

KIC 009909735

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}) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|-------|-------|-----------------------------|-----------------|------------------------|------------------------|
| 009909735-01 | OBS | 1779.01 | 4.662721 | 134.081838 | 1601.2 | 2.956 | 213.7 | 210.1 | 0.94 | 5729 | 4.23 | 275.93 |
| 009909735-02 | OBS | 1779.02 | 11.814992 | 133.091786 | 988.8 | 2.624 | 80.4 | 78.3 | 0.94 | 5729 | 3.21 | 79.88 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|------------|
| 009909735-01 | OBS | PC | 1.00 | 0 | 0 | 0 | 0 | NO_COMMENT |
| 009909735-02 | OBS | PC | 1.00 | 0 | 0 | 0 | 0 | NO_COMMENT |

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

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

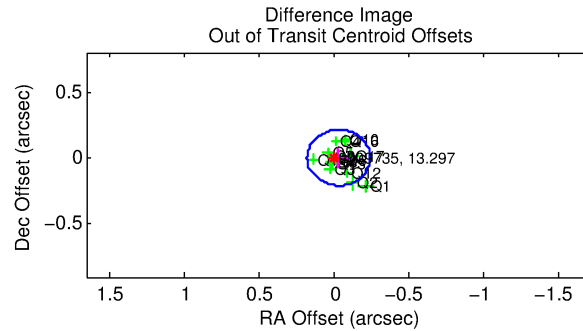
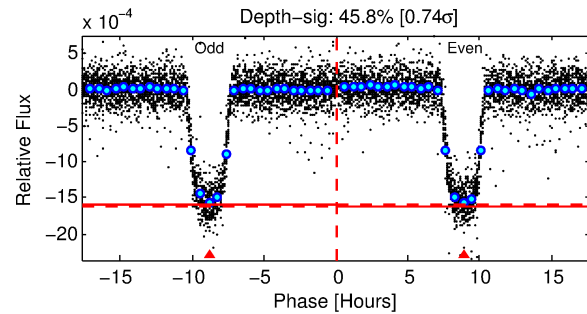
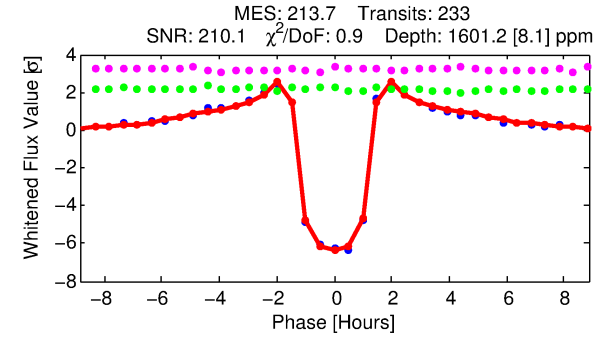
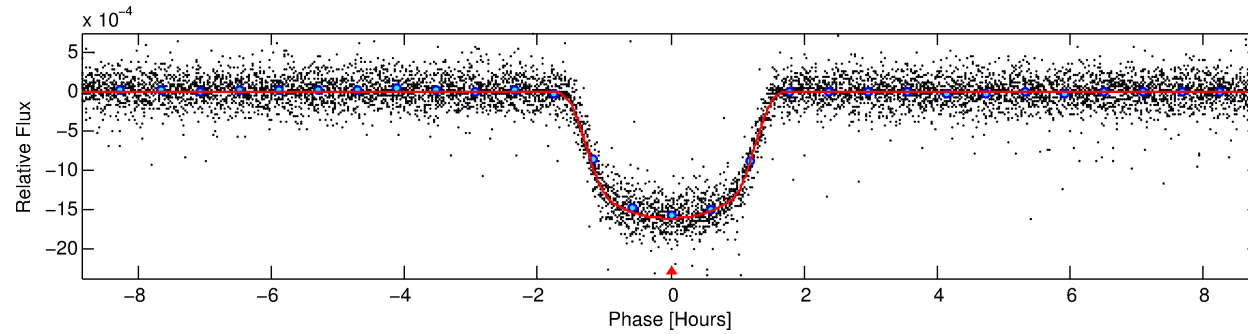
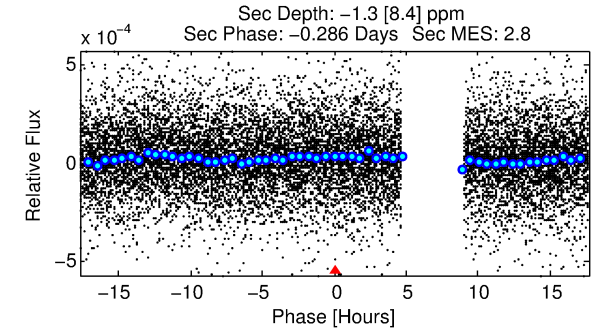
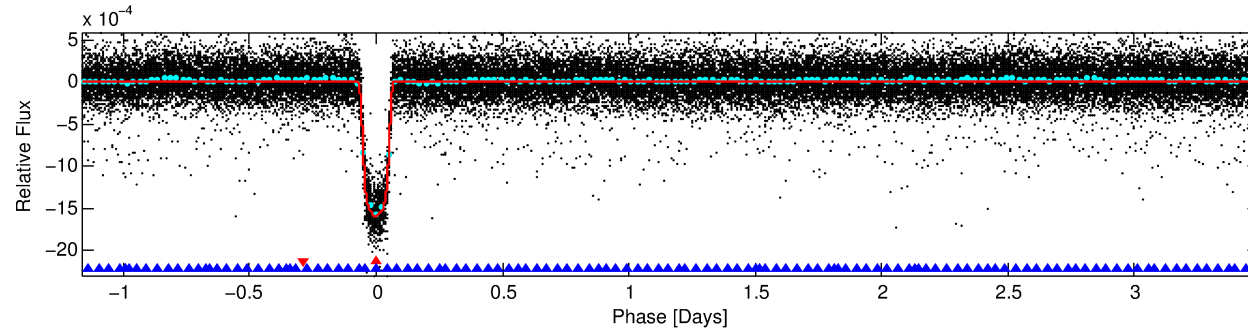
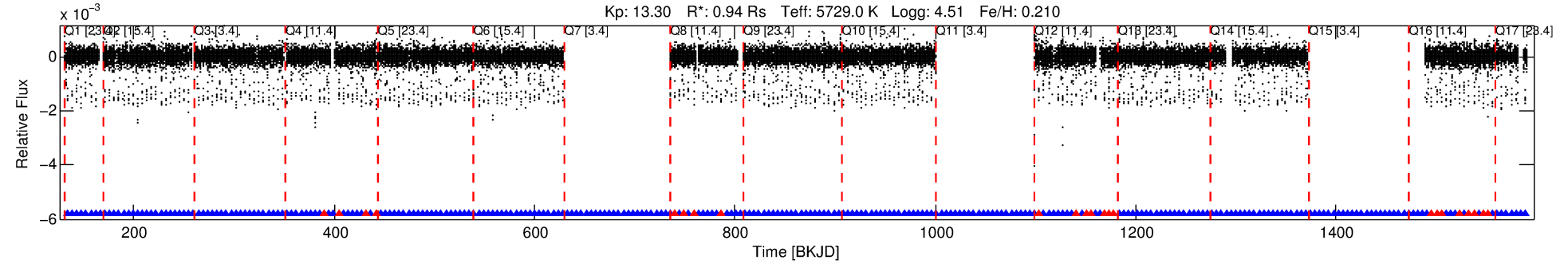
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 009909735-01

No Significant Match Found

DV One-Page Summary

KIC: 9909735 Candidate: 1 of 2 Period: 4.663 d
KOI: K01779.01 Name: Kepler-318b Corr: 0.962



DV Fit Results:

Period = $4.66272 [0.00000]$ d
Epoch = $134.0818 [0.0002]$ BKJD
Rp/R* = $0.0413 [0.0006]$
a/R* = $7.79 [0.44]$
b = $0.82 [0.02]$
Seff = $275.93 [66.46]$
Teq = $1039 [63]$ K
Rp = $4.23 [0.70]$ Re
a = $0.0555 [0.0082]$ AU
Ag = N/A
Teffp = N/A

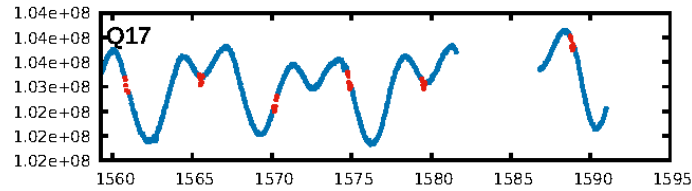
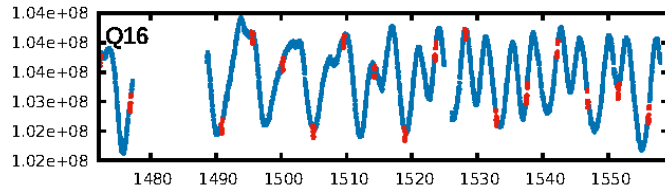
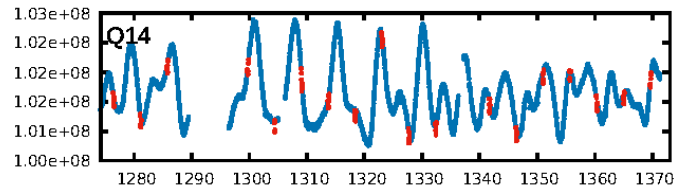
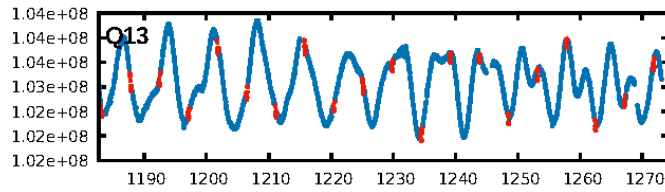
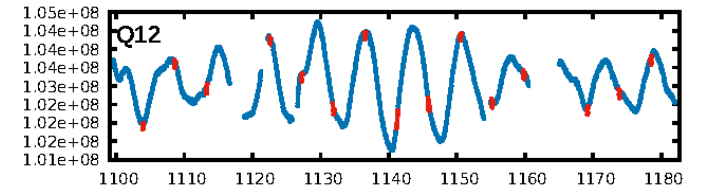
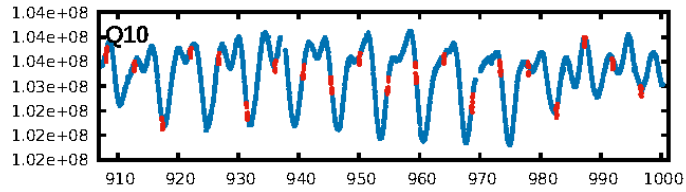
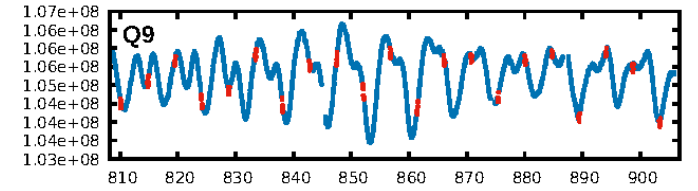
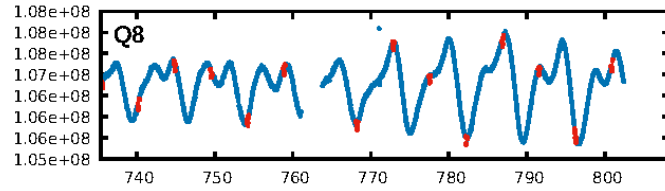
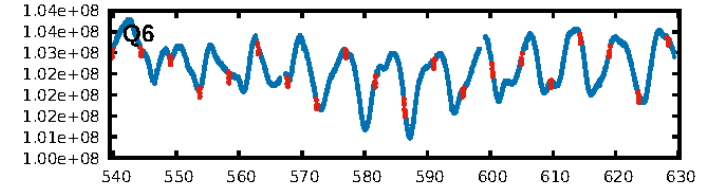
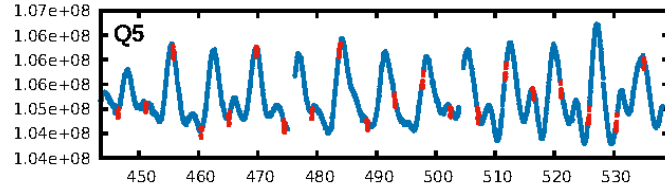
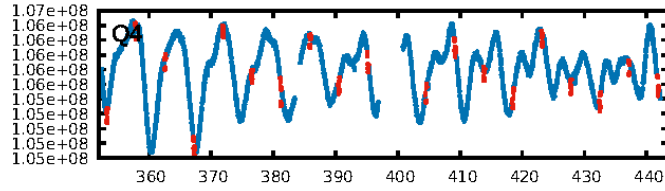
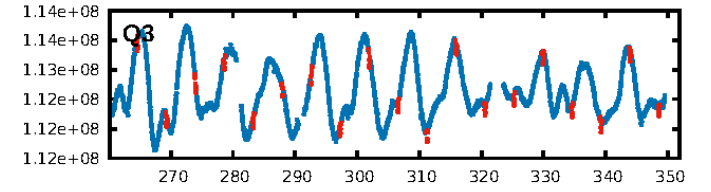
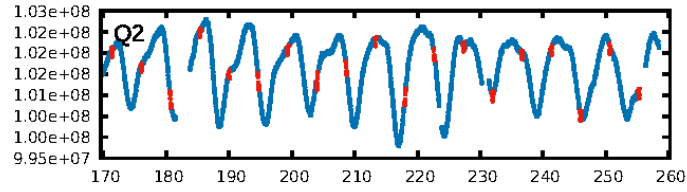
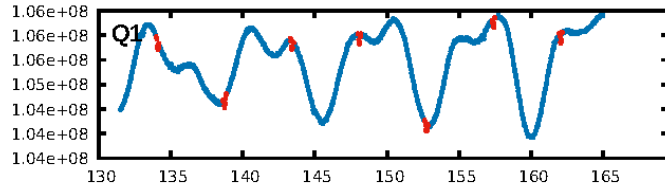
DV Diagnostic Results:

ShortPeriod-sig: N/A
LongPeriod-sig: $100.0\% [43.43\sigma]$
ModelChiSquare2-sig: N/A
ModelChiSquareGof-sig: N/A
Bootstrap-pfa: $0.00e+00$
RollingBand-fgt: $0.90 [197/220]$
GhostDiagnostic-chr: 2.224
Centroid-sig: N/A
Centroid-so: $0.202 \text{ arcsec} [4.57\sigma]$
OotOffset-rm: $0.036 \text{ arcsec} [0.51\sigma]$
KicOffset-rm: $0.078 \text{ arcsec} [1.05\sigma]$
OotOffset-st: $4/1/4/5 [14]$
KicOffset-st: $4/1/4/5 [14]$
DiffImageQuality-fgm: $1.00 [14/14]$
DiffImageOverlap-fno: $1.00 [14/14]$

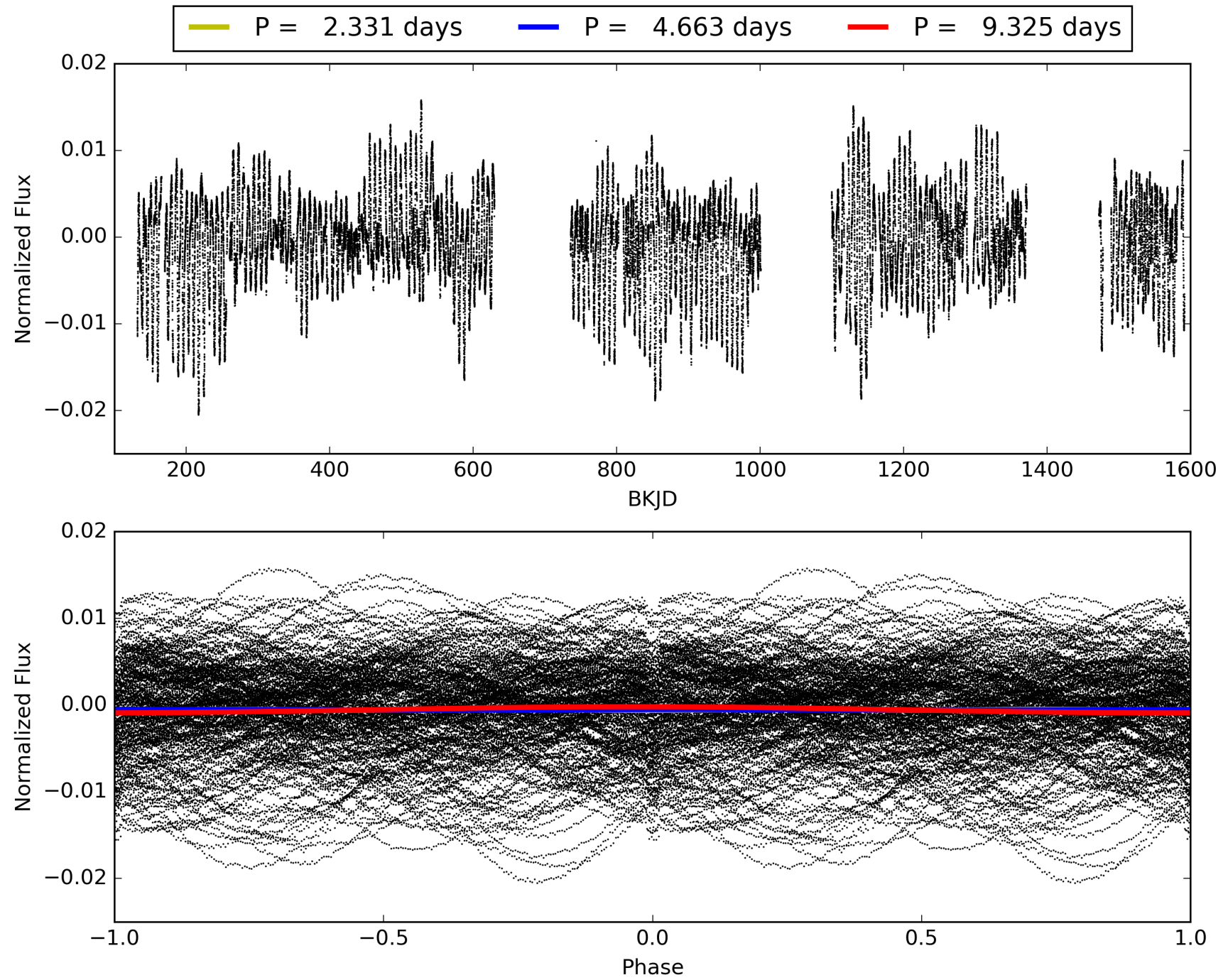
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 19:27:09 Z

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

TCE 009909735-01, PDC Light Curves

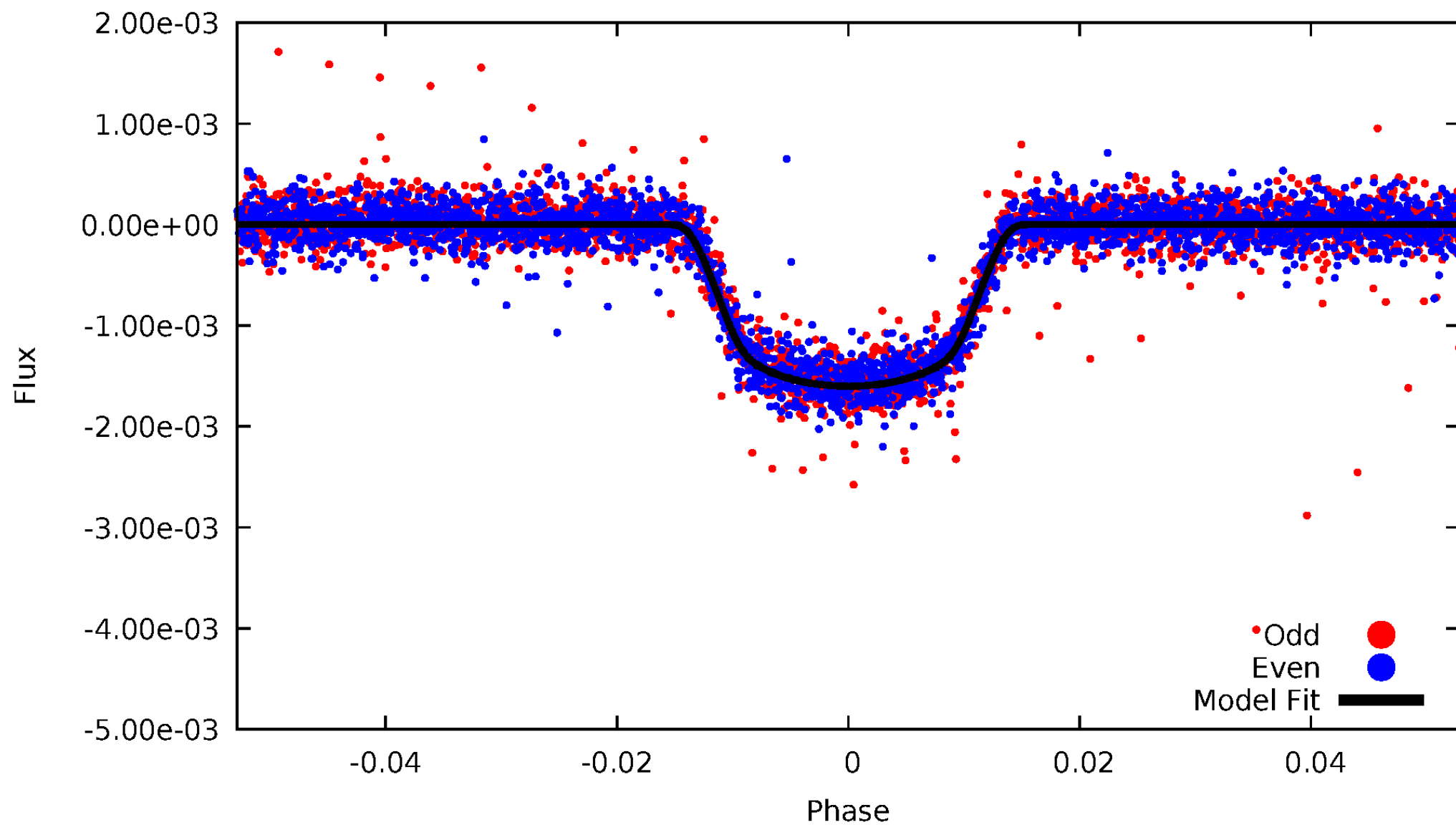


TCE 009909735-01



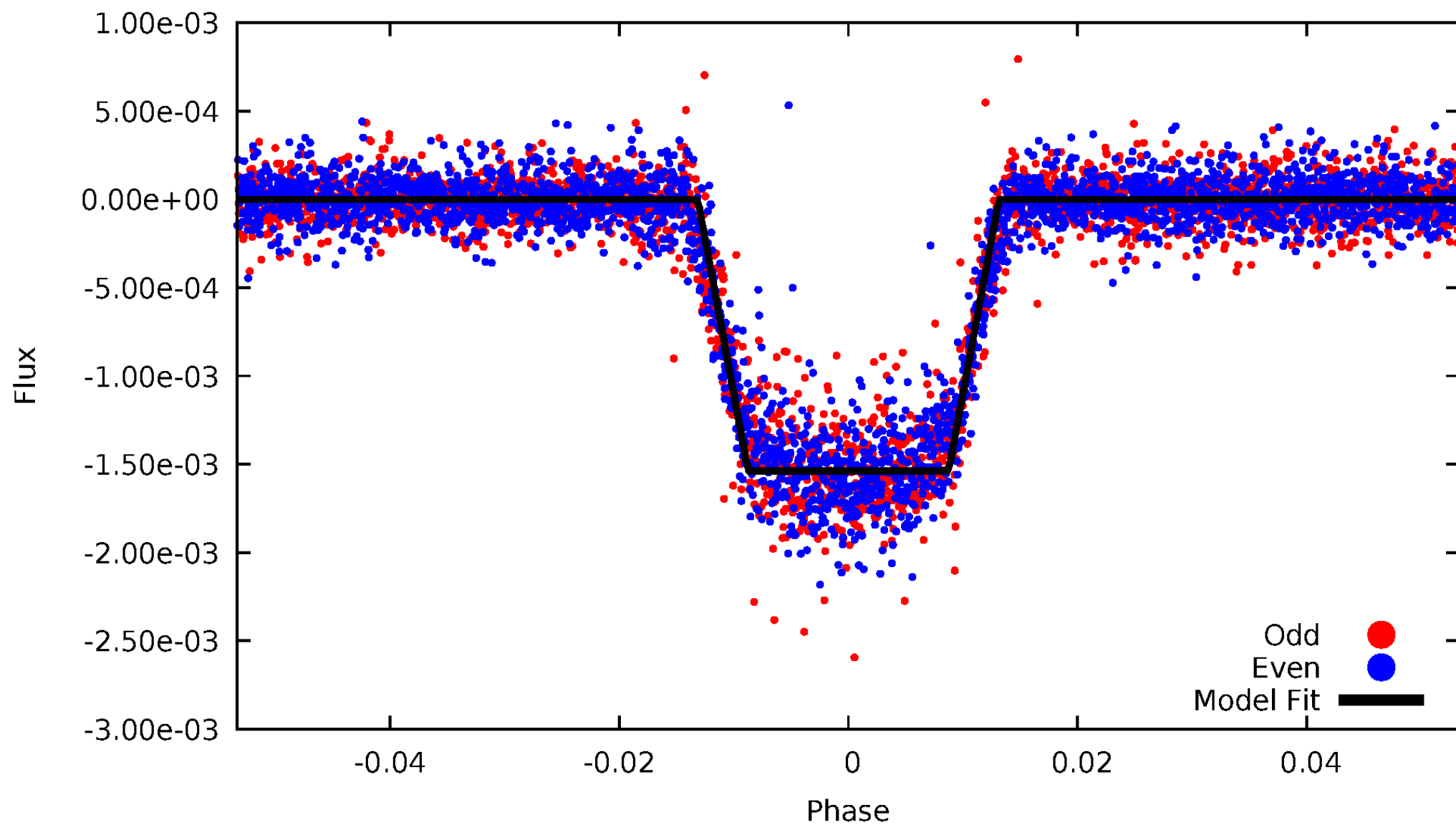
DV Odd/Even

TCE 009909735-01



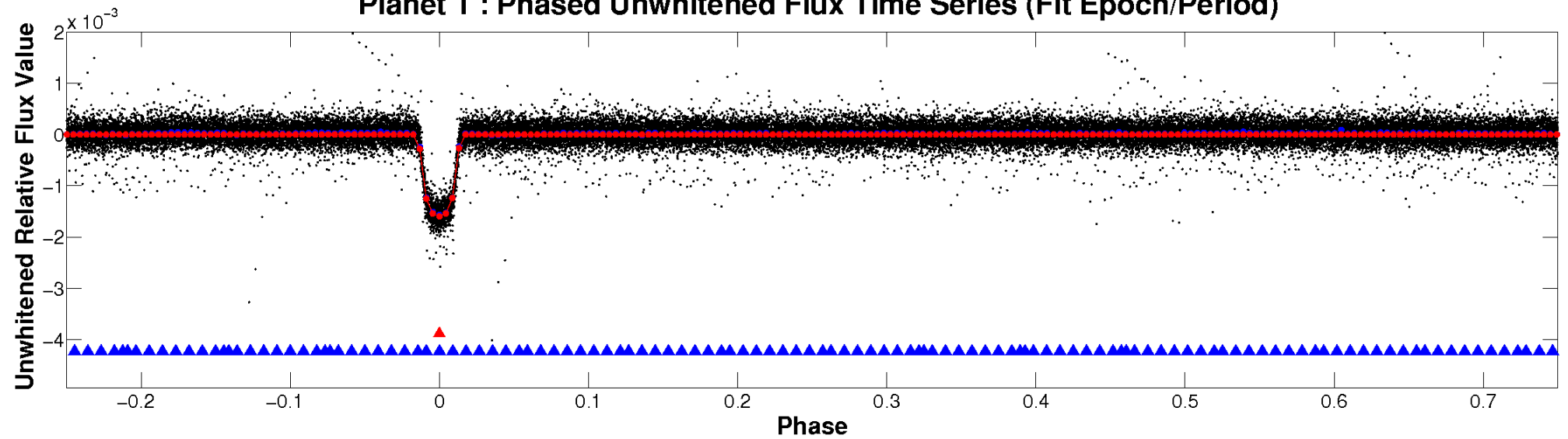
ALT Odd/Even

TCE 009909735-01

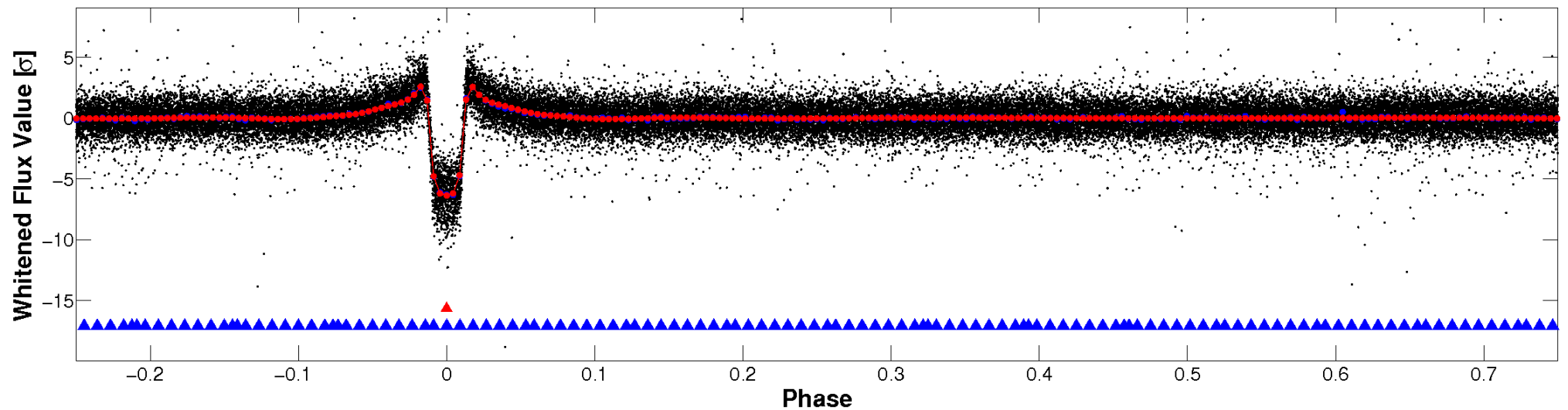


Non-Whitened Vs. Whitened Light Curve

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

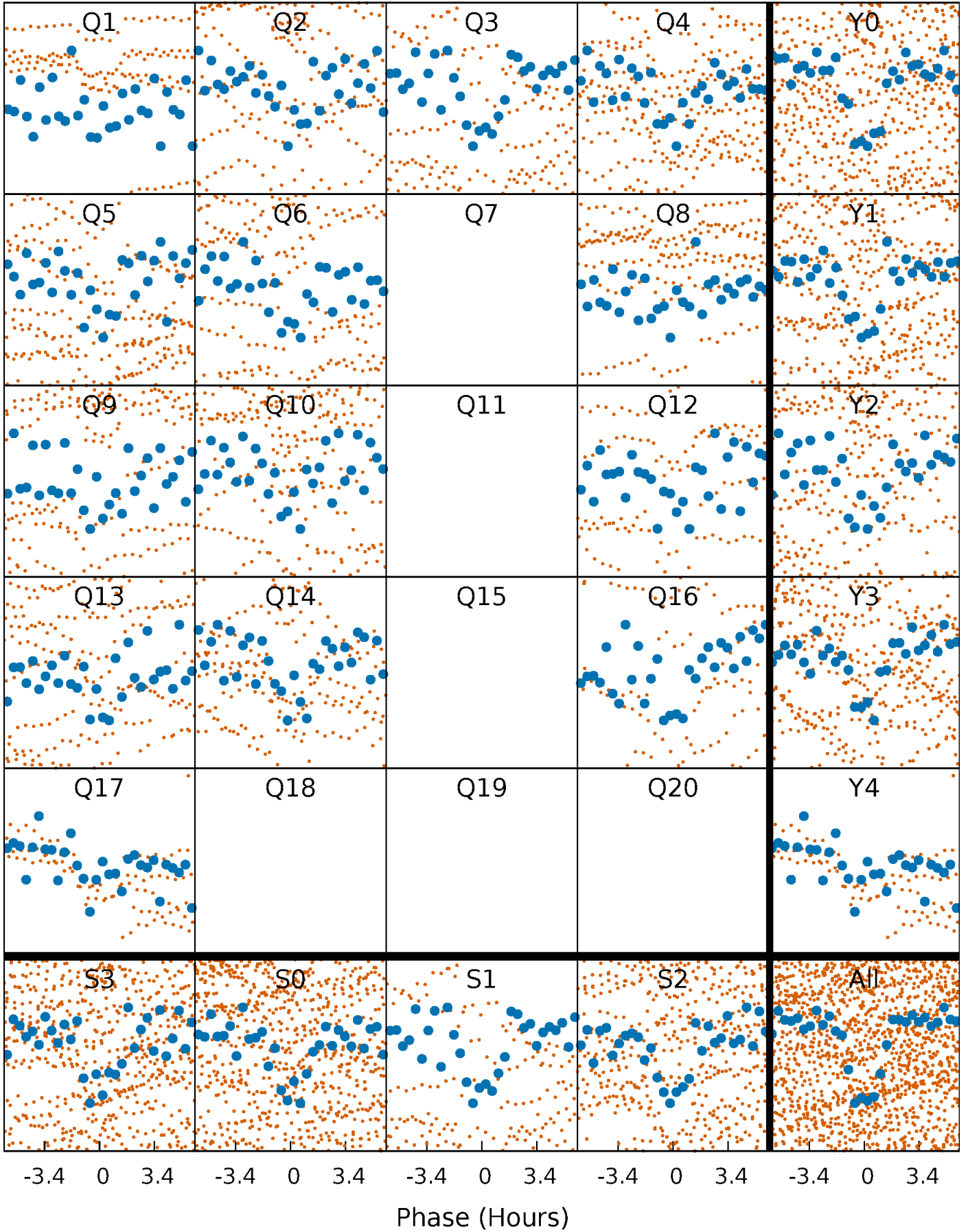


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



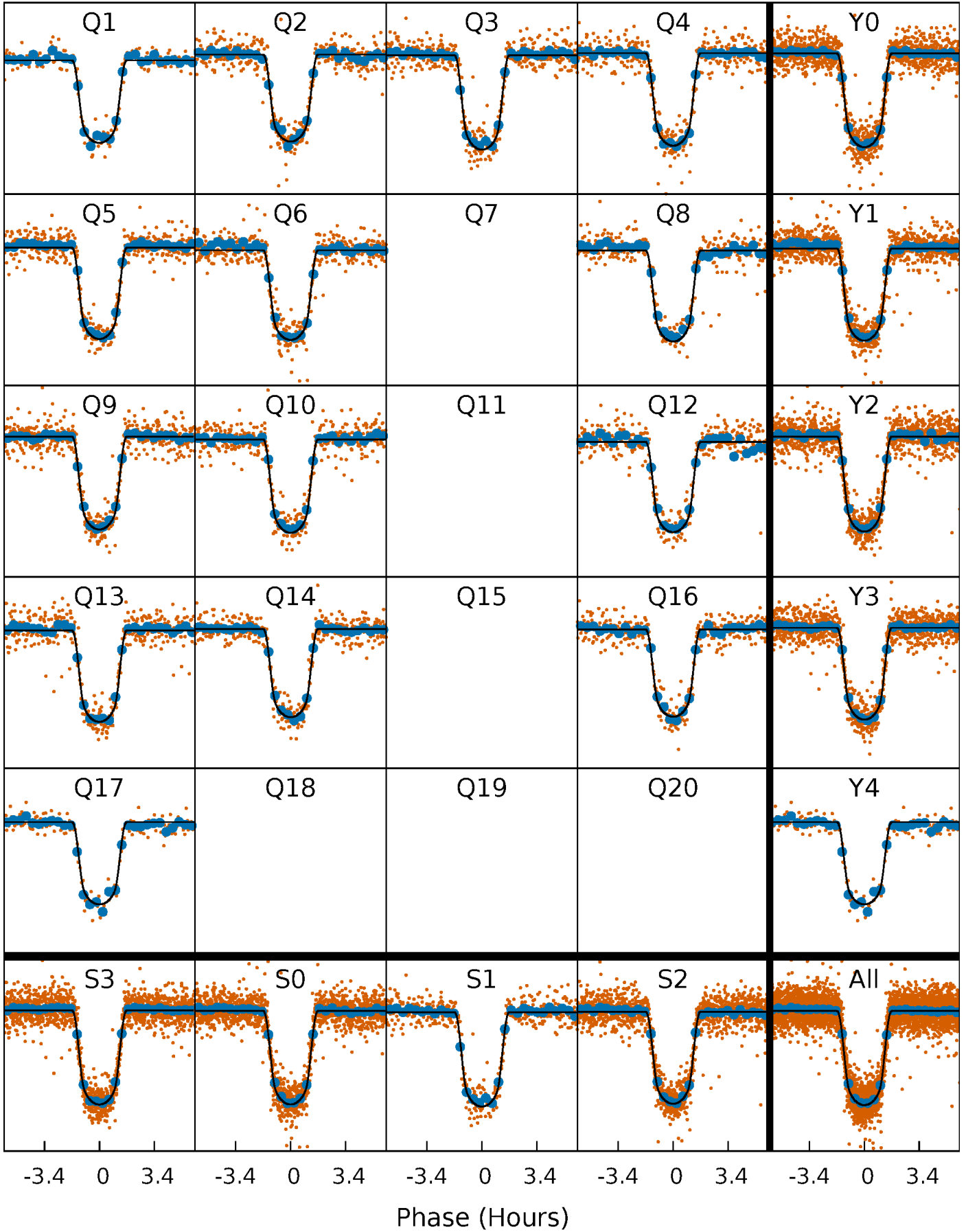
PDC Quarter-Phased Transit Curves

TCE 009909735-01 P= 4.662721 Days $T_0=134.081838$ (BKJD)



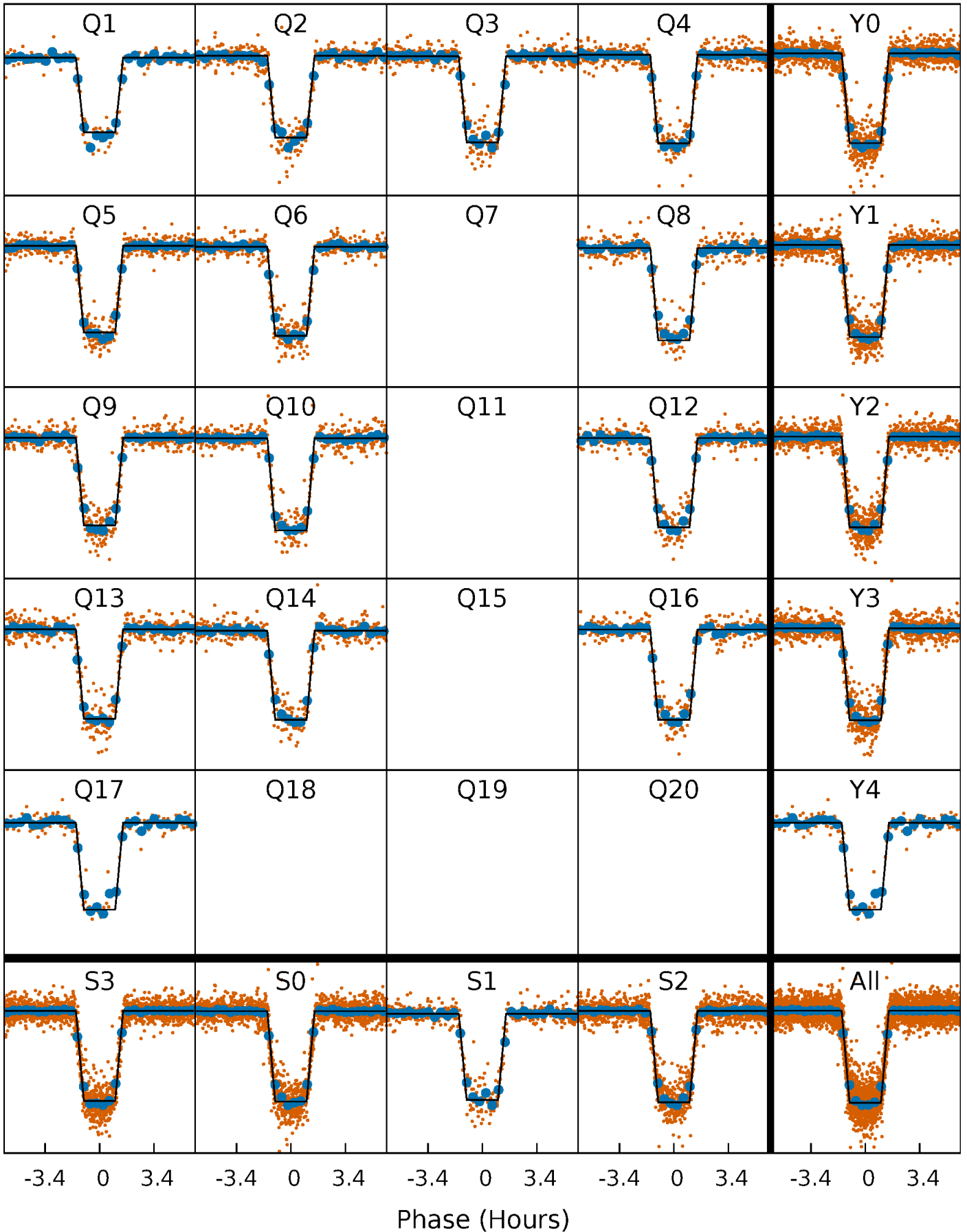
DV Quarter-Phased Transit Curves

TCE 009909735-01 P= 4.662721 Days $T_0=134.081838$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

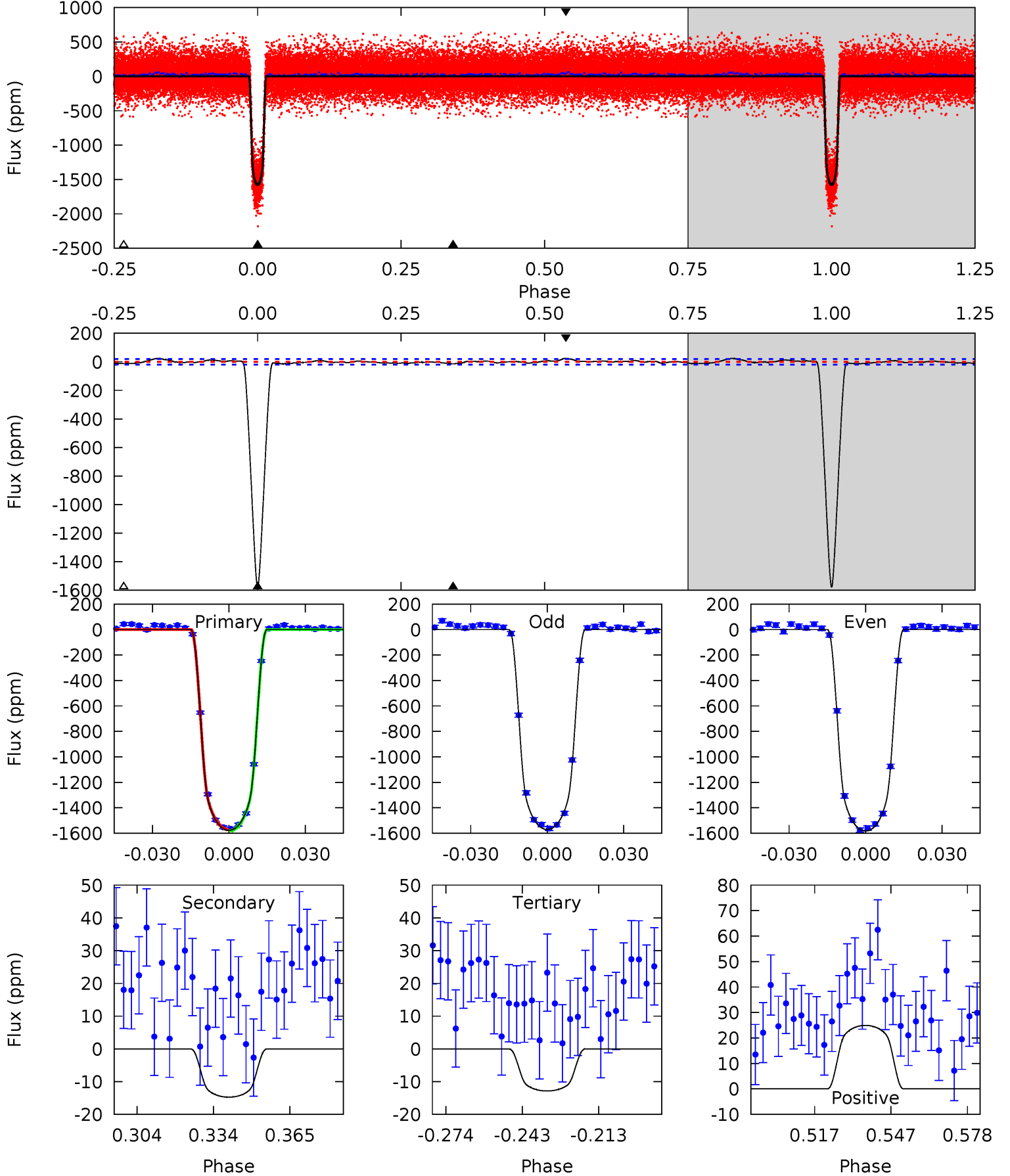
TCE 009909735-01 P= 4.662726 Days $T_0=134.081252$ (BKJD)



DV Model-Shift Uniqueness Test

009909735-01, P = 4.662721 Days, E = 129.419117 Days

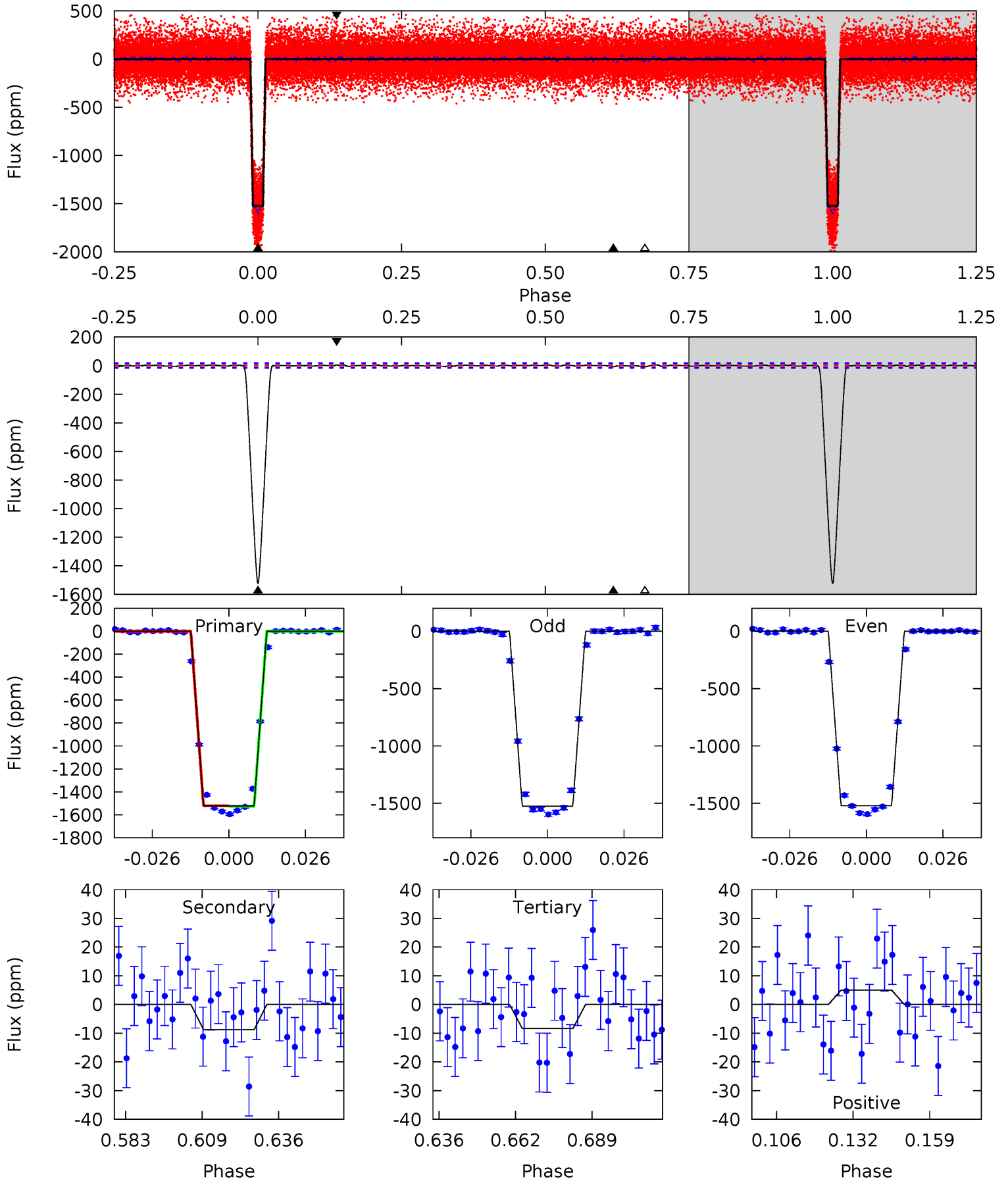
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|-------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 380.5 | 3.56 | 3.10 | 6.02 | 4.81 | 2.16 | 1.87 | 377.4 | 374.5 | 0.46 | -2.46 | 1.43 | 1.01 | 0.02 | 1.00 |



Alt Model-Shift Uniqueness Test

009909735-01, P = 4.662726 Days, E = 129.418526 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|-------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 461.5 | 2.66 | 2.54 | 1.51 | 4.84 | 2.22 | 0.68 | 458.9 | 460.0 | 0.13 | 1.15 | 0.65 | 1.00 | 0.00 | 0.82 |



Stellar Parameters For KIC 009909735

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | R (R_{\odot}) | M (M_{\odot}) | p_{\star} ($\text{g}\cdot\text{cm}^{-3}$) |
|--------|----------------------|---------------------------|---------------------------|---------------------------|---------------------------|---|
| | 5729^{+103}_{-126} | $4.514^{+0.022}_{-0.127}$ | $0.210^{+0.150}_{-0.150}$ | $0.939^{+0.156}_{-0.039}$ | $1.051^{+0.051}_{-0.076}$ | $1.787^{+0.156}_{-0.675}$ |
| | +2%/-2% | +0%/-3% | +71%/-71% | +17%/-4% | +5%/-7% | +9%/-38% |
| Source | SPE59 | SPE59 | SPE59 | DSEP | | |

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

Secondary Eclipse Parameters for KIC 009909735-01 / KOI 1779.01

| Detrend | Depth (ppm) | R_p (R_{\oplus}) | T_{max} (K) | T_{obs} (K) | A_{obs} |
|---------|-------------|------------------------|----------------------|----------------------|---------------------------|
| DV | -15 ± 4 | $4.29^{+0.41}_{-0.18}$ | 1470^{+63}_{-42} | 2481^{+100}_{-130} | $1.266^{+0.422}_{-0.378}$ |
| Alt. | -9 ± 3 | $4.07^{+0.41}_{-0.16}$ | 1471^{+62}_{-43} | 2330^{+131}_{-221} | $0.876^{+0.340}_{-0.343}$ |

T_{max} = Theoretical Maximum Planetary Temperature

T_{obs} = Observed Planetary Temperature (Assuming $A=0.3$)

A_{obs} = Observed Albedo (Assuming $T=0$)

If a secondary eclipse is present, the system is likely an EB if $T_{\text{obs}} \gg T_{\text{max}}$ AND $A_{\text{obs}} \gg 1.0$

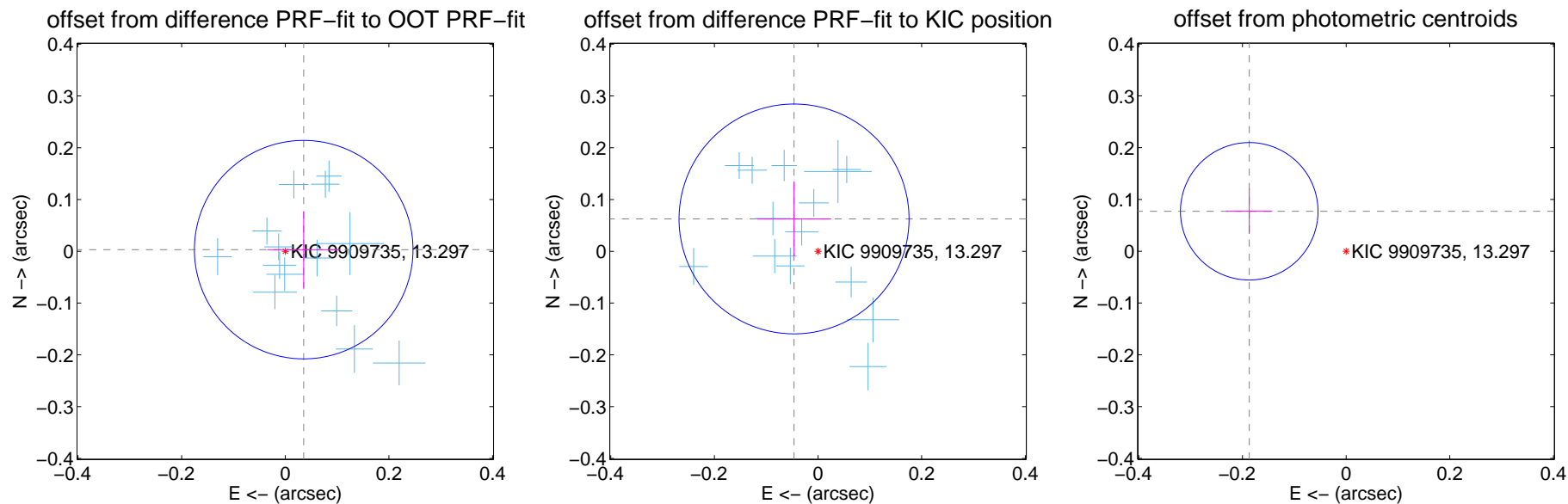
DV Centroid Data

Supplemental centroid analysis for 009909735-01. Kepler magnitude: 13.30. Transit SNR 210.07

There are 14 quarters with good PRF difference image offsets

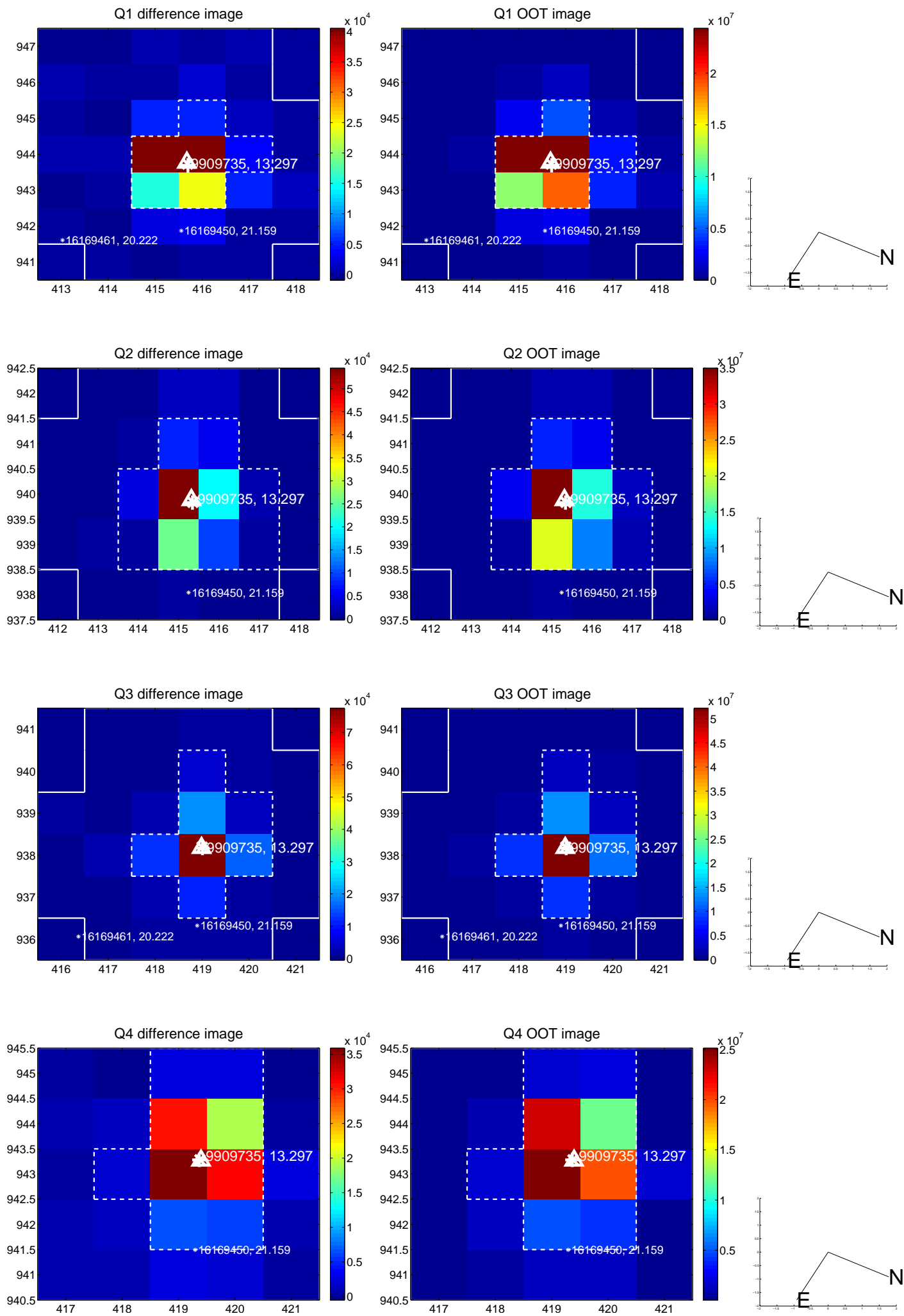
The direct PRF centroid is offset from the target star catalog position by about 0.16 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|---|--------------------|---------------------|--------------------|-------------------|
| PRF-fit source offset from OOT | 0.036 ± 0.070 | 0.51 | -0.036 ± 0.070 | 0.003 ± 0.074 |
| PRF-fit source offset from KIC position | 0.078 ± 0.074 | 1.05 | 0.046 ± 0.072 | 0.062 ± 0.072 |
| photometric centroid source offset | 0.20 ± 0.04 | 4.57 | 0.19 ± 0.04 | 0.08 ± 0.04 |

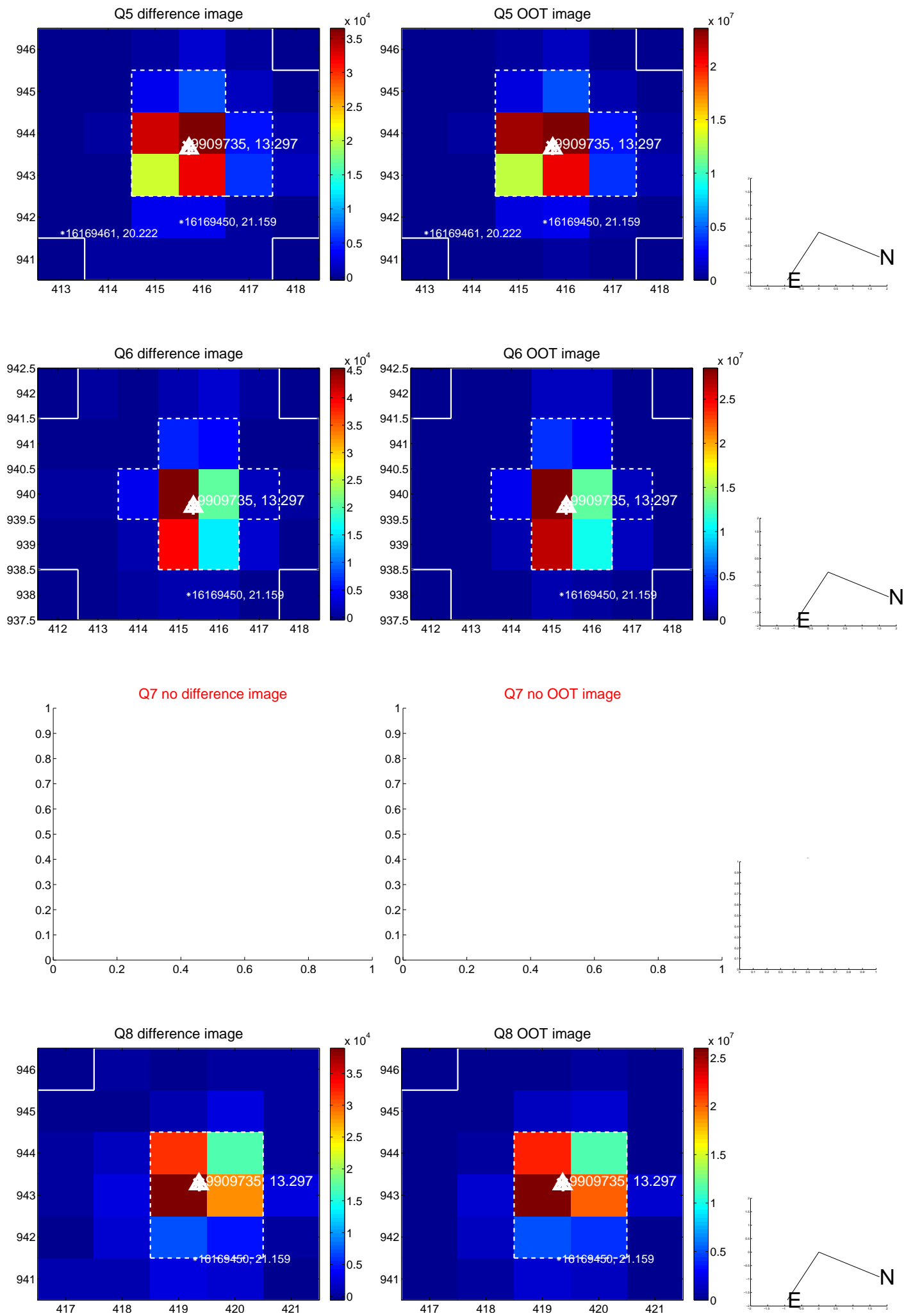


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

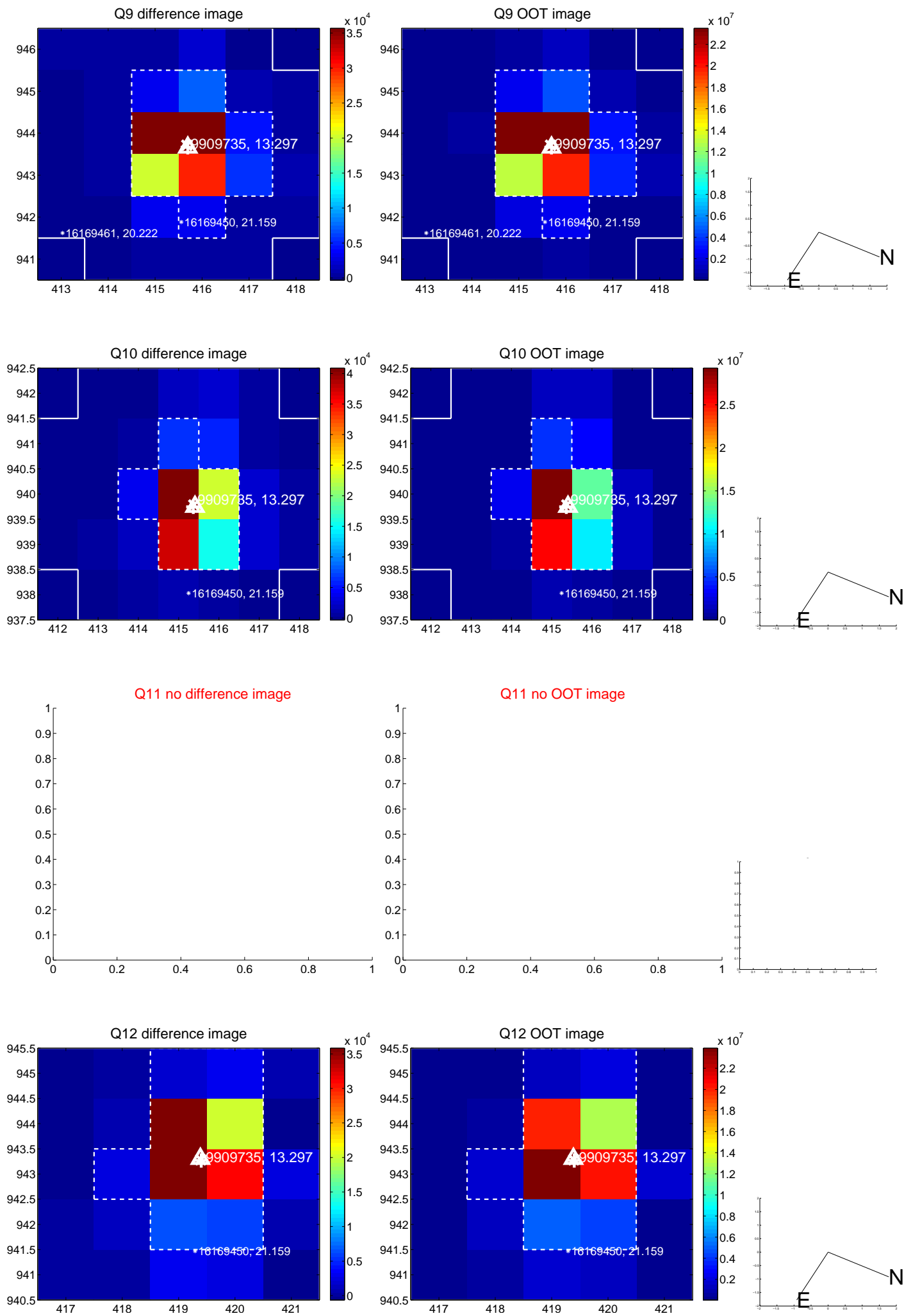
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



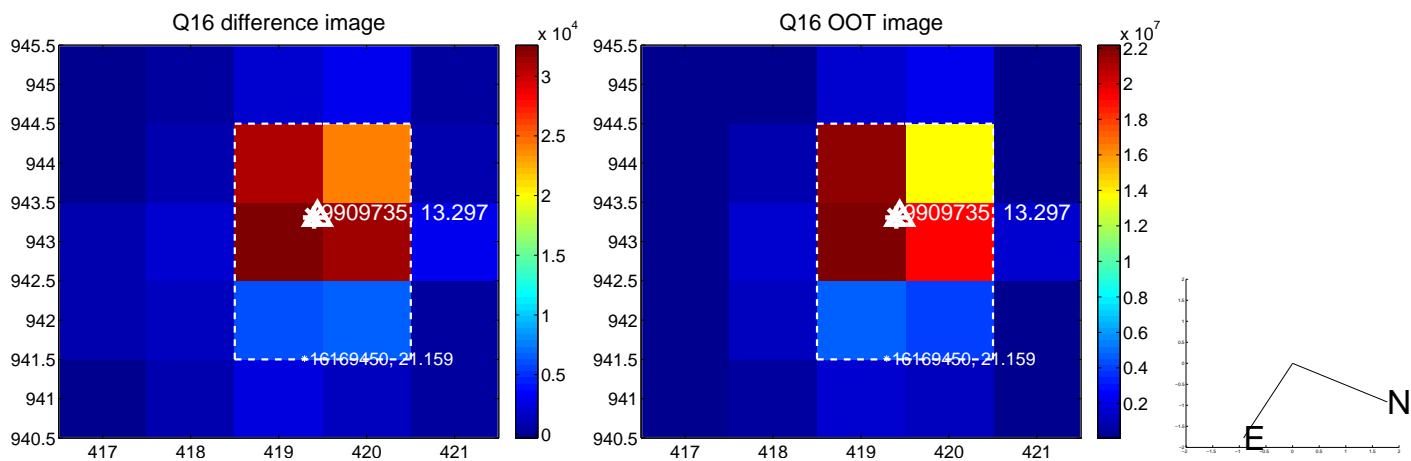
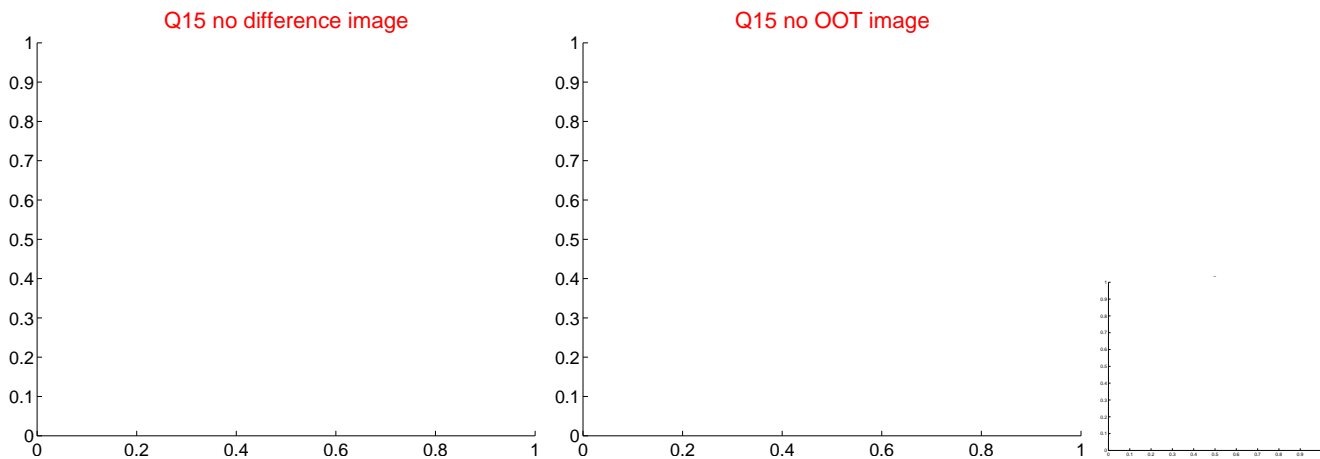
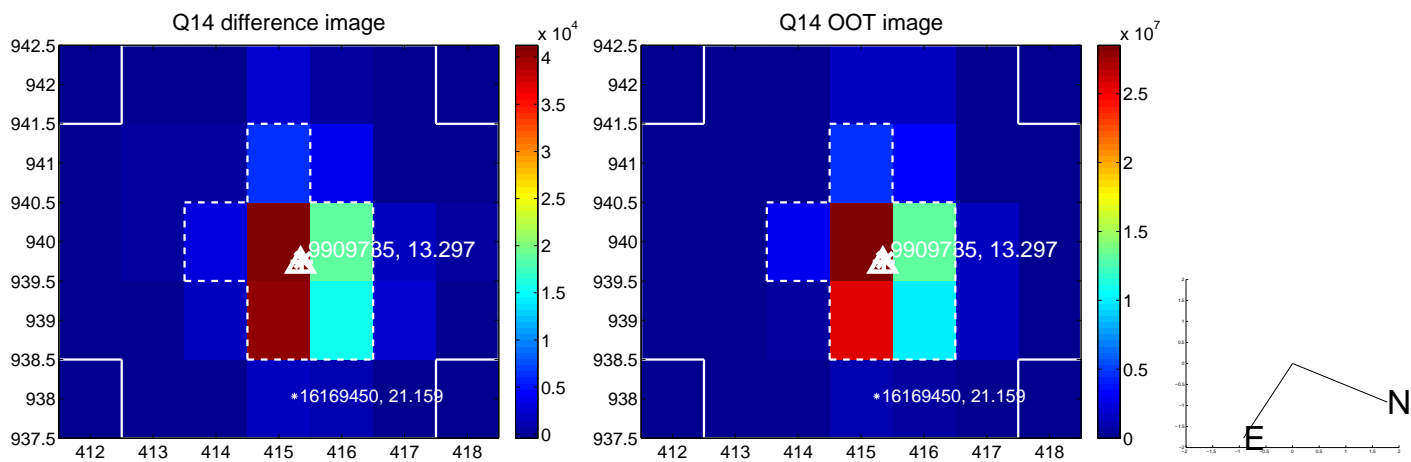
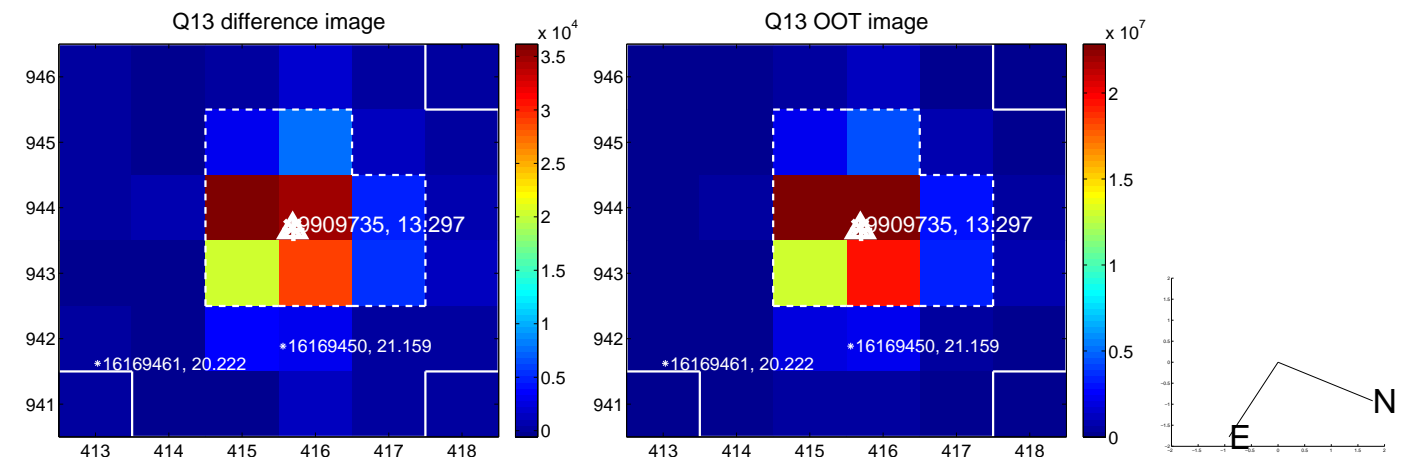
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



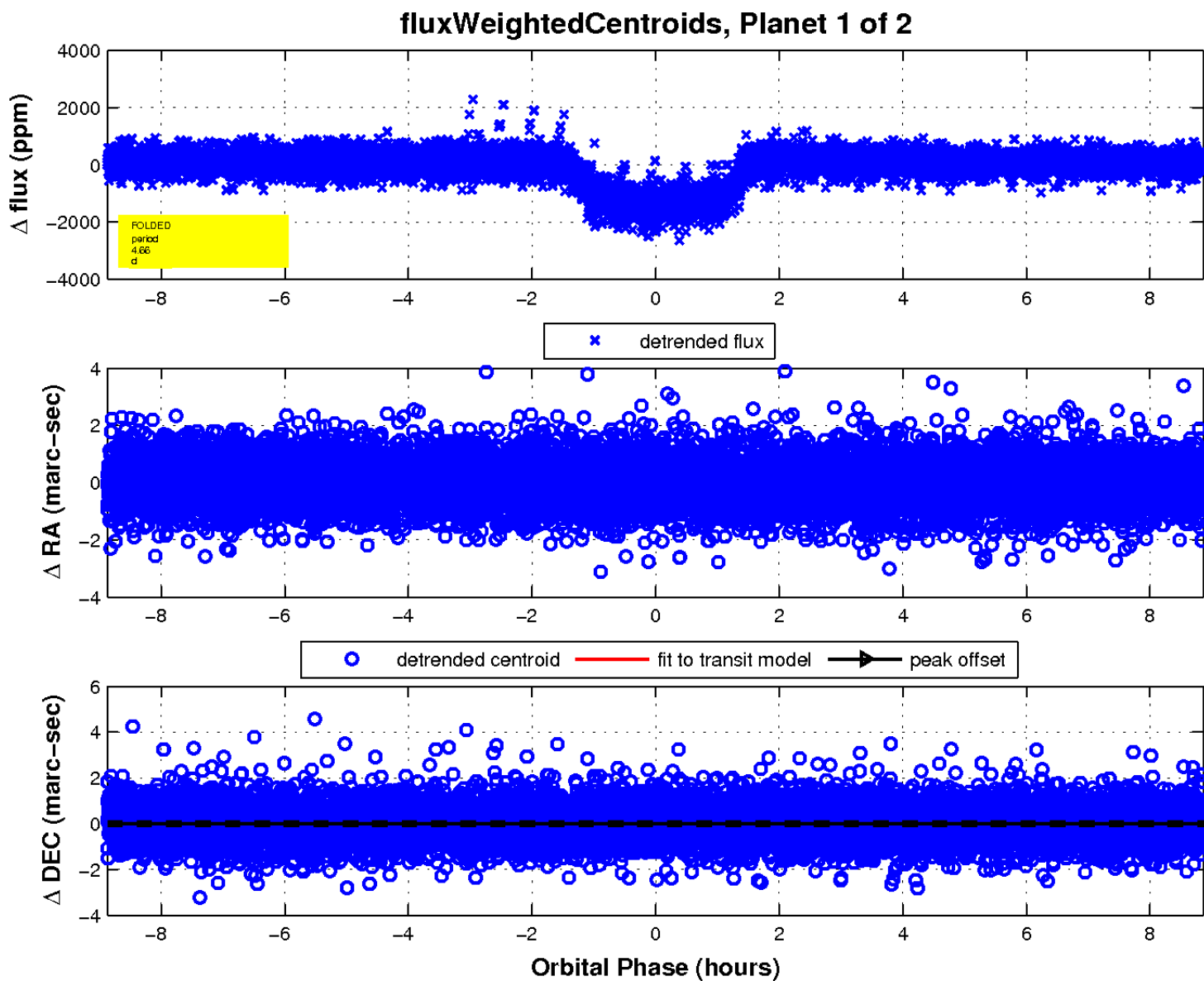
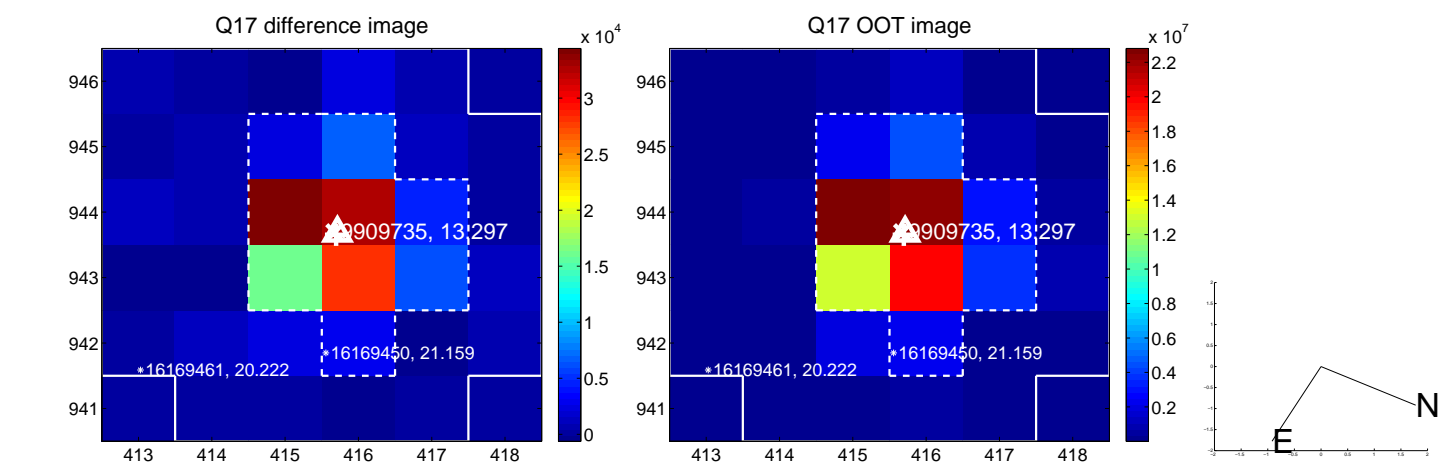
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

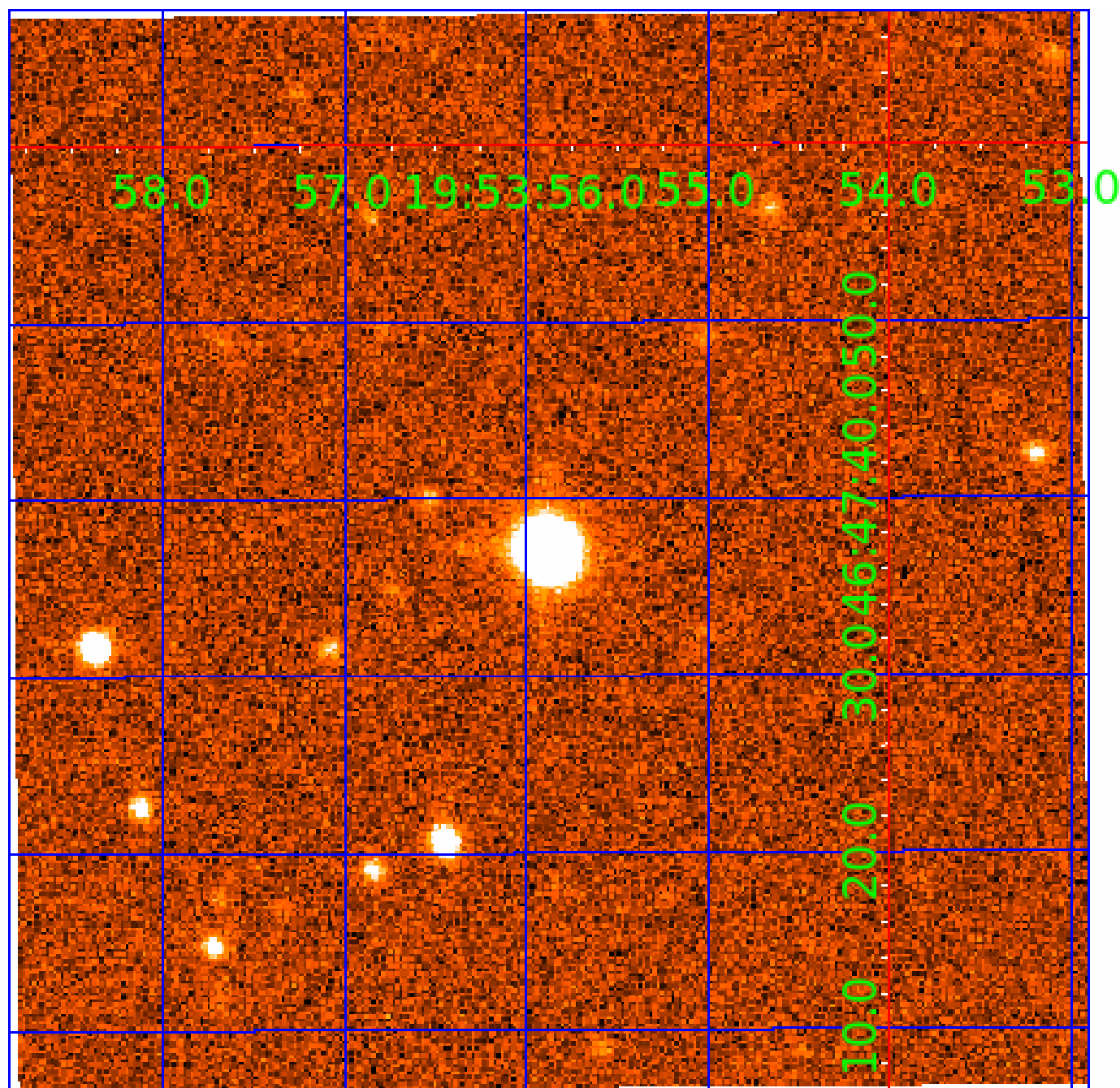


white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



UKIRT Image

Declination



KIC 009909735

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}) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|-------|-------|-----------------------------|-----------------|------------------------|------------------------|
| 009909735-01 | OBS | 1779.01 | 4.662721 | 134.081838 | 1601.2 | 2.956 | 213.7 | 210.1 | 0.94 | 5729 | 4.23 | 275.93 |
| 009909735-02 | OBS | 1779.02 | 11.814992 | 133.091786 | 988.8 | 2.624 | 80.4 | 78.3 | 0.94 | 5729 | 3.21 | 79.88 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|------------|
| 009909735-01 | OBS | PC | 1.00 | 0 | 0 | 0 | 0 | NO_COMMENT |
| 009909735-02 | OBS | PC | 1.00 | 0 | 0 | 0 | 0 | NO_COMMENT |

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

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

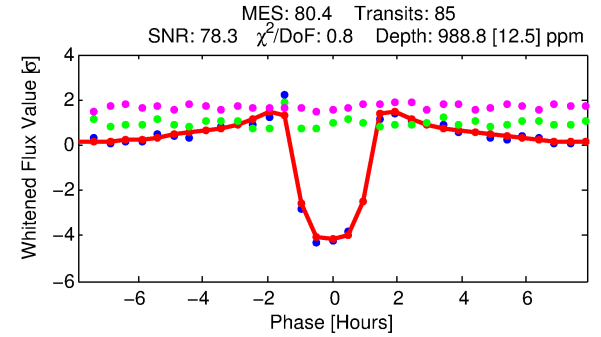
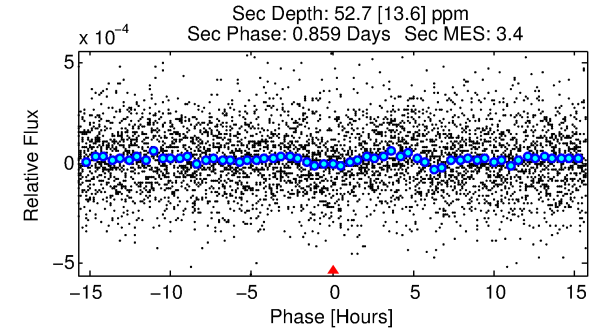
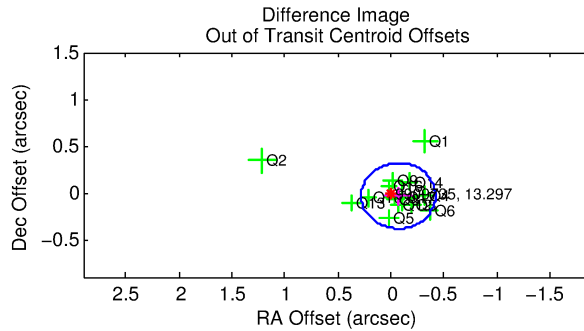
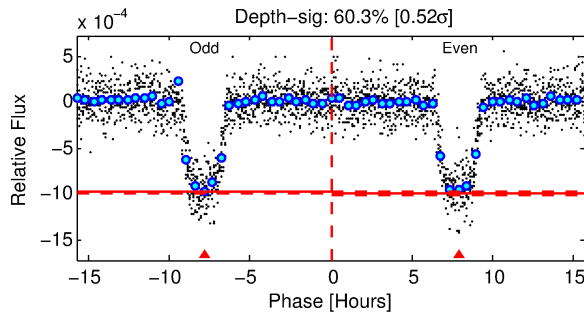
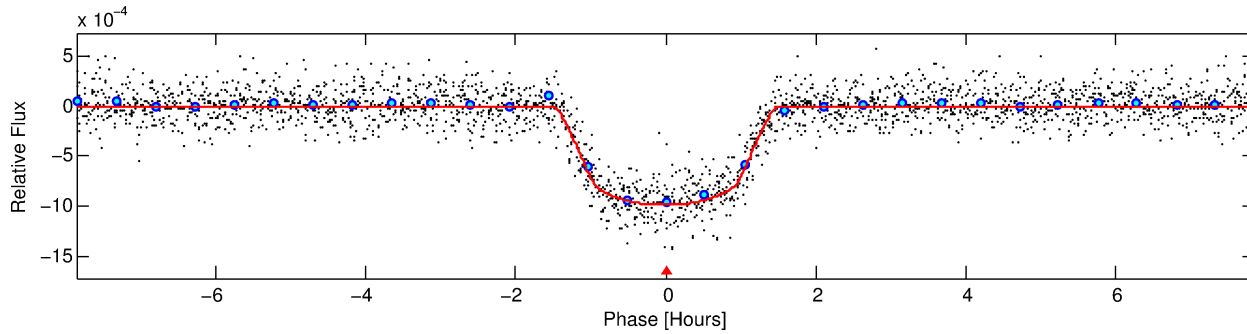
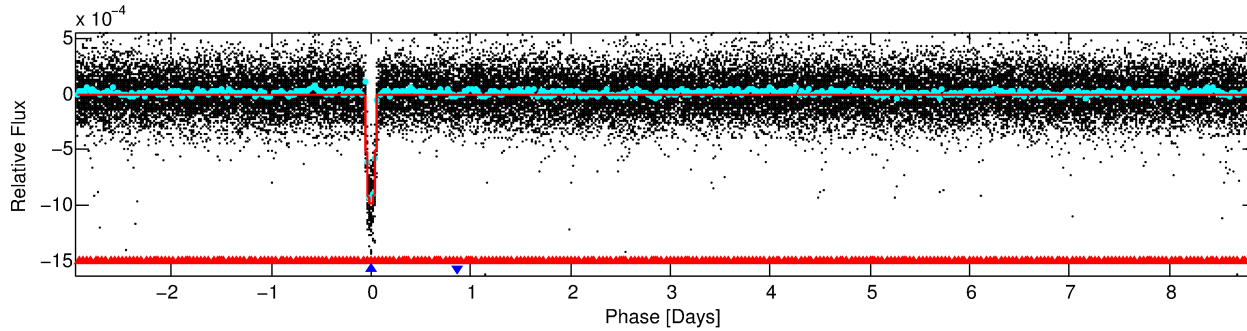
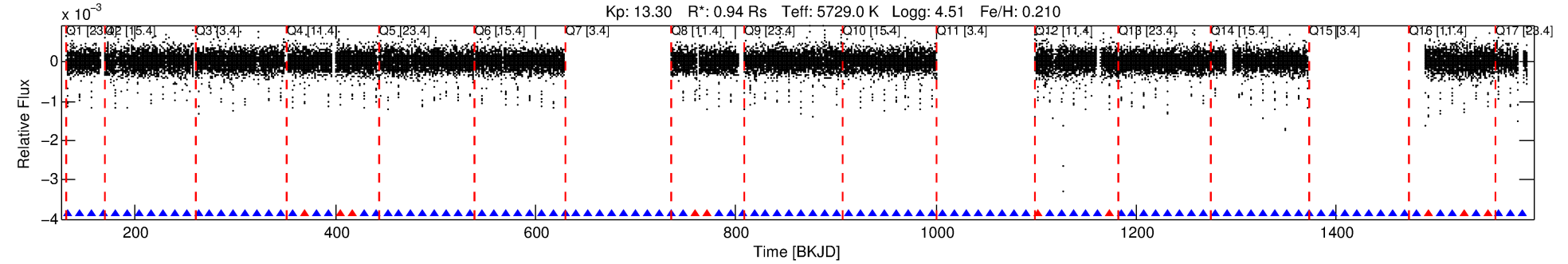
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 009909735-02

No Significant Match Found

DV One-Page Summary

KIC: 9909735 Candidate: 2 of 2 Period: 11.815 d
KOI: K01779.02 Name: Kepler-318c Corr: 0.980



DV Fit Results:

Period = 11.81499 [0.00001] d
Epoch = 133.0918 [0.0006] BKJD
Rp/R* = 0.0313 [0.0030]
a/R* = 24.40 [9.72]
b = 0.75 [0.24]
Seff = 79.87 [19.24]
Teq = 762 [46] K
Rp = 3.21 [0.62] Re
a = 0.1032 [0.0152] AU
Ag = 29.96 [11.72] [2.47 σ]
Teffp = 2757 [229] K [8.54 σ]

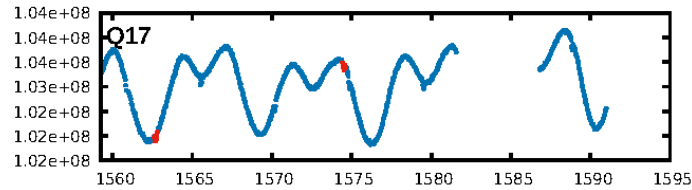
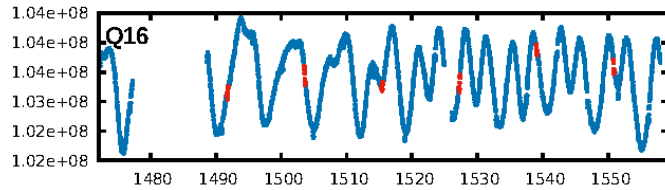
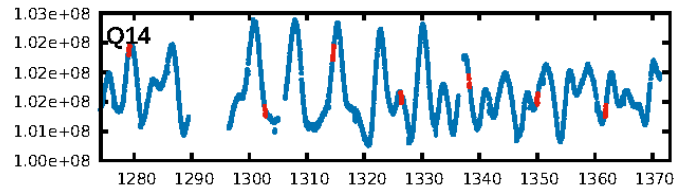
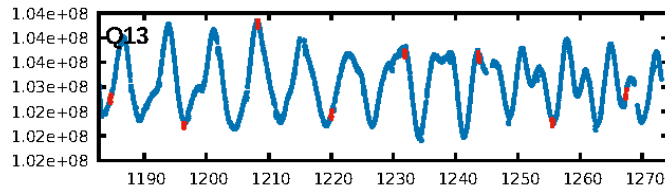
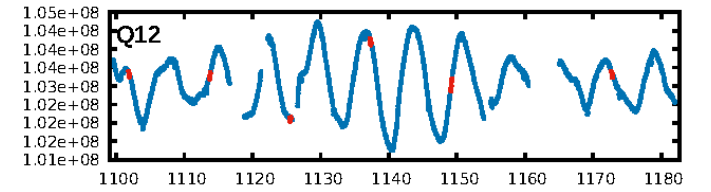
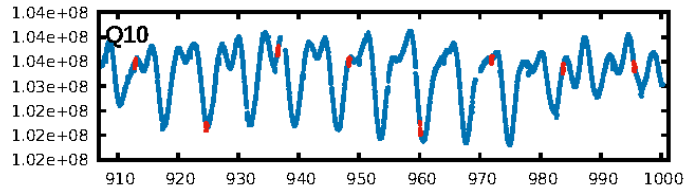
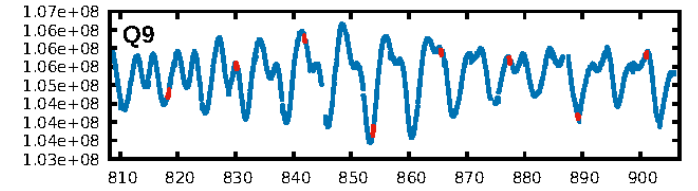
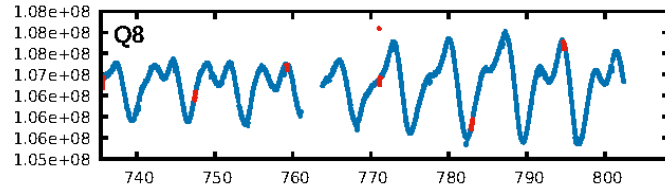
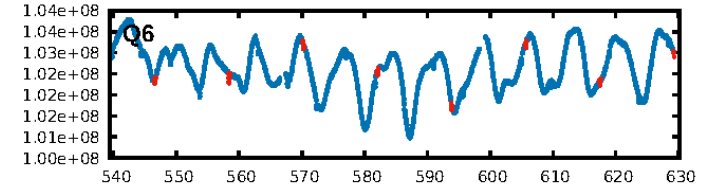
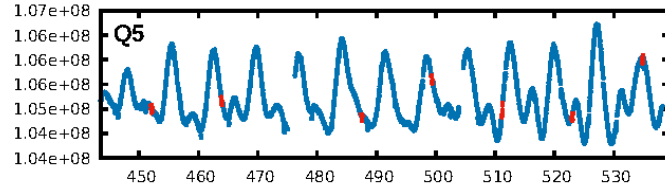
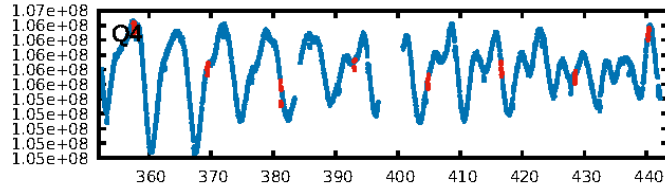
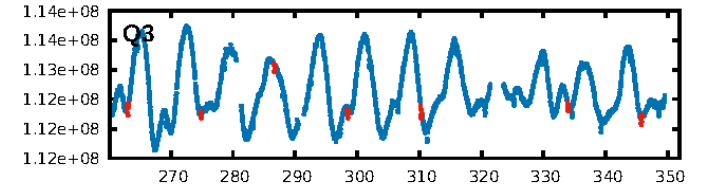
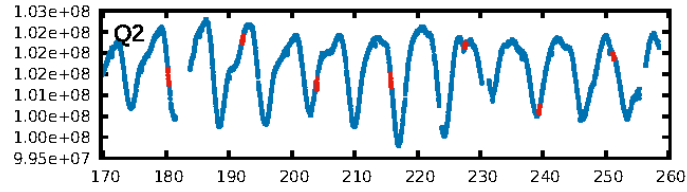
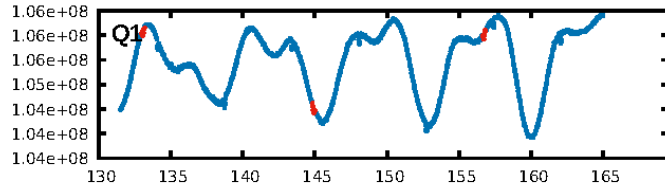
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [43.43 σ]
LongPeriod-sig: N/A
ModelChiSquare2-sig: 94.1%
ModelChiSquareGof-sig: 100.0%
Bootstrap-pfa: 0.00e+00
RollingBand-fgt: 0.88 [70/80]
GhostDiagnostic-chr: 3.064
Centroid-sig: N/A
Centroid-so: 0.109 arcsec [0.92 σ]
OotOffset-rm: 0.079 arcsec [0.68 σ]
KicOffset-rm: 0.015 arcsec [0.12 σ]
OotOffset-st: 4/1/4/5 [14]
KicOffset-st: 4/1/4/5 [14]
DiffImageQuality-fgm: 1.00 [14/14]
DiffImageOverlap-fno: 1.00 [14/14]

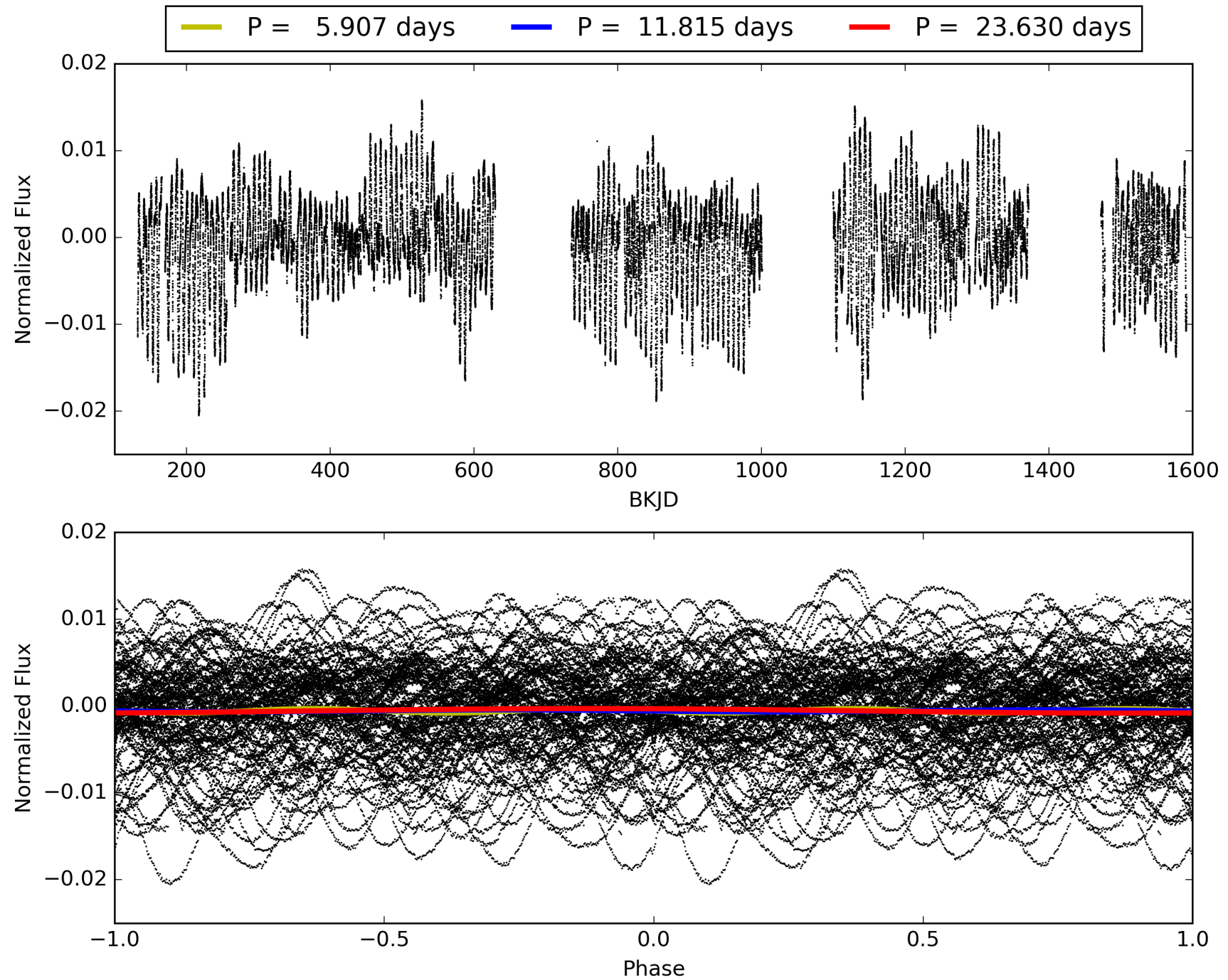
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 19:27:15 Z

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

TCE 009909735-02, PDC Light Curves

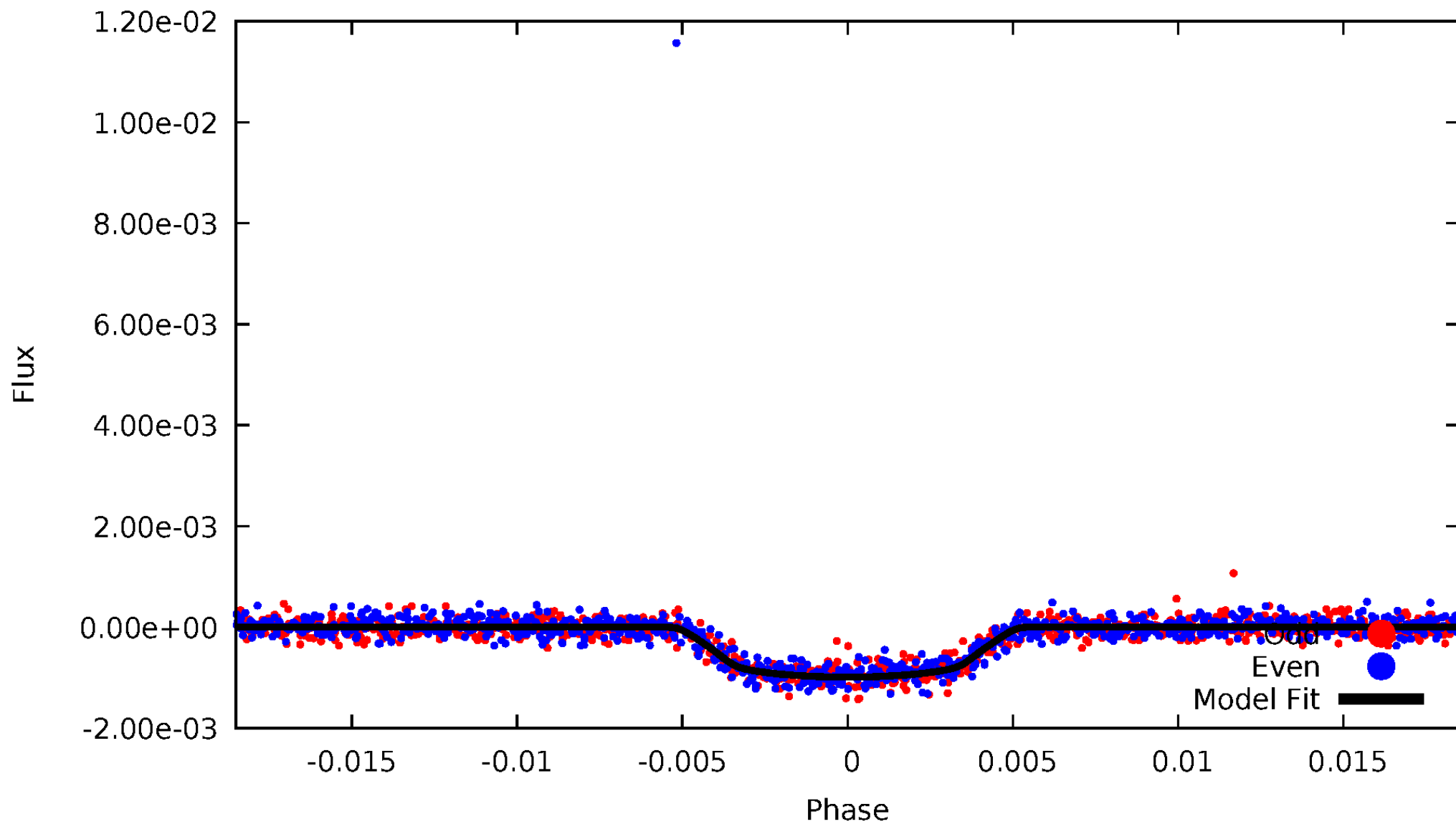


TCE 009909735-02



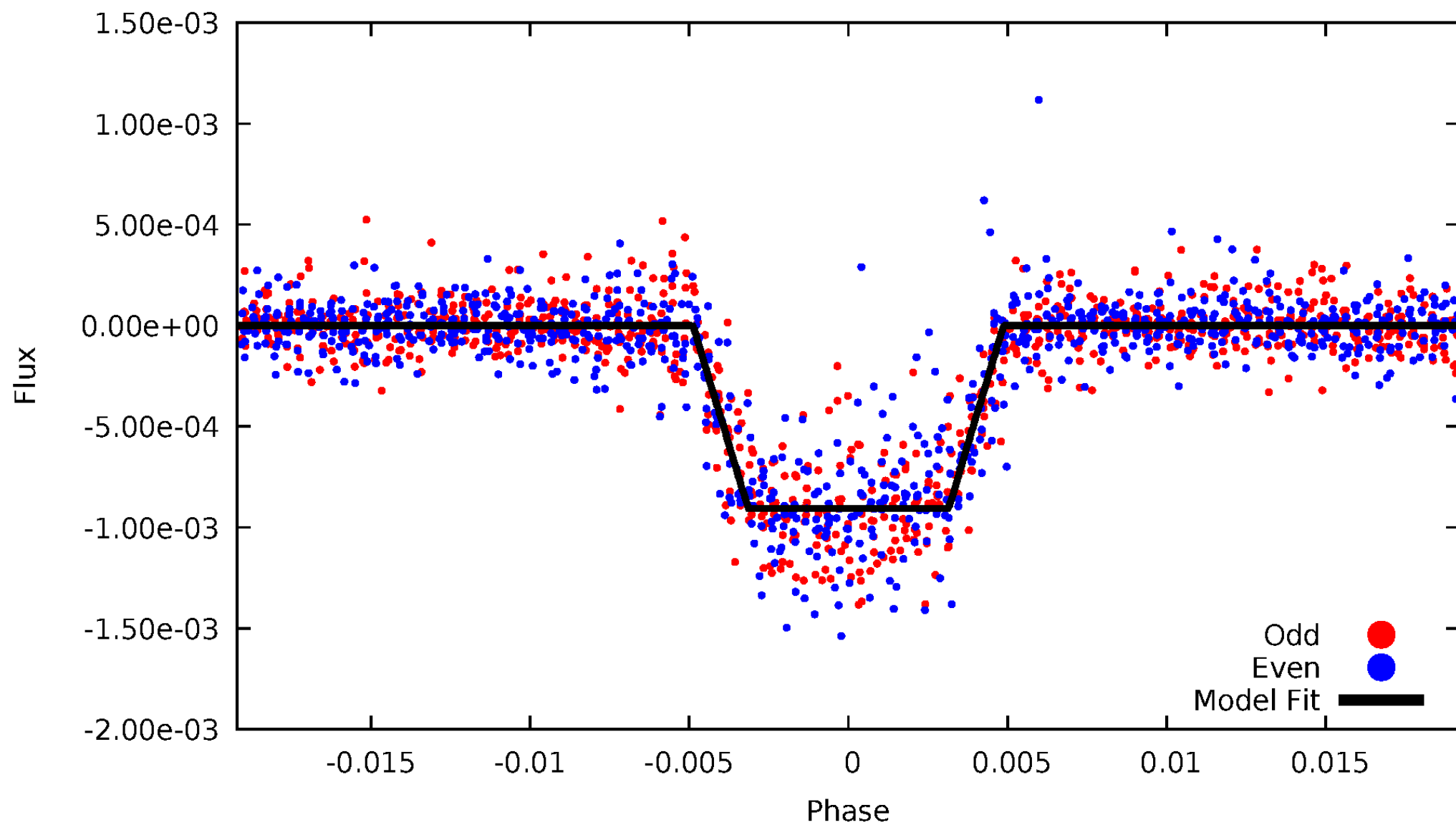
DV Odd/Even

TCE 009909735-02



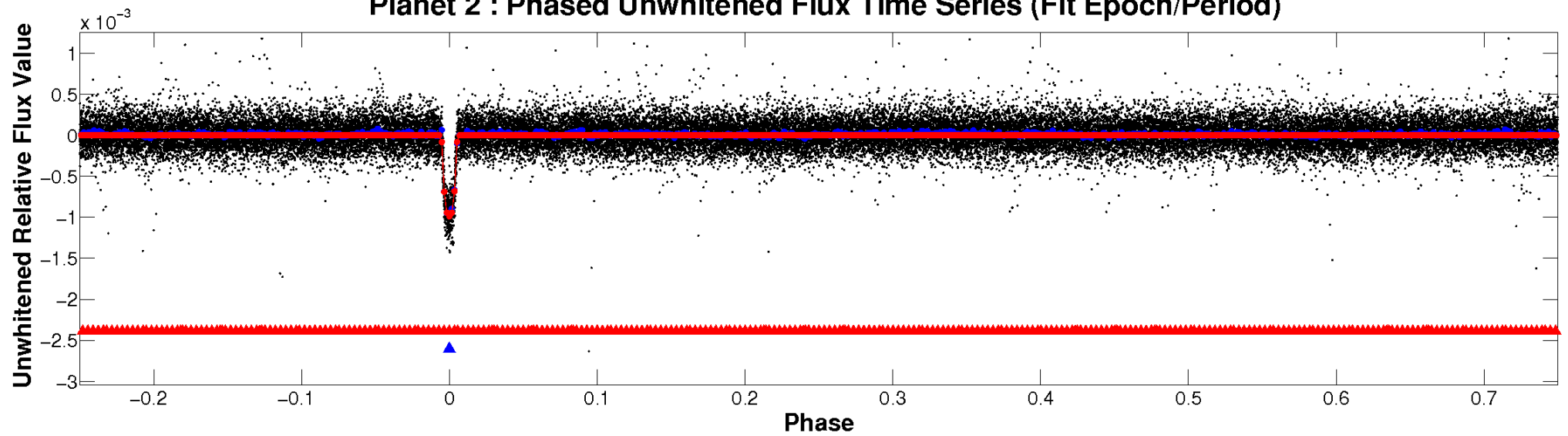
ALT Odd/Even

TCE 009909735-02

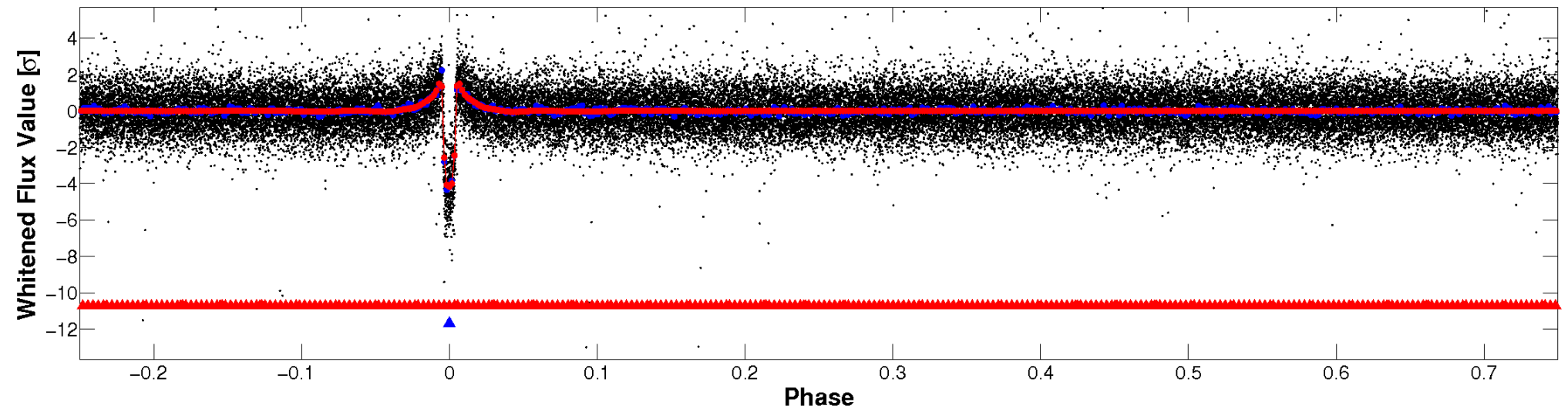


Non-Whitened Vs. Whitened Light Curve

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

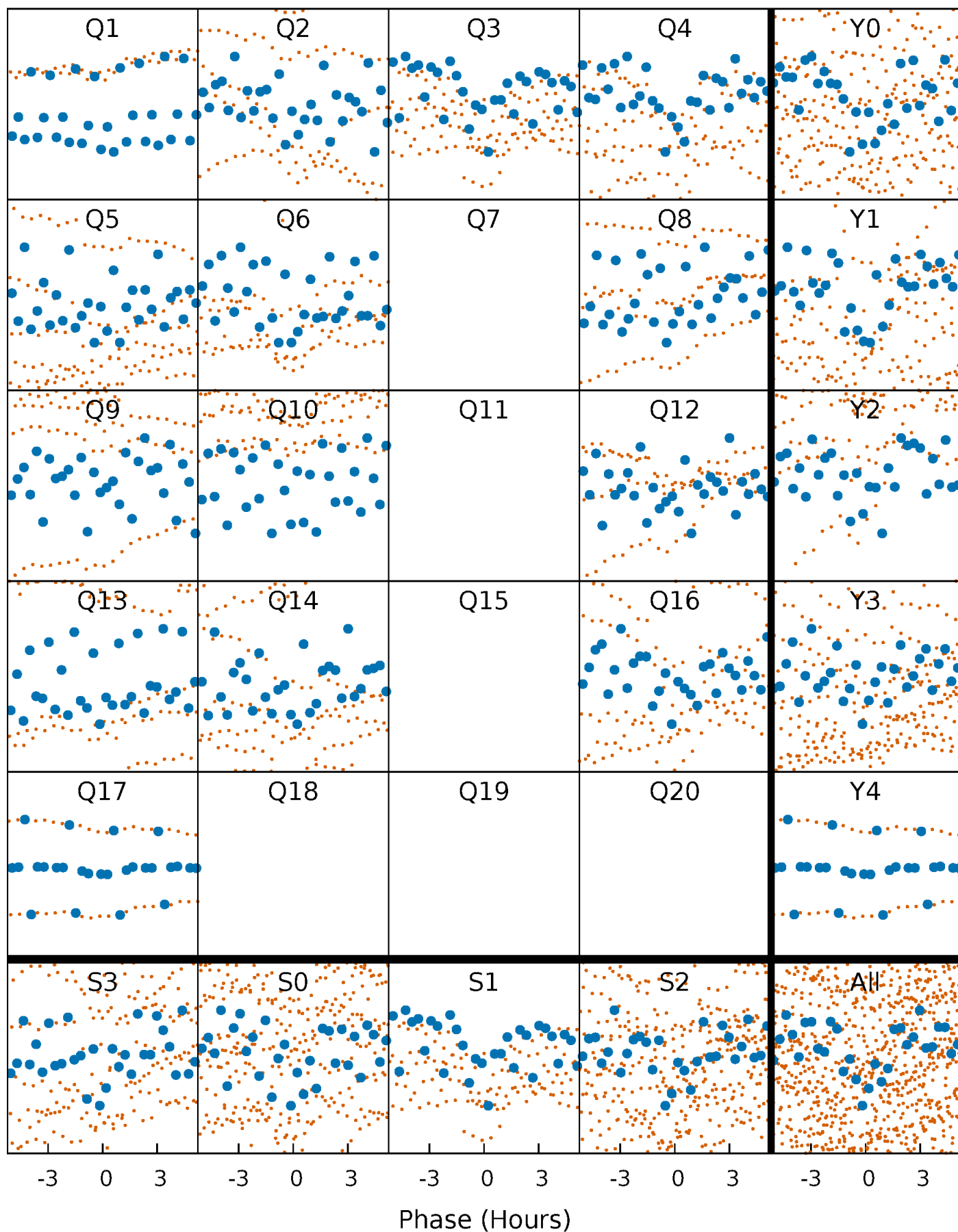


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



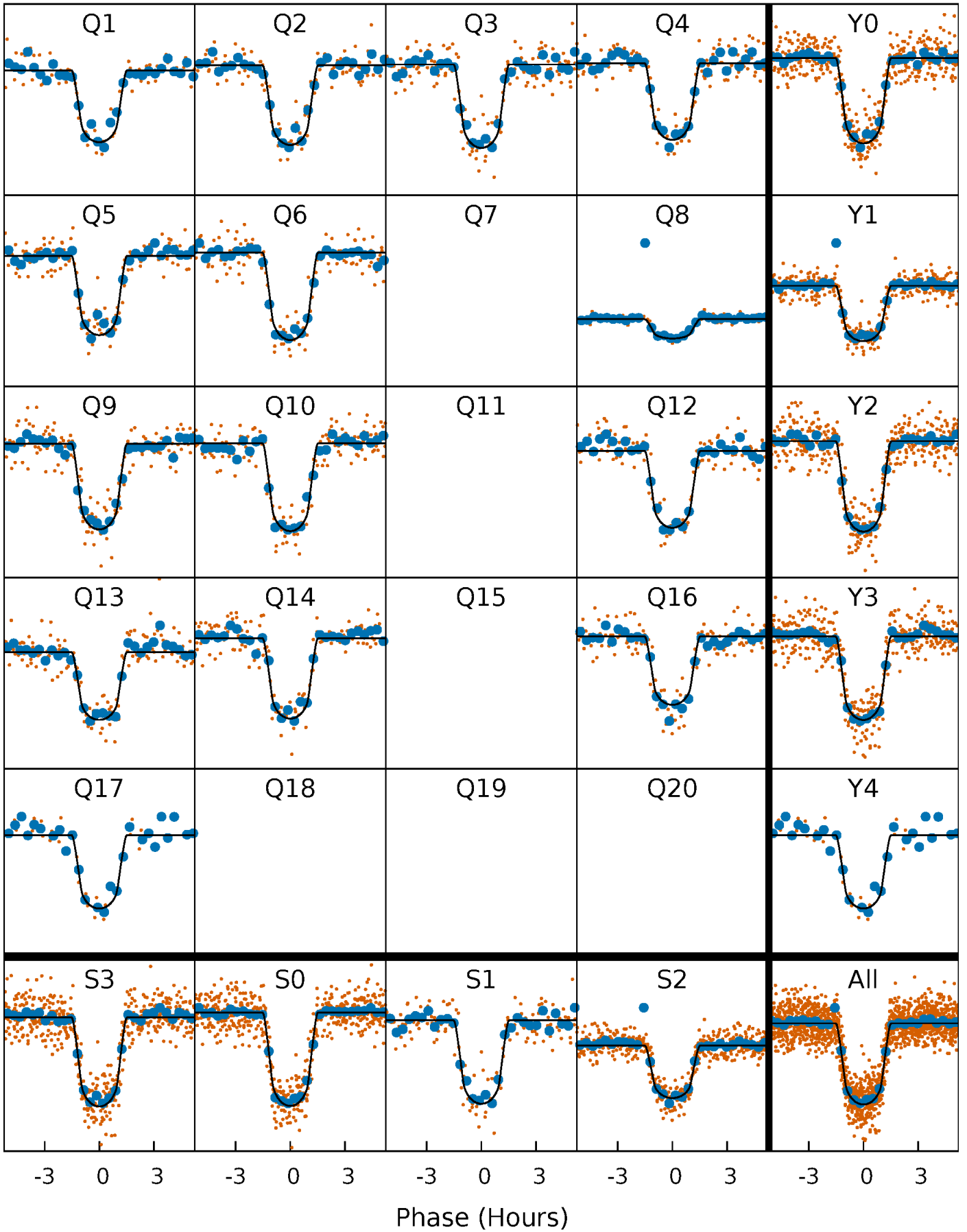
PDC Quarter-Phased Transit Curves

TCE 009909735-02 P= 11.814992 Days $T_0=133.091786$ (BKJD)



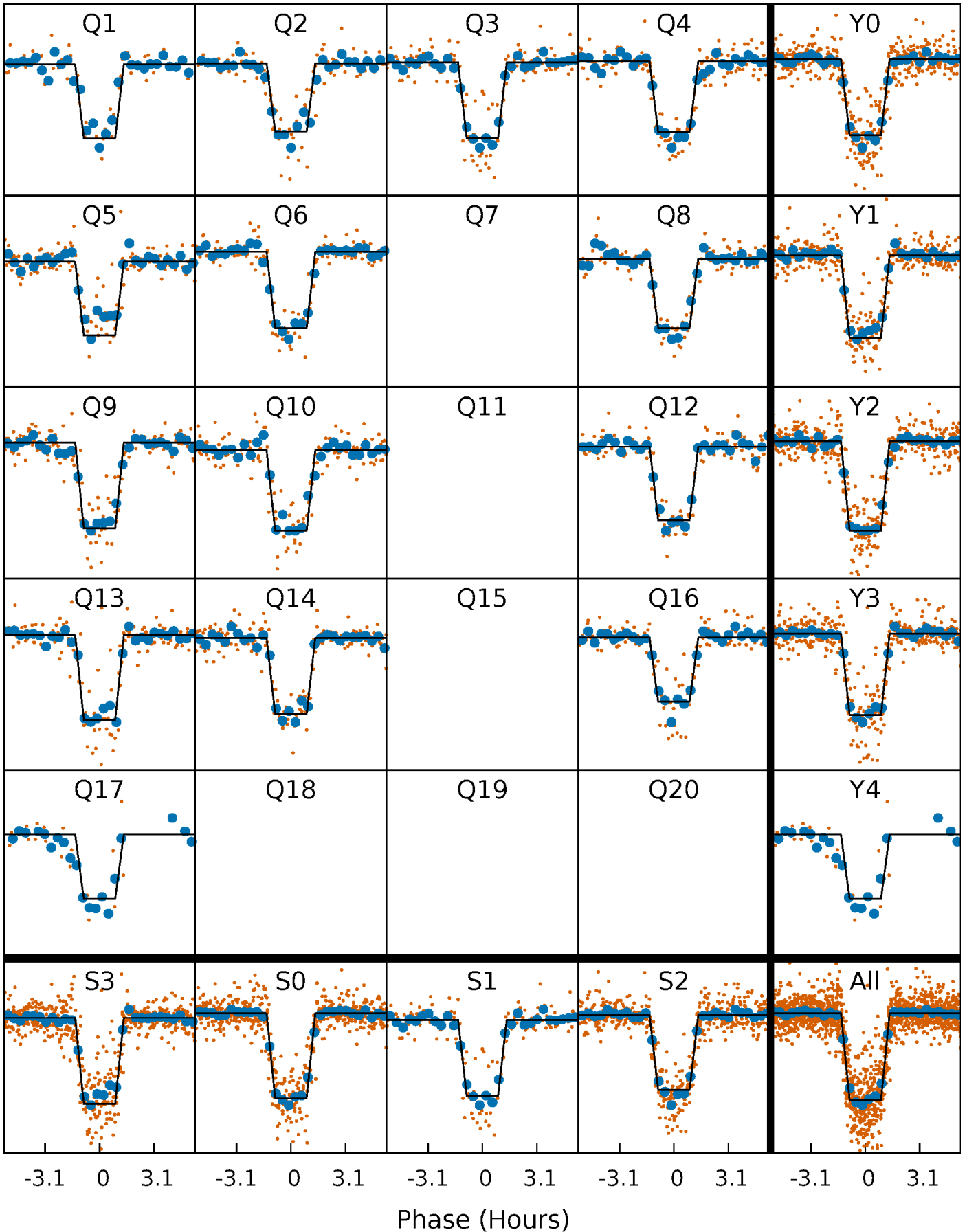
DV Quarter-Phased Transit Curves

TCE 009909735-02 P= 11.814992 Days $T_0=133.091786$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

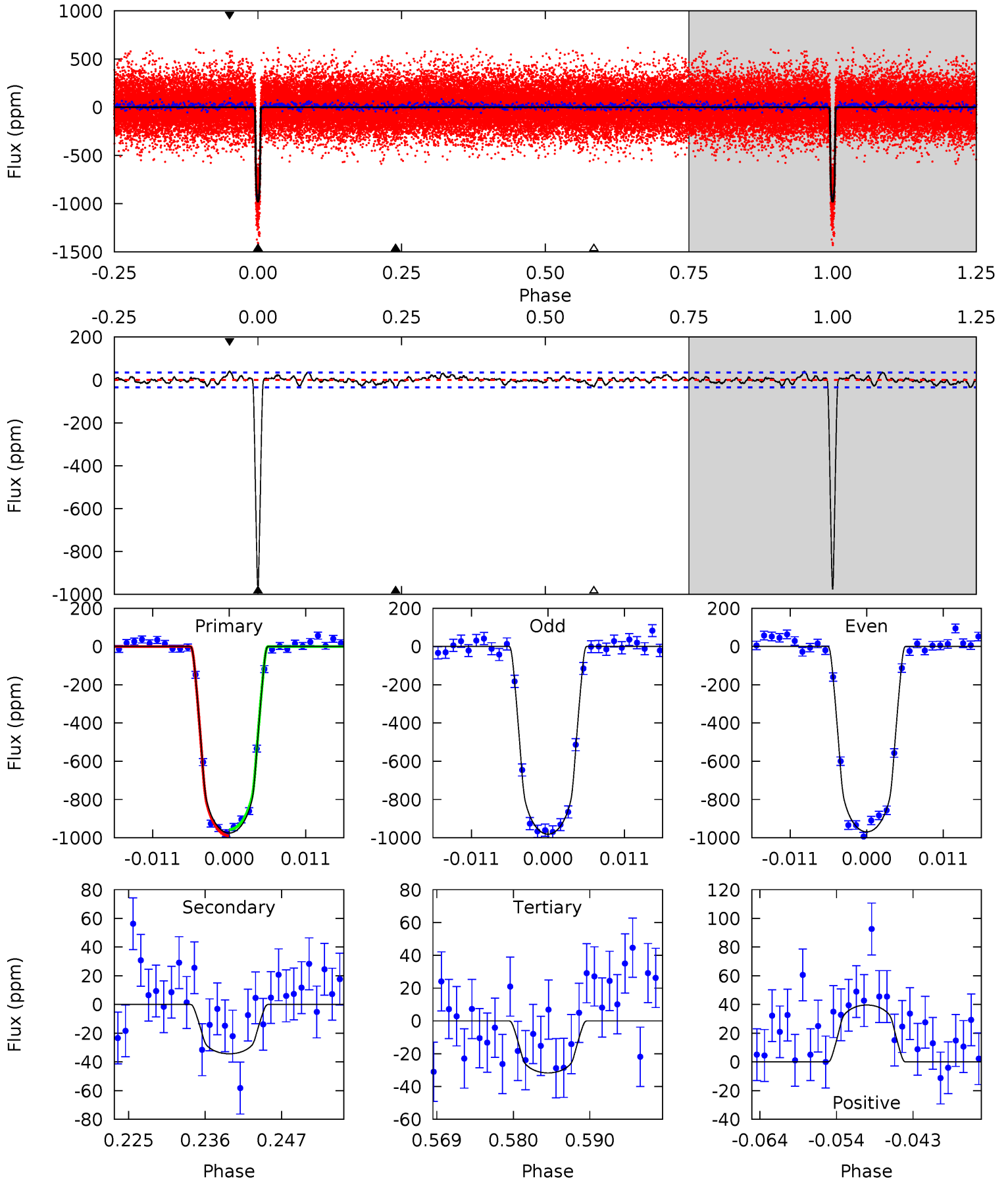
TCE 009909735-02 P= 11.814972 Days $T_0=133.092439$ (BKJD)



DV Model-Shift Uniqueness Test

009909735-02, P = 11.814992 Days, E = 121.276794 Days

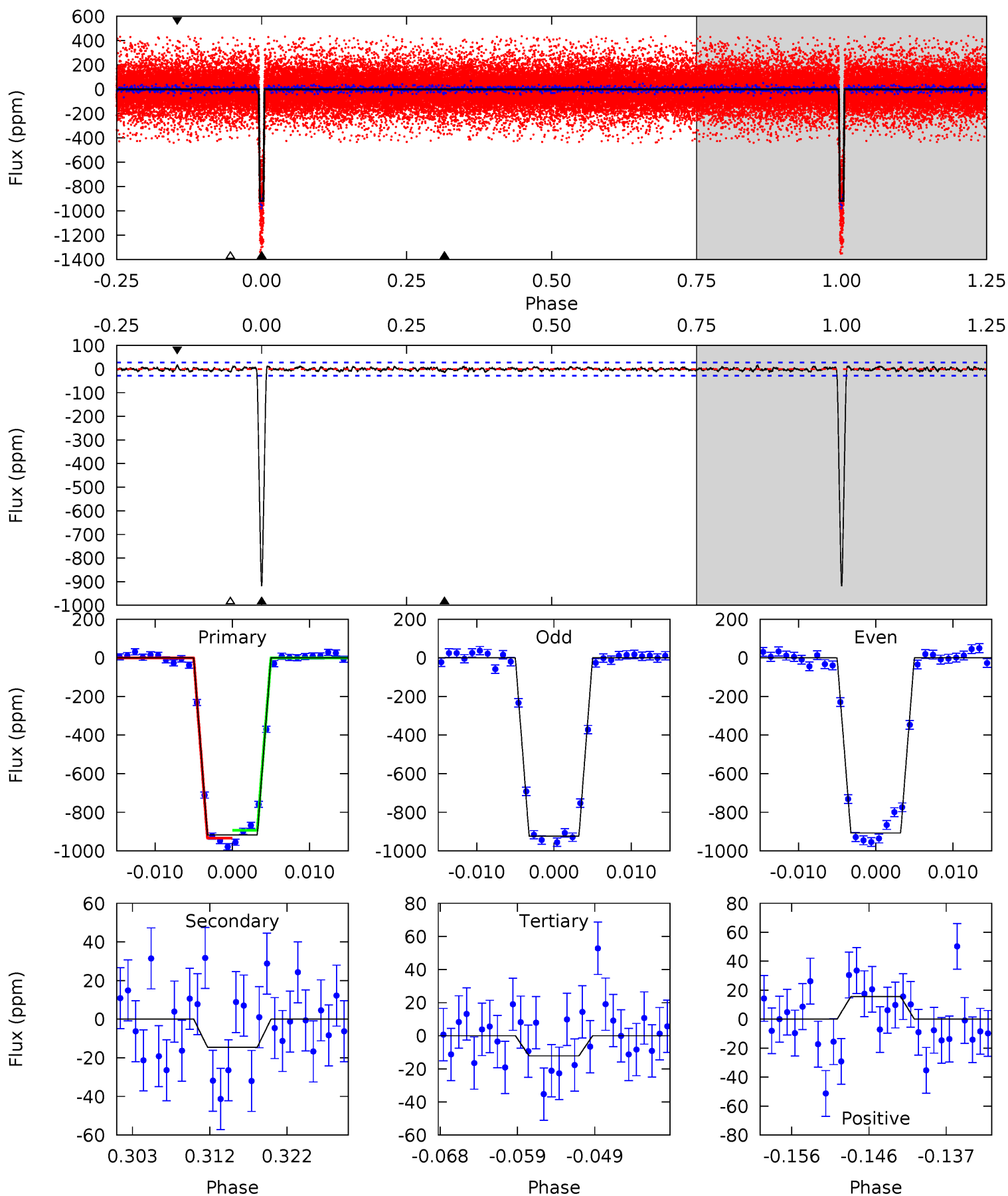
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|-------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 141.7 | 4.99 | 4.61 | 5.76 | 5.01 | 2.55 | 1.66 | 137.1 | 135.9 | 0.38 | -0.77 | 0.87 | 1.01 | 0.04 | 2.36 |



Alt Model-Shift Uniqueness Test

009909735-02, P = 11.814972 Days, E = 121.277467 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|-------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 165.3 | 2.61 | 2.19 | 2.81 | 5.03 | 2.58 | 0.79 | 163.1 | 162.5 | 0.42 | -0.19 | 1.47 | 1.00 | 0.02 | 3.66 |



Stellar Parameters For KIC 009909735

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | R (R_{\odot}) | M (M_{\odot}) | p_{\star} ($\text{g}\cdot\text{cm}^{-3}$) |
|--------|----------------------|---------------------------|---------------------------|---------------------------|---------------------------|---|
| | 5729^{+103}_{-126} | $4.514^{+0.022}_{-0.127}$ | $0.210^{+0.150}_{-0.150}$ | $0.939^{+0.156}_{-0.039}$ | $1.051^{+0.051}_{-0.076}$ | $1.787^{+0.156}_{-0.675}$ |
| | +2%/-2% | +0%/-3% | +71%/-71% | +17%/-4% | +5%/-7% | +9%/-38% |
| Source | SPE59 | SPE59 | SPE59 | DSEP | | |

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

Secondary Eclipse Parameters for KIC 009909735-02 / KOI 1779.02

| Detrend | Depth (ppm) | R_p (R_{\oplus}) | T_{max} (K) | T_{obs} (K) | A_{obs} |
|---------|-------------|------------------------|----------------------|----------------------|---------------------------|
| DV | -34 ± 7 | $3.31^{+0.36}_{-0.35}$ | 1080^{+43}_{-31} | 3089^{+134}_{-135} | 18^{+6}_{-5} |
| Alt. | -15 ± 6 | $3.18^{+0.40}_{-0.34}$ | 1080^{+45}_{-33} | 2761^{+173}_{-182} | $8.247^{+4.077}_{-3.361}$ |

T_{max} = Theoretical Maximum Planetary Temperature

T_{obs} = Observed Planetary Temperature (Assuming $A=0.3$)

A_{obs} = Observed Albedo (Assuming $T=0$)

If a secondary eclipse is present, the system is likely an EB if $T_{\text{obs}} \gg T_{\text{max}}$ AND $A_{\text{obs}} \gg 1.0$

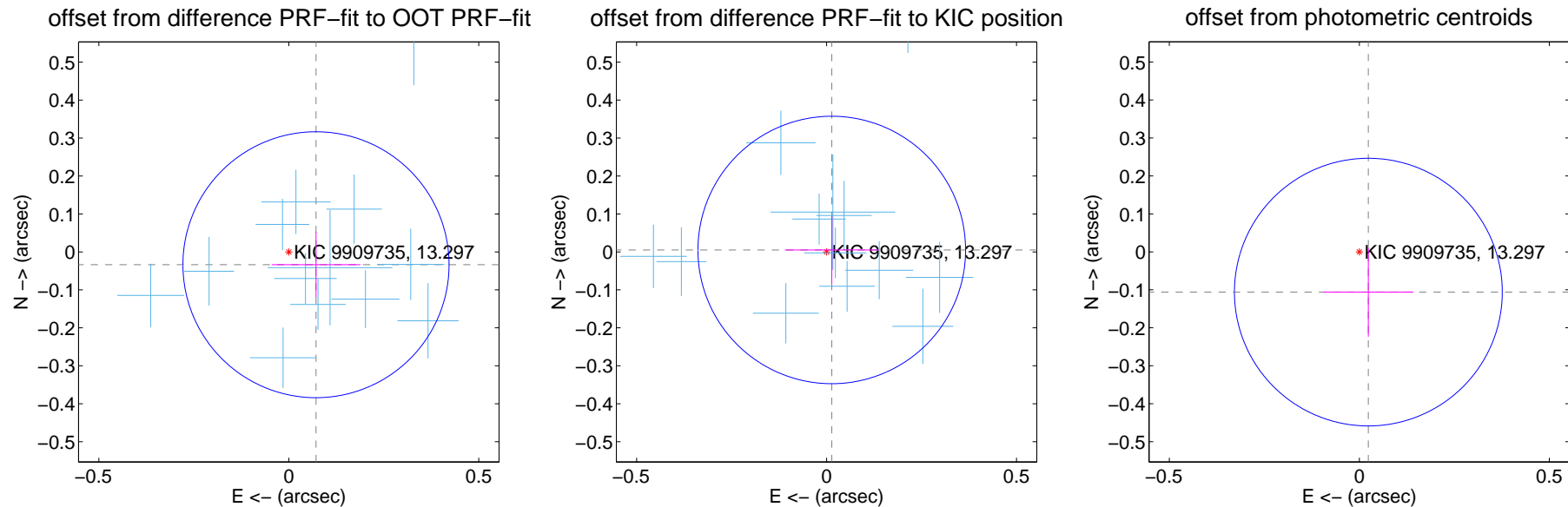
DV Centroid Data

Supplemental centroid analysis for 009909735-02. Kepler magnitude: 13.30. Transit SNR 78.31

There are 14 quarters with good PRF difference image offsets

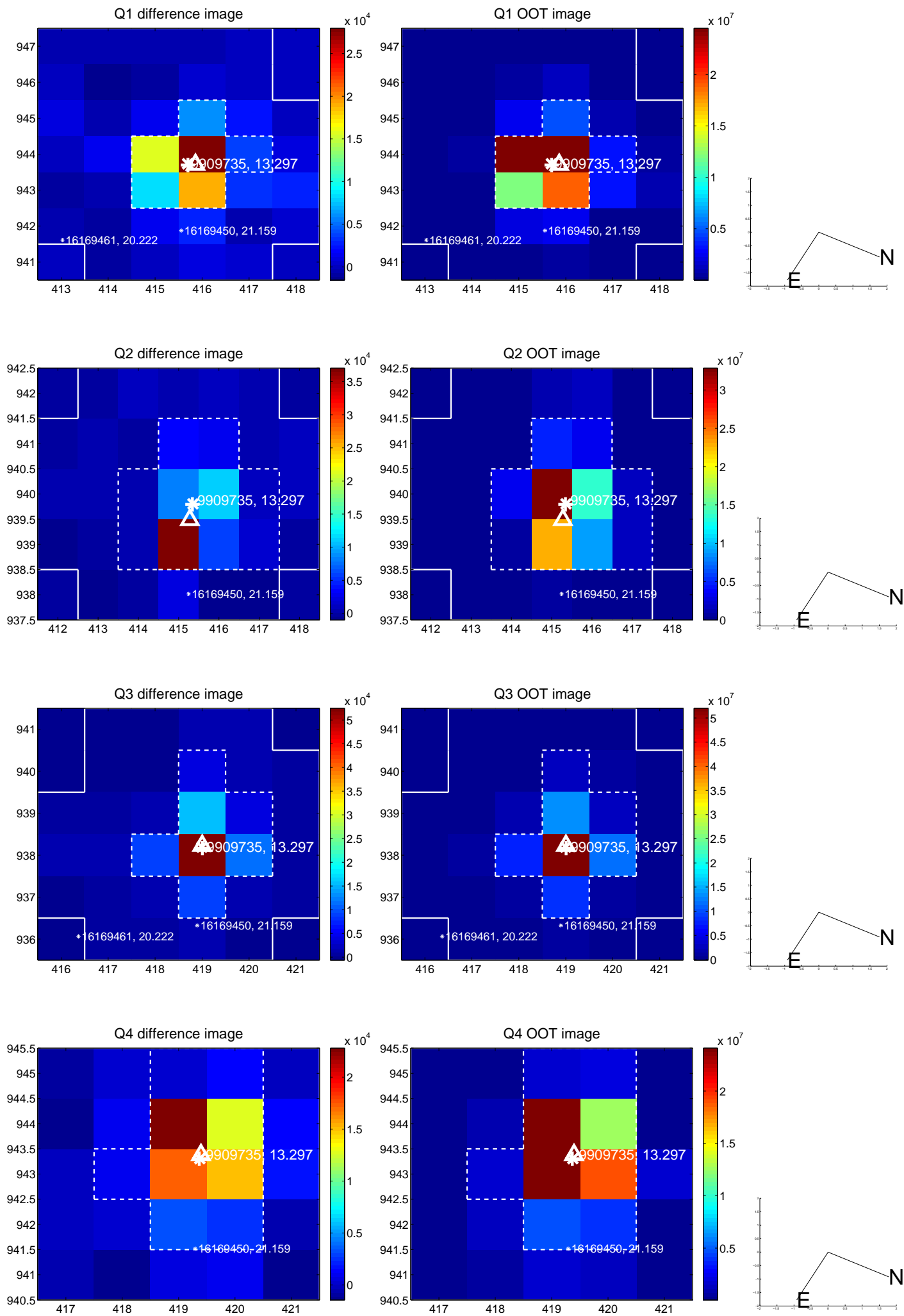
The direct PRF centroid is offset from the target star catalog position by about 0.17 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|---|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT | 0.079 ± 0.117 | 0.68 | -0.072 ± 0.117 | -0.034 ± 0.086 |
| PRF-fit source offset from KIC position | 0.015 ± 0.117 | 0.12 | -0.014 ± 0.123 | 0.005 ± 0.089 |
| photometric centroid source offset | 0.11 ± 0.12 | 0.92 | -0.02 ± 0.12 | -0.11 ± 0.12 |

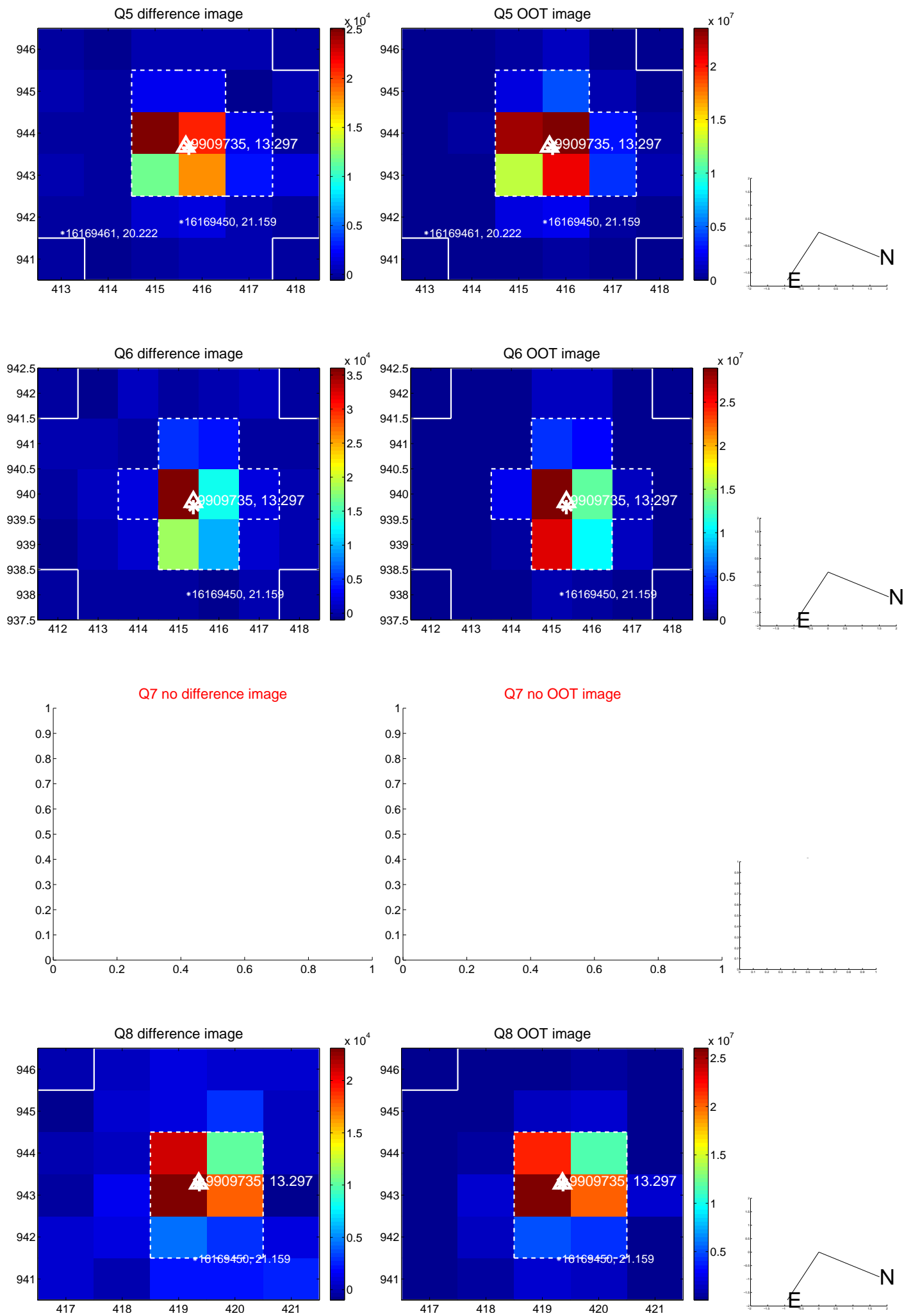


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

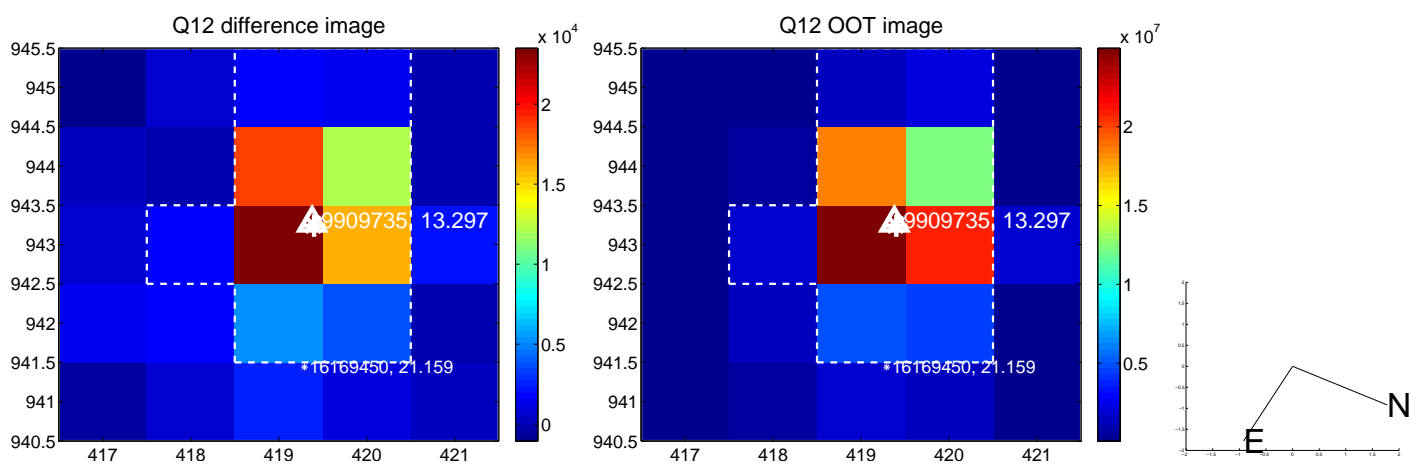
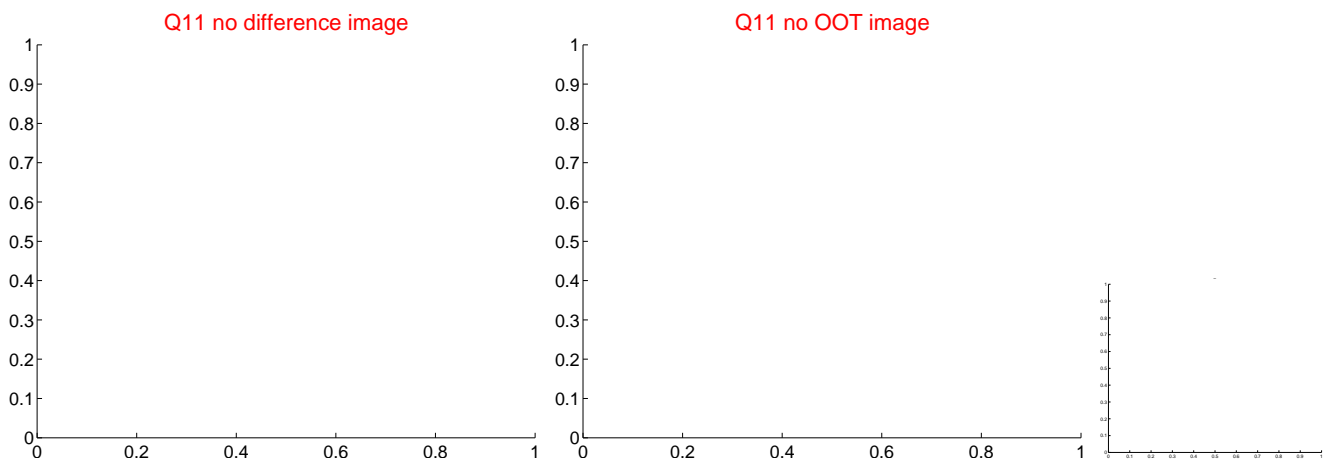
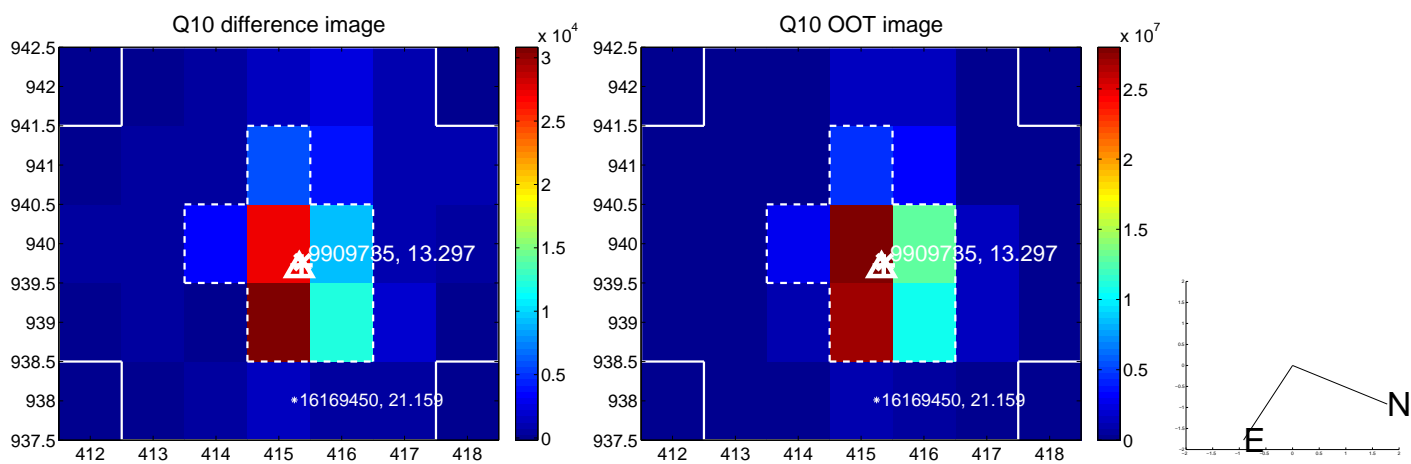
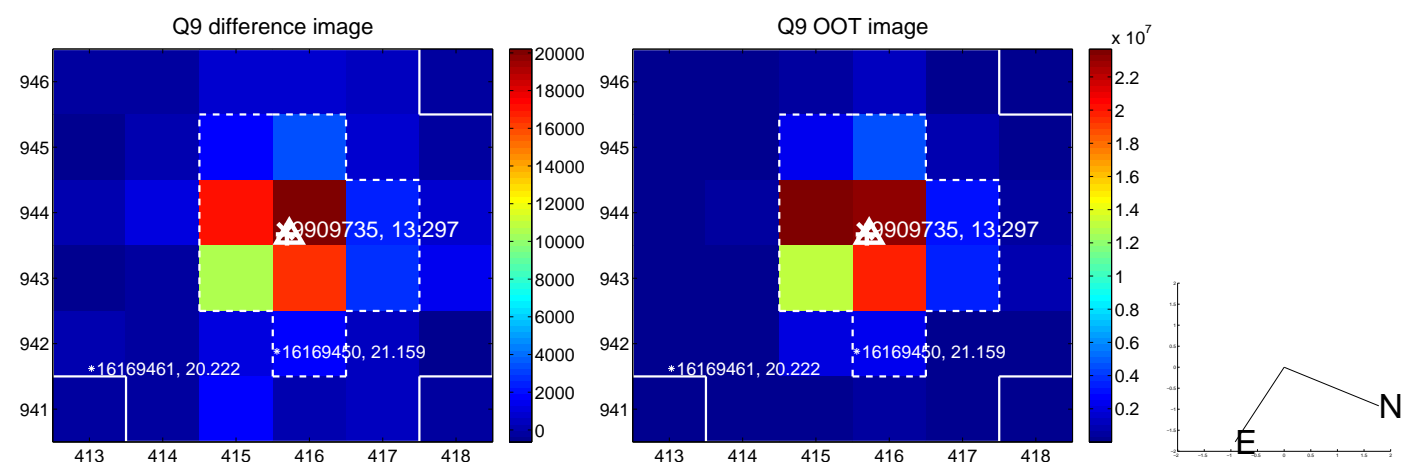
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



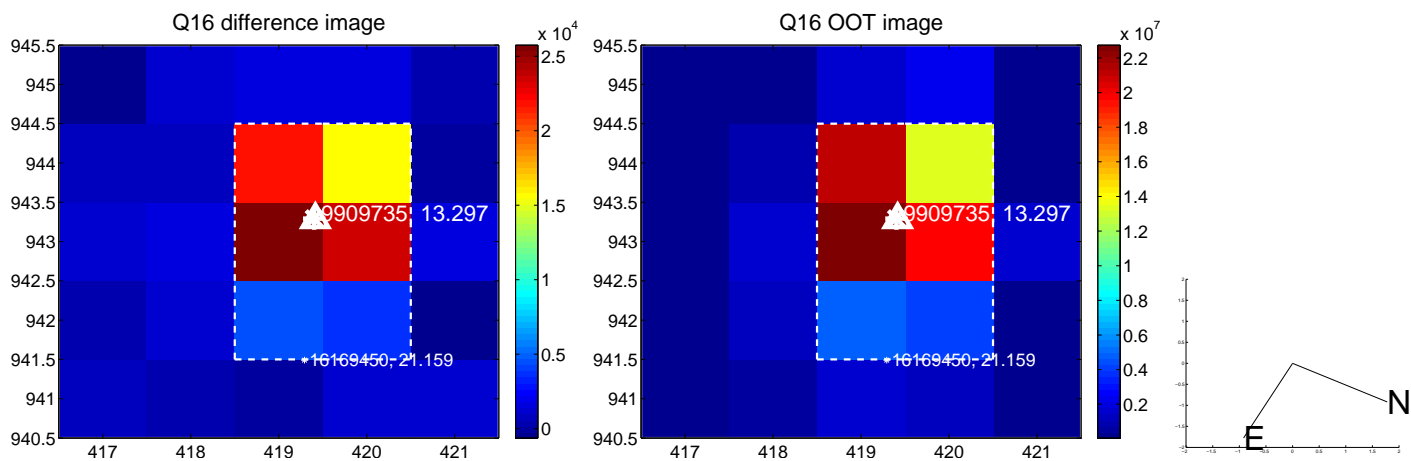
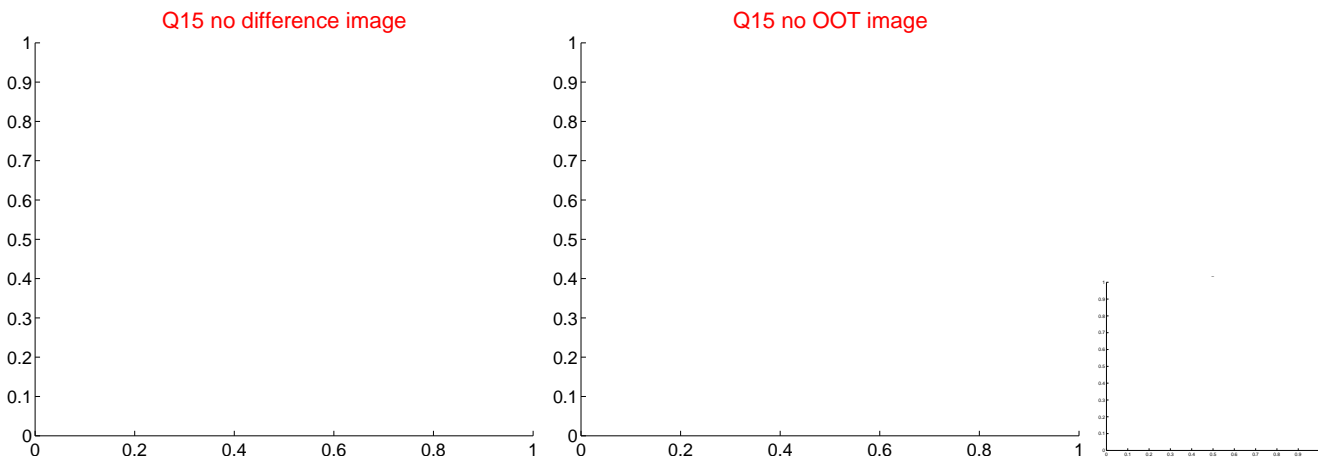
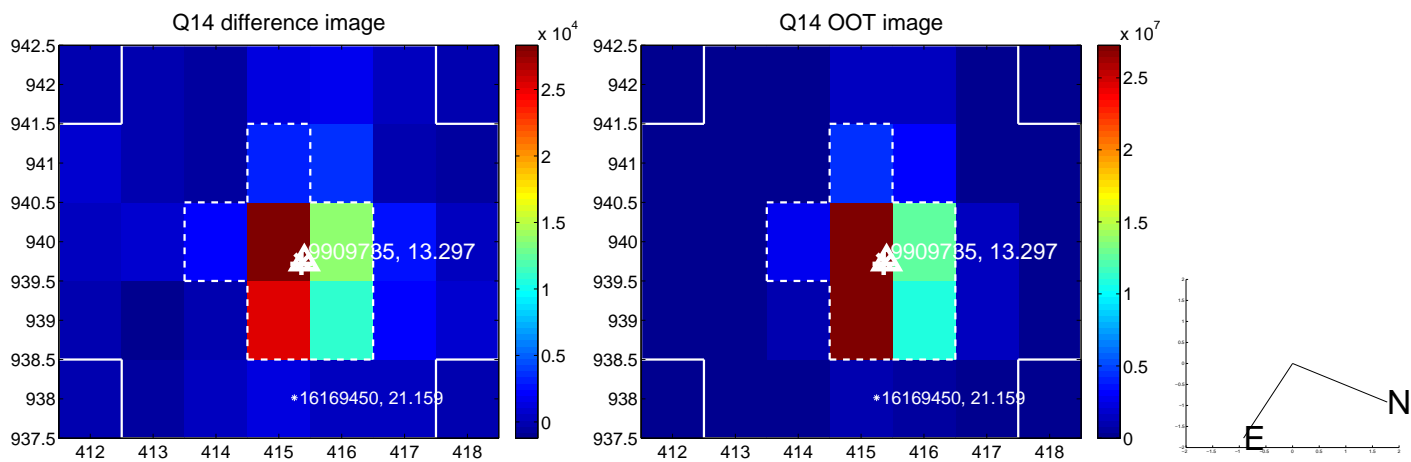
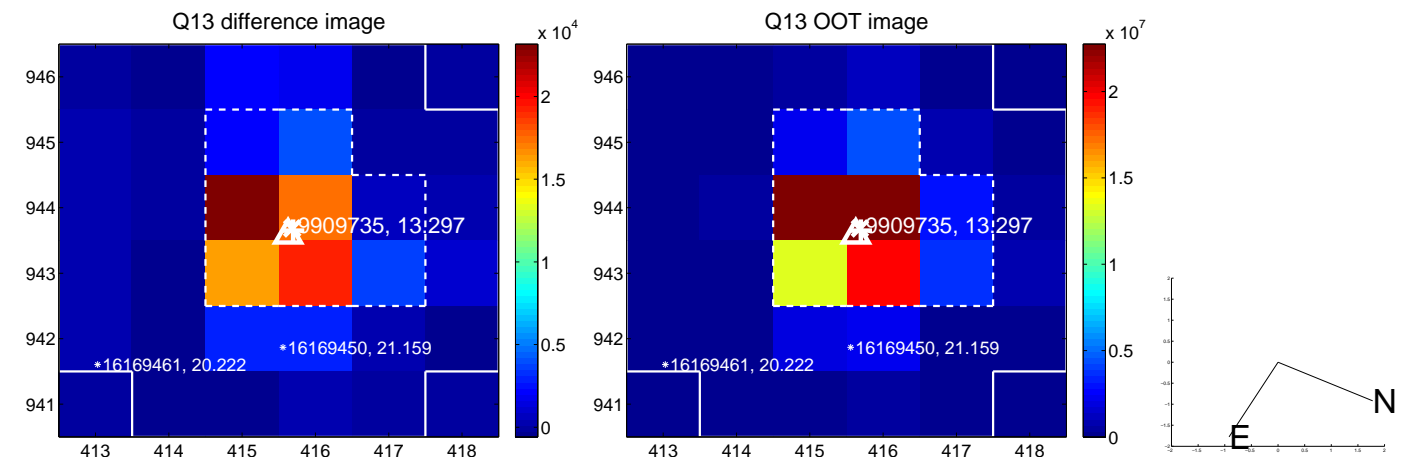
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



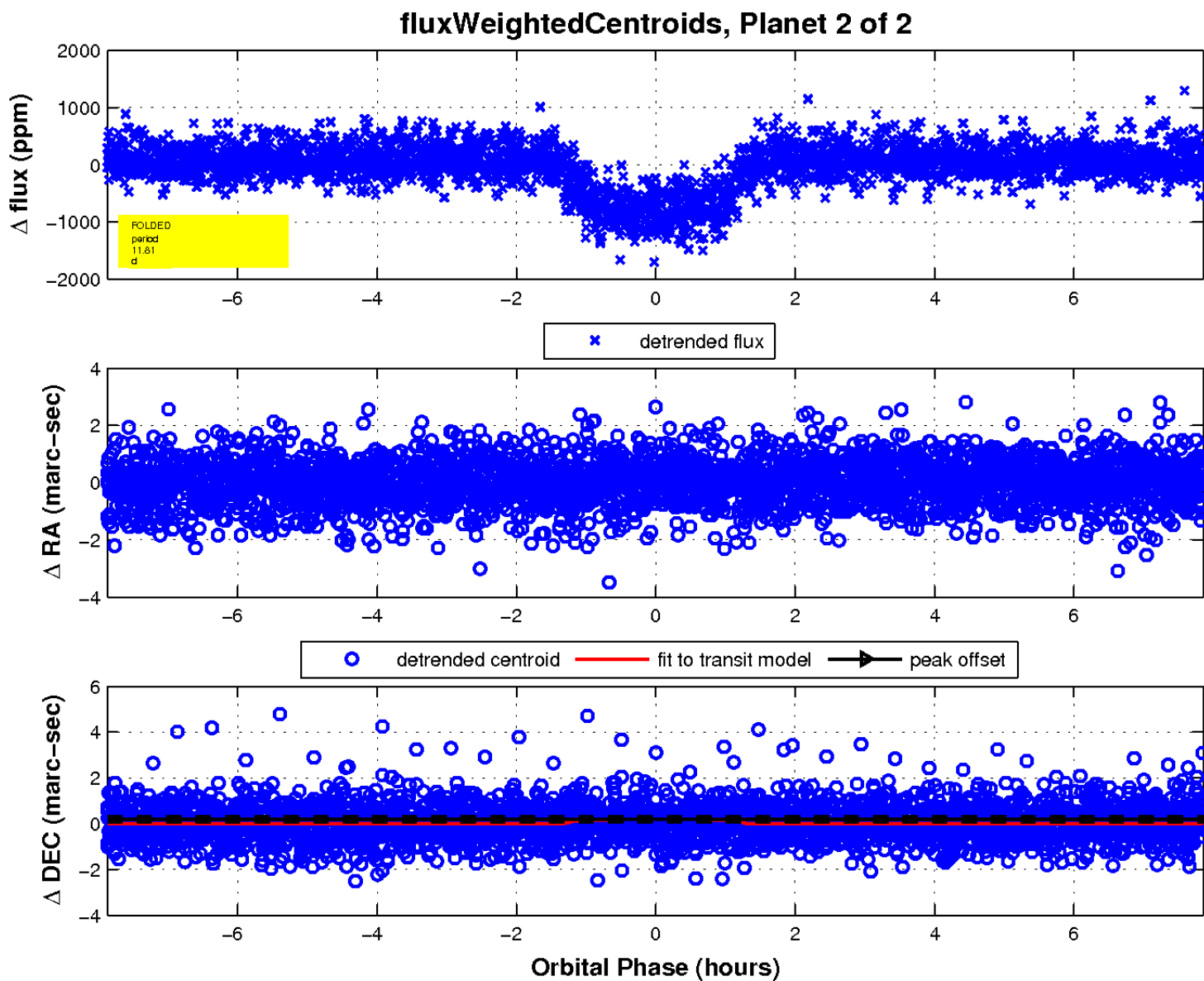
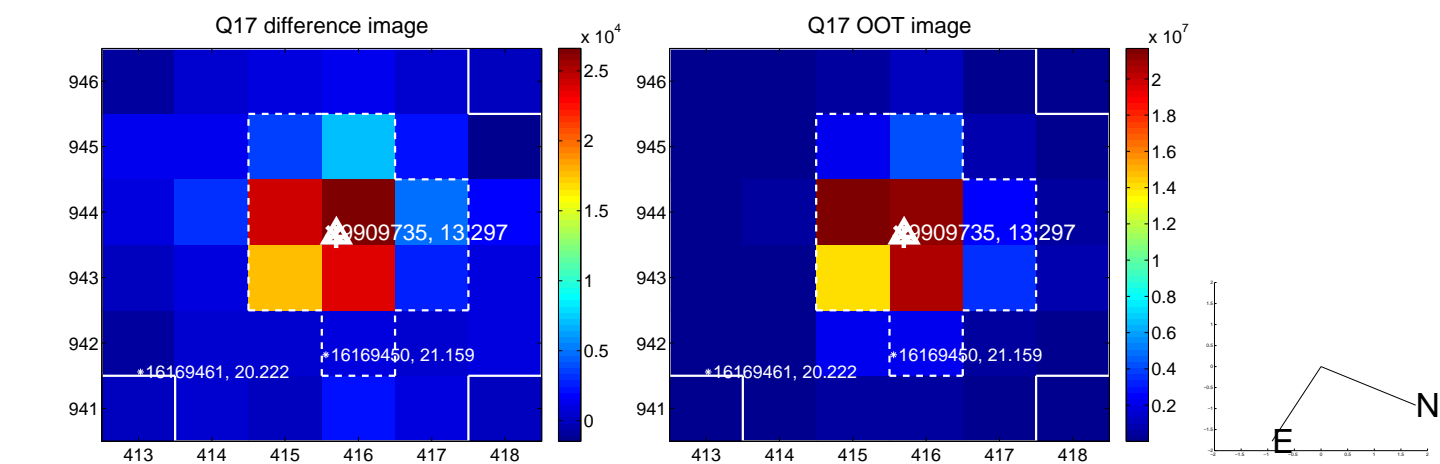
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

