

KIC 002708203

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}) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 002708203-01 | OBS | 4045.01 | 1.891241 | 132.690826 | 72.1 | 7.006 | 18.4 | 20.1 | 0.93 | 6569 | 1.09 | 1847.63 |
| 002708203-02 | OBS | No | 601.320609 | 266.227418 | 136.6 | 11.521 | 14.9 | 3.2 | 0.93 | 6569 | 1.16 | 0.85 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|---|
| 002708203-01 | OBS | FP | 0.00 | 0 | 0 | 1 | 1 | HALO_GHOST—EPHEM_MATCH |
| 002708203-02 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | INDIV_TRANS_MARSHALL_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS |

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.

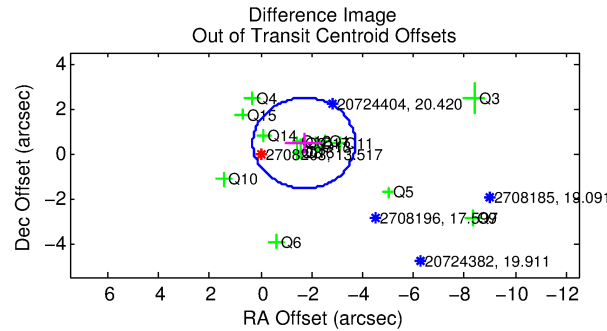
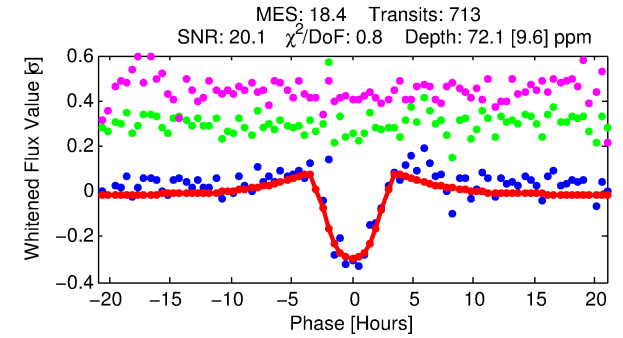
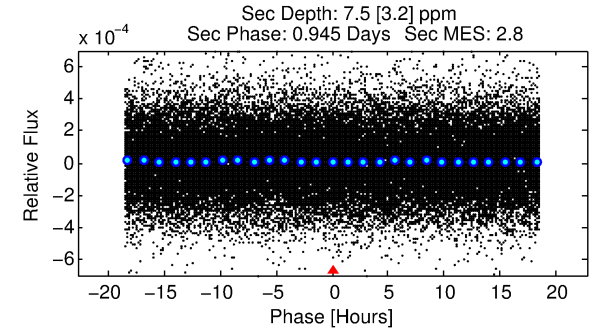
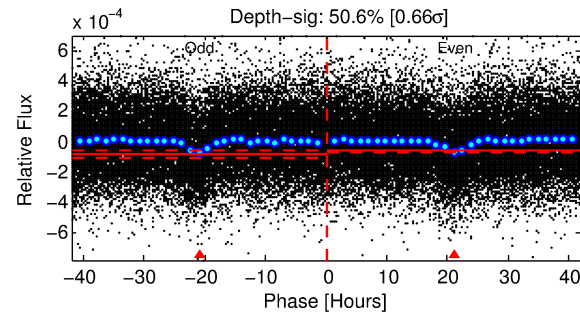
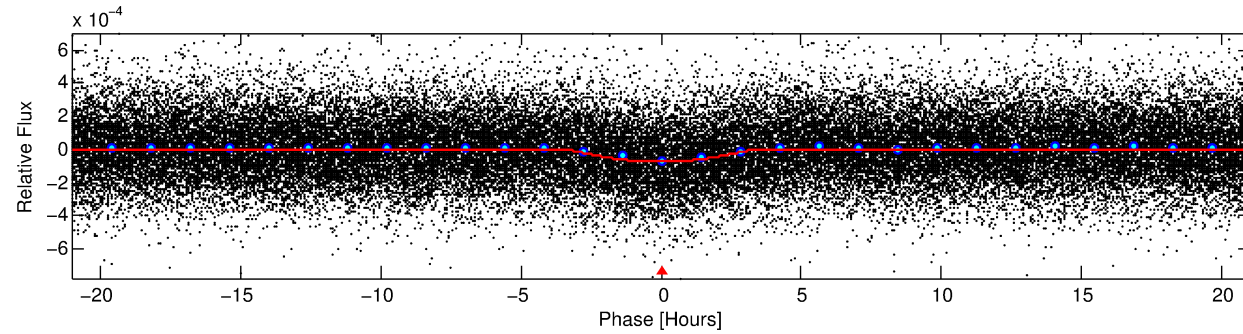
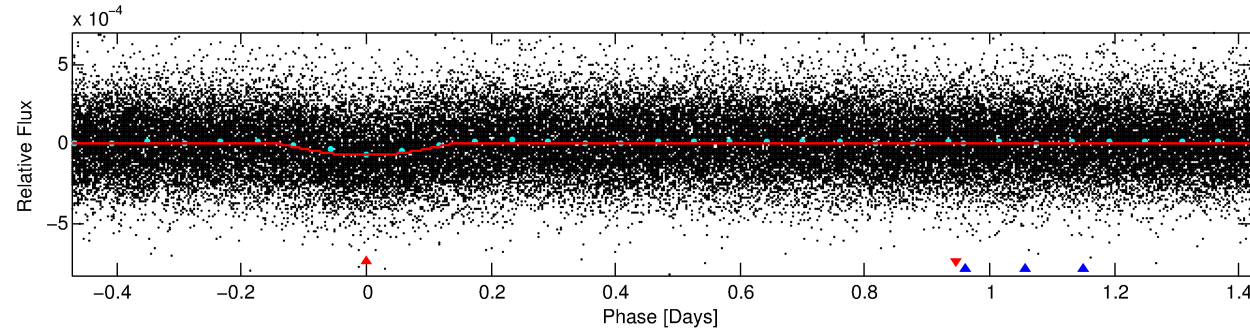
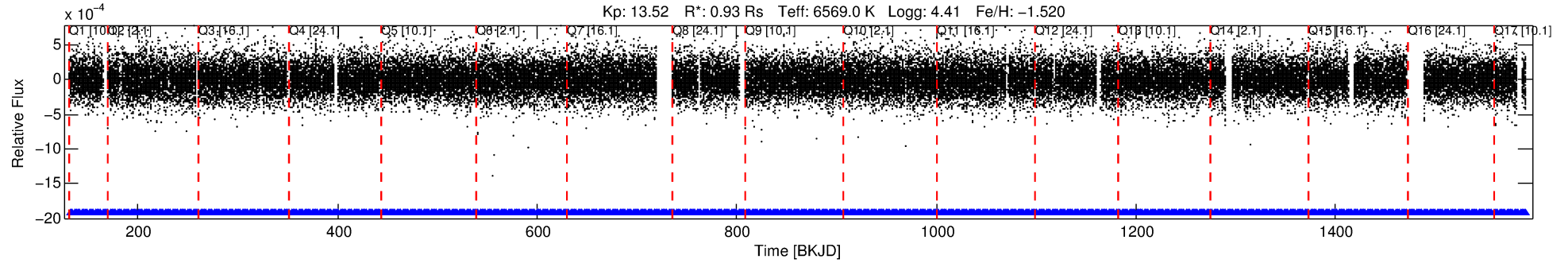
Ephemeris Match Information For 002708203-01

| TCE (1) | KIC | Parent (2) | Parent KIC | $P_1:P_2$ | Dist ($''$) | Δ Row | Δ Col | m_2 | m_1 | D_2/D_1 | Mechanism | Flag | σ_P | σ_T |
|--------------|---------|------------|------------|-----------|---------------|--------------|--------------|-------|-------|-----------|------------|------|------------|------------|
| 002708203-01 | 2708203 | 6286.01 | 2708156 | 1:1 | 105.1 | 25 | -6 | 10.67 | 13.51 | 8901.50 | Direct-PRF | 0 | 1.06 | 0.43 |

Notes: $P_1:P_2$ is the period ratio. Dist is the distance in arcseconds. Δ Row and Δ Col are the number of pixels apart in row and column. m_2 and m_1 are the magnitudes of the parent and child. D_2/D_1 is the parent's transit depth divided by the child's. σ_P and σ_T are the significance of the match in period and epoch. For a match to be considered significant $\sigma_P < 5.0$ and $\sigma_T < 5.0$. Matches which have σ_P and σ_T very close to this cutoff should receive extra scrutiny, especially if the period ratio is very large.

DV One-Page Summary

KIC: 2708203 Candidate: 1 of 2 Period: 1.891 d
KOI: K04045.01 Corr: 0.832



DV Fit Results:

Period = 1.89124 [0.00001] d
Epoch = 132.6908 [0.0054] BKJD
Rp/R* = 0.0108 [0.0011]
a/R* = 1.08 [0.02]
b = 0.99 [0.00]
Seff = 1847.63 [577.83]
Teq = 1672 [131] K
Rp = 1.09 [0.25] Re
a = 0.0279 [0.0052] AU
Ag = 2.69 [1.48] [1.14 σ]
Teffp = 3310 [401] K [3.88 σ]

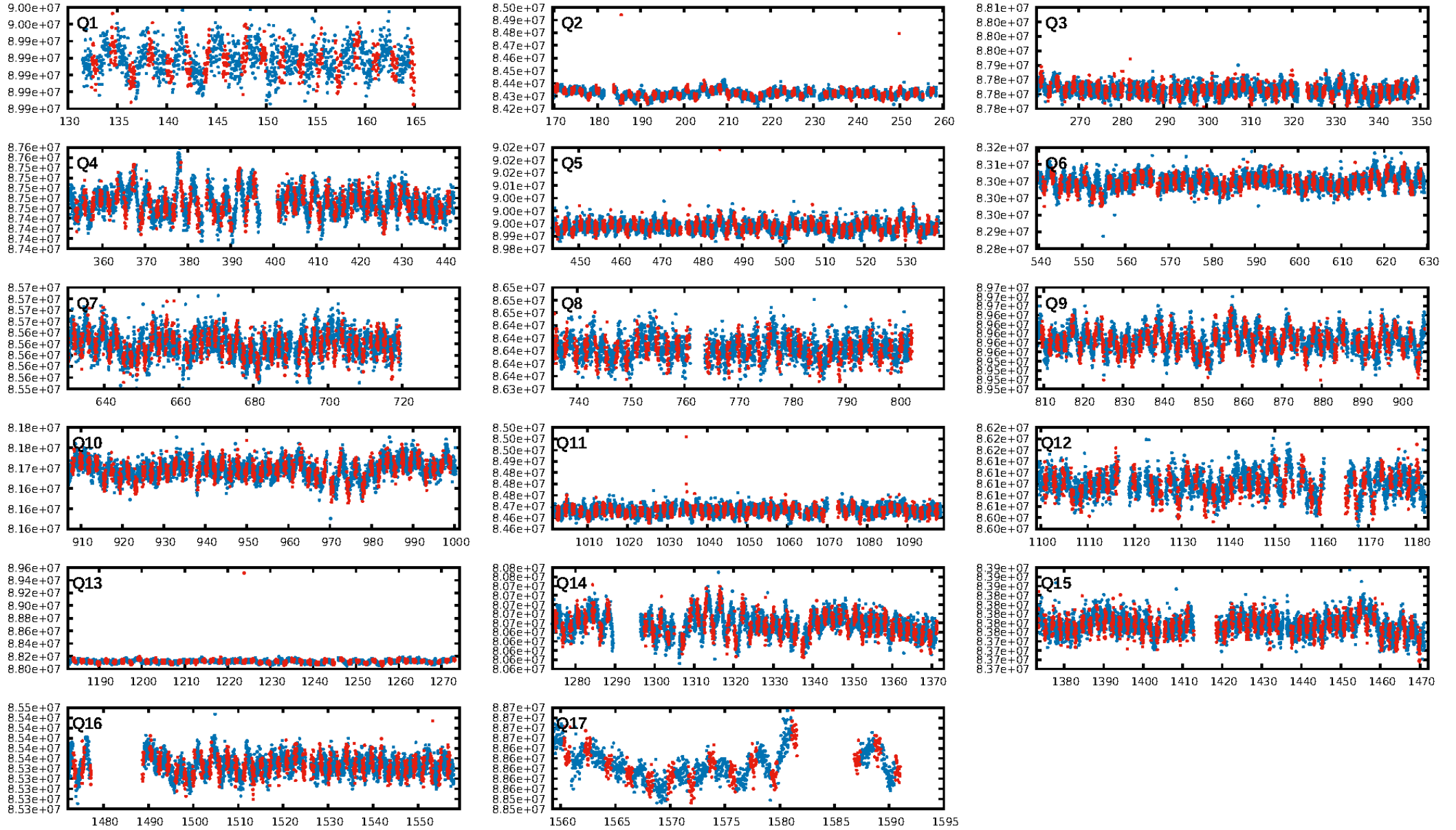
DV Diagnostic Results:

ShortPeriod-sig: N/A
LongPeriod-sig: 100.0% [1066.91 σ]
ModelChiSquare2-sig: N/A
ModelChiSquareGof-sig: N/A
Bootstrap-pfa: 4.76e-62
RollingBand-ftg: 1.00 [680/680]
GhostDiagnostic-chr: 0.03637
Centroid-sig: 0.0%
Centroid-so: 2.396 arcsec [4.90 σ]
OotOffset-rm: 1.770 arcsec [2.64 σ]
KicOffset-rm: 1.821 arcsec [2.66 σ]
OotOffset-st: 3/4/4/5 [16]
KicOffset-st: 3/4/4/5 [16]
DiffImageQuality-fgm: 0.06 [1/16]
DiffImageOverlap-fno: 1.00 [17/17]

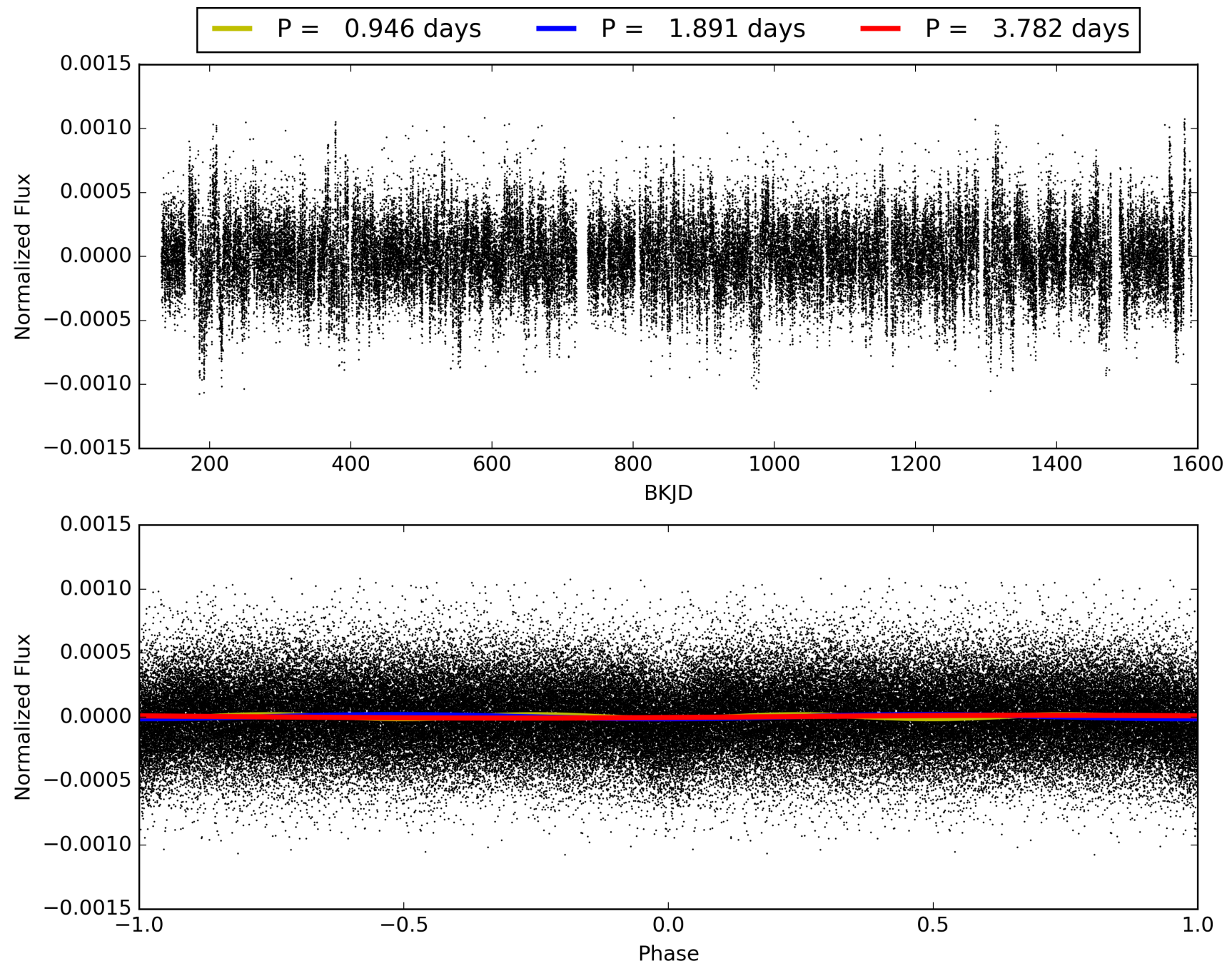
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 22:16:46 Z

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

TCE 002708203-01, PDC Light Curves

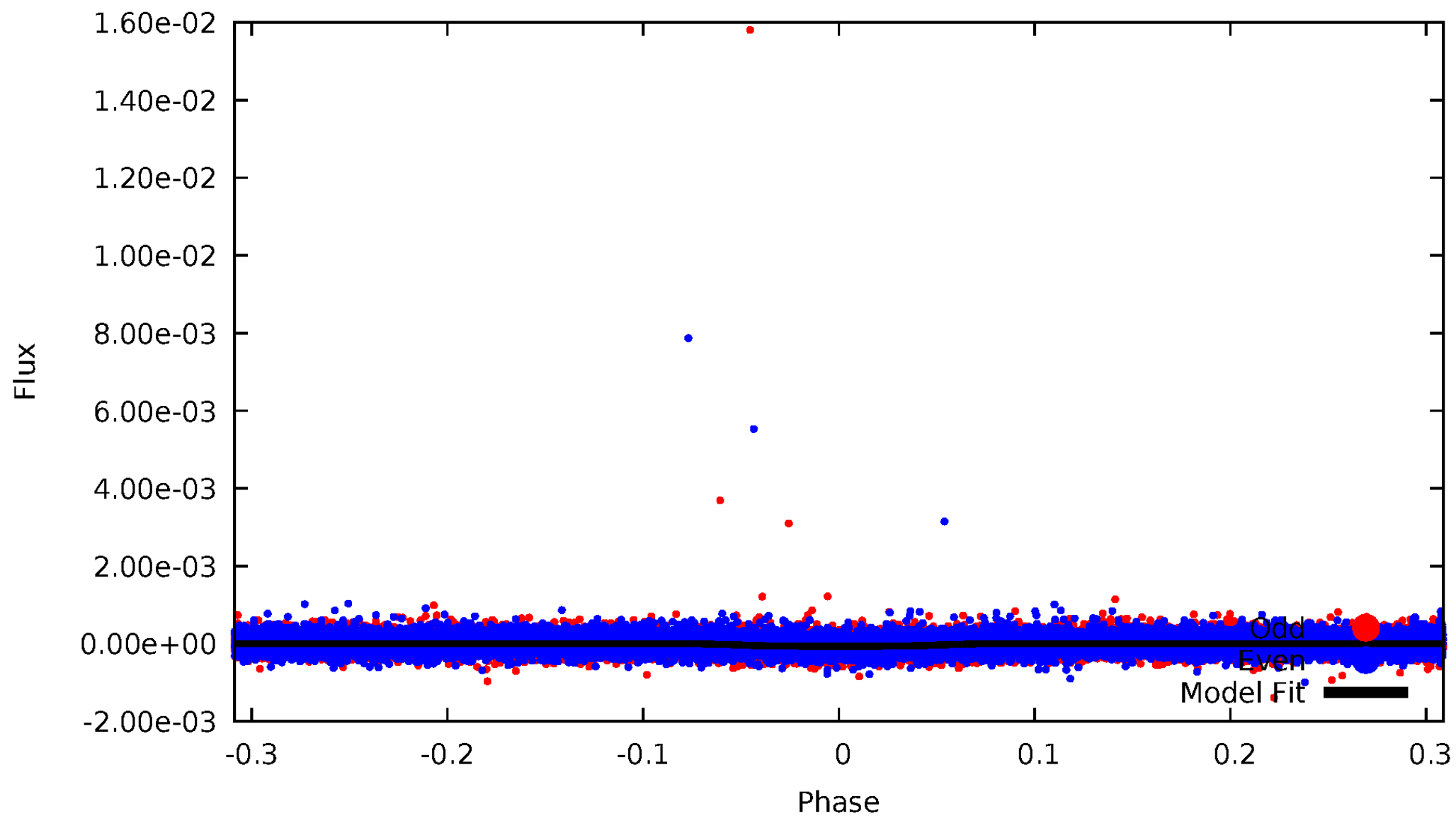


TCE 002708203-01



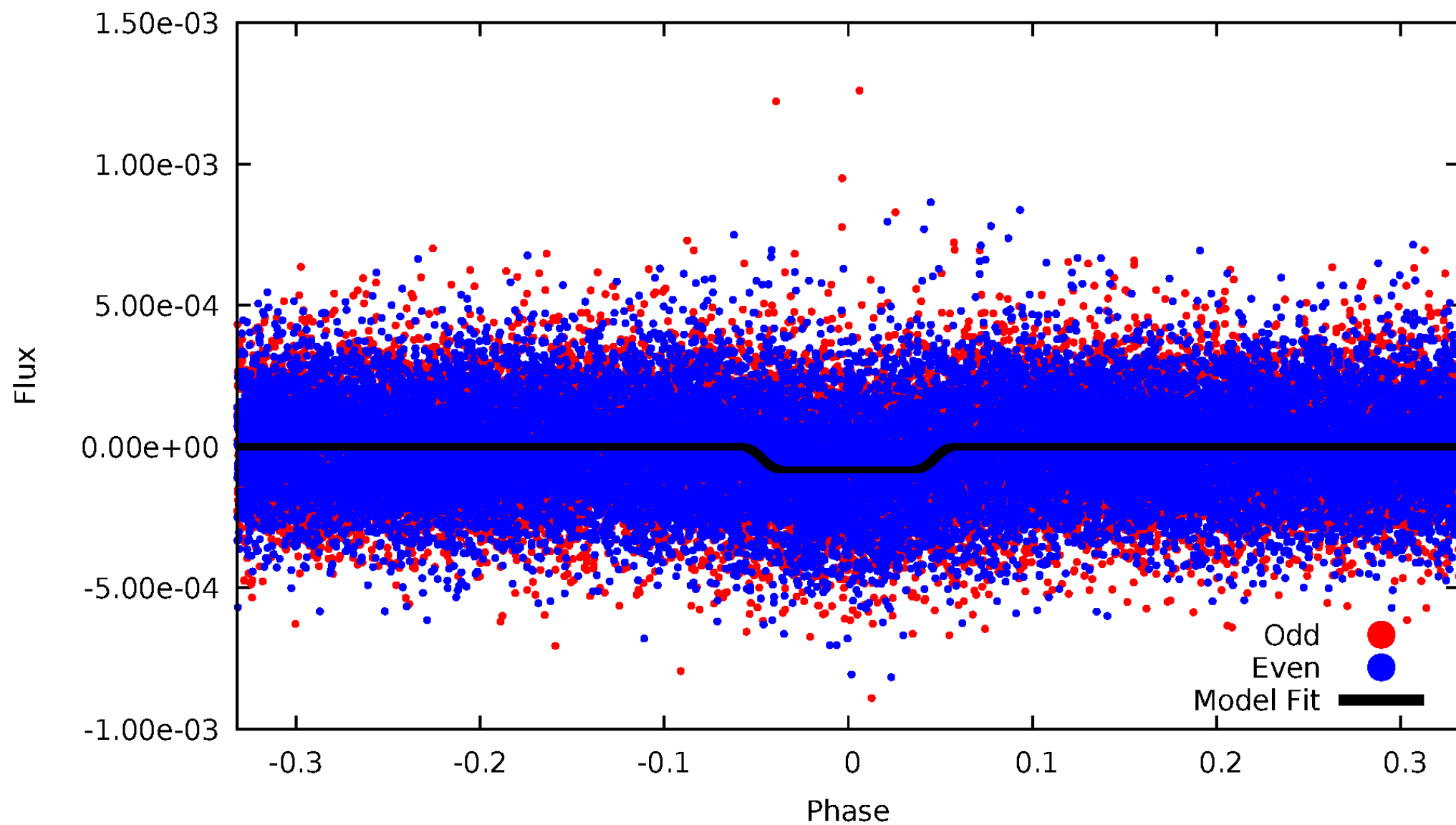
DV Odd/Even

TCE 002708203-01

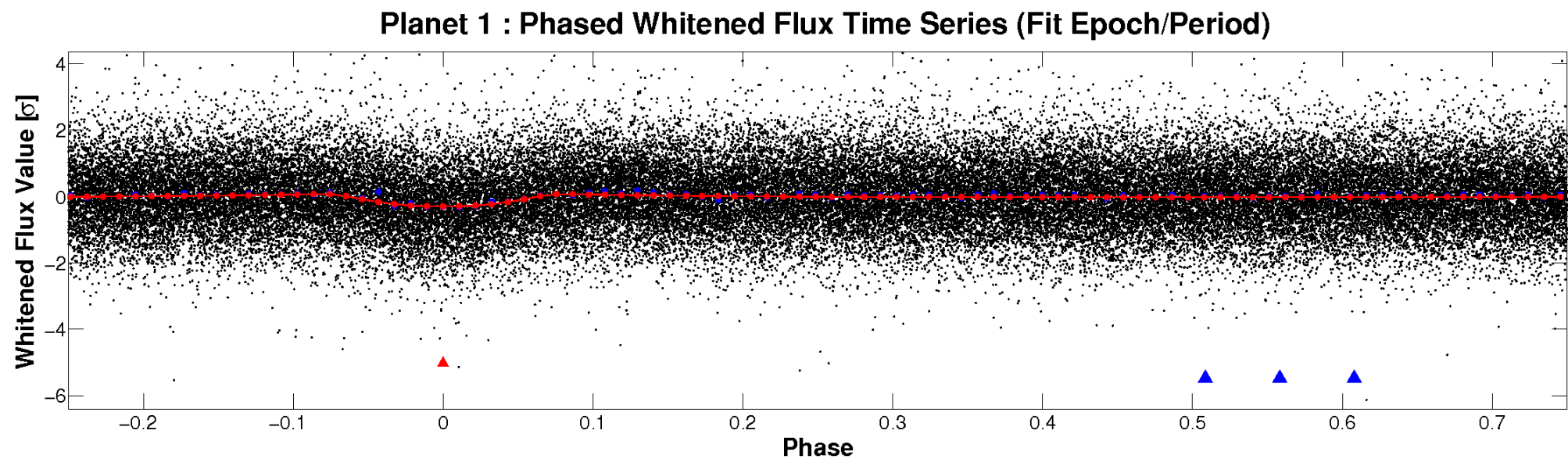
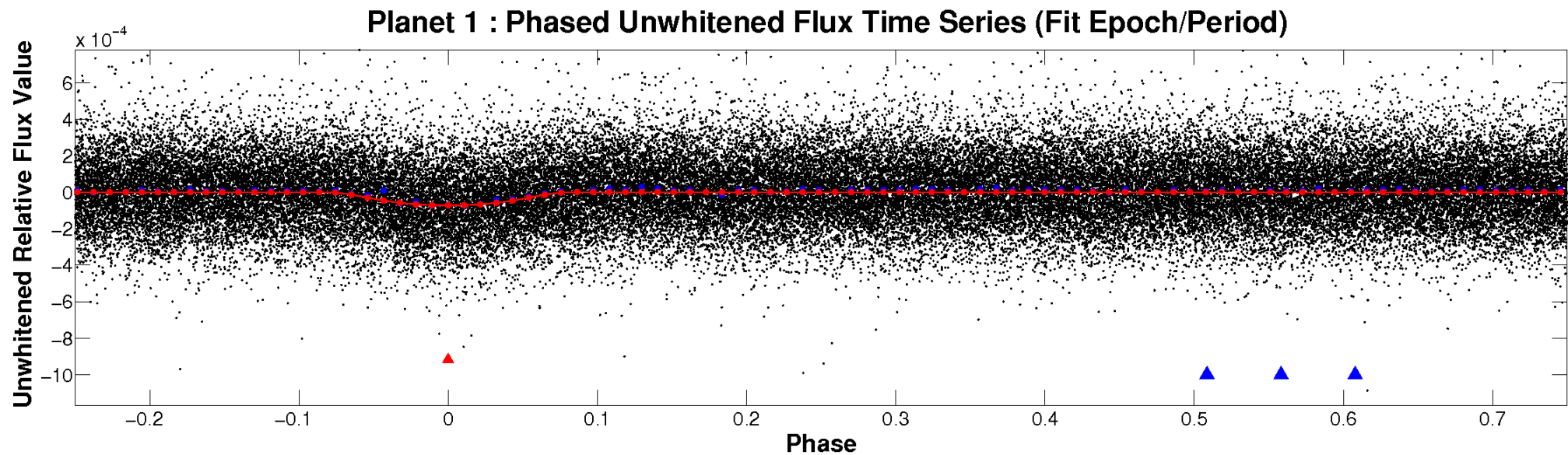


ALT Odd/Even

TCE 002708203-01

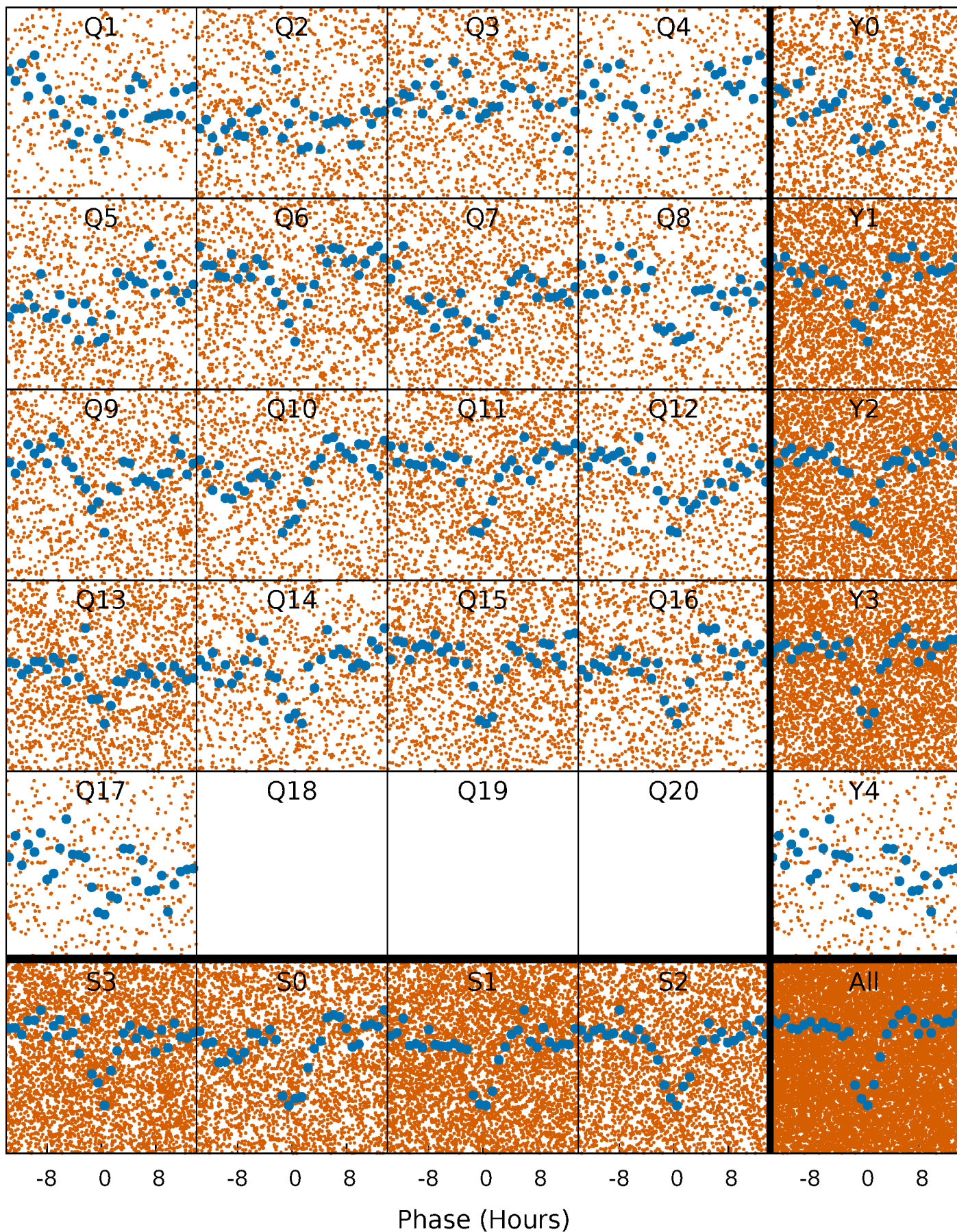


Non-Whitened Vs. Whitened Light Curve



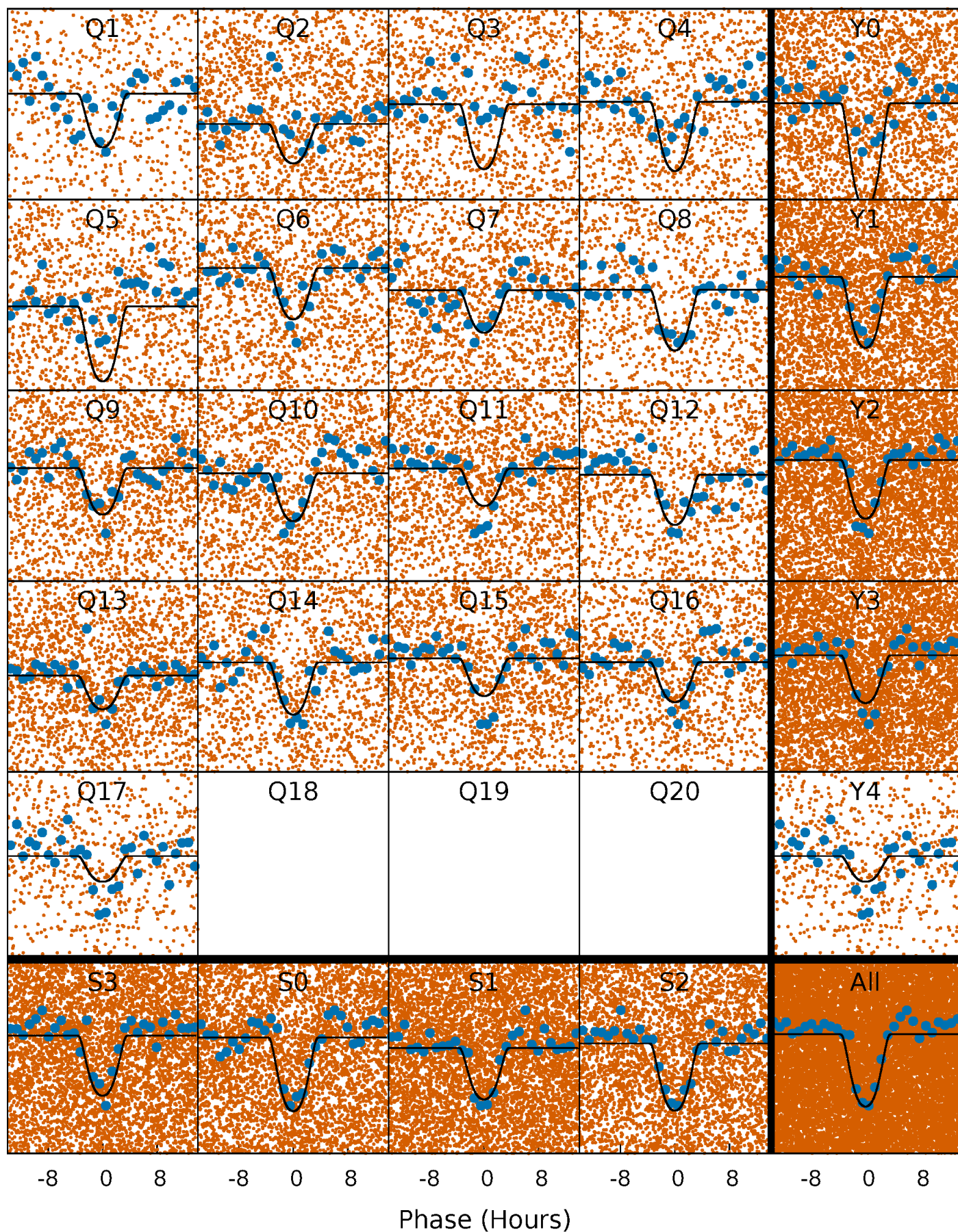
PDC Quarter-Phased Transit Curves

TCE 002708203-01 P= 1.891241 Days $T_0=132.690826$ (BKJD)



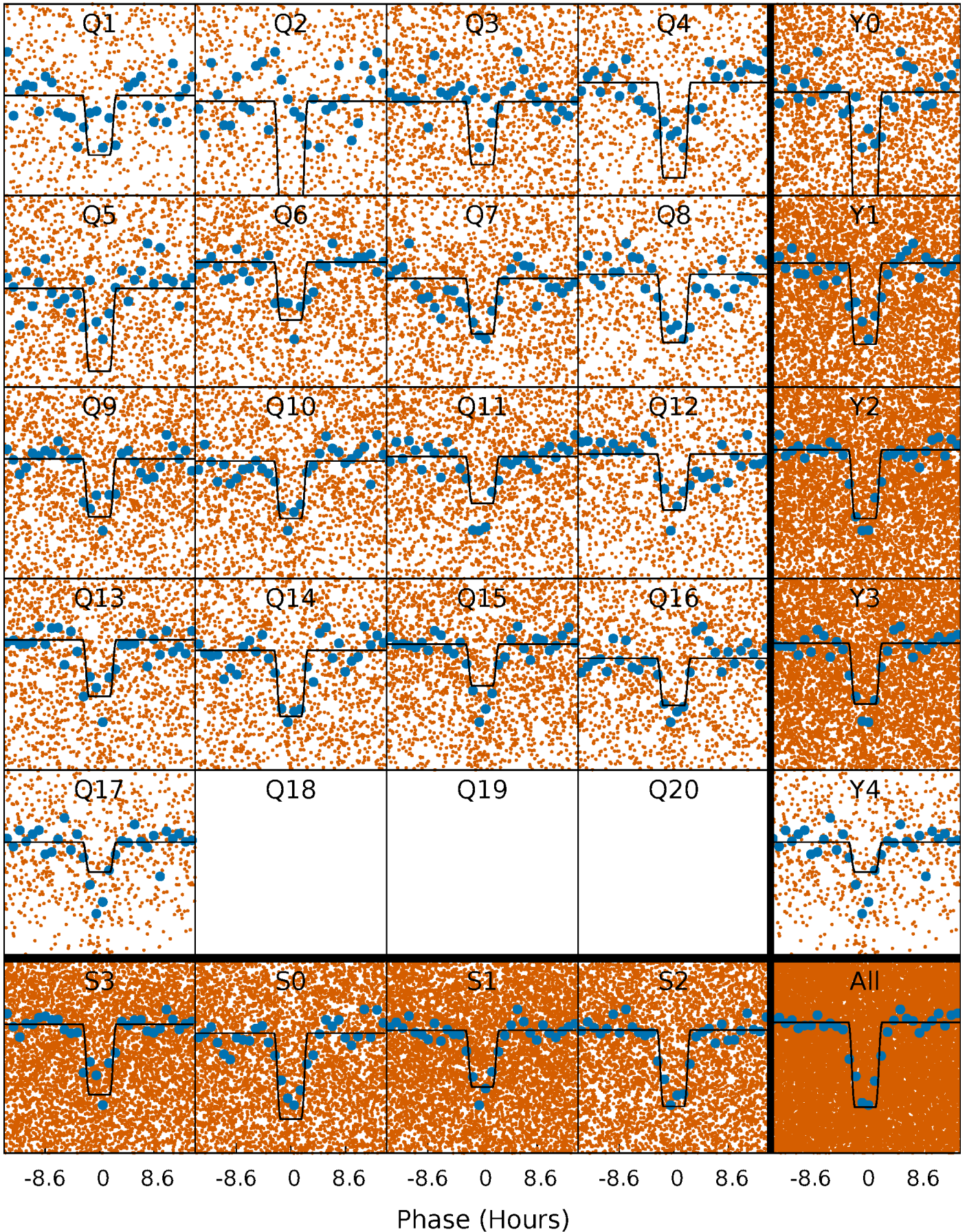
DV Quarter-Phased Transit Curves

TCE 002708203-01 P= 1.891241 Days $T_0=132.690826$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

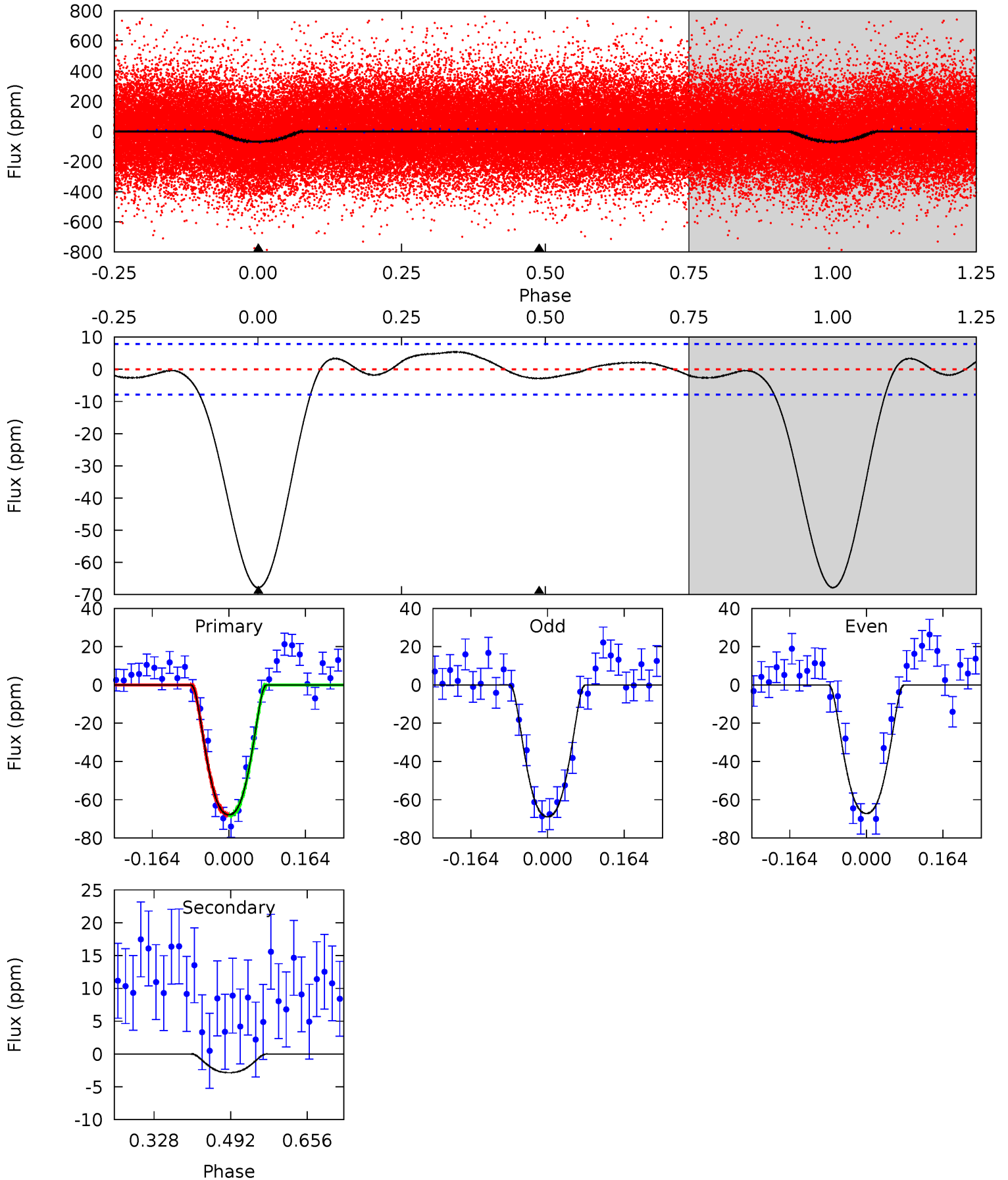
TCE 002708203-01 P= 1.891298 Days $T_0=132.664019$ (BKJD)



DV Model-Shift Uniqueness Test

002708203-01, P = 1.891241 Days, E = 130.799585 Days

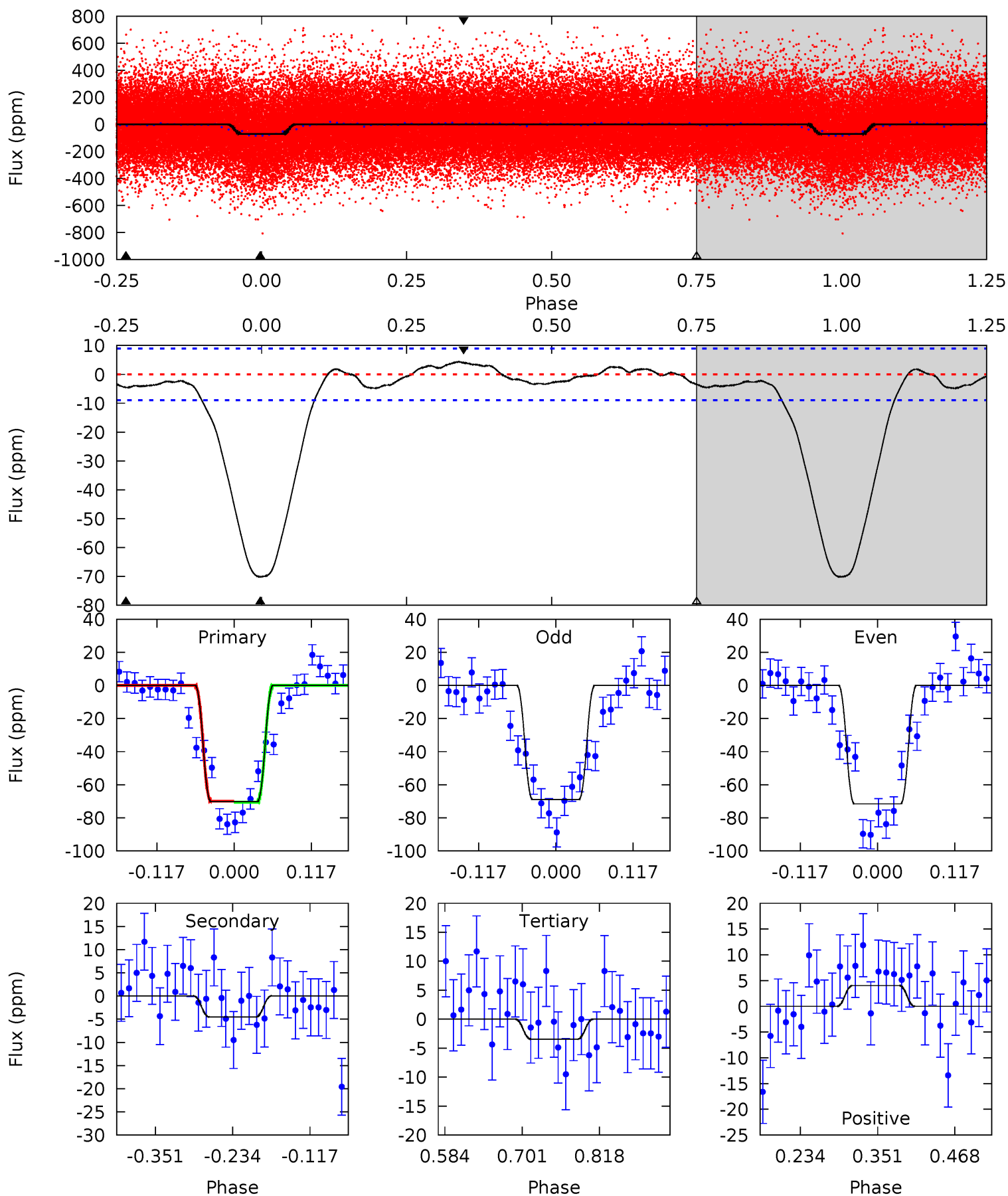
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|-----|-----|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 38.5 | 1.62 | 0 | 0 | 4.46 | 1.39 | 1.40 | 38.5 | 38.5 | 1.62 | 1.62 | 0.49 | 0.92 | 0.07 | 0.12 |



Alt Model-Shift Uniqueness Test

002708203-01, P = 1.891298 Days, E = 130.772721 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 35.5 | 2.29 | 1.75 | 2.04 | 4.53 | 1.57 | 1.23 | 33.8 | 33.5 | 0.54 | 0.25 | 0.67 | 1.00 | 0.06 | 0.15 |



Stellar Parameters For KIC 002708203

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | R (R_{\odot}) | $M(M_{\odot})$ | p_{\star} ($\text{g}\cdot\text{cm}^{-3}$) |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
| | 6569^{+157}_{-197} | $4.410^{+0.150}_{-0.165}$ | $-1.520^{+0.300}_{-0.250}$ | $0.927^{+0.193}_{-0.129}$ | $0.805^{+0.070}_{-0.041}$ | $1.424^{+0.843}_{-0.617}$ |
| | +2%/-3% | +3%/-4% | +20%/-16% | +21%/-14% | +9%/-5% | +59%/-43% |
| Source | PHO1 | KIC0 | KIC0 | DSEP | | |

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

Secondary Eclipse Parameters for KIC 002708203-01 / KOI 4045.01

| Detrend | Depth (ppm) | R_p (R_{\oplus}) | T_{max} (K) | T_{obs} (K) | A_{obs} |
|---------|-------------|------------------------|----------------------|----------------------|---------------------------|
| DV | -3 ± 2 | $1.09^{+0.16}_{-0.15}$ | 2331^{+142}_{-129} | 3035^{+312}_{-596} | $1.020^{+0.754}_{-0.585}$ |
| Alt. | -5 ± 2 | $0.92^{+0.16}_{-0.13}$ | 2332^{+143}_{-125} | 3534^{+306}_{-382} | $2.279^{+1.411}_{-1.129}$ |

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 $A_{obs} \gg 1.0$

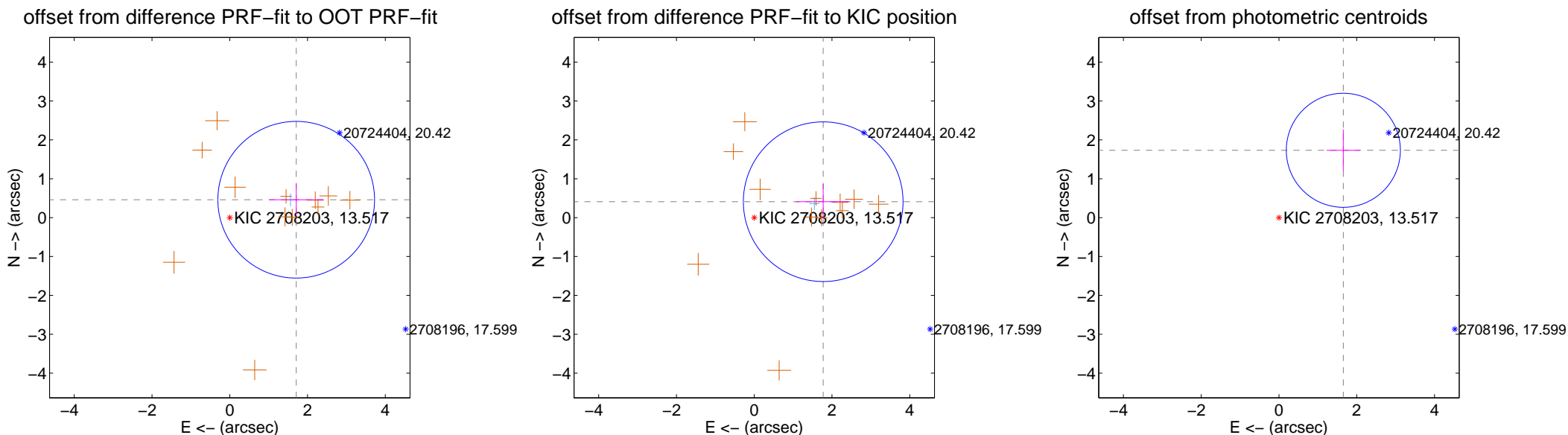
DV Centroid Data

Supplemental centroid analysis for 002708203-01. Kepler magnitude: 13.52. Transit SNR 20.14

There are 1 quarters with good PRF difference image offsets

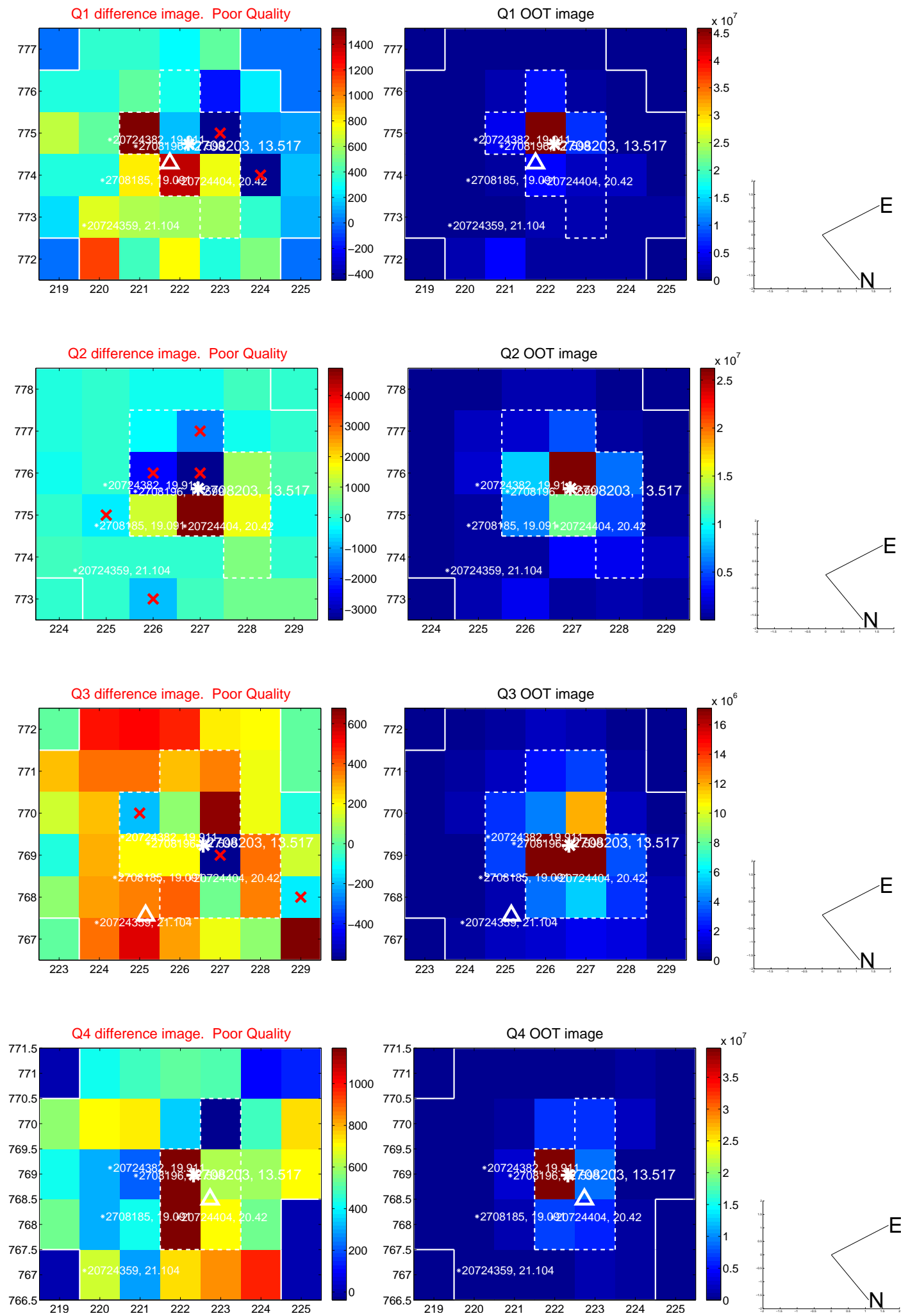
The direct PRF centroid is offset from the target star catalog position by about 0.05 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|---|--------------------|---------------------|--------------------|-------------------|
| PRF-fit source offset from OOT | 1.770 ± 0.672 | 2.64 | -1.709 ± 0.697 | 0.460 ± 0.413 |
| PRF-fit source offset from KIC position | 1.821 ± 0.684 | 2.66 | -1.774 ± 0.702 | 0.410 ± 0.458 |
| photometric centroid source offset | 2.40 ± 0.49 | 4.90 | -1.66 ± 0.43 | 1.73 ± 0.54 |

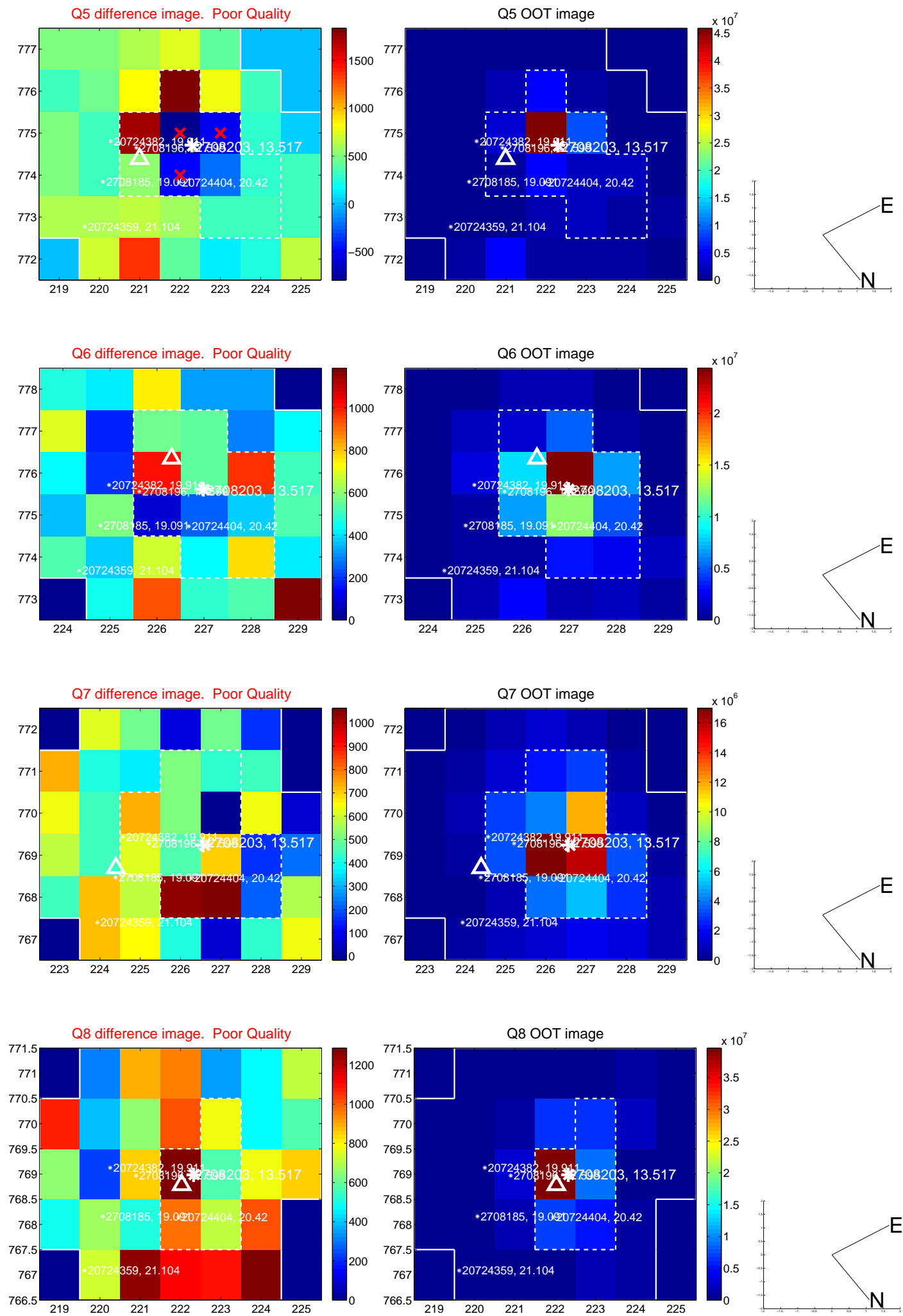


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three- σ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

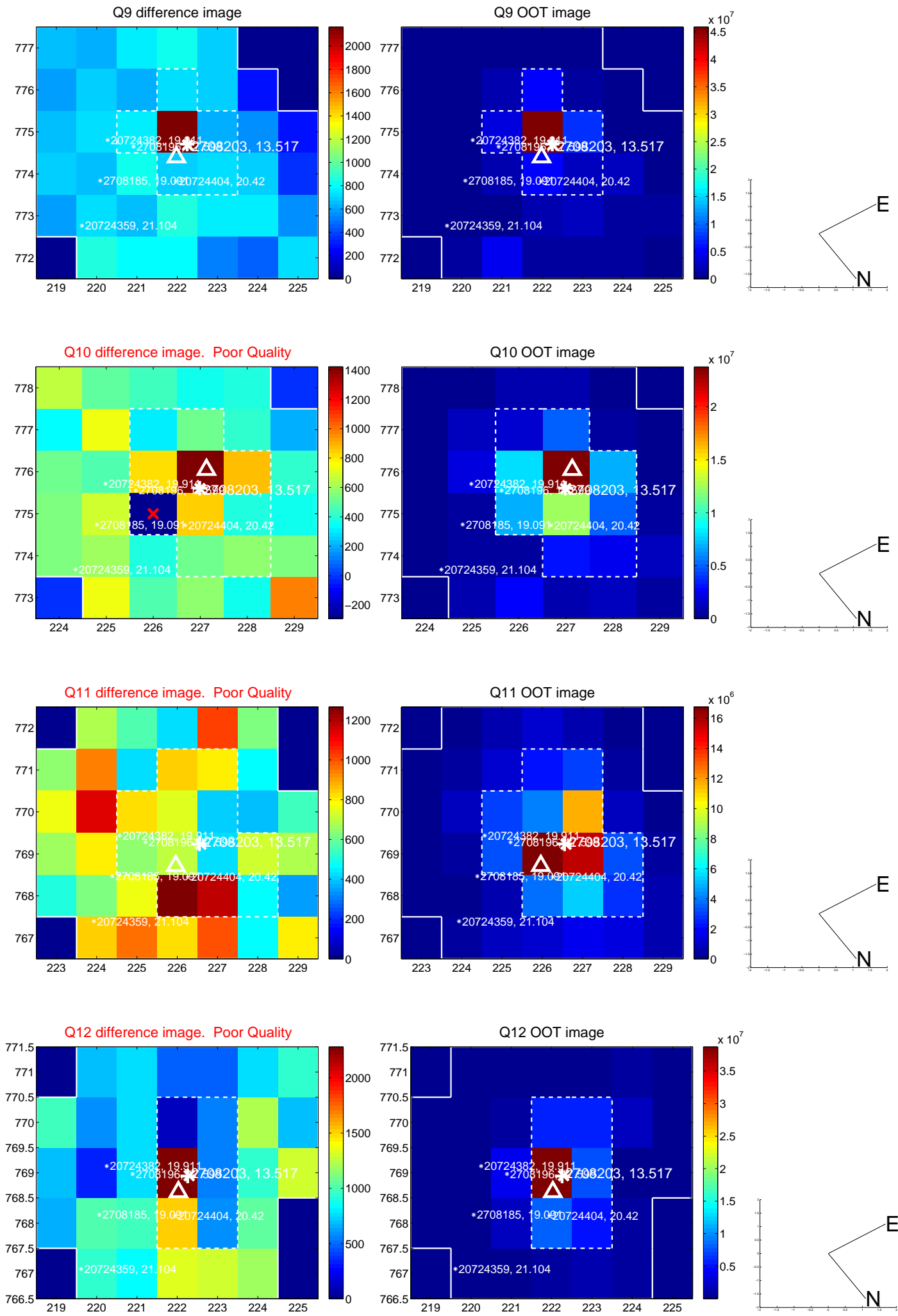
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



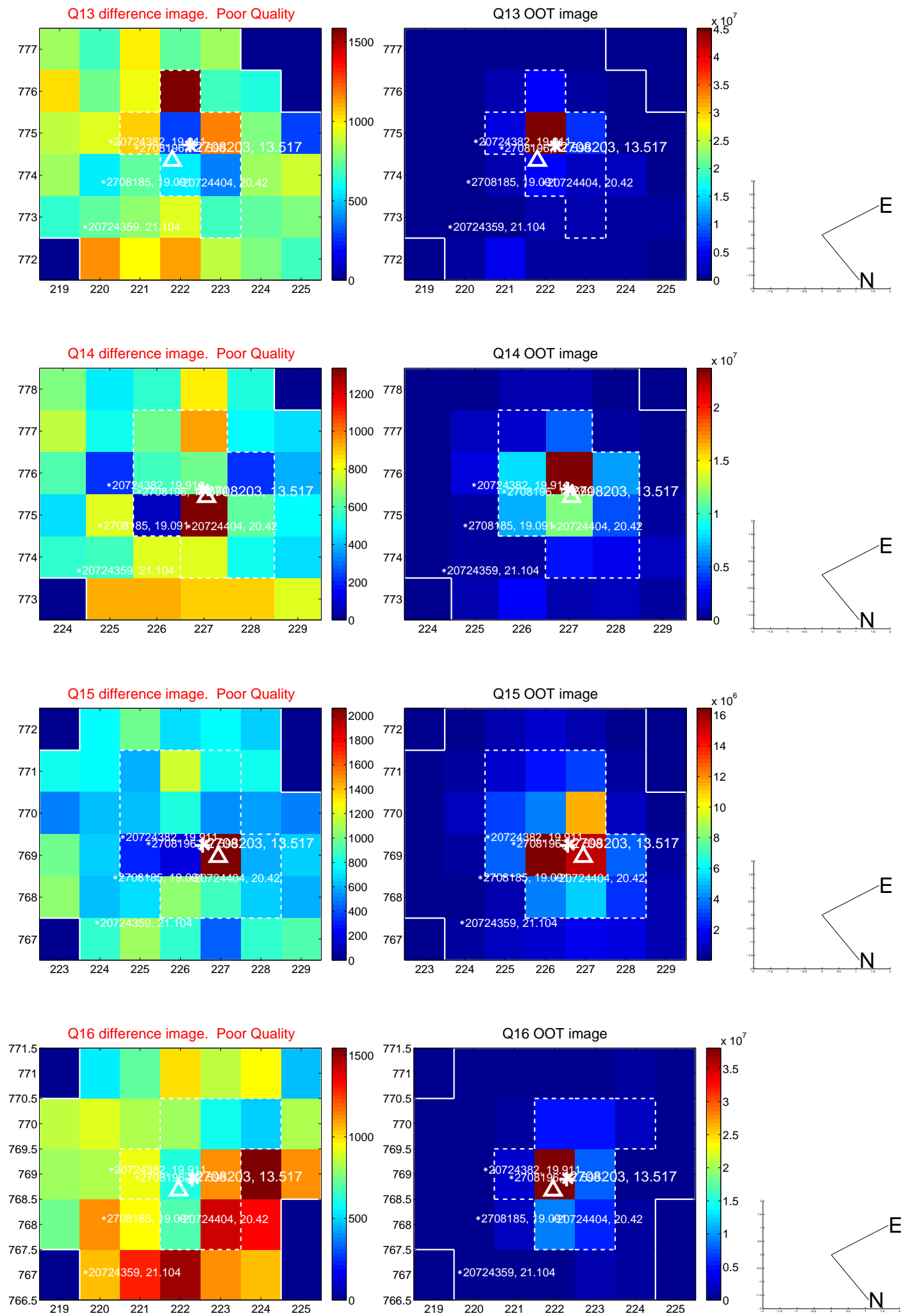
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



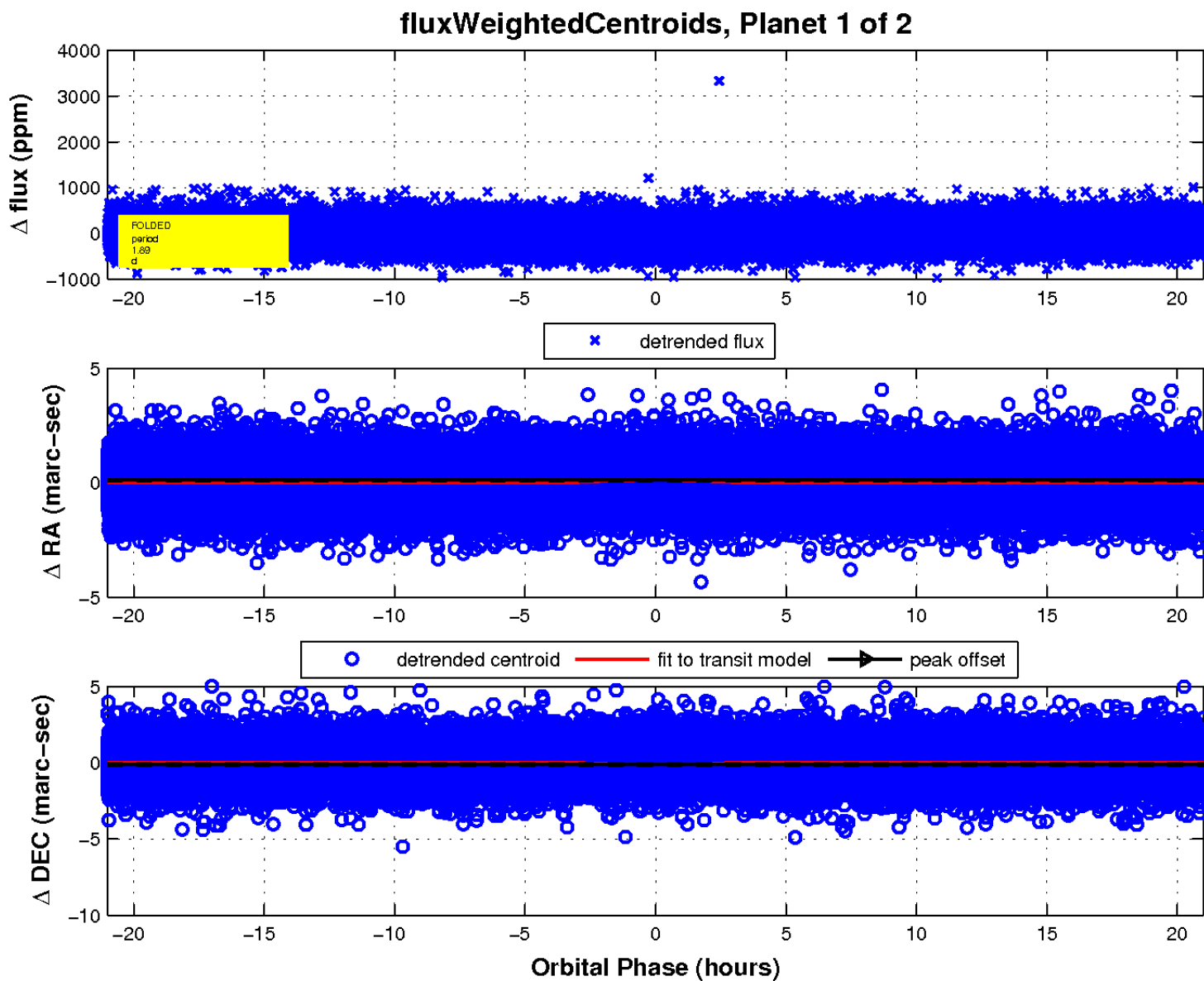
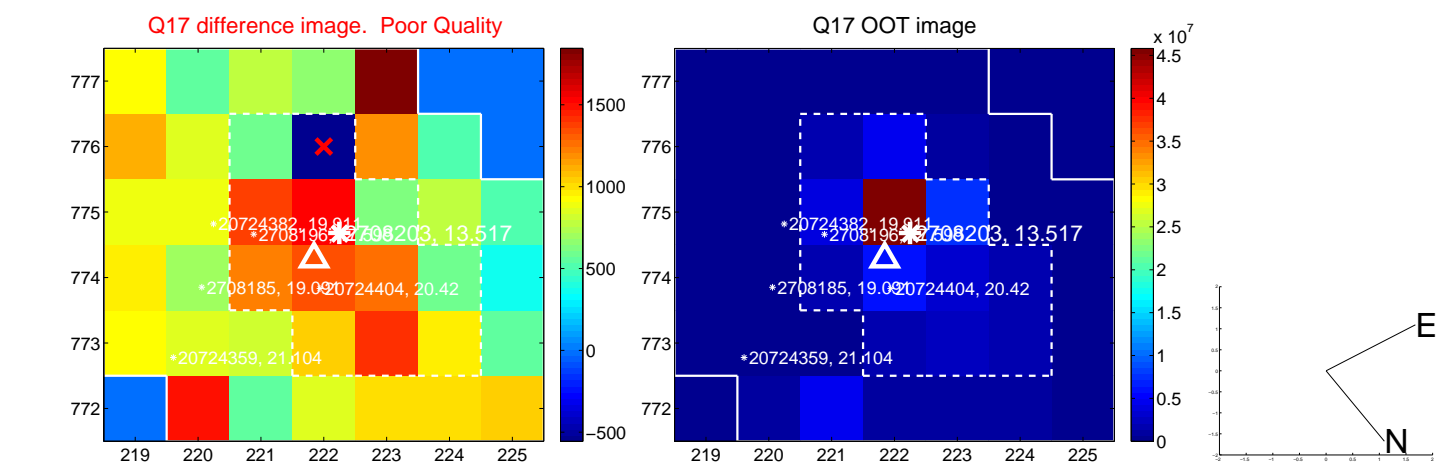
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

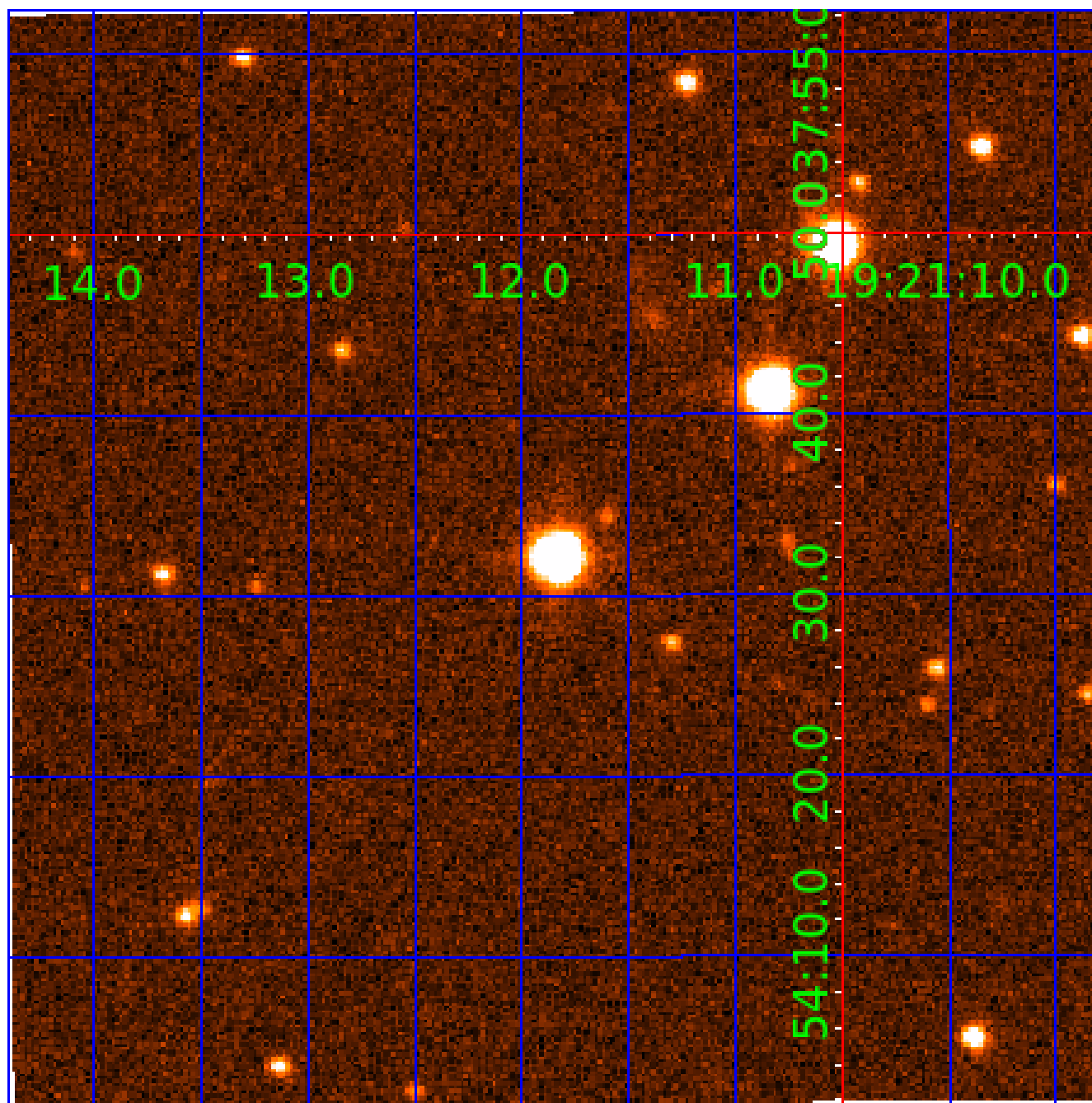


white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



UKIRT Image

Declination



KIC 002708203

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}) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 002708203-01 | OBS | 4045.01 | 1.891241 | 132.690826 | 72.1 | 7.006 | 18.4 | 20.1 | 0.93 | 6569 | 1.09 | 1847.63 |
| 002708203-02 | OBS | No | 601.320609 | 266.227418 | 136.6 | 11.521 | 14.9 | 3.2 | 0.93 | 6569 | 1.16 | 0.85 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|---|
| 002708203-01 | OBS | FP | 0.00 | 0 | 0 | 1 | 1 | HALO_GHOST—EPHEM_MATCH |
| 002708203-02 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | INDIV_TRANS_MARSHALL_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS |

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 002708203-02

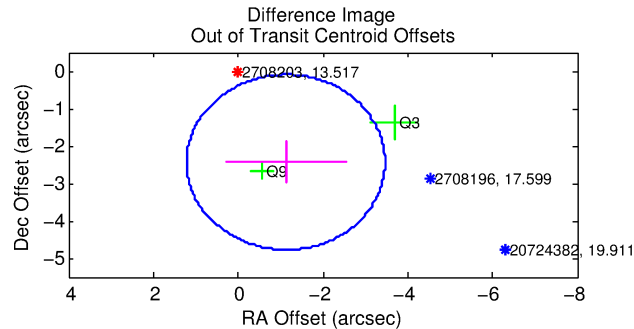
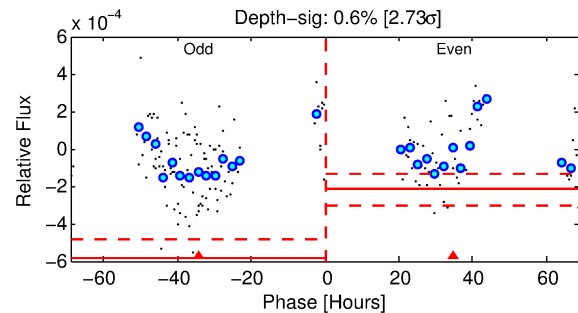
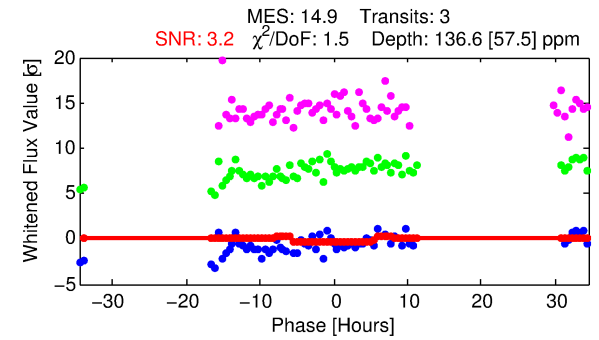
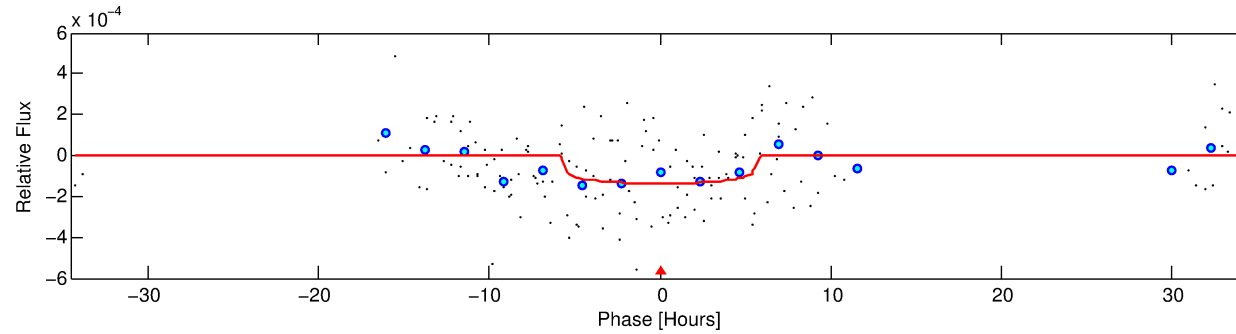
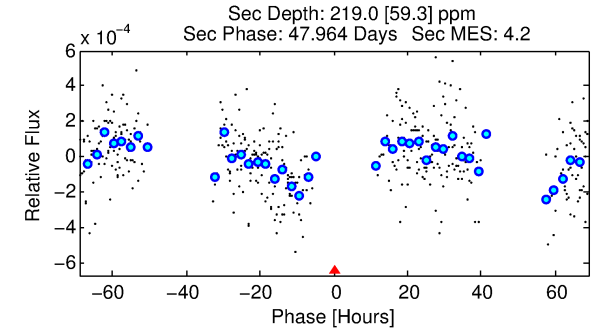
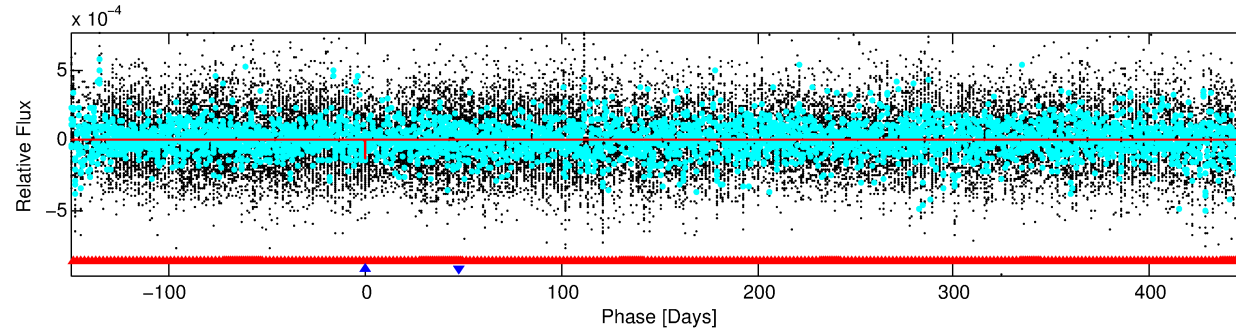
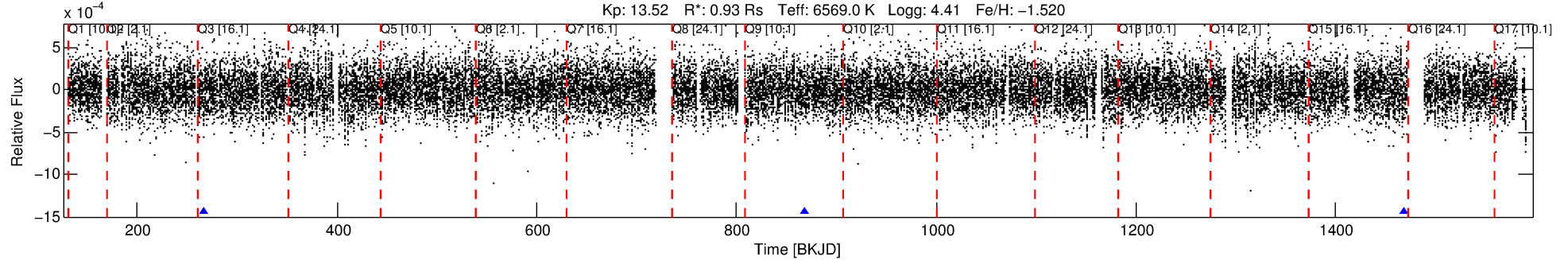
No Significant Match Found

DV One-Page Summary

KIC: 2708203 Candidate: 2 of 2 Period: 601.321 d

KOI: K04045 Corr: No Ephemeris Match

Kp: 13.52 R*: 0.93 Rs Teff: 6569.0 K Logg: 4.41 Fe/H: -1.520



DV Fit Results:

Period = 601.32061 [0.03047] d
Epoch = 266.2274 [0.0364] BKJD
Rp/R* = 0.0115 [0.0128]
a/R* = 292.10 [1802.89]
b = 0.70 [4.54]
Seff = 0.85 [0.27]
Teq = 245 [19] K
Rp = 1.16 [1.31] Re
a = 1.2976 [0.2438] AU
Ag = 150987.79 [341294.48] [0.44σ]
Teffp = 7465 [4190] K [1.72σ]

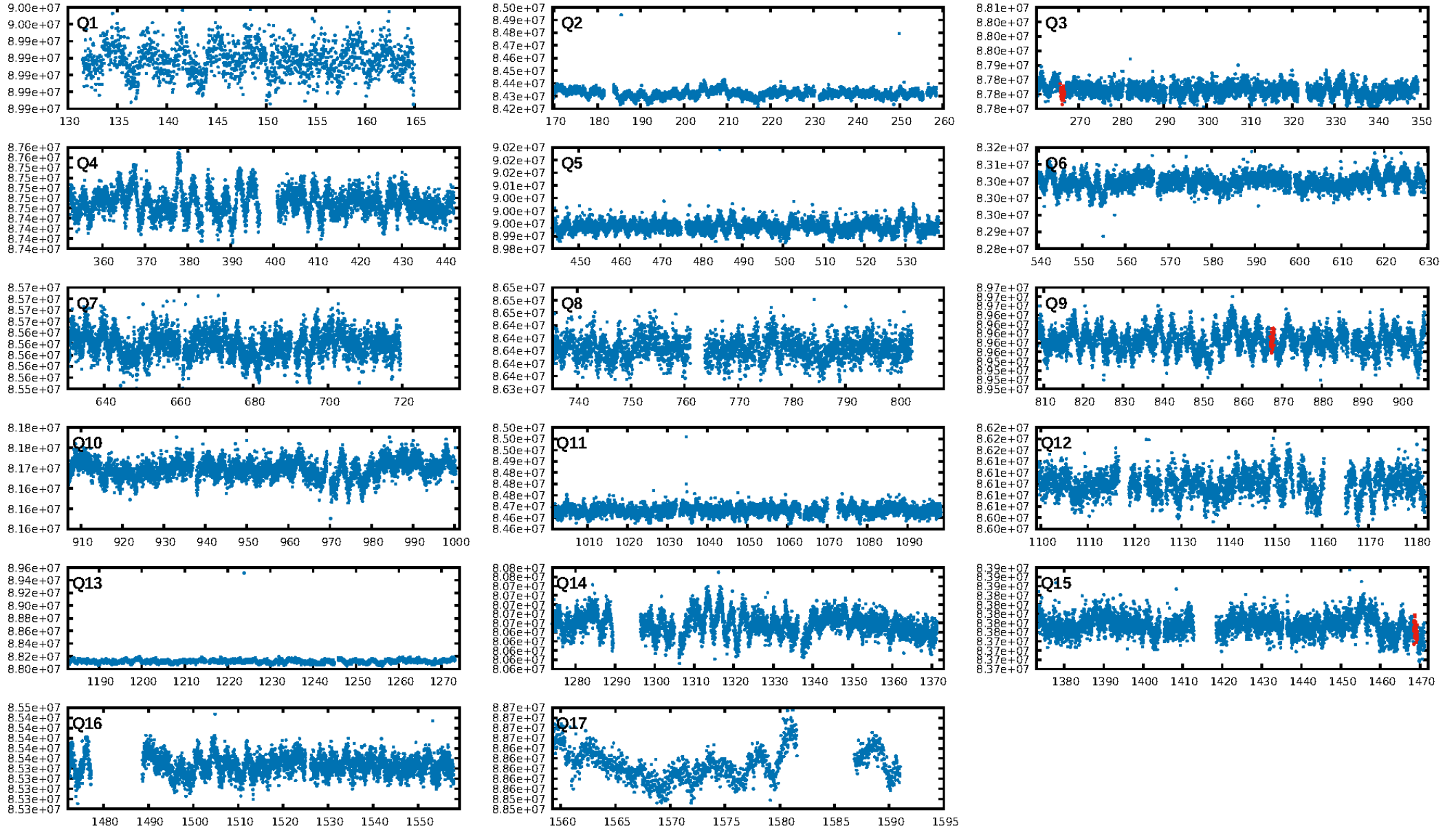
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [1066.91σ]
LongPeriod-sig: N/A
ModelChiSquare2-sig: 25.2%
ModelChiSquareGof-sig: 82.8%
Bootstrap-pfa: 3.06e-40
RollingBand-fgt: 1.00 [3/3]
GhostDiagnostic-chr: 0.5687
Centroid-sig: 11.4%
Centroid-so: 3.303 arcsec [1.12σ]
OotOffset-rm: 2.682 arcsec [3.44σ]
KicOffset-rm: 2.782 arcsec [3.52σ]
OotOffset-st: 0/1/0/1 [2]
KicOffset-st: 0/1/0/1 [2]
DiffImageQuality-fgm: 0.00 [0/2]
DiffImageOverlap-fno: 0.00 [0/3]

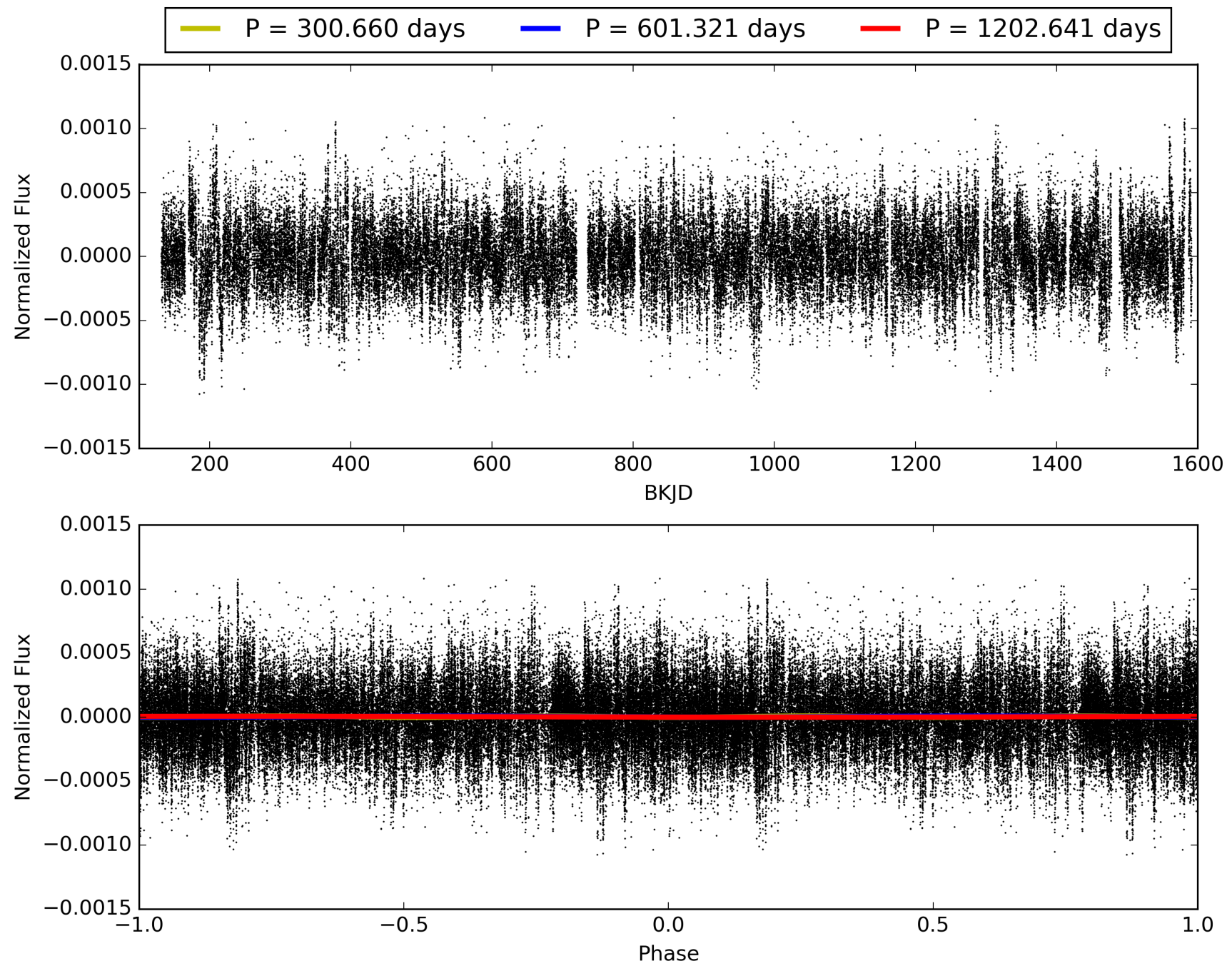
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 22:16:59 Z

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

TCE 002708203-02, PDC Light Curves

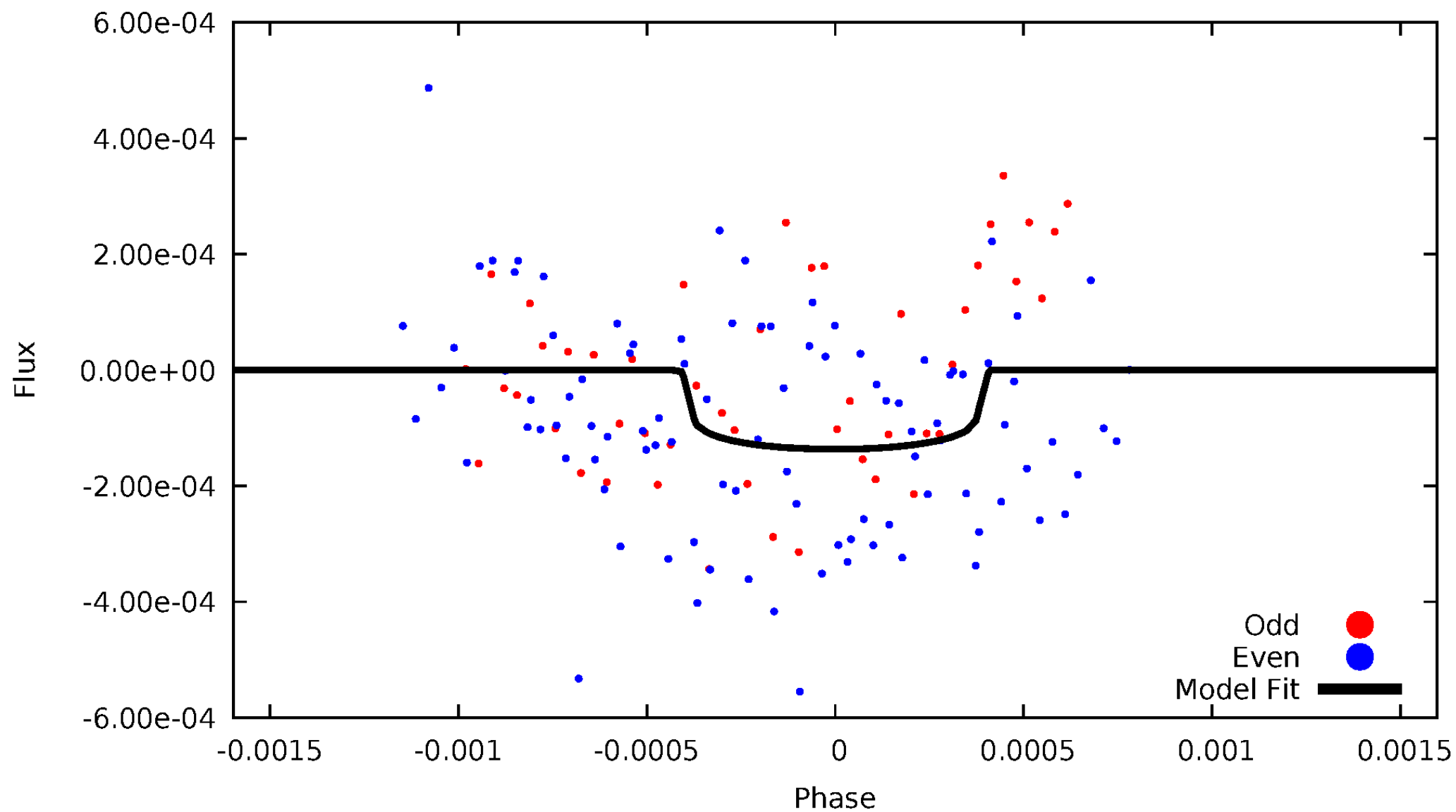


TCE 002708203-02



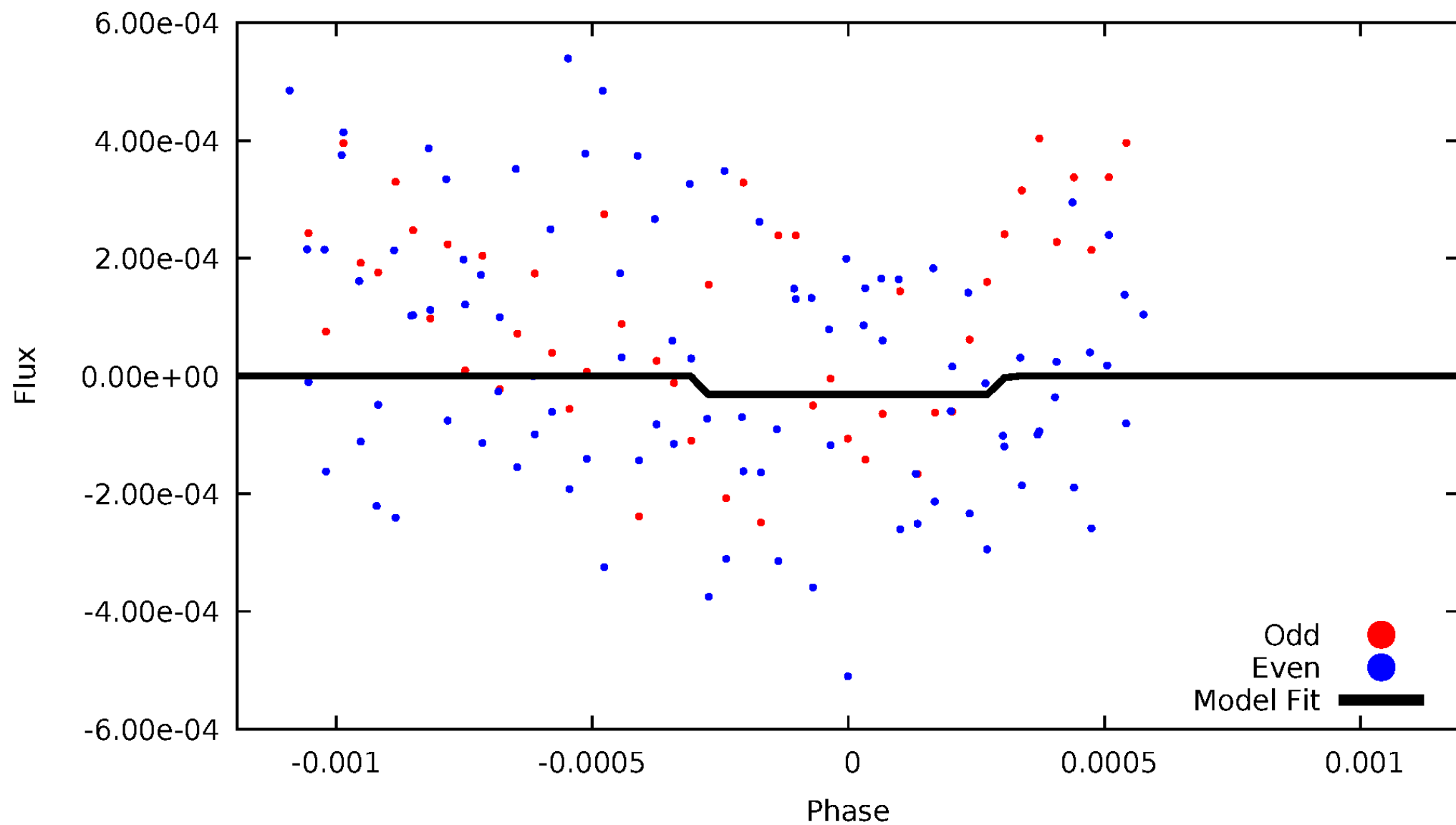
DV Odd/Even

TCE 002708203-02



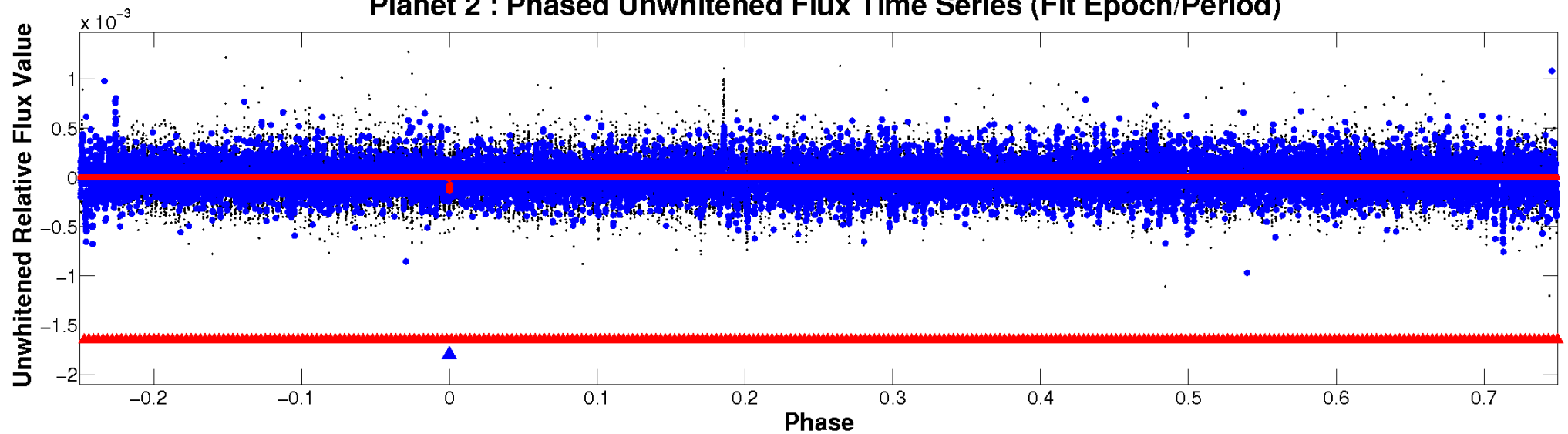
ALT Odd/Even

TCE 002708203-02

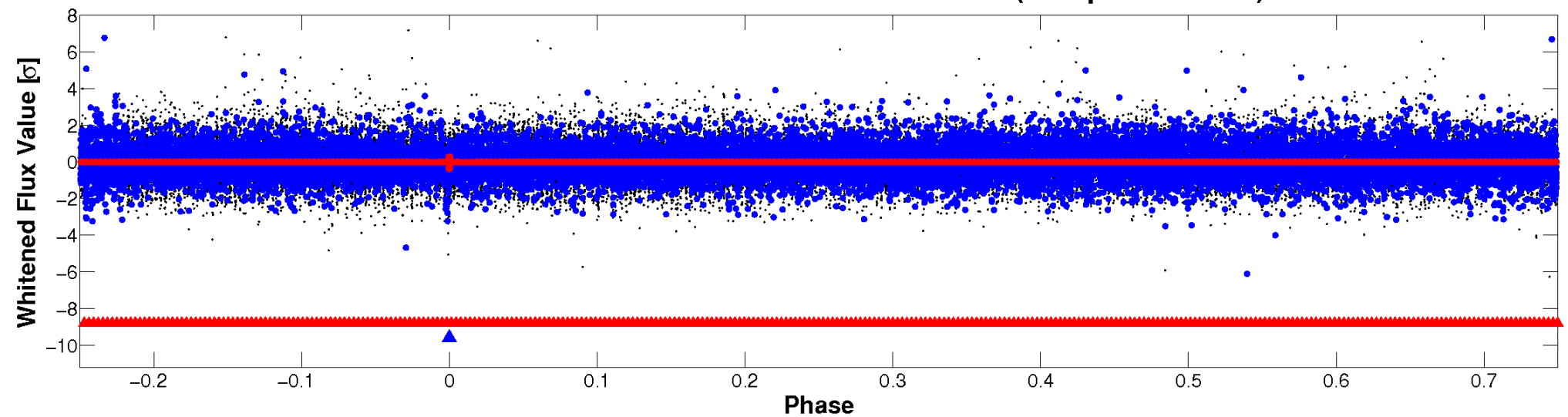


Non-Whitened Vs. Whitened Light Curve

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

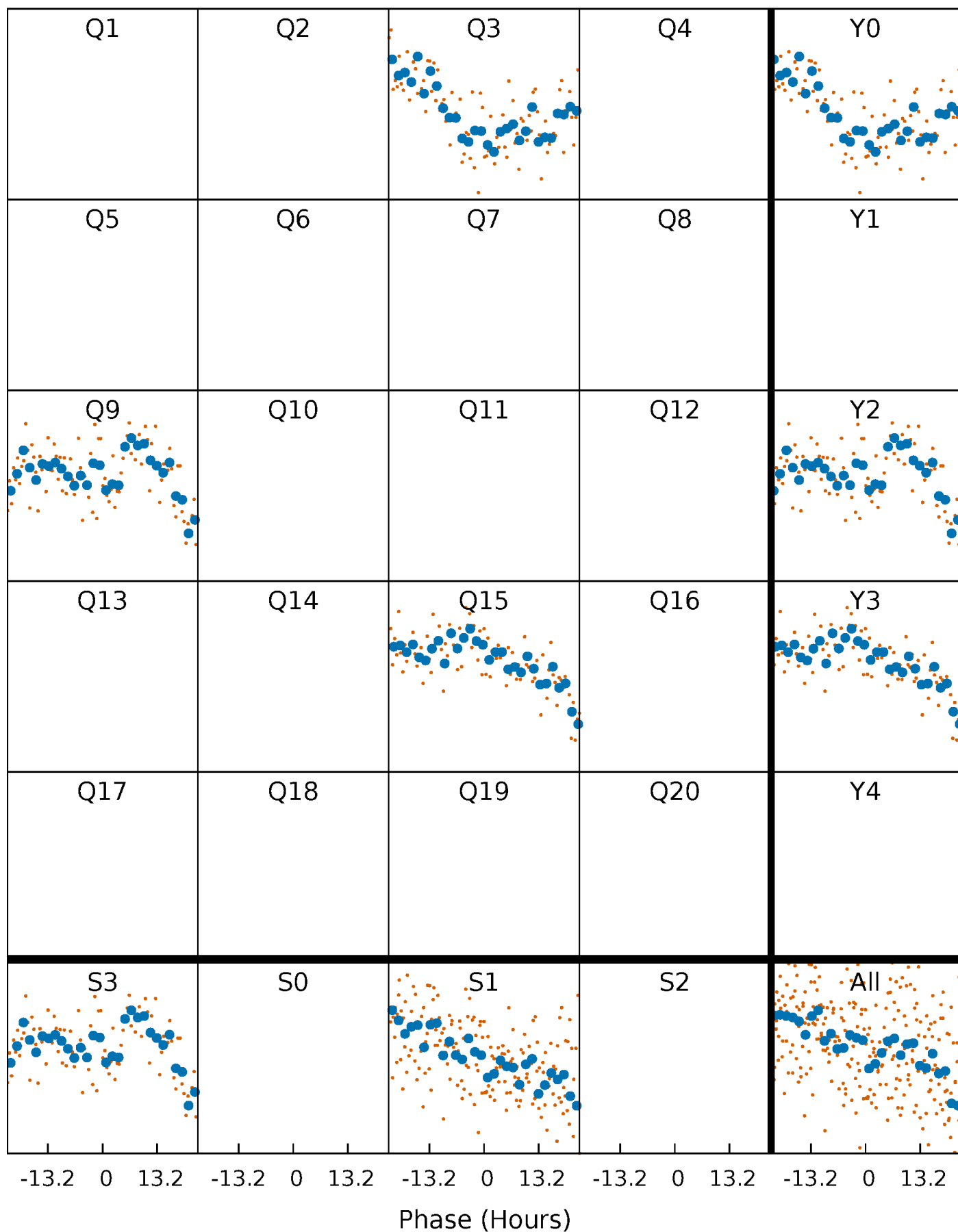


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



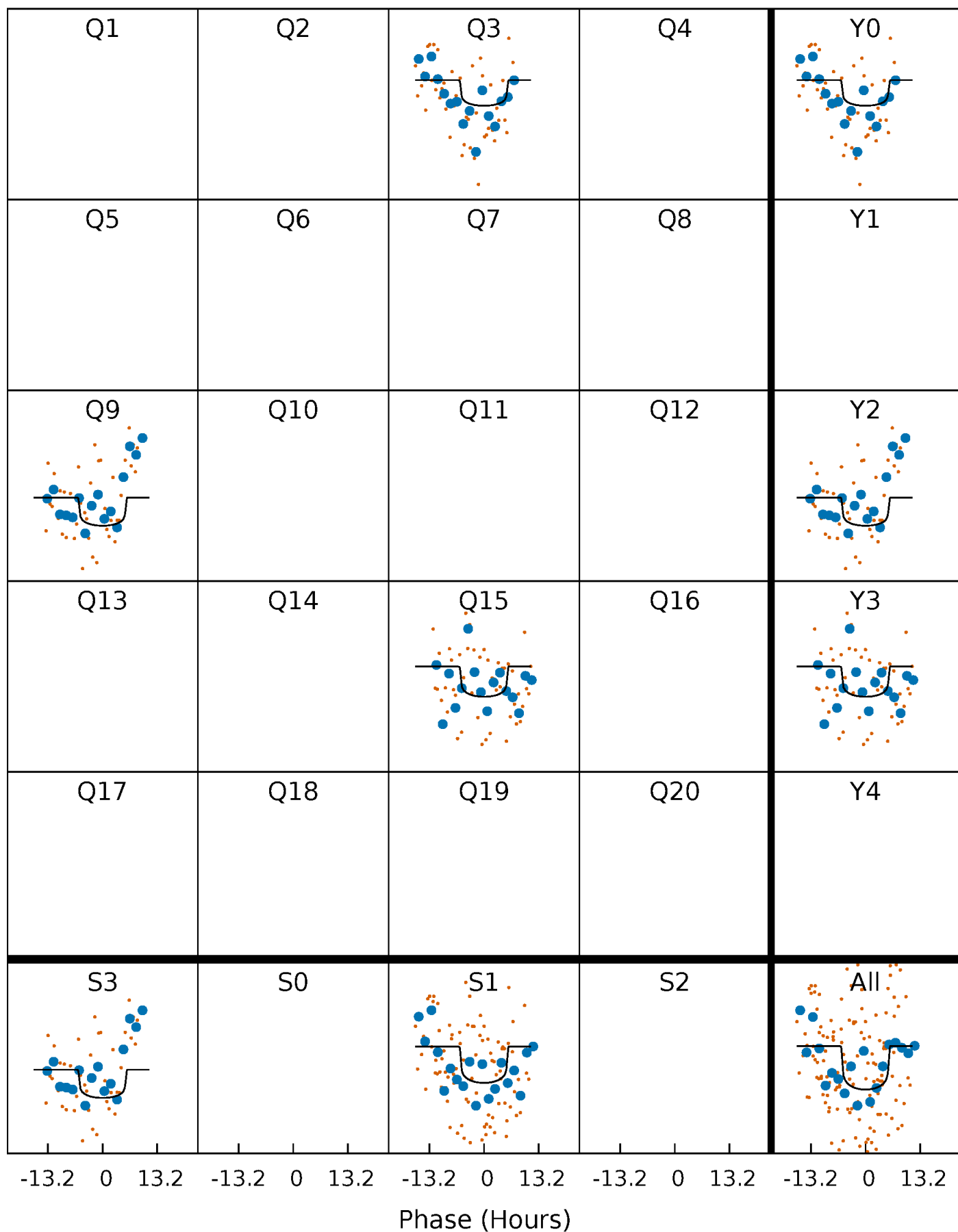
PDC Quarter-Phased Transit Curves

TCE 002708203-02 P=601.320609 Days $T_0=266.227418$ (BKJD)



DV Quarter-Phased Transit Curves

TCE 002708203-02 P=601.320609 Days $T_0=266.227418$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

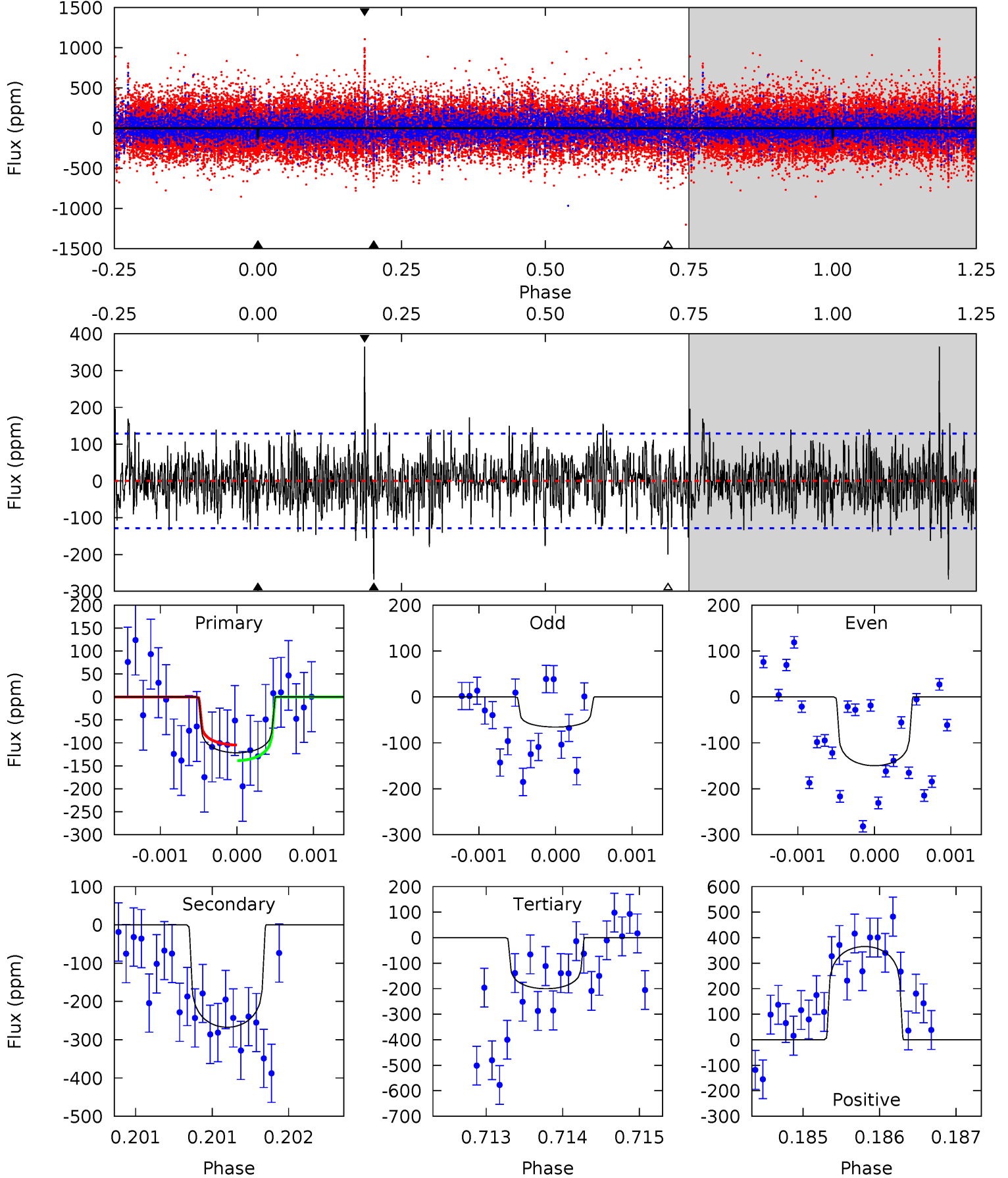
TCE 002708203-02 P=601.420971 Days $T_0=266.171493$ (BKJD)



DV Model-Shift Uniqueness Test

002708203-02, P = 601.320609 Days, E = 266.227418 Days

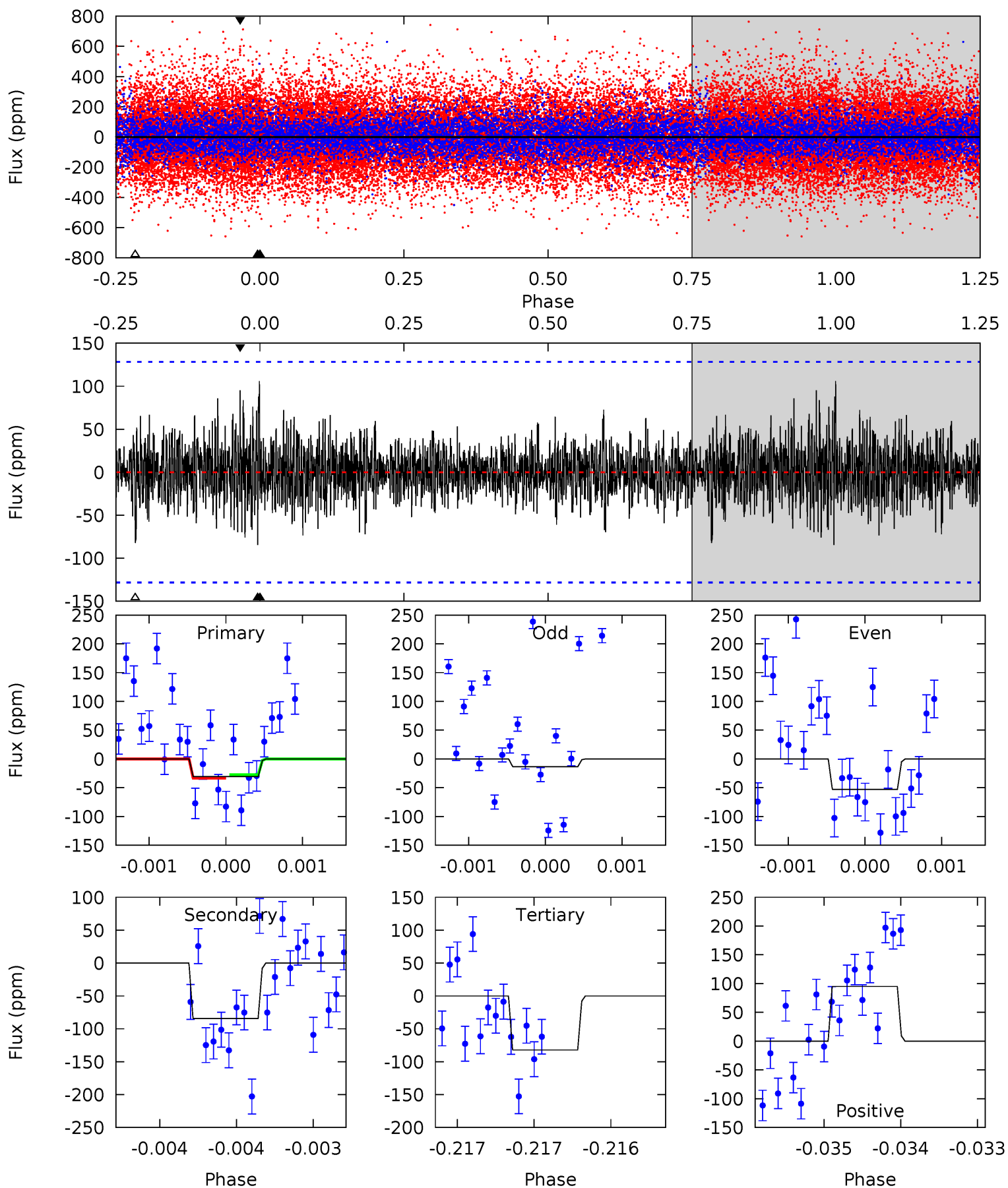
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 5.19 | 11.4 | 8.53 | 15.6 | 5.49 | 3.35 | 2.35 | -3.35 | -10.4 | 2.87 | -4.18 | 1.70 | 1.67 | 0.58 | 0.73 |



Alt Model-Shift Uniqueness Test

002708203-02, P = 601.420971 Days, E = 266.171493 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|-------|-------|------|
| 1.33 | 3.64 | 3.54 | 4.10 | 5.53 | 3.41 | 0.96 | -2.22 | -2.77 | 0.10 | -0.46 | 0.80 | -2.26 | 0.56 | 0.13 |



Stellar Parameters For KIC 002708203

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | R (R_{\odot}) | $M(M_{\odot})$ | p_{\star} ($\text{g}\cdot\text{cm}^{-3}$) |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
| | 6569^{+157}_{-197} | $4.410^{+0.150}_{-0.165}$ | $-1.520^{+0.300}_{-0.250}$ | $0.927^{+0.193}_{-0.129}$ | $0.805^{+0.070}_{-0.041}$ | $1.424^{+0.843}_{-0.617}$ |
| | +2%/-3% | +3%/-4% | +20%/-16% | +21%/-14% | +9%/-5% | +59%/-43% |
| Source | PHO1 | KIC0 | KIC0 | DSEP | | |

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

Secondary Eclipse Parameters for KIC 002708203-02 / KOI

| Detrend | Depth (ppm) | R_p (R_{\oplus}) | T_{max} (K) | T_{obs} (K) | A_{obs} |
|---------|---------------|------------------------|----------------------|------------------------|-----------------------------|
| DV | -267 ± 23 | $1.52^{+1.15}_{-0.93}$ | 342^{+20}_{-20} | 6827^{+6693}_{-1601} | $110421^{+581869}_{-75956}$ |
| Alt. | -84 ± 23 | $1.09^{+1.12}_{-0.73}$ | 342^{+21}_{-18} | 6021^{+6557}_{-1620} | $64083^{+561410}_{-49074}$ |

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

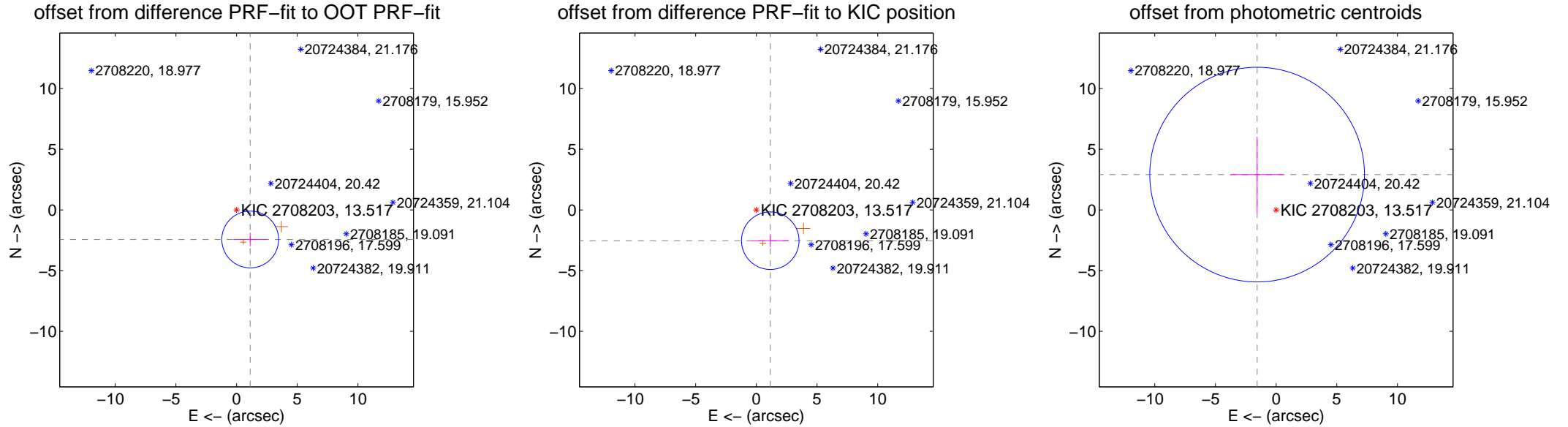
DV Centroid Data

Supplemental centroid analysis for 002708203-02. Kepler magnitude: 13.52. Transit SNR 3.18

There are 0 quarters with good PRF difference image offsets

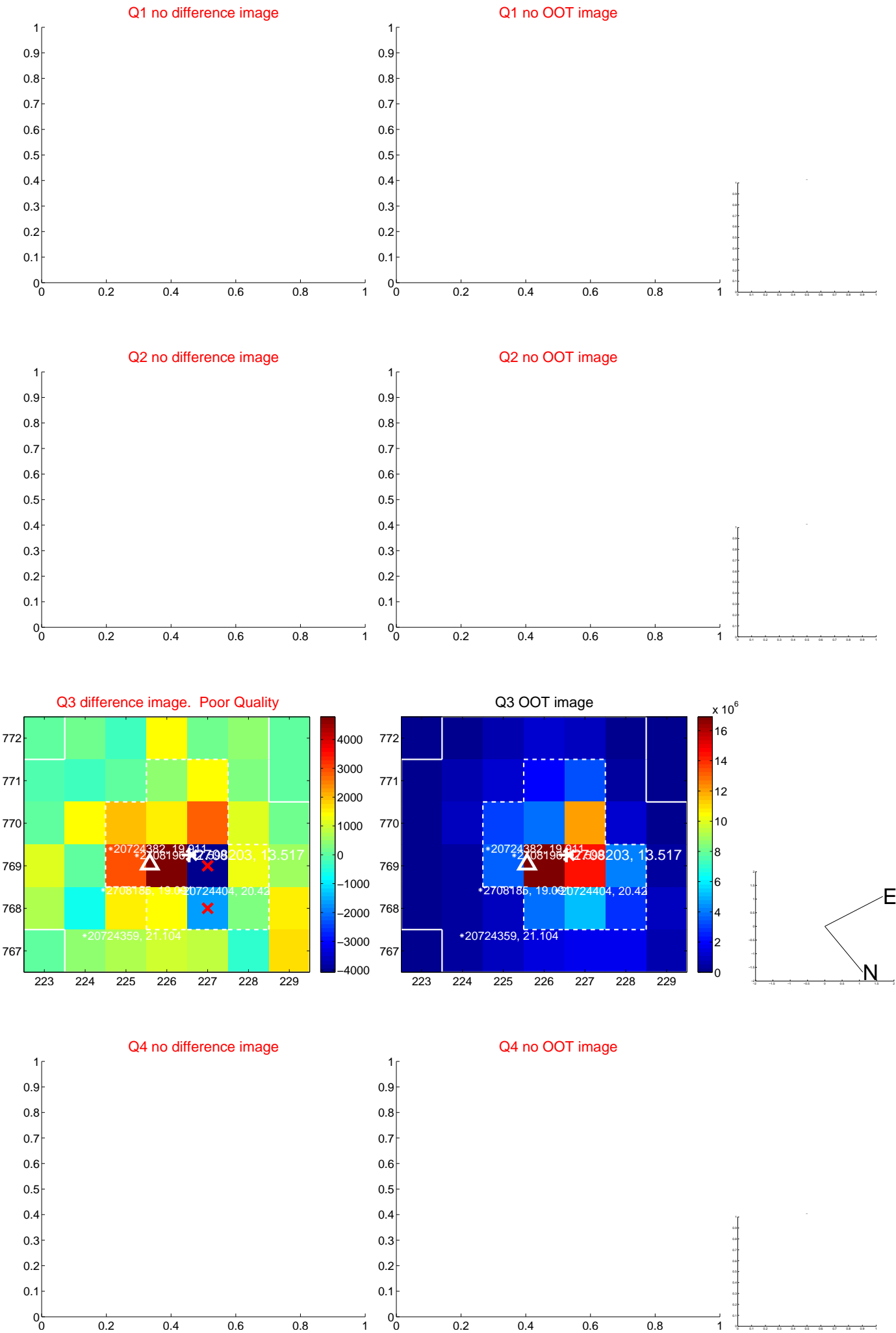
The direct PRF centroid is offset from the target star catalog position by about 0.09 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|---|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT | 2.682 ± 0.780 | 3.44 | -1.124 ± 1.407 | -2.435 ± 0.562 |
| PRF-fit source offset from KIC position | 2.782 ± 0.790 | 3.52 | -1.147 ± 1.509 | -2.535 ± 0.535 |
| photometric centroid source offset | 3.30 ± 2.95 | 1.12 | 1.56 ± 2.21 | 2.91 ± 3.13 |



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.

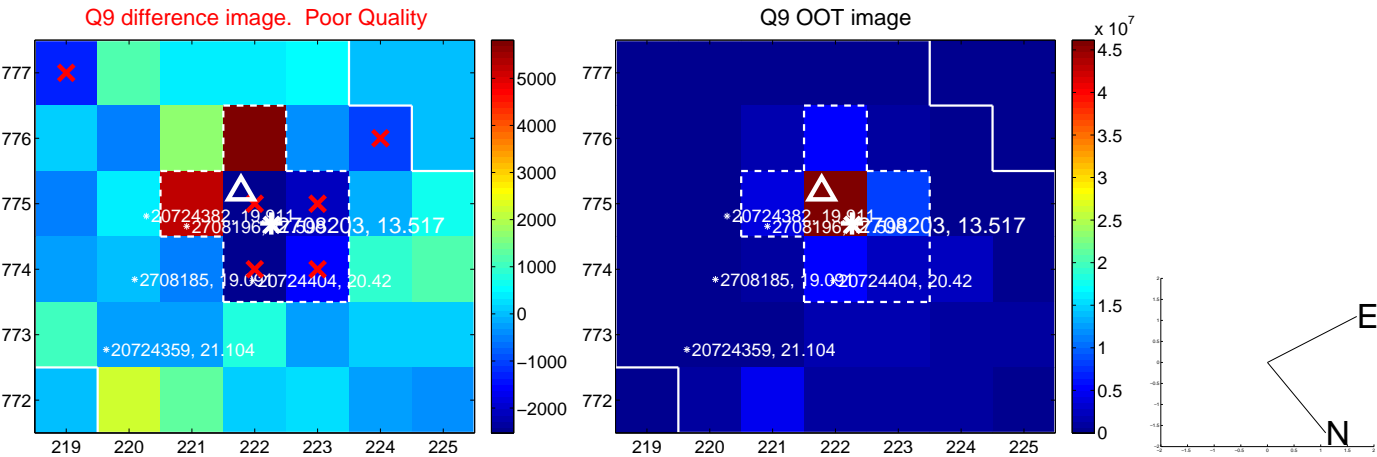
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



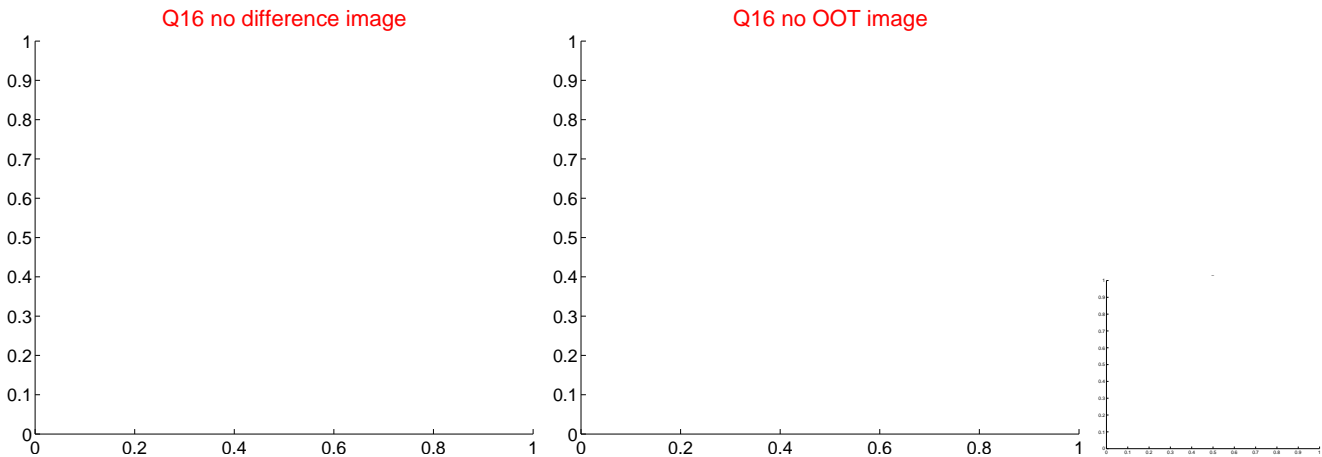
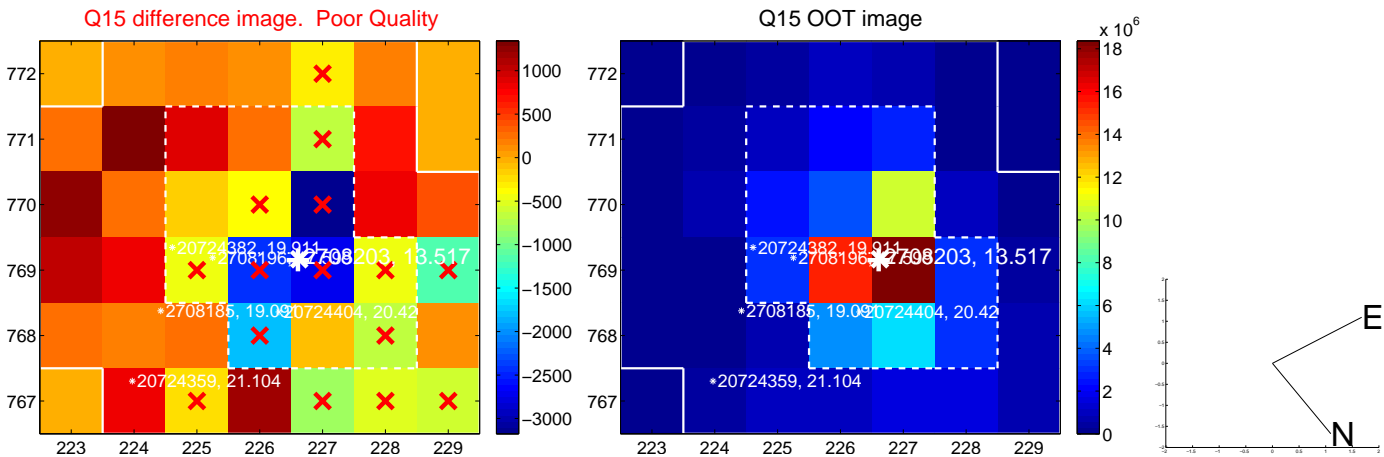
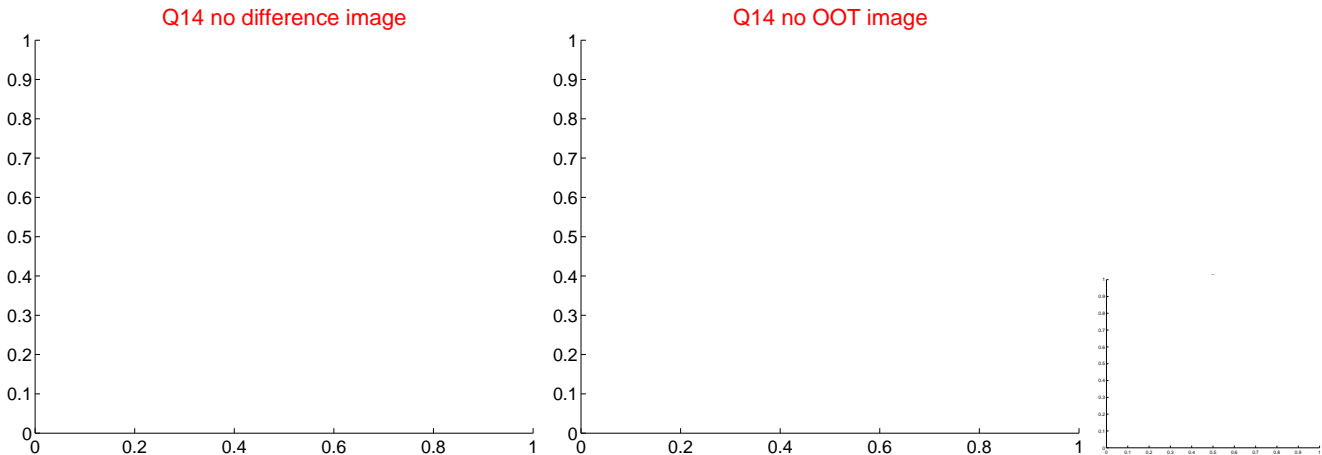
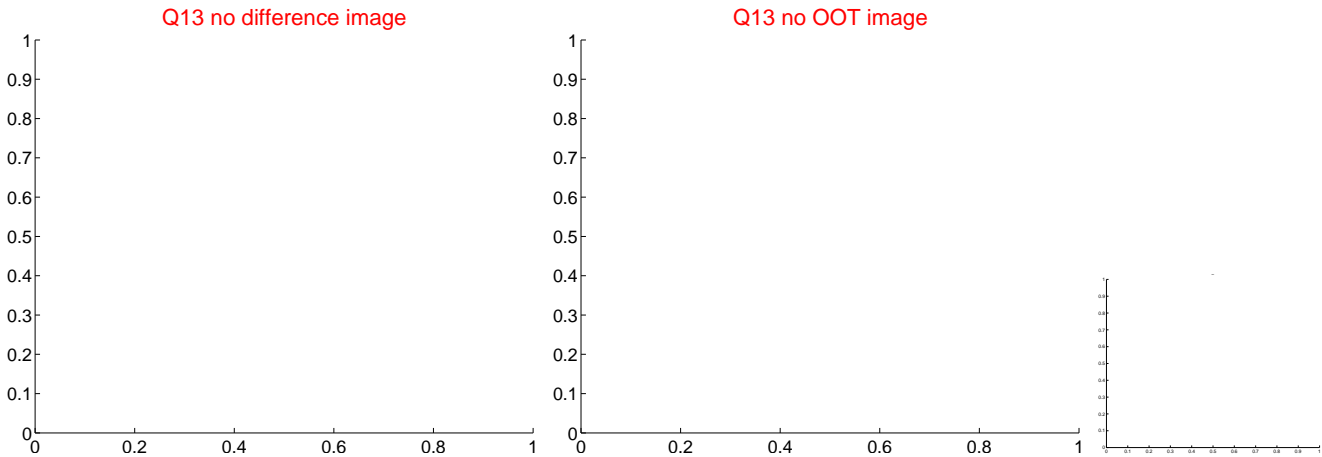
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



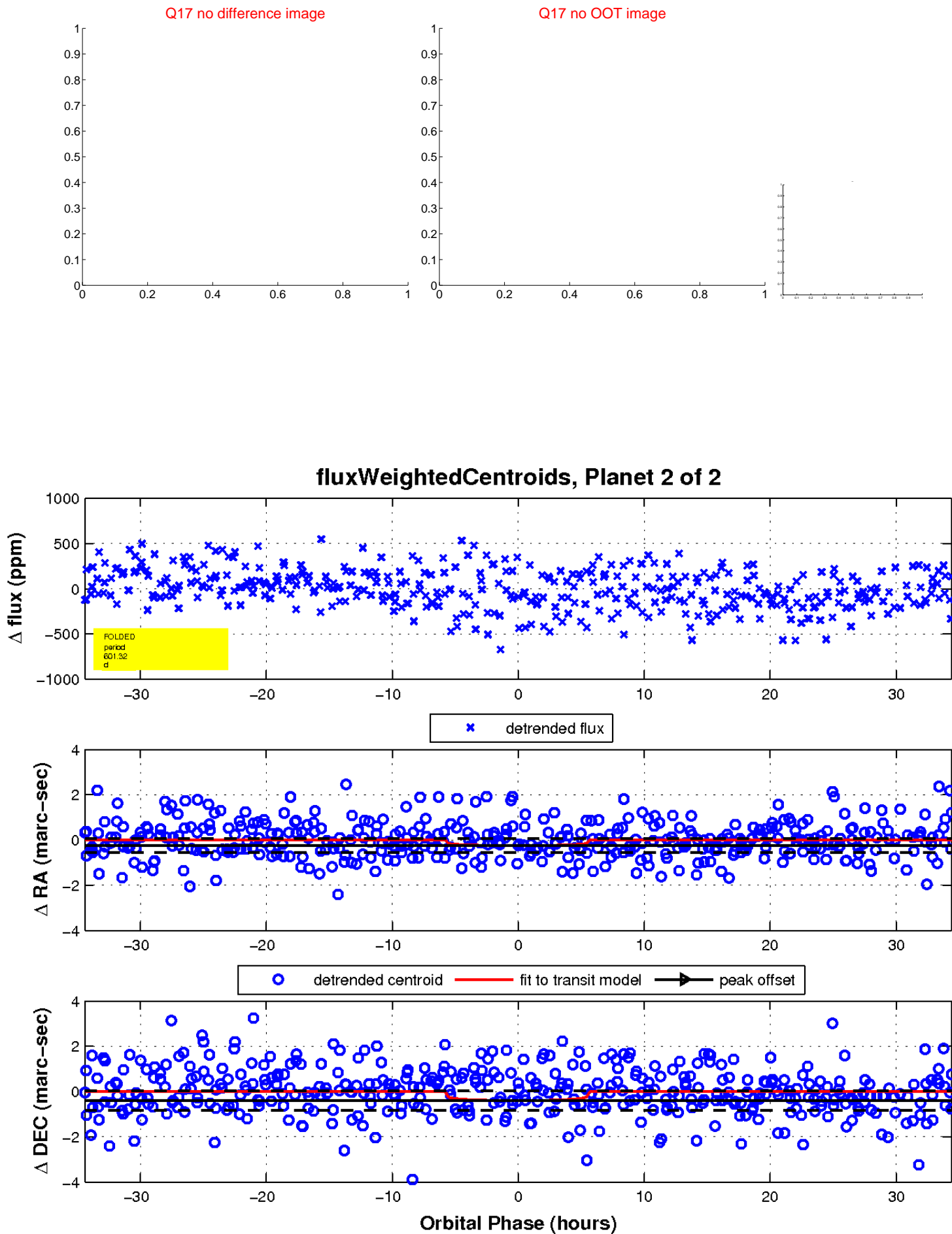
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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.



UKIRT Image

Declination

