

# KIC 009596355

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009596355-01	OBS	No	3.001610	133.721284	23.9	10.799	9.6	3.0	2.20	7622	1.32	6407.91
009596355-02	OBS	No	245.377943	198.639692	905.3	23.436	32.3	8.8	2.20	7622	8.06	18.06

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009596355-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_SKYE_ZUMA_TRACKER—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV
009596355-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS

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

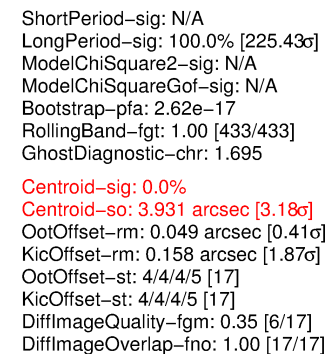
N = Not Transit-Like. S = Stellar Eclipse. C = Centroid Offset. E = Ephemeris Match.

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.

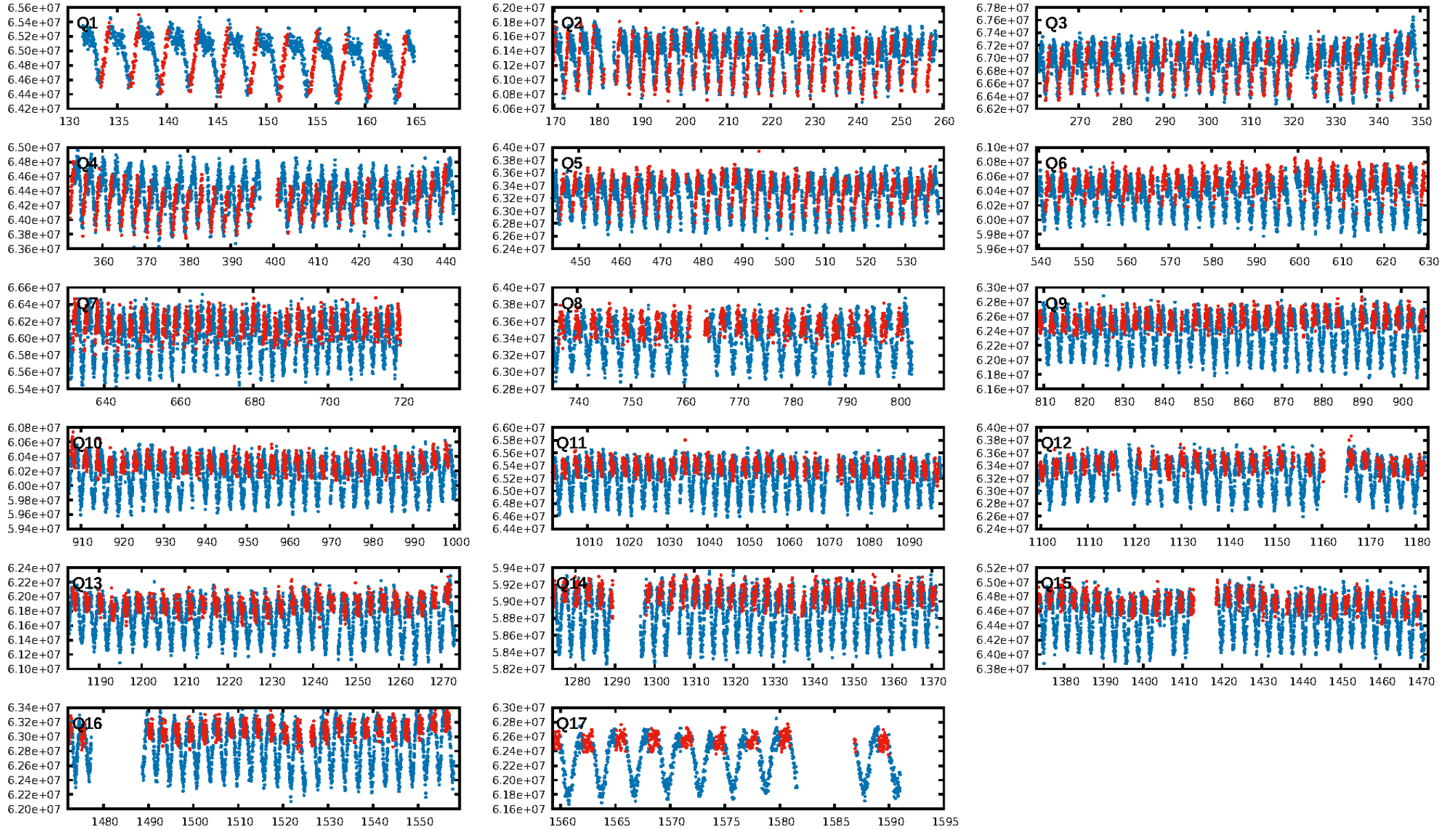
Ephemeris Match Information For 009596355-01

No Significant Match Found

## KIC: 9596355    Candidate: 1 of 2    Period: 3.002 d

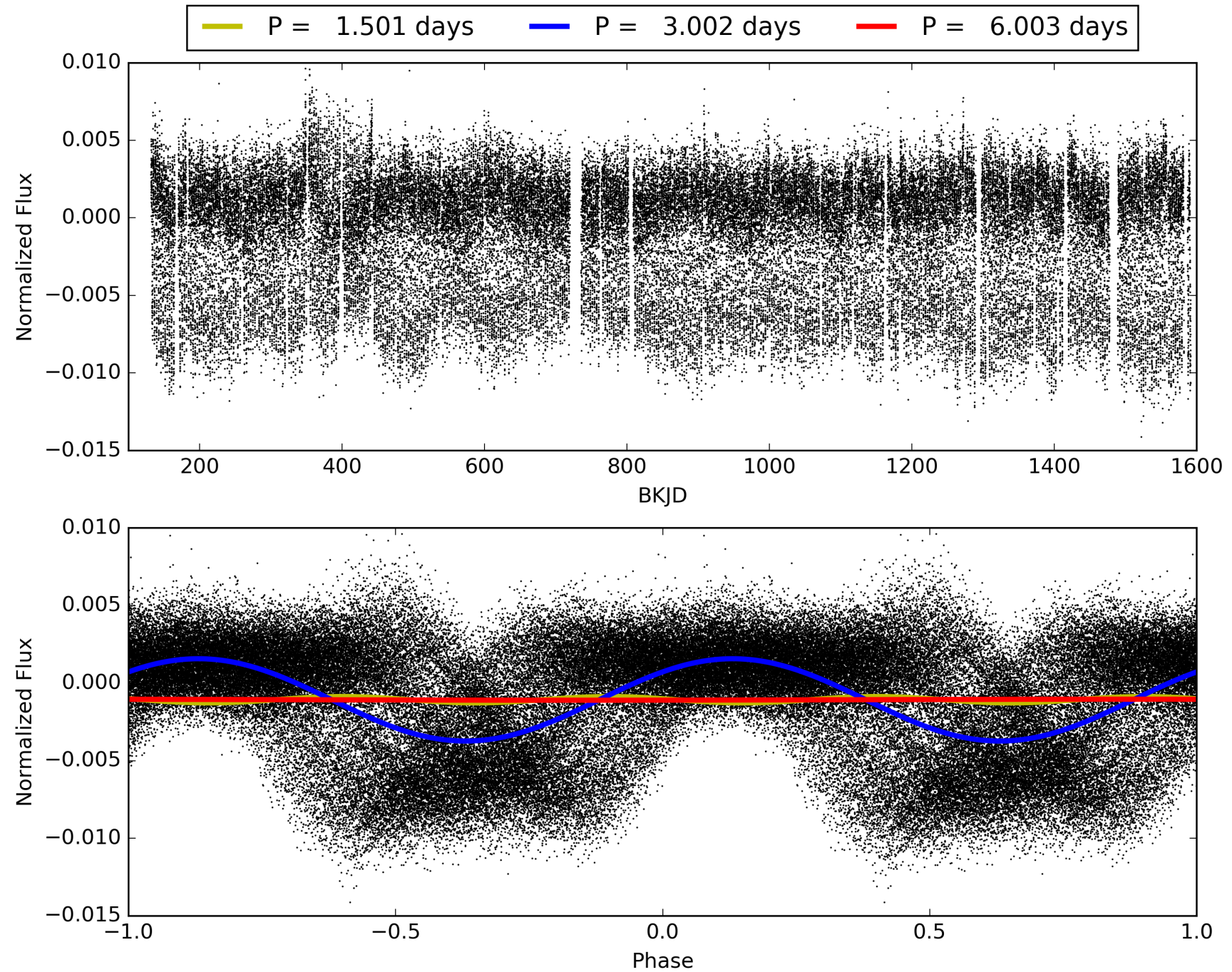


# TCE 009596355-01, PDC Light Curves



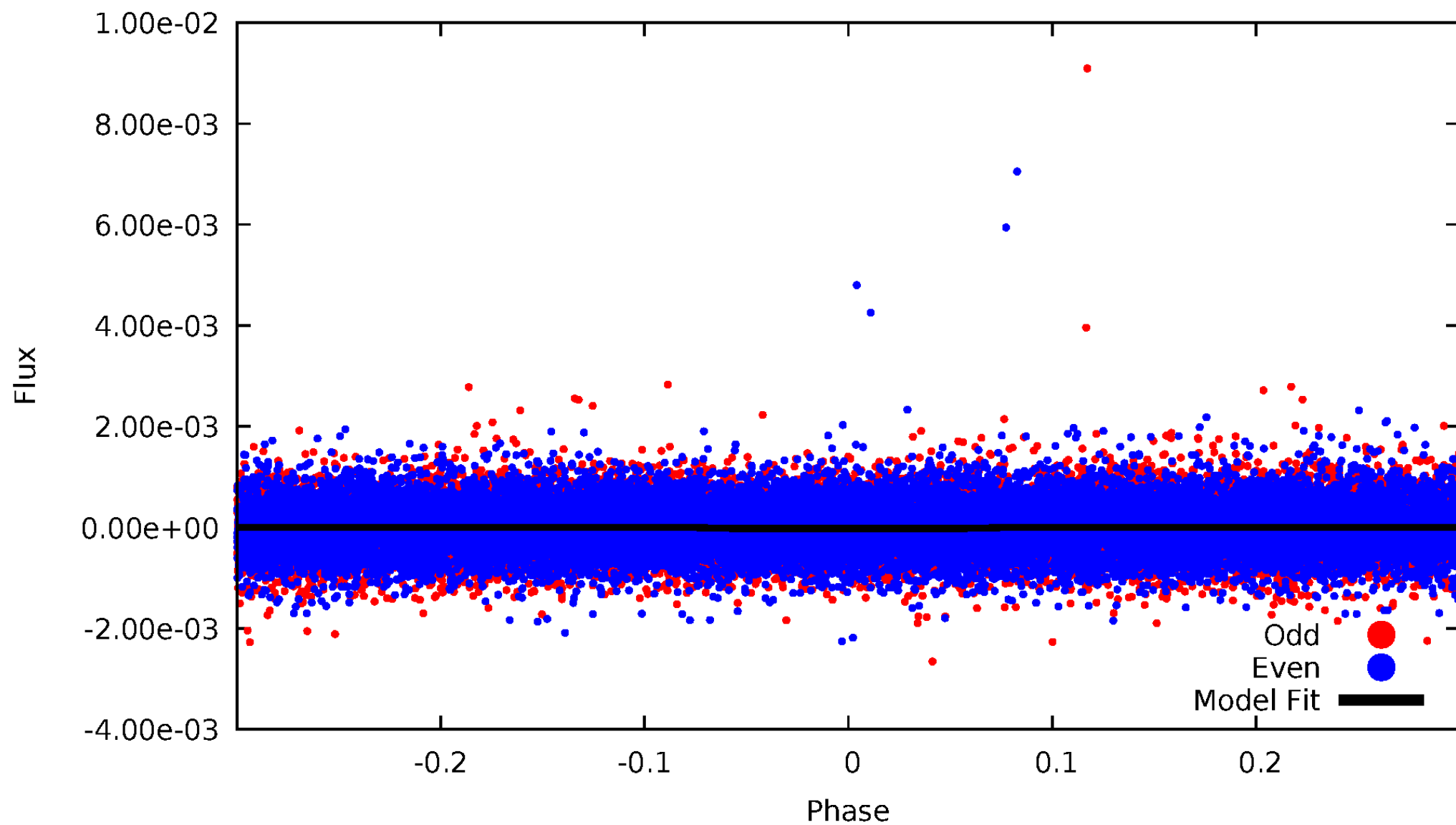


TCE 009596355-01



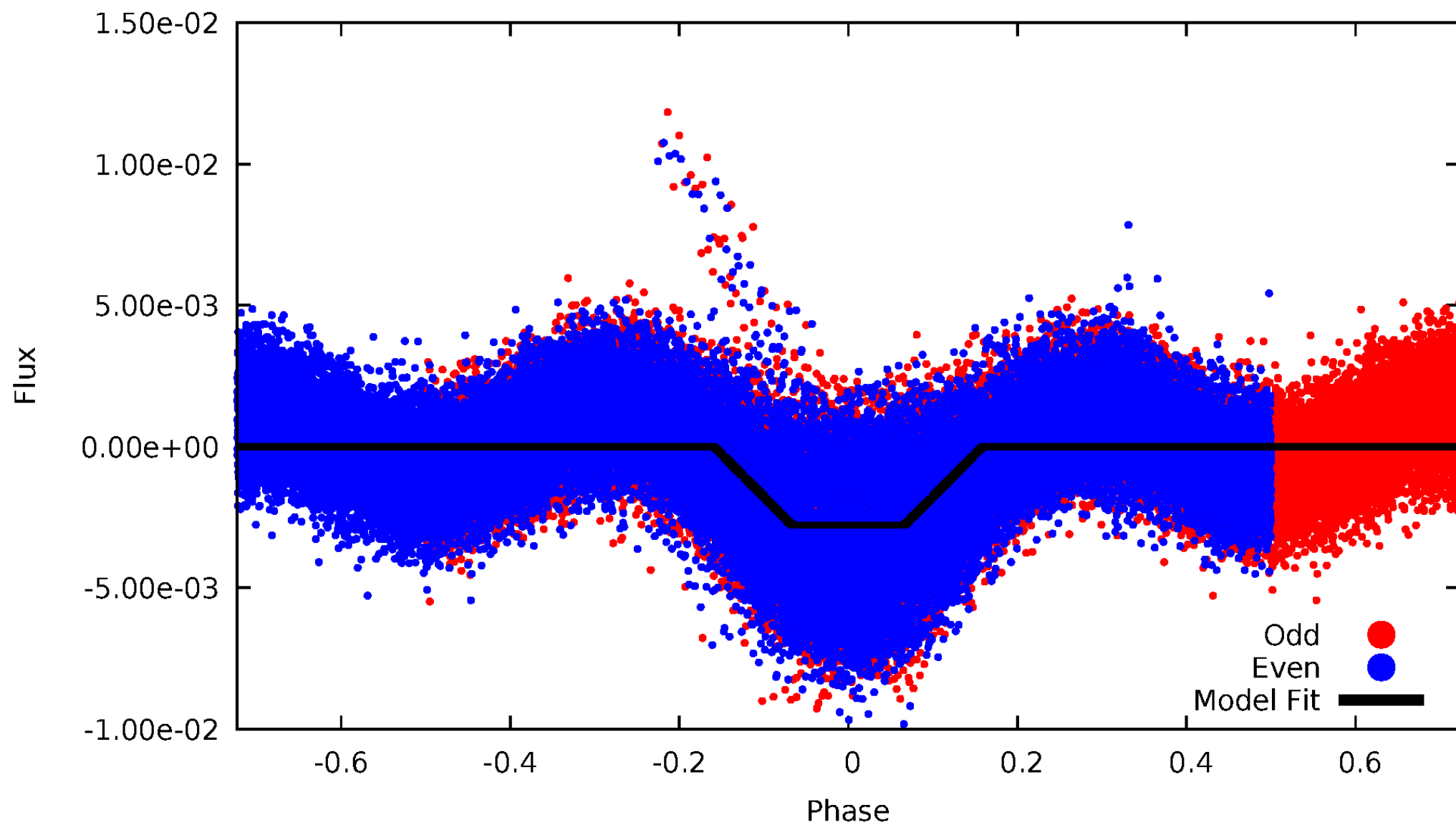
# DV Odd/Even

TCE 009596355-01



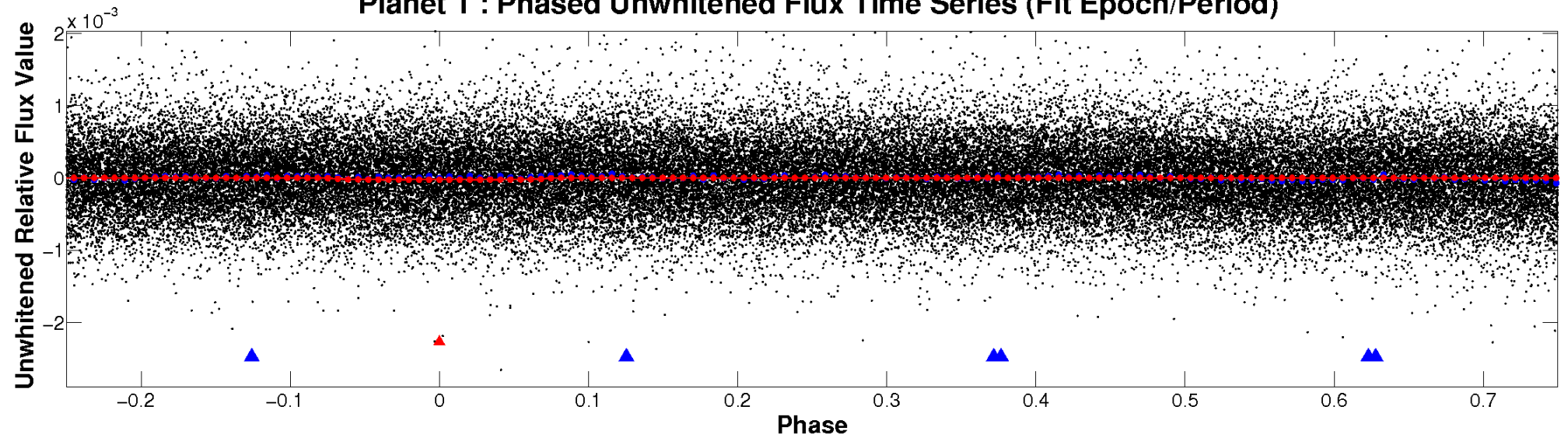
# ALT Odd/Even

TCE 009596355-01

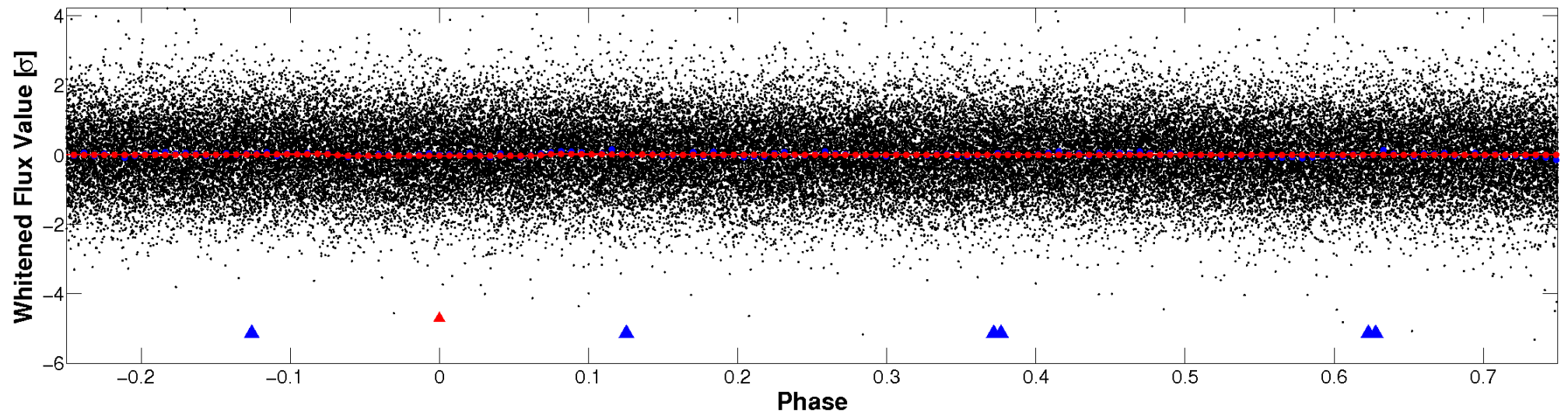


# Non-Whitened Vs. Whitened Light Curve

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



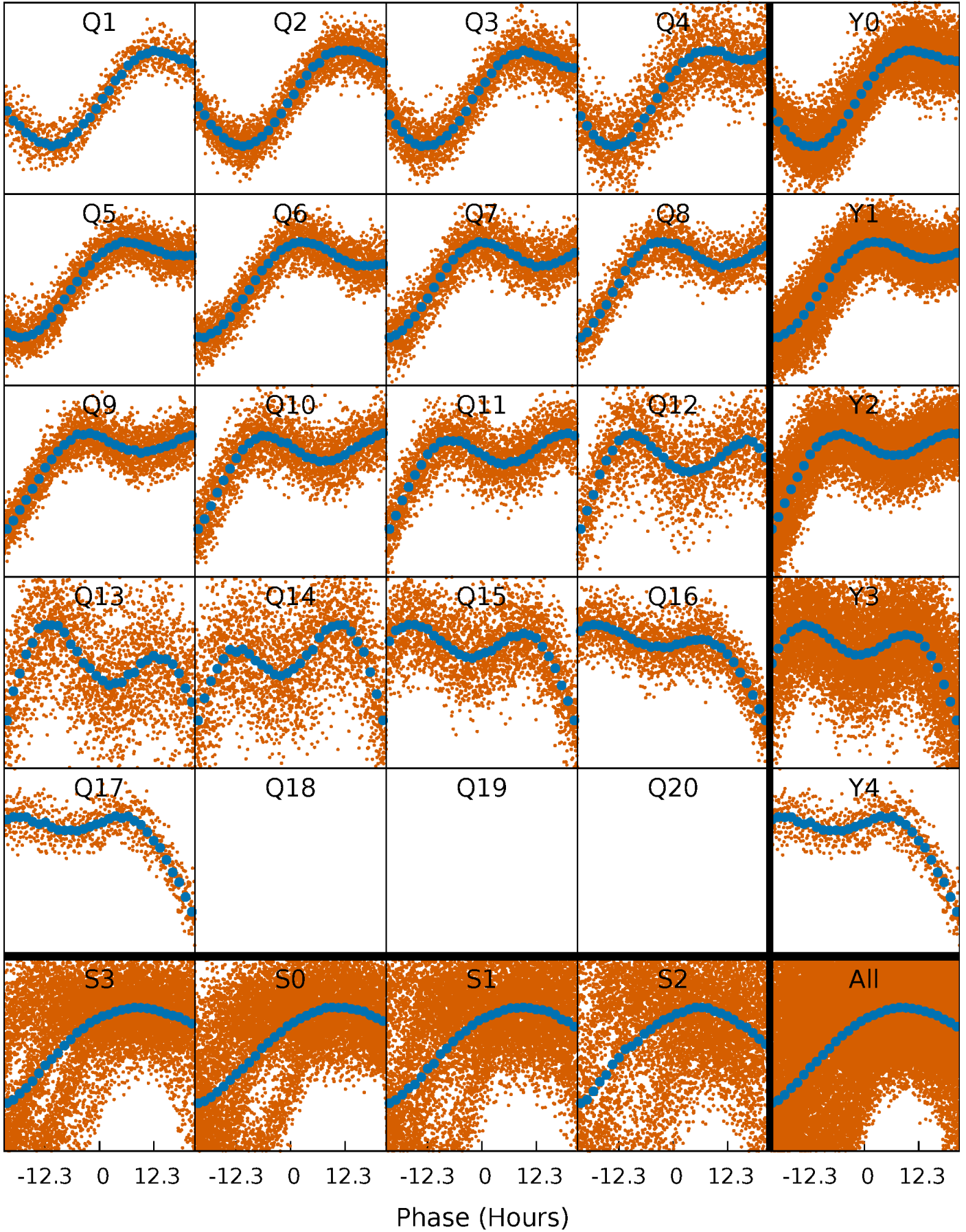
**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**





# PDC Quarter-Phased Transit Curves

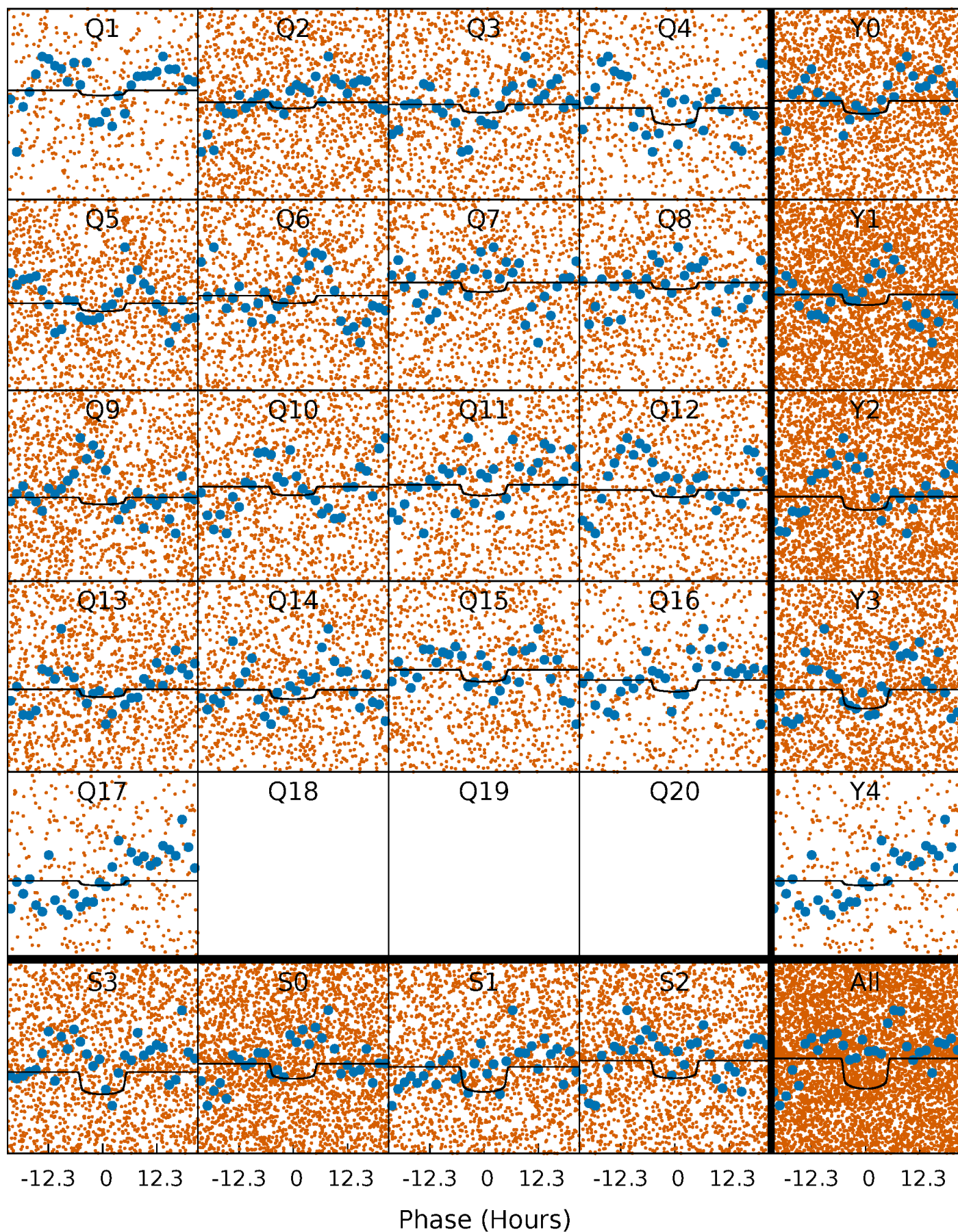
TCE 009596355-01   P= 3.001610 Days    $T_0=133.721284$  (BKJD)





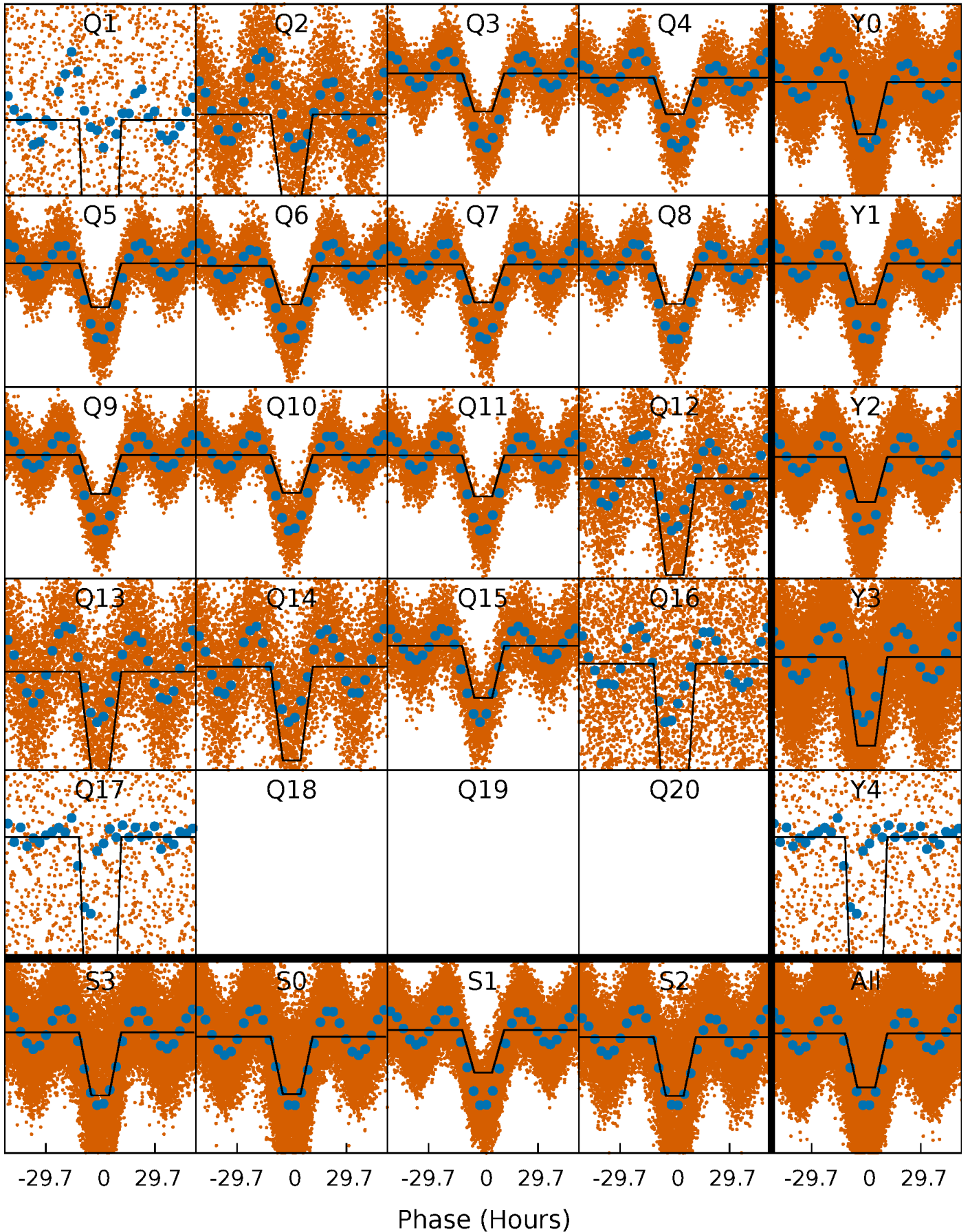
# DV Quarter-Phased Transit Curves

TCE 009596355-01 P= 3.001610 Days  $T_0=133.721284$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

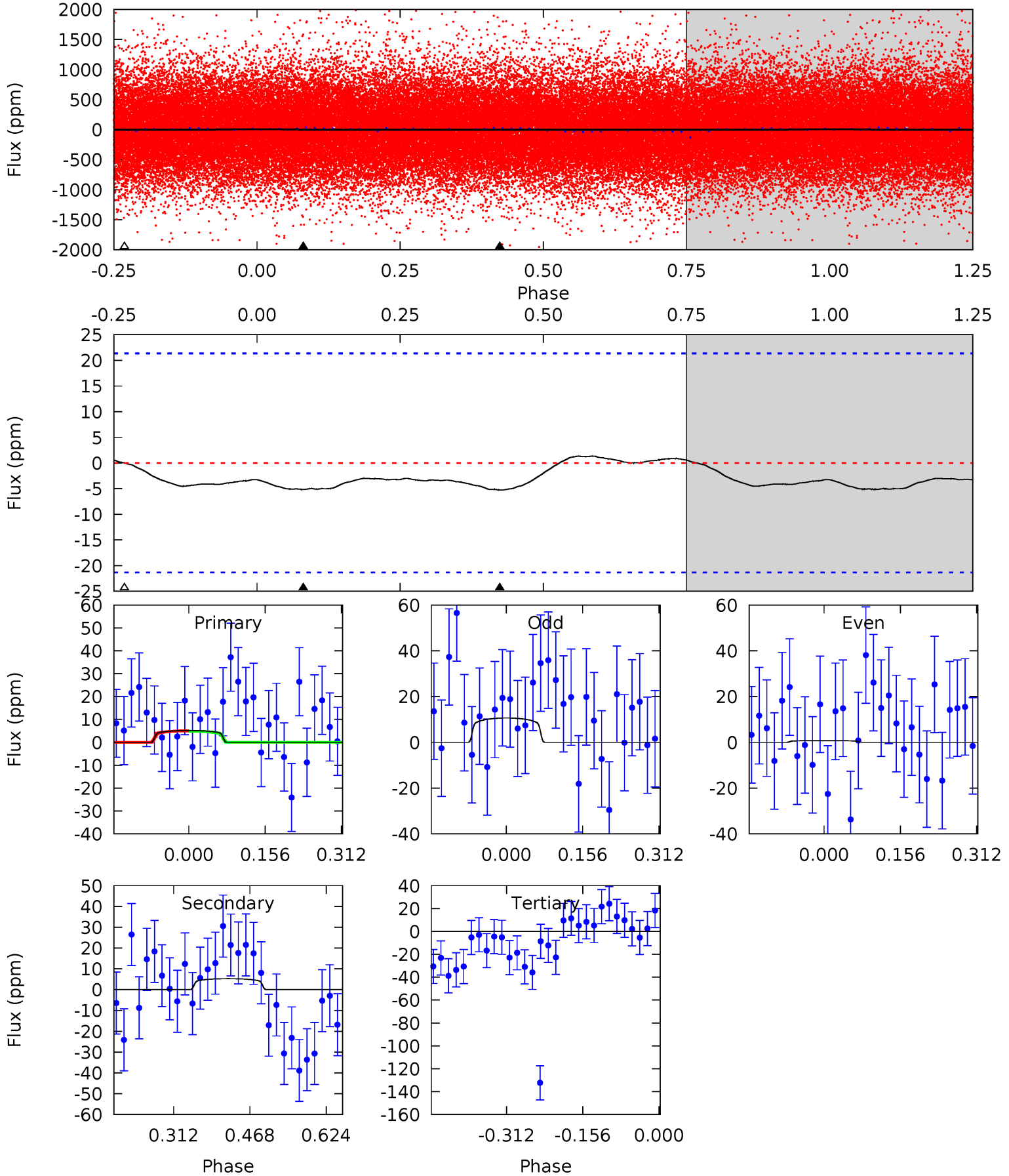
TCE 009596355-01 P= 2.998929 Days  $T_0=133.281750$  (BKJD)



# DV Model-Shift Uniqueness Test

009596355-01, P = 3.001610 Days, E = 130.719674 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
1.08	1.10	0	0	4.47	1.42	0.43	1.08	1.08	1.10	1.10	1.04	2.03	0.20	0.02

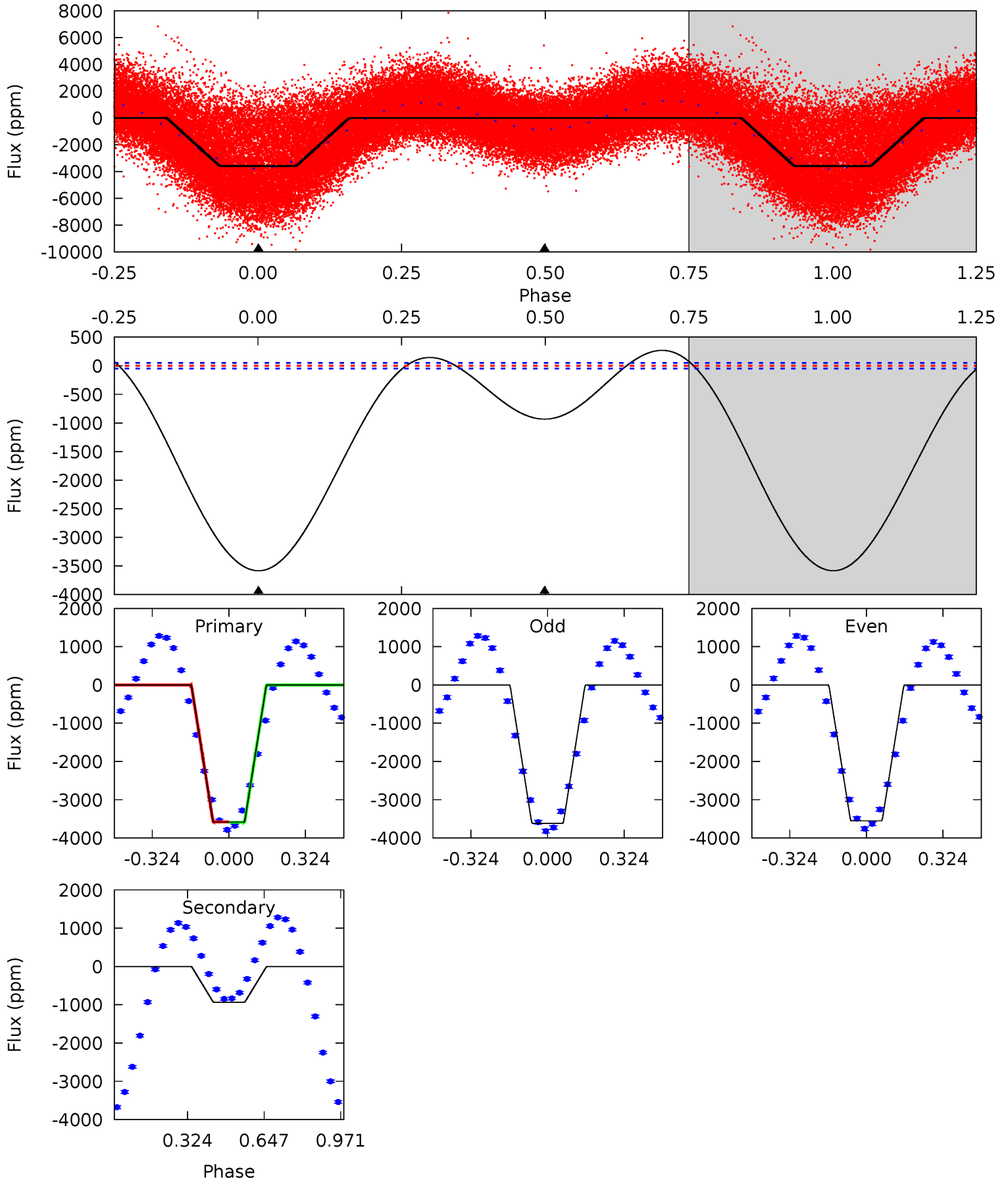




# Alt Model-Shift Uniqueness Test

009596355-01, P = 2.998929 Days, E = 130.282821 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
310.7	80.9	0	0	4.31	0.99	12.2	310.7	310.7	80.9	80.9	2.70	0.77	0.07	0.41





### Stellar Parameters For KIC 009596355

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7622^{+239}_{-319}$	$3.961^{+0.273}_{-0.147}$	$-0.340^{+0.250}_{-0.350}$	$2.198^{+0.506}_{-0.759}$	$1.610^{+0.169}_{-0.313}$	$0.214^{+0.382}_{-0.091}$
	+3%/-4%	+7%/-4%	+74%/-103%	+23%/-35%	+10%/-19%	+179%/-43%
Source	KIC0	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 009596355-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-5\pm5$	$1.26^{+0.47}_{-0.46}$	$3145^{+228}_{-290}$	$4744^{+1330}_{-7080}$	$3.609^{+7.696}_{-3.347}$
Alt.	$-933\pm12$	$12.41^{+1.82}_{-2.17}$	$3143^{+255}_{-302}$	$5652^{+182}_{-199}$	$7.531^{+3.440}_{-1.699}$

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

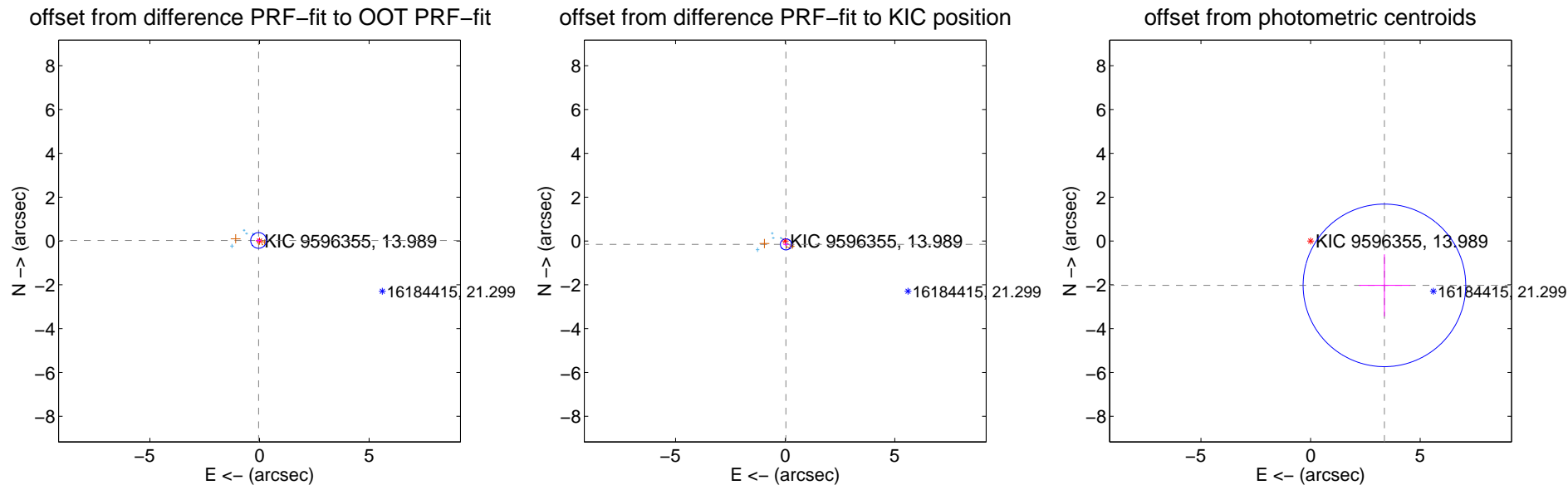
## DV Centroid Data

Supplemental centroid analysis for 009596355-01. Kepler magnitude: 13.99. Transit SNR 2.98

There are 6 quarters with good PRF difference image offsets

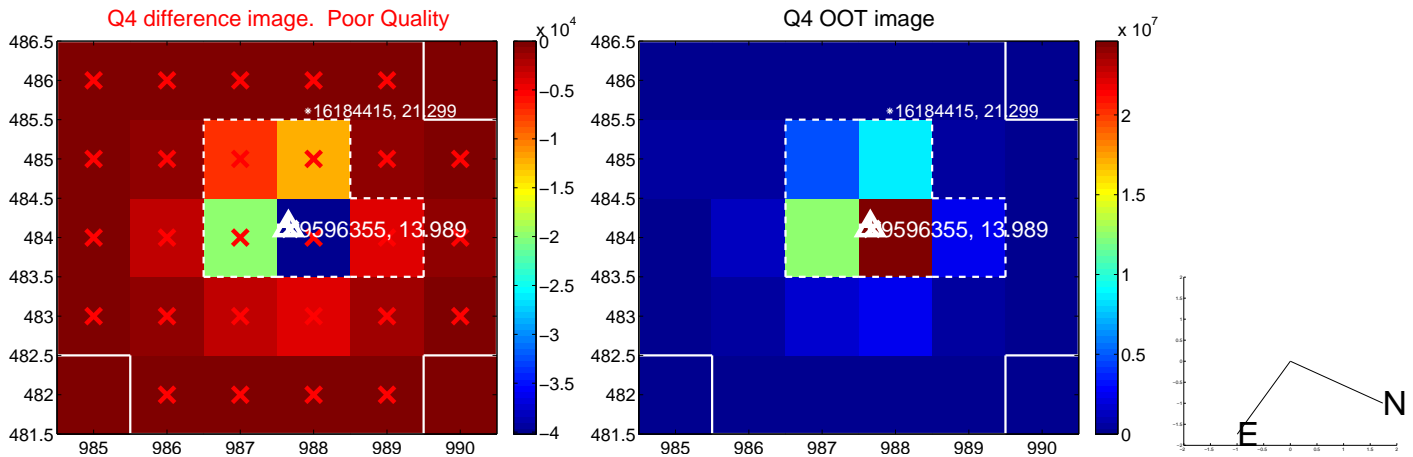
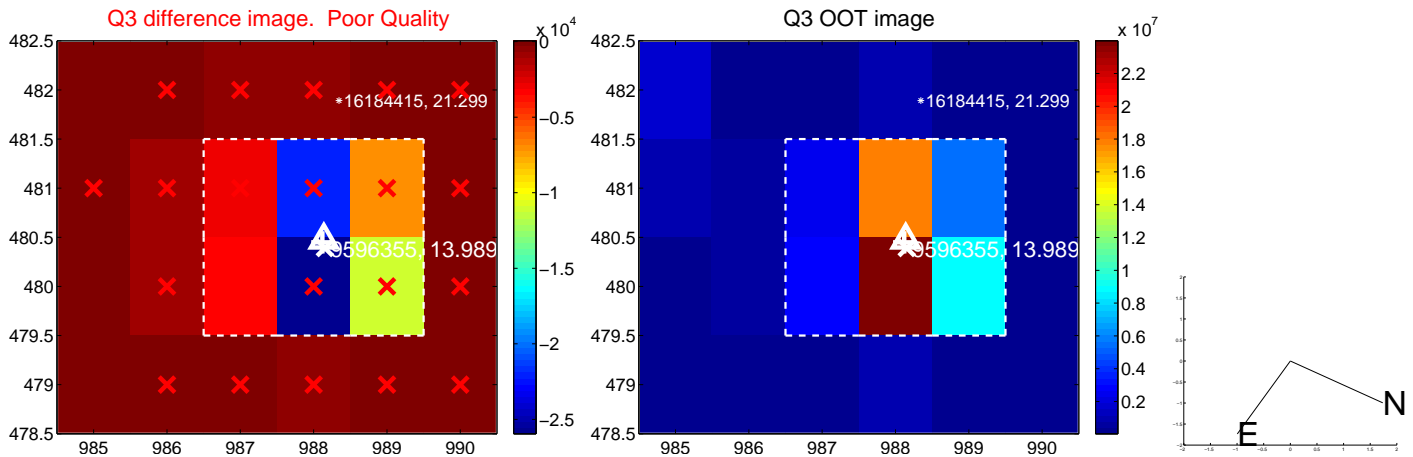
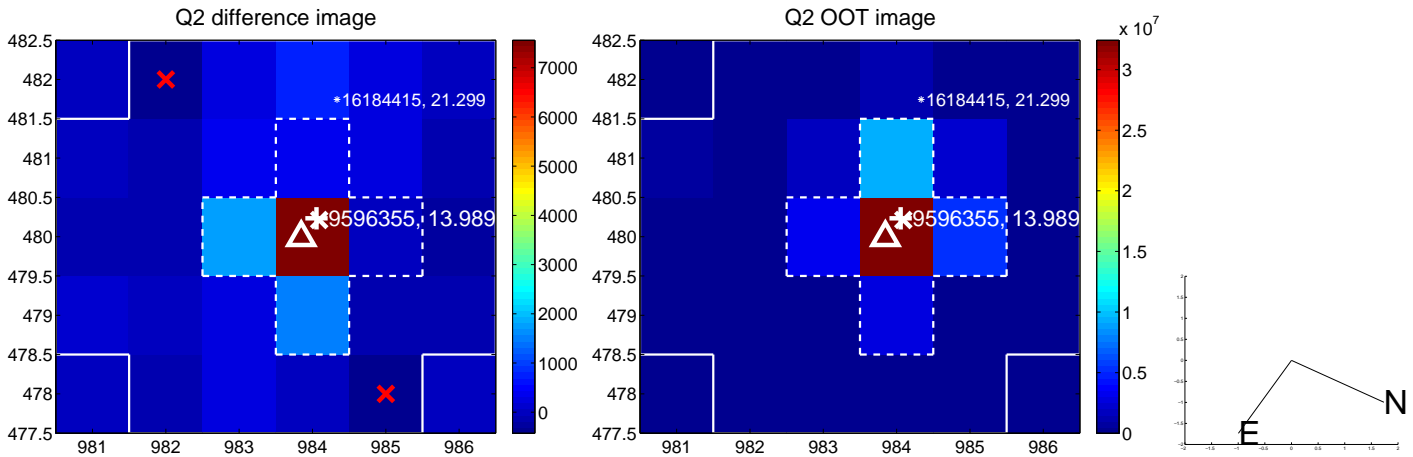
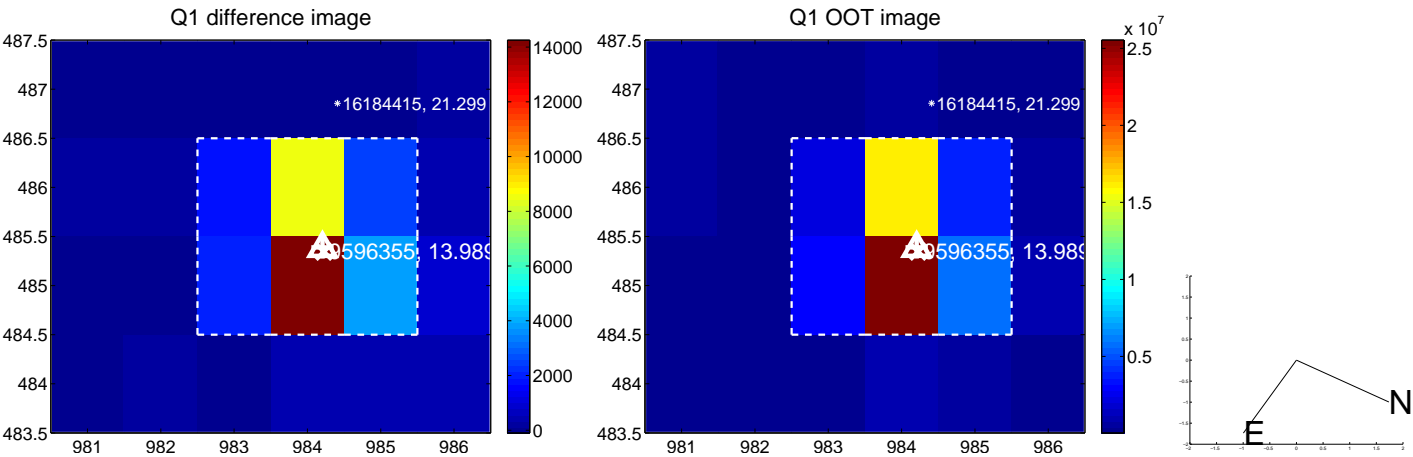
The direct PRF centroid is offset from the target star catalog position by about 0.18 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.049 \pm 0.119$	0.41	$0.043 \pm 0.122$	$0.024 \pm 0.082$
PRF-fit source offset from KIC position	$0.158 \pm 0.084$	1.87	$-0.035 \pm 0.125$	$-0.154 \pm 0.079$
photometric centroid source offset	$3.93 \pm 1.24$	3.18	$-3.37 \pm 1.17$	$-2.03 \pm 1.41$

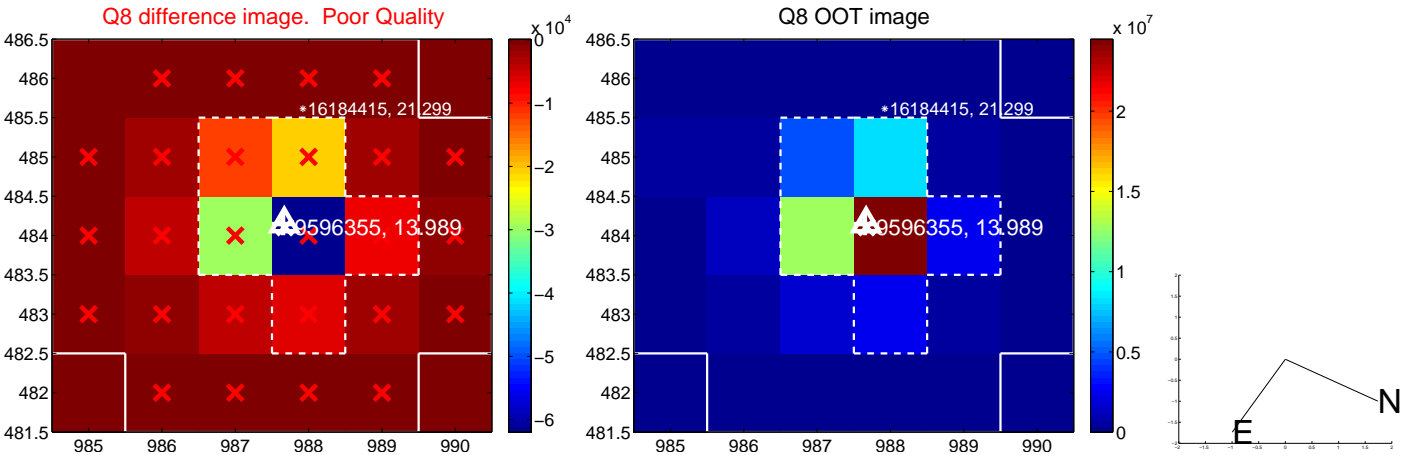
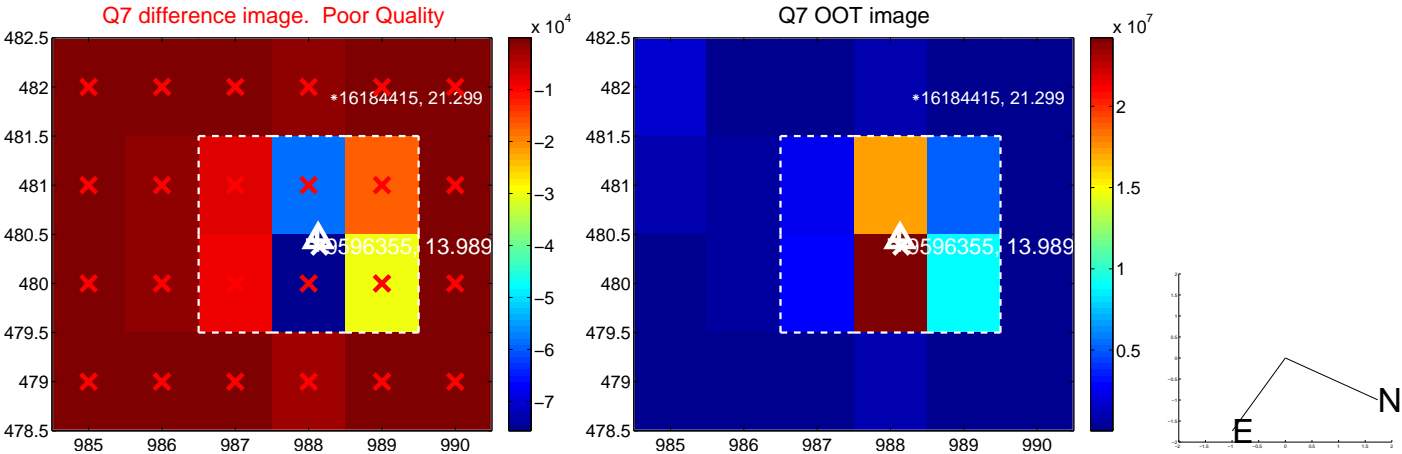
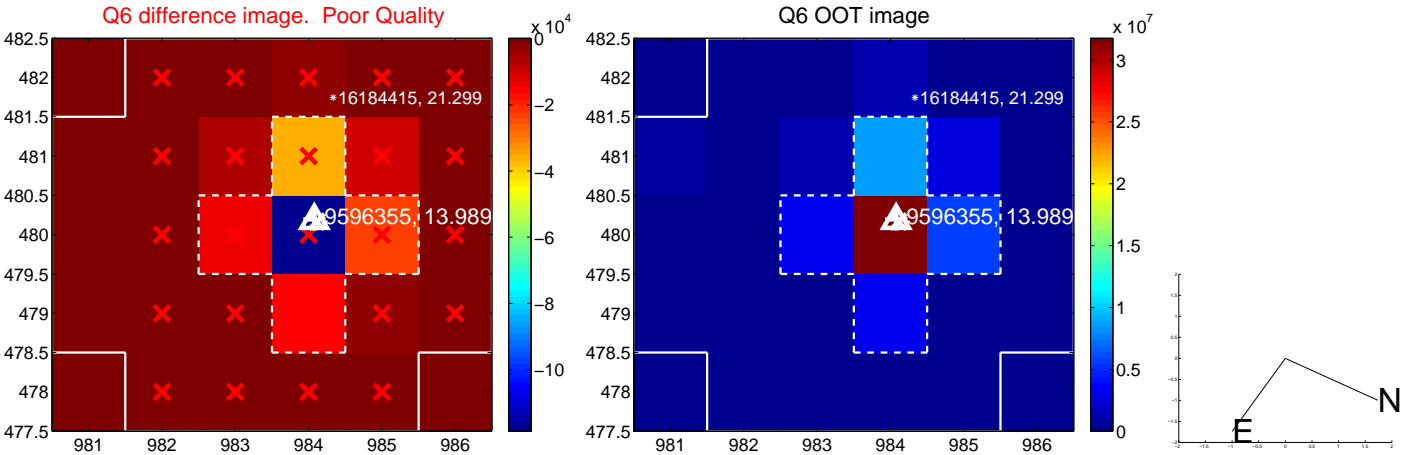
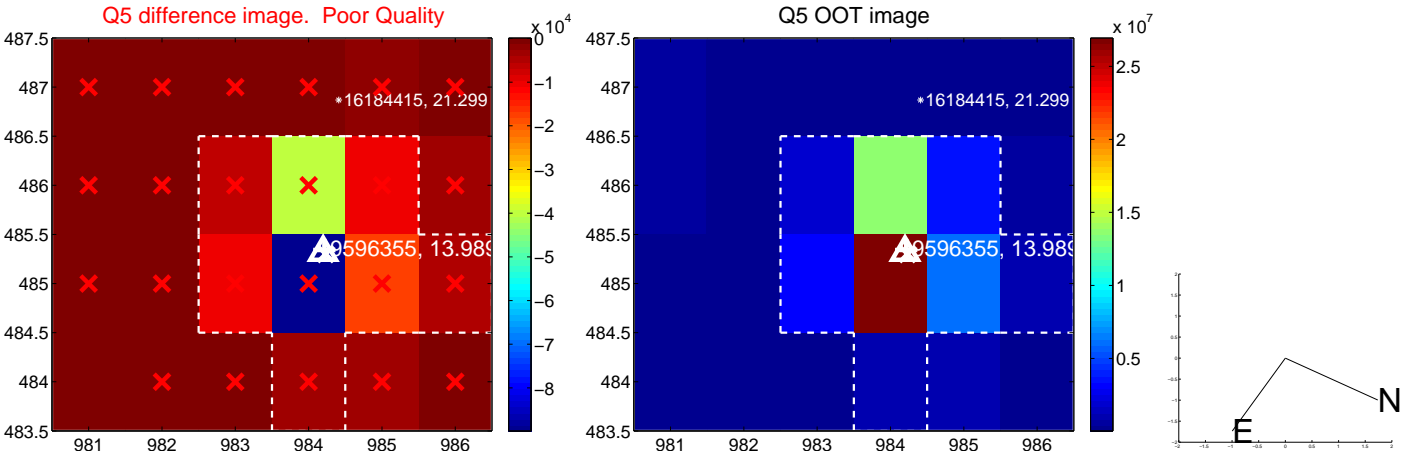


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

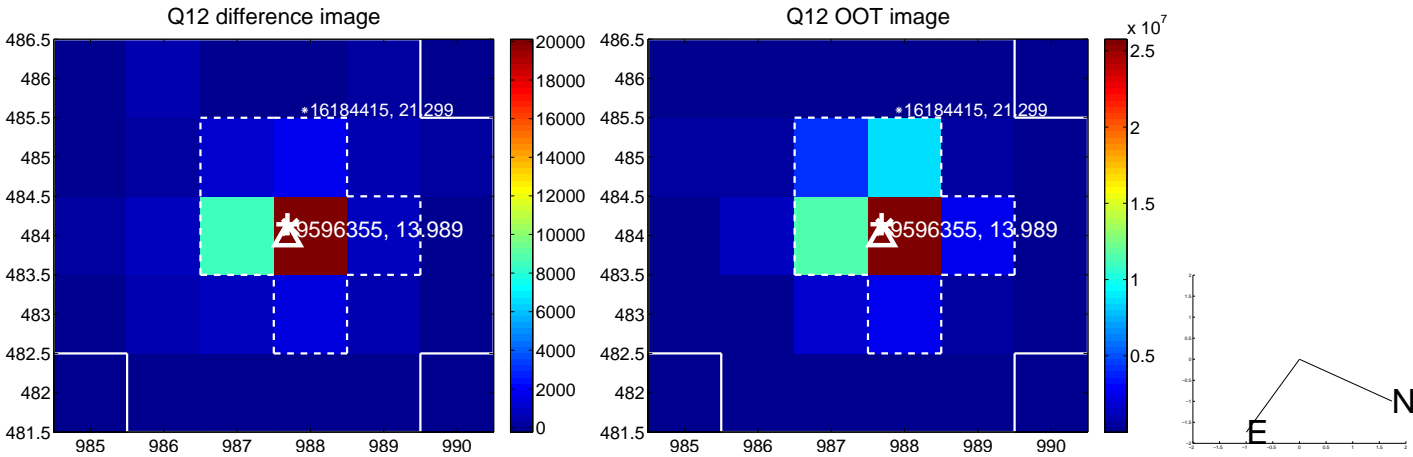
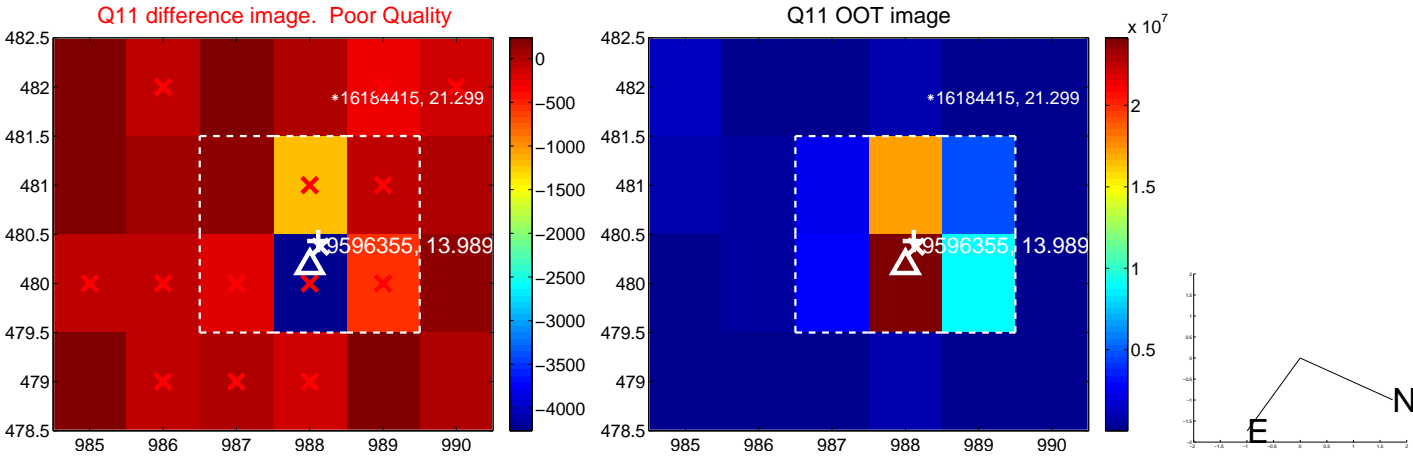
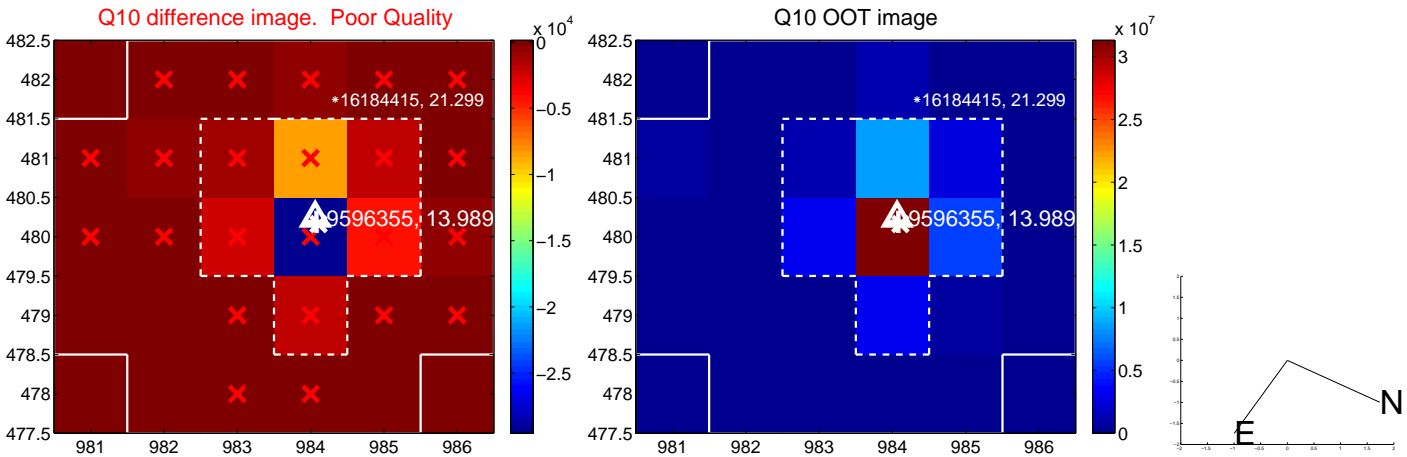
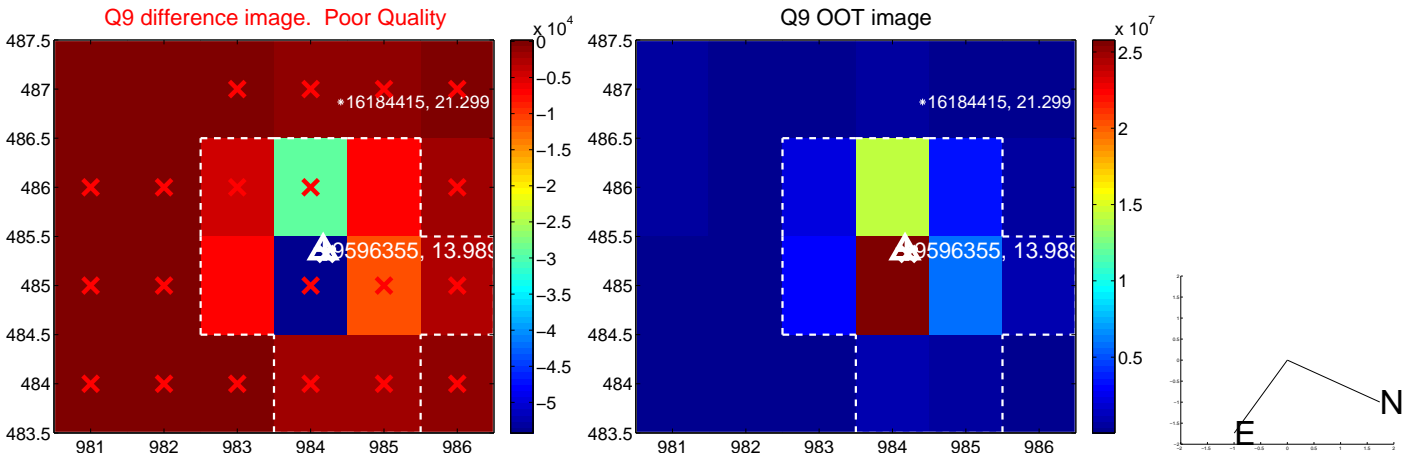


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

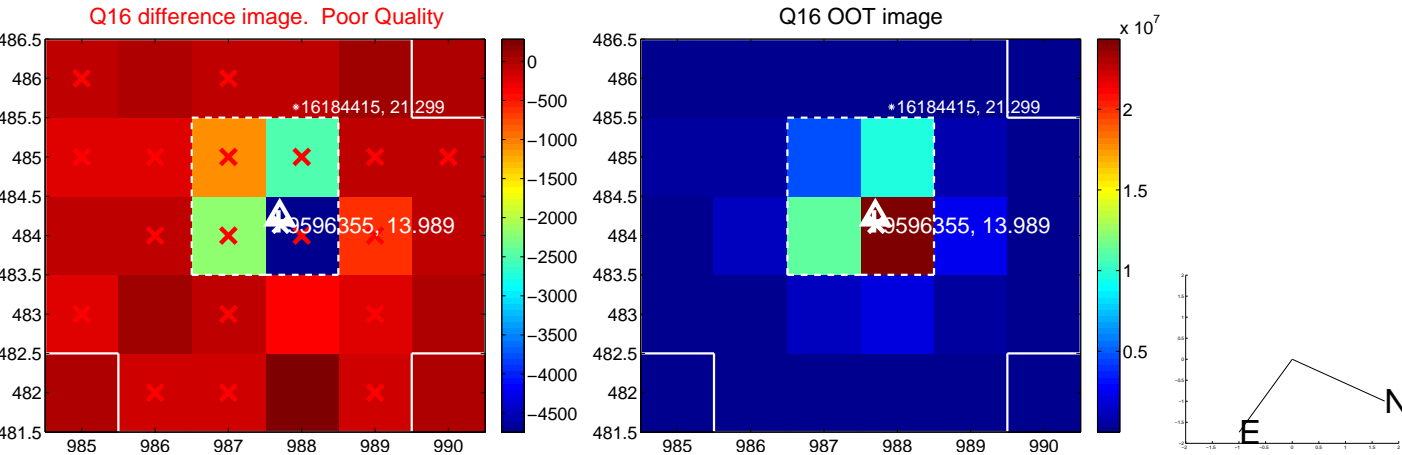
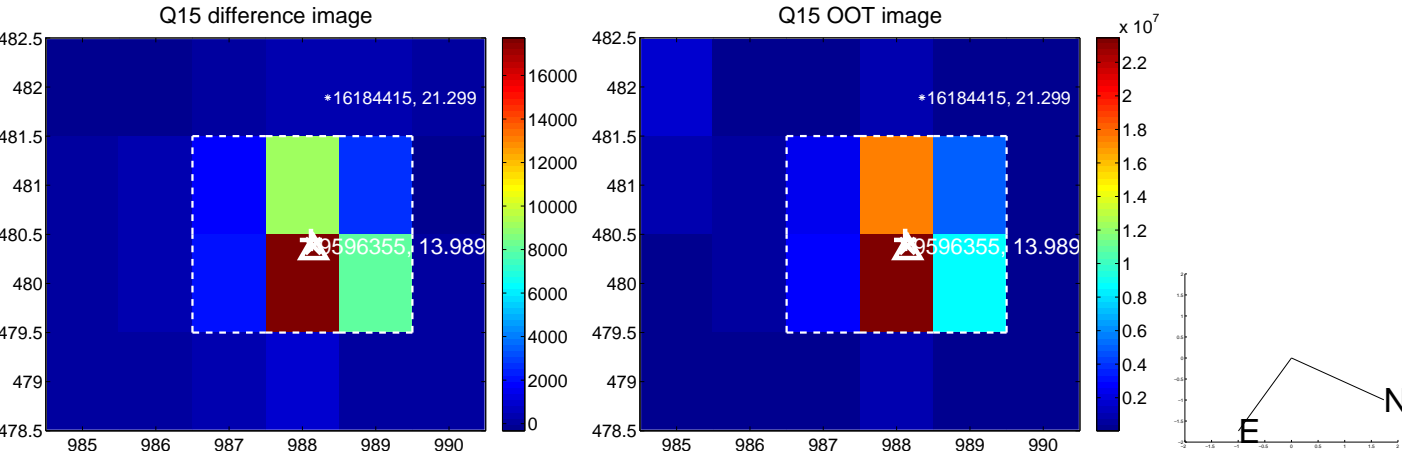
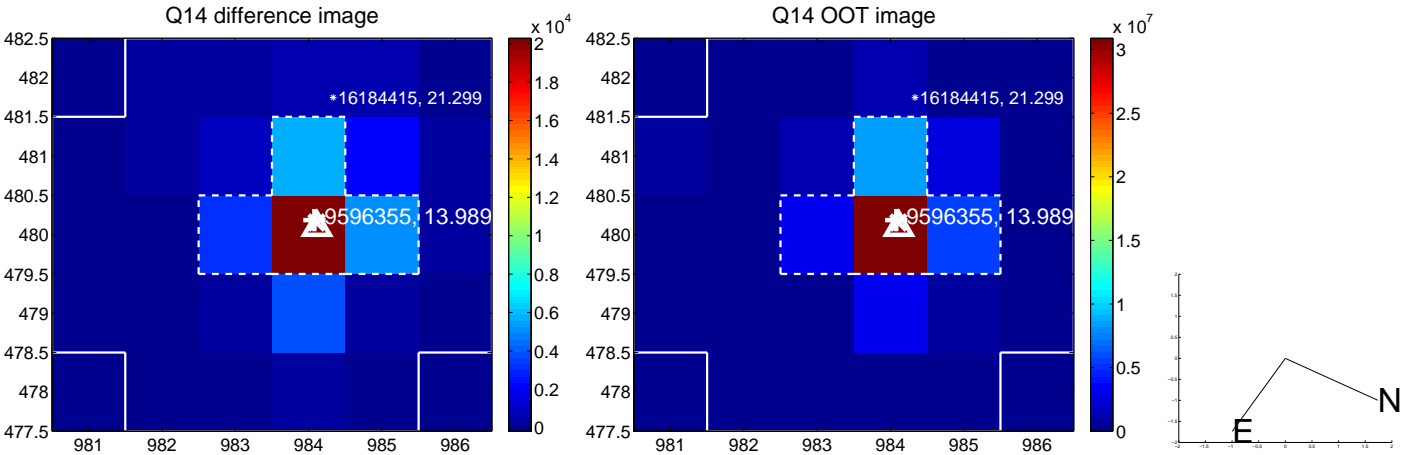
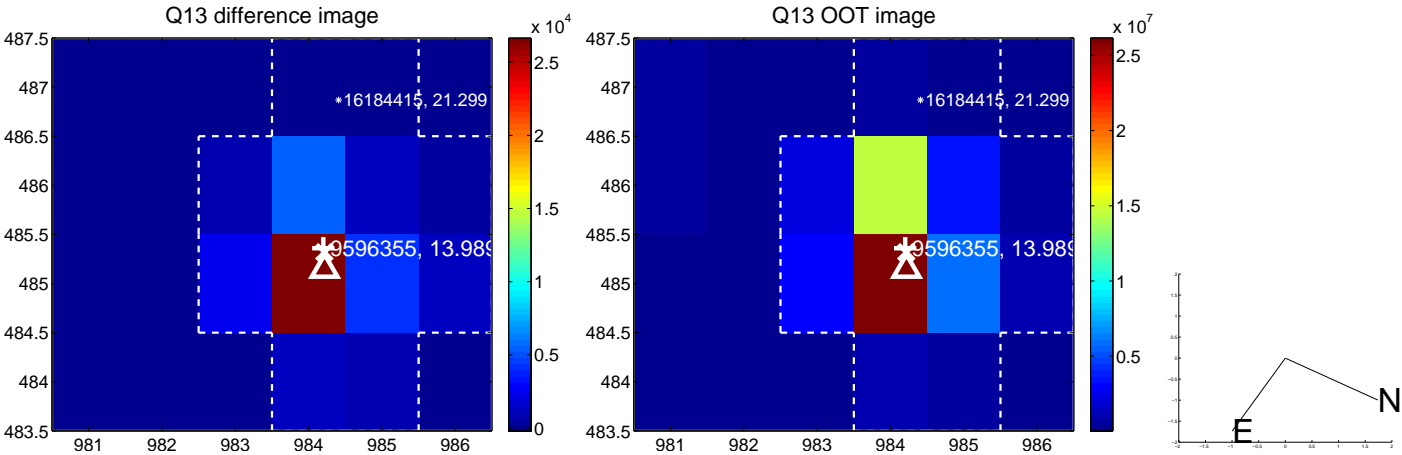




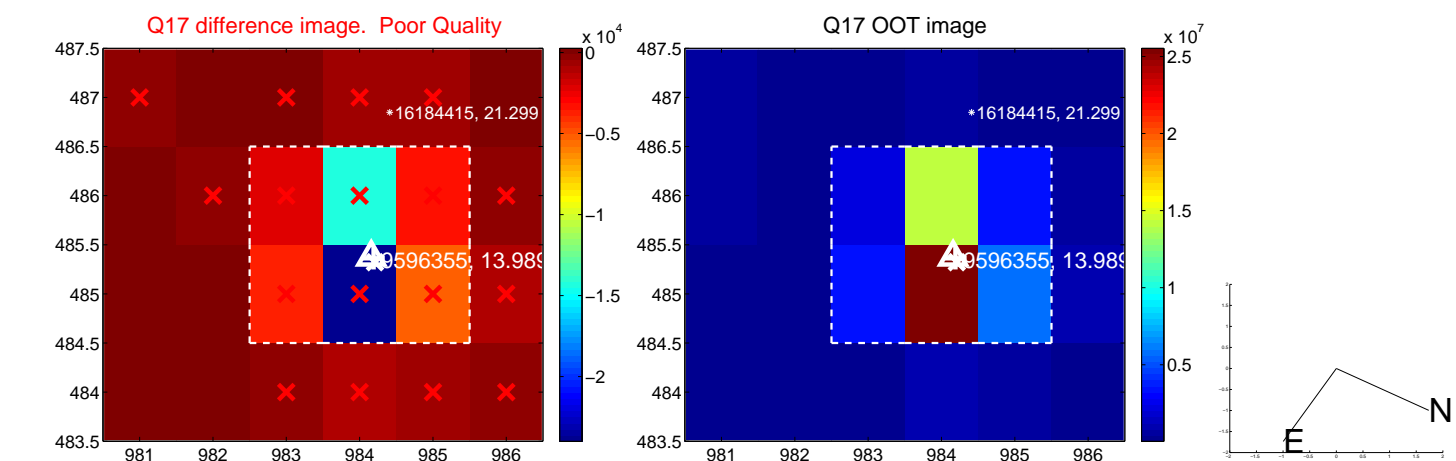
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



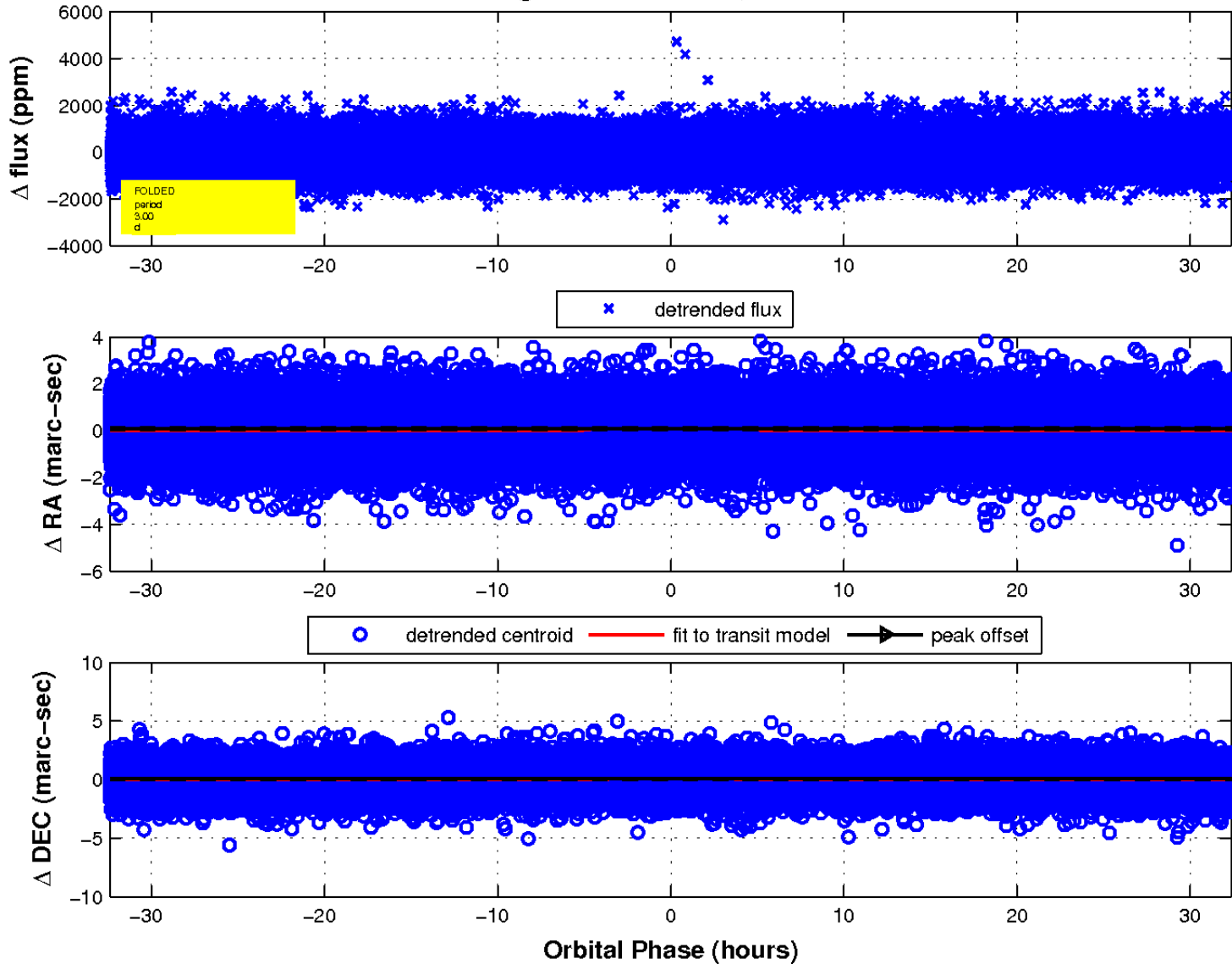
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



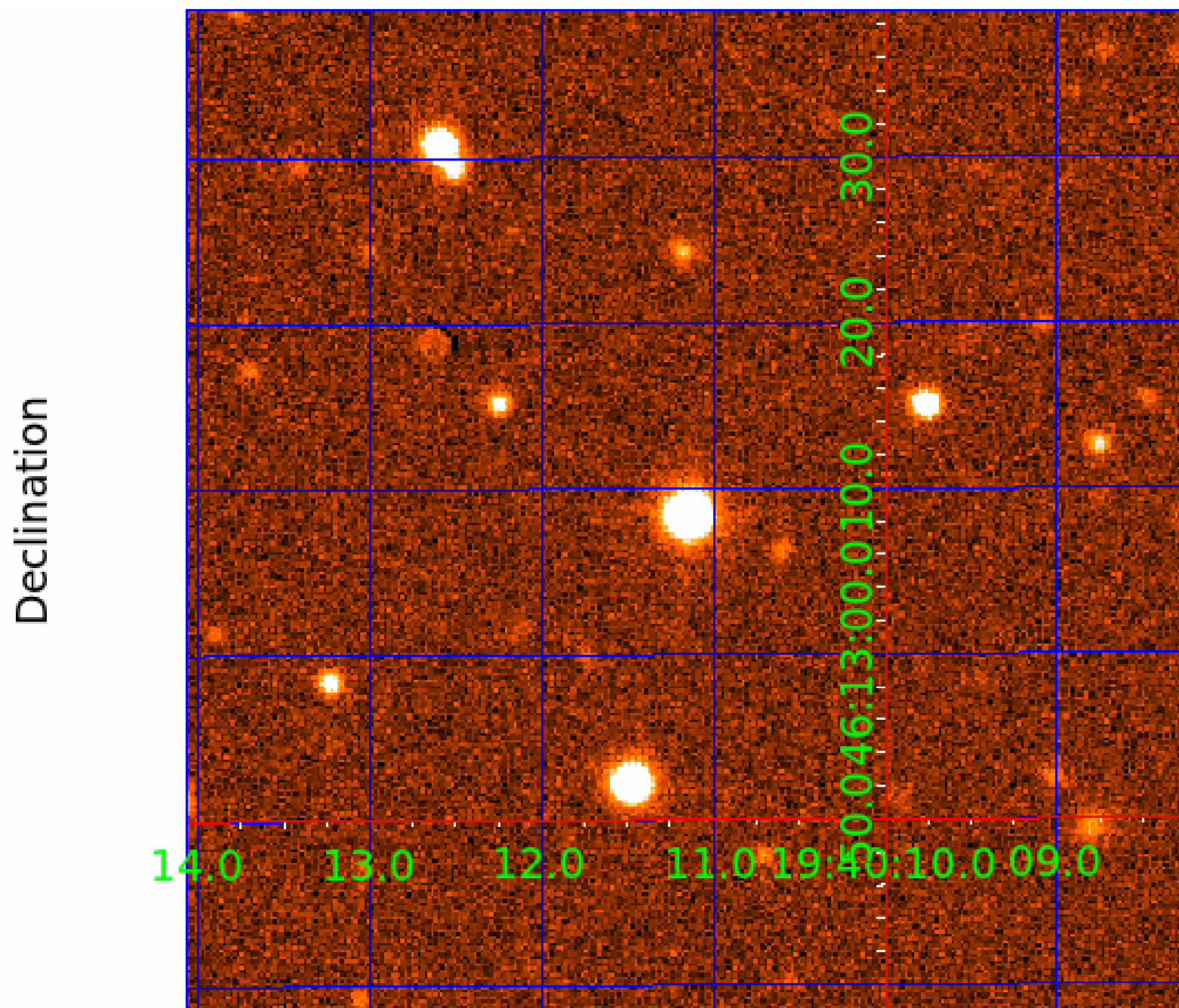
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



fluxWeightedCentroids, Planet 1 of 2



UKIRT Image





# KIC 009596355

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009596355-01	OBS	No	3.001610	133.721284	23.9	10.799	9.6	3.0	2.20	7622	1.32	6407.91
009596355-02	OBS	No	245.377943	198.639692	905.3	23.436	32.3	8.8	2.20	7622	8.06	18.06

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009596355-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_SKYE_ZUMA_TRACKER—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV
009596355-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS

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

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

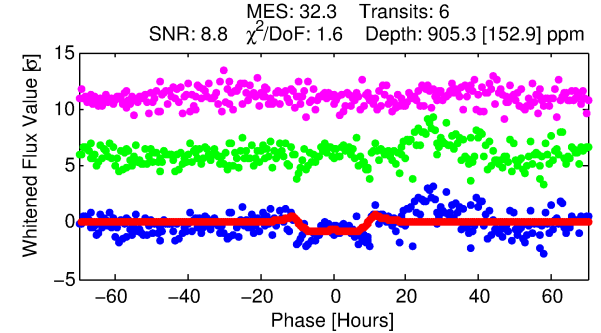
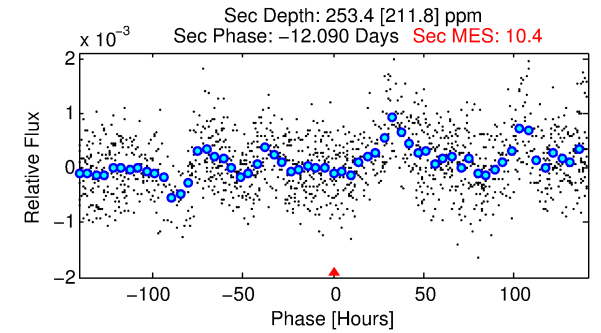
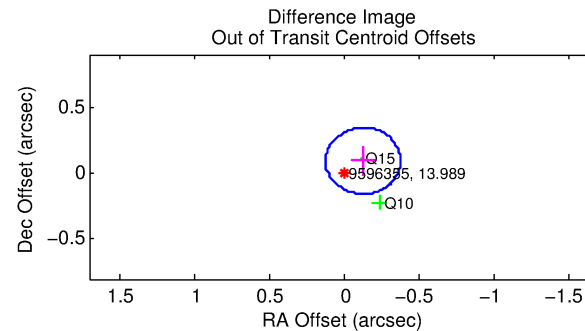
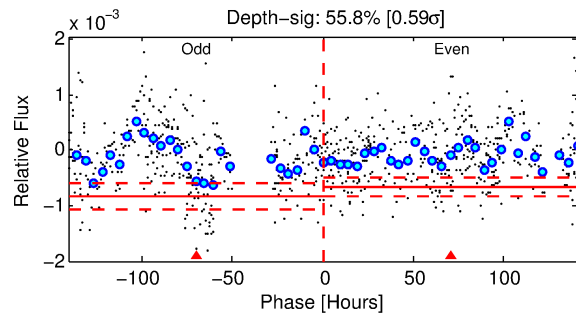
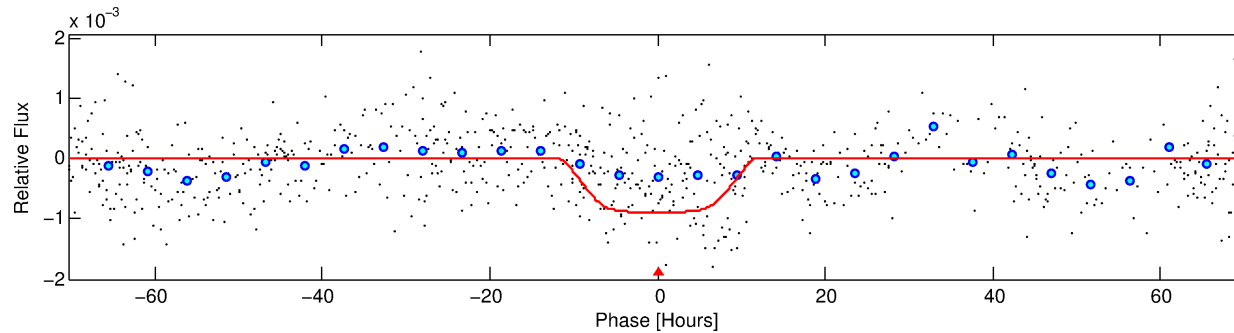
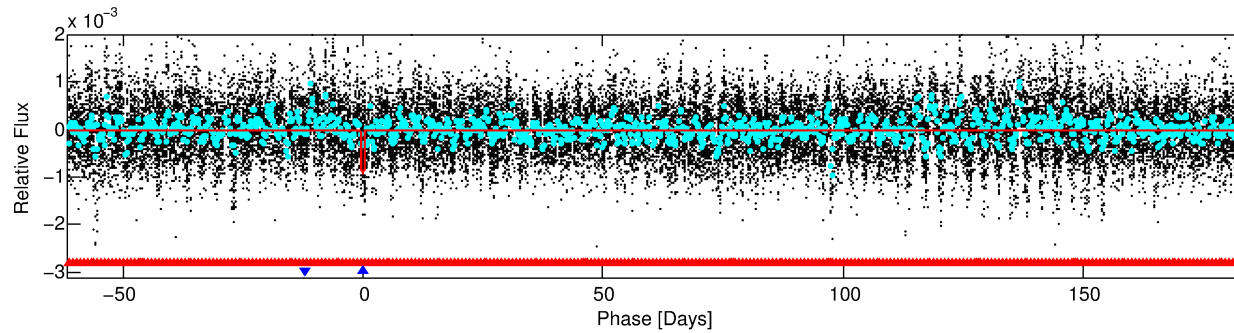
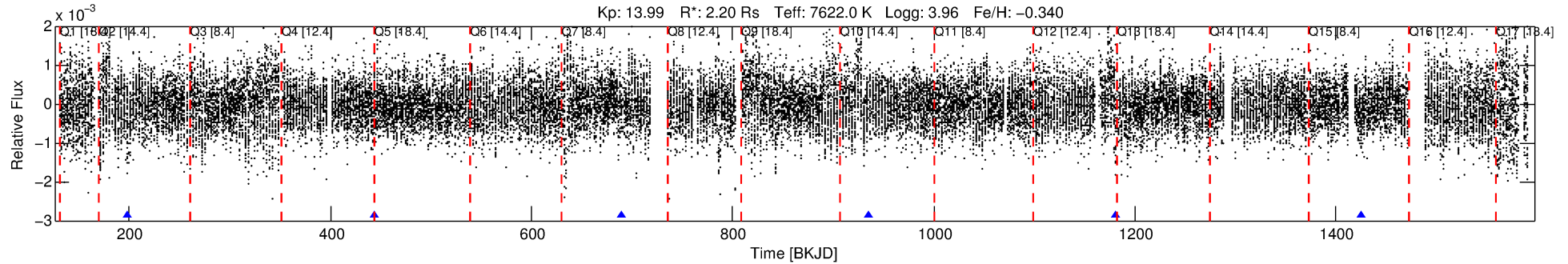
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009596355-02

No Significant Match Found

# DV One-Page Summary

KIC: 9596355 Candidate: 2 of 2 Period: 245.378 d



## DV Fit Results:

Period = 245.37794 [0.01144] d  
Epoch = 198.6397 [0.0378] BKJD  
Rp/R\* = 0.0336 [0.0032]  
a/R\* = 33.93 [5.70]  
b = 0.94 [0.02]  
Seff = 18.06 [9.15]  
Teq = 526 [67] K  
Rp = 8.06 [2.89] Re  
a = 0.8994 [0.2800] AU  
Ag = 1736.73 [1704.94] [1.02 $\sigma$ ]  
Teffp = 5247 [1146] K [4.11 $\sigma$ ]

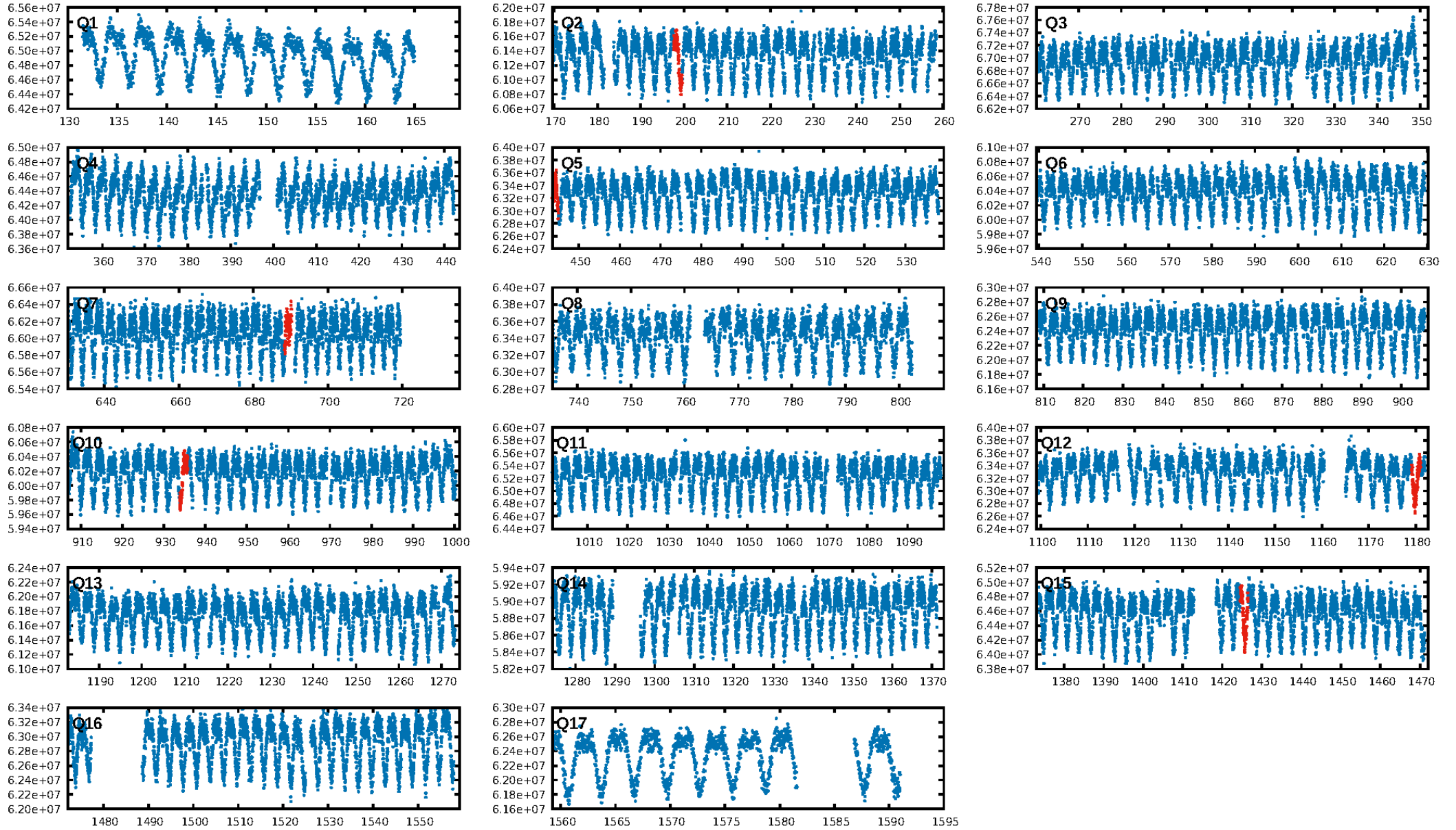
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [225.43 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 99.8%  
Bootstrap-pfa: 1.30e-82  
RollingBand-fgt: 1.00 [6/6]  
GhostDiagnostic-chr: 0.693  
Centroid-sig: 0.1%  
Centroid-so: 0.427 arcsec [1.80 $\sigma$ ]  
OotOffset-rm: 0.160 arcsec [1.91 $\sigma$ ]  
OotOffset-st: 1/1/0/0 [2]  
KicOffset-rm: 0.300 arcsec [3.46 $\sigma$ ]  
KicOffset-st: 1/1/0/0 [2]  
DiffImageQuality-fgm: 0.50 [1/2]  
DiffImageOverlap-fno: 0.00 [0/3]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 10:47:40 Z

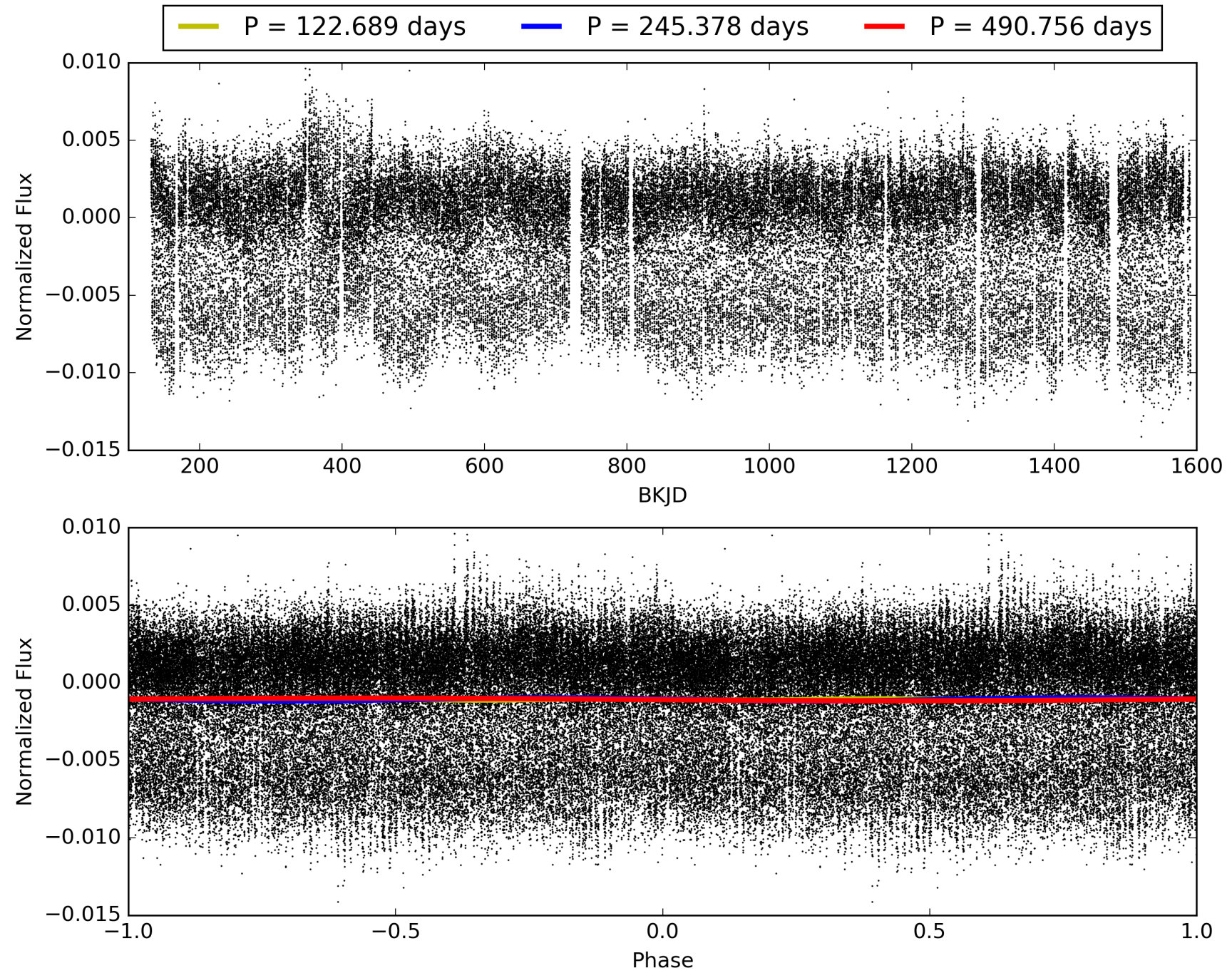
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 009596355-02, PDC Light Curves



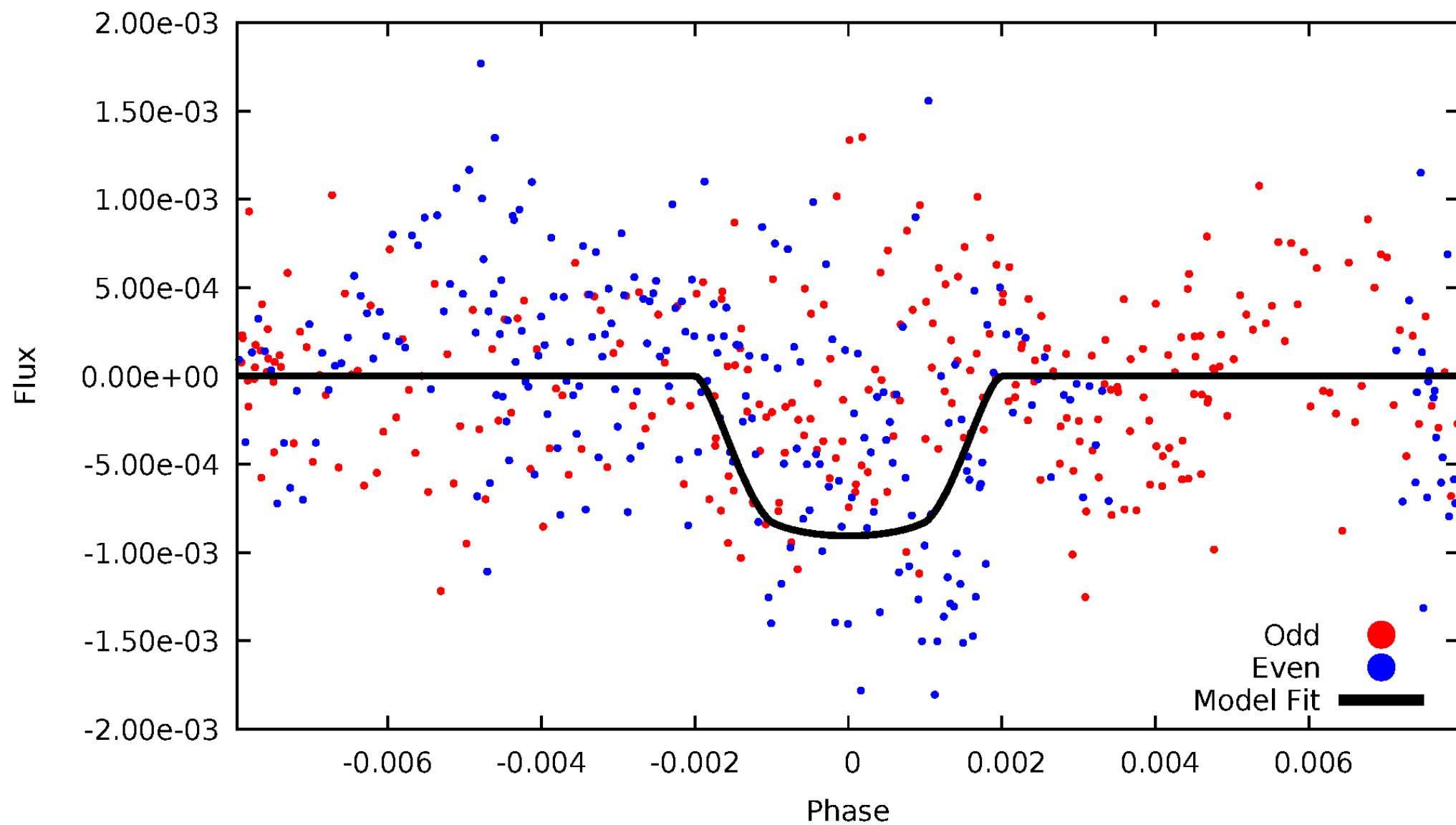


TCE 009596355-02



# DV Odd/Even

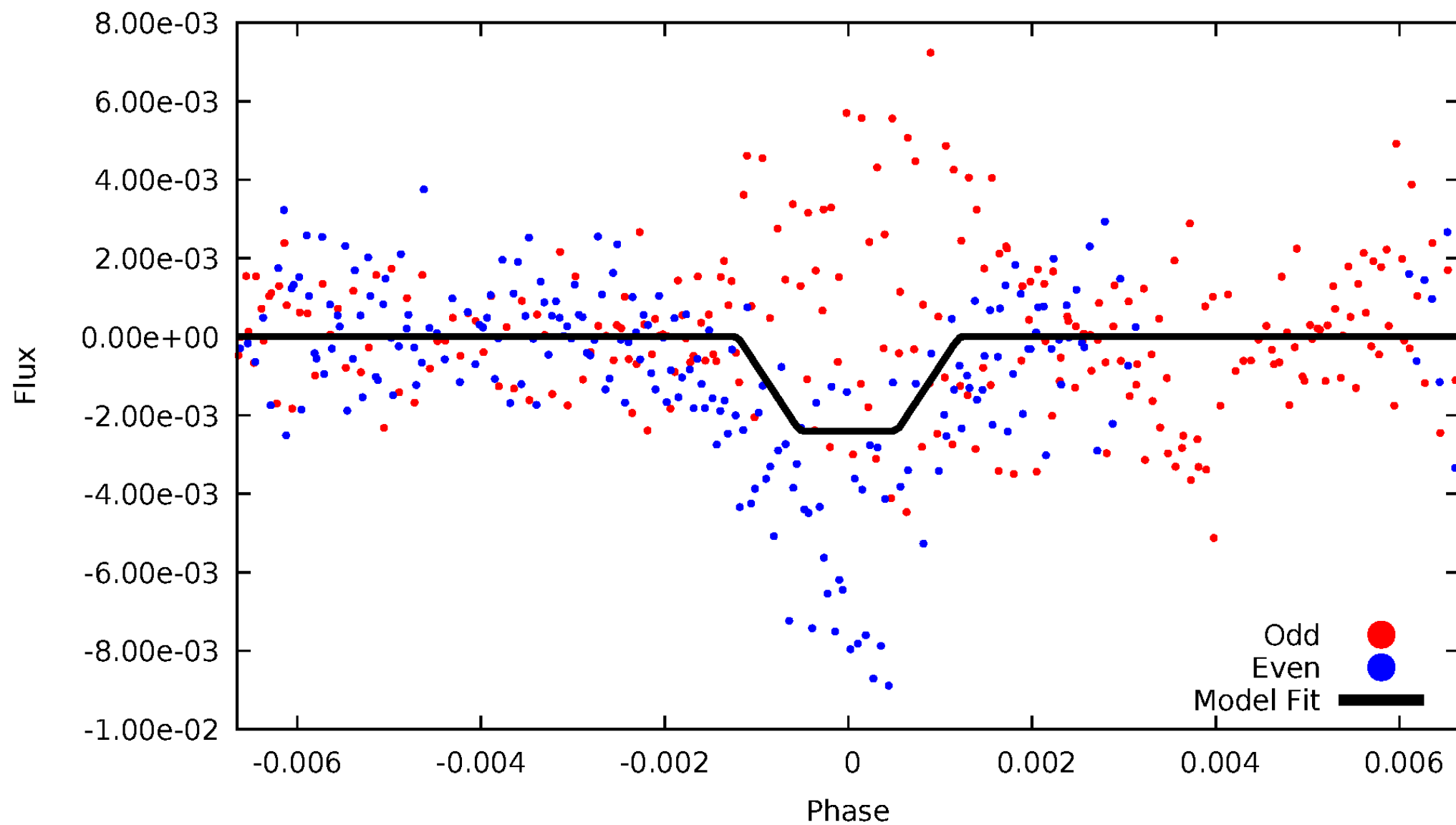
TCE 009596355-02





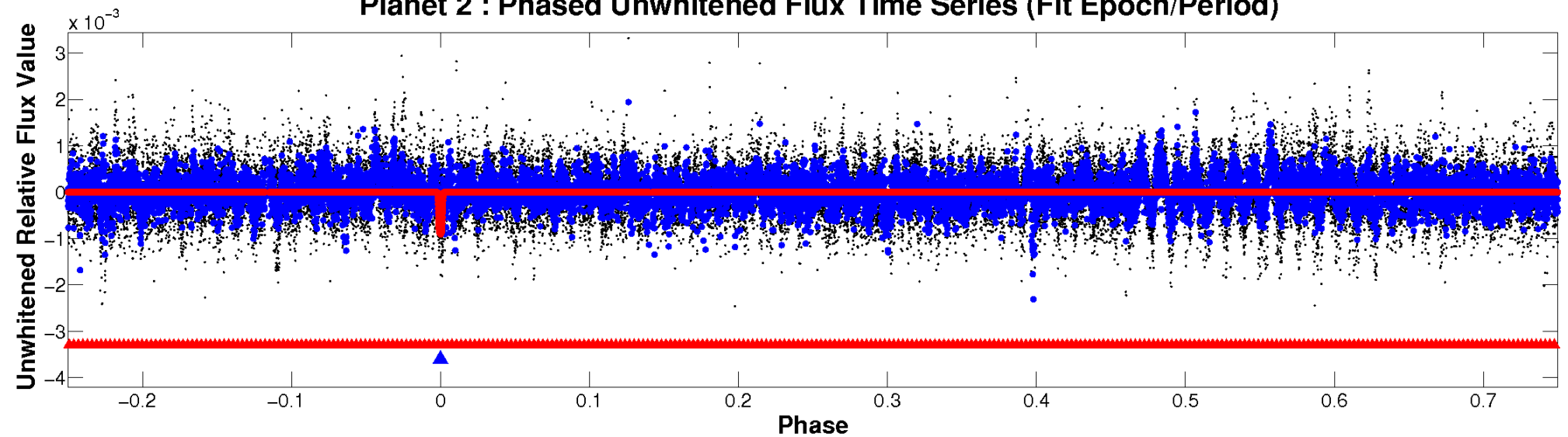
# ALT Odd/Even

TCE 009596355-02

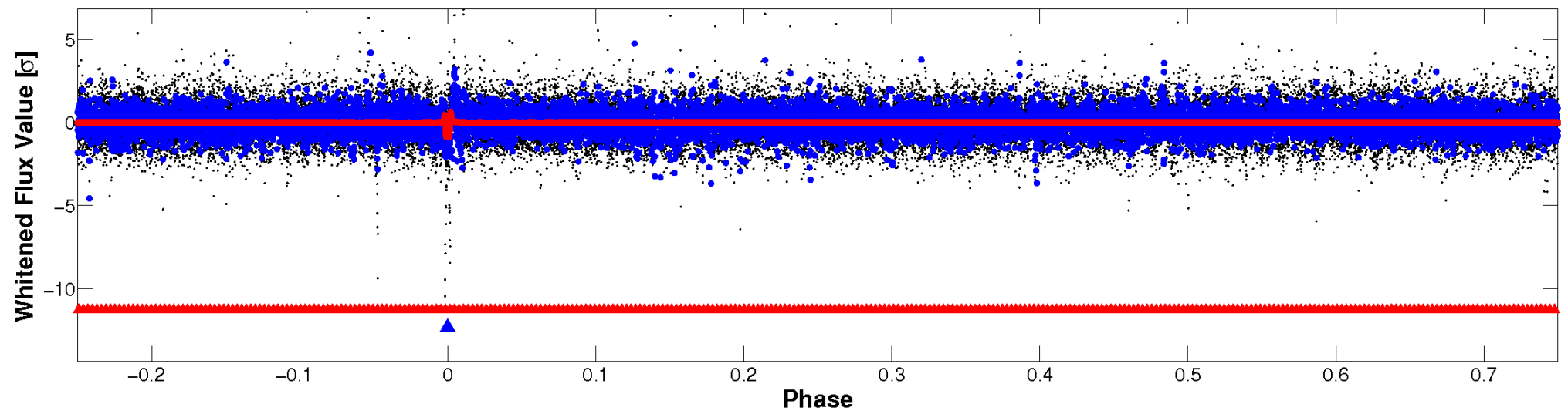


# Non-Whitened Vs. Whitened Light Curve

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

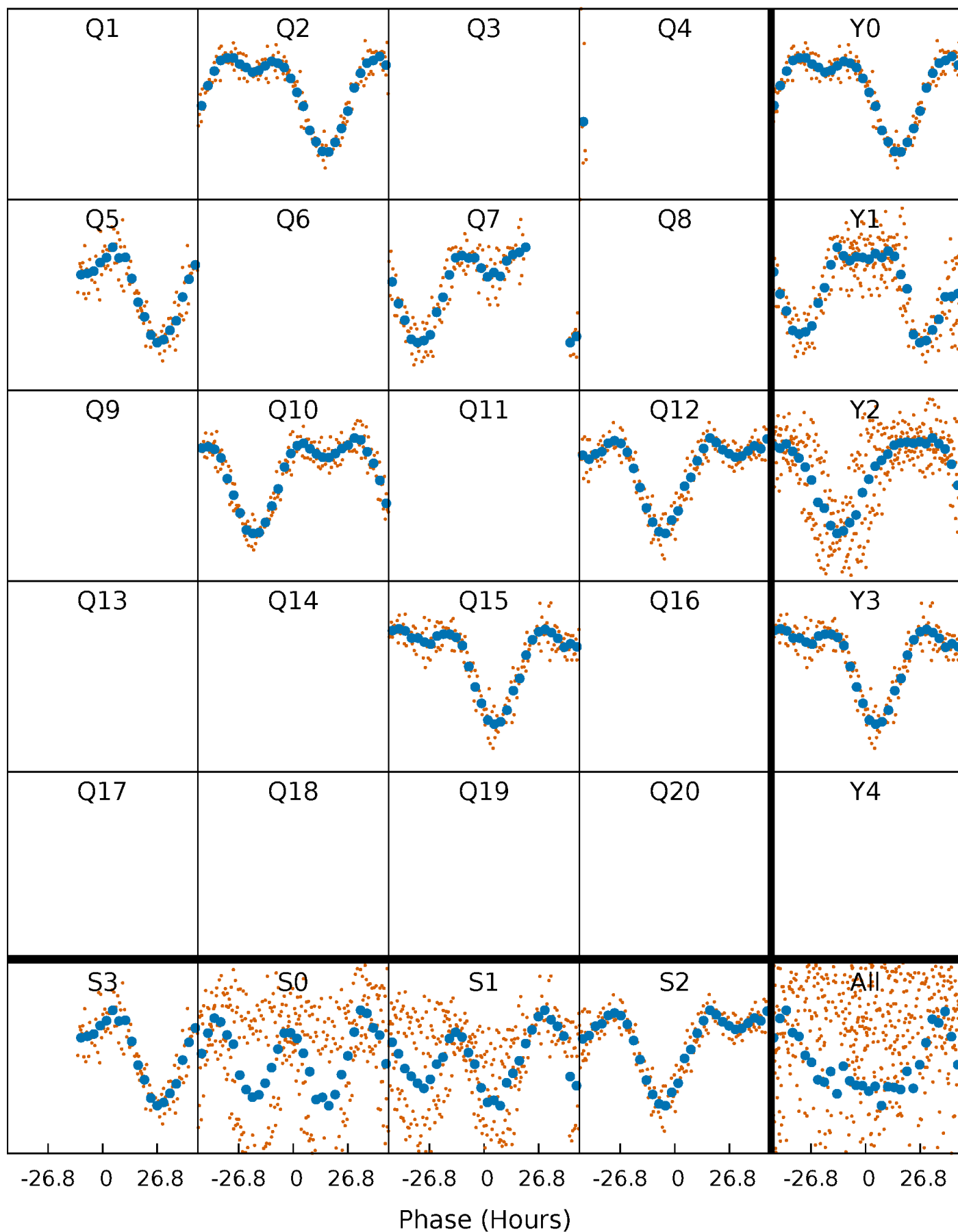


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



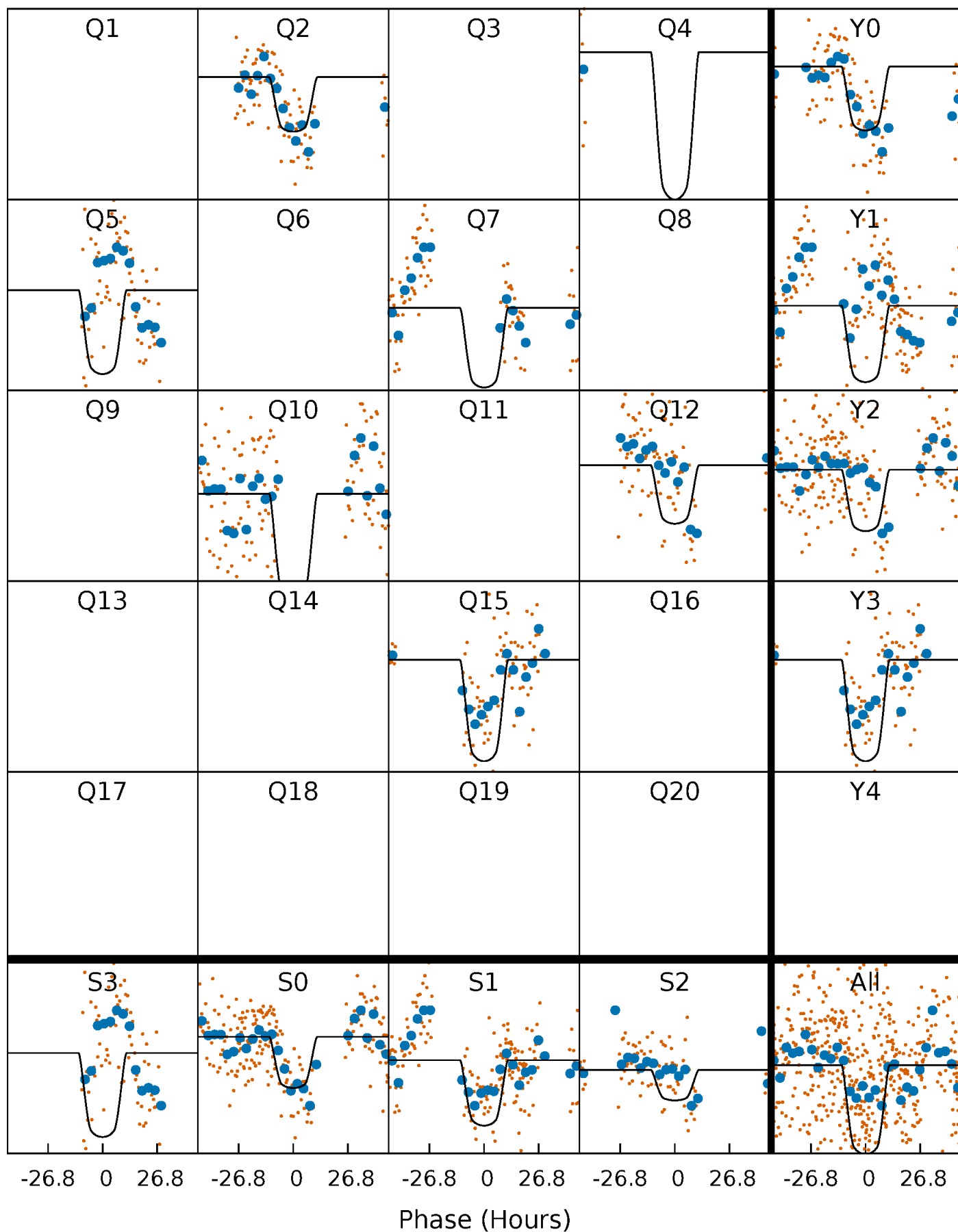
# PDC Quarter-Phased Transit Curves

TCE 009596355-02 P=245.377943 Days  $T_0=198.639692$  (BKJD)



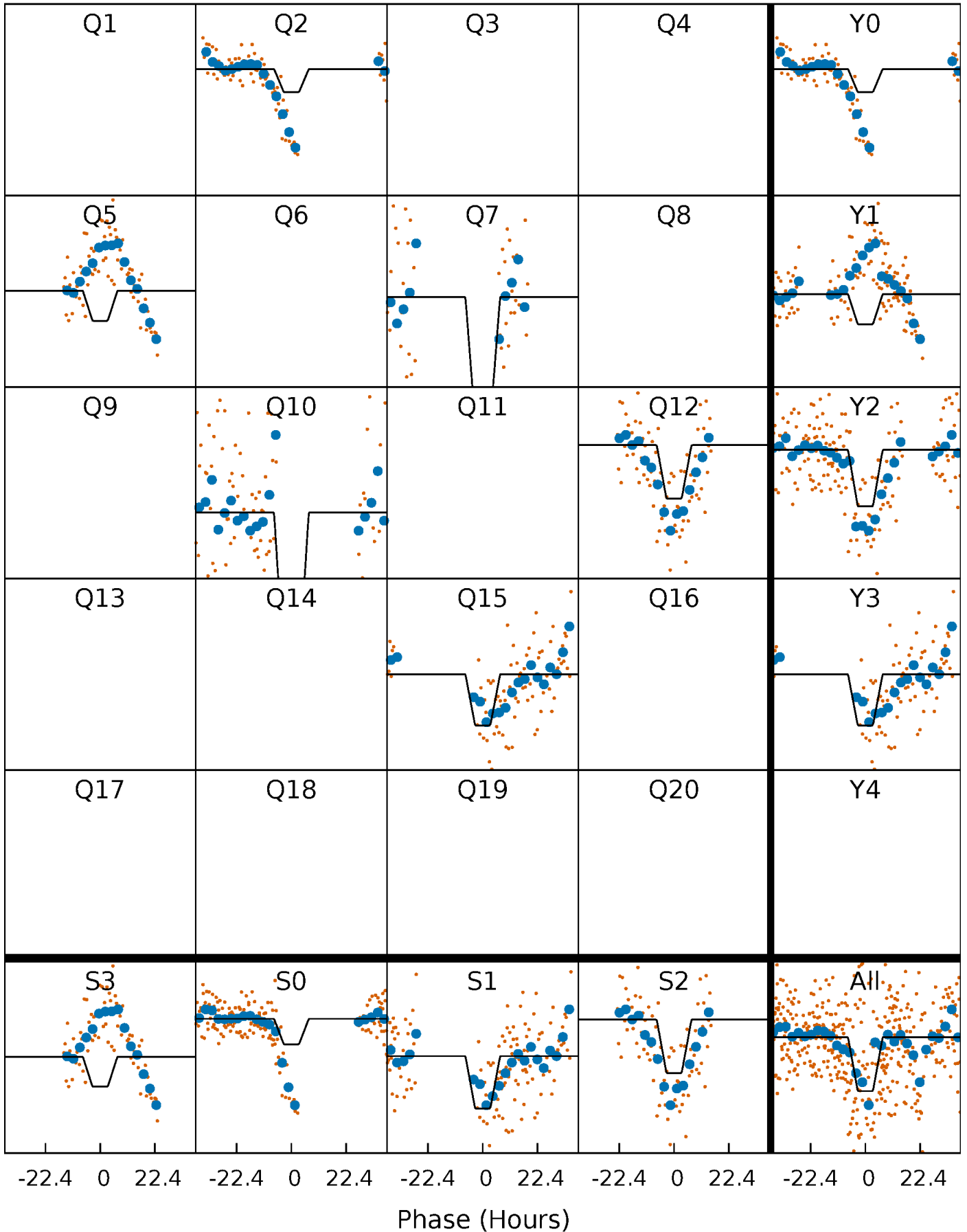
# DV Quarter-Phased Transit Curves

TCE 009596355-02 P=245.377943 Days  $T_0=198.639692$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 009596355-02 P=245.250398 Days  $T_0=198.959878$  (BKJD)

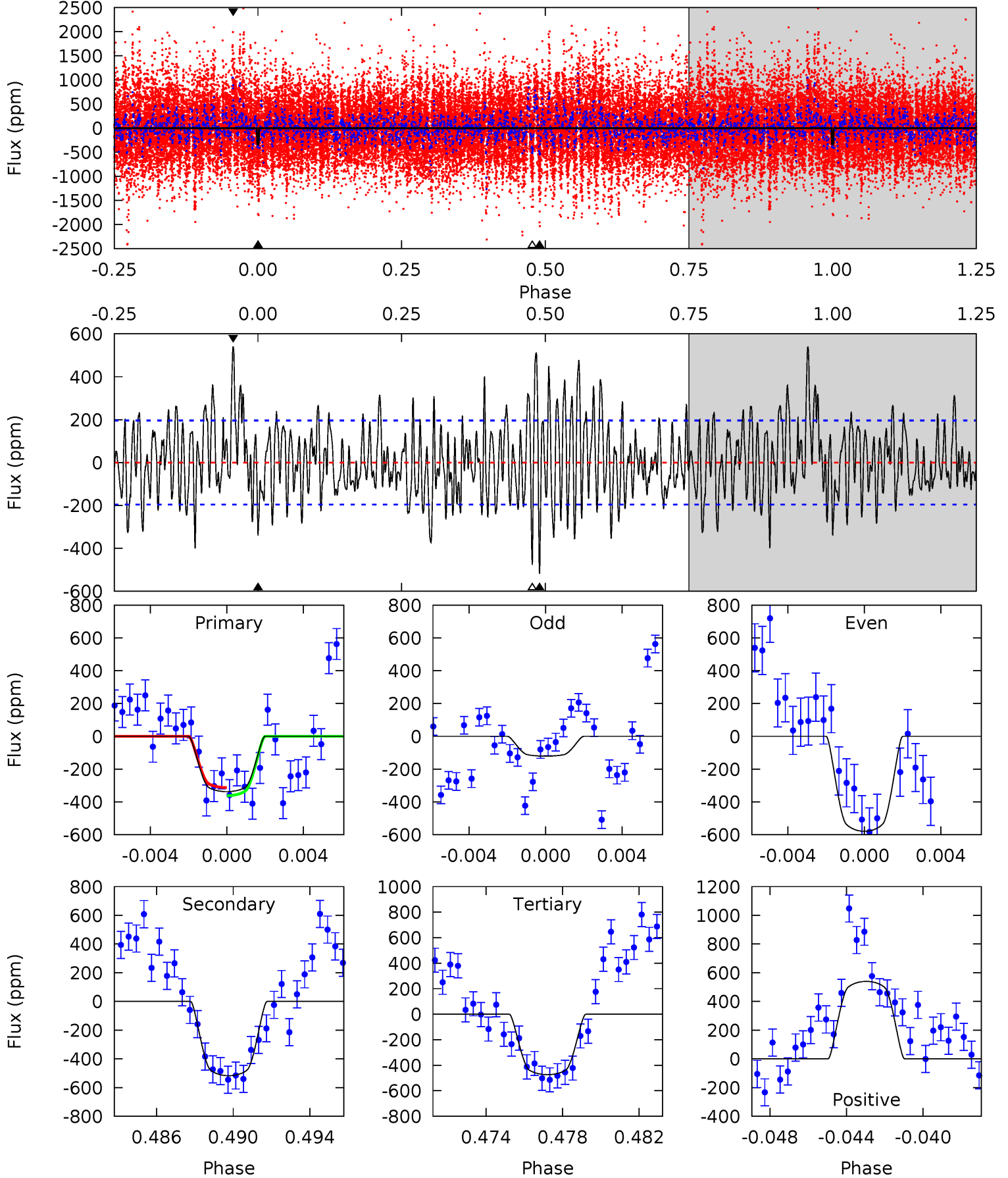




# DV Model-Shift Uniqueness Test

009596355-02, P = 245.377943 Days, E = 198.639692 Days

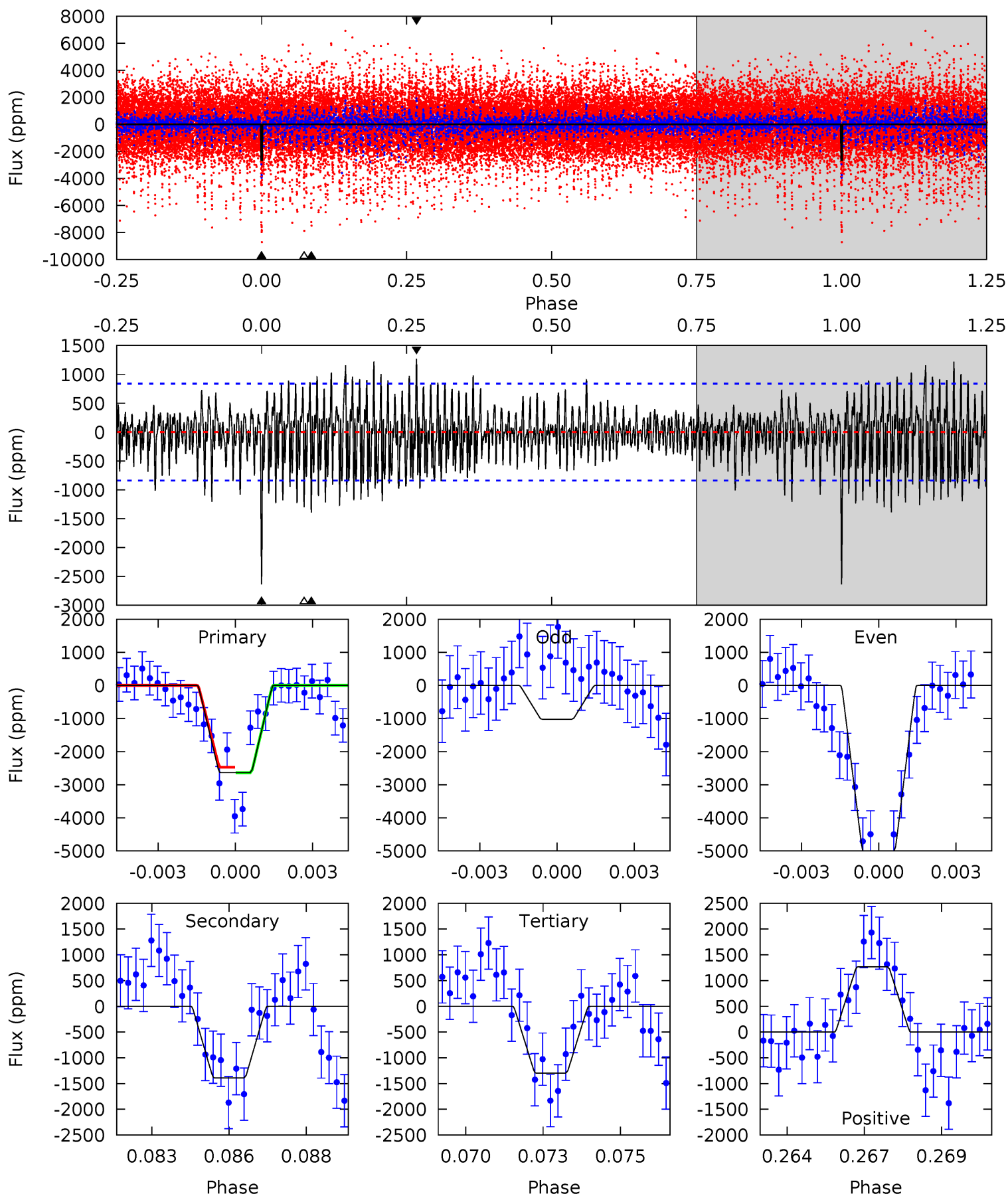
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
8.94	13.7	12.5	14.3	5.20	2.88	4.14	-3.61	-5.36	1.16	-0.59	6.08	1.11	0.51	0.65



# Alt Model-Shift Uniqueness Test

009596355-02, P = 245.250398 Days, E = 198.959878 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	8.77	8.19	7.99	5.28	3.02	2.43	8.44	8.64	0.58	0.78	13.1	0.35	0.32	0.53



### Stellar Parameters For KIC 009596355

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7622^{+239}_{-319}$	$3.961^{+0.273}_{-0.147}$	$-0.340^{+0.250}_{-0.350}$	$2.198^{+0.506}_{-0.759}$	$1.610^{+0.169}_{-0.313}$	$0.214^{+0.382}_{-0.091}$
	+3%/-4%	+7%/-4%	+74%/-103%	+23%/-35%	+10%/-19%	+179%/-43%
Source	KIC0	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 009596355-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-517 \pm 38$	$7.77^{+1.61}_{-1.38}$	$723^{+59}_{-64}$	$6139^{+431}_{-347}$	$3742^{+1768}_{-1107}$
Alt.	$-1390 \pm 159$	$11.56^{+1.81}_{-2.15}$	$726^{+55}_{-65}$	$6540^{+358}_{-380}$	$4689^{+2099}_{-1320}$

$T_{max}$  = 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

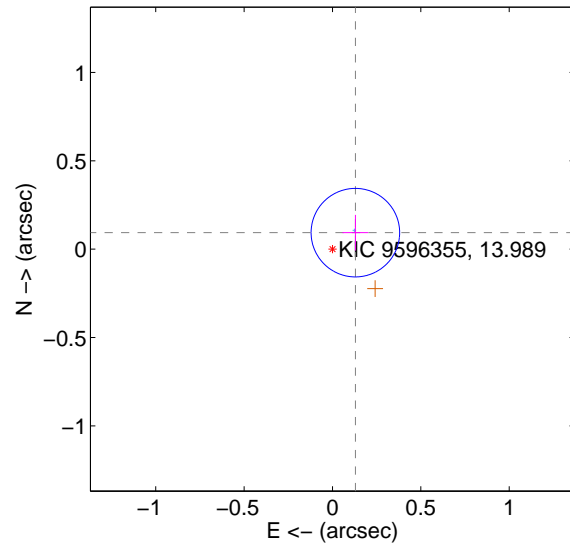
Supplemental centroid analysis for 009596355-02. Kepler magnitude: 13.99. Transit SNR 8.81

There are 1 quarters with good PRF difference image offsets

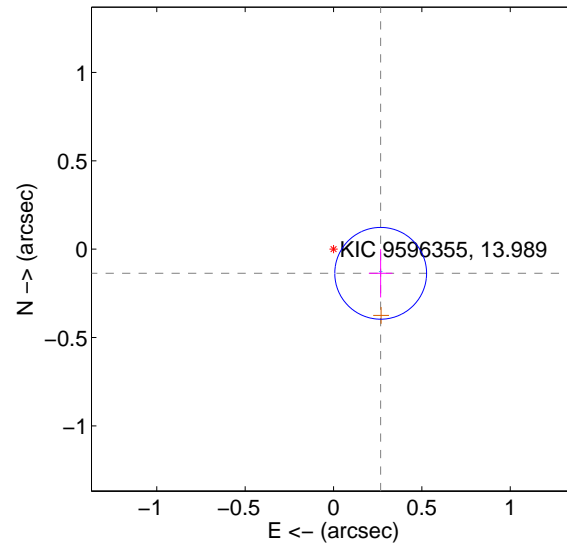
The direct PRF centroid is offset from the target star catalog position by about 0.27 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.160 \pm 0.083$	1.91	$-0.130 \pm 0.073$	$0.093 \pm 0.101$
PRF-fit source offset from KIC position	<b><math>0.300 \pm 0.087</math></b>	<b>3.46</b>	$-0.267 \pm 0.067$	$-0.137 \pm 0.136$
photometric centroid source offset	$0.43 \pm 0.24$	1.80	$-0.32 \pm 0.22$	$0.28 \pm 0.26$

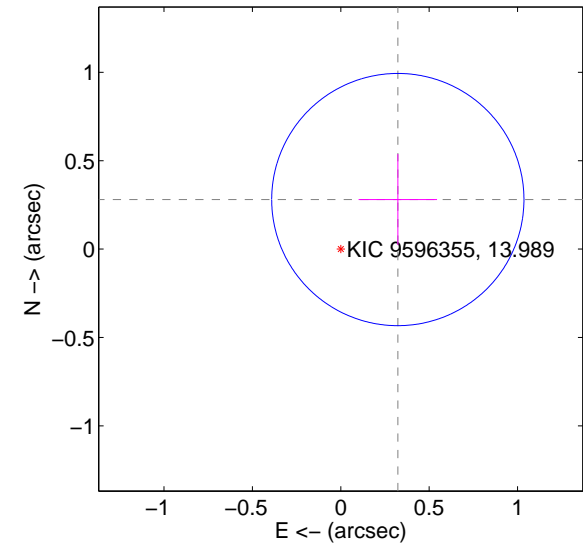
offset from difference PRF-fit to OOT PRF-fit



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

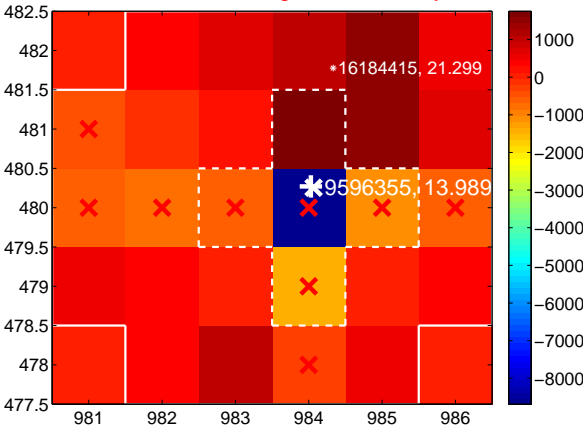
Q1 no difference image



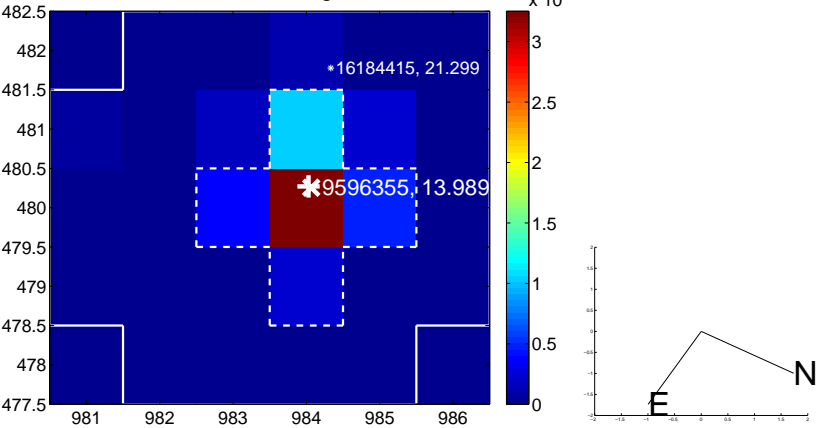
Q1 no OOT image



Q2 difference image. Poor Quality



Q2 OOT image



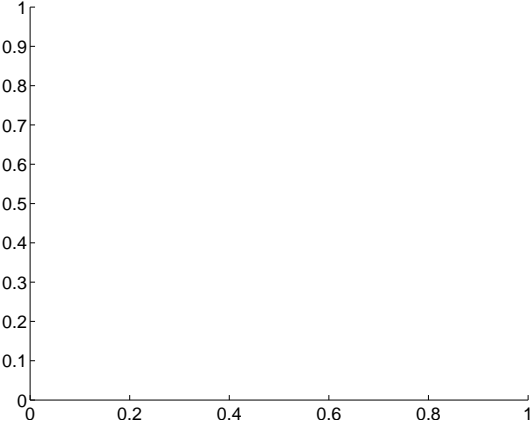
Q3 no difference image



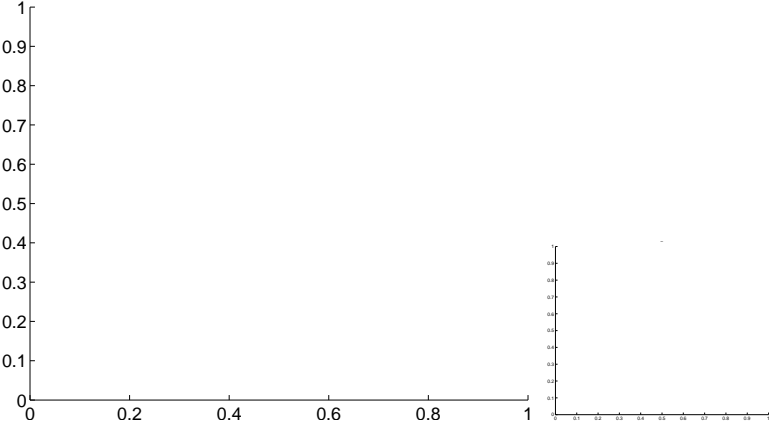
Q3 no OOT image



Q4 no difference image



Q4 no OOT image

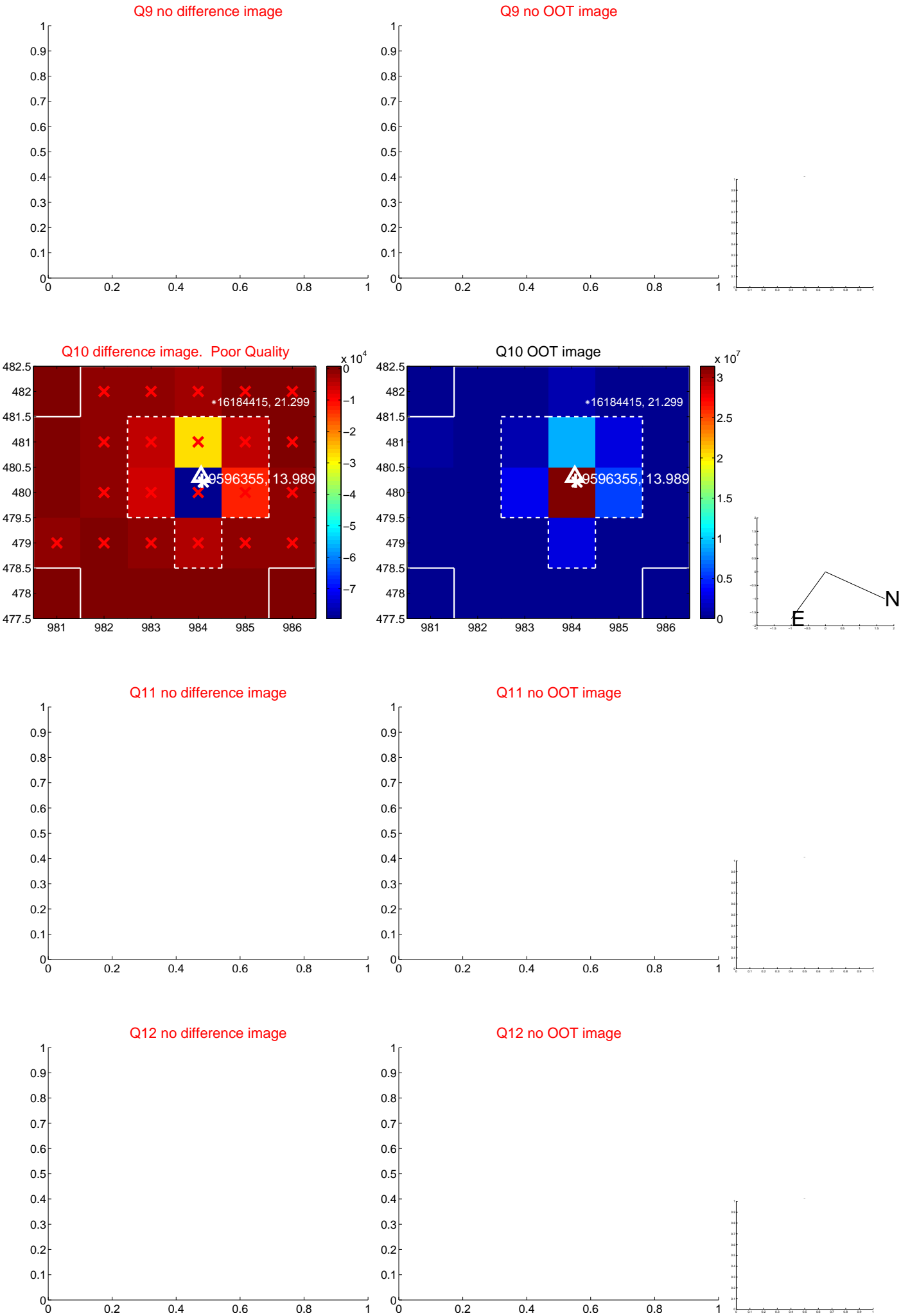




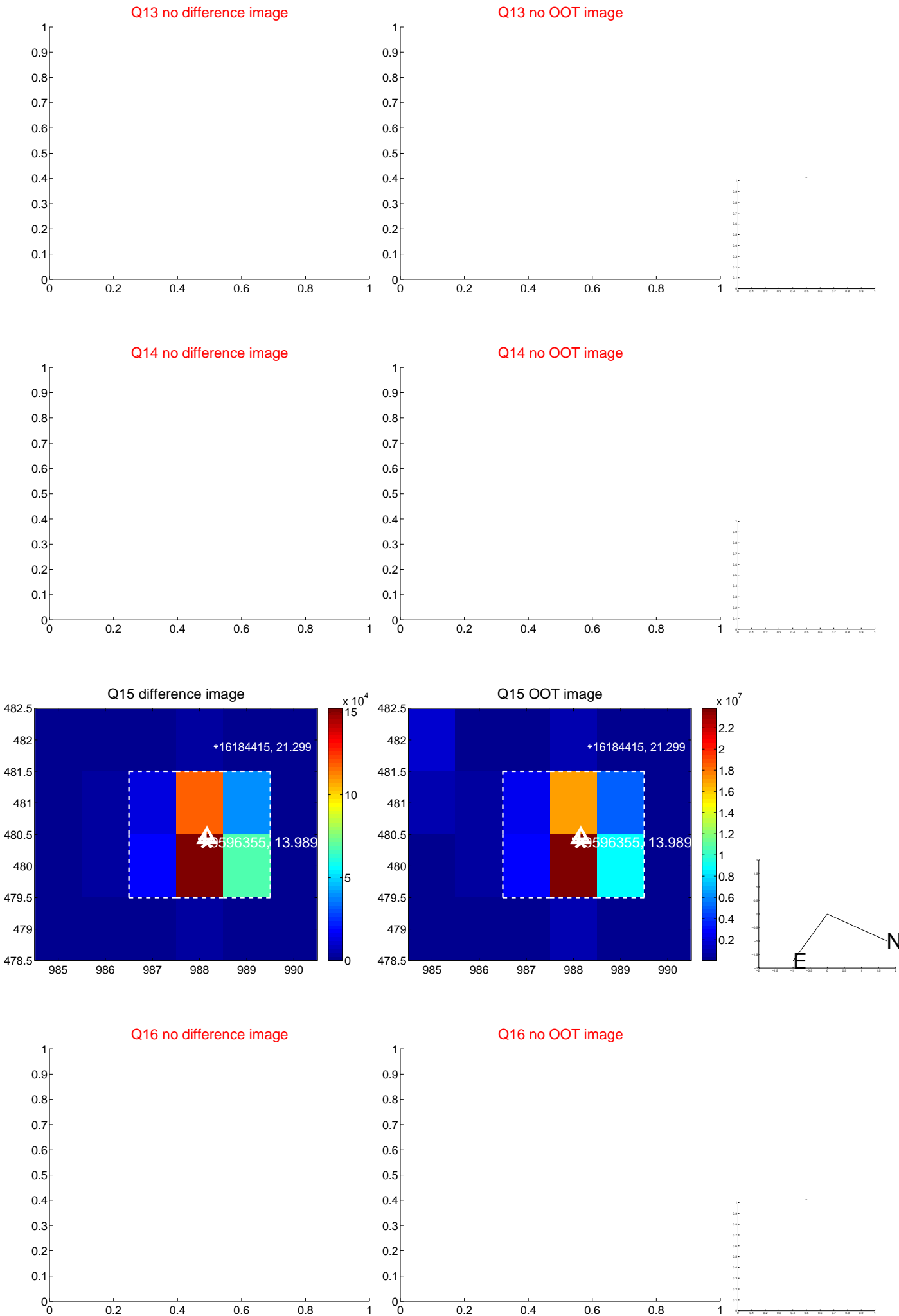
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



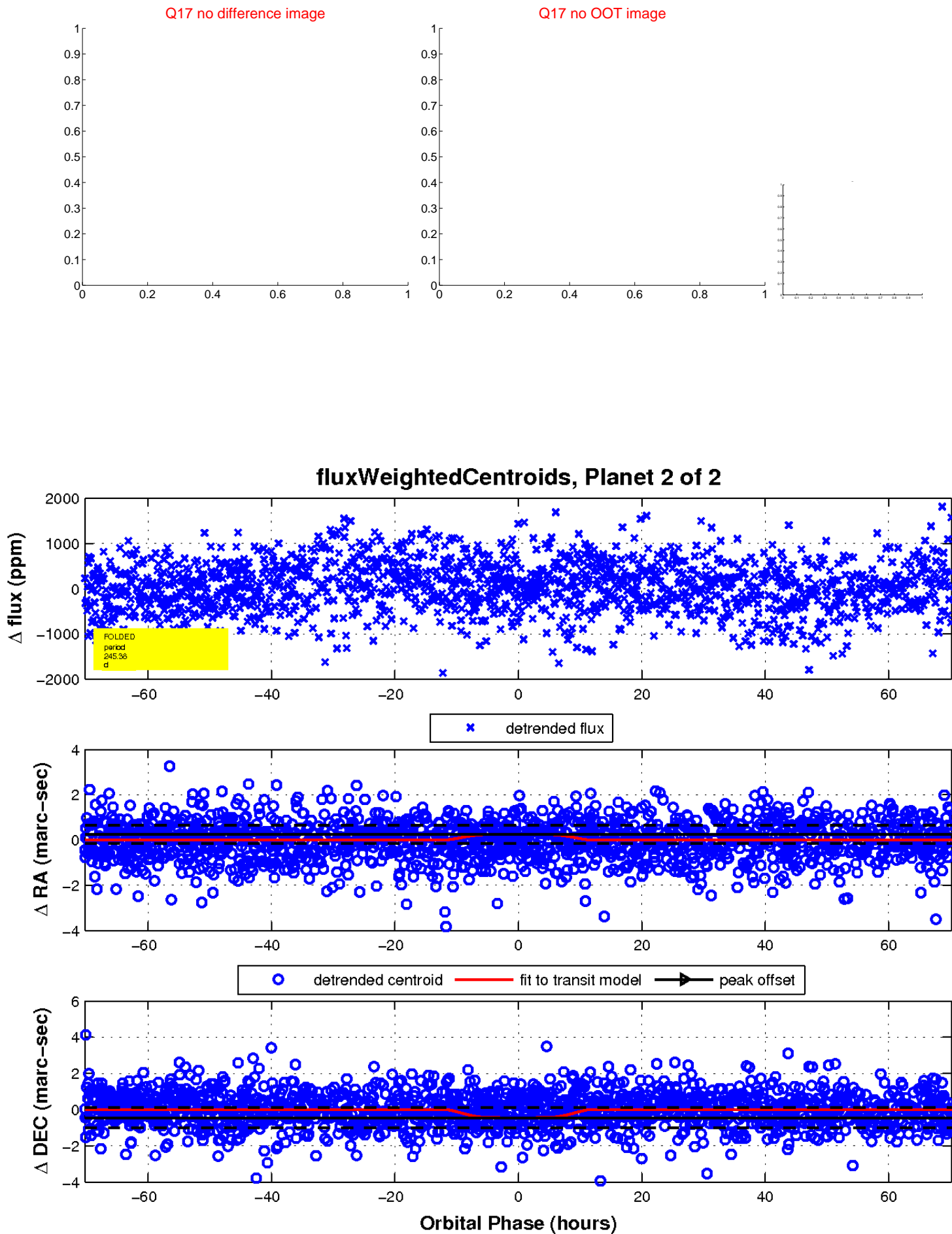
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



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



UKIRT Image

