004456940-01, PDC Light Curves

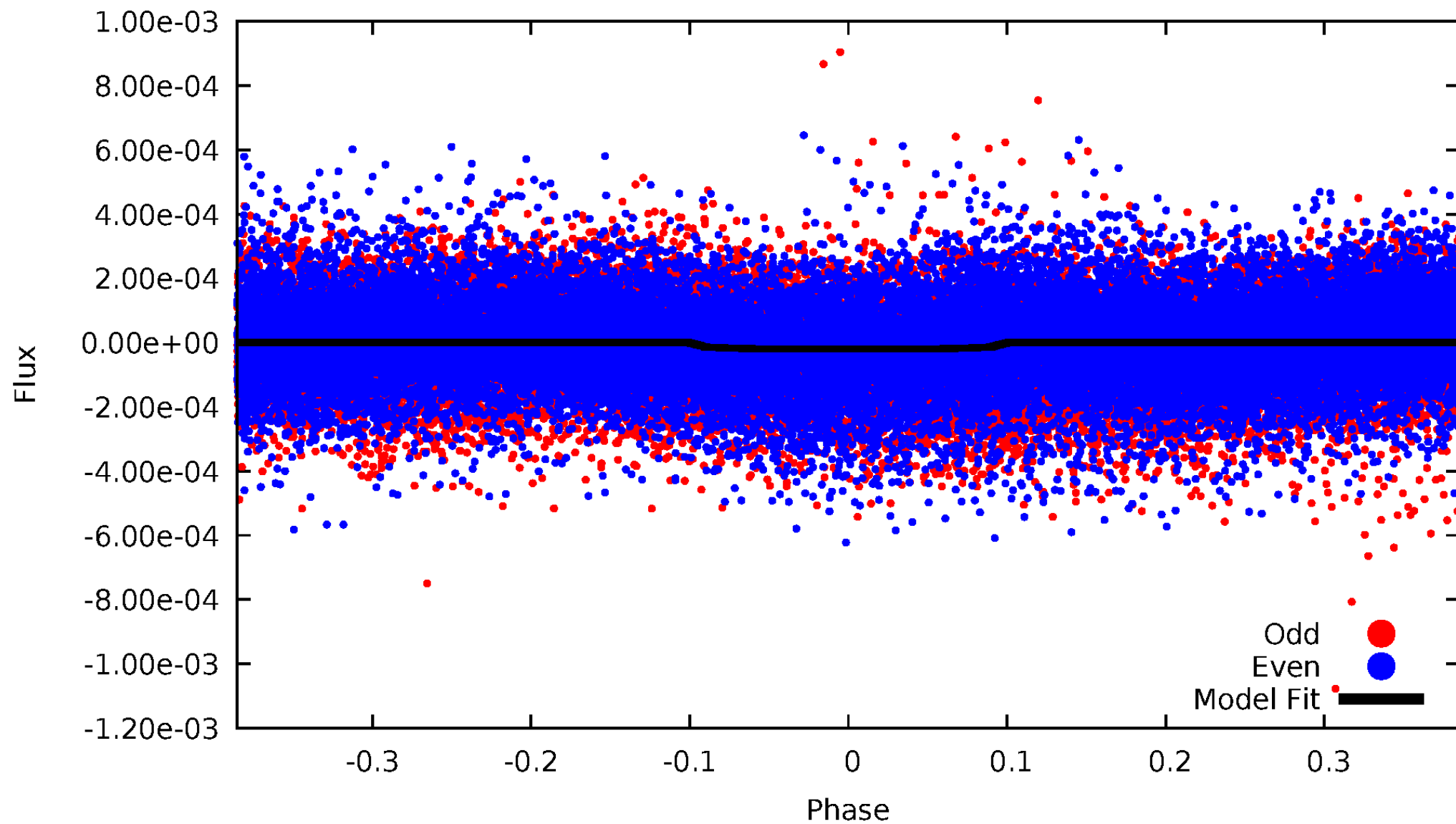


TCE 004456940-01



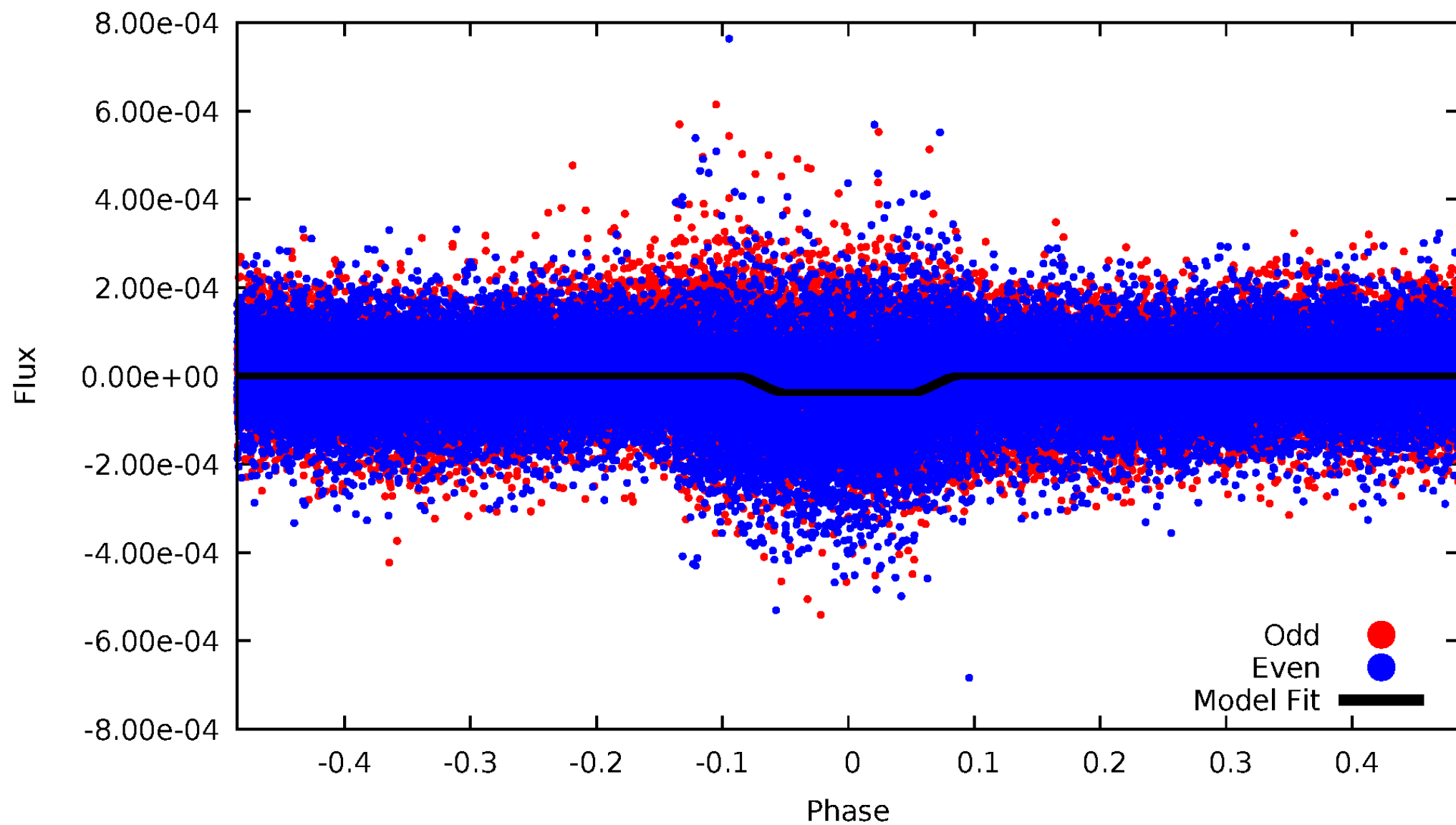
DV Odd/Even

TCE 004456940-01

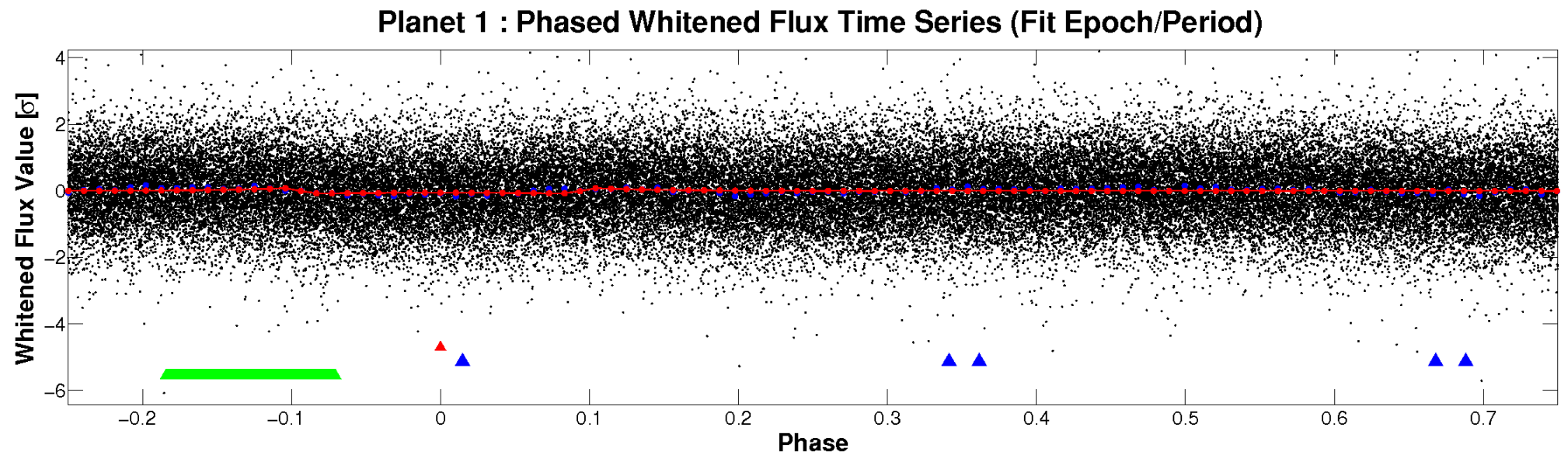
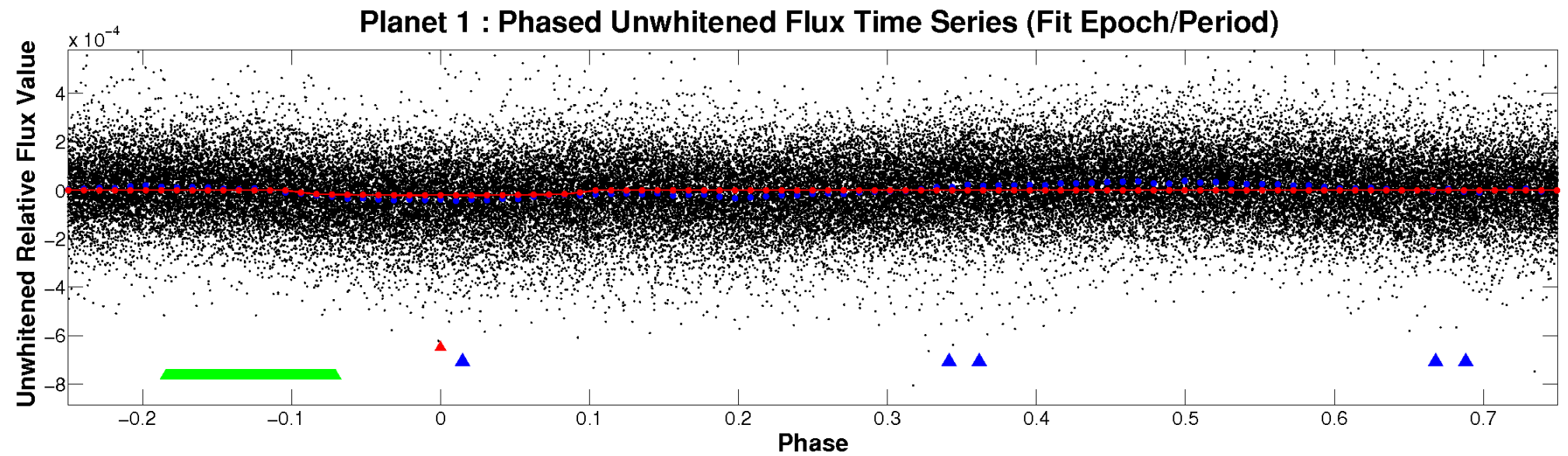


ALT Odd/Even

TCE 004456940-01

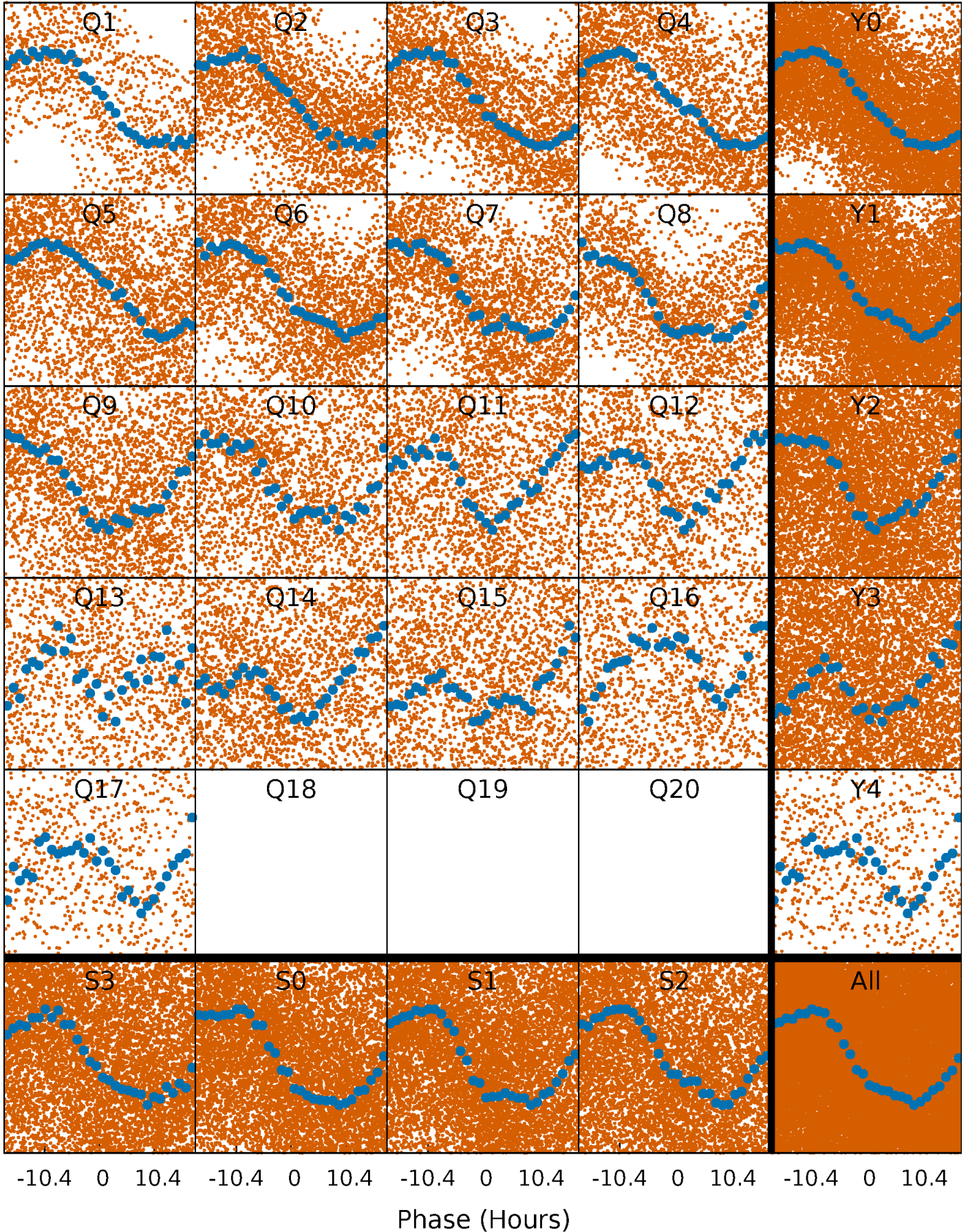


Non-Whitened Vs. Whitened Light Curve



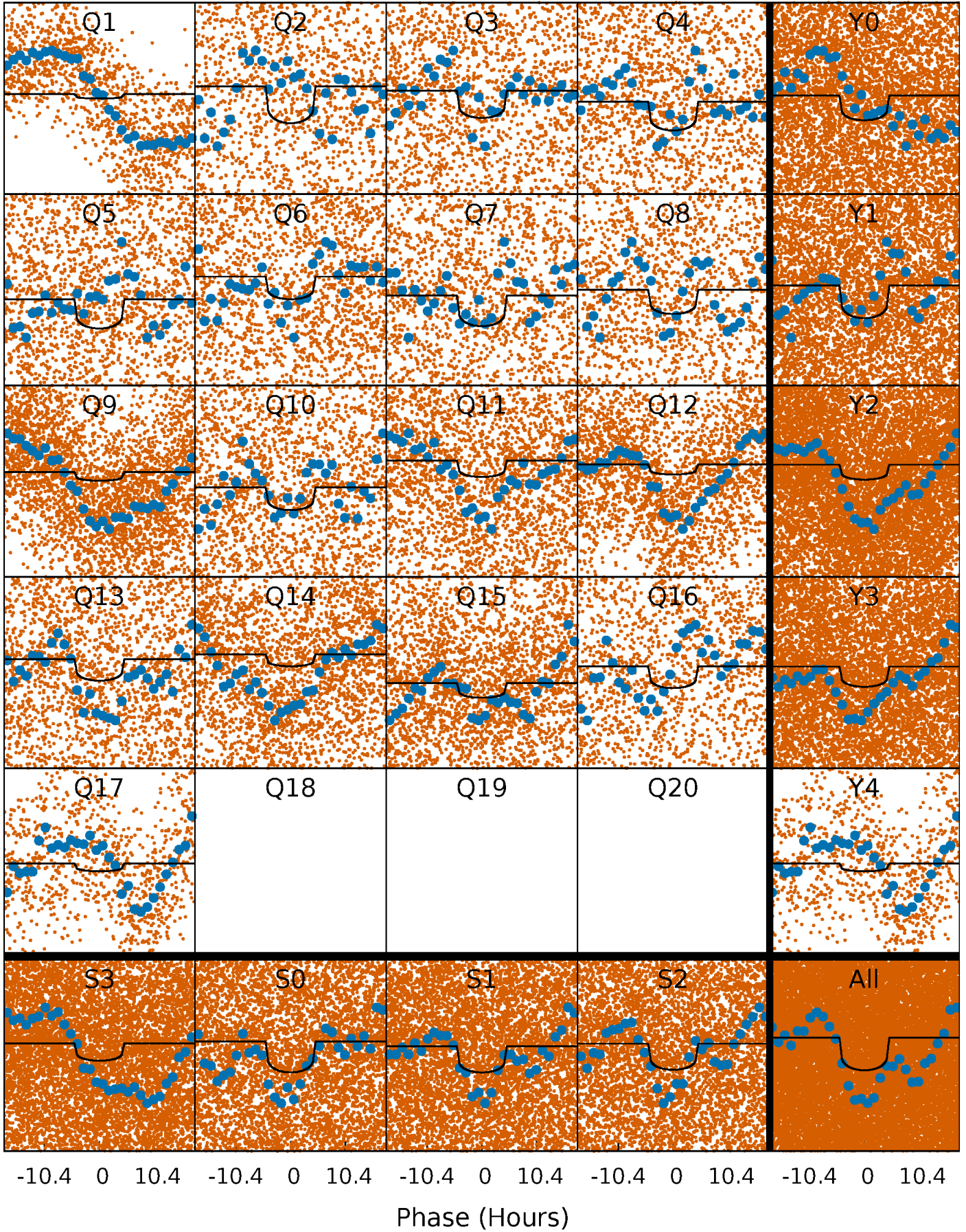
PDC Quarter-Phased Transit Curves

TCE 004456940-01 P= 1.963287 Days $T_0=131.796203$ (BKJD)



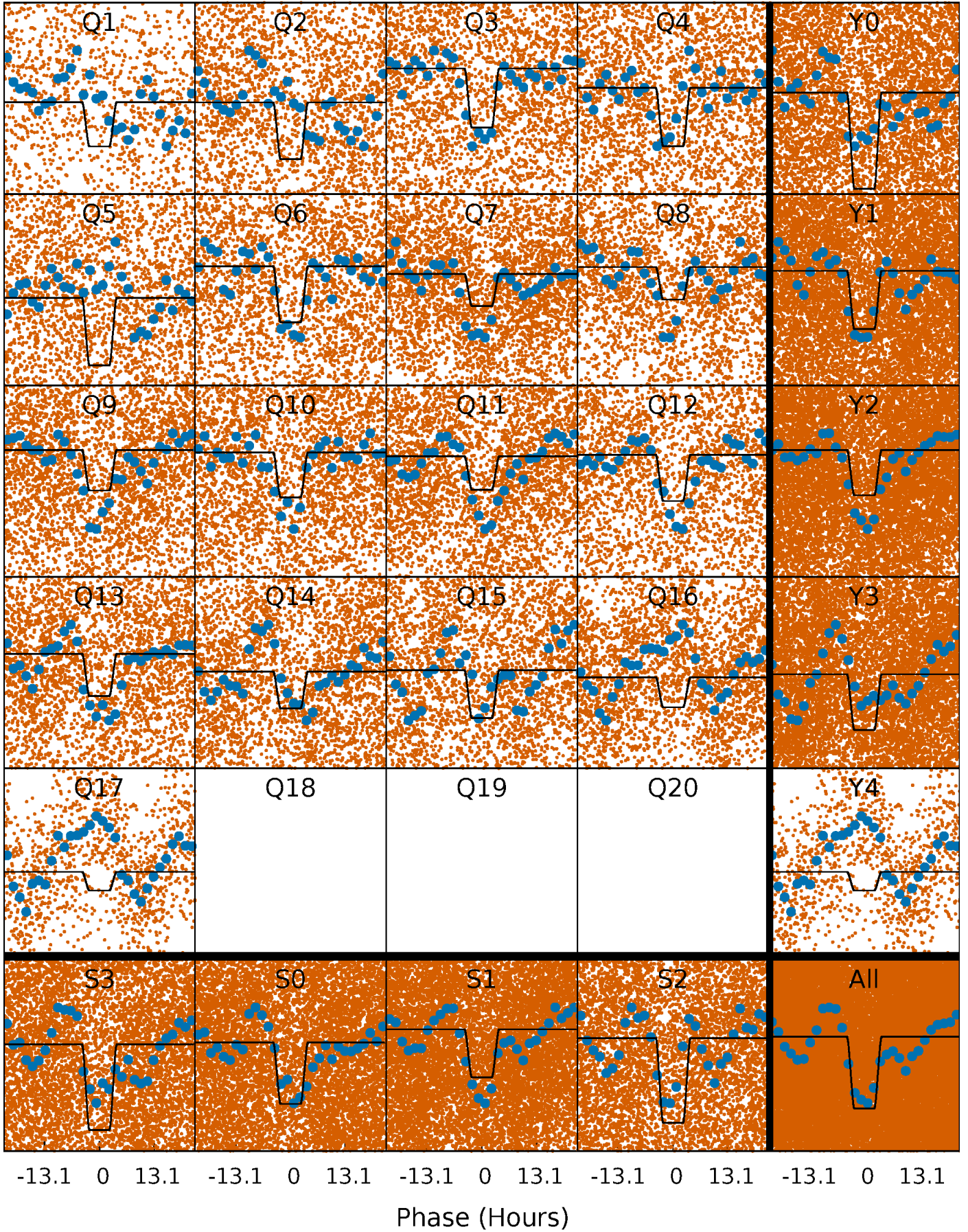
DV Quarter-Phased Transit Curves

TCE 004456940-01 P= 1.963287 Days $T_0=131.796203$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

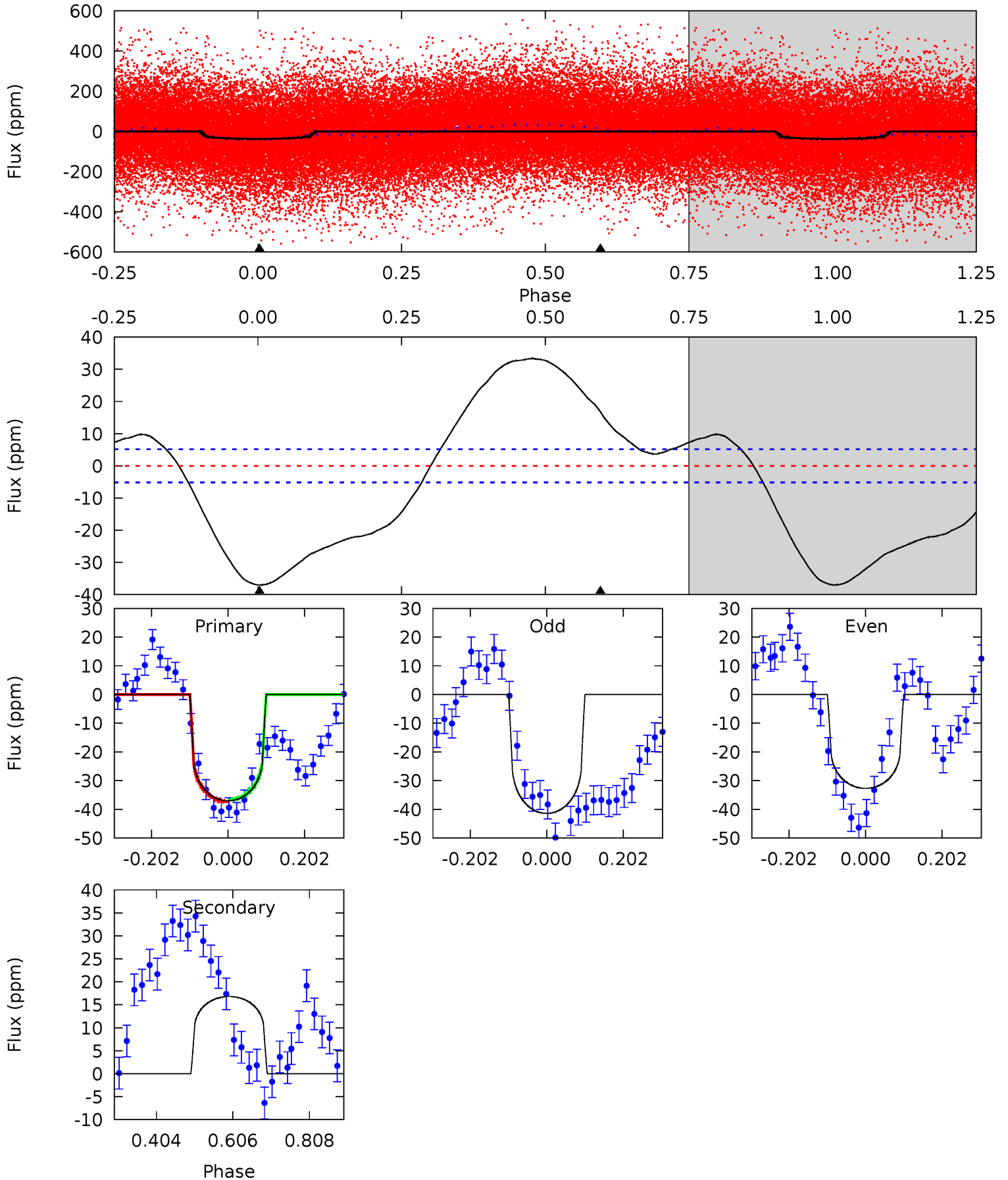
TCE 004456940-01 P= 1.963180 Days $T_0=131.836668$ (BKJD)



DV Model-Shift Uniqueness Test

004456940-01, P = 1.963287 Days, E = 129.832916 Days

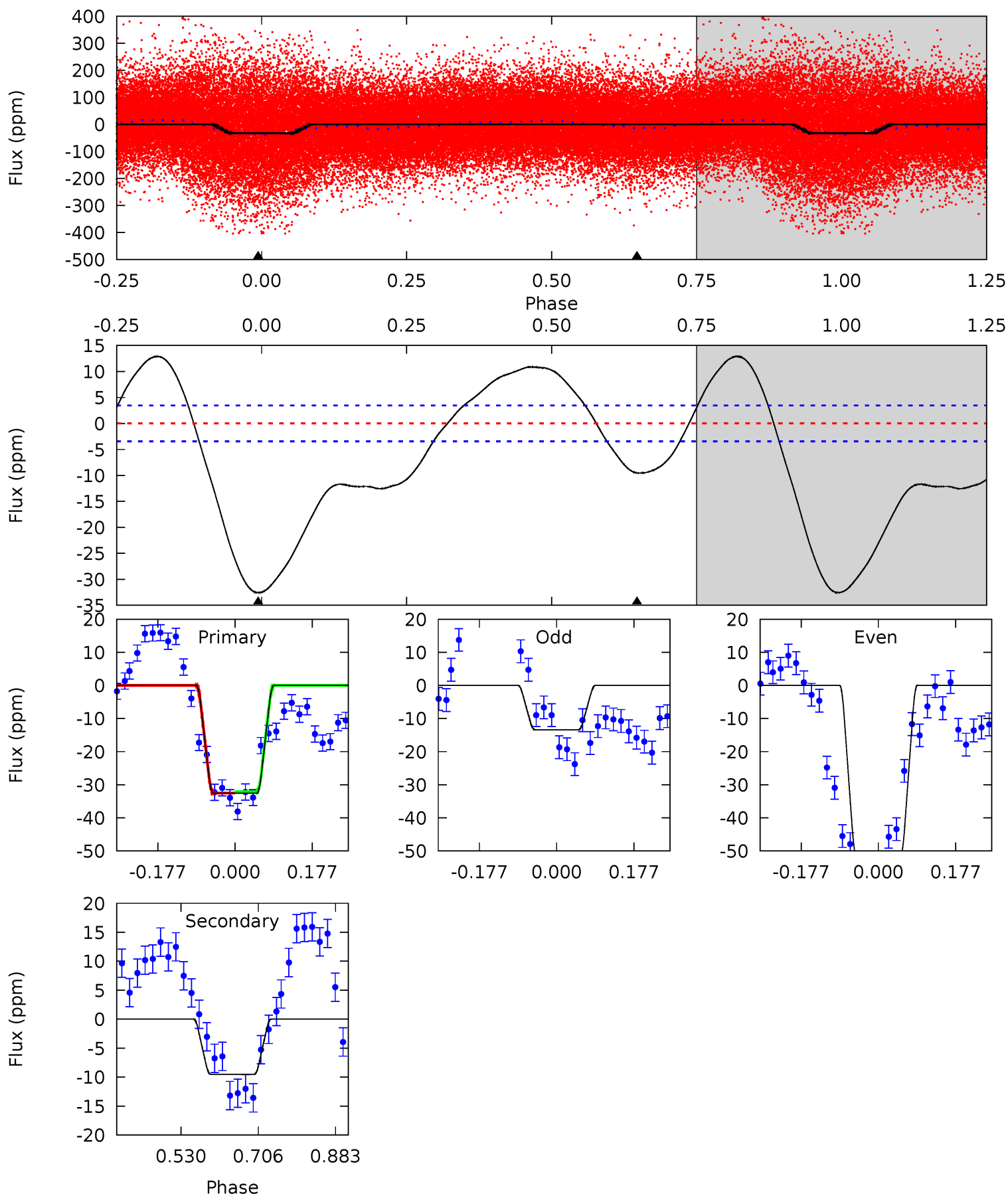
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|-------|-----|-----|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 31.6 | -14.3 | 0 | 0 | 4.42 | 1.28 | 12.4 | 31.6 | 31.6 | -14.3 | -14.3 | 3.78 | 1.32 | 0.47 | 0.25 |



Alt Model-Shift Uniqueness Test

004456940-01, P = 1.963180 Days, E = 129.873488 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|-----|-----|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 41.9 | 12.2 | 0 | 0 | 4.44 | 1.35 | 11.3 | 41.9 | 41.9 | 12.2 | 12.2 | 24.0 | 1.13 | 0.28 | 0.24 |



Stellar Parameters For KIC 004456940

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | $R (R_{\odot})$ | $M(M_{\odot})$ | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
| | 6537^{+181}_{-250} | $4.280^{+0.108}_{-0.201}$ | $-0.160^{+0.250}_{-0.300}$ | $1.307^{+0.404}_{-0.218}$ | $1.190^{+0.192}_{-0.174}$ | $0.750^{+0.445}_{-0.375}$ |
| | +3%/-4% | +3%/-5% | +156%/-188% | +31%/-17% | +16%/-15% | +59%/-50% |
| Source | PHO54 | PHO54 | PHO54 | DSEP | | |

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

Secondary Eclipse Parameters for KIC 004456940-01 / KOI

| Detrend | Depth (ppm) | $R_p (R_{\oplus})$ | $T_{max} (K)$ | $T_{obs} (K)$ | A_{obs} |
|---------|-------------|------------------------|----------------------|------------------------|-------------------------------|
| DV | 17 ± 1 | $0.62^{+0.27}_{-0.24}$ | 2587^{+183}_{-162} | -6417^{+904}_{-1943} | $-25.512^{+13.432}_{-41.452}$ |
| Alt. | -10 ± 1 | $0.89^{+0.28}_{-0.23}$ | 2592^{+202}_{-163} | 4704^{+675}_{-427} | $6.946^{+5.983}_{-3.006}$ |

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 $A_{obs} \gg 1.0$

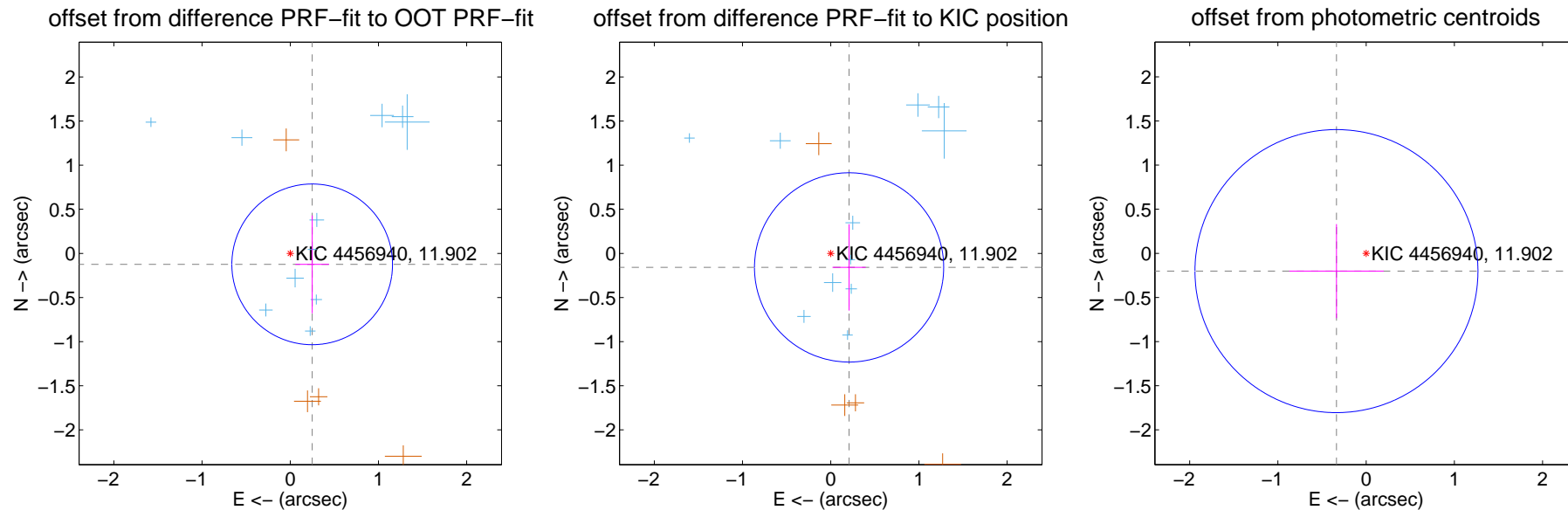
DV Centroid Data

Supplemental centroid analysis for 004456940-01. **Kepler magnitude: 11.90.** Transit SNR 8.51

There are 11 quarters with good PRF difference image offsets

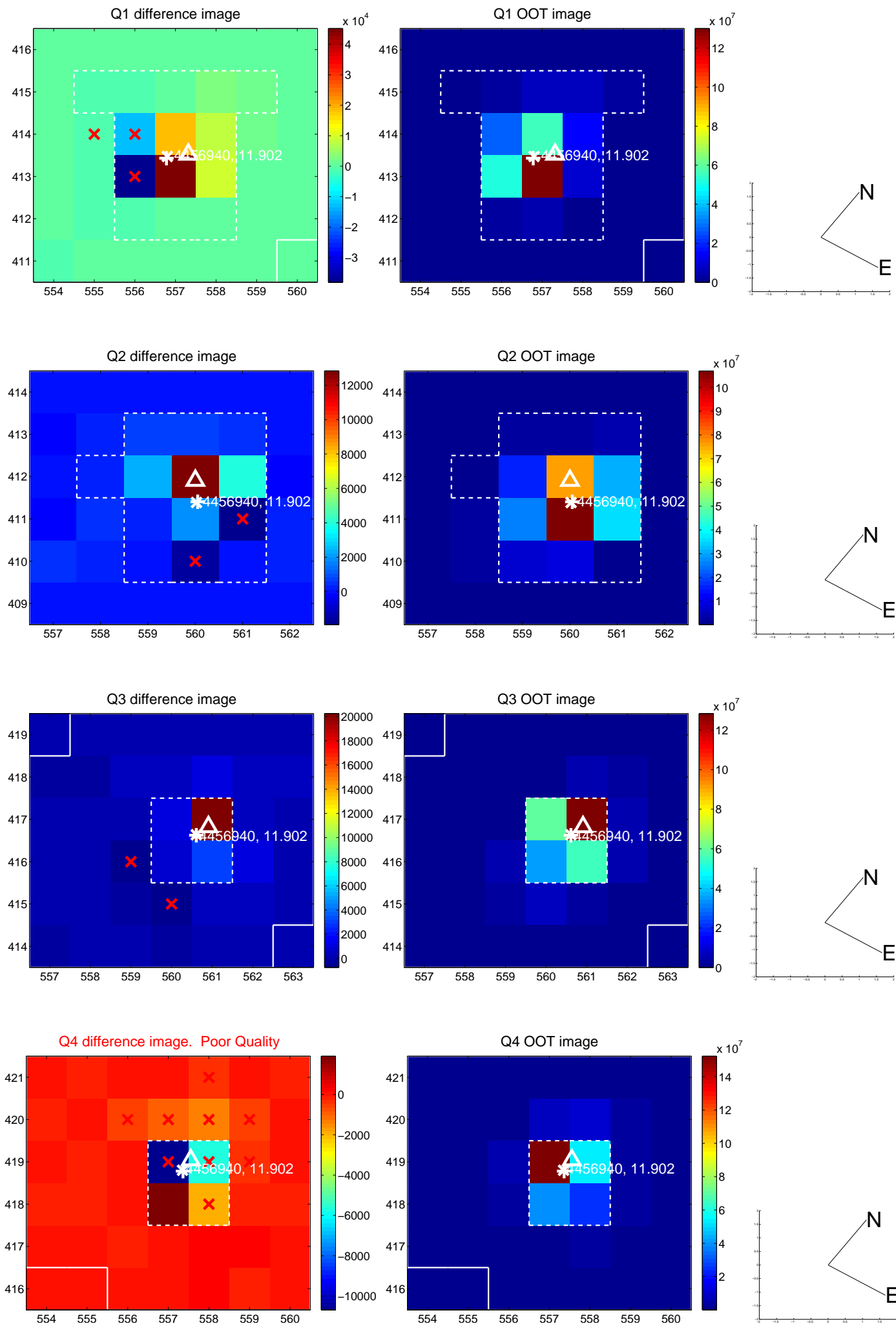
The direct PRF centroid is offset from the target star catalog position by about 0.09 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|---|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT | 0.278 ± 0.304 | 0.91 | -0.248 ± 0.191 | -0.124 ± 0.554 |
| PRF-fit source offset from KIC position | 0.262 ± 0.358 | 0.73 | -0.208 ± 0.188 | -0.159 ± 0.489 |
| photometric centroid source offset | 0.39 ± 0.53 | 0.73 | 0.34 ± 0.54 | -0.20 ± 0.53 |

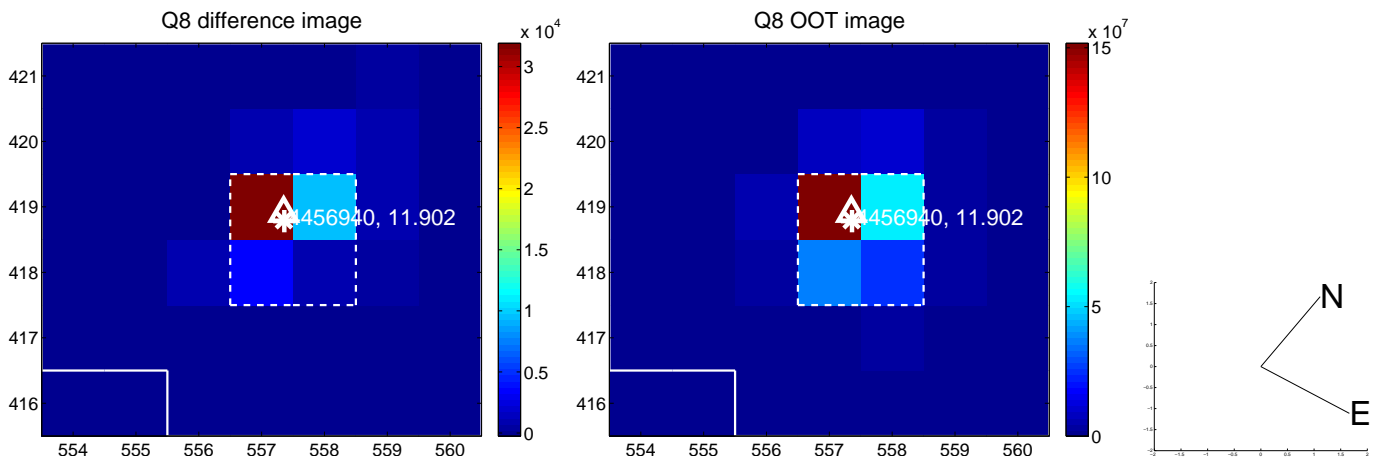
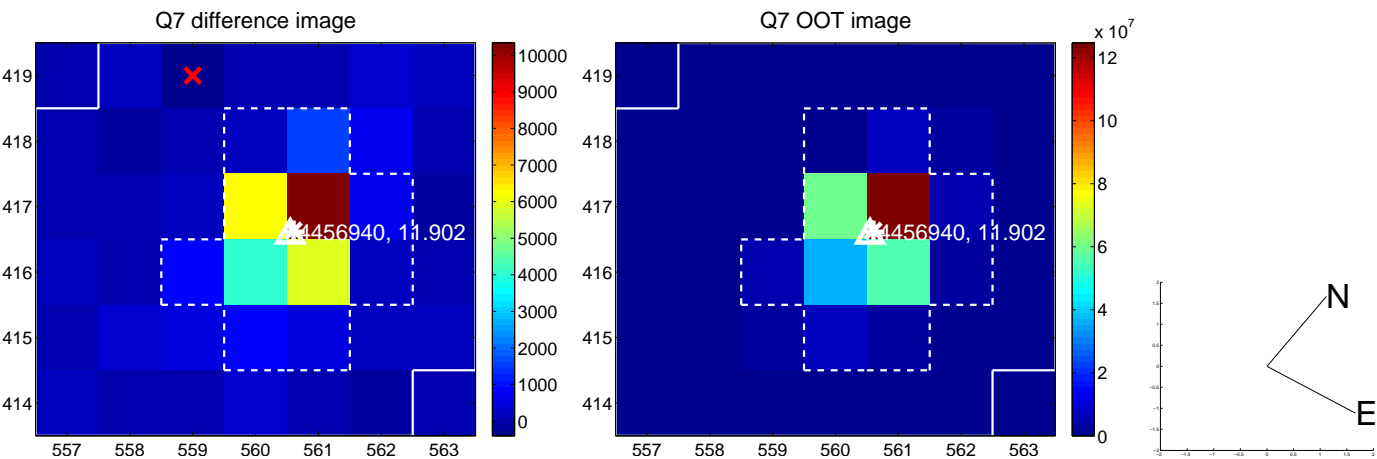
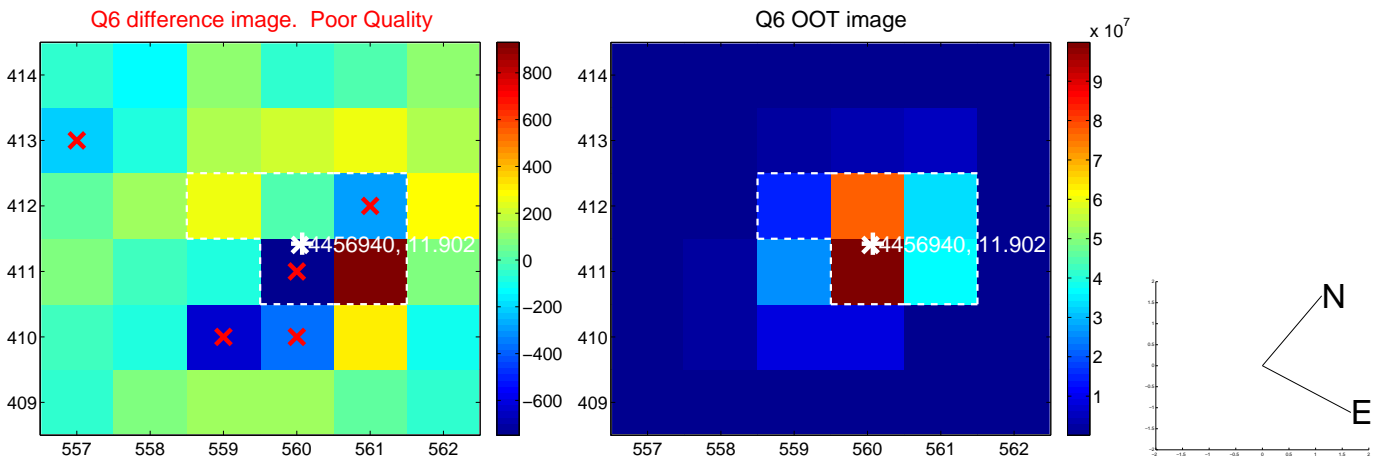
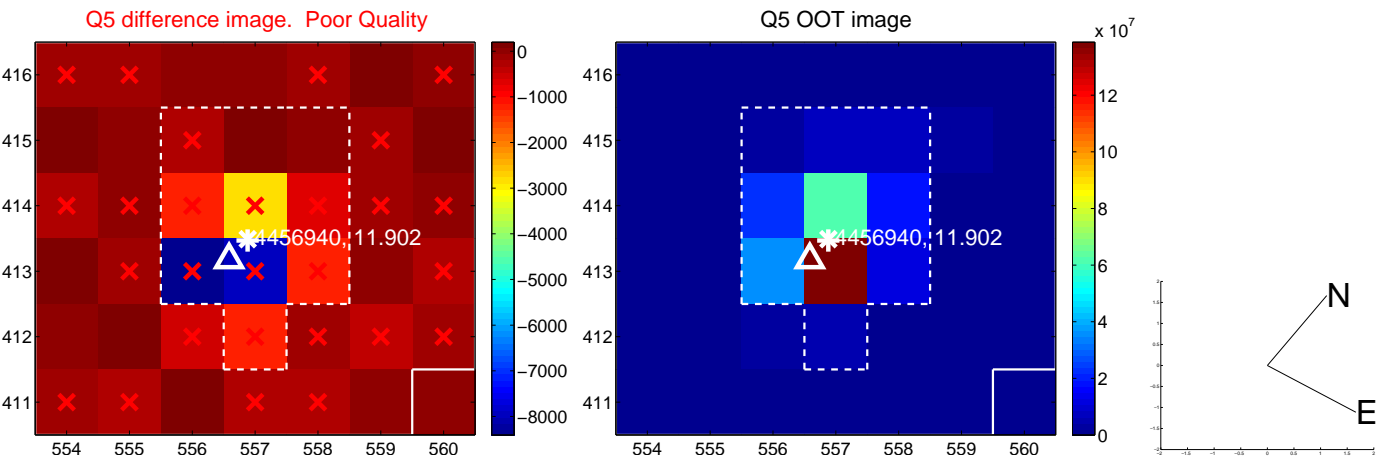


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

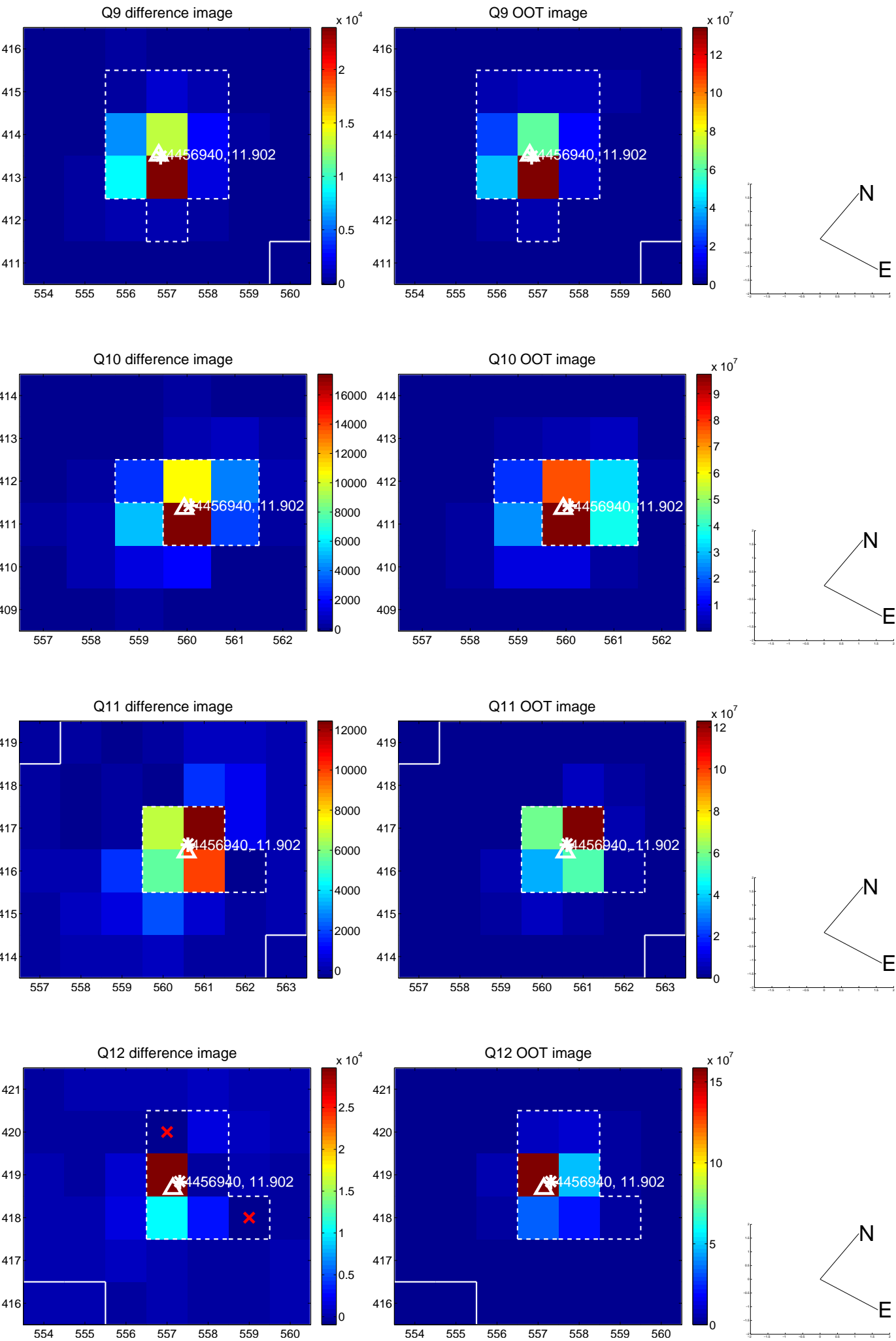
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



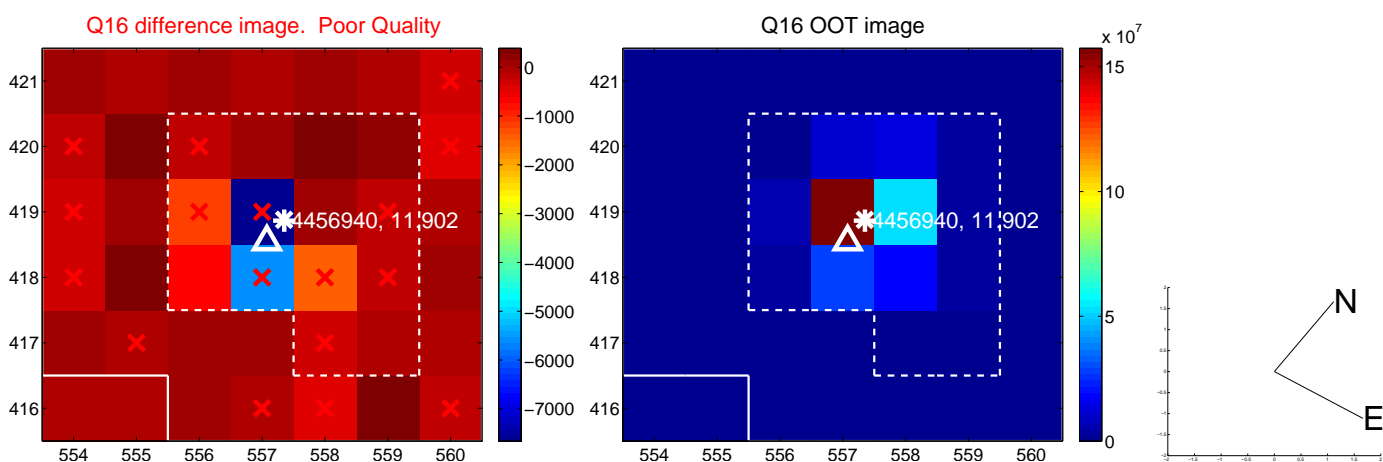
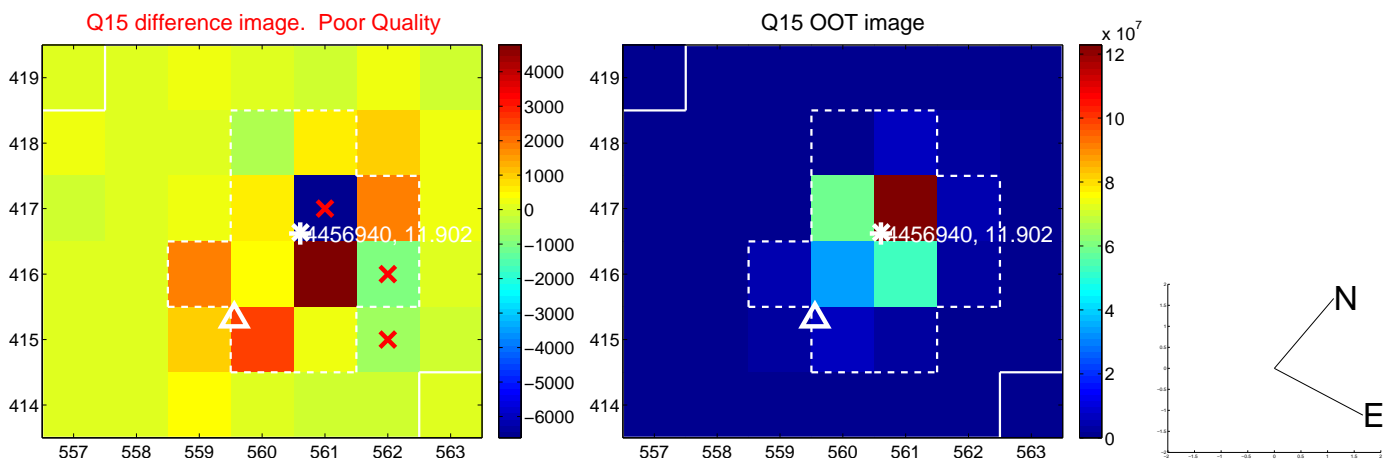
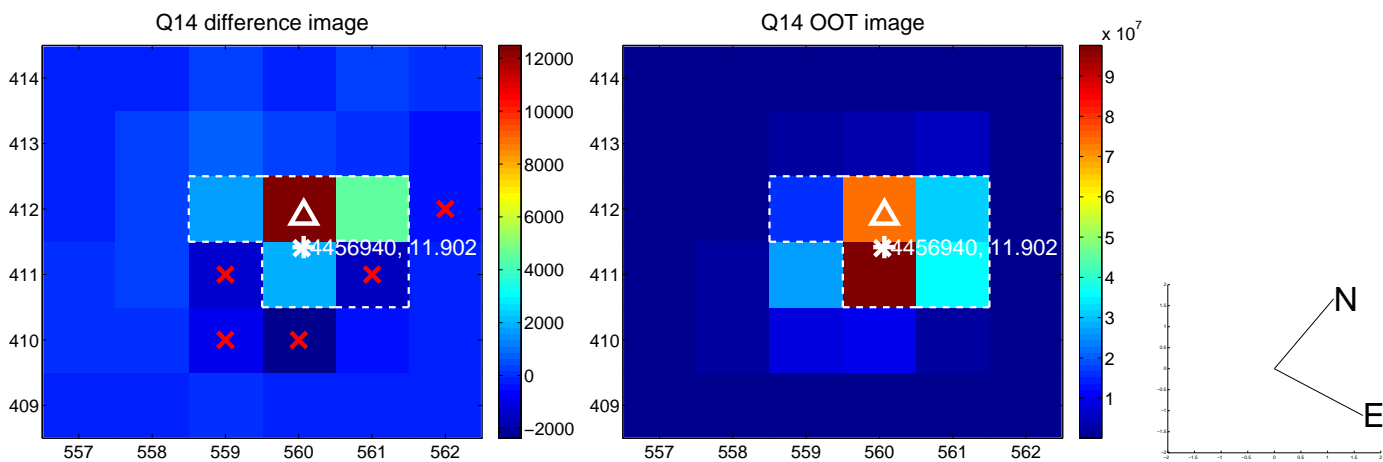
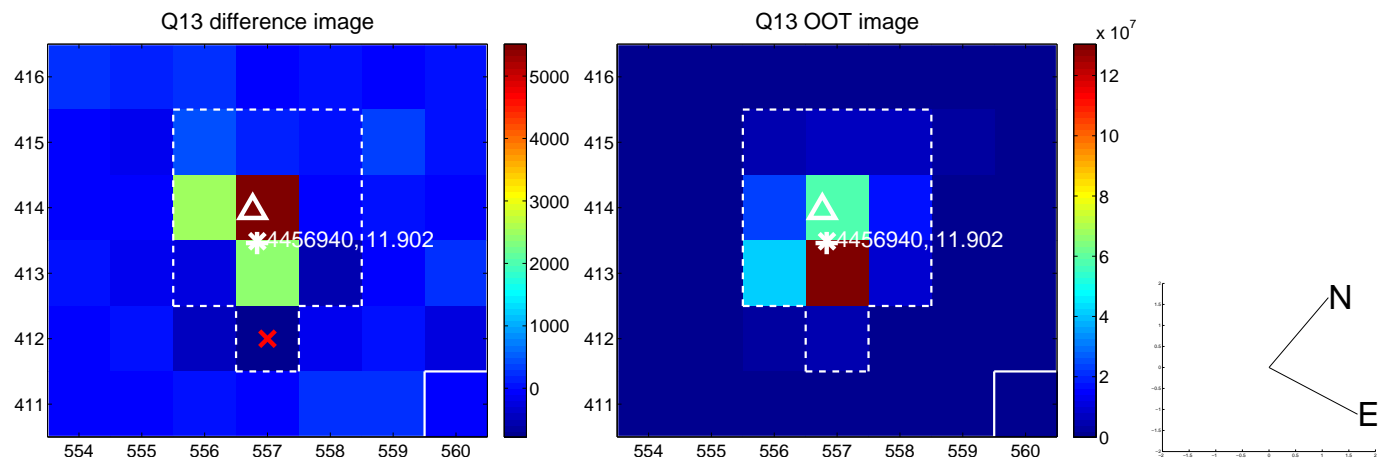
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



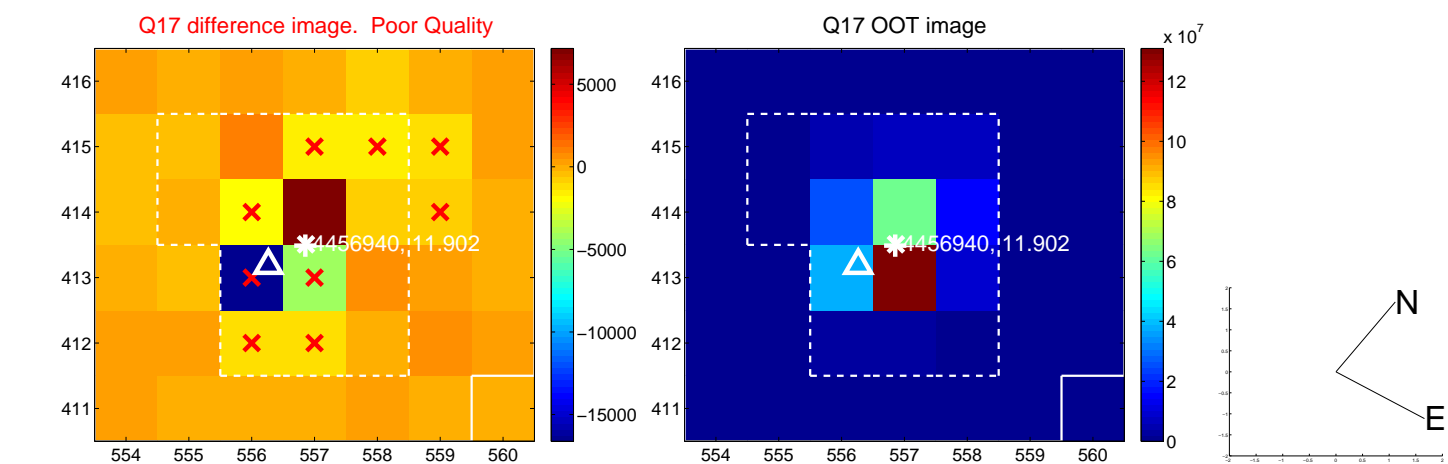
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



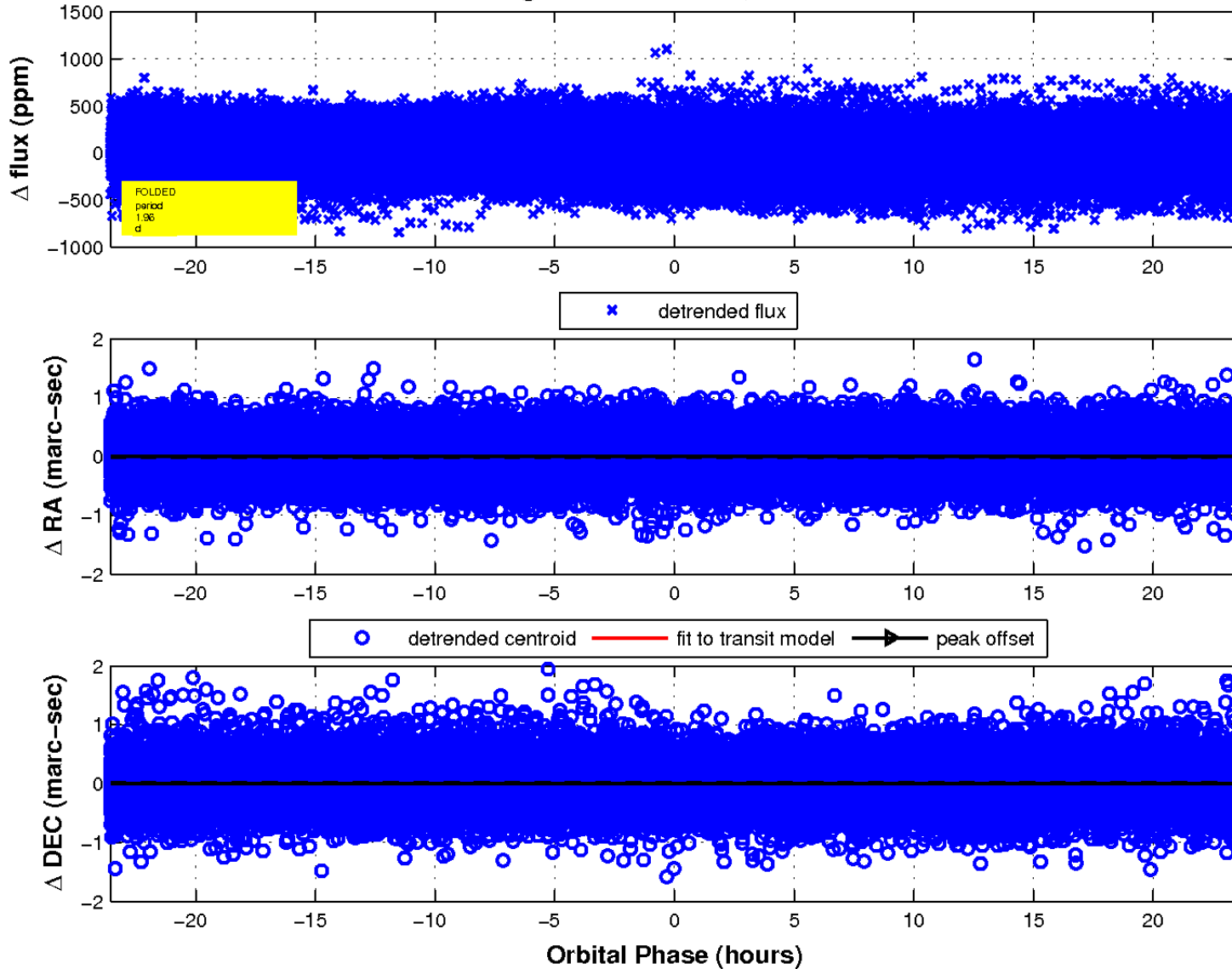
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

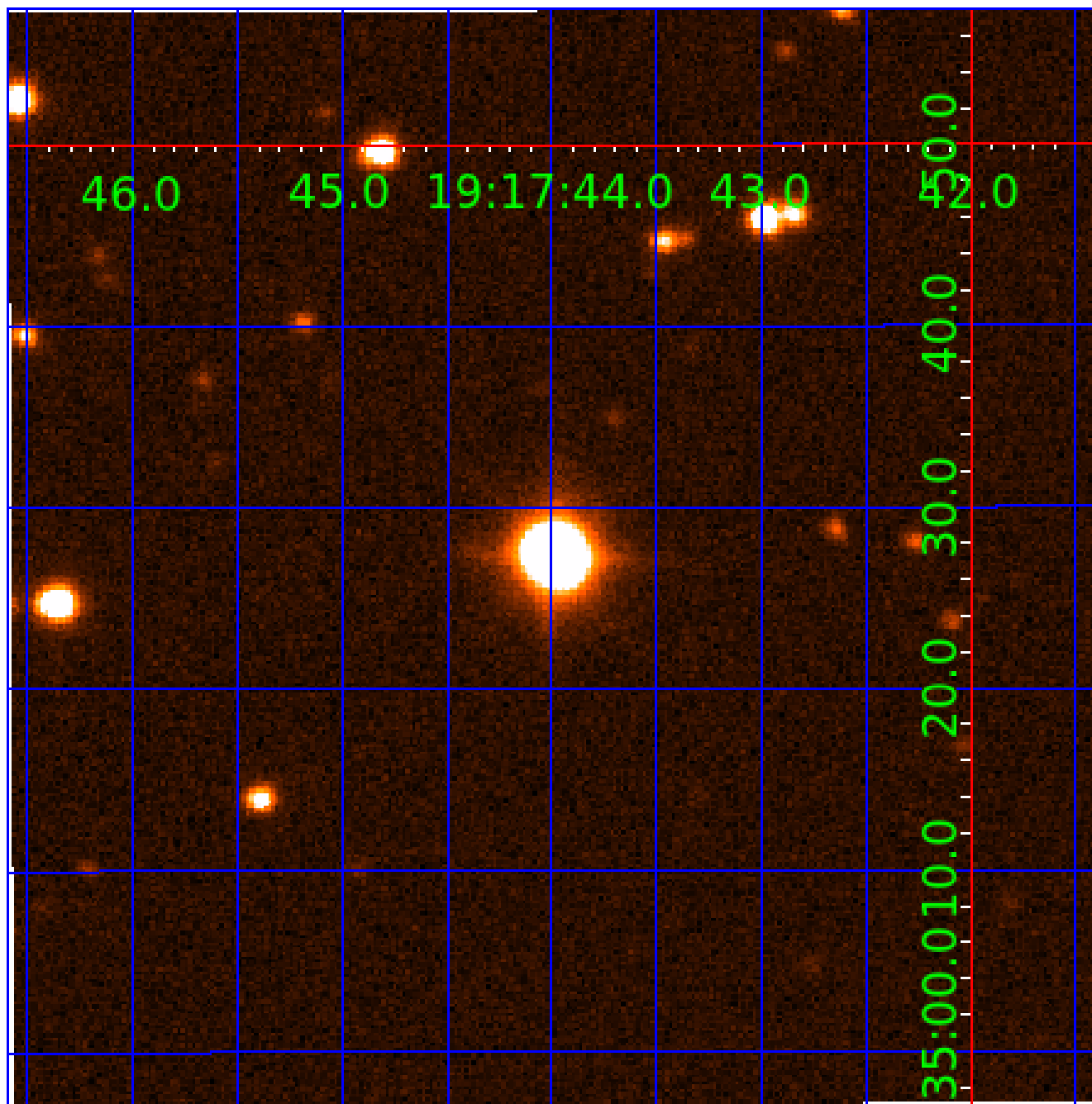


fluxWeightedCentroids, Planet 1 of 3



UKIRT Image

Declination



KIC 004456940

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}) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 004456940-01 | OBS | No | 1.963287 | 131.796203 | 20.4 | 9.075 | 11.4 | 8.5 | 1.31 | 6537 | 0.60 | 2646.15 |
| 004456940-02 | OBS | No | 314.767037 | 234.597095 | 289.4 | 5.087 | 17.5 | 8.2 | 1.31 | 6537 | 2.68 | 3.04 |
| 004456940-03 | OBS | No | 3.925970 | 133.621186 | 58.3 | 26.742 | 10.2 | 10.6 | 1.31 | 6537 | 1.03 | 1050.34 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|---|
| 004456940-01 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | SWEET_NTL—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT |
| 004456940-02 | OBS | FP | 0.00 | 1 | 0 | 1 | 0 | INDIV_TRANS_RUBBLE_MARSHALL_SKYE—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT— INCONSISTENT_TRANS—CENT_FEW_DIFFS—HALO_GHOST |
| 004456940-03 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_SKYE_ZUMA—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD |

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

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

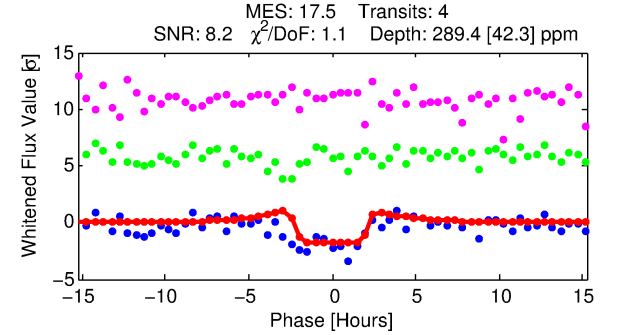
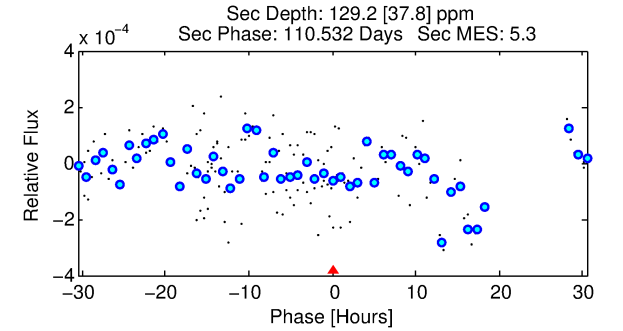
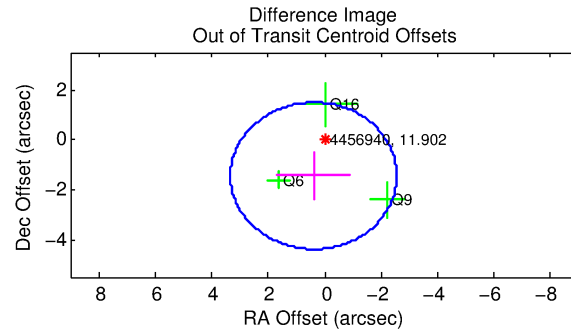
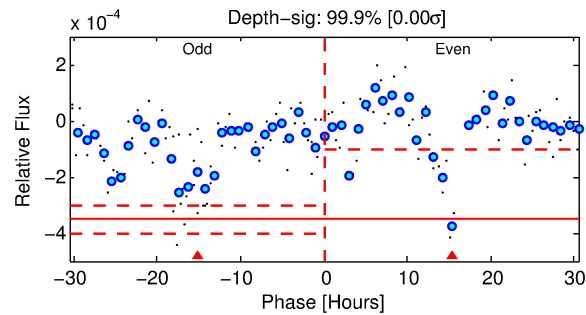
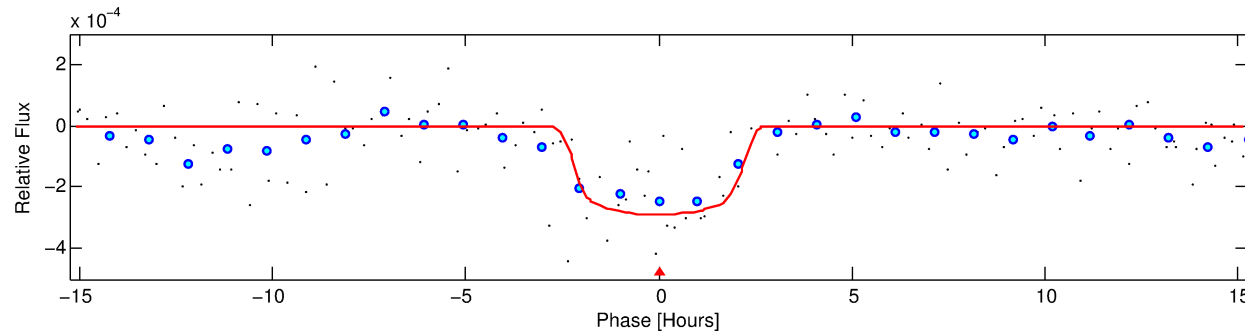
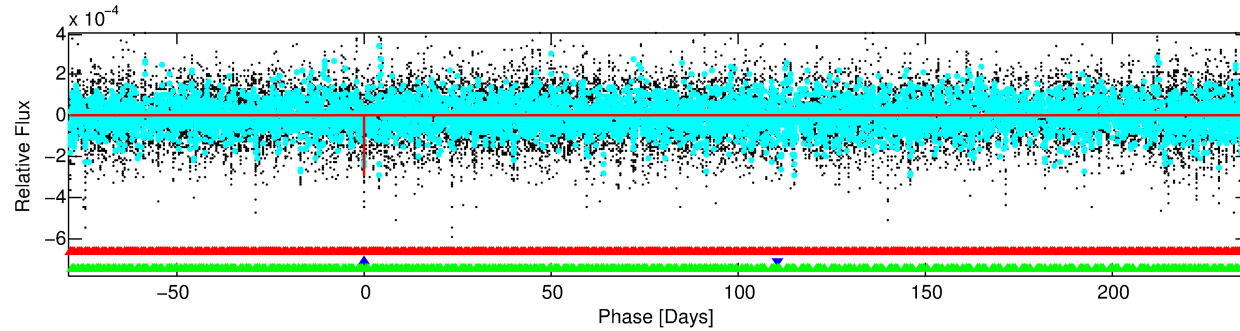
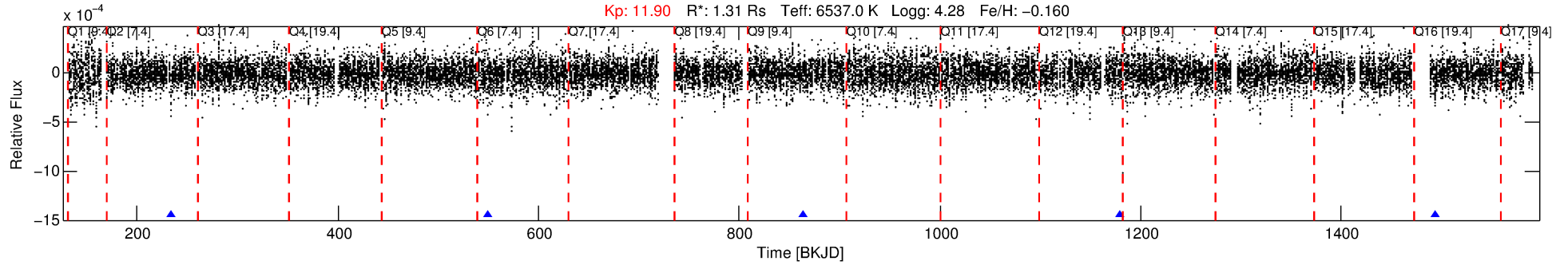
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 004456940-02

No Significant Match Found

DV One-Page Summary

KIC: 4456940 Candidate: 2 of 3 Period: 314.767 d



DV Fit Results:

Period = 314.76704 [0.00307] d
Epoch = 234.5971 [0.0078] BKJD
Rp/R* = 0.0188 [0.0026]
a/R* = 194.74 [116.16]
b = 0.93 [0.09]
Seff = 3.04 [1.22]
Teq = 337 [34] K
Rp = 2.68 [0.91] Re
a = 0.9591 [0.2469] AU
Ag = 9113.45 [4989.84] [1.83 σ]
Teffp = 5086 [548] K [8.66 σ]

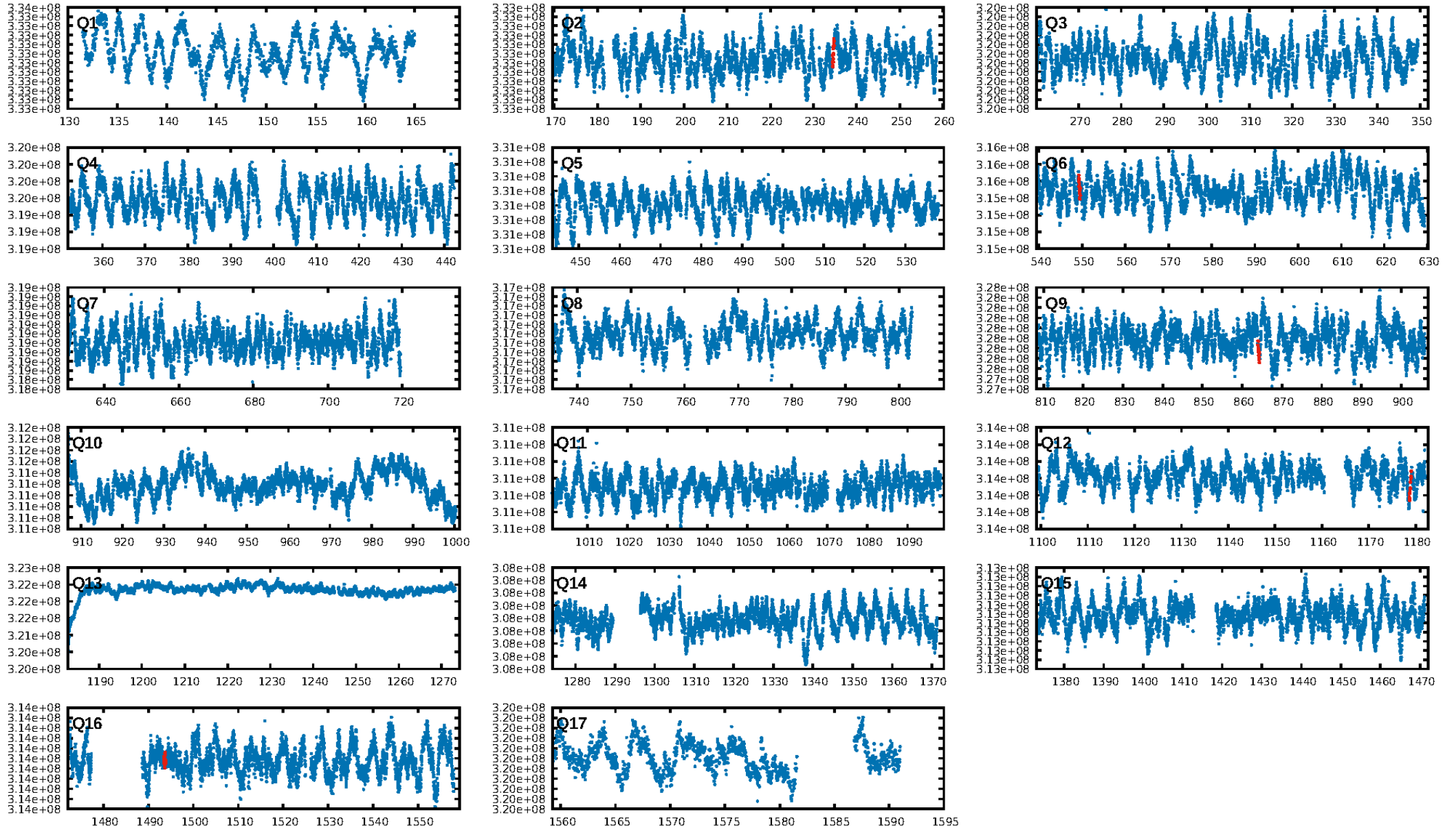
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [274.05 σ]
LongPeriod-sig: N/A
ModelChiSquare2-sig: 32.3%
ModelChiSquareGof-sig: 98.2%
Bootstrap-pfa: N/A
RollingBand-fgt: 1.00 [4/4]
GhostDiagnostic-chr: -0.1941
Centroid-sig: 18.6%
Centroid-so: 0.638 arcsec [1.05 σ]
OotOffset-rm: 1.501 arcsec [1.53 σ]
KicOffset-rm: 1.435 arcsec [1.54 σ]
OotOffset-st: 1/0/1/1 [3]
KicOffset-st: 1/0/1/1 [3]
DiffImageQuality-fgm: 0.33 [1/3]
DiffImageOverlap-fno: 0.50 [2/4]

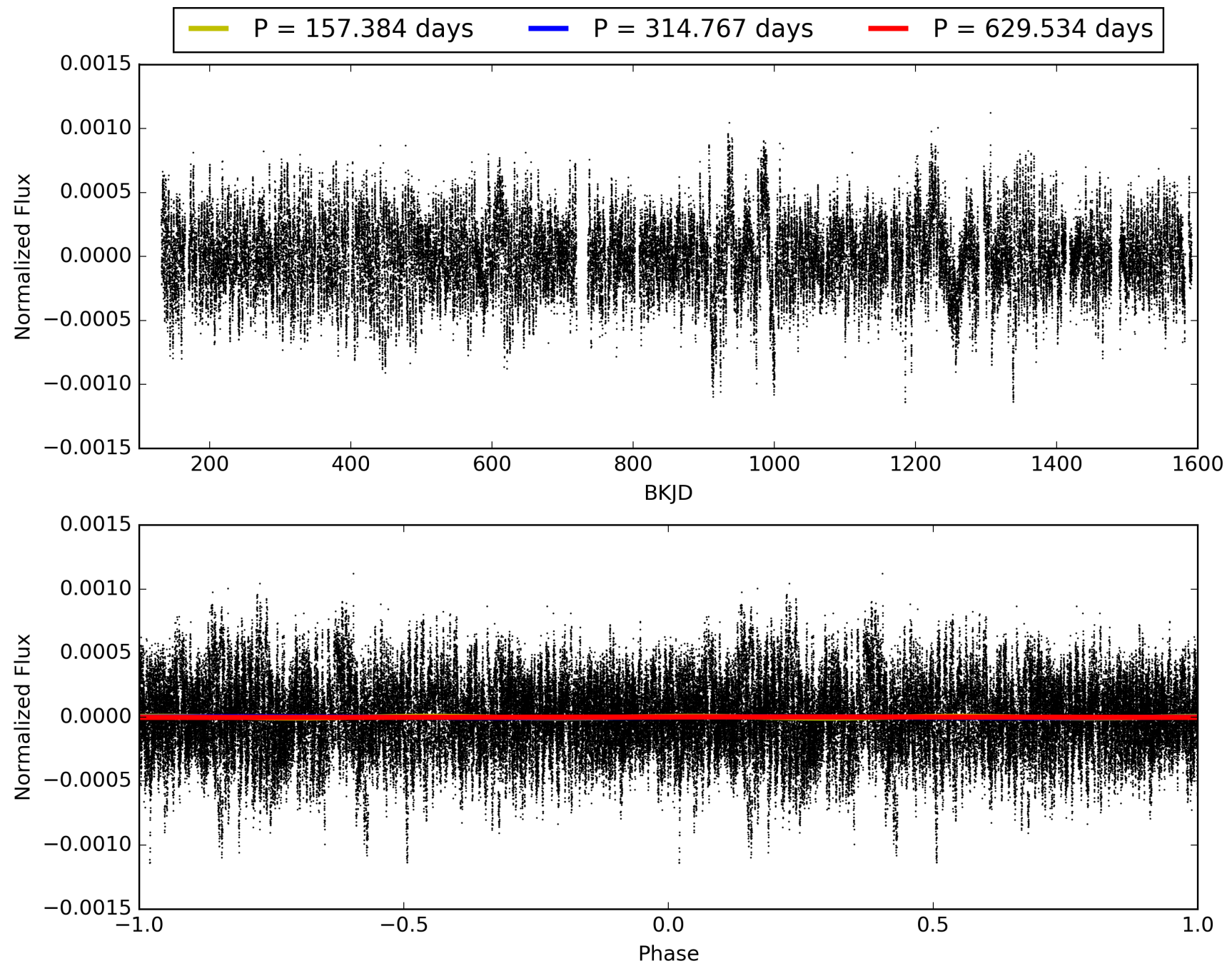
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 03:33:55 Z

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

TCE 004456940-02, PDC Light Curves

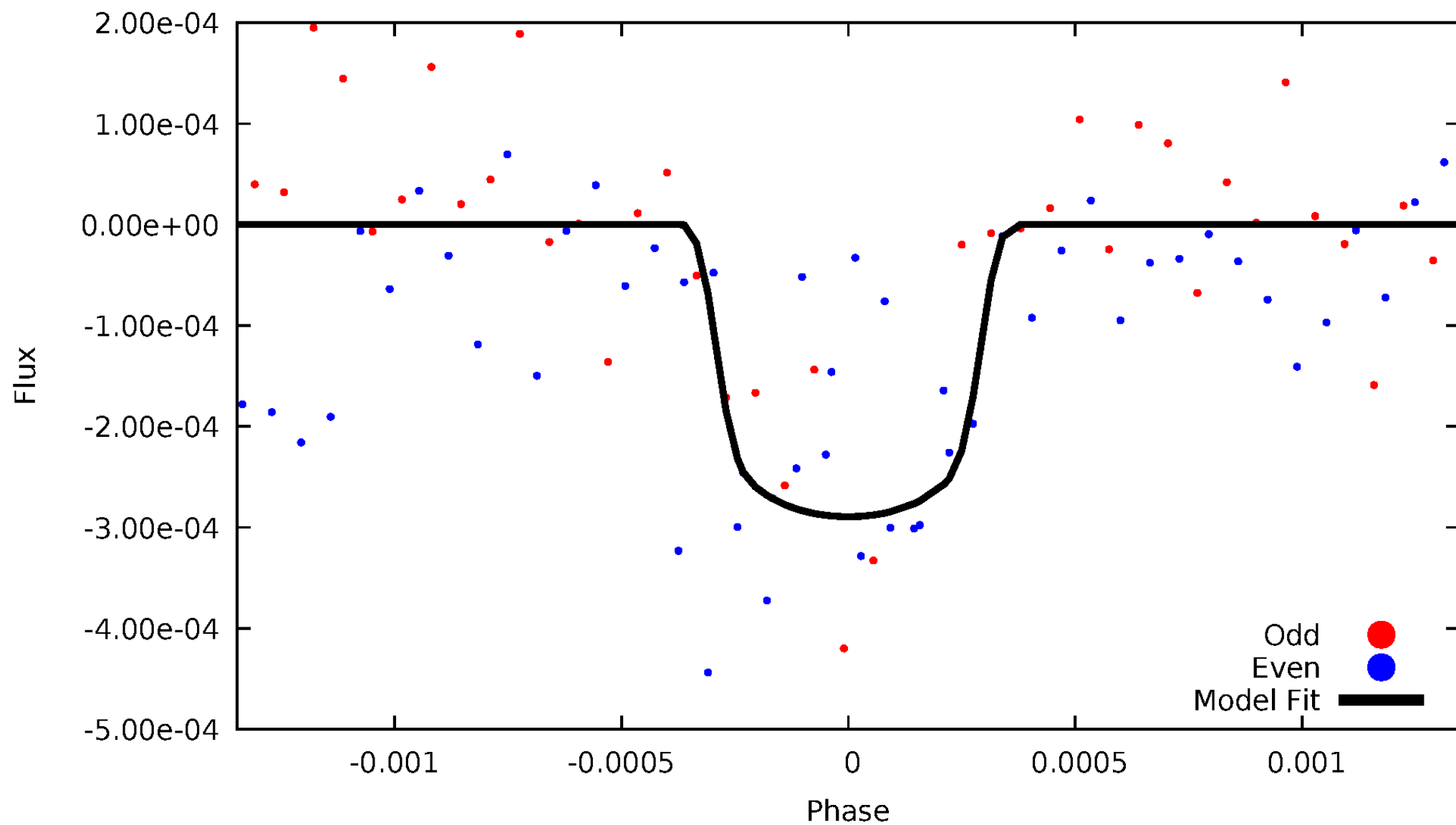


TCE 004456940-02



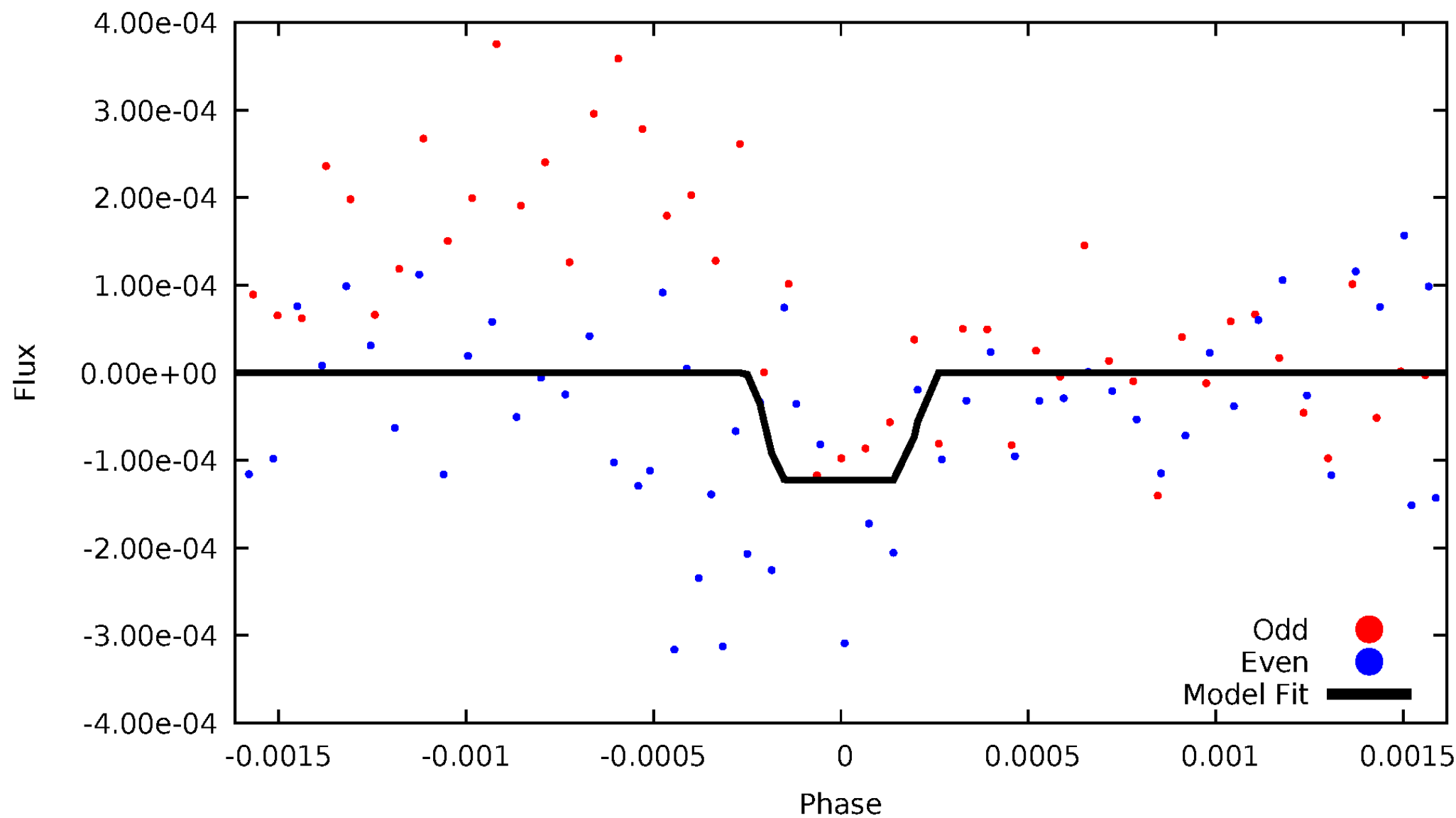
DV Odd/Even

TCE 004456940-02



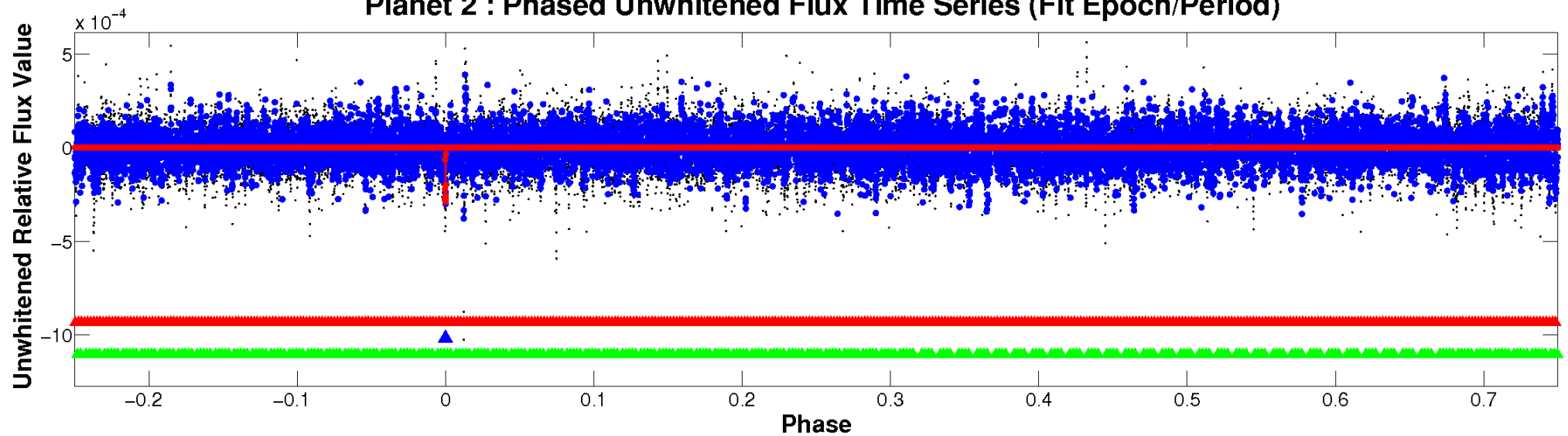
ALT Odd/Even

TCE 004456940-02

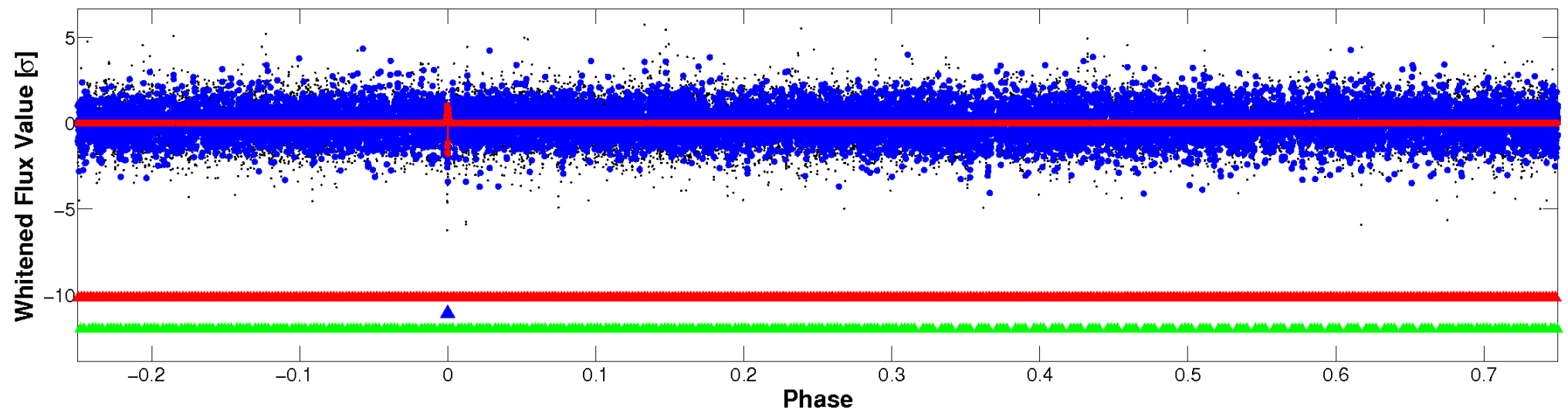


Non-Whitened Vs. Whitened Light Curve

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

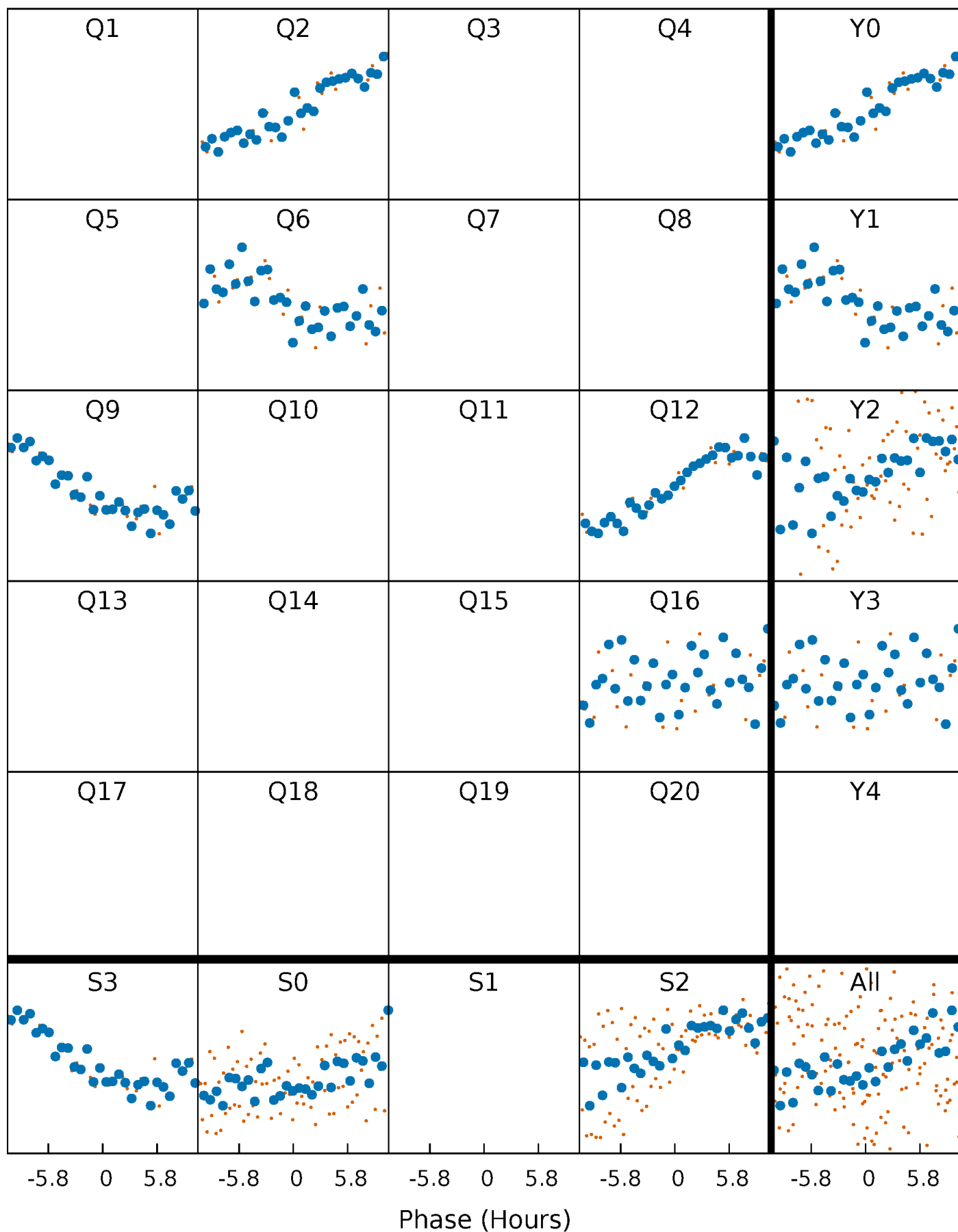


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



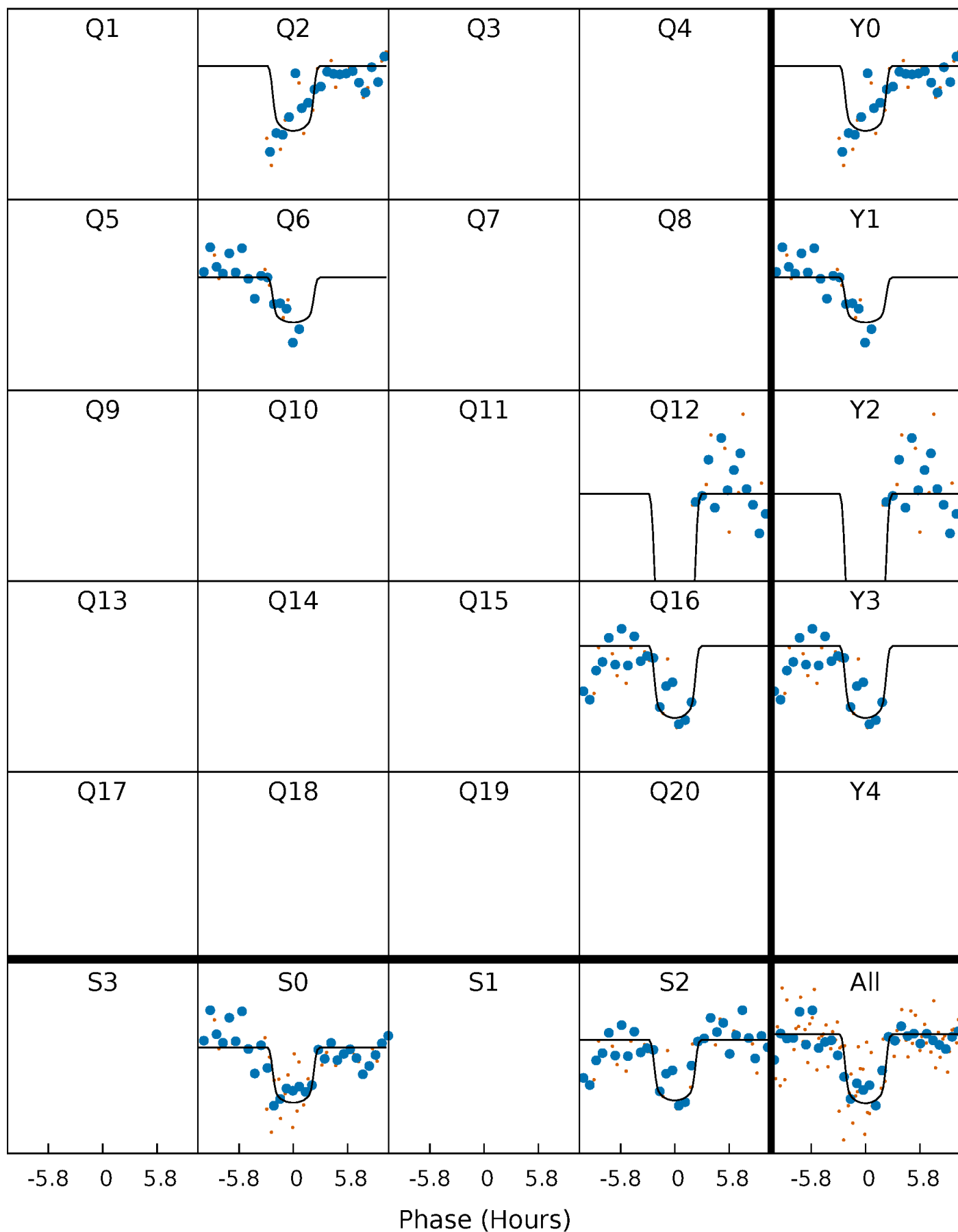
PDC Quarter-Phased Transit Curves

TCE 004456940-02 $P=314.767037$ Days $T_0=234.597095$ (BKJD)



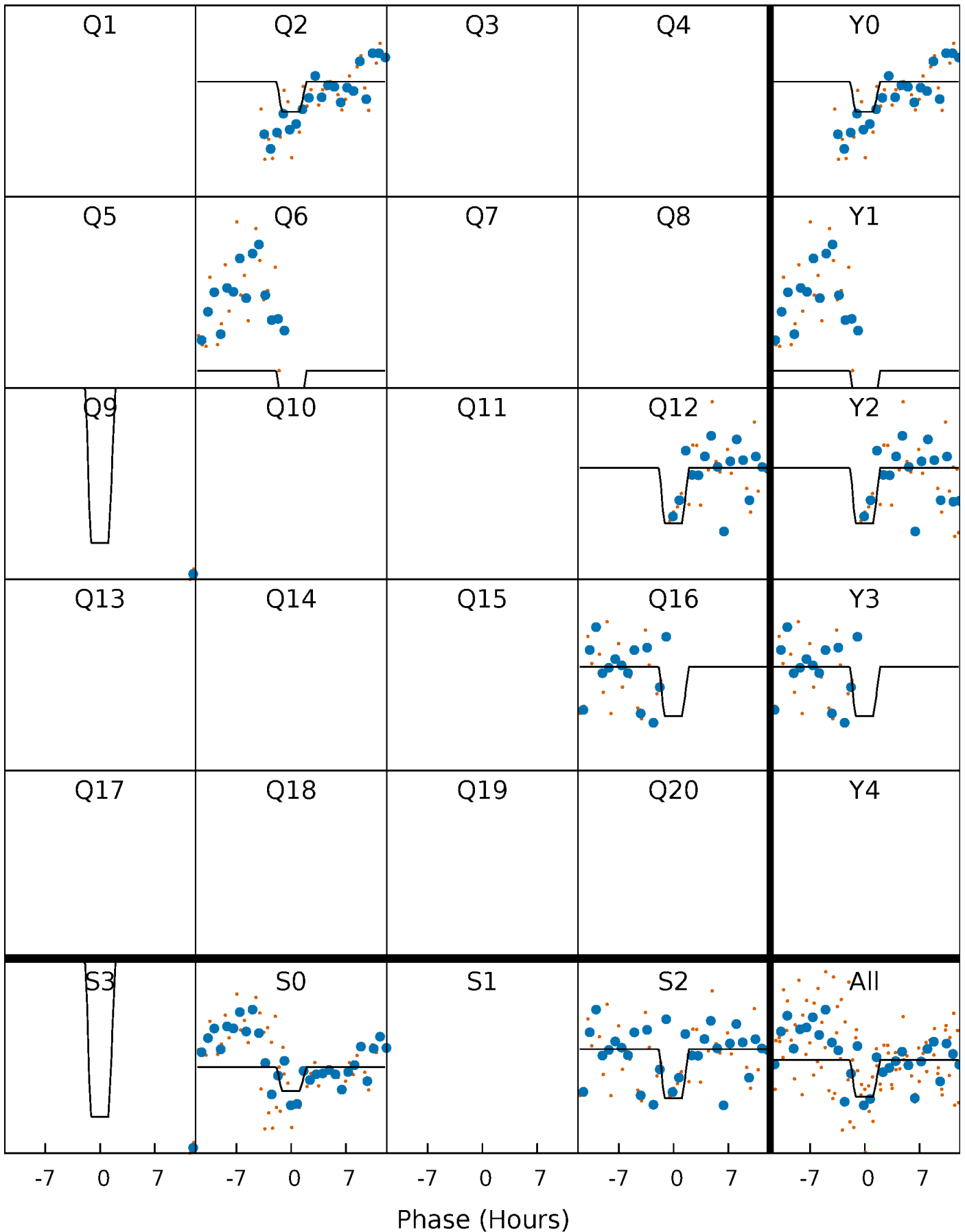
DV Quarter-Phased Transit Curves

TCE 004456940-02 $P=314.767037$ Days $T_0=234.597095$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

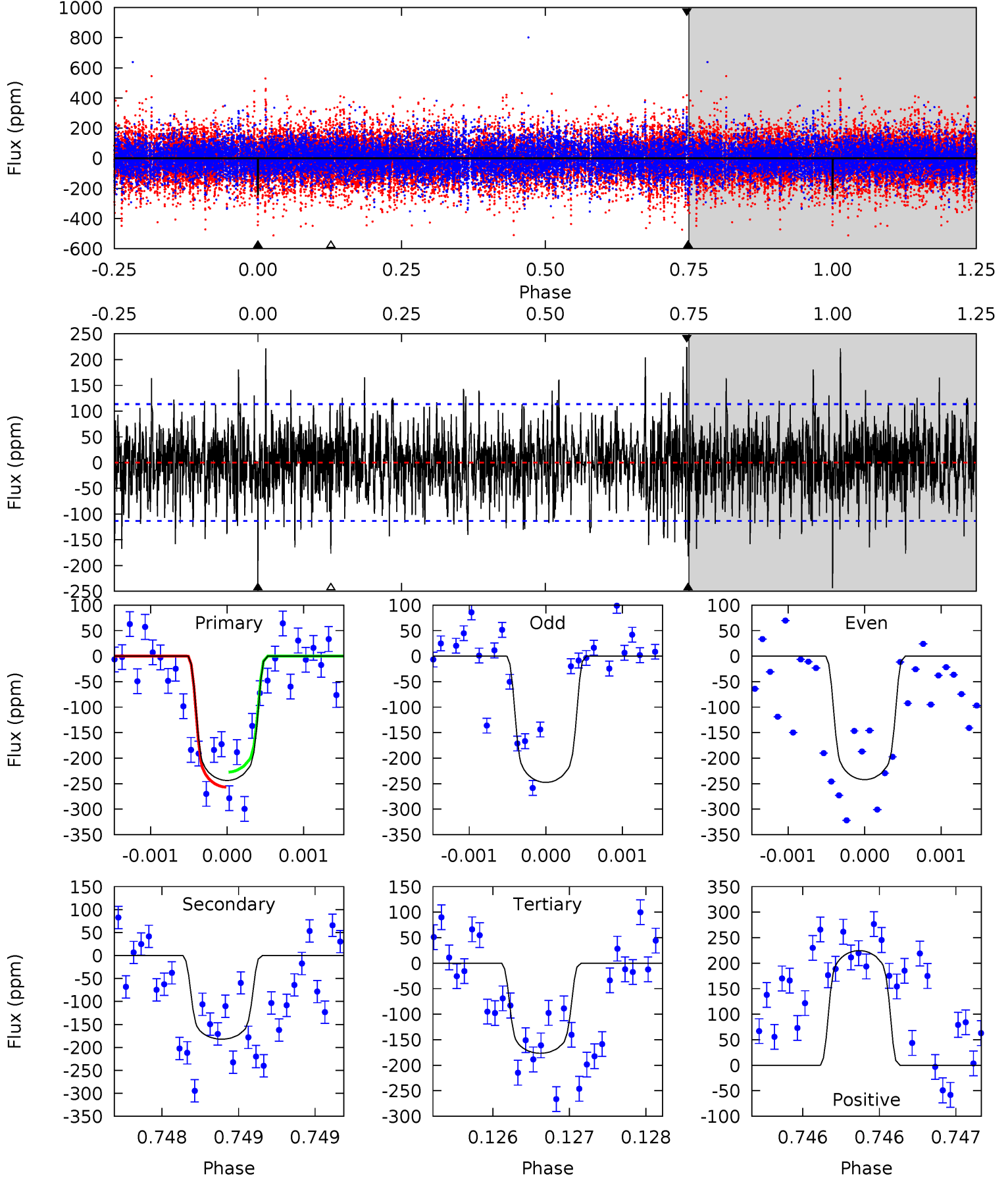
TCE 004456940-02 P=314.785803 Days $T_0=234.639603$ (BKJD)



DV Model-Shift Uniqueness Test

004456940-02, $P = 314.767037$ Days, $E = 234.597095$ Days

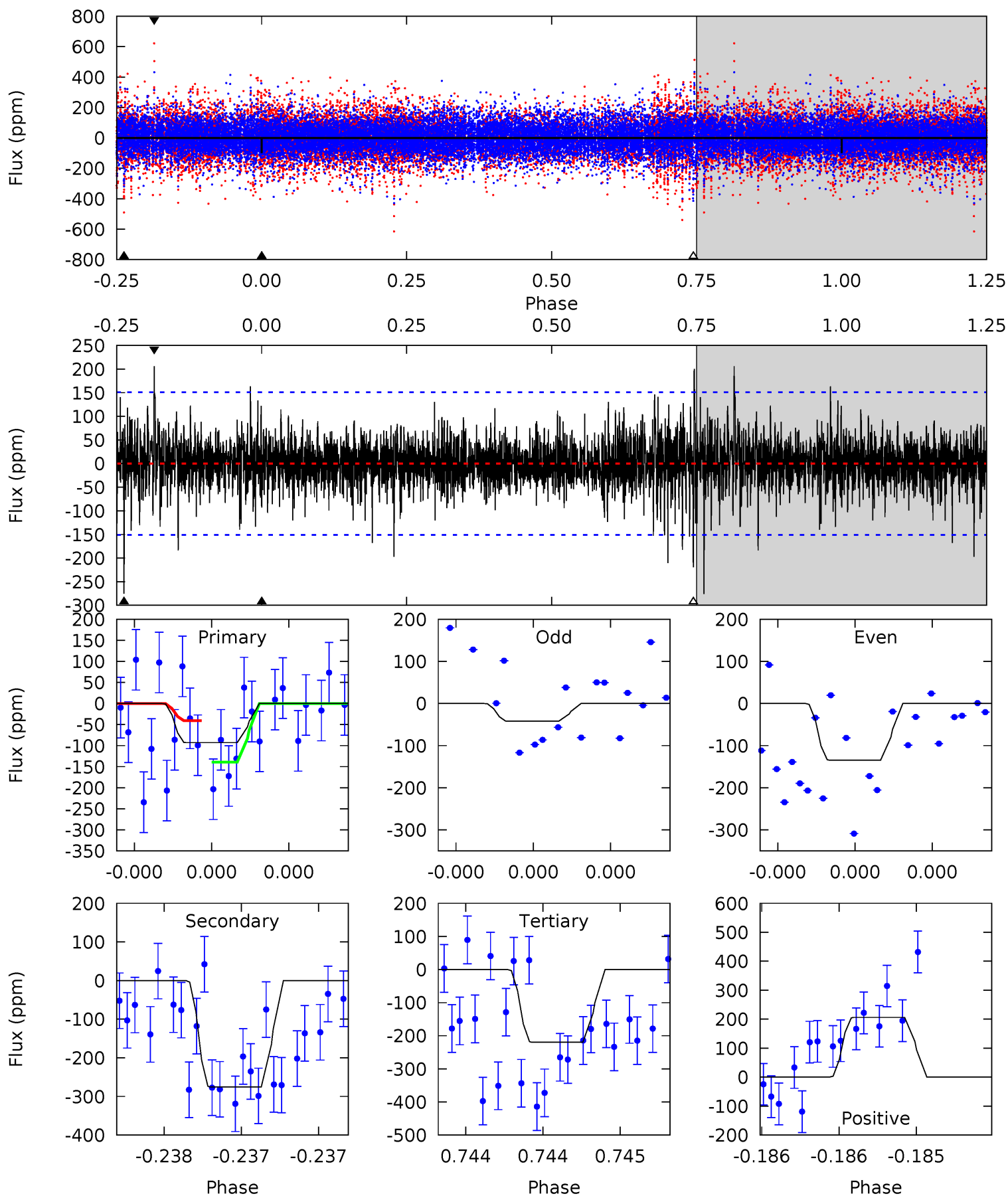
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 11.8 | 8.84 | 8.57 | 10.9 | 5.51 | 3.38 | 2.43 | 3.26 | 0.92 | 0.27 | -2.06 | 0.12 | 0.81 | 0.48 | 0.71 |



Alt Model-Shift Uniqueness Test

004456940-02, P = 314.785803 Days, E = 234.639603 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 3.45 | 10.2 | 8.15 | 7.65 | 5.60 | 3.53 | 1.52 | -4.69 | -4.19 | 2.08 | 2.58 | 1.78 | 3.06 | 0.43 | 1.83 |



Stellar Parameters For KIC 004456940

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | $R (R_{\odot})$ | $M(M_{\odot})$ | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
| | 6537^{+181}_{-250} | $4.280^{+0.108}_{-0.201}$ | $-0.160^{+0.250}_{-0.300}$ | $1.307^{+0.404}_{-0.218}$ | $1.190^{+0.192}_{-0.174}$ | $0.750^{+0.445}_{-0.375}$ |
| | +3%/-4% | +3%/-5% | +156%/-188% | +31%/-17% | +16%/-15% | +59%/-50% |
| Source | PHO54 | PHO54 | PHO54 | DSEP | | |

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

Secondary Eclipse Parameters for KIC 004456940-02 / KOI

| Detrend | Depth (ppm) | $R_p (R_{\oplus})$ | $T_{\text{max}} (K)$ | $T_{\text{obs}} (K)$ | A_{obs} |
|---------|---------------|------------------------|----------------------|------------------------|---------------------------|
| DV | -182 ± 21 | $2.77^{+0.59}_{-0.46}$ | 476^{+37}_{-29} | 5511^{+438}_{-358} | 11712^{+5270}_{-3689} |
| Alt. | -276 ± 27 | $1.62^{+0.44}_{-0.40}$ | 476^{+36}_{-29} | 8241^{+1755}_{-1011} | 53399^{+38562}_{-21003} |

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

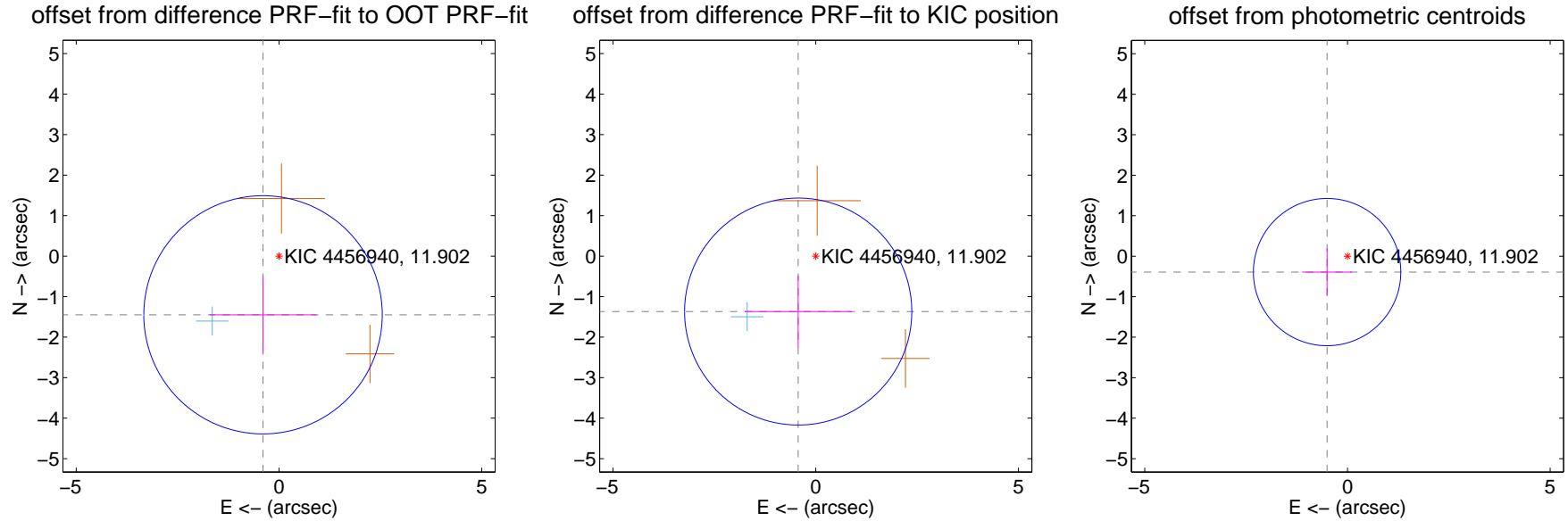
DV Centroid Data

Supplemental centroid analysis for 004456940-02. **Kepler magnitude: 11.90.** Transit SNR 8.15

There are 1 quarters with good PRF difference image offsets

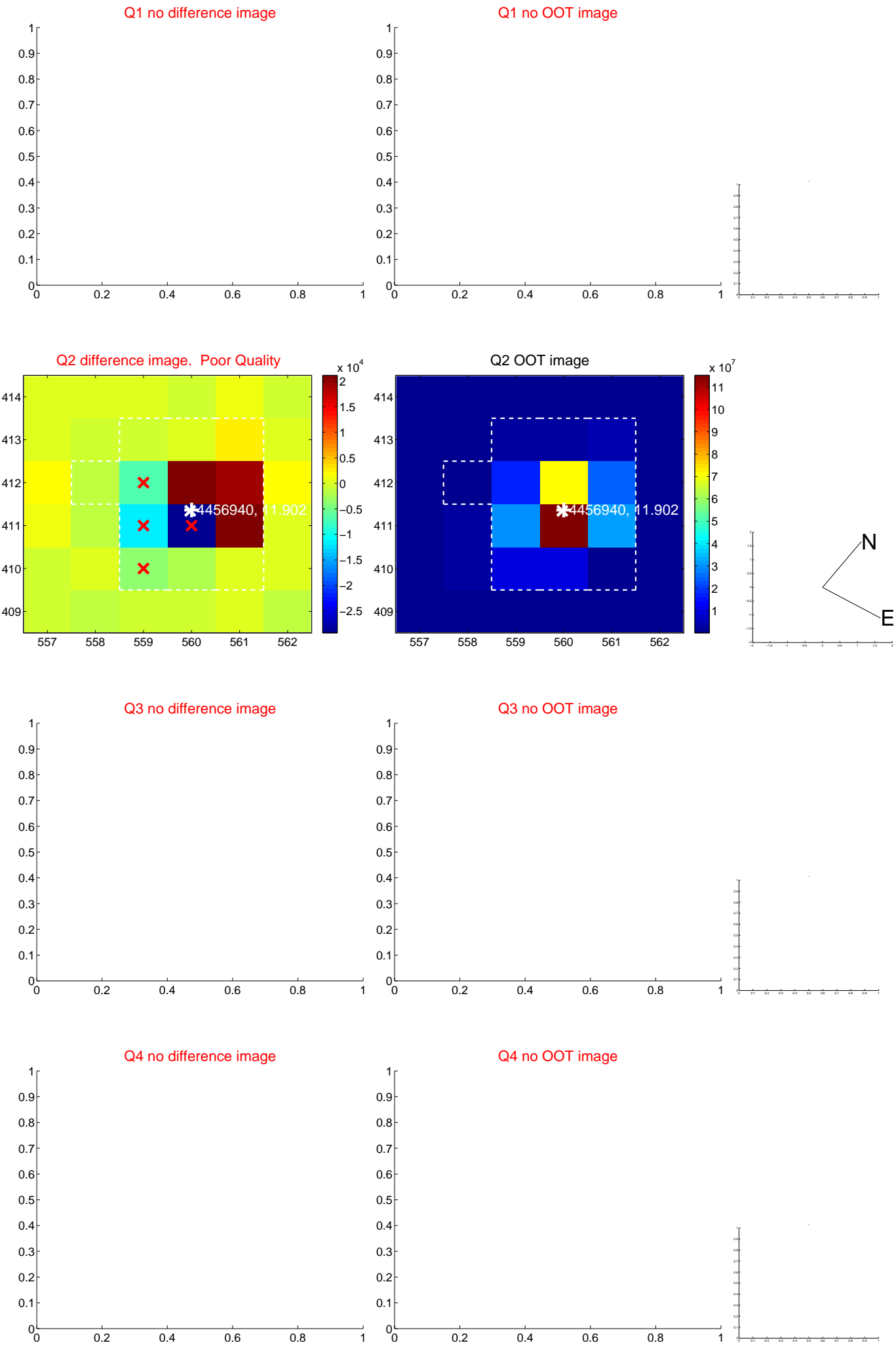
The direct PRF centroid is offset from the target star catalog position by about 0.06 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|---|--------------------|---------------------|-------------------|--------------------|
| PRF-fit source offset from OOT | 1.501 ± 0.980 | 1.53 | 0.394 ± 1.316 | -1.449 ± 0.951 |
| PRF-fit source offset from KIC position | 1.435 ± 0.934 | 1.54 | 0.432 ± 1.320 | -1.368 ± 0.886 |
| photometric centroid source offset | 0.64 ± 0.61 | 1.05 | 0.50 ± 0.62 | -0.39 ± 0.59 |



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.

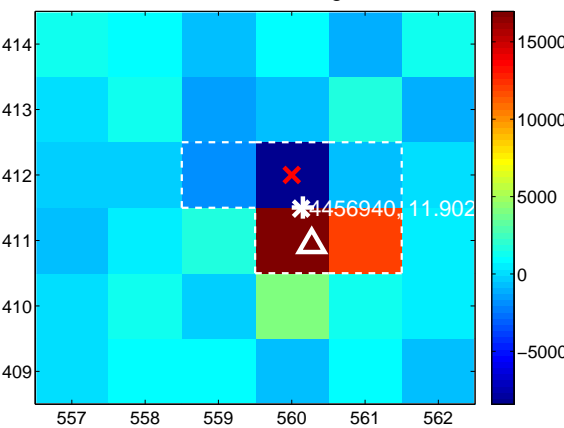
Q5 no difference image



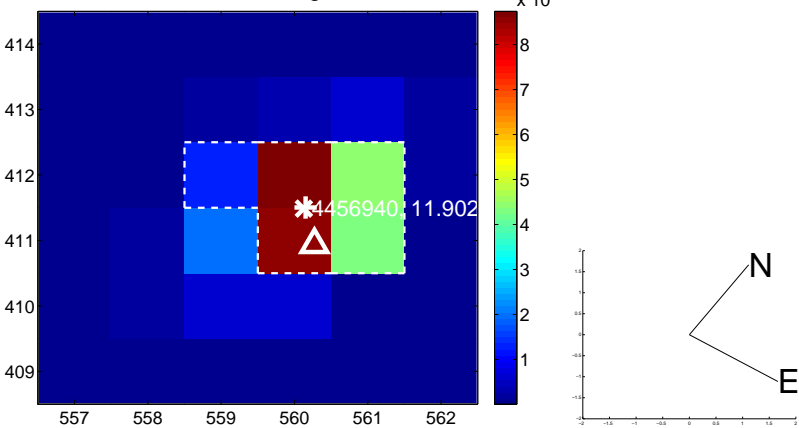
Q5 no OOT image



Q6 difference image



Q6 OOT image



Q7 no difference image



Q7 no OOT image



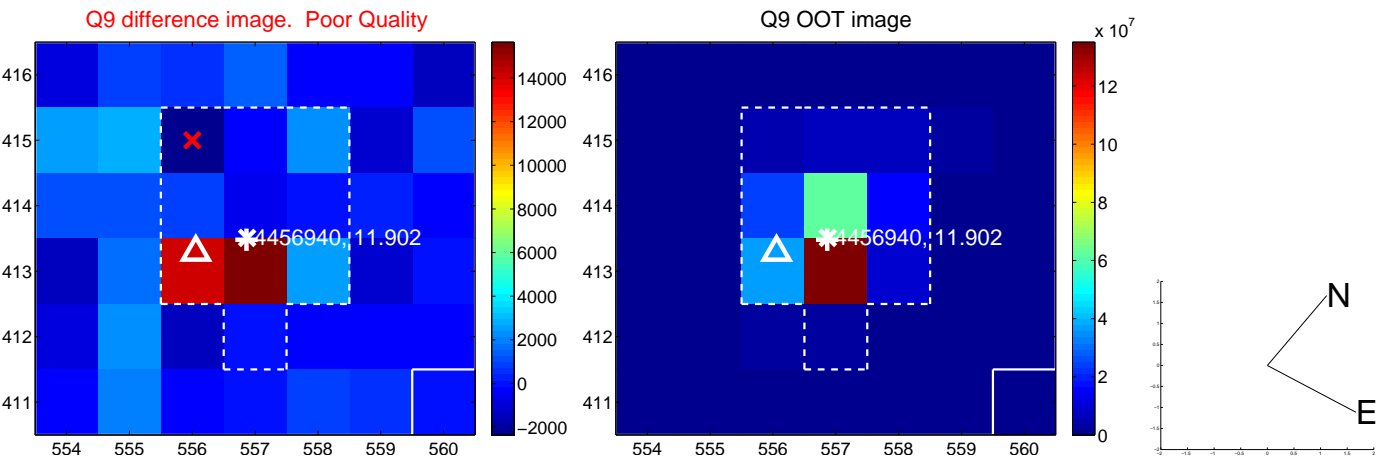
Q8 no difference image



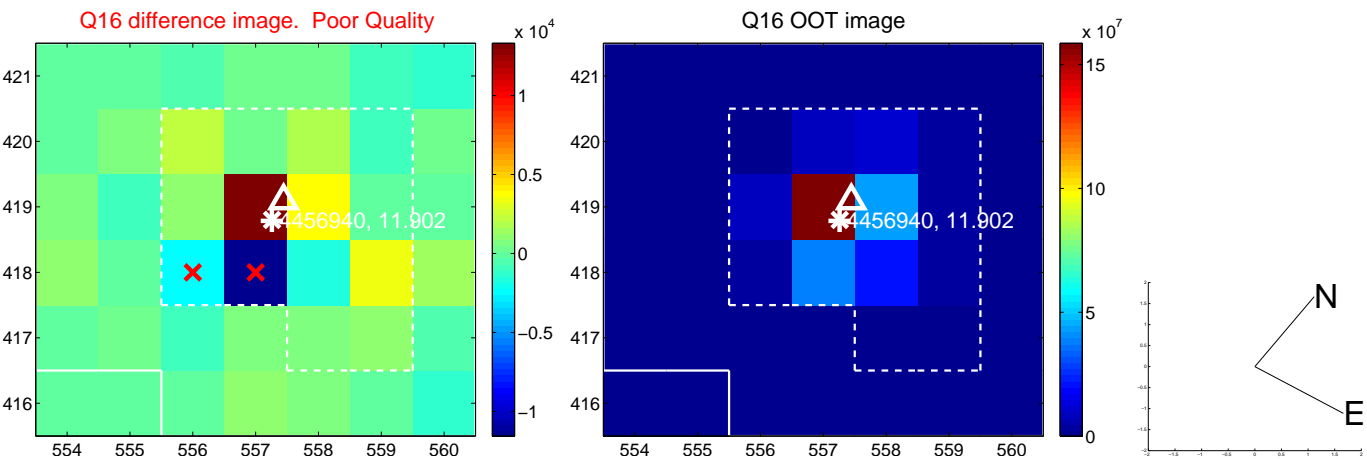
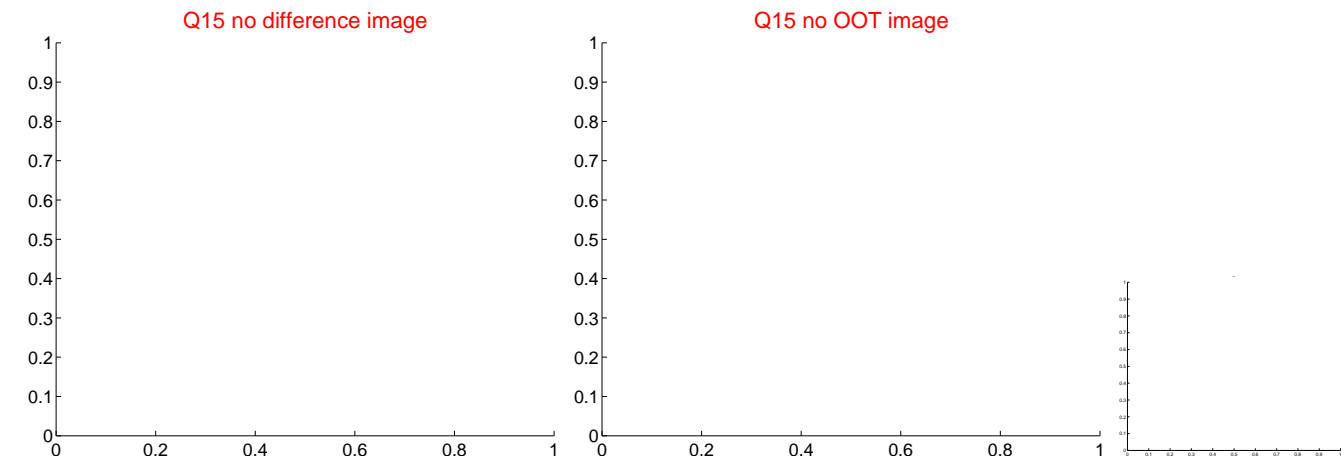
Q8 no OOT image



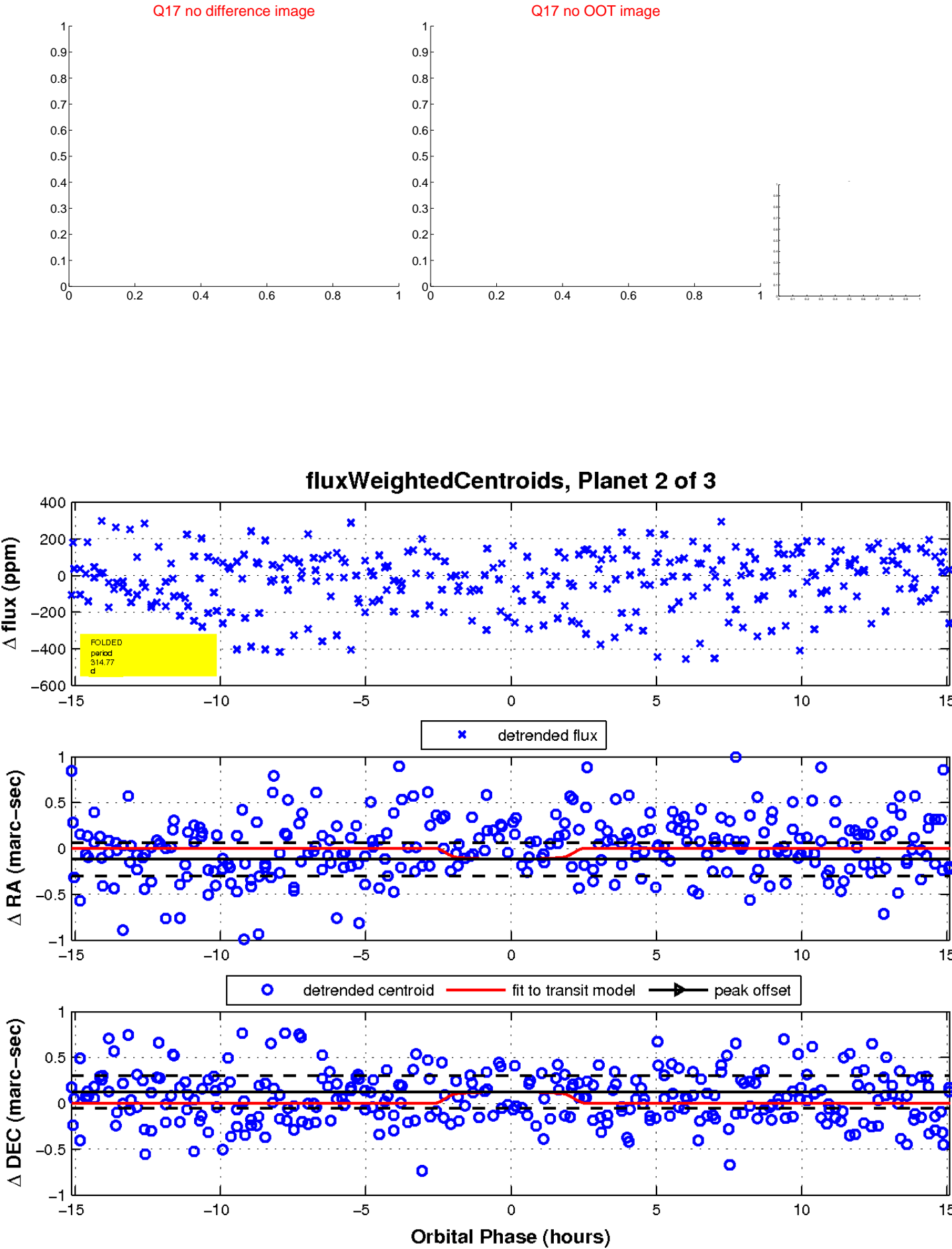
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

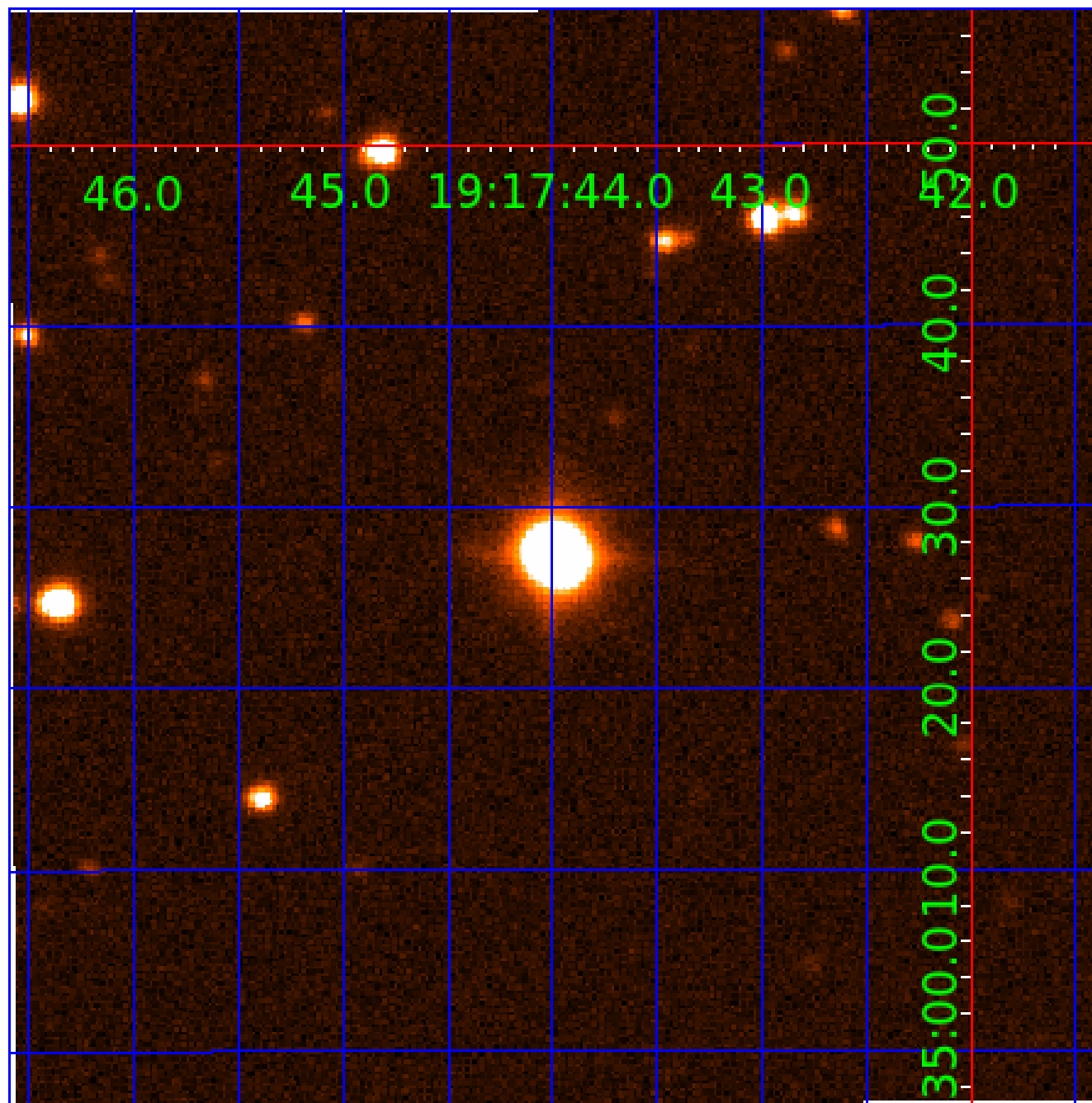


white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



UKIRT Image

Declination



KIC 004456940

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}) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 004456940-01 | OBS | No | 1.963287 | 131.796203 | 20.4 | 9.075 | 11.4 | 8.5 | 1.31 | 6537 | 0.60 | 2646.15 |
| 004456940-02 | OBS | No | 314.767037 | 234.597095 | 289.4 | 5.087 | 17.5 | 8.2 | 1.31 | 6537 | 2.68 | 3.04 |
| 004456940-03 | OBS | No | 3.925970 | 133.621186 | 58.3 | 26.742 | 10.2 | 10.6 | 1.31 | 6537 | 1.03 | 1050.34 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|---|
| 004456940-01 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | SWEET_NTL—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT |
| 004456940-02 | OBS | FP | 0.00 | 1 | 0 | 1 | 0 | INDIV_TRANS_RUBBLE_MARSHALL_SKYE—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS—HALO_GHOST |
| 004456940-03 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_SKYE_ZUMA—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD |

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

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

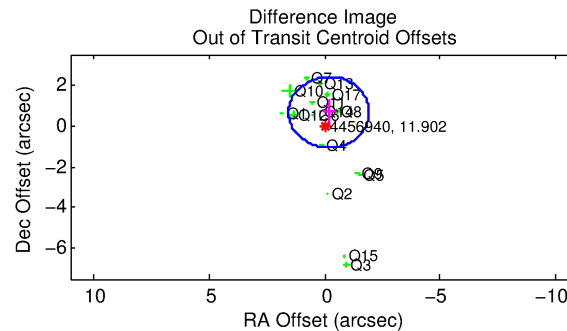
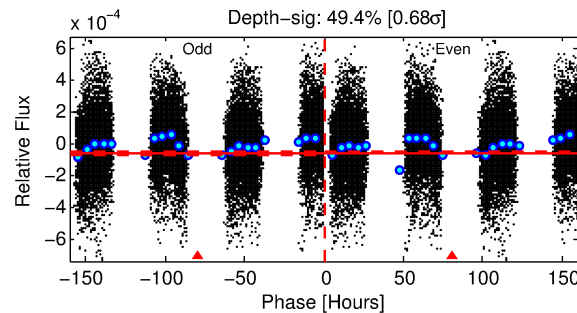
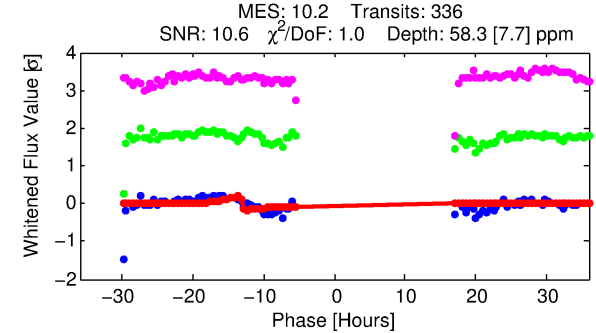
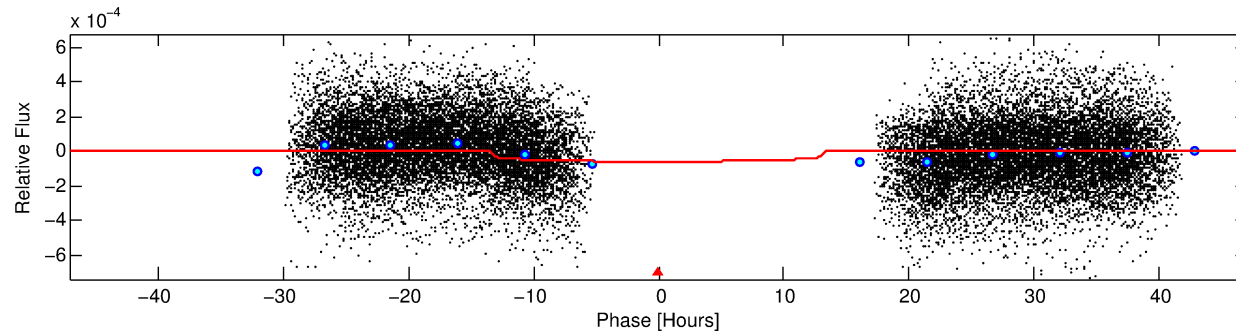
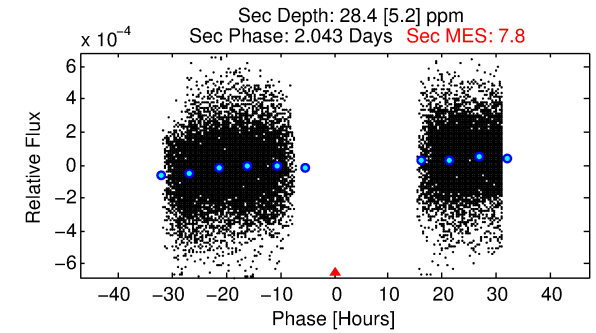
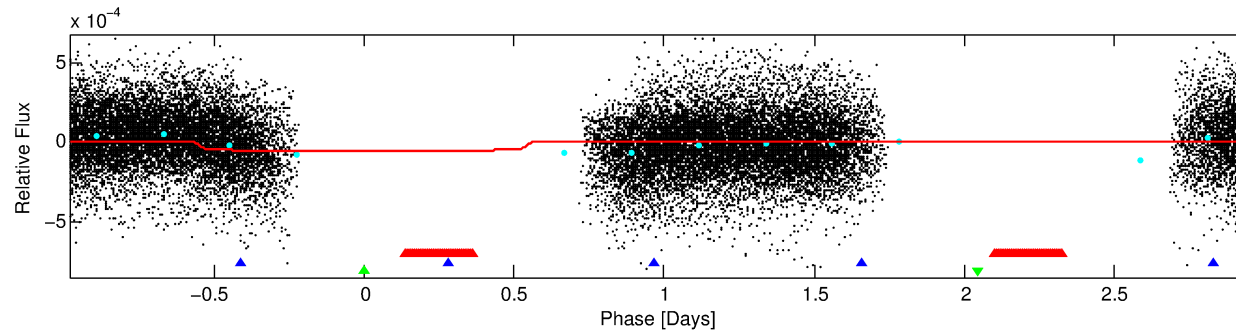
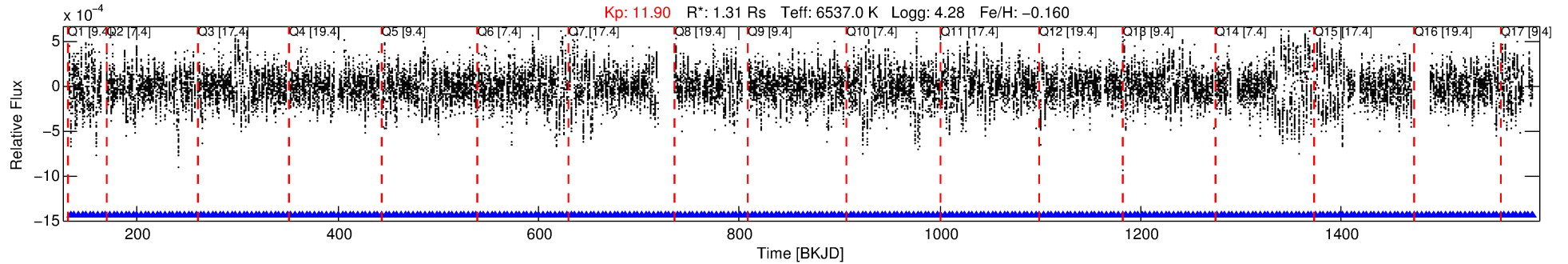
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 004456940-03

No Significant Match Found

DV One-Page Summary

KIC: 4456940 Candidate: 3 of 3 Period: 3.926 d



DV Fit Results:

Period = 3.92597 [0.00003] d
Epoch = 133.6212 [0.0377] BKJD
Rp/R* = 0.0073 [0.0018]
a/R* = 1.22 [0.57]
b = 0.53 [2.04]
Seff = 1050.34 [421.53]
Teff = 1452 [146] K
Rp = 1.04 [0.41] Re
a = 0.0516 [0.0133] AU
Ag = 38.77 [25.28] [1.49σ]
Teffp = 5601 [781] K [5.22σ]

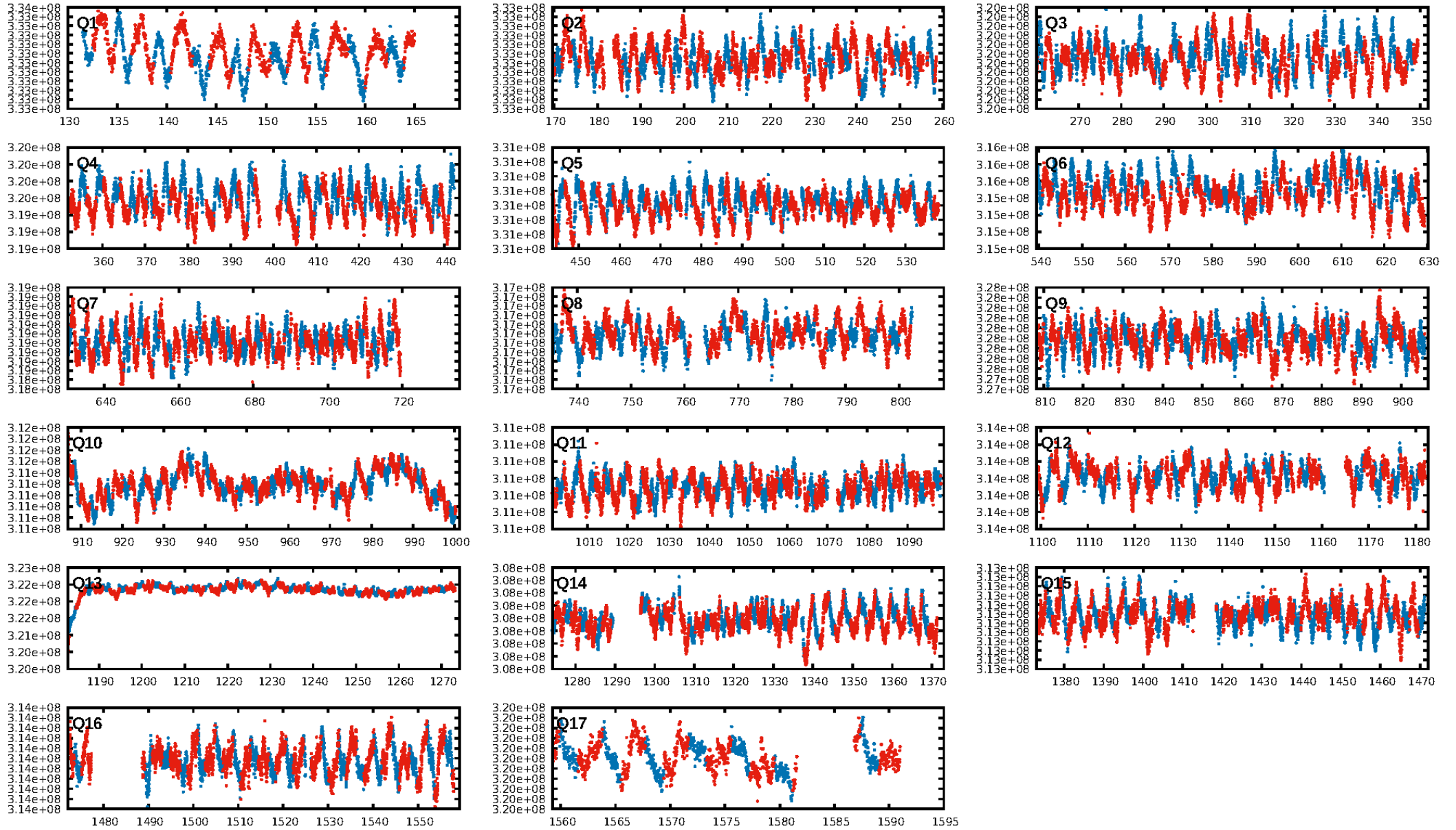
DV Diagnostic Results:

ShortPeriod-sig: 90.5% [1.67σ]
LongPeriod-sig: 100.0% [274.05σ]
ModelChiSquare2-sig: N/A
ModelChiSquareGof-sig: N/A
Bootstrap-pfa: N/A
RollingBand-fgt: 1.00 [321/321]
GhostDiagnostic-chr: 2.164
Centroid-sig: 0.0%
Centroid-so: 0.496 arcsec [2.40σ]
OotOffset-rm: 0.683 arcsec [1.18σ]
OotOffset-st: 4/4/3/5 [16]
KicOffset-rm: 0.521 arcsec [0.83σ]
KicOffset-st: 4/4/3/5 [16]
DiffImageQuality-fgm: 0.56 [9/16]
DiffImageOverlap-fno: 0.00 [0/17]

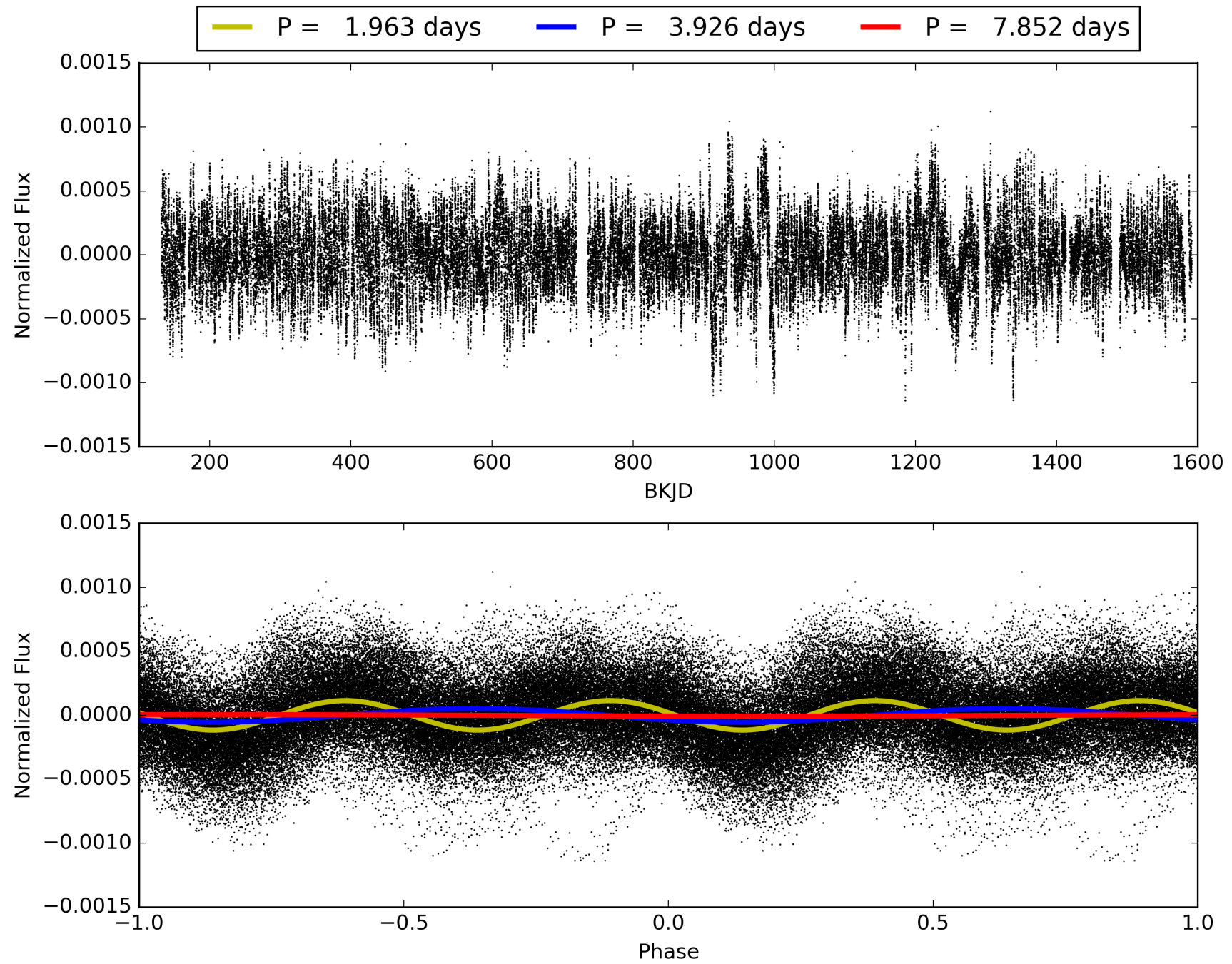
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 03:34:03 Z

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

TCE 004456940-03, PDC Light Curves

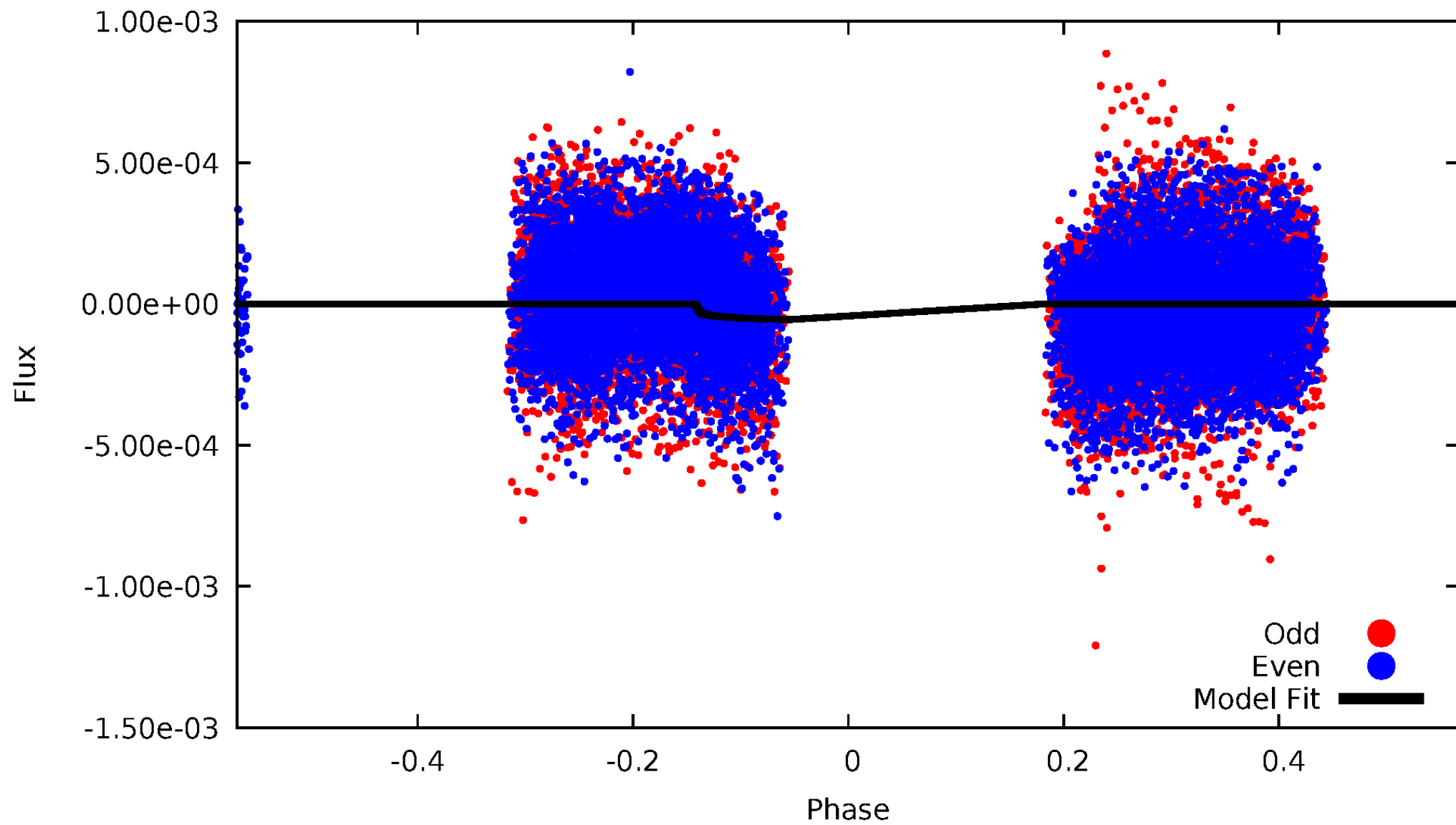


TCE 004456940-03



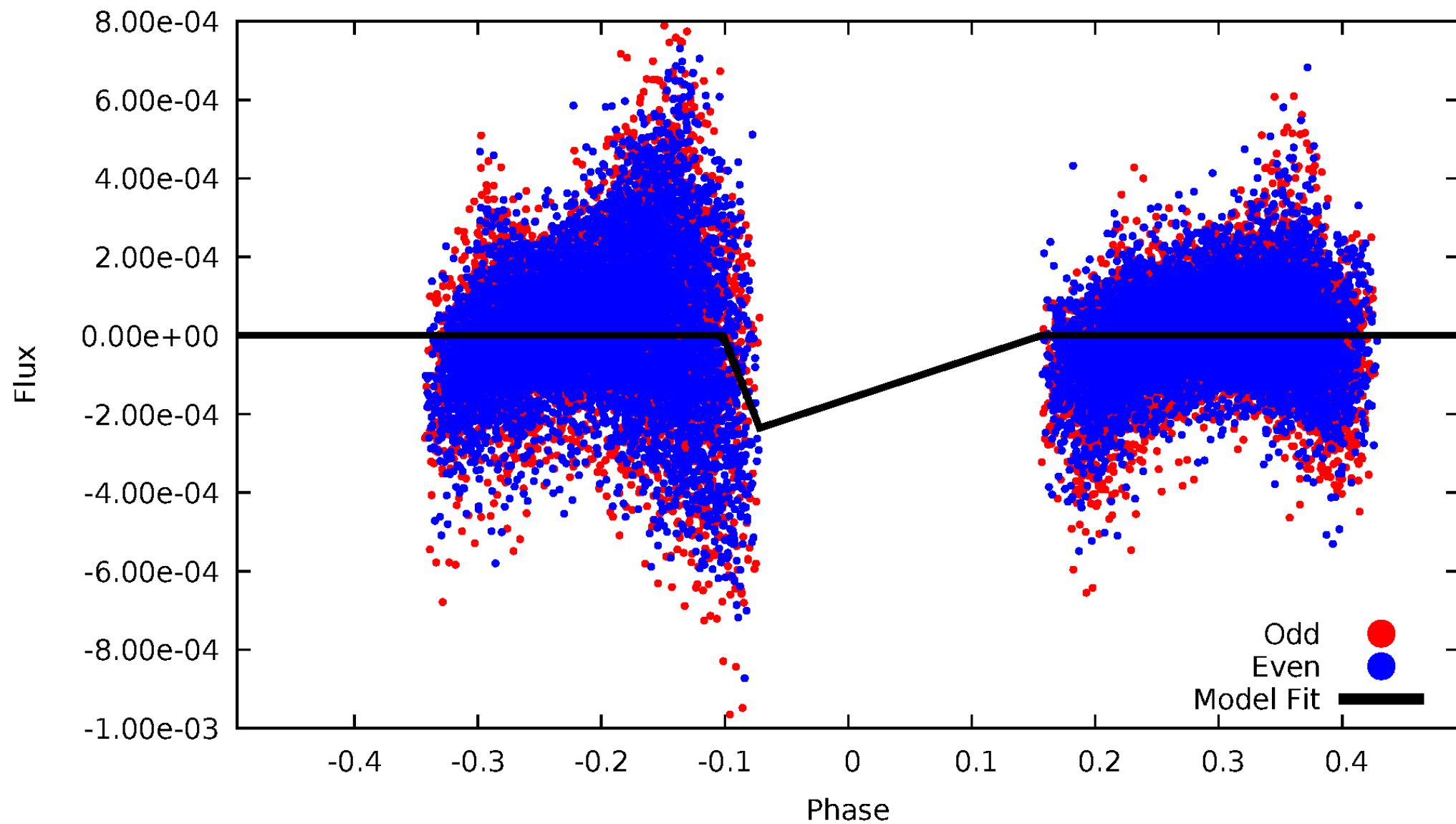
DV Odd/Even

TCE 004456940-03



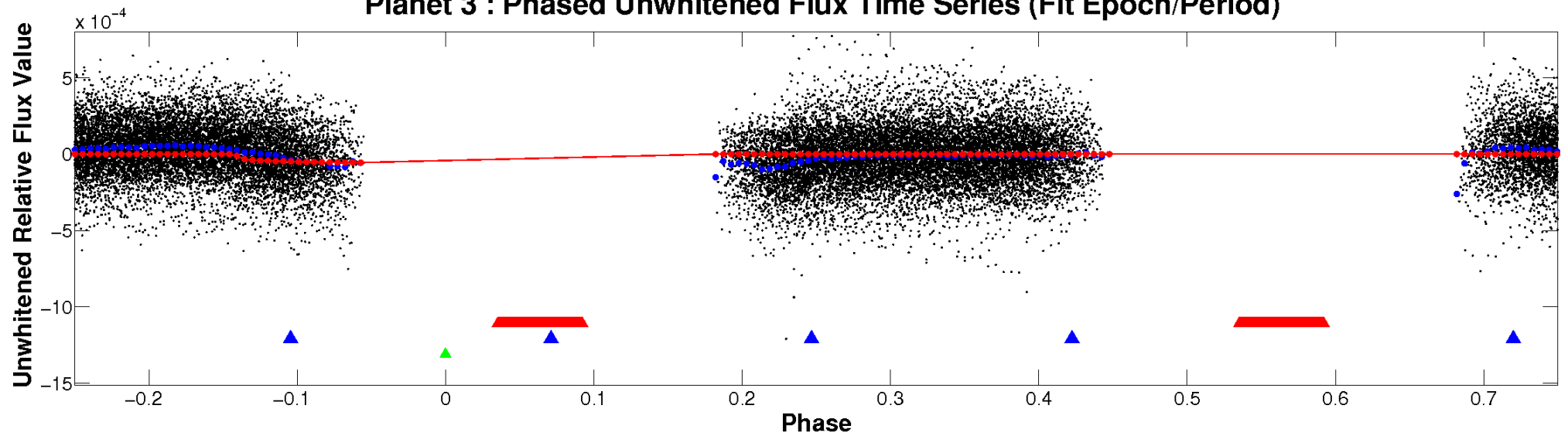
ALT Odd/Even

TCE 004456940-03

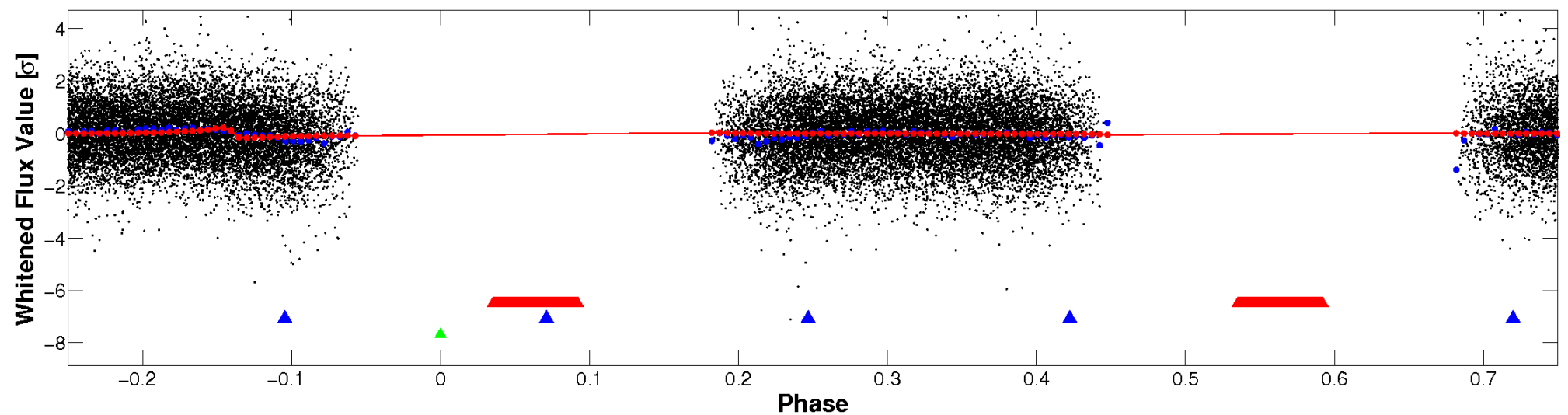


Non-Whitened Vs. Whitened Light Curve

Planet 3 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

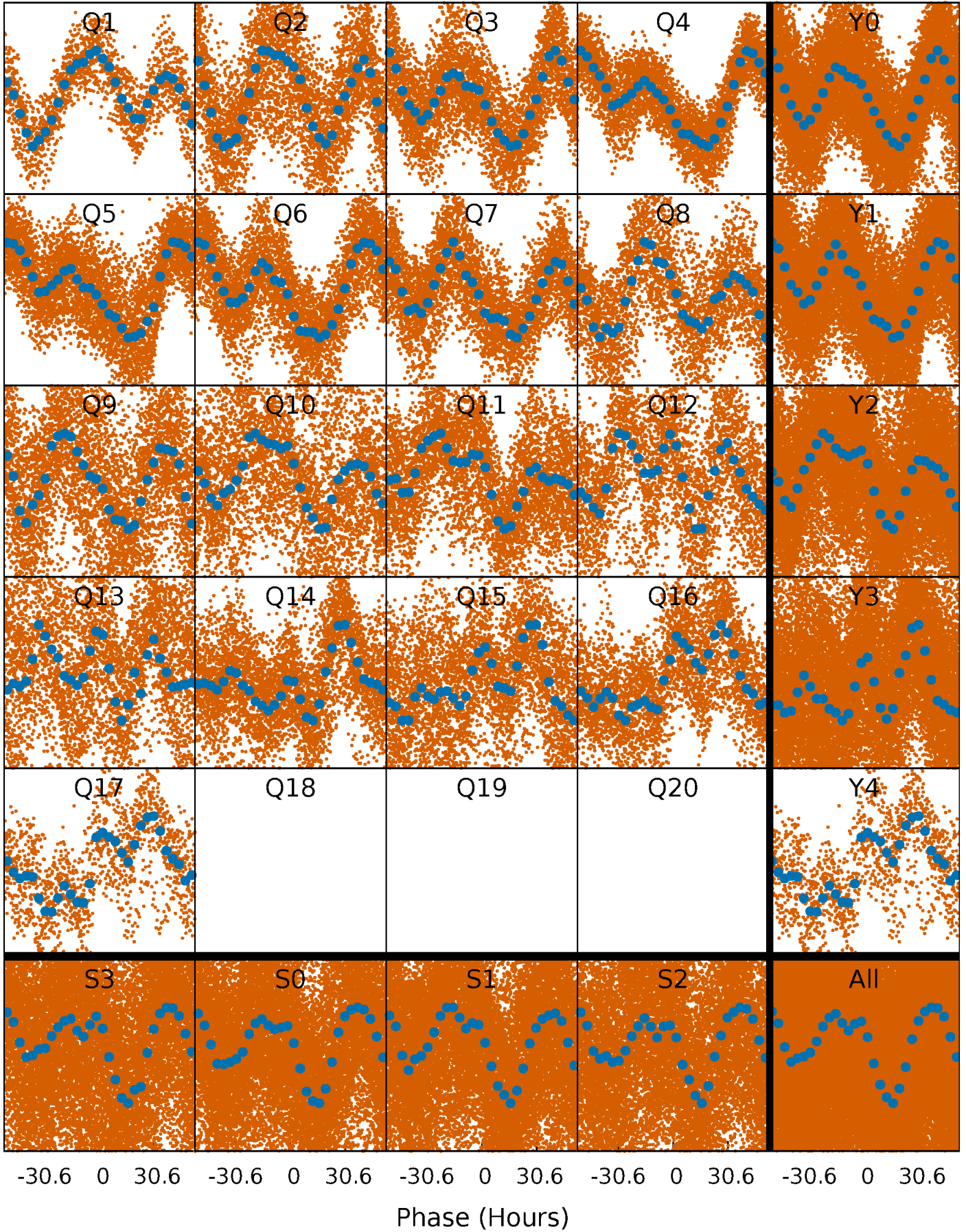


Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



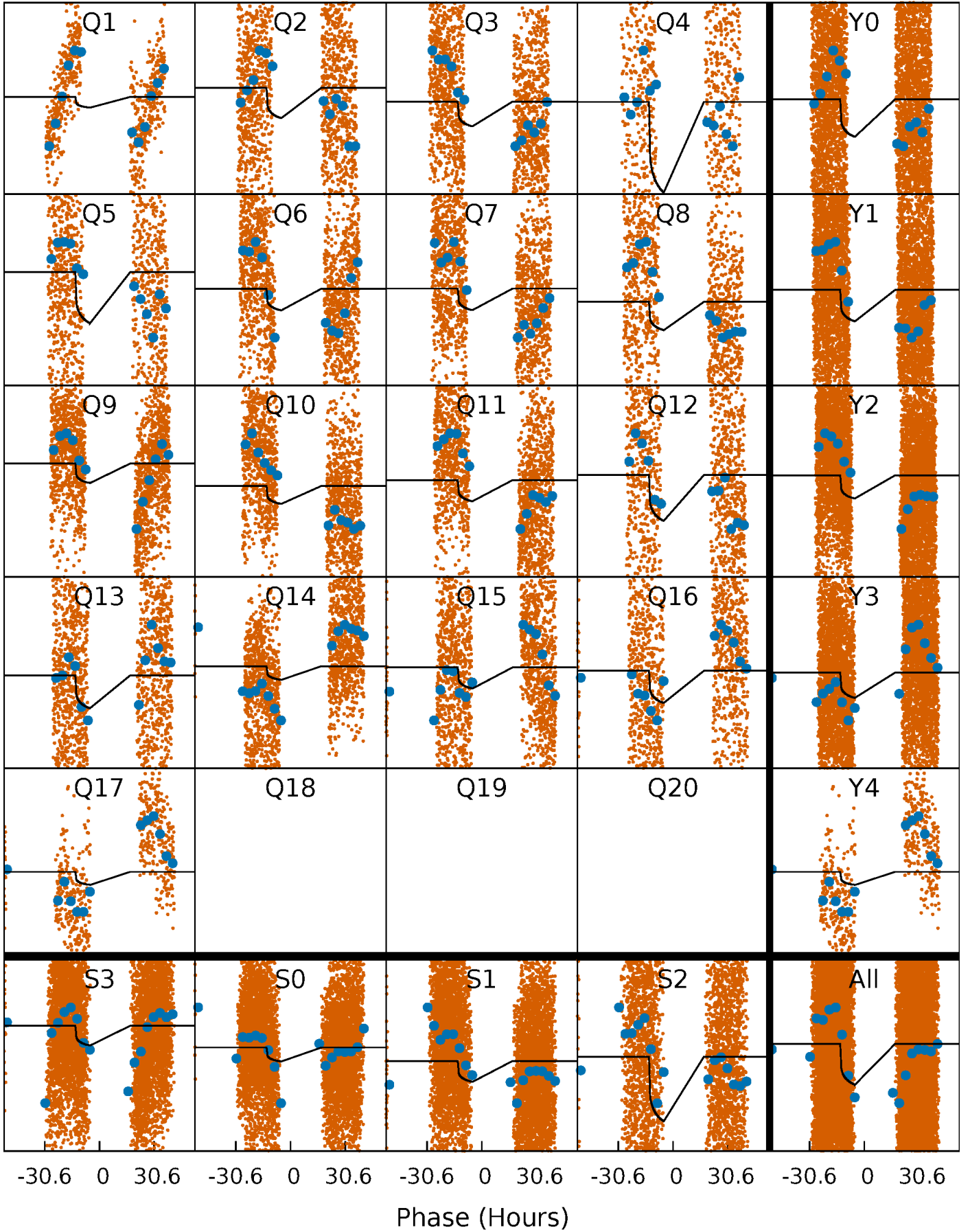
PDC Quarter-Phased Transit Curves

TCE 004456940-03 P= 3.925970 Days $T_0=133.621186$ (BKJD)



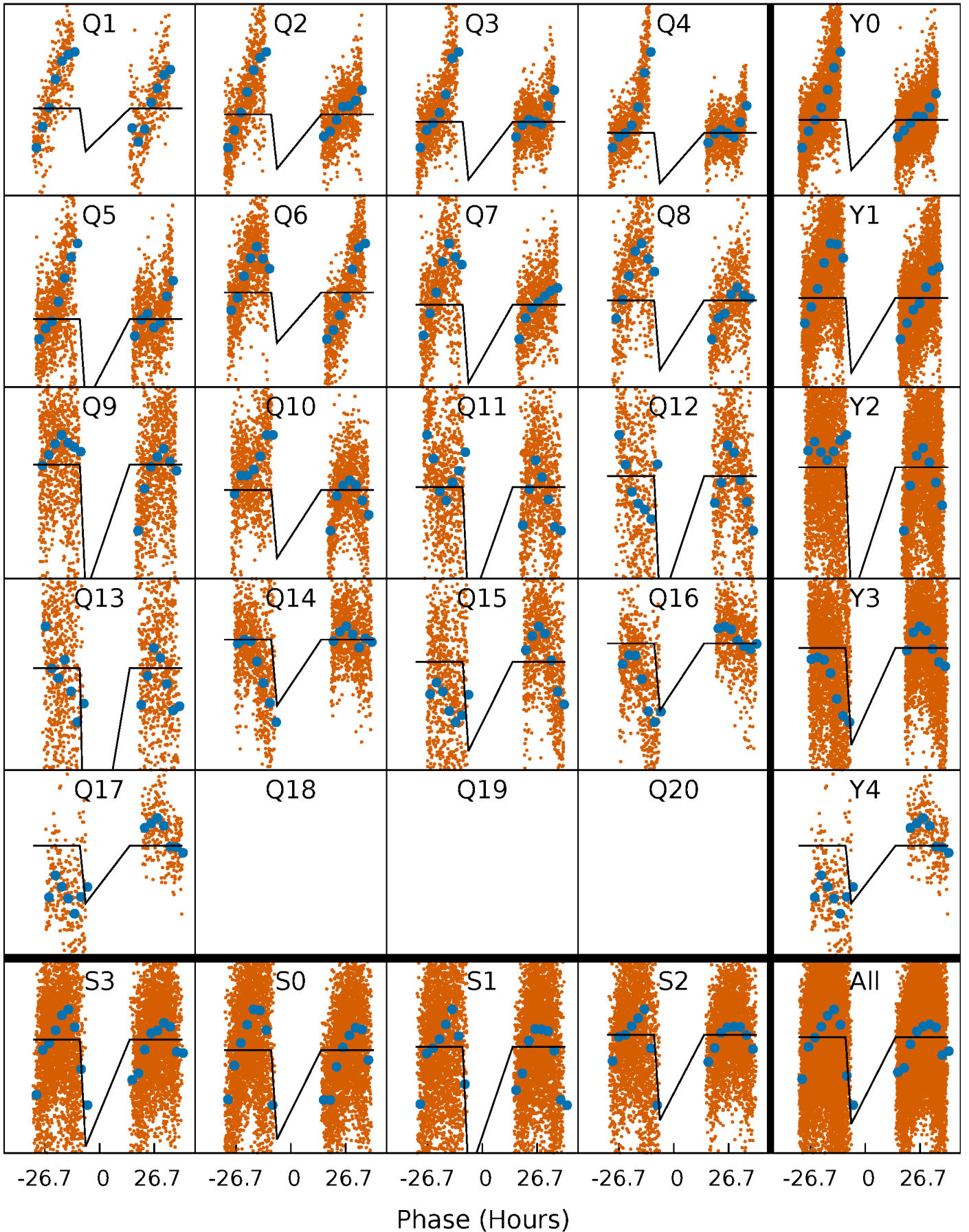
DV Quarter-Phased Transit Curves

TCE 004456940-03 P= 3.925970 Days $T_0=133.621186$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

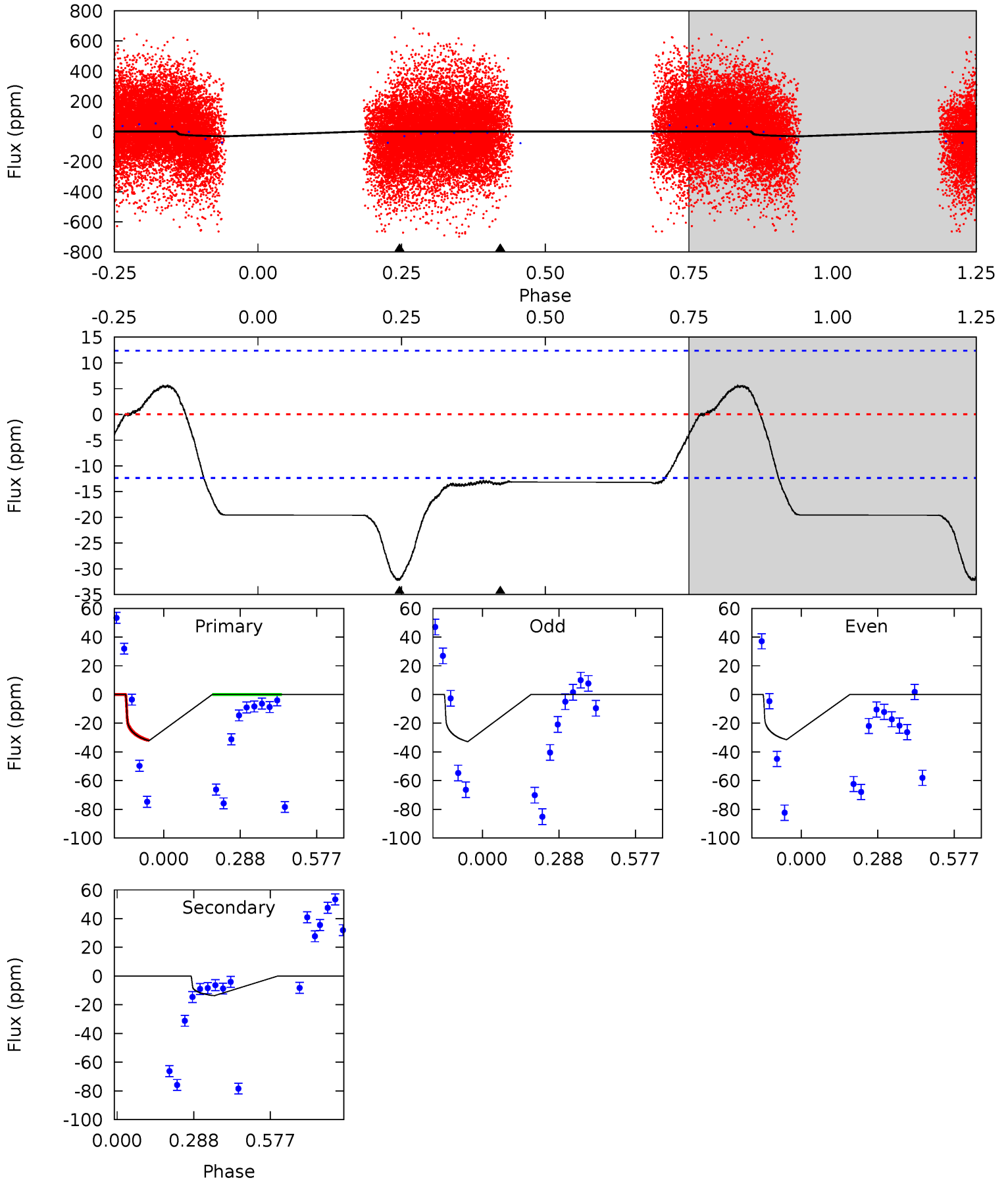
TCE 004456940-03 P= 3.925864 Days $T_0=133.725674$ (BKJD)



DV Model-Shift Uniqueness Test

004456940-03, P = 3.925970 Days, E = 129.695216 Days

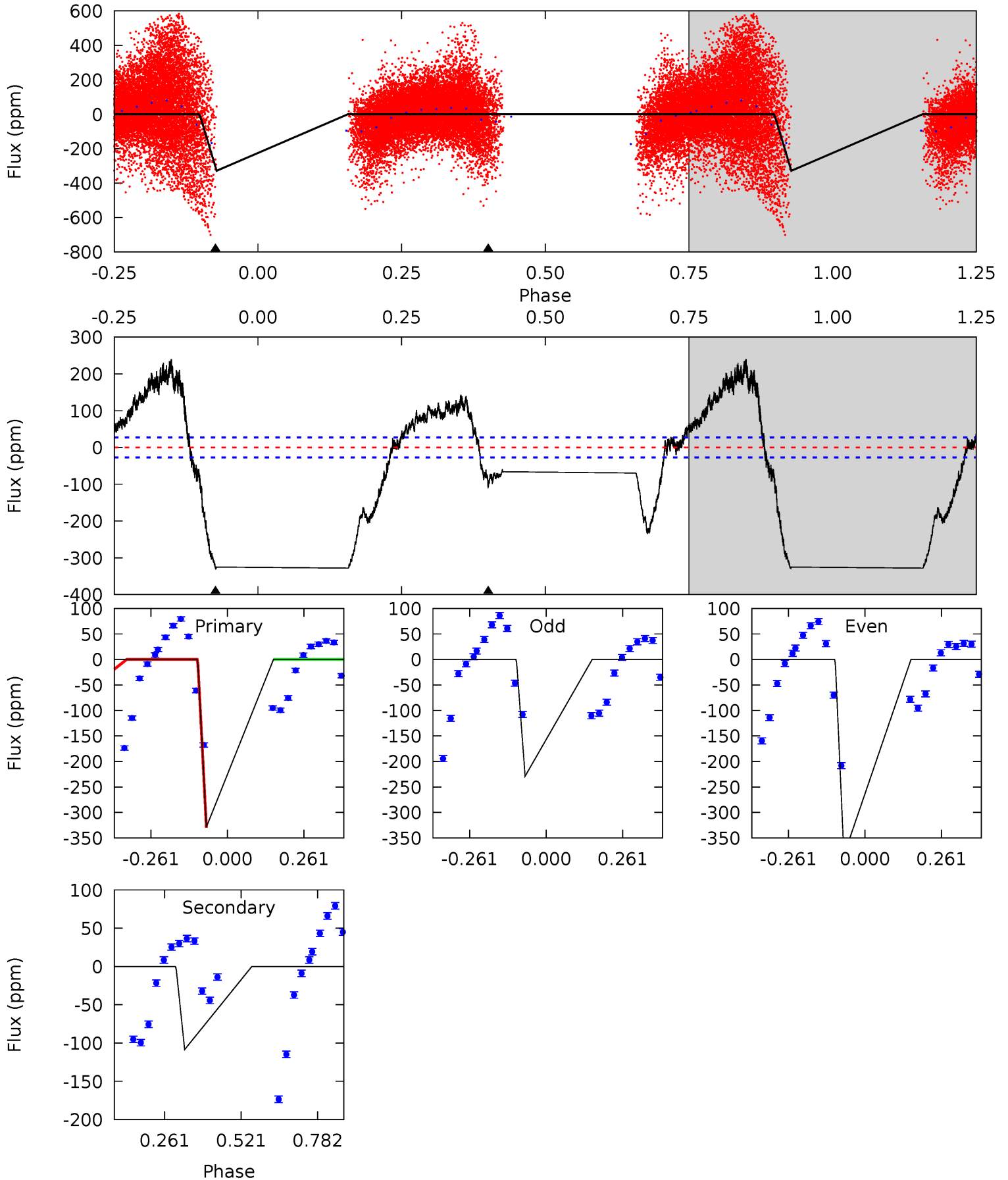
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|-----|-----|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|-----|-------|-----|
| 11.3 | 4.80 | 0 | 0 | 4.34 | 1.06 | 2.15 | 11.3 | 11.3 | 4.80 | 4.80 | 0.24 | 0 | 0.15 | 0 |



Alt Model-Shift Uniqueness Test

004456940-03, P = 3.925864 Days, E = 129.799810 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|-----|-----|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|-----|-------|-----|
| 53.1 | 17.5 | 0 | 0 | 4.36 | 1.13 | 10.3 | 53.1 | 53.1 | 17.5 | 17.5 | 11.9 | 0 | 0.42 | 0 |



Stellar Parameters For KIC 004456940

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | $R (R_{\odot})$ | $M(M_{\odot})$ | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
| | 6537^{+181}_{-250} | $4.280^{+0.108}_{-0.201}$ | $-0.160^{+0.250}_{-0.300}$ | $1.307^{+0.404}_{-0.218}$ | $1.190^{+0.192}_{-0.174}$ | $0.750^{+0.445}_{-0.375}$ |
| | +3%/-4% | +3%/-5% | +156%/-188% | +31%/-17% | +16%/-15% | +59%/-50% |
| Source | PHO54 | PHO54 | PHO54 | DSEP | | |

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

Secondary Eclipse Parameters for KIC 004456940-03 / KOI

| Detrend | Depth (ppm) | $R_p (R_{\oplus})$ | $T_{\text{max}} (K)$ | $T_{\text{obs}} (K)$ | A_{obs} |
|---------|--------------|------------------------|----------------------|----------------------|------------------|
| DV | -14 ± 3 | $1.06^{+0.31}_{-0.28}$ | 2041^{+137}_{-119} | 4731^{+709}_{-424} | 18^{+16}_{-8} |
| Alt. | -109 ± 6 | $3.16^{+0.54}_{-0.42}$ | 2049^{+153}_{-122} | 4651^{+217}_{-209} | 16^{+5}_{-4} |

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

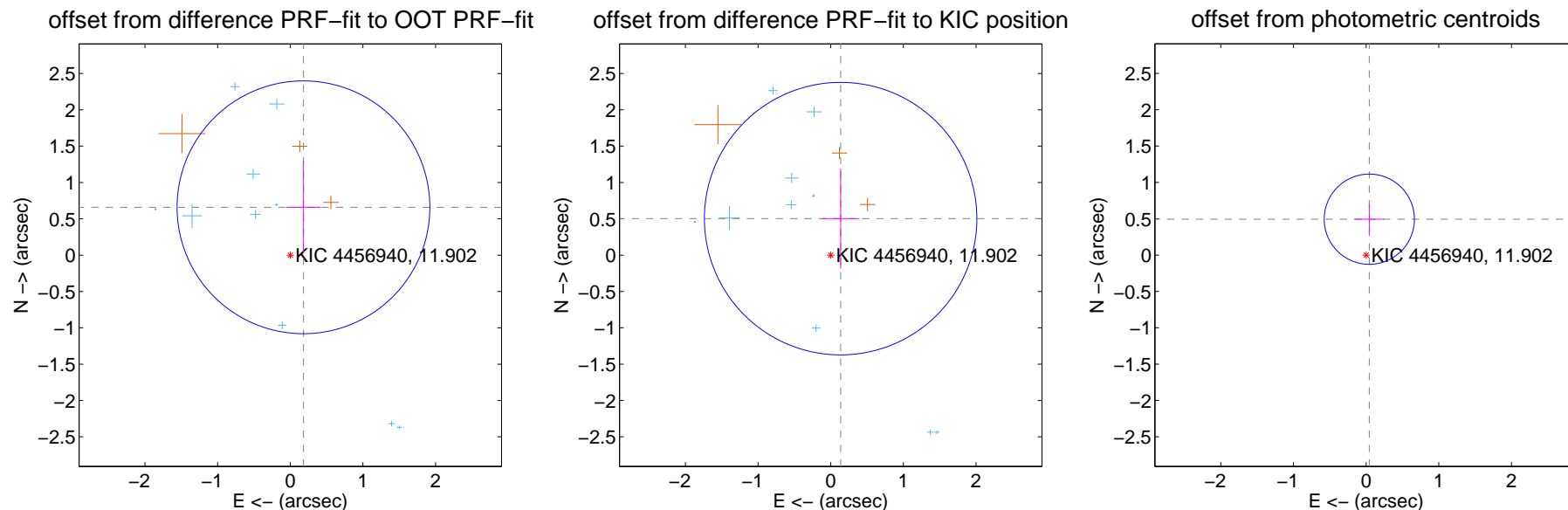
DV Centroid Data

Supplemental centroid analysis for 004456940-03. **Kepler magnitude: 11.90.** Transit SNR 10.60

There are 9 quarters with good PRF difference image offsets

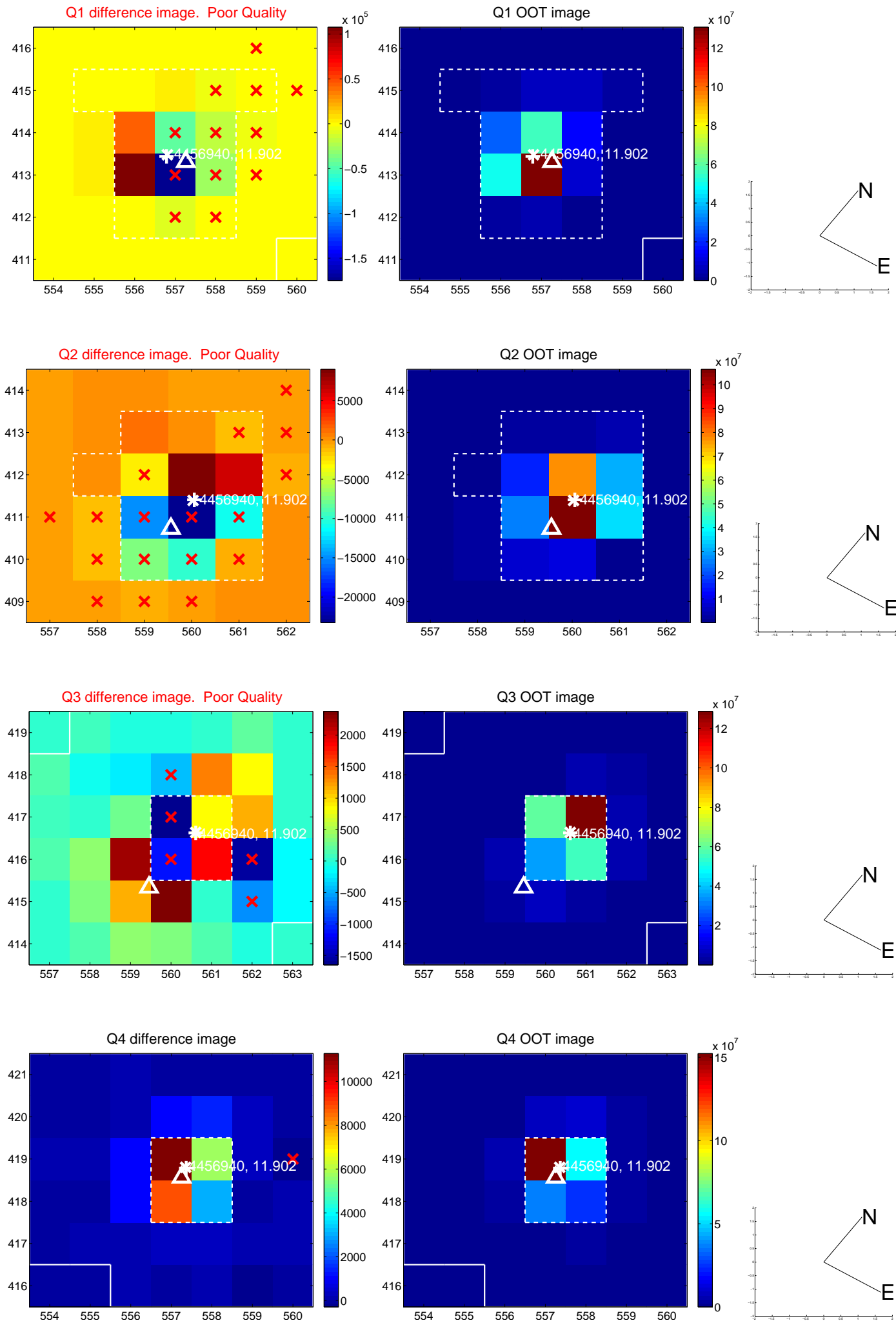
The direct PRF centroid is offset from the target star catalog position by about 0.09 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|---|--------------------|---------------------|--------------------|-------------------|
| PRF-fit source offset from OOT | 0.683 ± 0.580 | 1.18 | -0.182 ± 0.237 | 0.659 ± 0.638 |
| PRF-fit source offset from KIC position | 0.521 ± 0.625 | 0.83 | -0.136 ± 0.258 | 0.503 ± 0.688 |
| photometric centroid source offset | 0.50 ± 0.21 | 2.40 | -0.04 ± 0.20 | 0.49 ± 0.21 |

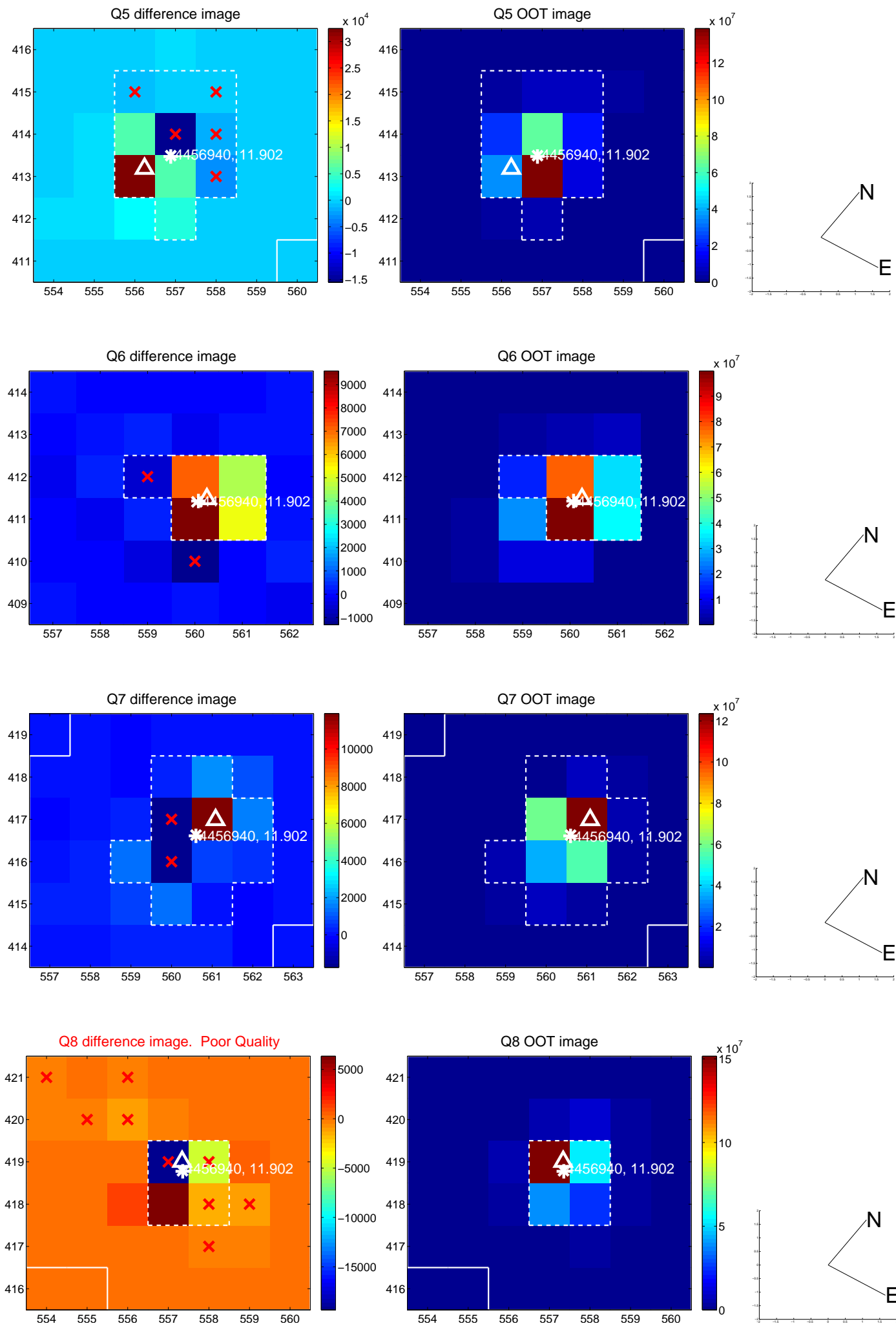


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

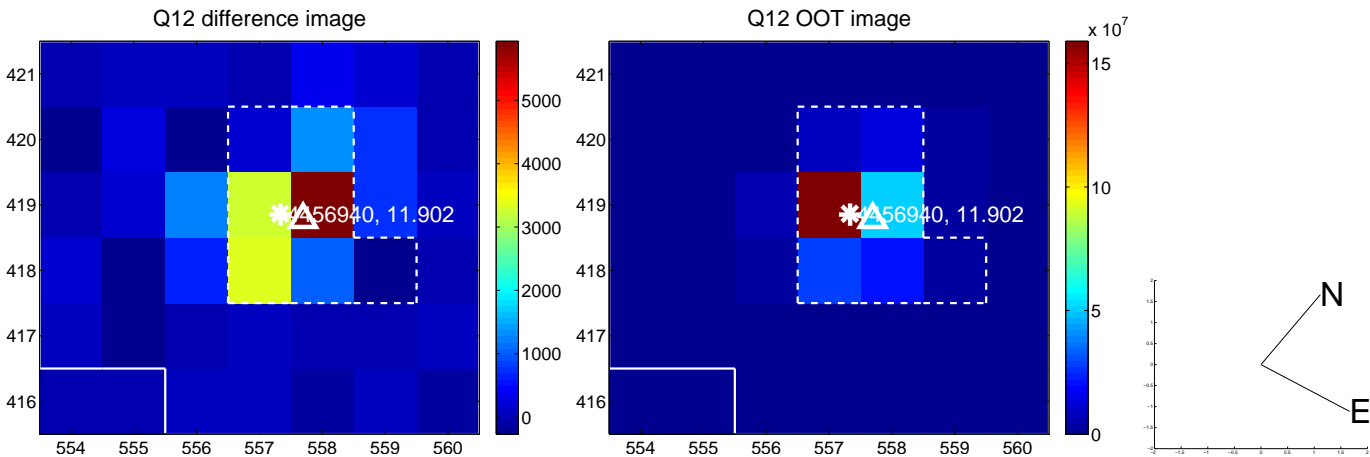
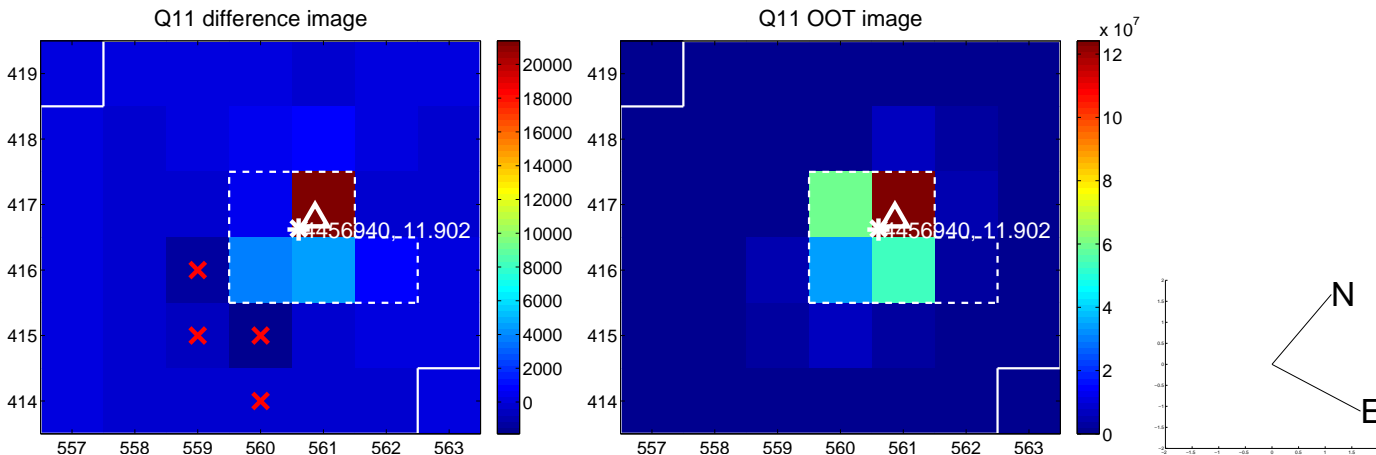
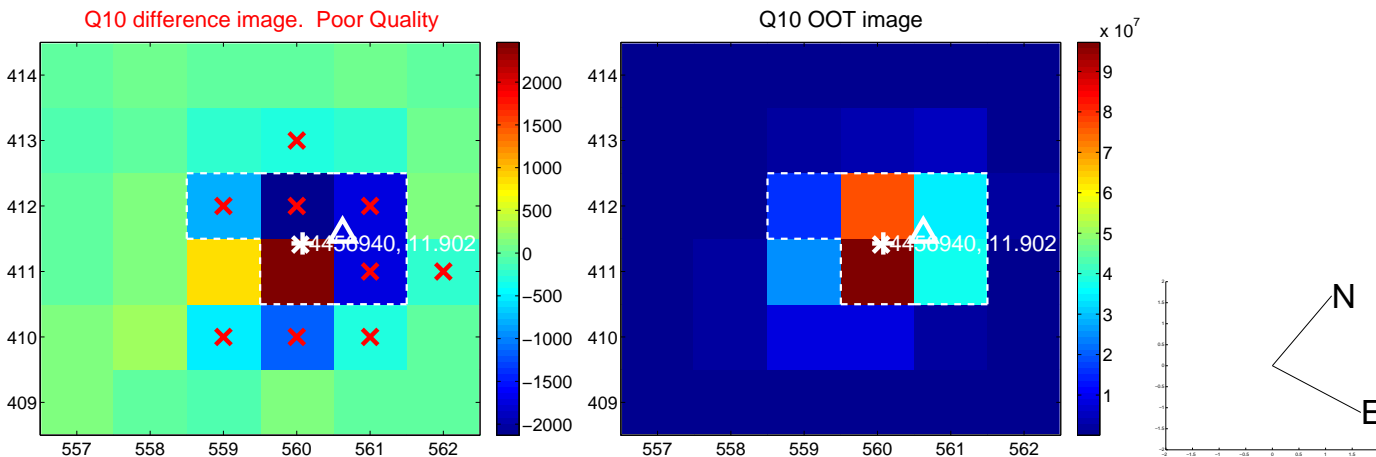
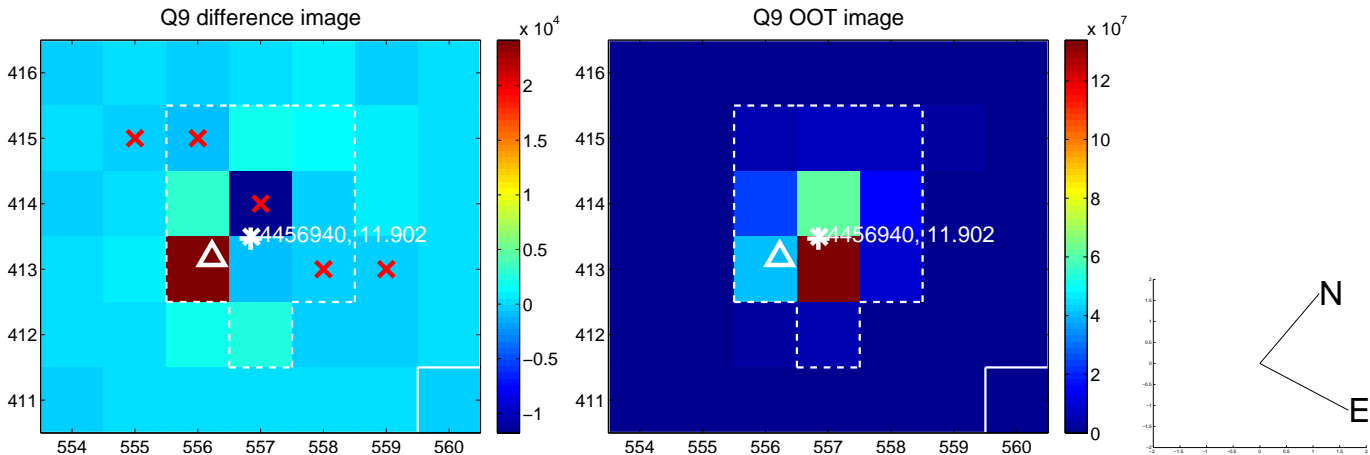
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



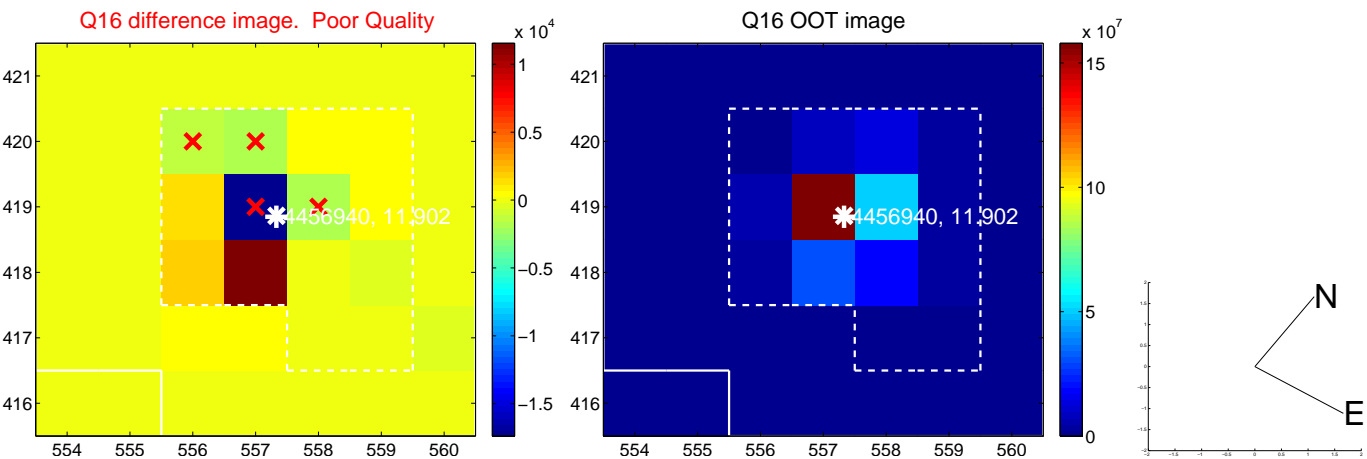
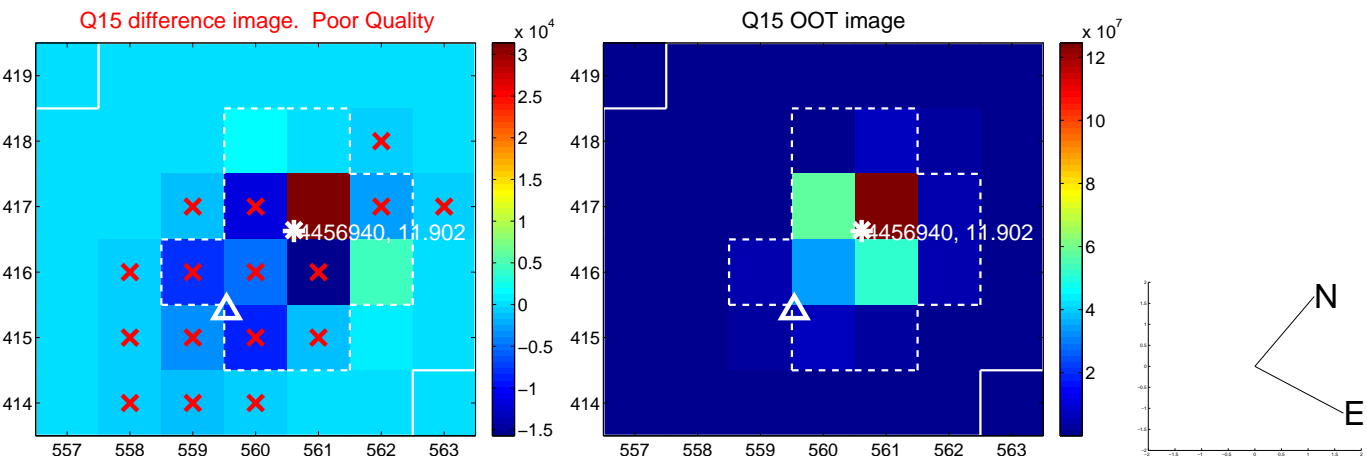
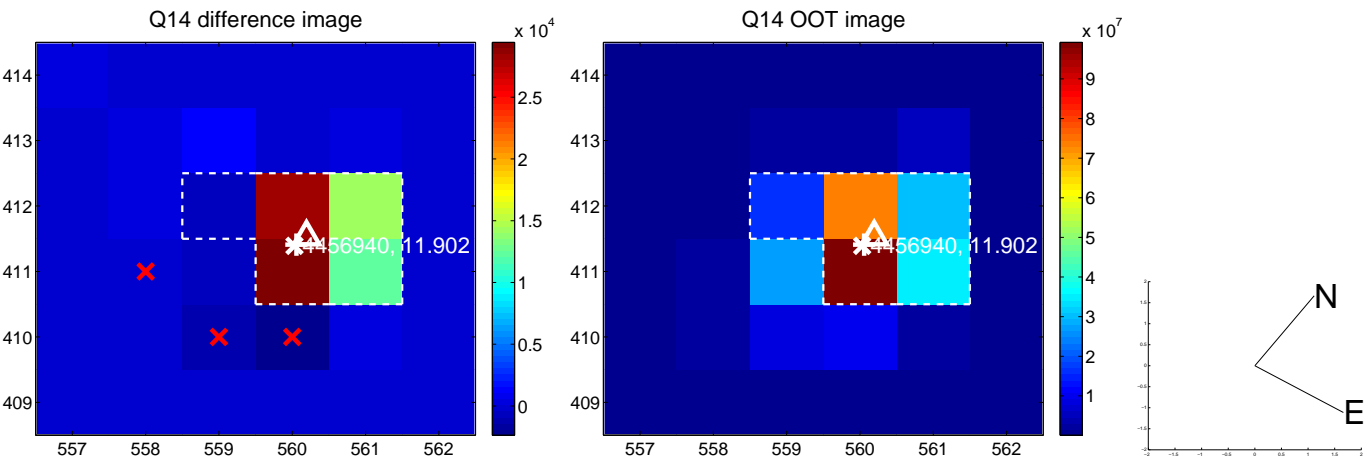
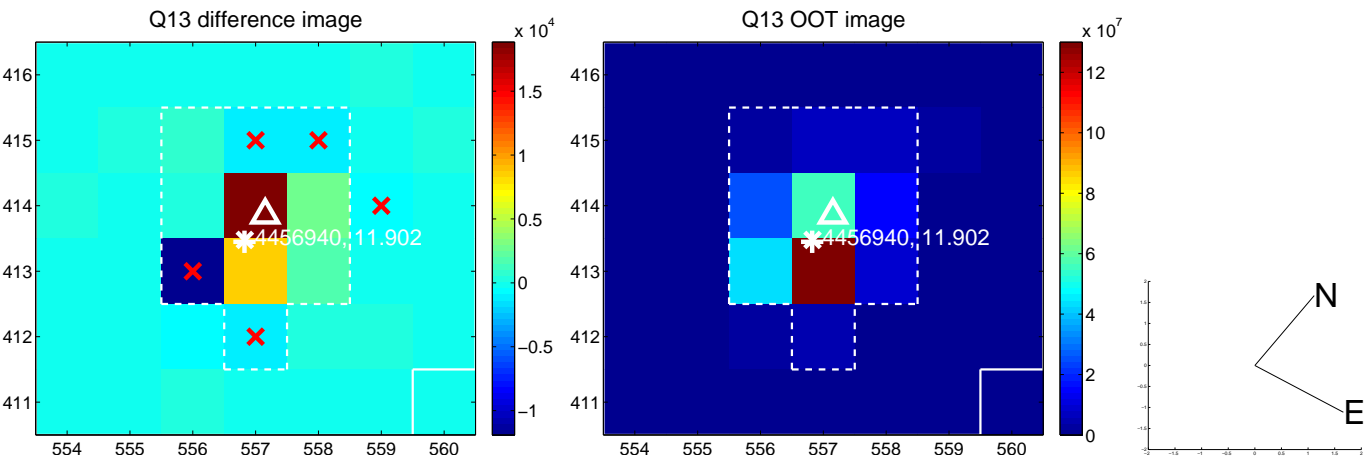
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



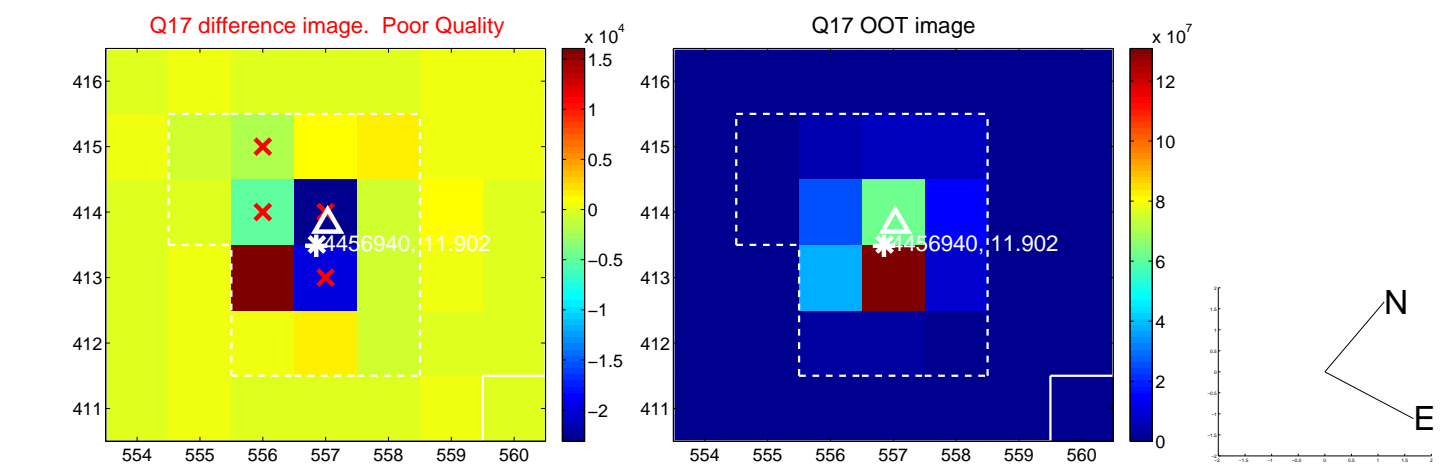
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



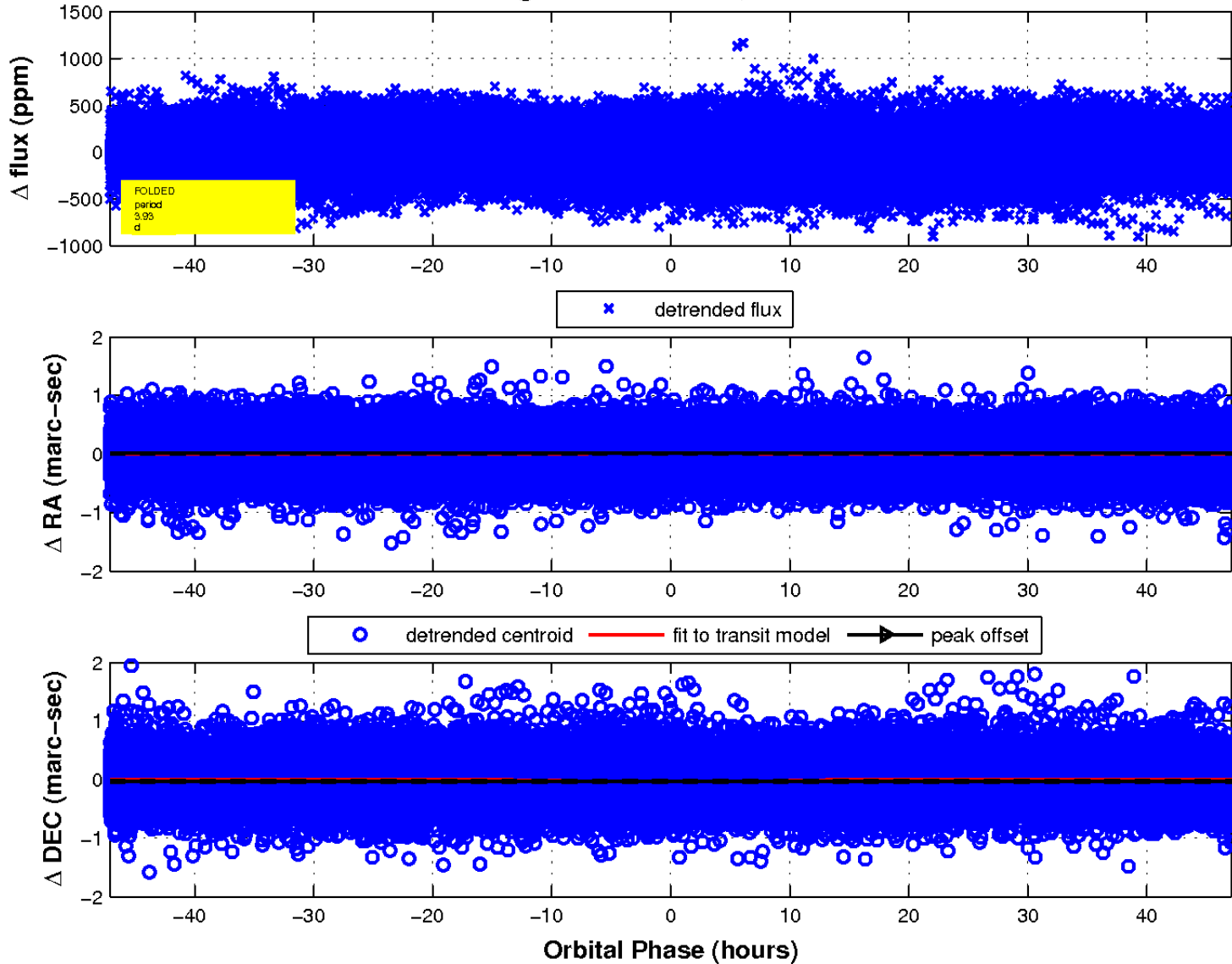
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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



fluxWeightedCentroids, Planet 3 of 3



UKIRT Image

Declination

