

KIC 007428316

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}) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 007428316-01 | OBS | 2809.01 | 14.253849 | 137.410013 | 321.4 | 3.790 | 19.0 | 20.0 | 0.90 | 6050 | 2.13 | 73.71 |
| 007428316-02 | OBS | No | 7.126722 | 137.463363 | 137.8 | 3.397 | 8.7 | 9.0 | 0.90 | 6050 | 1.40 | 185.75 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|---|
| 007428316-01 | OBS | FP | 0.00 | 0 | 1 | 1 | 0 | MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE—CENT_RESOLVED_OFFSET |
| 007428316-02 | OBS | FP | 0.00 | 1 | 1 | 1 | 0 | IS_SEC_TCE—CENT_RESOLVED_OFFSET—HALO_GHOST |

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.

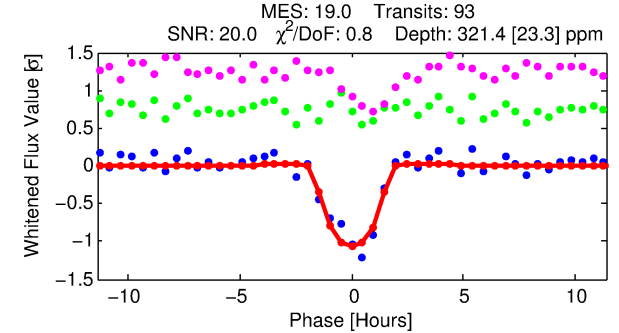
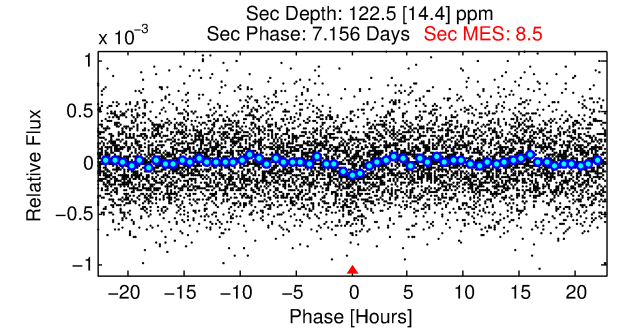
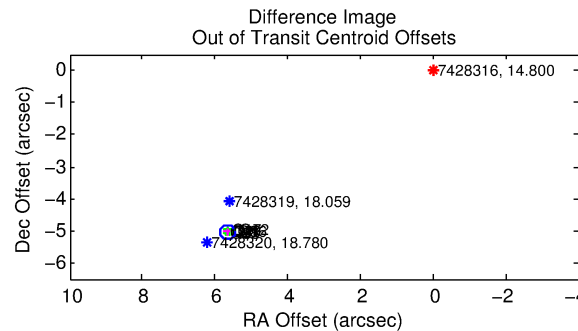
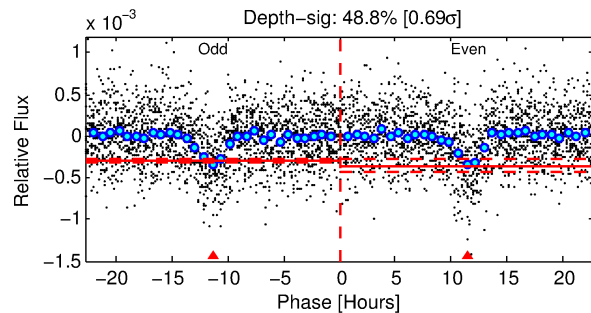
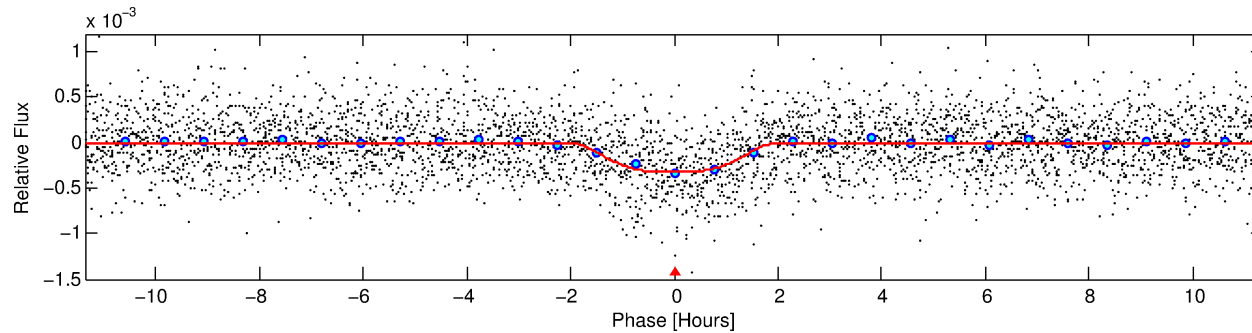
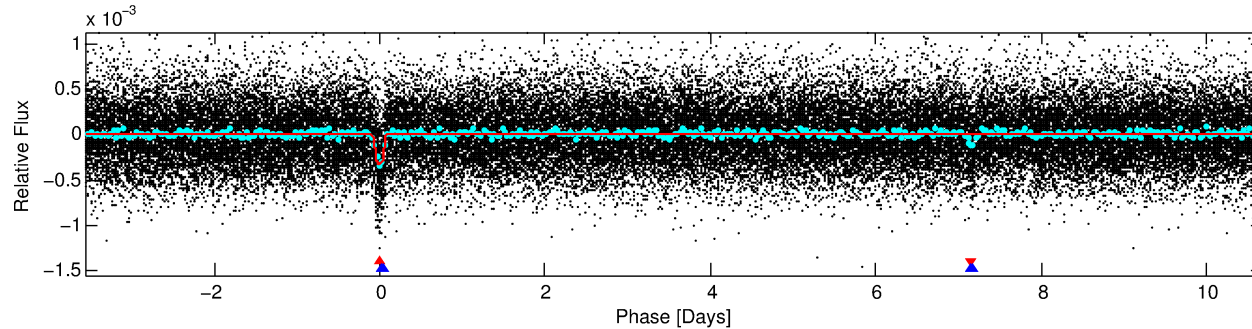
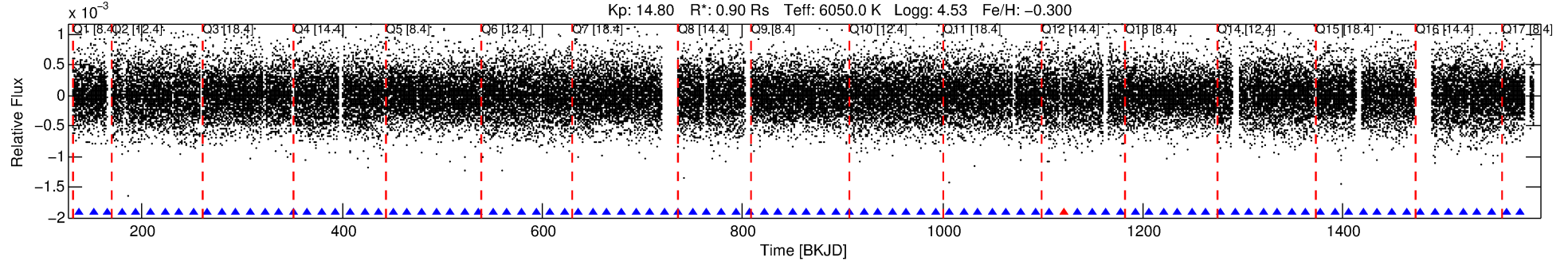
Ephemeris Match Information For 007428316-01

No Significant Match Found

DV One-Page Summary

KIC: 7428316 Candidate: 1 of 2 Period: 14.254 d
KOI: K02809 Corr: No Ephemeris Match

Kp: 14.80 R*: 0.90 Rs Teff: 6050.0 K Logg: 4.53 Fe/H: -0.300



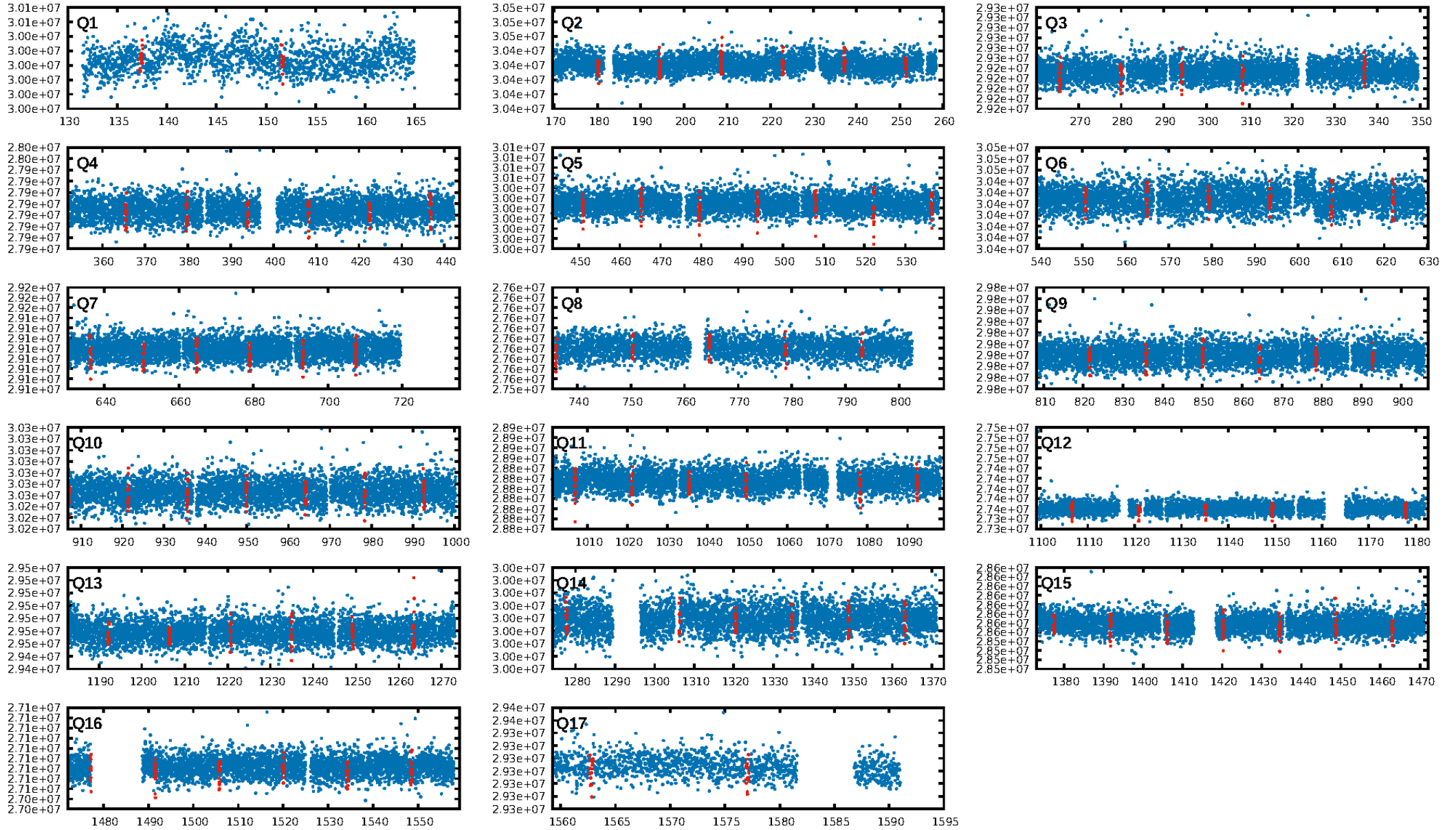
DV Fit Results:

Period = 14.25385 [0.00008] d
Epoch = 137.4100 [0.0047] BKJD
Rp/R* = 0.0217 [0.0012]
a/R* = 8.91 [1.13]
b = 0.97 [0.01]
Seff = 73.71 [25.22]
Teff = 747 [64] K
Rp = 2.13 [0.56] Re
a = 0.1143 [0.0250] AU
Ag = 194.99 [69.91] [2.77σ]
Teffp = 4317 [217] K [15.77σ]

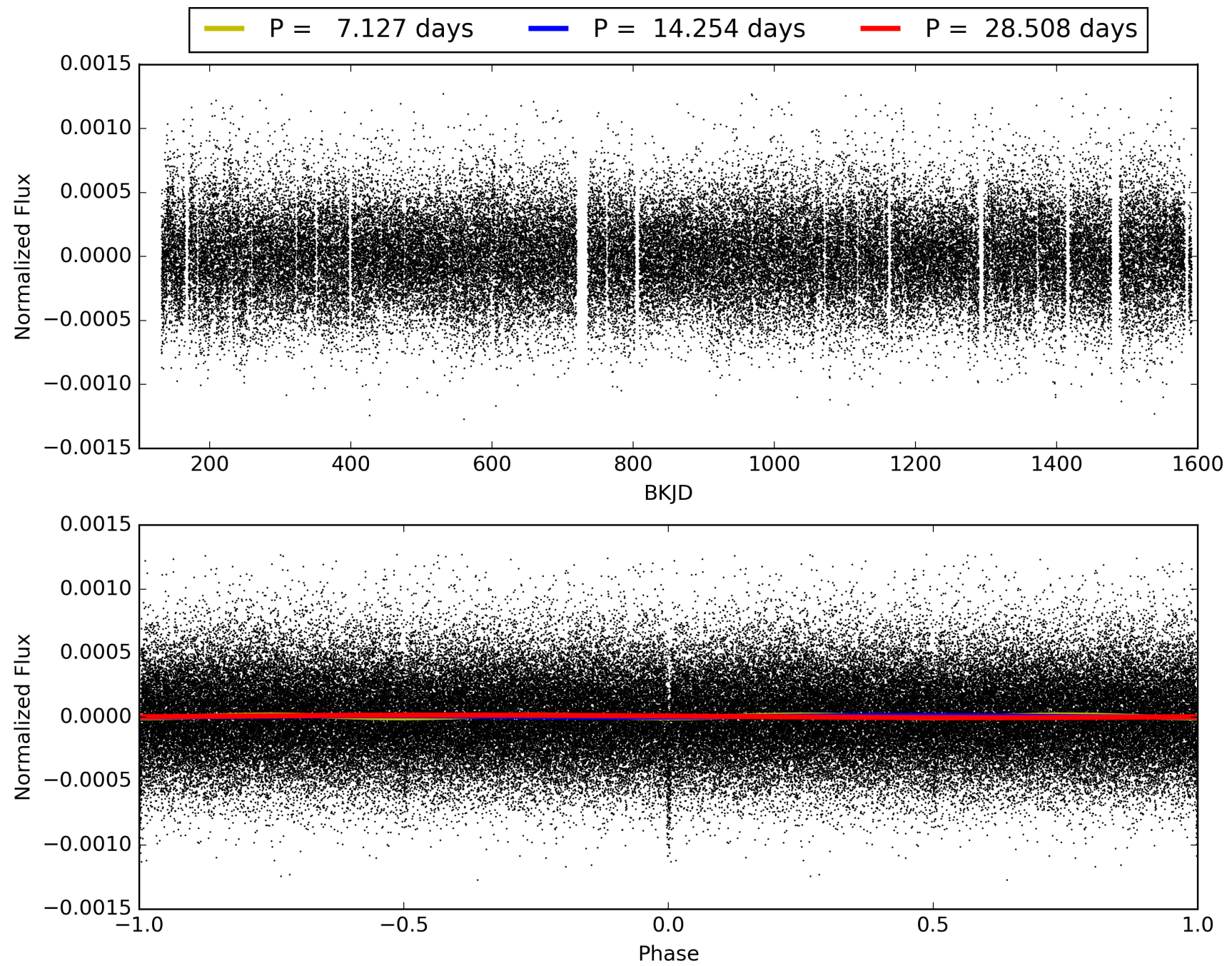
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [33.61σ]
LongPeriod-sig: N/A
ModelChiSquare2-sig: 20.0%
ModelChiSquareGof-sig: 100.0%
Bootstrap-pfa: 1.37e-78
RollingBand-fgt: 0.99 [88/89]
GhostDiagnostic-chr: -0.2907
Centroid-sig: 0.0%
Centroid-so: 35.783 arcsec [40.76σ]
OotOffset-rm: 7.582 arcsec [106.67σ]
KicOffset-rm: 7.619 arcsec [108.88σ]
OotOffset-st: 0/4/3/5 [12]
KicOffset-st: 0/4/3/5 [12]
DiffImageQuality-fgm: 1.00 [12/12]
DiffImageOverlap-fno: 0.00 [0/17]

TCE 007428316-01, PDC Light Curves

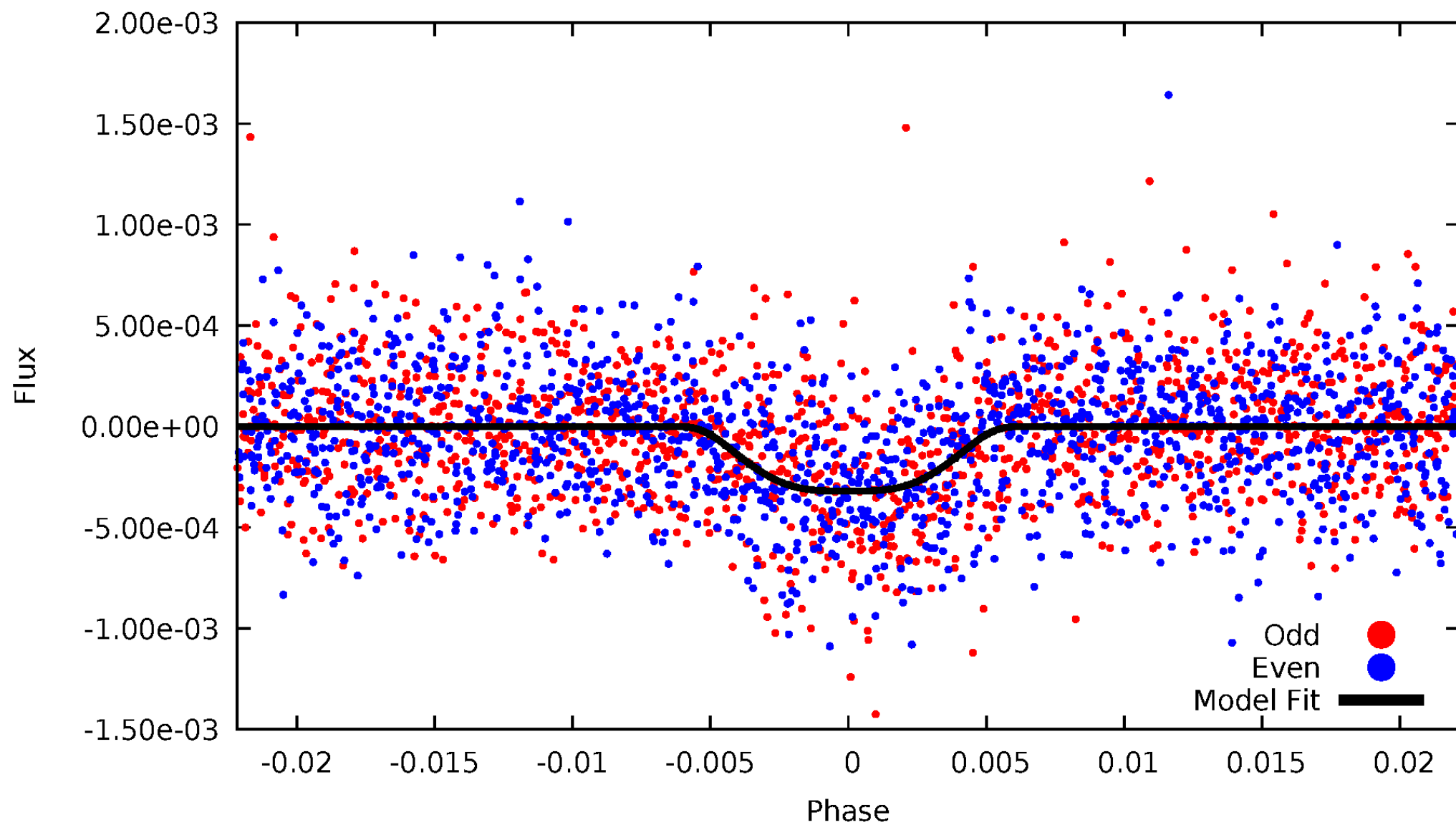


TCE 007428316-01



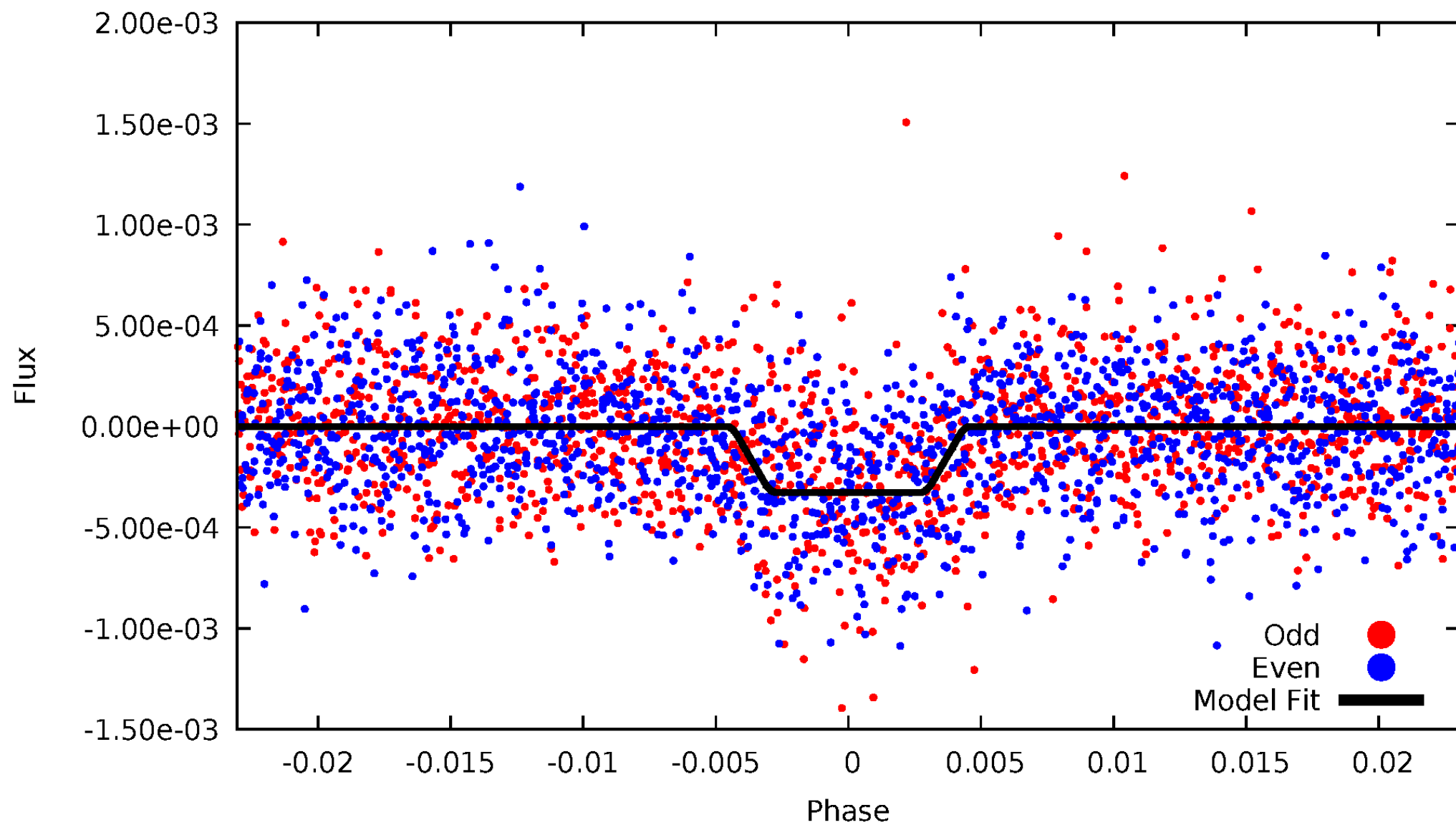
DV Odd/Even

TCE 007428316-01

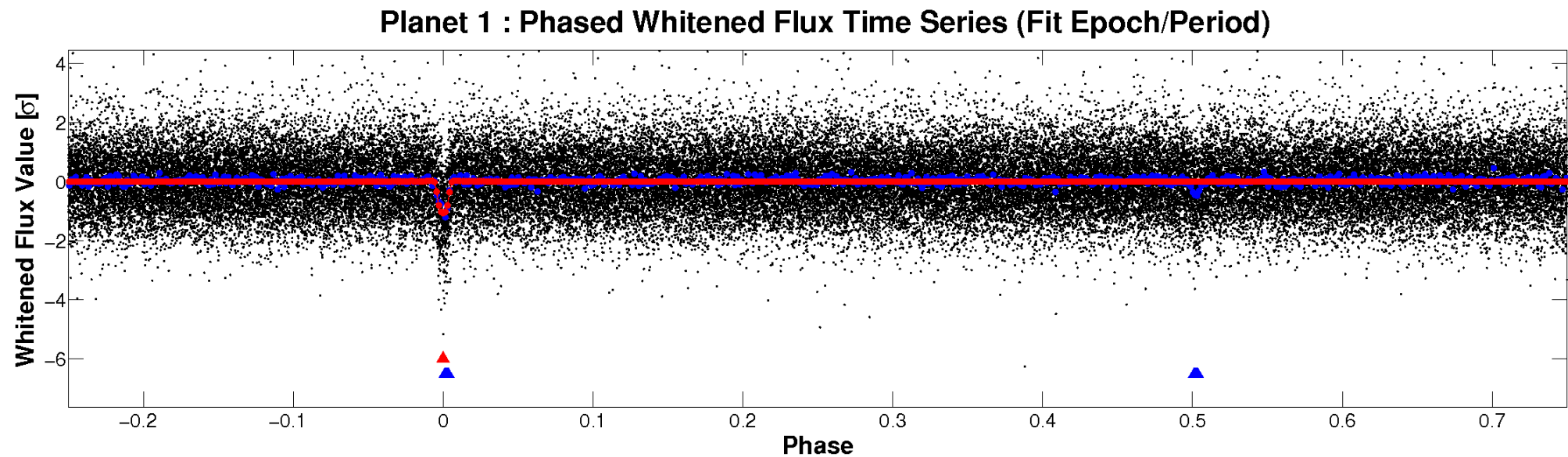
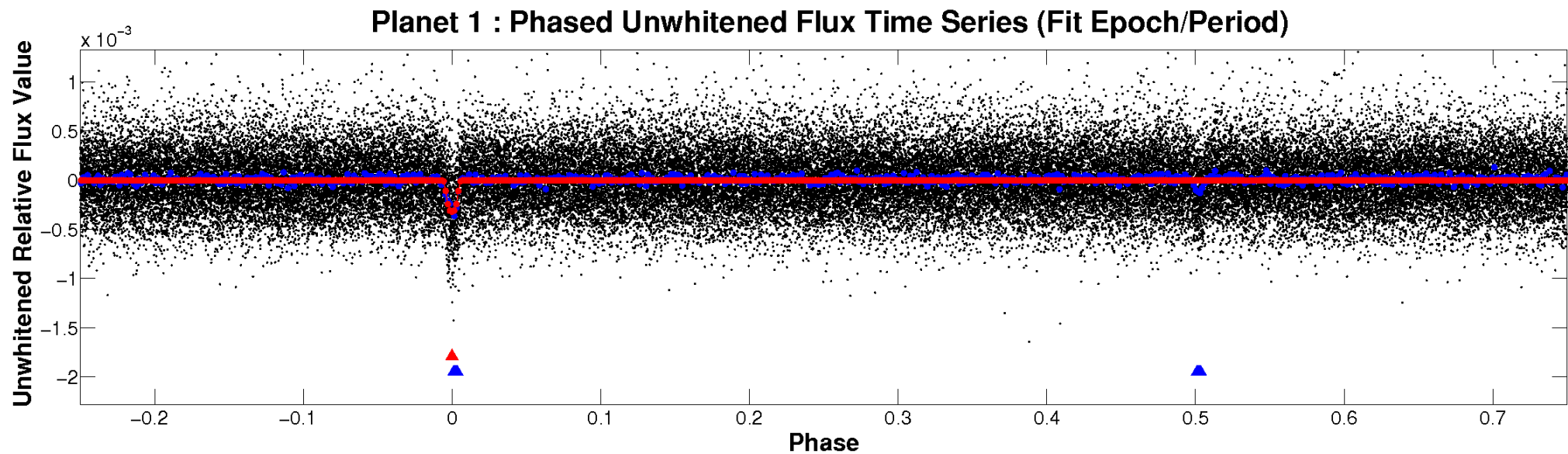


ALT Odd/Even

TCE 007428316-01

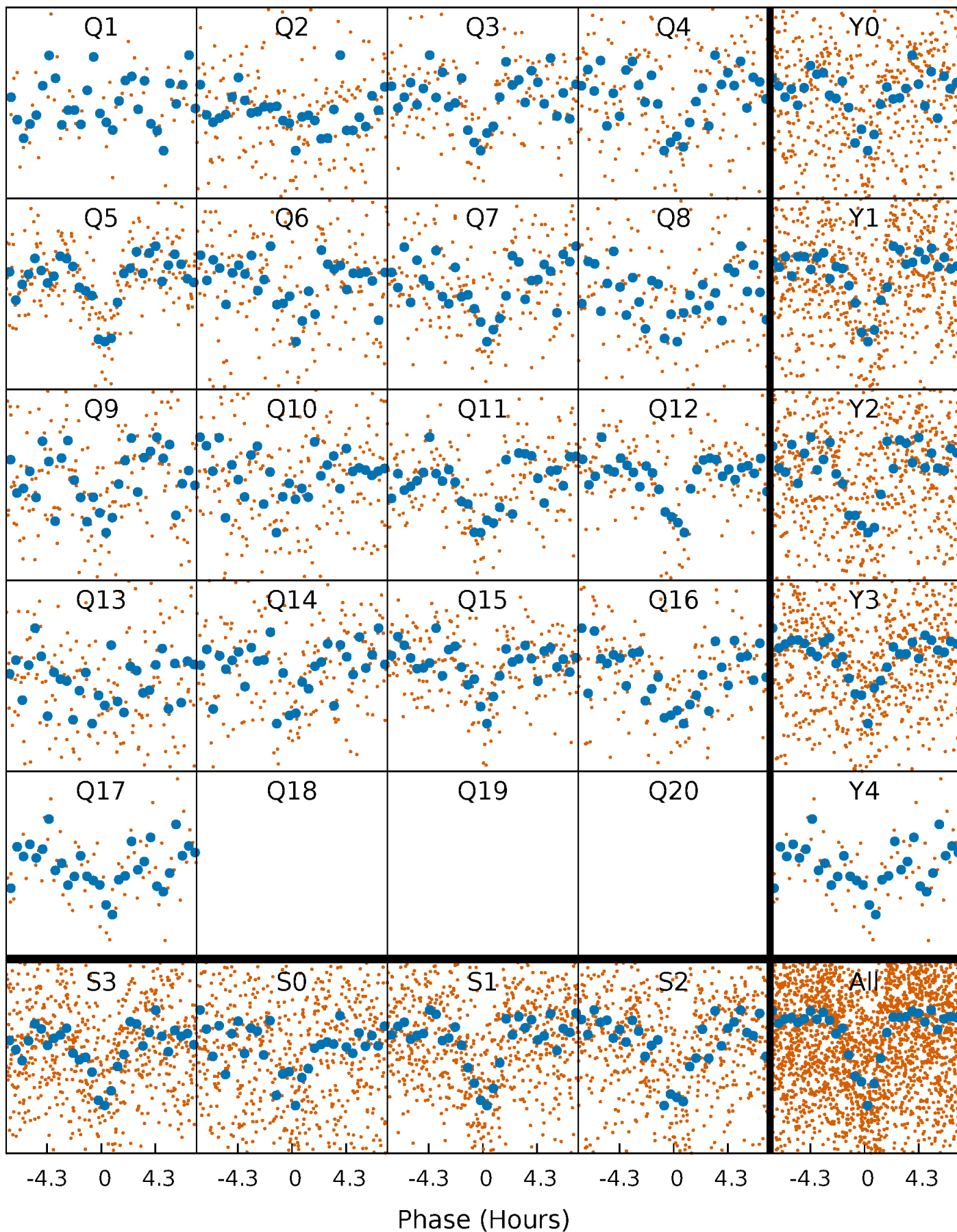


Non-Whitened Vs. Whitened Light Curve



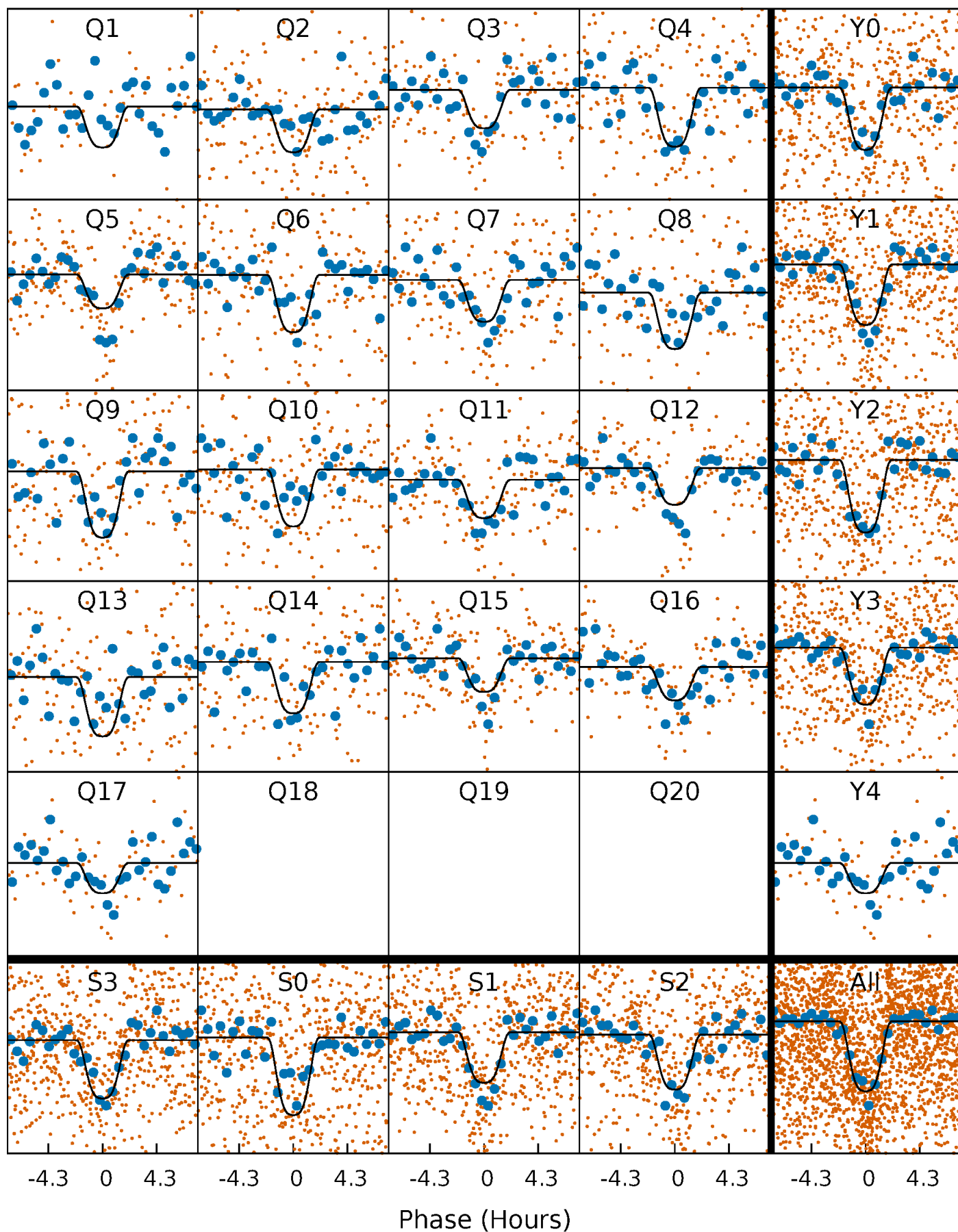
PDC Quarter-Phased Transit Curves

TCE 007428316-01 P= 14.253849 Days $T_0=137.410013$ (BKJD)



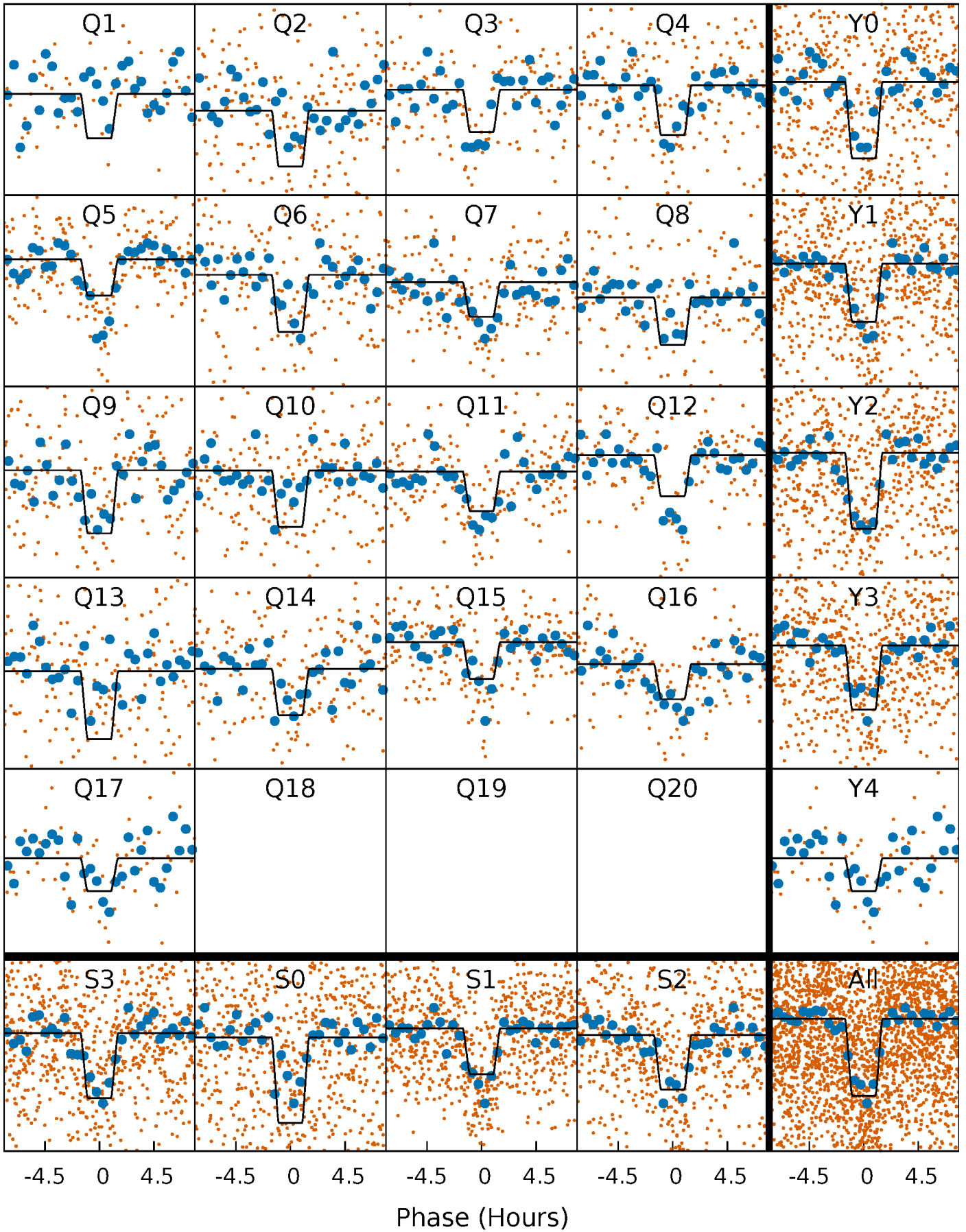
DV Quarter-Phased Transit Curves

TCE 007428316-01 P= 14.253849 Days $T_0=137.410013$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

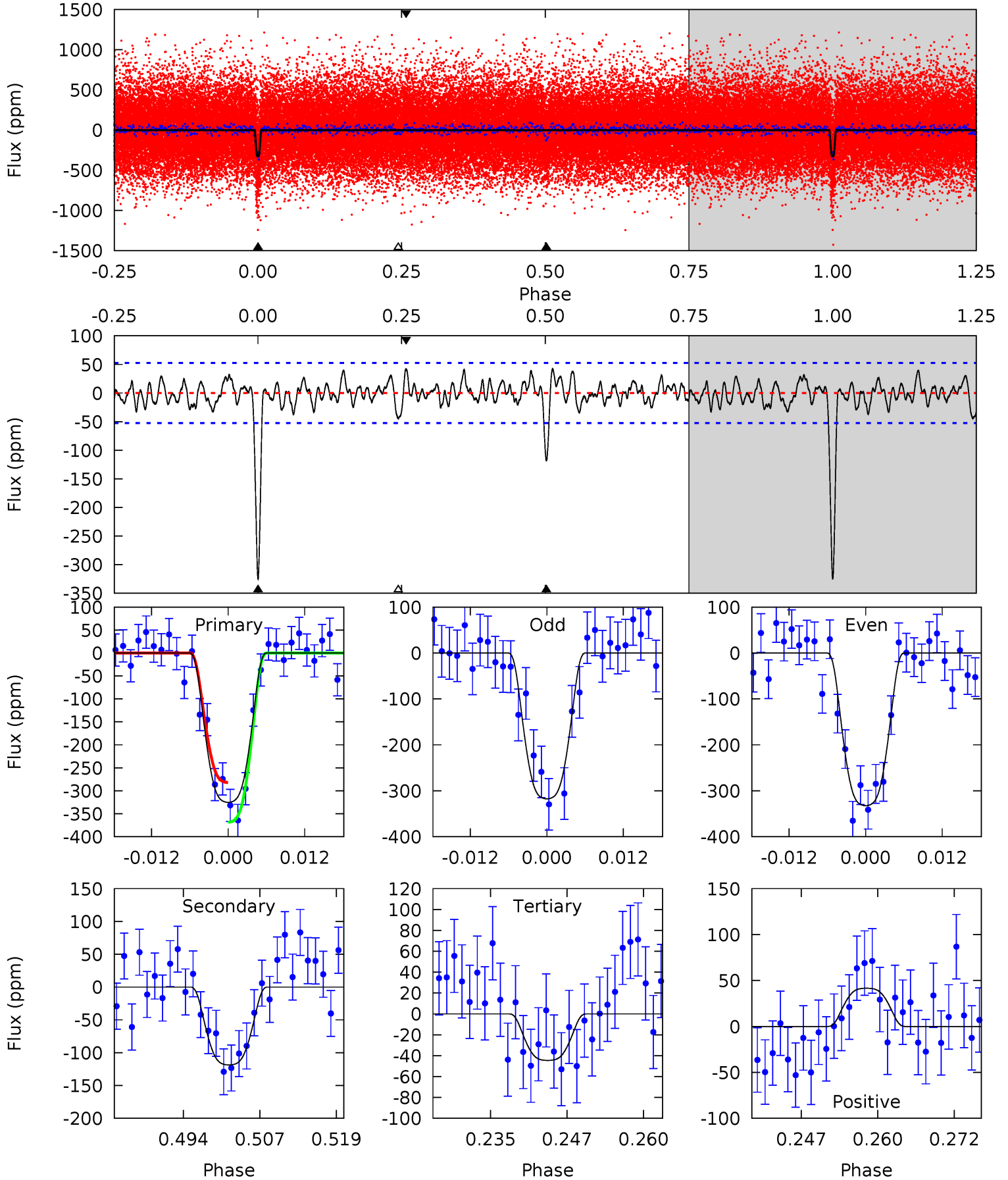
TCE 007428316-01 P= 14.253732 Days $T_0=137.417847$ (BKJD)



DV Model-Shift Uniqueness Test

007428316-01, P = 14.253849 Days, E = 123.156164 Days

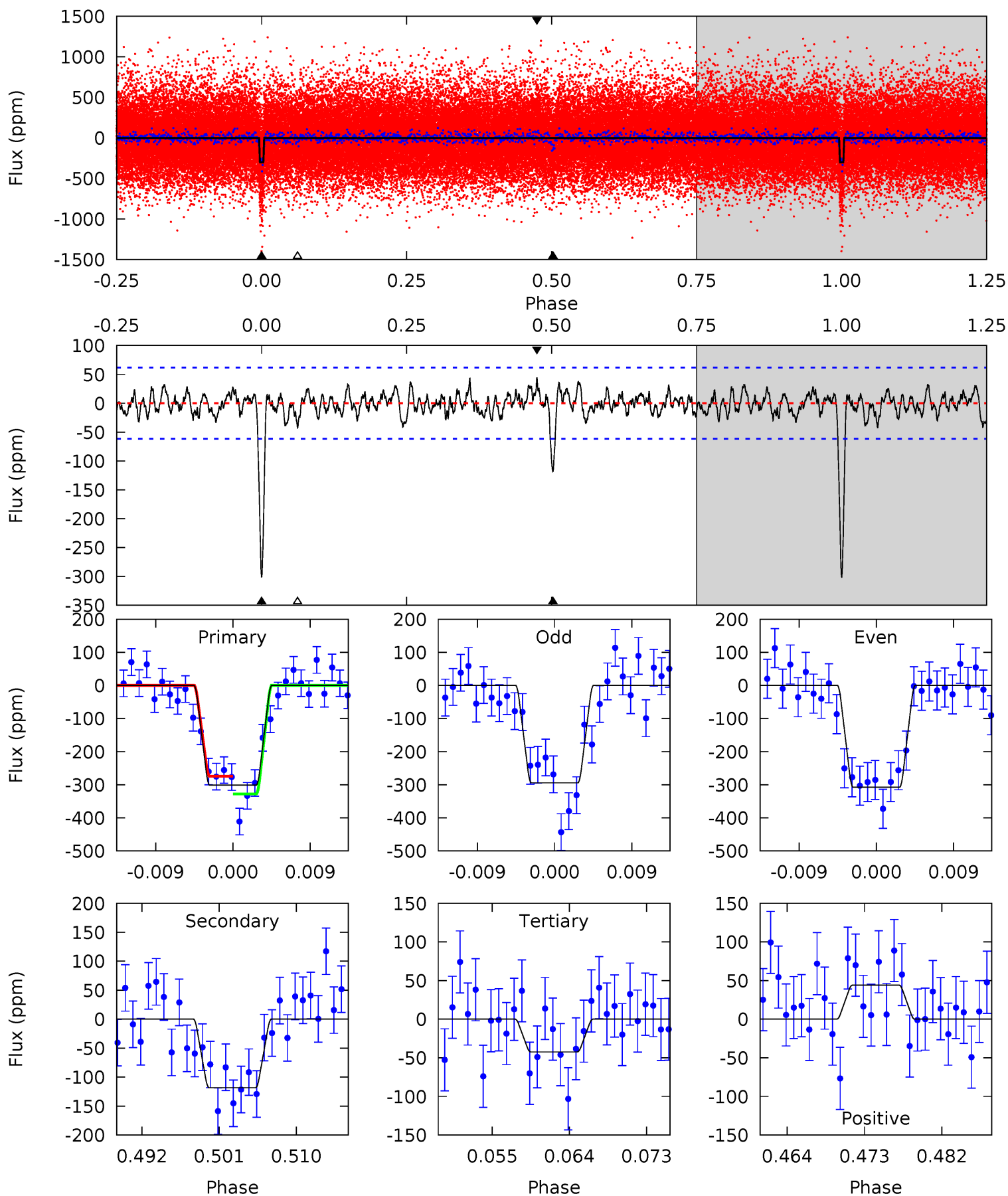
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 30.9 | 11.3 | 4.23 | 3.94 | 4.99 | 2.50 | 1.48 | 26.6 | 26.9 | 7.03 | 7.32 | 0.71 | 1.07 | 0.12 | 4.10 |



Alt Model-Shift Uniqueness Test

007428316-01, P = 14.253732 Days, E = 123.164115 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 24.6 | 9.68 | 3.47 | 3.60 | 5.04 | 2.61 | 1.22 | 21.2 | 21.0 | 6.21 | 6.08 | 0.54 | 1.02 | 0.13 | 2.19 |



Stellar Parameters For KIC 007428316

| | $T_{\text{eff}} (K)$ | $\log(g)$ | $[\text{Fe}/\text{H}]$ | $R (R_{\odot})$ | $M (M_{\odot})$ | $\rho_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|--|
| | 6050^{+164}_{-182} | $4.525^{+0.044}_{-0.176}$ | $-0.300^{+0.250}_{-0.350}$ | $0.896^{+0.231}_{-0.082}$ | $0.979^{+0.107}_{-0.131}$ | $1.918^{+0.455}_{-0.905}$ |
| | +3%/-3% | +1%/-4% | +83%/-117% | +26%/-9% | +11%/-13% | +24%/-47% |
| 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 007428316-01 / KOI 2809.01

| Detrend | Depth (ppm) | $R_p (R_{\oplus})$ | $T_{\text{max}} (K)$ | $T_{\text{obs}} (K)$ | A_{obs} |
|---------|---------------|------------------------|----------------------|----------------------|-------------------|
| DV | -119 ± 11 | $2.20^{+0.31}_{-0.22}$ | 1064^{+69}_{-45} | 4466^{+161}_{-149} | 171^{+38}_{-37} |
| Alt. | -118 ± 12 | $1.82^{+0.24}_{-0.19}$ | 1064^{+69}_{-46} | 4804^{+220}_{-191} | 250^{+59}_{-57} |

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

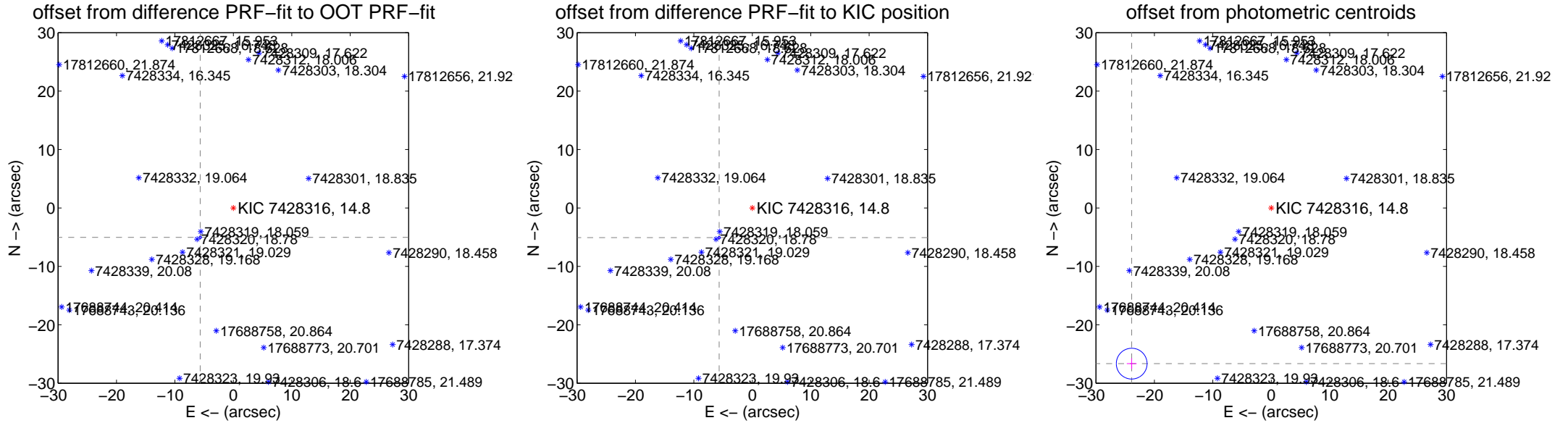
DV Centroid Data

Supplemental centroid analysis for 007428316-01. Kepler magnitude: 14.80. Transit SNR 20.05

There are 12 quarters with good PRF difference image offsets

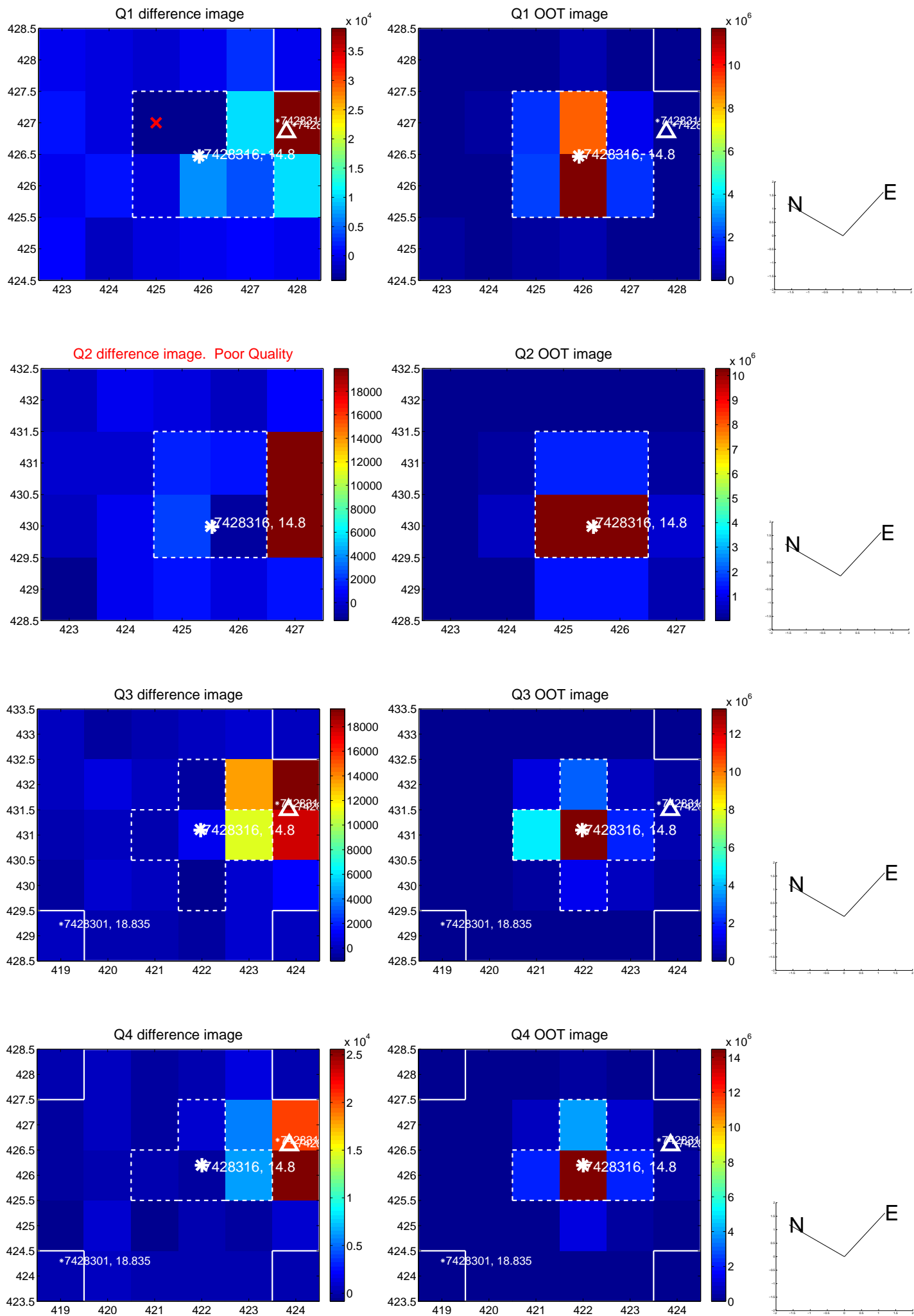
The direct PRF centroid is offset from the target star catalog position by about 0.07 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|---|--------------------|---------------------|-------------------|--------------------|
| PRF-fit source offset from OOT | 7.582 \pm 0.071 | 106.67 | 5.666 \pm 0.071 | -5.038 \pm 0.068 |
| PRF-fit source offset from KIC position | 7.619 \pm 0.070 | 108.88 | 5.677 \pm 0.070 | -5.082 \pm 0.067 |
| photometric centroid source offset | 35.79 \pm 0.88 | 40.76 | 23.89 \pm 0.84 | -26.65 \pm 0.91 |

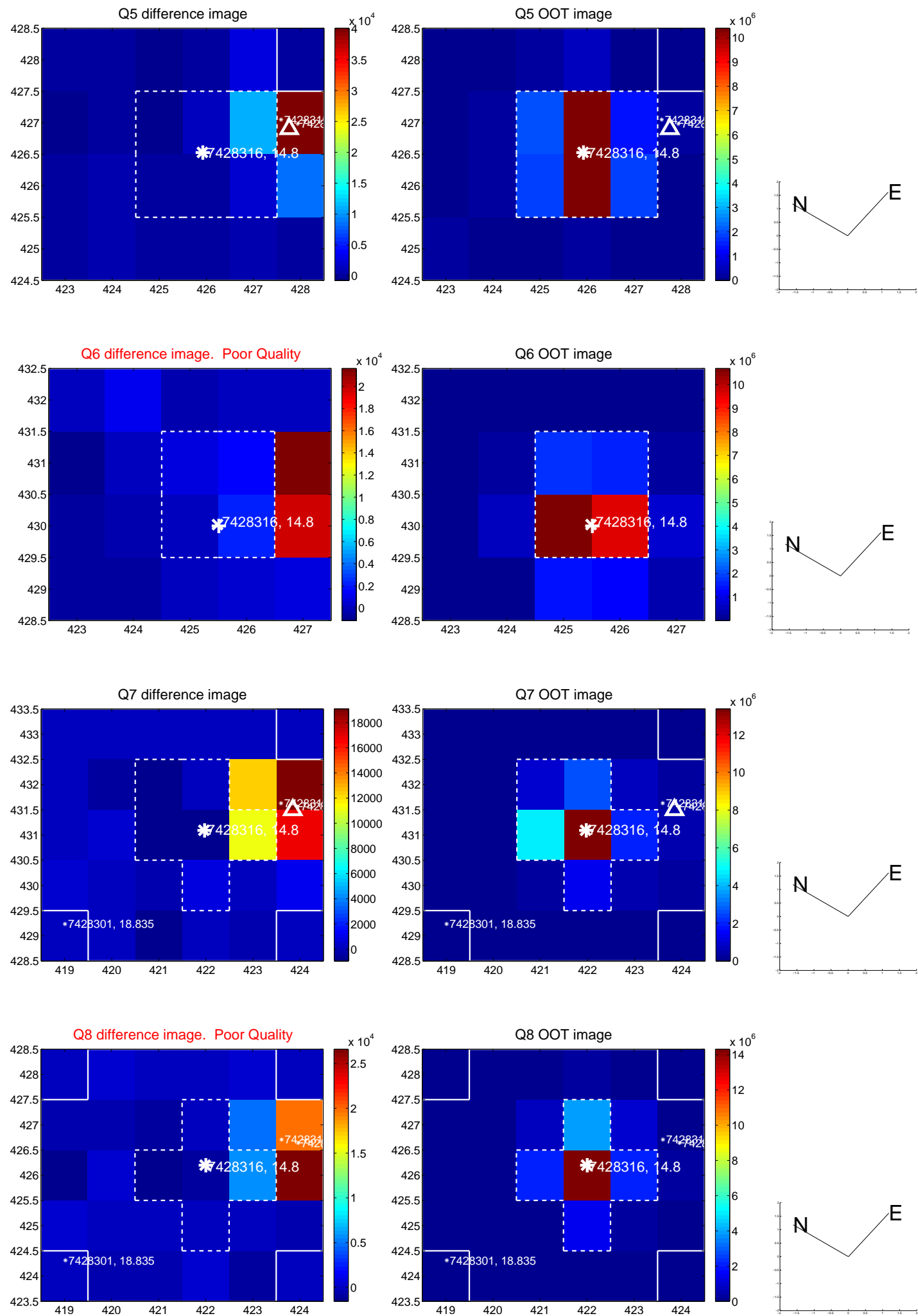


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three- σ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

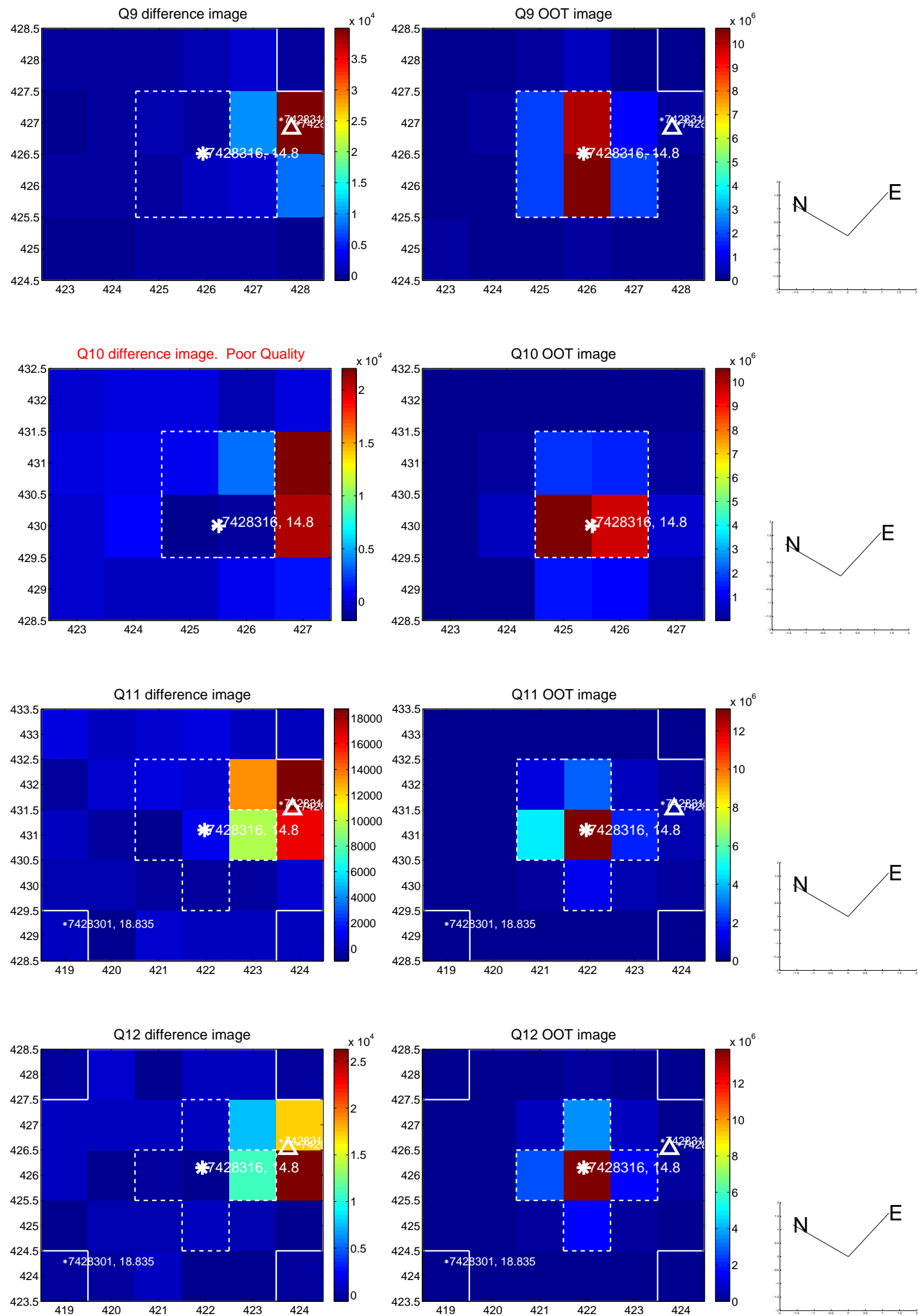
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



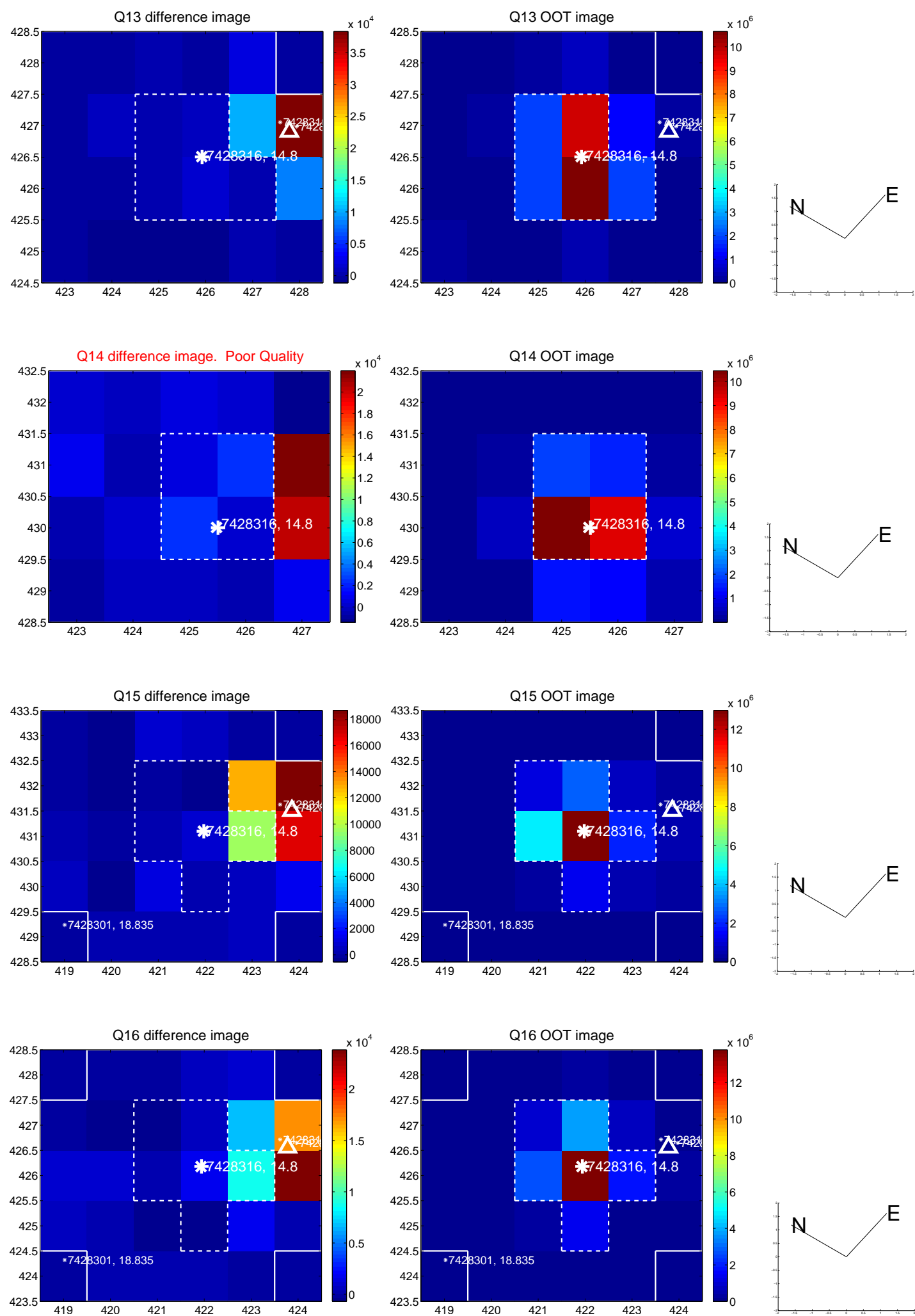
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



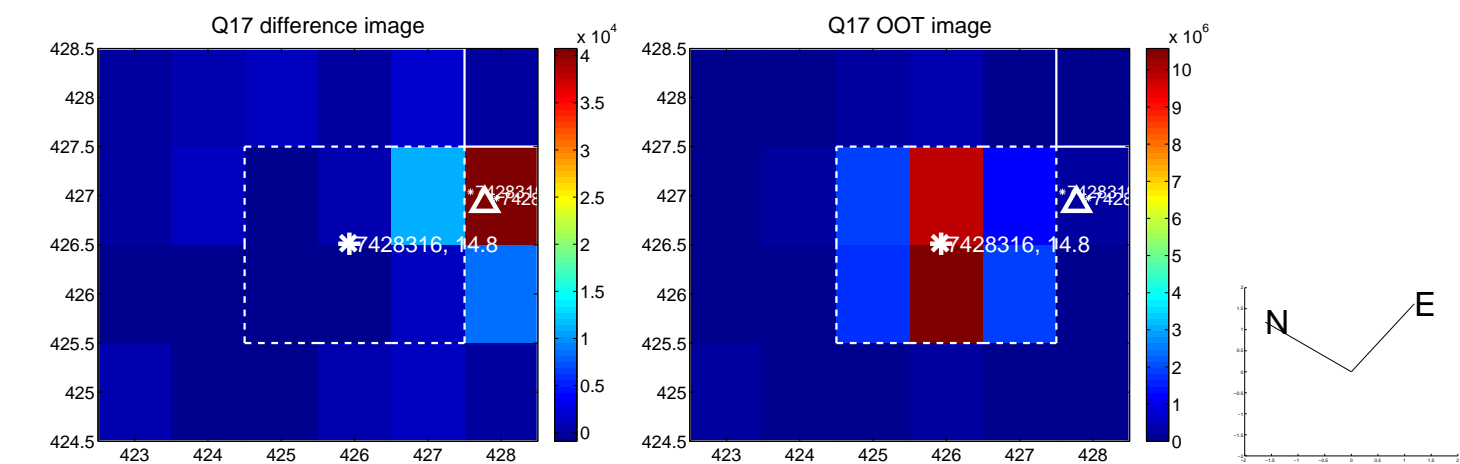
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



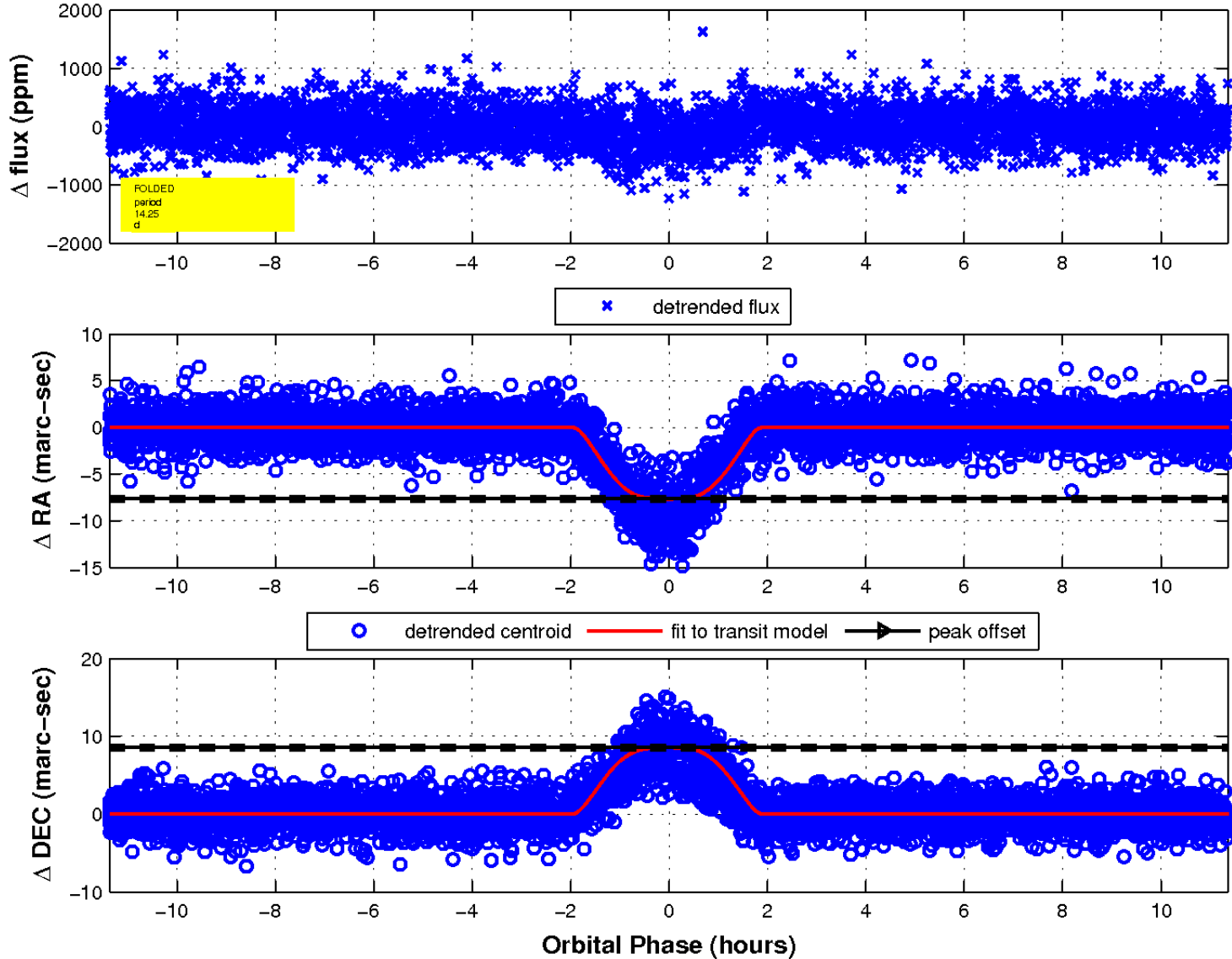
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

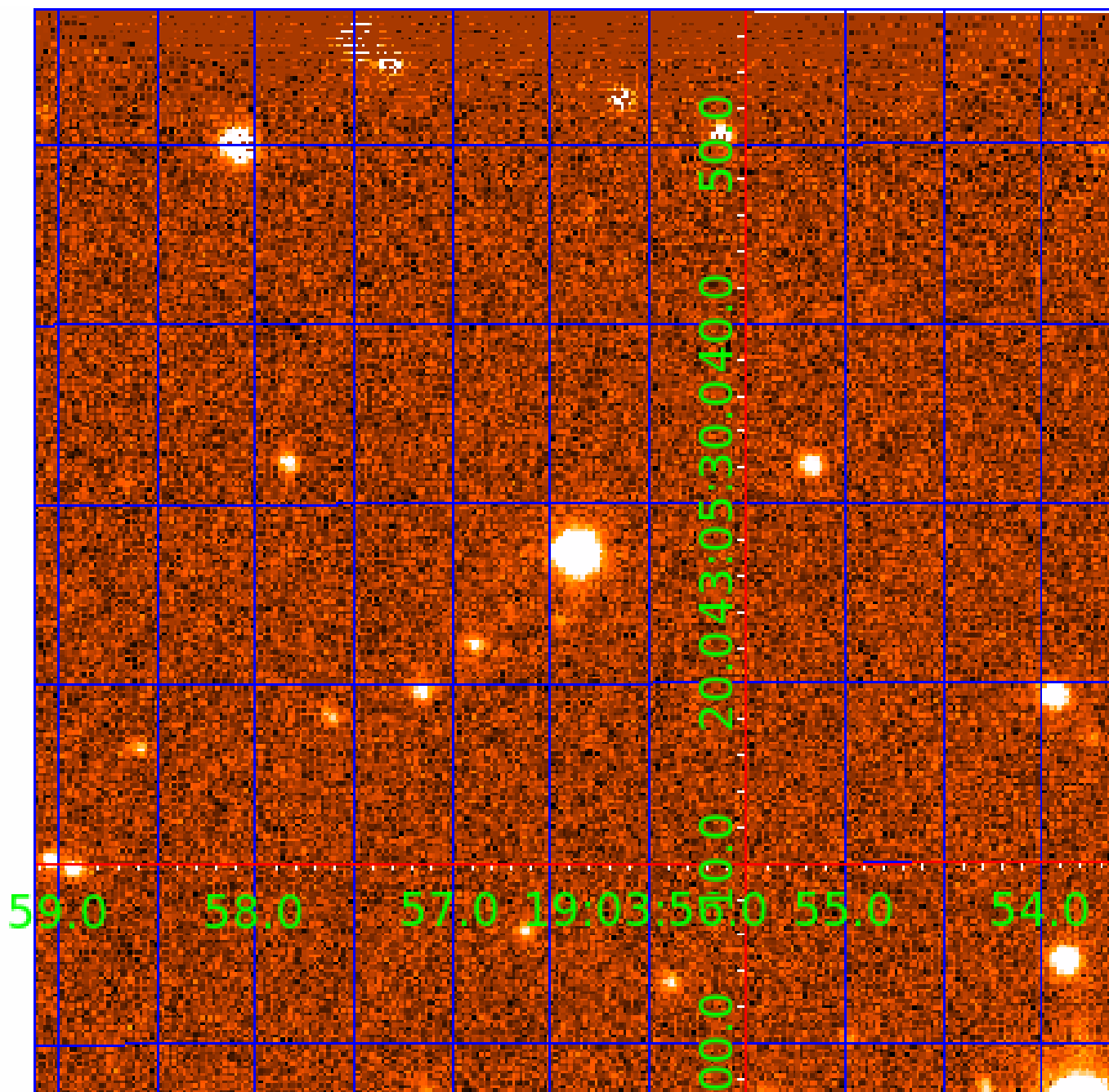


fluxWeightedCentroids, Planet 1 of 2



UKIRT Image

Declination



KIC 007428316

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}) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 007428316-01 | OBS | 2809.01 | 14.253849 | 137.410013 | 321.4 | 3.790 | 19.0 | 20.0 | 0.90 | 6050 | 2.13 | 73.71 |
| 007428316-02 | OBS | No | 7.126722 | 137.463363 | 137.8 | 3.397 | 8.7 | 9.0 | 0.90 | 6050 | 1.40 | 185.75 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|---|
| 007428316-01 | OBS | FP | 0.00 | 0 | 1 | 1 | 0 | MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE—CENT_RESOLVED_OFFSET |
| 007428316-02 | OBS | FP | 0.00 | 1 | 1 | 1 | 0 | IS_SEC_TCE—CENT_RESOLVED_OFFSET—HALO_GHOST |

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.

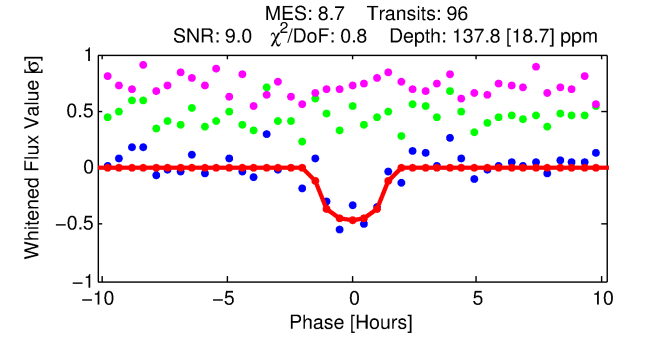
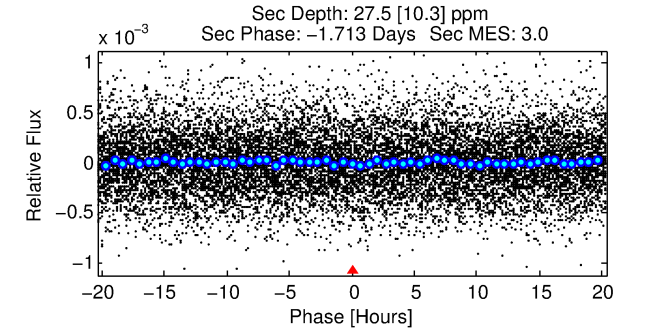
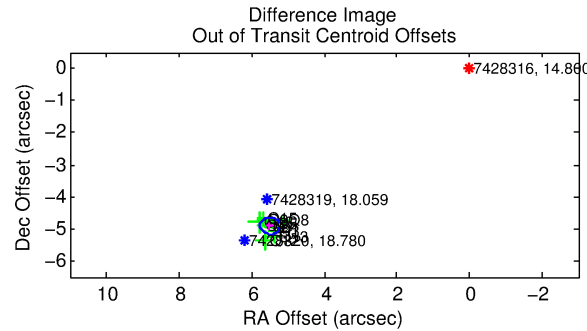
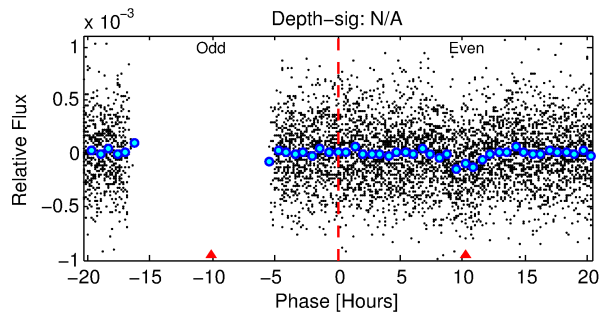
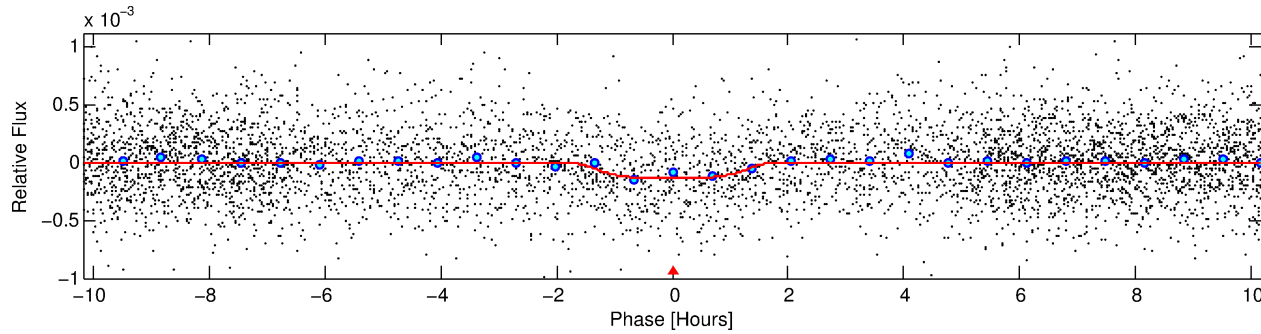
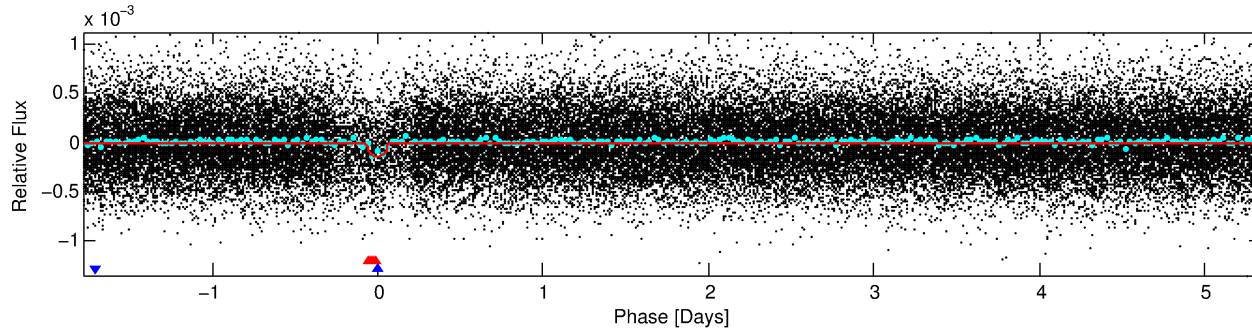
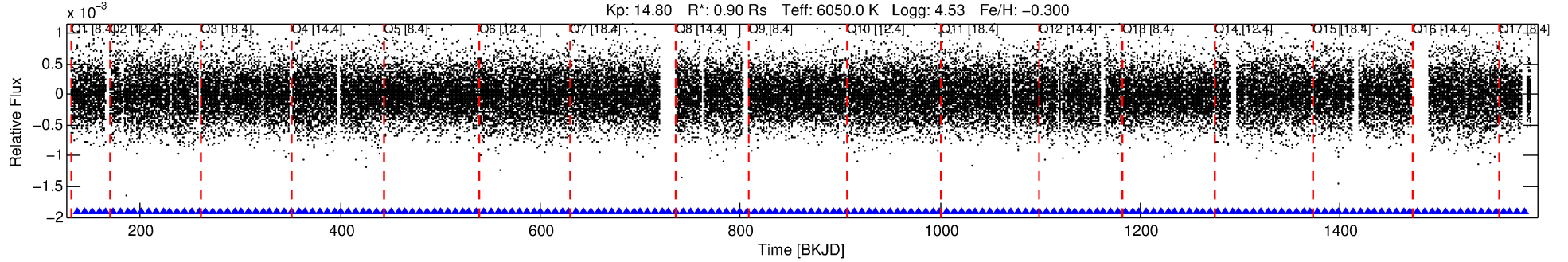
Ephemeris Match Information For 007428316-02

No Significant Match Found

DV One-Page Summary

KIC: 7428316 Candidate: 2 of 2 Period: 7.127 d
KOI: K02809.01 Corr: 0.883

Kp: 14.80 R*: 0.90 Rs Teff: 6050.0 K Logg: 4.53 Fe/H: -0.300



DV Fit Results:

Period = 7.12672 [0.00008] d
Epoch = 137.4634 [0.0085] BKJD
Rp/R* = 0.0143 [0.0016]
a/R* = 4.53 [1.82]
b = 0.98 [0.02]
Seff = 185.75 [63.54]
Teq = 941 [81] K
Rp = 1.40 [0.39] Re
a = 0.0720 [0.0157] AU
Ag = 40.33 [21.80] [1.80σ]
Teffp = 3668 [414] K [6.46σ]

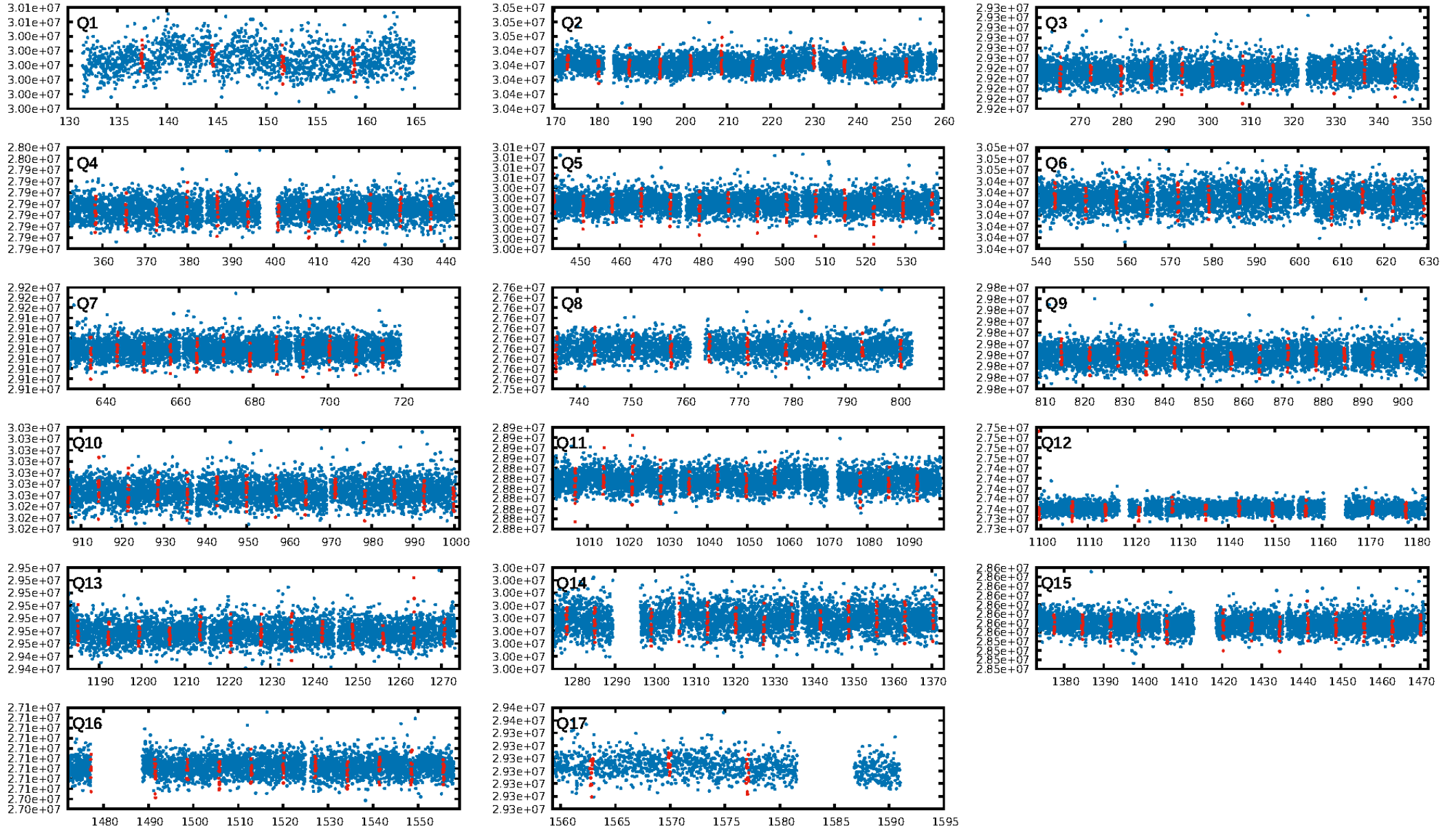
DV Diagnostic Results:

ShortPeriod-sig: N/A
LongPeriod-sig: 100.0% [33.61σ]
ModelChiSquare2-sig: 92.7%
ModelChiSquareGof-sig: 100.0%
Bootstrap-pfa: 1.28e-18
RollingBand-fgt: 1.00 [93/93]
GhostDiagnostic-chr: -0.1685
Centroid-sig: 0.0%
Centroid-so: 25.348 arcsec [18.23σ]
OotOffset-rm: 7.371 arcsec [83.32σ]
KicOffset-rm: 7.414 arcsec [80.17σ]
OotOffset-st: 0/4/3/4 [11]
KicOffset-st: 0/4/3/4 [11]
DiffImageQuality-fgm: 1.00 [11/11]
DiffImageOverlap-fno: 1.00 [17/17]

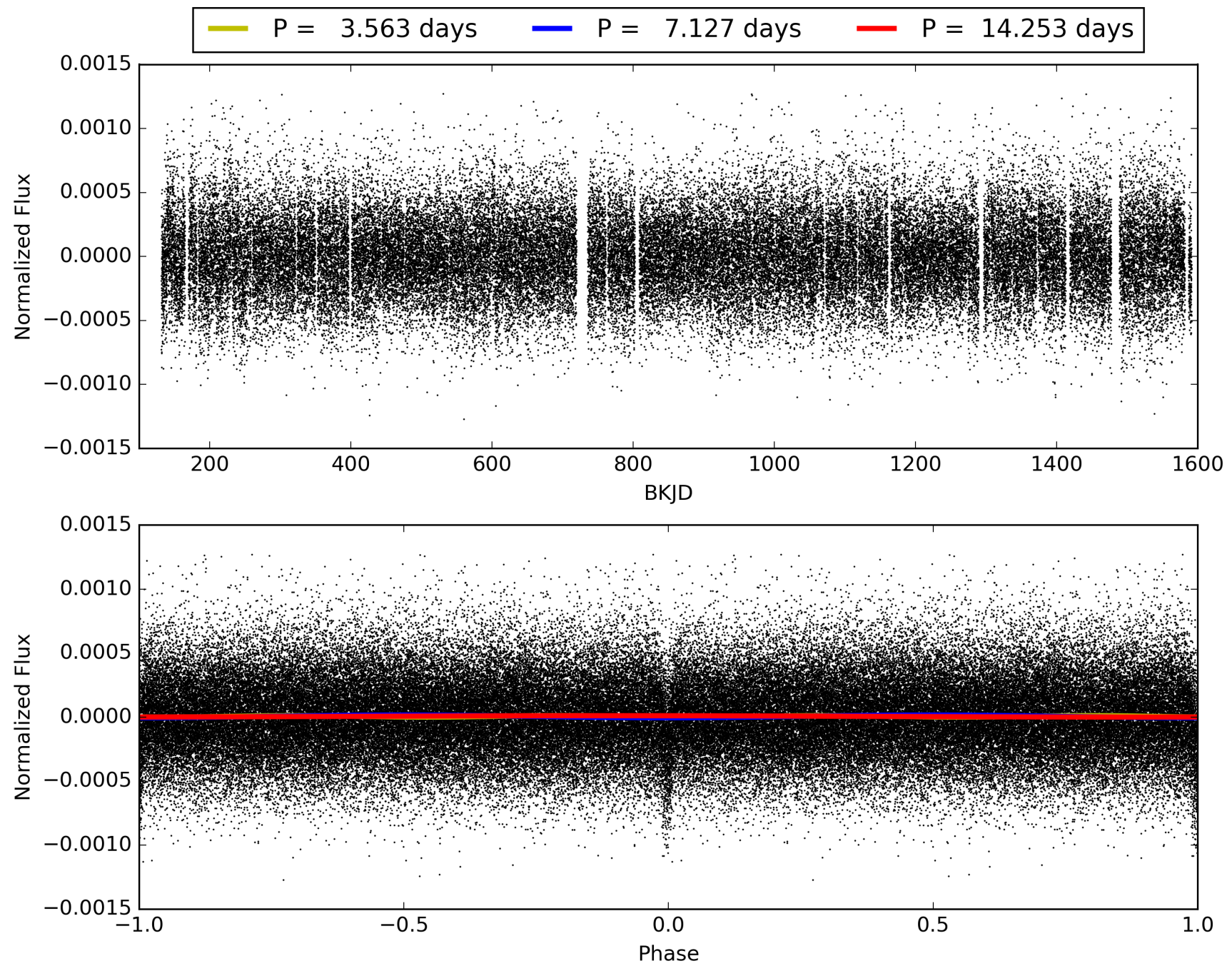
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 01:33:53 Z

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

TCE 007428316-02, PDC Light Curves

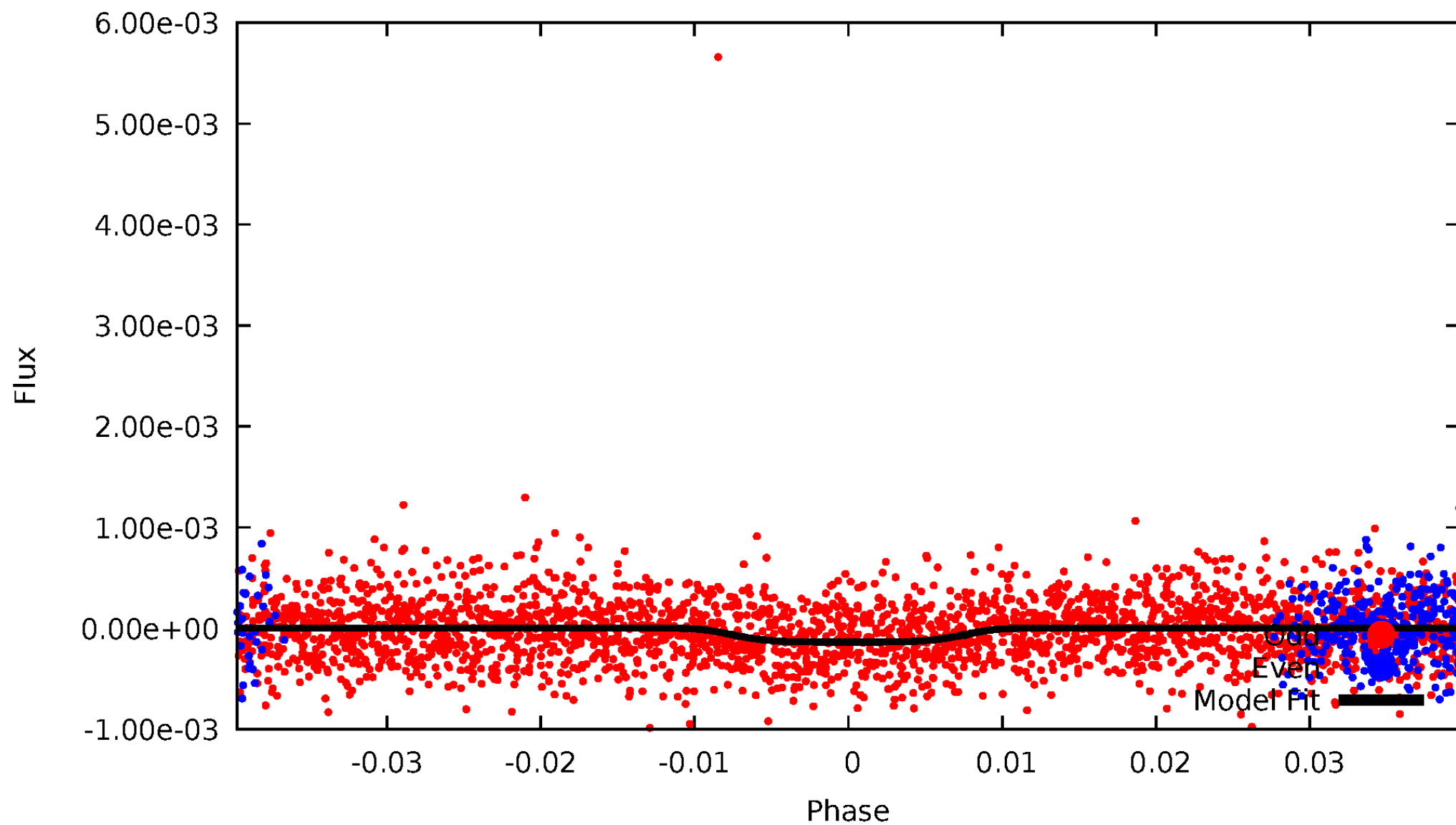


TCE 007428316-02



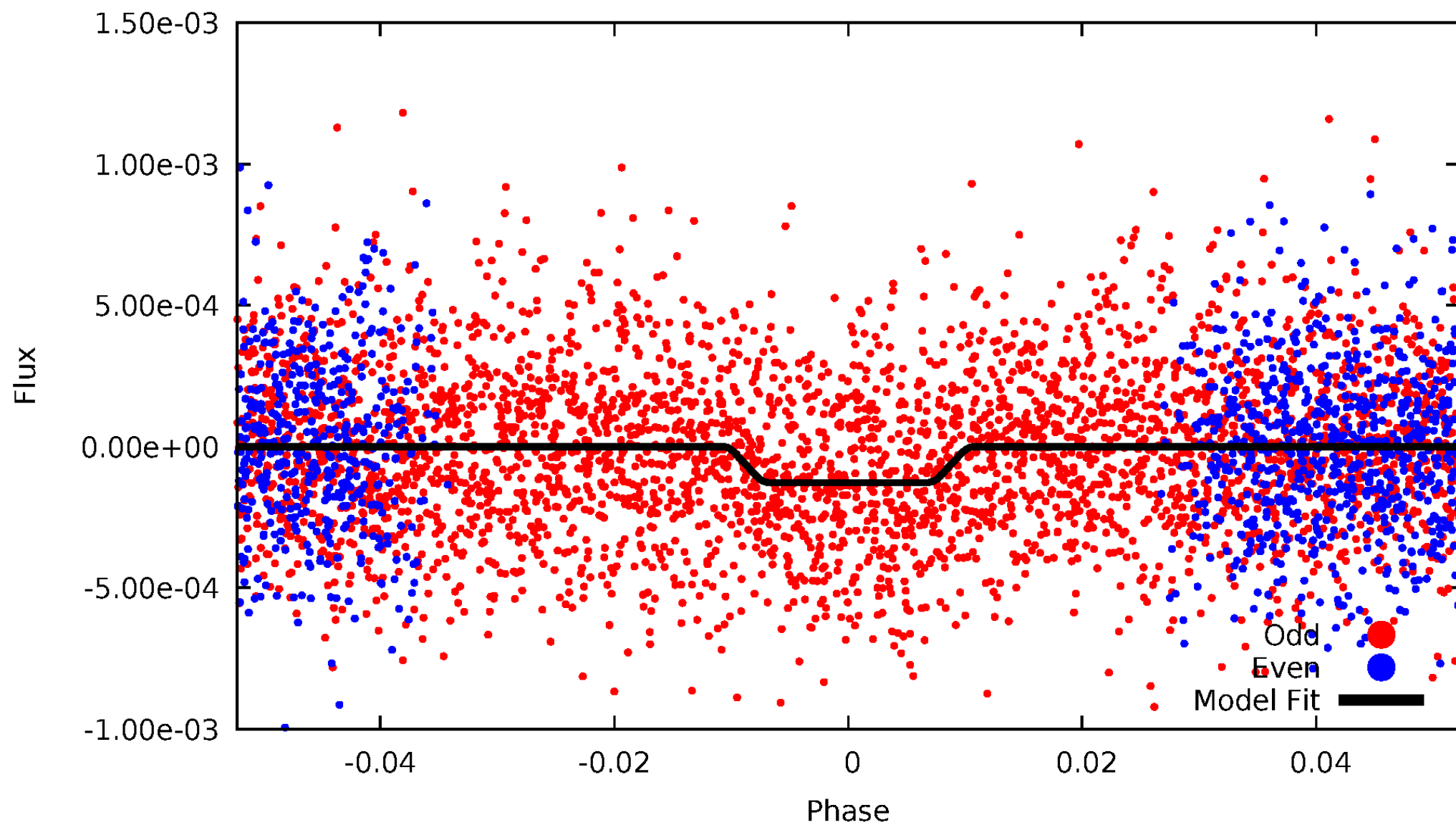
DV Odd/Even

TCE 007428316-02



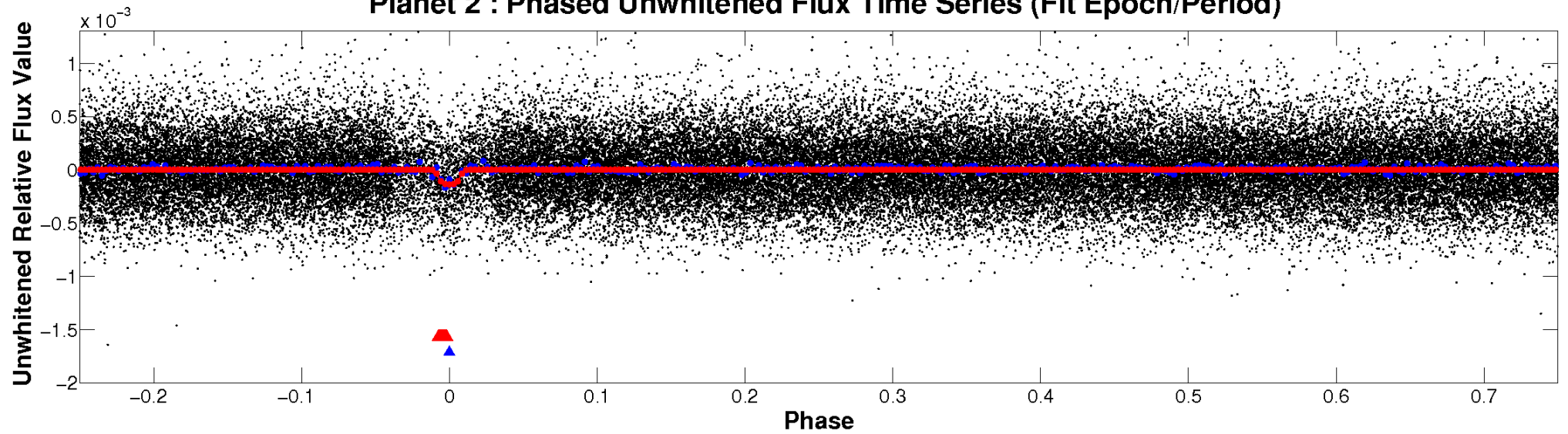
ALT Odd/Even

TCE 007428316-02

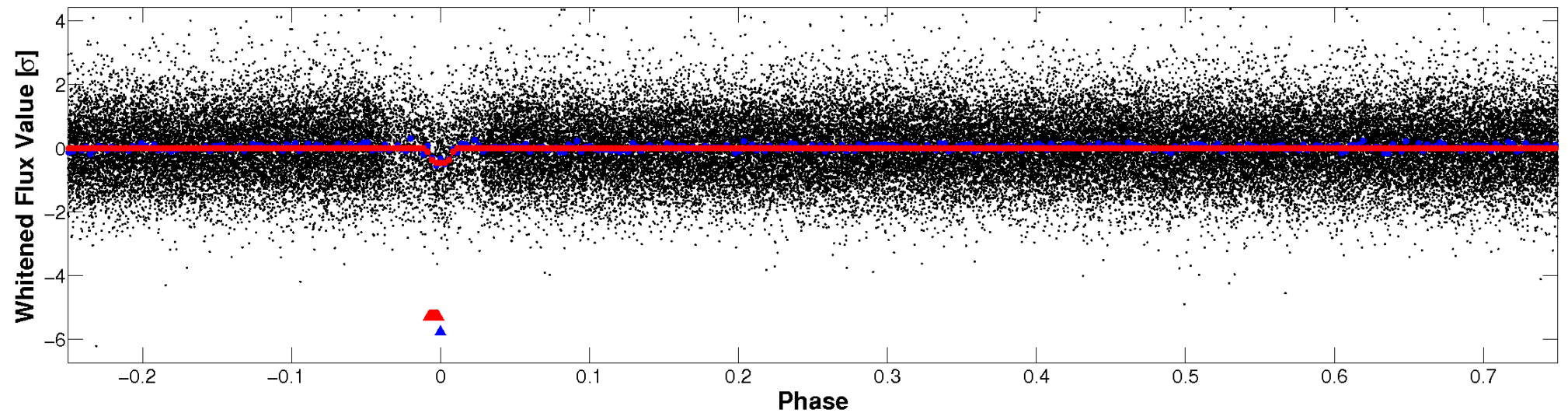


Non-Whitened Vs. Whitened Light Curve

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

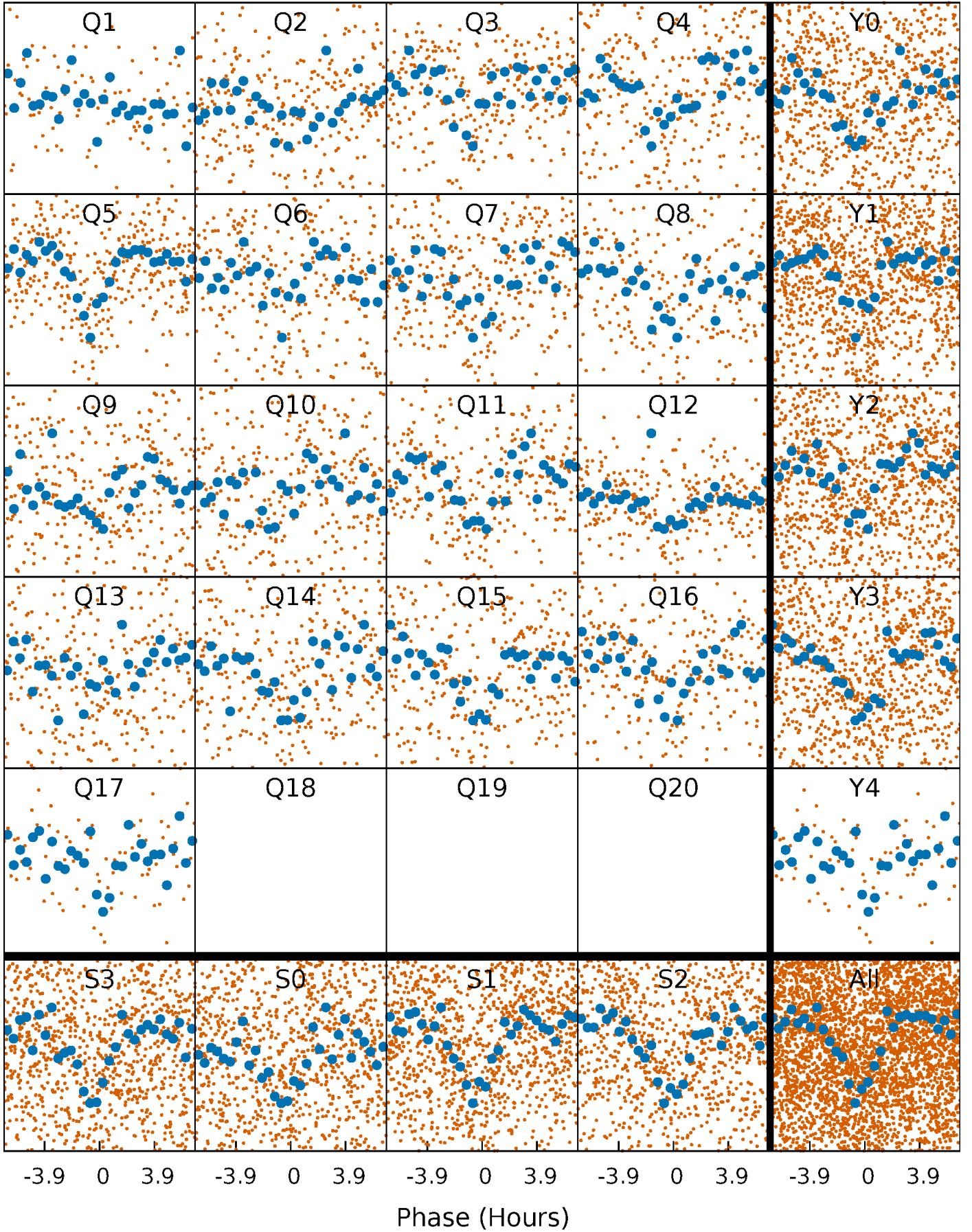


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



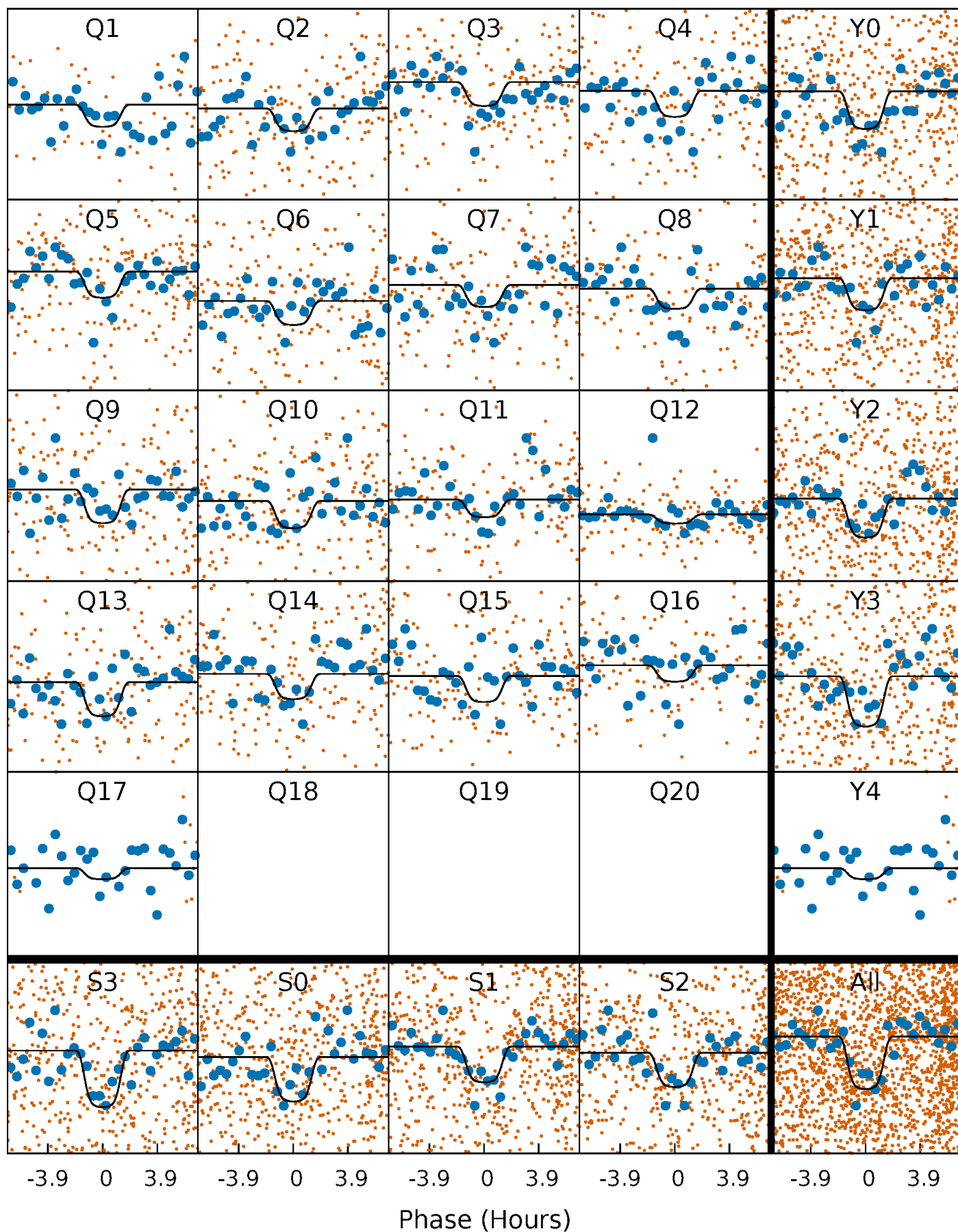
PDC Quarter-Phased Transit Curves

TCE 007428316-02 P= 7.126722 Days $T_0=137.463363$ (BKJD)



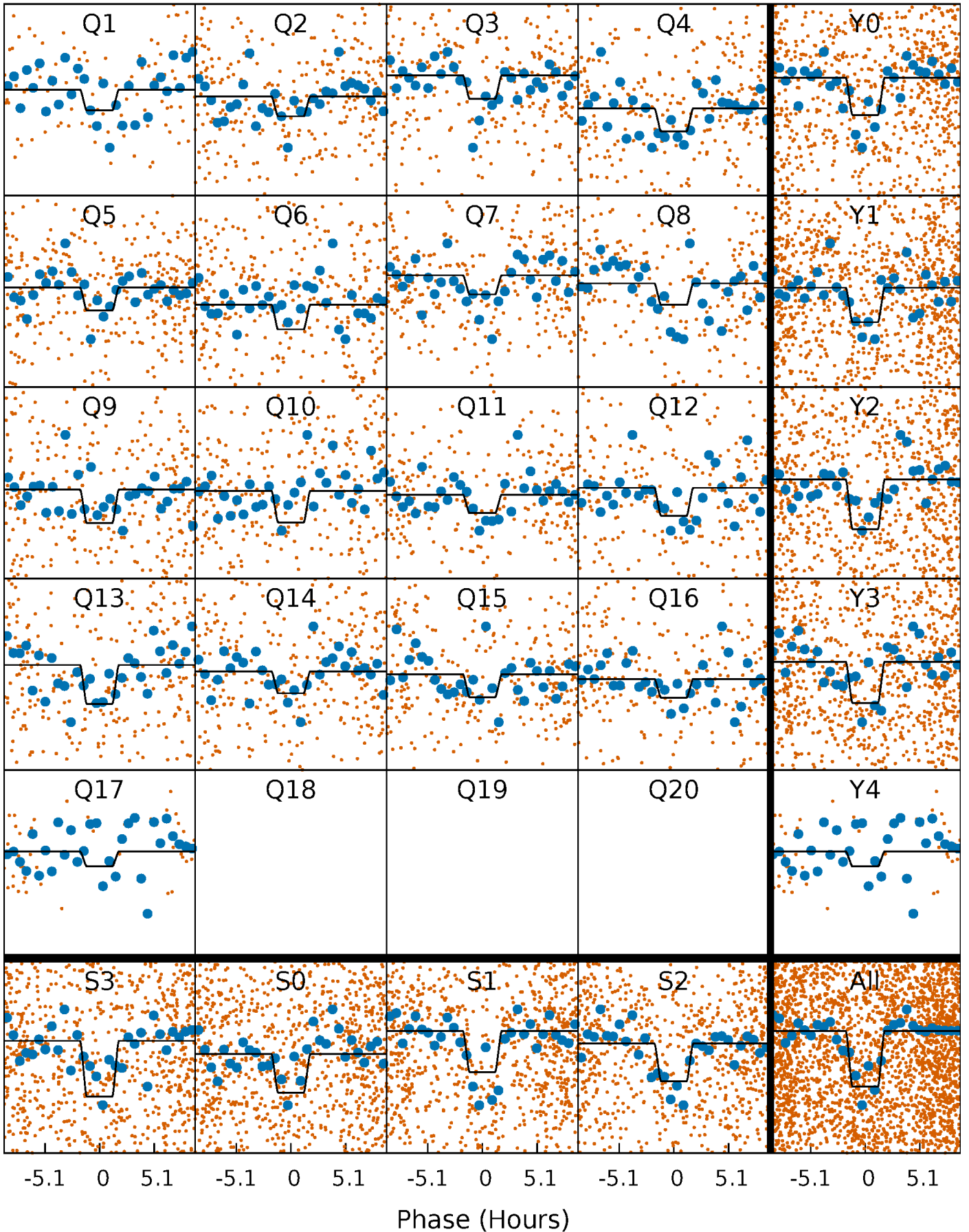
DV Quarter-Phased Transit Curves

TCE 007428316-02 P= 7.126722 Days $T_0=137.463363$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

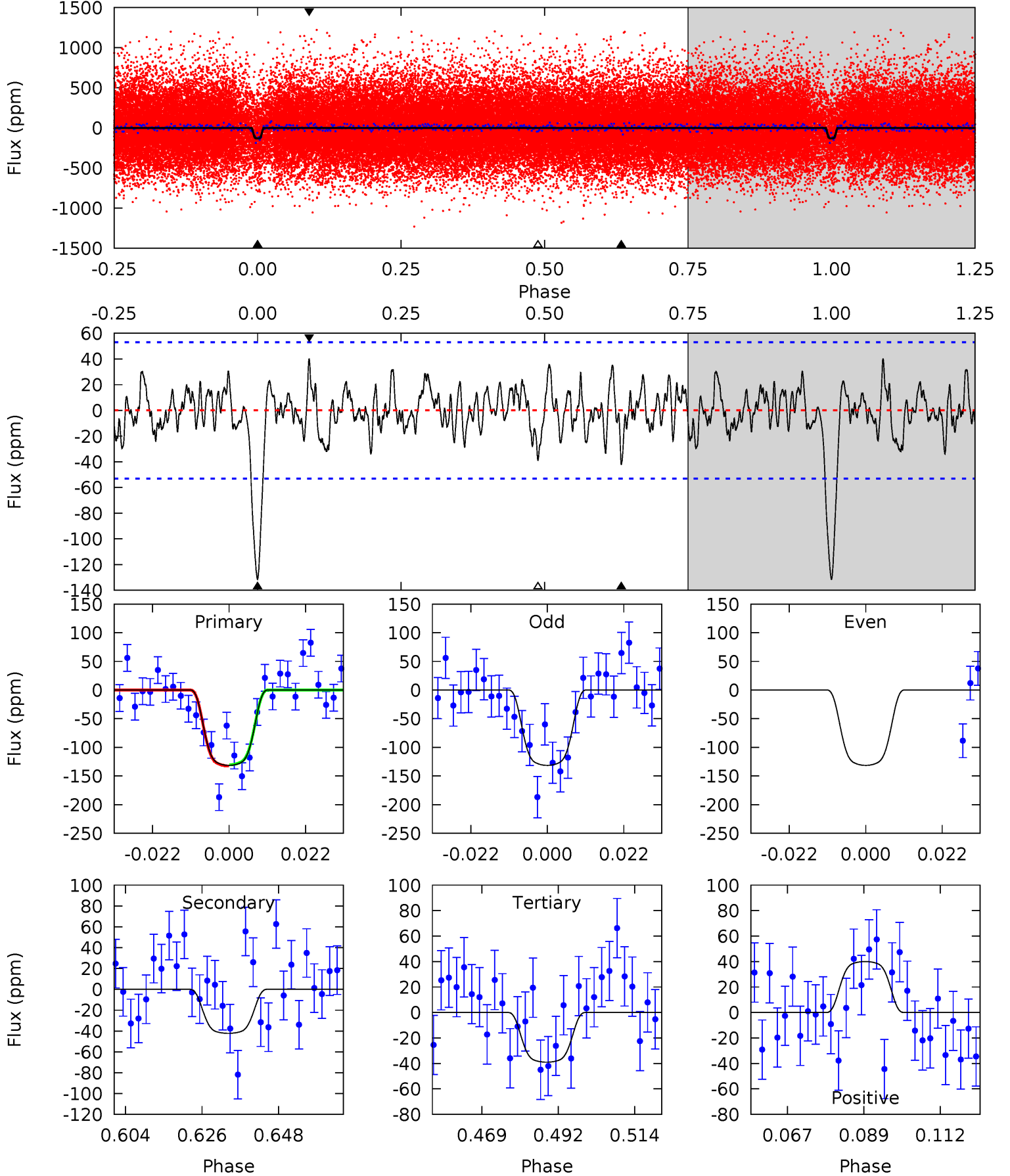
TCE 007428316-02 P= 7.126599 Days $T_0=137.471043$ (BKJD)



DV Model-Shift Uniqueness Test

007428316-02, P = 7.126722 Days, E = 130.336641 Days

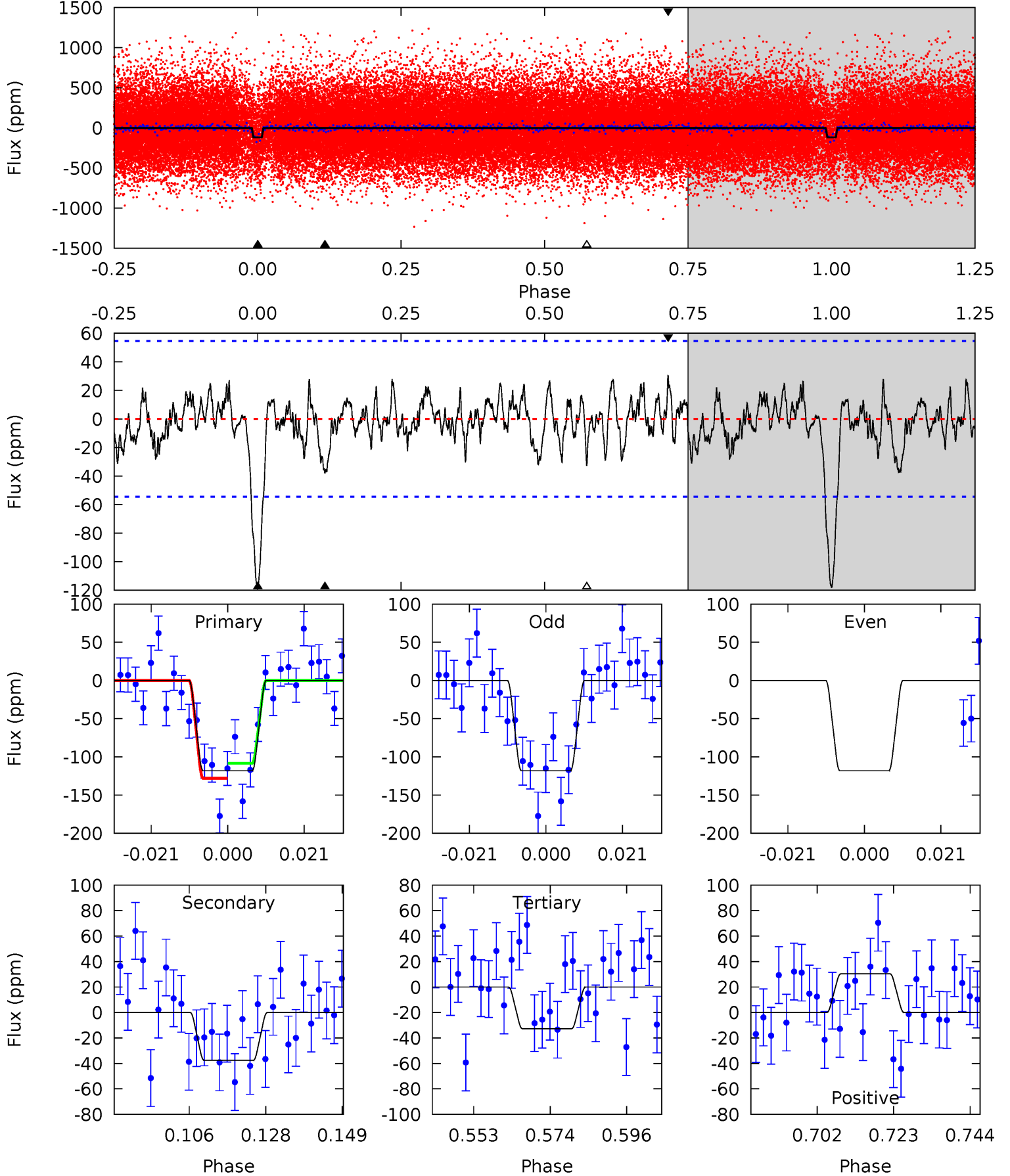
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 12.1 | 3.87 | 3.58 | 3.67 | 4.87 | 2.28 | 1.28 | 8.49 | 8.40 | 0.30 | 0.20 | 0 | 1.08 | 0.23 | 0.10 |



Alt Model-Shift Uniqueness Test

007428316-02, P = 7.126599 Days, E = 130.344444 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 10.6 | 3.36 | 2.93 | 2.72 | 4.88 | 2.30 | 1.08 | 7.64 | 7.85 | 0.43 | 0.64 | 0 | 1.21 | 0.20 | 0.88 |



Stellar Parameters For KIC 007428316

| | $T_{\text{eff}} (K)$ | $\log(g)$ | $[\text{Fe}/\text{H}]$ | $R (R_{\odot})$ | $M (M_{\odot})$ | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
| | 6050^{+164}_{-182} | $4.525^{+0.044}_{-0.176}$ | $-0.300^{+0.250}_{-0.350}$ | $0.896^{+0.231}_{-0.082}$ | $0.979^{+0.107}_{-0.131}$ | $1.918^{+0.455}_{-0.905}$ |
| | +3%/-3% | +1%/-4% | +83%/-117% | +26%/-9% | +11%/-13% | +24%/-47% |
| 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 007428316-02 / KOI

| Detrend | Depth (ppm) | $R_p (R_{\oplus})$ | $T_{\text{max}} (K)$ | $T_{\text{obs}} (K)$ | A_{obs} |
|---------|--------------|------------------------|----------------------|----------------------|------------------|
| DV | -42 ± 11 | $1.44^{+0.23}_{-0.20}$ | 1340^{+78}_{-61} | 4294^{+311}_{-294} | 56^{+25}_{-19} |
| Alt. | -38 ± 11 | $1.14^{+0.22}_{-0.18}$ | 1342^{+92}_{-58} | 4616^{+437}_{-376} | 79^{+43}_{-30} |

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

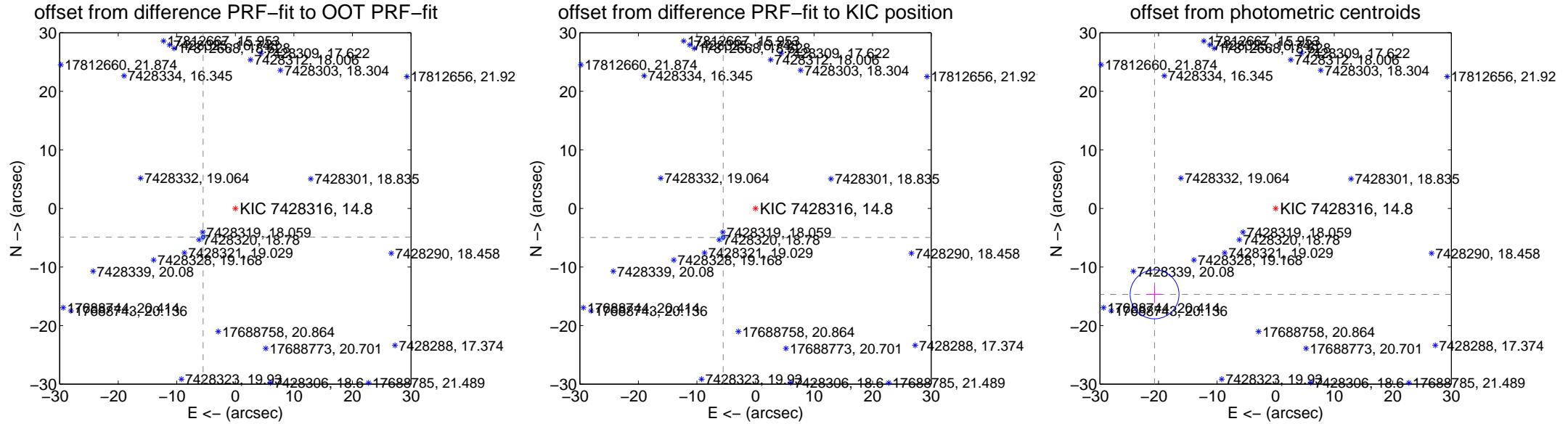
DV Centroid Data

Supplemental centroid analysis for 007428316-02. Kepler magnitude: 14.80. Transit SNR 9.03

There are 11 quarters with good PRF difference image offsets

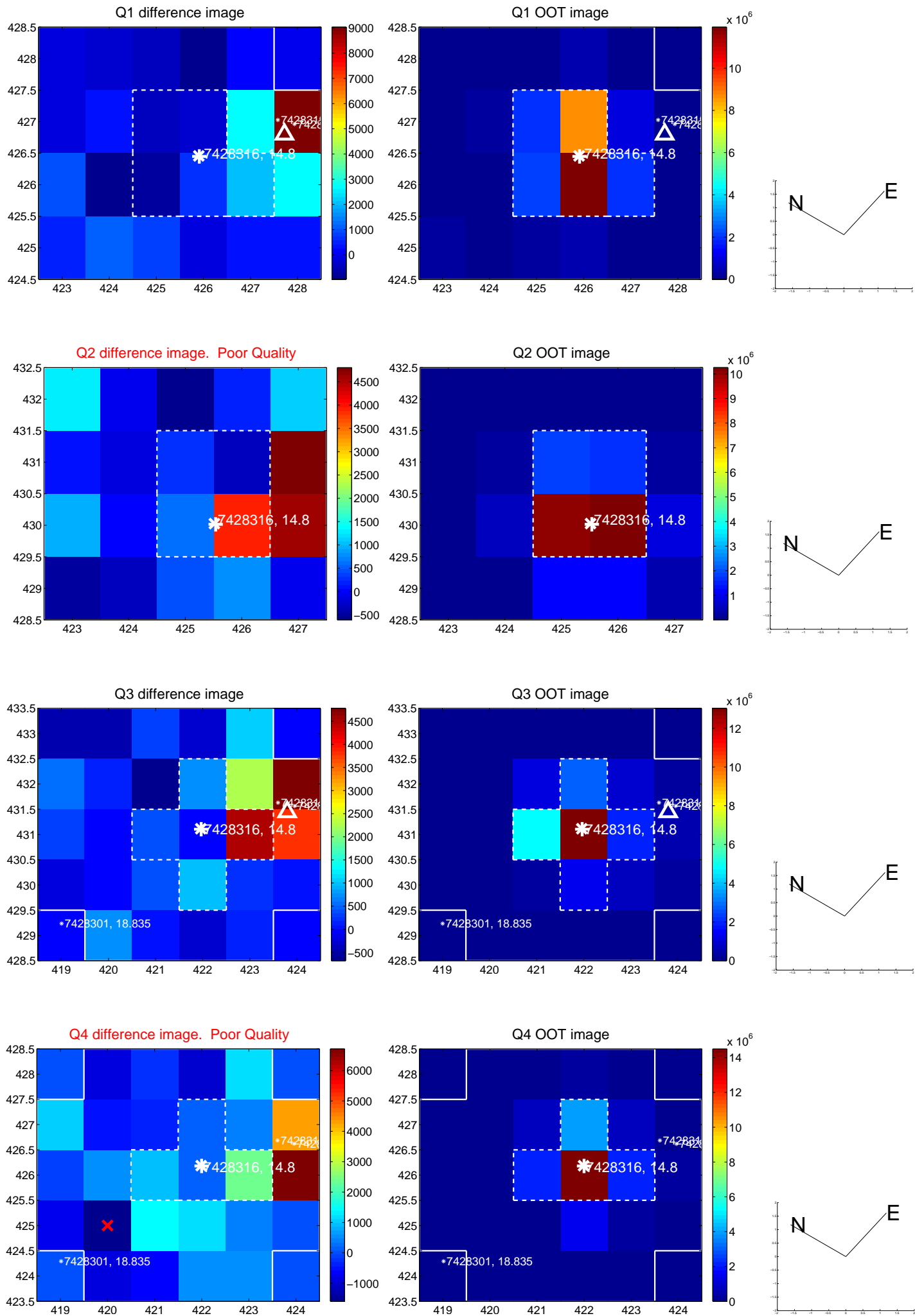
The direct PRF centroid is offset from the target star catalog position by about 0.05 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|---|--------------------|---------------------|-------------------|--------------------|
| PRF-fit source offset from OOT | 7.371 \pm 0.088 | 83.32 | 5.497 \pm 0.087 | -4.910 \pm 0.091 |
| PRF-fit source offset from KIC position | 7.414 \pm 0.092 | 80.17 | 5.513 \pm 0.093 | -4.957 \pm 0.092 |
| photometric centroid source offset | 25.35 \pm 1.39 | 18.23 | 20.67 \pm 1.34 | -14.67 \pm 1.48 |

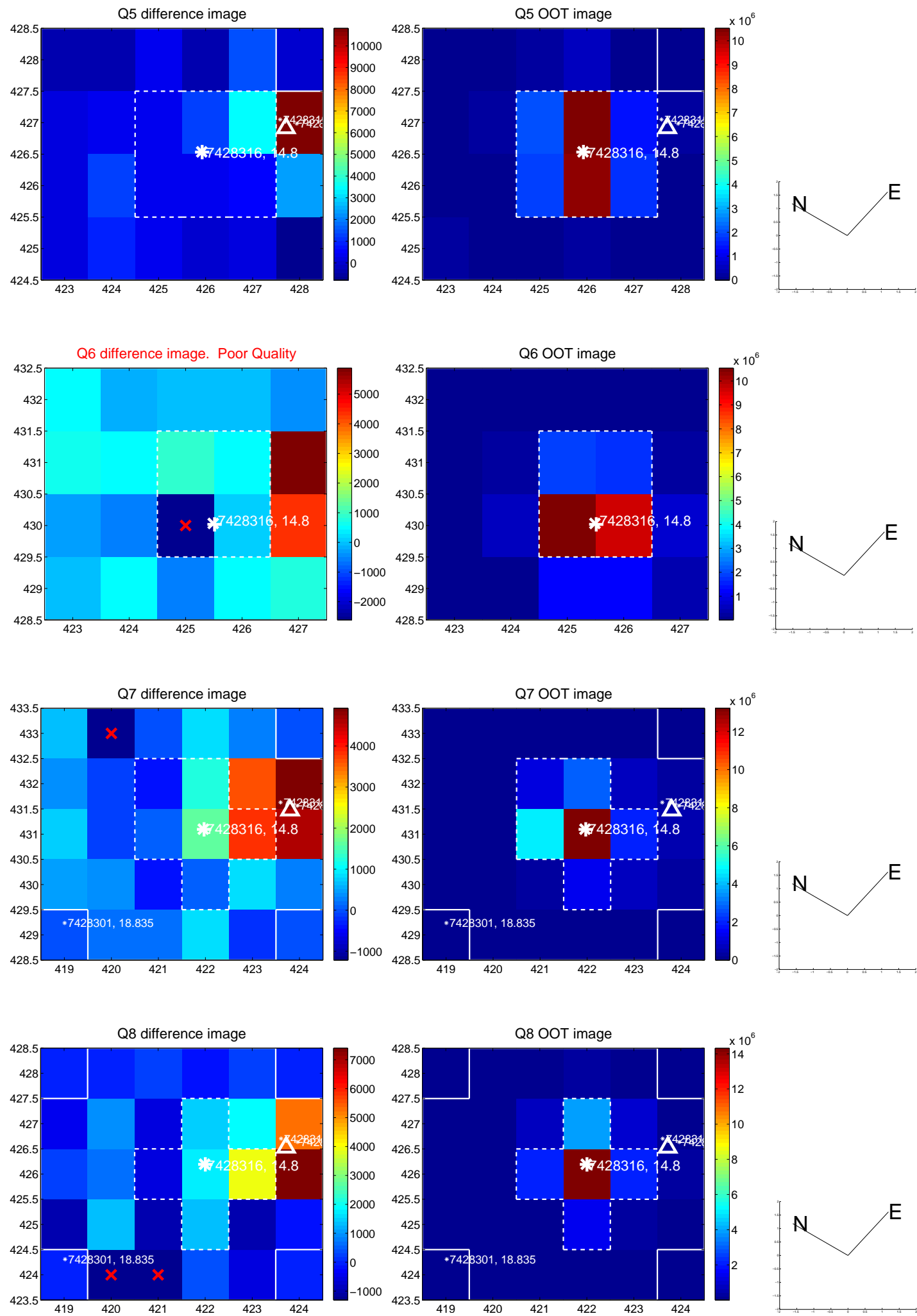


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three- σ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

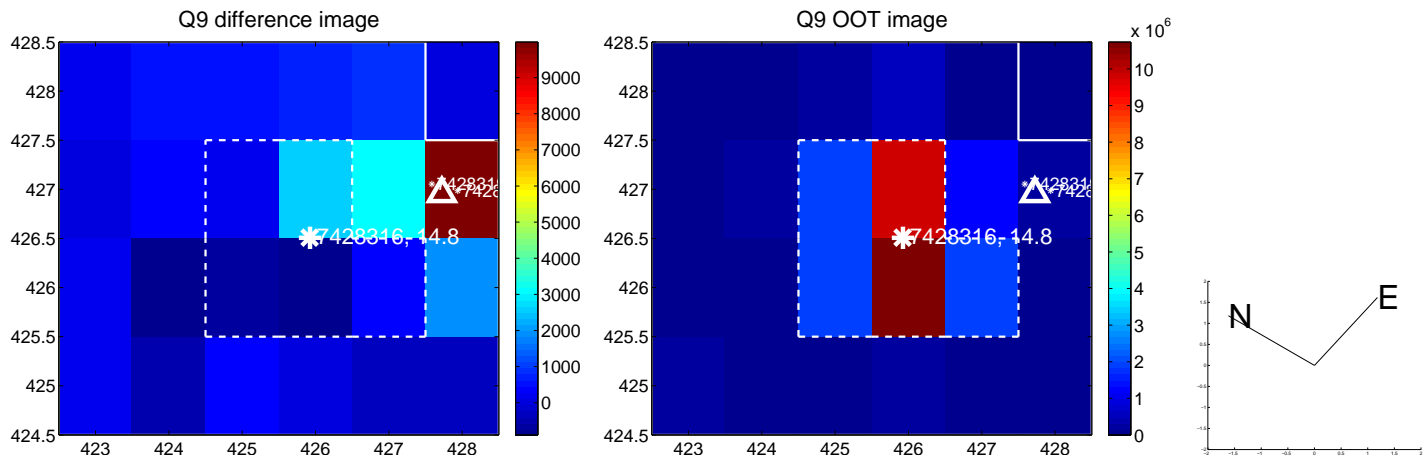
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ×: large negative pixel value.



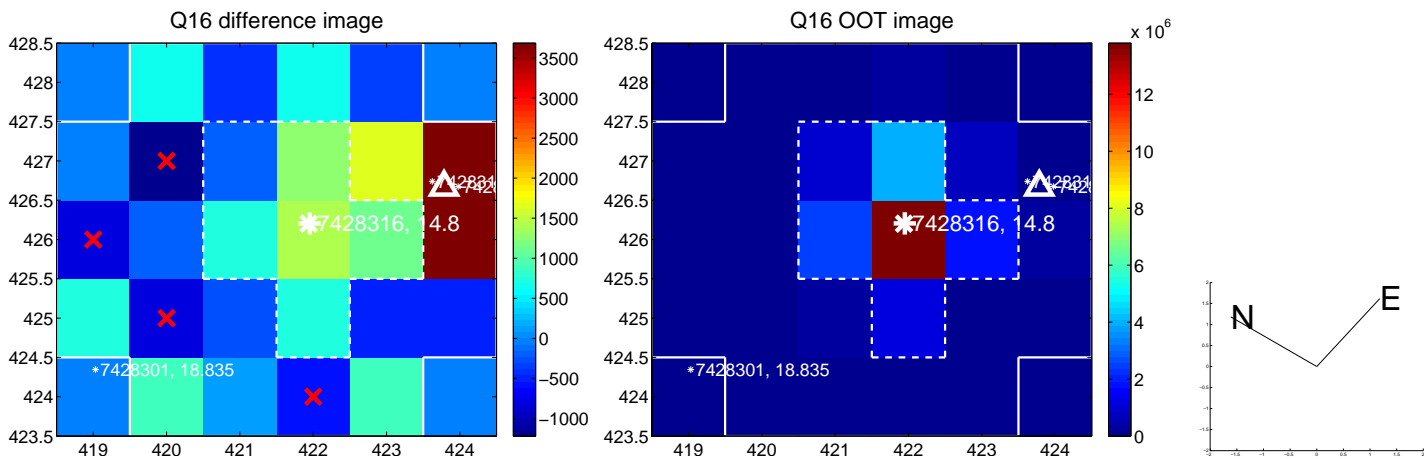
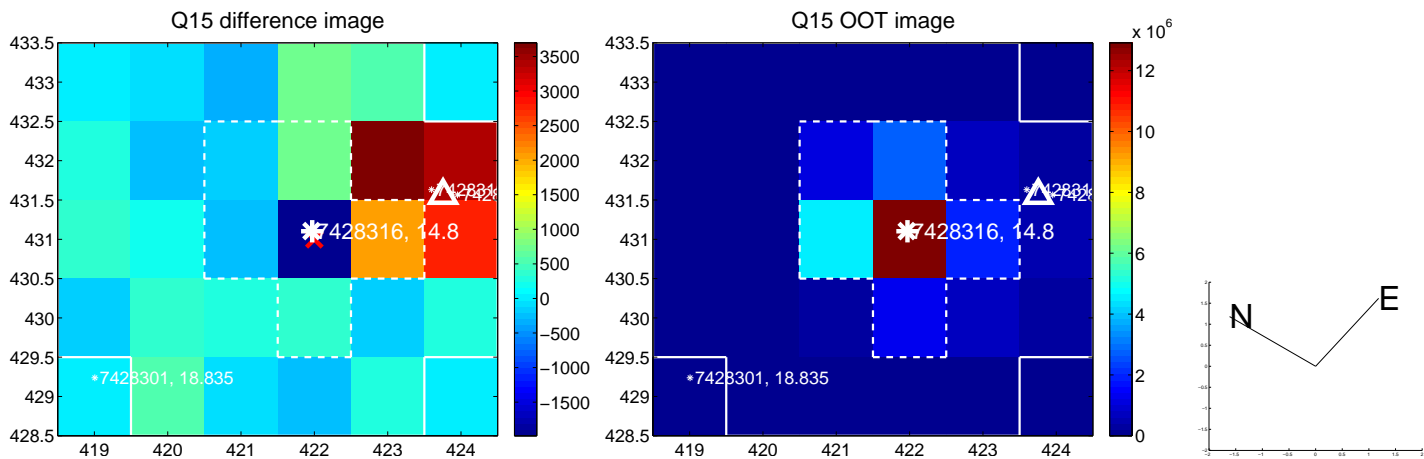
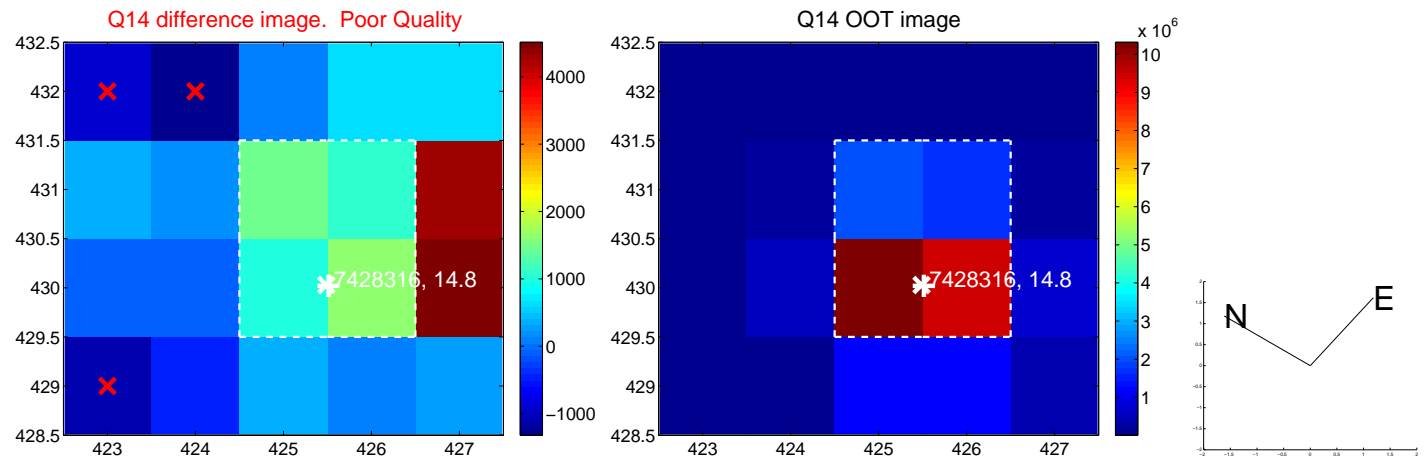
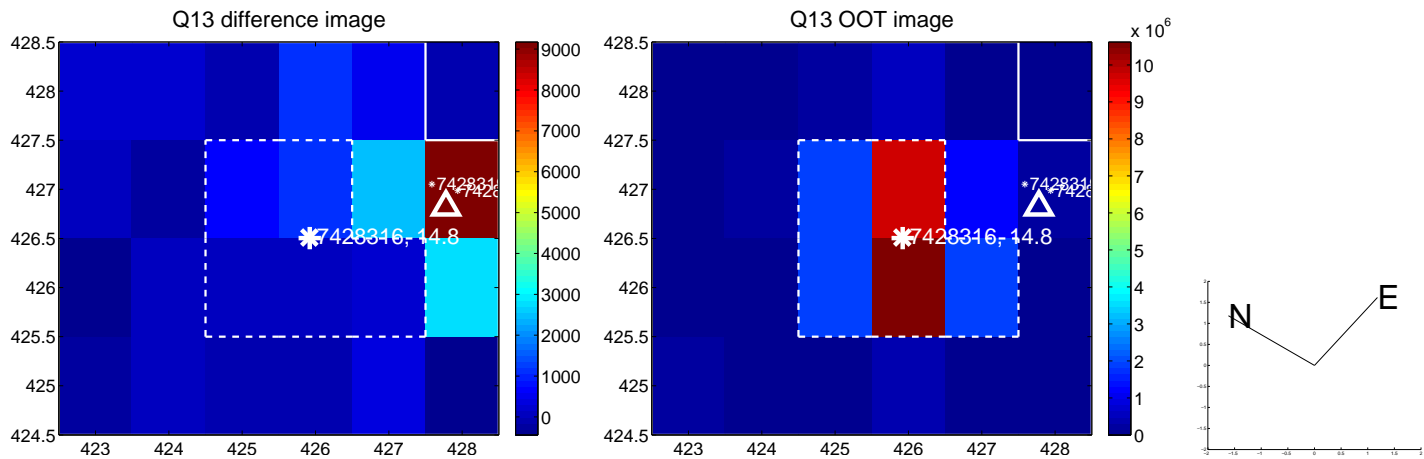
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



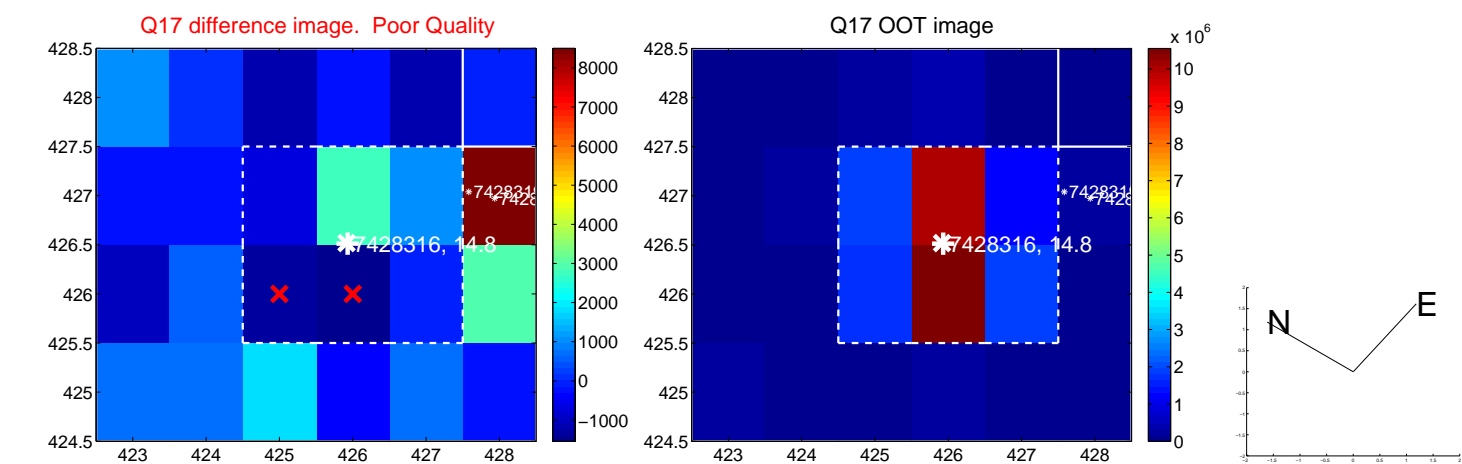
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



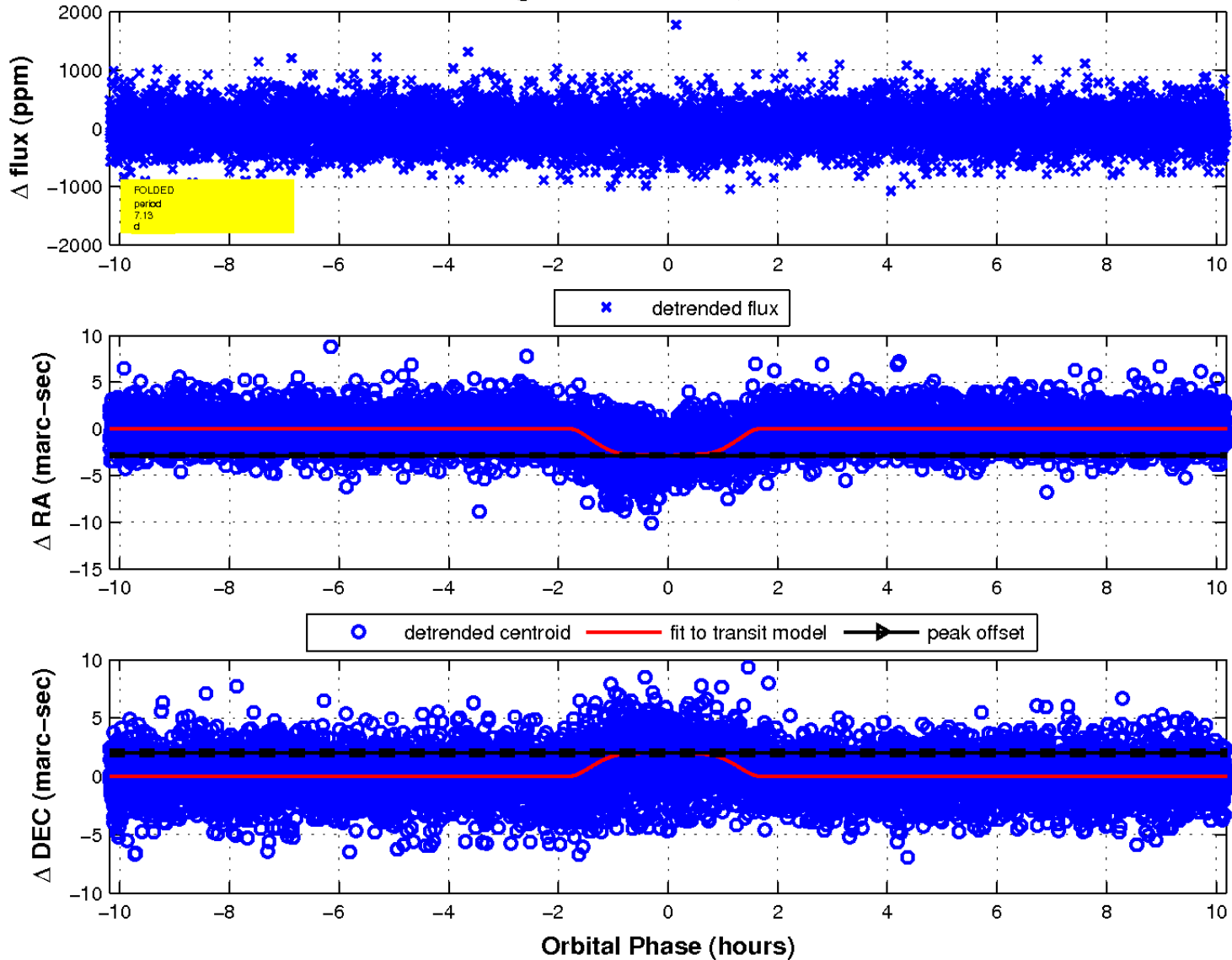
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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



fluxWeightedCentroids, Planet 2 of 2



UKIRT Image

Declination

