

KIC 009649222

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}) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|--------|--------|-----------------------------|-----------------|------------------------|------------------------|
| 009649222-01 | OBS | 6071.01 | 5.918620 | 132.924667 | 94429.7 | 3.952 | 3800.5 | 2751.3 | 0.97 | 5957 | 29.87 | 245.96 |
| 009649222-02 | OBS | No | 5.918612 | 135.885029 | 2689.1 | 3.849 | 109.4 | 112.1 | 0.97 | 5957 | 5.75 | 245.96 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|------------------------------------|
| 009649222-01 | OBS | FP | 0.00 | 0 | 1 | 0 | 0 | MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE |
| 009649222-02 | OBS | FP | 0.00 | 1 | 1 | 0 | 0 | IS_SEC_TCE |

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 009649222-01

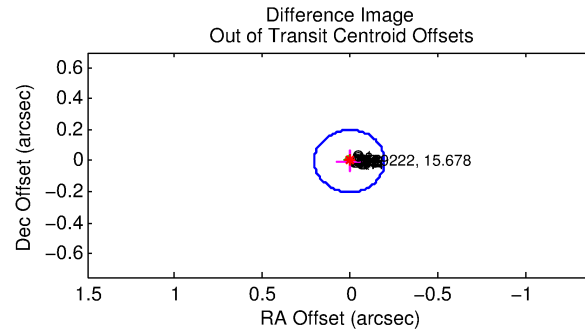
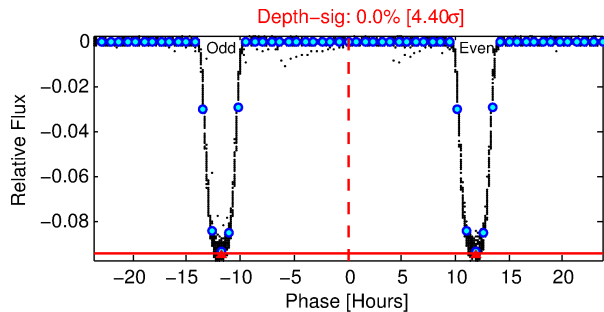
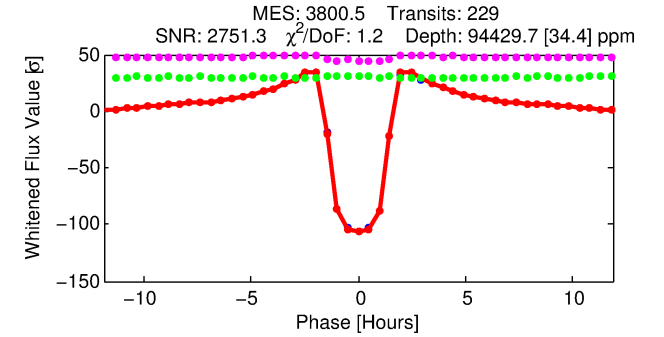
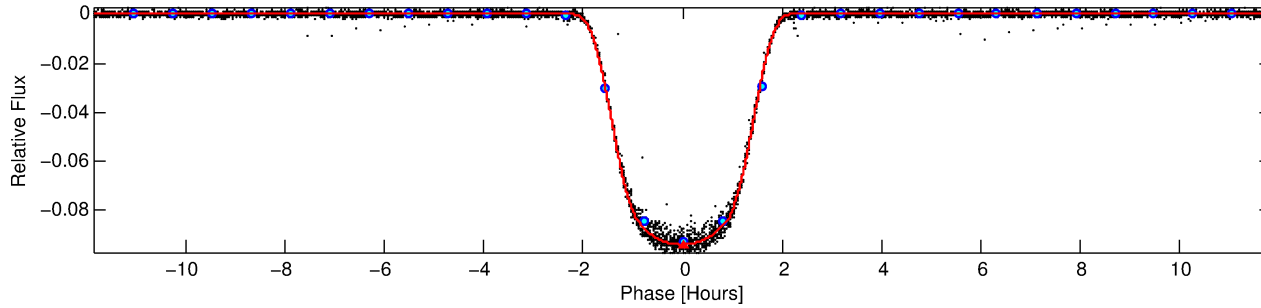
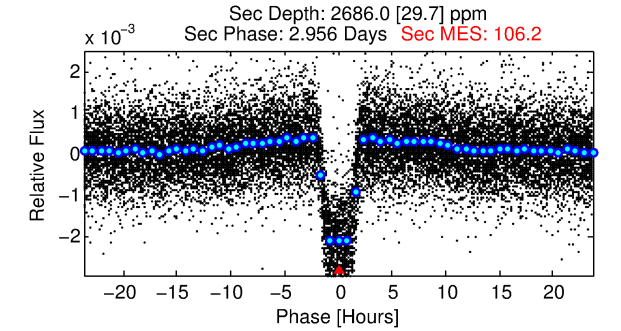
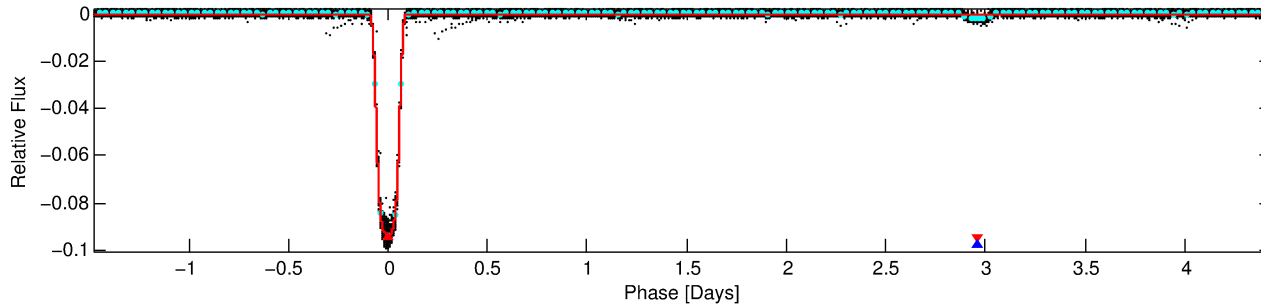
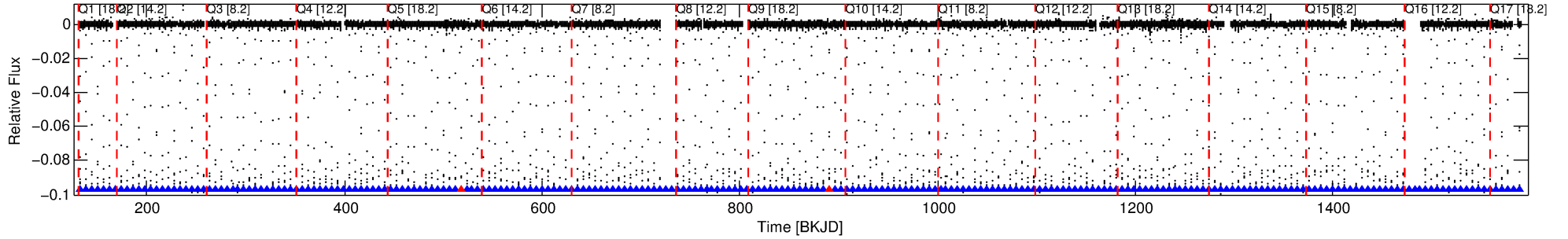
No Significant Match Found

DV One-Page Summary

KIC: 9649222 Candidate: 1 of 2 Period: 5.919 d

KOI: K06071.01 Corr: 1.000

Kp: 15.68 R*: 0.97 Rs Teff: 5957.0 K Logg: 4.50 Fe/H: 0.070



DV Fit Results:

Period = 5.91862 [0.00000] d
Epoch = 132.9247 [0.0000] BKJD
Rp/R* = 0.2819 [0.0001]
a/R* = 14.56 [0.02]
b = 0.17 [0.01]
Seff = 245.96 [104.65]
Teq = 1010 [107] K
Rp = 29.87 [9.60] Re
a = 0.0658 [0.0180] AU
Ag = 7.16 [2.88] [2.14σ]
Teffp = 2554 [91] K [10.98σ]

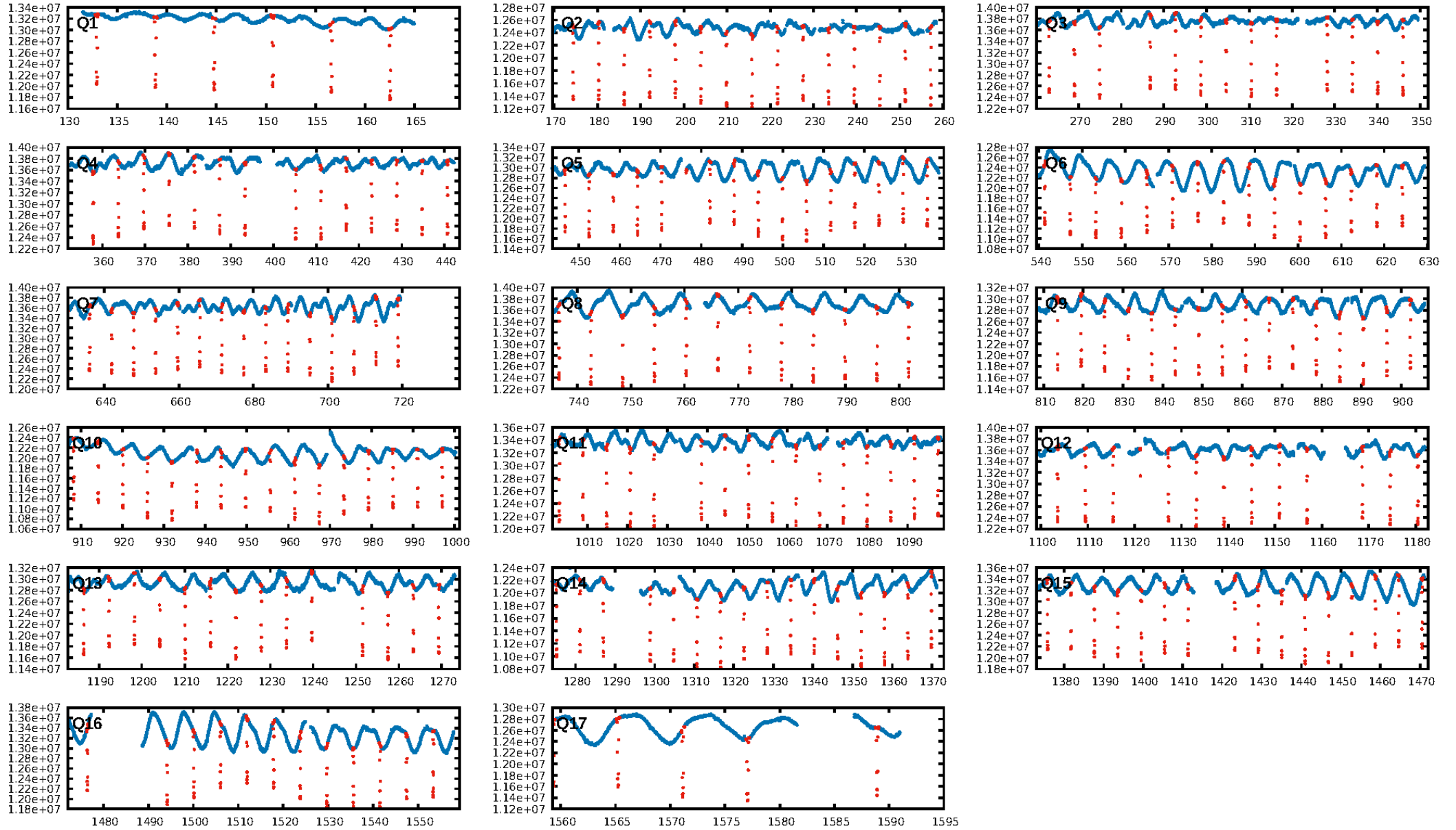
DV Diagnostic Results:

ShortPeriod-sig: 0.0% [0.00σ]
LongPeriod-sig: N/A
ModelChiSquare2-sig: N/A
ModelChiSquareGof-sig: N/A
Bootstrap-pfa: 0.00e+00
RollingBand-fgt: 0.99 [216/218]
GhostDiagnostic-chr: 1.943
Centroid-sig: 0.0%
Centroid-so: 0.163 arcsec [61.17σ]
OotOffset-rm: 0.006 arcsec [0.09σ]
KicOffset-rm: 0.059 arcsec [0.72σ]
OotOffset-st: 4/4/4/5 [17]
KicOffset-st: 4/4/4/5 [17]
DiffImageQuality-fgm: 1.00 [17/17]
DiffImageOverlap-fno: 1.00 [17/17]

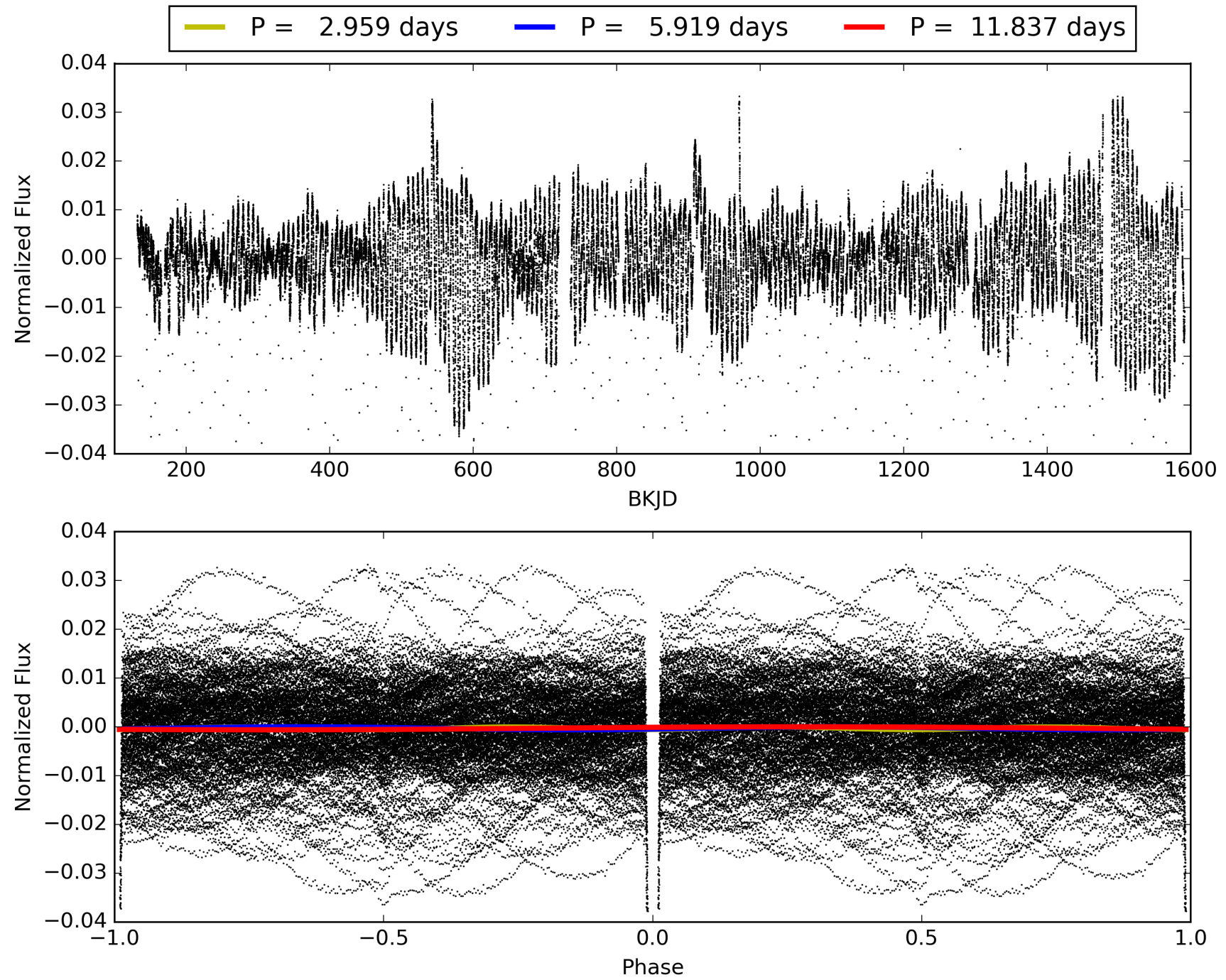
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 08:05:15 Z

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

TCE 009649222-01, PDC Light Curves

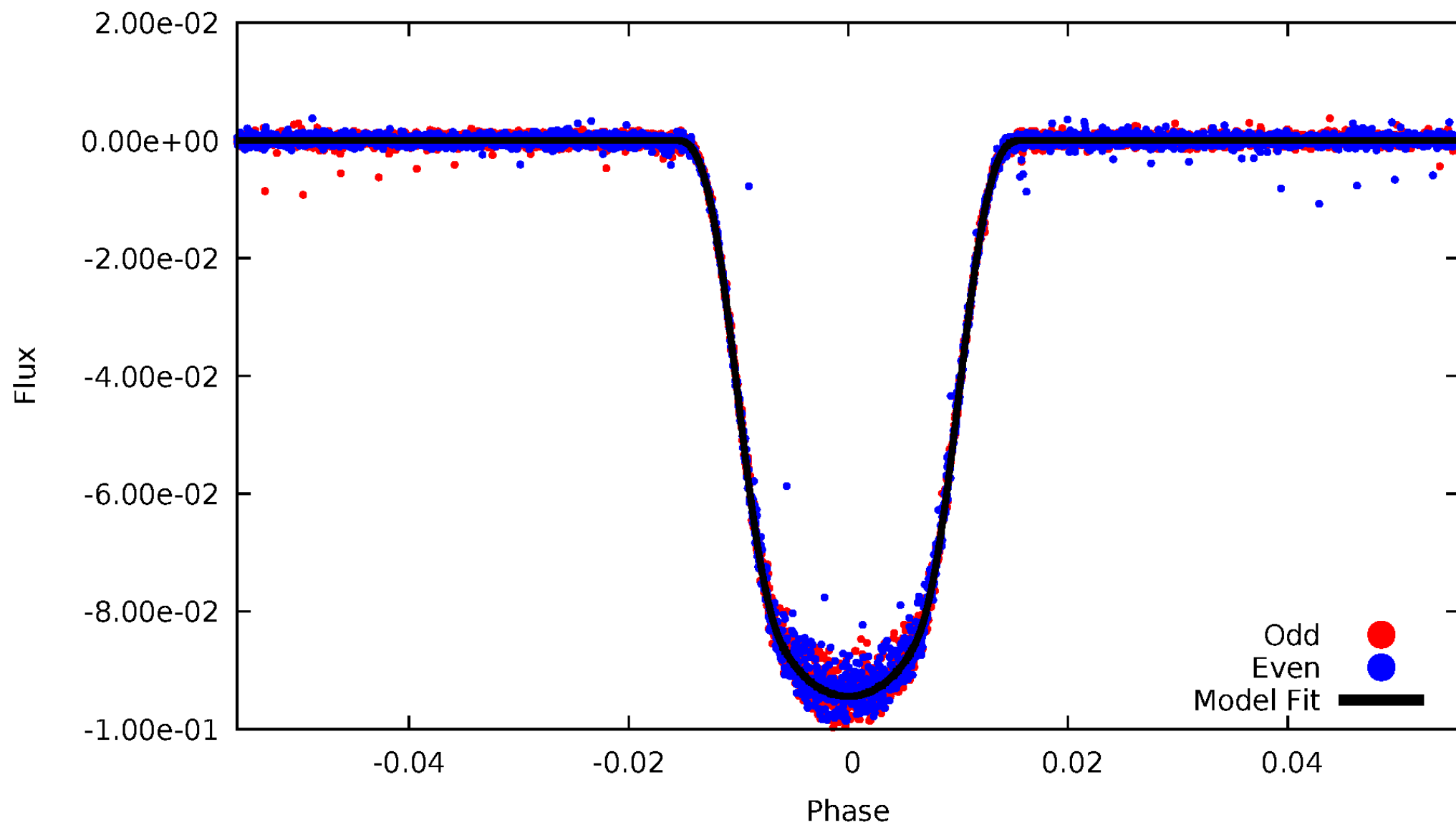


TCE 009649222-01



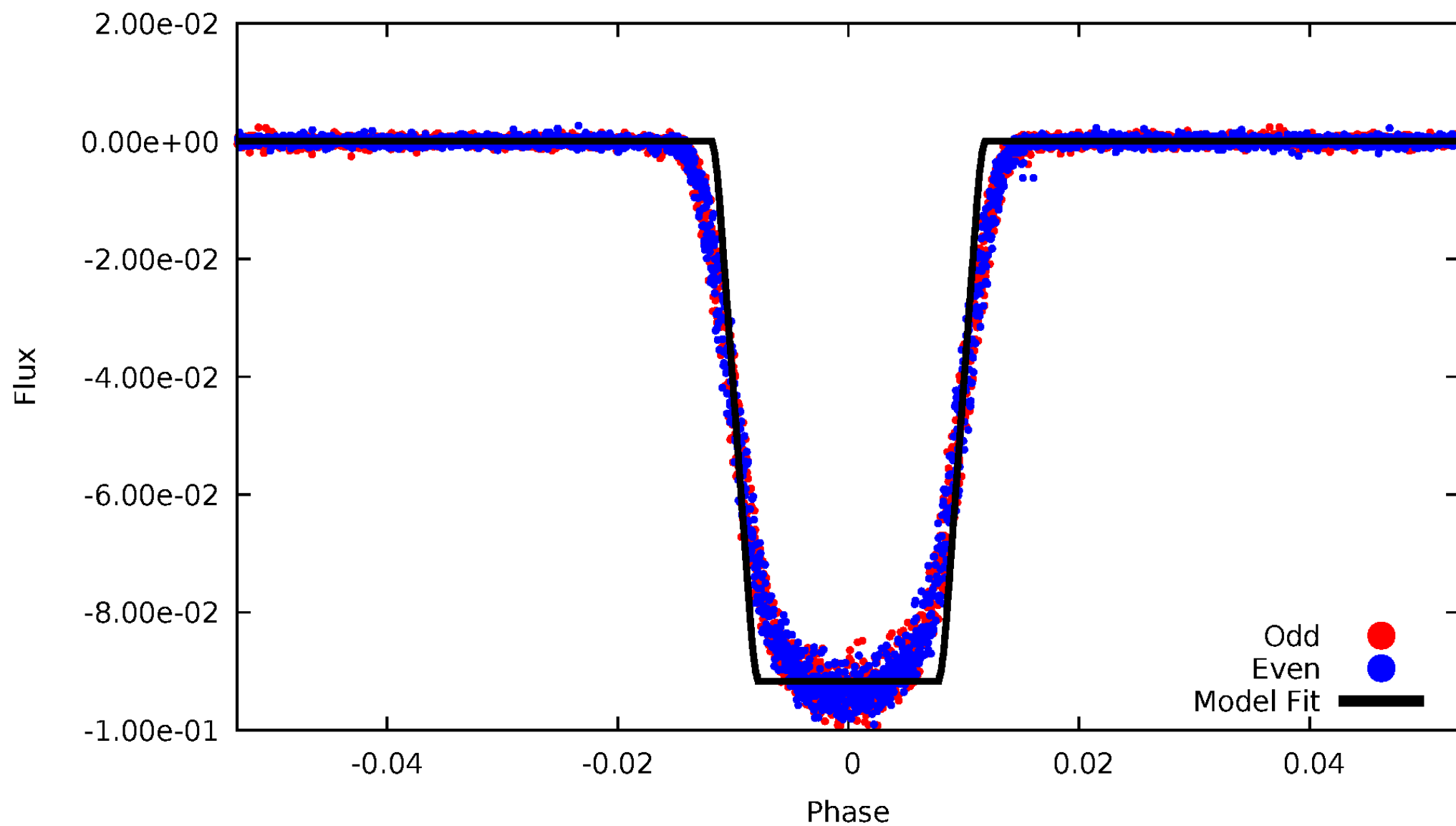
DV Odd/Even

TCE 009649222-01



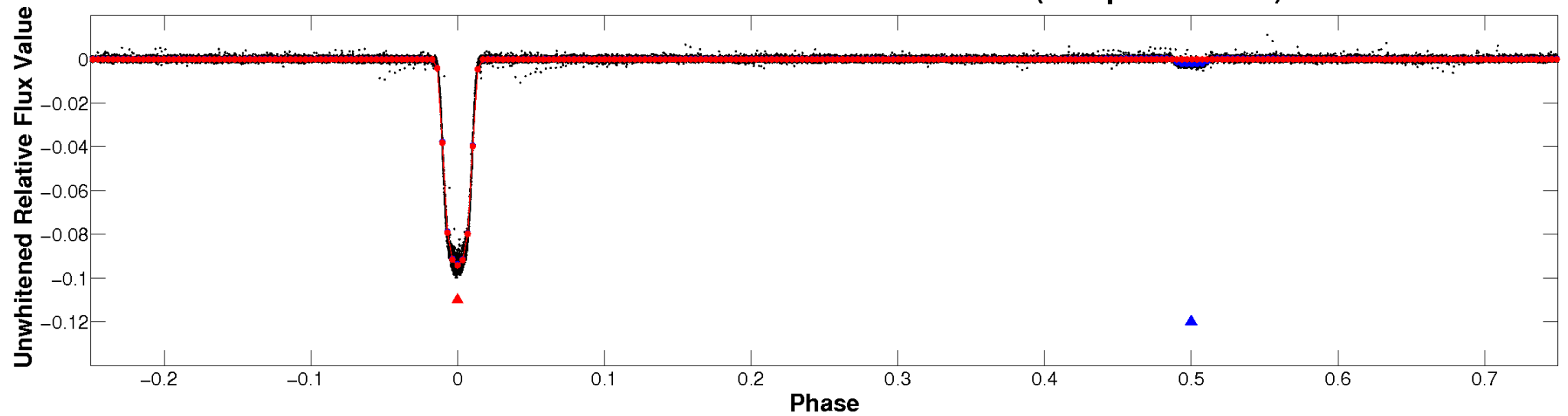
ALT Odd/Even

TCE 009649222-01

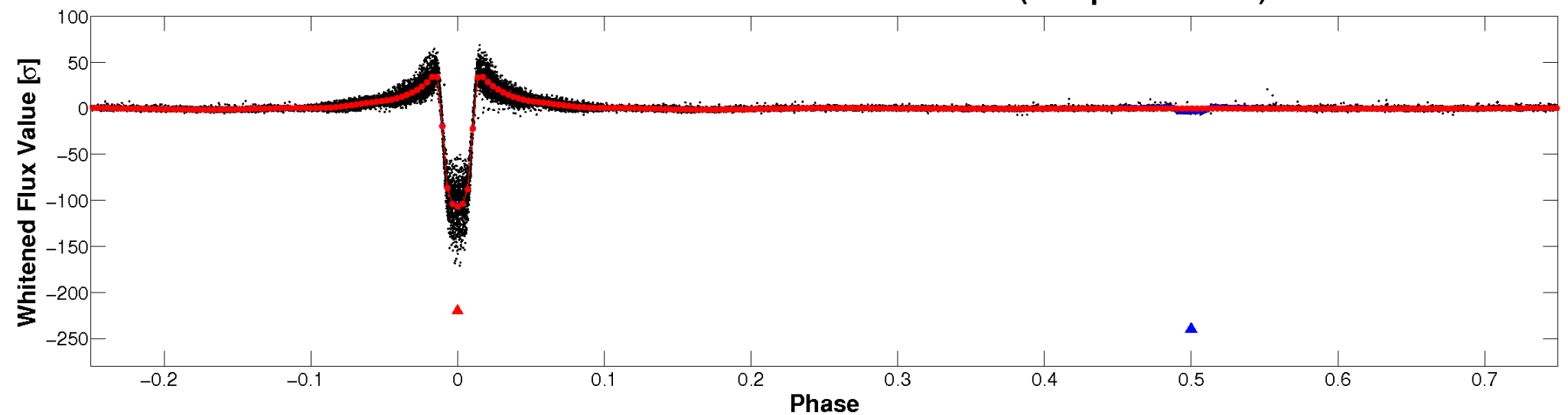


Non-Whitened Vs. Whitened Light Curve

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

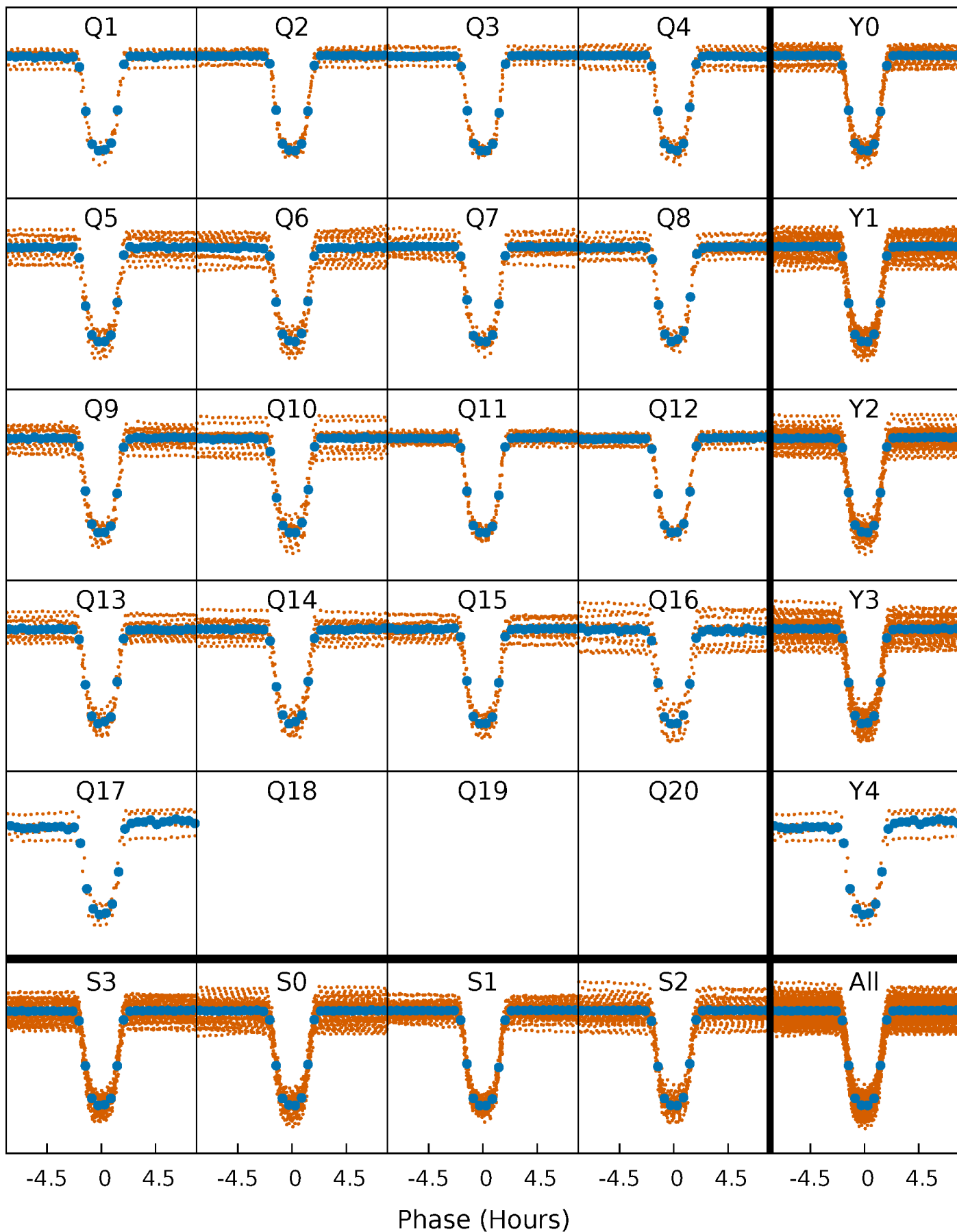


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



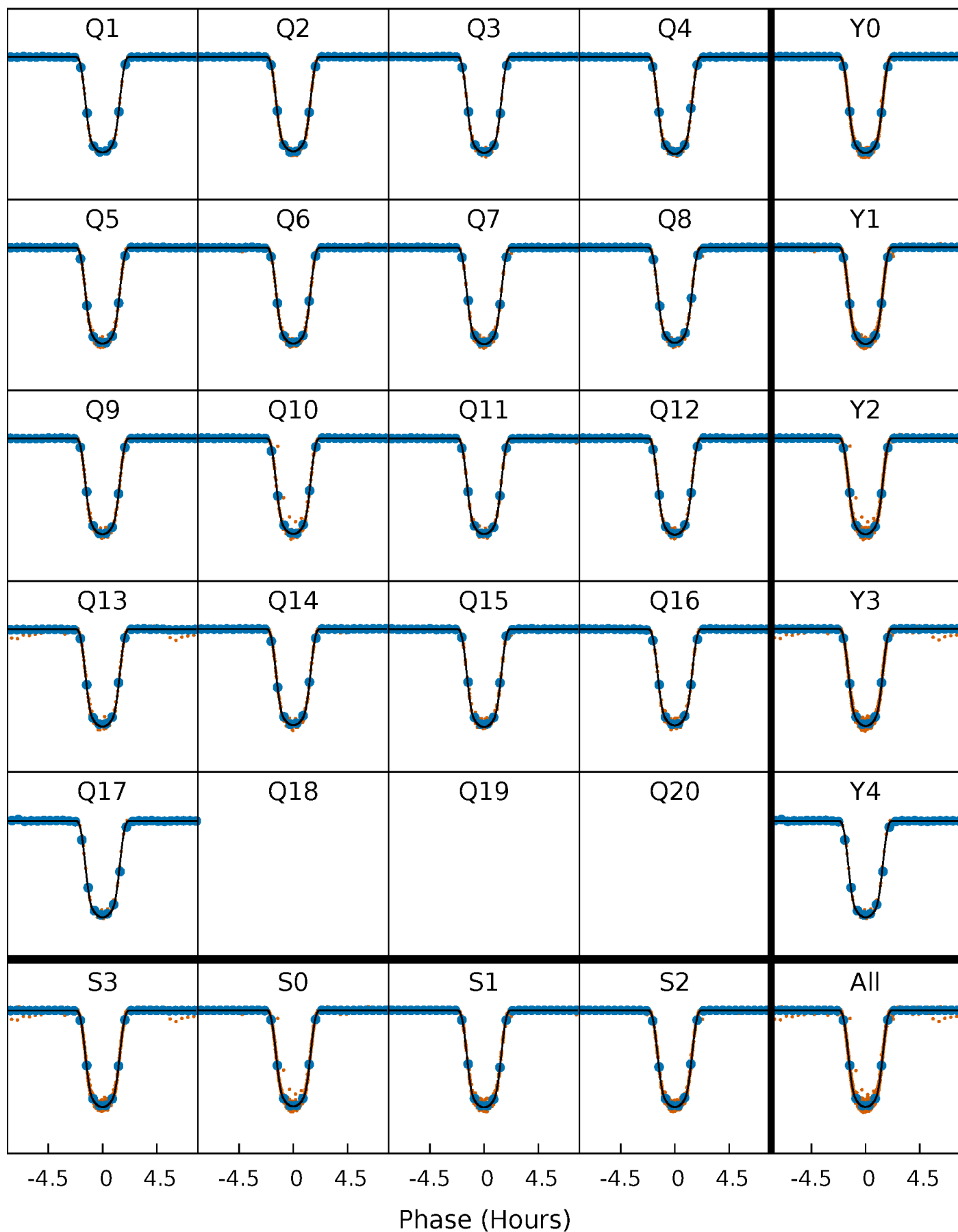
PDC Quarter-Phased Transit Curves

TCE 009649222-01 P= 5.918620 Days $T_0=132.924667$ (BKJD)



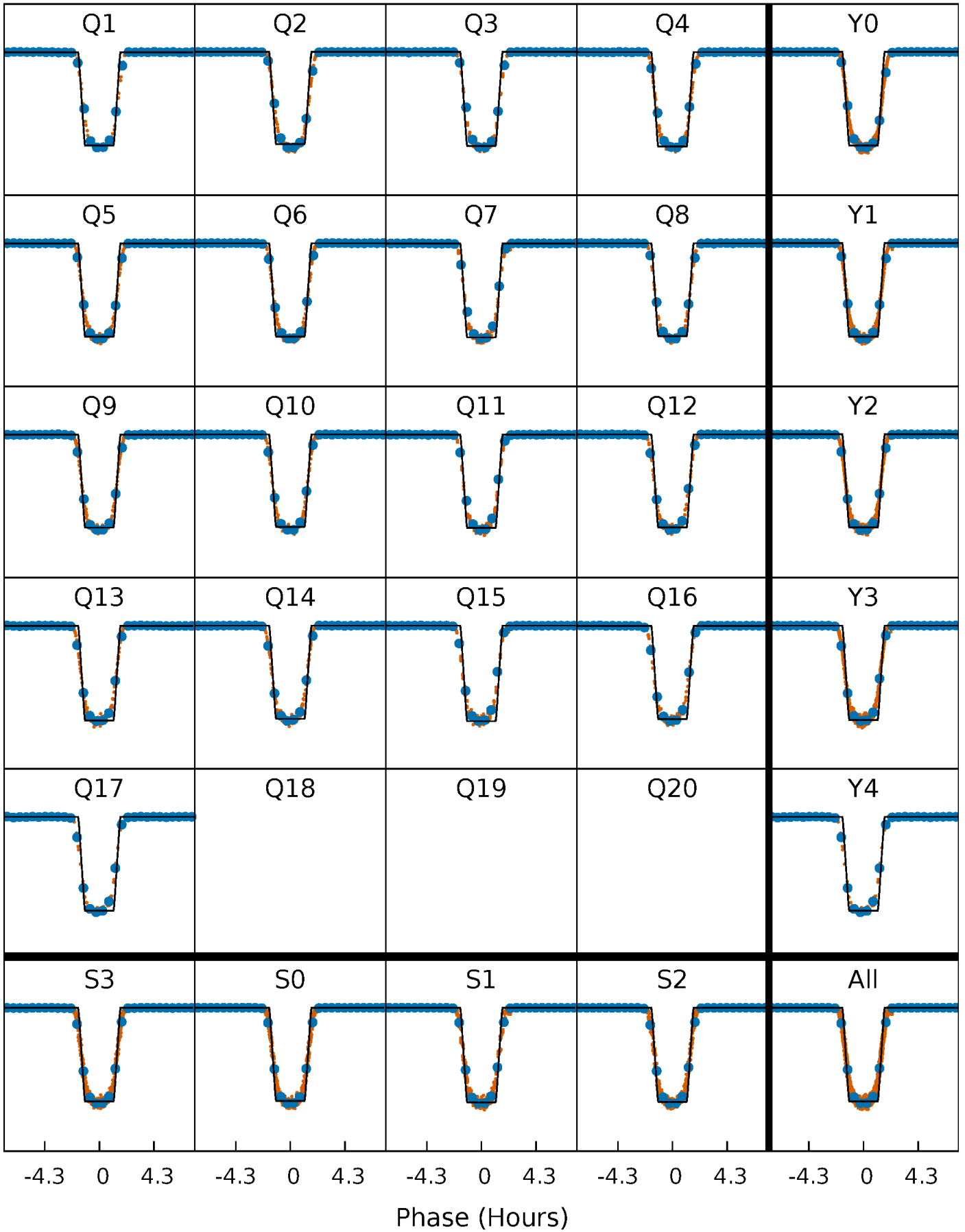
DV Quarter-Phased Transit Curves

TCE 009649222-01 P= 5.918620 Days $T_0=132.924667$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

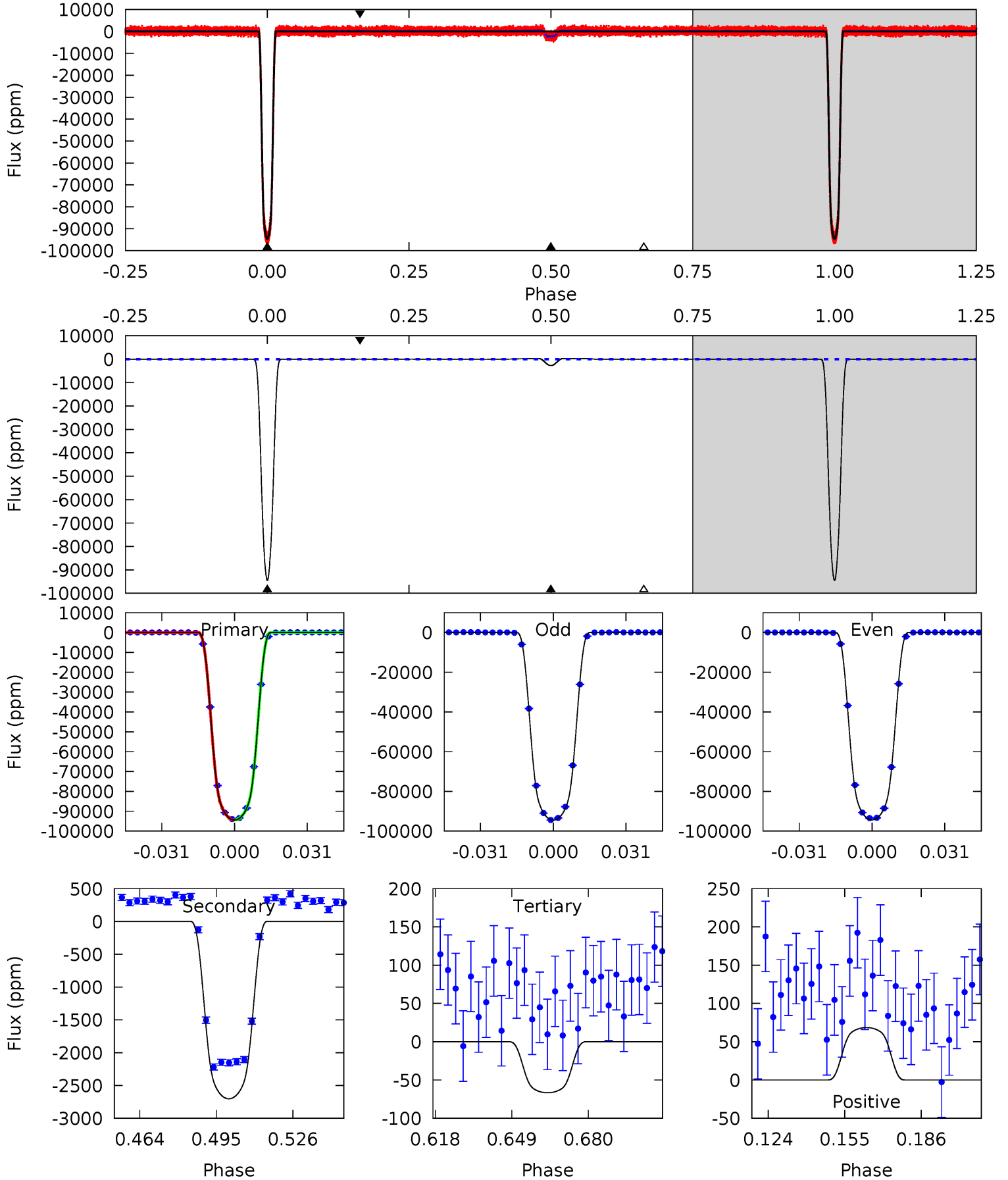
TCE 009649222-01 P= 5.918652 Days $T_0=132.920918$ (BKJD)



DV Model-Shift Uniqueness Test

009649222-01, P = 5.918620 Days, E = 127.006047 Days

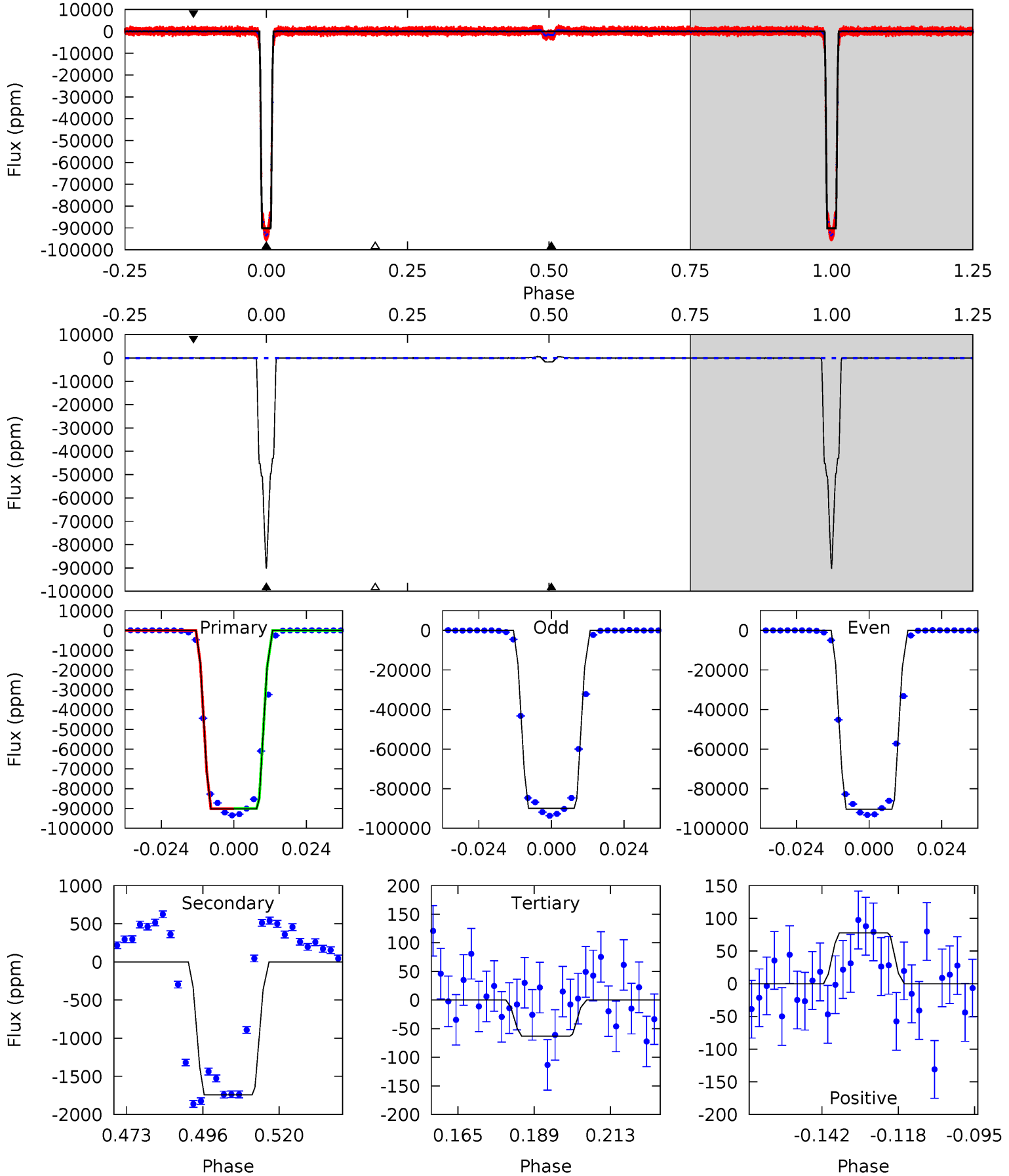
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|-------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 6118 | 175.1 | 4.32 | 4.43 | 4.81 | 2.16 | 4.41 | 6114 | 6114 | 170.7 | 170.6 | 3.82 | 1.00 | 0.00 | 3.00 |



Alt Model-Shift Uniqueness Test

009649222-01, P = 5.918652 Days, E = 127.002266 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 4066 | 78.6 | 2.85 | 3.51 | 4.86 | 2.26 | 2.49 | 4063 | 4063 | 75.7 | 75.1 | 9.60 | 1.00 | 0.01 | 3.20 |



Stellar Parameters For KIC 009649222

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | $R (R_{\odot})$ | $M(M_{\odot})$ | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|----------------------|---------------------------|---------------------------|---------------------------|---------------------------|---|
| | 5957^{+176}_{-211} | $4.498^{+0.039}_{-0.221}$ | $0.070^{+0.250}_{-0.300}$ | $0.971^{+0.312}_{-0.104}$ | $1.083^{+0.124}_{-0.152}$ | $1.665^{+0.366}_{-0.915}$ |
| | +3%/-4% | +1%/-5% | +357%/-429% | +32%/-11% | +11%/-14% | +22%/-55% |
| 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 009649222-01 / KOI 6071.01

| Detrend | Depth (ppm) | $R_p (R_{\oplus})$ | $T_{max} (K)$ | $T_{obs} (K)$ | A_{obs} |
|---------|----------------|-------------------------|---------------------|--------------------|---------------------------|
| DV | -2702 ± 15 | $31.11^{+4.93}_{-2.61}$ | 1452^{+108}_{-72} | 3144^{+59}_{-68} | $6.568^{+0.949}_{-1.630}$ |
| Alt. | -1742 ± 22 | $33.13^{+5.45}_{-2.57}$ | 1447^{+100}_{-71} | 2880^{+46}_{-56} | $3.693^{+0.527}_{-0.882}$ |

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 $A_{obs} \gg 1.0$

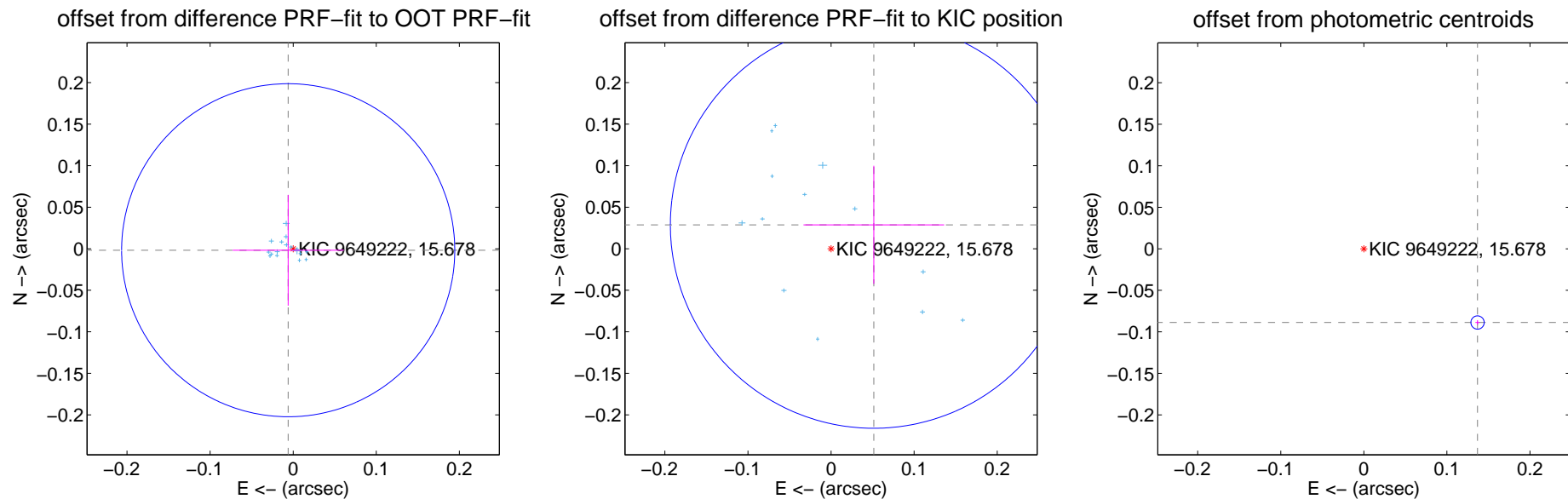
DV Centroid Data

Supplemental centroid analysis for 009649222-01. Kepler magnitude: 15.68. Transit SNR 2751.34

There are 17 quarters with good PRF difference image offsets

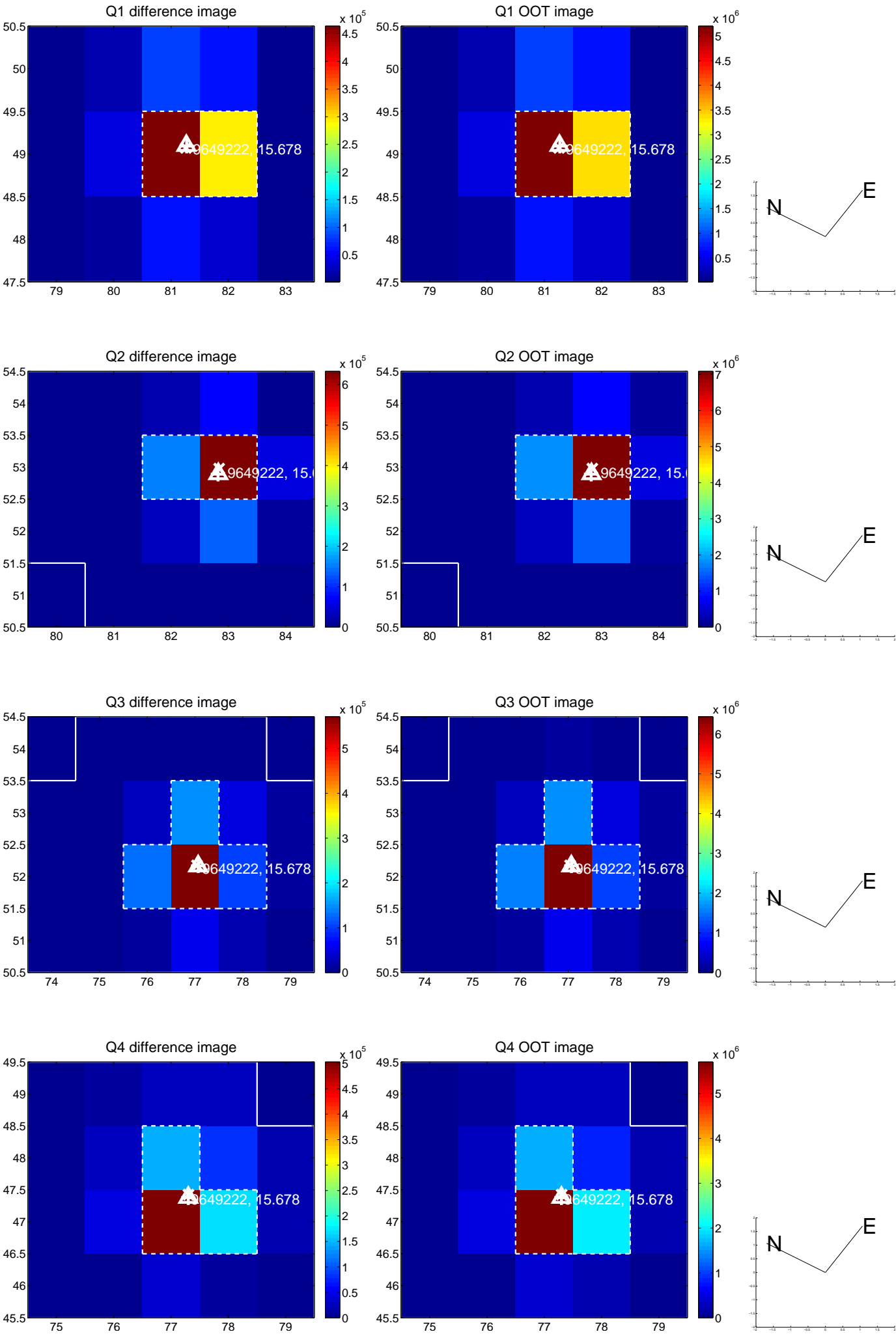
The direct PRF centroid is offset from the target star catalog position by about 0.10 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|---|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT | 0.006 ± 0.067 | 0.09 | 0.006 ± 0.067 | -0.002 ± 0.067 |
| PRF-fit source offset from KIC position | 0.059 ± 0.082 | 0.72 | -0.052 ± 0.085 | 0.029 ± 0.071 |
| photometric centroid source offset | 0.16 ± 0.00 | 61.17 | -0.14 ± 0.00 | -0.09 ± 0.00 |

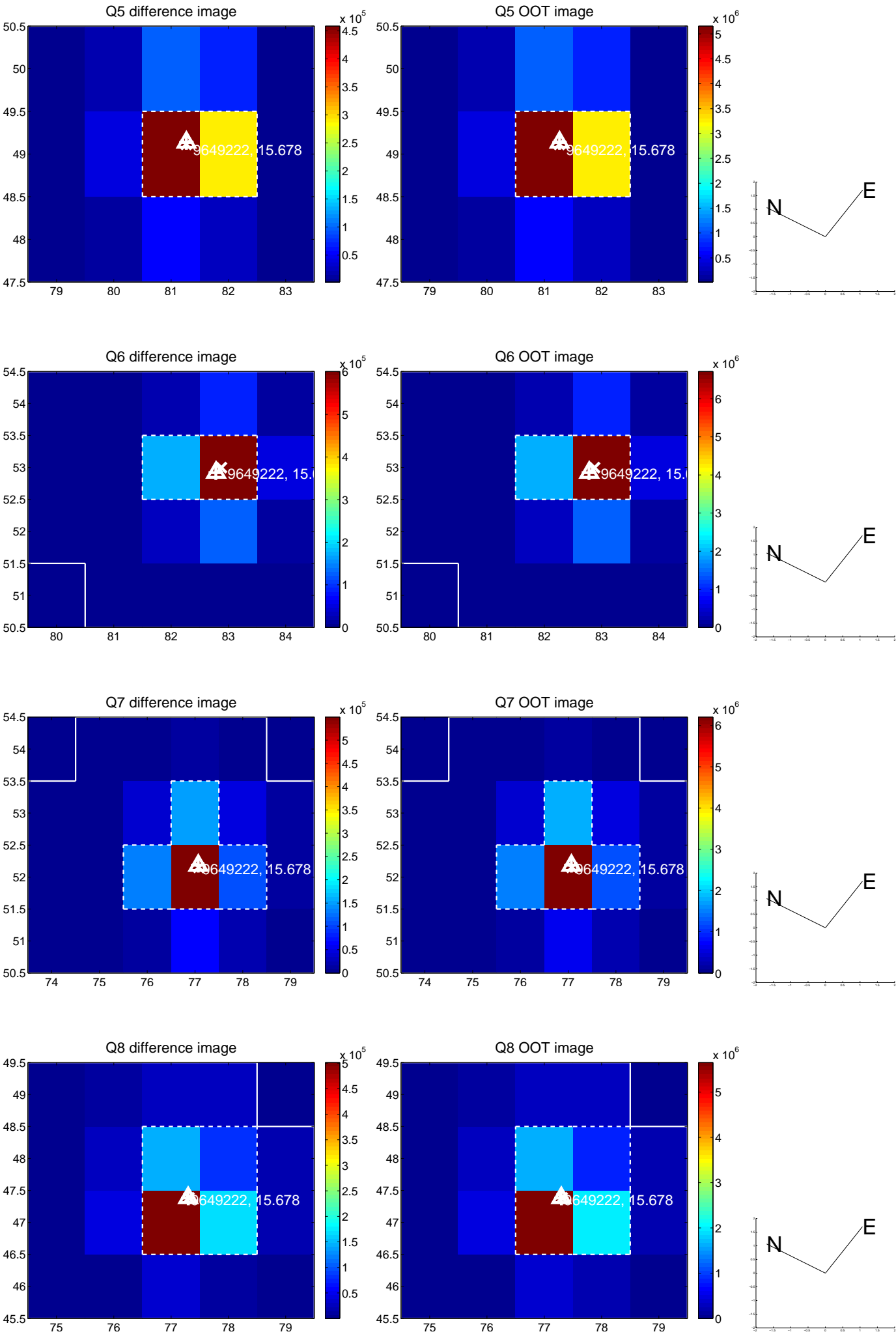


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

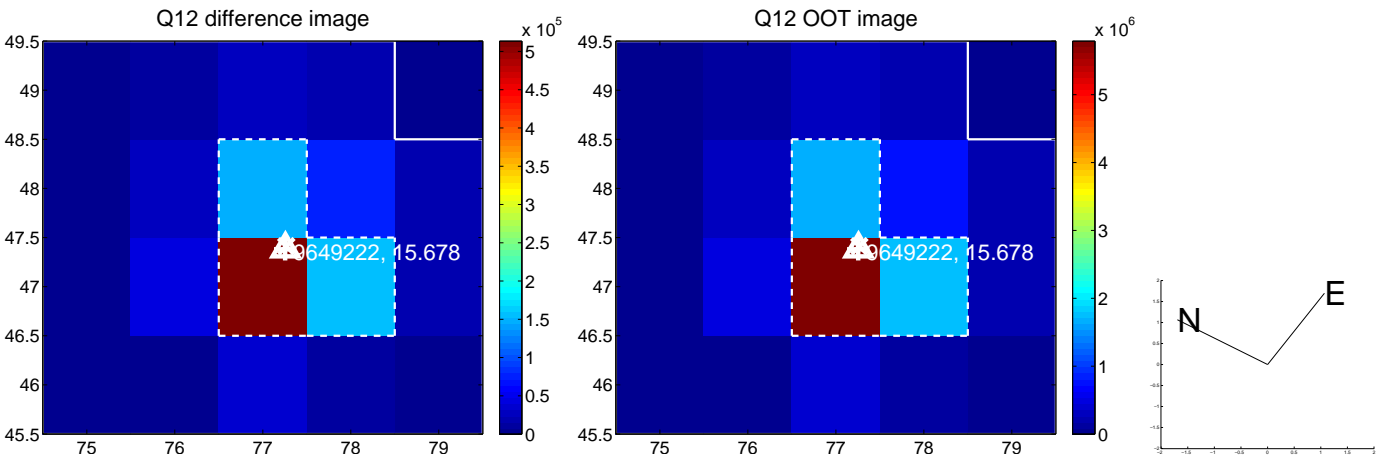
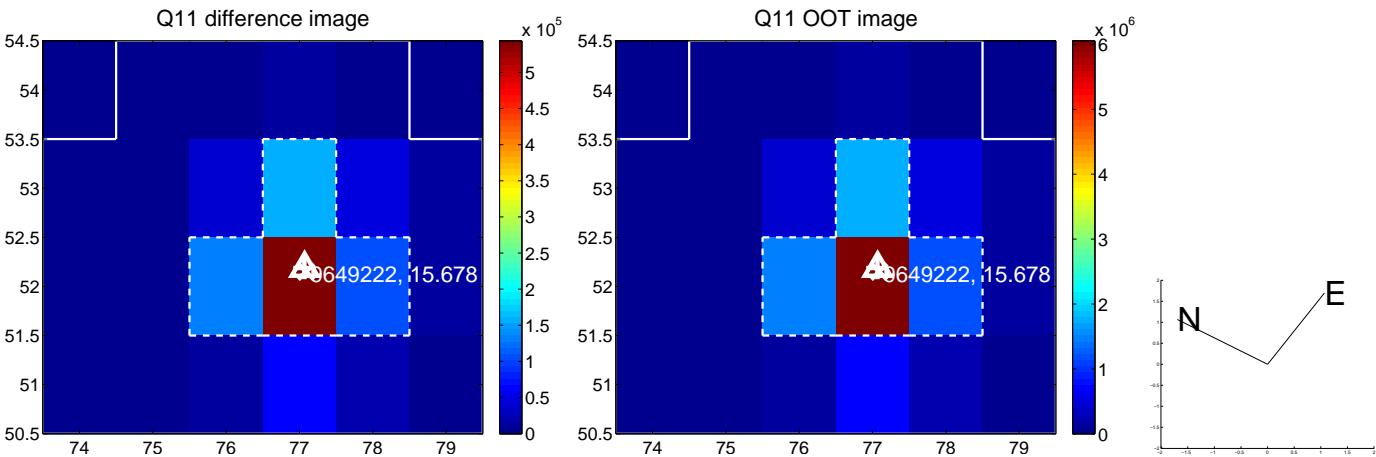
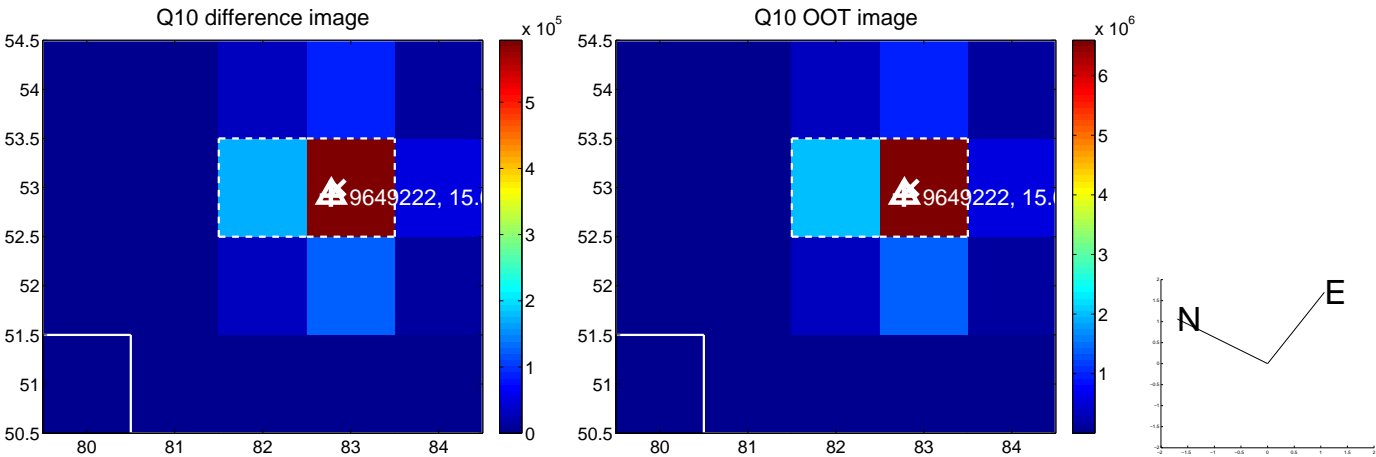
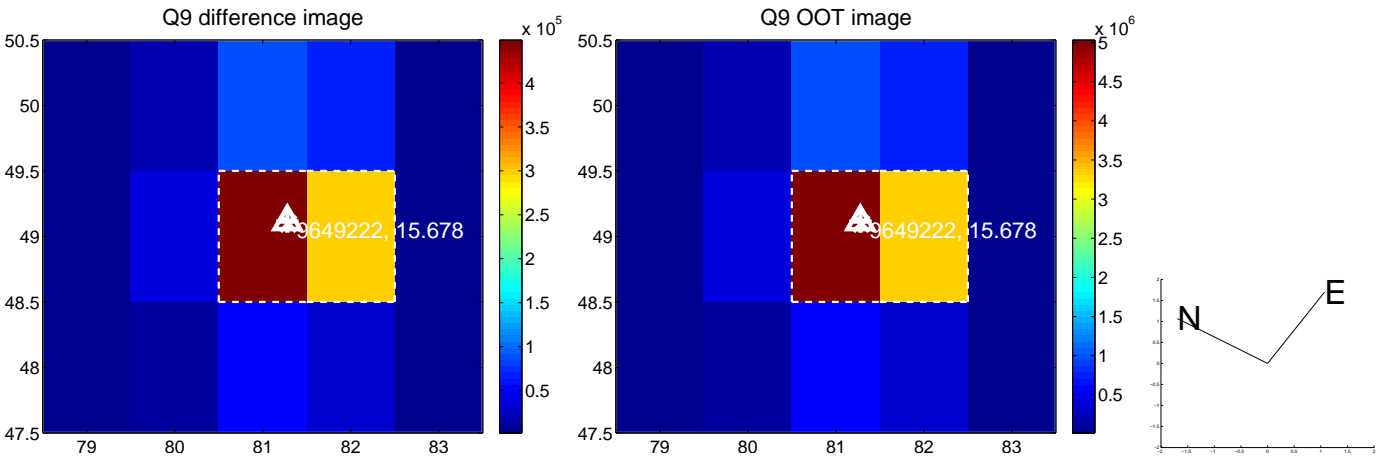
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



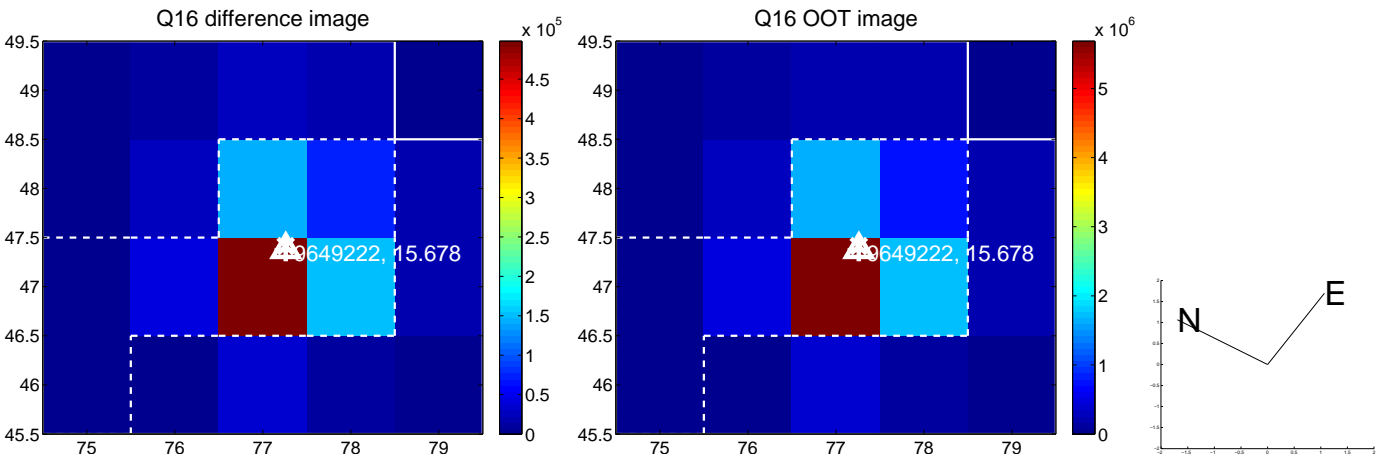
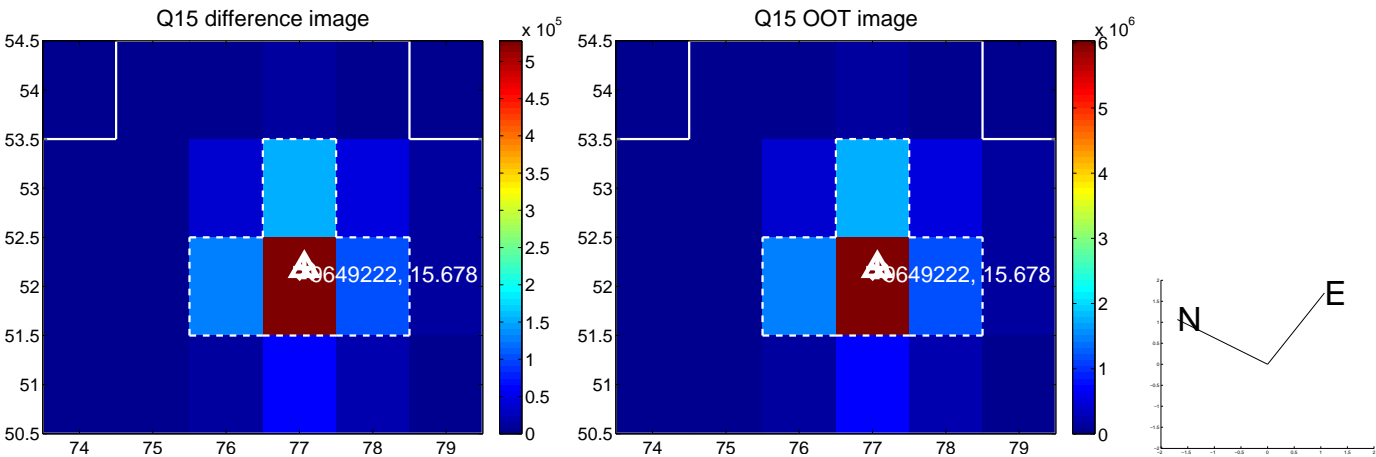
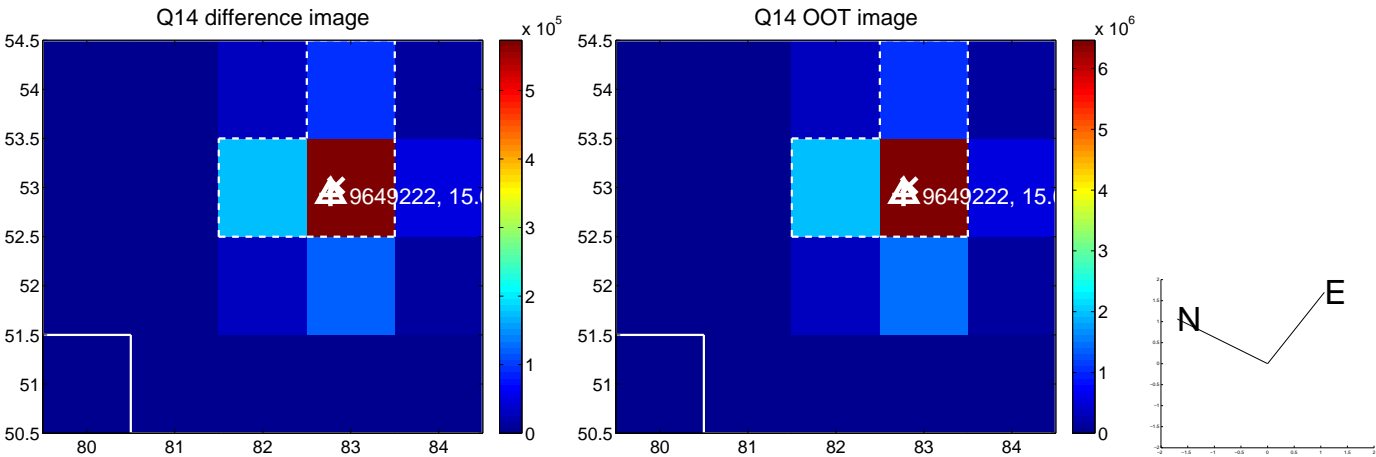
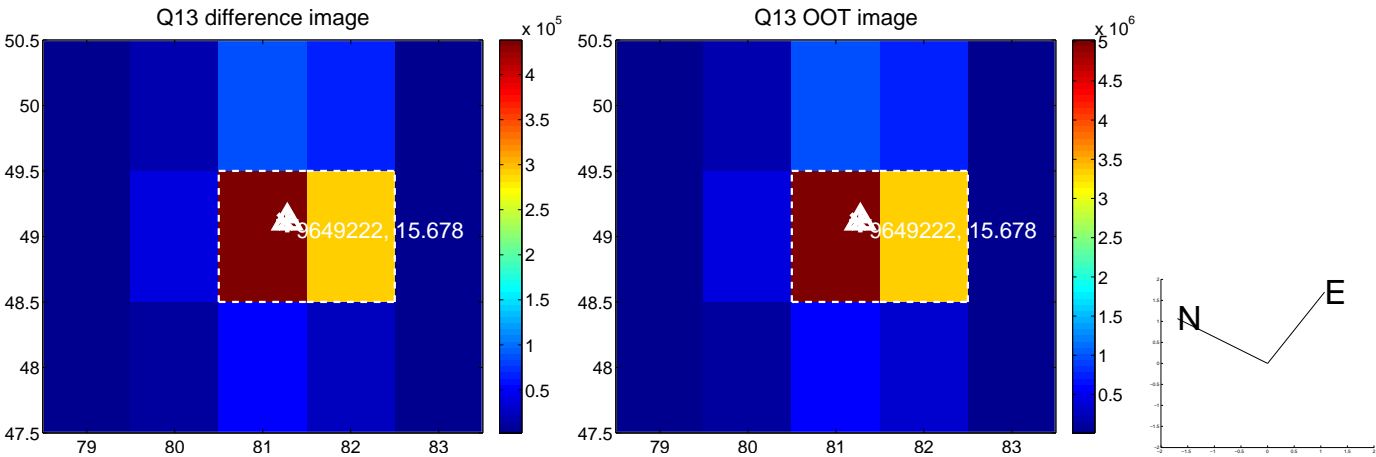
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



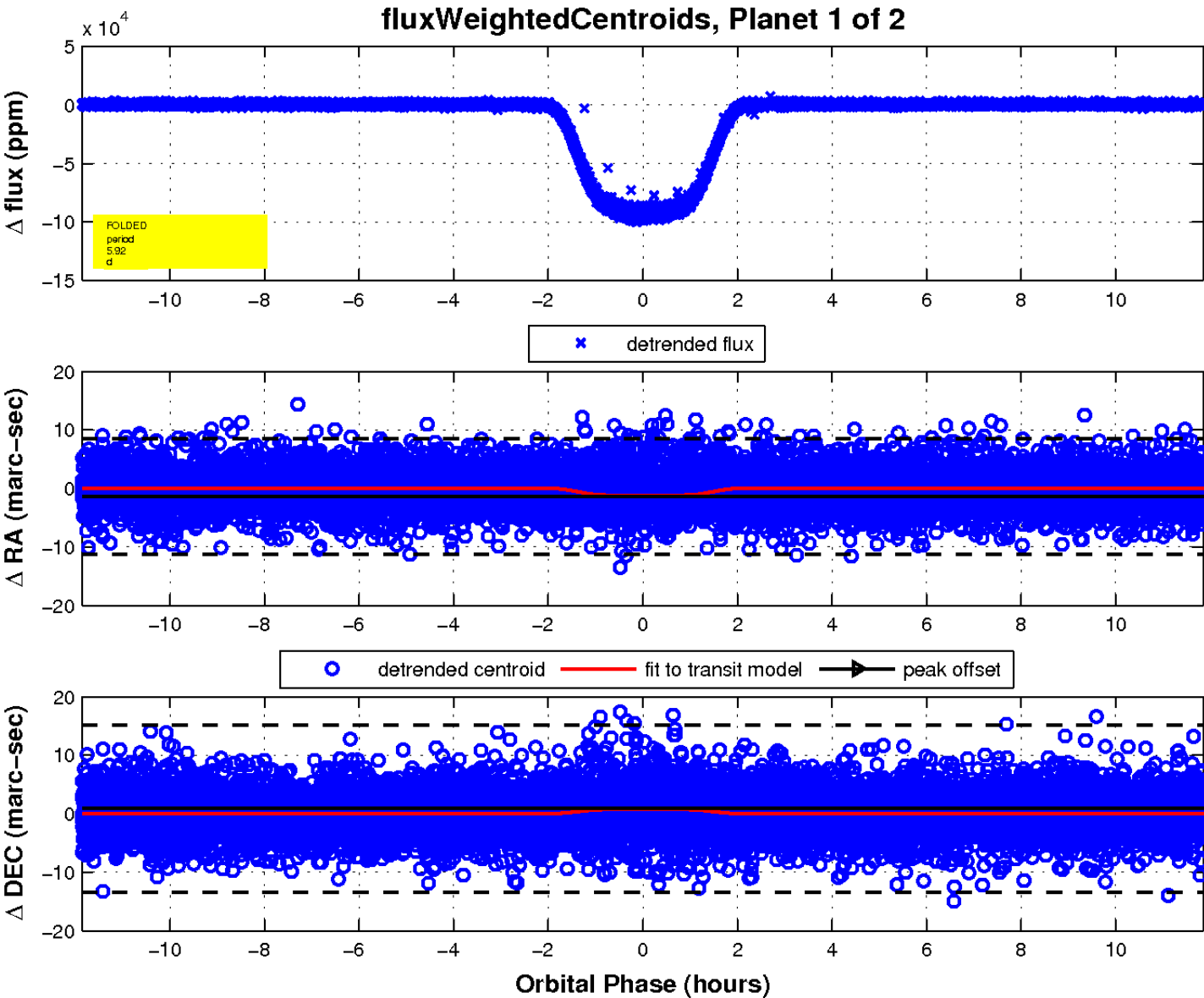
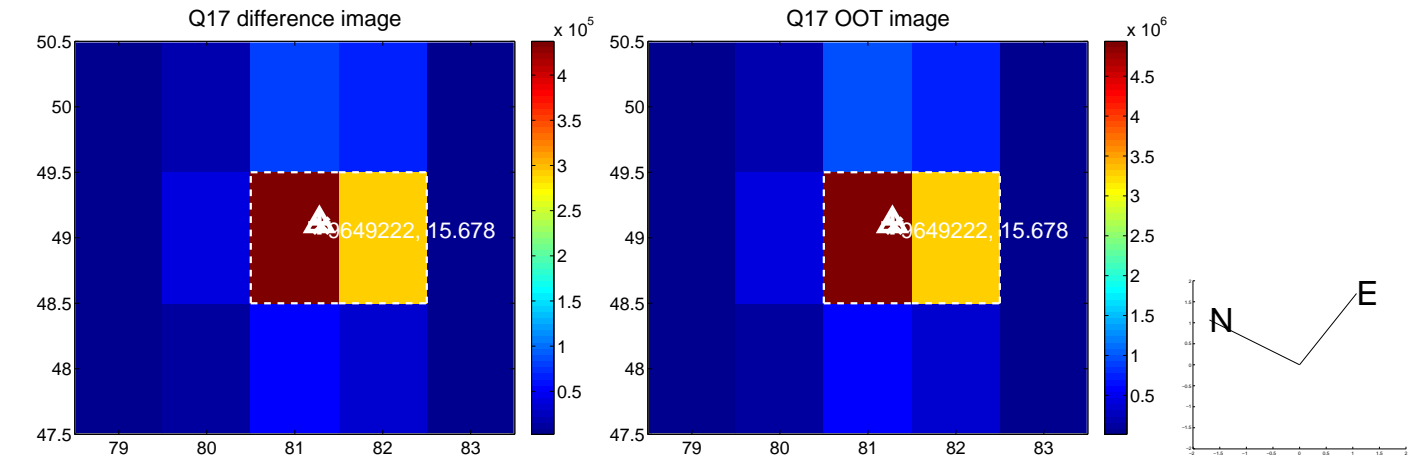
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

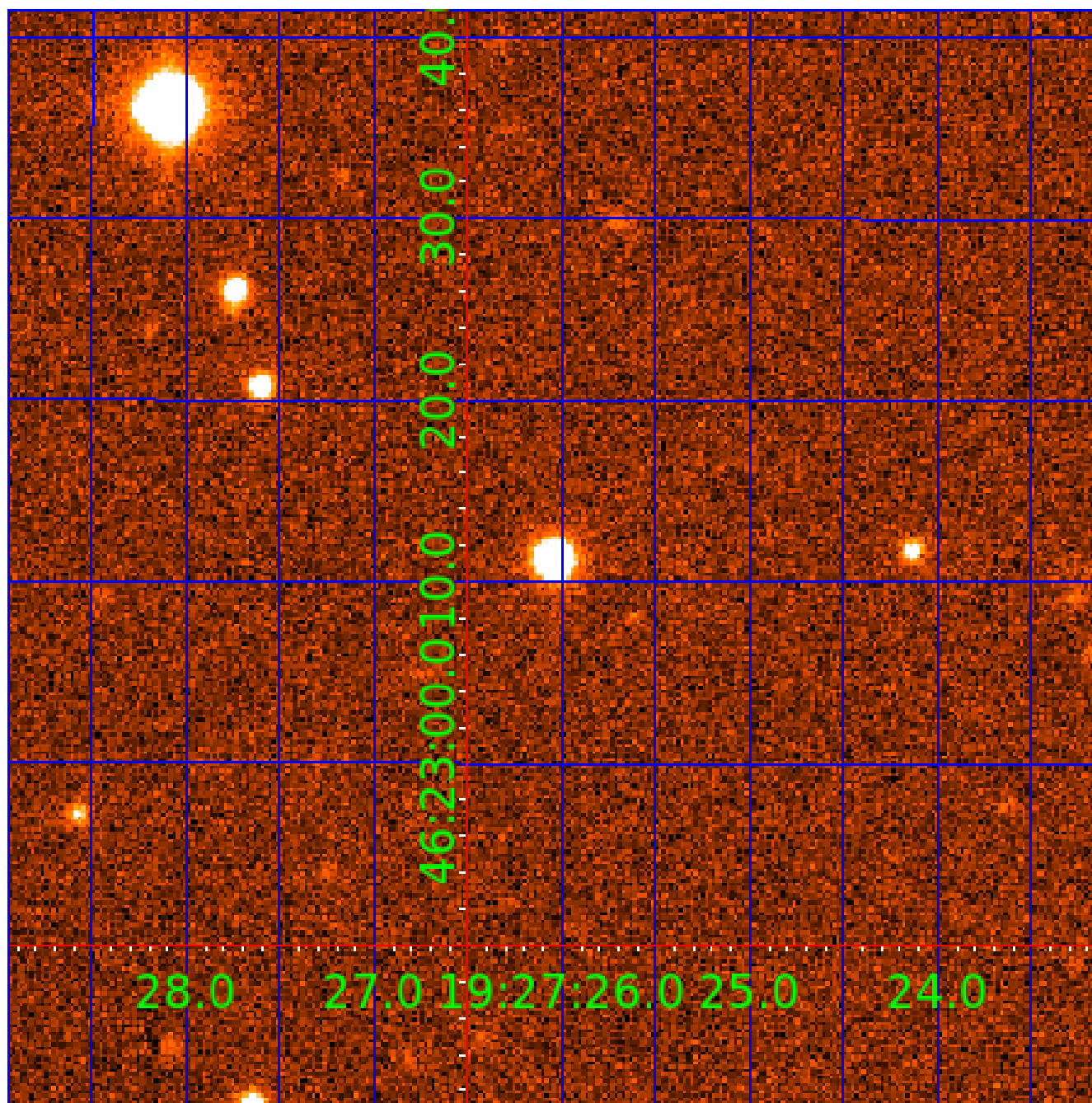


white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



UKIRT Image

Declination



KIC 009649222

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}) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|--------|--------|-----------------------------|-----------------|------------------------|------------------------|
| 009649222-01 | OBS | 6071.01 | 5.918620 | 132.924667 | 94429.7 | 3.952 | 3800.5 | 2751.3 | 0.97 | 5957 | 29.87 | 245.96 |
| 009649222-02 | OBS | No | 5.918612 | 135.885029 | 2689.1 | 3.849 | 109.4 | 112.1 | 0.97 | 5957 | 5.75 | 245.96 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|------------------------------------|
| 009649222-01 | OBS | FP | 0.00 | 0 | 1 | 0 | 0 | MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE |
| 009649222-02 | OBS | FP | 0.00 | 1 | 1 | 0 | 0 | IS_SEC_TCE |

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 009649222-02

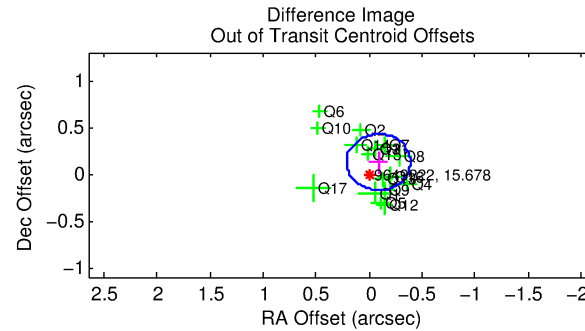
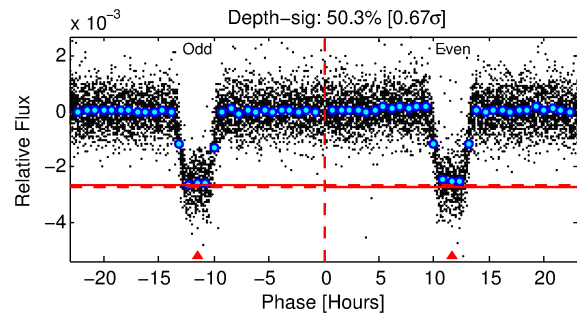
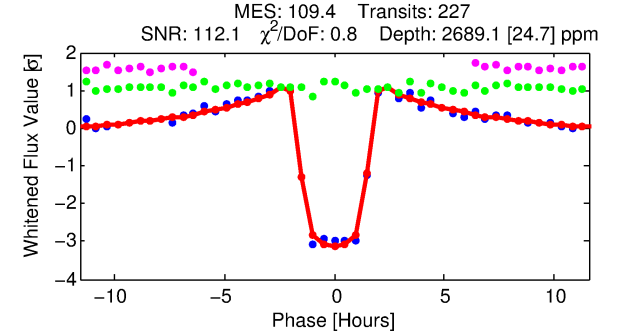
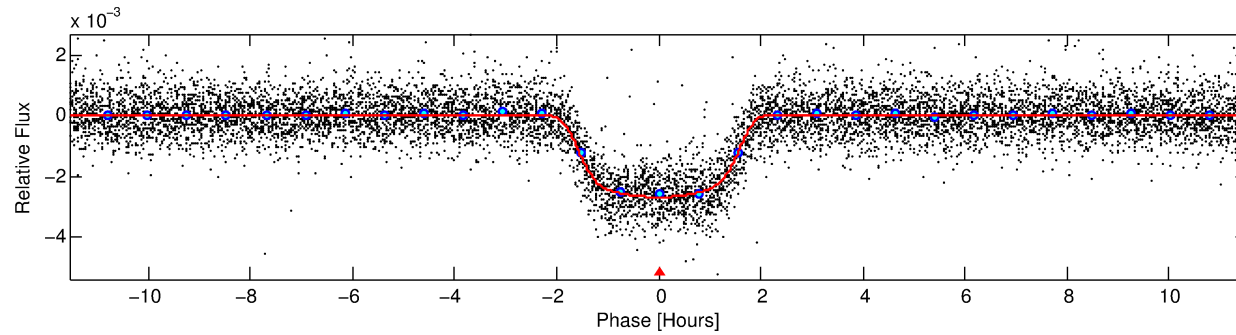
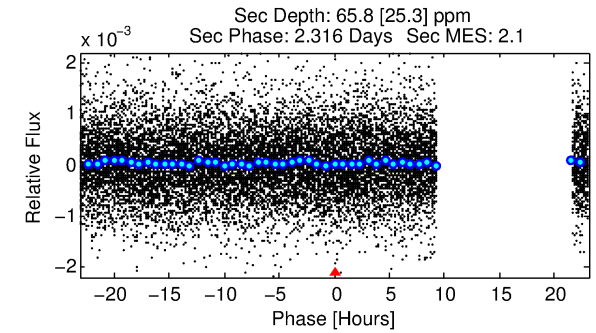
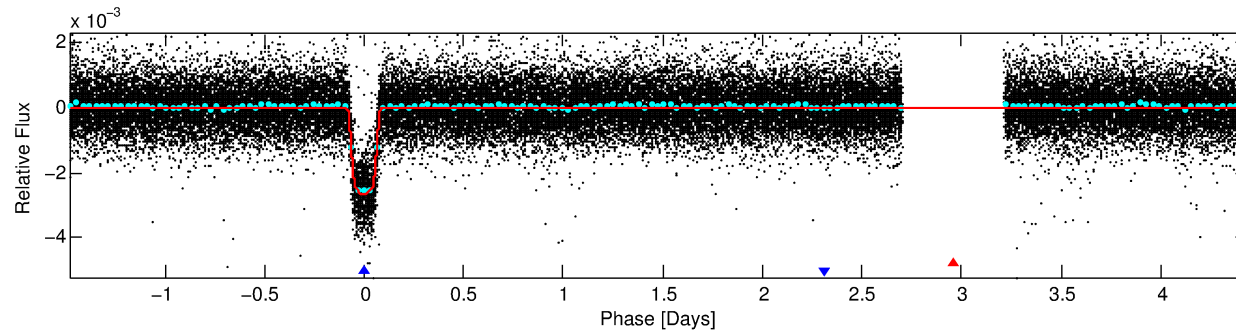
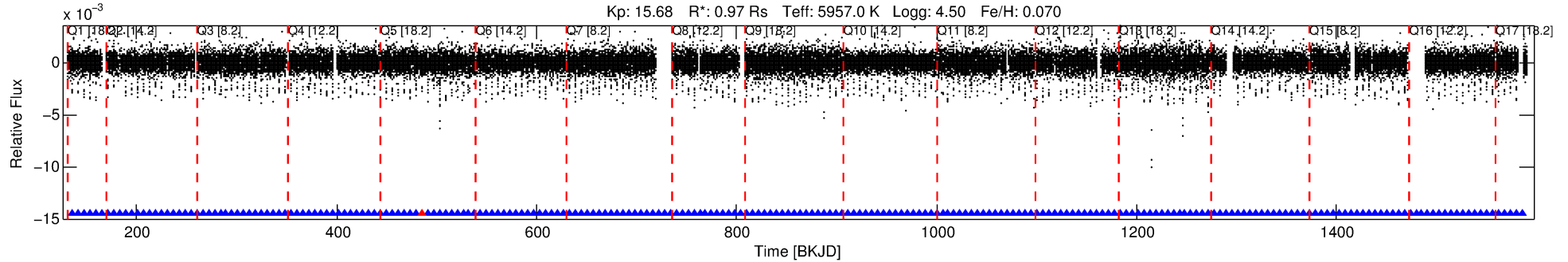
No Significant Match Found

DV One-Page Summary

KIC: 9649222 Candidate: 2 of 2 Period: 5.919 d

KOI: K06071 Corr: No Ephemeris Match

Kp: 15.68 R*: 0.97 Rs Teff: 5957.0 K Logg: 4.50 Fe/H: 0.070



DV Fit Results:

Period = 5.91861 [0.00000] d
Epoch = 135.8850 [0.0005] BKJD
Rp/R* = 0.0543 [0.0006]
a/R* = 7.36 [0.32]
b = 0.85 [0.01]
Seff = 245.96 [104.65]
Teq = 1010 [107] K
Rp = 5.75 [1.85] Re
a = 0.0658 [0.0180] AU
Ag = 4.73 [2.63] [1.42σ]
Teffp = 2303 [236] K [4.98σ]

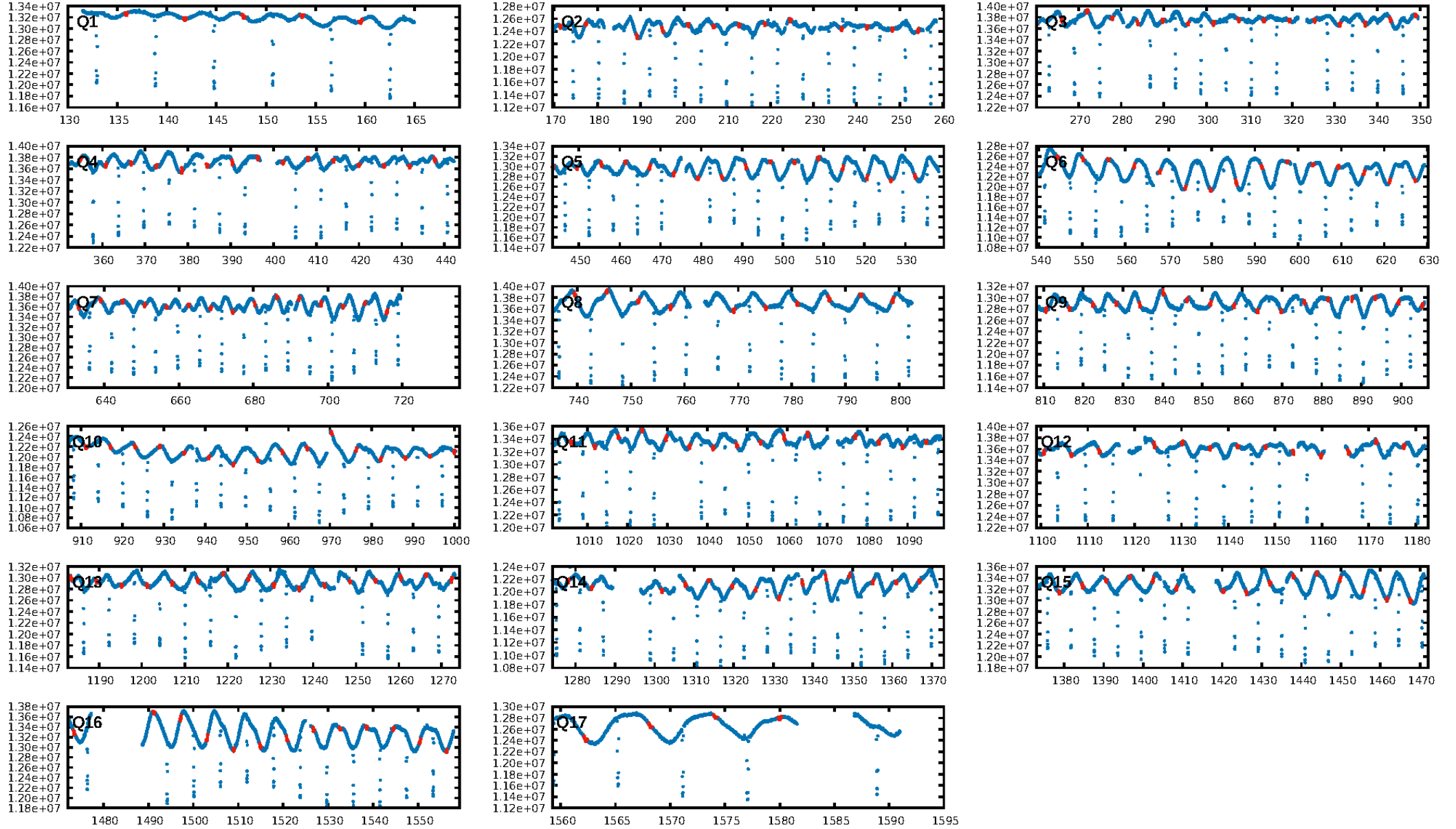
DV Diagnostic Results:

ShortPeriod-sig: N/A
LongPeriod-sig: 0.0% [0.00σ]
ModelChiSquare2-sig: N/A
ModelChiSquareGof-sig: N/A
Bootstrap-pfa: 0.00e+00
RollingBand-fgt: 1.00 [217/218]
GhostDiagnostic-chr: 1.672
Centroid-sig: 17.2%
Centroid-so: 0.197 arcsec [2.31σ]
OotOffset-rm: 0.154 arcsec [1.54σ]
KicOffset-rm: 0.168 arcsec [1.56σ]
OotOffset-st: 4/4/4/5 [17]
KicOffset-st: 4/4/4/5 [17]
DiffImageQuality-fgm: 1.00 [17/17]
DiffImageOverlap-fno: 1.00 [17/17]

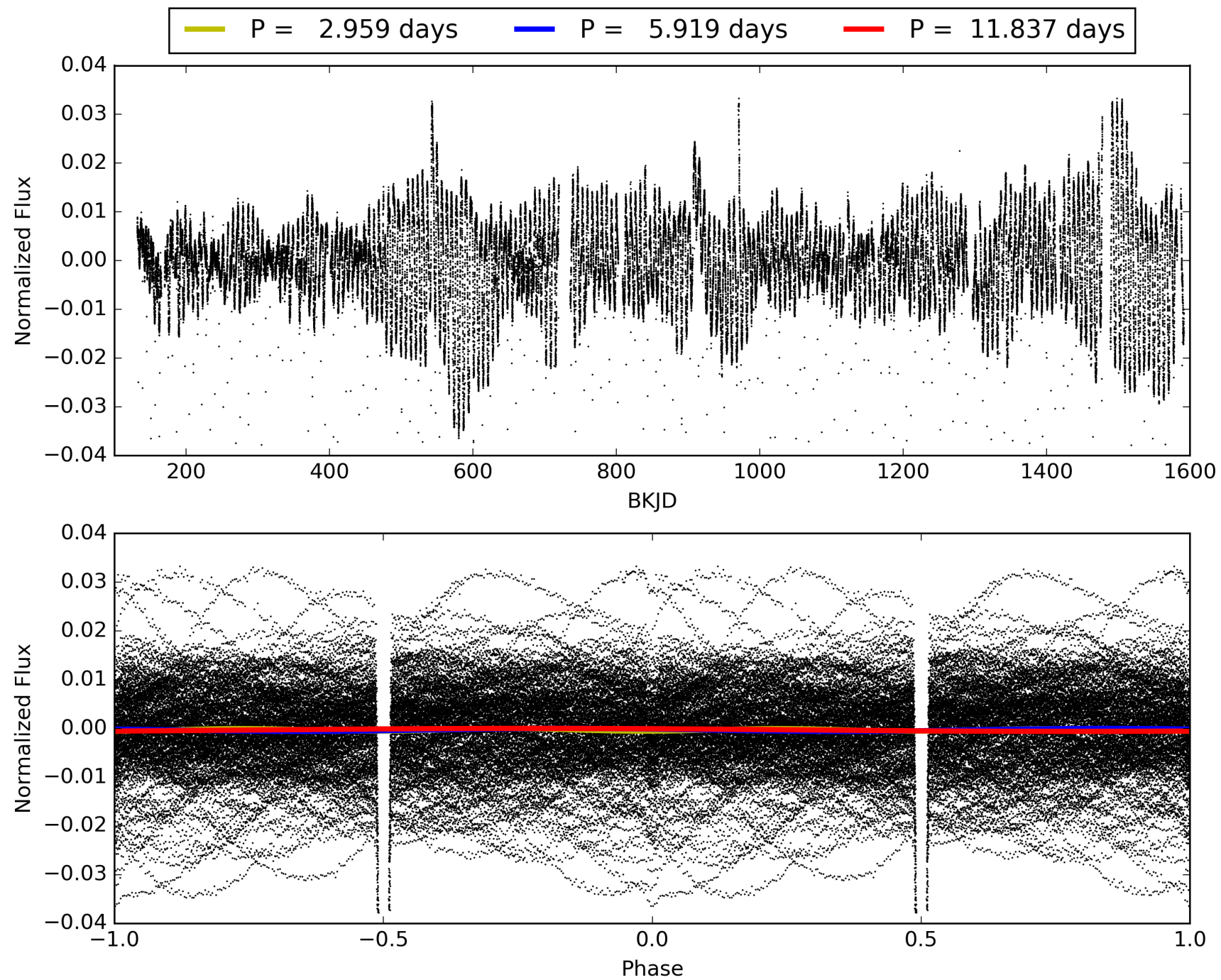
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 08:05:21 Z

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

TCE 009649222-02, PDC Light Curves

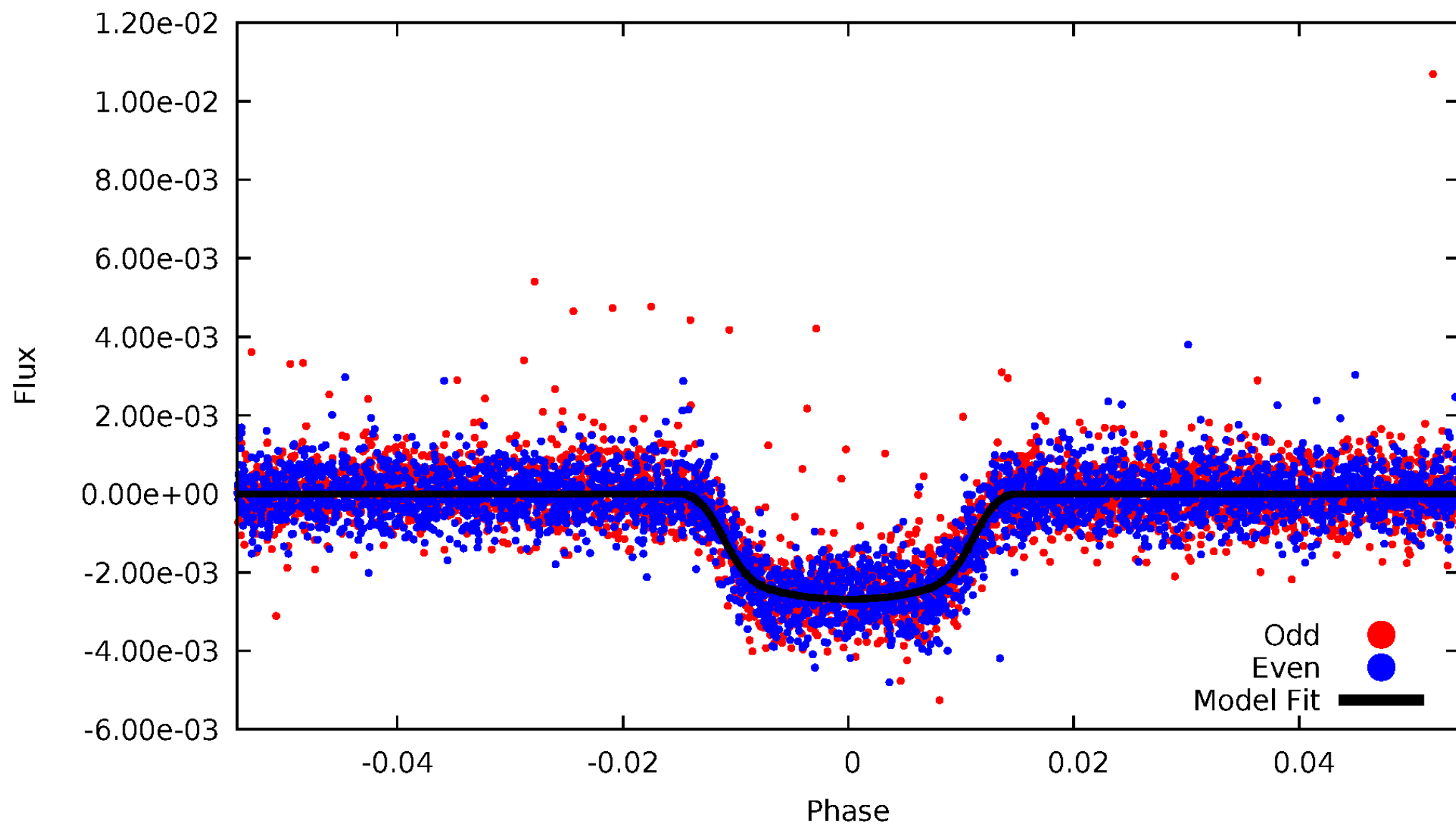


TCE 009649222-02



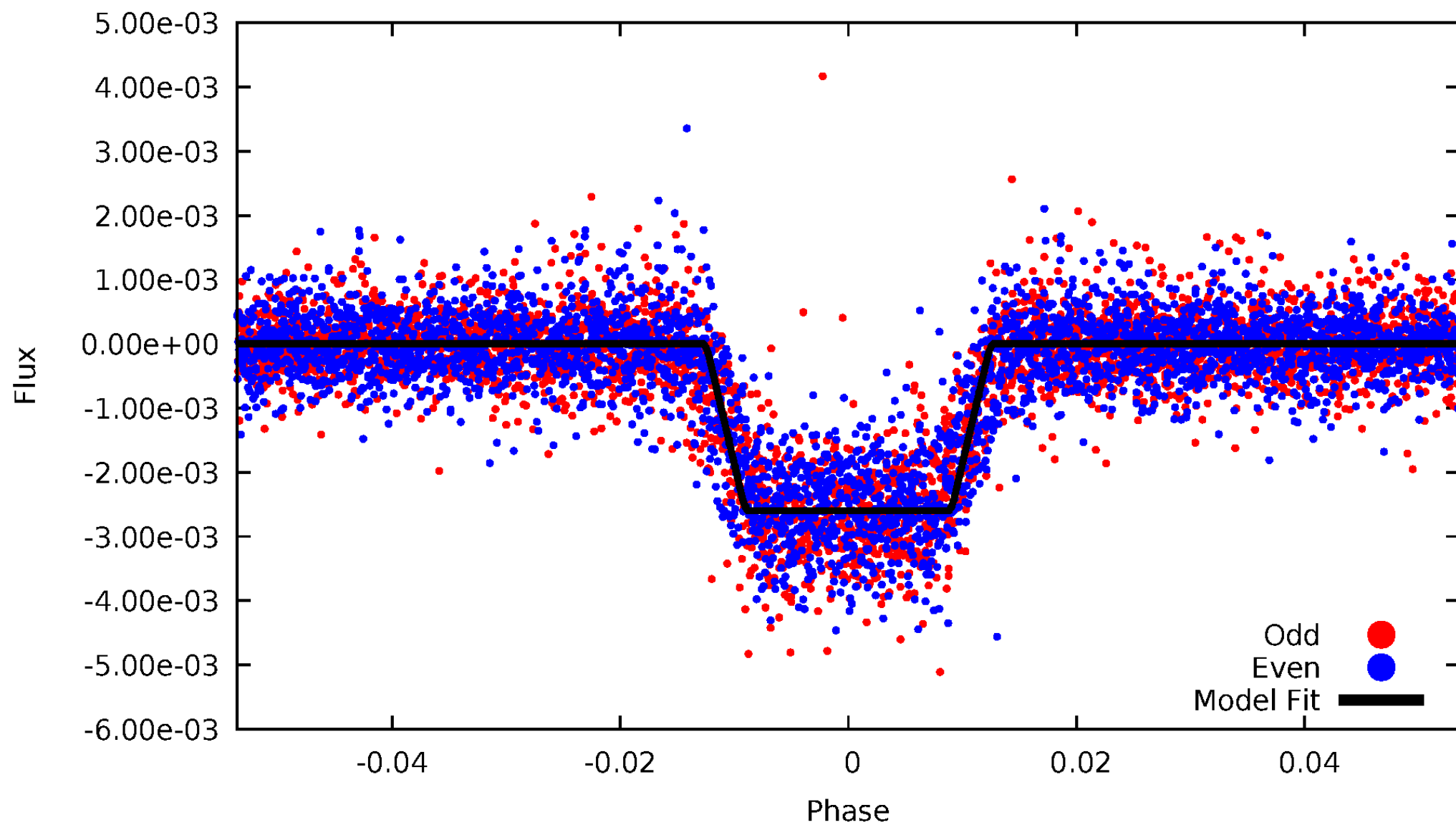
DV Odd/Even

TCE 009649222-02



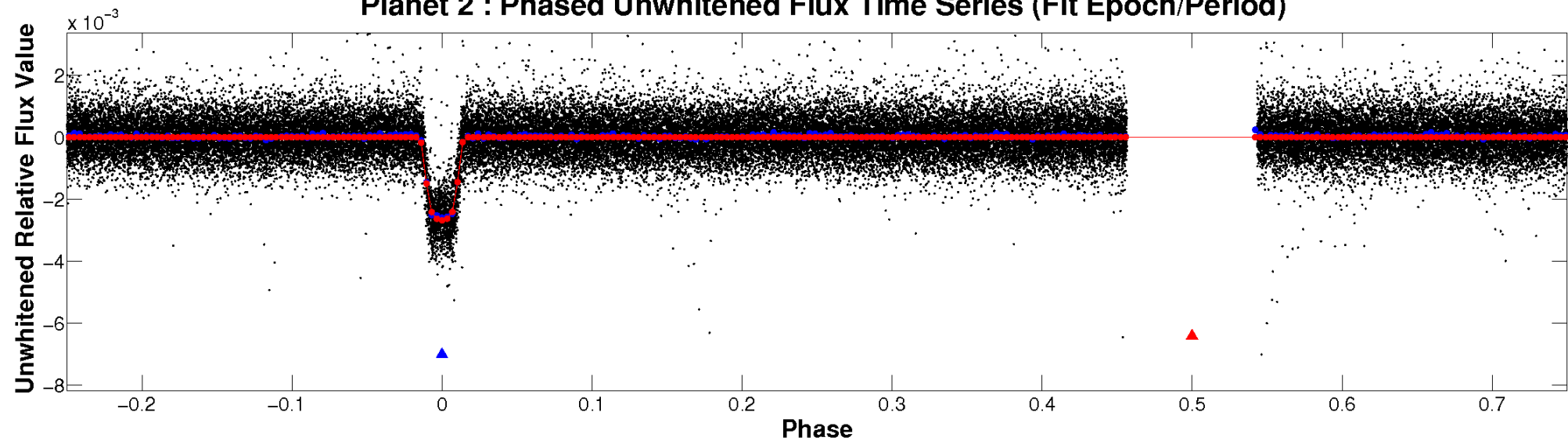
ALT Odd/Even

TCE 009649222-02

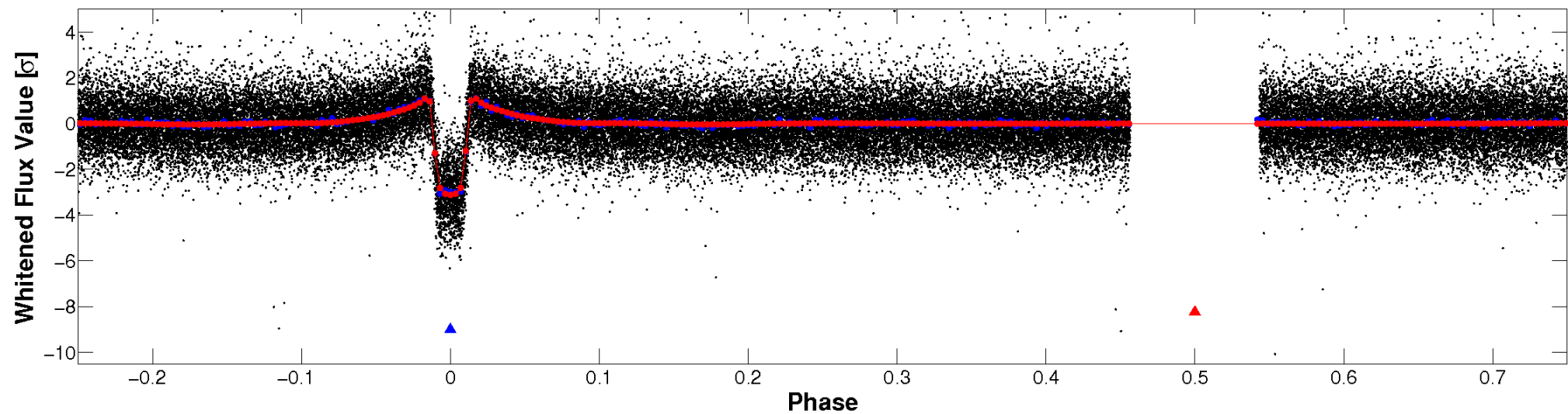


Non-Whitened Vs. Whitened Light Curve

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

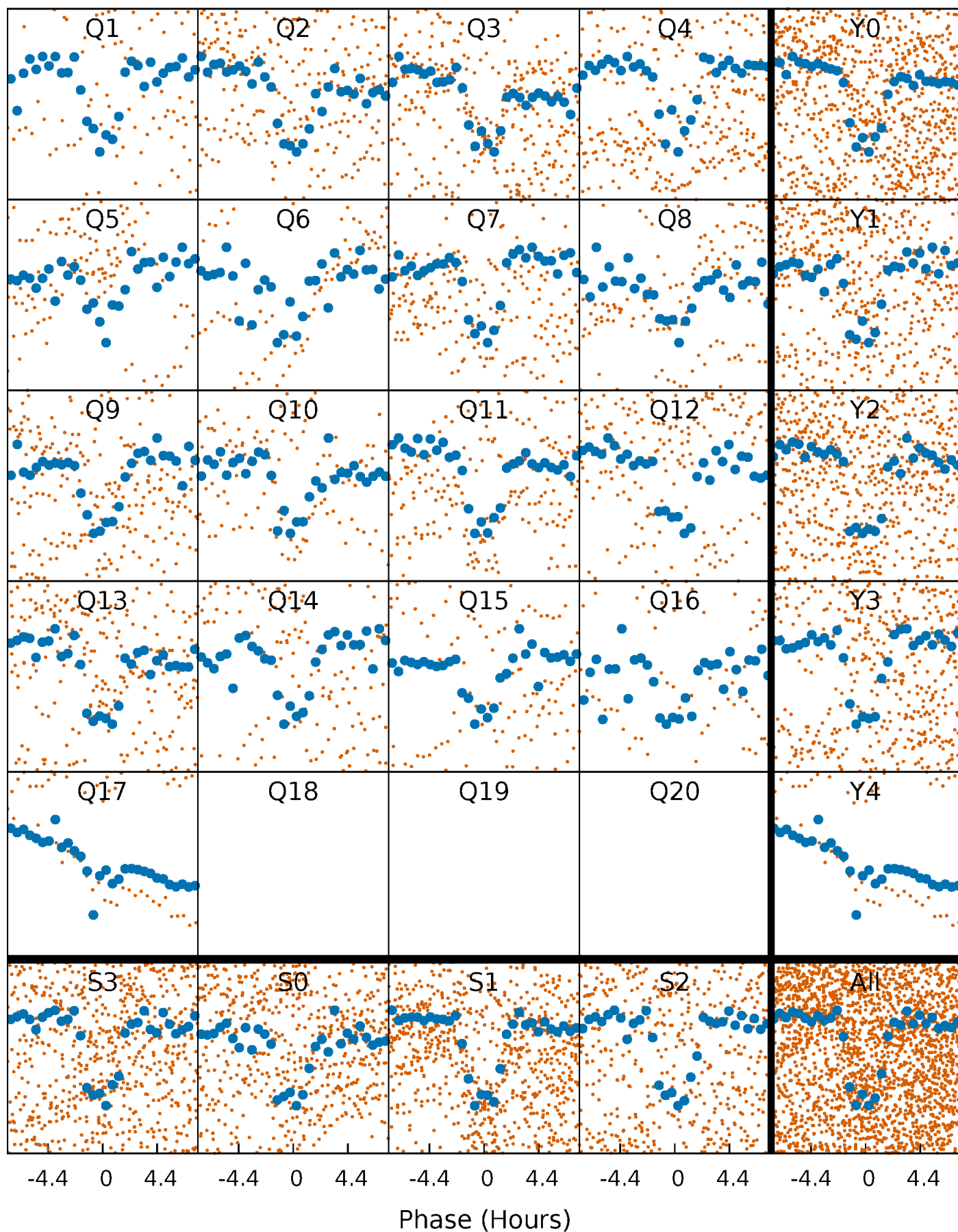


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



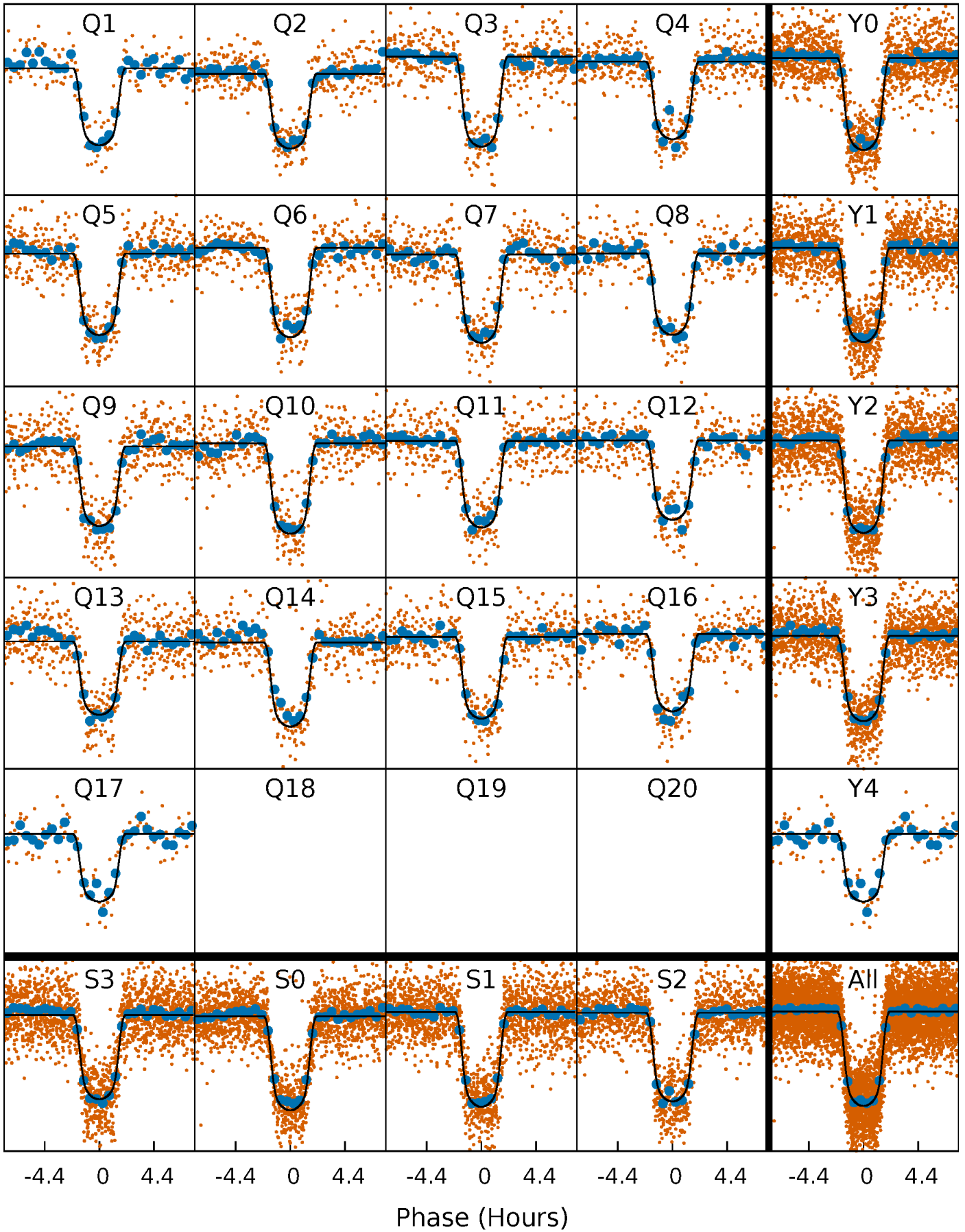
PDC Quarter-Phased Transit Curves

TCE 009649222-02 P= 5.918612 Days $T_0=135.885029$ (BKJD)



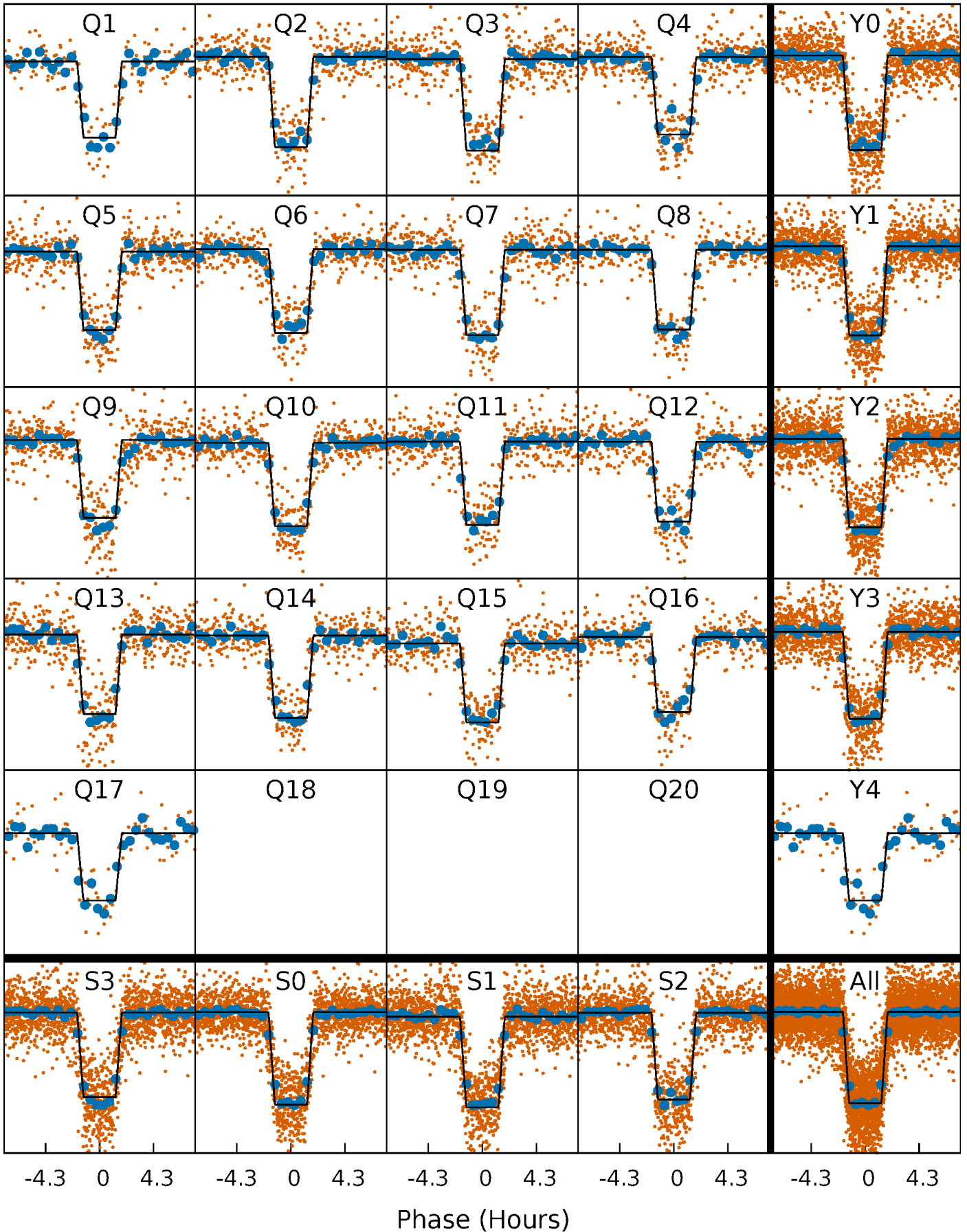
DV Quarter-Phased Transit Curves

TCE 009649222-02 P= 5.918612 Days $T_0=135.885029$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

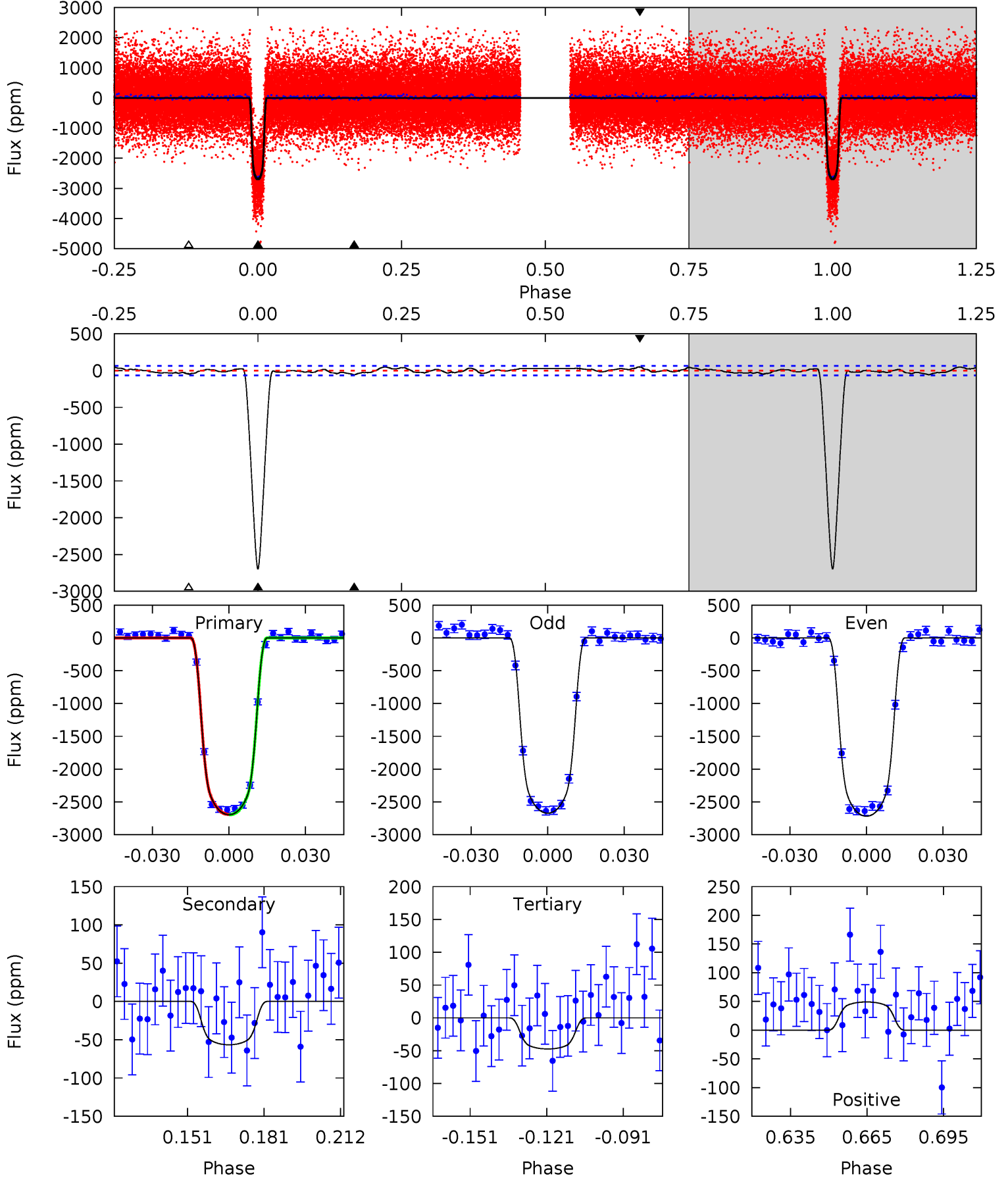
TCE 009649222-02 P= 5.918658 Days $T_0=135.879649$ (BKJD)



DV Model-Shift Uniqueness Test

009649222-02, P = 5.918612 Days, E = 129.966417 Days

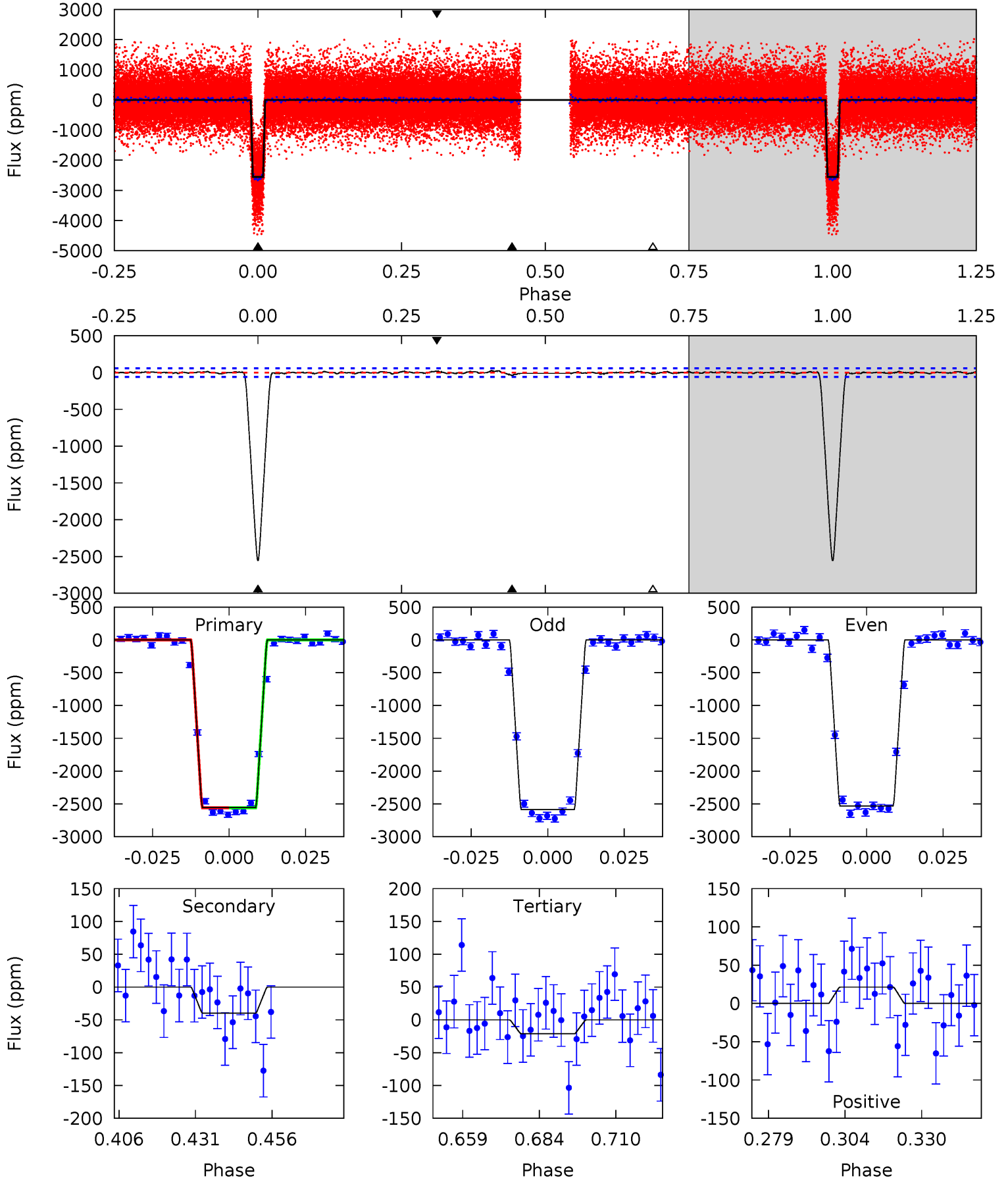
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|-------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 198.1 | 4.16 | 3.48 | 3.61 | 4.81 | 2.17 | 1.62 | 194.6 | 194.5 | 0.68 | 0.55 | 1.69 | 1.00 | 0.02 | 0.25 |



Alt Model-Shift Uniqueness Test

009649222-02, P = 5.918658 Days, E = 129.960991 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|-------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 209.4 | 3.26 | 1.74 | 1.75 | 4.84 | 2.24 | 0.67 | 207.6 | 207.6 | 1.51 | 1.50 | 2.09 | 1.02 | 0.01 | 0.01 |



Stellar Parameters For KIC 009649222

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | $R (R_{\odot})$ | $M(M_{\odot})$ | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|----------------------|---------------------------|---------------------------|---------------------------|---------------------------|---|
| | 5957^{+176}_{-211} | $4.498^{+0.039}_{-0.221}$ | $0.070^{+0.250}_{-0.300}$ | $0.971^{+0.312}_{-0.104}$ | $1.083^{+0.124}_{-0.152}$ | $1.665^{+0.366}_{-0.915}$ |
| | +3%/-4% | +1%/-5% | +357%/-429% | +32%/-11% | +11%/-14% | +22%/-55% |
| 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 009649222-02 / KOI

| Detrend | Depth (ppm) | $R_p (R_{\oplus})$ | $T_{max} (K)$ | $T_{obs} (K)$ | A_{obs} |
|---------|--------------|------------------------|---------------------|----------------------|---------------------------|
| DV | -57 ± 14 | $5.95^{+1.14}_{-0.53}$ | 1455^{+114}_{-81} | 2883^{+107}_{-131} | $3.512^{+1.215}_{-1.045}$ |
| Alt. | -40 ± 12 | $5.68^{+0.82}_{-0.51}$ | 1449^{+104}_{-69} | 2775^{+137}_{-165} | $2.769^{+1.164}_{-1.042}$ |

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 $A_{obs} \gg 1.0$

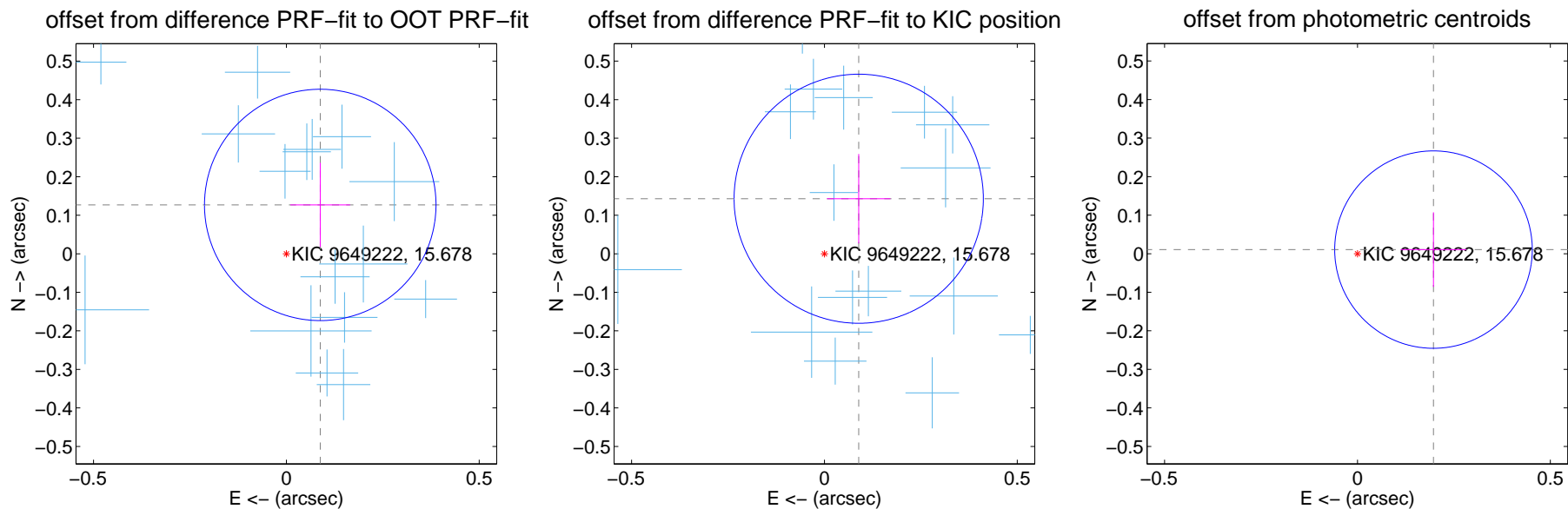
DV Centroid Data

Supplemental centroid analysis for 009649222-02. Kepler magnitude: 15.68. Transit SNR 112.06

There are 17 quarters with good PRF difference image offsets

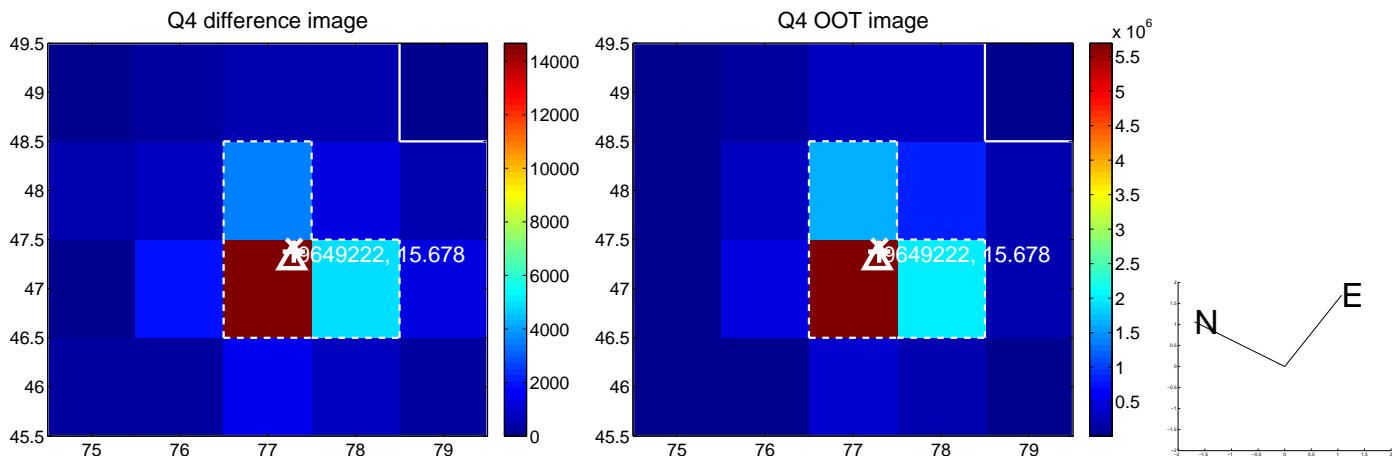
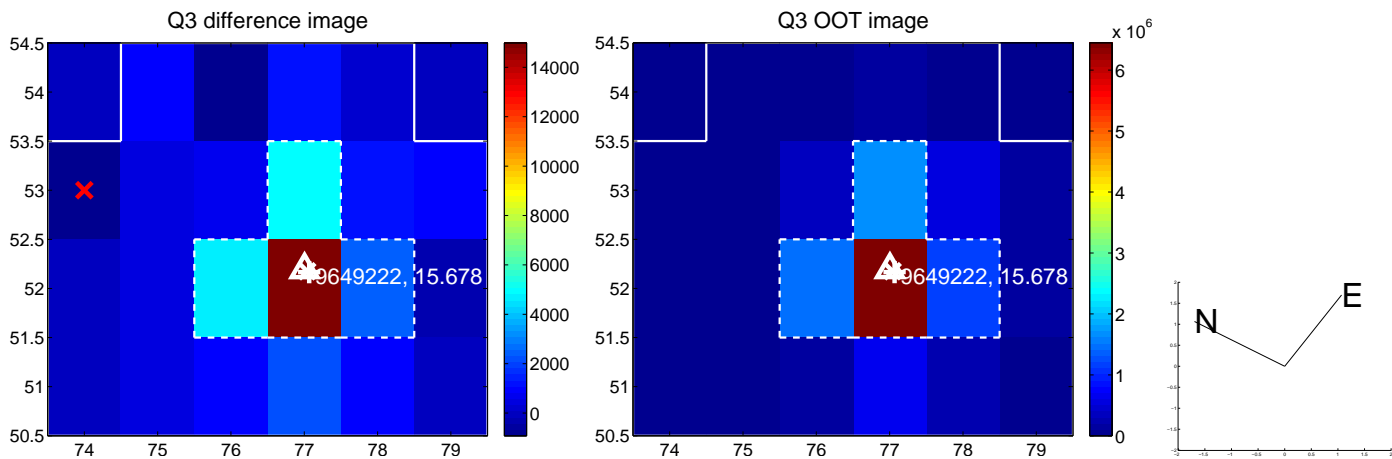
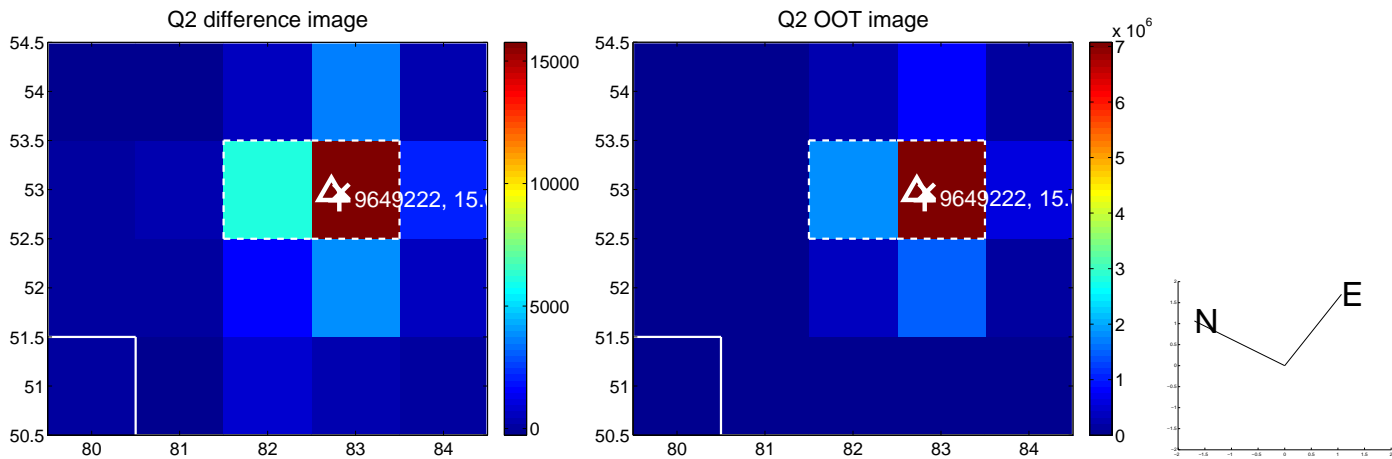
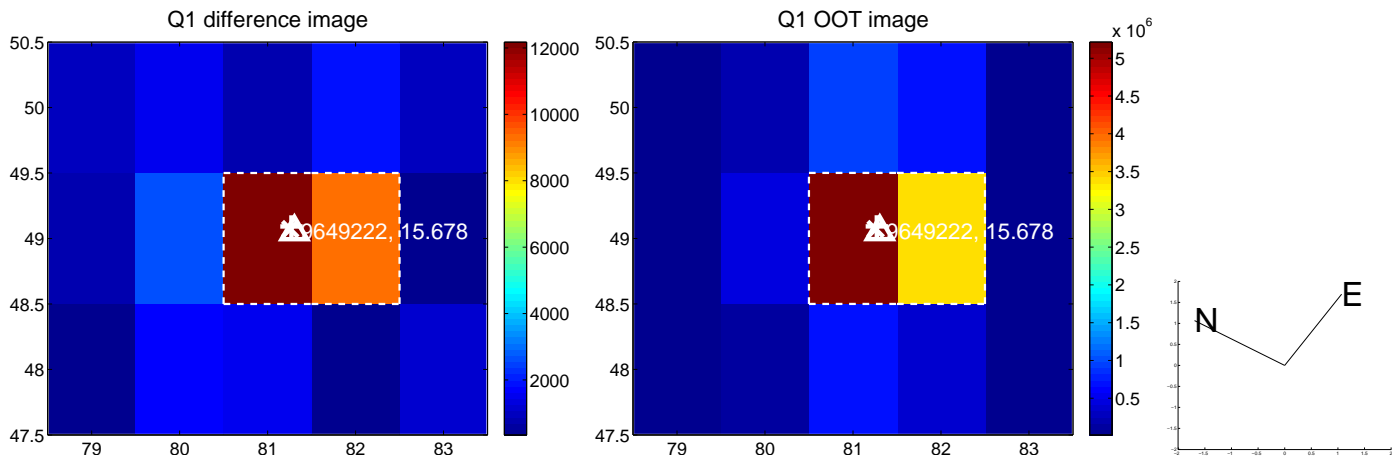
The direct PRF centroid is offset from the target star catalog position by about 0.11 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|---|--------------------|---------------------|--------------------|-------------------|
| PRF-fit source offset from OOT | 0.154 ± 0.100 | 1.54 | -0.088 ± 0.077 | 0.127 ± 0.109 |
| PRF-fit source offset from KIC position | 0.168 ± 0.108 | 1.56 | -0.089 ± 0.082 | 0.143 ± 0.116 |
| photometric centroid source offset | 0.20 ± 0.09 | 2.31 | -0.20 ± 0.09 | 0.01 ± 0.10 |

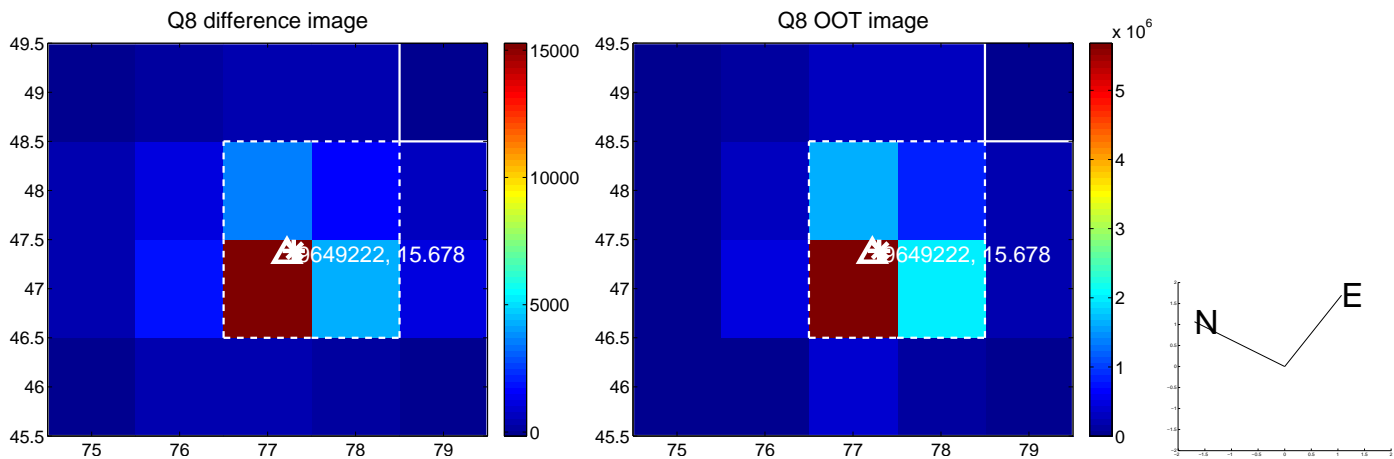
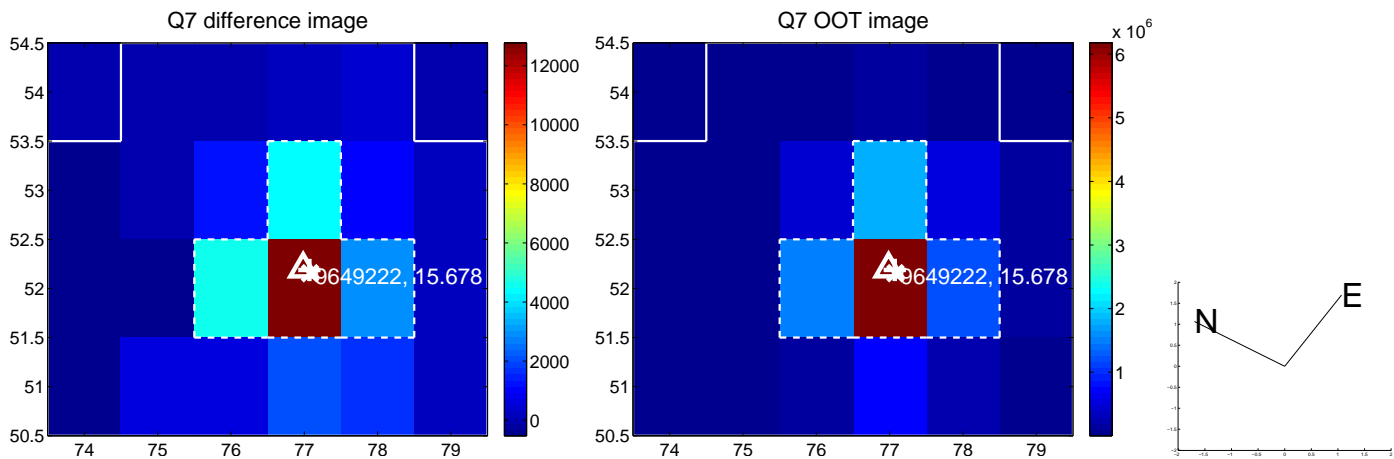
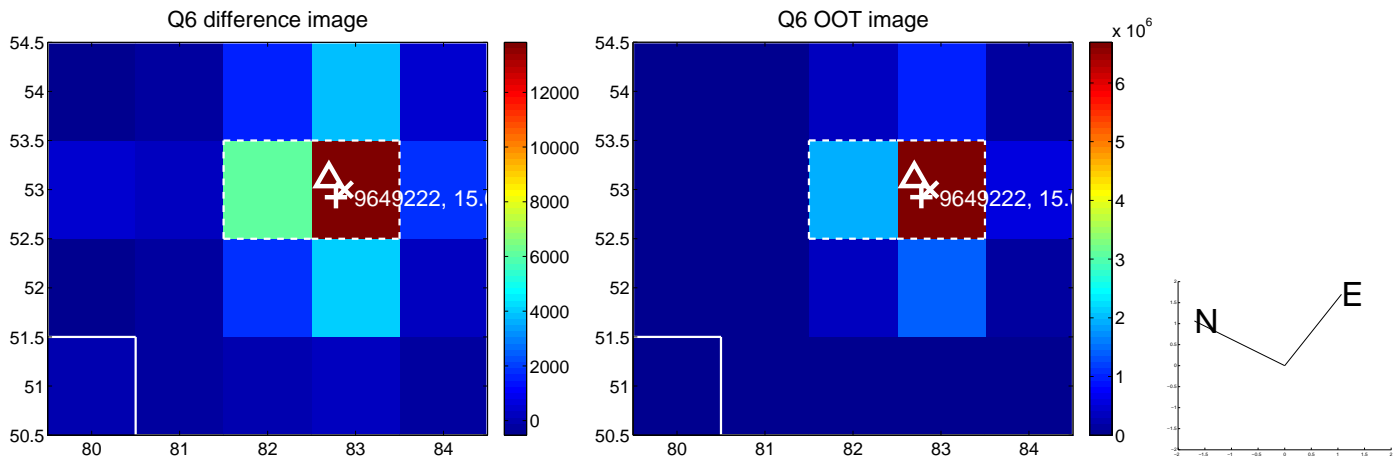
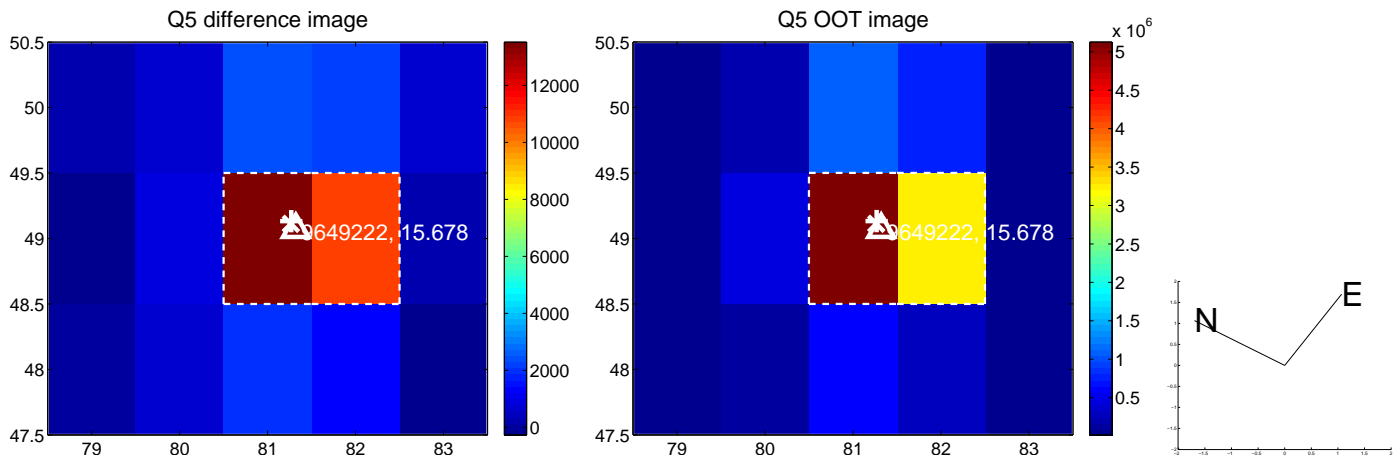


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

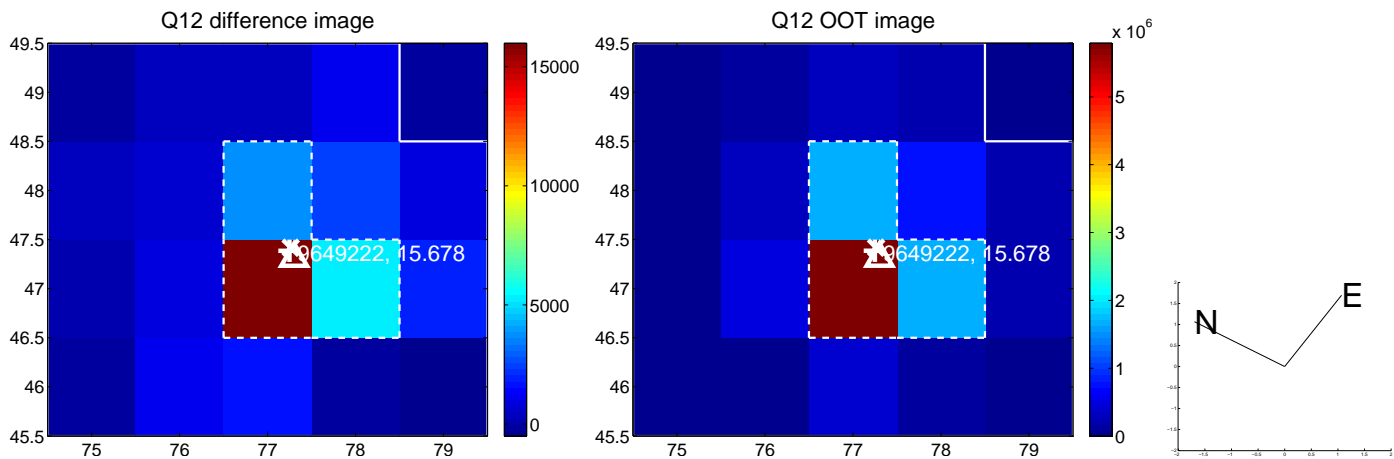
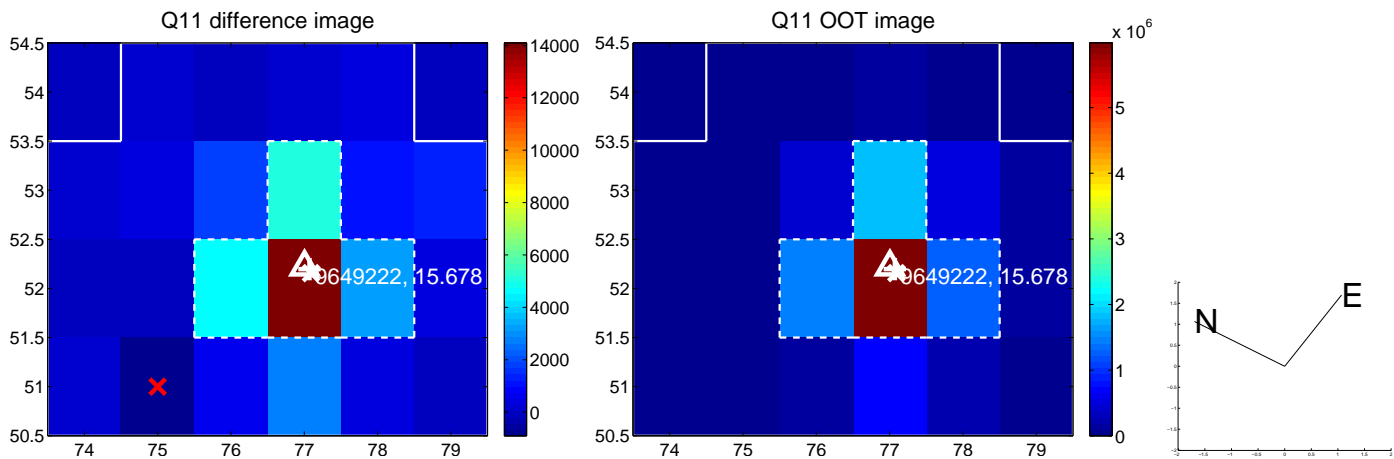
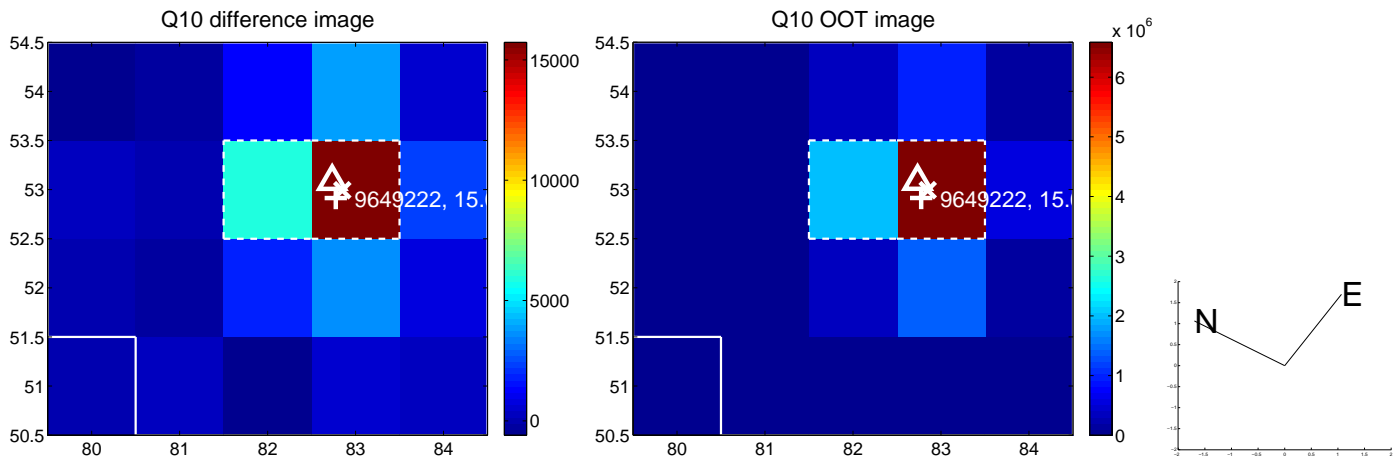
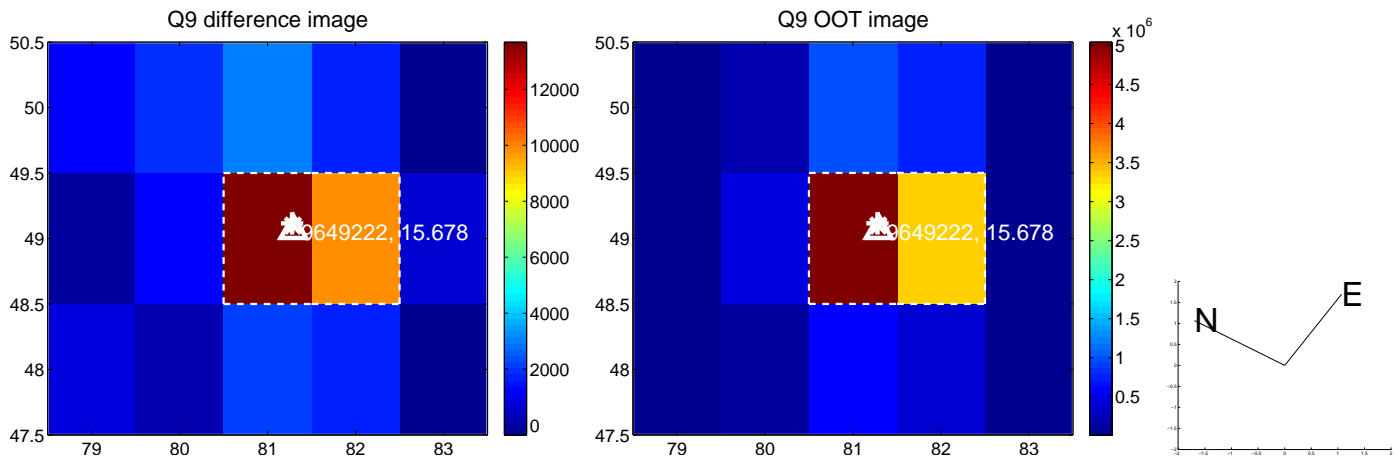
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



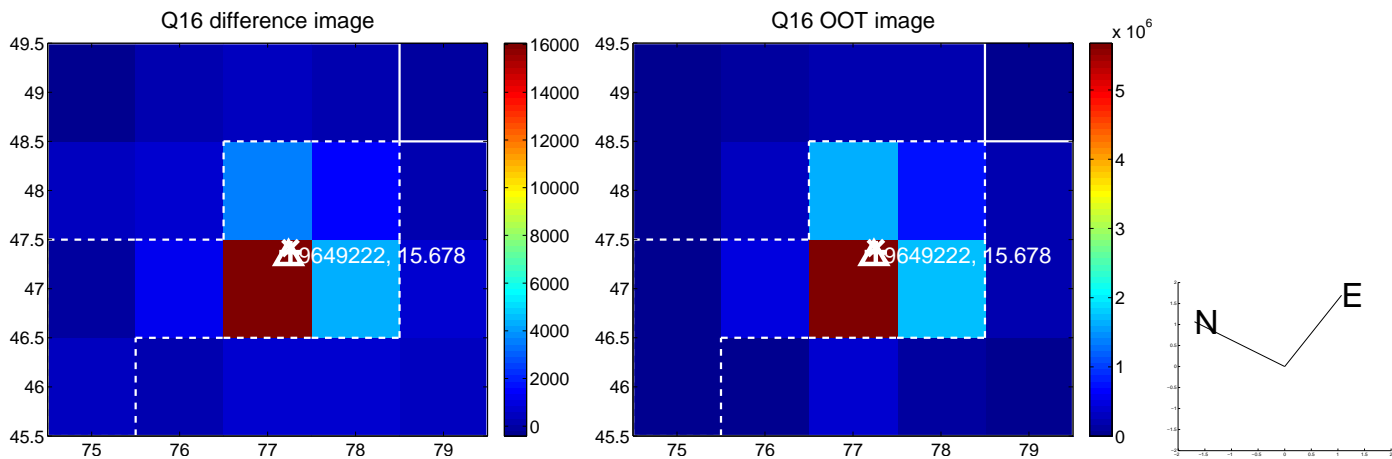
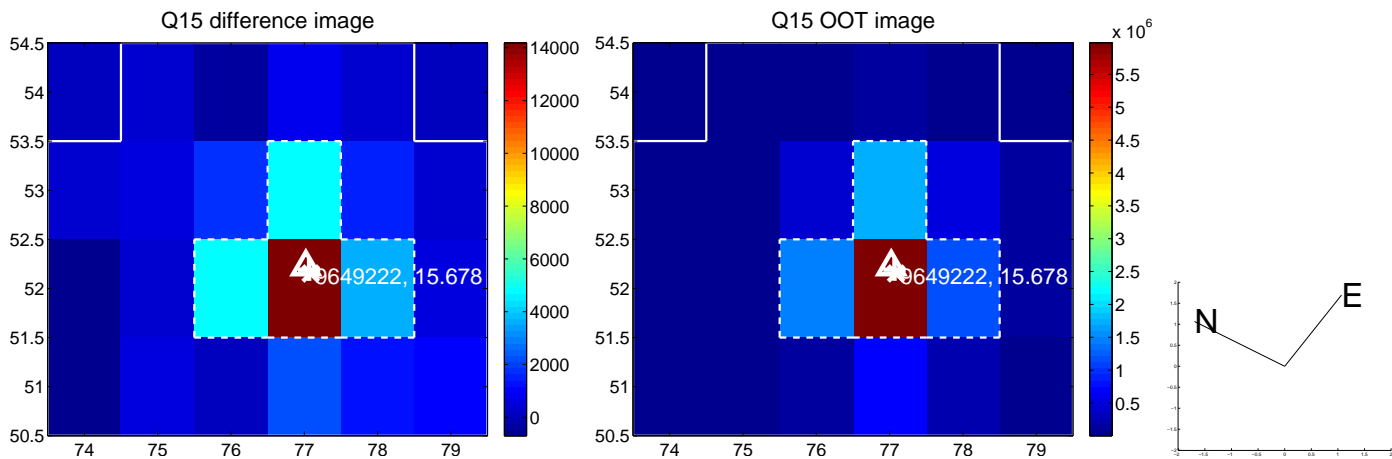
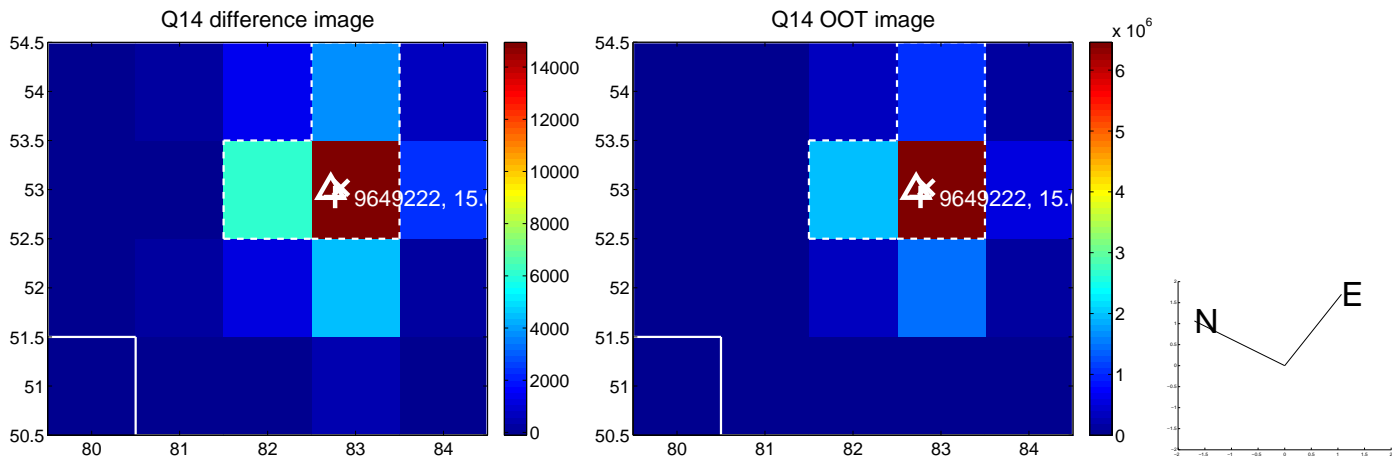
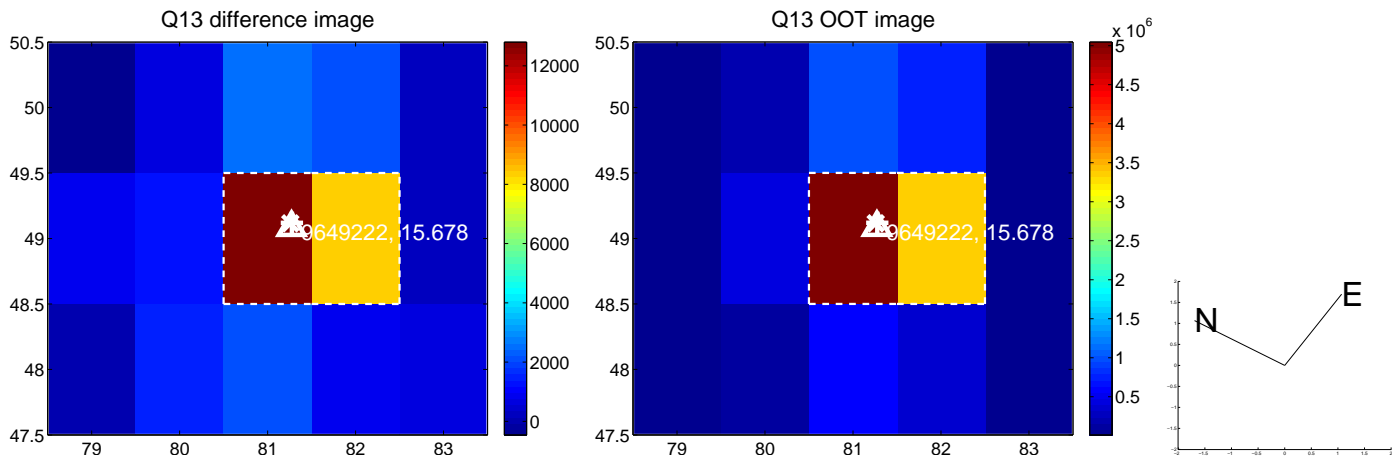
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



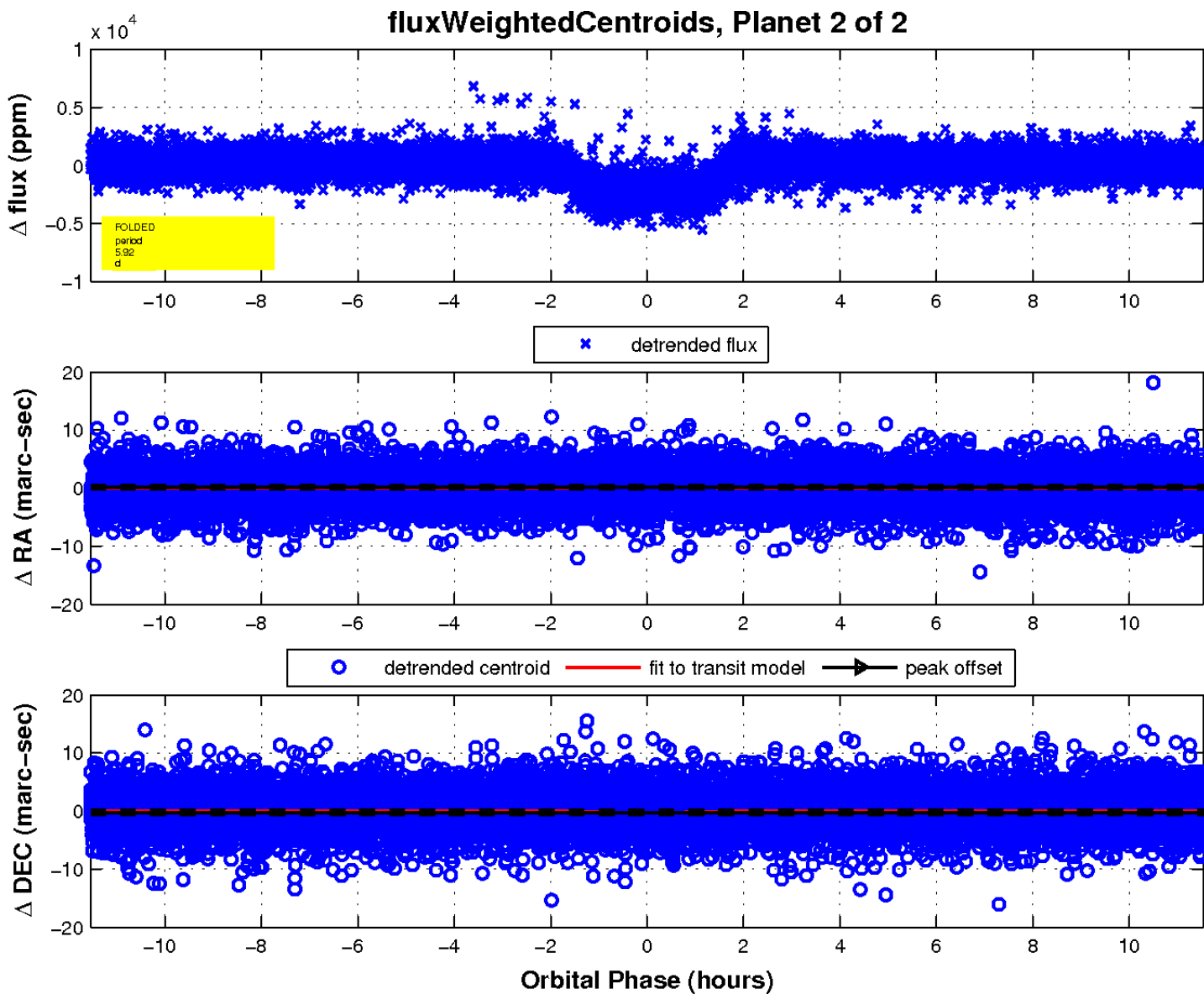
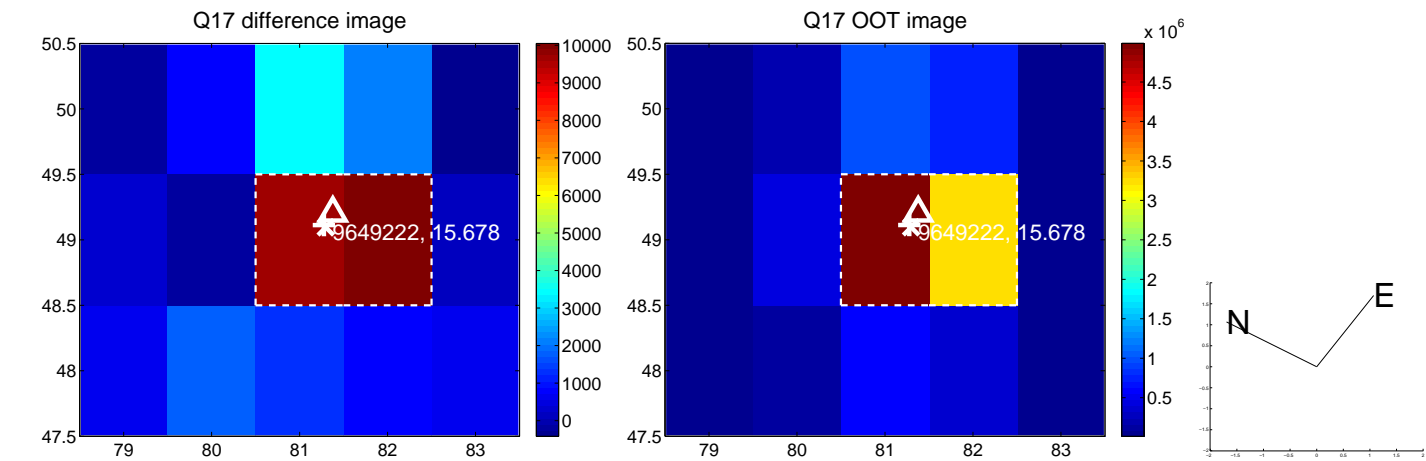
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

