

# KIC 009210387

## 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) | $R_p$ ( $R_{\oplus}$ ) | $S_p$ ( $S_{\oplus}$ ) |
|--------------|----------|---------|---------------|--------------|-------------|------------------|------|------|-----------------------------|-----------------|------------------------|------------------------|
| 009210387-01 | OBS      | 2416.01 | 5.906094      | 131.557862   | 330.4       | 2.696            | 11.8 | 13.4 | 0.96                        | 5966            | 2.04                   | 248.34                 |

## Robovetter Results

| TCE          | Run Type | Disp | Score | N | S | C | E | Comments     |
|--------------|----------|------|-------|---|---|---|---|--------------|
| 009210387-01 | OBS      | PC   | 1.00  | 0 | 0 | 0 | 0 | CENT_KIC_POS |

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

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

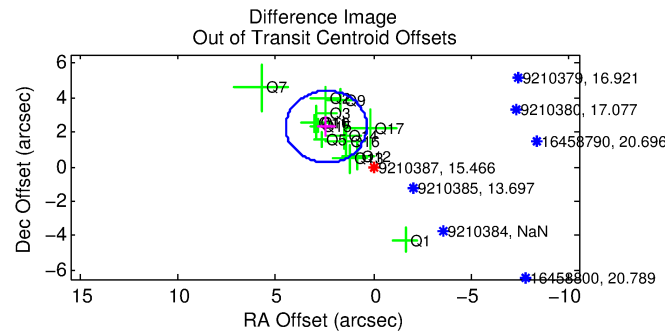
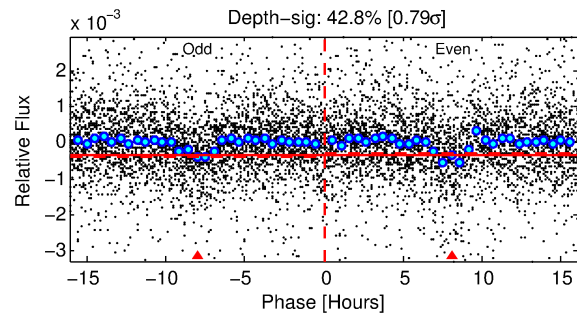
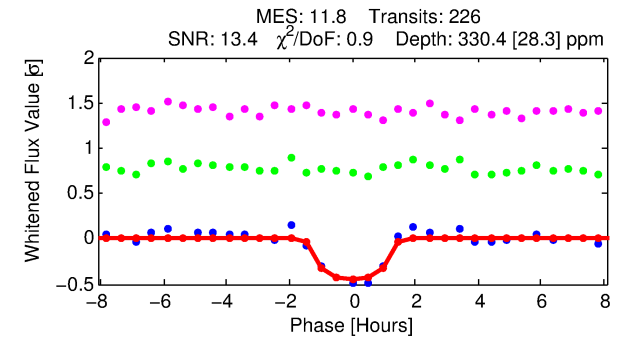
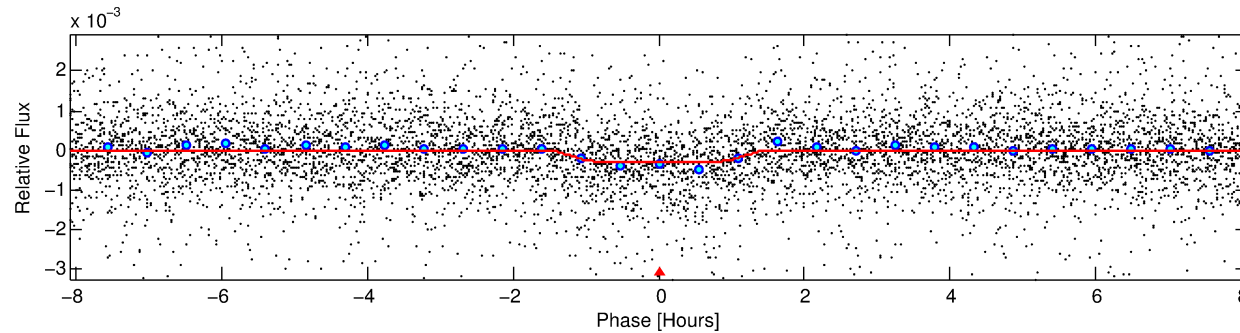
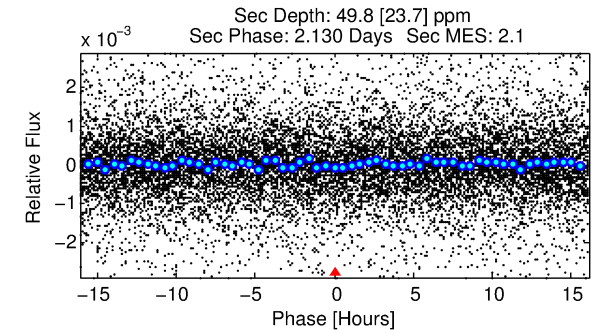
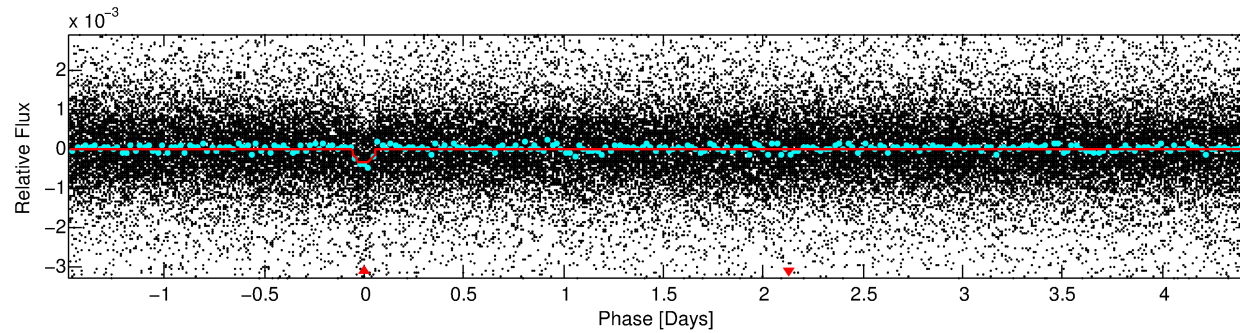
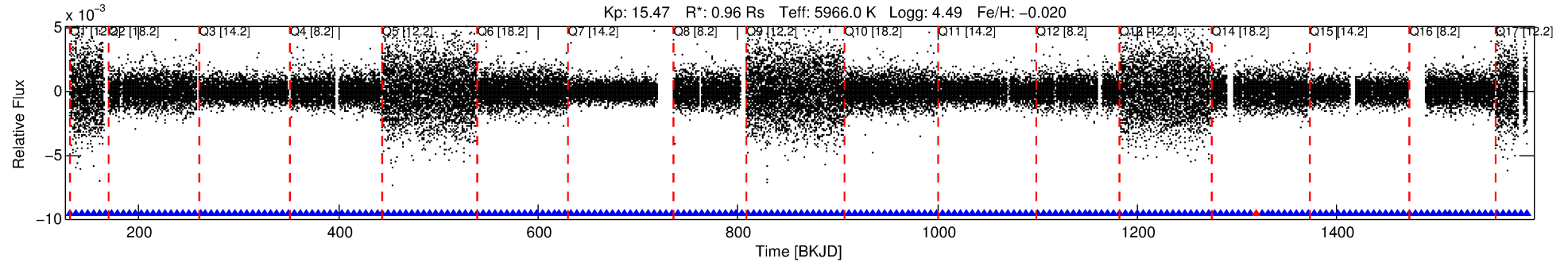
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009210387-01

No Significant Match Found

# DV One-Page Summary

KIC: 9210387 Candidate: 1 of 1 Period: 5.906 d  
KOI: K02416.01 Corr: 0.942



## DV Fit Results:

Period = 5.90609 [0.00003] d  
Epoch = 131.5579 [0.0041] BKJD  
Rp/R\* = 0.0195 [0.0087]  
a/R\* = 8.52 [18.41]  
b = 0.88 [0.55]  
Seff = 248.34 [103.06]  
Teq = 1012 [105] K  
Rp = 2.04 [1.11] Re  
a = 0.0650 [0.0173] AU  
Ag = 27.75 [30.11] [0.89σ]  
Teffp = 3592 [917] K [2.79σ]

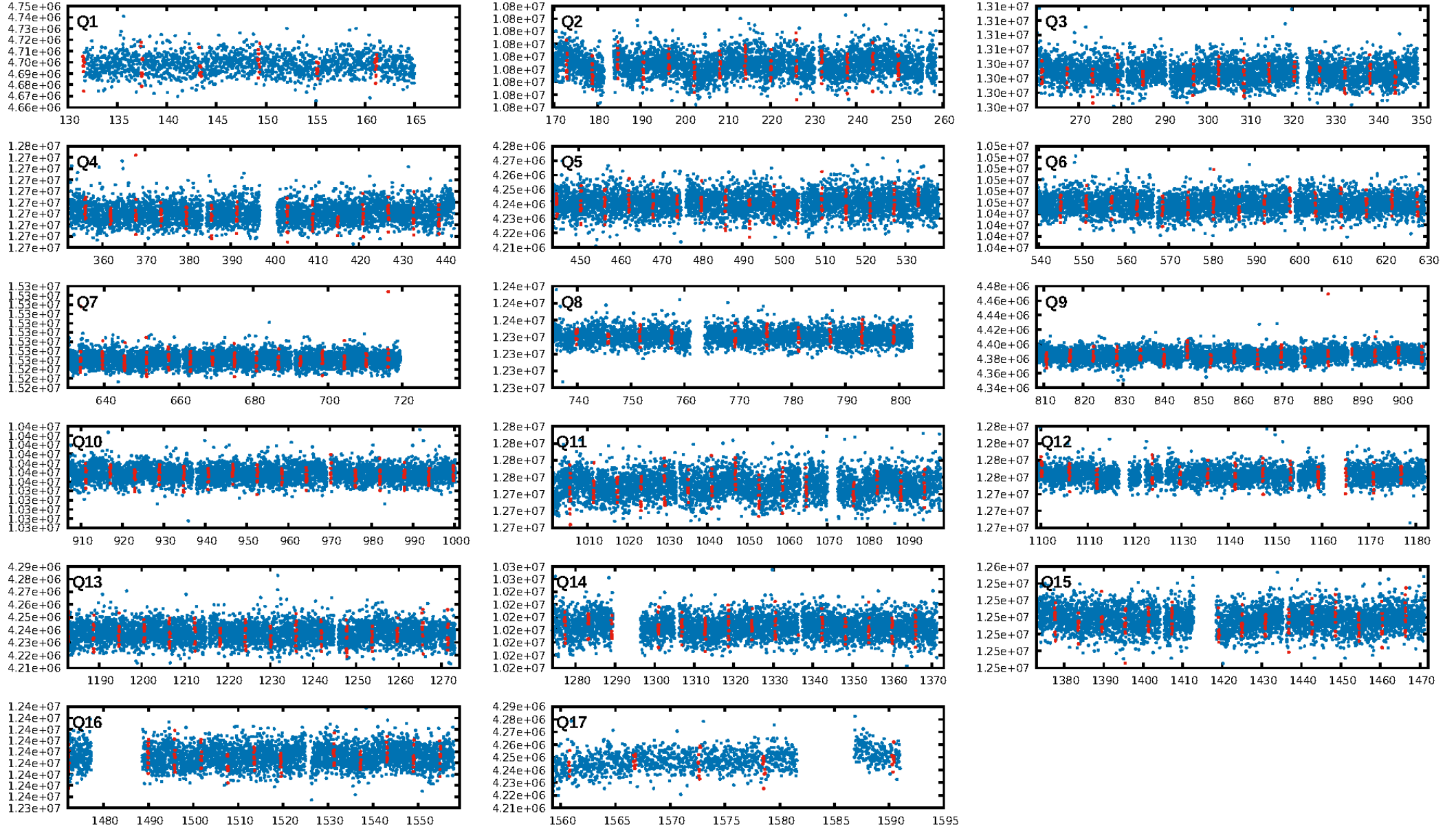
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 1.39e-31  
RollingBand-fgt: 1.00 [214/215]  
GhostDiagnostic-chr: -17.6  
Centroid-sig: 0.2%  
Centroid-so: 1.822 arcsec [4.07σ]  
OotOffset-rm: 3.346 arcsec [4.84σ]  
KicOffset-rm: 0.061 arcsec [0.14σ]  
OotOffset-st: 3/4/2/5 [14]  
KicOffset-st: 3/4/2/5 [14]  
DiffImageQuality-fgm: 0.79 [11/14]  
DiffImageOverlap-fno: 1.00 [17/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 28-Jan-2016 22:44:15 Z

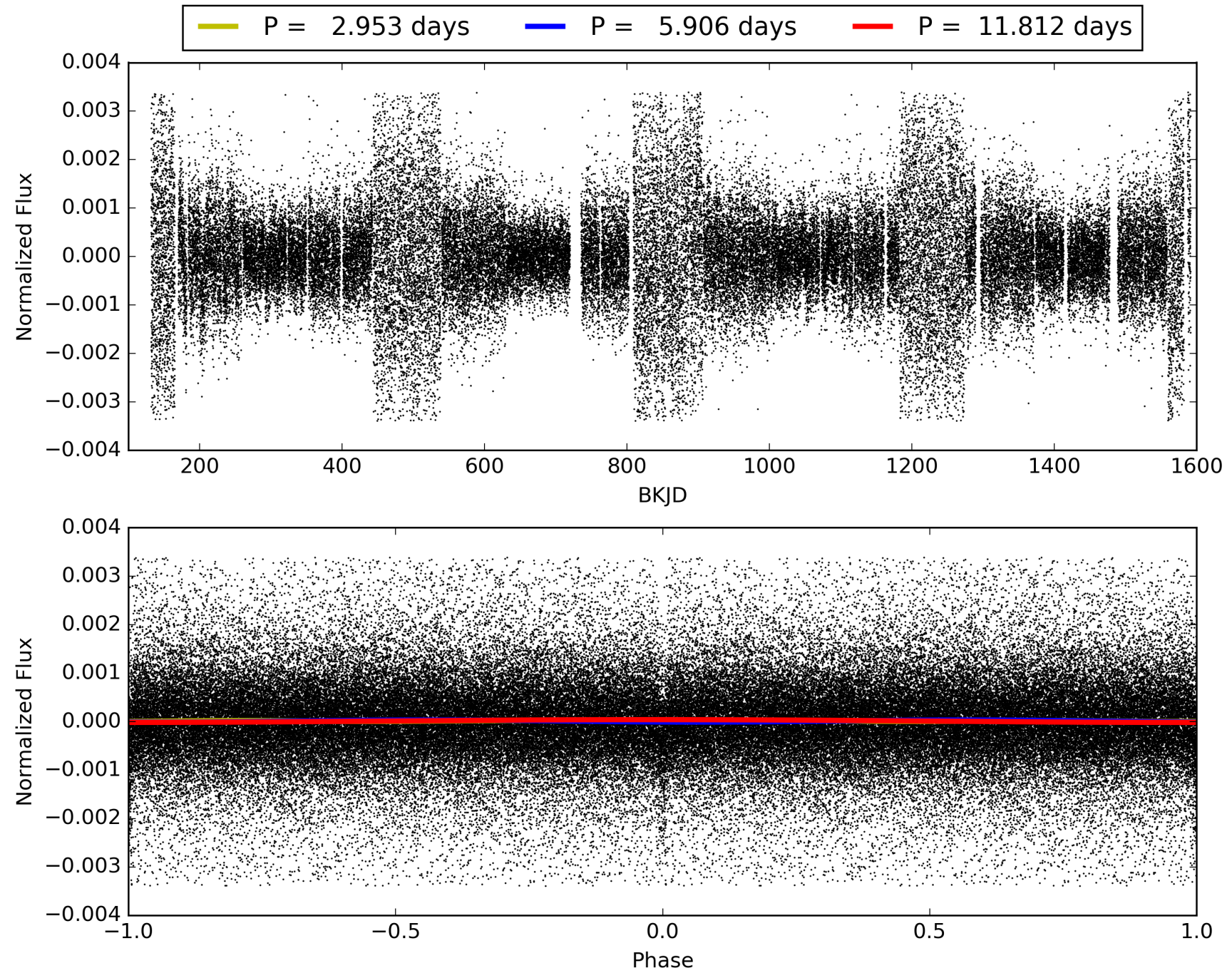
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 009210387-01, PDC Light Curves



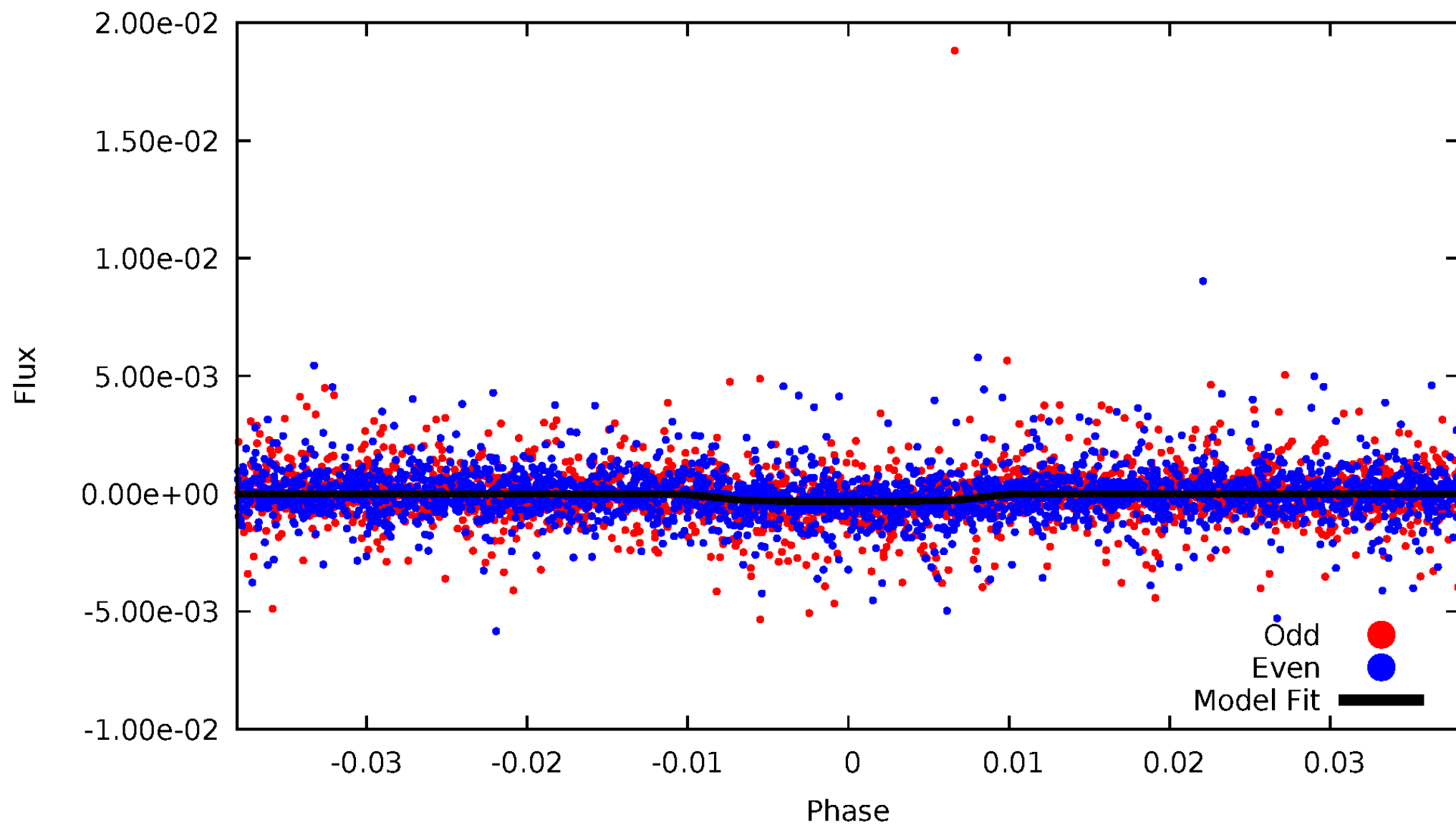


TCE 009210387-01



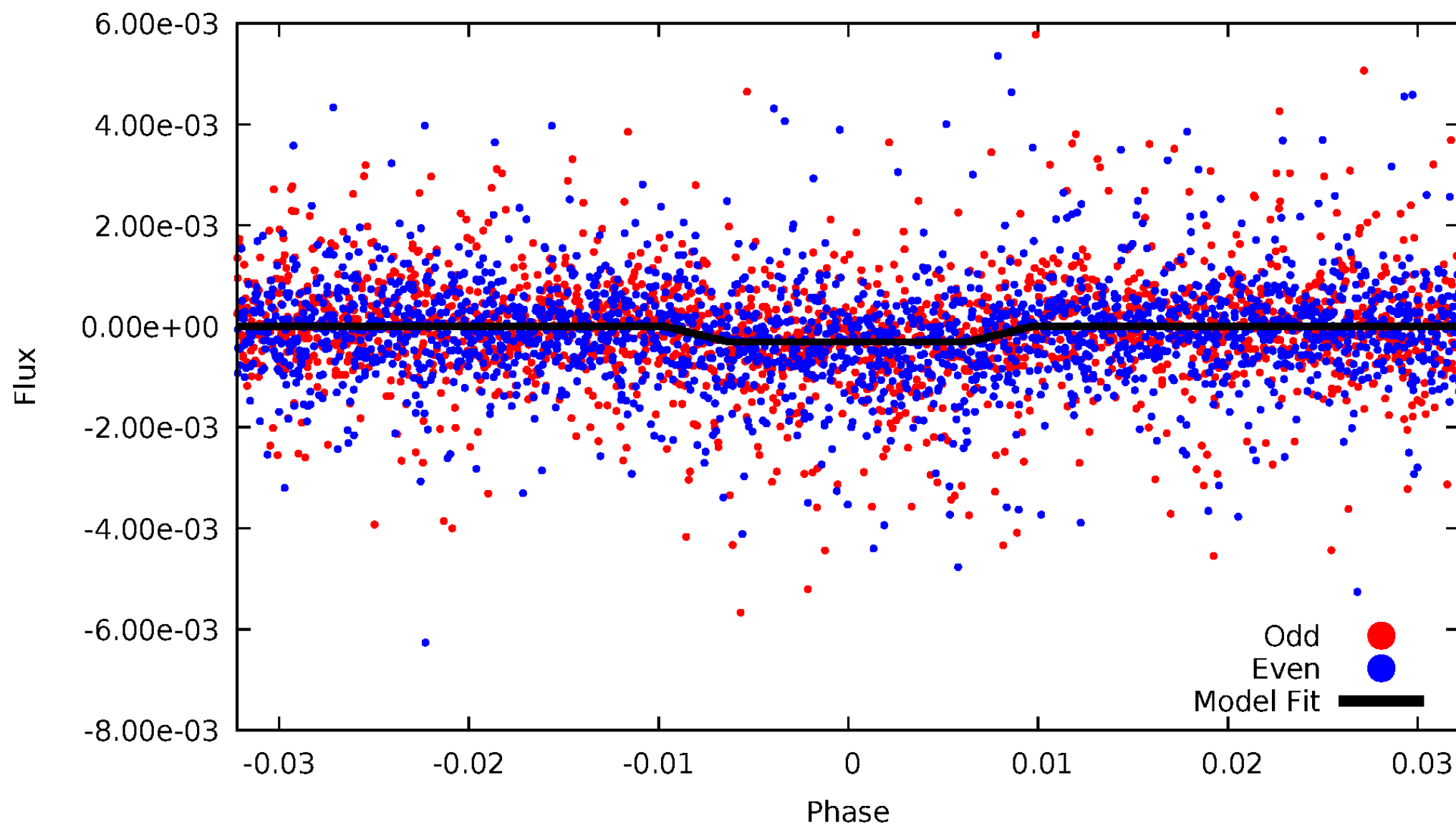
# DV Odd/Even

TCE 009210387-01



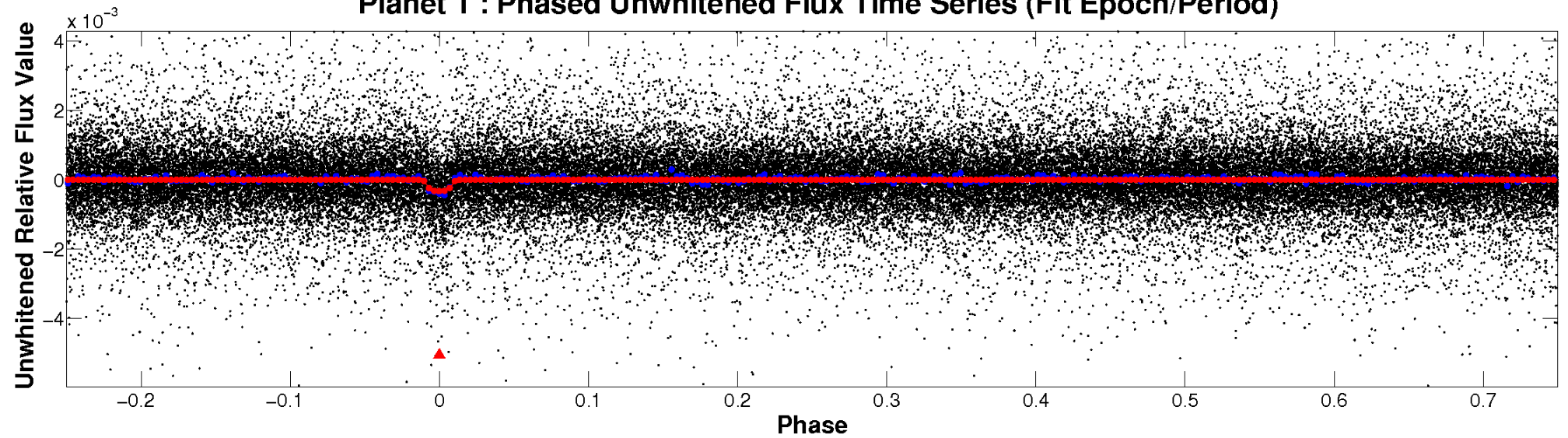
# ALT Odd/Even

TCE 009210387-01

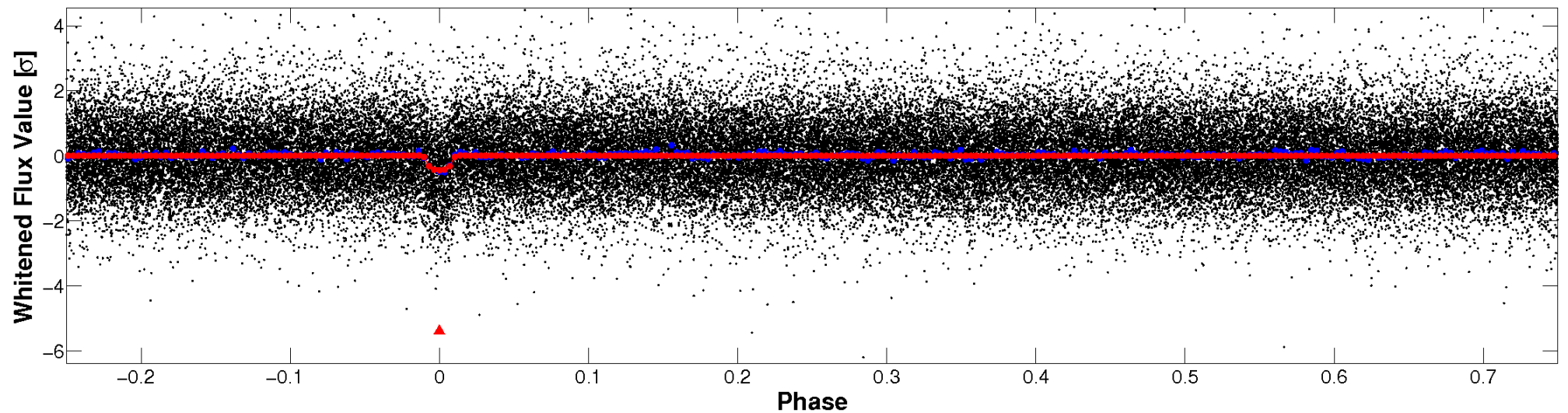


# Non-Whitened Vs. Whitened Light Curve

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



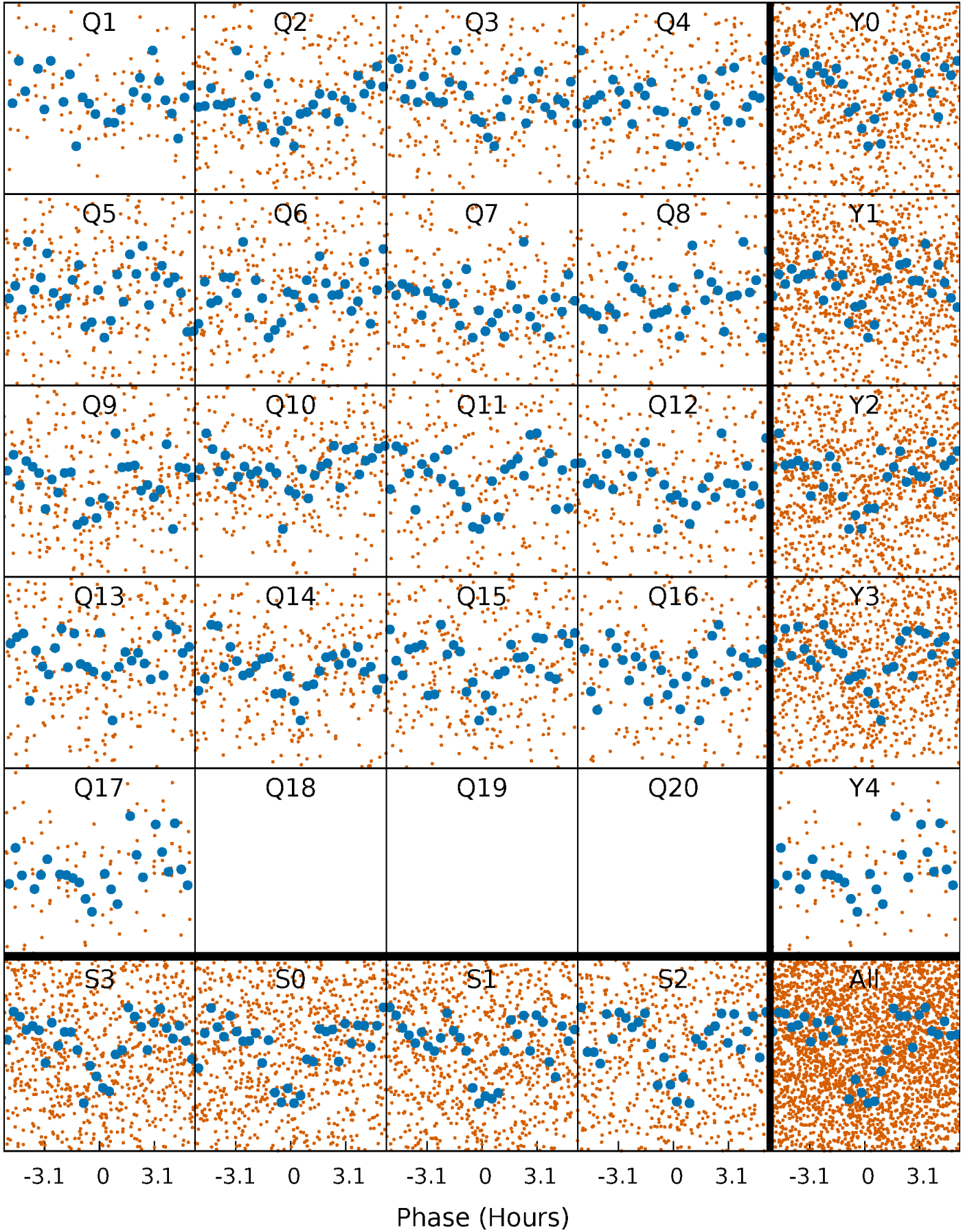
**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**





# PDC Quarter-Phased Transit Curves

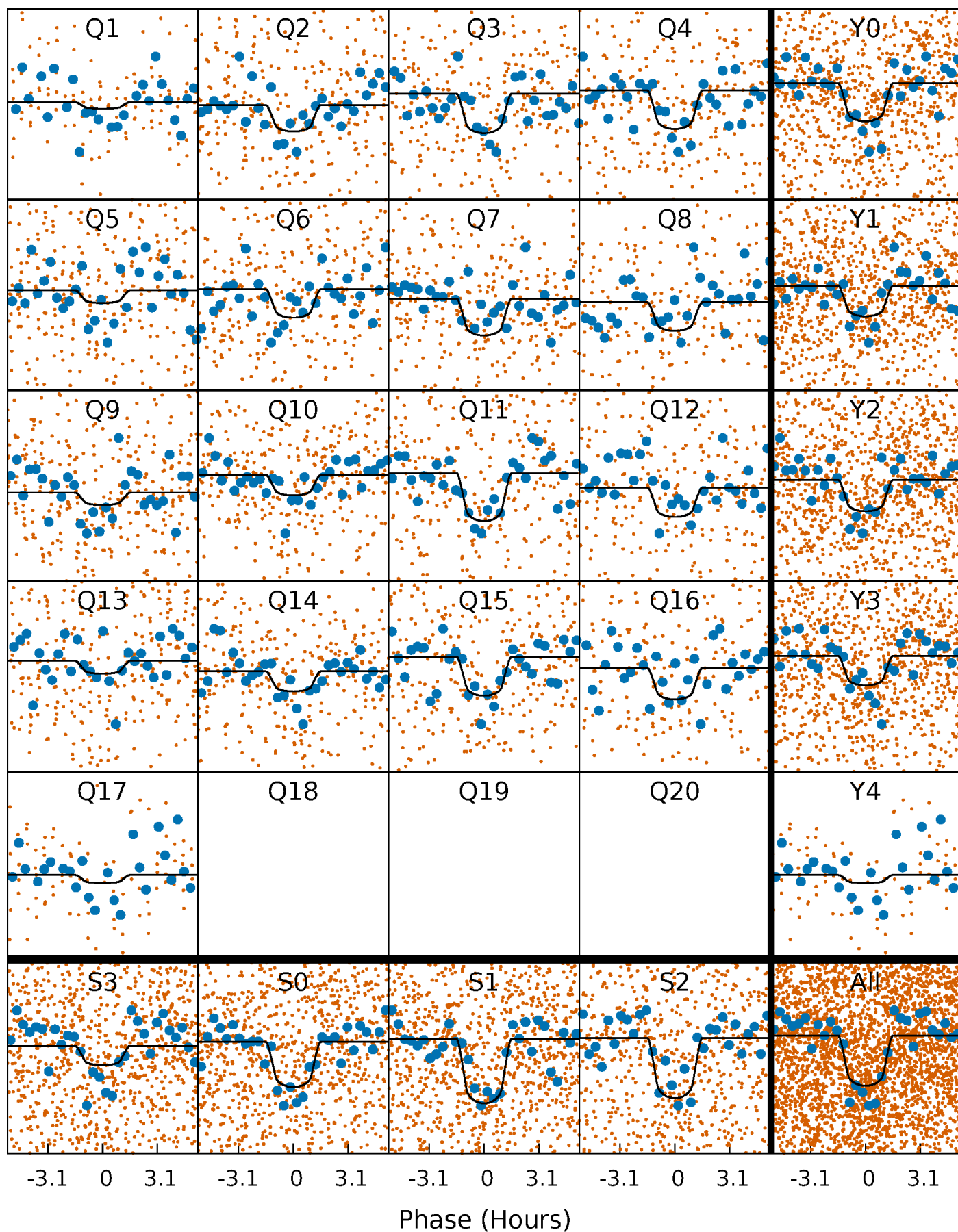
TCE 009210387-01 P= 5.906094 Days  $T_0=131.557862$  (BKJD)





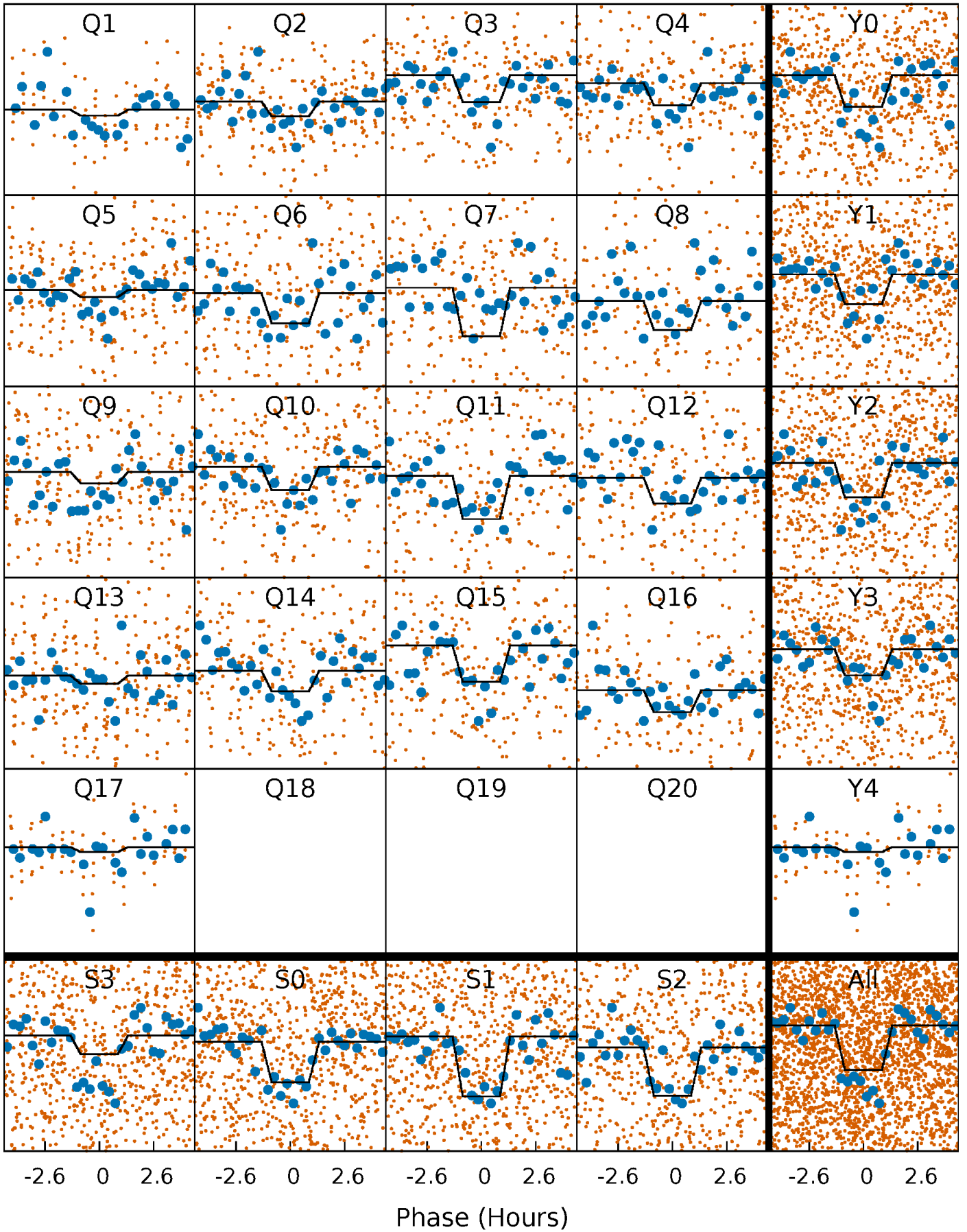
# DV Quarter-Phased Transit Curves

TCE 009210387-01 P= 5.906094 Days  $T_0=131.557862$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

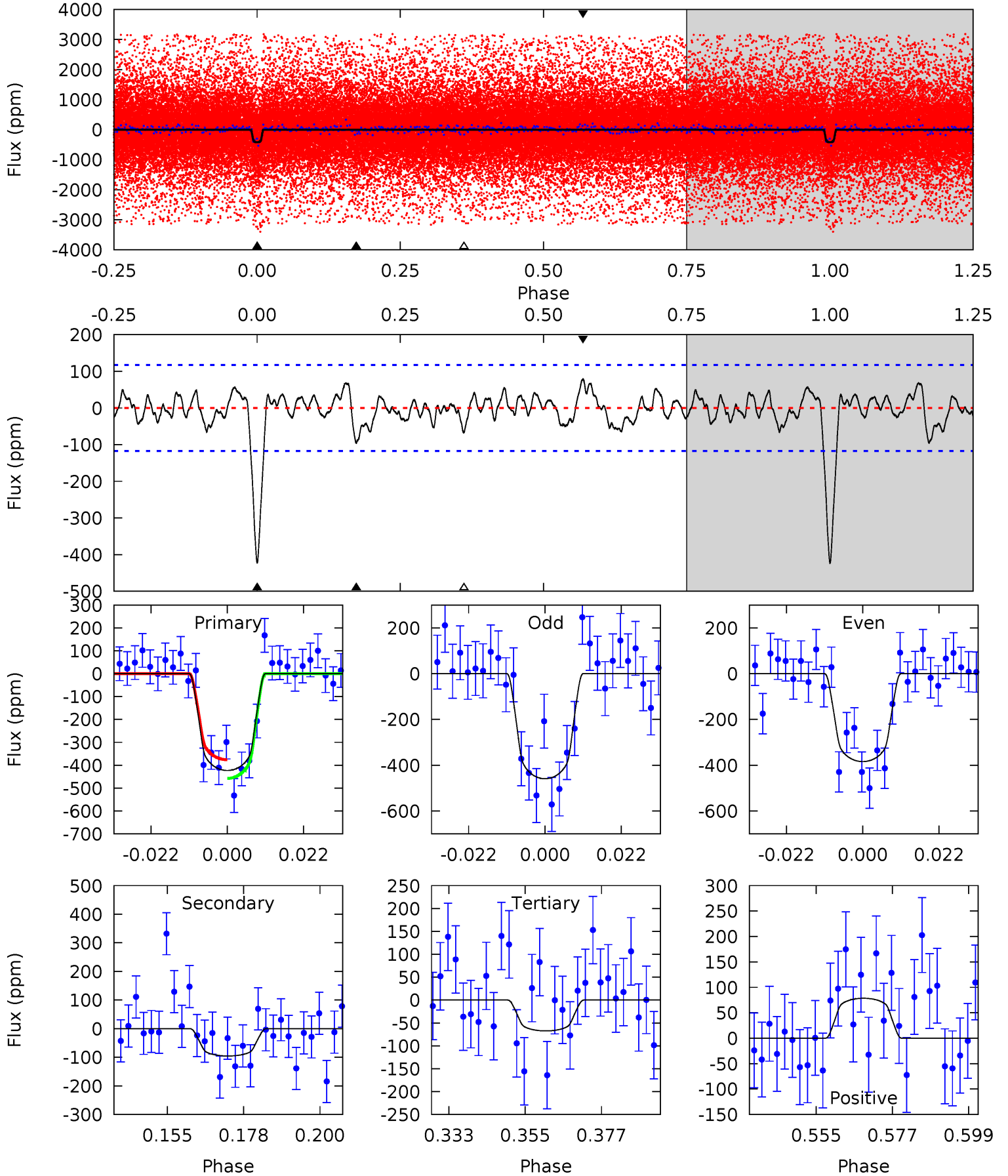
TCE 009210387-01 P= 5.906078 Days  $T_0=131.559994$  (BKJD)



# DV Model-Shift Uniqueness Test

009210387-01,  $P = 5.906094$  Days,  $E = 125.651768$  Days

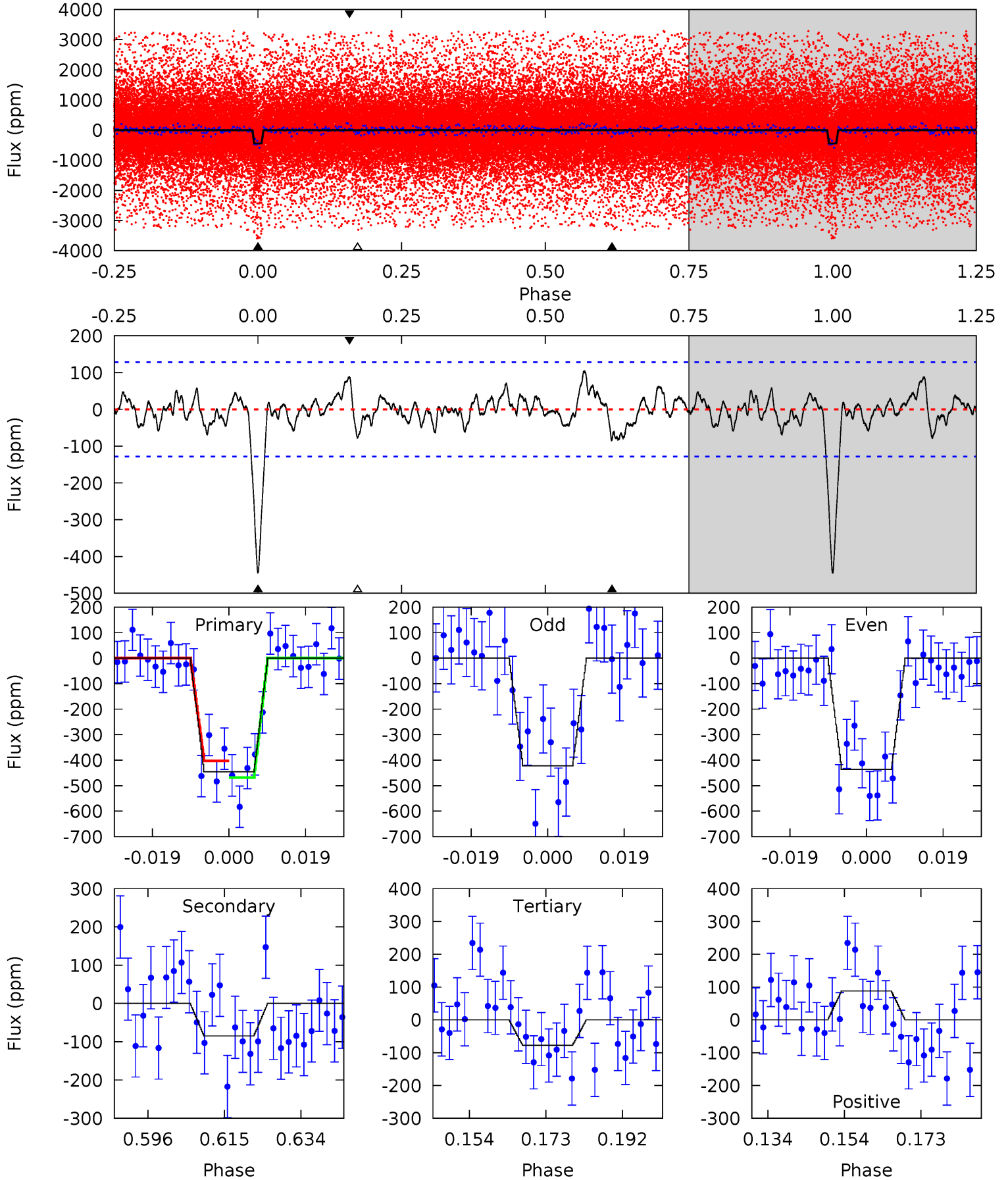
| Pri  | Sec  | Ter  | Pos  | FA <sub>1</sub> | FA <sub>2</sub> | F <sub>Red</sub> | Pri-Ter | Pri-Pos | Sec-Ter | Sec-Pos | Odd-Evn | DMM  | Shape | TAT  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 17.5 | 3.96 | 2.79 | 3.26 | 4.87            | 2.29            | 1.19             | 14.8    | 14.3    | 1.17    | 0.70    | 1.57    | 1.12 | 0.16  | 1.71 |



# Alt Model-Shift Uniqueness Test

009210387-01, P = 5.906078 Days, E = 125.653916 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  |
|------|------|------|------|-----------------|-----------------|------------------|---------|---------|---------|---------|---------|------|-------|------|
| 17.0 | 3.25 | 2.97 | 3.37 | 4.90            | 2.34            | 1.19             | 14.1    | 13.7    | 0.28    | -0.12   | 0.27    | 1.26 | 0.19  | 1.26 |





### Stellar Parameters For KIC 009210387

|        | $T_{\text{eff}}(K)$  | $\log(g)$                 | [Fe/H]                     | $R$ ( $R_{\odot}$ )       | $M(M_{\odot})$            | $p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ ) |
|--------|----------------------|---------------------------|----------------------------|---------------------------|---------------------------|---|
|        | $5966^{+186}_{-207}$ | $4.493^{+0.040}_{-0.216}$ | $-0.020^{+0.250}_{-0.350}$ | $0.961^{+0.299}_{-0.100}$ | $1.049^{+0.126}_{-0.140}$ | $1.665^{+0.358}_{-0.904}$                     |
|        | +3%/-3%              | +1%/-5%                   | +1250%/-1750%              | +31%/-10%                 | +12%/-13%                 | +22%/-54%                                     |
| Source | PHO1                 | KIC0                      | KIC0                       | DSEP                      |                           |   |

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

### Secondary Eclipse Parameters for KIC 009210387-01 / KOI 2416.01

| Detrend | Depth (ppm)  | $R_p$ ( $R_{\oplus}$ ) | $T_{\text{max}}$ (K) | $T_{\text{obs}}$ (K)  | $A_{\text{obs}}$  |
|---------|--------------|------------------------|----------------------|-----------------------|-------------------|
| DV      | $-96 \pm 24$ | $2.16^{+1.04}_{-0.97}$ | $1453^{+108}_{-72}$  | $4406^{+1229}_{-615}$ | $46^{+105}_{-26}$ |
| Alt.    | $-85 \pm 26$ | $1.97^{+0.97}_{-0.93}$ | $1449^{+99}_{-73}$   | $4469^{+1469}_{-712}$ | $50^{+136}_{-31}$ |

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

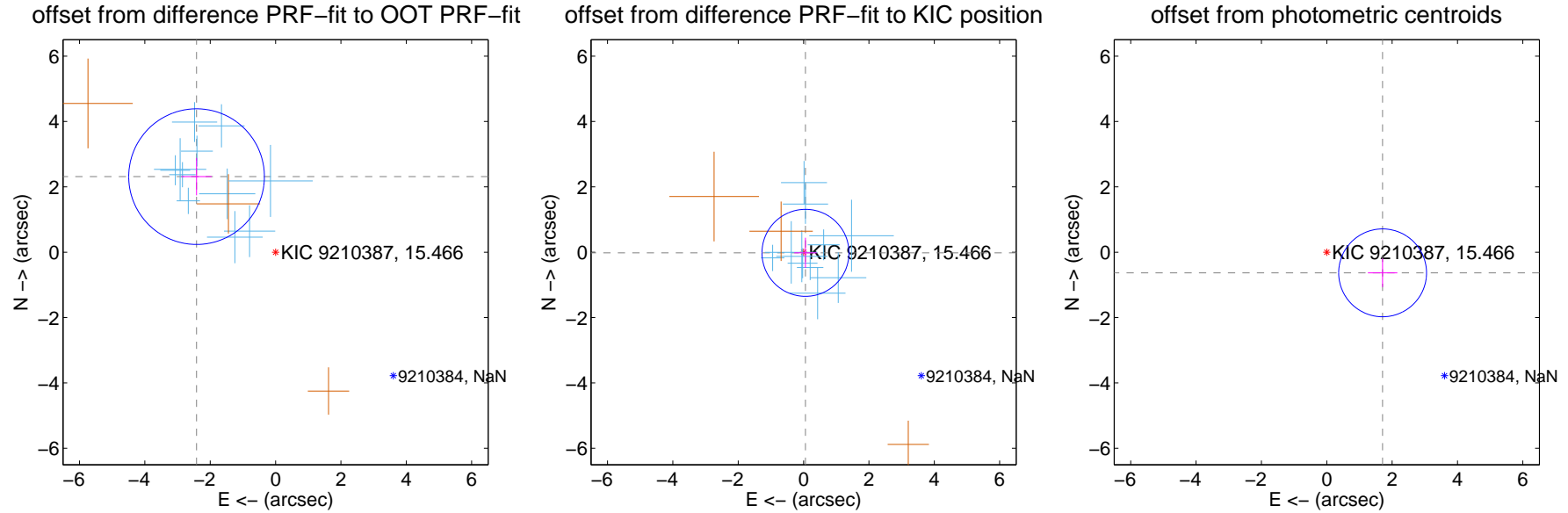
## DV Centroid Data

Supplemental centroid analysis for 009210387-01. Kepler magnitude: 15.47. Transit SNR 13.36

There are 11 quarters with good PRF difference image offsets

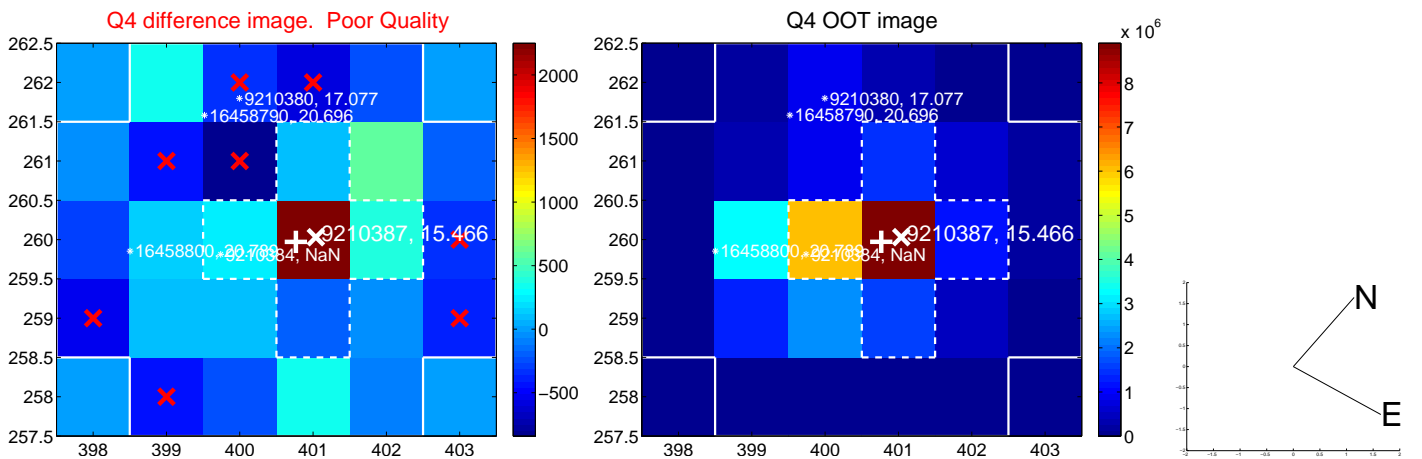
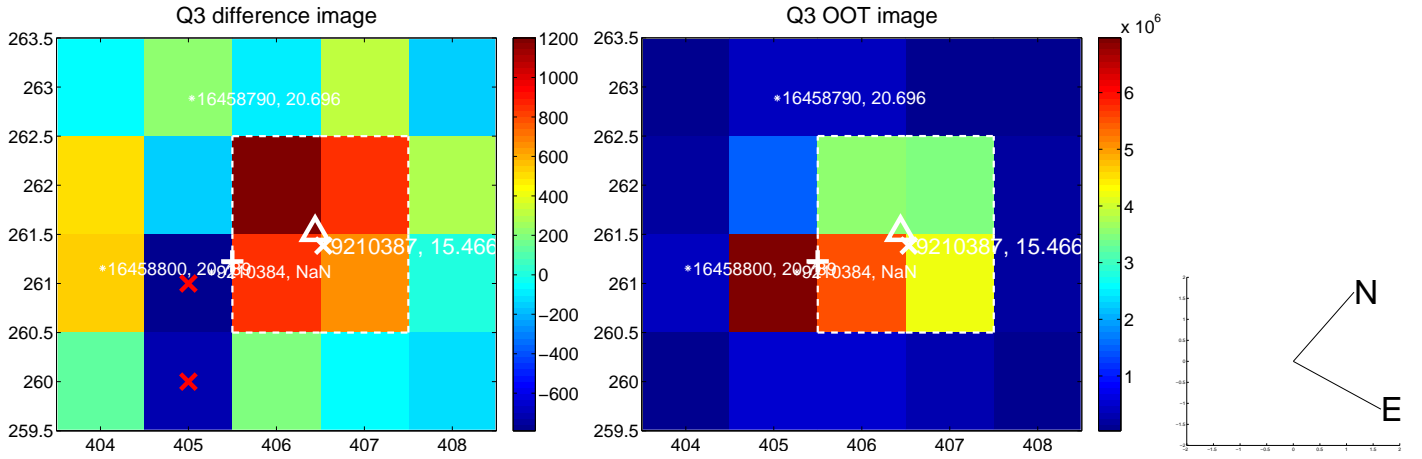
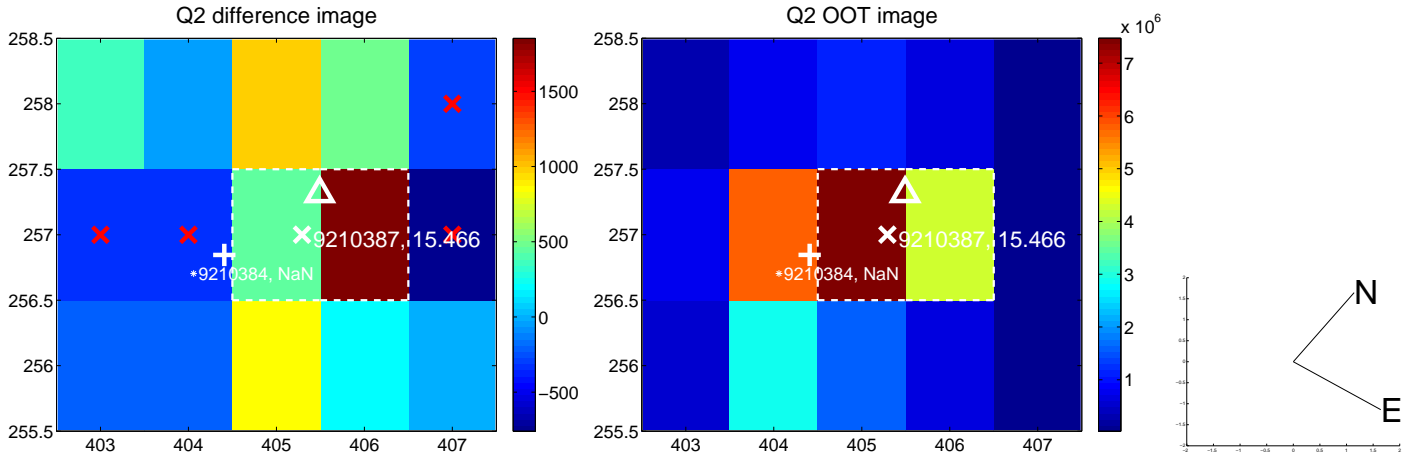
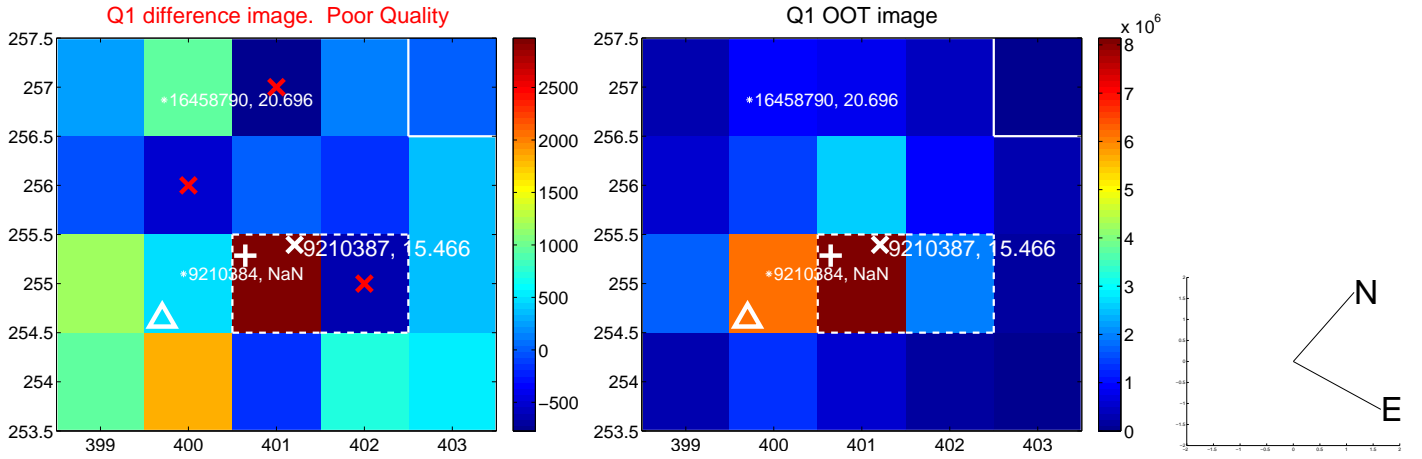
The OOT PRF centroid is offset from the target star catalog position by about 2.33 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

|   | Distance in arcsec | Distance / $\sigma$ | $\Delta$ RA        | $\Delta$ Dec       |
|---|--------------------|---------------------|--------------------|--------------------|
| PRF-fit source offset from OOT          | $3.346 \pm 0.692$  | 4.84                | $2.418 \pm 0.461$  | $2.313 \pm 0.571$  |
| PRF-fit source offset from KIC position | $0.061 \pm 0.444$  | 0.14                | $-0.058 \pm 0.343$ | $-0.020 \pm 0.462$ |
| photometric centroid source offset      | $1.82 \pm 0.45$    | 4.07                | $-1.71 \pm 0.45$   | $-0.63 \pm 0.44$   |

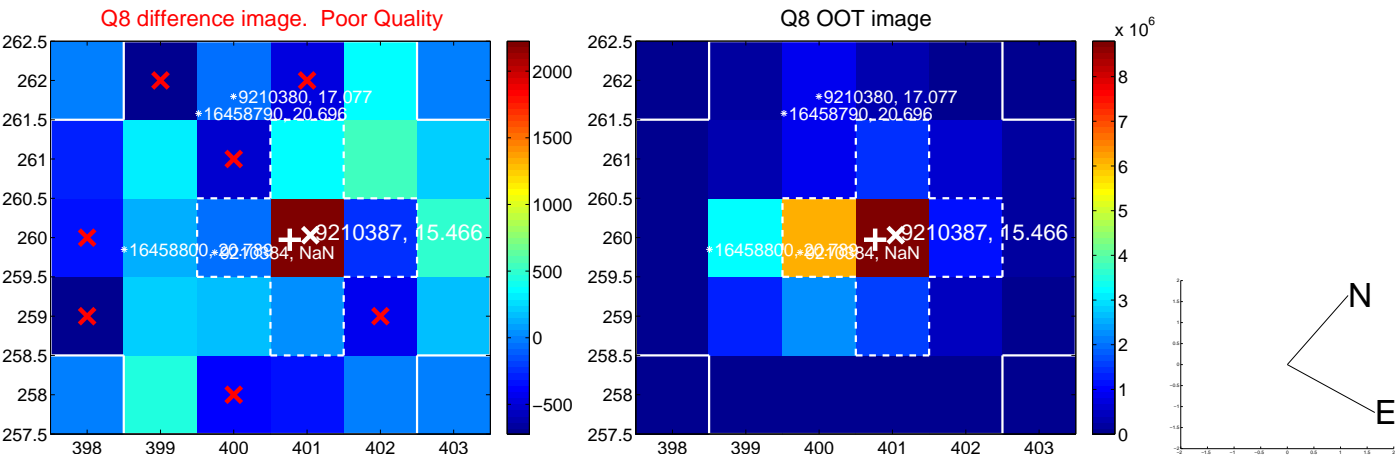
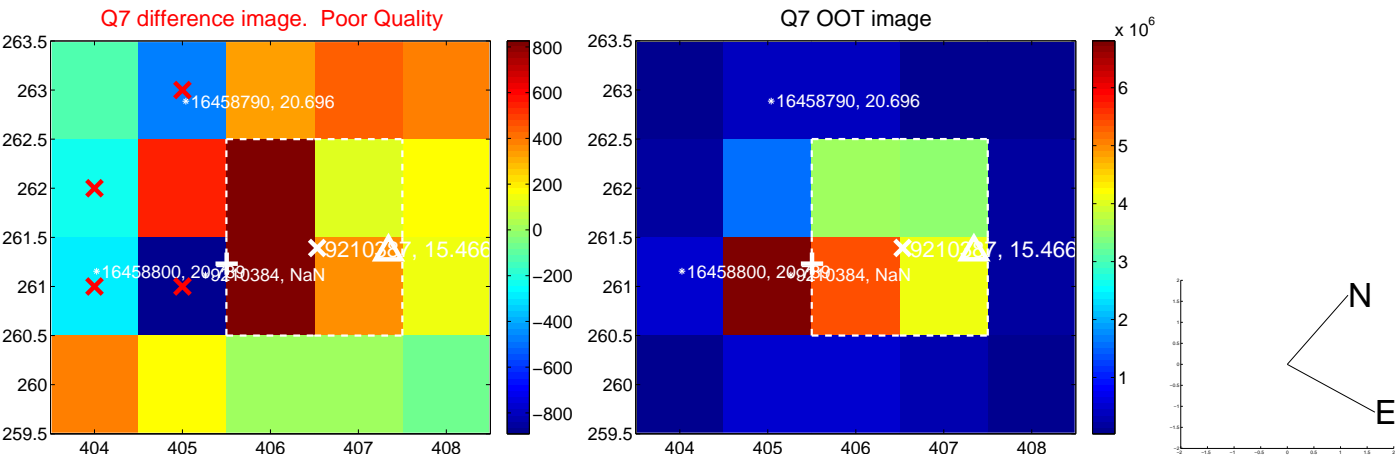
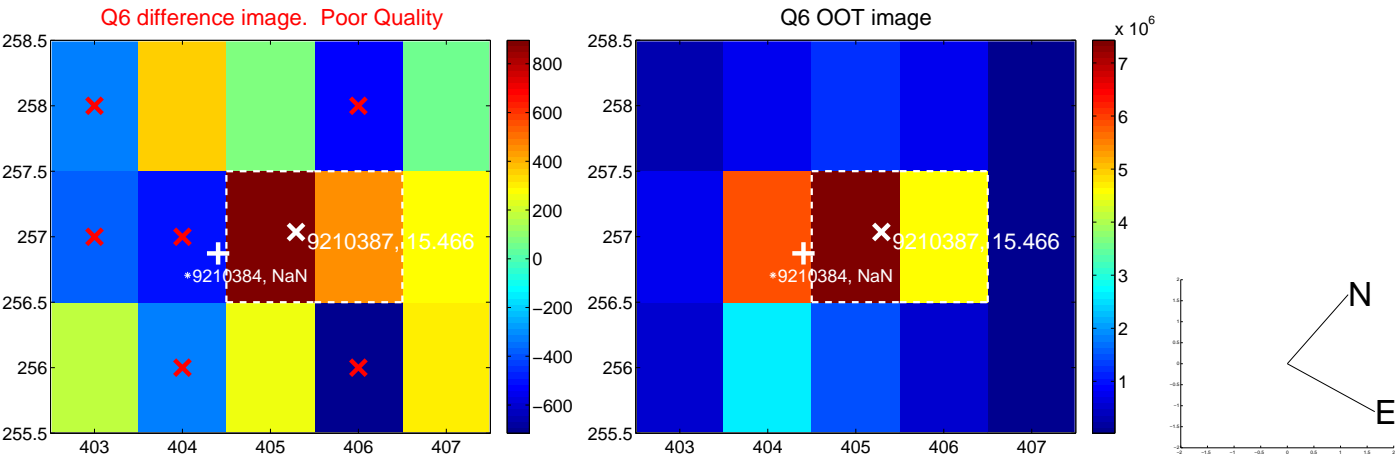
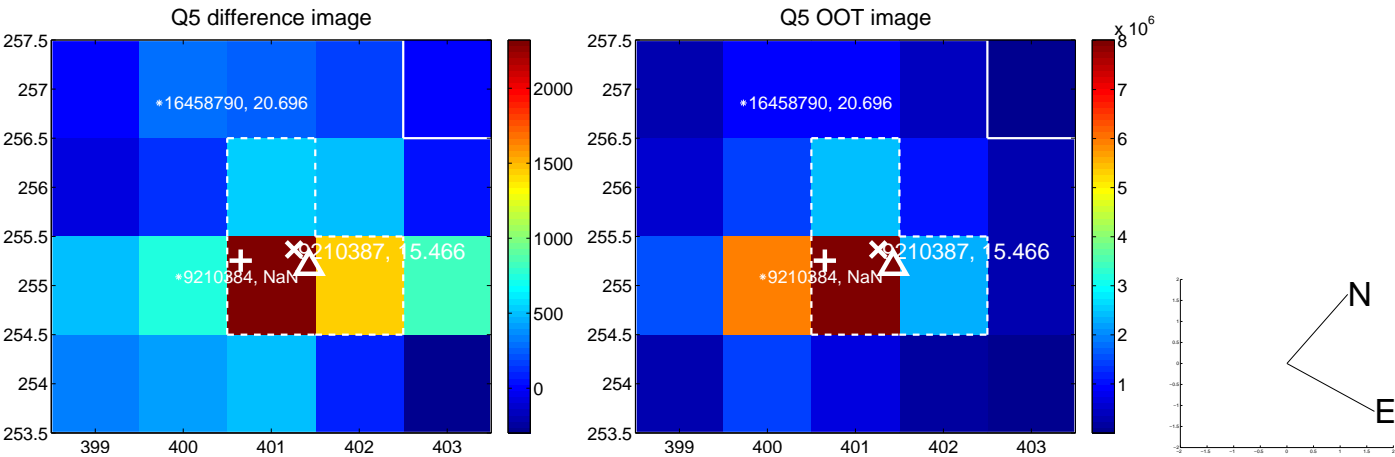


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

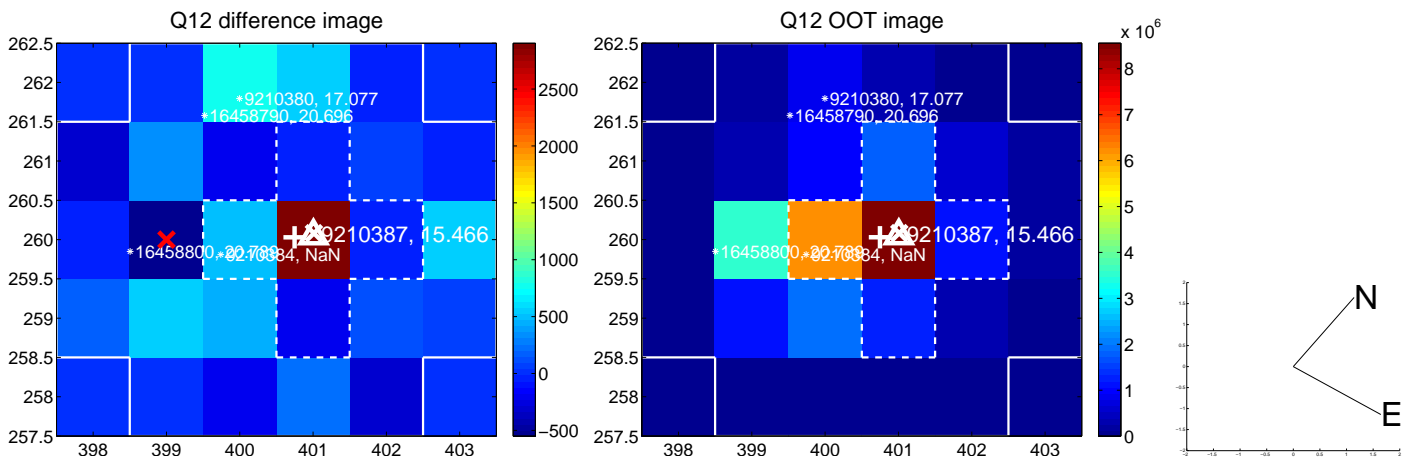
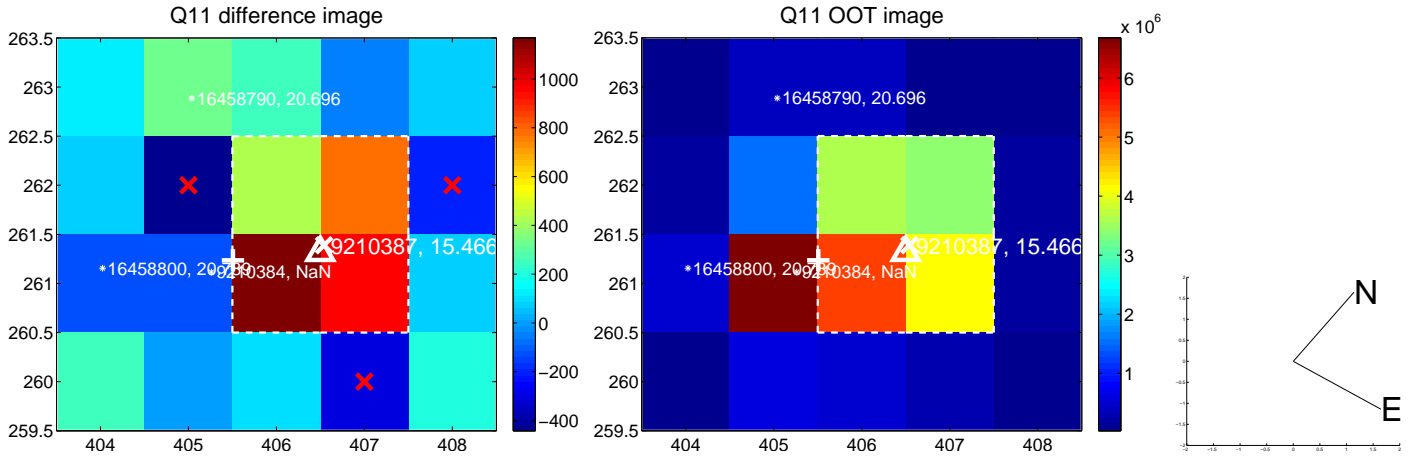
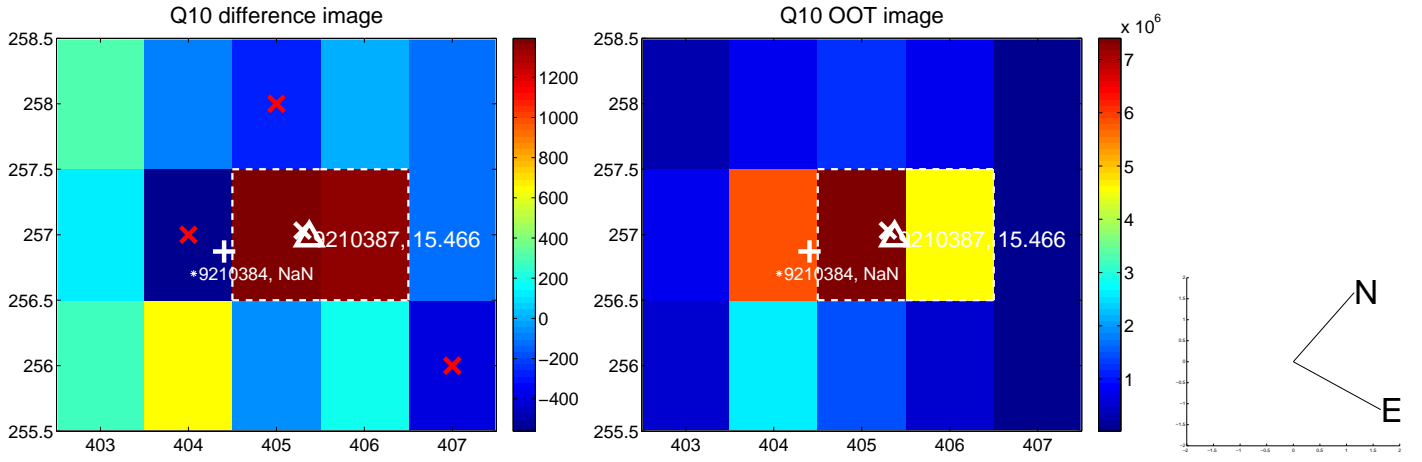
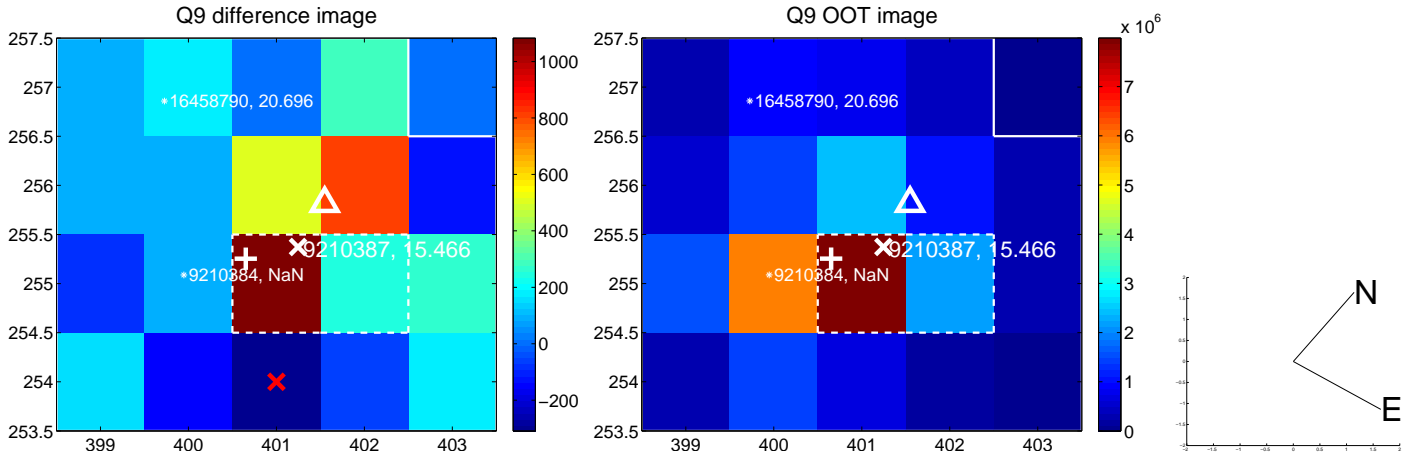


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

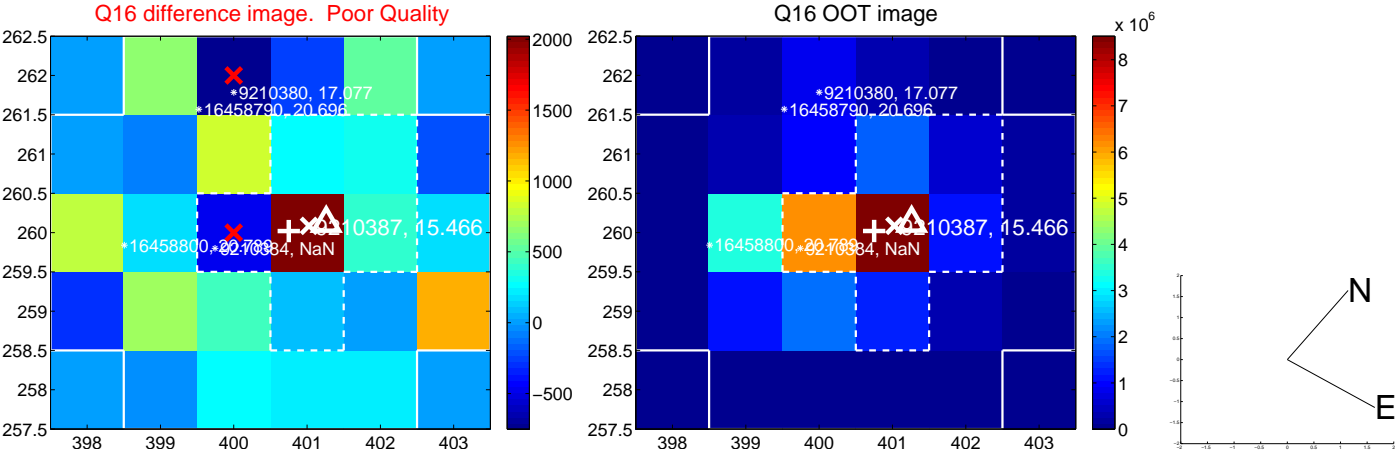
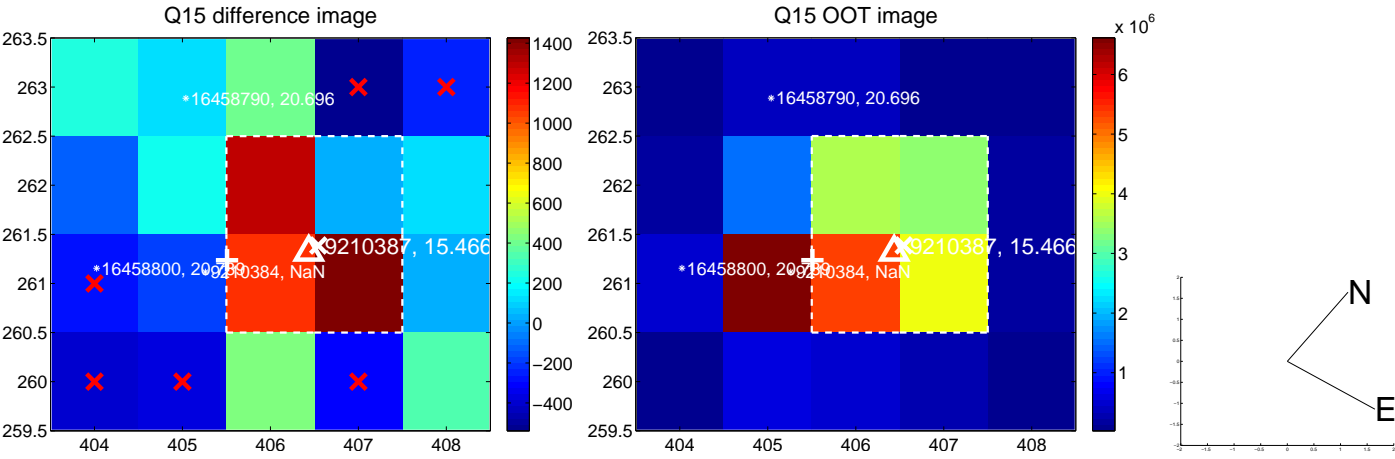
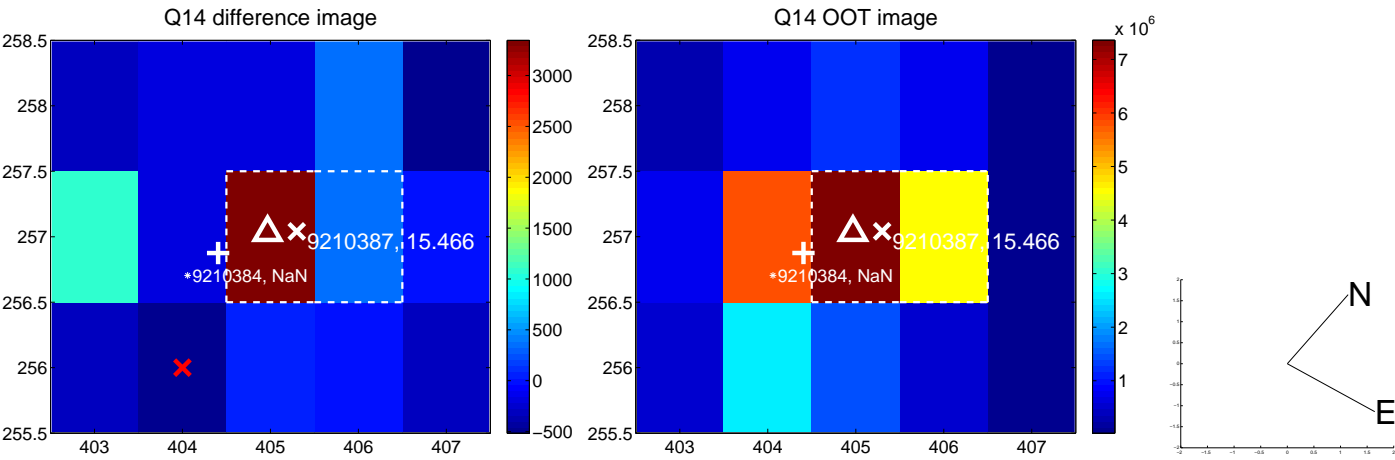
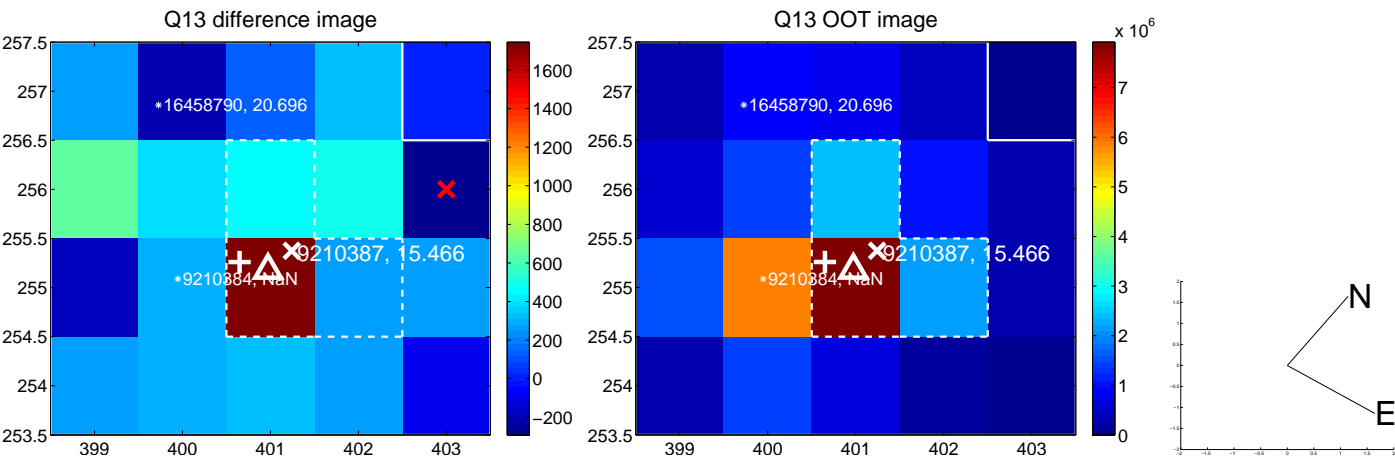




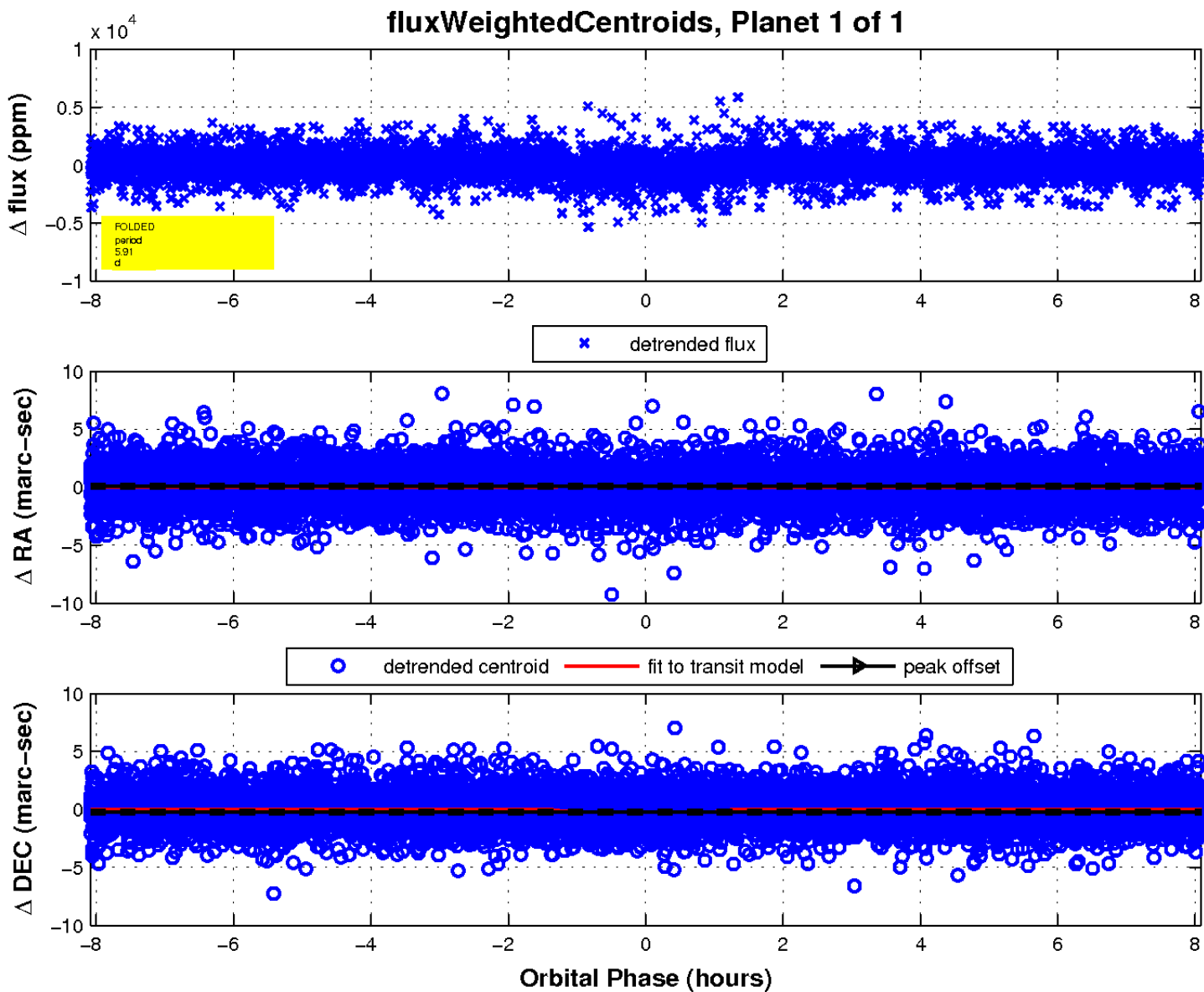
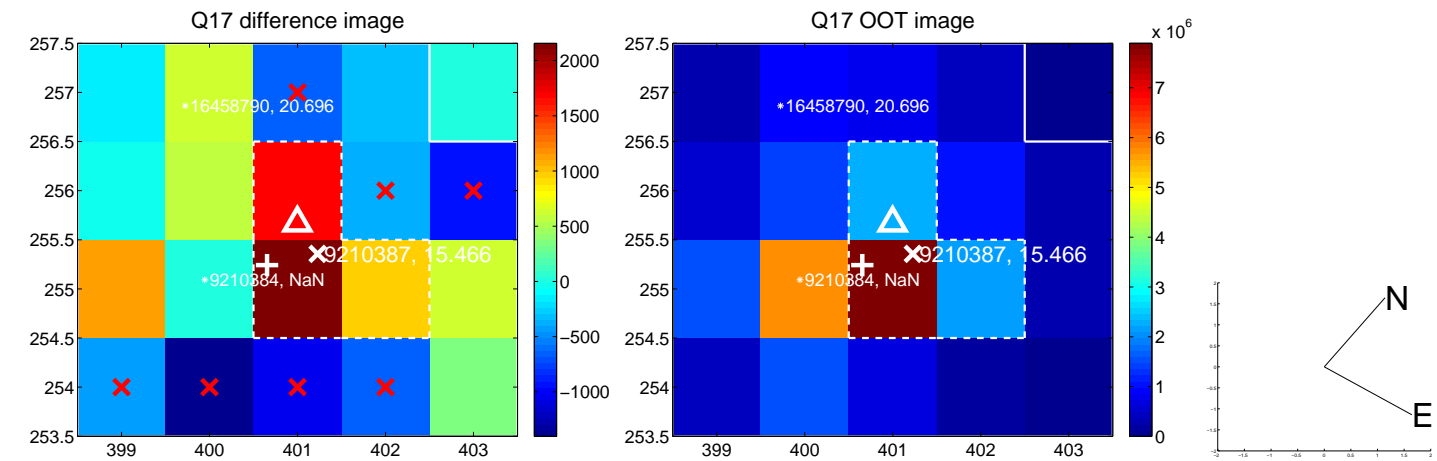
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



# UKIRT Image

Declination

