

# KIC 005288937

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|-----|-----|-----------------------------|-----------------|------------------------|------------------------|
| 005288937-01 | OBS      | No   | 0.669907      | 131.621138   | 10.9        | 4.220            | 9.0 | 3.3 | 12.08                       | 6740            | 4.05                   | 0.00                   |
| 005288937-02 | OBS      | No   | 20.061400     | 142.842908   | 296.5       | 3.274            | 8.9 | 6.5 | 12.08                       | 6740            | 24.03                  | 5620.35                |
| 005288937-04 | OBS      | No   | 67.844141     | 156.771648   | 444.3       | 2.170            | 8.5 | 9.3 | 12.08                       | 6740            | 27.36                  | 1107.21                |
| 005288937-06 | OBS      | No   | 19.956635     | 149.151627   | 123.8       | 9.226            | 8.3 | 4.2 | 12.08                       | 6740            | 14.66                  | 5659.73                |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments  |
|--------------|----------|------|-------|---|---|---|---|---|
| 005288937-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT   |
| 005288937-02 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT                                       |
| 005288937-04 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_ALT—ALL_TRANS_CHASES—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT   |
| 005288937-06 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT |

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

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

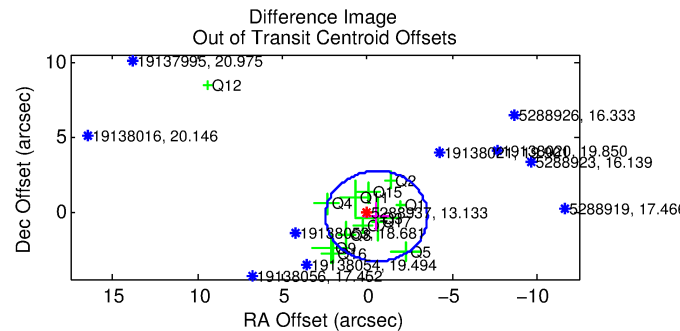
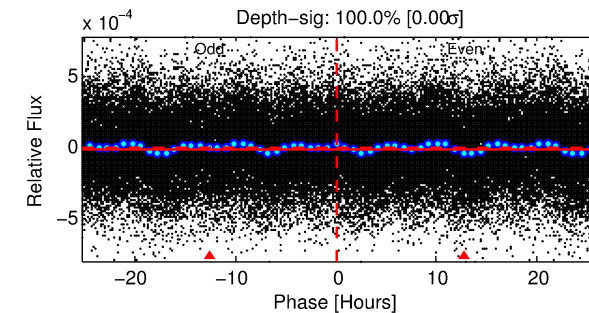
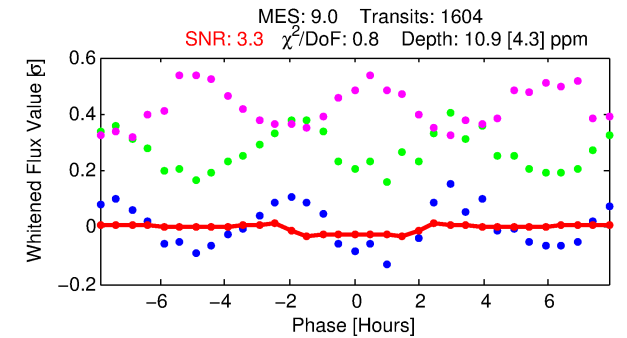
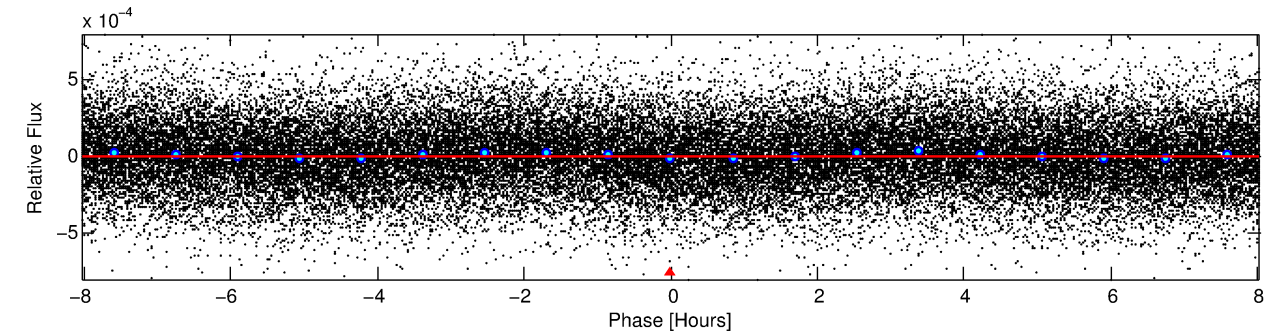
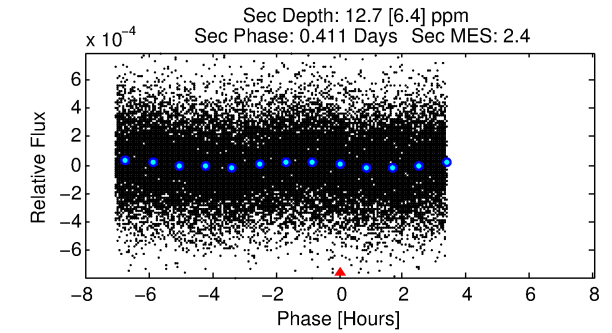
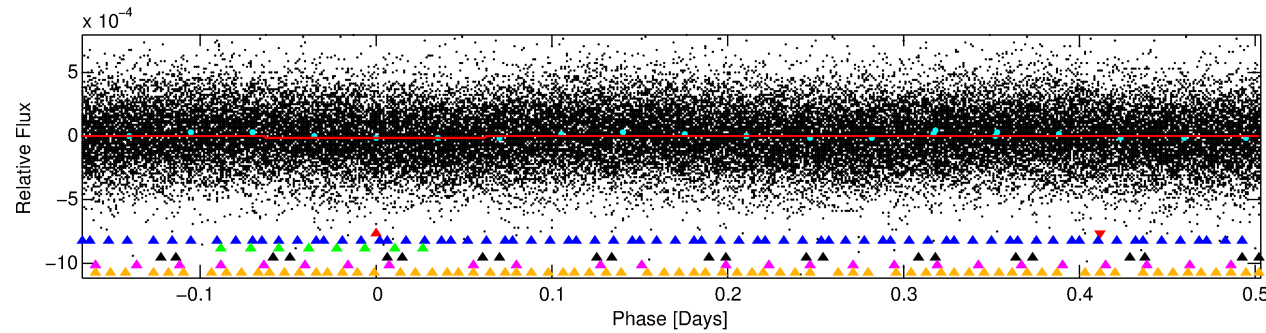
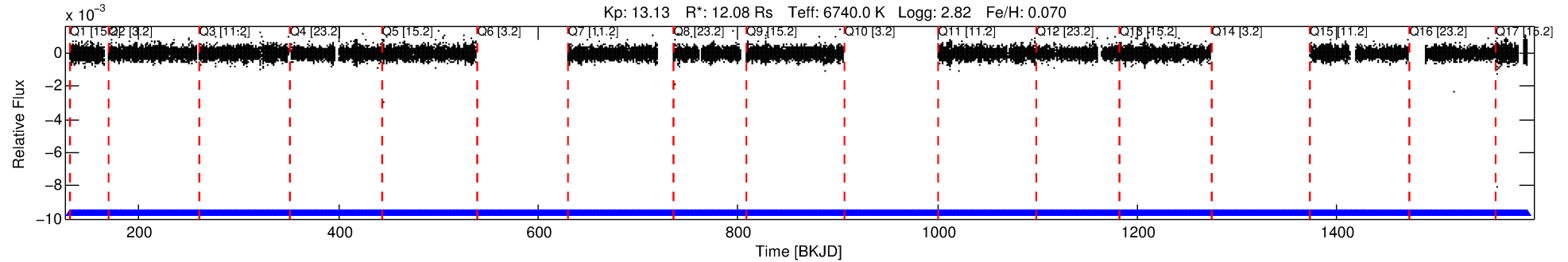
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 005288937-01

No Significant Match Found

# DV One-Page Summary

KIC: 5288937 Candidate: 1 of 6 Period: 0.670 d



## DV Fit Results:

Period = 0.66991 [0.00003] d  
Epoch = 131.6211 [0.0070] BKJD  
Rp/R\* = 0.0031 [0.0030]  
a/R\* = 1.34 [3.11]  
b = 0.30 [16.12]  
Seff = N/A  
Teq = N/A  
Rp = 4.05 [4.31] Re  
a = N/A  
Ag = N/A  
Teffp = N/A

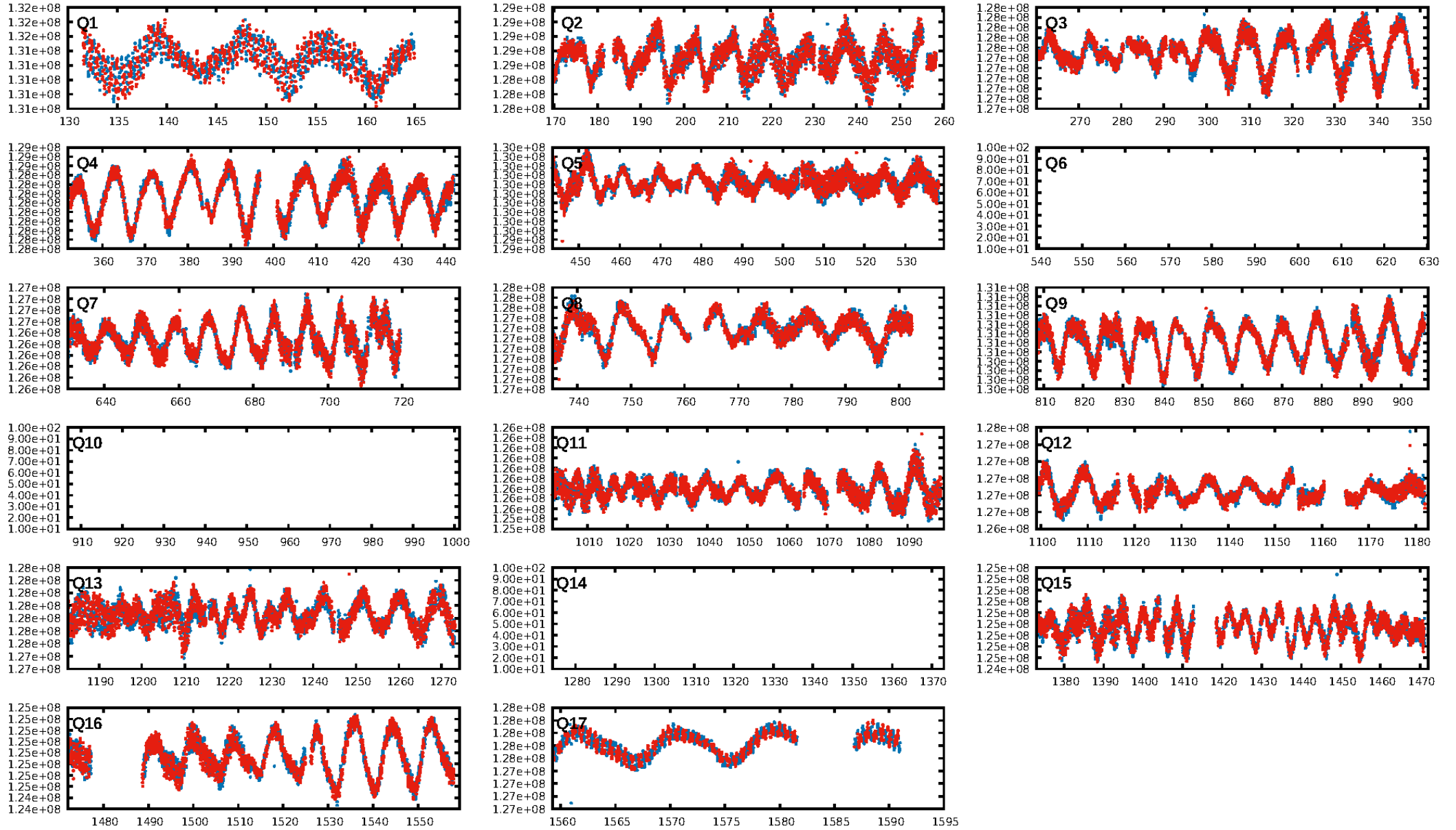
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [45.62σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 2.67e-17  
RollingBand-fgt: 1.00 [1514/1514]  
GhostDiagnostic-chr: 4.959  
Centroid-sig: 21.6%  
Centroid-so: 1.857 arcsec [1.07σ]  
OotOffset-rm: 0.633 arcsec [0.63σ]  
KicOffset-rm: 0.610 arcsec [0.63σ]  
OotOffset-st: 1/4/4/4 [13]  
KicOffset-st: 1/4/4/4 [13]  
DiffImageQuality-fgm: 0.38 [5/13]  
DiffImageOverlap-fno: 1.00 [14/14]

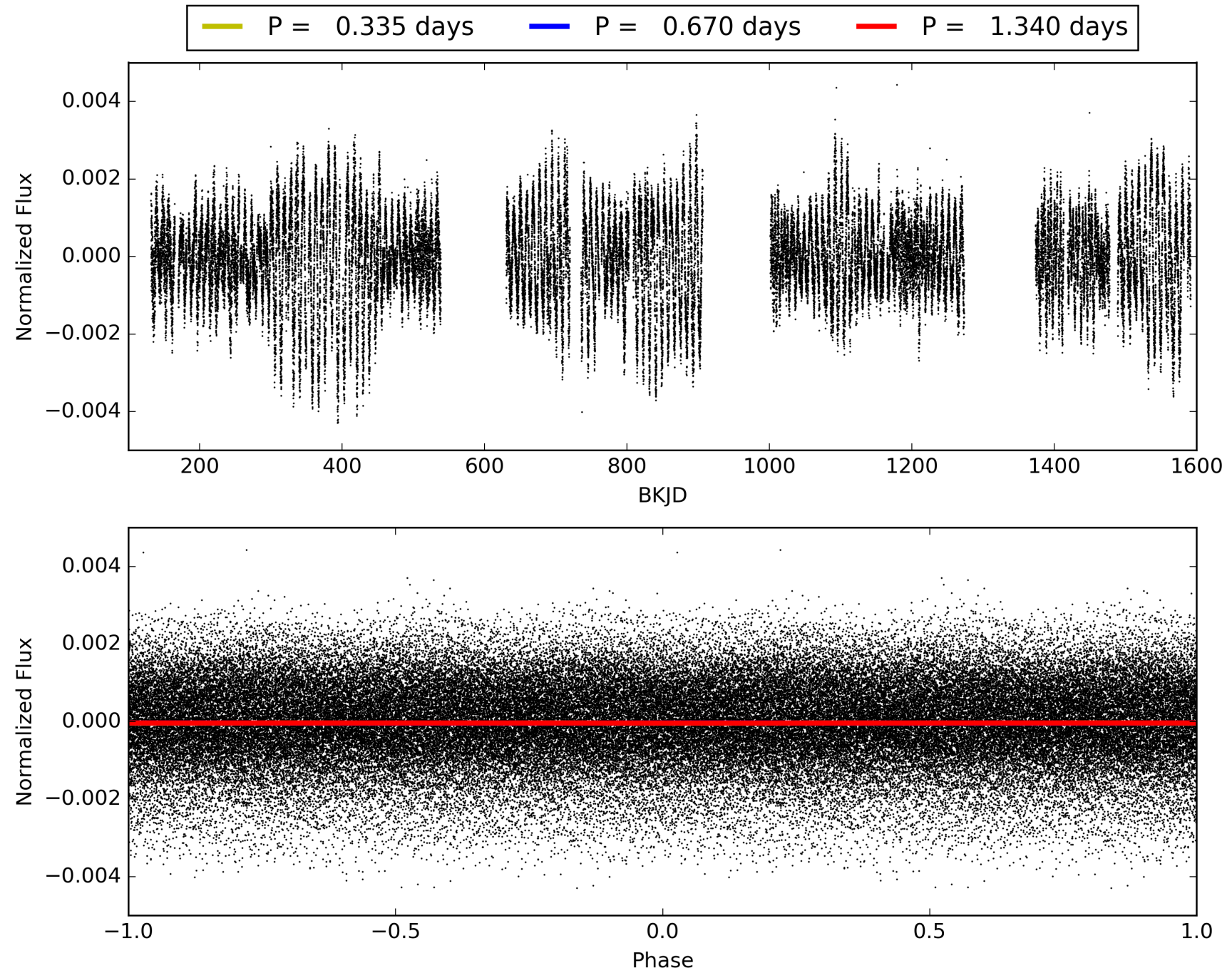
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 18:29:09 Z

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

# TCE 005288937-01, PDC Light Curves



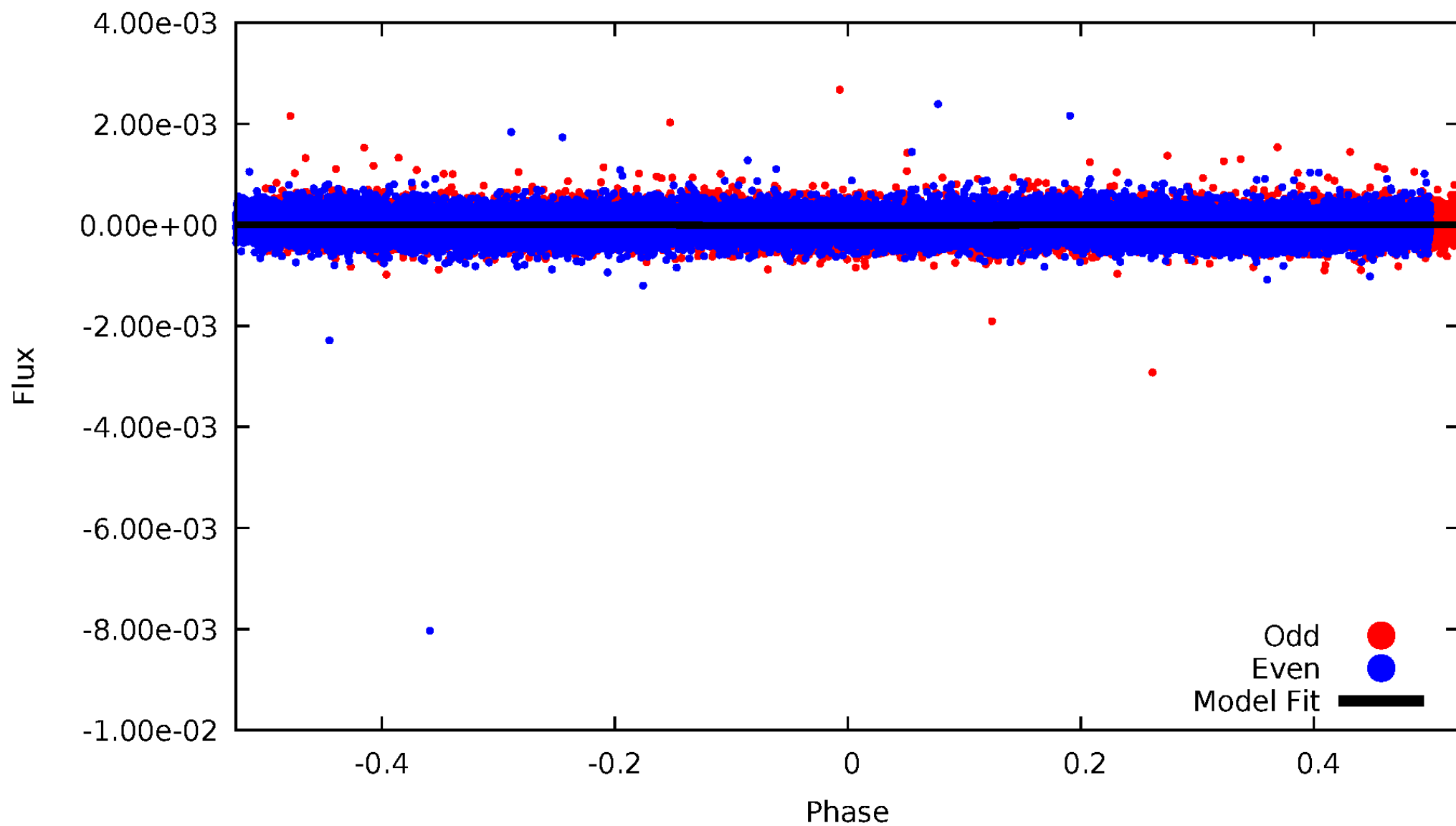
TCE 005288937-01





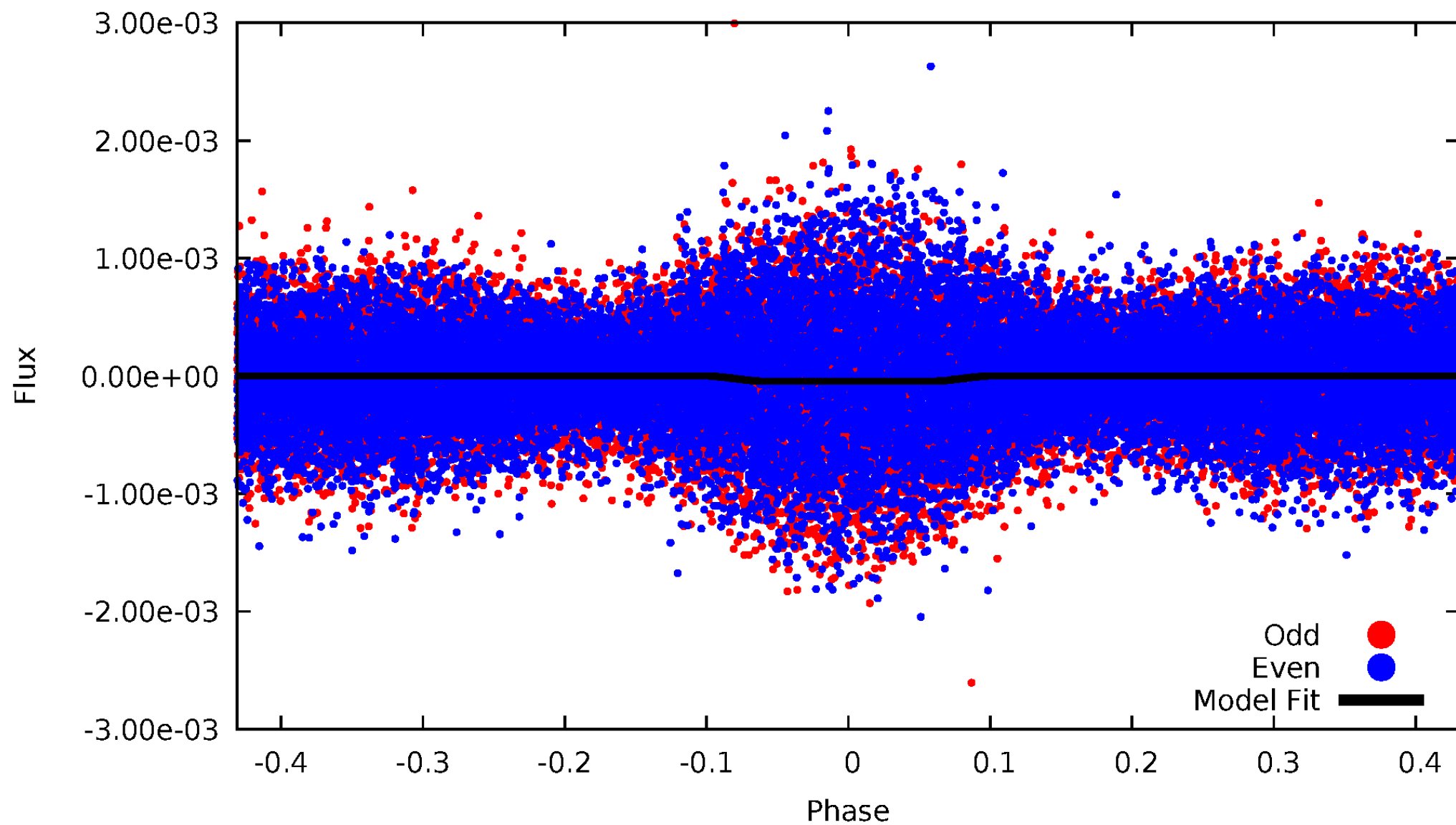
# DV Odd/Even

TCE 005288937-01

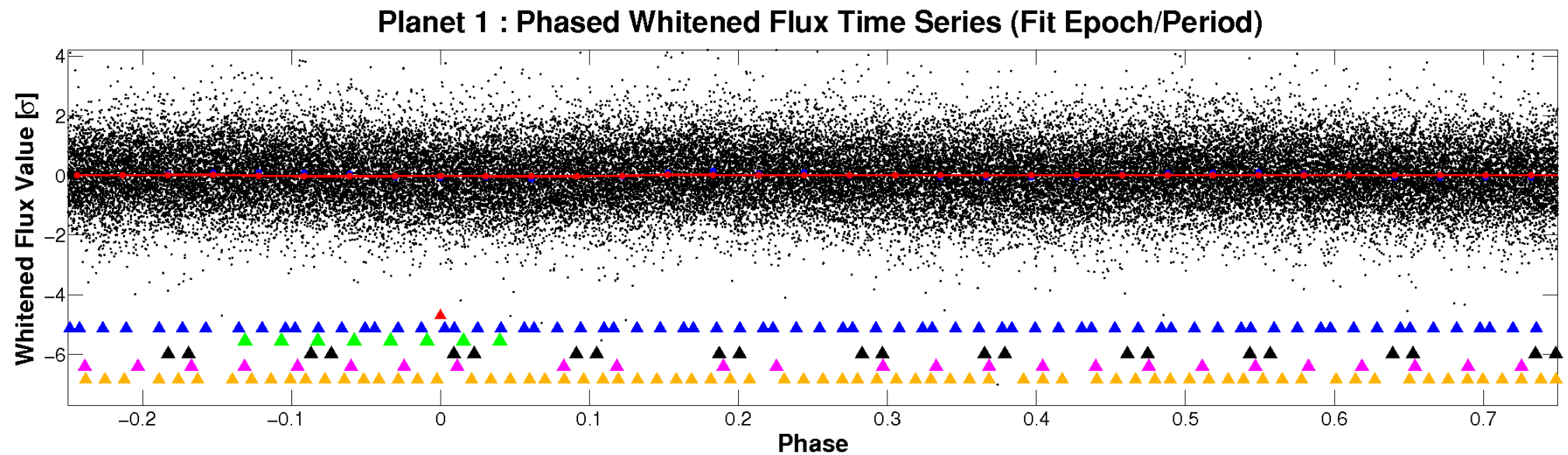
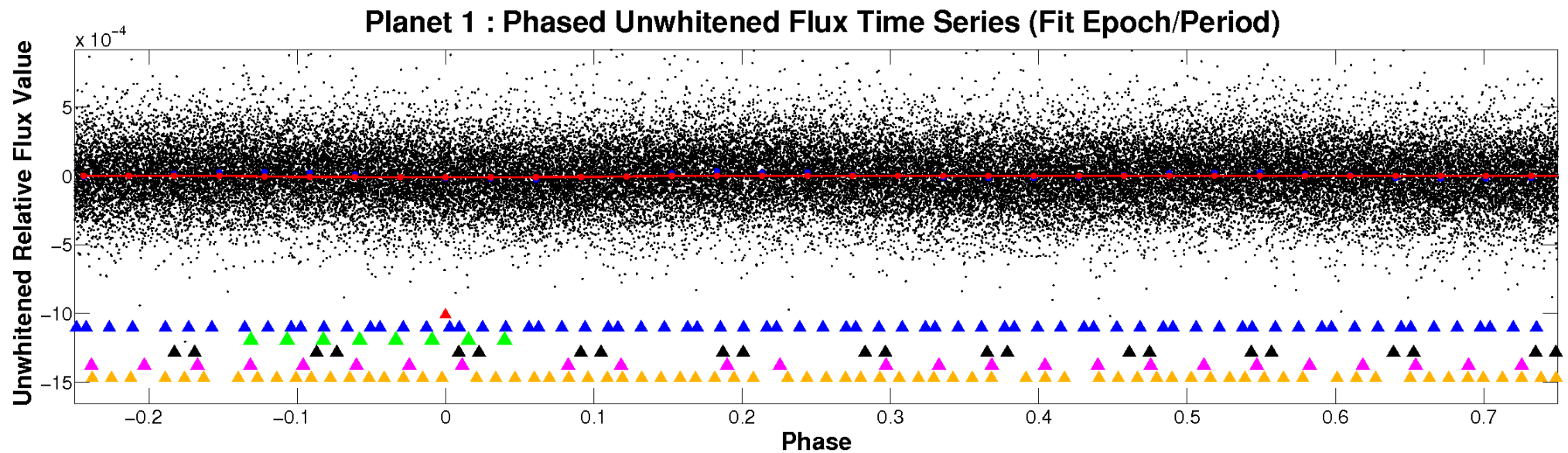


# ALT Odd/Even

TCE 005288937-01

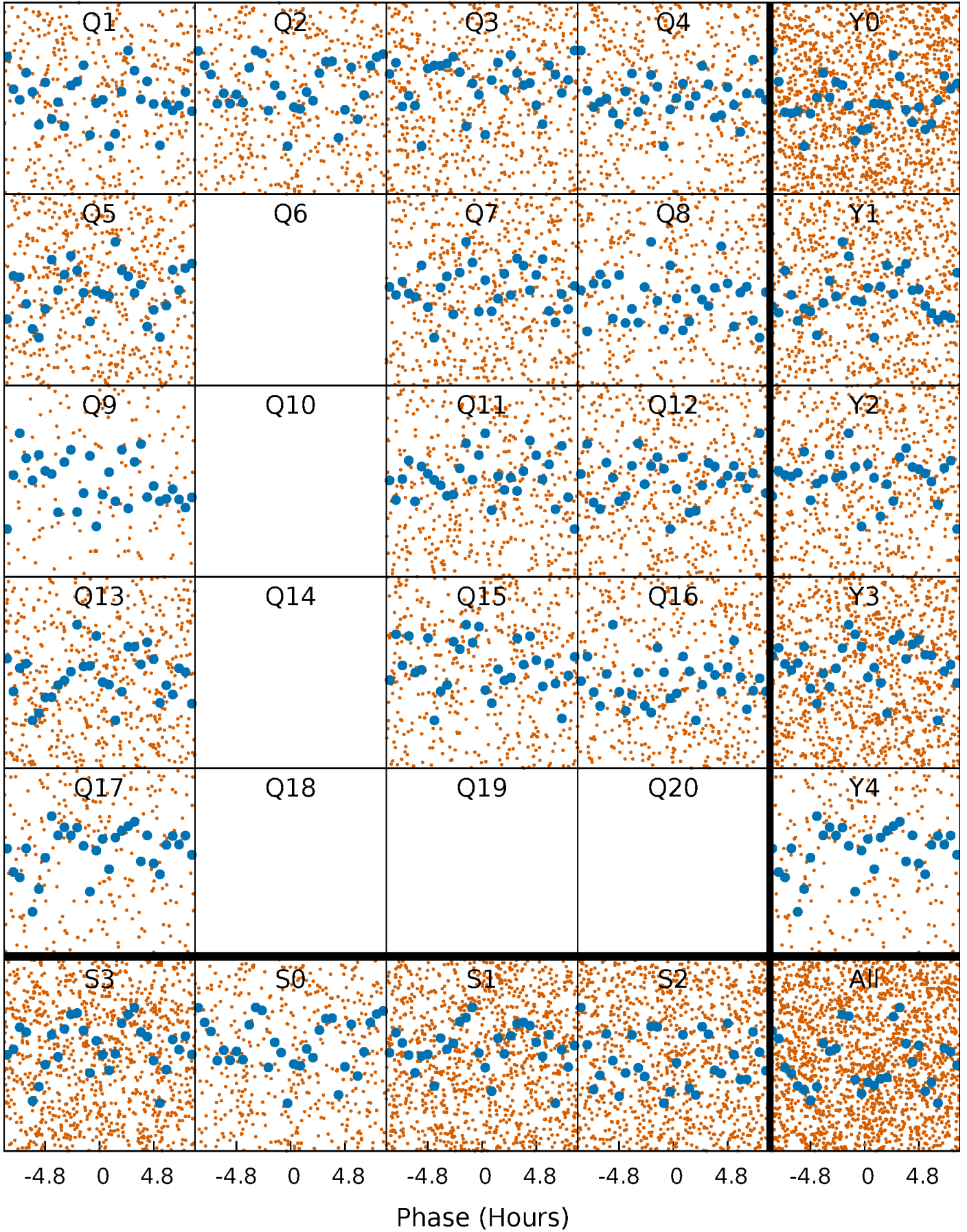


# Non-Whitened Vs. Whitened Light Curve



# PDC Quarter-Phased Transit Curves

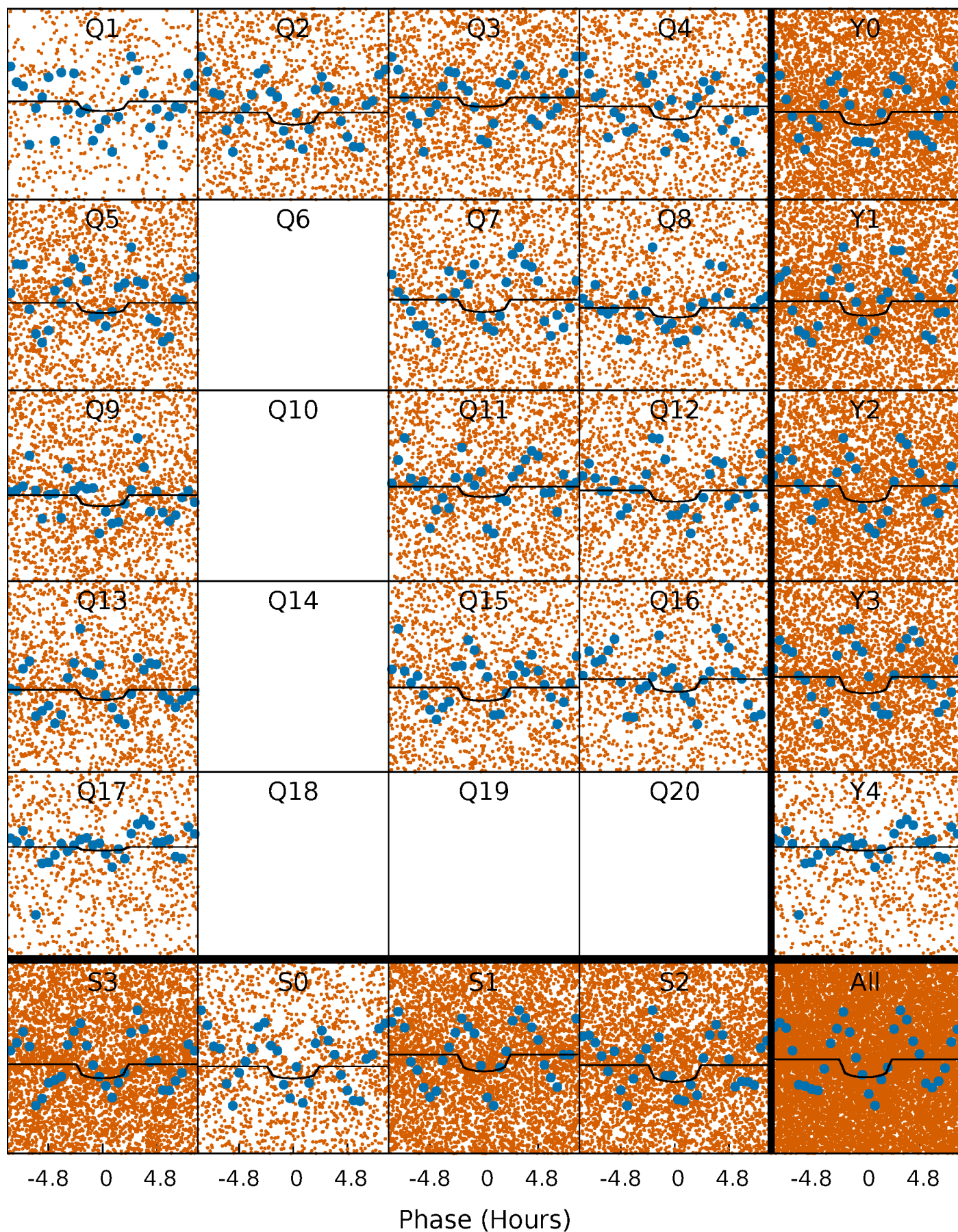
TCE 005288937-01   P= 0.669907 Days    $T_0=131.621138$  (BKJD)





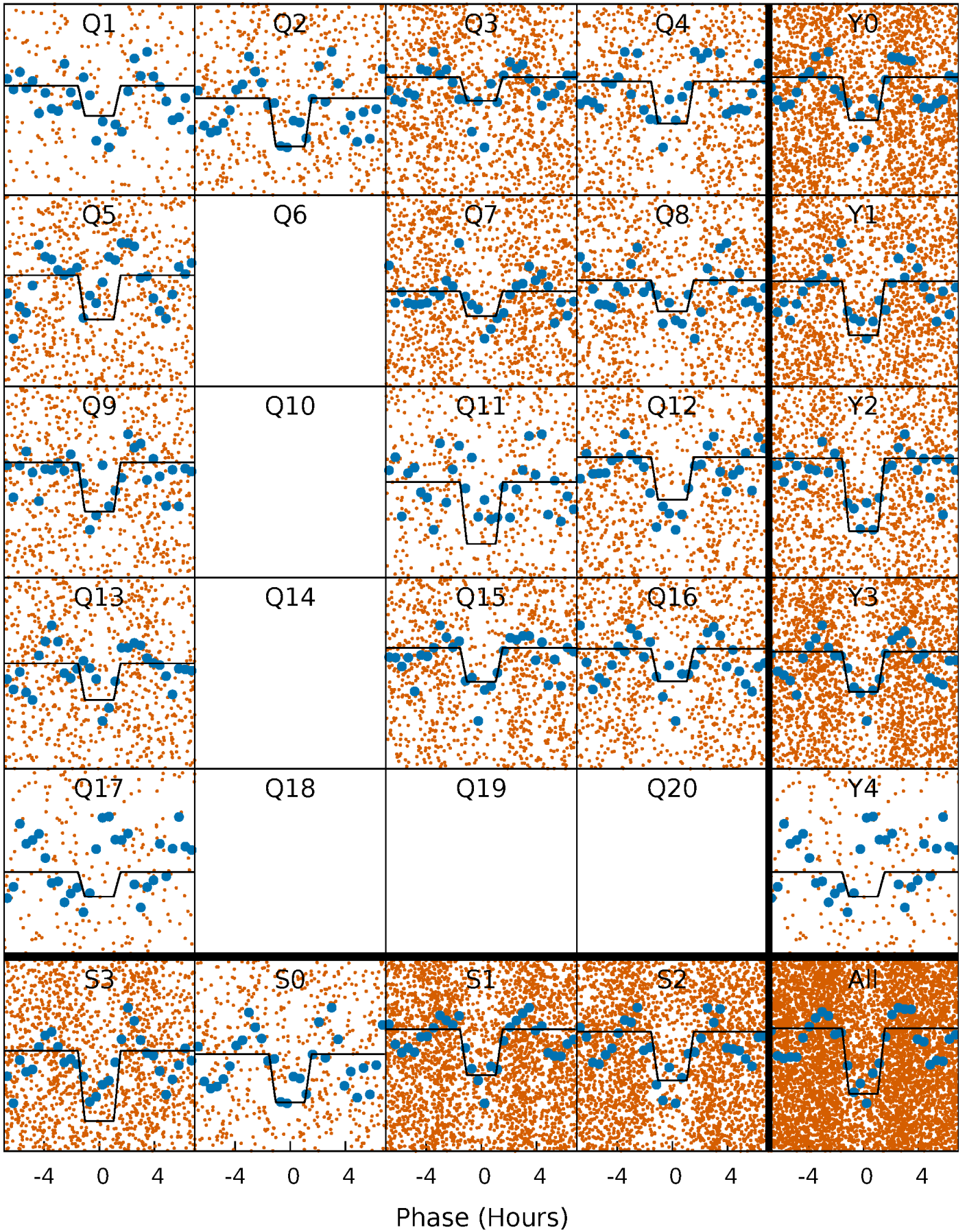
# DV Quarter-Phased Transit Curves

TCE 005288937-01 P= 0.669907 Days  $T_0=131.621138$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

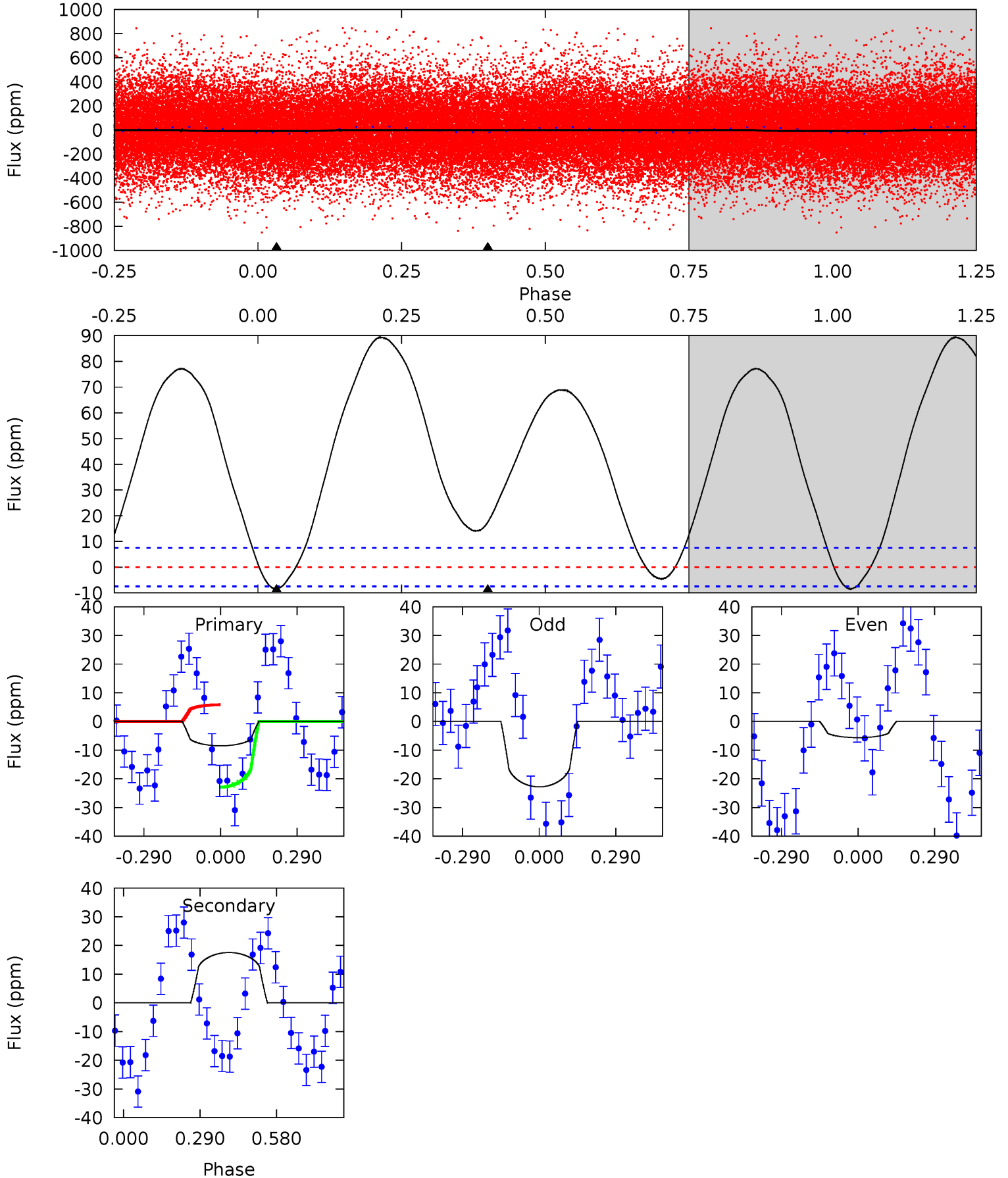
TCE 005288937-01 P= 0.669939 Days  $T_0=131.616849$  (BKJD)



# DV Model-Shift Uniqueness Test

005288937-01, P = 0.669907 Days, E = 130.951231 Days

| Pri  | Sec   | Ter | Pos | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|-------|-----|-----|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 4.91 | -10.2 | 0   | 0   | 4.34            | 1.06            | 4.73             | 4.91    | 4.91    | -10.2   | -10.2   | 5.01    | 1.29 | 0.91  | 4.95 |

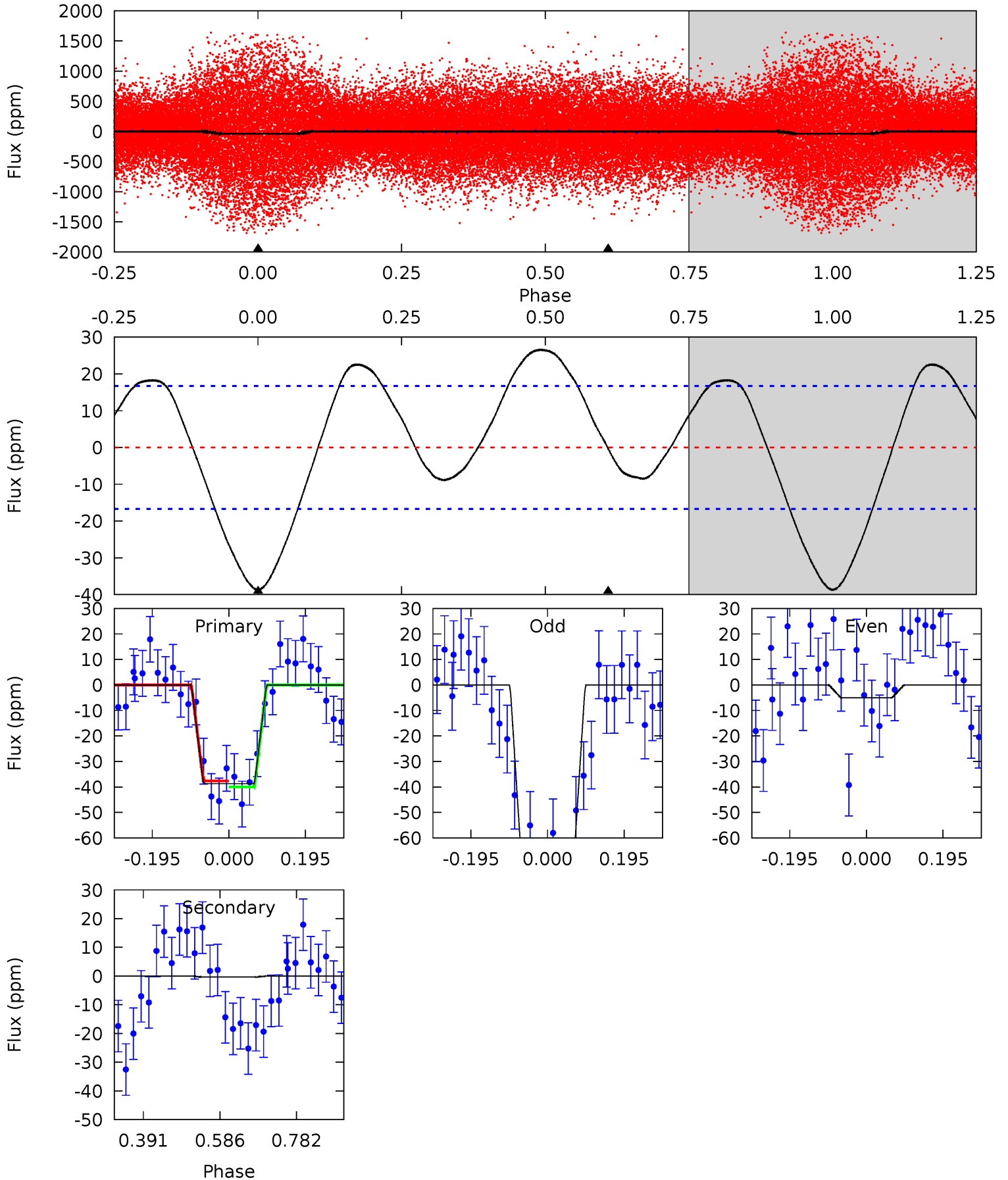




# Alt Model-Shift Uniqueness Test

005288937-01, P = 0.669939 Days, E = 130.946910 Days

| Pri  | Sec  | Ter | Pos | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|-----|-----|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 10.2 | 0.10 | 0   | 0   | 4.42            | 1.29            | 2.40             | 10.2    | 10.2    | 0.10    | 0.10    | 8.07    | 1.85 | 0.41  | 0.32 |





### Stellar Parameters For KIC 005288937

|        | $T_{\text{eff}}(K)$   | $\log(g)$                 | [Fe/H]                    | $R (R_{\odot})$            | $M(M_{\odot})$            | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|-----------------------|---------------------------|---------------------------|----------------------------|---------------------------|---|
|        | $6740^{+448}_{-1908}$ | $2.816^{+0.172}_{-0.258}$ | $0.070^{+0.250}_{-0.600}$ | $12.080^{+3.326}_{-4.989}$ | $3.479^{+0.111}_{-2.117}$ | $0.003^{+0.004}_{-0.001}$                 |
|        | +7%/-28%              | +6%/-9%                   | +357%/-857%               | +28%/-41%                  | +3%/-61%                  | +136%/-53%                                |
| Source | PHO1                  | FLK73                     | 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 005288937-01 / KOI

| Detrend | Depth (ppm) | $R_p (R_{\oplus})$     | $T_{max} (K)$          | $T_{obs} (K)$           | $A_{obs}$                  |
|---------|-------------|------------------------|------------------------|-------------------------|----------------------------|
| DV      | $18 \pm 2$  | $4.88^{+3.55}_{-3.11}$ | $9422^{+1378}_{-2457}$ | $-9592^{+3001}_{-5152}$ | $-0.201^{+0.134}_{-1.254}$ |
| Alt.    | $-0 \pm 4$  | $8.80^{+4.57}_{-4.25}$ | $9348^{+1480}_{-2228}$ | $-7762^{+2150}_{-1688}$ | $0.001^{+0.016}_{-0.016}$  |

$T_{max}$  = 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  $A_{obs} \gg 1.0$

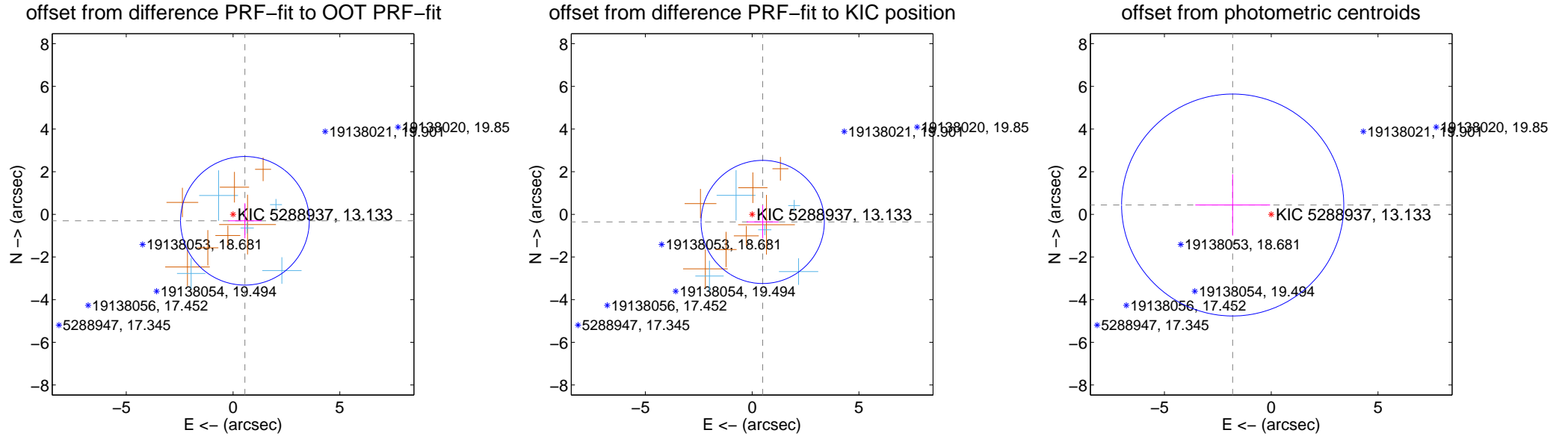
## DV Centroid Data

Supplemental centroid analysis for 005288937-01. Kepler magnitude: 13.13. Transit SNR 3.32

There are 5 quarters with good PRF difference image offsets

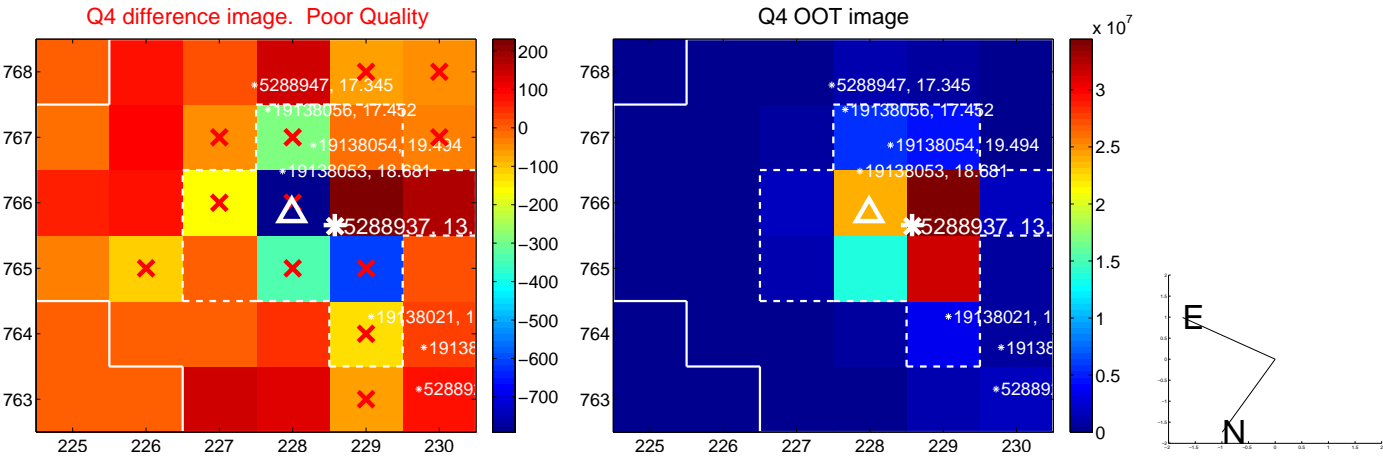
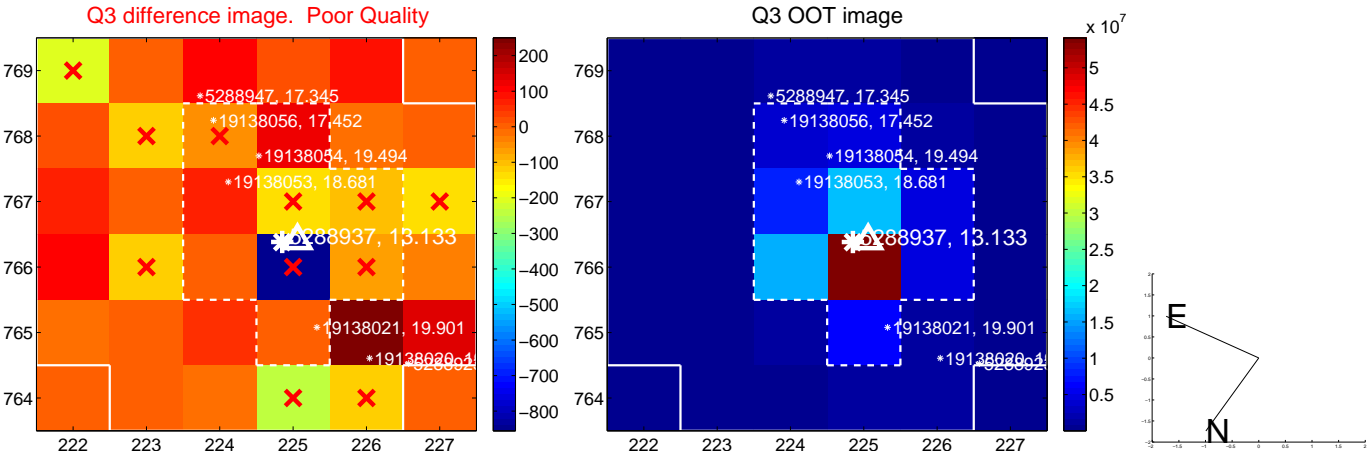
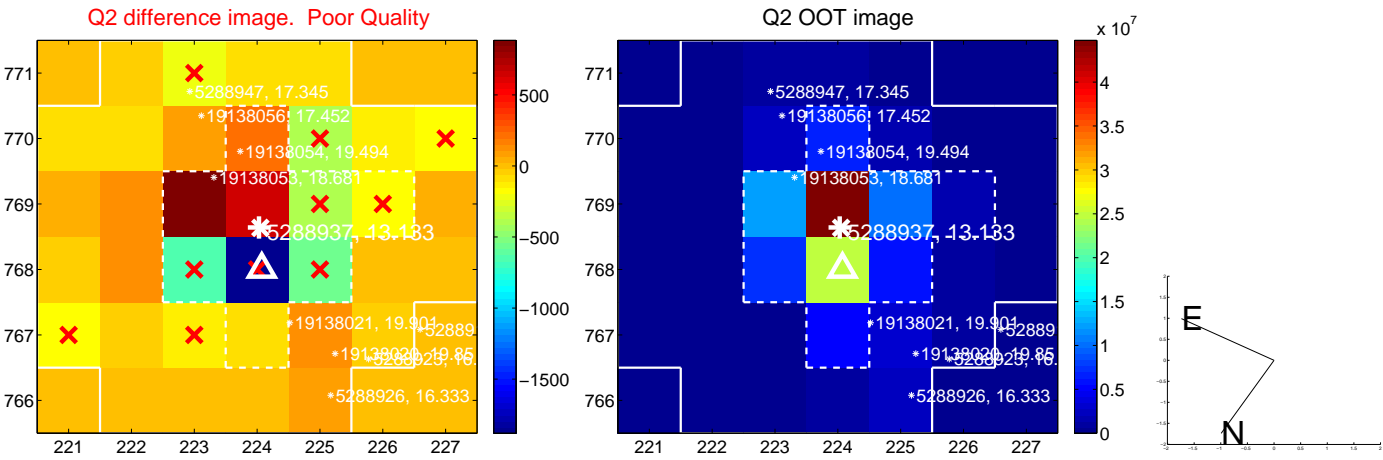
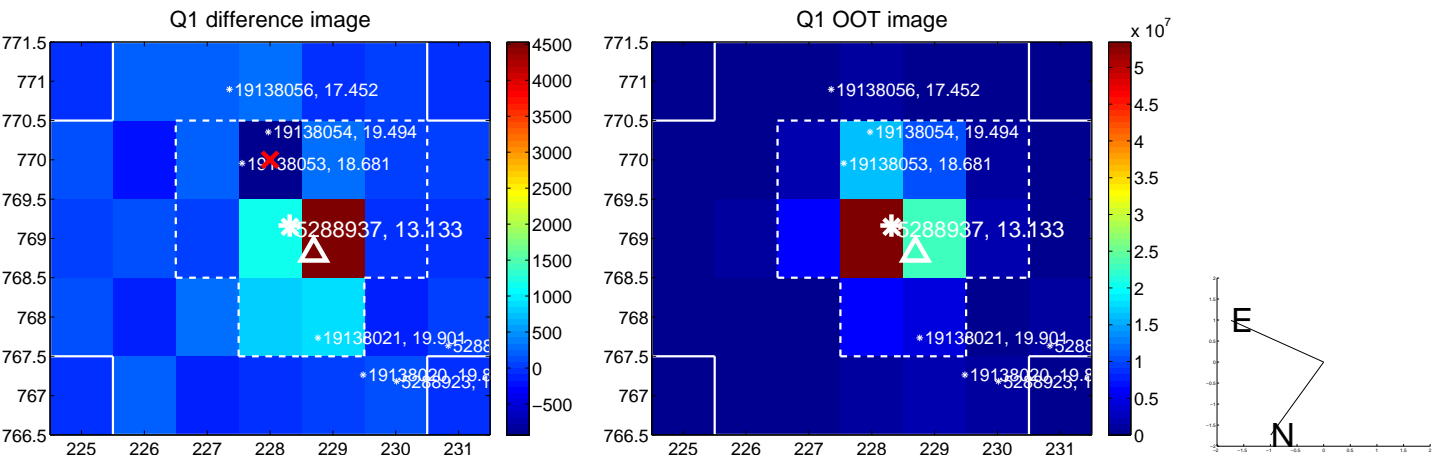
The direct PRF centroid is offset from the target star catalog position by about 0.11 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA        | $\Delta$ Dec       |
|---|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT          | $0.633 \pm 1.005$  | 0.63                | $-0.556 \pm 0.783$ | $-0.303 \pm 0.823$ |
| PRF-fit source offset from KIC position | $0.610 \pm 0.962$  | 0.63                | $-0.495 \pm 0.752$ | $-0.356 \pm 0.774$ |
| photometric centroid source offset      | $1.86 \pm 1.73$    | 1.07                | $1.80 \pm 1.75$    | $0.44 \pm 1.44$    |

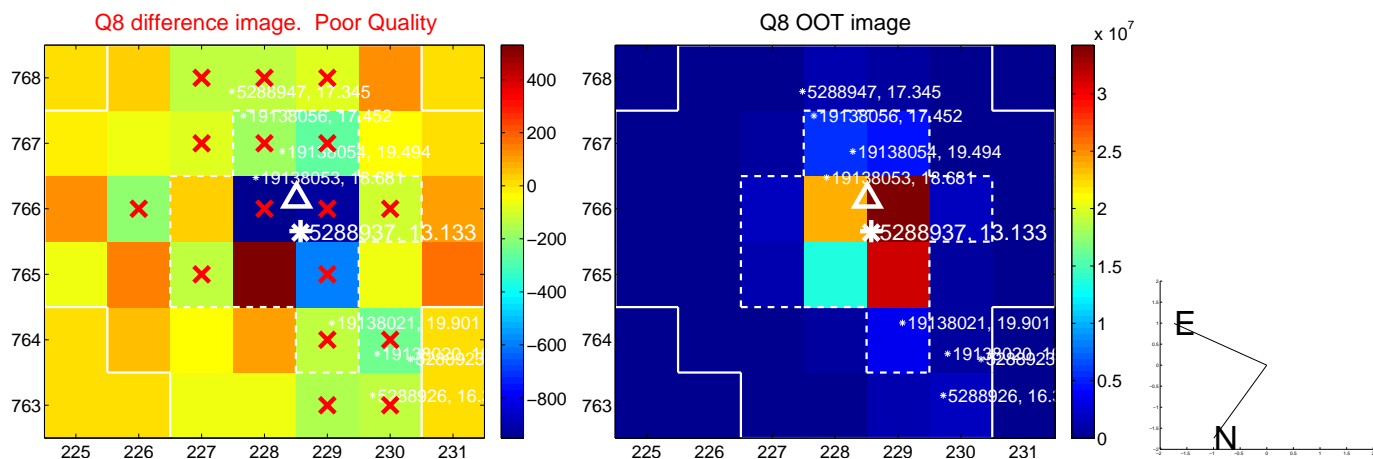
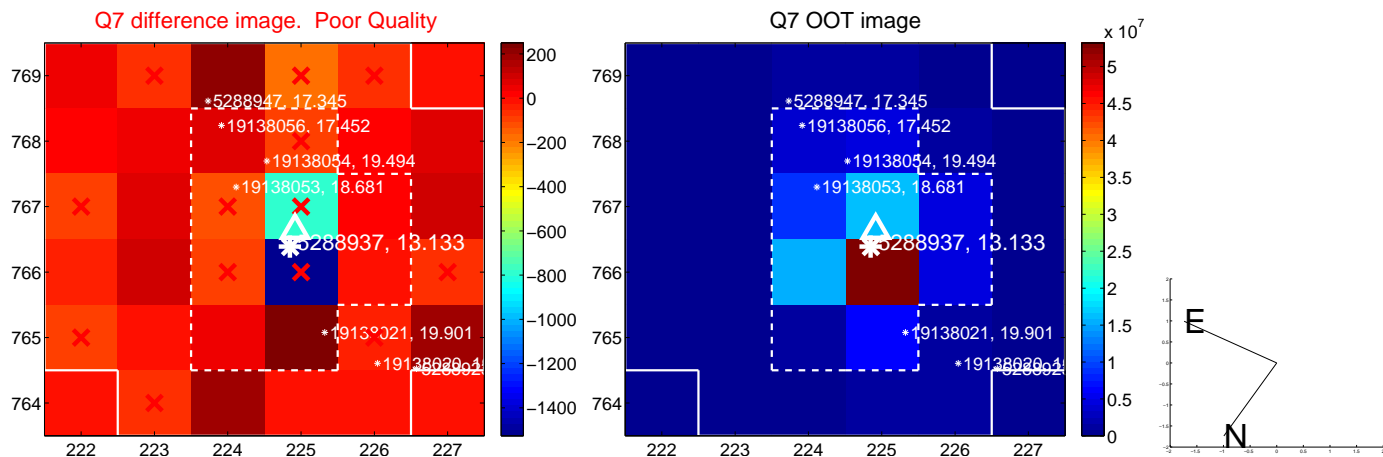
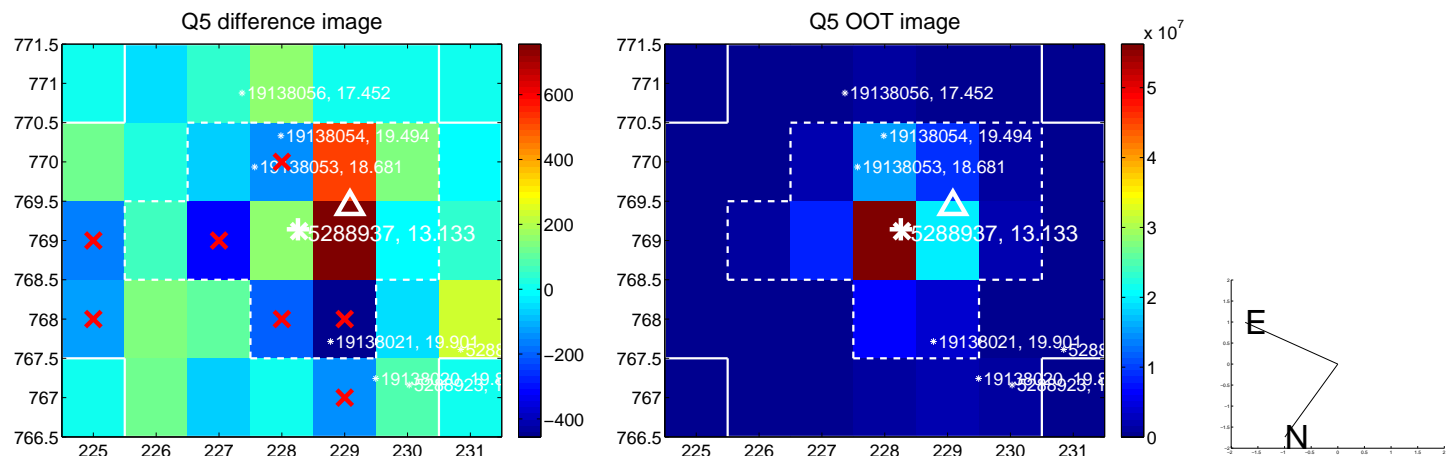


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

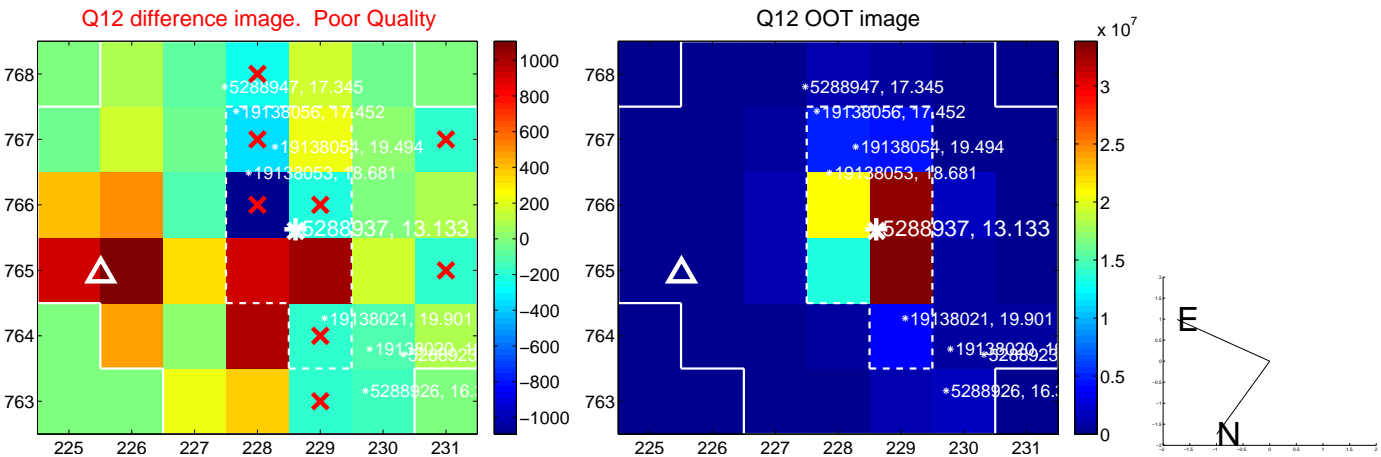
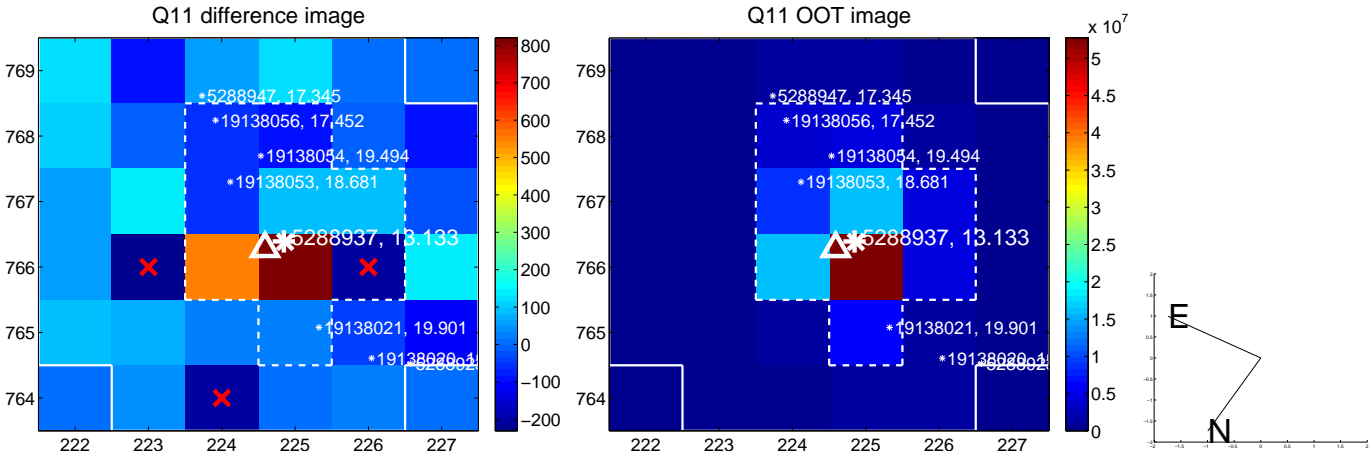
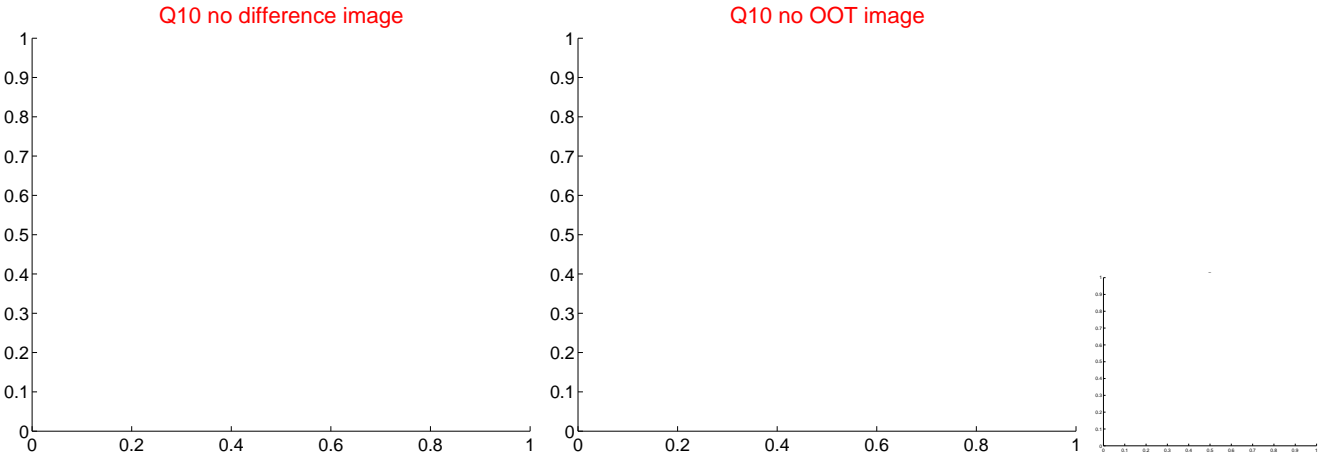
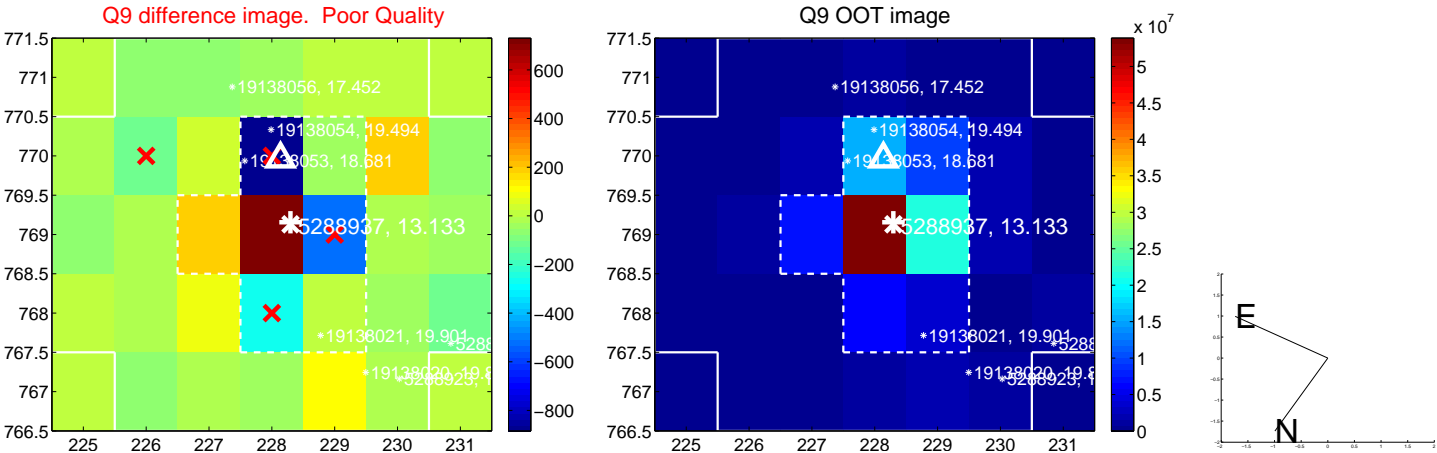


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

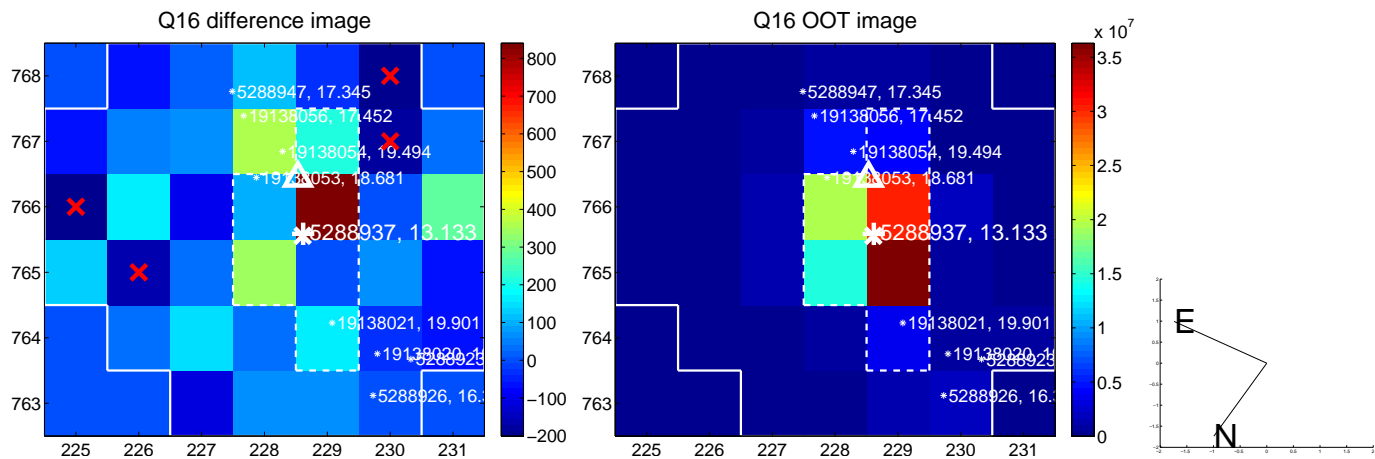
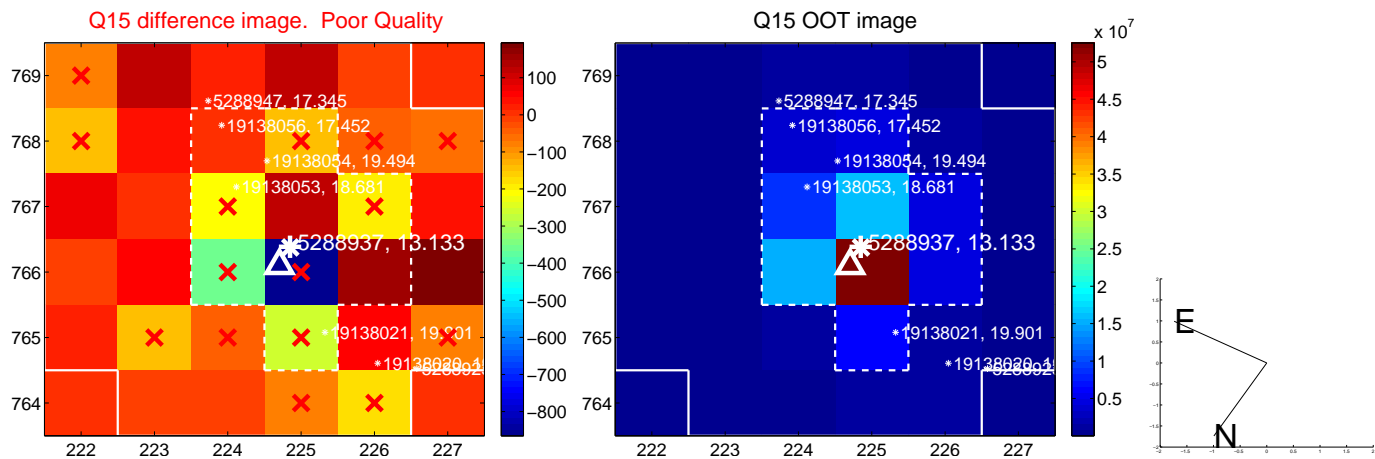
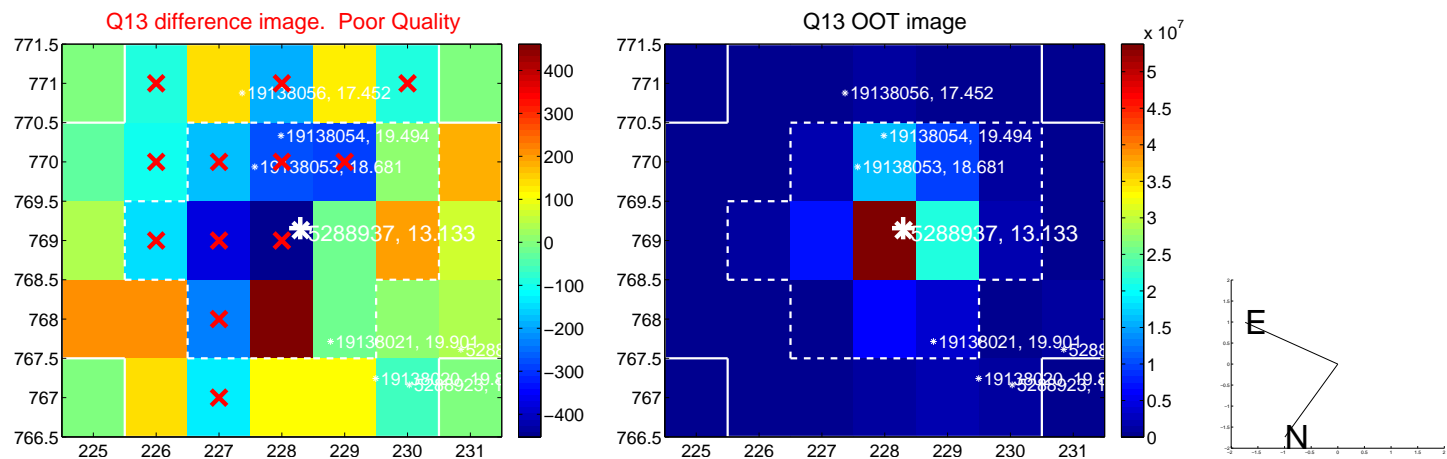




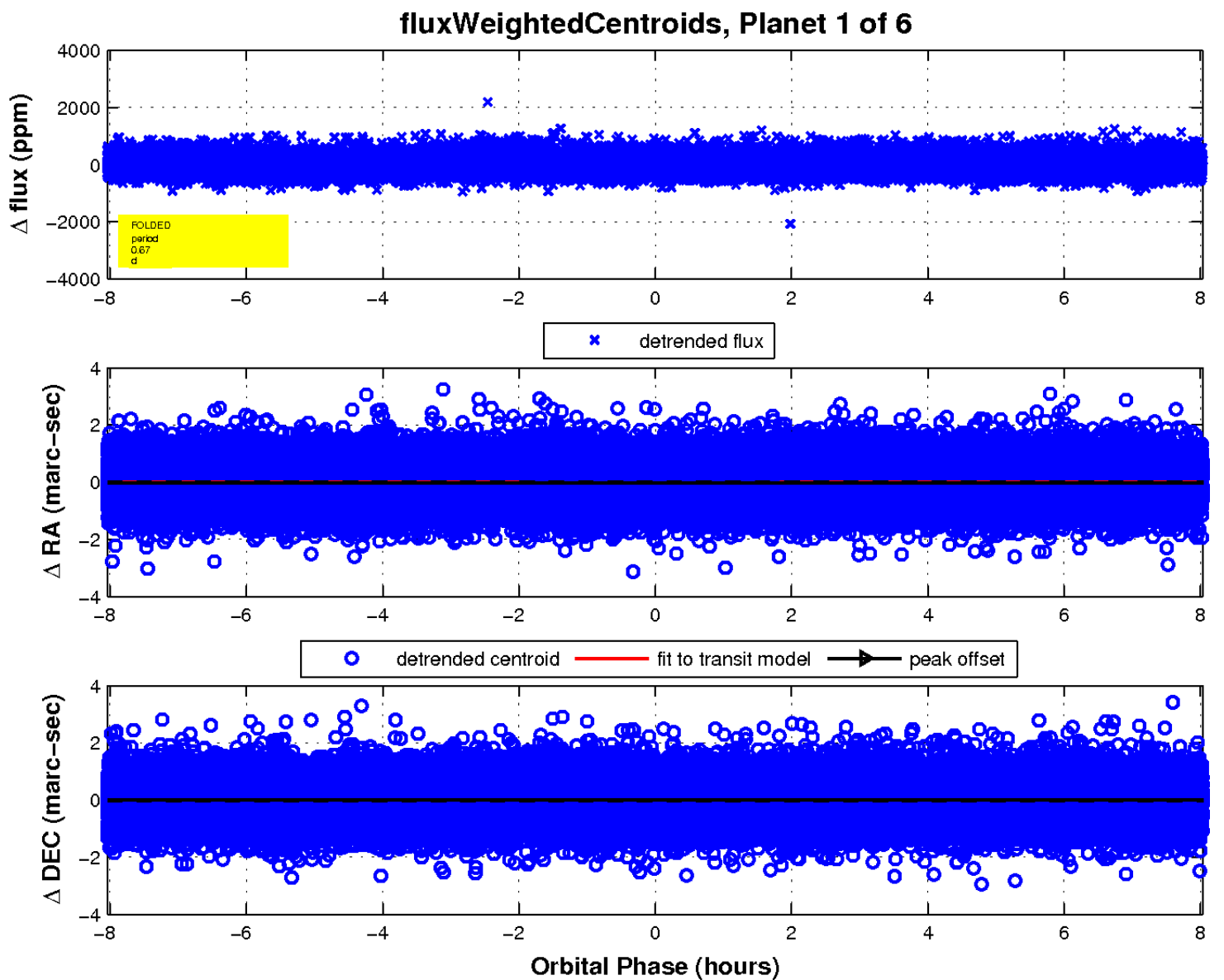
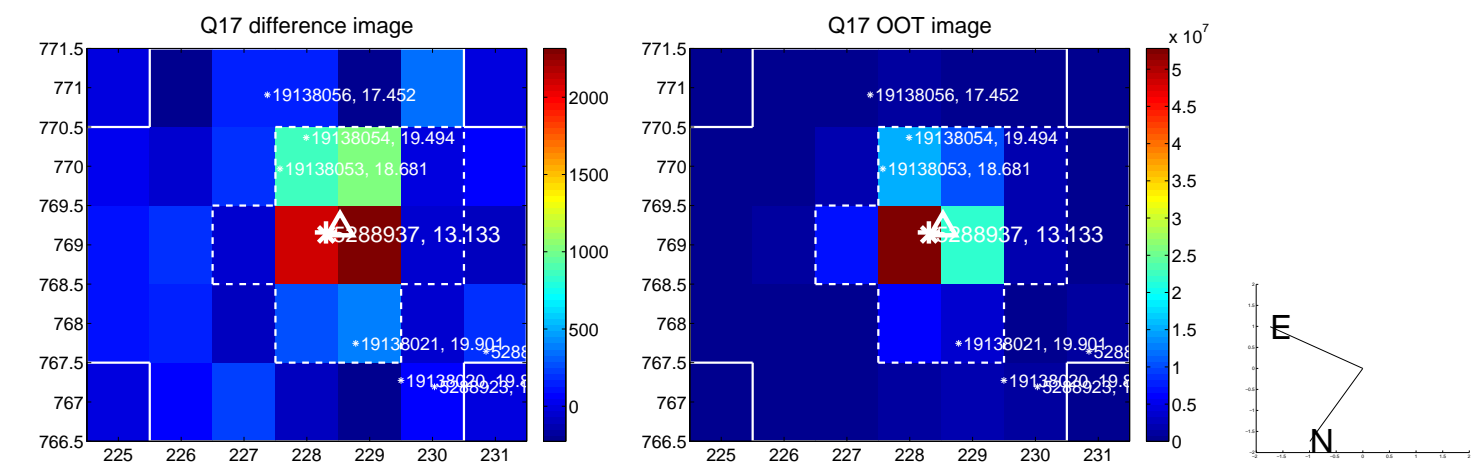
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

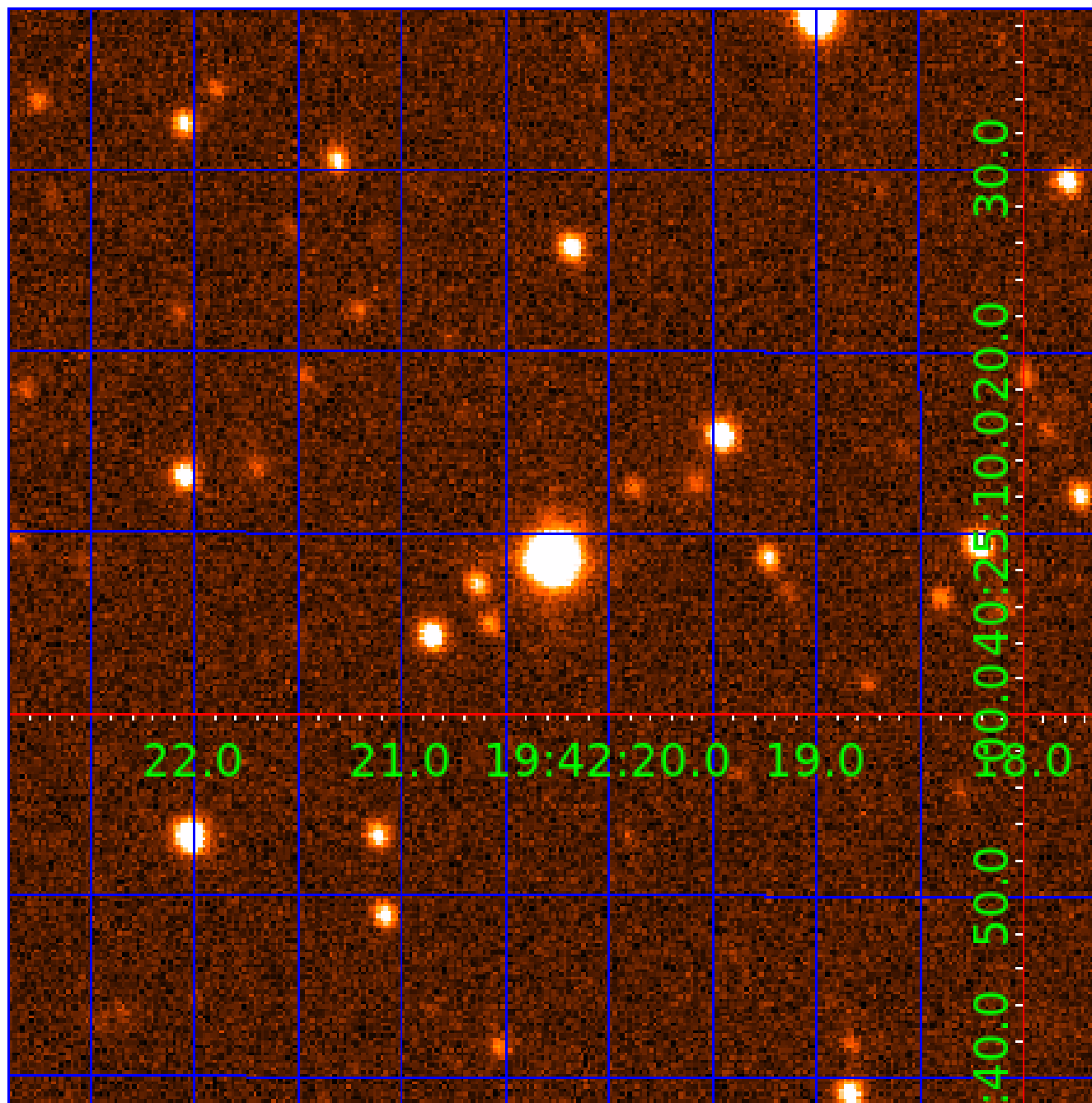


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 005288937

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|-----|-----|-----------------------------|-----------------|------------------------|------------------------|
| 005288937-01 | OBS      | No   | 0.669907      | 131.621138   | 10.9        | 4.220            | 9.0 | 3.3 | 12.08                       | 6740            | 4.05                   | 0.00                   |
| 005288937-02 | OBS      | No   | 20.061400     | 142.842908   | 296.5       | 3.274            | 8.9 | 6.5 | 12.08                       | 6740            | 24.03                  | 5620.35                |
| 005288937-04 | OBS      | No   | 67.844141     | 156.771648   | 444.3       | 2.170            | 8.5 | 9.3 | 12.08                       | 6740            | 27.36                  | 1107.21                |
| 005288937-06 | OBS      | No   | 19.956635     | 149.151627   | 123.8       | 9.226            | 8.3 | 4.2 | 12.08                       | 6740            | 14.66                  | 5659.73                |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments  |
|--------------|----------|------|-------|---|---|---|---|---|
| 005288937-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT   |
| 005288937-02 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT                                       |
| 005288937-04 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_ALT—ALL_TRANS_CHASES—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT   |
| 005288937-06 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT |

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

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

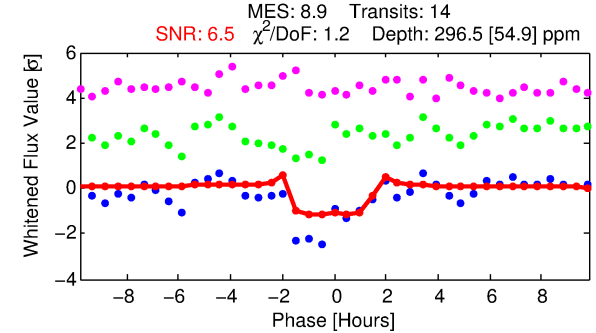
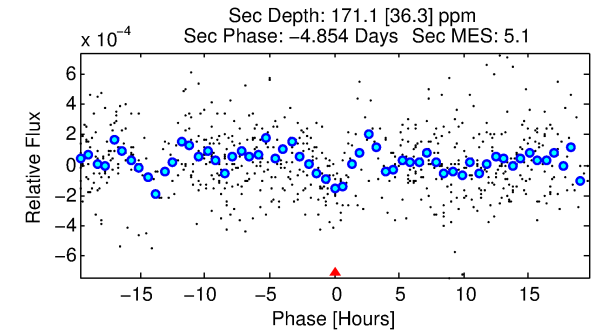
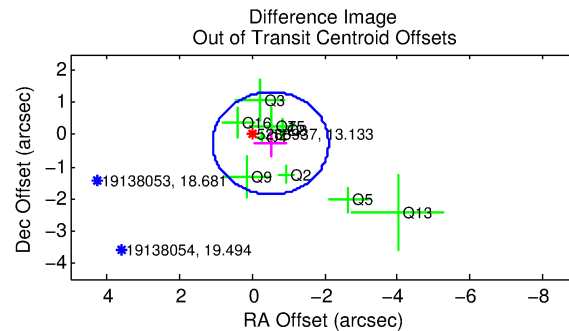
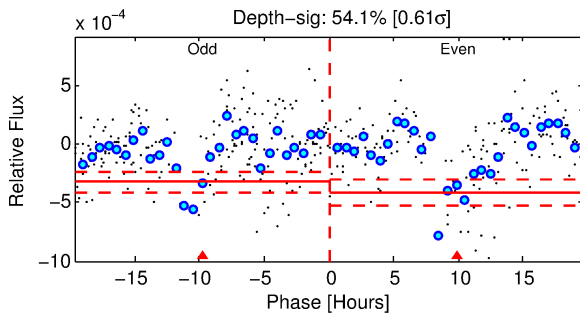
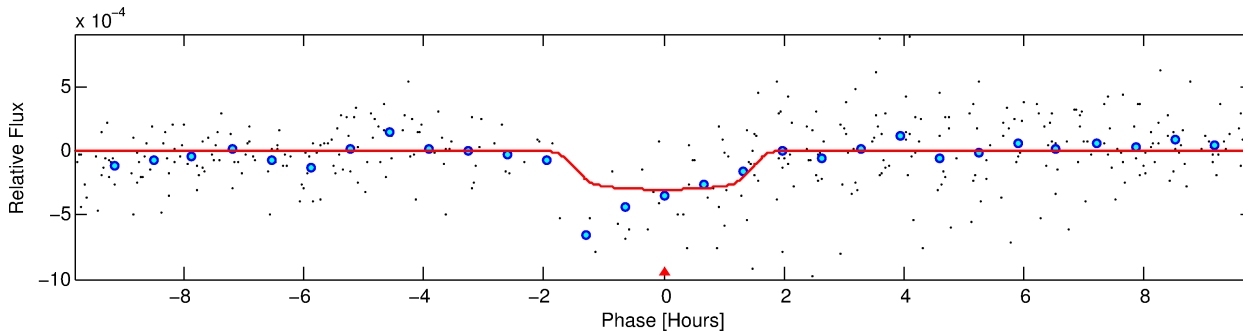
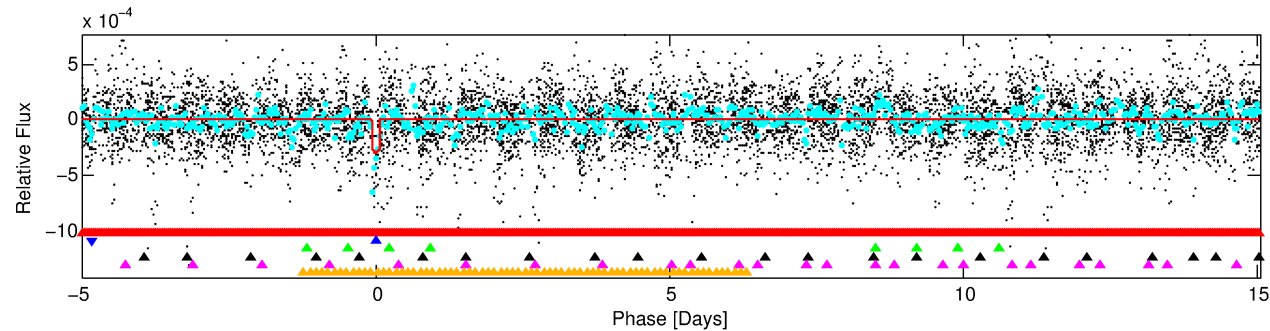
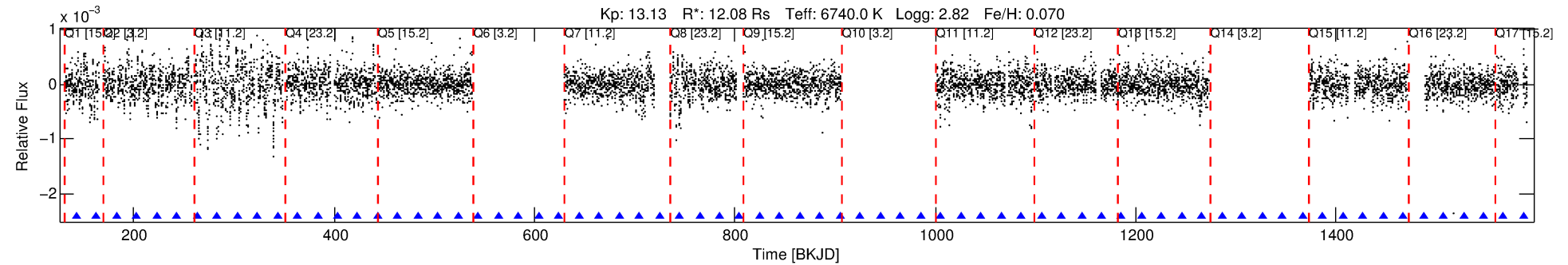
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 005288937-02

No Significant Match Found

# DV One-Page Summary

KIC: 5288937 Candidate: 2 of 6 Period: 20.061 d



## DV Fit Results:

Period = 20.06140 [0.00022] d  
Epoch = 142.8429 [0.0101] BKJD  
Rp/R\* = 0.0182 [0.0111]  
a/R\* = 23.39 [84.28]  
b = 0.89 [0.86]  
Seff = 5620.35 [6917.51]  
Teq = 2208 [679] K  
Rp = 24.03 [17.69] Re  
a = 0.2191 [0.0743] AU  
Ag = 7.83 [10.39] [0.66 $\sigma$ ]  
Teffp = 5709 [2394] K [1.41 $\sigma$ ]

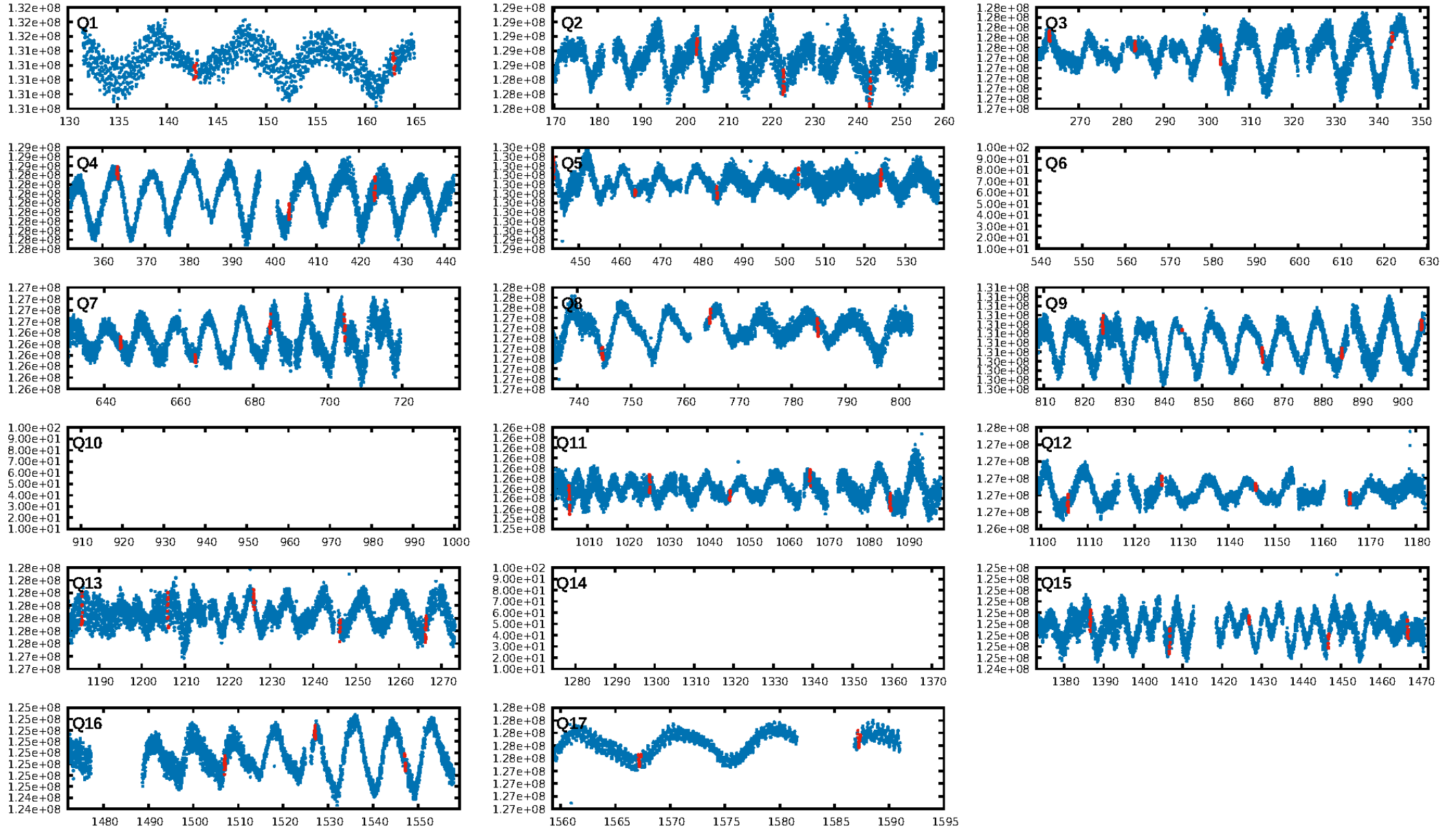
## DV Diagnostic Results:

ShortPeriod-sig: 20.3% [0.26 $\sigma$ ]  
LongPeriod-sig: 100.0% [141.78 $\sigma$ ]  
ModelChiSquare2-sig: 2.5%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 5.21e-12  
RollingBand-fgt: 1.00 [14/14]  
GhostDiagnostic-chr: 1.602  
Centroid-sig: 7.8%  
Centroid-so: 0.519 arcsec [1.22 $\sigma$ ]  
OotOffset-rm: 0.580 arcsec [1.09 $\sigma$ ]  
KicOffset-rm: 0.562 arcsec [1.18 $\sigma$ ]  
OotOffset-st: 1/3/3/3 [10]  
KicOffset-st: 1/3/3/3 [10]  
DiffImageQuality-fgm: 0.70 [7/10]  
DiffImageOverlap-fno: 0.00 [0/14]

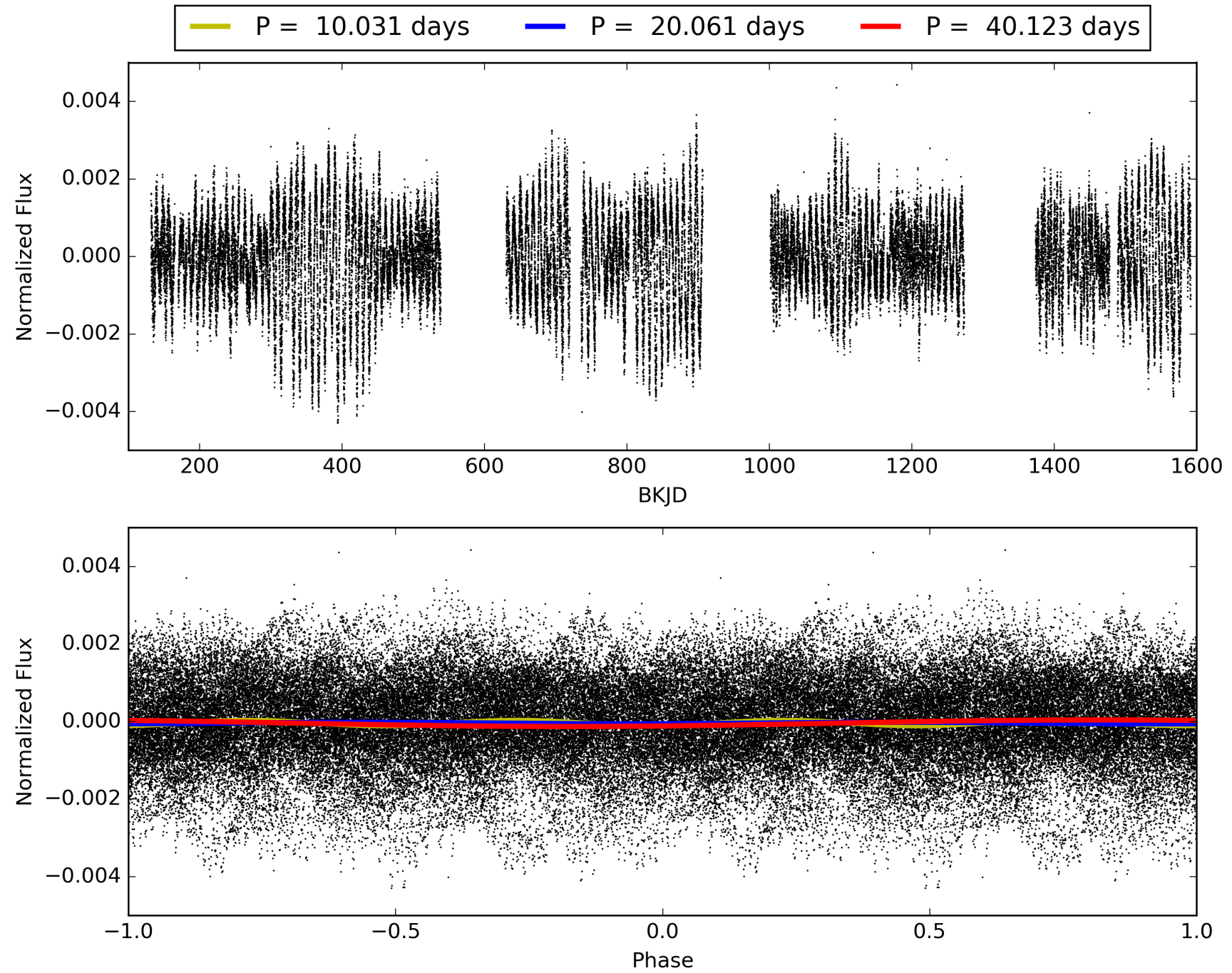
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 18:29:18 Z

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

# TCE 005288937-02, PDC Light Curves

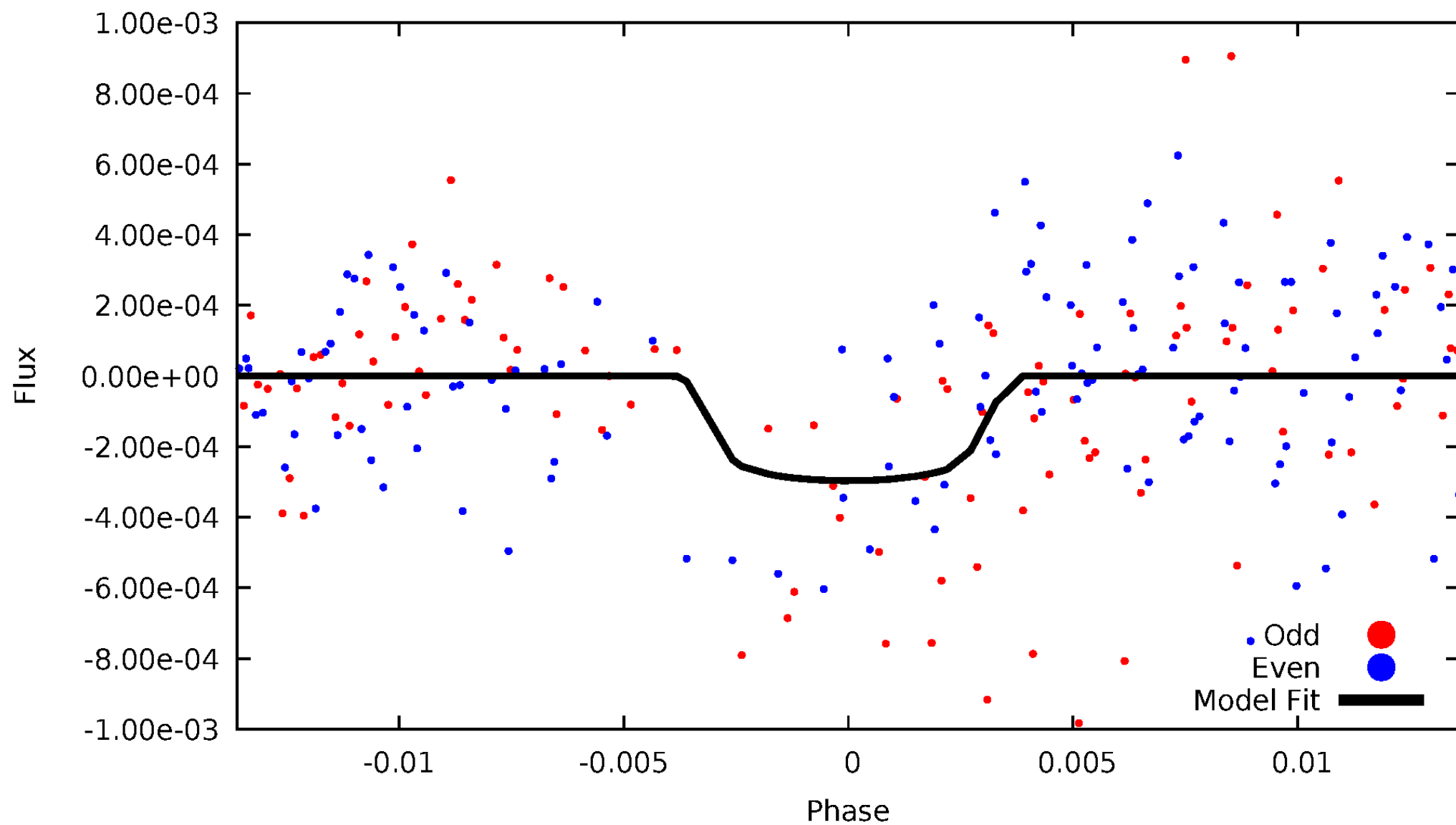


TCE 005288937-02



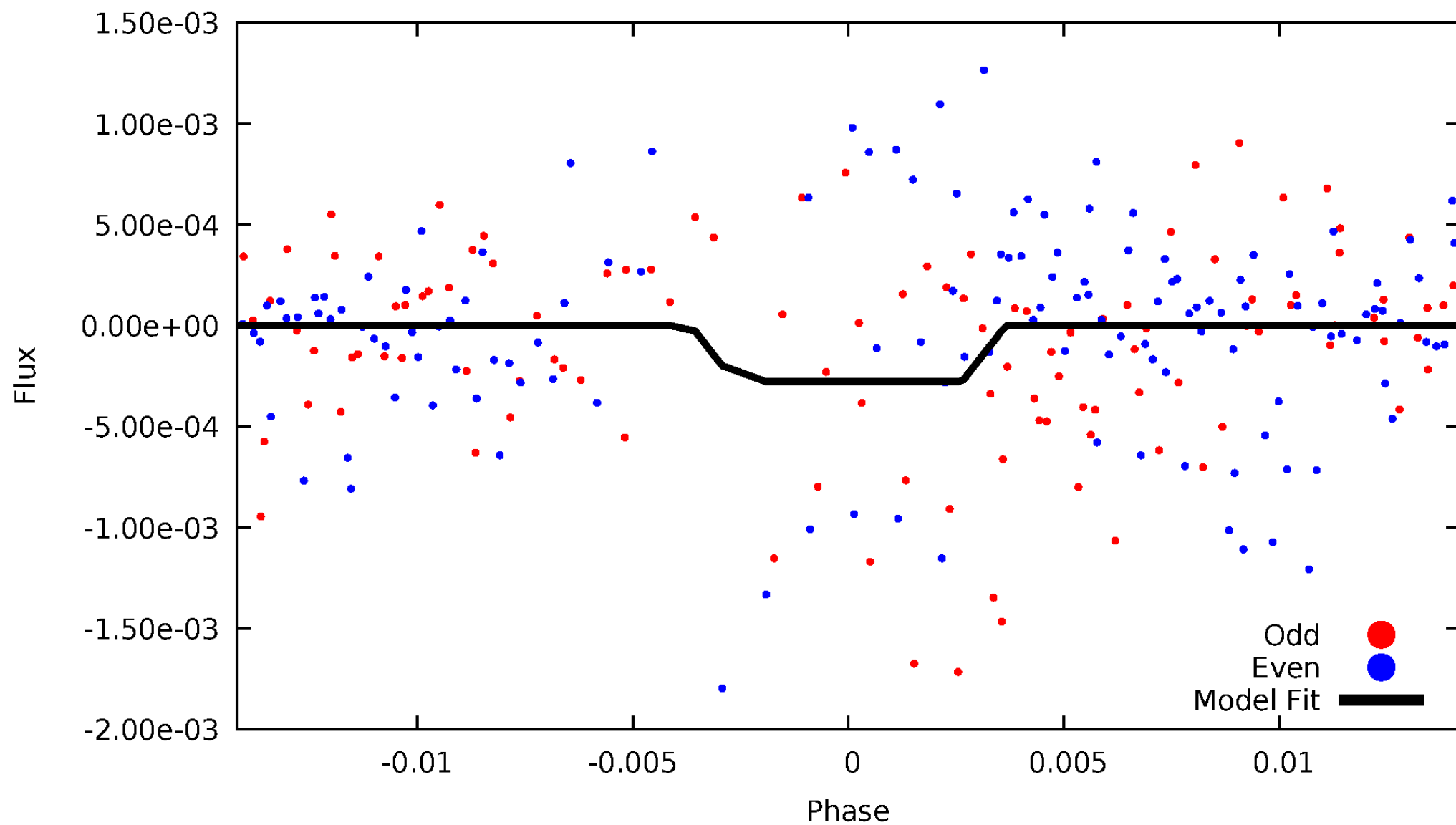
# DV Odd/Even

TCE 005288937-02



# ALT Odd/Even

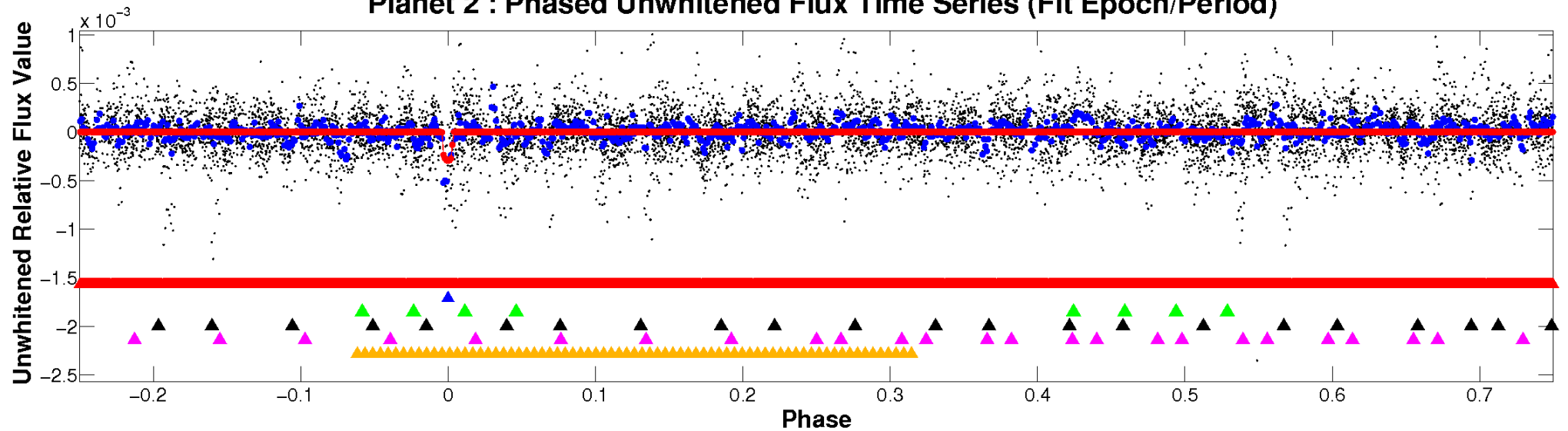
TCE 005288937-02



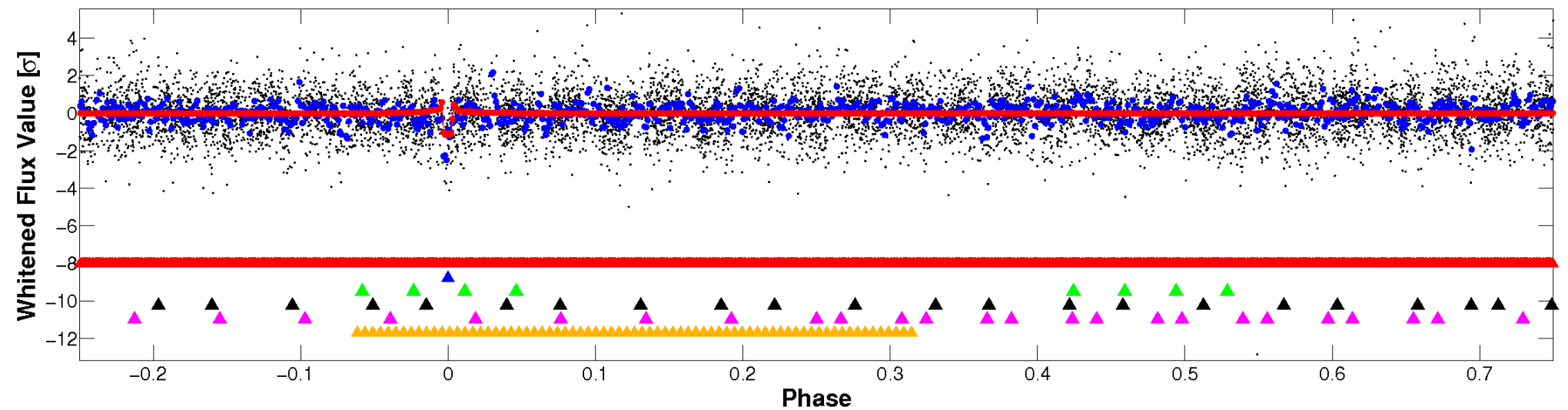


# Non-Whitened Vs. Whitened Light Curve

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

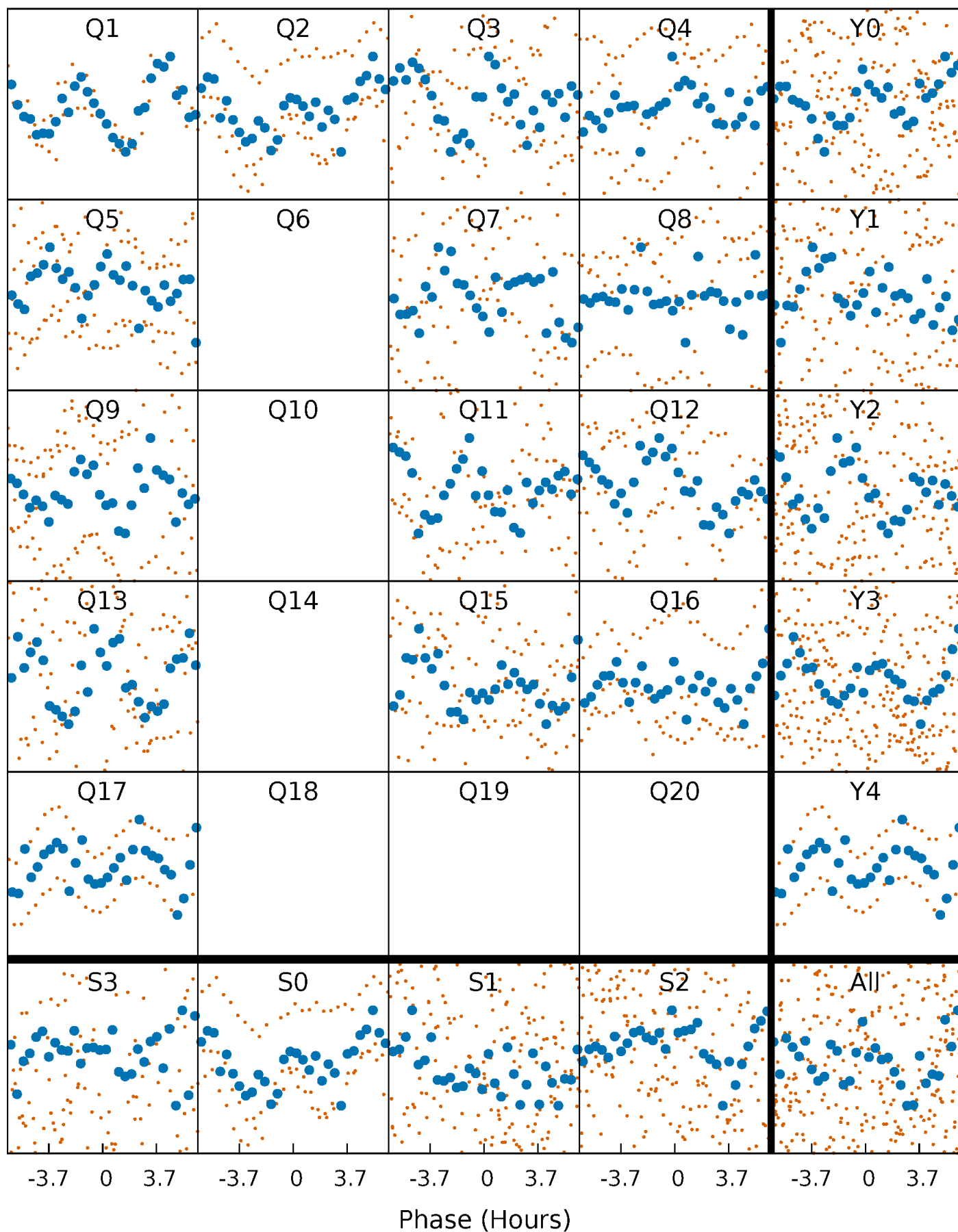


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



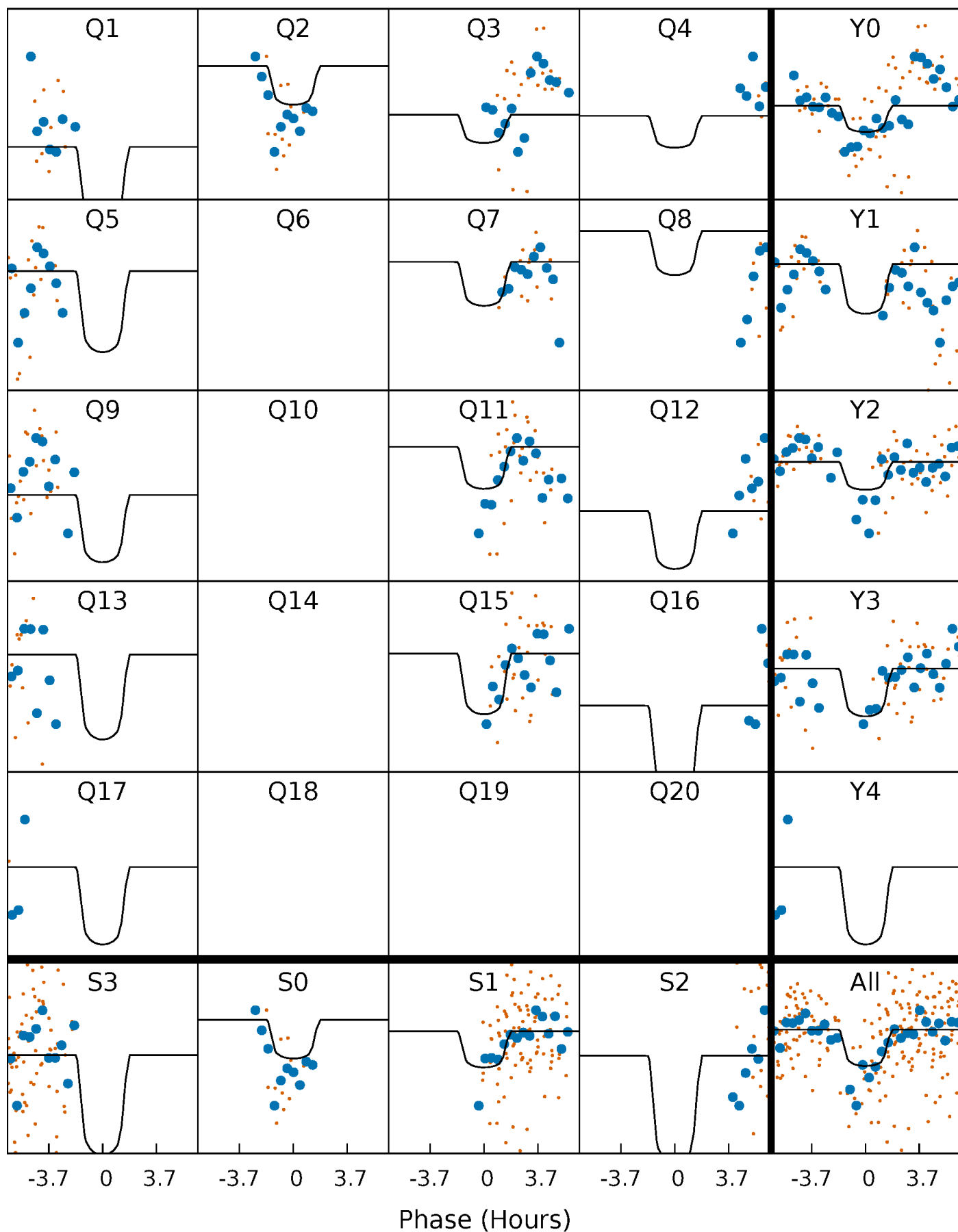
# PDC Quarter-Phased Transit Curves

TCE 005288937-02     $P = 20.061400$  Days     $T_0 = 142.842908$  (BKJD)



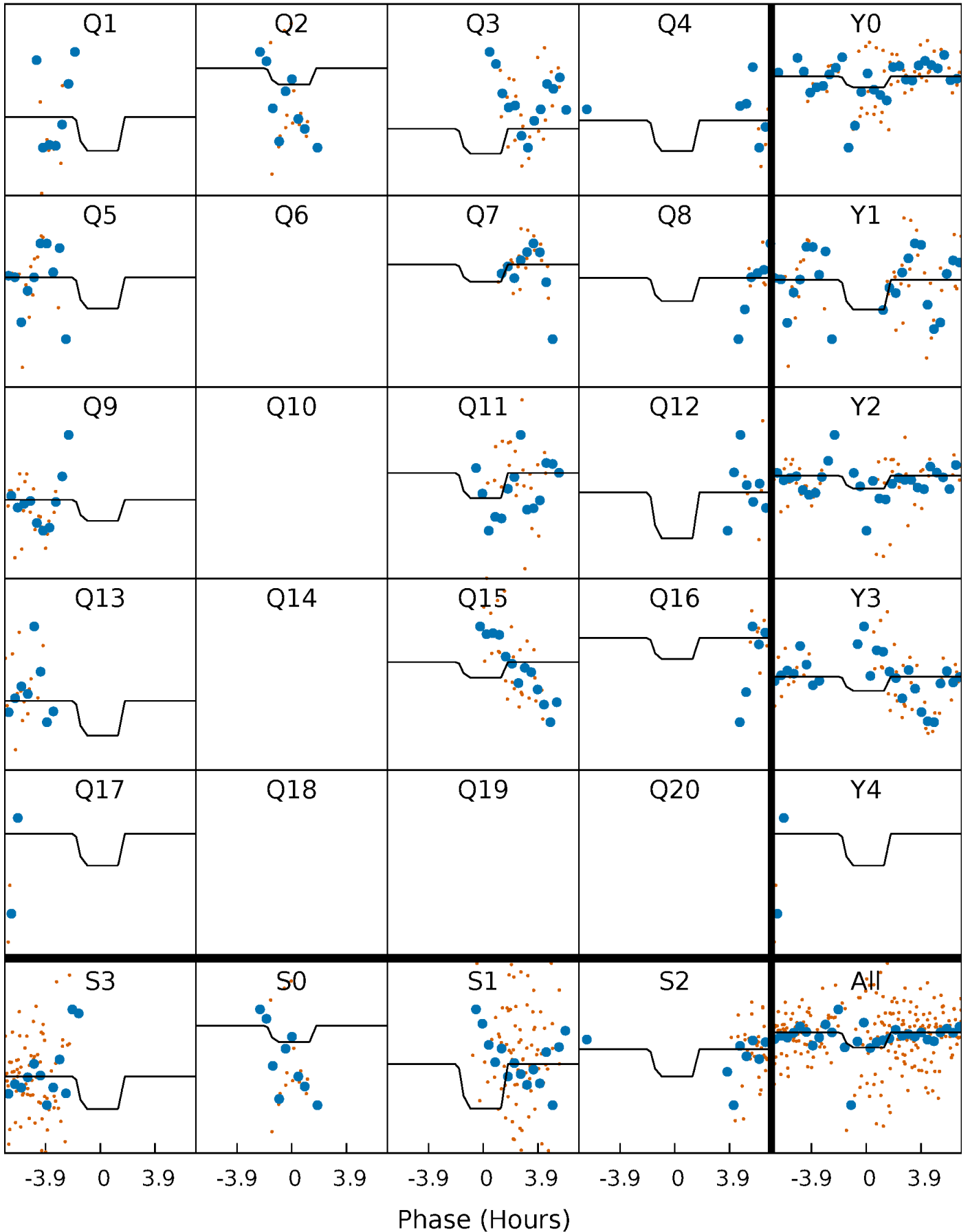
# DV Quarter-Phased Transit Curves

TCE 005288937-02     $P = 20.061400$  Days     $T_0 = 142.842908$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

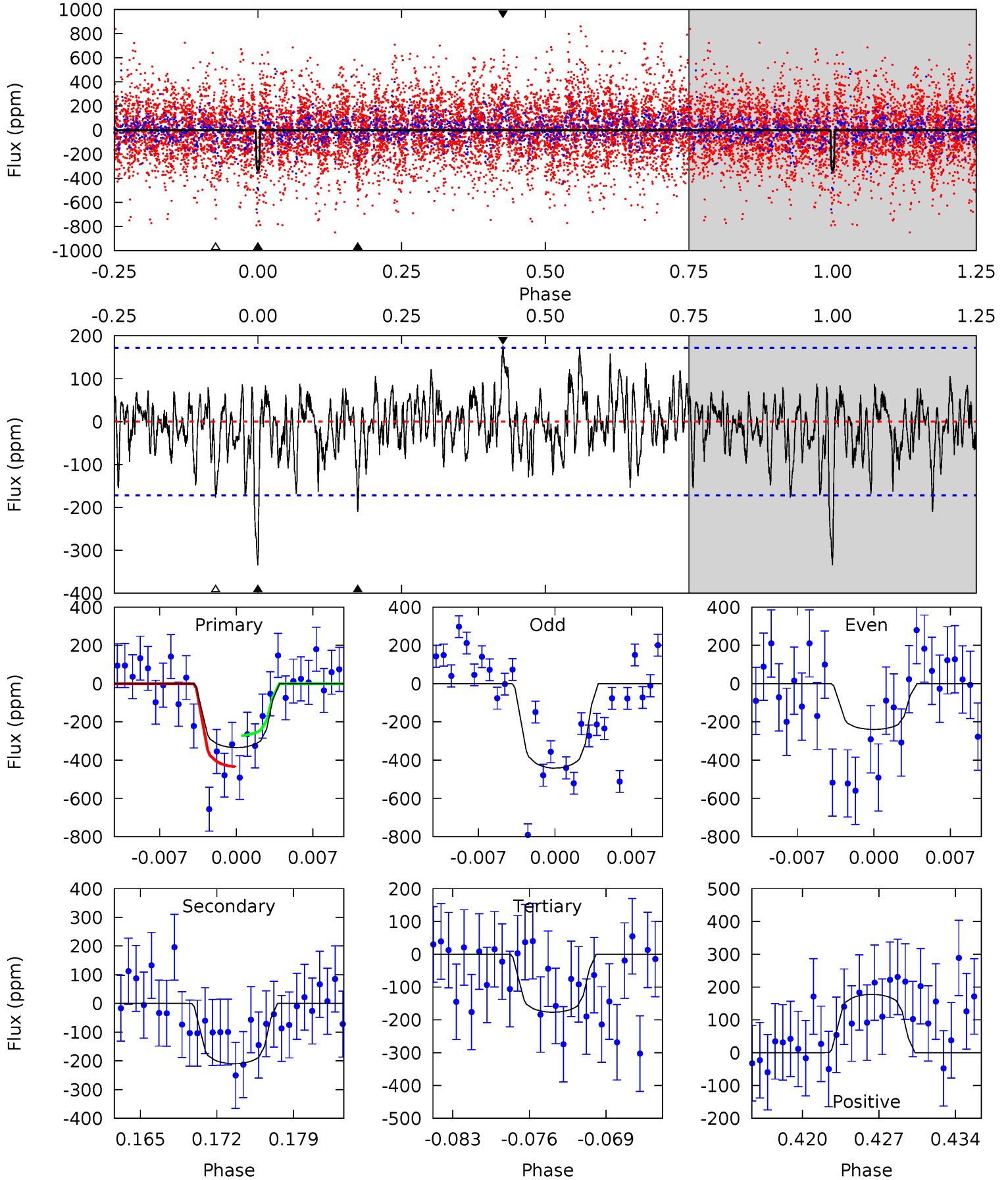
TCE 005288937-02   P= 20.061914 Days    $T_0=142.827323$  (BKJD)



# DV Model-Shift Uniqueness Test

005288937-02, P = 20.061400 Days, E = 122.781508 Days

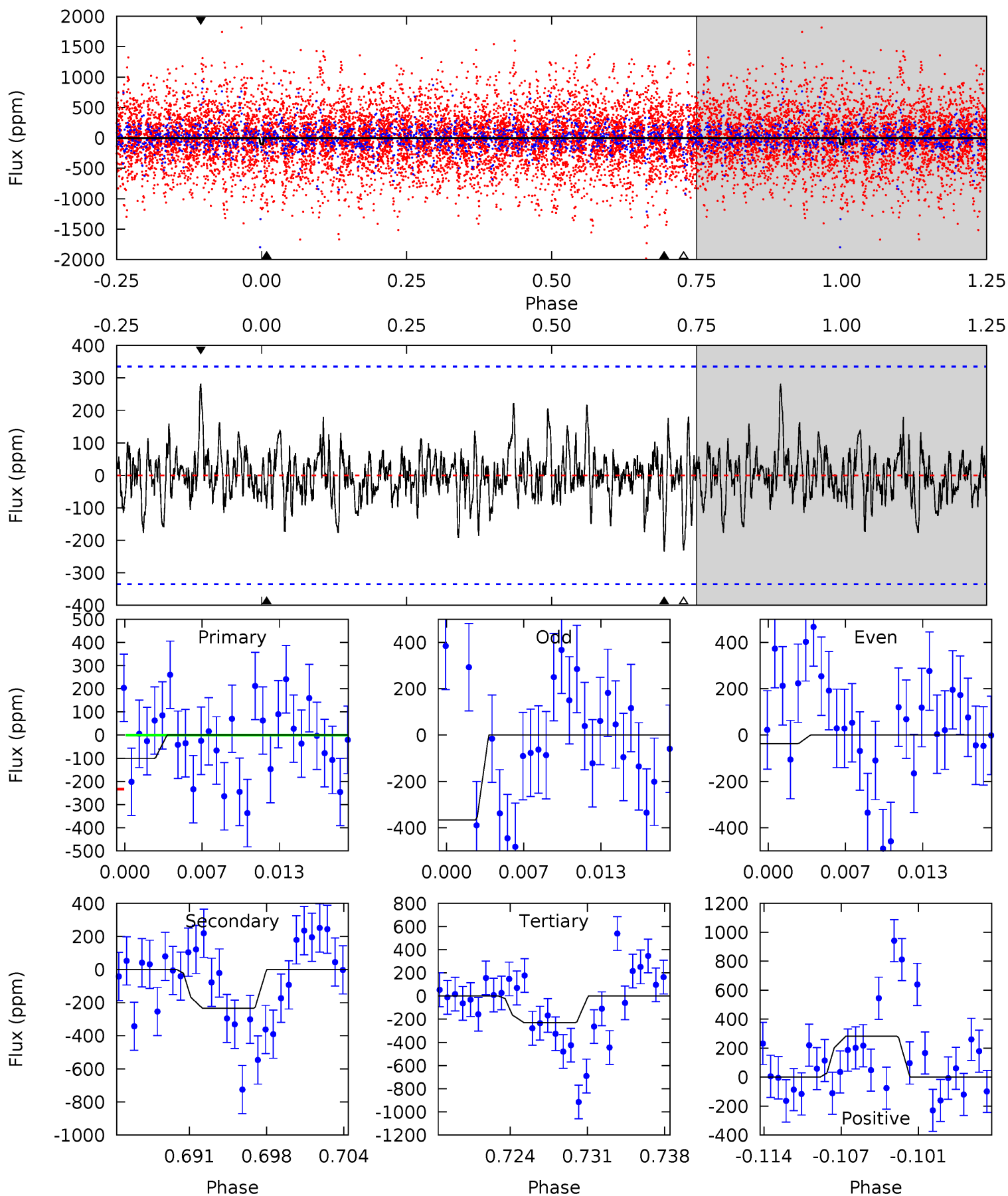
| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 9.91 | 6.23 | 5.24 | 5.27 | 5.10            | 2.70            | 1.62             | 4.67    | 4.65    | 0.99    | 0.96    | 3.02    | 0.91 | 0.35  | 2.22 |



# Alt Model-Shift Uniqueness Test

005288937-02, P = 20.061914 Days, E = 122.765409 Days

| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM   | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|-------|-------|------|
| 1.54 | 3.57 | 3.51 | 4.30 | 5.10            | 2.71            | 0.94             | -1.97   | -2.75   | 0.06    | -0.72   | 2.57    | -0.46 | 0.55  | 1.50 |



### Stellar Parameters For KIC 005288937

|        | $T_{\text{eff}}(K)$   | $\log(g)$                 | [Fe/H]                    | $R (R_{\odot})$            | $M(M_{\odot})$            | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|-----------------------|---------------------------|---------------------------|----------------------------|---------------------------|---|
|        | $6740^{+448}_{-1908}$ | $2.816^{+0.172}_{-0.258}$ | $0.070^{+0.250}_{-0.600}$ | $12.080^{+3.326}_{-4.989}$ | $3.479^{+0.111}_{-2.117}$ | $0.003^{+0.004}_{-0.001}$                 |
|        | +7%/-28%              | +6%/-9%                   | +357%/-857%               | +28%/-41%                  | +3%/-61%                  | +136%/-53%                                |
| Source | PHO1                  | FLK73                     | 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 005288937-02 / KOI

| Detrend | Depth (ppm)   | $R_p (R_{\oplus})$        | $T_{max} (K)$        | $T_{obs} (K)$          | $A_{obs}$                  |
|---------|---------------|---------------------------|----------------------|------------------------|----------------------------|
| DV      | $-210 \pm 34$ | $25.22^{+15.06}_{-13.54}$ | $2986^{+482}_{-751}$ | $5365^{+2714}_{-1369}$ | $7.871^{+25.766}_{-4.642}$ |
| Alt.    | $-235 \pm 66$ | $24.02^{+16.01}_{-13.59}$ | $3061^{+456}_{-853}$ | $5607^{+3905}_{-1556}$ | $9.878^{+43.293}_{-6.617}$ |

$T_{max}$  = 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

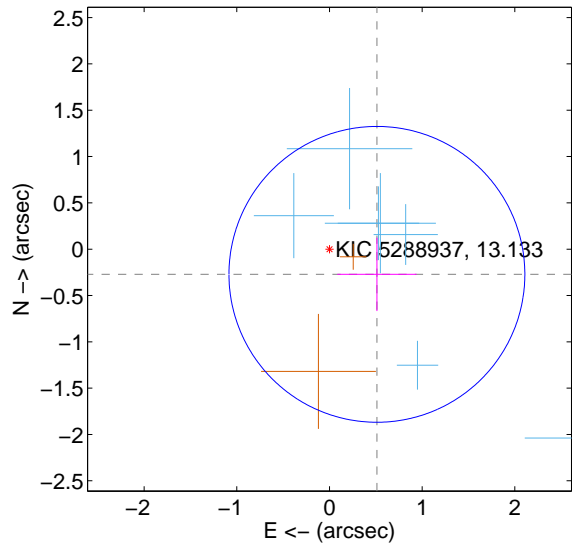
Supplemental centroid analysis for 005288937-02. Kepler magnitude: 13.13. Transit SNR 6.49

There are 7 quarters with good PRF difference image offsets

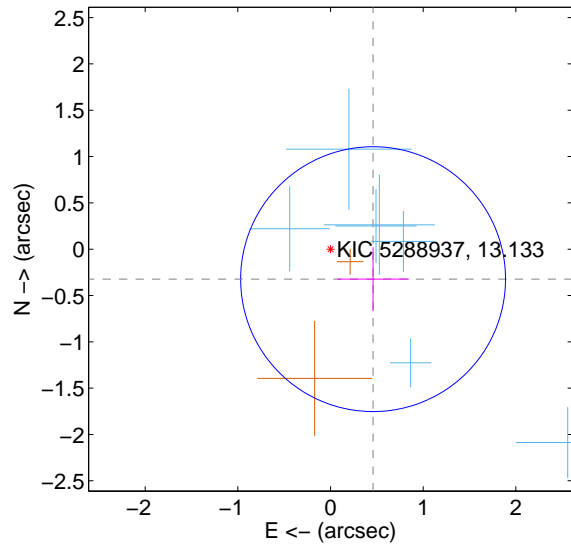
The direct PRF centroid is offset from the target star catalog position by about 0.15 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA        | $\Delta$ Dec       |
|---|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT          | $0.580 \pm 0.532$  | 1.09                | $-0.512 \pm 0.428$ | $-0.272 \pm 0.396$ |
| PRF-fit source offset from KIC position | $0.562 \pm 0.476$  | 1.18                | $-0.459 \pm 0.387$ | $-0.324 \pm 0.345$ |
| photometric centroid source offset      | $0.52 \pm 0.43$    | 1.22                | $0.52 \pm 0.43$    | $-0.03 \pm 0.35$   |

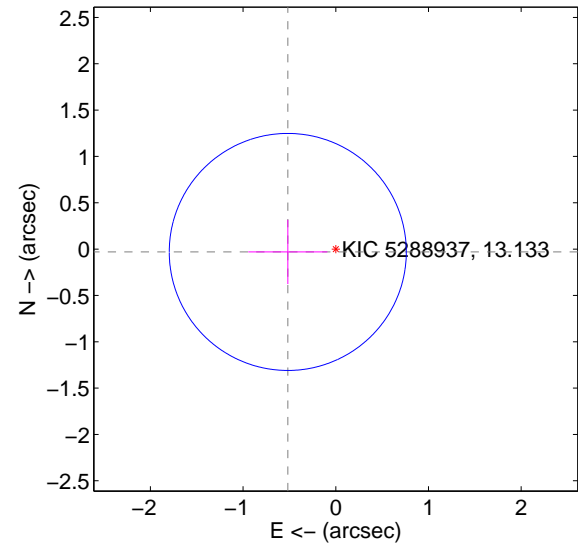
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

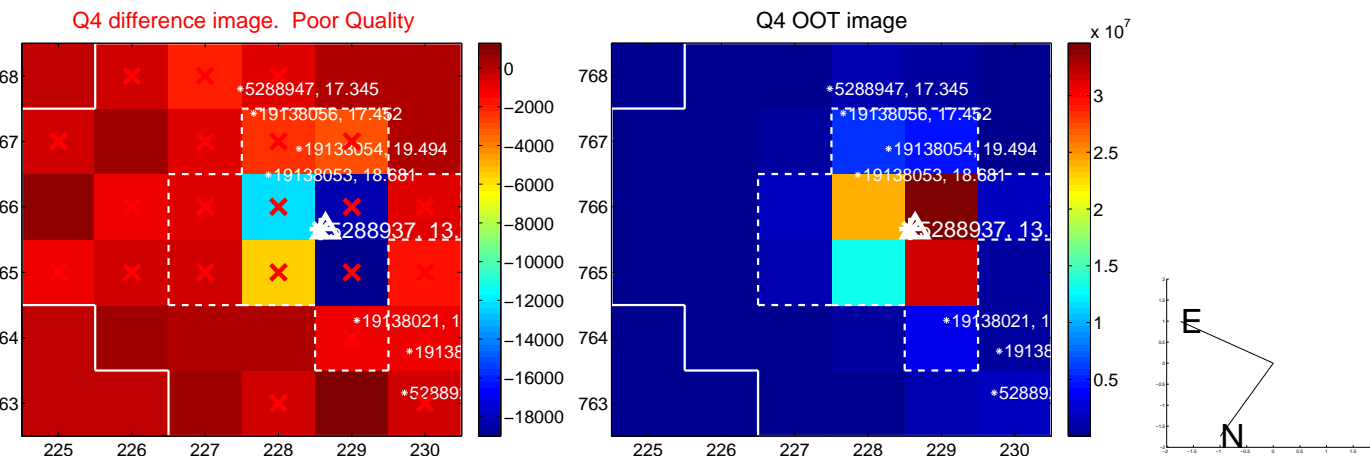
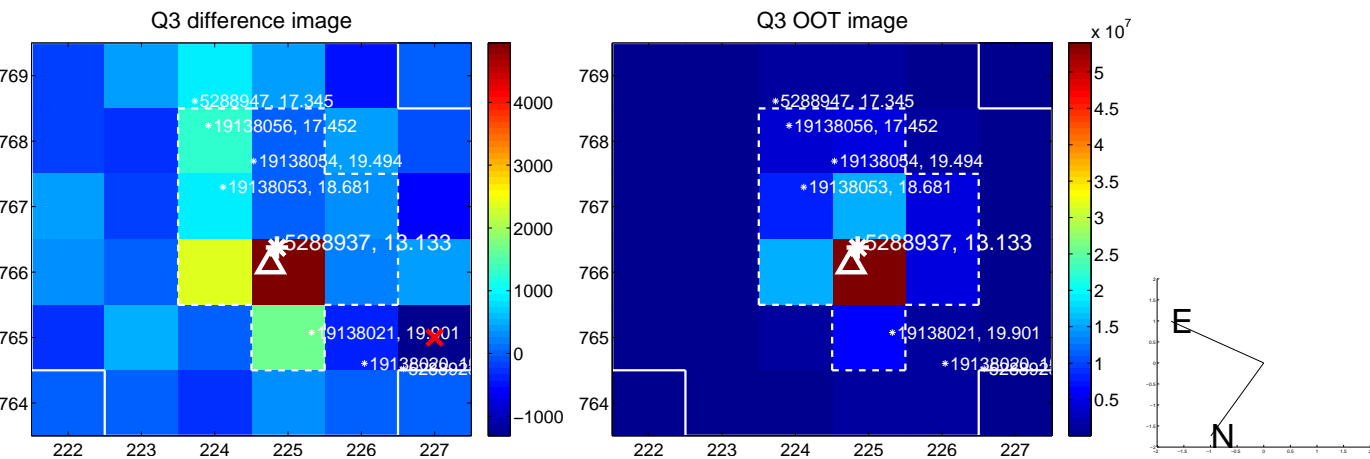
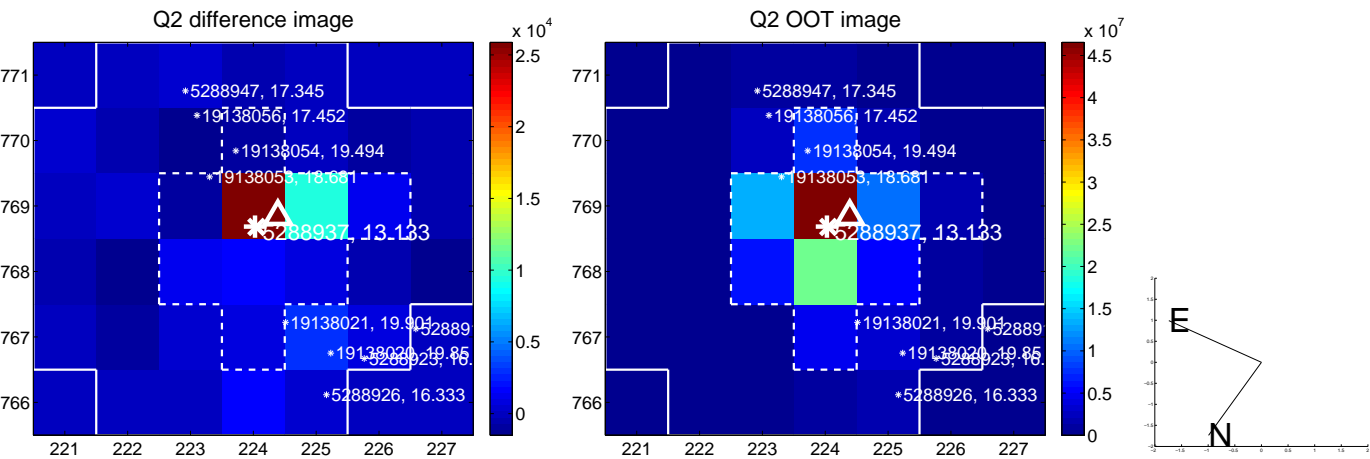
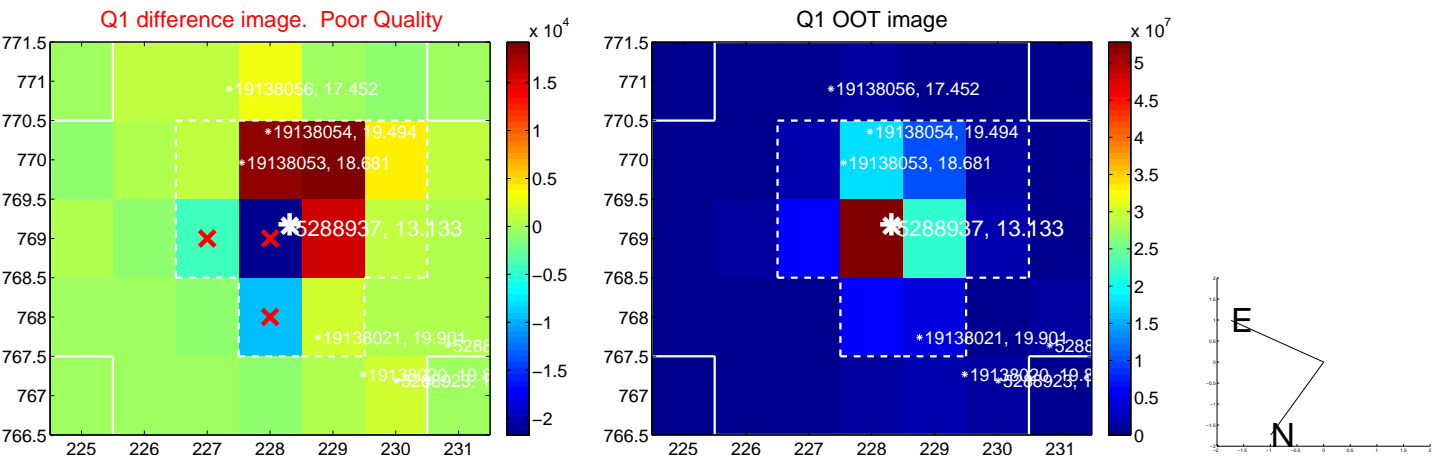


offset from photometric centroids

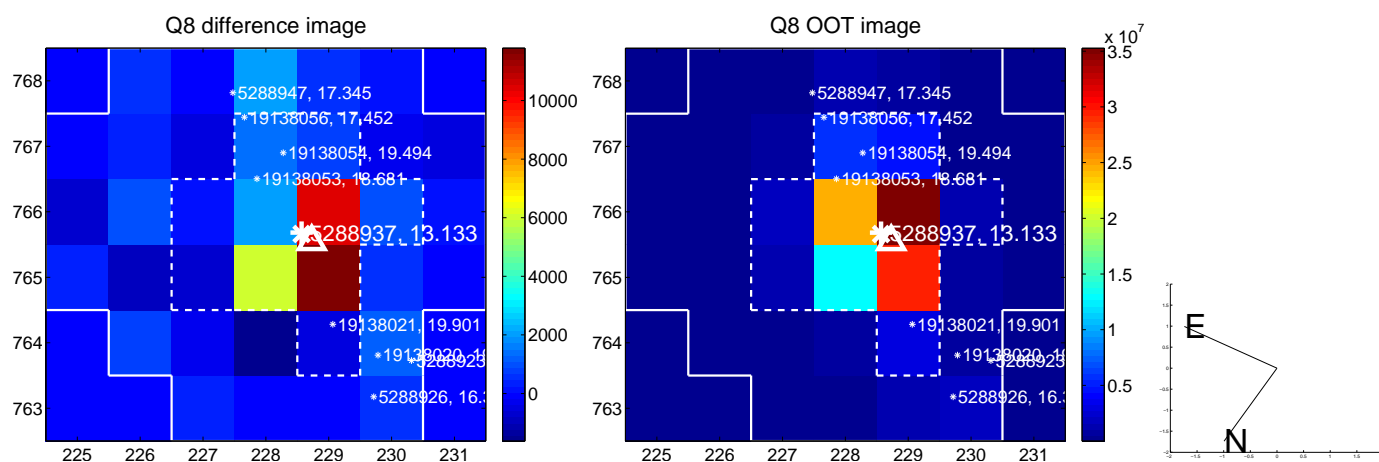
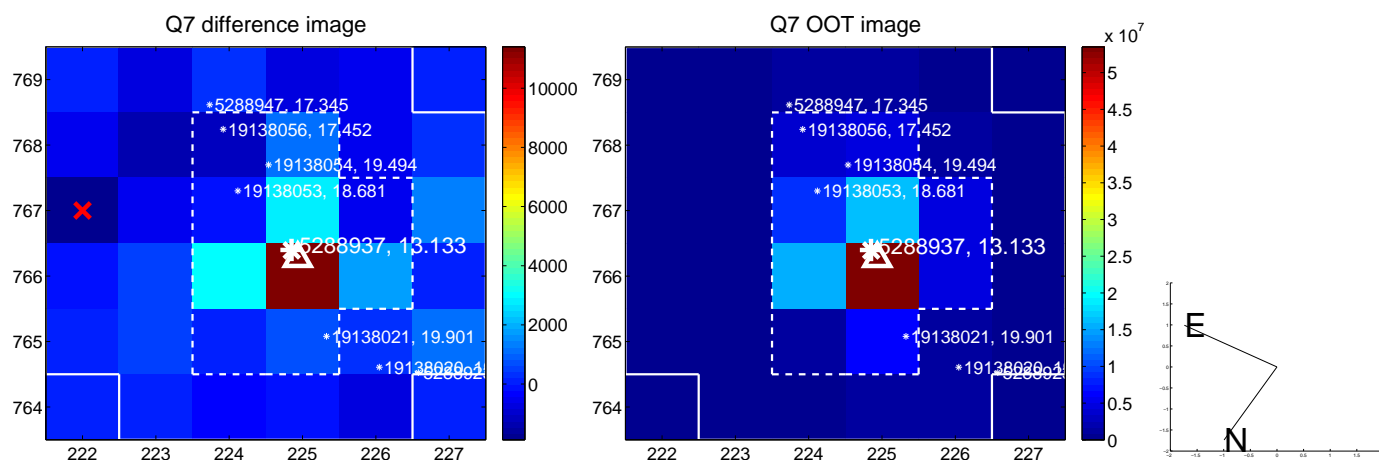
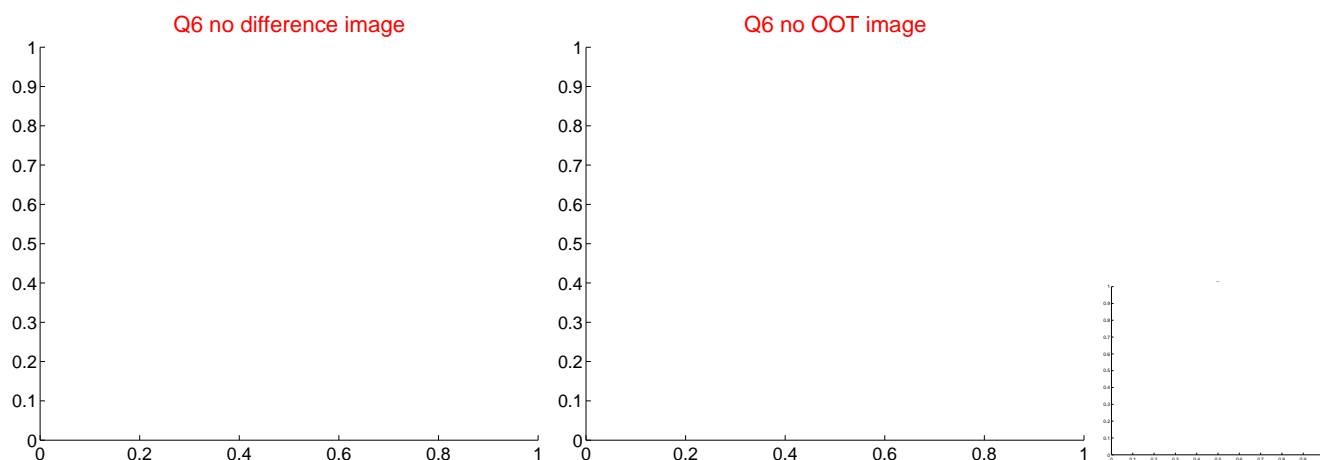
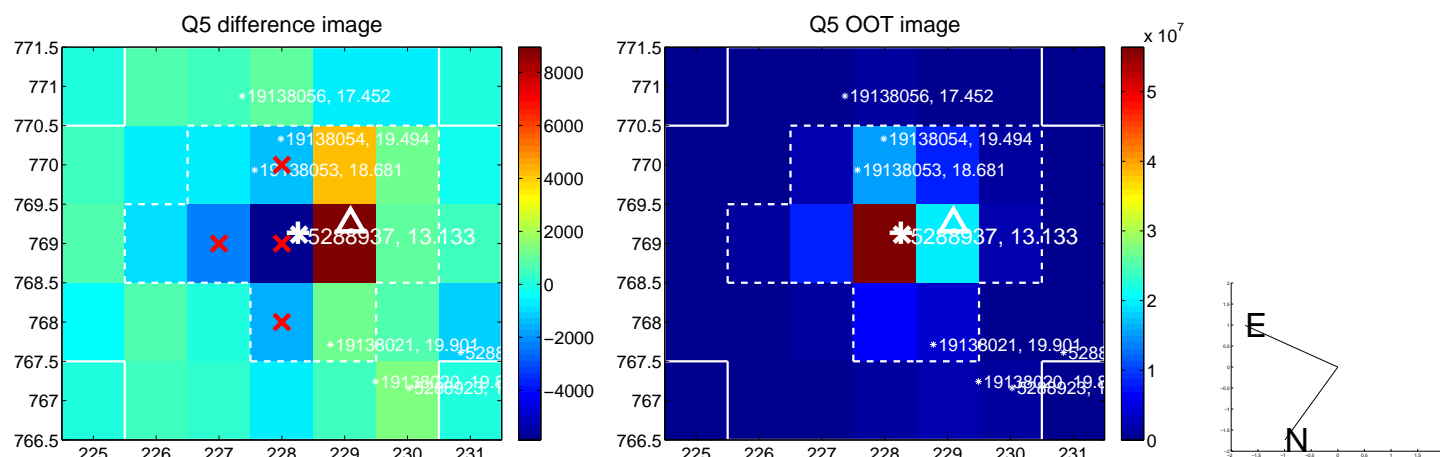


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

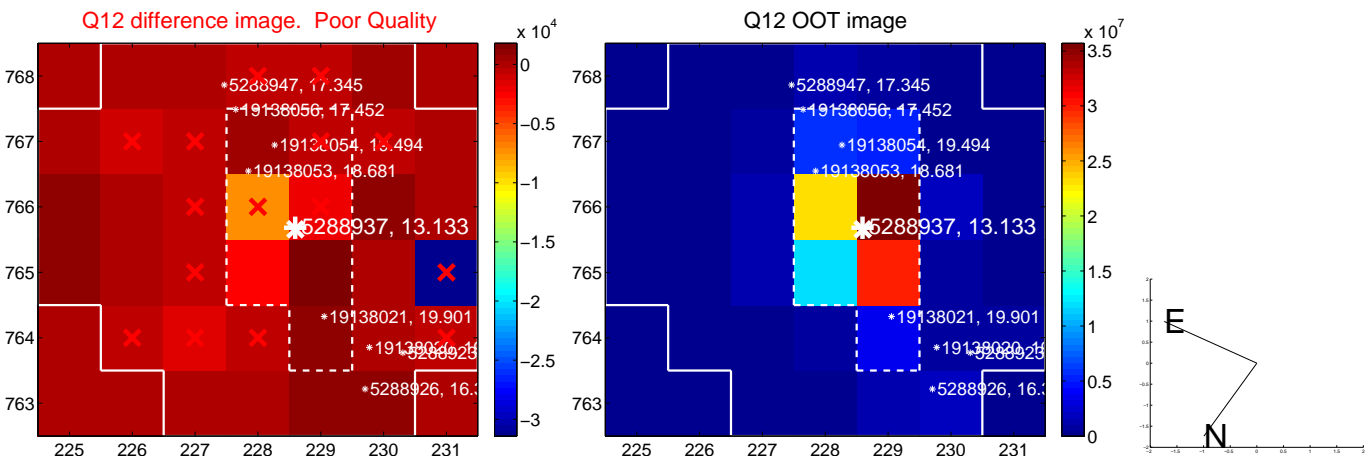
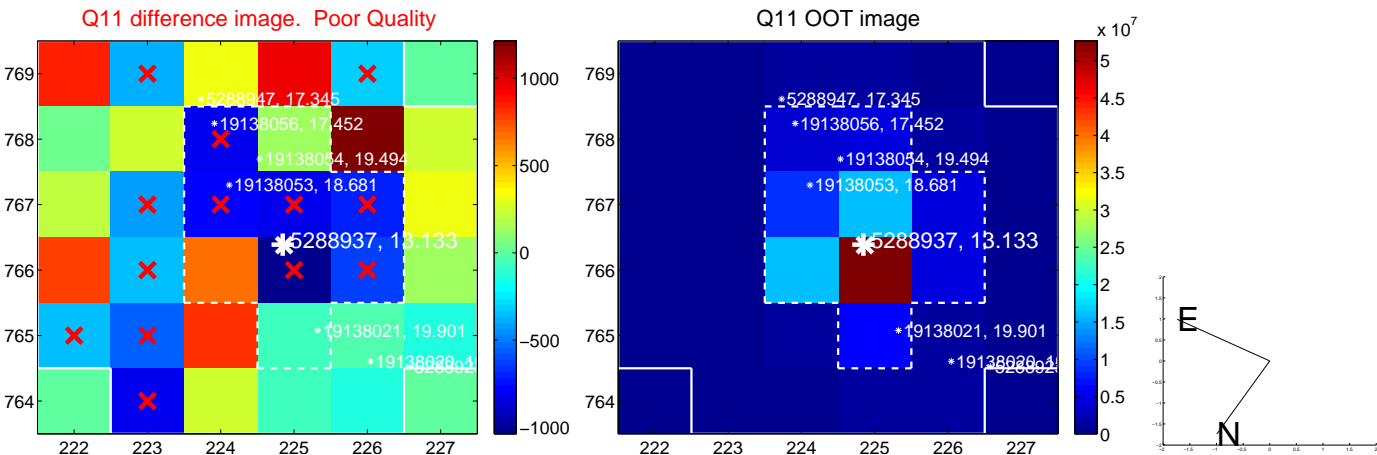
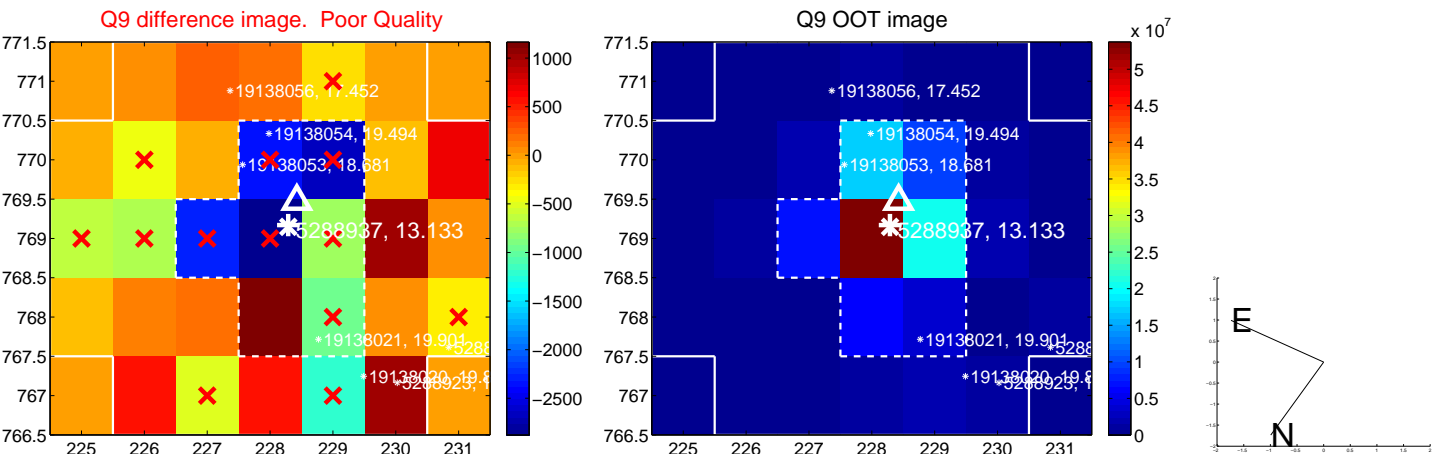
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



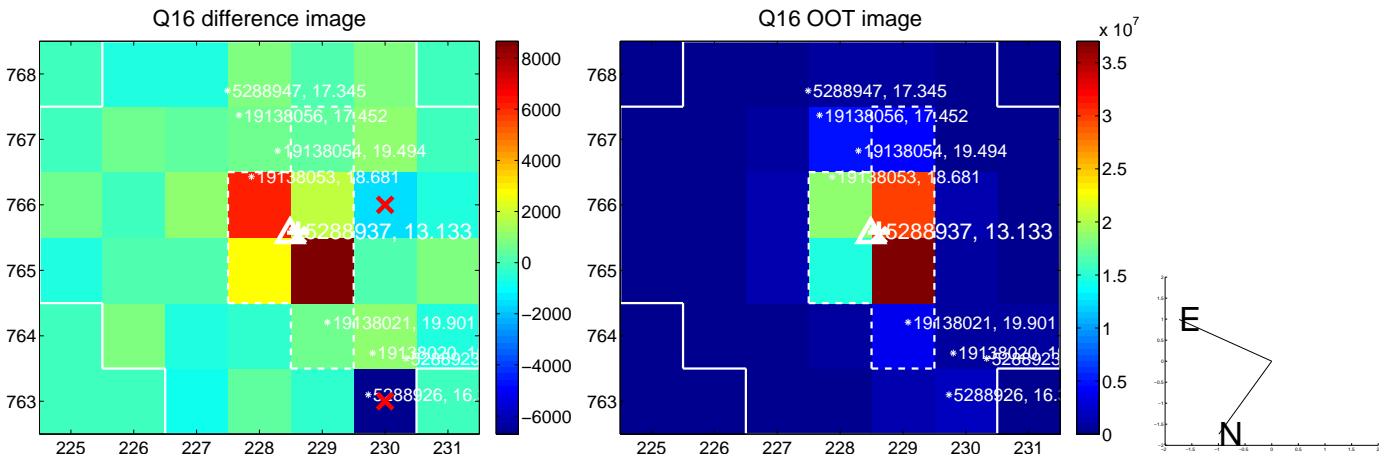
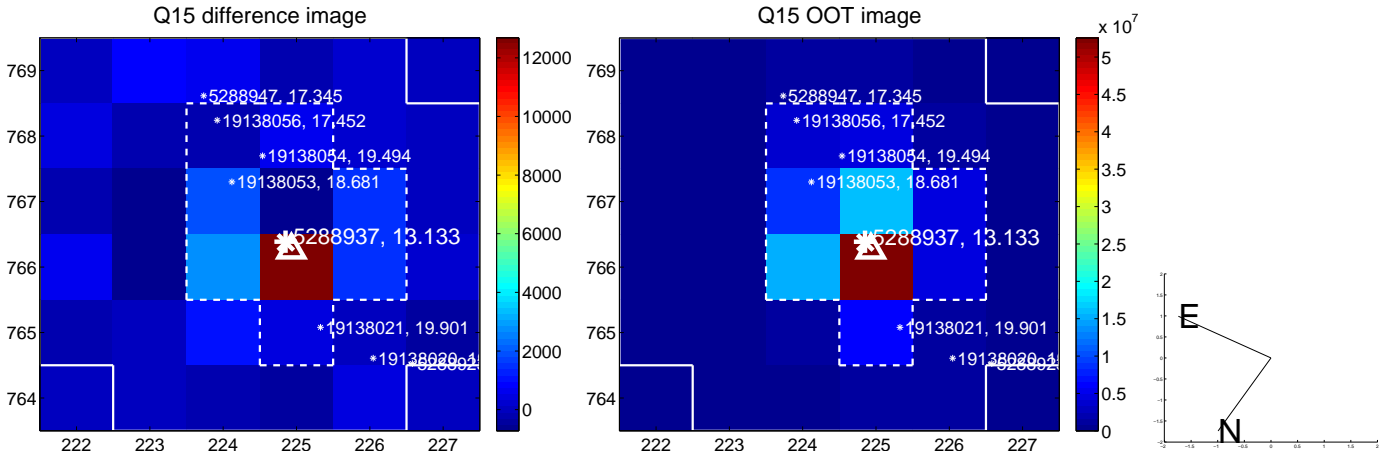
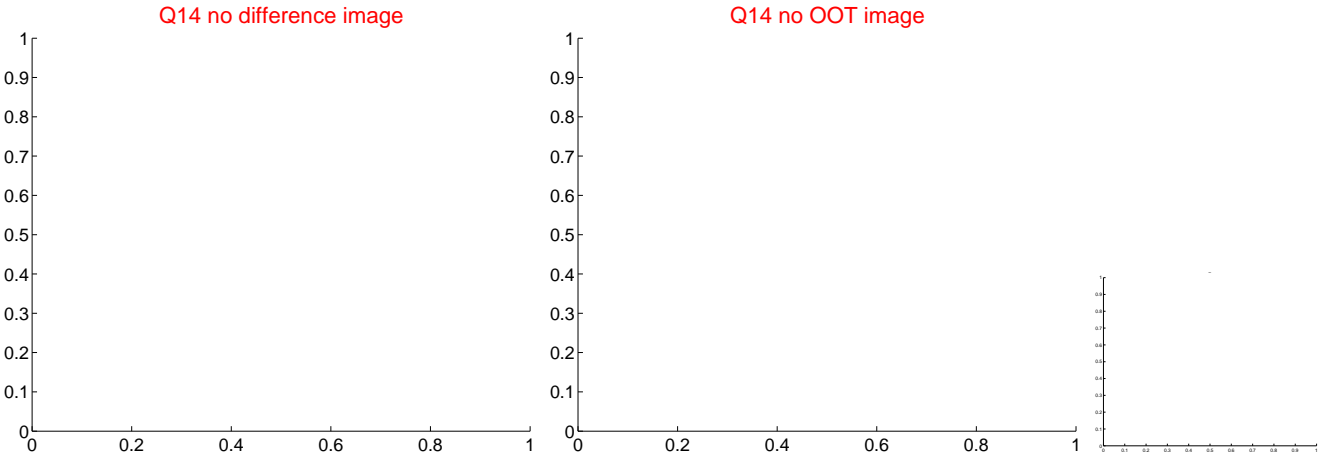
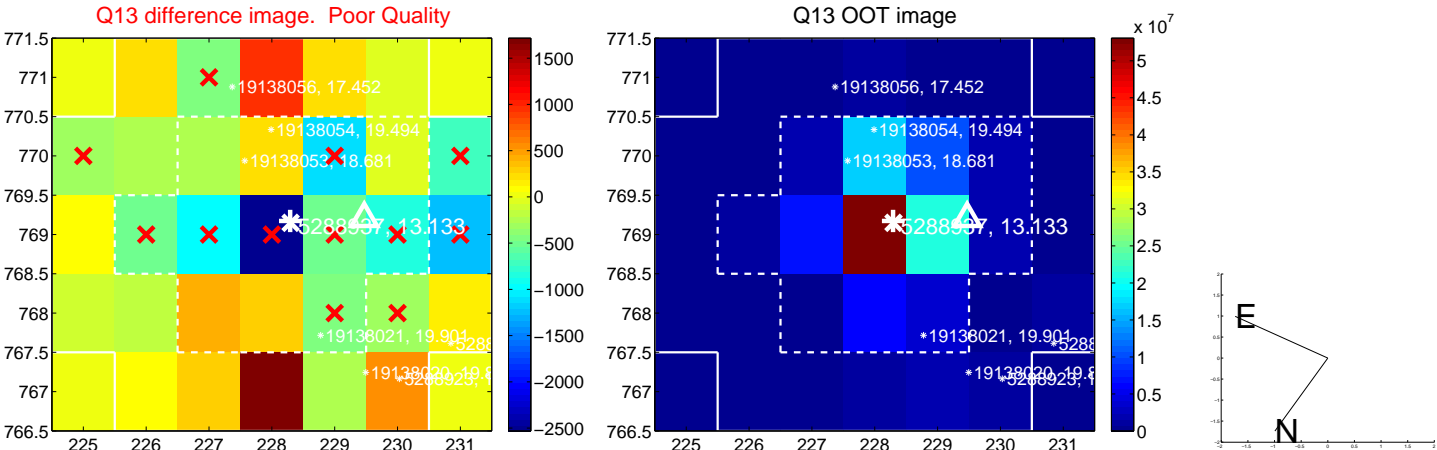
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



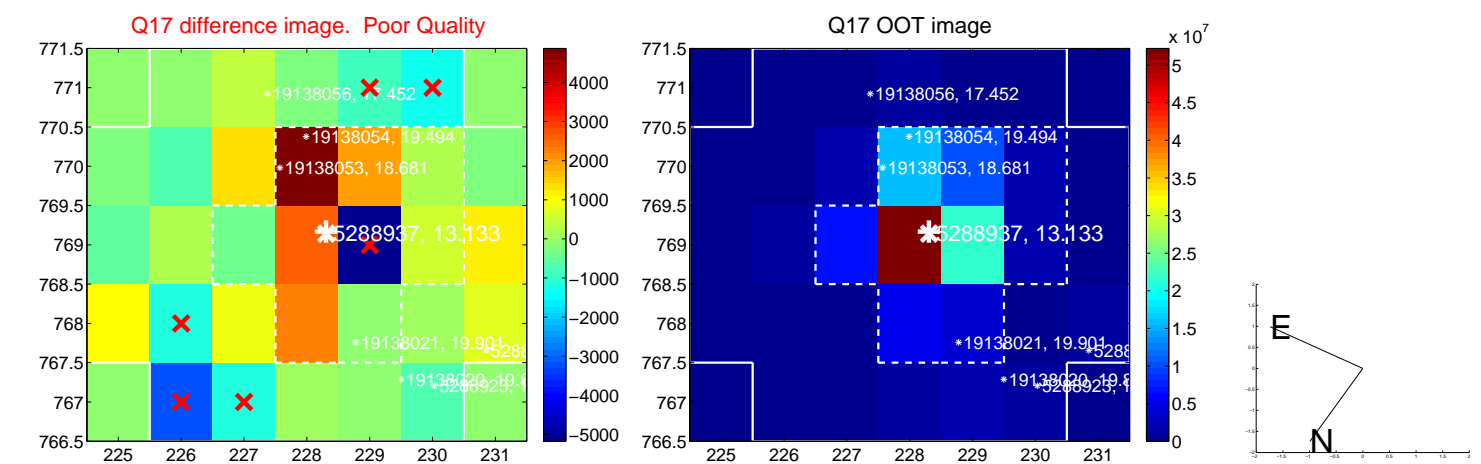
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



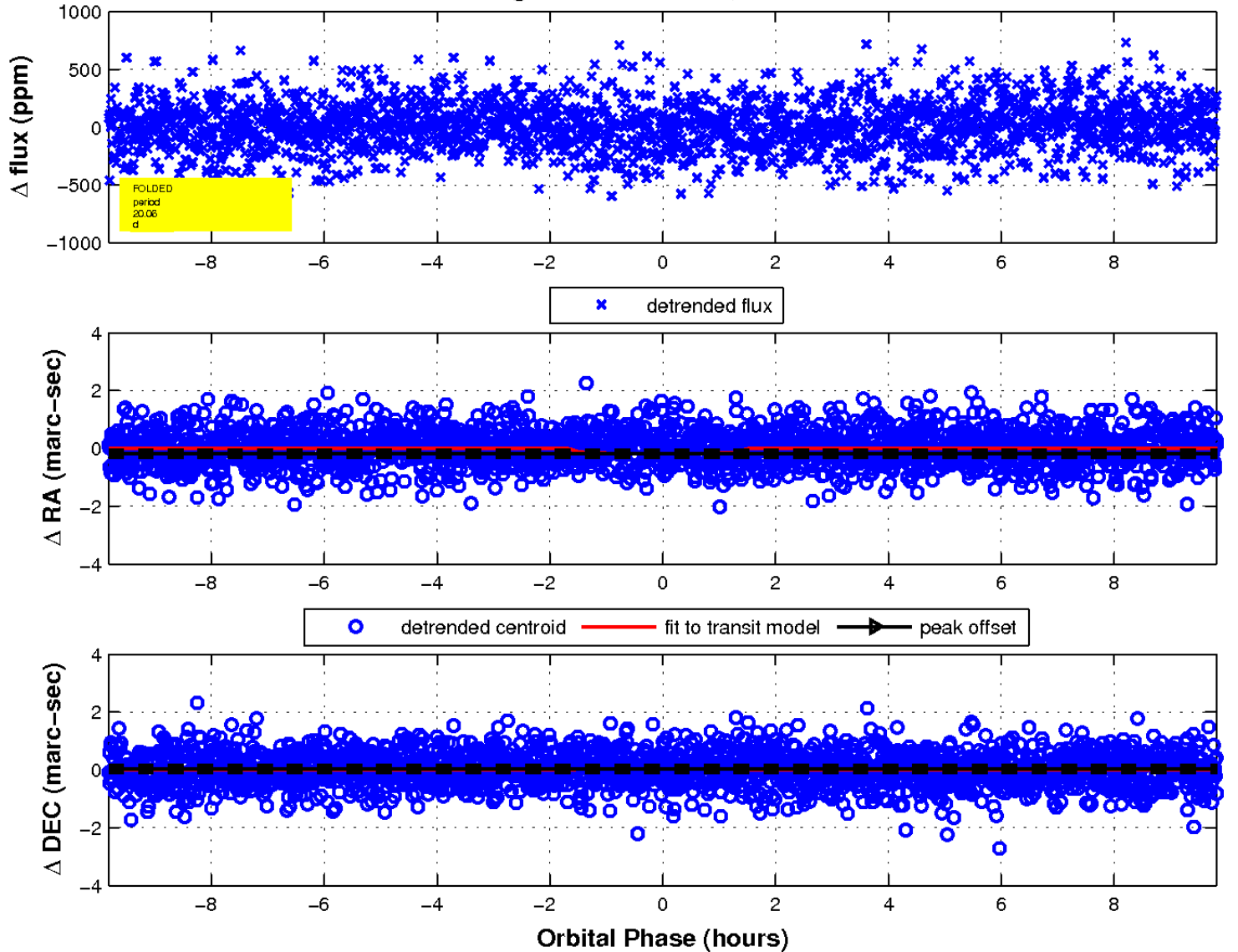
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

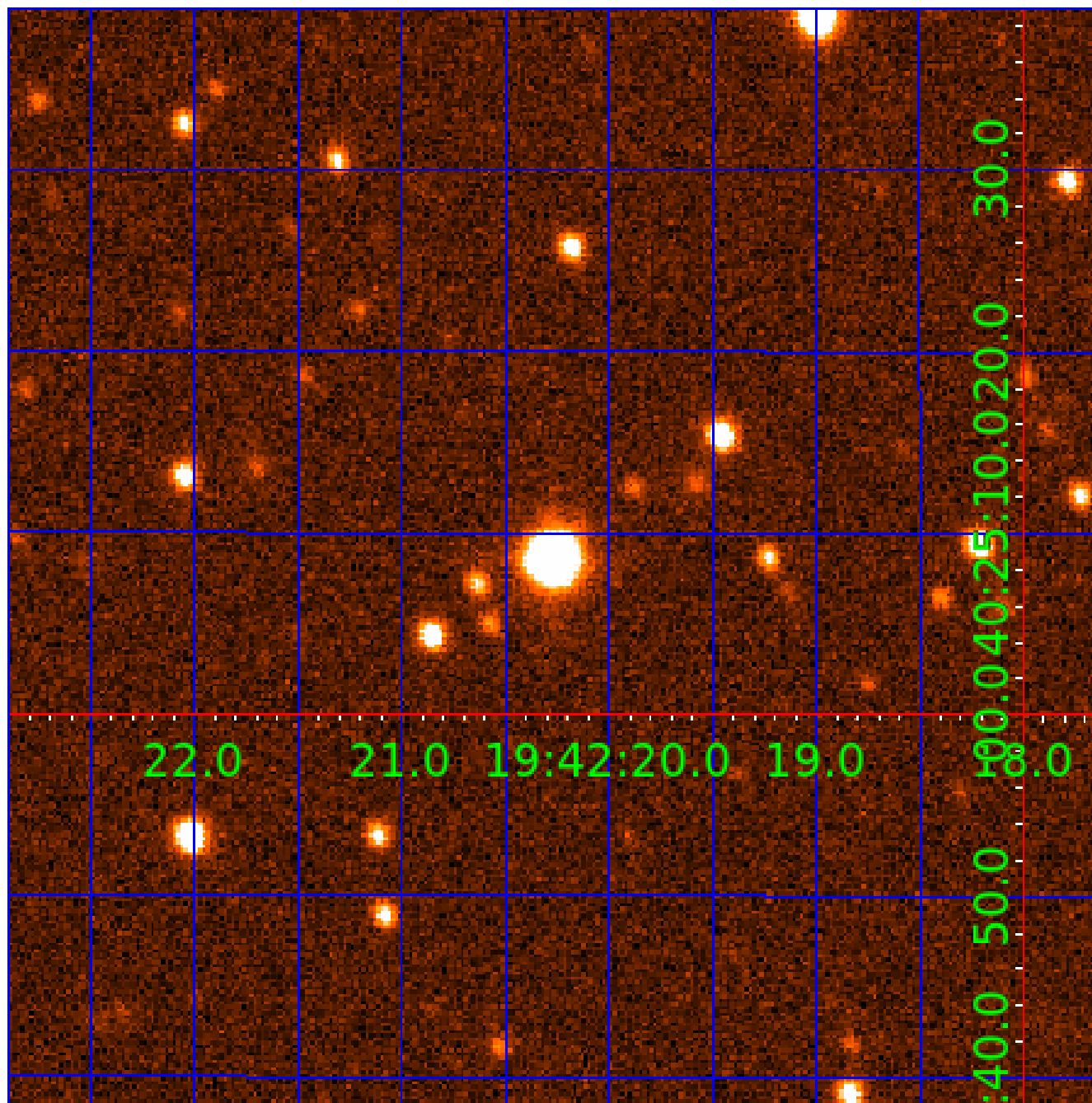


fluxWeightedCentroids, Planet 2 of 6



UKIRT Image

Declination





# KIC 005288937

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|-----|-----|-----------------------------|-----------------|------------------------|------------------------|
| 005288937-01 | OBS      | No   | 0.669907      | 131.621138   | 10.9        | 4.220            | 9.0 | 3.3 | 12.08                       | 6740            | 4.05                   | 0.00                   |
| 005288937-02 | OBS      | No   | 20.061400     | 142.842908   | 296.5       | 3.274            | 8.9 | 6.5 | 12.08                       | 6740            | 24.03                  | 5620.35                |
| 005288937-04 | OBS      | No   | 67.844141     | 156.771648   | 444.3       | 2.170            | 8.5 | 9.3 | 12.08                       | 6740            | 27.36                  | 1107.21                |
| 005288937-06 | OBS      | No   | 19.956635     | 149.151627   | 123.8       | 9.226            | 8.3 | 4.2 | 12.08                       | 6740            | 14.66                  | 5659.73                |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments  |
|--------------|----------|------|-------|---|---|---|---|---|
| 005288937-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT   |
| 005288937-02 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT                                       |
| 005288937-04 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_ALT—ALL_TRANS_CHASES—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT   |
| 005288937-06 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT |

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

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

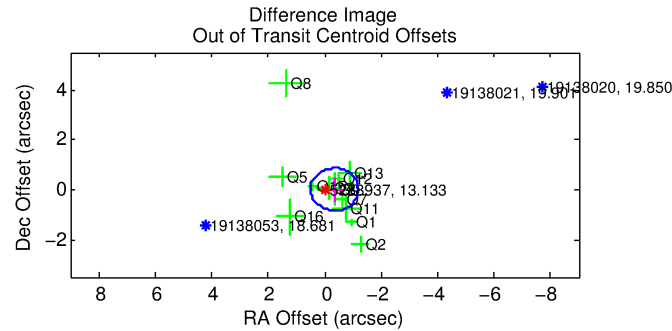
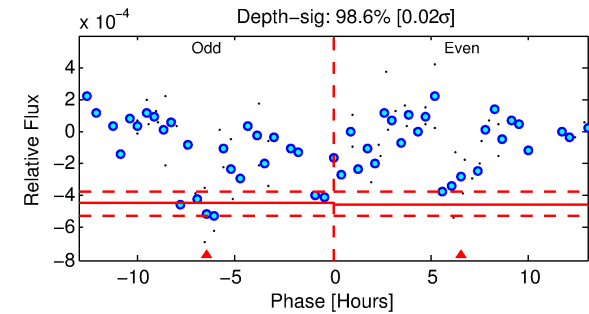
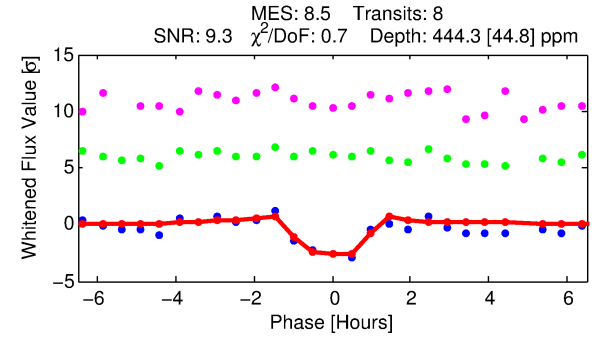
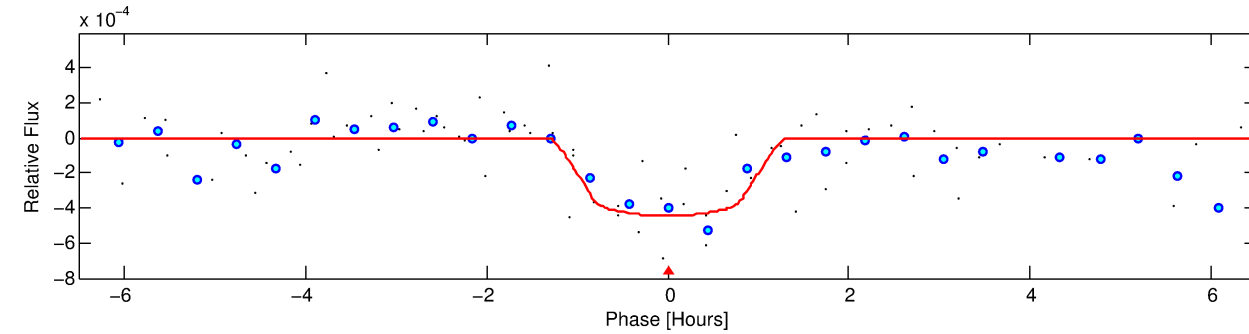
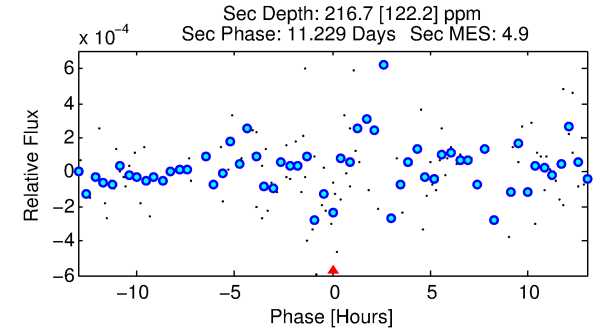
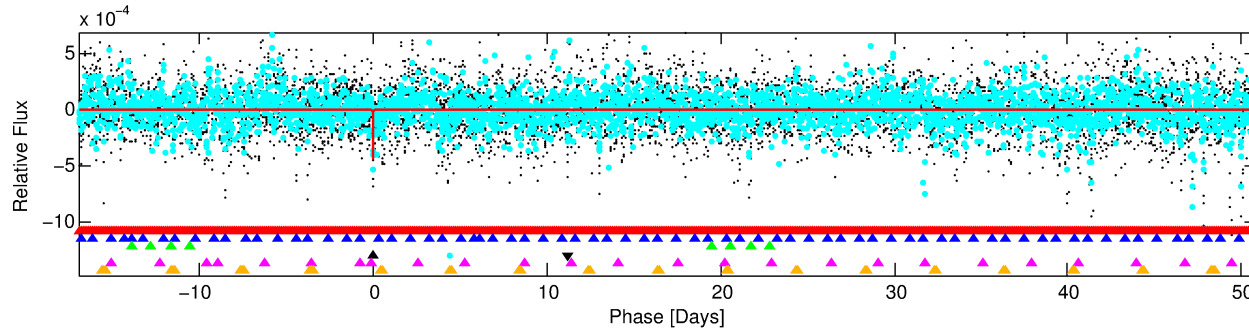
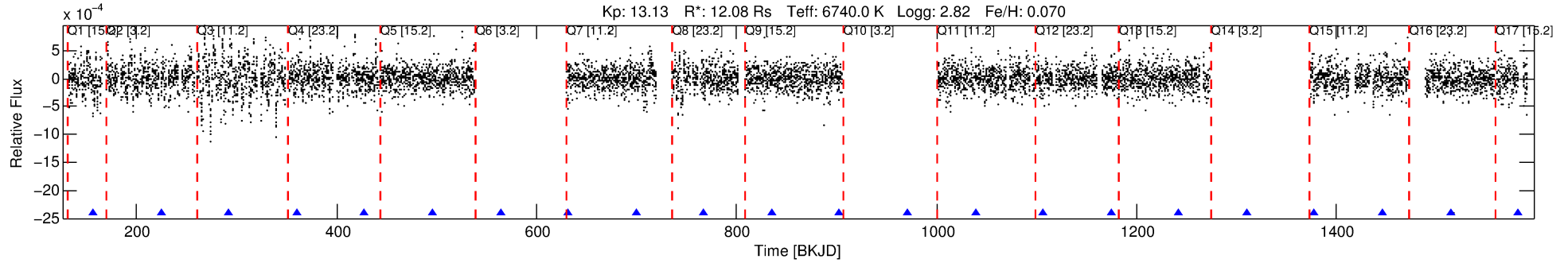
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 005288937-04

No Significant Match Found

# DV One-Page Summary

KIC: 5288937 Candidate: 4 of 6 Period: 67.844 d



## DV Fit Results:

Period = 67.84414 [0.00037] d  
Epoch = 156.7716 [0.0041] BKJD  
Rp/R\* = 0.0208 [0.0176]  
a/R\* = 176.21 [835.22]  
b = 0.71 [3.40]  
Seff = 1107.21 [1362.75]  
Teq = 1471 [453] K  
Rp = 27.36 [25.81] Re  
a = 0.4936 [0.1674] AU  
Ag = 38.82 [71.88] [0.53 $\sigma$ ]  
Teffp = 5677 [3003] K [1.38 $\sigma$ ]

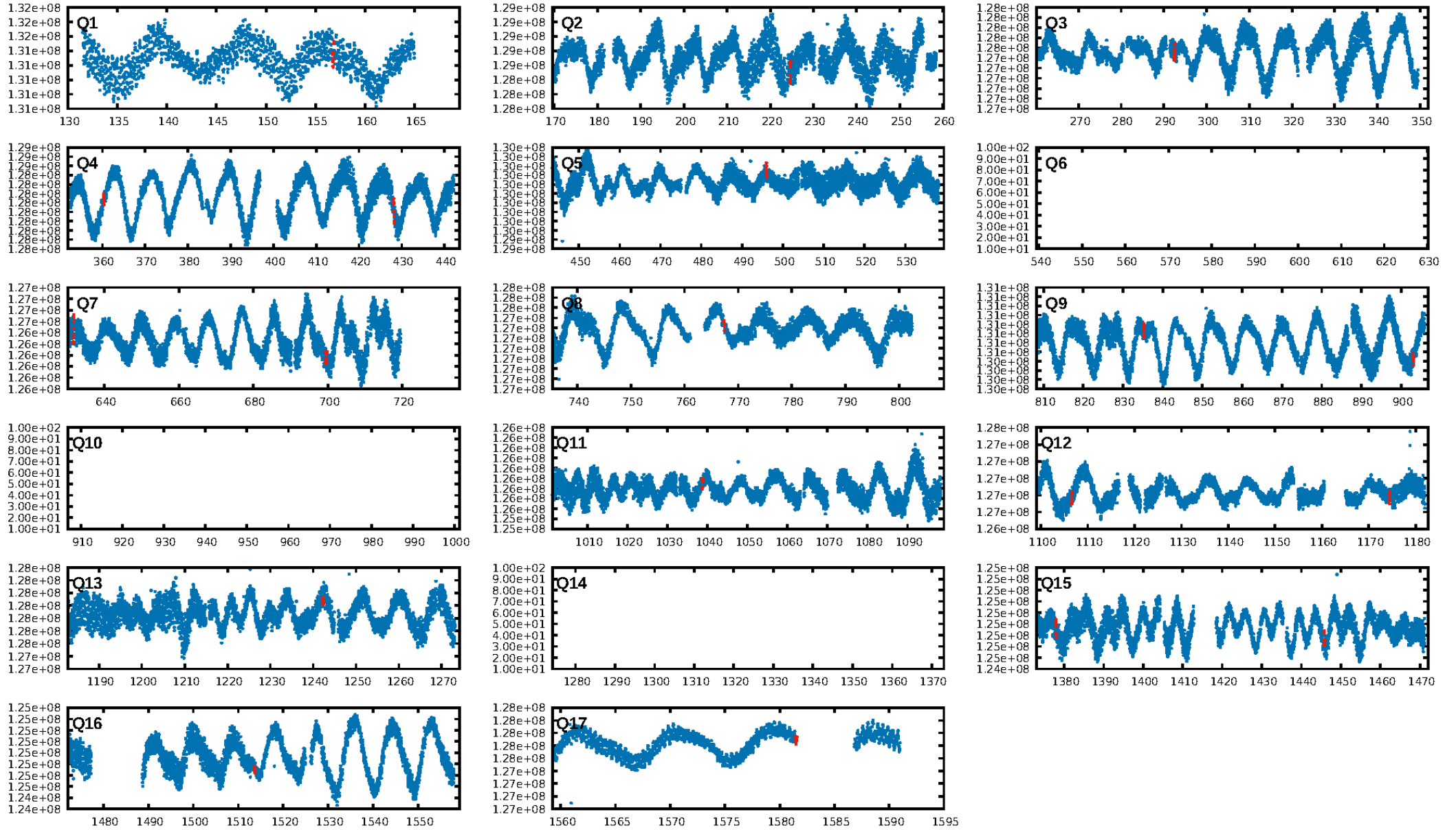
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [34.57 $\sigma$ ]  
LongPeriod-sig: 100.0% [99.95 $\sigma$ ]  
ModelChiSquare2-sig: 58.3%  
ModelChiSquareGof-sig: 100.0%  
**Bootstrap-pfa: 3.93e-11**  
RollingBand-fgt: 1.00 [7/7]  
GhostDiagnostic-chr: -1.609  
Centroid-sig: 6.6%  
Centroid-so: 0.535 arcsec [1.17 $\sigma$ ]  
OotOffset-rm: 0.344 arcsec [1.21 $\sigma$ ]  
OotOffset-st: 1/3/4/4 [12]  
KicOffset-rm: 0.294 arcsec [1.00 $\sigma$ ]  
KicOffset-st: 1/3/4/4 [12]  
DiffImageQuality-fgm: 0.58 [7/12]  
DiffImageOverlap-fno: 0.00 [0/12]

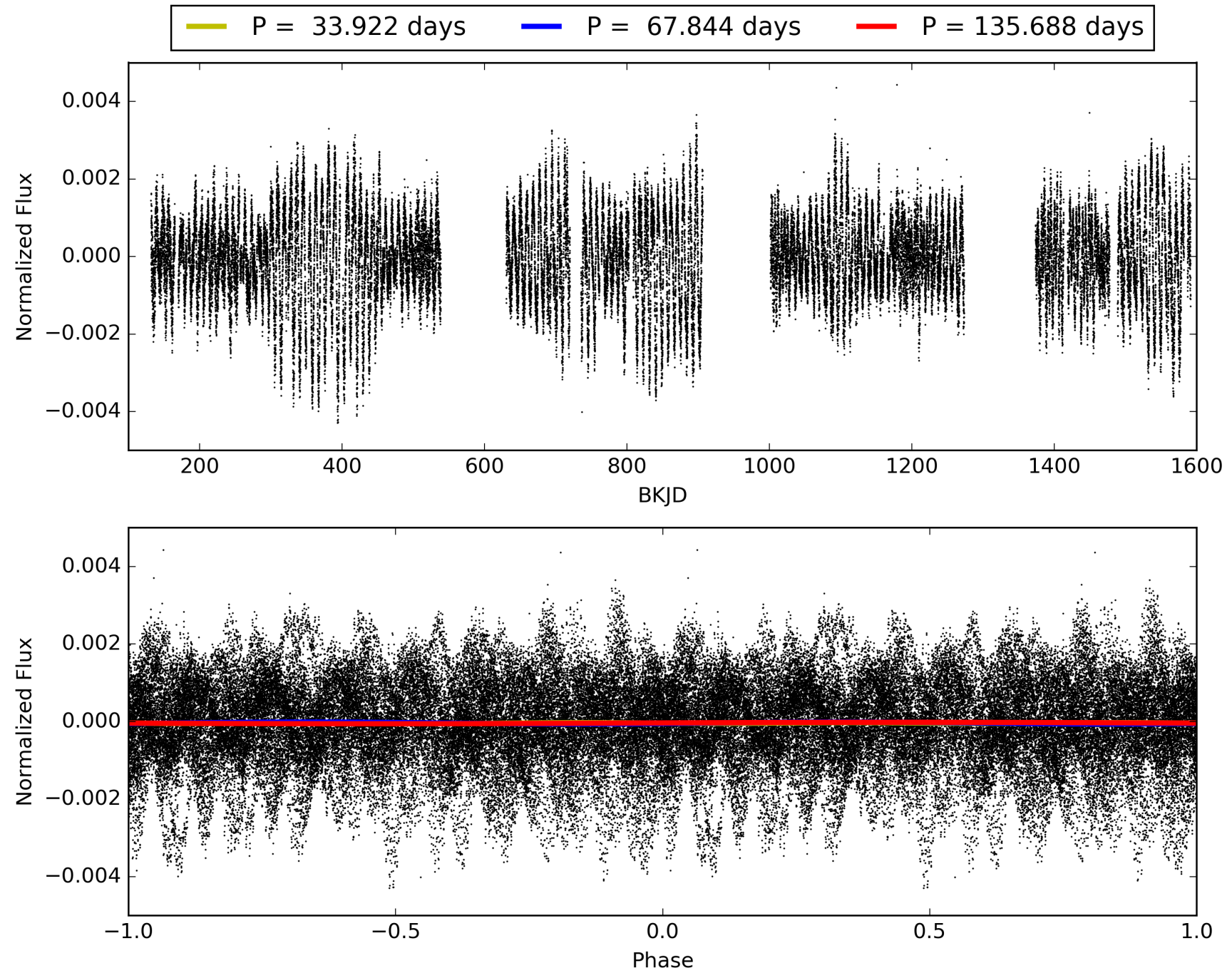
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 18:29:25 Z

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

# TCE 005288937-04, PDC Light Curves

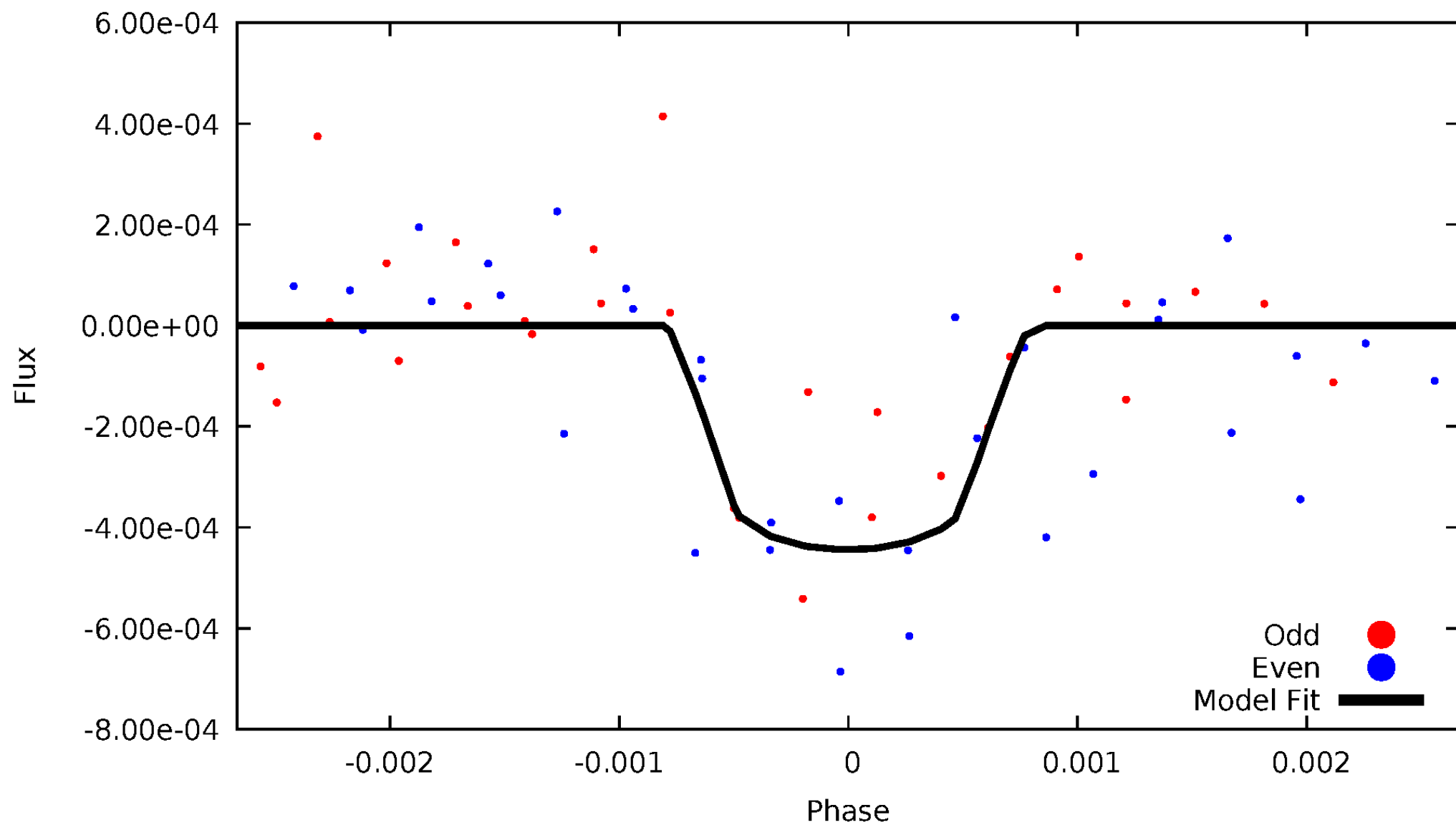


TCE 005288937-04



# DV Odd/Even

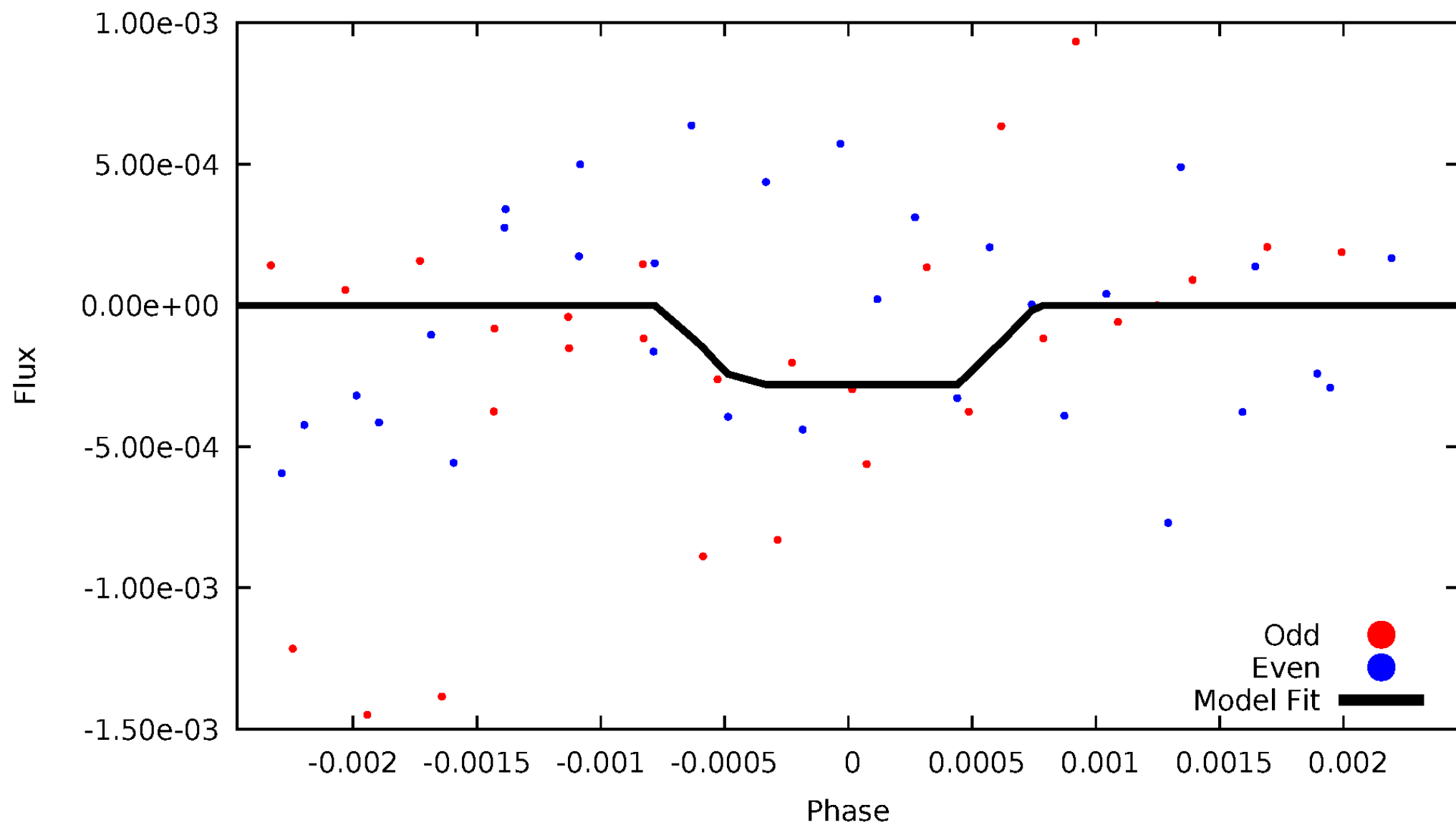
TCE 005288937-04





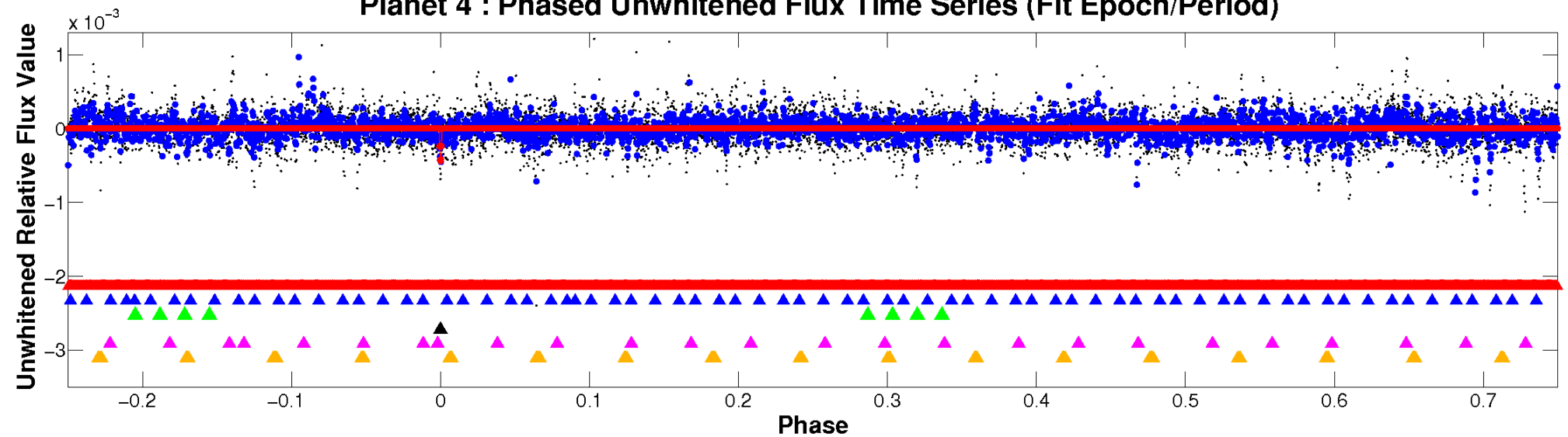
# ALT Odd/Even

TCE 005288937-04

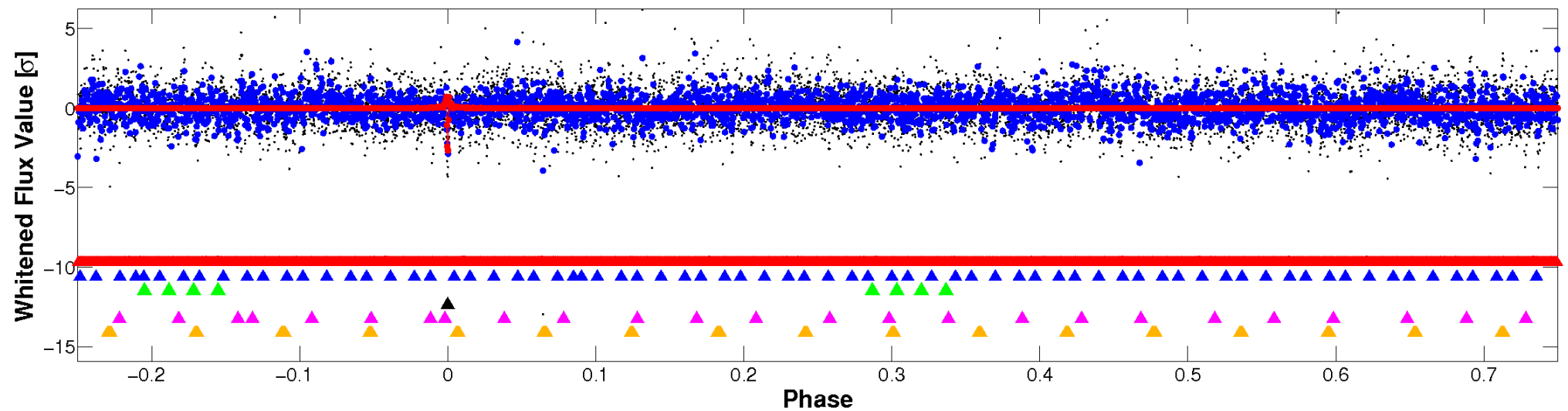


# Non-Whitened Vs. Whitened Light Curve

## Planet 4 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

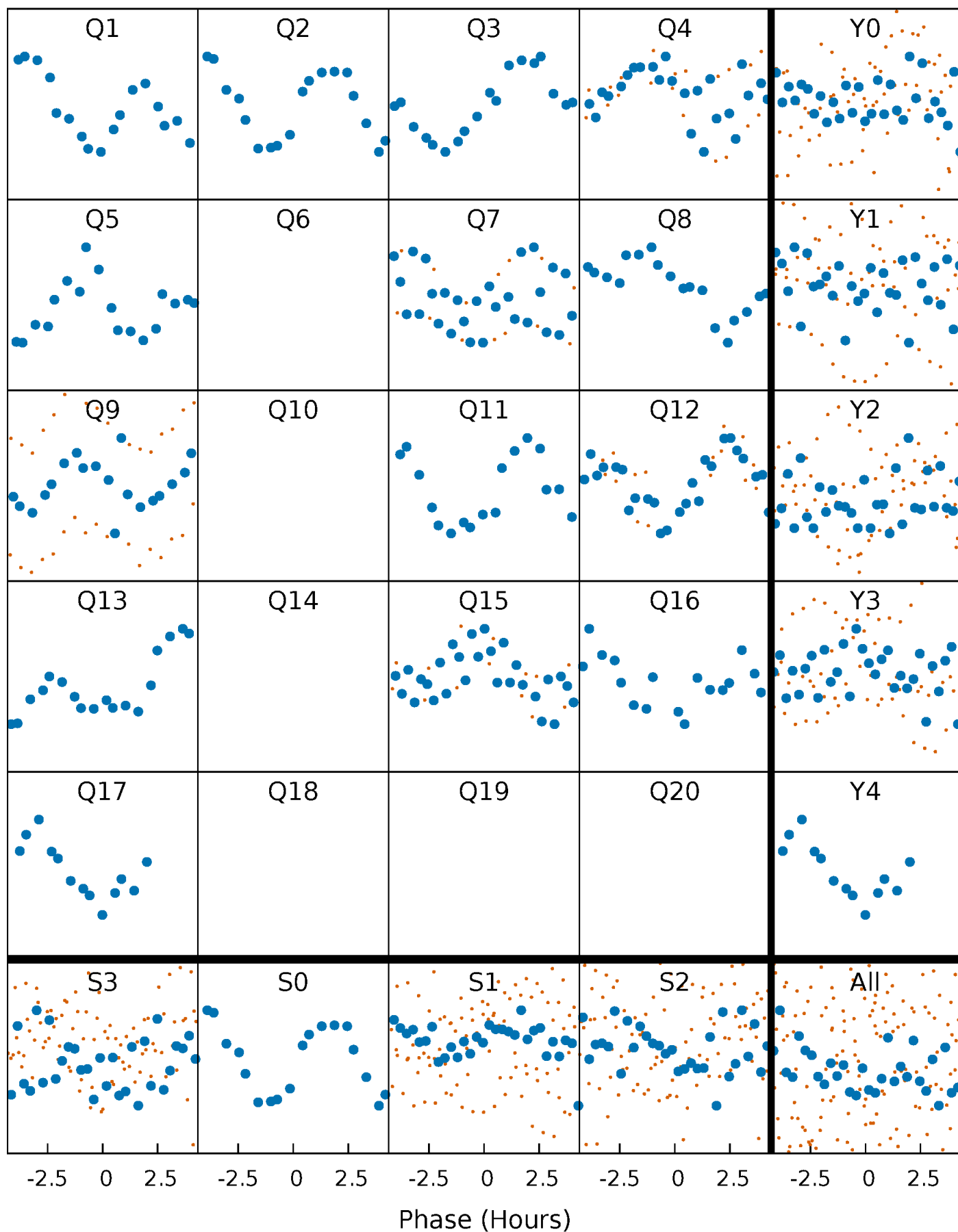


## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



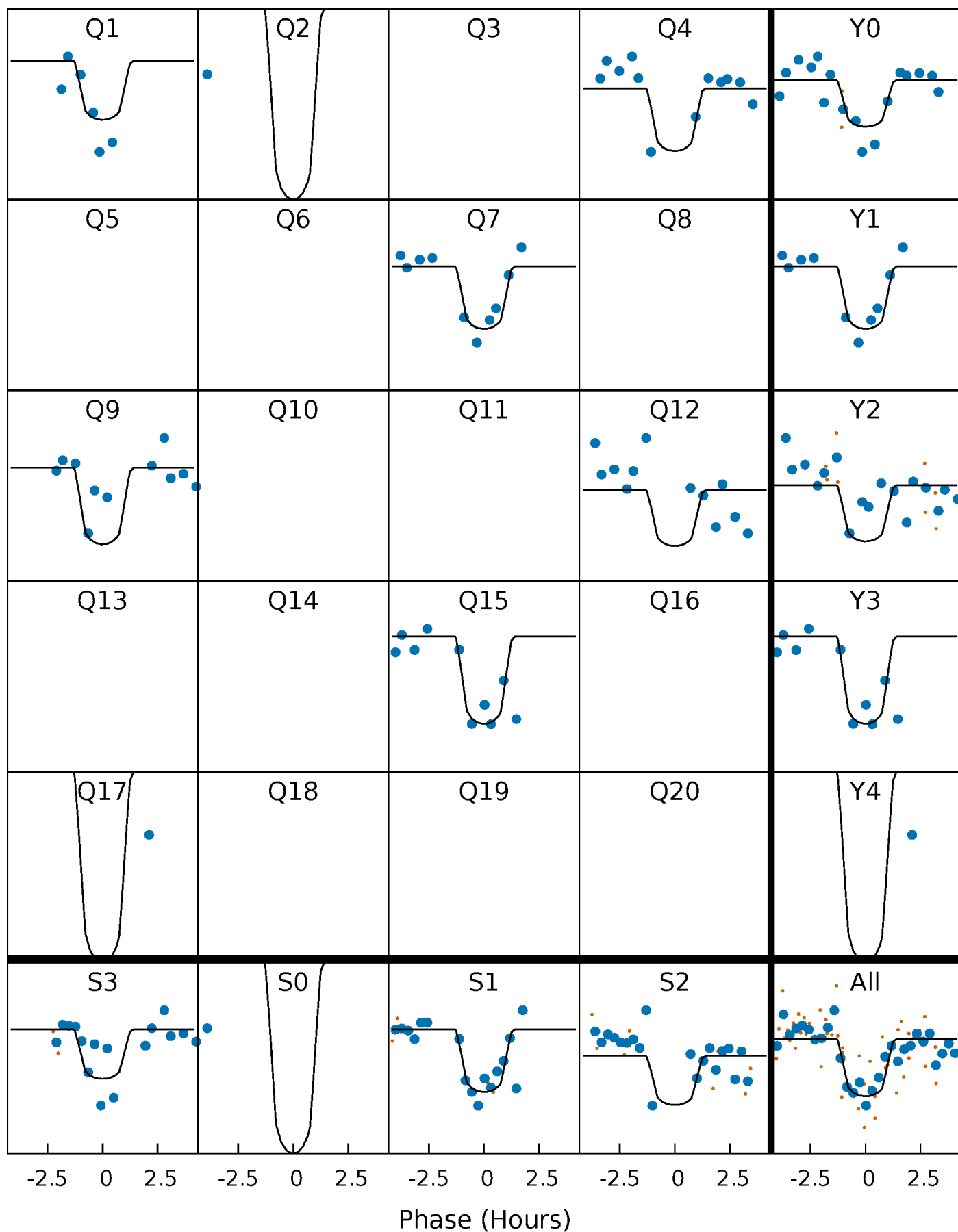
# PDC Quarter-Phased Transit Curves

TCE 005288937-04   P= 67.844141 Days    $T_0=156.771648$  (BKJD)



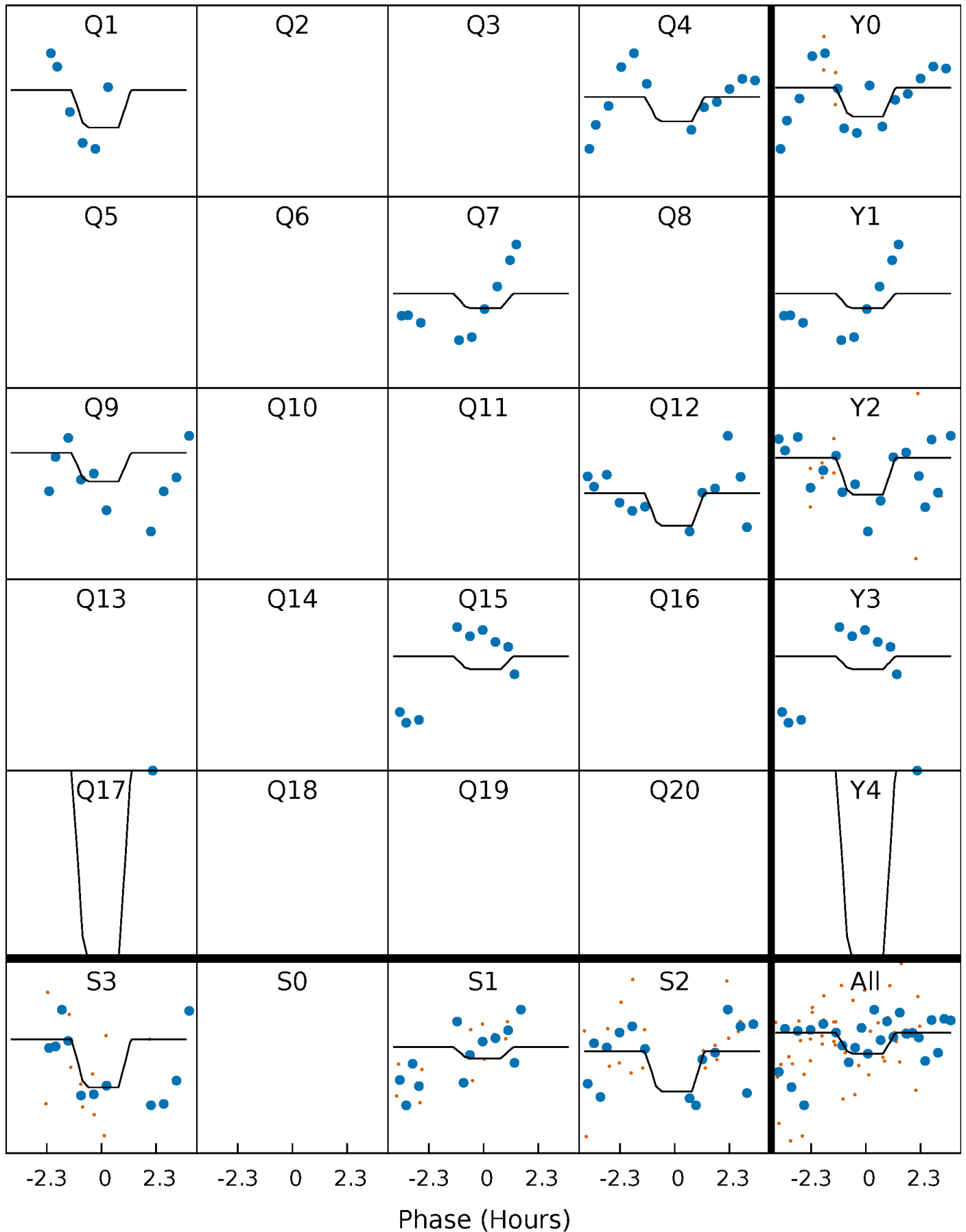
# DV Quarter-Phased Transit Curves

TCE 005288937-04   P= 67.844141 Days    $T_0=156.771648$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

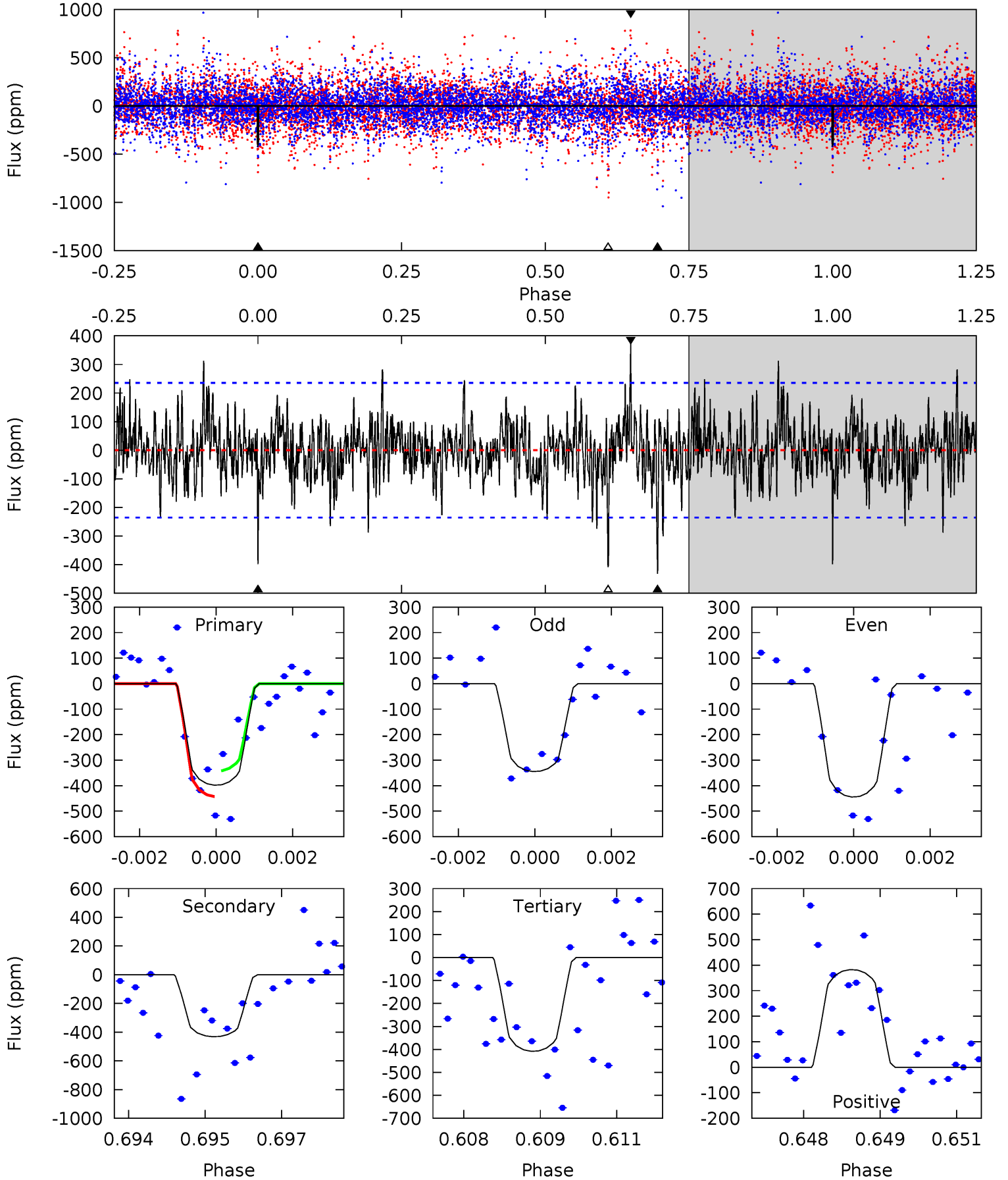
TCE 005288937-04     $P = 67.843546$  Days     $T_0 = 156.781769$  (BKJD)



# DV Model-Shift Uniqueness Test

005288937-04, P = 67.844141 Days, E = 88.927507 Days

| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 9.08 | 9.84 | 9.31 | 8.73 | 5.38            | 3.17            | 1.90             | -0.23   | 0.35    | 0.53    | 1.12    | 1.13    | 0.80 | 0.47  | 1.15 |

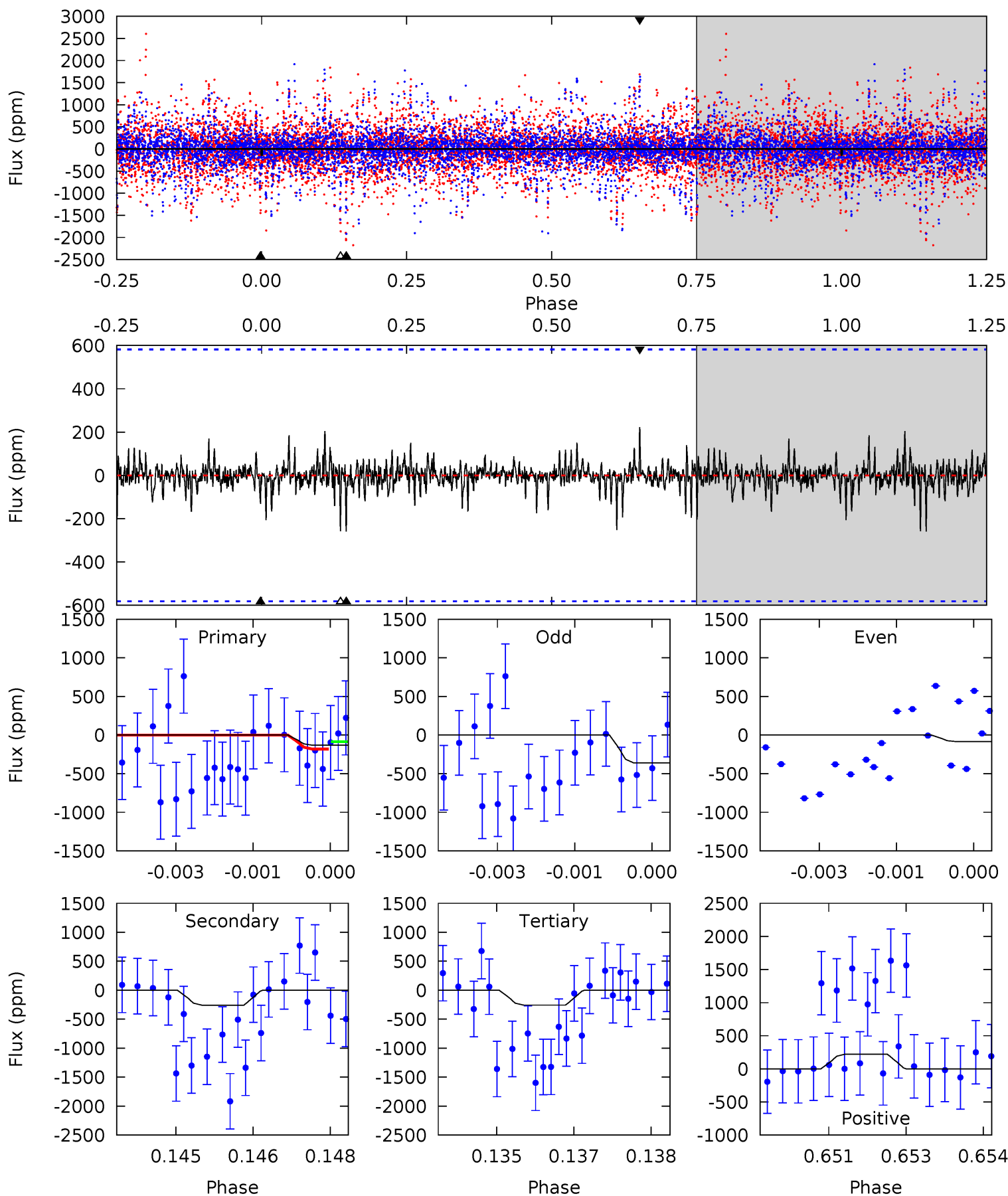




# Alt Model-Shift Uniqueness Test

005288937-04, P = 67.843546 Days, E = 88.938223 Days

| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 1.22 | 2.39 | 2.38 | 2.06 | 5.39            | 3.19            | 0.44             | -1.17   | -0.84   | 0.01    | 0.34    | 1.19    | 0.51 | 0.46  | 0.44 |



### Stellar Parameters For KIC 005288937

|        | $T_{\text{eff}}(K)$   | $\log(g)$                 | [Fe/H]                    | $R (R_{\odot})$            | $M(M_{\odot})$            | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|-----------------------|---------------------------|---------------------------|----------------------------|---------------------------|---|
|        | $6740^{+448}_{-1908}$ | $2.816^{+0.172}_{-0.258}$ | $0.070^{+0.250}_{-0.600}$ | $12.080^{+3.326}_{-4.989}$ | $3.479^{+0.111}_{-2.117}$ | $0.003^{+0.004}_{-0.001}$                 |
|        | +7%/-28%              | +6%/-9%                   | +357%/-857%               | +28%/-41%                  | +3%/-61%                  | +136%/-53%                                |
| Source | PHO1                  | FLK73                     | 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 005288937-04 / KOI

| Detrend | Depth (ppm)    | $R_p (R_{\oplus})$        | $T_{max} (K)$        | $T_{obs} (K)$          | $A_{obs}$         |
|---------|----------------|---------------------------|----------------------|------------------------|-------------------|
| DV      | $-431 \pm 44$  | $31.84^{+20.79}_{-20.21}$ | $2038^{+285}_{-499}$ | $5901^{+4047}_{-1458}$ | $53^{+322}_{-34}$ |
| Alt.    | $-258 \pm 108$ | $26.56^{+21.28}_{-16.29}$ | $2000^{+286}_{-539}$ | $5388^{+3792}_{-1496}$ | $41^{+248}_{-29}$ |

$T_{max}$  = 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  $A_{obs} \gg 1.0$

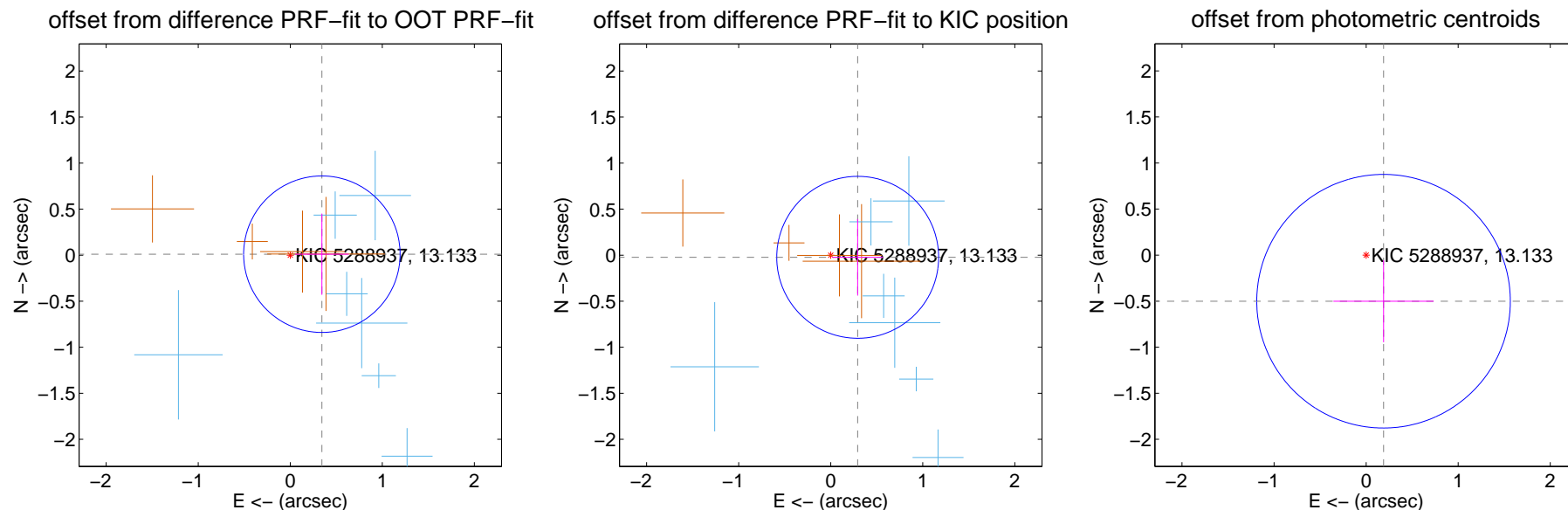
## DV Centroid Data

Supplemental centroid analysis for 005288937-04. Kepler magnitude: 13.13. Transit SNR 9.33

There are 7 quarters with good PRF difference image offsets

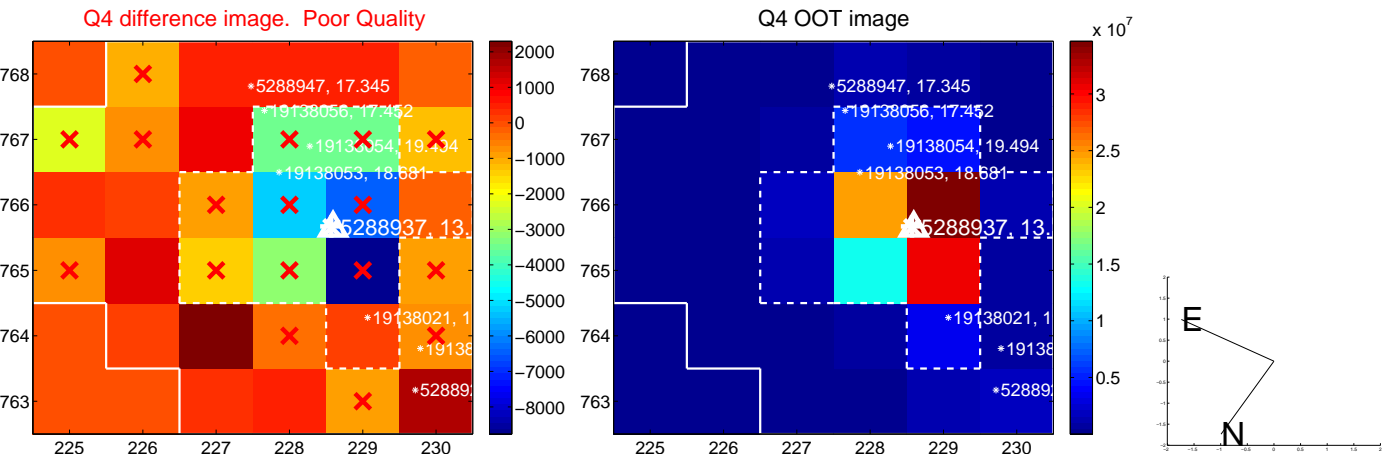
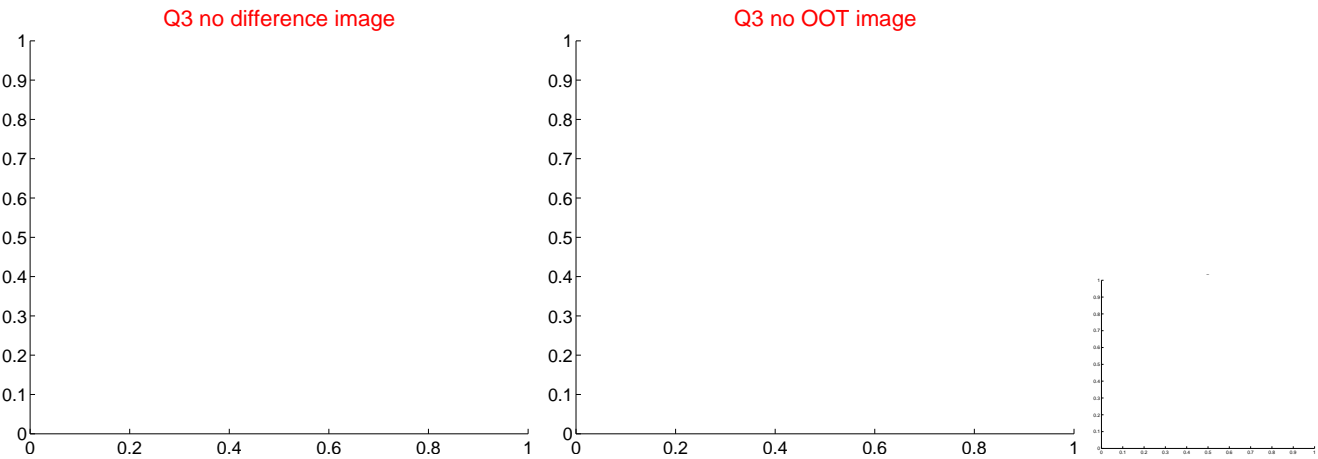
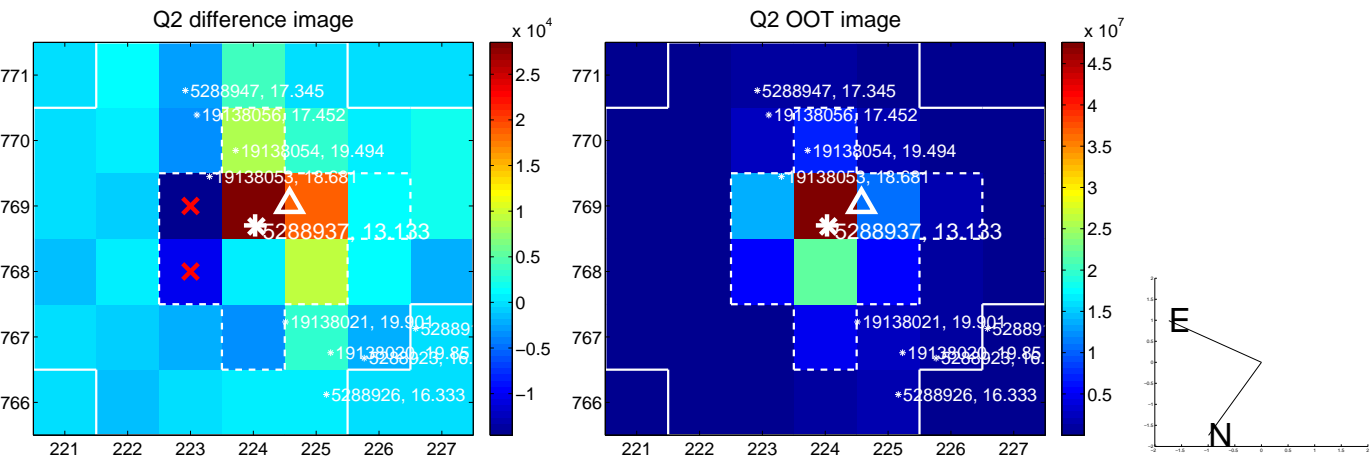
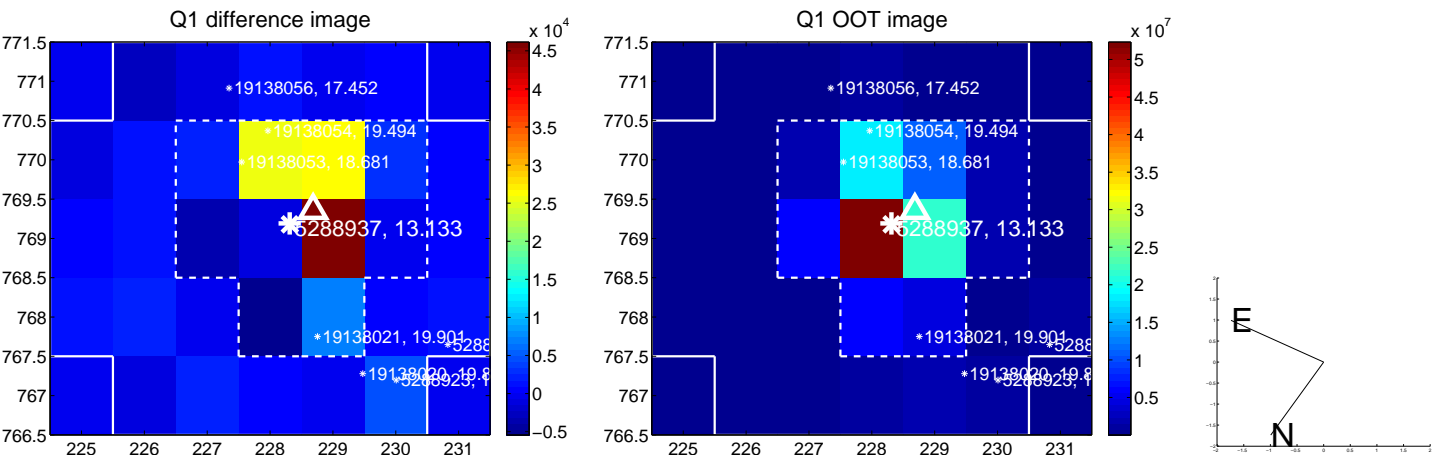
The direct PRF centroid is offset from the target star catalog position by about 0.14 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA        | $\Delta$ Dec       |
|---|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT          | $0.344 \pm 0.283$  | 1.21                | $-0.343 \pm 0.291$ | $0.010 \pm 0.441$  |
| PRF-fit source offset from KIC position | $0.294 \pm 0.293$  | 1.00                | $-0.293 \pm 0.275$ | $-0.023 \pm 0.416$ |
| photometric centroid source offset      | $0.54 \pm 0.46$    | 1.17                | $-0.19 \pm 0.54$   | $-0.50 \pm 0.45$   |

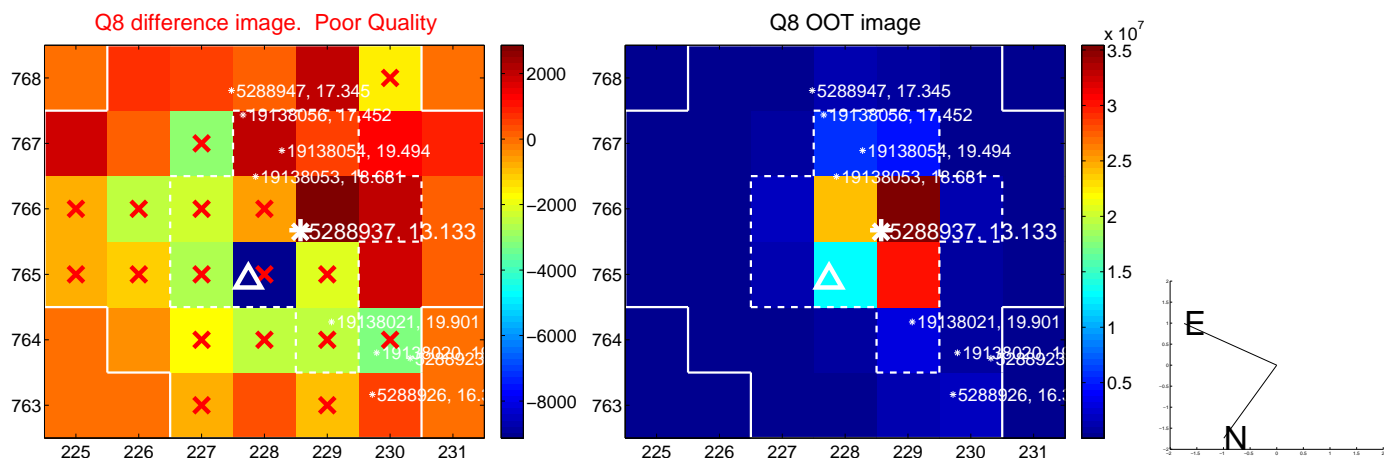
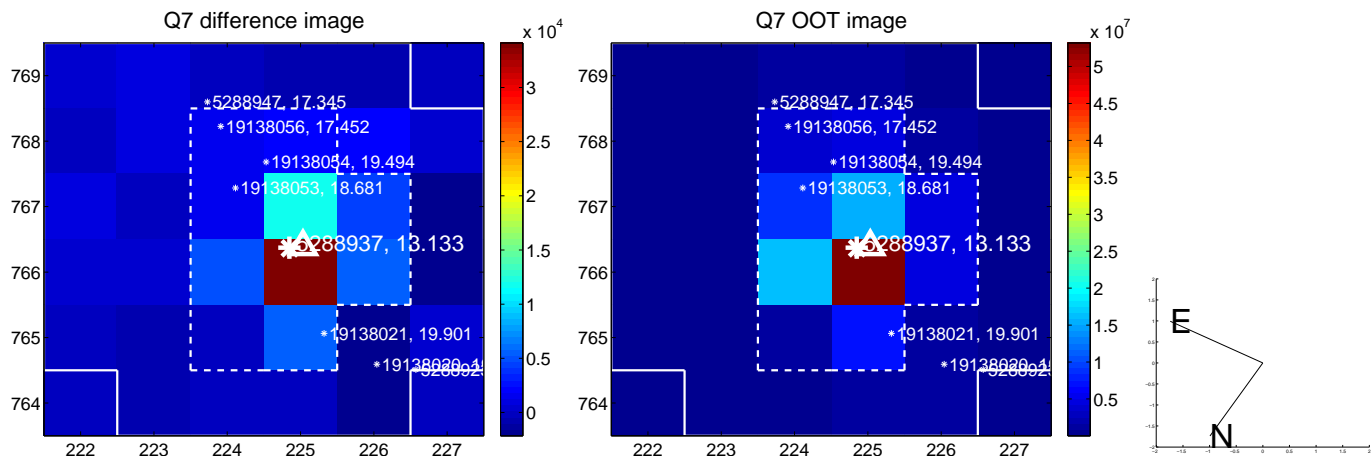
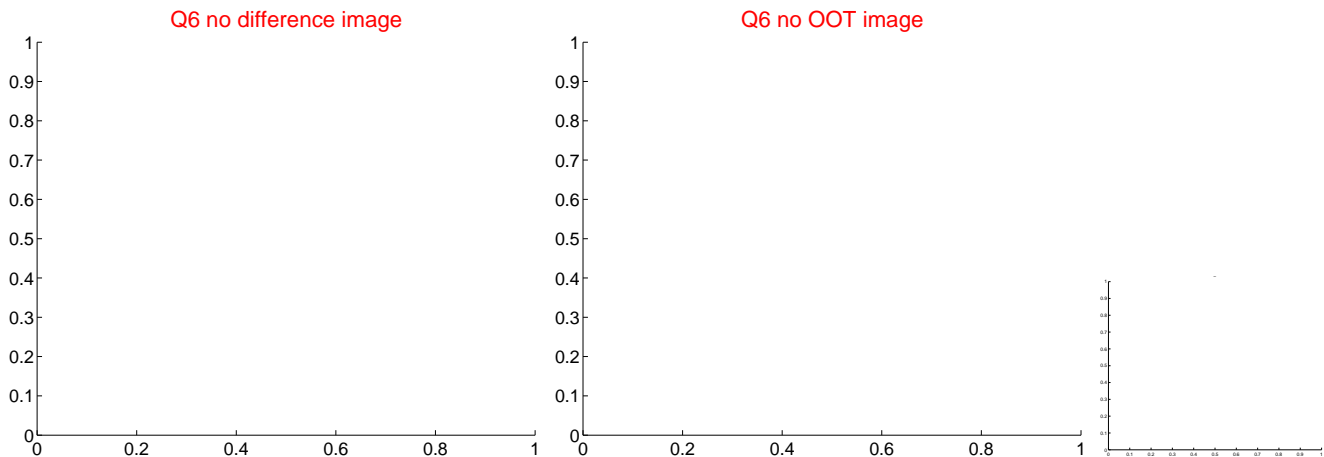
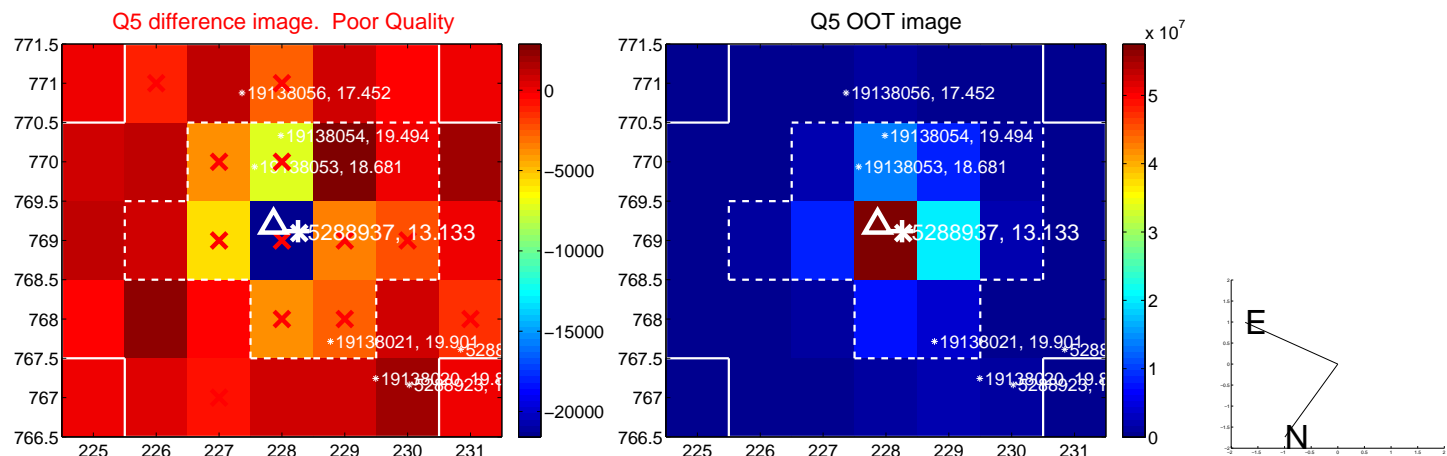


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

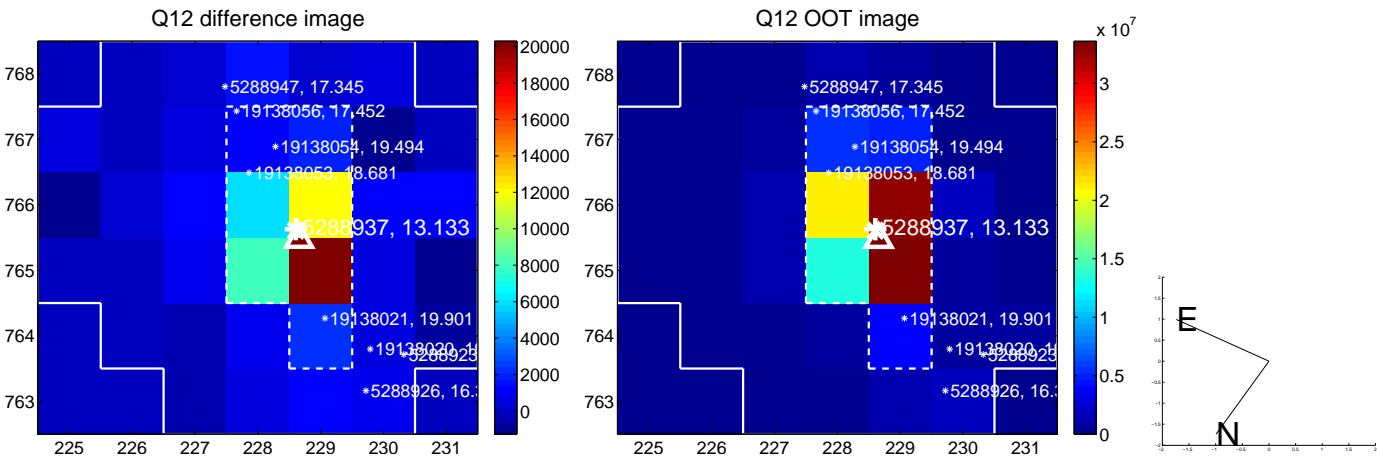
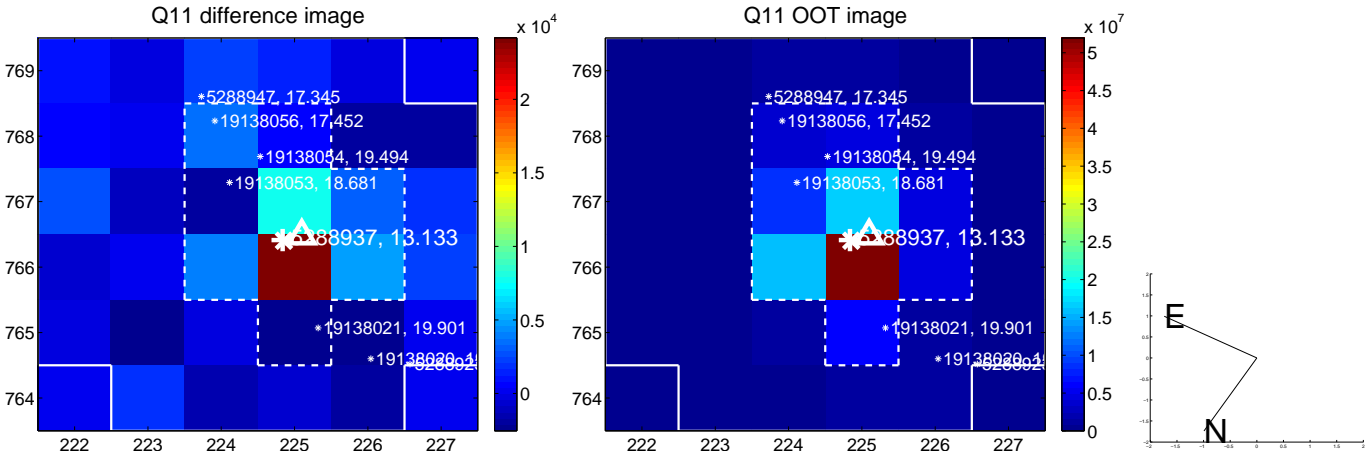
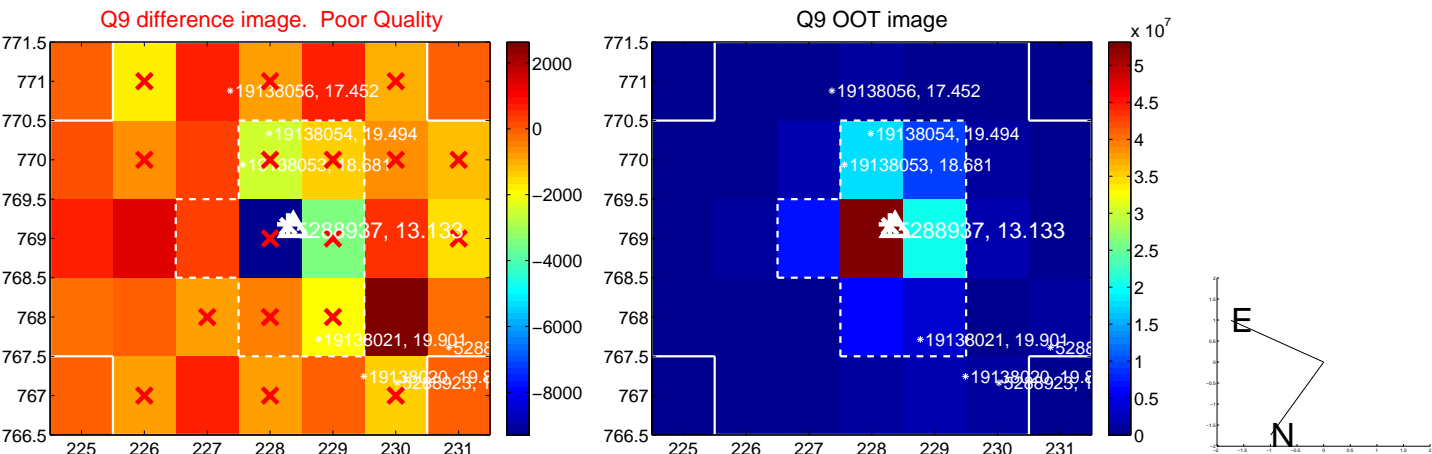
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

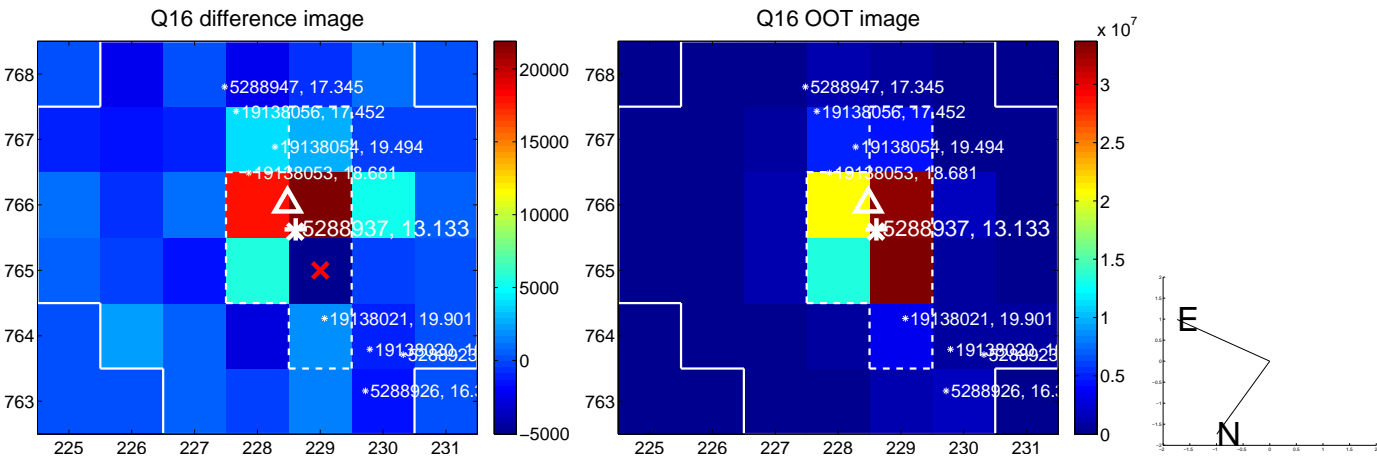
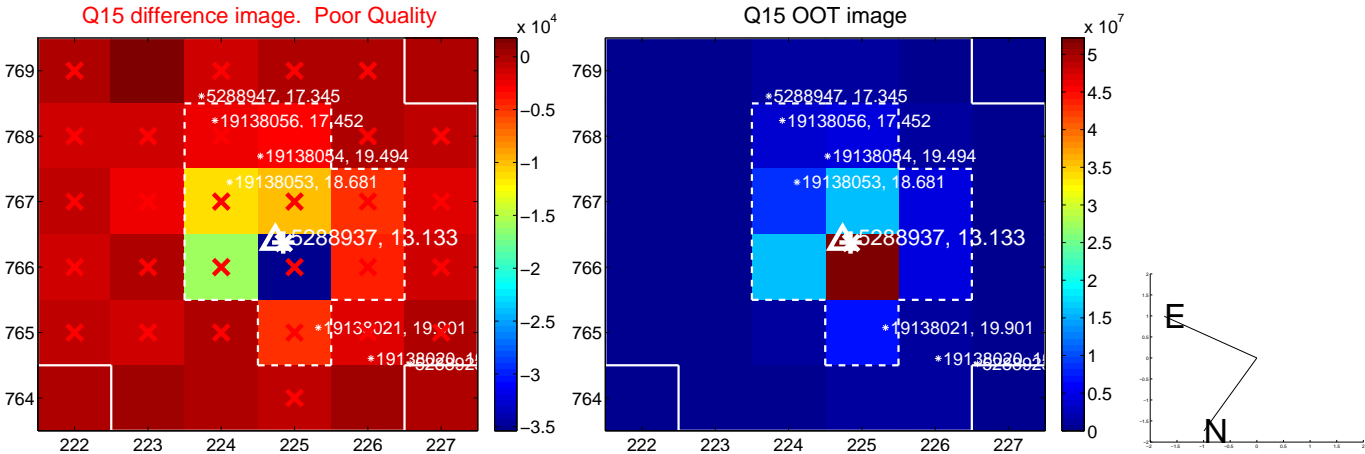
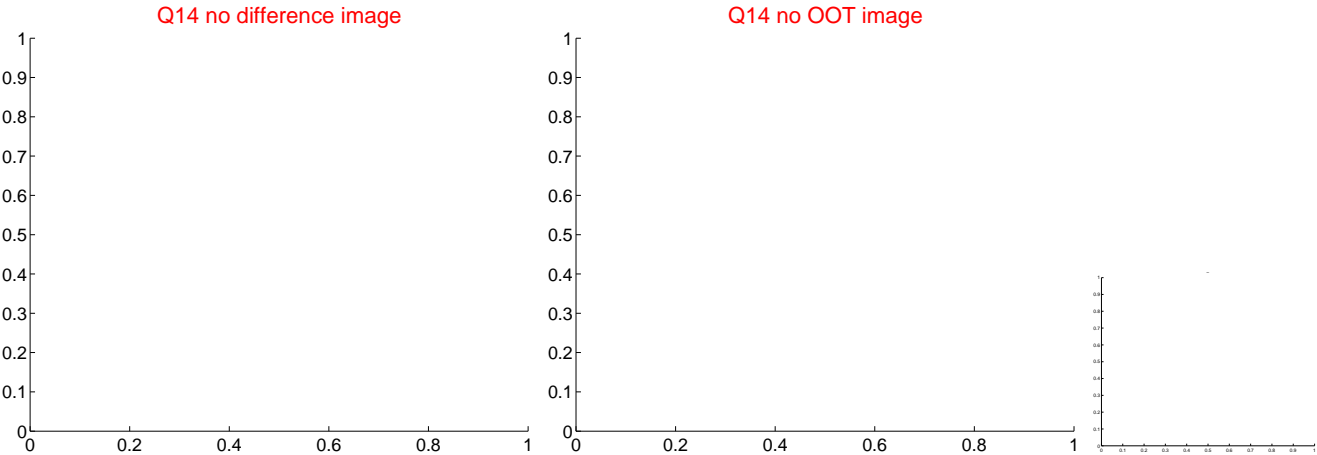
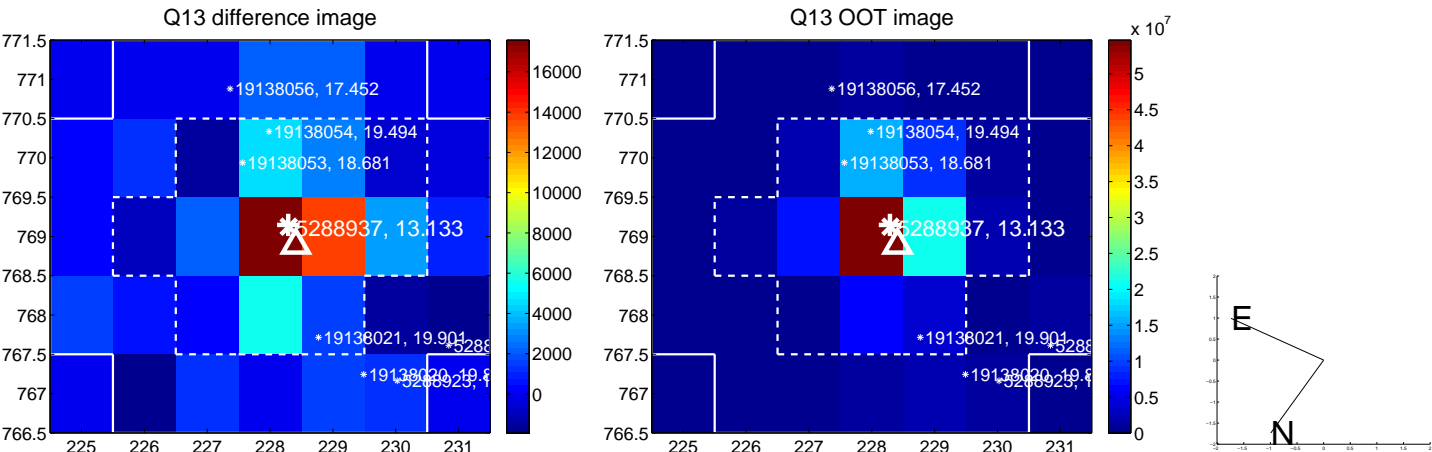


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

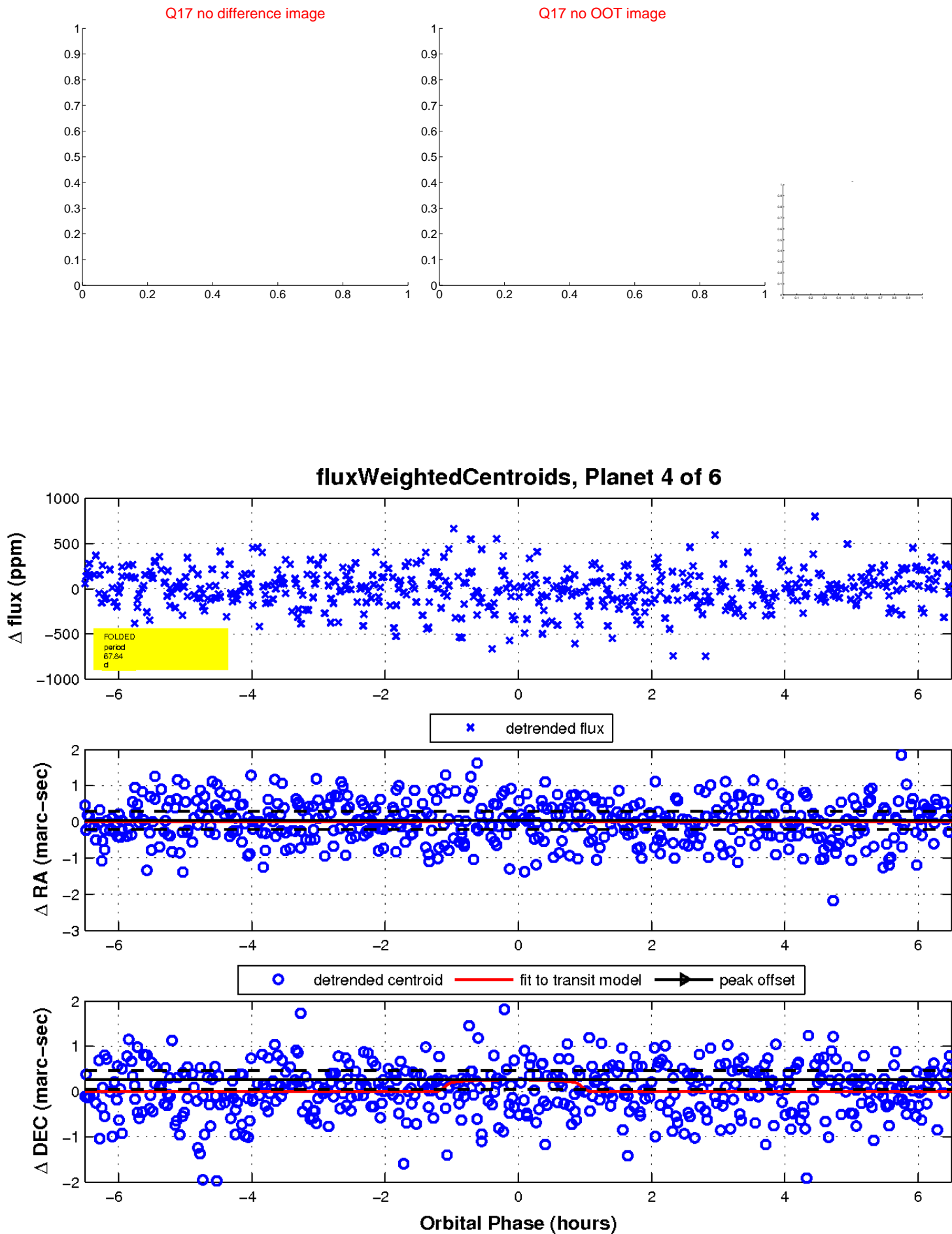




white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

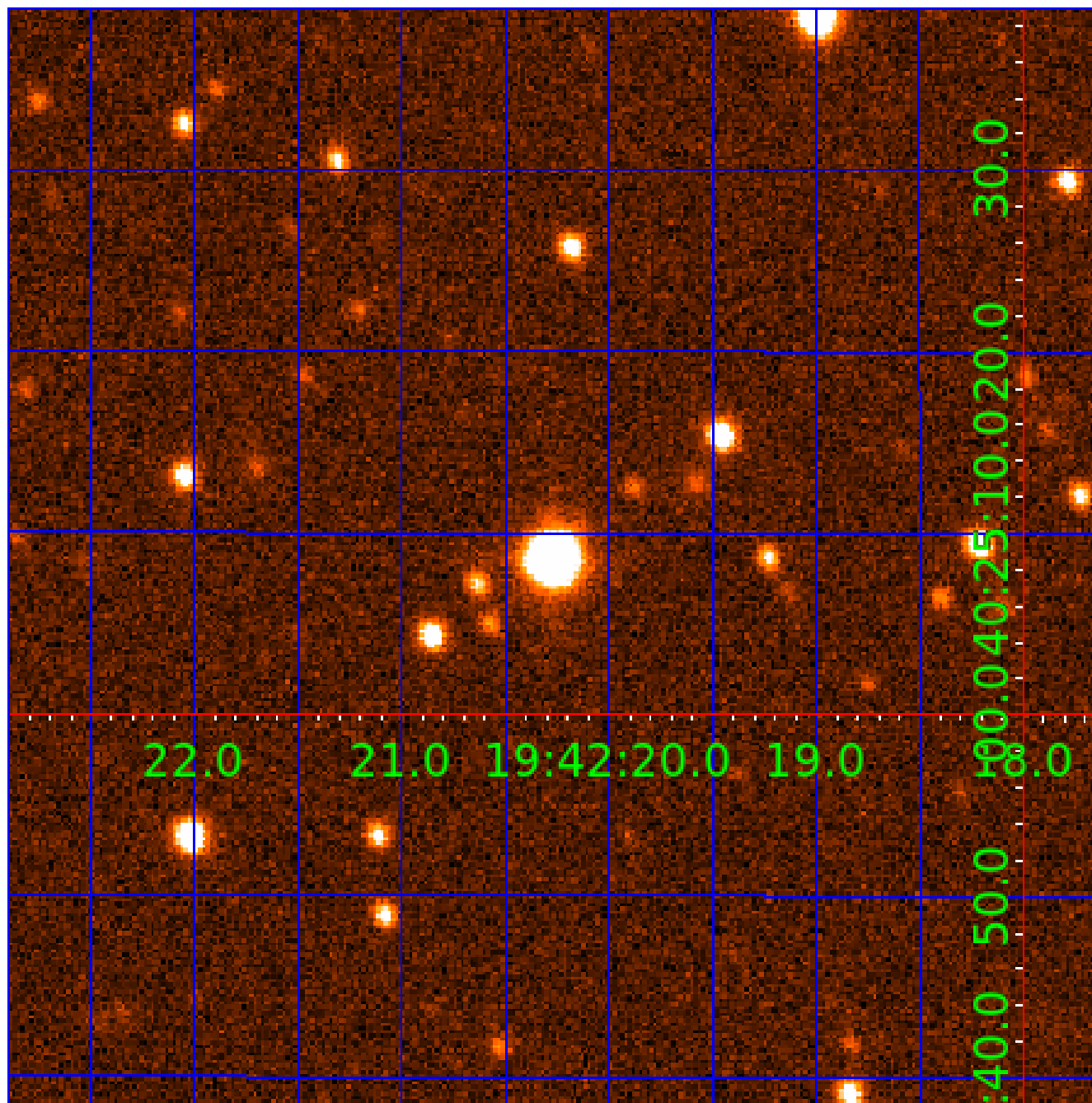


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 005288937

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|------|---------------|--------------|-------------|------------------|-----|-----|-----------------------------|-----------------|------------------------|------------------------|
| 005288937-01 | OBS      | No   | 0.669907      | 131.621138   | 10.9        | 4.220            | 9.0 | 3.3 | 12.08                       | 6740            | 4.05                   | 0.00                   |
| 005288937-02 | OBS      | No   | 20.061400     | 142.842908   | 296.5       | 3.274            | 8.9 | 6.5 | 12.08                       | 6740            | 24.03                  | 5620.35                |
| 005288937-04 | OBS      | No   | 67.844141     | 156.771648   | 444.3       | 2.170            | 8.5 | 9.3 | 12.08                       | 6740            | 27.36                  | 1107.21                |
| 005288937-06 | OBS      | No   | 19.956635     | 149.151627   | 123.8       | 9.226            | 8.3 | 4.2 | 12.08                       | 6740            | 14.66                  | 5659.73                |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments  |
|--------------|----------|------|-------|---|---|---|---|---|
| 005288937-01 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT   |
| 005288937-02 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT                                       |
| 005288937-04 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_ALT—ALL_TRANS_CHASES—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT   |
| 005288937-06 | OBS      | FP   | 0.00  | 1 | 0 | 0 | 0 | INDIV_TRANS_RUBBLE_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT |

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

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

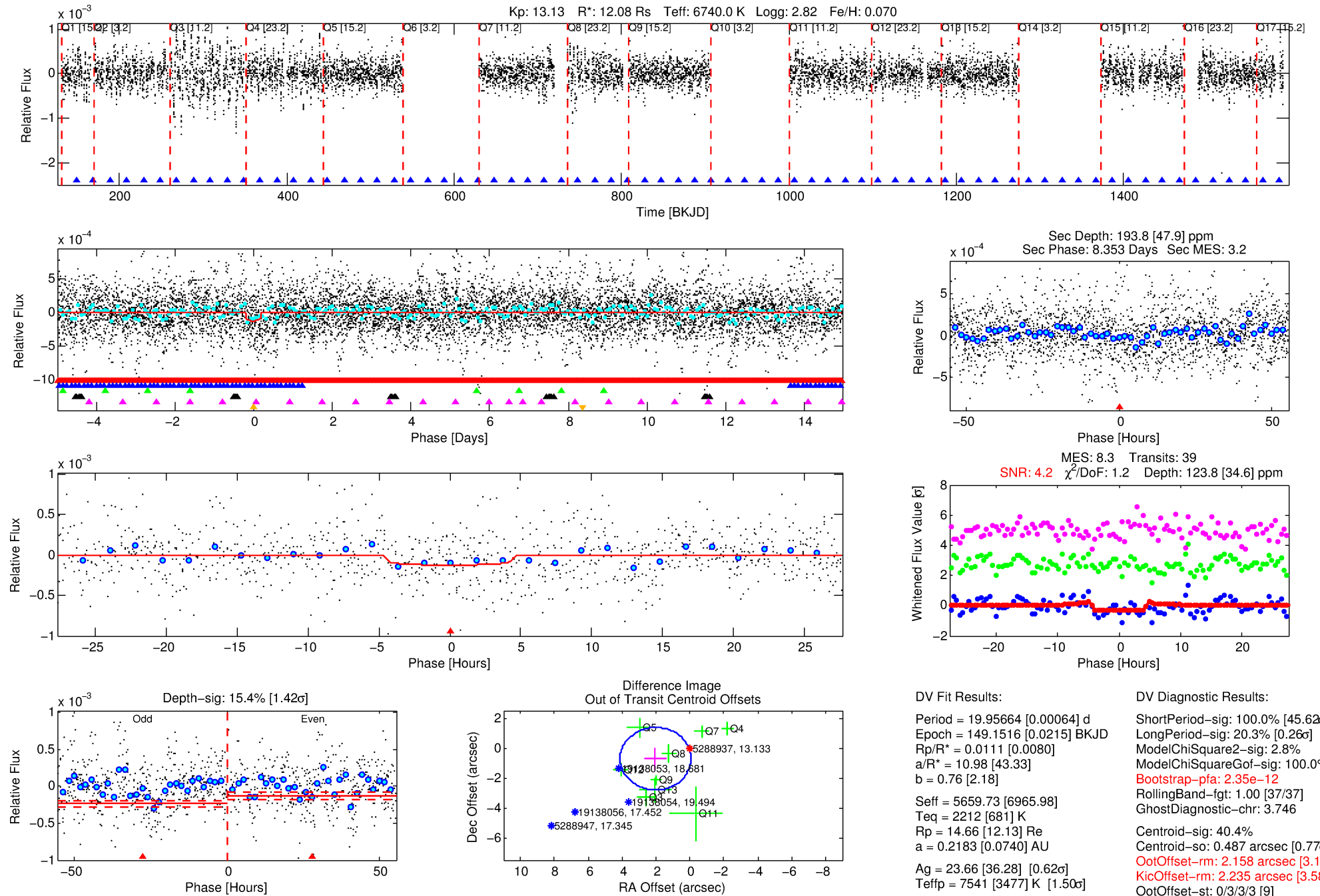
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 005288937-06

No Significant Match Found

# DV One-Page Summary

KIC: 5288937 Candidate: 6 of 6 Period: 19.957 d



## DV Fit Results:

Period = 19.95664 [0.00064] d  
Epoch = 149.1516 [0.0215] BKJD  
Rp/R\* = 0.0111 [0.0080]  
a/R\* = 10.98 [43.33]  
b = 0.76 [2.18]  
Seff = 5659.73 [6965.98]  
Teq = 2212 [681] K  
Rp = 14.66 [12.13] Re  
a = 0.2183 [0.0740] AU  
Ag = 23.66 [36.28] [0.62 $\sigma$ ]  
Teffp = 7541 [3477] K [1.50 $\sigma$ ]

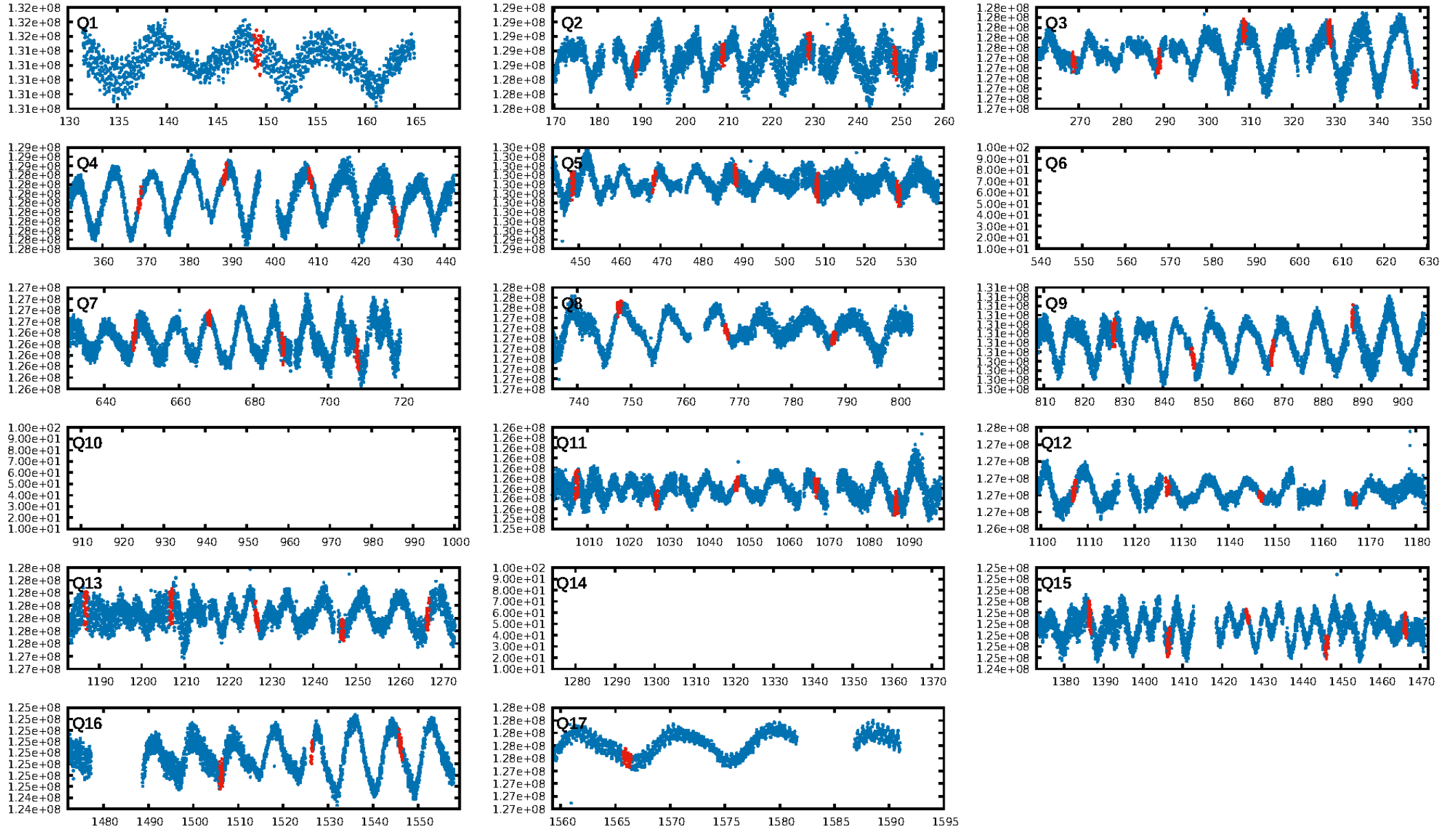
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [45.62 $\sigma$ ]  
LongPeriod-sig: 20.3% [0.26 $\sigma$ ]  
ModelChiSquare2-sig: 2.8%  
ModelChiSquareGof-sig: 100.0%  
**Bootstrap-pfa: 2.35e-12**  
RollingBand-fgt: 1.00 [37/37]  
GhostDiagnostic-chr: 3.746  
Centroid-sig: 40.4%  
Centroid-so: 0.487 arcsec [0.77 $\sigma$ ]  
**OotOffset-rm: 2.158 arcsec [3.10 $\sigma$ ]**  
**KicOffset-rm: 2.235 arcsec [3.58 $\sigma$ ]**  
OotOffset-st: 0/3/3/3 [9]  
KicOffset-st: 0/3/3/3 [9]  
DiffImageQuality-fgm: 0.33 [3/9]  
DiffImageOverlap-fno: 0.00 [0/13]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 18:29:32 Z

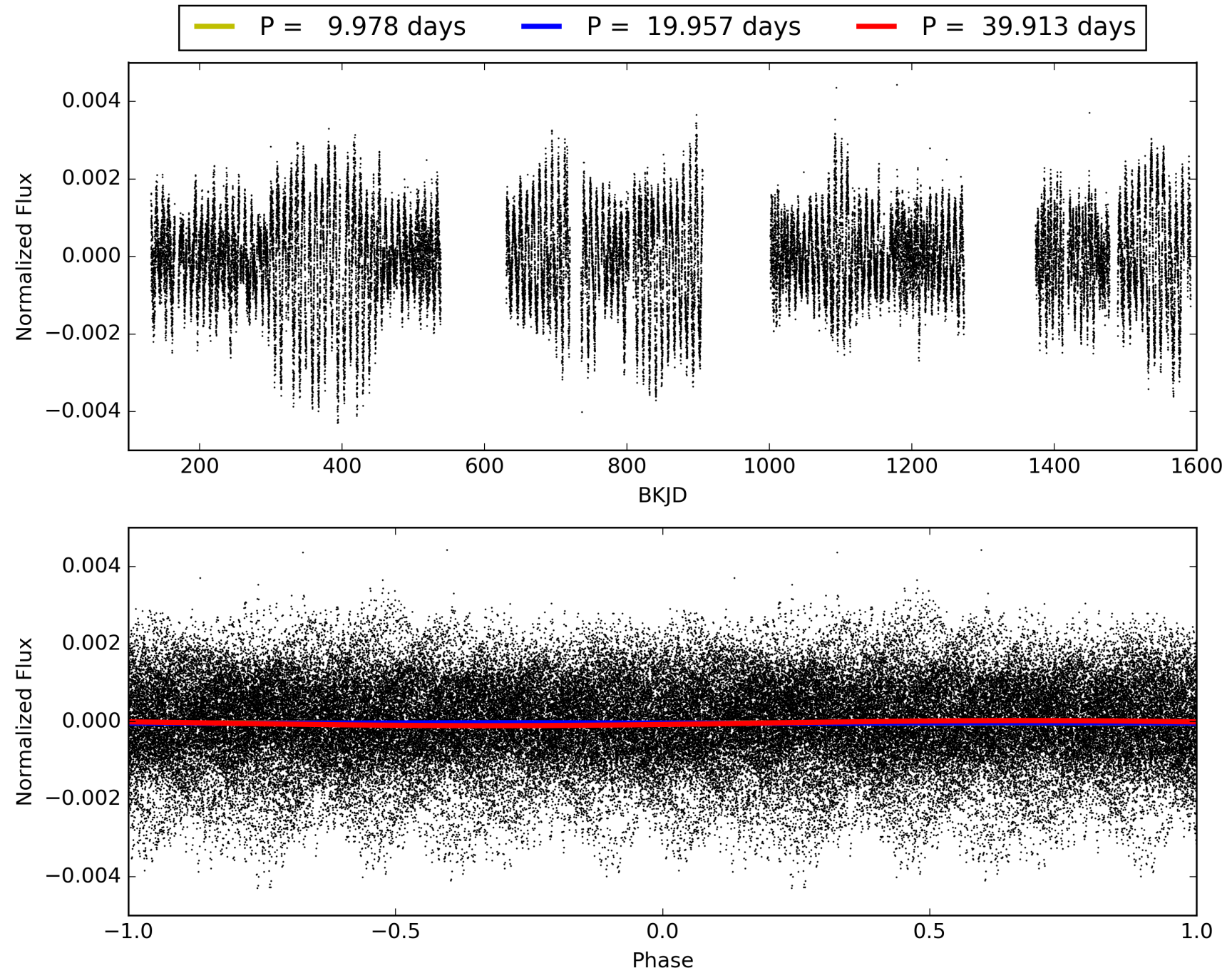
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 005288937-06, PDC Light Curves





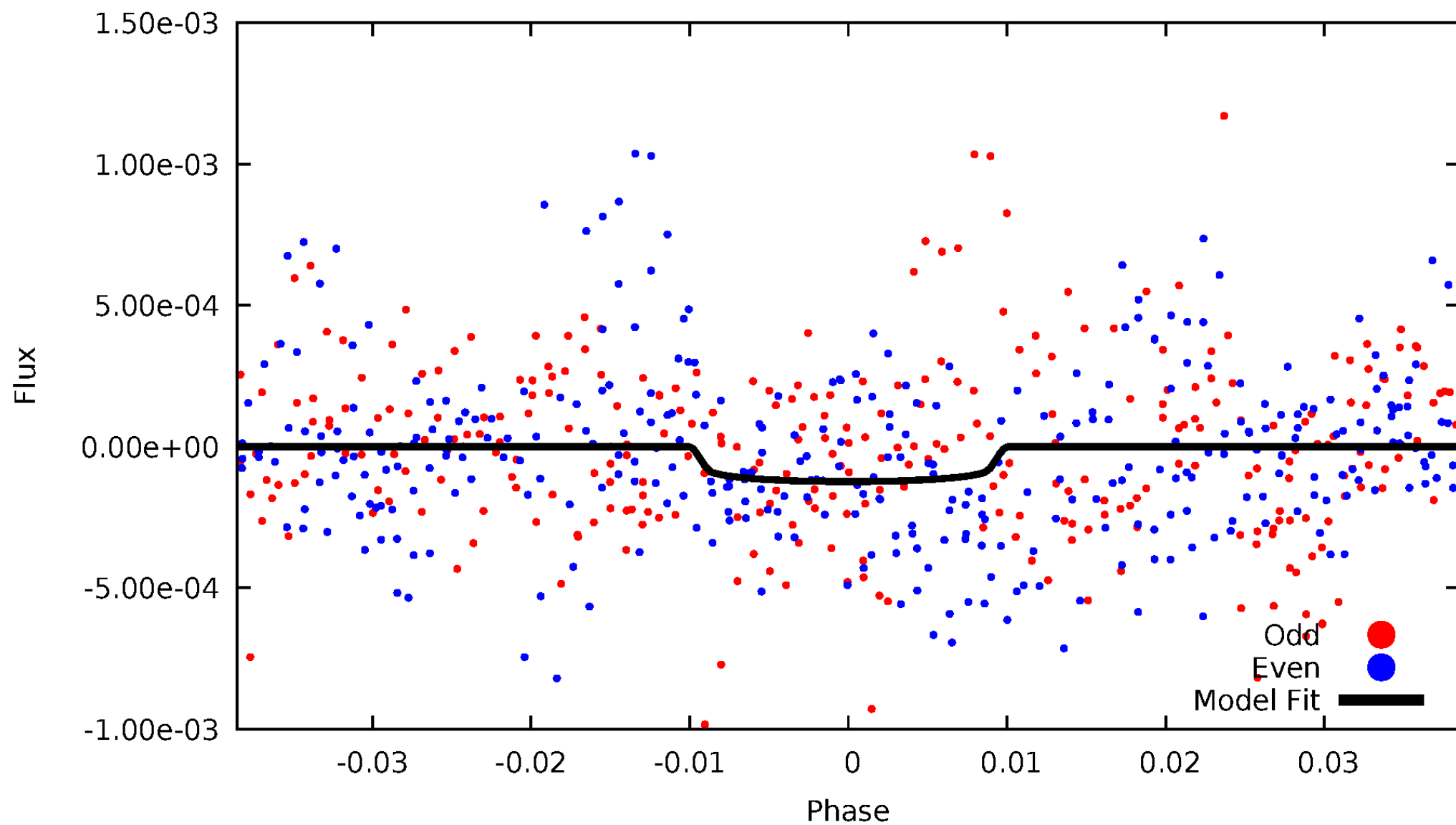
TCE 005288937-06





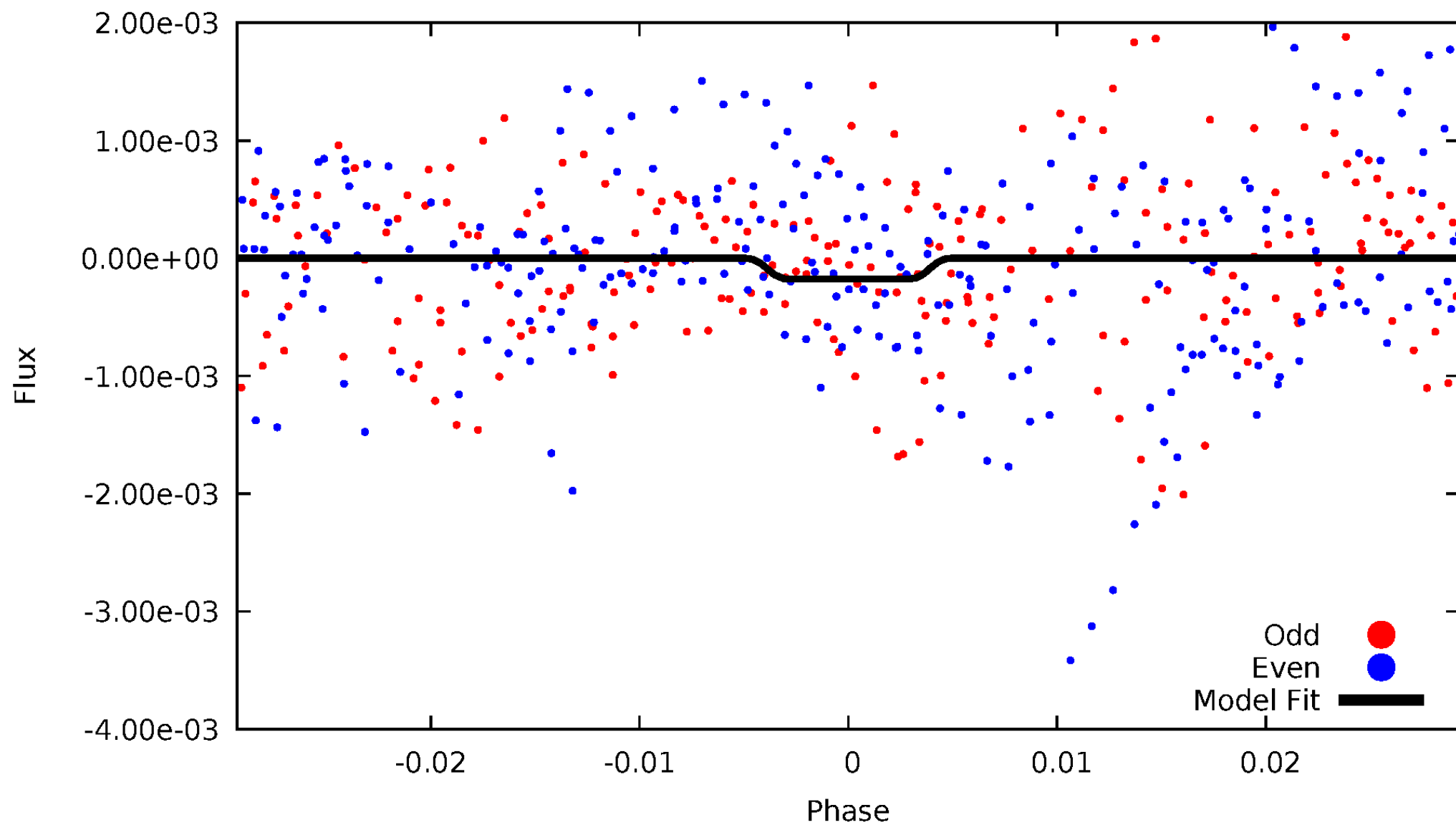
# DV Odd/Even

TCE 005288937-06



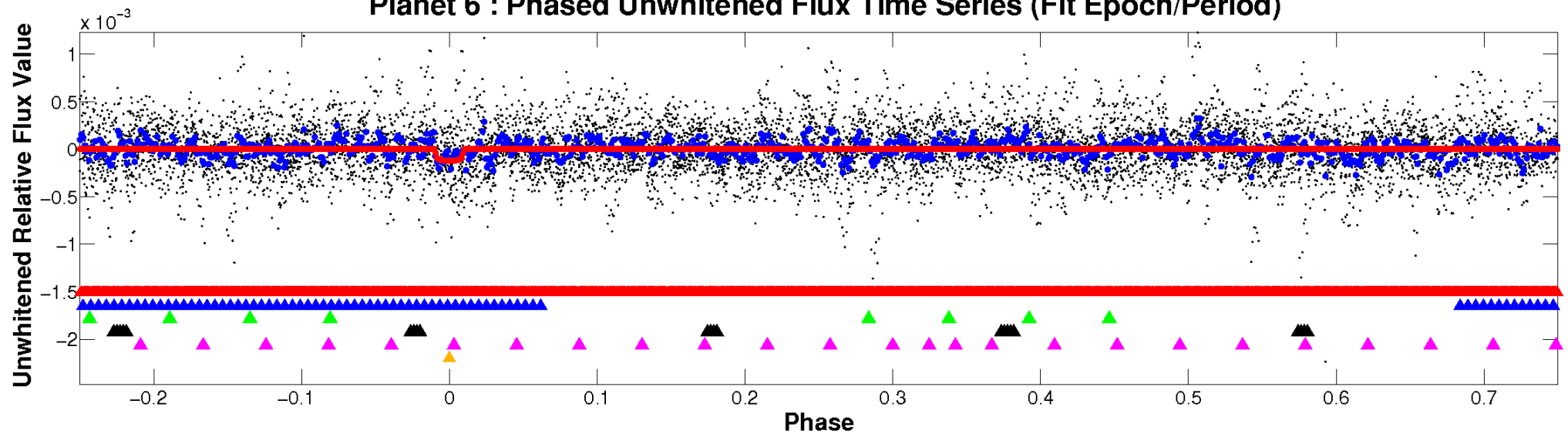
# ALT Odd/Even

TCE 005288937-06

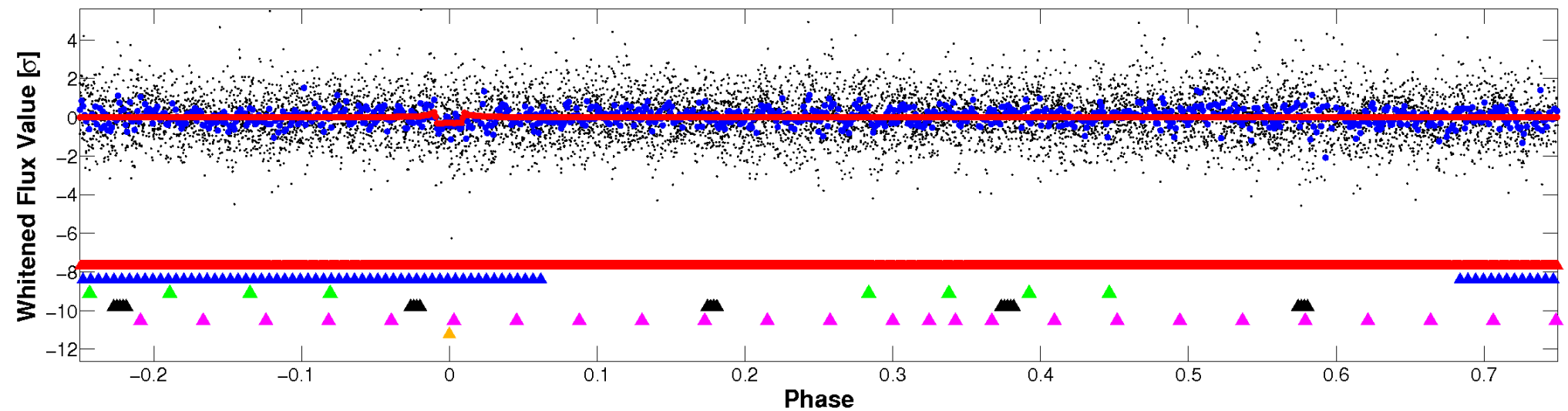


# Non-Whitened Vs. Whitened Light Curve

## Planet 6 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

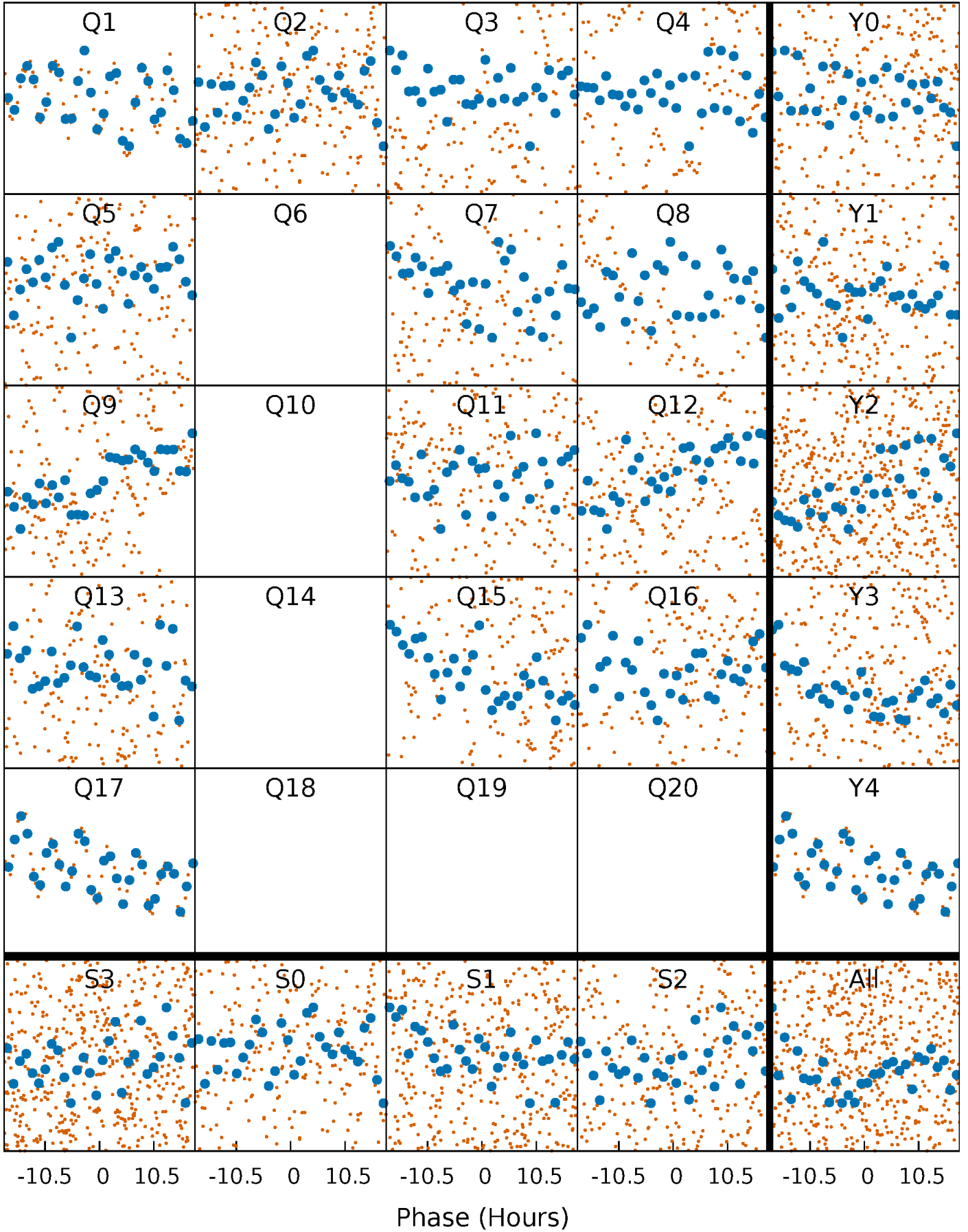


## Planet 6 : Phased Whitened Flux Time Series (Fit Epoch/Period)



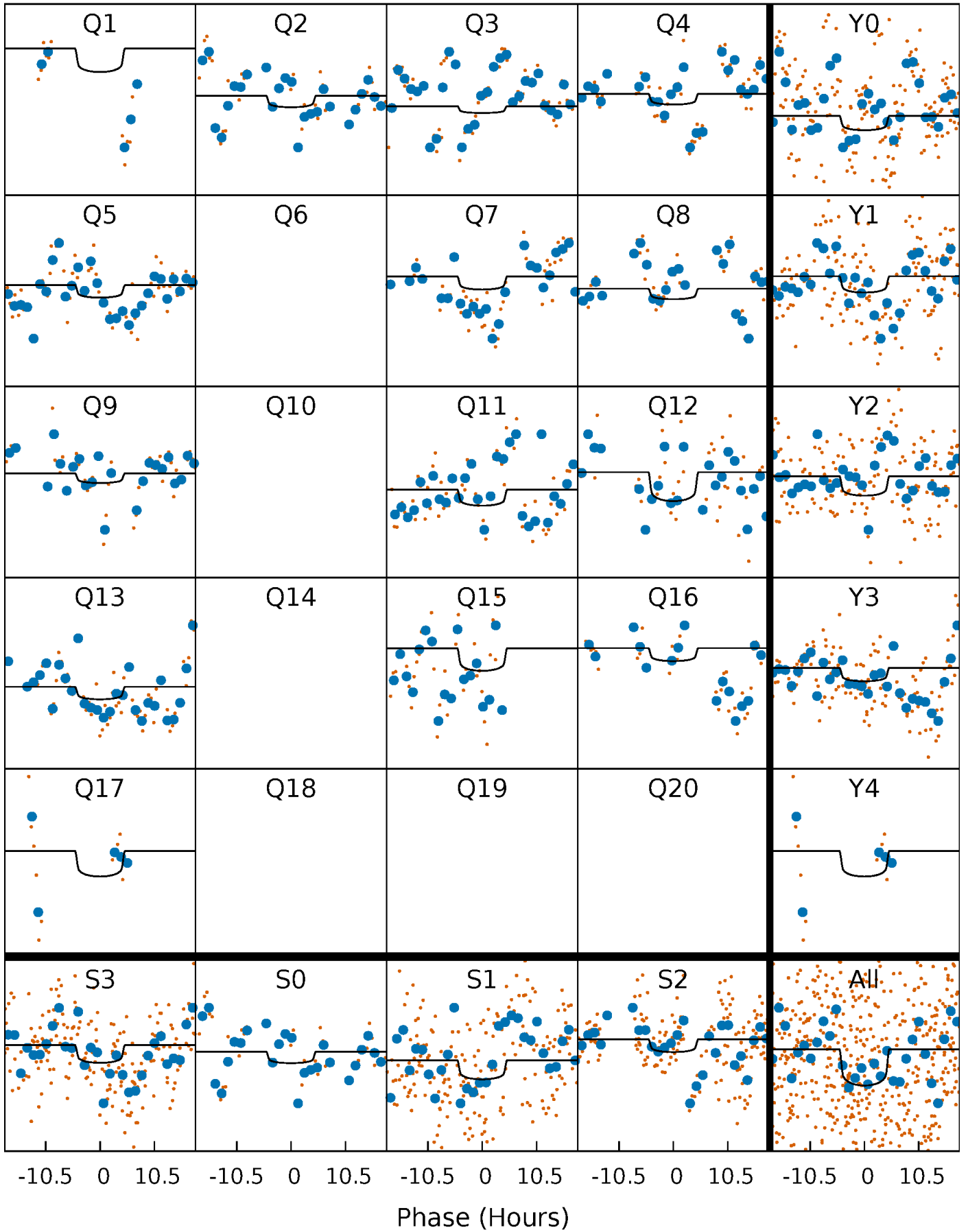
# PDC Quarter-Phased Transit Curves

TCE 005288937-06 P= 19.956635 Days  $T_0=149.151627$  (BKJD)



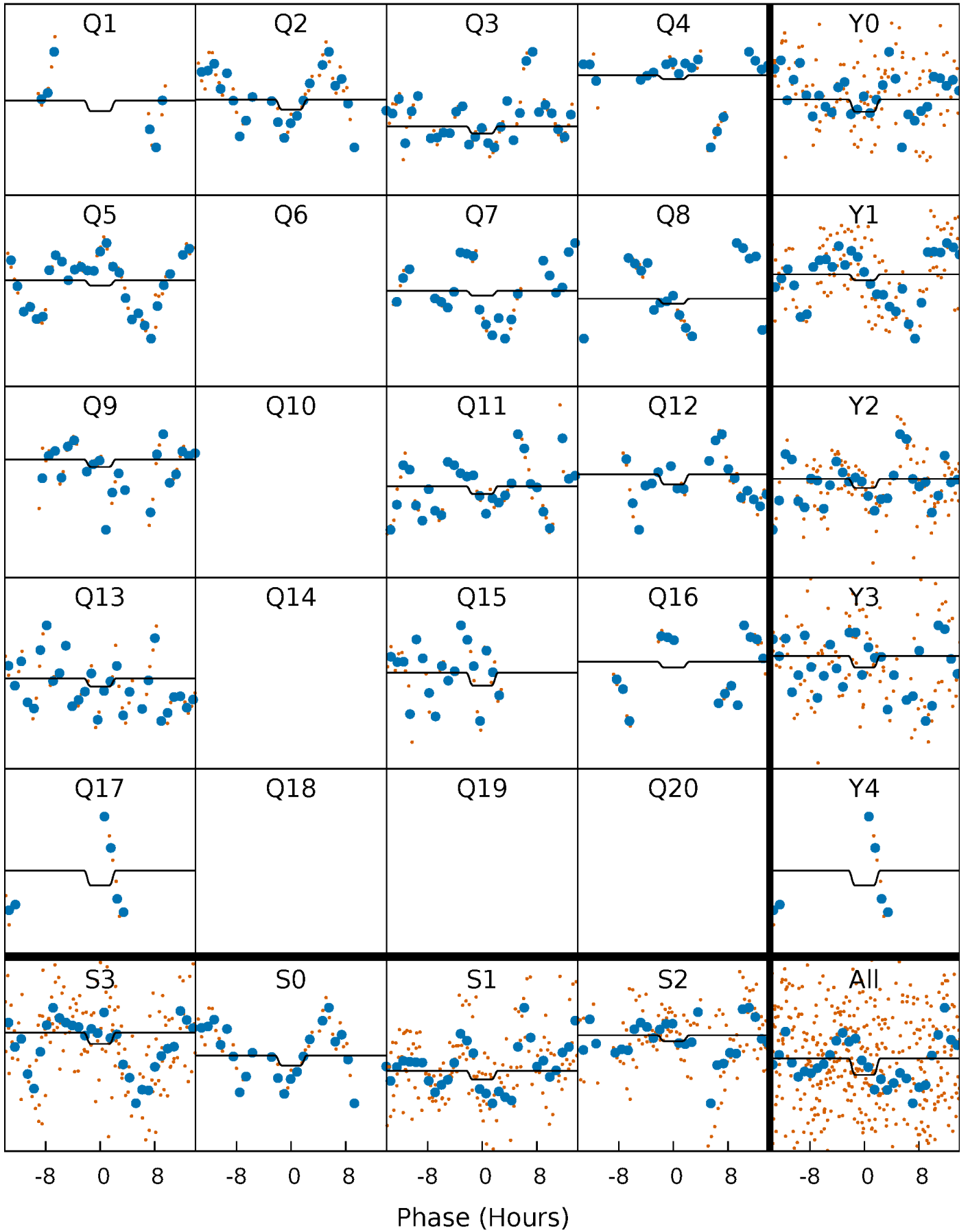
# DV Quarter-Phased Transit Curves

TCE 005288937-06   P= 19.956635 Days    $T_0=149.151627$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

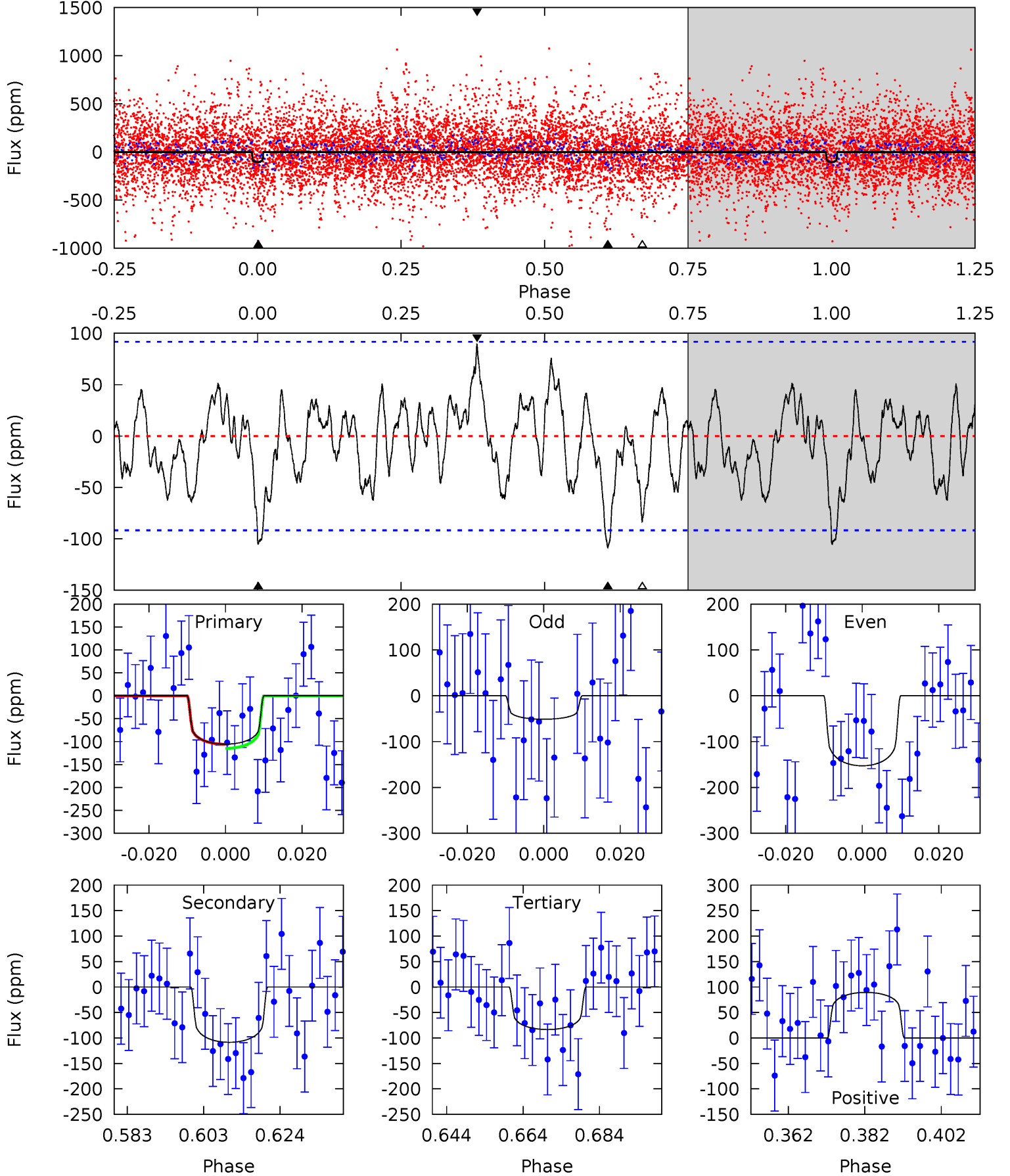
TCE 005288937-06 P= 19.959184 Days  $T_0=149.034264$  (BKJD)



# DV Model-Shift Uniqueness Test

005288937-06, P = 19.956635 Days, E = 129.194992 Days

| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 5.63 | 5.79 | 4.45 | 4.77 | 4.89            | 2.32            | 1.69             | 1.18    | 0.86    | 1.34    | 1.02    | 2.71    | 1.17 | 0.45  | 0.24 |

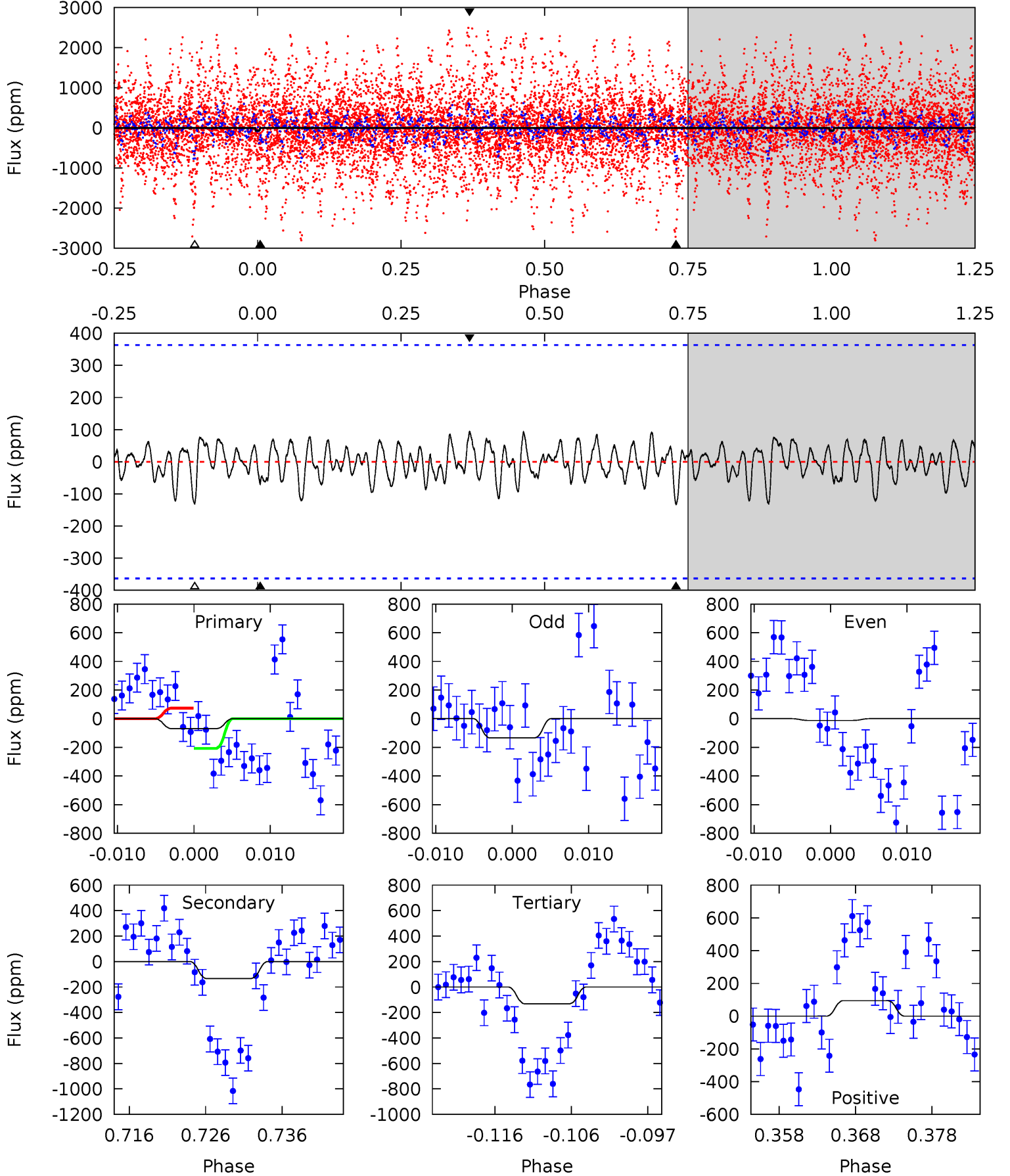




# Alt Model-Shift Uniqueness Test

005288937-06,  $P = 19.959184$  Days,  $E = 129.075080$  Days

| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 0.97 | 1.84 | 1.82 | 1.31 | 5.03            | 2.59            | 0.61             | -0.86   | -0.34   | 0.02    | 0.53    | 0.86    | 0.77 | 0.42  | 0.94 |



### Stellar Parameters For KIC 005288937

|        | $T_{\text{eff}}(K)$   | $\log(g)$                 | [Fe/H]                    | $R (R_{\odot})$            | $M(M_{\odot})$            | $\rho_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|-----------------------|---------------------------|---------------------------|----------------------------|---------------------------|--|
|        | $6740^{+448}_{-1908}$ | $2.816^{+0.172}_{-0.258}$ | $0.070^{+0.250}_{-0.600}$ | $12.080^{+3.326}_{-4.989}$ | $3.479^{+0.111}_{-2.117}$ | $0.003^{+0.004}_{-0.001}$                    |
|        | +7%/-28%              | +6%/-9%                   | +357%/-857%               | +28%/-41%                  | +3%/-61%                  | +136%/-53%                                   |
| Source | PHO1                  | FLK73                     | 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 005288937-06 / KOI

| Detrend | Depth (ppm) | $R_p (R_{\oplus})$        | $T_{\text{max}} (K)$ | $T_{\text{obs}} (K)$   | $A_{\text{obs}}$           |
|---------|-------------|---------------------------|----------------------|------------------------|----------------------------|
| DV      | -109±19     | $16.14^{+11.01}_{-9.41}$  | $3082^{+405}_{-795}$ | $5759^{+3860}_{-1552}$ | $10^{+45}_{-7}$            |
| Alt.    | -133±72     | $18.98^{+10.90}_{-10.60}$ | $3079^{+421}_{-809}$ | $5478^{+3145}_{-1742}$ | $8.621^{+33.495}_{-6.356}$ |

$T_{\text{max}}$  = Theoretical Maximum Planetary Temperature  
 $T_{\text{obs}}$  = Observed Planetary Temperature (Assuming A=0.3)  
 $A_{\text{obs}}$  = 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

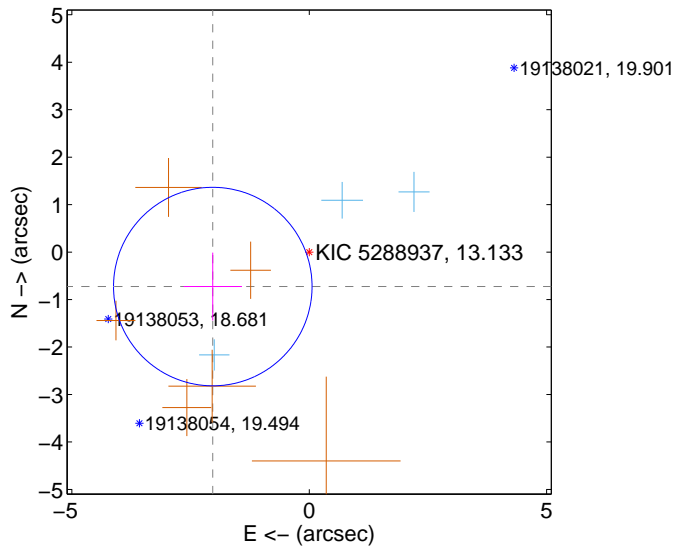
Supplemental centroid analysis for 005288937-06. Kepler magnitude: 13.13. Transit SNR 4.18

There are 3 quarters with good PRF difference image offsets

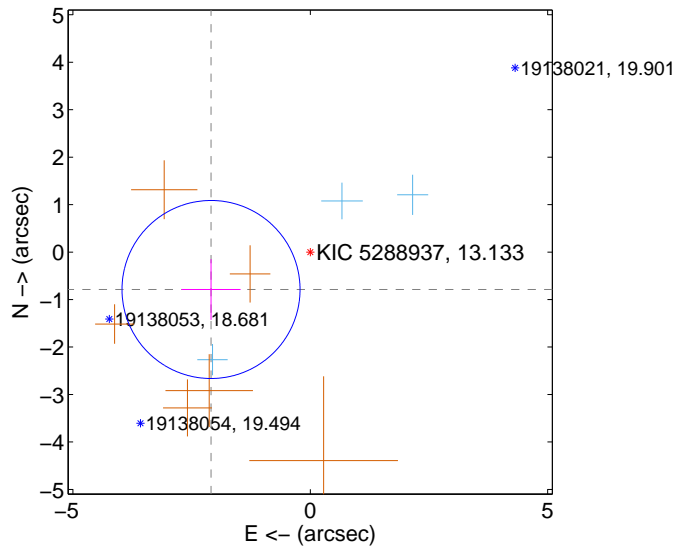
The direct PRF centroid is offset from the target star catalog position by about 0.13 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA       | $\Delta$ Dec       |
|---|--------------------|---------------------|-------------------|--------------------|
| PRF-fit source offset from OOT          | $2.158 \pm 0.697$  | 3.10                | $2.032 \pm 0.614$ | $-0.726 \pm 0.715$ |
| PRF-fit source offset from KIC position | $2.235 \pm 0.625$  | 3.58                | $2.091 \pm 0.622$ | $-0.788 \pm 0.639$ |
| photometric centroid source offset      | $0.49 \pm 0.63$    | 0.77                | $0.46 \pm 0.65$   | $0.15 \pm 0.52$    |

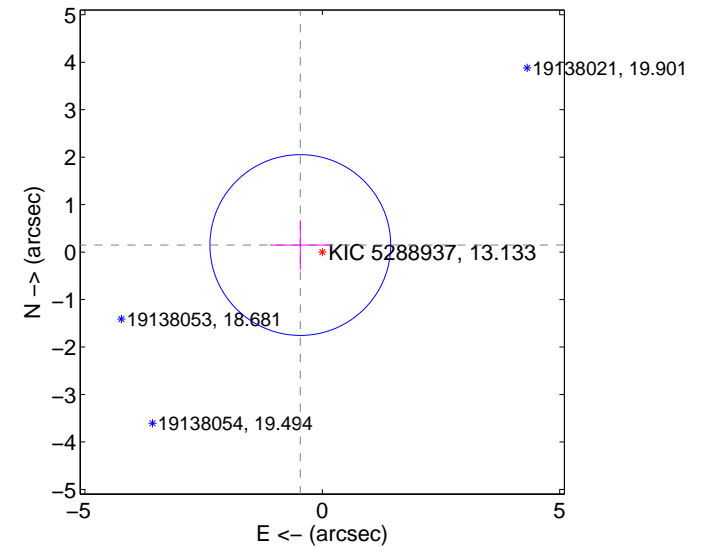
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

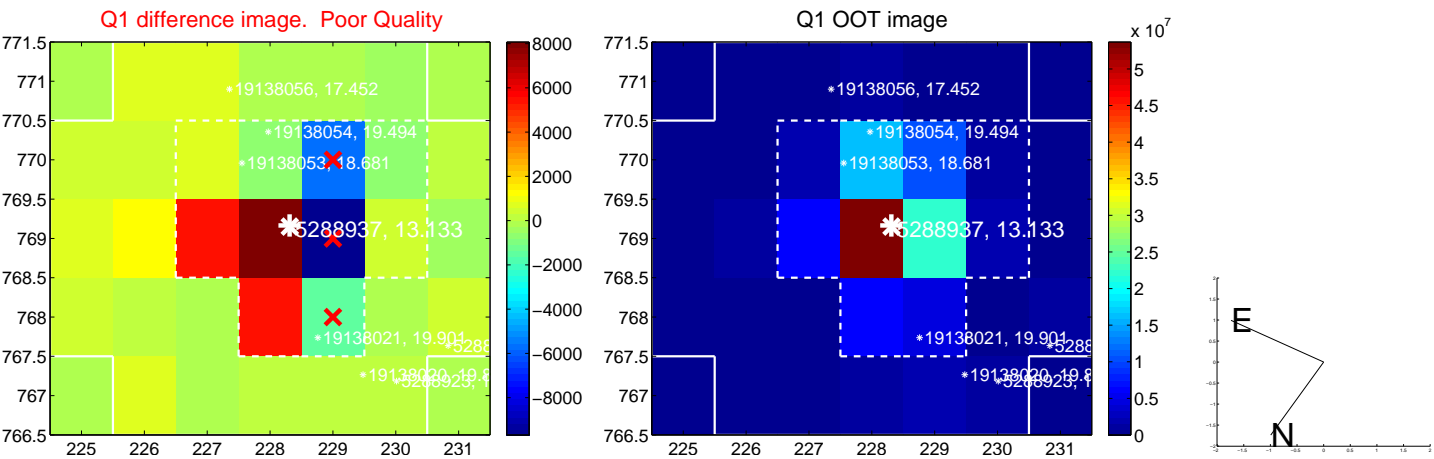


offset from photometric centroids

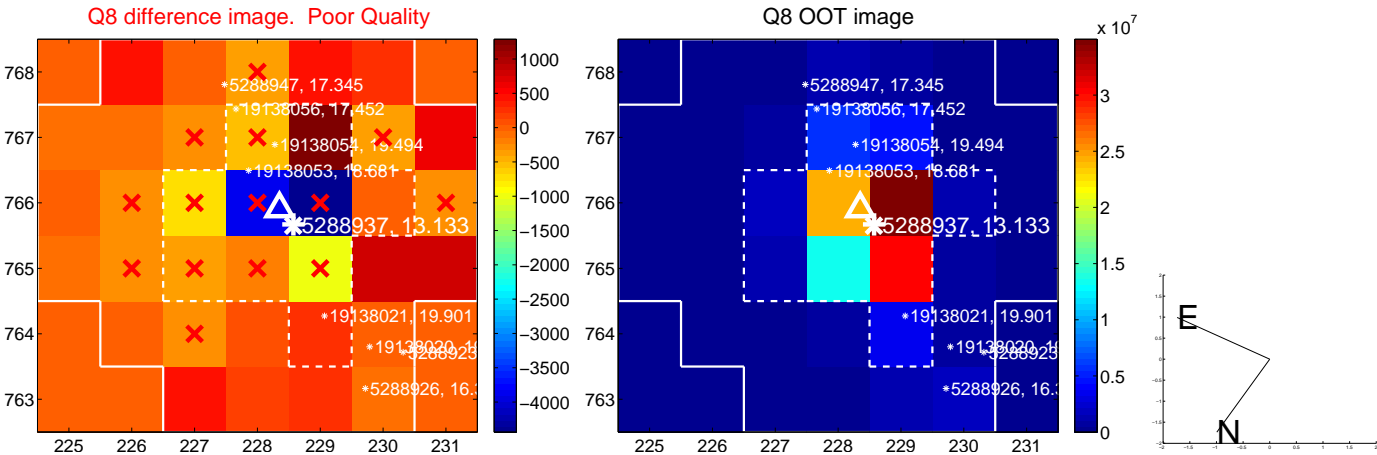
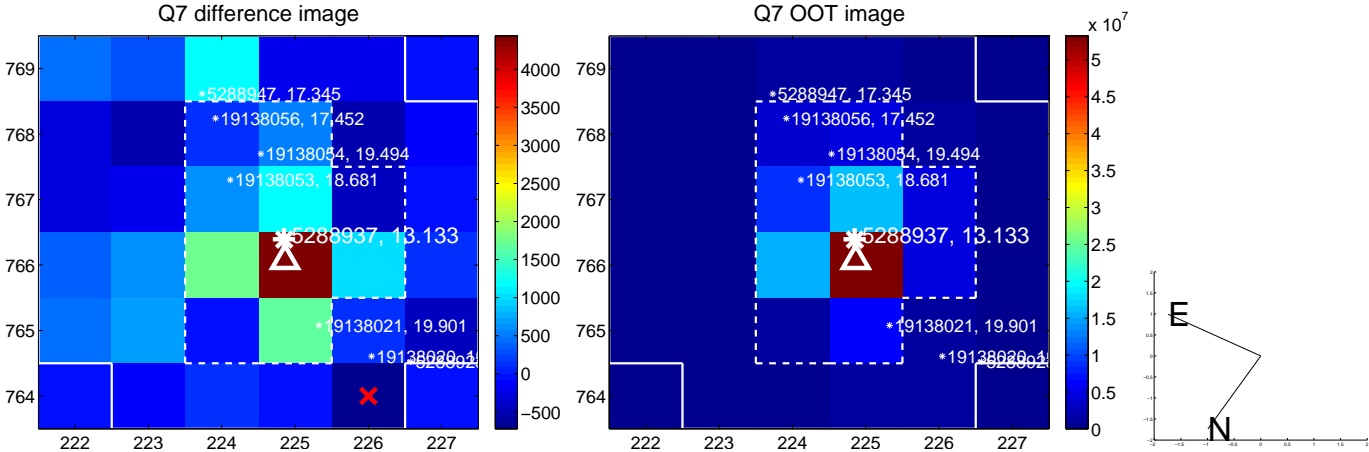
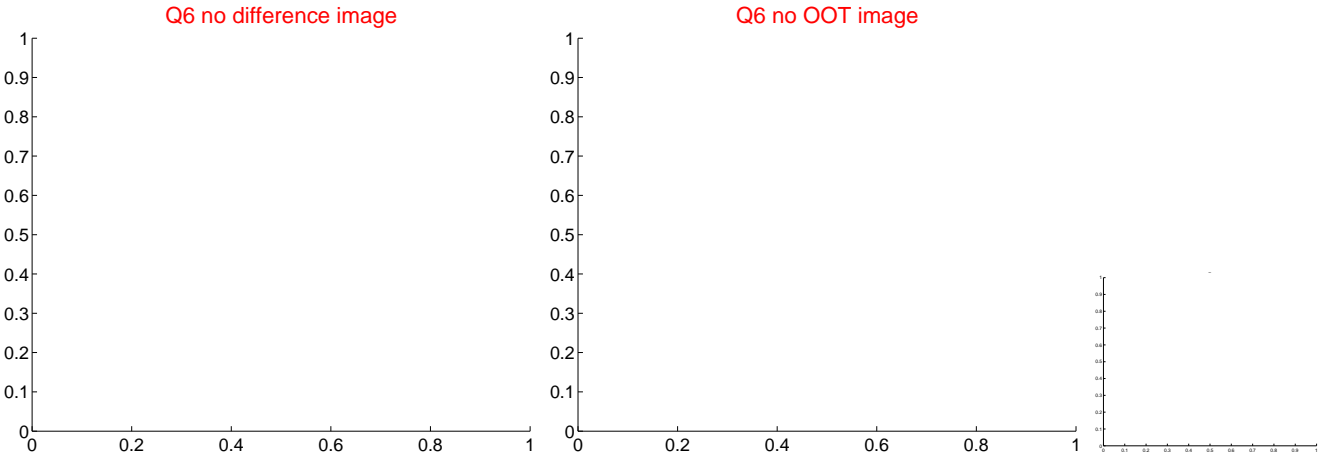
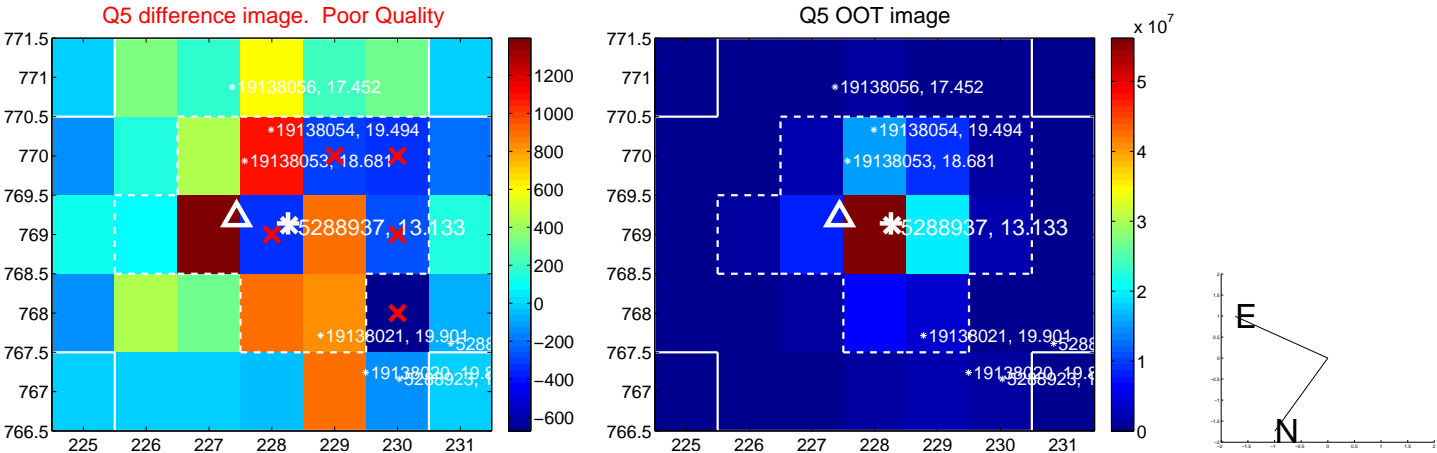


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

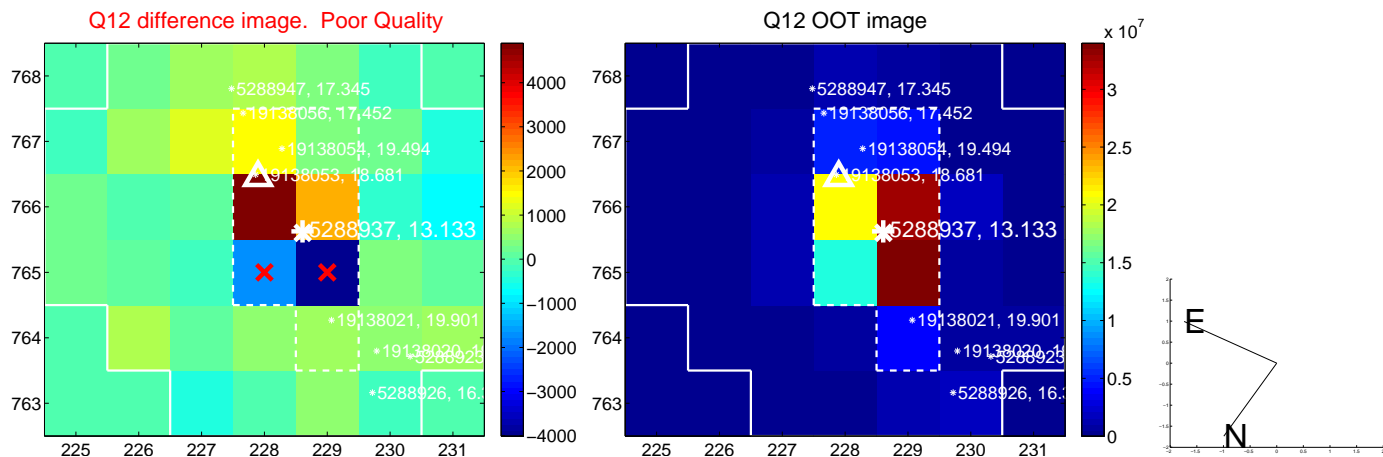
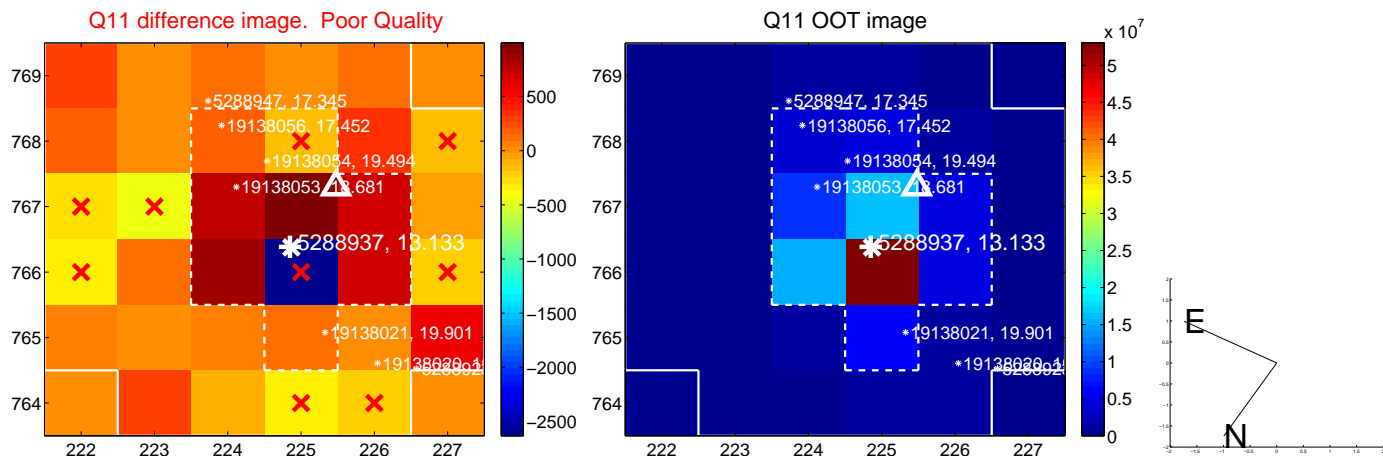
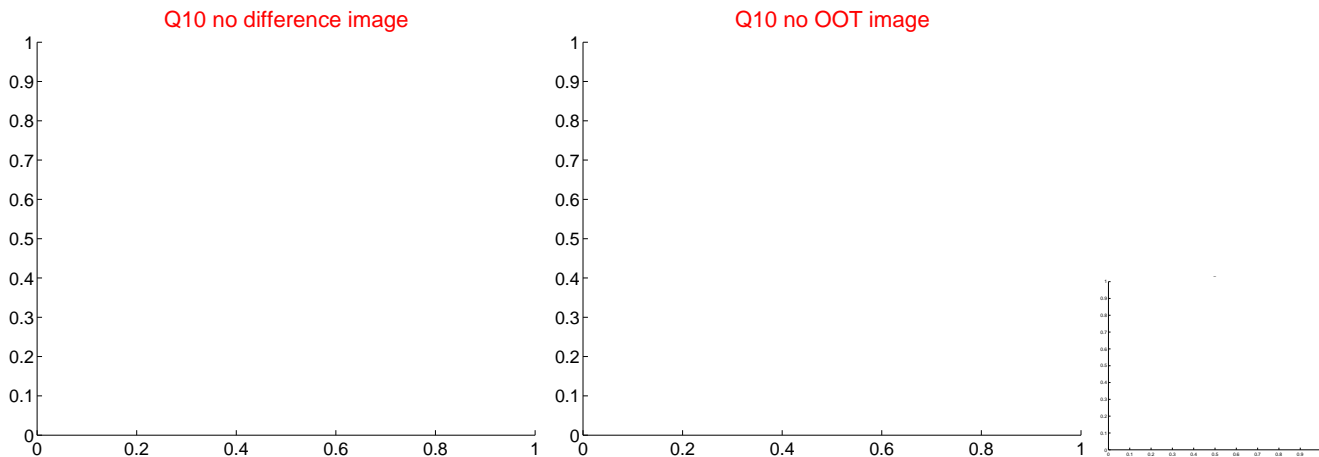
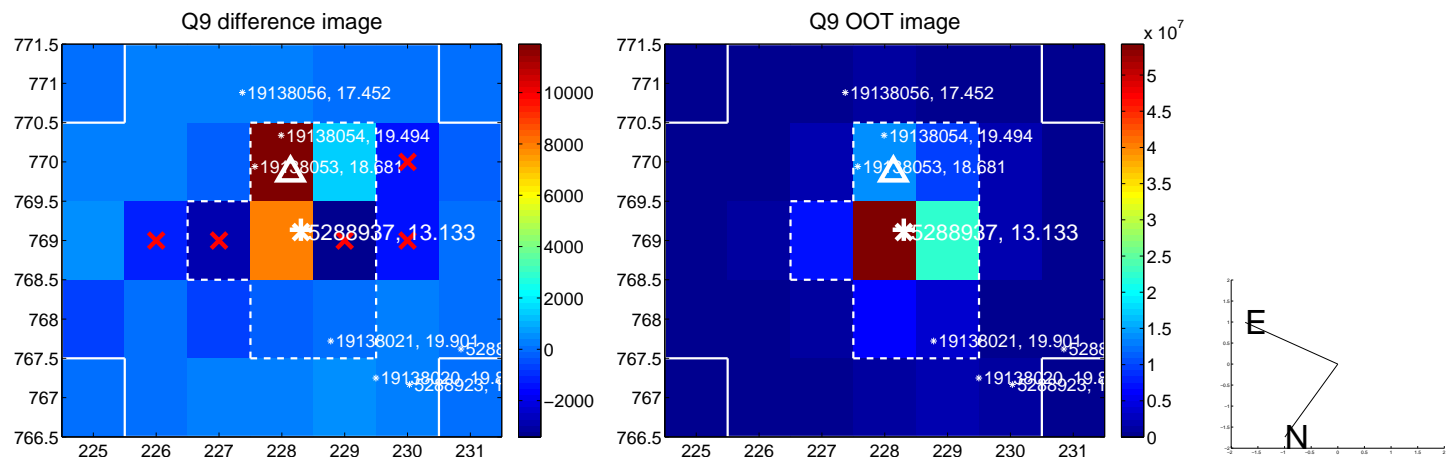
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



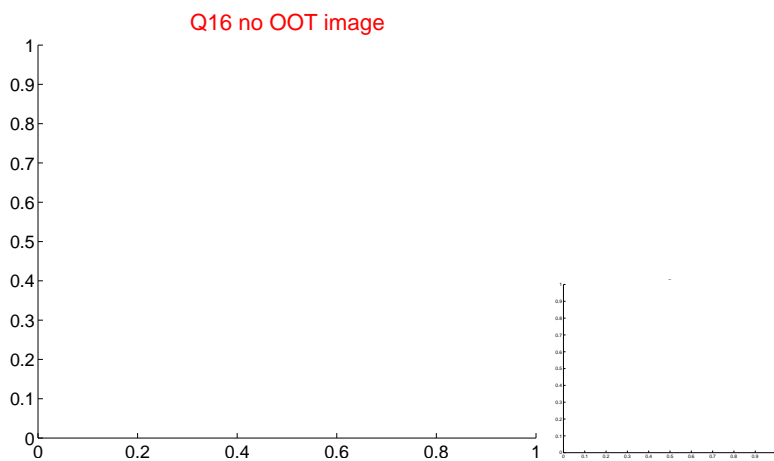
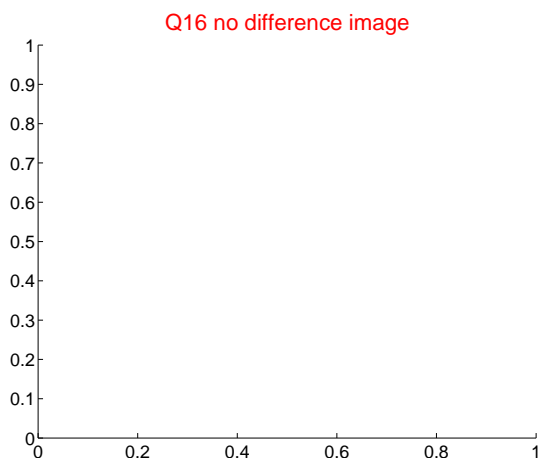
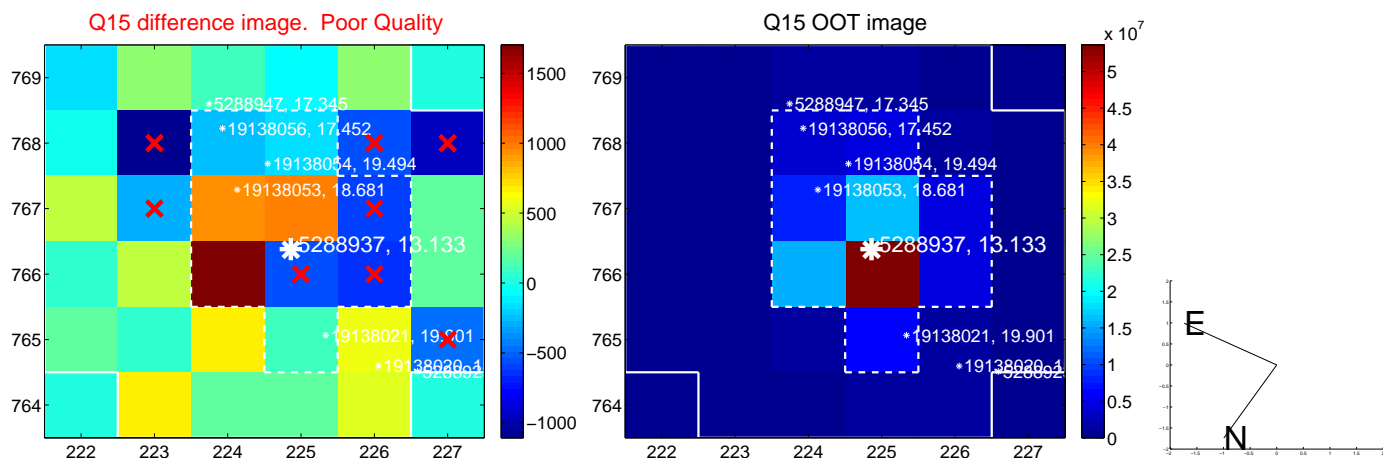
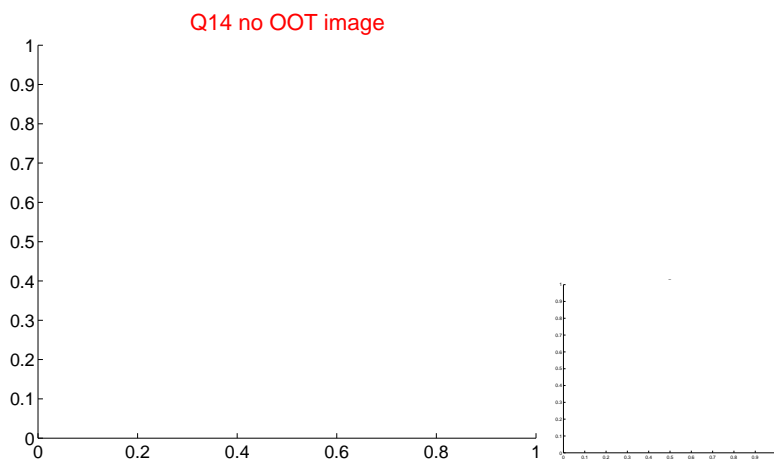
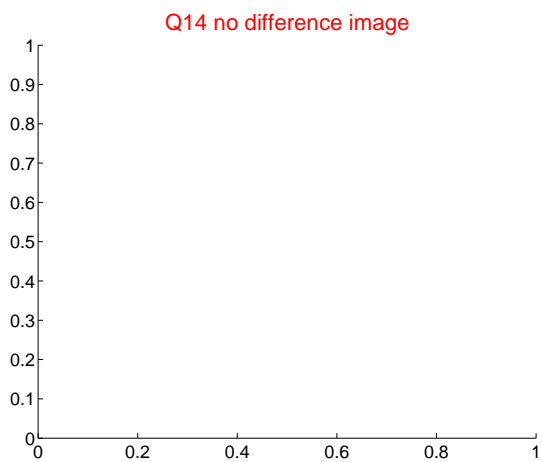
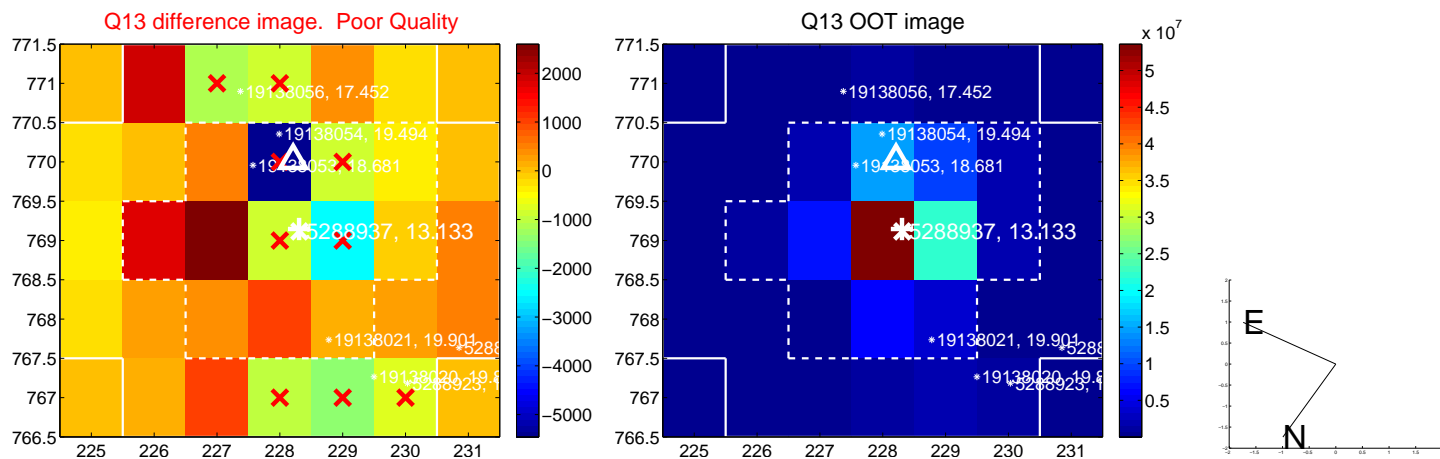
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

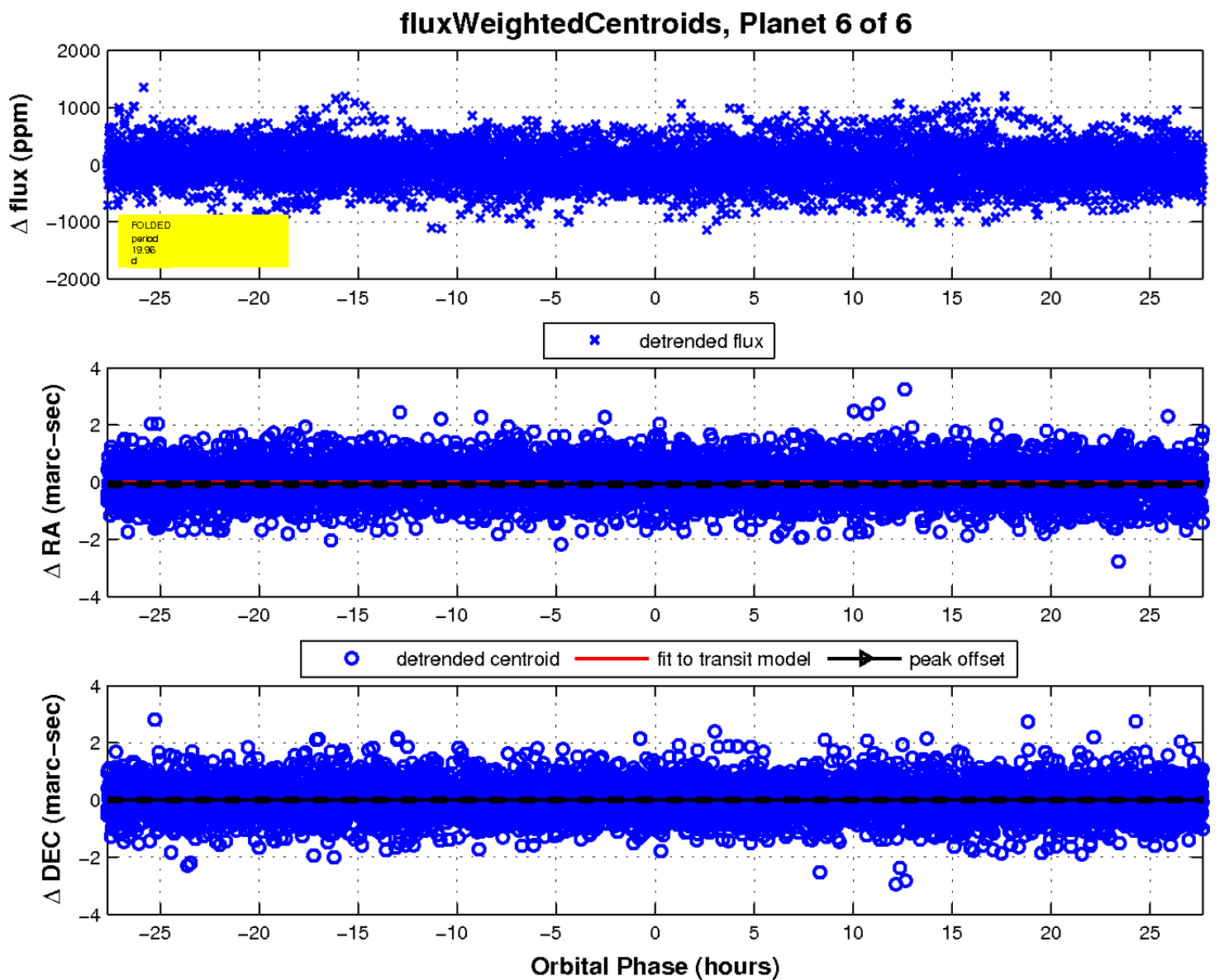
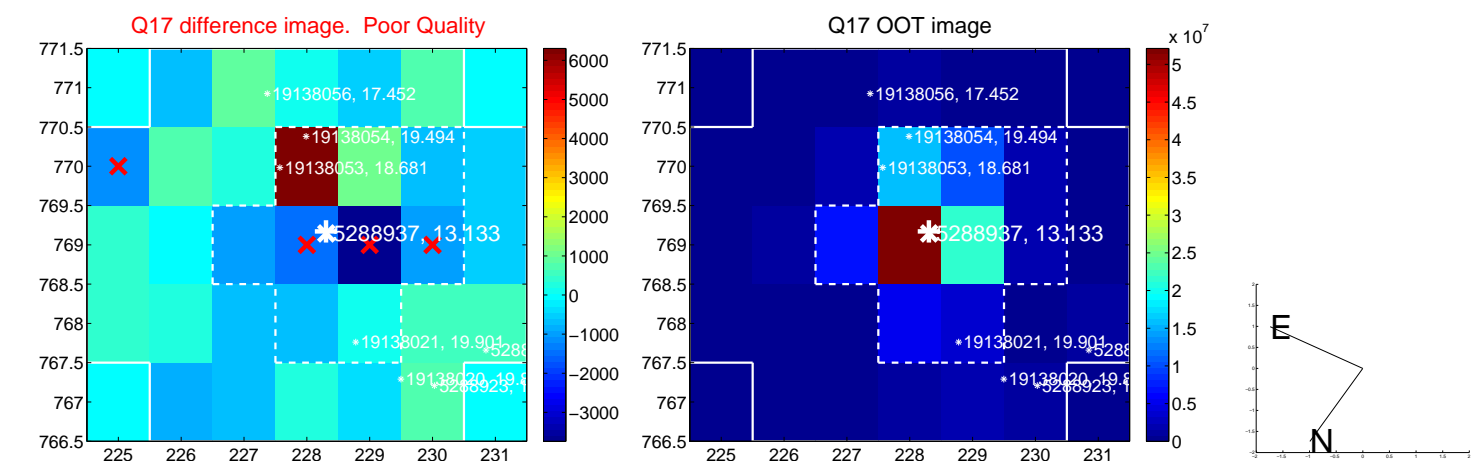


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





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



UKIRT Image

Declination

