

KIC 002570281

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}) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 002570281-01 | OBS | No | 14.471303 | 145.930316 | 945.7 | 11.375 | 16.4 | 17.4 | 12.07 | 4825 | 42.84 | 2968.81 |
| 002570281-02 | OBS | No | 14.471154 | 145.582466 | 2716.3 | 39.517 | 17.2 | 22.9 | 12.07 | 4825 | 60.52 | 2968.85 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|------------------------------------------------|
| 002570281-01 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | LPP_DV |
| 002570281-02 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_ZUMA—LPP_DV—SAME_NTL_PERIOD |

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

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

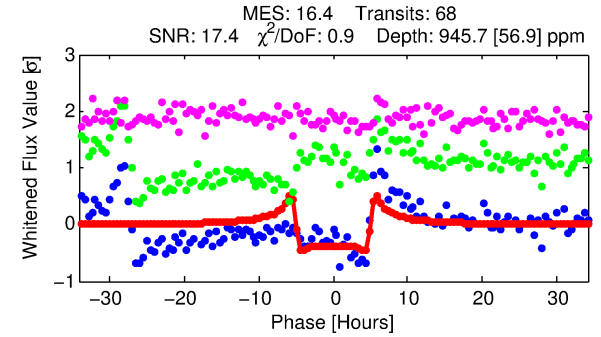
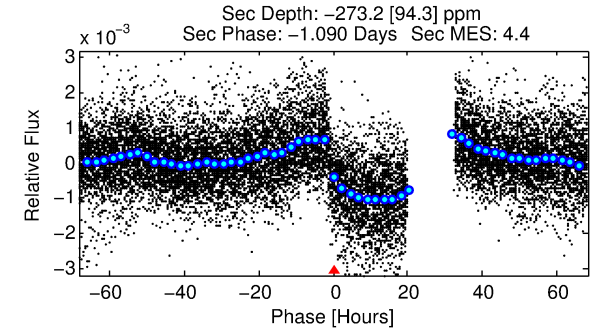
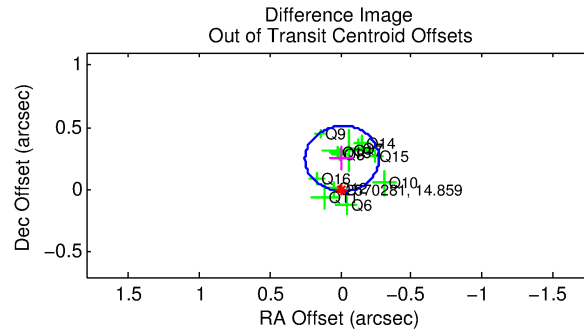
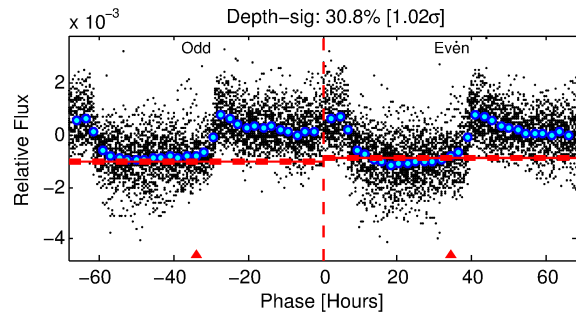
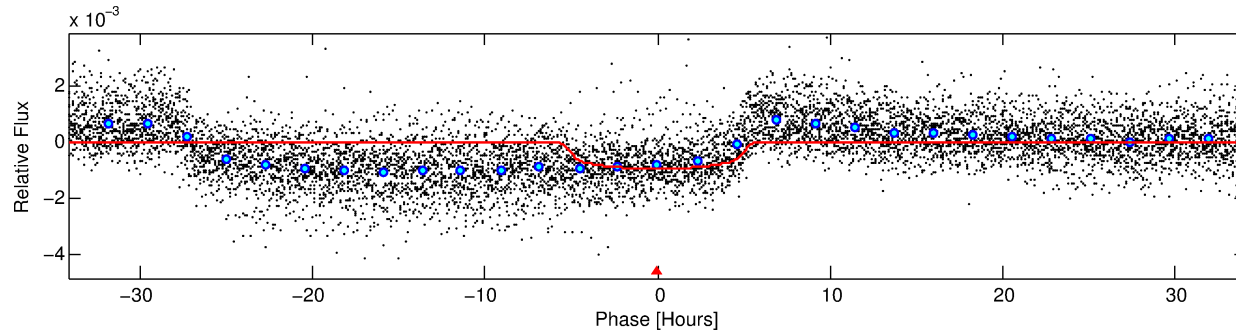
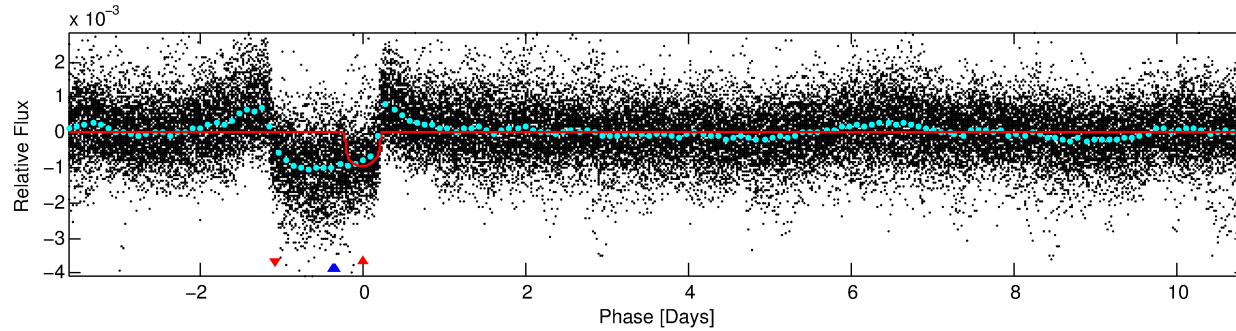
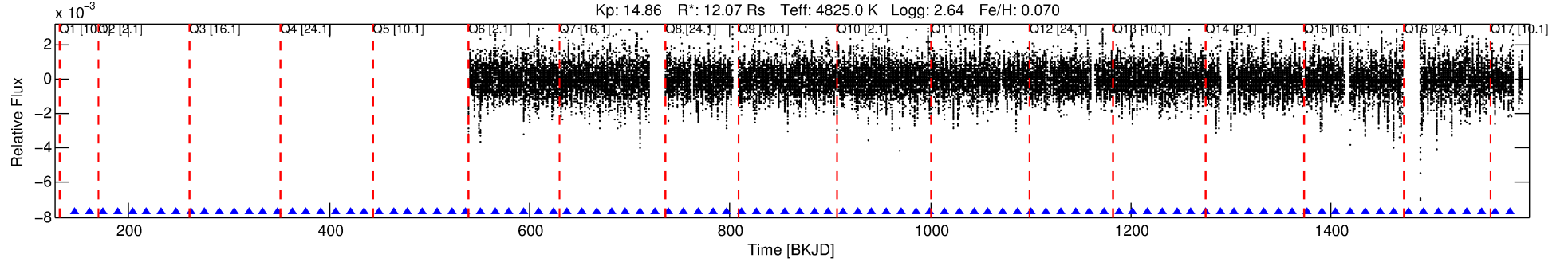
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 002570281-01

No Significant Match Found

DV One-Page Summary

KIC: 2570281 Candidate: 1 of 2 Period: 14.471 d



DV Fit Results:

Period = 14.47130 [0.00012] d
Epoch = 145.9303 [0.0081] BKJD
Rp/R* = 0.0325 [0.0015]
a/R* = 5.90 [0.62]
b = 0.84 [0.04]
Seff = 2968.81 [2680.31]
Teff = 1882 [425] K
Rp = 42.84 [26.02] Re
a = 0.1543 [0.0874] AU
Ag = N/A
Teffp = N/A

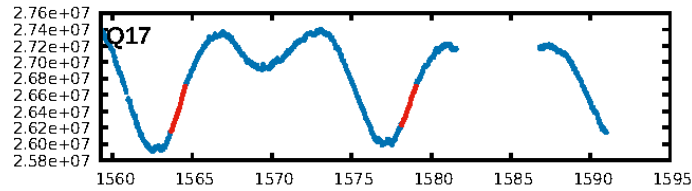
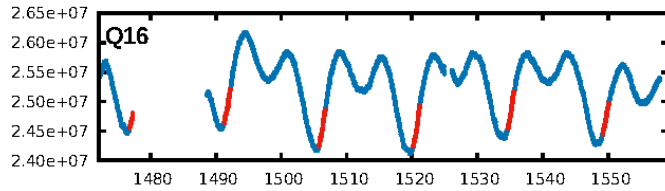
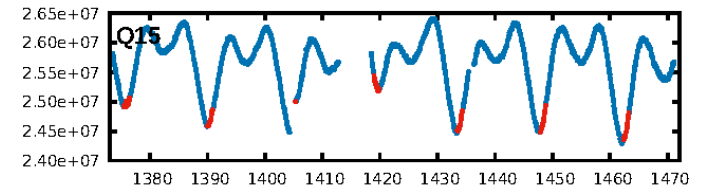
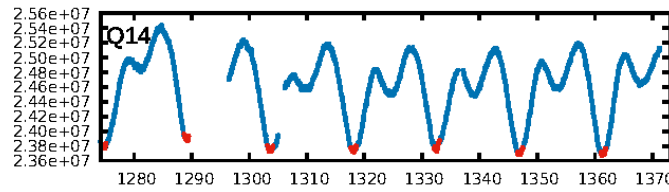
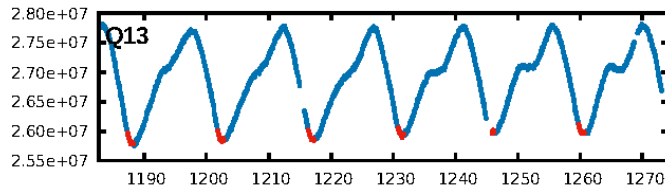
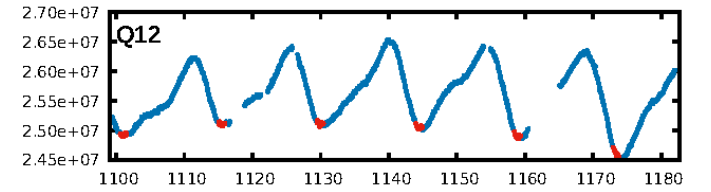
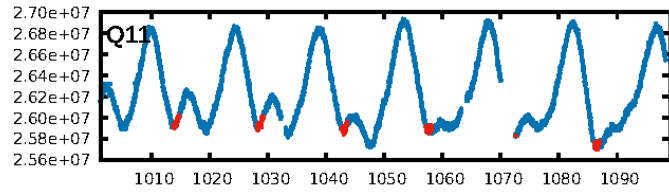
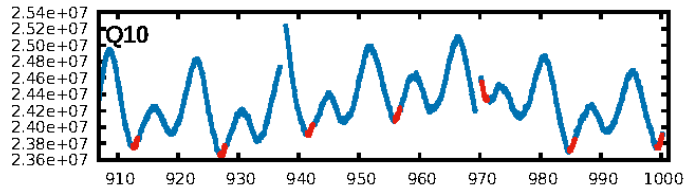
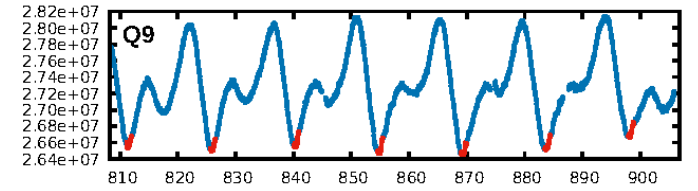
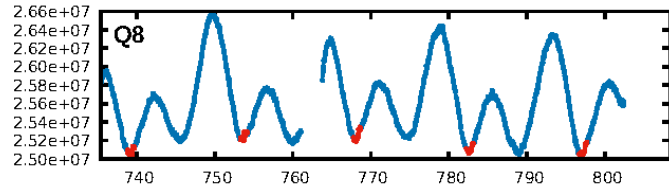
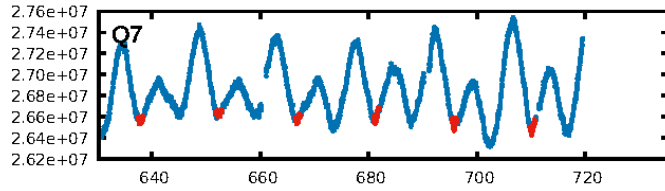
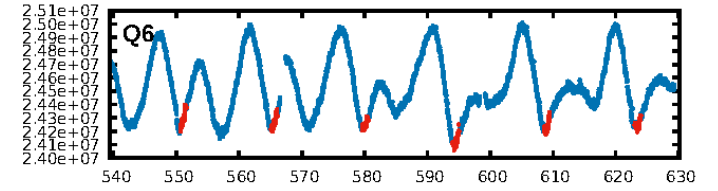
DV Diagnostic Results:

ShortPeriod-sig: 0.0% [0.00 σ]
LongPeriod-sig: N/A
ModelChiSquare2-sig: 51.6%
ModelChiSquareGof-sig: 100.0%
Bootstrap-pfa: 2.83e-56
RollingBand-fgt: 1.00 [66/66]
GhostDiagnostic-chr: -3.415
Centroid-sig: 11.6%
Centroid-so: 1.114 arcsec [2.82 σ]
OotOffset-rm: 0.248 arcsec [2.85 σ]
KicOffset-rm: 0.159 arcsec [1.46 σ]
OotOffset-st: 3/3/3/3 [12]
KicOffset-st: 3/3/3/3 [12]
DiffImageQuality-fgm: 1.00 [12/12]
DiffImageOverlap-fno: 0.00 [0/12]

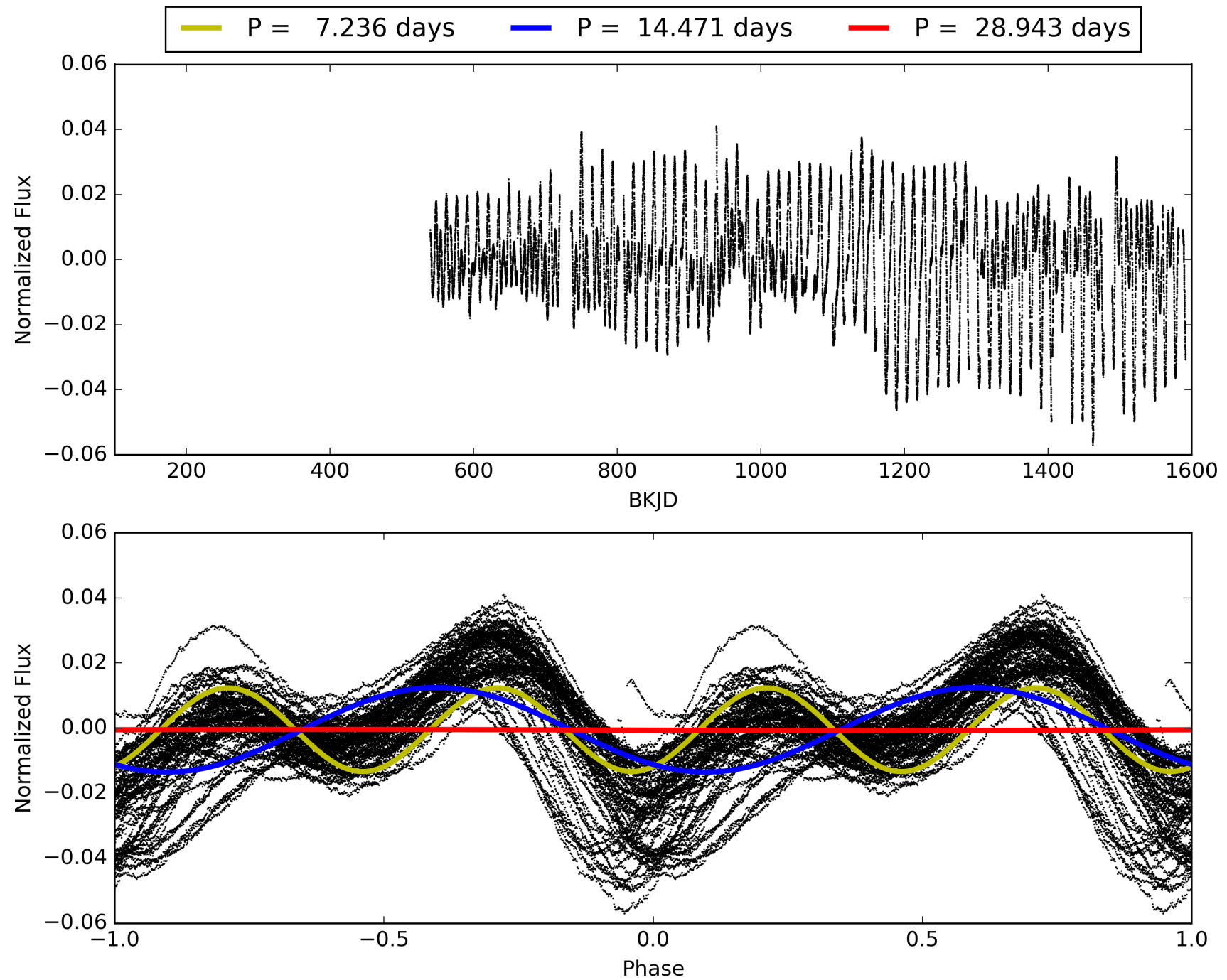
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 20:56:32 Z

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

TCE 002570281-01, PDC Light Curves

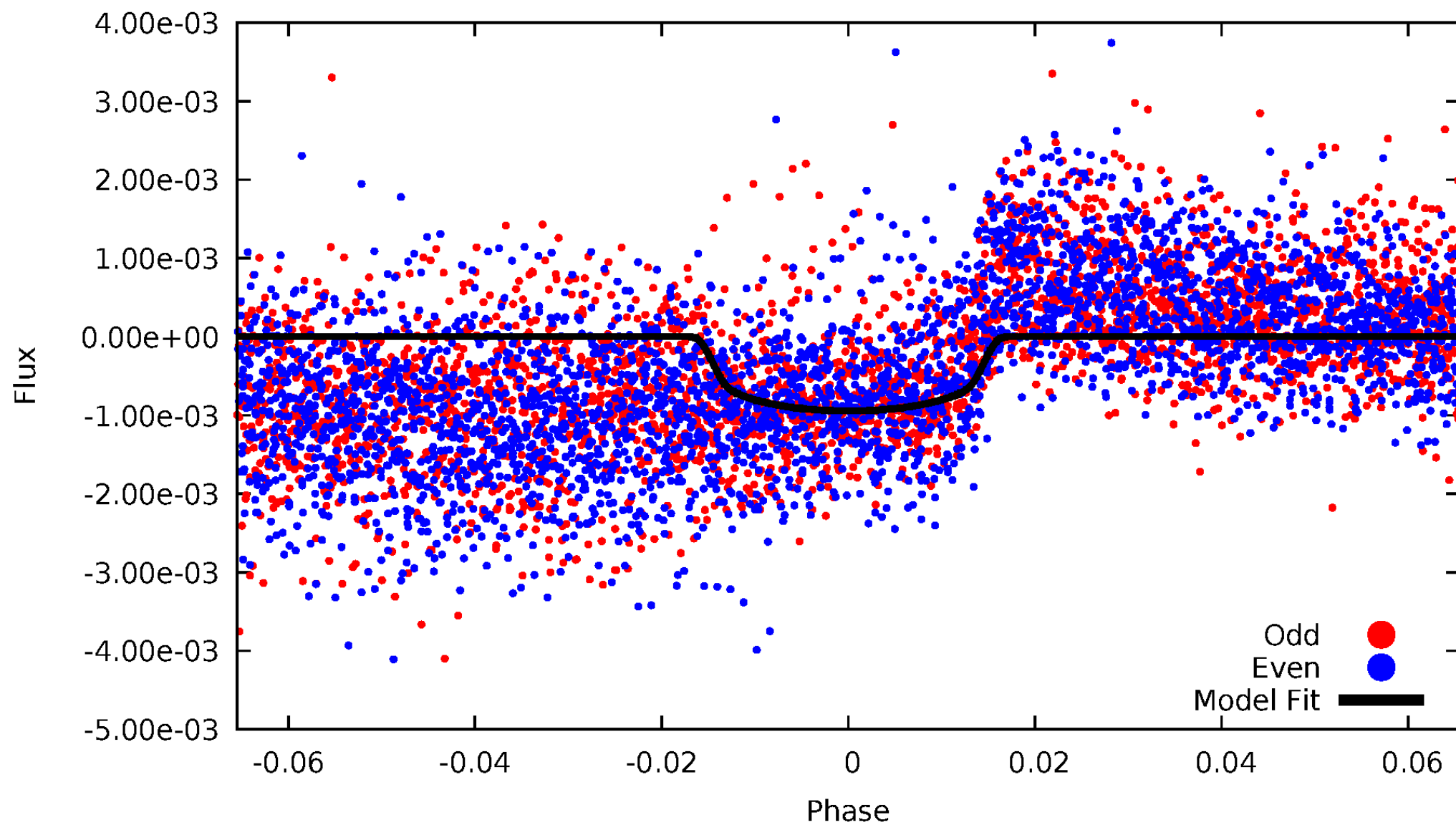


TCE 002570281-01



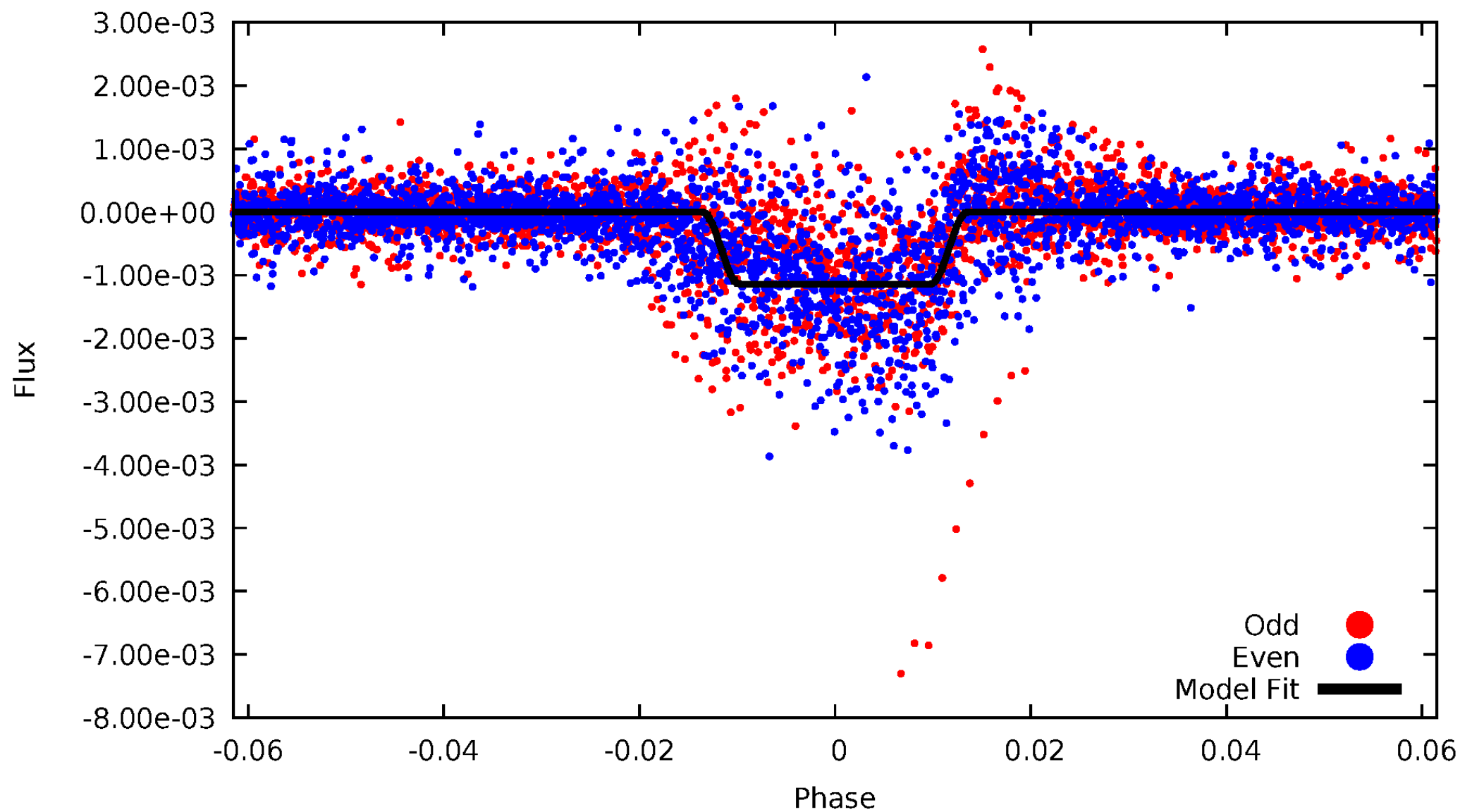
DV Odd/Even

TCE 002570281-01



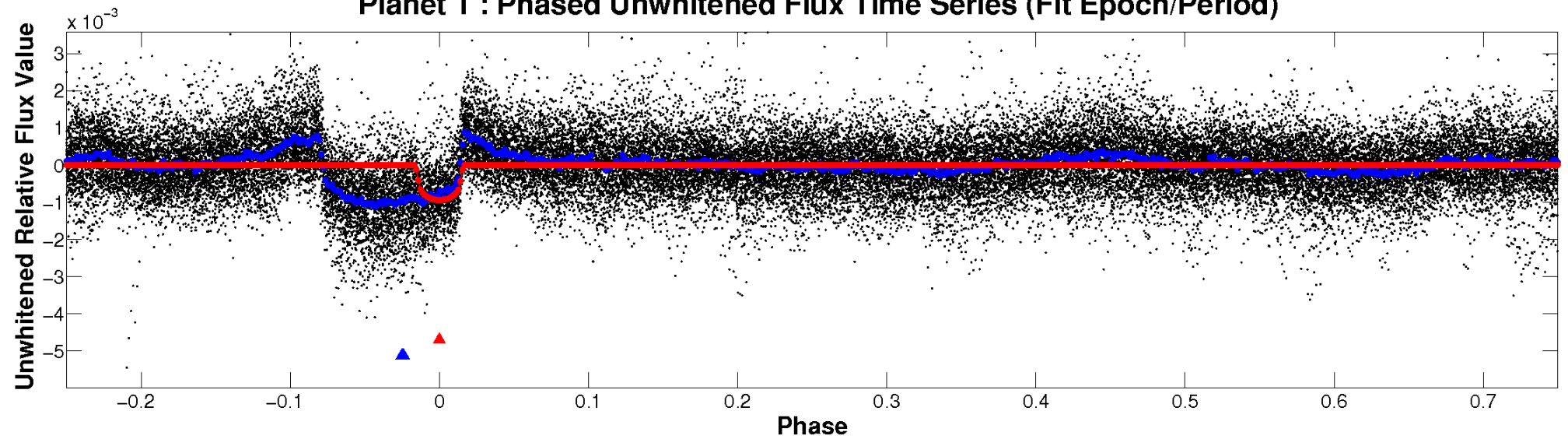
ALT Odd/Even

TCE 002570281-01

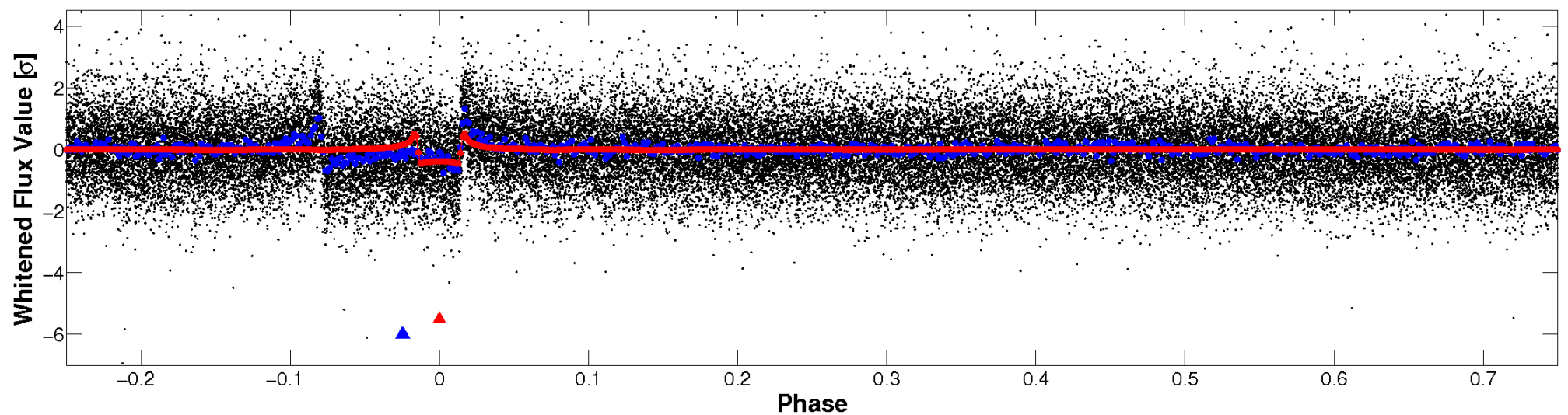


Non-Whitened Vs. Whitened Light Curve

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

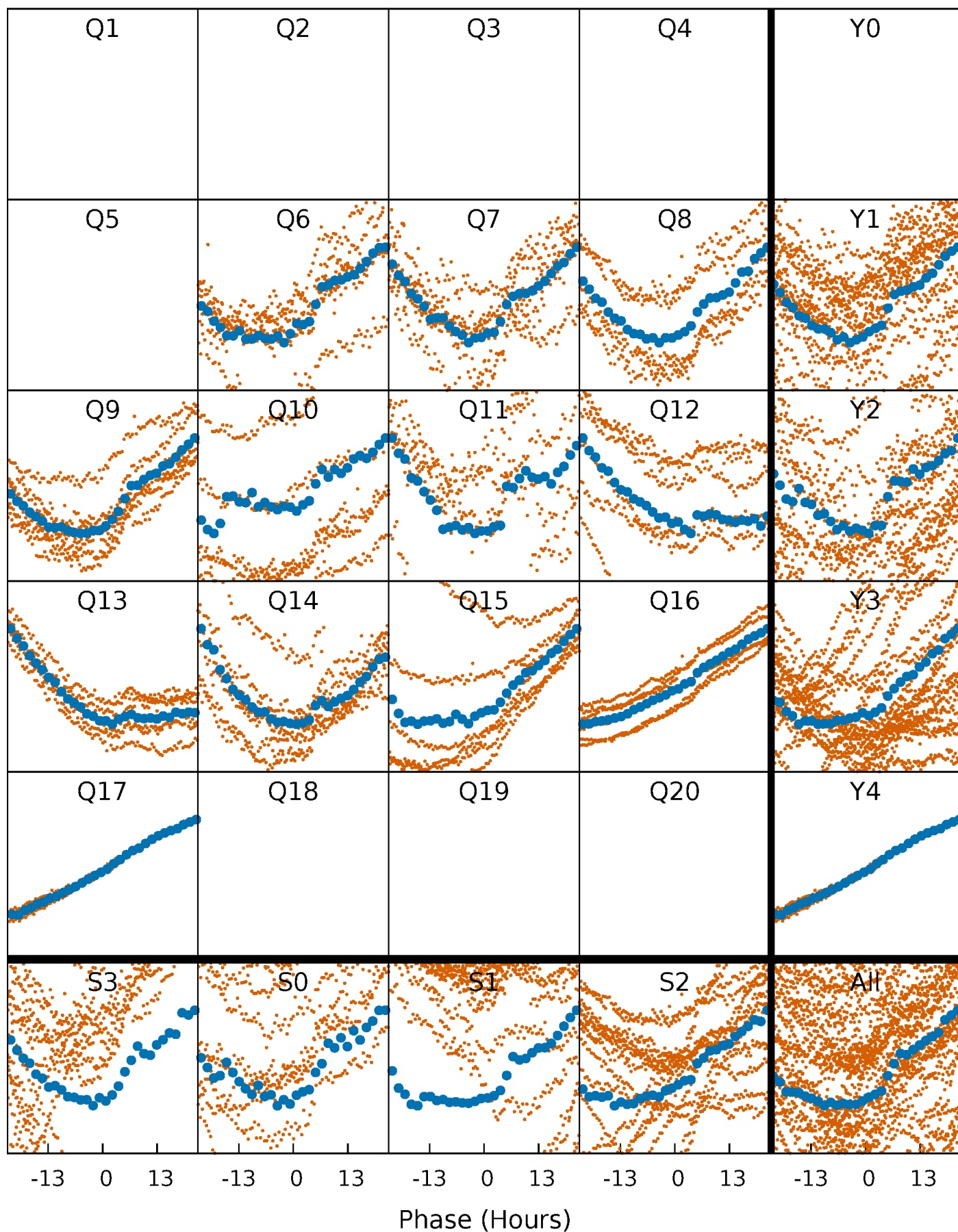


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



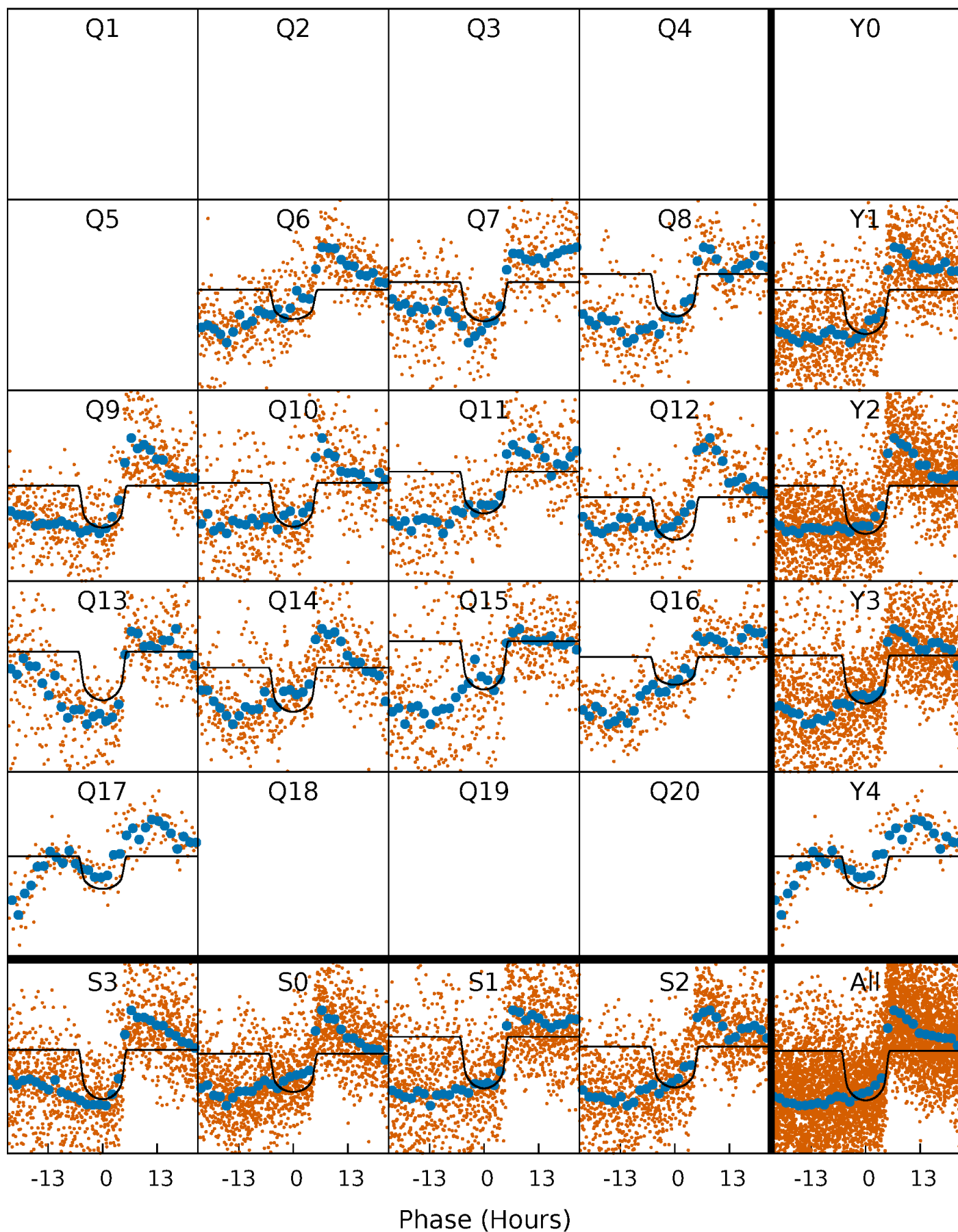
PDC Quarter-Phased Transit Curves

TCE 002570281-01 P= 14.471303 Days $T_0=145.930316$ (BKJD)



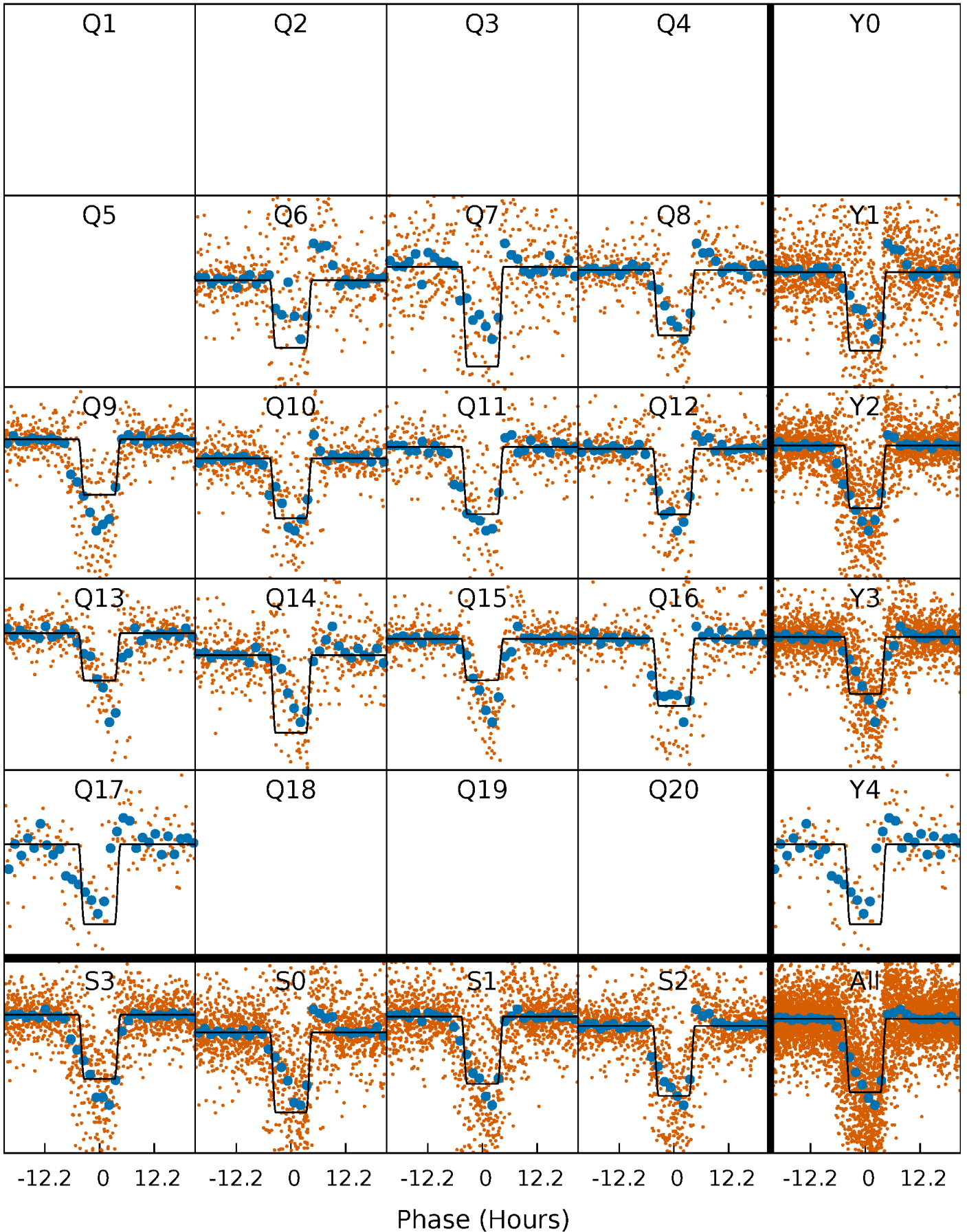
DV Quarter-Phased Transit Curves

TCE 002570281-01 P= 14.471303 Days $T_0=145.930316$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

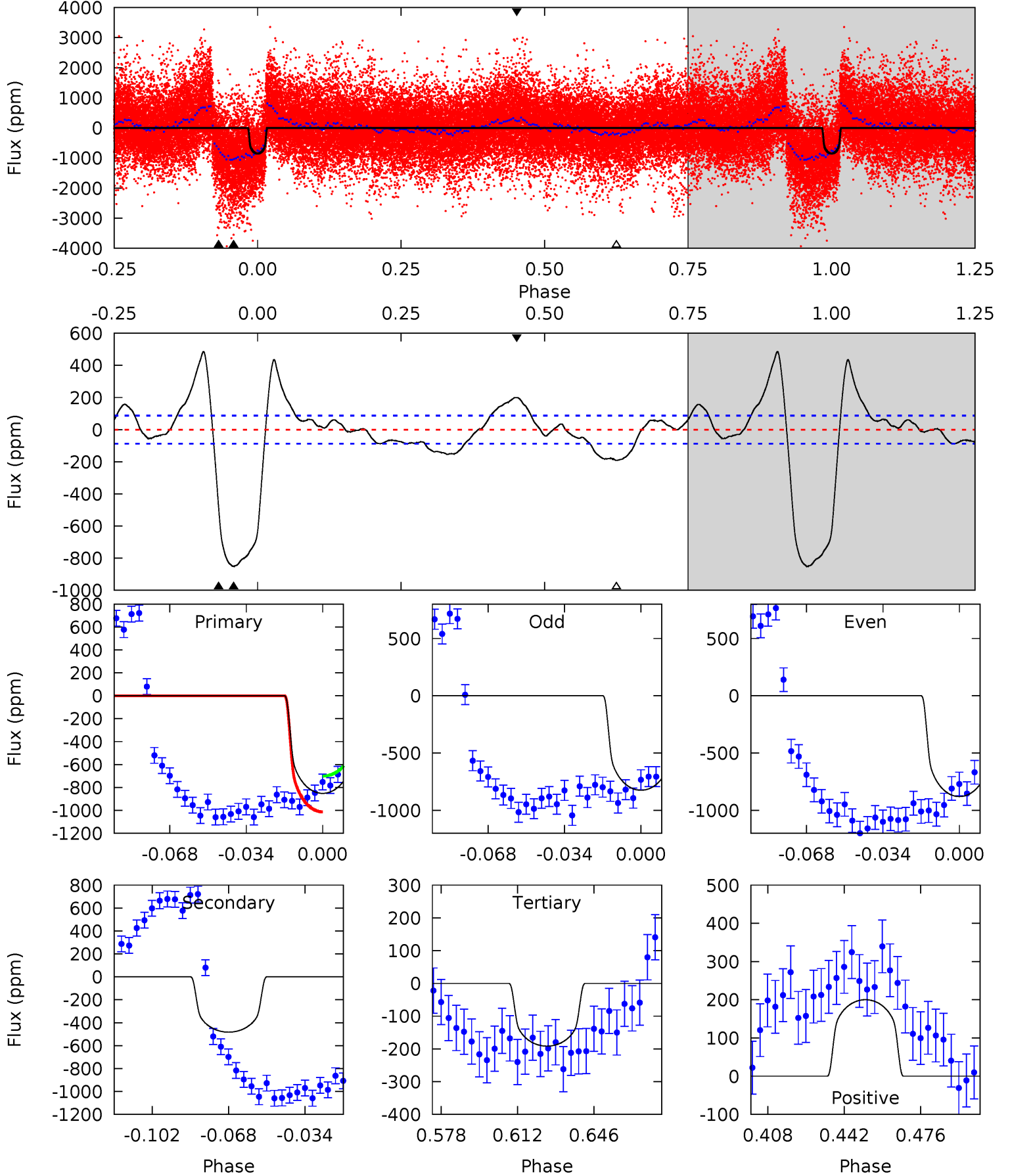
TCE 002570281-01 $P = 14.470970$ Days $T_0 = 145.988545$ (BKJD)



DV Model-Shift Uniqueness Test

002570281-01, P = 14.471303 Days, E = 145.930316 Days

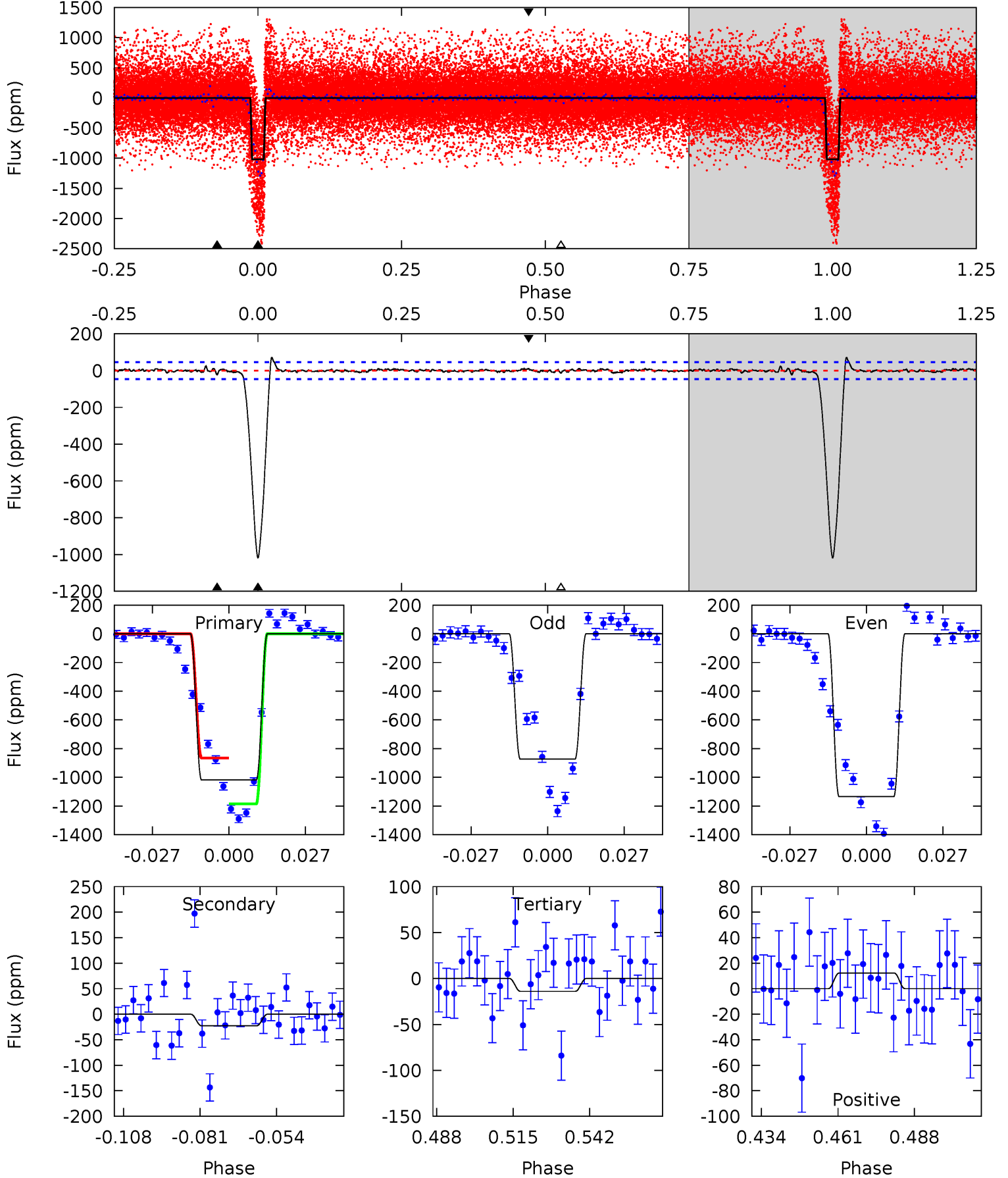
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 46.6 | 26.4 | 10.5 | 11.0 | 4.79 | 2.12 | 7.91 | 36.1 | 35.7 | 15.9 | 15.5 | 1.51 | 1.00 | 0.36 | 8.49 |



Alt Model-Shift Uniqueness Test

002570281-01, P = 14.470970 Days, E = 145.988545 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|-------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 106.1 | 2.37 | 1.46 | 1.28 | 4.83 | 2.21 | 0.59 | 104.7 | 104.8 | 0.91 | 1.09 | 13.5 | 1.17 | 0.07 | 16.5 |



Stellar Parameters For KIC 002570281

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | R (R_{\odot}) | $M(M_{\odot})$ | ρ_{\star} ($\text{g}\cdot\text{cm}^{-3}$) |
|--------|----------------------|---------------------------|---------------------------|----------------------------|---------------------------|--------------------------------------------------|
| | 4825^{+113}_{-170} | $2.644^{+0.518}_{-0.185}$ | $0.070^{+0.200}_{-0.300}$ | $12.066^{+3.131}_{-7.306}$ | $2.338^{+0.680}_{-1.263}$ | $0.002^{+0.013}_{-0.001}$ |
| | +2%/-4% | +20%/-7% | +286%/-429% | +26%/-61% | +29%/-54% | +718%/-52% |
| Source | KIC0 | 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 002570281-01 / KOI

| Detrend | Depth (ppm) | R_p (R_{\oplus}) | T_{max} (K) | T_{obs} (K) | A_{obs} |
|---------|---------------|--------------------------|----------------------|-----------------------|---------------------------|
| DV | -483 ± 18 | $43.06^{+8.78}_{-14.10}$ | 2574^{+227}_{-340} | 4070^{+129}_{-145} | $3.625^{+2.811}_{-1.004}$ |
| Alt. | -23 ± 10 | $44.59^{+7.75}_{-12.94}$ | 2581^{+240}_{-332} | -2545^{+752}_{-226} | $0.155^{+0.136}_{-0.073}$ |

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

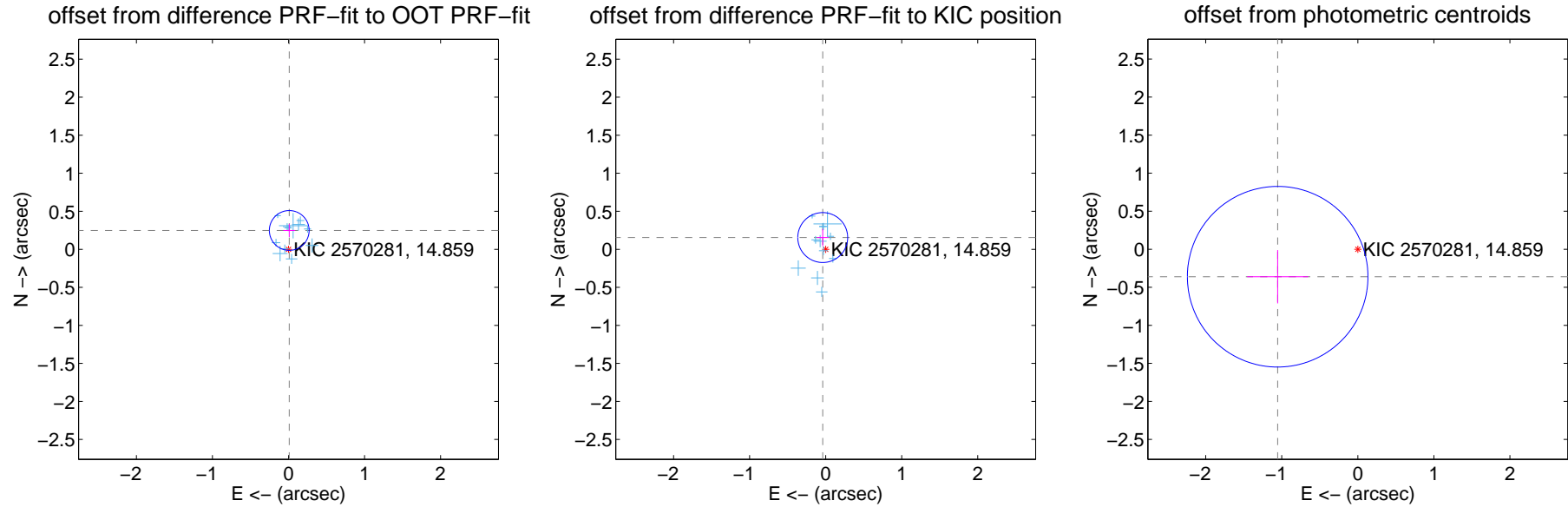
DV Centroid Data

Supplemental centroid analysis for 002570281-01. Kepler magnitude: 14.86. Transit SNR 17.43

There are 12 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.04 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|-----------------------------------------|--------------------|---------------------|--------------------|-------------------|
| PRF-fit source offset from OOT | 0.248 ± 0.087 | 2.85 | -0.010 ± 0.077 | 0.248 ± 0.087 |
| PRF-fit source offset from KIC position | 0.159 ± 0.109 | 1.46 | 0.039 ± 0.075 | 0.155 ± 0.113 |
| photometric centroid source offset | 1.11 ± 0.40 | 2.82 | 1.05 ± 0.40 | -0.36 ± 0.35 |

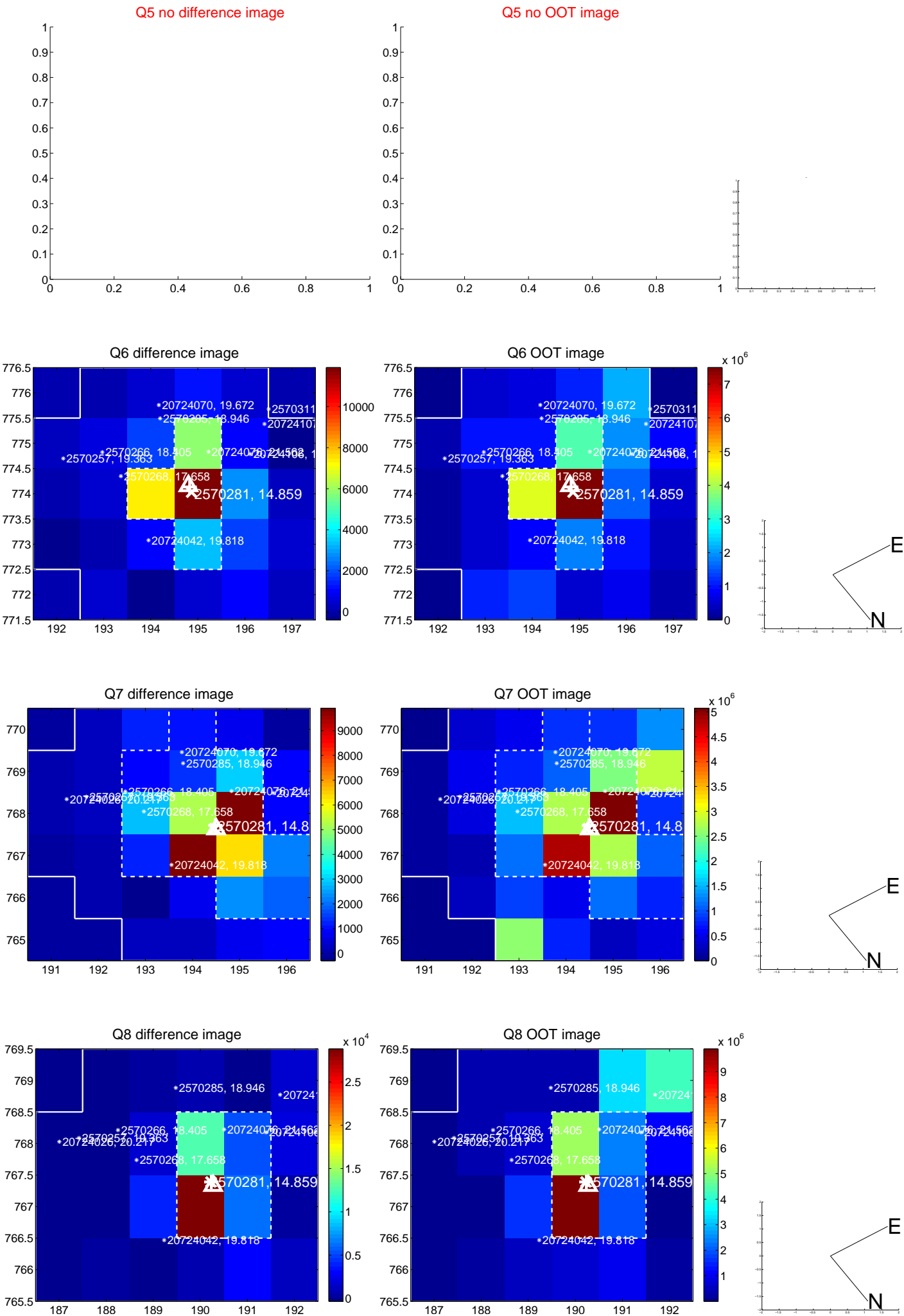


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

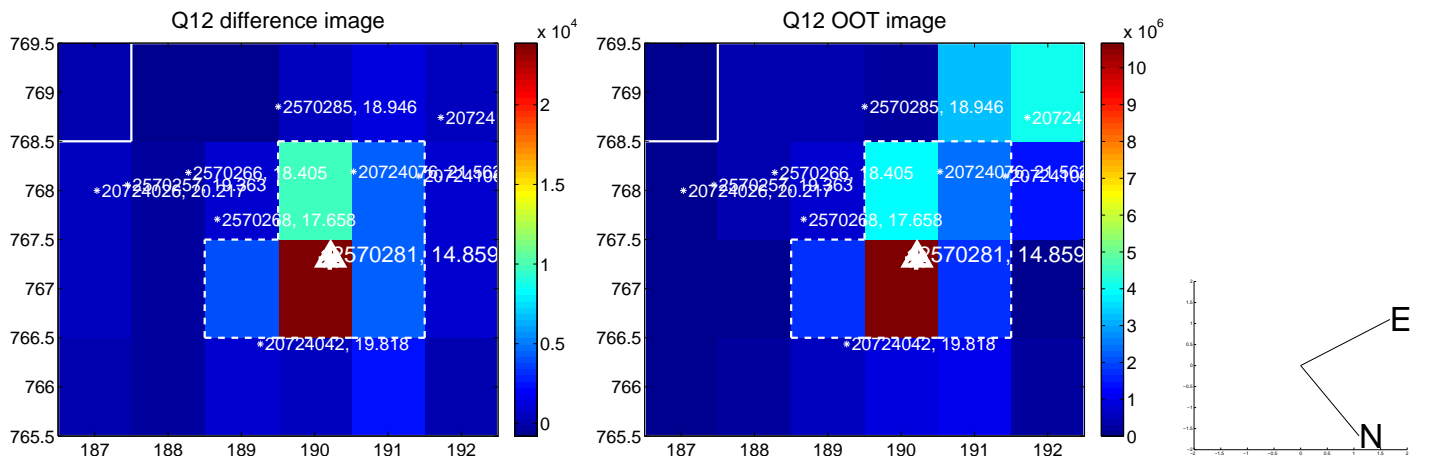
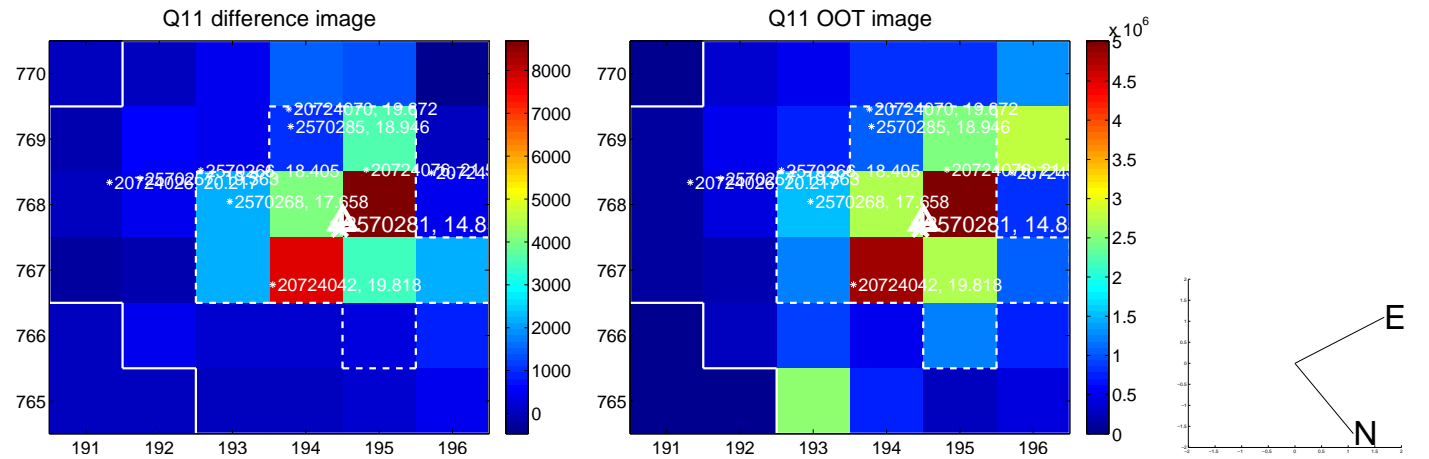
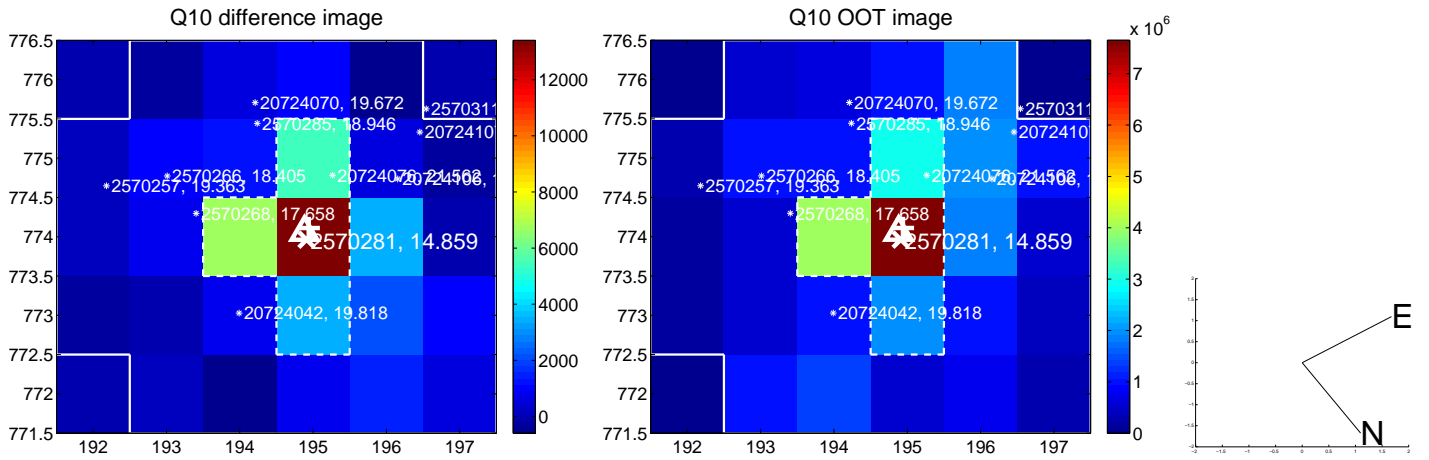
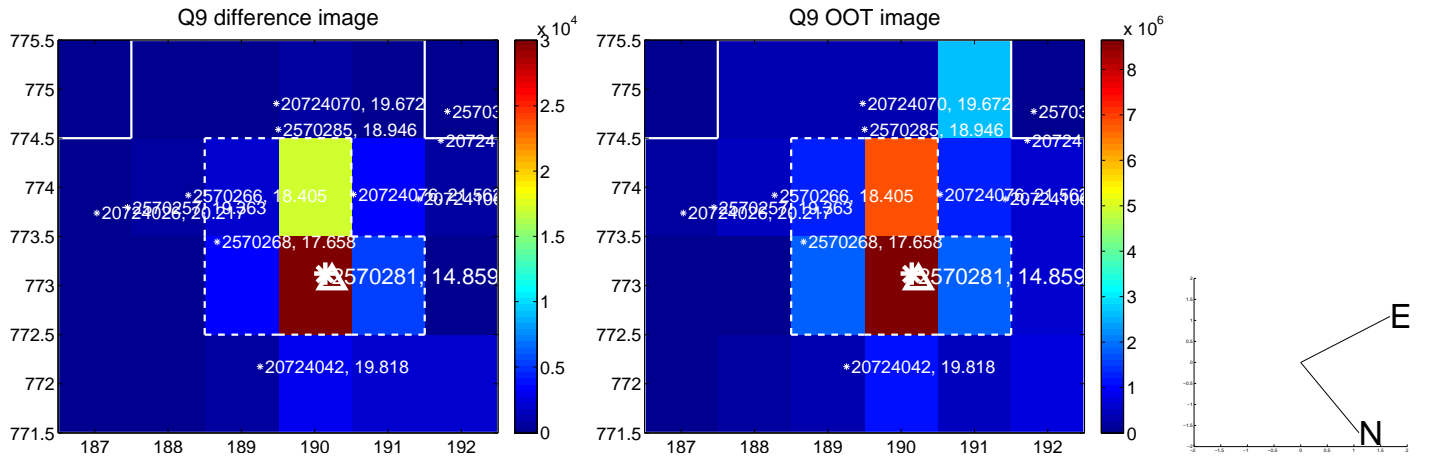
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



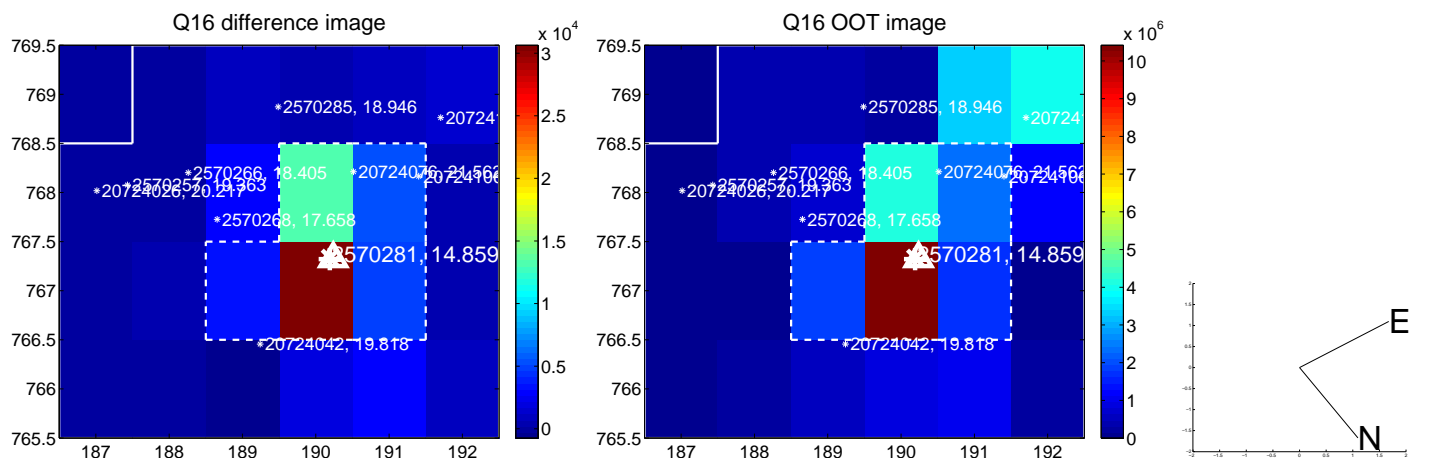
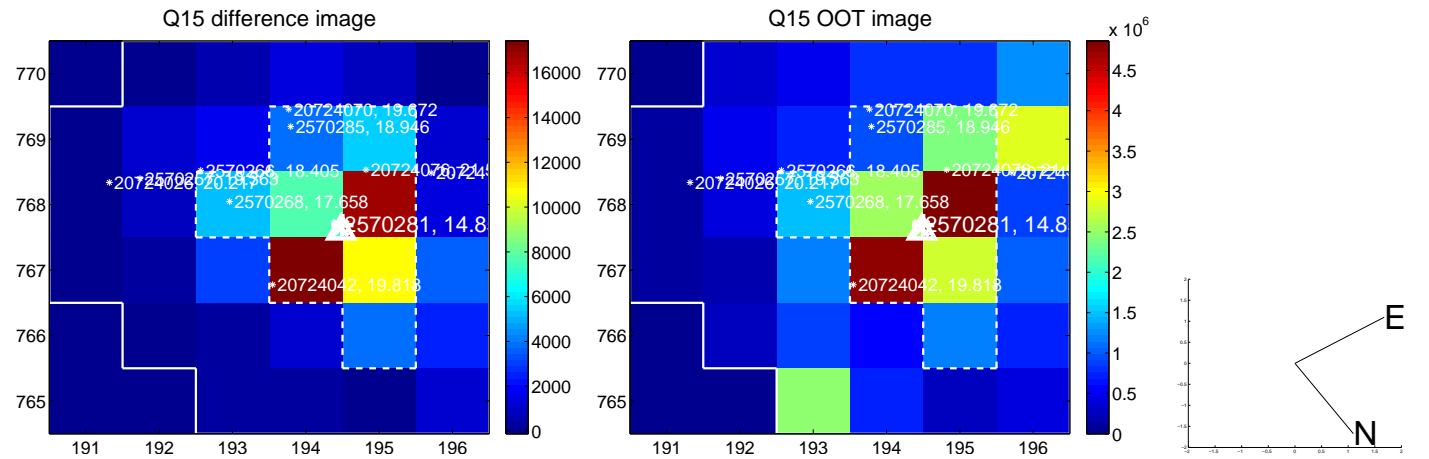
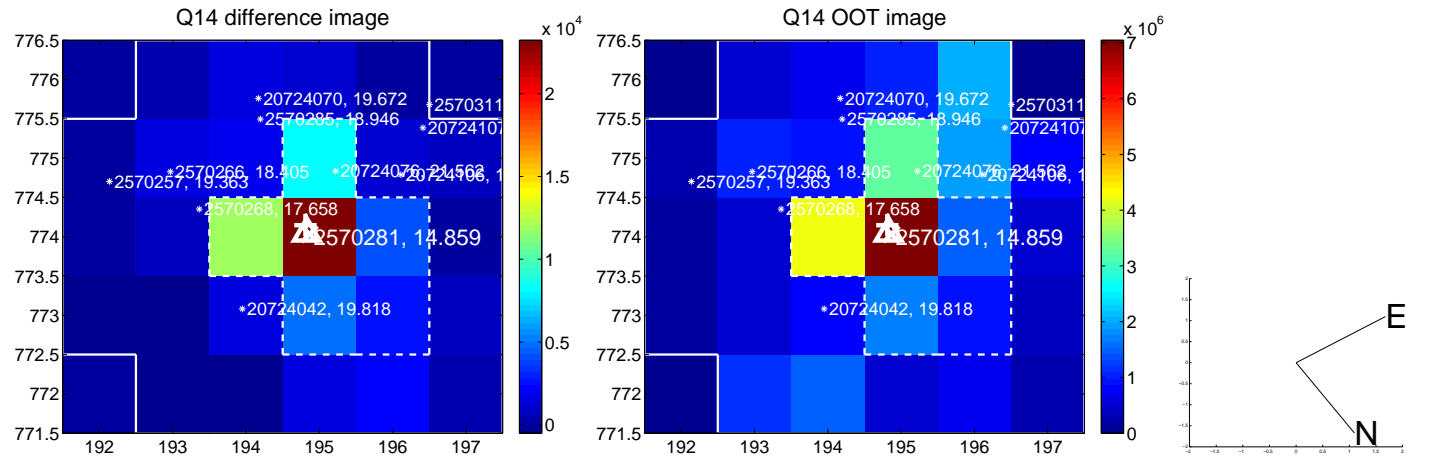
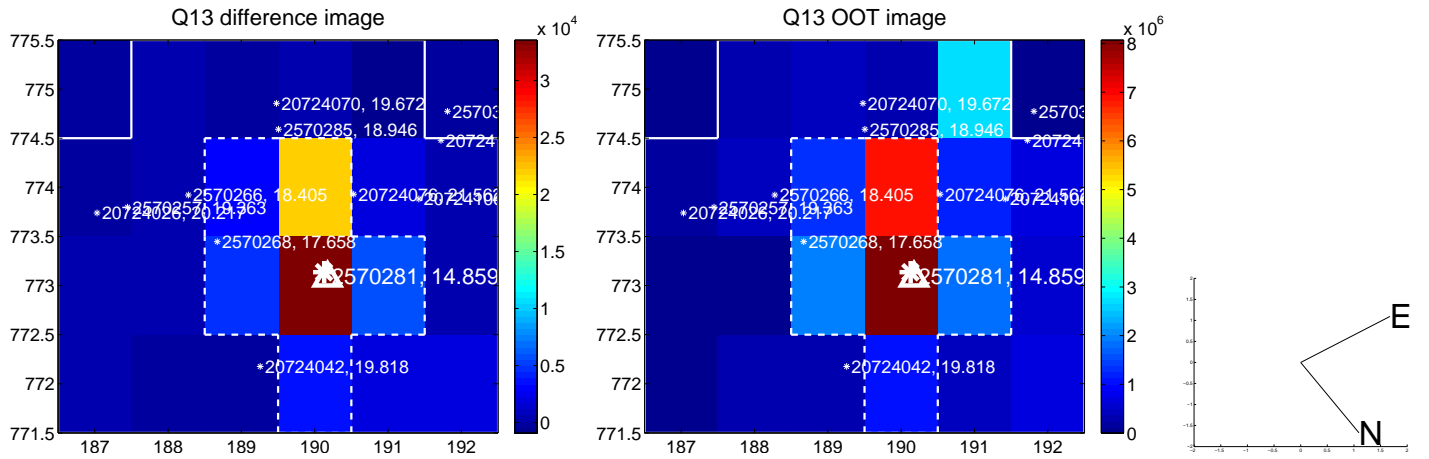
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



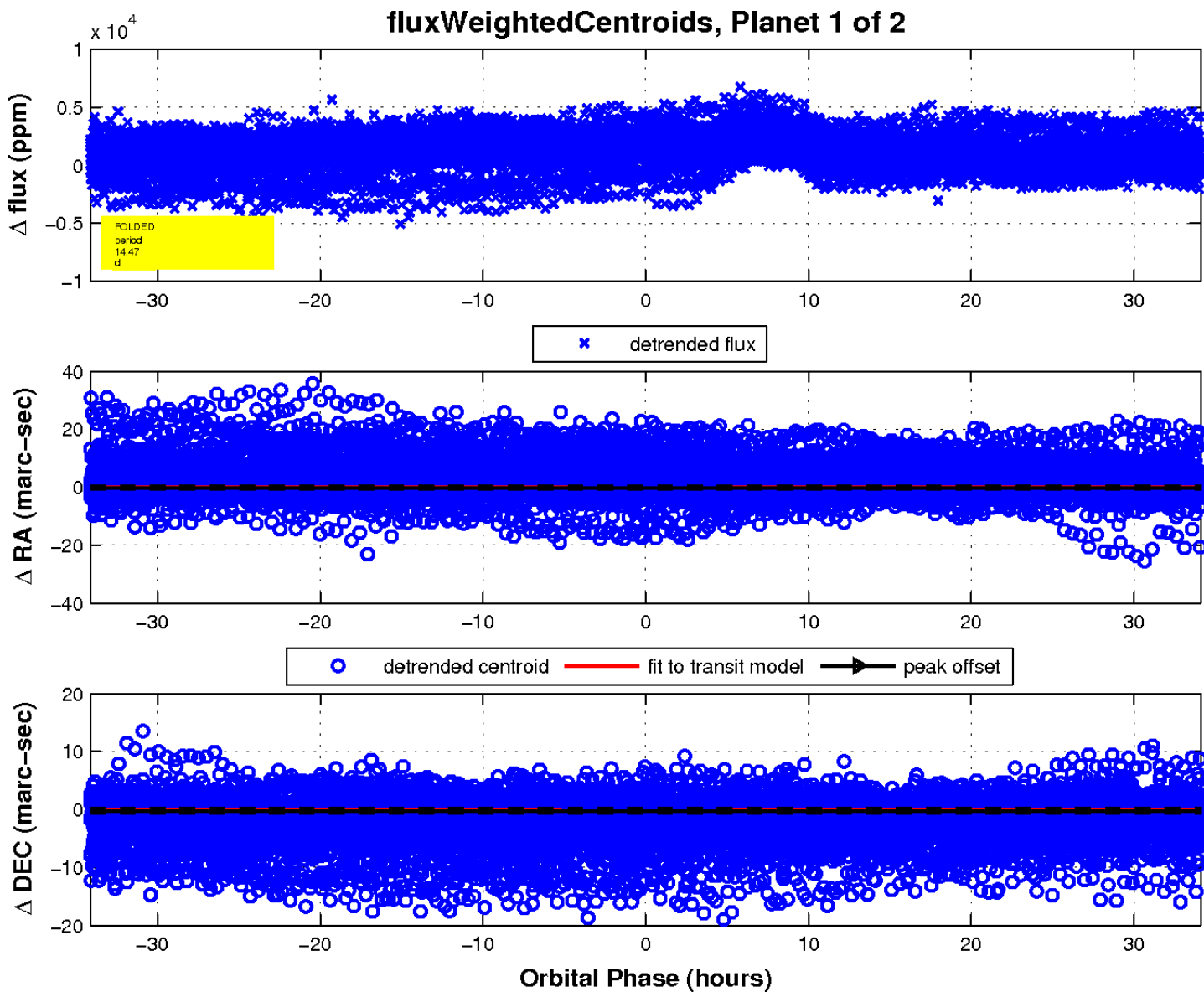
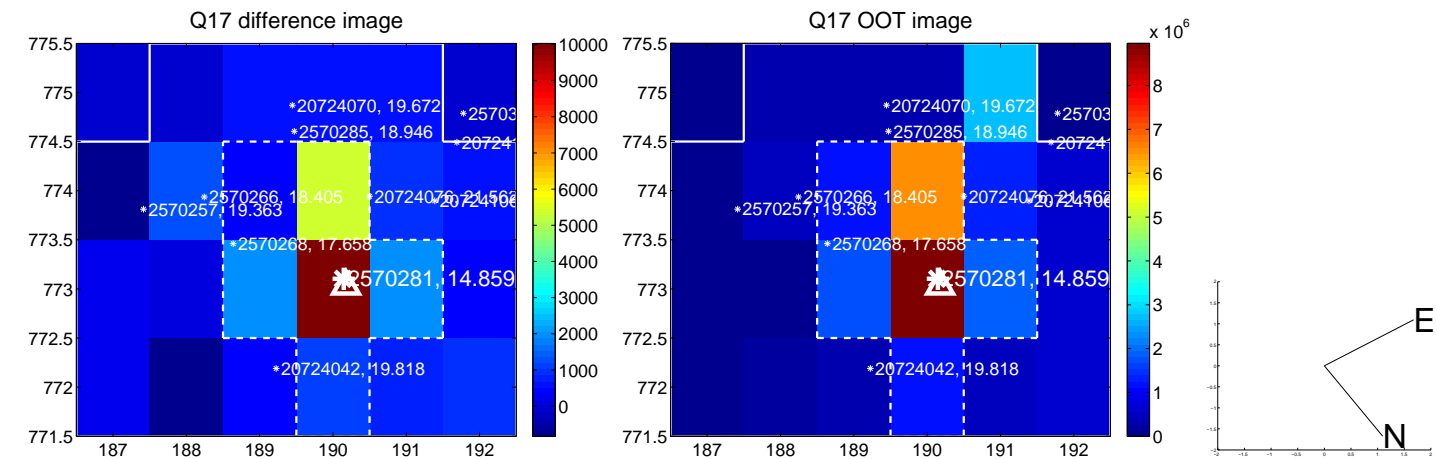
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



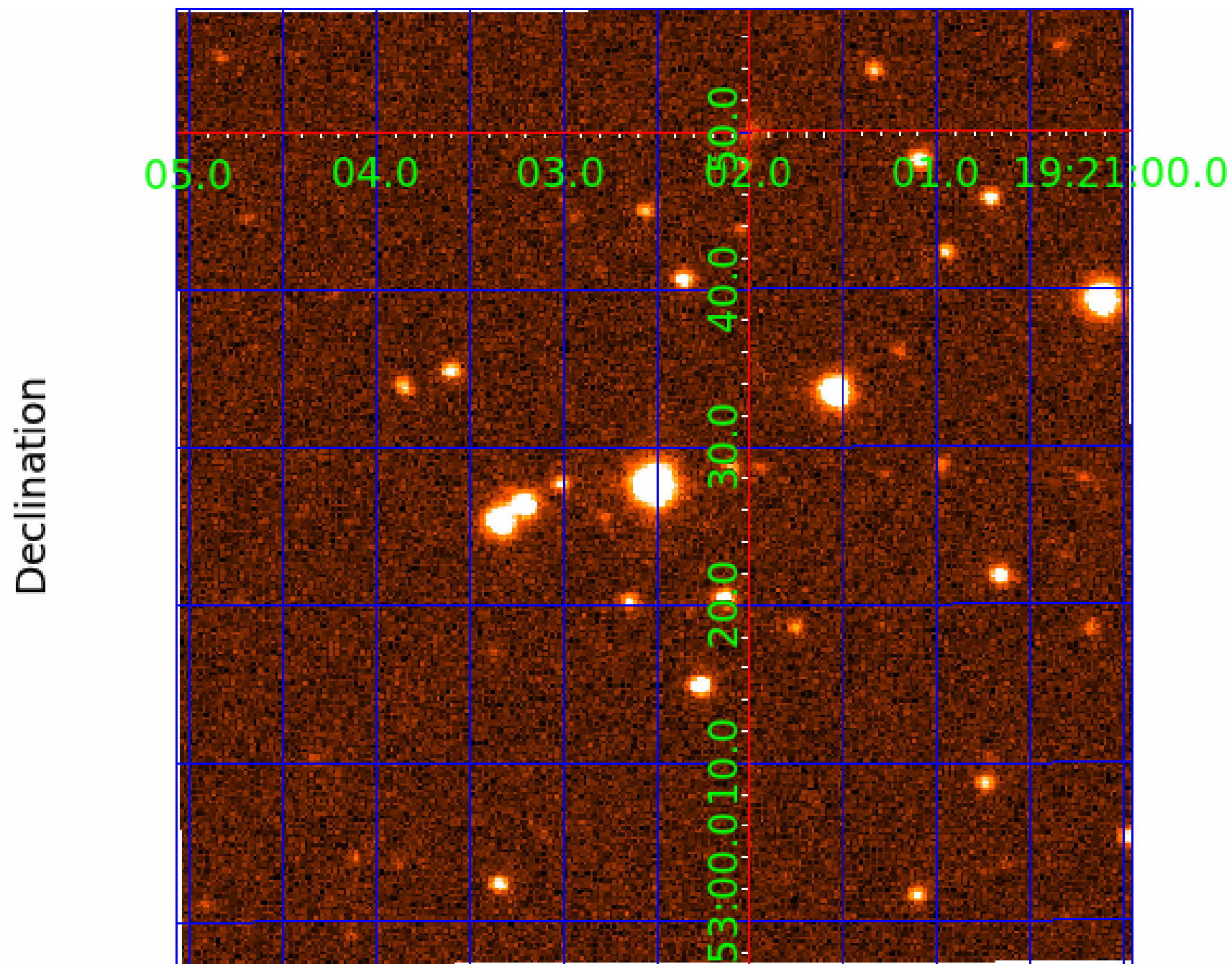
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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



UKIRT Image



KIC 002570281

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}) |
|--------------|----------|------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 002570281-01 | OBS | No | 14.471303 | 145.930316 | 945.7 | 11.375 | 16.4 | 17.4 | 12.07 | 4825 | 42.84 | 2968.81 |
| 002570281-02 | OBS | No | 14.471154 | 145.582466 | 2716.3 | 39.517 | 17.2 | 22.9 | 12.07 | 4825 | 60.52 | 2968.85 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|------------------------------------------------|
| 002570281-01 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | LPP_DV |
| 002570281-02 | OBS | FP | 0.00 | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_ZUMA—LPP_DV—SAME_NTL_PERIOD |

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

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

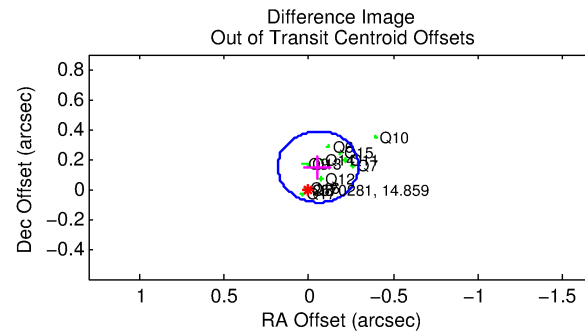
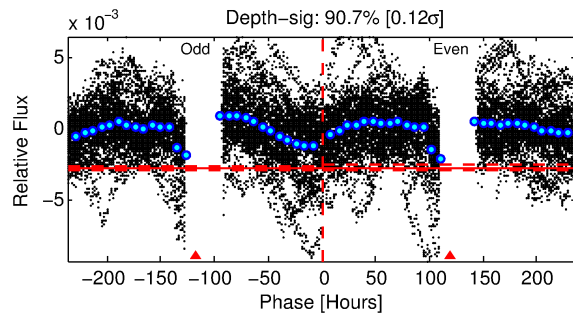
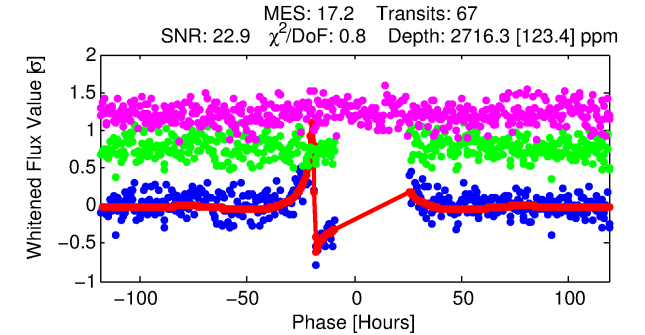
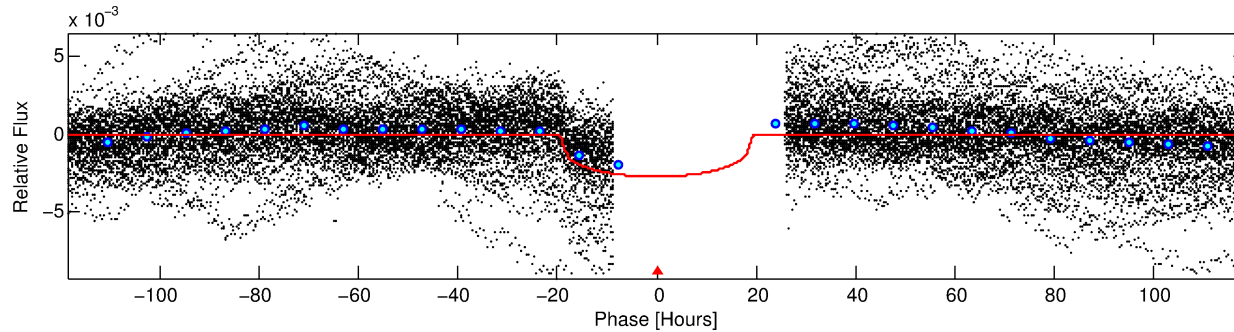
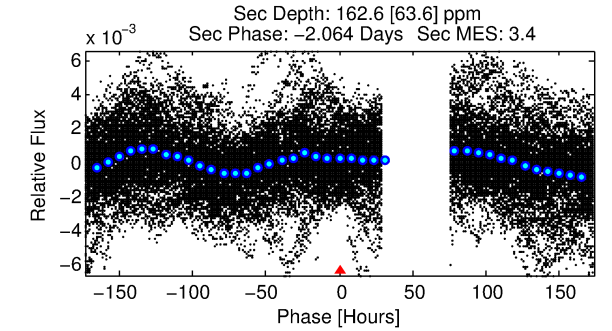
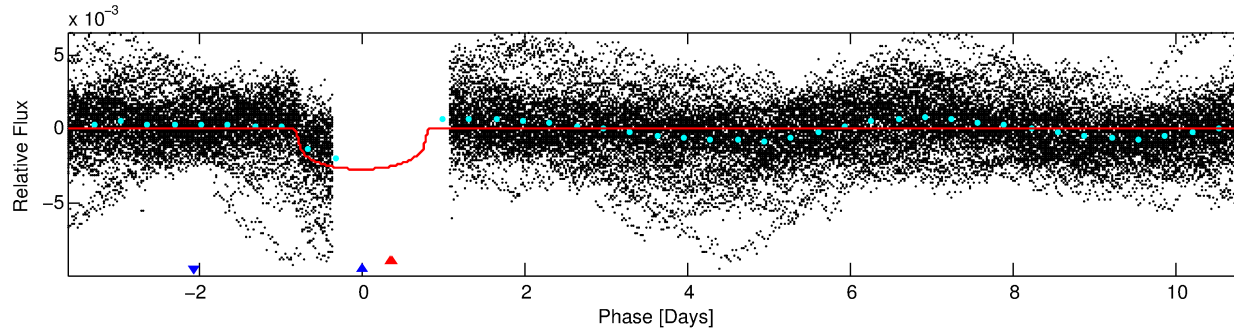
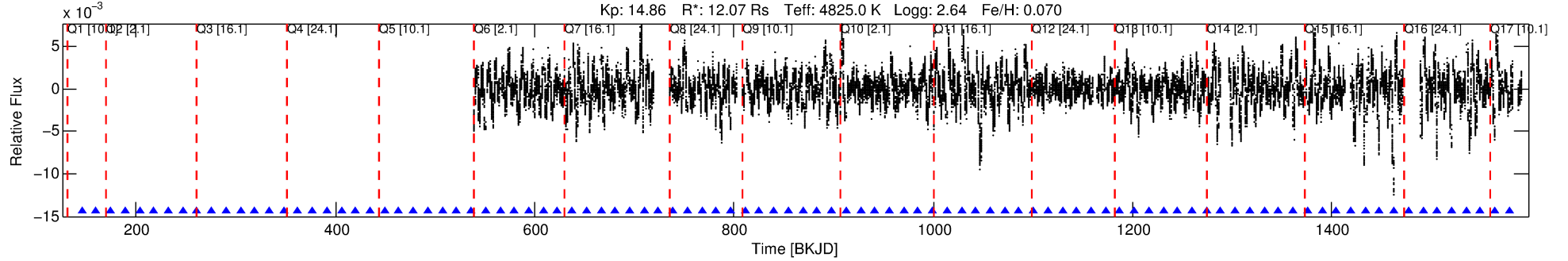
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 002570281-02

No Significant Match Found

DV One-Page Summary

KIC: 2570281 Candidate: 2 of 2 Period: 14.471 d



DV Fit Results:

Period = 14.47115 [0.00012] d
Epoch = 145.5825 [0.0237] BKJD
Rp/R* = 0.0460 [0.0014]
a/R* = 2.99 [0.17]
b = 0.05 [1.71]
Seff = 2968.85 [2680.35]
Teq = 1882 [425] K
Rp = 60.52 [36.69] Re
a = 0.1543 [0.0874] AU
Ag = 0.58 [0.57] [-0.74σ]
Teffp = 2542 [267] K [1.31σ]

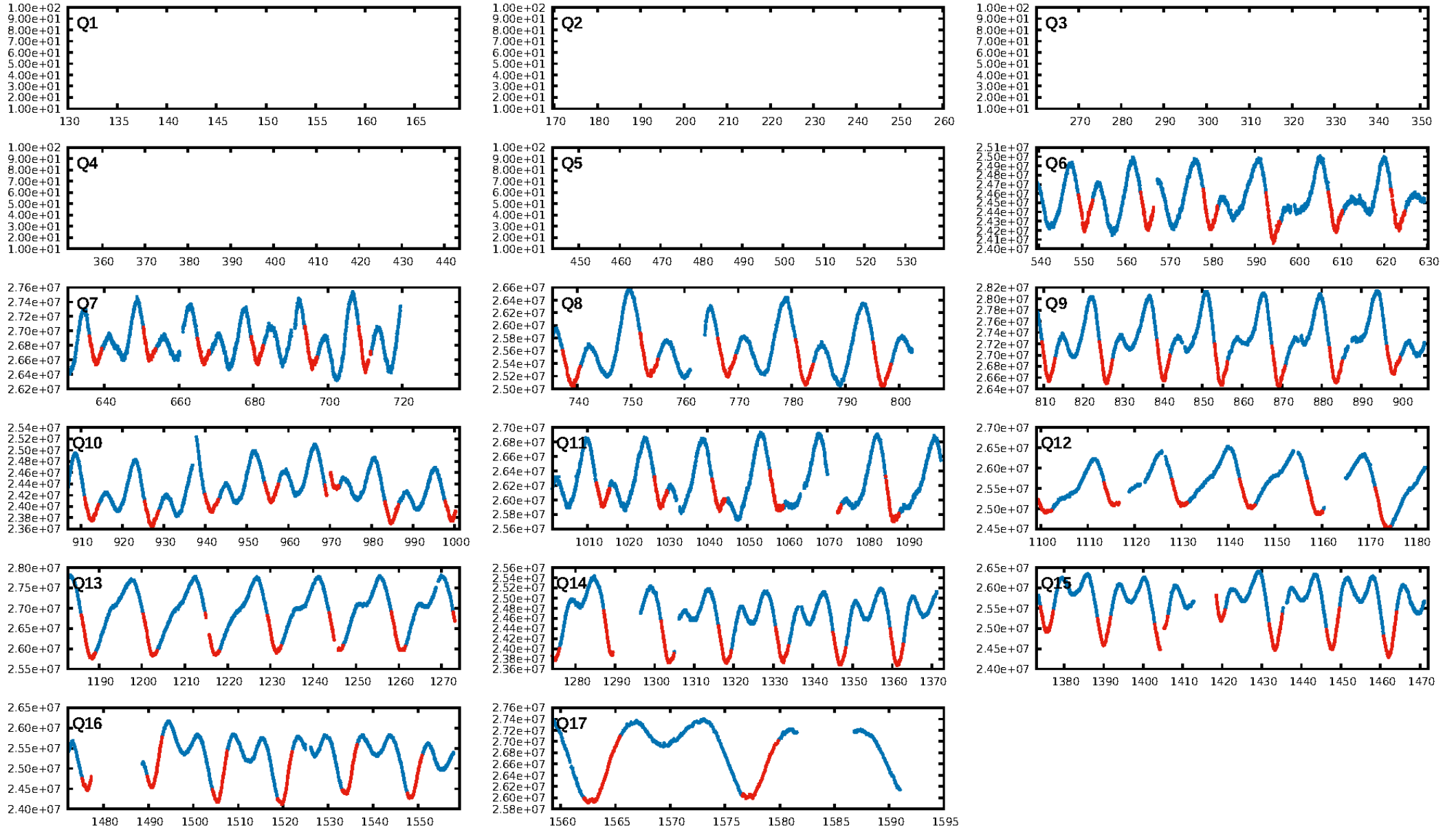
DV Diagnostic Results:

ShortPeriod-sig: N/A
LongPeriod-sig: 0.0% [0.00σ]
ModelChiSquare2-sig: 67.7%
ModelChiSquareGof-sig: 100.0%
Bootstrap-pfa: 6.83e-63
RollingBand-fgt: 1.00 [65/65]
GhostDiagnostic-chr: 0.7728
Centroid-sig: 0.0%
Centroid-so: 0.626 arcsec [4.28σ]
OotOffset-rm: 0.158 arcsec [2.00σ]
KicOffset-rm: 0.056 arcsec [0.73σ]
OotOffset-st: 3/3/3/3 [12]
KicOffset-st: 3/3/3/3 [12]
DiffImageQuality-fgm: 1.00 [12/12]
DiffImageOverlap-fno: 0.00 [0/12]

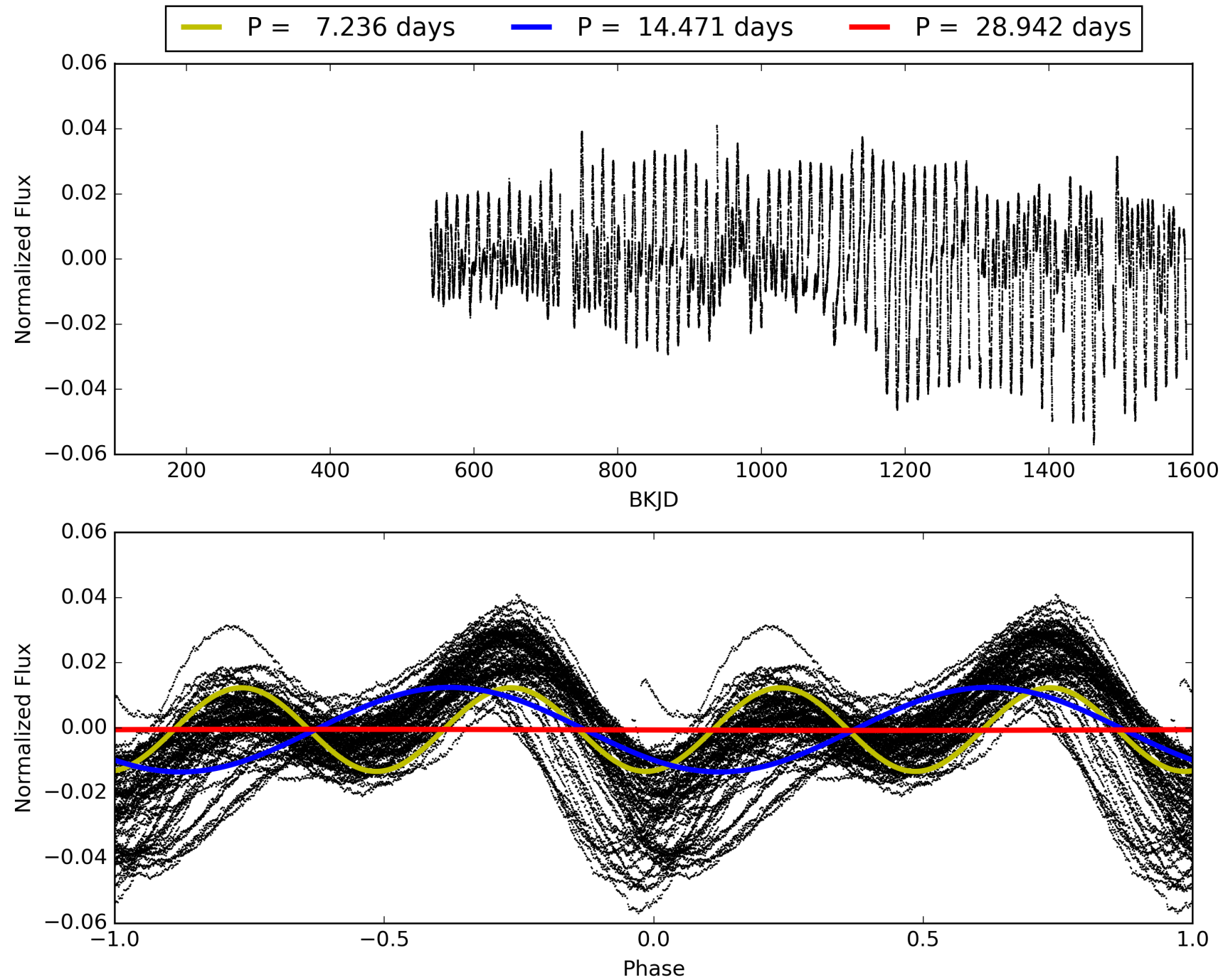
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This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

TCE 002570281-02, PDC Light Curves

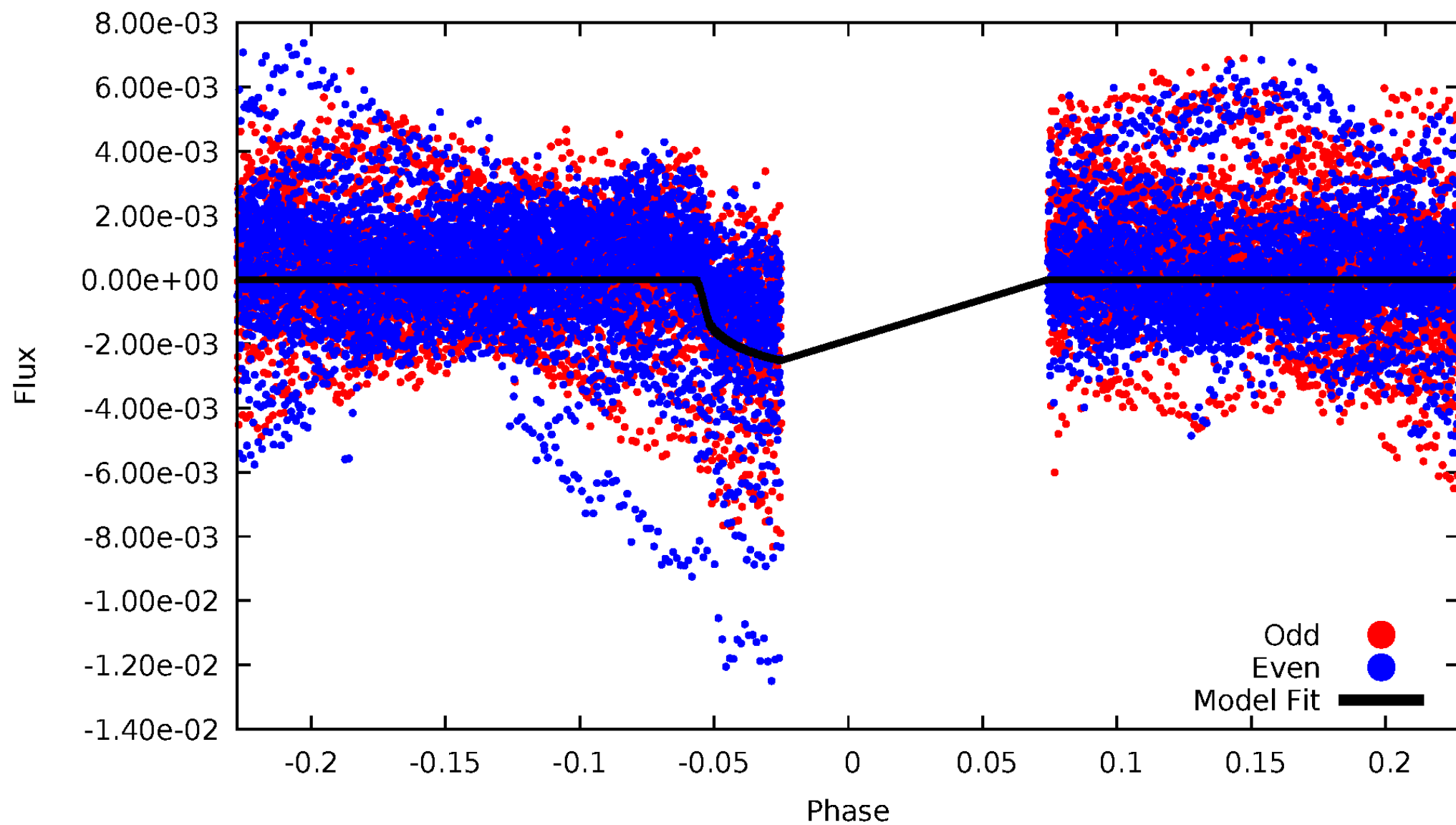


TCE 002570281-02



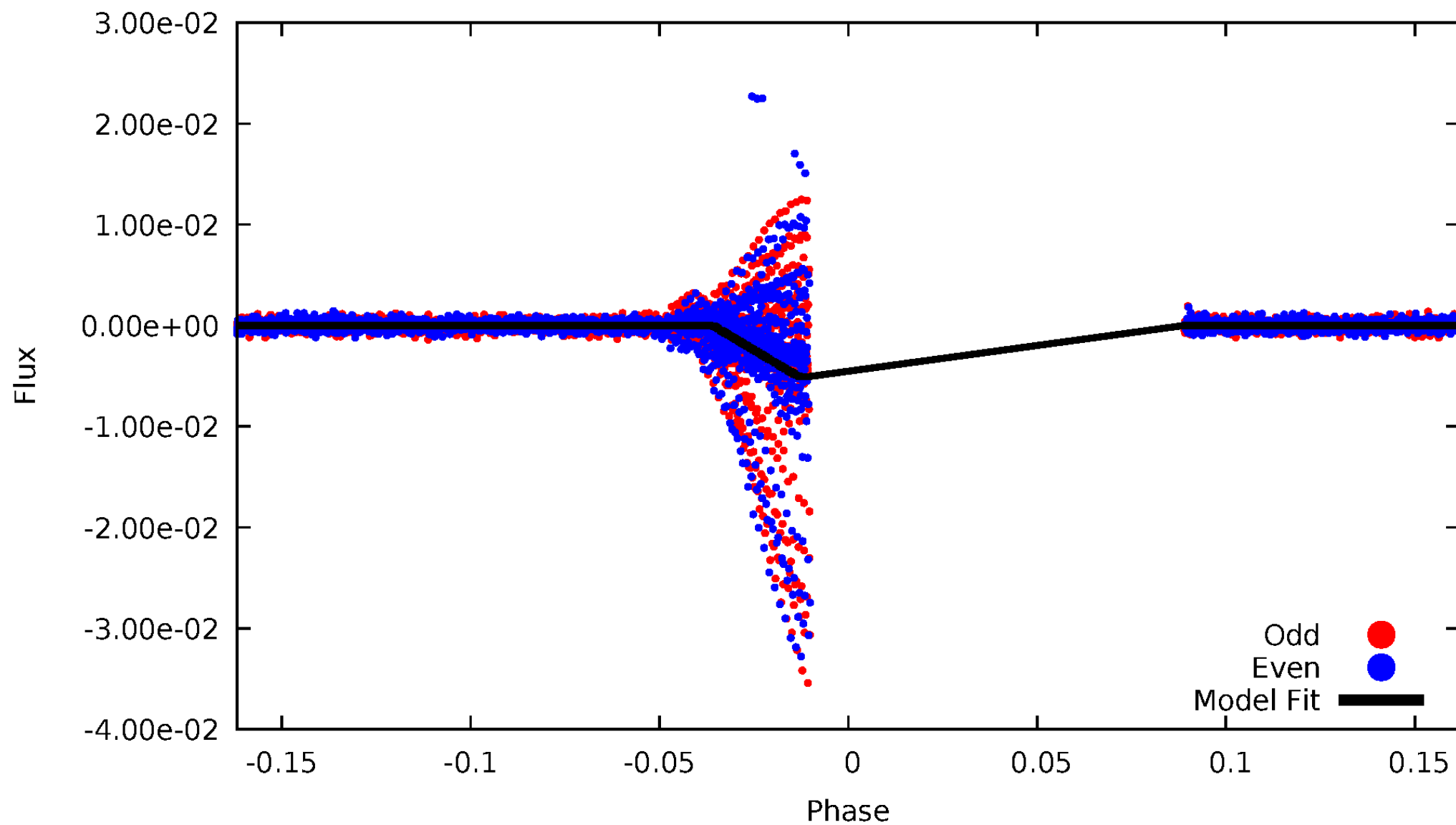
DV Odd/Even

TCE 002570281-02



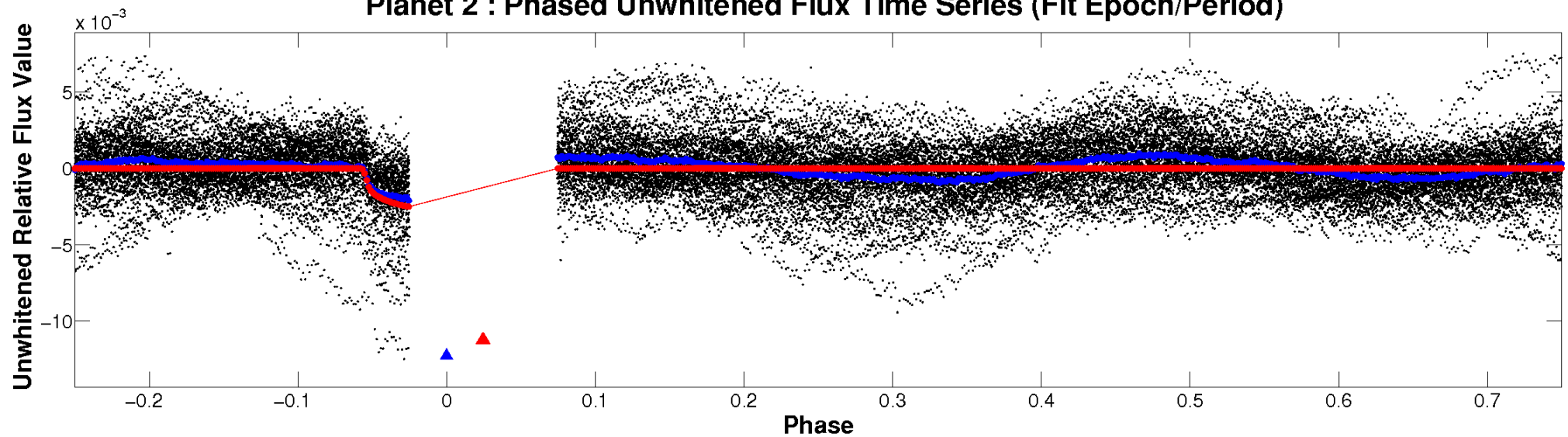
ALT Odd/Even

TCE 002570281-02

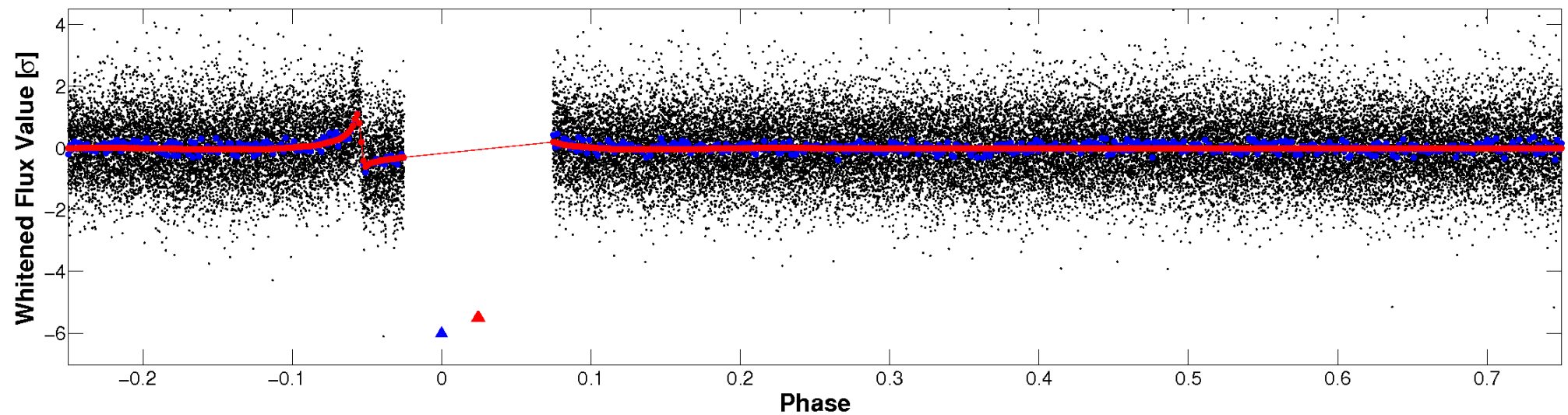


Non-Whitened Vs. Whitened Light Curve

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

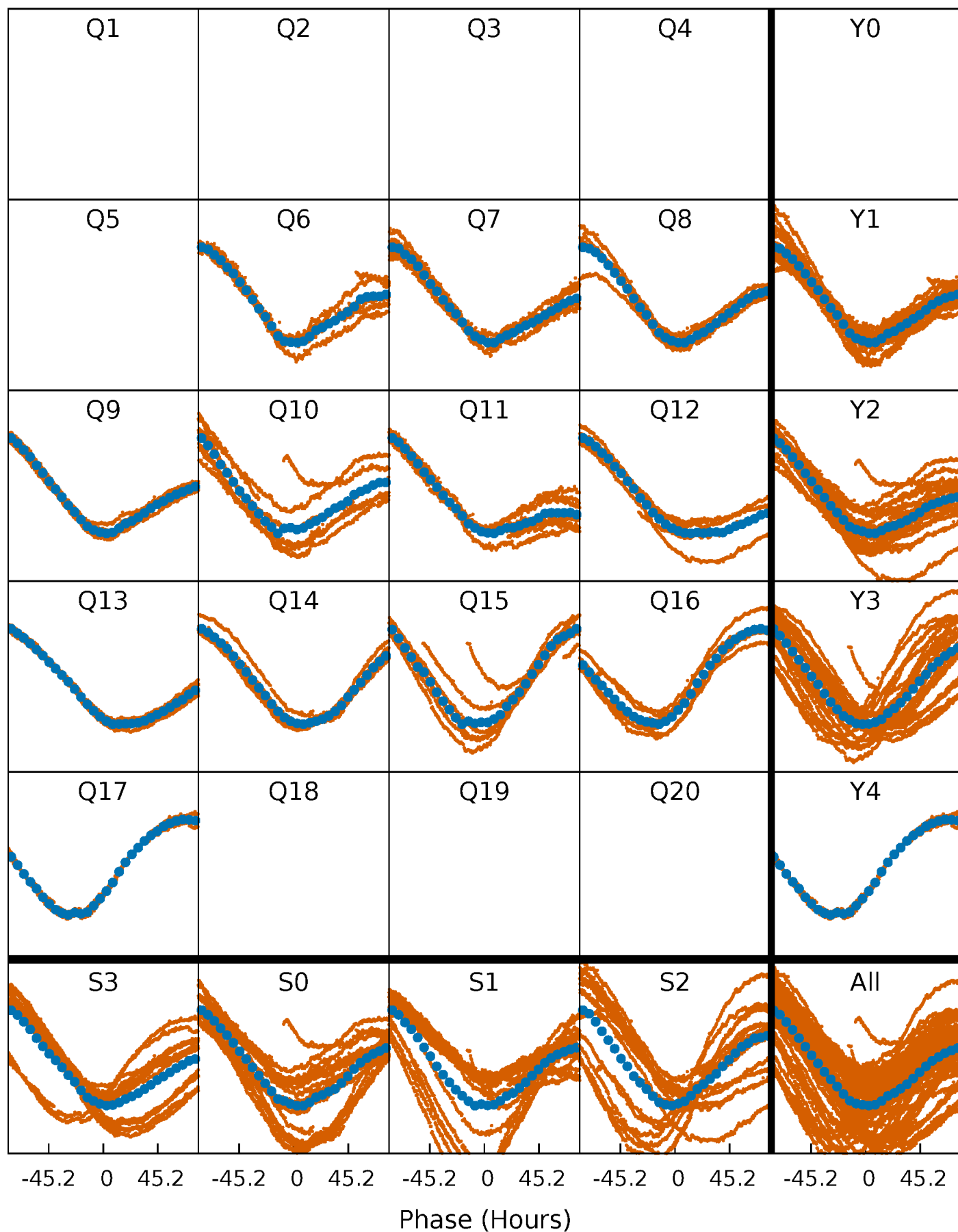


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



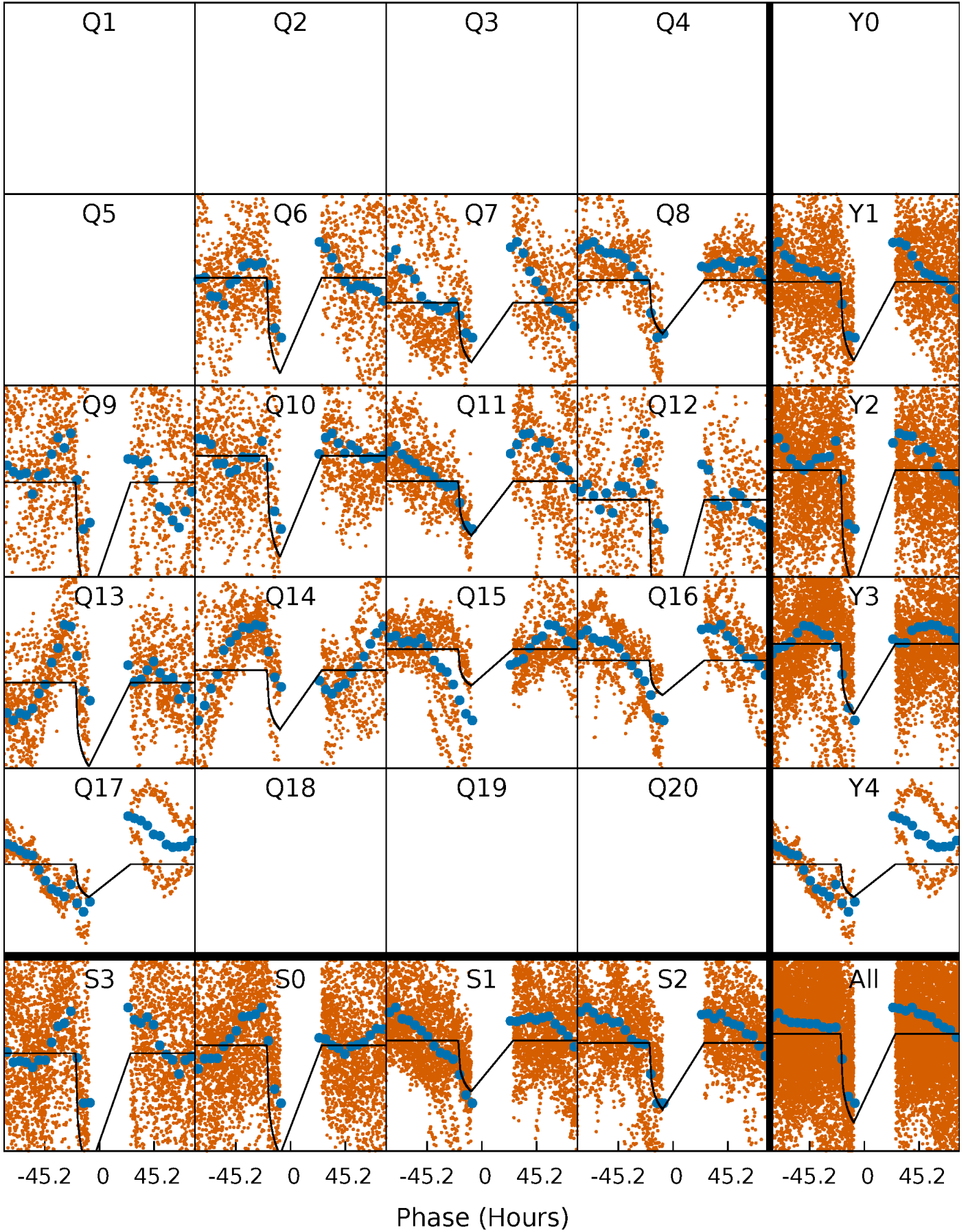
PDC Quarter-Phased Transit Curves

TCE 002570281-02 P= 14.471154 Days $T_0=145.582466$ (BKJD)



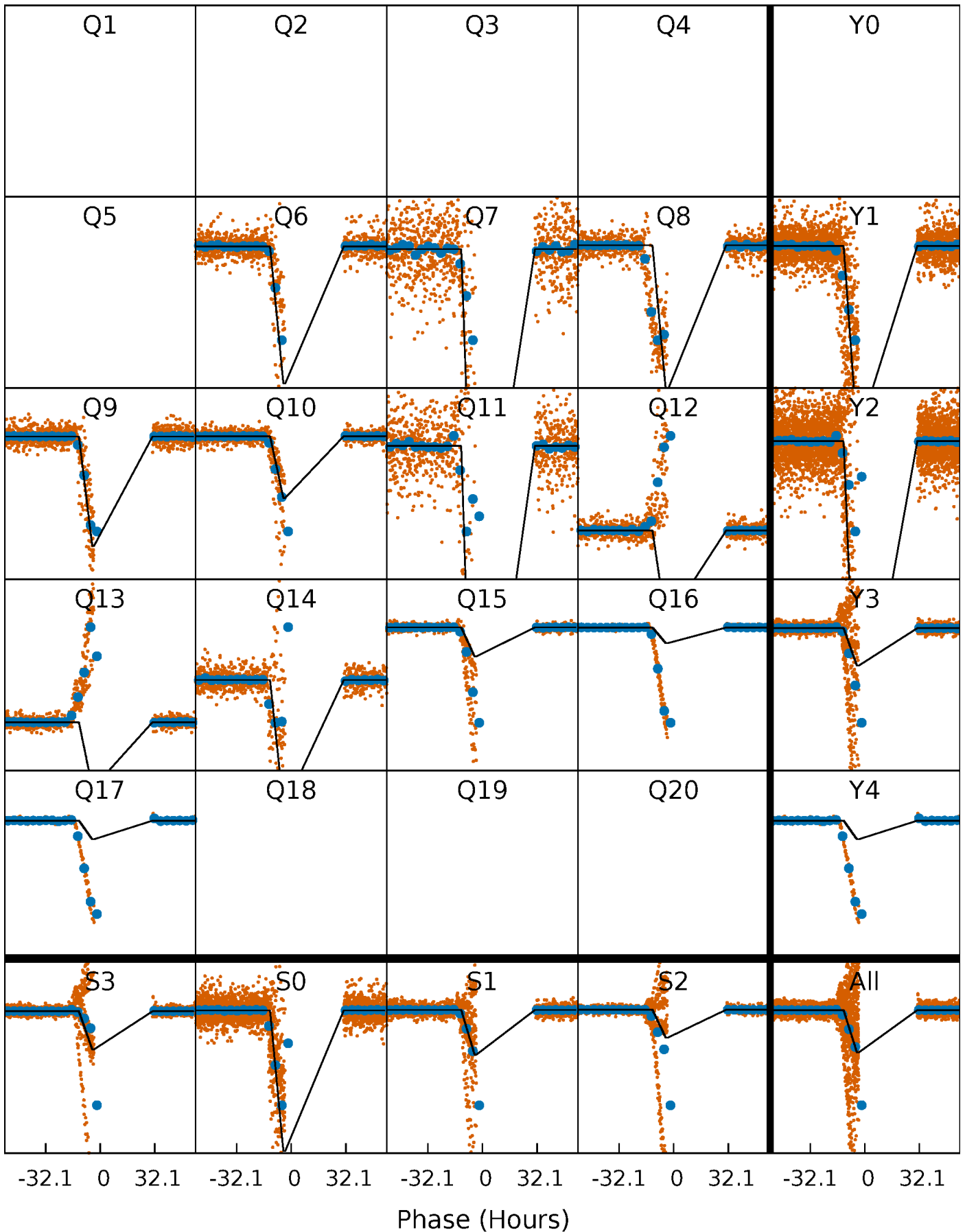
DV Quarter-Phased Transit Curves

TCE 002570281-02 P= 14.471154 Days $T_0=145.582466$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

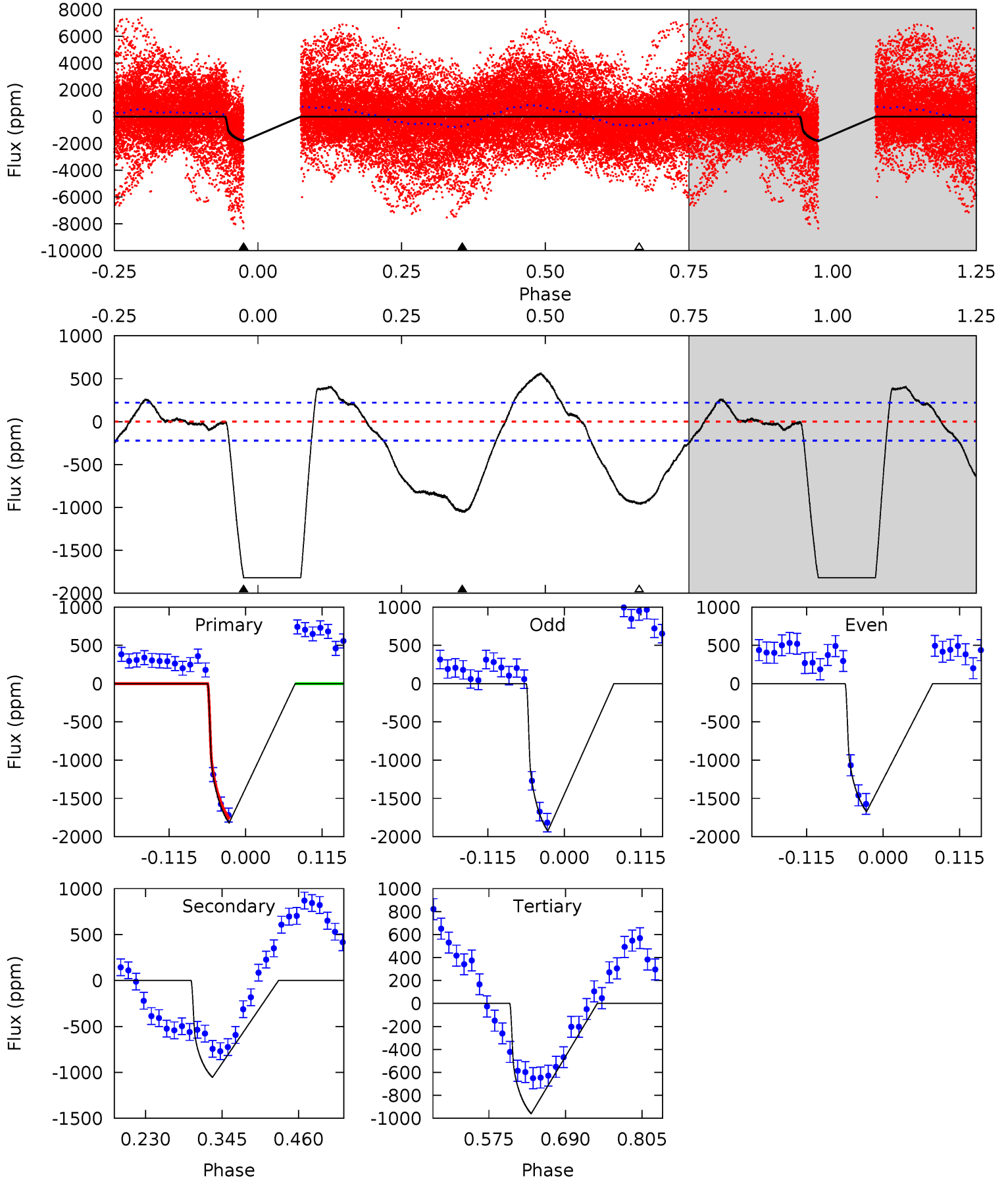
TCE 002570281-02 P= 14.471101 Days $T_0=145.373051$ (BKJD)



DV Model-Shift Uniqueness Test

002570281-02, $P = 14.471154$ Days, $E = 145.582466$ Days

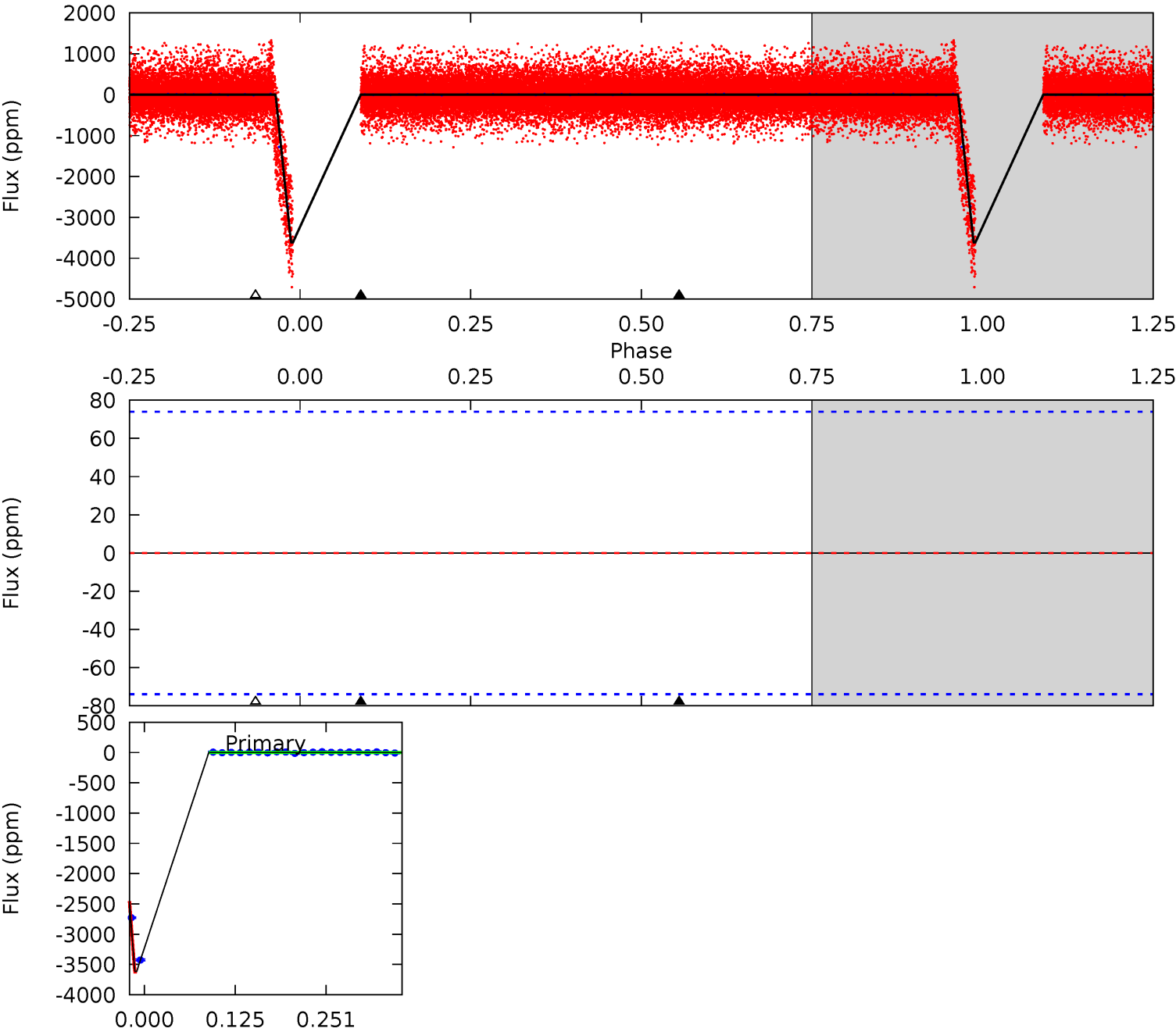
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|-----|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|-----|-------|-----|
| 37.3 | 21.6 | 19.7 | 0 | 4.54 | 1.58 | 8.87 | 17.6 | 37.3 | 1.94 | 21.6 | 2.62 | 0 | 0.24 | 0 |



Alt Model-Shift Uniqueness Test

002570281-02, P = 14.471101 Days, E = 145.373051 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|-----|-----|-----|-----|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|-----|-------|-----|
| 0 | 0 | 0 | 0 | 4.52 | 1.53 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |



Stellar Parameters For KIC 002570281

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | R (R_{\odot}) | $M(M_{\odot})$ | ρ_{\star} ($\text{g}\cdot\text{cm}^{-3}$) |
|--------|----------------------|---------------------------|---------------------------|----------------------------|---------------------------|--------------------------------------------------|
| | 4825^{+113}_{-170} | $2.644^{+0.518}_{-0.185}$ | $0.070^{+0.200}_{-0.300}$ | $12.066^{+3.131}_{-7.306}$ | $2.338^{+0.680}_{-1.263}$ | $0.002^{+0.013}_{-0.001}$ |
| | +2%/-4% | +20%/-7% | +286%/-429% | +26%/-61% | +29%/-54% | +718%/-52% |
| Source | KIC0 | 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 002570281-02 / KOI

| Detrend | Depth (ppm) | R_p (R_{\oplus}) | T_{max} (K) | T_{obs} (K) | A_{obs} |
|---------|----------------|---------------------------|----------------------|-----------------------|----------------------------|
| DV | -1054 ± 49 | $60.87^{+10.58}_{-19.69}$ | 2565^{+225}_{-337} | 4138^{+125}_{-137} | $4.016^{+3.250}_{-1.123}$ |
| Alt. | -0 ± 16 | $94.44^{+16.19}_{-28.32}$ | 2574^{+215}_{-342} | -2796^{+207}_{-140} | $-0.000^{+0.029}_{-0.030}$ |

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

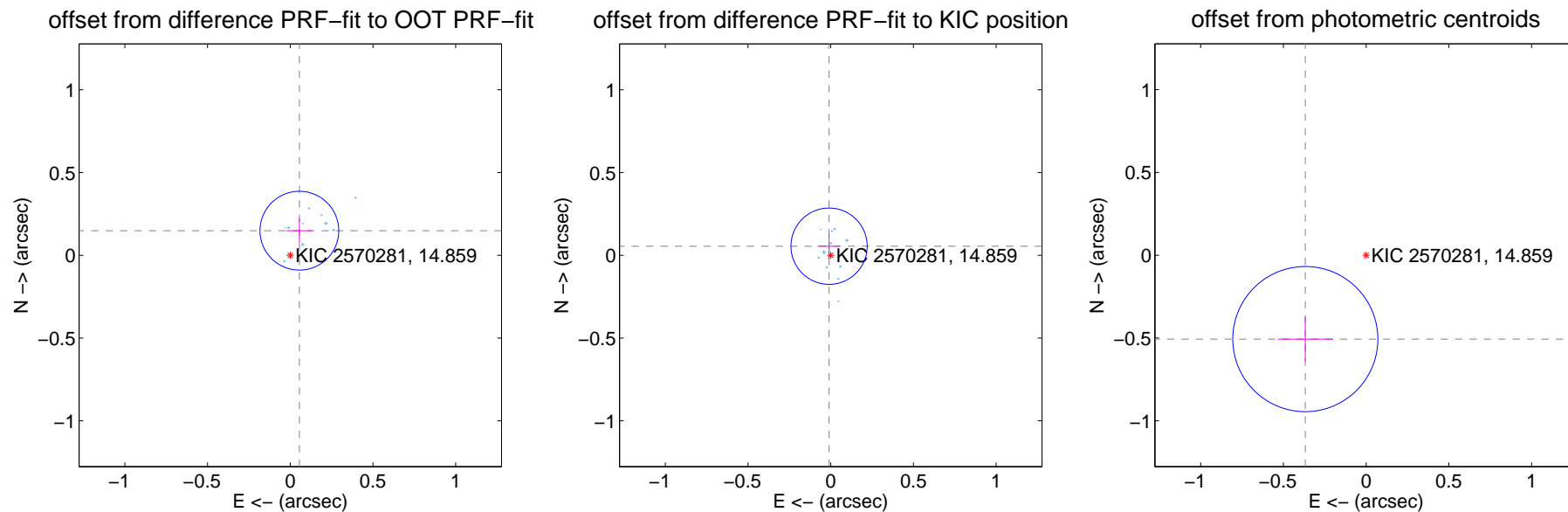
DV Centroid Data

Supplemental centroid analysis for 002570281-02. Kepler magnitude: 14.86. Transit SNR 22.86

There are 12 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.04 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|-----------------------------------------|--------------------|---------------------|--------------------|-------------------|
| PRF-fit source offset from OOT | 0.158 ± 0.079 | 2.00 | -0.055 ± 0.077 | 0.148 ± 0.075 |
| PRF-fit source offset from KIC position | 0.056 ± 0.077 | 0.73 | 0.010 ± 0.068 | 0.055 ± 0.077 |
| photometric centroid source offset | 0.63 ± 0.15 | 4.28 | 0.37 ± 0.17 | -0.51 ± 0.13 |

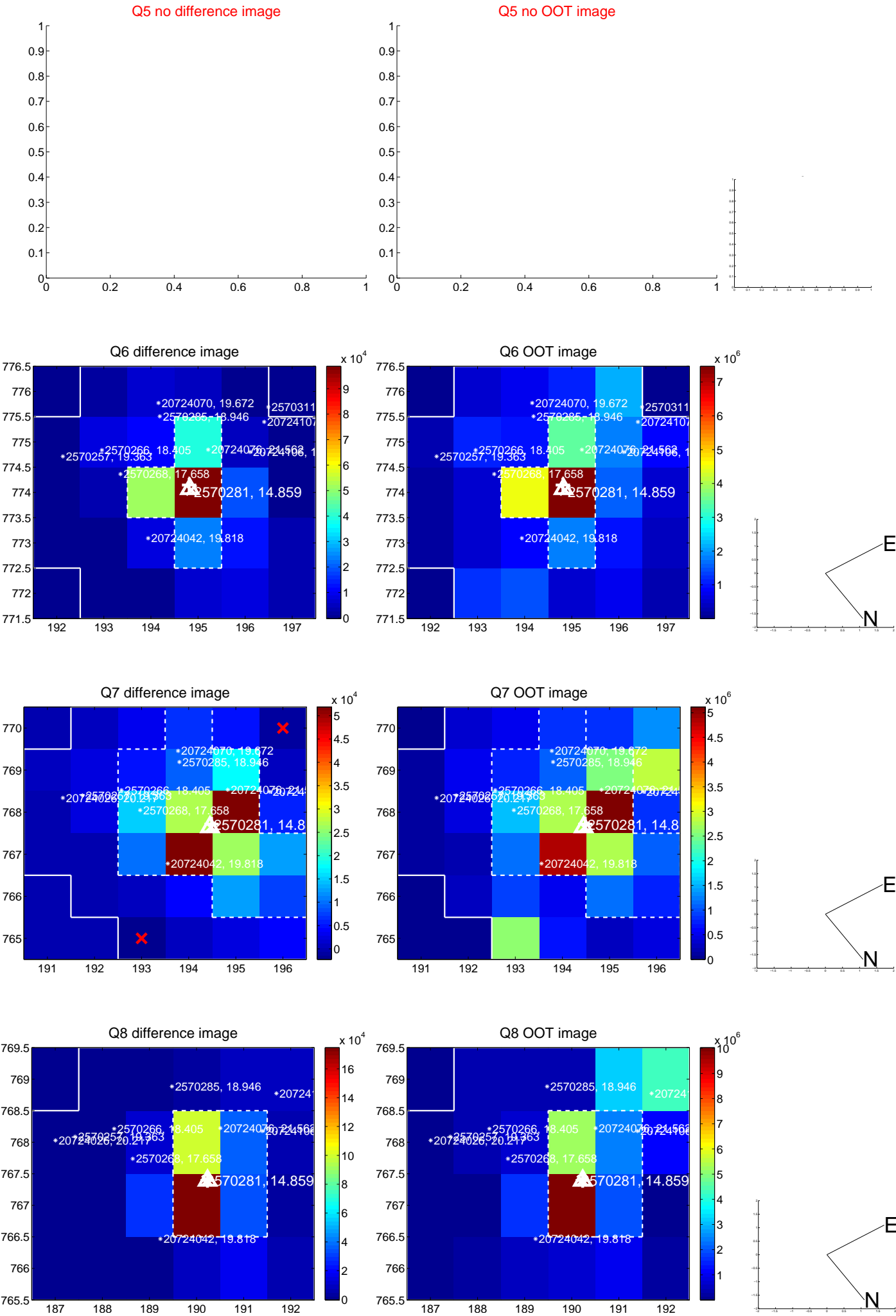


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

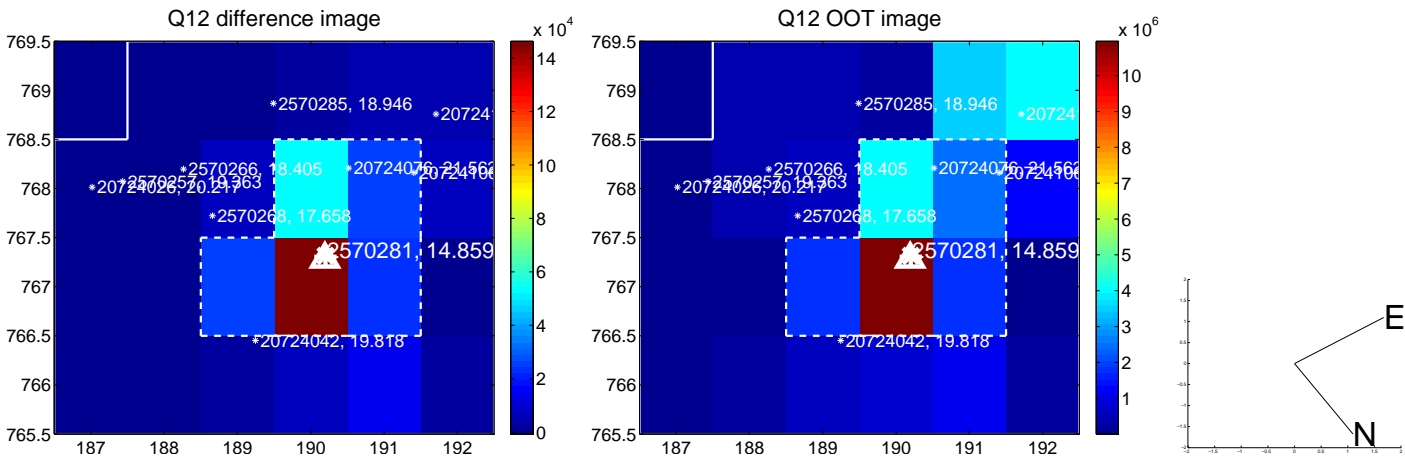
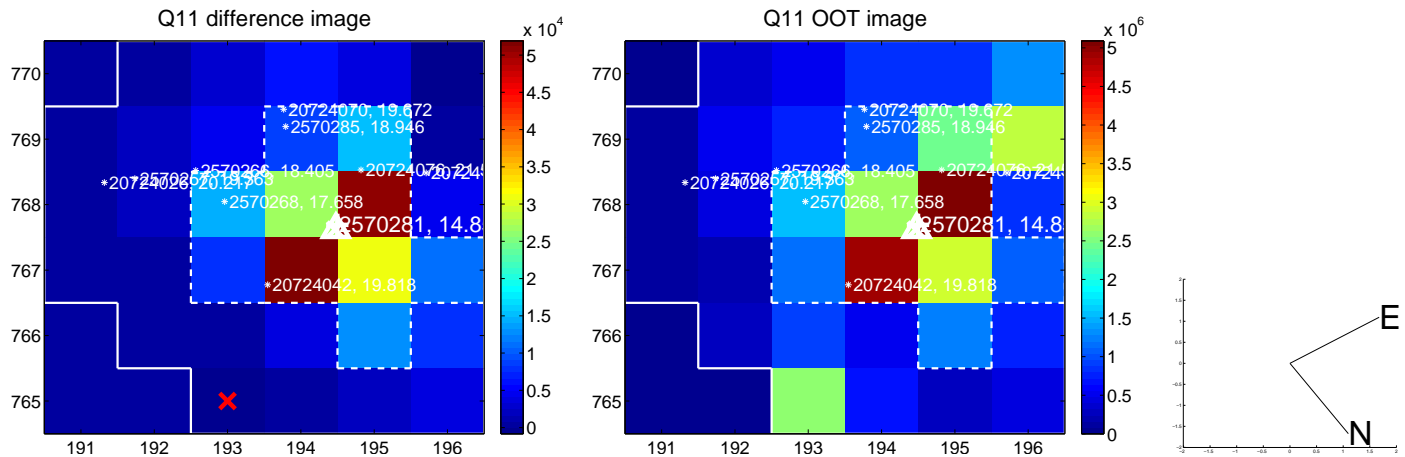
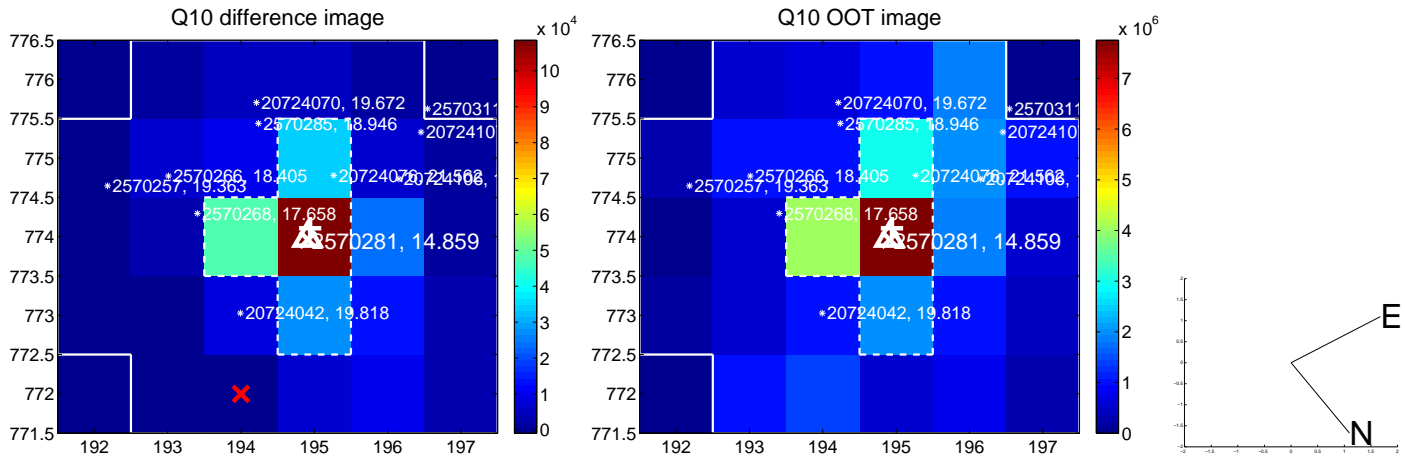
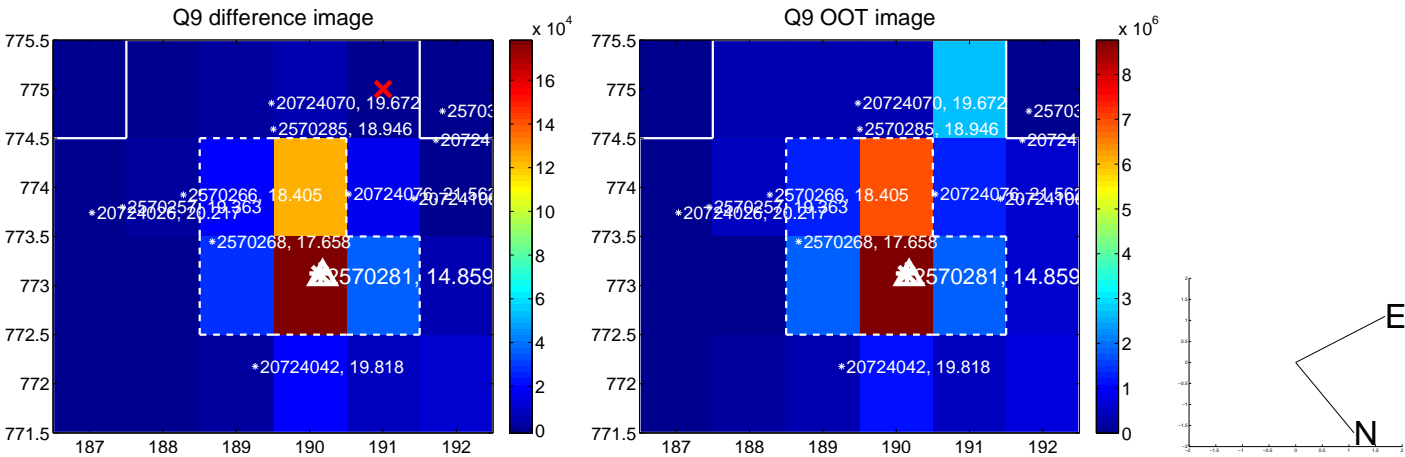
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



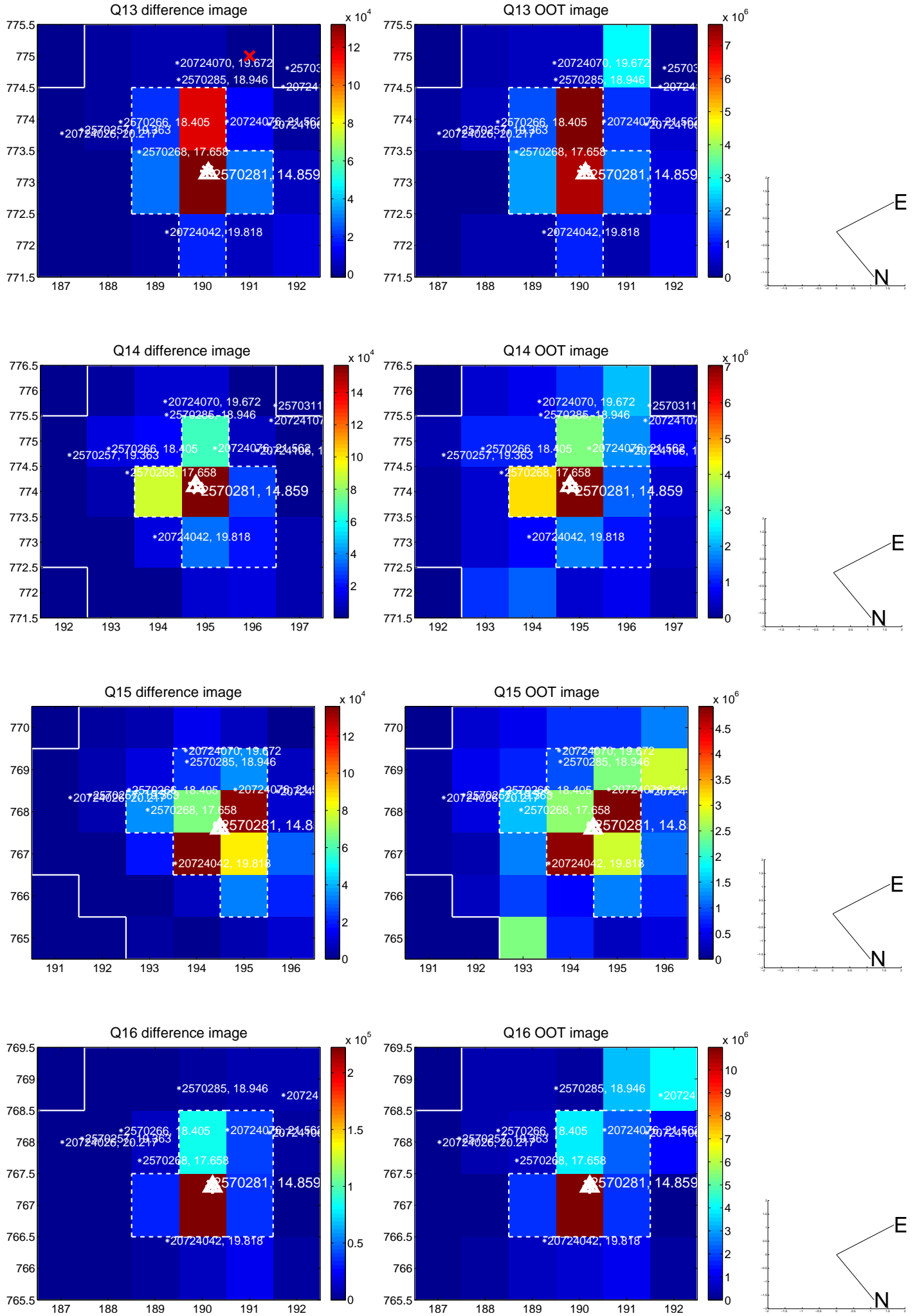
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



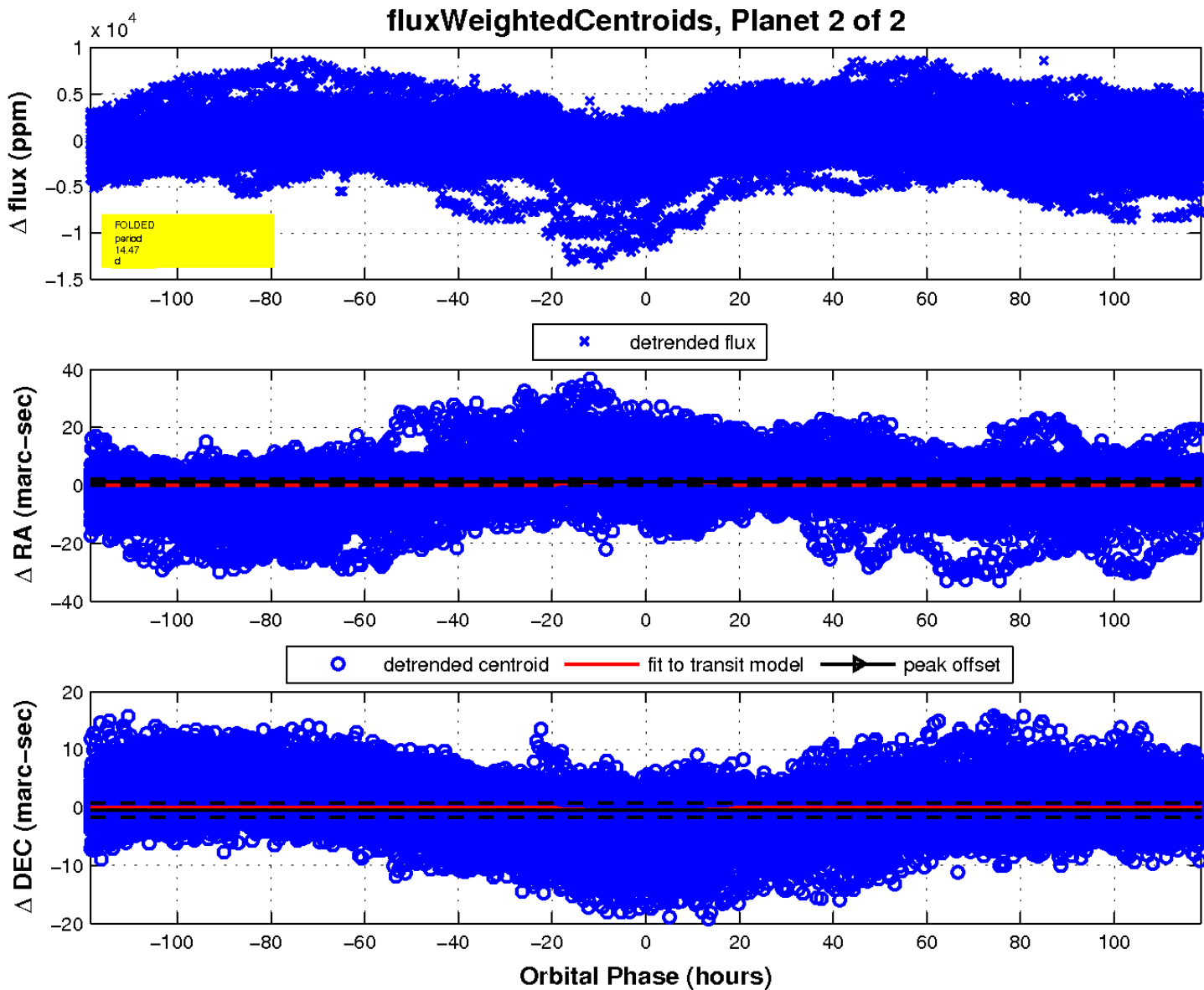
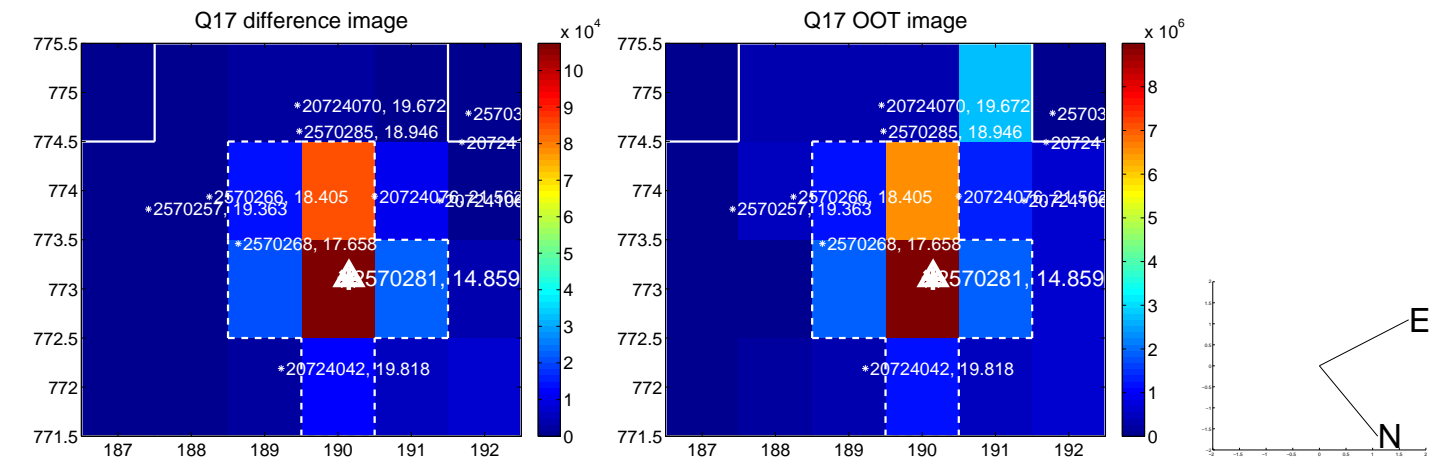
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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



UKIRT Image

