

KIC 010405224

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}) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|-----|-----|-----------------------------|-----------------|------------------------|------------------------|
| 010405224-01 | OBS | 8008.01 | 0.933767 | 132.415600 | 62.8 | 4.290 | 8.3 | 7.9 | 0.75 | 4938 | 0.73 | 981.70 |
| 010405224-02 | OBS | No | 354.003109 | 163.347247 | 1165.3 | 4.368 | 7.7 | 6.0 | 0.75 | 4938 | 3.40 | 0.36 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|--|
| 010405224-01 | OBS | FP | 0.00 | 1 | 0 | 0 | 1 | LPP_DV—EPHEM_MATCH |
| 010405224-02 | OBS | FP | 0.00 | 1 | 0 | 1 | 0 | INDIV_TRANS_RUBBLE_CHASES_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS—HALO_GHOST |

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

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

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

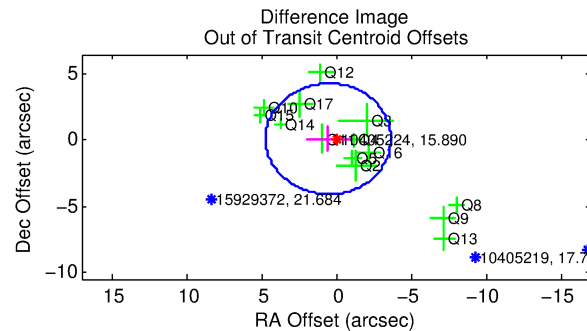
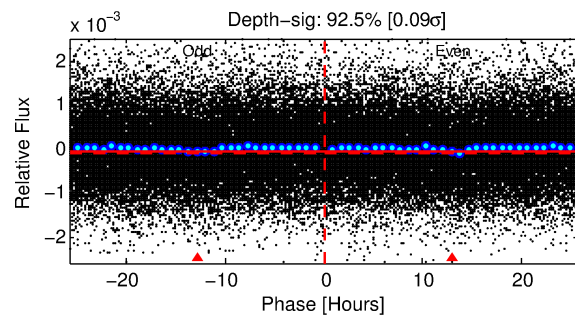
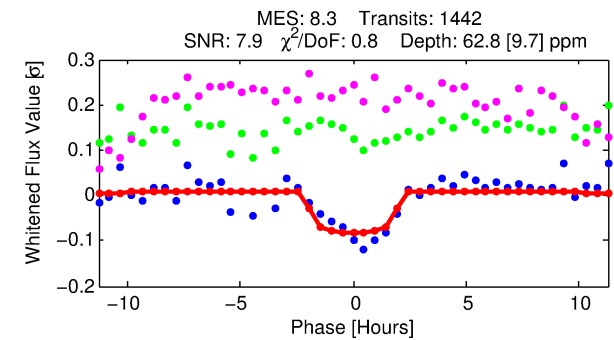
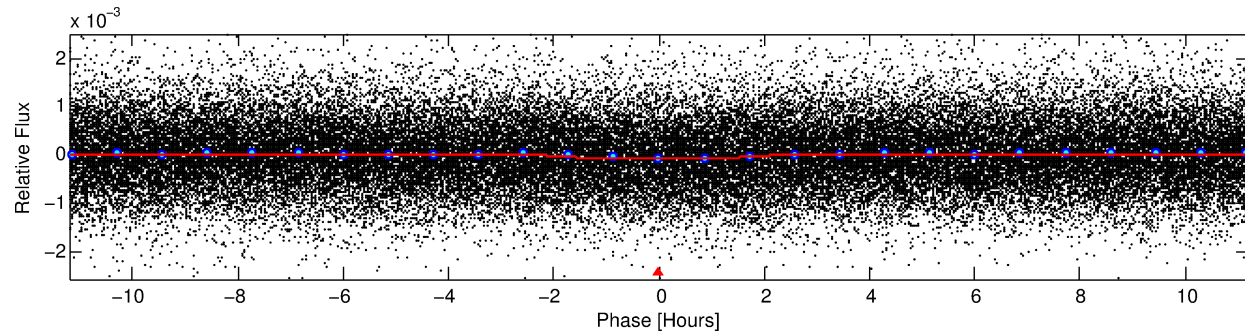
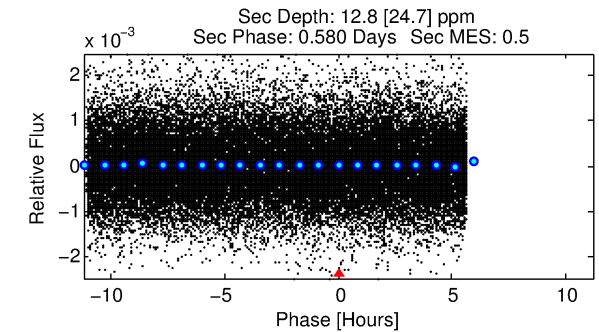
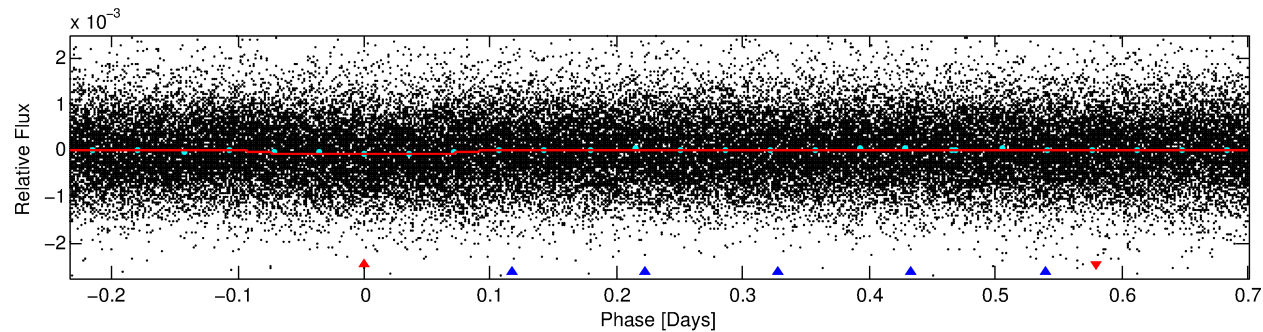
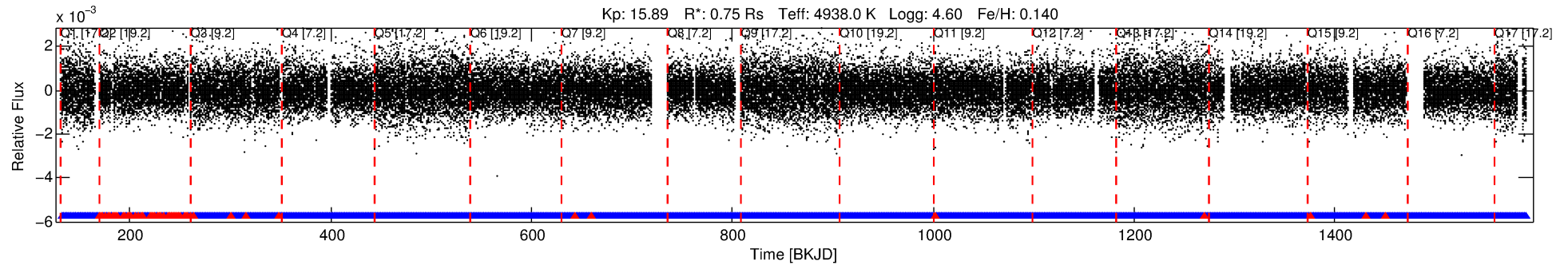
Ephemeris Match Information For 010405224-01

| TCE (1) | KIC | Parent (2) | Parent KIC | $P_1:P_2$ | Dist ($''$) | ΔRow | ΔCol | m_2 | m_1 | D_2/D_1 | Mechanism | Flag | σ_P | σ_T |
|--------------|----------|---------------|------------|-----------|---------------|--------------------|--------------------|-------|-------|-----------|------------|------|------------|------------|
| 010405224-01 | 10405224 | V2083-Cyg-pri | 10342012 | 1:2 | 1926.2 | 277 | -398 | 6.90 | 15.89 | 3148.00 | Direct-PRF | 0 | 3.67 | 2.86 |

Notes: $P_1:P_2$ is the period ratio. Dist is the distance in arcseconds. ΔRow and ΔCol are the number of pixels apart in row and column. m_2 and m_1 are the magnitudes of the parent and child. D_2/D_1 is the parent's transit depth divided by the child's. σ_P and σ_T are the significance of the match in period and epoch. For a match to be considered significant $\sigma_P < 5.0$ and $\sigma_T < 5.0$. Matches which have σ_P and σ_T very close to this cutoff should receive extra scrutiny, especially if the period ratio is very large.

DV One-Page Summary

KIC: 10405224 Candidate: 1 of 2 Period: 0.934 d



DV Fit Results:

Period = 0.93377 [0.00002] d
Epoch = 132.4156 [0.0062] BKJD
Rp/R* = 0.0089 [0.0072]
a/R* = 1.21 [1.24]
b = 0.90 [0.71]
Seff = 981.70 [167.88]
Teq = 1427 [61] K
Rp = 0.73 [0.60] Re
a = 0.0175 [0.0015] AU
Ag = 4.09 [10.32] [0.30σ]
Teffp = 3138 [1981] K [0.86σ]

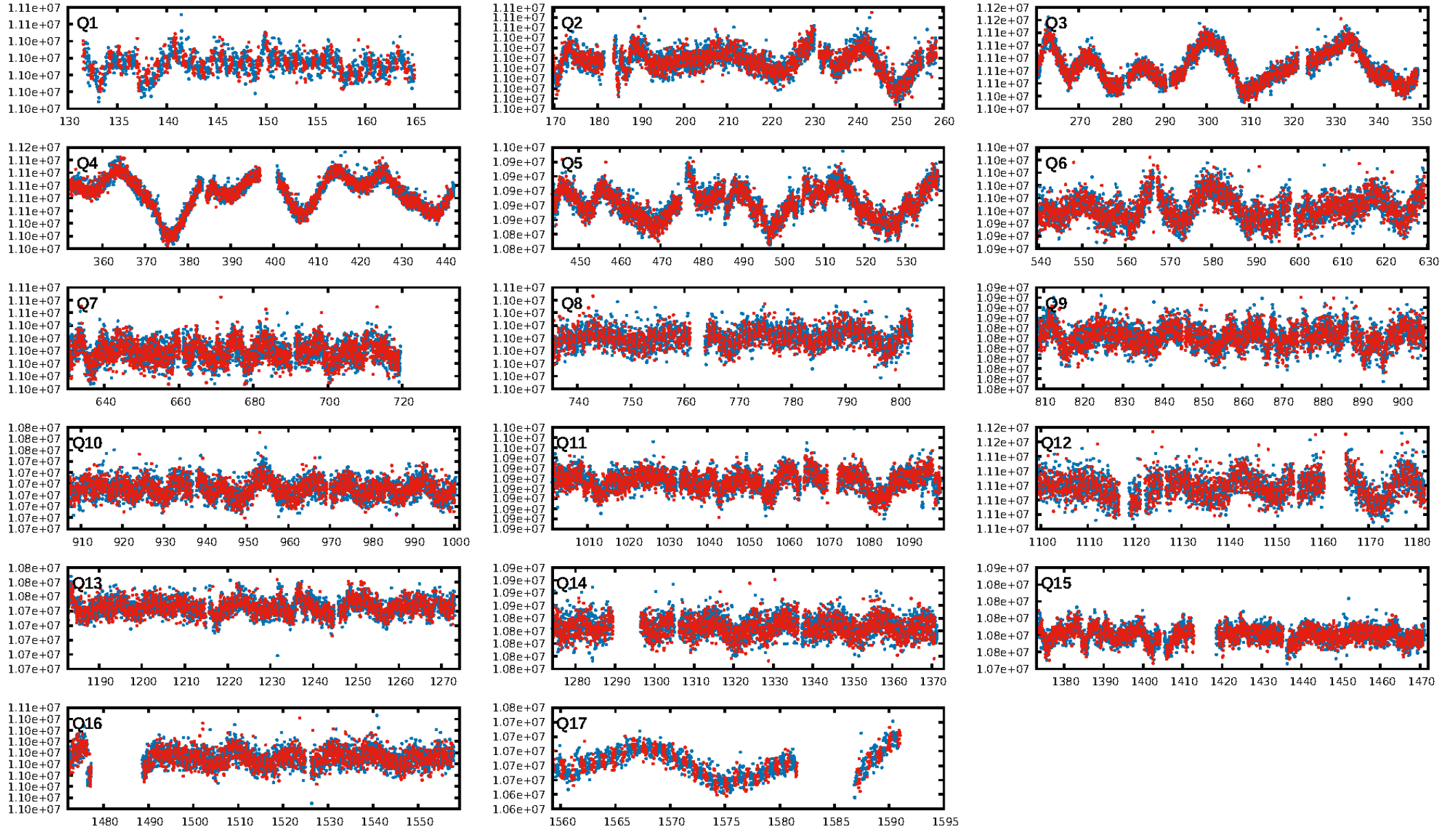
DV Diagnostic Results:

ShortPeriod-sig: N/A
LongPeriod-sig: 100.0% [1384.15σ]
ModelChiSquare2-sig: N/A
ModelChiSquareGof-sig: N/A
Bootstrap-pfa: 5.67e-16
RollingBand-fgt: 0.96 [1318/1376]
GhostDiagnostic-chr: 0.371
Centroid-sig: 38.3%
Centroid-so: 2.220 arcsec [1.04σ]
OotOffset-rm: 0.532 arcsec [0.38σ]
KicOffset-rm: 0.596 arcsec [0.40σ]
OotOffset-st: 3/3/4/4 [14]
KicOffset-st: 3/3/4/4 [14]
DiffImageQuality-fgm: 0.00 [0/14]
DiffImageOverlap-fno: 1.00 [17/17]




Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 07:34:36 Z

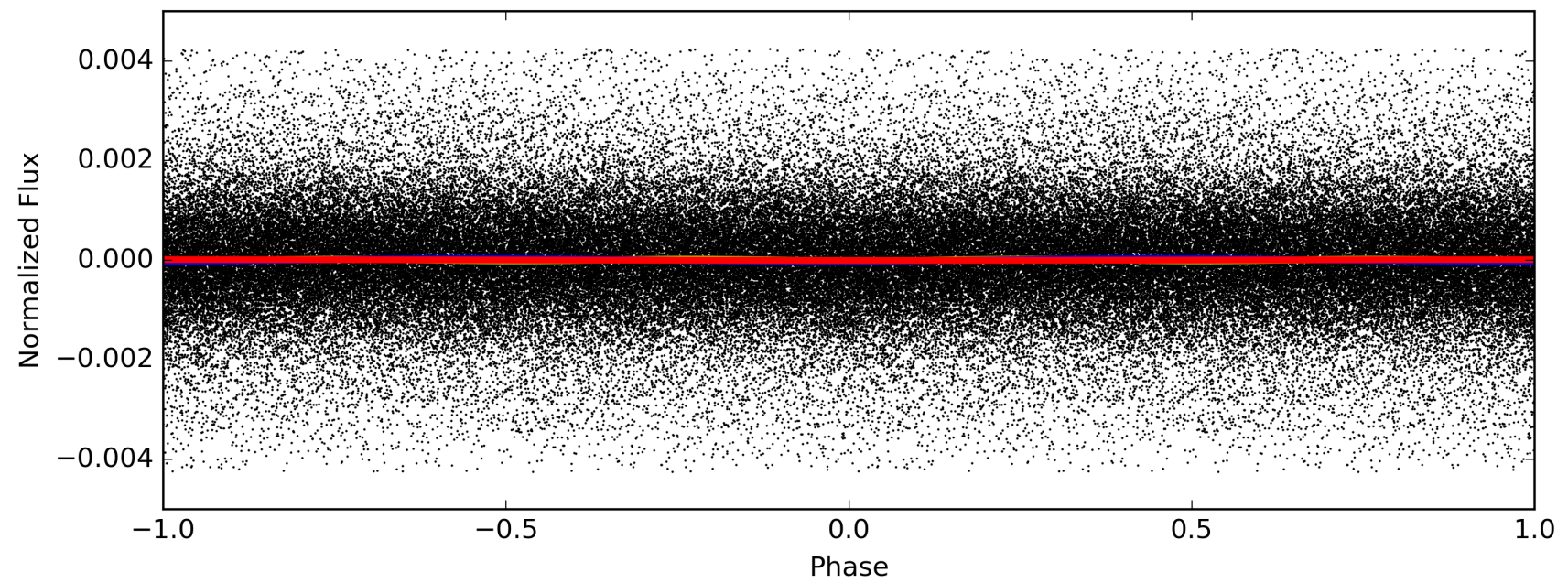
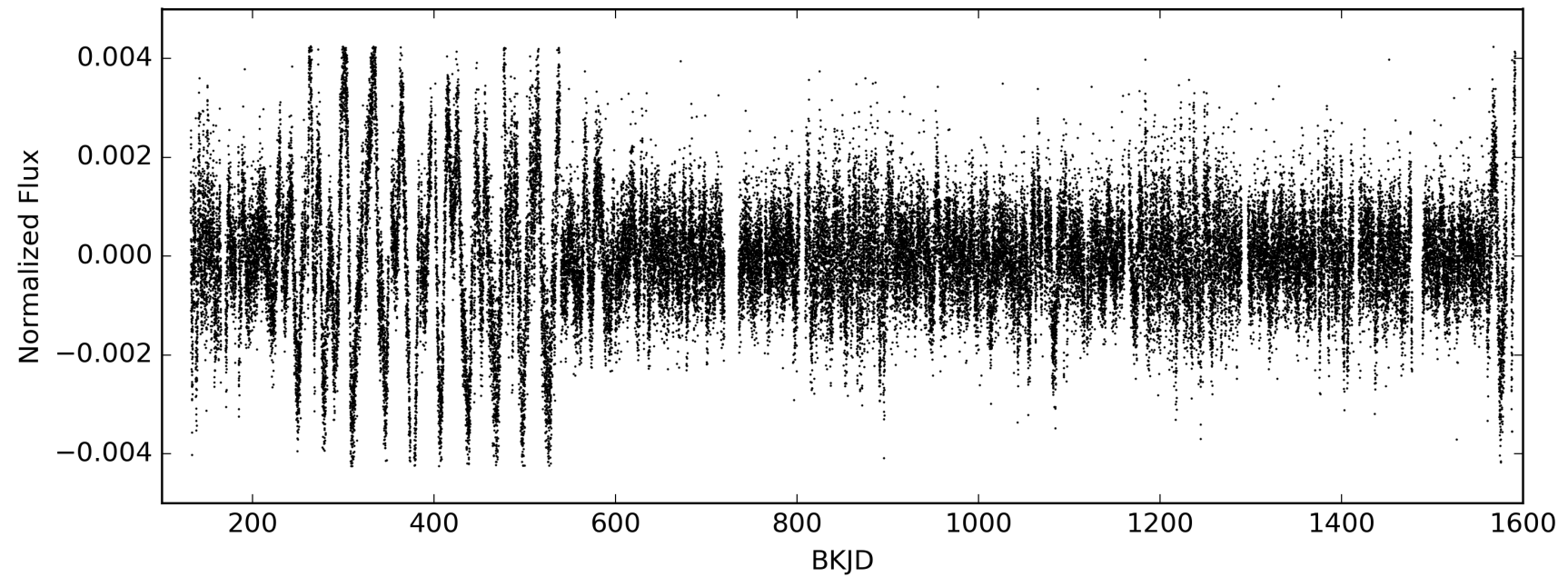
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

TCE 010405224-01, PDC Light Curves



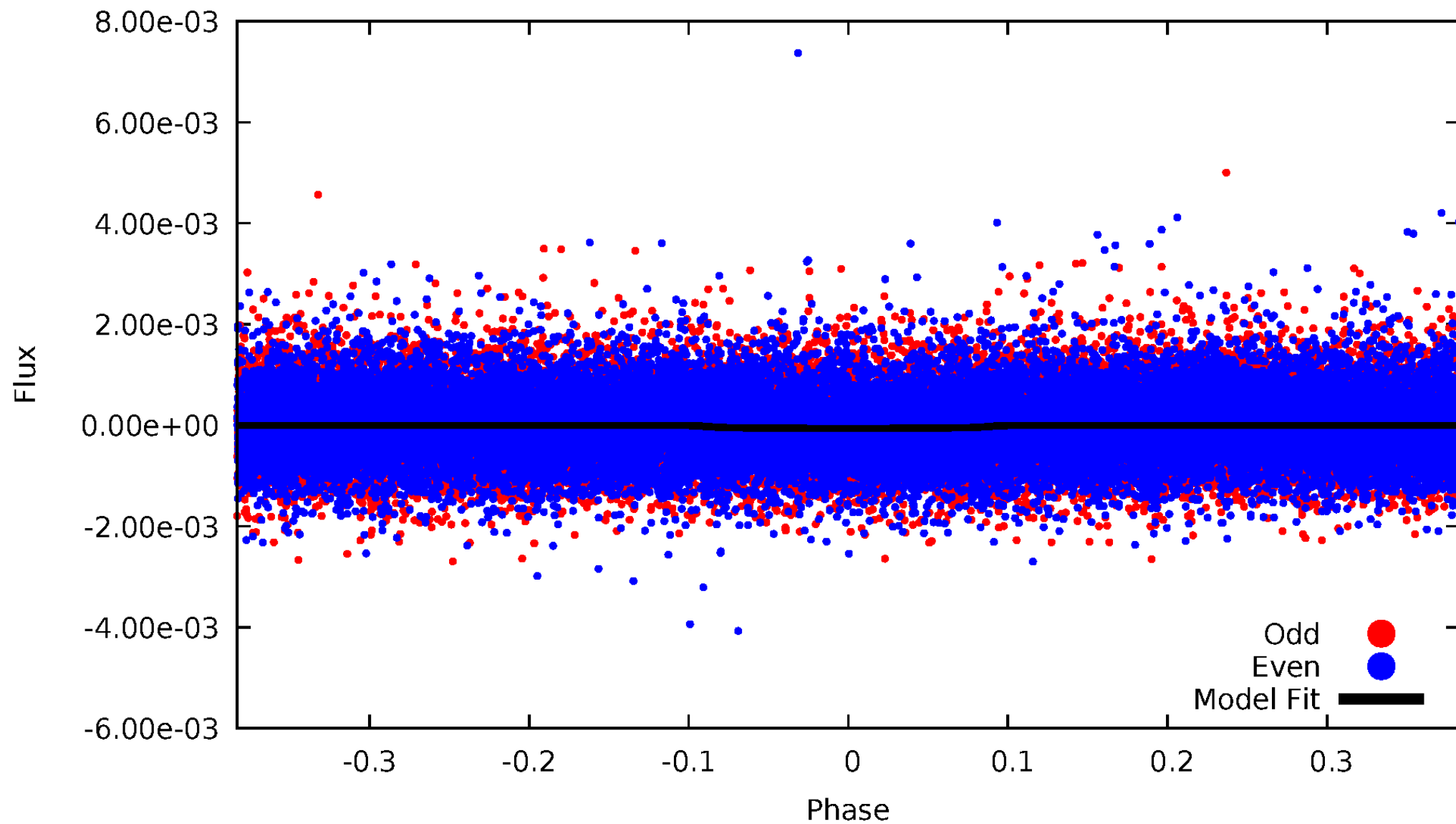
TCE 010405224-01

 P = 0.467 days  P = 0.934 days  P = 1.868 days



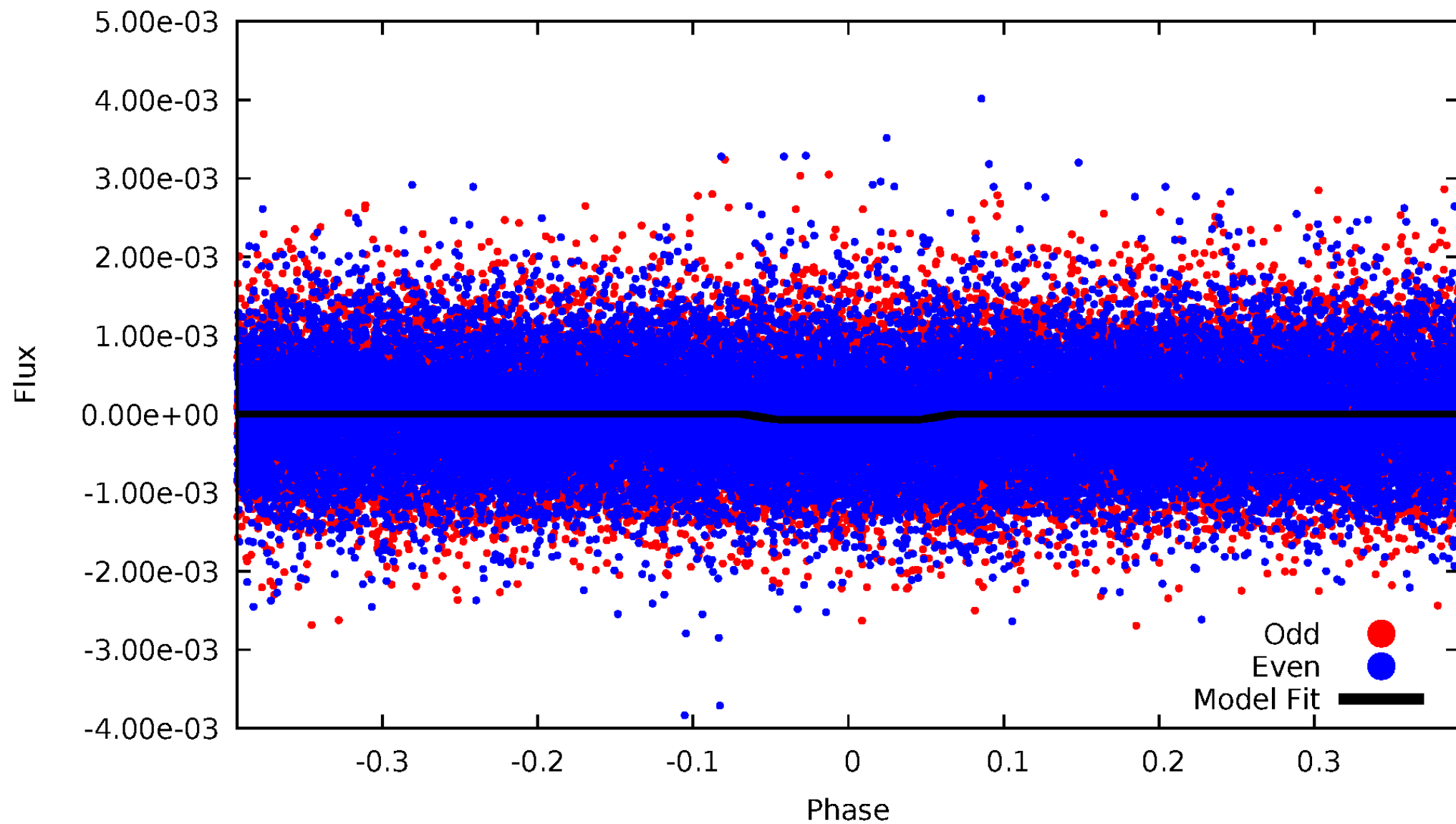
DV Odd/Even

TCE 010405224-01



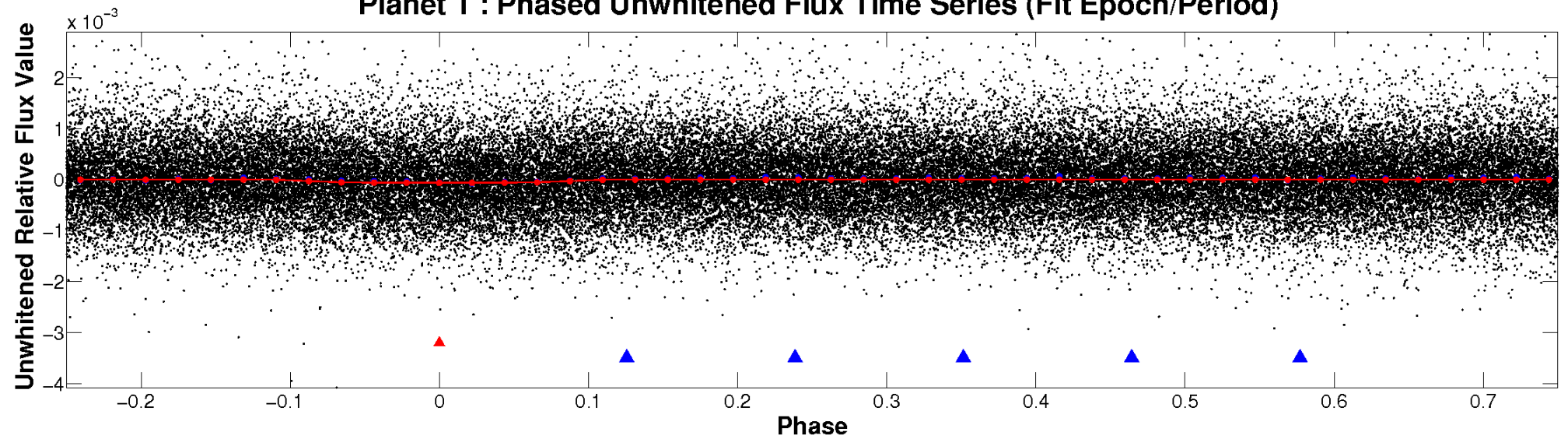
ALT Odd/Even

TCE 010405224-01

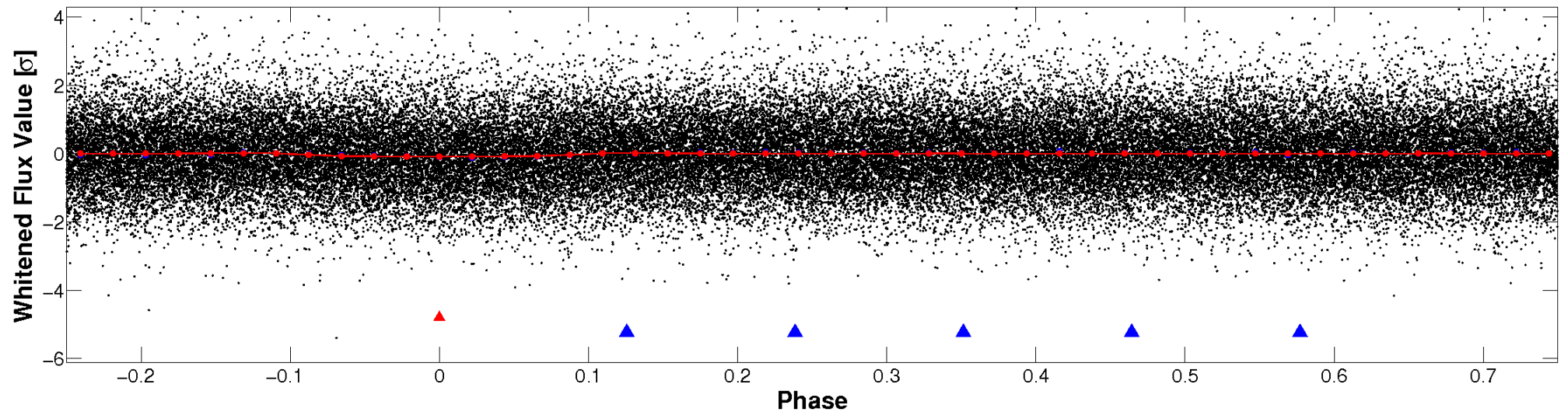


Non-Whitened Vs. Whitened Light Curve

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

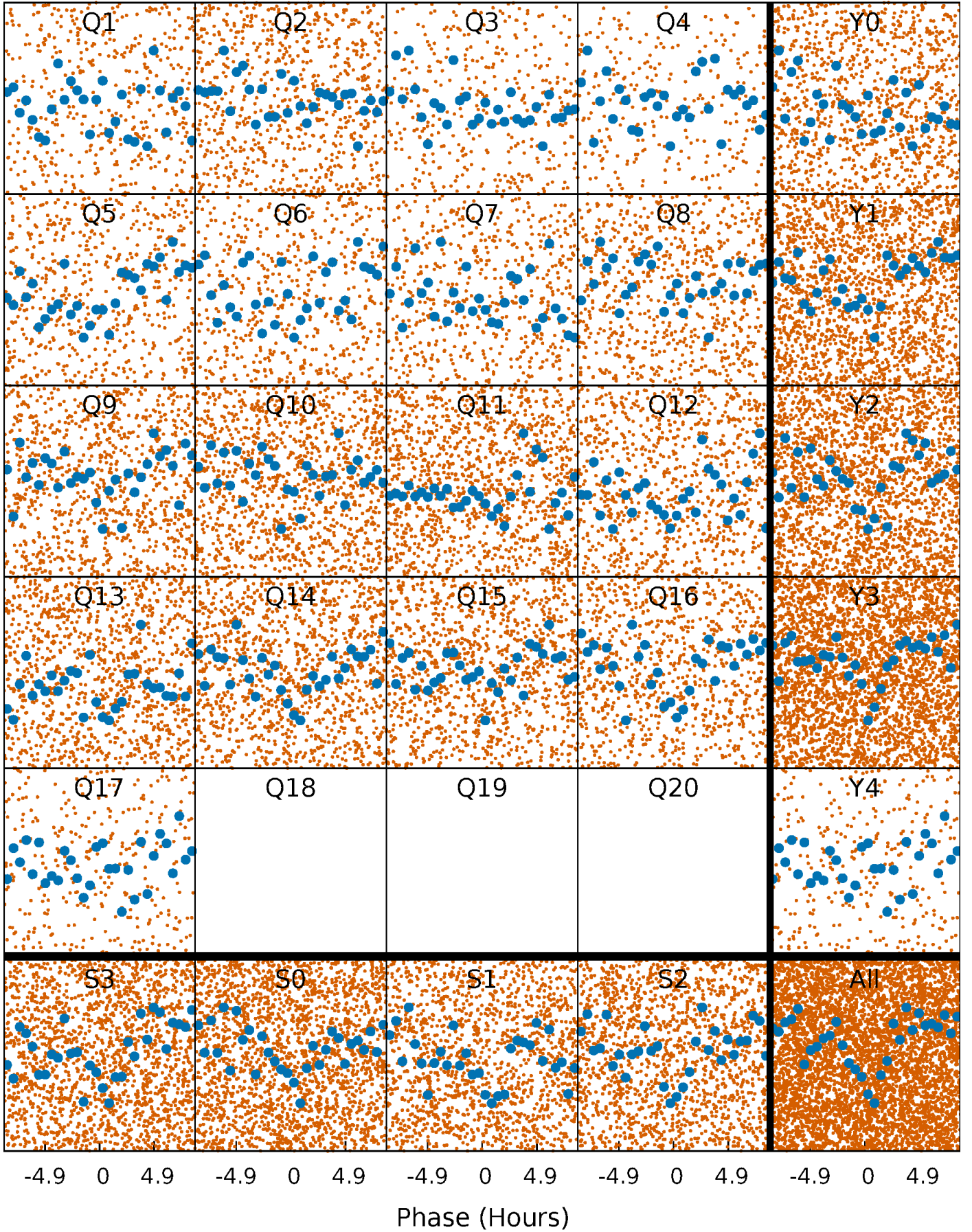


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



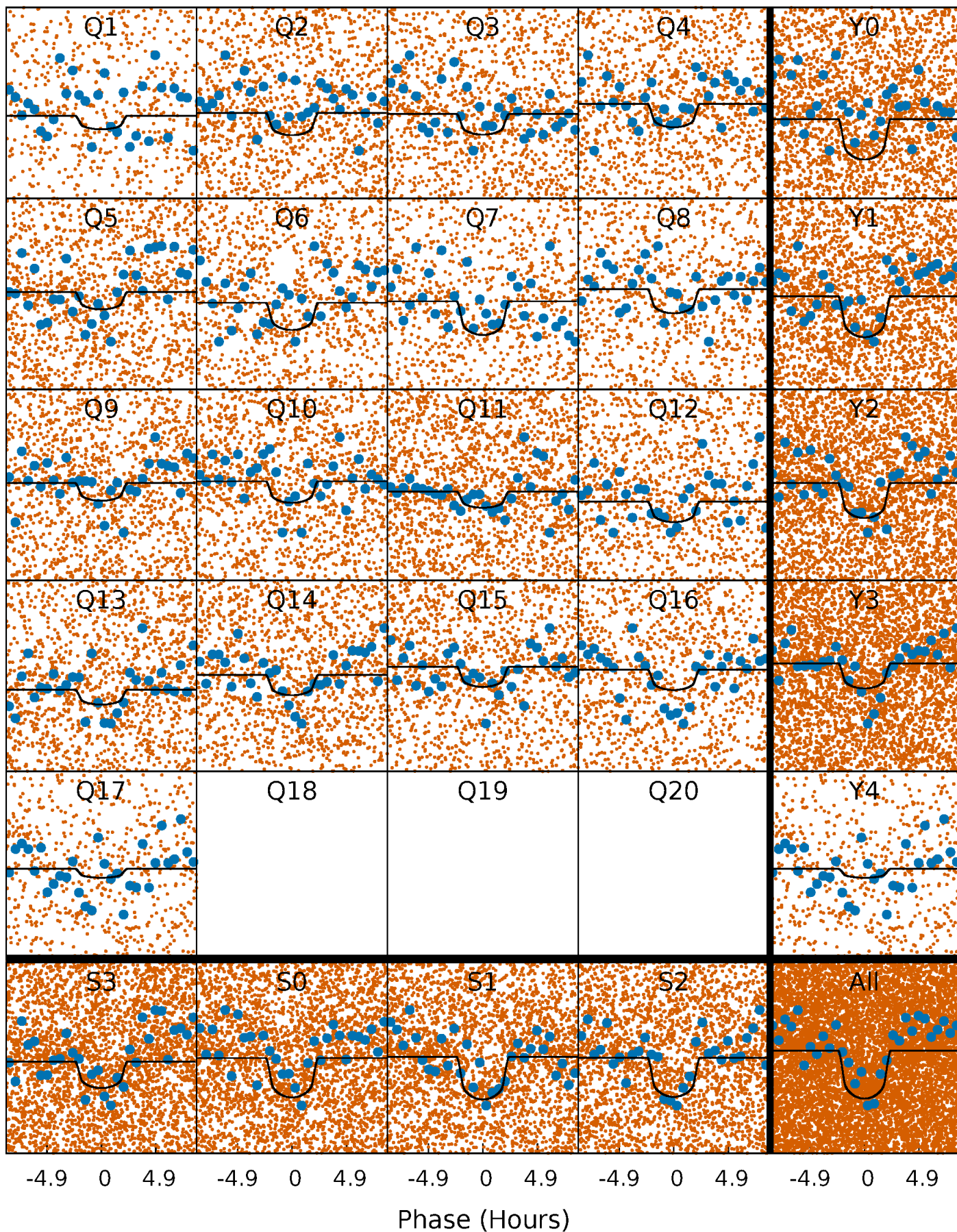
PDC Quarter-Phased Transit Curves

TCE 010405224-01 P= 0.933767 Days $T_0=132.415600$ (BKJD)



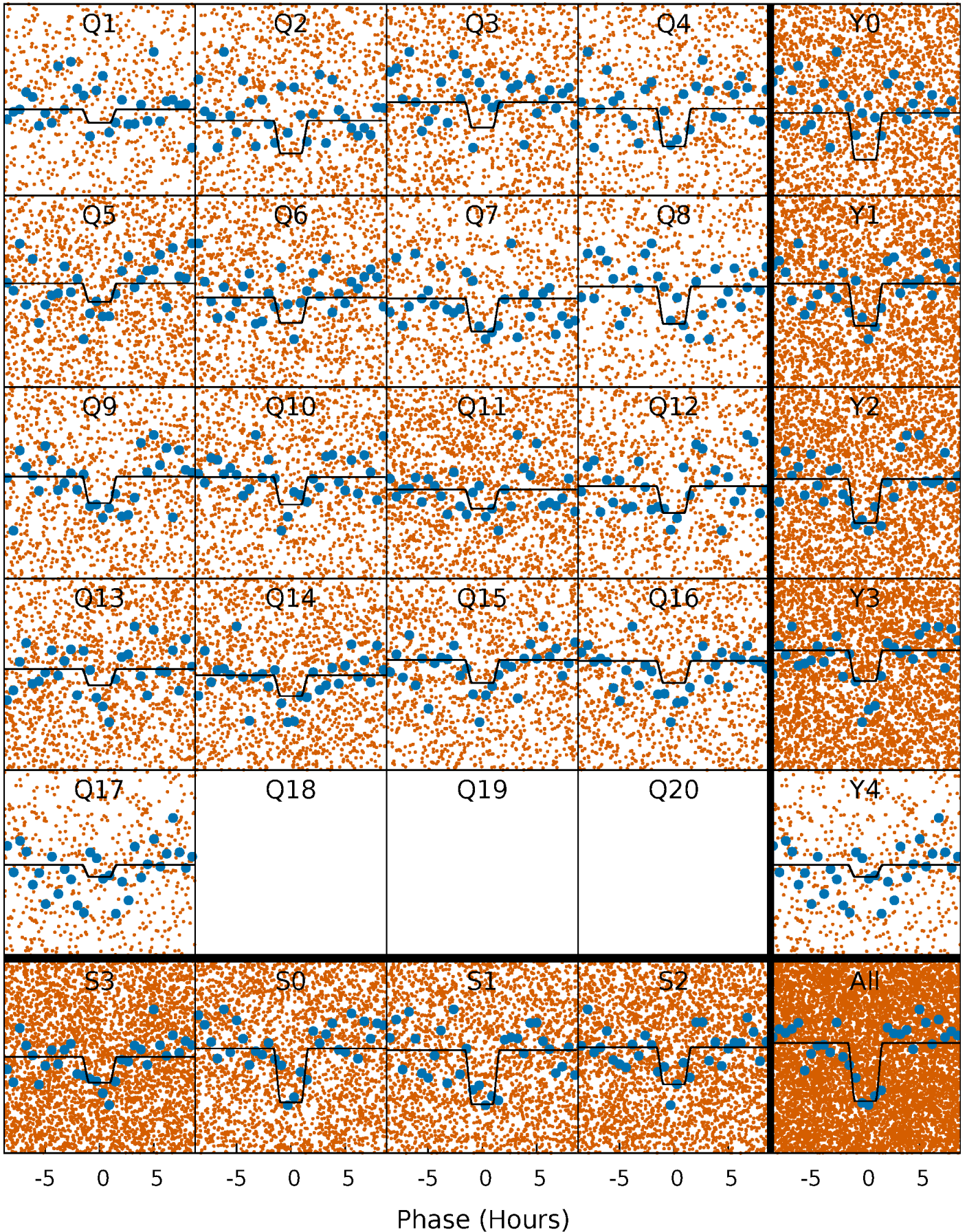
DV Quarter-Phased Transit Curves

TCE 010405224-01 P= 0.933767 Days $T_0=132.415600$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

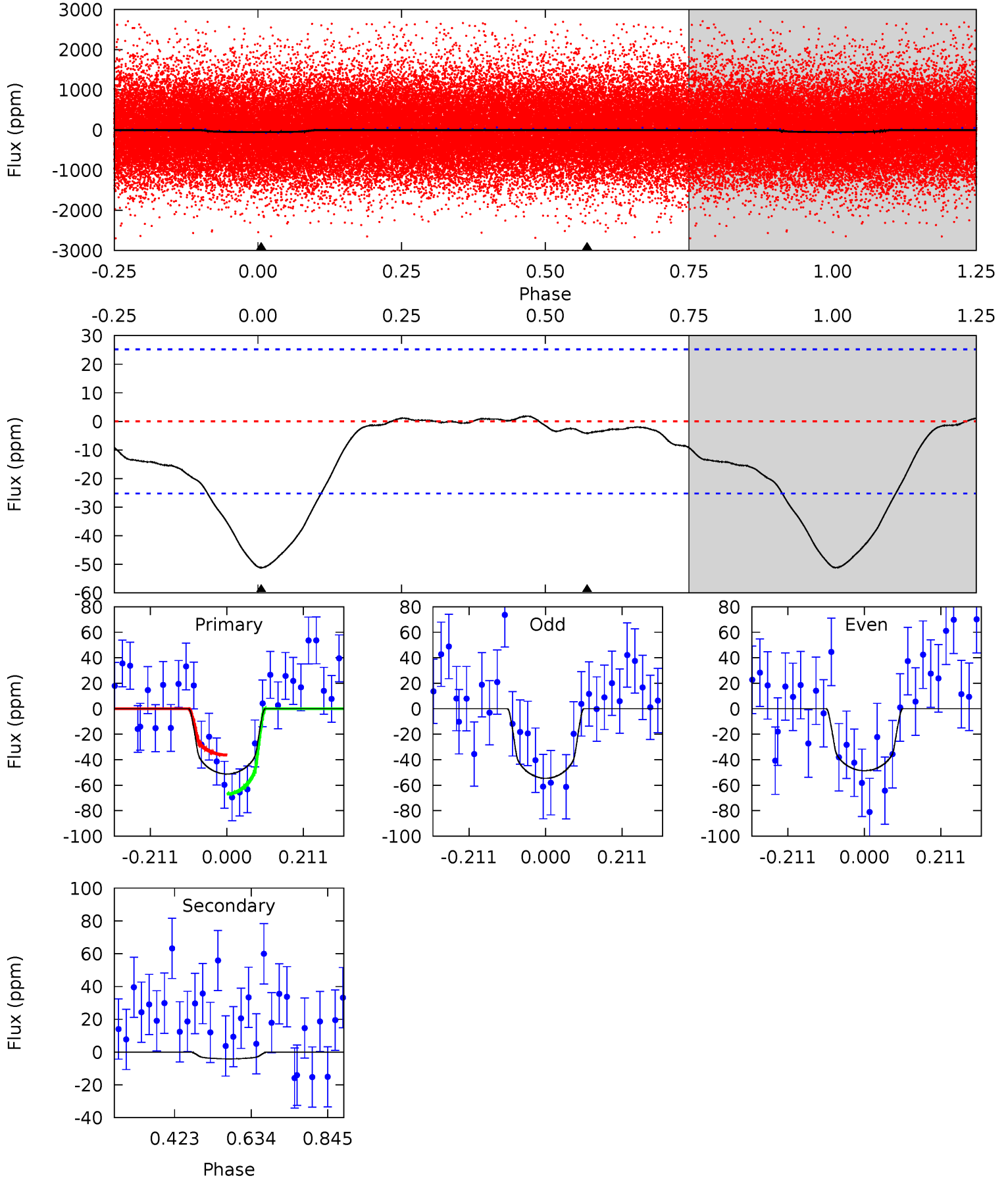
TCE 010405224-01 P= 0.933778 Days $T_0=132.416331$ (BKJD)



DV Model-Shift Uniqueness Test

010405224-01, P = 0.933767 Days, E = 131.481833 Days

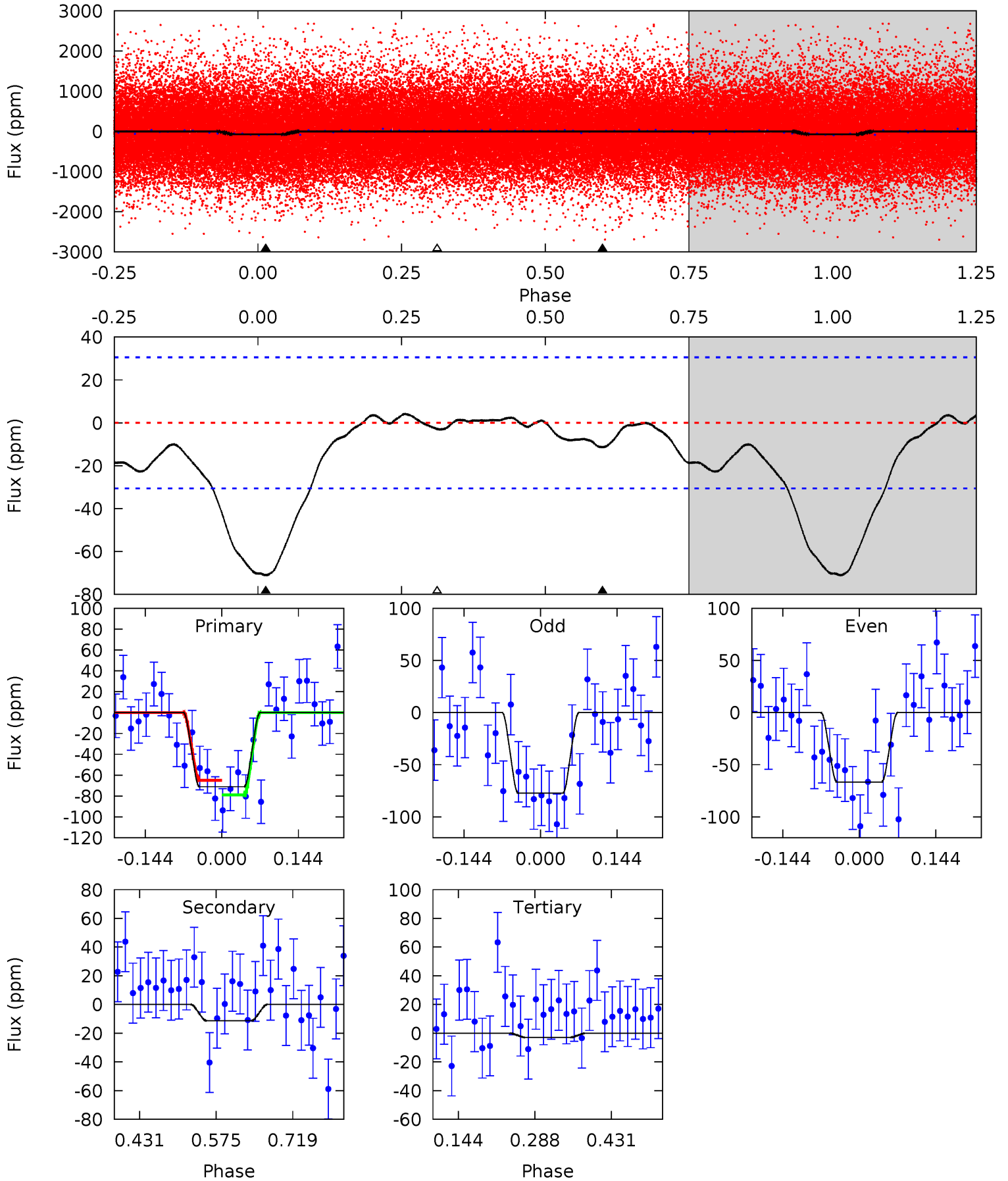
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|-----|-----|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 8.94 | 0.73 | 0 | 0 | 4.41 | 1.25 | 0.61 | 8.94 | 8.94 | 0.73 | 0.73 | 0.52 | 0.97 | 0.03 | 2.67 |



Alt Model-Shift Uniqueness Test

010405224-01, P = 0.933778 Days, E = 131.482553 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|-----|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 10.4 | 1.66 | 0.42 | 0 | 4.49 | 1.46 | 1.26 | 10.0 | 10.4 | 1.24 | 1.66 | 0.78 | 0.79 | 0.06 | 1.03 |



Stellar Parameters For KIC 010405224

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | $R (R_{\odot})$ | $M(M_{\odot})$ | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|----------------------|---------------------------|---------------------------|---------------------------|---------------------------|---|
| | 4938^{+148}_{-148} | $4.601^{+0.022}_{-0.067}$ | $0.140^{+0.250}_{-0.300}$ | $0.753^{+0.074}_{-0.051}$ | $0.836^{+0.043}_{-0.079}$ | $2.761^{+0.347}_{-0.626}$ |
| | +3%/-3% | +0%/-1% | +179%/-214% | +10%/-7% | +5%/-9% | +13%/-23% |
| 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 010405224-01 / KOI 8008.01

| Detrend | Depth (ppm) | $R_p (R_{\oplus})$ | $T_{max} (K)$ | $T_{obs} (K)$ | A_{obs} |
|---------|-------------|------------------------|--------------------|------------------------|----------------------------|
| DV | -4 ± 6 | $0.81^{+0.62}_{-0.47}$ | 2018^{+77}_{-67} | 2639^{+1151}_{-5368} | $0.794^{+5.444}_{-1.136}$ |
| Alt. | -11 ± 7 | $0.80^{+0.59}_{-0.49}$ | 2019^{+74}_{-78} | 3294^{+1503}_{-868} | $2.717^{+18.075}_{-2.181}$ |

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 $A_{obs} \gg 1.0$

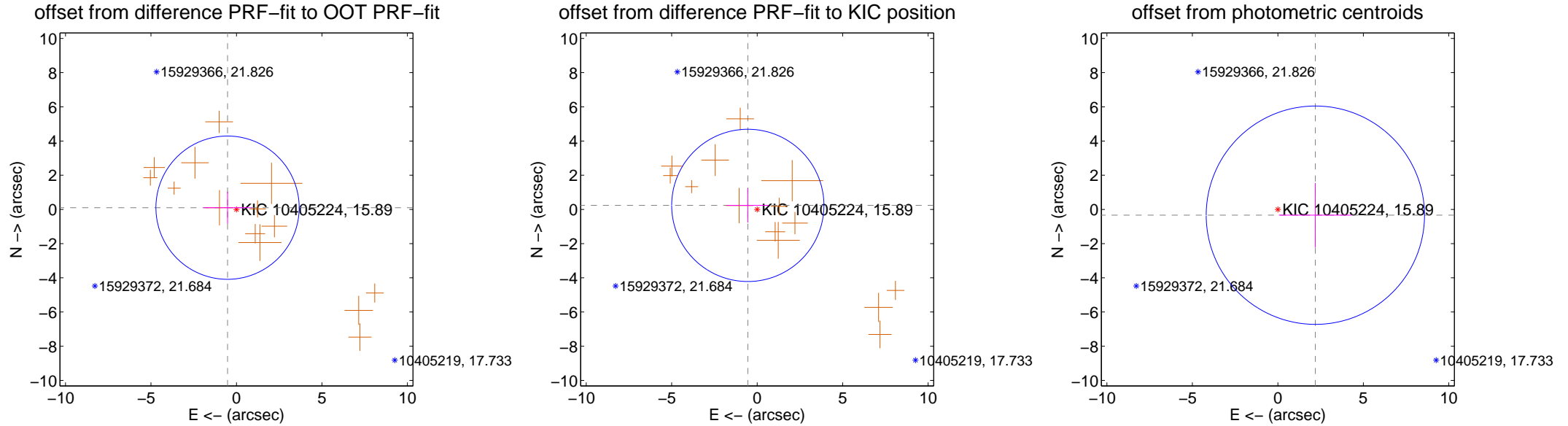
DV Centroid Data

Supplemental centroid analysis for 010405224-01. Kepler magnitude: 15.89. Transit SNR 7.87

There are 0 quarters with good PRF difference image offsets

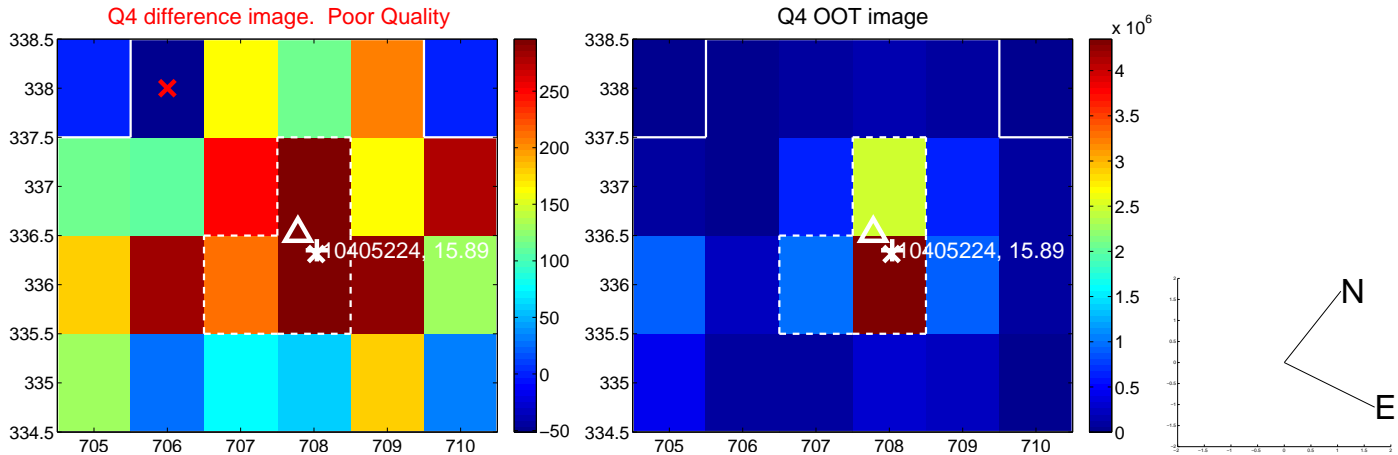
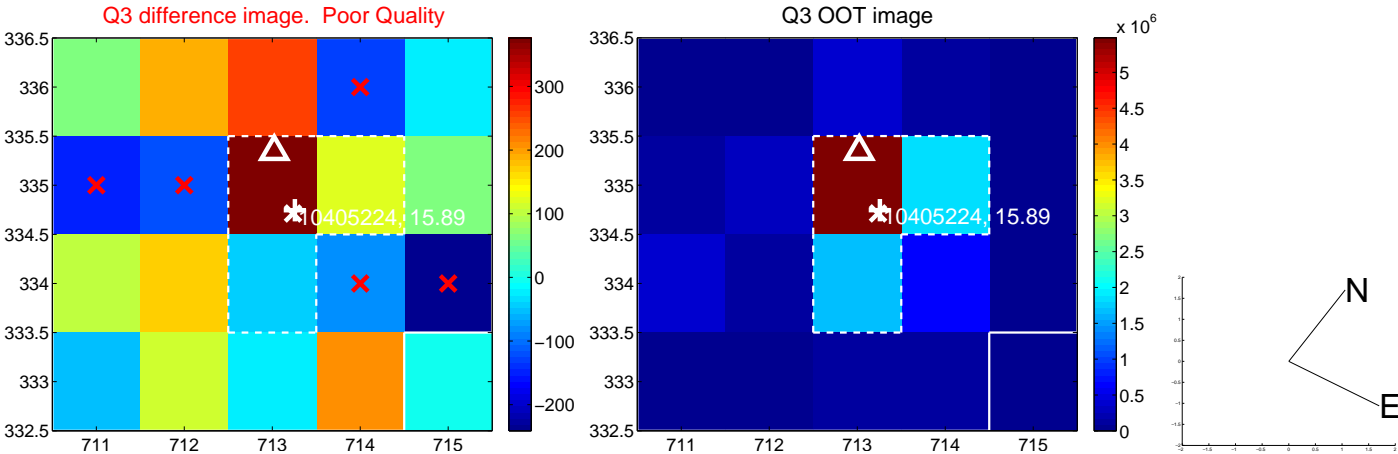
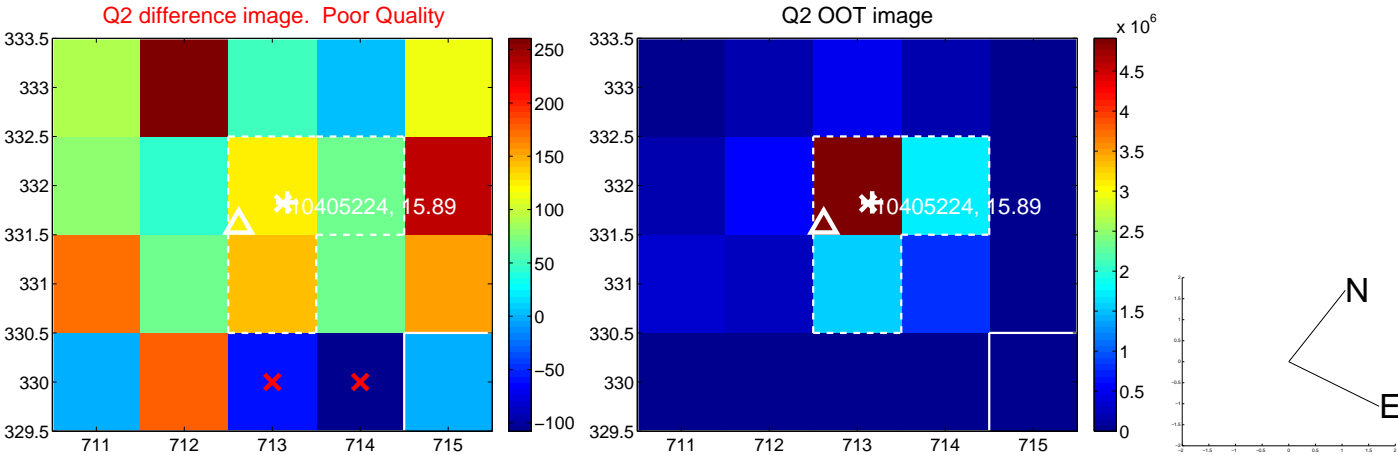
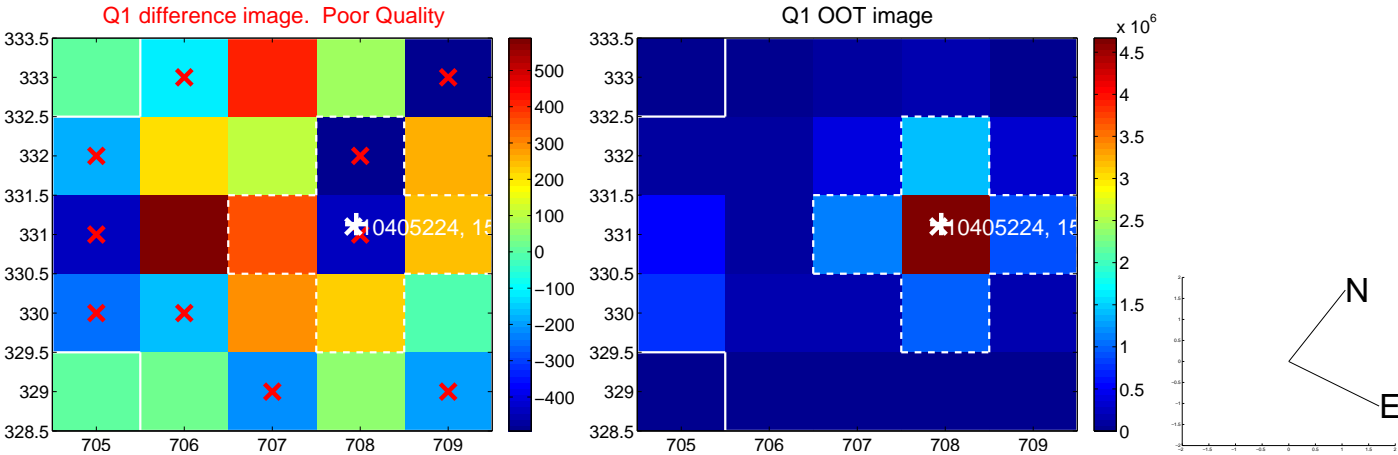
The direct PRF centroid is offset from the target star catalog position by about 0.16 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|---|--------------------|---------------------|-------------------|-------------------|
| PRF-fit source offset from OOT | 0.532 ± 1.397 | 0.38 | 0.522 ± 1.411 | 0.102 ± 0.936 |
| PRF-fit source offset from KIC position | 0.596 ± 1.484 | 0.40 | 0.547 ± 1.230 | 0.236 ± 1.001 |
| photometric centroid source offset | 2.22 ± 2.13 | 1.04 | -2.19 ± 2.13 | -0.34 ± 1.88 |

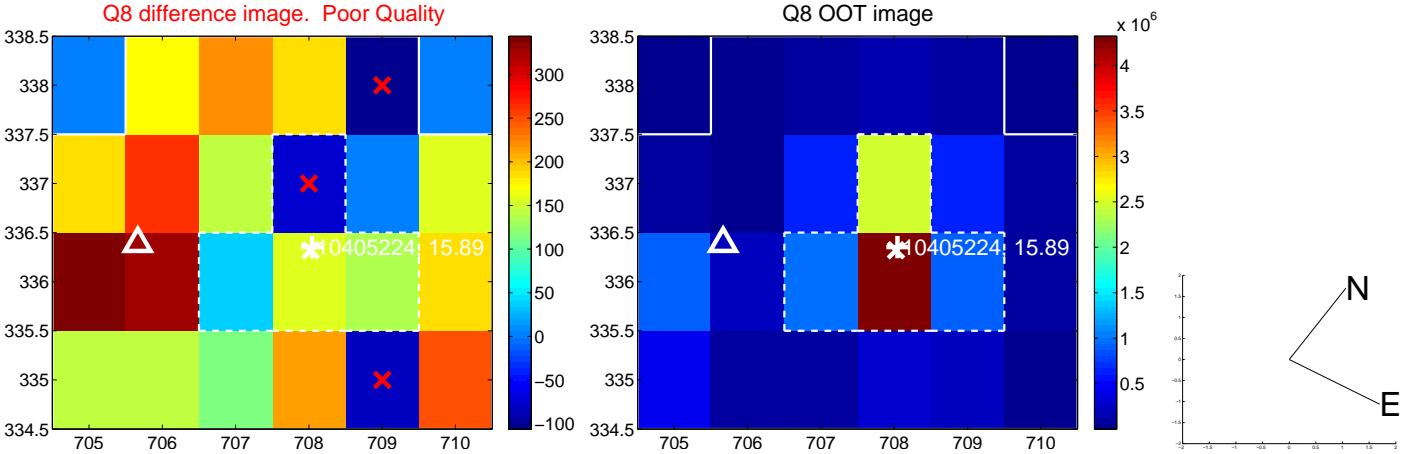
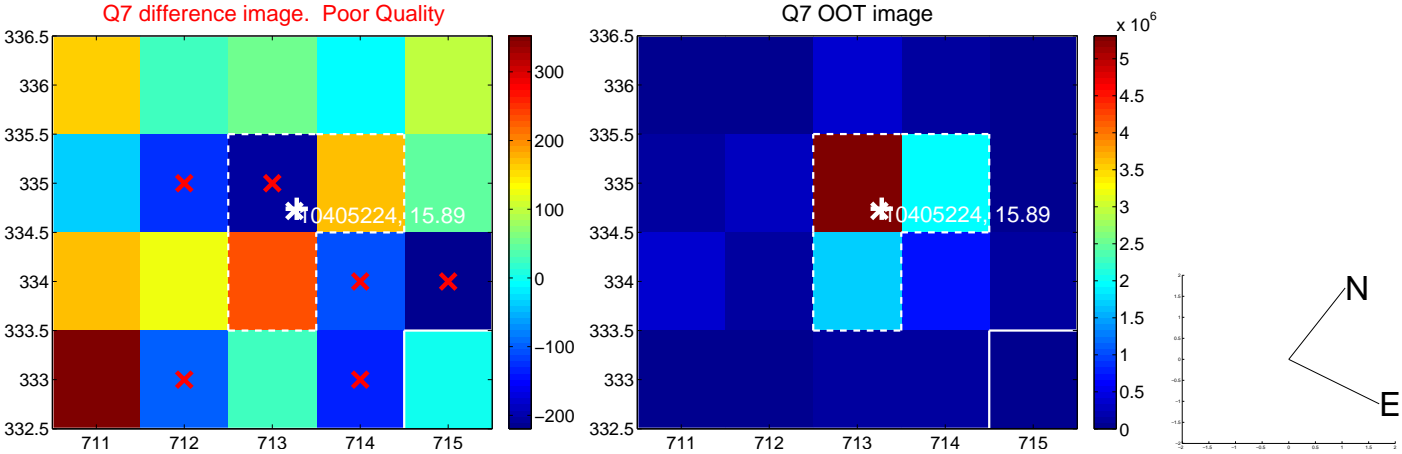
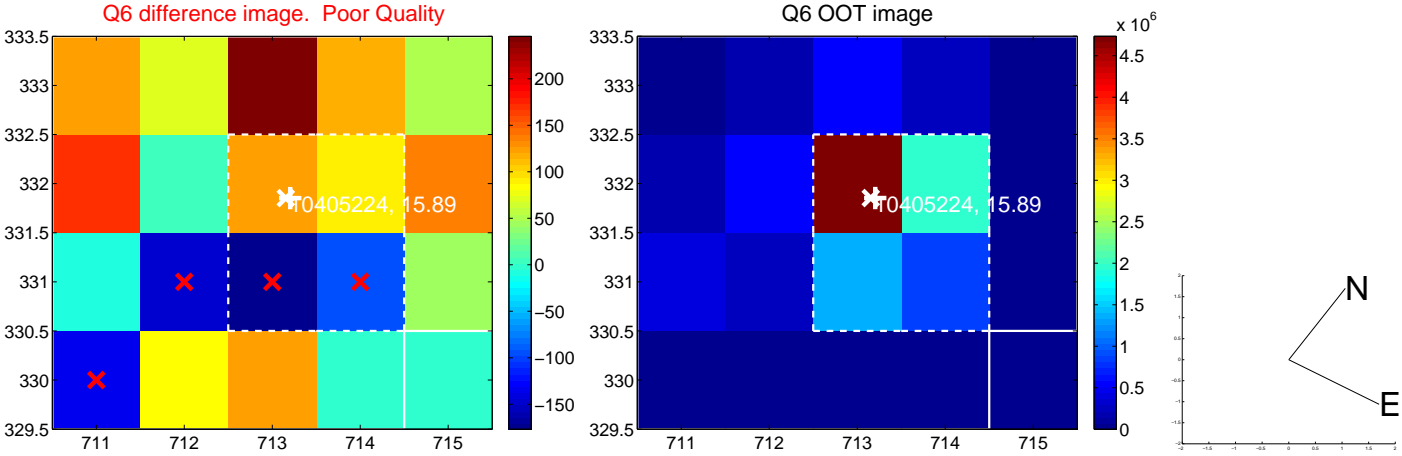
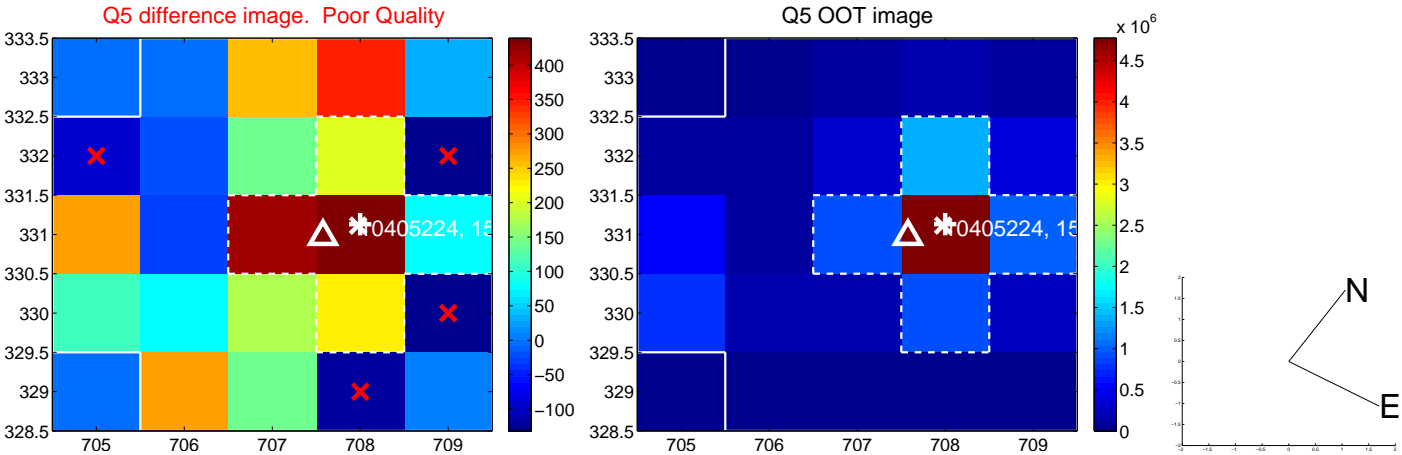


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three- σ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

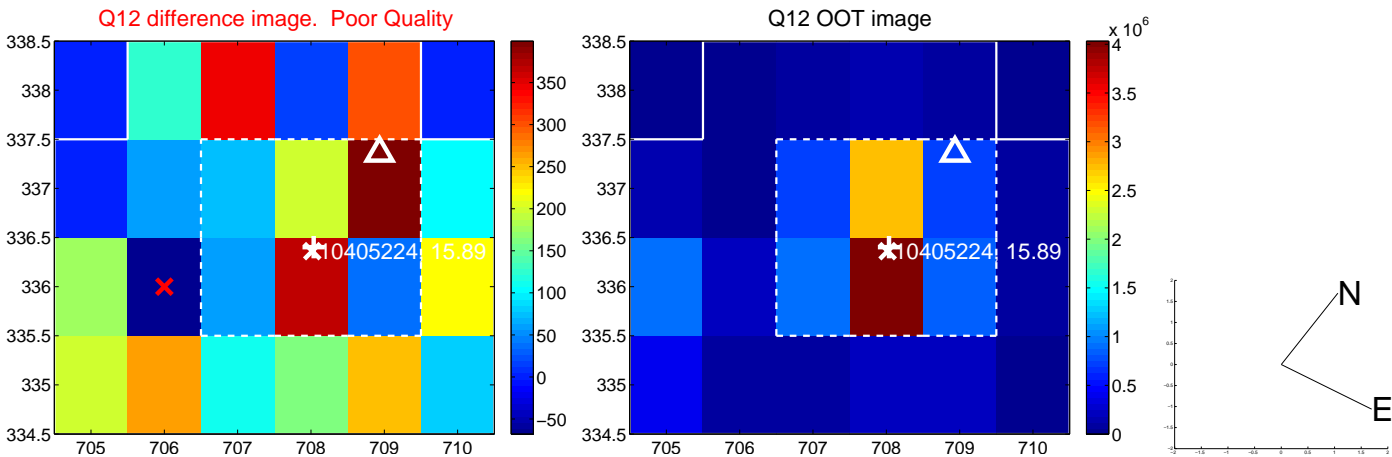
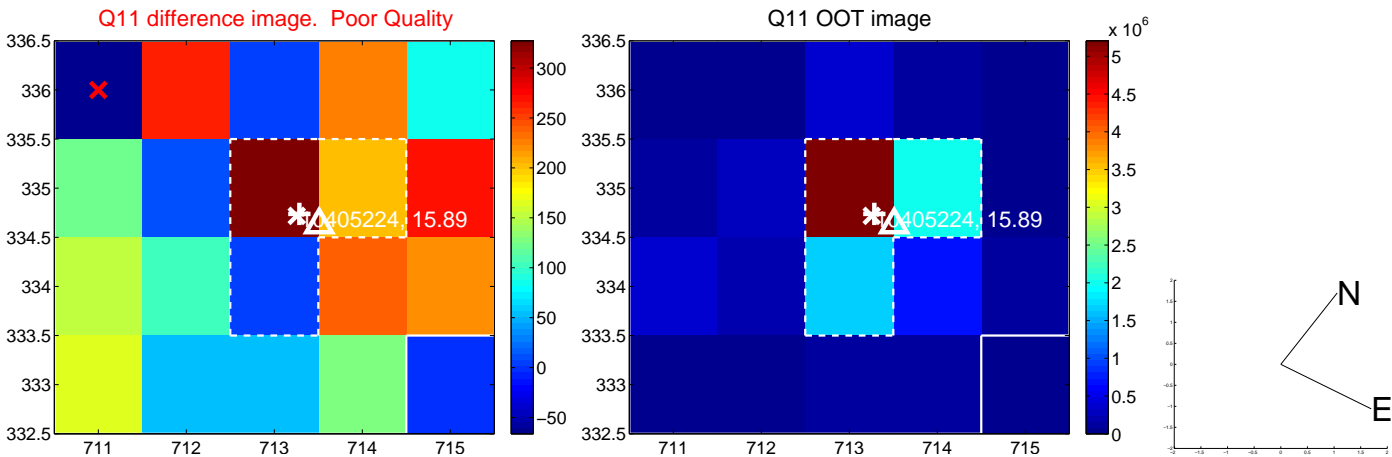
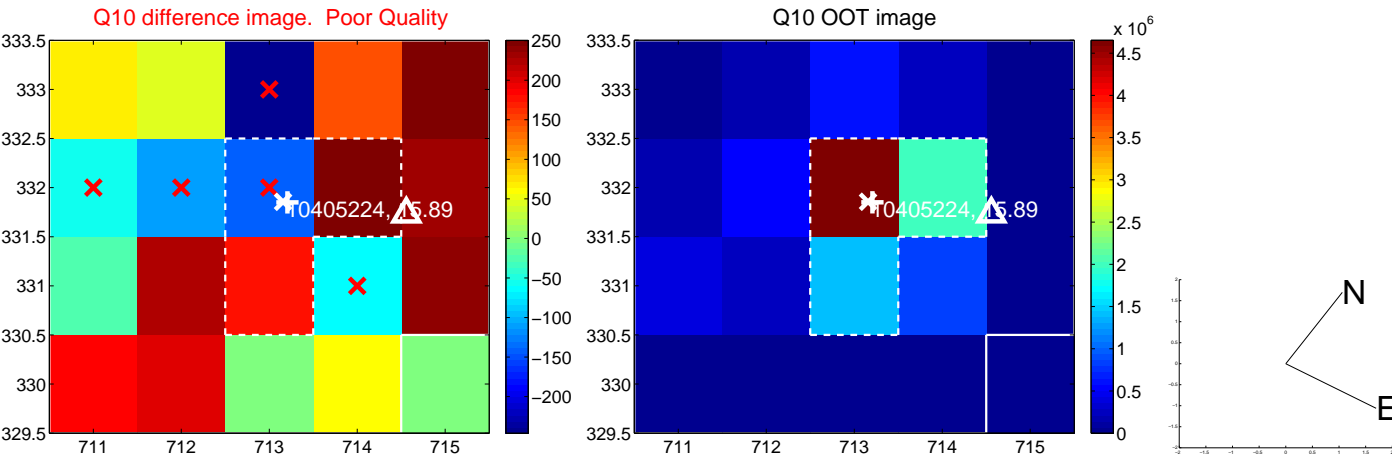
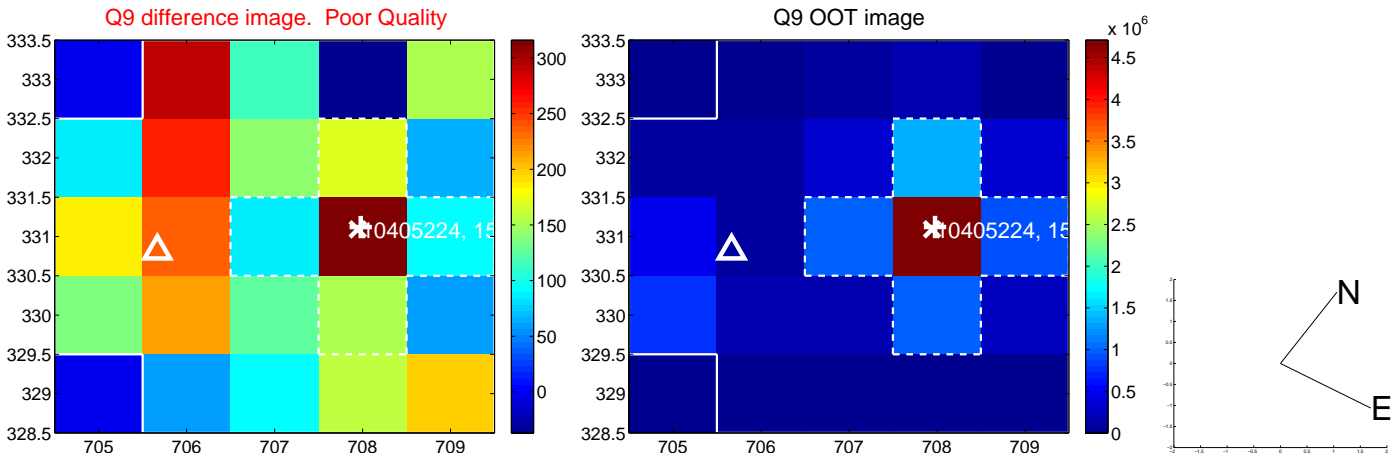
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



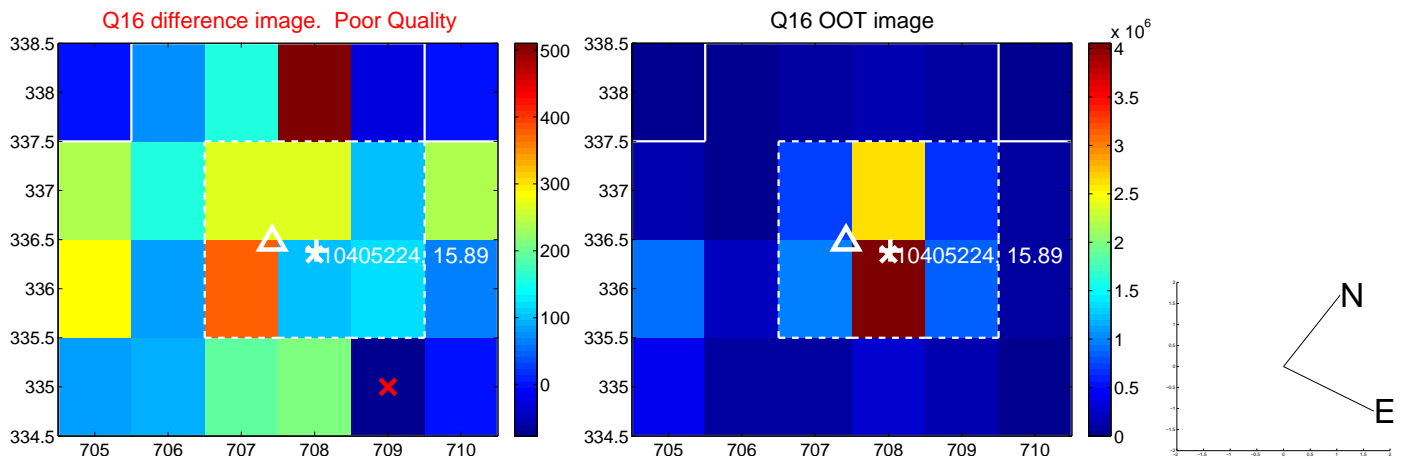
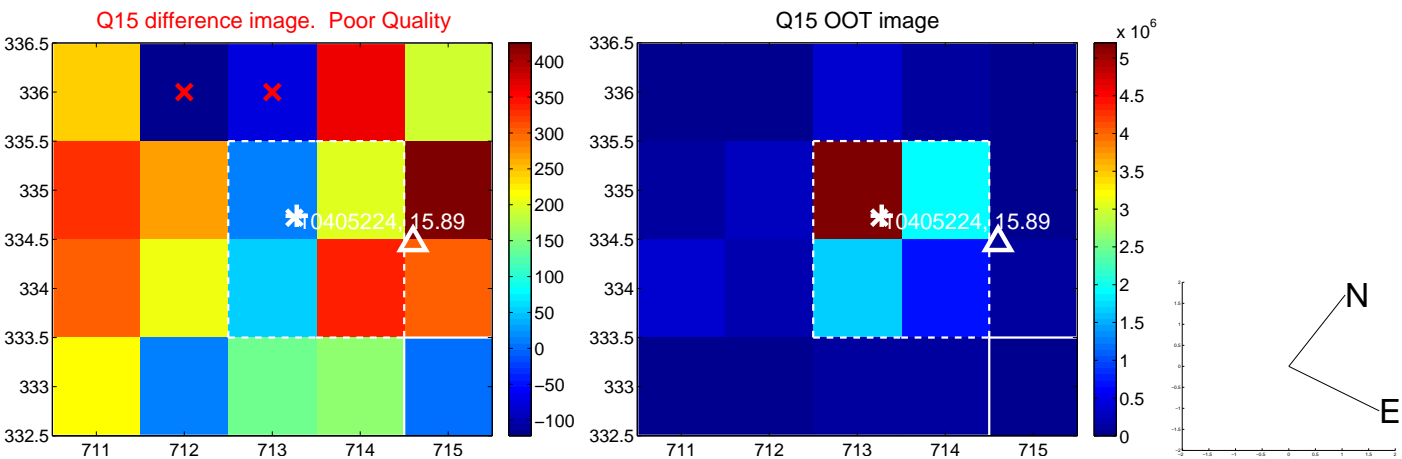
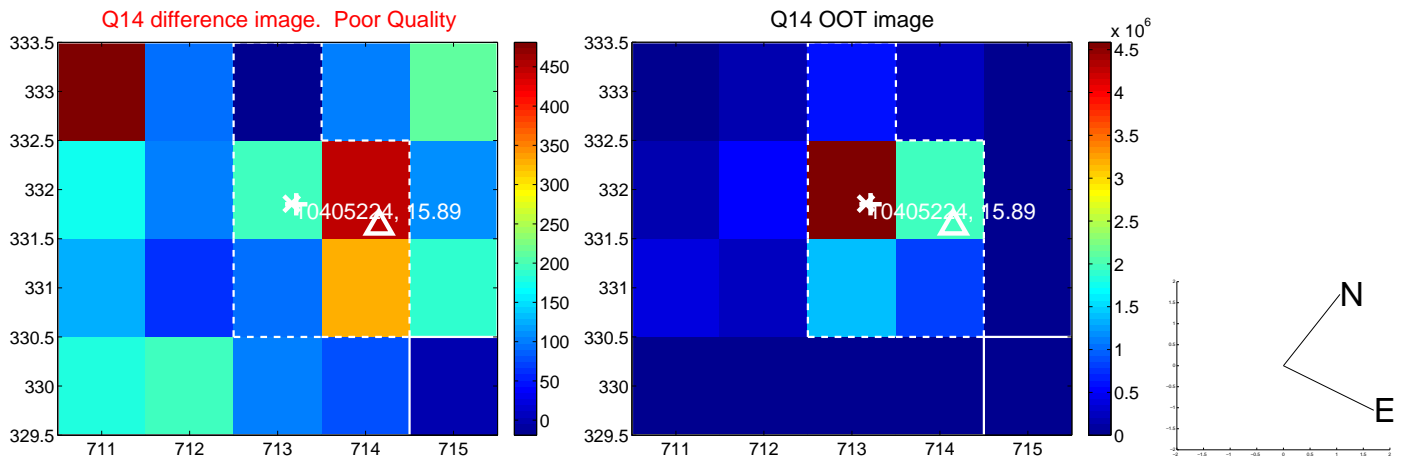
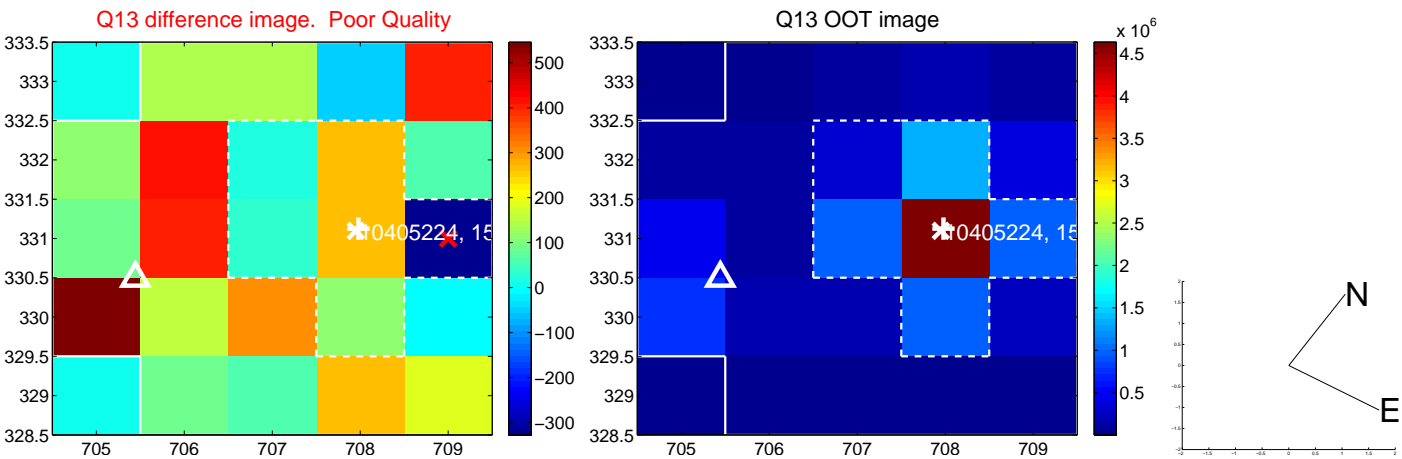
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



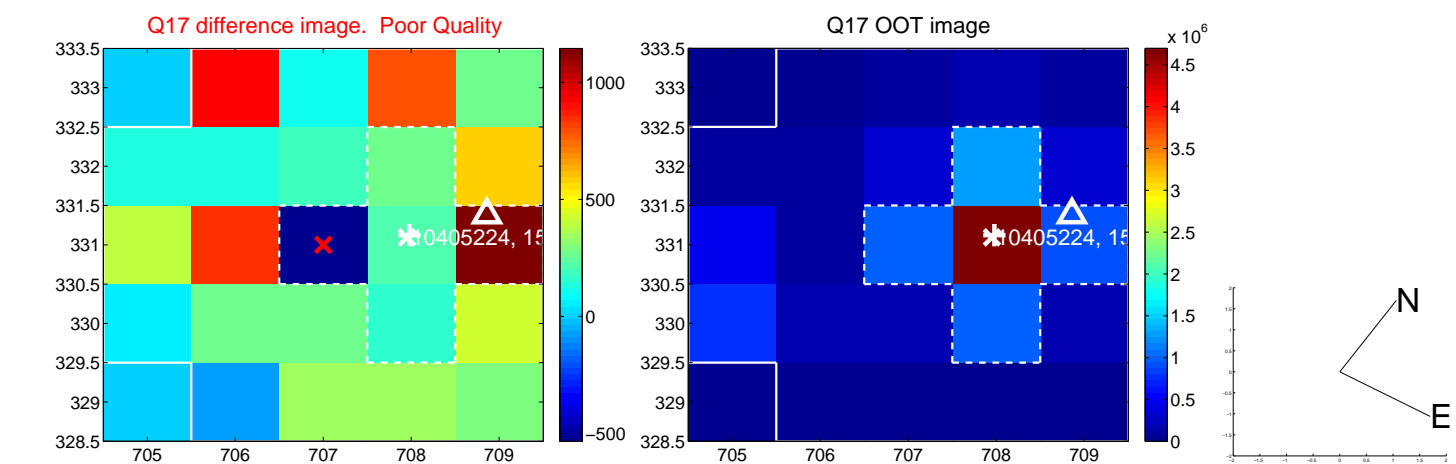
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



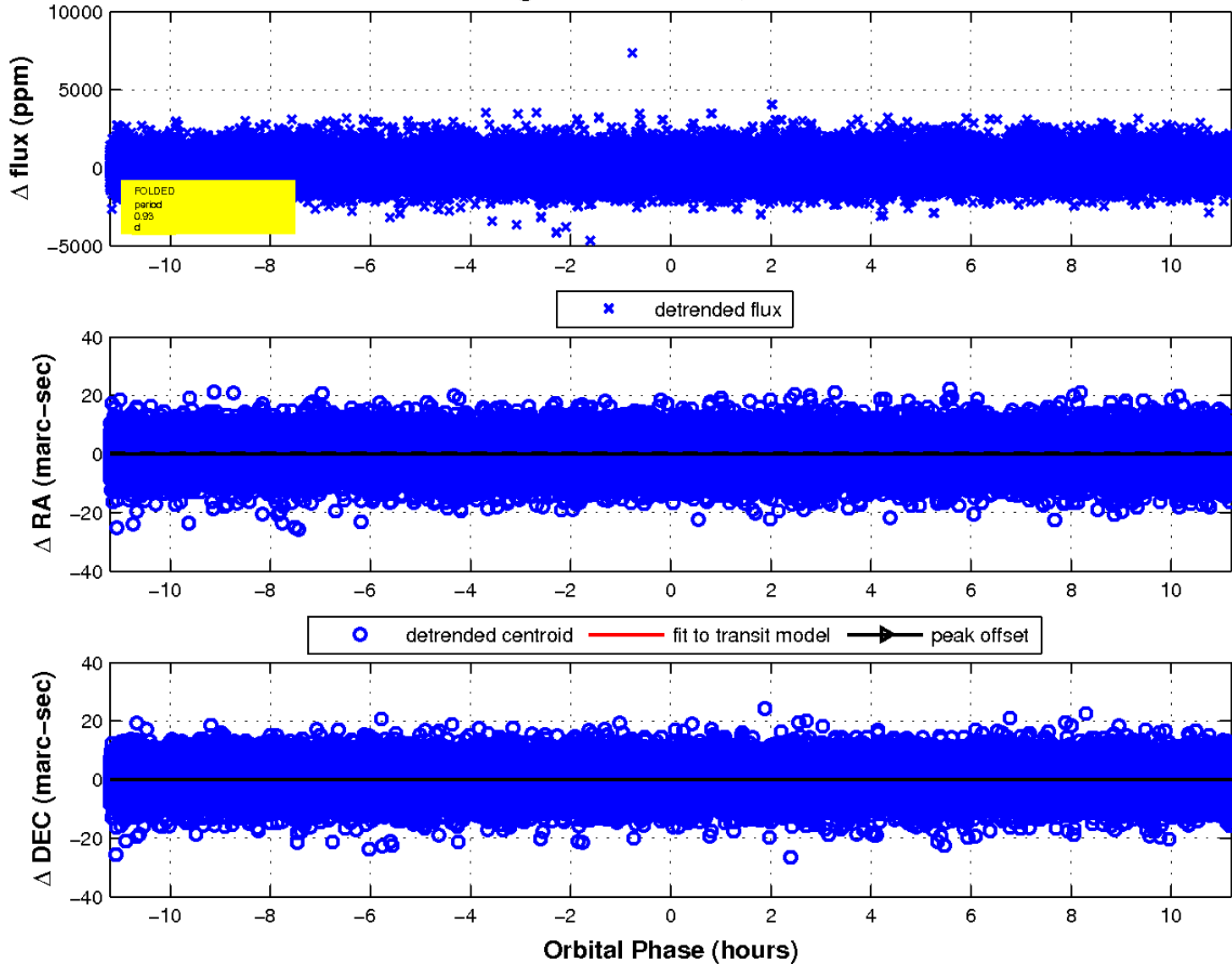
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

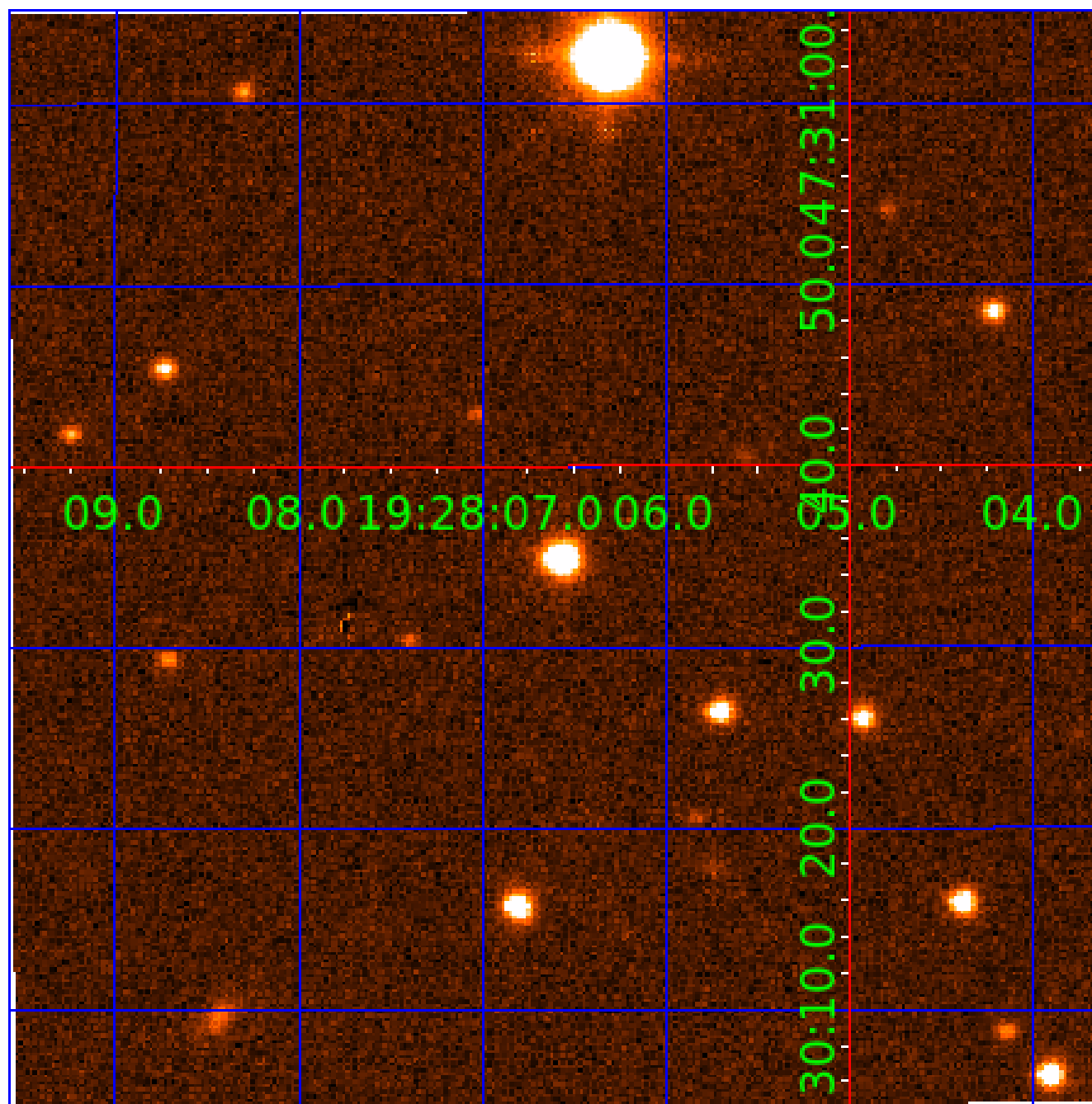


fluxWeightedCentroids, Planet 1 of 2



UKIRT Image

Declination



KIC 010405224

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}) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|-----|-----|-----------------------------|-----------------|------------------------|------------------------|
| 010405224-01 | OBS | 8008.01 | 0.933767 | 132.415600 | 62.8 | 4.290 | 8.3 | 7.9 | 0.75 | 4938 | 0.73 | 981.70 |
| 010405224-02 | OBS | No | 354.003109 | 163.347247 | 1165.3 | 4.368 | 7.7 | 6.0 | 0.75 | 4938 | 3.40 | 0.36 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|--|
| 010405224-01 | OBS | FP | 0.00 | 1 | 0 | 0 | 1 | LPP_DV—EPHEM_MATCH |
| 010405224-02 | OBS | FP | 0.00 | 1 | 0 | 1 | 0 | INDIV_TRANS_RUBBLE_CHASES_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS—HALO_GHOST |

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

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

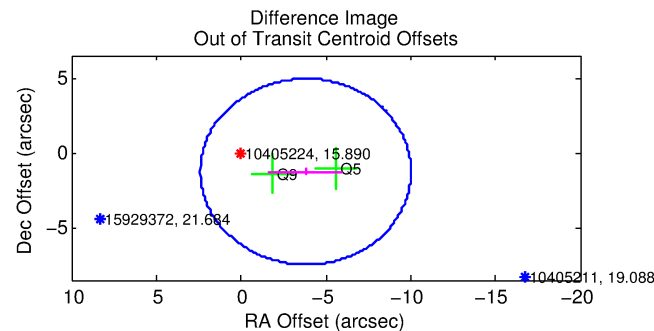
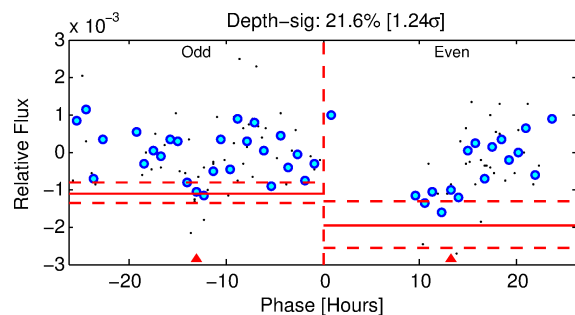
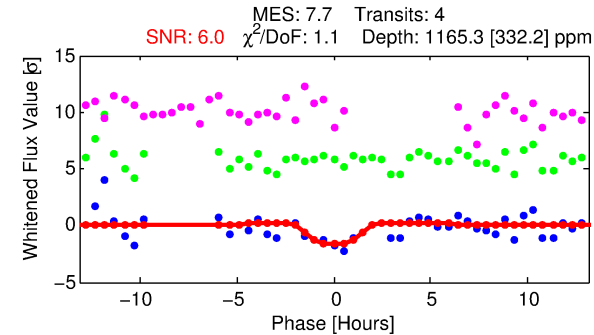
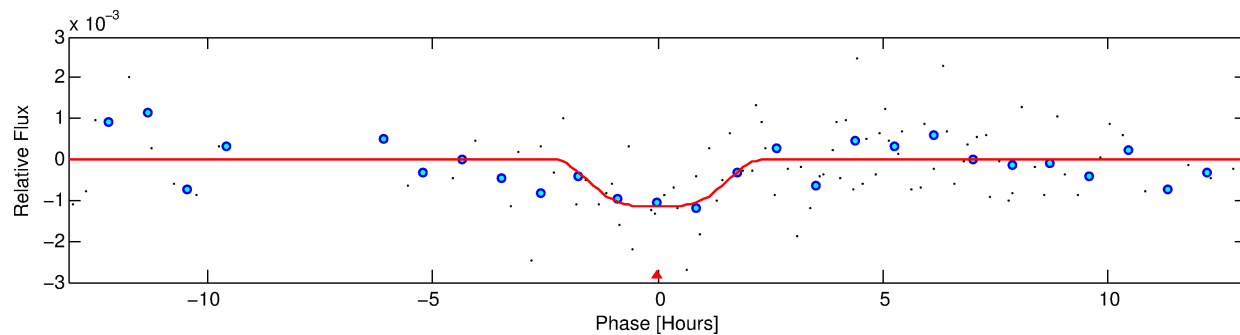
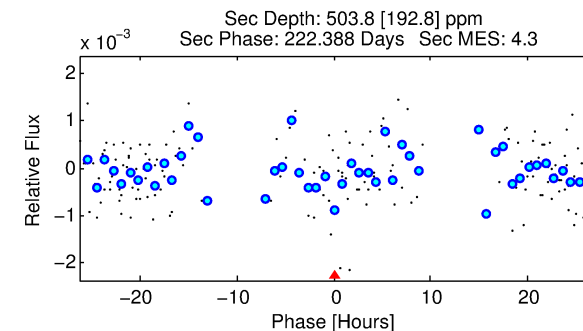
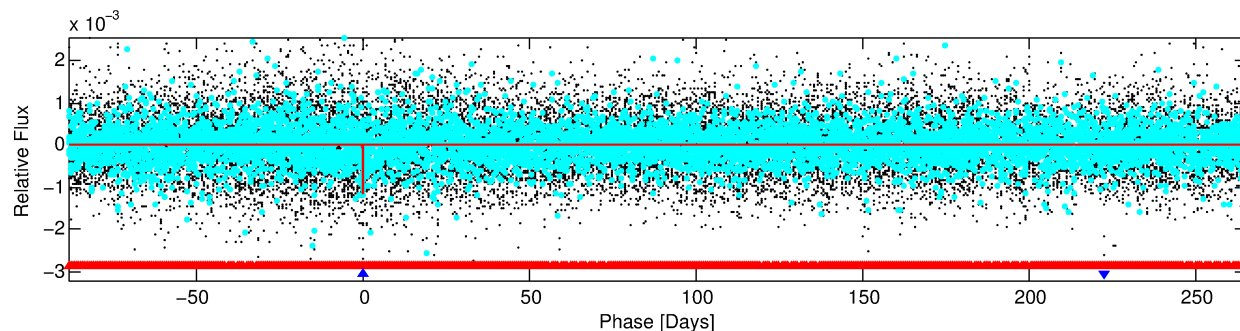
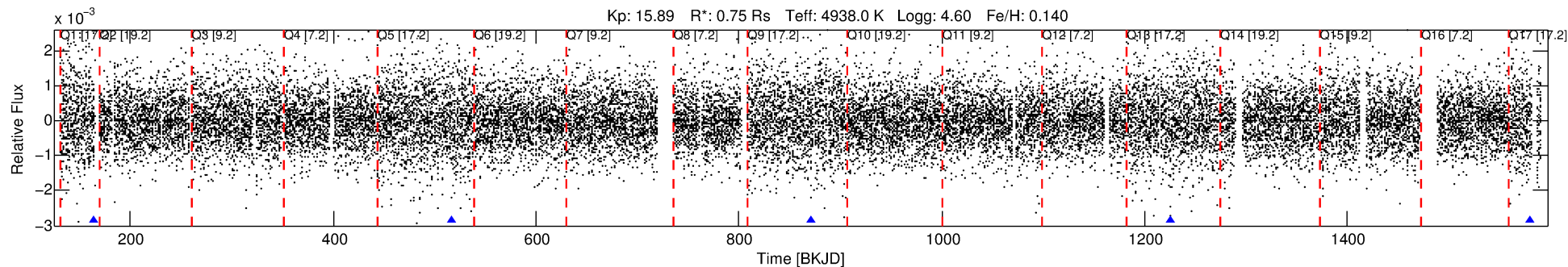
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 010405224-02

No Significant Match Found

DV One-Page Summary

KIC: 10405224 Candidate: 2 of 2 Period: 354.003 d



DV Fit Results:

Period = 354.00311 [0.01081] d
Epoch = 163.3472 [0.0354] BKJD
Rp/R* = 0.0414 [0.0125]
a/R* = 267.74 [193.36]
b = 0.95 [0.09]
Seff = 0.36 [0.06]
Teq = 197 [8] K
Rp = 3.40 [1.08] Re
a = 0.9188 [0.0765] AU
Ag = 20265.68 [14738.06] [1.37σ]
Teff = 3638 [661] K [5.20σ]

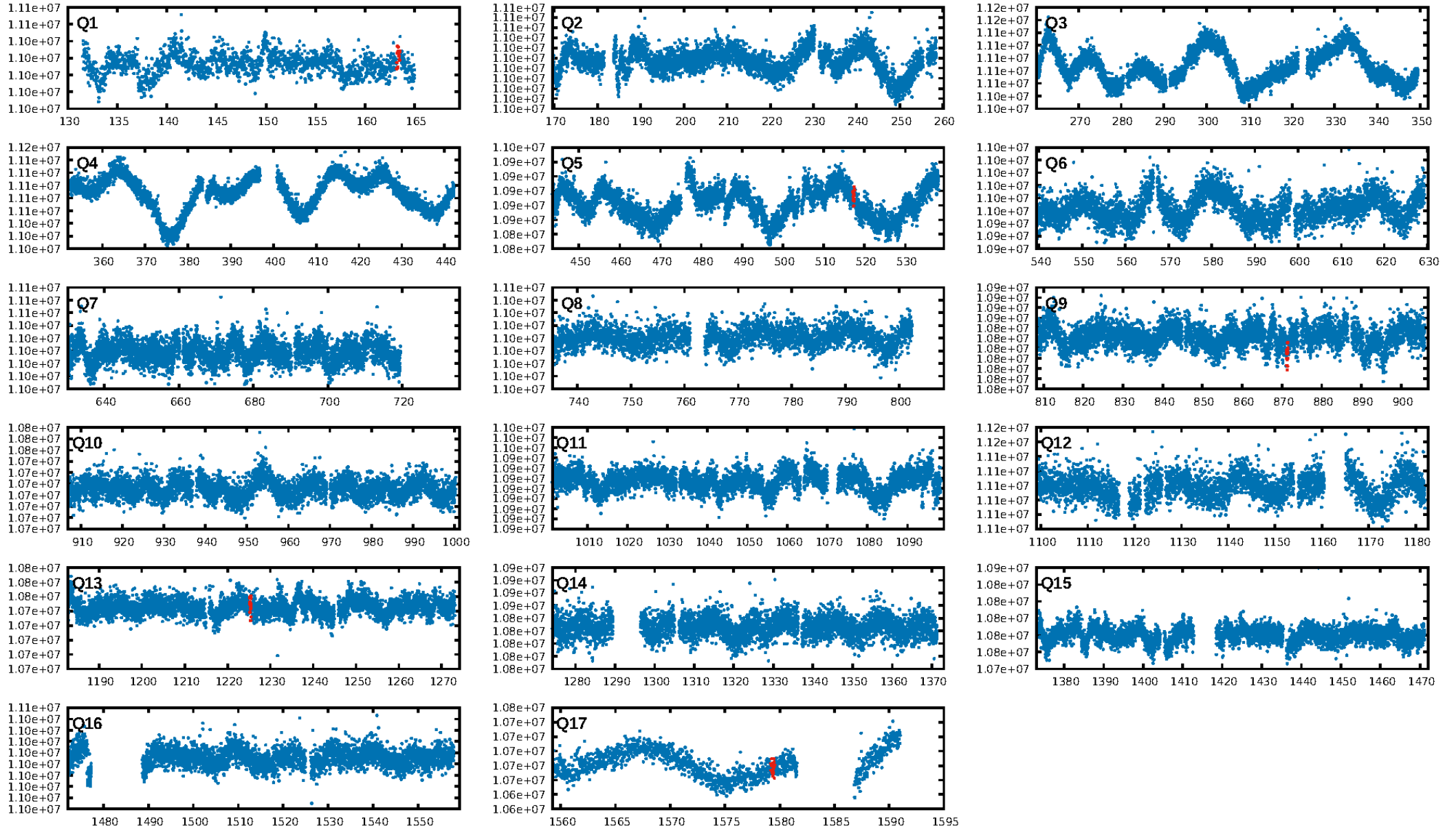
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [1384.15σ]
LongPeriod-sig: N/A
ModelChiSquare2-sig: 16.9%
ModelChiSquareGof-sig: 99.8%
Bootstrap-pfa: 8.02e-09
RollingBand-fgt: 1.00 [3/3]
GhostDiagnostic-chr: 0.06665
Centroid-sig: 8.9%
Centroid-so: 3.945 arcsec [1.35σ]
OotOffset-rm: 4.016 arcsec [1.94σ]
KicOffset-rm: 3.921 arcsec [1.88σ]
OotOffset-st: 0/0/0/2 [2]
KicOffset-st: 0/0/0/2 [2]
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DiffImageOverlap-fno: 0.00 [0/5]

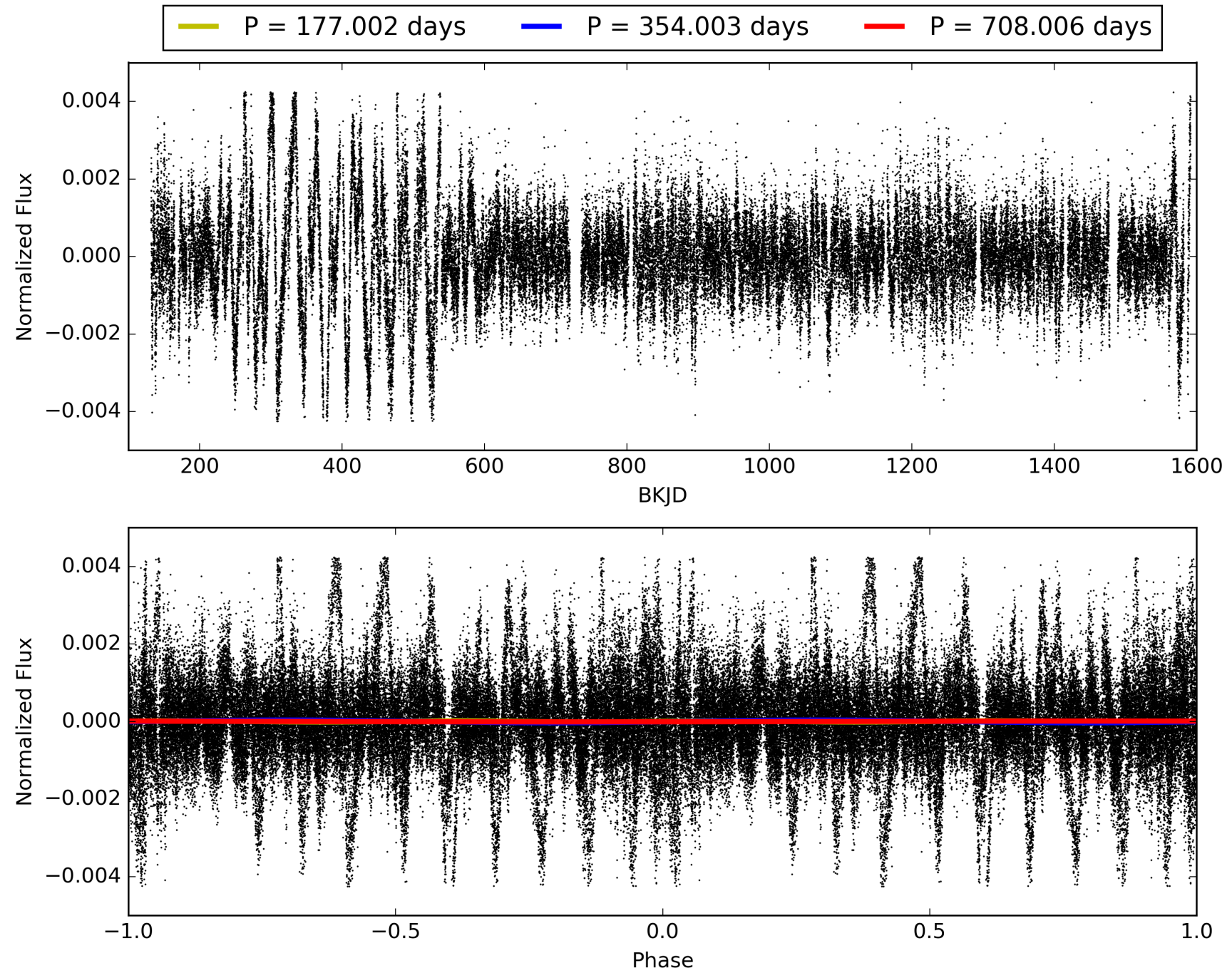
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This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

TCE 010405224-02, PDC Light Curves

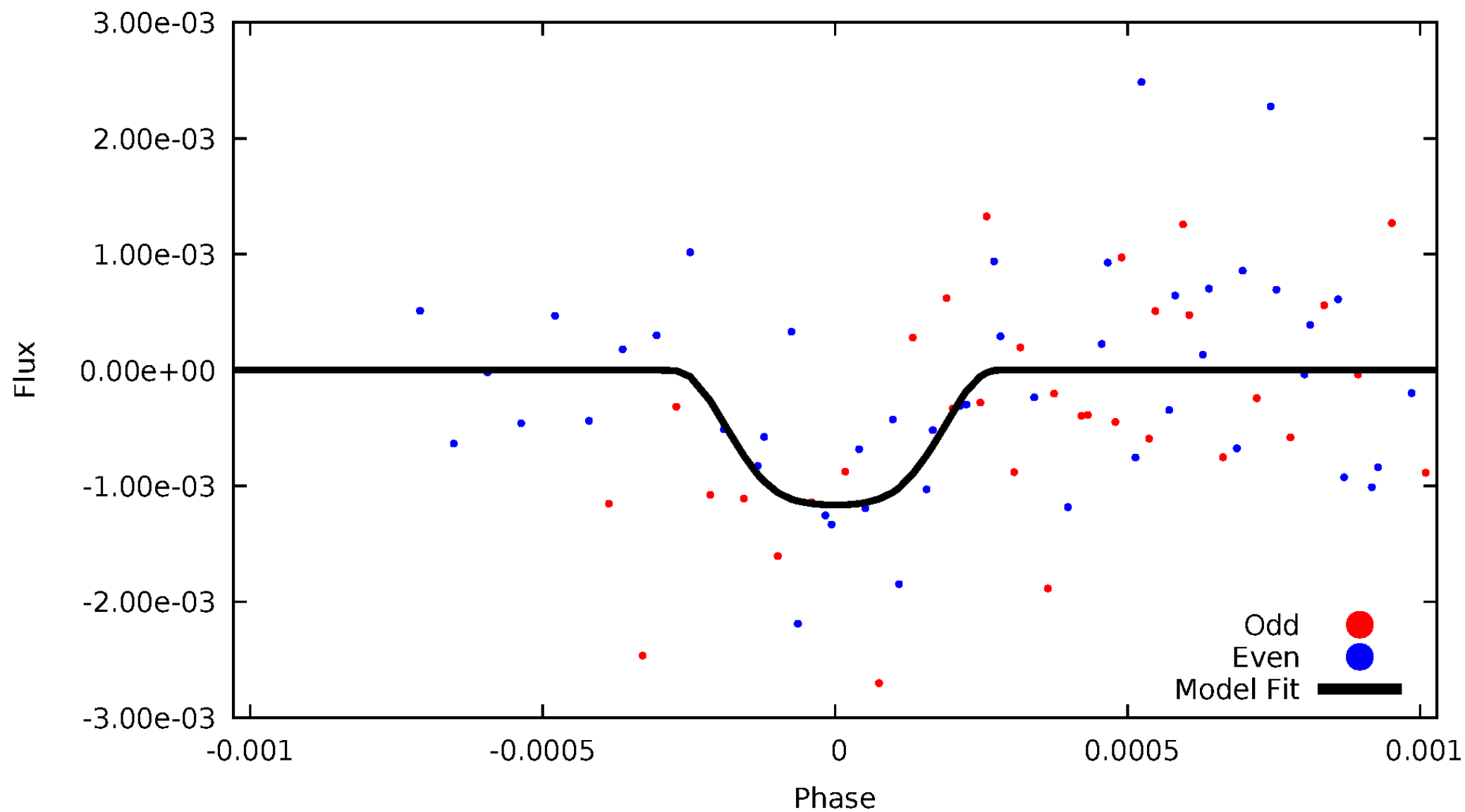


TCE 010405224-02



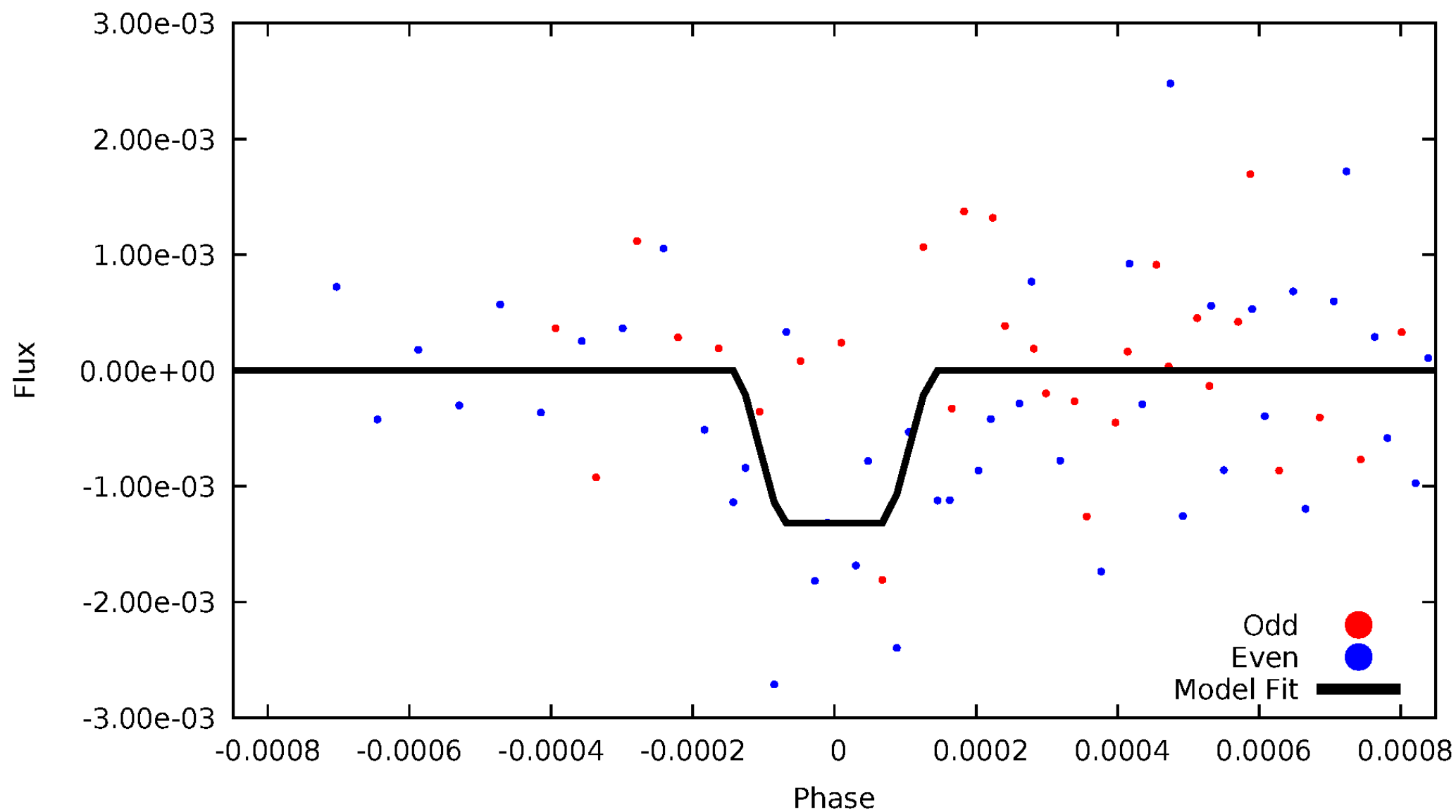
DV Odd/Even

TCE 010405224-02



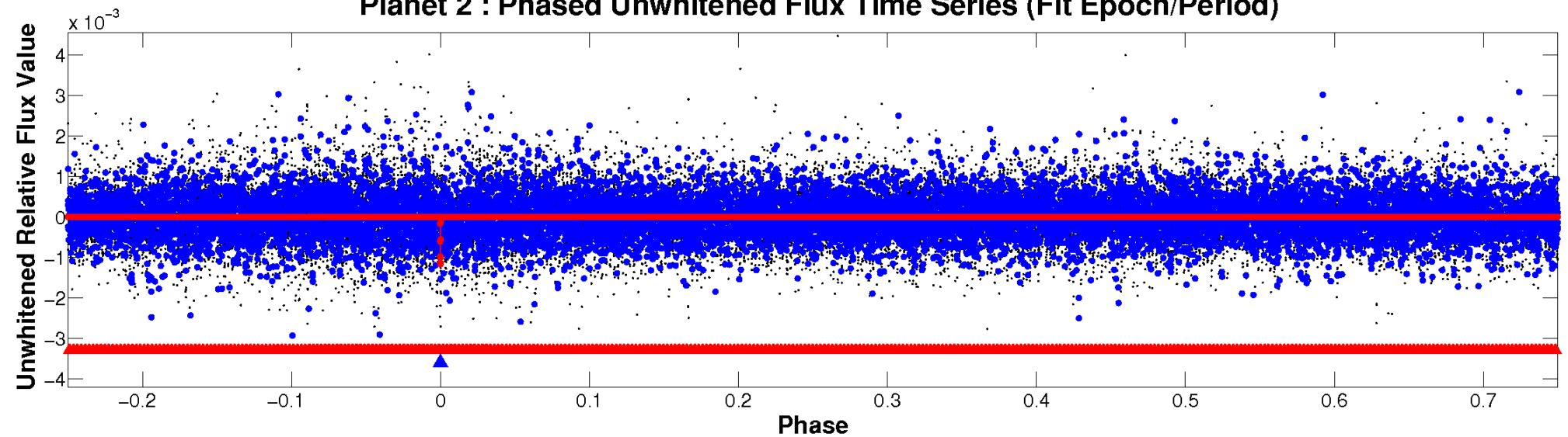
ALT Odd/Even

TCE 010405224-02

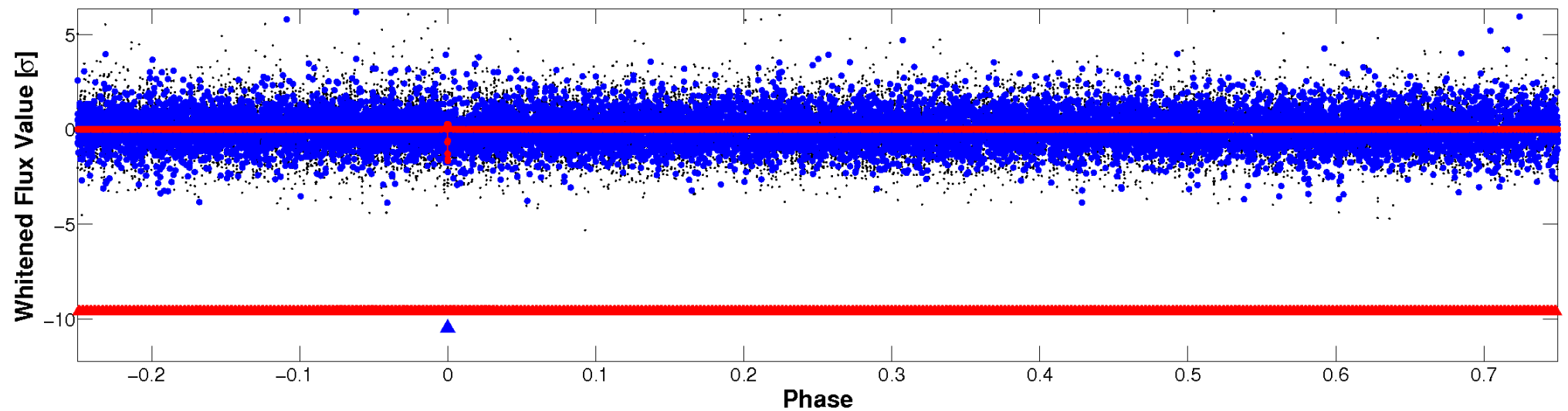


Non-Whitened Vs. Whitened Light Curve

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

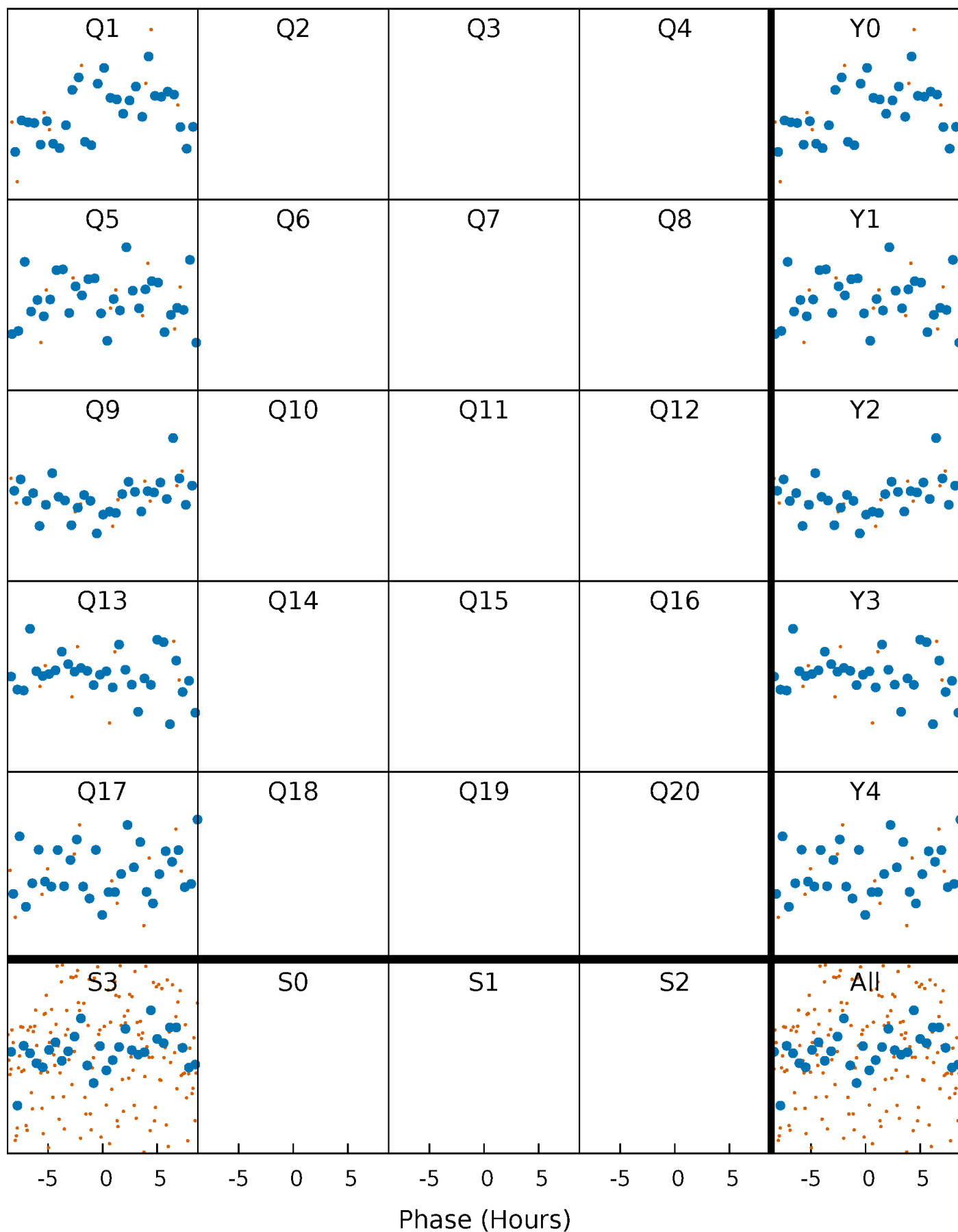


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



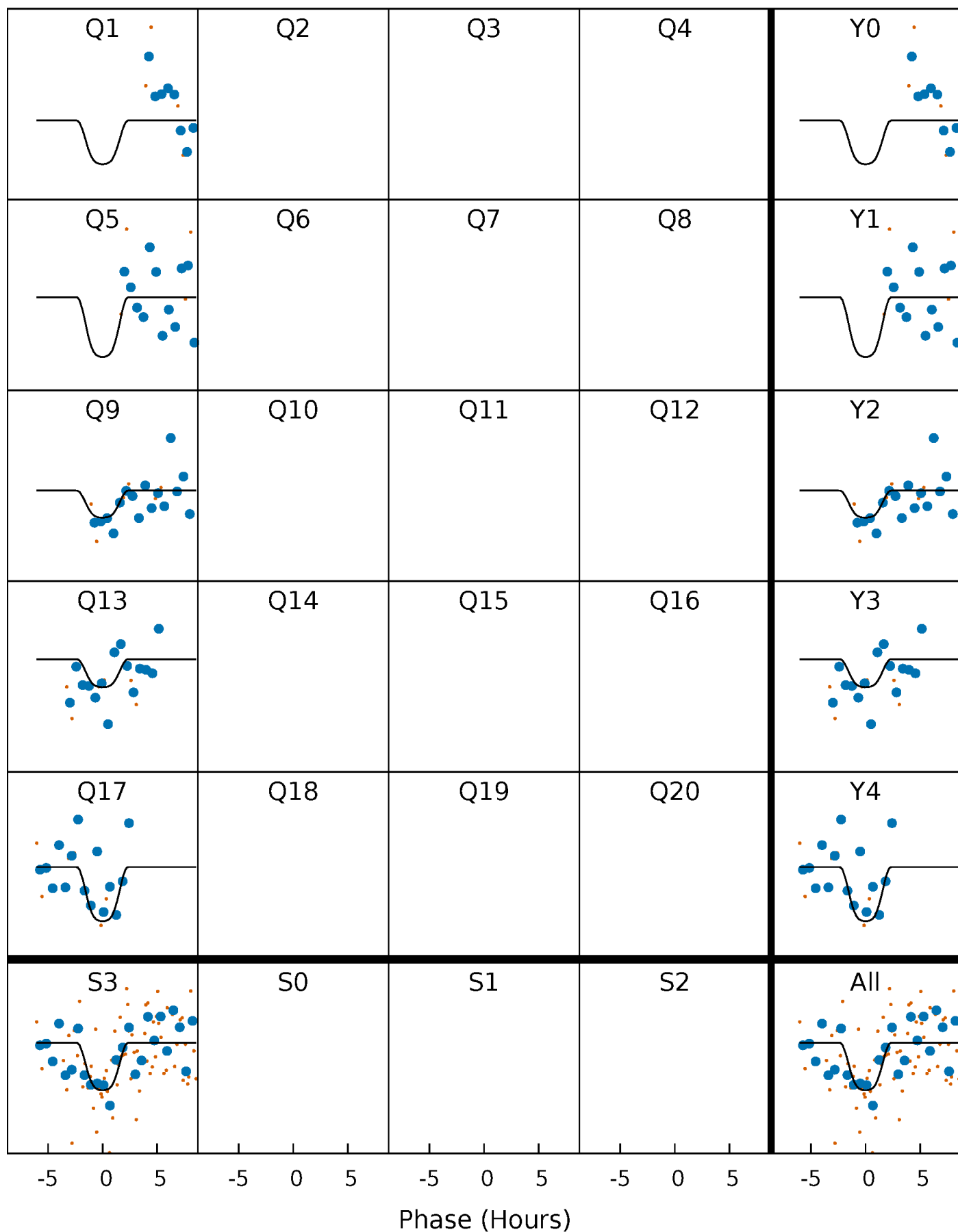
PDC Quarter-Phased Transit Curves

TCE 010405224-02 $P=354.003109$ Days $T_0=163.347247$ (BKJD)



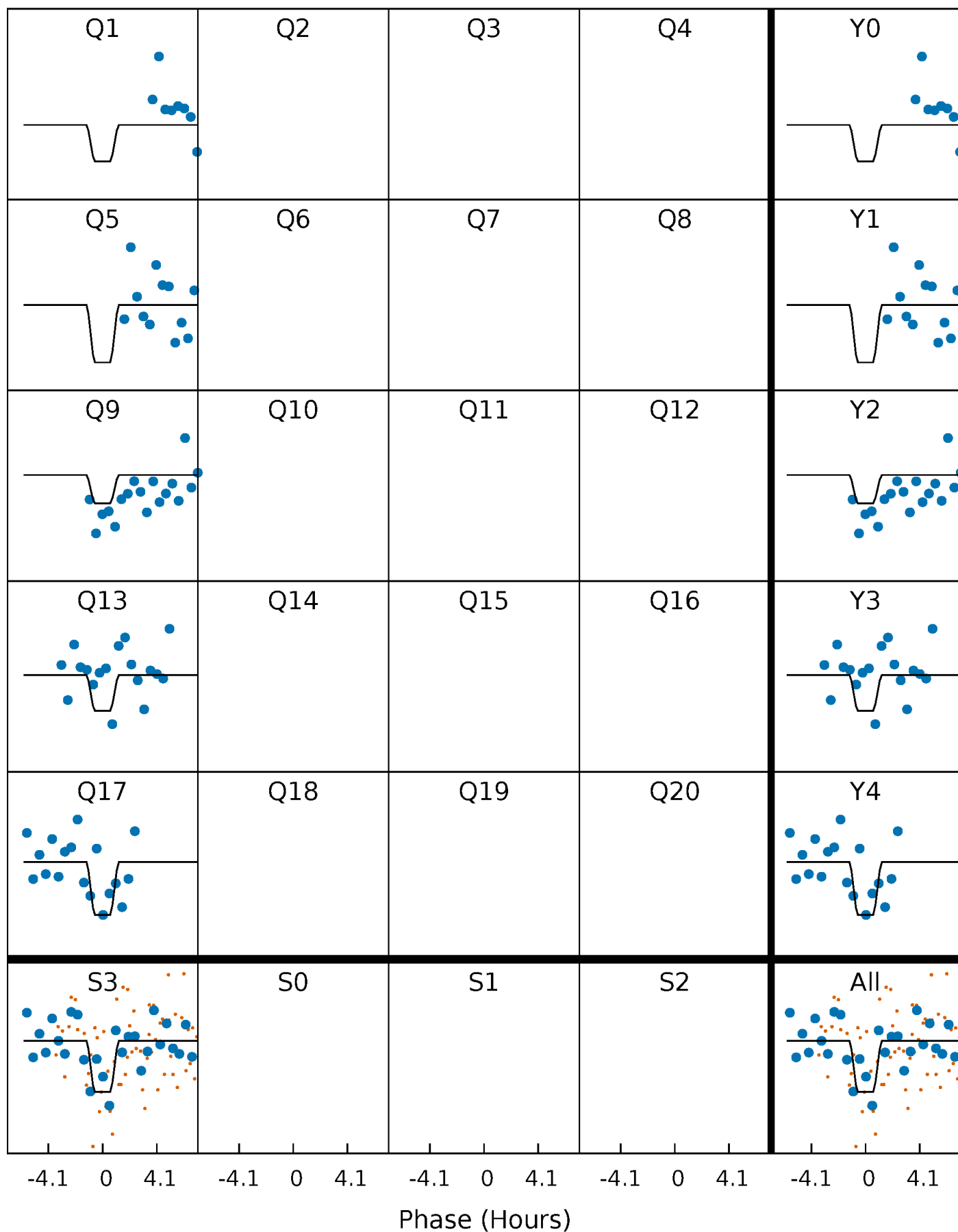
DV Quarter-Phased Transit Curves

TCE 010405224-02 $P=354.003109$ Days $T_0=163.347247$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

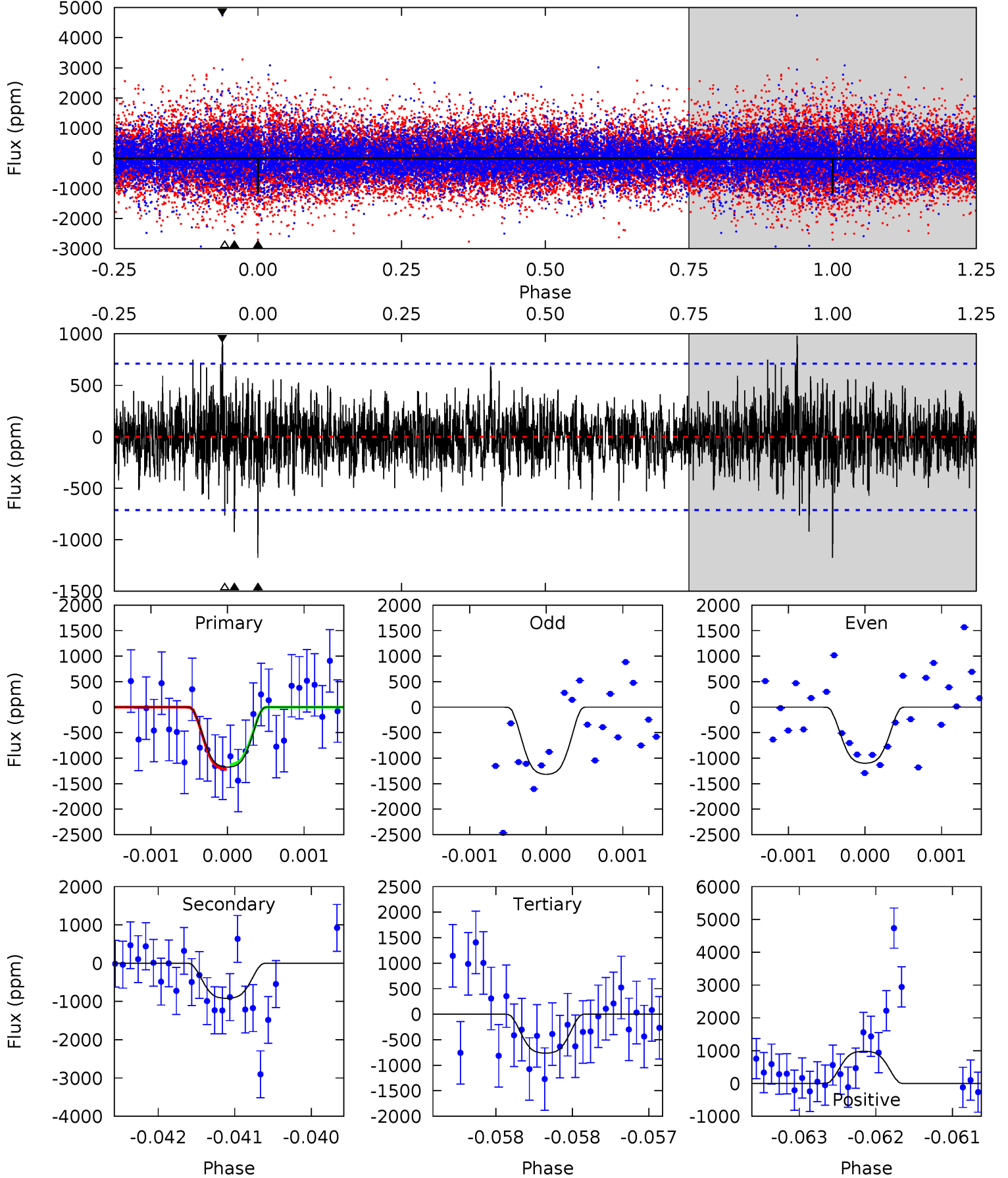
TCE 010405224-02 $P=353.998184$ Days $T_0=163.364630$ (BKJD)



DV Model-Shift Uniqueness Test

010405224-02, P = 354.003109 Days, E = 163.347247 Days

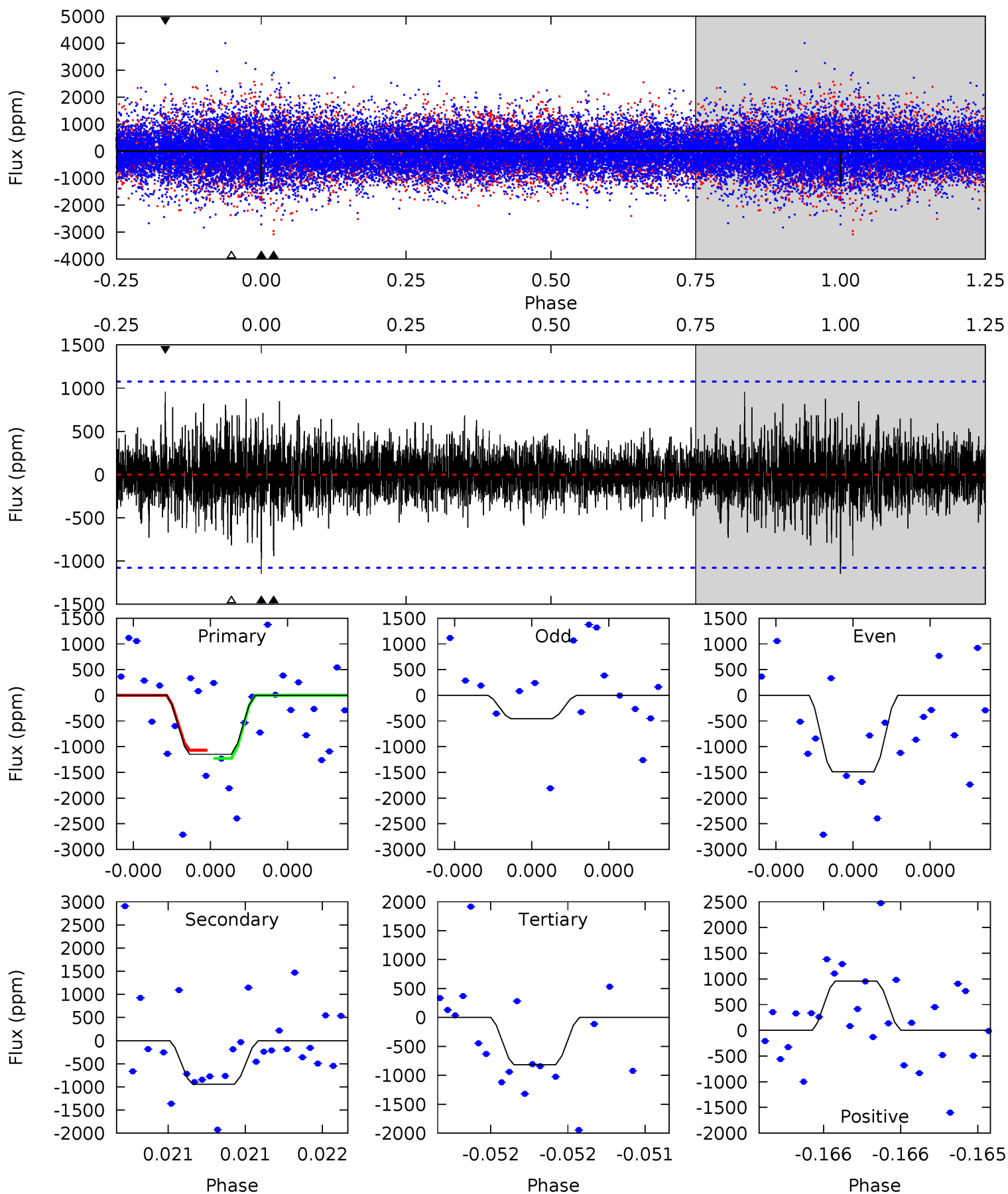
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 9.19 | 7.18 | 5.97 | 7.68 | 5.56 | 3.45 | 1.48 | 3.22 | 1.51 | 1.22 | -0.50 | 0.83 | 1.03 | 0.46 | 0.35 |



Alt Model-Shift Uniqueness Test

010405224-02, P = 353.998184 Days, E = 163.364630 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 6.07 | 4.99 | 4.32 | 5.06 | 5.69 | 3.66 | 1.07 | 1.74 | 1.01 | 0.66 | -0.07 | 2.57 | 1.72 | 0.45 | 0.42 |



Stellar Parameters For KIC 010405224

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | $R (R_{\odot})$ | $M(M_{\odot})$ | $p_{\star} (g \cdot \text{cm}^{-3})$ |
|--------|----------------------|---------------------------|---------------------------|---------------------------|---------------------------|--------------------------------------|
| | 4938^{+148}_{-148} | $4.601^{+0.022}_{-0.067}$ | $0.140^{+0.250}_{-0.300}$ | $0.753^{+0.074}_{-0.051}$ | $0.836^{+0.043}_{-0.079}$ | $2.761^{+0.347}_{-0.626}$ |
| | +3%/-3% | +0%/-1% | +179%/-214% | +10%/-7% | +5%/-9% | +13%/-23% |
| 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 010405224-02 / KOI

| Detrend | Depth (ppm) | $R_p (R_{\oplus})$ | $T_{max} (K)$ | $T_{obs} (K)$ | A_{obs} |
|---------|-------------|------------------------|------------------|----------------------|---------------------------|
| DV | -919±128 | $3.39^{+1.18}_{-1.08}$ | 278^{+11}_{-9} | 4390^{+740}_{-473} | 37151^{+43365}_{-17191} |
| Alt. | -943±189 | $3.02^{+1.05}_{-1.11}$ | 279^{+10}_{-9} | 4597^{+983}_{-520} | 46296^{+67056}_{-21632} |

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

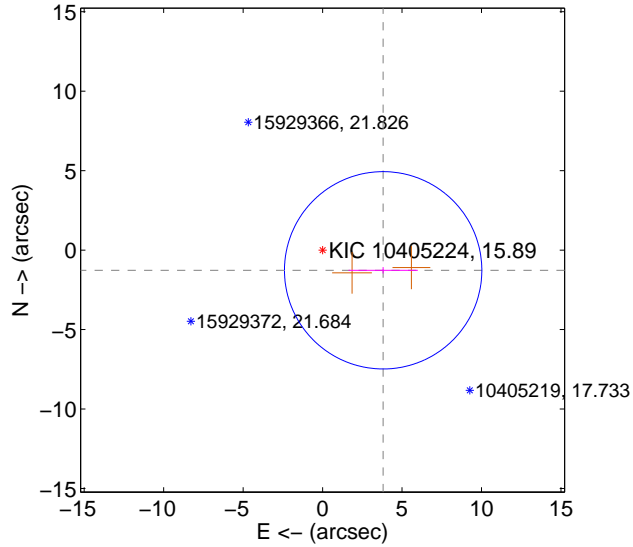
Supplemental centroid analysis for 010405224-02. Kepler magnitude: 15.89. Transit SNR 5.97

There are 0 quarters with good PRF difference image offsets

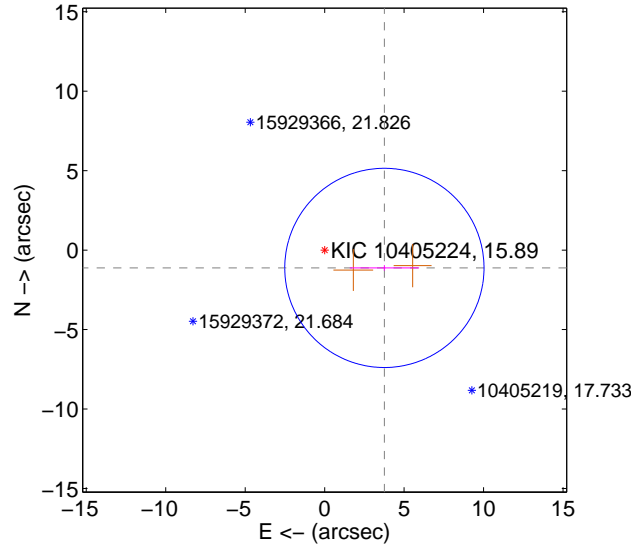
The direct PRF centroid is offset from the target star catalog position by about 0.18 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|---|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT | 4.016 ± 2.069 | 1.94 | -3.810 ± 2.180 | -1.271 ± 0.203 |
| PRF-fit source offset from KIC position | 3.921 ± 2.089 | 1.88 | -3.758 ± 2.179 | -1.121 ± 0.175 |
| photometric centroid source offset | 3.94 ± 2.91 | 1.35 | 2.93 ± 3.11 | 2.64 ± 2.66 |

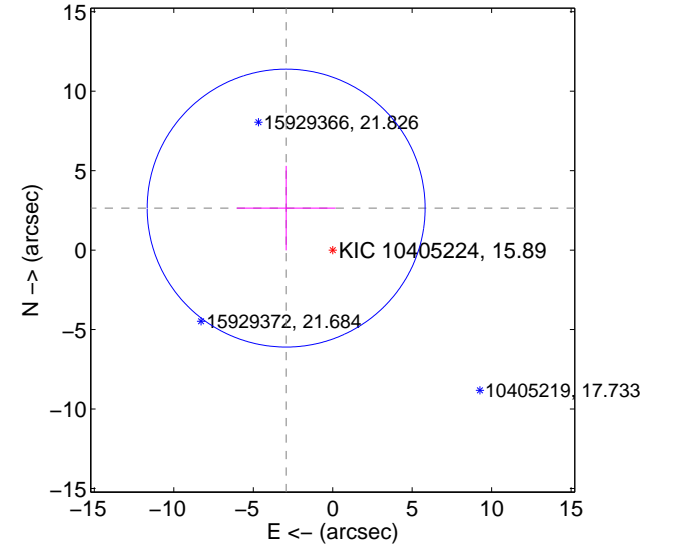
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

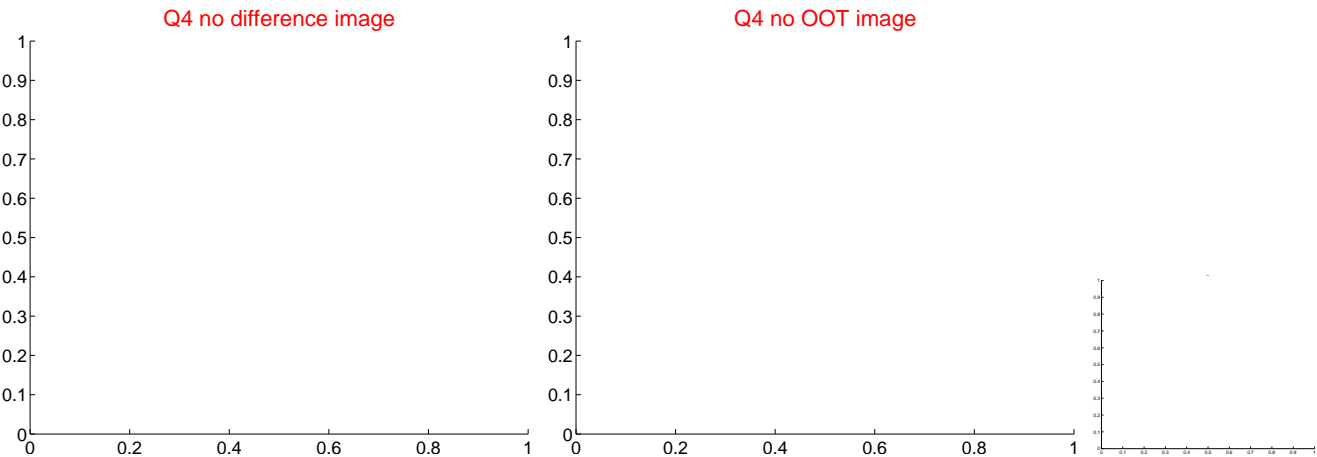
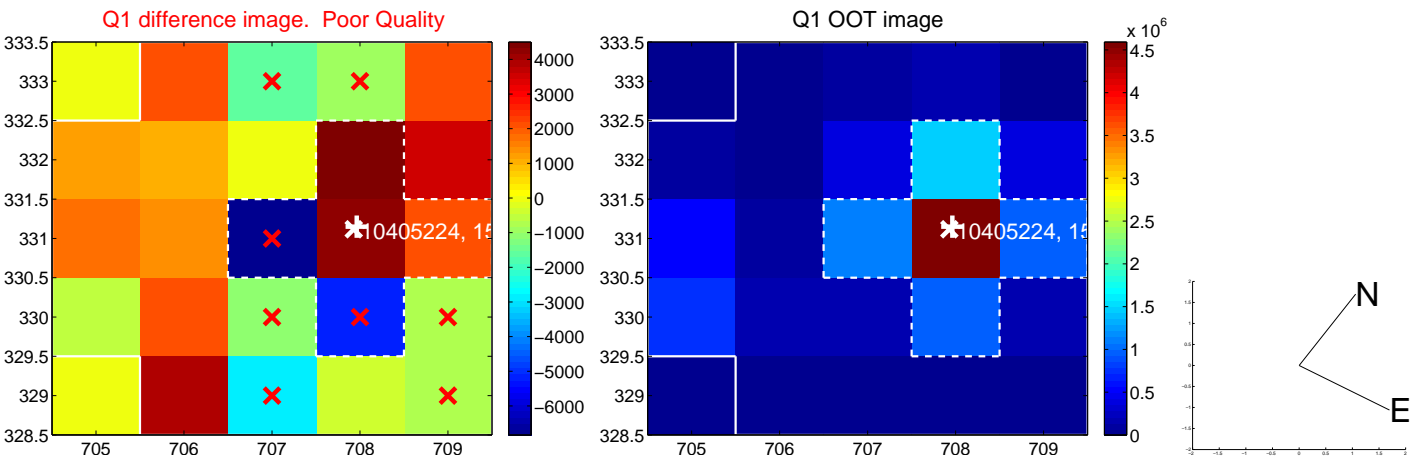


offset from photometric centroids

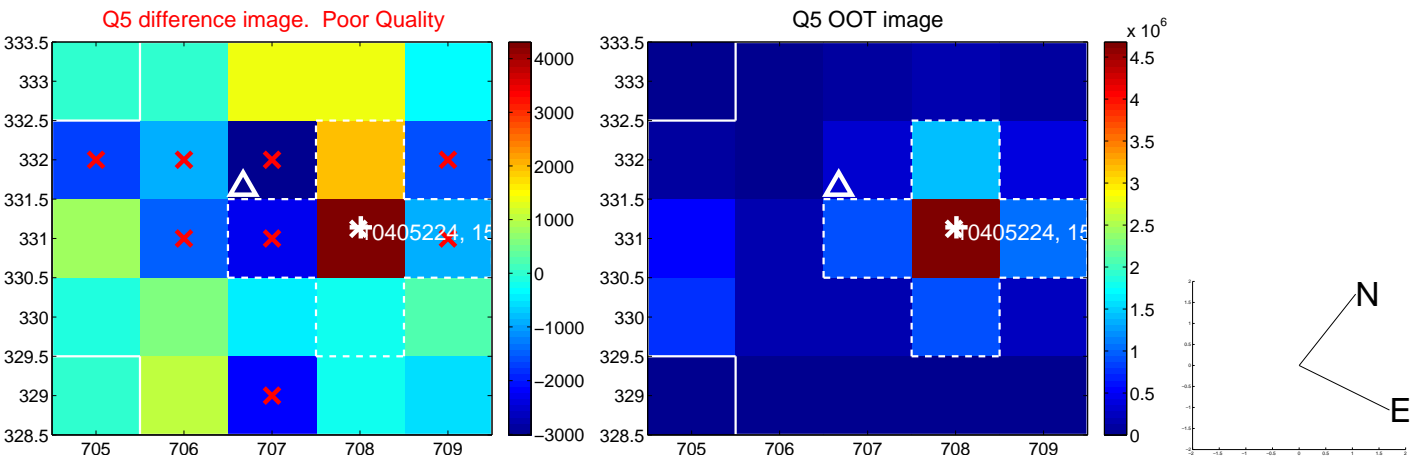


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three- σ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

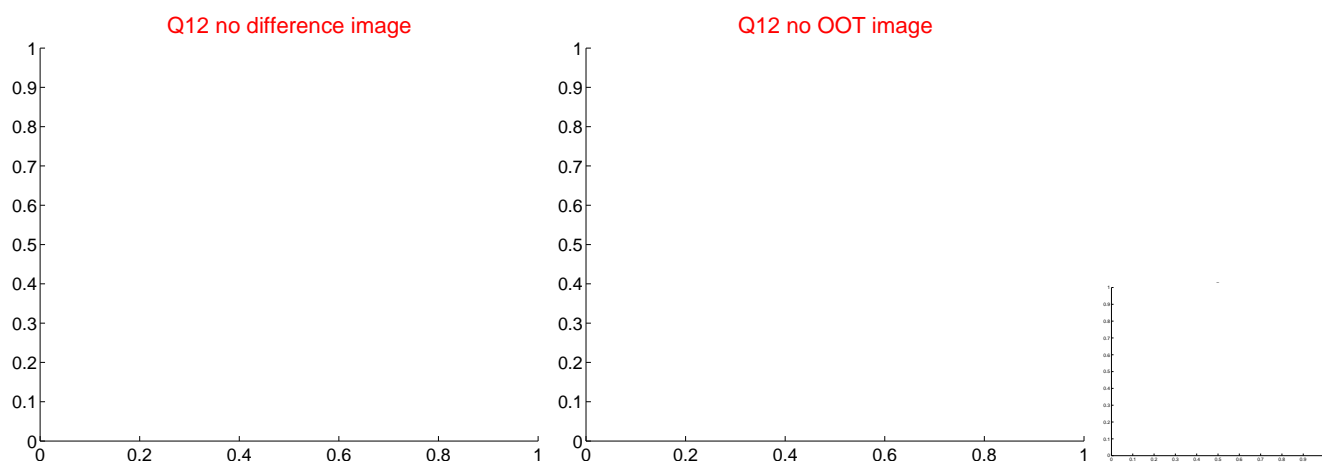
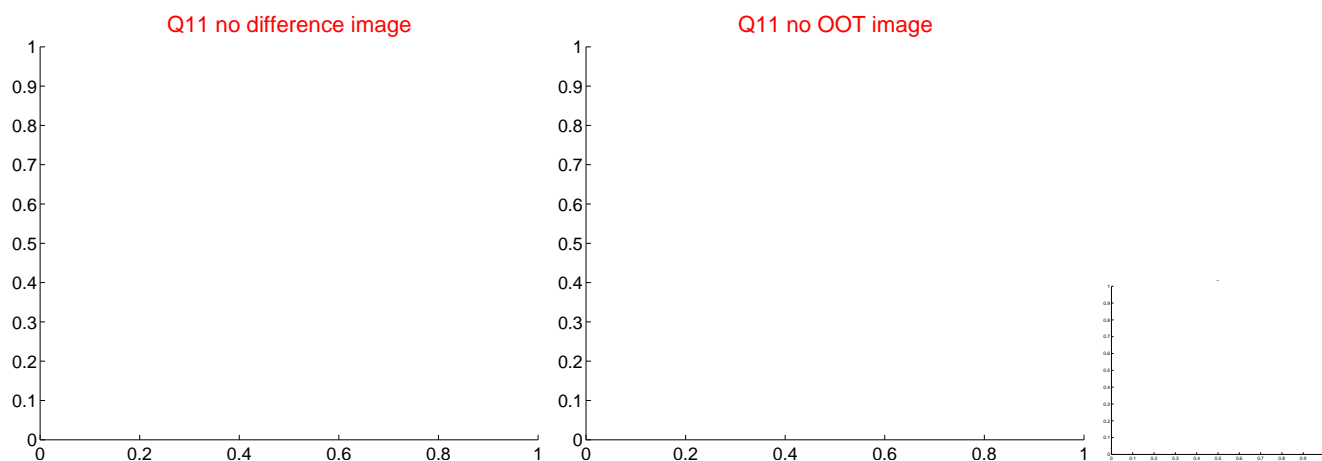
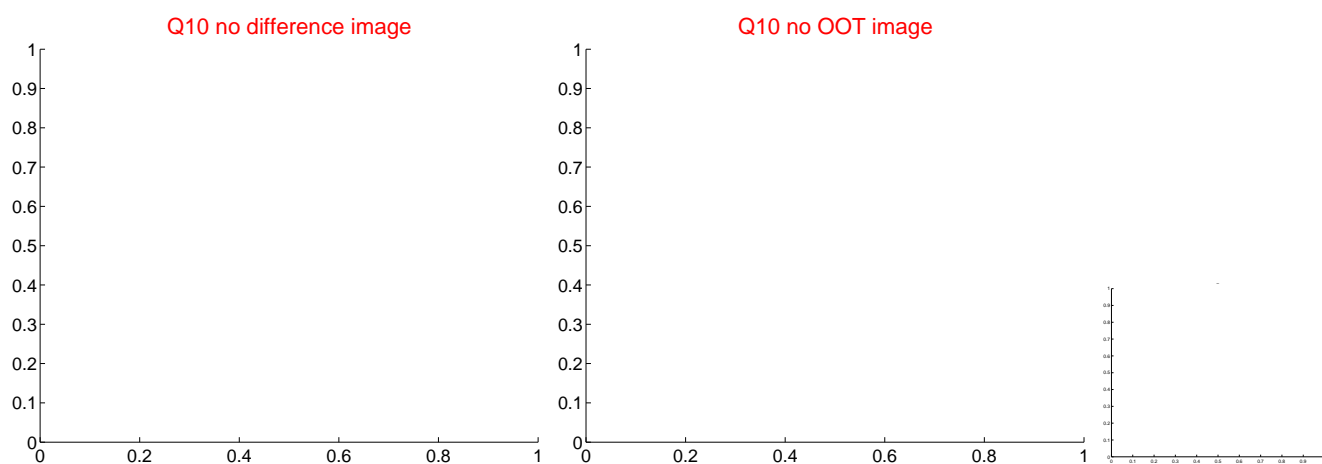
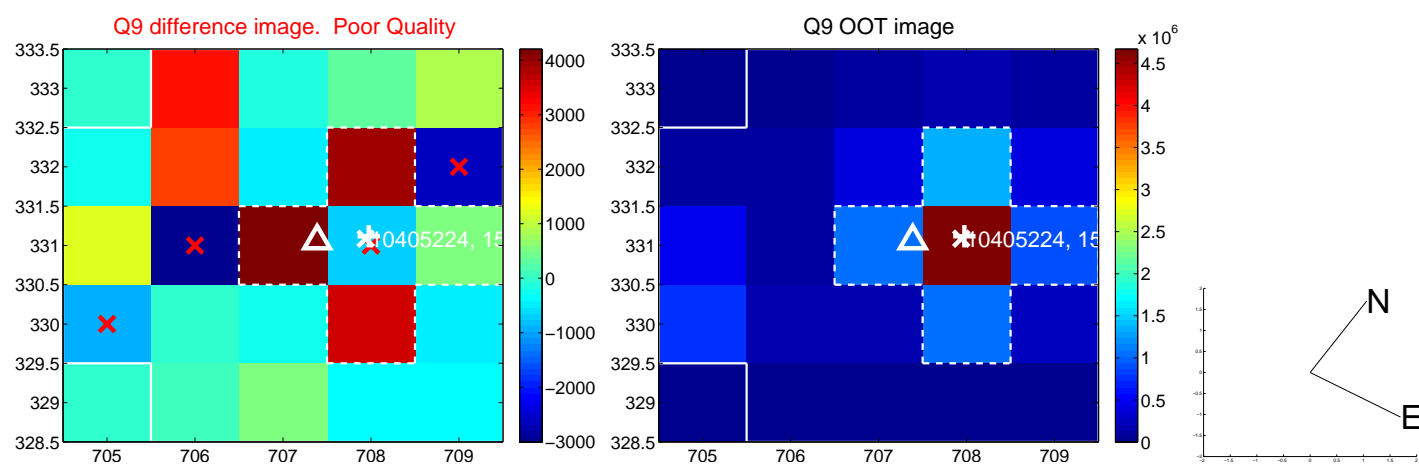
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.



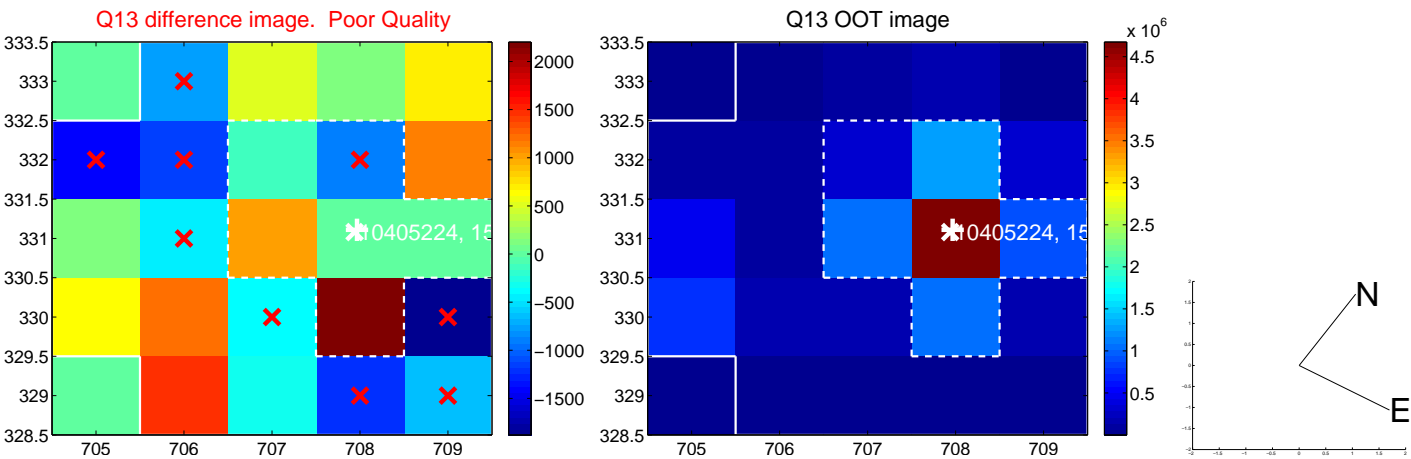
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.



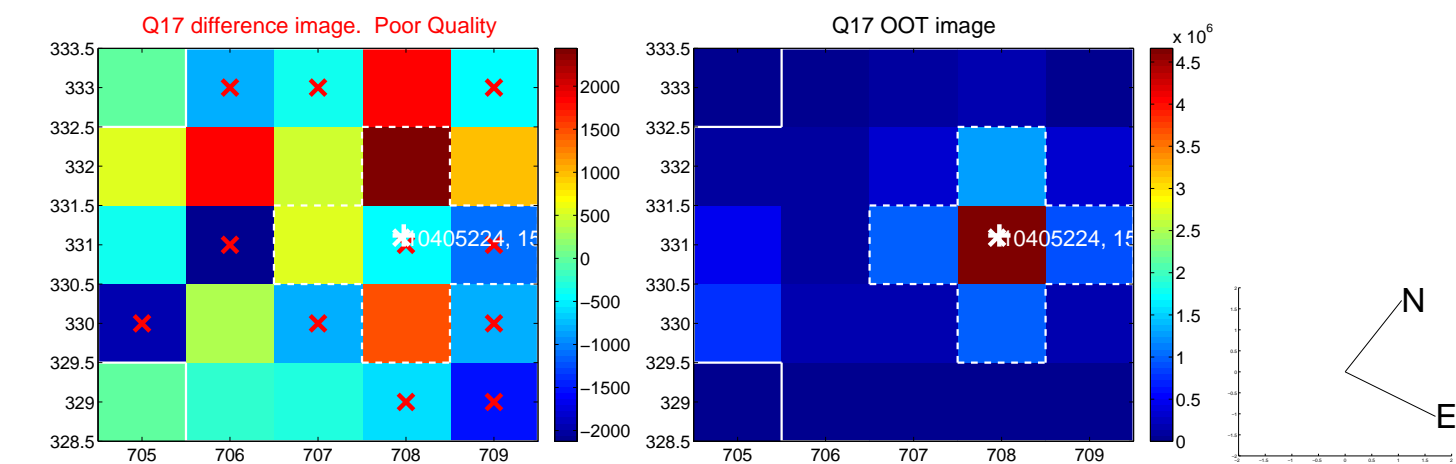
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



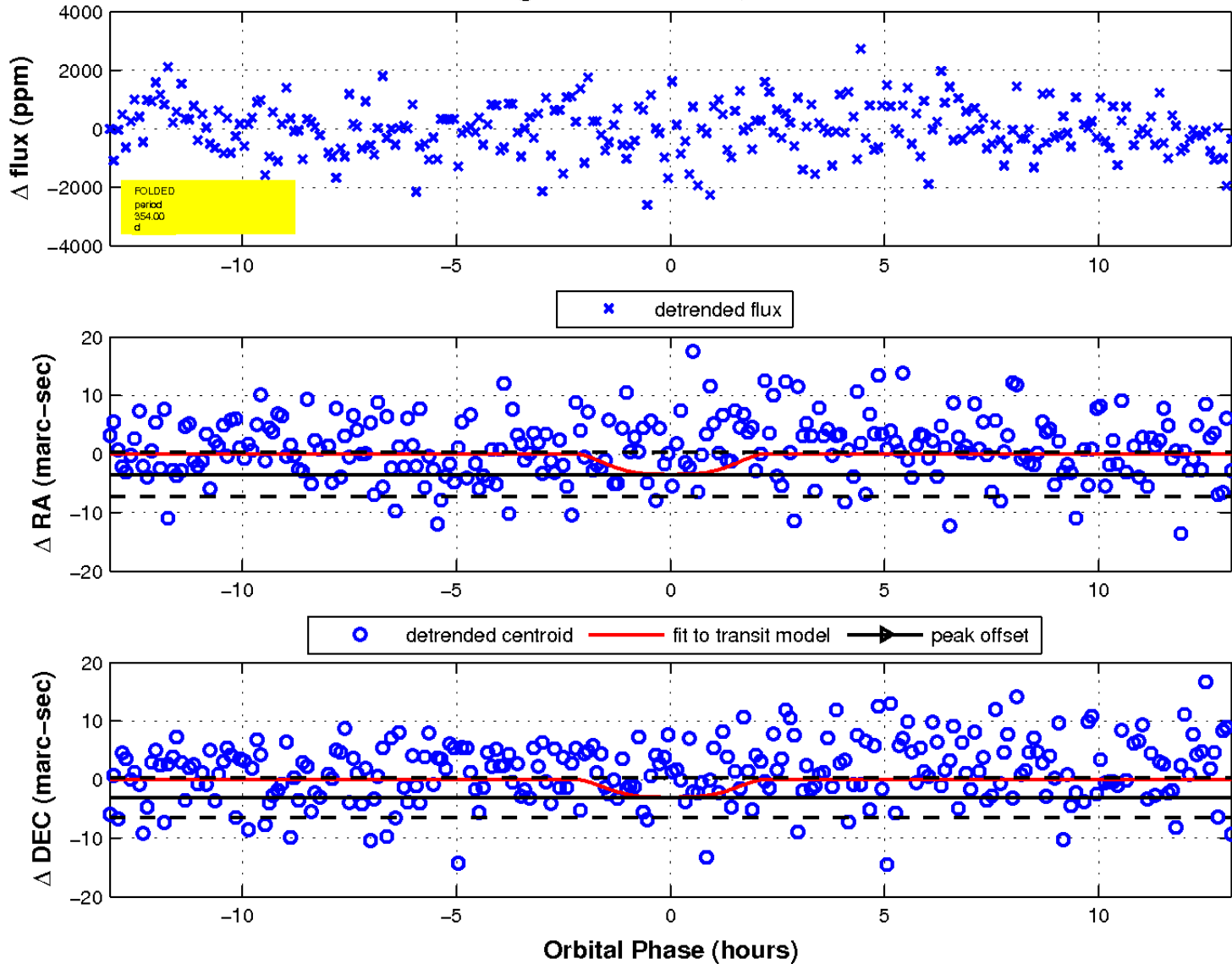
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ×: large negative pixel value.



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



fluxWeightedCentroids, Planet 2 of 2



UKIRT Image

Declination

