

# KIC 004847782

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004847782-01	OBS	3067.01	30.961013	156.155820	257.5	10.037	14.0	13.5	0.71	4947	1.21	8.69
004847782-02	OBS	No	30.960105	139.435017	406.2	5.174	12.2	13.2	0.71	4947	3.01	8.69

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004847782-01	OBS	FP	0.00	0	1	1	1	MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE—CENT_RESOLVED_OFFSET—HALO_GHOST—EPHEM_MATCH
004847782-02	OBS	FP	0.00	1	1	1	1	IS_SEC_TCE—CENT_RESOLVED_OFFSET—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 004847782-01

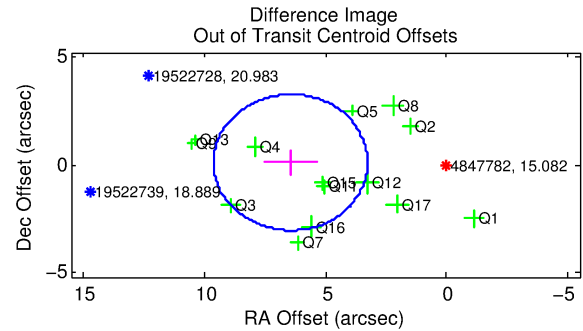
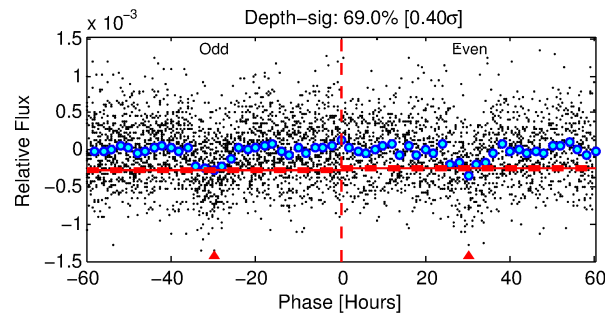
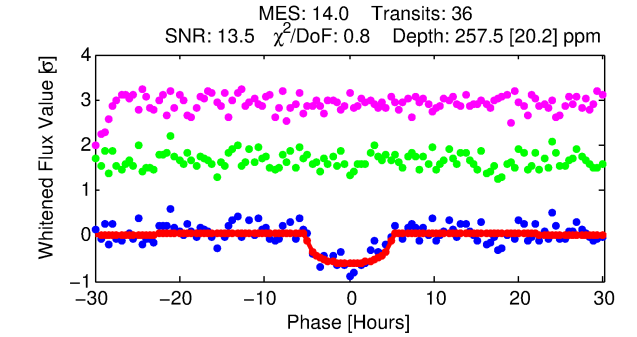
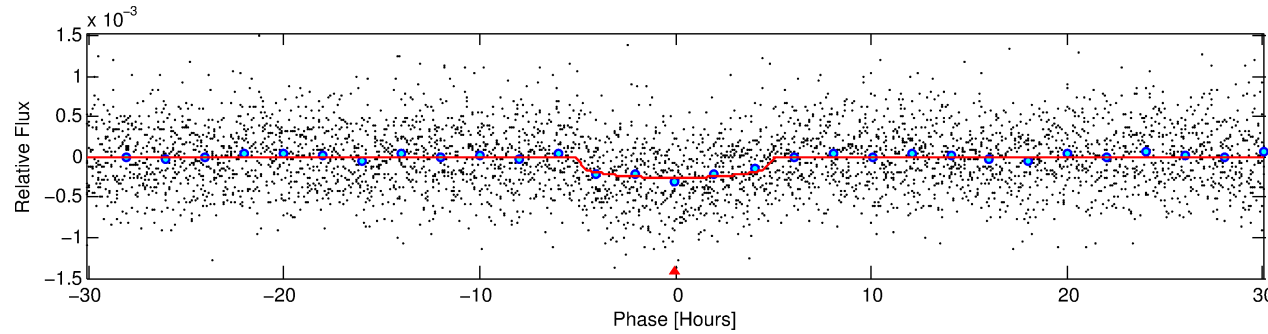
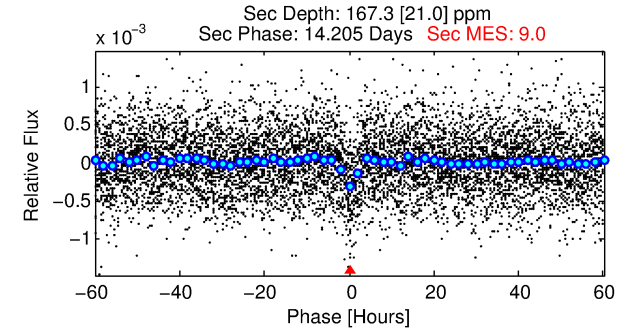
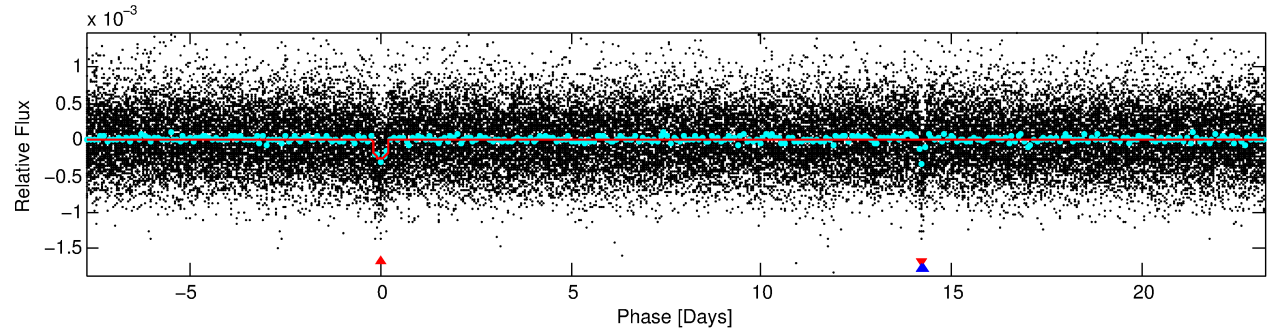
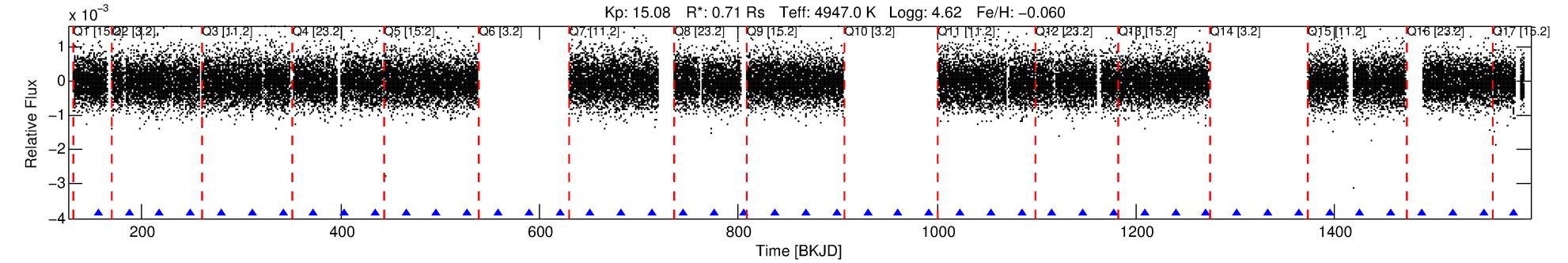
TCE (1)	KIC	Parent (2)	Parent KIC	$P_1:P_2$	Dist ( $''$ )	$\Delta$ Row	$\Delta$ Col	$m_2$	$m_1$	$D_2/D_1$	Mechanism	Flag	$\sigma_P$	$\sigma_T$
004847782-01	4847782	004847832-01	4847832	1:1	34.8	-6	7	12.45	15.08	1337.60	Direct-PRF	0	0.45	0.11

**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: 4847782 Candidate: 1 of 2 Period: 30.961 d

KOI: K03067 Corr: No Ephemeris Match



## DV Fit Results:

Period = 30.96101 [0.00046] d  
Epoch = 156.1558 [0.0120] BKJD  
Rp/R\* = 0.0155 [0.0094]  
a/R\* = 18.13 [38.12]  
b = 0.66 [1.81]  
Seff = 8.69 [1.97]  
Teff = 438 [25] K  
Rp = 1.21 [0.75] Re  
a = 0.1774 [0.0181] AU  
Ag = 1994.74 [2452.86] [0.81σ]  
Teffp = 4524 [1397] K [2.92σ]

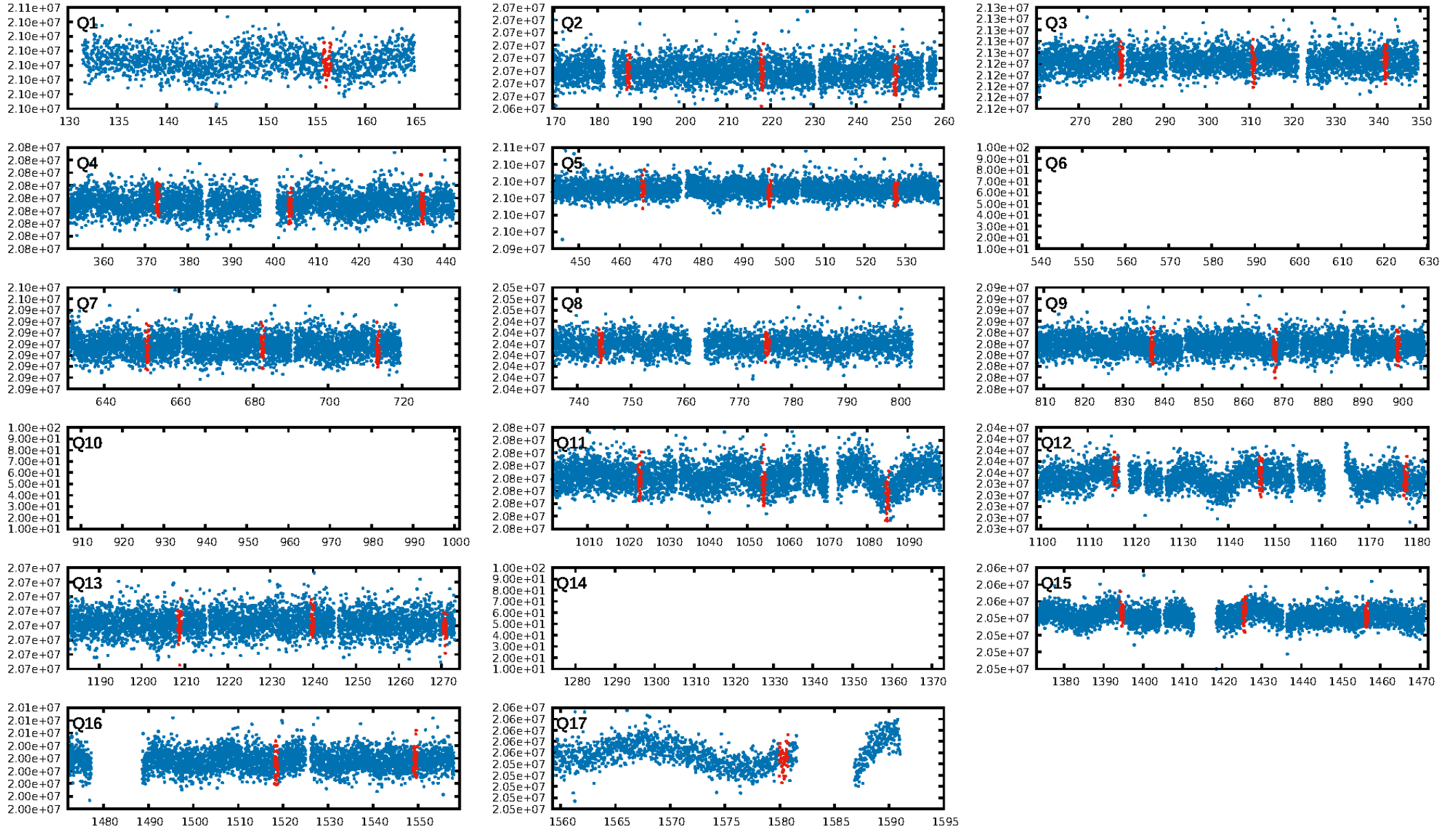
## DV Diagnostic Results:

ShortPeriod-sig: 0.2% [0.00σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 71.1%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 7.71e-44  
RollingBand-fgt: 1.00 [34/34]  
GhostDiagnostic-chr: 0.06863  
Centroid-sig: 0.0%  
Centroid-so: 4.778 arcsec [4.81σ]  
OotOffset-rm: 6.443 arcsec [6.08σ]  
KicOffset-rm: 6.393 arcsec [6.00σ]  
OotOffset-st: 1/4/4/5 [14]  
KicOffset-st: 1/4/4/5 [14]  
DiffImageQuality-fgm: 0.14 [2/14]  
DiffImageOverlap-fno: 1.00 [14/14]

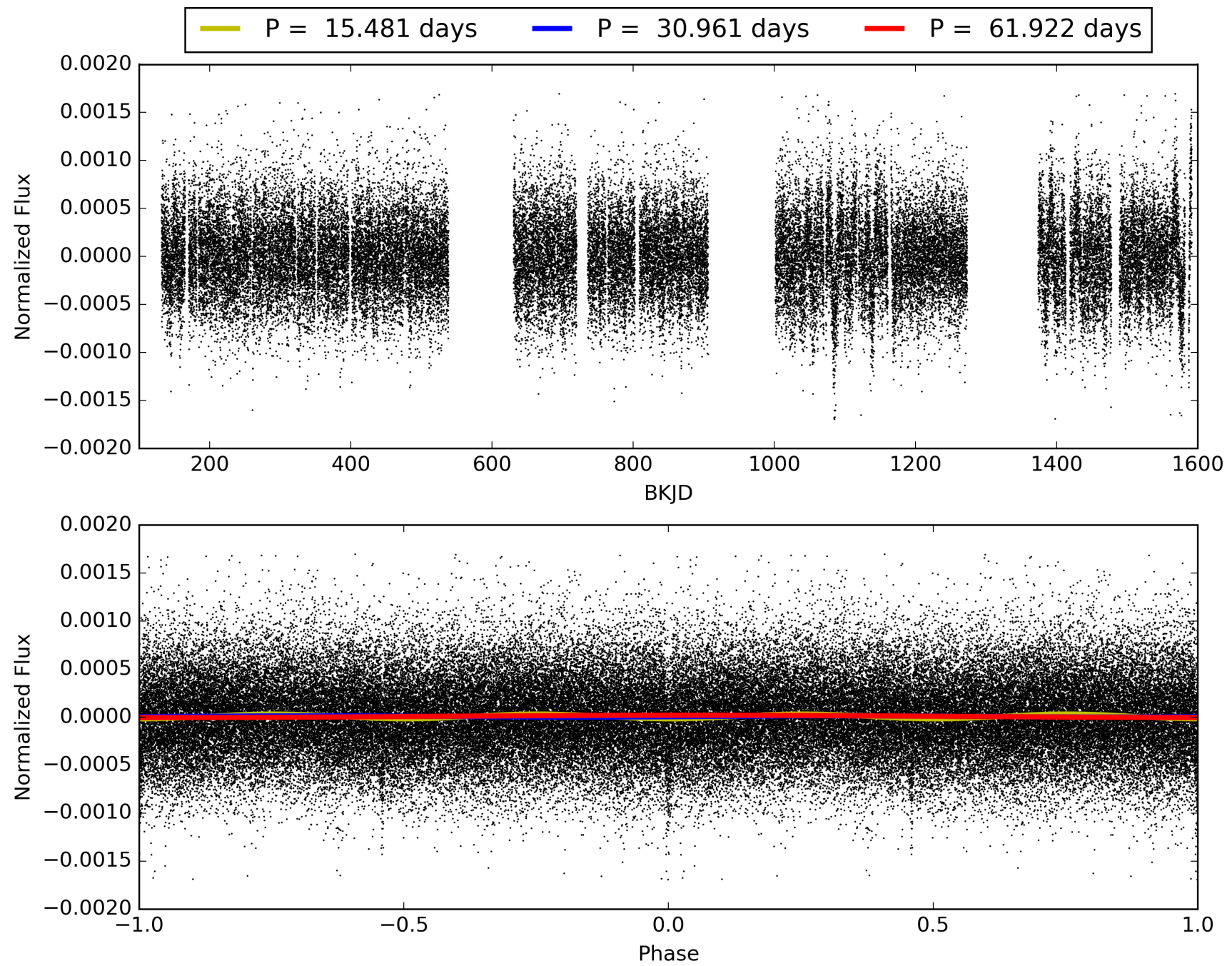
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 23:37:28 Z

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

# TCE 004847782-01, PDC Light Curves

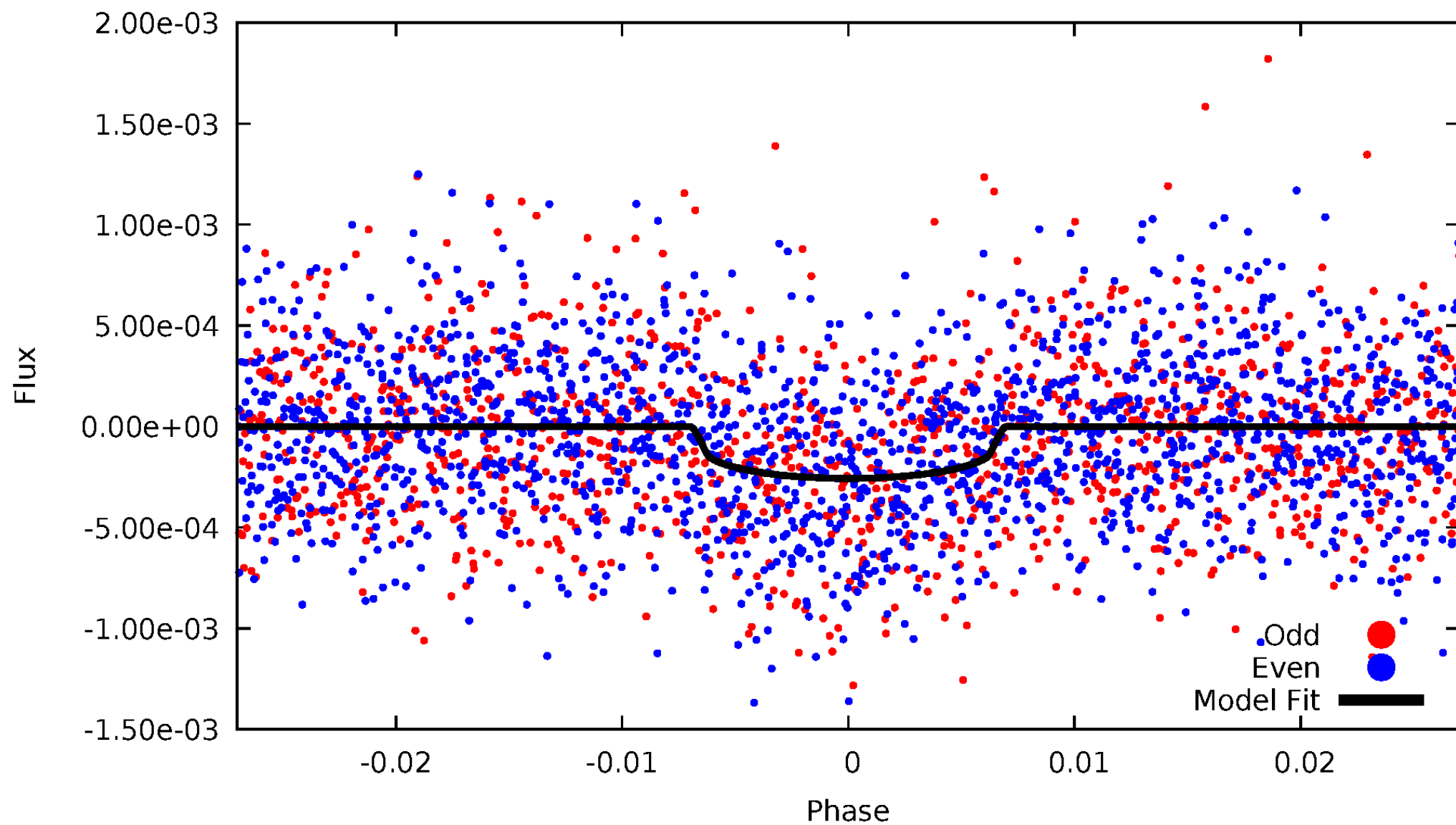


TCE 004847782-01



# DV Odd/Even

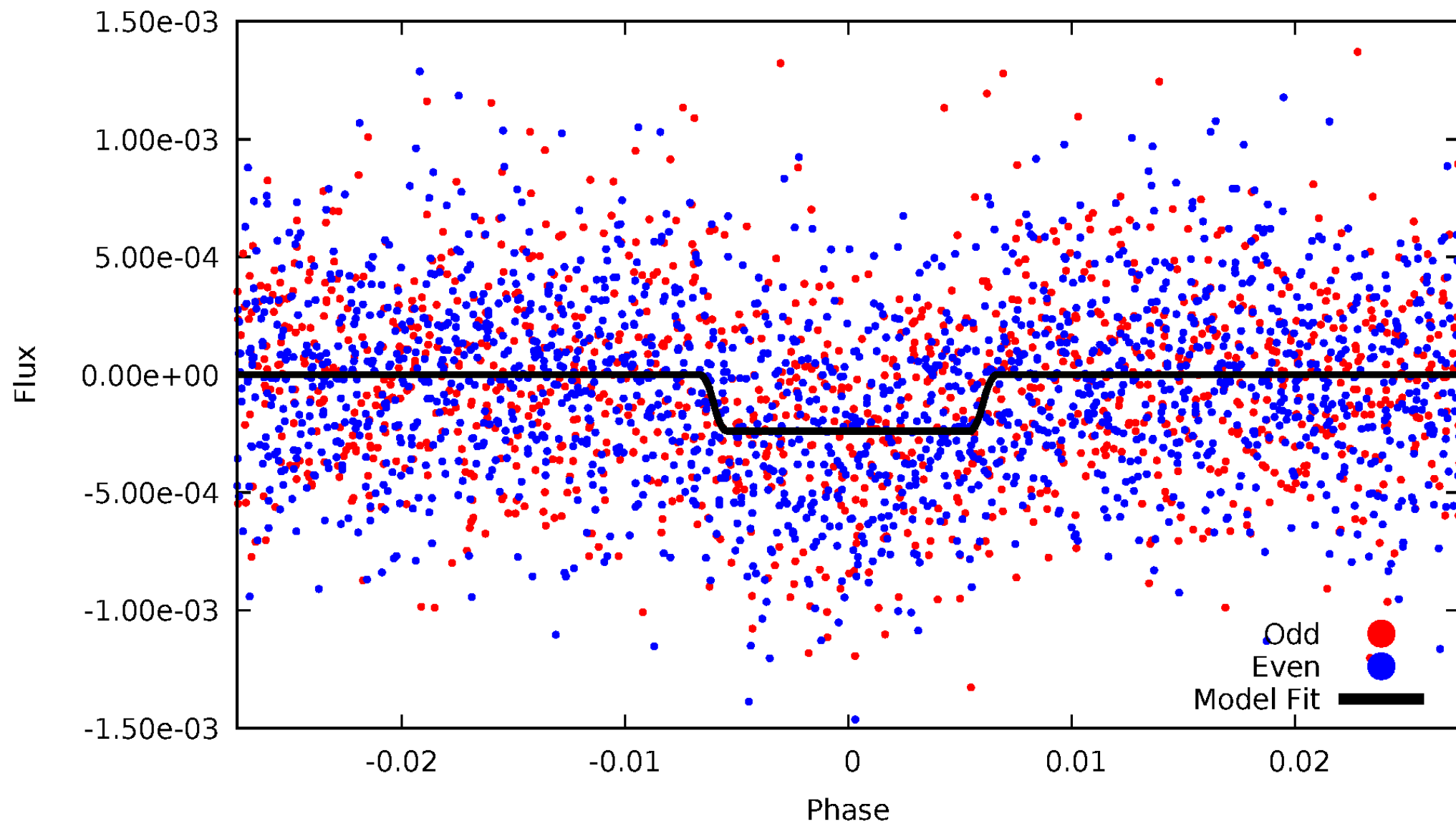
TCE 004847782-01



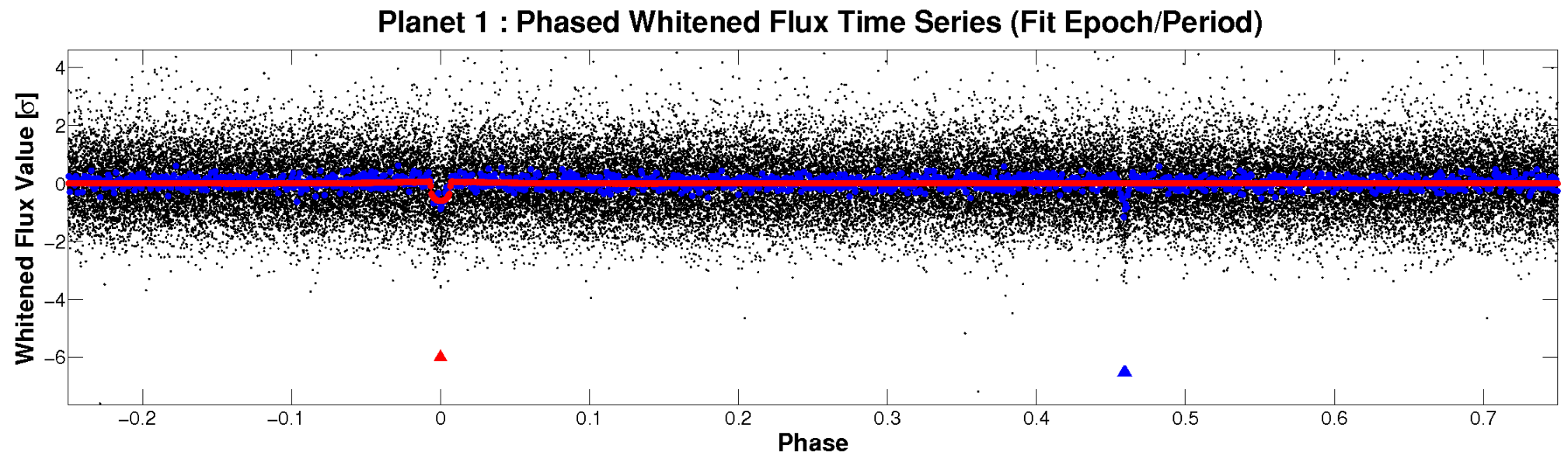
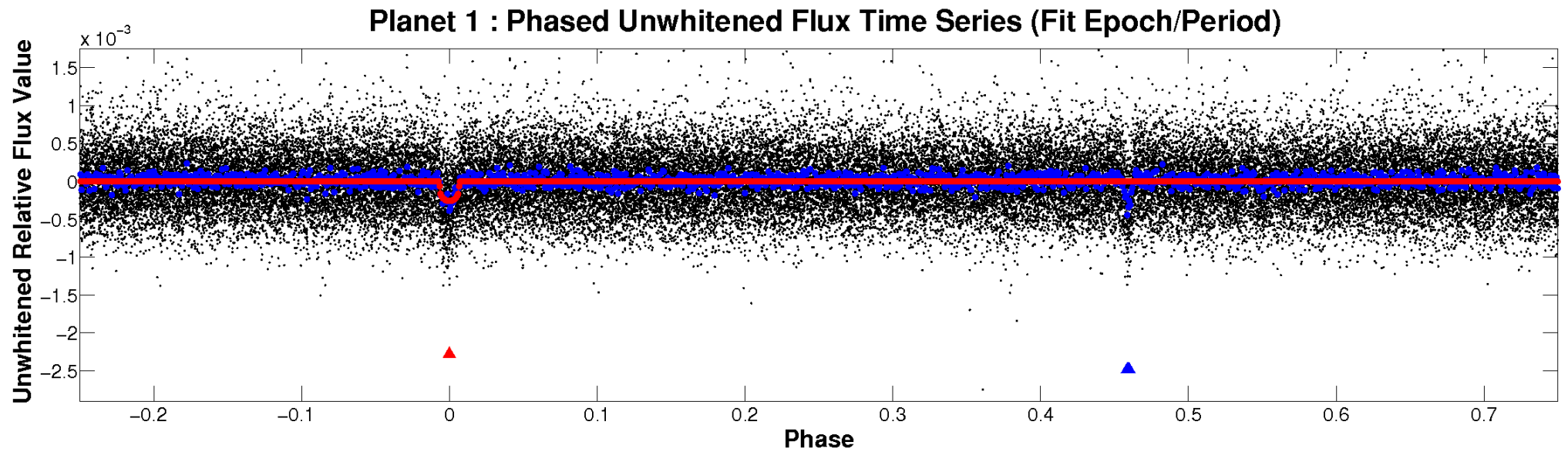


# ALT Odd/Even

TCE 004847782-01

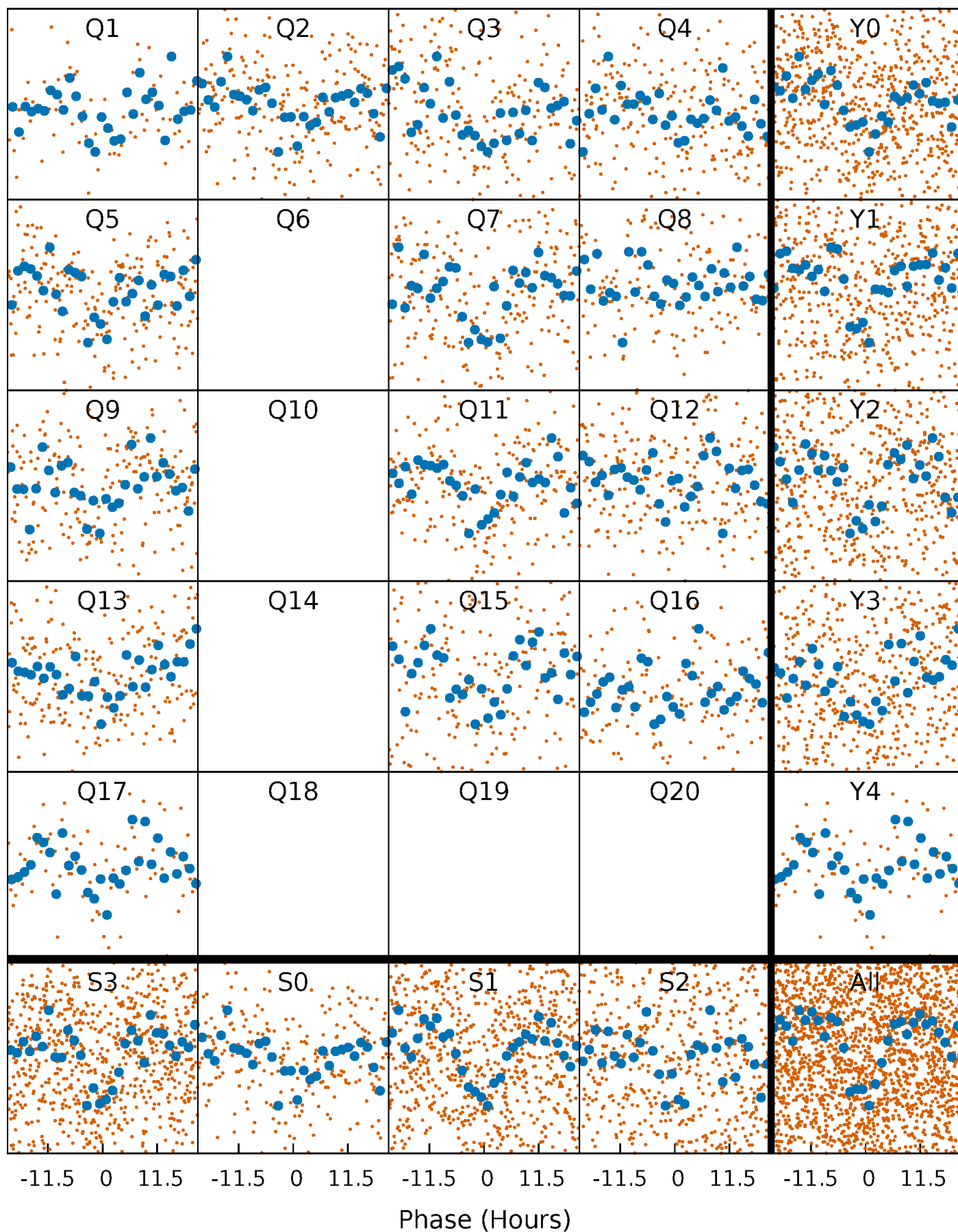


# Non-Whitened Vs. Whitened Light Curve



# PDC Quarter-Phased Transit Curves

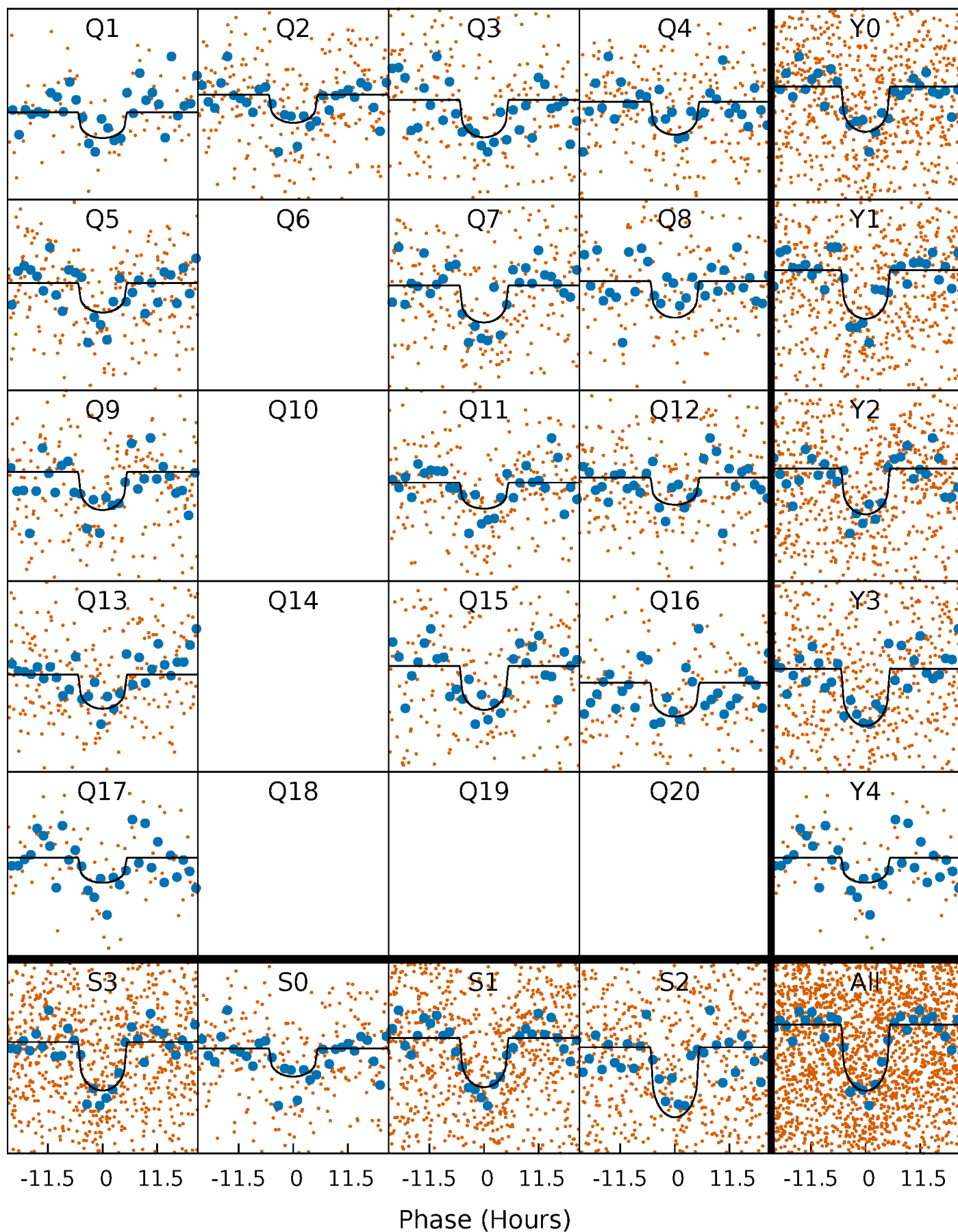
TCE 004847782-01 P= 30.961013 Days  $T_0=156.155820$  (BKJD)





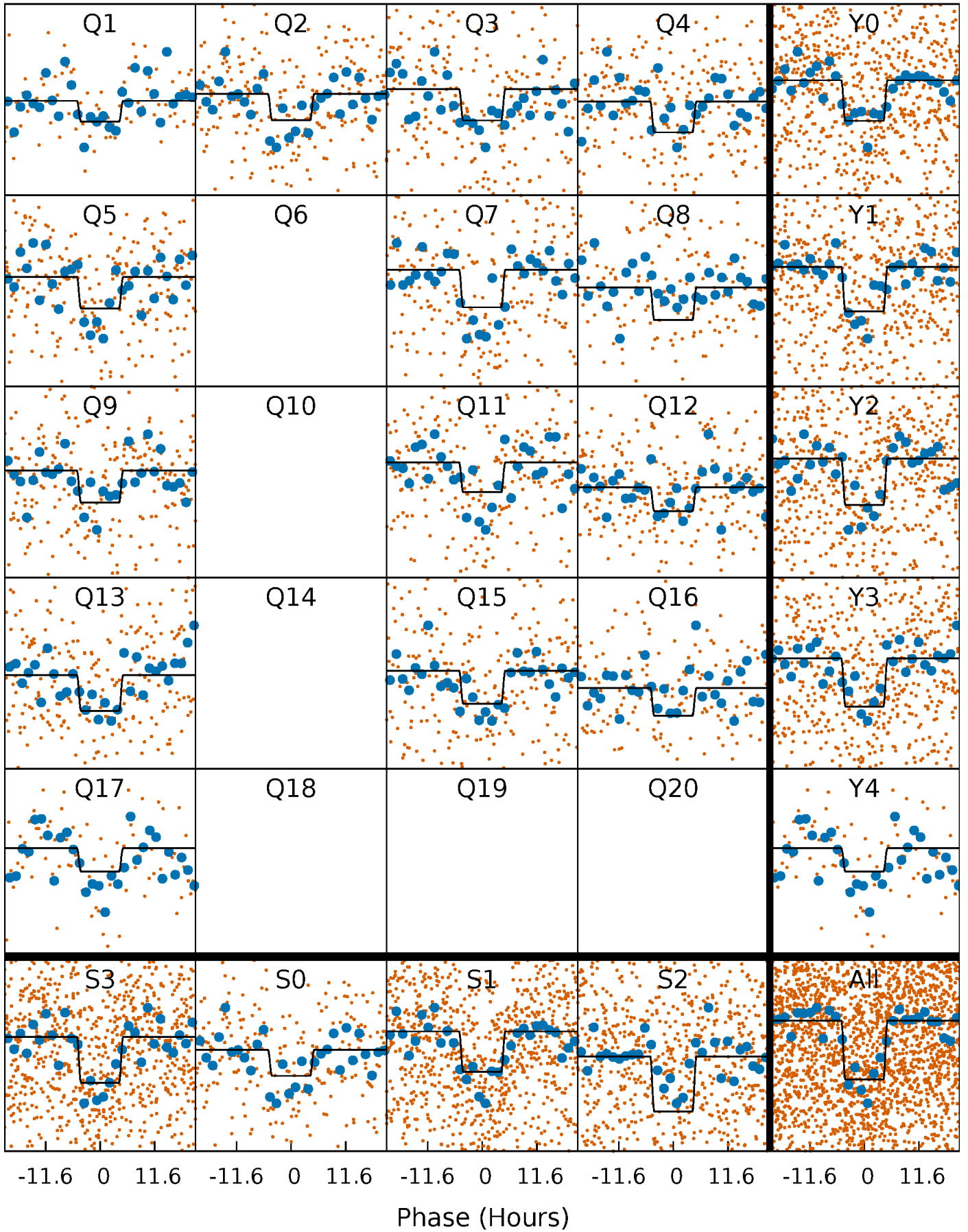
# DV Quarter-Phased Transit Curves

TCE 004847782-01 P= 30.961013 Days  $T_0=156.155820$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

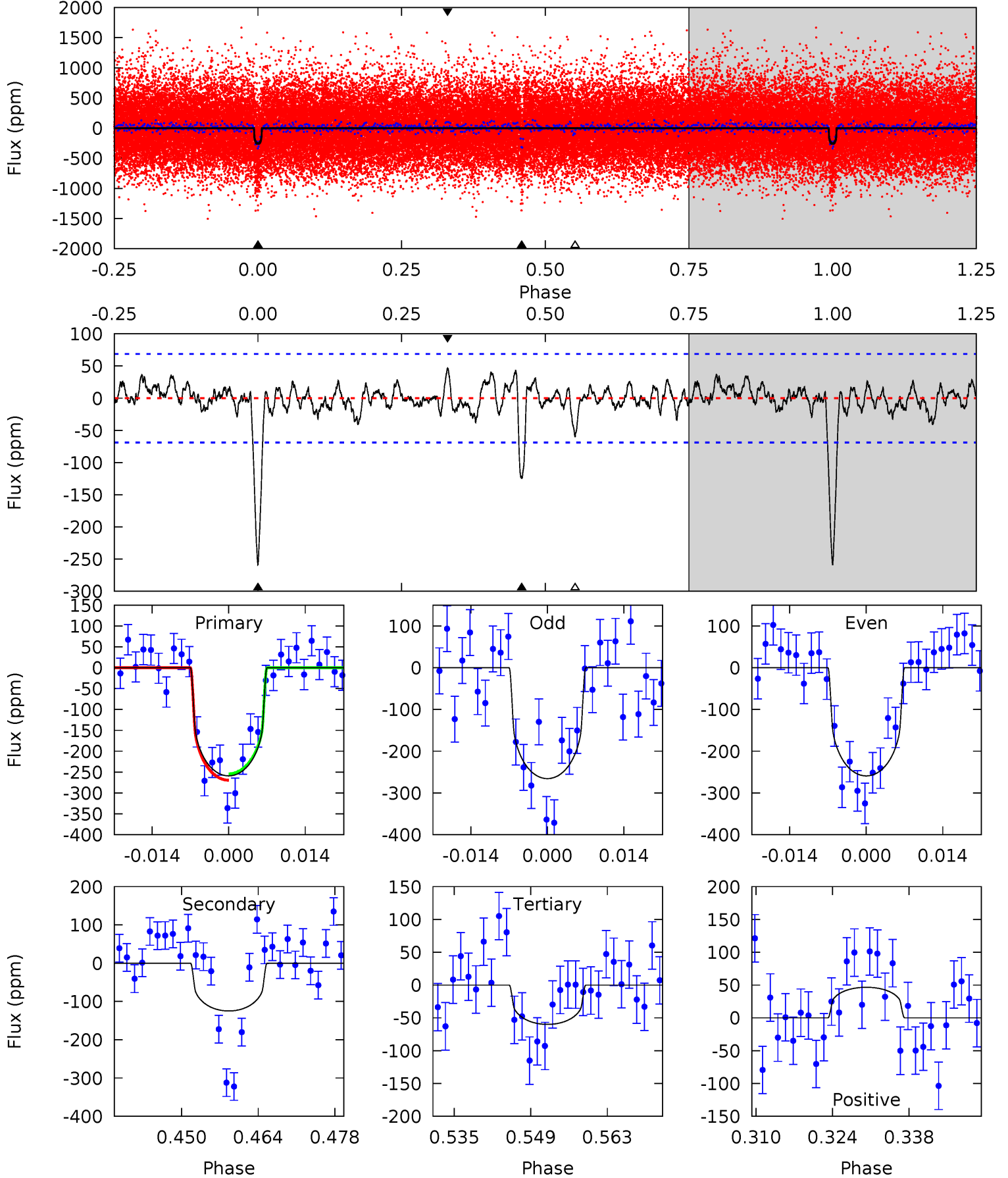
TCE 004847782-01 P= 30.960463 Days  $T_0=156.165742$  (BKJD)



# DV Model-Shift Uniqueness Test

004847782-01, P = 30.961013 Days, E = 125.194807 Days

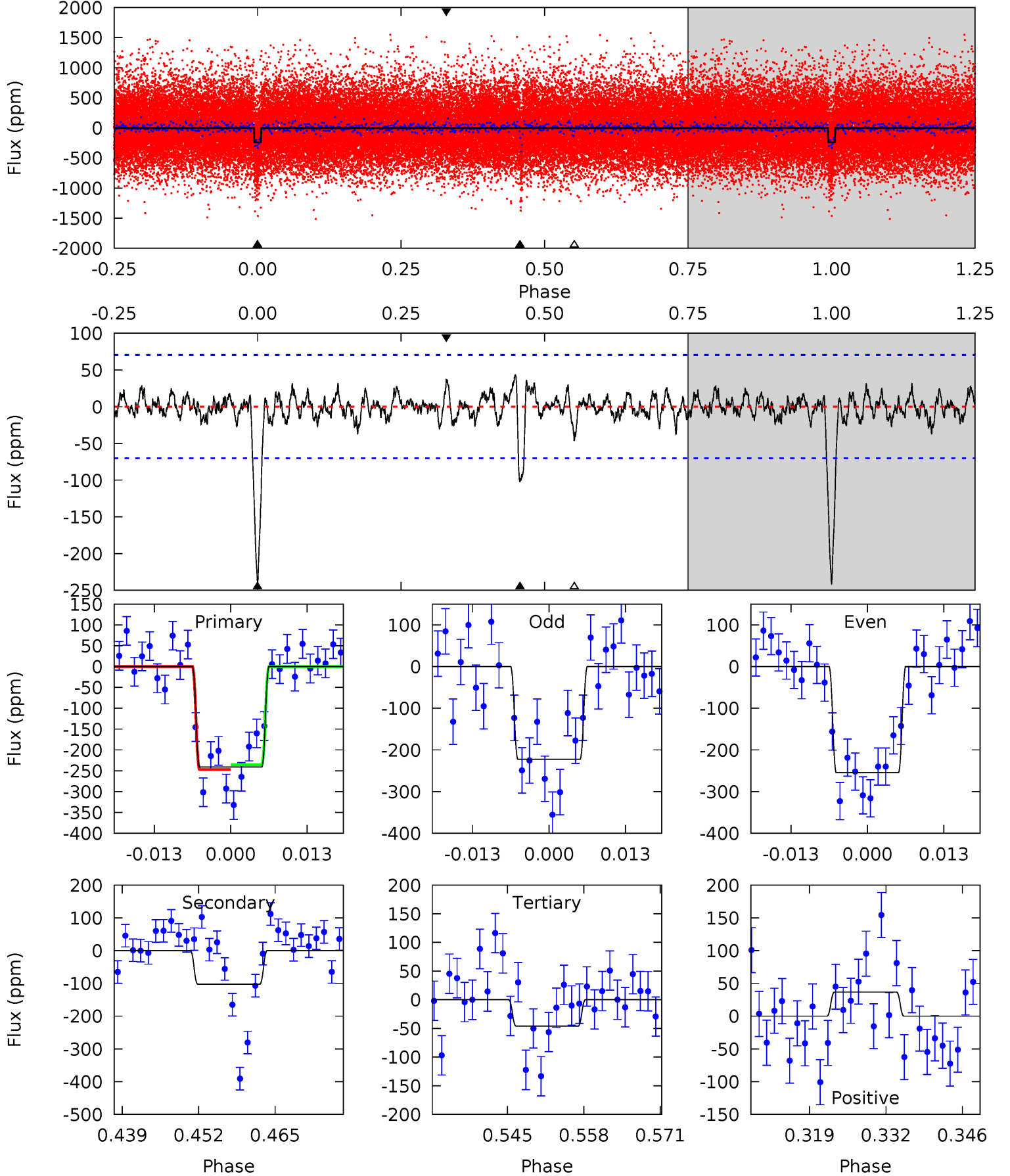
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
18.7	9.01	4.32	3.36	4.96	2.46	1.12	14.4	15.3	4.68	5.64	0.23	1.03	0.15	0.55



# Alt Model-Shift Uniqueness Test

004847782-01, P = 30.960463 Days, E = 125.205279 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
17.1	7.24	3.25	2.60	4.97	2.48	0.90	13.8	14.5	3.99	4.64	1.12	0.93	0.15	0.42



### Stellar Parameters For KIC 004847782

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$4947^{+222}_{-222}$	$4.621^{+0.030}_{-0.070}$	$-0.060^{+0.300}_{-0.300}$	$0.714^{+0.093}_{-0.058}$	$0.800^{+0.063}_{-0.095}$	$3.089^{+0.429}_{-0.758}$
	+4%/-4%	+1%/-2%	+500%/-500%	+13%/-8%	+8%/-12%	+14%/-25%
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 004847782-01 / KOI 3067.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-125 \pm 14$	$1.27^{+0.73}_{-0.68}$	$617^{+31}_{-28}$	$4291^{+1679}_{-663}$	$1352^{+5294}_{-820}$
Alt.	$-102 \pm 14$	$1.28^{+0.77}_{-0.66}$	$619^{+34}_{-30}$	$4162^{+1436}_{-655}$	$1120^{+3554}_{-697}$

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



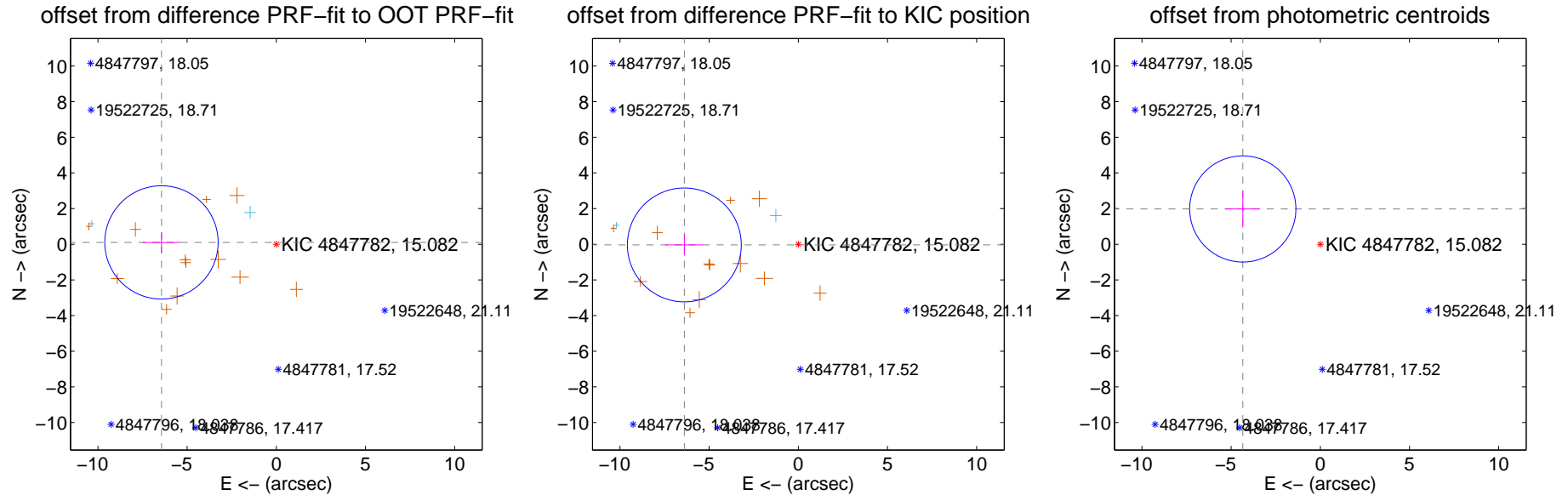
## DV Centroid Data

Supplemental centroid analysis for 004847782-01. Kepler magnitude: 15.08. Transit SNR 13.53

There are 2 quarters with good PRF difference image offsets

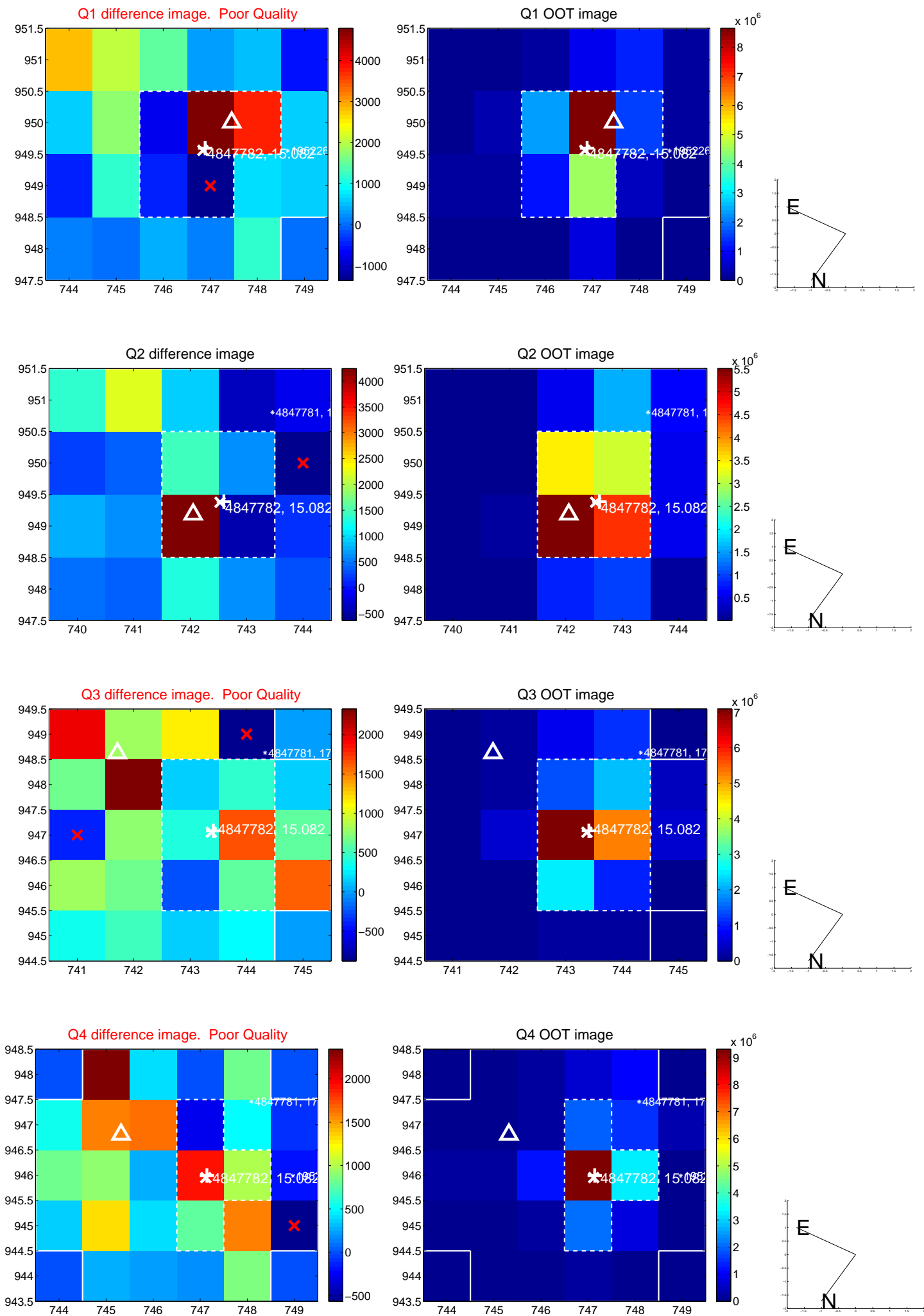
The direct PRF centroid is offset from the target star catalog position by about 0.15 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$6.443 \pm 1.060$	6.08	$6.442 \pm 1.060$	$0.104 \pm 0.580$
PRF-fit source offset from KIC position	$6.393 \pm 1.065$	6.00	$6.393 \pm 1.065$	$-0.038 \pm 0.594$
photometric centroid source offset	$4.78 \pm 0.99$	4.81	$4.35 \pm 0.98$	$1.98 \pm 1.04$

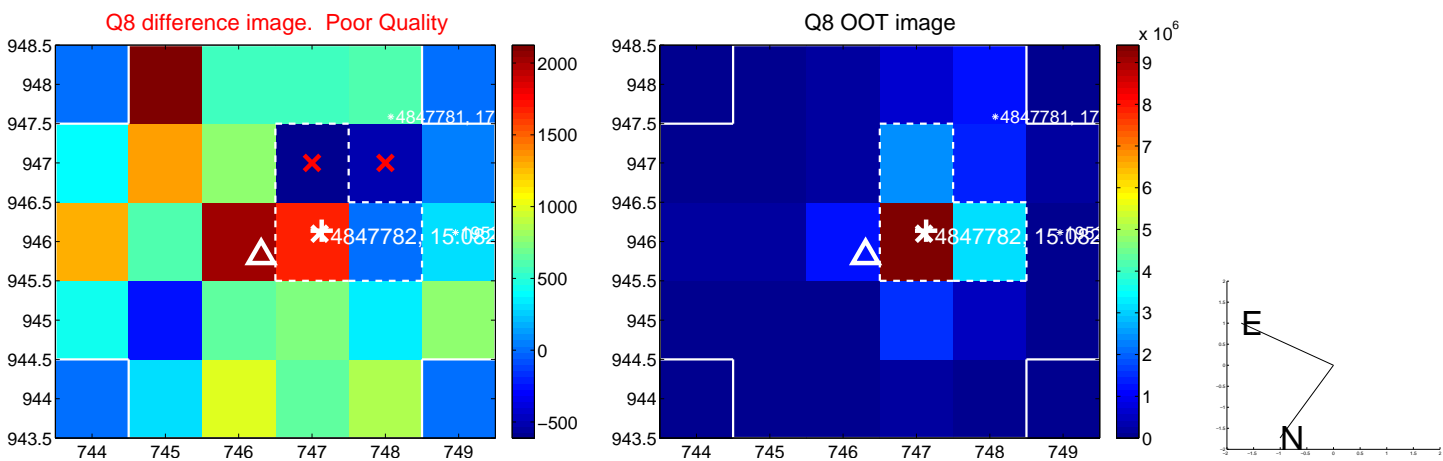
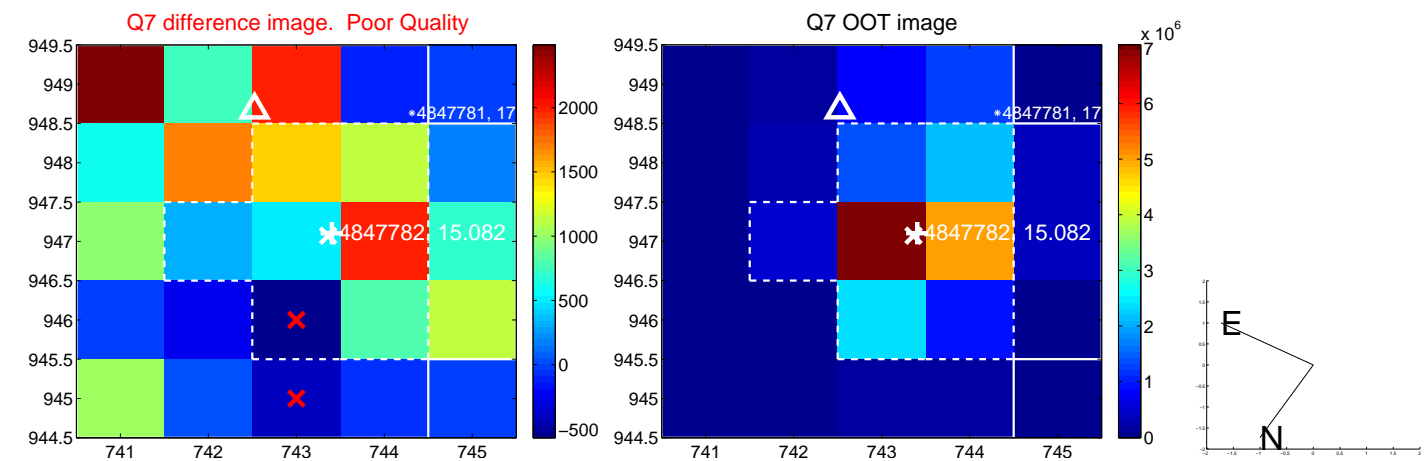
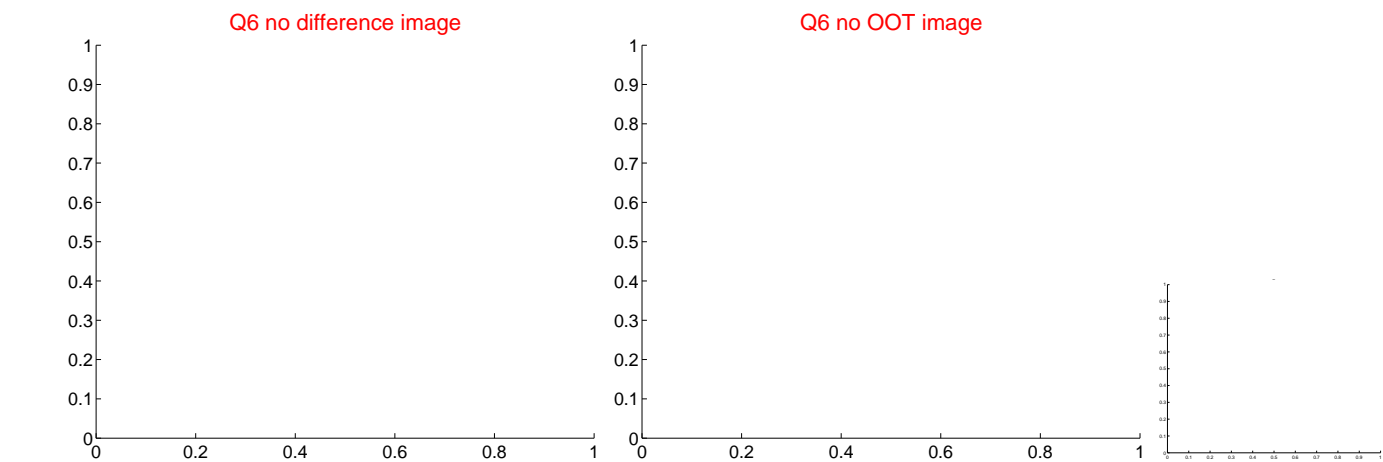
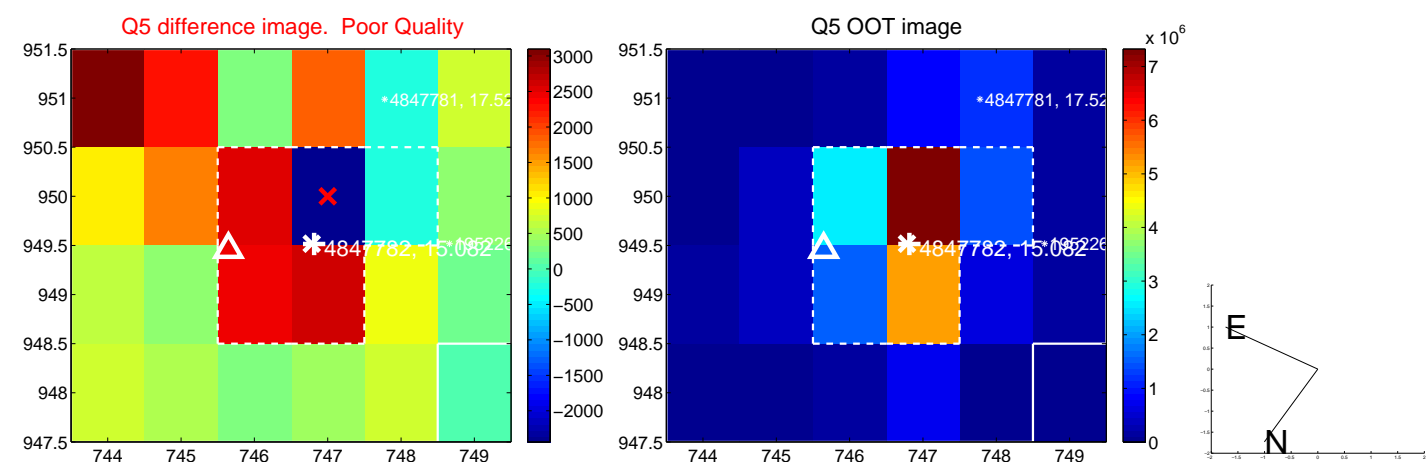


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

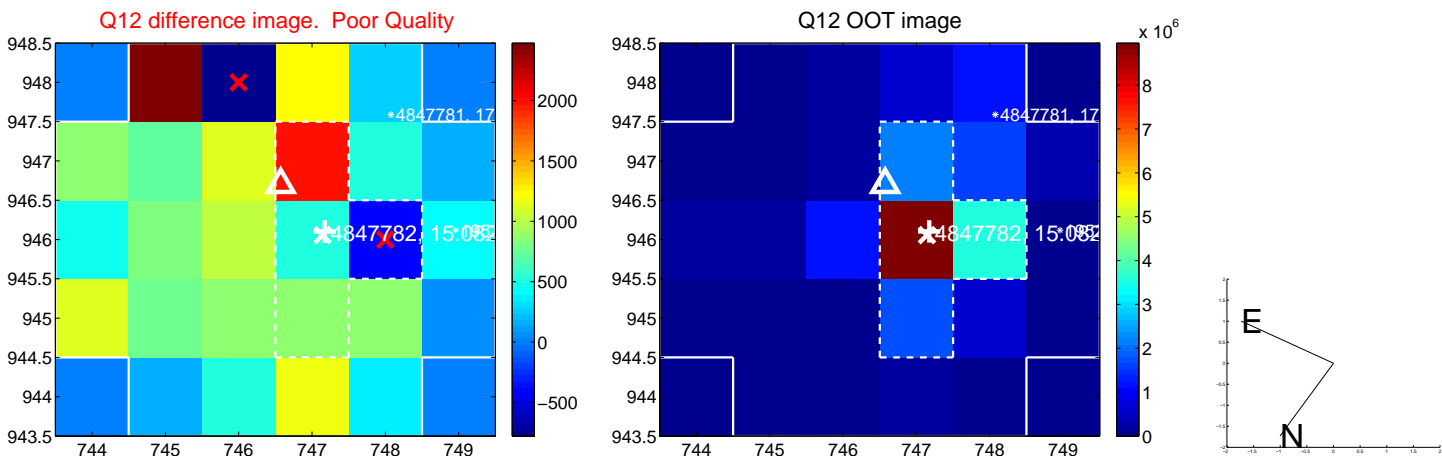
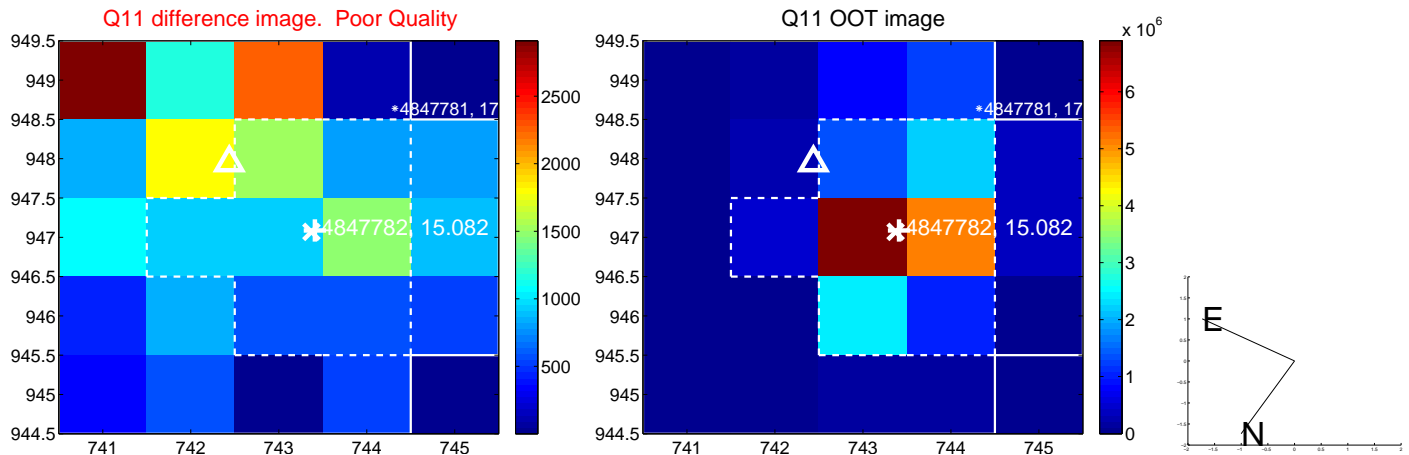
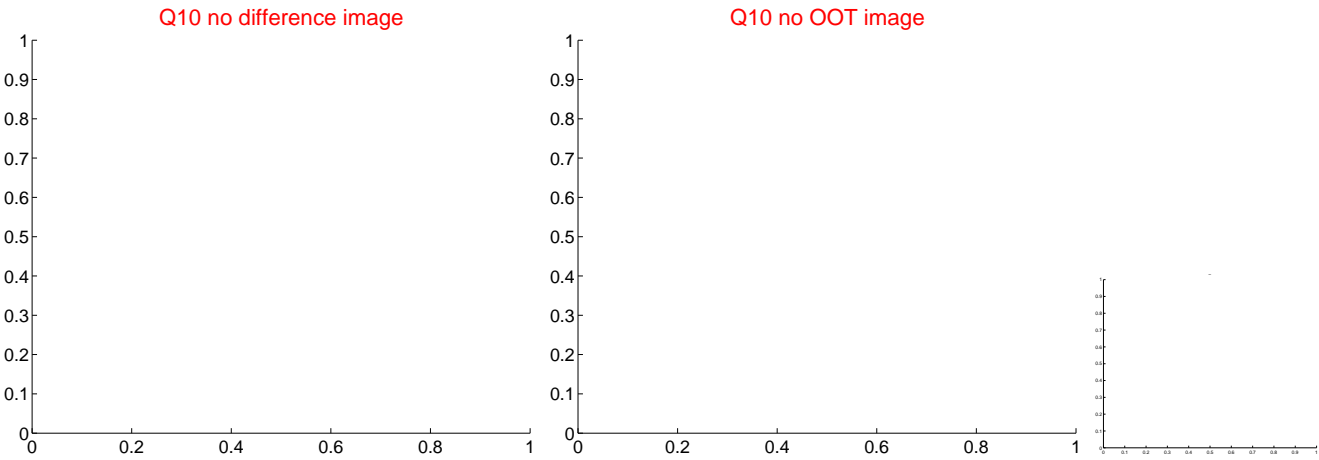
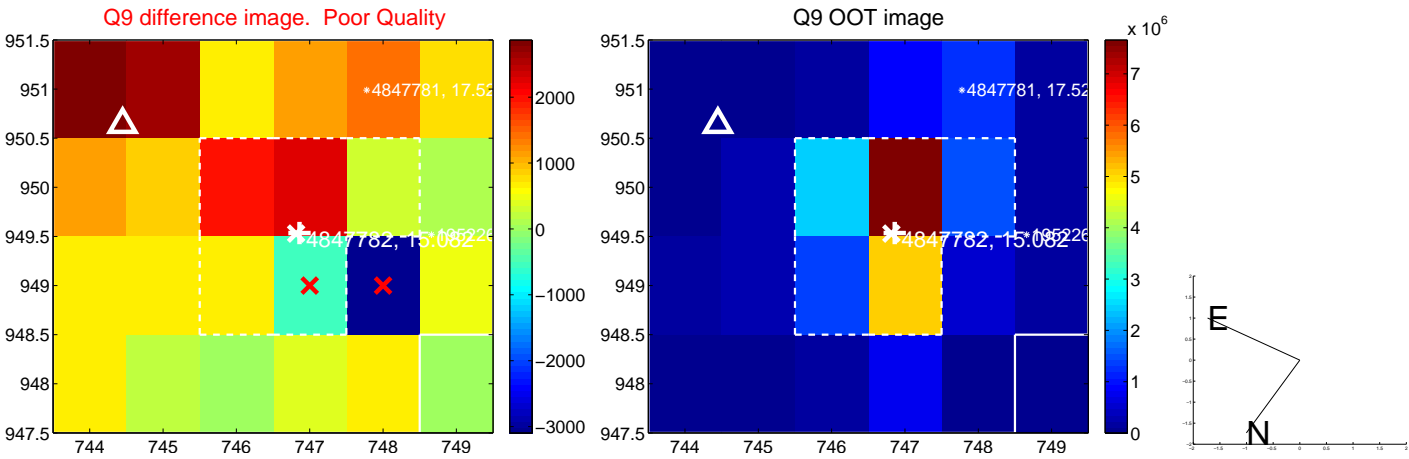
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



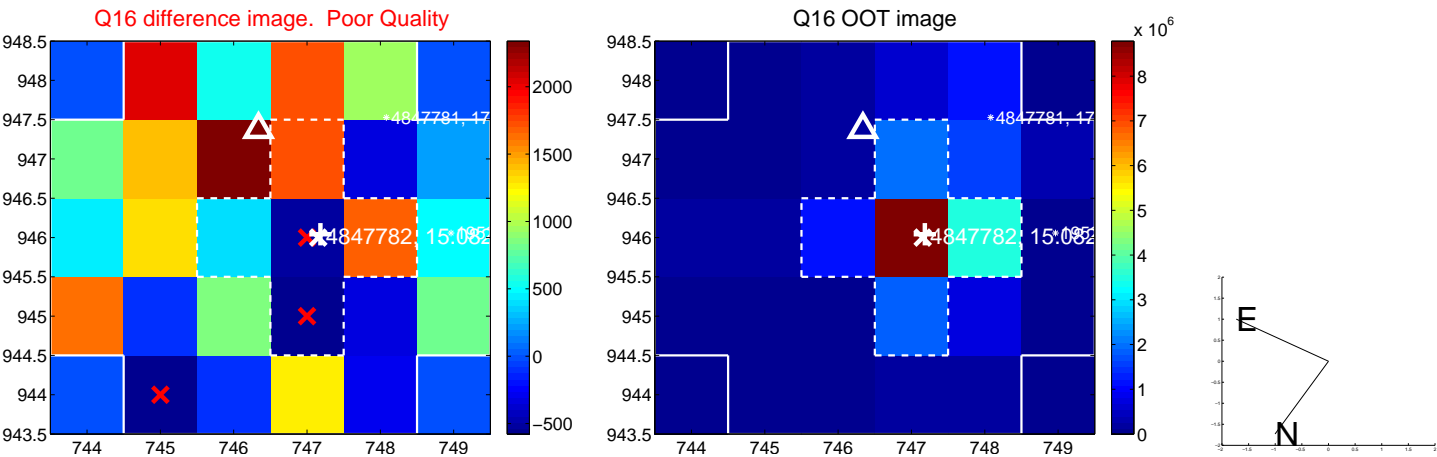
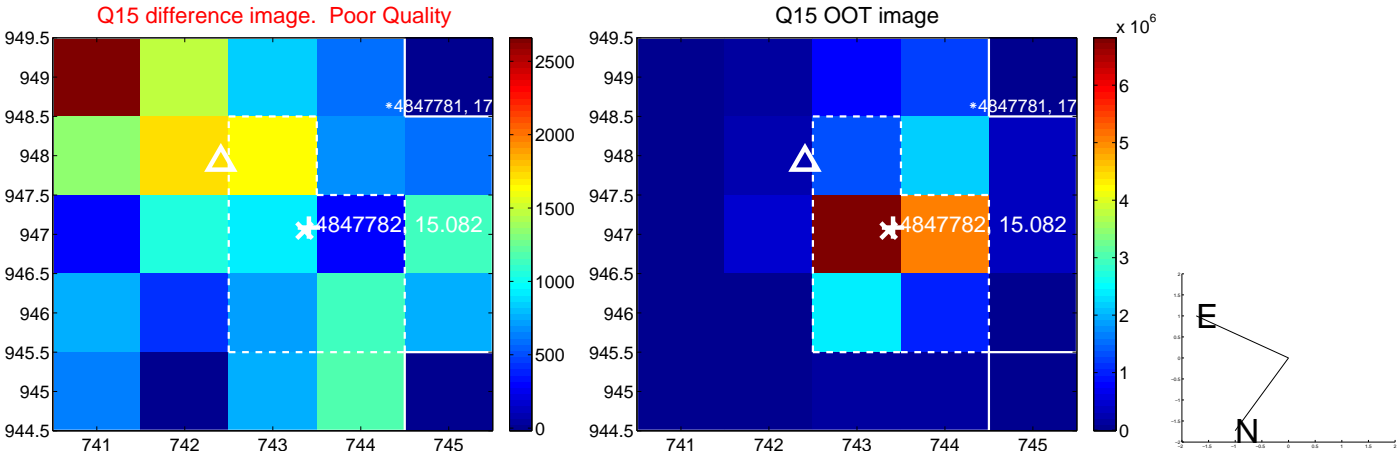
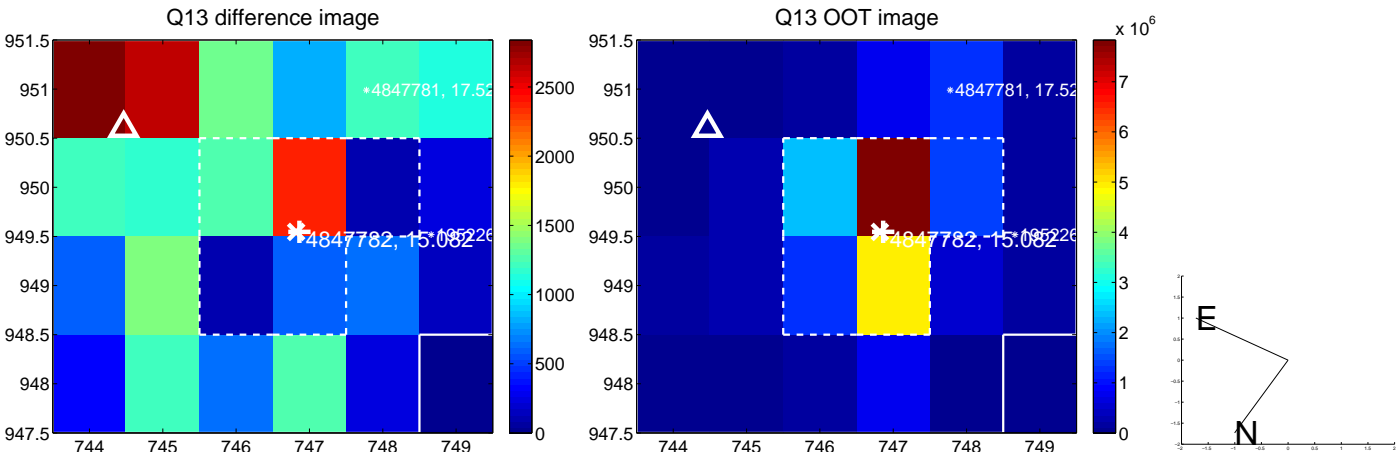
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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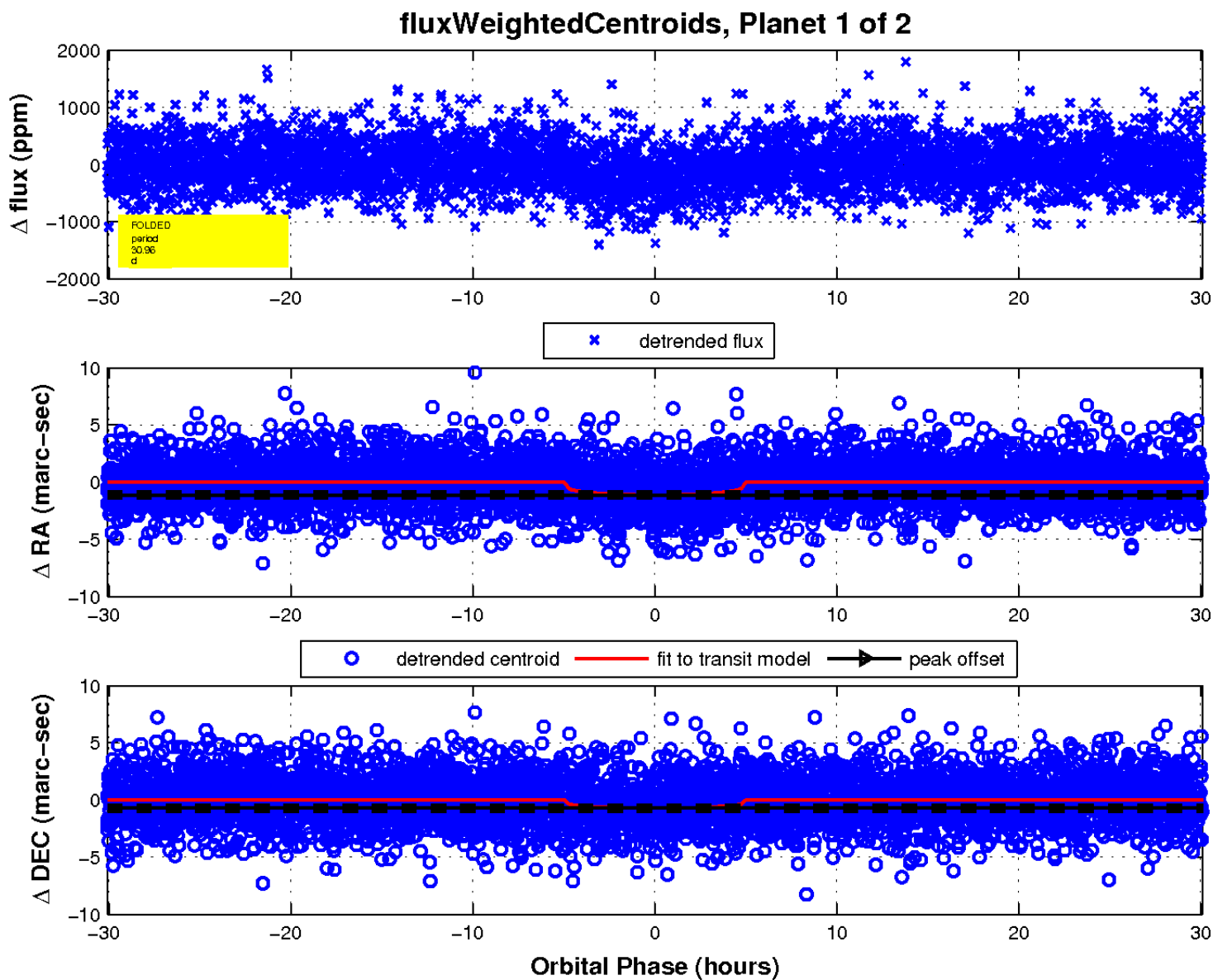
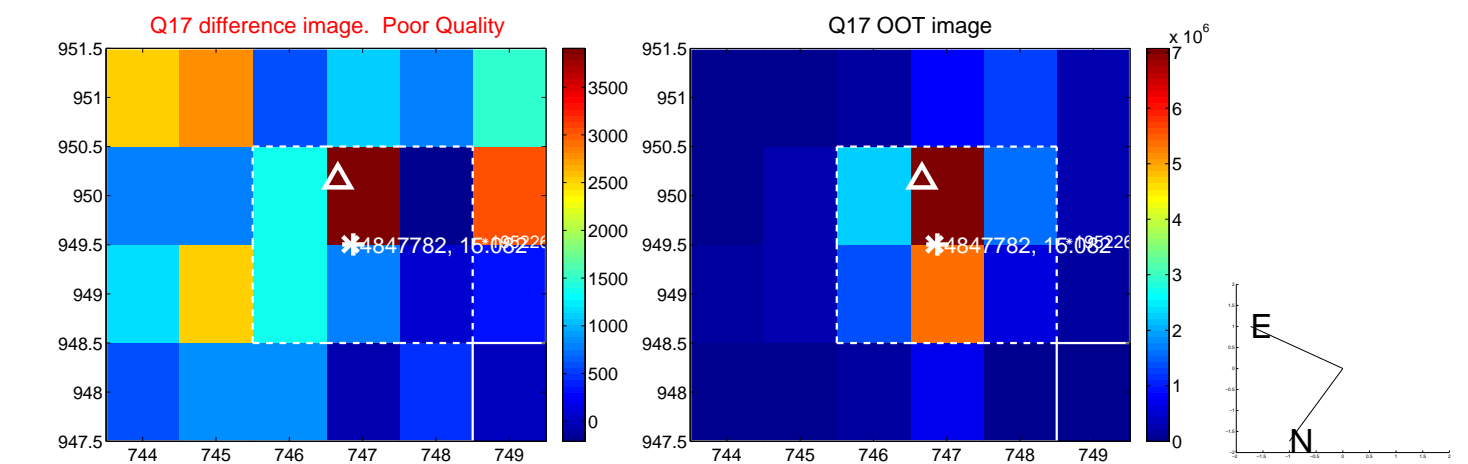


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



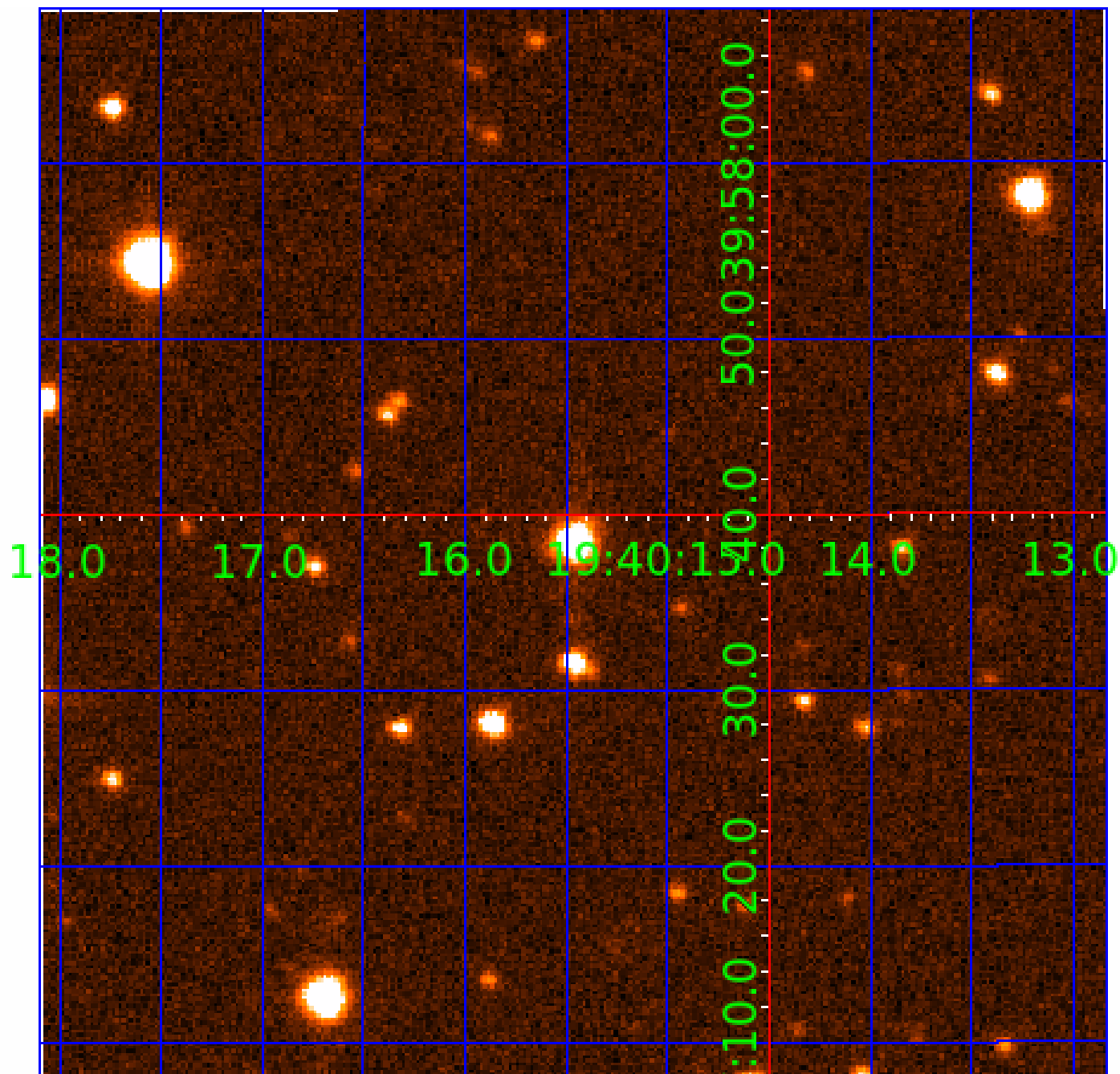


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 004847782

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004847782-01	OBS	3067.01	30.961013	156.155820	257.5	10.037	14.0	13.5	0.71	4947	1.21	8.69
004847782-02	OBS	No	30.960105	139.435017	406.2	5.174	12.2	13.2	0.71	4947	3.01	8.69

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004847782-01	OBS	FP	0.00	0	1	1	1	MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE—CENT_RESOLVED_OFFSET—HALO_GHOST—EPHEM_MATCH
004847782-02	OBS	FP	0.00	1	1	1	1	IS_SEC_TCE—CENT_RESOLVED_OFFSET—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 004847782-02

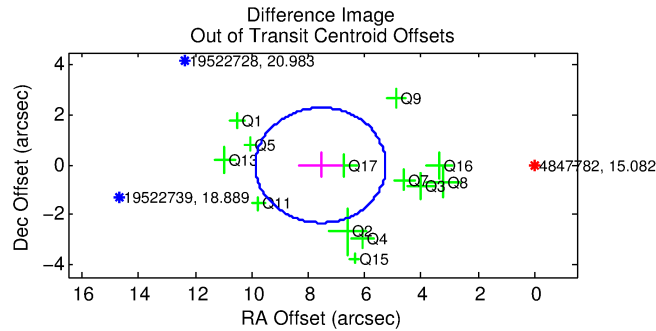
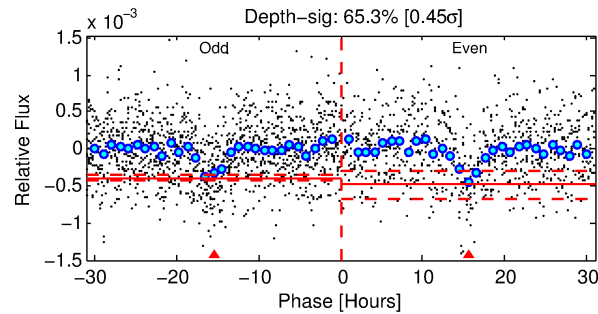
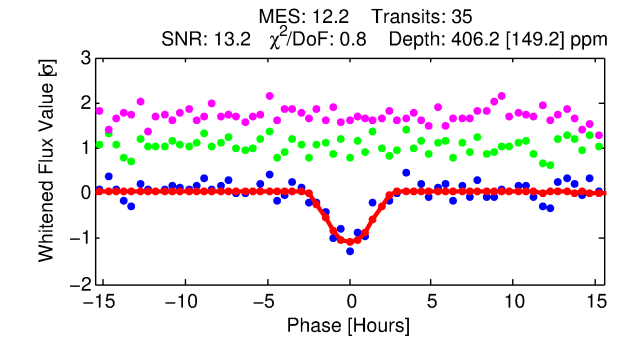
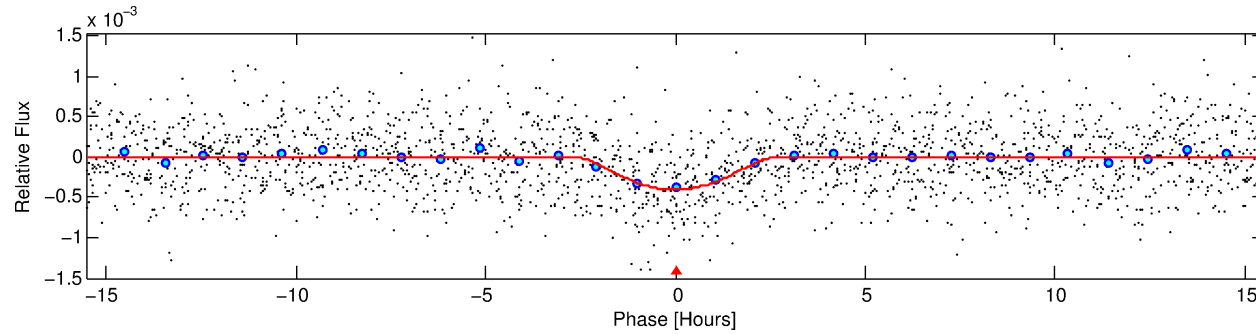
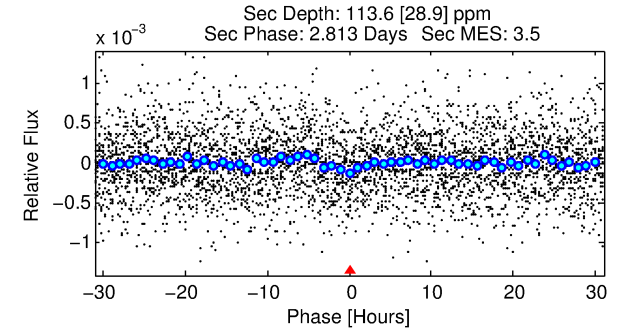
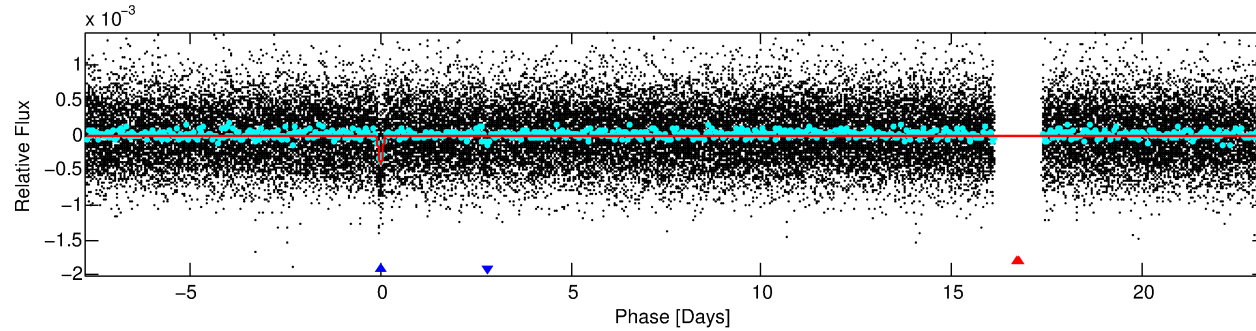
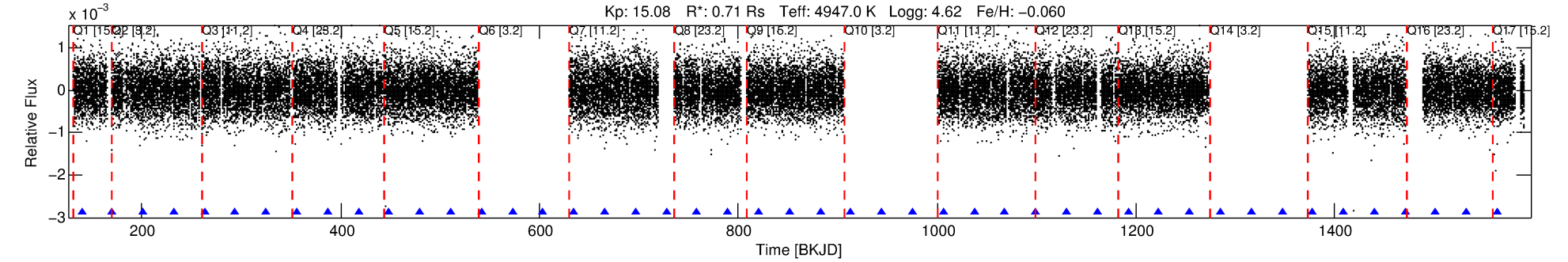
TCE (1)	KIC	Parent (2)	Parent KIC	$P_1:P_2$	Dist (")	$\Delta\text{Row}$	$\Delta\text{Col}$	$m_2$	$m_1$	$D_2/D_1$	Mechanism	Flag	$\sigma_P$	$\sigma_T$
004847782-02	4847782	004847832-02	4847832	1:1	34.8	-6	7	12.45	15.08	968.69	Direct-PRF	0	0.17	0.06

**Notes:**  $P_1:P_2$  is the period ratio. Dist is the distance in arcseconds.  $\Delta\text{Row}$  and  $\Delta\text{Col}$  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: 4847782 Candidate: 2 of 2 Period: 30.960 d

KOI: K03067.01 Corr: 0.833



## DV Fit Results:

Period = 30.96010 [0.00032] d  
Epoch = 139.4350 [0.0085] BKJD  
Rp/R\* = 0.0387 [0.1287]  
a/R\* = 12.94 [10.72]  
b = 1.00 [0.19]  
Seff = 8.69 [1.97]  
Teff = 438 [25] K  
Rp = 3.01 [10.03] Re  
a = 0.1774 [0.0181] AU  
Ag = 216.88 [1444.94] [0.15σ]  
Teffp = 2598 [4327] K [0.50σ]

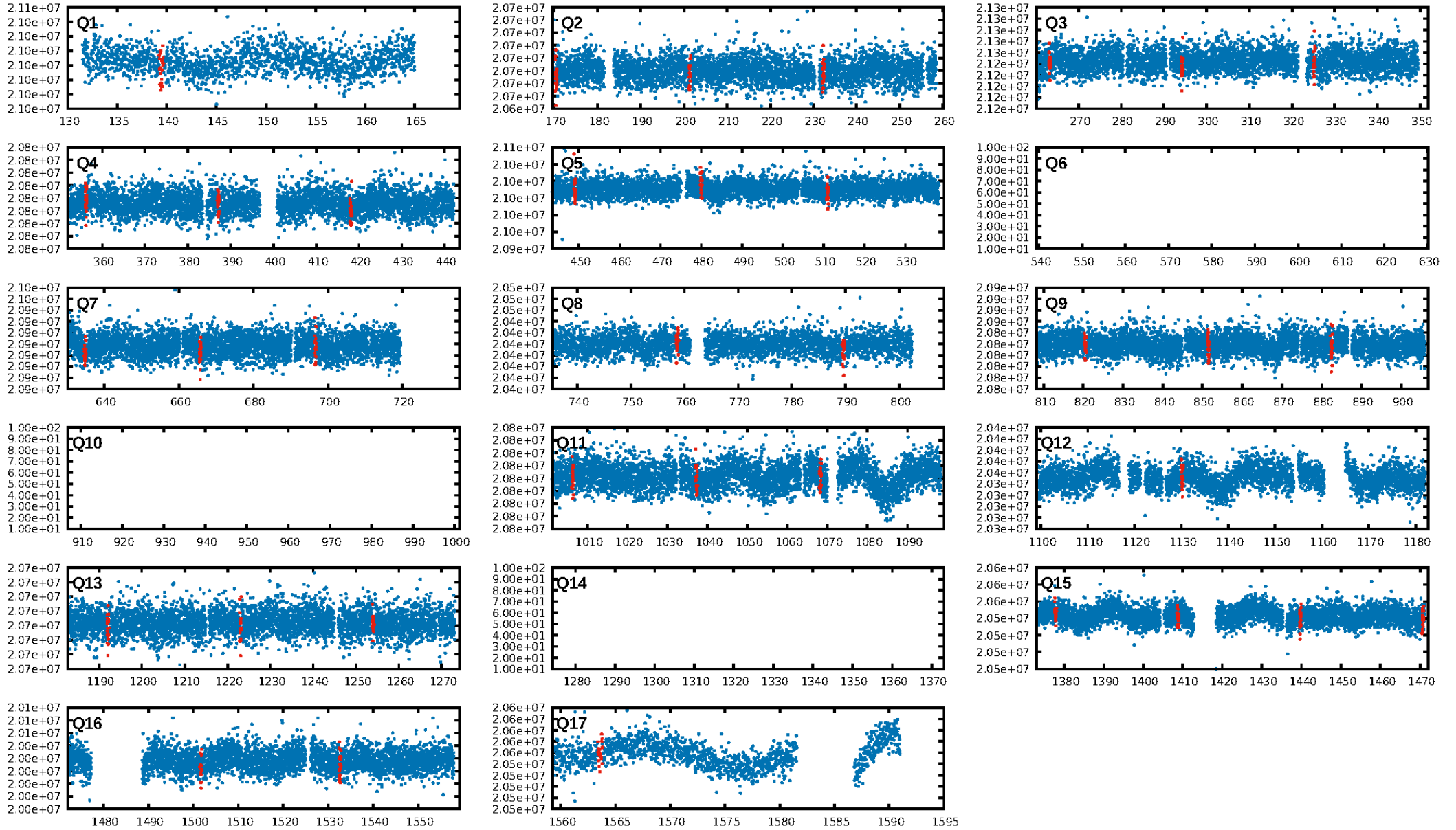
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.2% [0.00σ]  
ModelChiSquare2-sig: 96.6%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 5.54e-32  
RollingBand-fgt: 1.00 [33/33]  
GhostDiagnostic-chr: 0.1238  
Centroid-sig: 0.0%  
Centroid-so: 5.830 arcsec [5.38σ]  
OotOffset-rm: 7.564 arcsec [9.84σ]  
KicOffset-rm: 7.458 arcsec [9.79σ]  
OotOffset-st: 1/4/3/5 [13]  
KicOffset-st: 1/4/3/5 [13]  
DiffImageQuality-fgm: 0.08 [1/13]  
DiffImageOverlap-fno: 1.00 [13/13]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 23:37:35 Z

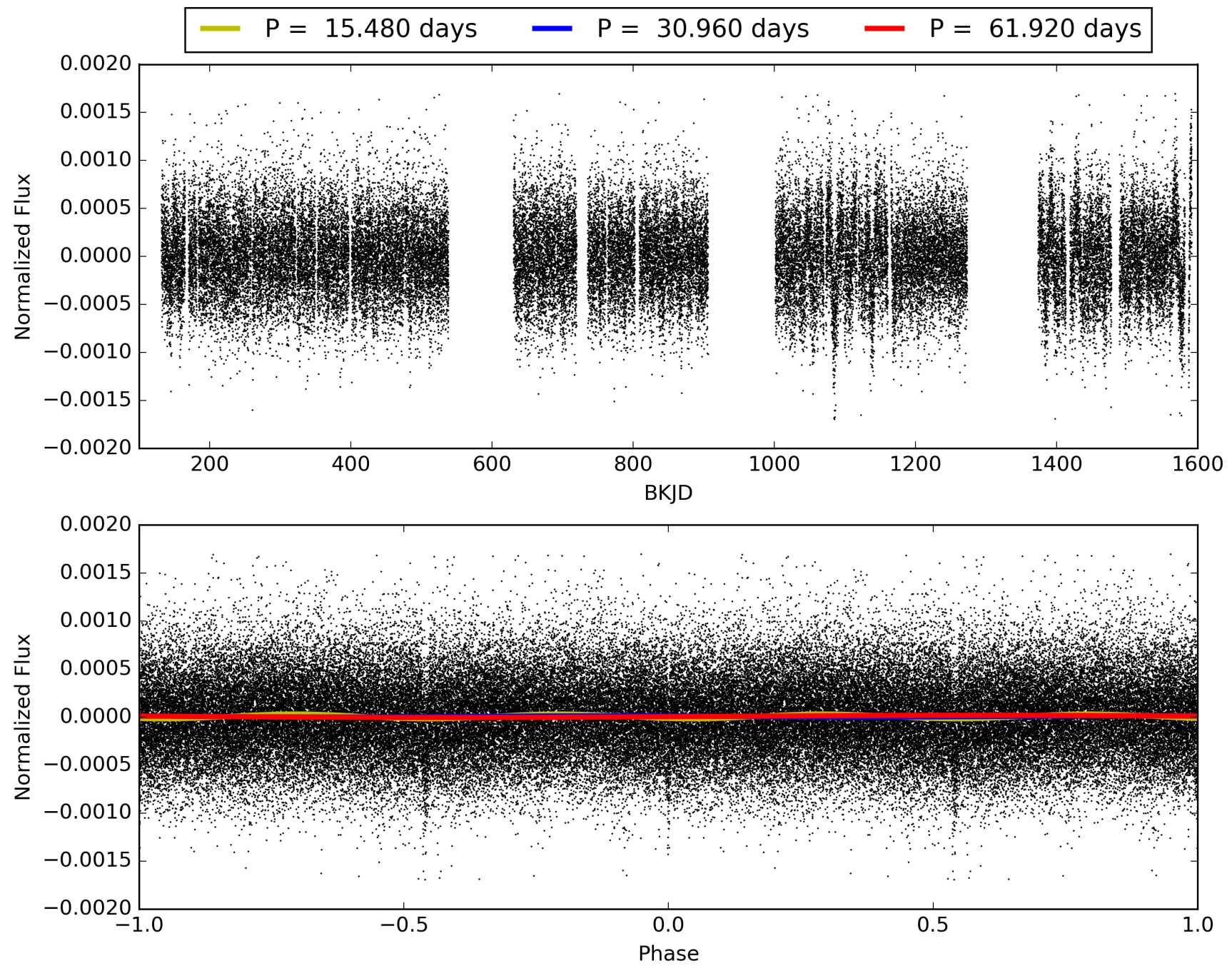
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 004847782-02, PDC Light Curves



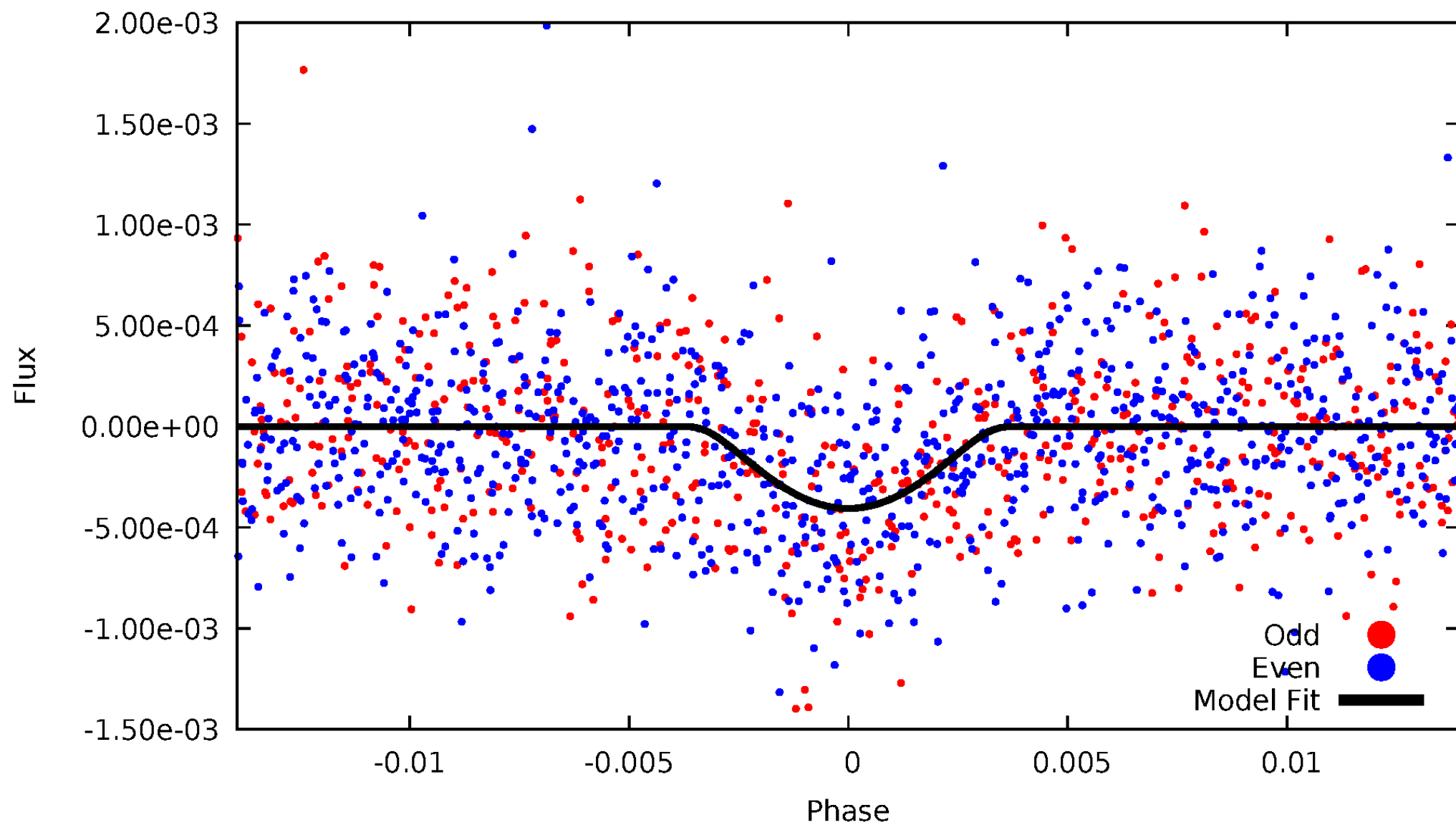


TCE 004847782-02



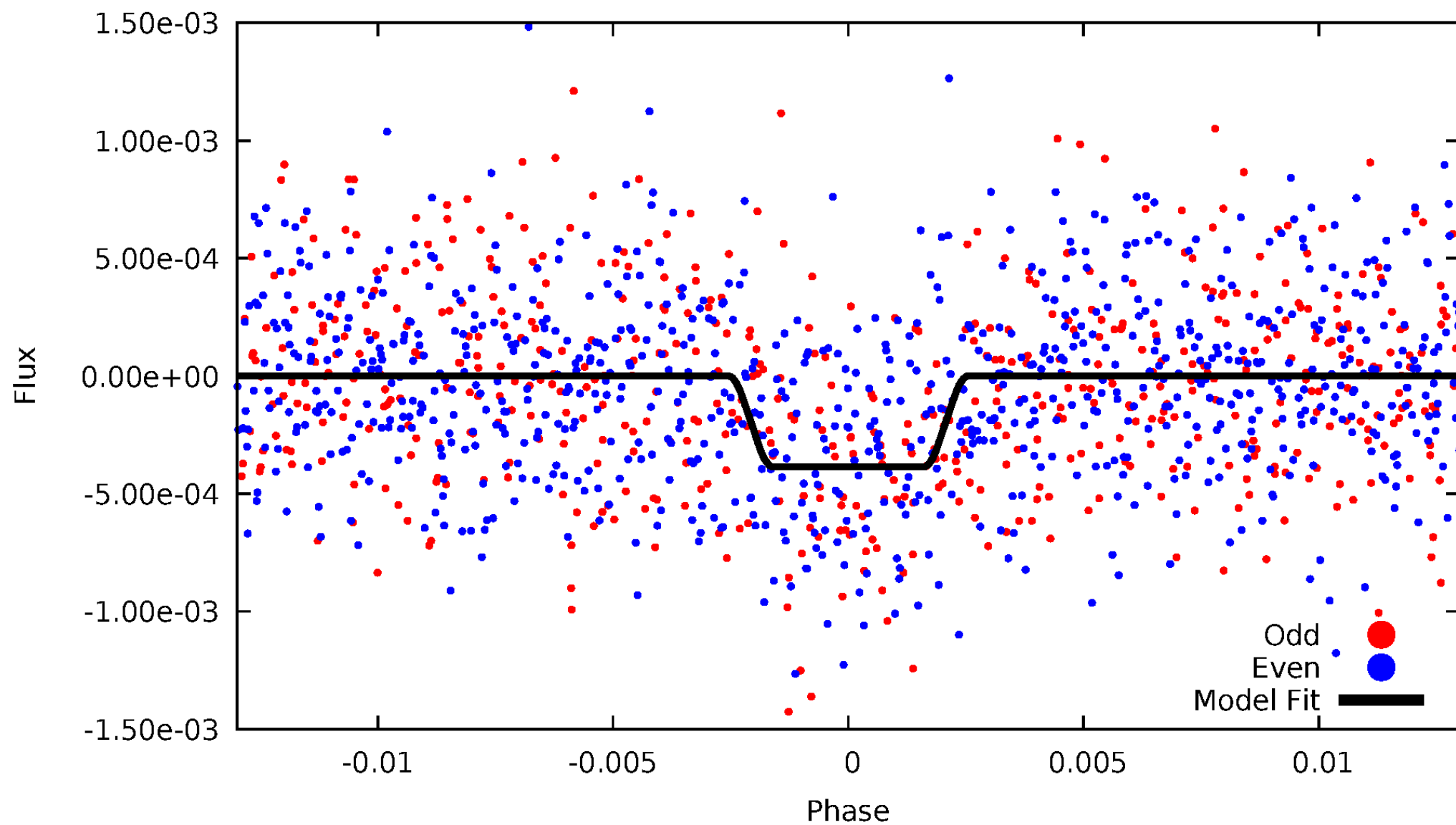
# DV Odd/Even

TCE 004847782-02



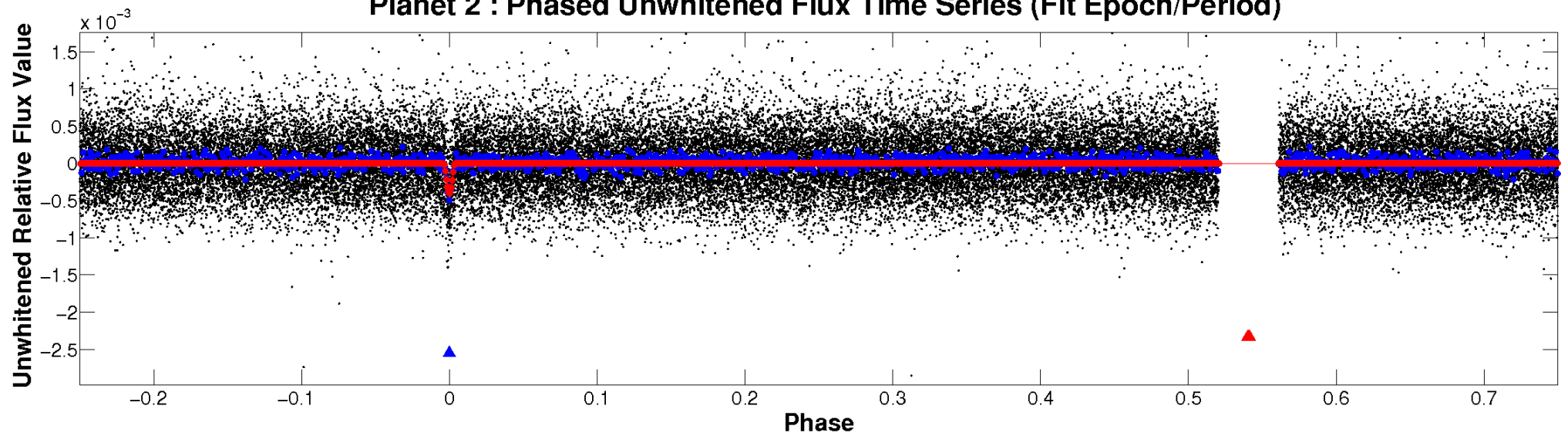
# ALT Odd/Even

TCE 004847782-02

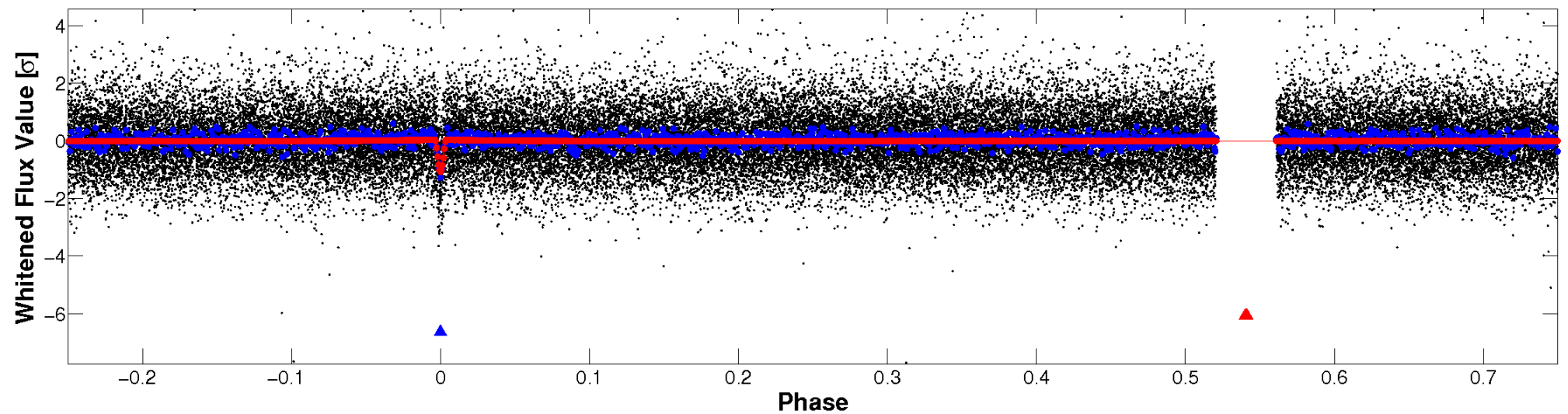


# Non-Whitened Vs. Whitened Light Curve

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

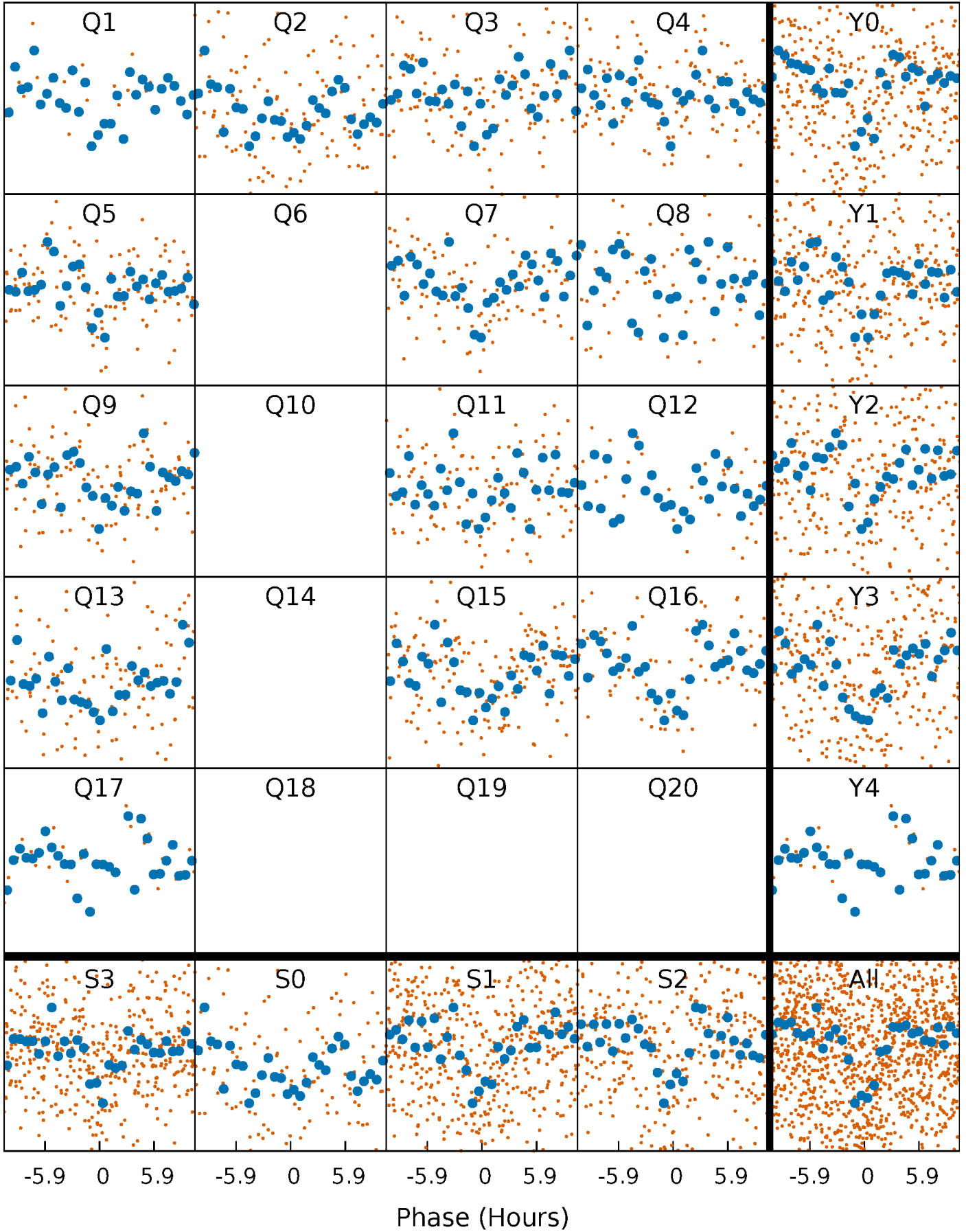


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

TCE 004847782-02     $P = 30.960105$  Days     $T_0 = 139.435017$  (BKJD)





# DV Quarter-Phased Transit Curves

TCE 004847782-02 P= 30.960105 Days  $T_0=139.435017$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

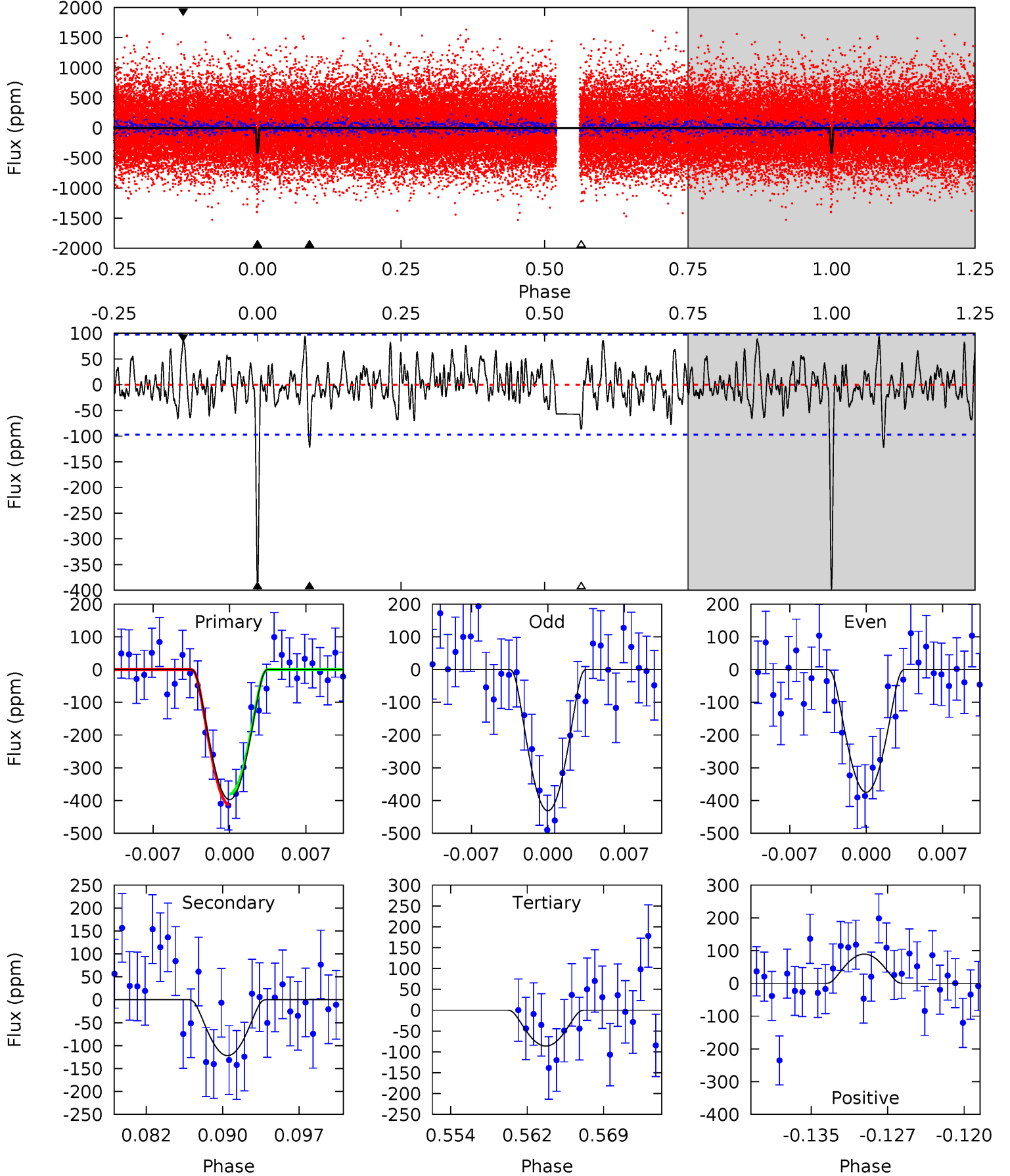
TCE 004847782-02 P= 30.959716 Days  $T_0=139.437767$  (BKJD)



# DV Model-Shift Uniqueness Test

004847782-02, P = 30.960105 Days, E = 108.474912 Days

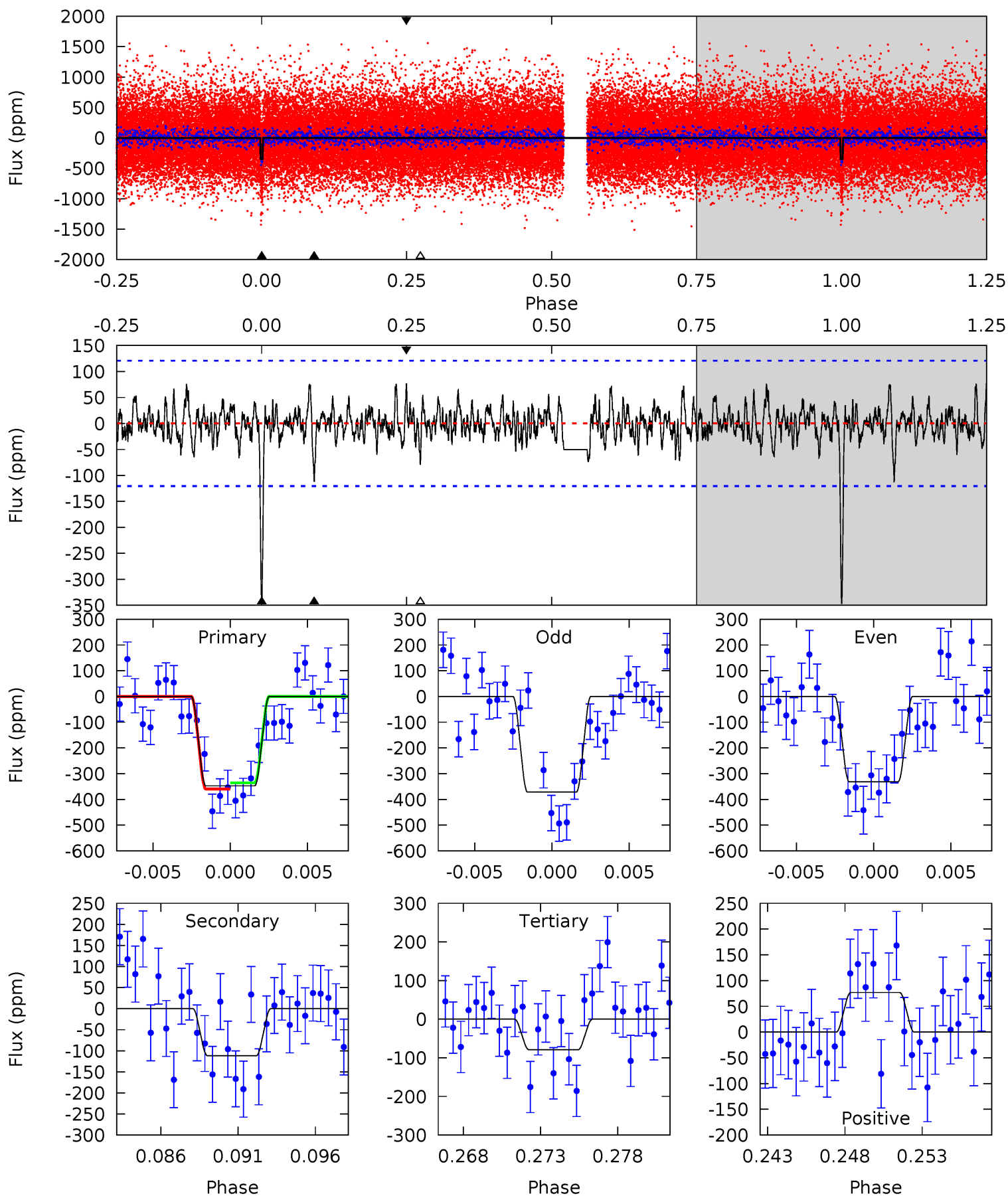
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
20.8	6.37	4.50	4.67	5.08	2.67	1.53	16.3	16.1	1.87	1.70	1.45	1.02	0.19	0.87



# Alt Model-Shift Uniqueness Test

004847782-02, P = 30.959716 Days, E = 108.478051 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
14.8	4.78	3.39	3.28	5.16	2.80	1.07	11.5	11.6	1.39	1.49	0.84	1.00	0.18	0.52



### Stellar Parameters For KIC 004847782

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$4947^{+222}_{-222}$	$4.621^{+0.030}_{-0.070}$	$-0.060^{+0.300}_{-0.300}$	$0.714^{+0.093}_{-0.058}$	$0.800^{+0.063}_{-0.095}$	$3.089^{+0.429}_{-0.758}$
	+4%/-4%	+1%/-2%	+500%/-500%	+13%/-8%	+8%/-12%	+14%/-25%
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 004847782-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-122 \pm 19$	$7.74^{+8.24}_{-5.49}$	$618^{+32}_{-28}$	$2470^{+1072}_{-371}$	$34^{+385}_{-26}$
Alt.	$-112 \pm 23$	$7.62^{+7.94}_{-5.70}$	$618^{+31}_{-29}$	$2472^{+1155}_{-401}$	$31^{+504}_{-24}$

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

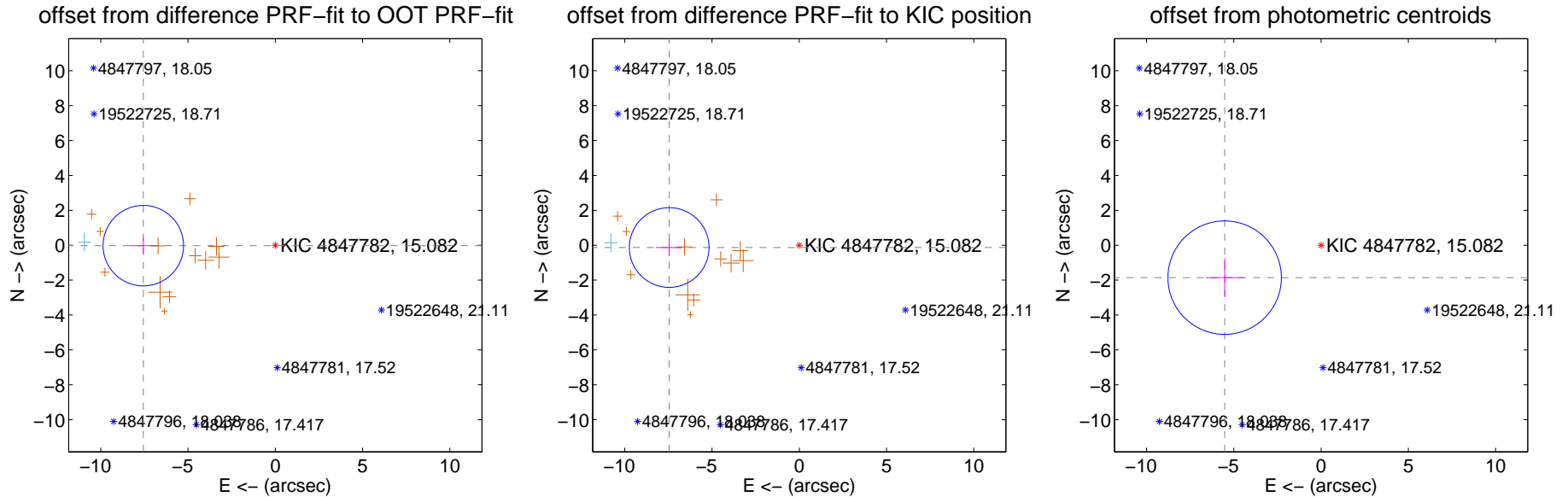
## DV Centroid Data

Supplemental centroid analysis for 004847782-02. Kepler magnitude: 15.08. Transit SNR 13.23

There are 1 quarters with good PRF difference image offsets

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

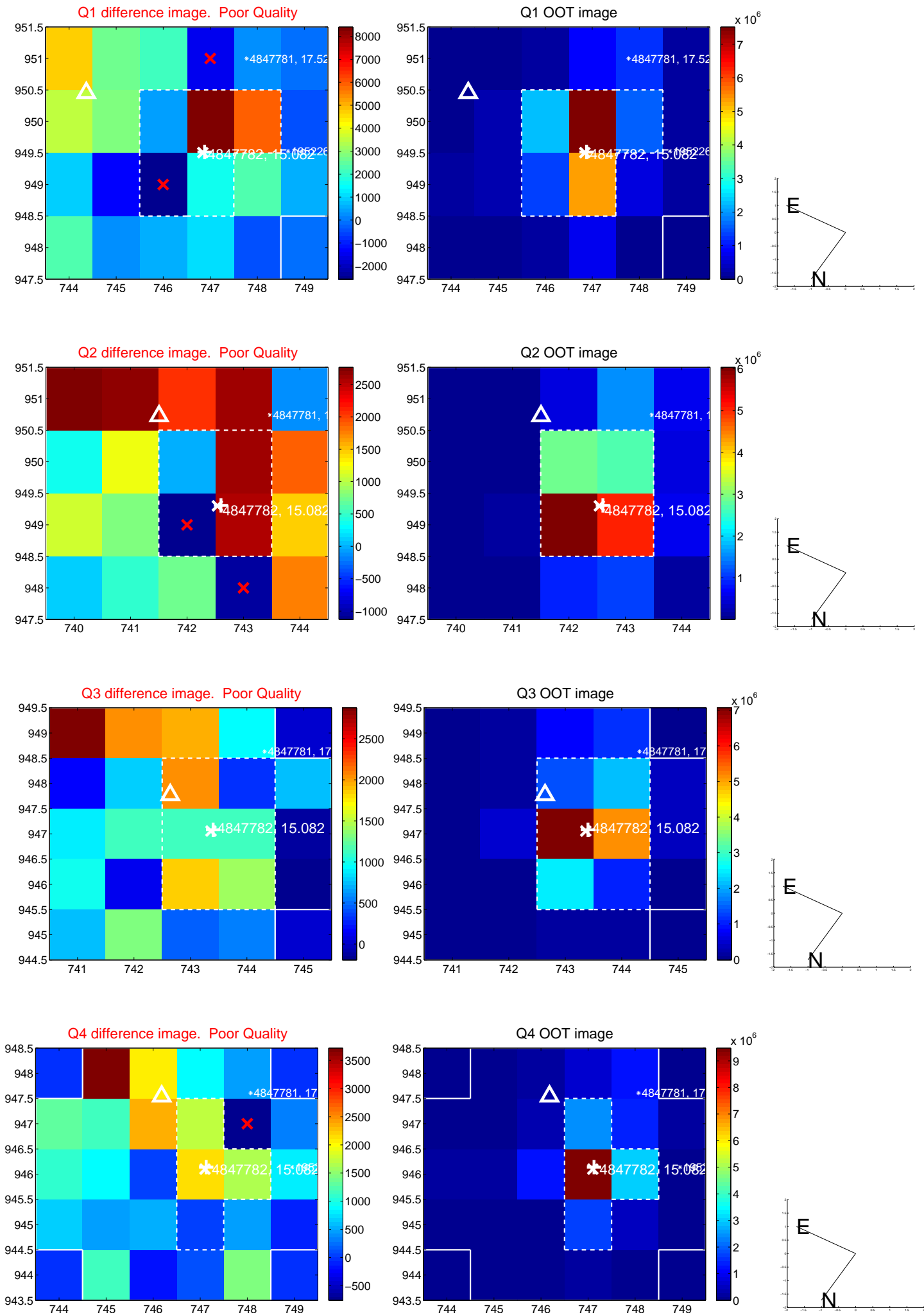
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$7.564 \pm 0.769$	9.84	$7.564 \pm 0.769$	$-0.025 \pm 0.493$
PRF-fit source offset from KIC position	$7.458 \pm 0.762$	9.79	$7.457 \pm 0.762$	$-0.131 \pm 0.509$
photometric centroid source offset	$5.83 \pm 1.08$	5.38	$5.53 \pm 1.08$	$-1.86 \pm 1.10$



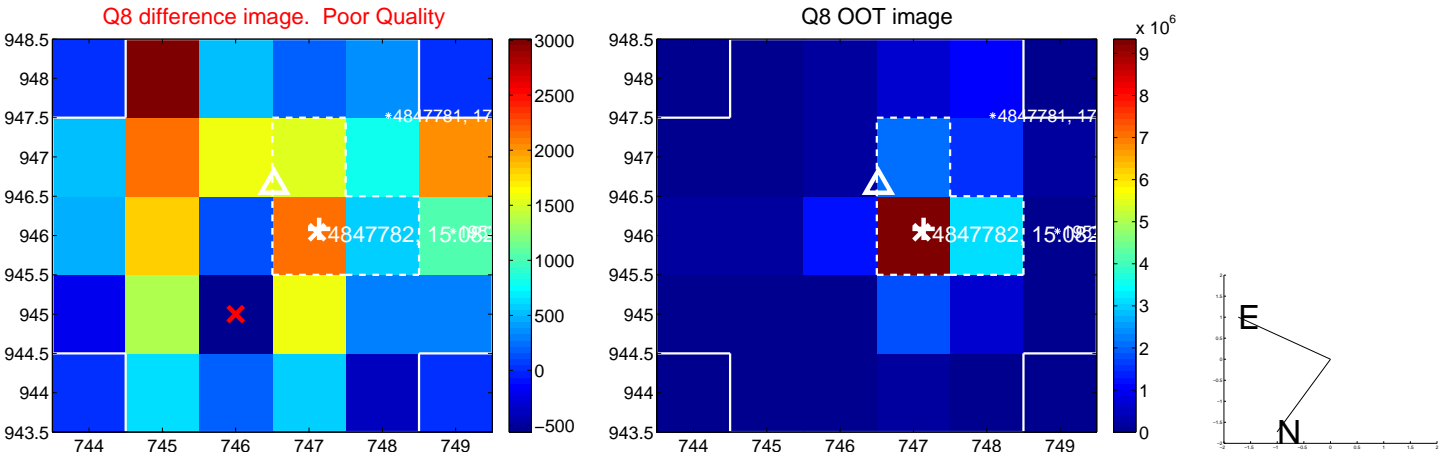
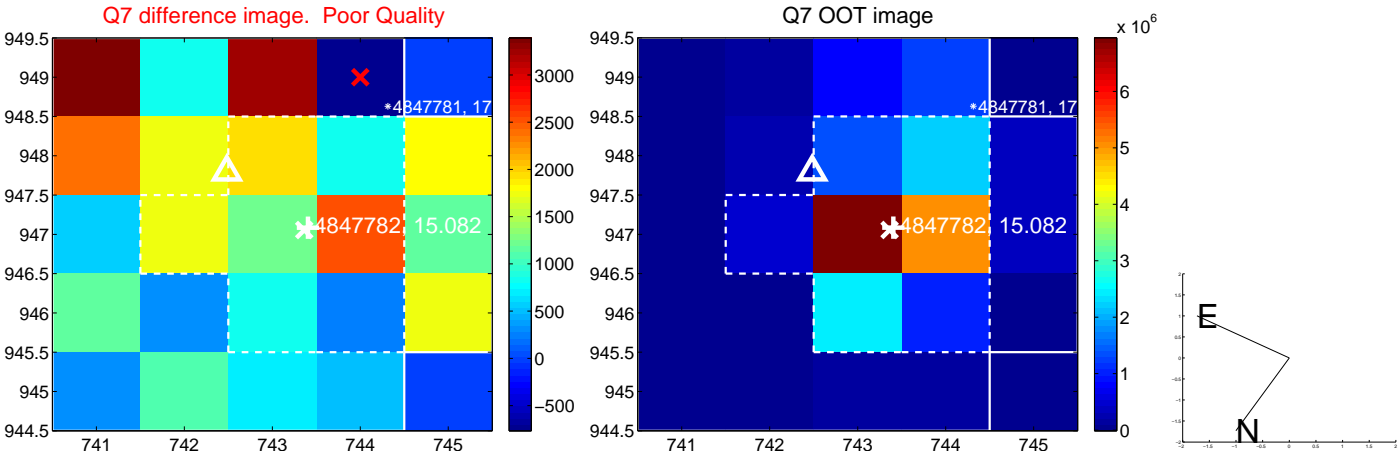
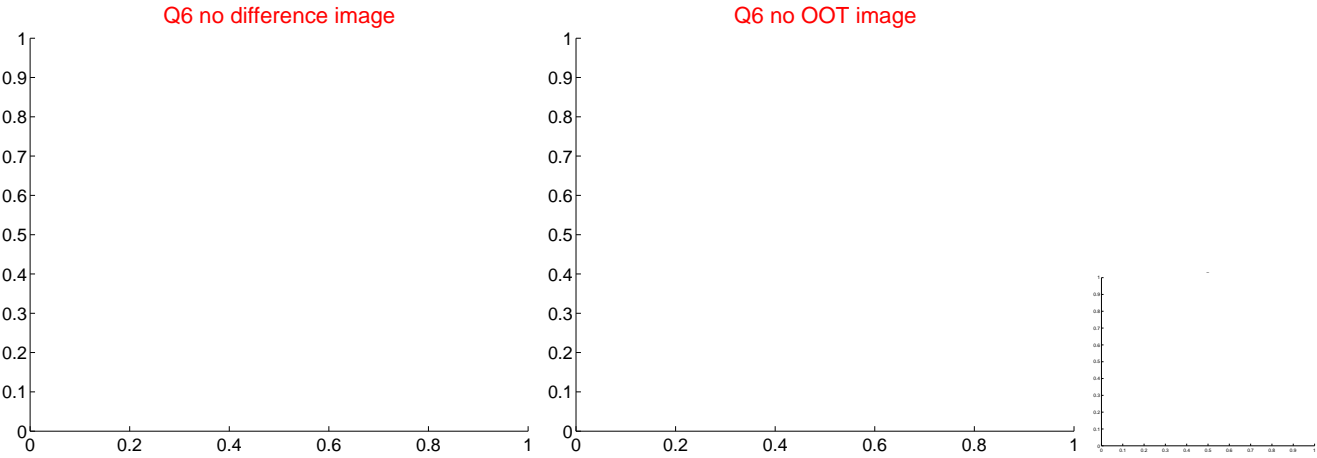
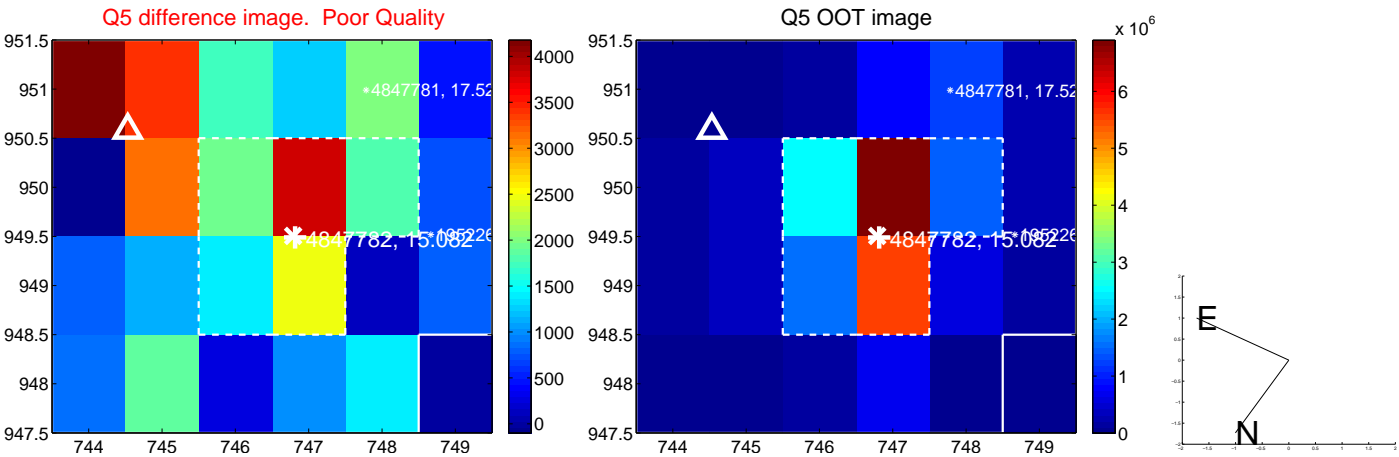
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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



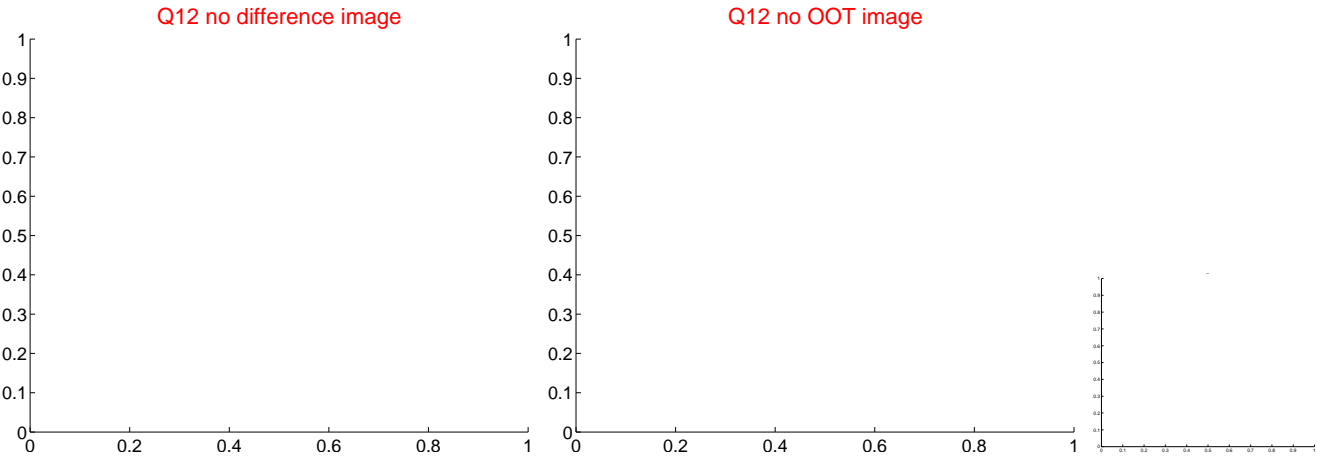
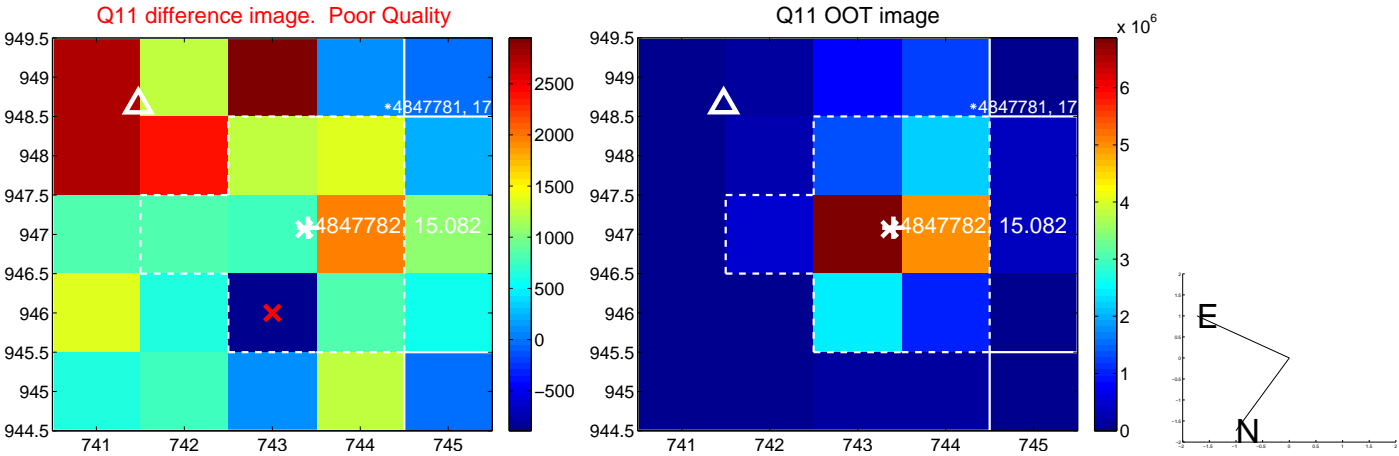
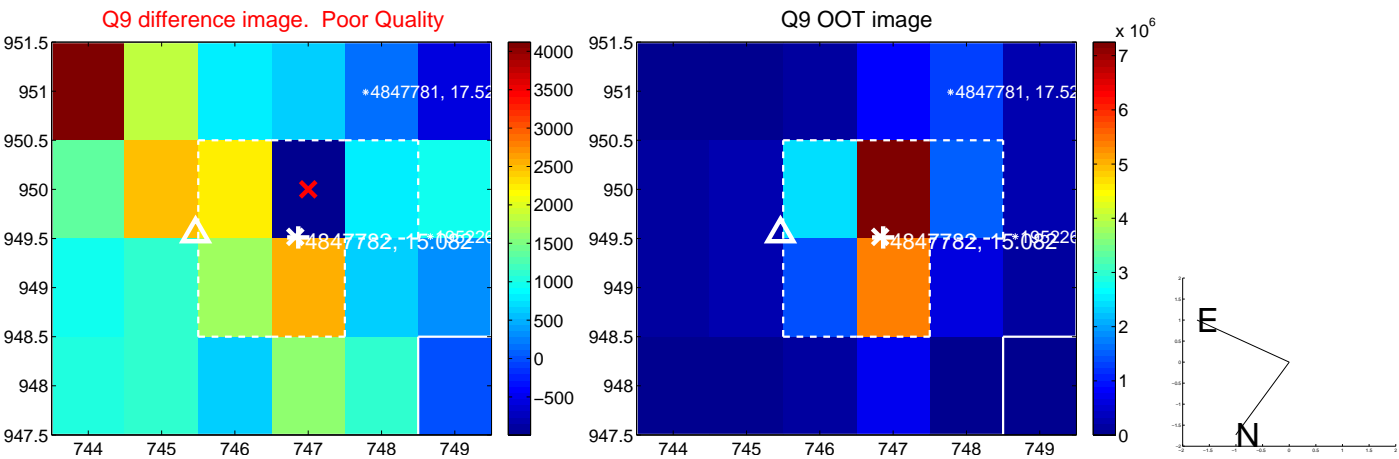
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



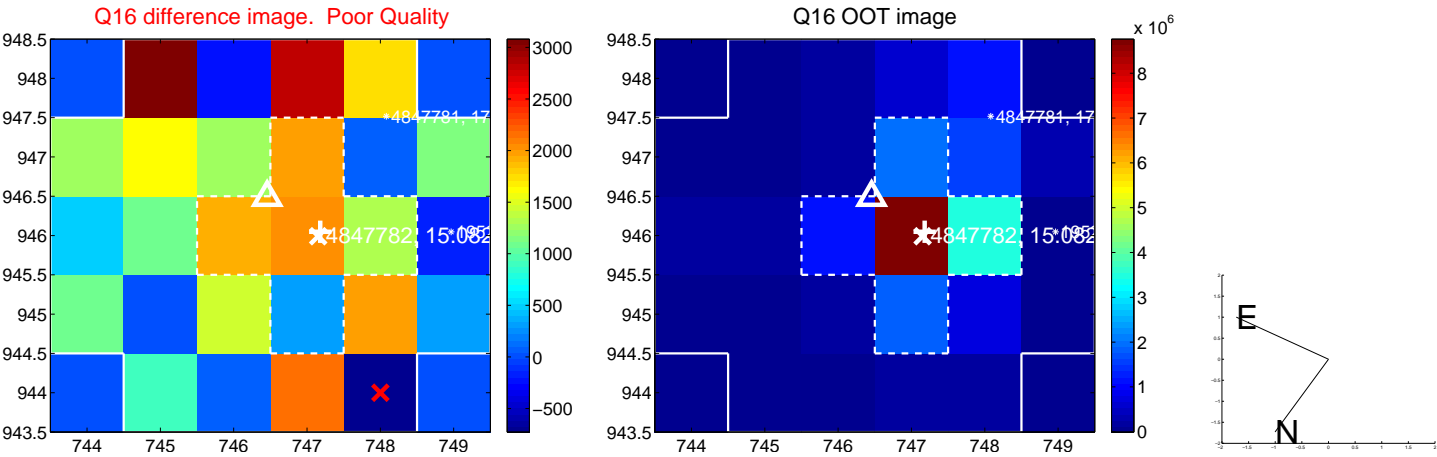
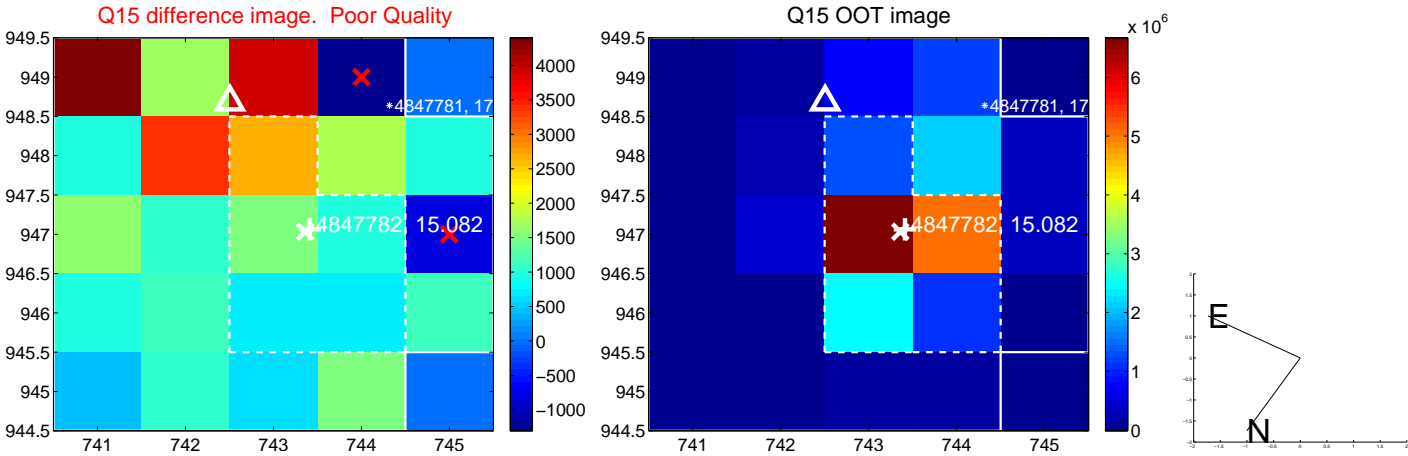
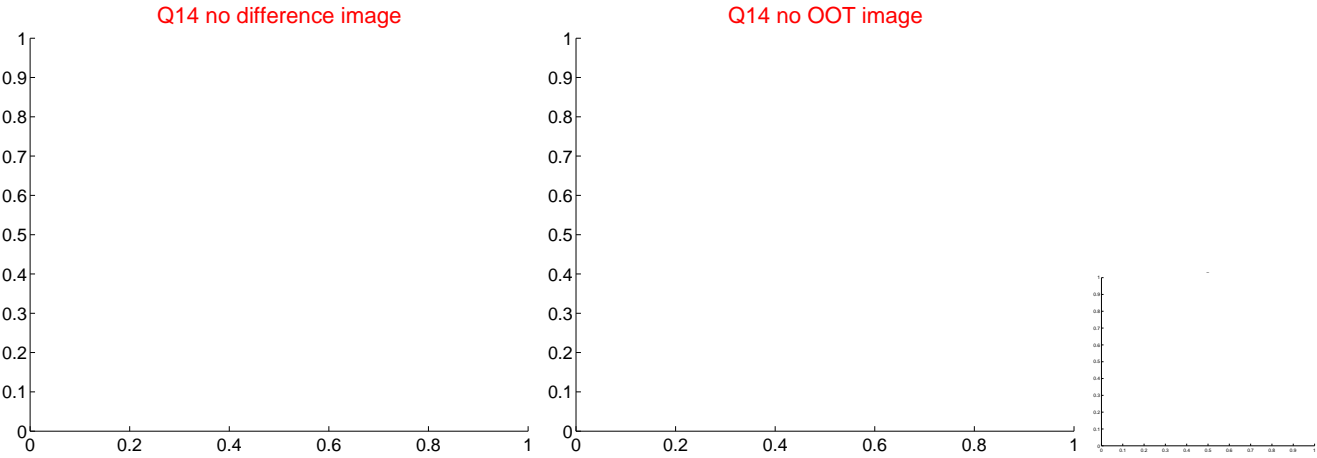
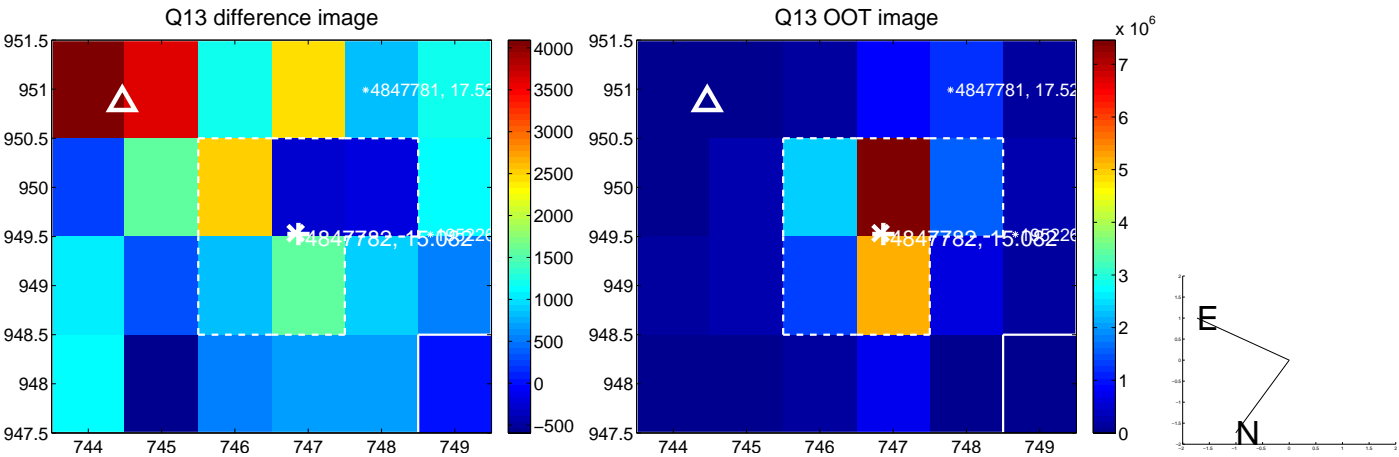
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



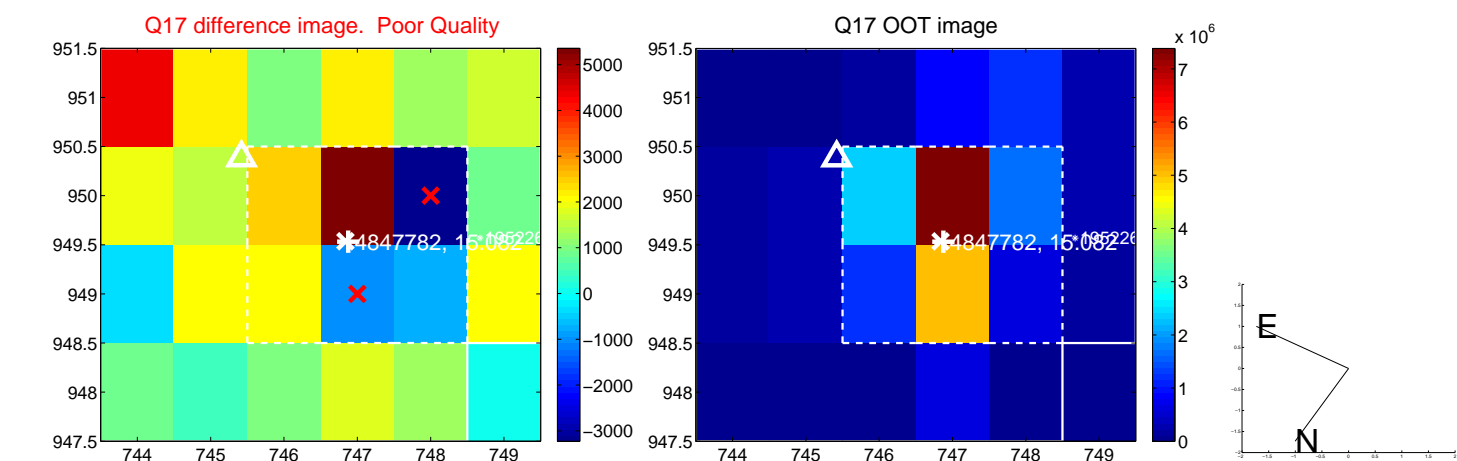
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



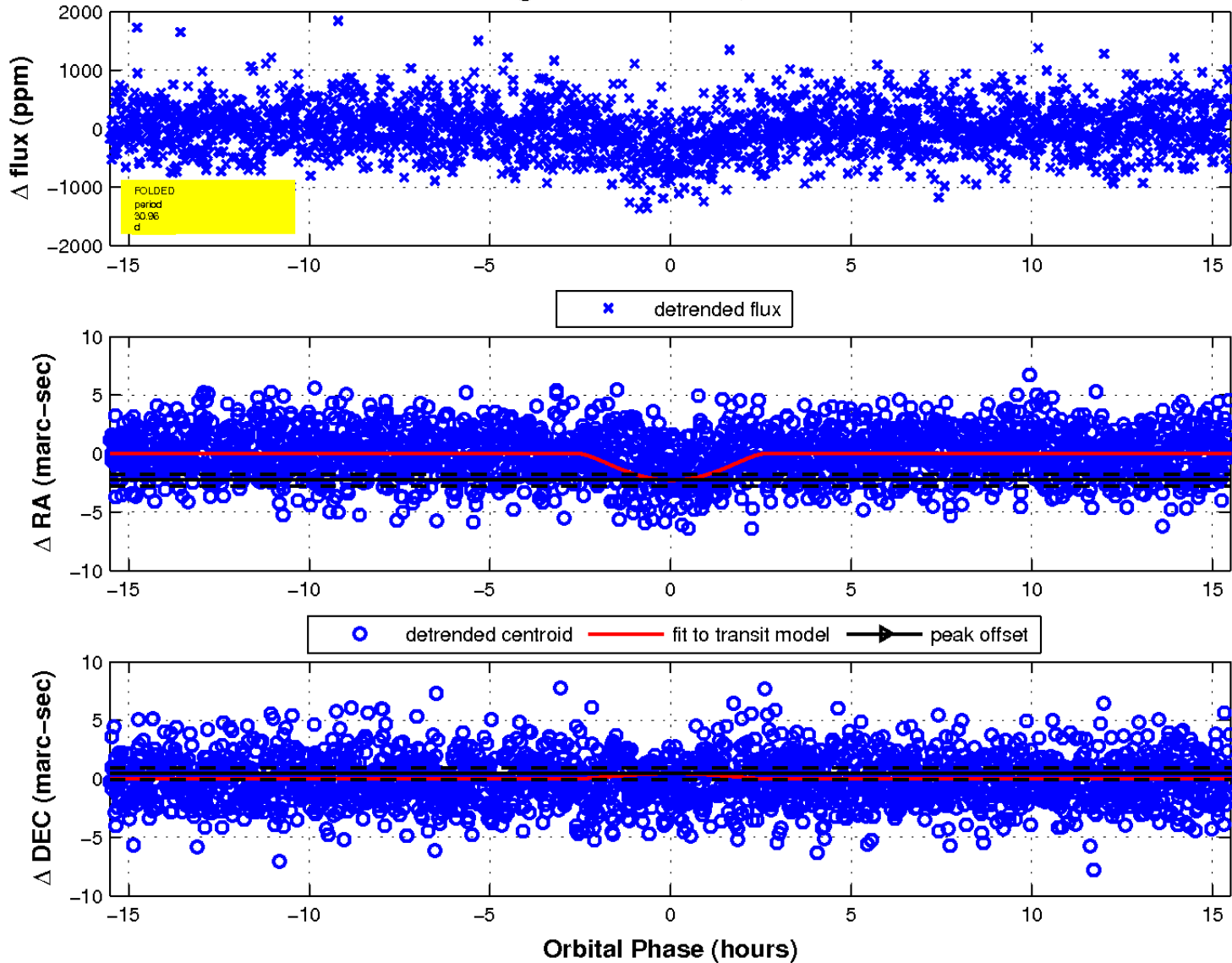
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



fluxWeightedCentroids, Planet 2 of 2



UKIRT Image

Declination

