

KIC 010731839

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}) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|-----|-----------------------------|-----------------|------------------------|------------------------|
| 010731839-01 | OBS | No | 433.286537 | 393.885530 | 186.6 | 6.409 | 13.3 | 6.1 | 0.21 | 3256 | 0.33 | 0.01 |
| 010731839-02 | OBS | No | 460.498439 | 184.758862 | 170.9 | 13.585 | 9.2 | 7.1 | 0.21 | 3256 | 0.33 | 0.01 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|---|
| 010731839-01 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS |
| 010731839-02 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_MARSHALL_SKYE_ZUMA—LPP_DV—ALL_TRANS_CHASES—MOD_TER_DV—MOD_POS_DV—MOD_TER_ALT—MOD_POS_ALT—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.

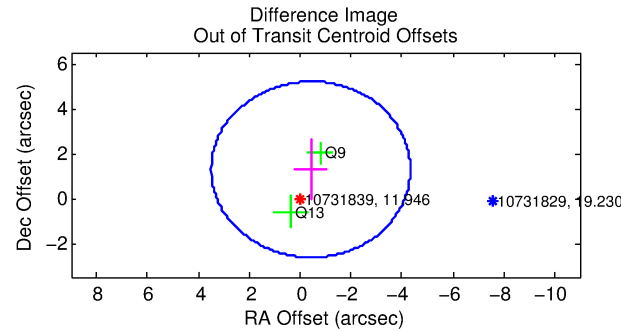
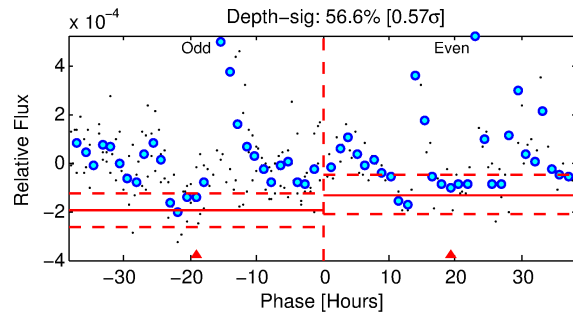
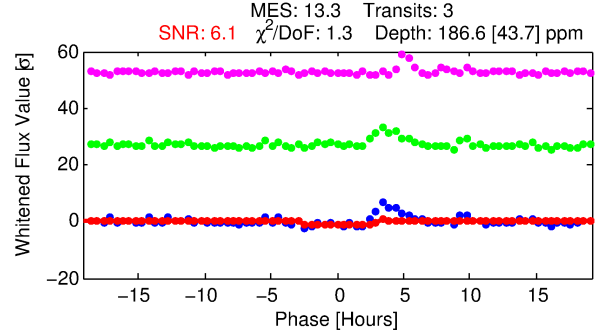
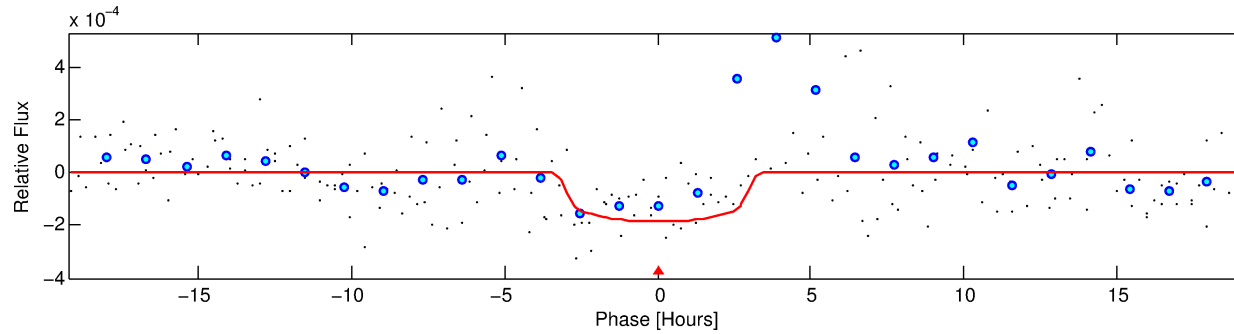
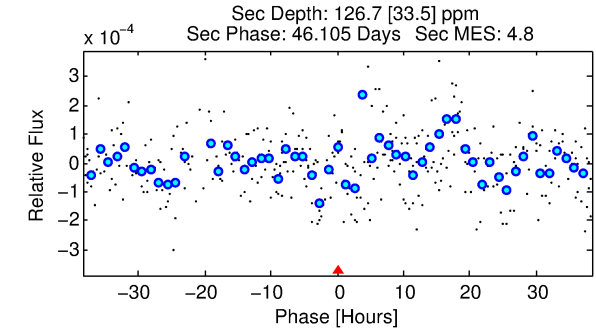
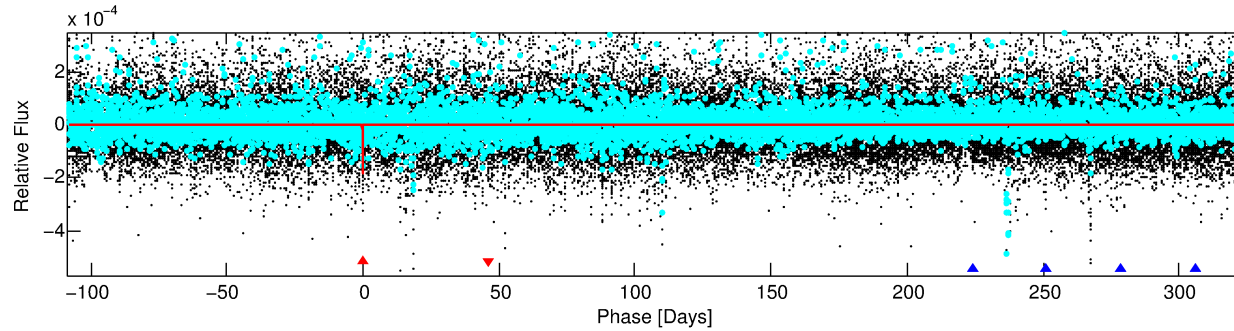
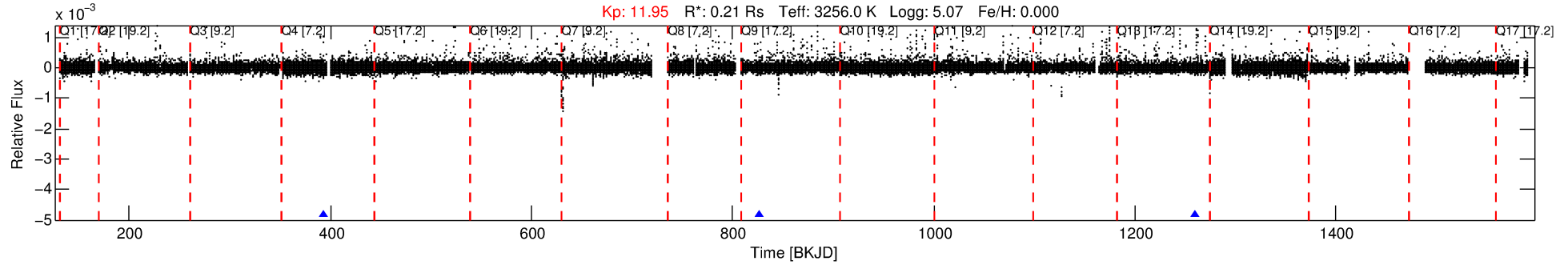
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 010731839-01

No Significant Match Found

DV One-Page Summary

KIC: 10731839 Candidate: 1 of 2 Period: 433.287 d



DV Fit Results:

Period = 433.28654 [0.01326] d
Epoch = 393.8855 [0.0177] BKJD
Rp/R* = 0.0146 [0.0062]
a/R* = 261.47 [437.13]
b = 0.88 [0.44]
Seff = 0.01 [0.00]
Teq = 82 [3] K
Rp = 0.33 [0.15] Re
a = 0.6376 [0.0691] AU
Ag = 259860.06 [231893.49] [1.12 σ]
Teffp = 2857 [632] K [4.39 σ]

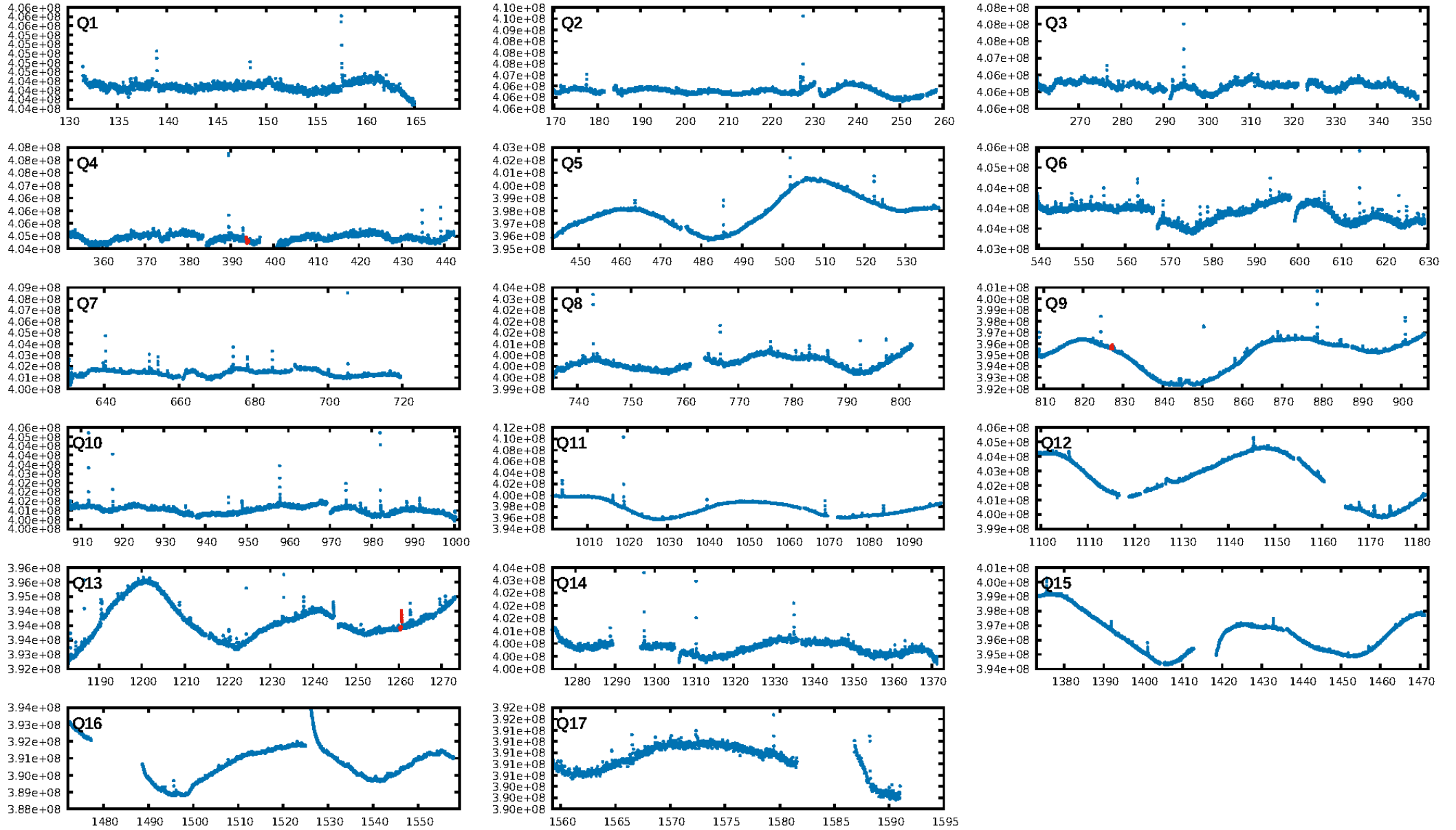
DV Diagnostic Results:

ShortPeriod-sig: N/A
LongPeriod-sig: 100.0% [43.48 σ]
ModelChiSquare2-sig: 13.9%
ModelChiSquareGof-sig: 97.7%
Bootstrap-pfa: 9.30e-18
RollingBand-fgt: 1.00 [3/3]
GhostDiagnostic-chr: -10.28
Centroid-sig: 5.6%
Centroid-so: 1.363 arcsec [1.28 σ]
OotOffset-rm: 1.352 arcsec [1.04 σ]
OotOffset-st: 0/0/0/2 [2]
KicOffset-rm: 1.493 arcsec [1.18 σ]
KicOffset-st: 0/0/0/2 [2]
DiffImageQuality-fgm: 1.00 [2/2]
DiffImageOverlap-fno: 1.00 [3/3]

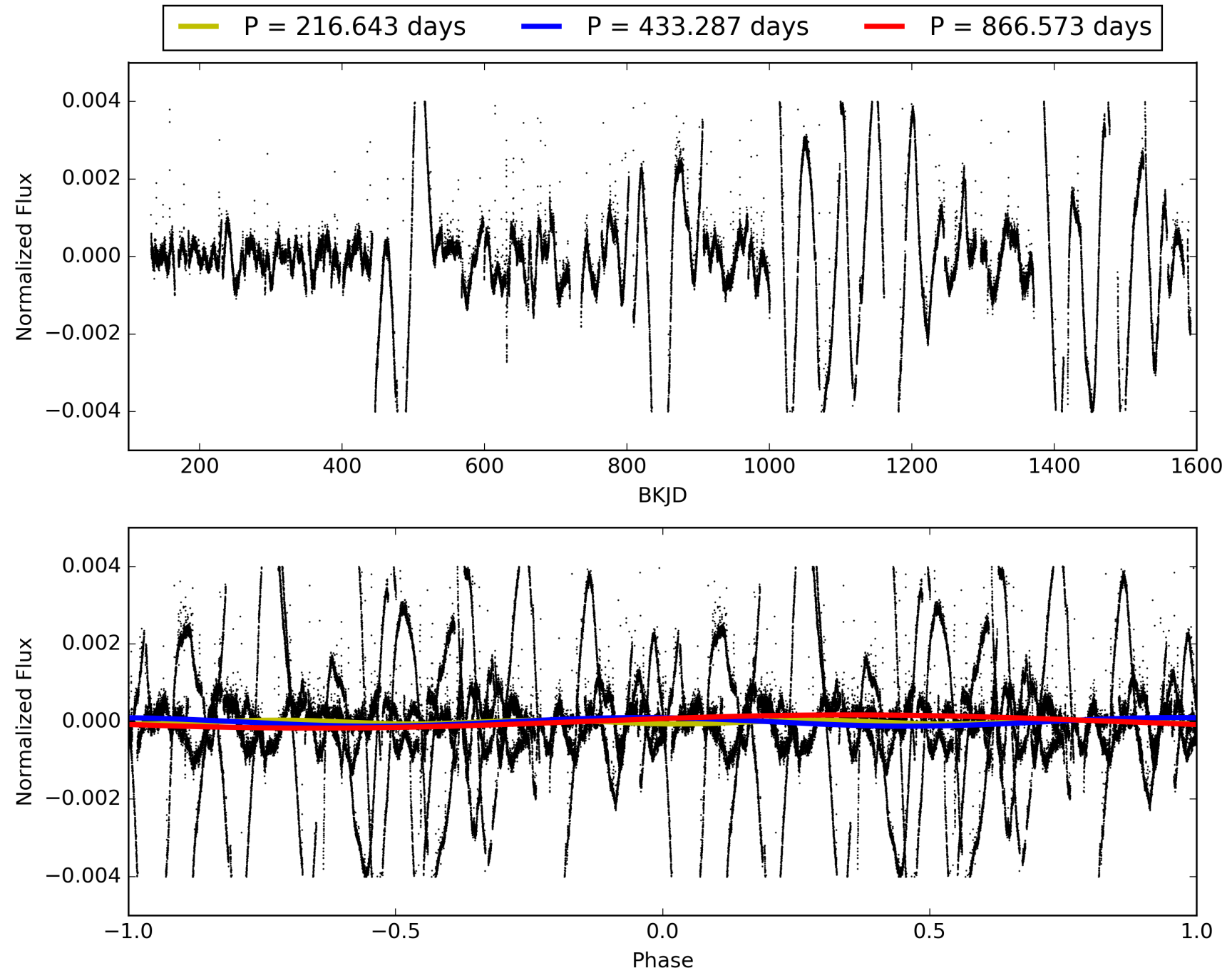
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 05:54:22 Z

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

TCE 010731839-01, PDC Light Curves

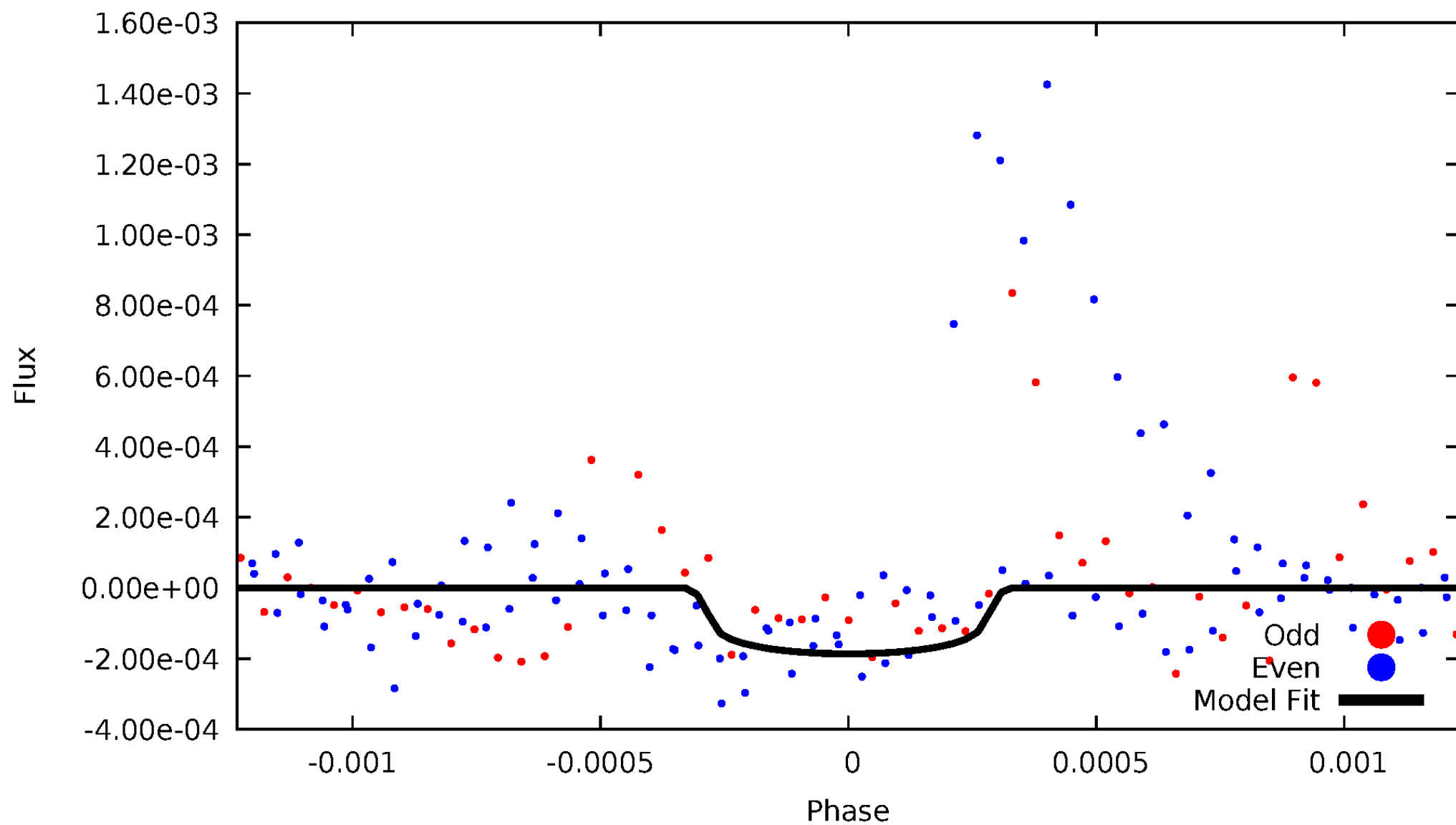


TCE 010731839-01



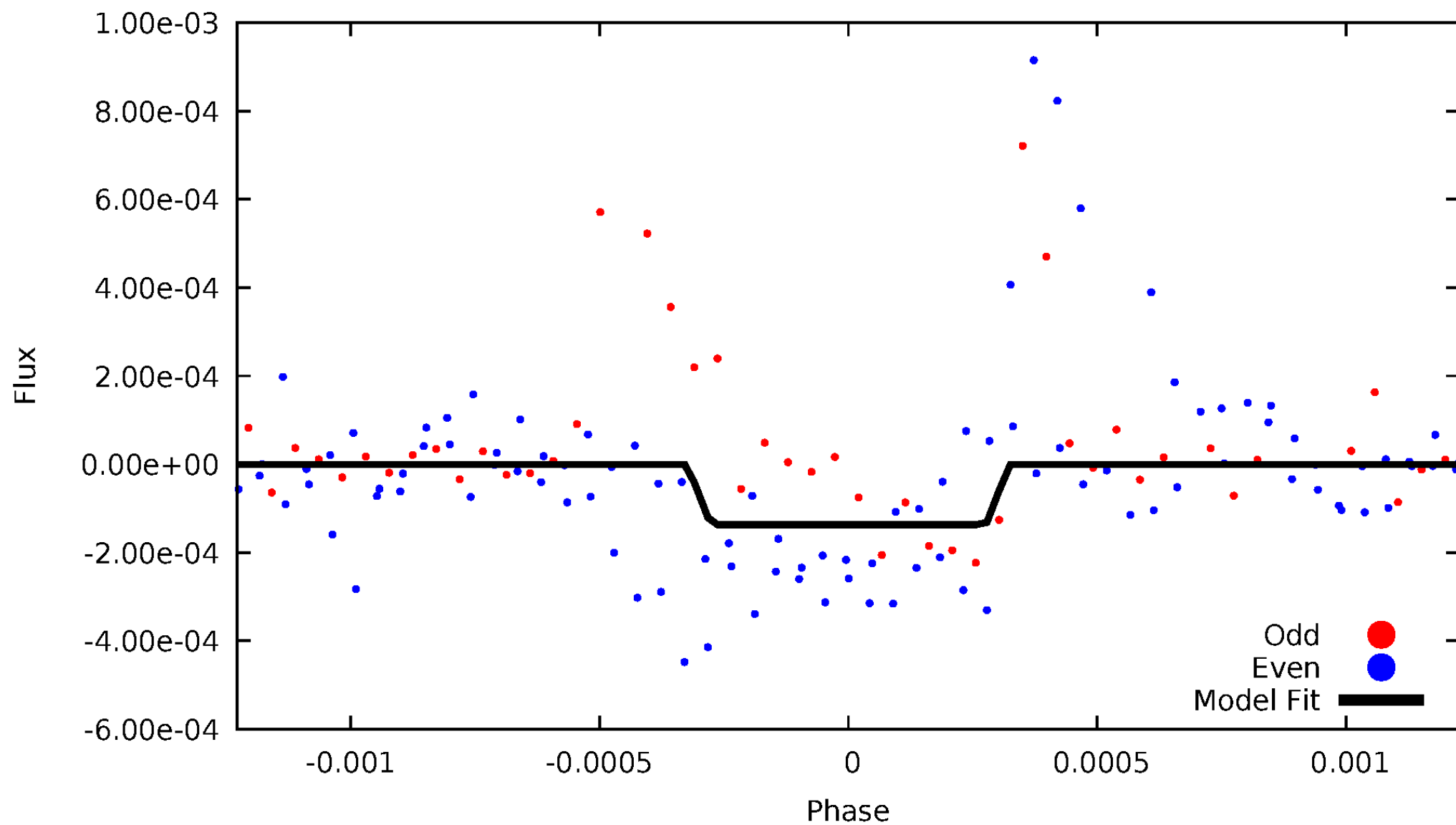
DV Odd/Even

TCE 010731839-01

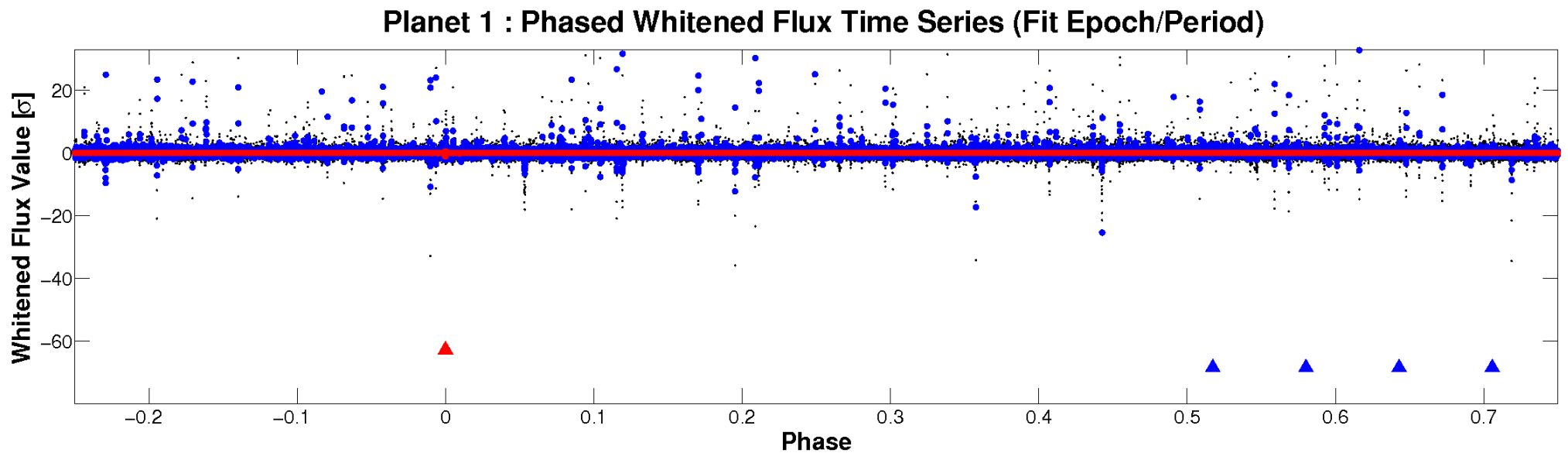
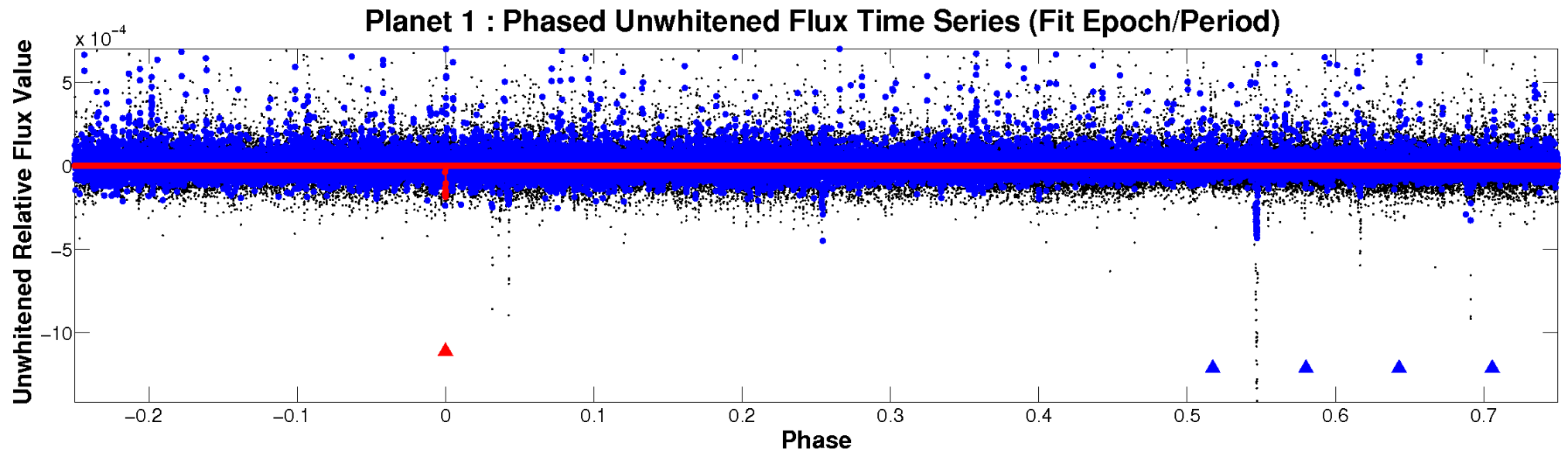


ALT Odd/Even

TCE 010731839-01

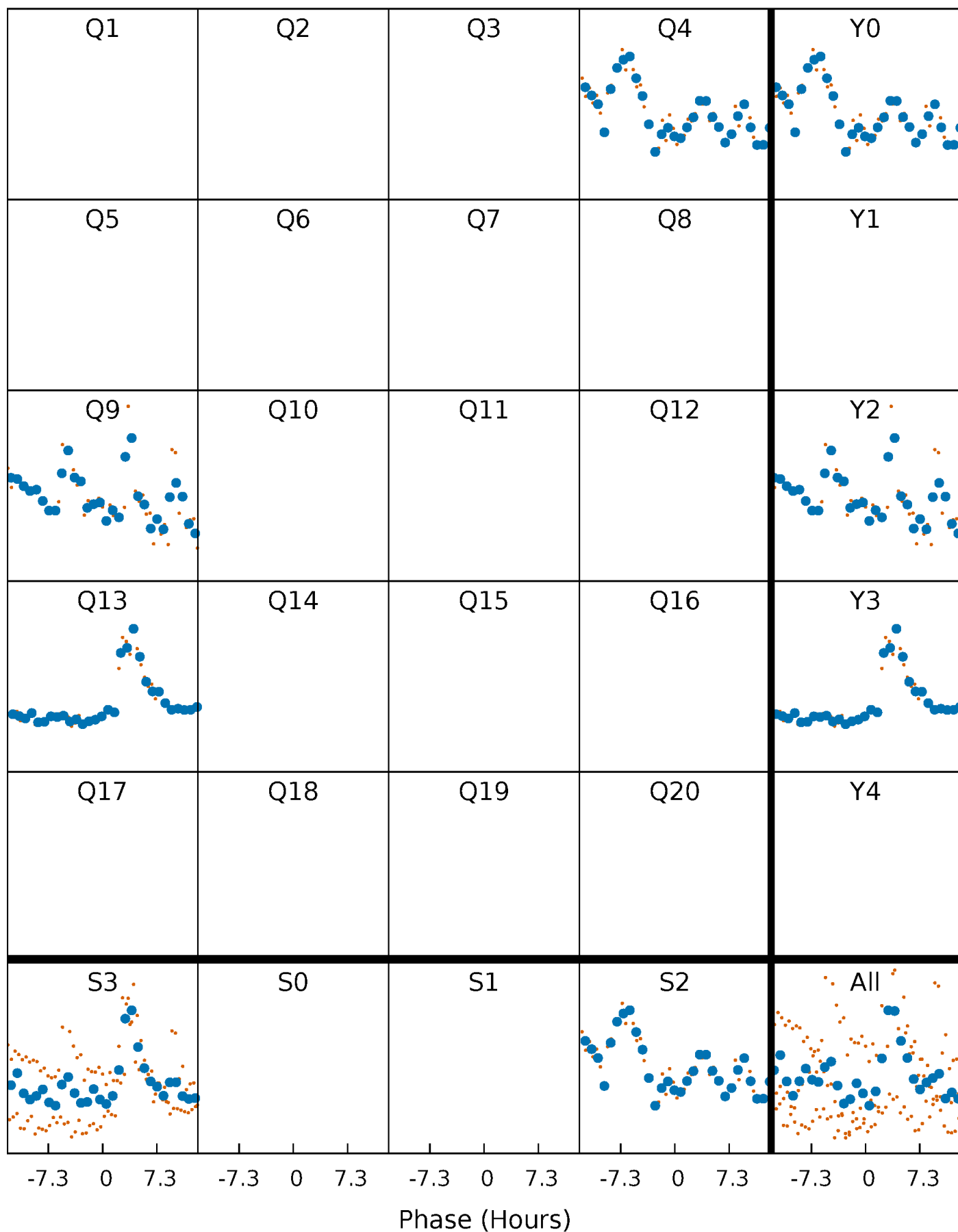


Non-Whitened Vs. Whitened Light Curve



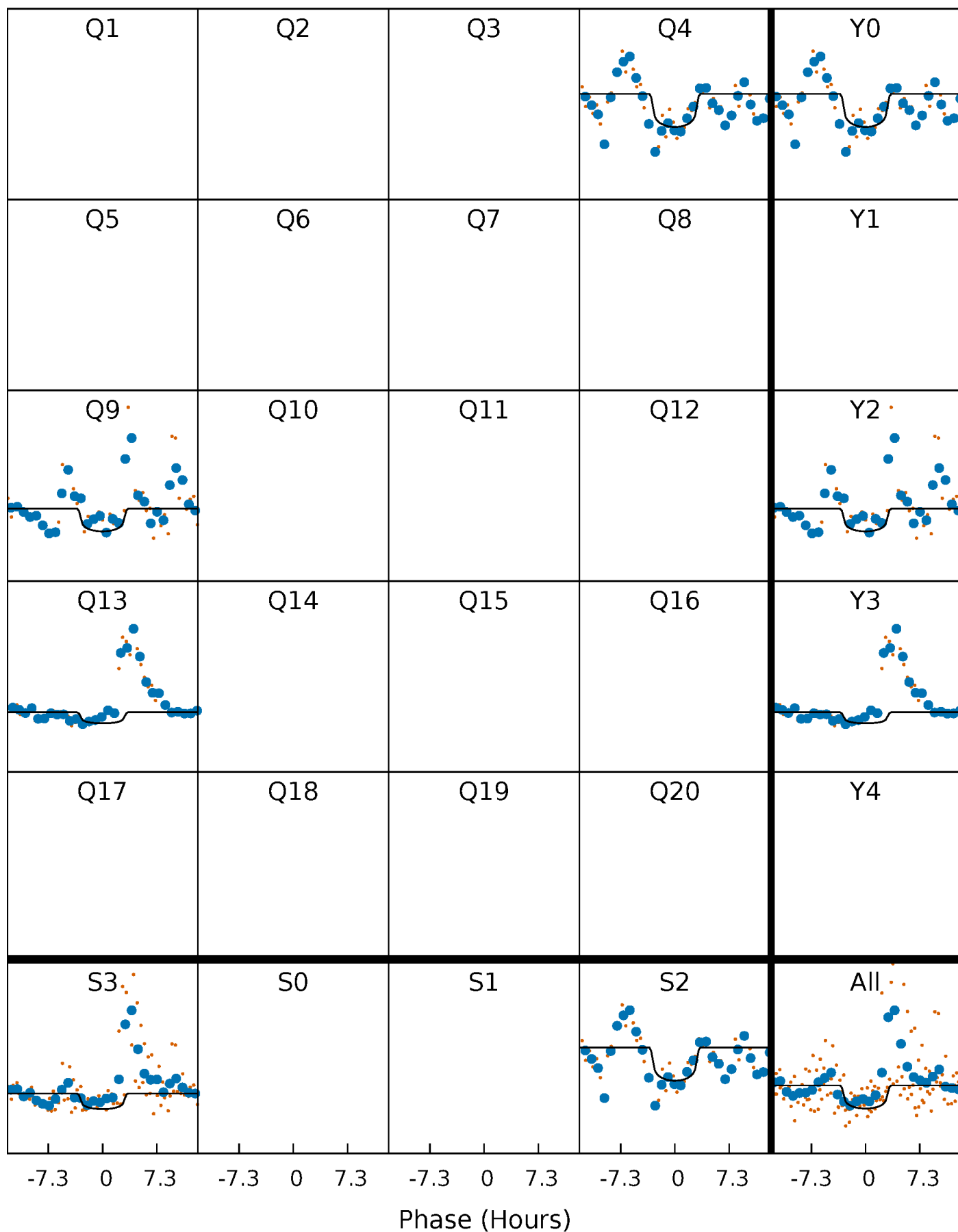
PDC Quarter-Phased Transit Curves

TCE 010731839-01 P=433.286537 Days $T_0=393.885530$ (BKJD)



DV Quarter-Phased Transit Curves

TCE 010731839-01 $P=433.286537$ Days $T_0=393.885530$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

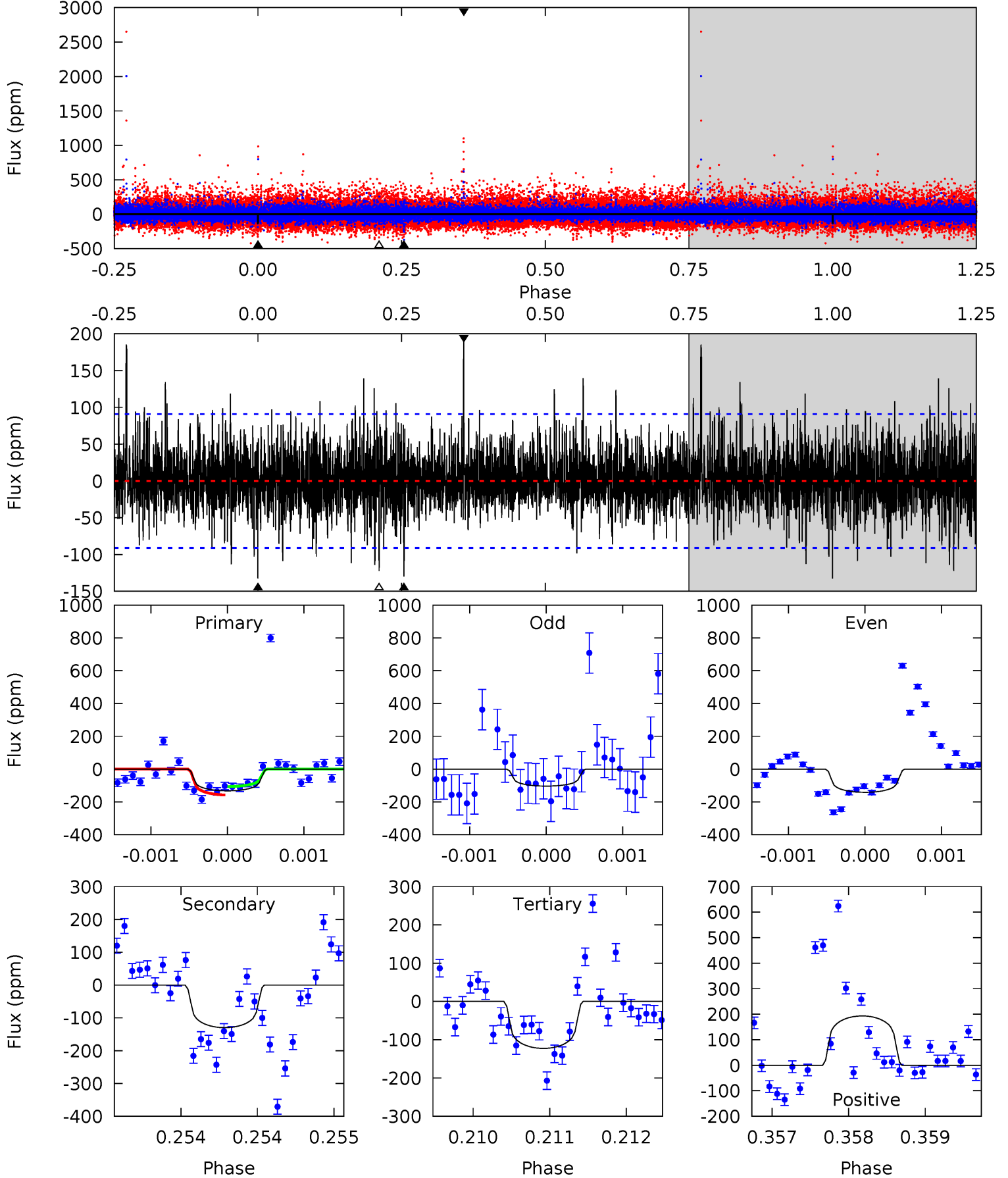
TCE 010731839-01 $P=433.245962$ Days $T_0=393.917594$ (BKJD)



DV Model-Shift Uniqueness Test

010731839-01, P = 433.286537 Days, E = 393.885530 Days

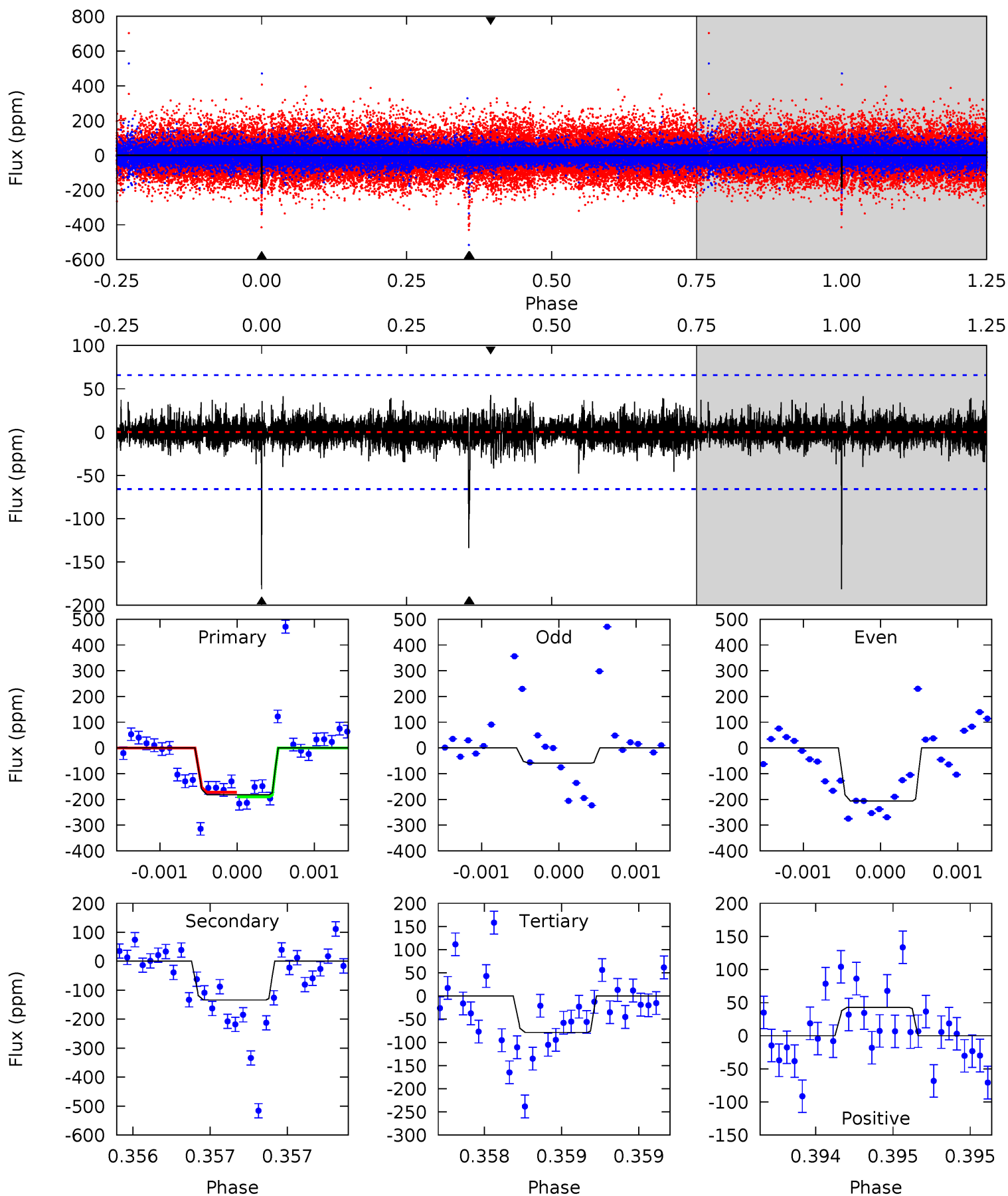
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 8.07 | 7.90 | 7.46 | 11.8 | 5.53 | 3.42 | 1.88 | 0.61 | -3.69 | 0.44 | -3.86 | 0.61 | 0.70 | 0.59 | 1.57 |



Alt Model-Shift Uniqueness Test

010731839-01, P = 433.245962 Days, E = 393.917594 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 15.3 | 11.3 | 6.62 | 3.60 | 5.54 | 3.43 | 0.87 | 8.65 | 11.7 | 4.65 | 7.67 | 5.27 | 0.89 | 0.19 | 0.74 |



Stellar Parameters For KIC 010731839

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | $R (R_{\odot})$ | $M(M_{\odot})$ | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|---------------------|---------------------------|---------------------------|---------------------------|---------------------------|---|
| | 3256^{+39}_{-29} | $5.071^{+0.044}_{-0.044}$ | $0.000^{+0.100}_{-0.100}$ | $0.207^{+0.032}_{-0.023}$ | $0.184^{+0.036}_{-0.024}$ | $29.290^{+7.081}_{-6.256}$ |
| | +1%/-1% | +1%/-1% | +inf%/-inf% | +15%/-11% | +20%/-13% | +24%/-21% |
| Source | PHO2 | PHO2 | PHO2 | DSEP | | |

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

Secondary Eclipse Parameters for KIC 010731839-01 / KOI

| Detrend | Depth (ppm) | $R_p (R_{\oplus})$ | $T_{\text{max}} (K)$ | $T_{\text{obs}} (K)$ | A_{obs} |
|---------|---------------|------------------------|----------------------|----------------------|------------------------------|
| DV | -130 ± 16 | $0.34^{+0.14}_{-0.14}$ | 114^{+3}_{-3} | 3011^{+538}_{-276} | $250299^{+499593}_{-123364}$ |
| Alt. | -134 ± 12 | $0.28^{+0.13}_{-0.13}$ | 115^{+3}_{-3} | 3207^{+757}_{-341} | $389113^{+998682}_{-215602}$ |

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

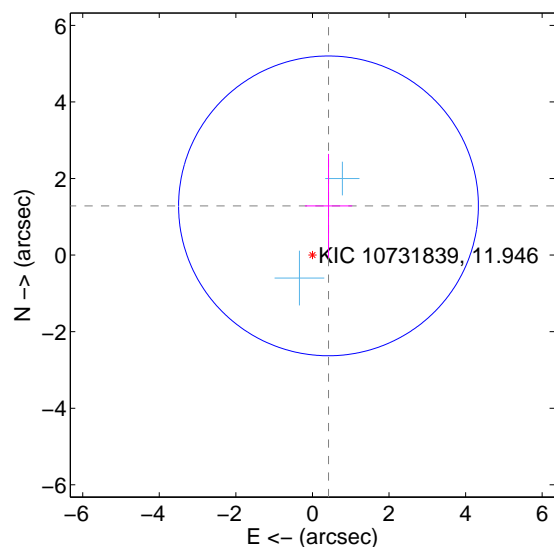
Supplemental centroid analysis for 010731839-01. **Kepler magnitude: 11.95.** Transit SNR 6.12

There are 2 quarters with good PRF difference image offsets

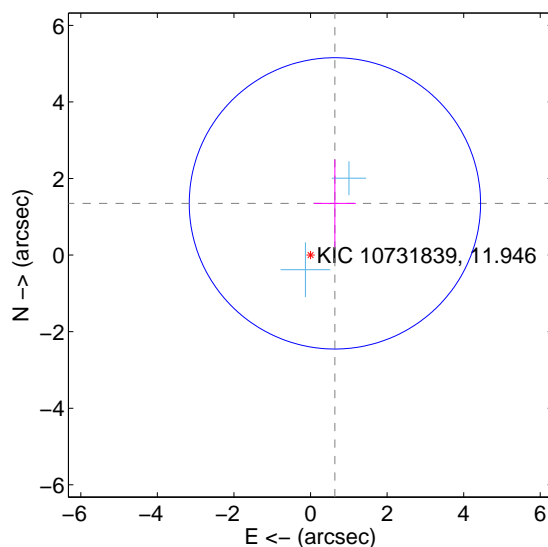
The direct PRF centroid is offset from the target star catalog position by about 0.30 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|---|--------------------|---------------------|--------------------|-------------------|
| PRF-fit source offset from OOT | 1.352 ± 1.305 | 1.04 | -0.419 ± 0.616 | 1.286 ± 1.358 |
| PRF-fit source offset from KIC position | 1.493 ± 1.268 | 1.18 | -0.637 ± 0.547 | 1.351 ± 1.146 |
| photometric centroid source offset | 1.36 ± 1.06 | 1.28 | 0.97 ± 1.20 | -0.96 ± 0.90 |

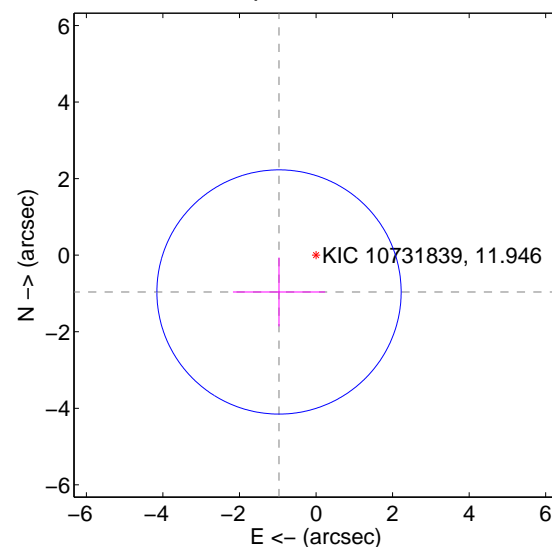
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

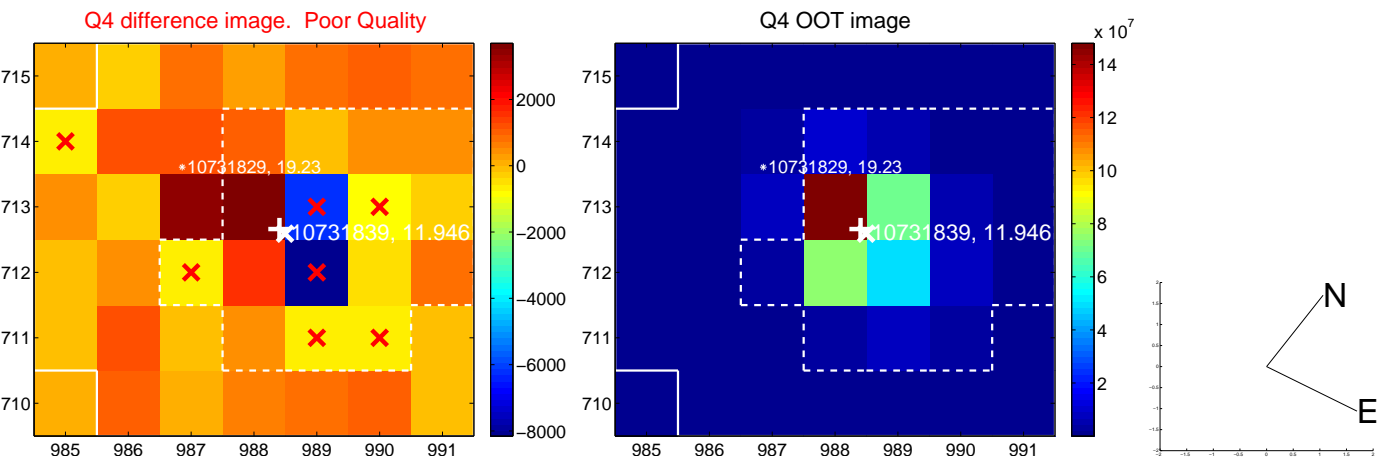
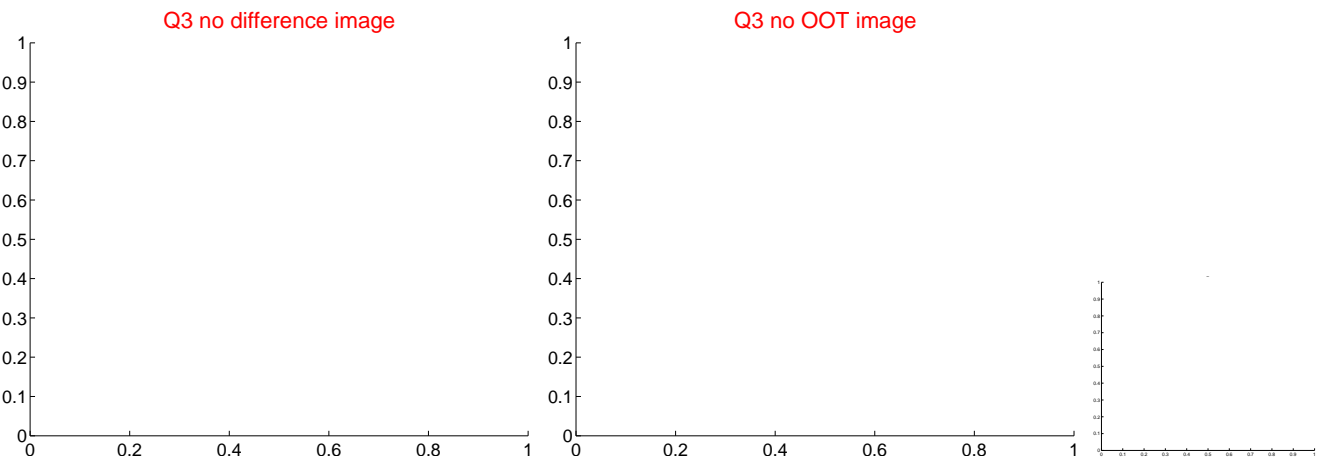
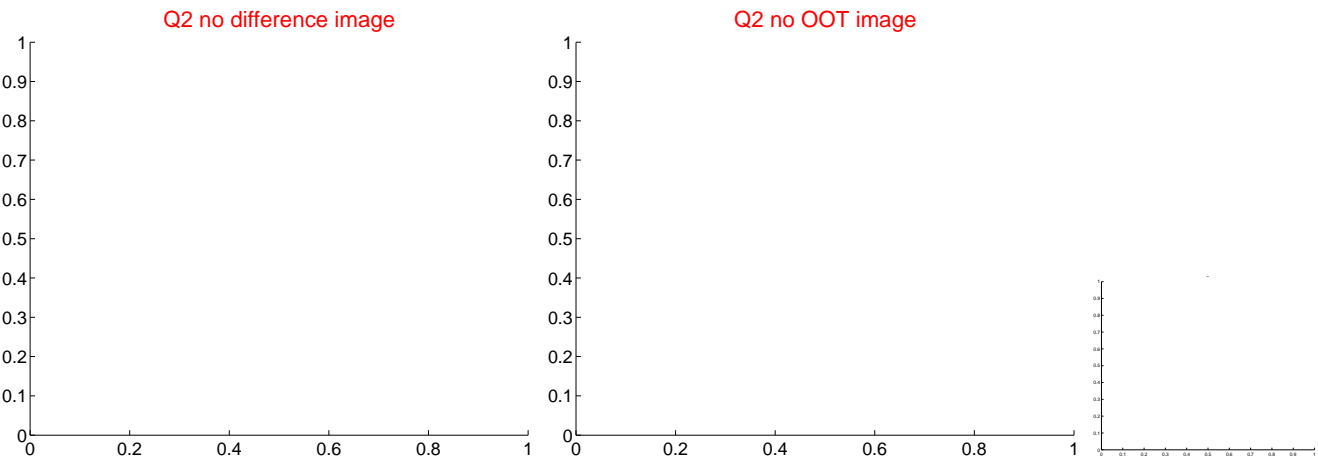
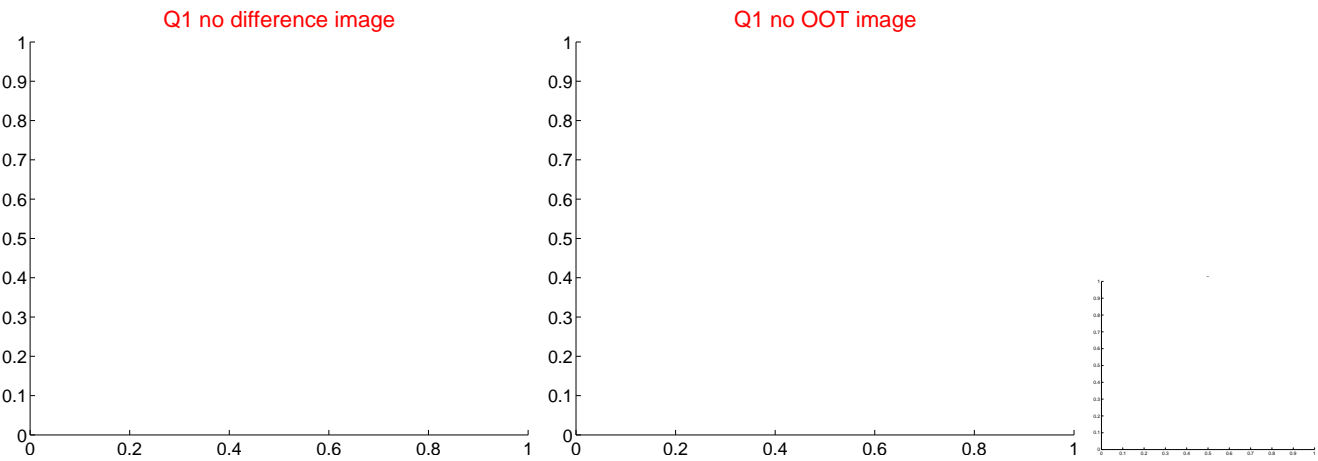


offset from photometric centroids



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

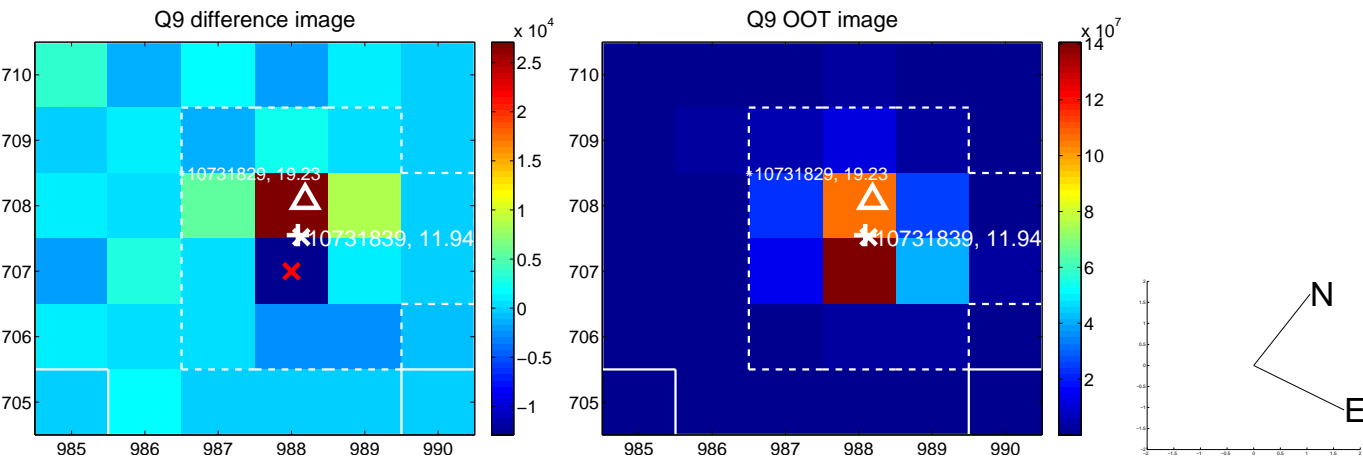
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.



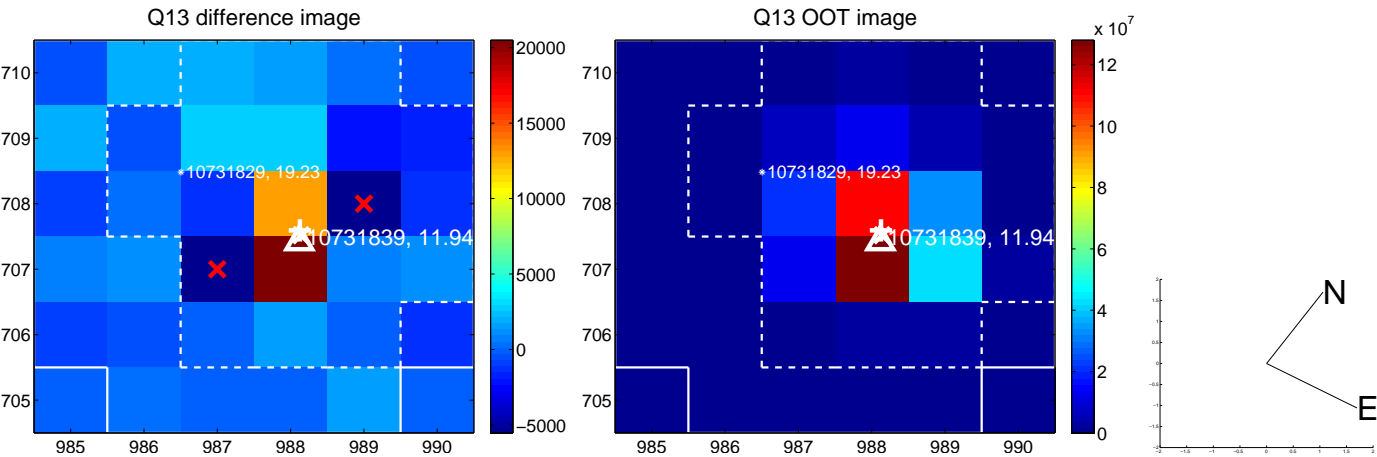
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



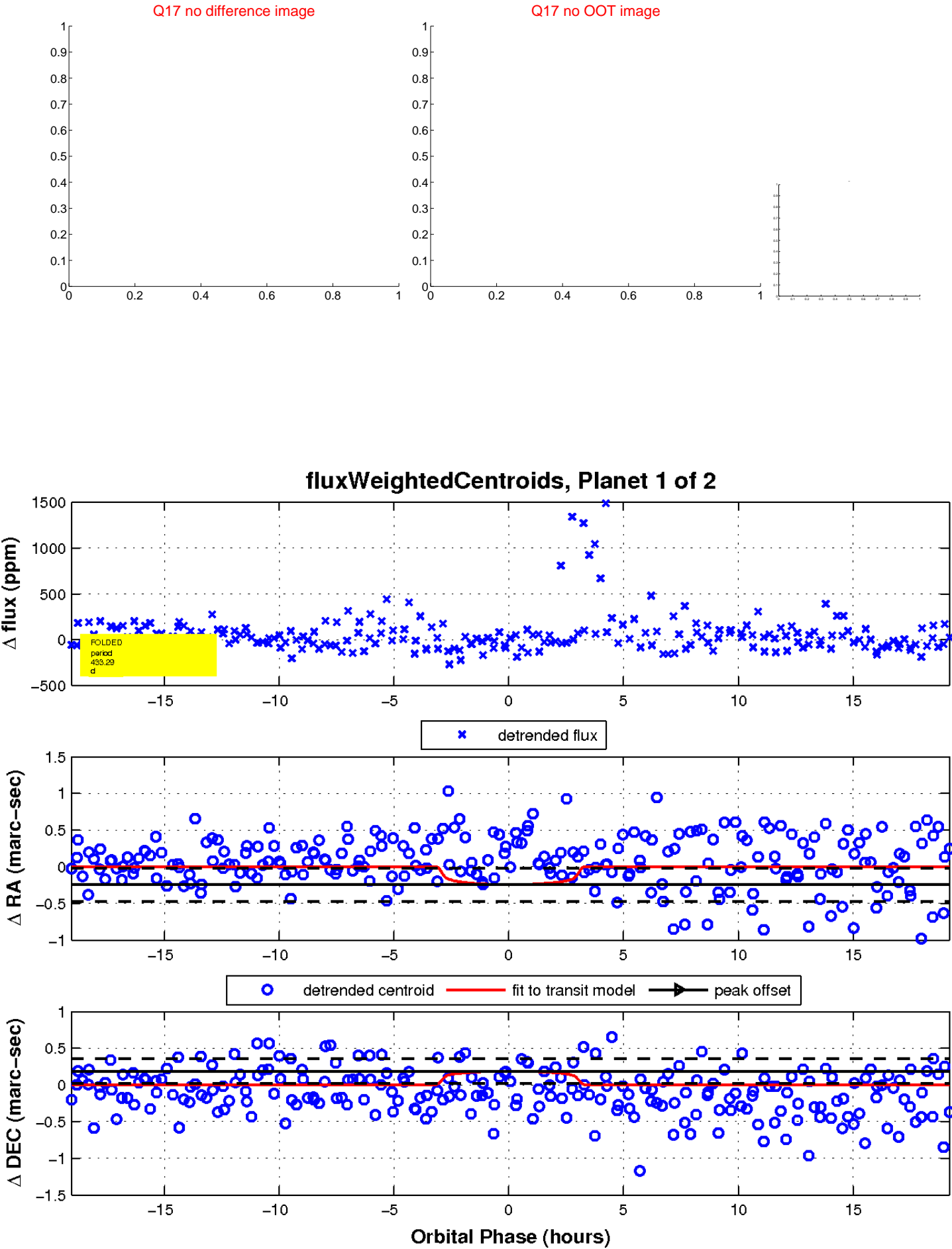
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



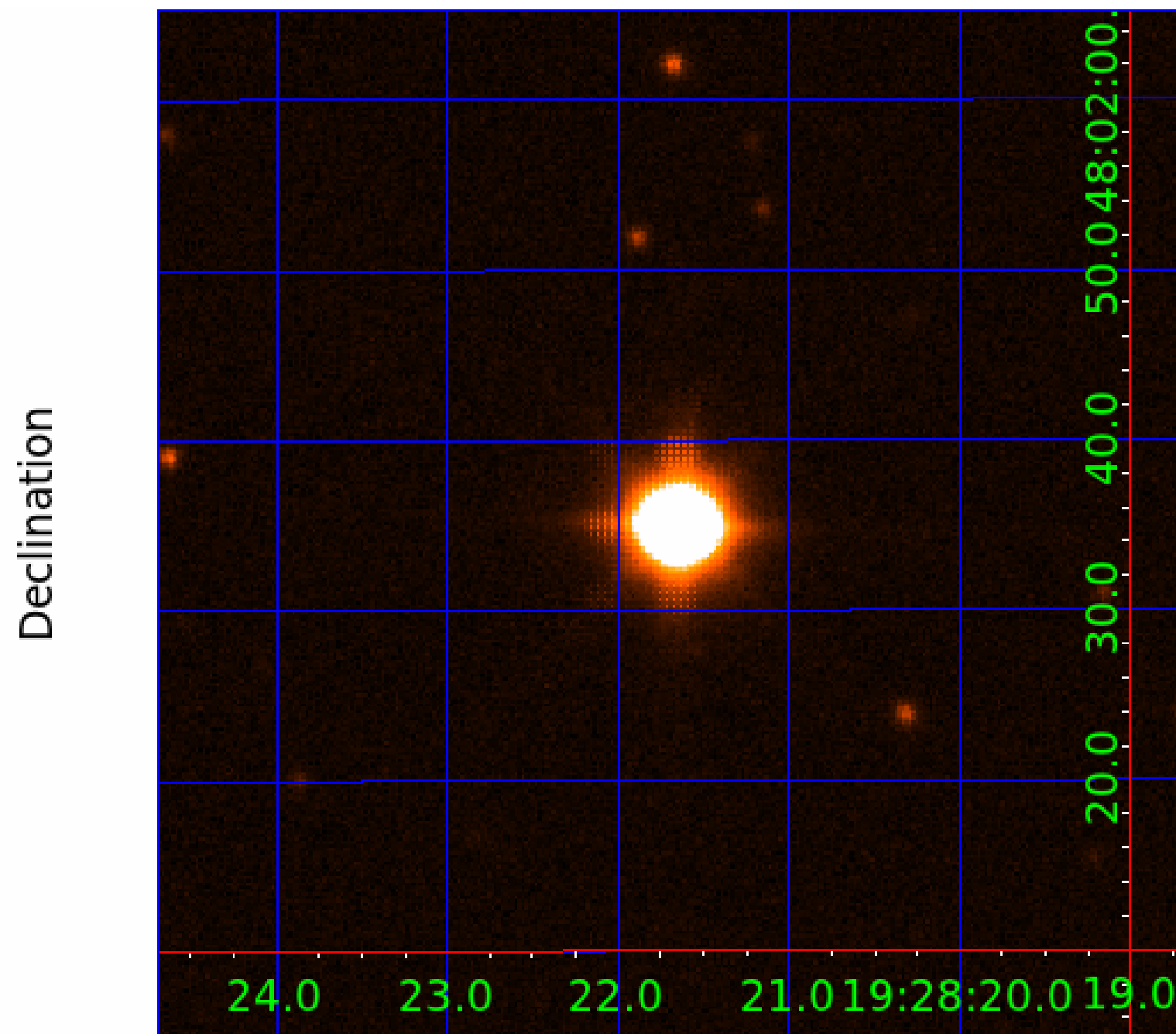
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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



UKIRT Image



KIC 010731839

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}) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|-----|-----------------------------|-----------------|------------------------|------------------------|
| 010731839-01 | OBS | No | 433.286537 | 393.885530 | 186.6 | 6.409 | 13.3 | 6.1 | 0.21 | 3256 | 0.33 | 0.01 |
| 010731839-02 | OBS | No | 460.498439 | 184.758862 | 170.9 | 13.585 | 9.2 | 7.1 | 0.21 | 3256 | 0.33 | 0.01 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|---|
| 010731839-01 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS |
| 010731839-02 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | INDIV_TRANS_CHASES_MARSHALL_SKYE_ZUMA—LPP_DV—ALL_TRANS_CHASES—MOD_TER_DV—MOD_POS_DV—MOD_TER_ALT—MOD_POS_ALT—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.

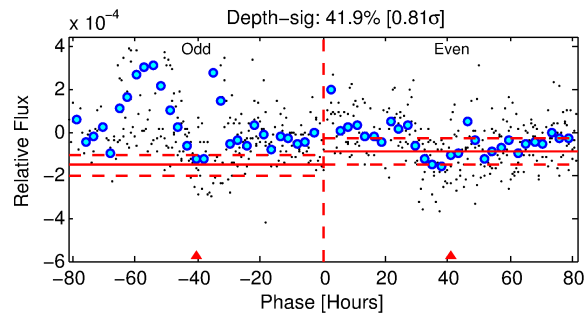
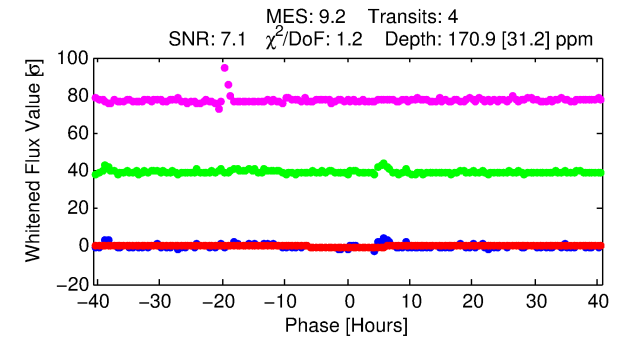
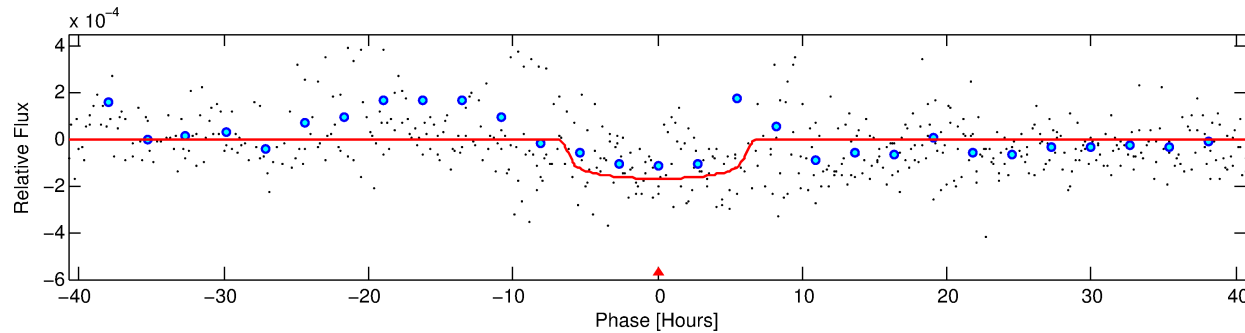
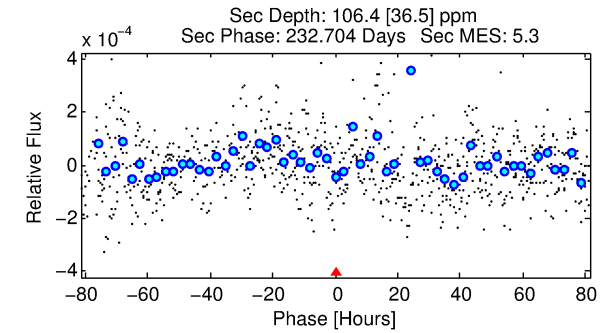
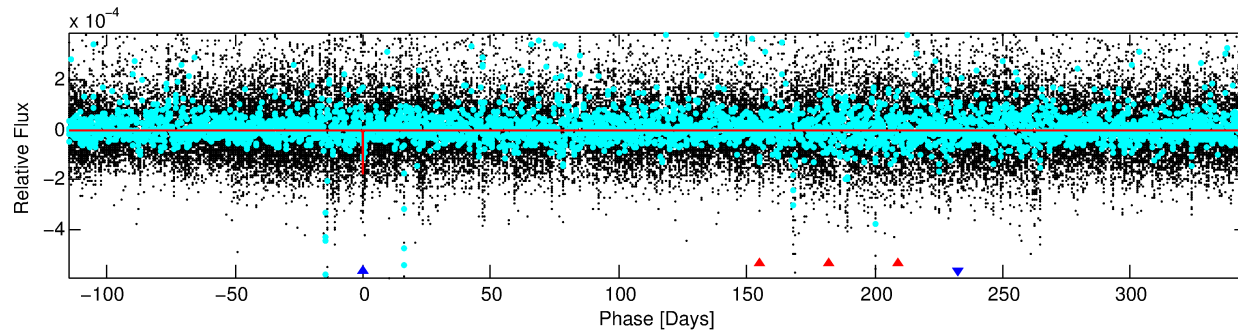
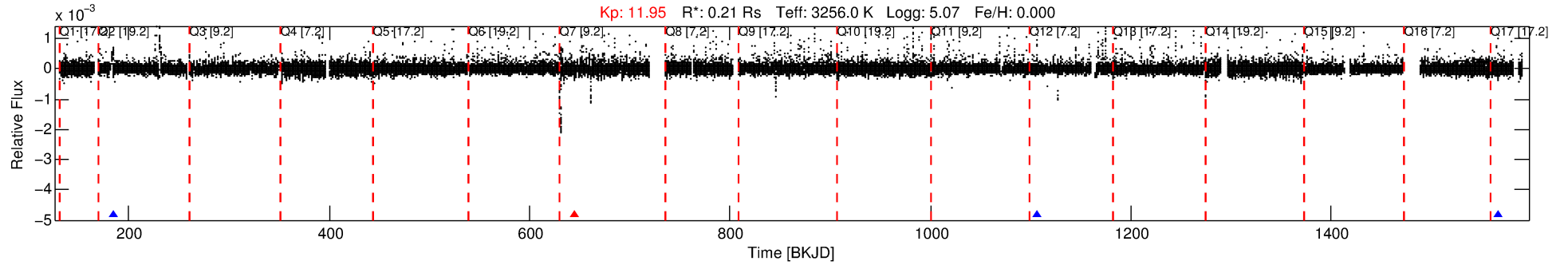
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 010731839-02

No Significant Match Found

DV One-Page Summary

KIC: 10731839 Candidate: 2 of 2 Period: 460.498 d



DV Fit Results:

Period = 460.49844 [0.01076] d
Epoch = 184.7589 [0.0204] BKJD
Rp/R* = 0.0145 [0.0023]
a/R* = 113.42 [60.60]
b = 0.92 [0.10]
Seff = 0.01 [0.00]
Teq = 80 [3] K
Rp = 0.33 [0.07] Re
a = 0.6640 [0.0720] AU
Ag = 239865.21 [116524.93] [2.06σ]
Teffp = 2744 [324] K [8.22σ]

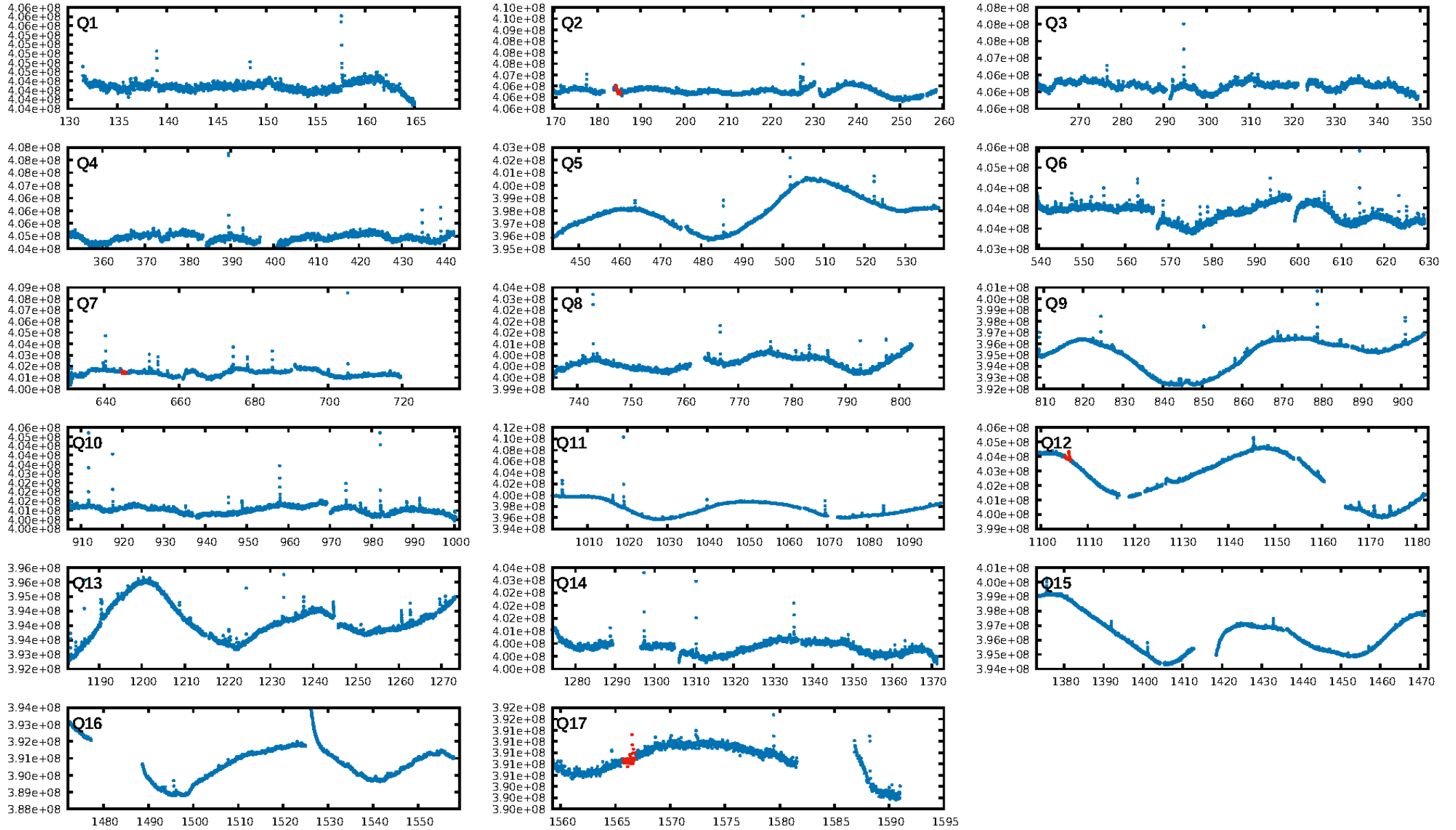
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [43.48σ]
LongPeriod-sig: N/A
ModelChiSquare2-sig: 84.1%
ModelChiSquareGoF-sig: 99.9%
Bootstrap-pfa: 2.09e-10
RollingBand-fgt: 0.67 [2/3]
GhostDiagnostic-chr: -0.4264
Centroid-sig: 1.2%
Centroid-so: 0.947 arcsec [1.54σ]
OotOffset-rm: N/A
OotOffset-st: 0/0/0 [0]
KicOffset-rm: N/A
KicOffset-st: 0/0/0 [0]
DiffImageQuality-fgm: N/A
DiffImageOverlap-fno: 1.00 [2/2]

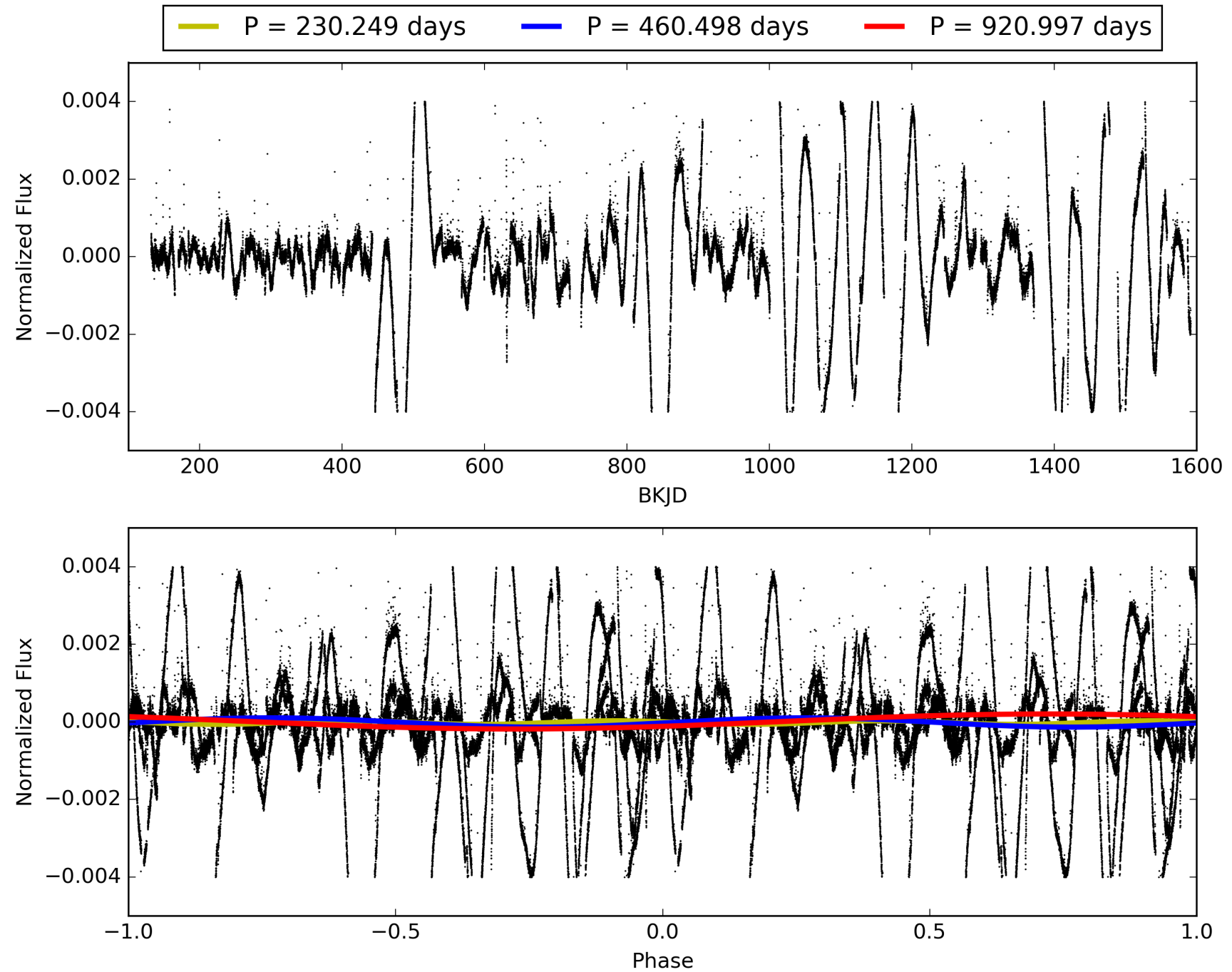
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 05:54:31 Z

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

TCE 010731839-02, PDC Light Curves

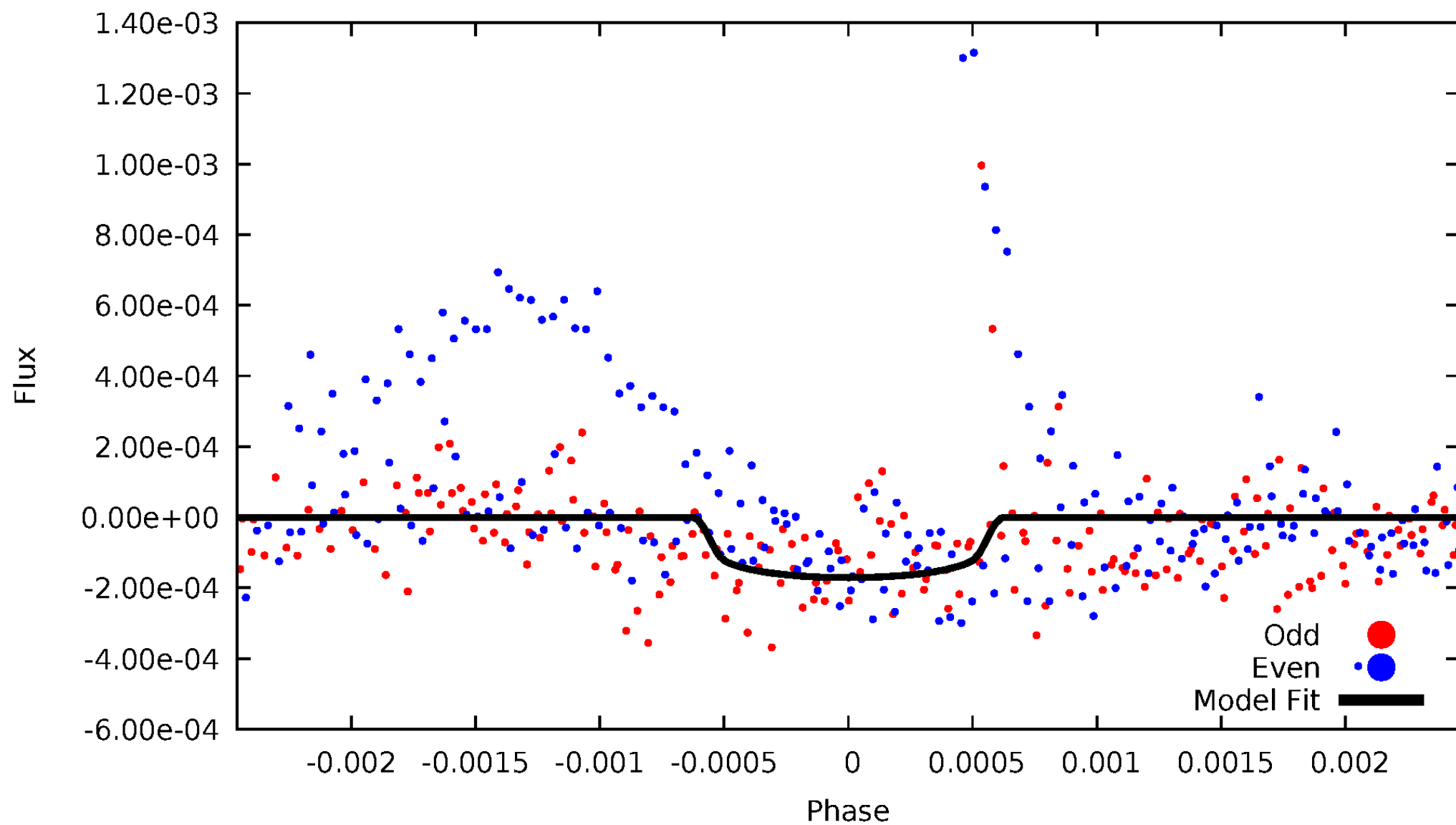


TCE 010731839-02



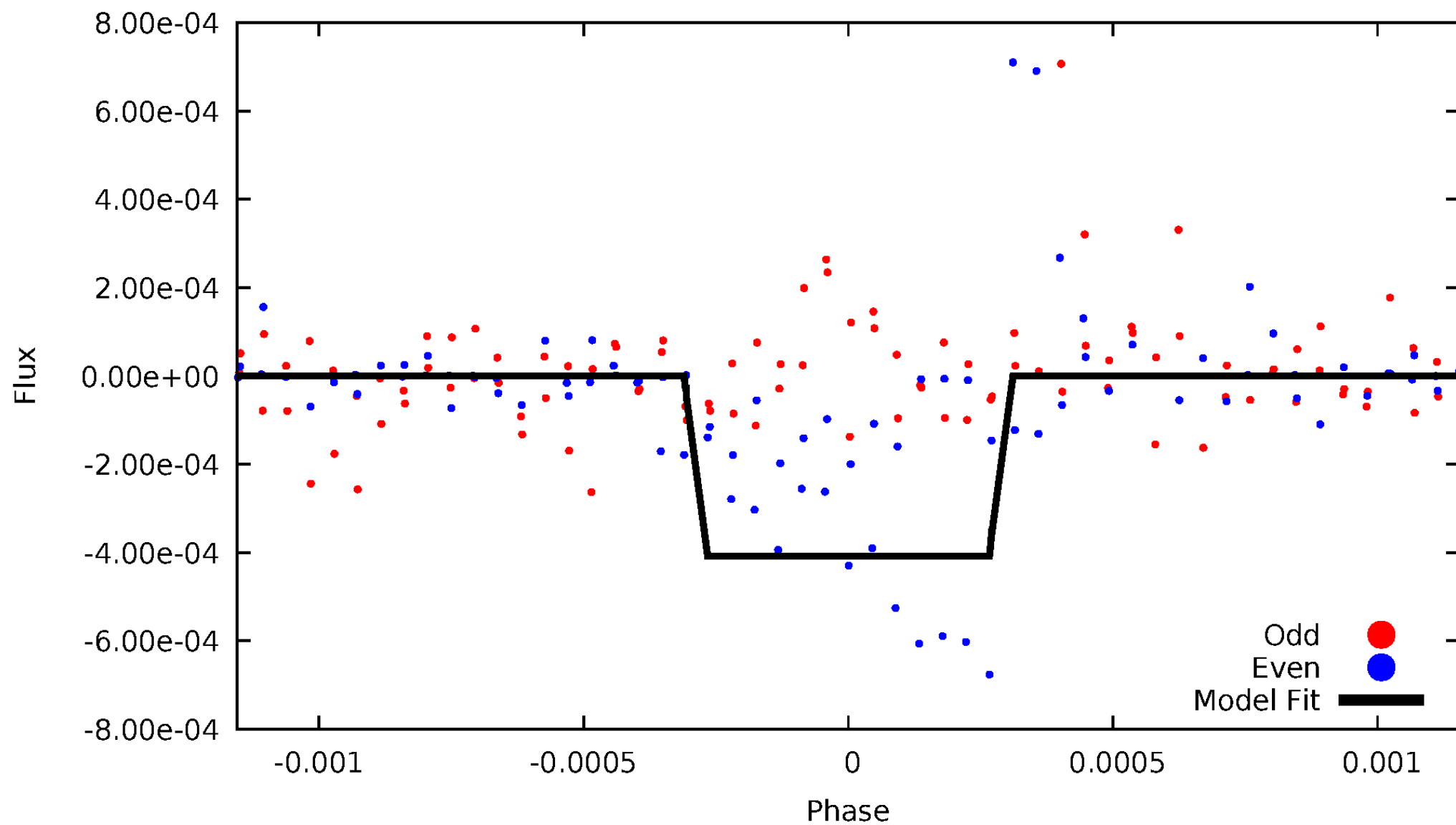
DV Odd/Even

TCE 010731839-02



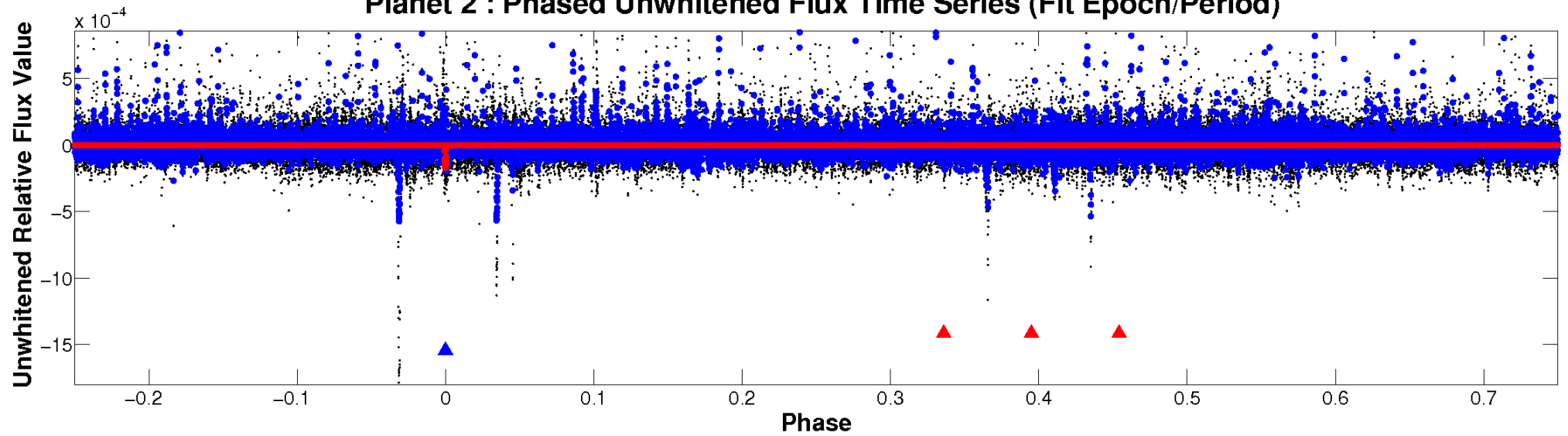
ALT Odd/Even

TCE 010731839-02

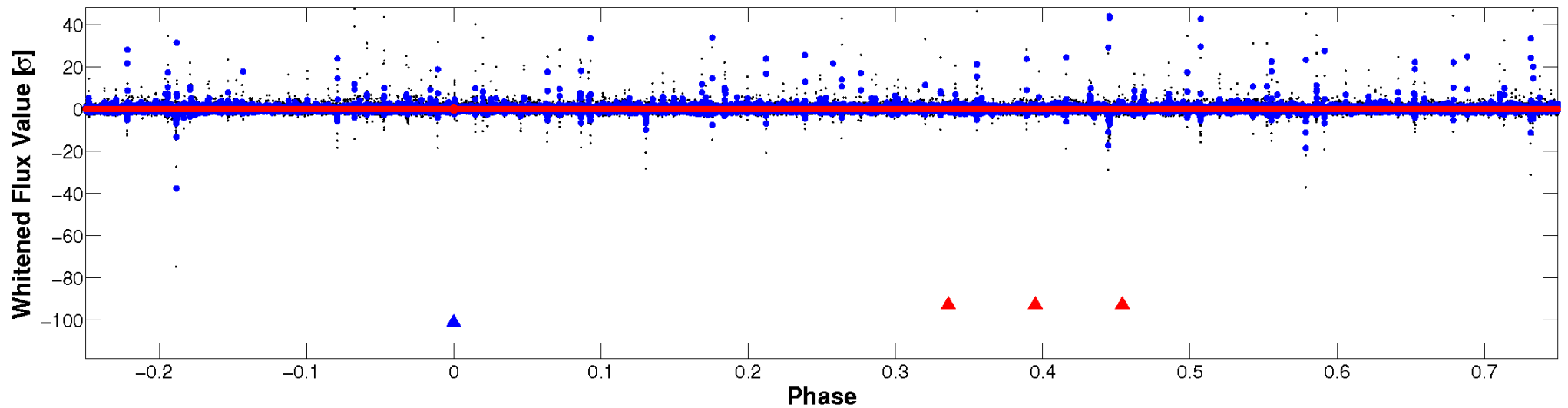


Non-Whitened Vs. Whitened Light Curve

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

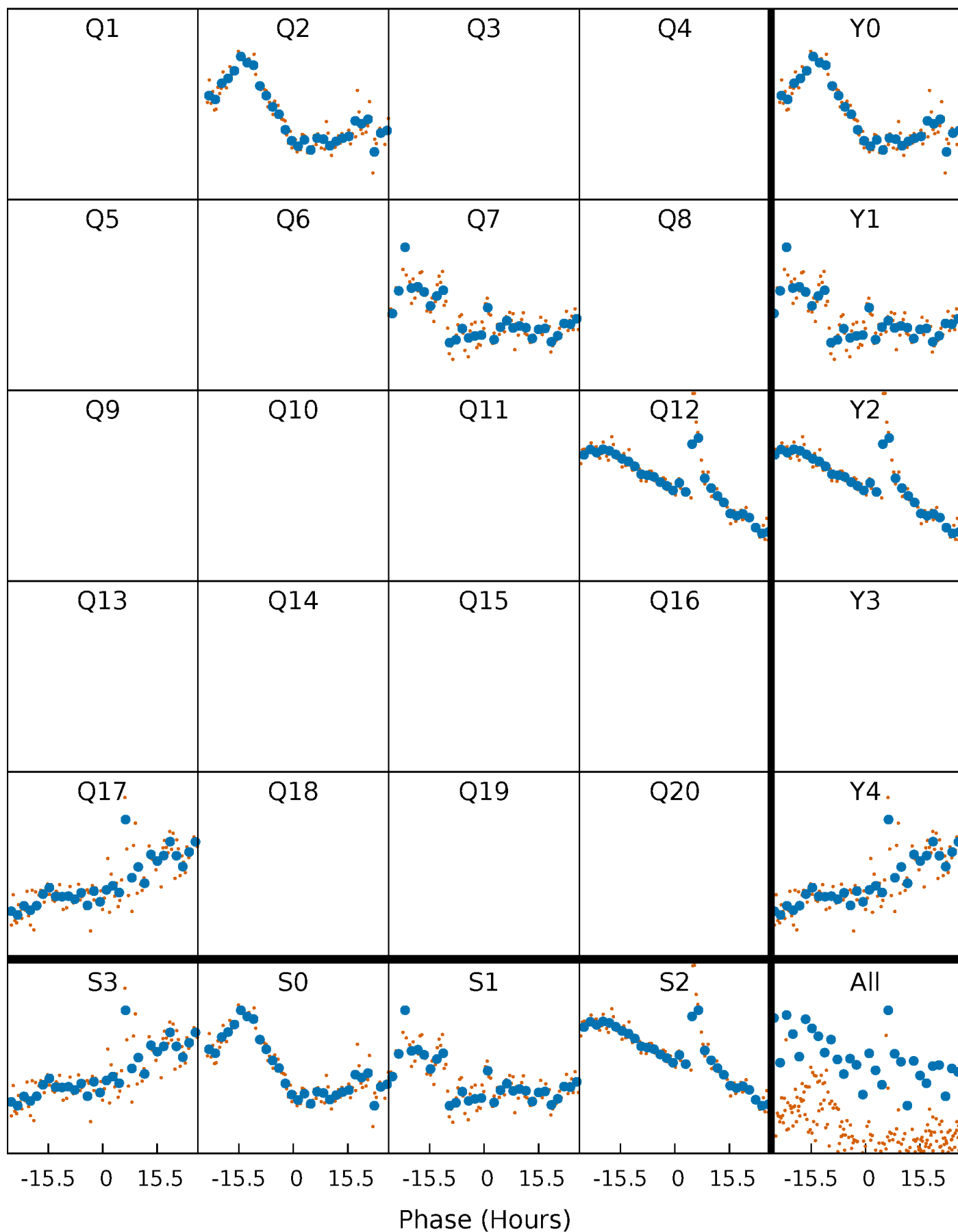


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



PDC Quarter-Phased Transit Curves

TCE 010731839-02 P=460.498439 Days $T_0=184.758862$ (BKJD)



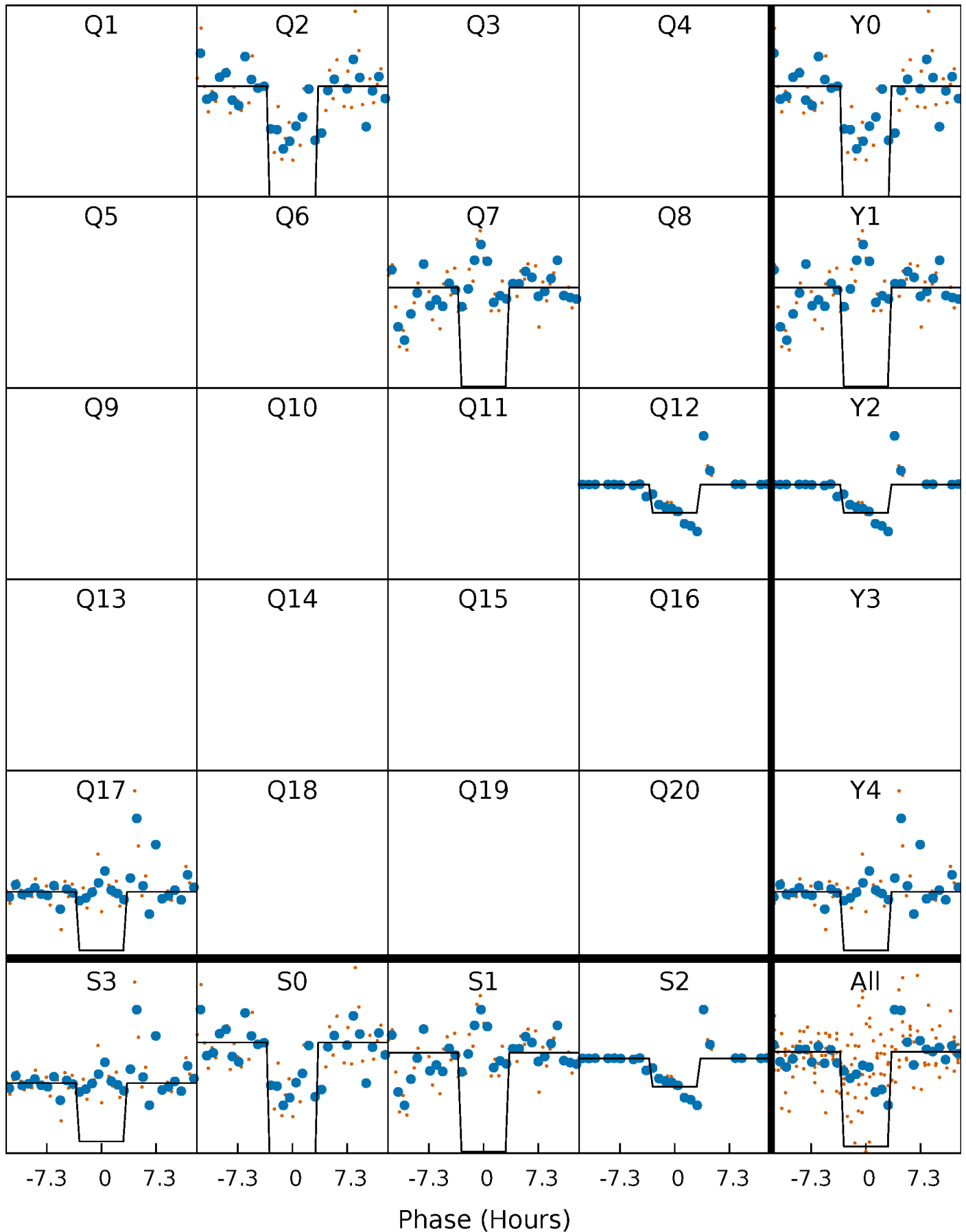
DV Quarter-Phased Transit Curves

TCE 010731839-02 $P=460.498439$ Days $T_0=184.758862$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

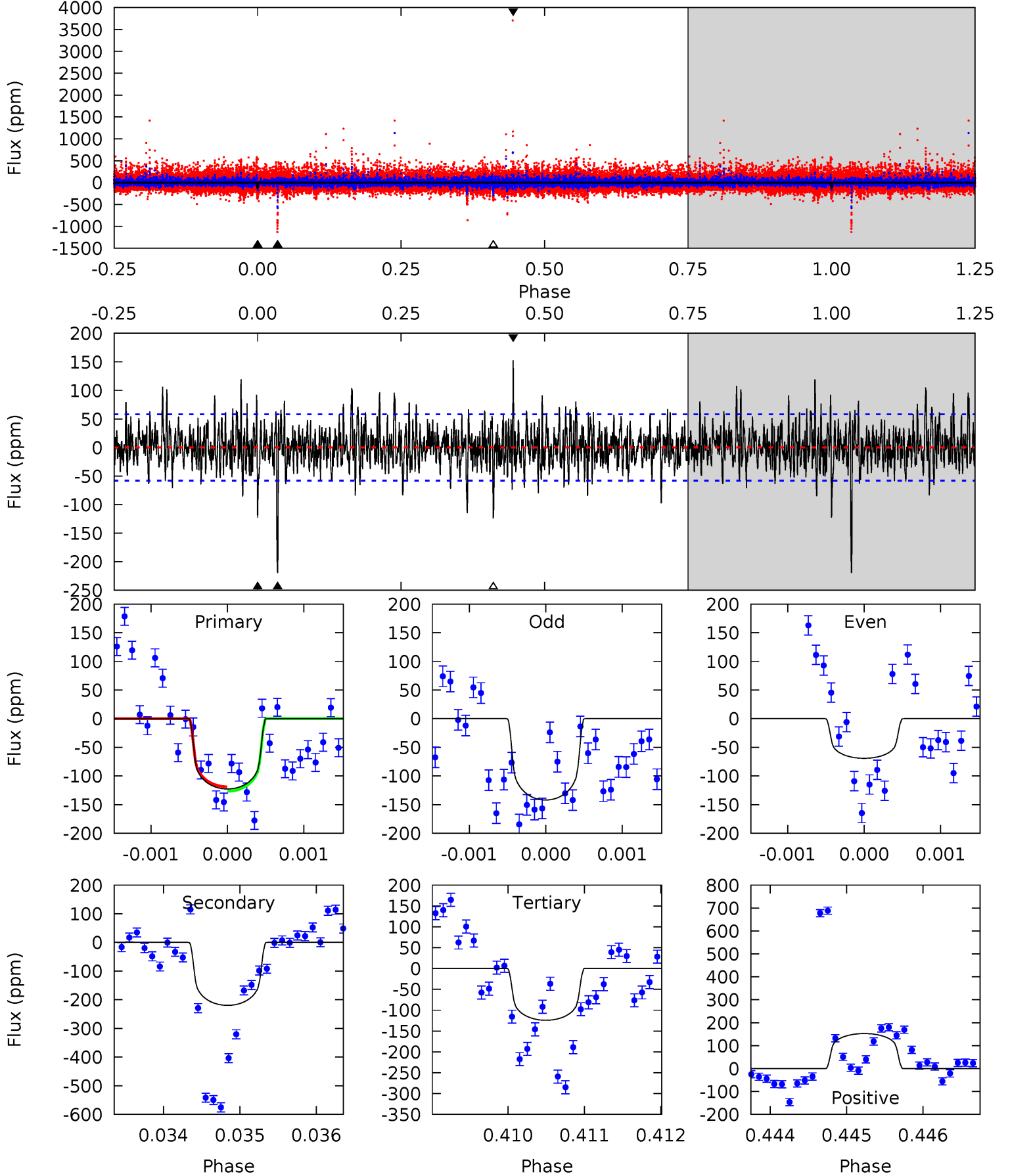
TCE 010731839-02 P=460.511142 Days $T_0=184.802473$ (BKJD)



DV Model-Shift Uniqueness Test

010731839-02, P = 460.498439 Days, E = 184.758862 Days

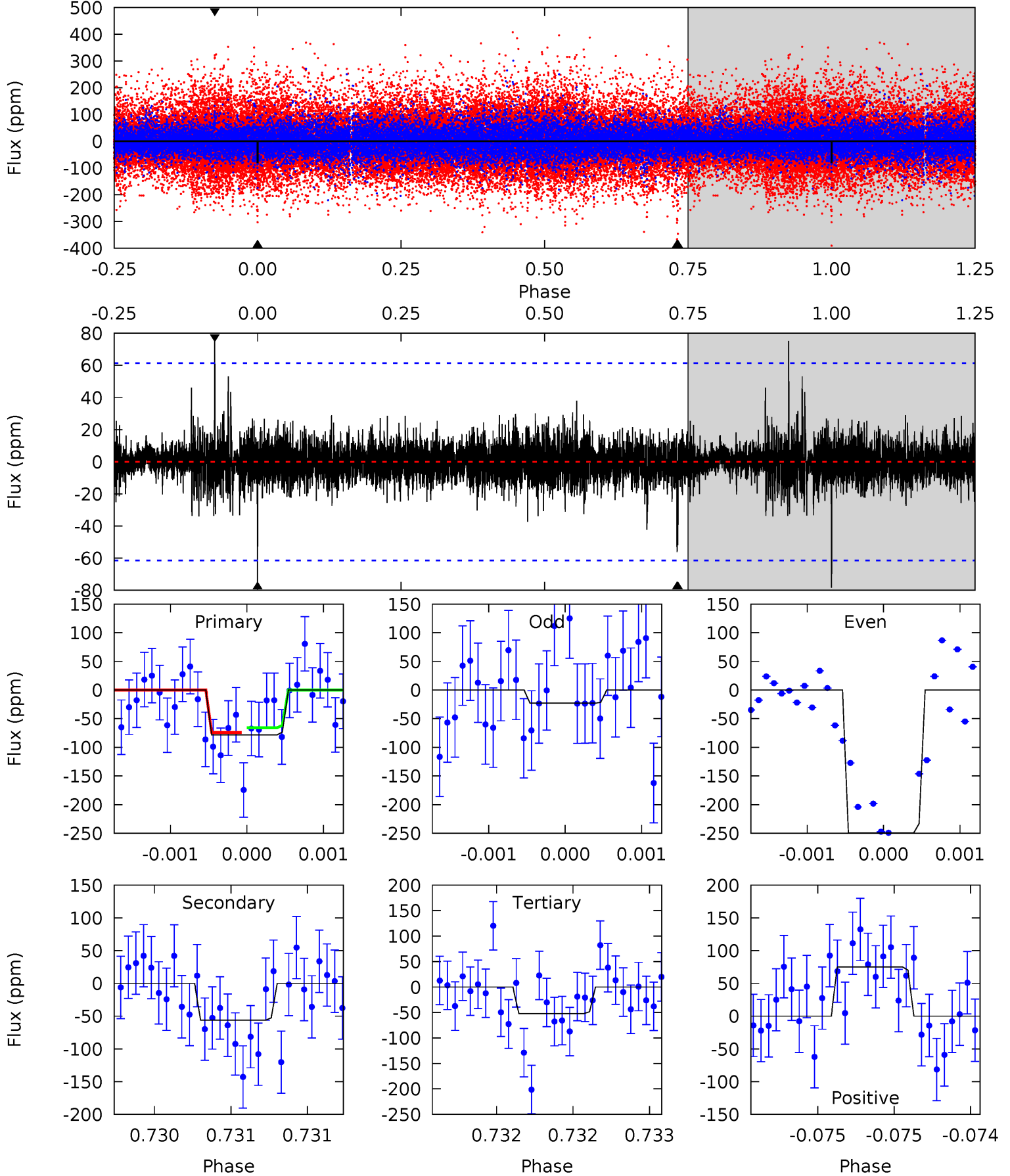
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 11.4 | 20.4 | 11.5 | 14.2 | 5.41 | 3.23 | 2.70 | -0.14 | -2.78 | 8.87 | 6.23 | 2.20 | 0.70 | 0.41 | 0.36 |



Alt Model-Shift Uniqueness Test

010731839-02, P = 460.511142 Days, E = 184.802473 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 7.09 | 5.07 | 4.70 | 6.79 | 5.55 | 3.44 | 0.78 | 2.39 | 0.30 | 0.37 | -1.72 | 10.6 | 2.37 | 0.49 | 0.38 |



Stellar Parameters For KIC 010731839

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | $R (R_{\odot})$ | $M(M_{\odot})$ | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|---------------------|---------------------------|---------------------------|---------------------------|---------------------------|---|
| | 3256^{+39}_{-29} | $5.071^{+0.044}_{-0.044}$ | $0.000^{+0.100}_{-0.100}$ | $0.207^{+0.032}_{-0.023}$ | $0.184^{+0.036}_{-0.024}$ | $29.290^{+7.081}_{-6.256}$ |
| | +1%/-1% | +1%/-1% | +inf%/-inf% | +15%/-11% | +20%/-13% | +24%/-21% |
| Source | PHO2 | PHO2 | PHO2 | DSEP | | |

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

Secondary Eclipse Parameters for KIC 010731839-02 / KOI

| Detrend | Depth (ppm) | $R_p (R_{\oplus})$ | $T_{\text{max}} (K)$ | $T_{\text{obs}} (K)$ | A_{obs} |
|---------|---------------|------------------------|----------------------|----------------------|------------------------------|
| DV | -220 ± 11 | $0.33^{+0.06}_{-0.05}$ | 112^{+3}_{-3} | 3283^{+190}_{-166} | $493483^{+199353}_{-142061}$ |
| Alt. | -56 ± 11 | $0.46^{+0.07}_{-0.06}$ | 112^{+3}_{-2} | 2495^{+95}_{-90} | 65226^{+23517}_{-17699} |

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

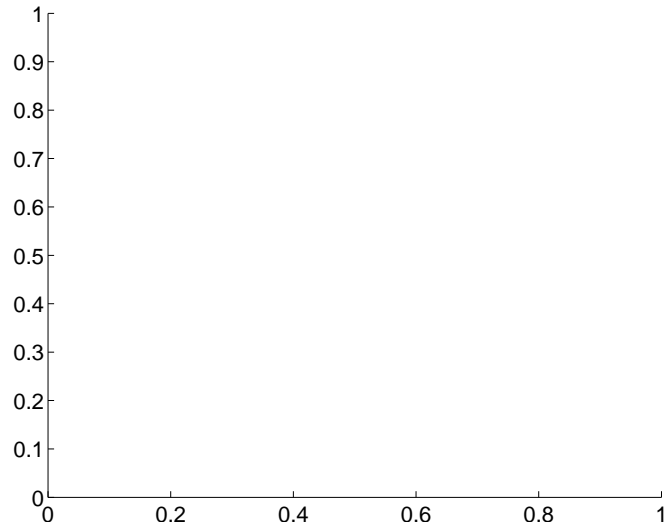
Supplemental centroid analysis for 010731839-02. **Kepler magnitude: 11.95.** Transit SNR 7.11

There are 0 quarters with good PRF difference image offsets

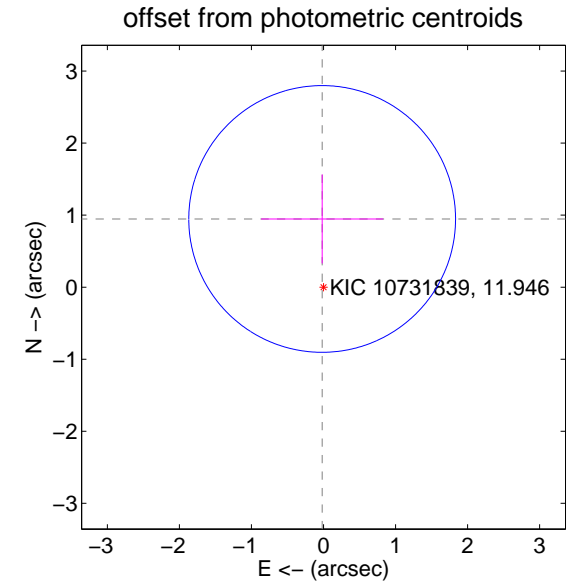
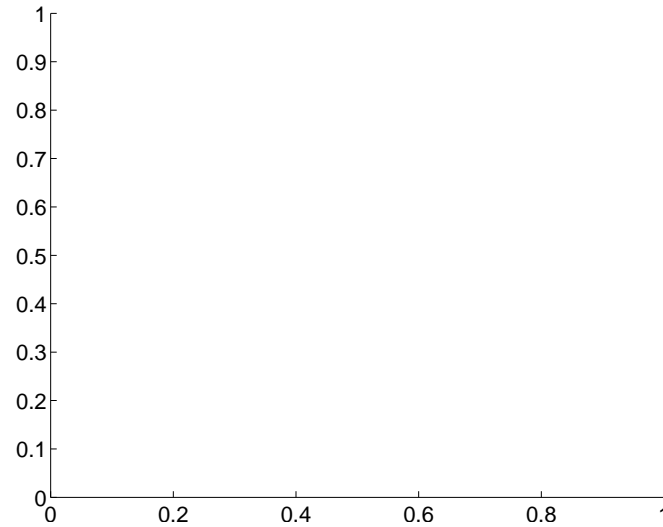
The direct PRF centroid is offset from the target star catalog position by about NaN arcsec

| | 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 | 0.95 ± 0.62 | 1.54 | 0.02 ± 0.85 | 0.95 ± 0.62 |

There is no PRF-fit offset from OOT-fit



There is no PRF-fit offset from KIC



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.

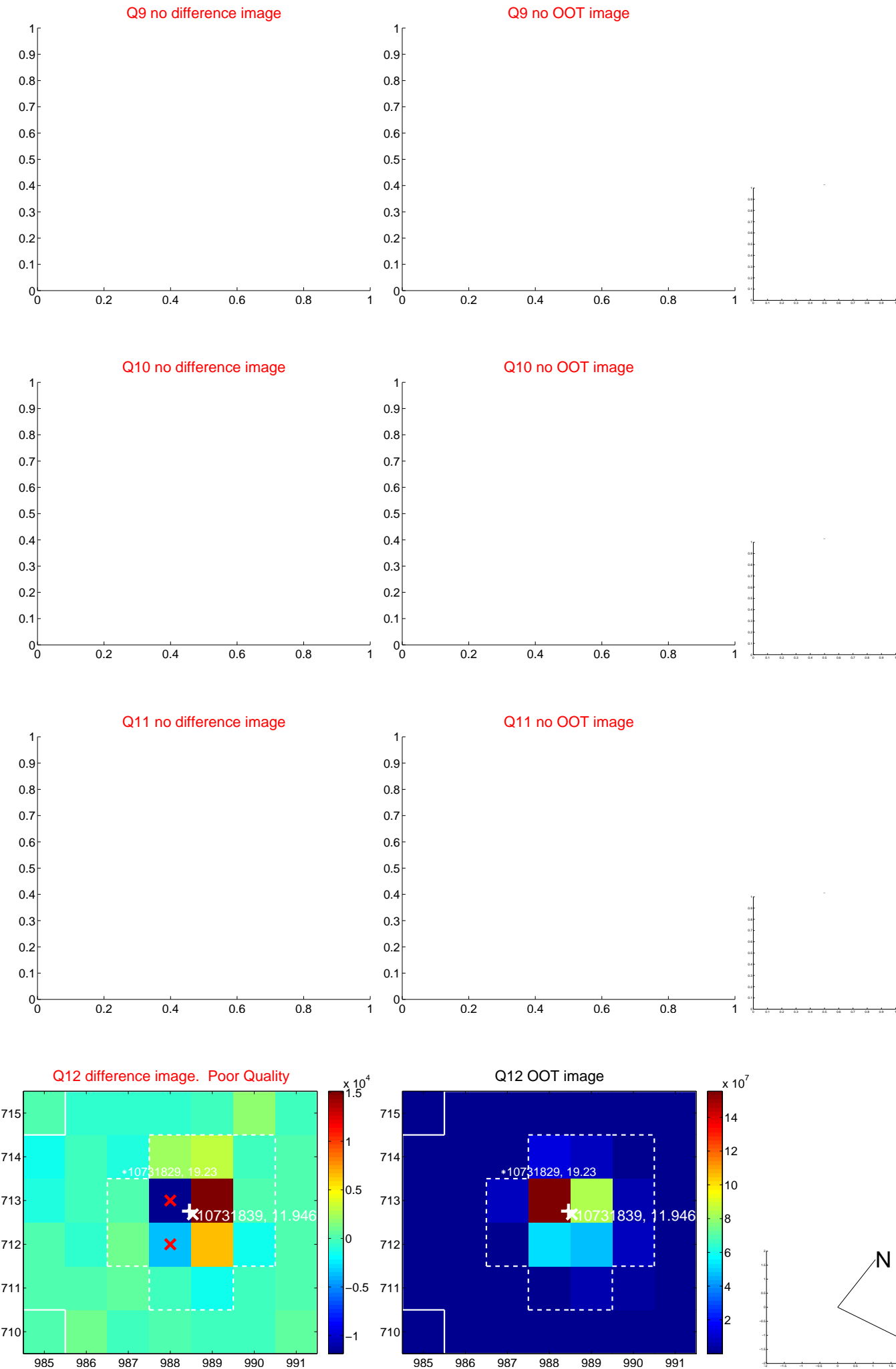
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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



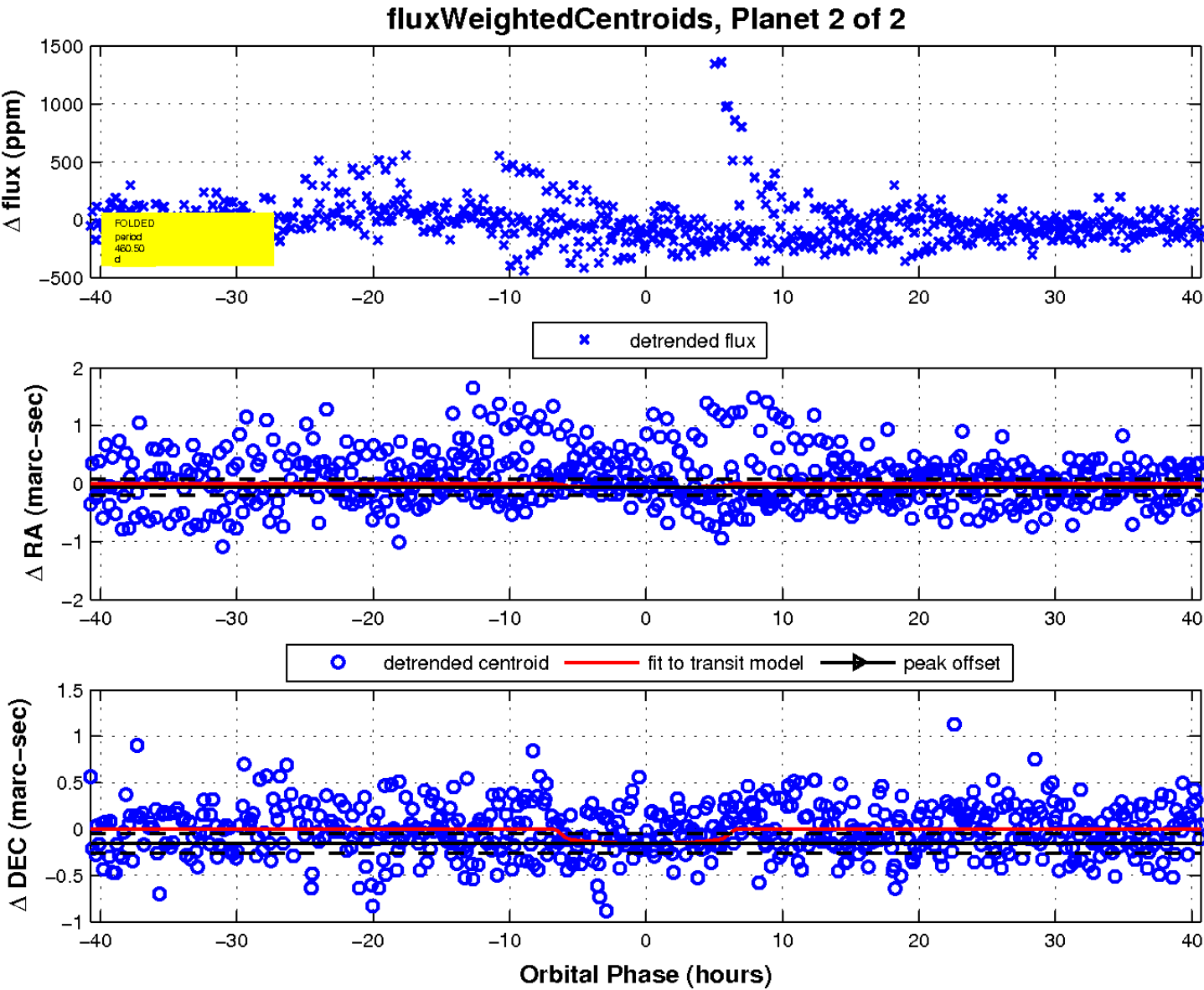
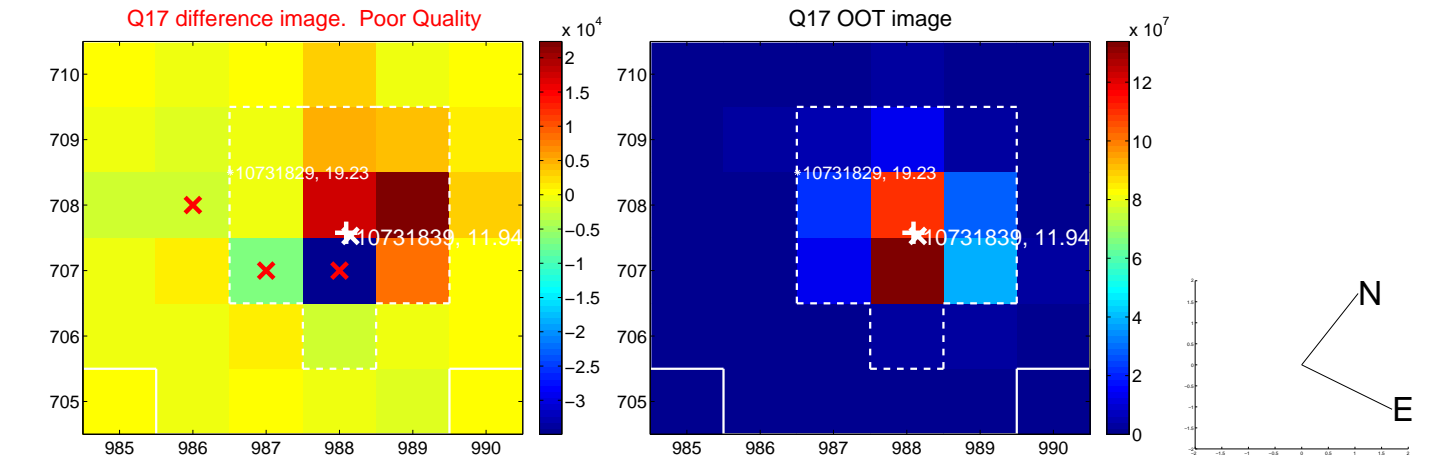
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

