

KIC 008740898

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}) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 008740898-01 | OBS | No | 3.544502 | 134.187235 | 111.6 | 3.837 | 18.5 | 20.3 | 1.78 | 8042 | 2.31 | 3741.63 |
| 008740898-02 | OBS | No | 3.544522 | 132.318963 | 64.2 | 2.424 | 9.7 | 11.0 | 1.78 | 8042 | 1.67 | 3741.60 |
| 008740898-03 | OBS | No | 1.181470 | 132.692934 | 17.0 | 1.976 | 8.4 | 5.0 | 1.78 | 8042 | 0.85 | 16189.65 |
| 008740898-04 | OBS | No | 249.303169 | 264.565967 | 444.7 | 15.115 | 10.8 | 8.3 | 1.78 | 8042 | 4.32 | 12.89 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|--|
| 008740898-01 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | SWEET_NTL—LPP_DV |
| 008740898-02 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | SWEET_NTL—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT—SAME_NTL_PERIOD—CENT_FEW_DIFFS |
| 008740898-03 | OBS | FP | 0.00 | 1 | 0 | 1 | 0 | INDIV_TRANS_RUBBLE_SKYE_ZUMA_TRACKER—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD—CENT_FEW_DIFFS—HALO_GHOST |
| 008740898-04 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_MARSHALL_SKYE—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—INCONSISTENT_TRANS |

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

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

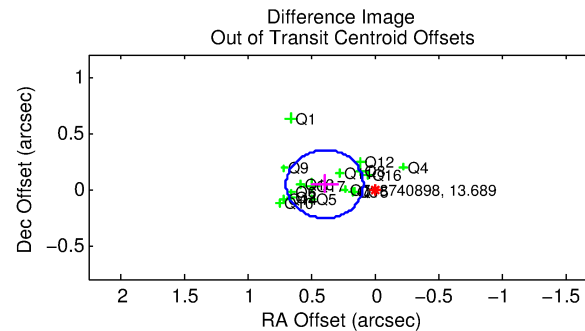
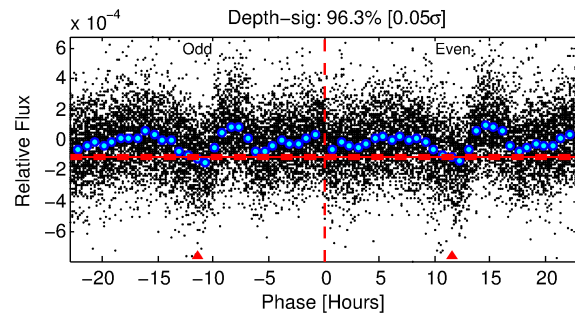
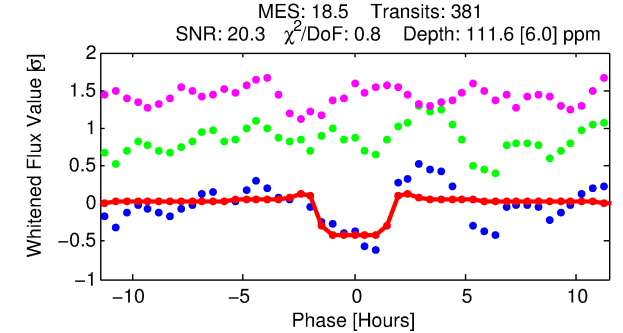
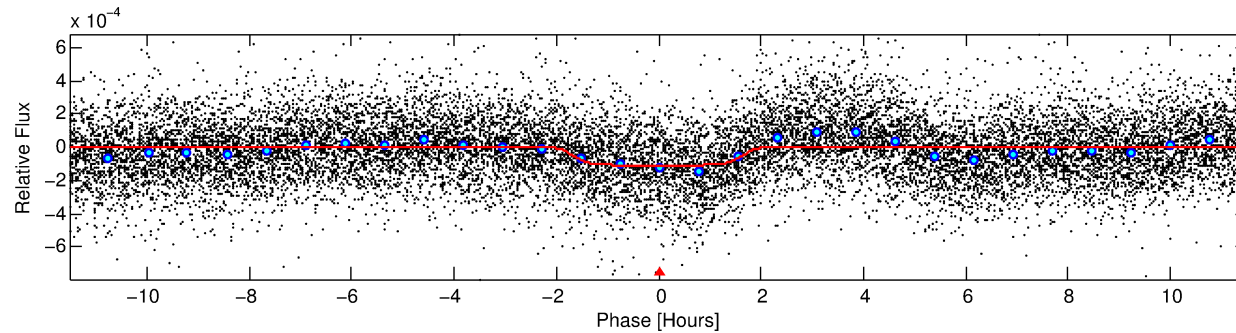
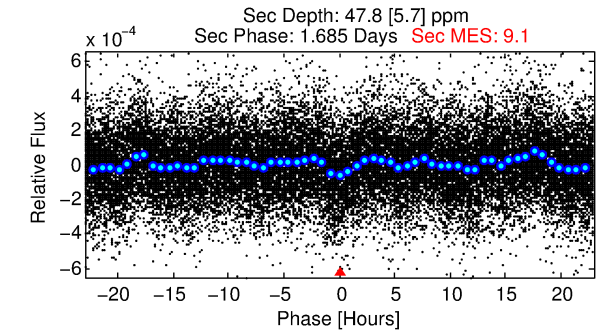
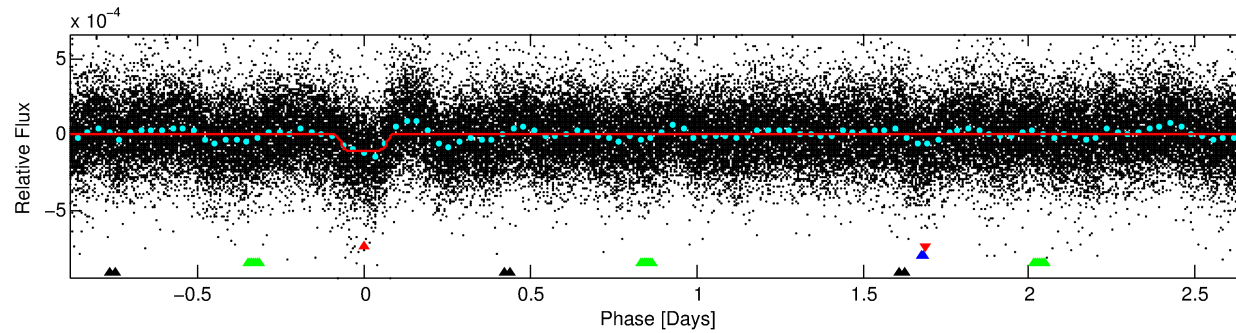
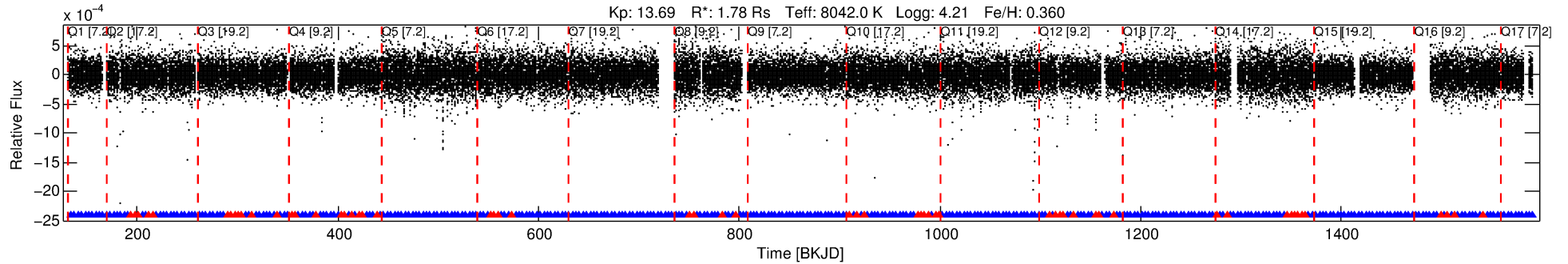
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 008740898-01

No Significant Match Found

DV One-Page Summary

KIC: 8740898 Candidate: 1 of 4 Period: 3.545 d



DV Fit Results:

Period = 3.54450 [0.00001] d
Epoch = 134.1872 [0.0019] BKJD
Rp/R* = 0.0119 [0.0006]
a/R* = 2.54 [0.64]
b = 0.96 [0.03]
Seff = 3741.63 [1637.31]
Teff = 1994 [218] K
Rp = 2.31 [0.79] Re
a = 0.0563 [0.0158] AU
Ag = 15.61 [6.75] [2.16σ]
Teffp = 6129 [365] K [9.72σ]

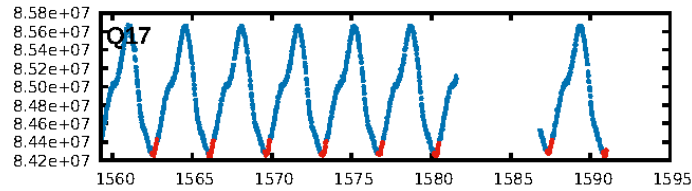
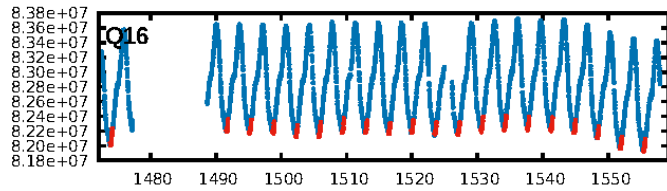
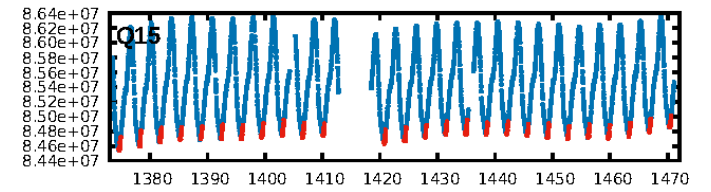
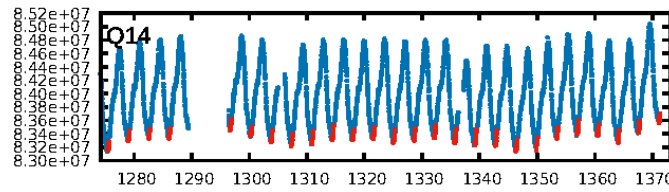
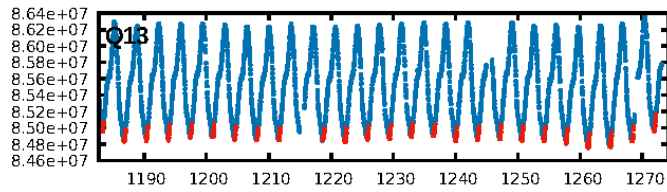
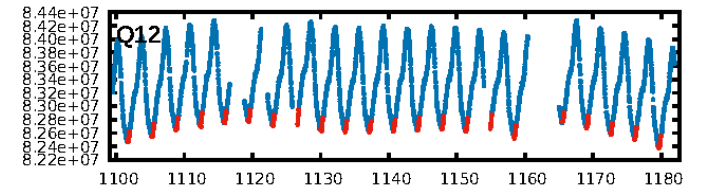
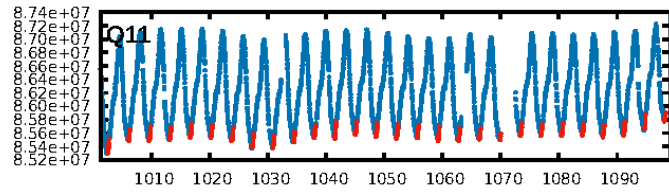
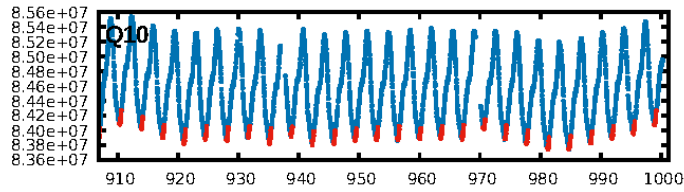
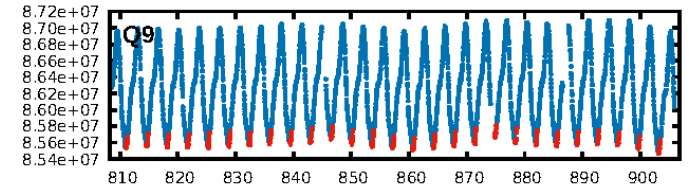
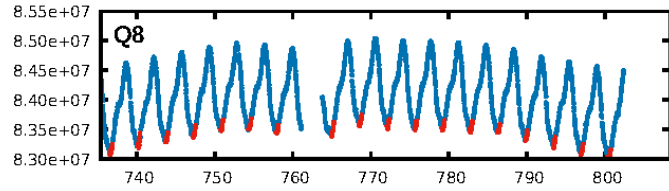
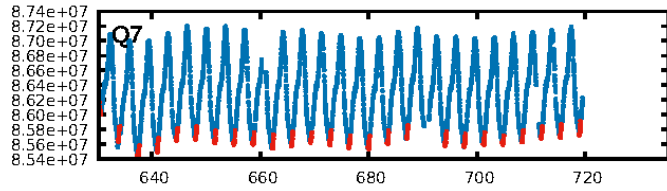
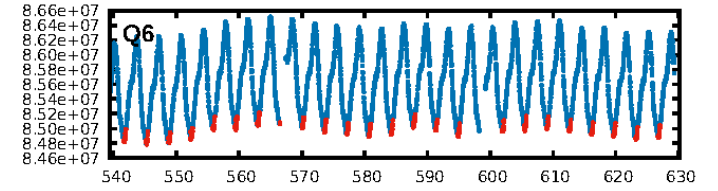
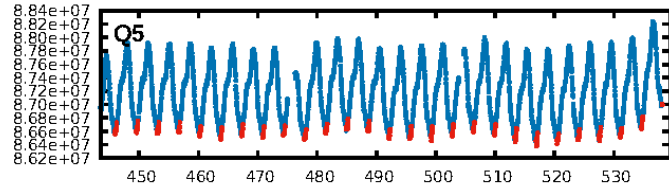
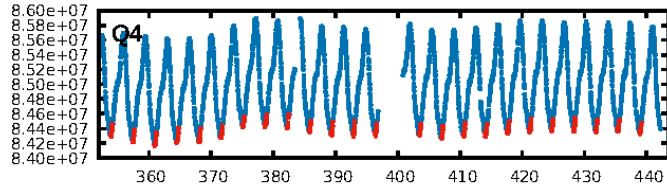
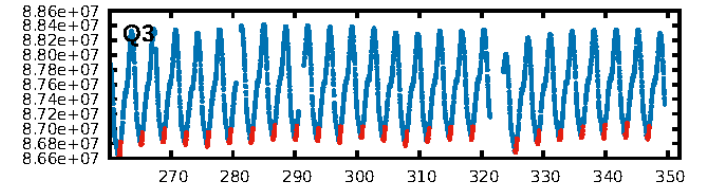
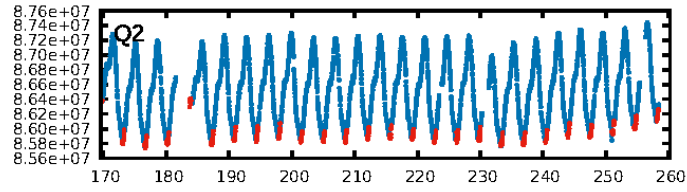
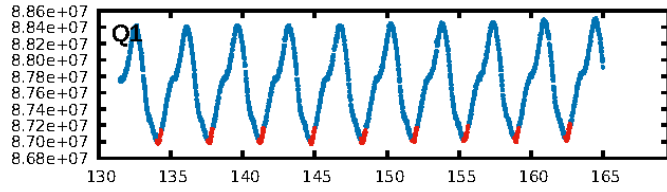
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [13.14σ]
LongPeriod-sig: 0.0% [0.00σ]
ModelChiSquare2-sig: N/A
ModelChiSquareGof-sig: N/A
Bootstrap-pfa: 1.19e-64
RollingBand-fgt: 0.84 [306/364]
GhostDiagnostic-chr: 0.9406
Centroid-sig: 0.0%
Centroid-so: 1.380 arcsec [3.24σ]
OotOffset-rm: 0.393 arcsec [3.89σ]
KicOffset-rm: 0.377 arcsec [3.63σ]
OotOffset-st: 4/4/4/5 [17]
KicOffset-st: 4/4/4/5 [17]
DiffImageQuality-fgm: 1.00 [17/17]
DiffImageOverlap-fno: 0.00 [0/17]

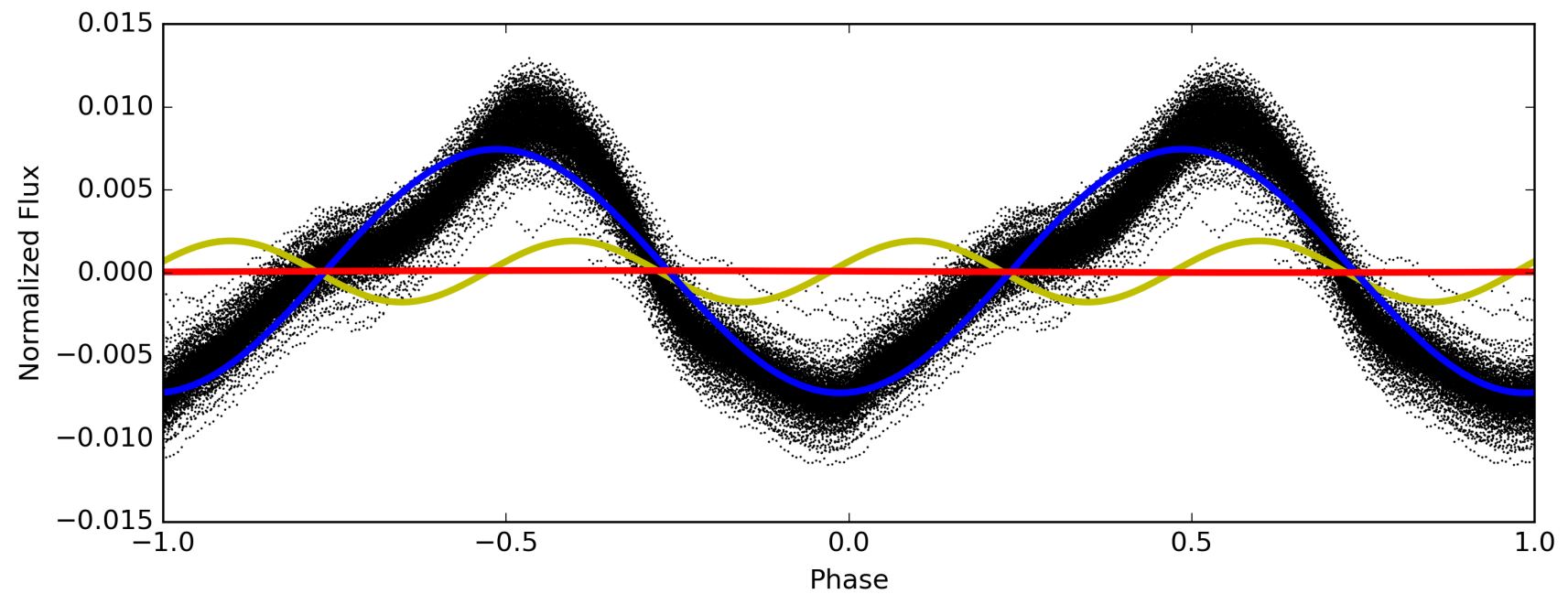
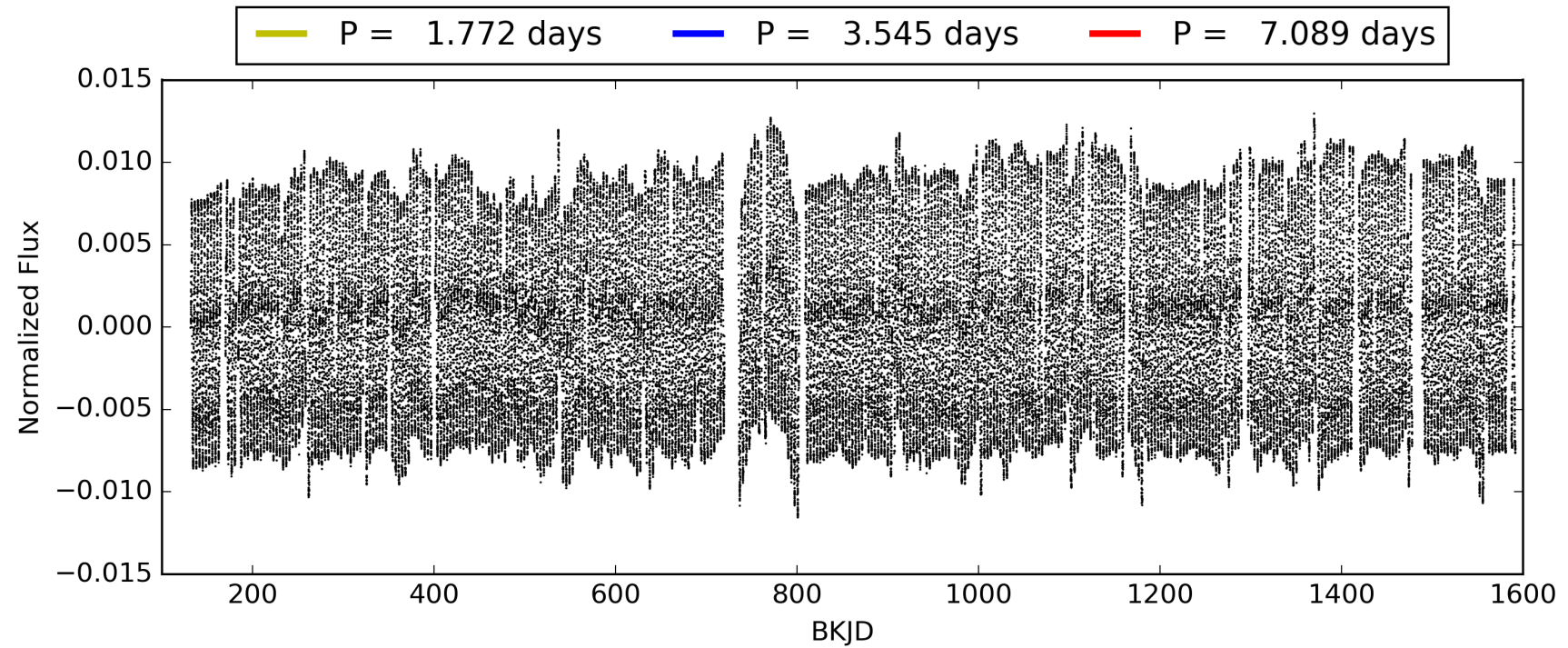
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 23:11:45 Z

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

TCE 008740898-01, PDC Light Curves

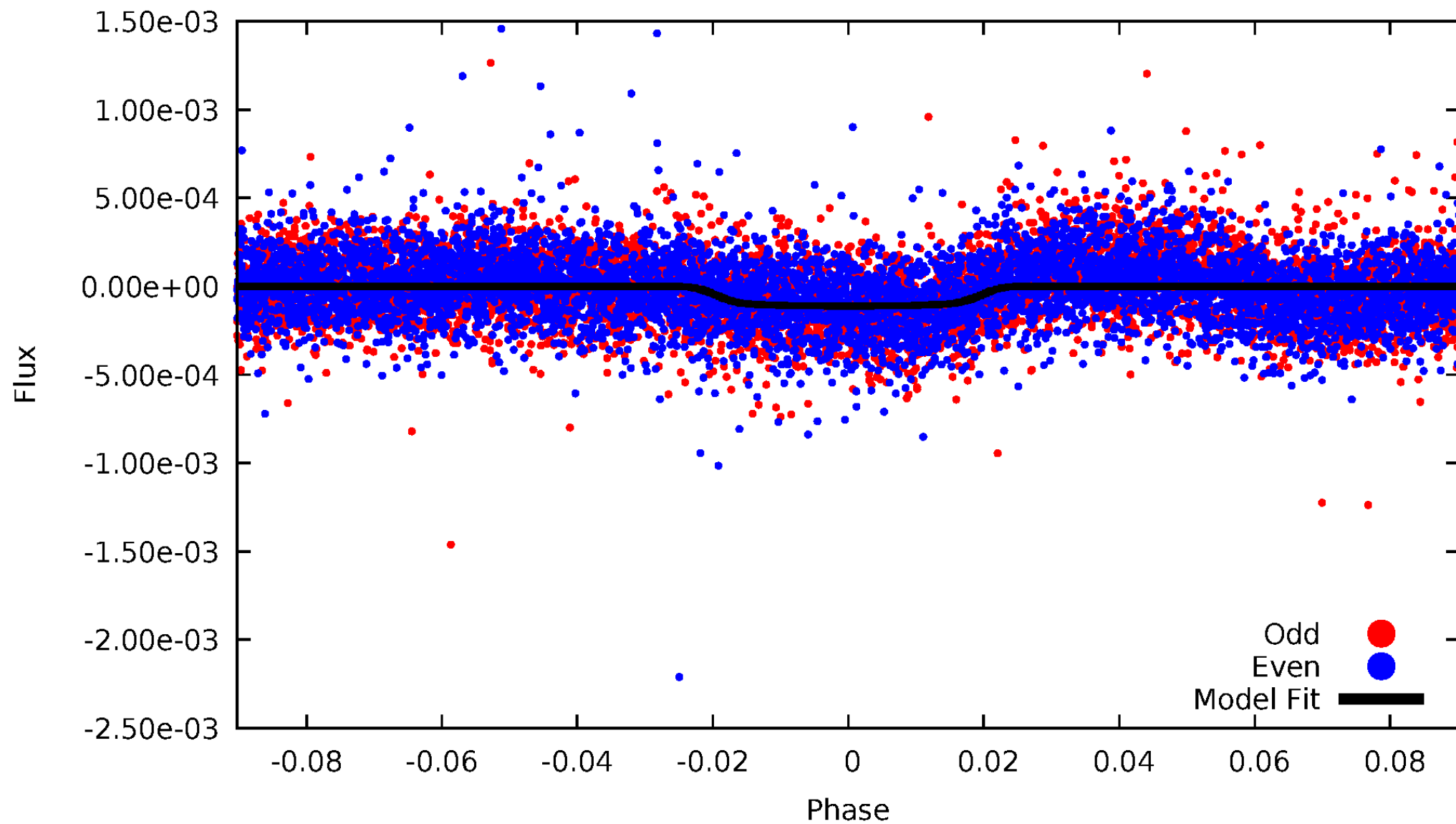


TCE 008740898-01



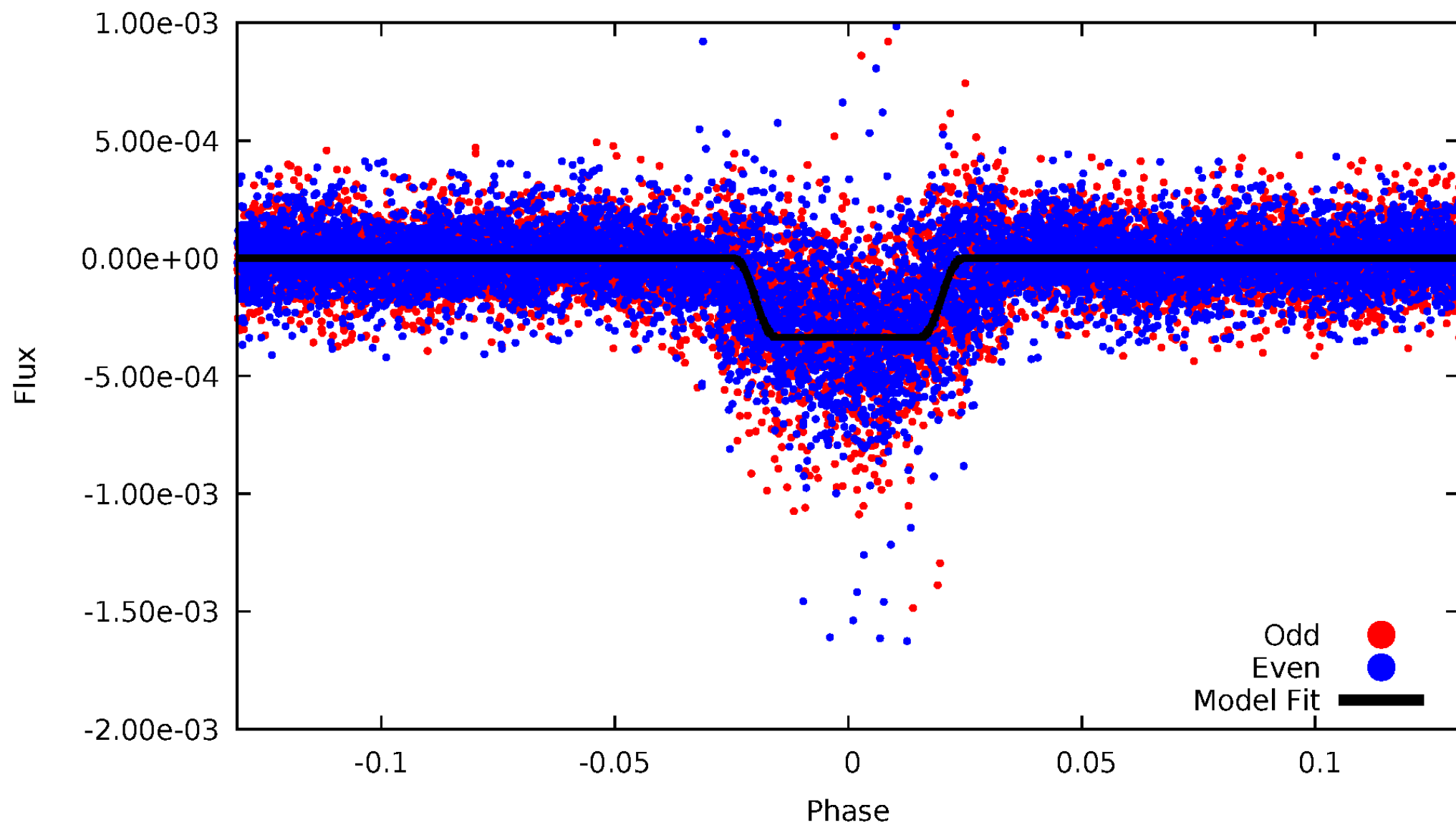
DV Odd/Even

TCE 008740898-01

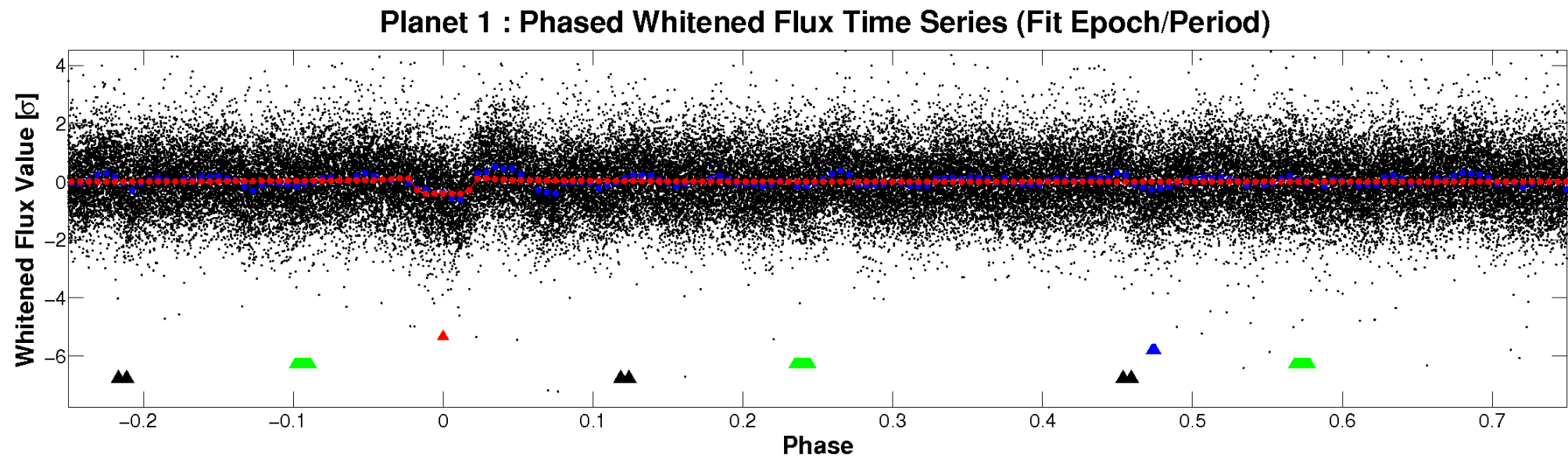
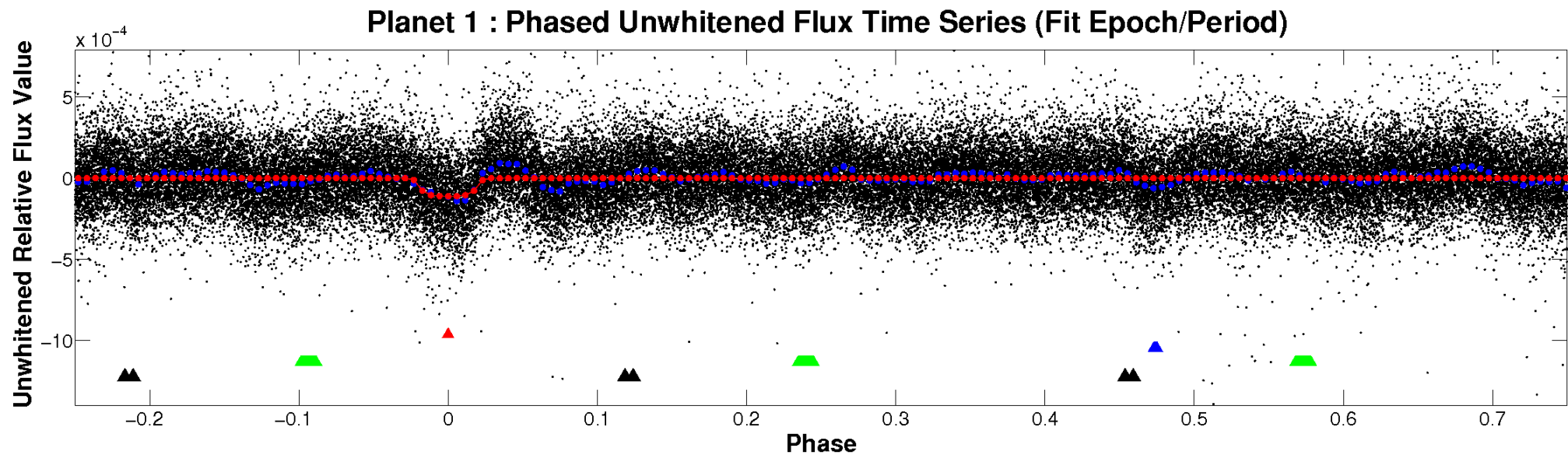


ALT Odd/Even

TCE 008740898-01

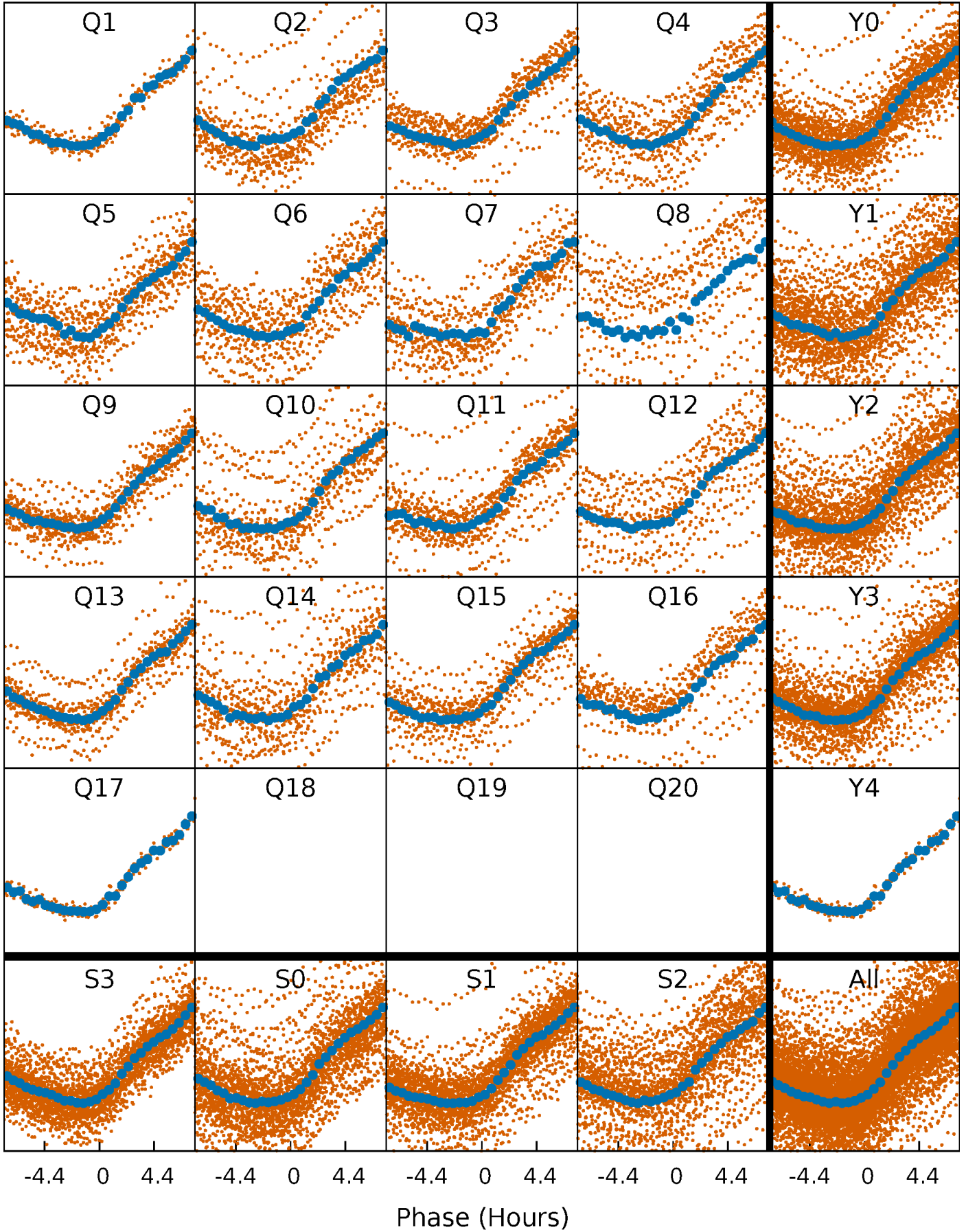


Non-Whitened Vs. Whitened Light Curve



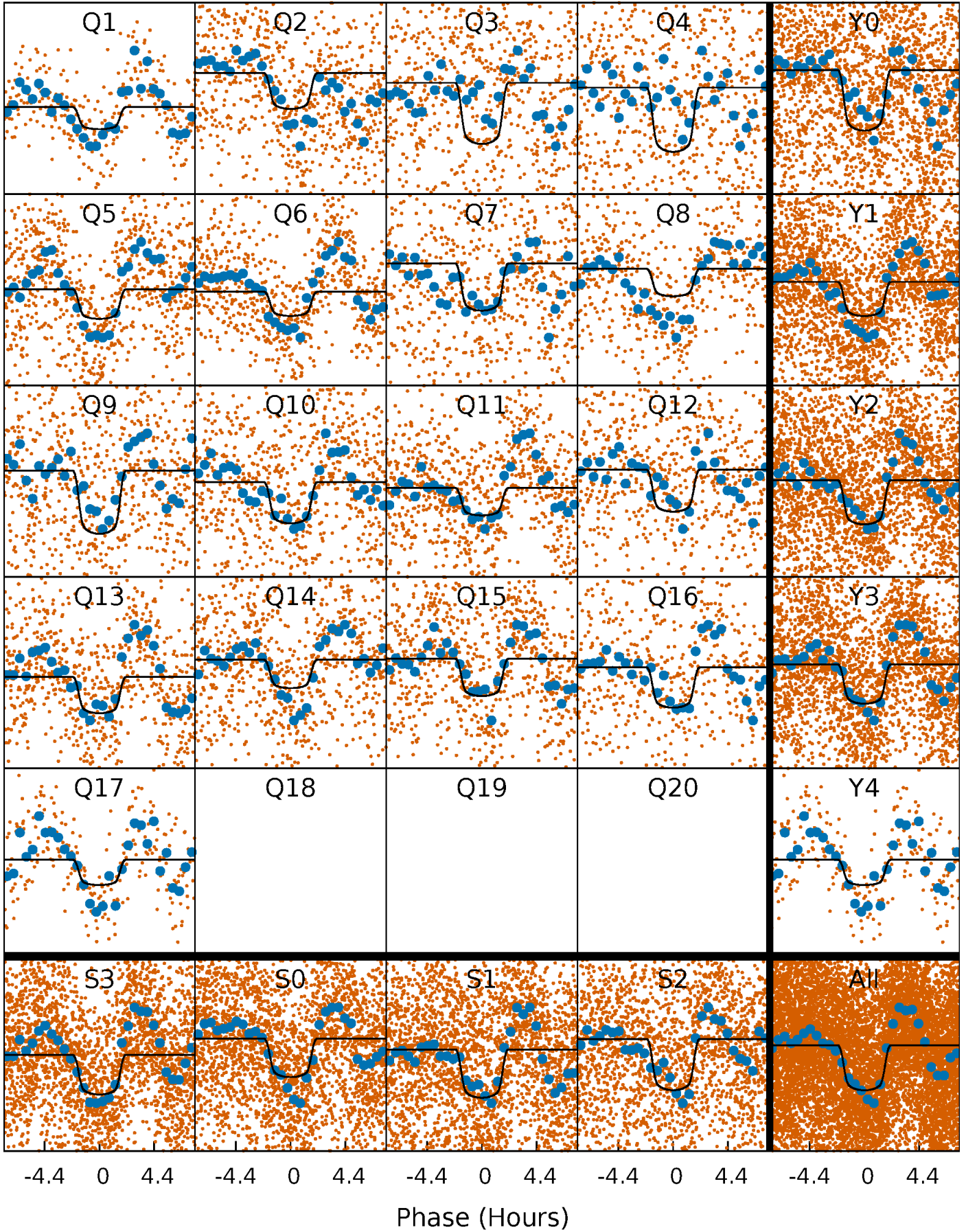
PDC Quarter-Phased Transit Curves

TCE 008740898-01 P= 3.544502 Days $T_0=134.187236$ (BKJD)



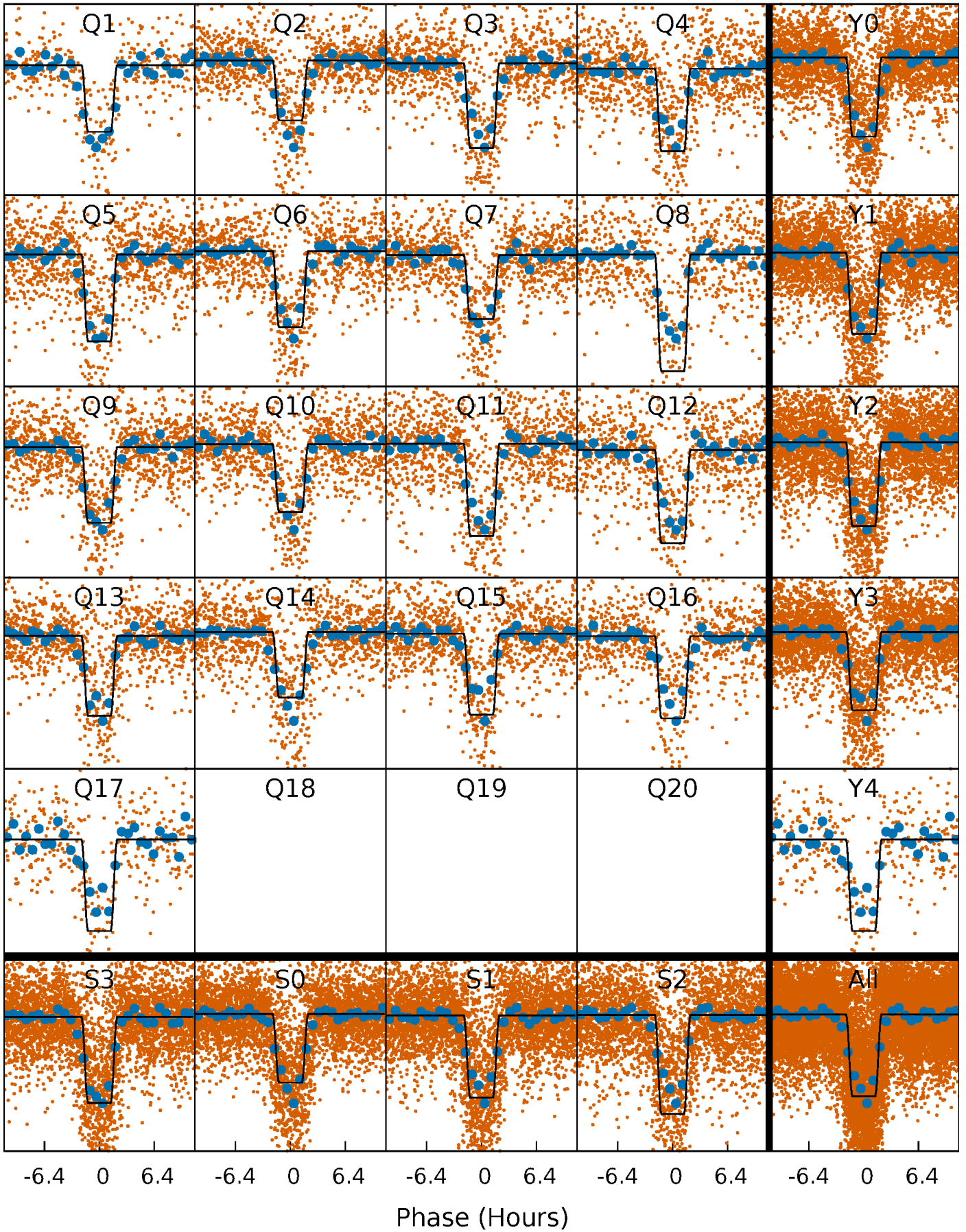
DV Quarter-Phased Transit Curves

TCE 008740898-01 P= 3.544502 Days $T_0=134.187236$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

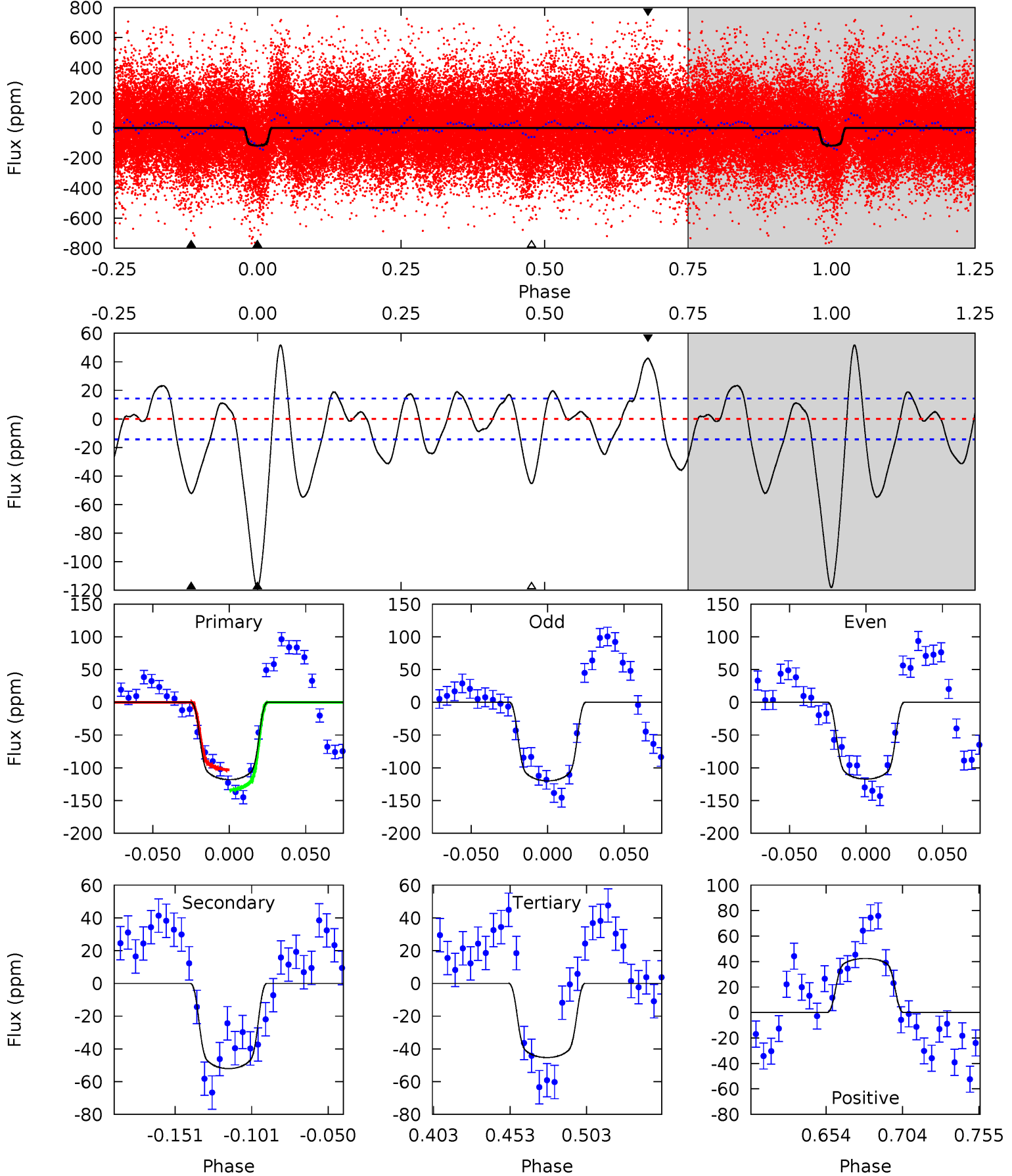
TCE 008740898-01 P= 3.544513 Days $T_0=134.197116$ (BKJD)



DV Model-Shift Uniqueness Test

008740898-01, P = 3.544502 Days, E = 130.642734 Days

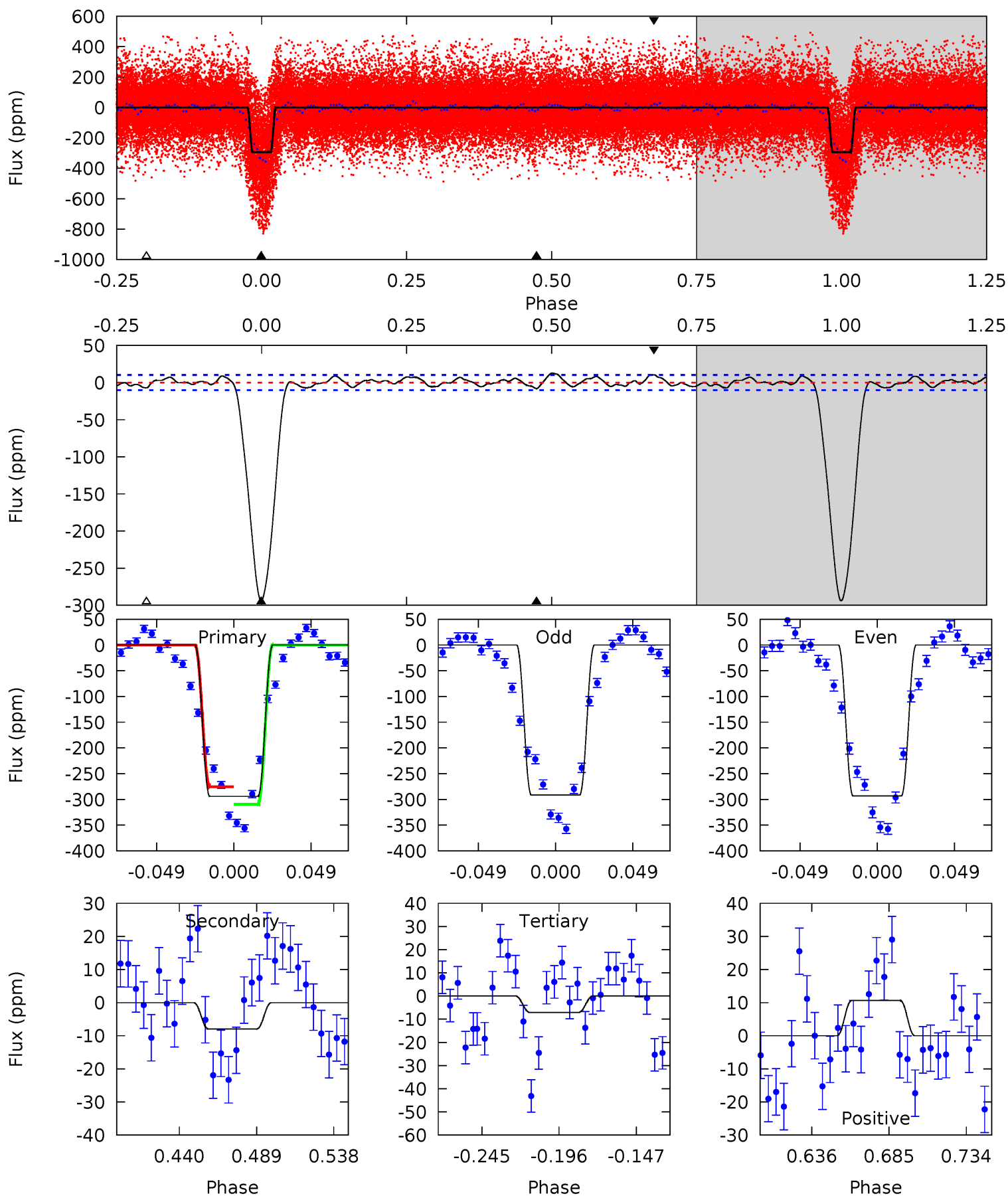
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 38.9 | 17.2 | 14.9 | 14.0 | 4.71 | 1.96 | 6.50 | 24.0 | 24.9 | 2.23 | 3.17 | 0.43 | 1.04 | 0.30 | 5.11 |



Alt Model-Shift Uniqueness Test

008740898-01, P = 3.544513 Days, E = 130.652603 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|-------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 134.8 | 3.65 | 3.26 | 4.89 | 4.71 | 1.97 | 1.92 | 131.6 | 129.9 | 0.39 | -1.24 | 0.38 | 1.09 | 0.04 | 7.86 |



Stellar Parameters For KIC 008740898

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | R (R_{\odot}) | M (M_{\odot}) | p_{\star} ($\text{g}\cdot\text{cm}^{-3}$) |
|--------|----------------------|---------------------------|---------------------------|---------------------------|---------------------------|---|
| | 8042^{+224}_{-352} | $4.215^{+0.054}_{-0.216}$ | $0.360^{+0.050}_{-0.500}$ | $1.779^{+0.602}_{-0.201}$ | $1.897^{+0.288}_{-0.262}$ | $0.474^{+0.105}_{-0.261}$ |
| | +3%/-4% | +1%/-5% | +14%/-139% | +34%/-11% | +15%/-14% | +22%/-55% |
| Source | KIC0 | 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 008740898-01 / KOI

| Detrend | Depth (ppm) | R_p (R_{\oplus}) | T_{max} (K) | T_{obs} (K) | A_{obs} |
|---------|-------------|------------------------|----------------------|----------------------|---------------------------|
| DV | -52 ± 3 | $2.38^{+0.39}_{-0.24}$ | 2844^{+192}_{-152} | 6052^{+258}_{-261} | 16^{+3}_{-4} |
| Alt. | -8 ± 2 | $3.68^{+0.66}_{-0.35}$ | 2841^{+221}_{-156} | 3322^{+203}_{-276} | $0.957^{+0.373}_{-0.319}$ |

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

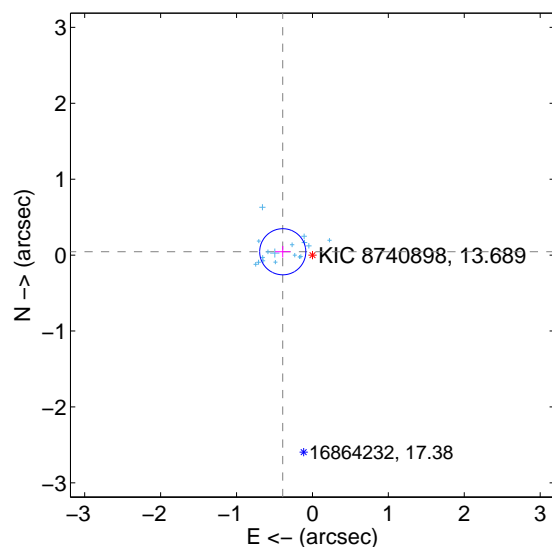
Supplemental centroid analysis for 008740898-01. Kepler magnitude: 13.69. Transit SNR 20.26

There are 17 quarters with good PRF difference image offsets

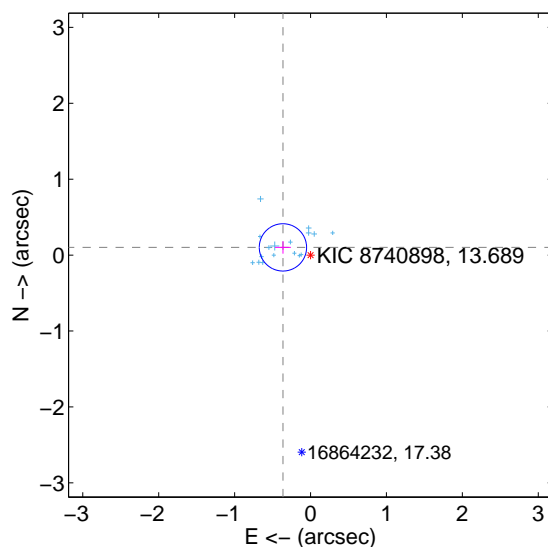
The direct PRF centroid is offset from the target star catalog position by about 0.10 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|---|--------------------|---------------------|-------------------|-------------------|
| PRF-fit source offset from OOT | 0.393 ± 0.101 | 3.89 | 0.391 ± 0.101 | 0.044 ± 0.076 |
| PRF-fit source offset from KIC position | 0.377 ± 0.104 | 3.63 | 0.363 ± 0.105 | 0.102 ± 0.082 |
| photometric centroid source offset | 1.38 ± 0.43 | 3.24 | 0.21 ± 0.50 | 1.36 ± 0.42 |

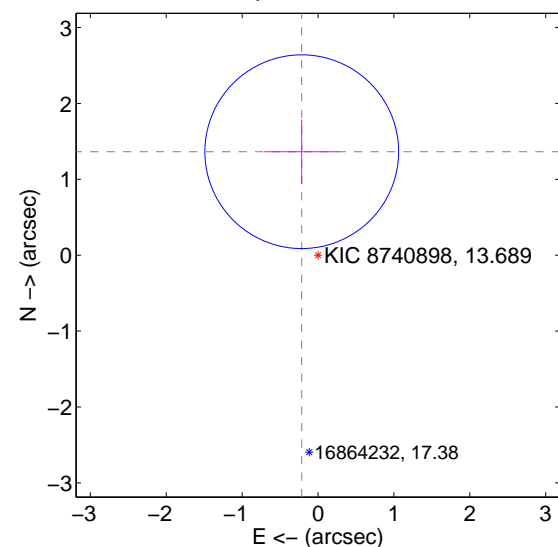
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

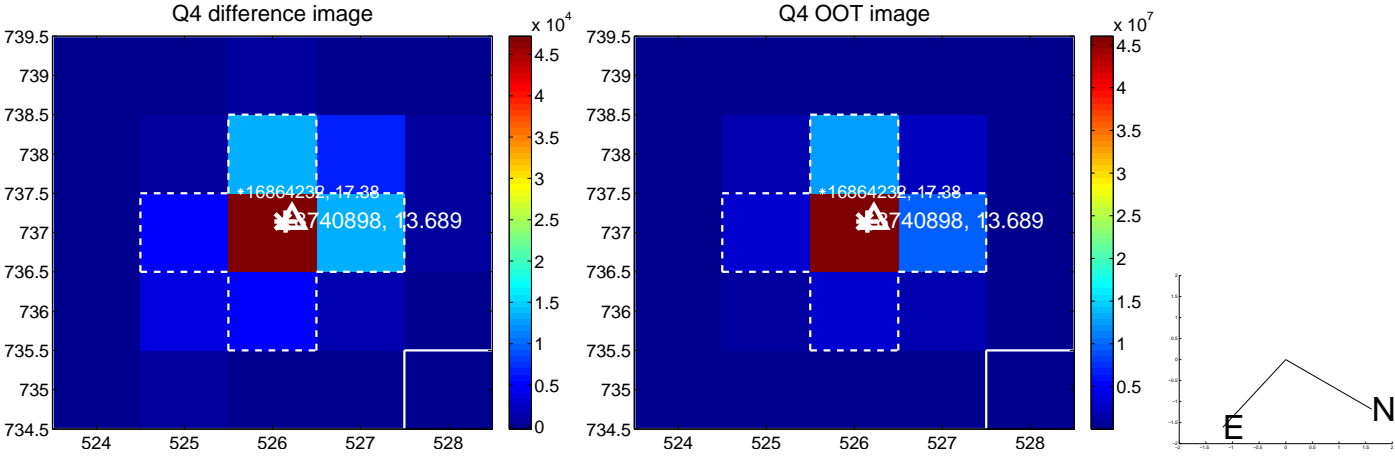
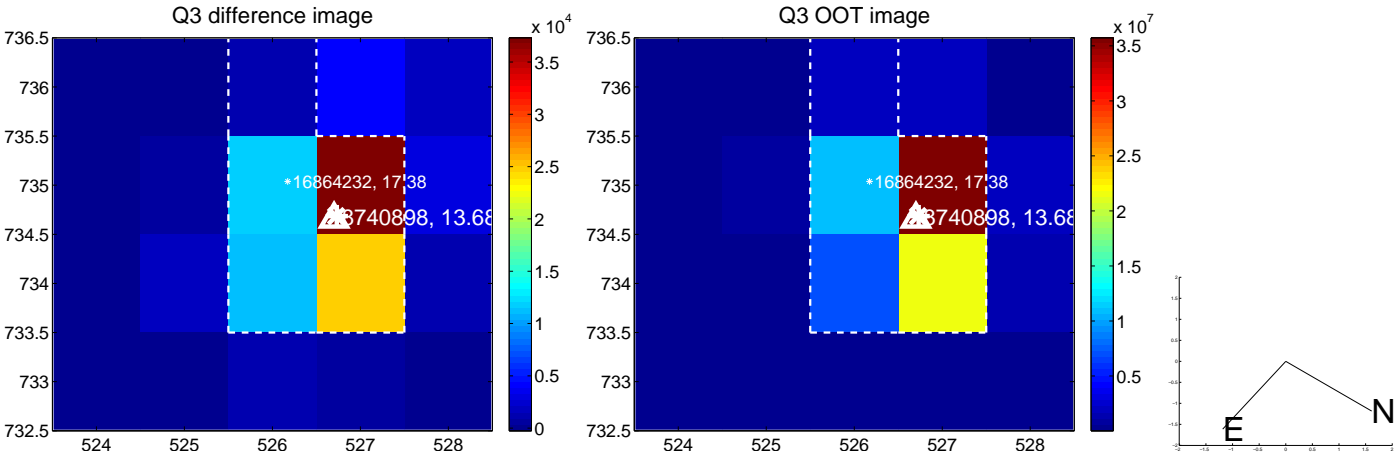
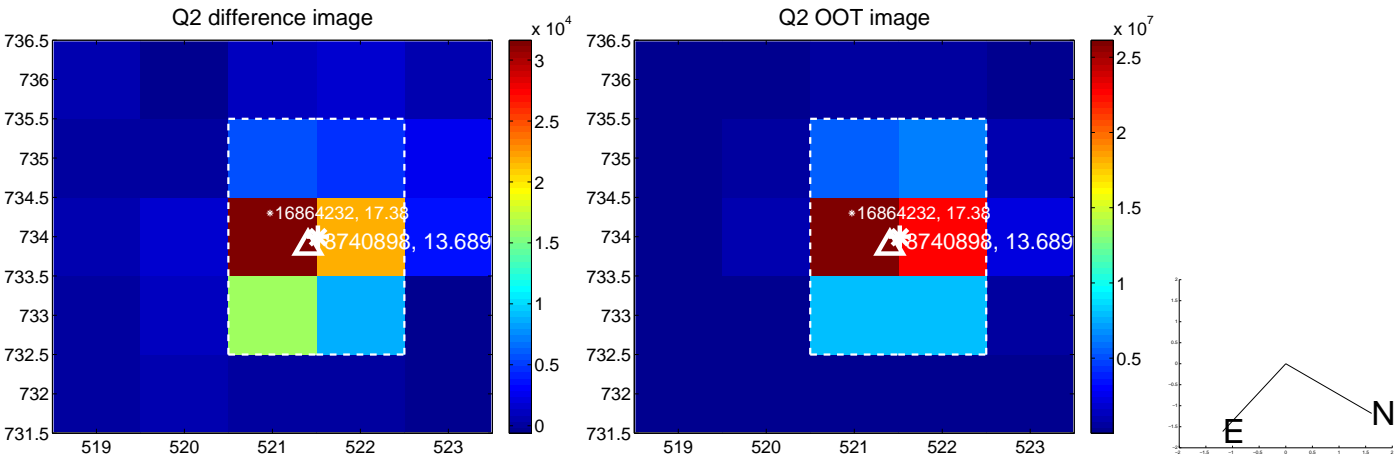
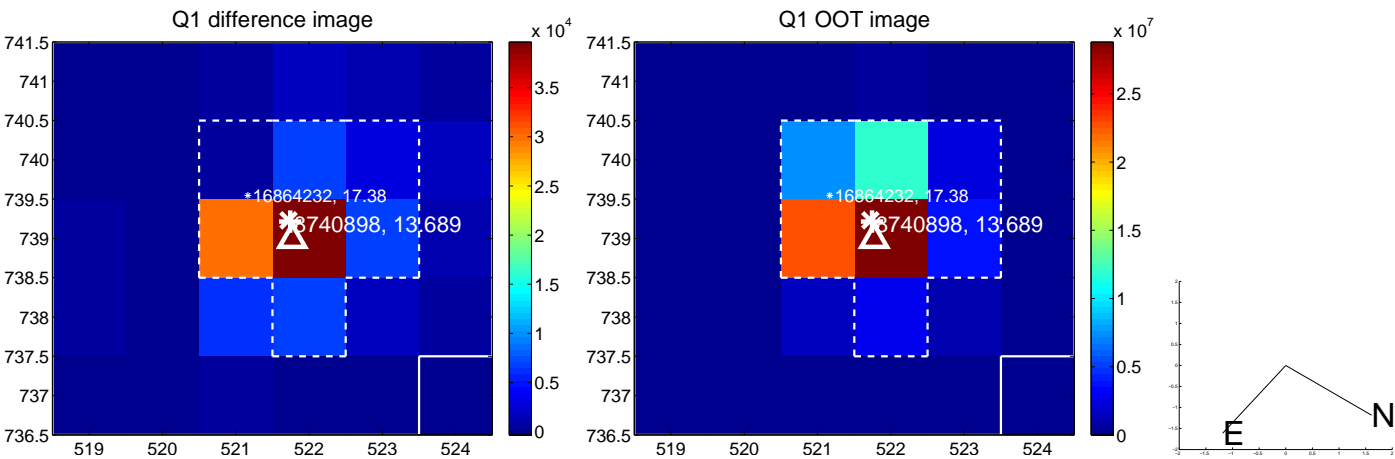


offset from photometric centroids

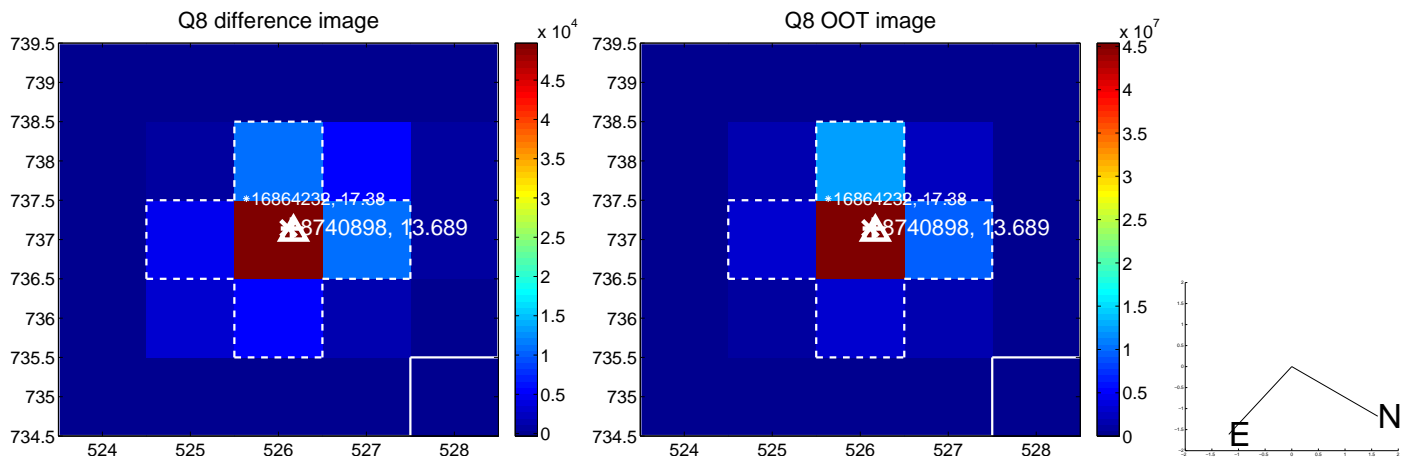
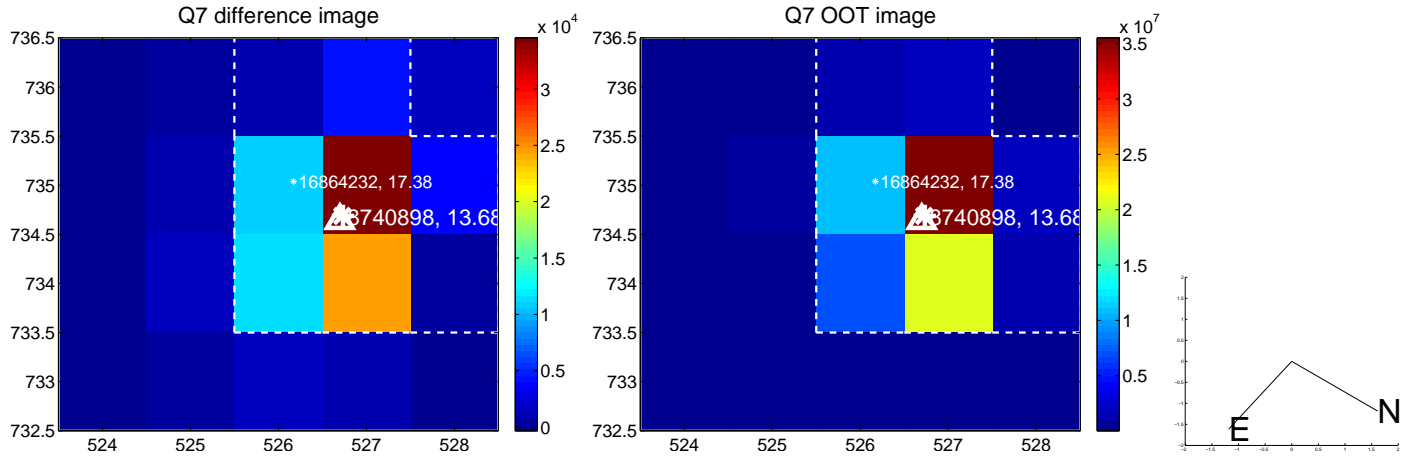
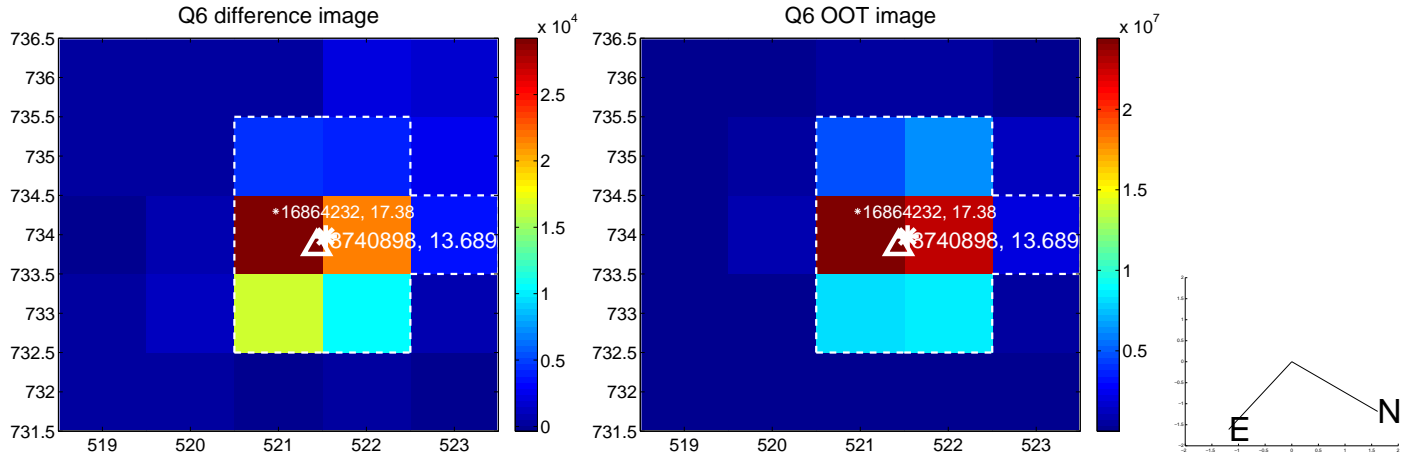
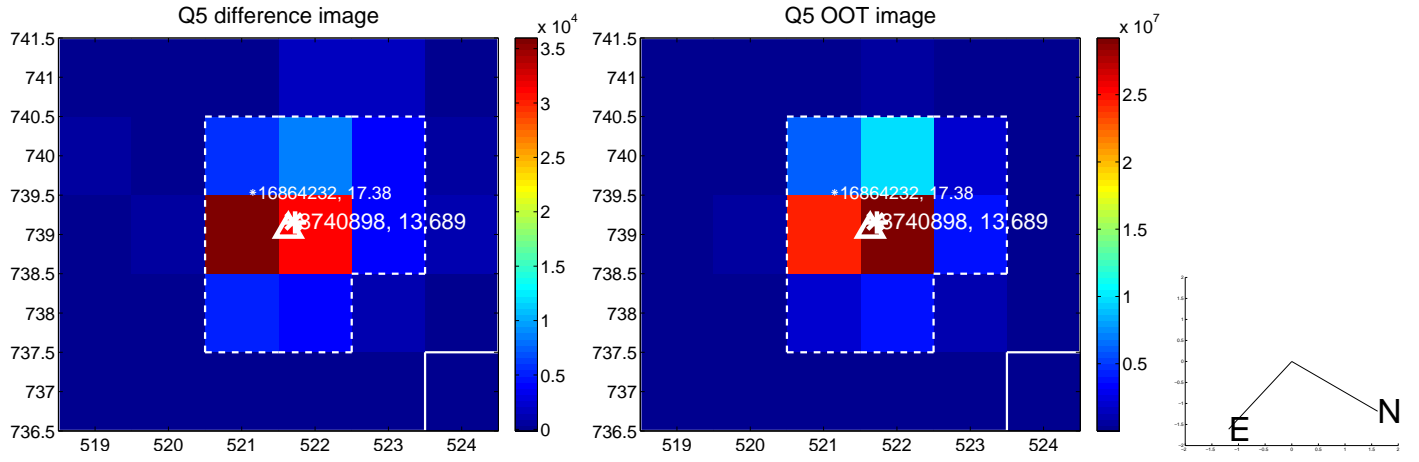


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

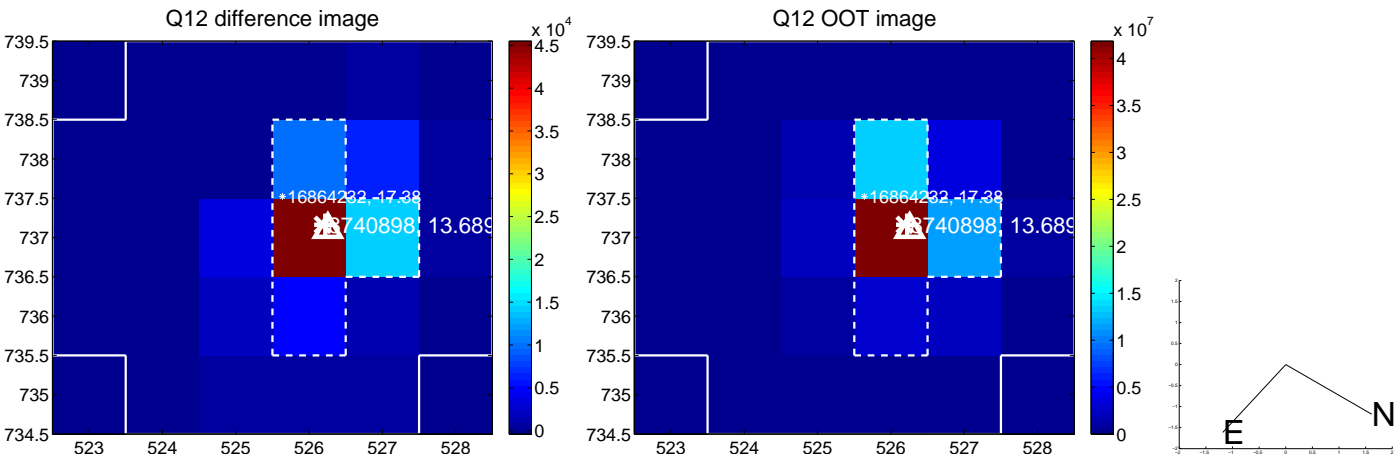
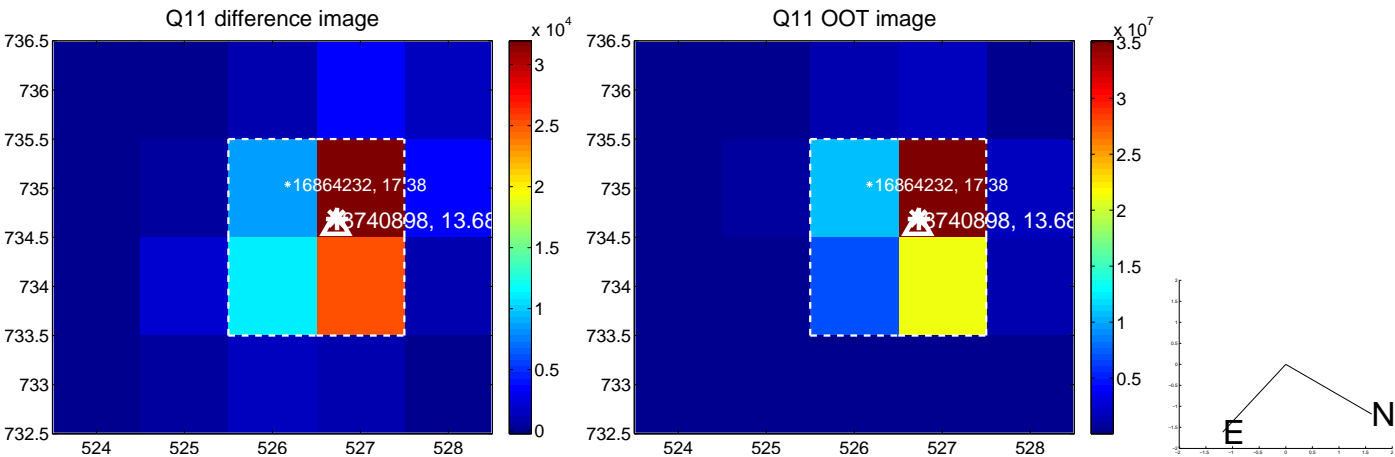
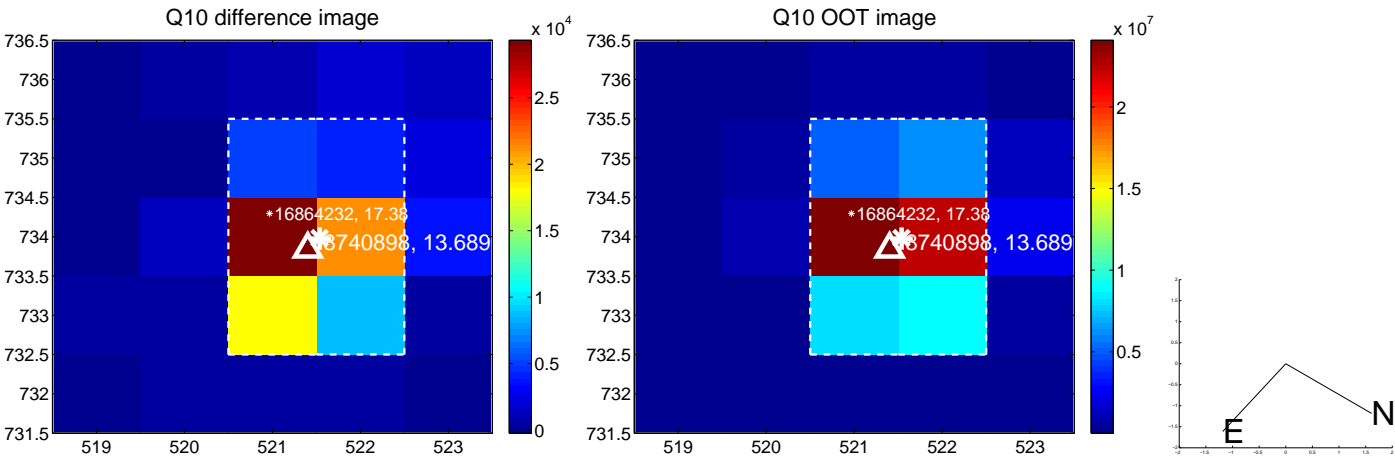
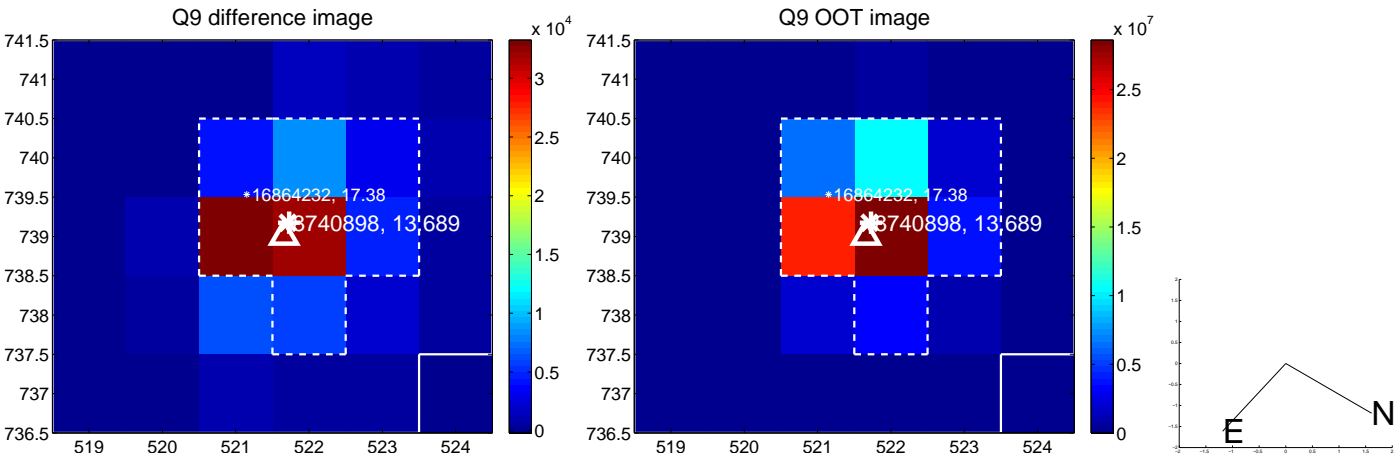
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



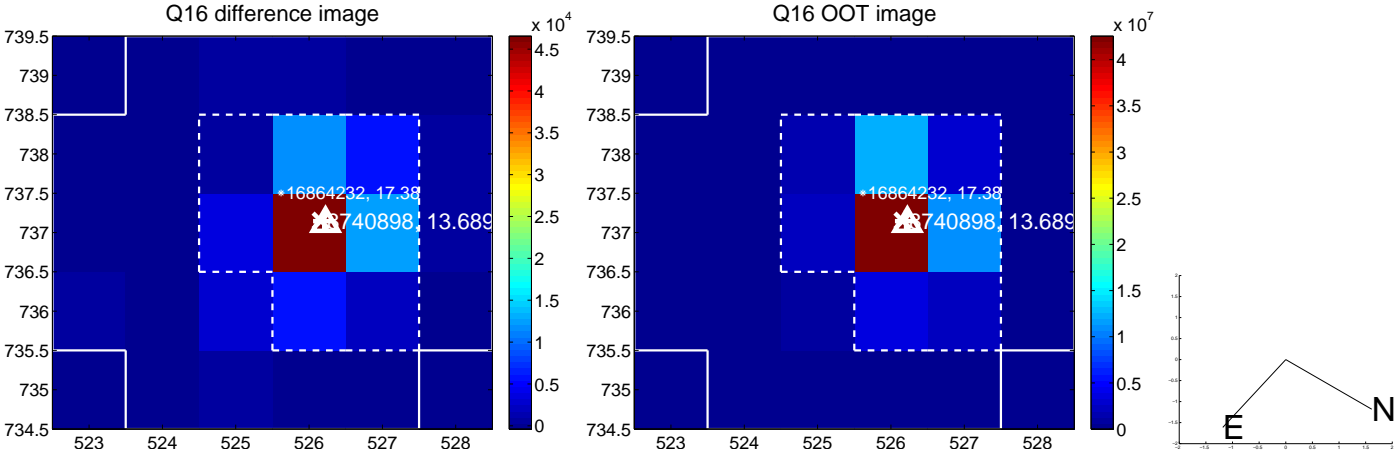
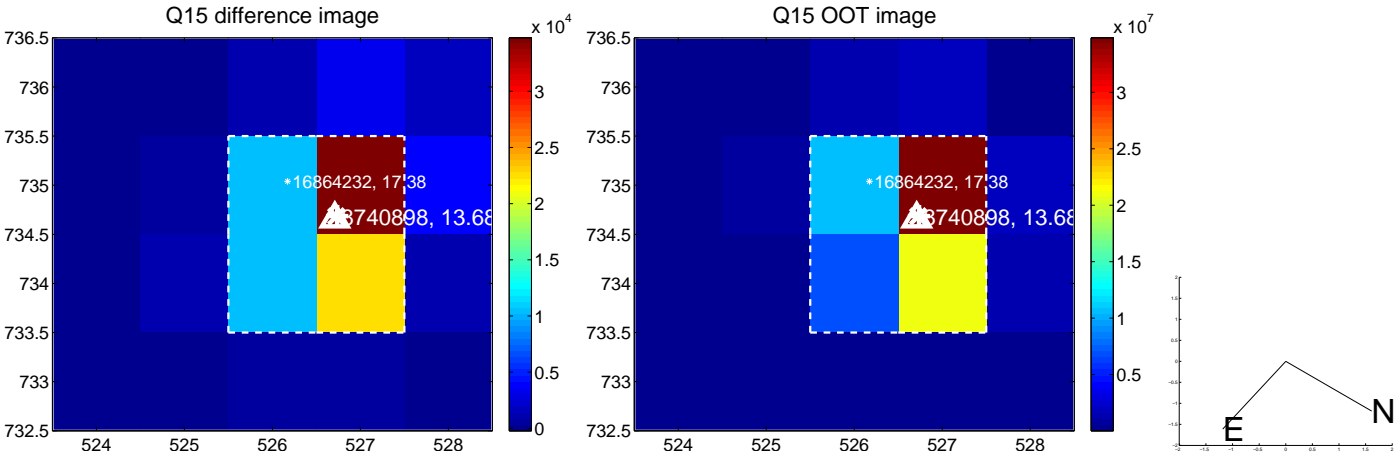
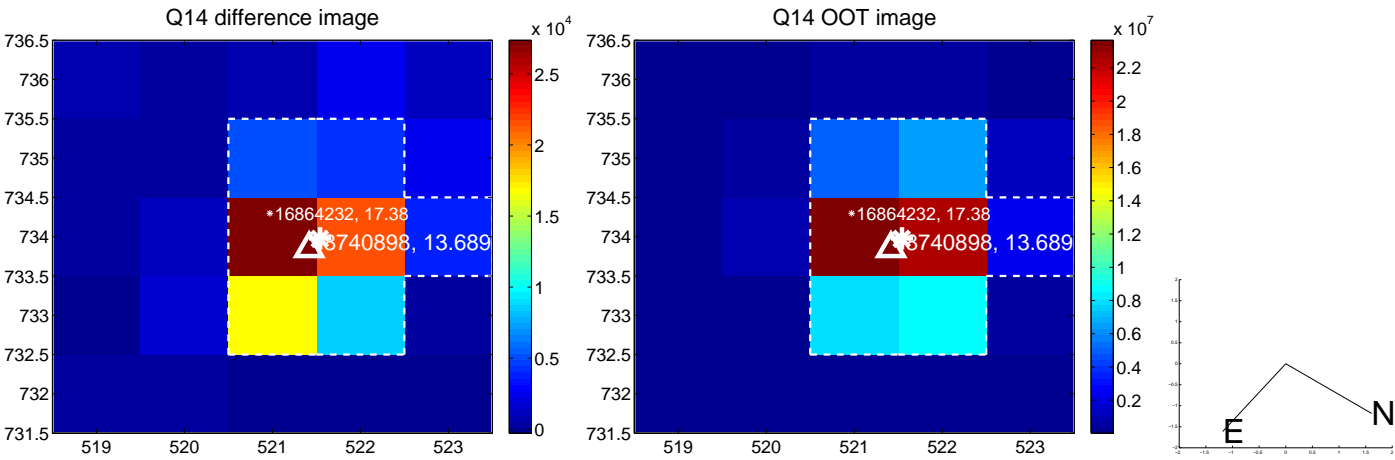
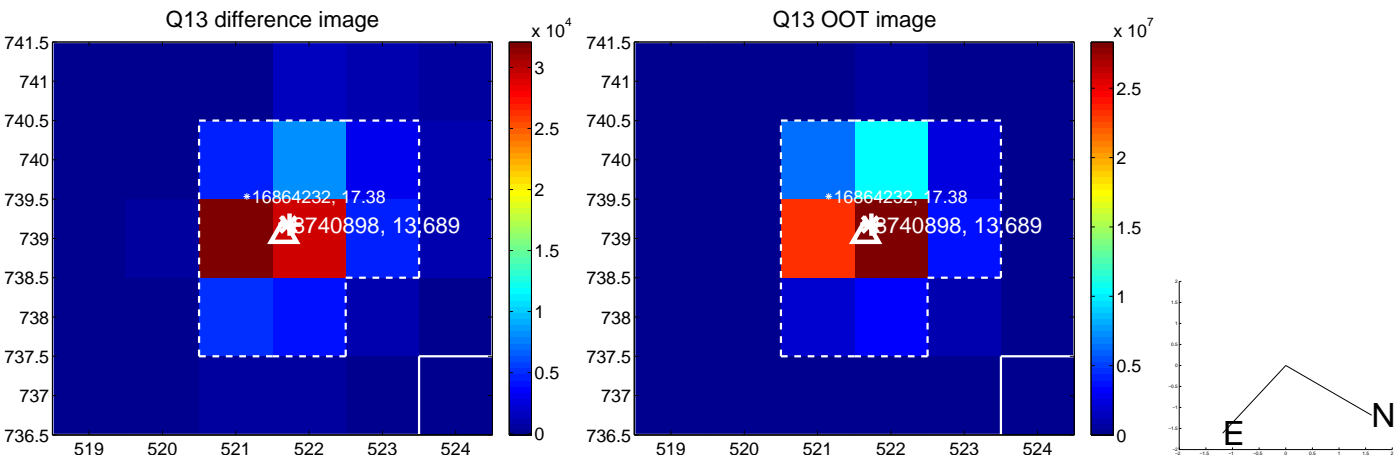
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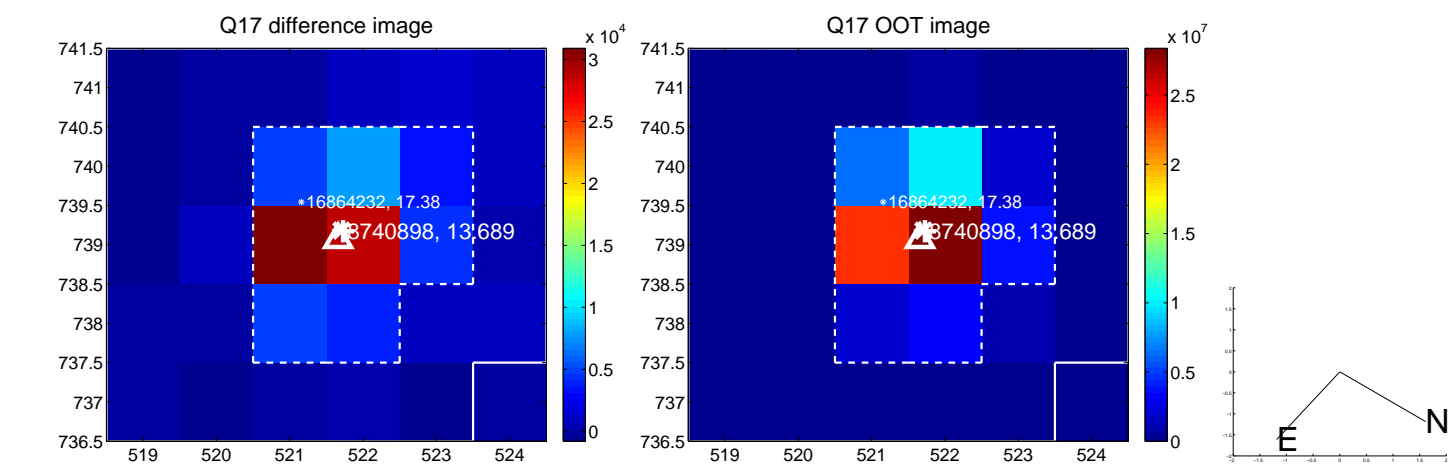
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



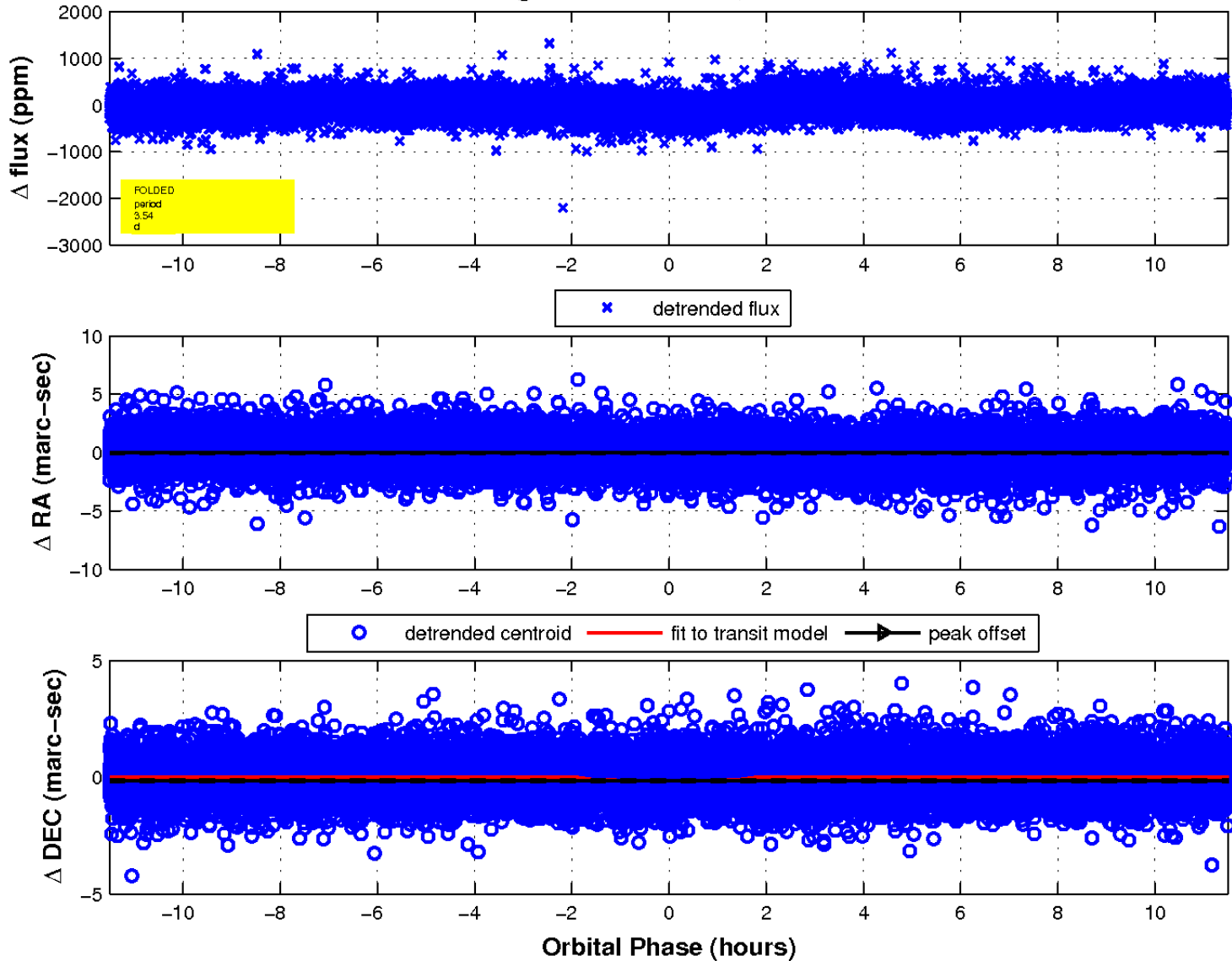
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

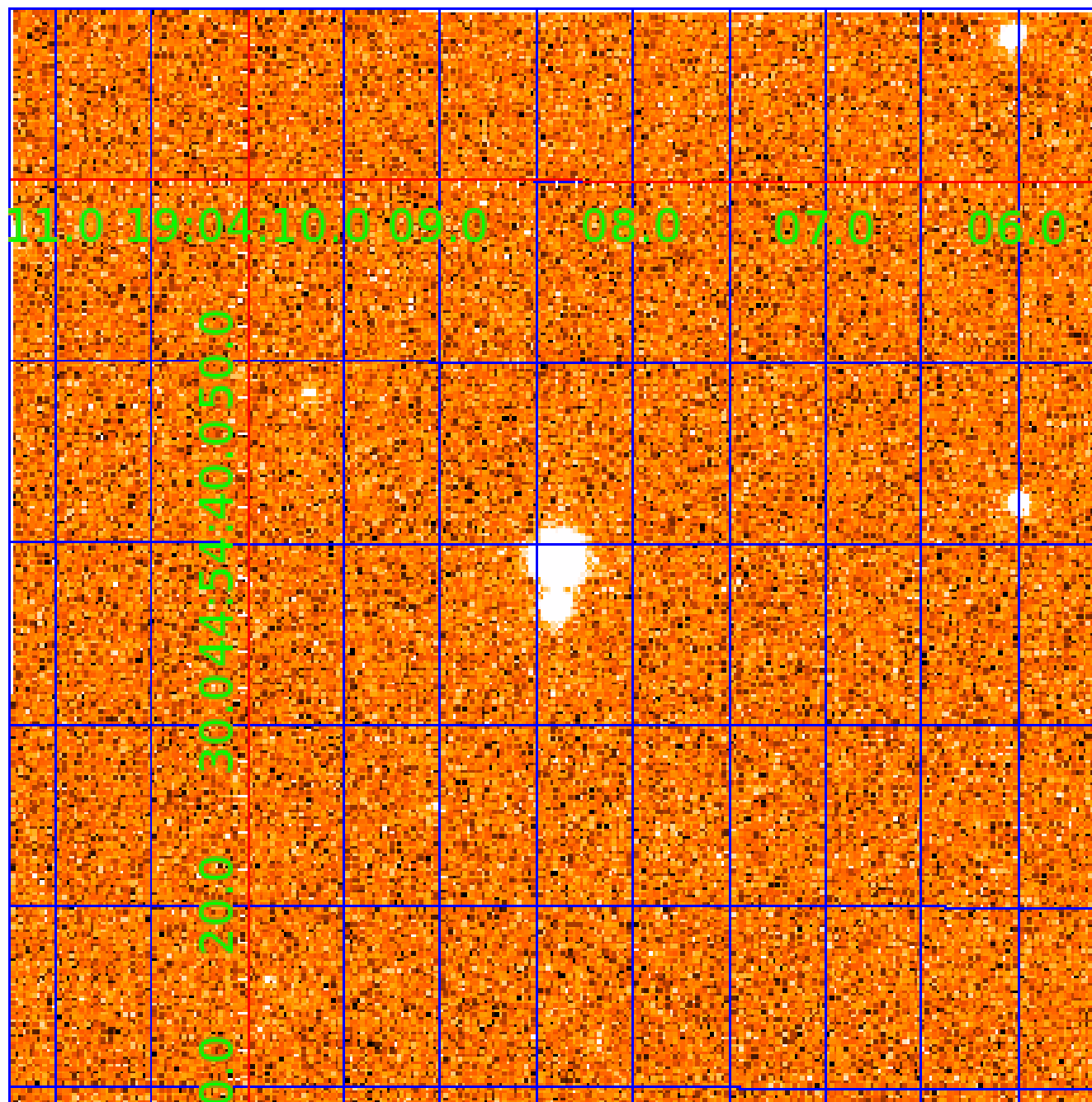


fluxWeightedCentroids, Planet 1 of 4



UKIRT Image

Declination



KIC 008740898

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}) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 008740898-01 | OBS | No | 3.544502 | 134.187235 | 111.6 | 3.837 | 18.5 | 20.3 | 1.78 | 8042 | 2.31 | 3741.63 |
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| 008740898-04 | OBS | No | 249.303169 | 264.565967 | 444.7 | 15.115 | 10.8 | 8.3 | 1.78 | 8042 | 4.32 | 12.89 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|--|
| 008740898-01 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | SWEET_NTL—LPP_DV |
| 008740898-02 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | SWEET_NTL—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT—SAME_NTL_PERIOD—CENT_FEW_DIFFS |
| 008740898-03 | OBS | FP | 0.00 | 1 | 0 | 1 | 0 | INDIV_TRANS_RUBBLE_SKYE_ZUMA_TRACKER—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD—CENT_FEW_DIFFS—HALO_GHOST |
| 008740898-04 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_MARSHALL_SKYE—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—INCONSISTENT_TRANS |

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

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

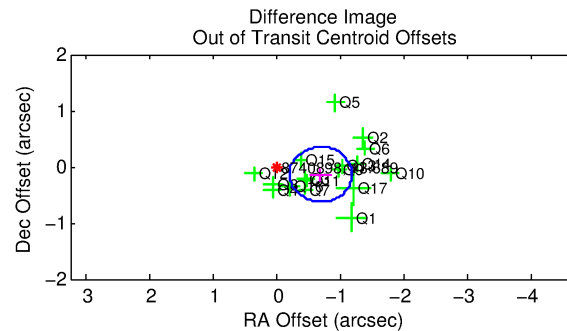
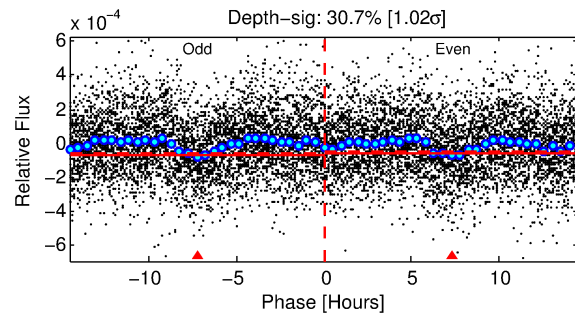
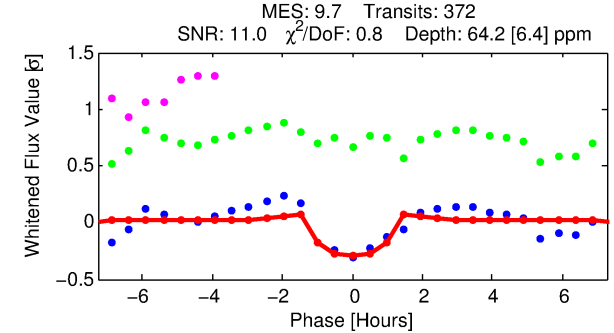
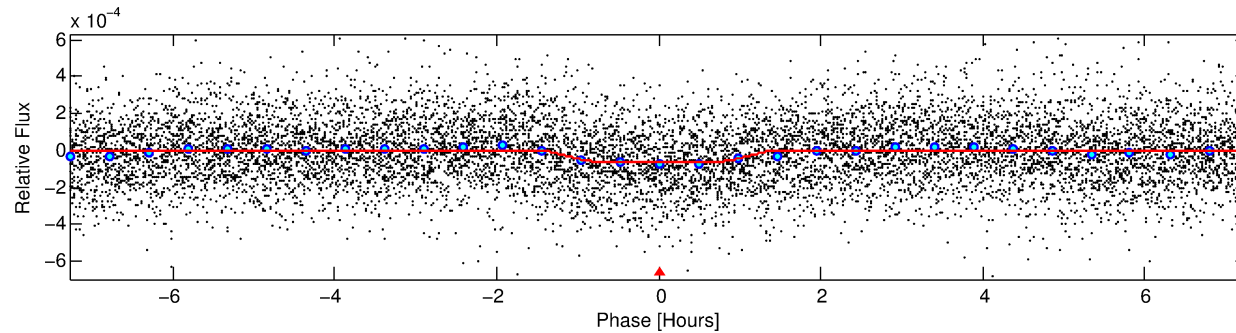
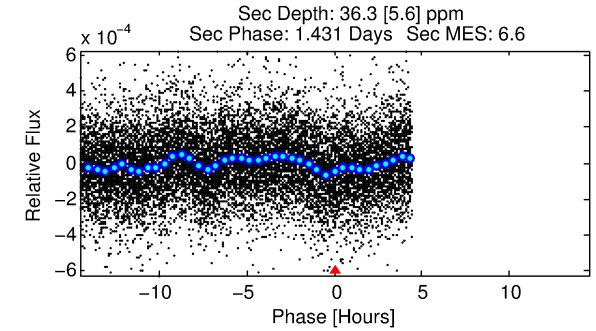
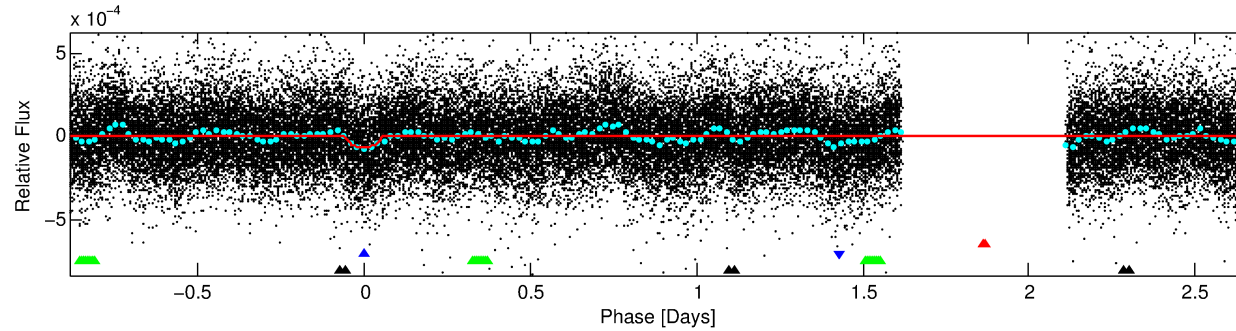
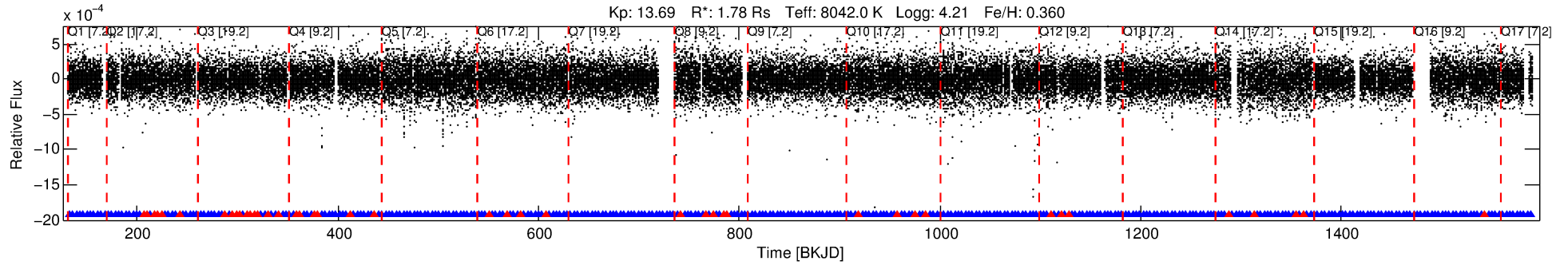
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 008740898-02

No Significant Match Found

DV One-Page Summary

KIC: 8740898 Candidate: 2 of 4 Period: 3.545 d



DV Fit Results:

Period = 3.54452 [0.00002] d
Epoch = 132.3190 [0.0028] BKJD
Rp/R* = 0.0086 [0.0027]
a/R* = 4.86 [9.45]
b = 0.91 [0.37]
Seff = 3741.60 [1637.29]
Teff = 1994 [218] K
Rp = 1.67 [0.78] Re
a = 0.0563 [0.0158] AU
Ag = 22.66 [17.37] [1.25σ]
Teffp = 6727 [1138] K [4.09σ]

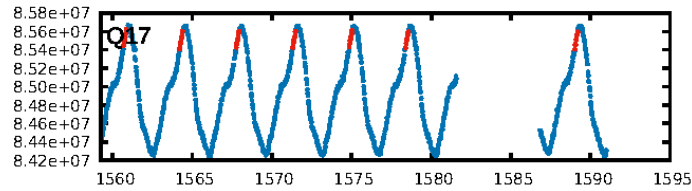
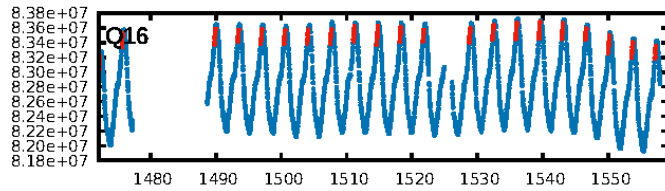
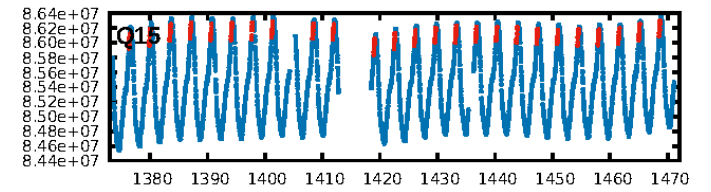
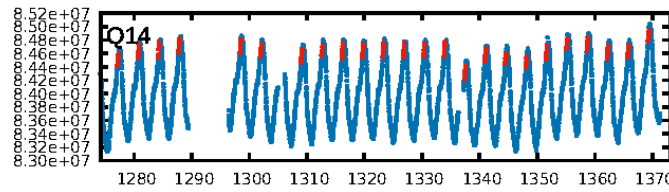
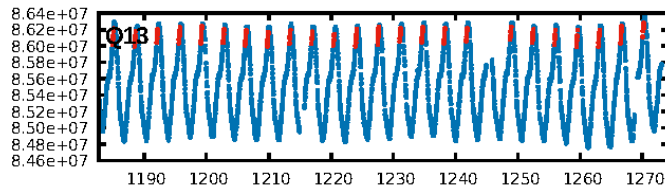
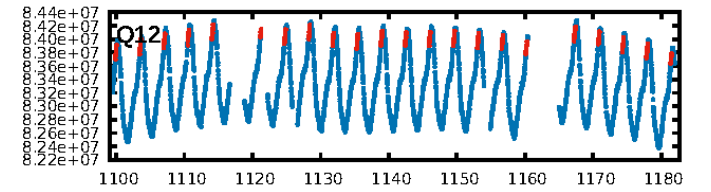
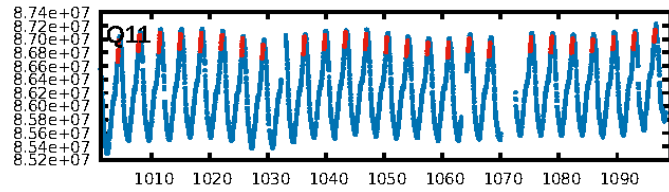
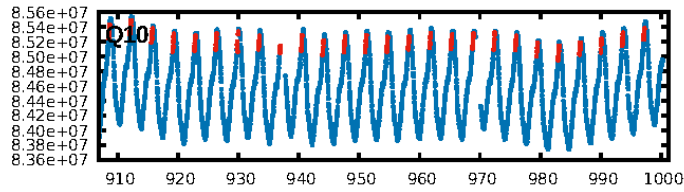
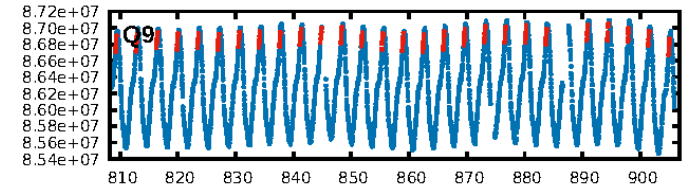
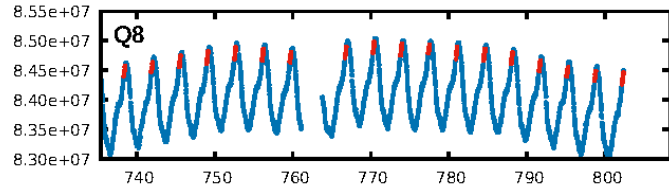
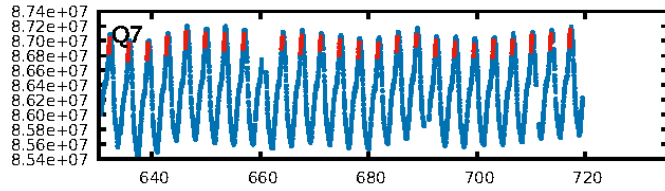
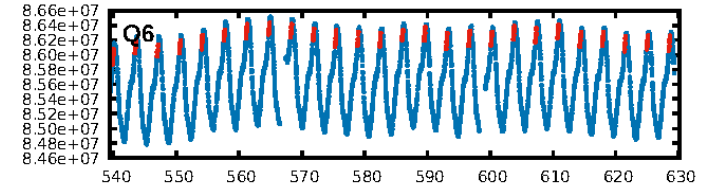
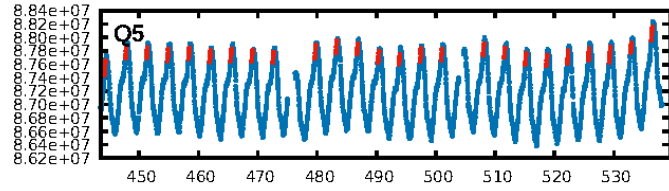
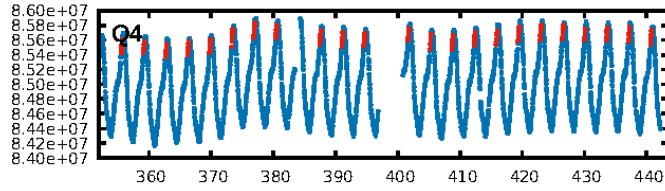
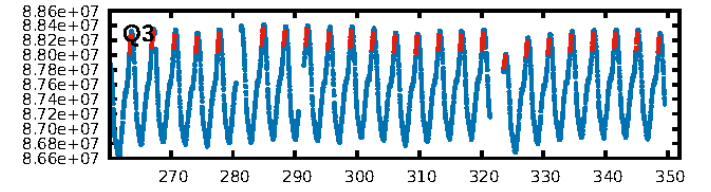
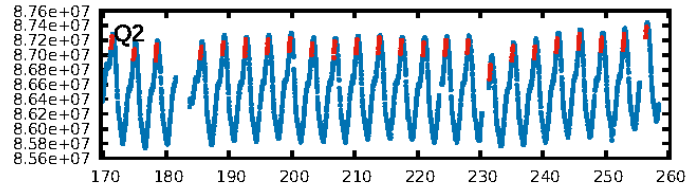
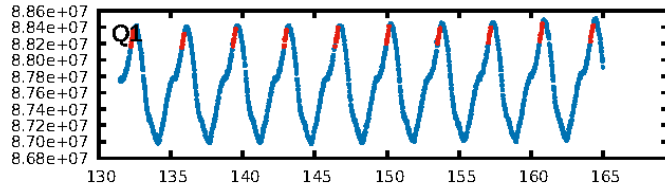
DV Diagnostic Results:

ShortPeriod-sig: 0.0% [0.00σ]
LongPeriod-sig: 100.0% [385.30σ]
ModelChiSquare2-sig: N/A
ModelChiSquareGof-sig: N/A
Bootstrap-pfa: 8.49e-20
RollingBand-fgt: 0.88 [312/355]
GhostDiagnostic-chr: -2.094
Centroid-sig: 21.3%
Centroid-so: 0.944 arcsec [1.06σ]
OotOffset-rm: 0.703 arcsec [4.31σ]
KicOffset-rm: 0.732 arcsec [4.48σ]
OotOffset-st: 4/4/4/5 [17]
KicOffset-st: 4/4/4/5 [17]
DiffImageQuality-fgm: 0.00 [0/17]
DiffImageOverlap-fno: 1.00 [17/17]

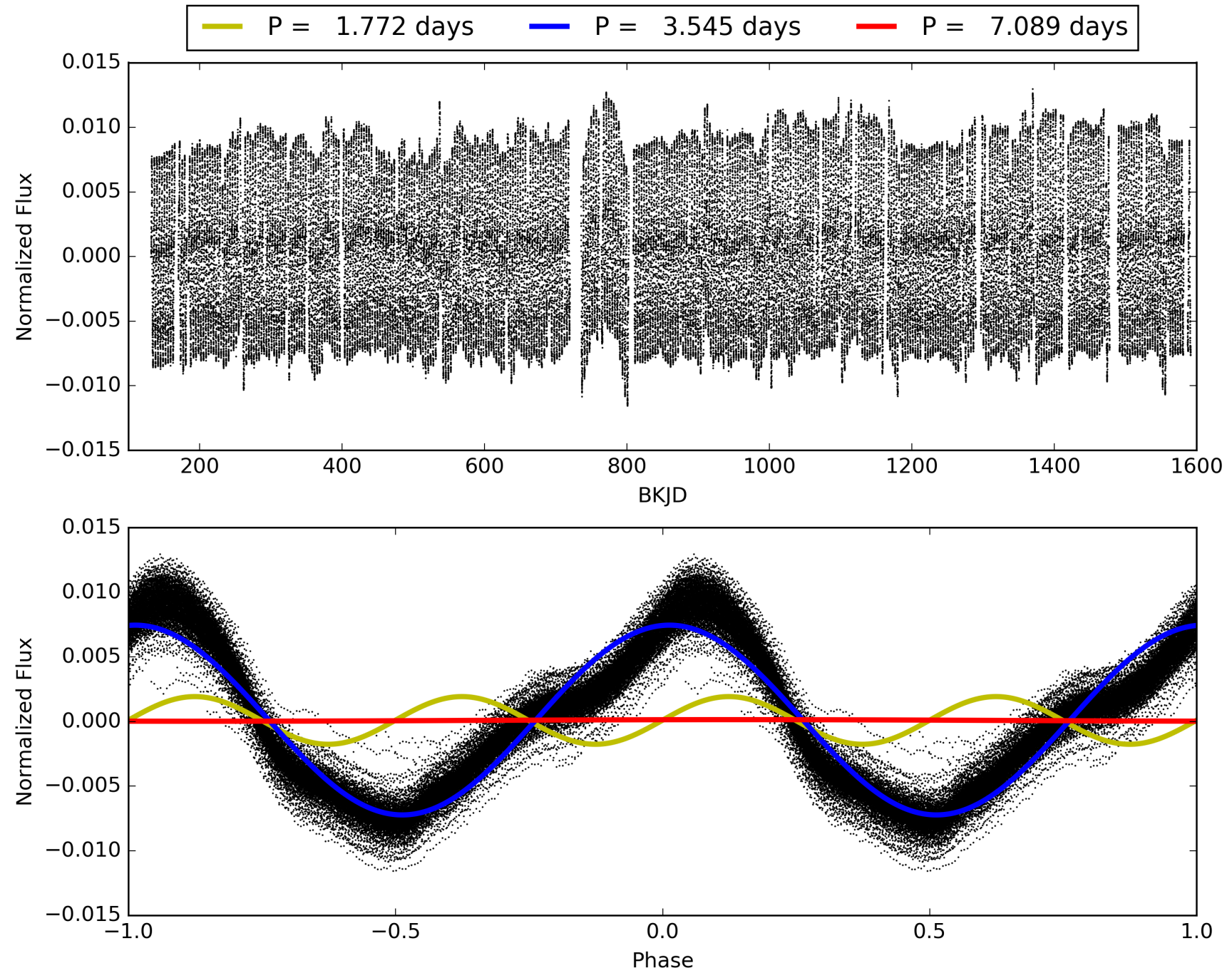
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 23:11:53 Z

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

TCE 008740898-02, PDC Light Curves

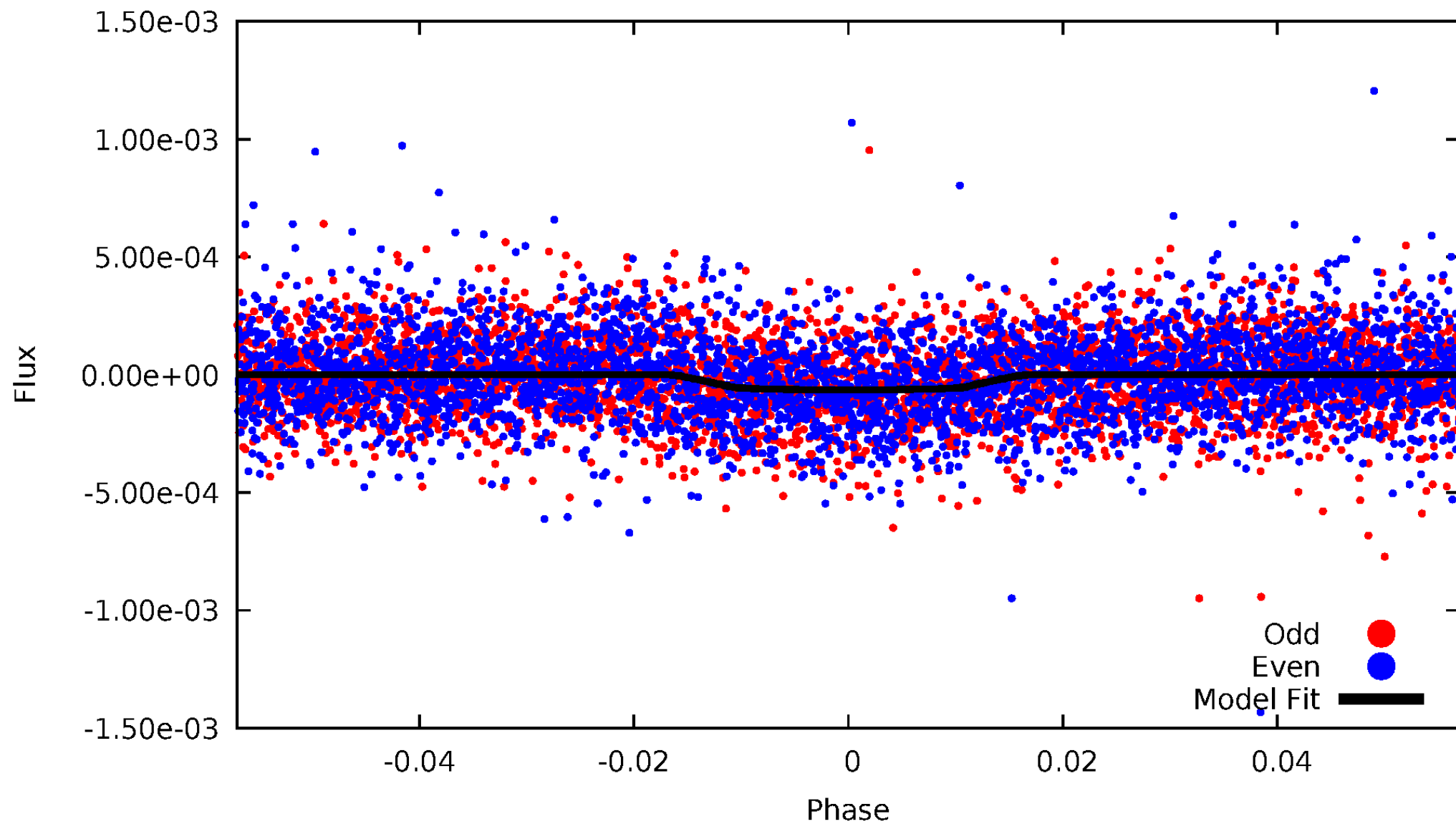


TCE 008740898-02



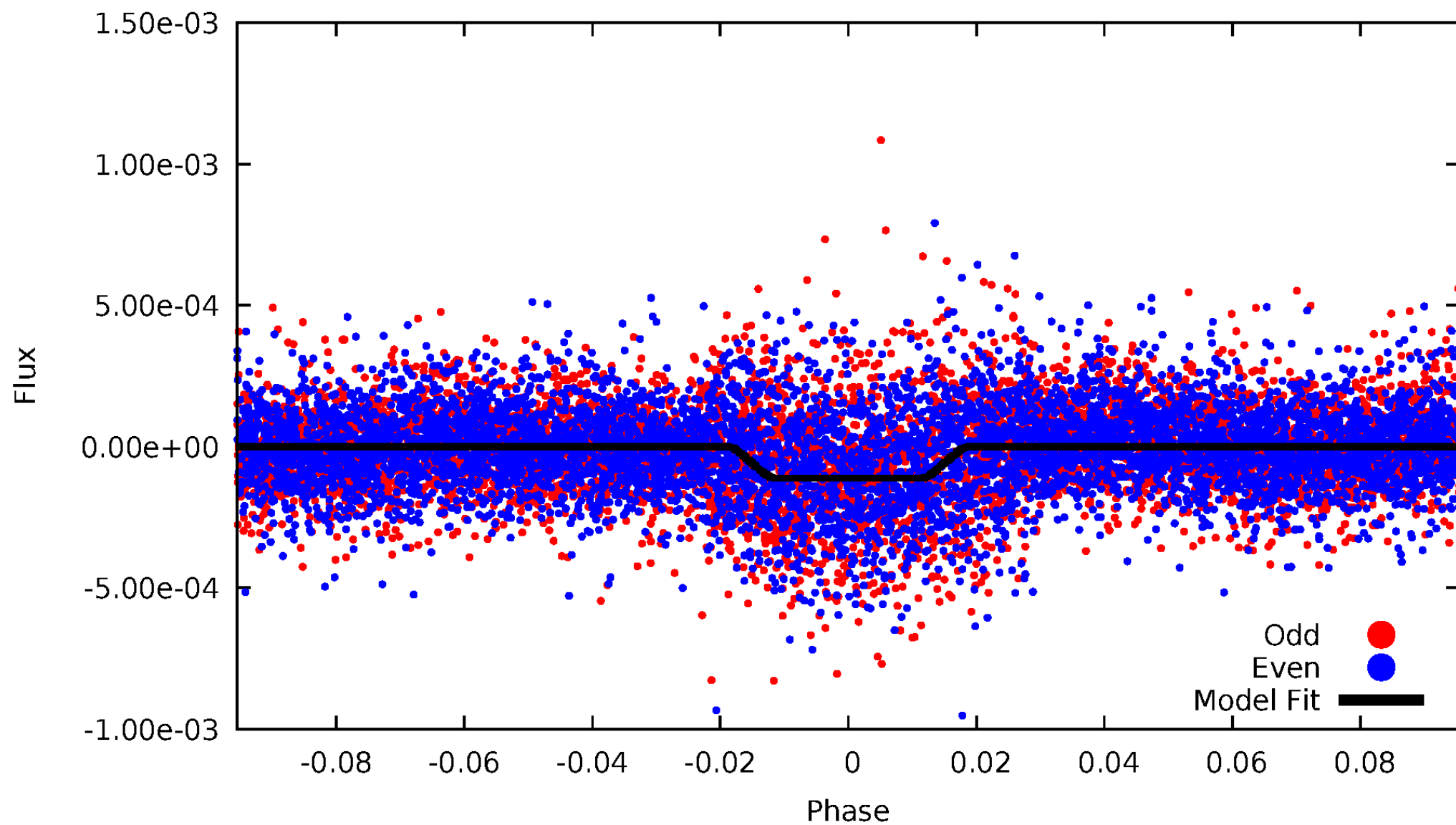
DV Odd/Even

TCE 008740898-02



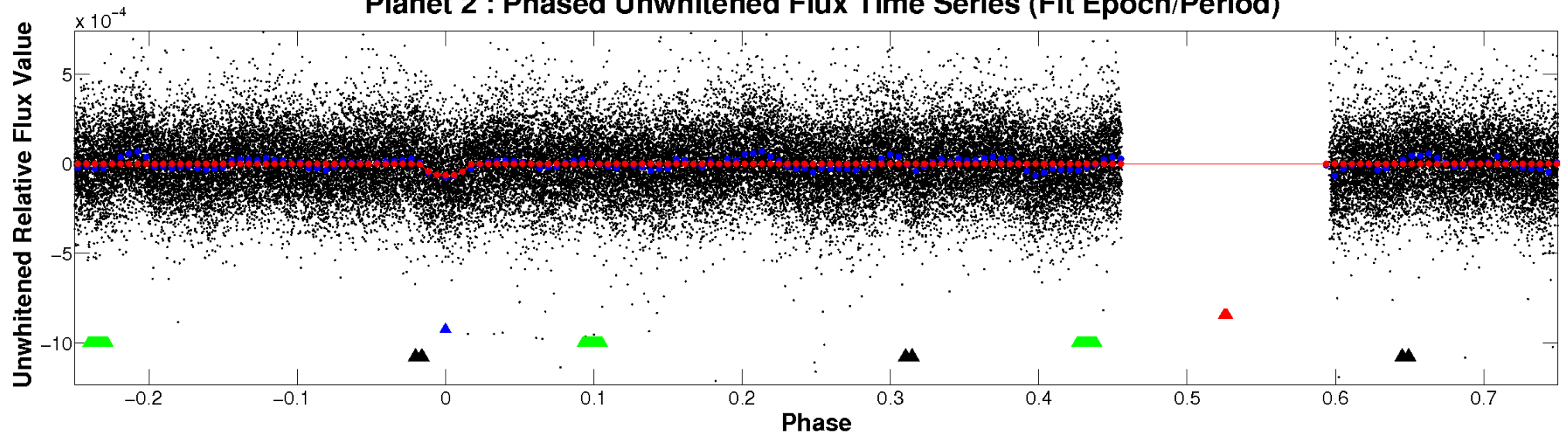
ALT Odd/Even

TCE 008740898-02

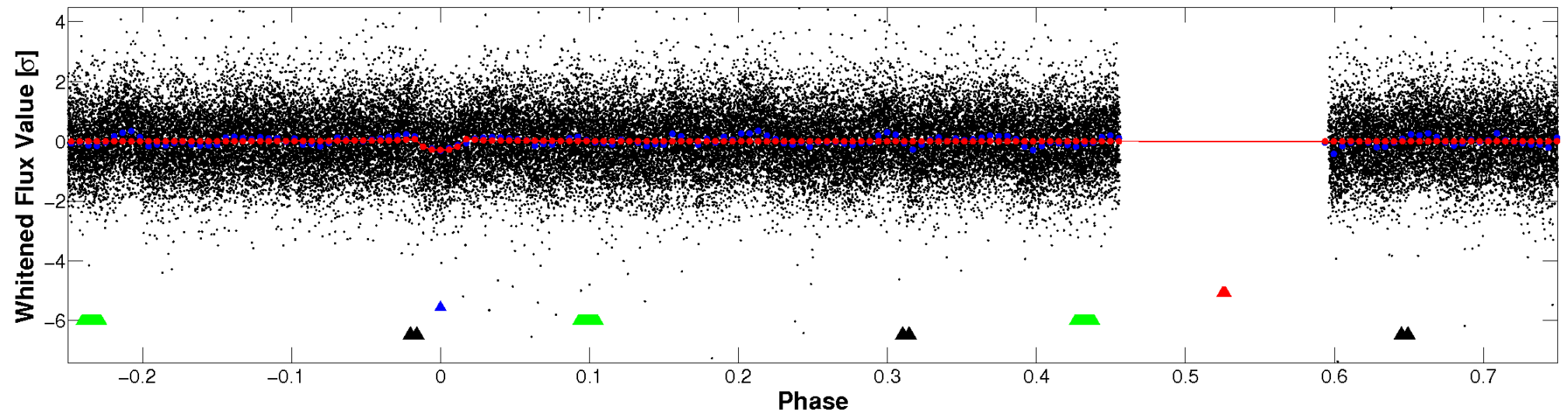


Non-Whitened Vs. Whitened Light Curve

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

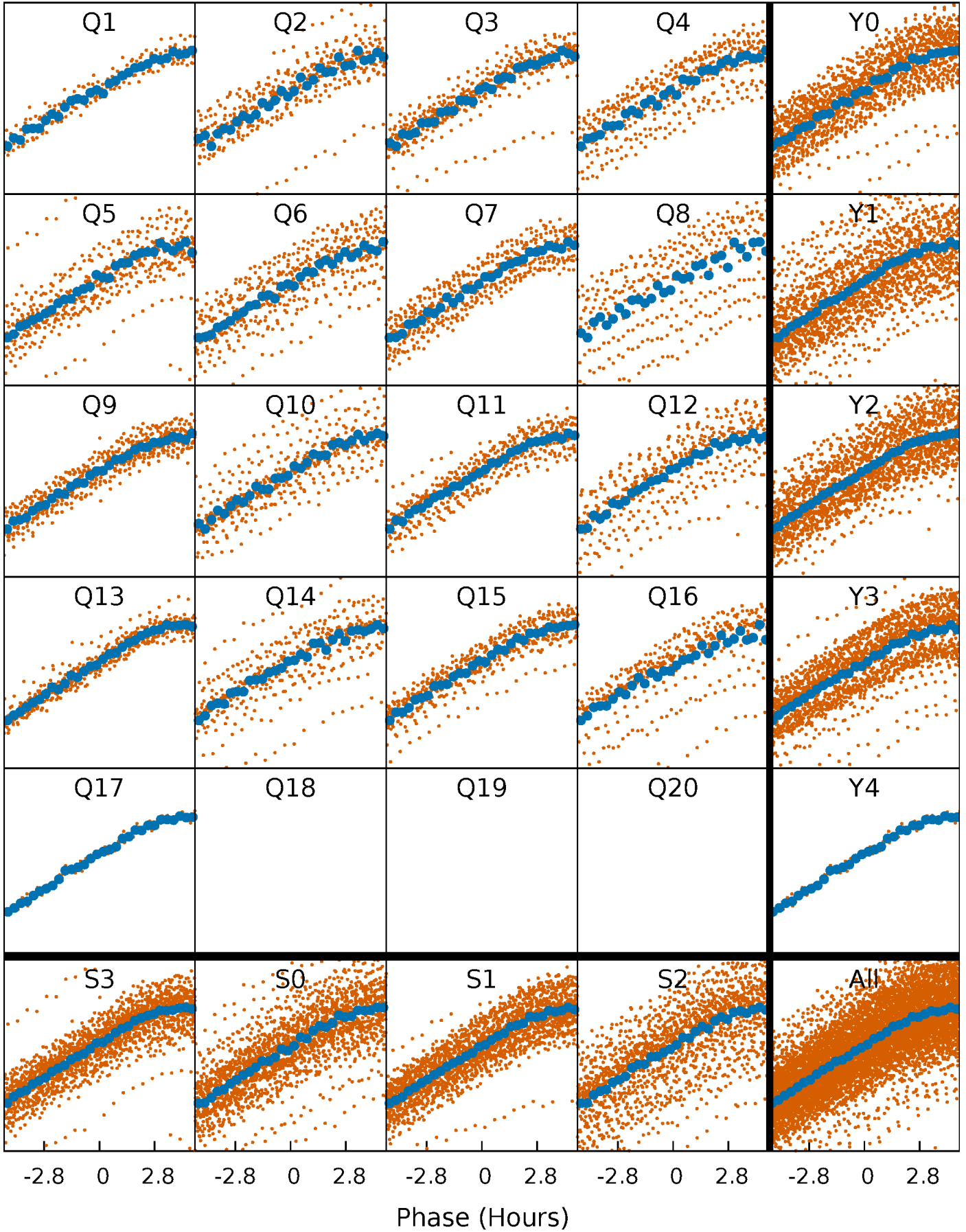


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



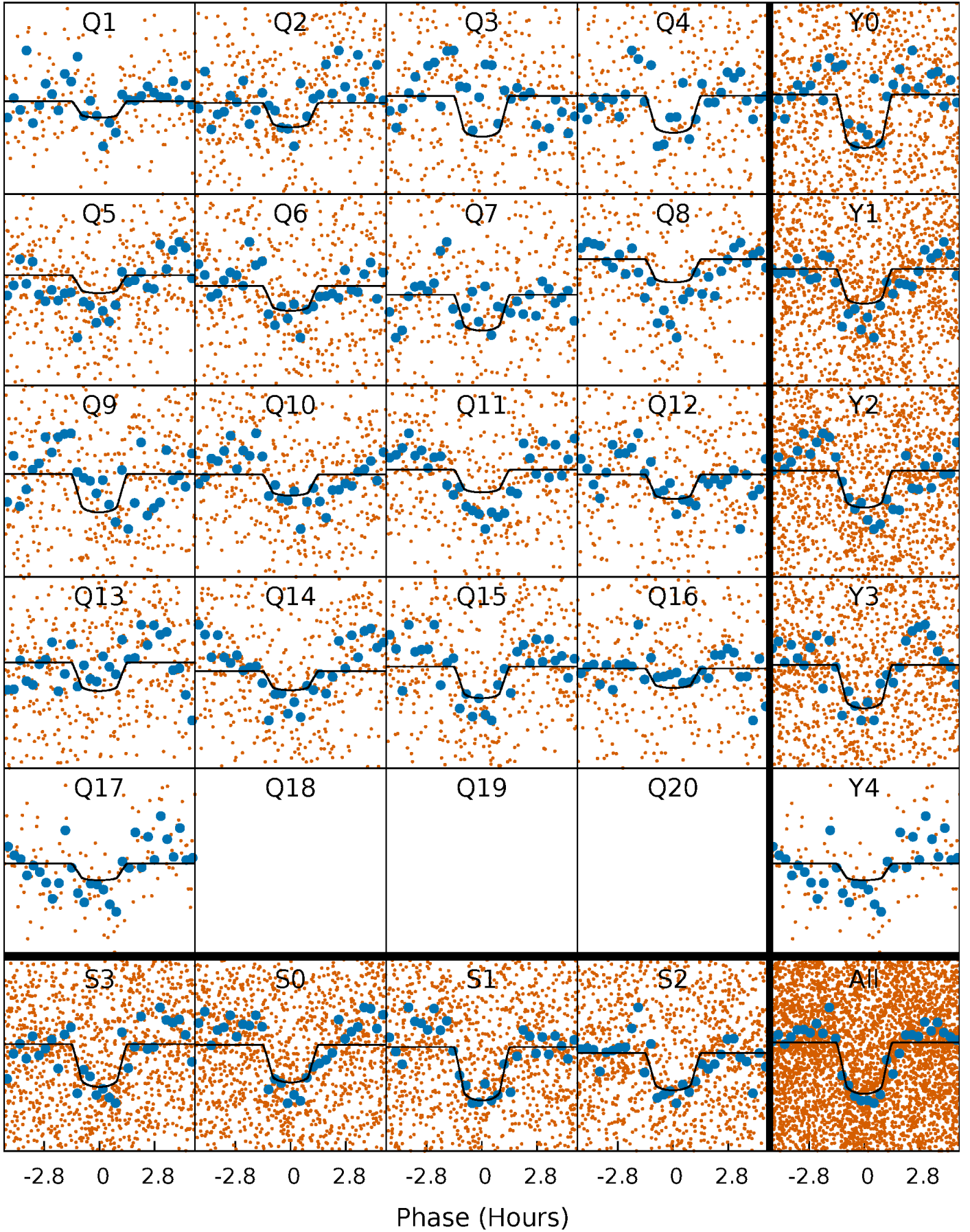
PDC Quarter-Phased Transit Curves

TCE 008740898-02 $P = 3.544522$ Days $T_0 = 132.318963$ (BKJD)



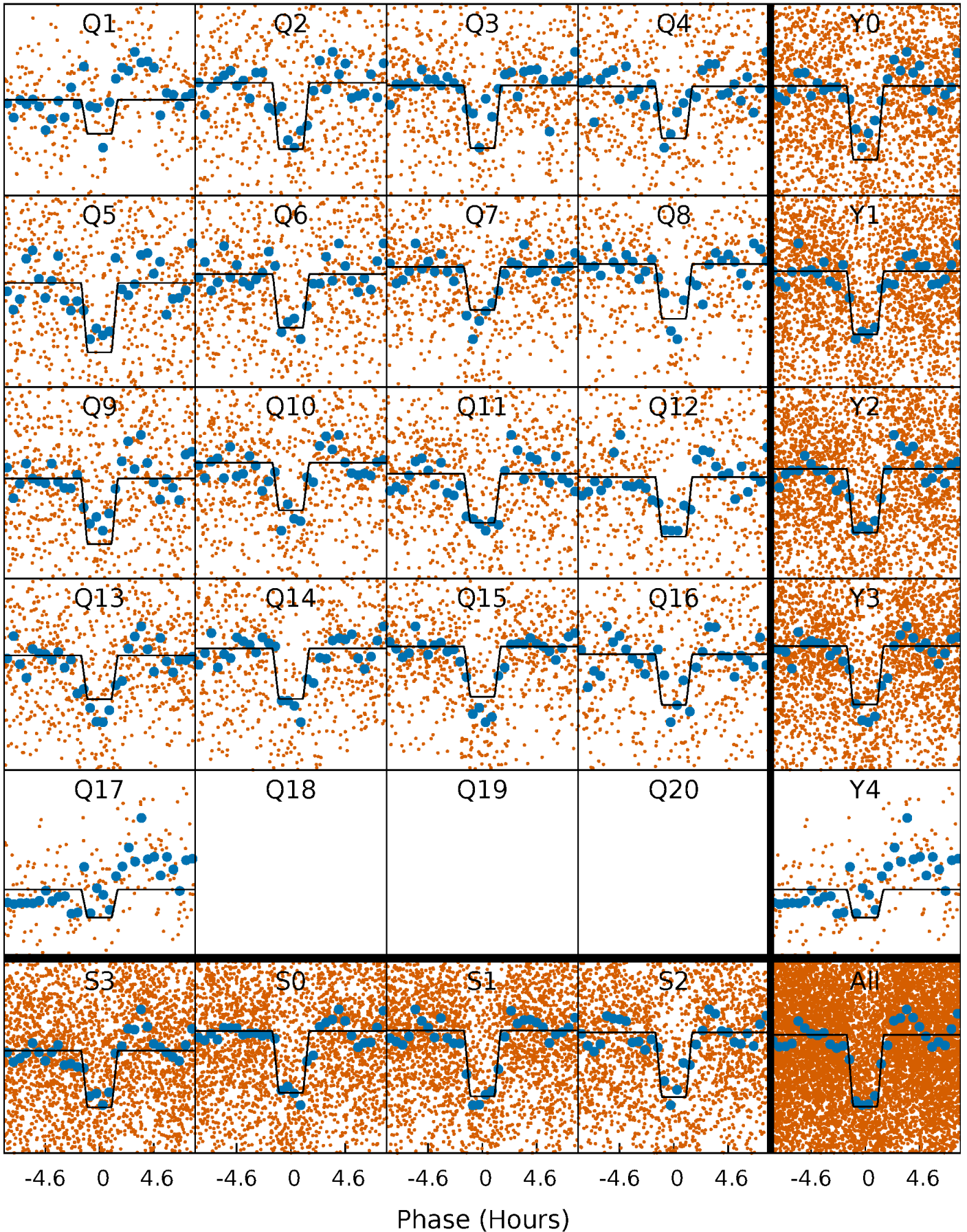
DV Quarter-Phased Transit Curves

TCE 008740898-02 $P = 3.544522$ Days $T_0 = 132.318963$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

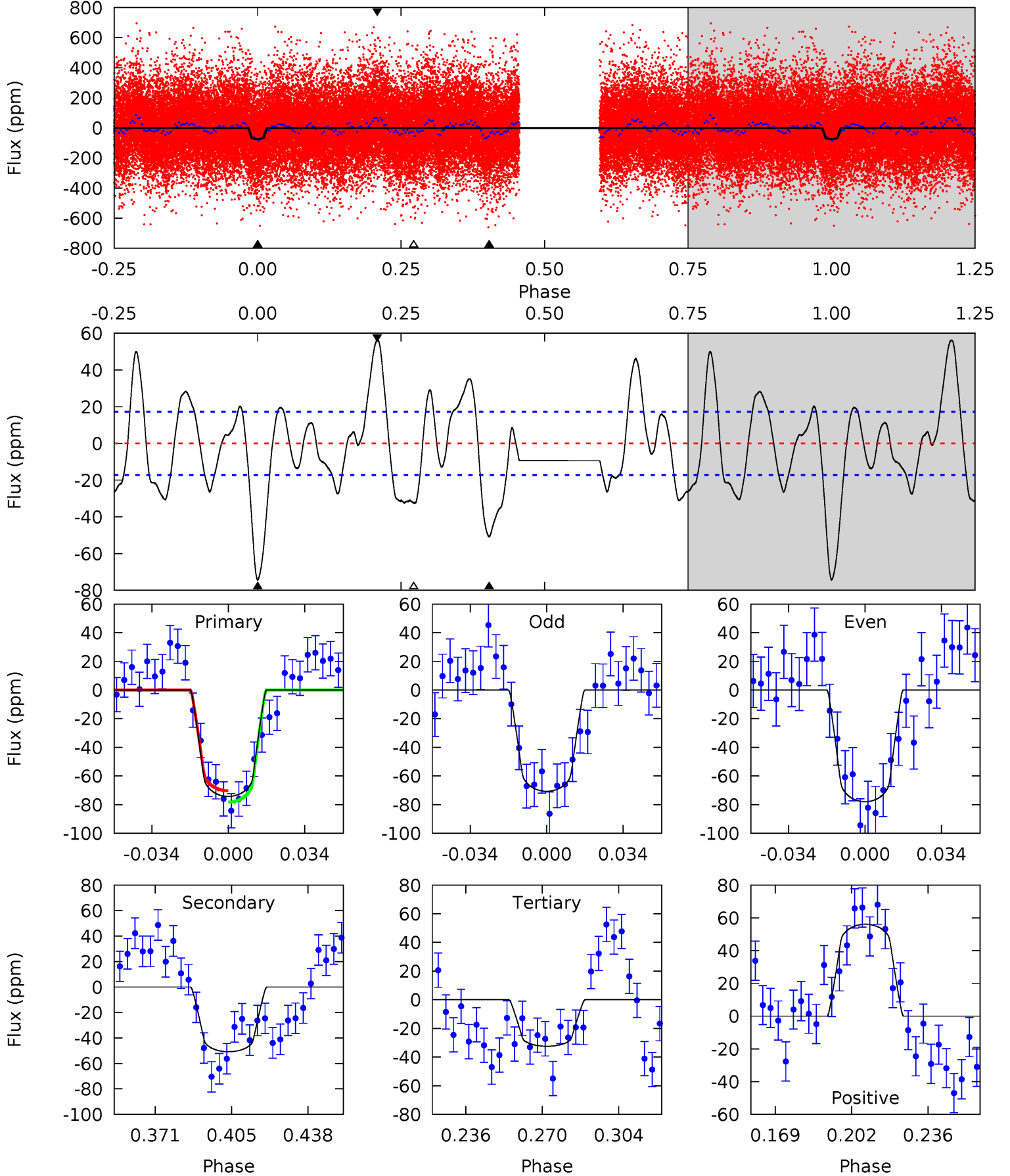
TCE 008740898-02 P= 3.544493 Days $T_0=132.317477$ (BKJD)



DV Model-Shift Uniqueness Test

008740898-02, P = 3.544522 Days, E = 128.774441 Days

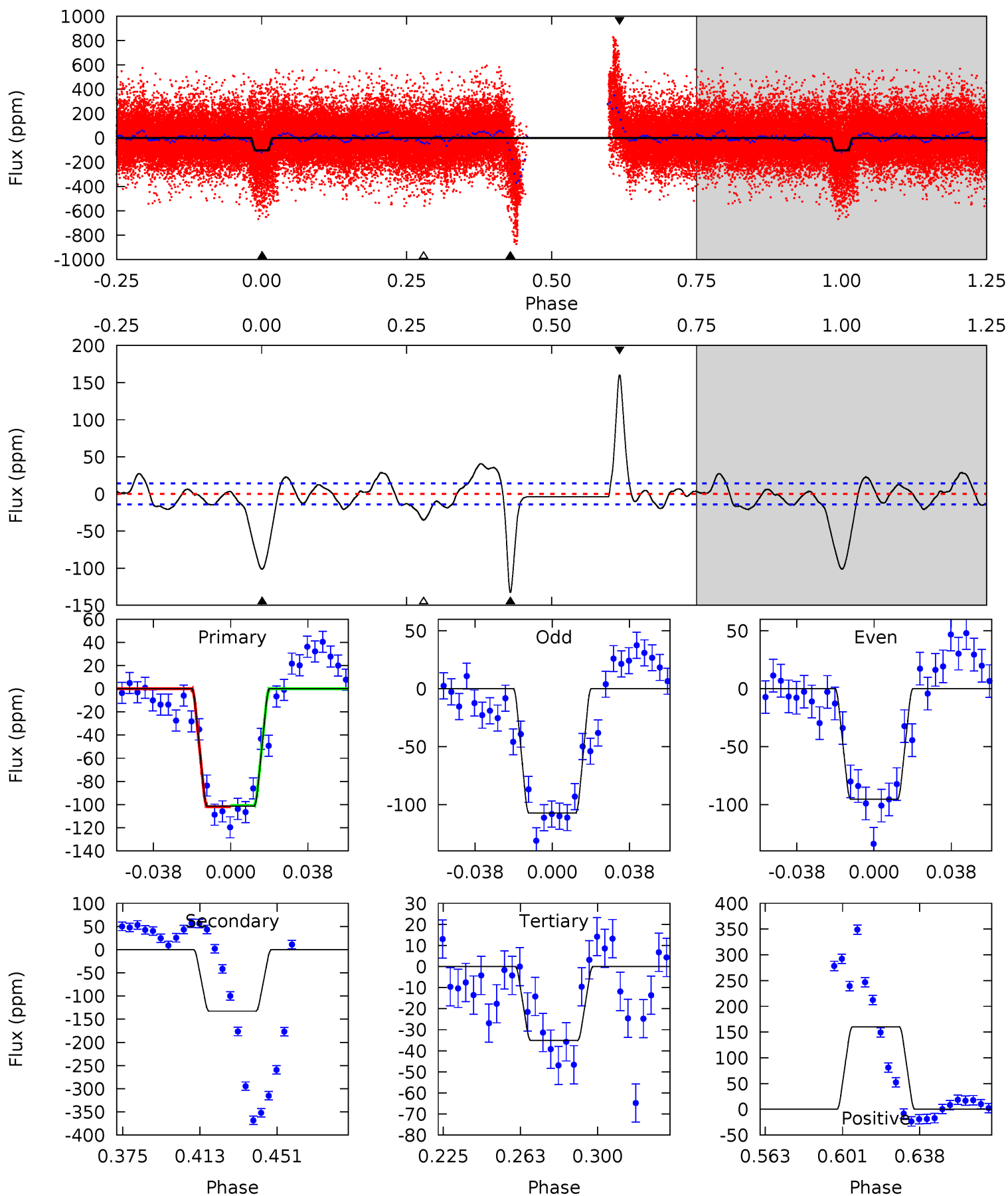
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 20.6 | 14.1 | 9.01 | 15.6 | 4.79 | 2.12 | 6.09 | 11.6 | 5.05 | 5.10 | -1.47 | 1.01 | 0.99 | 0.43 | 1.10 |



Alt Model-Shift Uniqueness Test

008740898-02, P = 3.544493 Days, E = 128.772984 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 34.3 | 45.0 | 11.9 | 54.3 | 4.77 | 2.08 | 8.54 | 22.4 | -20.0 | 33.1 | -9.32 | 2.03 | 0.95 | 0.55 | 0.23 |



Stellar Parameters For KIC 008740898

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | $R (R_{\odot})$ | $M(M_{\odot})$ | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|----------------------|---------------------------|---------------------------|---------------------------|---------------------------|---|
| | 8042^{+224}_{-352} | $4.215^{+0.054}_{-0.216}$ | $0.360^{+0.050}_{-0.500}$ | $1.779^{+0.602}_{-0.201}$ | $1.897^{+0.288}_{-0.262}$ | $0.474^{+0.105}_{-0.261}$ |
| | +3%/-4% | +1%/-5% | +14%/-139% | +34%/-11% | +15%/-14% | +22%/-55% |
| Source | KIC0 | 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 008740898-02 / KOI

| Detrend | Depth (ppm) | $R_p (R_{\oplus})$ | $T_{max} (K)$ | $T_{obs} (K)$ | A_{obs} |
|---------|--------------|------------------------|----------------------|------------------------|------------------|
| DV | -51 ± 4 | $1.74^{+0.63}_{-0.57}$ | 2832^{+229}_{-152} | 7140^{+1914}_{-1001} | 29^{+32}_{-14} |
| Alt. | -133 ± 3 | $2.18^{+0.68}_{-0.63}$ | 2844^{+207}_{-157} | 8448^{+2148}_{-1192} | 48^{+48}_{-20} |

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 $A_{obs} \gg 1.0$

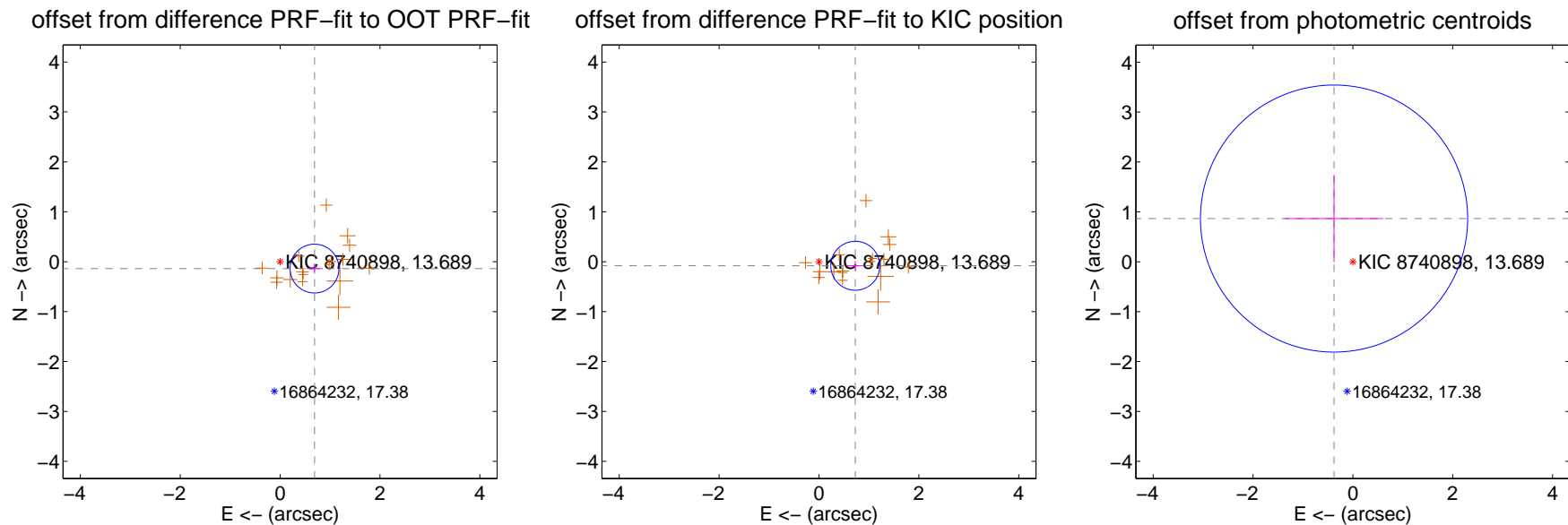
DV Centroid Data

Supplemental centroid analysis for 008740898-02. Kepler magnitude: 13.69. Transit SNR 11.04

There are 0 quarters with good PRF difference image offsets

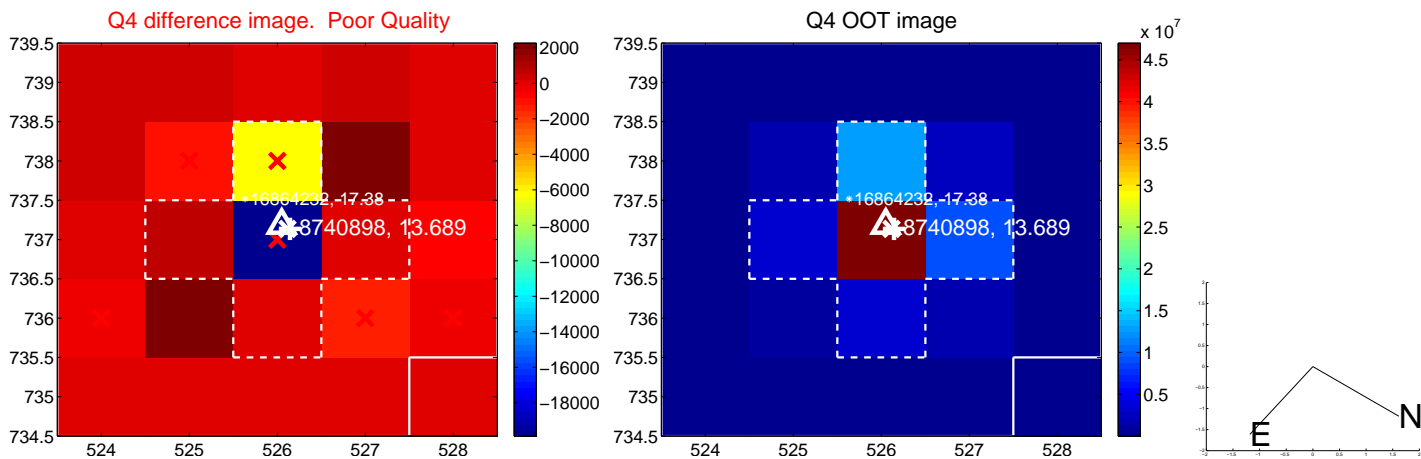
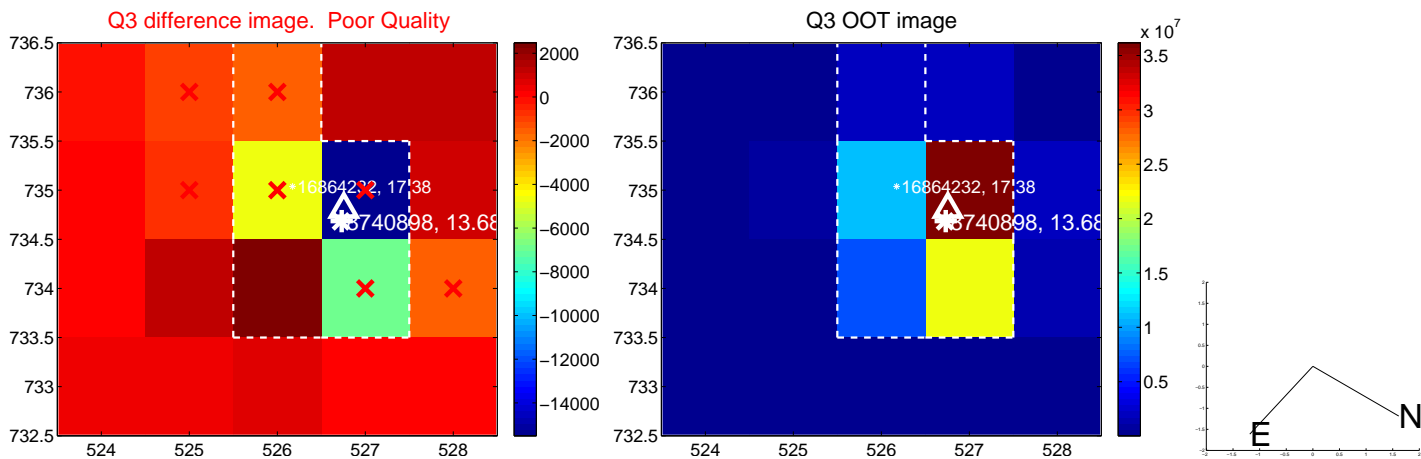
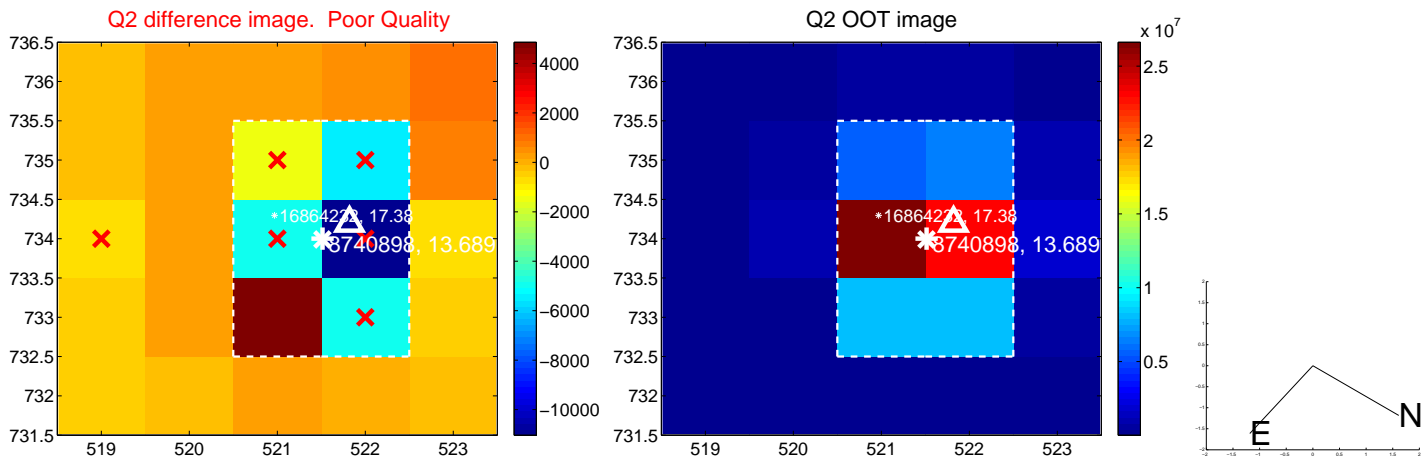
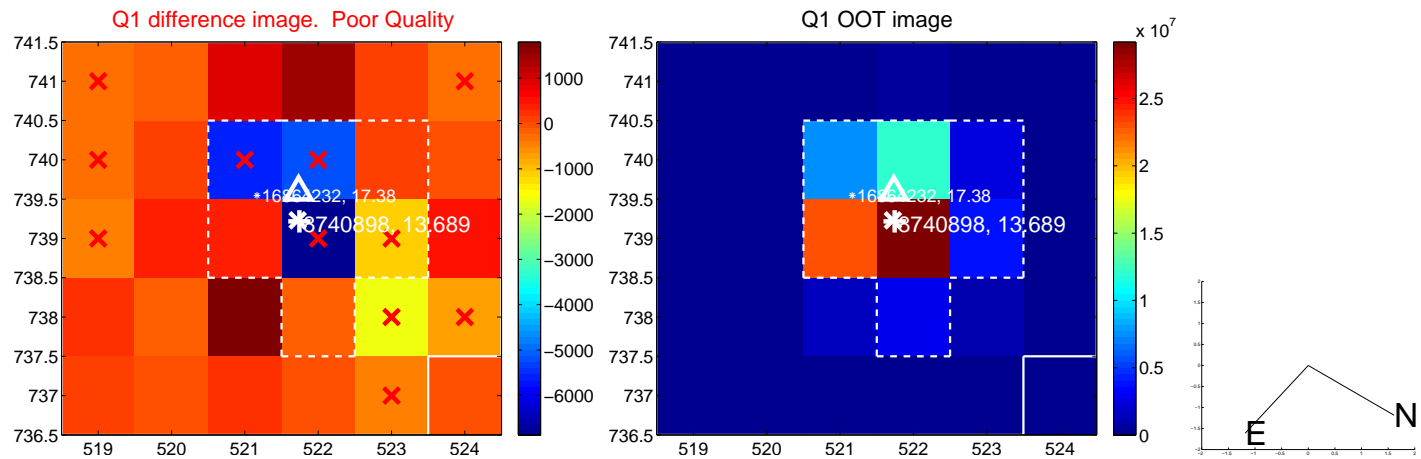
The direct PRF centroid is offset from the target star catalog position by about 0.10 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|---|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT | 0.703 ± 0.163 | 4.31 | -0.689 ± 0.165 | -0.138 ± 0.101 |
| PRF-fit source offset from KIC position | 0.732 ± 0.163 | 4.48 | -0.727 ± 0.164 | -0.082 ± 0.096 |
| photometric centroid source offset | 0.94 ± 0.89 | 1.06 | 0.38 ± 0.99 | 0.87 ± 0.87 |

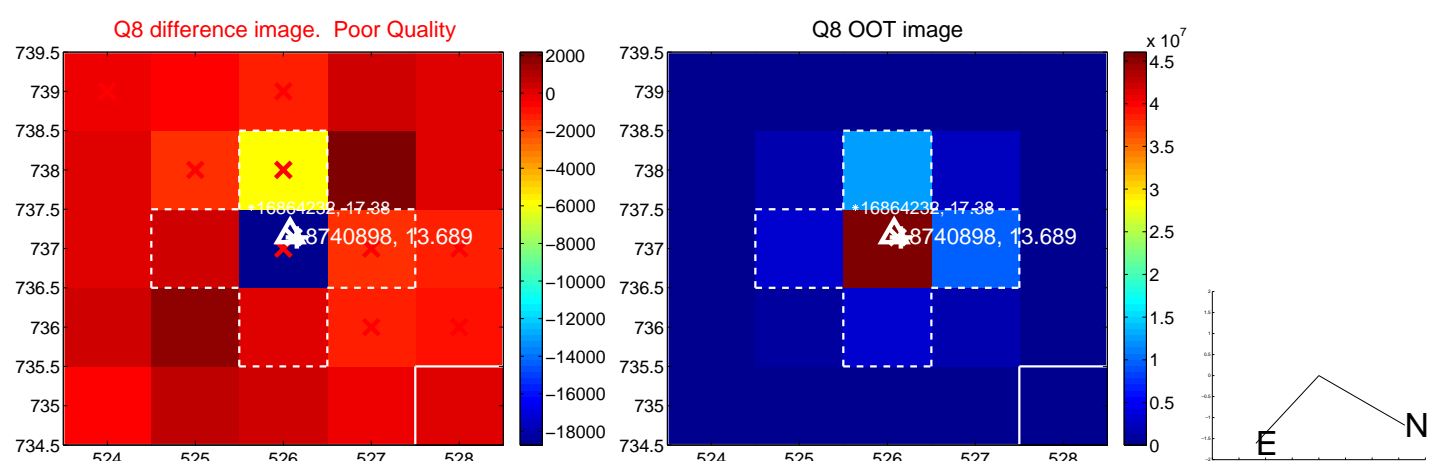
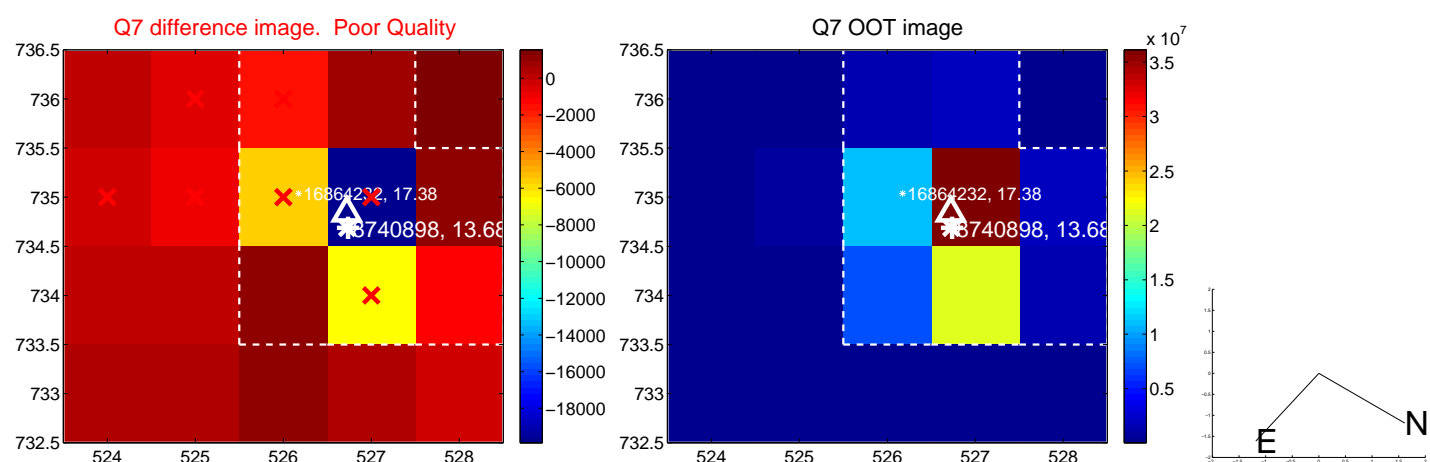
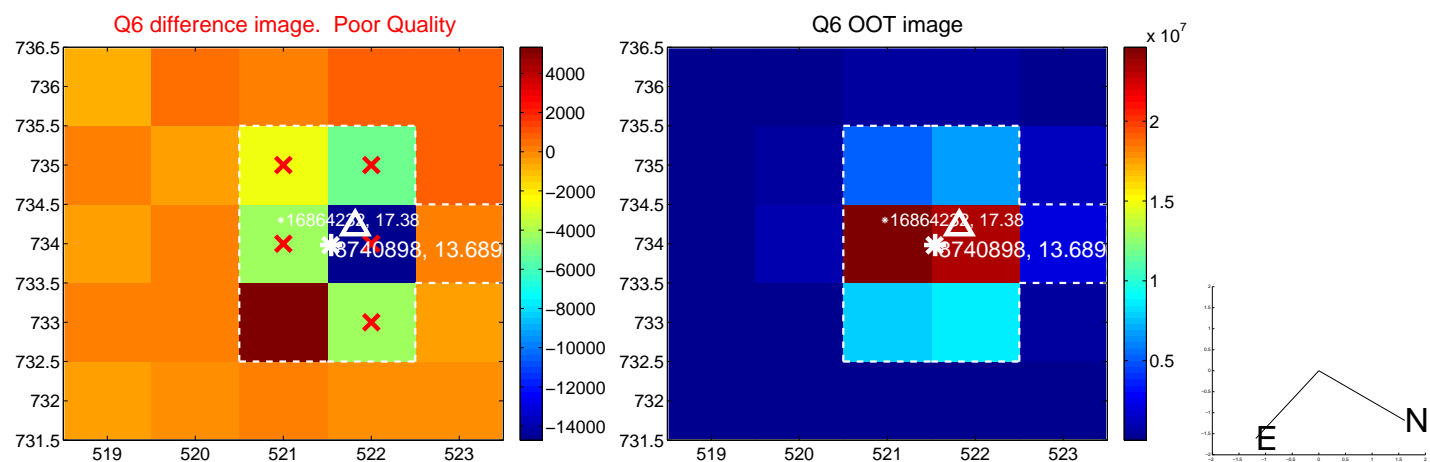
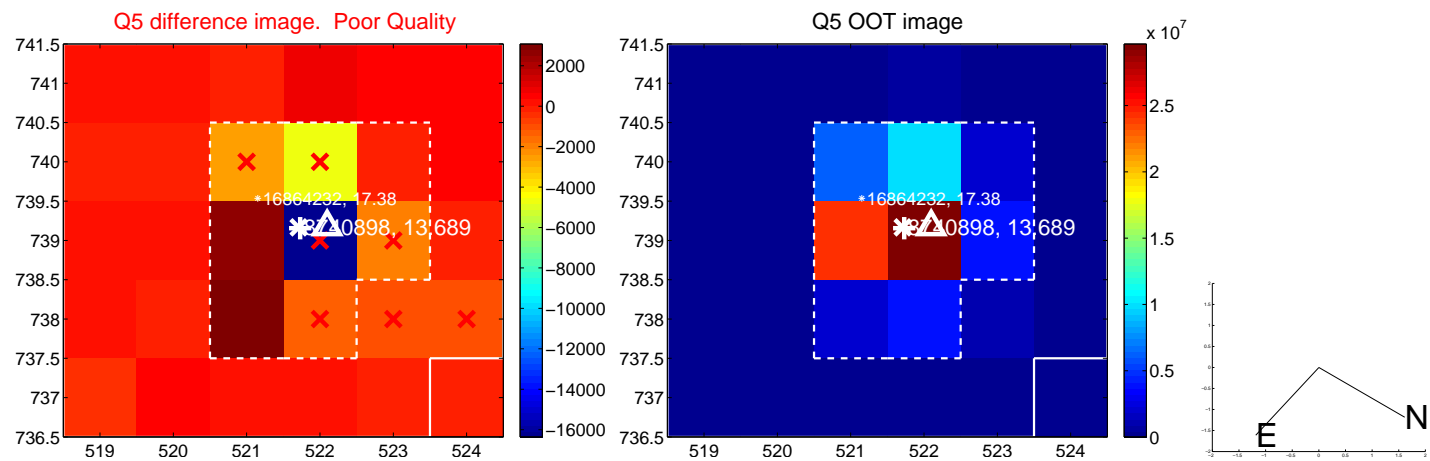


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three- σ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

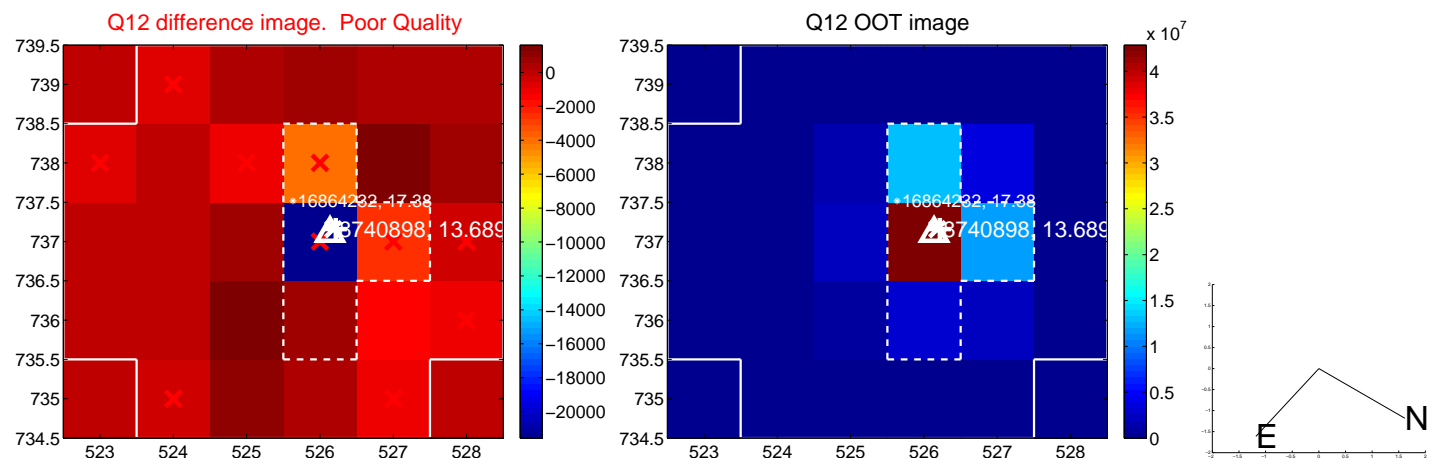
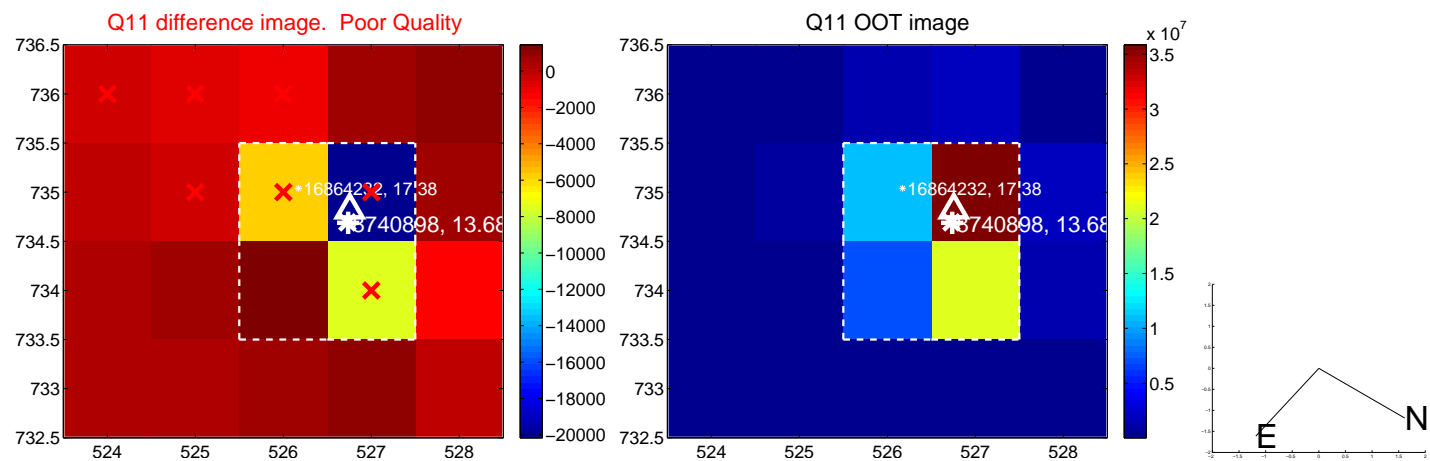
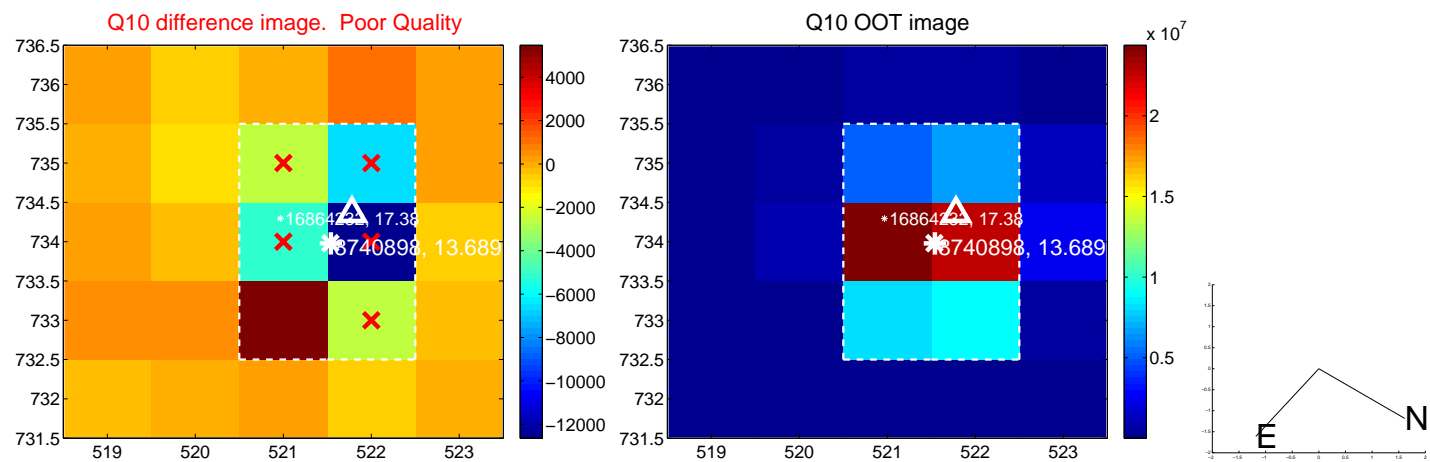
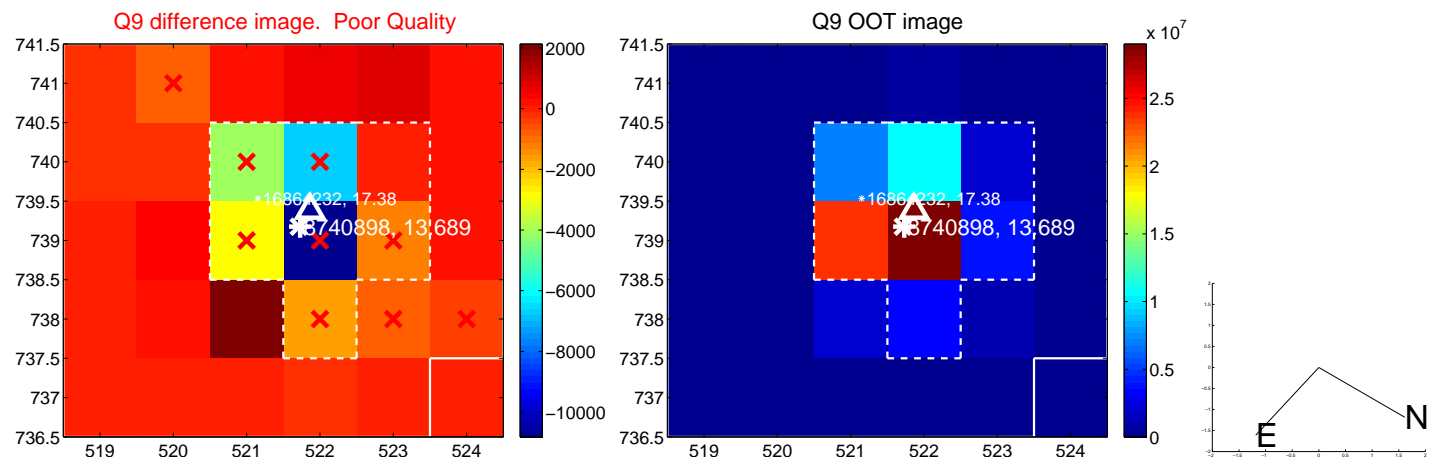
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



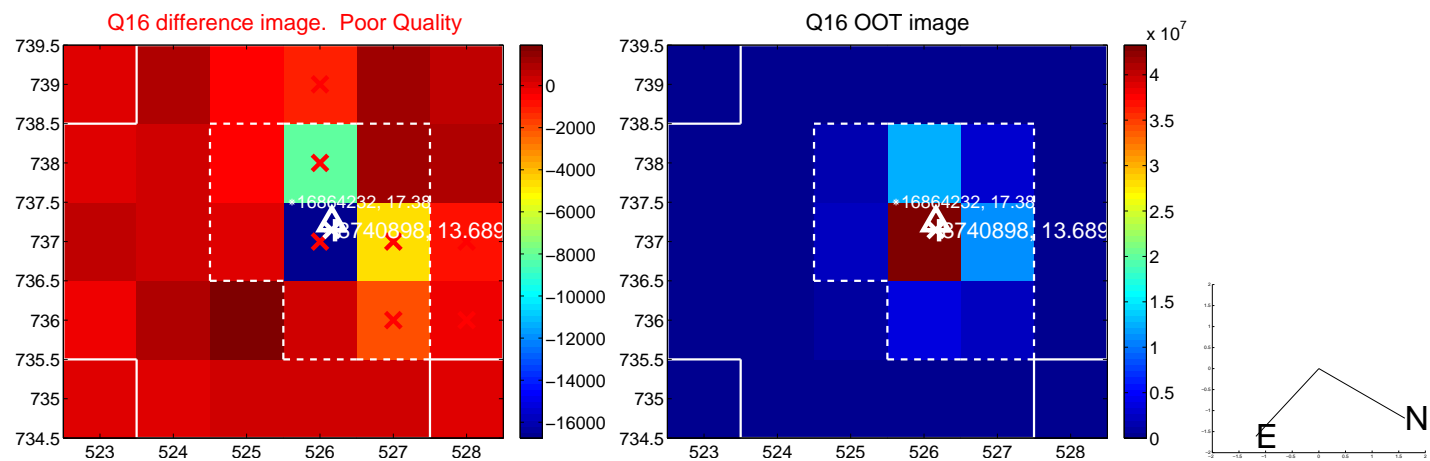
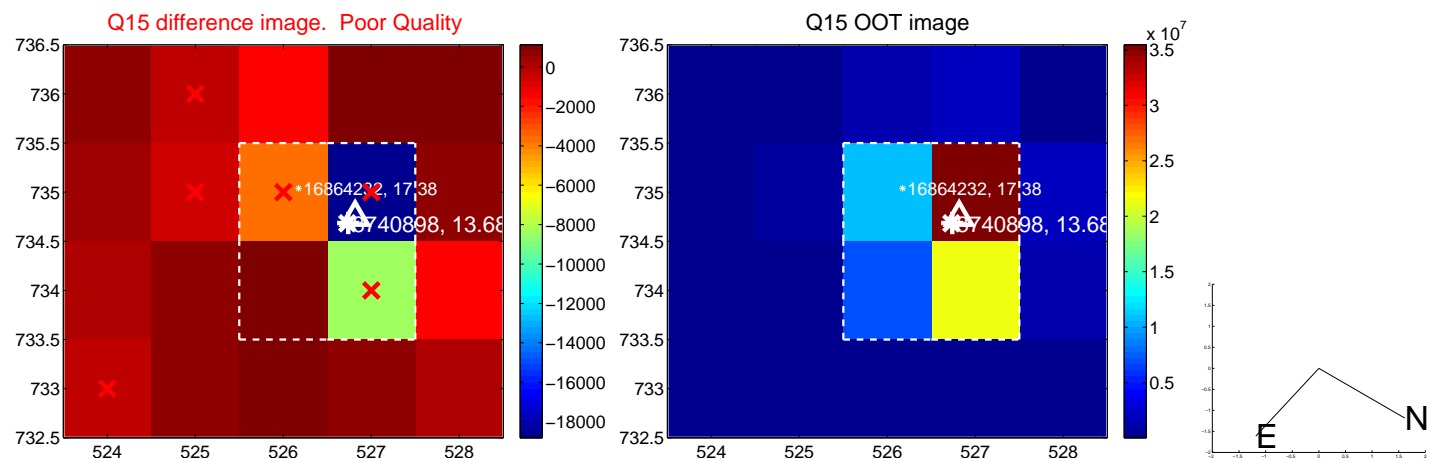
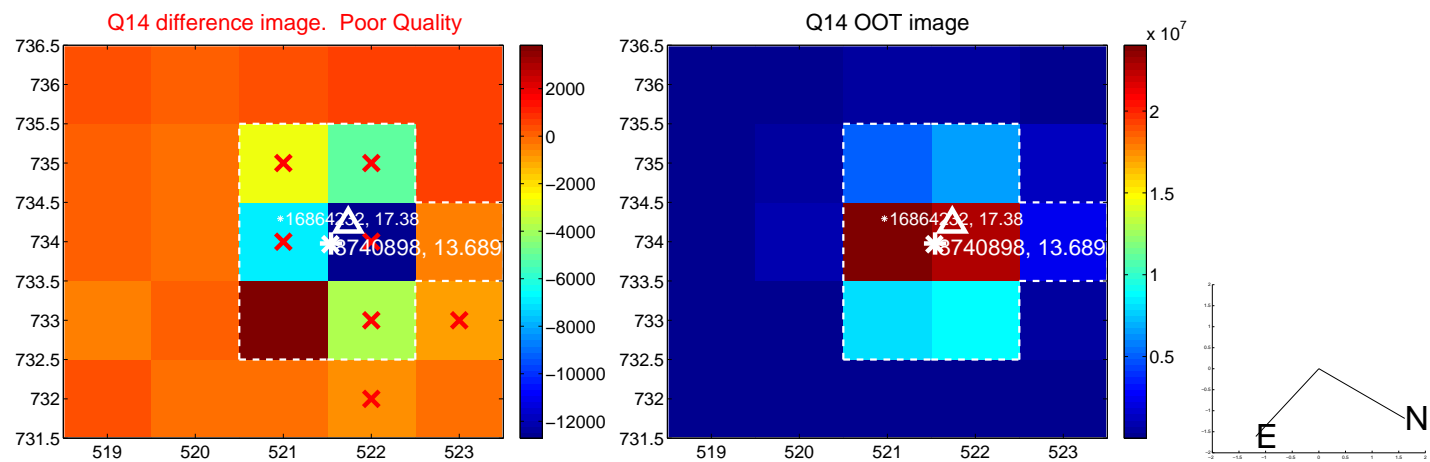
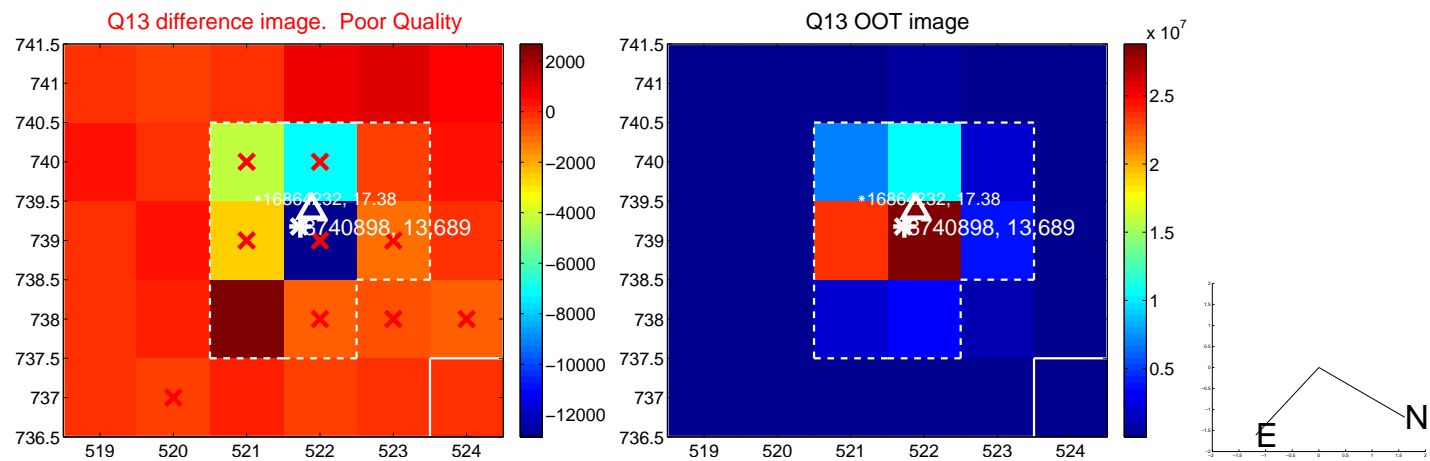
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



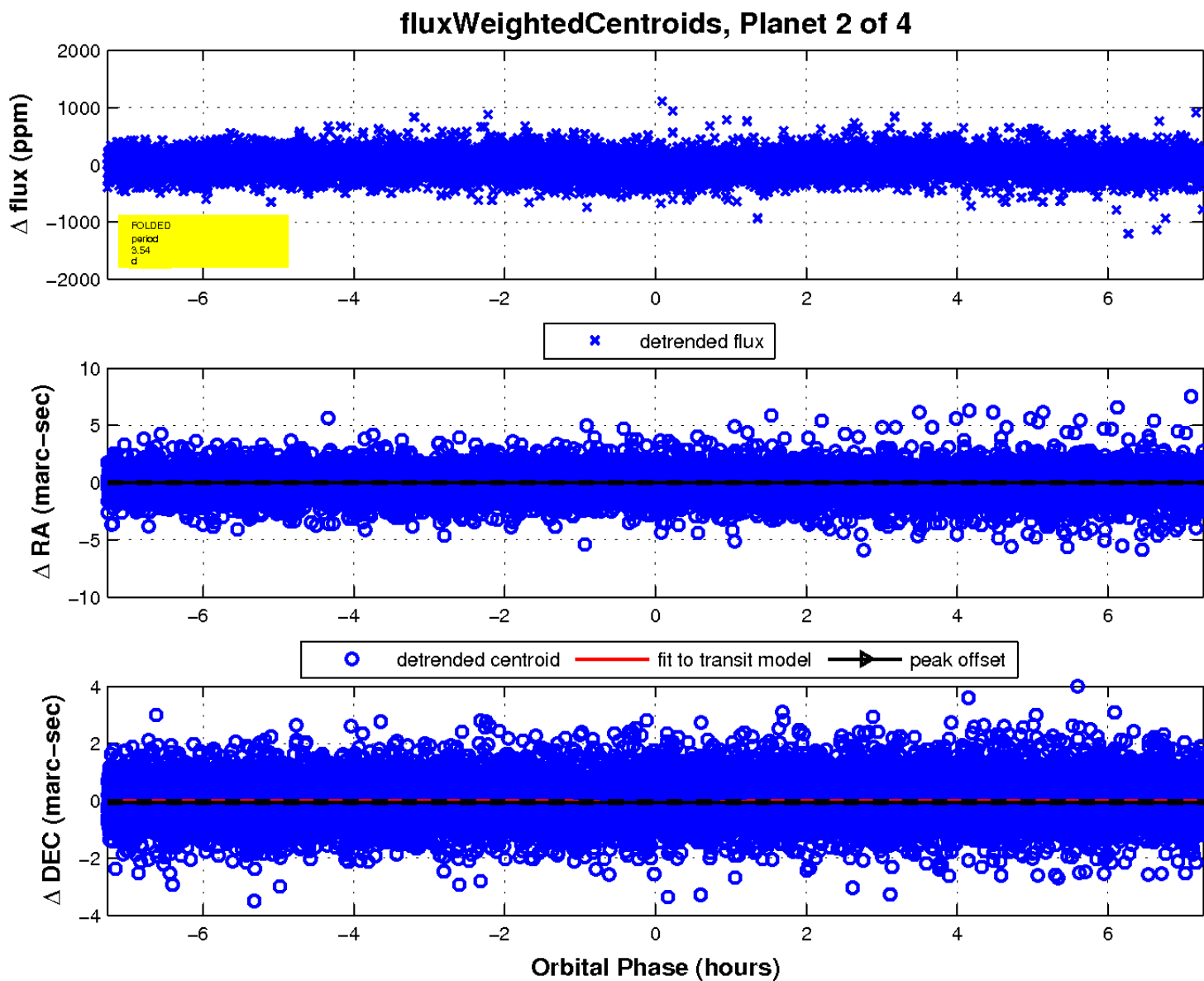
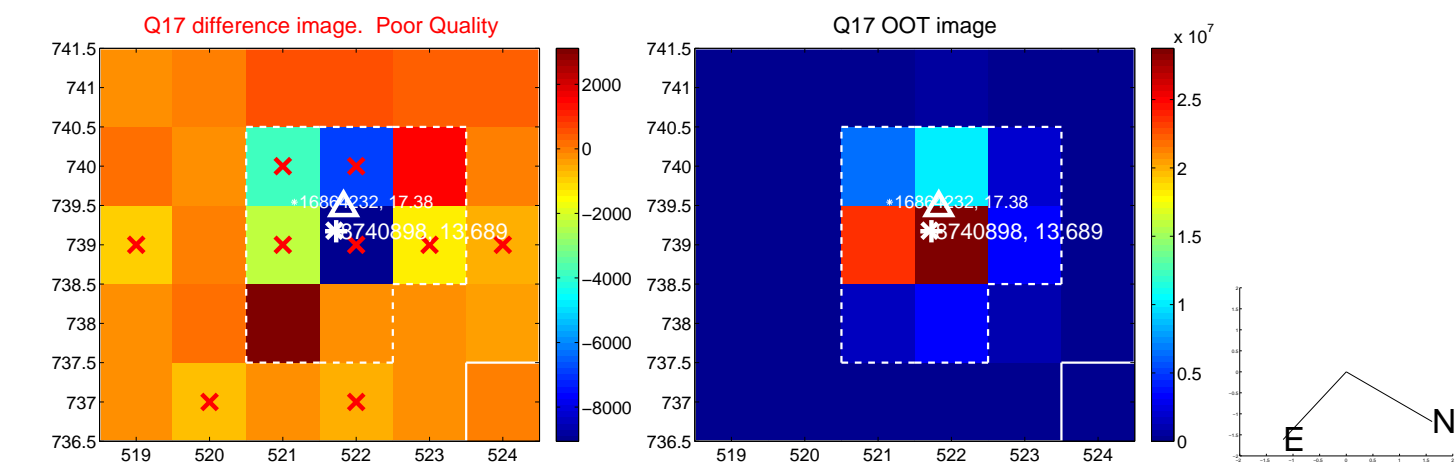
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

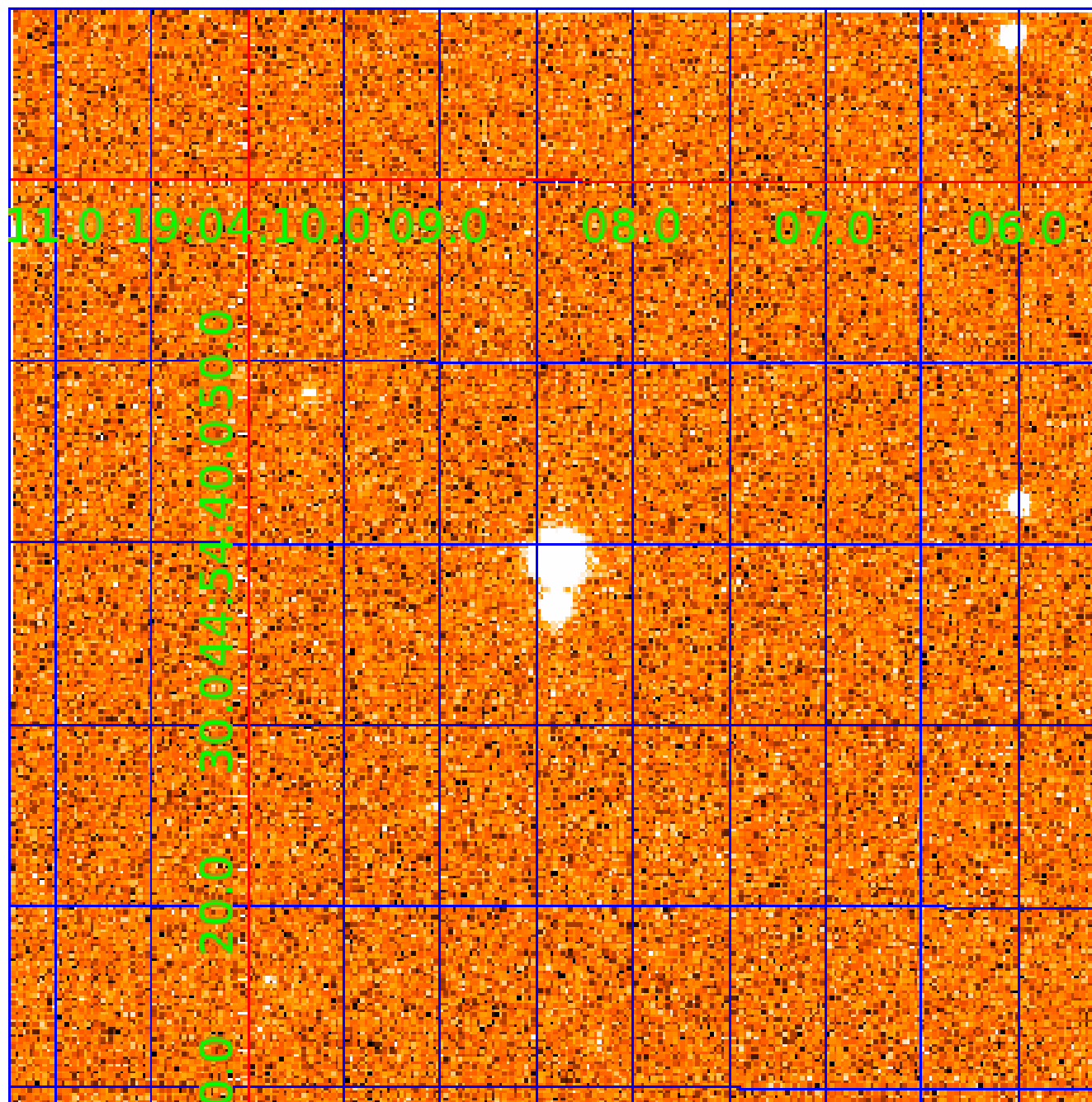


white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



UKIRT Image

Declination



KIC 008740898

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}) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 008740898-01 | OBS | No | 3.544502 | 134.187235 | 111.6 | 3.837 | 18.5 | 20.3 | 1.78 | 8042 | 2.31 | 3741.63 |
| 008740898-02 | OBS | No | 3.544522 | 132.318963 | 64.2 | 2.424 | 9.7 | 11.0 | 1.78 | 8042 | 1.67 | 3741.60 |
| 008740898-03 | OBS | No | 1.181470 | 132.692934 | 17.0 | 1.976 | 8.4 | 5.0 | 1.78 | 8042 | 0.85 | 16189.65 |
| 008740898-04 | OBS | No | 249.303169 | 264.565967 | 444.7 | 15.115 | 10.8 | 8.3 | 1.78 | 8042 | 4.32 | 12.89 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|--|
| 008740898-01 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | SWEET_NTL—LPP_DV |
| 008740898-02 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | SWEET_NTL—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT—SAME_NTL_PERIOD—CENT_FEW_DIFFS |
| 008740898-03 | OBS | FP | 0.00 | 1 | 0 | 1 | 0 | INDIV_TRANS_RUBBLE_SKYE_ZUMA_TRACKER—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD—CENT_FEW_DIFFS—HALO_GHOST |
| 008740898-04 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_MARSHALL_SKYE—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—INCONSISTENT_TRANS |

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

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

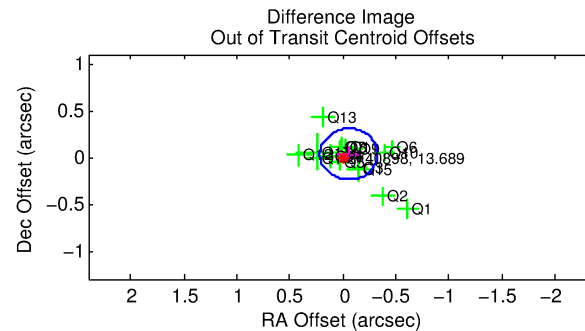
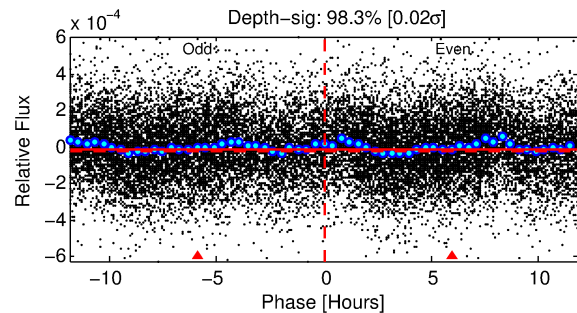
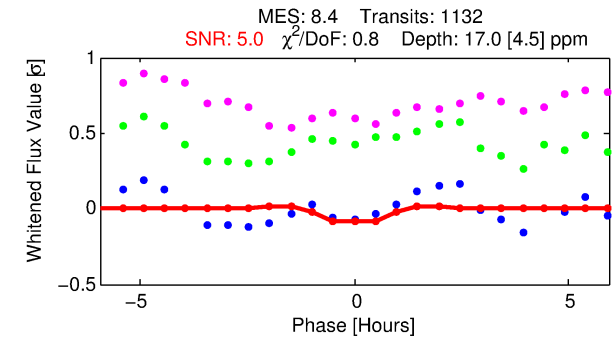
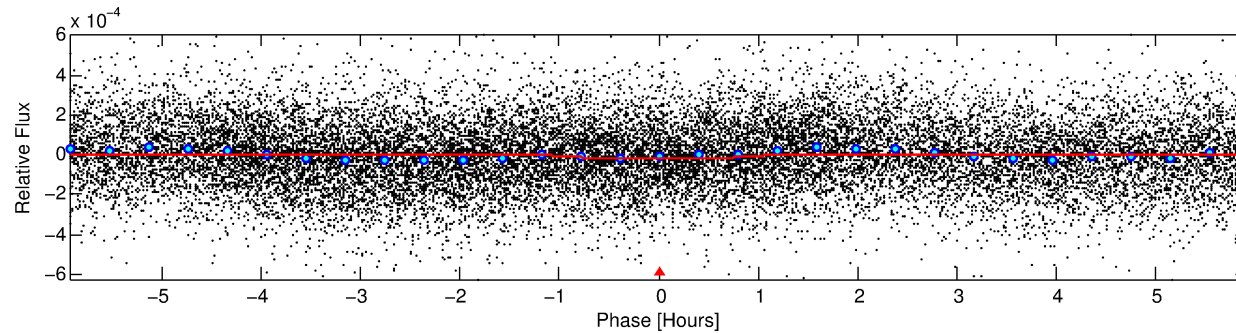
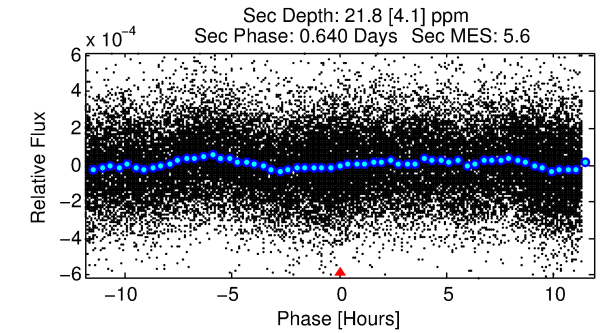
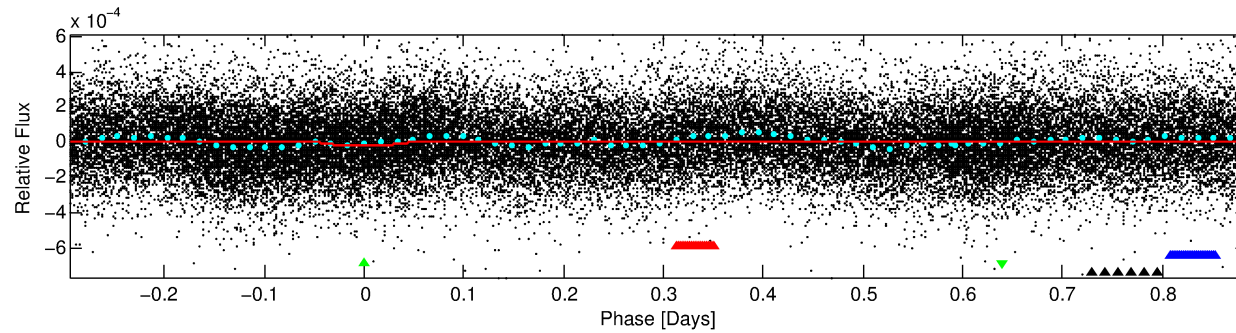
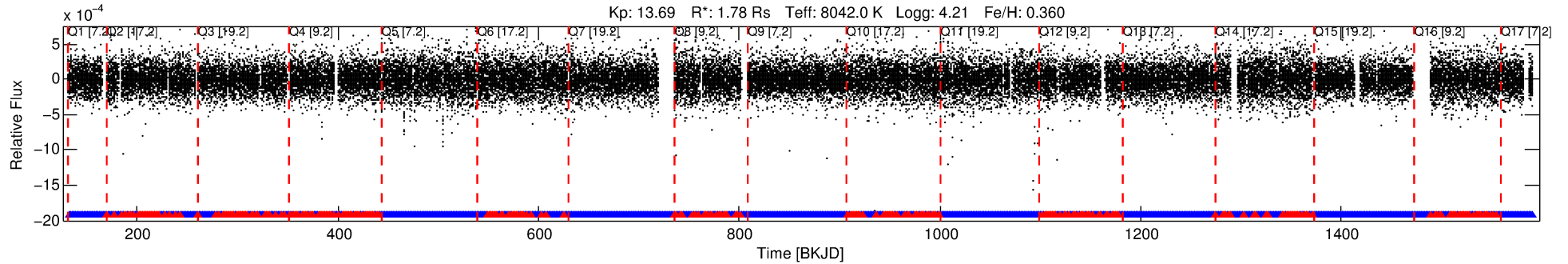
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 008740898-03

No Significant Match Found

DV One-Page Summary

KIC: 8740898 Candidate: 3 of 4 Period: 1.181 d



DV Fit Results:

Period = 1.18147 [0.00002] d
Epoch = 132.6929 [0.0047] BKJD
Rp/R* = 0.0044 [0.0016]
a/R* = 2.24 [3.80]
b = 0.90 [0.45]
Seff = 16189.65 [7084.46]
Teq = 2876 [315] K
Rp = 0.85 [0.42] Re
a = 0.0271 [0.0076] AU
Ag = 12.09 [10.16] [1.09σ]
Teffp = 8292 [1574] K [3.37σ]

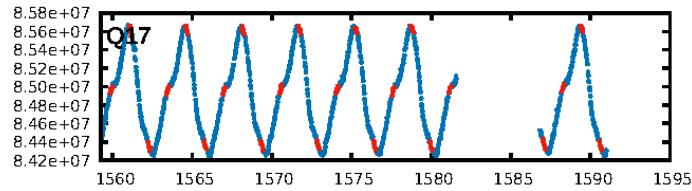
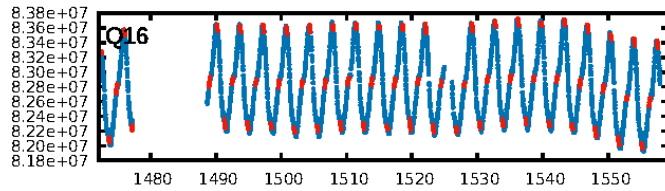
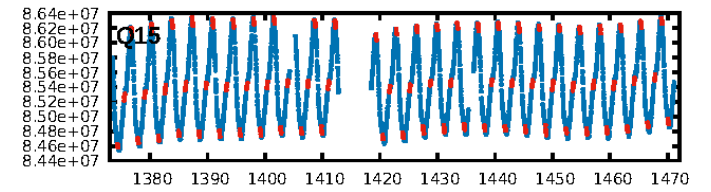
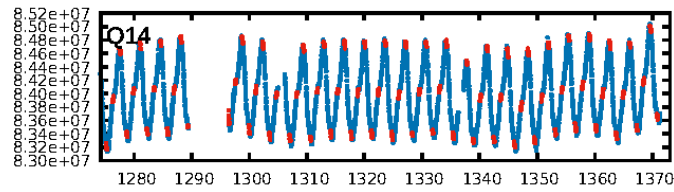
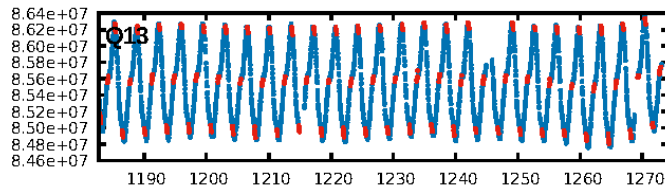
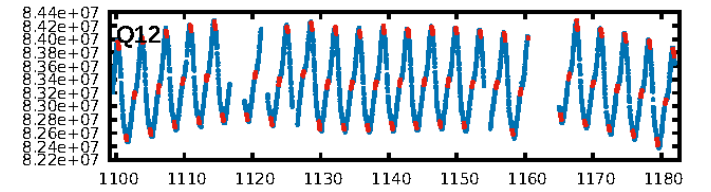
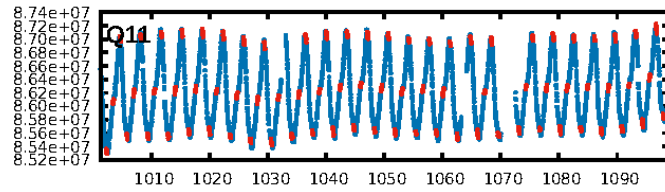
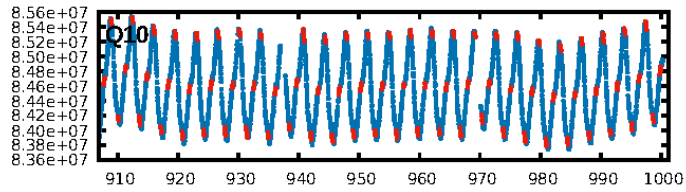
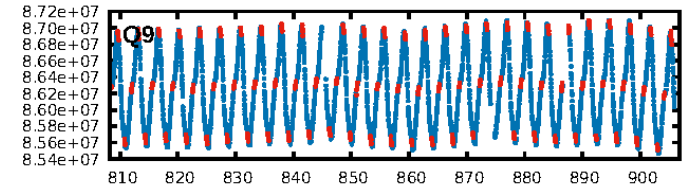
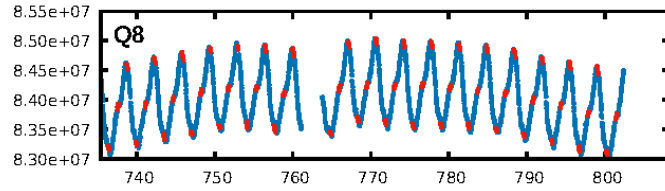
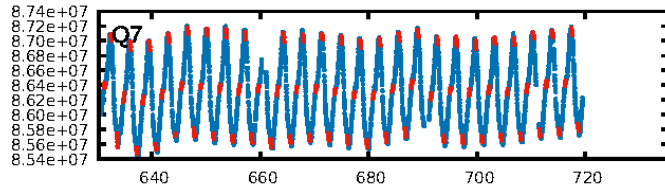
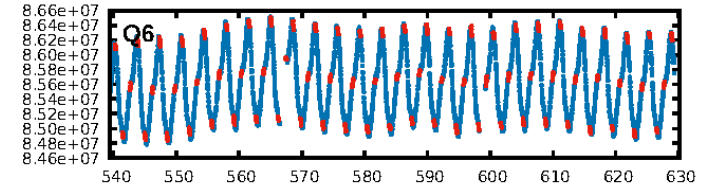
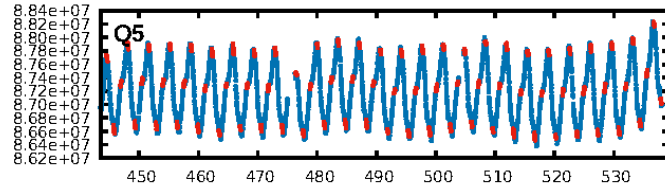
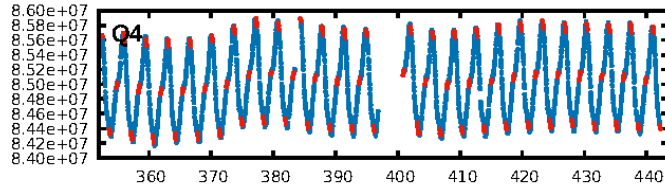
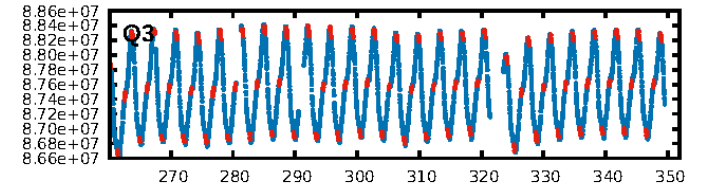
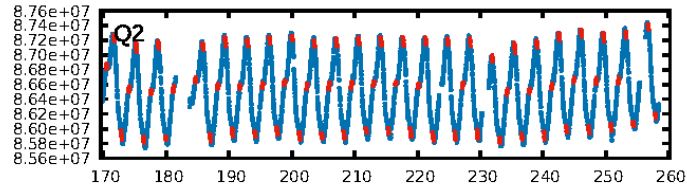
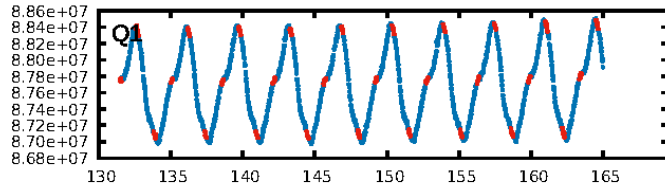
DV Diagnostic Results:

ShortPeriod-sig: N/A
LongPeriod-sig: 100.0% [13.14σ]
ModelChiSquare2-sig: N/A
ModelChiSquareGof-sig: N/A
Bootstrap-pfa: 2.26e-16
RollingBand-fgt: 0.72 [777/1080]
GhostDiagnostic-chr: -0.1295
Centroid-sig: 8.8%
Centroid-so: 3.529 arcsec [1.58σ]
OotOffset-rm: 0.068 arcsec [0.75σ]
KicOffset-rm: 0.140 arcsec [1.68σ]
OotOffset-st: 4/4/4/5 [17]
KicOffset-st: 4/4/4/5 [17]
DiffImageQuality-fgm: 0.00 [0/17]
DiffImageOverlap-fno: 1.00 [17/17]

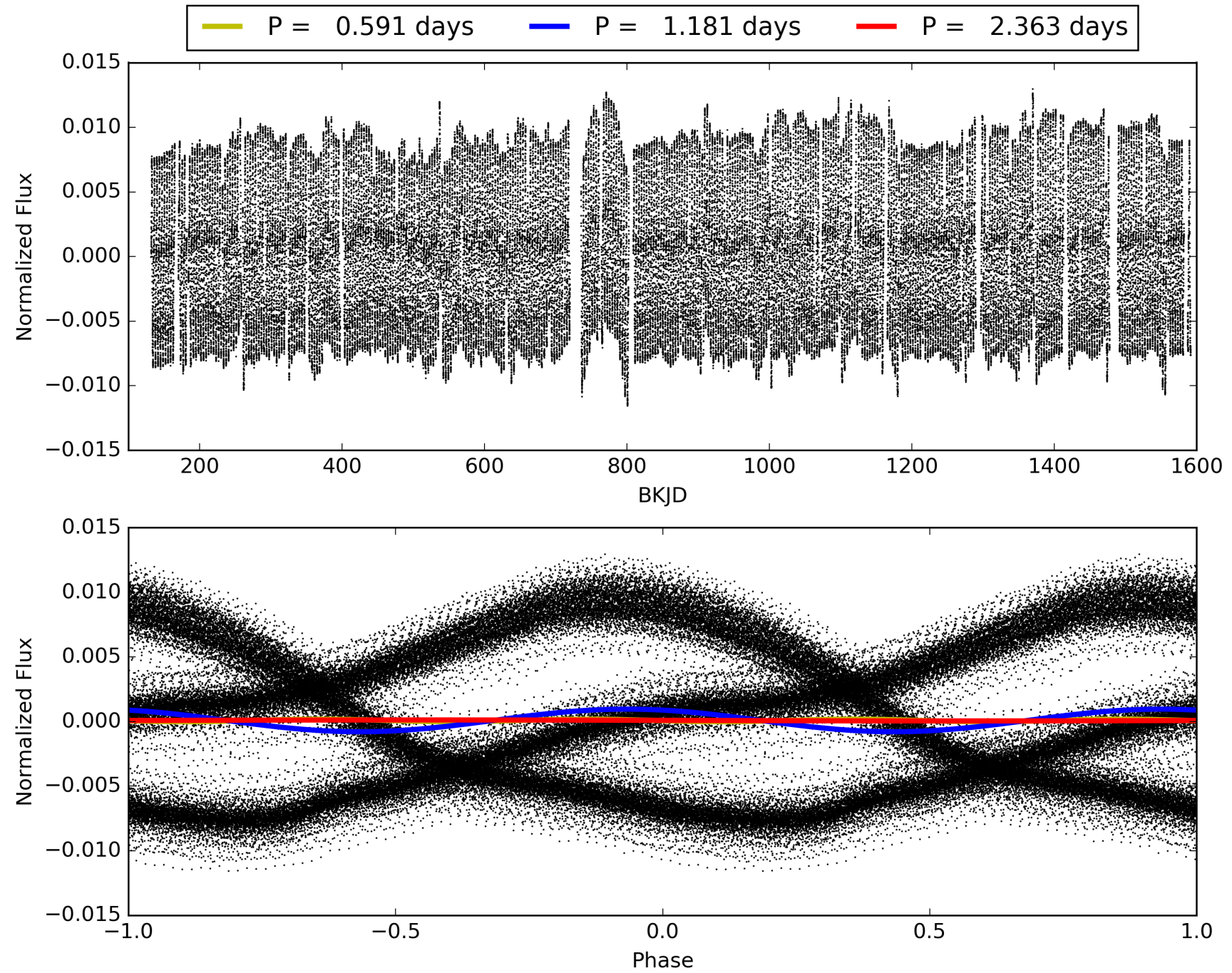
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 23:12:01 Z

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

TCE 008740898-03, PDC Light Curves

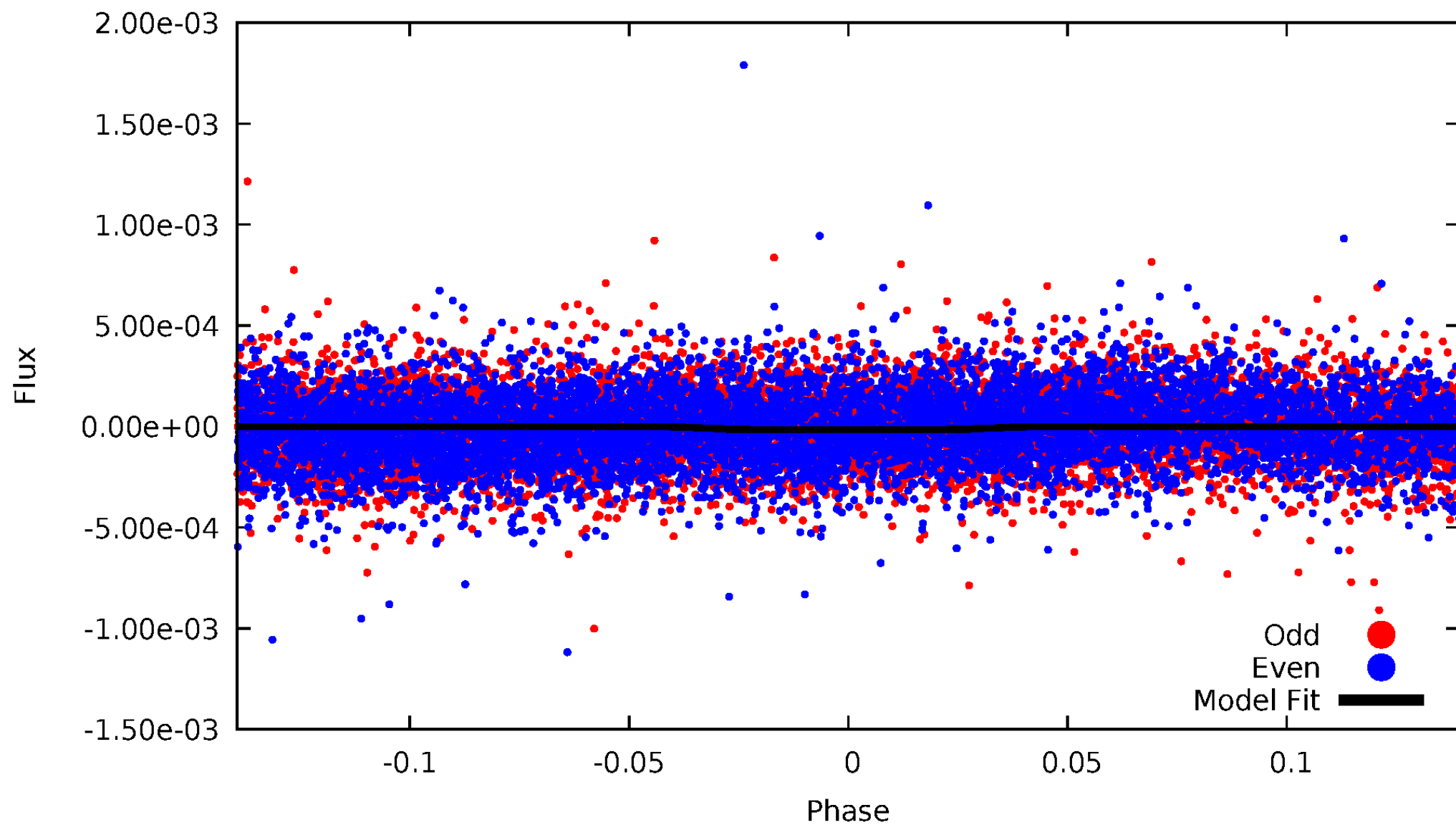


TCE 008740898-03



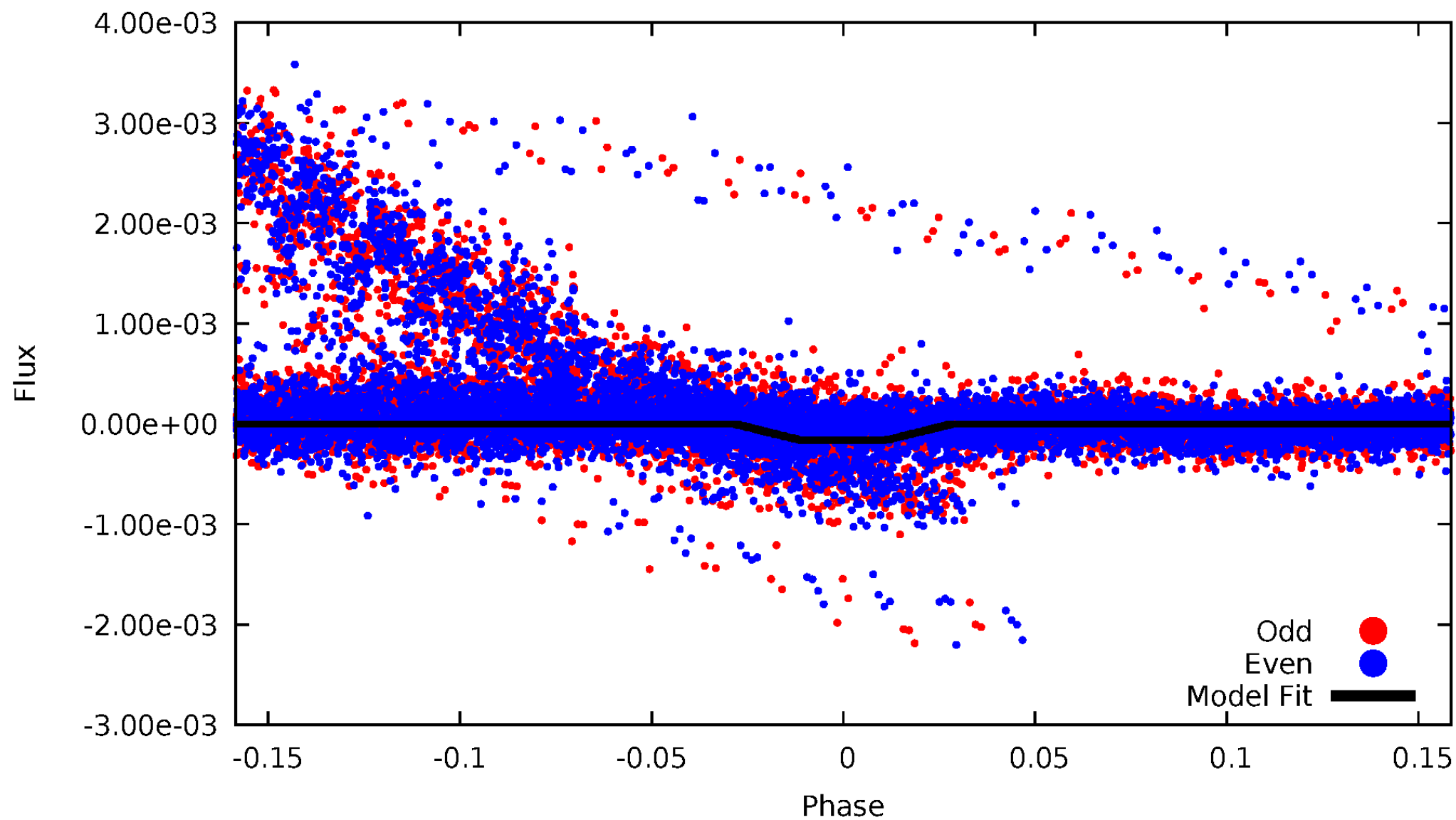
DV Odd/Even

TCE 008740898-03

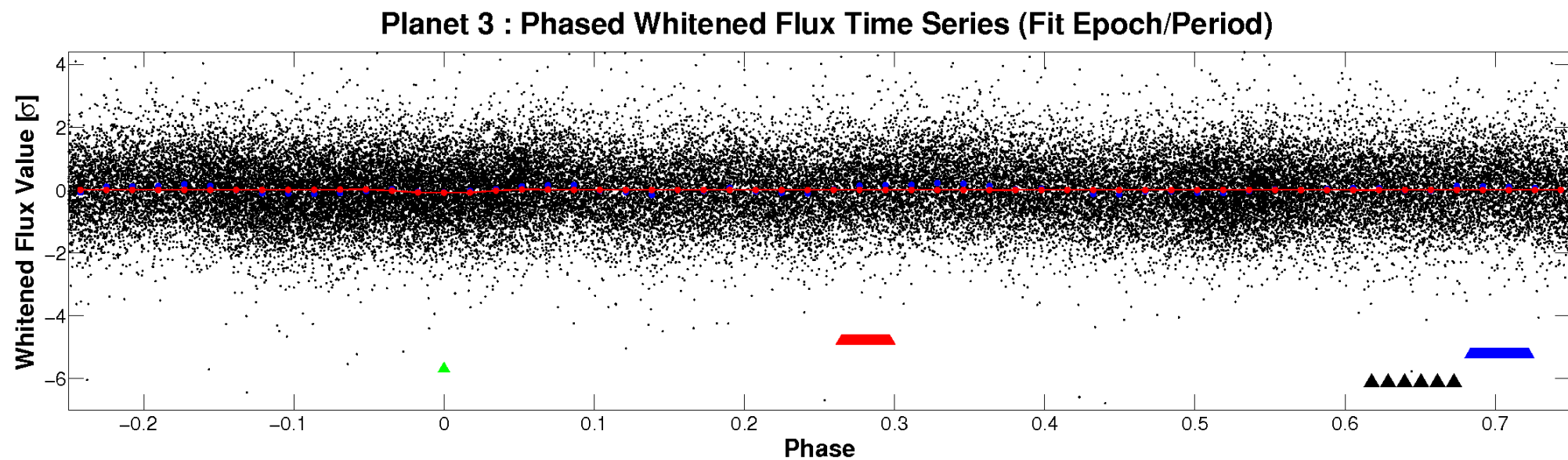
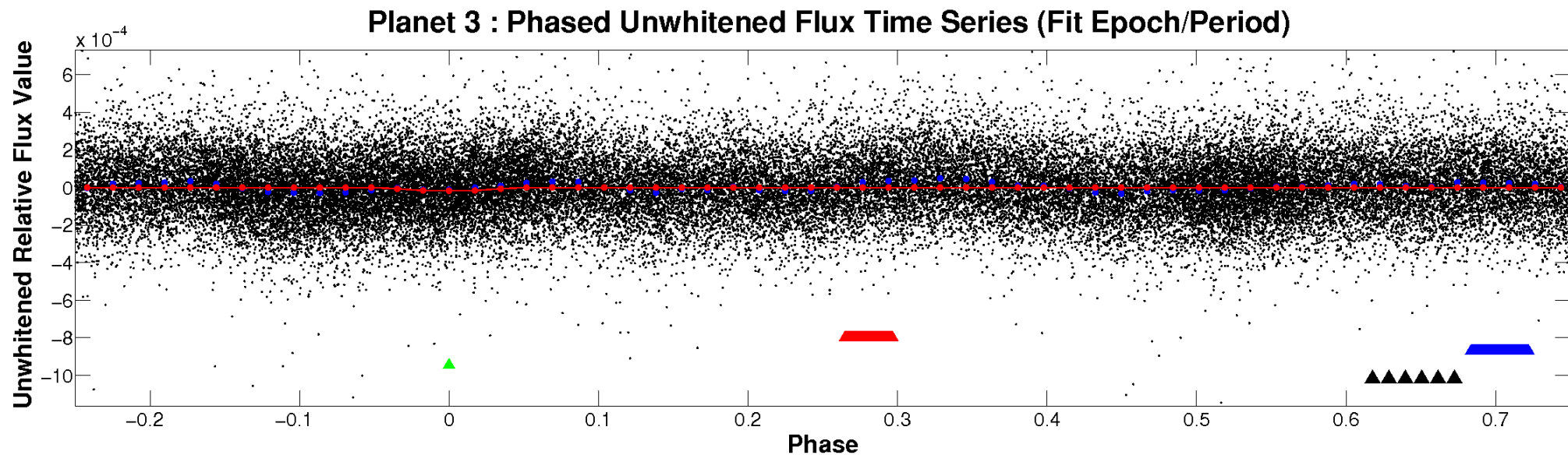


ALT Odd/Even

TCE 008740898-03

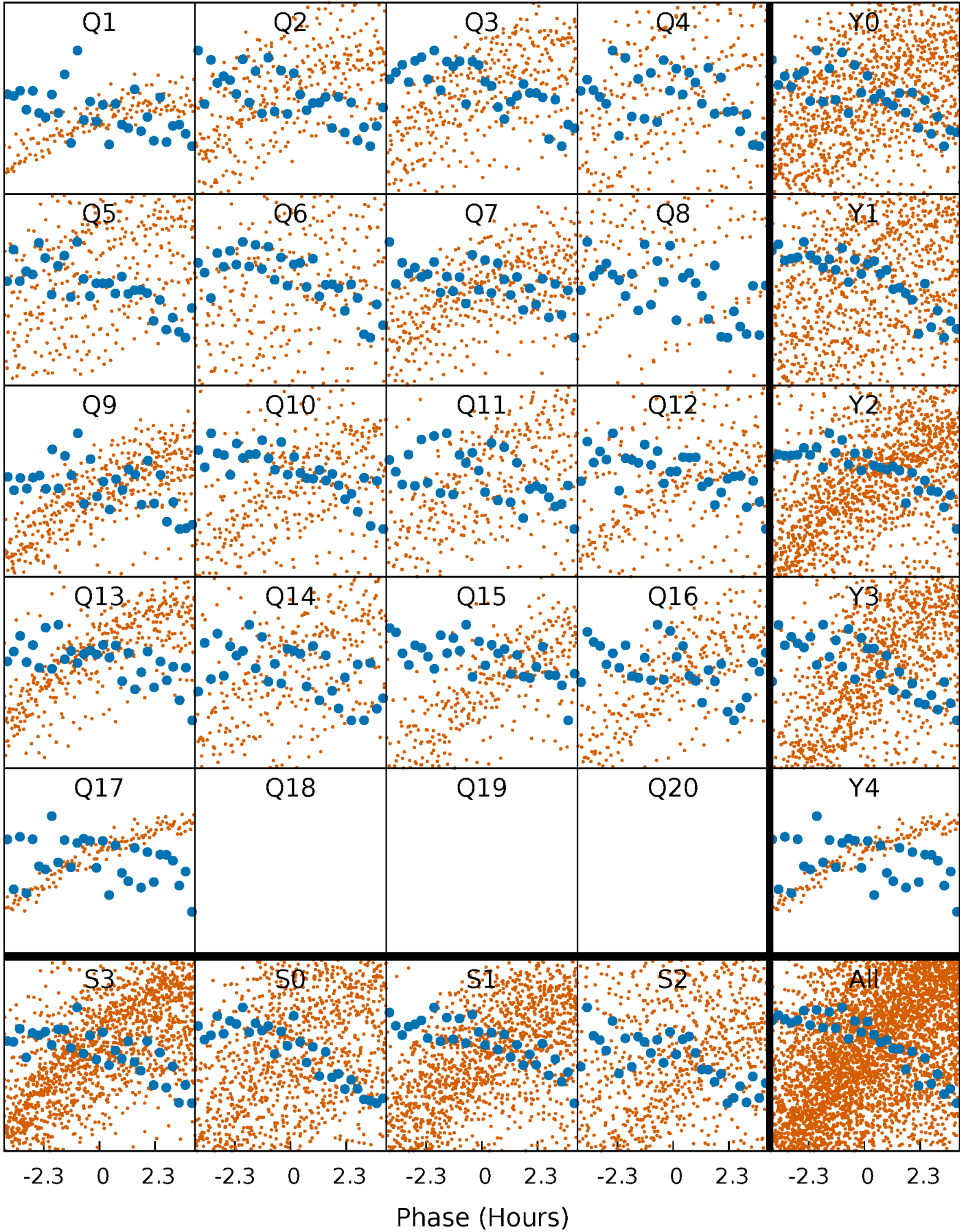


Non-Whitened Vs. Whitened Light Curve



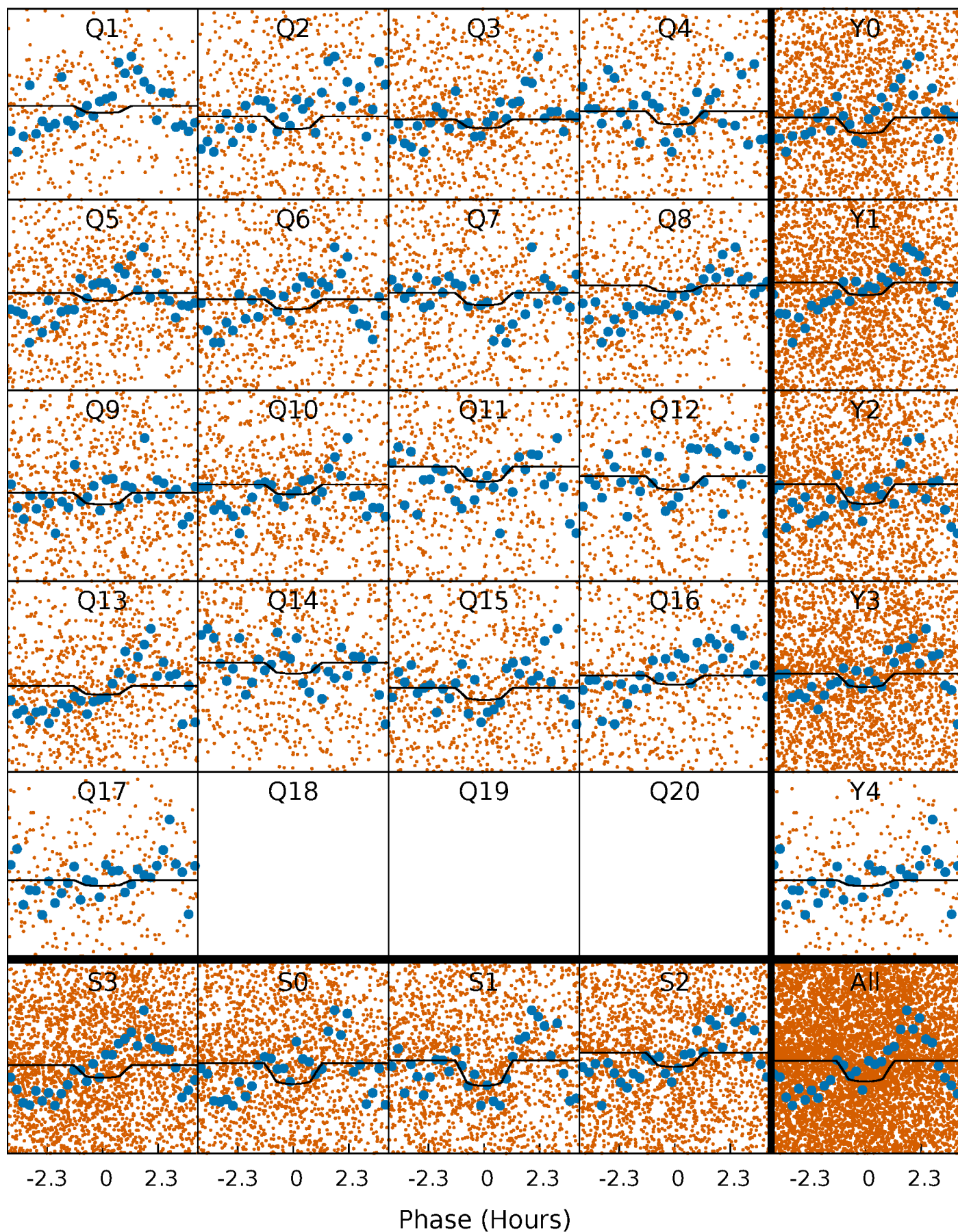
PDC Quarter-Phased Transit Curves

TCE 008740898-03 P= 1.181470 Days $T_0=132.692934$ (BKJD)



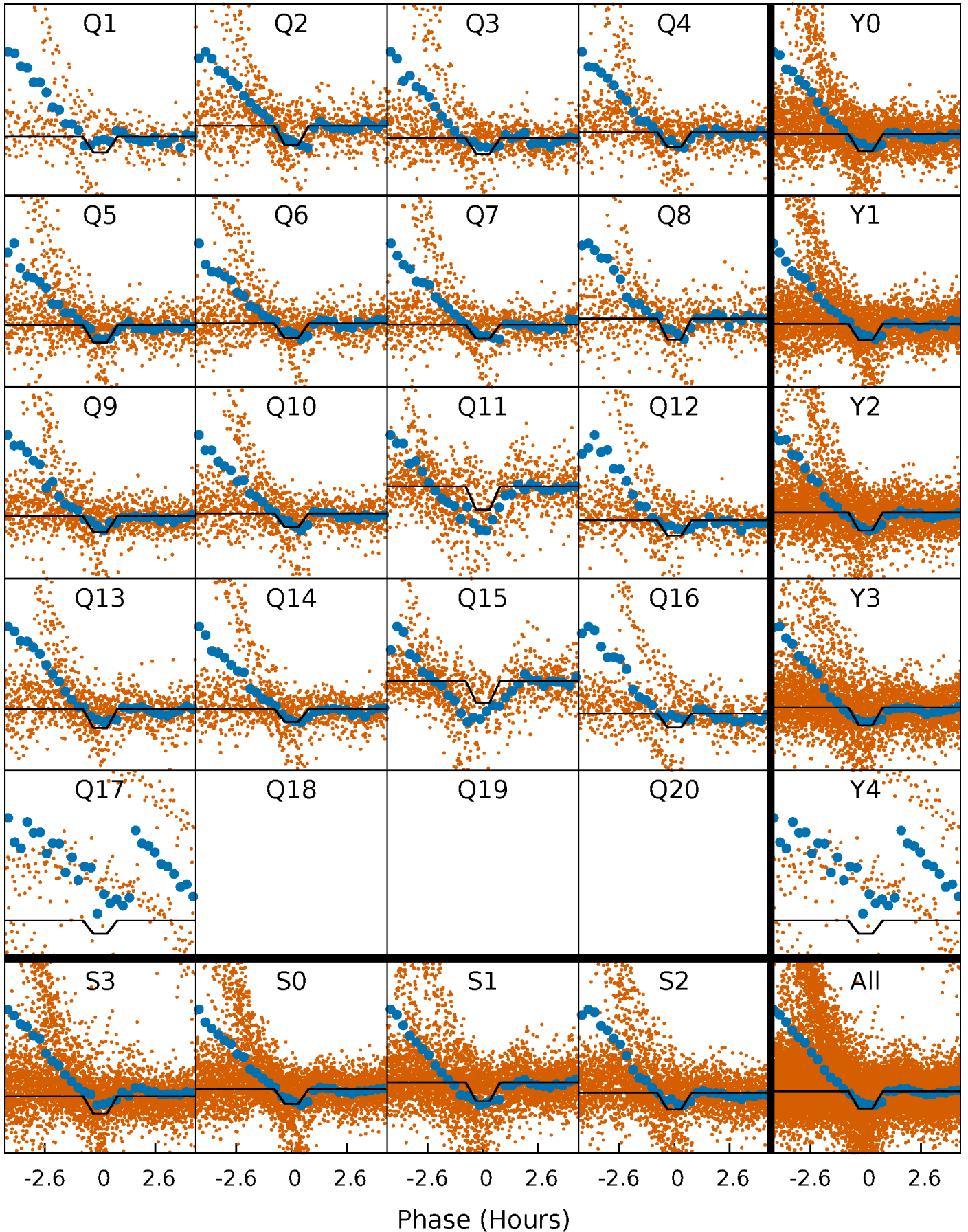
DV Quarter-Phased Transit Curves

TCE 008740898-03 P= 1.181470 Days $T_0=132.692934$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

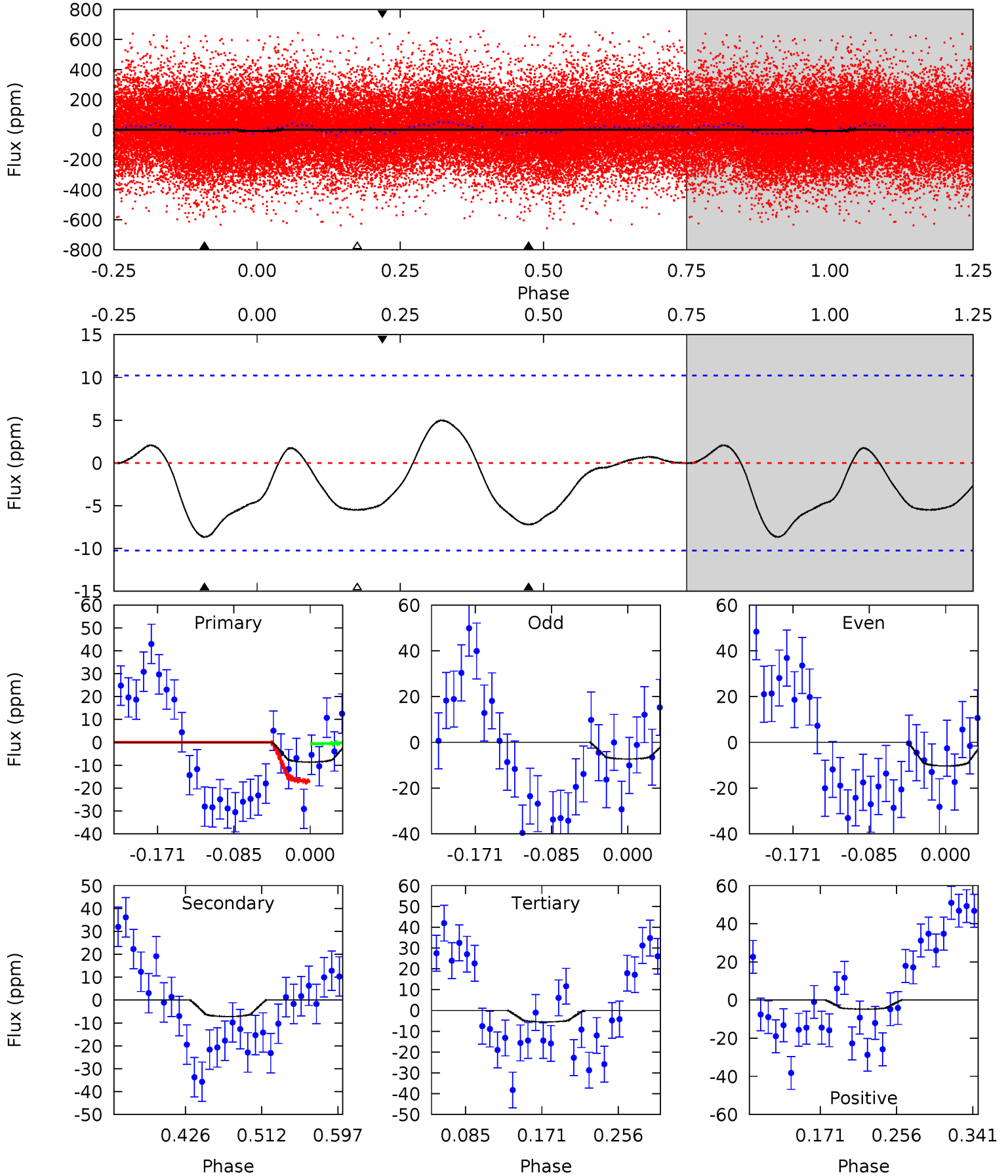
TCE 008740898-03 P= 1.181499 Days $T_0=132.699753$ (BKJD)



DV Model-Shift Uniqueness Test

008740898-03, P = 1.181470 Days, E = 131.511464 Days

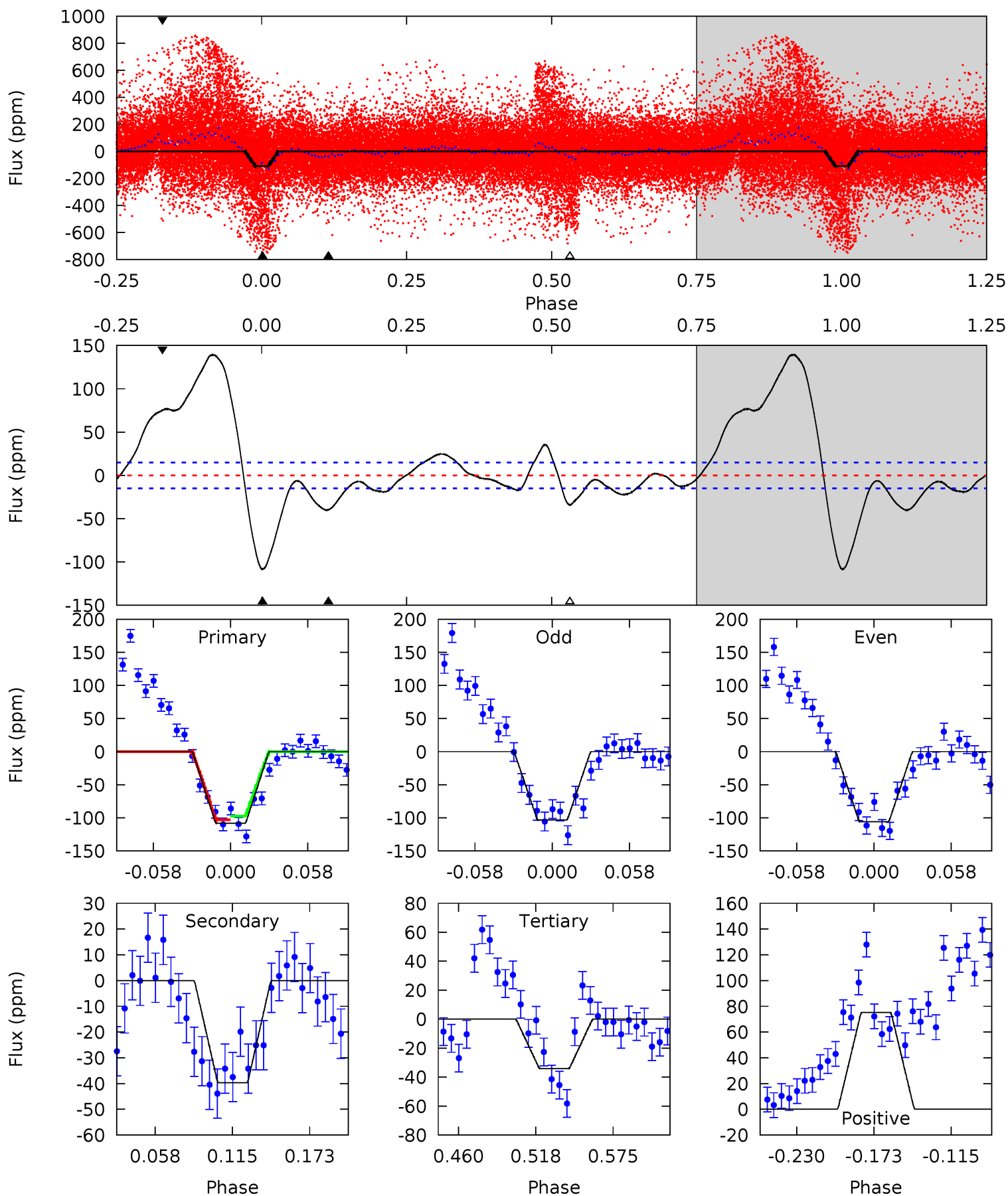
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|-------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 3.89 | 3.24 | 2.47 | -2.13 | 4.60 | 1.72 | 1.25 | 1.43 | 6.03 | 0.77 | 5.37 | 0.68 | 0.65 | 0.37 | 3.72 |



Alt Model-Shift Uniqueness Test

008740898-03, P = 1.181499 Days, E = 130.336755 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 34.0 | 12.5 | 10.7 | 23.6 | 4.68 | 1.90 | 13.9 | 23.3 | 10.4 | 1.76 | -11.2 | 0.39 | 2.44 | 0.56 | 0.94 |



Stellar Parameters For KIC 008740898

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | R (R_{\odot}) | M (M_{\odot}) | p_{\star} ($\text{g}\cdot\text{cm}^{-3}$) |
|--------|----------------------|---------------------------|---------------------------|---------------------------|---------------------------|---|
| | 8042^{+224}_{-352} | $4.215^{+0.054}_{-0.216}$ | $0.360^{+0.050}_{-0.500}$ | $1.779^{+0.602}_{-0.201}$ | $1.897^{+0.288}_{-0.262}$ | $0.474^{+0.105}_{-0.261}$ |
| | +3%/-4% | +1%/-5% | +14%/-139% | +34%/-11% | +15%/-14% | +22%/-55% |
| Source | KIC0 | 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 008740898-03 / KOI

| Detrend | Depth (ppm) | R_p (R_{\oplus}) | T_{max} (K) | T_{obs} (K) | A_{obs} |
|---------|-------------|------------------------|----------------------|-----------------------|---------------------------|
| DV | -7 ± 2 | $0.90^{+0.35}_{-0.33}$ | 4094^{+314}_{-226} | 5857^{+1723}_{-980} | $3.370^{+4.897}_{-1.767}$ |
| Alt. | -40 ± 3 | $2.59^{+0.48}_{-0.40}$ | 4090^{+302}_{-216} | 5312^{+412}_{-336} | $2.318^{+0.920}_{-0.652}$ |

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

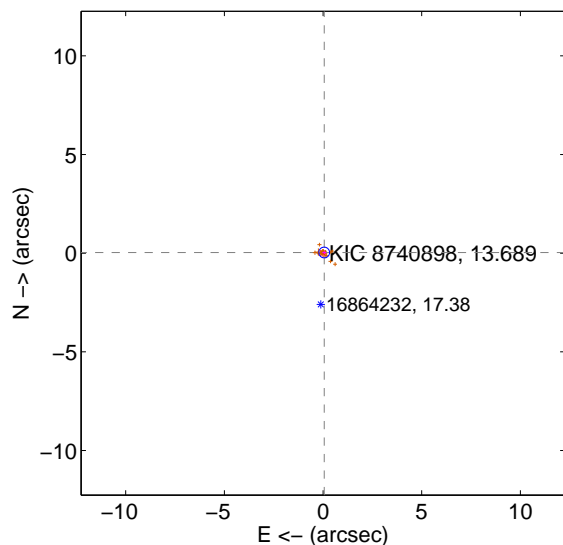
Supplemental centroid analysis for 008740898-03. Kepler magnitude: 13.69. Transit SNR 4.96

There are 0 quarters with good PRF difference image offsets

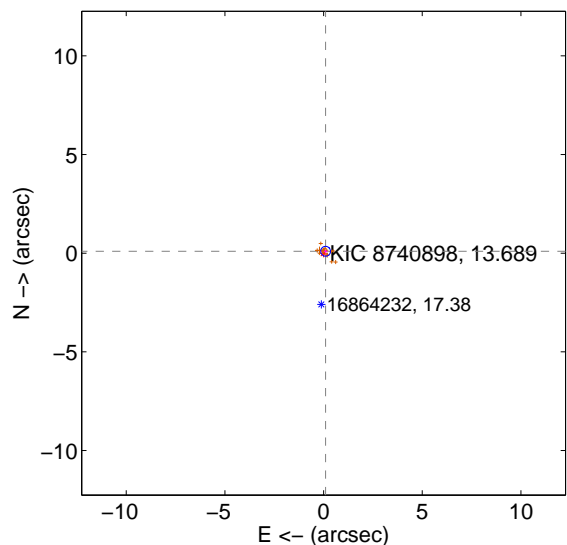
The direct PRF centroid is offset from the target star catalog position by about 0.10 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|---|--------------------|---------------------|--------------------|-------------------|
| PRF-fit source offset from OOT | 0.068 ± 0.091 | 0.75 | -0.058 ± 0.096 | 0.035 ± 0.074 |
| PRF-fit source offset from KIC position | 0.140 ± 0.083 | 1.68 | -0.101 ± 0.092 | 0.097 ± 0.073 |
| photometric centroid source offset | 3.53 ± 2.23 | 1.58 | -3.37 ± 2.25 | -1.03 ± 2.01 |

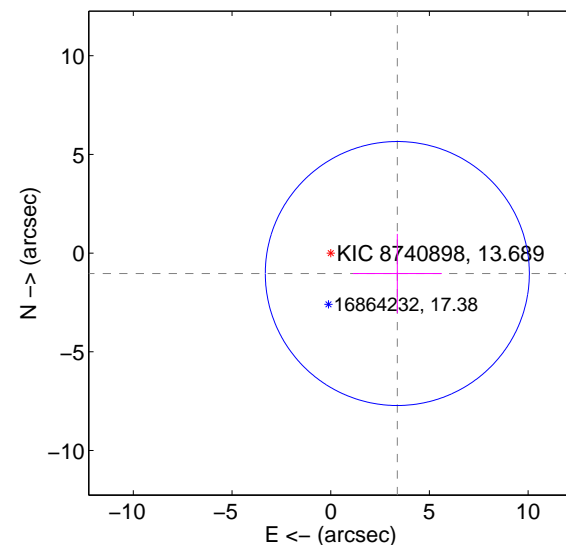
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

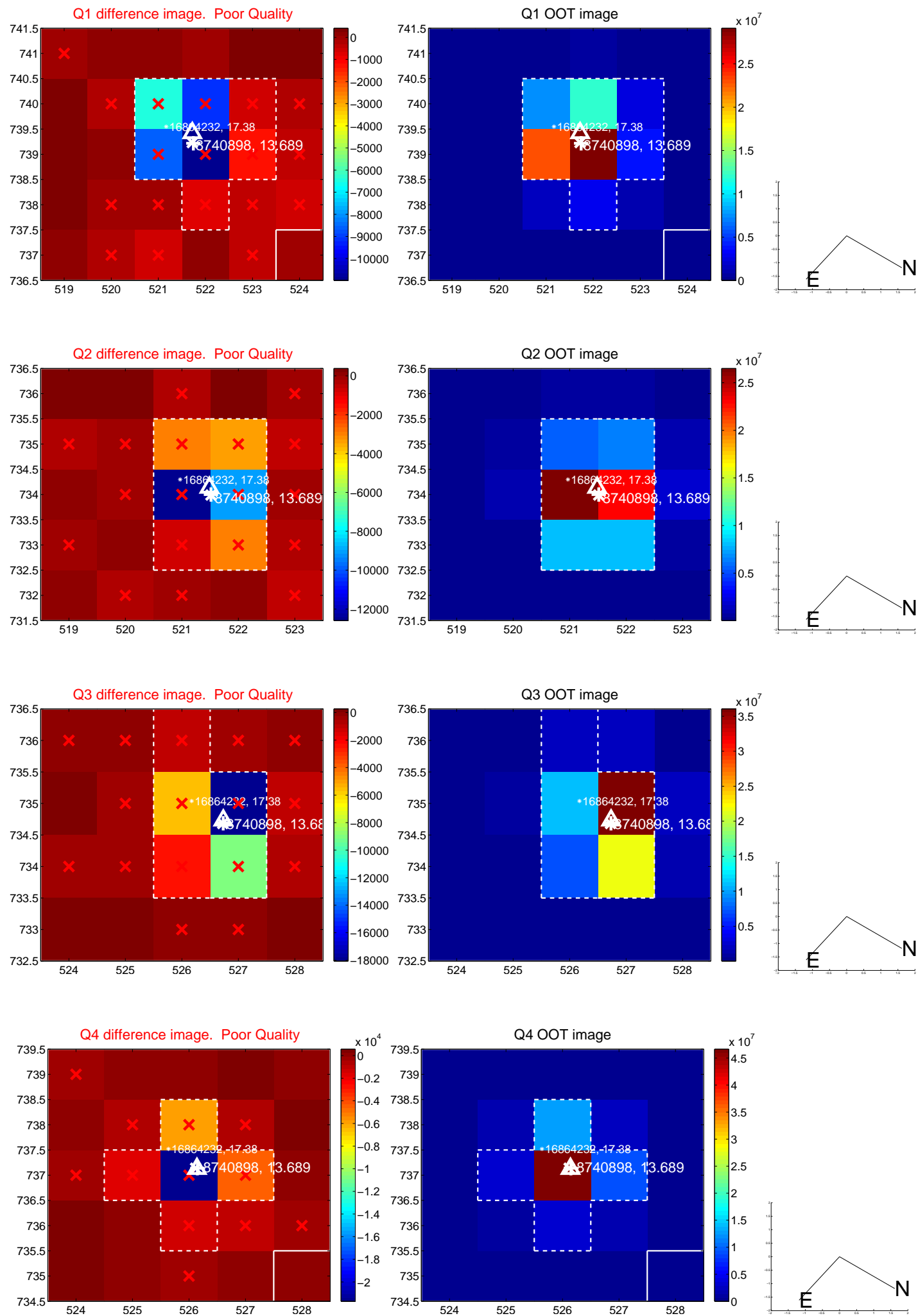


offset from photometric centroids

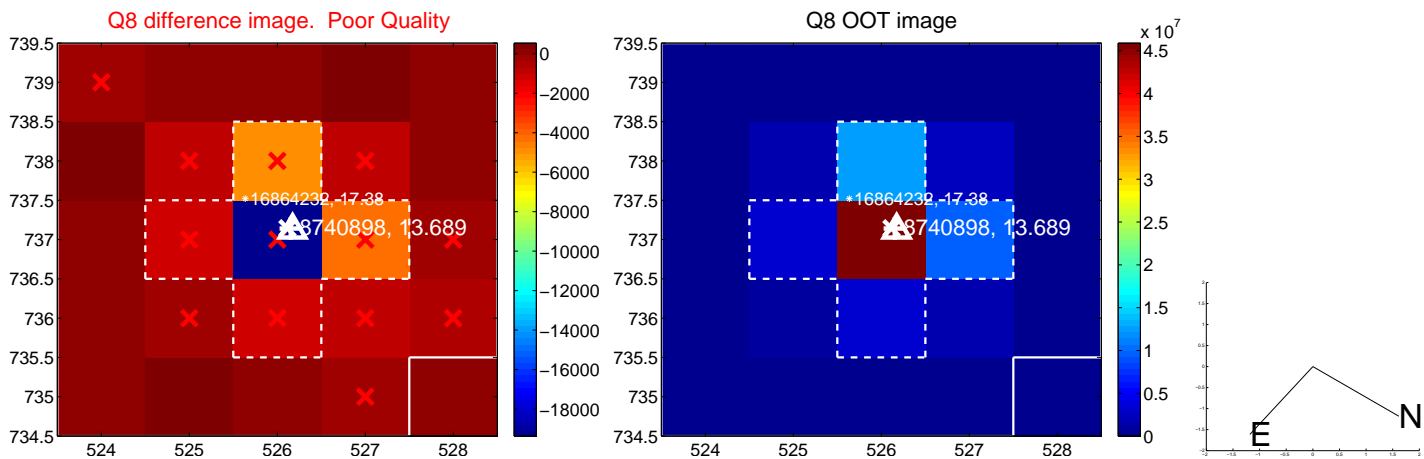
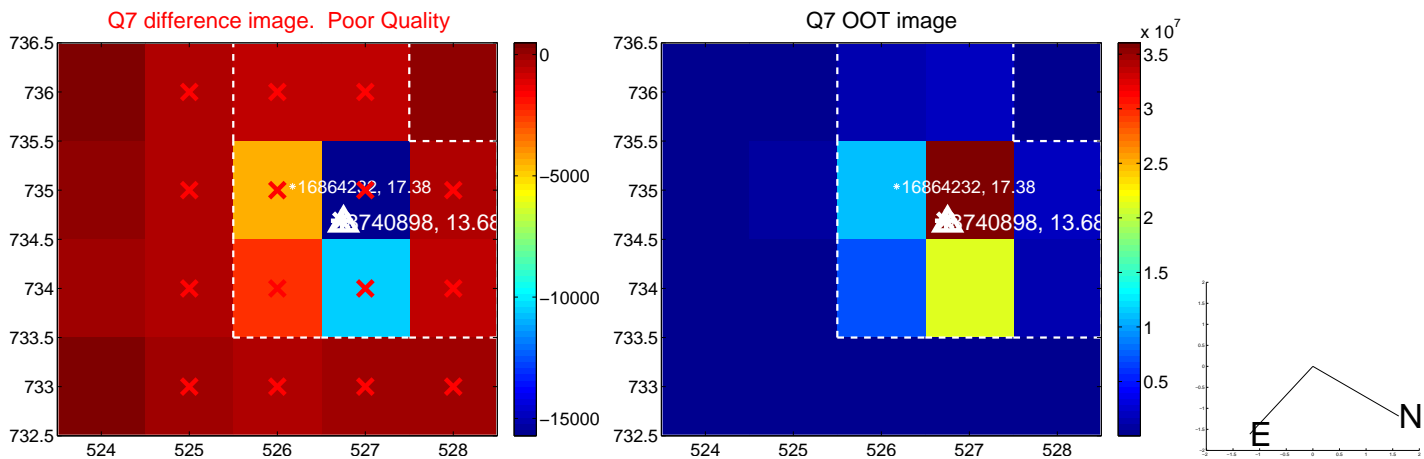
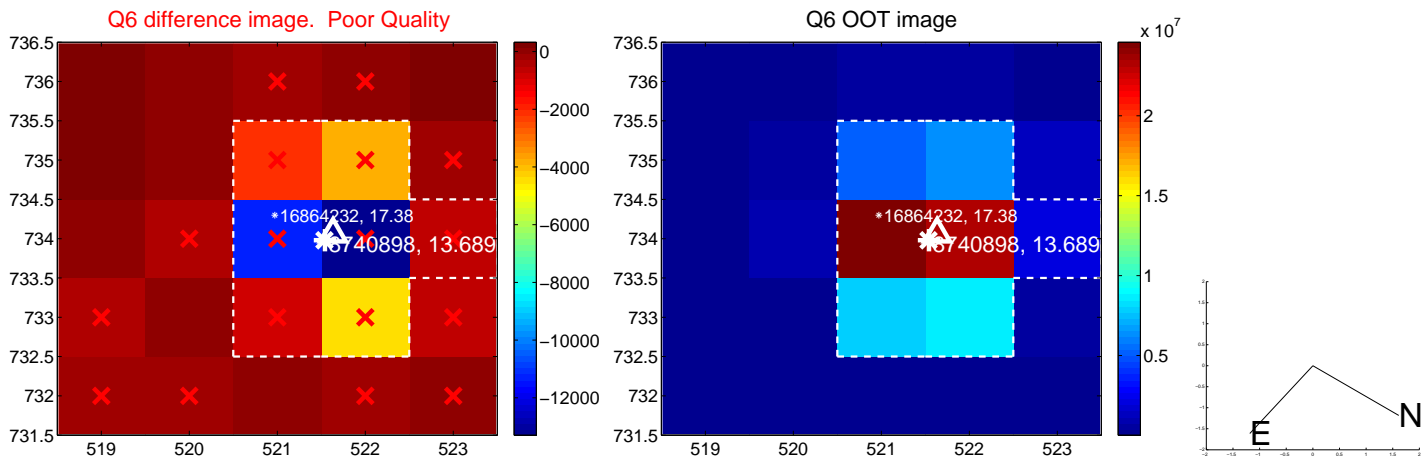
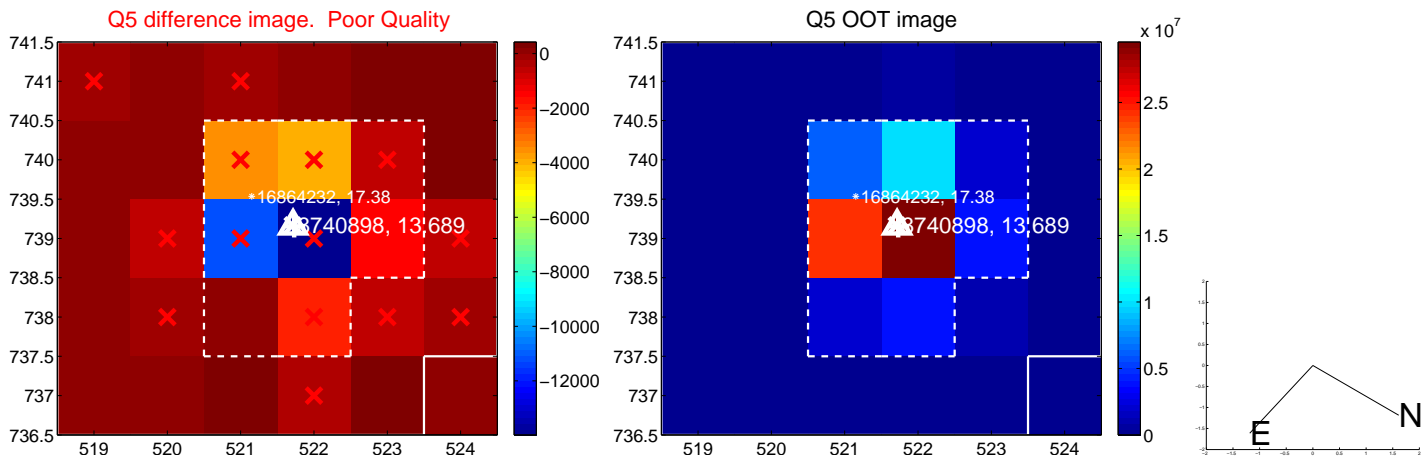


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three- σ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

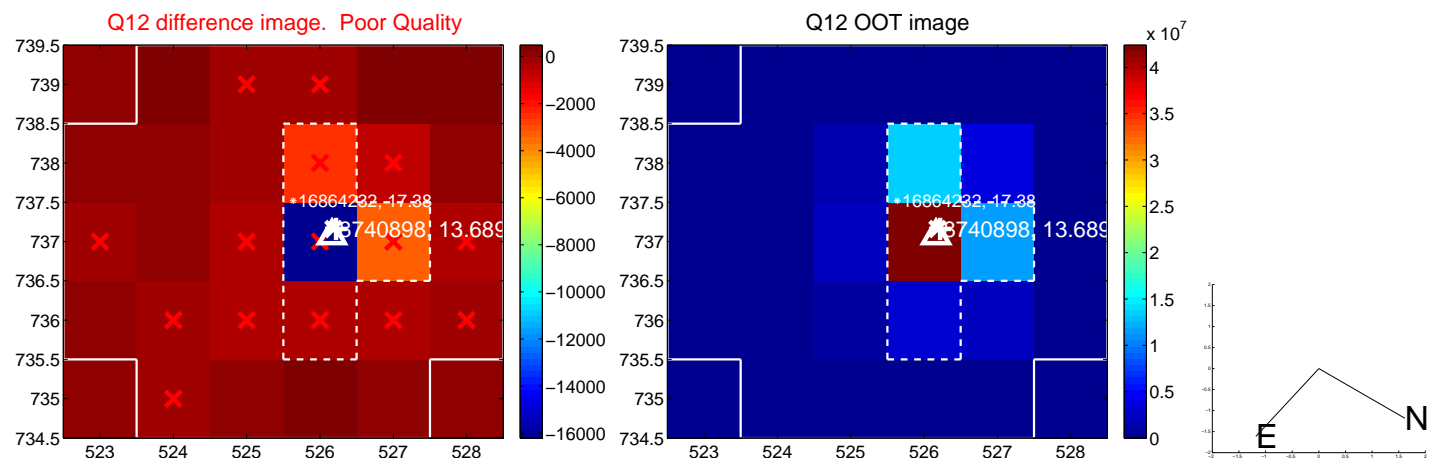
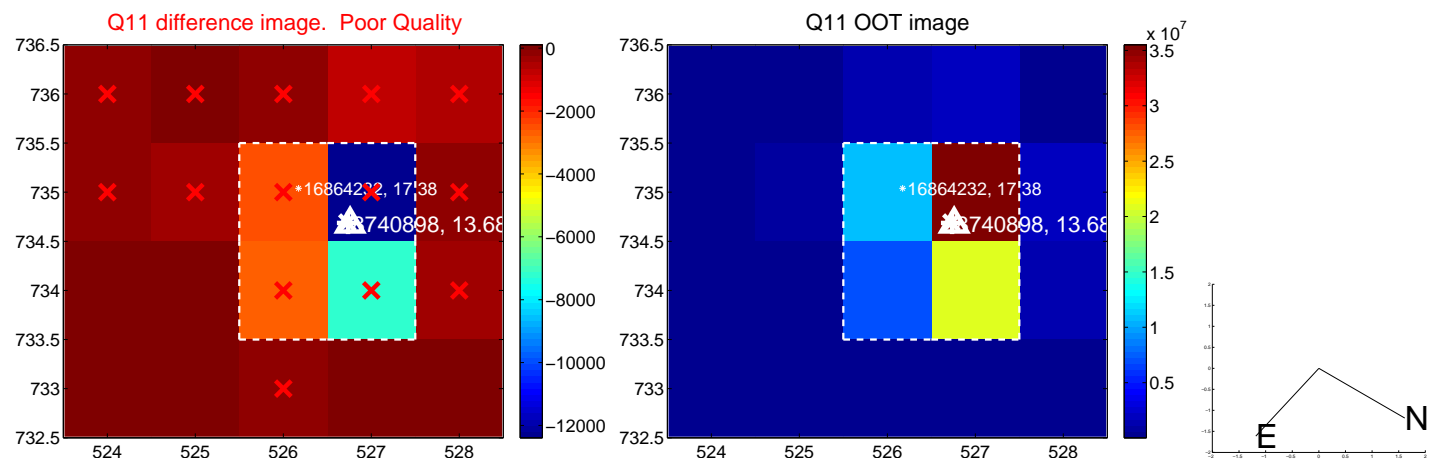
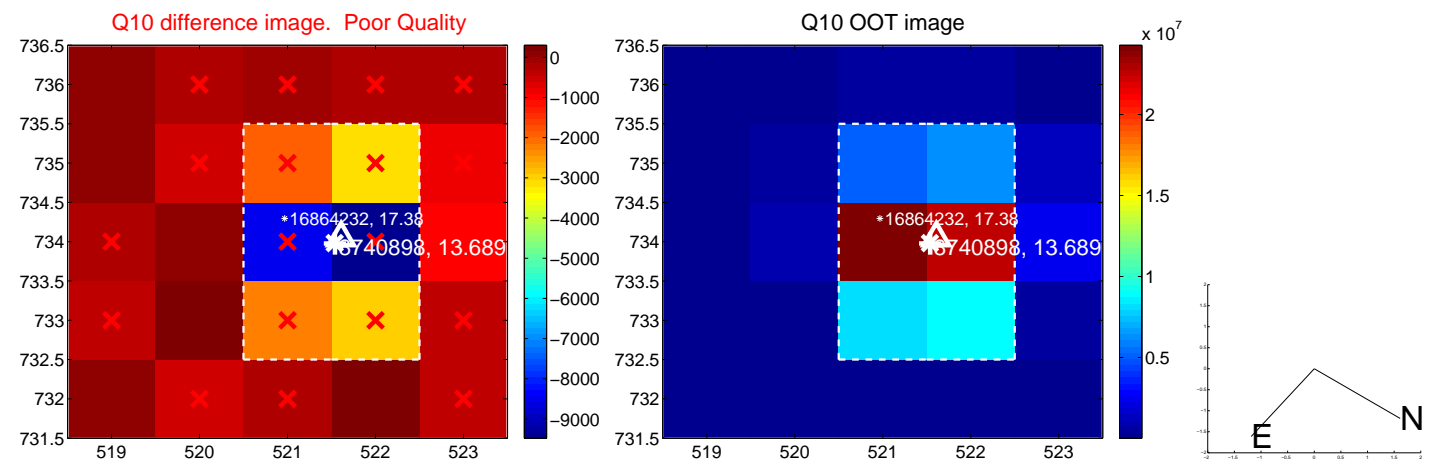
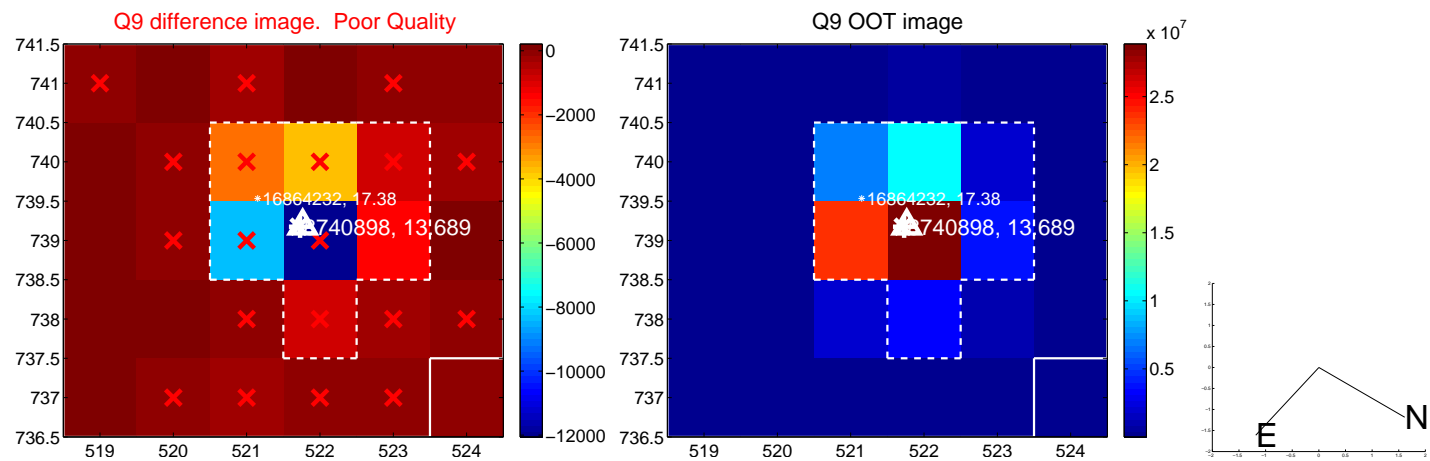
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



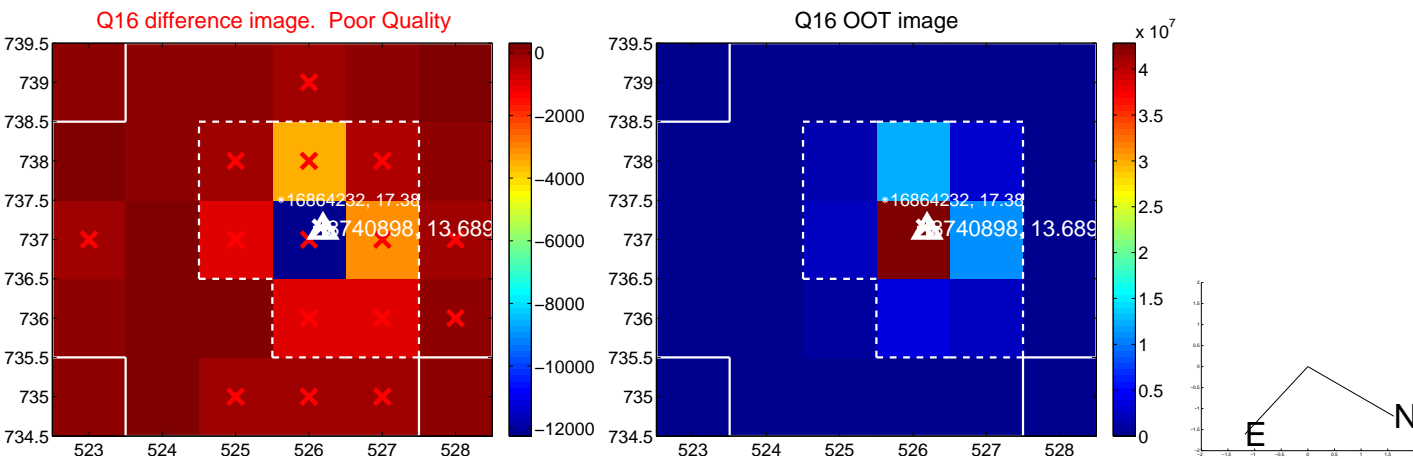
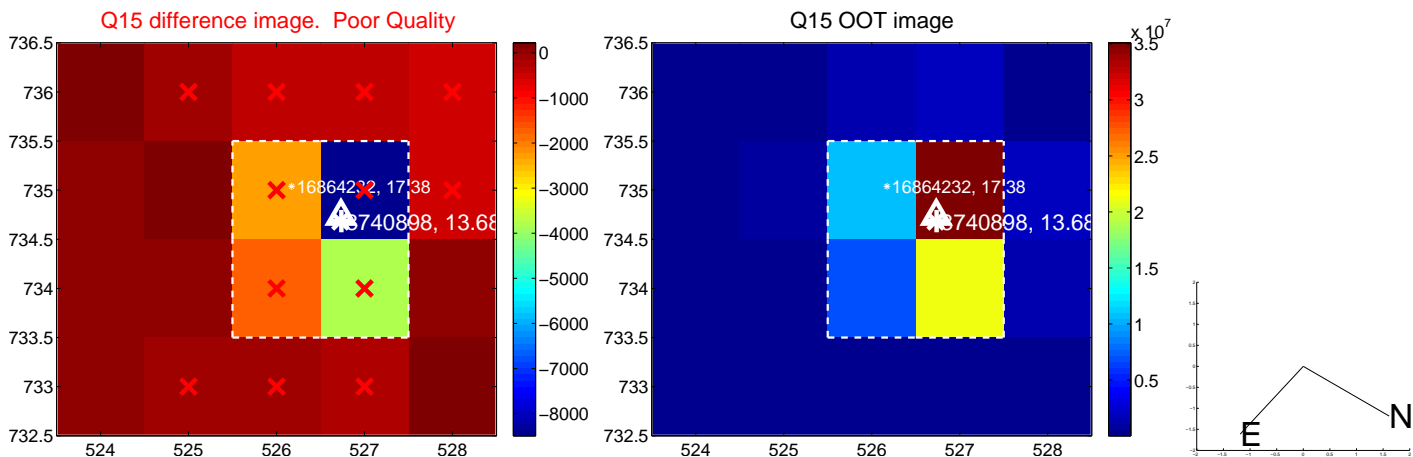
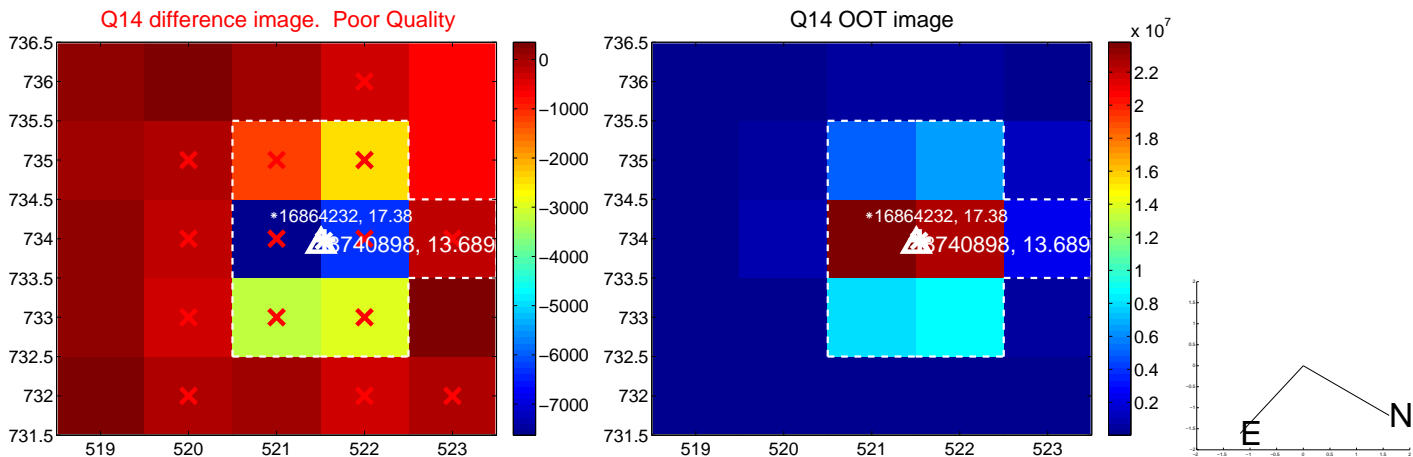
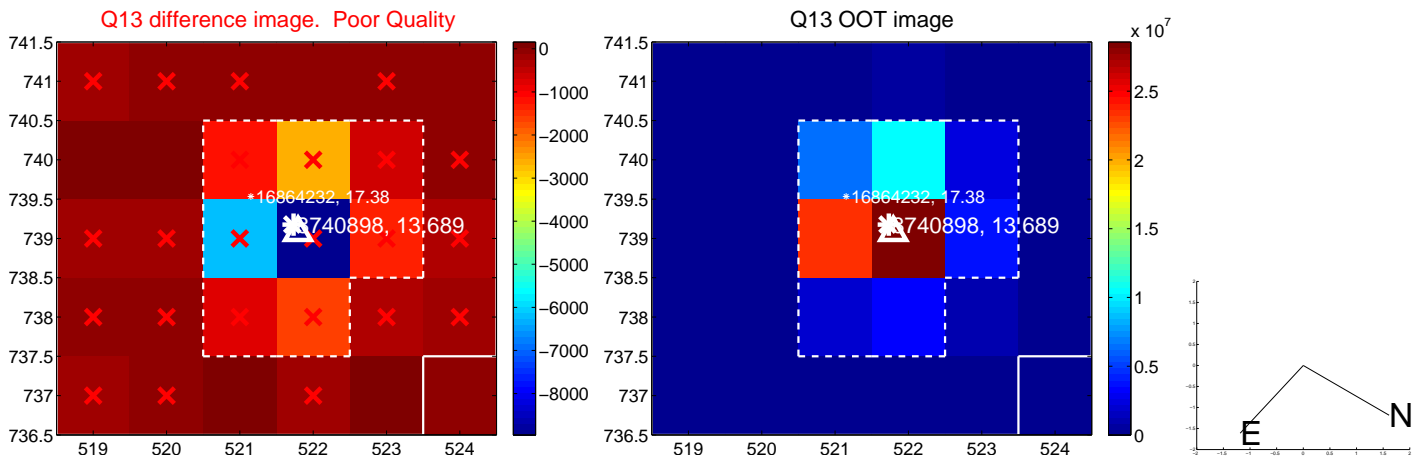
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



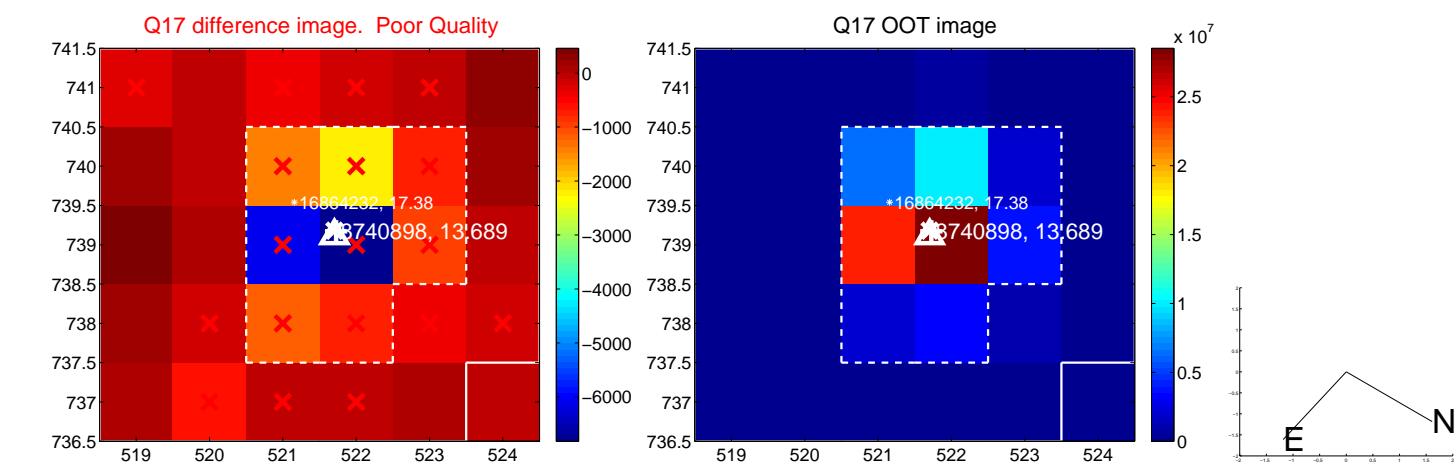
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



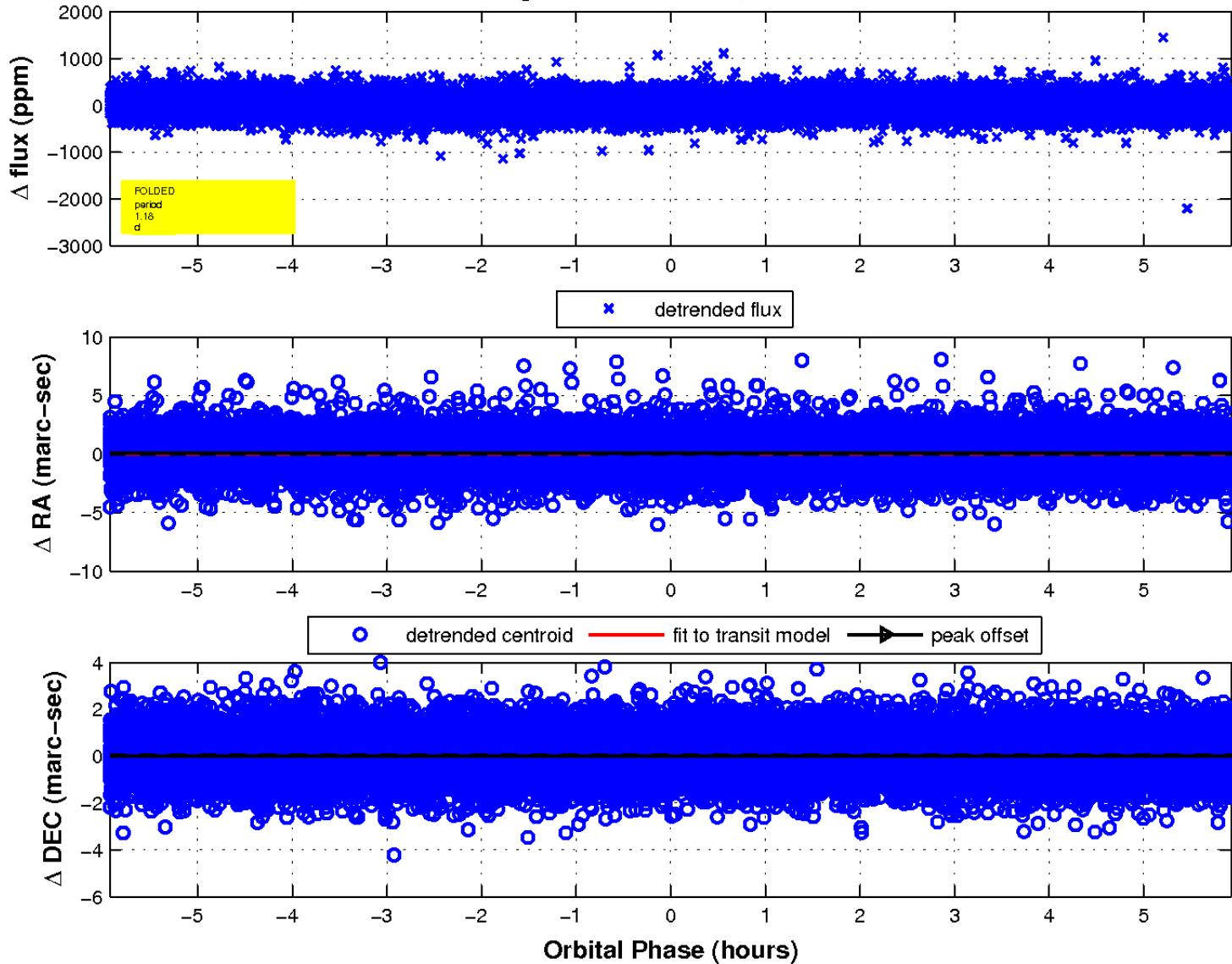
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

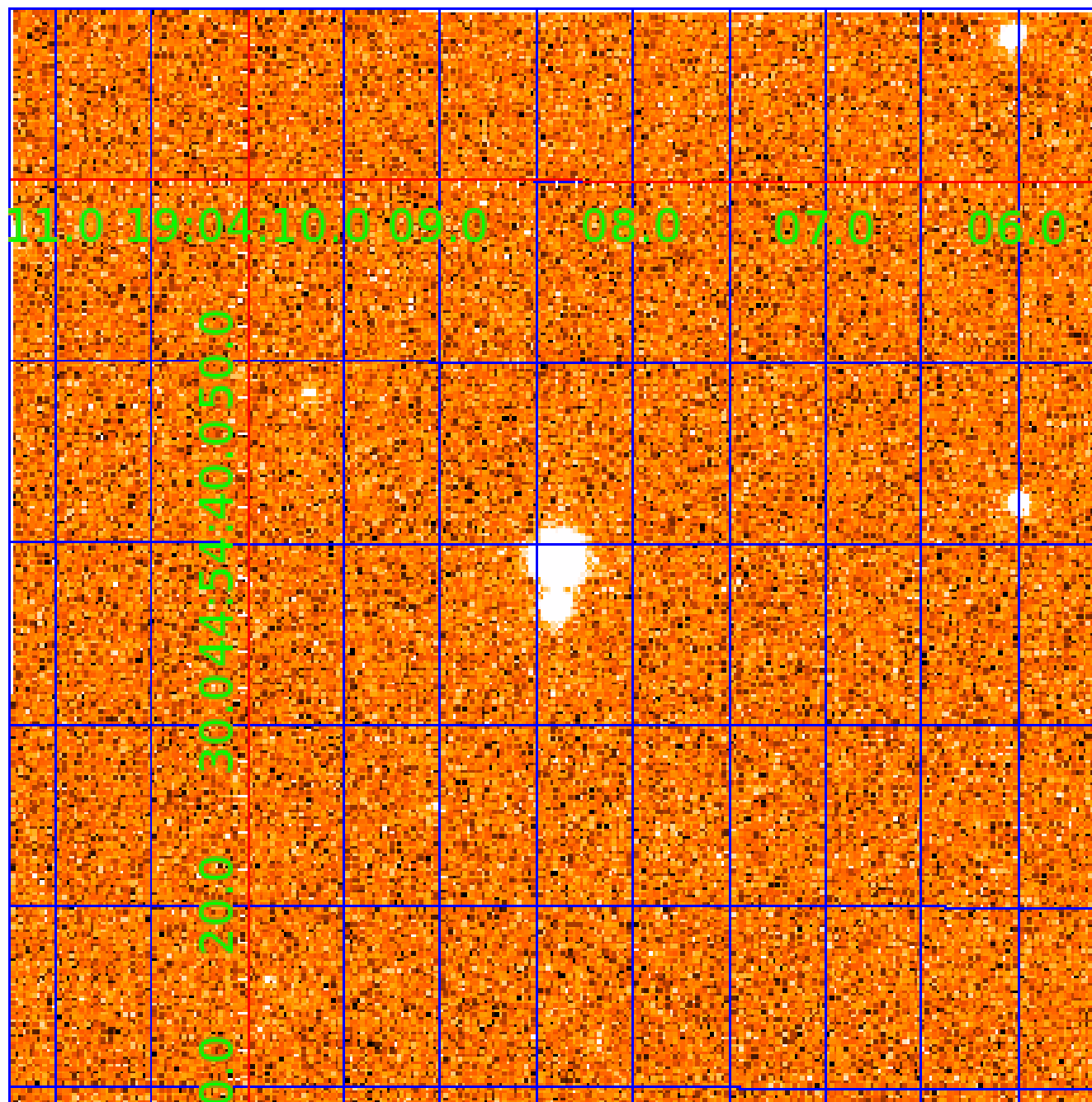


fluxWeightedCentroids, Planet 3 of 4



UKIRT Image

Declination



KIC 008740898

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}) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 008740898-01 | OBS | No | 3.544502 | 134.187235 | 111.6 | 3.837 | 18.5 | 20.3 | 1.78 | 8042 | 2.31 | 3741.63 |
| 008740898-02 | OBS | No | 3.544522 | 132.318963 | 64.2 | 2.424 | 9.7 | 11.0 | 1.78 | 8042 | 1.67 | 3741.60 |
| 008740898-03 | OBS | No | 1.181470 | 132.692934 | 17.0 | 1.976 | 8.4 | 5.0 | 1.78 | 8042 | 0.85 | 16189.65 |
| 008740898-04 | OBS | No | 249.303169 | 264.565967 | 444.7 | 15.115 | 10.8 | 8.3 | 1.78 | 8042 | 4.32 | 12.89 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|--|
| 008740898-01 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | SWEET_NTL—LPP_DV |
| 008740898-02 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | SWEET_NTL—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT—SAME_NTL_PERIOD—CENT_FEW_DIFFS |
| 008740898-03 | OBS | FP | 0.00 | 1 | 0 | 1 | 0 | INDIV_TRANS_RUBBLE_SKYE_ZUMA_TRACKER—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD—CENT_FEW_DIFFS—HALO_GHOST |
| 008740898-04 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_MARSHALL_SKYE—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—INCONSISTENT_TRANS |

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

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

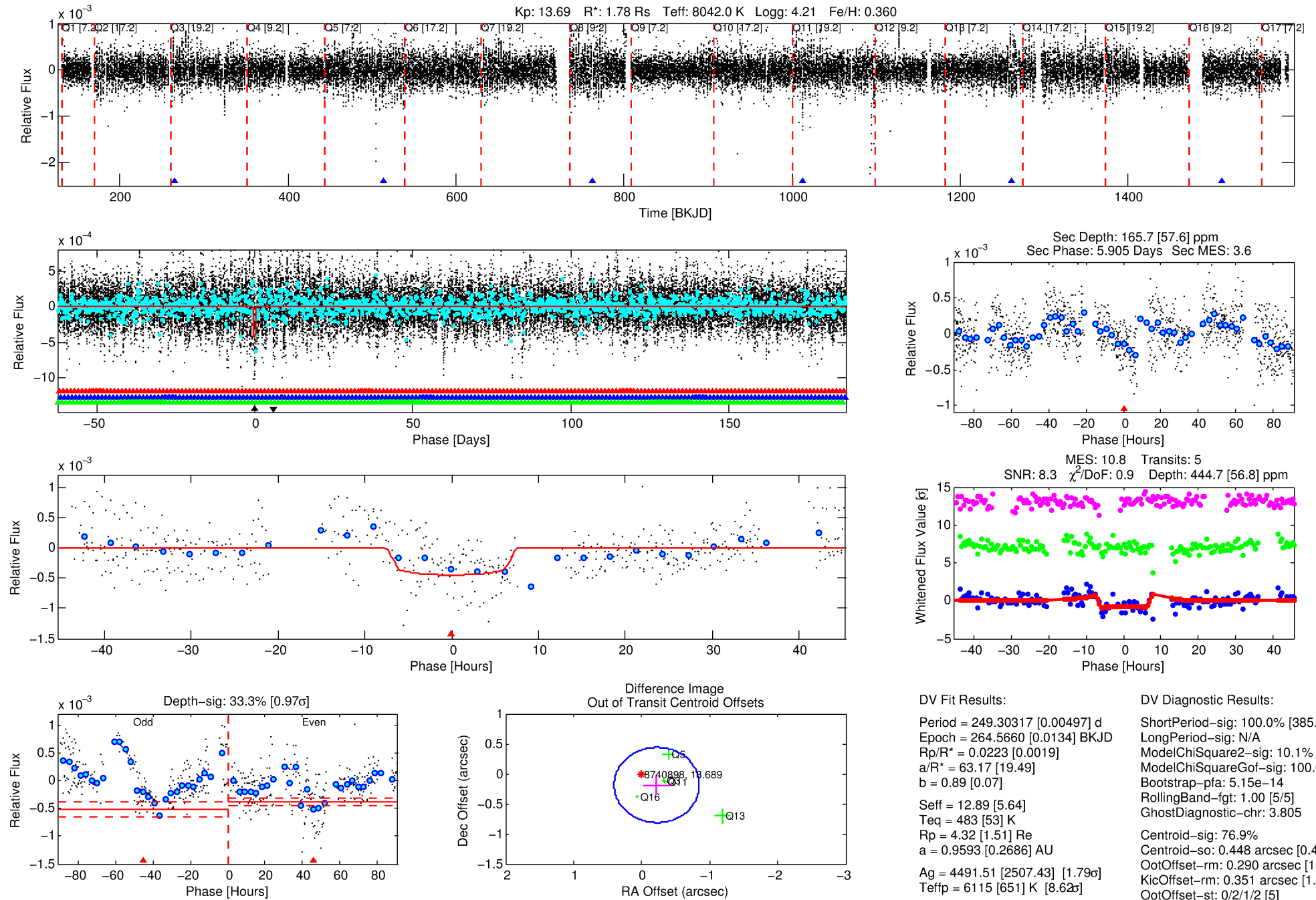
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 008740898-04

No Significant Match Found

DV One-Page Summary

KIC: 8740898 Candidate: 4 of 4 Period: 249.303 d



DV Fit Results:

Period = 249.30317 [0.00497] d
Epoch = 264.5660 [0.0134] BKJD
Rp/R* = 0.0223 [0.0019]
a/R* = 63.17 [19.49]
b = 0.89 [0.07]
Seff = 12.89 [5.64]
Teq = 483 [53] K
Rp = 4.32 [1.51] Re
a = 0.9593 [0.2686] AU
Ag = 4491.51 [2507.43] [1.79 σ]
Teff = 6115 [651] K [8.62 σ]

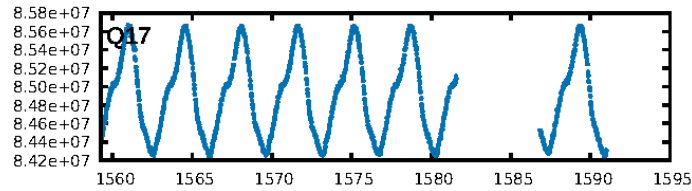
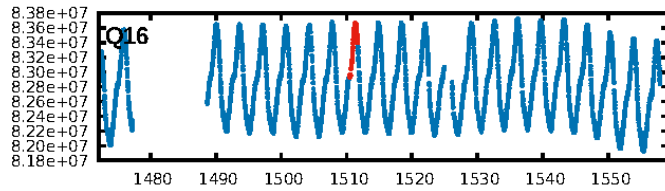
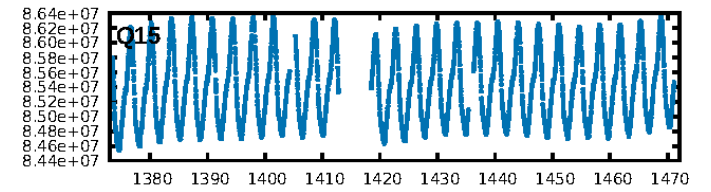
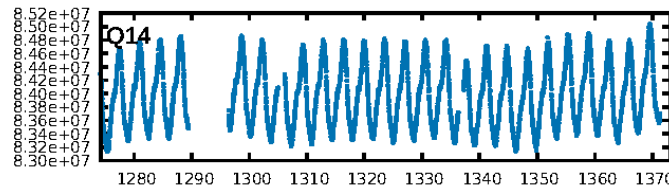
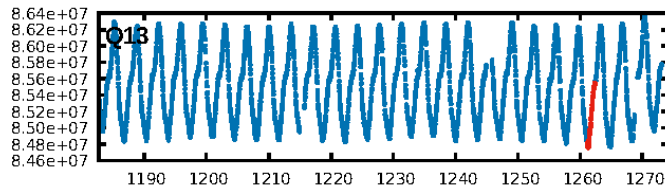
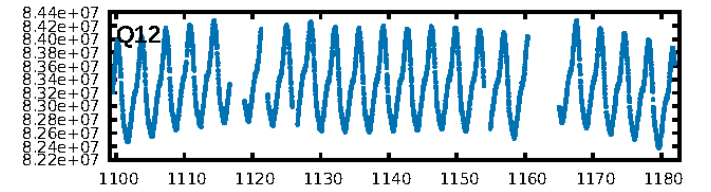
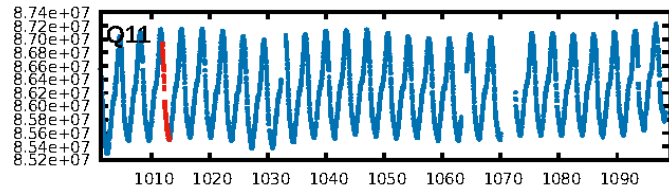
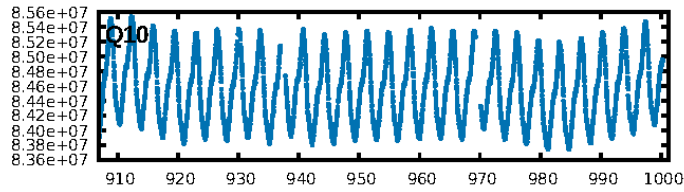
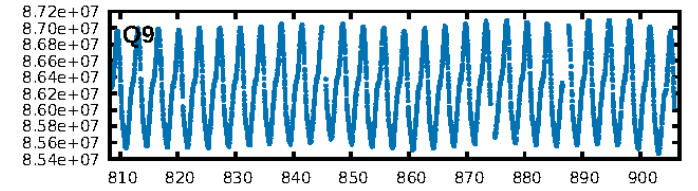
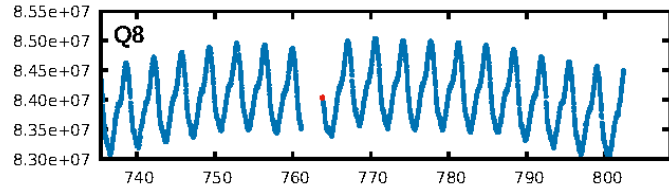
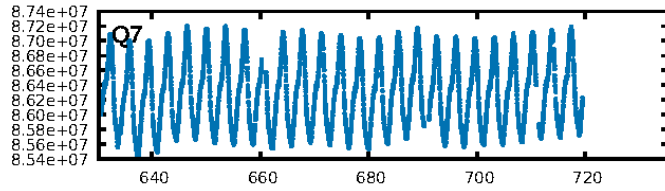
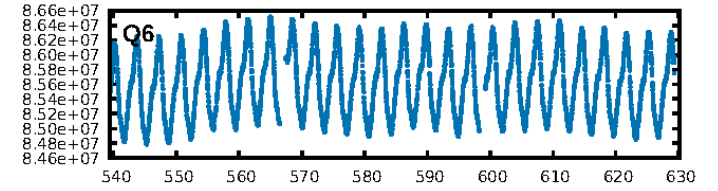
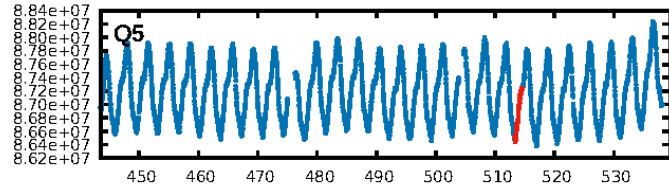
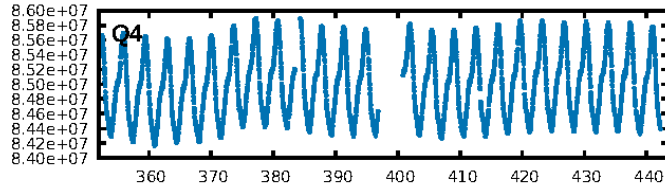
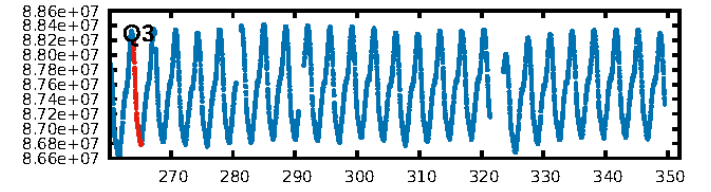
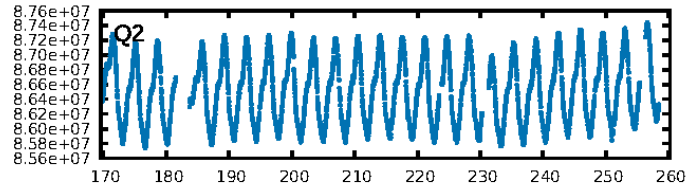
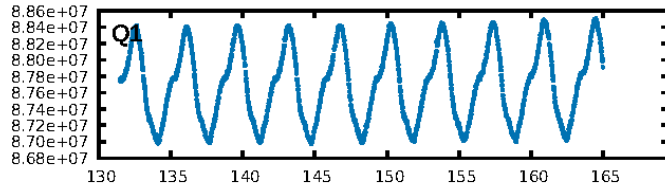
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [385.30 σ]
LongPeriod-sig: N/A
ModelChiSquare2-sig: 10.1%
ModelChiSquareGof-sig: 100.0%
Bootstrap-pfa: 5.15e-14
RollingBand-fgt: 1.00 [5/5]
GhostDiagnostic-chr: 3.805
Centroid-sig: 76.9%
Centroid-so: 0.448 arcsec [0.48 σ]
OotOffset-rm: 0.290 arcsec [1.39 σ]
OotOffset-st: 0/2/1/2 [5]
KicOffset-rm: 0.351 arcsec [1.81 σ]
KicOffset-st: 0/2/1/2 [5]
DiffImageQuality-fgm: 0.80 [4/5]
DiffImageOverlap-fno: 0.00 [0/5]

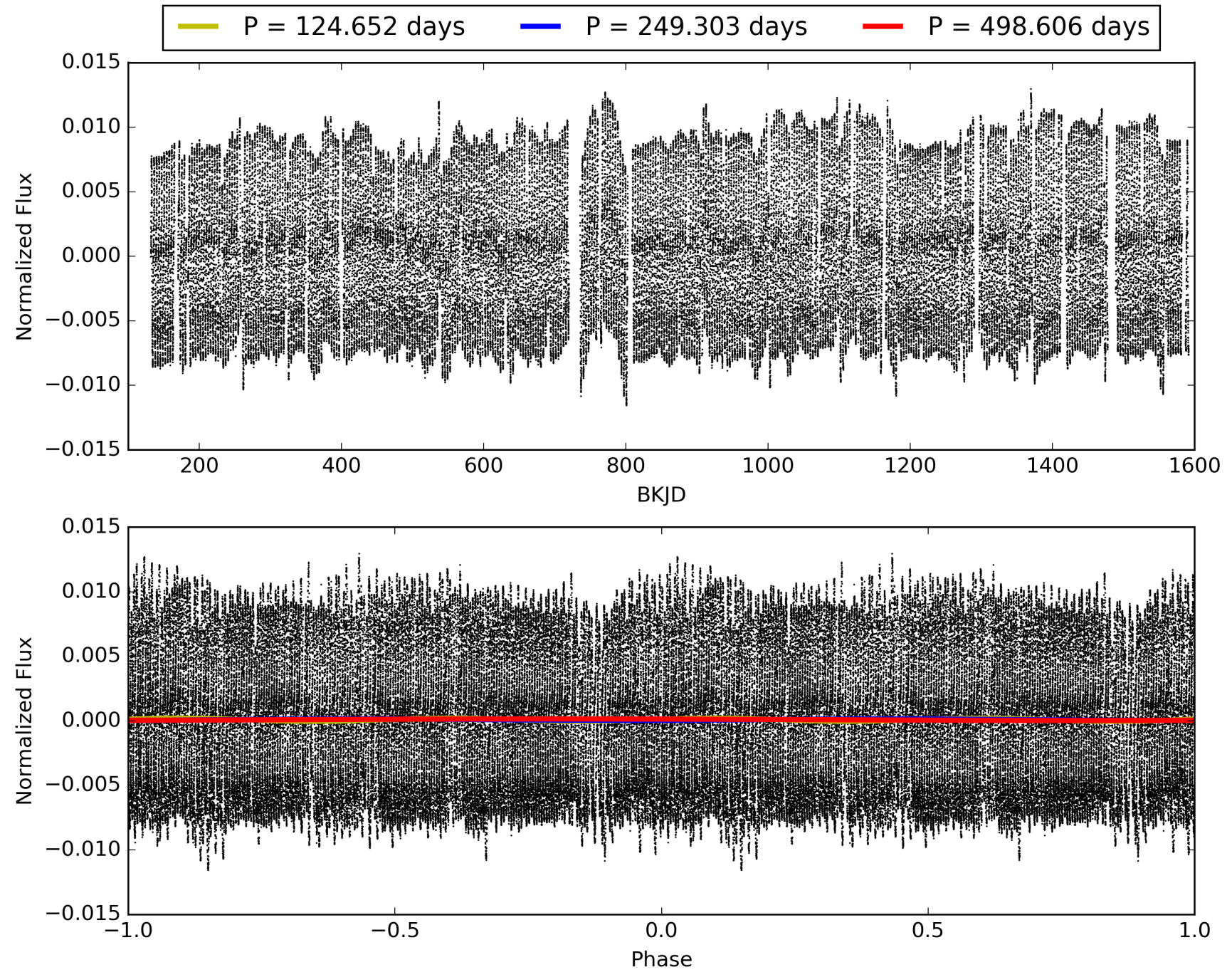
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 23:12:10 Z

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

TCE 008740898-04, PDC Light Curves

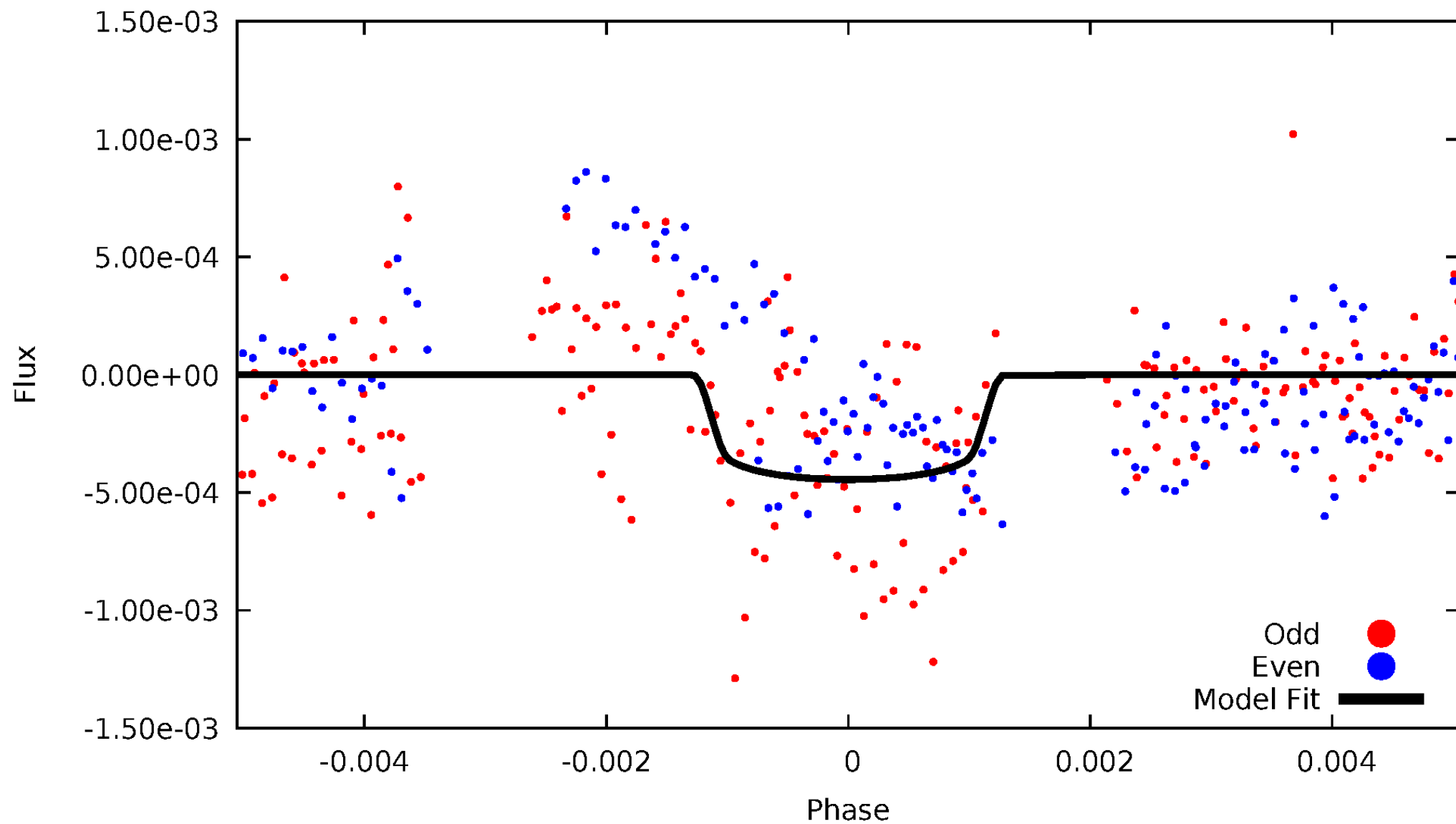


TCE 008740898-04



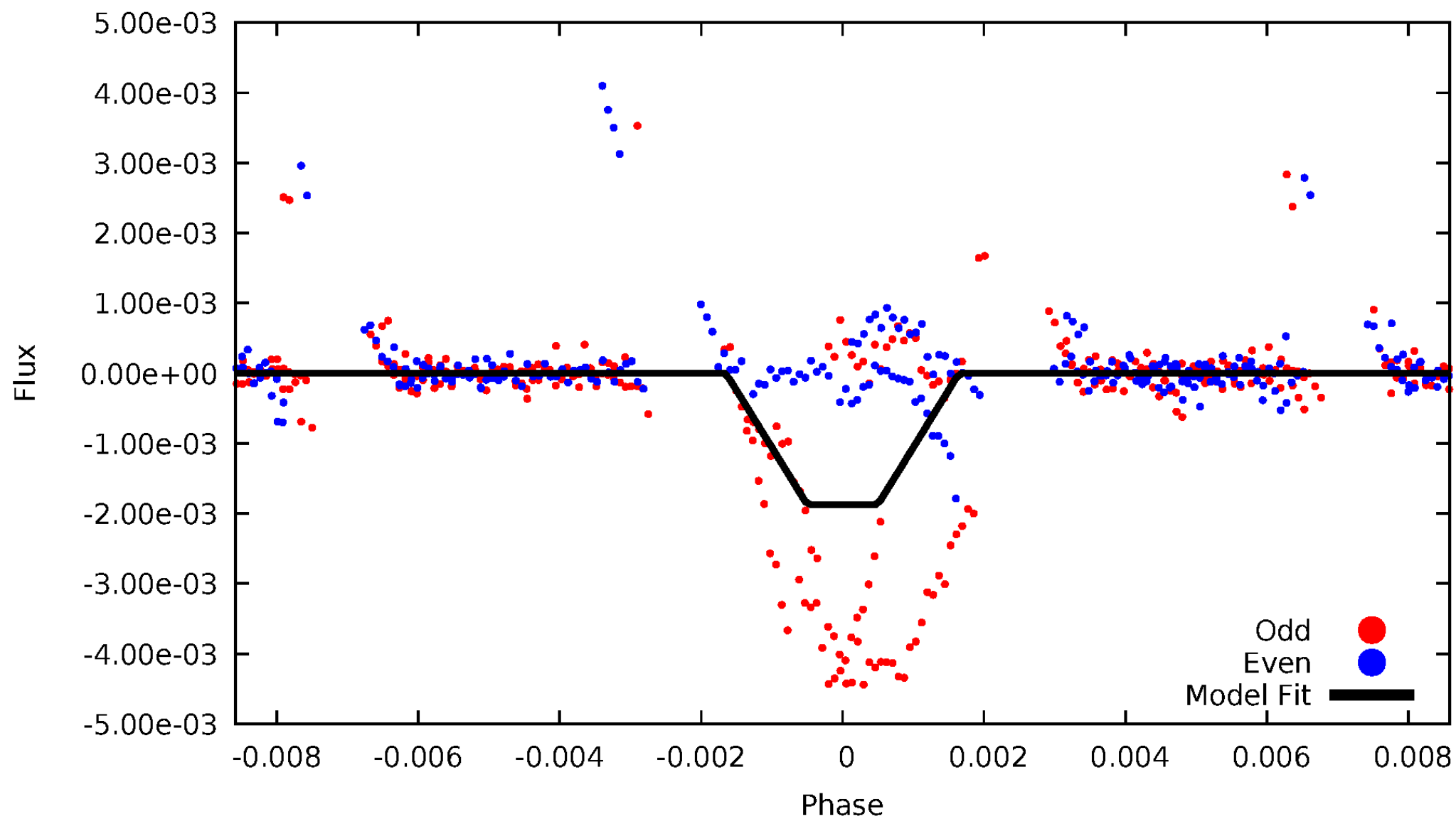
DV Odd/Even

TCE 008740898-04



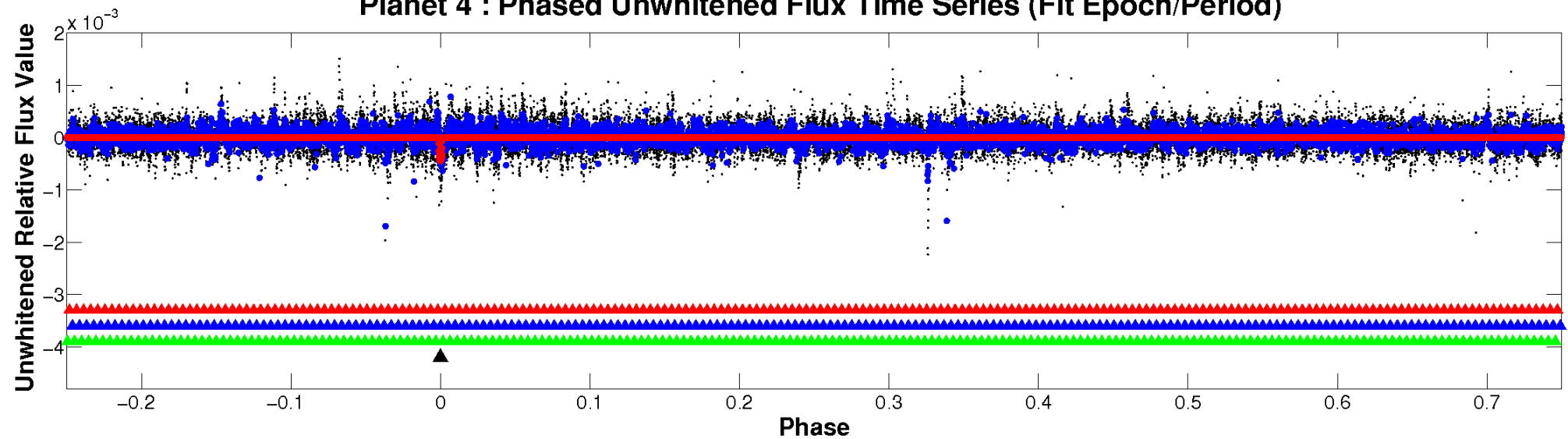
ALT Odd/Even

TCE 008740898-04

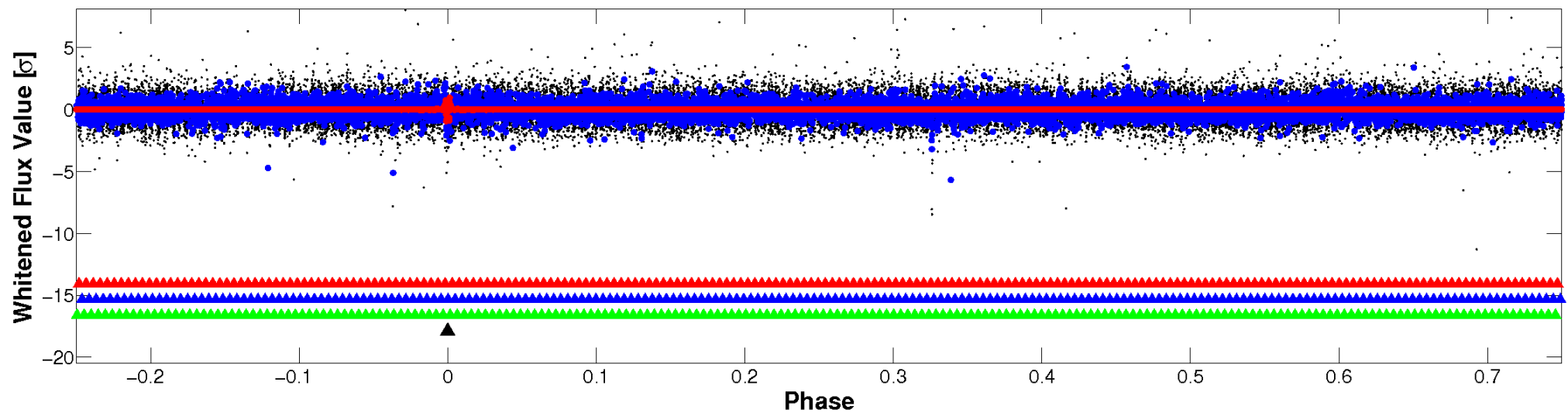


Non-Whitened Vs. Whitened Light Curve

Planet 4 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

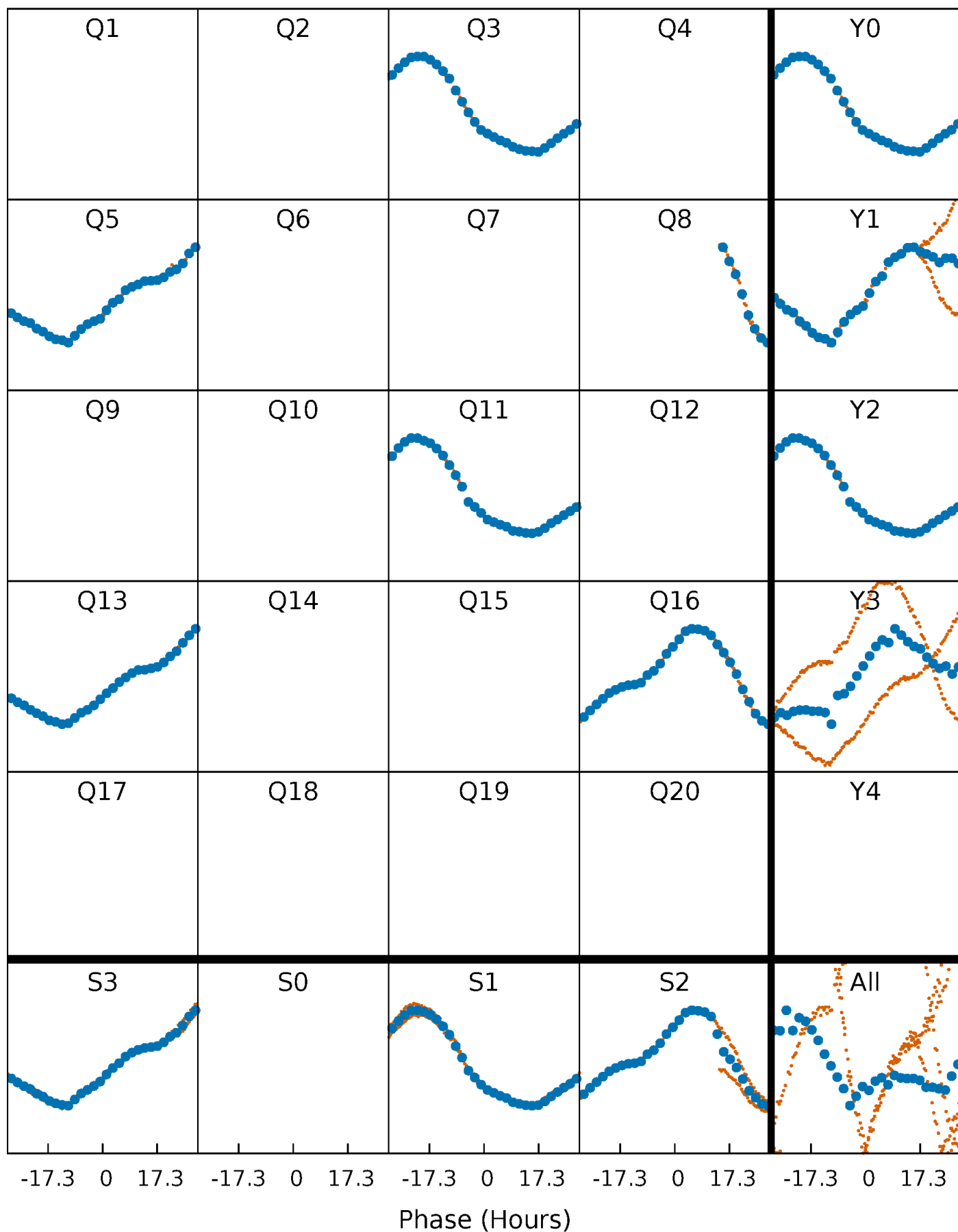


Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



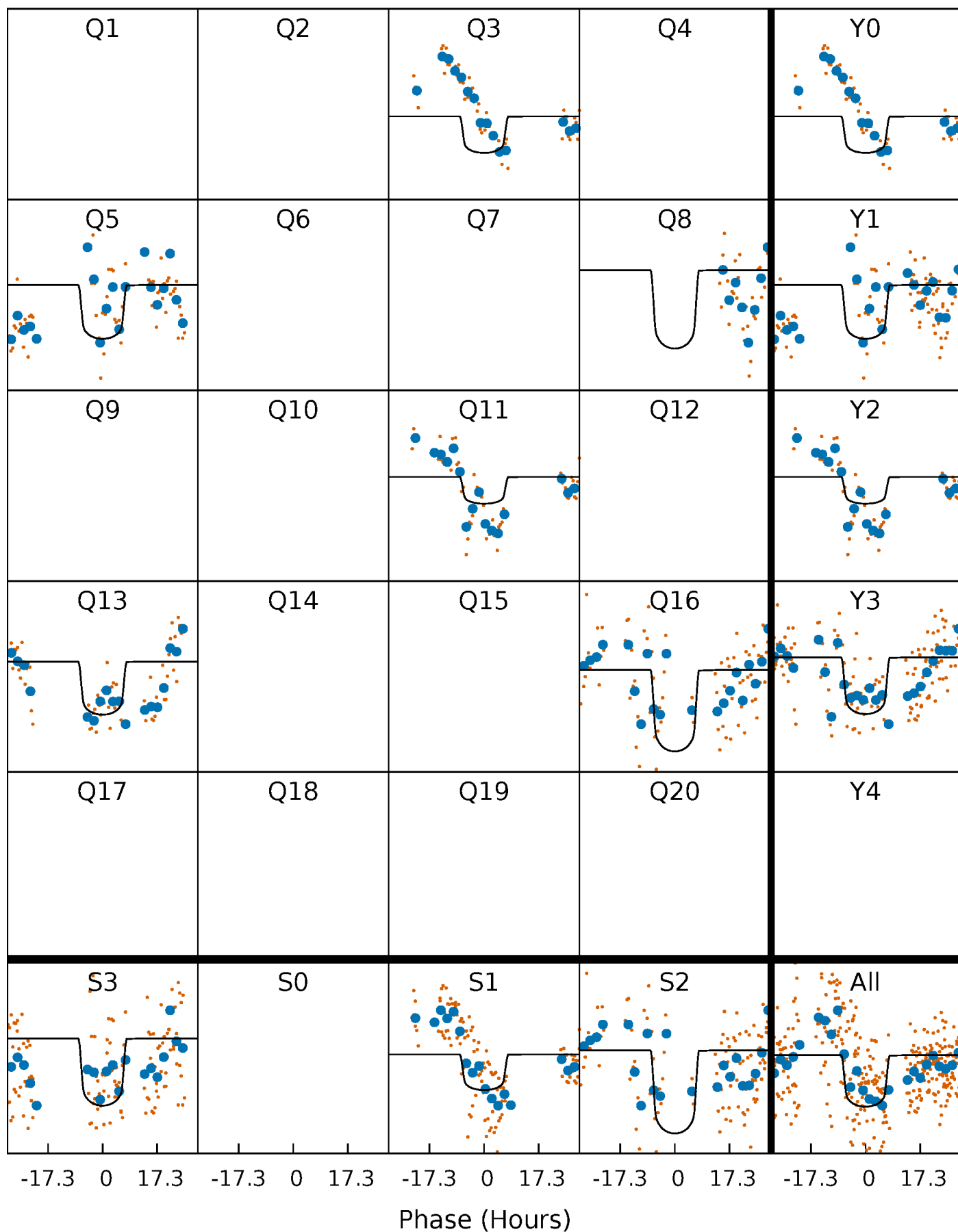
PDC Quarter-Phased Transit Curves

TCE 008740898-04 $P=249.303169$ Days $T_0=264.565967$ (BKJD)



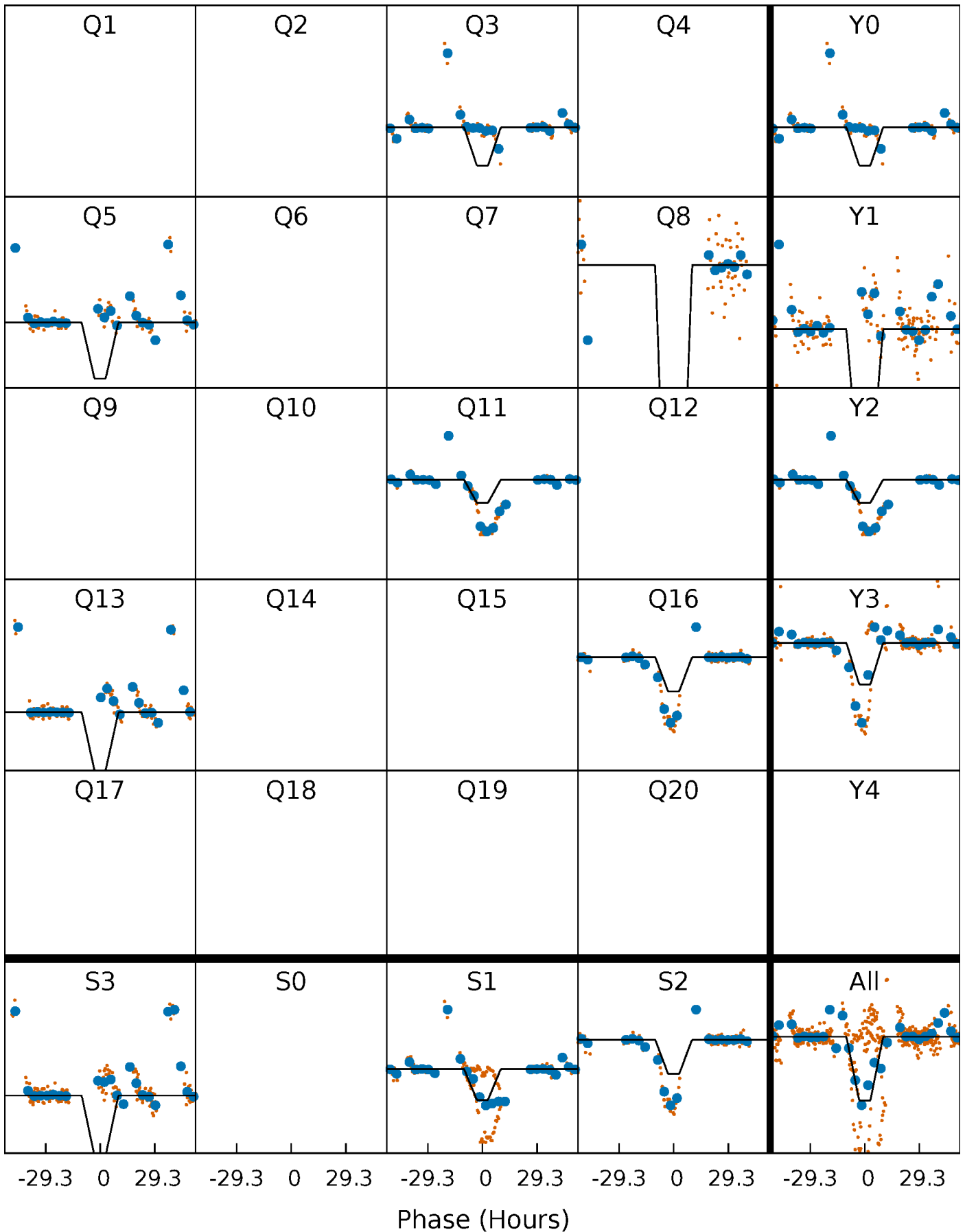
DV Quarter-Phased Transit Curves

TCE 008740898-04 $P=249.303169$ Days $T_0=264.565967$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

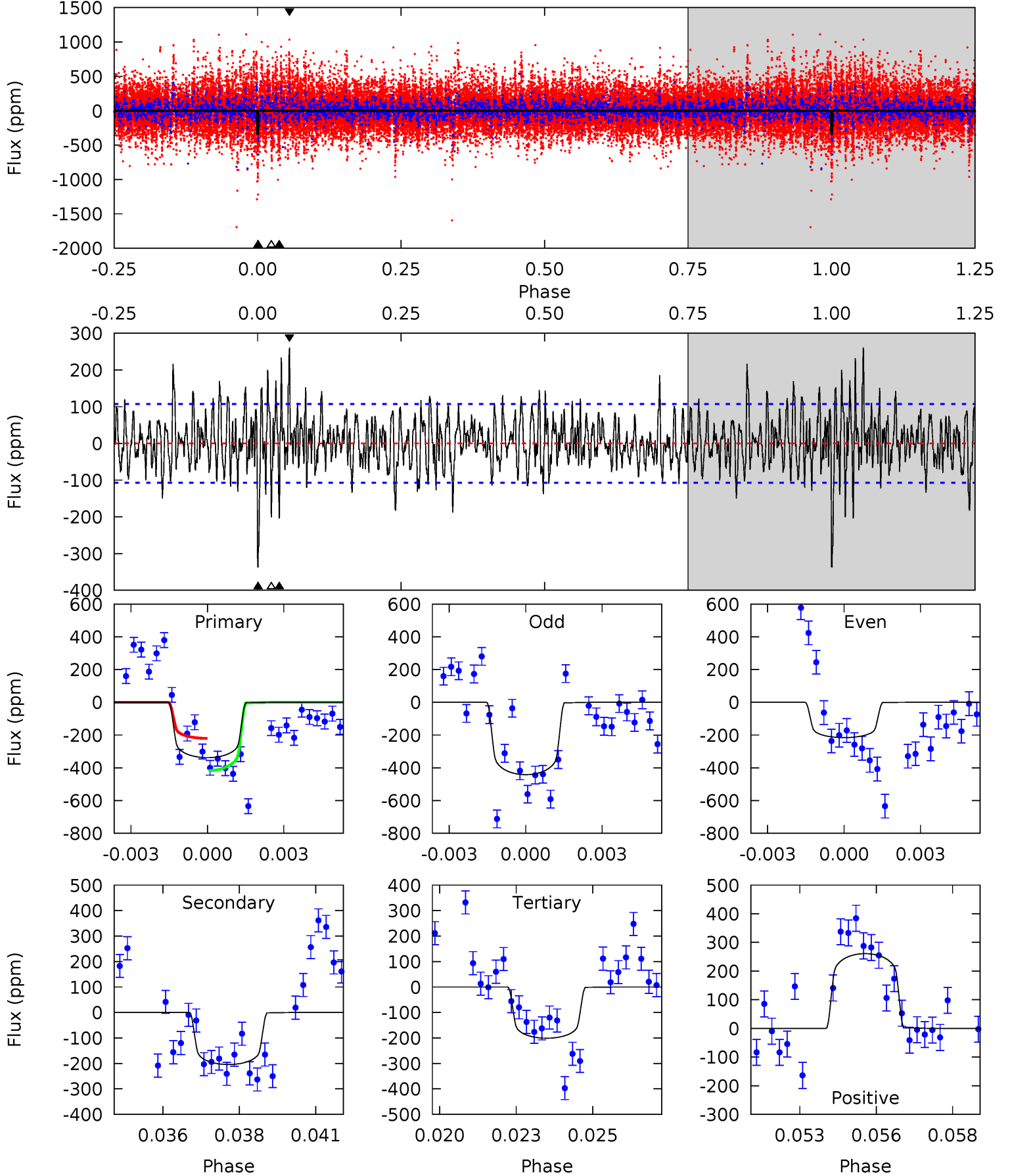
TCE 008740898-04 $P=249.268998$ Days $T_0=264.483206$ (BKJD)



DV Model-Shift Uniqueness Test

008740898-04, P = 249.303169 Days, E = 15.262798 Days

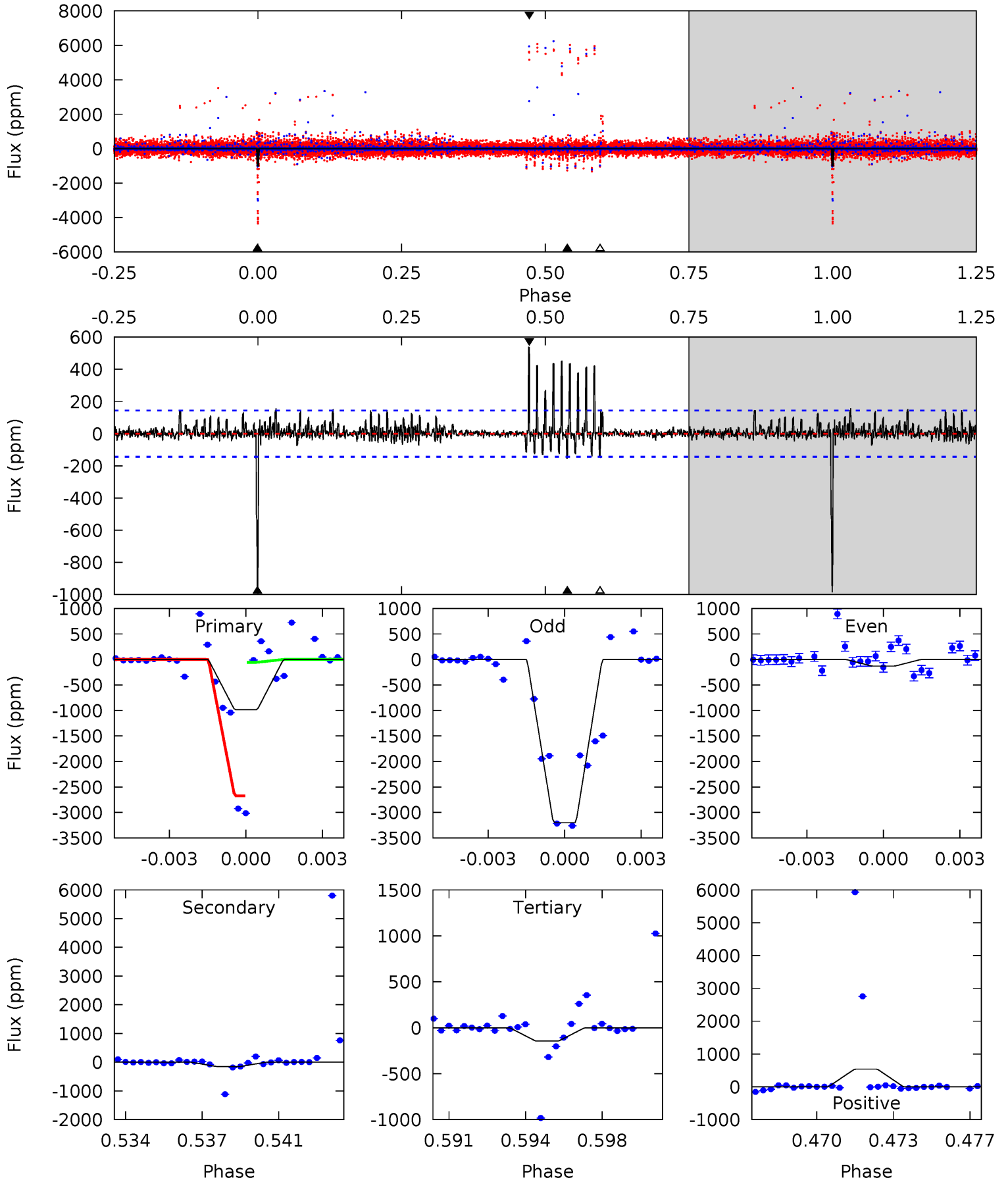
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 16.6 | 10.0 | 9.89 | 12.8 | 5.28 | 3.02 | 2.91 | 6.74 | 3.78 | 0.16 | -2.80 | 5.46 | 1.41 | 0.44 | 4.81 |



Alt Model-Shift Uniqueness Test

008740898-04, P = 249.268998 Days, E = 15.214208 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 35.8 | 5.55 | 5.27 | 19.6 | 5.23 | 2.93 | 1.79 | 30.6 | 16.3 | 0.28 | -14.0 | 51.2 | 7.73 | 0.35 | 45.4 |



Stellar Parameters For KIC 008740898

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | $R (R_{\odot})$ | $M(M_{\odot})$ | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|----------------------|---------------------------|---------------------------|---------------------------|---------------------------|---|
| | 8042^{+224}_{-352} | $4.215^{+0.054}_{-0.216}$ | $0.360^{+0.050}_{-0.500}$ | $1.779^{+0.602}_{-0.201}$ | $1.897^{+0.288}_{-0.262}$ | $0.474^{+0.105}_{-0.261}$ |
| | +3%/-4% | +1%/-5% | +14%/-139% | +34%/-11% | +15%/-14% | +22%/-55% |
| Source | KIC0 | 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 008740898-04 / KOI

| Detrend | Depth (ppm) | $R_p (R_{\oplus})$ | $T_{max} (K)$ | $T_{obs} (K)$ | A_{obs} |
|---------|---------------|------------------------|-------------------|----------------------|------------------------|
| DV | -204 ± 20 | $4.51^{+0.82}_{-0.58}$ | 688^{+57}_{-38} | 6233^{+409}_{-347} | 4942^{+1551}_{-1352} |
| Alt. | -153 ± 28 | $8.77^{+1.65}_{-0.92}$ | 692^{+55}_{-37} | 4384^{+193}_{-207} | 981^{+292}_{-310} |

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 $A_{obs} \gg 1.0$

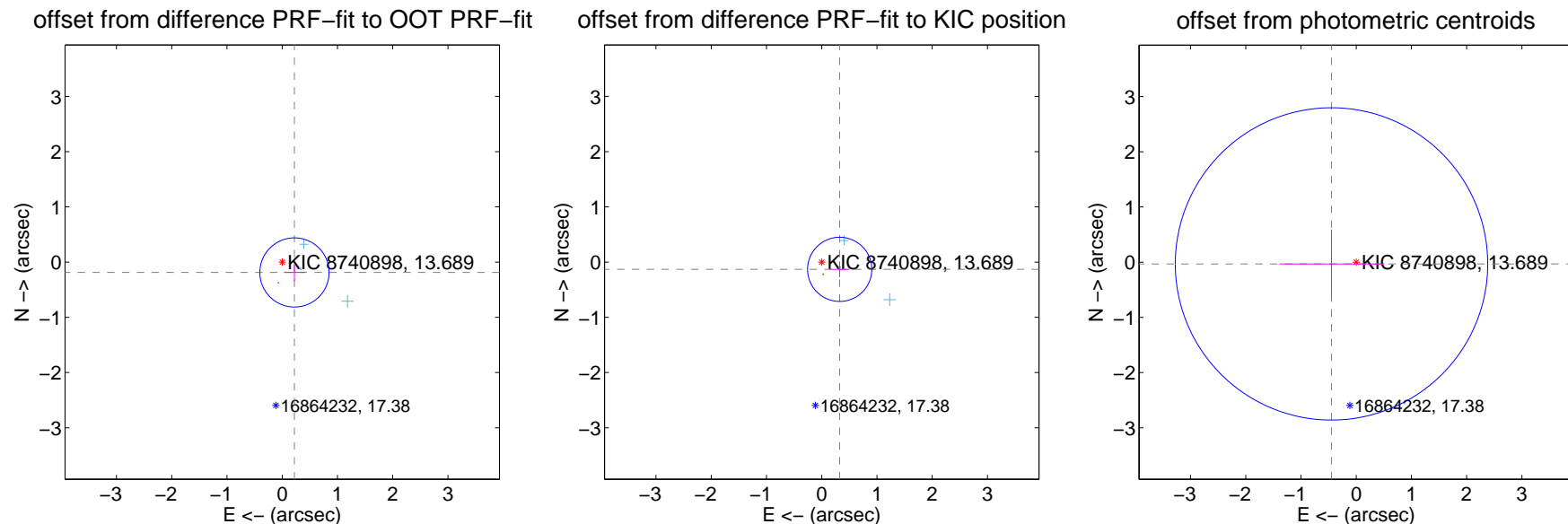
DV Centroid Data

Supplemental centroid analysis for 008740898-04. Kepler magnitude: 13.69. Transit SNR 8.34

There are 4 quarters with good PRF difference image offsets

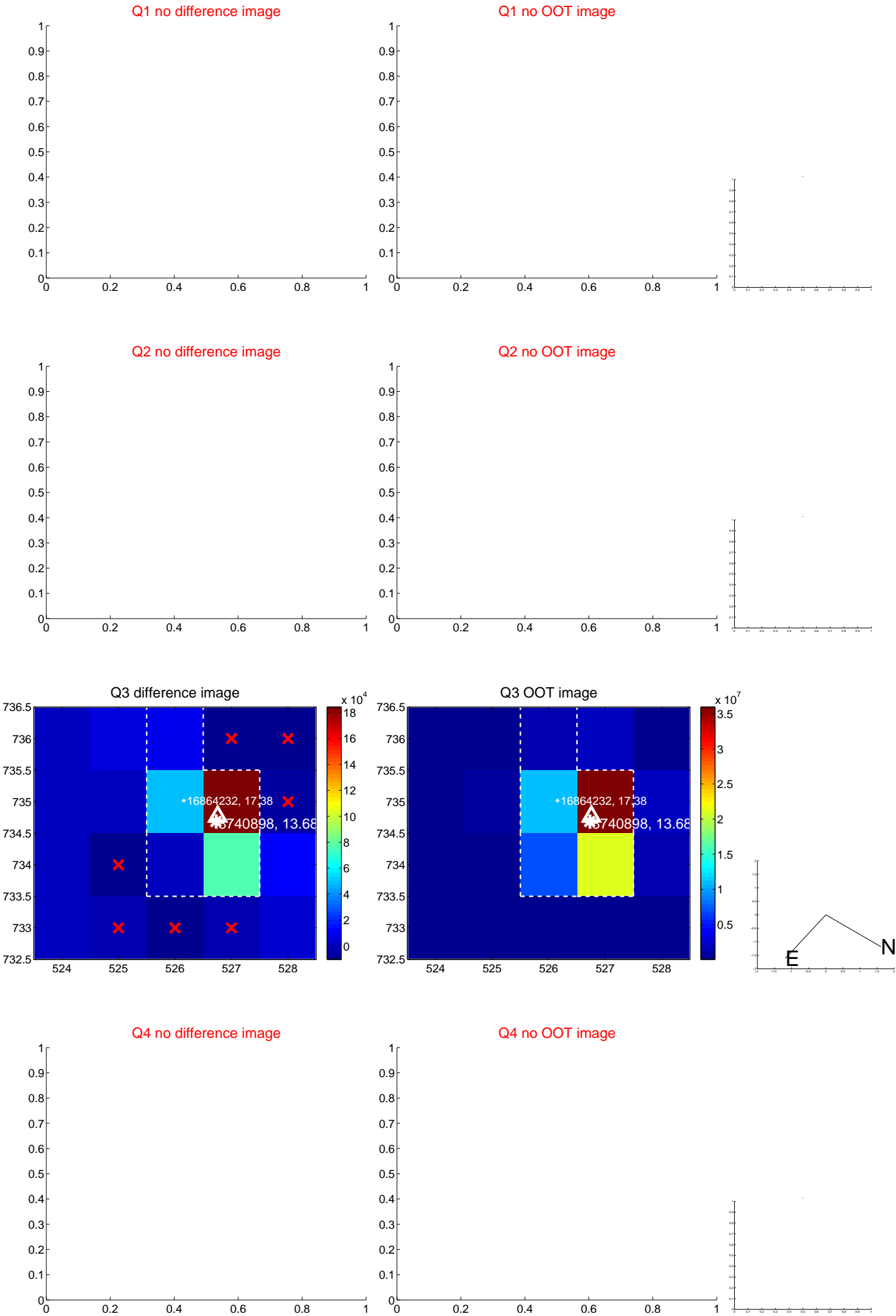
The direct PRF centroid is offset from the target star catalog position by about 0.18 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|---|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT | 0.290 ± 0.209 | 1.39 | -0.221 ± 0.188 | -0.188 ± 0.157 |
| PRF-fit source offset from KIC position | 0.351 ± 0.194 | 1.81 | -0.325 ± 0.179 | -0.131 ± 0.141 |
| photometric centroid source offset | 0.45 ± 0.94 | 0.48 | 0.45 ± 0.94 | -0.03 ± 0.62 |

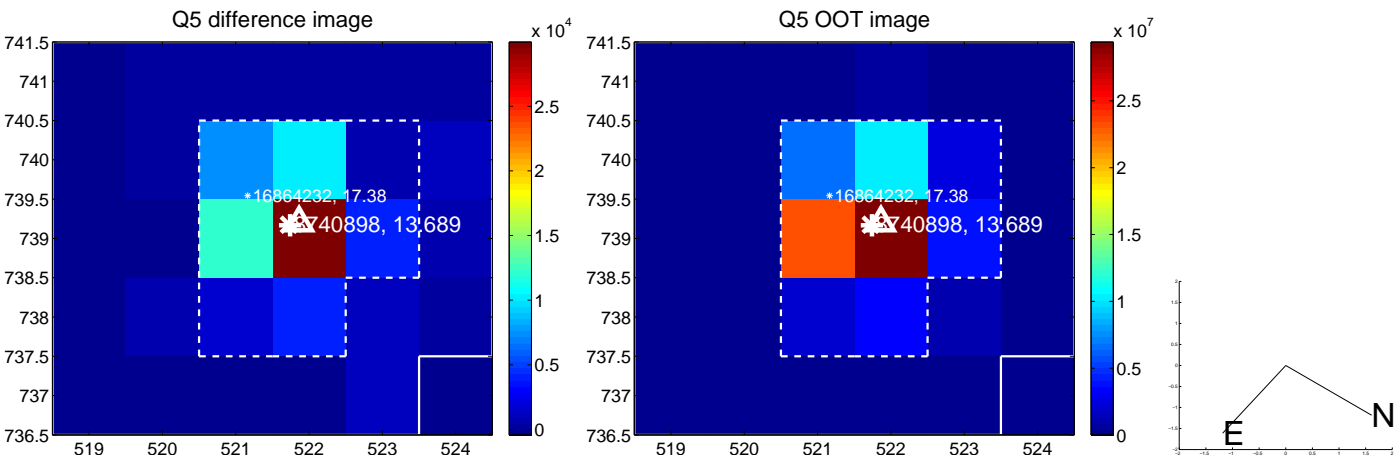


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three- σ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

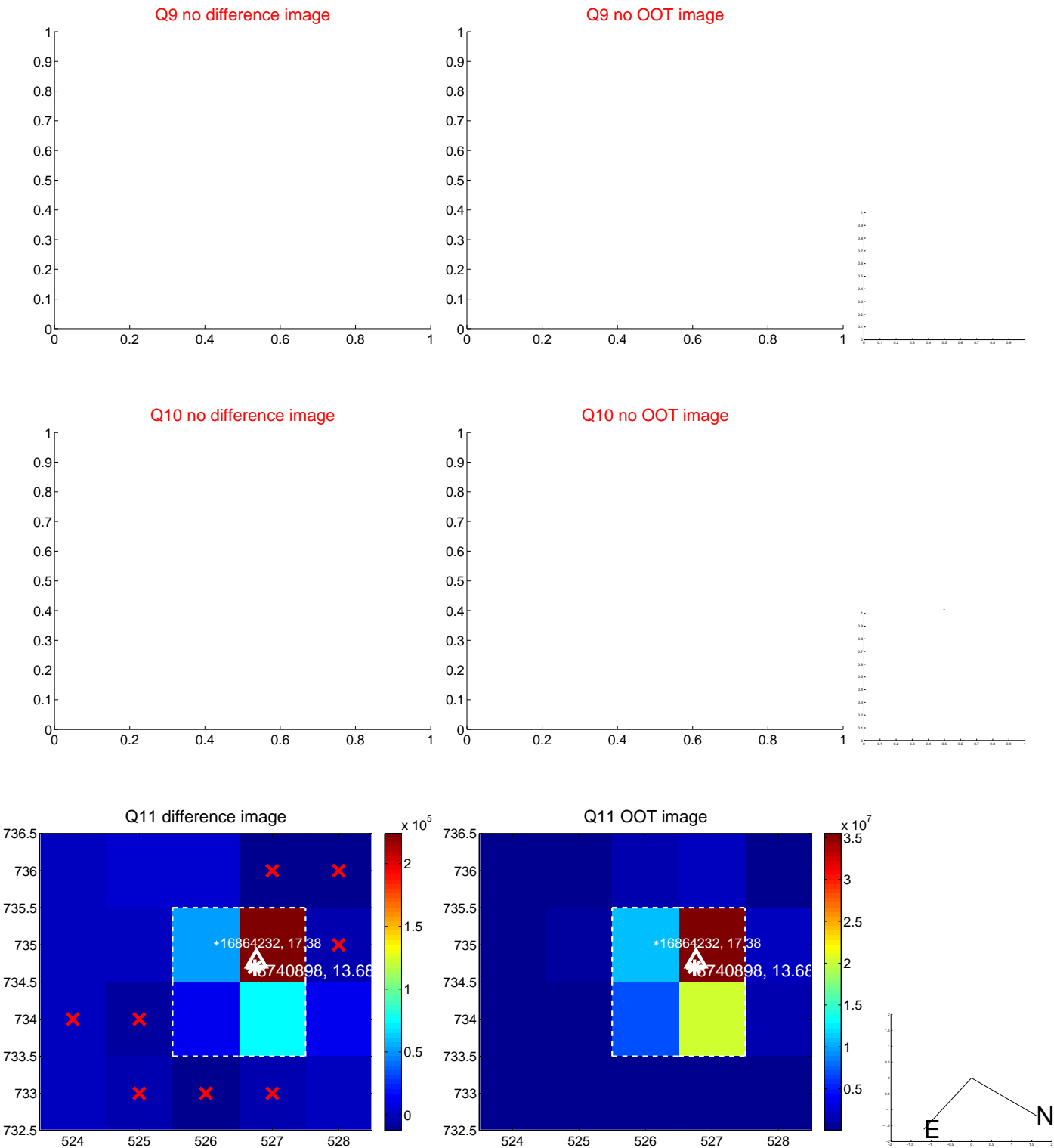
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



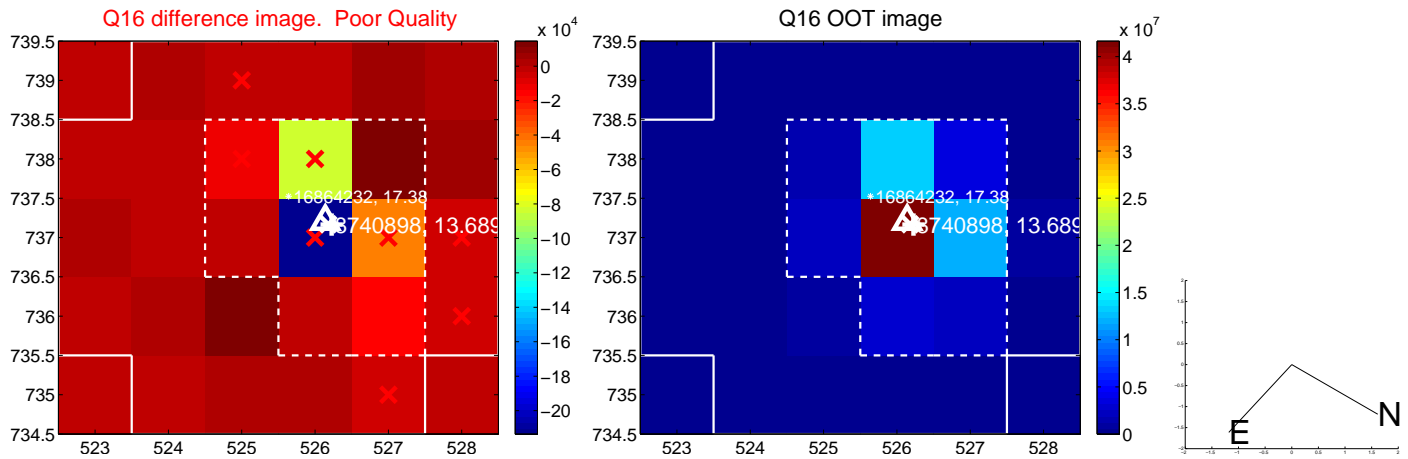
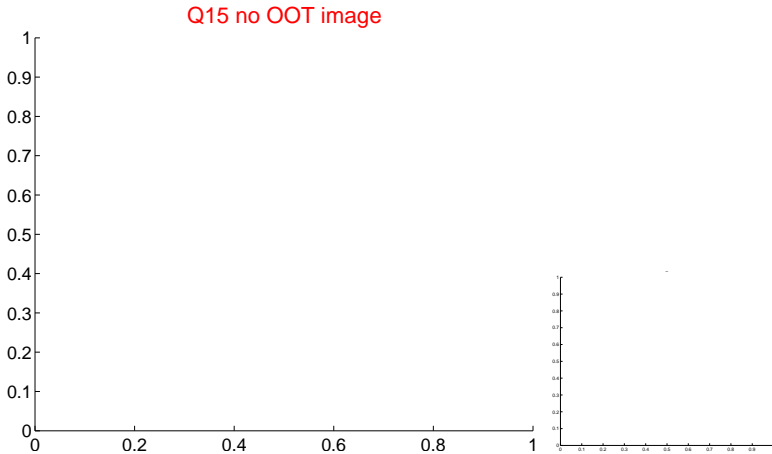
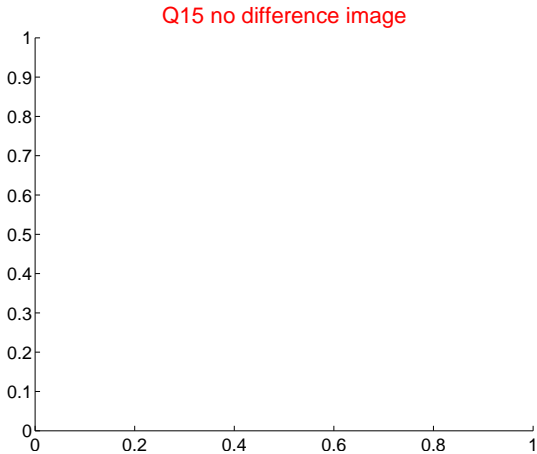
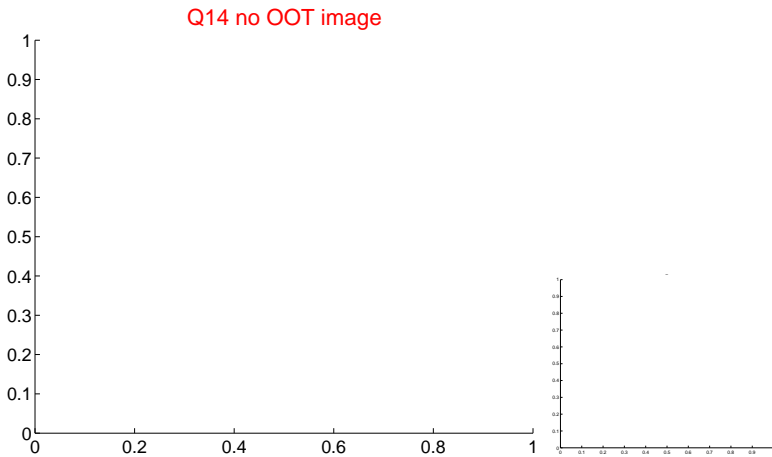
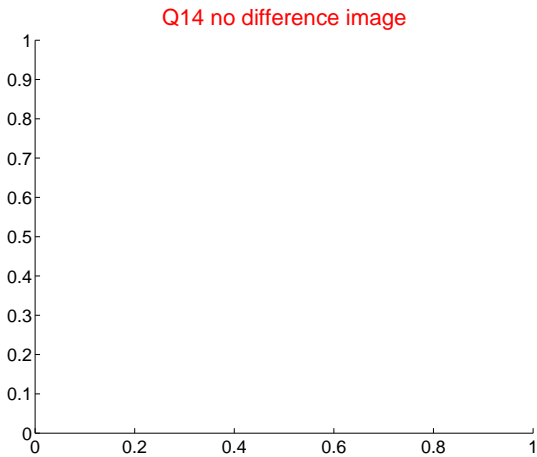
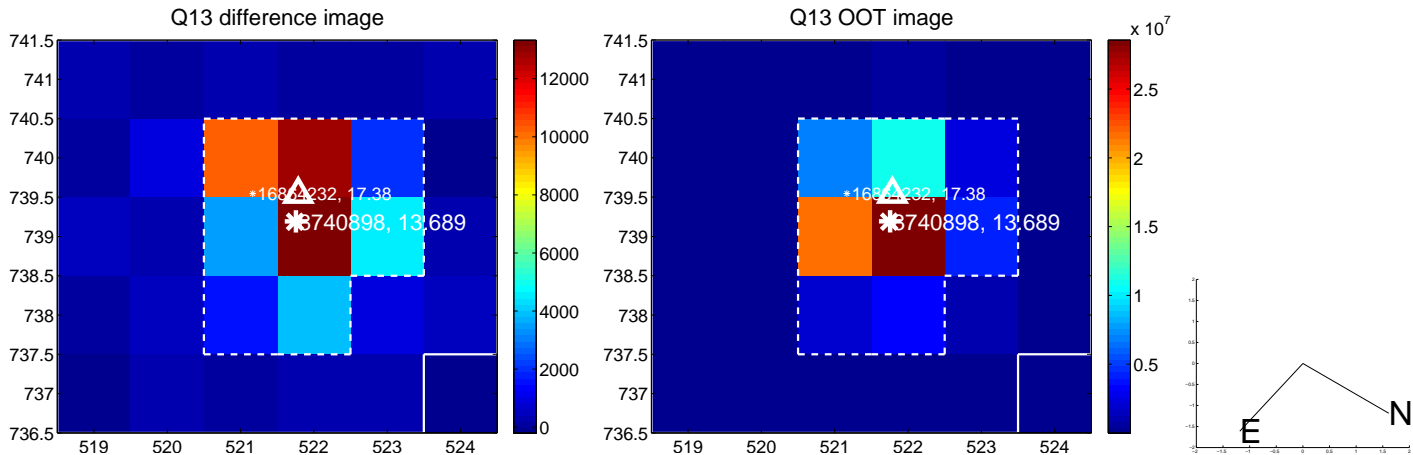
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



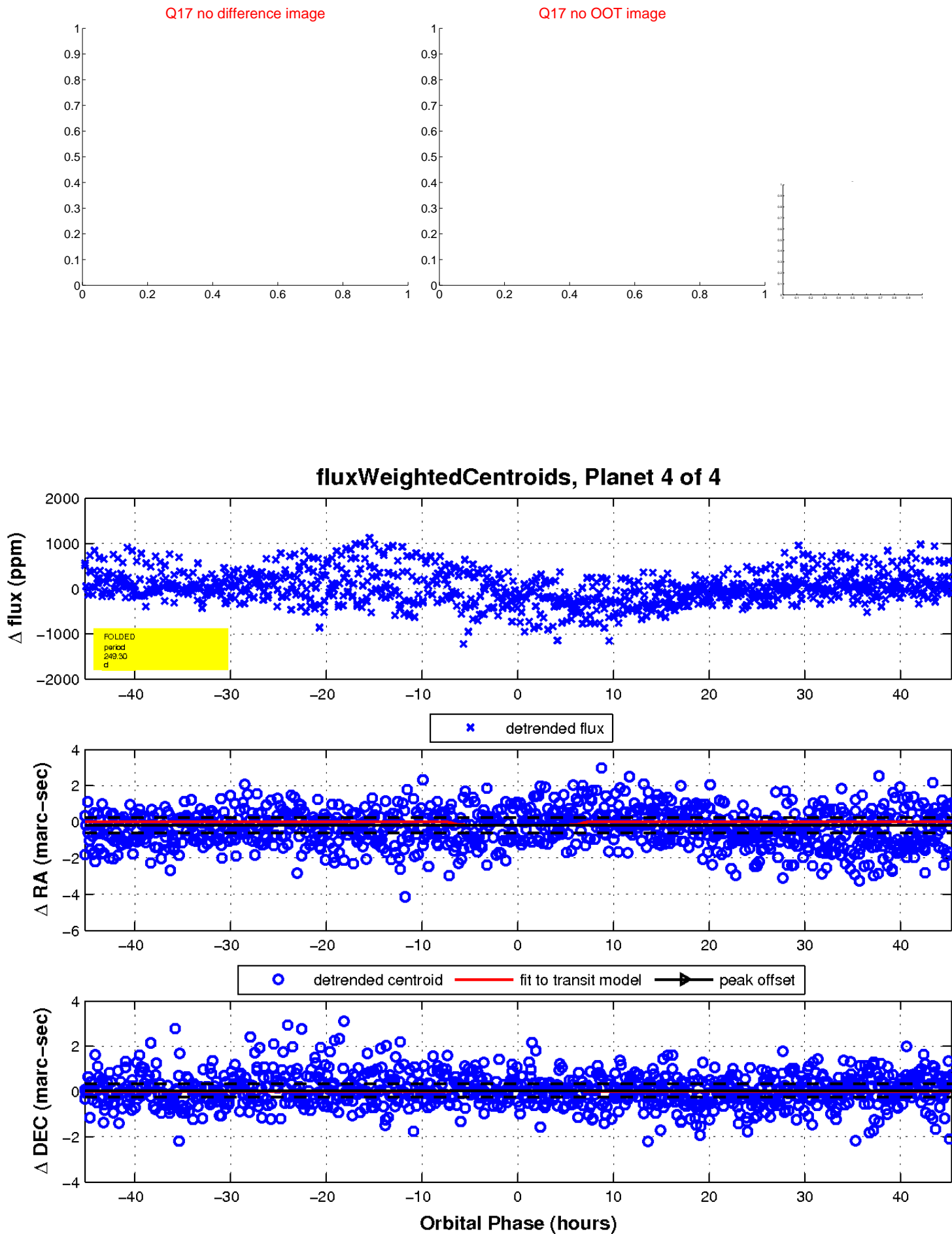
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

