

KIC 009904006

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}) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 009904006-01 | OBS | 2135.01 | 55.186387 | 180.760427 | 366.8 | 9.235 | 23.0 | 24.2 | 1.27 | 6178 | 2.69 | 24.61 |
| 009904006-02 | OBS | 2135.03 | 8.486522 | 138.016791 | 115.2 | 5.507 | 17.8 | 19.0 | 1.27 | 6178 | 1.56 | 298.65 |
| 009904006-03 | OBS | 2135.02 | 20.188882 | 142.194851 | 94.8 | 6.462 | 10.5 | 10.2 | 1.27 | 6178 | 1.38 | 94.04 |
| 009904006-04 | OBS | No | 215.392731 | 221.783212 | 215.5 | 45.978 | 8.0 | 6.1 | 1.27 | 6178 | 1.90 | 4.00 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|-----------------------------------------------------------------------------------------------|
| 009904006-01 | OBS | PC | 0.98 | 0 | 0 | 0 | 0 | NO_COMMENT |
| 009904006-02 | OBS | PC | 1.00 | 0 | 0 | 0 | 0 | NO_COMMENT |
| 009904006-03 | OBS | PC | 1.00 | 0 | 0 | 0 | 0 | NO_COMMENT |
| 009904006-04 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_MARSHALL—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS |

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

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

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

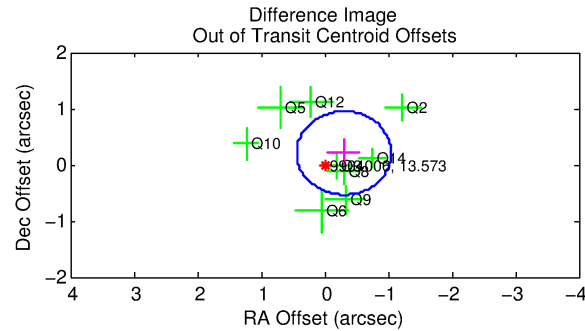
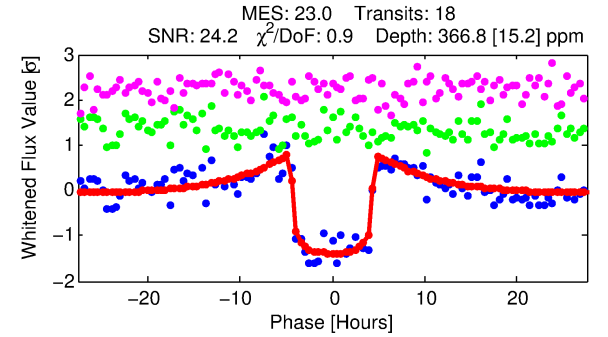
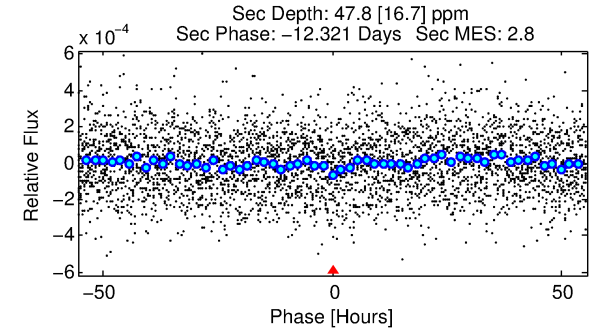
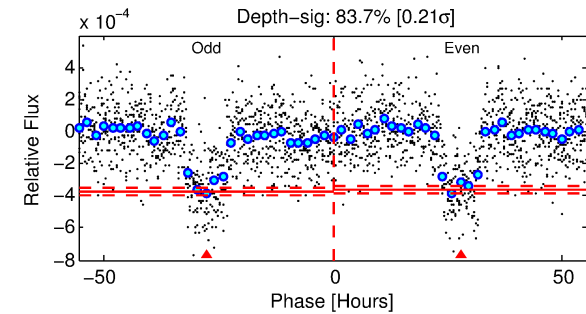
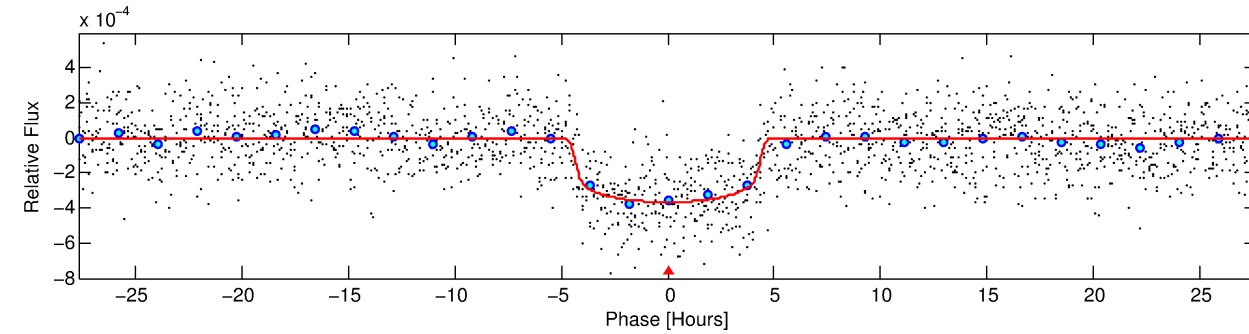
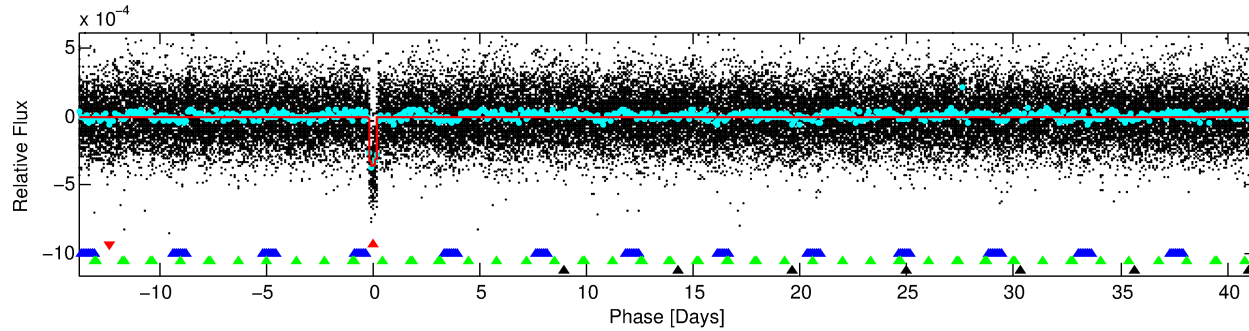
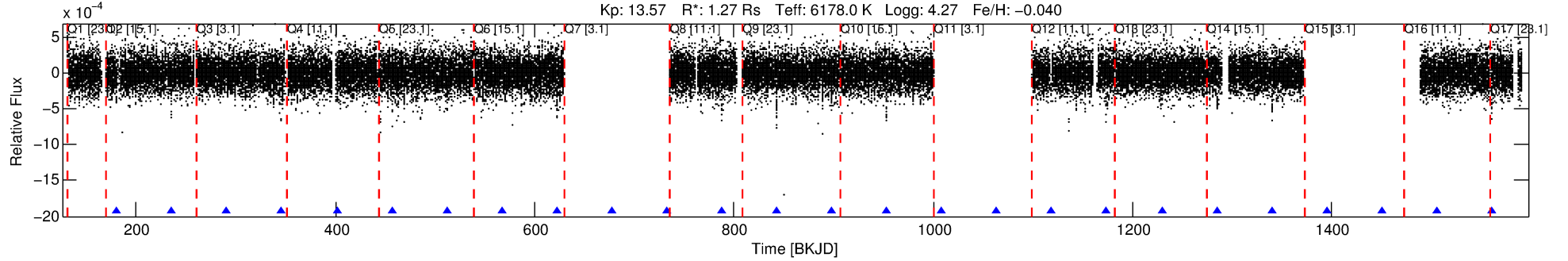
Ephemeris Match Information For 009904006-01

No Significant Match Found

DV One-Page Summary

KIC: 9904006 Candidate: 1 of 4 Period: 55.186 d
KOI: K02135.01 Name: Kepler-361c Corr: 0.988

Kp: 13.57 R*: 1.27 Rs Teff: 6178.0 K Logg: 4.27 Fe/H: -0.040



DV Fit Results:

Period = 55.18639 [0.00031] d
Epoch = 180.7604 [0.0046] BKJD
Rp/R* = 0.0194 [0.0017]
a/R* = 28.78 [12.35]
b = 0.80 [0.19]
Seff = 24.61 [6.03]
Teq = 568 [35] K
Rp = 2.69 [0.56] Re
a = 0.2918 [0.0459] AU
Ag = 310.25 [140.72] [2.20σ]
Teffp = 3685 [370] K [8.40σ]

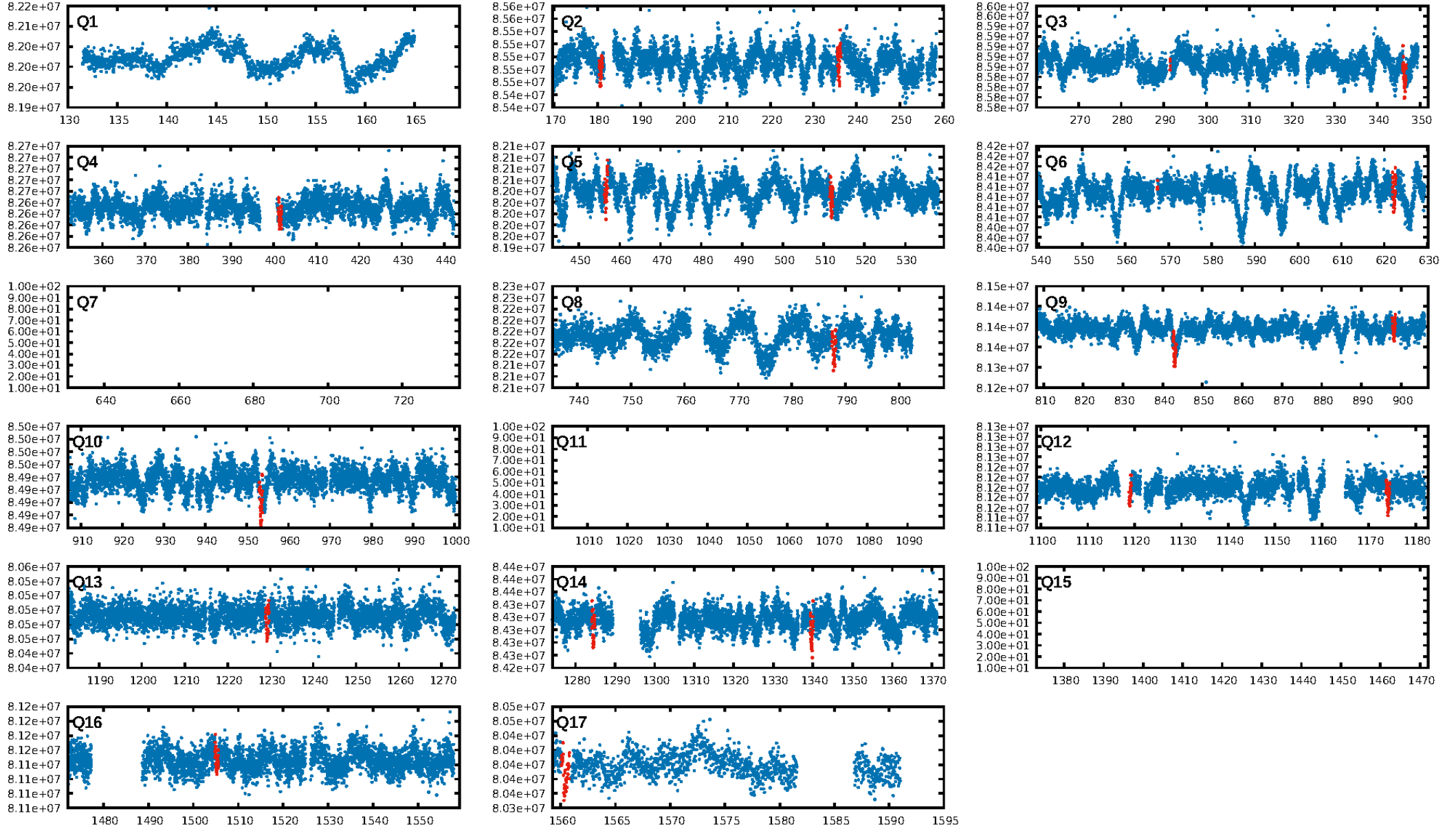
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [74.52σ]
LongPeriod-sig: 100.0% [81.99σ]
ModelChiSquare2-sig: 5.8%
ModelChiSquareGof-sig: 100.0%
Bootstrap-pfa: 3.69e-114
RollingBand-fgt: 1.00 [17/17]
GhostDiagnostic-chr: 3.415
Centroid-sig: 96.5%
Centroid-so: 0.257 arcsec [0.79σ]
OotOffset-rm: 0.367 arcsec [1.48σ]
OotOffset-st: 4/1/2/2 [9]
KicOffset-rm: 0.429 arcsec [1.60σ]
KicOffset-st: 4/1/2/2 [9]
DiffImageQuality-fgm: 1.00 [9/9]
DiffImageOverlap-fno: 0.56 [5/9]

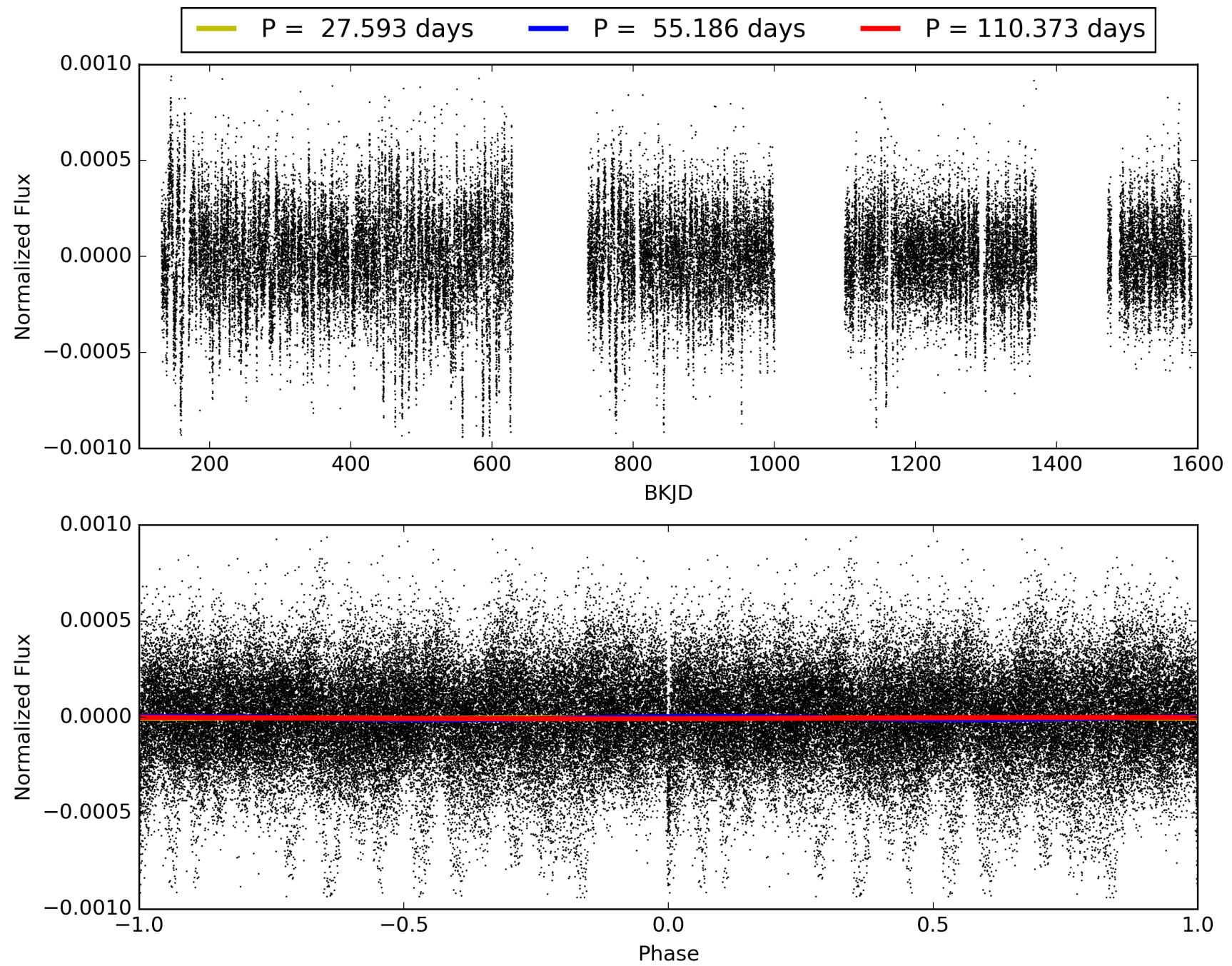
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 19:11:43 Z

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

TCE 009904006-01, PDC Light Curves

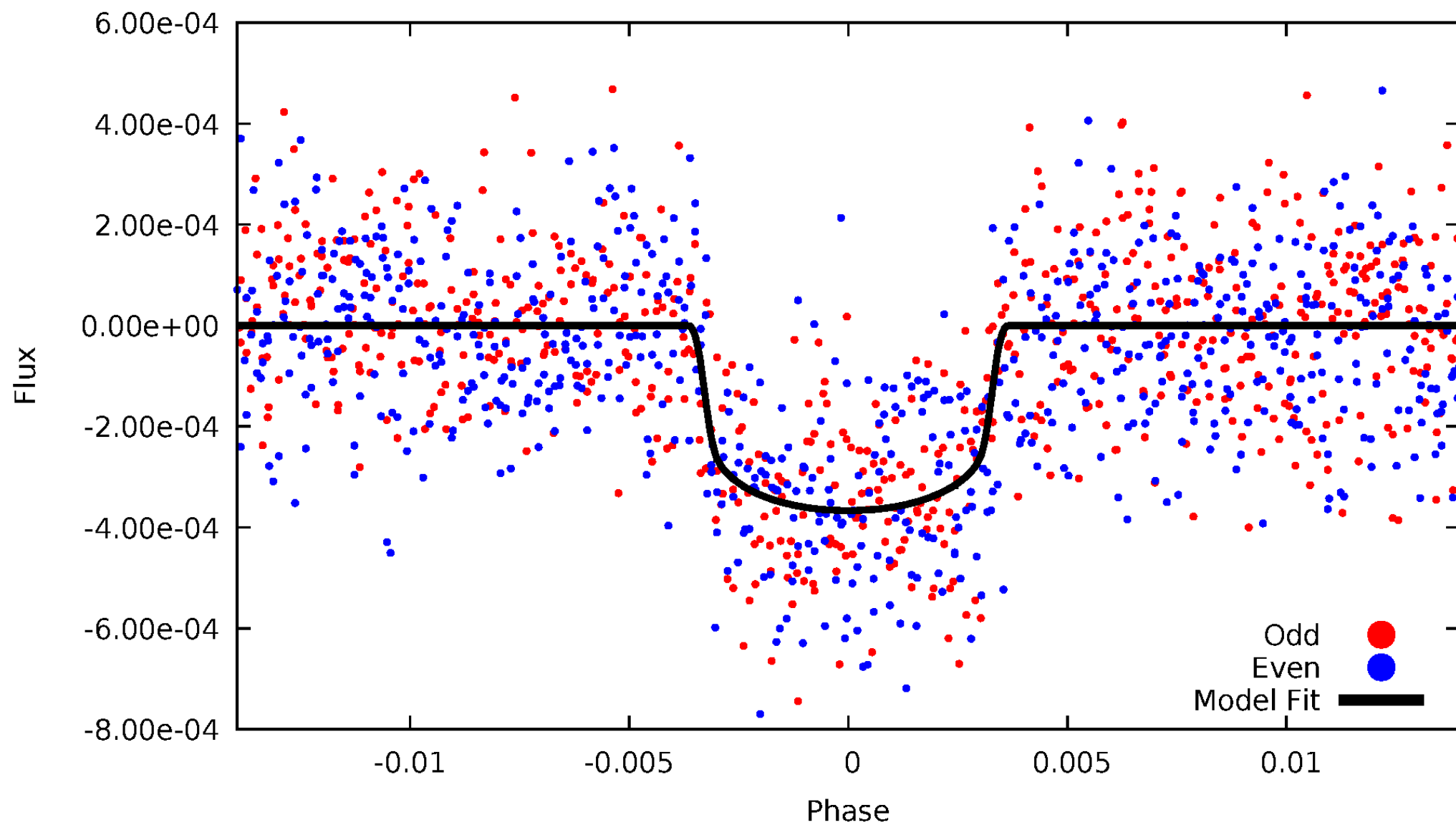


TCE 009904006-01



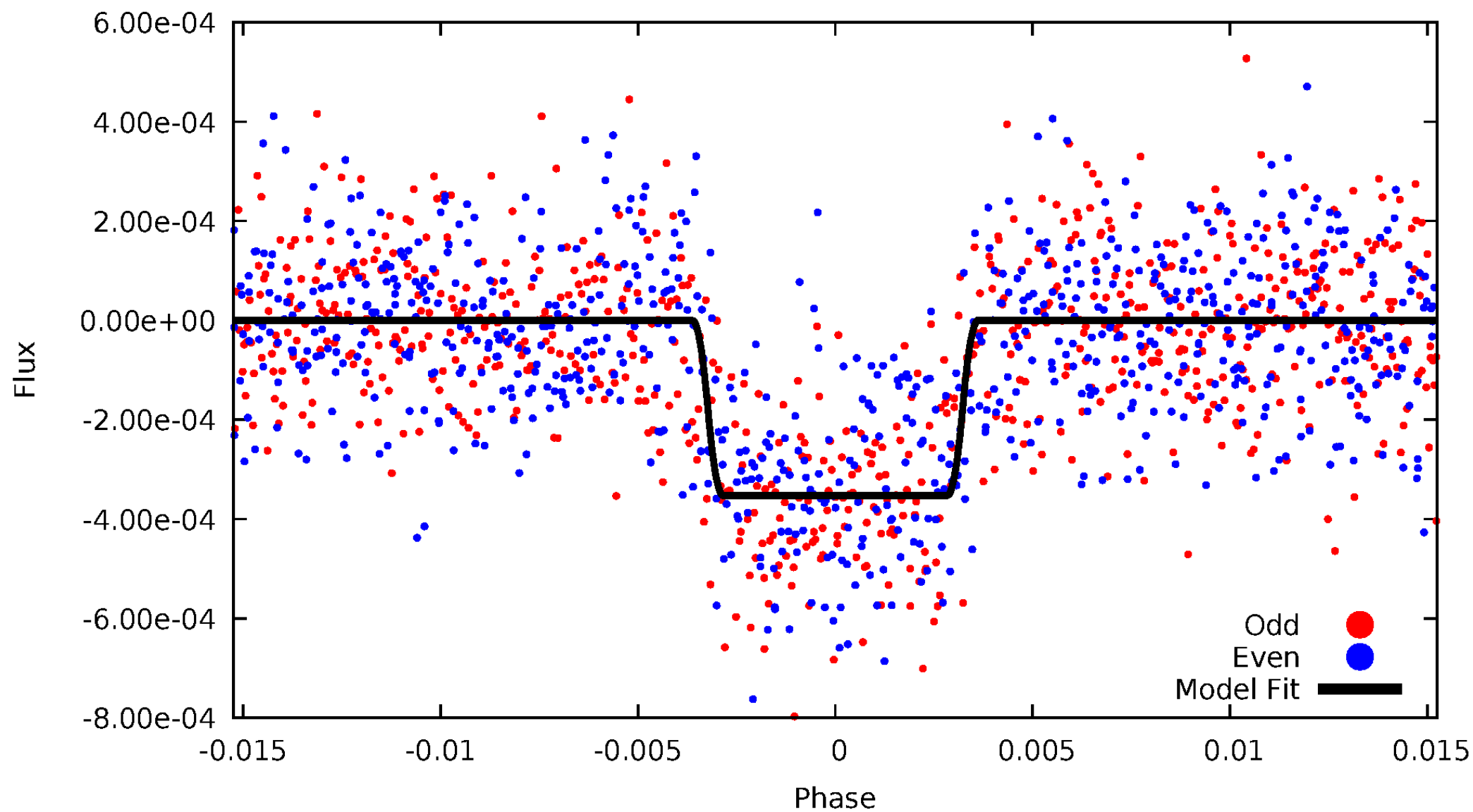
DV Odd/Even

TCE 009904006-01



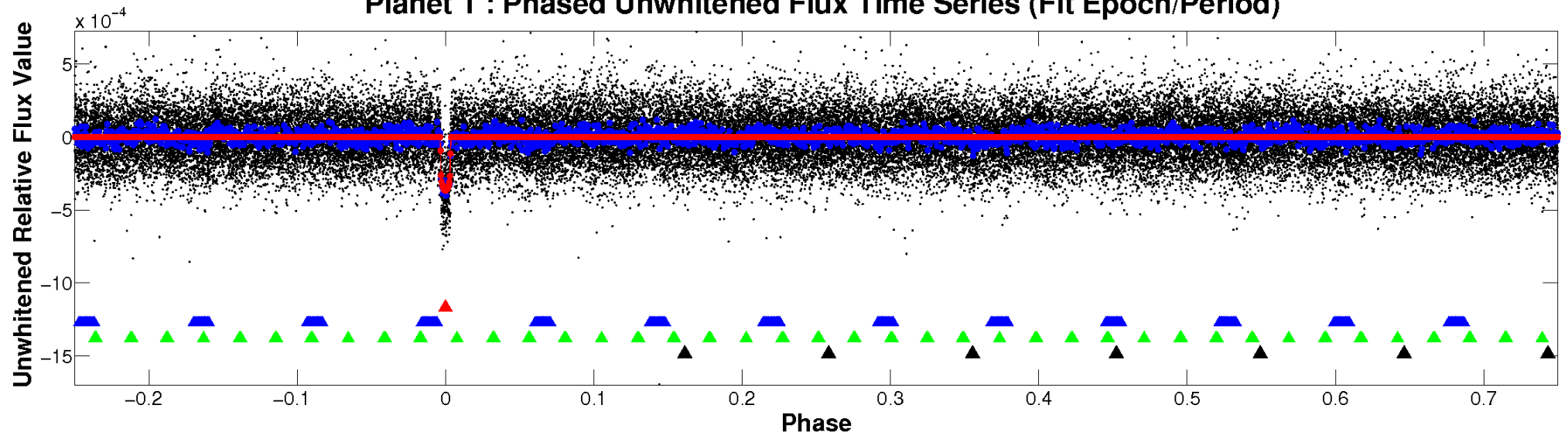
ALT Odd/Even

TCE 009904006-01

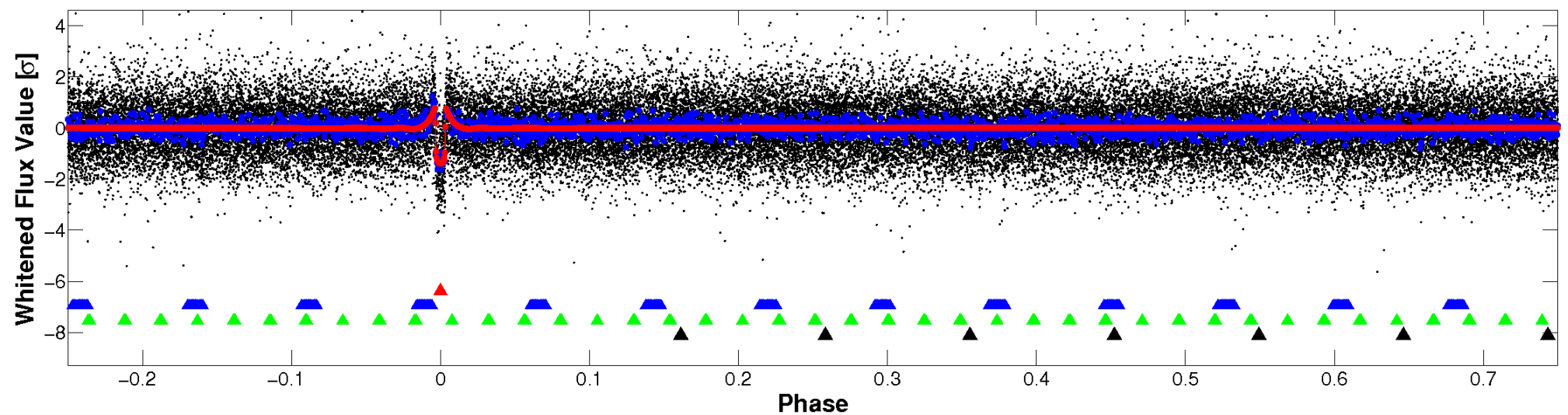


Non-Whitened Vs. Whitened Light Curve

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

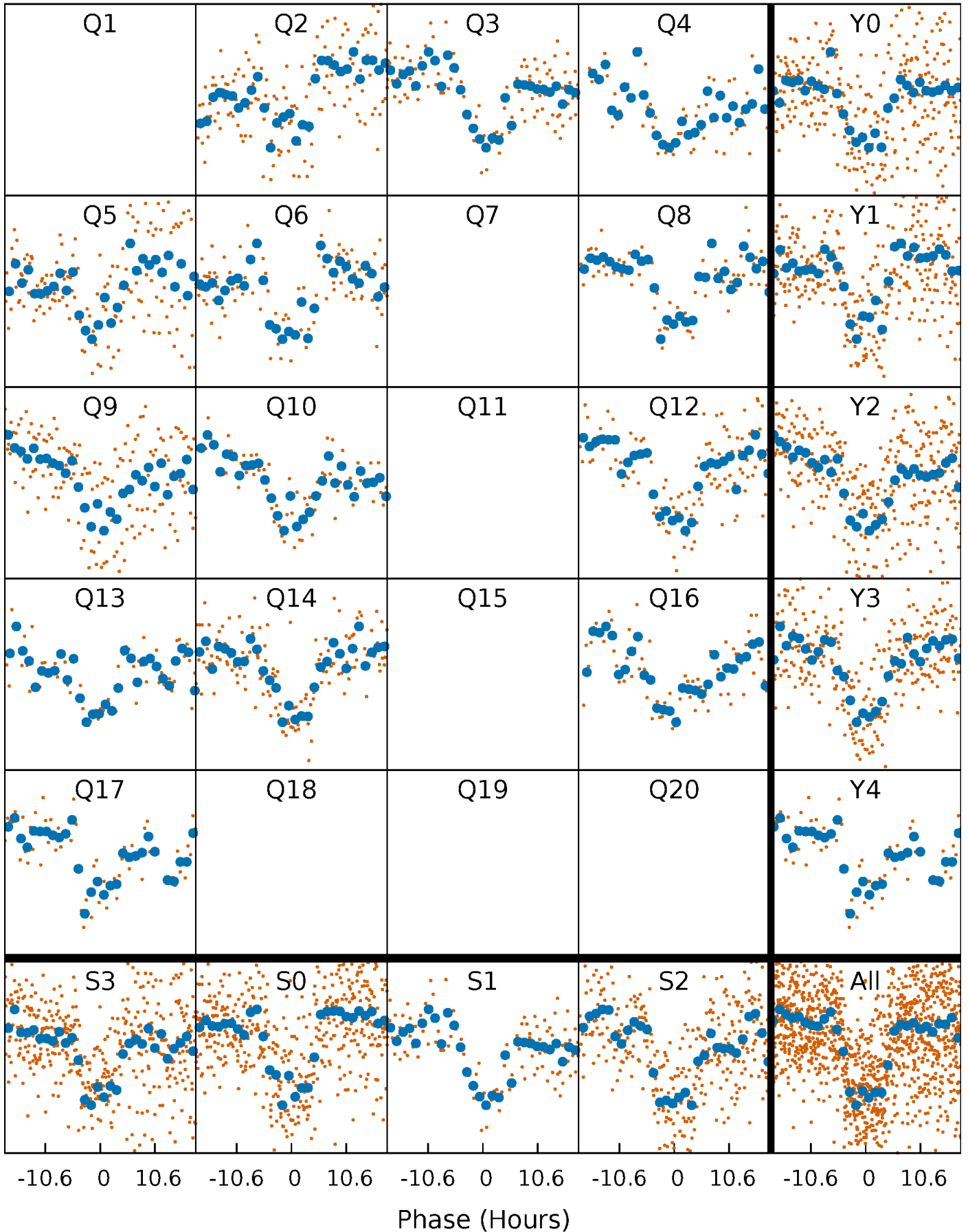


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



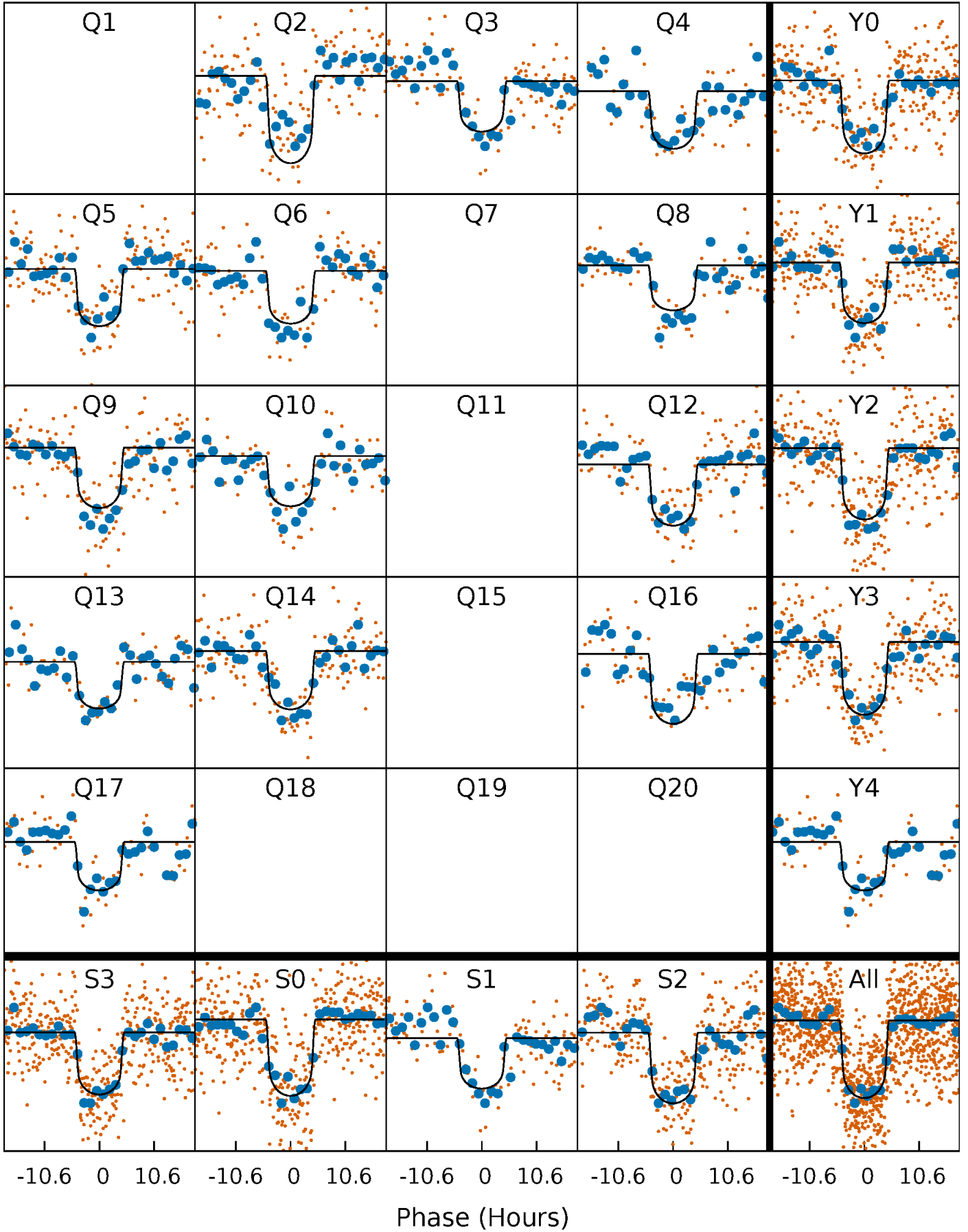
PDC Quarter-Phased Transit Curves

TCE 009904006-01 P= 55.186387 Days $T_0=180.760426$ (BKJD)



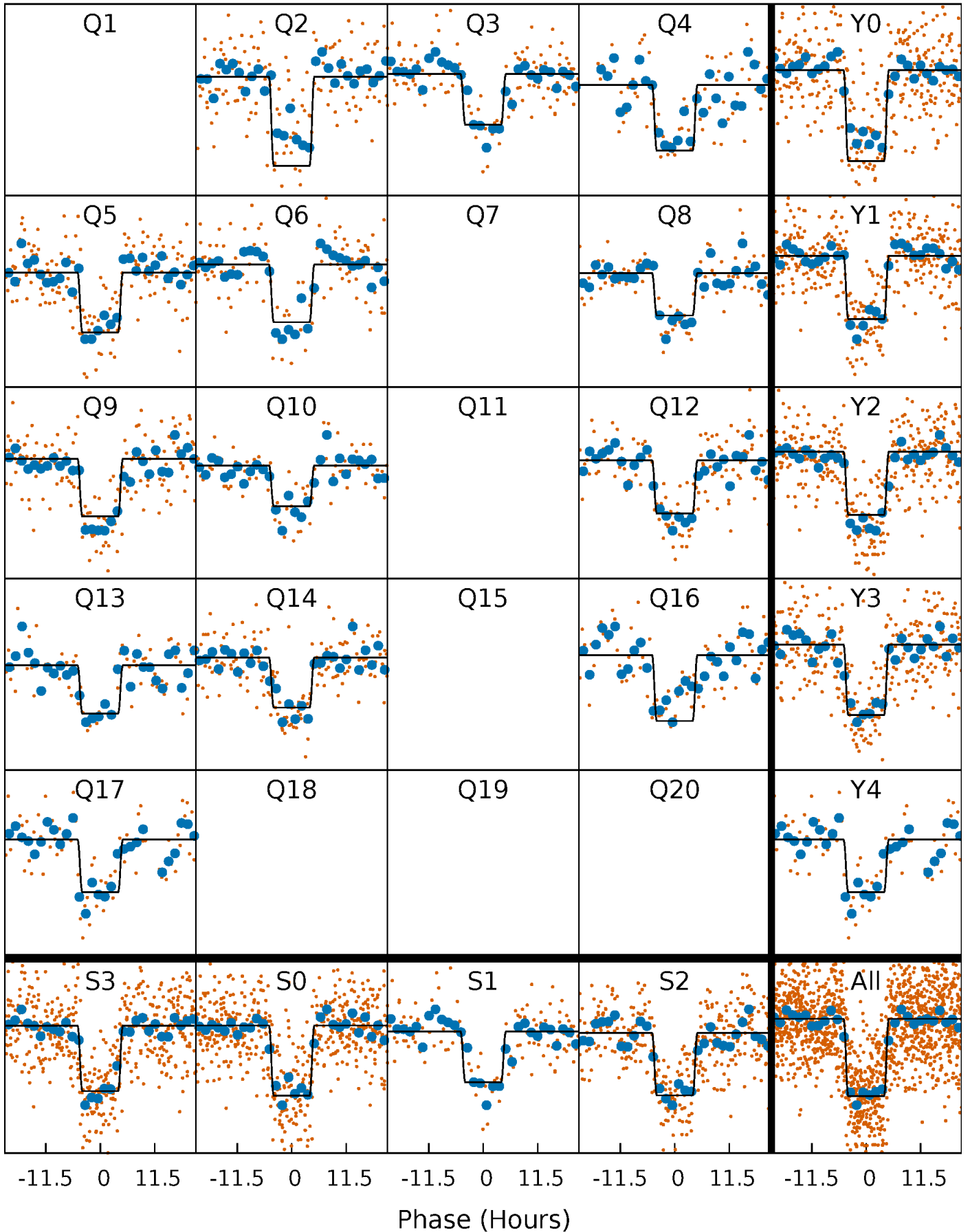
DV Quarter-Phased Transit Curves

TCE 009904006-01 P= 55.186387 Days $T_0=180.760426$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

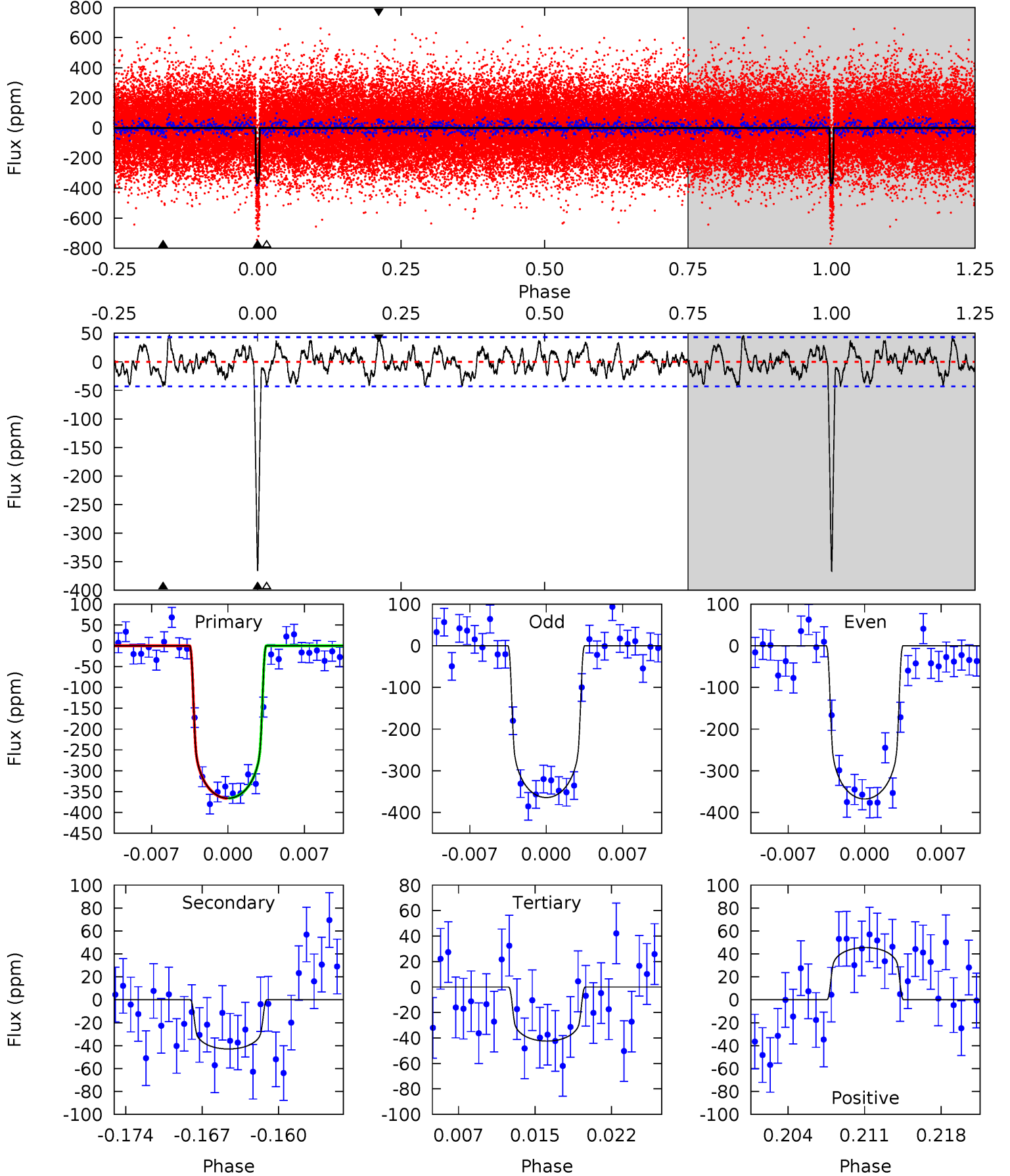
TCE 009904006-01 P= 55.187823 Days $T_0=180.747051$ (BKJD)



DV Model-Shift Uniqueness Test

009904006-01, P = 55.186387 Days, E = 125.574039 Days

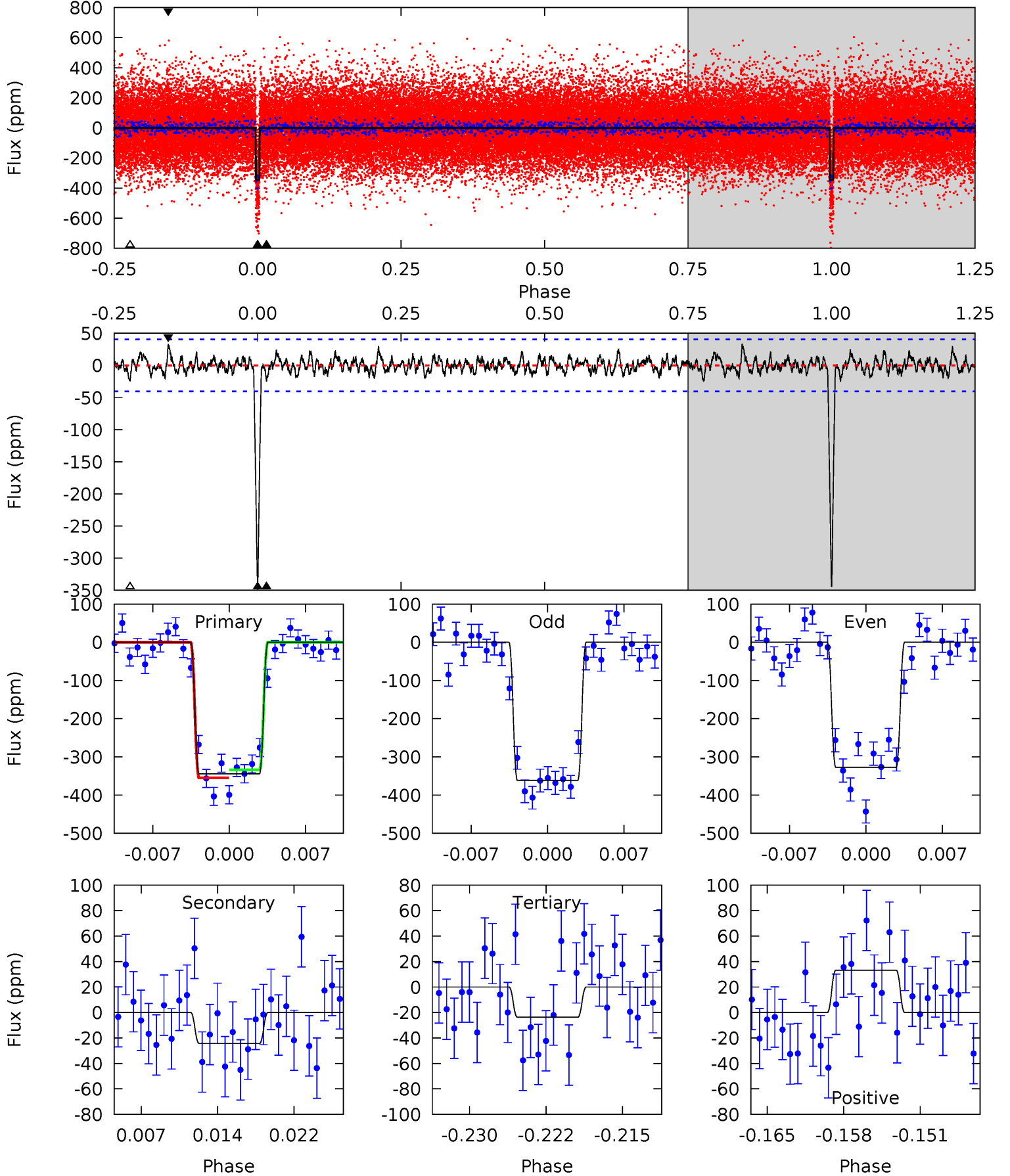
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 43.2 | 5.07 | 5.01 | 5.38 | 5.09 | 2.68 | 1.94 | 38.2 | 37.8 | 0.06 | -0.31 | 0.20 | 1.01 | 0.11 | 0.02 |



Alt Model-Shift Uniqueness Test

009904006-01, P = 55.187823 Days, E = 125.559228 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 43.4 | 3.07 | 2.99 | 4.18 | 5.09 | 2.69 | 1.10 | 40.4 | 39.2 | 0.07 | -1.12 | 2.18 | 1.00 | 0.09 | 1.32 |



Stellar Parameters For KIC 009904006

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | $R (R_{\odot})$ | $M(M_{\odot})$ | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|-------------------------------------------|
| | 6178^{+111}_{-135} | $4.269^{+0.125}_{-0.125}$ | $-0.040^{+0.150}_{-0.150}$ | $1.267^{+0.237}_{-0.178}$ | $1.085^{+0.113}_{-0.075}$ | $0.751^{+0.408}_{-0.264}$ |
| | +2%/-2% | +3%/-3% | +375%/-375% | +19%/-14% | +10%/-7% | +54%/-35% |
| Source | SPE58 | SPE58 | SPE58 | DSEP | | |

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

Secondary Eclipse Parameters for KIC 009904006-01 / KOI 2135.01

| Detrend | Depth (ppm) | $R_p (R_{\oplus})$ | $T_{max} (K)$ | $T_{obs} (K)$ | A_{obs} |
|---------|-------------|------------------------|-------------------|----------------------|--------------------|
| DV | -43 ± 8 | $2.72^{+0.38}_{-0.34}$ | 793^{+42}_{-36} | 3921^{+179}_{-184} | 272^{+110}_{-78} |
| Alt. | -24 ± 8 | $2.60^{+0.35}_{-0.32}$ | 793^{+40}_{-37} | 3607^{+200}_{-248} | 166^{+76}_{-62} |

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 $A_{obs} \gg 1.0$

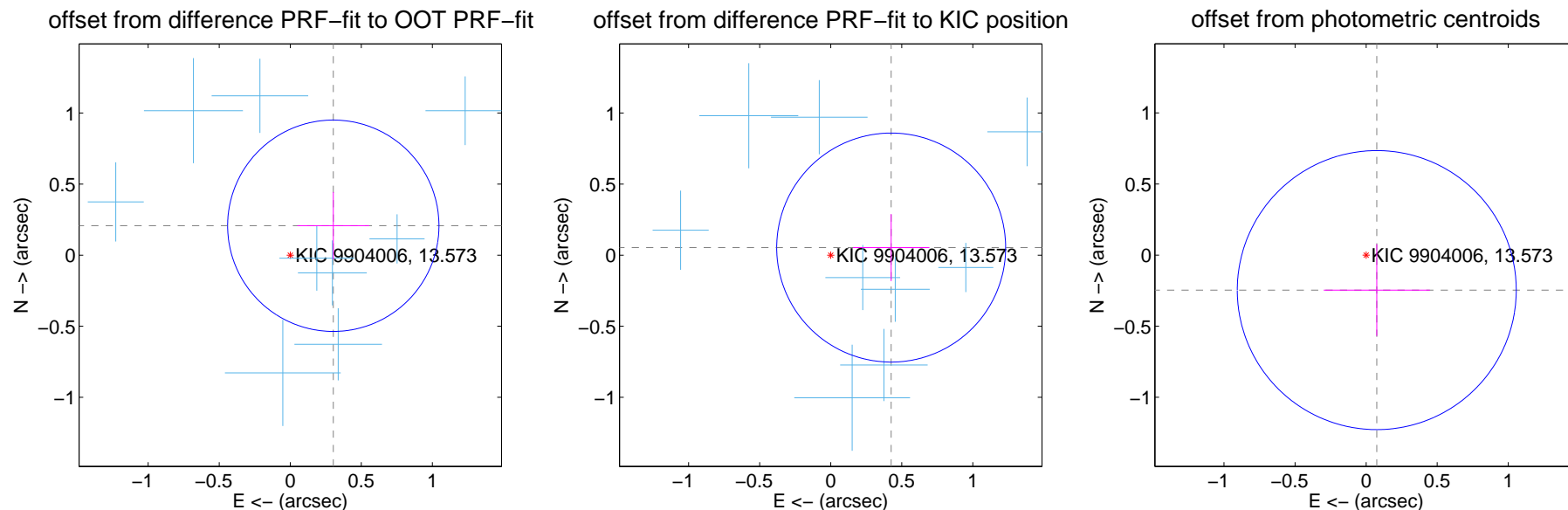
DV Centroid Data

Supplemental centroid analysis for 009904006-01. Kepler magnitude: 13.57. Transit SNR 24.25

There are 9 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.28 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|-----------------------------------------|--------------------|---------------------|--------------------|-------------------|
| PRF-fit source offset from OOT | 0.367 ± 0.248 | 1.48 | -0.303 ± 0.253 | 0.207 ± 0.237 |
| PRF-fit source offset from KIC position | 0.429 ± 0.269 | 1.60 | -0.425 ± 0.269 | 0.053 ± 0.236 |
| photometric centroid source offset | 0.26 ± 0.33 | 0.79 | -0.07 ± 0.37 | -0.25 ± 0.32 |



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.

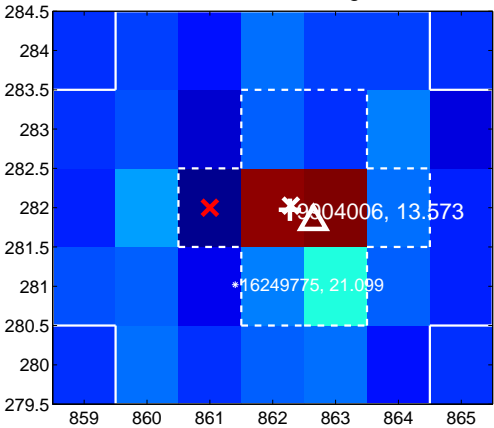
Q1 no difference image



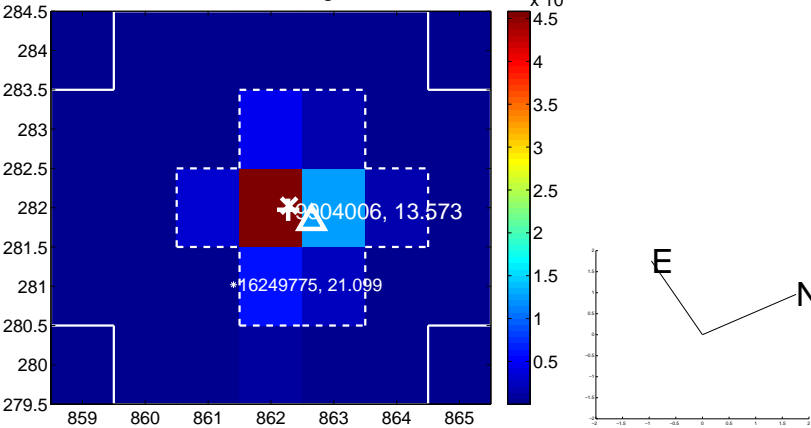
Q1 no OOT image



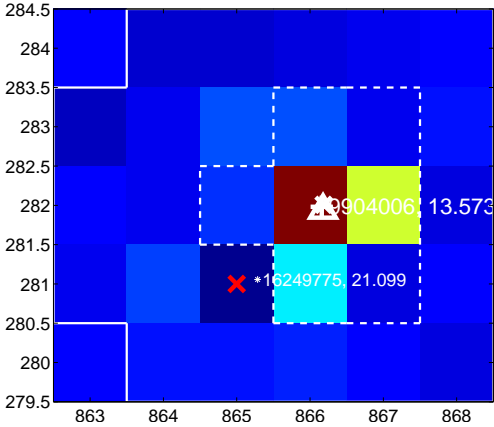
Q2 difference image



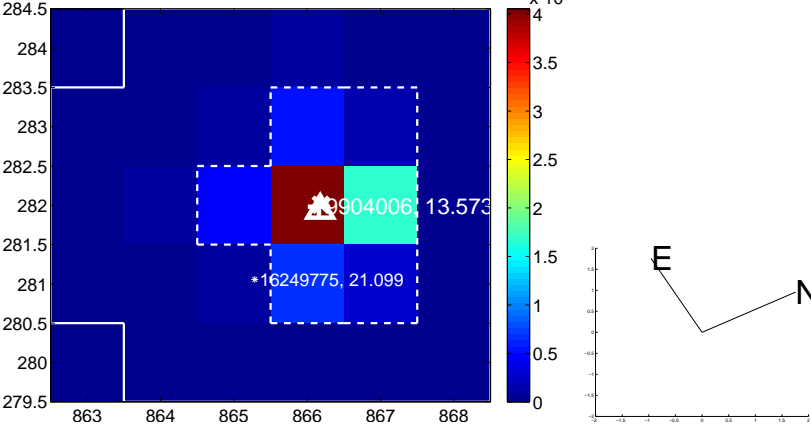
Q2 OOT image



Q3 difference image



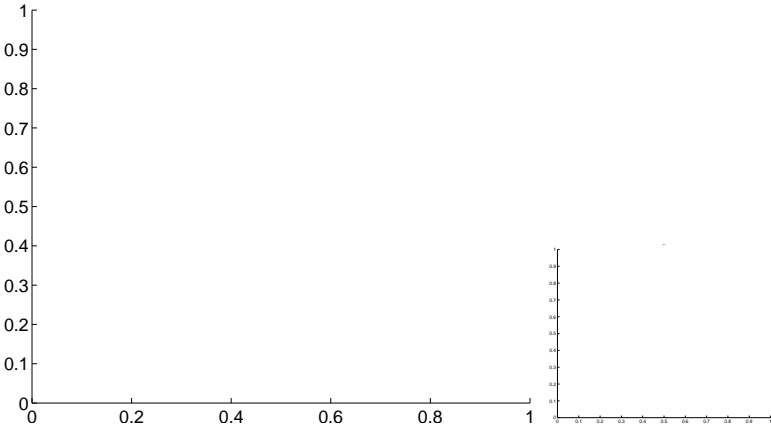
Q3 OOT image



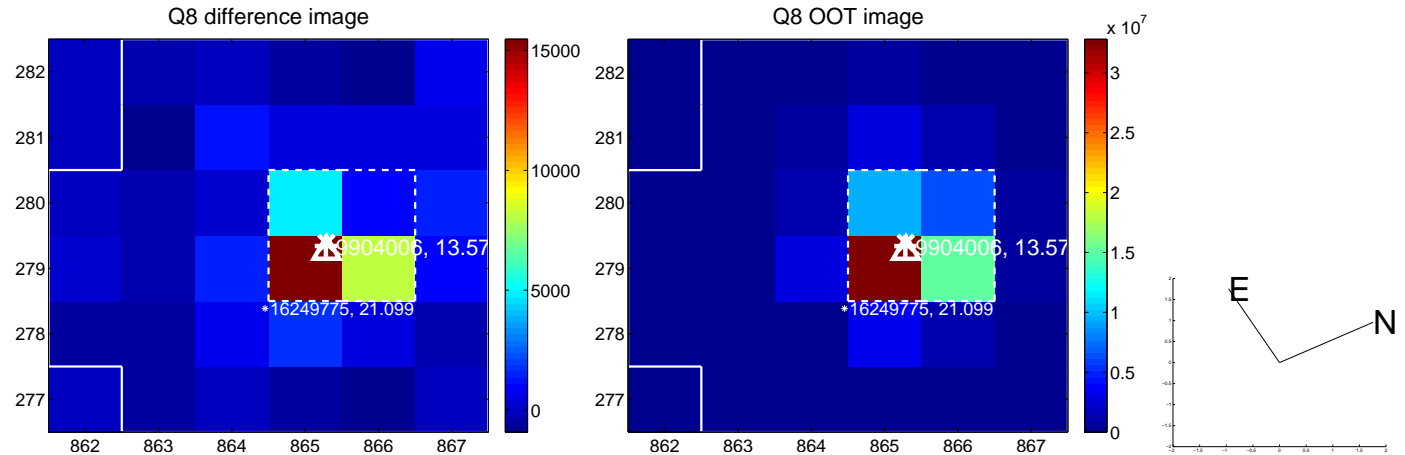
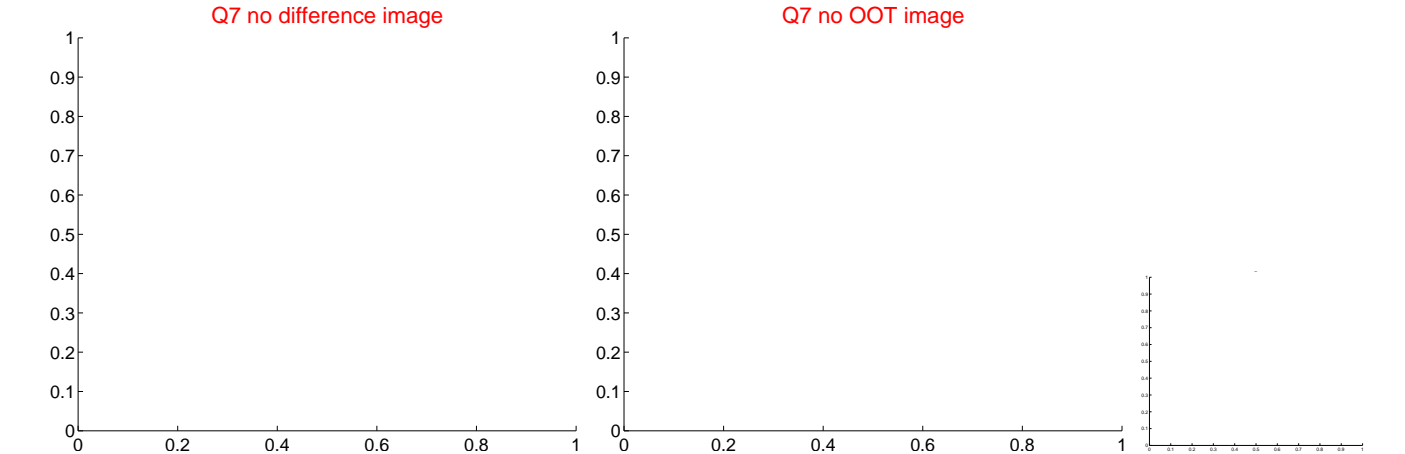
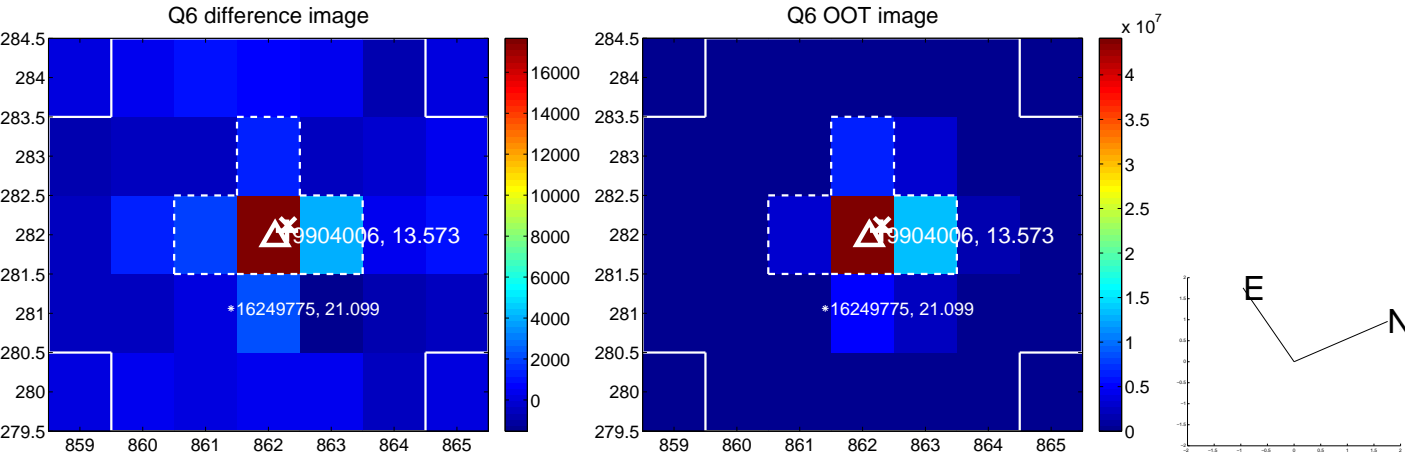
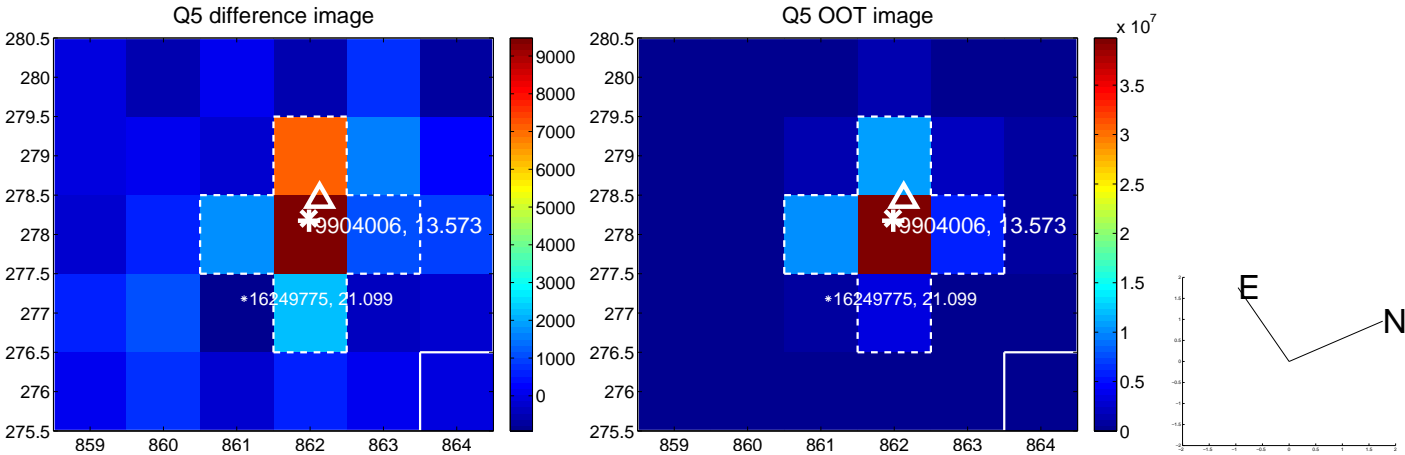
Q4 no difference image



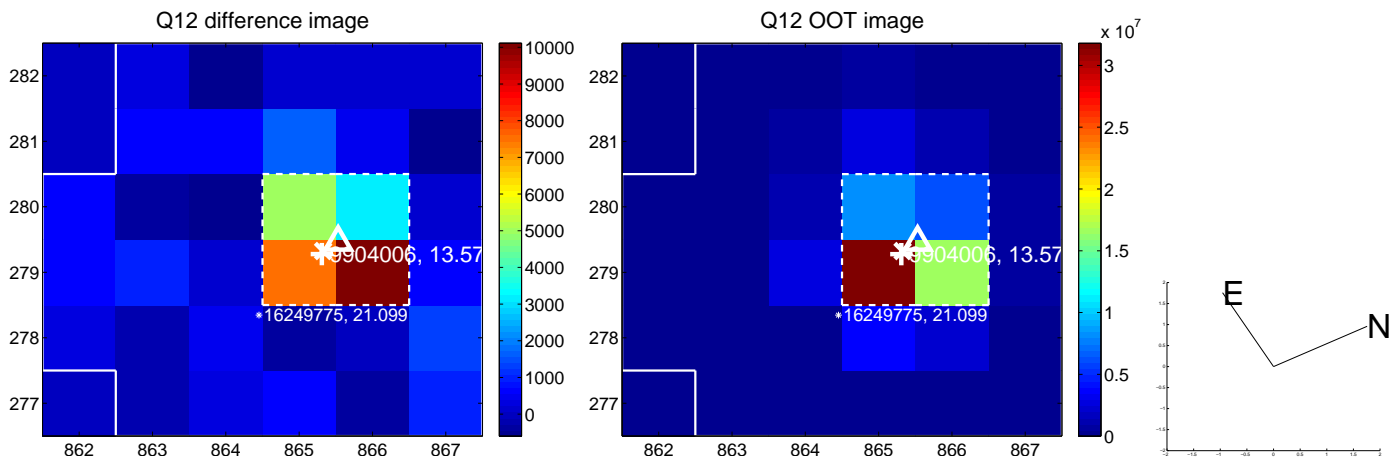
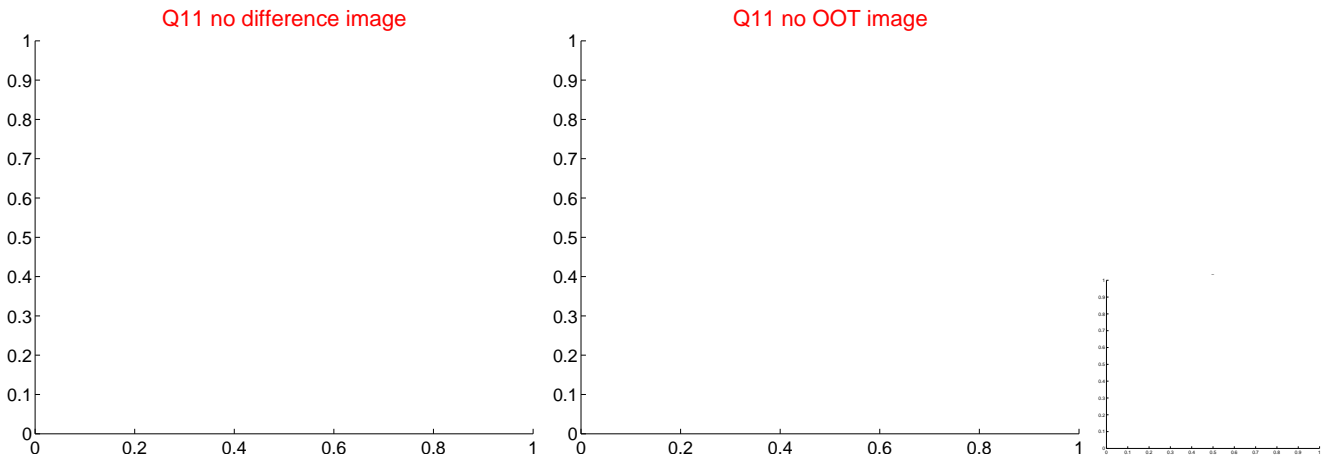
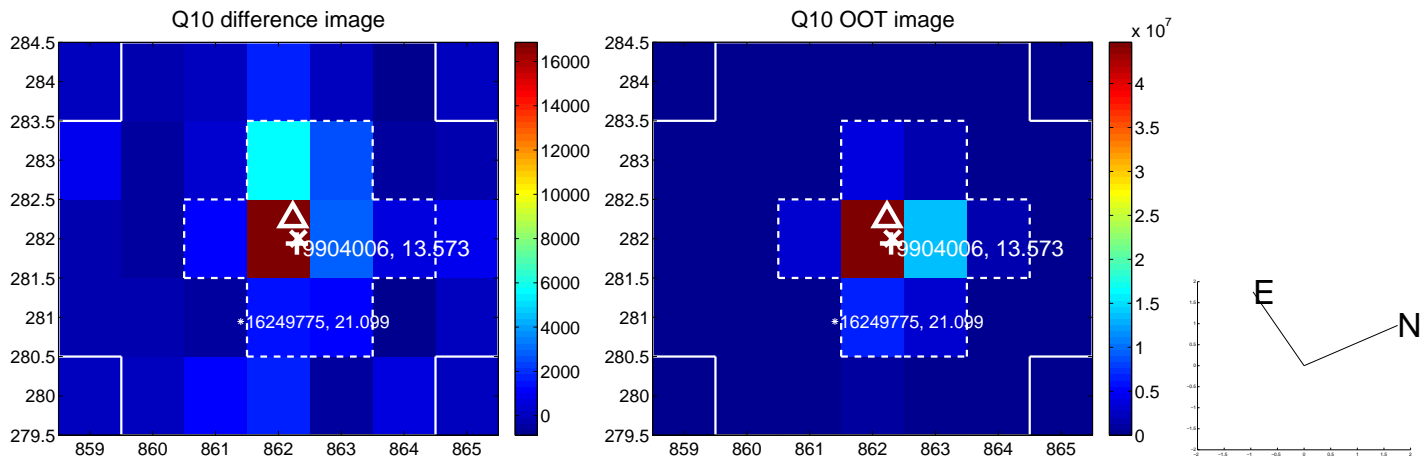
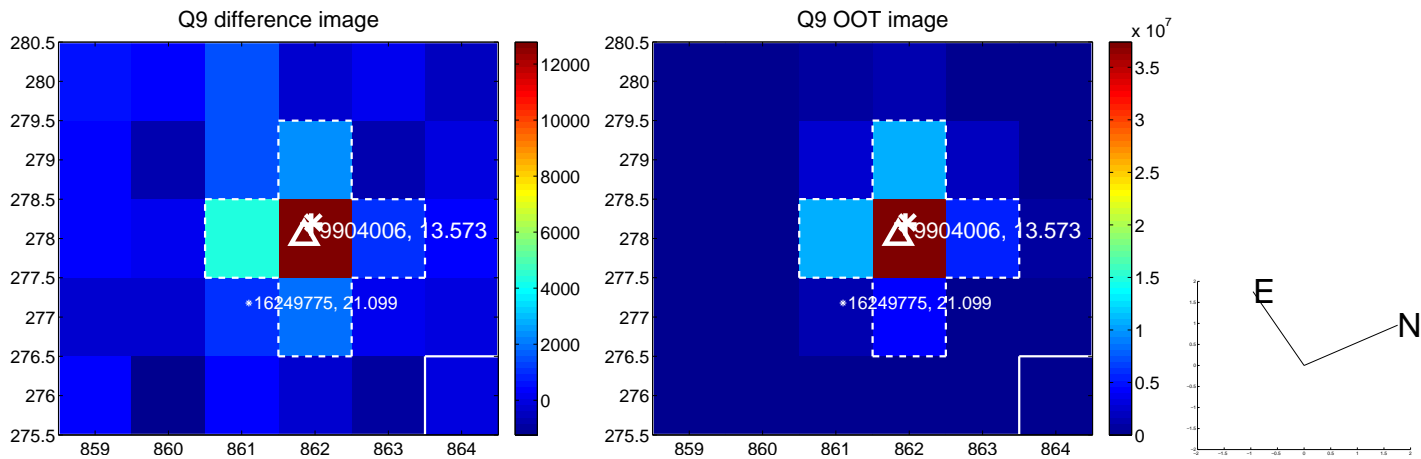
Q4 no OOT image



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.



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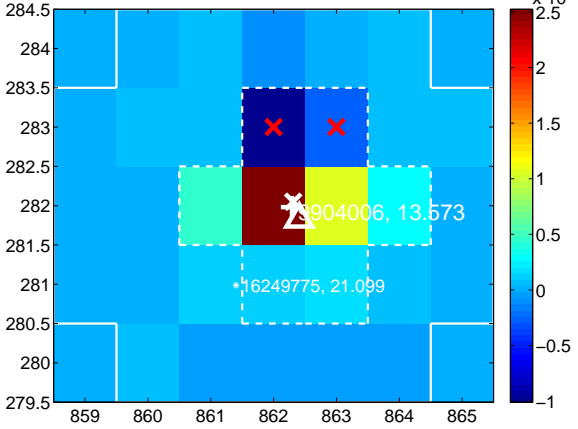
Q13 no difference image



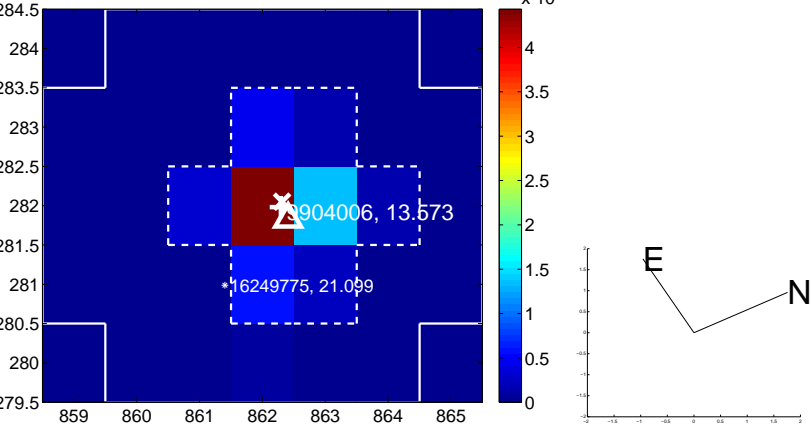
Q13 no OOT image



Q14 difference image



Q14 OOT image



Q15 no difference image



Q15 no OOT image



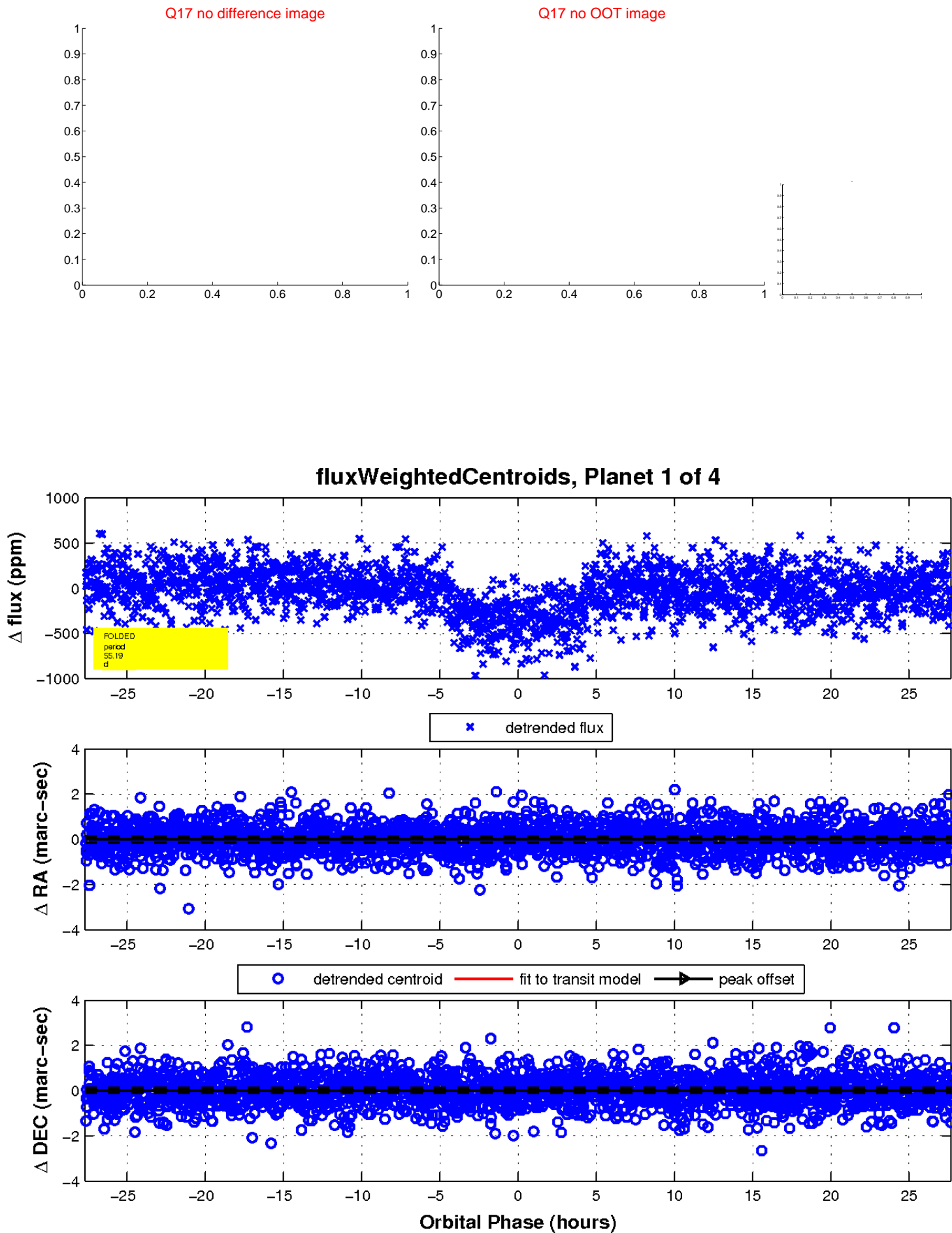
Q16 no difference image



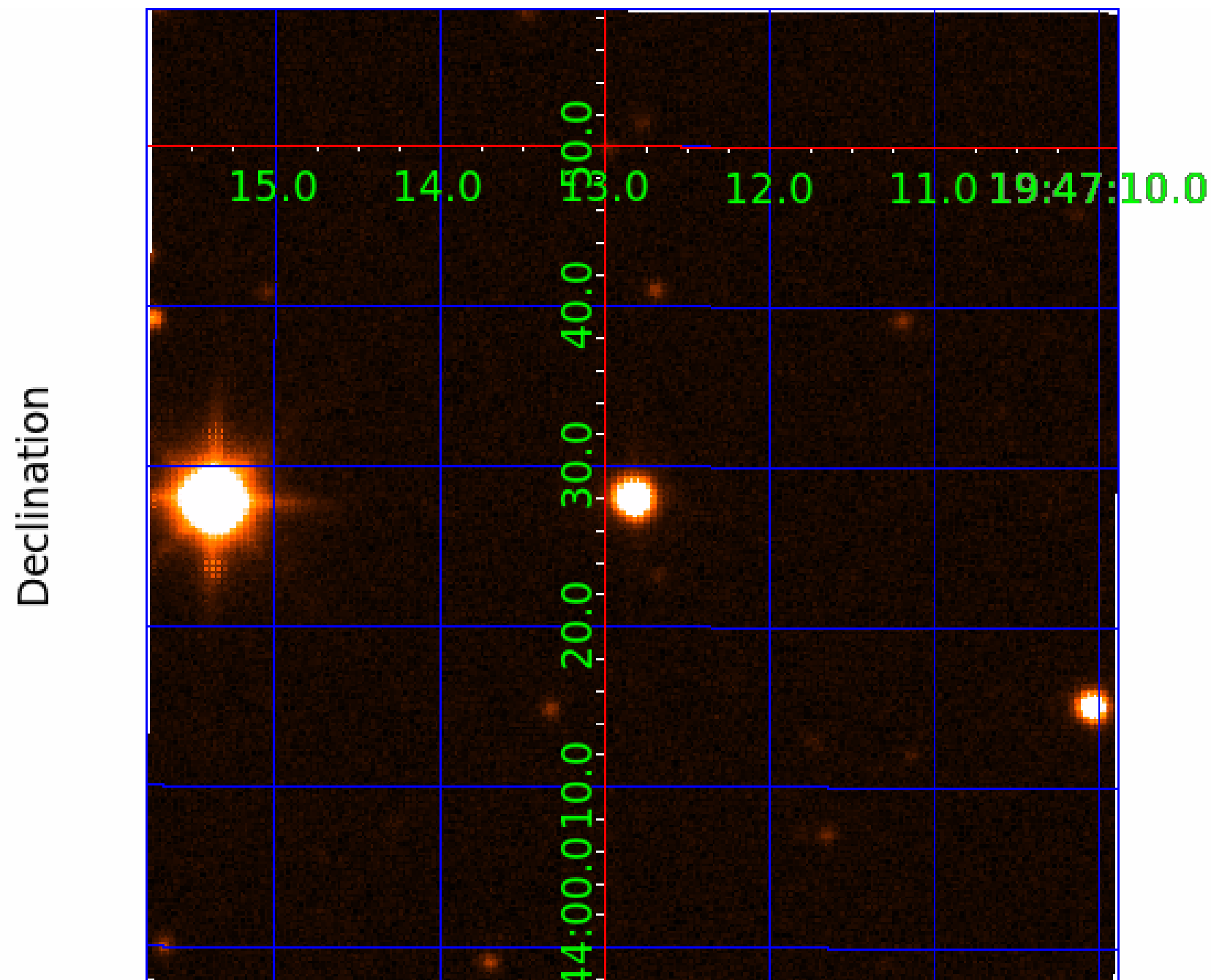
Q16 no OOT image



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



UKIRT Image



KIC 009904006

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}) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 009904006-01 | OBS | 2135.01 | 55.186387 | 180.760427 | 366.8 | 9.235 | 23.0 | 24.2 | 1.27 | 6178 | 2.69 | 24.61 |
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| 009904006-03 | OBS | 2135.02 | 20.188882 | 142.194851 | 94.8 | 6.462 | 10.5 | 10.2 | 1.27 | 6178 | 1.38 | 94.04 |
| 009904006-04 | OBS | No | 215.392731 | 221.783212 | 215.5 | 45.978 | 8.0 | 6.1 | 1.27 | 6178 | 1.90 | 4.00 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|-----------------------------------------------------------------------------------------------|
| 009904006-01 | OBS | PC | 0.98 | 0 | 0 | 0 | 0 | NO_COMMENT |
| 009904006-02 | OBS | PC | 1.00 | 0 | 0 | 0 | 0 | NO_COMMENT |
| 009904006-03 | OBS | PC | 1.00 | 0 | 0 | 0 | 0 | NO_COMMENT |
| 009904006-04 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_MARSHALL—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS |

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

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

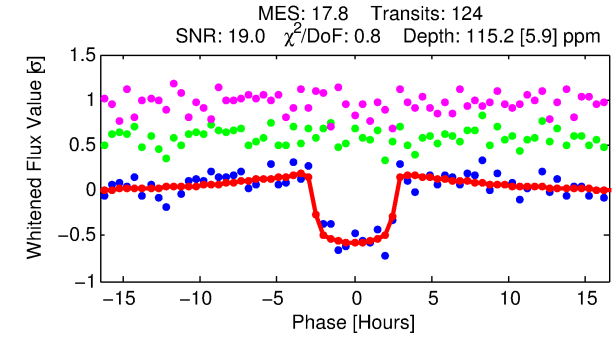
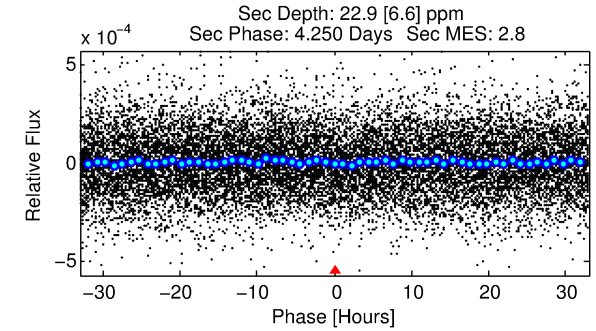
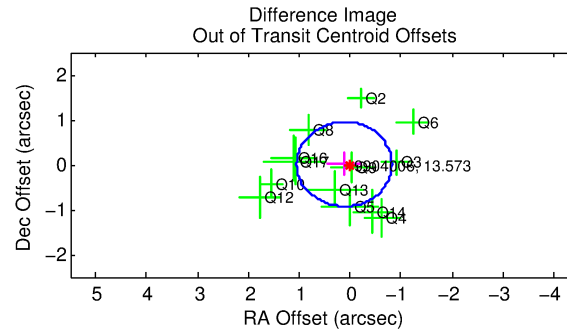
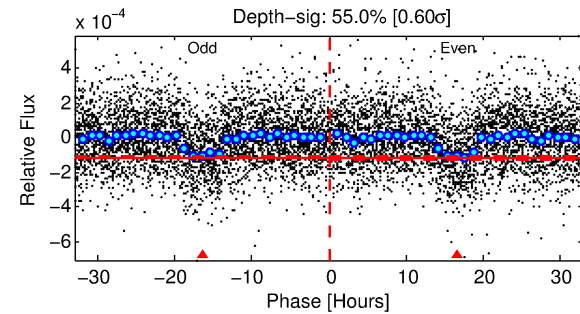
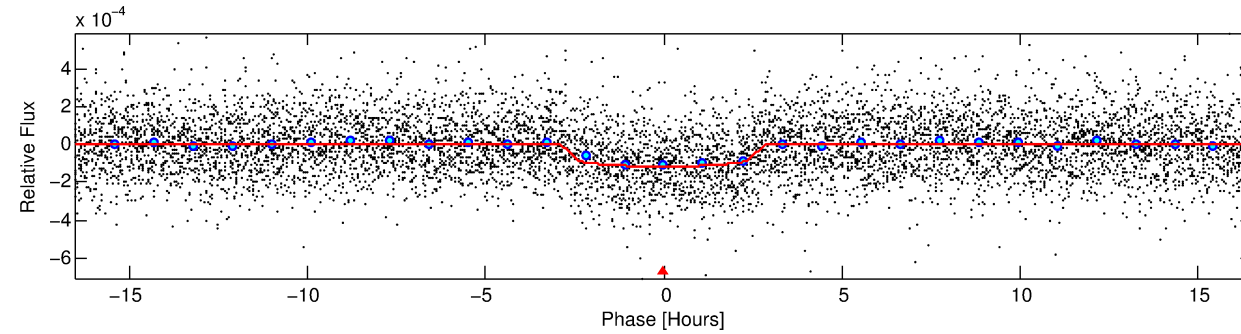
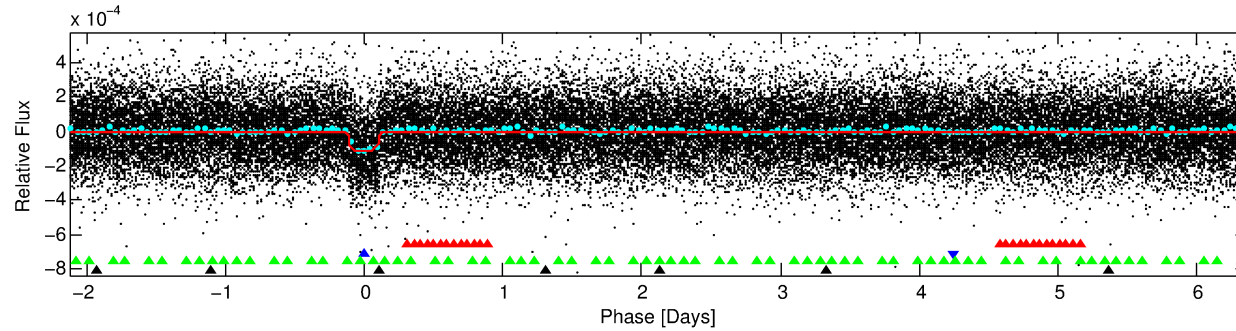
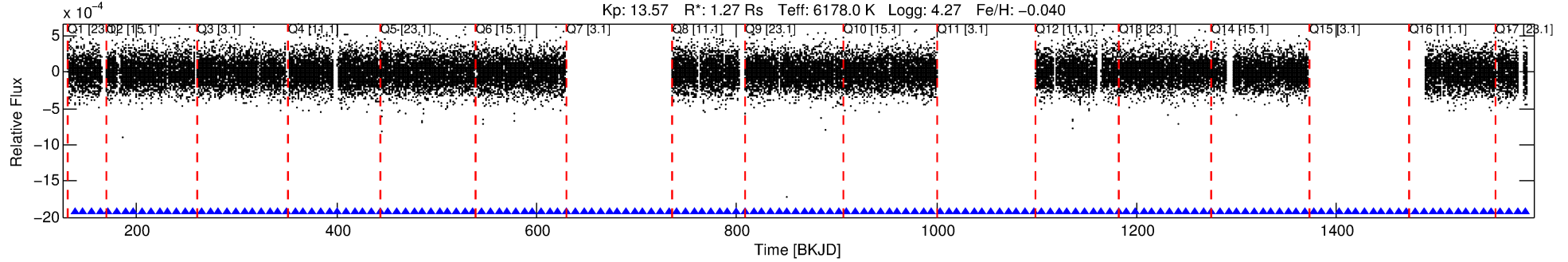
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 009904006-02

No Significant Match Found

DV One-Page Summary

KIC: 9904006 Candidate: 2 of 4 Period: 8.487 d
KOI: K02135.03 Name: Kepler-361b Corr: 0.978



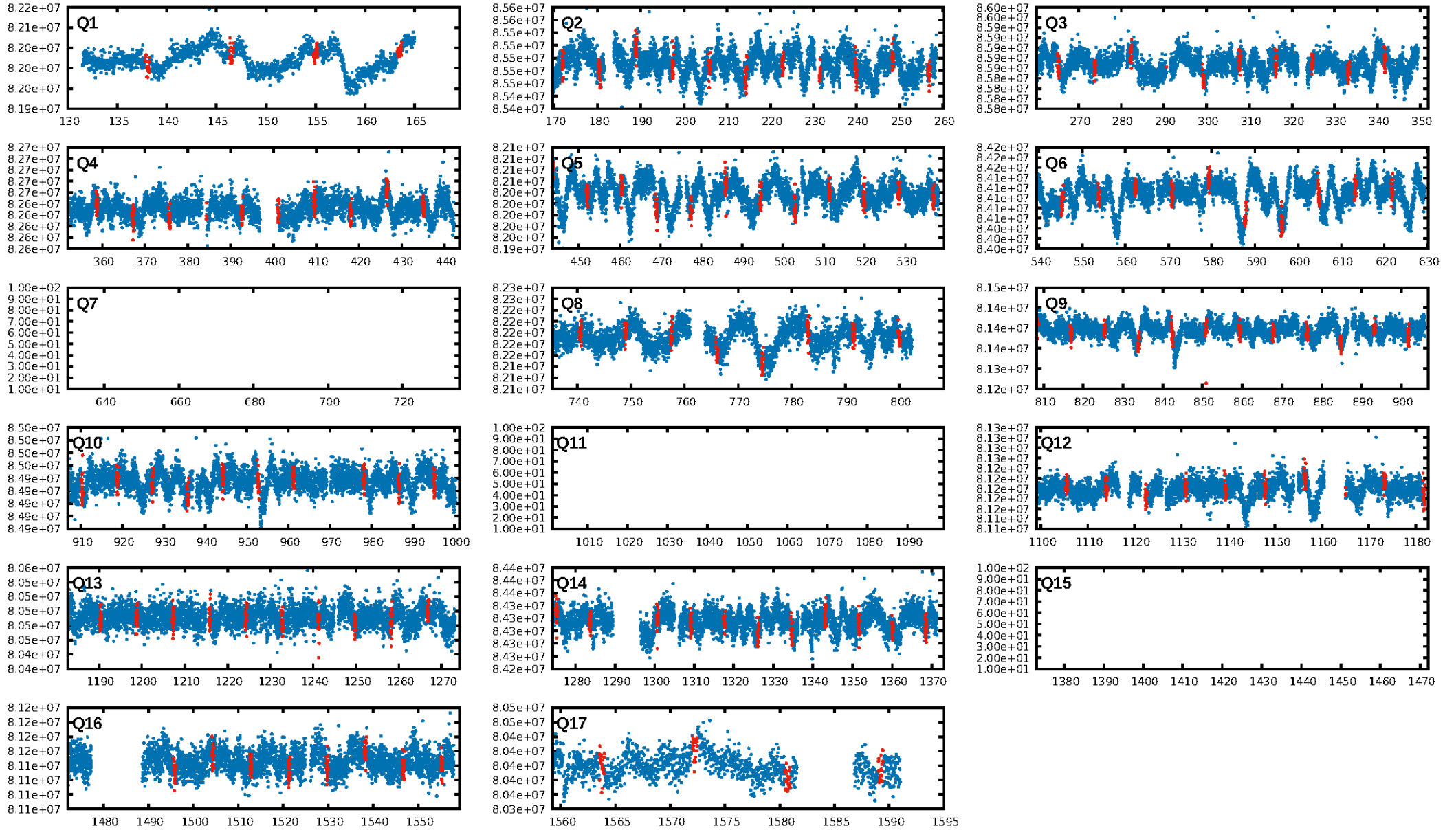
DV Fit Results:

Period = 8.48652 [0.00004] d
Epoch = 138.0168 [0.0040] BKJD
Rp/R* = 0.0113 [0.0024]
a/R* = 6.24 [6.78]
b = 0.86 [0.33]
Seff = 298.65 [73.16]
Teq = 1060 [65] K
Rp = 1.56 [0.44] Re
a = 0.0838 [0.0132] AU
Ag = 36.44 [20.55] [1.72 σ]
Teffp = 4027 [526] K [5.59 σ]

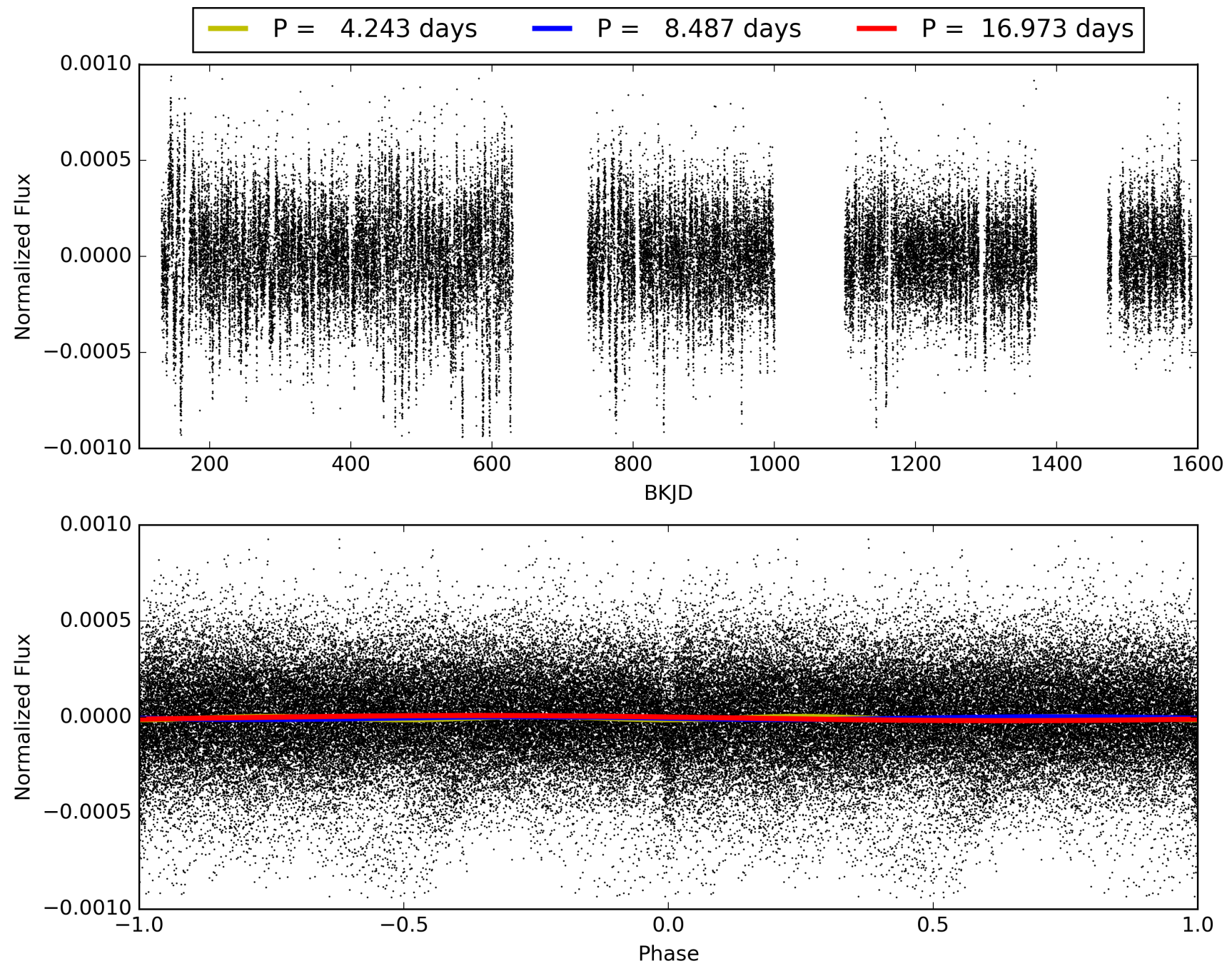
DV Diagnostic Results:

ShortPeriod-sig: N/A
LongPeriod-sig: 100.0% [33.08 σ]
ModelChiSquare2-sig: 100.0%
ModelChiSquareGof-sig: 100.0%
Bootstrap-pfa: 7.10e-72
RollingBand-fgt: 1.00 [116/116]
GhostDiagnostic-chr: 143.5
Centroid-sig: 8.2%
Centroid-so: 0.478 arcsec [0.93 σ]
OotOffset-rm: 0.115 arcsec [0.37 σ]
KicOffset-rm: 0.068 arcsec [0.27 σ]
OotOffset-st: 4/1/4/4 [13]
KicOffset-st: 4/1/4/4 [13]
DiffImageQuality-fgm: 1.00 [13/13]
DiffImageOverlap-fno: 1.00 [14/14]

TCE 009904006-02, PDC Light Curves

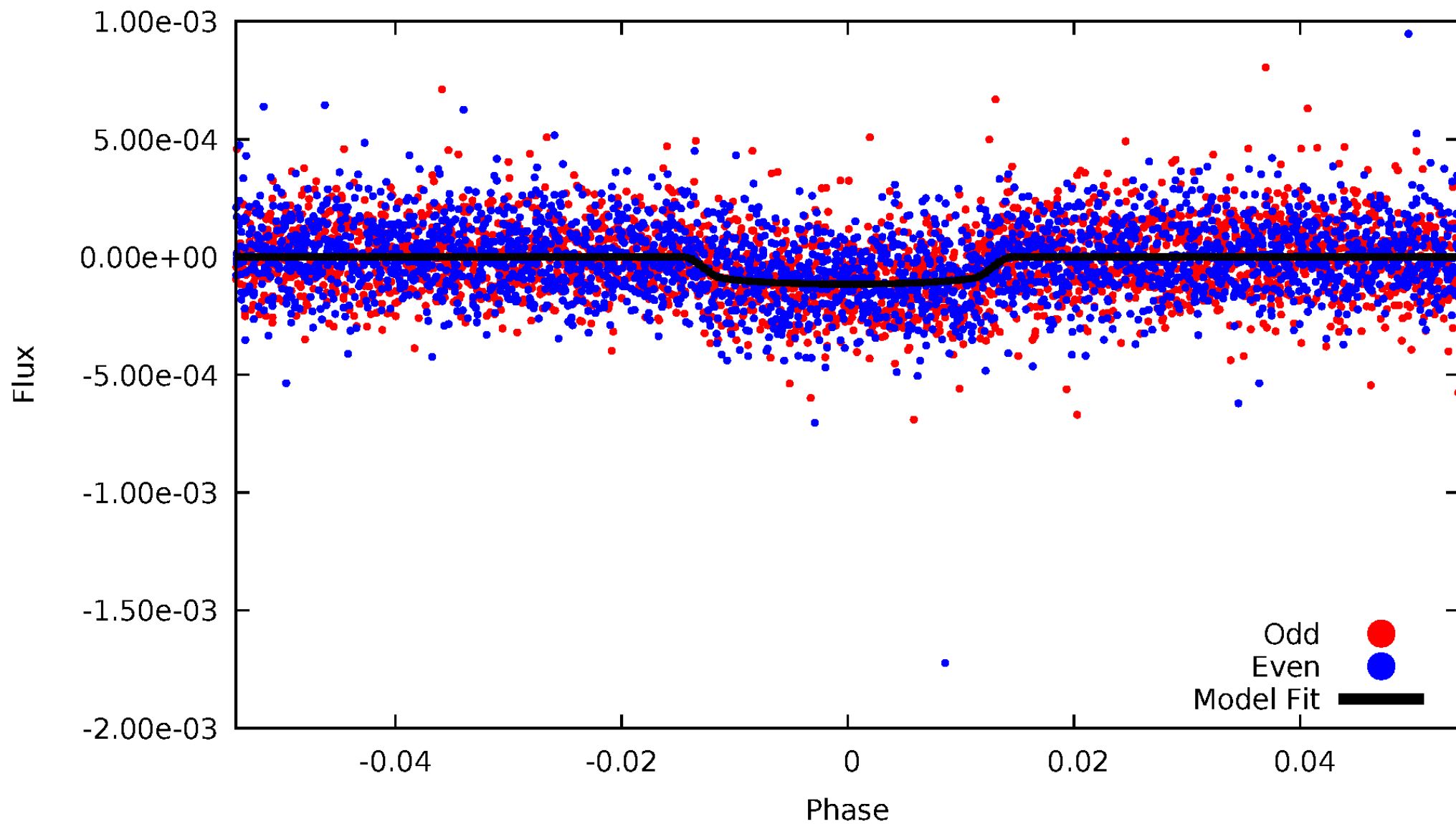


TCE 009904006-02



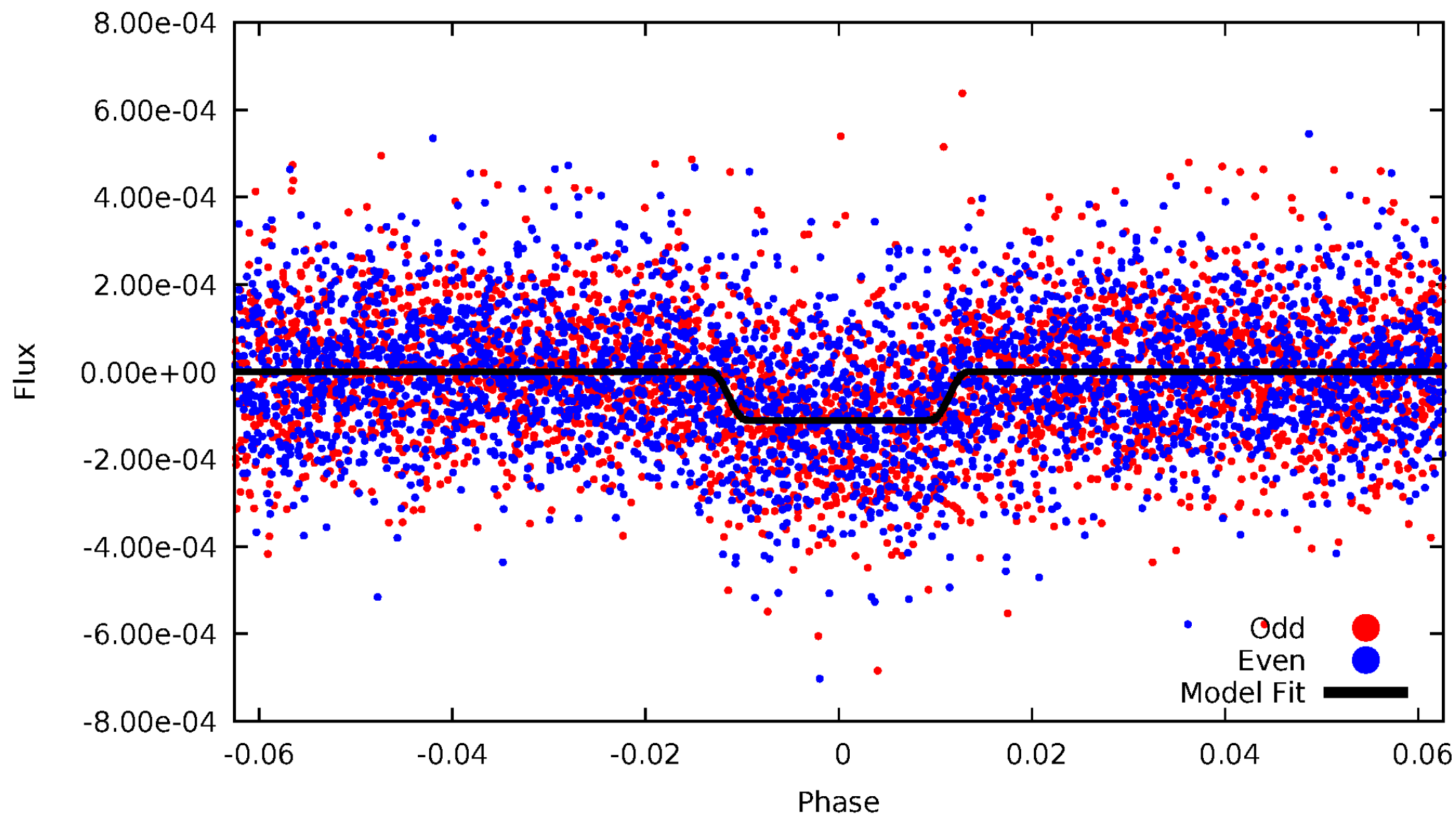
DV Odd/Even

TCE 009904006-02



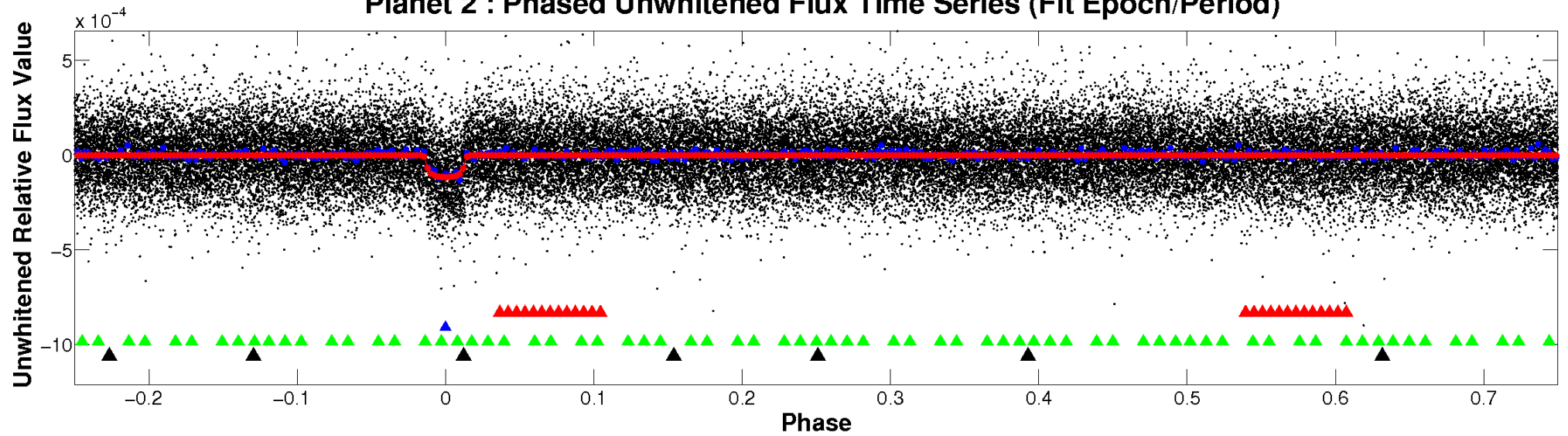
ALT Odd/Even

TCE 009904006-02

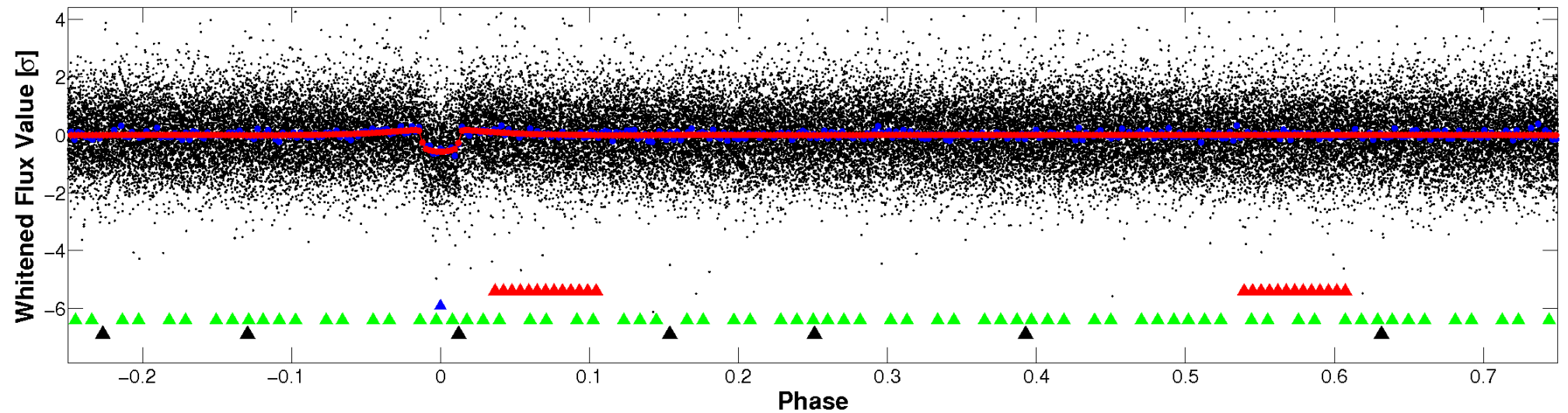


Non-Whitened Vs. Whitened Light Curve

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

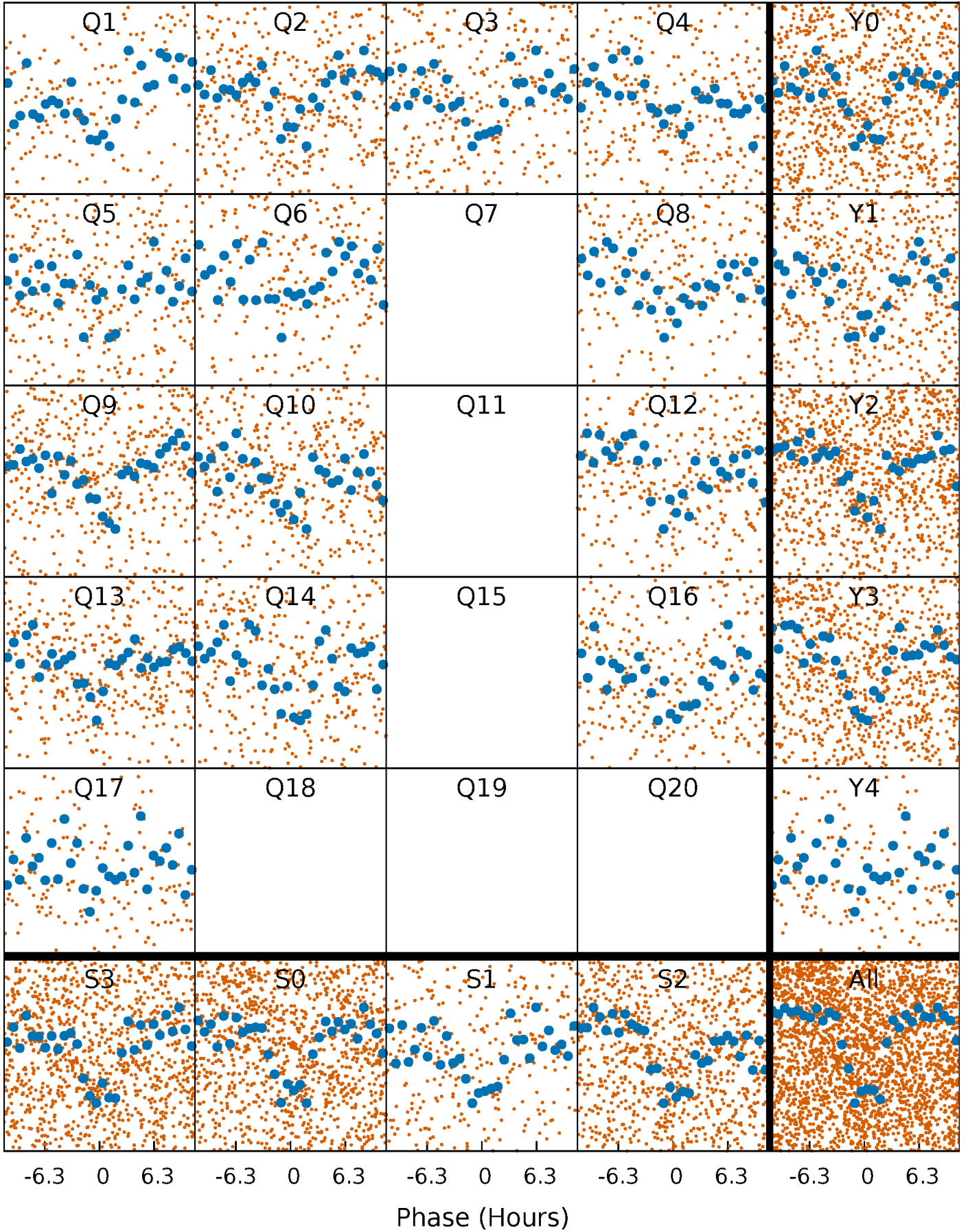


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



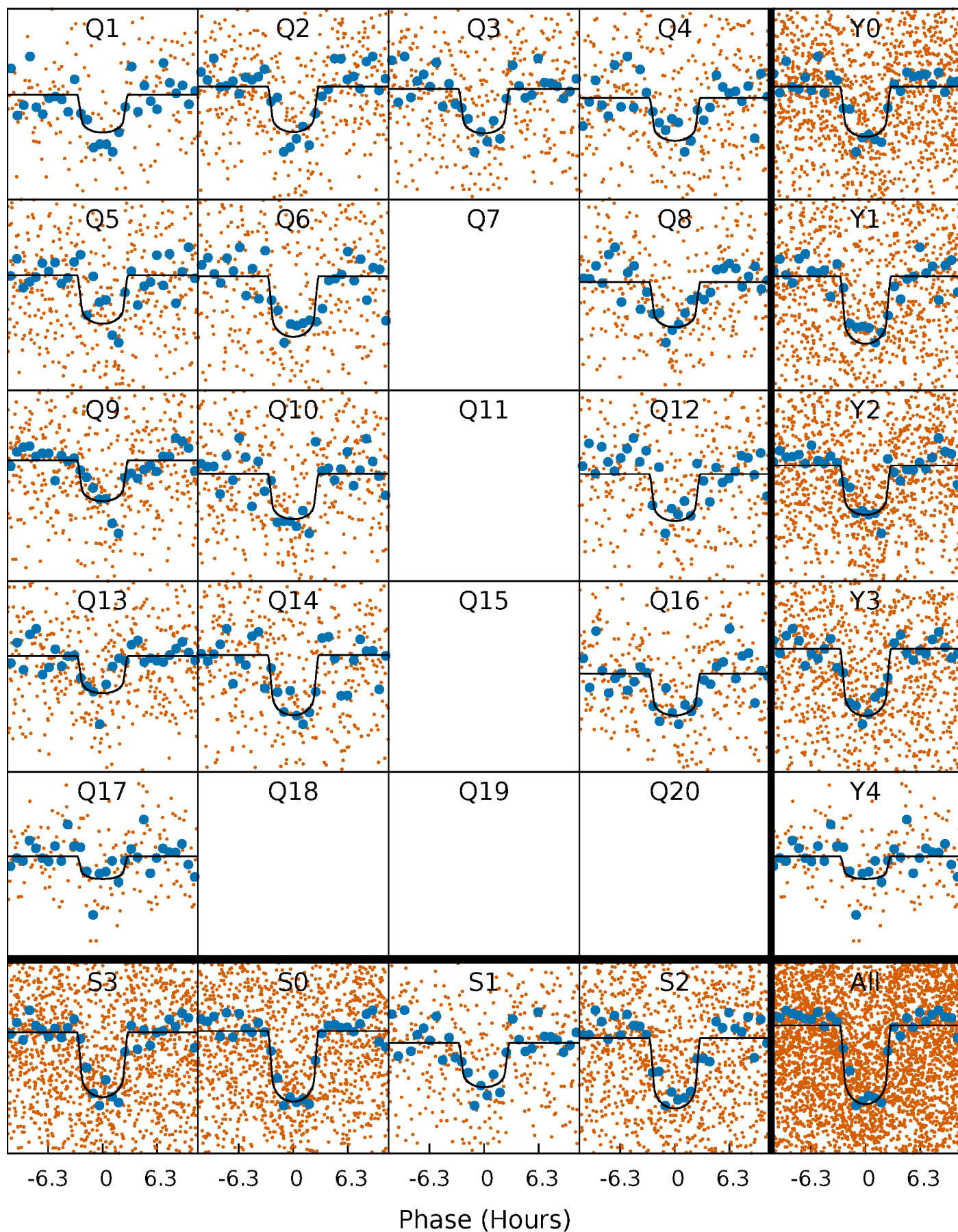
PDC Quarter-Phased Transit Curves

TCE 009904006-02 P= 8.486522 Days $T_0=138.016791$ (BKJD)



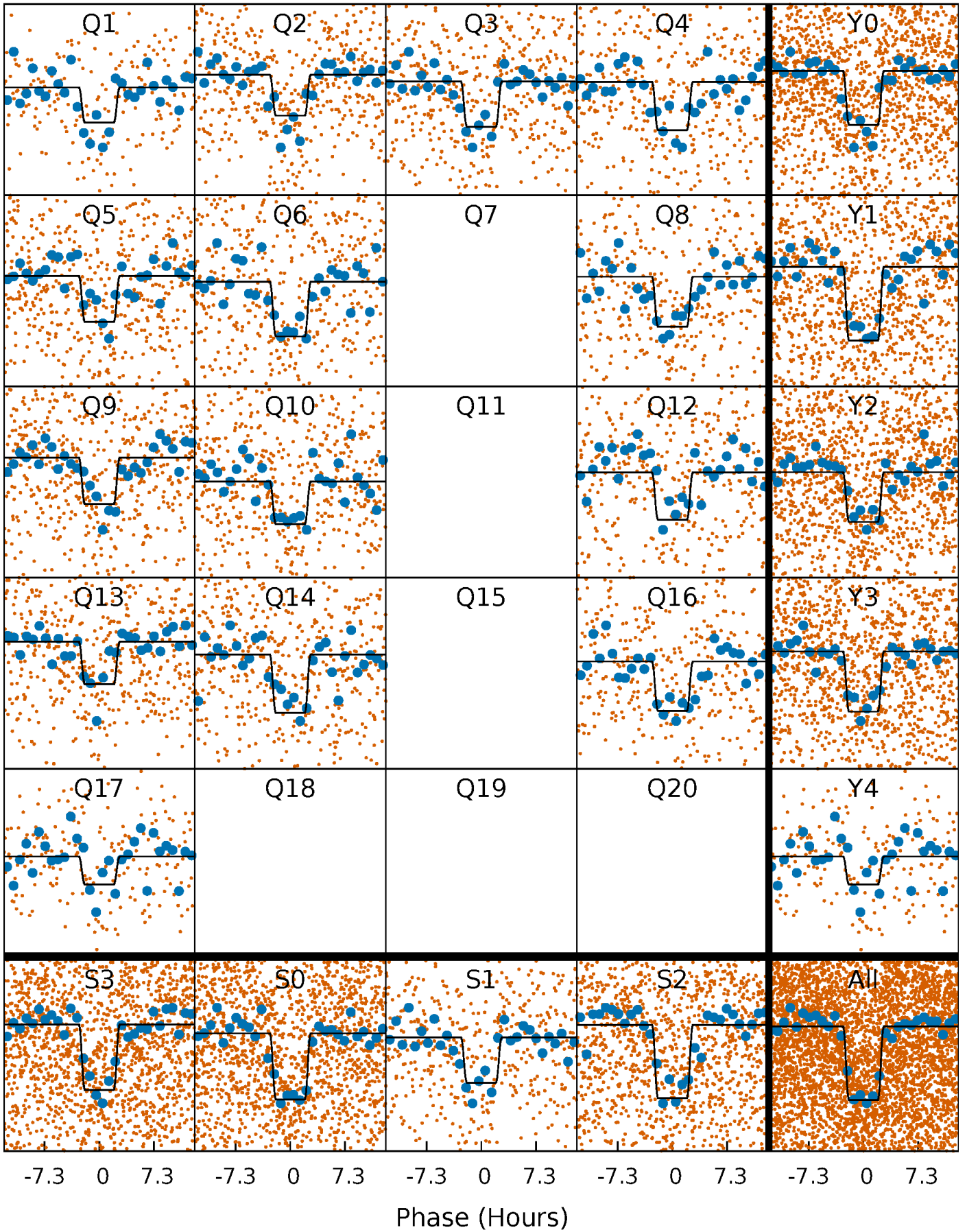
DV Quarter-Phased Transit Curves

TCE 009904006-02 P= 8.486522 Days $T_0=138.016791$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

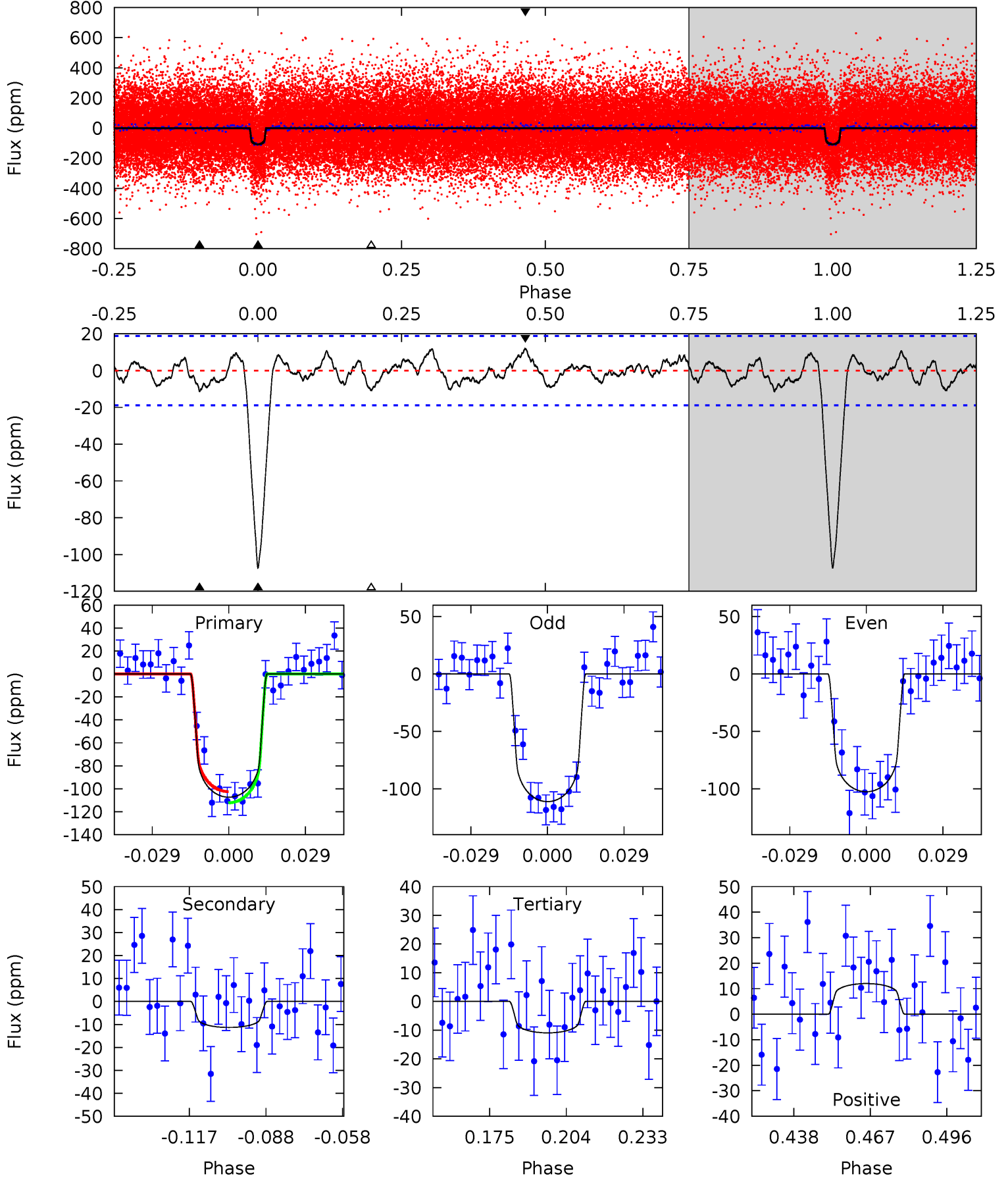
TCE 009904006-02 P= 8.486262 Days $T_0=138.042724$ (BKJD)



DV Model-Shift Uniqueness Test

009904006-02, P = 8.486522 Days, E = 129.530269 Days

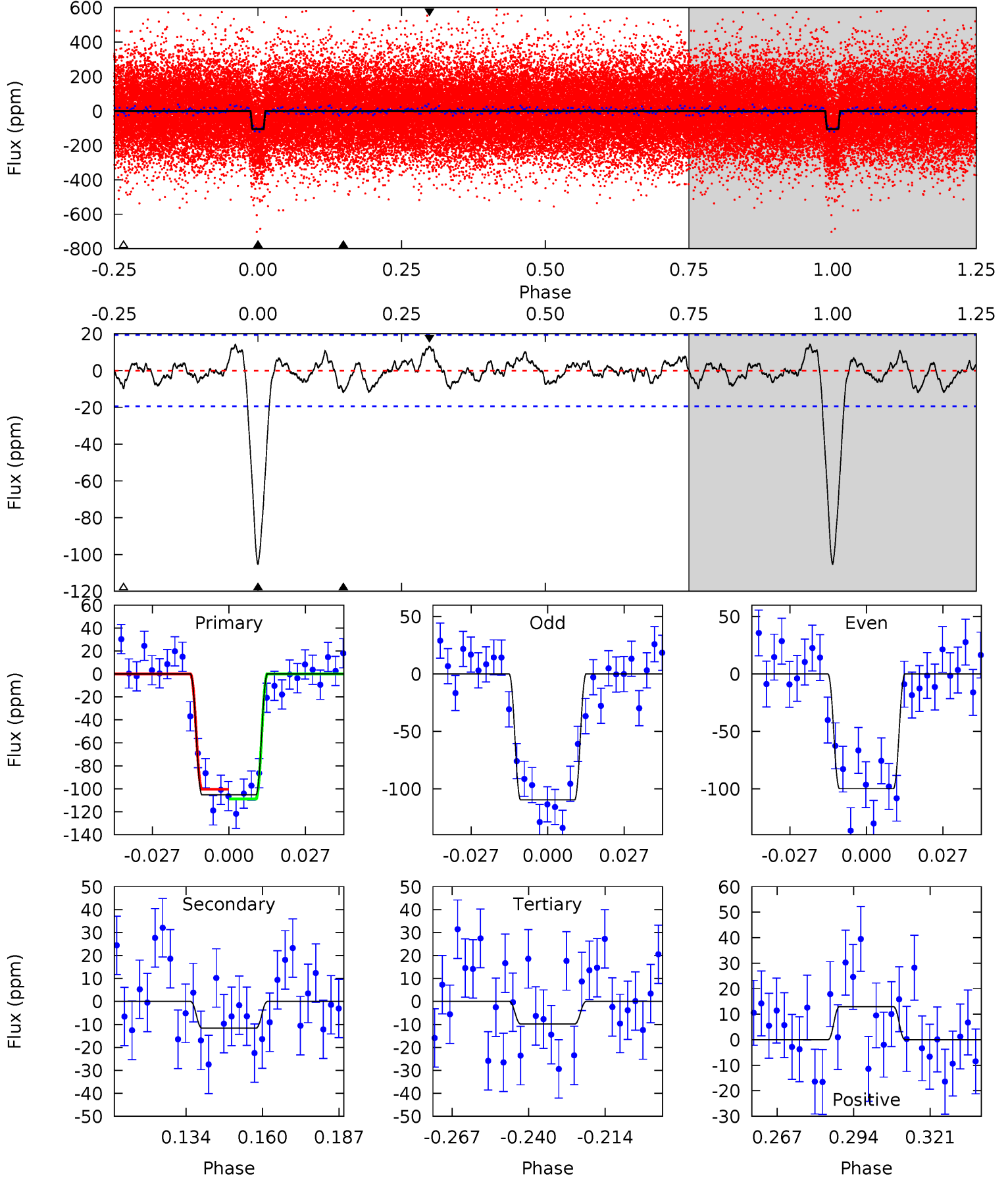
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 27.4 | 2.89 | 2.79 | 3.07 | 4.82 | 2.18 | 1.24 | 24.6 | 24.3 | 0.10 | -0.17 | 1.10 | 1.00 | 0.10 | 1.23 |



Alt Model-Shift Uniqueness Test

009904006-02, P = 8.486262 Days, E = 129.556462 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 26.2 | 2.89 | 2.44 | 3.22 | 4.83 | 2.22 | 1.17 | 23.7 | 22.9 | 0.45 | -0.33 | 1.22 | 0.99 | 0.12 | 1.04 |



Stellar Parameters For KIC 009904006

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | $R (R_{\odot})$ | $M(M_{\odot})$ | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|-------------------------------------------|
| | 6178^{+111}_{-135} | $4.269^{+0.125}_{-0.125}$ | $-0.040^{+0.150}_{-0.150}$ | $1.267^{+0.237}_{-0.178}$ | $1.085^{+0.113}_{-0.075}$ | $0.751^{+0.408}_{-0.264}$ |
| | +2%/-2% | +3%/-3% | +375%/-375% | +19%/-14% | +10%/-7% | +54%/-35% |
| Source | SPE58 | SPE58 | SPE58 | DSEP | | |

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

Secondary Eclipse Parameters for KIC 009904006-02 / KOI 2135.03

| Detrend | Depth (ppm) | $R_p (R_{\oplus})$ | $T_{\text{max}} (K)$ | $T_{\text{obs}} (K)$ | A_{obs} |
|---------|-------------|------------------------|----------------------|----------------------|------------------|
| DV | -11 ± 4 | $1.54^{+0.38}_{-0.35}$ | 1477^{+69}_{-71} | 3756^{+423}_{-339} | 18^{+15}_{-9} |
| Alt. | -12 ± 4 | $1.46^{+0.37}_{-0.33}$ | 1481^{+72}_{-66} | 3885^{+377}_{-394} | 21^{+16}_{-10} |

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

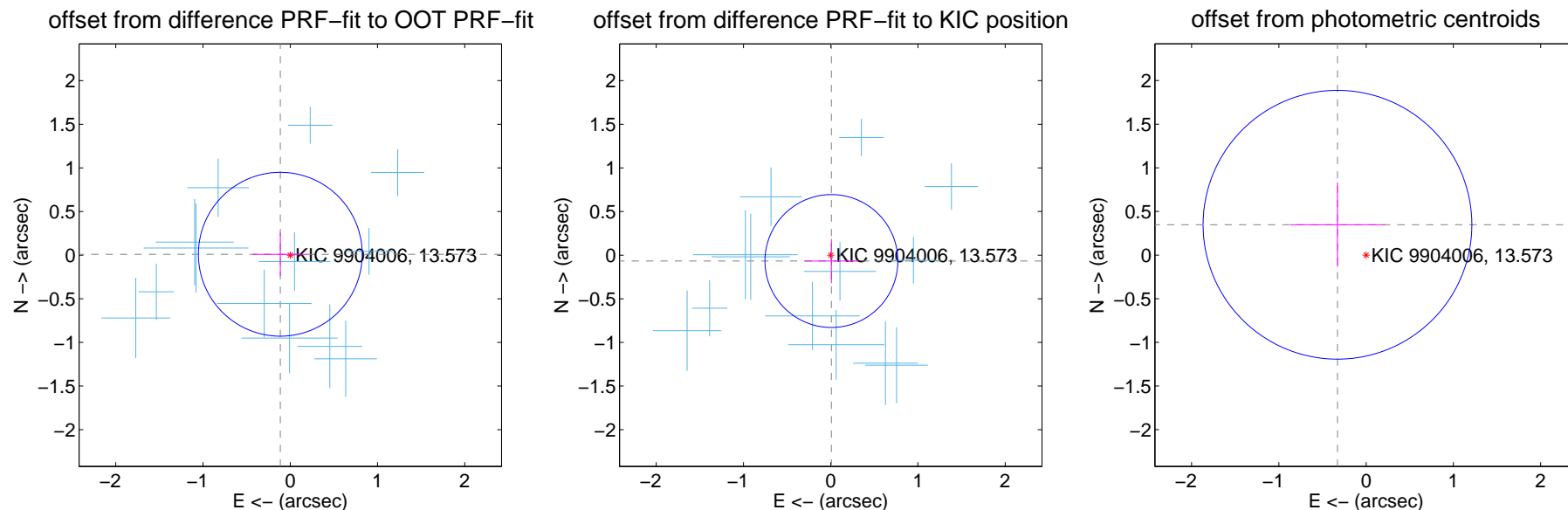
DV Centroid Data

Supplemental centroid analysis for 009904006-02. Kepler magnitude: 13.57. Transit SNR 19.01

There are 13 quarters with good PRF difference image offsets

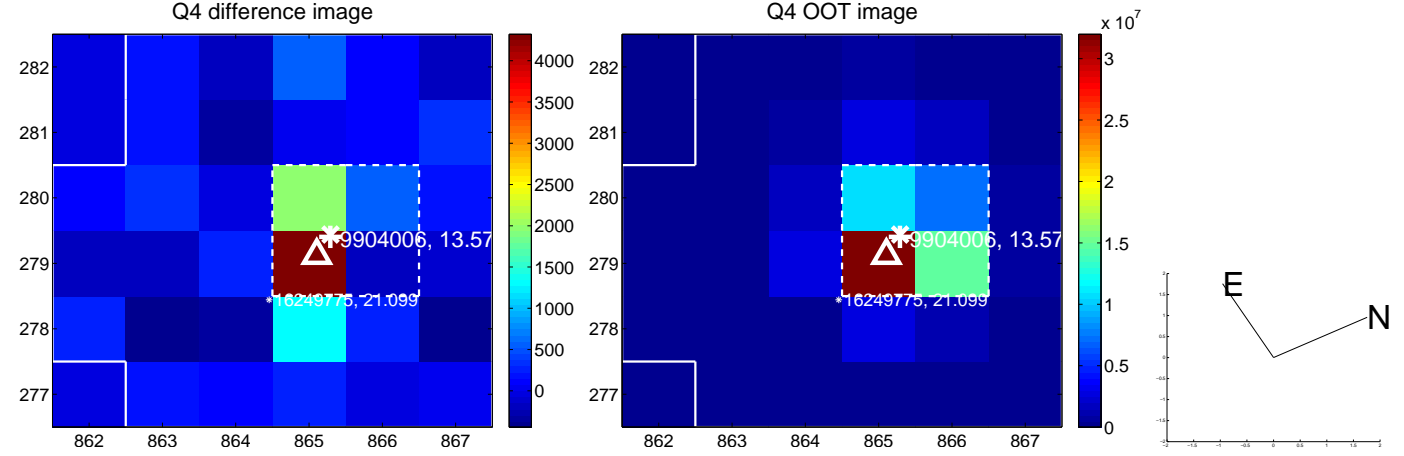
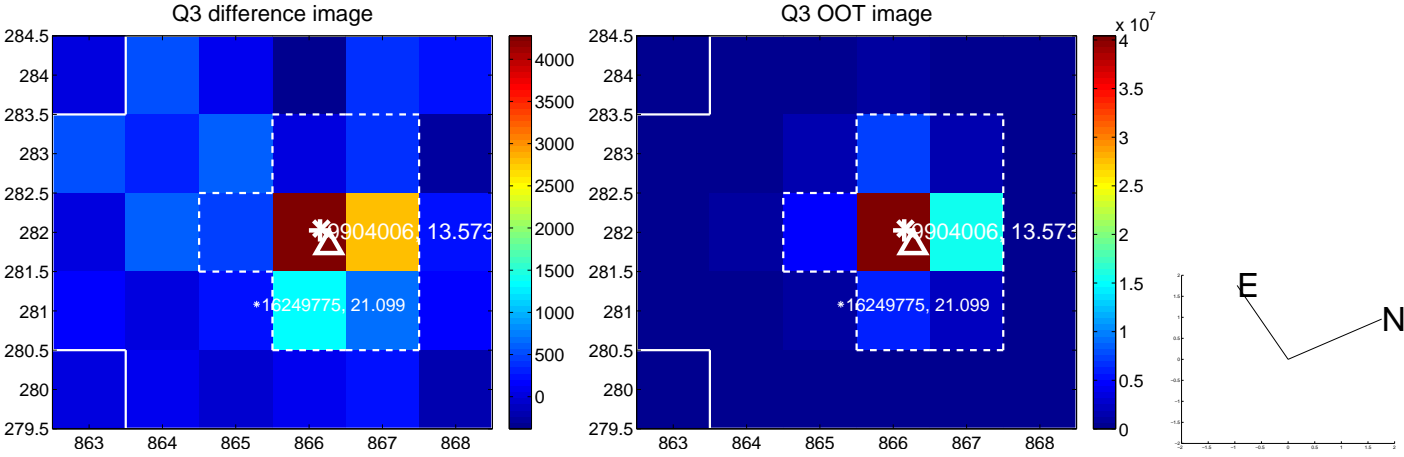
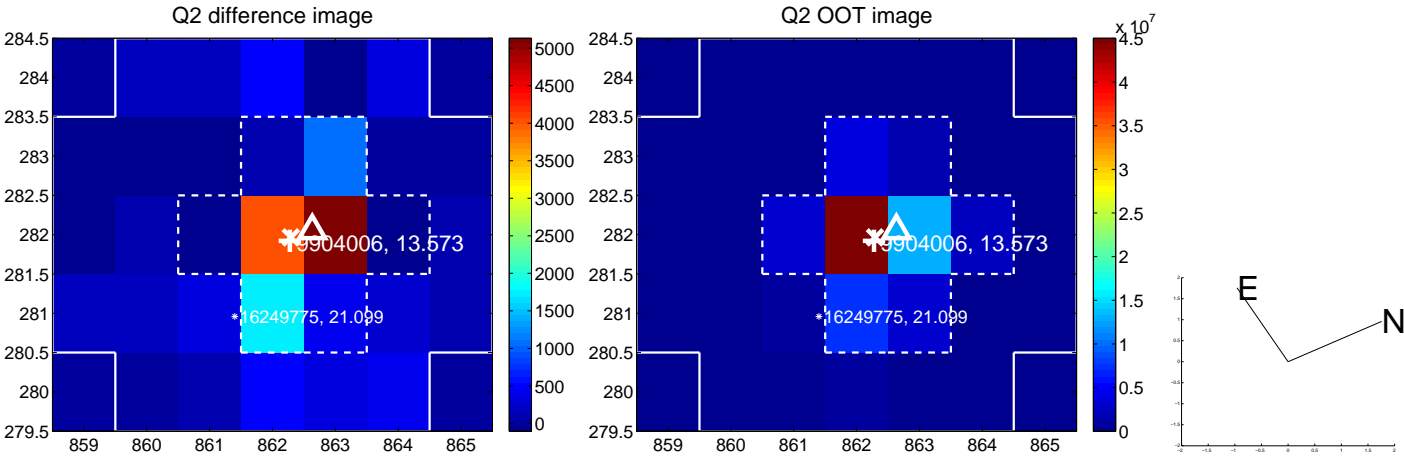
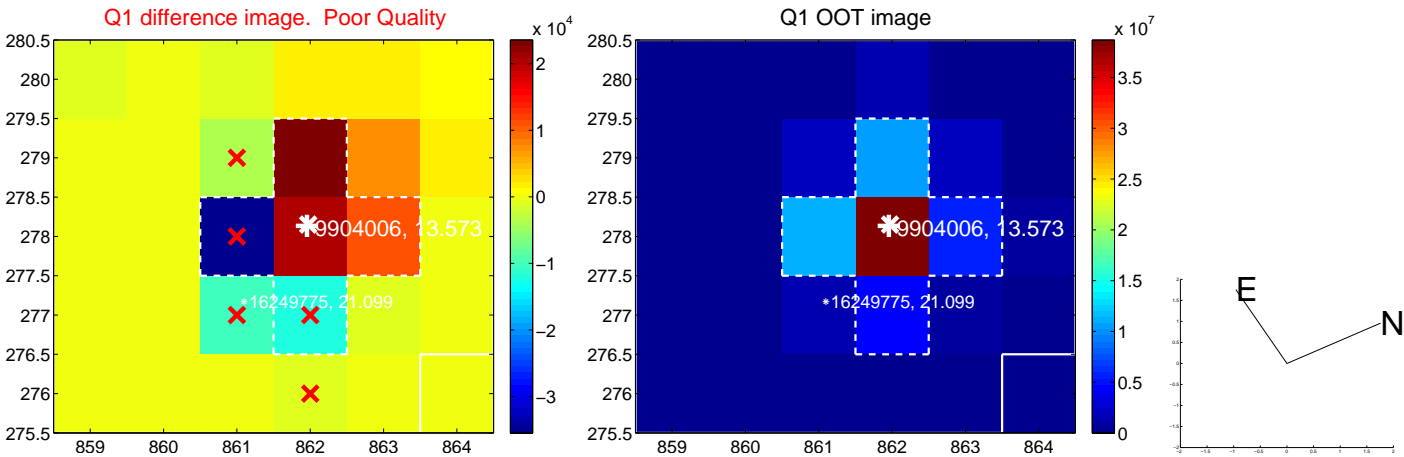
The direct PRF centroid is offset from the target star catalog position by about 0.13 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|-----------------------------------------|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT | 0.115 ± 0.313 | 0.37 | 0.114 ± 0.313 | 0.010 ± 0.248 |
| PRF-fit source offset from KIC position | 0.068 ± 0.254 | 0.27 | -0.008 ± 0.310 | -0.067 ± 0.253 |
| photometric centroid source offset | 0.48 ± 0.51 | 0.93 | 0.33 ± 0.54 | 0.35 ± 0.48 |

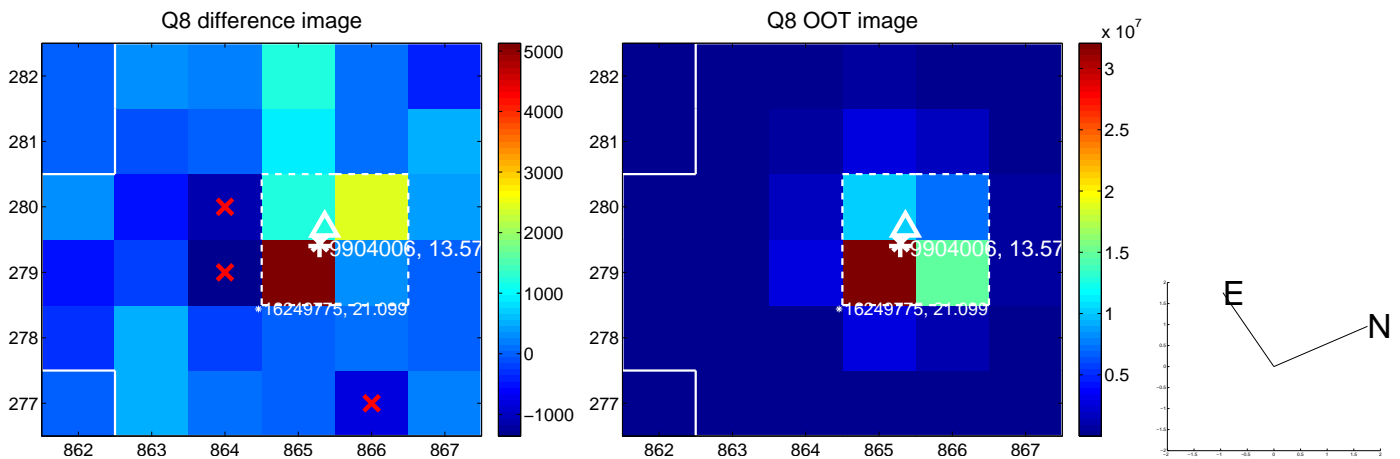
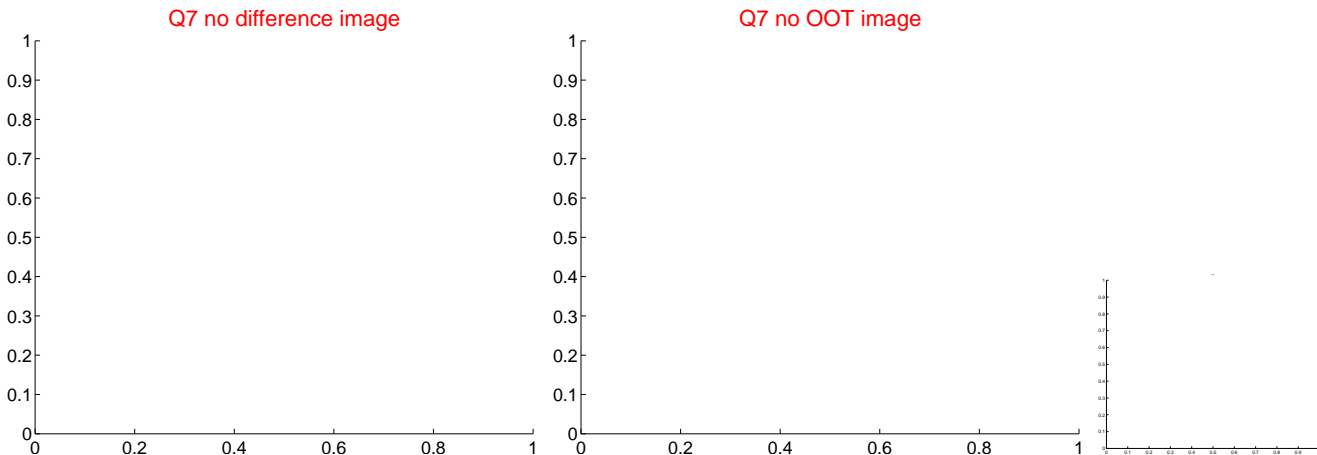
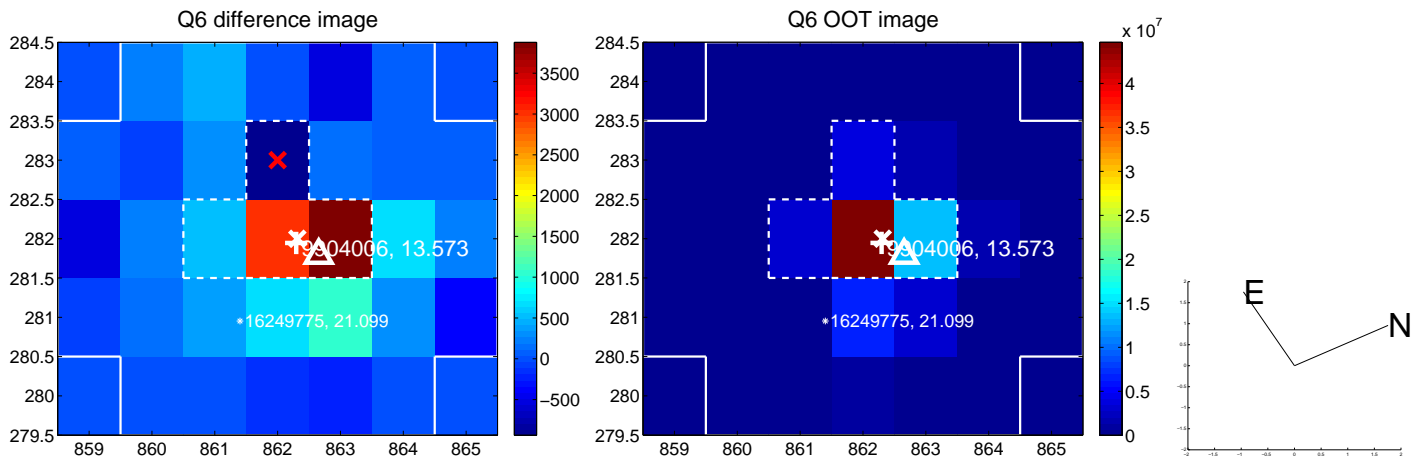
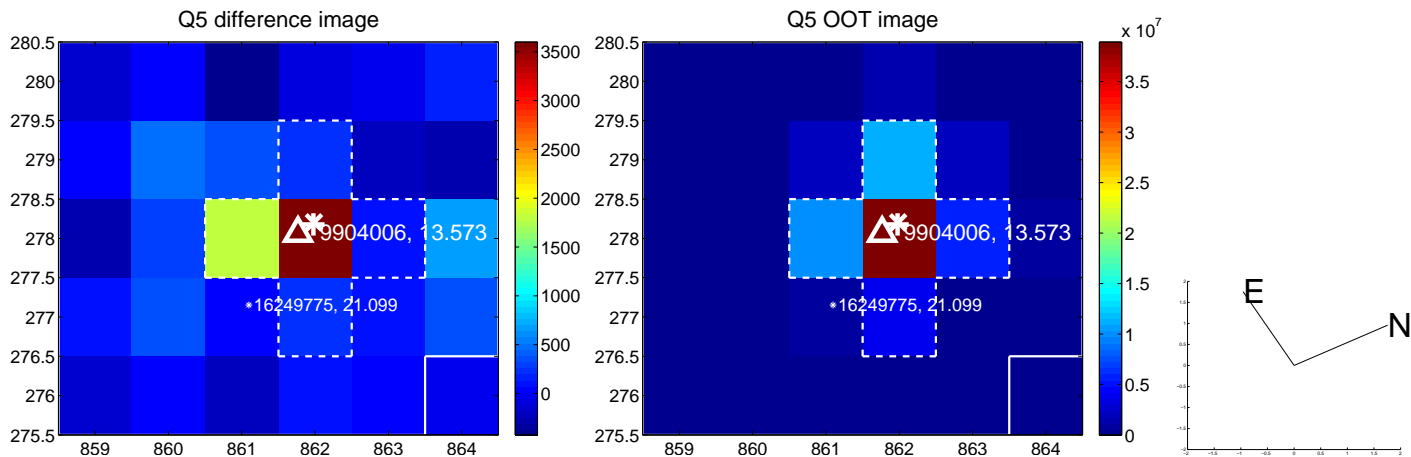


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three- σ . Red *: target star. Blue *: Other stars. Text next to a star gives its KIC ID and kepmag. KIC IDs > 15,000,000 are from the UKIRT catalog.

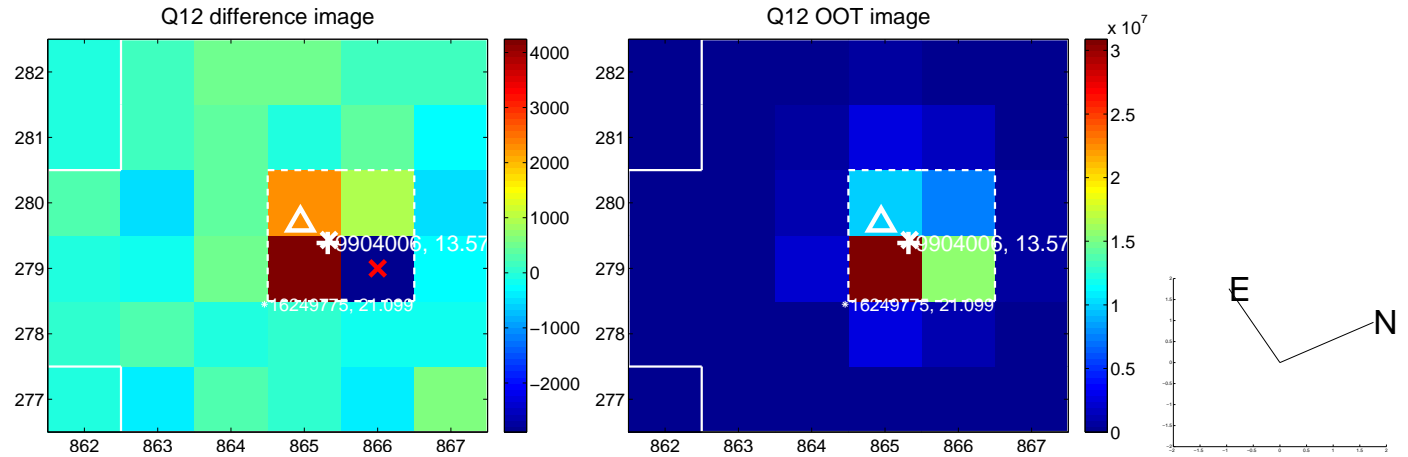
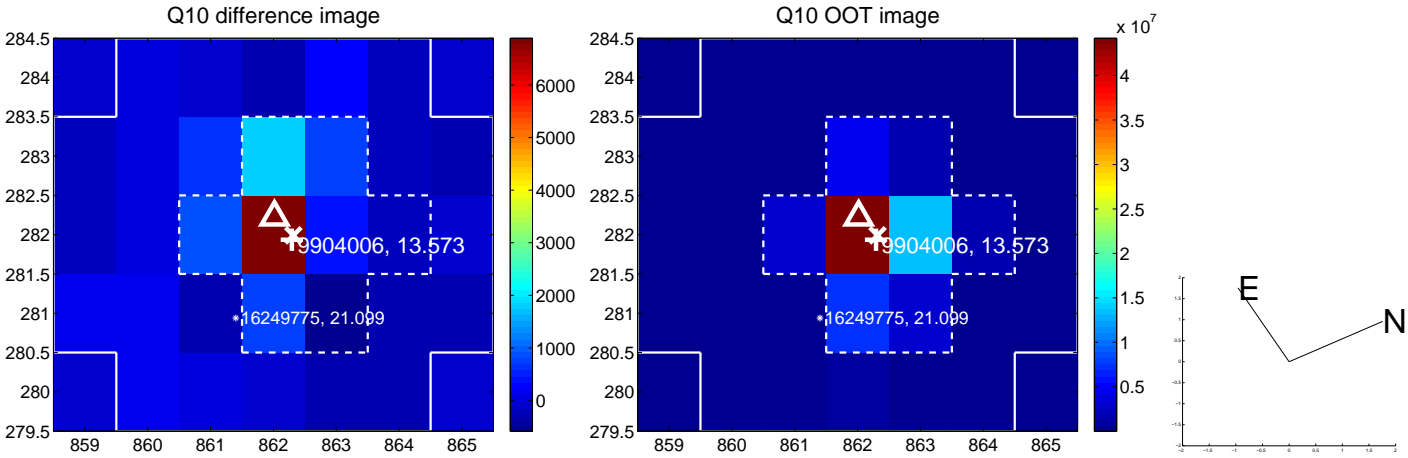
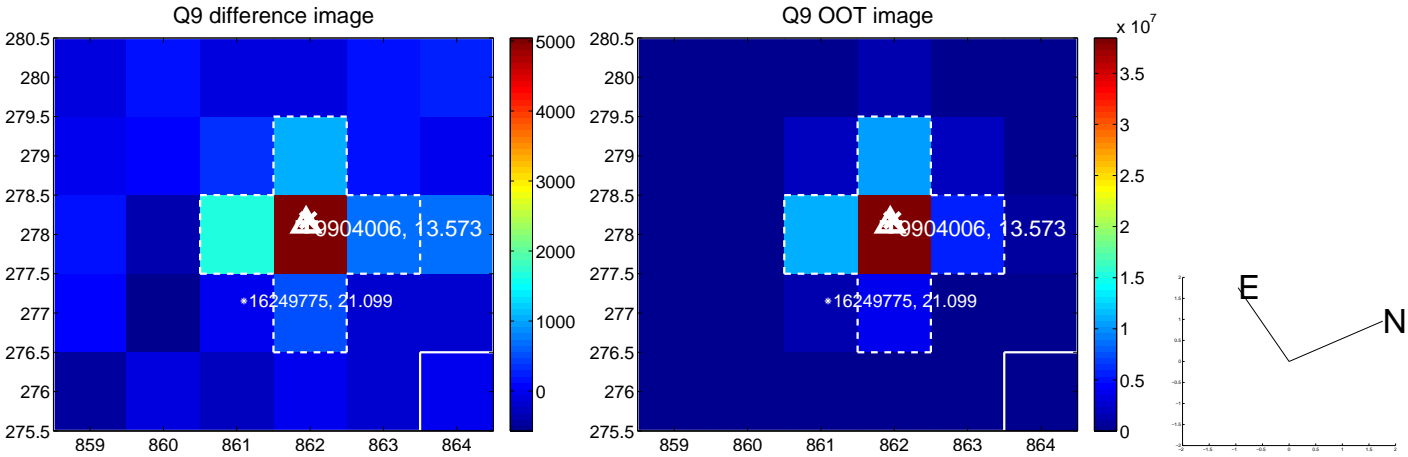
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



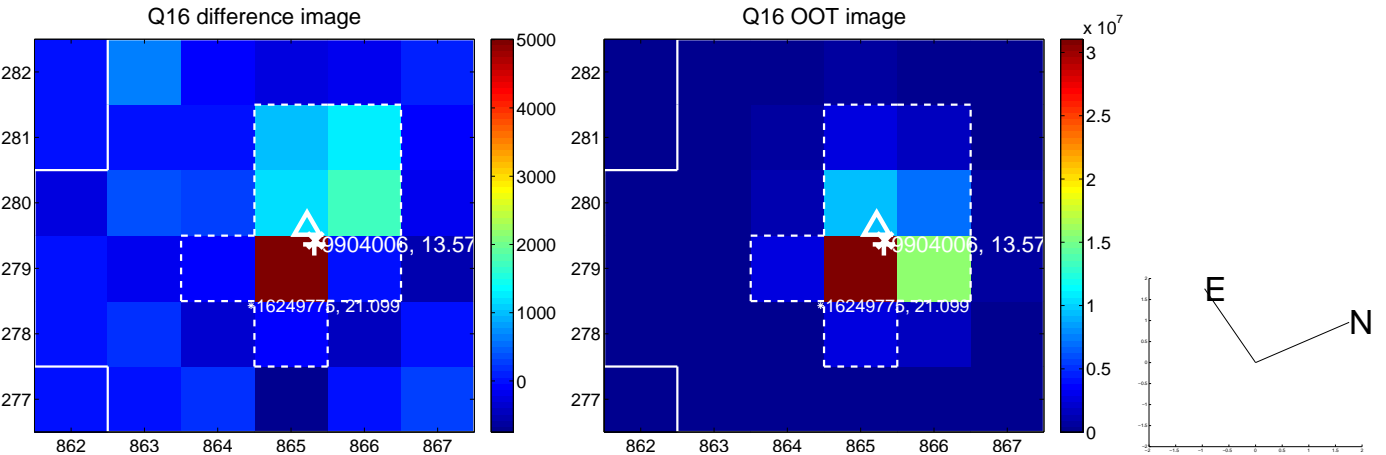
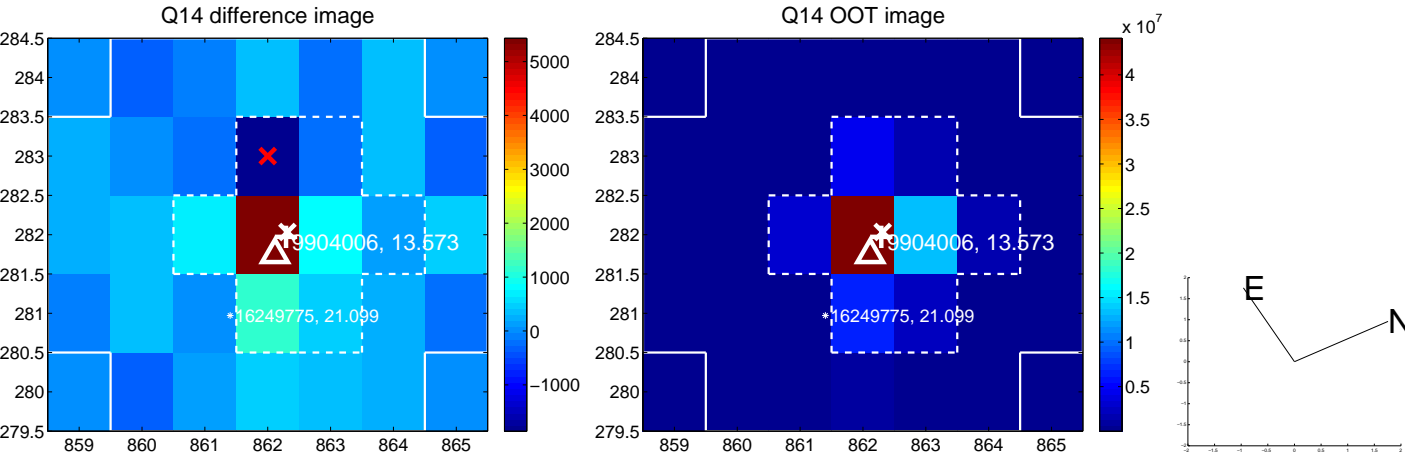
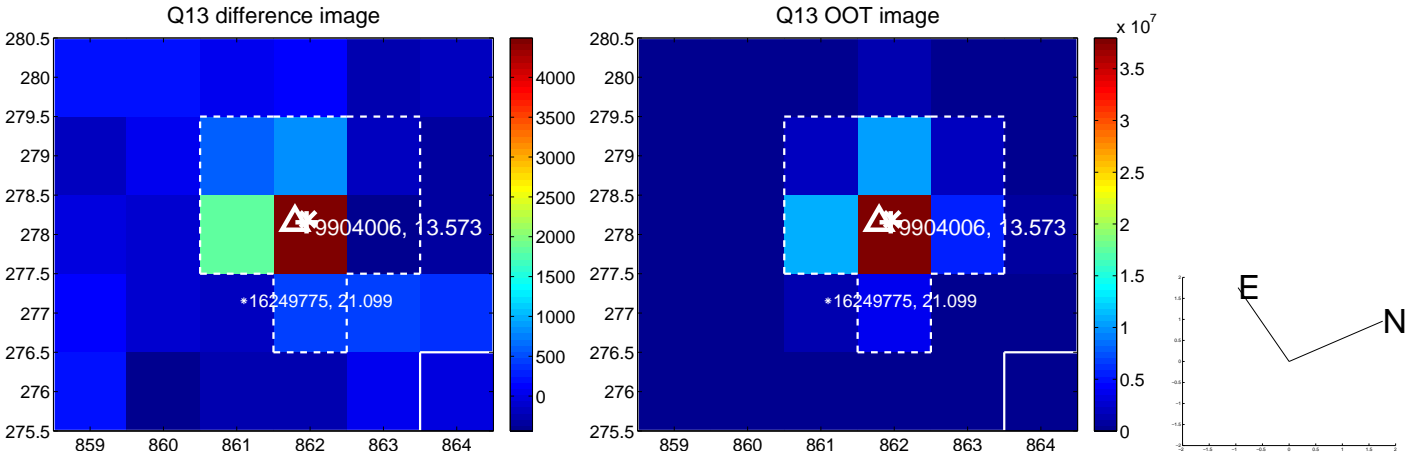
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



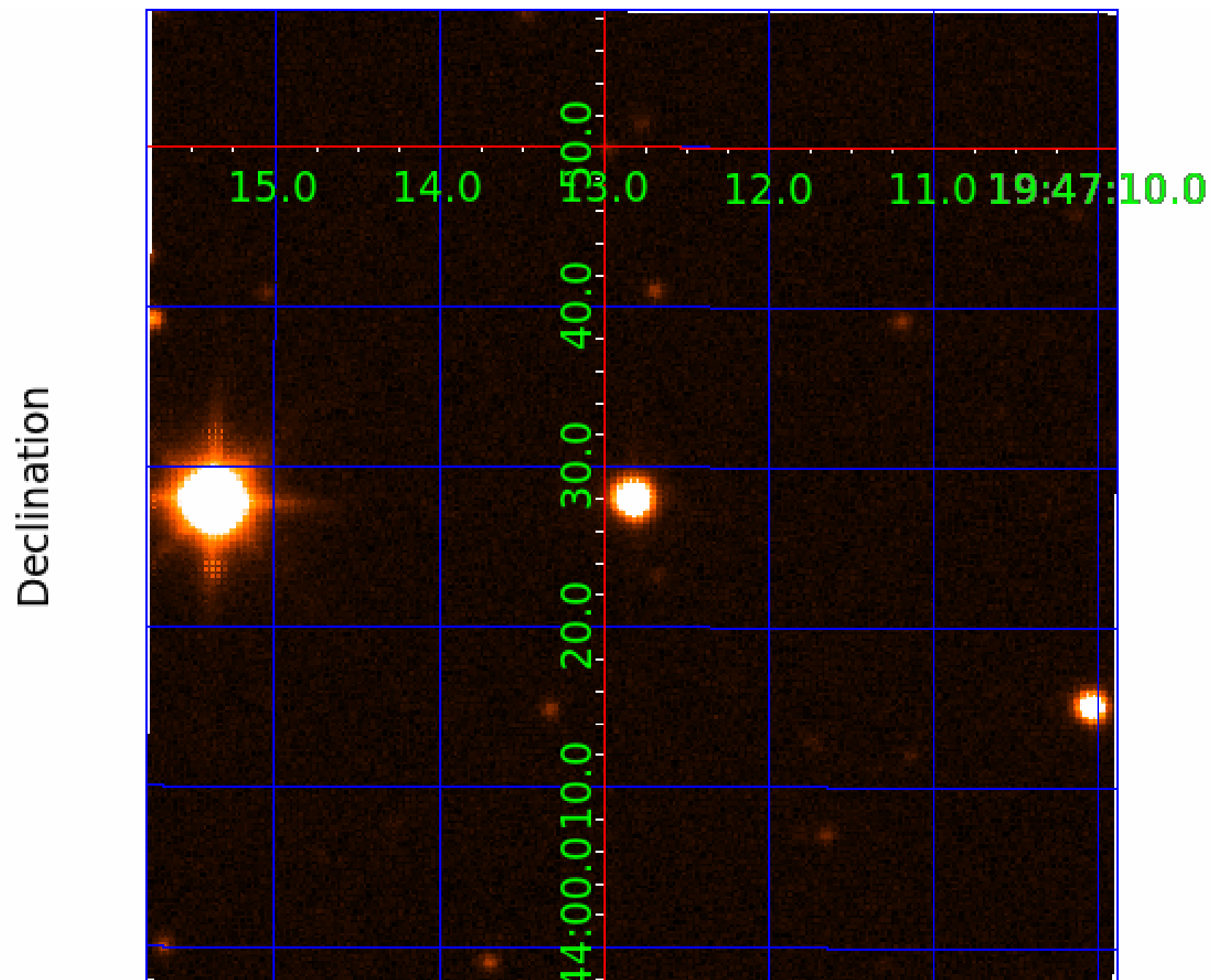
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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



UKIRT Image



KIC 009904006

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}) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 009904006-01 | OBS | 2135.01 | 55.186387 | 180.760427 | 366.8 | 9.235 | 23.0 | 24.2 | 1.27 | 6178 | 2.69 | 24.61 |
| 009904006-02 | OBS | 2135.03 | 8.486522 | 138.016791 | 115.2 | 5.507 | 17.8 | 19.0 | 1.27 | 6178 | 1.56 | 298.65 |
| 009904006-03 | OBS | 2135.02 | 20.188882 | 142.194851 | 94.8 | 6.462 | 10.5 | 10.2 | 1.27 | 6178 | 1.38 | 94.04 |
| 009904006-04 | OBS | No | 215.392731 | 221.783212 | 215.5 | 45.978 | 8.0 | 6.1 | 1.27 | 6178 | 1.90 | 4.00 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|-----------------------------------------------------------------------------------------------|
| 009904006-01 | OBS | PC | 0.98 | 0 | 0 | 0 | 0 | NO_COMMENT |
| 009904006-02 | OBS | PC | 1.00 | 0 | 0 | 0 | 0 | NO_COMMENT |
| 009904006-03 | OBS | PC | 1.00 | 0 | 0 | 0 | 0 | NO_COMMENT |
| 009904006-04 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_MARSHALL—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS |

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

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

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

Ephemeris Match Information For 009904006-03

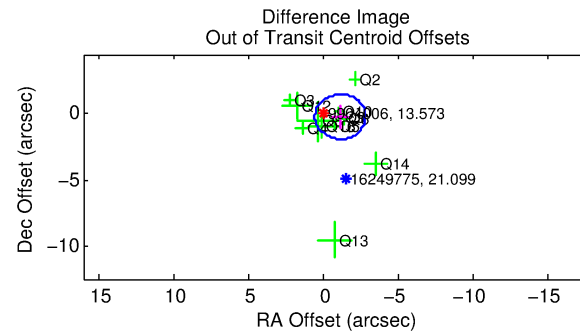
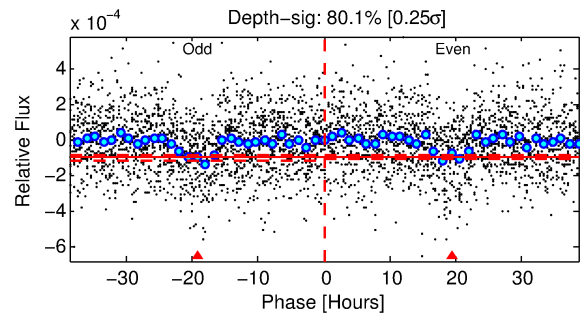
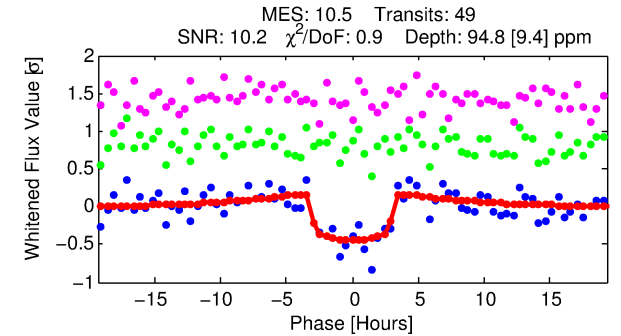
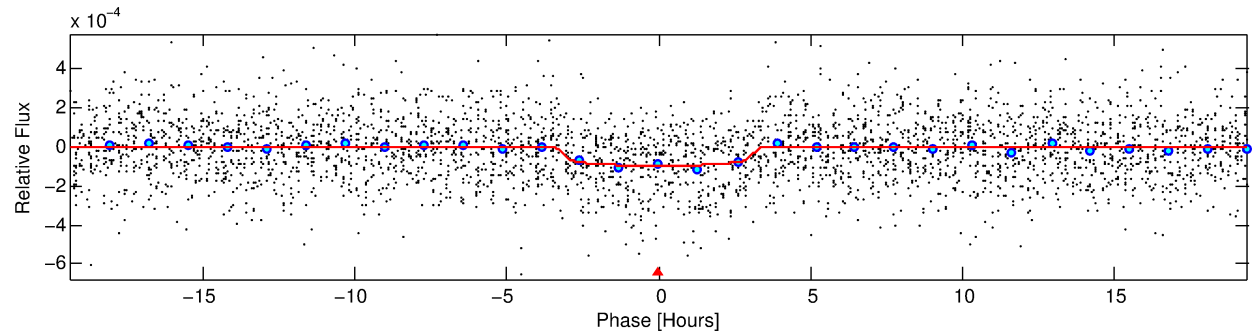
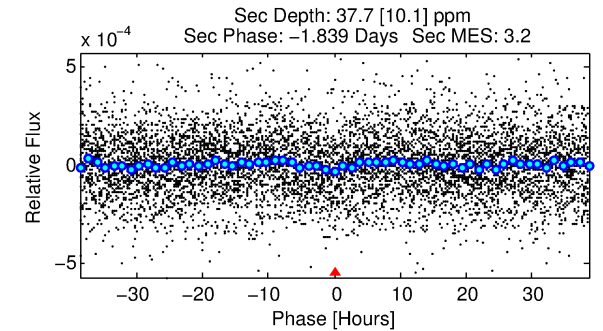
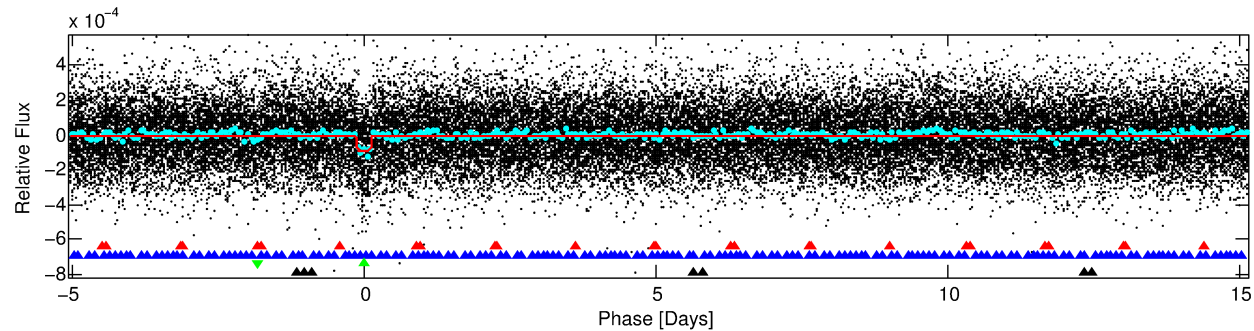
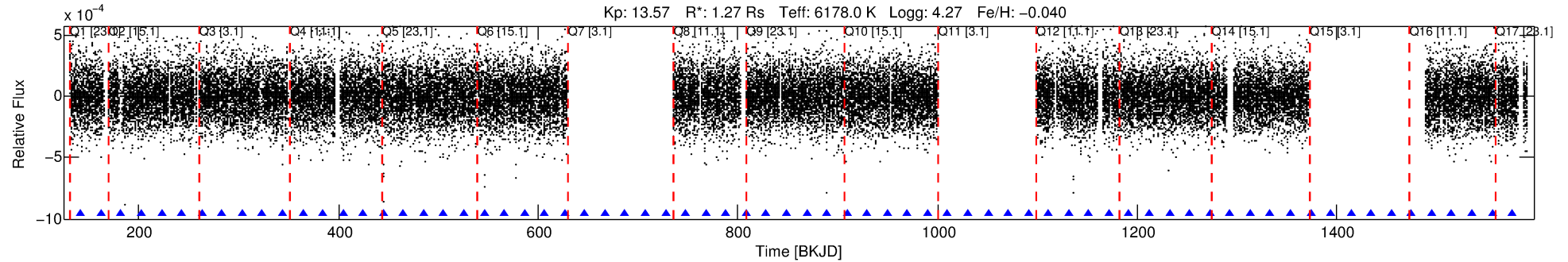
No Significant Match Found

DV One-Page Summary

KIC: 9904006 Candidate: 3 of 4 Period: 20.189 d

KOI: K02135.02 Corr: 0.978

Kp: 13.57 R*: 1.27 Rs Teff: 6178.0 K Logg: 4.27 Fe/H: -0.040



DV Fit Results:

Period = 20.18888 [0.00024] d
Epoch = 142.1949 [0.0091] BKJD
Rp/R* = 0.0100 [0.0040]
a/R* = 14.02 [28.46]
b = 0.82 [0.81]
Seff = 94.04 [23.04]
Teff = 794 [49] K
Rp = 1.38 [0.61] Re
a = 0.1493 [0.0235] AU
Ag = 242.99 [212.81] [1.14σ]
Teffp = 4847 [1030] K [3.93σ]

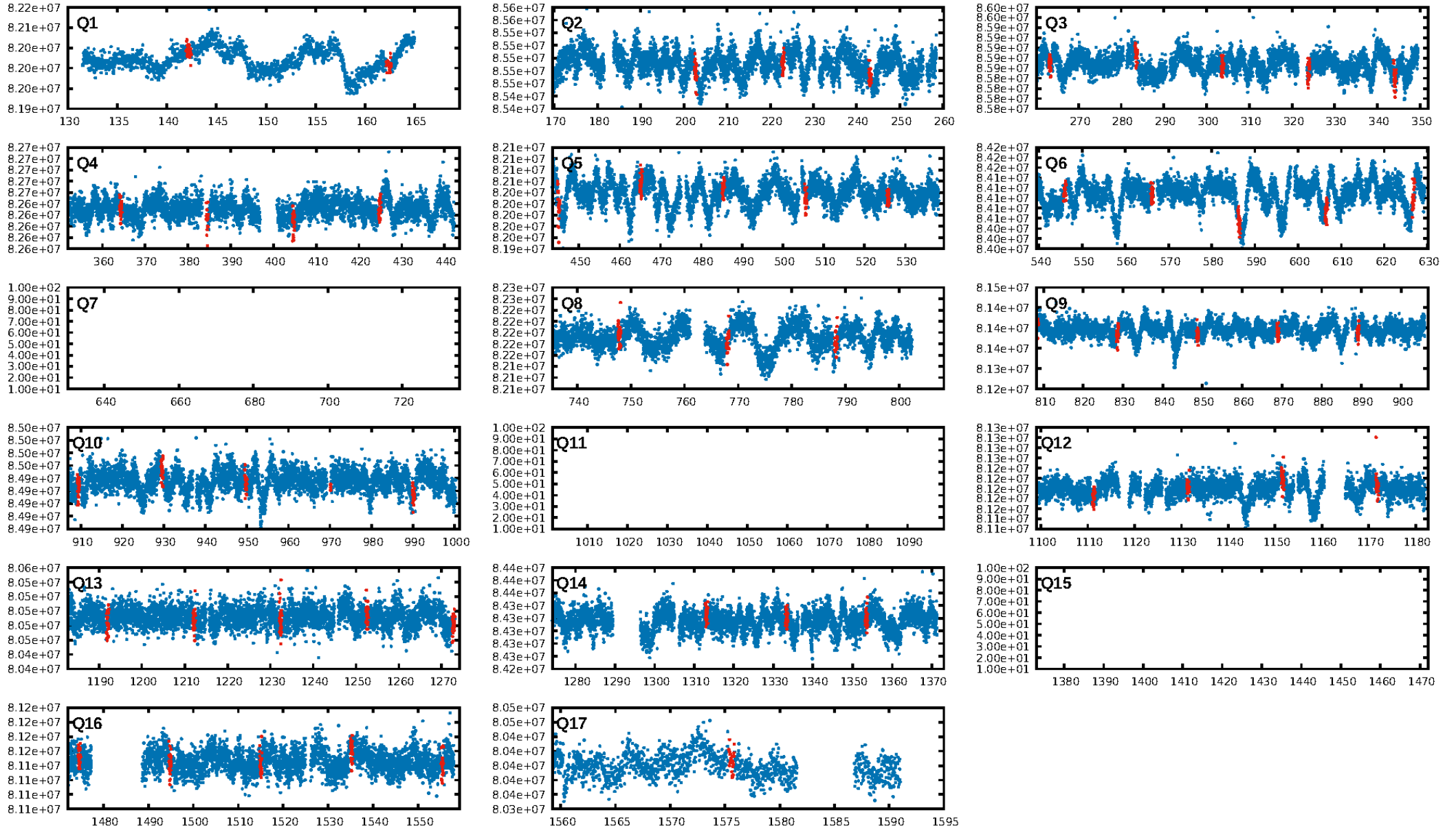
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [33.08σ]
LongPeriod-sig: 100.0% [74.52σ]
ModelChiSquare2-sig: 90.6%
ModelChiSquareGof-sig: 100.0%
Bootstrap-pfa: 2.02e-26
RollingBand-fgt: 1.00 [46/46]
GhostDiagnostic-chr: 4.65
Centroid-sig: 22.2%
Centroid-so: 1.020 arcsec [1.08σ]
OotOffset-rm: 1.199 arcsec [2.12σ]
KicOffset-rm: 1.345 arcsec [2.39σ]
OotOffset-st: 4/1/4/3 [12]
KicOffset-st: 4/1/4/3 [12]
DiffImageQuality-fgm: 0.75 [9/12]
DiffImageOverlap-fno: 1.00 [14/14]

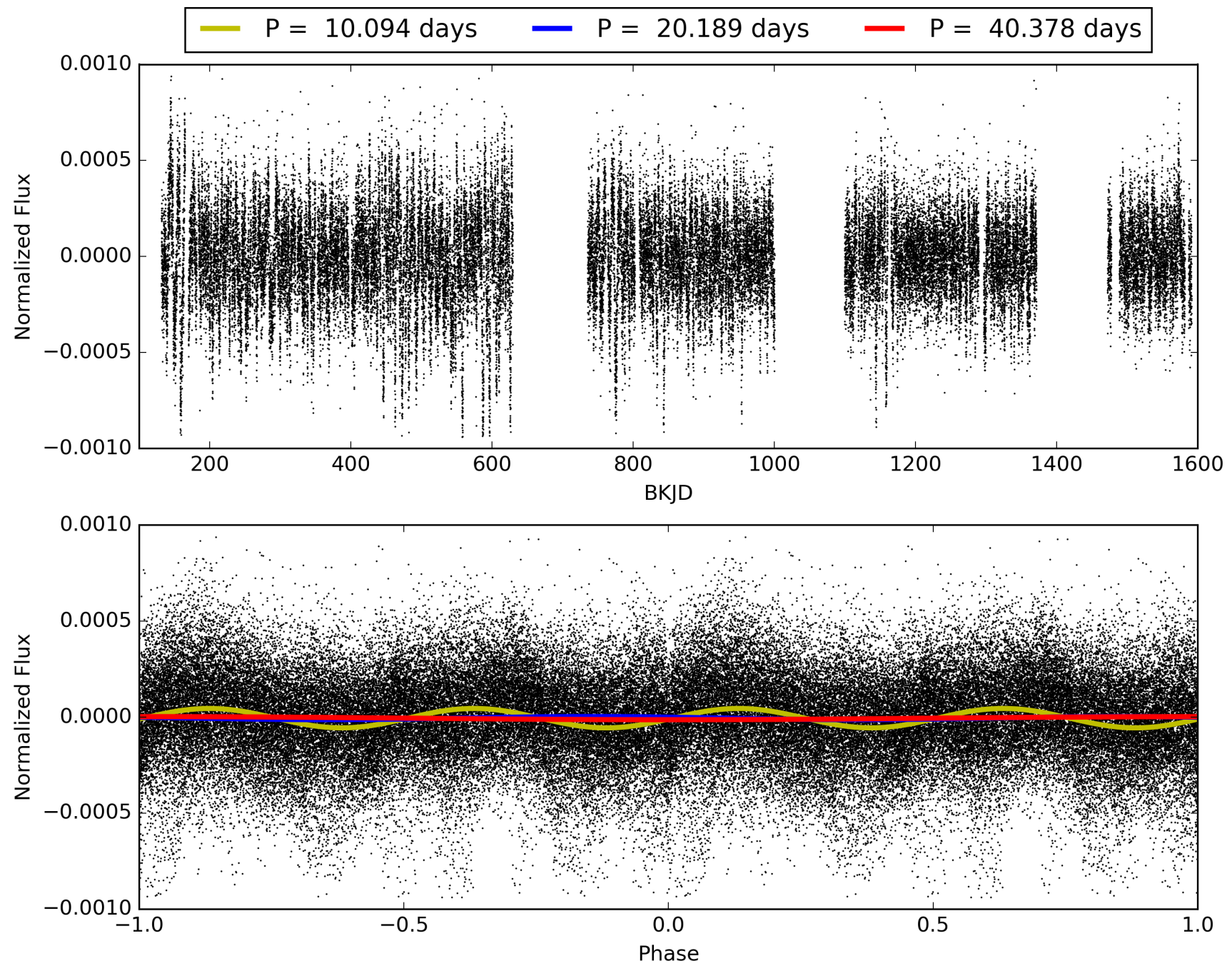
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 19:11:55 Z

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

TCE 009904006-03, PDC Light Curves

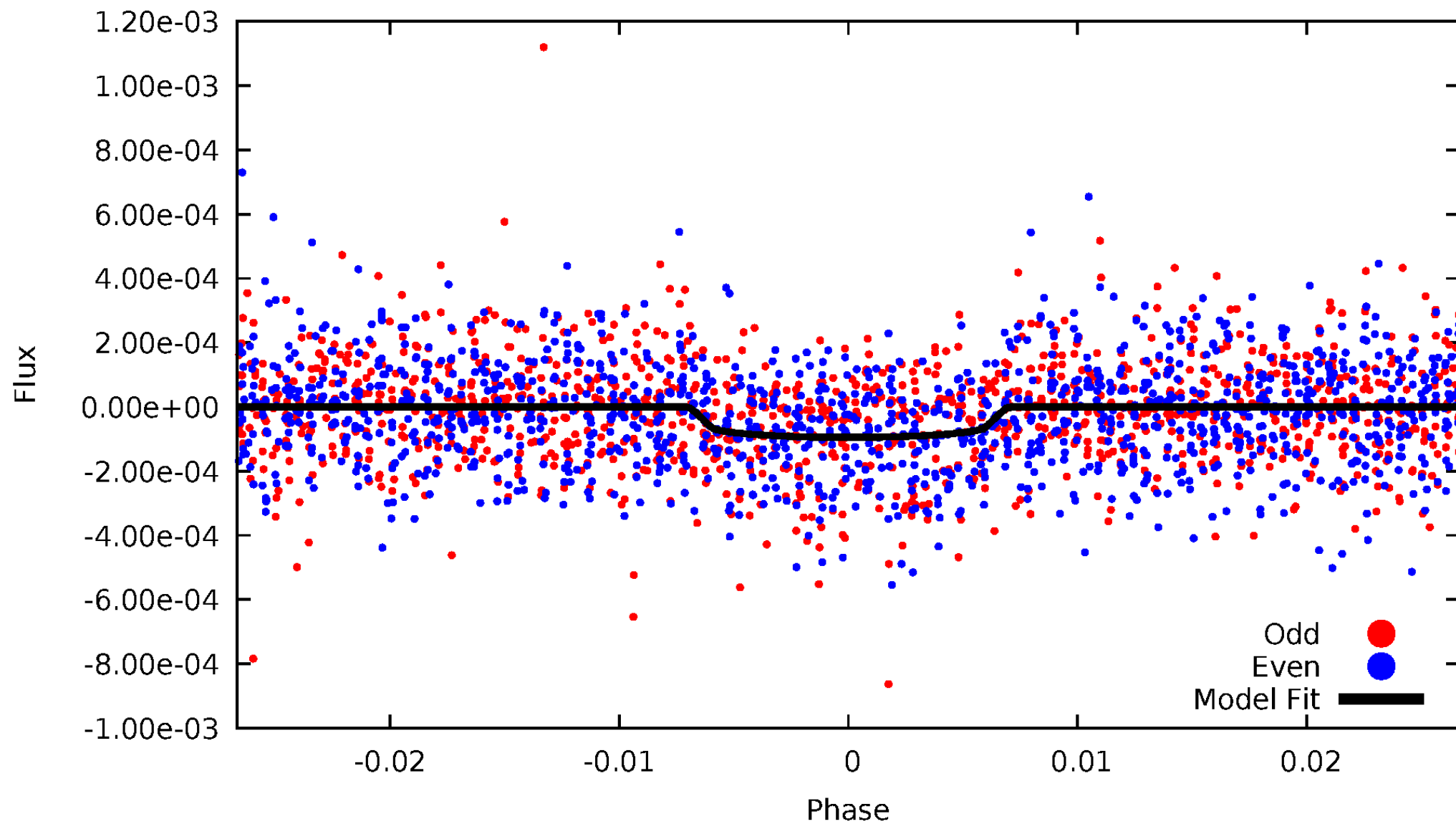


TCE 009904006-03



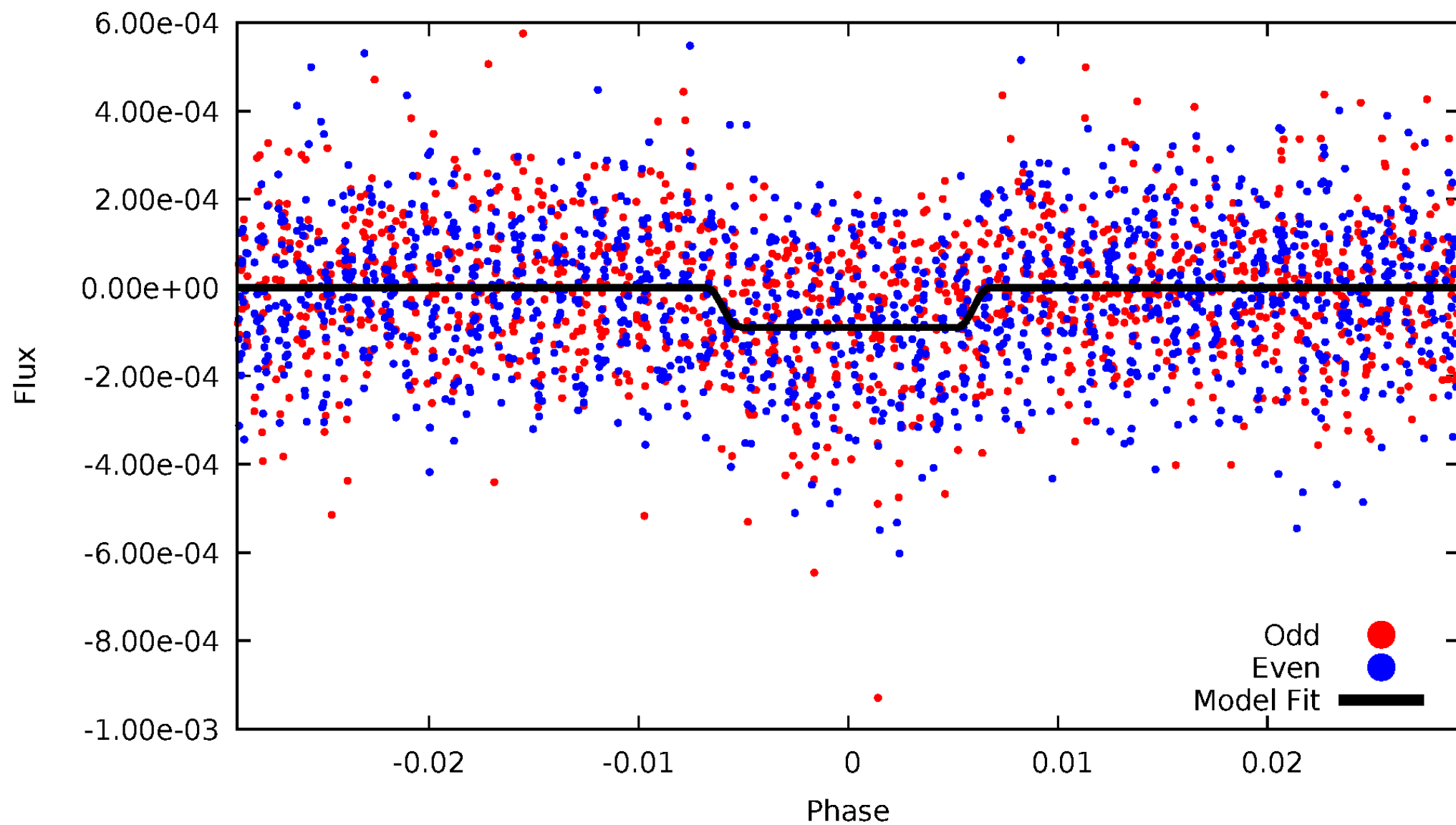
DV Odd/Even

TCE 009904006-03

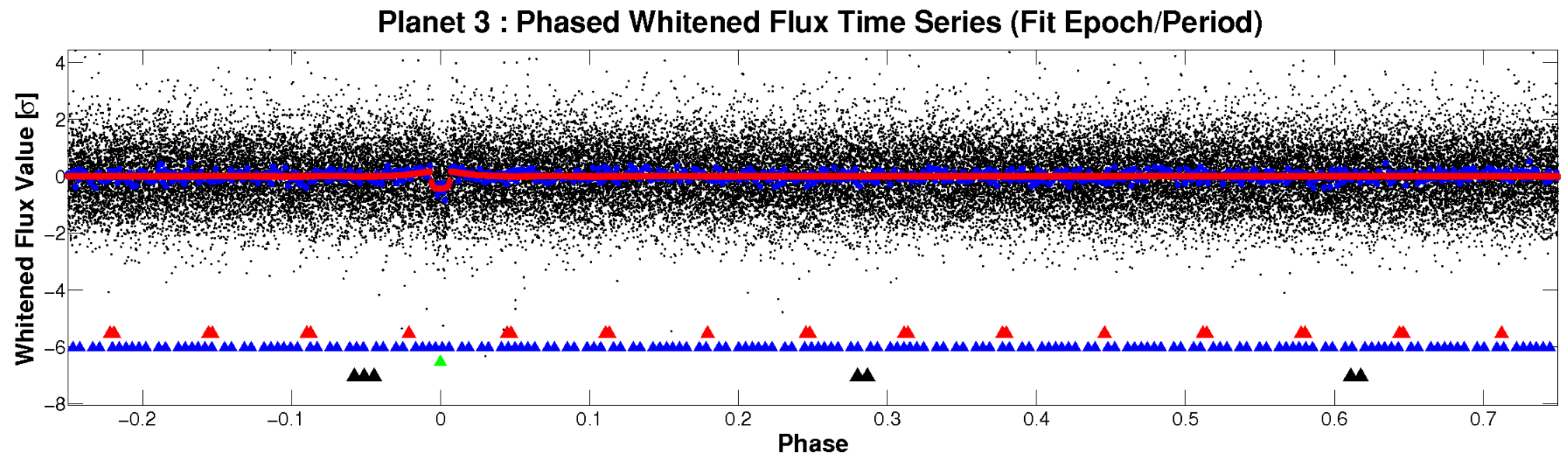
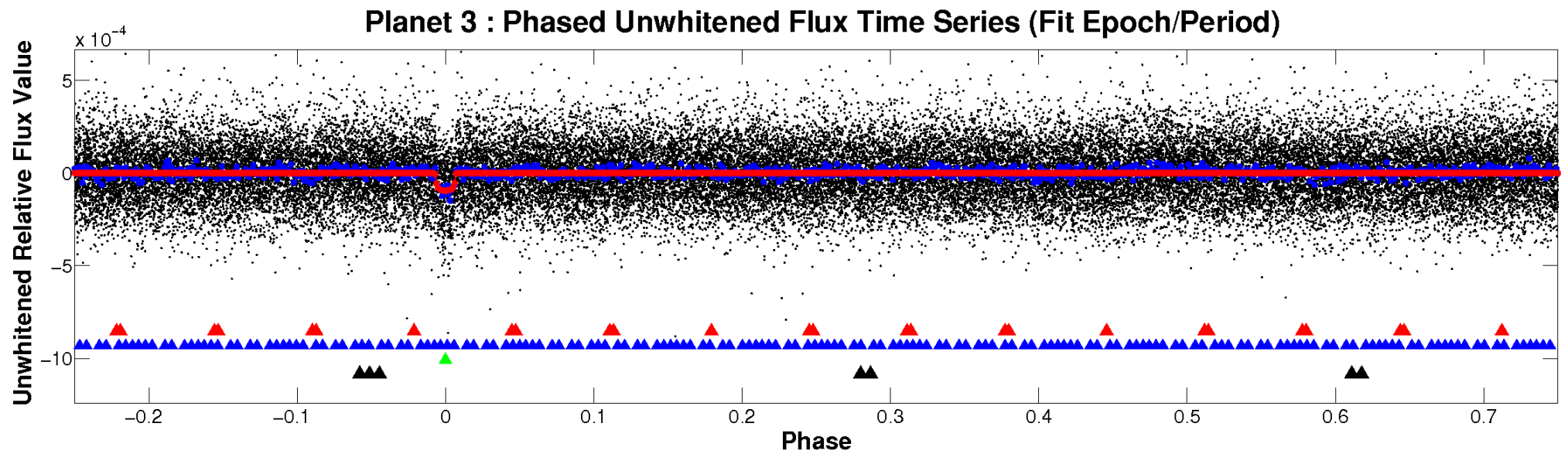


ALT Odd/Even

TCE 009904006-03

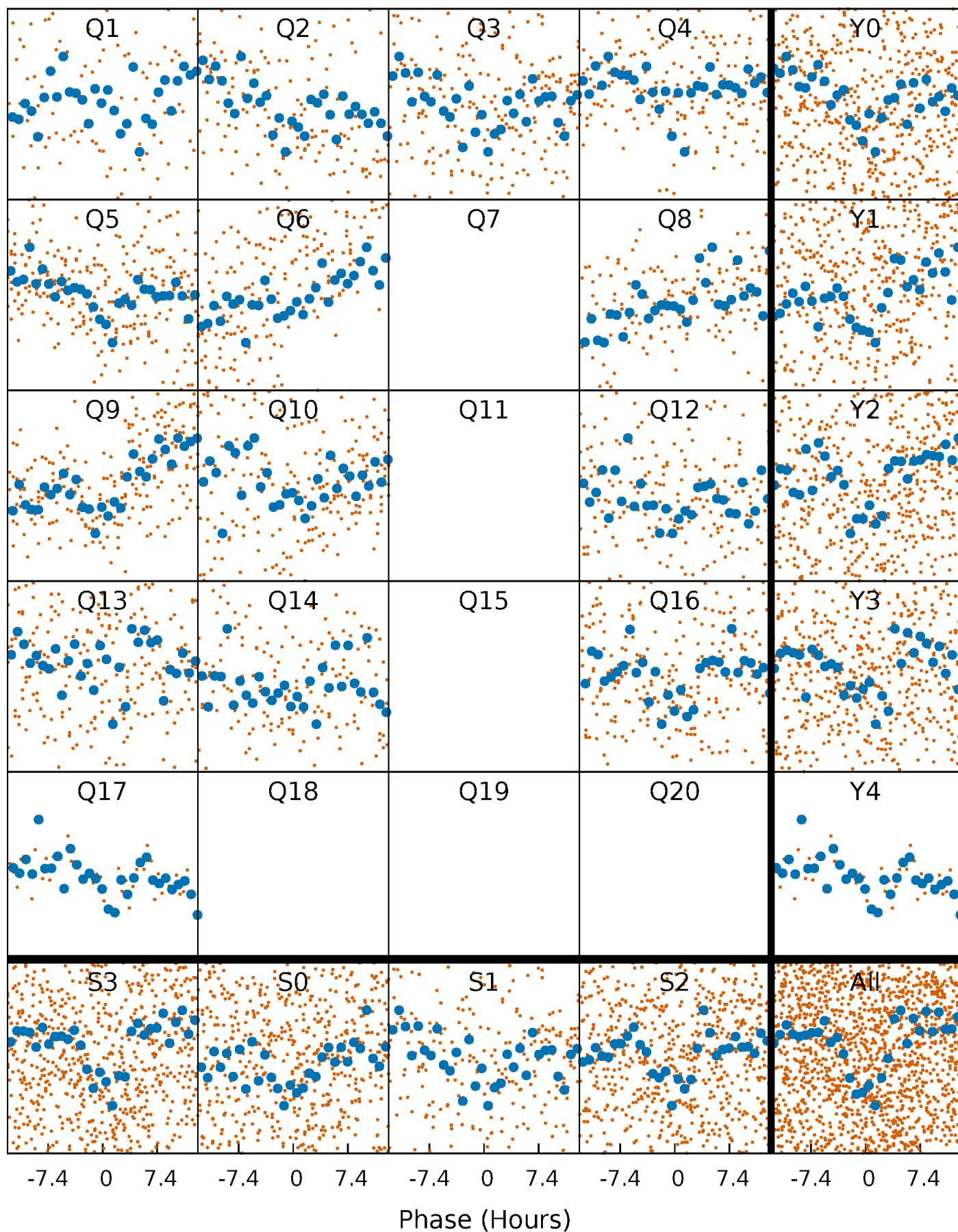


Non-Whitened Vs. Whitened Light Curve



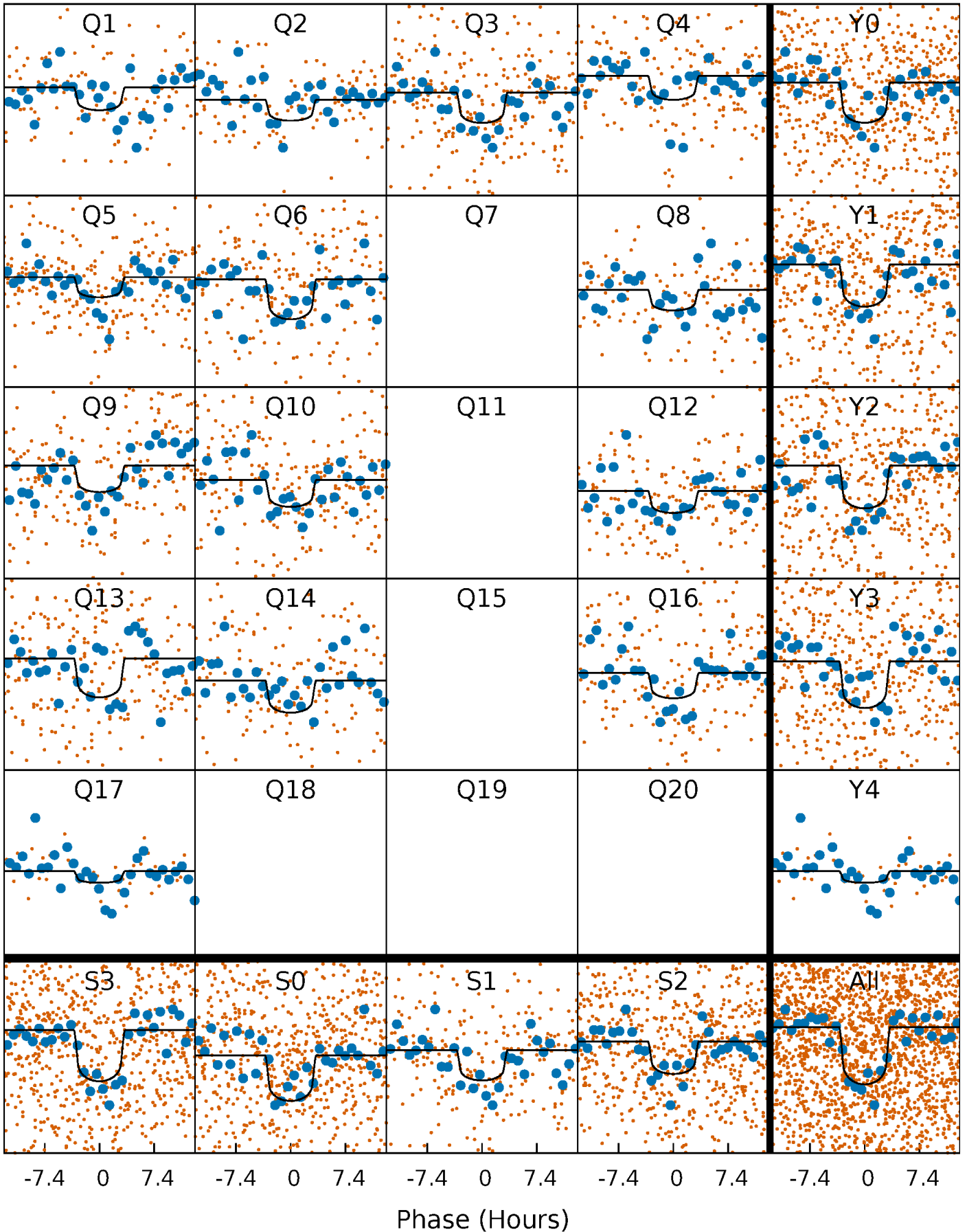
PDC Quarter-Phased Transit Curves

TCE 009904006-03 P= 20.188882 Days $T_0=142.194851$ (BKJD)



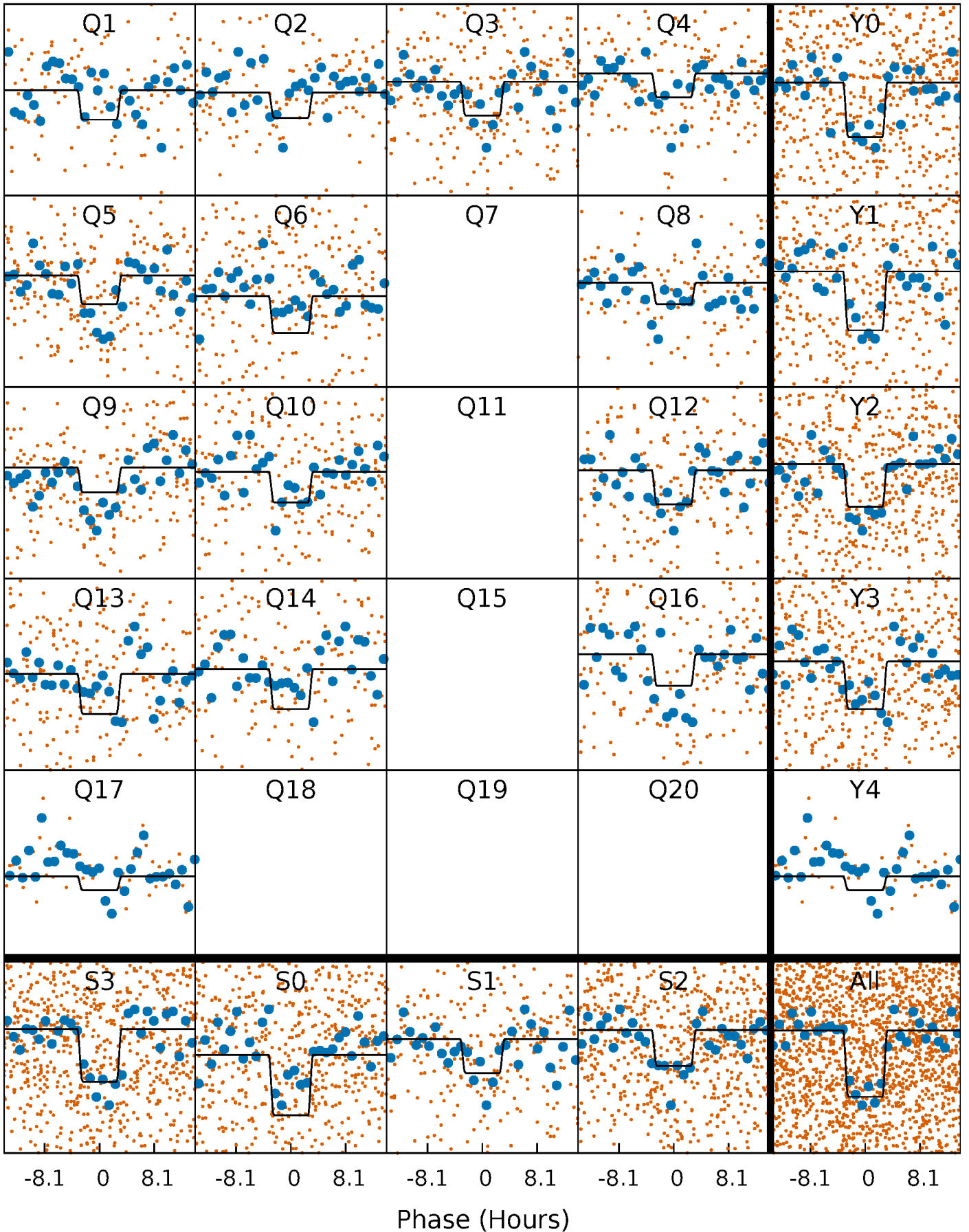
DV Quarter-Phased Transit Curves

TCE 009904006-03 P= 20.188882 Days $T_0=142.194851$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

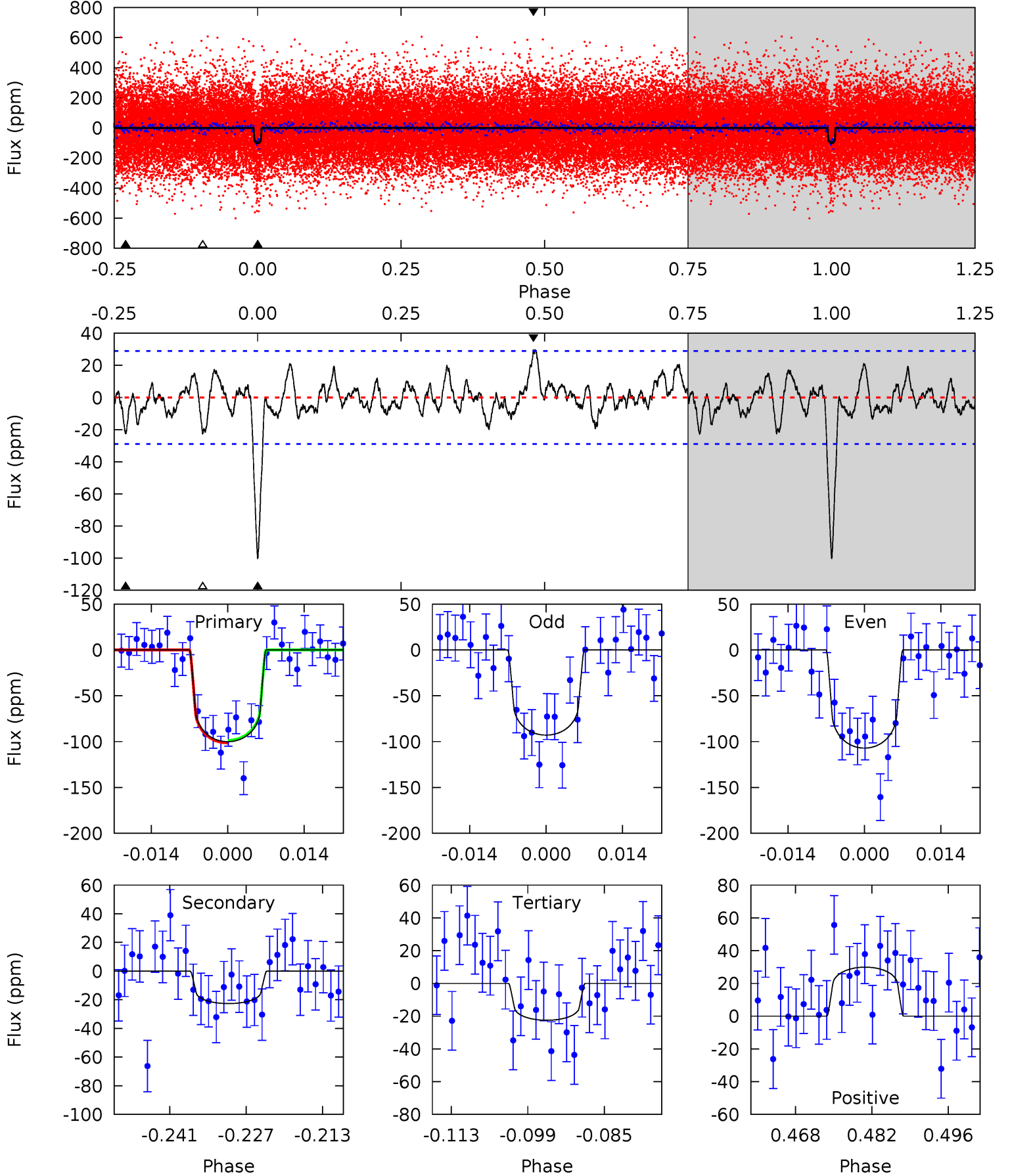
TCE 009904006-03 P= 20.188536 Days $T_0=142.206794$ (BKJD)



DV Model-Shift Uniqueness Test

009904006-03, P = 20.188882 Days, E = 122.005969 Days

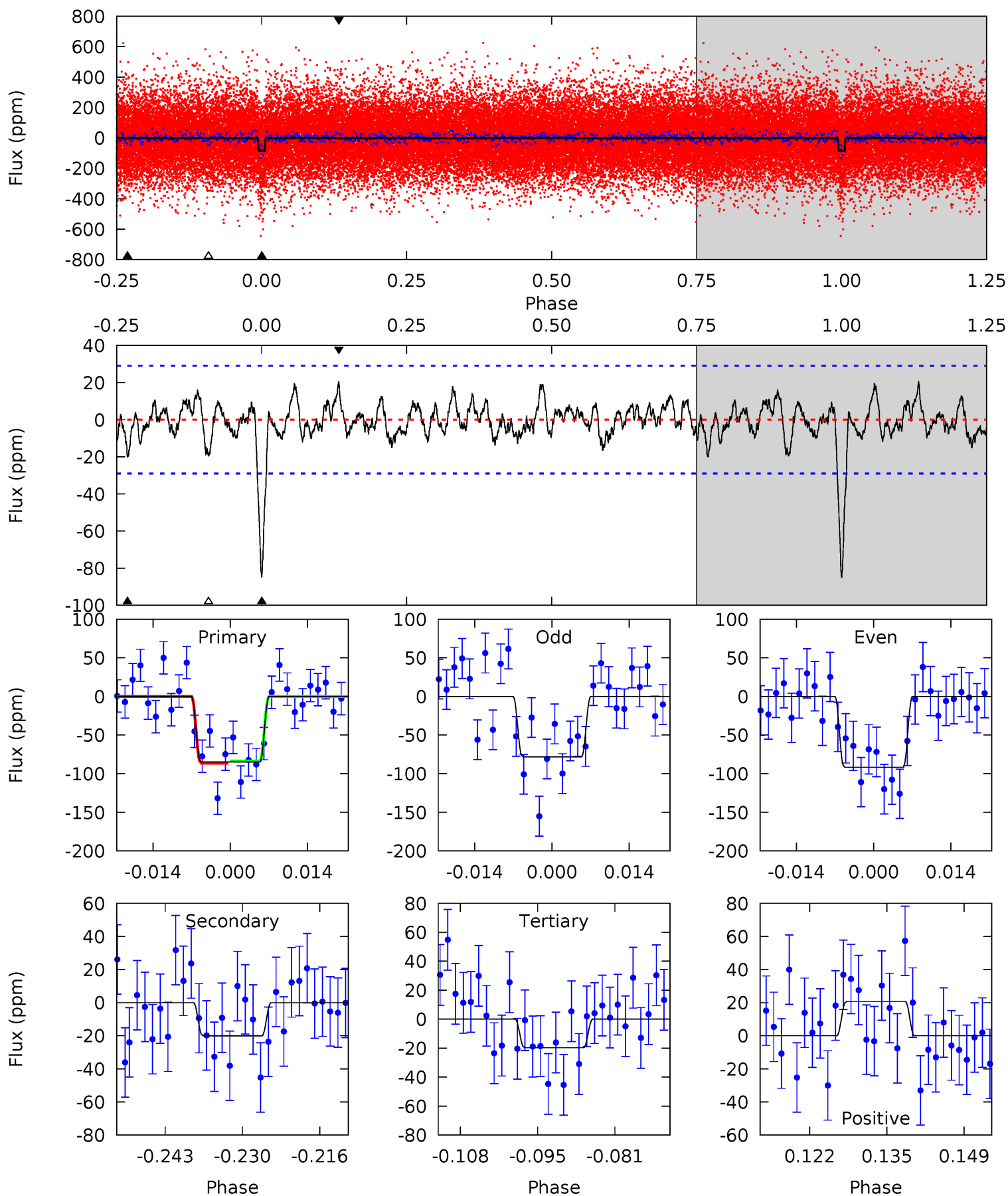
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 17.1 | 3.88 | 3.86 | 5.12 | 4.96 | 2.45 | 1.46 | 13.3 | 12.0 | 0.03 | -1.24 | 1.21 | 1.05 | 0.23 | 0.23 |



Alt Model-Shift Uniqueness Test

009904006-03, P = 20.188536 Days, E = 122.018258 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 14.6 | 3.43 | 3.37 | 3.54 | 4.97 | 2.47 | 1.19 | 11.2 | 11.0 | 0.06 | -0.11 | 1.16 | 1.12 | 0.20 | 0.26 |



Stellar Parameters For KIC 009904006

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | R (R_{\odot}) | M (M_{\odot}) | p_{\star} ($\text{g}\cdot\text{cm}^{-3}$) |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|-----------------------------------------------|
| | 6178^{+111}_{-135} | $4.269^{+0.125}_{-0.125}$ | $-0.040^{+0.150}_{-0.150}$ | $1.267^{+0.237}_{-0.178}$ | $1.085^{+0.113}_{-0.075}$ | $0.751^{+0.408}_{-0.264}$ |
| | +2%/-2% | +3%/-3% | +375%/-375% | +19%/-14% | +10%/-7% | +54%/-35% |
| Source | SPE58 | SPE58 | SPE58 | DSEP | | |

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

Secondary Eclipse Parameters for KIC 009904006-03 / KOI 2135.02

| Detrend | Depth (ppm) | R_p (R_{\oplus}) | T_{max} (K) | T_{obs} (K) | A_{obs} |
|---------|-------------|------------------------|----------------------|-----------------------|--------------------|
| DV | -23 ± 6 | $1.37^{+0.62}_{-0.53}$ | 1110^{+57}_{-55} | 4456^{+1115}_{-581} | 146^{+286}_{-83} |
| Alt. | -20 ± 6 | $1.33^{+0.61}_{-0.57}$ | 1109^{+55}_{-56} | 4404^{+1160}_{-586} | 134^{+279}_{-72} |

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

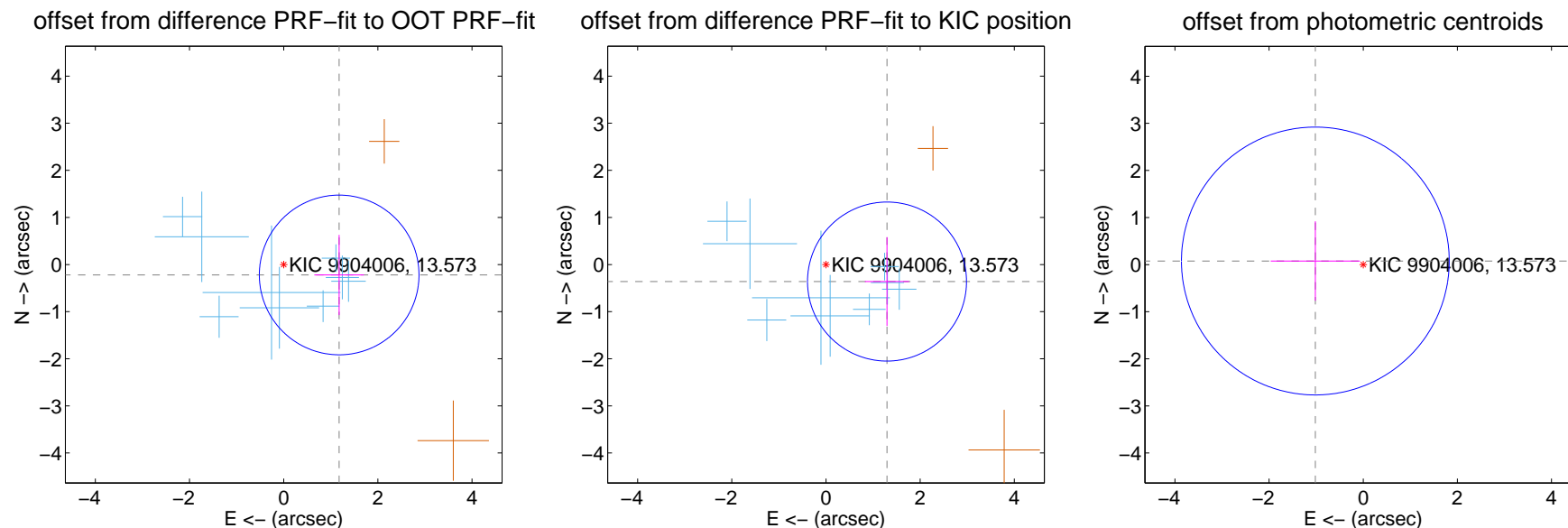
DV Centroid Data

Supplemental centroid analysis for 009904006-03. Kepler magnitude: 13.57. Transit SNR 10.15

There are 9 quarters with good PRF difference image offsets

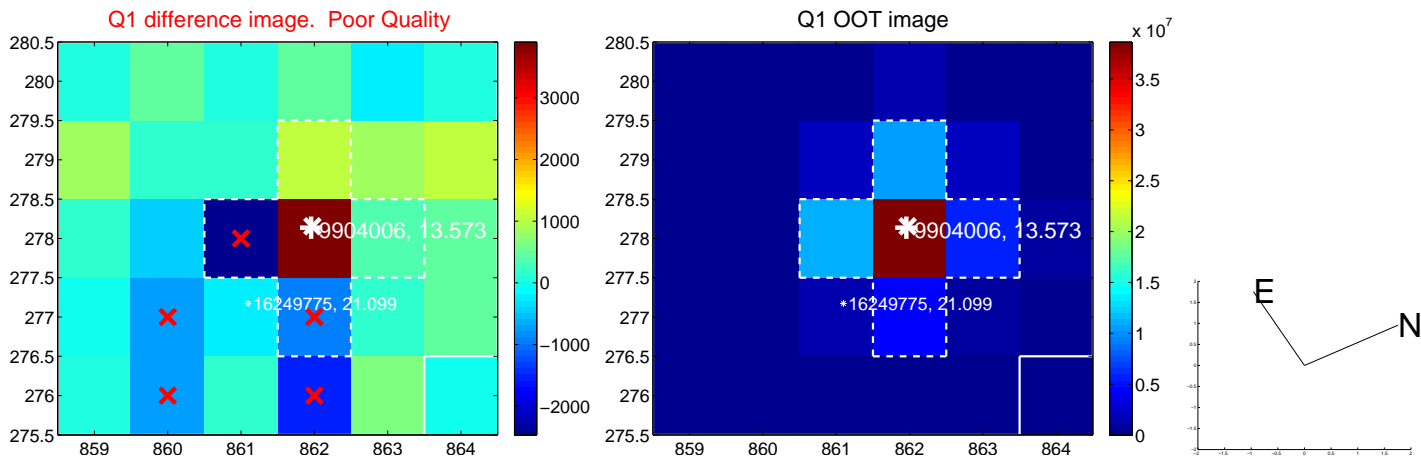
The direct PRF centroid is offset from the target star catalog position by about 0.25 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|-----------------------------------------|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT | 1.199 ± 0.565 | 2.12 | -1.178 ± 0.526 | -0.221 ± 0.850 |
| PRF-fit source offset from KIC position | 1.345 ± 0.563 | 2.39 | -1.296 ± 0.470 | -0.361 ± 0.943 |
| photometric centroid source offset | 1.02 ± 0.95 | 1.08 | 1.02 ± 0.95 | 0.08 ± 0.84 |

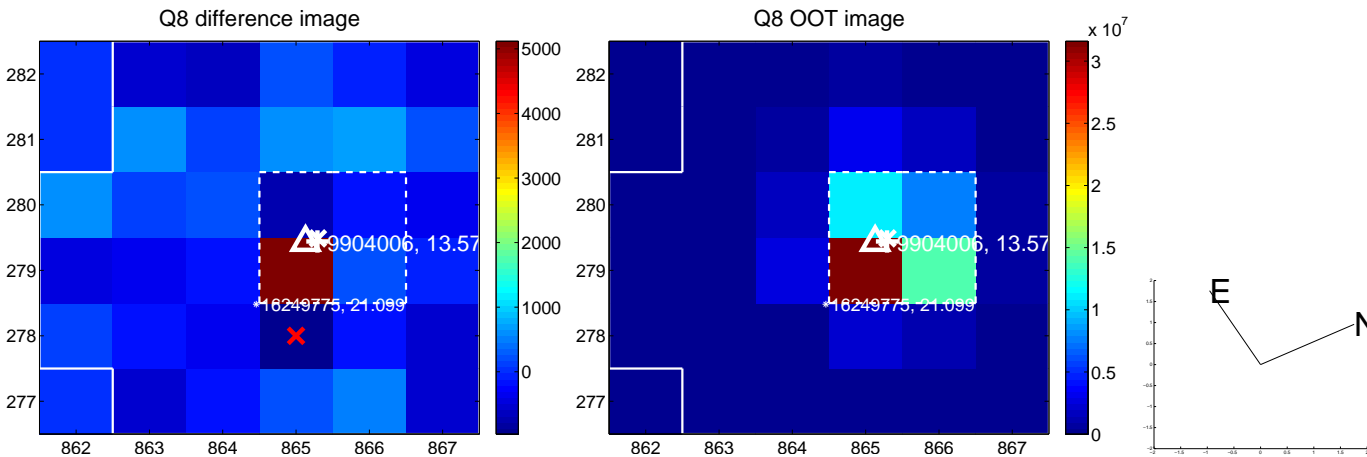
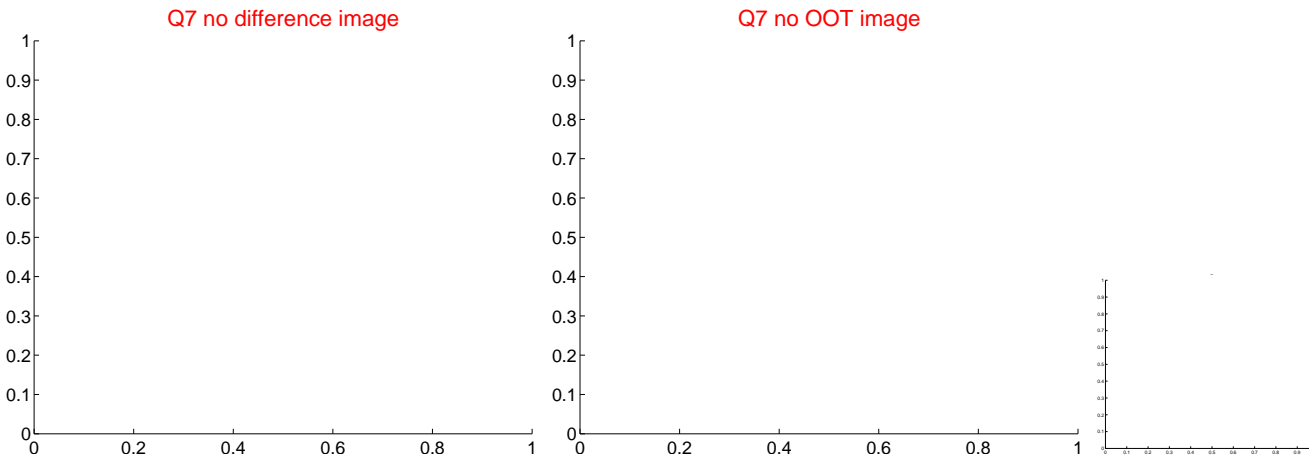
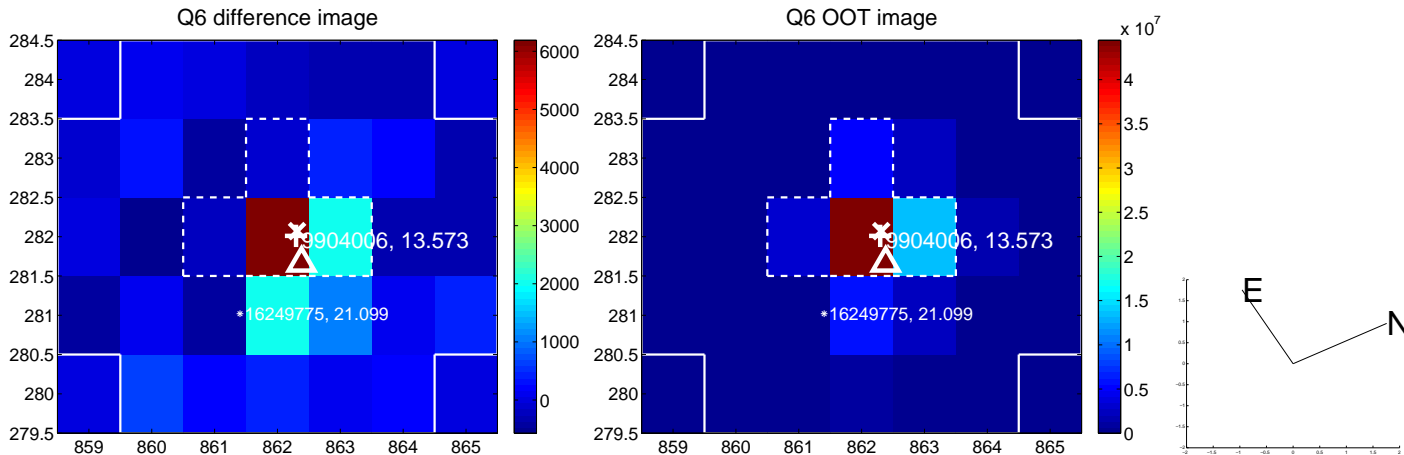
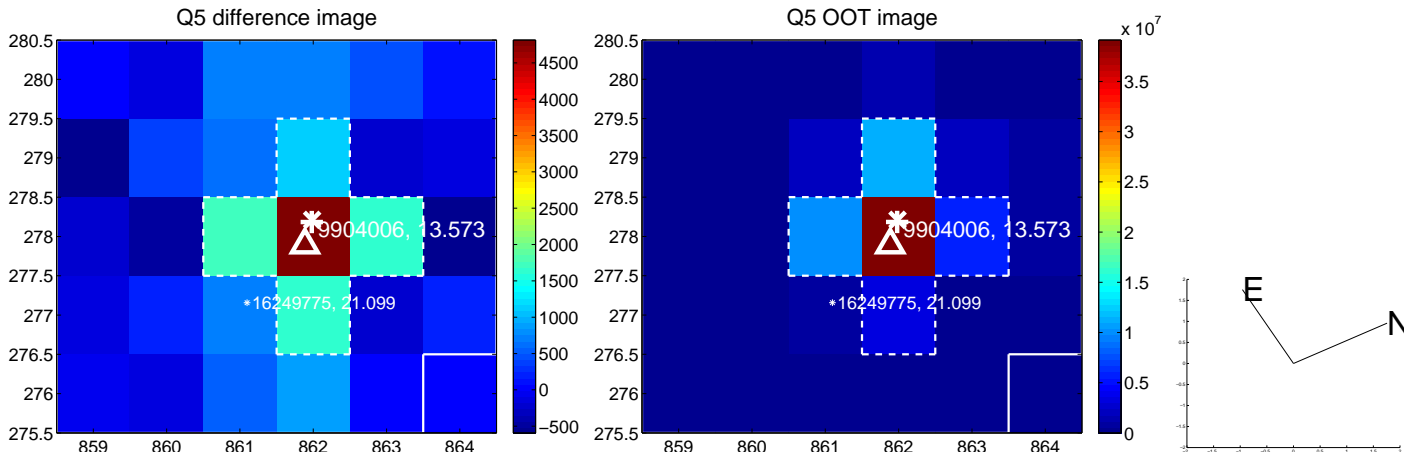


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

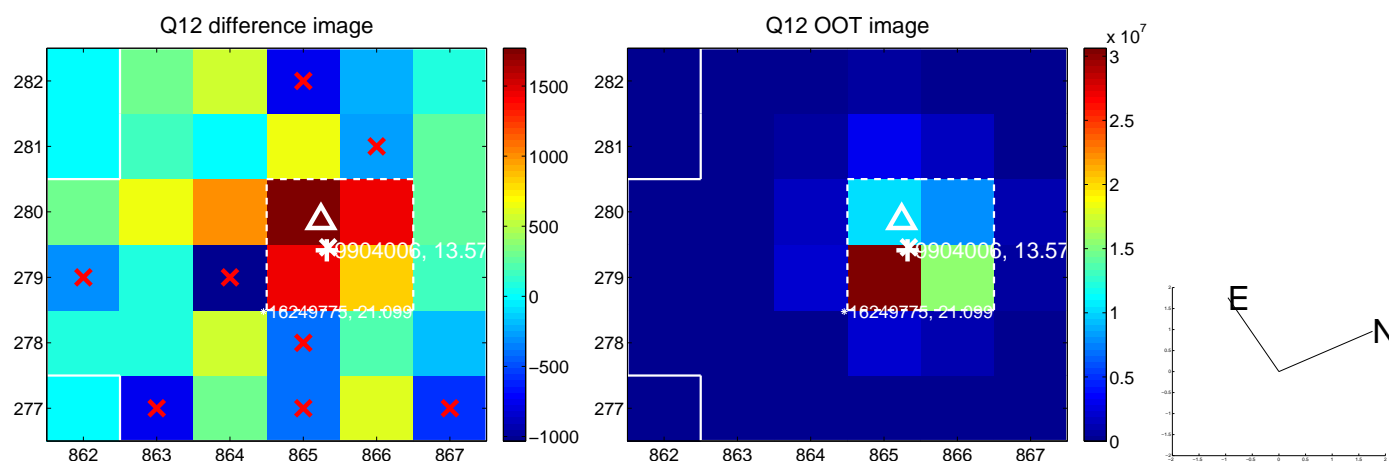
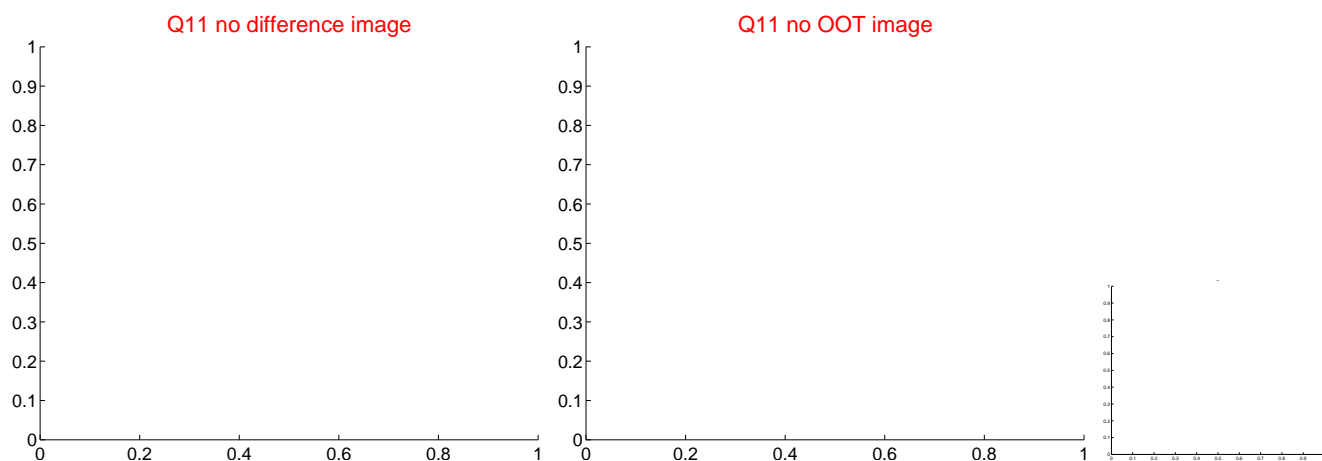
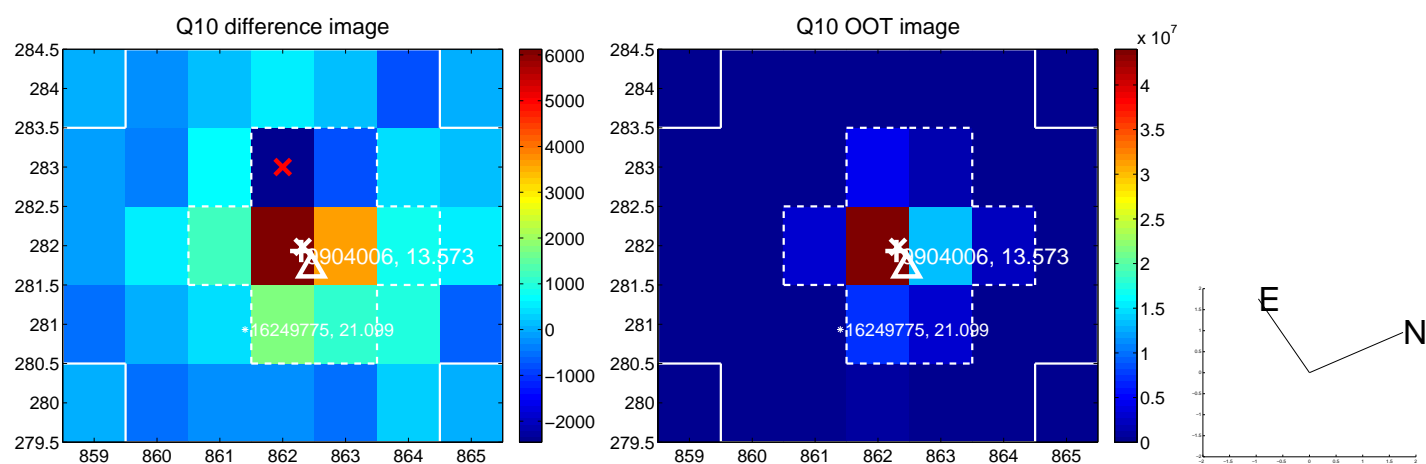
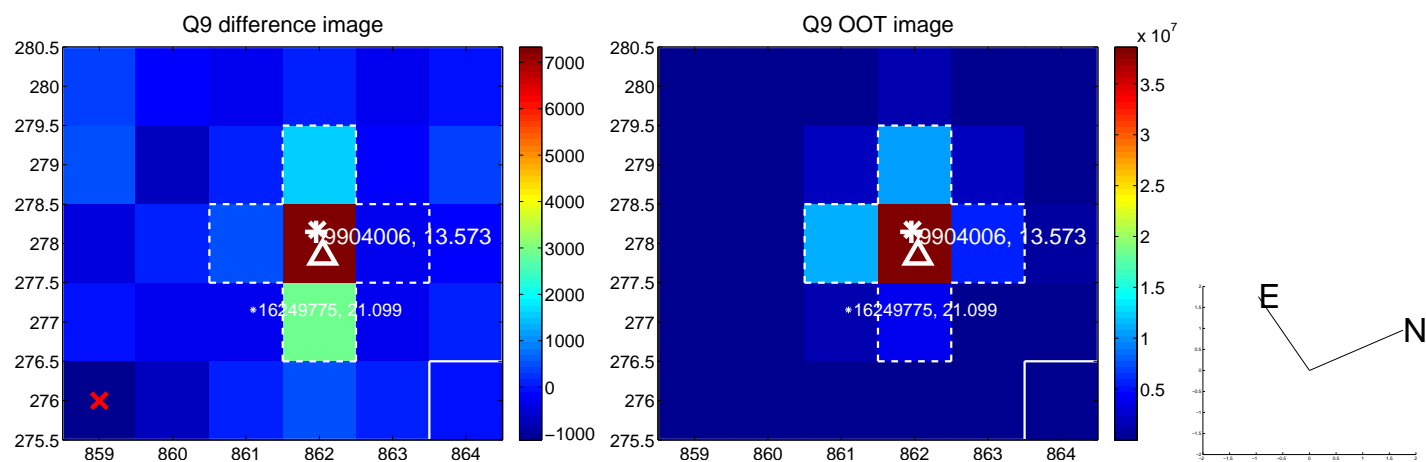
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



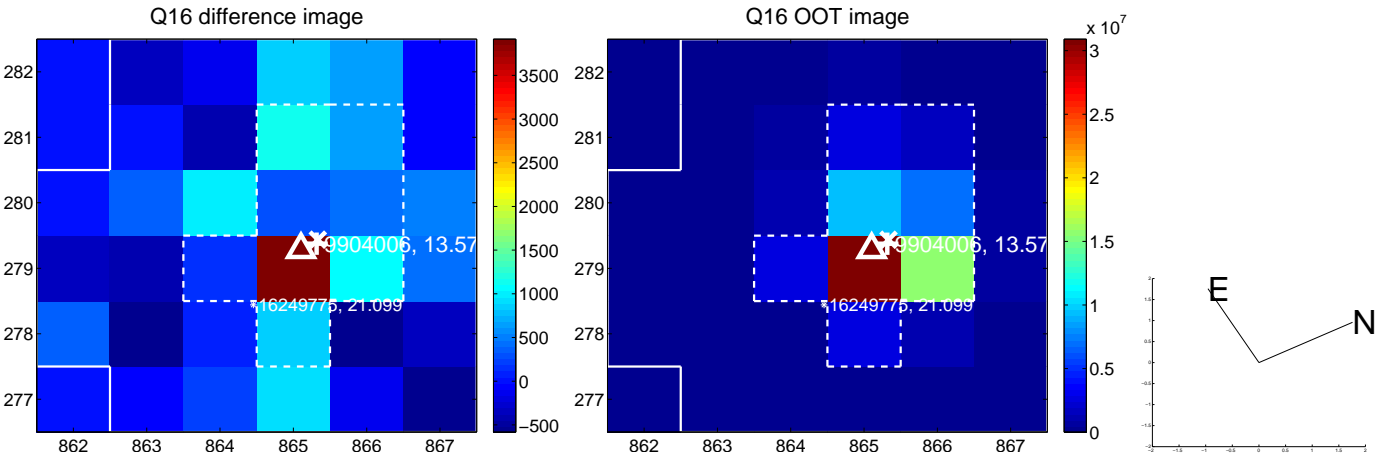
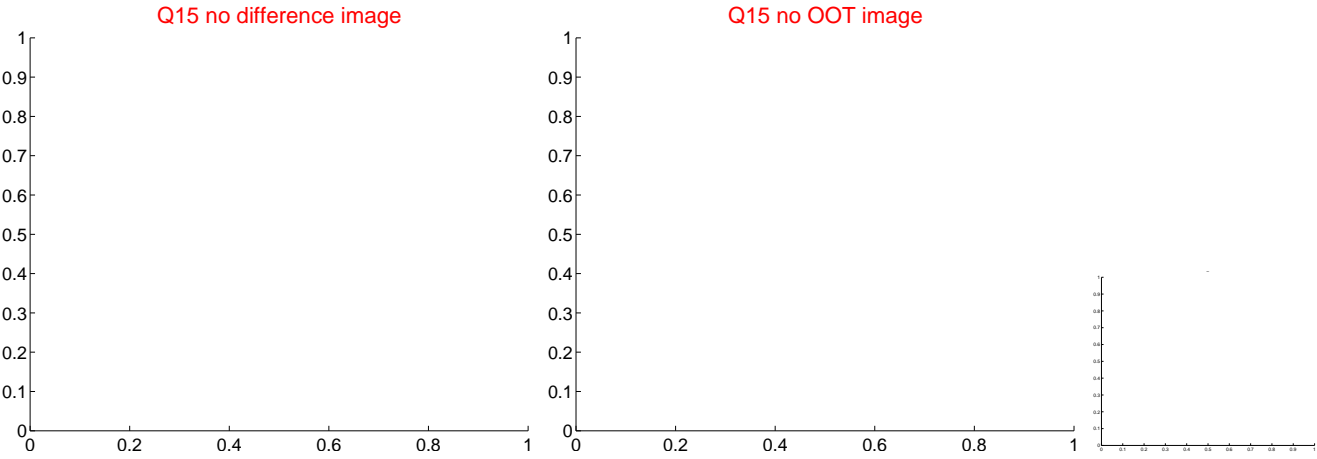
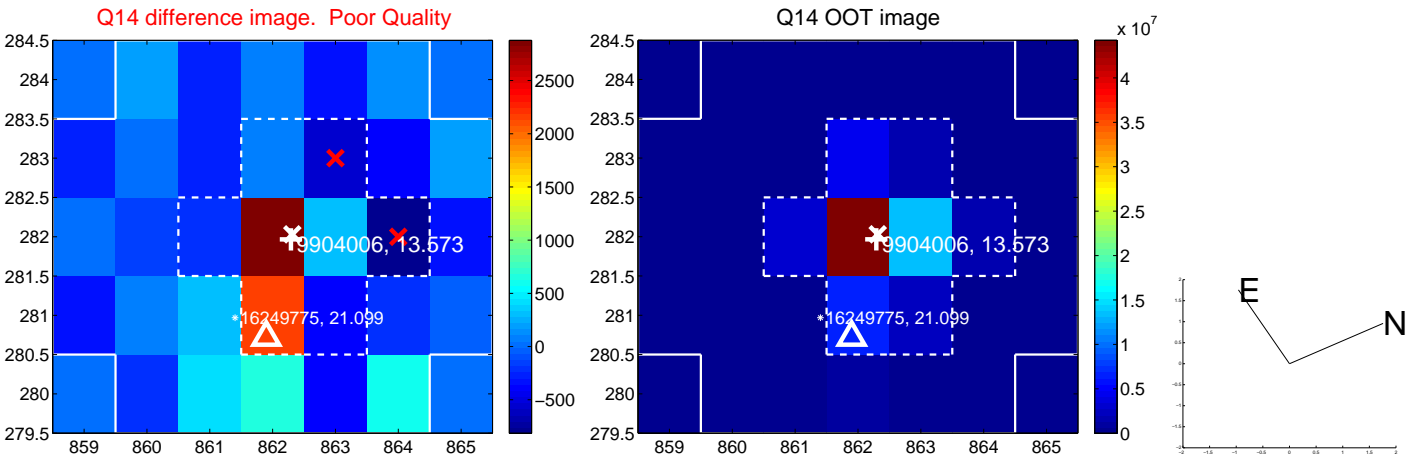
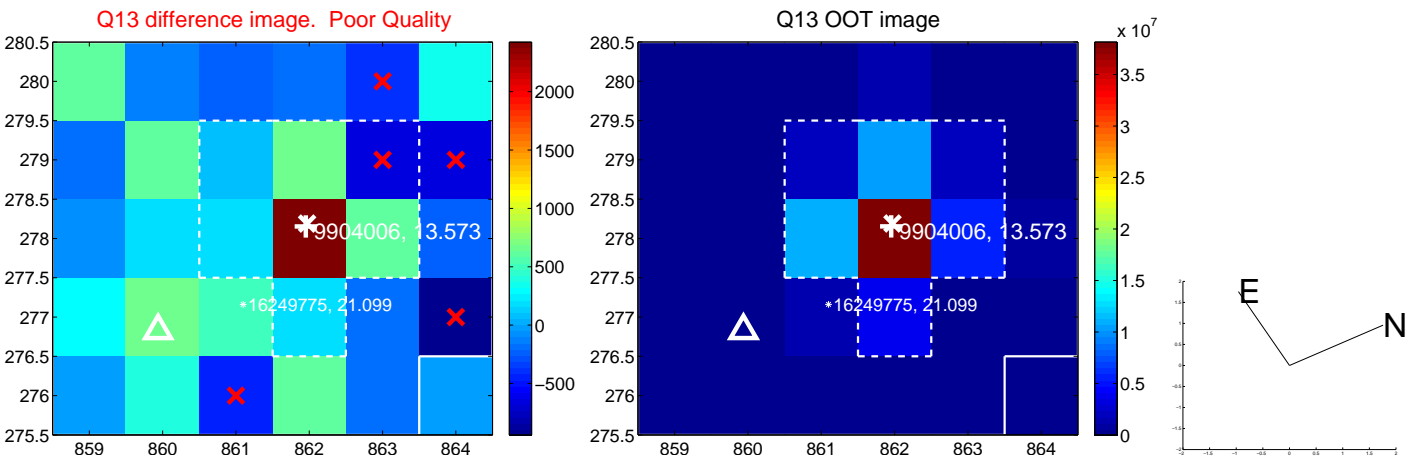
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value



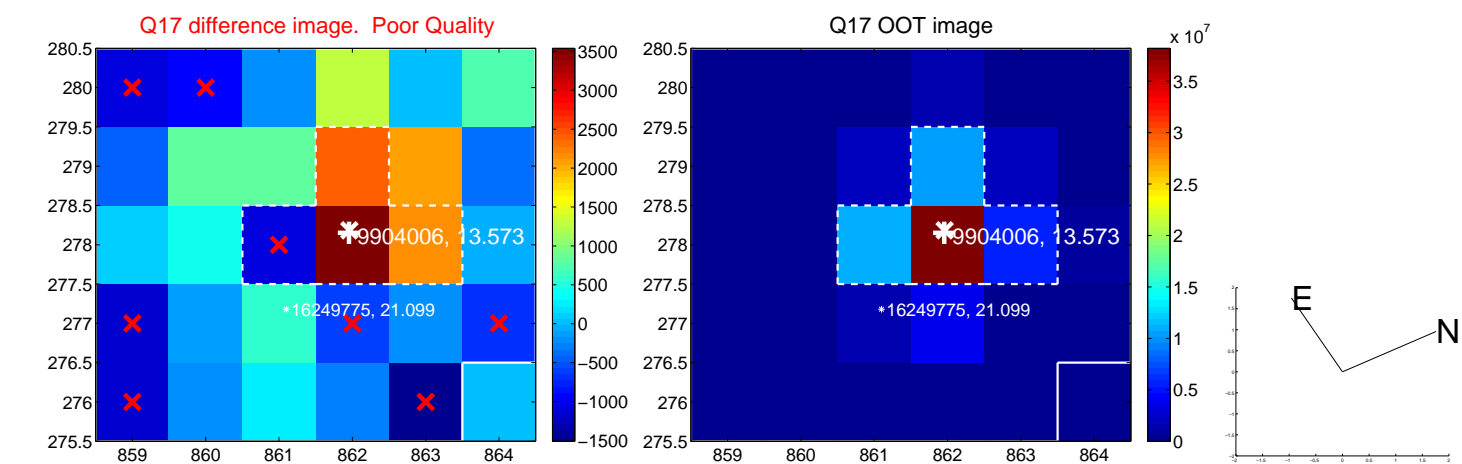
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value



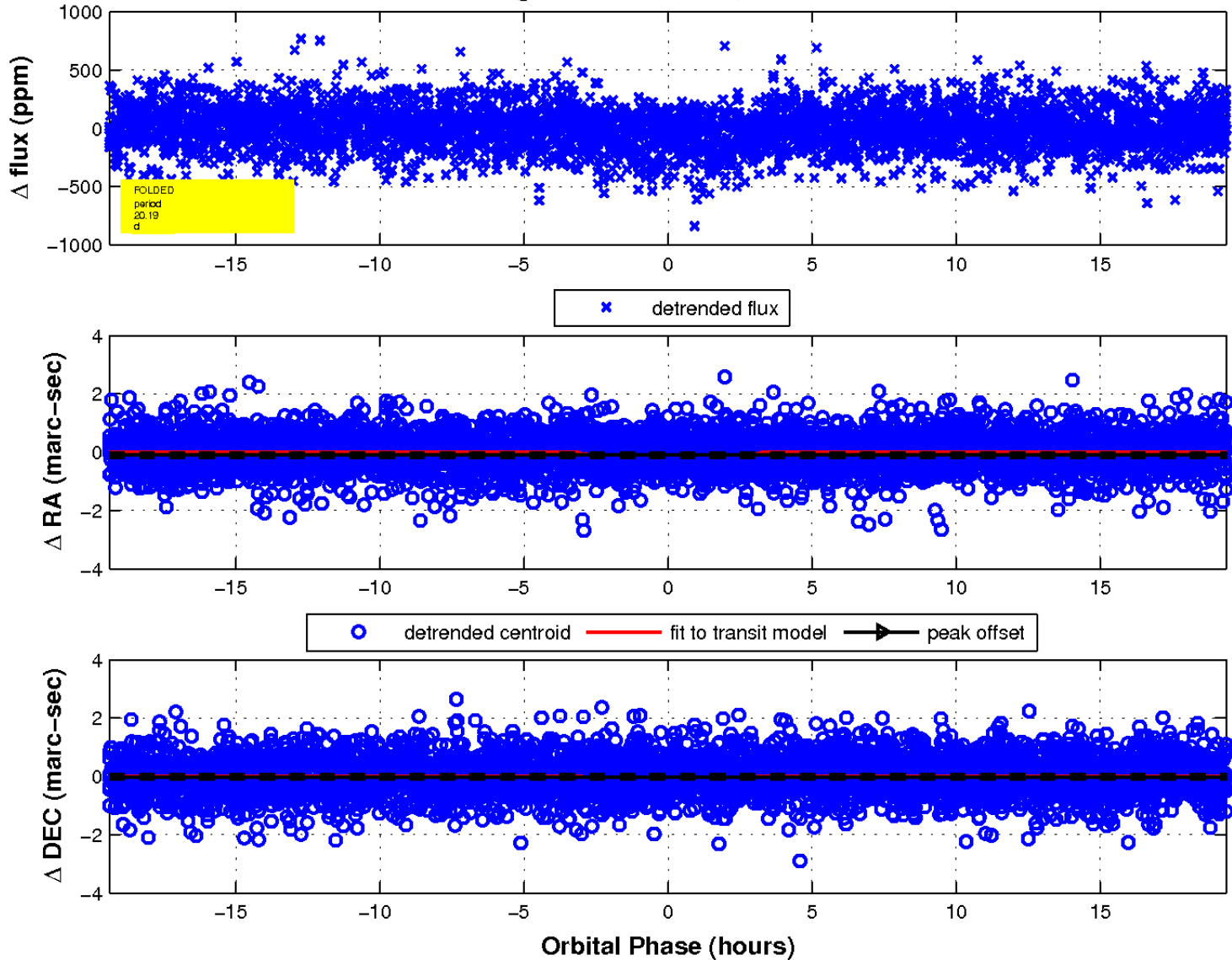
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



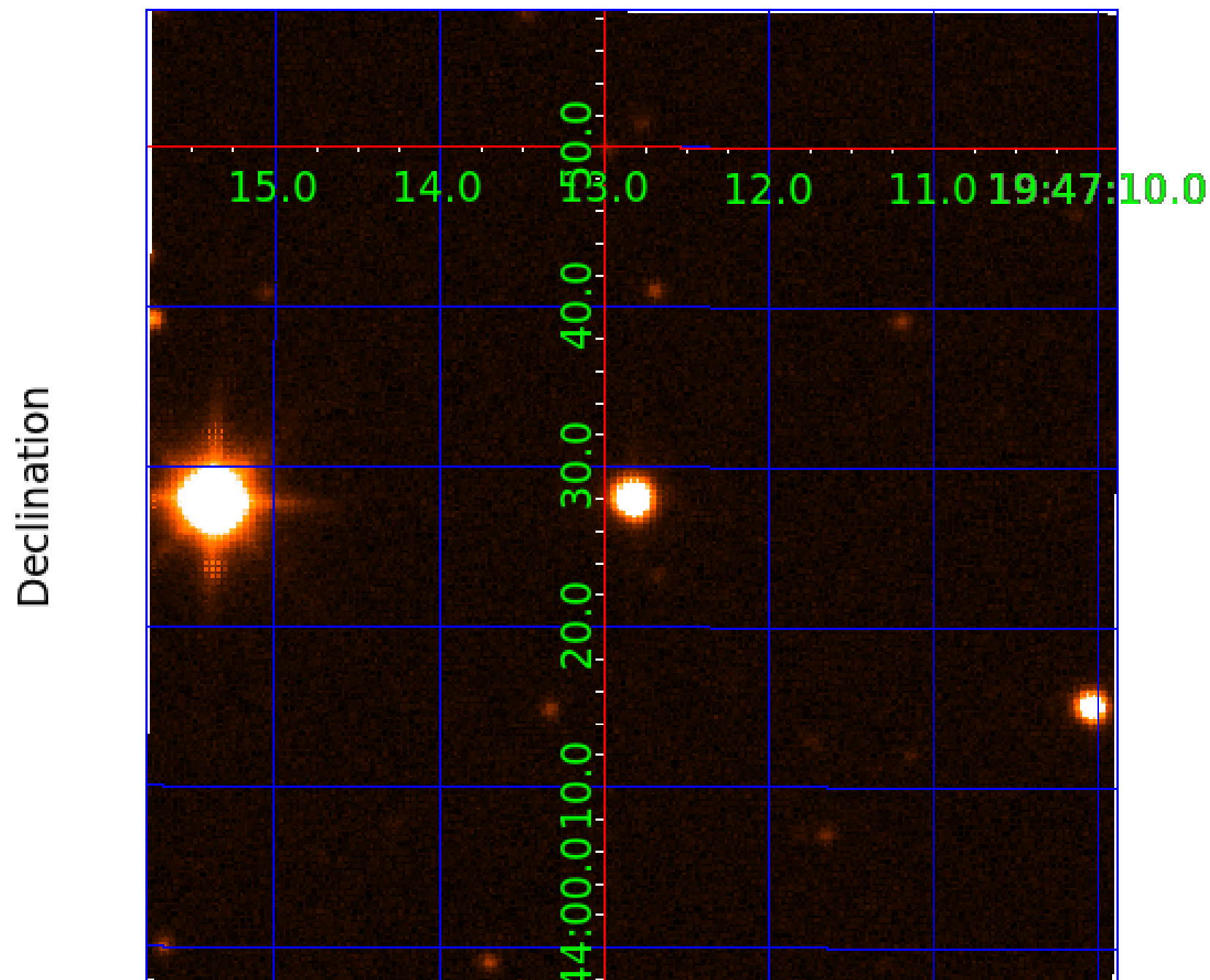
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



fluxWeightedCentroids, Planet 3 of 4



UKIRT Image



KIC 009904006

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}) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 009904006-01 | OBS | 2135.01 | 55.186387 | 180.760427 | 366.8 | 9.235 | 23.0 | 24.2 | 1.27 | 6178 | 2.69 | 24.61 |
| 009904006-02 | OBS | 2135.03 | 8.486522 | 138.016791 | 115.2 | 5.507 | 17.8 | 19.0 | 1.27 | 6178 | 1.56 | 298.65 |
| 009904006-03 | OBS | 2135.02 | 20.188882 | 142.194851 | 94.8 | 6.462 | 10.5 | 10.2 | 1.27 | 6178 | 1.38 | 94.04 |
| 009904006-04 | OBS | No | 215.392731 | 221.783212 | 215.5 | 45.978 | 8.0 | 6.1 | 1.27 | 6178 | 1.90 | 4.00 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|-----------------------------------------------------------------------------------------------|
| 009904006-01 | OBS | PC | 0.98 | 0 | 0 | 0 | 0 | NO_COMMENT |
| 009904006-02 | OBS | PC | 1.00 | 0 | 0 | 0 | 0 | NO_COMMENT |
| 009904006-03 | OBS | PC | 1.00 | 0 | 0 | 0 | 0 | NO_COMMENT |
| 009904006-04 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_MARSHALL—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS |

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

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

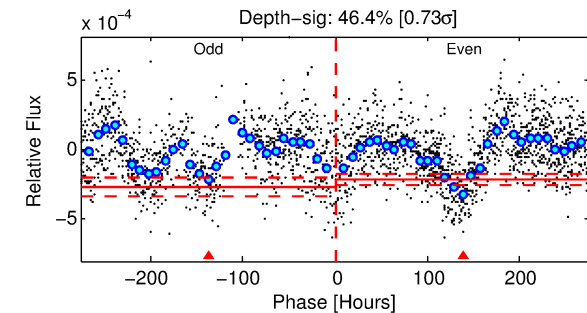
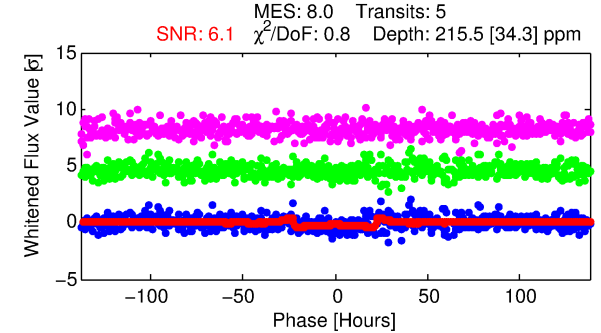
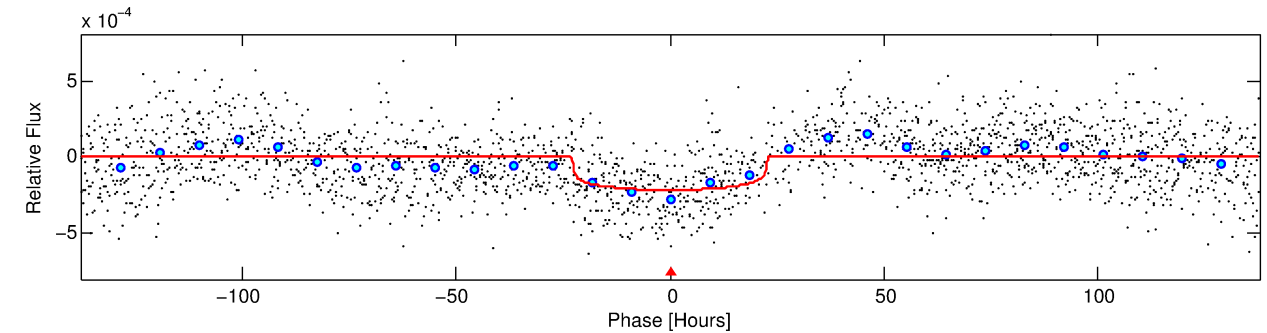
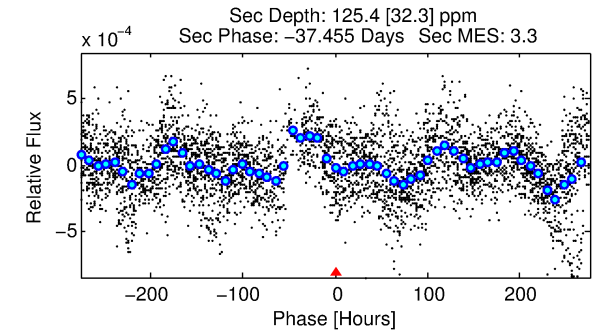
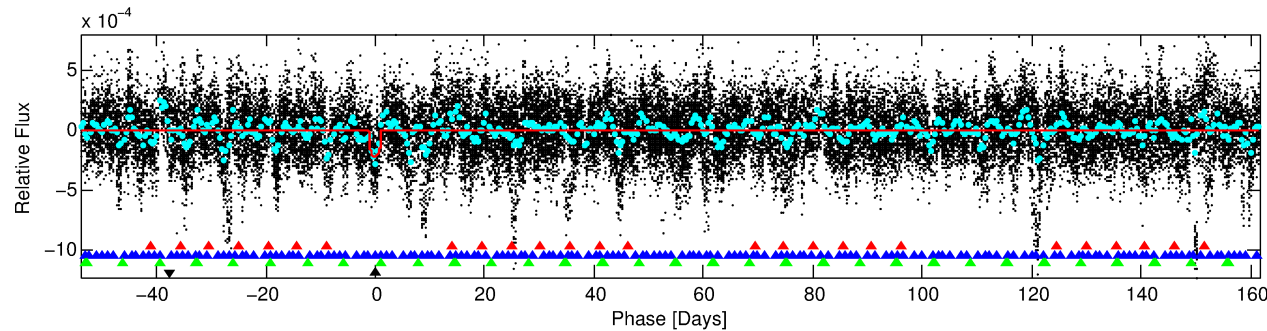
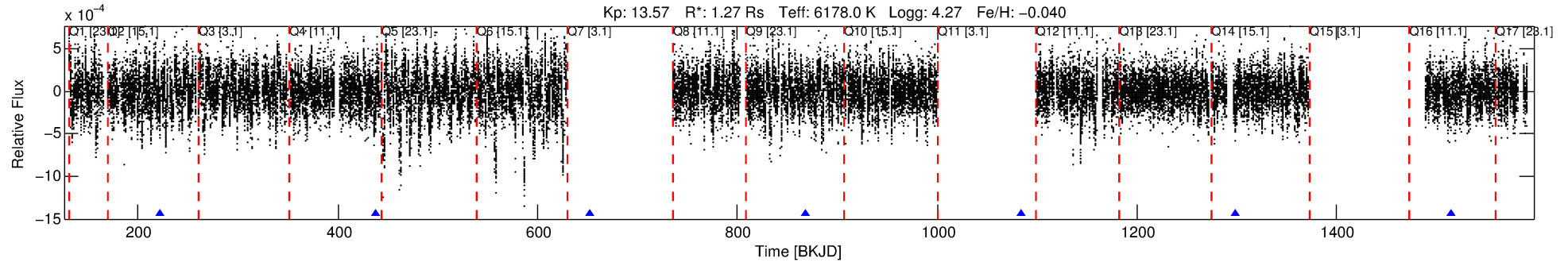
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 009904006-04

No Significant Match Found

DV One-Page Summary

KIC: 9904006 Candidate: 4 of 4 Period: 215.393 d
KOI: K02135 Name: Kepler-361 Corr: No Ephemeris Match



DV Fit Results:

Period = 215.39273 [0.00638] d
Epoch = 221.7832 [0.0247] BKJD
Rp/R* = 0.0137 [0.0029]
a/R* = 32.77 [30.77]
b = 0.44 [1.75]
Seff = 4.00 [0.98]
Teq = 361 [22] K
Rp = 1.90 [0.53] Re
a = 0.7234 [0.1138] AU
Ag = 10035.00 [5446.56] [1.84σ]
Teffp = 5582 [698] K [7.48σ]

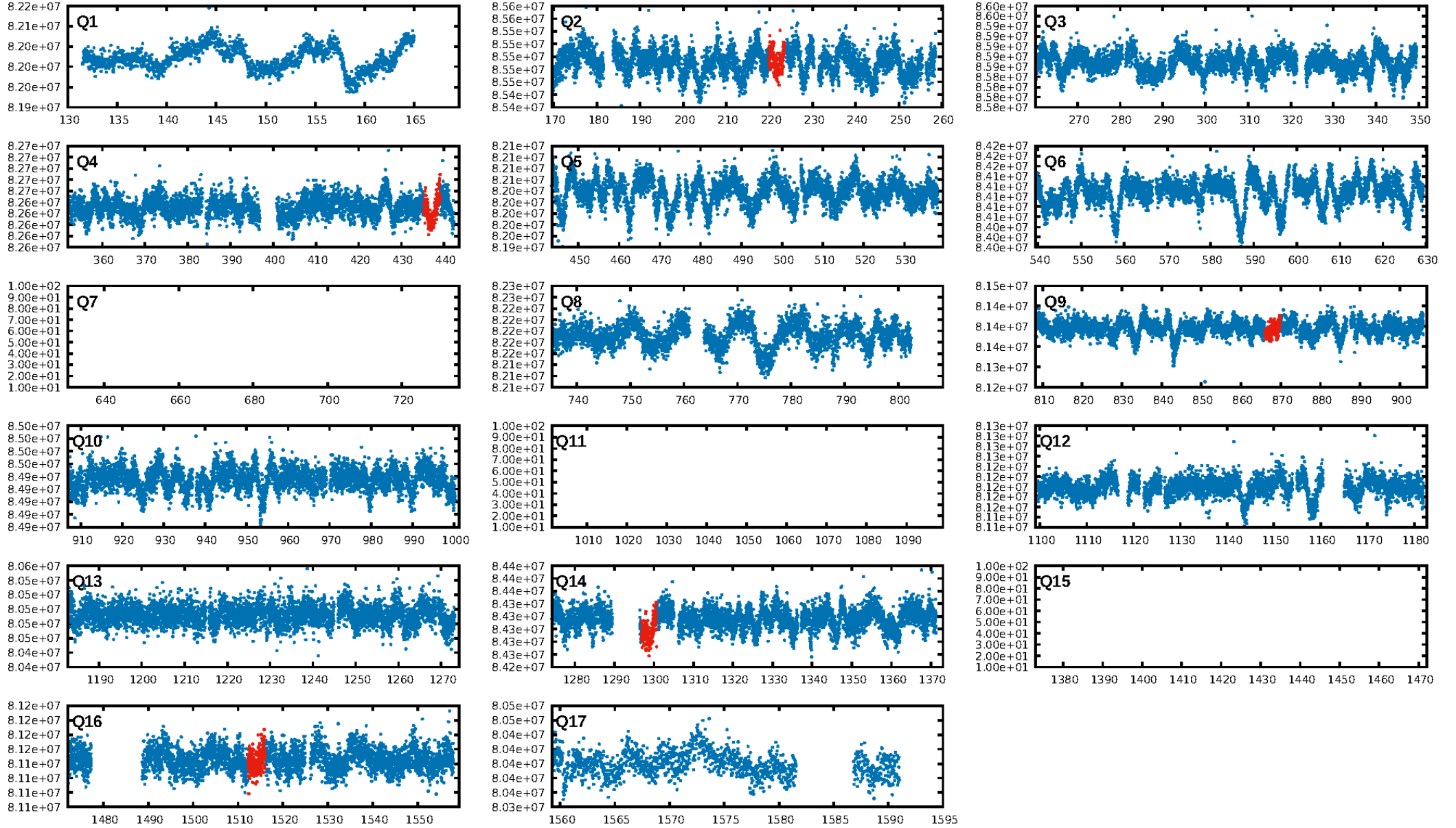
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [81.99σ]
LongPeriod-sig: N/A
ModelChiSquare2-sig: 39.2%
ModelChiSquareGof-sig: 100.0%
Bootstrap-pfa: 1.64e-15
RollingBand-fgt: 1.00 [5/5]
GhostDiagnostic-chr: 1.071
Centroid-sig: 6.6%
Centroid-so: 0.930 arcsec [1.33σ]
OotOffset-rm: N/A
KicOffset-rm: N/A
OotOffset-st: 0/0/0/0 [0]
KicOffset-st: 0/0/0/0 [0]
DiffImageQuality-fgm: N/A
DiffImageOverlap-fno: 0.00 [0/1]

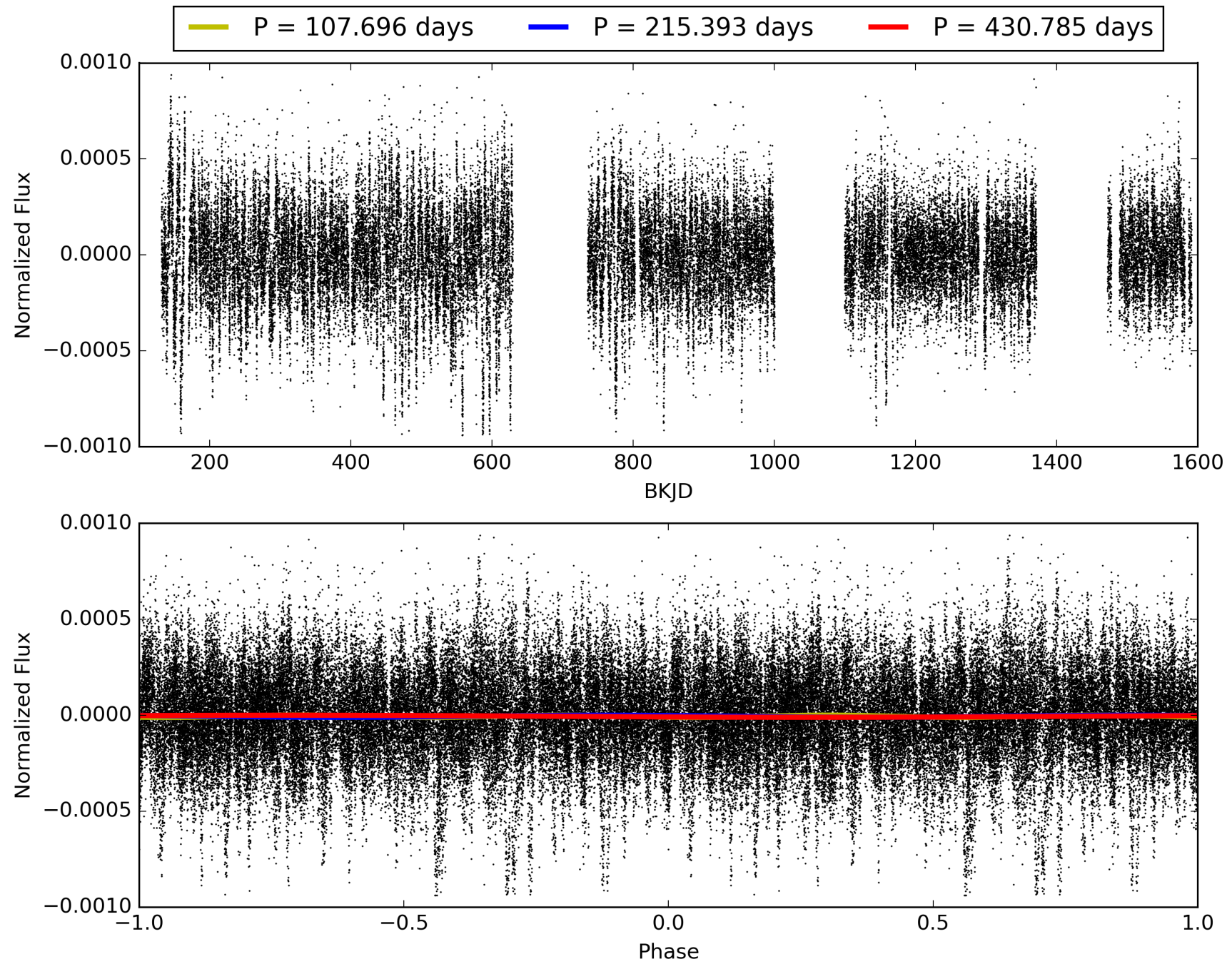
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 19:12:02 Z

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

TCE 009904006-04, PDC Light Curves

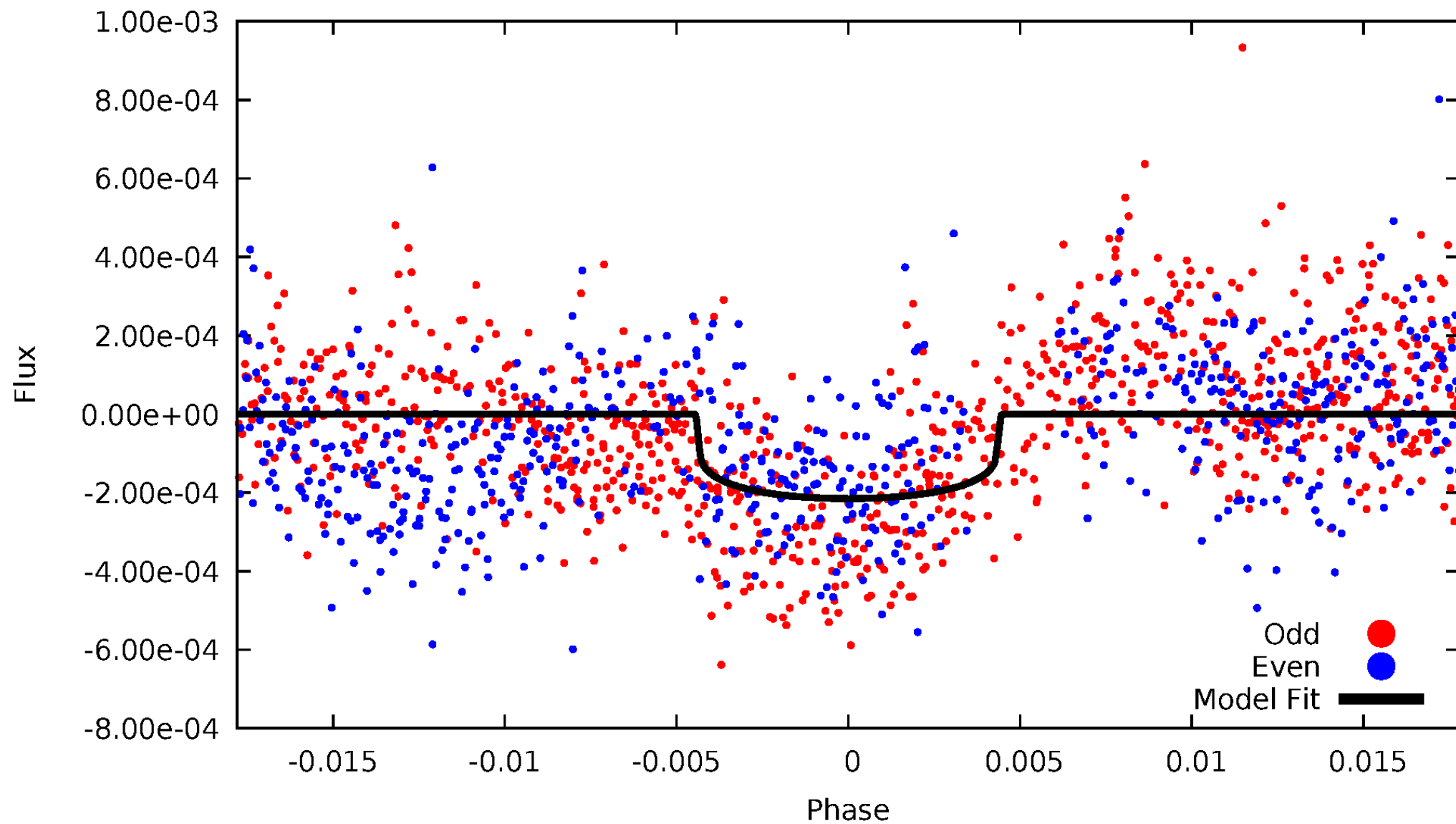


TCE 009904006-04



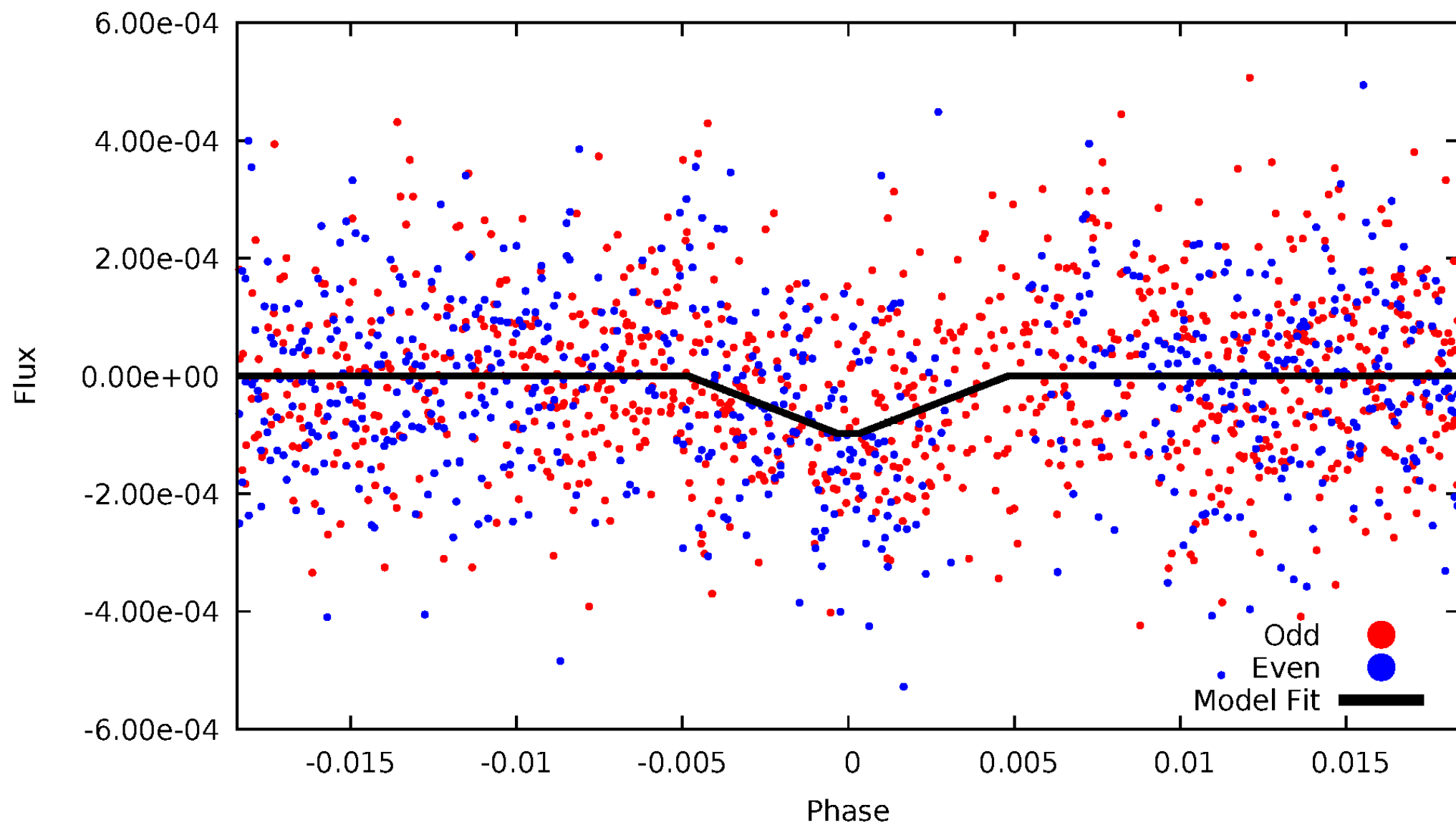
DV Odd/Even

TCE 009904006-04



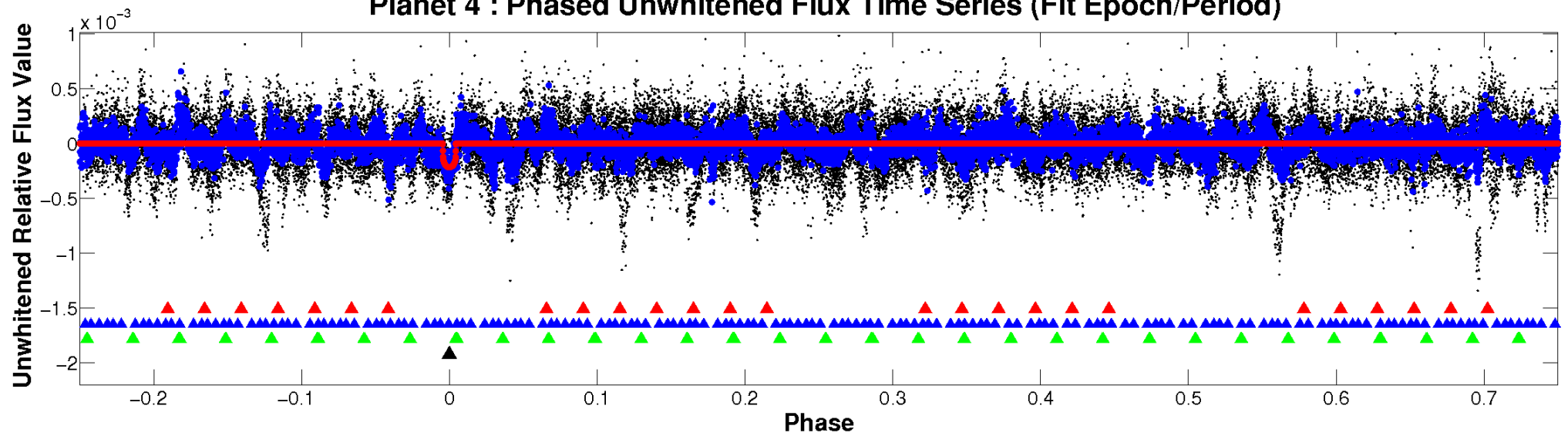
ALT Odd/Even

TCE 009904006-04

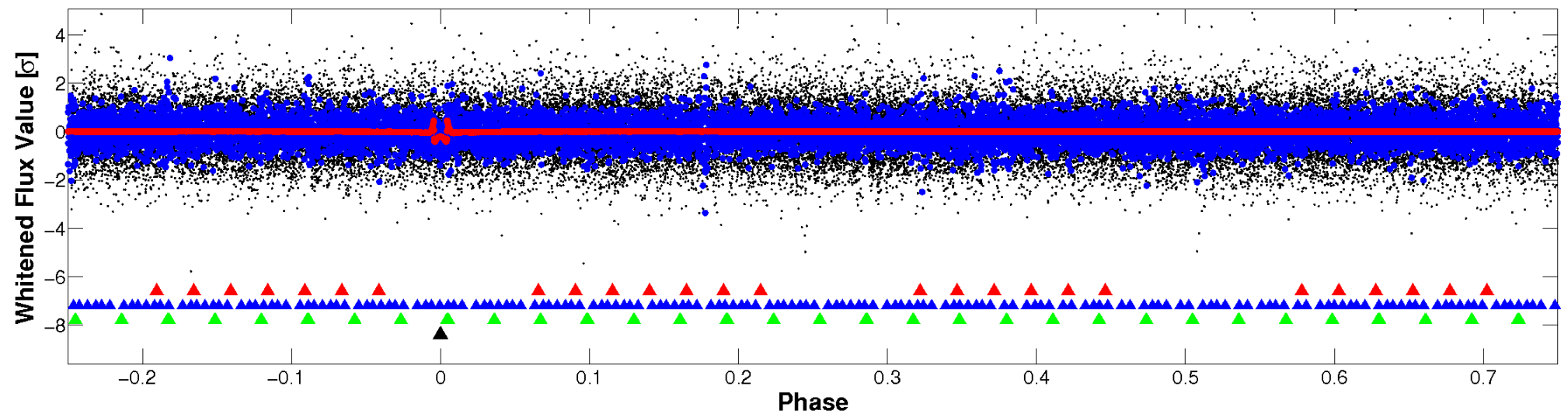


Non-Whitened Vs. Whitened Light Curve

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 009904006-04 P=215.392731 Days $T_0=221.783212$ (BKJD)



DV Quarter-Phased Transit Curves

TCE 009904006-04 P=215.392731 Days $T_0=221.783212$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

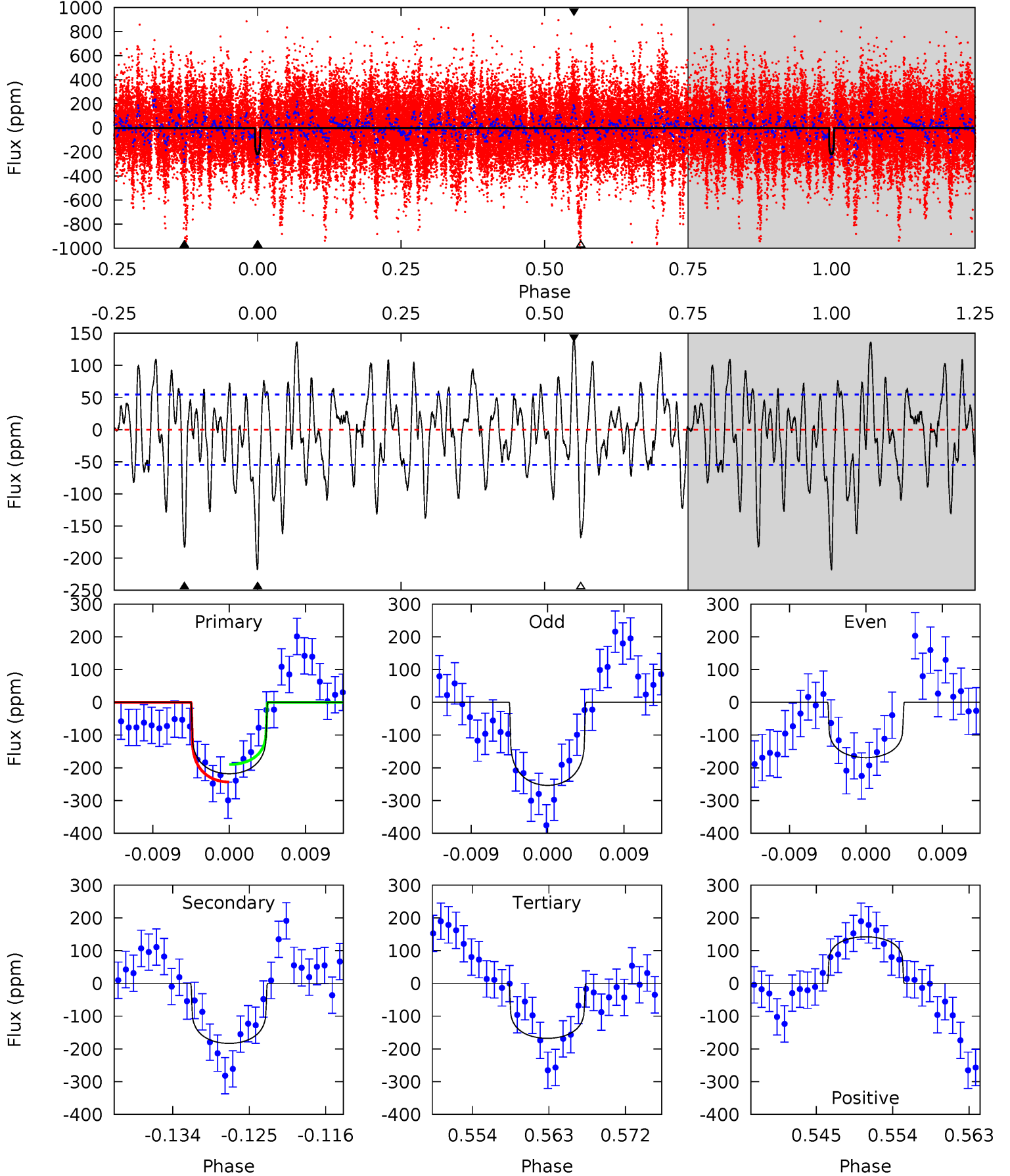
TCE 009904006-04 $P=215.403778$ Days $T_0=221.859488$ (BKJD)



DV Model-Shift Uniqueness Test

009904006-04, P = 215.392731 Days, E = 6.390481 Days

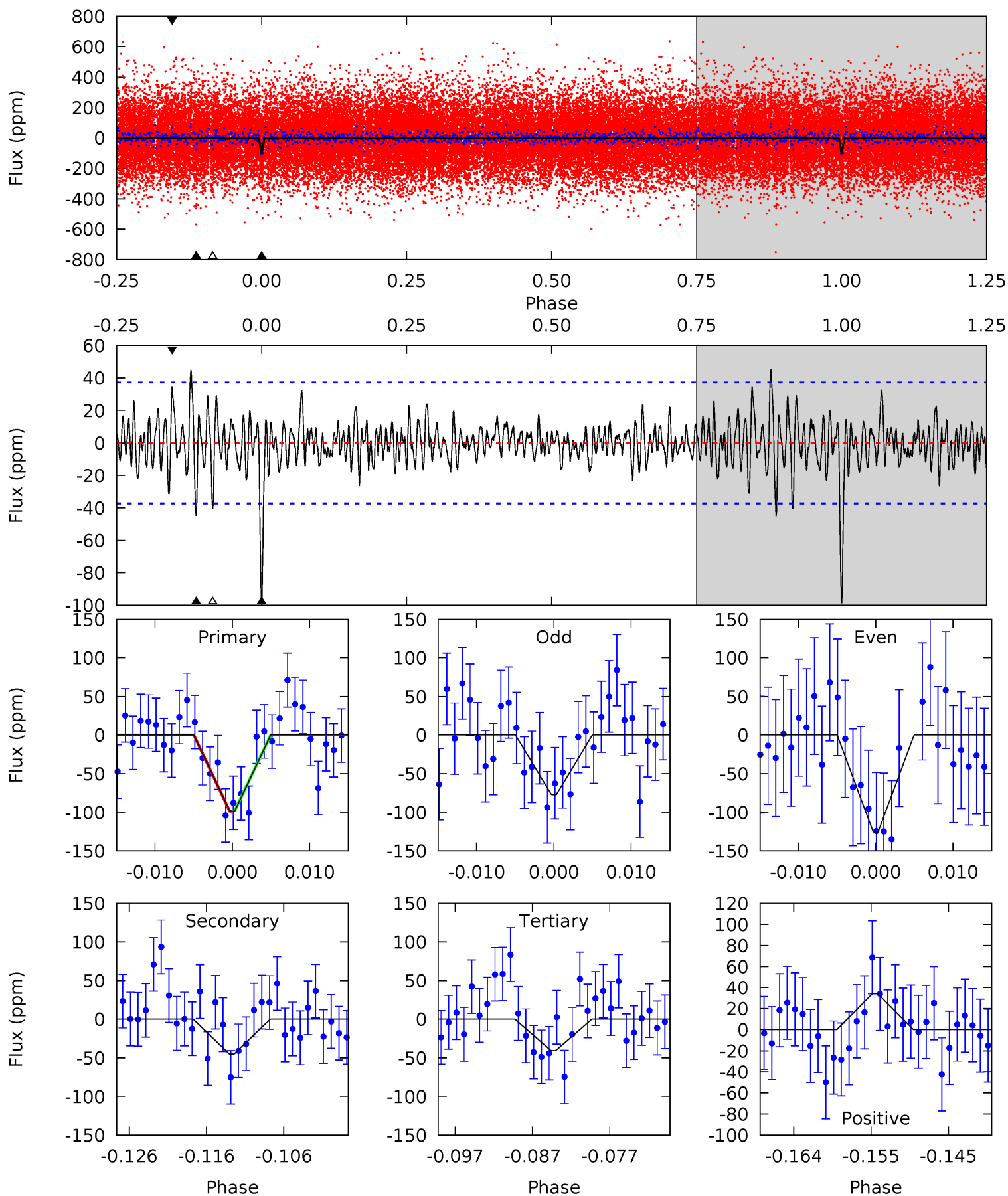
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 20.2 | 16.9 | 15.5 | 13.1 | 5.05 | 2.61 | 5.05 | 4.66 | 7.03 | 1.43 | 3.79 | 3.80 | 0.96 | 0.39 | 2.46 |



Alt Model-Shift Uniqueness Test

009904006-04, P = 215.403778 Days, E = 6.455710 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 13.3 | 6.06 | 5.46 | 4.63 | 5.03 | 2.59 | 1.33 | 7.82 | 8.65 | 0.60 | 1.43 | 3.16 | 0.95 | 0.31 | 0.05 |



Stellar Parameters For KIC 009904006

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | $R (R_{\odot})$ | $M(M_{\odot})$ | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|-------------------------------------------|
| | 6178^{+111}_{-135} | $4.269^{+0.125}_{-0.125}$ | $-0.040^{+0.150}_{-0.150}$ | $1.267^{+0.237}_{-0.178}$ | $1.085^{+0.113}_{-0.075}$ | $0.751^{+0.408}_{-0.264}$ |
| | +2%/-2% | +3%/-3% | +375%/-375% | +19%/-14% | +10%/-7% | +54%/-35% |
| Source | SPE58 | SPE58 | SPE58 | DSEP | | |

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

Secondary Eclipse Parameters for KIC 009904006-04 / KOI

| Detrend | Depth (ppm) | $R_p (R_{\oplus})$ | $T_{\text{max}} (K)$ | $T_{\text{obs}} (K)$ | A_{obs} |
|---------|---------------|------------------------|----------------------|----------------------|-------------------------|
| DV | -183 ± 11 | $1.87^{+0.48}_{-0.43}$ | 502^{+25}_{-22} | 6153^{+781}_{-582} | 15081^{+9920}_{-5506} |
| Alt. | -45 ± 7 | $1.36^{+0.42}_{-0.38}$ | 502^{+27}_{-22} | 5114^{+964}_{-531} | 6913^{+7220}_{-3051} |

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

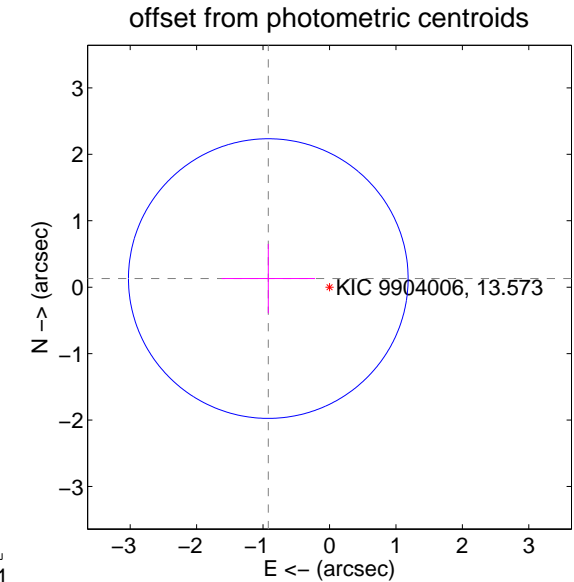
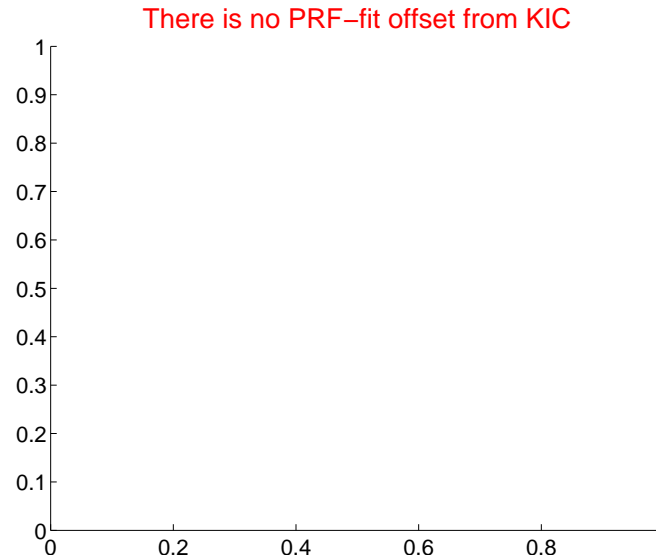
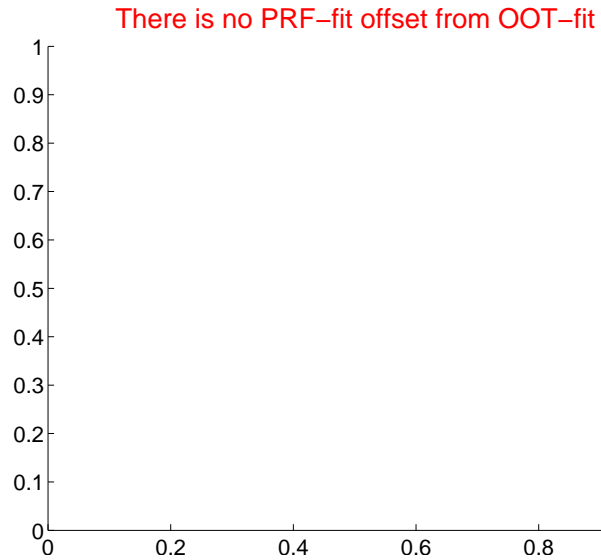
DV Centroid Data

Supplemental centroid analysis for 009904006-04. Kepler magnitude: 13.57. Transit SNR 6.13

There are 0 quarters with good PRF difference image offsets

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

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|-----------------------------------------|--------------------|---------------------|-----------------|-----------------|
| PRF-fit source offset from OOT | — | — | — | — |
| PRF-fit source offset from KIC position | — | — | — | — |
| photometric centroid source offset | 0.93 ± 0.70 | 1.33 | 0.92 ± 0.70 | 0.13 ± 0.52 |



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.

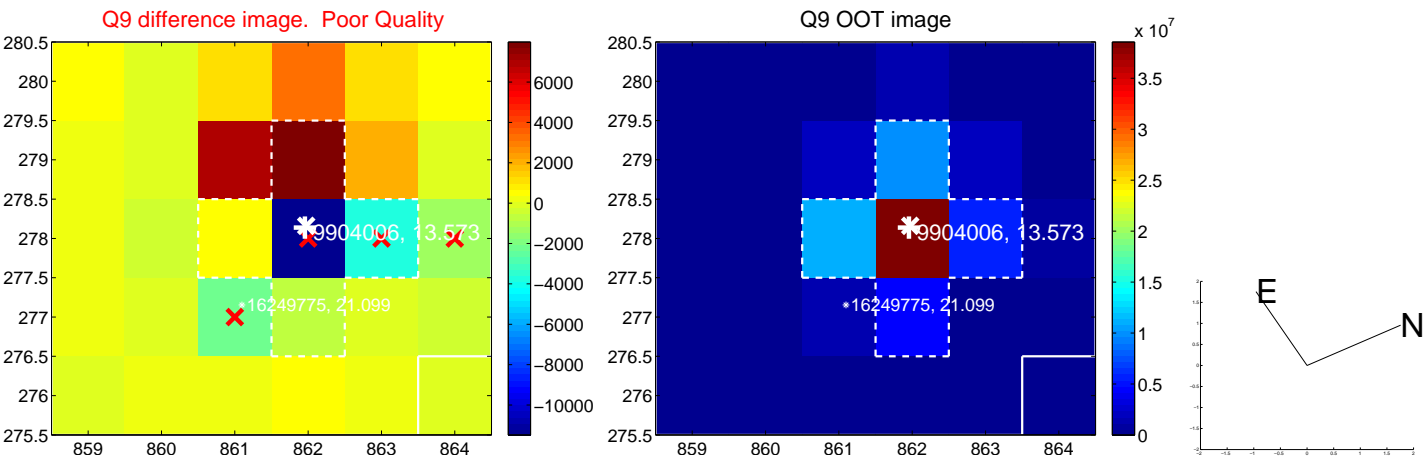
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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



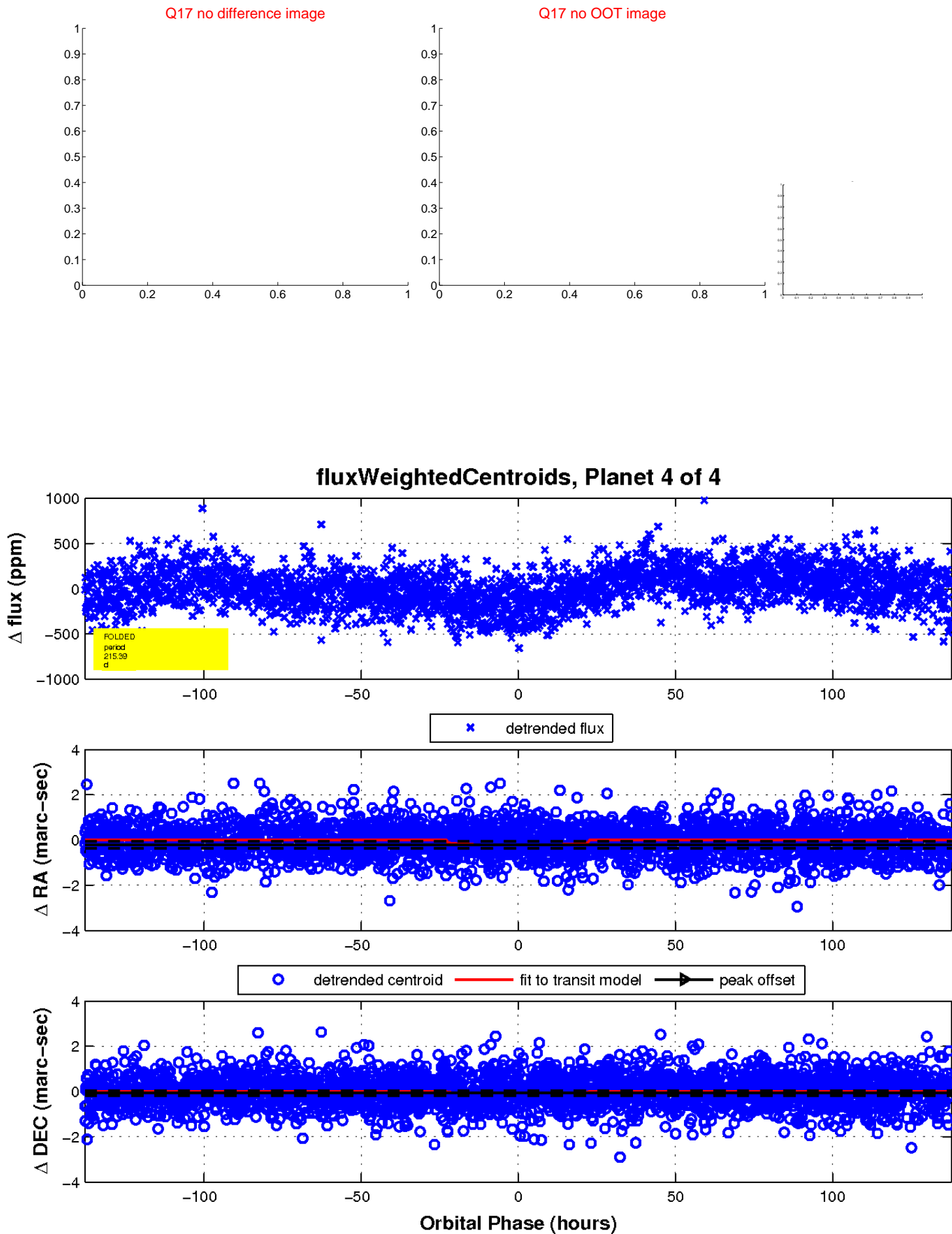
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

