

# KIC 009851226

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009851226-01	OBS	1468.01	8.480289	135.855397	1325.9	7.148	75.4	79.6	0.99	5951	4.33	168.30
009851226-02	OBS	No	8.480809	132.650997	172.1	9.844	12.6	13.2	0.99	5951	1.64	168.29

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009851226-01	OBS	FP	0.00	0	1	1	1	MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE—CENT_FEW_DIFFS—HALO_GHOST—EPHEM_MATCH
009851226-02	OBS	FP	0.00	1	1	0	1	IS_SEC_TCE—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.

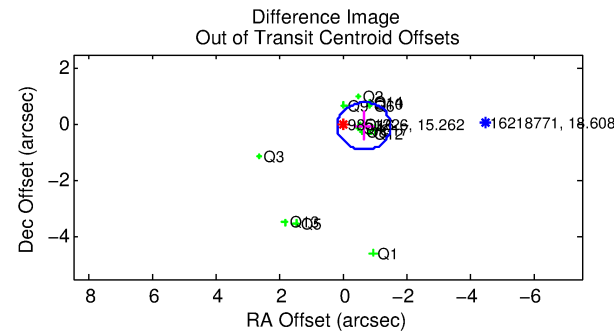
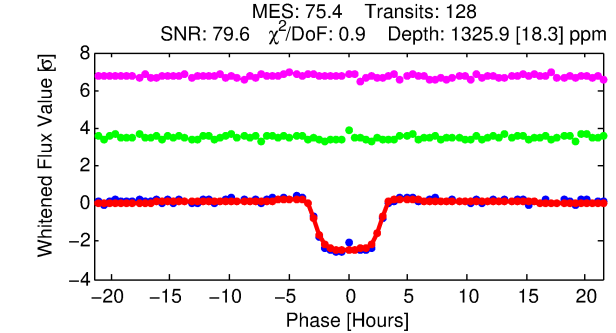
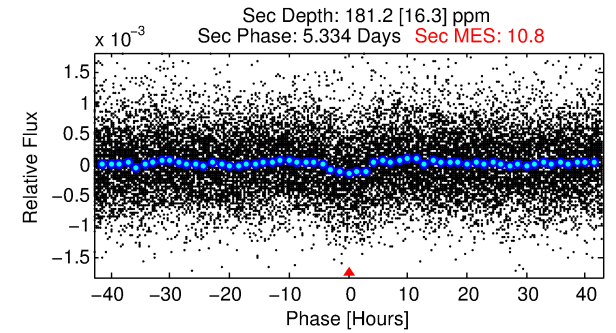
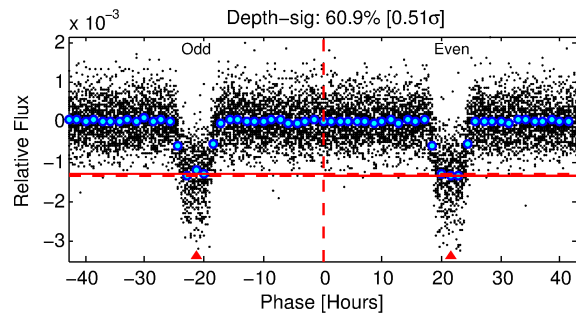
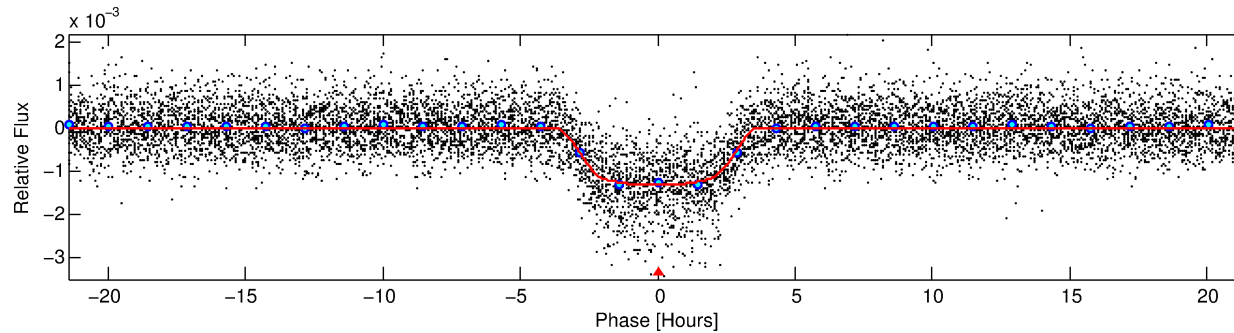
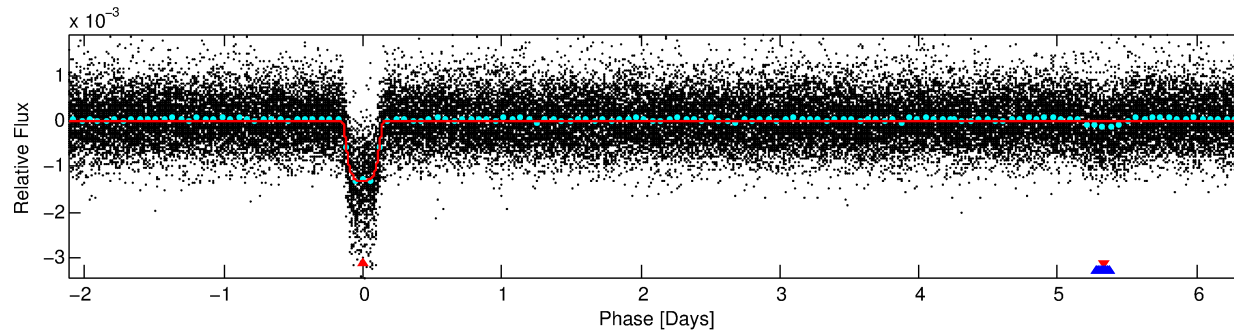
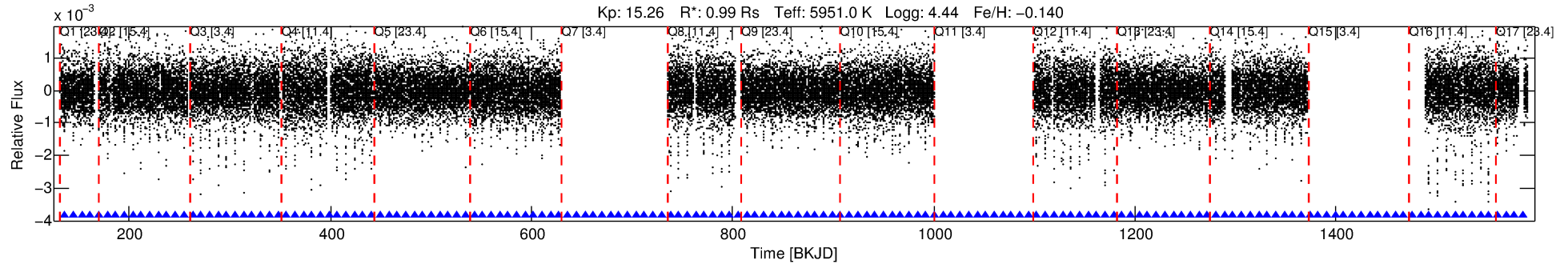
## Ephemeris Match Information For 009851226-01

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	$\sigma_P$	$\sigma_T$
009851226-01	9851226	009851142-pri	9851142	1:1	77.9	-6	-19	7.63	15.26	68.70	Direct-PRF	0	0.05	0.00

**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: 9851226 Candidate: 1 of 2 Period: 8.480 d  
KOI: K01468.01 Corr: 0.997



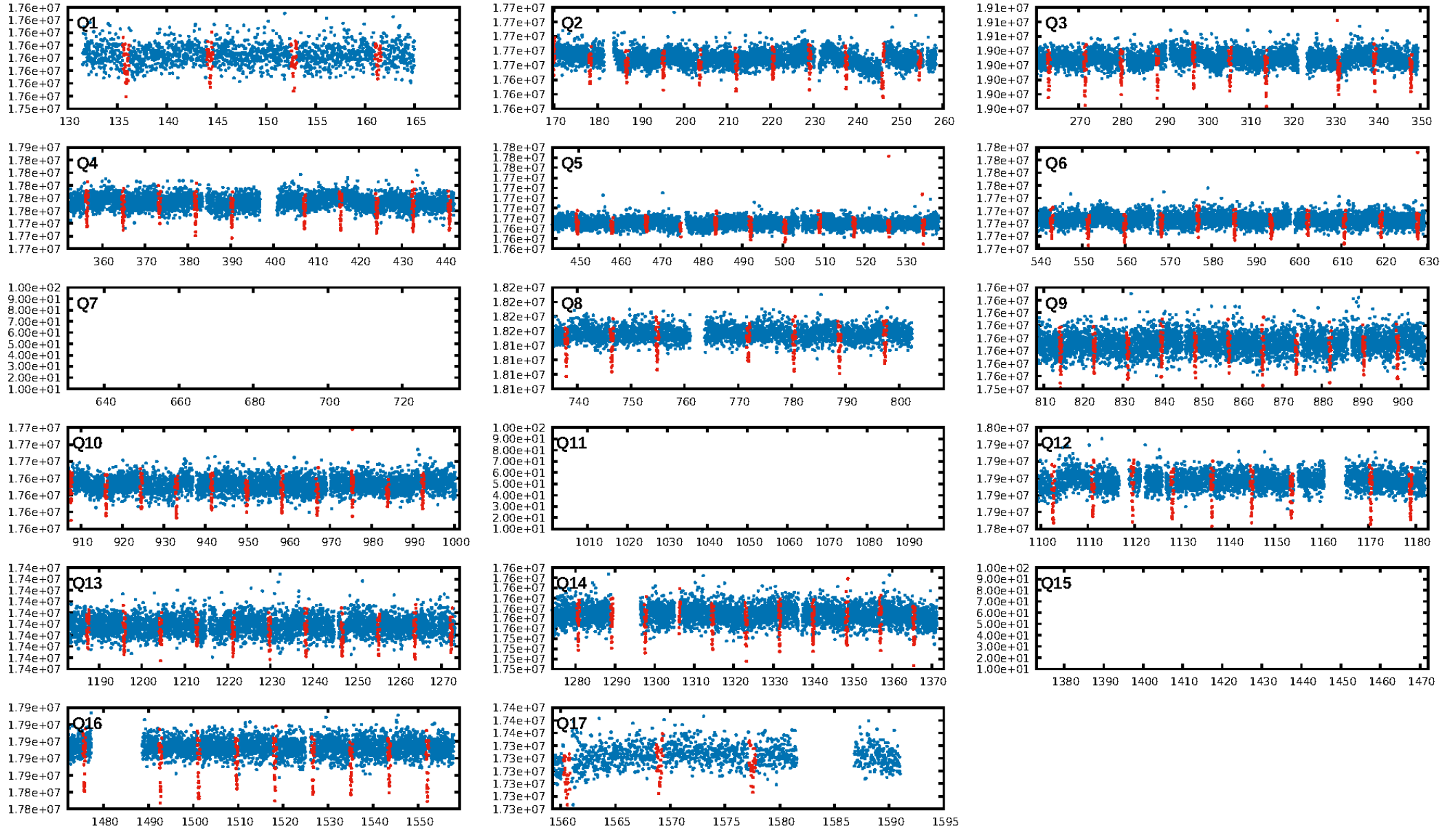
## DV Fit Results:

Period = 8.48029 [0.00002] d  
Epoch = 135.8554 [0.0018] BKJD  
Rp/R\* = 0.0401 [0.0005]  
a/R\* = 4.58 [0.19]  
b = 0.92 [0.01]  
Seff = 168.30 [65.66]  
Teq = 918 [90] K  
Rp = 4.33 [1.32] Re  
a = 0.0810 [0.0204] AU  
Ag = 34.80 [13.04] [2.59 $\sigma$ ]  
**Teffp = 3449 [148] K [14.63 $\sigma$ ]**

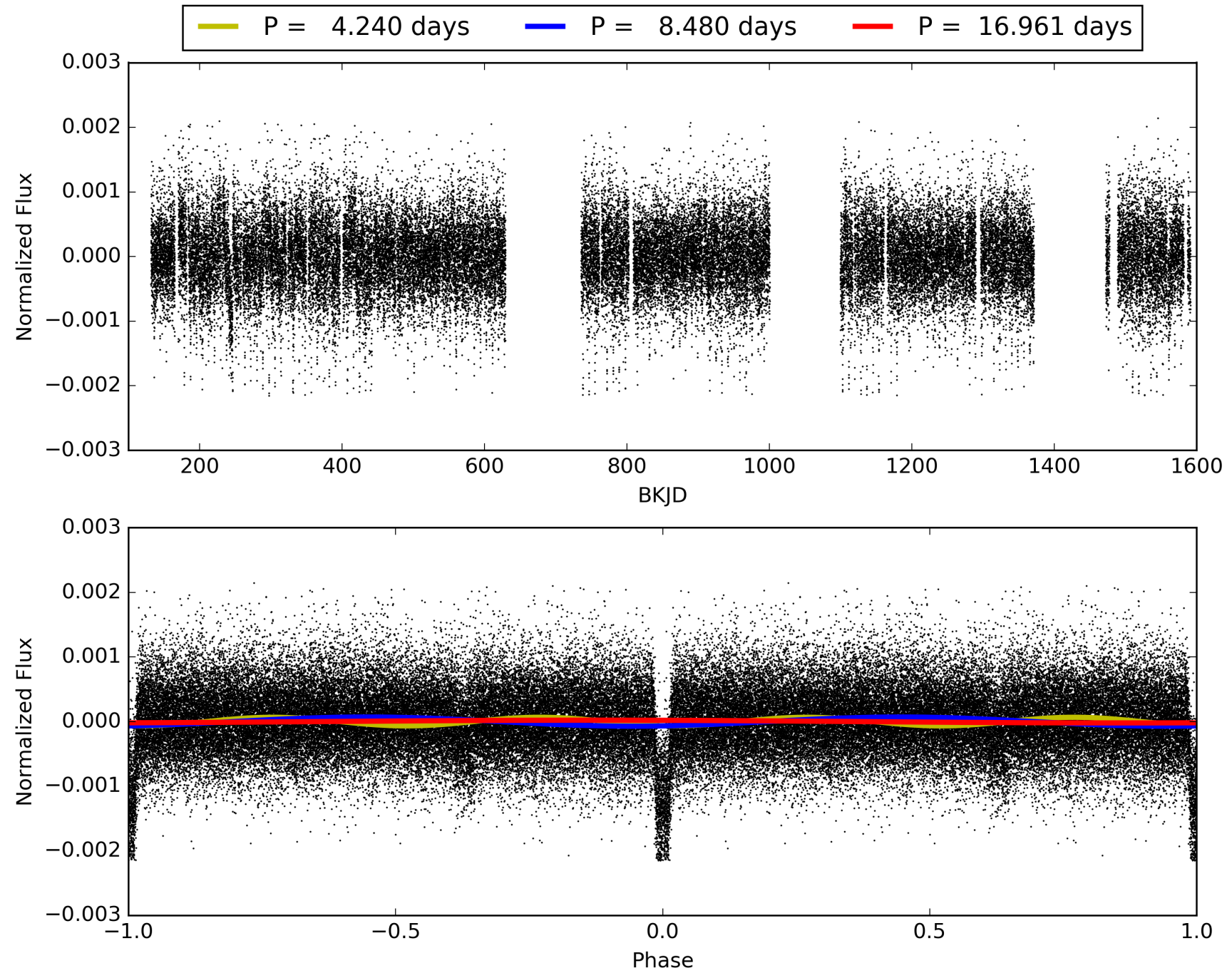
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
**LongPeriod-sig: 0.1% [0.00 $\sigma$ ]**  
**ModelChiSquare2-sig: 0.0%**  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [121/121]  
**GhostDiagnostic-chr: -0.00607**  
Centroid-sig: 0.0%  
**Centroid-so: 1.382 arcsec [8.01 $\sigma$ ]**  
OotOffset-rm: 0.649 arcsec [2.31 $\sigma$ ]  
KicOffset-rm: 0.663 arcsec [2.59 $\sigma$ ]  
OotOffset-st: 4/1/4/5 [14]  
KicOffset-st: 4/1/4/5 [14]  
DiffImageQuality-fgm: 0.07 [1/14]  
DiffImageOverlap-fno: 1.00 [14/14]

# TCE 009851226-01, PDC Light Curves

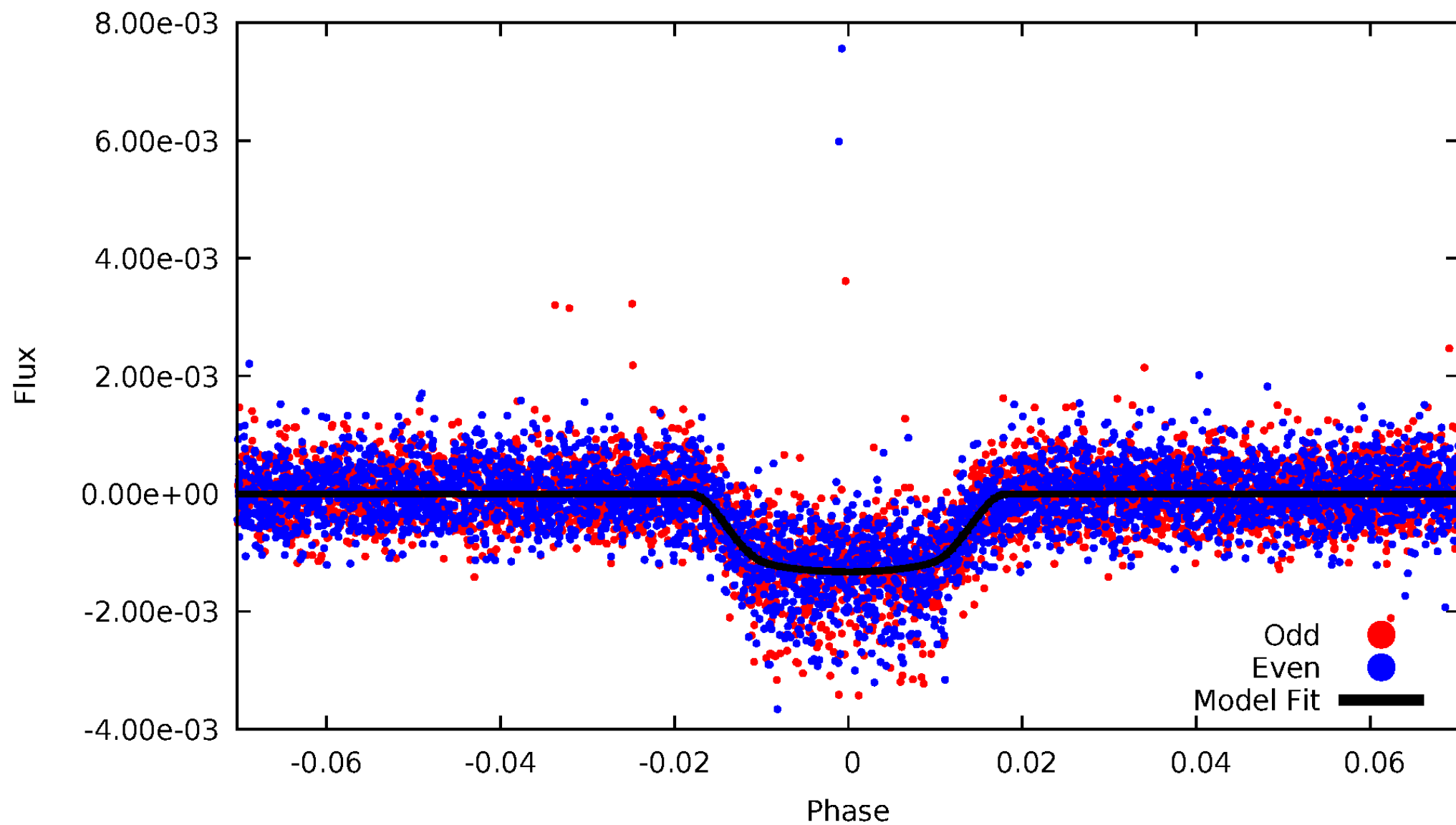


TCE 009851226-01



# DV Odd/Even

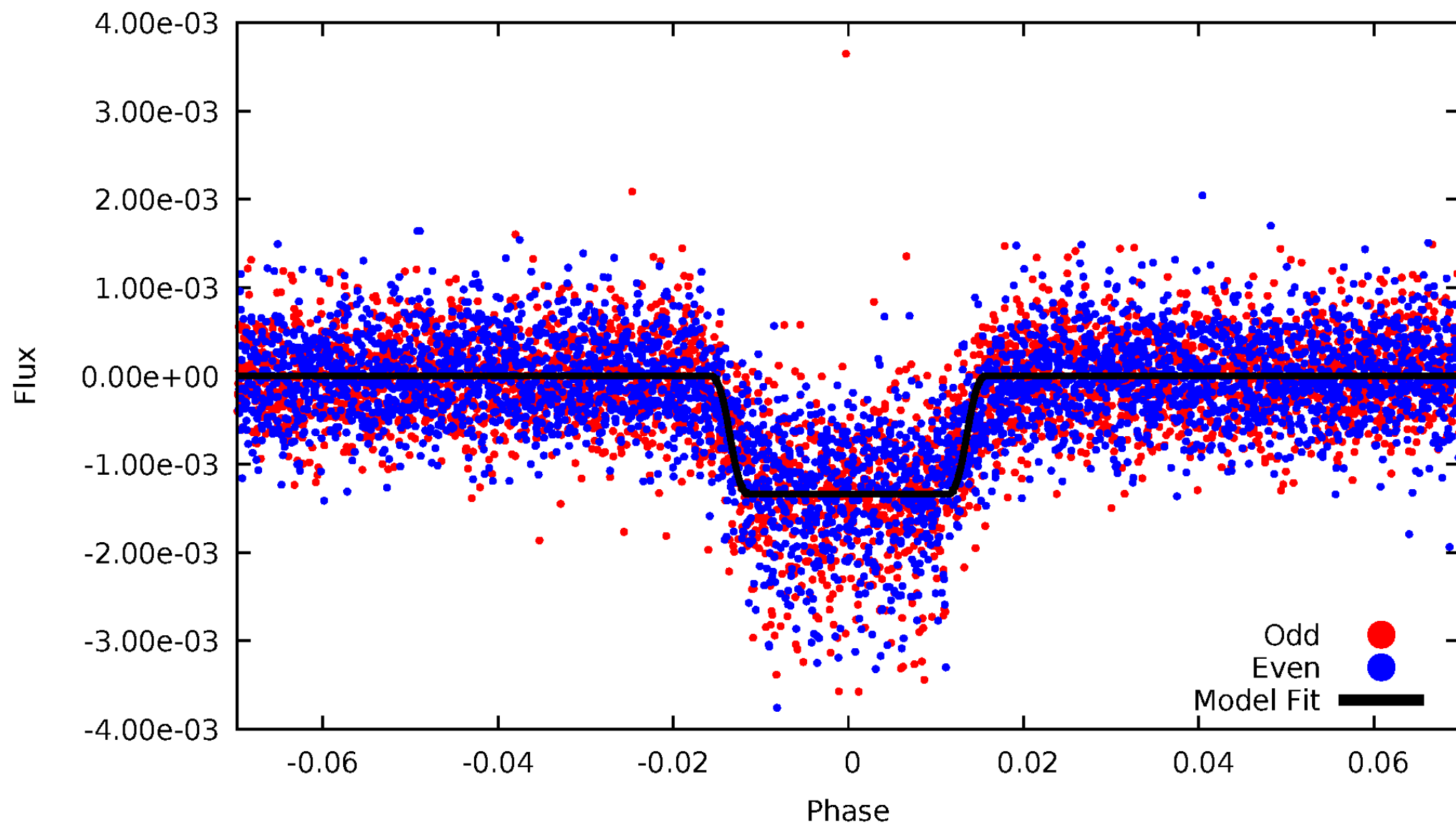
TCE 009851226-01





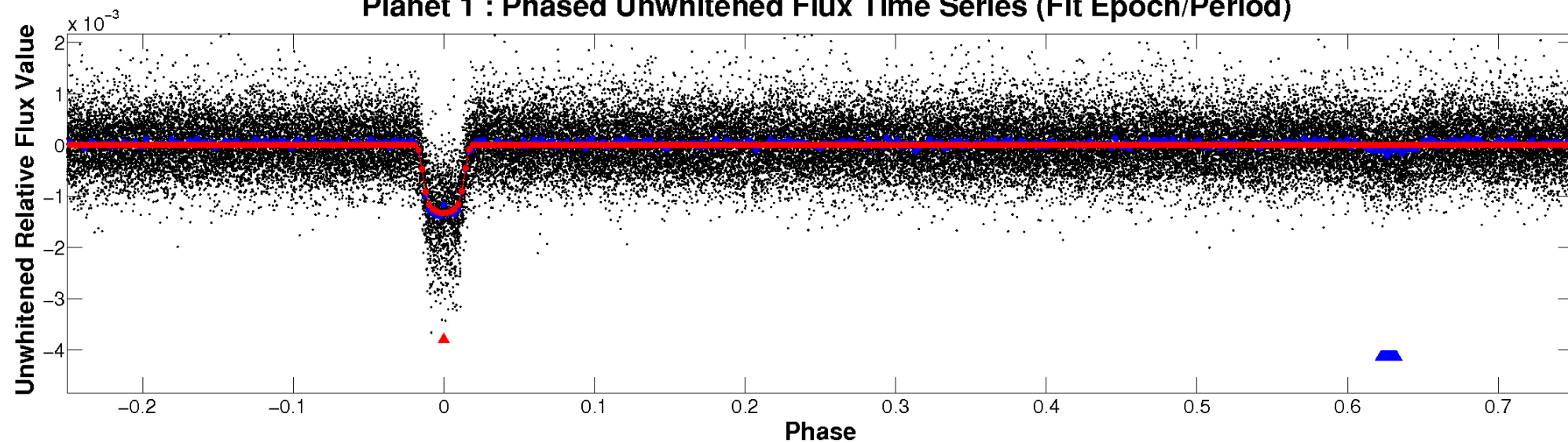
# ALT Odd/Even

TCE 009851226-01

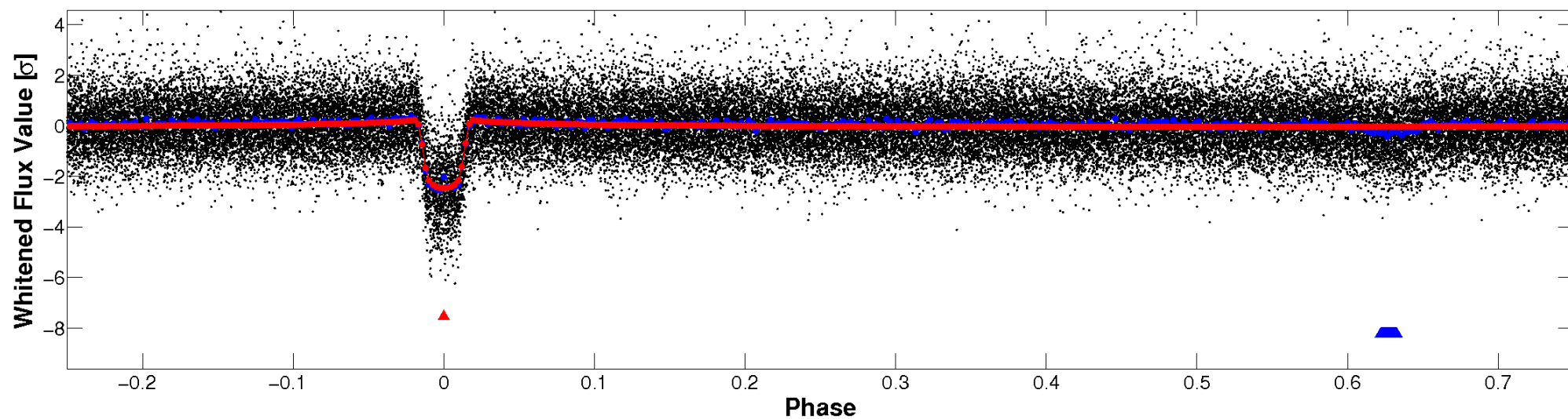


# Non-Whitened Vs. Whitened Light Curve

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

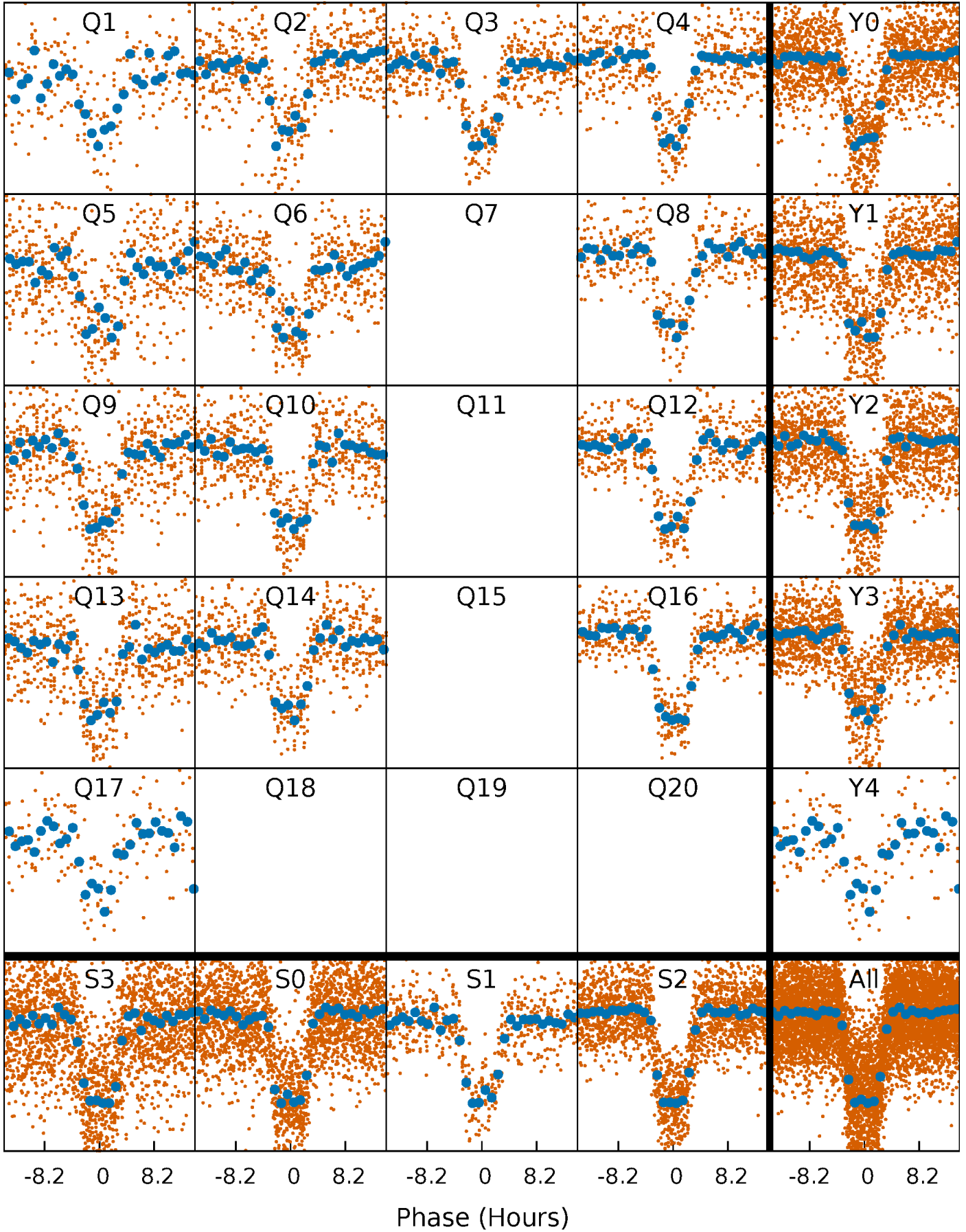


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

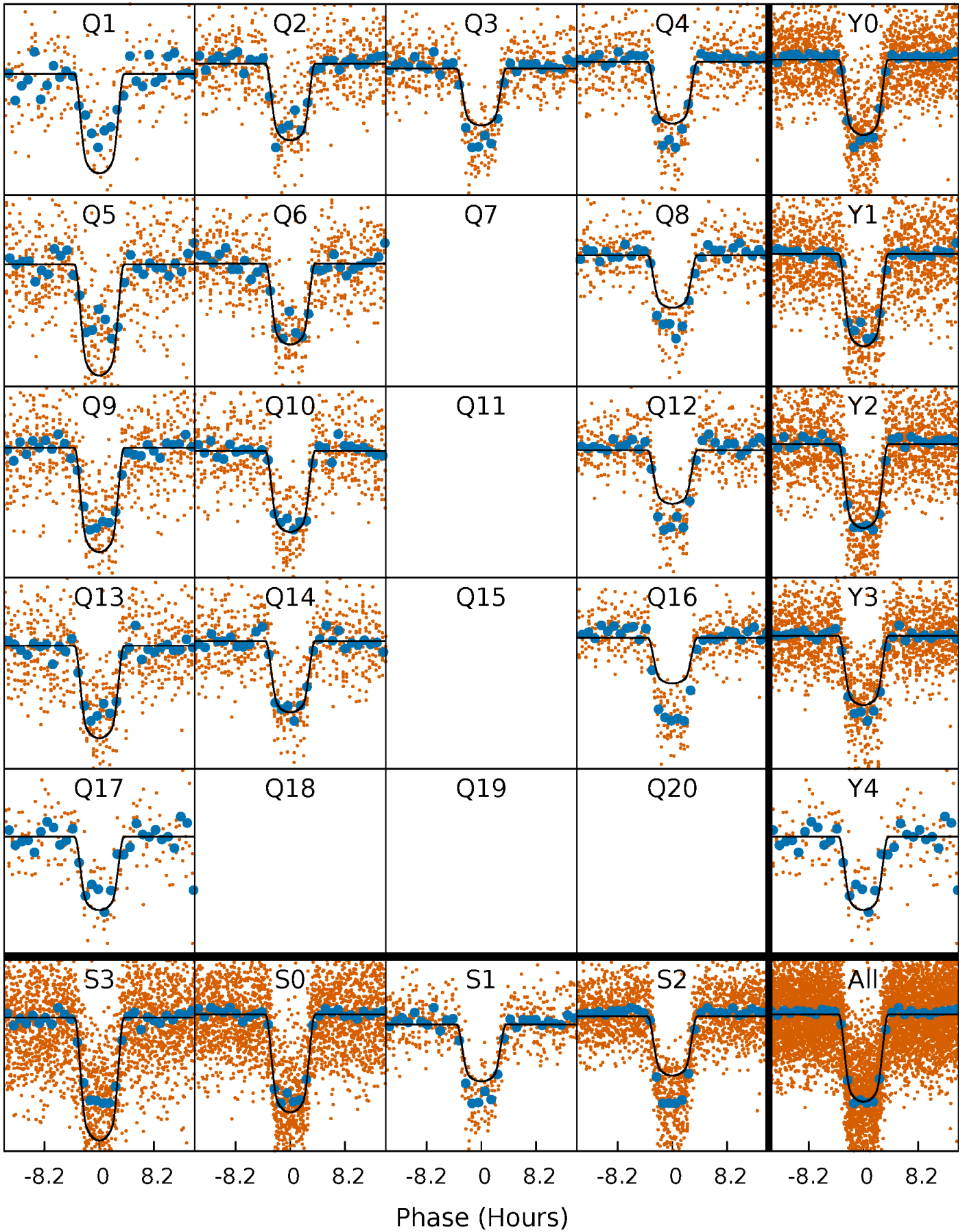
TCE 009851226-01 P= 8.480289 Days  $T_0=135.855397$  (BKJD)





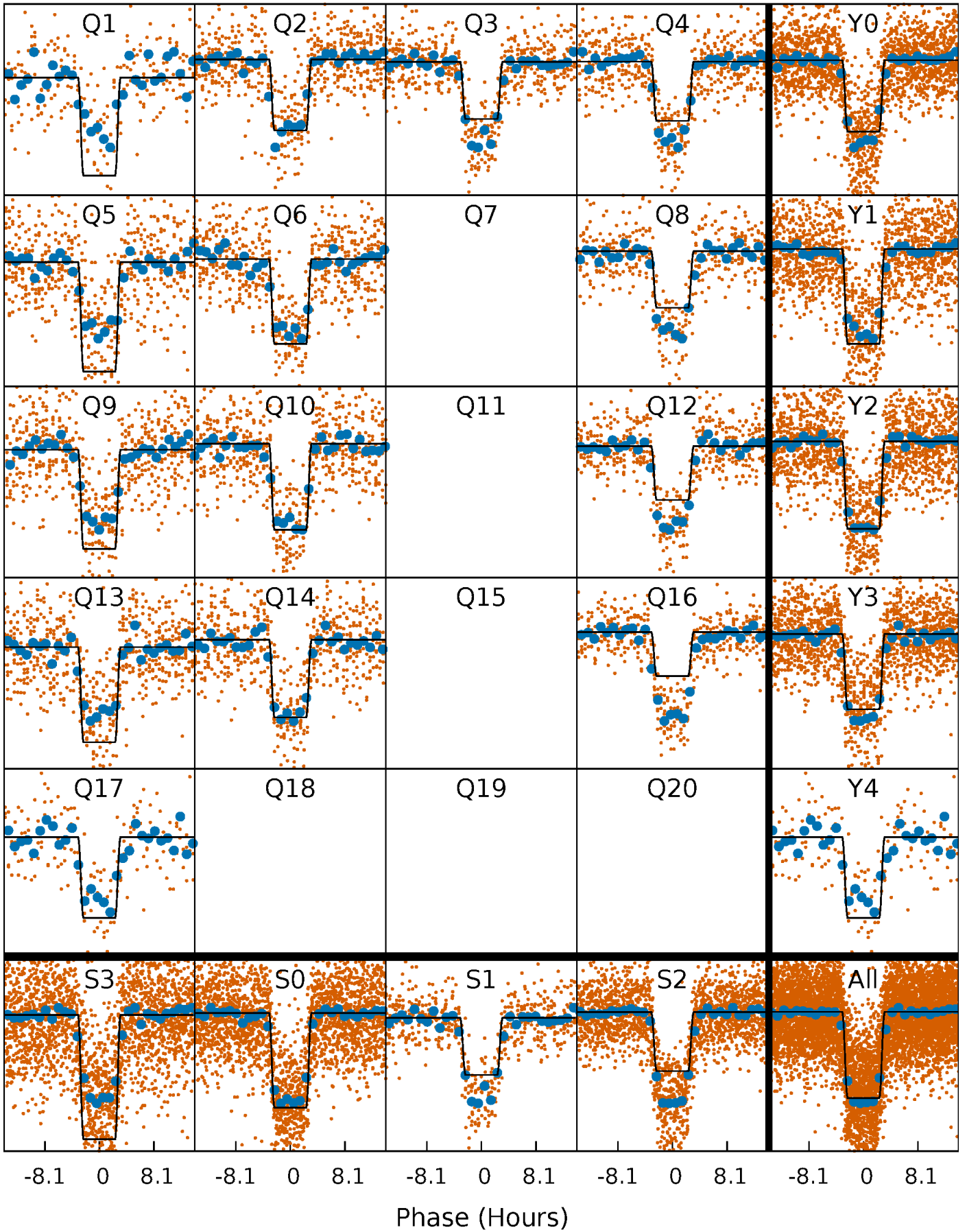
# DV Quarter-Phased Transit Curves

TCE 009851226-01 P= 8.480289 Days  $T_0=135.855397$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

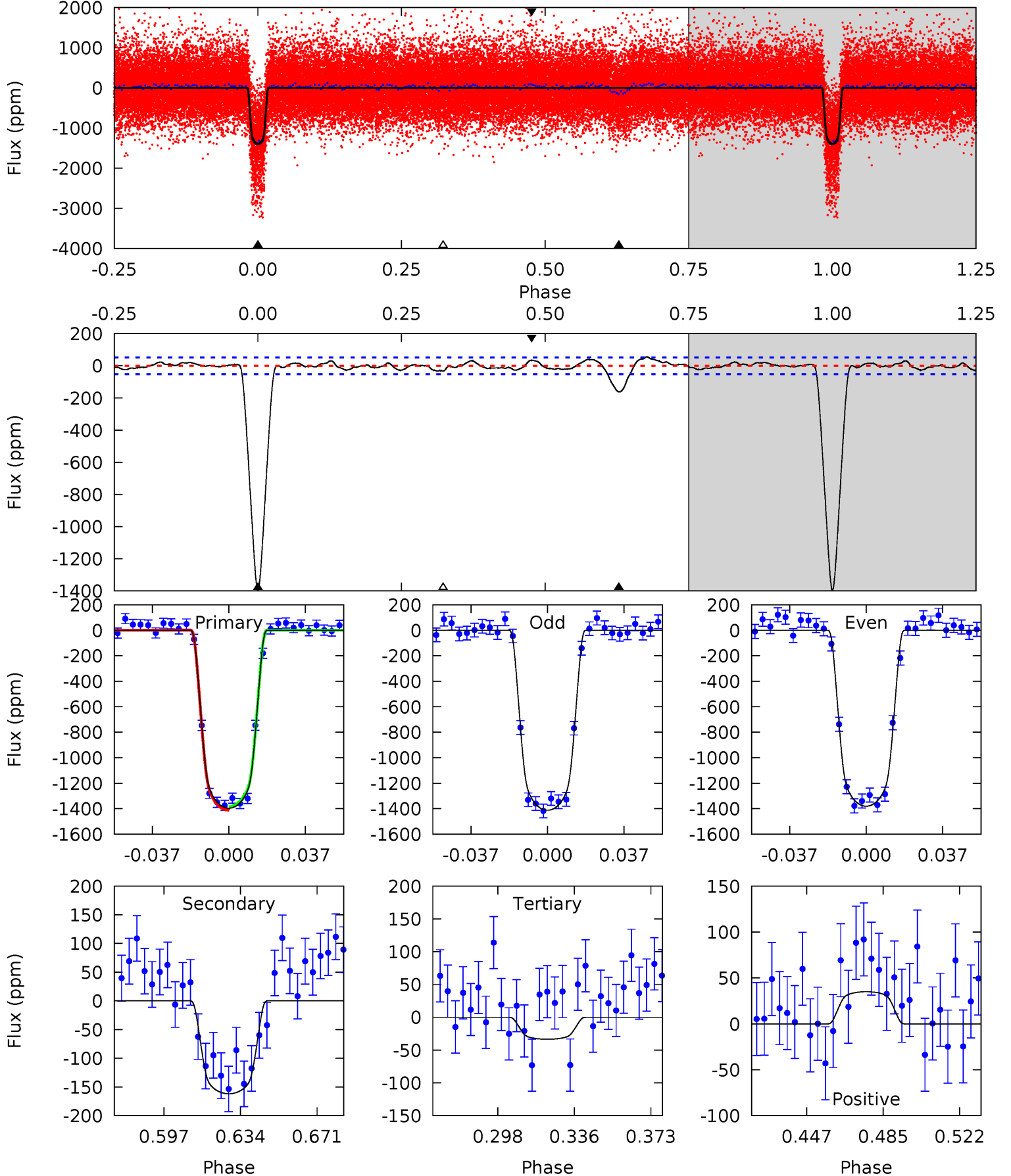
TCE 009851226-01 P= 8.480296 Days  $T_0=135.854384$  (BKJD)



# DV Model-Shift Uniqueness Test

009851226-01, P = 8.480289 Days, E = 127.375108 Days

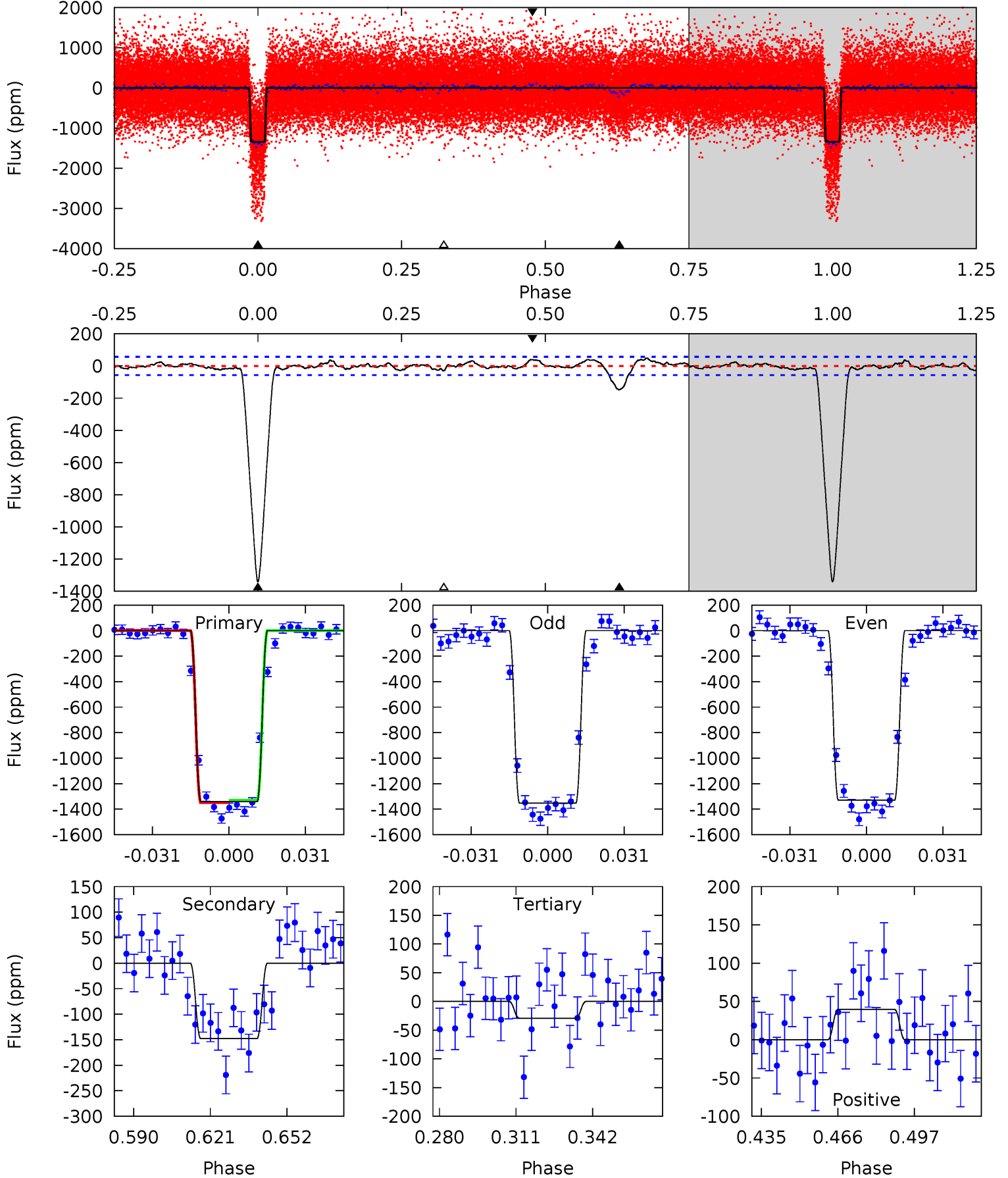
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
127.6	14.8	3.06	3.20	4.77	2.08	1.64	124.5	124.4	11.7	11.6	1.46	1.08	0.04	1.15



# Alt Model-Shift Uniqueness Test

009851226-01, P = 8.480296 Days, E = 127.374088 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
112.7	12.4	2.45	3.34	4.80	2.16	1.36	110.3	109.4	9.97	9.09	1.00	1.08	0.04	0.75



### Stellar Parameters For KIC 009851226

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5951^{+178}_{-214}$	$4.439^{+0.084}_{-0.196}$	$-0.140^{+0.300}_{-0.300}$	$0.991^{+0.301}_{-0.129}$	$0.983^{+0.132}_{-0.119}$	$1.423^{+0.524}_{-0.742}$
	+3%/-4%	+2%/-4%	+214%/-214%	+30%/-13%	+13%/-12%	+37%/-52%
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 009851226-01 / KOI 1468.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-162 \pm 11$	$4.42^{+0.74}_{-0.40}$	$1301^{+95}_{-72}$	$3745^{+89}_{-110}$	$29^{+6}_{-7}$
Alt.	$-148 \pm 12$	$3.99^{+0.63}_{-0.31}$	$1301^{+93}_{-72}$	$3803^{+103}_{-108}$	$33^{+6}_{-8}$

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



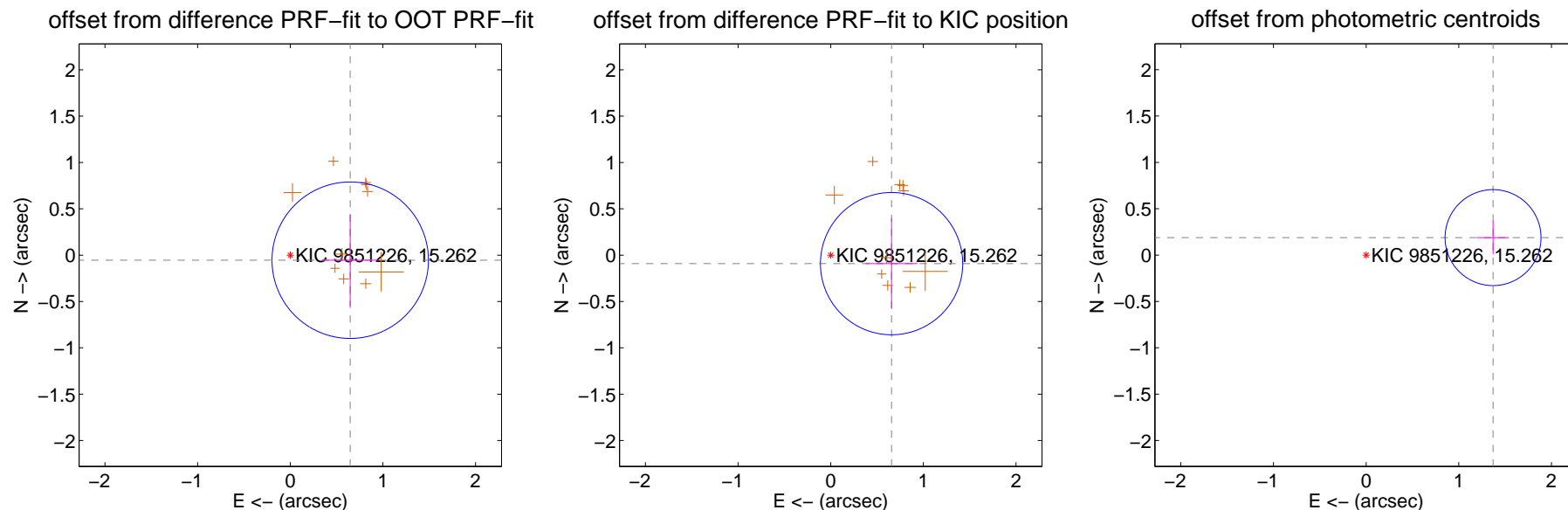
## DV Centroid Data

Supplemental centroid analysis for 009851226-01. Kepler magnitude: 15.26. Transit SNR 79.58

There are 1 quarters with good PRF difference image offsets

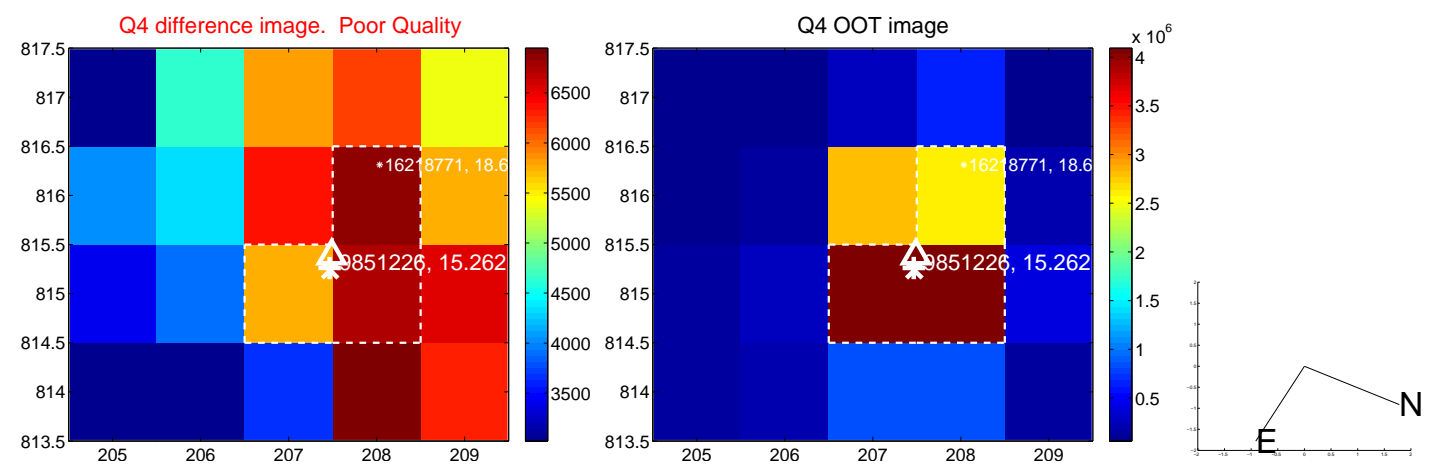
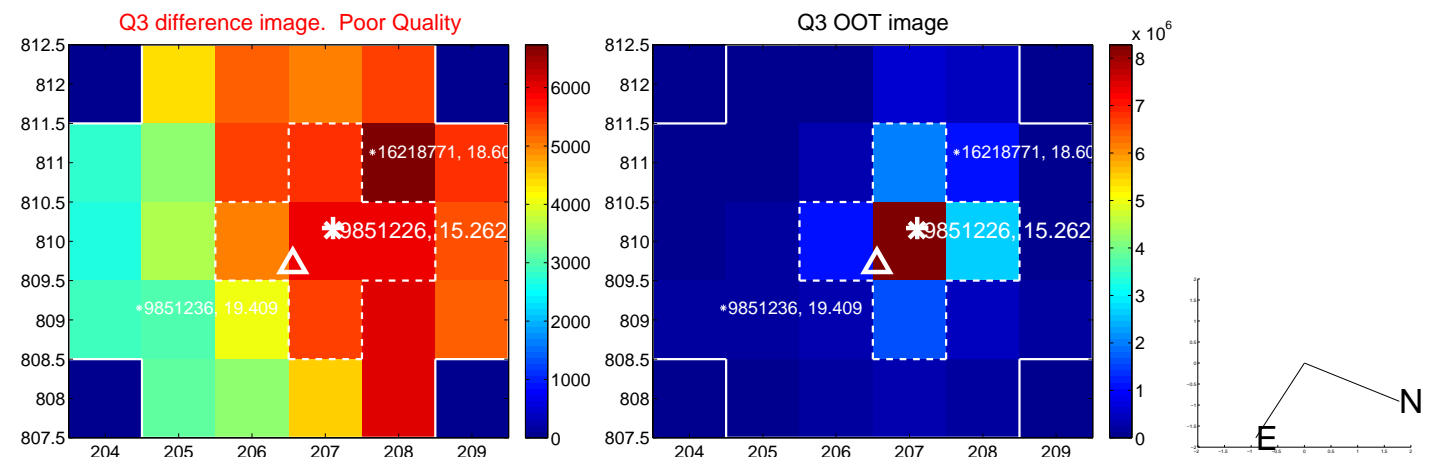
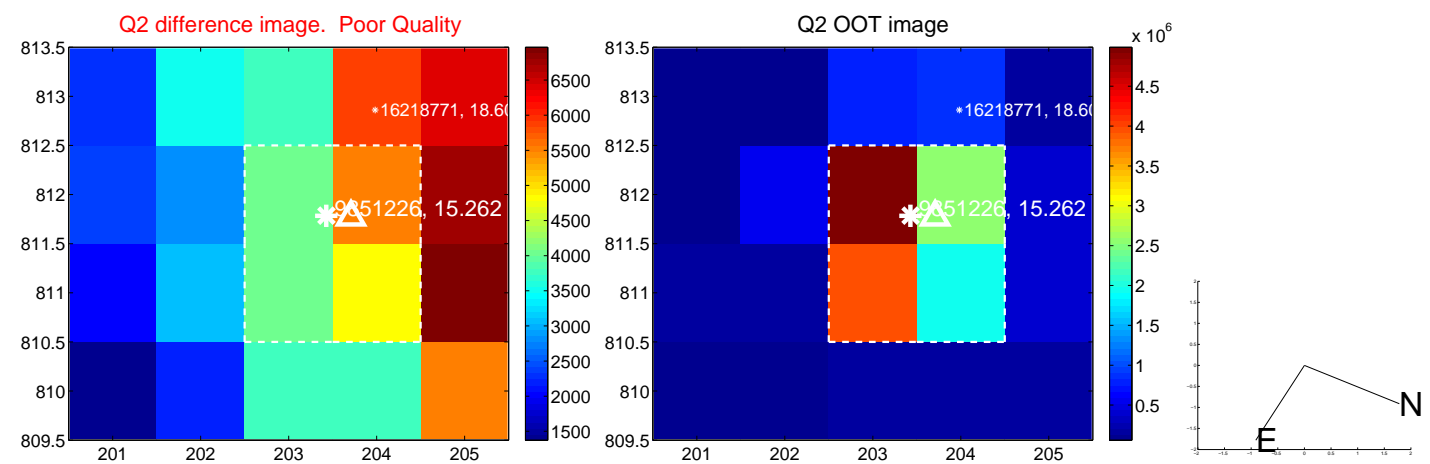
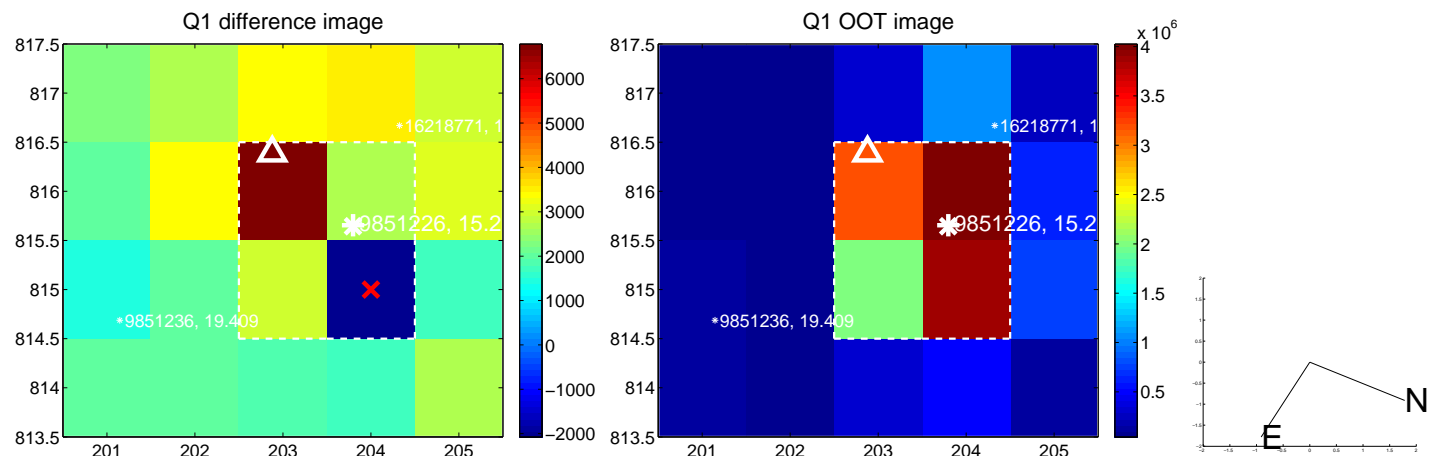
The direct PRF centroid is offset from the target star catalog position by about 0.04 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.649 \pm 0.281$	2.31	$-0.647 \pm 0.301$	$-0.055 \pm 0.496$
PRF-fit source offset from KIC position	$0.663 \pm 0.256$	2.59	$-0.657 \pm 0.280$	$-0.092 \pm 0.489$
photometric centroid source offset	$1.38 \pm 0.17$	8.01	$-1.37 \pm 0.17$	$0.19 \pm 0.18$

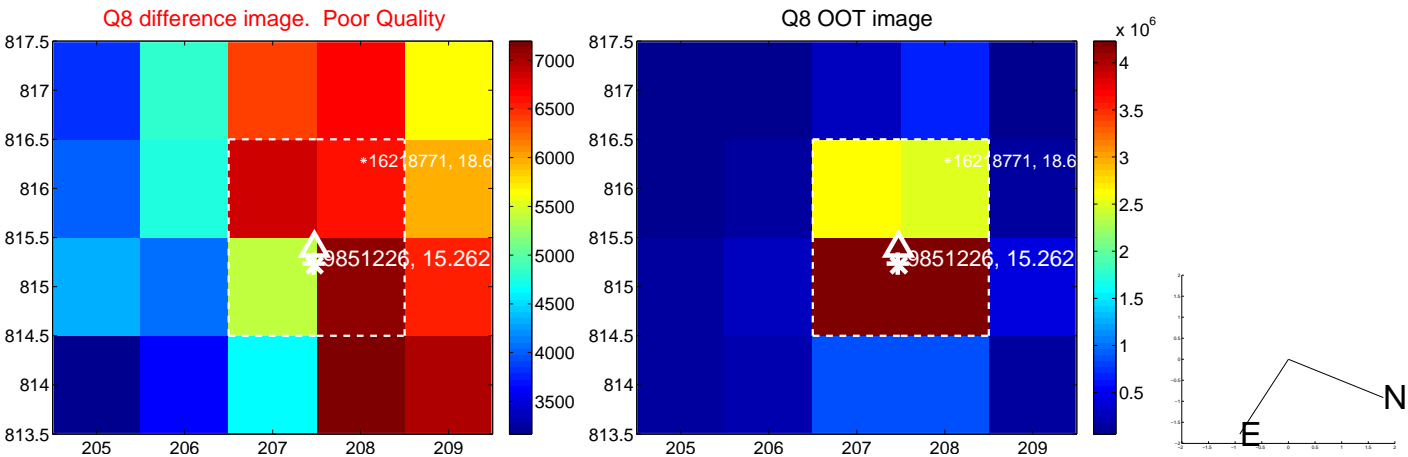
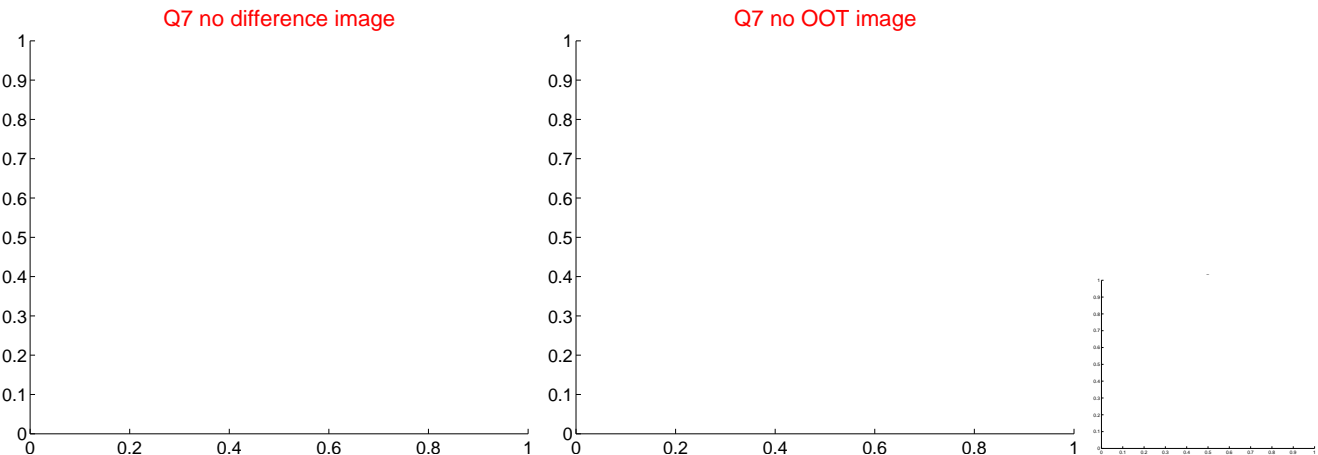
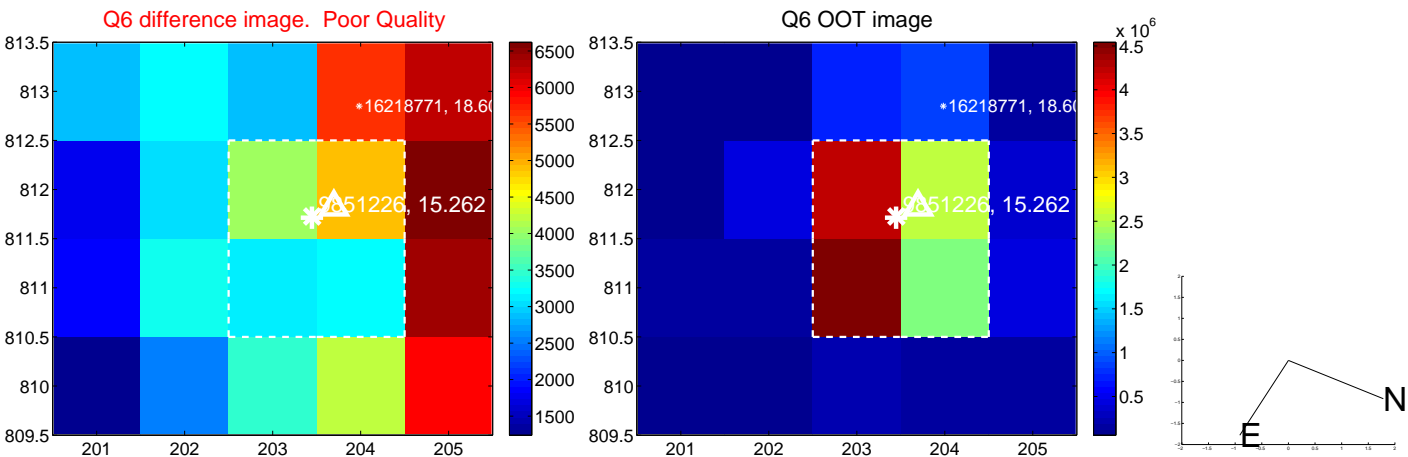
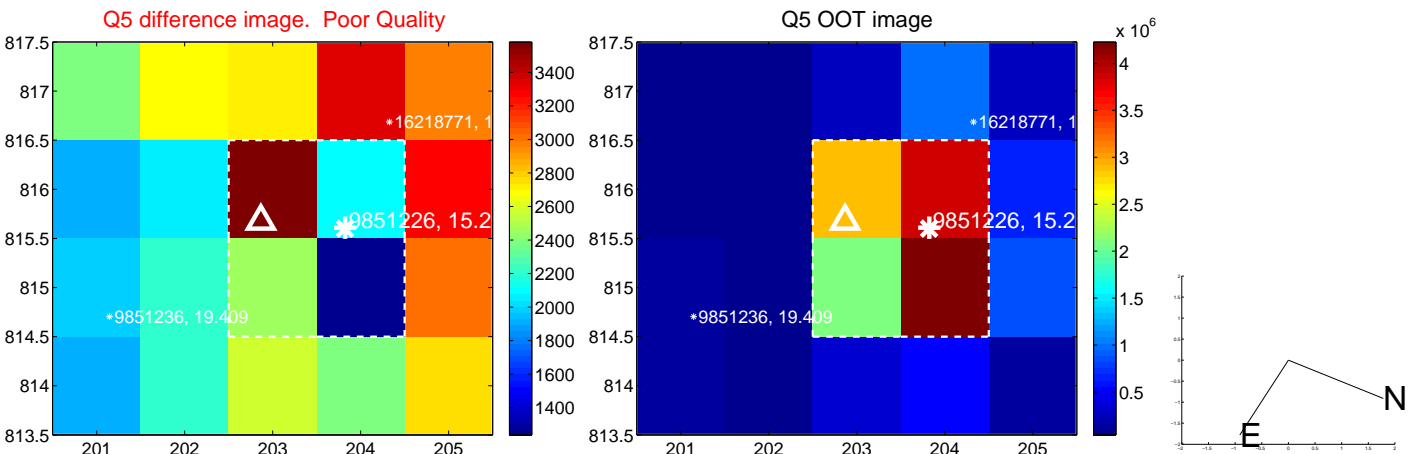


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

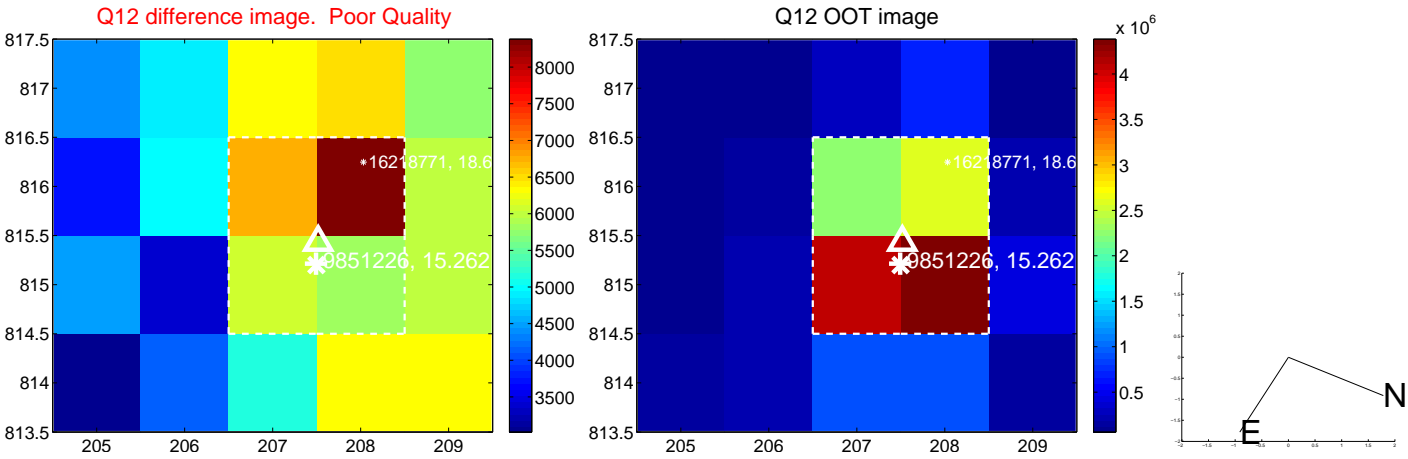
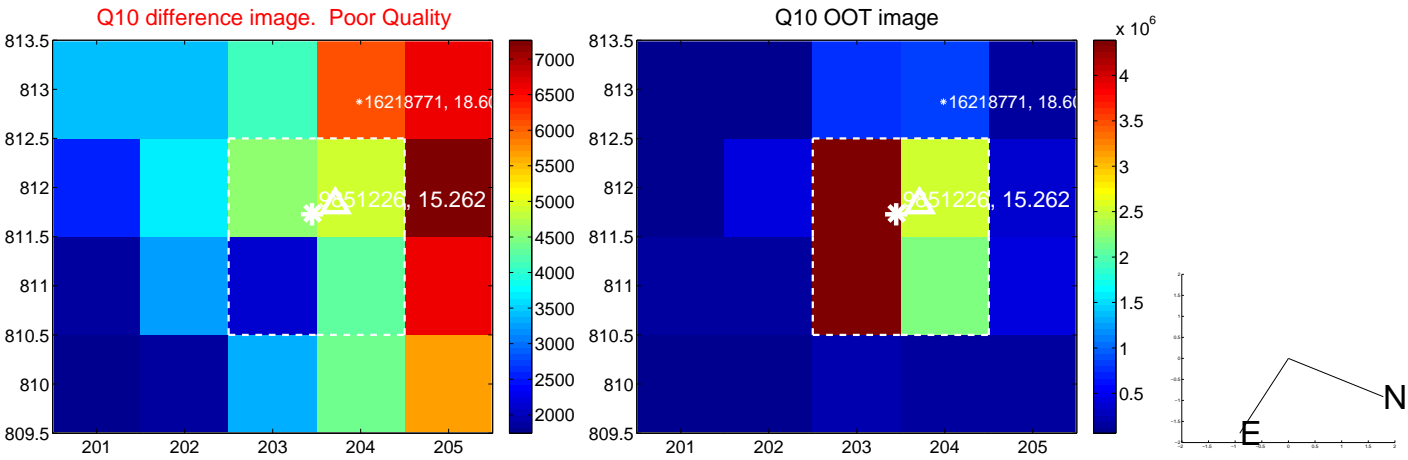
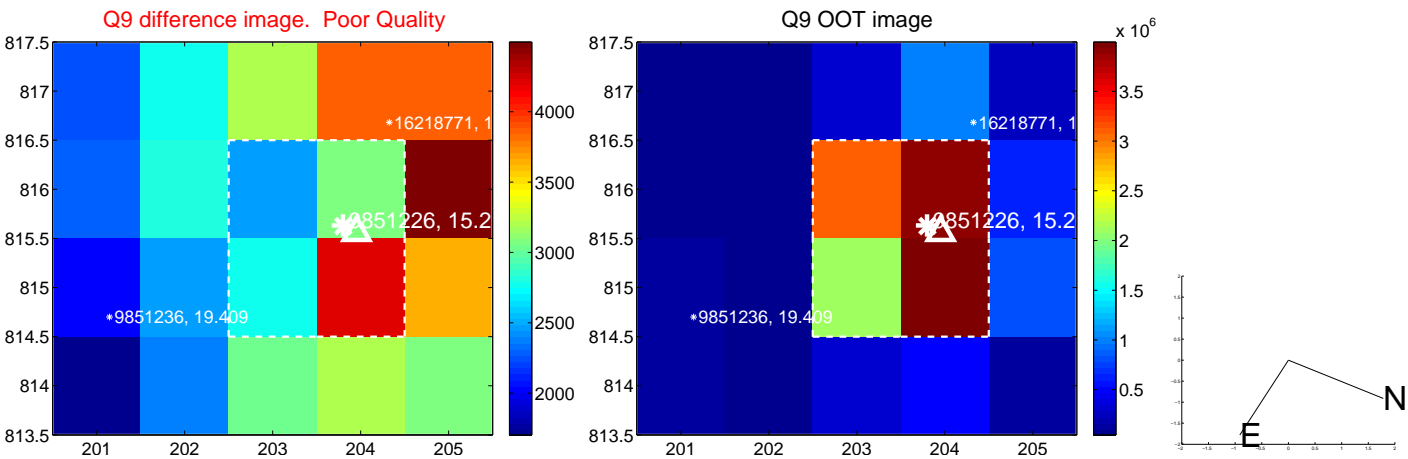
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



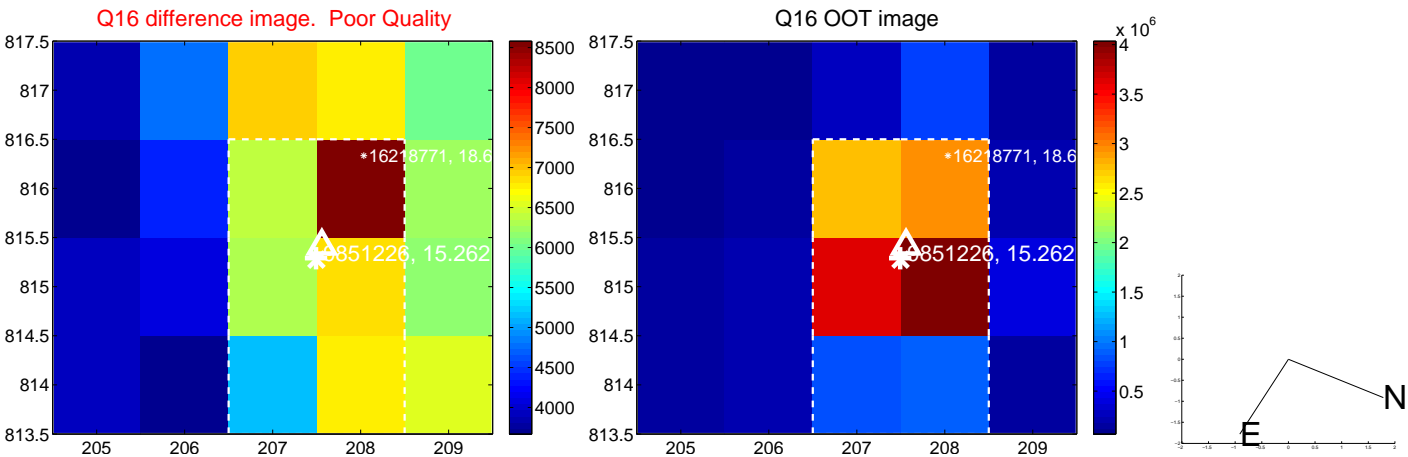
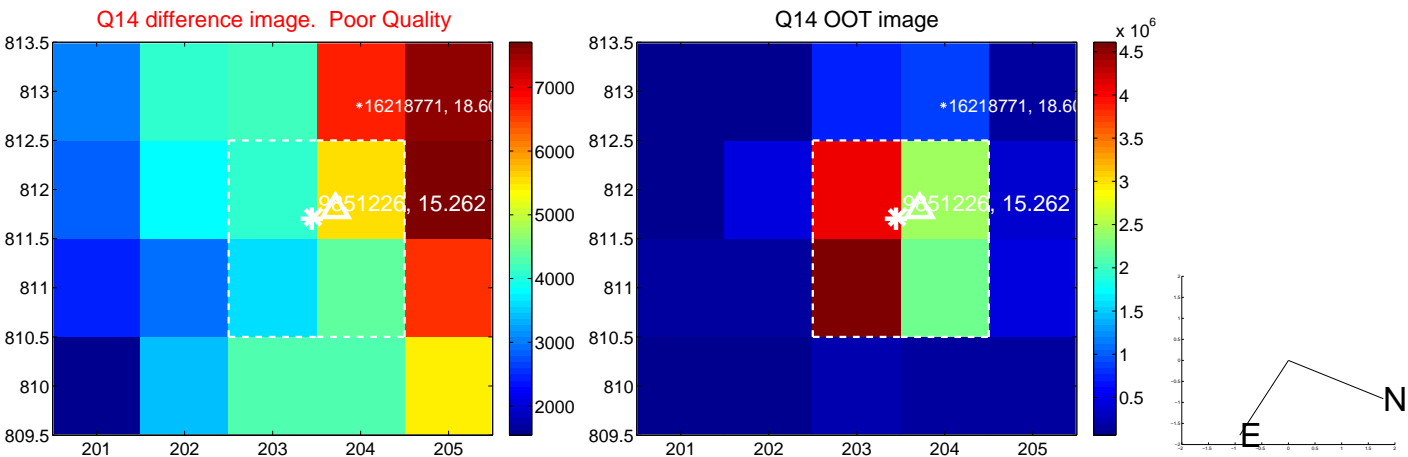
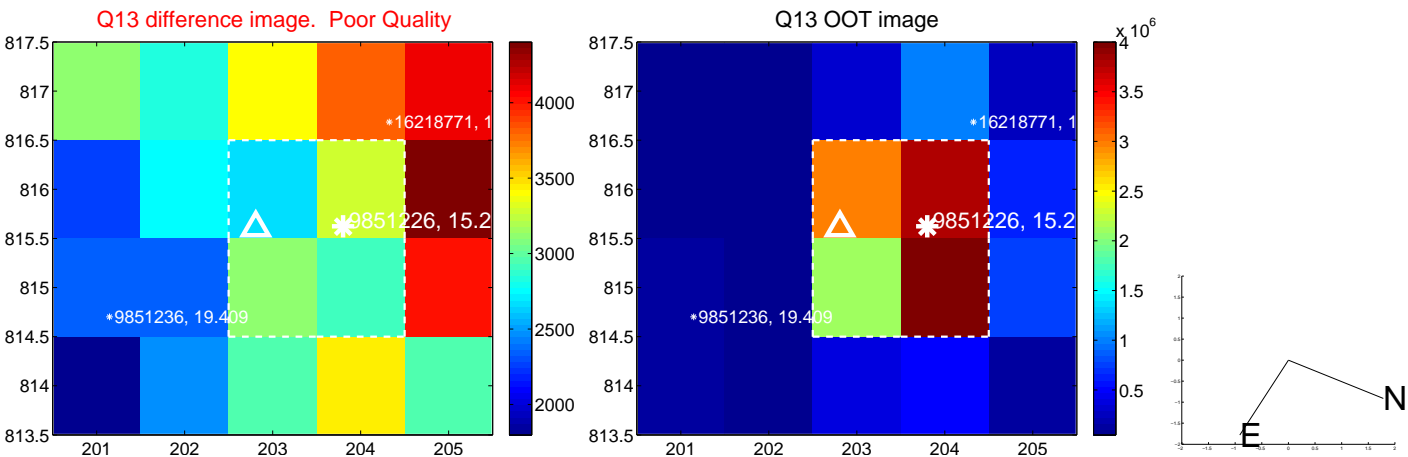
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

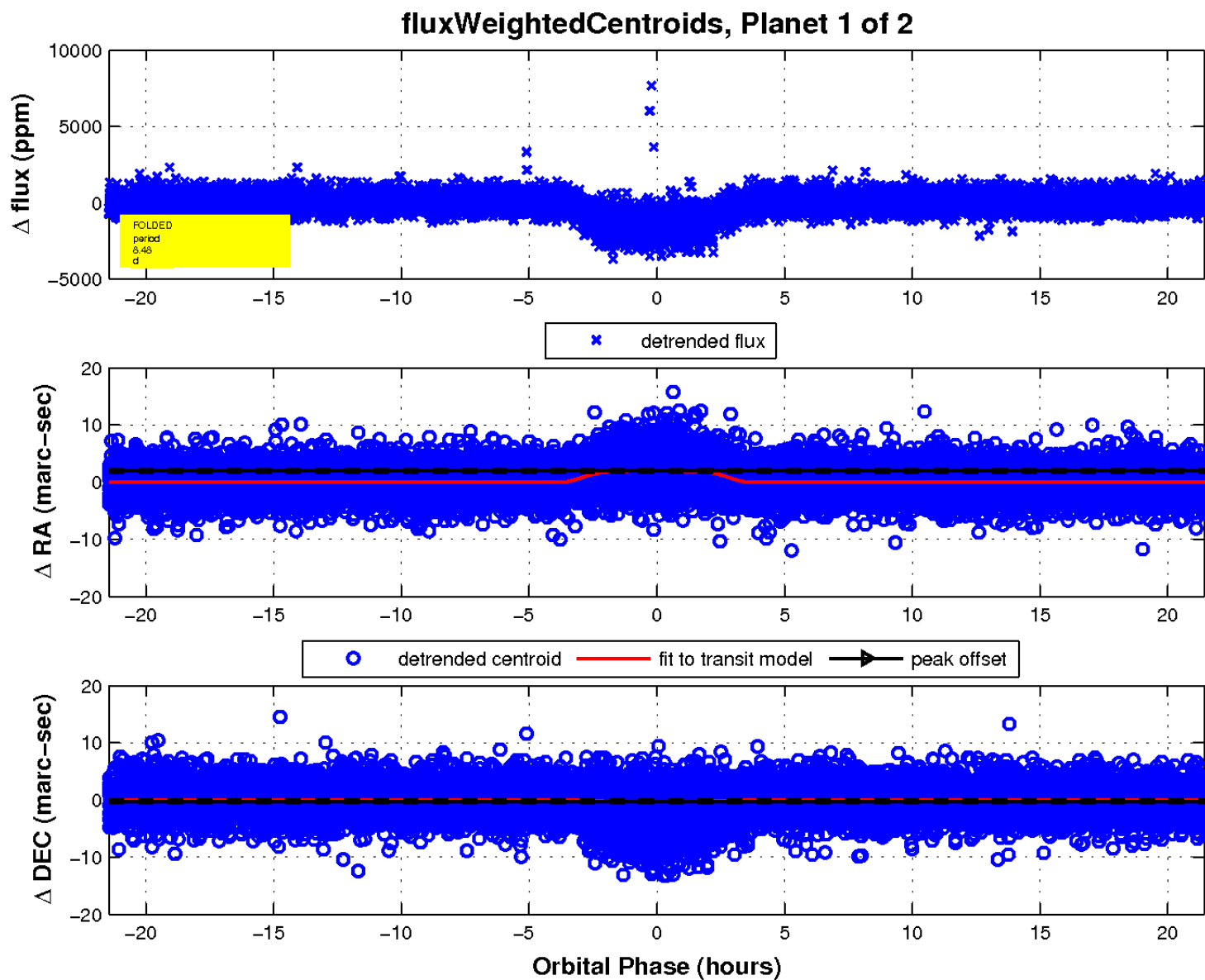
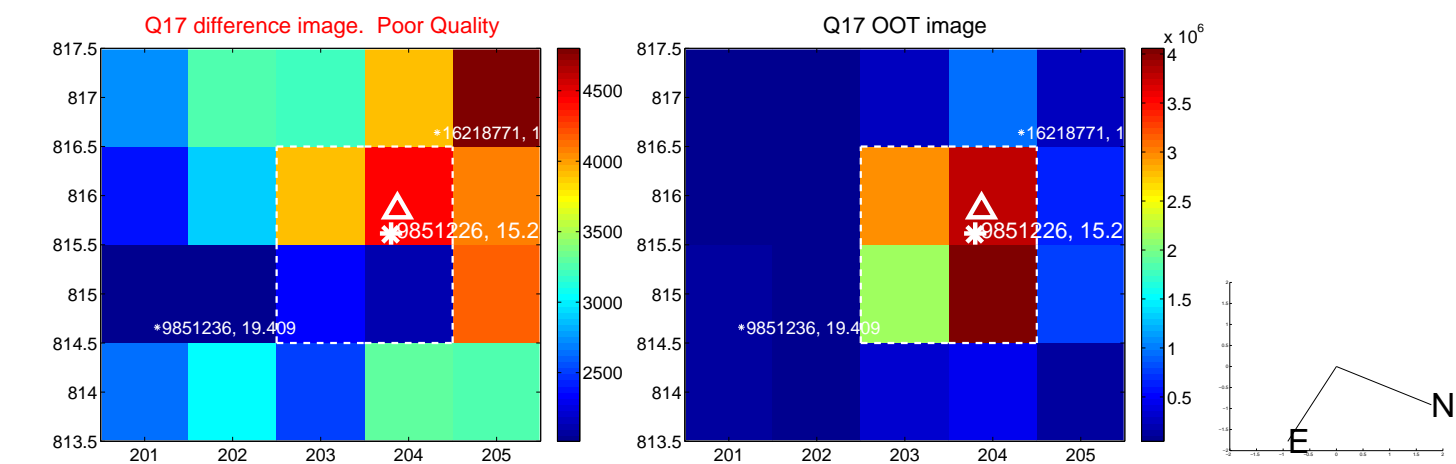


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



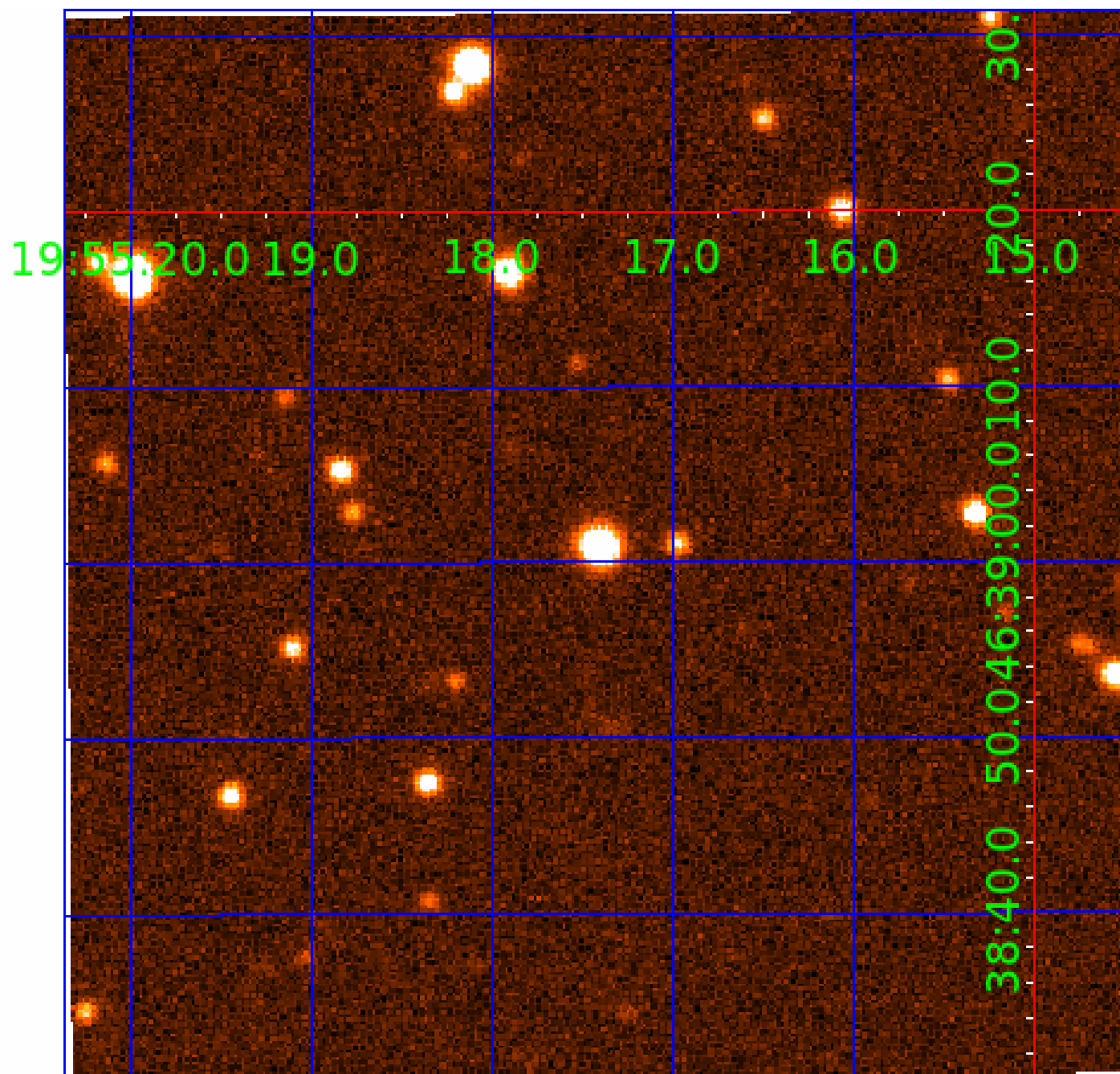


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 009851226

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009851226-01	OBS	1468.01	8.480289	135.855397	1325.9	7.148	75.4	79.6	0.99	5951	4.33	168.30
009851226-02	OBS	No	8.480809	132.650997	172.1	9.844	12.6	13.2	0.99	5951	1.64	168.29

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009851226-01	OBS	FP	0.00	0	1	1	1	MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE—CENT_FEW_DIFFS—HALO_GHOST—EPHEM_MATCH
009851226-02	OBS	FP	0.00	1	1	0	1	IS_SEC_TCE—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 009851226-02

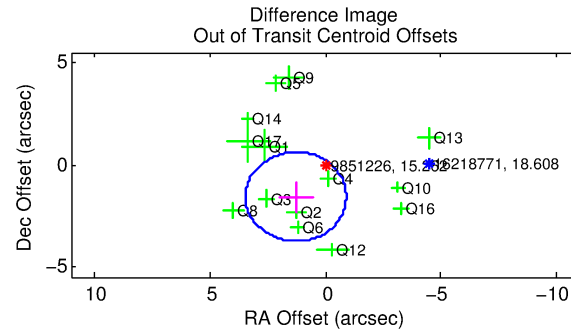
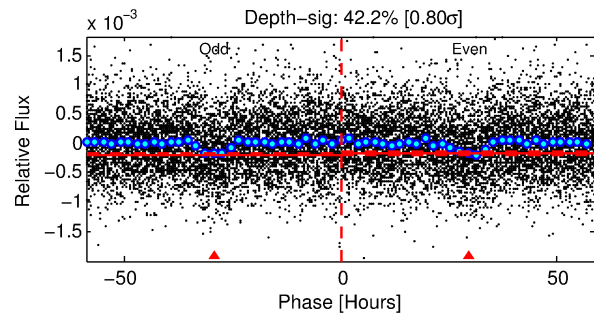
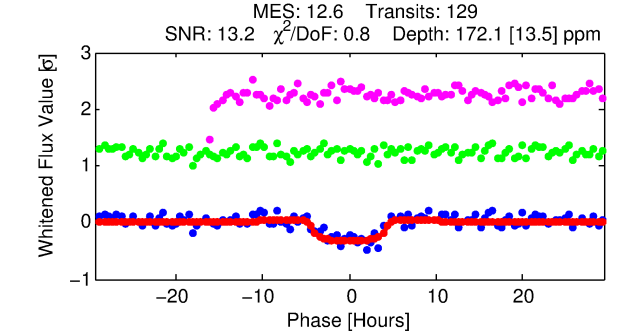
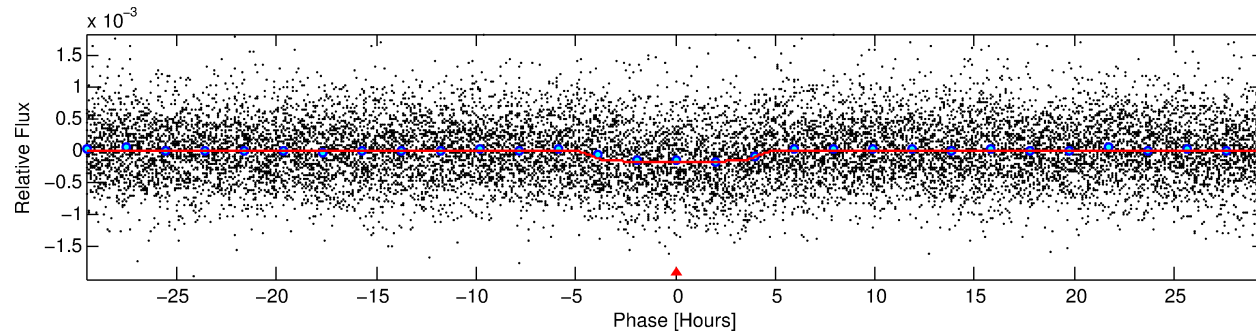
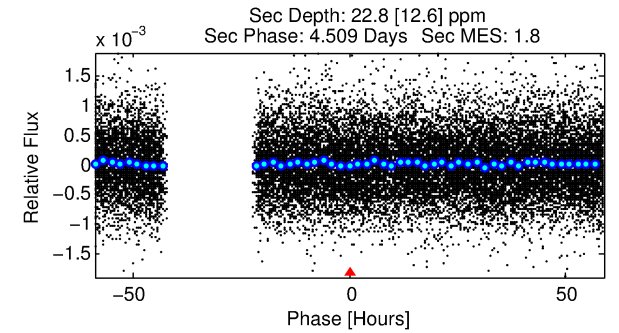
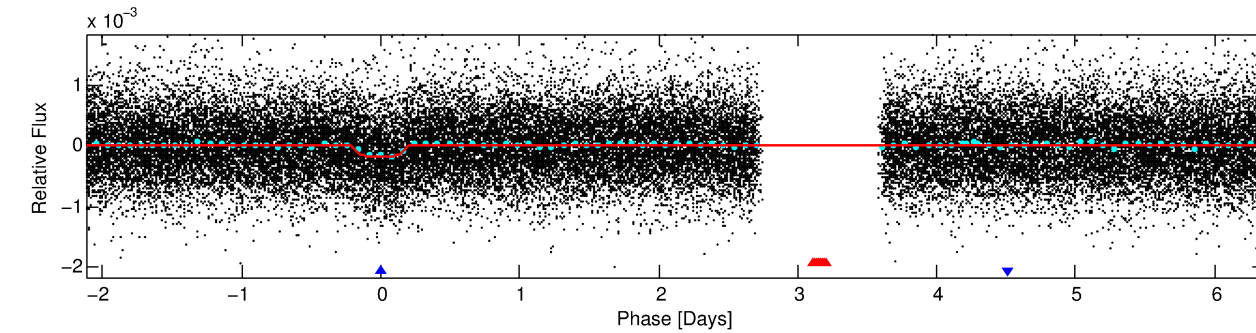
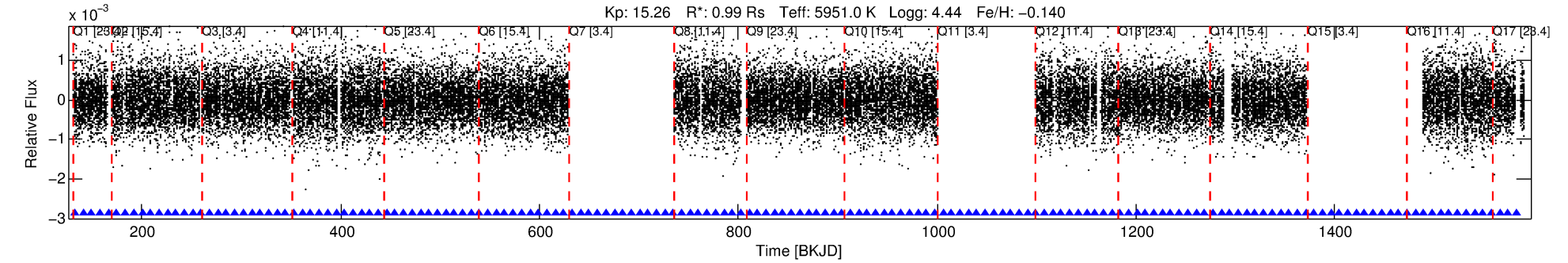
TCE (1)	KIC	Parent (2)	Parent KIC	$P_1:P_2$	Dist ( $''$ )	$\Delta$ Row	$\Delta$ Col	$m_2$	$m_1$	$D_2/D_1$	Mechanism	Flag	$\sigma_P$	$\sigma_T$
009851226-02	9851226	009851142-sec	9851142	1:1	77.9	-6	-19	7.63	15.26	71.51	Direct-PRF	0	2.47	2.09

**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: 9851226 Candidate: 2 of 2 Period: 8.481 d

KOI: K01468 Corr: No Ephemeris Match



## DV Fit Results:

Period = 8.48081 [0.00015] d  
Epoch = 132.6510 [0.0136] BKJD  
Rp/R\* = 0.0151 [0.0012]  
a/R\* = 2.53 [0.72]  
b = 0.95 [0.03]  
Seff = 168.29 [65.66]  
Teq = 918 [90] K  
Rp = 1.64 [0.51] Re  
a = 0.0810 [0.0204] AU  
Ag = 30.69 [20.84] [1.42σ]  
Teffp = 3342 [495] K [4.82σ]

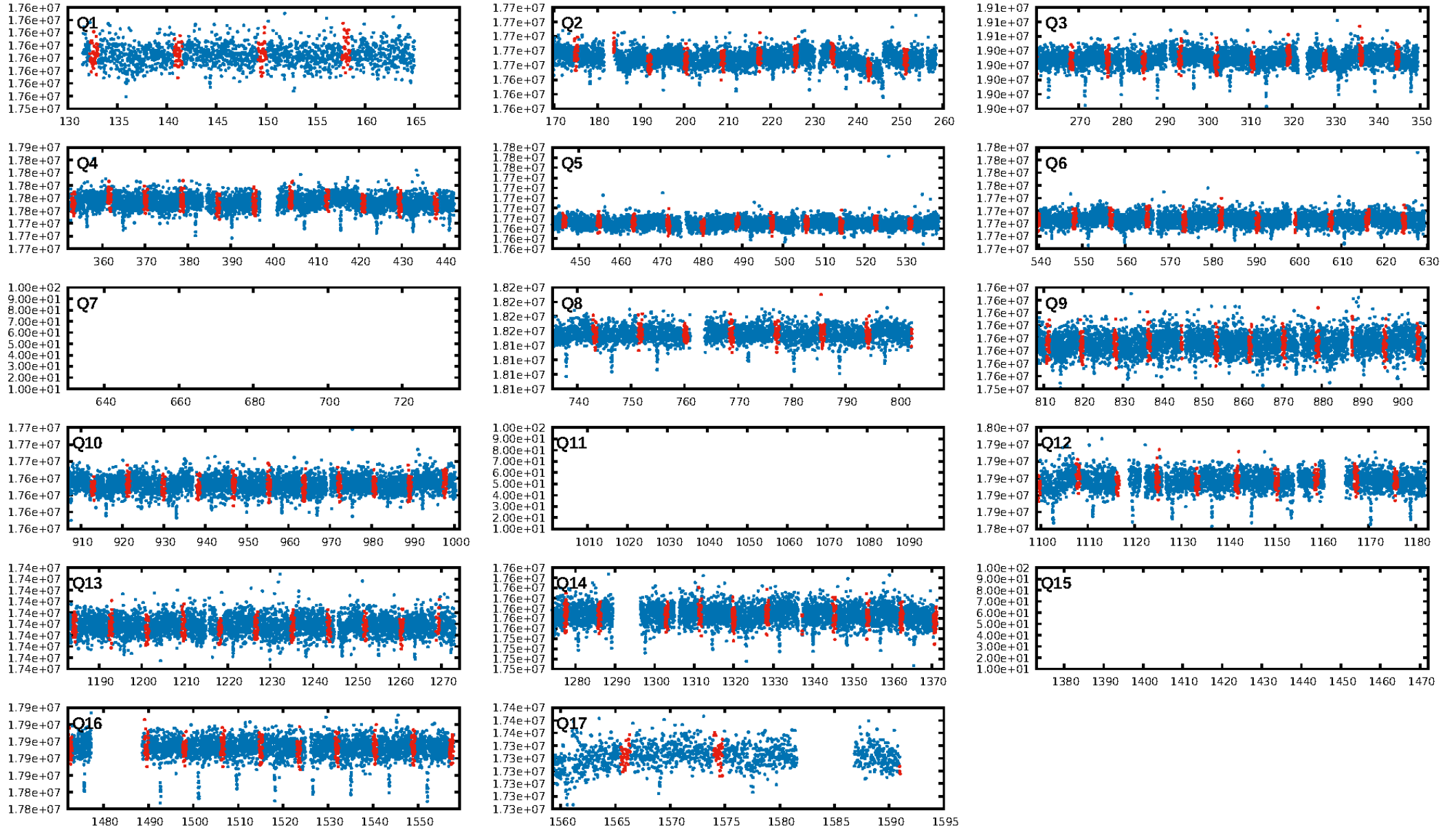
## DV Diagnostic Results:

ShortPeriod-sig: 0.1% [0.00σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 99.2%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 2.78e-37  
RollingBand-fgt: 1.00 [123/123]  
GhostDiagnostic-chr: 0.2592  
Centroid-sig: 4.4%  
Centroid-so: 1.952 arcsec [1.75σ]  
OotOffset-rm: 2.030 arcsec [2.79σ]  
KicOffset-rm: 2.421 arcsec [3.90σ]  
OotOffset-st: 4/1/4/5 [14]  
KicOffset-st: 4/1/4/5 [14]  
DiffImageQuality-fgm: 0.00 [0/14]  
DiffImageOverlap-fno: 1.00 [14/14]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 14:39:45 Z

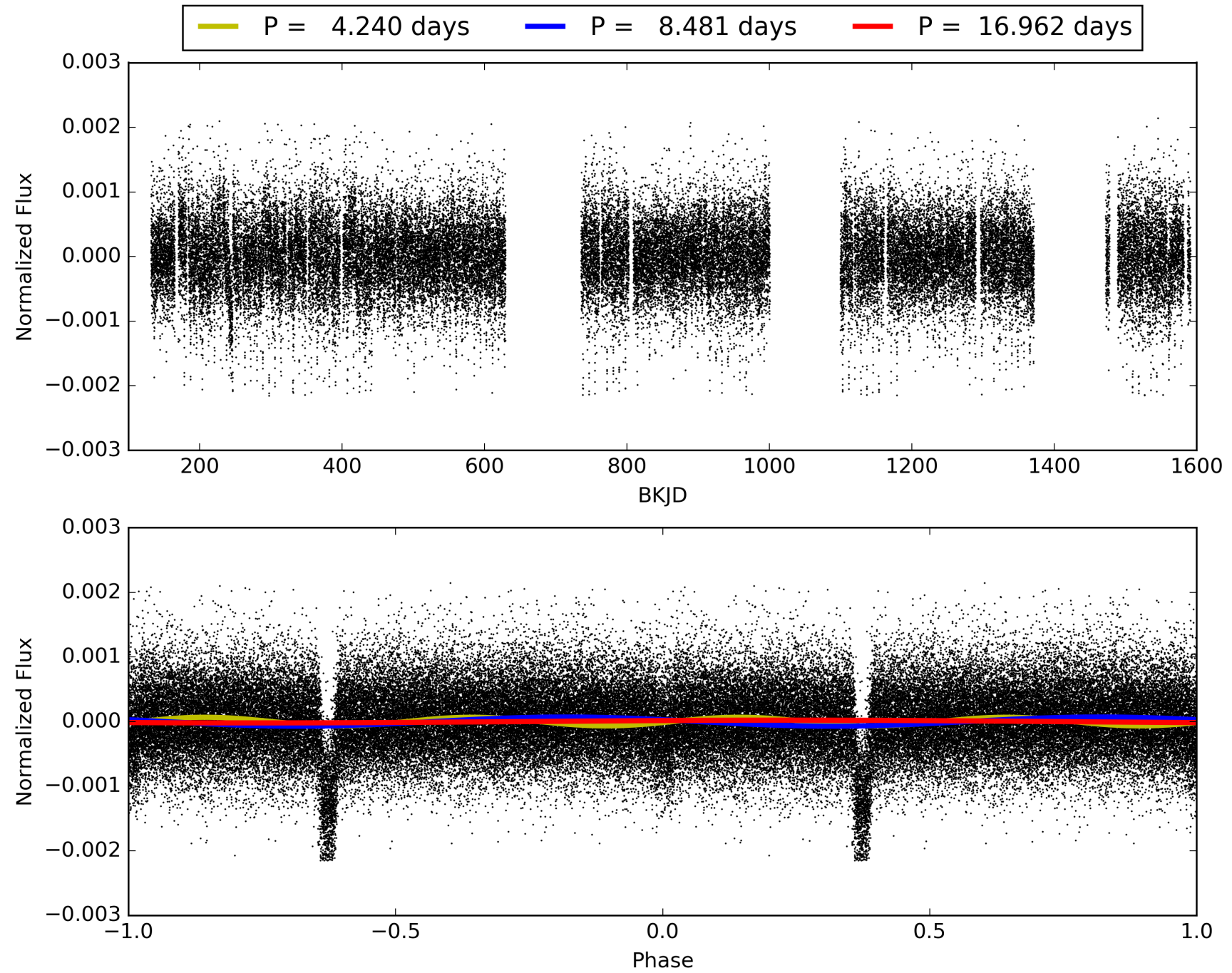
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 009851226-02, PDC Light Curves



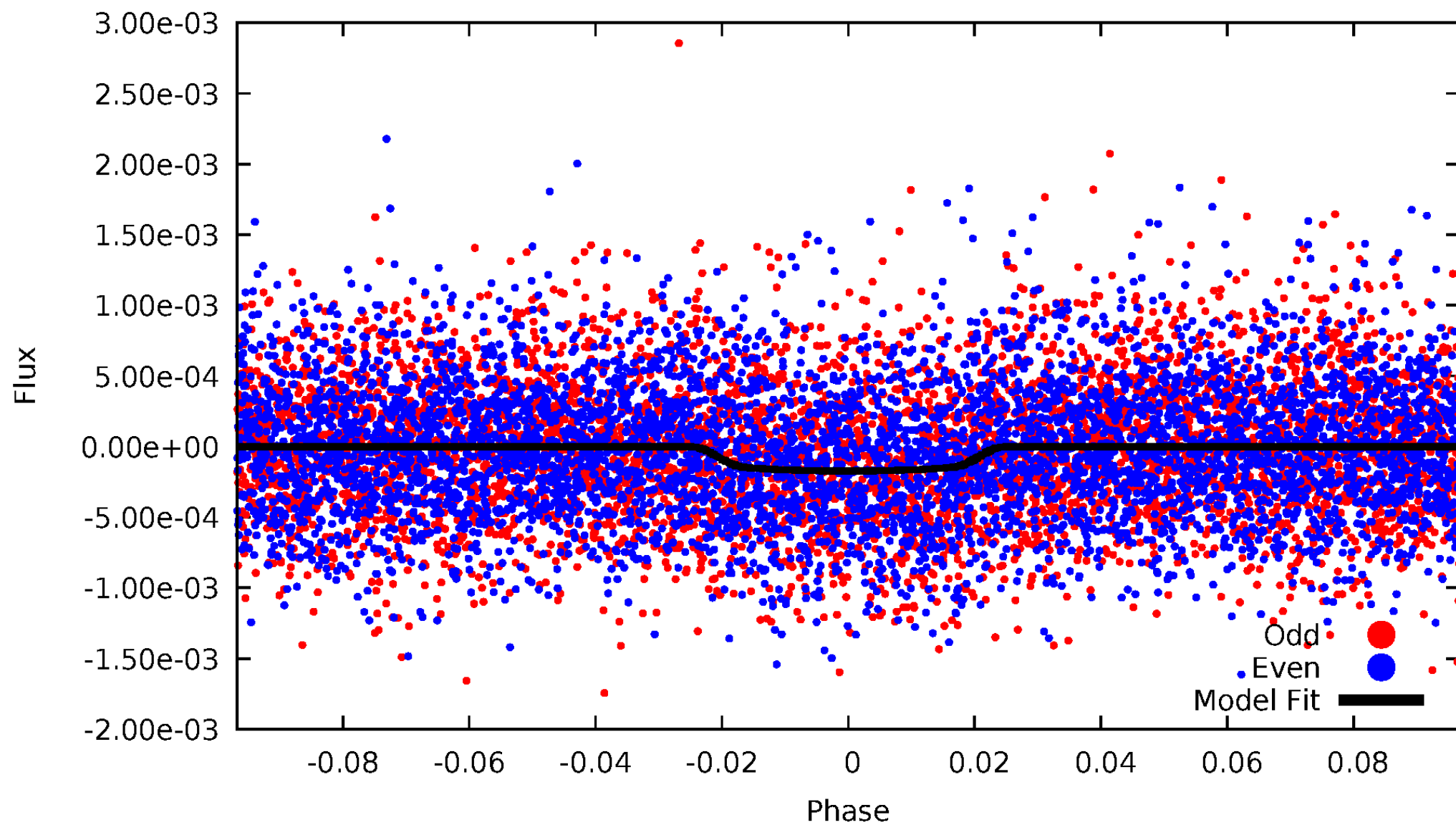


TCE 009851226-02



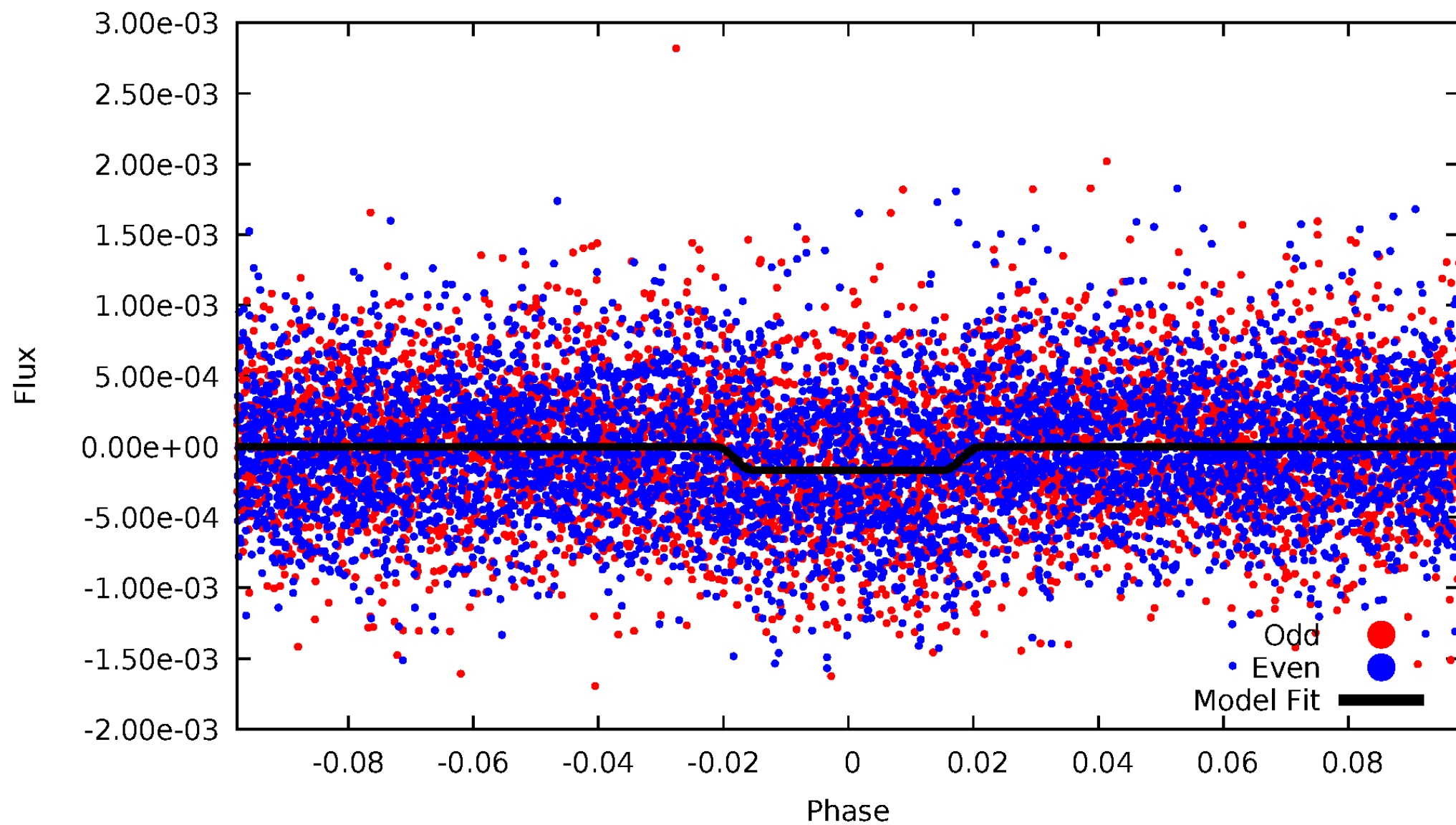
# DV Odd/Even

TCE 009851226-02



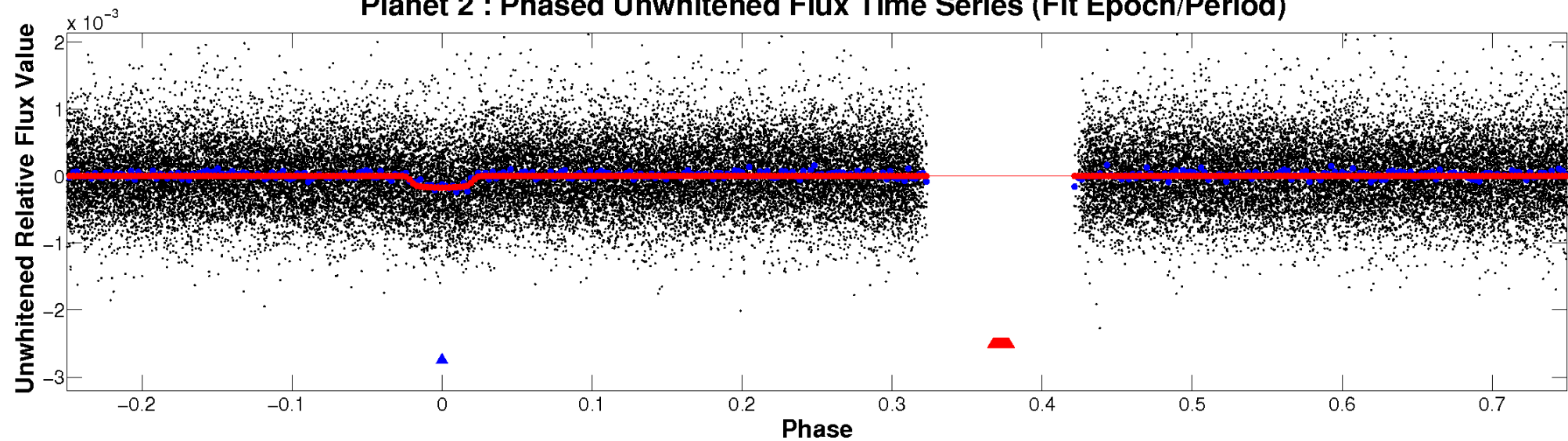
# ALT Odd/Even

TCE 009851226-02

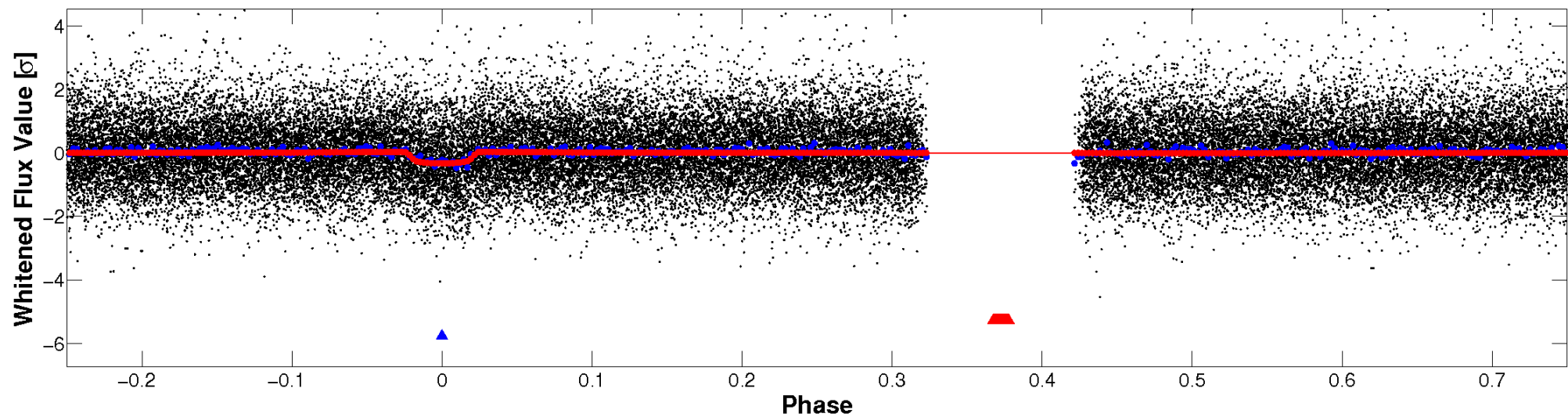


# Non-Whitened Vs. Whitened Light Curve

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



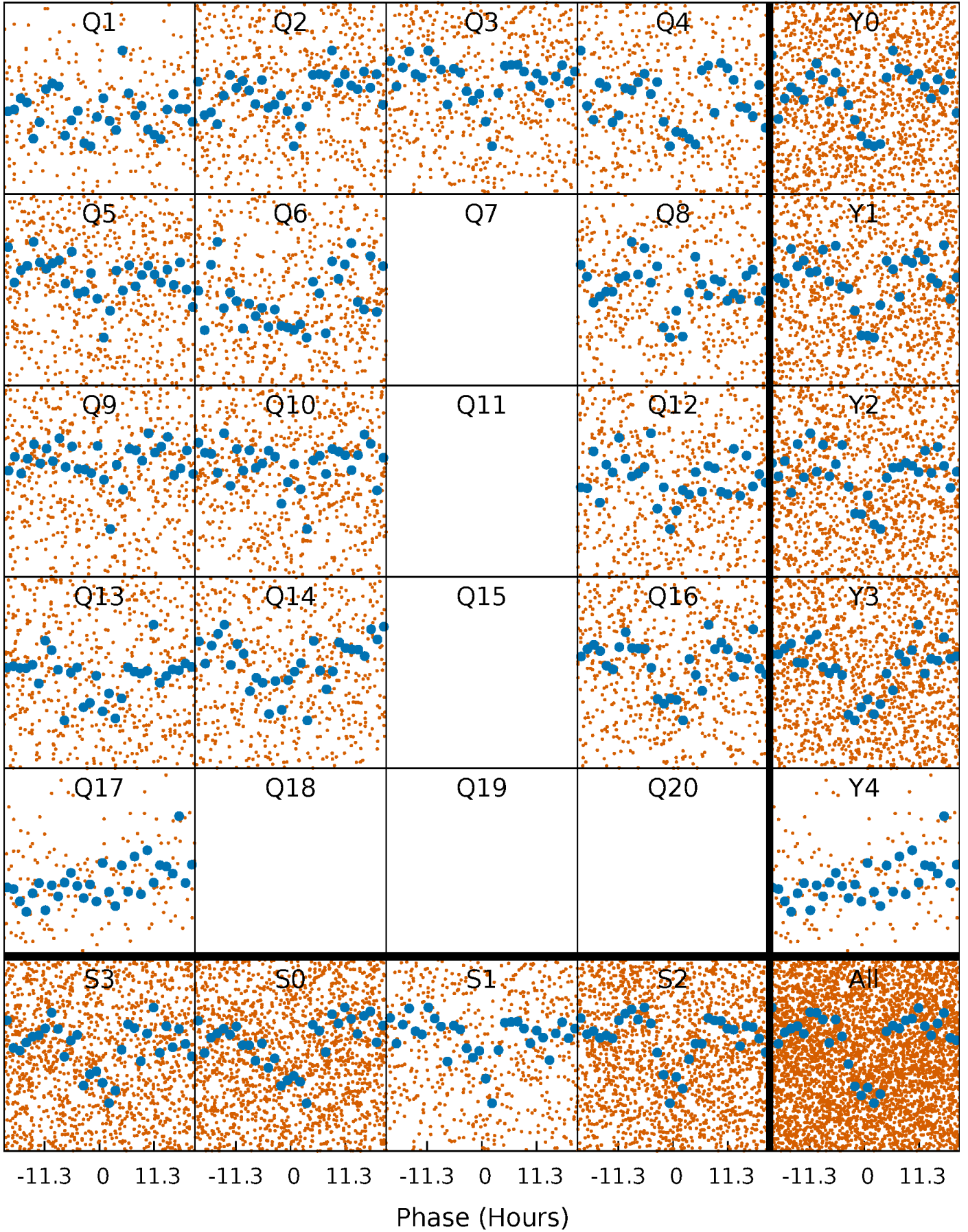
## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)





# PDC Quarter-Phased Transit Curves

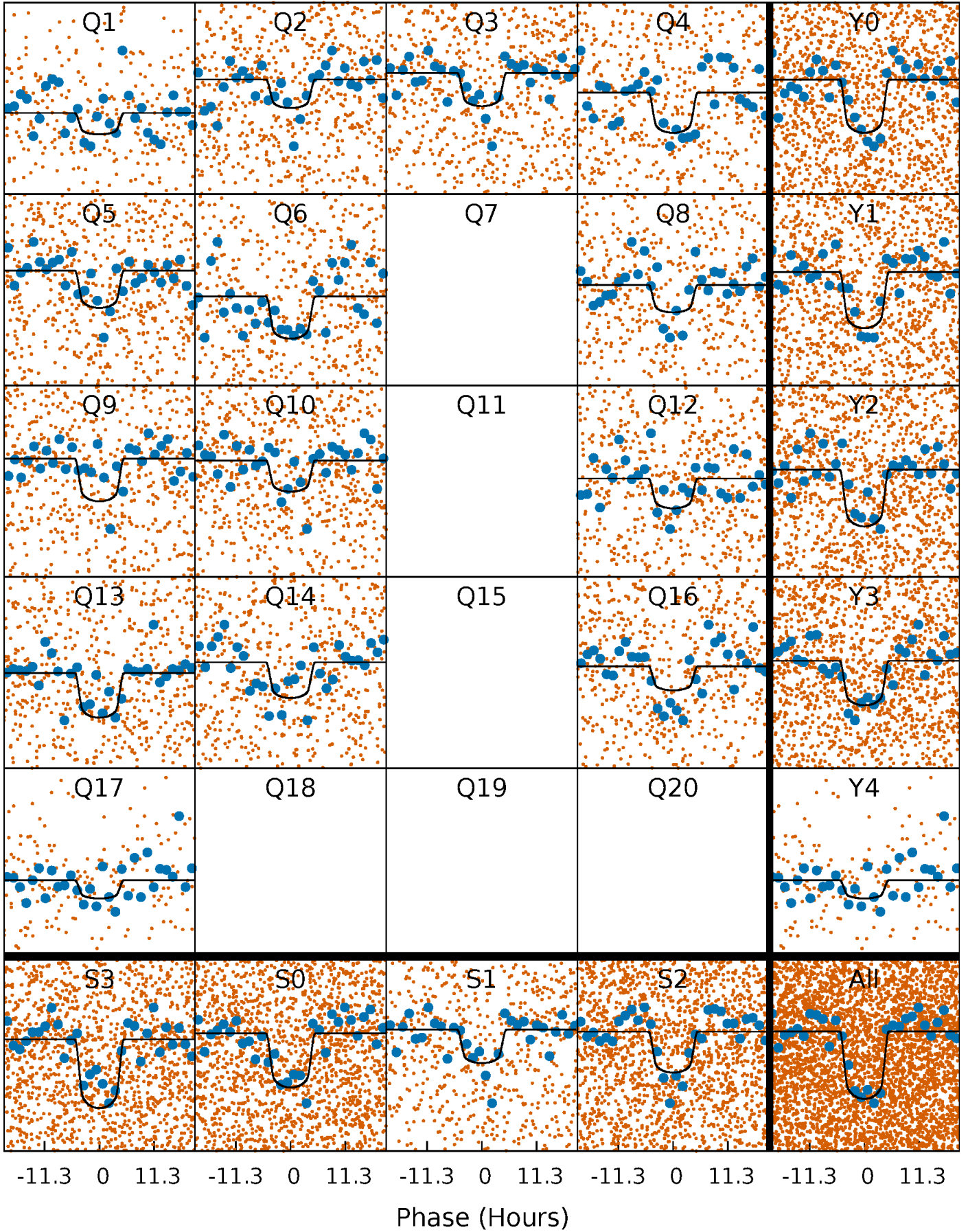
TCE 009851226-02    P= 8.480809 Days     $T_0=132.650997$  (BKJD)





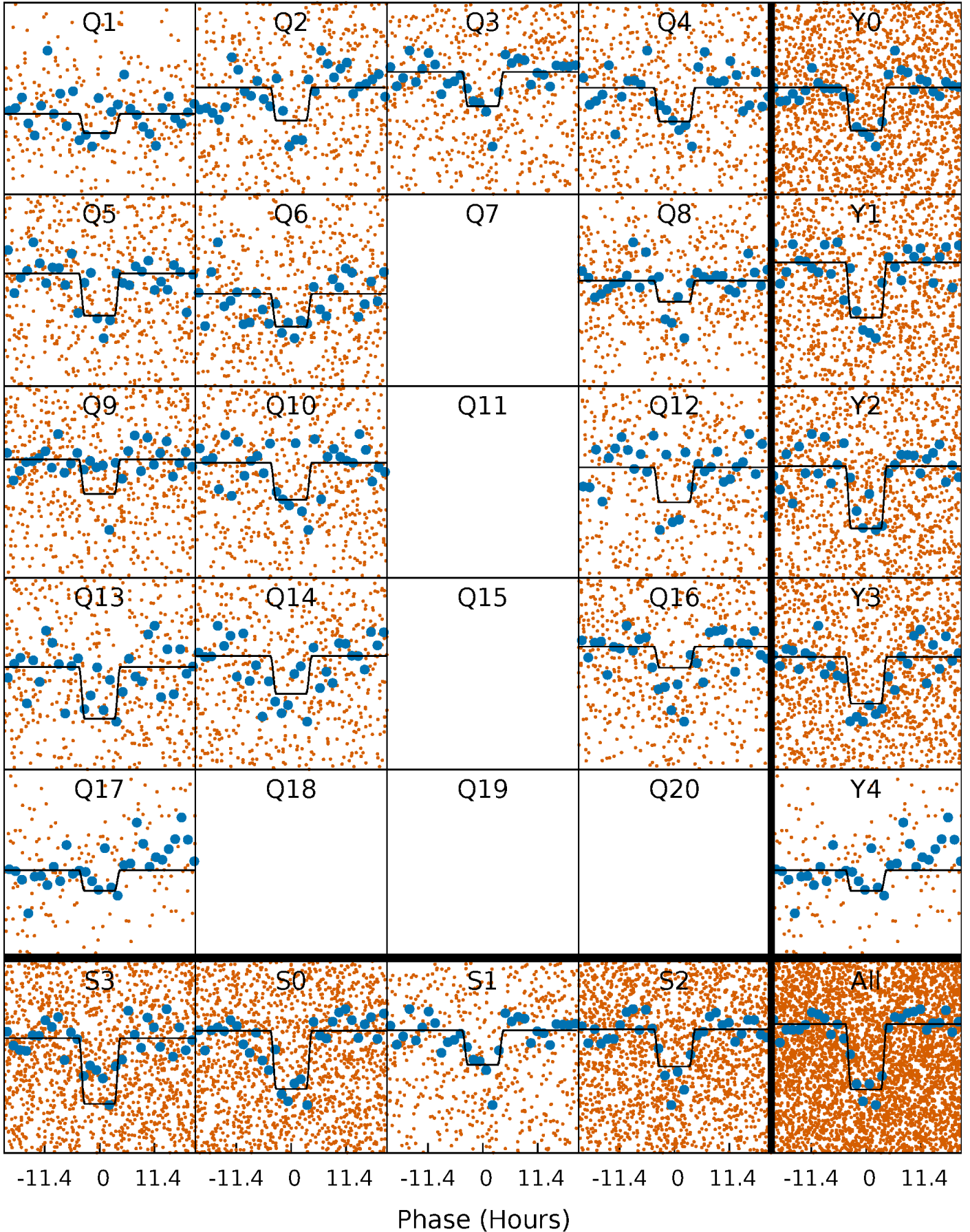
# DV Quarter-Phased Transit Curves

TCE 009851226-02   P= 8.480809 Days    $T_0=132.650997$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

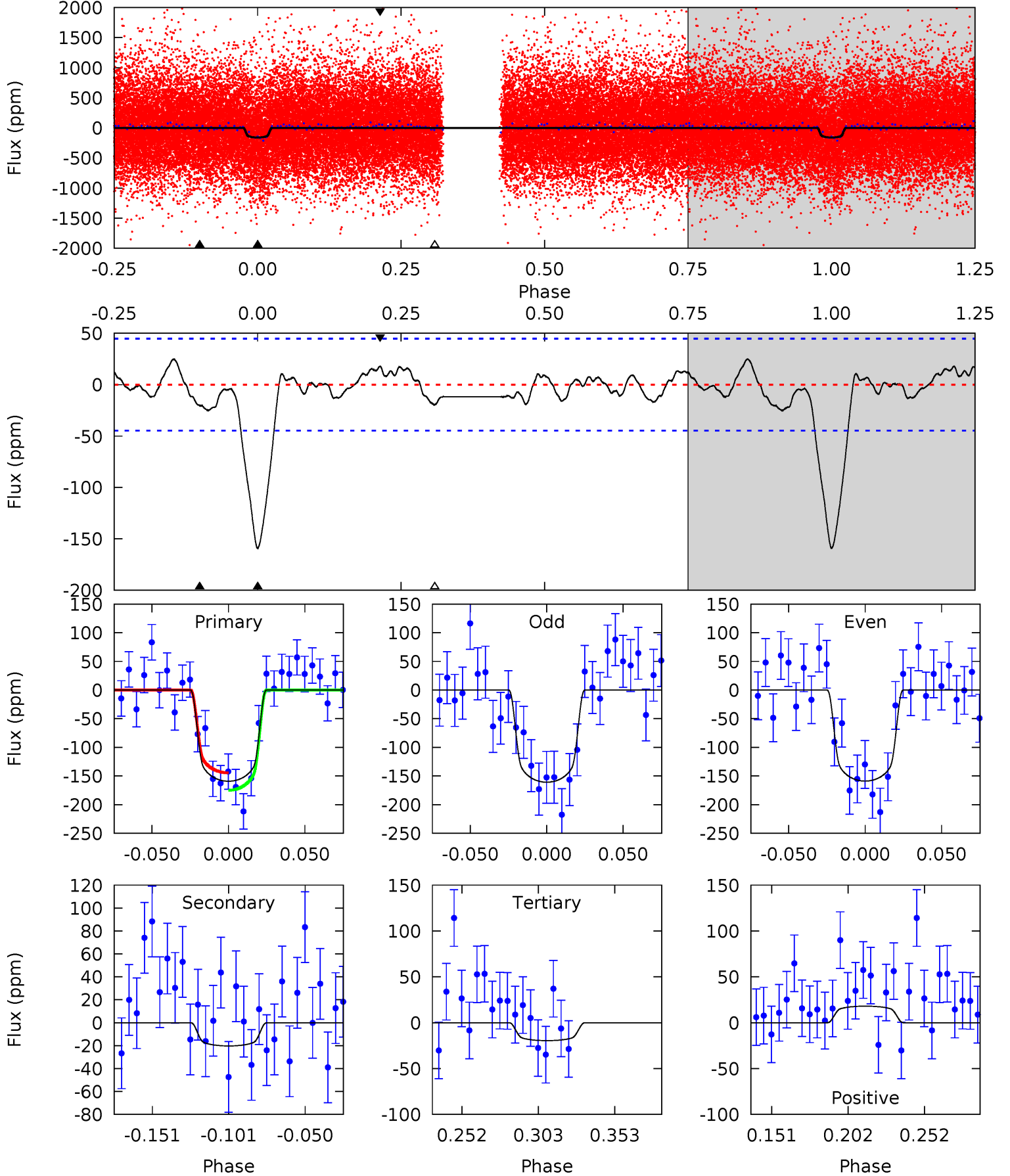
TCE 009851226-02   P= 8.480659 Days    $T_0=132.668746$  (BKJD)



# DV Model-Shift Uniqueness Test

009851226-02, P = 8.480809 Days, E = 124.170188 Days

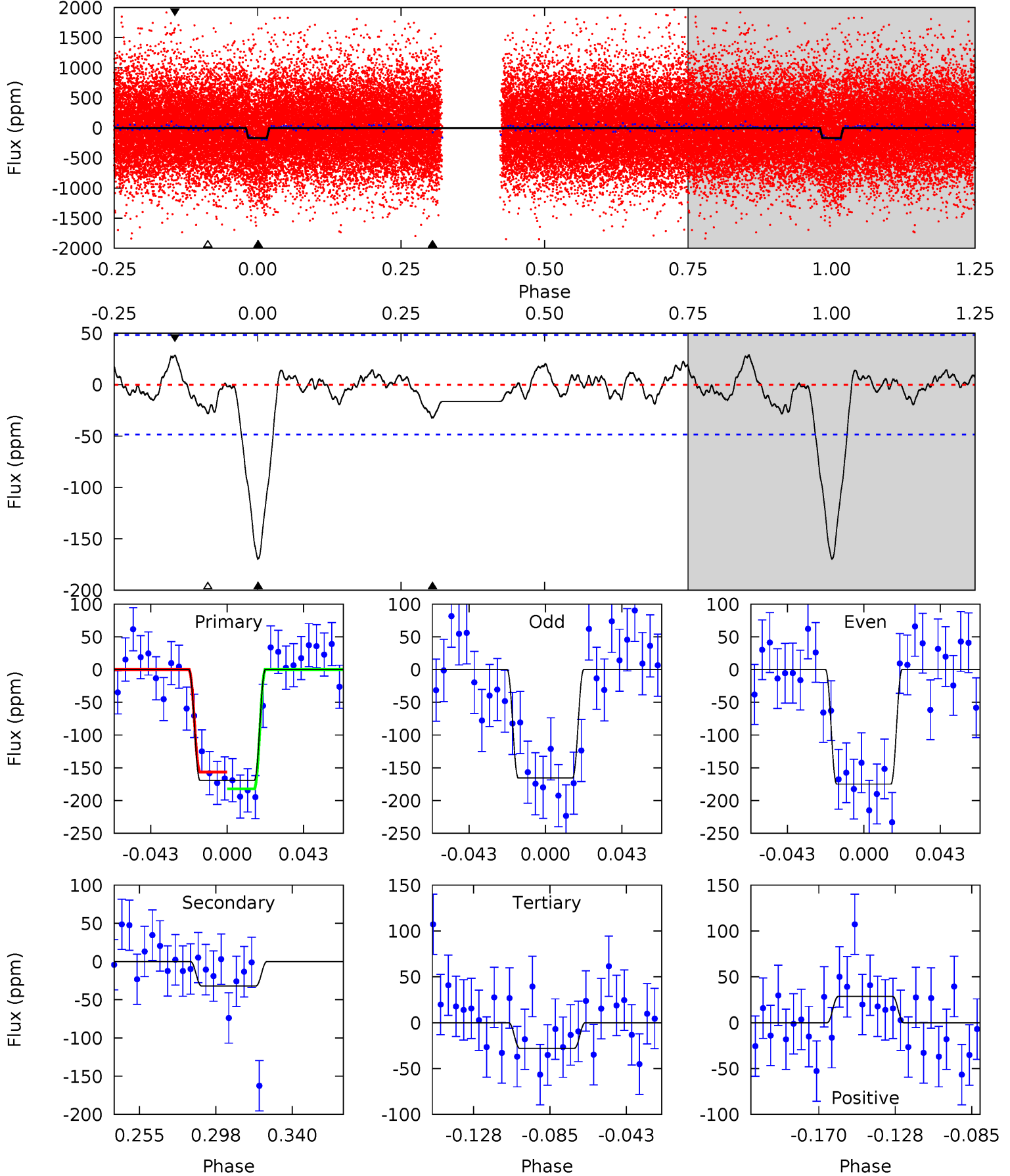
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
16.7	2.13	2.06	1.89	4.71	1.96	1.00	14.7	14.8	0.07	0.24	0.10	1.24	0.14	1.61



# Alt Model-Shift Uniqueness Test

009851226-02, P = 8.480659 Days, E = 124.188087 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
16.6	3.13	2.75	2.80	4.74	2.03	1.04	13.8	13.8	0.38	0.33	0.45	1.07	0.14	1.26



### Stellar Parameters For KIC 009851226

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5951^{+178}_{-214}$	$4.439^{+0.084}_{-0.196}$	$-0.140^{+0.300}_{-0.300}$	$0.991^{+0.301}_{-0.129}$	$0.983^{+0.132}_{-0.119}$	$1.423^{+0.524}_{-0.742}$
	+3%/-4%	+2%/-4%	+214%/-214%	+30%/-13%	+13%/-12%	+37%/-52%
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 009851226-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-20 \pm 10$	$1.67^{+0.30}_{-0.20}$	$1299^{+97}_{-70}$	$3658^{+276}_{-329}$	$25^{+16}_{-12}$
Alt.	$-32 \pm 10$	$1.43^{+0.26}_{-0.18}$	$1298^{+99}_{-72}$	$4160^{+294}_{-298}$	$54^{+27}_{-21}$

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



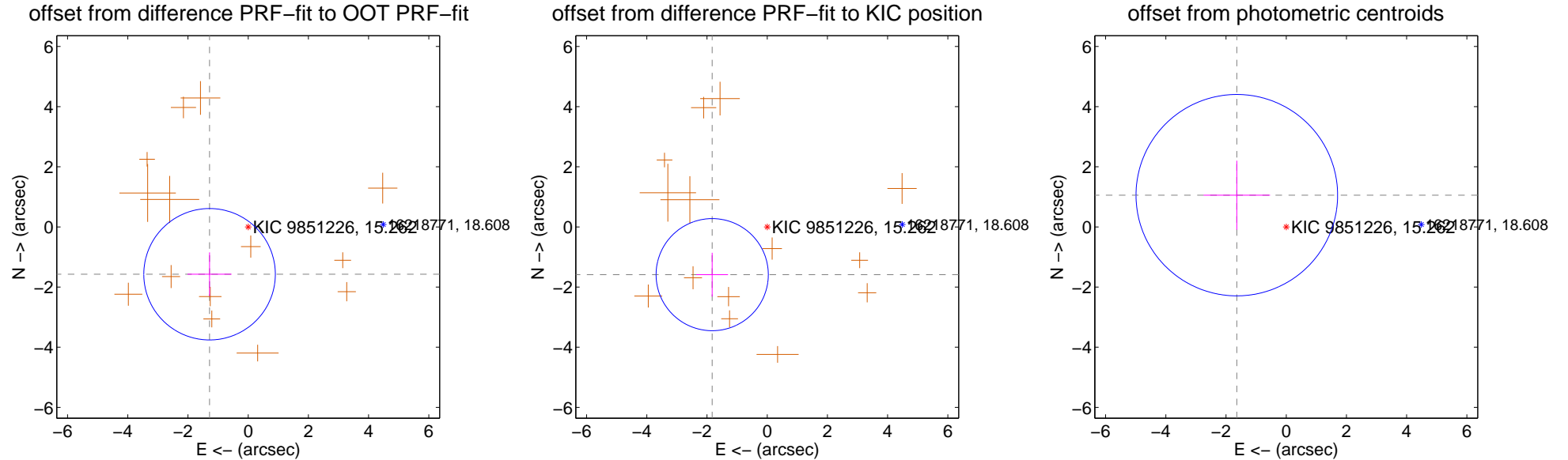
## DV Centroid Data

Supplemental centroid analysis for 009851226-02. Kepler magnitude: 15.26. Transit SNR 13.17

There are 0 quarters with good PRF difference image offsets

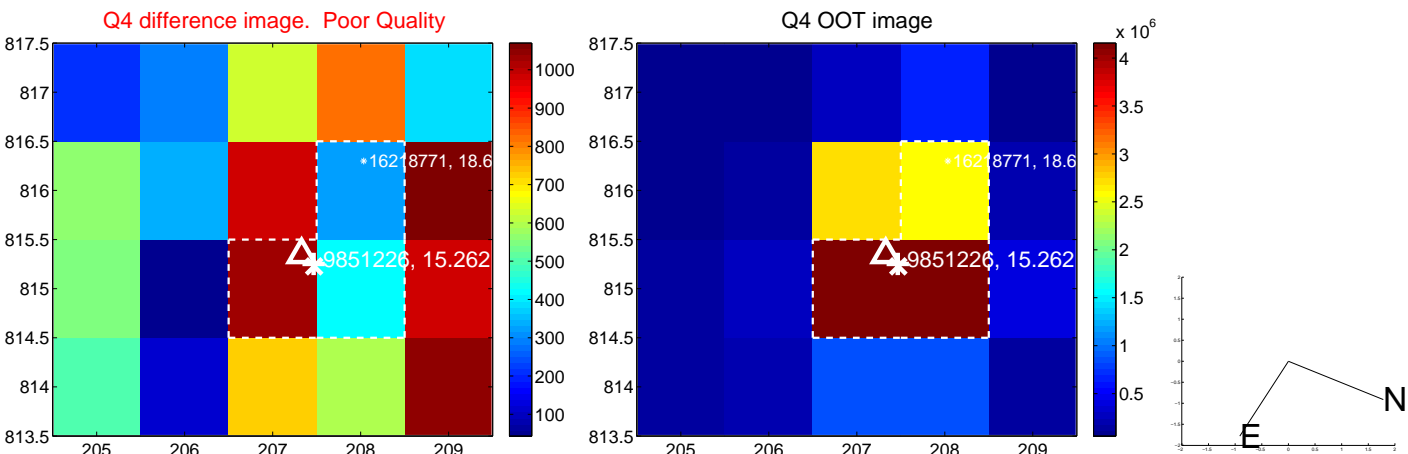
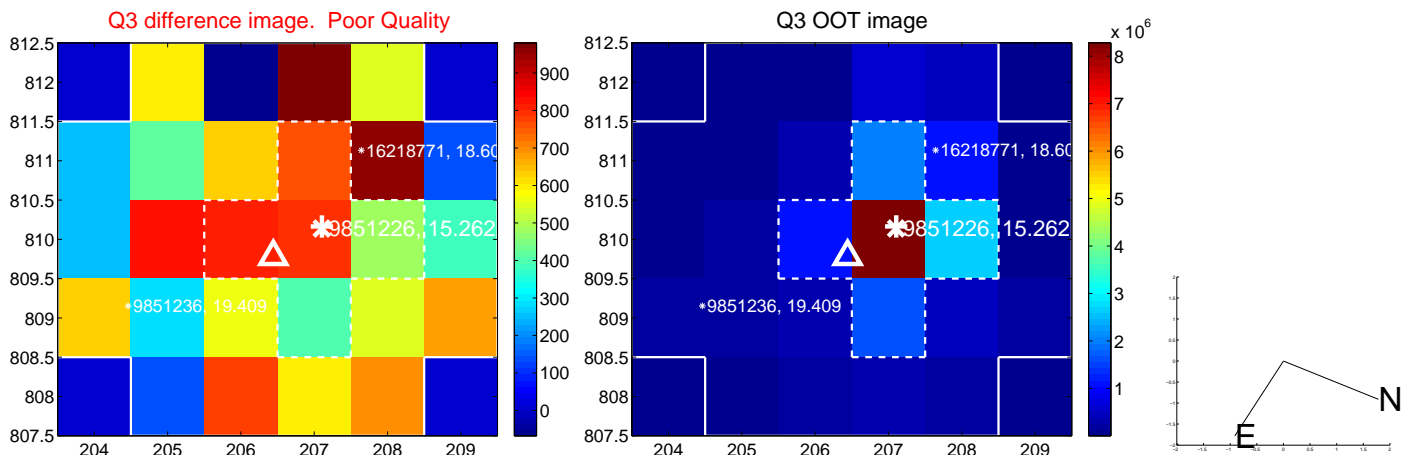
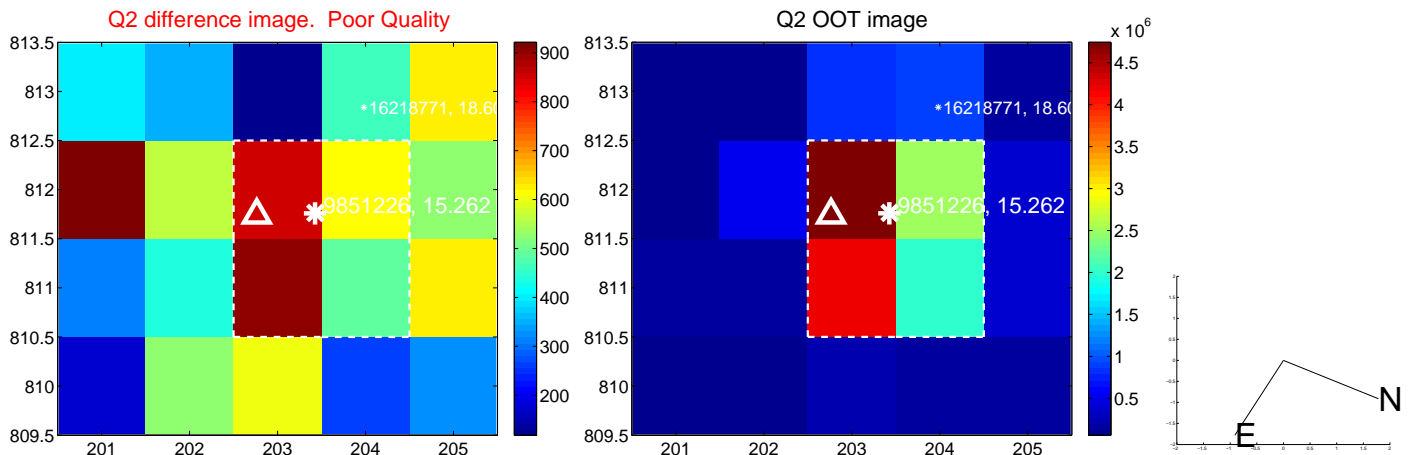
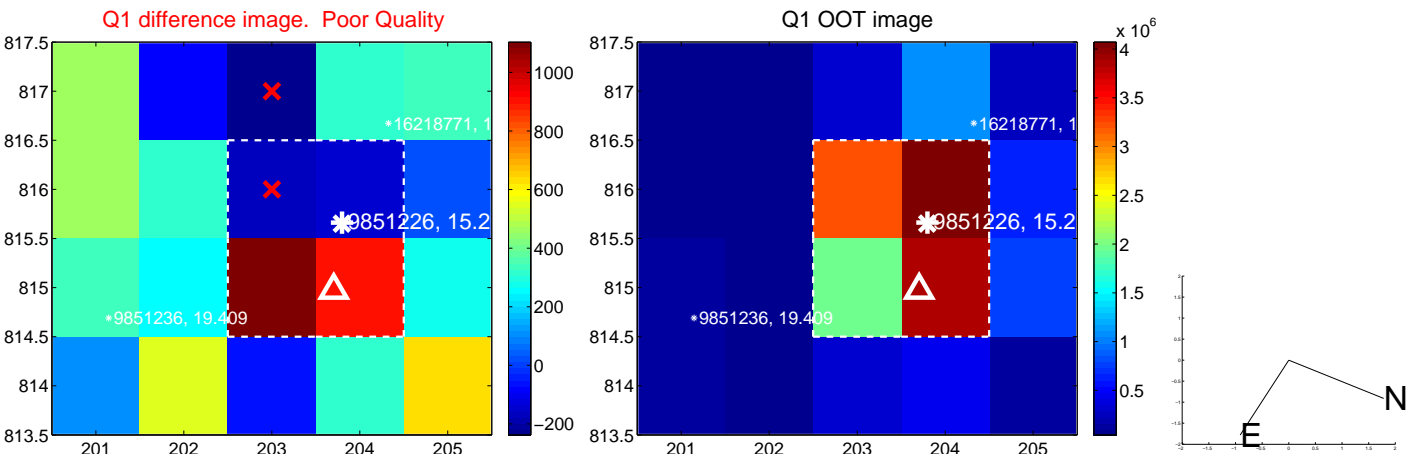
The direct PRF centroid is offset from the target star catalog position by about 0.04 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$2.030 \pm 0.728$	2.79	$1.283 \pm 0.731$	$-1.573 \pm 0.726$
PRF-fit source offset from KIC position	$2.421 \pm 0.621$	3.90	$1.827 \pm 0.527$	$-1.587 \pm 0.728$
photometric centroid source offset	$1.95 \pm 1.12$	1.75	$1.64 \pm 1.10$	$1.06 \pm 1.15$



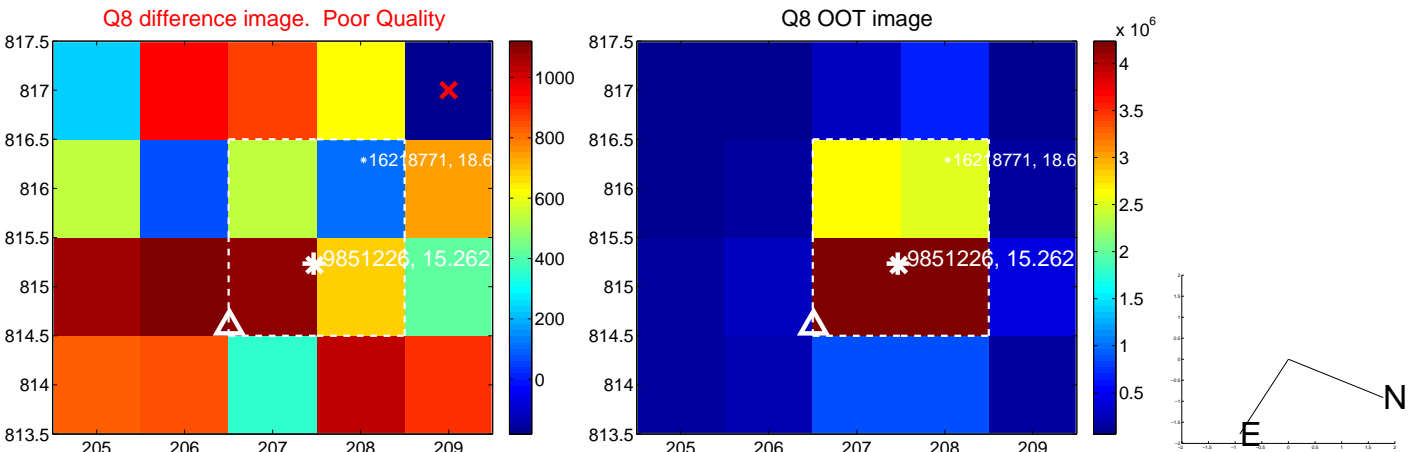
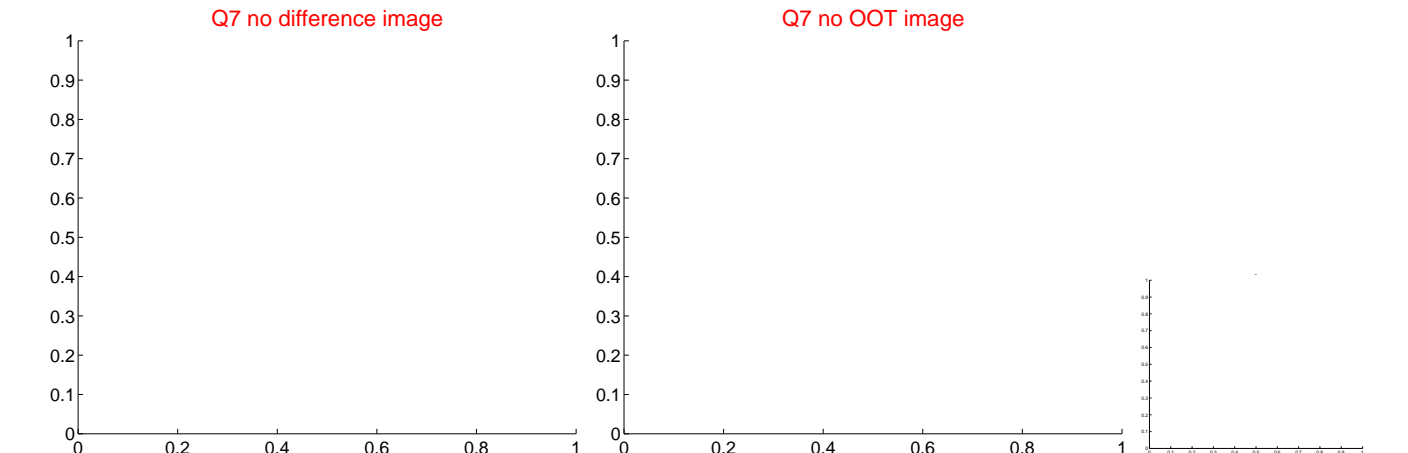
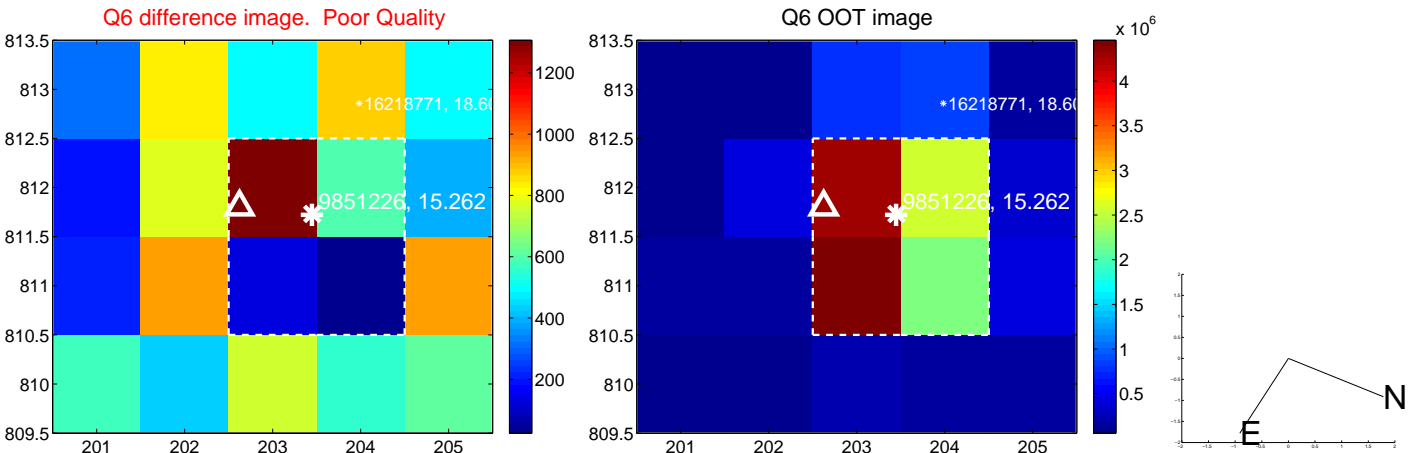
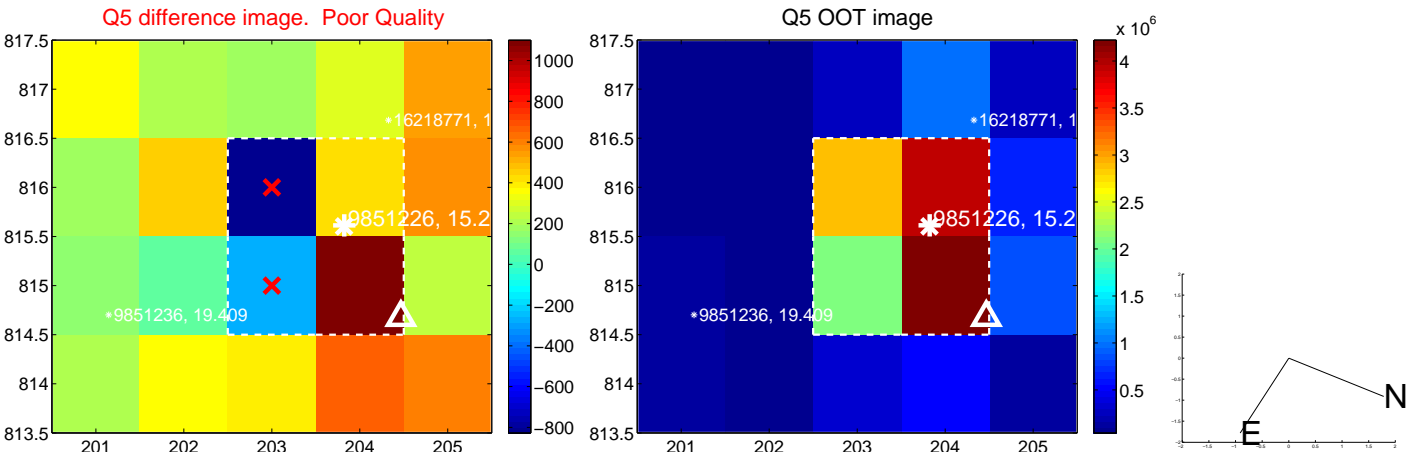
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

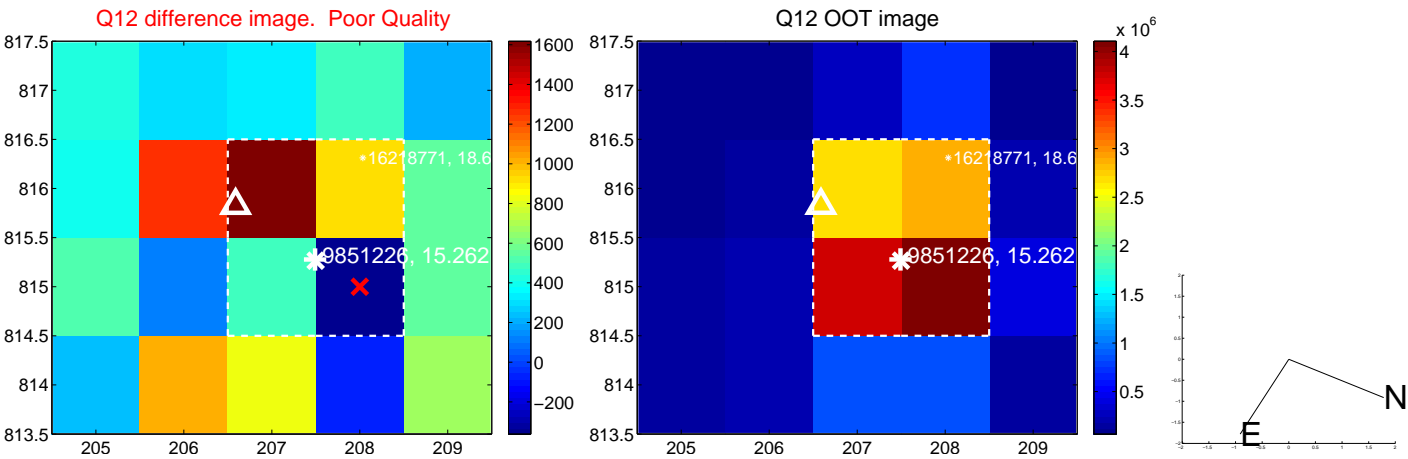
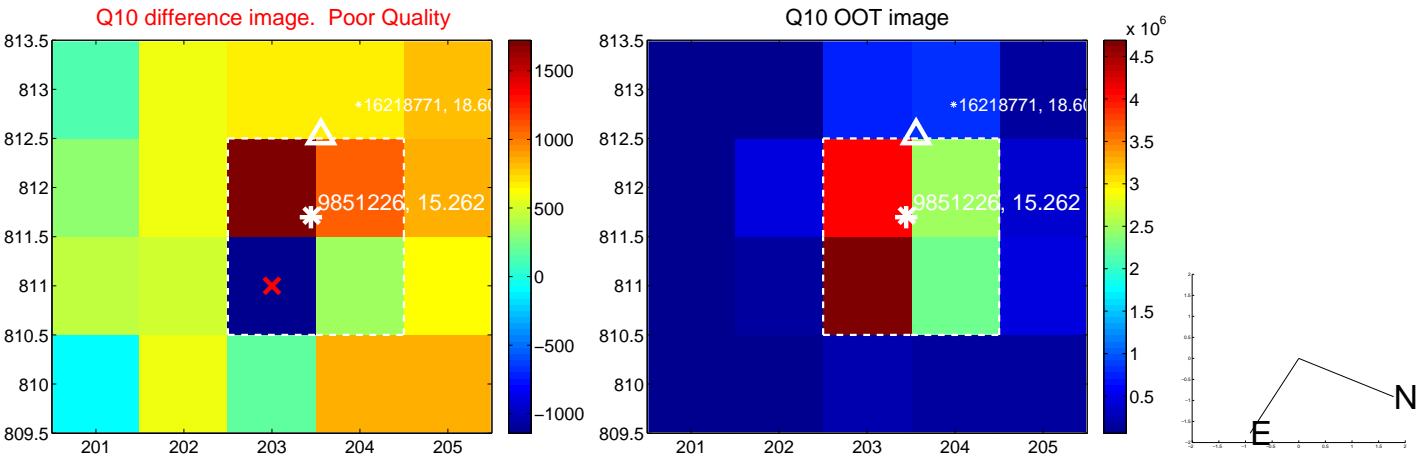
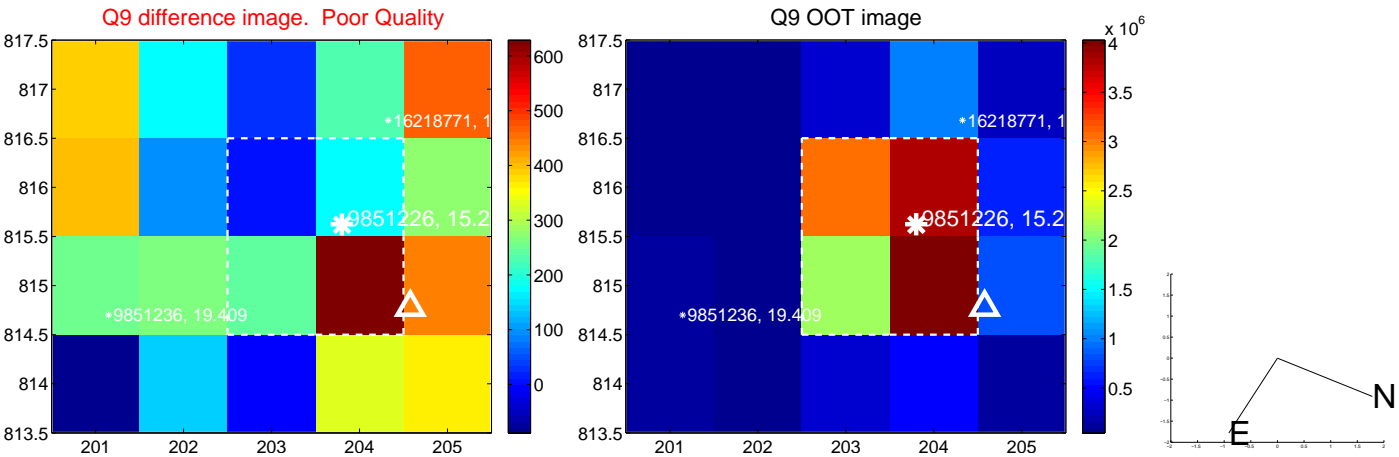




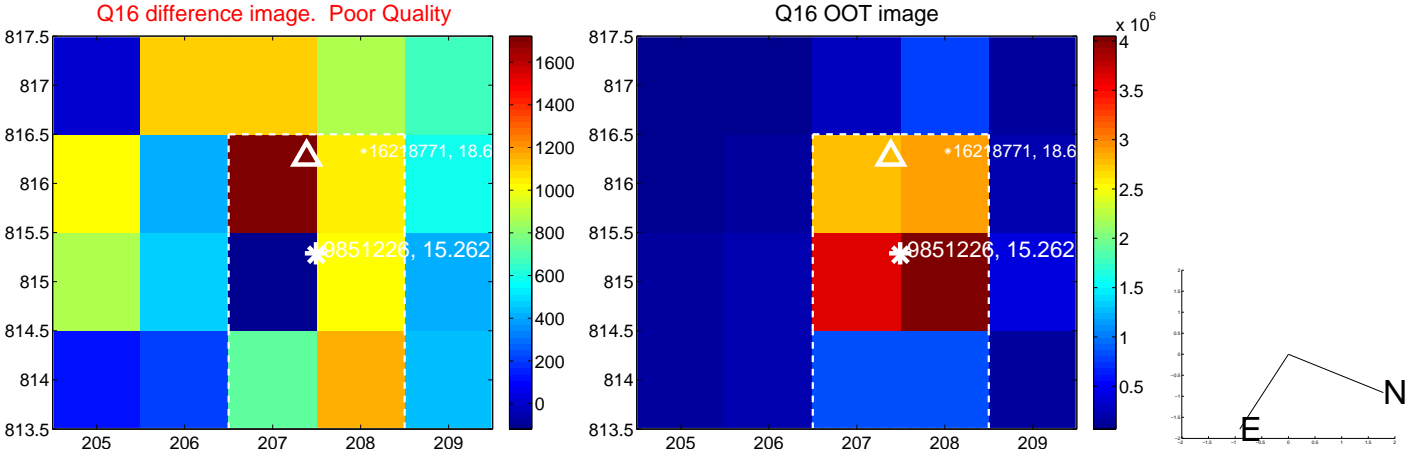
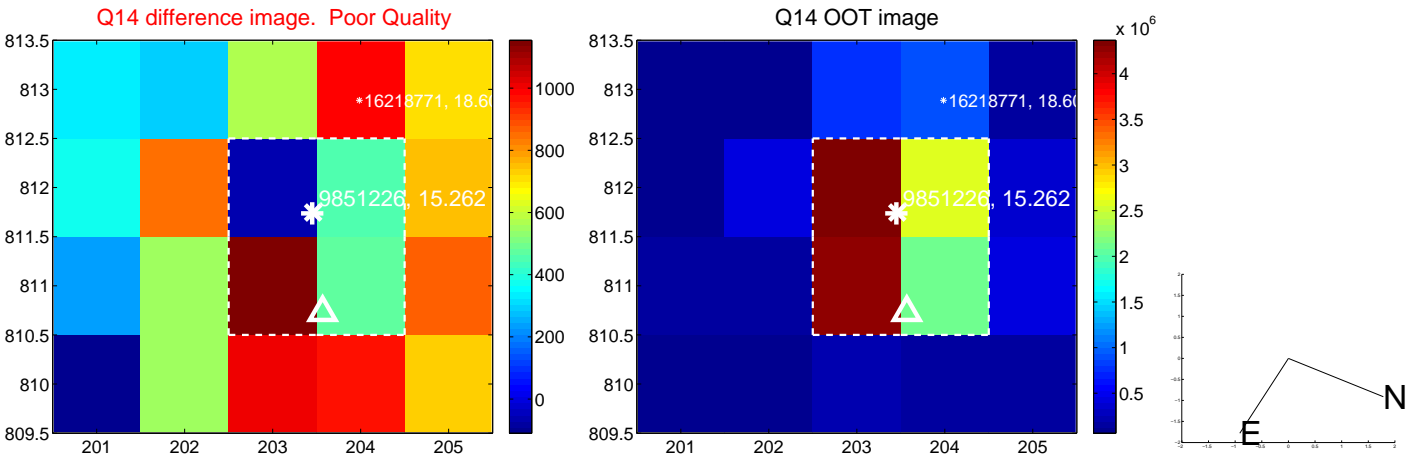
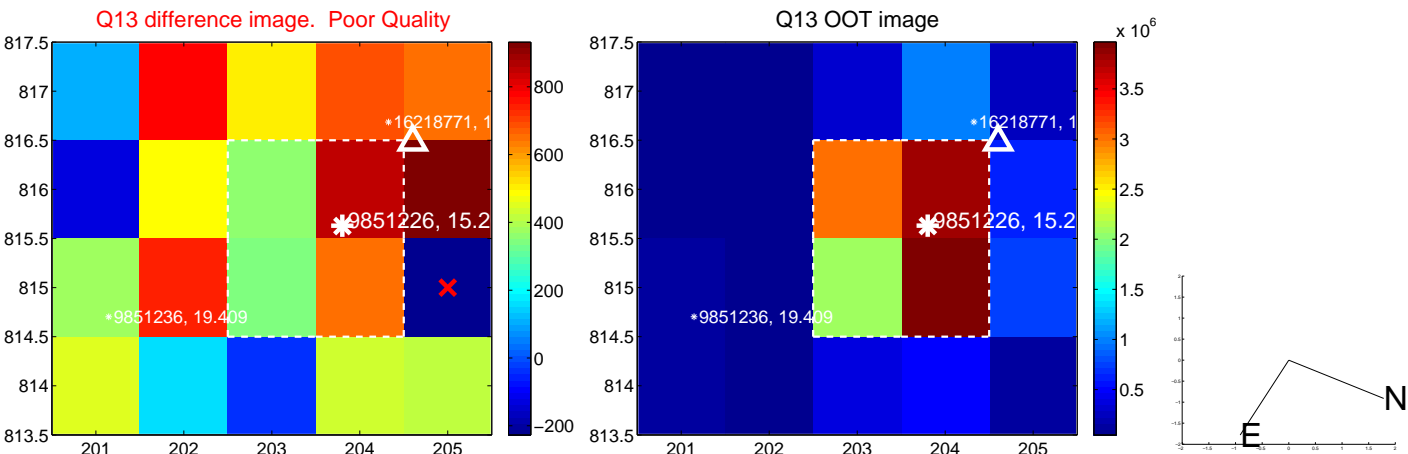
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



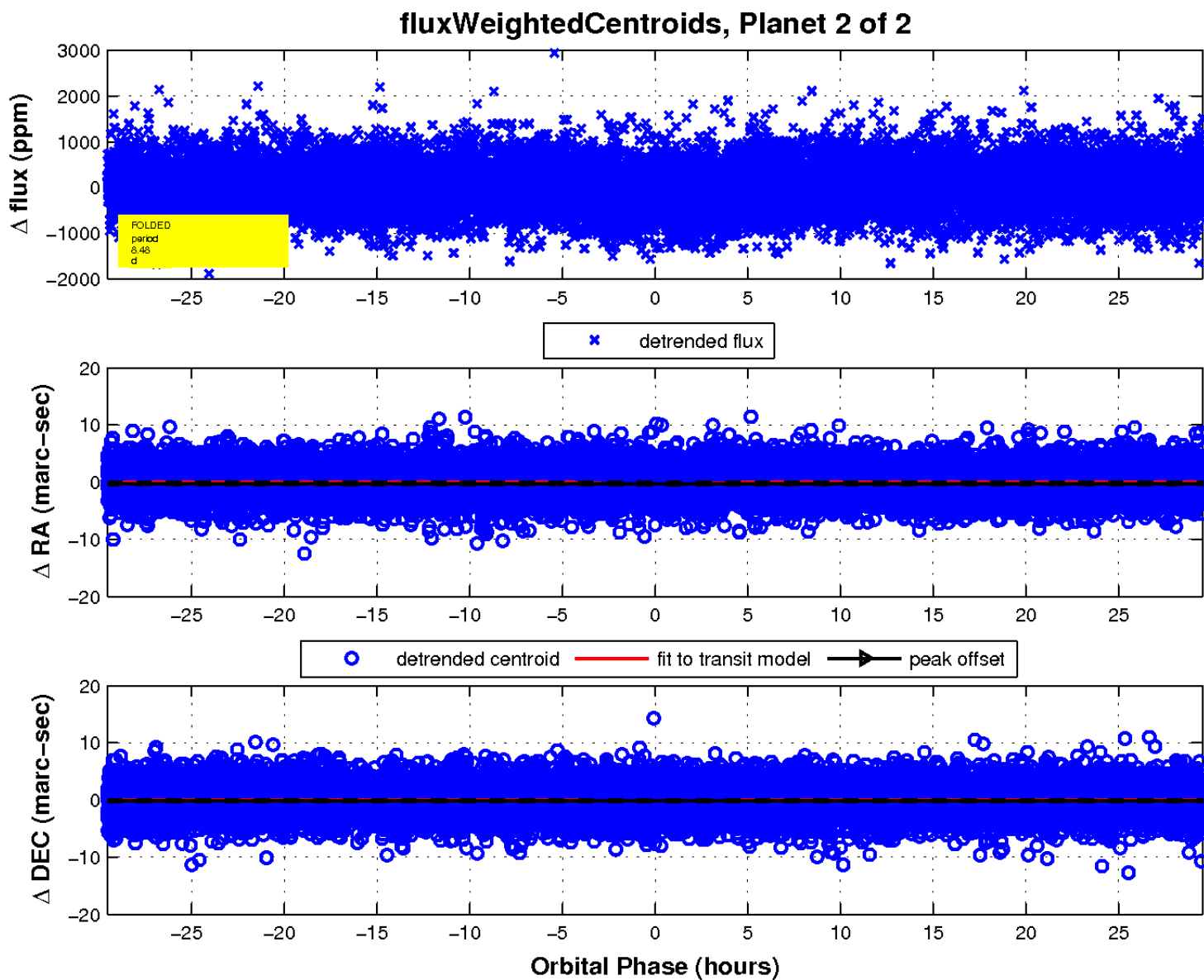
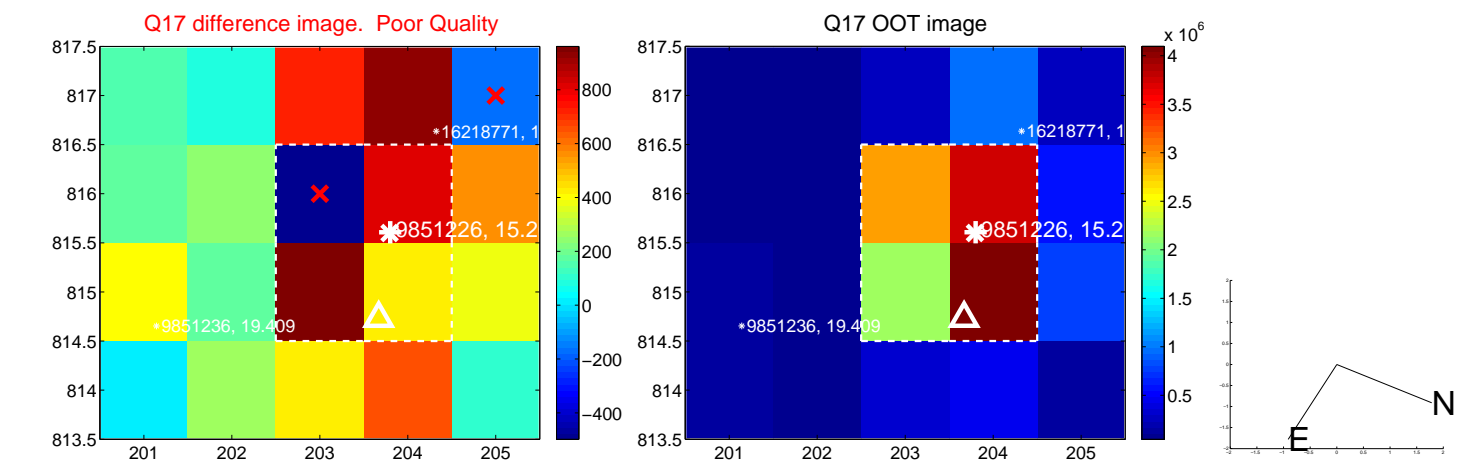
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white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination

