

KIC 002161949

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}) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|-----|-----|-----------------------------|-----------------|------------------------|------------------------|
| 002161949-01 | OBS | 6259.01 | 4.781150 | 131.703185 | 99.2 | 2.636 | 8.1 | 8.7 | 1.11 | 5683 | 1.34 | 386.67 |
| 002161949-02 | OBS | 6259.02 | 7.188377 | 133.176505 | 113.7 | 3.402 | 7.6 | 8.9 | 1.11 | 5683 | 1.27 | 224.50 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|--------------|
| 002161949-01 | OBS | PC | 0.81 | 0 | 0 | 0 | 0 | CENT_KIC_POS |
| 002161949-02 | OBS | PC | 0.97 | 0 | 0 | 0 | 0 | CENT_KIC_POS |

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

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

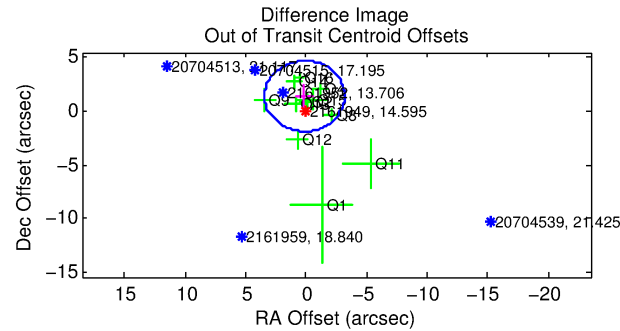
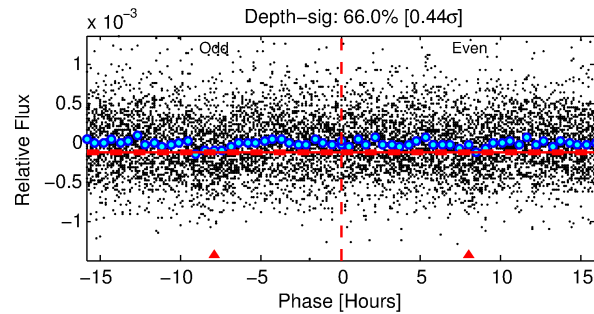
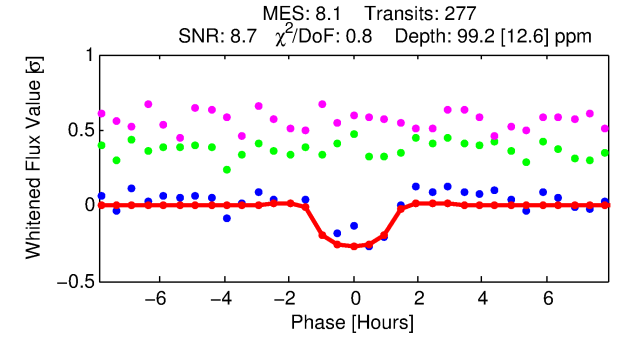
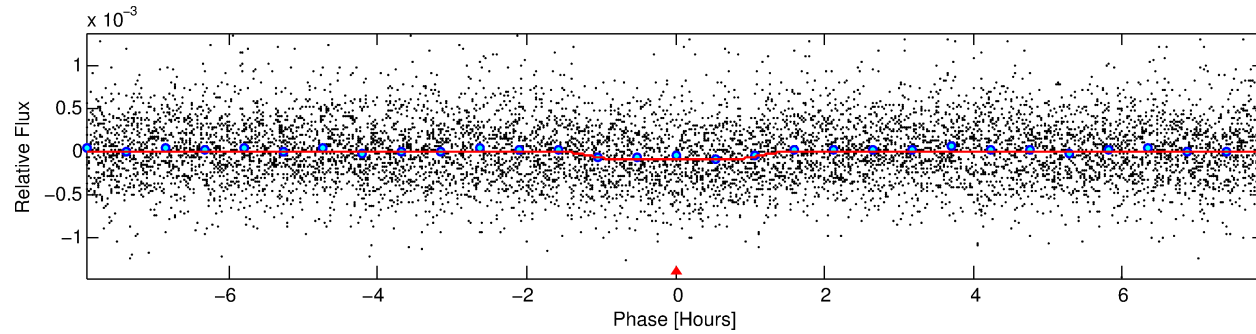
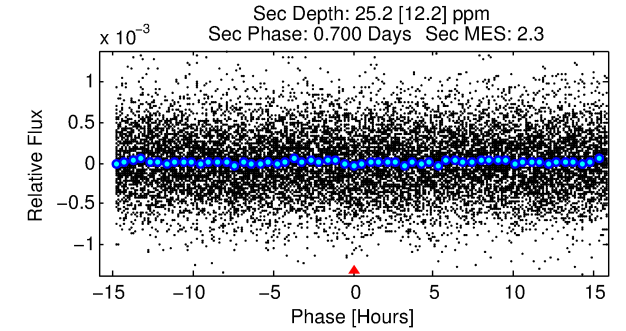
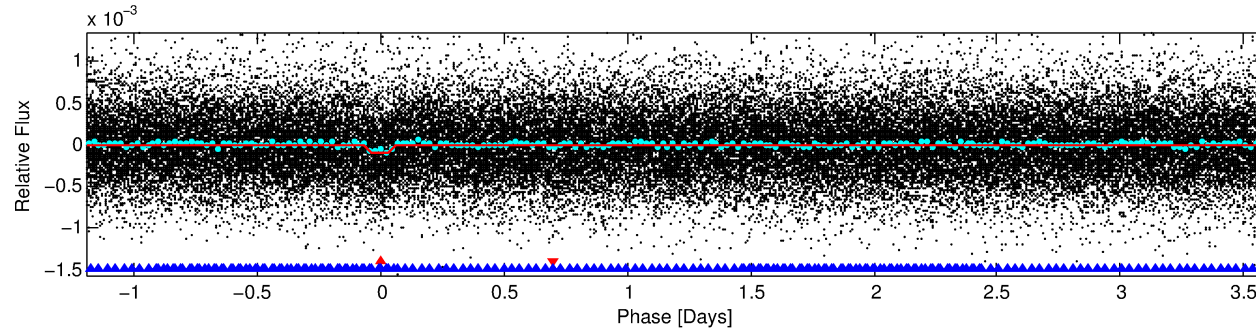
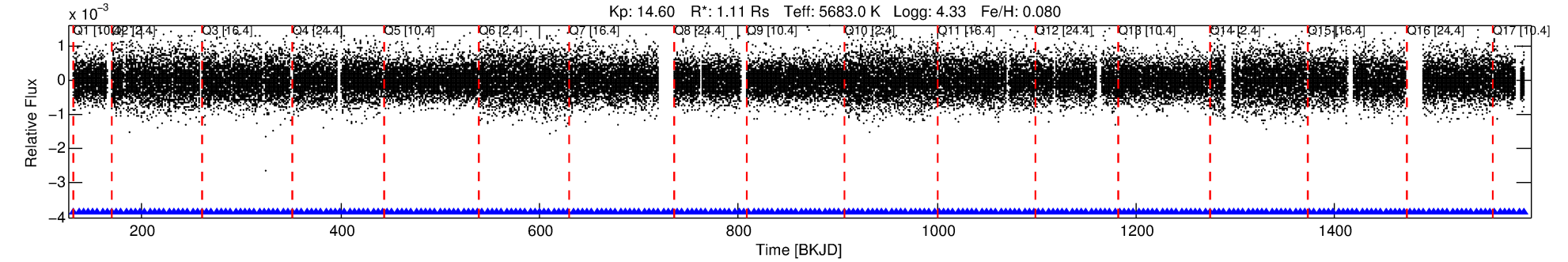
See http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col for comment definitions.

Ephemeris Match Information For 002161949-01

No Significant Match Found

DV One-Page Summary

KIC: 2161949 Candidate: 1 of 2 Period: 4.781 d
KOI: K06259.01 Corr: 0.973



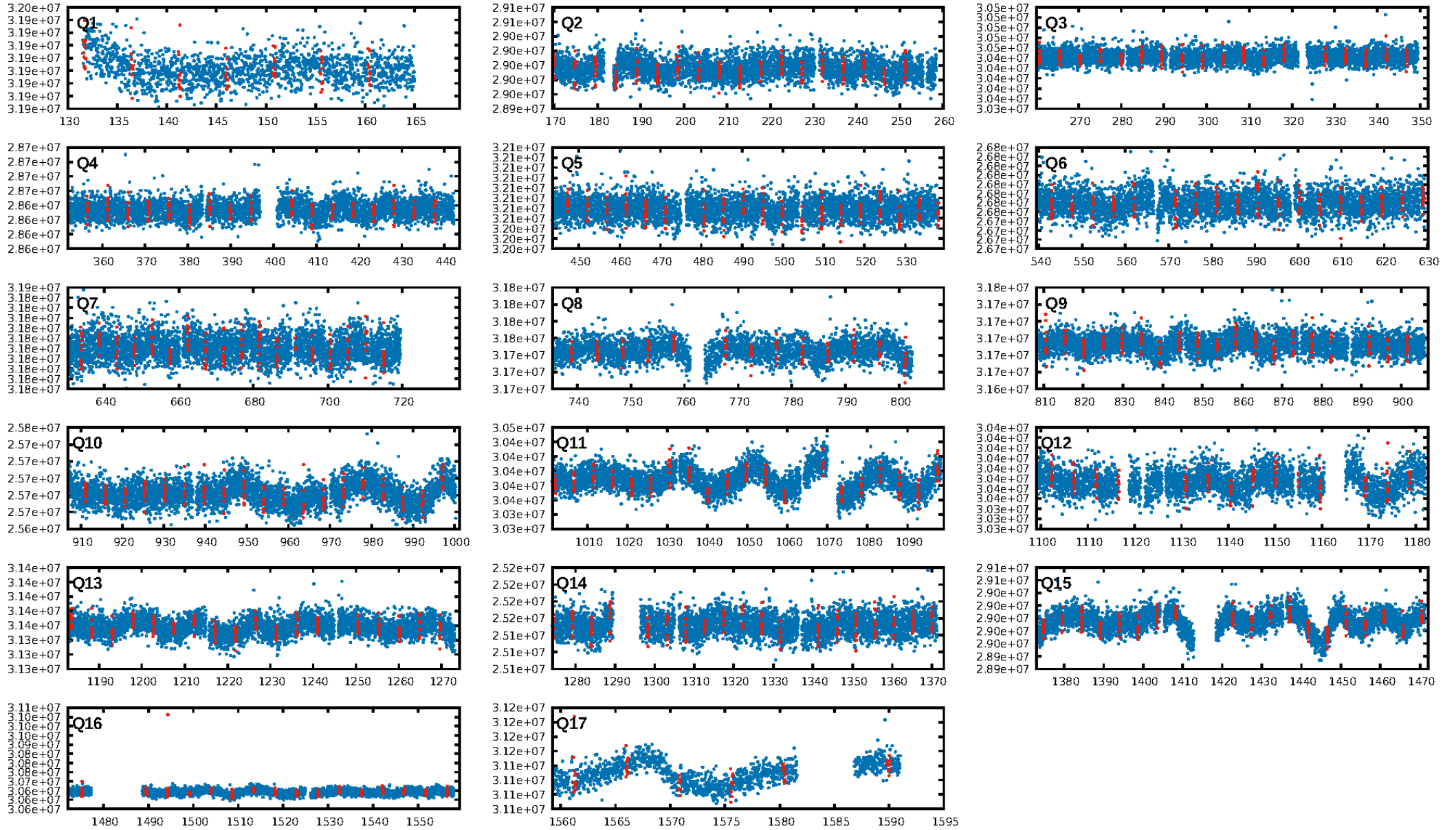
DV Fit Results:

Period = 4.78115 [0.00004] d
Epoch = 131.7032 [0.0059] BKJD
Rp/R* = 0.0110 [0.0092]
a/R* = 6.17 [23.91]
b = 0.91 [0.77]
Seff = 386.67 [138.61]
Teff = 1131 [101] K
Rp = 1.34 [1.18] Re
a = 0.0548 [0.0129] AU
Ag = 23.19 [41.17] [0.54σ]
Teffp = 3836 [1674] K [1.61σ]

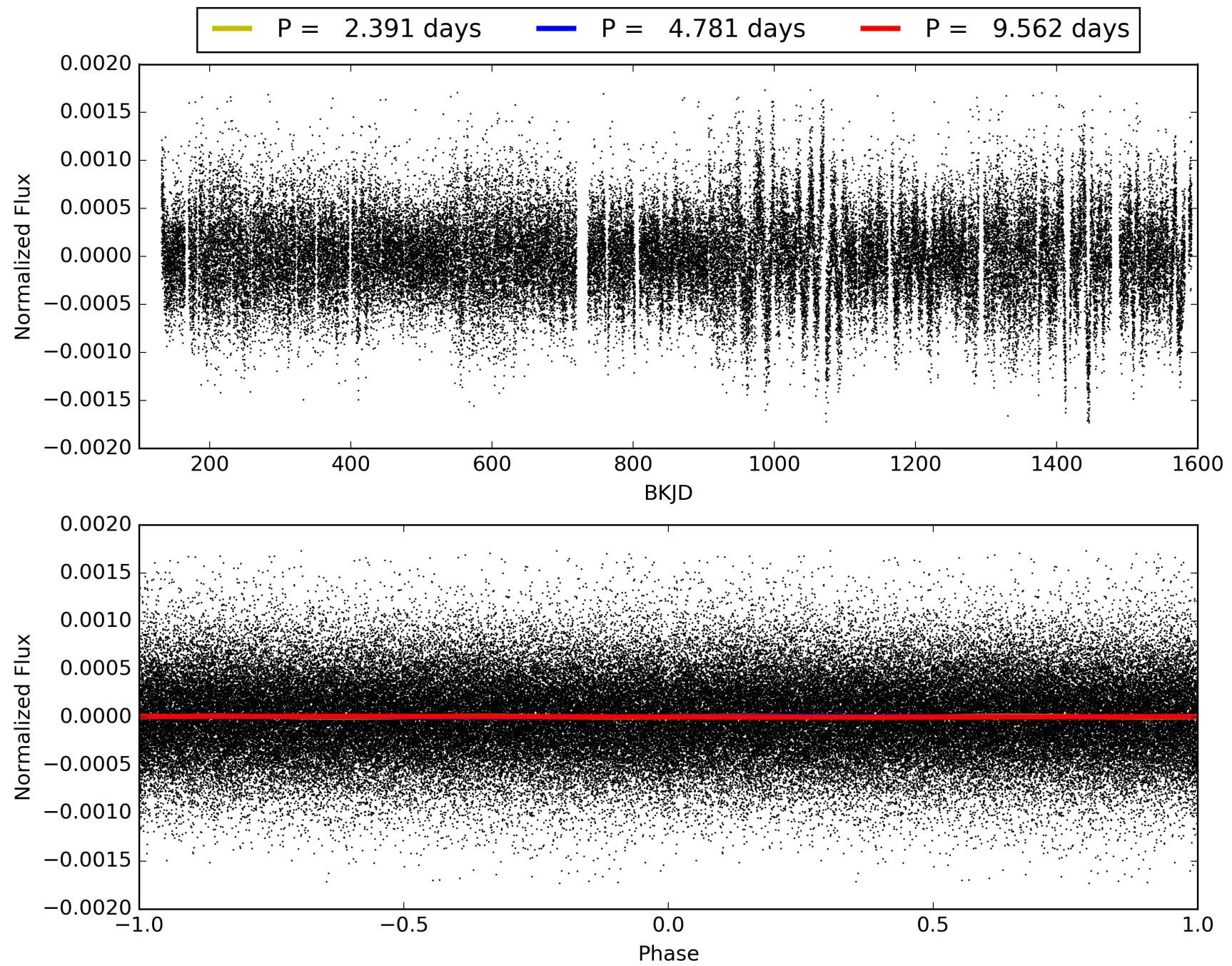
DV Diagnostic Results:

ShortPeriod-sig: N/A
LongPeriod-sig: 100.0% [13.42σ]
ModelChiSquare2-sig: N/A
ModelChiSquareGof-sig: N/A
Bootstrap-pfa: 3.37e-16
RollingBand-fgt: 1.00 [264/264]
GhostDiagnostic-chr: 2.084
Centroid-sig: 50.8%
Centroid-so: 1.233 arcsec [0.90σ]
OotOffset-rm: 1.414 arcsec [1.29σ]
KicOffset-rm: 1.810 arcsec [1.48σ]
OotOffset-st: 2/2/4/3 [11]
KicOffset-st: 2/2/4/3 [11]
DiffImageQuality-fgm: 0.64 [7/11]
DiffImageOverlap-fno: 1.00 [17/17]

TCE 002161949-01, PDC Light Curves

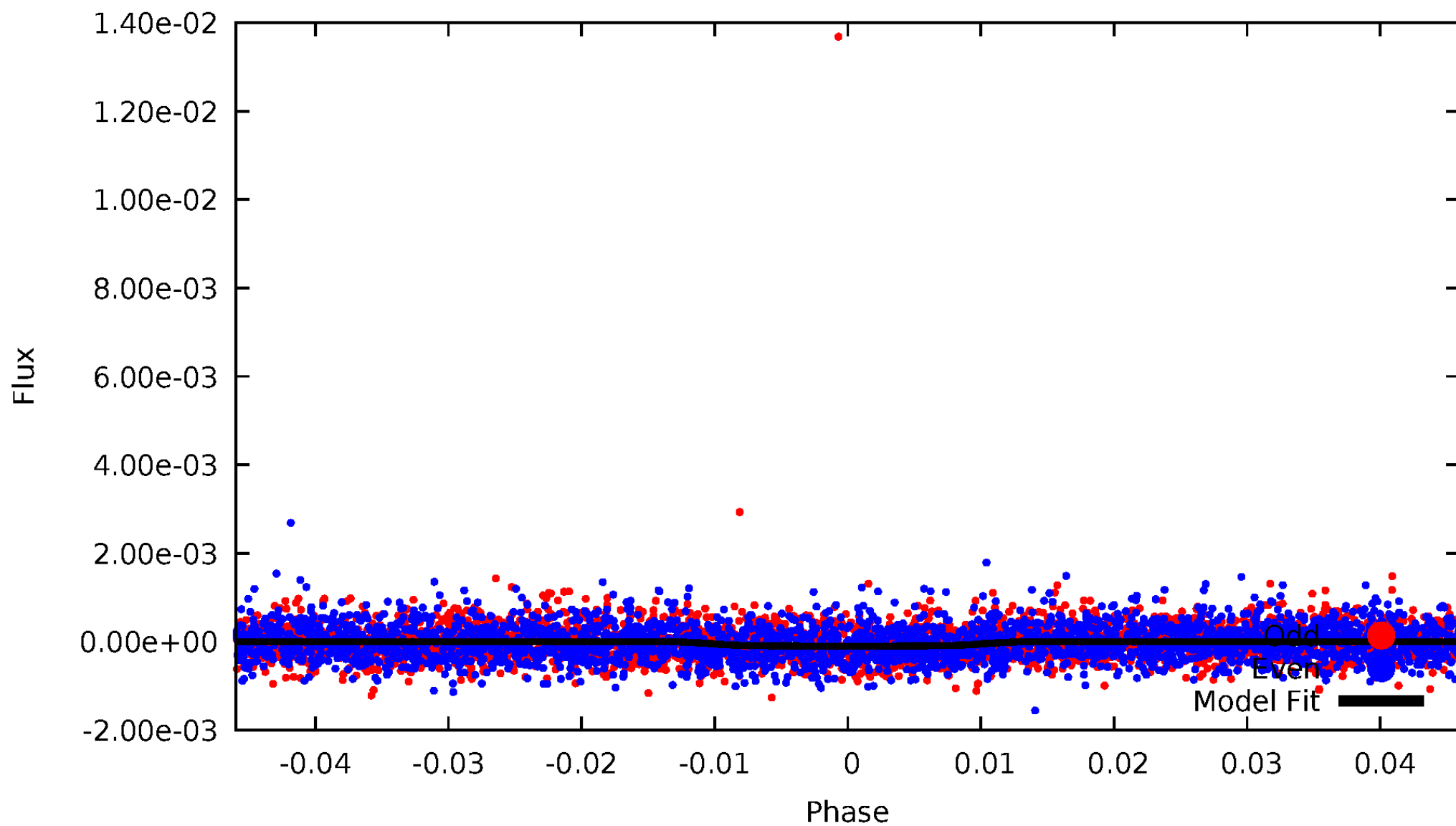


TCE 002161949-01



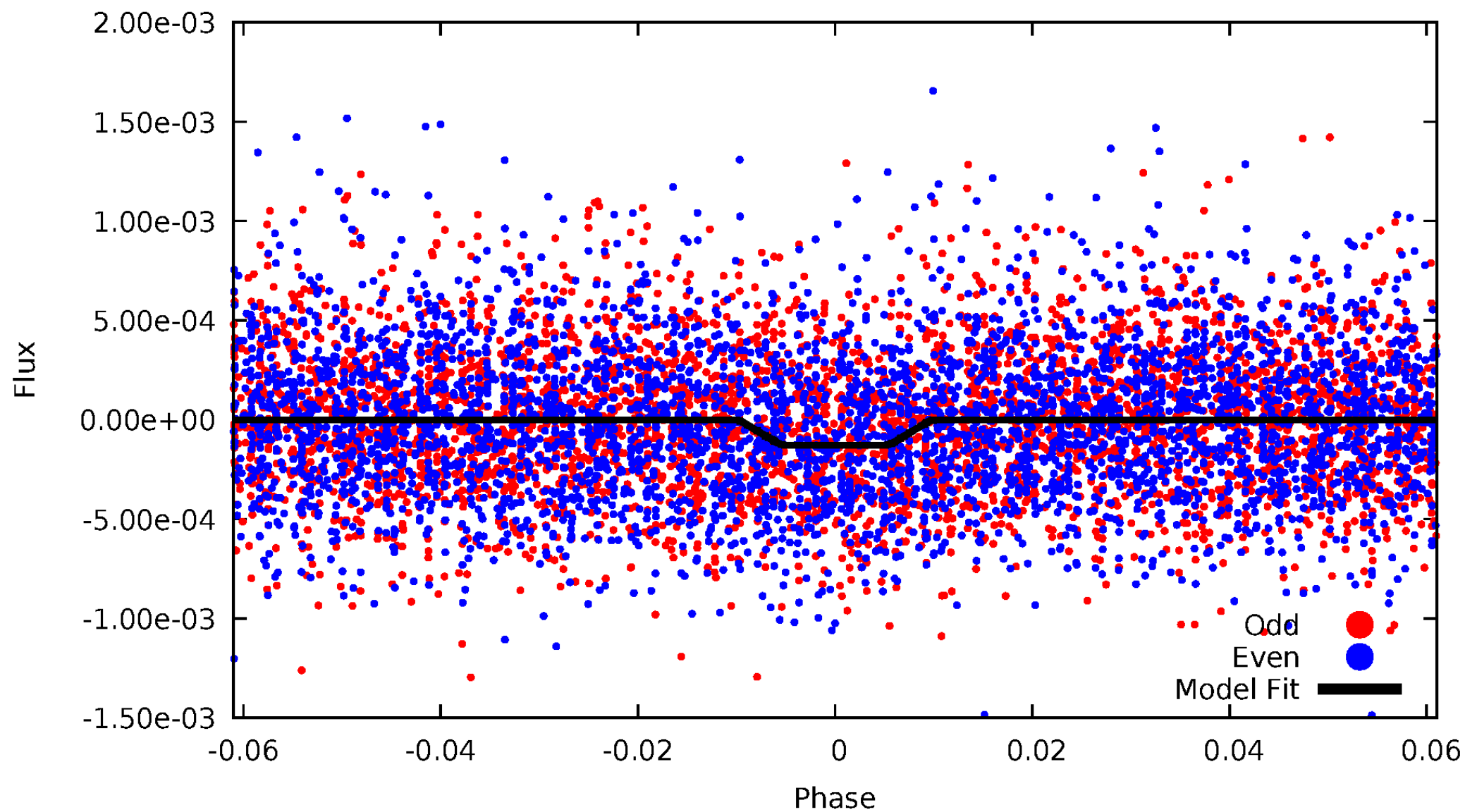
DV Odd/Even

TCE 002161949-01



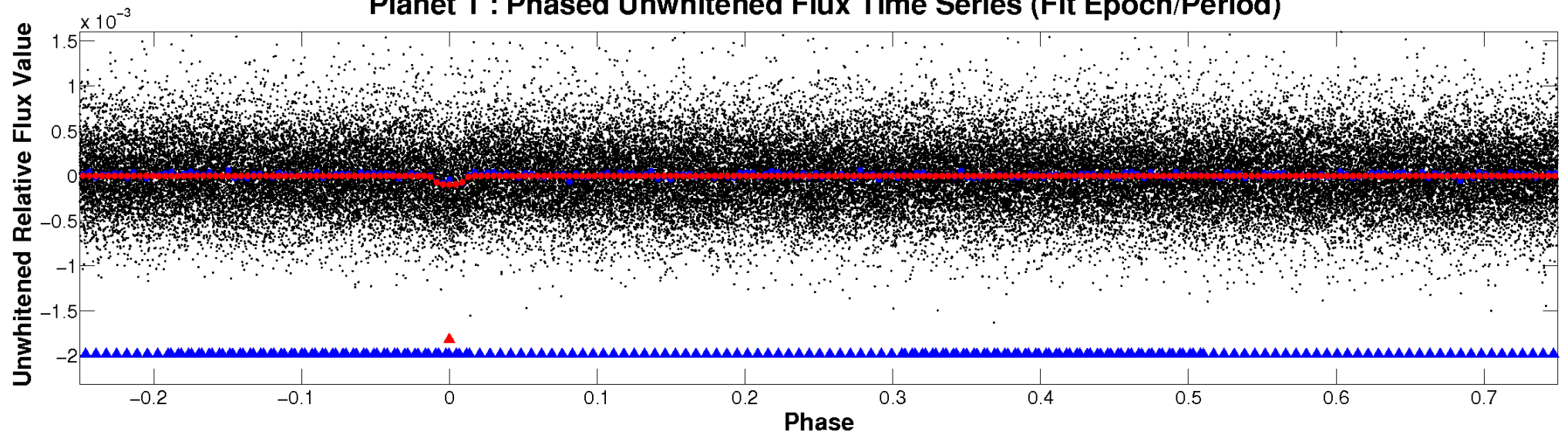
ALT Odd/Even

TCE 002161949-01

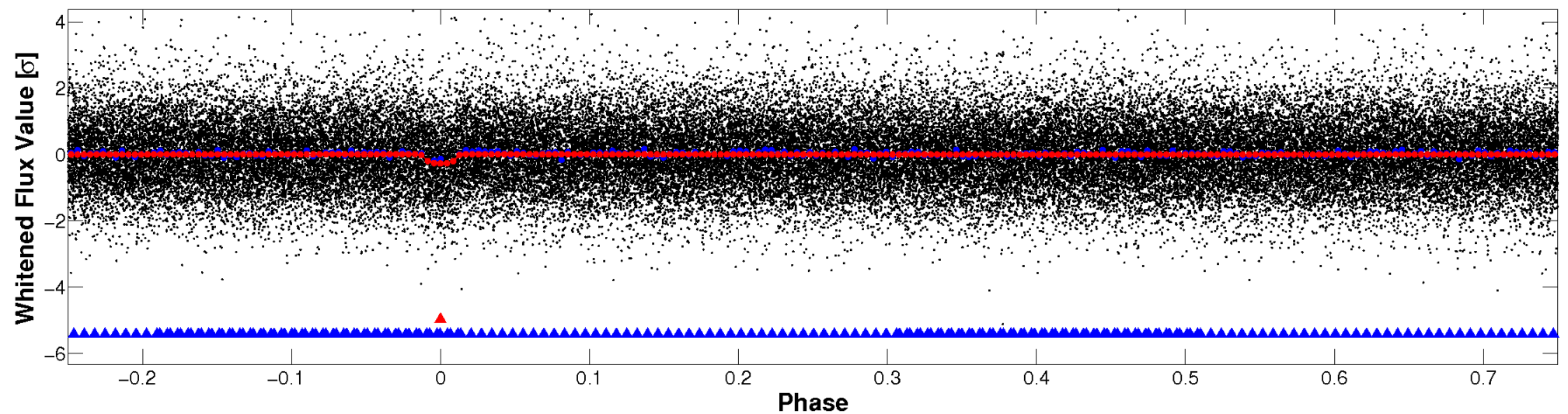


Non-Whitened Vs. Whitened Light Curve

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

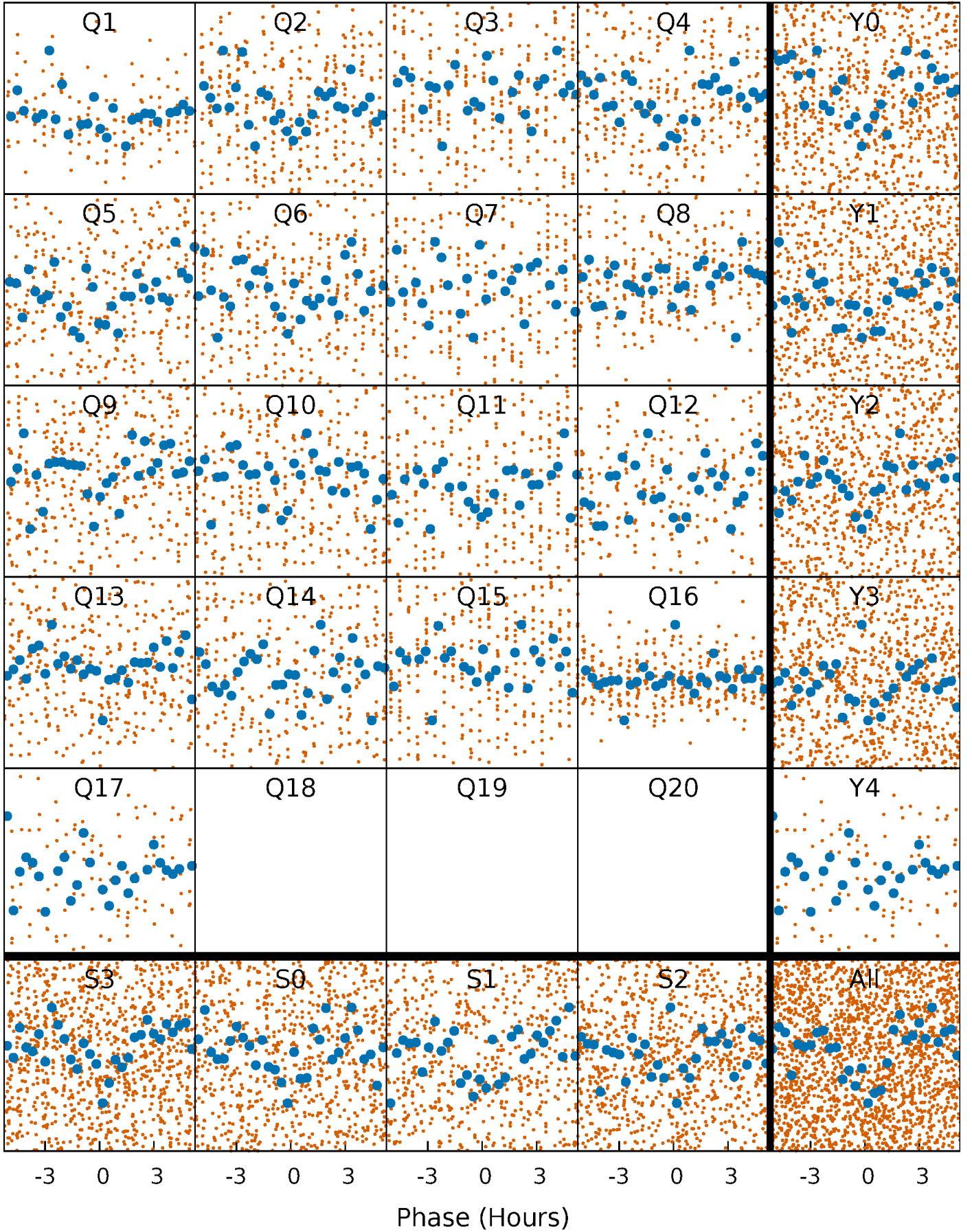


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



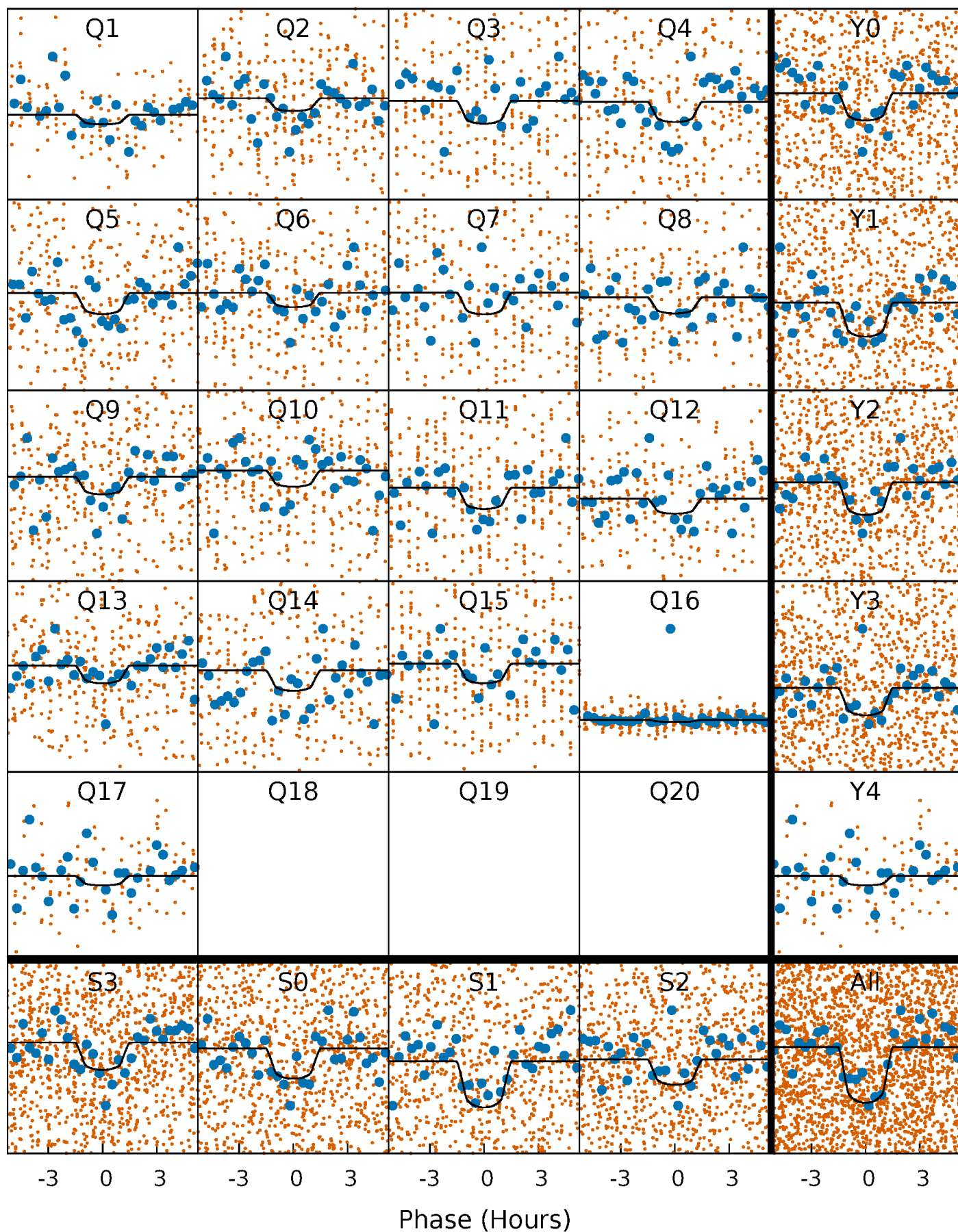
PDC Quarter-Phased Transit Curves

TCE 002161949-01 P= 4.781150 Days $T_0=131.703185$ (BKJD)



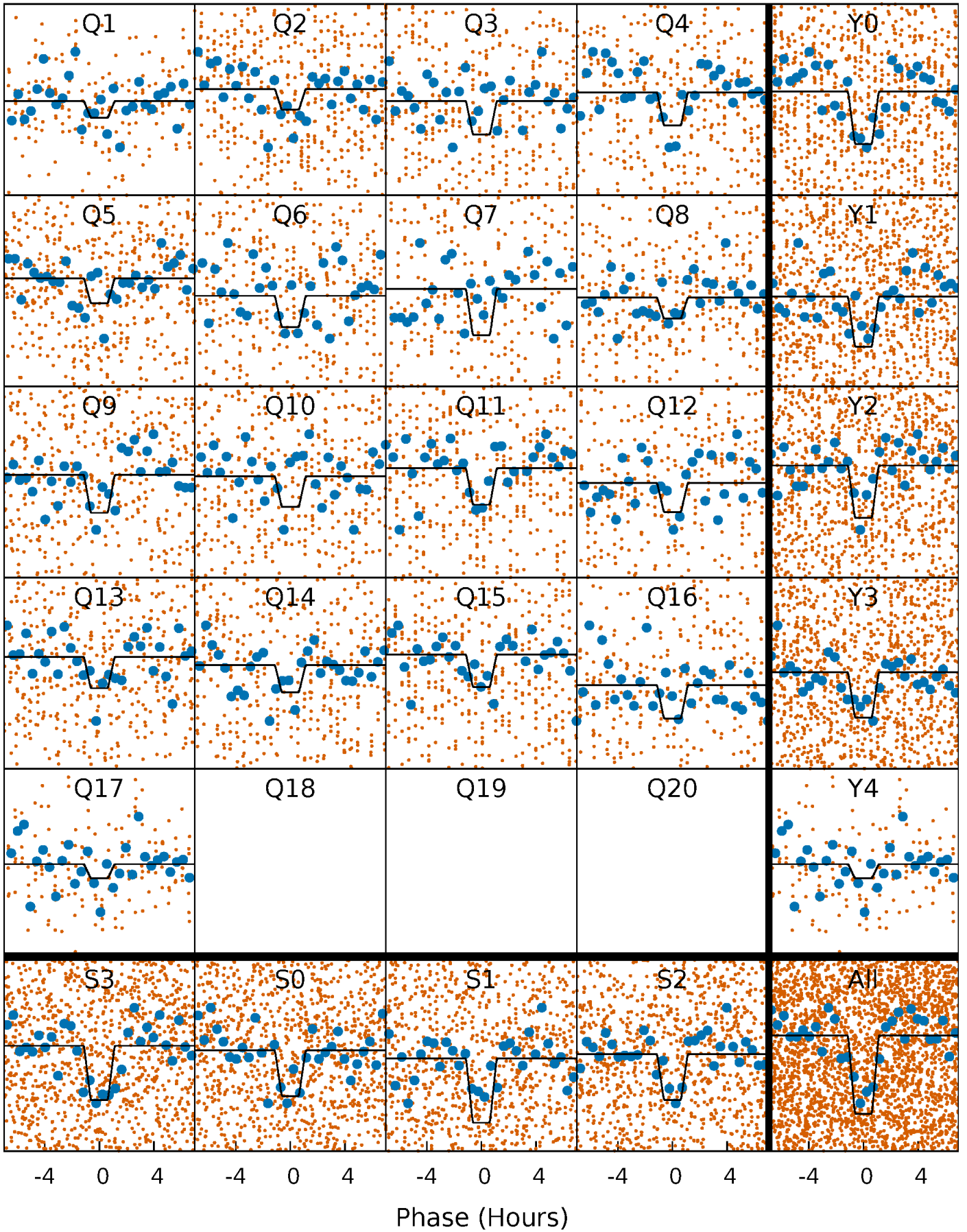
DV Quarter-Phased Transit Curves

TCE 002161949-01 P= 4.781150 Days $T_0=131.703185$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

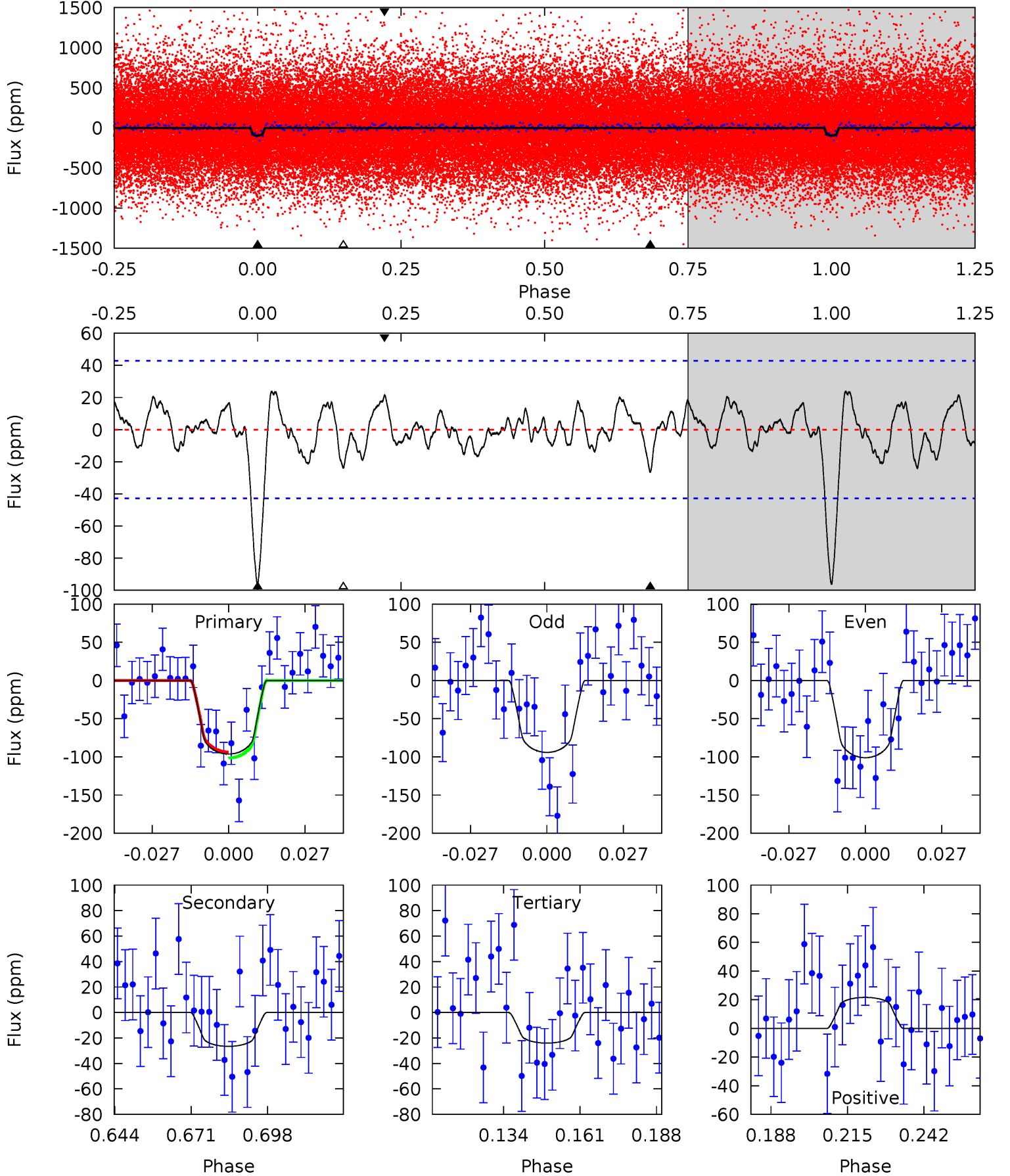
TCE 002161949-01 P= 4.781251 Days $T_0=131.688078$ (BKJD)



DV Model-Shift Uniqueness Test

002161949-01, P = 4.781150 Days, E = 126.922035 Days

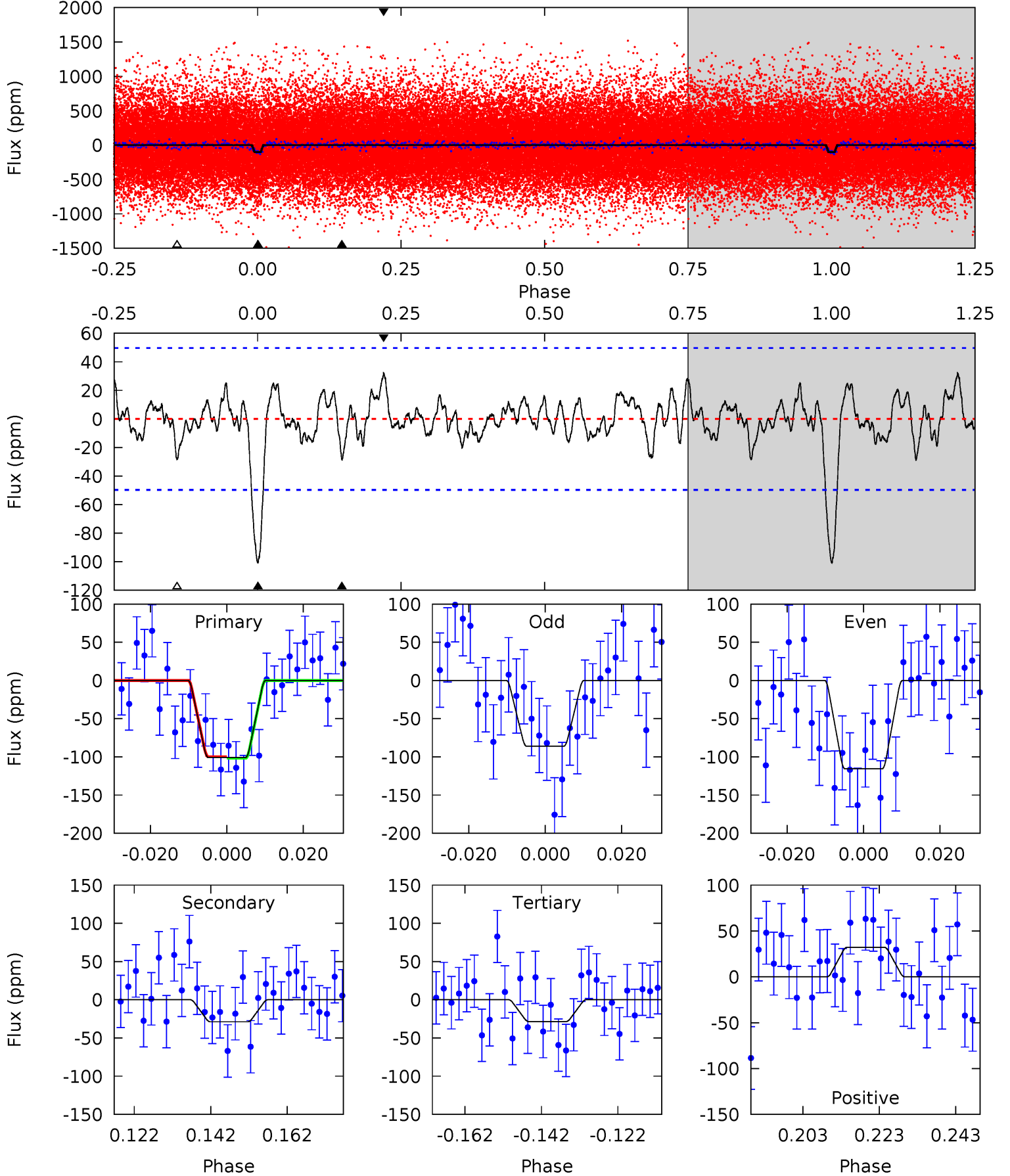
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 10.9 | 3.00 | 2.71 | 2.45 | 4.83 | 2.21 | 1.10 | 8.16 | 8.42 | 0.29 | 0.56 | 0.39 | 0.80 | 0.20 | 0.44 |



Alt Model-Shift Uniqueness Test

002161949-01, P = 4.781251 Days, E = 126.906827 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 9.92 | 2.84 | 2.81 | 3.17 | 4.89 | 2.32 | 1.06 | 7.12 | 6.76 | 0.04 | -0.32 | 1.46 | 0.88 | 0.24 | 0.10 |



Stellar Parameters For KIC 002161949

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | $R (R_{\odot})$ | $M(M_{\odot})$ | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|----------------------|---------------------------|---------------------------|---------------------------|---------------------------|---|
| | 5683^{+154}_{-154} | $4.326^{+0.170}_{-0.187}$ | $0.080^{+0.250}_{-0.300}$ | $1.115^{+0.310}_{-0.207}$ | $0.959^{+0.120}_{-0.090}$ | $0.976^{+0.720}_{-0.476}$ |
| | +3%/-3% | +4%/-4% | +312%/-375% | +28%/-19% | +13%/-9% | +74%/-49% |
| 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 002161949-01 / KOI 6259.01

| Detrend | Depth (ppm) | $R_p (R_{\oplus})$ | $T_{max} (K)$ | $T_{obs} (K)$ | A_{obs} |
|---------|--------------|------------------------|----------------------|-----------------------|------------------|
| DV | -27 ± 9 | $1.52^{+1.14}_{-0.87}$ | 1584^{+115}_{-109} | 3961^{+1653}_{-741} | 19^{+94}_{-13} |
| Alt. | -29 ± 10 | $1.59^{+1.06}_{-0.94}$ | 1583^{+109}_{-96} | 3935^{+1686}_{-656} | 18^{+86}_{-12} |

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 $A_{obs} \gg 1.0$

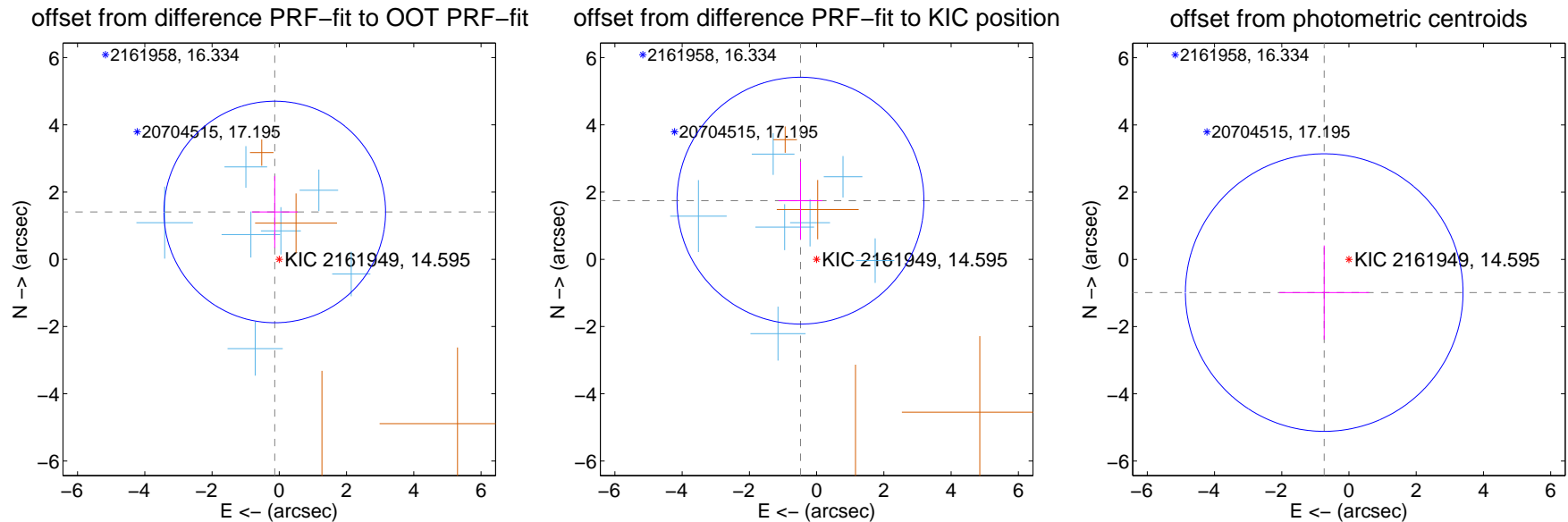
DV Centroid Data

Supplemental centroid analysis for 002161949-01. Kepler magnitude: 14.60. Transit SNR 8.72

There are 7 quarters with good PRF difference image offsets

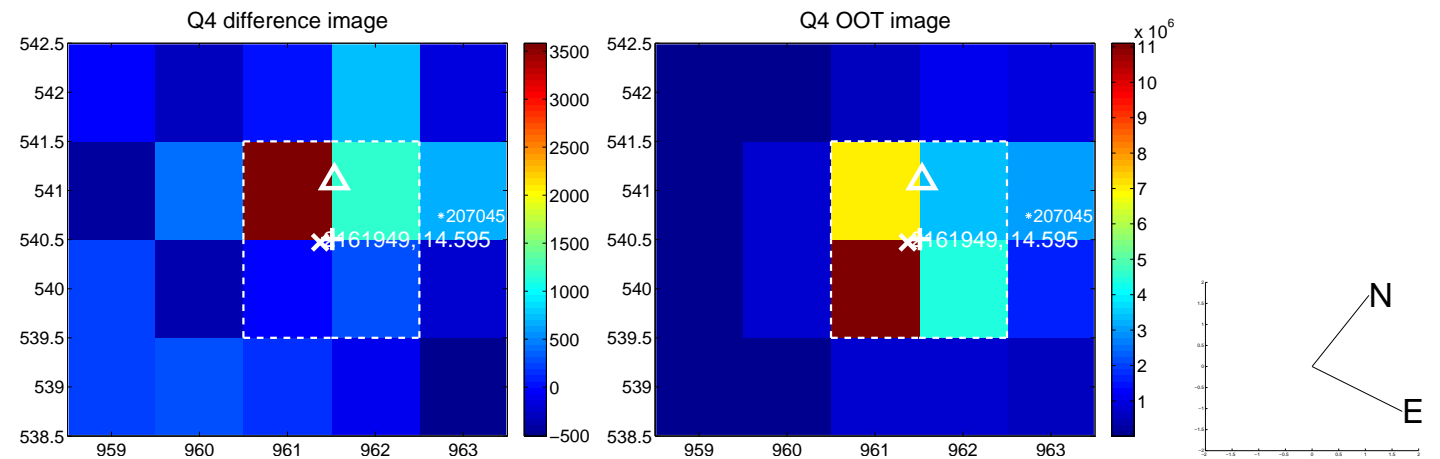
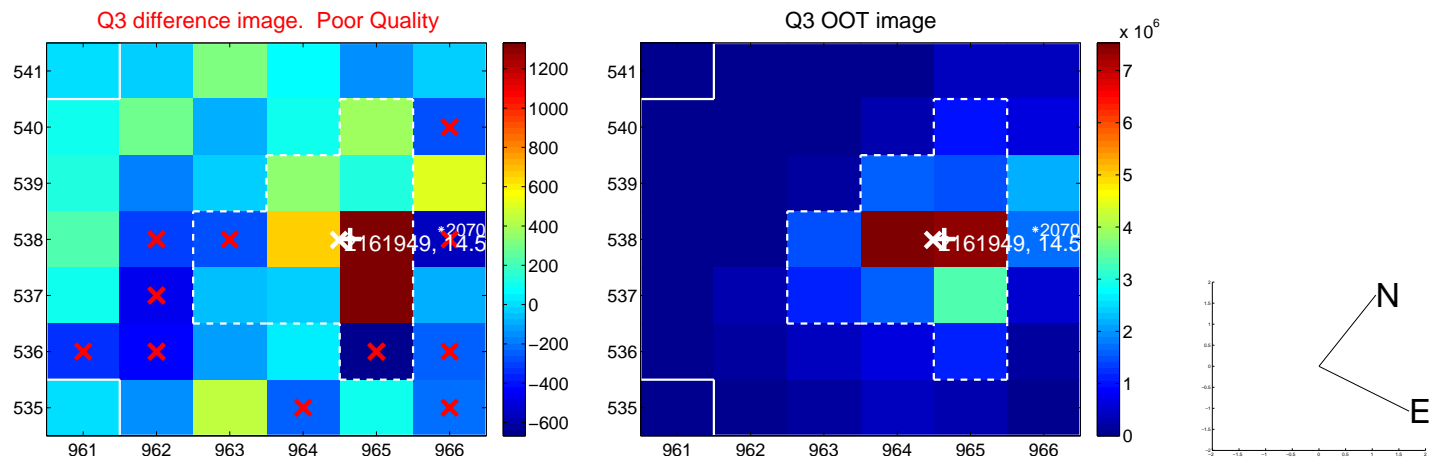
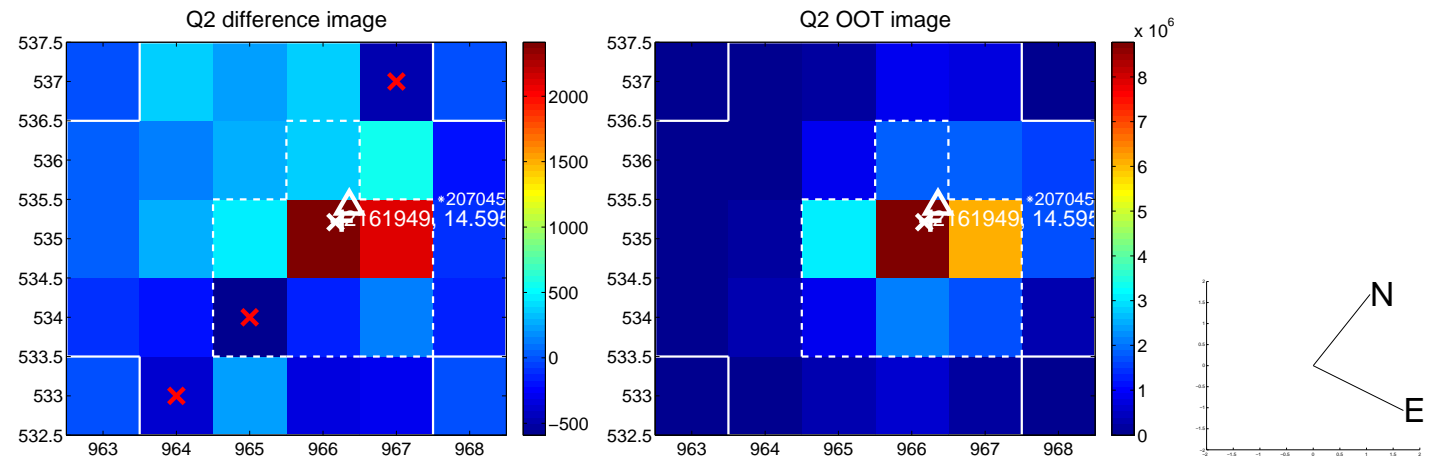
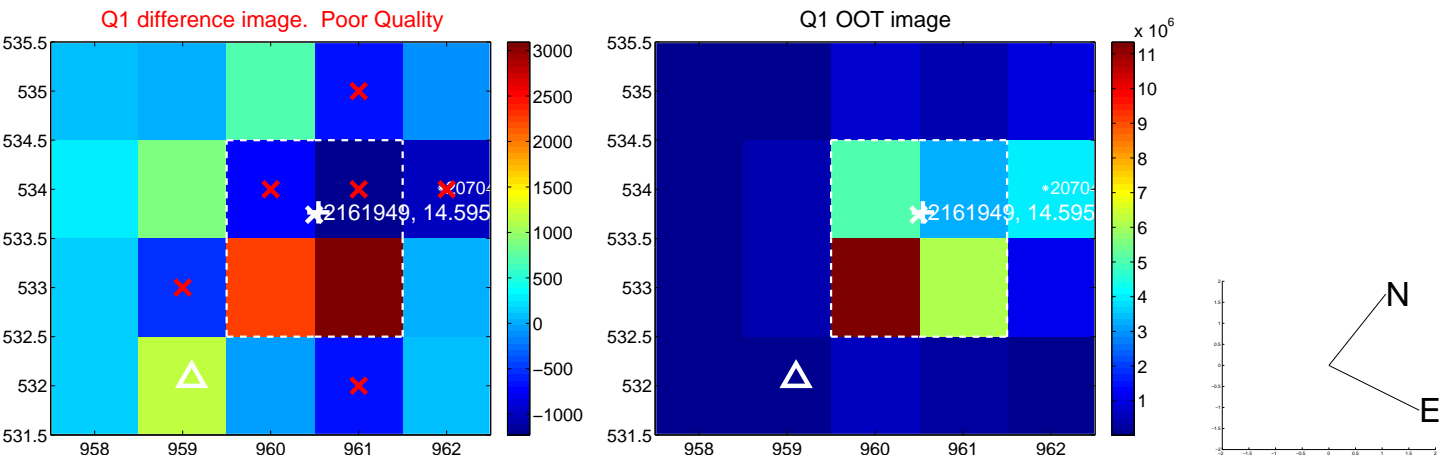
The direct PRF centroid is offset from the target star catalog position by about 0.57 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|---|--------------------|---------------------|-------------------|-------------------|
| PRF-fit source offset from OOT | 1.414 ± 1.098 | 1.29 | 0.135 ± 0.683 | 1.408 ± 1.068 |
| PRF-fit source offset from KIC position | 1.810 ± 1.224 | 1.48 | 0.481 ± 0.651 | 1.744 ± 1.157 |
| photometric centroid source offset | 1.23 ± 1.38 | 0.90 | 0.74 ± 1.33 | -0.99 ± 1.40 |

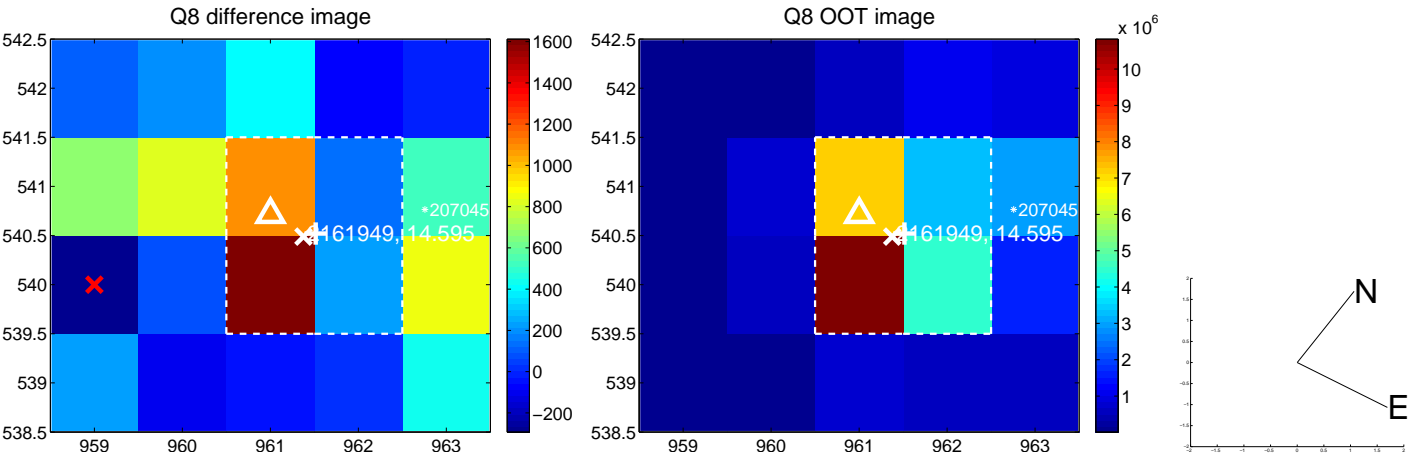
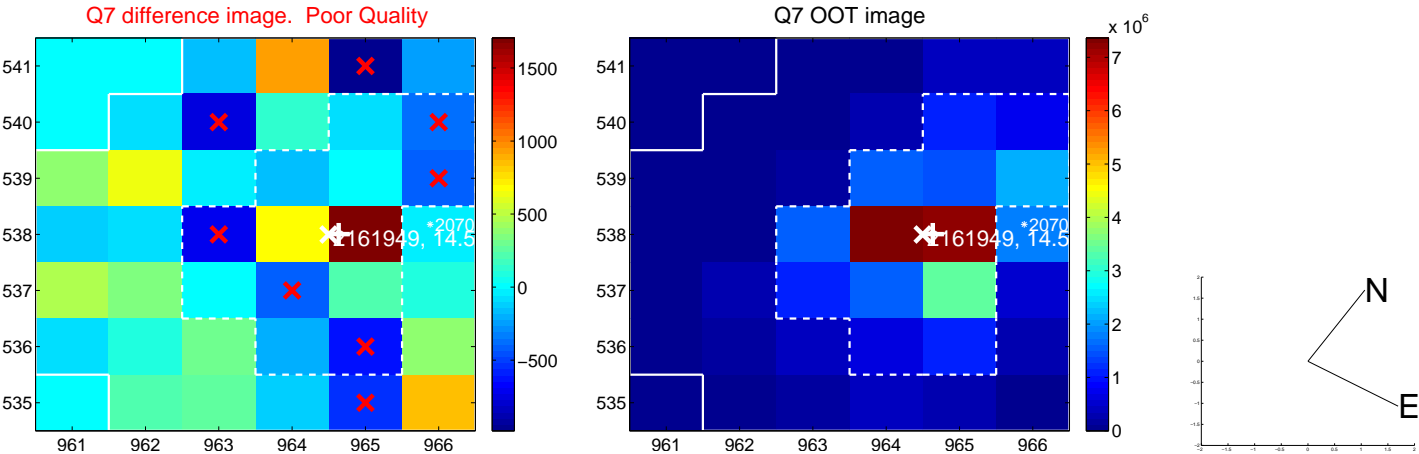
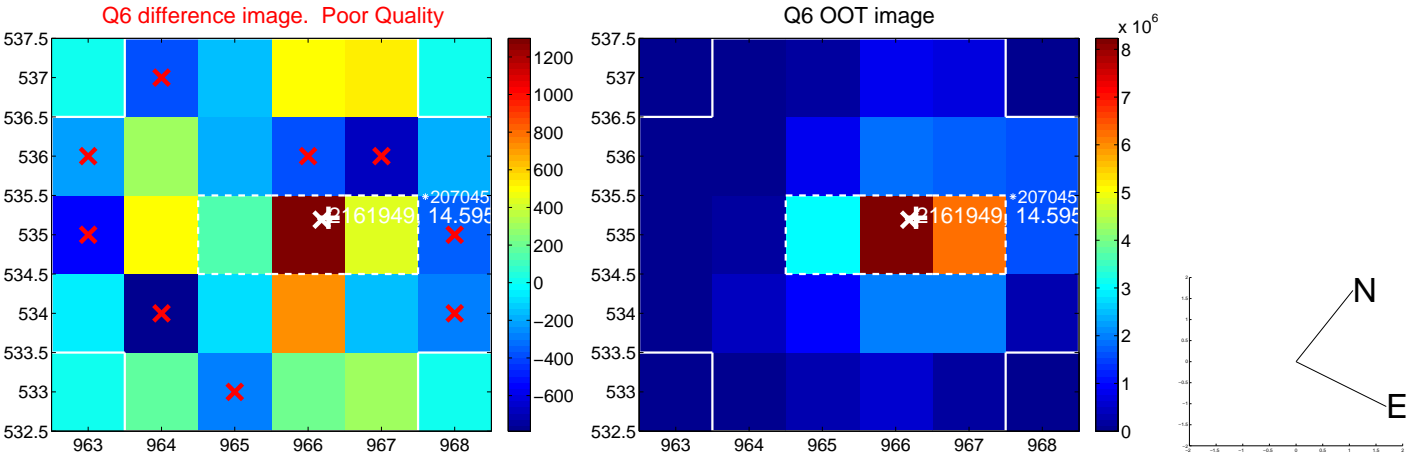
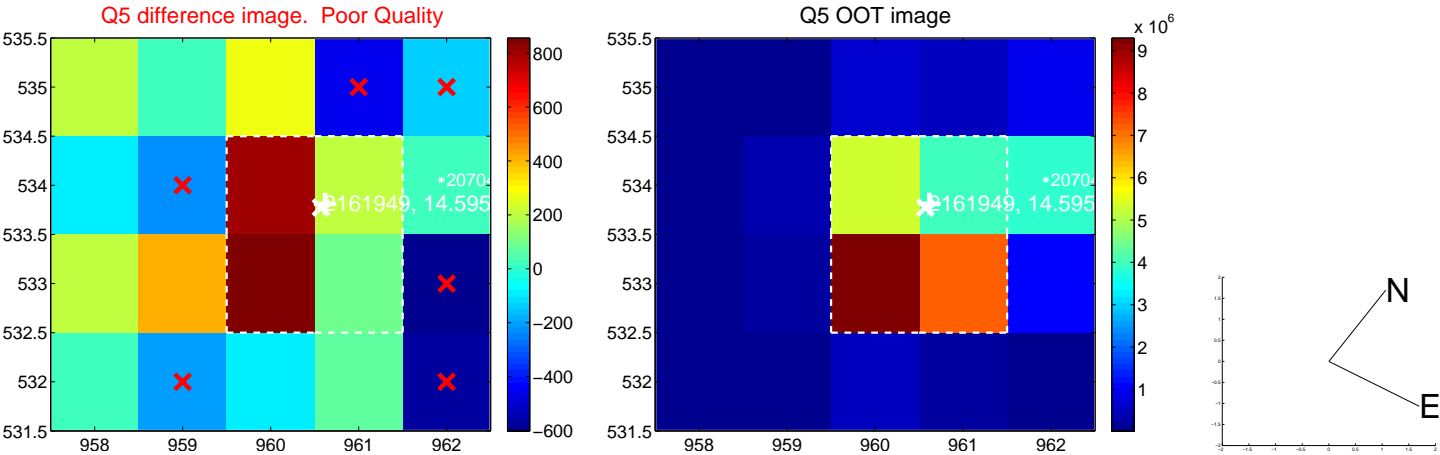


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three-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

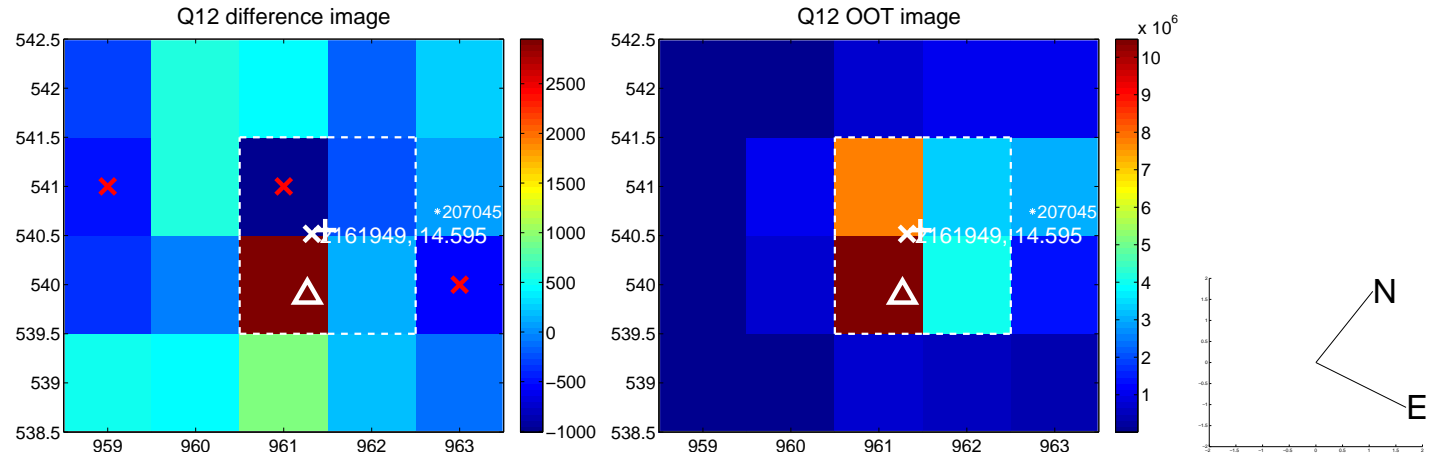
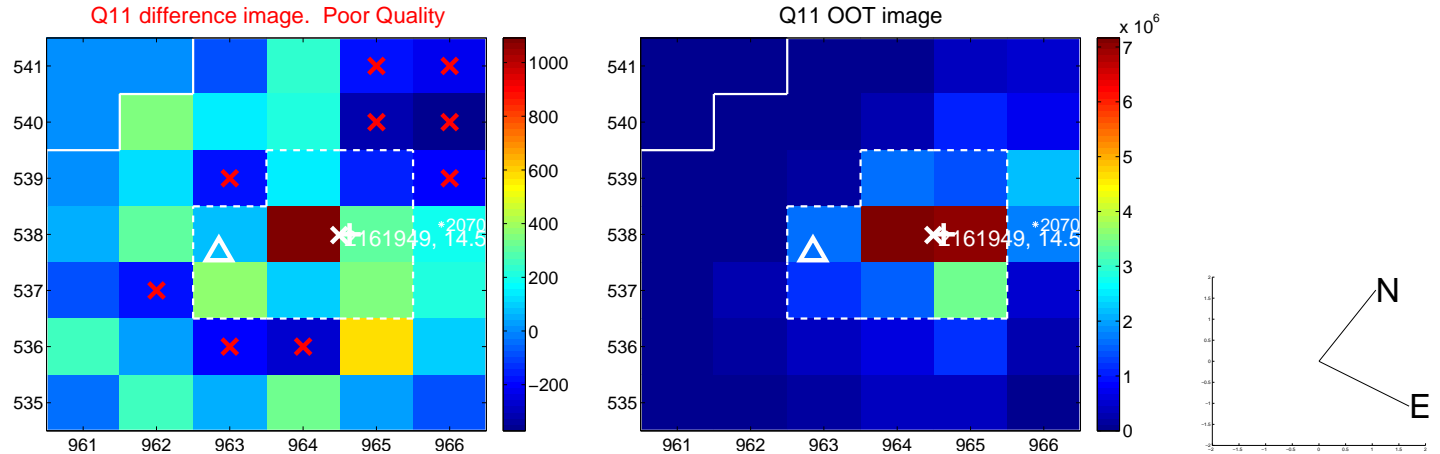
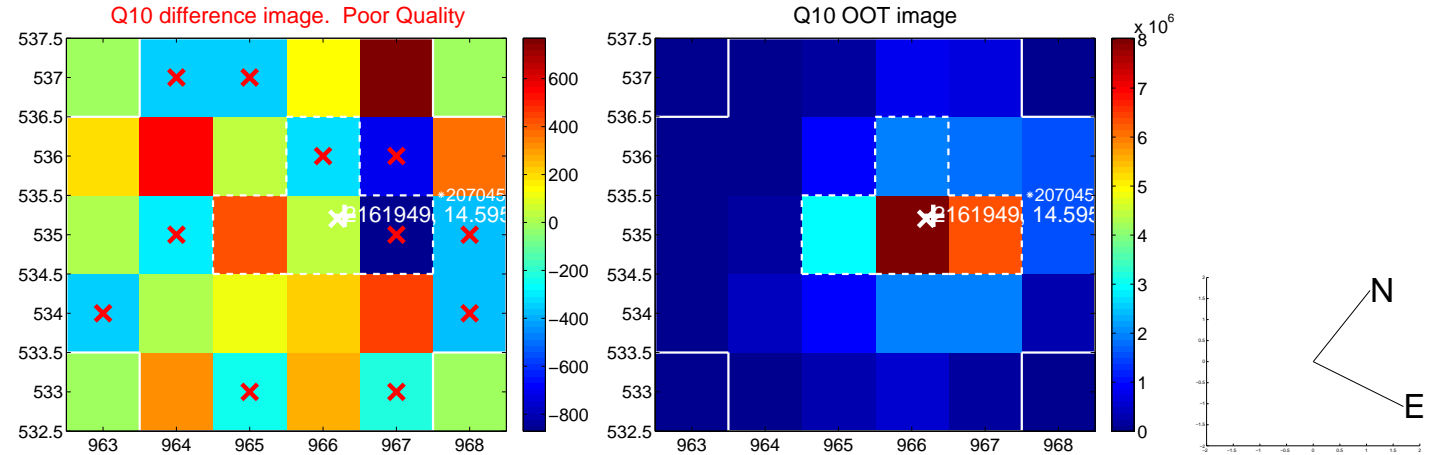
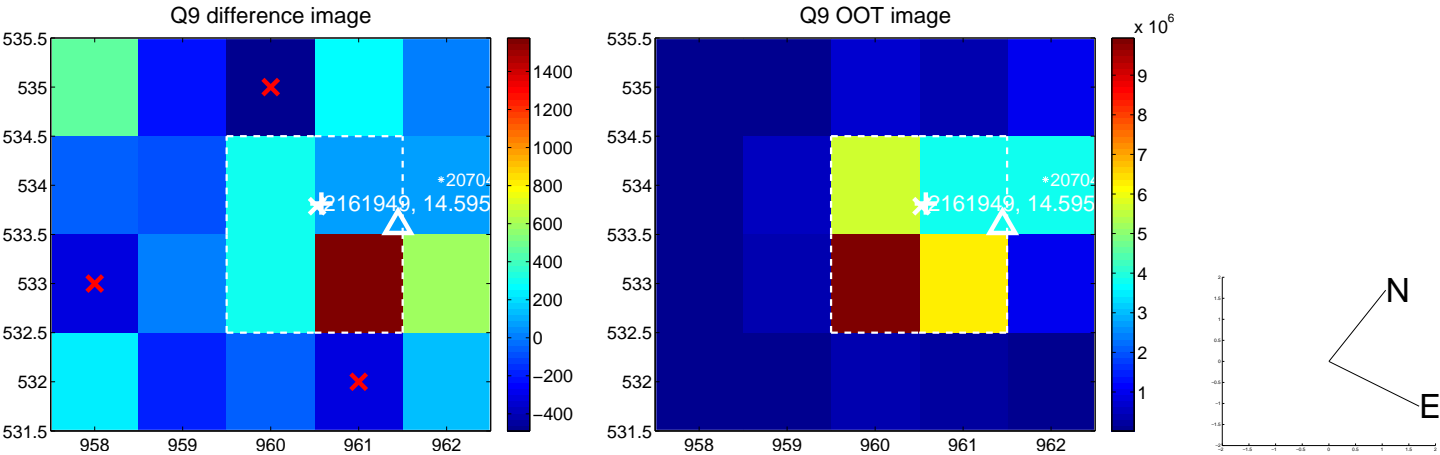
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



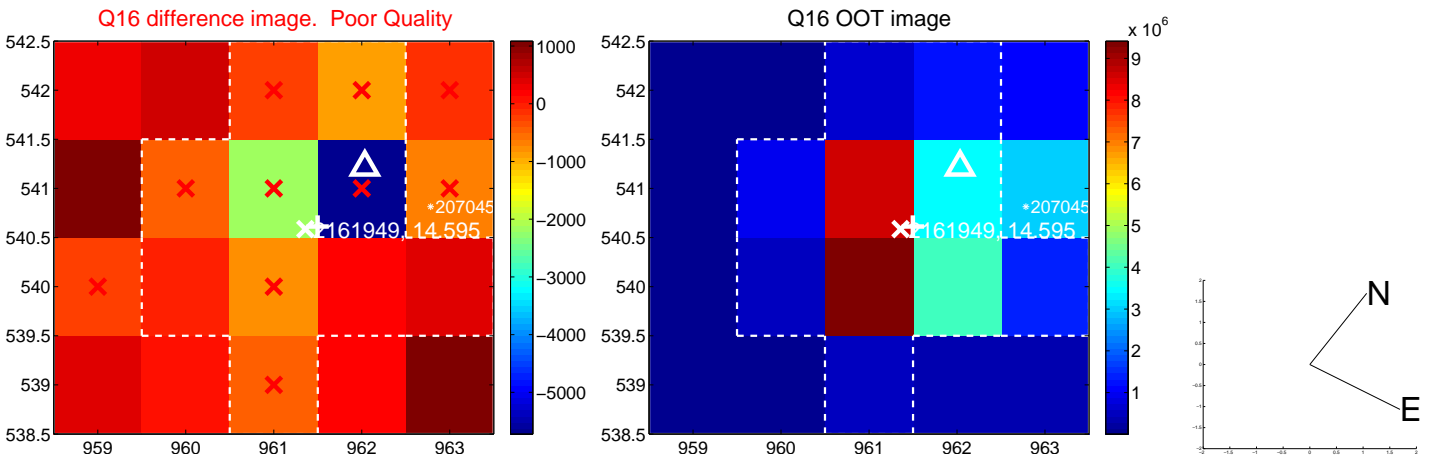
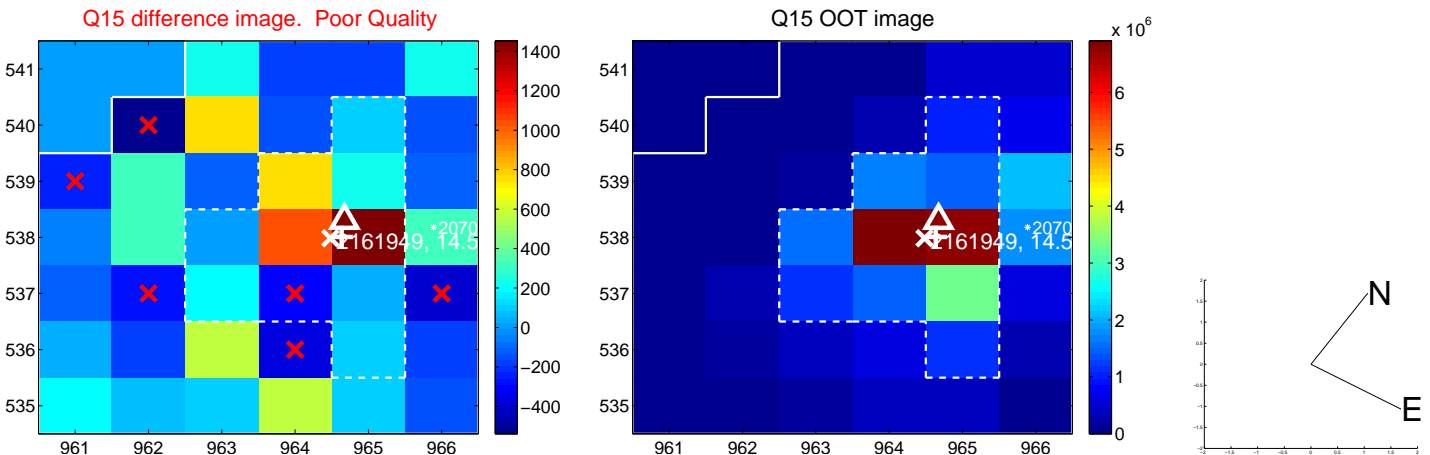
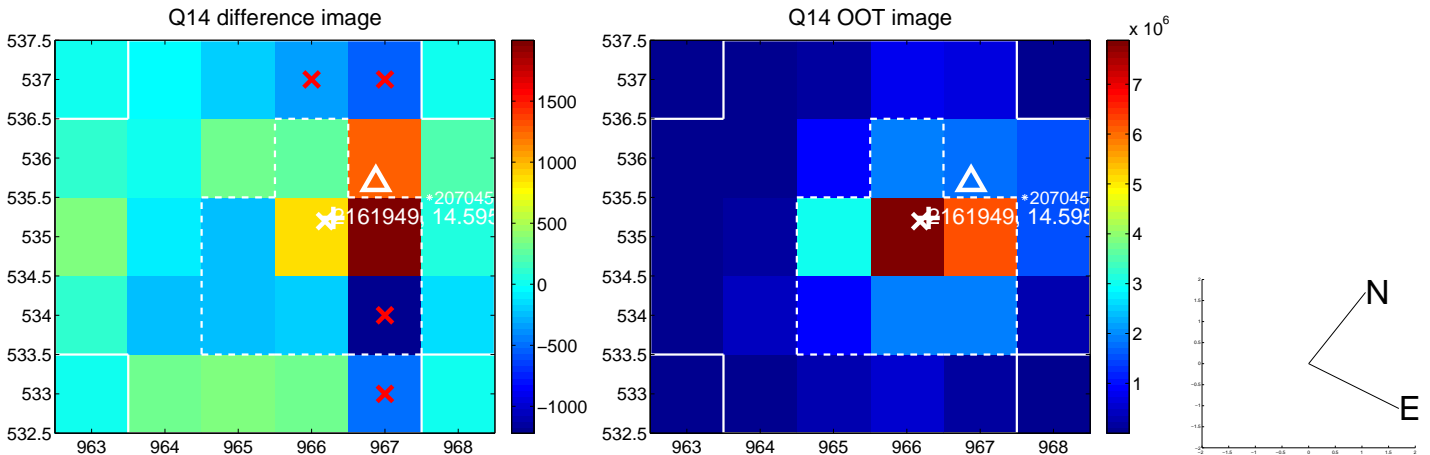
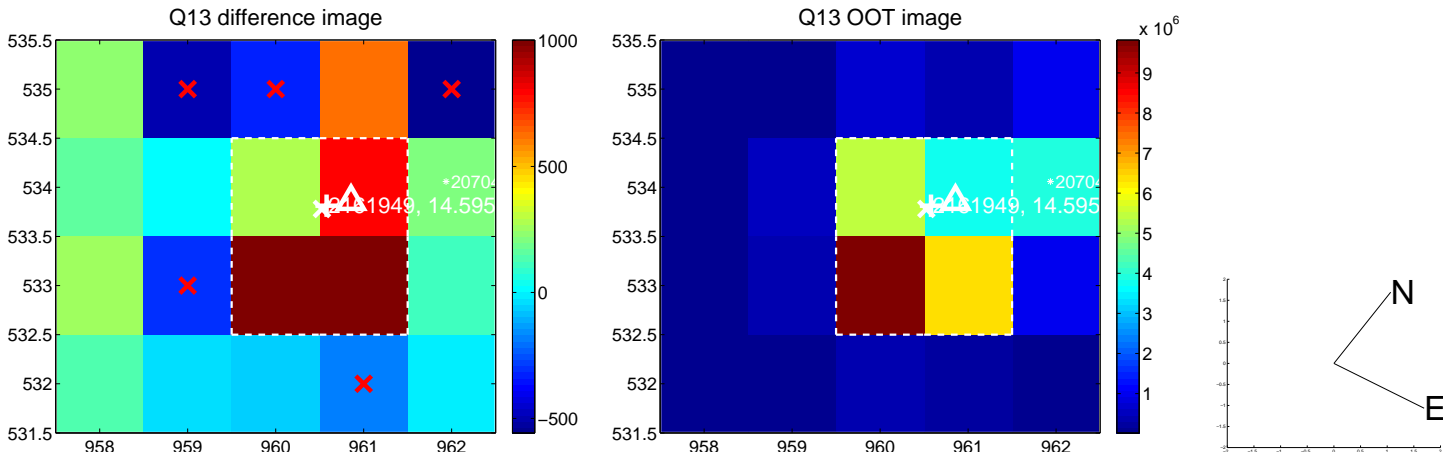
white \times : KIC target position; +: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



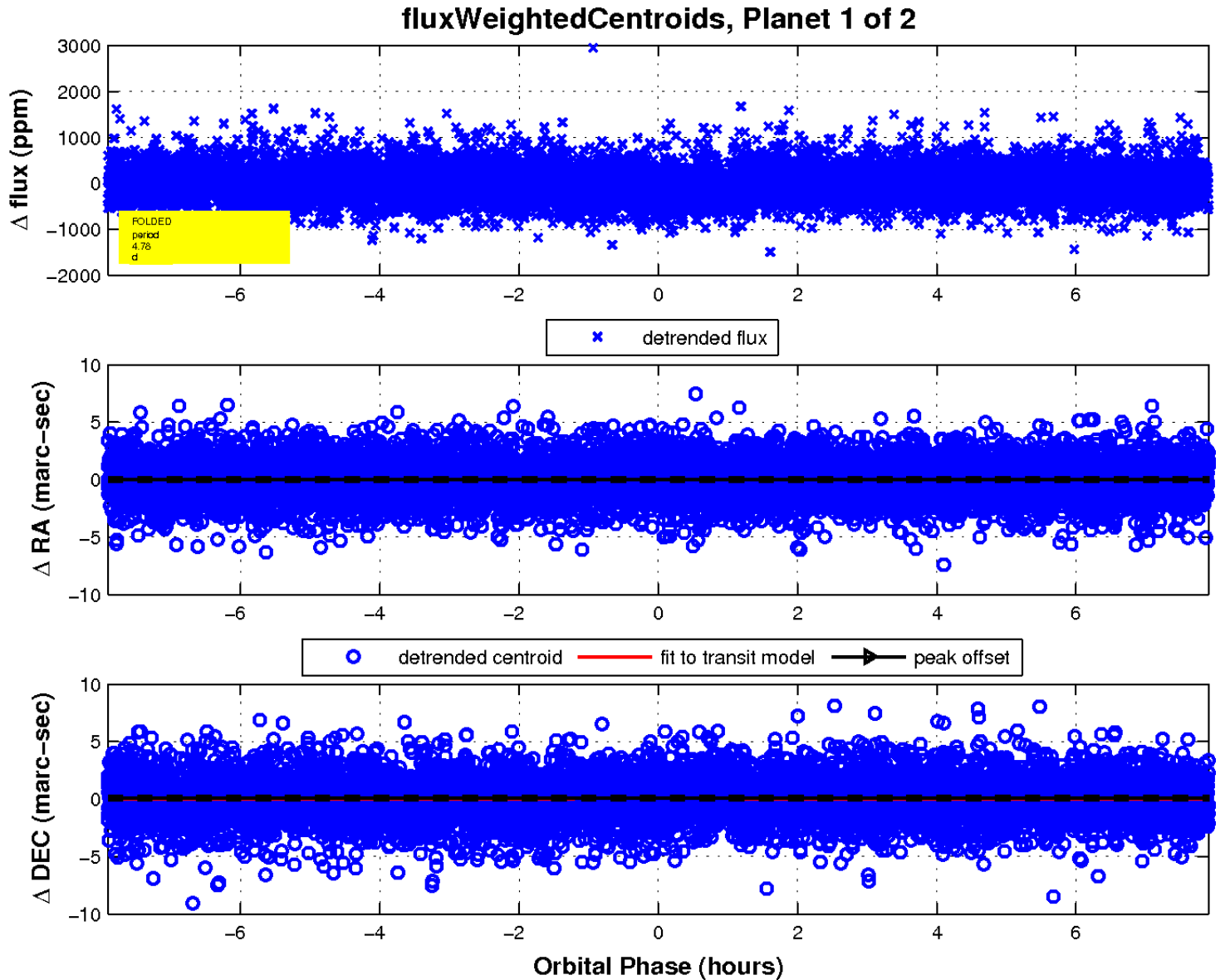
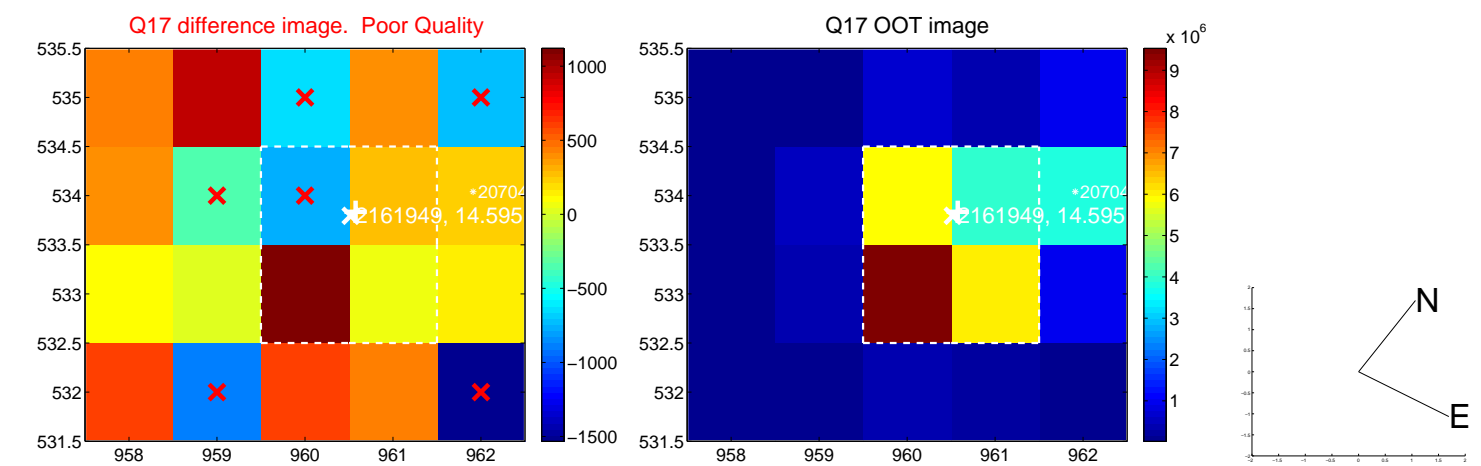
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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

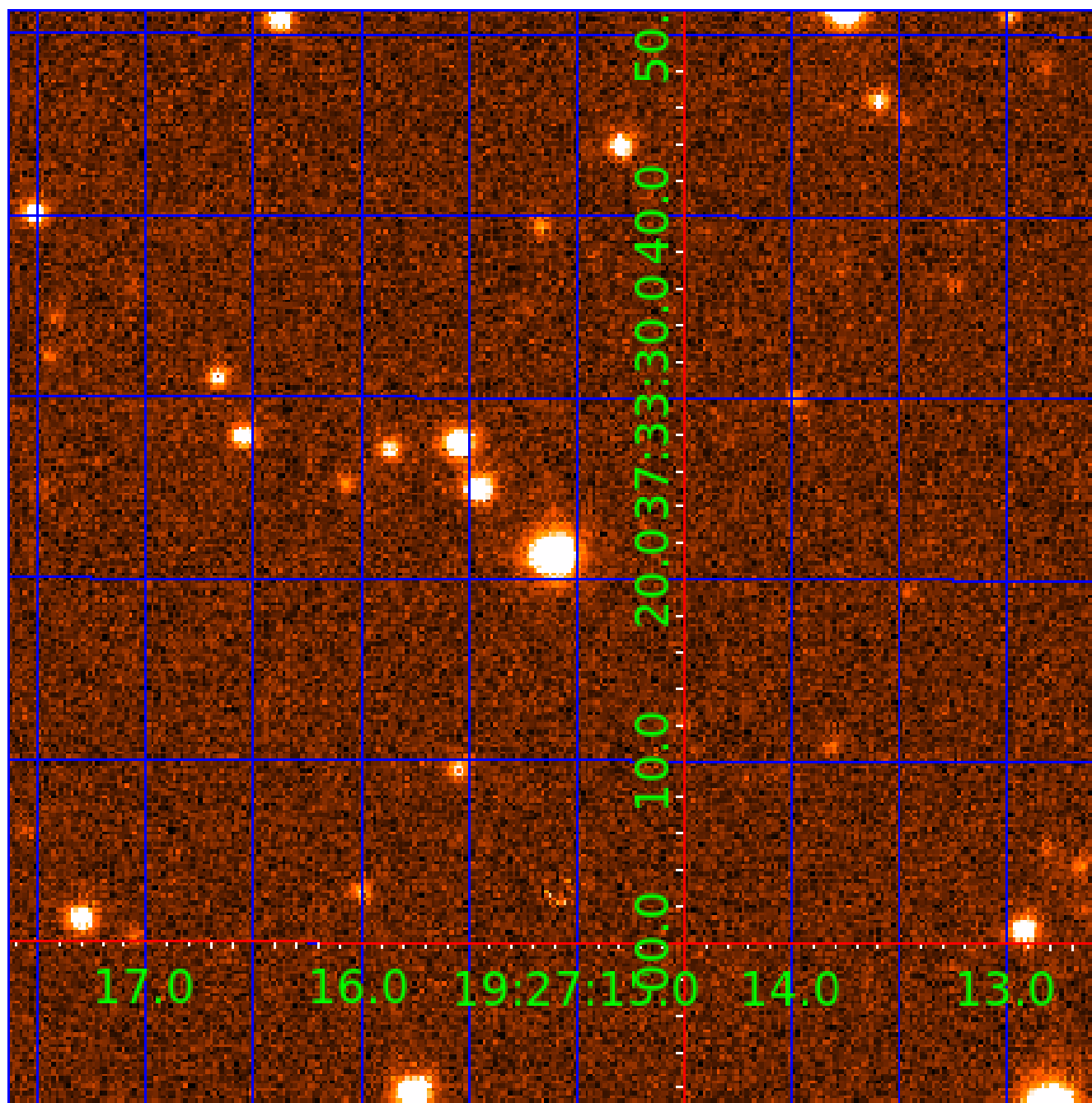


white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



UKIRT Image

Declination



KIC 002161949

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}) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|-----|-----|-----------------------------|-----------------|------------------------|------------------------|
| 002161949-01 | OBS | 6259.01 | 4.781150 | 131.703185 | 99.2 | 2.636 | 8.1 | 8.7 | 1.11 | 5683 | 1.34 | 386.67 |
| 002161949-02 | OBS | 6259.02 | 7.188377 | 133.176505 | 113.7 | 3.402 | 7.6 | 8.9 | 1.11 | 5683 | 1.27 | 224.50 |

Robovetter Results

| TCE | Run Type | Disp | Score | N | S | C | E | Comments |
|--------------|----------|------|-------|---|---|---|---|--------------|
| 002161949-01 | OBS | PC | 0.81 | 0 | 0 | 0 | 0 | CENT_KIC_POS |
| 002161949-02 | OBS | PC | 0.97 | 0 | 0 | 0 | 0 | CENT_KIC_POS |

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.

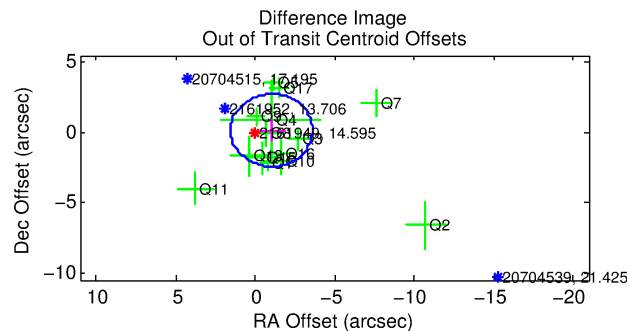
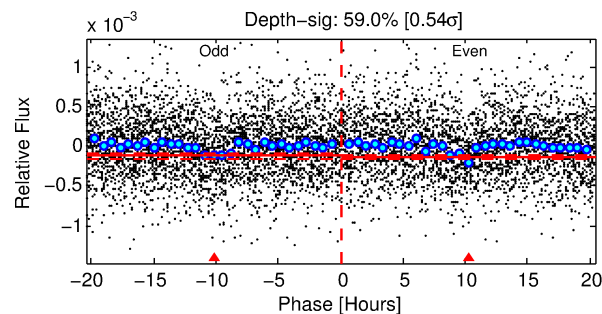
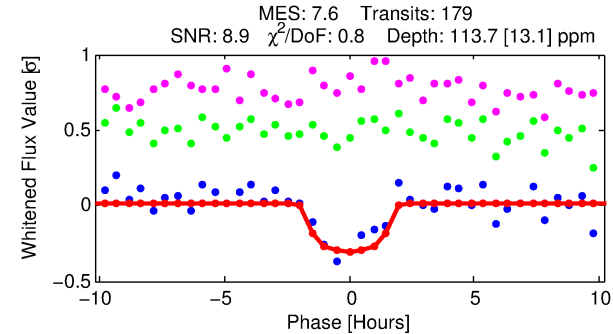
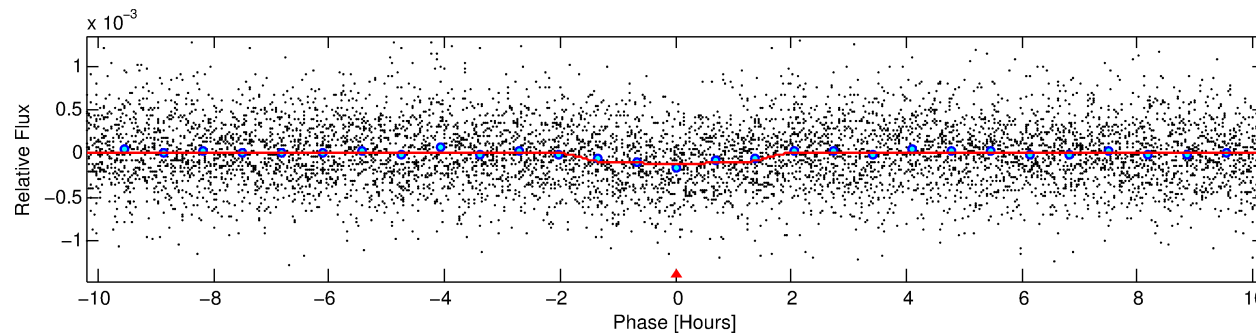
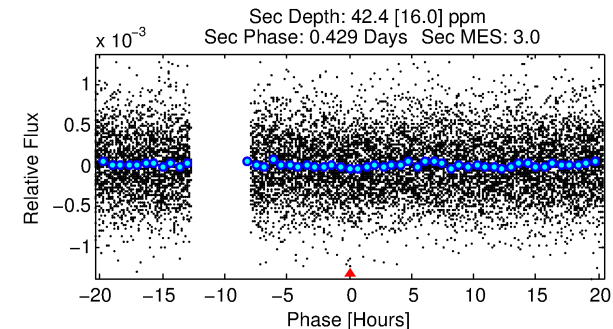
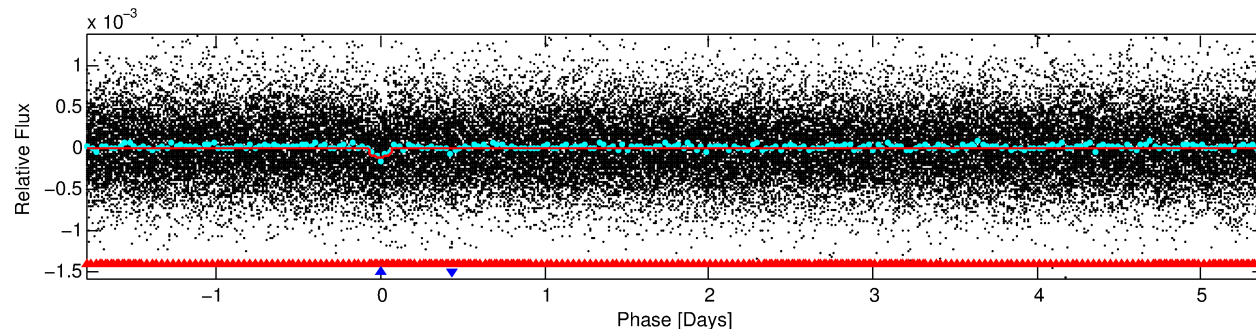
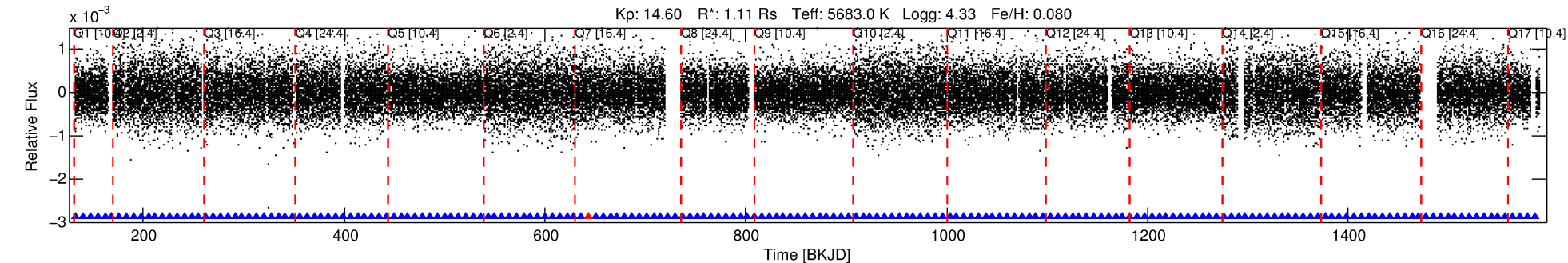
Ephemeris Match Information For 002161949-02

No Significant Match Found

DV One-Page Summary

KIC: 2161949 Candidate: 2 of 2 Period: 7.188 d

KOI: K06259.02 Corr: 0.812



DV Fit Results:

Period = 7.18838 [0.00007] d
Epoch = 133.1765 [0.0078] BKJD
Rp/R* = 0.0105 [0.0097]
a/R* = 11.70 [45.72]
b = 0.71 [2.84]
Seff = 224.50 [80.48]
Teff = 987 [88] K
Rp = 1.27 [1.23] Re
a = 0.0719 [0.0169] AU
Ag = 74.51 [143.17] [0.51σ]
Teffp = 4484 [2123] K [1.65σ]

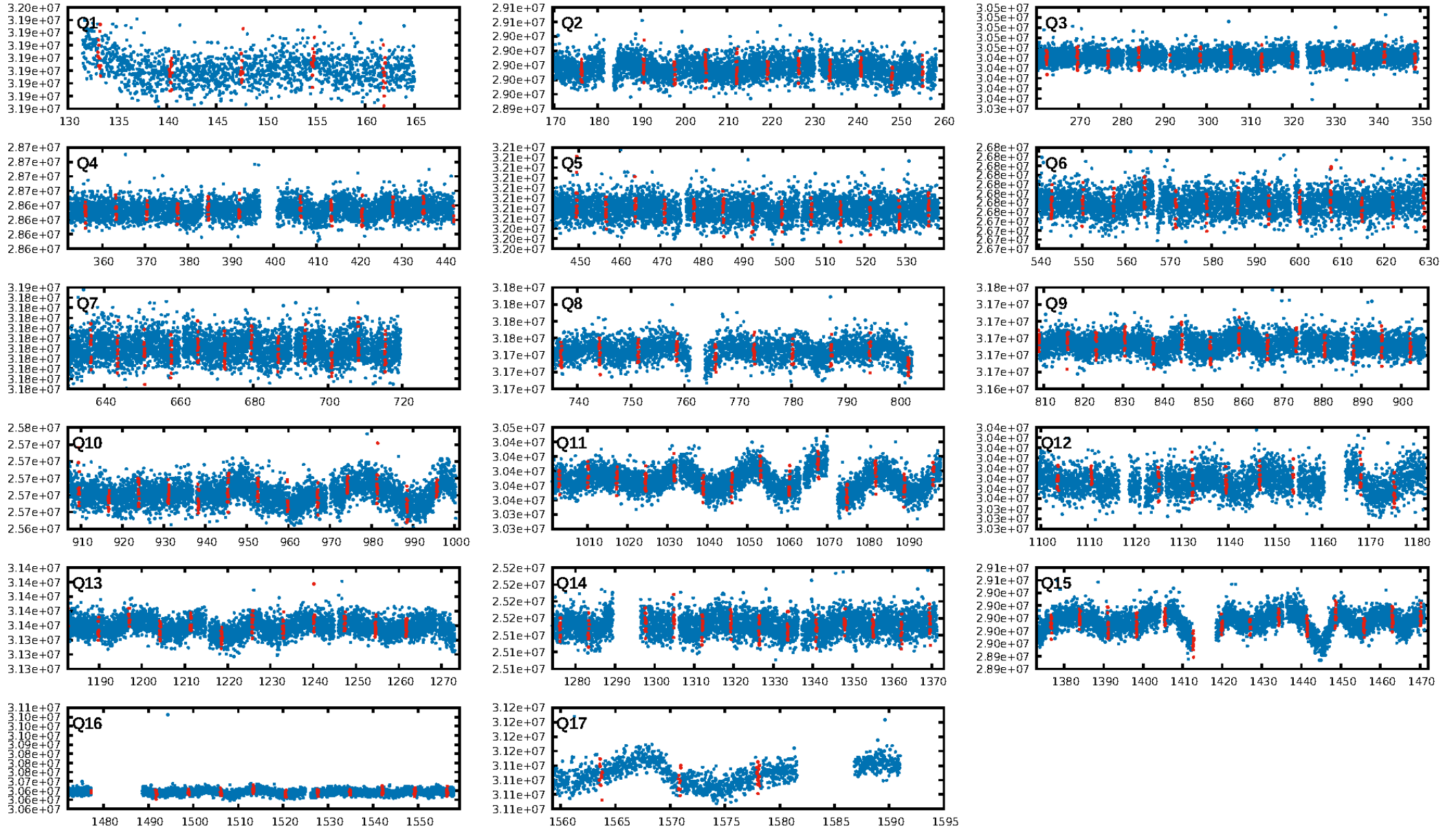
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [13.42σ]
LongPeriod-sig: N/A
ModelChiSquare2-sig: 100.0%
ModelChiSquareGof-sig: 100.0%
Bootstrap-pfa: 1.19e-14
RollingBand-fgt: 0.99 [171/172]
GhostDiagnostic-chr: 1.166
Centroid-sig: 31.6%
Centroid-so: 1.332 arcsec [1.04σ]
OotOffset-rm: 1.050 arcsec [1.22σ]
KicOffset-rm: 0.976 arcsec [1.16σ]
OotOffset-st: 2/4/3/5 [14]
KicOffset-st: 2/4/3/5 [14]
DiffImageQuality-fgm: 0.21 [3/14]
DiffImageOverlap-fno: 1.00 [17/17]

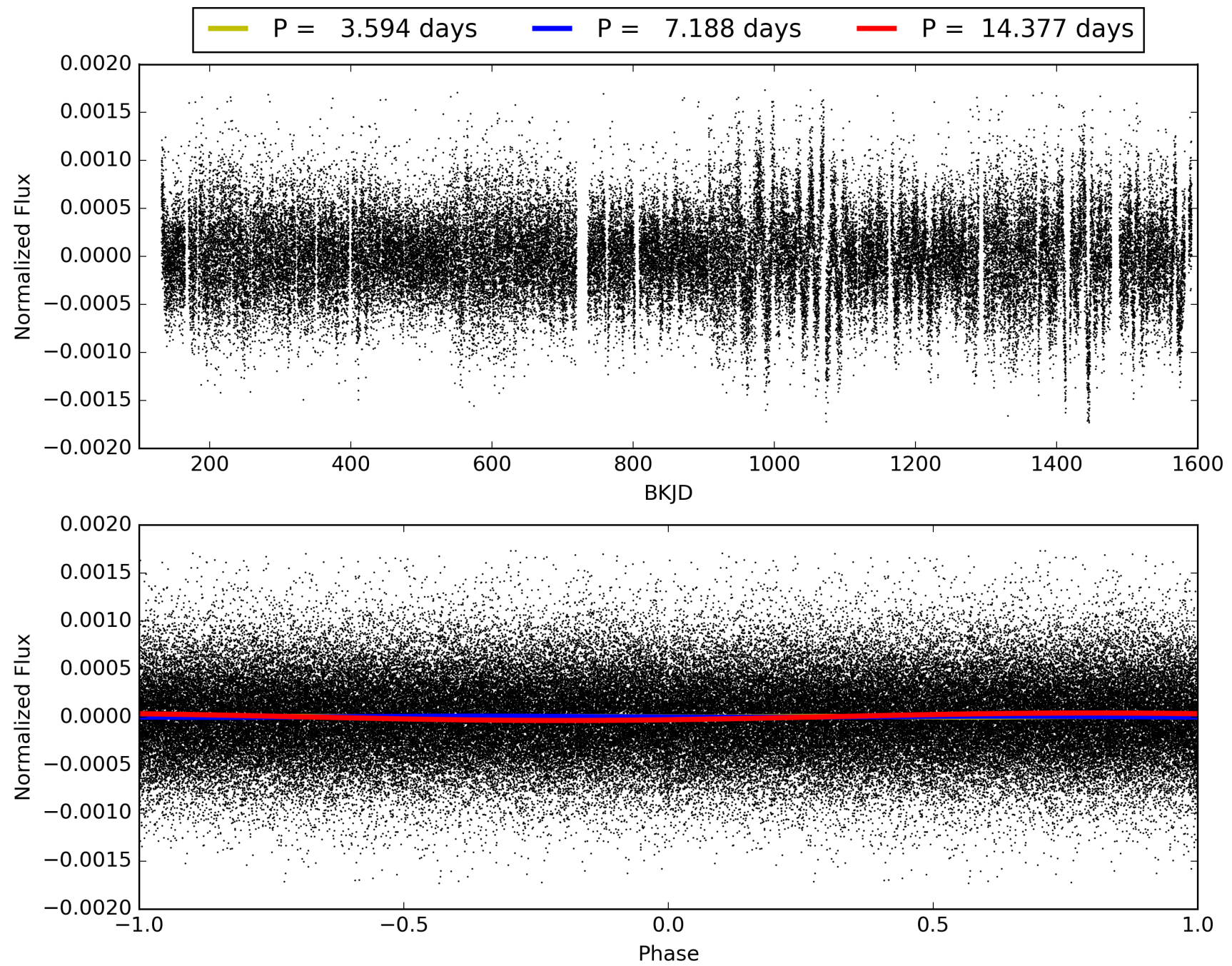
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 21:53:10 Z

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

TCE 002161949-02, PDC Light Curves

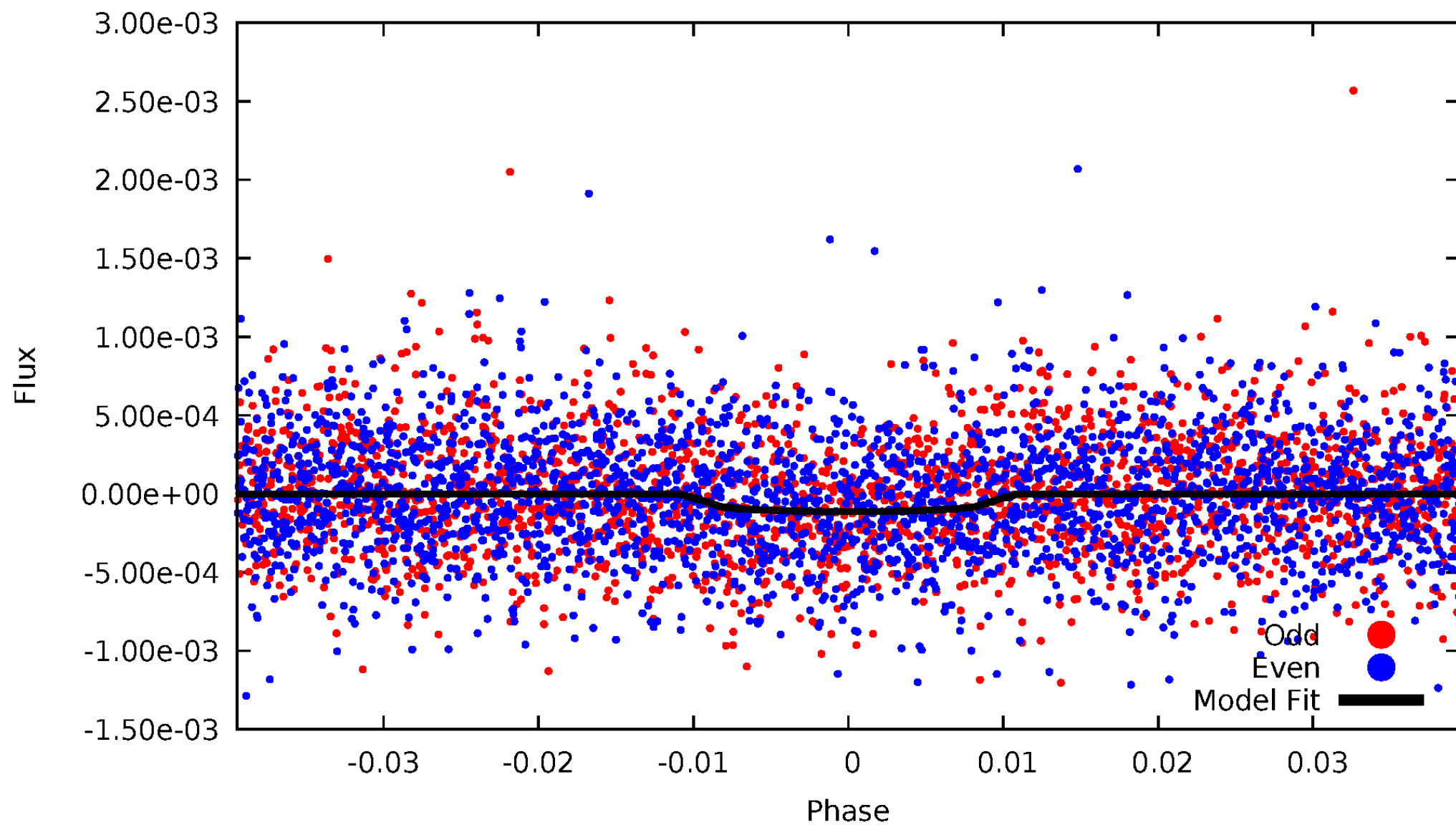


TCE 002161949-02



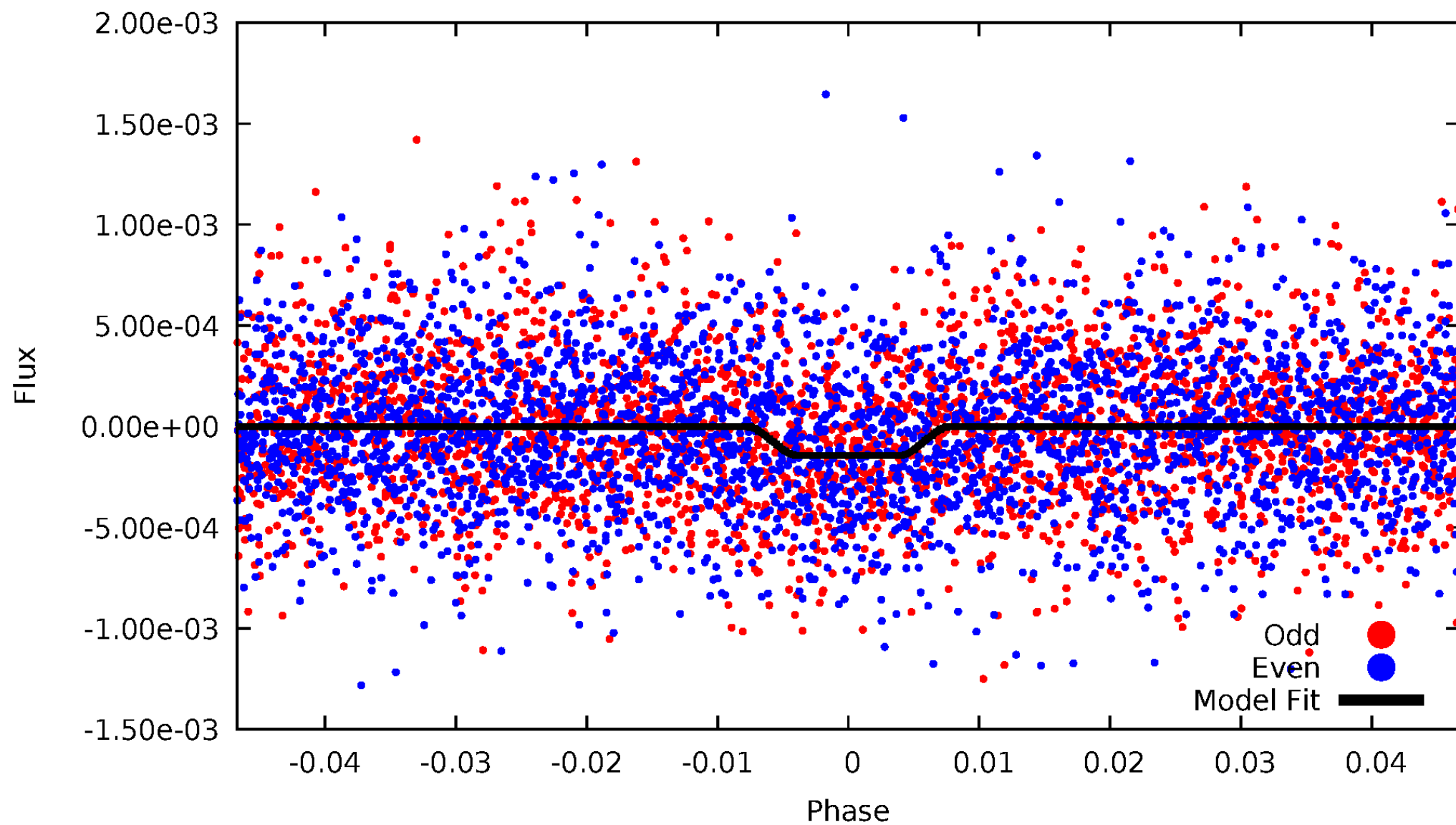
DV Odd/Even

TCE 002161949-02



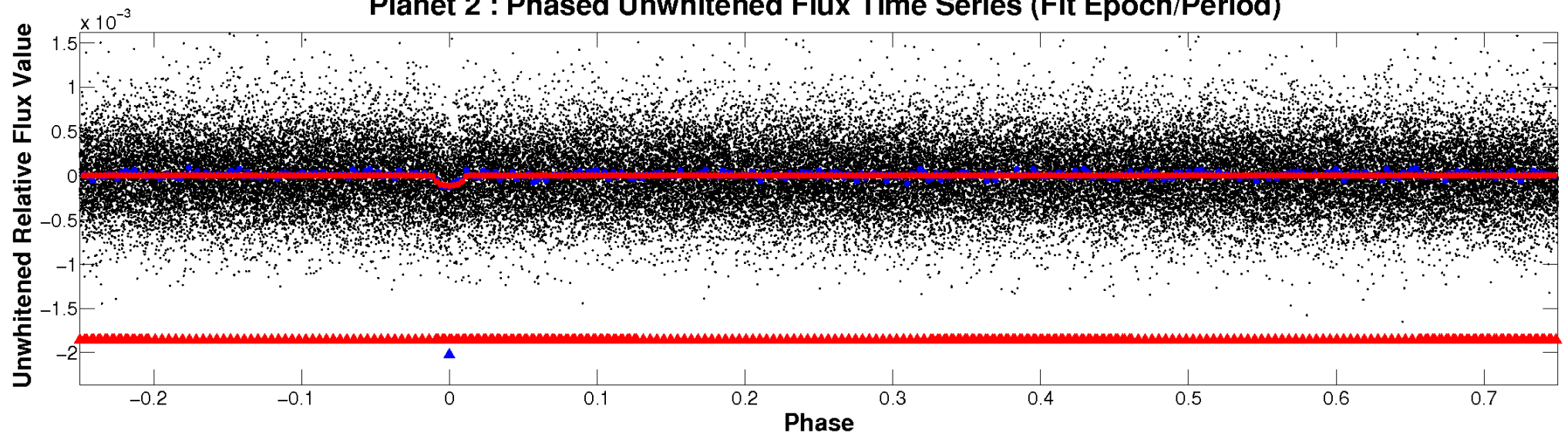
ALT Odd/Even

TCE 002161949-02

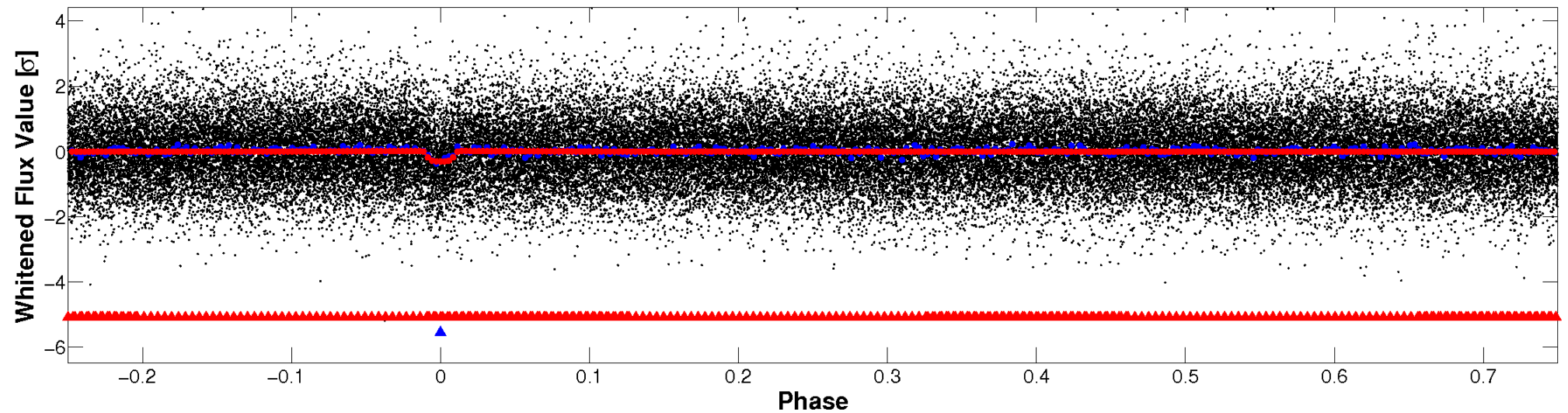


Non-Whitened Vs. Whitened Light Curve

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

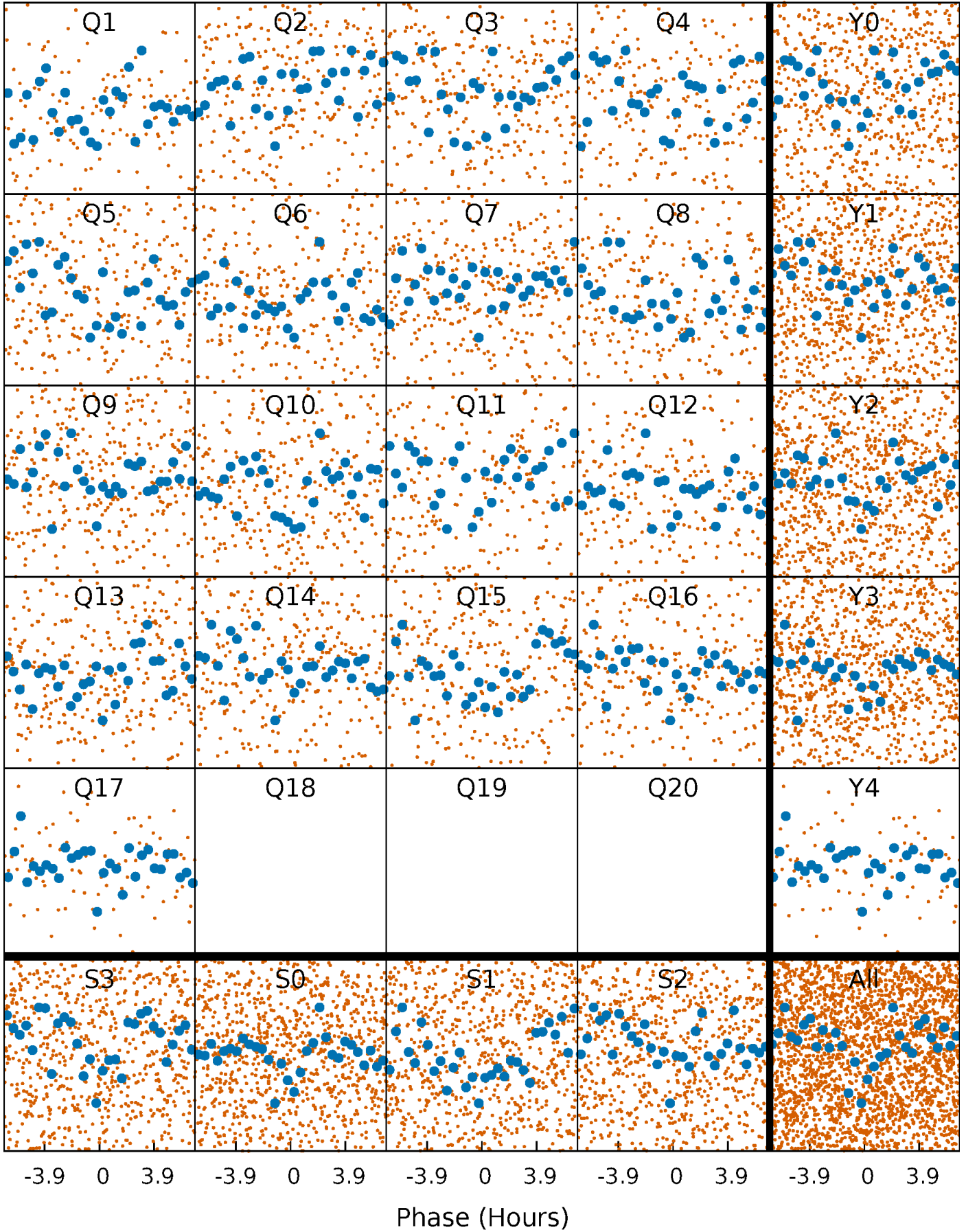


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



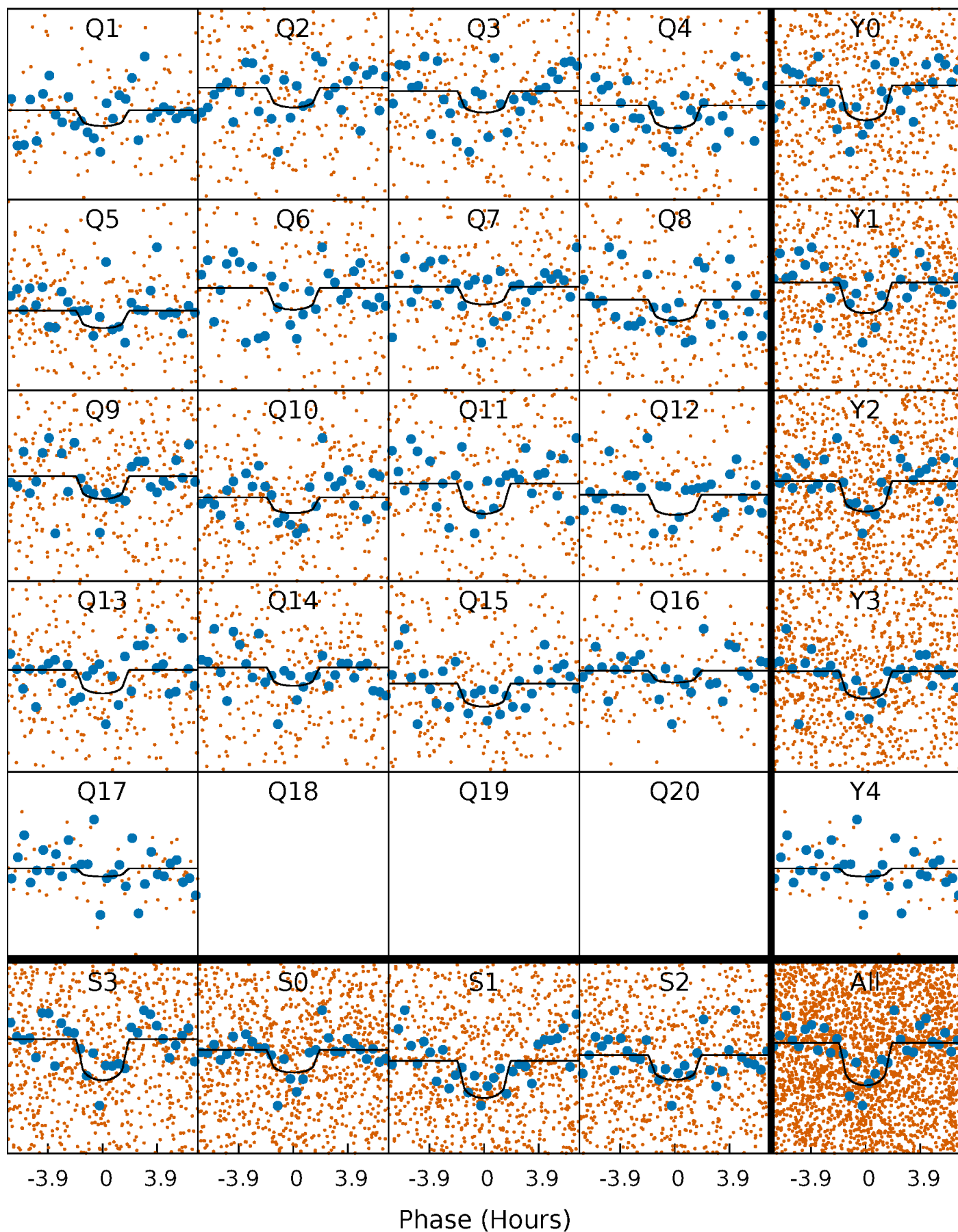
PDC Quarter-Phased Transit Curves

TCE 002161949-02 P= 7.188377 Days $T_0=133.176505$ (BKJD)



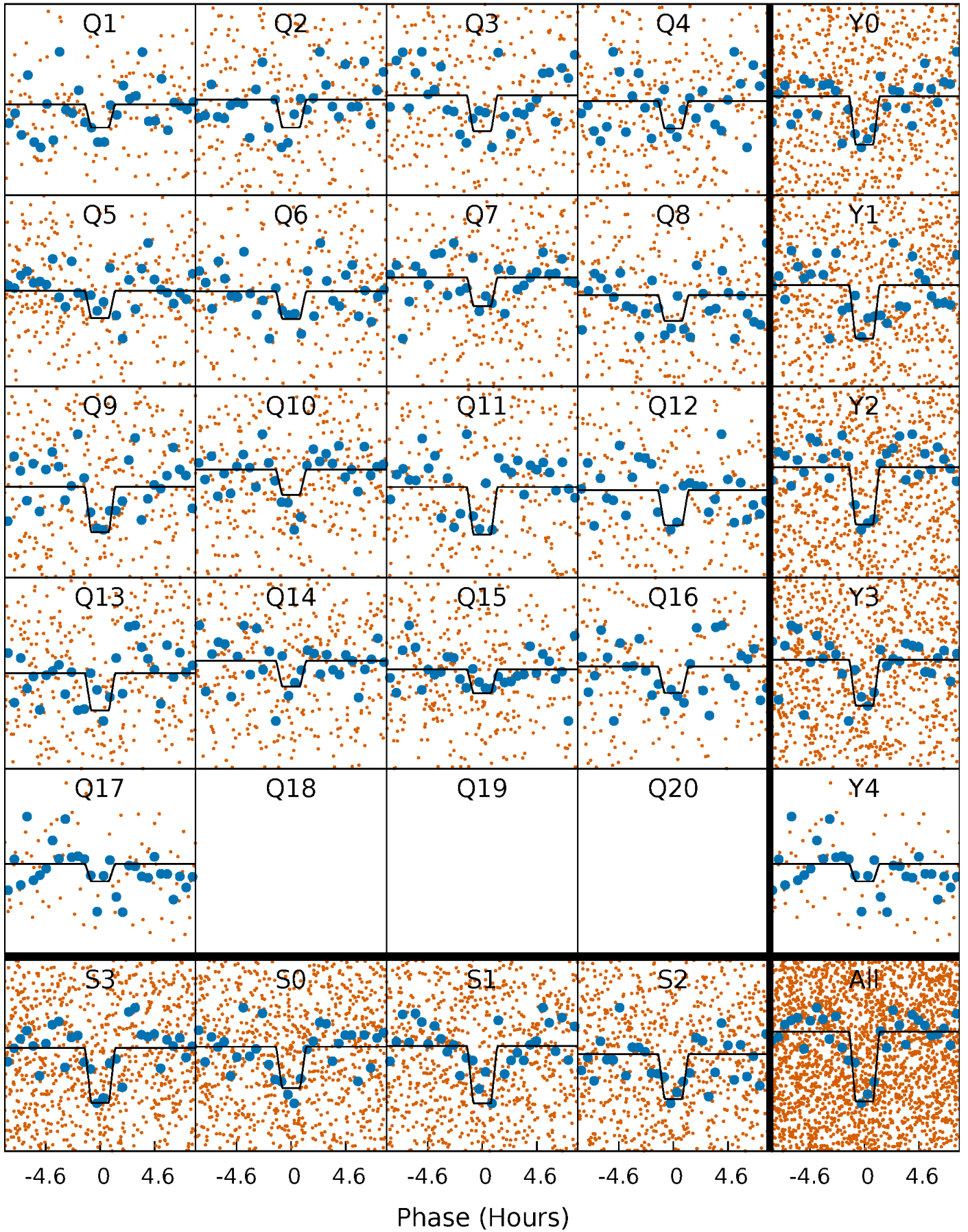
DV Quarter-Phased Transit Curves

TCE 002161949-02 P= 7.188377 Days $T_0=133.176505$ (BKJD)



Alt. Detrend Quarter-Phased Transit Curves

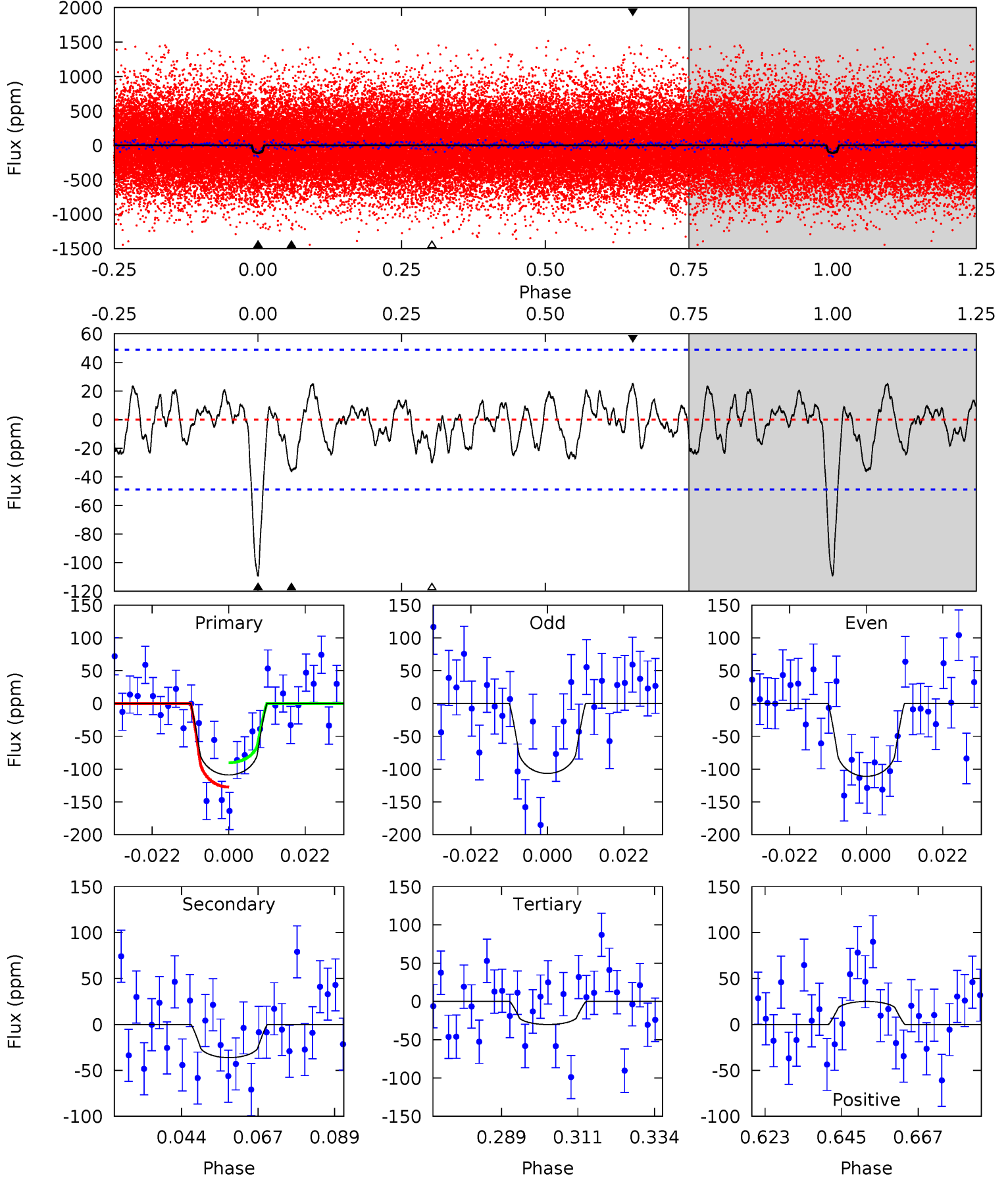
TCE 002161949-02 P= 7.188577 Days $T_0=133.149595$ (BKJD)



DV Model-Shift Uniqueness Test

002161949-02, P = 7.188377 Days, E = 125.988128 Days

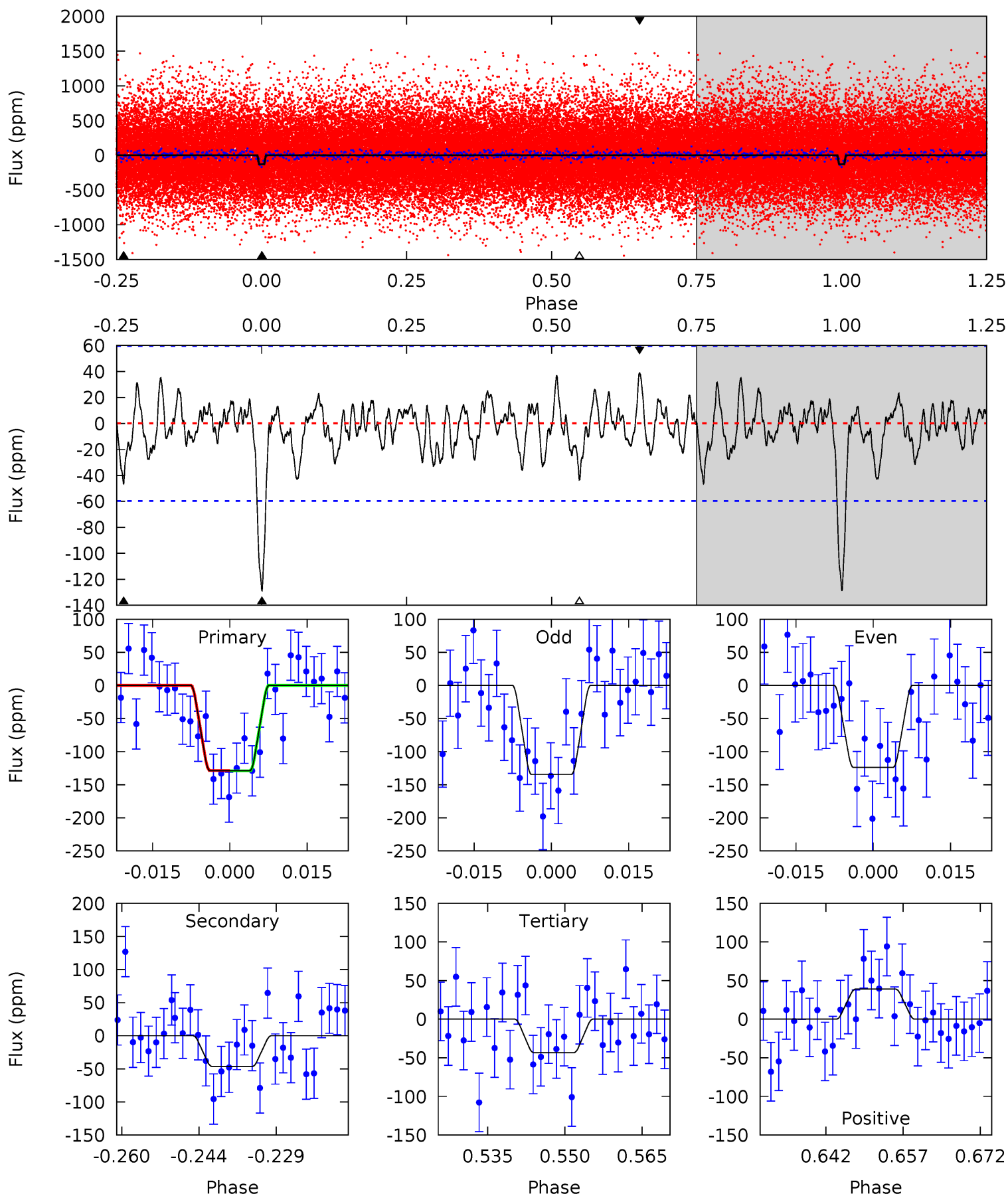
| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 10.8 | 3.60 | 3.00 | 2.49 | 4.87 | 2.29 | 1.20 | 7.85 | 8.36 | 0.60 | 1.11 | 0.22 | 1.01 | 0.19 | 1.85 |



Alt Model-Shift Uniqueness Test

002161949-02, P = 7.188577 Days, E = 125.961018 Days

| Pri | Sec | Ter | Pos | FA ₁ | FA ₂ | F _{Red} | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM | Shape | TAT |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 10.7 | 3.86 | 3.60 | 3.23 | 4.94 | 2.43 | 1.23 | 7.09 | 7.46 | 0.26 | 0.63 | 0.45 | 1.04 | 0.23 | 0.03 |



Stellar Parameters For KIC 002161949

| | $T_{\text{eff}}(K)$ | $\log(g)$ | [Fe/H] | $R (R_{\odot})$ | $M(M_{\odot})$ | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|----------------------|---------------------------|---------------------------|---------------------------|---------------------------|---|
| | 5683^{+154}_{-154} | $4.326^{+0.170}_{-0.187}$ | $0.080^{+0.250}_{-0.300}$ | $1.115^{+0.310}_{-0.207}$ | $0.959^{+0.120}_{-0.090}$ | $0.976^{+0.720}_{-0.476}$ |
| | +3%/-3% | +4%/-4% | +312%/-375% | +28%/-19% | +13%/-9% | +74%/-49% |
| 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 002161949-02 / KOI 6259.02

| Detrend | Depth (ppm) | $R_p (R_{\oplus})$ | $T_{max} (K)$ | $T_{obs} (K)$ | A_{obs} |
|---------|--------------|------------------------|--------------------|-----------------------|-------------------|
| DV | -36 ± 10 | $1.43^{+1.14}_{-0.87}$ | 1382^{+96}_{-87} | 4263^{+2041}_{-794} | 48^{+241}_{-34} |
| Alt. | -47 ± 12 | $1.57^{+1.22}_{-0.95}$ | 1386^{+91}_{-84} | 4356^{+2065}_{-830} | 53^{+282}_{-37} |

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 $A_{obs} \gg 1.0$

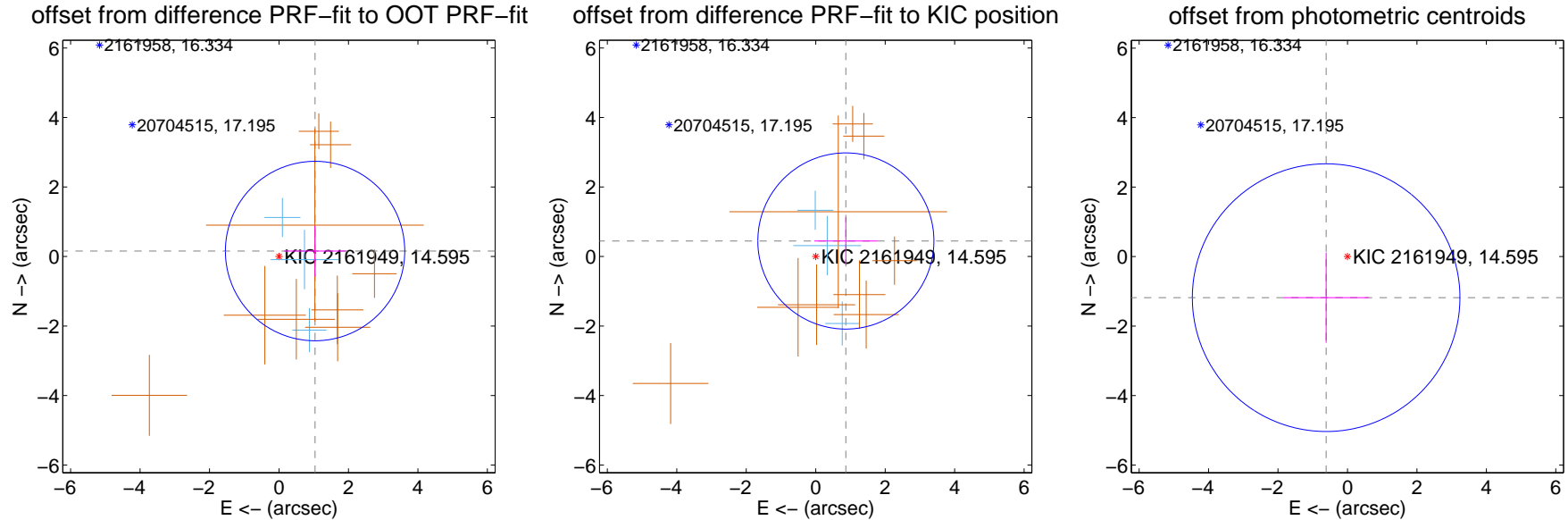
DV Centroid Data

Supplemental centroid analysis for 002161949-02. Kepler magnitude: 14.60. Transit SNR 8.91

There are 3 quarters with good PRF difference image offsets

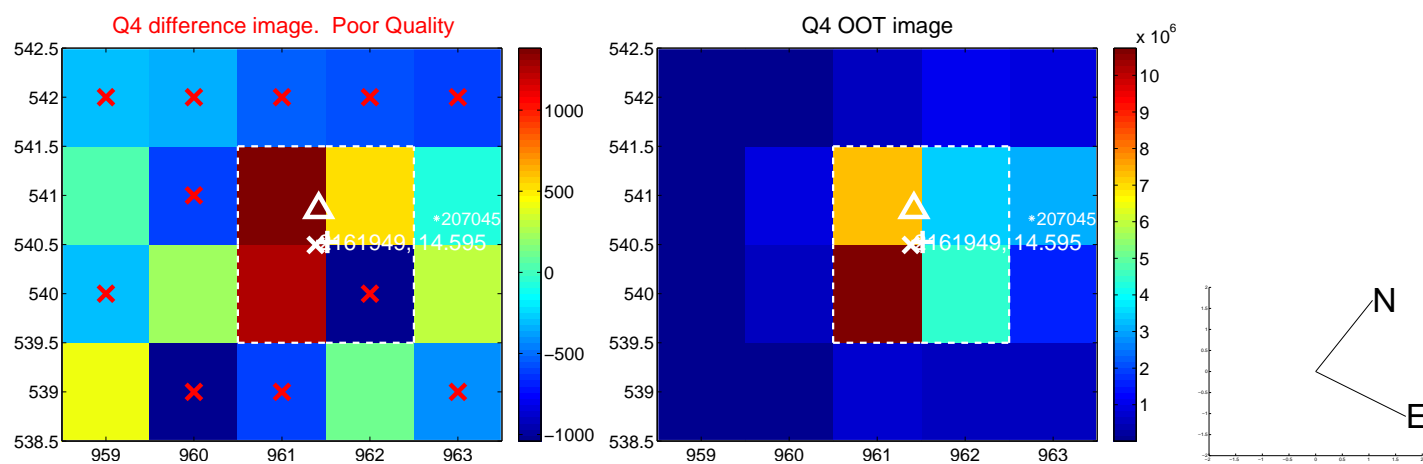
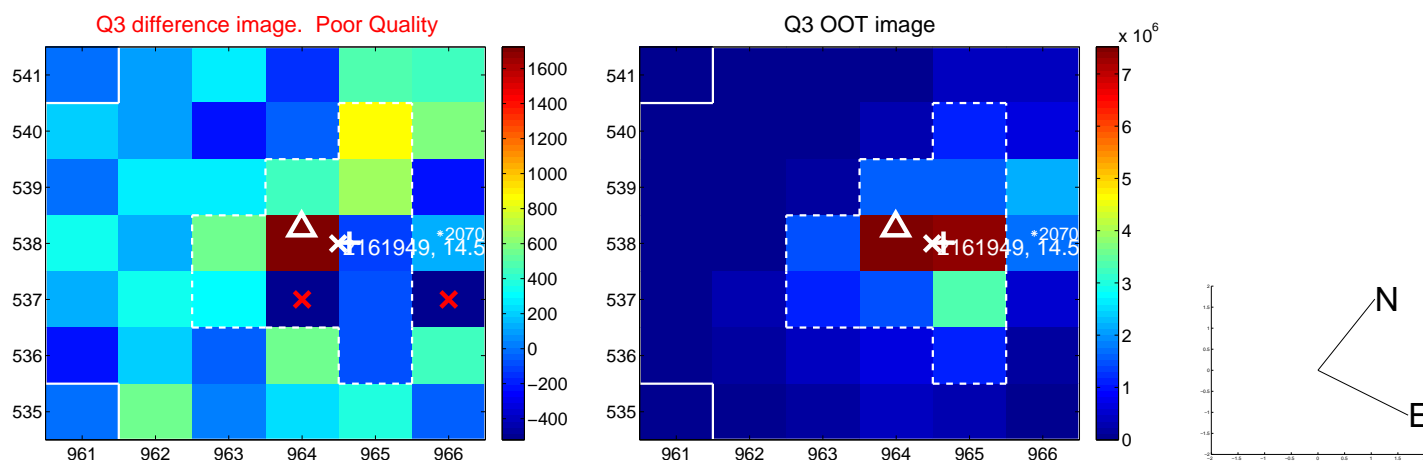
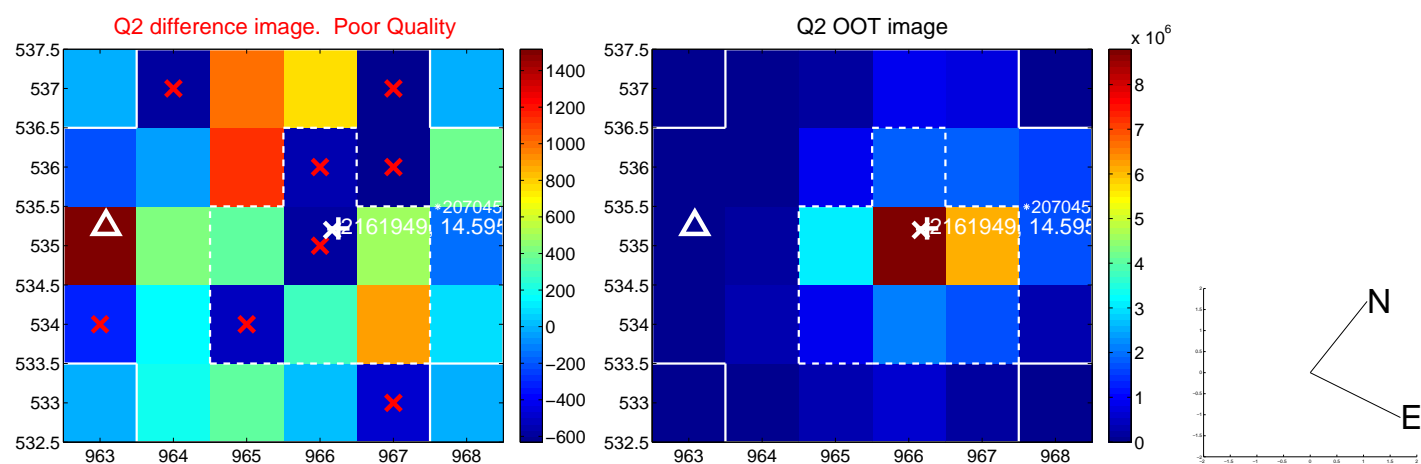
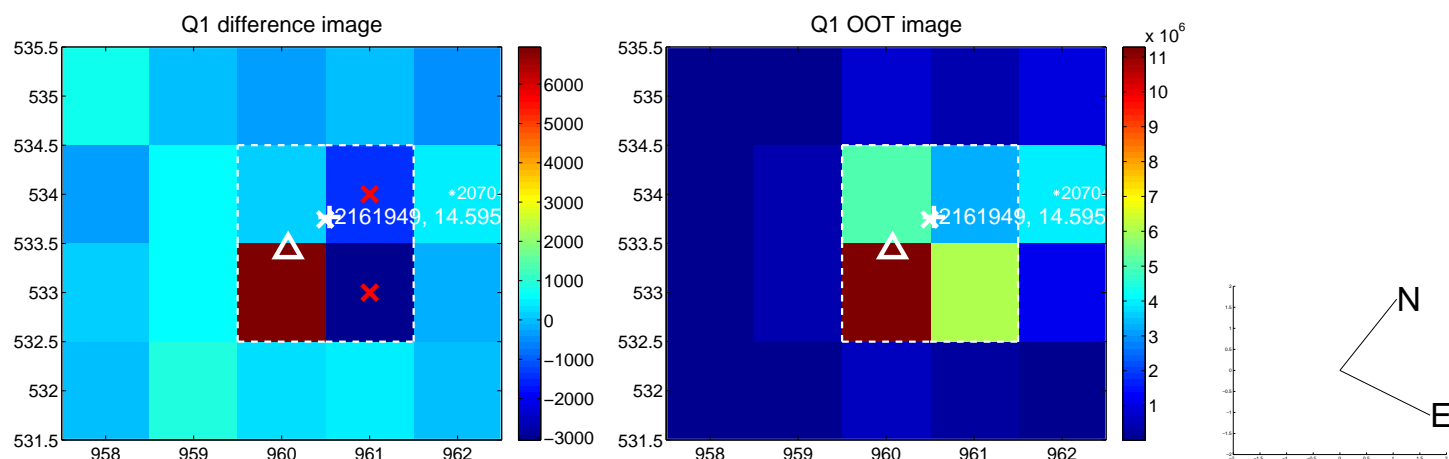
The direct PRF centroid is offset from the target star catalog position by about 0.27 arcsec

| | Distance in arcsec | Distance / σ | Δ RA | Δ Dec |
|---|--------------------|---------------------|--------------------|-------------------|
| PRF-fit source offset from OOT | 1.050 ± 0.861 | 1.22 | -1.039 ± 0.887 | 0.158 ± 0.731 |
| PRF-fit source offset from KIC position | 0.976 ± 0.845 | 1.16 | -0.868 ± 0.910 | 0.446 ± 0.682 |
| photometric centroid source offset | 1.33 ± 1.28 | 1.04 | 0.61 ± 1.23 | -1.18 ± 1.30 |

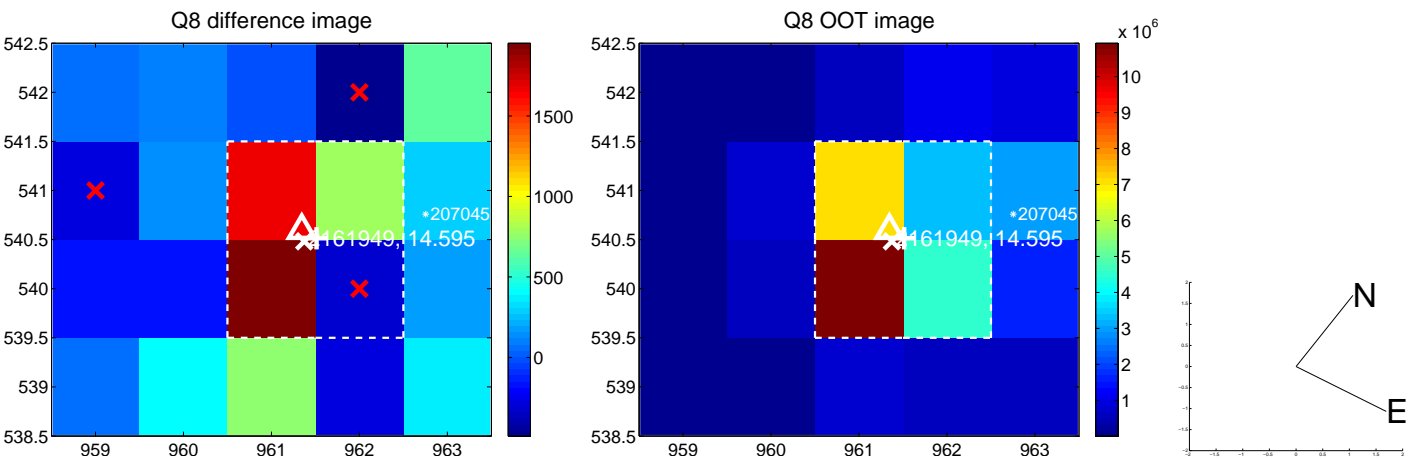
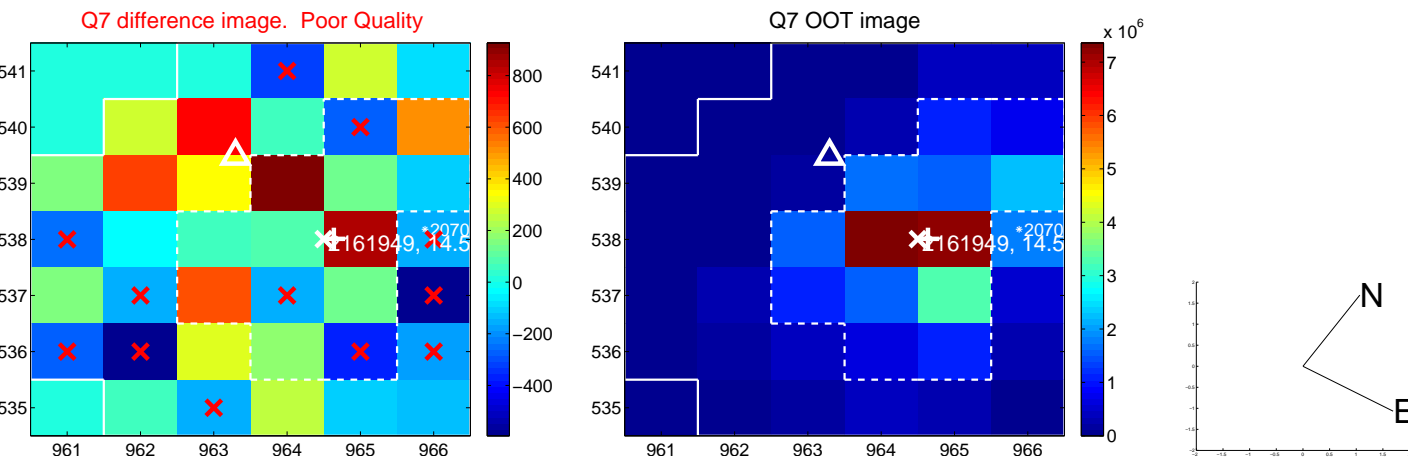
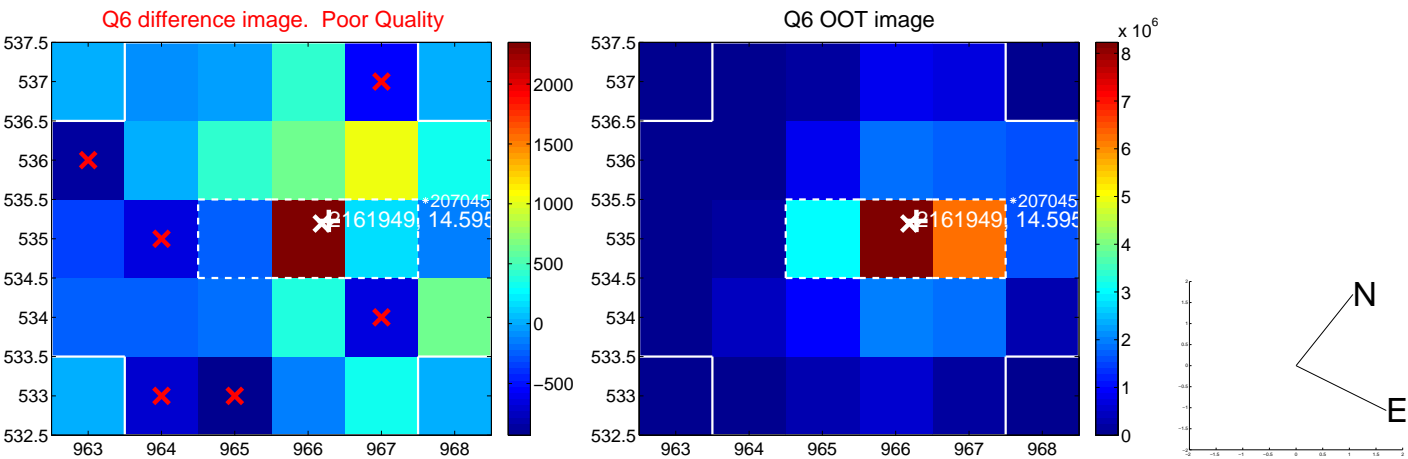
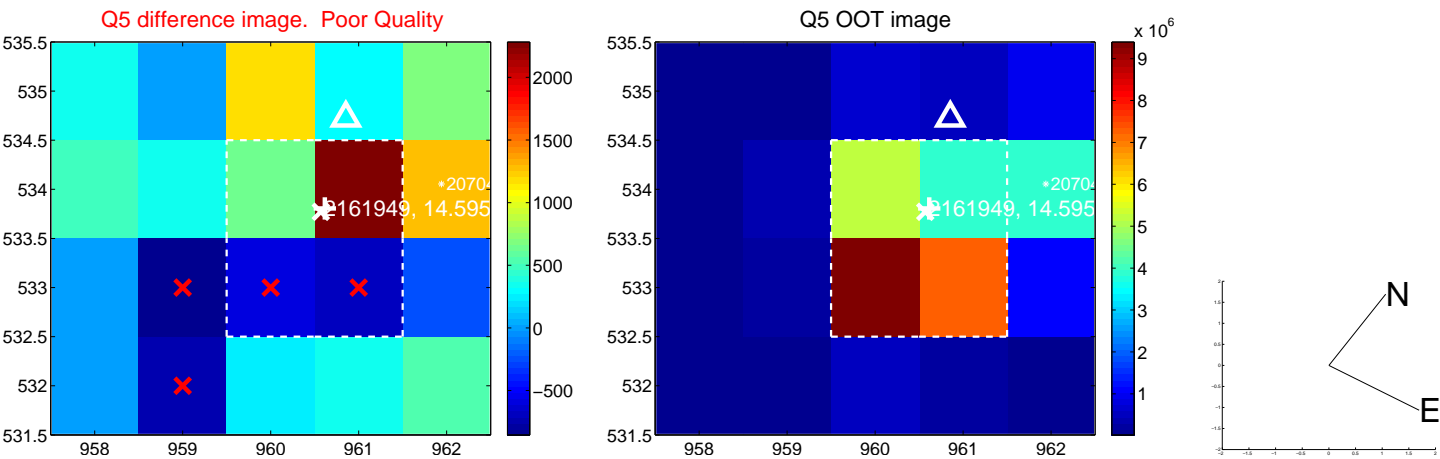


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- σ uncertainty. Blue circle: three- σ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

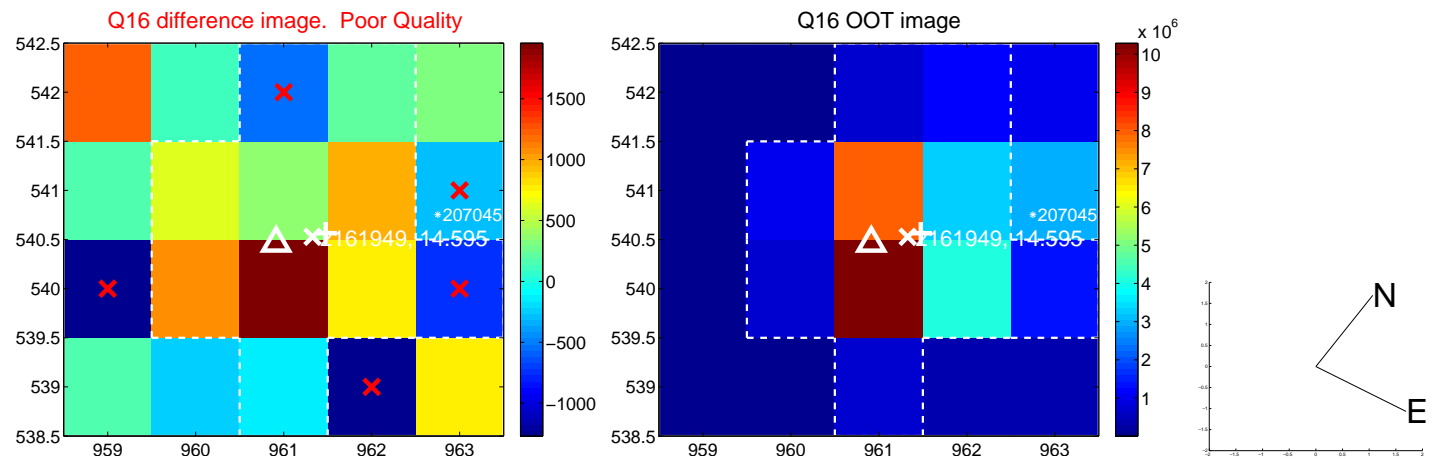
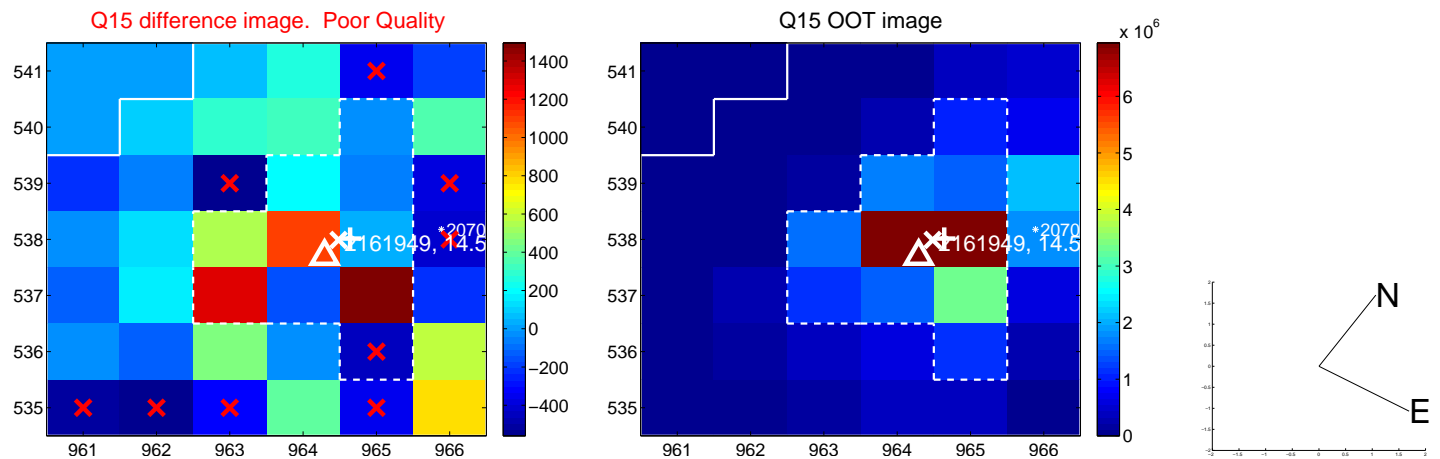
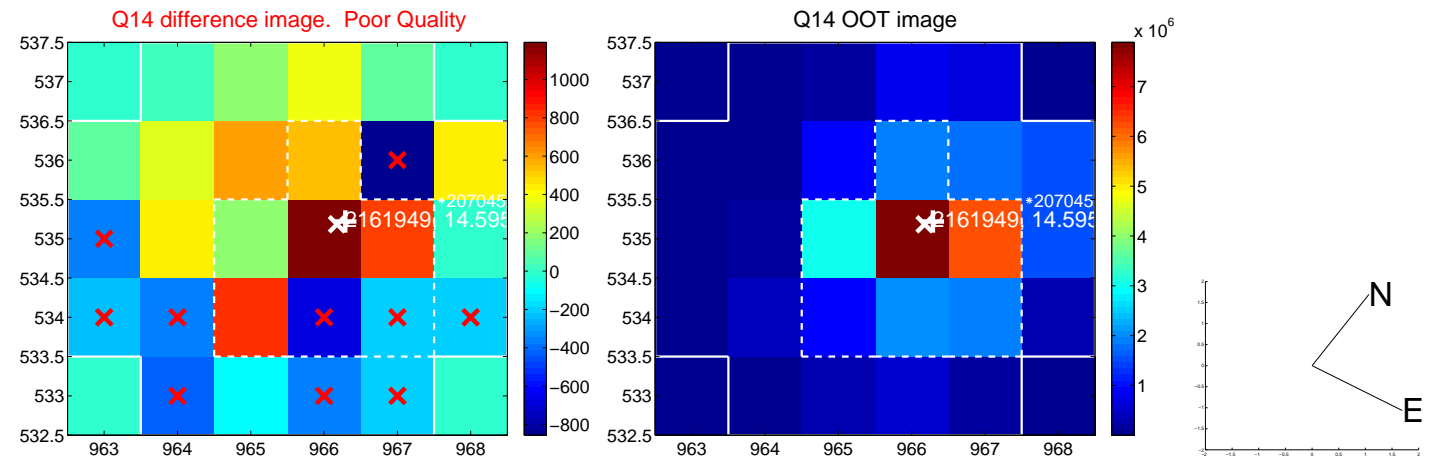
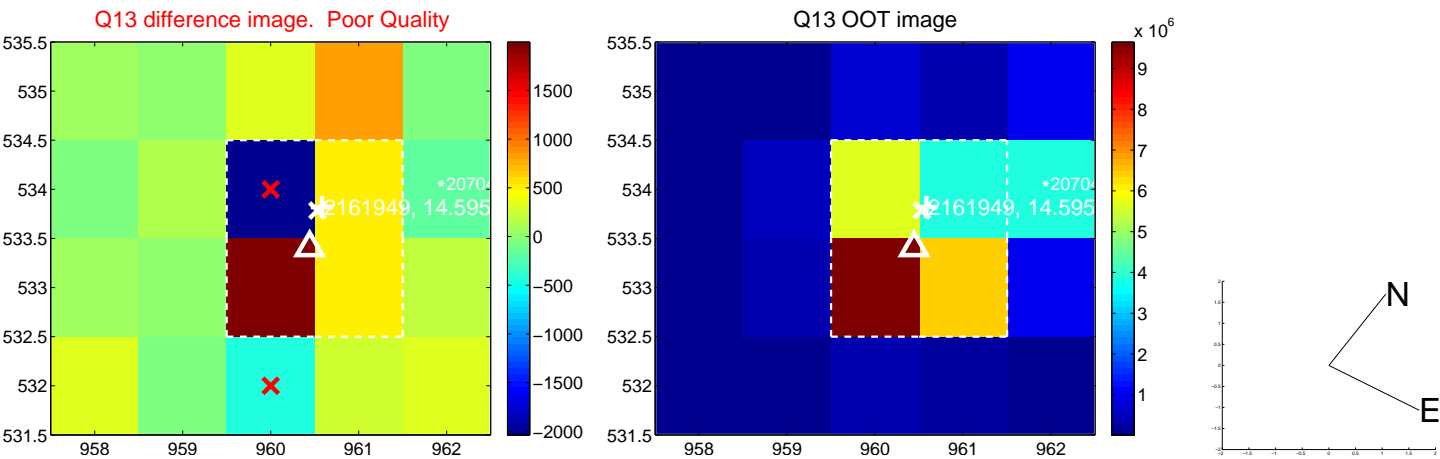
white \times : KIC target position; $+$: OOT centroid; \triangle : difference centroid. red \times : large negative pixel value.



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.



UKIRT Image

Declination

