

# KIC 005386163

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 005386163-01 | OBS      | 6006.01 | 12.424735     | 141.601935   | 44.2        | 22.234           | 10.9 | 12.9 | 2.66                        | 6098            | 2.22                   | 662.00                 |
| 005386163-02 | OBS      | No      | 12.426066     | 133.944290   | 40.4        | 24.690           | 10.7 | 13.2 | 2.66                        | 6098            | 1.95                   | 661.90                 |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments   |
|--------------|----------|------|-------|---|---|---|---|--|
| 005386163-01 | OBS      | FP   | 0.00  | 1 | 0 | 1 | 1 | LPP_DV—CENT_KIC_POS—HALO_GHOST—EPHEM_MATCH                           |
| 005386163-02 | OBS      | FP   | 0.00  | 1 | 0 | 1 | 1 | LPP_DV—LPP_ALT—SAME_NTL_PERIOD—CENT_FEW_DIFFS—HALO_GHOST—EPHEM_MATCH |

**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.

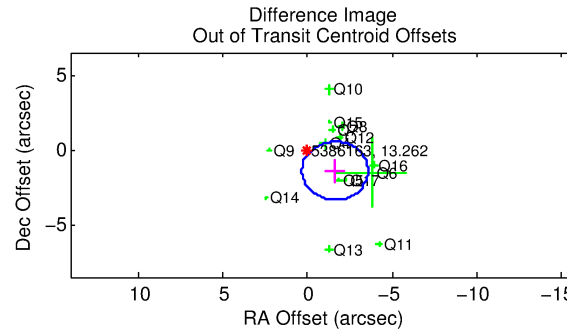
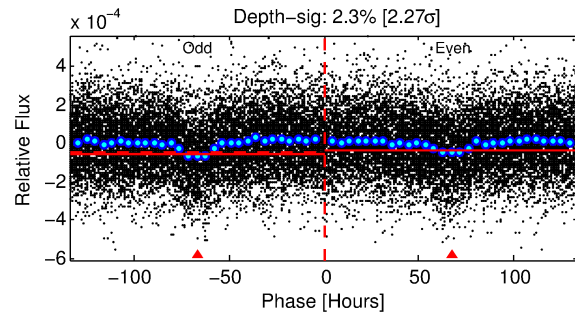
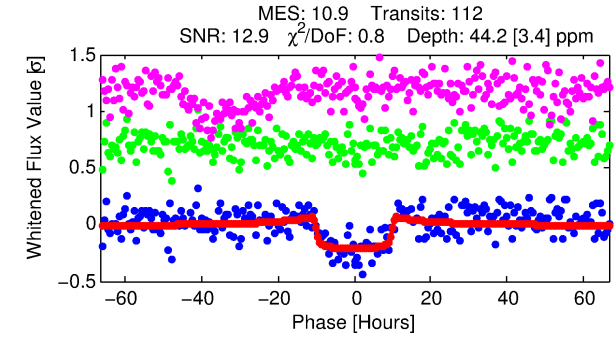
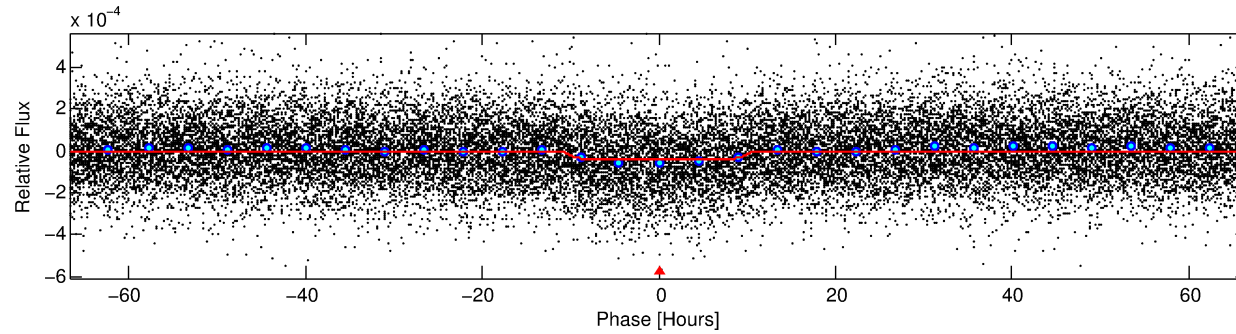
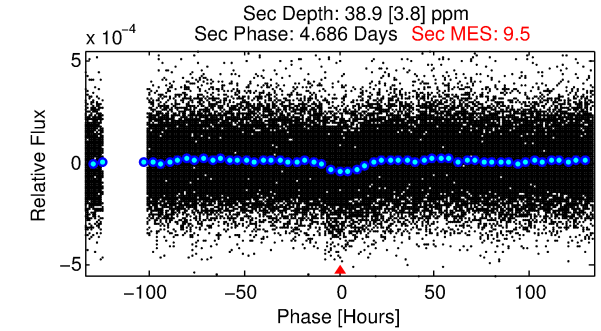
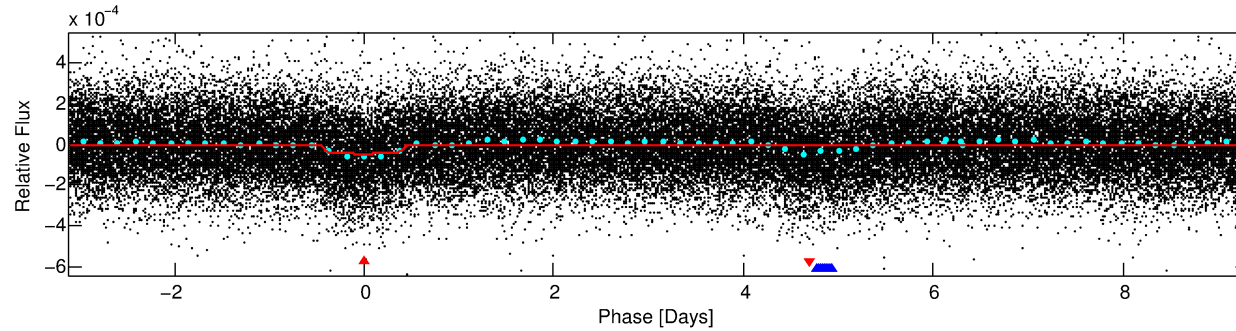
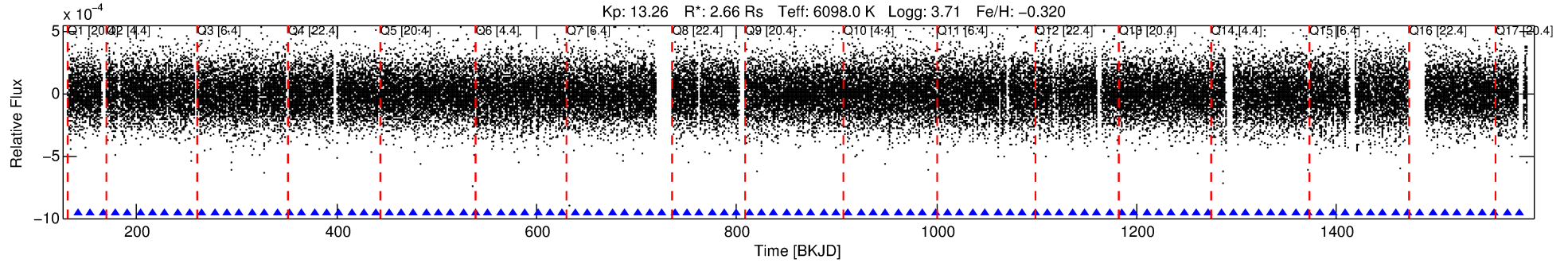
## Ephemeris Match Information For 005386163-01

| TCE (1)      | KIC     | Parent (2)   | Parent KIC | $P_1:P_2$ | Dist ( $''$ ) | $\Delta$ Row | $\Delta$ Col | $m_2$ | $m_1$ | $D_2/D_1$ | Mechanism  | Flag | $\sigma_P$ | $\sigma_T$ |
|--------------|---------|--------------|------------|-----------|---------------|--------------|--------------|-------|-------|-----------|------------|------|------------|------------|
| 005386163-01 | 5386163 | V380-Cyg-pri | 5385723    | 1:1       | 317.3         | -70          | 40           | 5.77  | 13.26 | 3293.90   | Direct-PRF | 0    | 2.82       | 1.86       |

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

# DV One-Page Summary

KIC: 5386163 Candidate: 1 of 2 Period: 12.425 d  
KOI: K06006.01 Corr: 0.950



## DV Fit Results:

Period = 12.42473 [0.00035] d  
Epoch = 141.6019 [0.0228] BKJD  
Rp/R\* = 0.0077 [0.0005]  
a/R\* = 1.67 [0.32]  
b = 0.96 [0.03]  
Seff = 662.00 [395.21]  
Teq = 1293 [193] K  
Rp = 2.22 [0.83] Re  
a = 0.1149 [0.0415] AU  
Ag = 57.20 [34.63] [1.62σ]  
Teffp = 5500 [290] K [12.07σ]

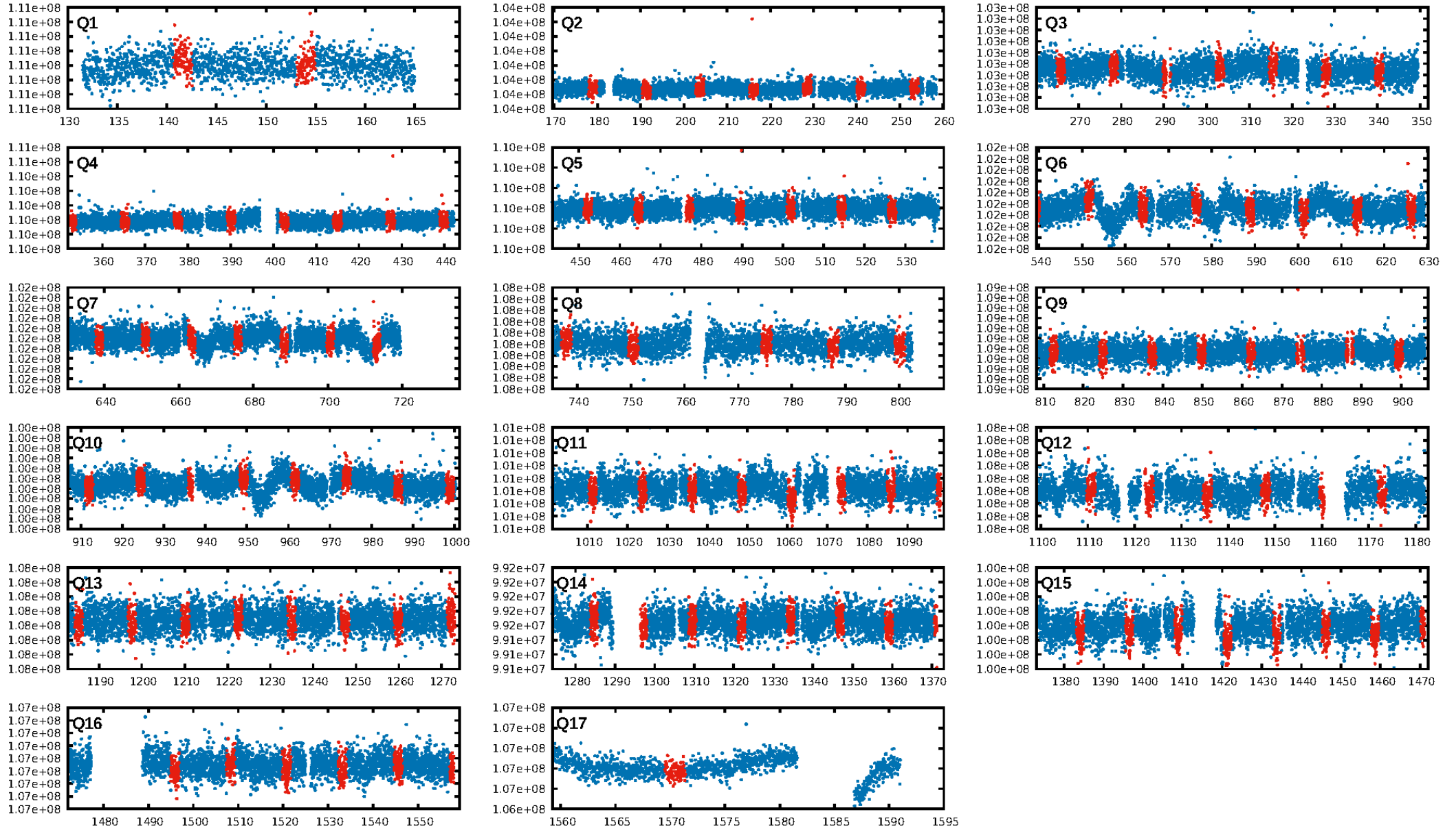
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.1% [0.00σ]  
ModelChiSquare2-sig: 2.0%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 7.80e-28  
RollingBand-fgt: 1.00 [109/109]  
GhostDiagnostic-chr: 0.1833  
Centroid-sig: 0.0%  
Centroid-so: 3.167 arcsec [3.30σ]  
OotOffset-rm: 2.144 arcsec [3.30σ]  
KicOffset-rm: 1.754 arcsec [2.70σ]  
OotOffset-st: 3/3/4/4 [14]  
KicOffset-st: 3/3/4/4 [14]  
DiffImageQuality-fgm: 0.50 [7/14]  
DiffImageOverlap-fno: 1.00 [17/17]

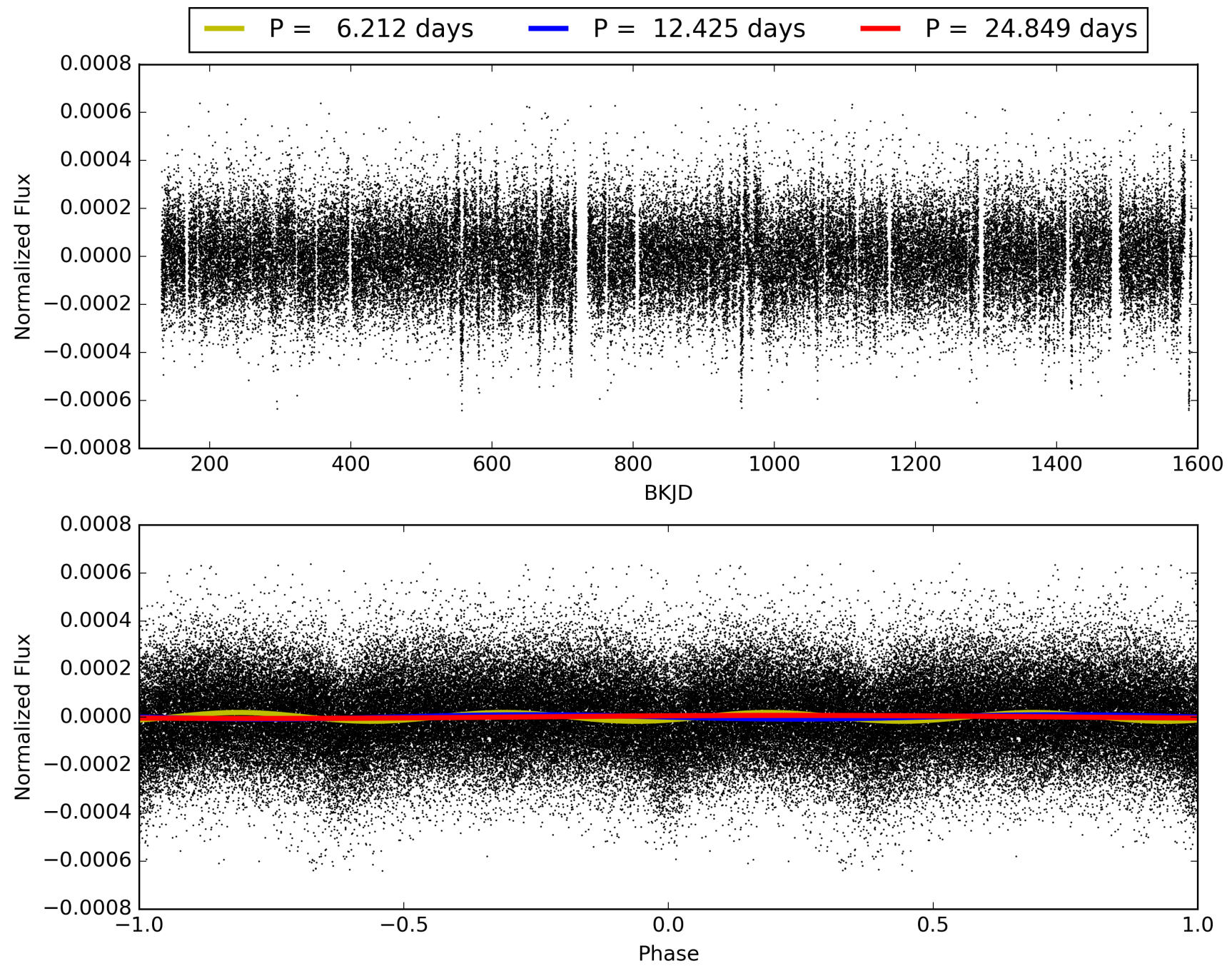
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 10:29:29 Z

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

# TCE 005386163-01, PDC Light Curves



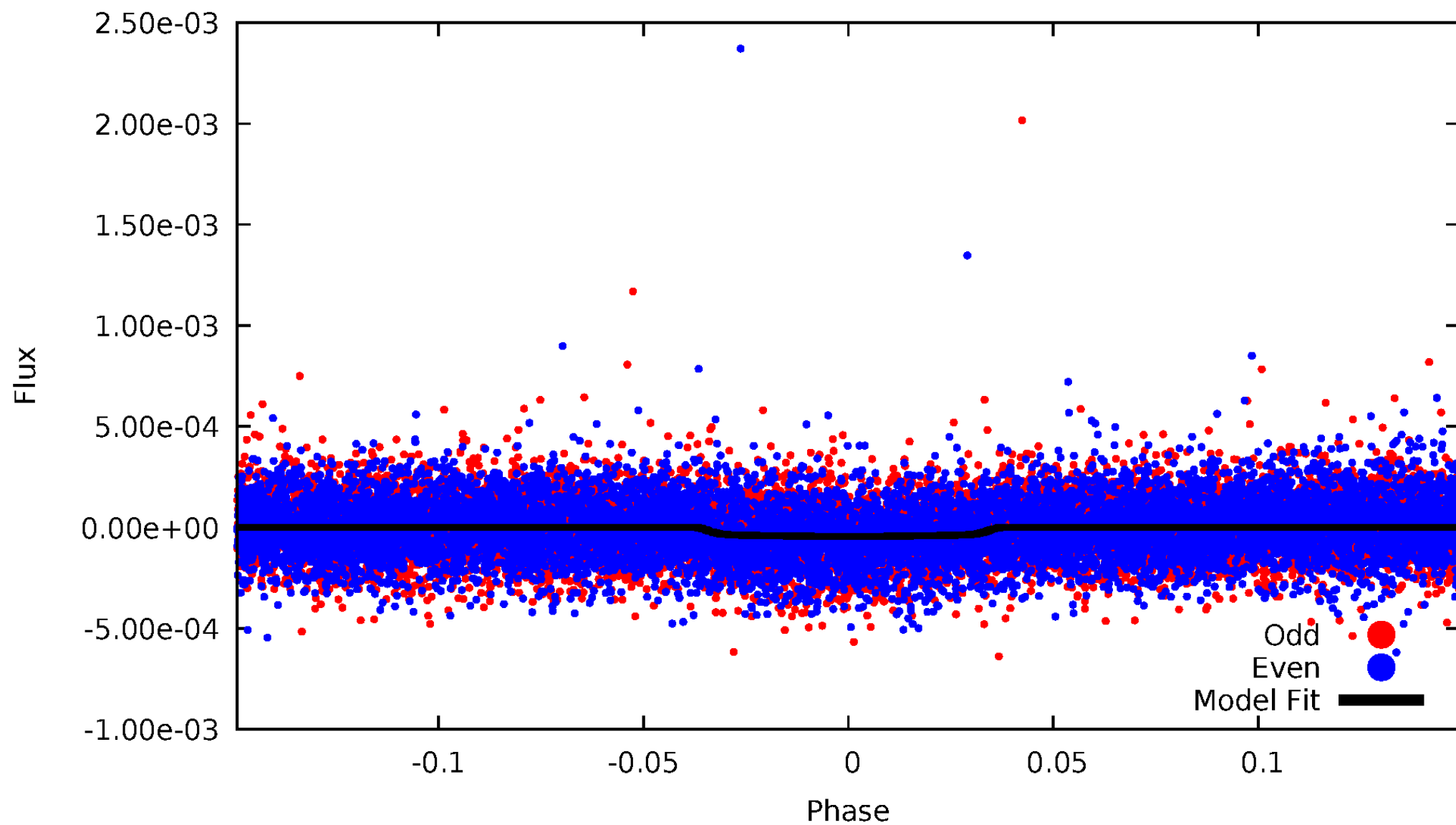
TCE 005386163-01





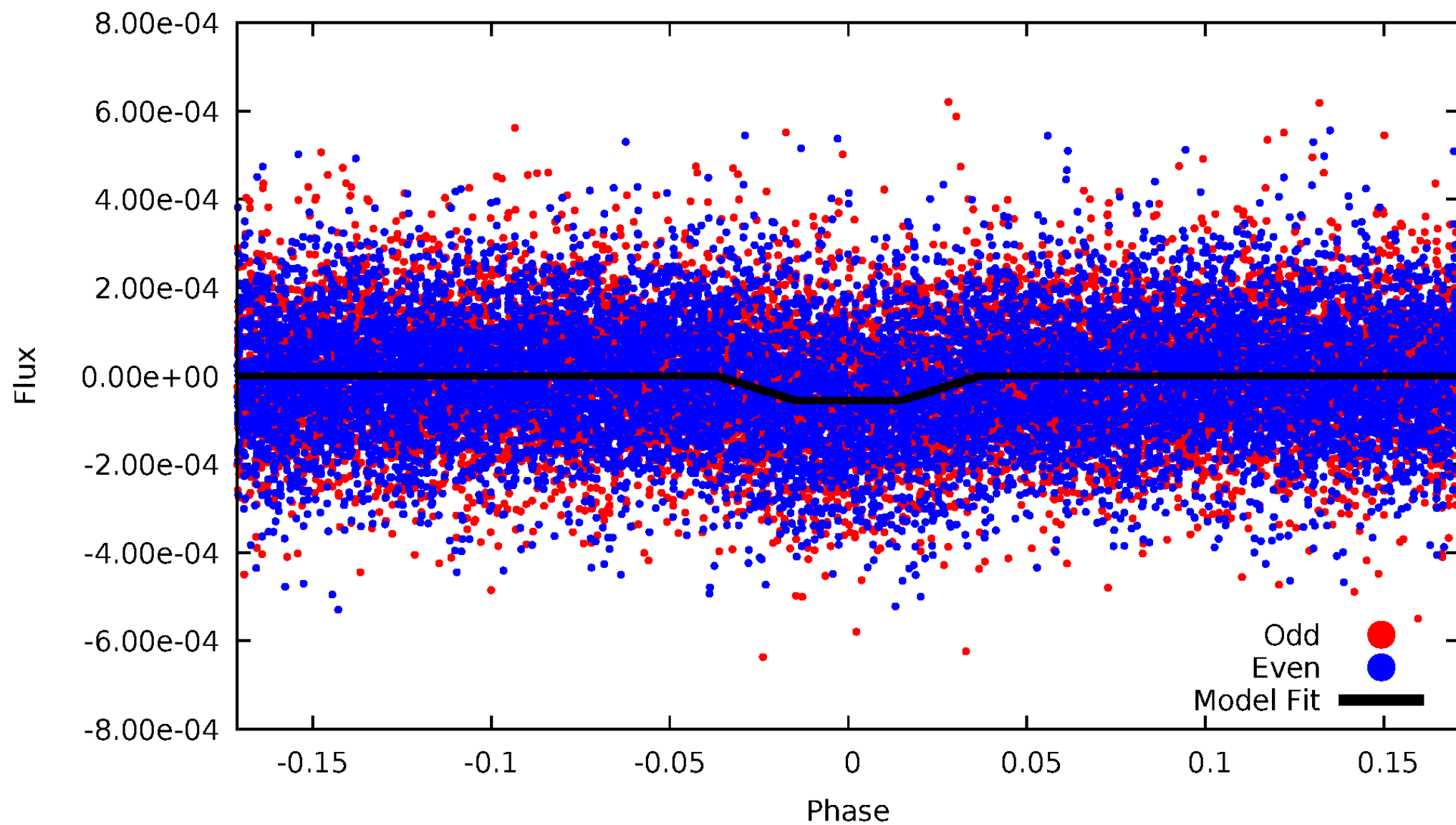
# DV Odd/Even

TCE 005386163-01



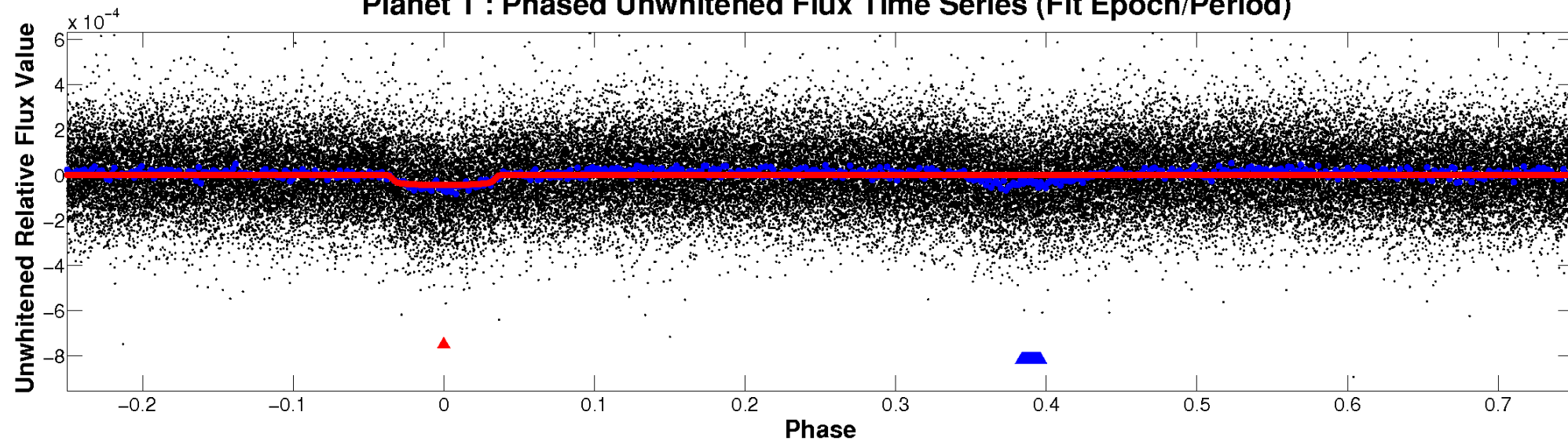
# ALT Odd/Even

TCE 005386163-01

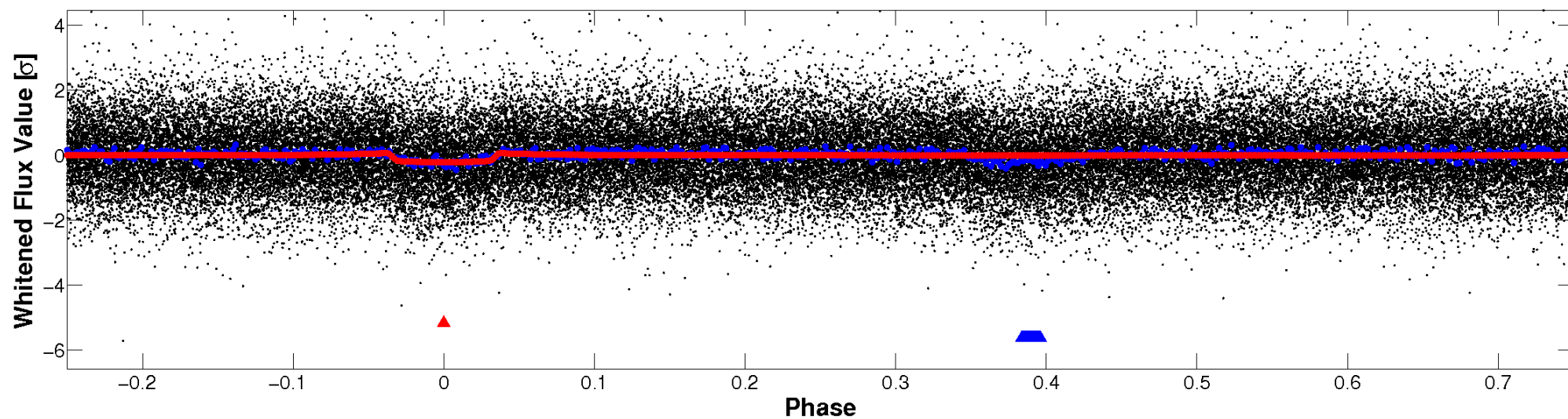


# Non-Whitened Vs. Whitened Light Curve

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

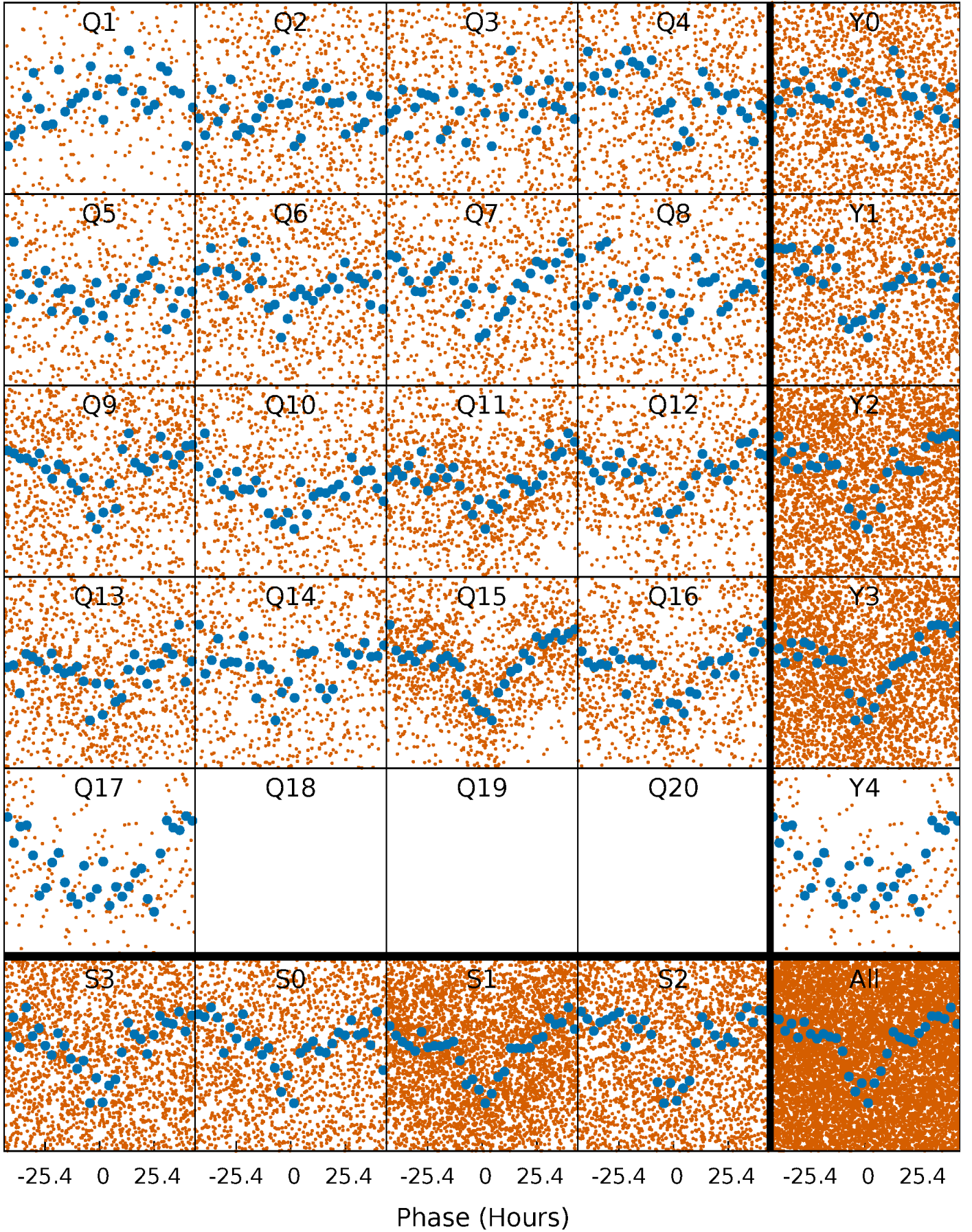


**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

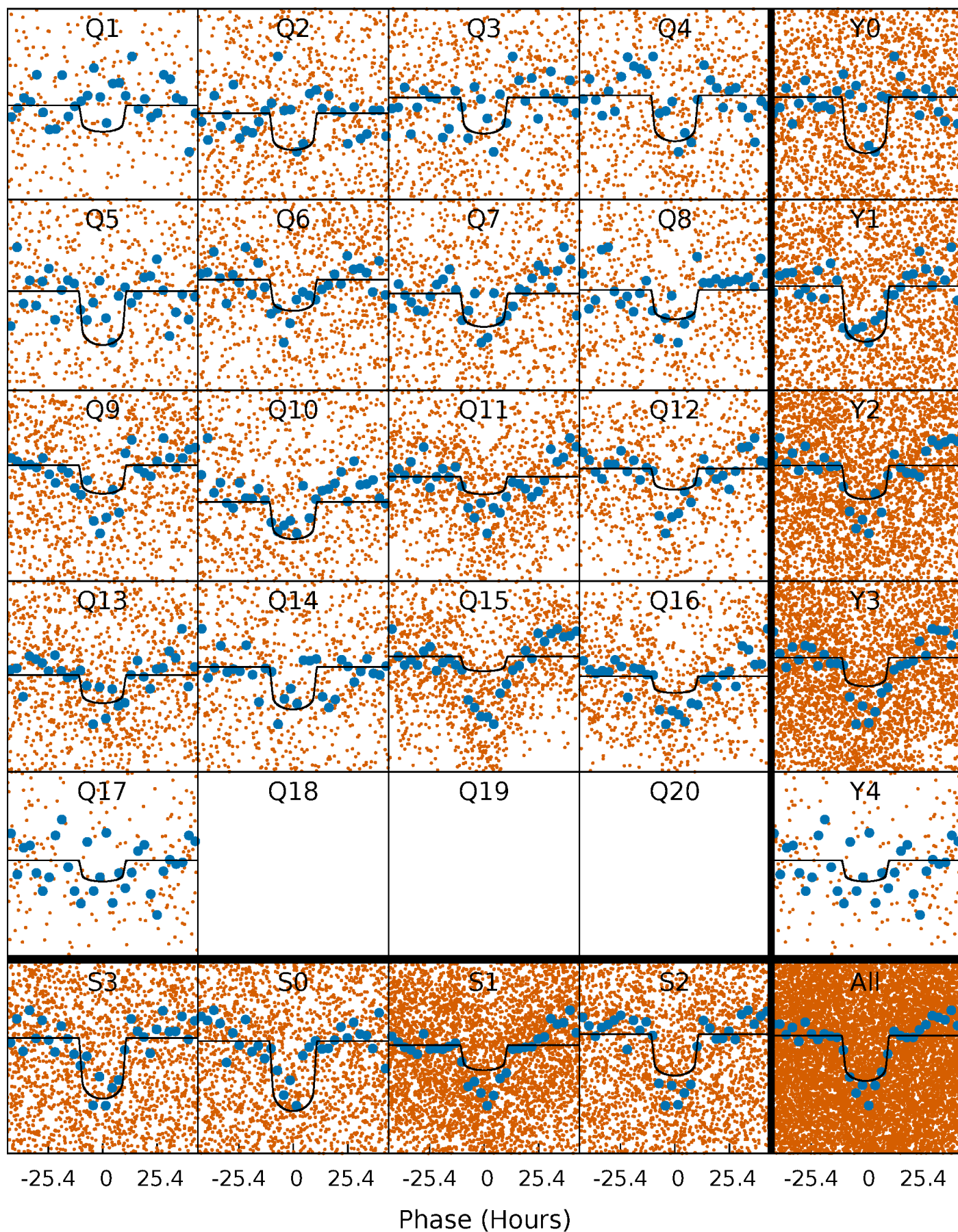
TCE 005386163-01 P= 12.424735 Days  $T_0=141.601935$  (BKJD)





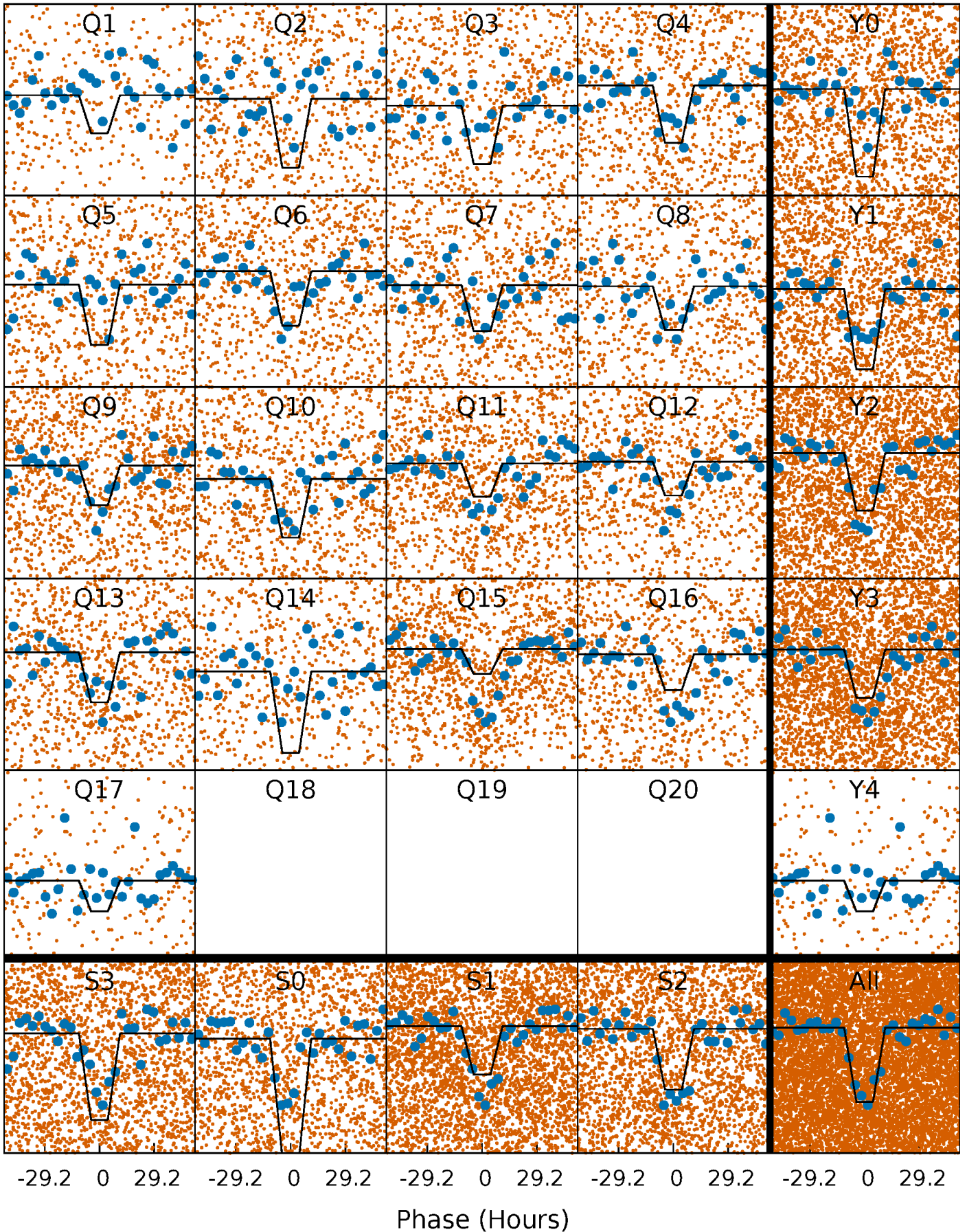
# DV Quarter-Phased Transit Curves

TCE 005386163-01 P= 12.424735 Days  $T_0=141.601935$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

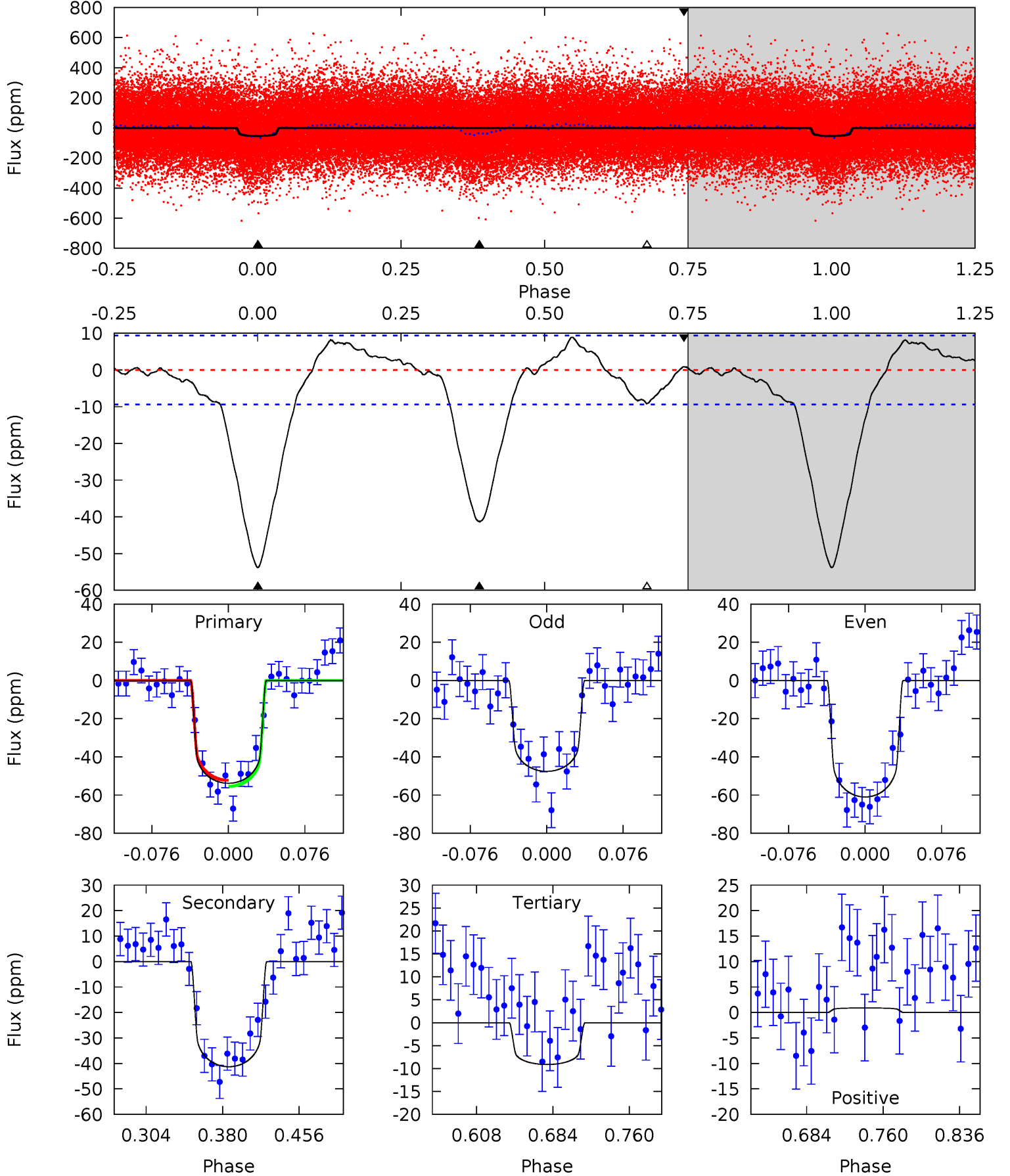
TCE 005386163-01 P= 12.423554 Days  $T_0=141.667652$  (BKJD)



# DV Model-Shift Uniqueness Test

005386163-01, P = 12.424735 Days, E = 129.177200 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  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 26.5 | 20.3 | 4.49 | 0.45 | 4.62            | 1.77            | 2.17             | 22.0    | 26.0    | 15.8    | 19.9    | 3.31    | 1.30 | 0.14  | 0.78 |

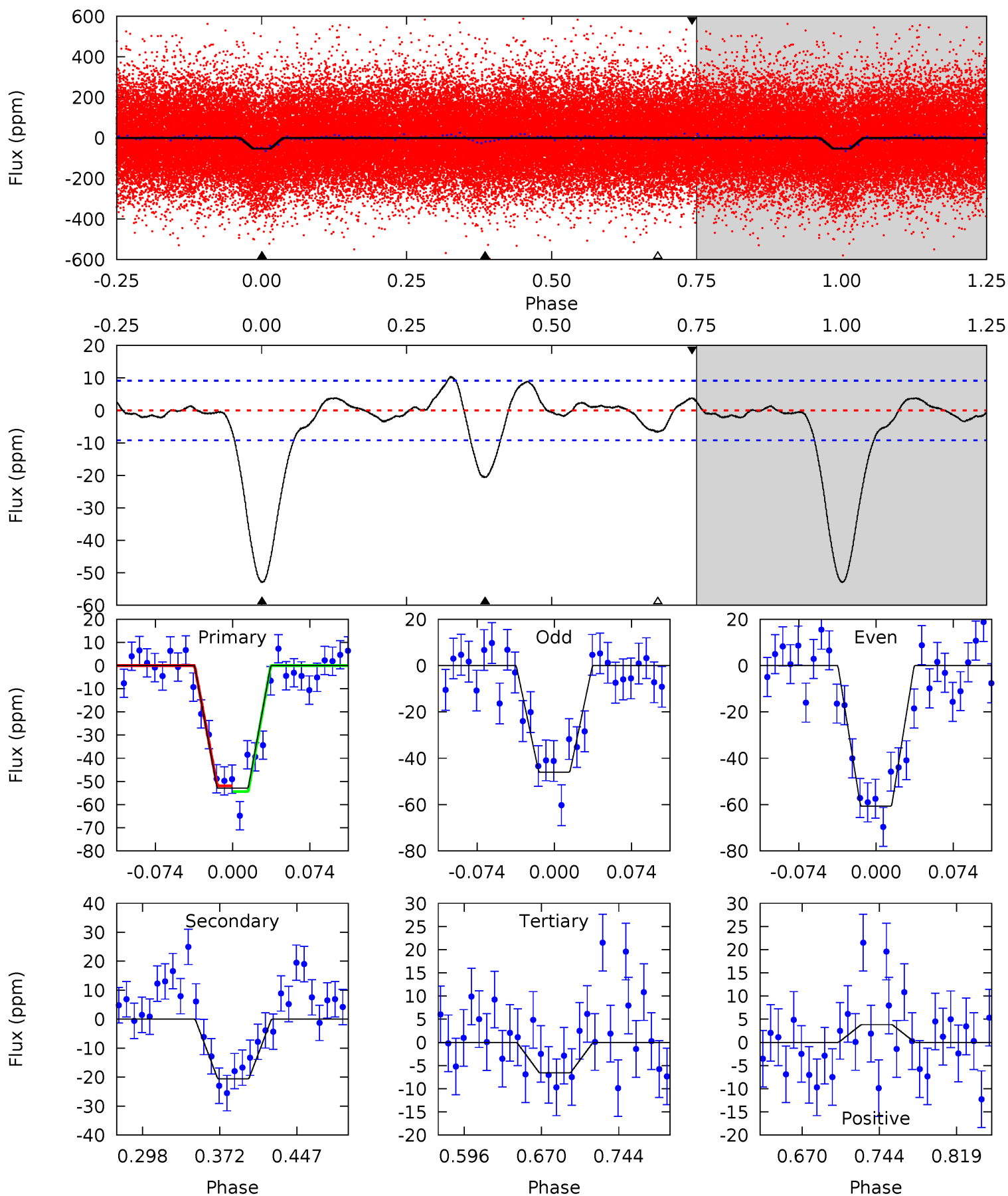




# Alt Model-Shift Uniqueness Test

005386163-01, P = 12.423554 Days, E = 129.244098 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  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 26.6 | 10.4 | 3.32 | 1.92 | 4.63            | 1.78            | 1.33             | 23.3    | 24.7    | 7.06    | 8.45    | 3.70    | 1.26 | 0.16  | 0.63 |





### Stellar Parameters For KIC 005386163

|        | $T_{\text{eff}}(K)$  | $\log(g)$                 | [Fe/H]                     | $R (R_{\odot})$           | $M(M_{\odot})$            | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
|        | $6098^{+200}_{-182}$ | $3.707^{+0.344}_{-0.108}$ | $-0.320^{+0.350}_{-0.300}$ | $2.657^{+0.452}_{-0.979}$ | $1.313^{+0.213}_{-0.292}$ | $0.099^{+0.249}_{-0.032}$                 |
|        | +3%/-3%              | +9%/-3%                   | +109%/-94%                 | +17%/-37%                 | +16%/-22%                 | +253%/-32%                                |
| 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 005386163-01 / KOI 6006.01

| Detrend | Depth (ppm) | $R_p (R_{\oplus})$     | $T_{max} (K)$        | $T_{obs} (K)$        | $A_{obs}$        |
|---------|-------------|------------------------|----------------------|----------------------|------------------|
| DV      | $-41 \pm 2$ | $2.15^{+0.35}_{-0.45}$ | $1771^{+123}_{-161}$ | $5609^{+252}_{-239}$ | $66^{+33}_{-16}$ |
| Alt.    | $-21 \pm 2$ | $2.08^{+0.33}_{-0.43}$ | $1766^{+119}_{-171}$ | $4863^{+239}_{-196}$ | $35^{+20}_{-8}$  |

$T_{max}$  = 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

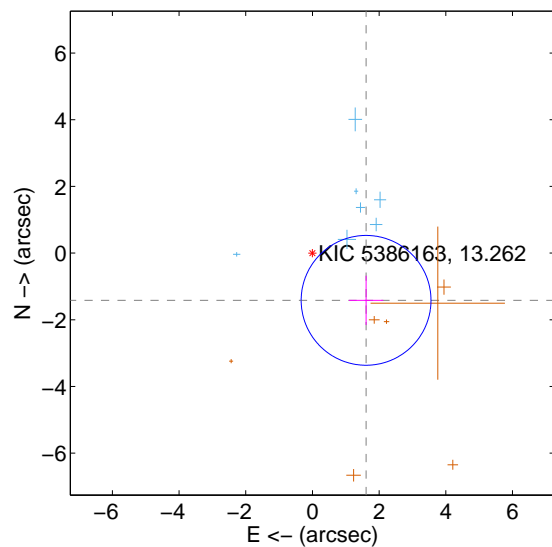
Supplemental centroid analysis for 005386163-01. Kepler magnitude: 13.26. Transit SNR 12.88

There are 7 quarters with good PRF difference image offsets

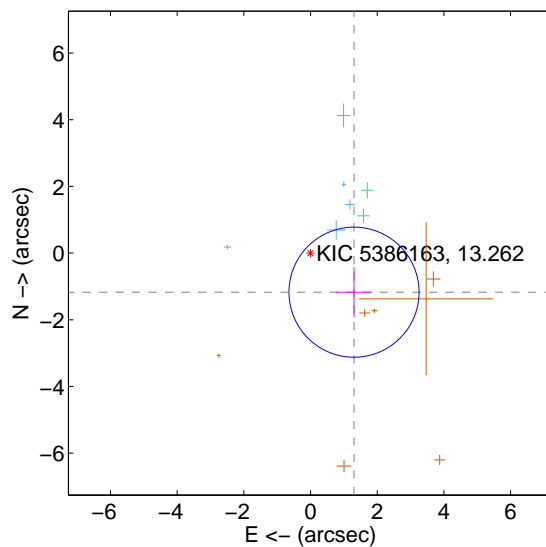
The direct PRF centroid is offset from the target star catalog position by about 0.45 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA        | $\Delta$ Dec       |
|---|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT          | $2.144 \pm 0.649$  | $3.30$              | $-1.609 \pm 0.516$ | $-1.417 \pm 0.738$ |
| PRF-fit source offset from KIC position | $1.754 \pm 0.650$  | $2.70$              | $-1.304 \pm 0.537$ | $-1.173 \pm 0.752$ |
| photometric centroid source offset      | $3.17 \pm 0.96$    | $3.30$              | $-2.87 \pm 0.97$   | $1.33 \pm 0.90$    |

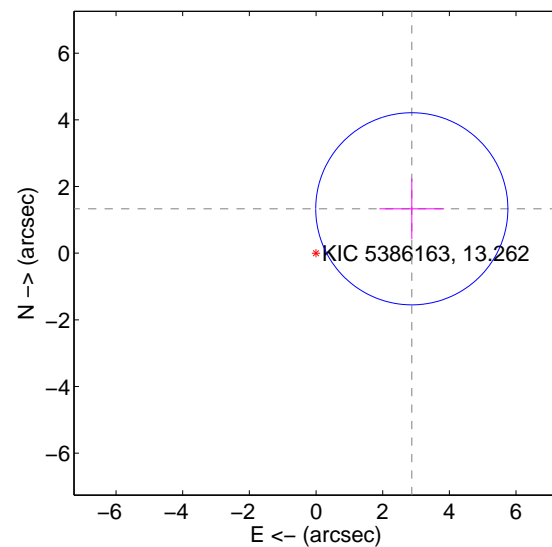
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

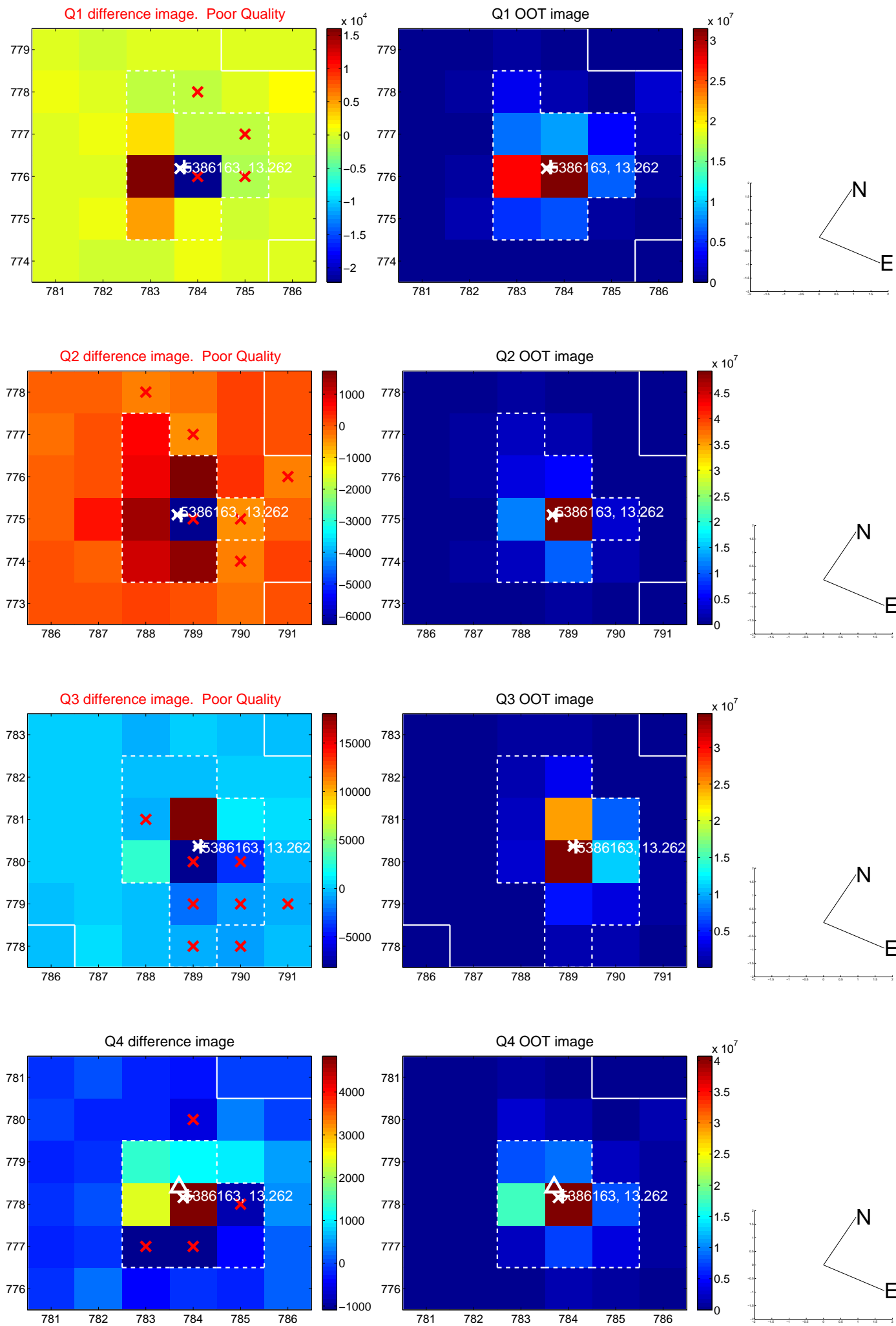


offset from photometric centroids



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

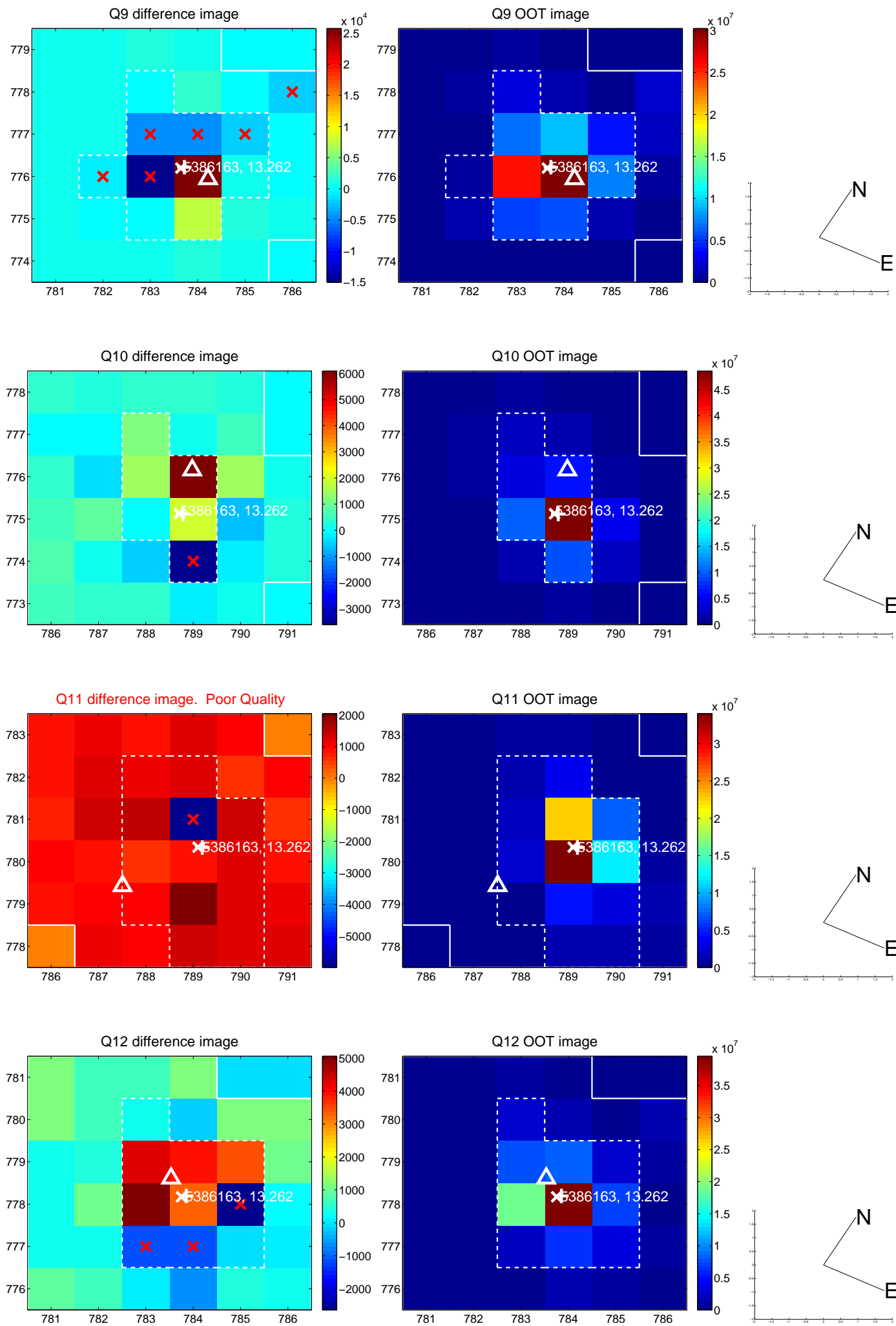
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



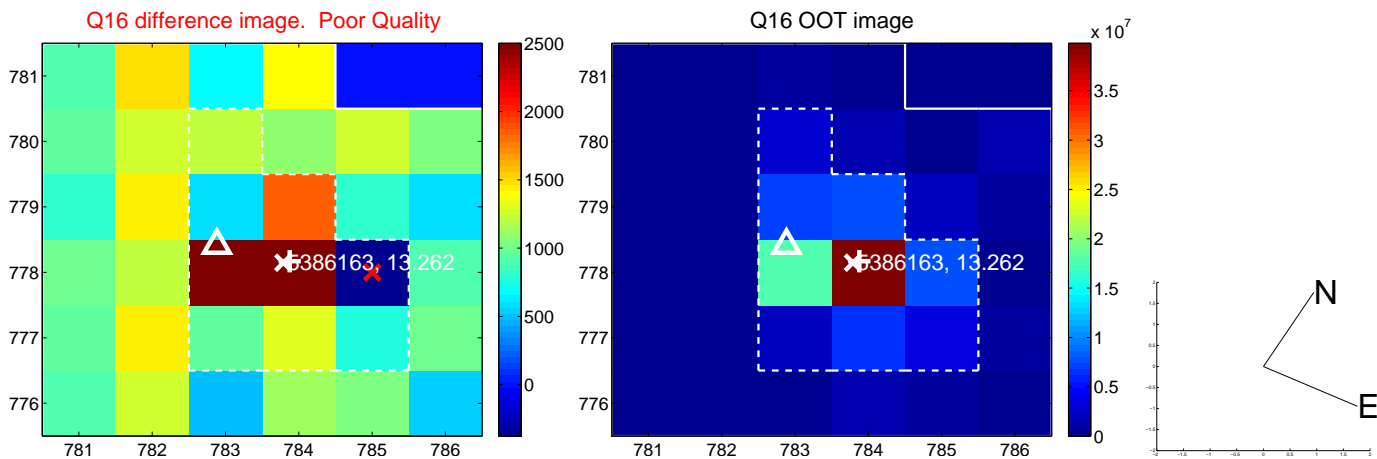
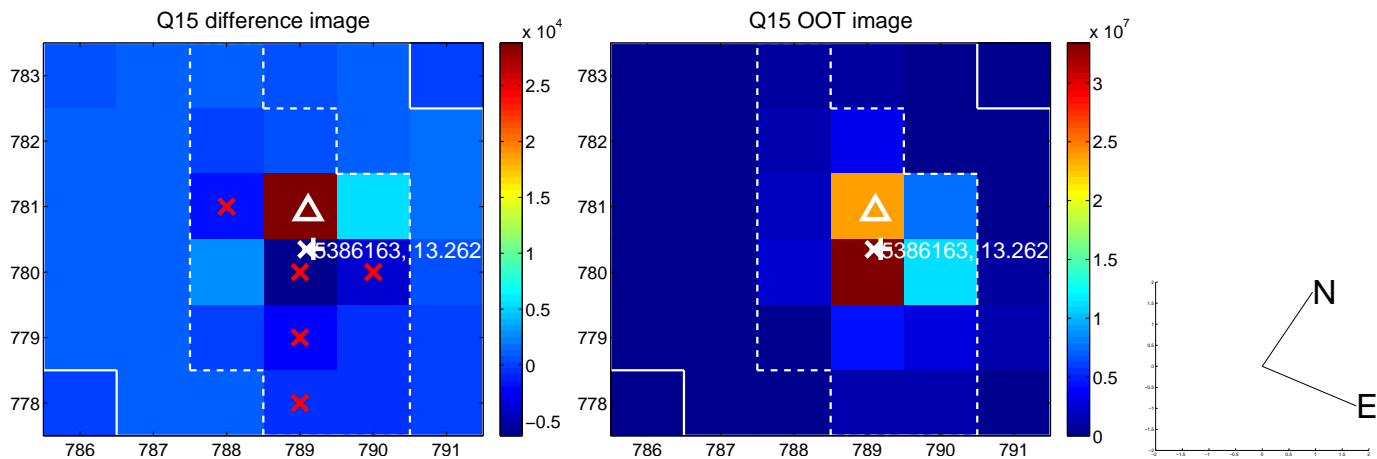
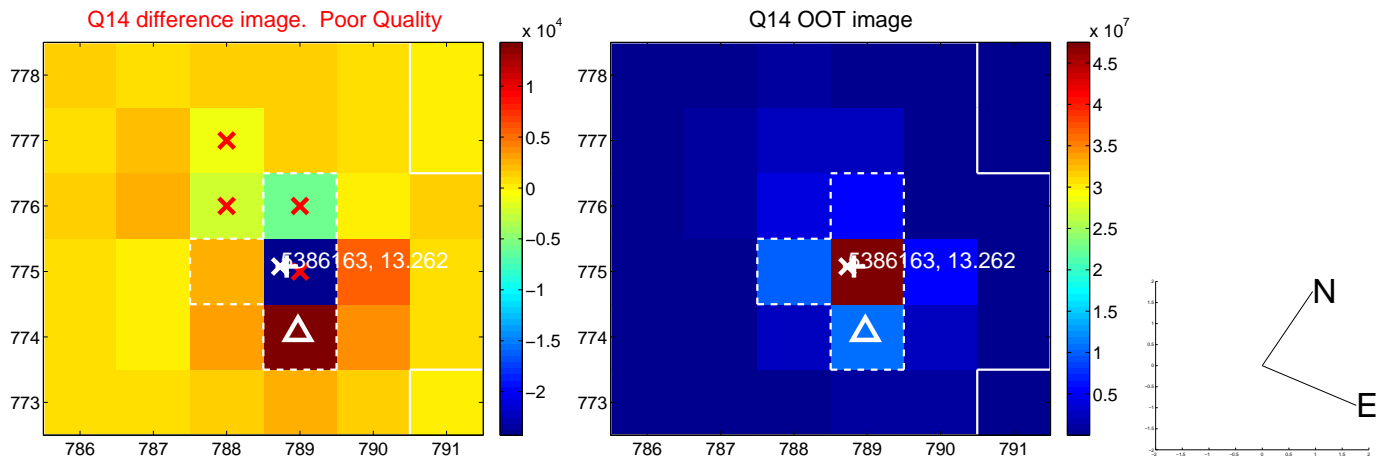
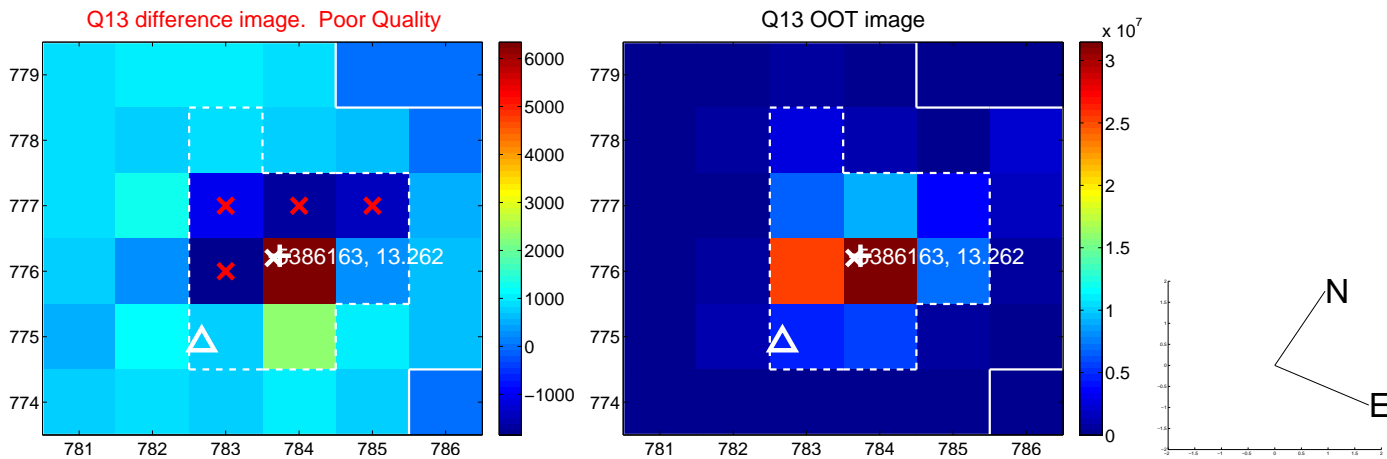




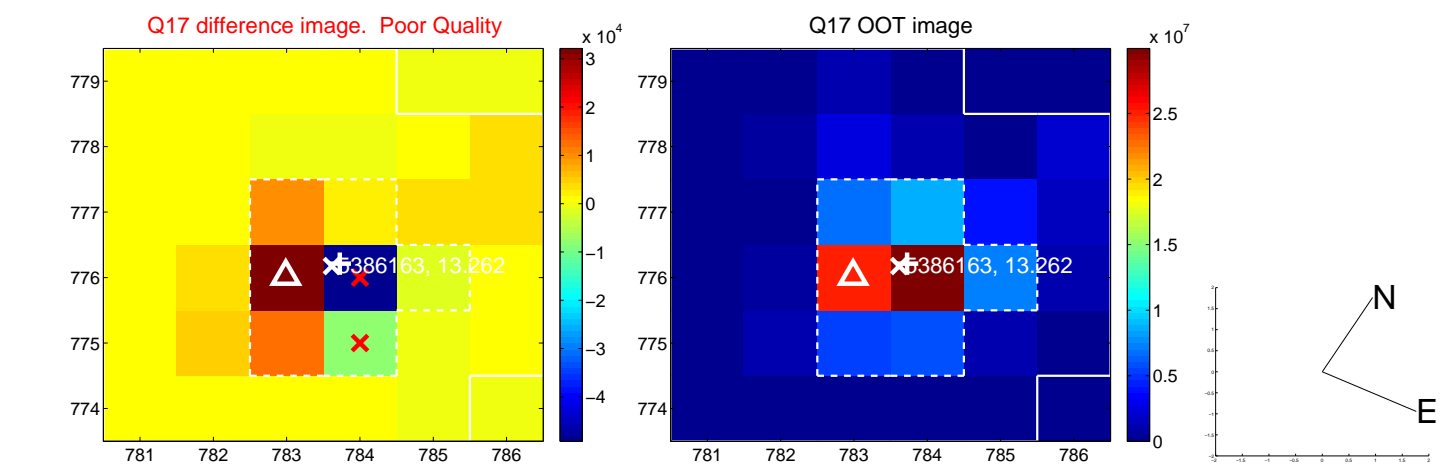
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



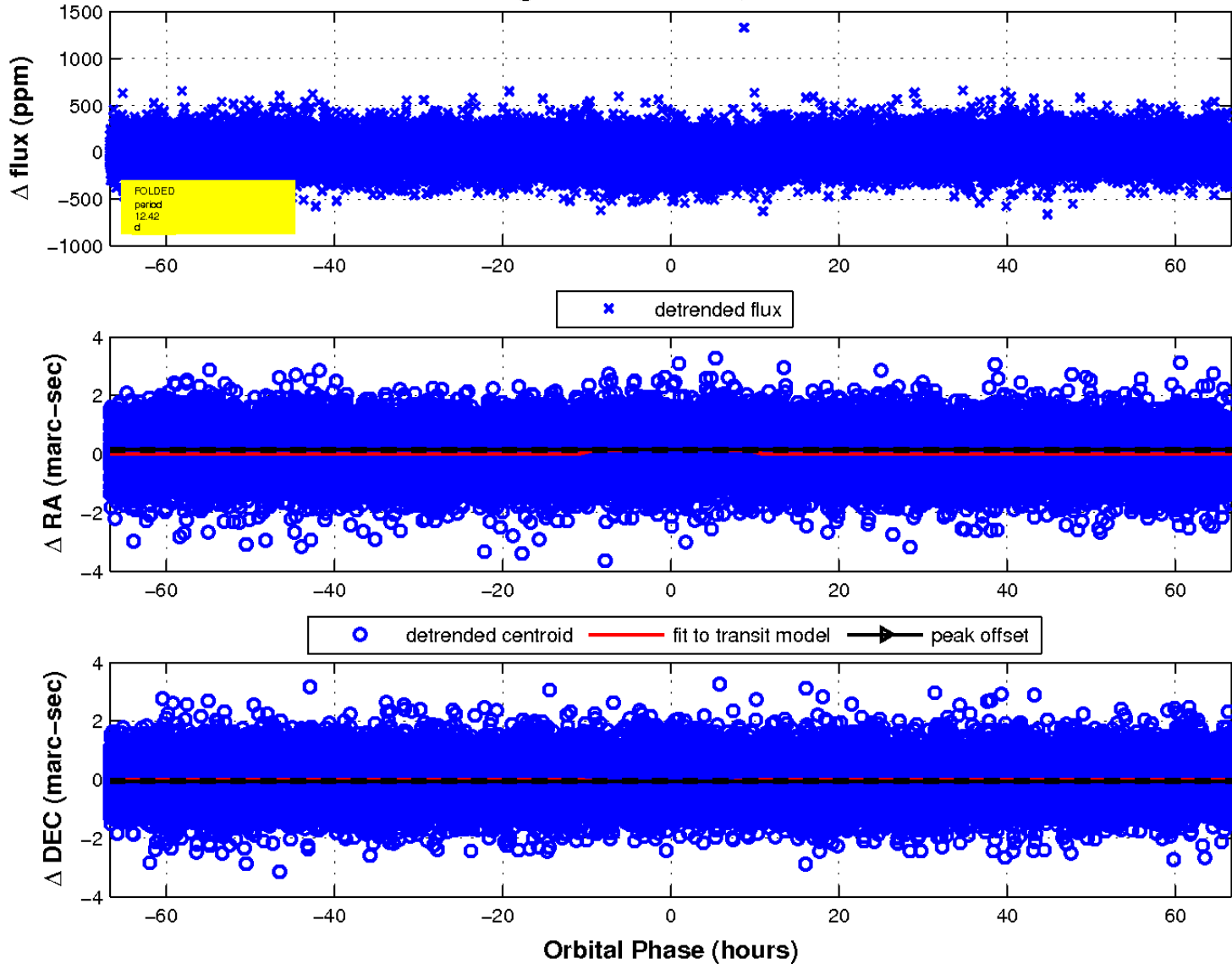
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

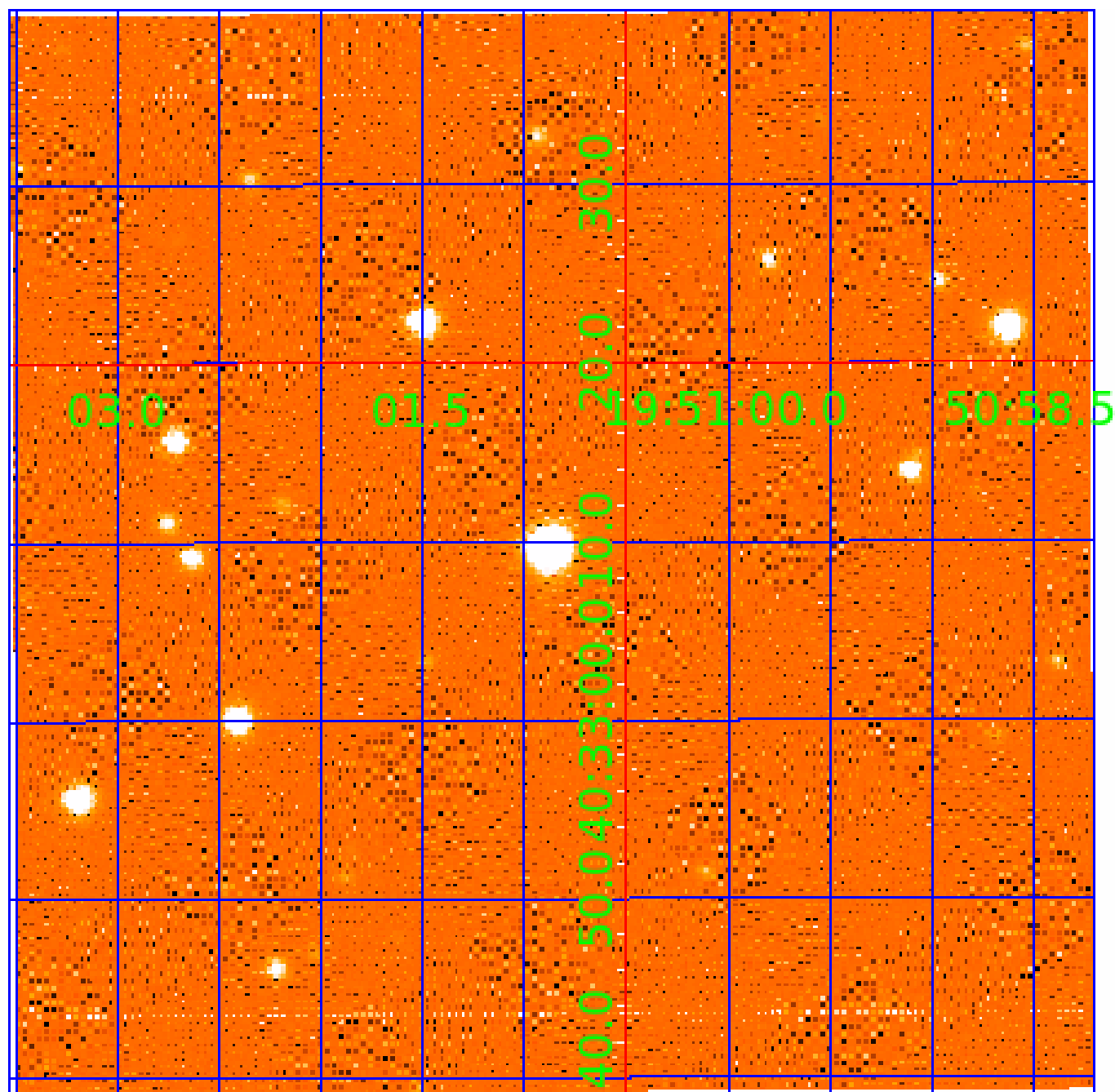


fluxWeightedCentroids, Planet 1 of 2



# UKIRT Image

Declination





# KIC 005386163

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 005386163-01 | OBS      | 6006.01 | 12.424735     | 141.601935   | 44.2        | 22.234           | 10.9 | 12.9 | 2.66                        | 6098            | 2.22                   | 662.00                 |
| 005386163-02 | OBS      | No      | 12.426066     | 133.944290   | 40.4        | 24.690           | 10.7 | 13.2 | 2.66                        | 6098            | 1.95                   | 661.90                 |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments   |
|--------------|----------|------|-------|---|---|---|---|--|
| 005386163-01 | OBS      | FP   | 0.00  | 1 | 0 | 1 | 1 | LPP_DV—CENT_KIC_POS—HALO_GHOST—EPHEM_MATCH                           |
| 005386163-02 | OBS      | FP   | 0.00  | 1 | 0 | 1 | 1 | LPP_DV—LPP_ALT—SAME_NTL_PERIOD—CENT_FEW_DIFFS—HALO_GHOST—EPHEM_MATCH |

**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 005386163-02

| TCE (1)      | KIC     | Parent (2)   | Parent KIC | $P_1:P_2$ | Dist ( $''$ ) | $\Delta$ Row | $\Delta$ Col | $m_2$ | $m_1$ | $D_2/D_1$ | Mechanism  | Flag | $\sigma_P$ | $\sigma_T$ |
|--------------|---------|--------------|------------|-----------|---------------|--------------|--------------|-------|-------|-----------|------------|------|------------|------------|
| 005386163-02 | 5386163 | V380-Cyg-sec | 5385723    | 1:1       | 317.3         | -70          | 40           | 5.77  | 13.26 | 3225.90   | Direct-PRF | 0    | 1.67       | 0.07       |

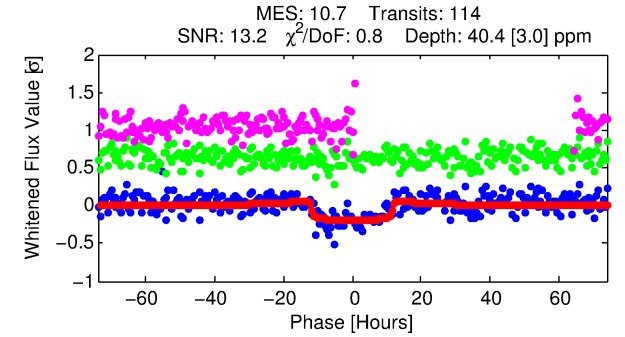
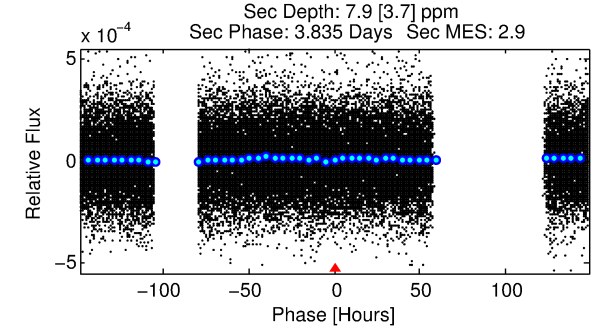
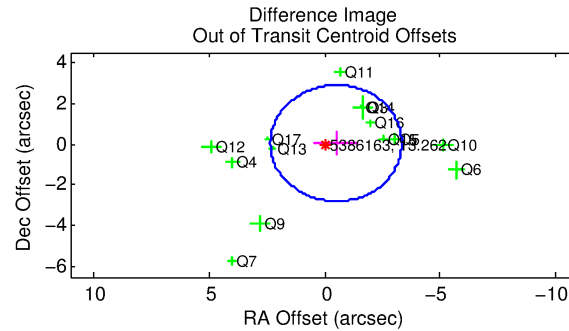
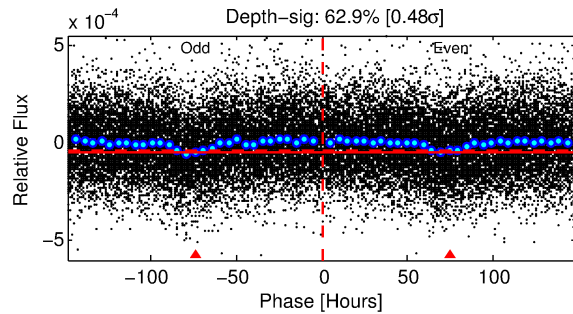
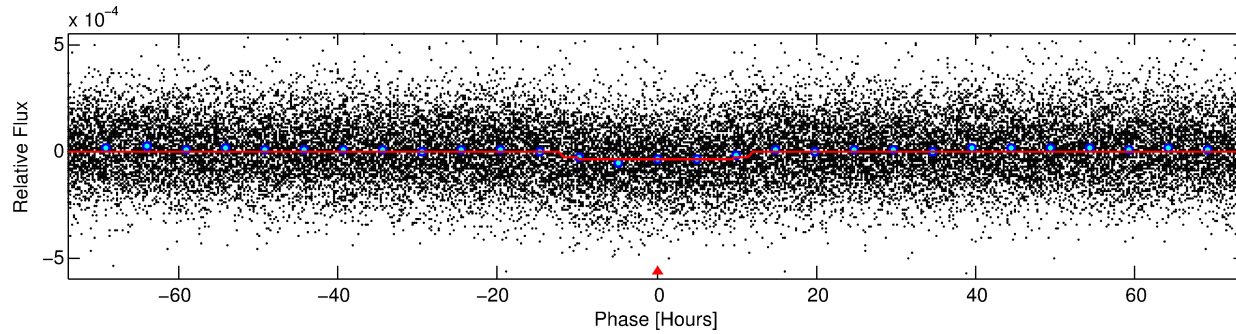
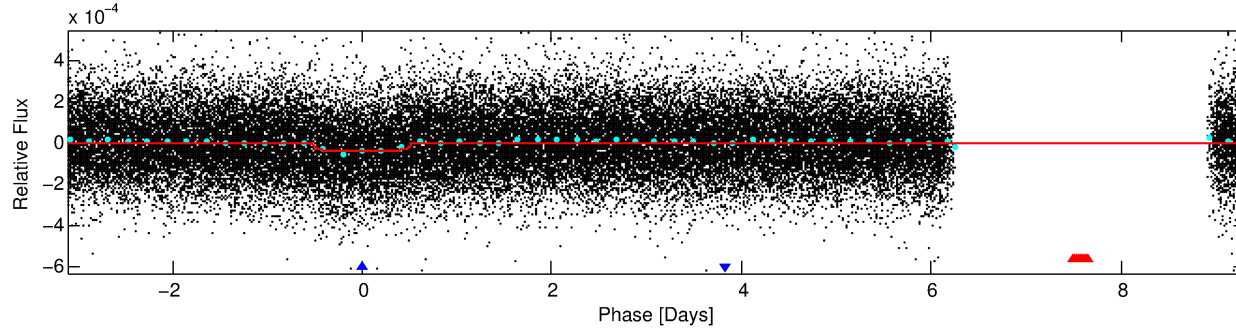
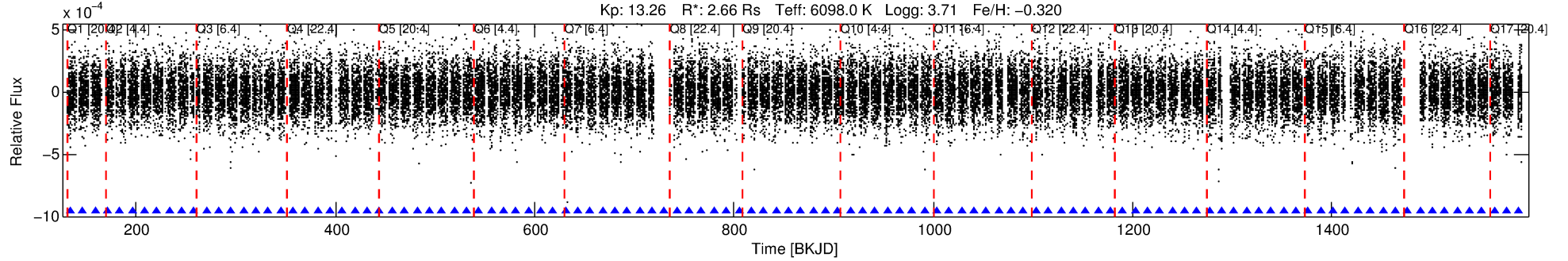
**Notes:**  $P_1:P_2$  is the period ratio. Dist is the distance in arcseconds.  $\Delta$ Row and  $\Delta$ Col are the number of pixels apart in row and column.  $m_2$  and  $m_1$  are the magnitudes of the parent and child.  $D_2/D_1$  is the parent's transit depth divided by the child's.  $\sigma_P$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

# DV One-Page Summary

KIC: 5386163 Candidate: 2 of 2 Period: 12.426 d

KOI: K06006 Corr: No Ephemeris Match

Kp: 13.26 R\*: 2.66 Rs Teff: 6098.0 K Logg: 3.71 Fe/H: -0.320



## DV Fit Results:

Period = 12.42607 [0.00029] d  
Epoch = 133.9443 [0.0186] BKJD  
Rp/R\* = 0.0067 [0.0006]  
a/R\* = 2.10 [0.73]  
b = 0.88 [0.12]  
Seff = 661.90 [395.15]  
Teq = 1293 [193] K  
Rp = 1.95 [0.74] Re  
a = 0.1150 [0.0415] AU  
Ag = 15.12 [11.64] [1.21σ]  
Teffp = 3943 [513] K [4.84σ]

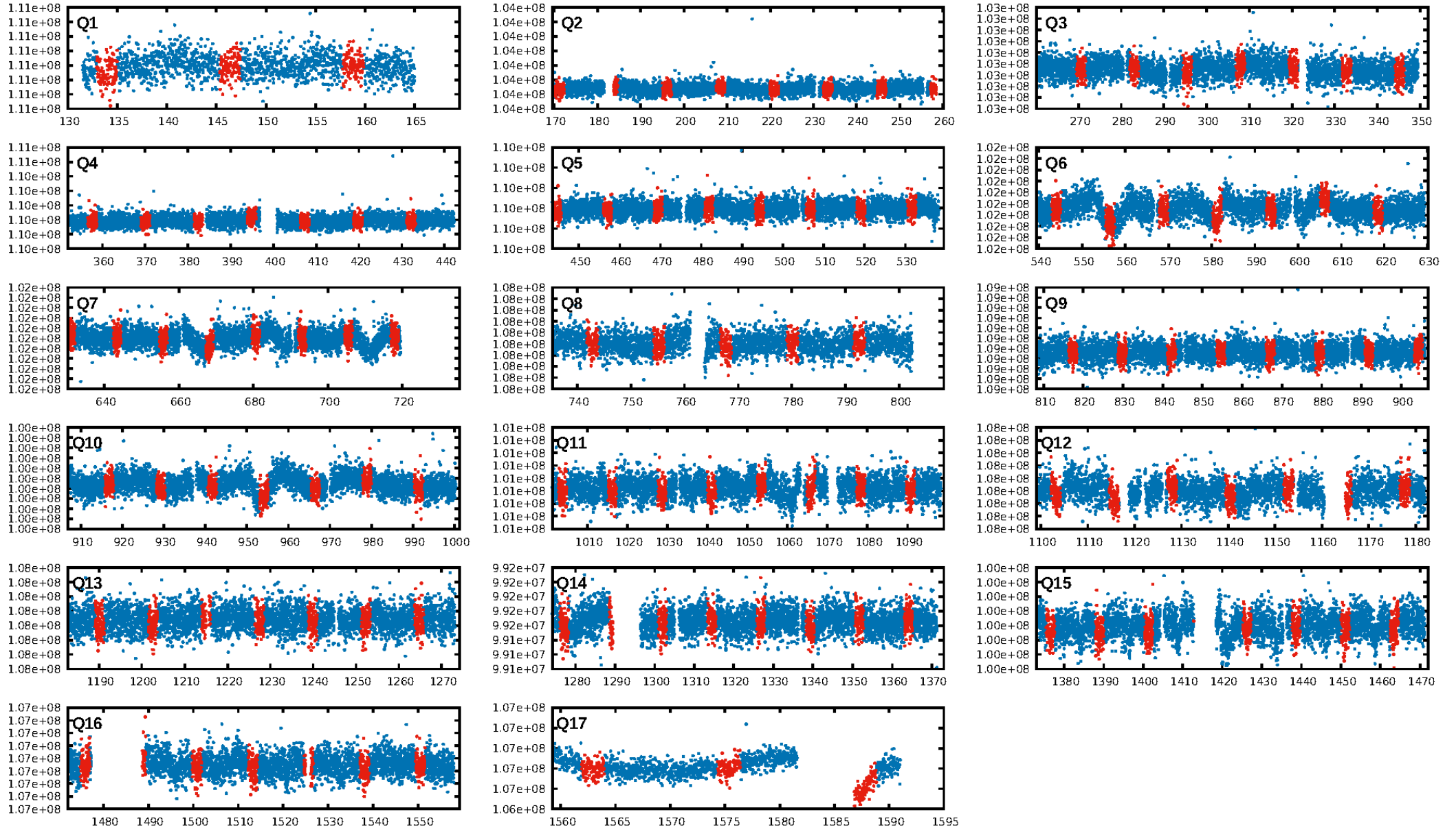
## DV Diagnostic Results:

ShortPeriod-sig: 0.1% [0.00σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 59.4%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 8.49e-27  
RollingBand-fgt: 1.00 [108/108]  
GhostDiagnostic-chr: 0.04181  
Centroid-sig: 0.0%  
Centroid-so: 3.458 arcsec [3.55σ]  
OotOffset-rm: 0.498 arcsec [0.52σ]  
KicOffset-rm: 0.400 arcsec [0.48σ]  
OotOffset-st: 3/4/3/4 [14]  
KicOffset-st: 3/4/3/4 [14]  
DiffImageQuality-fgm: 0.36 [5/14]  
DiffImageOverlap-fno: 1.00 [17/17]

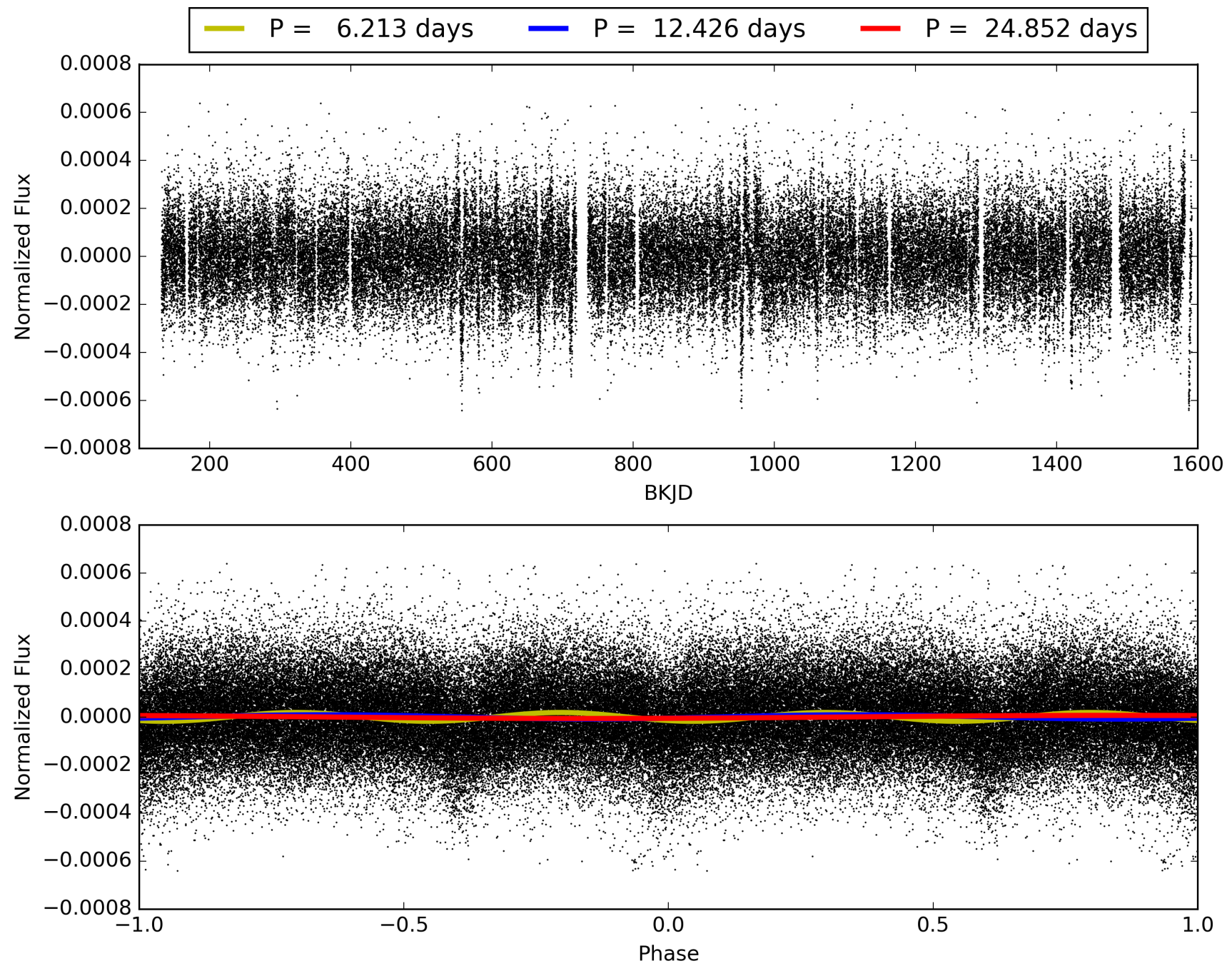
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 10:29:40 Z

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

# TCE 005386163-02, PDC Light Curves



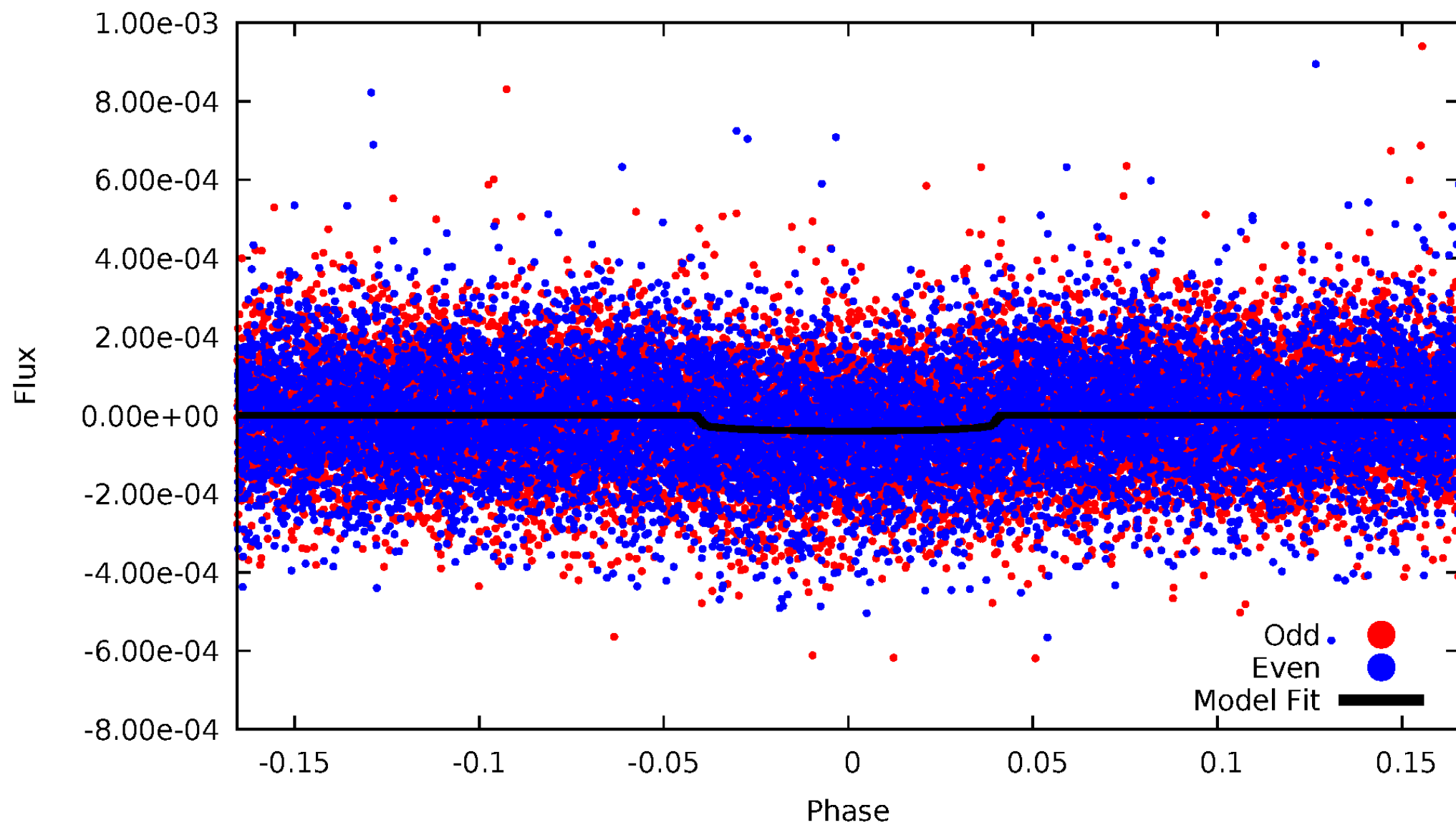
TCE 005386163-02





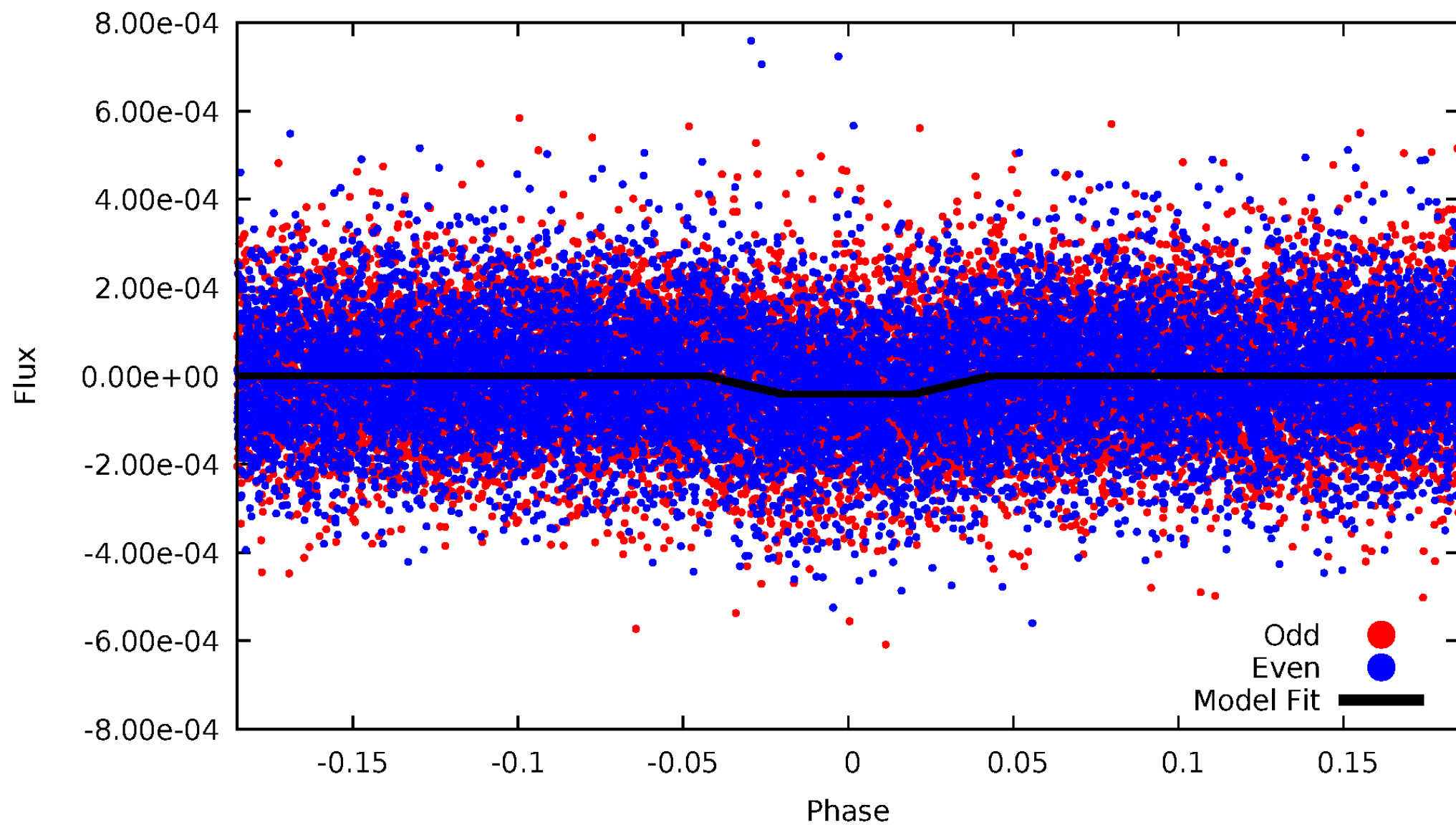
# DV Odd/Even

TCE 005386163-02



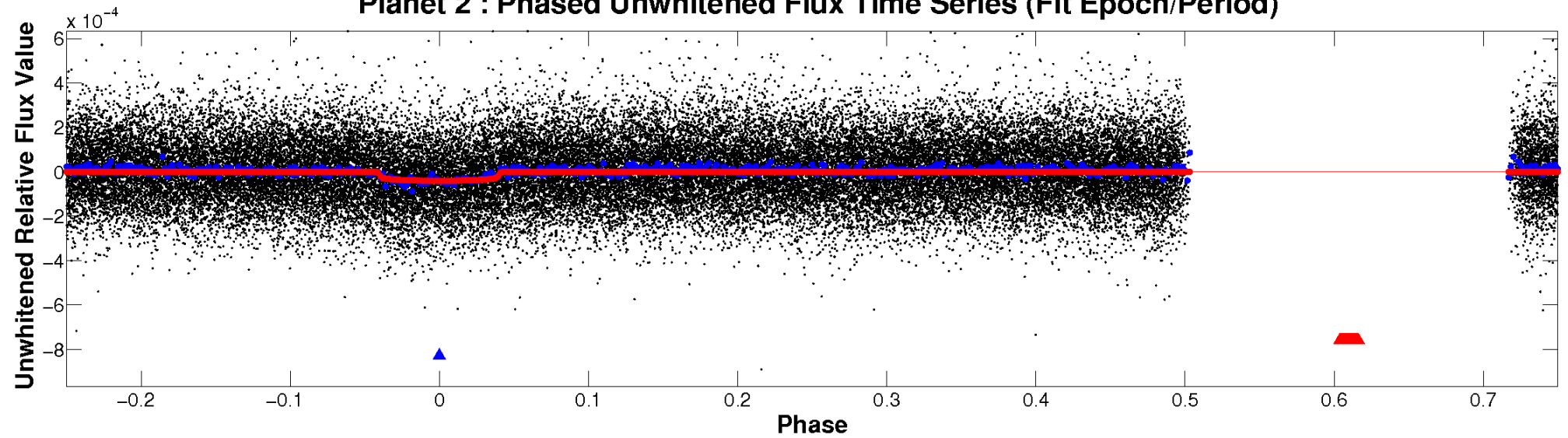
# ALT Odd/Even

TCE 005386163-02

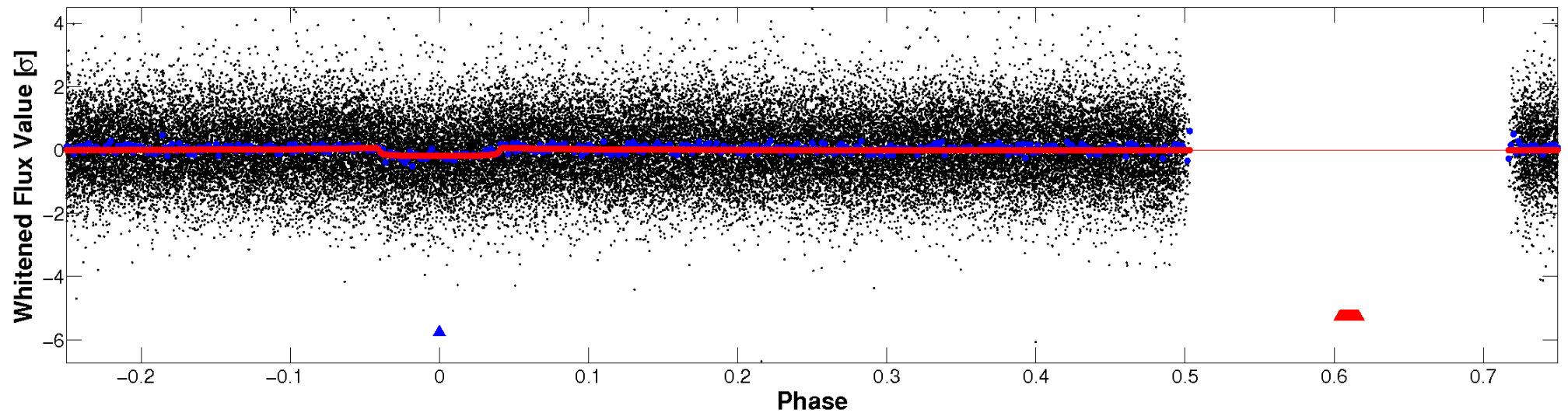


# Non-Whitened Vs. Whitened Light Curve

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

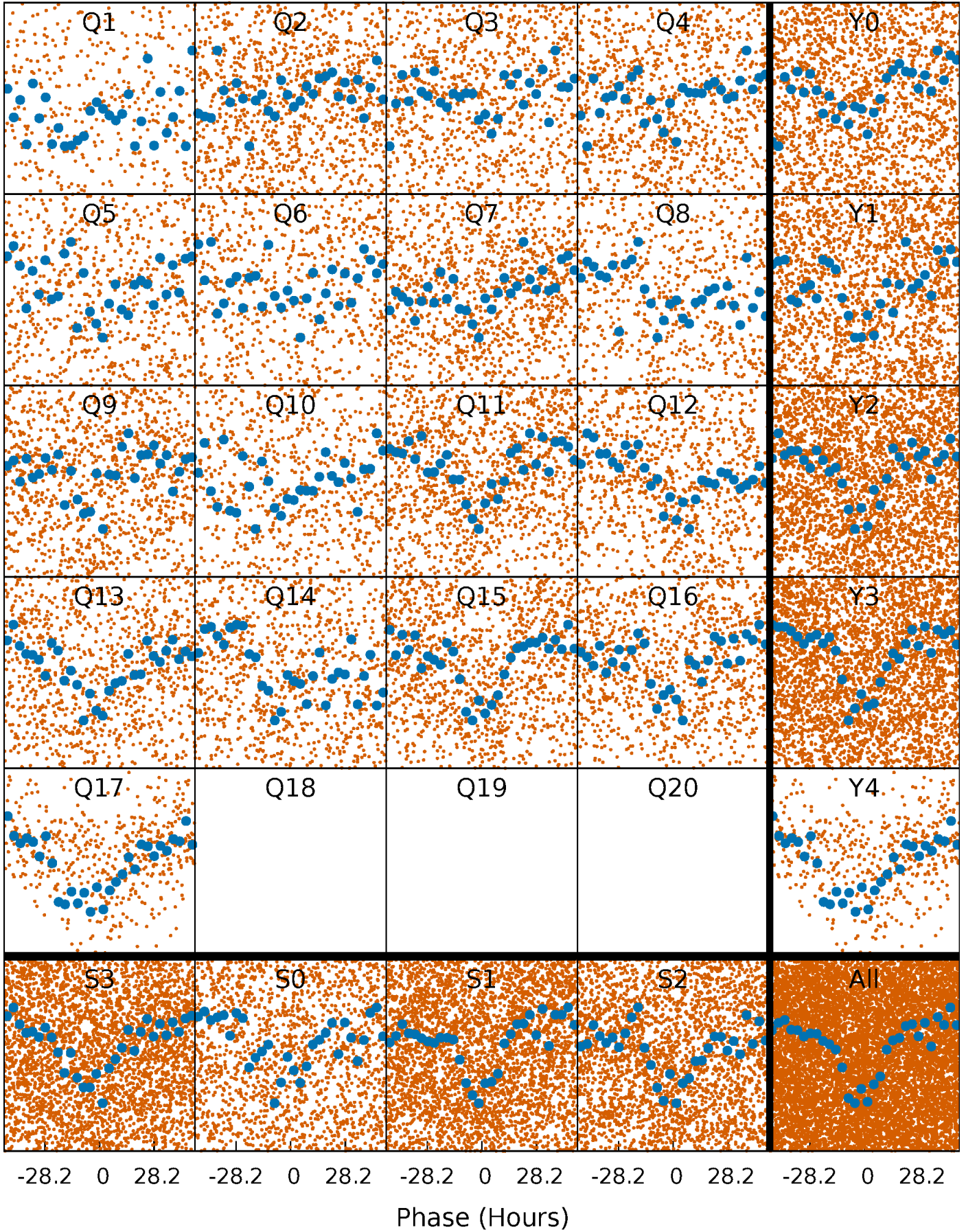


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

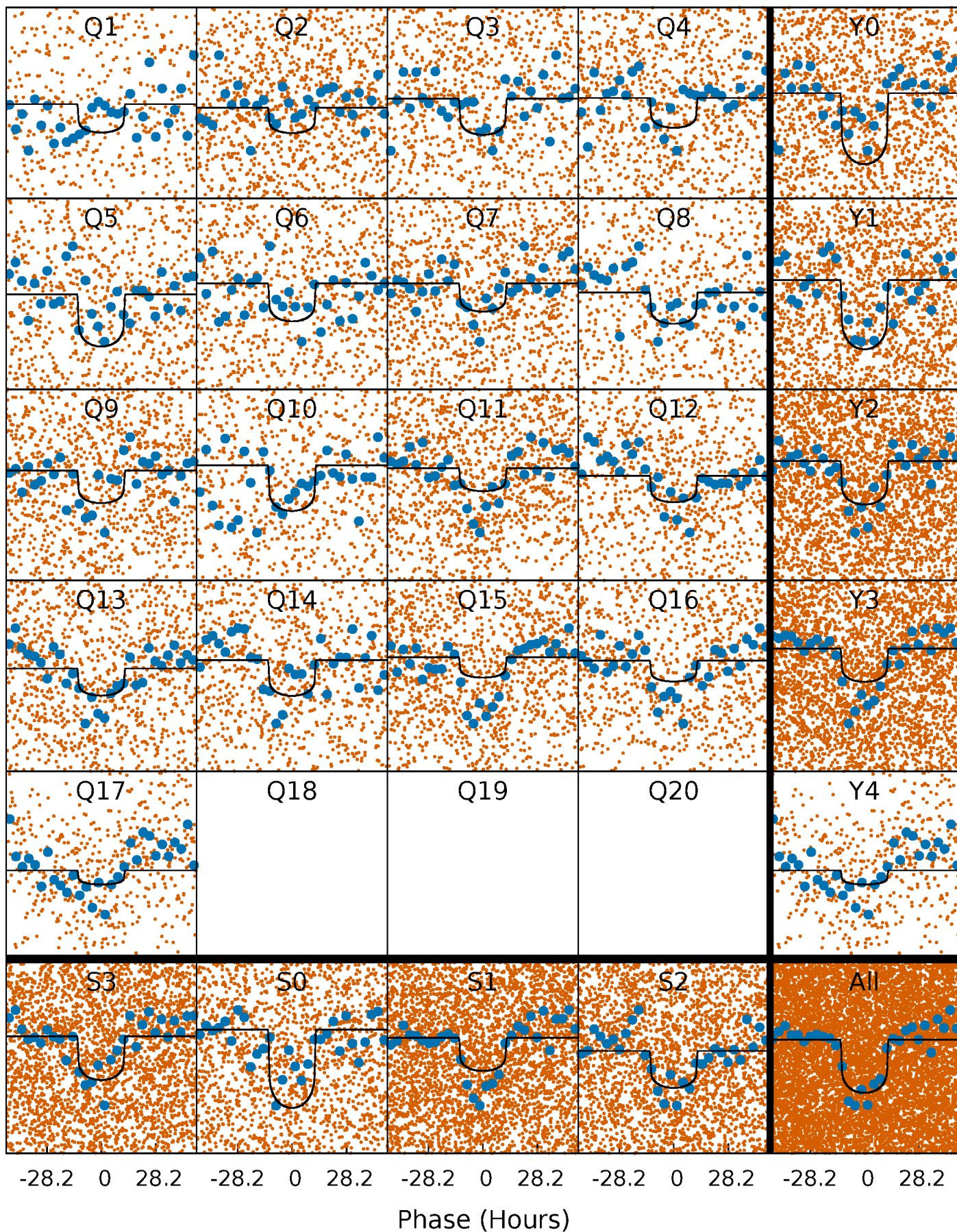
TCE 005386163-02 P= 12.426066 Days  $T_0=133.944290$  (BKJD)





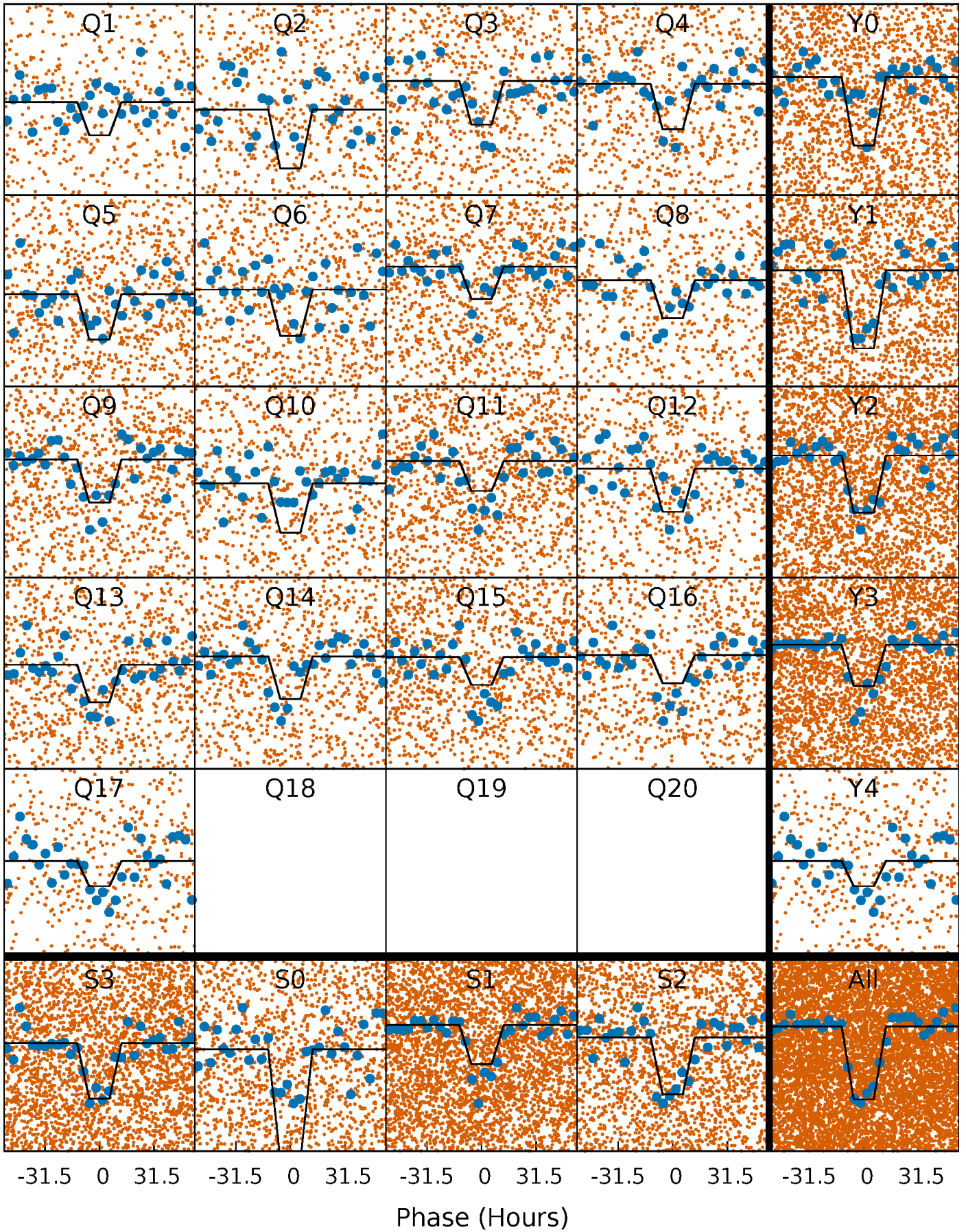
# DV Quarter-Phased Transit Curves

TCE 005386163-02 P= 12.426066 Days  $T_0=133.944290$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 005386163-02 P= 12.424613 Days  $T_0=133.974659$  (BKJD)

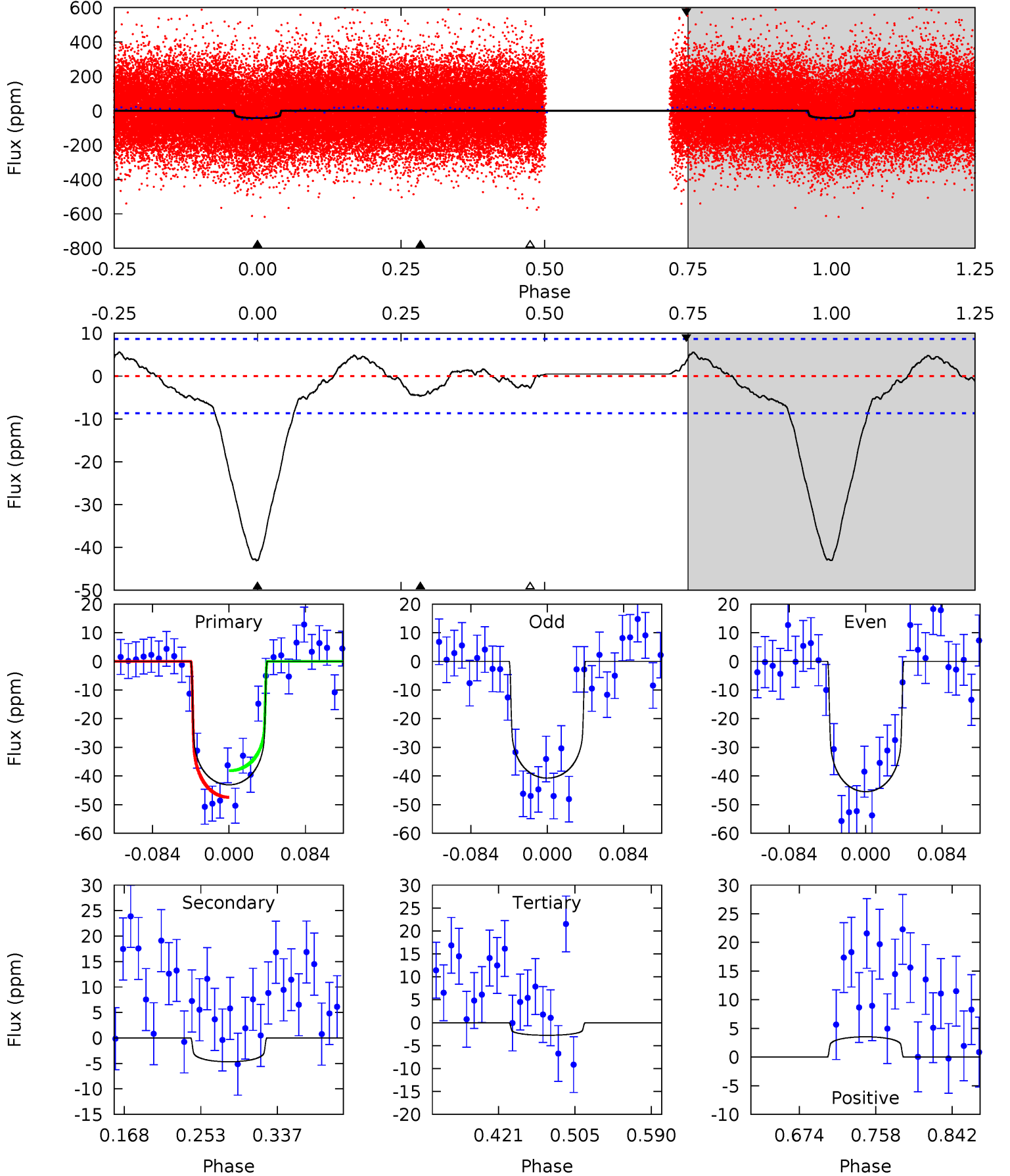




# DV Model-Shift Uniqueness Test

005386163-02,  $P = 12.426066$  Days,  $E = 121.518224$  Days

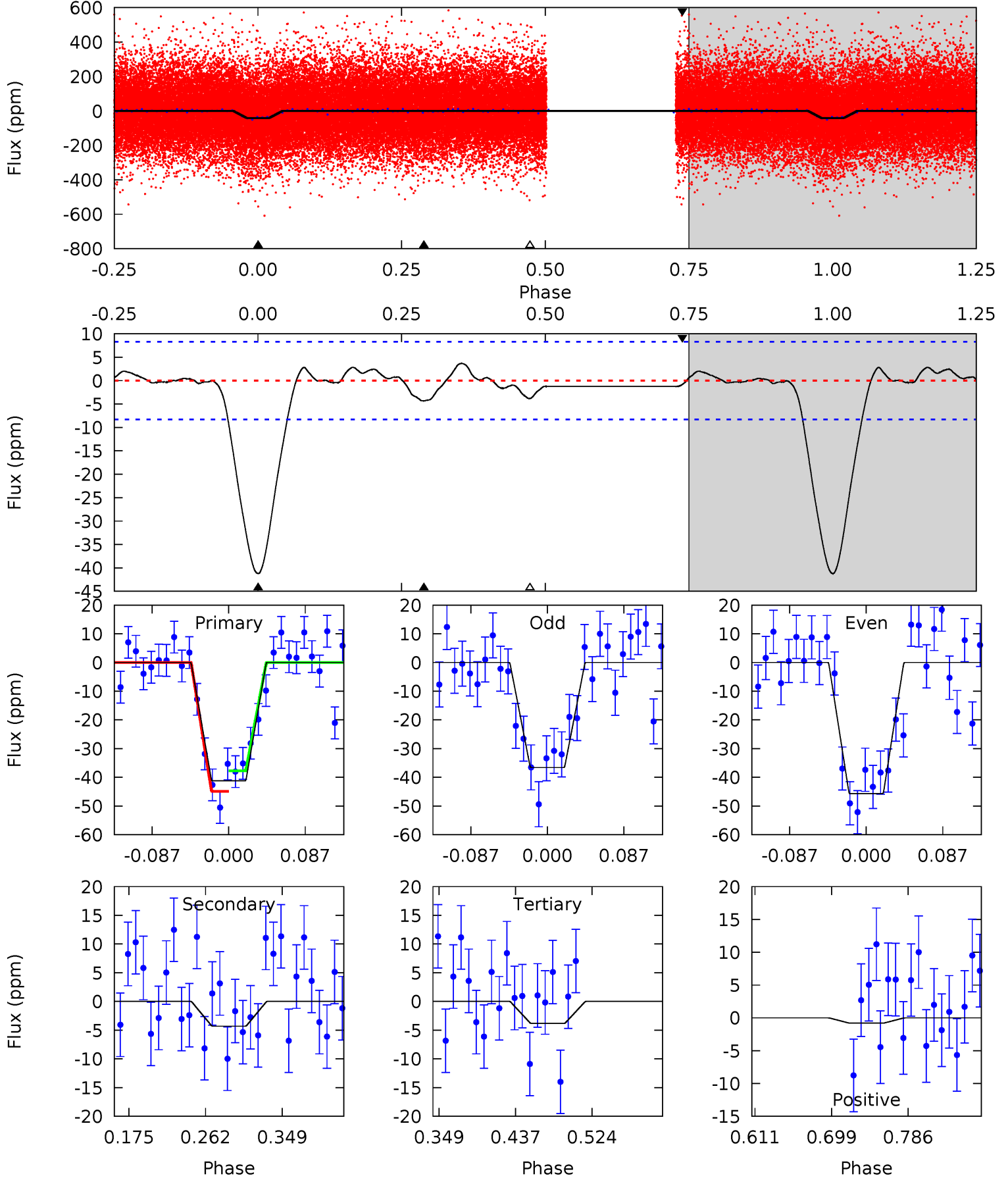
| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 22.8 | 2.47 | 1.45 | 1.87 | 4.60            | 1.73            | 1.65             | 21.3    | 20.9    | 1.02    | 0.60    | 1.26    | 0.99 | 0.12  | 2.46 |



# Alt Model-Shift Uniqueness Test

005386163-02, P = 12.424613 Days, E = 121.550046 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  |
|------|------|------|-------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 22.8 | 2.38 | 2.12 | -0.45 | 4.59            | 1.71            | 0.78             | 20.7    | 23.2    | 0.26    | 2.82    | 2.52    | 1.11 | 0.08  | 2.00 |



### Stellar Parameters For KIC 005386163

|        | $T_{\text{eff}}(K)$  | $\log(g)$                 | [Fe/H]                     | $R (R_{\odot})$           | $M(M_{\odot})$            | $p_{\star} (\text{g}\cdot\text{cm}^{-3})$ |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
|        | $6098^{+200}_{-182}$ | $3.707^{+0.344}_{-0.108}$ | $-0.320^{+0.350}_{-0.300}$ | $2.657^{+0.452}_{-0.979}$ | $1.313^{+0.213}_{-0.292}$ | $0.099^{+0.249}_{-0.032}$                 |
|        | +3%/-3%              | +9%/-3%                   | +109%/-94%                 | +17%/-37%                 | +16%/-22%                 | +253%/-32%                                |
| 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 005386163-02 / KOI

| Detrend | Depth (ppm) | $R_p (R_{\oplus})$     | $T_{\text{max}} (K)$ | $T_{\text{obs}} (K)$ | $A_{\text{obs}}$          |
|---------|-------------|------------------------|----------------------|----------------------|---------------------------|
| DV      | $-5 \pm 2$  | $1.87^{+0.35}_{-0.42}$ | $1776^{+117}_{-174}$ | $3798^{+296}_{-354}$ | $9.853^{+6.914}_{-4.546}$ |
| Alt.    | $-4 \pm 2$  | $1.79^{+0.31}_{-0.37}$ | $1770^{+119}_{-169}$ | $3802^{+335}_{-368}$ | $9.897^{+7.852}_{-4.946}$ |

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

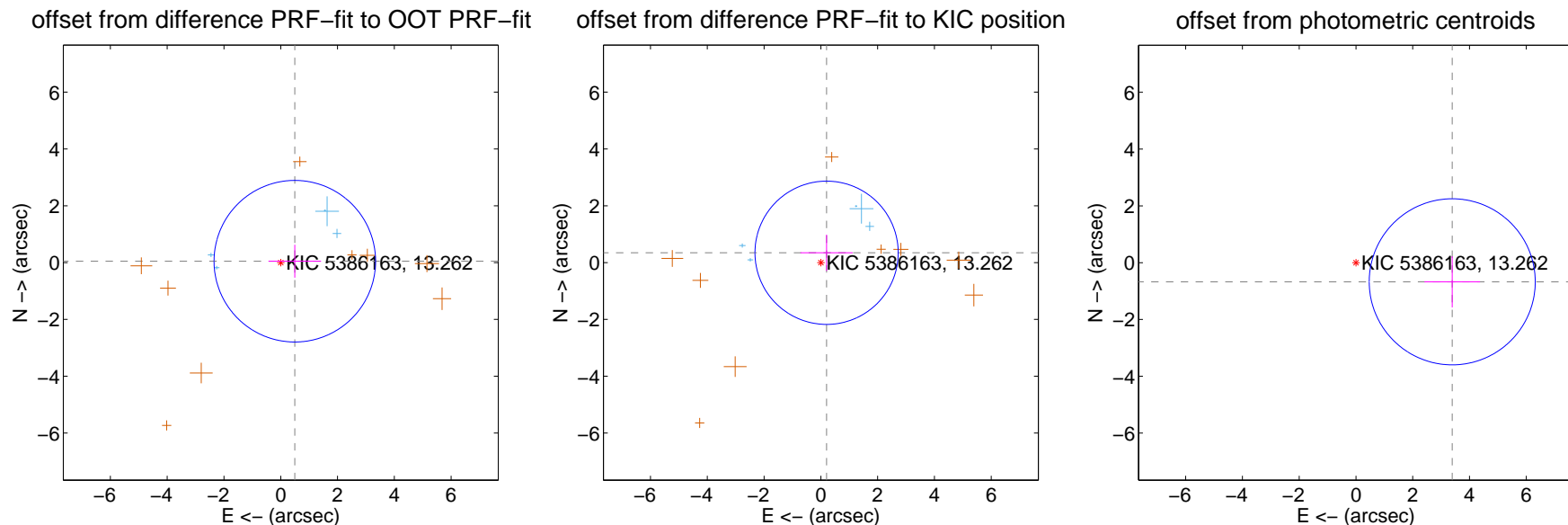
## DV Centroid Data

Supplemental centroid analysis for 005386163-02. Kepler magnitude: 13.26. Transit SNR 13.18

There are 5 quarters with good PRF difference image offsets

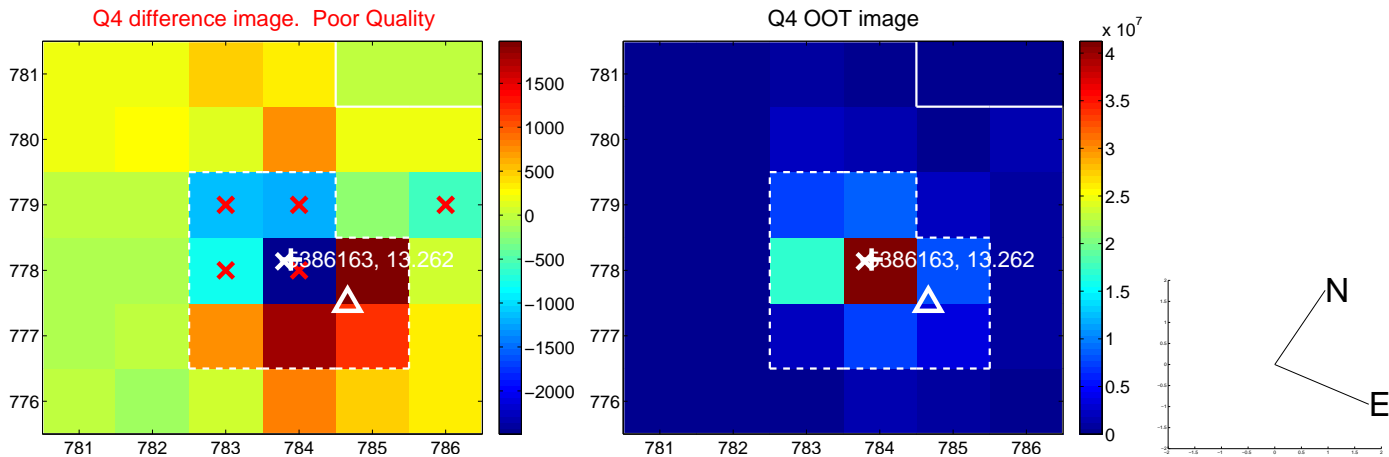
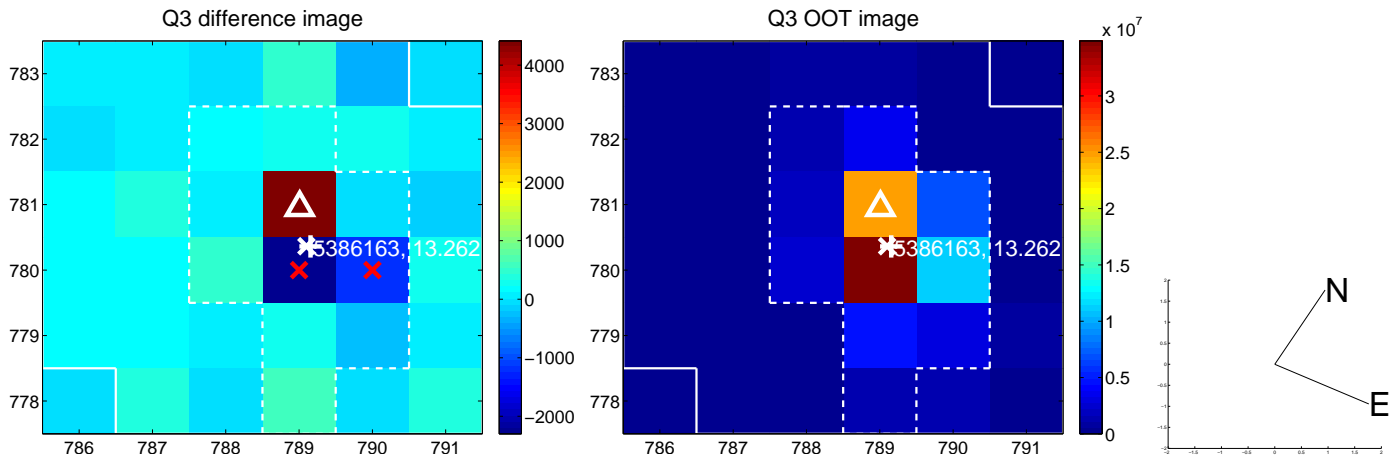
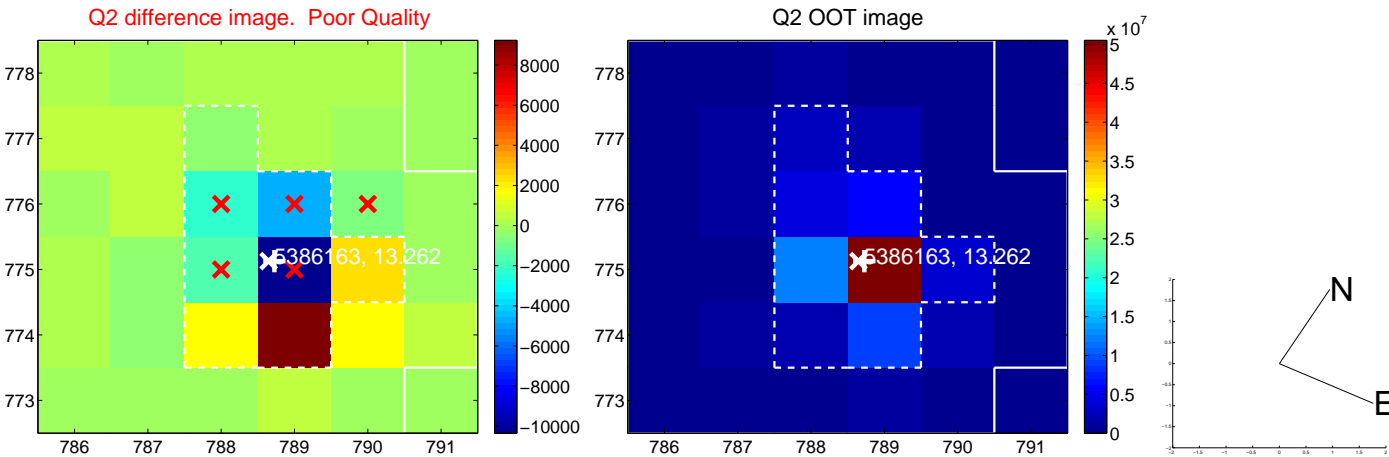
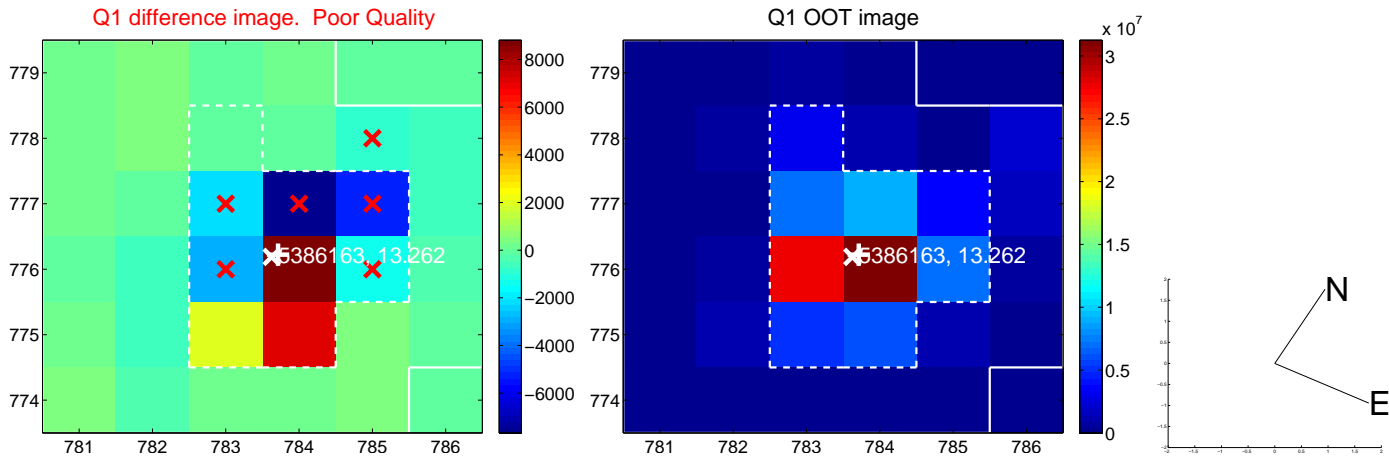
The direct PRF centroid is offset from the target star catalog position by about 0.45 arcsec

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA        | $\Delta$ Dec      |
|---|--------------------|---------------------|--------------------|-------------------|
| PRF-fit source offset from OOT          | $0.498 \pm 0.948$  | 0.52                | $-0.495 \pm 0.923$ | $0.048 \pm 0.579$ |
| PRF-fit source offset from KIC position | $0.400 \pm 0.841$  | 0.48                | $-0.202 \pm 0.921$ | $0.345 \pm 0.638$ |
| photometric centroid source offset      | $3.46 \pm 0.97$    | 3.55                | $-3.39 \pm 0.98$   | $-0.67 \pm 0.90$  |



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.

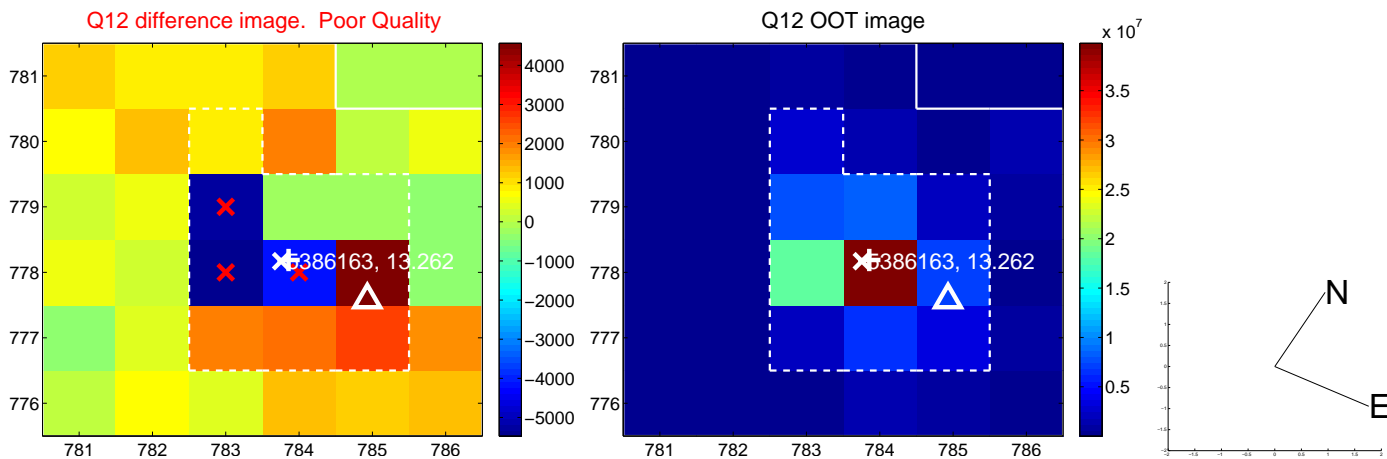
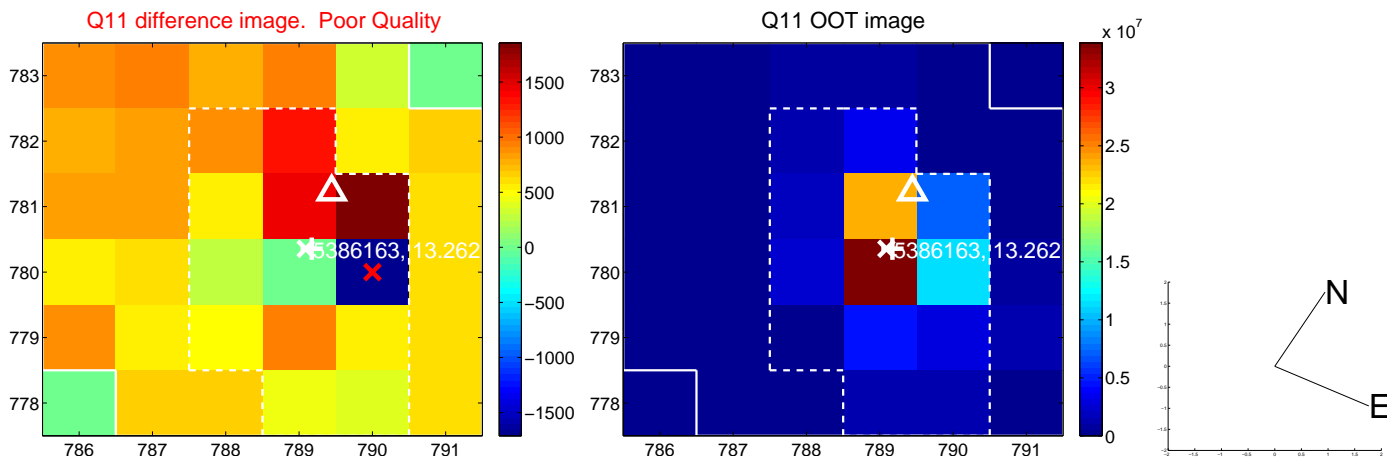
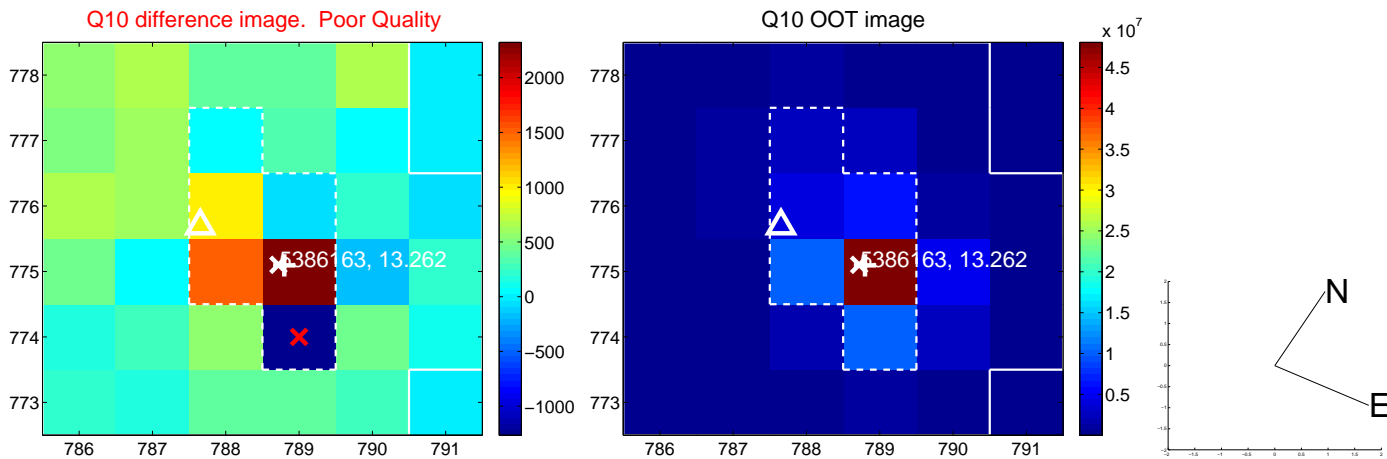
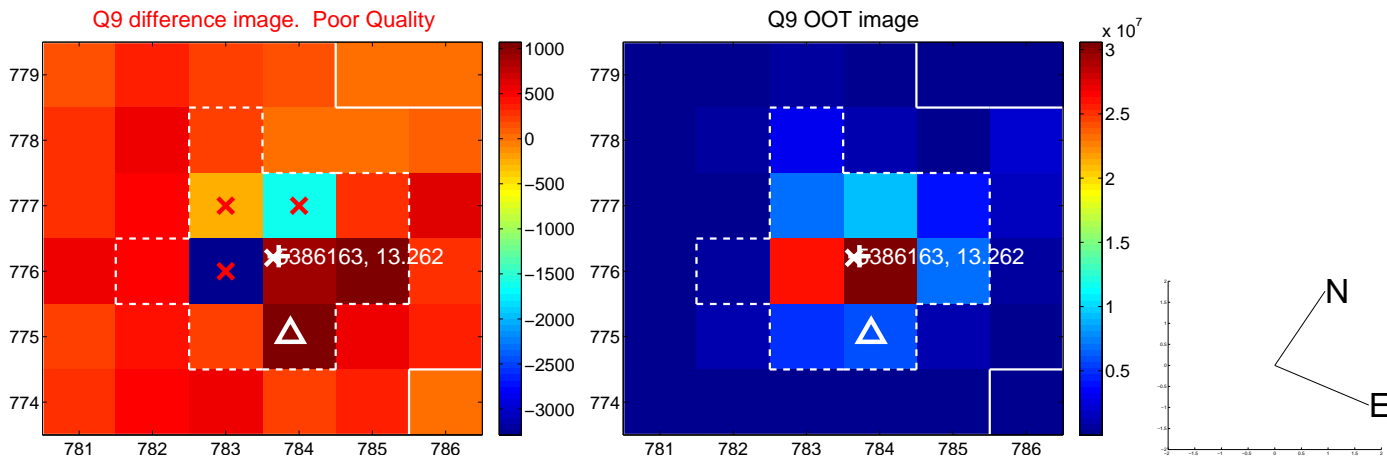
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



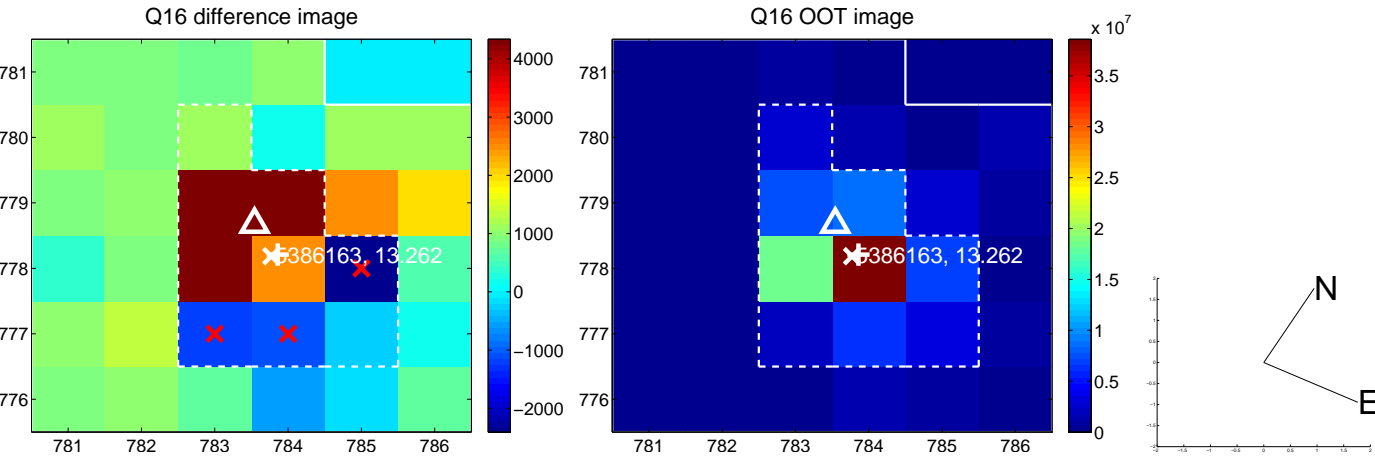
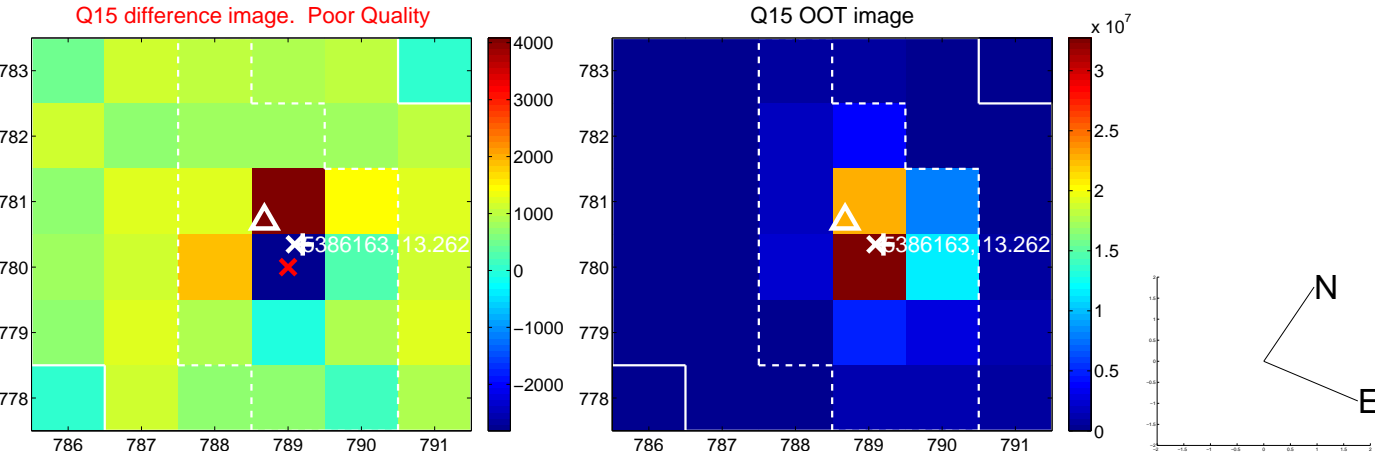
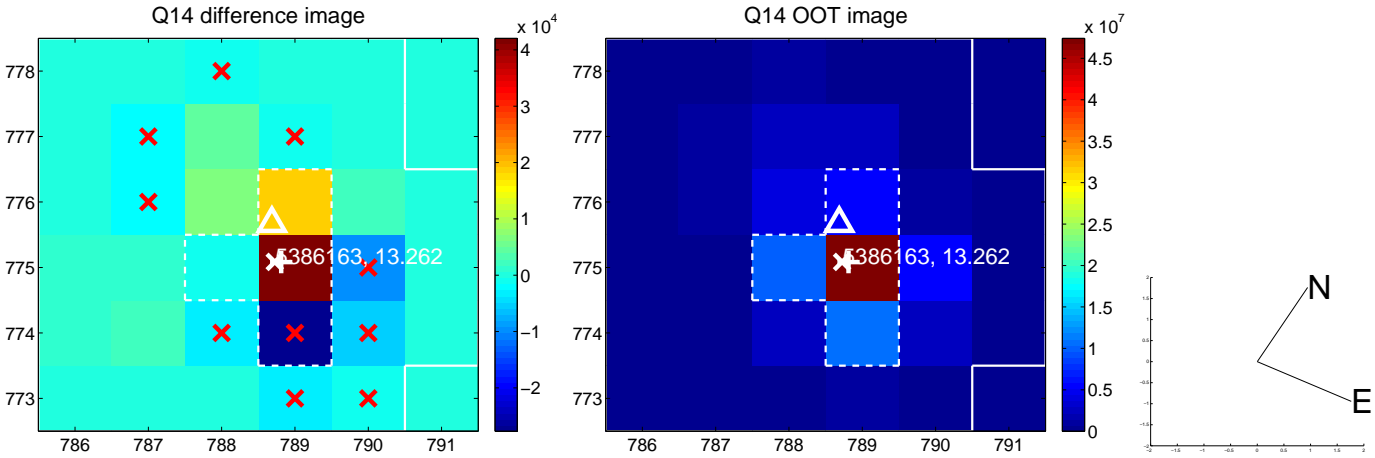
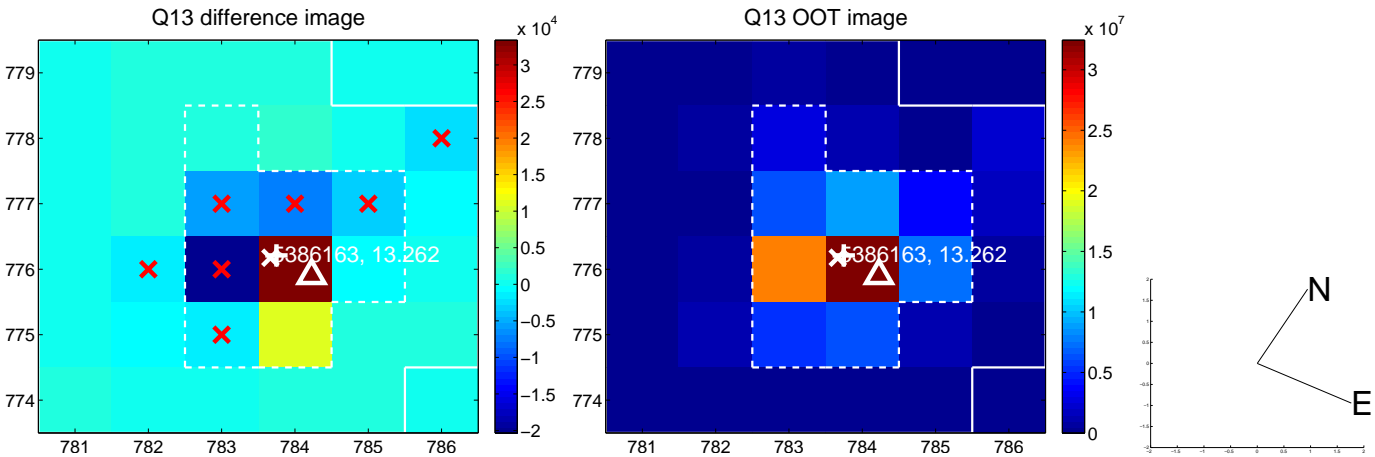




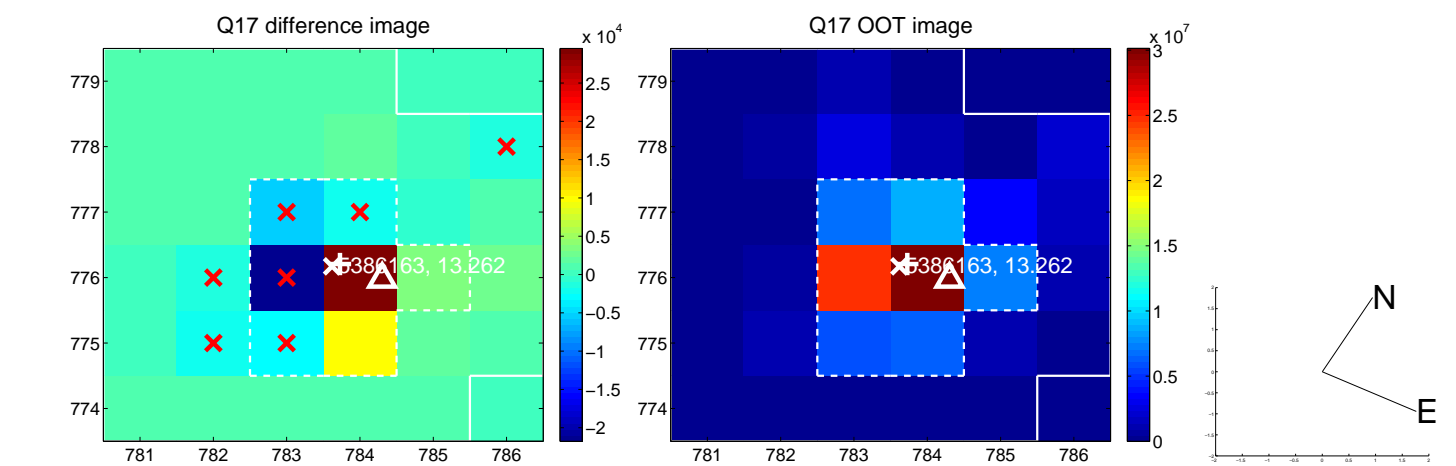
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



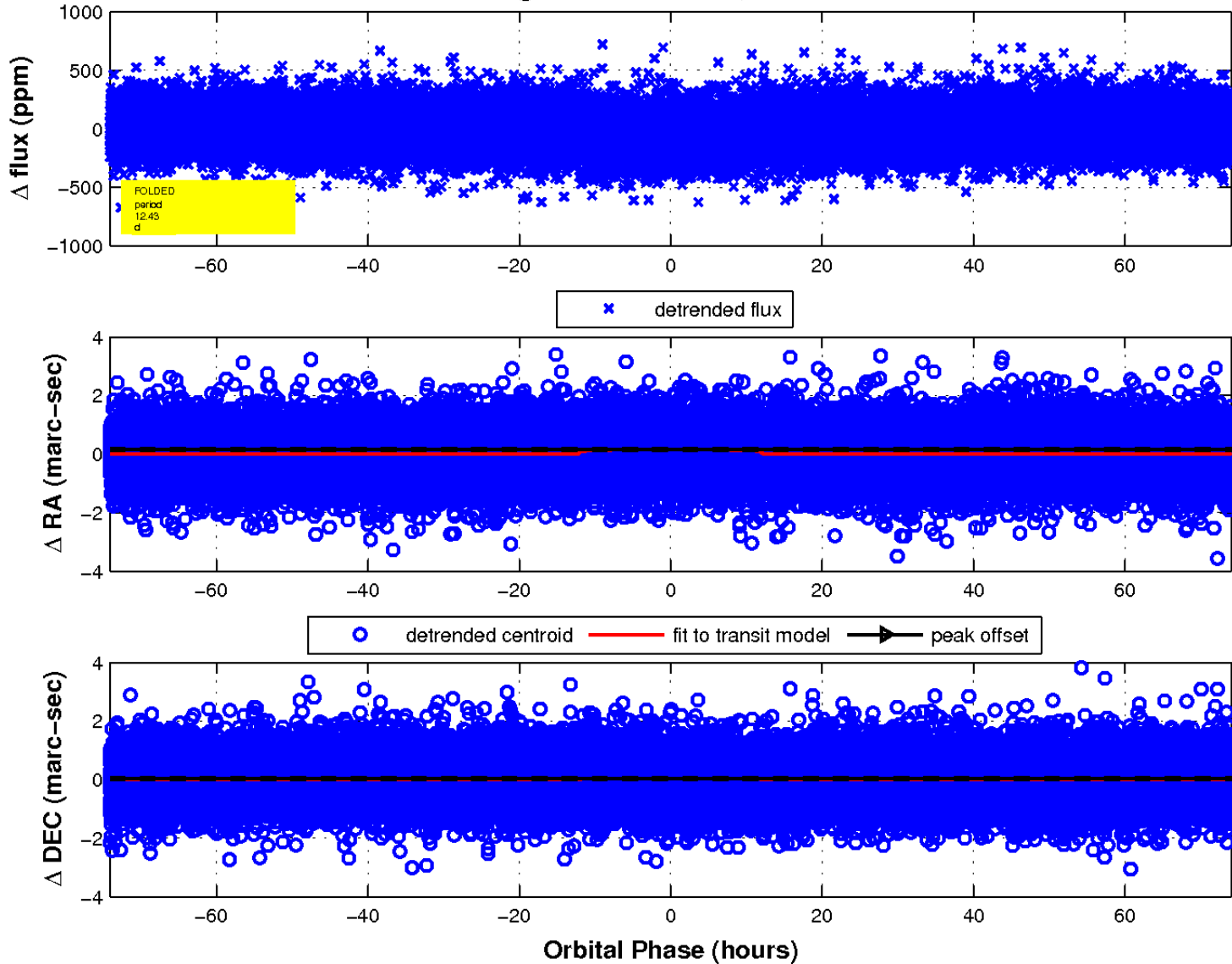
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



fluxWeightedCentroids, Planet 2 of 2



# UKIRT Image

Declination

