

KIC 010468940

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}) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 010468940-01 | OBS | 1163.01 | 2.936531 | 132.779985 | 360.3 | 1.827 | 29.5 | 34.0 | 1.00 | 5359 | 2.25 | 505.86 |
| 010468940-02 | OBS | 1163.02 | 8.014984 | 134.828787 | 380.4 | 3.934 | 22.9 | 25.3 | 1.00 | 5359 | 2.74 | 132.62 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|------------|
| 010468940-01 | OBS | PC | 1.00 | 0 | 0 | 0 | 0 | NO_COMMENT |
| 010468940-02 | OBS | PC | 1.00 | 0 | 0 | 0 | 0 | NO_COMMENT |

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.

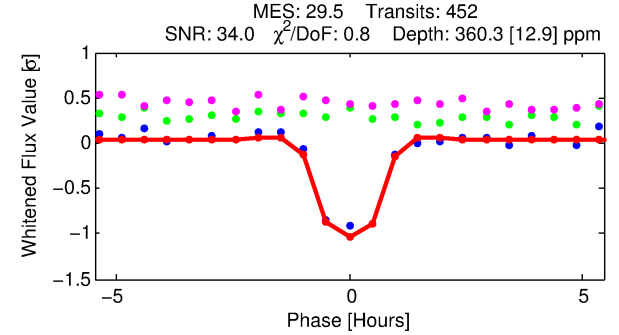
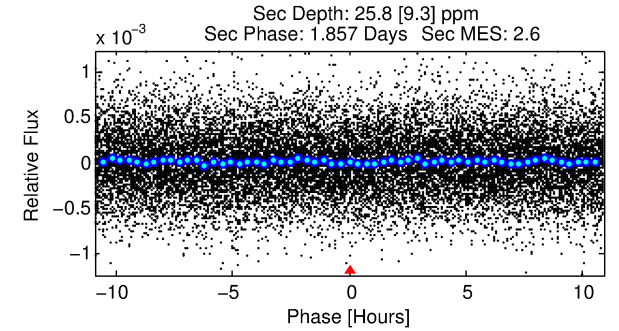
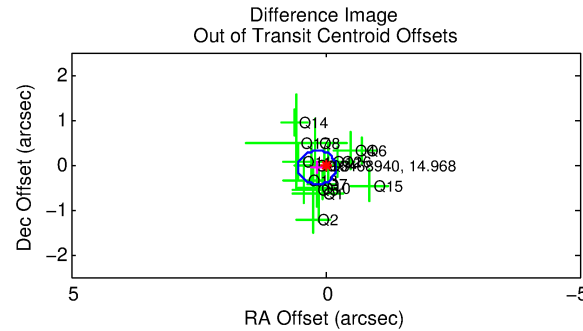
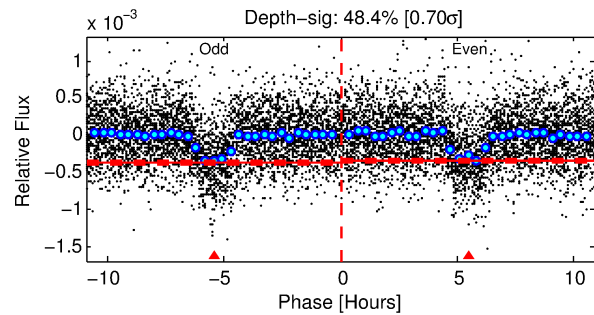
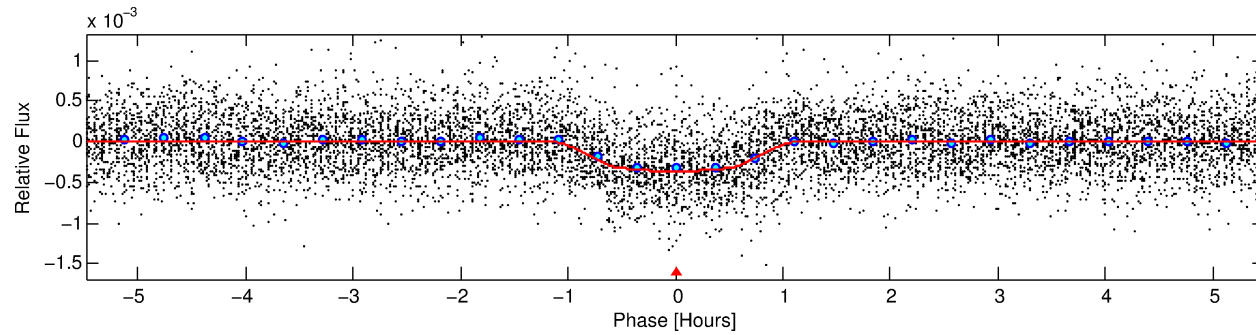
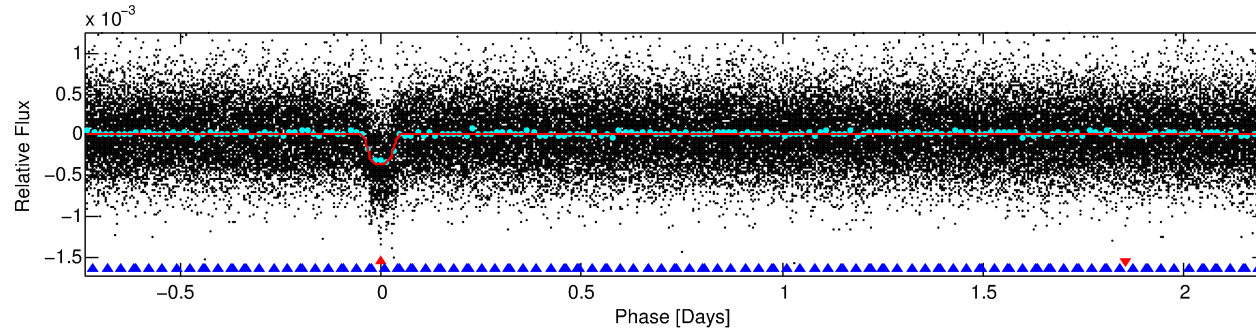
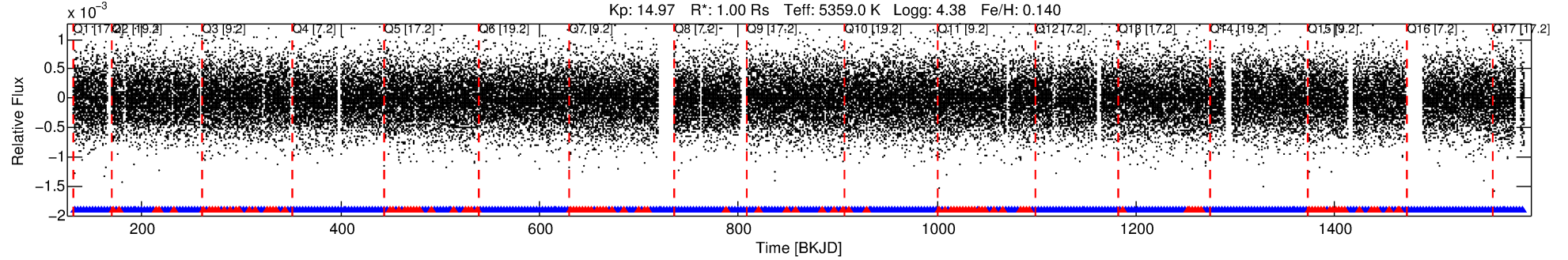
Ephemeris Match Information For 010468940-01

No Significant Match Found

DV One-Page Summary

KIC: 10468940 Candidate: 1 of 2 Period: 2.937 d
KOI: K01163.01 Name: Kepler-273b Corr: 0.983

Kp: 14.97 R*: 1.00 Rs Teff: 5359.0 K Logg: 4.38 Fe/H: 0.140



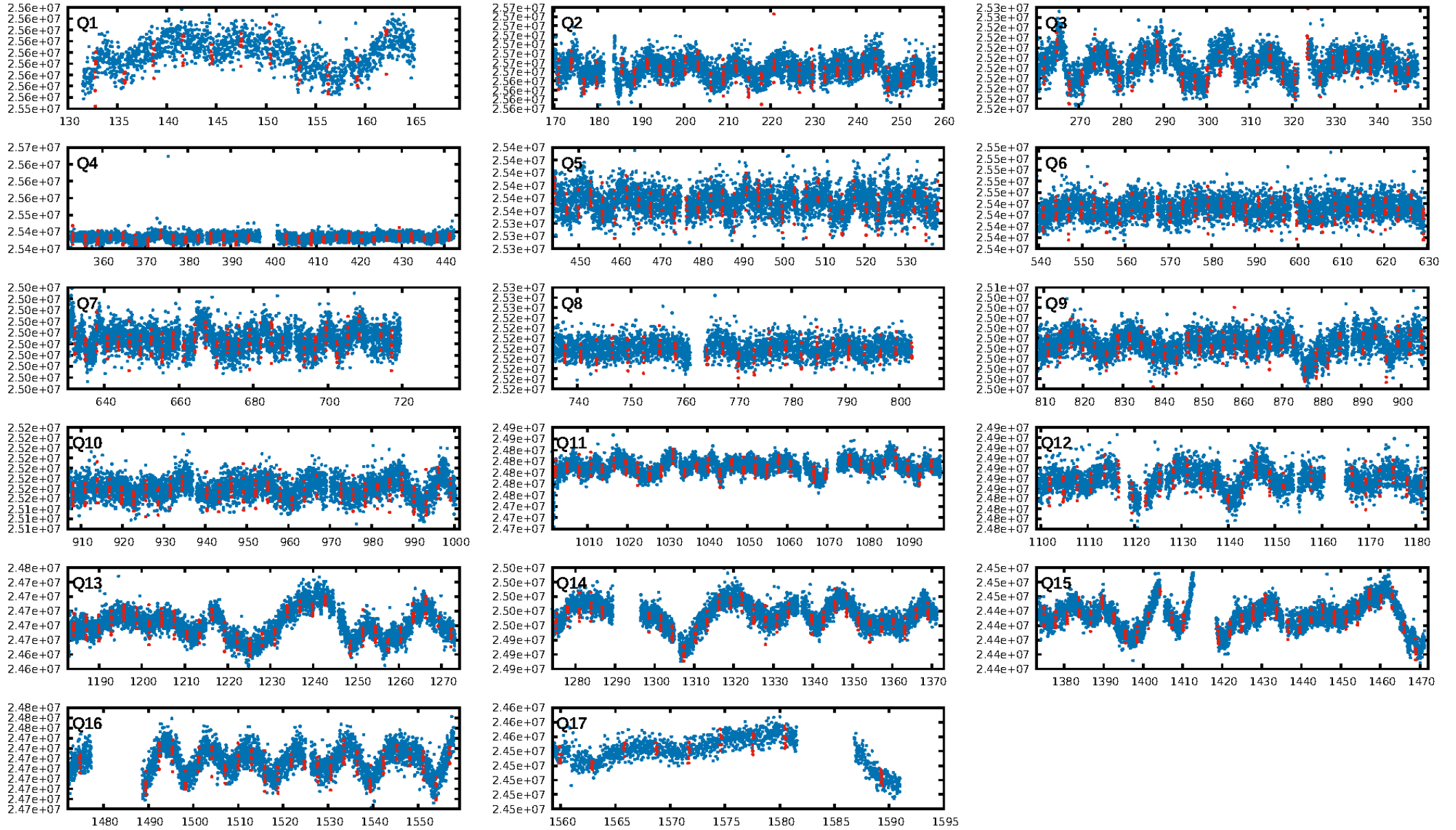
DV Fit Results:

Period = 2.93653 [0.00000] d
Epoch = 132.7800 [0.0009] BKJD
Rp/R* = 0.0205 [0.0060]
a/R* = 6.49 [7.53]
b = 0.88 [0.32]
Seff = 505.86 [116.25]
Teff = 1209 [69] K
Rp = 2.25 [0.72] Re
a = 0.0383 [0.0052] AU
Ag = 4.12 [2.96] [1.06σ]
Teffp = 2665 [457] K [3.15σ]

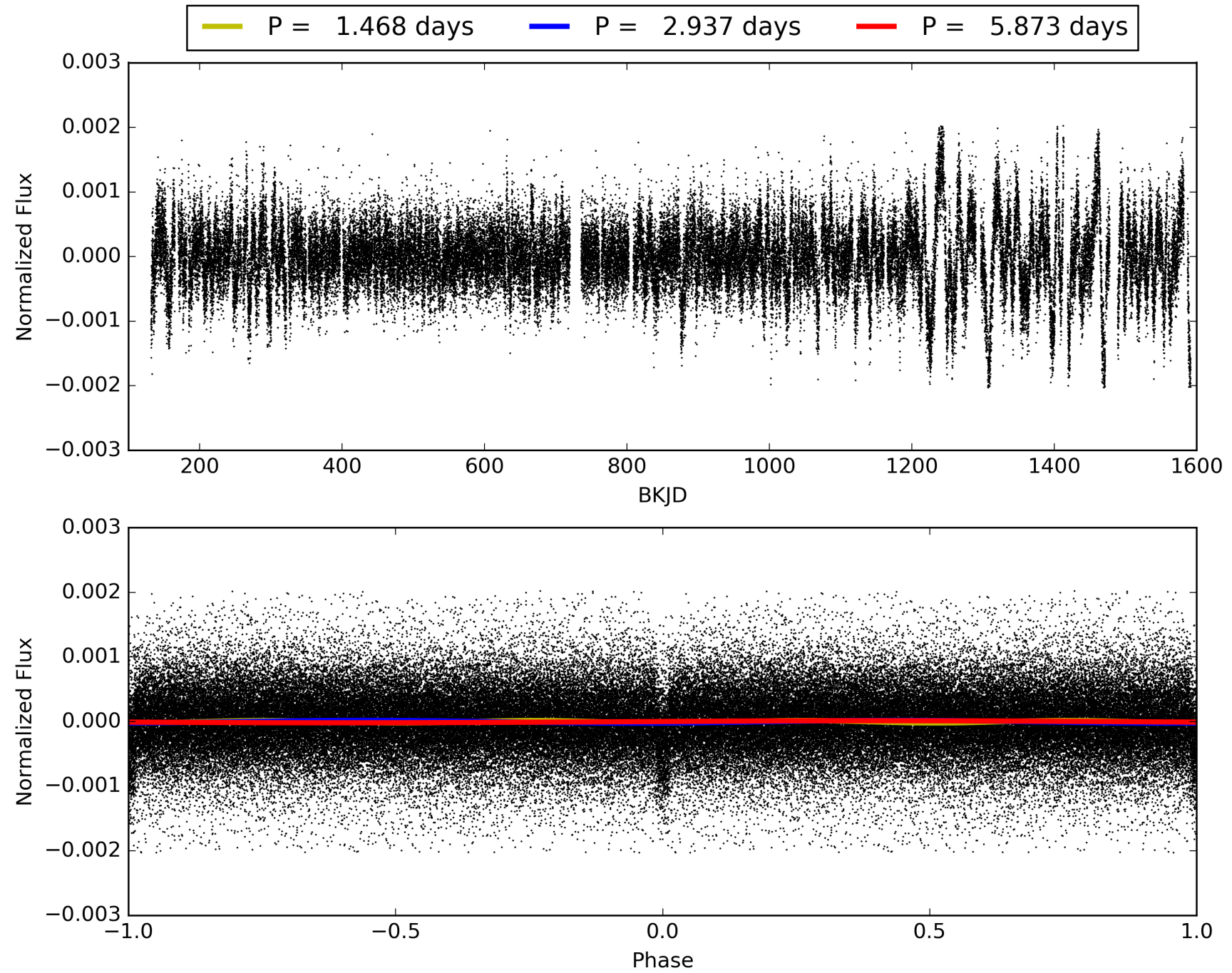
DV Diagnostic Results:

ShortPeriod-sig: N/A
LongPeriod-sig: 100.0% [28.10σ]
ModelChiSquare2-sig: N/A
ModelChiSquareGof-sig: N/A
Bootstrap-pfa: 3.49e-188
RollingBand-fgt: 0.75 [324/432]
GhostDiagnostic-chr: -5.475
Centroid-sig: 16.4%
Centroid-so: 0.678 arcsec [1.50σ]
OotOffset-rm: 0.174 arcsec [1.39σ]
KicOffset-rm: 0.271 arcsec [1.96σ]
OotOffset-st: 4/4/4/5 [17]
KicOffset-st: 4/4/4/5 [17]
DiffImageQuality-fgm: 0.94 [16/17]
DiffImageOverlap-fno: 1.00 [17/17]

TCE 010468940-01, PDC Light Curves

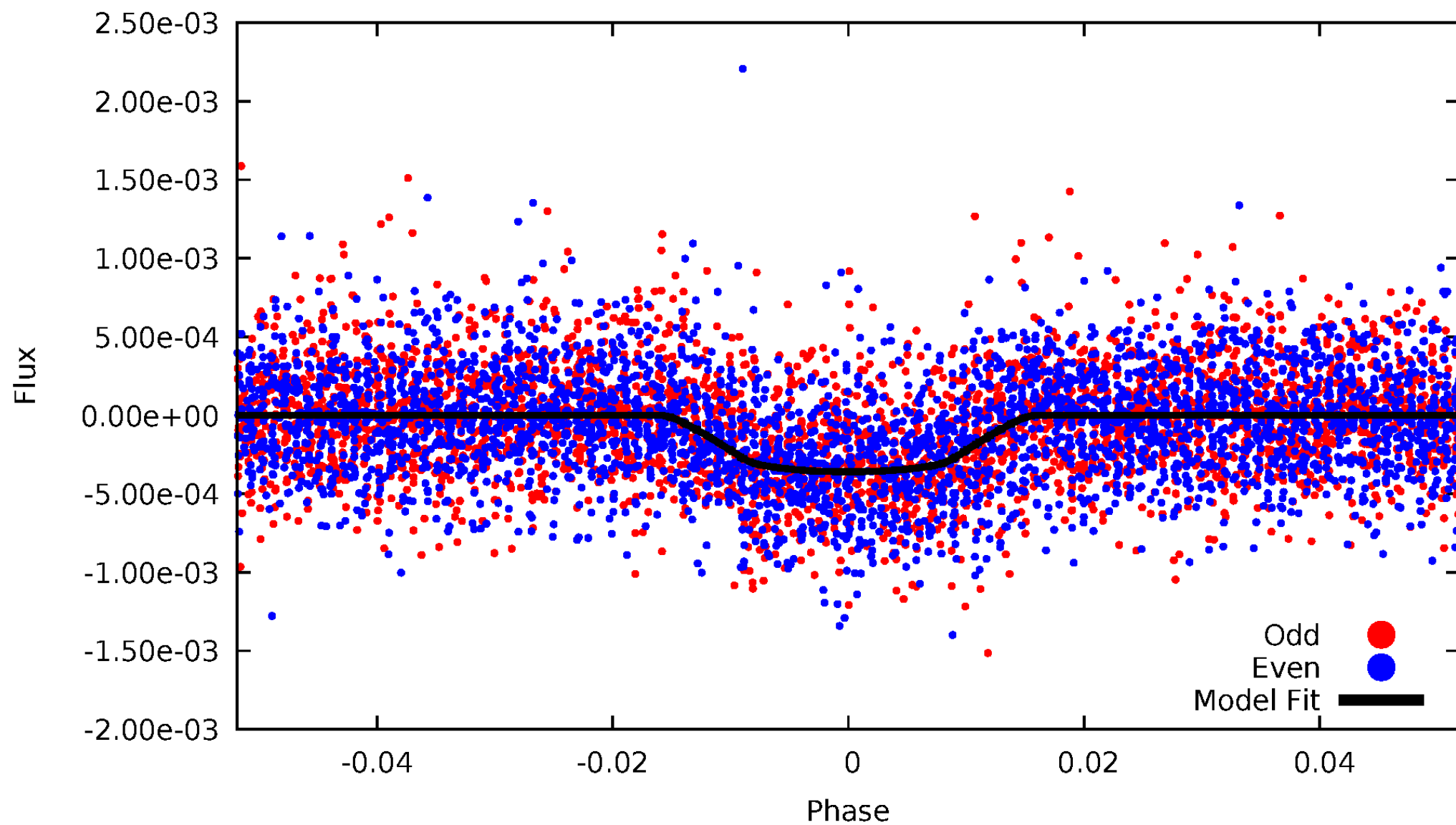


TCE 010468940-01



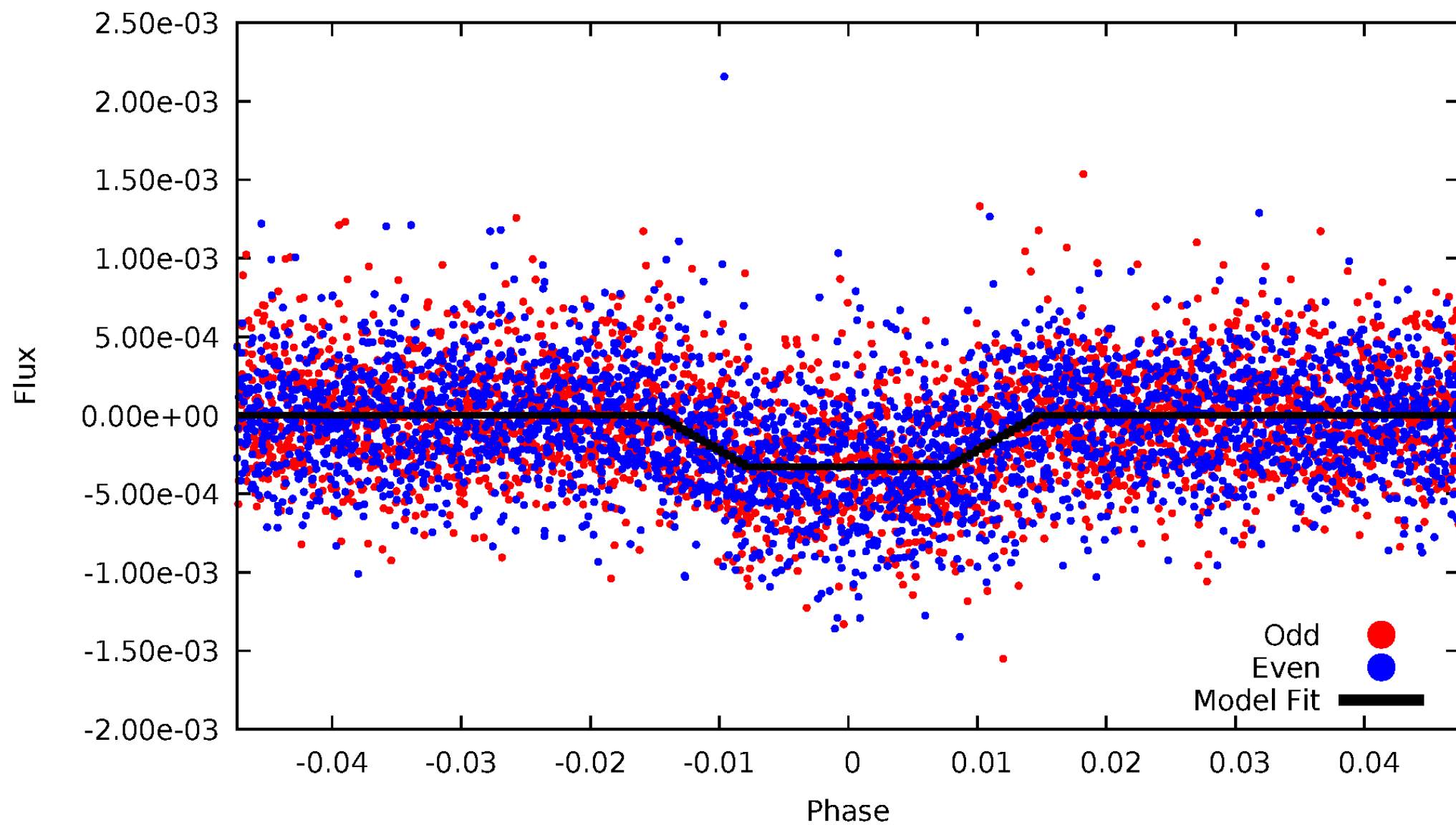
DV Odd/Even

TCE 010468940-01



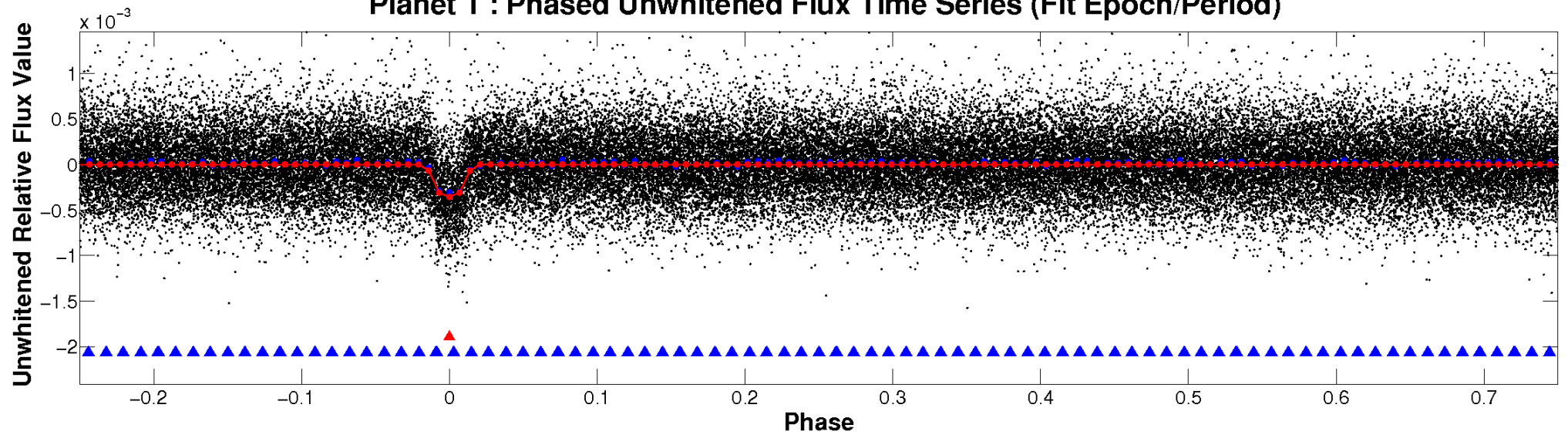
ALT Odd/Even

TCE 010468940-01

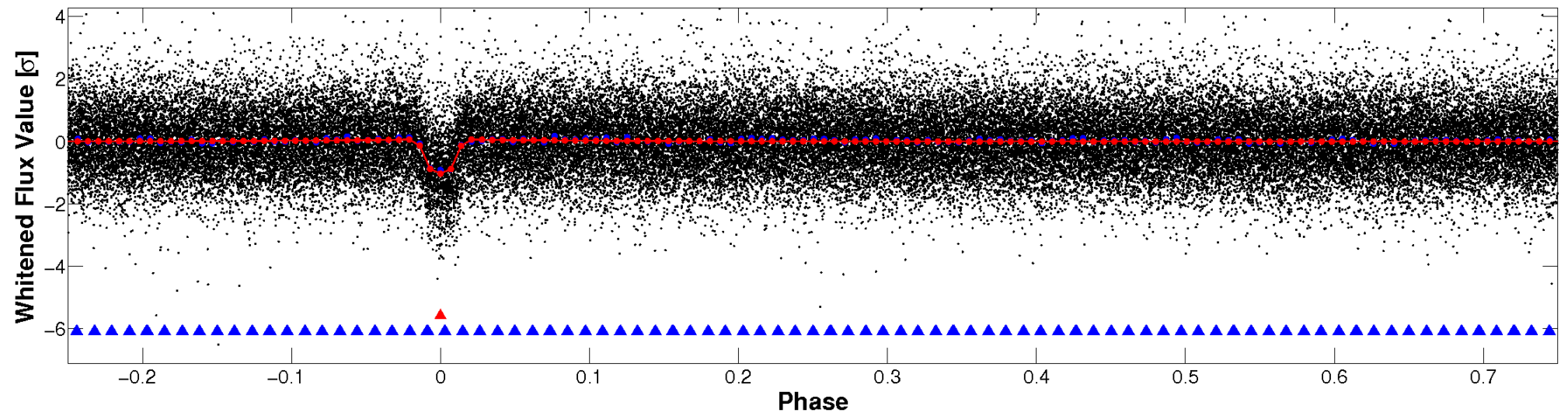


Non-Whitened Vs. Whitened Light Curve

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

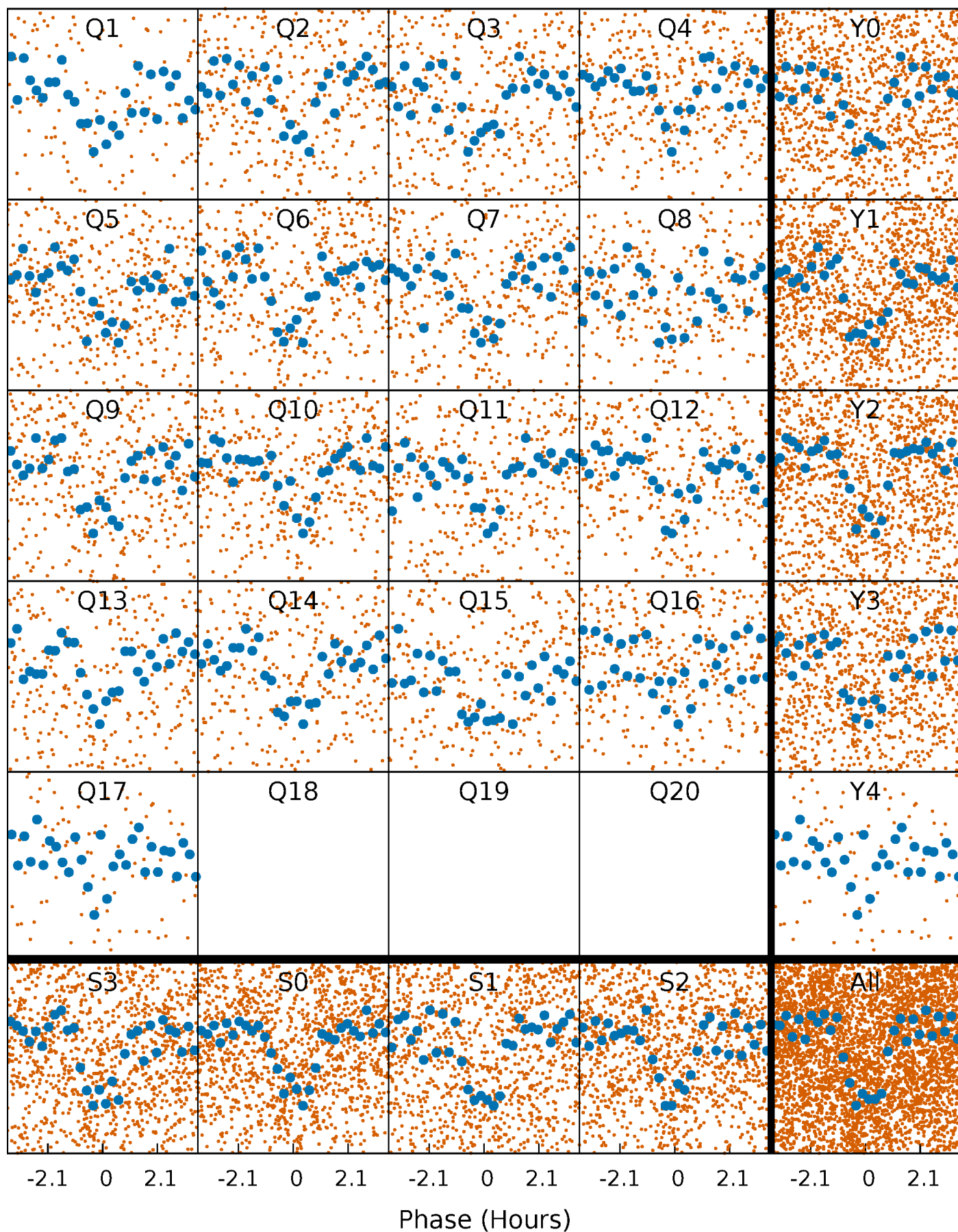


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



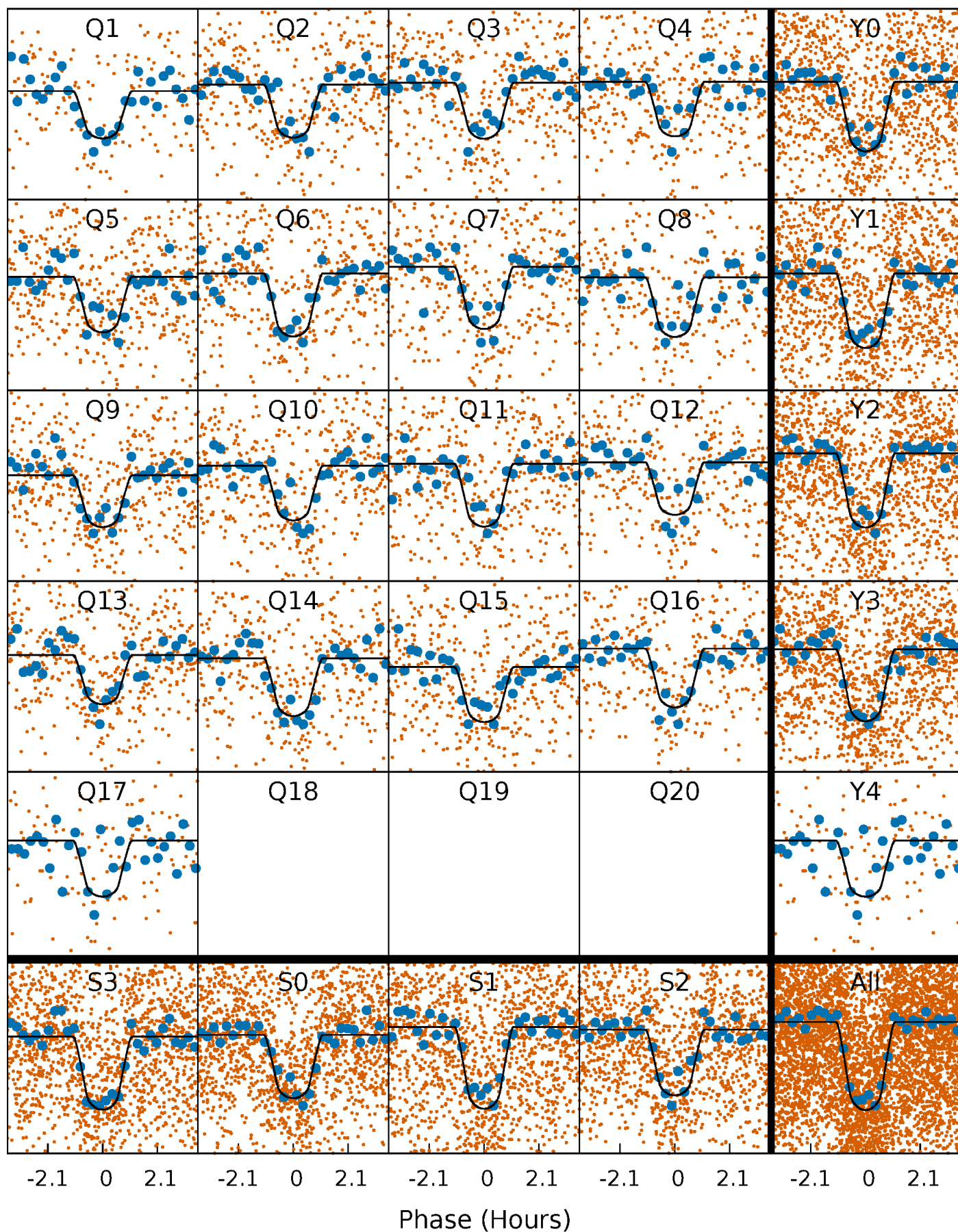
PDC Quarter-Phased Transit Curves

TCE 010468940-01 P= 2.936531 Days $T_0=132.779985$ (BKJD)



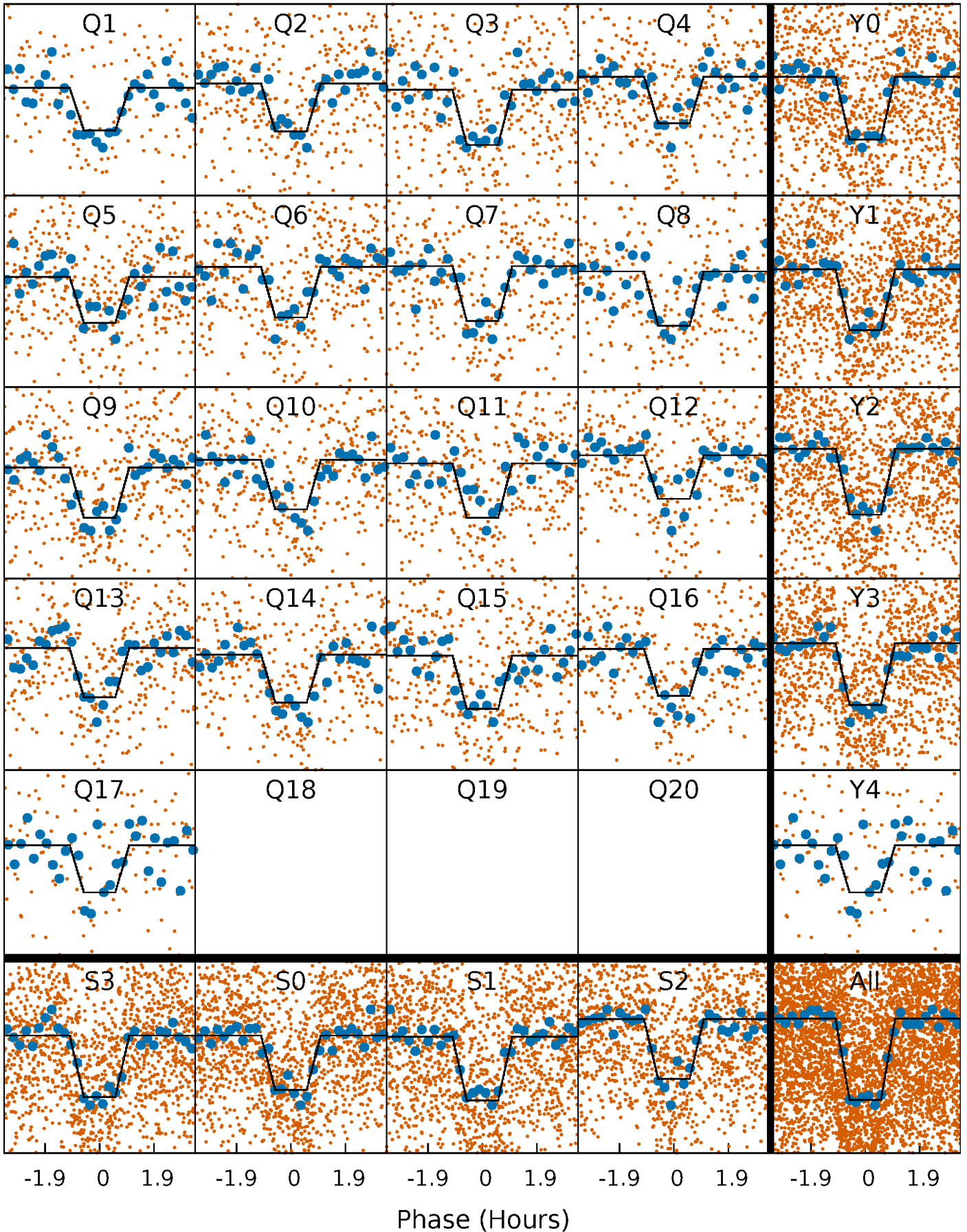
DV Quarter-Phased Transit Curves

TCE 010468940-01 P= 2.936531 Days $T_0=132.779985$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

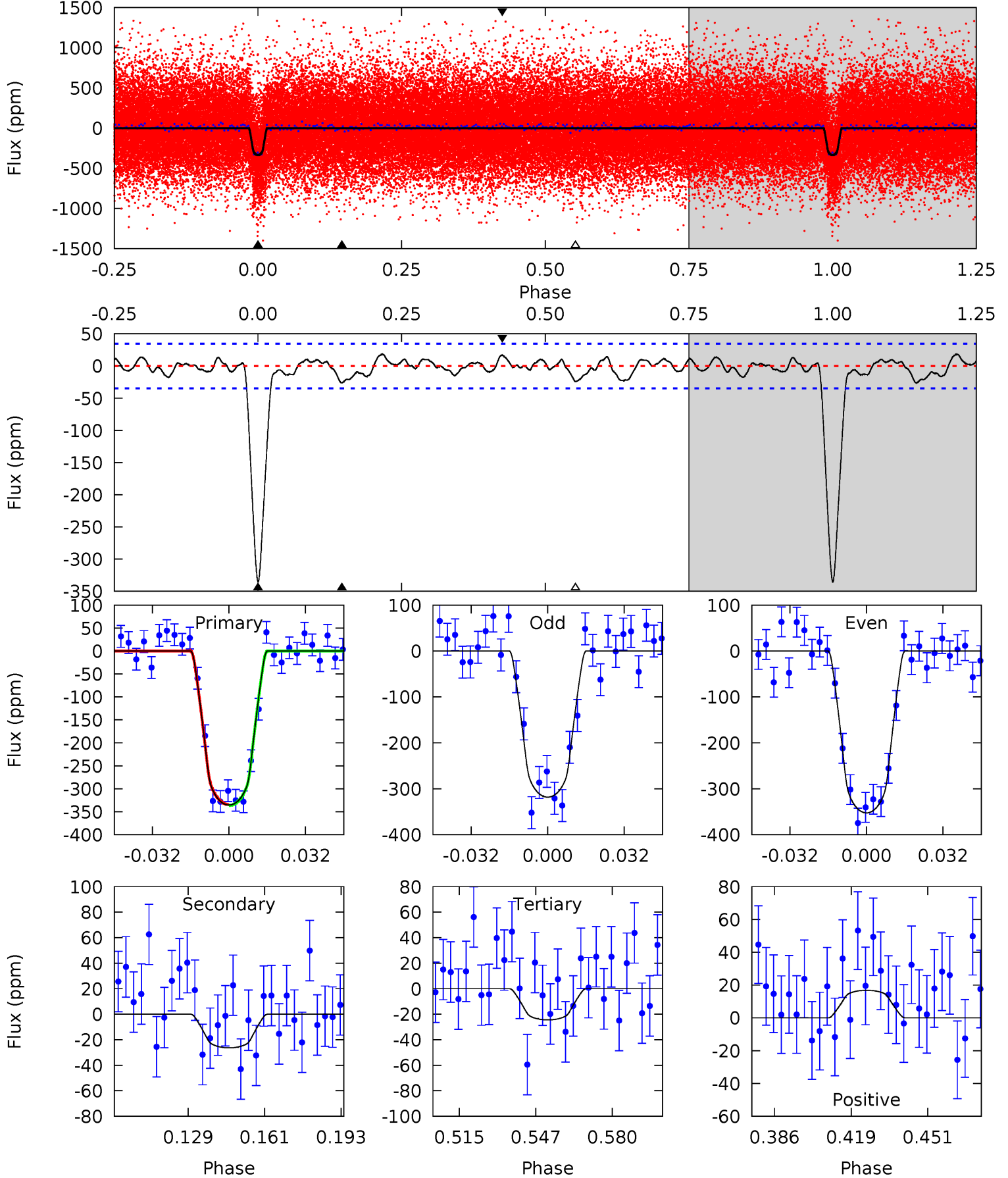
TCE 010468940-01 P= 2.936525 Days $T_0=132.782120$ (BKJD)



DV Model-Shift Uniqueness Test

010468940-01, P = 2.936531 Days, E = 129.843454 Days

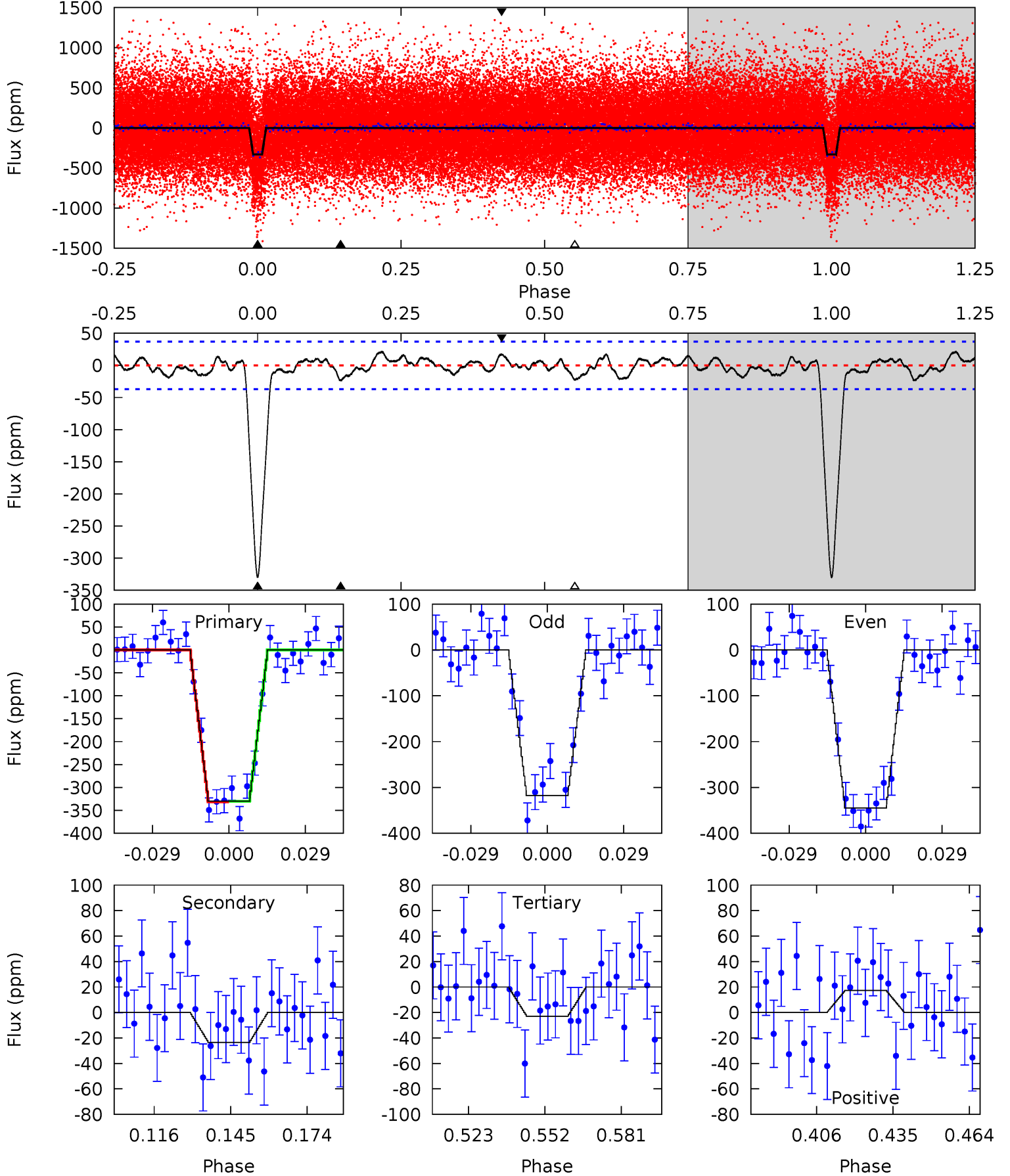
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 46.4 | 3.65 | 3.38 | 2.33 | 4.80 | 2.14 | 1.24 | 43.0 | 44.1 | 0.26 | 1.32 | 2.37 | 0.97 | 0.05 | 0.13 |



Alt Model-Shift Uniqueness Test

010468940-01, P = 2.936525 Days, E = 129.845595 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 42.9 | 3.05 | 2.98 | 2.25 | 4.82 | 2.18 | 1.20 | 39.9 | 40.7 | 0.07 | 0.80 | 1.76 | 0.96 | 0.06 | 0.09 |



Stellar Parameters For KIC 010468940

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | $R (R_{\odot})$ | $M(M_{\odot})$ | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|---------------------|---------------------------|---------------------------|---------------------------|---------------------------|---|
| | 5359^{+80}_{-72} | $4.375^{+0.132}_{-0.077}$ | $0.140^{+0.150}_{-0.150}$ | $1.002^{+0.111}_{-0.136}$ | $0.867^{+0.068}_{-0.032}$ | $1.215^{+0.709}_{-0.298}$ |
| | +1%/-1% | +3%/-2% | +107%/-107% | +11%/-14% | +8%/-4% | +58%/-25% |
| 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 010468940-01 / KOI 1163.01

| Detrend | Depth (ppm) | $R_p (R_{\oplus})$ | $T_{\text{max}} (K)$ | $T_{\text{obs}} (K)$ | A_{obs} |
|---------|-------------|------------------------|----------------------|----------------------|---------------------------|
| DV | -26 ± 7 | $2.20^{+0.66}_{-0.66}$ | 1680^{+64}_{-68} | 3192^{+404}_{-279} | $4.300^{+4.611}_{-2.046}$ |
| Alt. | -23 ± 8 | $1.93^{+0.68}_{-0.65}$ | 1682^{+60}_{-73} | 3281^{+465}_{-325} | $5.105^{+6.338}_{-2.627}$ |

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

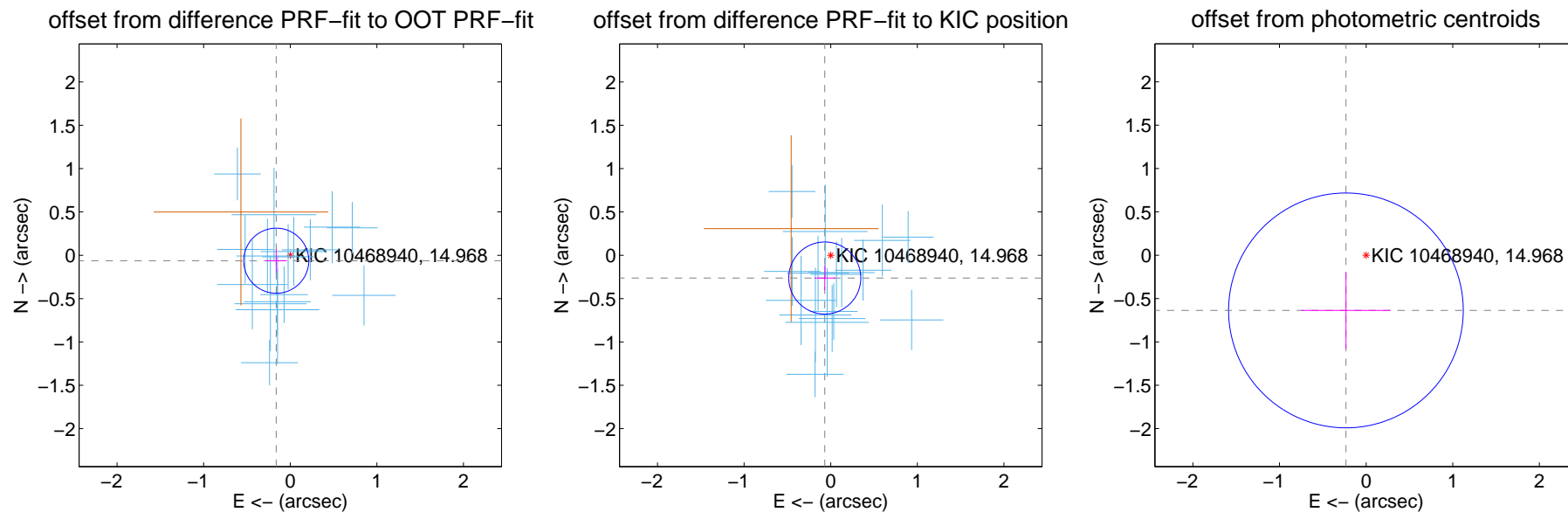
DV Centroid Data

Supplemental centroid analysis for 010468940-01. Kepler magnitude: 14.97. Transit SNR 33.98

There are 16 quarters with good PRF difference image offsets

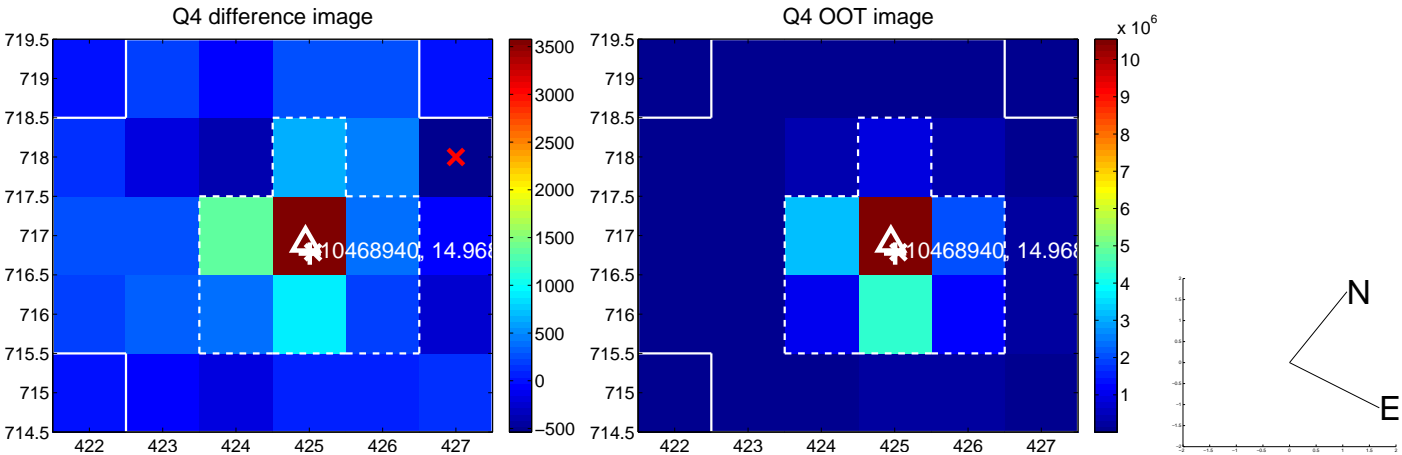
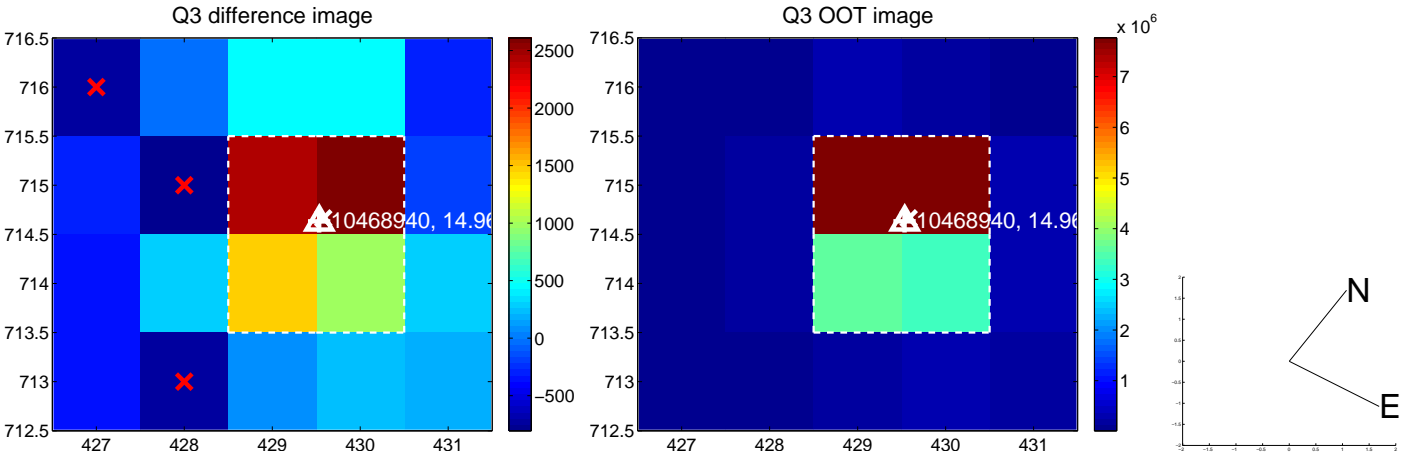
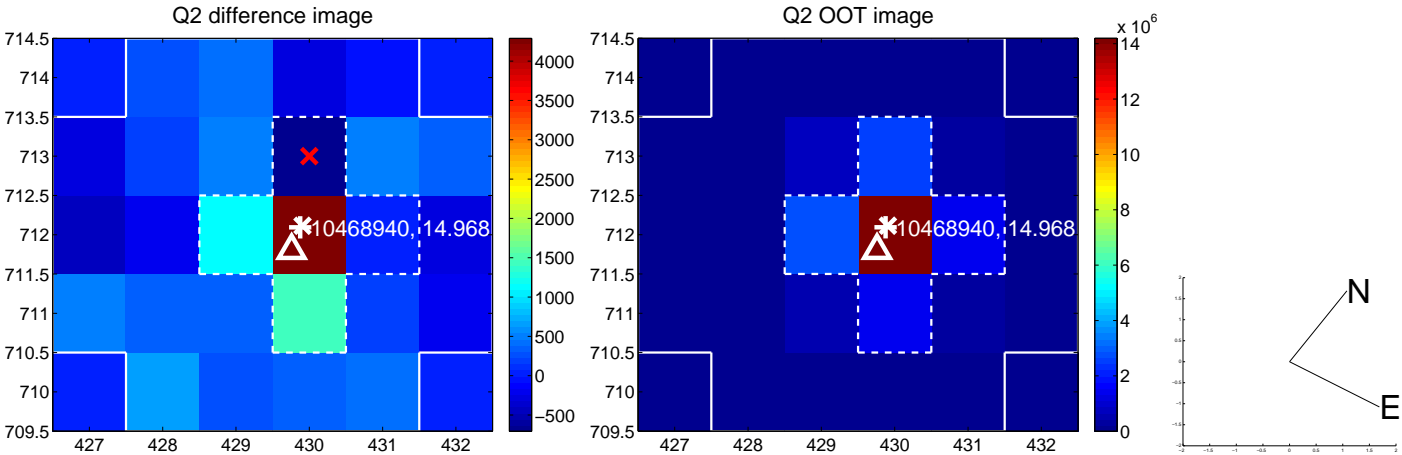
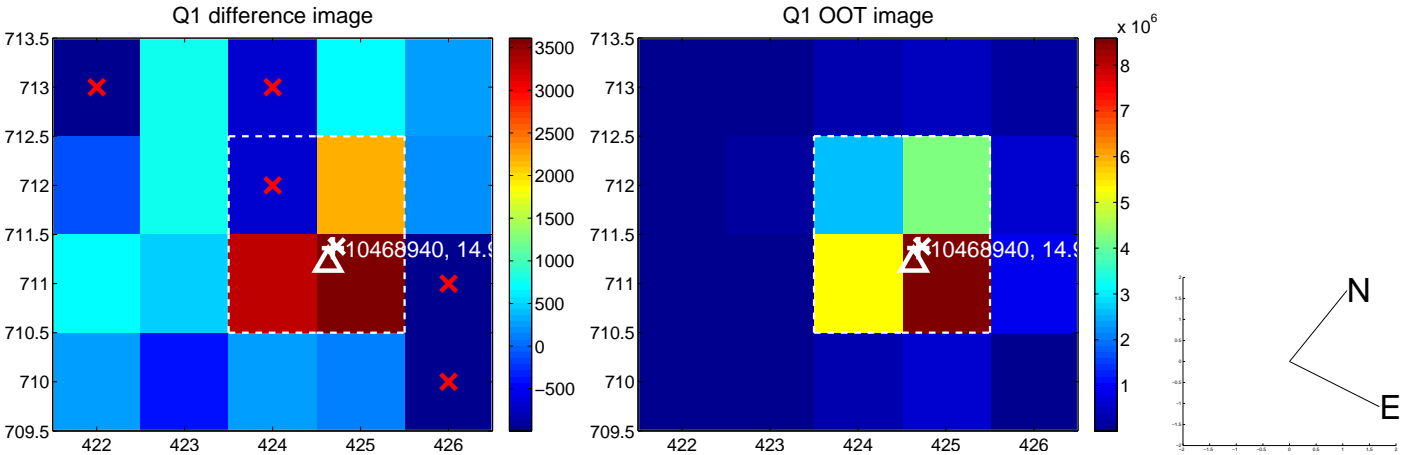
The direct PRF centroid is offset from the target star catalog position by about 0.22 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|---|--------------------|---------------------|-------------------|--------------------|
| PRF-fit source offset from OOT | 0.174 ± 0.125 | 1.39 | 0.162 ± 0.124 | -0.063 ± 0.135 |
| PRF-fit source offset from KIC position | 0.271 ± 0.139 | 1.96 | 0.069 ± 0.123 | -0.262 ± 0.141 |
| photometric centroid source offset | 0.68 ± 0.45 | 1.50 | 0.23 ± 0.51 | -0.64 ± 0.44 |

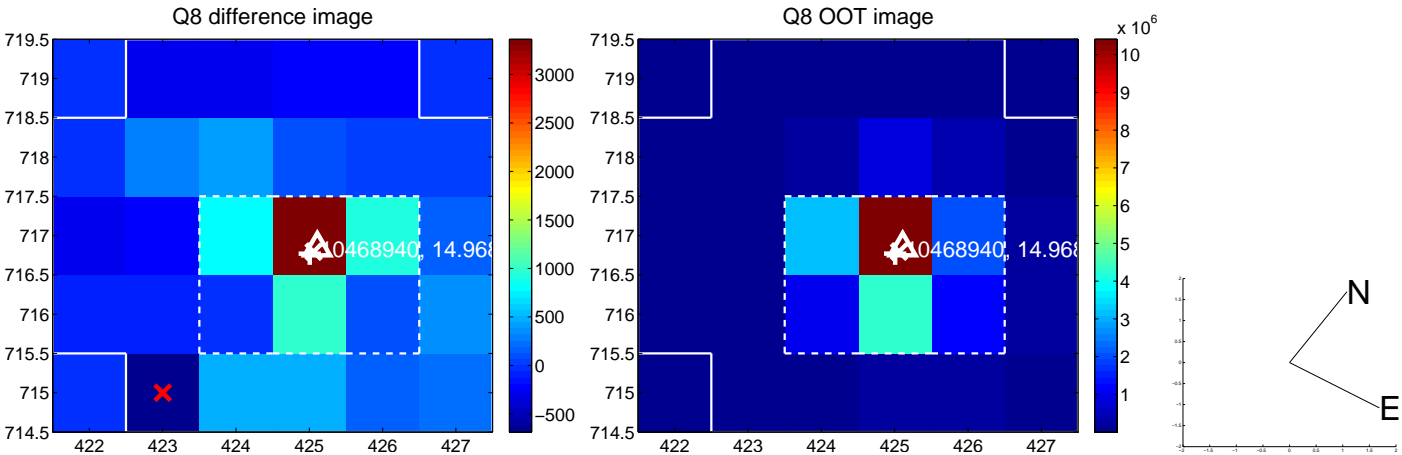
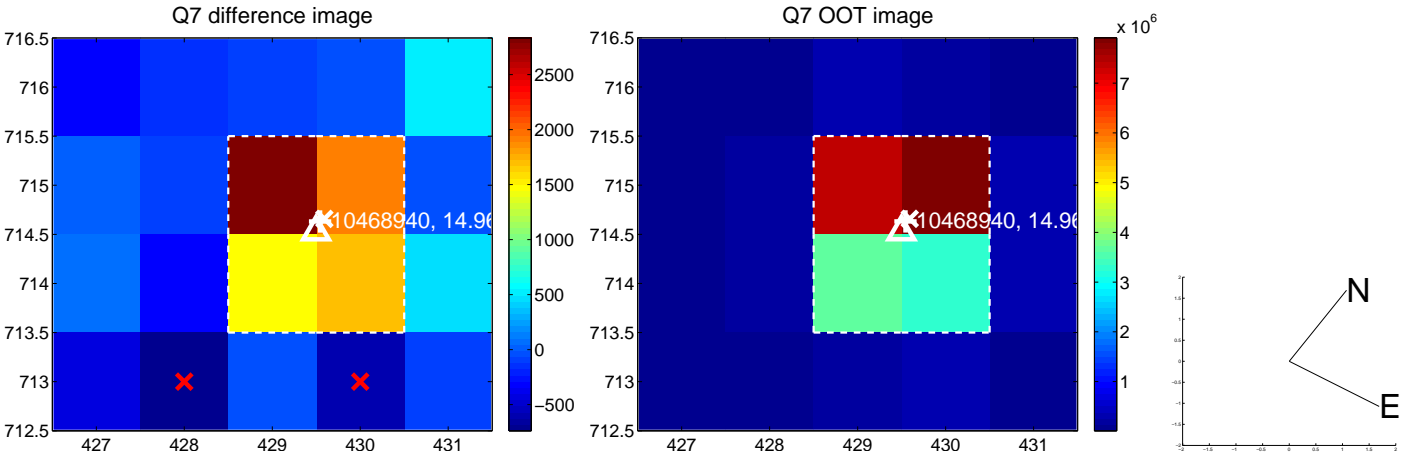
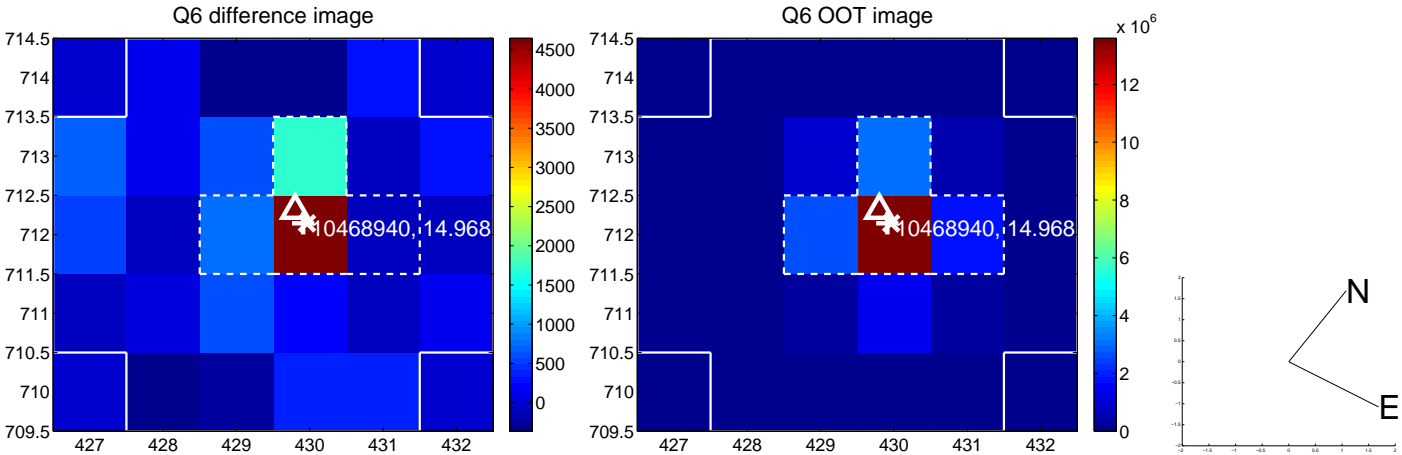
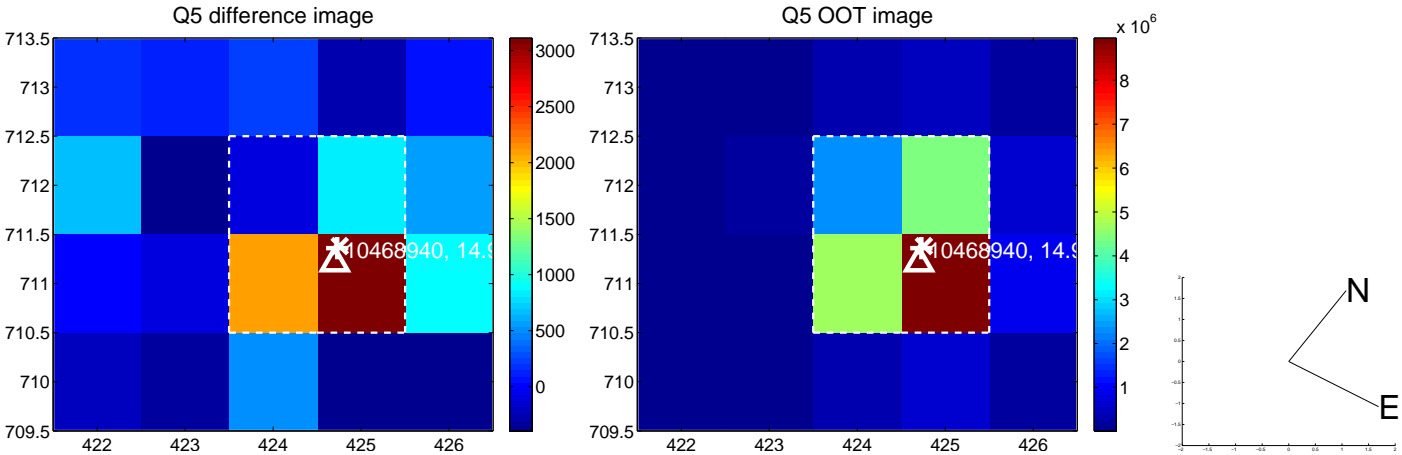


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

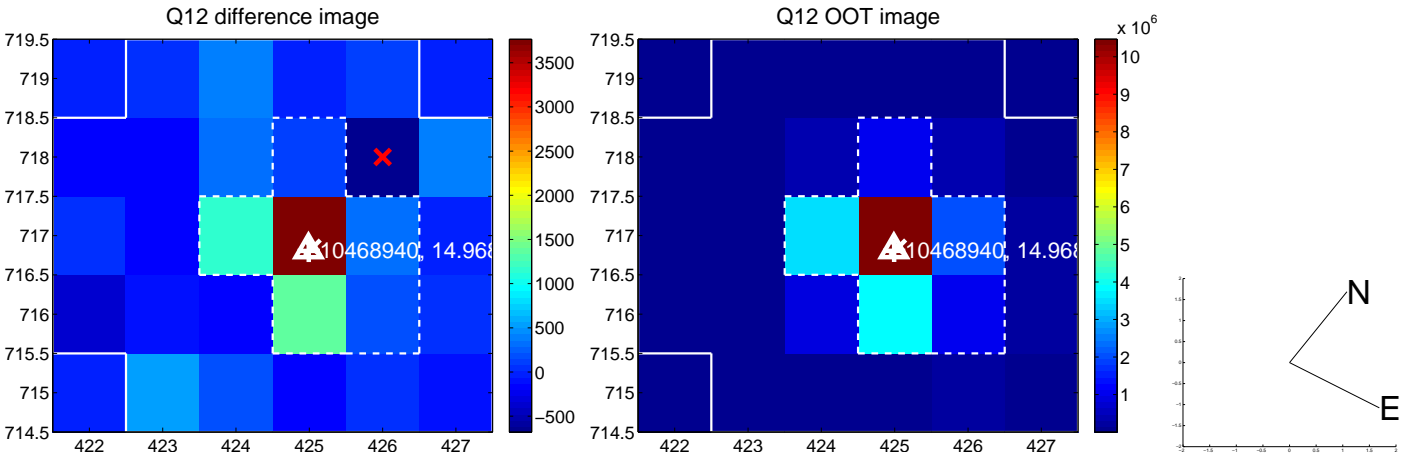
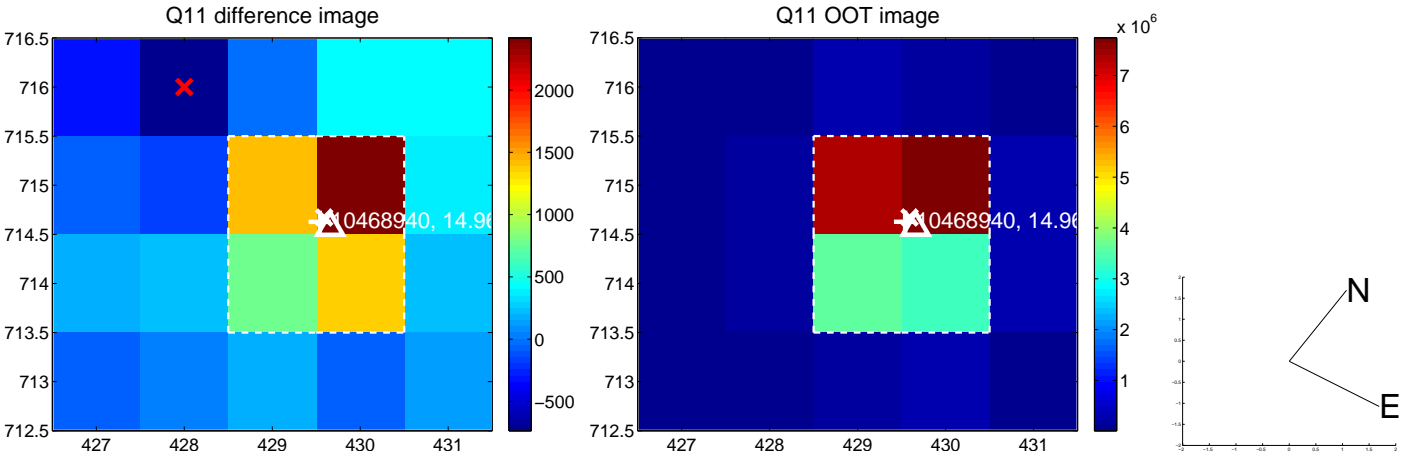
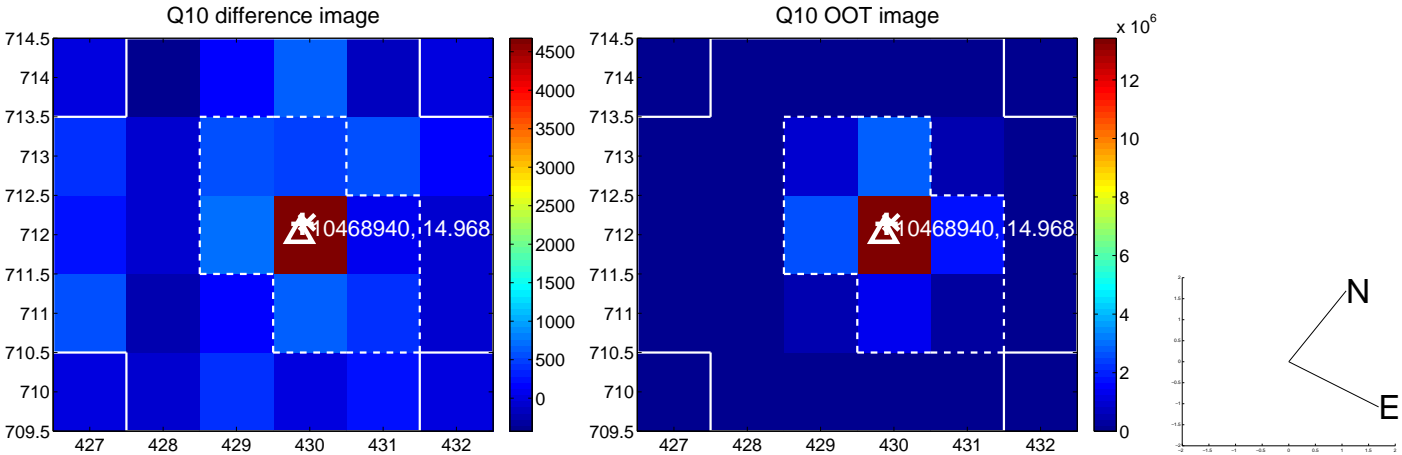
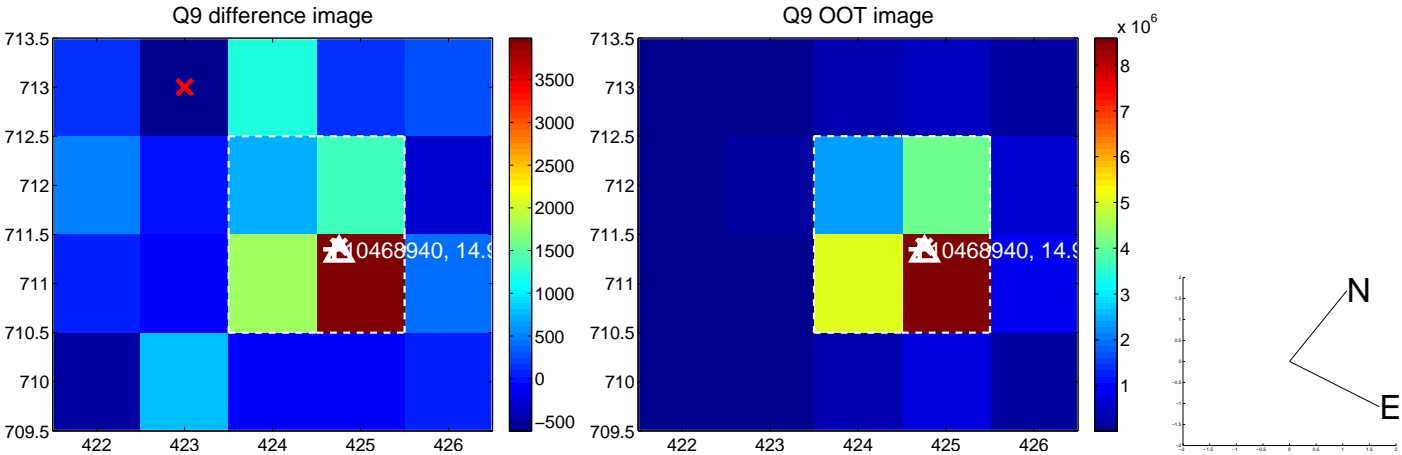
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



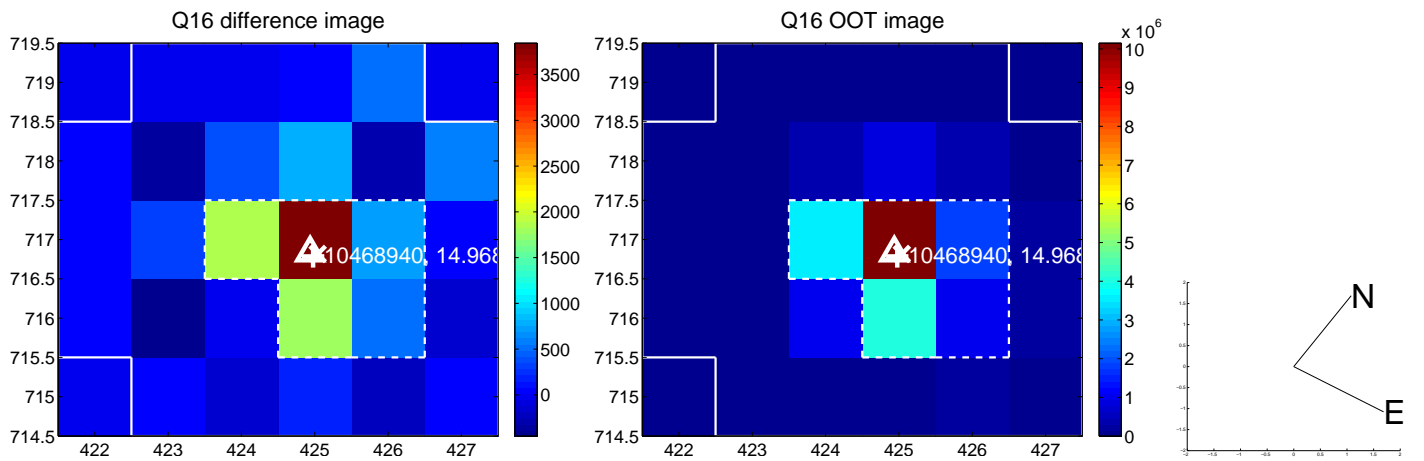
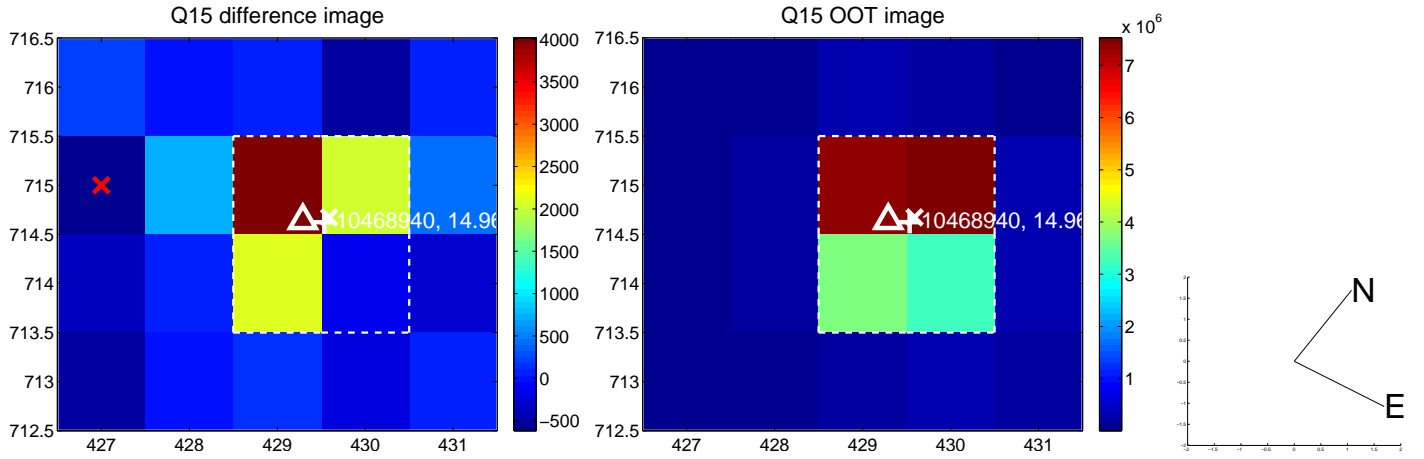
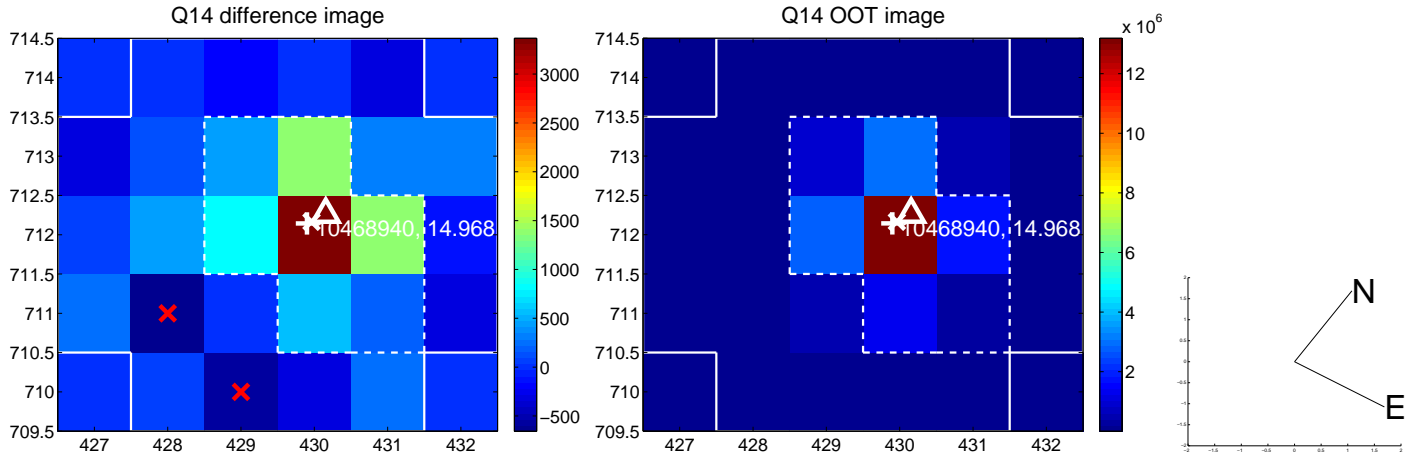
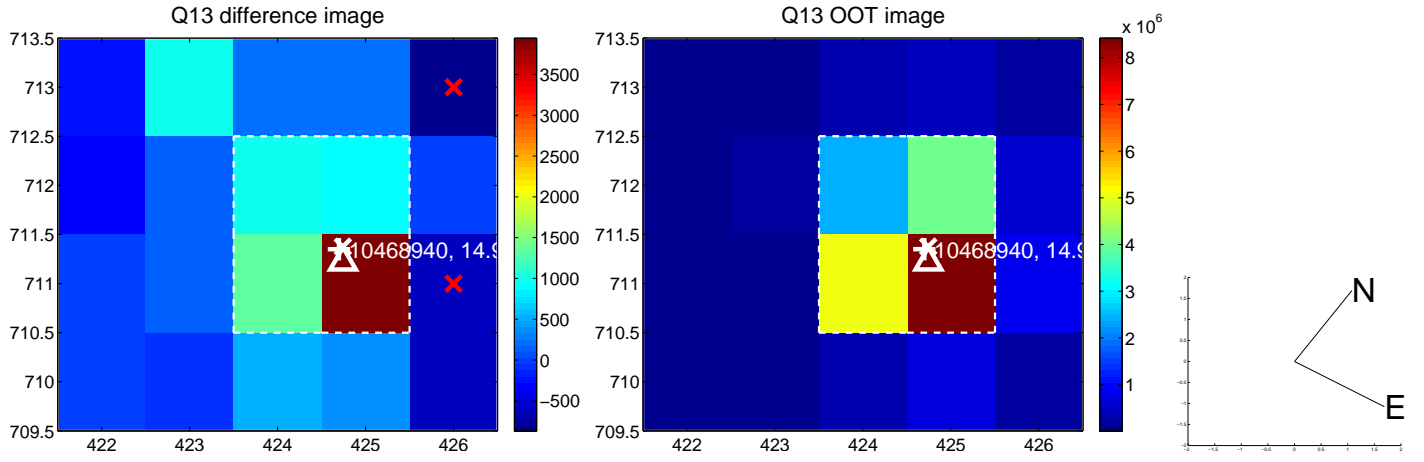
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



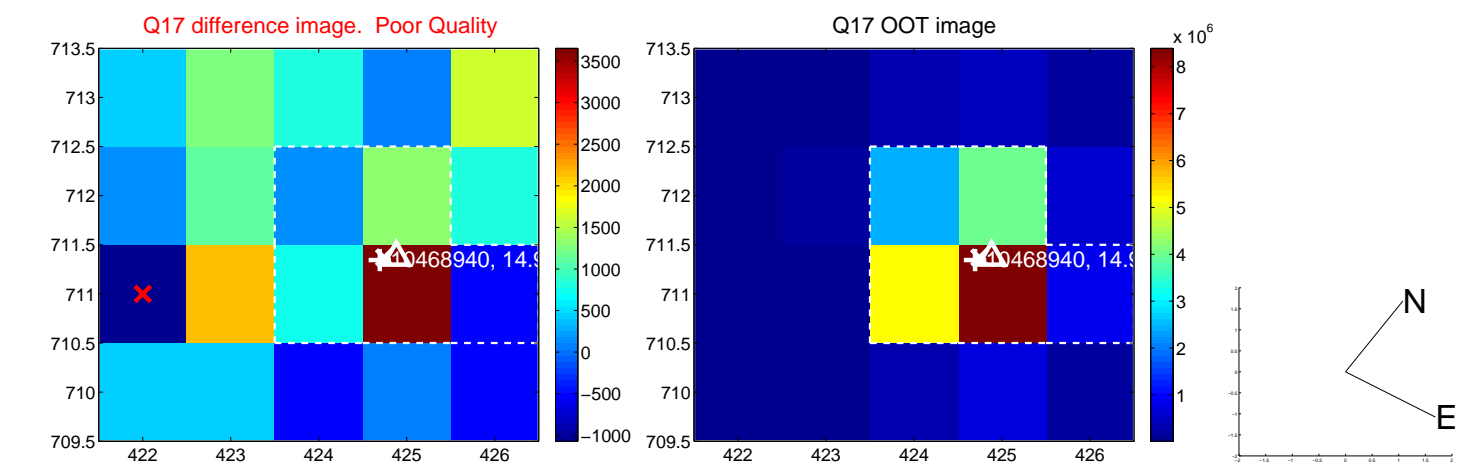
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



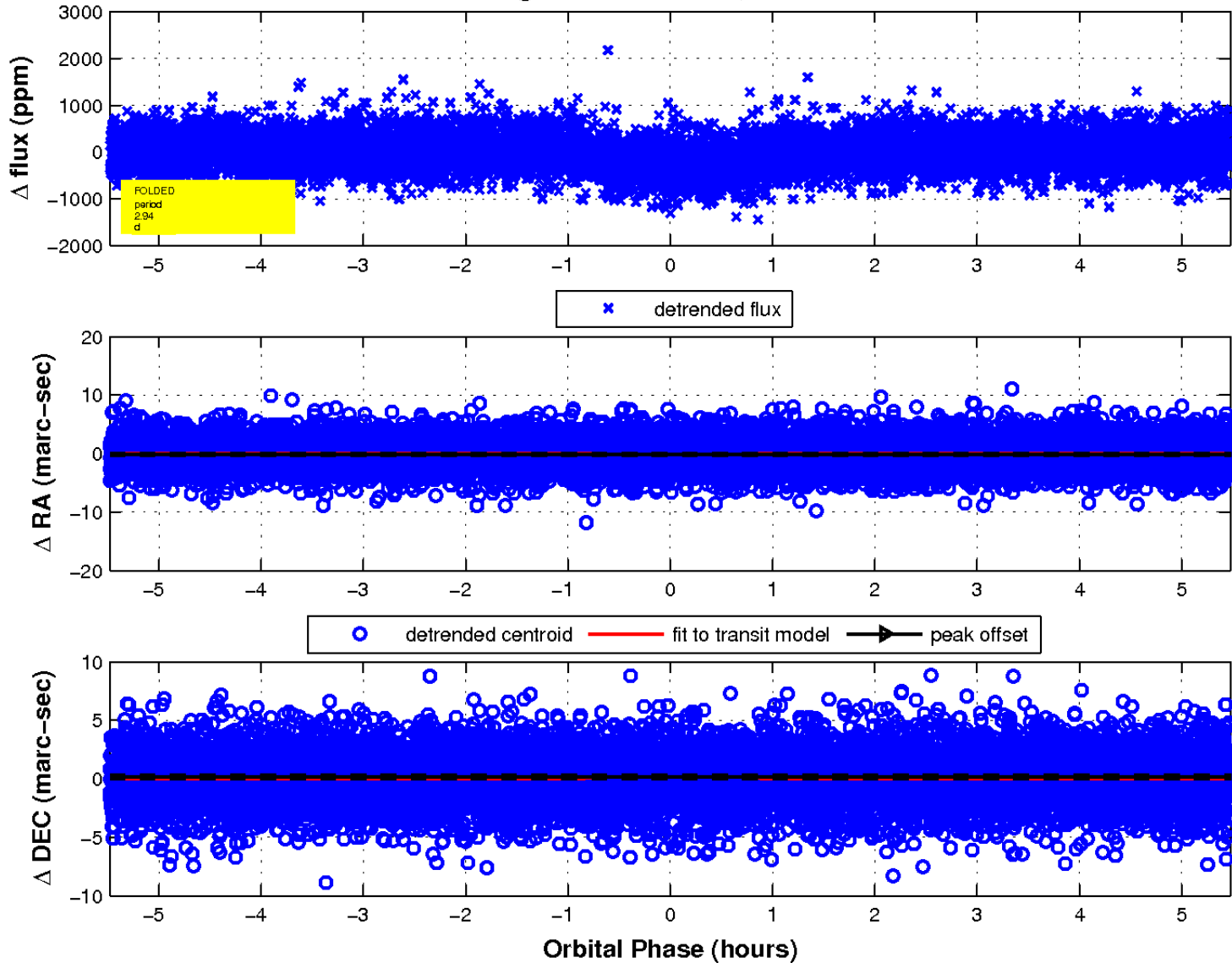
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

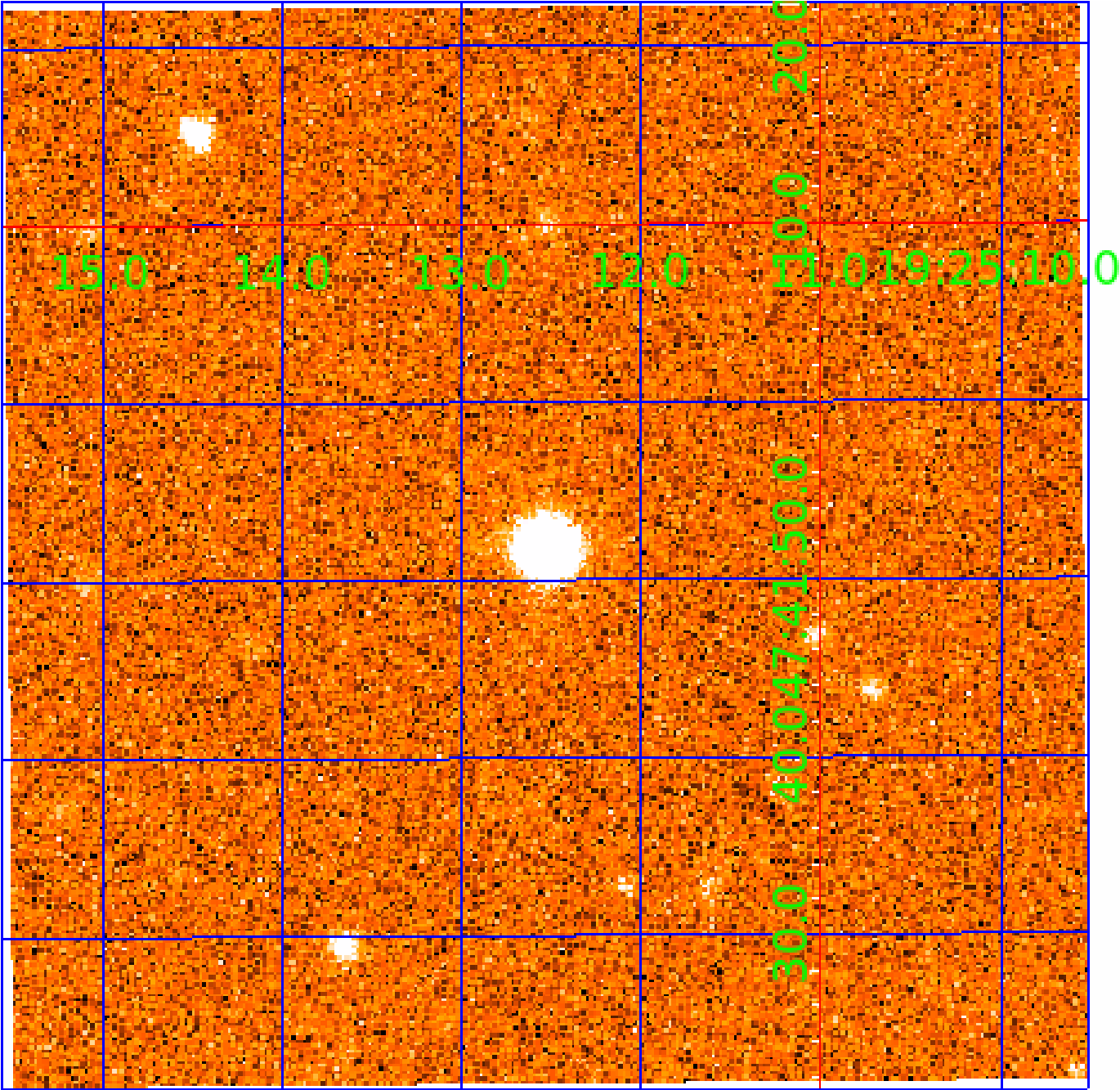


fluxWeightedCentroids, Planet 1 of 2



UKIRT Image

Declination



KIC 010468940

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}) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 010468940-01 | OBS | 1163.01 | 2.936531 | 132.779985 | 360.3 | 1.827 | 29.5 | 34.0 | 1.00 | 5359 | 2.25 | 505.86 |
| 010468940-02 | OBS | 1163.02 | 8.014984 | 134.828787 | 380.4 | 3.934 | 22.9 | 25.3 | 1.00 | 5359 | 2.74 | 132.62 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|------------|
| 010468940-01 | OBS | PC | 1.00 | 0 | 0 | 0 | 0 | NO_COMMENT |
| 010468940-02 | OBS | PC | 1.00 | 0 | 0 | 0 | 0 | NO_COMMENT |

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.

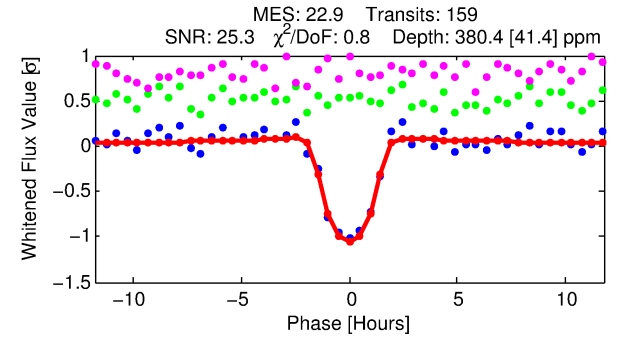
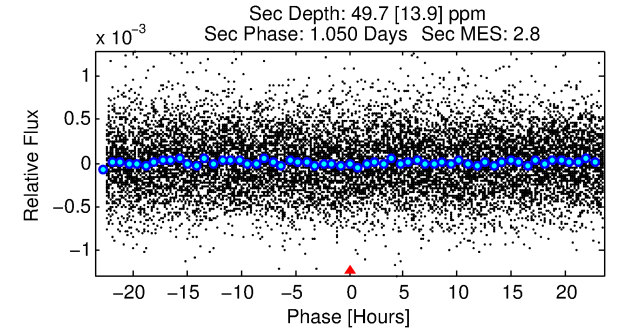
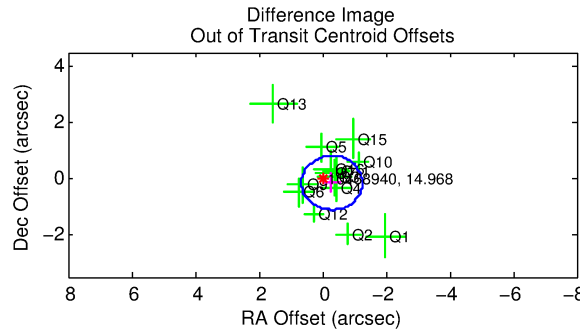
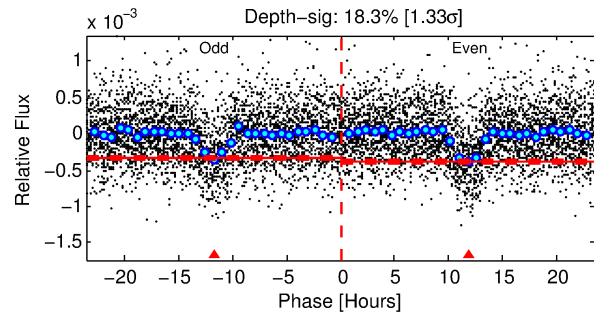
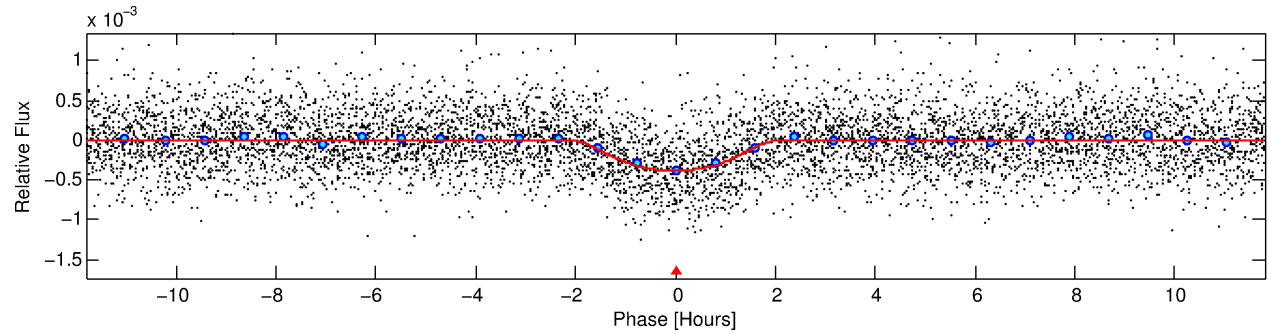
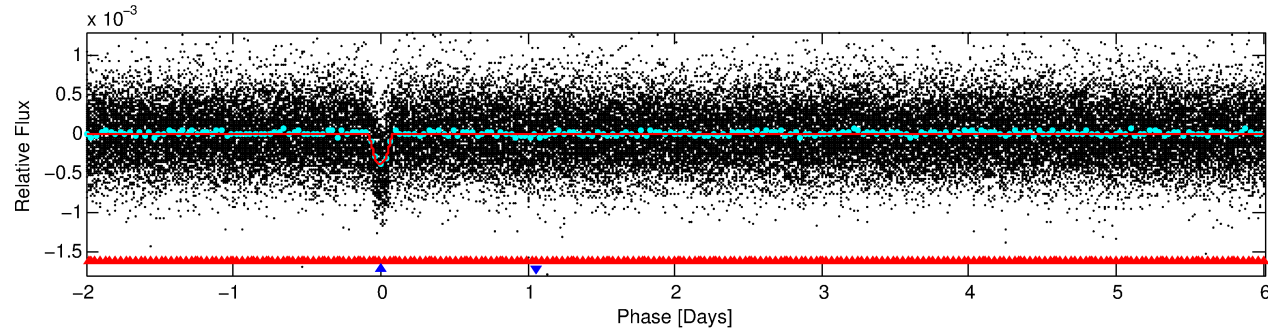
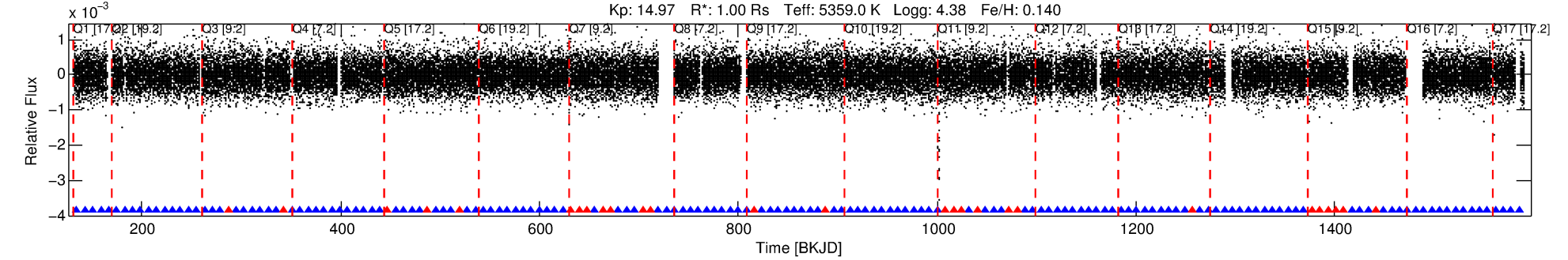
Ephemeris Match Information For 010468940-02

No Significant Match Found

DV One-Page Summary

KIC: 10468940 Candidate: 2 of 2 Period: 8.015 d
KOI: K01163.02 Name: Kepler-273c Corr: 0.871

Kp: 14.97 R*: 1.00 Rs Teff: 5359.0 K Logg: 4.38 Fe/H: 0.140



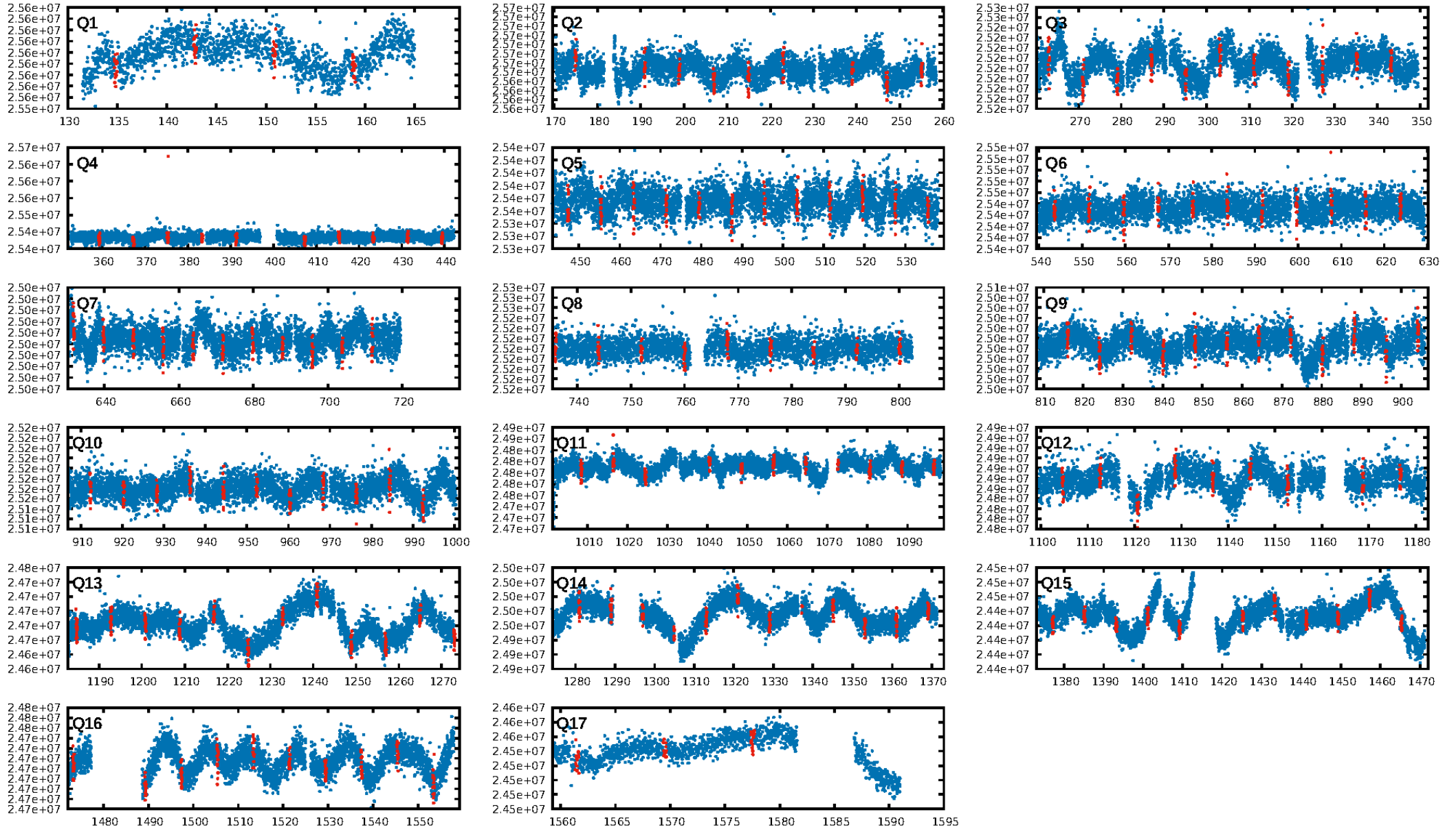
DV Fit Results:

Period = 8.01498 [0.00004] d
Epoch = 134.8288 [0.0036] BKJD
Rp/R* = 0.0250 [0.0024]
a/R* = 5.00 [0.54]
b = 0.98 [0.01]
Seff = 132.62 [30.48]
Teff = 865 [50] K
Rp = 2.74 [0.46] Re
a = 0.0748 [0.0102] AU
Ag = 20.38 [8.26] [2.35σ]
Teffp = 2843 [245] K [7.92σ]

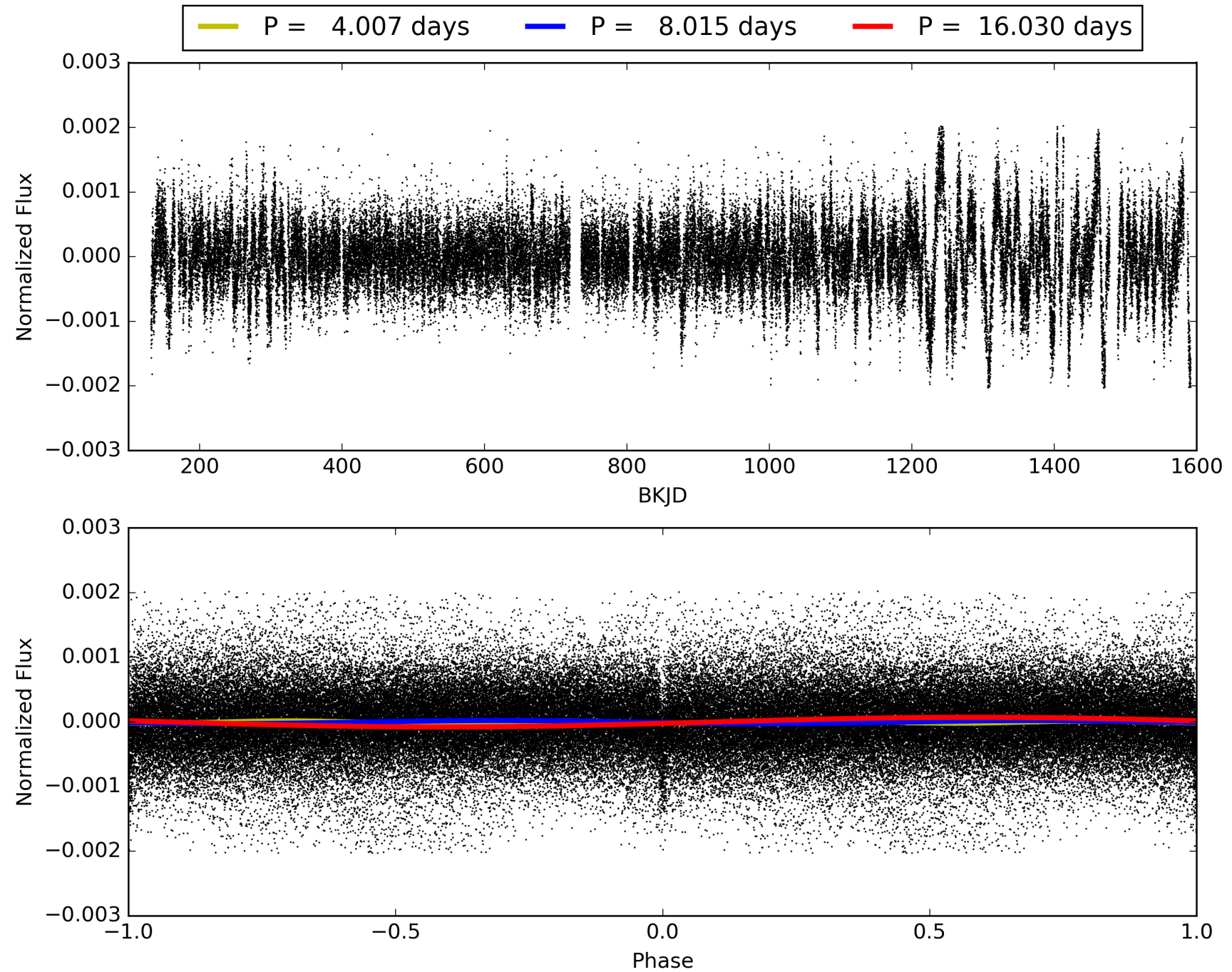
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [28.10σ]
LongPeriod-sig: N/A
ModelChiSquare2-sig: 100.0%
ModelChiSquareGof-sig: 100.0%
Bootstrap-pfa: 8.15e-113
RollingBand-fgt: 0.82 [126/153]
GhostDiagnostic-chr: -302.3
Centroid-sig: 48.5%
Centroid-so: 0.461 arcsec [0.70σ]
OotOffset-rm: 0.327 arcsec [1.02σ]
KicOffset-rm: 0.492 arcsec [1.48σ]
OotOffset-st: 3/4/3/4 [14]
KicOffset-st: 3/4/3/4 [14]
DiffImageQuality-fgm: 0.93 [13/14]
DiffImageOverlap-fno: 1.00 [17/17]

TCE 010468940-02, PDC Light Curves

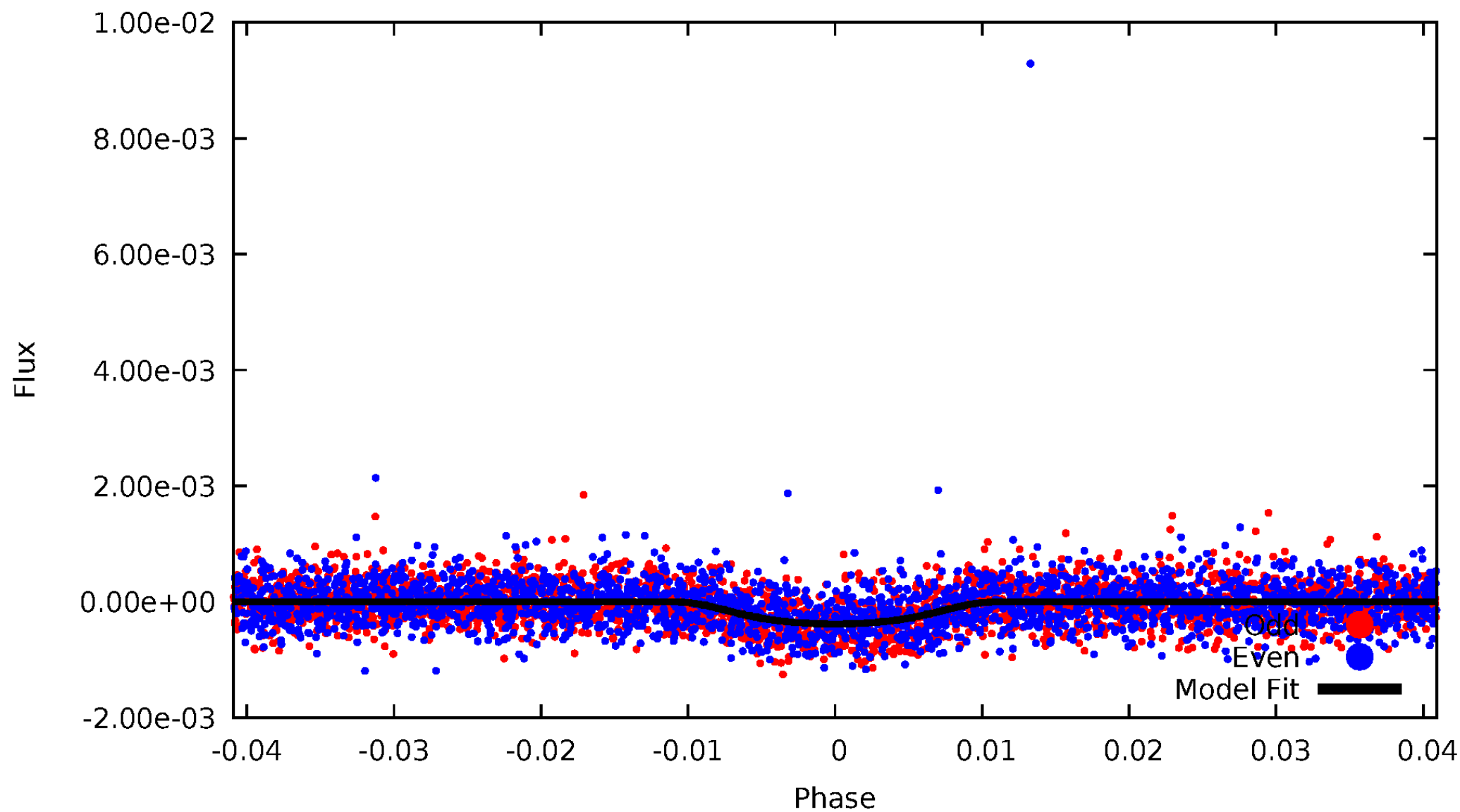


TCE 010468940-02



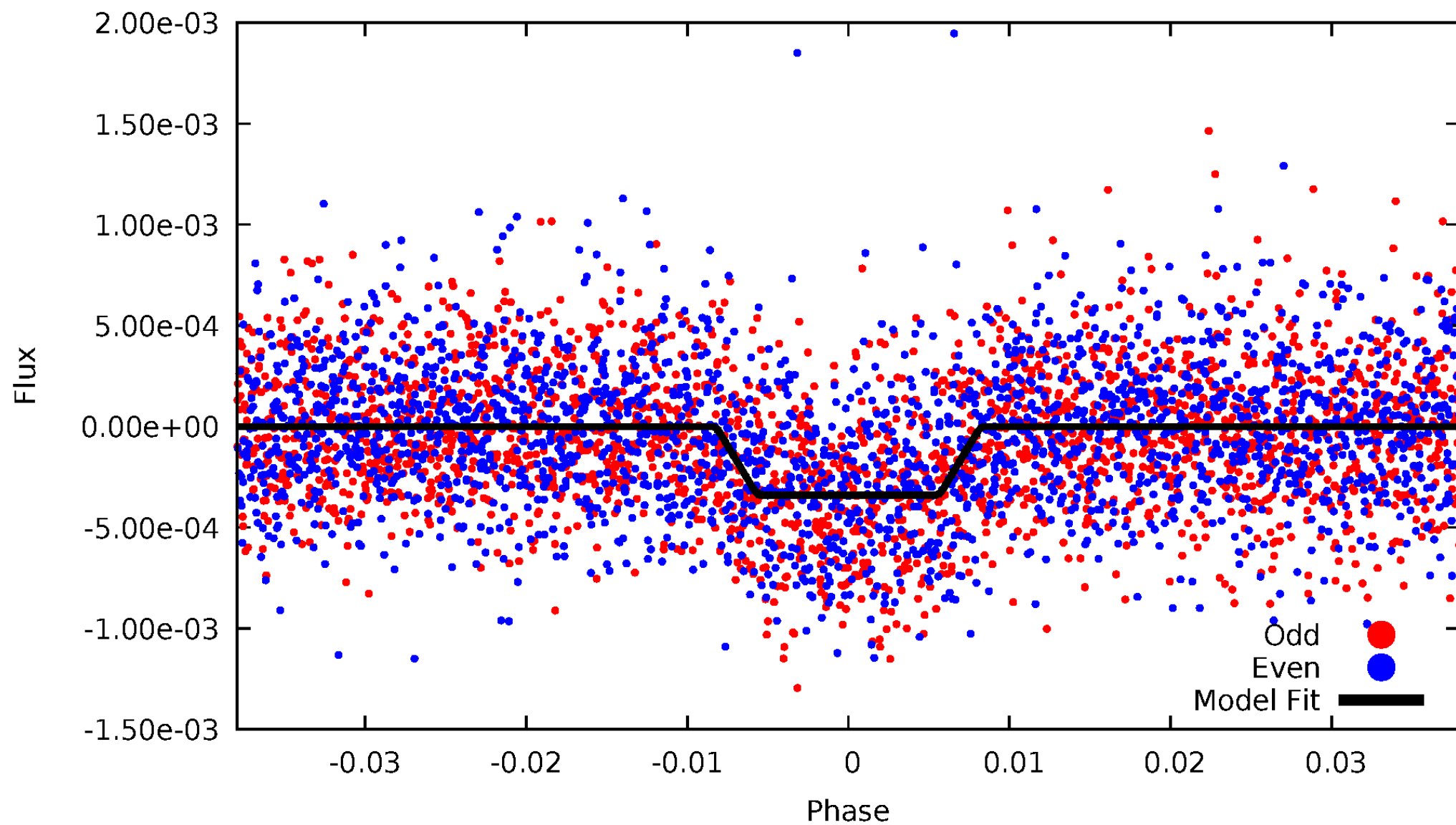
DV Odd/Even

TCE 010468940-02



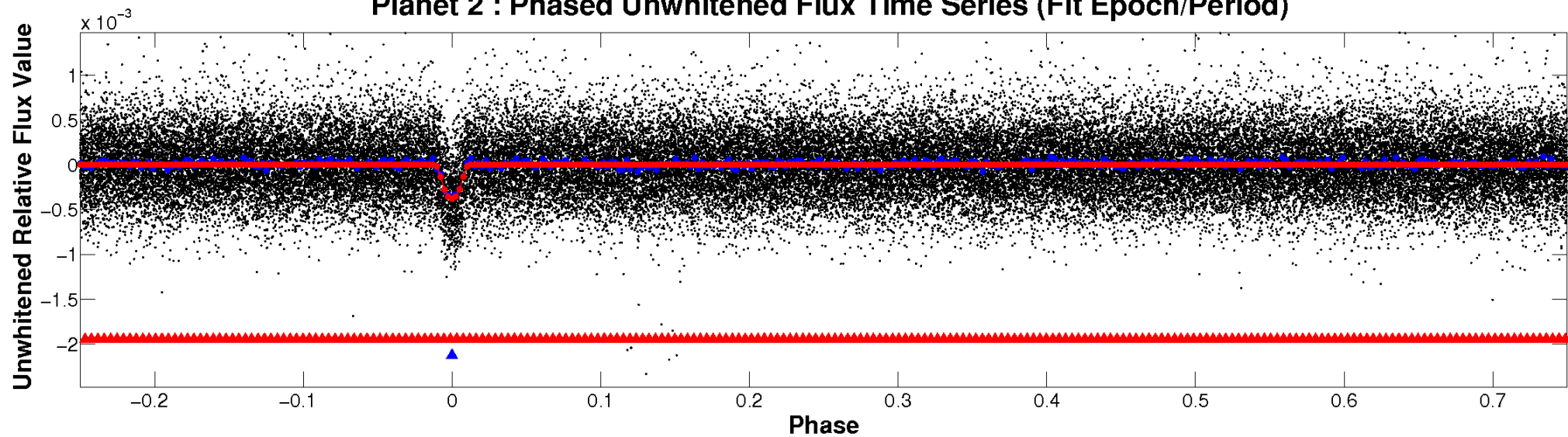
ALT Odd/Even

TCE 010468940-02

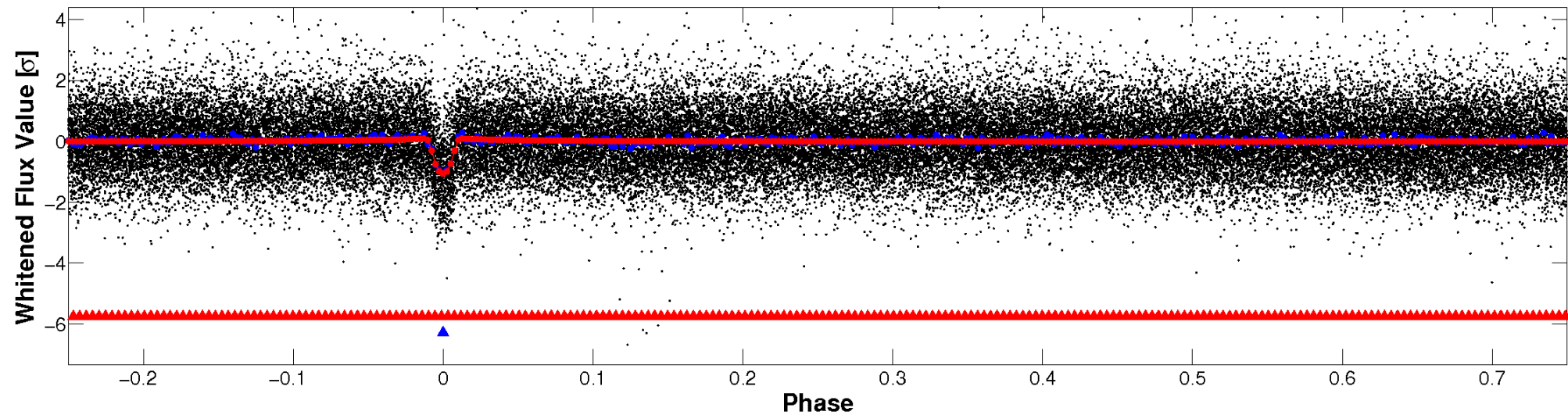


Non-Whitened Vs. Whitened Light Curve

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

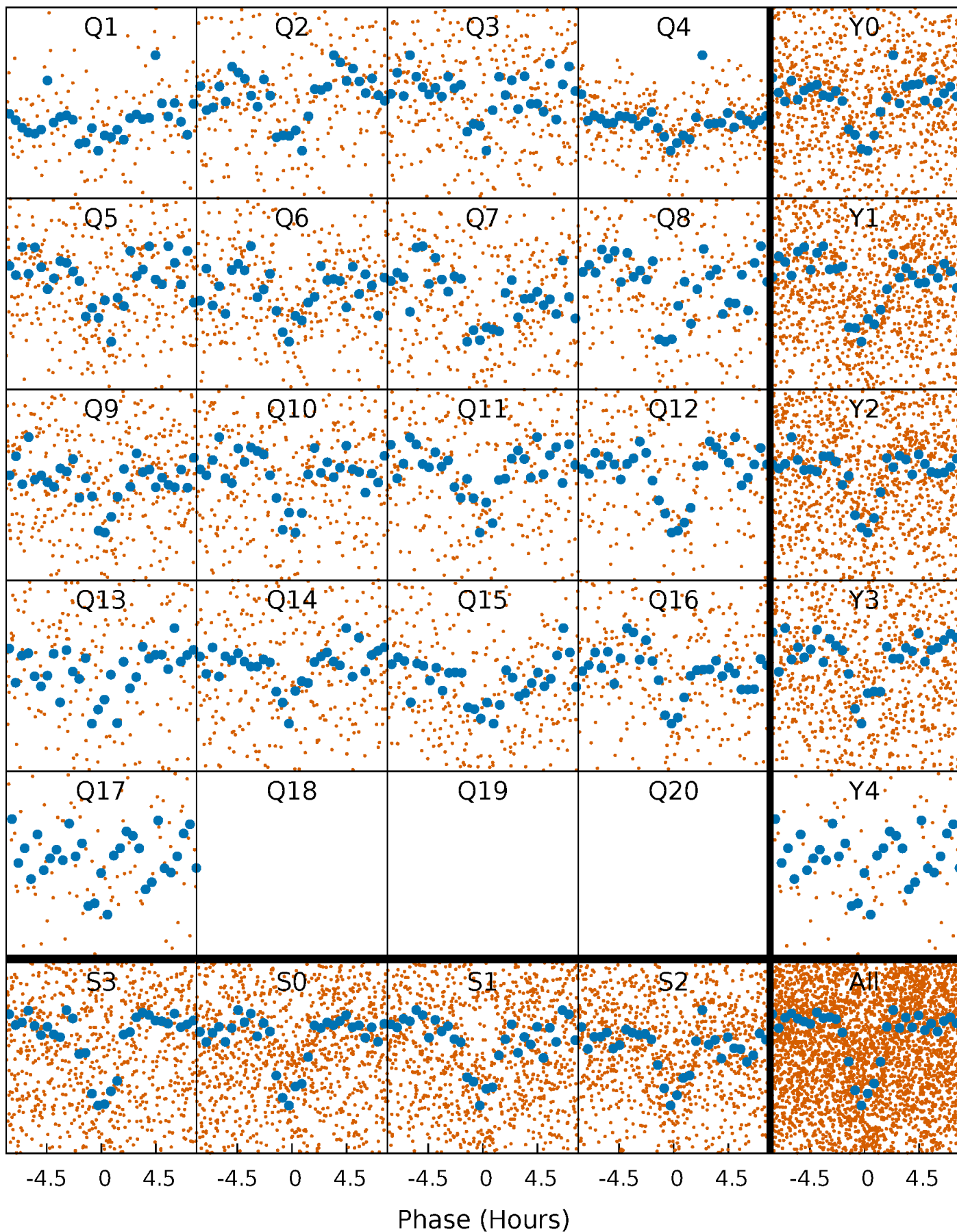


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



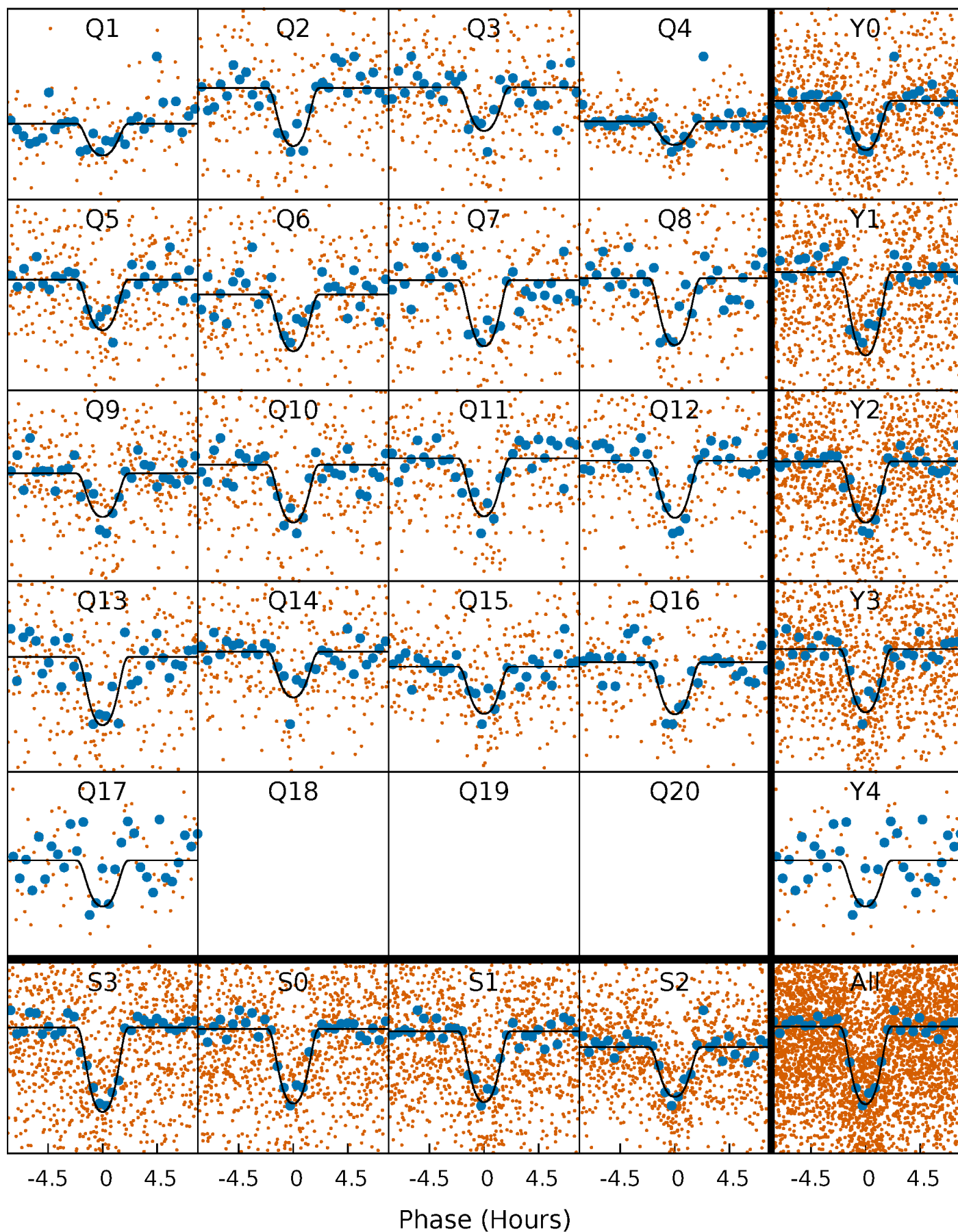
PDC Quarter-Phased Transit Curves

TCE 010468940-02 $P = 8.014984$ Days $T_0 = 134.828787$ (BKJD)



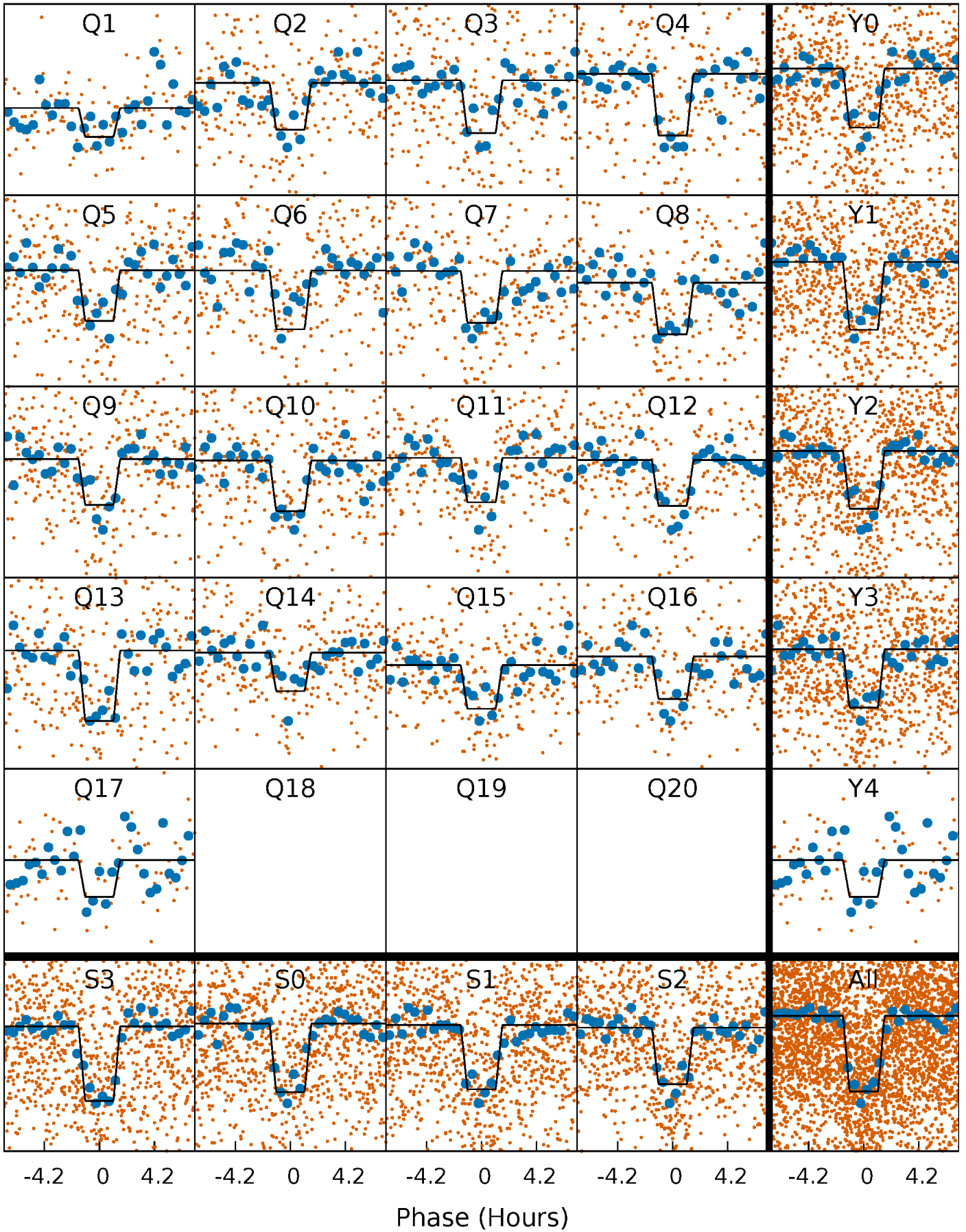
DV Quarter-Phased Transit Curves

TCE 010468940-02 P= 8.014984 Days $T_0=134.828787$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

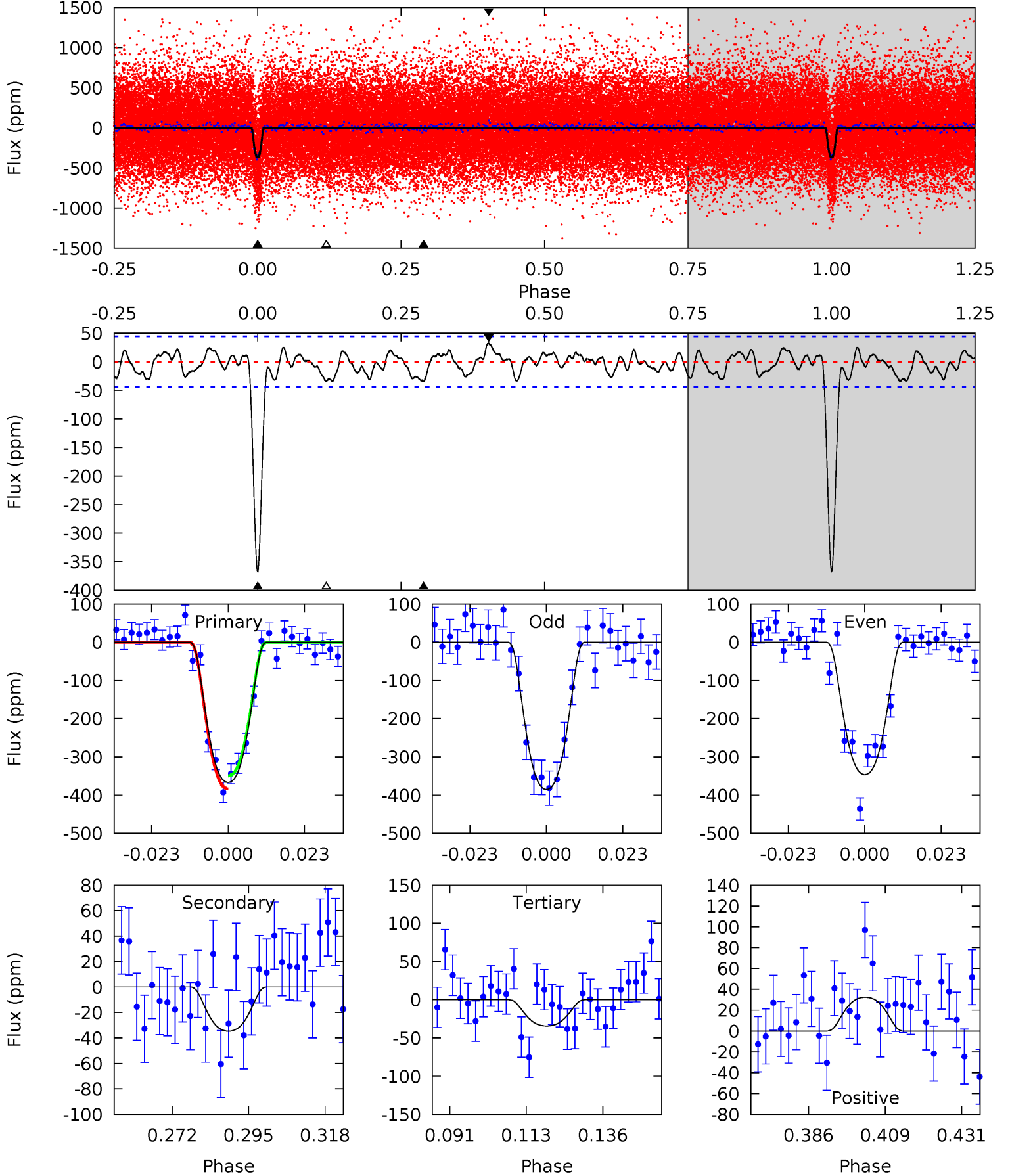
TCE 010468940-02 P= 8.014939 Days $T_0=134.833402$ (BKJD)



DV Model-Shift Uniqueness Test

010468940-02, P = 8.014984 Days, E = 126.813803 Days

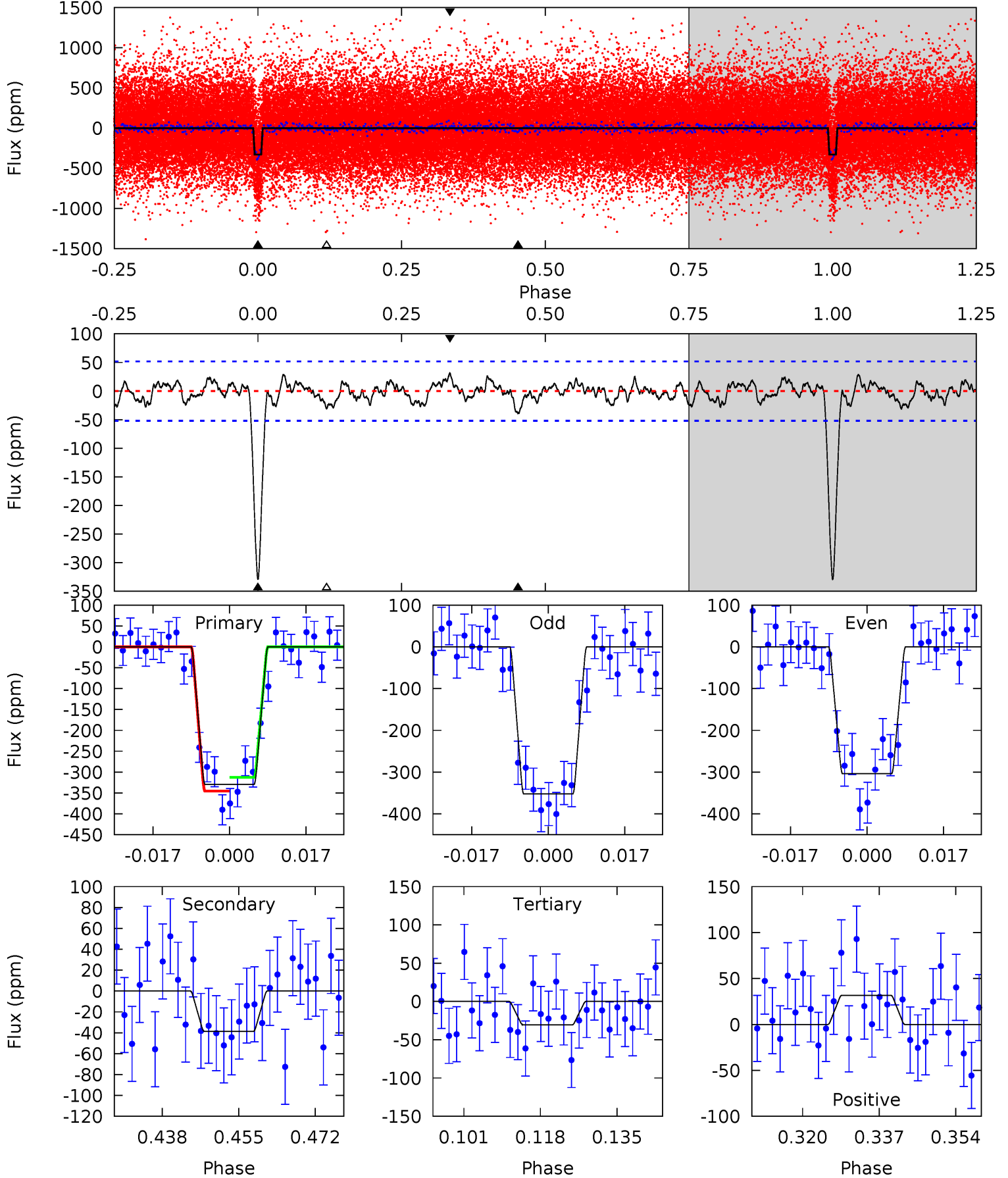
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 40.2 | 3.80 | 3.77 | 3.55 | 4.87 | 2.28 | 1.60 | 36.5 | 36.7 | 0.03 | 0.25 | 2.14 | 0.98 | 0.08 | 1.87 |



Alt Model-Shift Uniqueness Test

010468940-02, P = 8.014939 Days, E = 126.818463 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 31.2 | 3.67 | 2.90 | 3.00 | 4.93 | 2.39 | 1.18 | 28.3 | 28.2 | 0.77 | 0.67 | 2.31 | 1.00 | 0.09 | 1.55 |



Stellar Parameters For KIC 010468940

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | $R (R_{\odot})$ | $M(M_{\odot})$ | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|---------------------|---------------------------|---------------------------|---------------------------|---------------------------|---|
| | 5359^{+80}_{-72} | $4.375^{+0.132}_{-0.077}$ | $0.140^{+0.150}_{-0.150}$ | $1.002^{+0.111}_{-0.136}$ | $0.867^{+0.068}_{-0.032}$ | $1.215^{+0.709}_{-0.298}$ |
| | +1%/-1% | +3%/-2% | +107%/-107% | +11%/-14% | +8%/-4% | +58%/-25% |
| 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 010468940-02 / KOI 1163.02

| Detrend | Depth (ppm) | $R_p (R_{\oplus})$ | $T_{max} (K)$ | $T_{obs} (K)$ | A_{obs} |
|---------|--------------|------------------------|--------------------|----------------------|------------------|
| DV | -35 ± 9 | $2.71^{+0.34}_{-0.34}$ | 1205^{+40}_{-51} | 3176^{+152}_{-165} | 15^{+6}_{-5} |
| Alt. | -39 ± 11 | $1.99^{+0.29}_{-0.28}$ | 1202^{+40}_{-50} | 3552^{+232}_{-222} | 31^{+15}_{-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 $A_{obs} \gg 1.0$

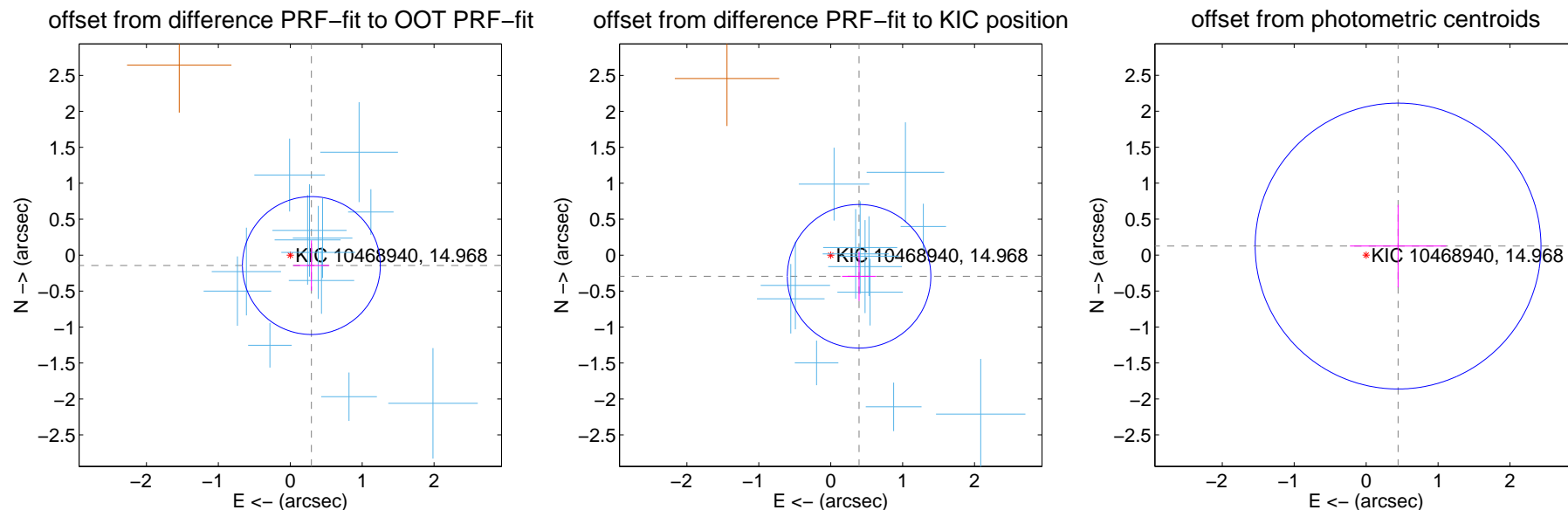
DV Centroid Data

Supplemental centroid analysis for 010468940-02. Kepler magnitude: 14.97. Transit SNR 25.26

There are 13 quarters with good PRF difference image offsets

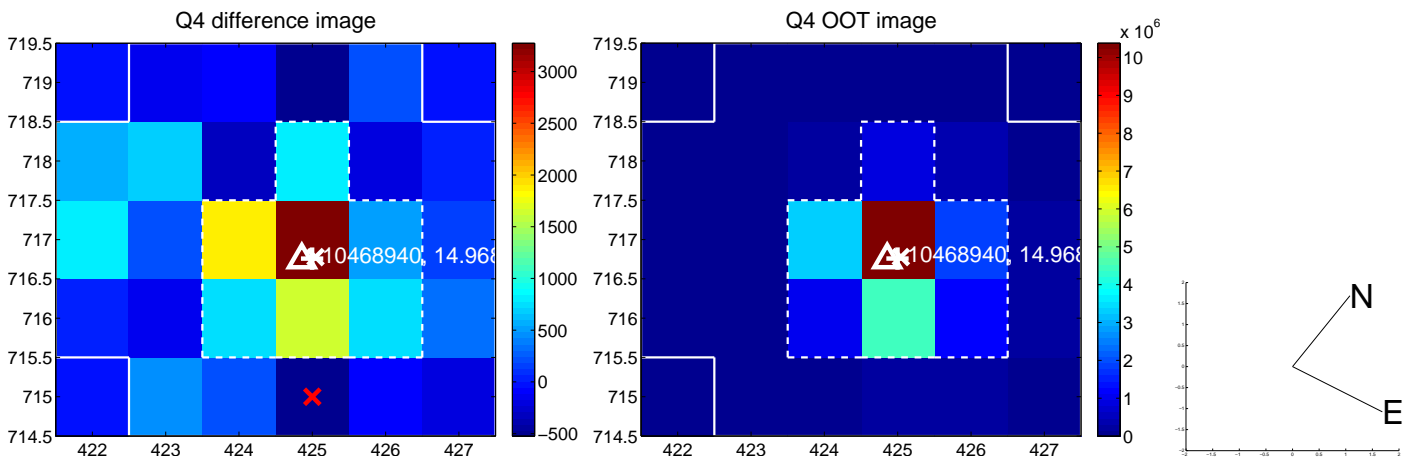
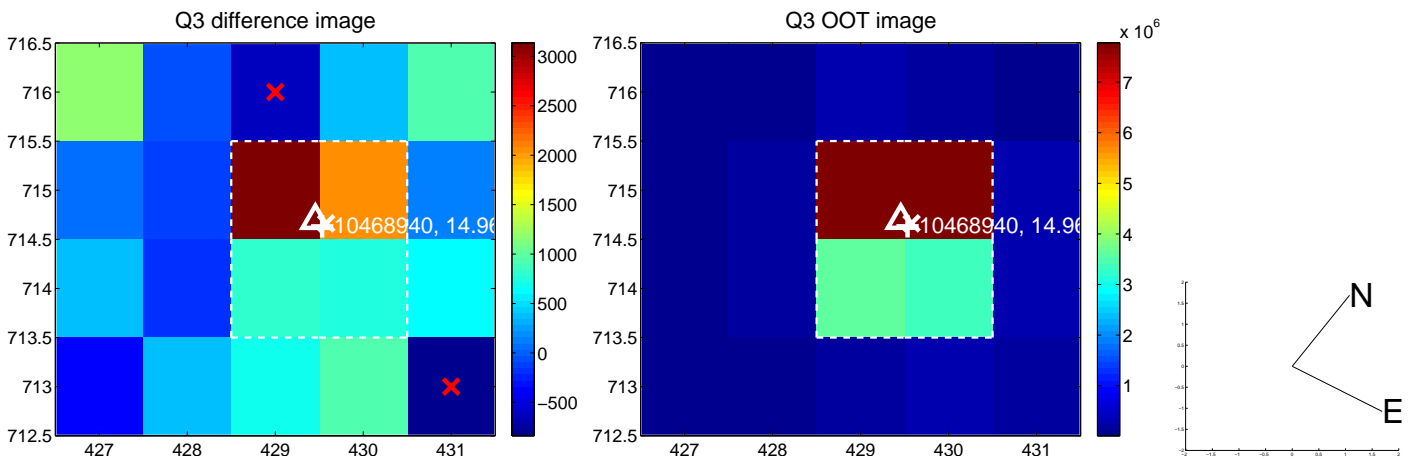
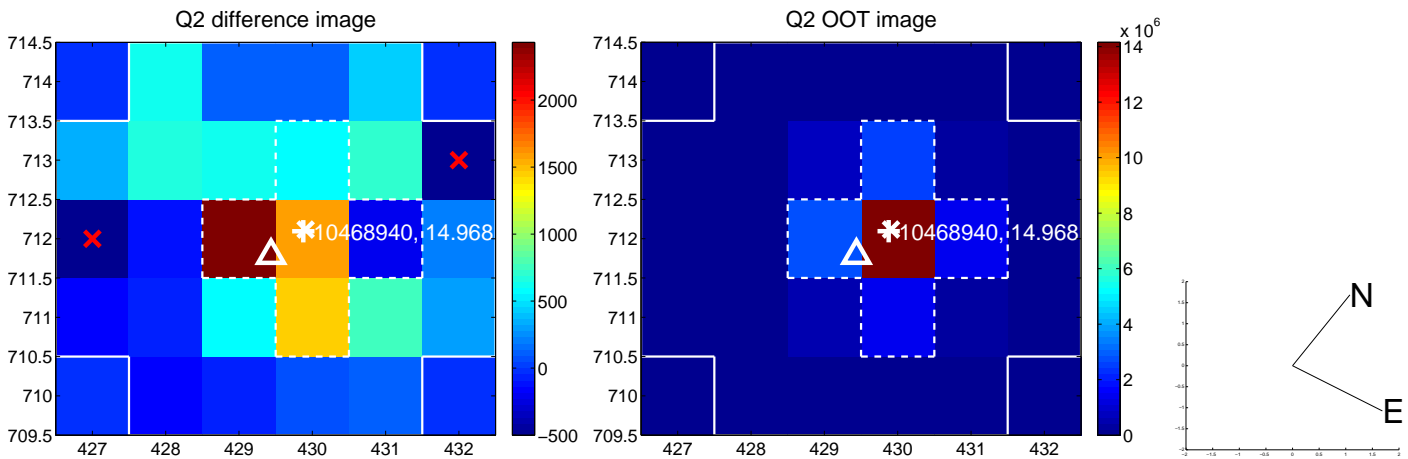
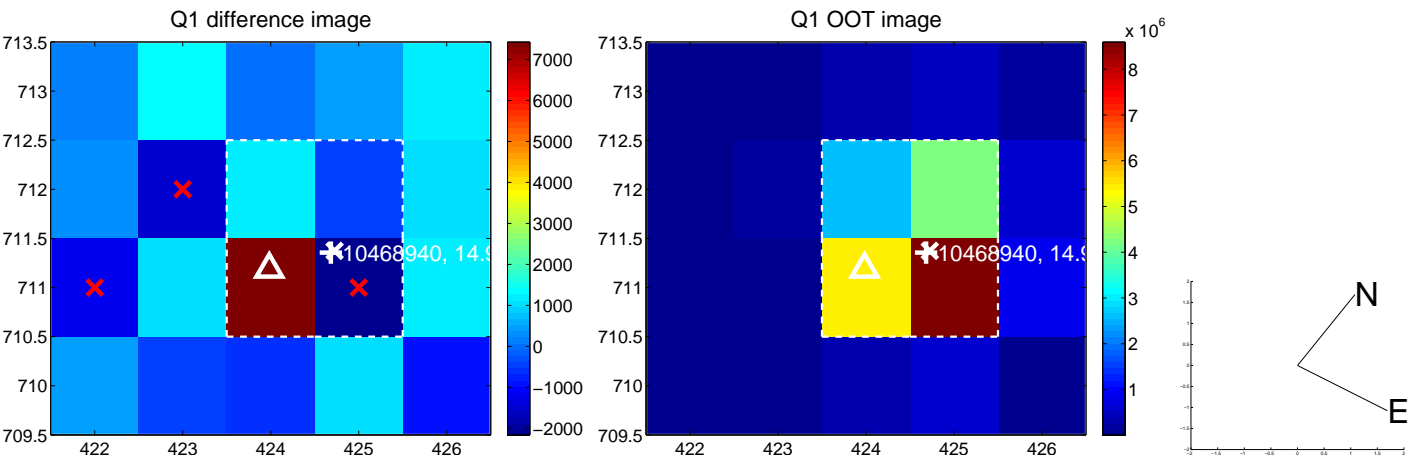
The direct PRF centroid is offset from the target star catalog position by about 0.28 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|---|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT | 0.327 ± 0.320 | 1.02 | -0.294 ± 0.250 | -0.144 ± 0.349 |
| PRF-fit source offset from KIC position | 0.492 ± 0.333 | 1.48 | -0.395 ± 0.236 | -0.294 ± 0.343 |
| photometric centroid source offset | 0.46 ± 0.66 | 0.70 | -0.44 ± 0.67 | 0.13 ± 0.57 |

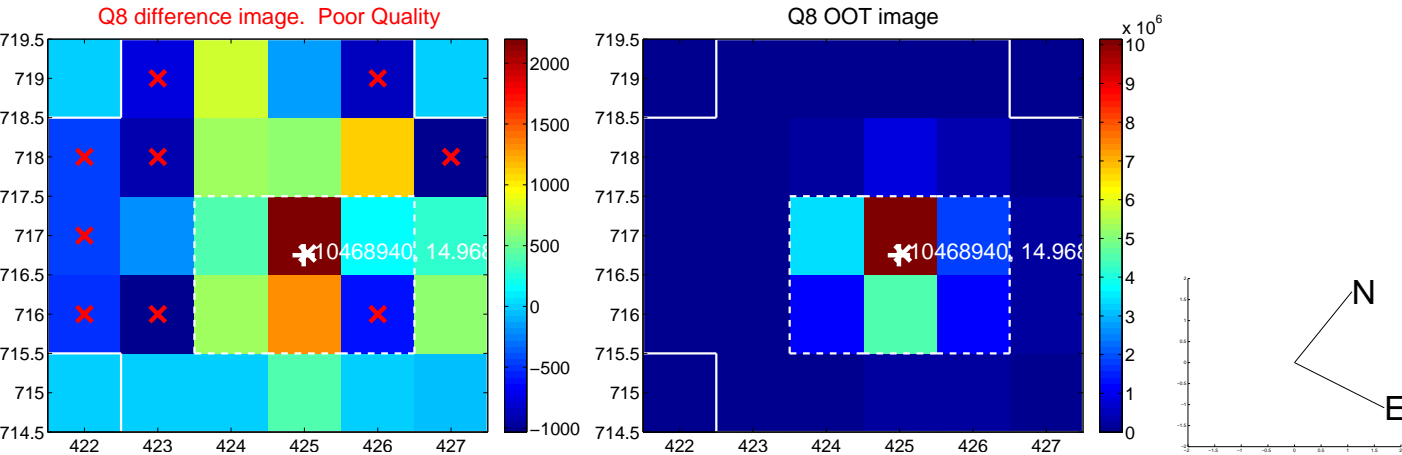
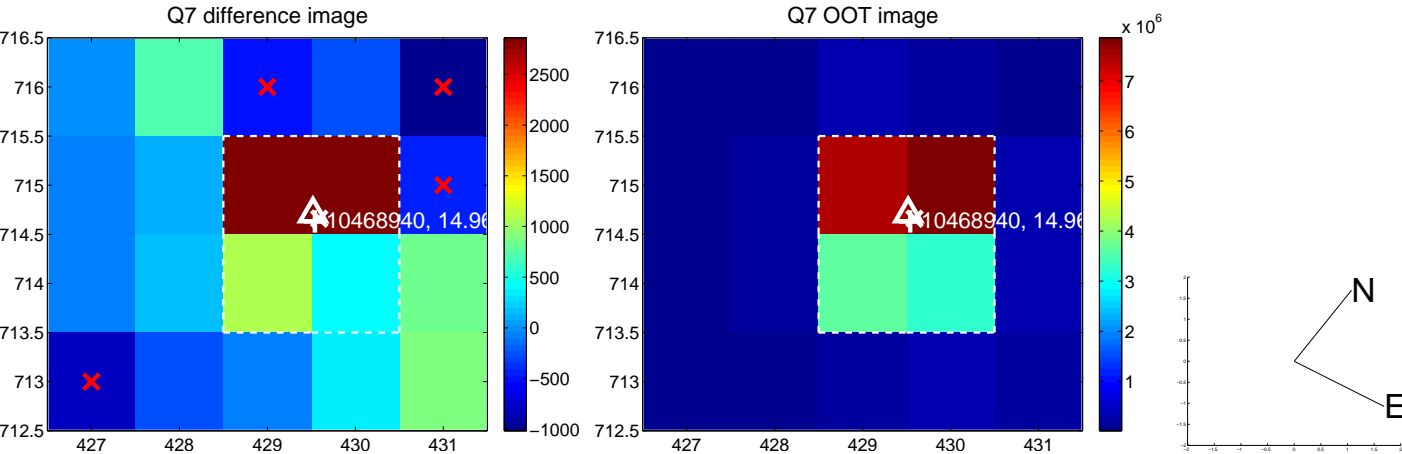
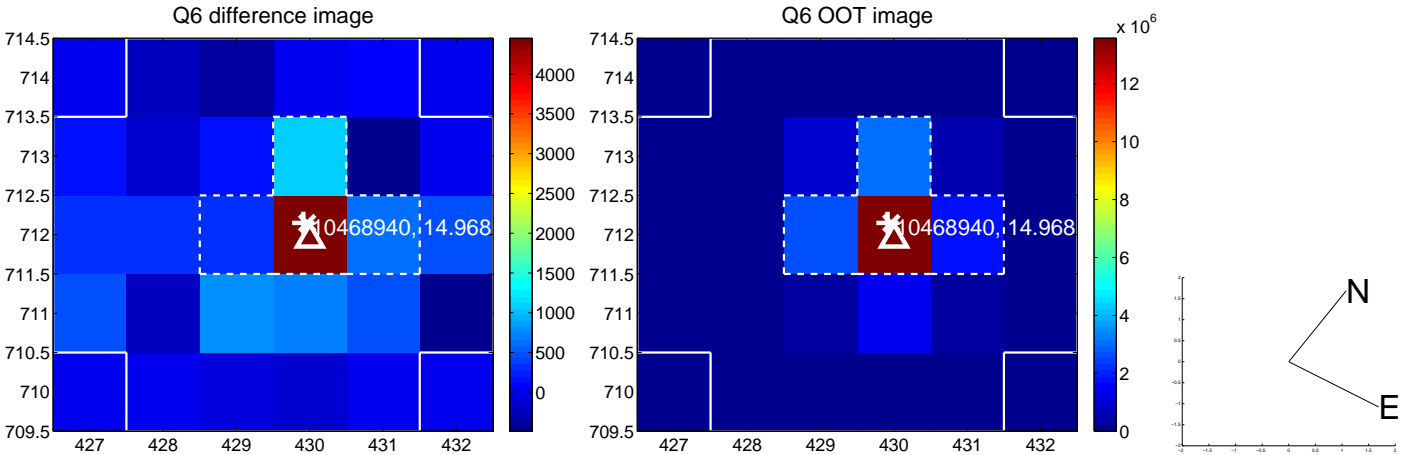
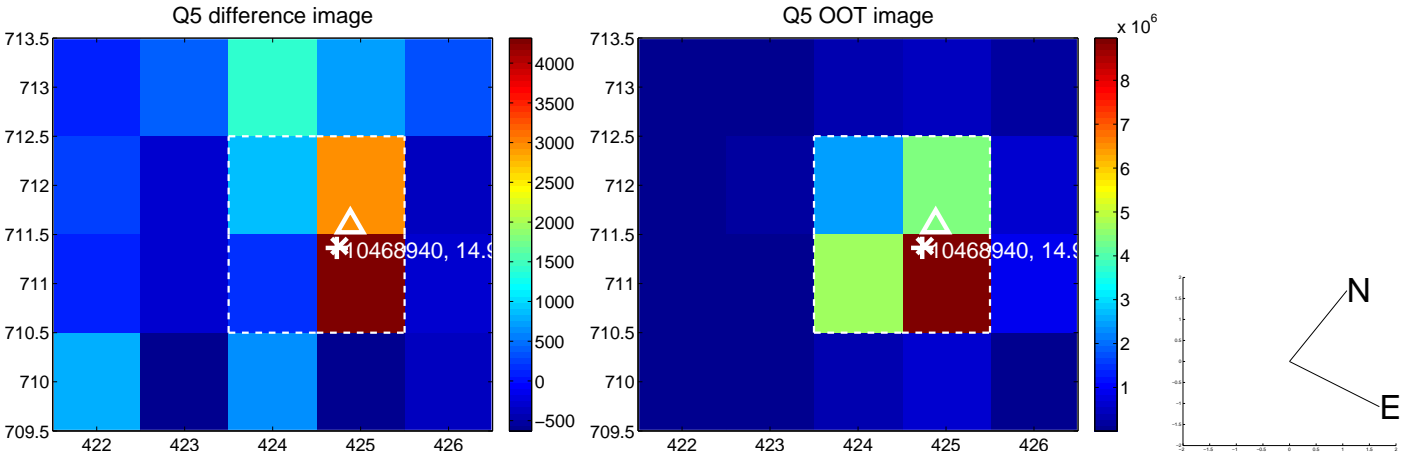


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three- σ . Red *: target star. Blue *: Other stars. Text next to a star gives its KIC ID and kepmag. KIC IDs > 15,000,000 are from the UKIRT catalog.

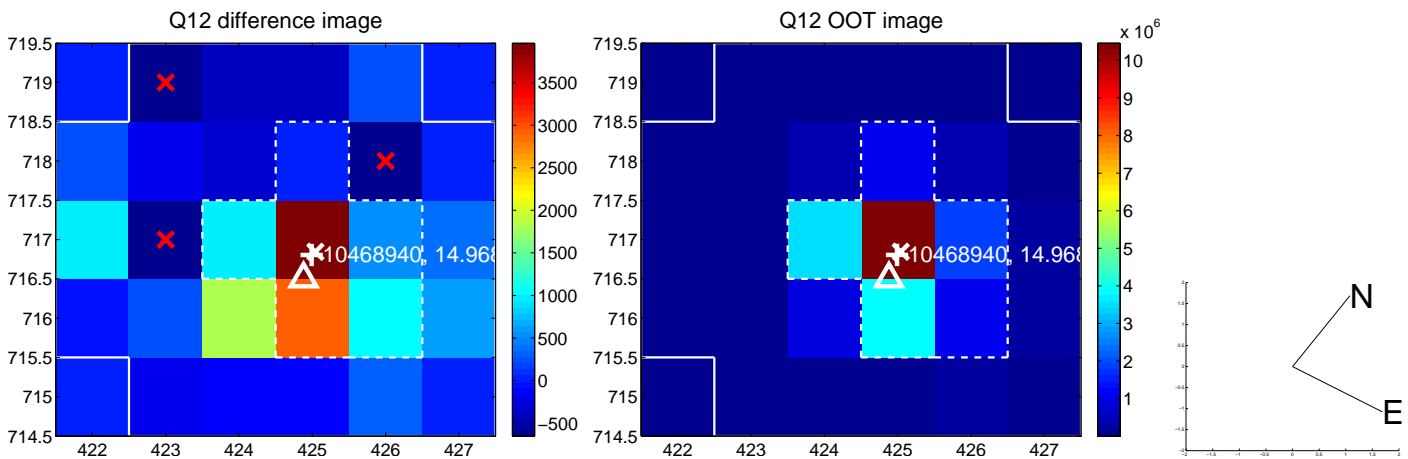
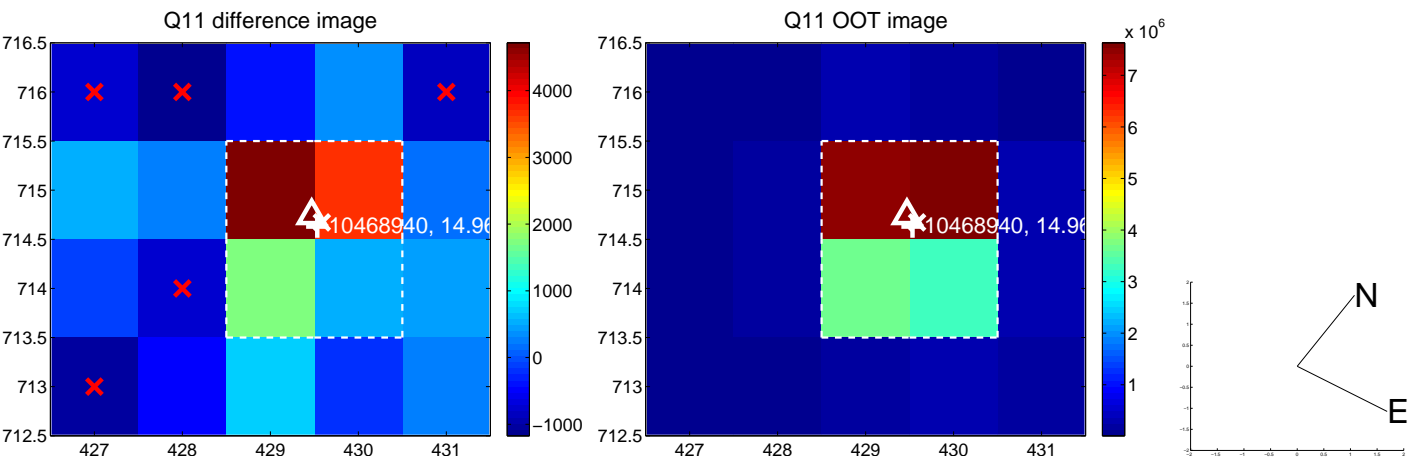
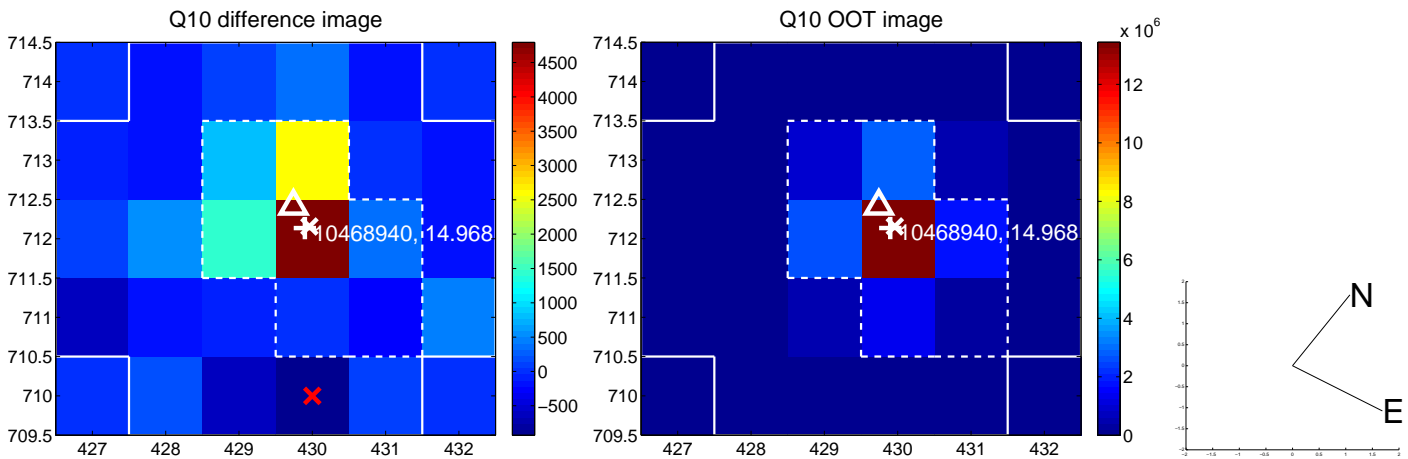
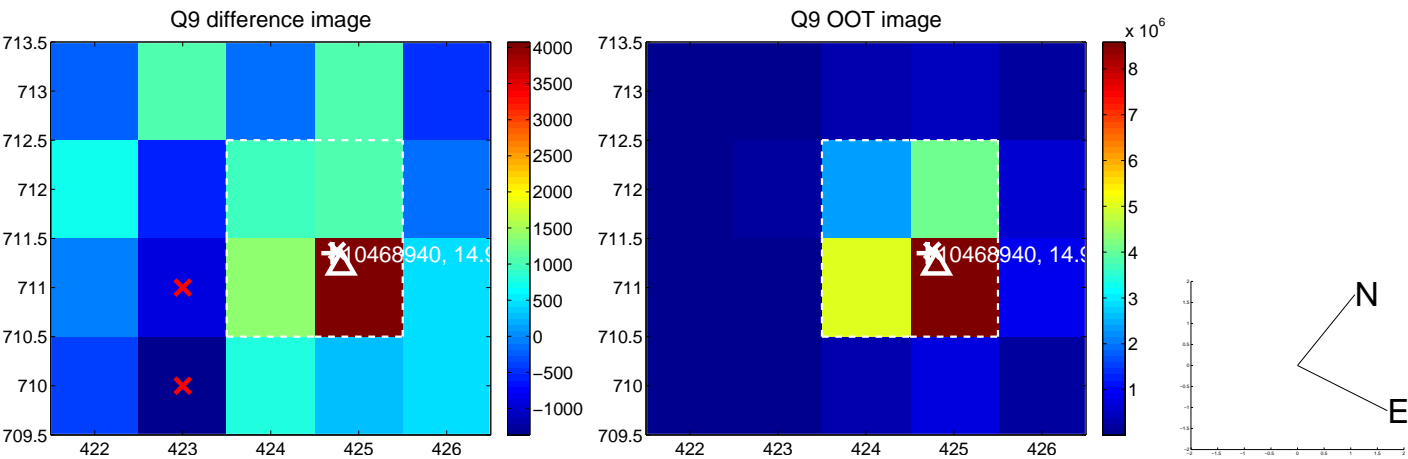
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



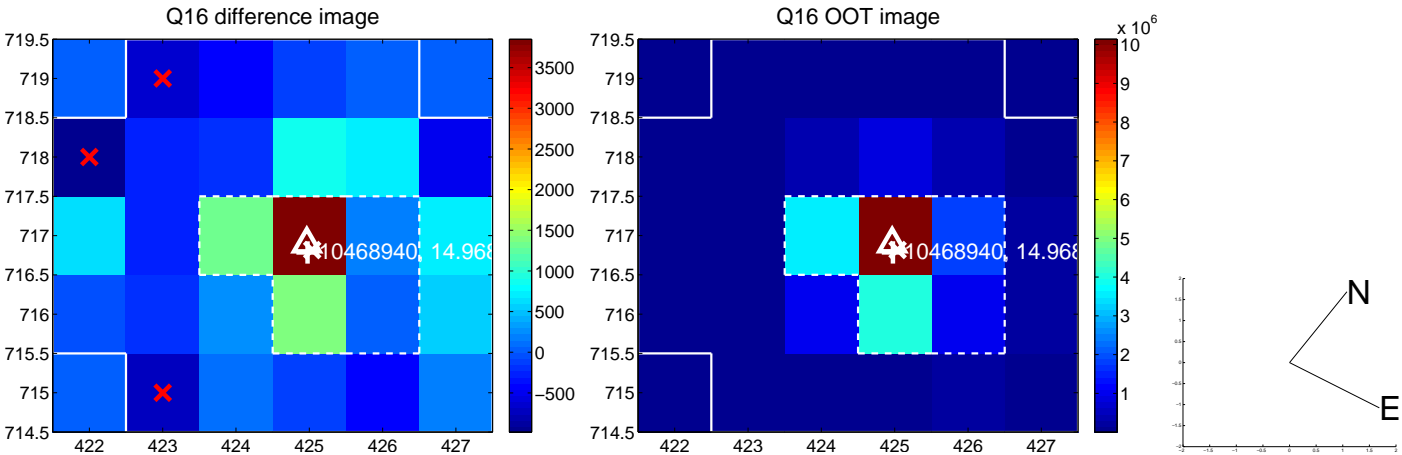
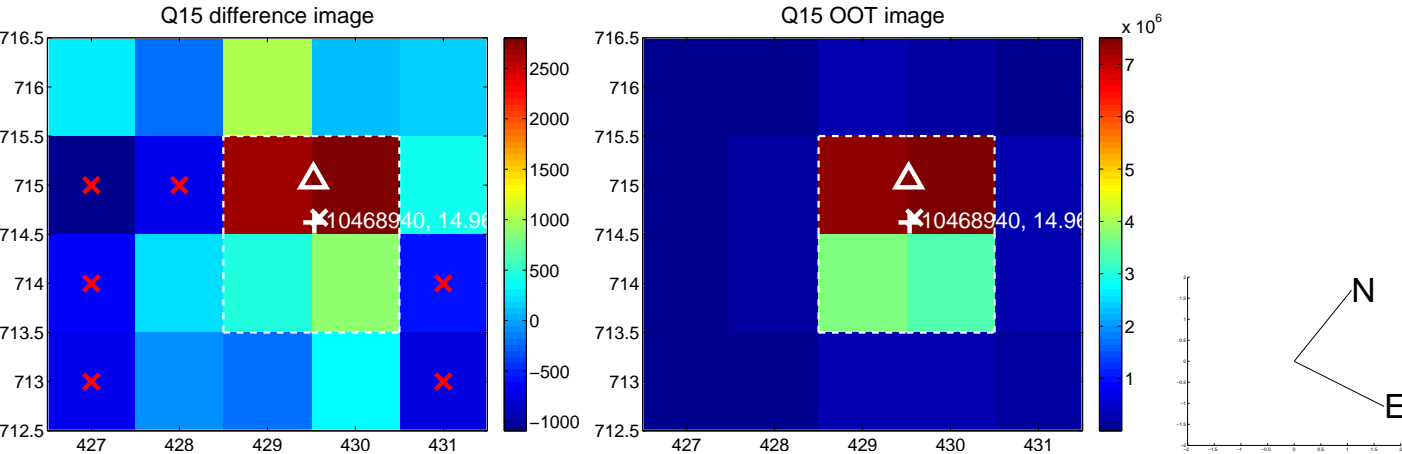
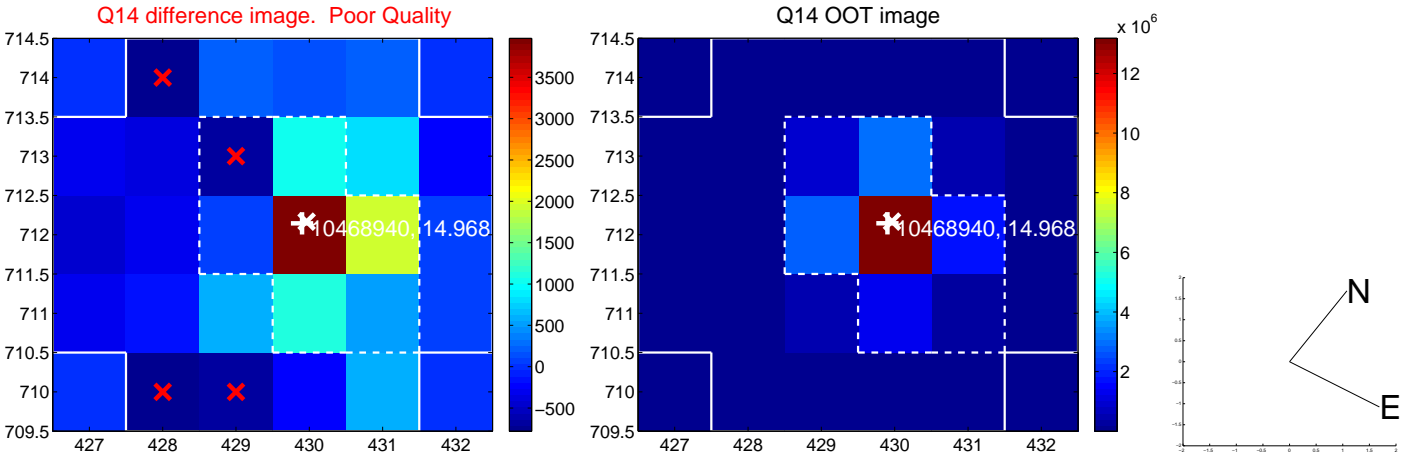
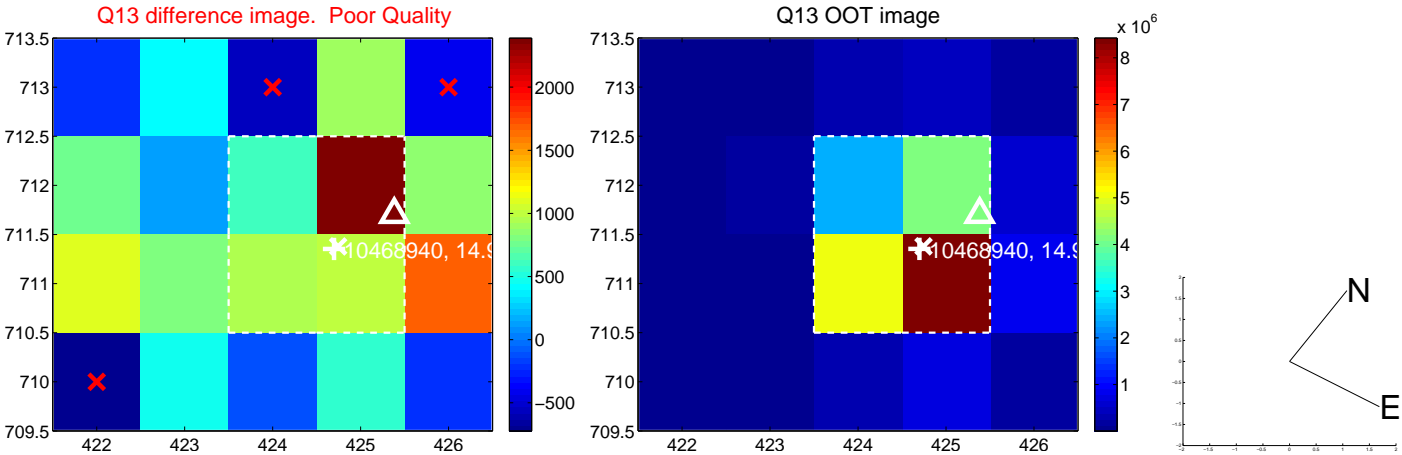
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



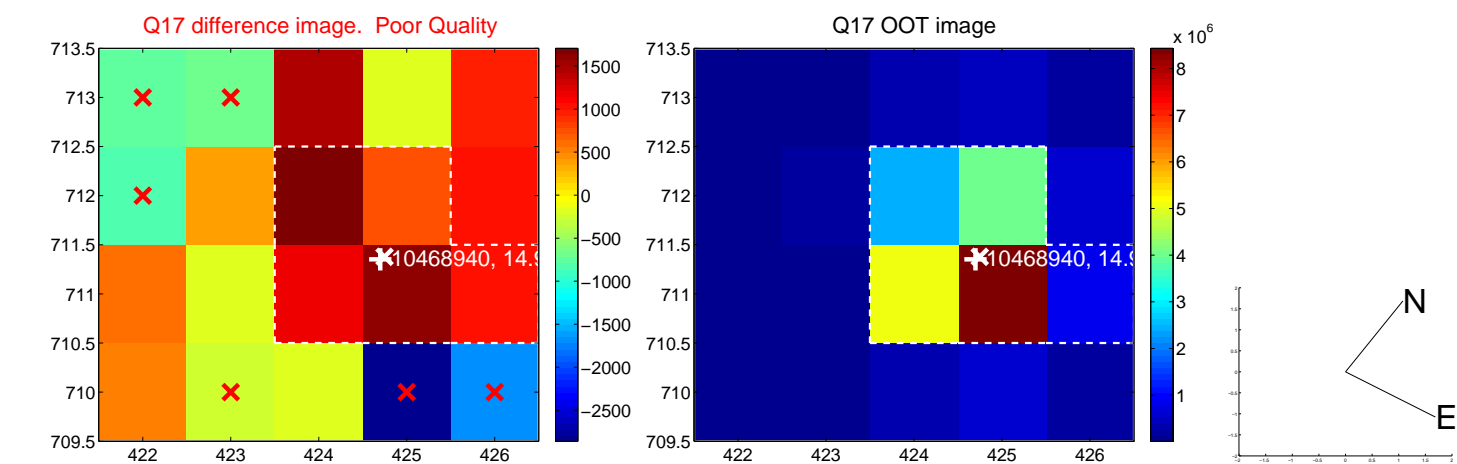
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



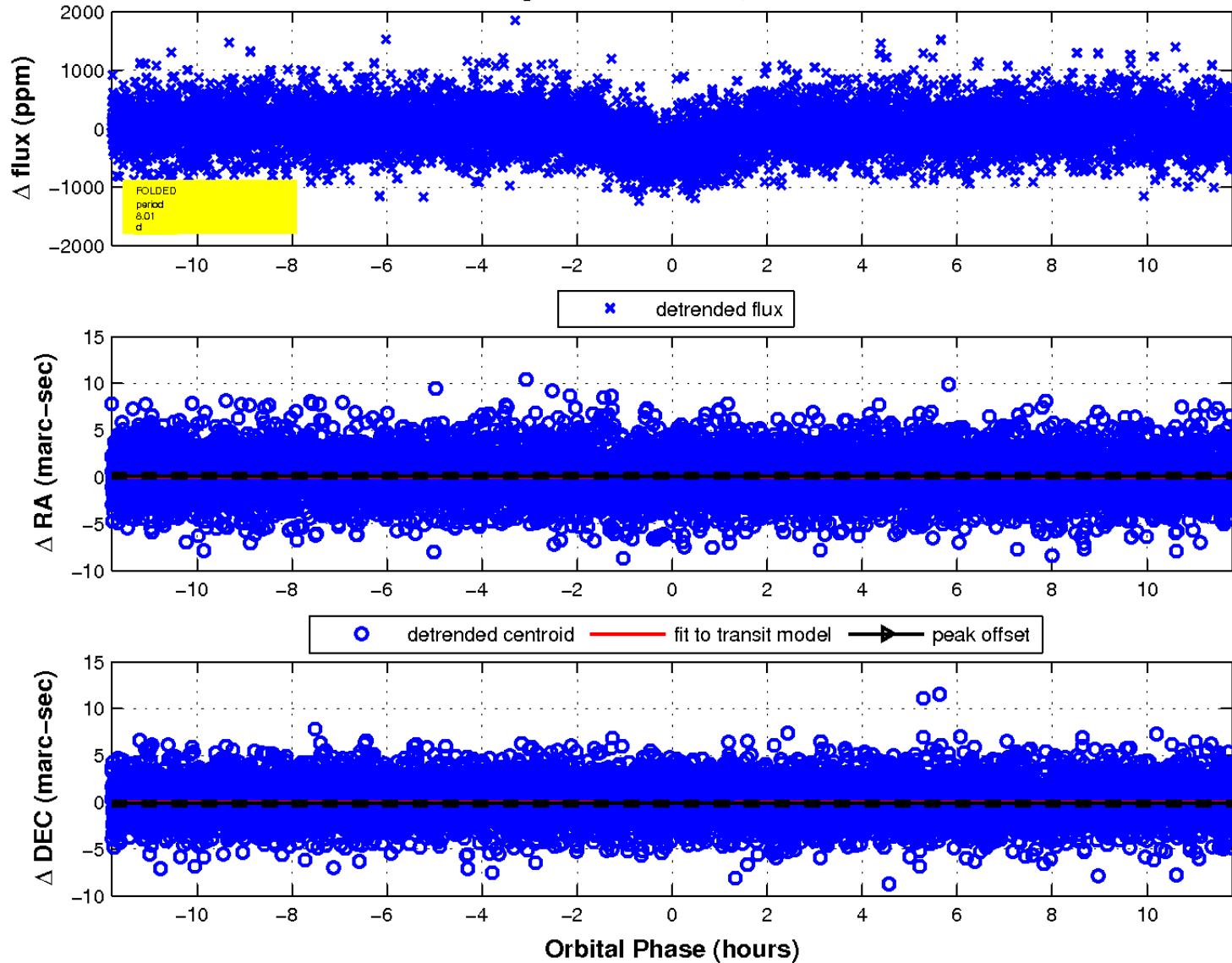
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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



fluxWeightedCentroids, Planet 2 of 2



UKIRT Image

Declination

