

# KIC 006933781

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
006933781-01	OBS	3737.01	130.419498	229.757994	2154.9	4.195	146.0	89.9	1.69	5770	14.62	11.81
006933781-02	OBS	No	130.418857	204.238562	1118.5	7.616	83.1	75.1	1.69	5770	10.74	11.81

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
006933781-01	OBS	FP	0.00	0	1	0	0	MOD_SEC_DV—MOD_SEC_ALT—DEEP_V_SHAPED—HAS_SEC_TCE—CENT_SATURATED
006933781-02	OBS	FP	0.00	1	1	0	0	IS_SEC_TCE—CENT_SATURATED

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

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

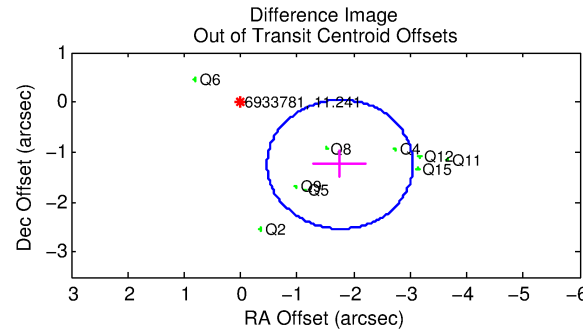
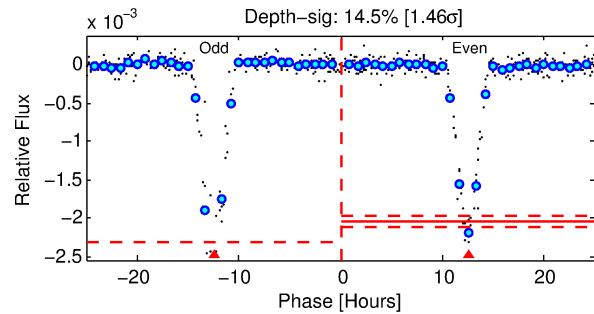
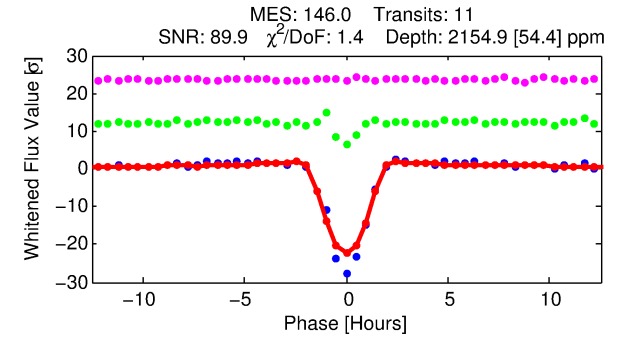
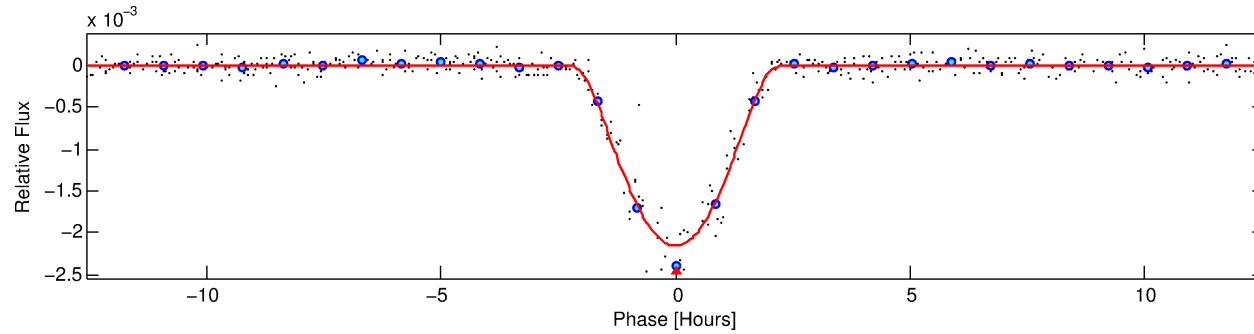
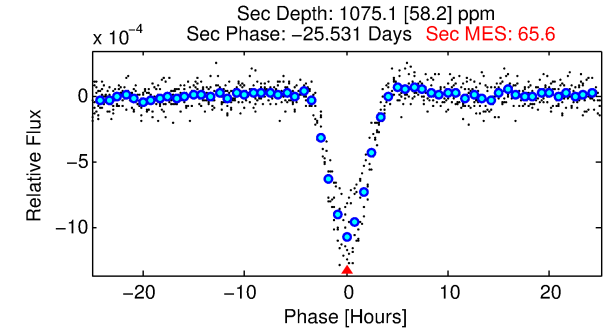
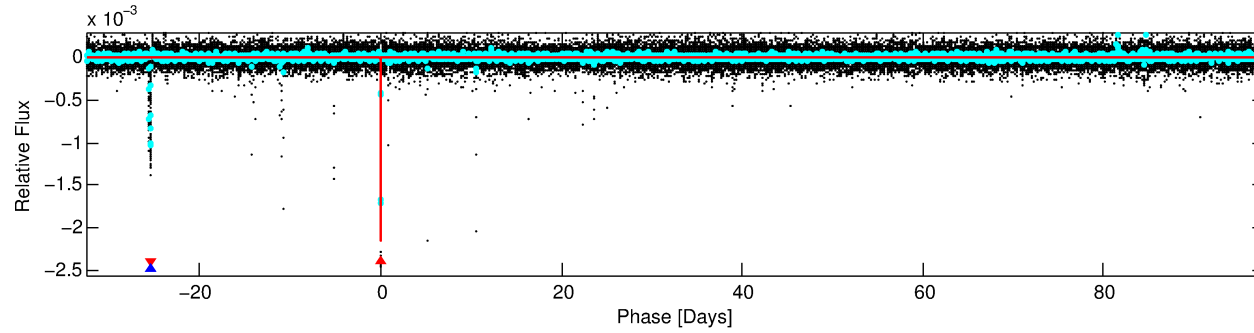
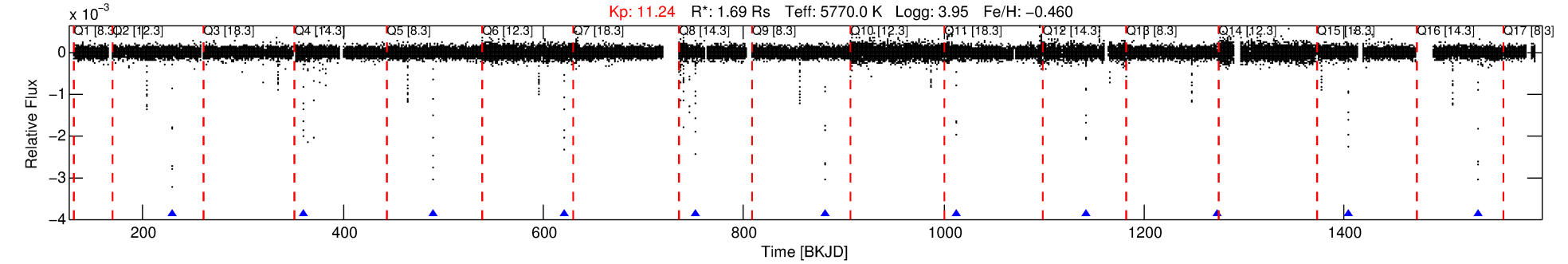
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 006933781-01

No Significant Match Found

# DV One-Page Summary

KIC: 6933781 Candidate: 1 of 2 Period: 130.419 d  
KOI: K03737.01 Corr: 0.971



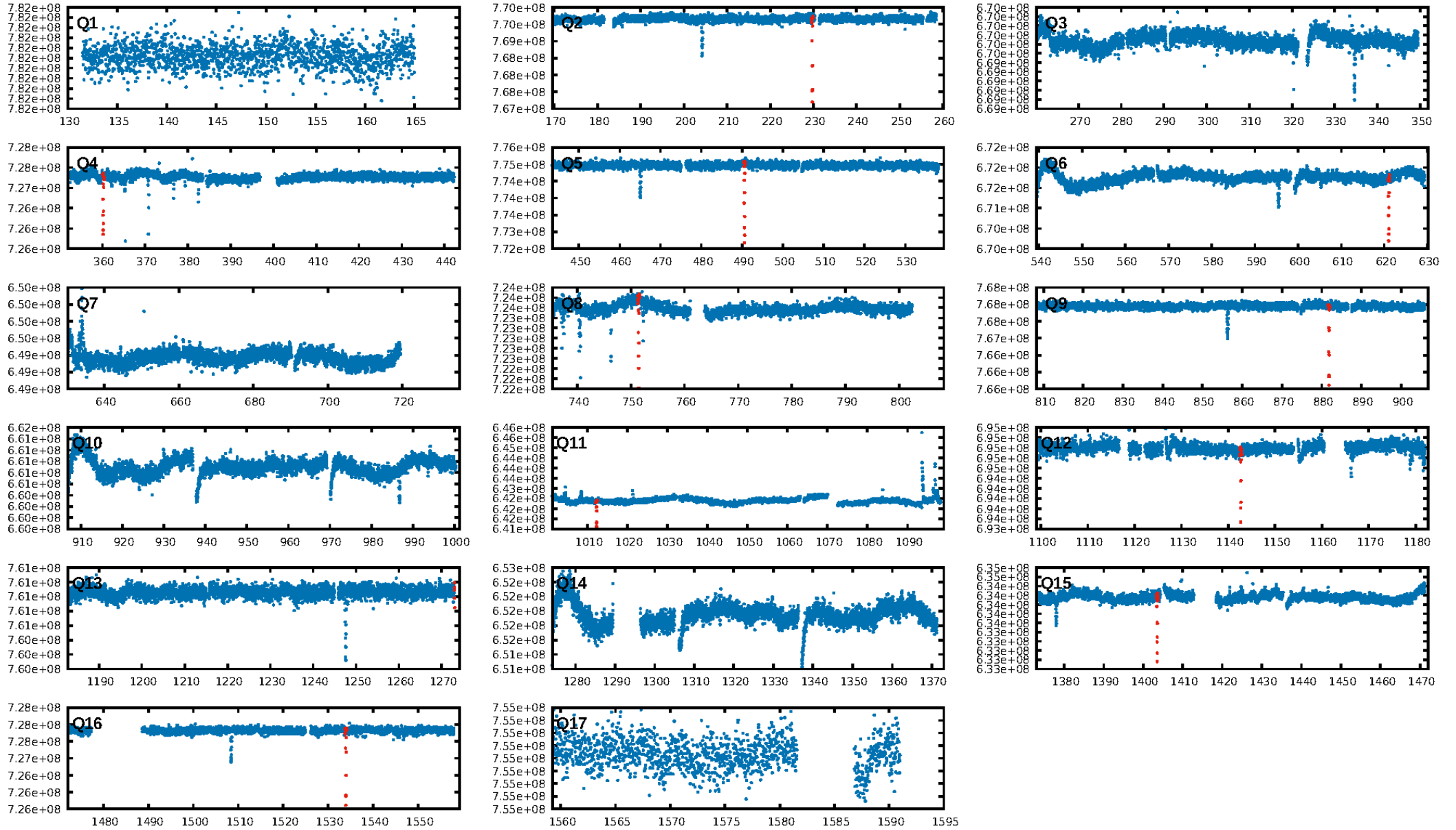
## DV Fit Results:

Period = 130.41950 [0.00016] d  
Epoch = 229.7580 [0.0009] BKJD  
Rp/R\* = 0.0795 [0.0296]  
a/R\* = 97.19 [7.82]  
b = 1.00 [0.04]  
Seff = 11.81 [6.40]  
Teq = 473 [64] K  
Rp = 14.62 [7.25] Re  
a = 0.4886 [0.1592] AU  
Ag = 660.46 [604.51] [1.09σ]  
Teffp = 3705 [698] K [4.61σ]

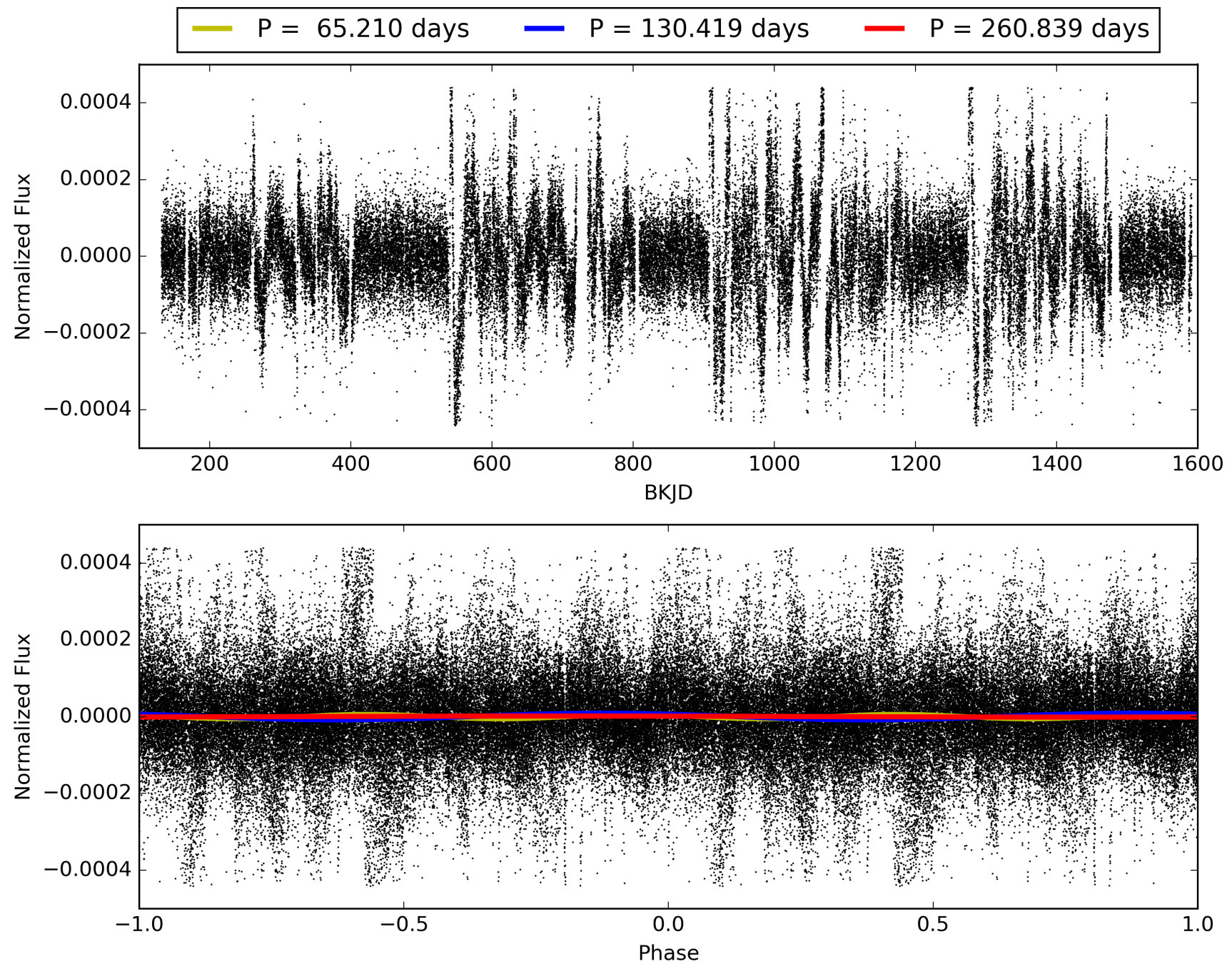
## DV Diagnostic Results:

ShortPeriod-sig: 0.1% [0.00σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 61.7%  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [11/11]  
GhostDiagnostic-chr: 1.253  
Centroid-sig: 0.0%  
Centroid-so: 2.839 arcsec [50.69σ]  
OotOffset-rm: 2.155 arcsec [5.01σ]  
KicOffset-rm: 2.842 arcsec [5.76σ]  
OotOffset-st: 2/2/3/2 [9]  
KicOffset-st: 2/2/3/2 [9]  
DiffImageQuality-fgm: 0.56 [5/9]  
DiffImageOverlap-fno: 1.00 [9/9]

# TCE 006933781-01, PDC Light Curves

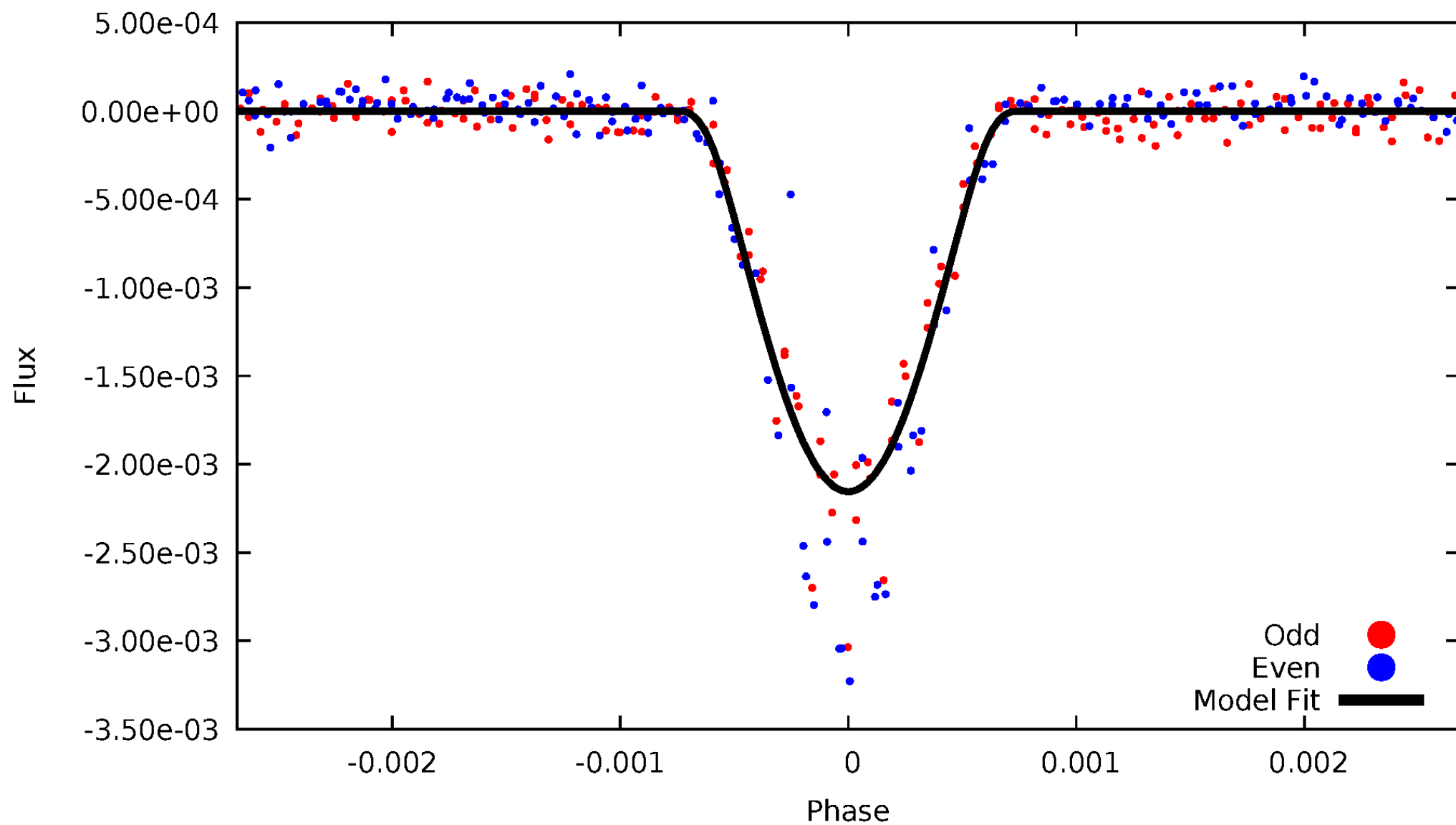


TCE 006933781-01



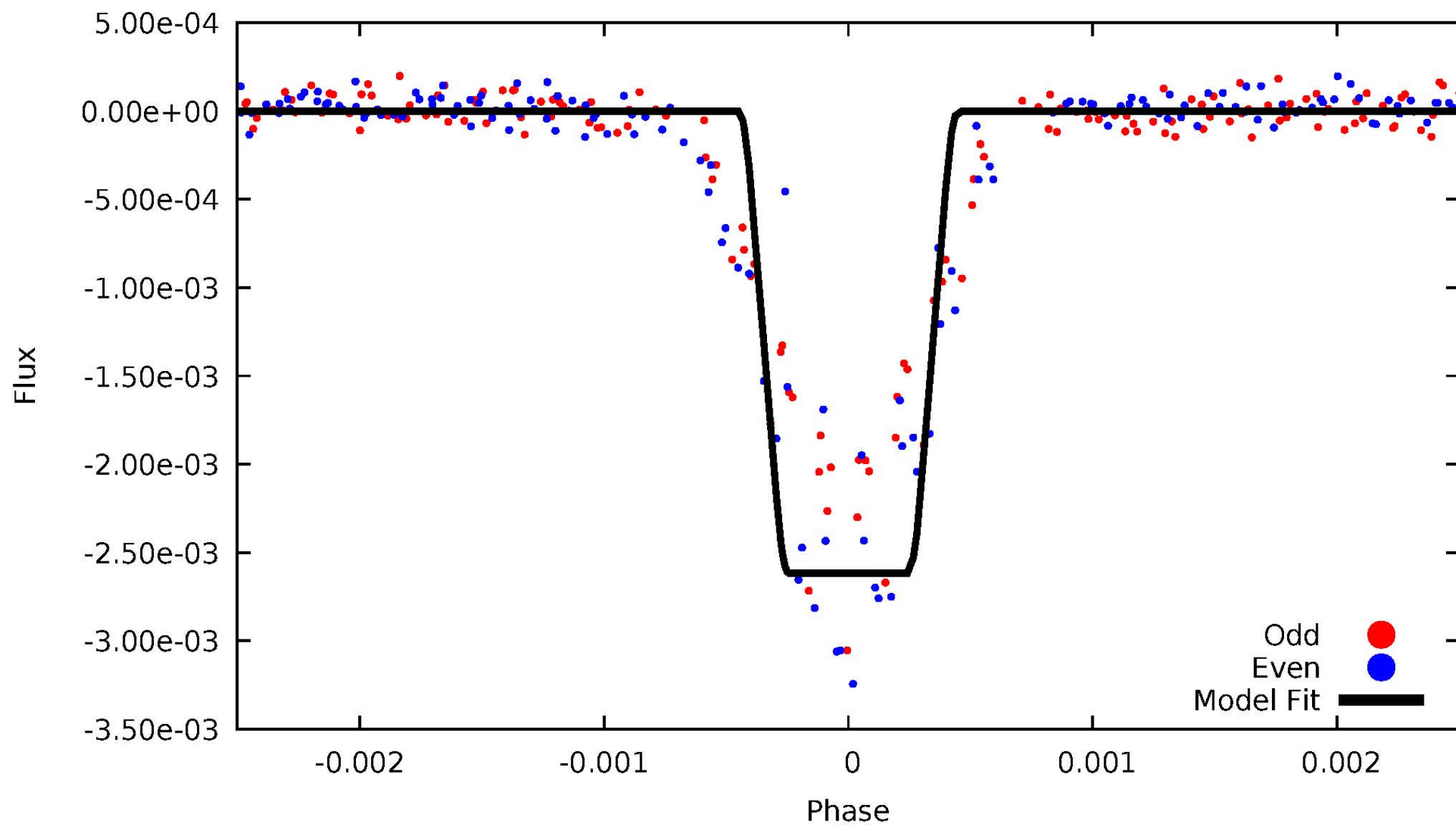
# DV Odd/Even

TCE 006933781-01



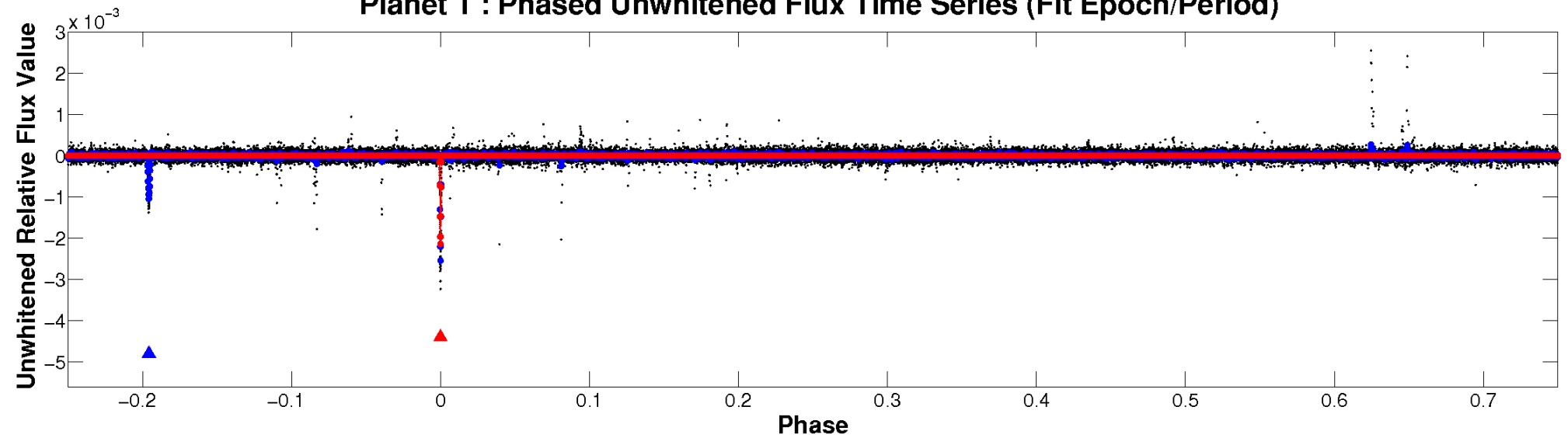
# ALT Odd/Even

TCE 006933781-01

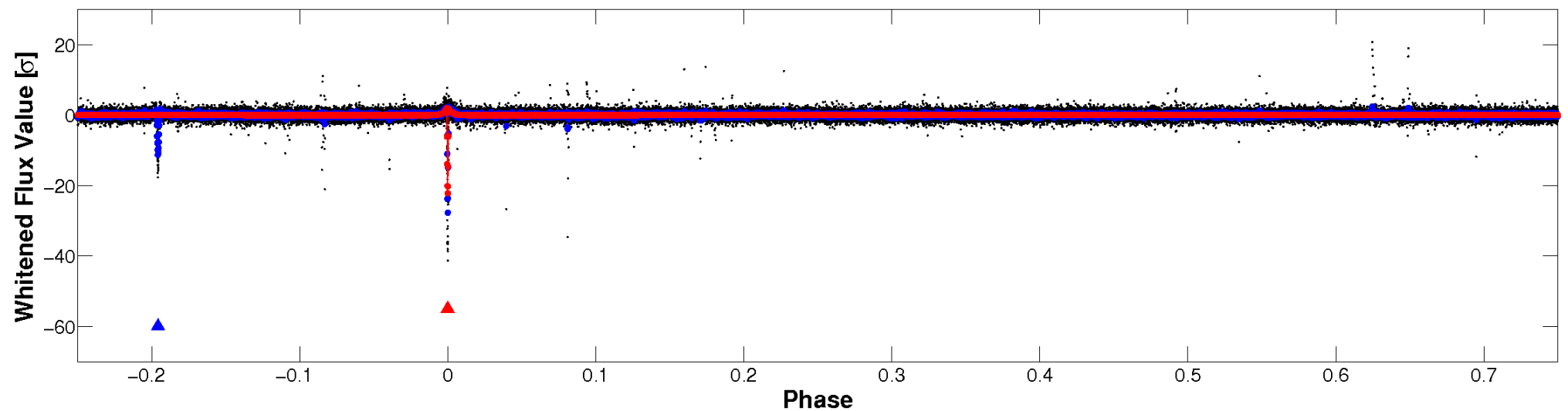


# Non-Whitened Vs. Whitened Light Curve

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

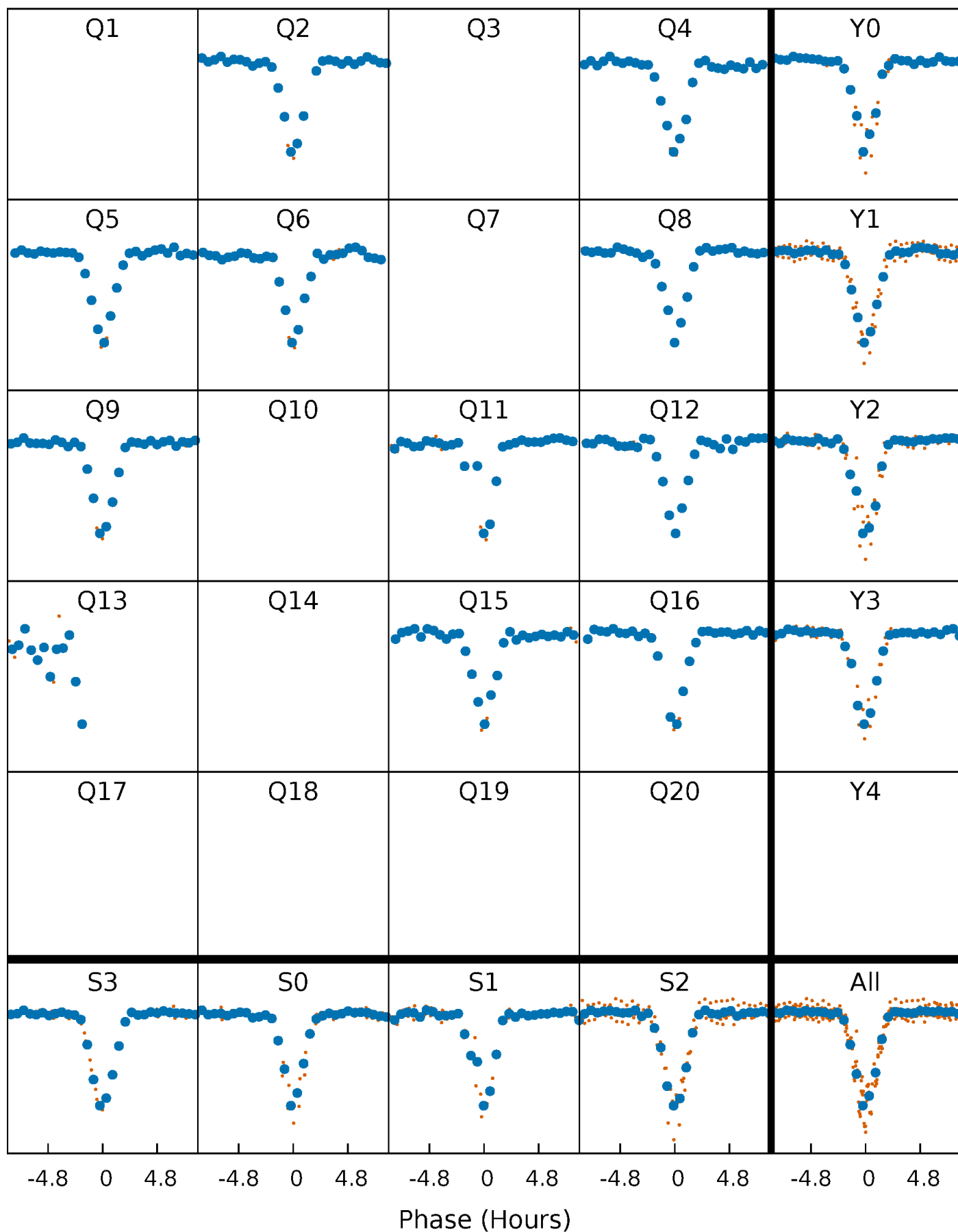


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

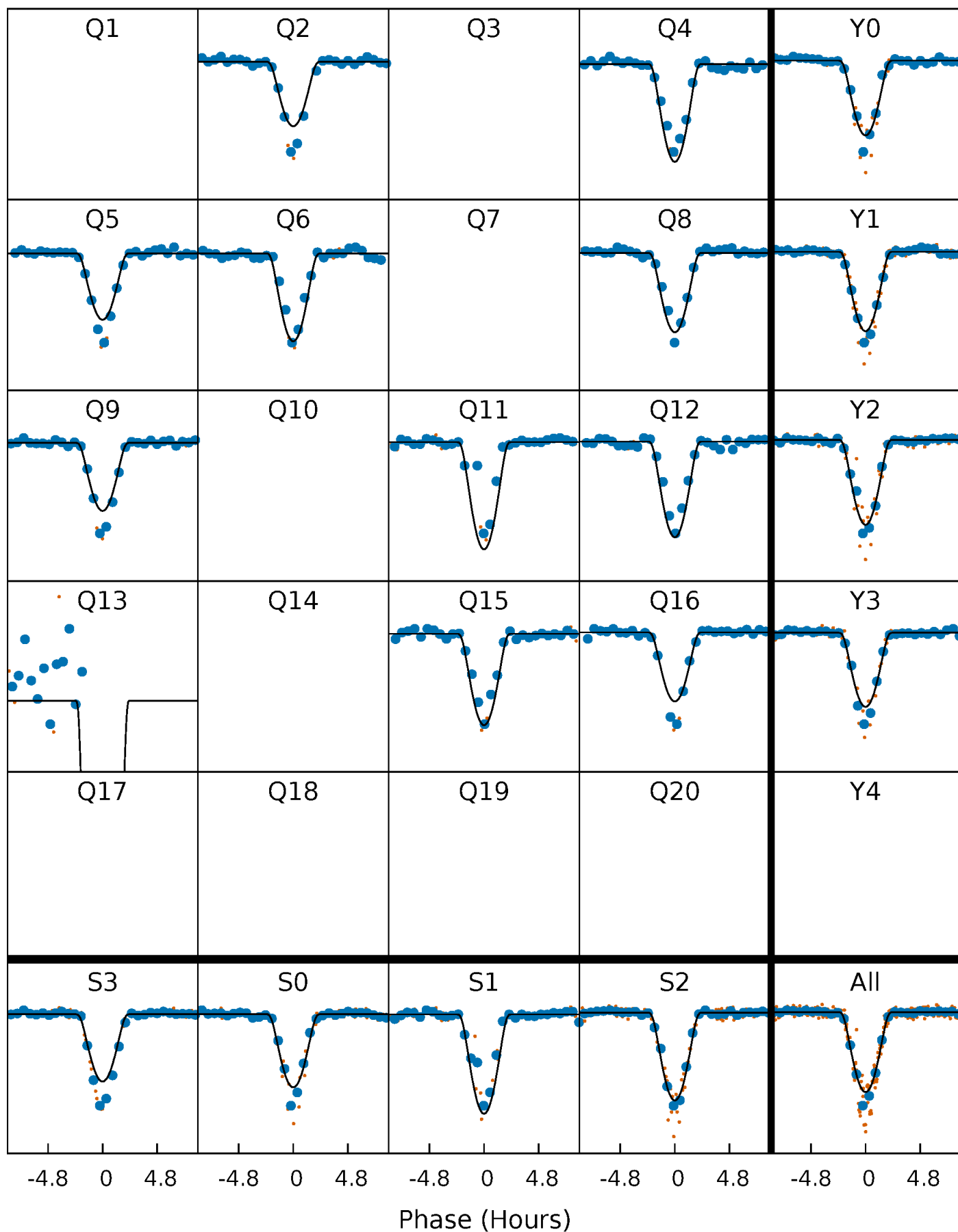
TCE 006933781-01 P=130.419498 Days  $T_0=229.757994$  (BKJD)





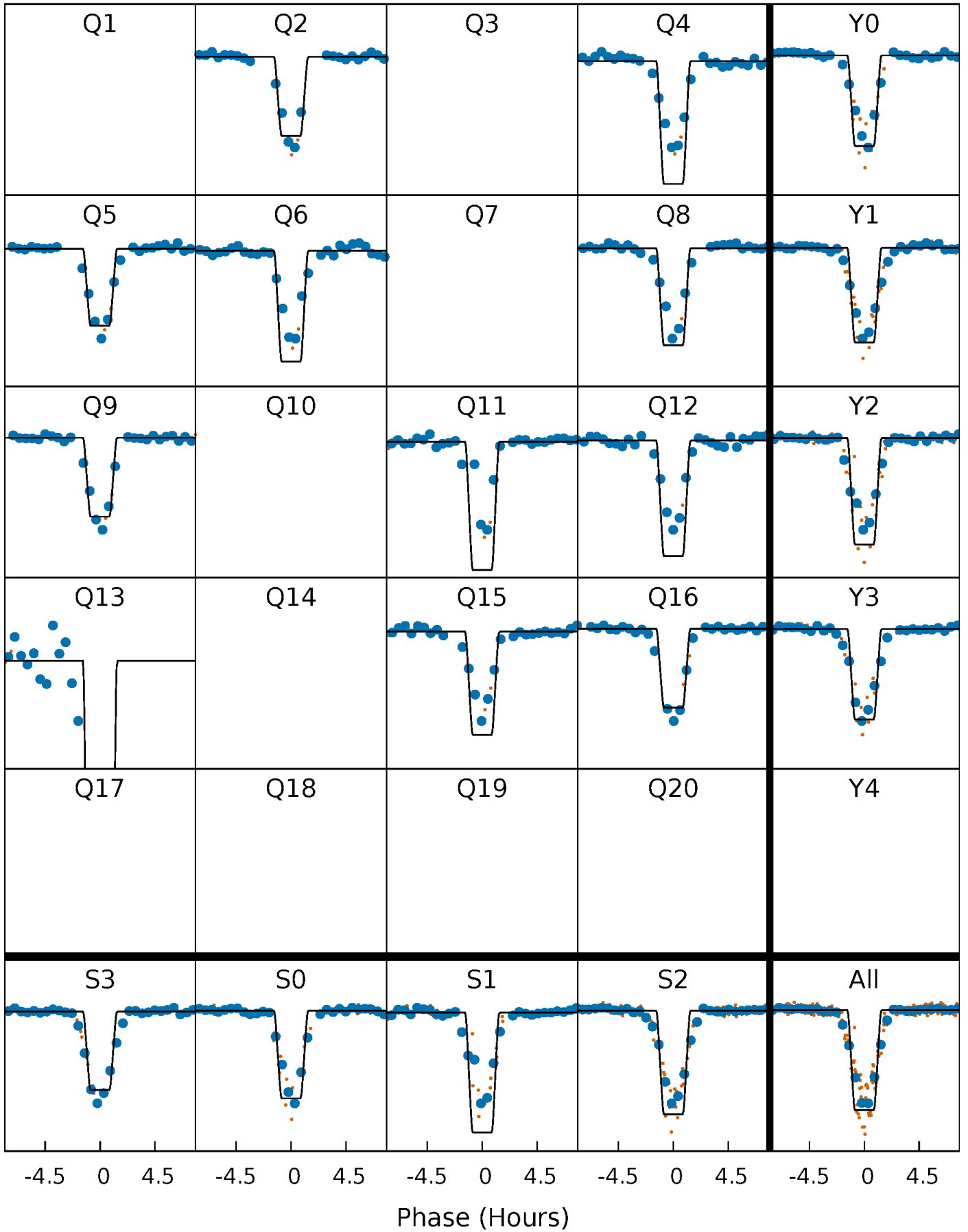
# DV Quarter-Phased Transit Curves

TCE 006933781-01 P=130.419498 Days  $T_0=229.757994$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

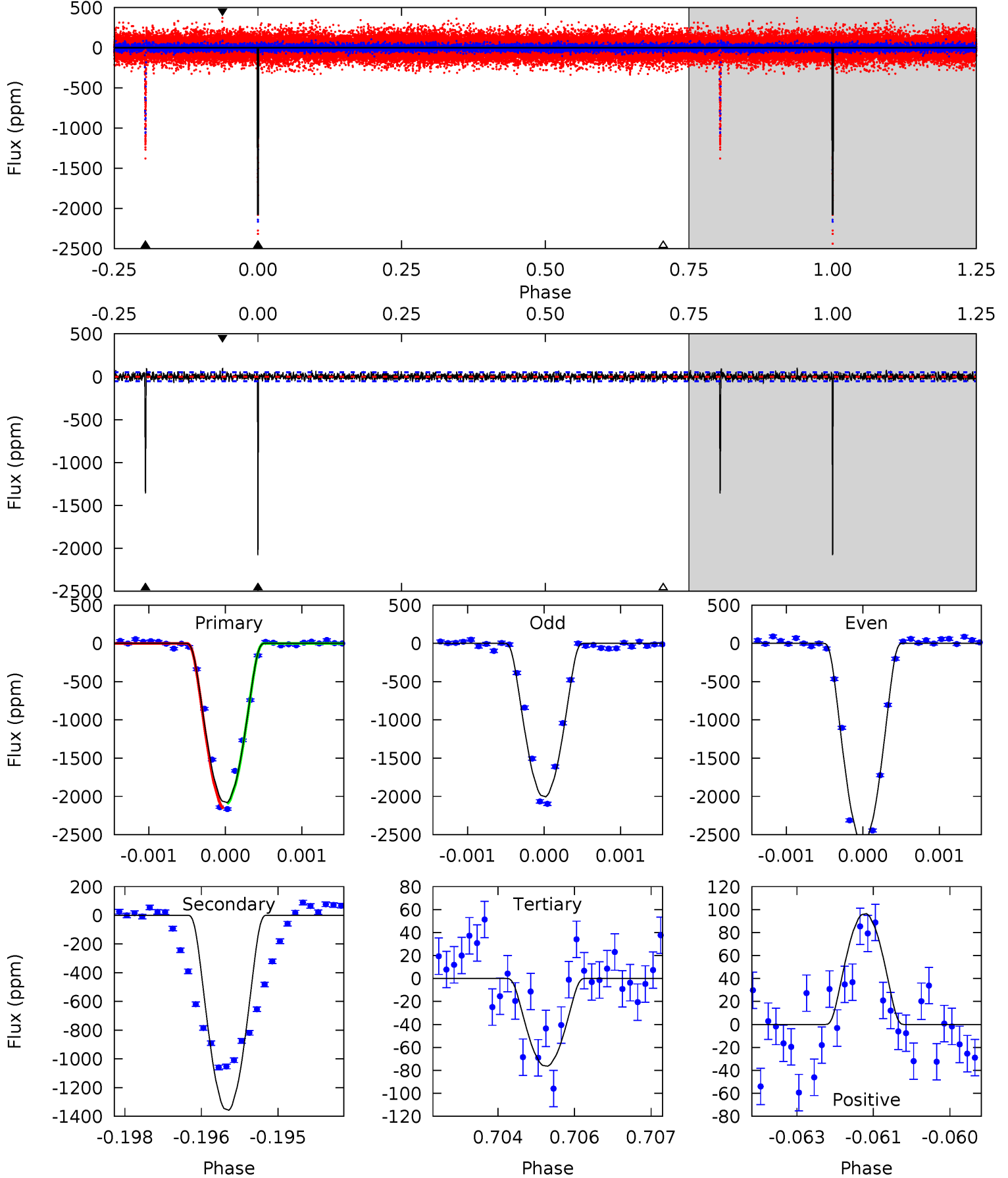
TCE 006933781-01 P=130.419895 Days  $T_0=229.756389$  (BKJD)



# DV Model-Shift Uniqueness Test

006933781-01,  $P = 130.419498$  Days,  $E = 99.338496$  Days

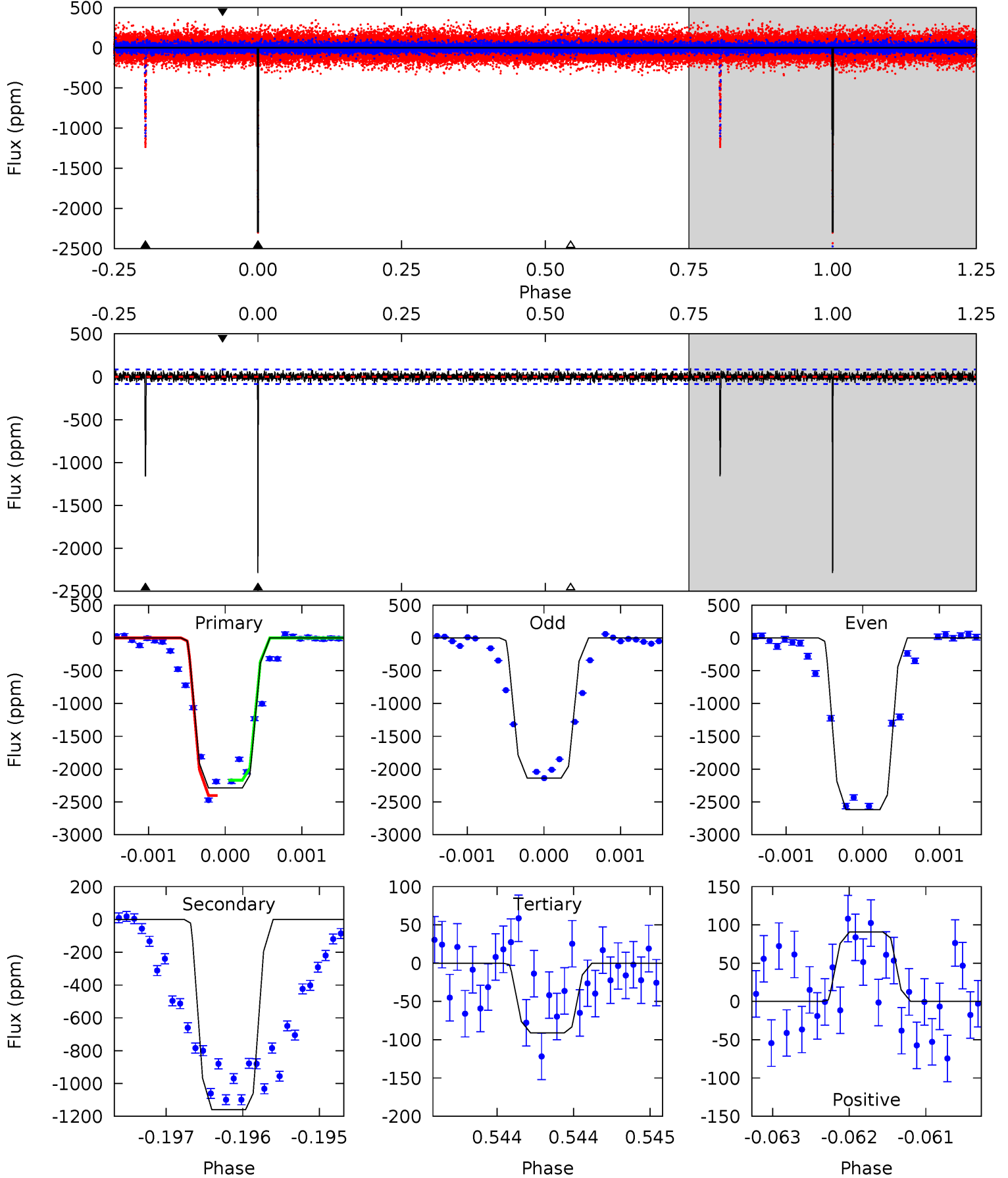
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
216.8	141.6	7.96	10.1	5.38	3.18	2.22	208.9	206.8	133.7	131.6	32.5	1.07	0.04	0



# Alt Model-Shift Uniqueness Test

006933781-01, P = 130.419895 Days, E = 99.336494 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
148.1	75.1	5.90	5.87	5.48	3.33	1.55	142.2	142.3	69.2	69.2	15.6	1.07	0.04	0



### Stellar Parameters For KIC 006933781

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5770^{+159}_{-130}$	$3.946^{+0.315}_{-0.135}$	$-0.460^{+0.350}_{-0.200}$	$1.685^{+0.368}_{-0.552}$	$0.915^{+0.134}_{-0.089}$	$0.270^{+0.580}_{-0.105}$
	+3%/-2%	+8%/-3%	+76%/-43%	+22%/-33%	+15%/-10%	+215%/-39%
Source	PHO1	FLK73	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 006933781-01 / KOI 3737.01

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-1358 \pm 10$	$14.14^{+6.25}_{-5.63}$	$653^{+47}_{-59}$	$4200^{+751}_{-439}$	$912^{+1584}_{-463}$
Alt.	$-1159 \pm 15$	$9.45^{+6.03}_{-4.77}$	$652^{+44}_{-60}$	$4711^{+1761}_{-709}$	$1744^{+5450}_{-1097}$

$T_{max}$  = 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

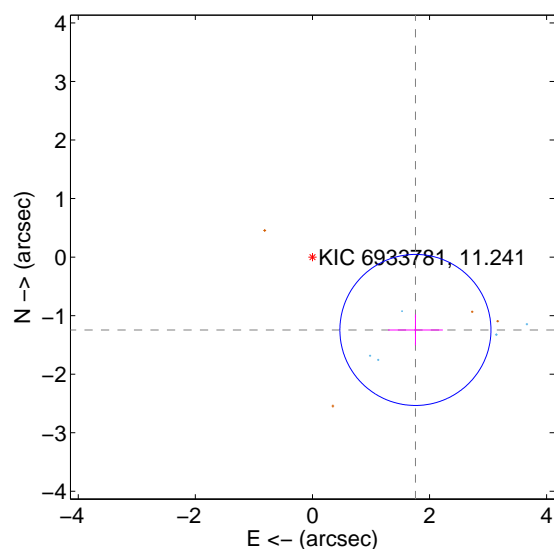
Supplemental centroid analysis for 006933781-01. **Kepler magnitude: 11.24.** Transit SNR 89.91

There are 5 quarters with good PRF difference image offsets

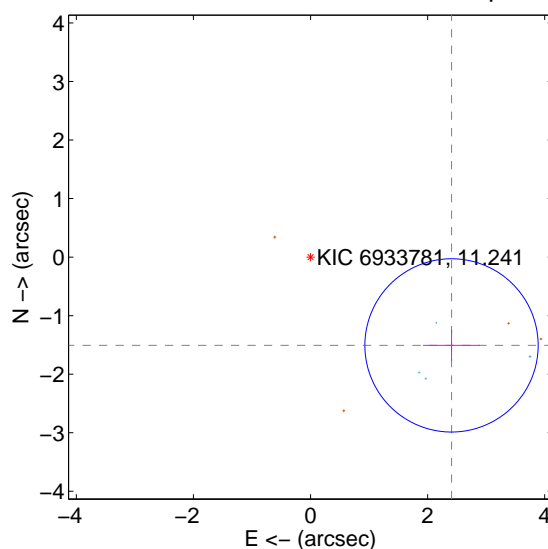
The direct PRF centroid is offset from the target star catalog position by about 0.71 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	<b><math>2.155 \pm 0.430</math></b>	<b>5.01</b>	$-1.760 \pm 0.467$	$-1.245 \pm 0.263$
PRF-fit source offset from KIC position	<b><math>2.842 \pm 0.493</math></b>	<b>5.76</b>	$-2.409 \pm 0.486$	$-1.509 \pm 0.269$
photometric centroid source offset	<b><math>2.84 \pm 0.06</math></b>	<b>50.69</b>	$-2.00 \pm 0.06$	$-2.02 \pm 0.05$

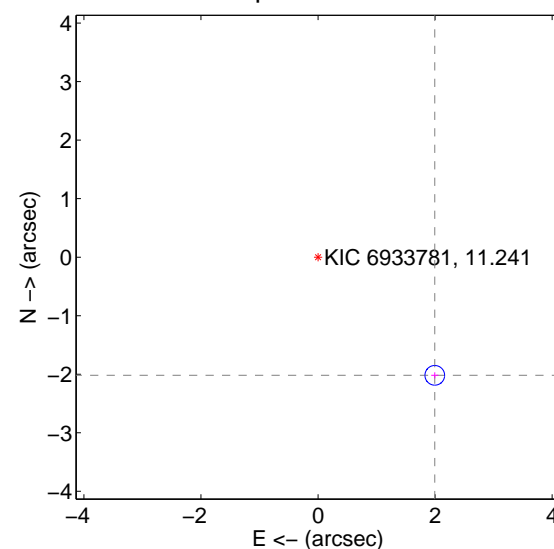
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

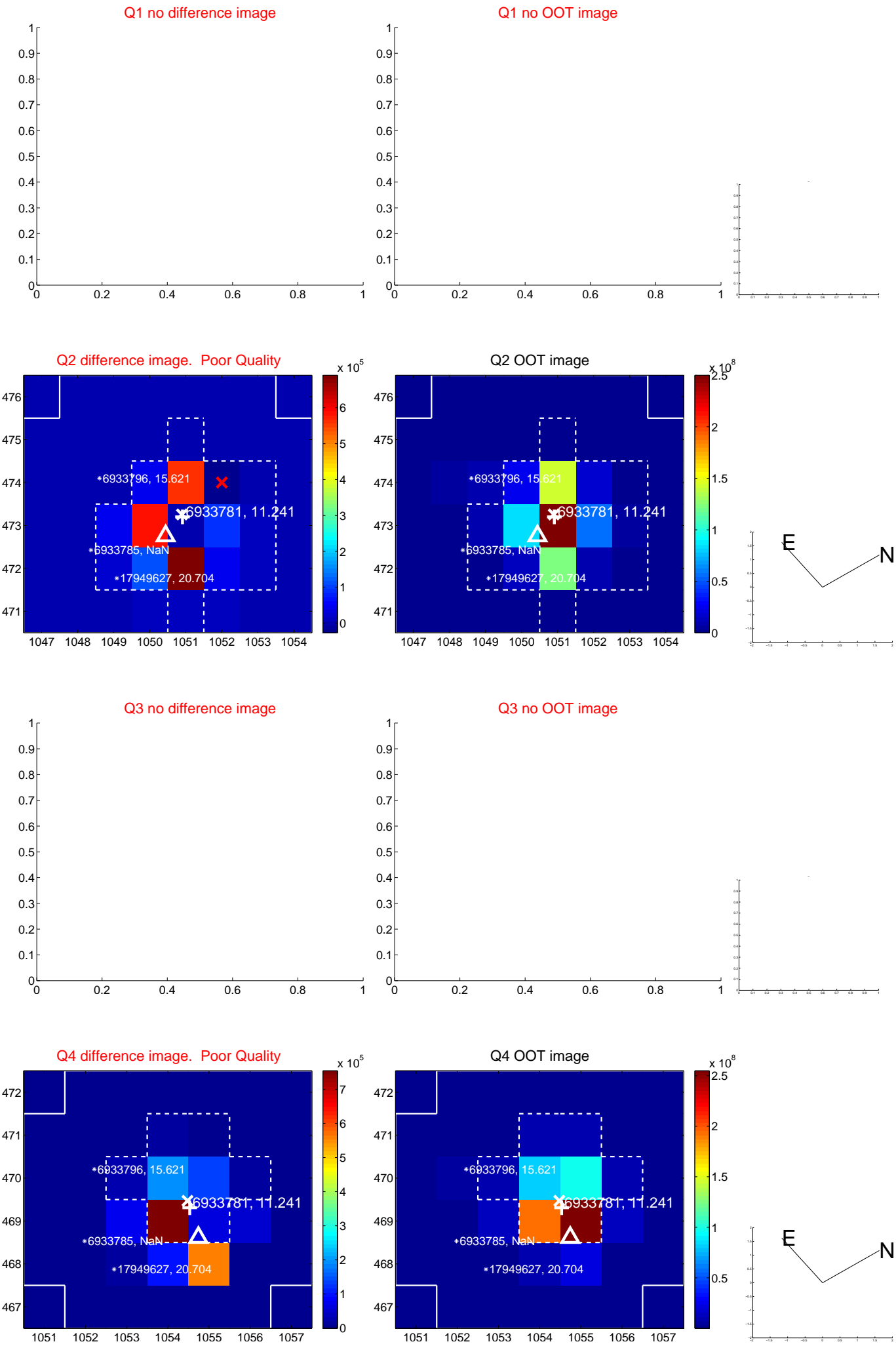


offset from photometric centroids

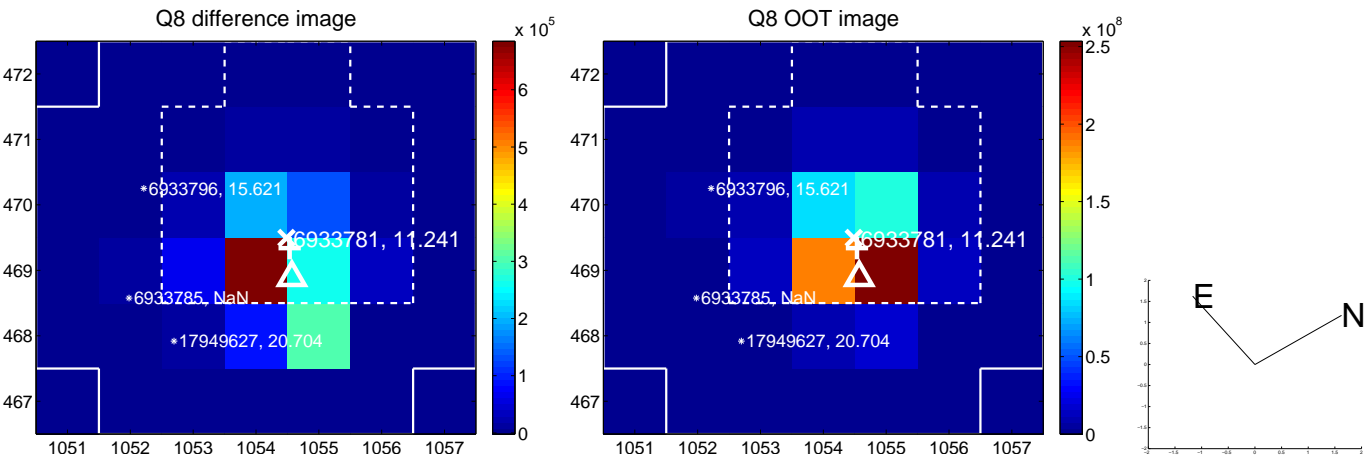
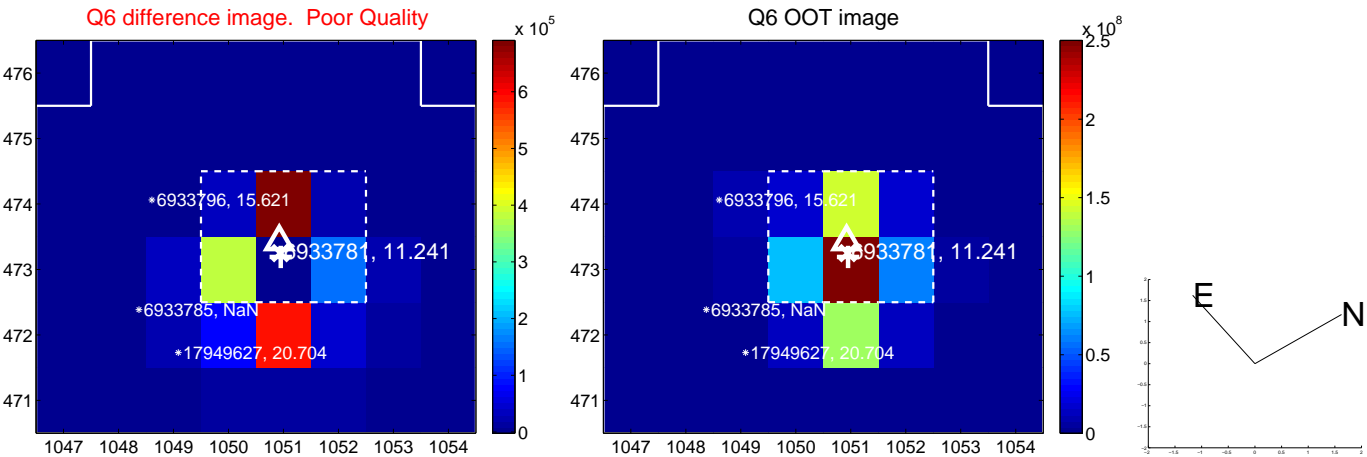
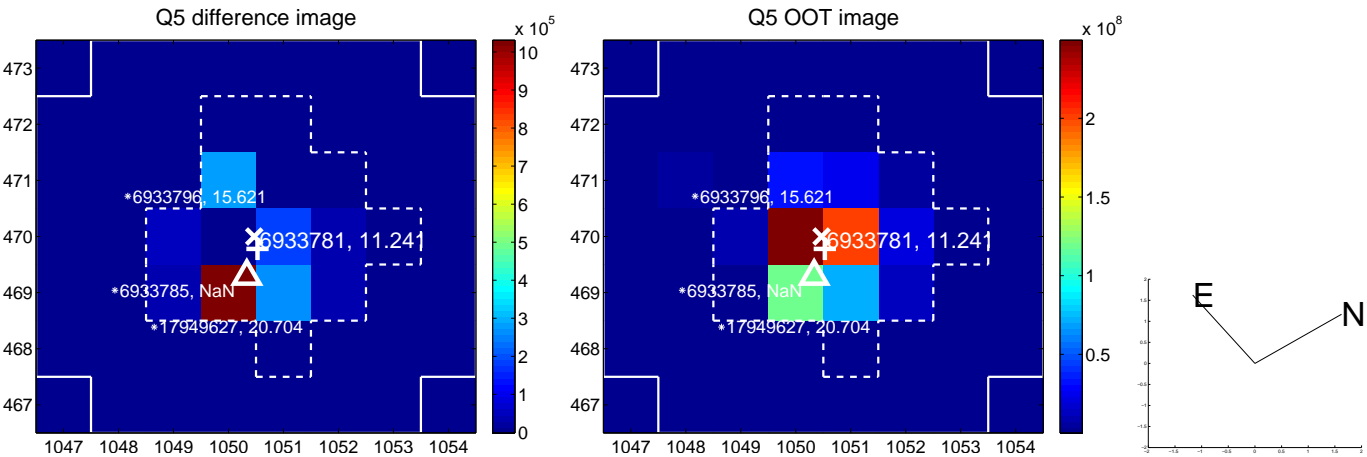


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three- $\sigma$ . Red \*: target star. Blue \*: Other stars. Text next to a star gives its KIC ID and kepmag. KIC IDs > 15,000,000 are from the UKIRT catalog.

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

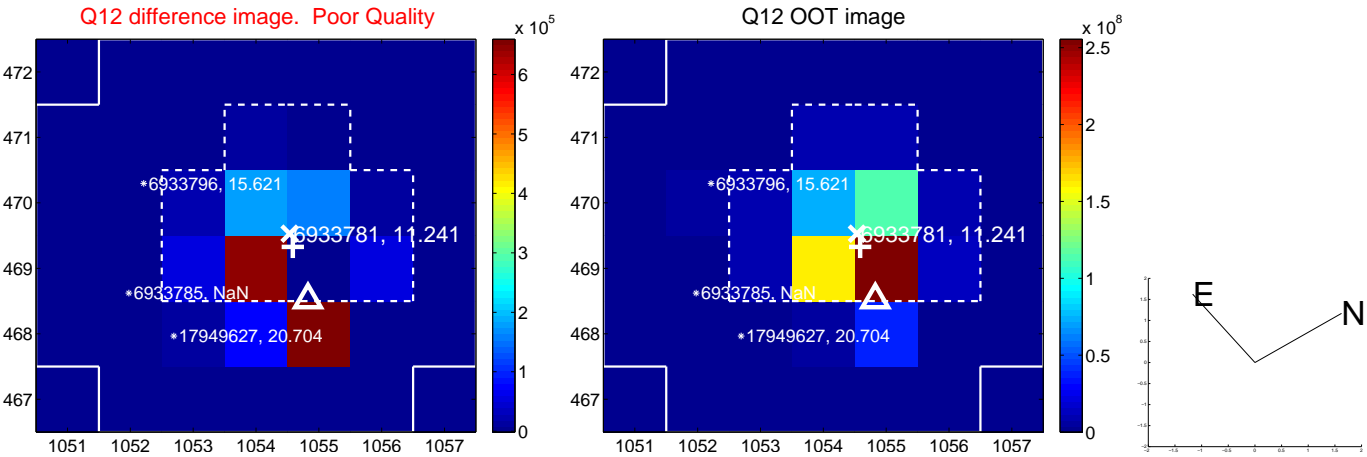
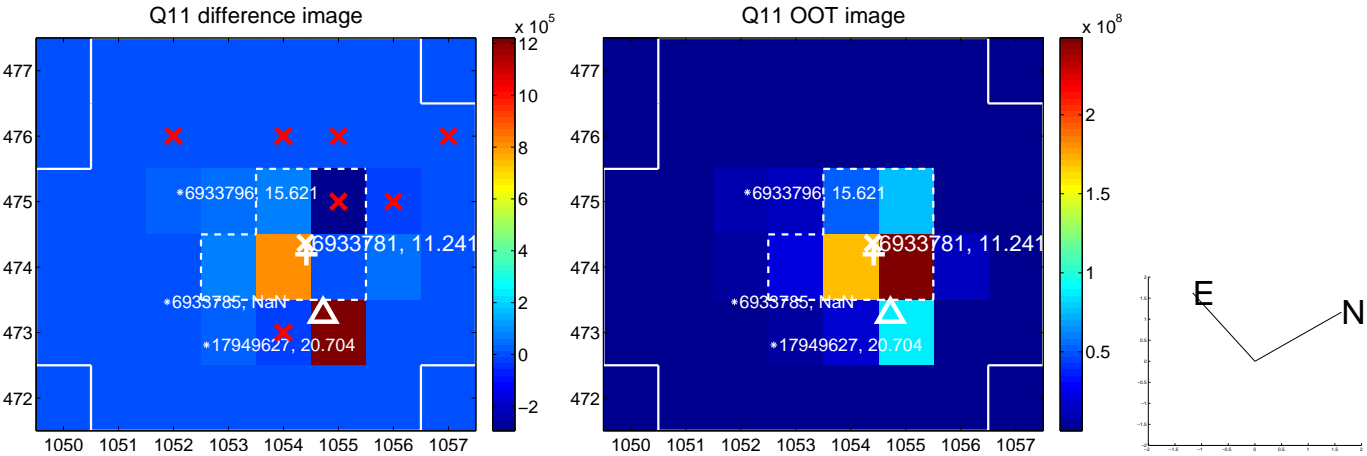
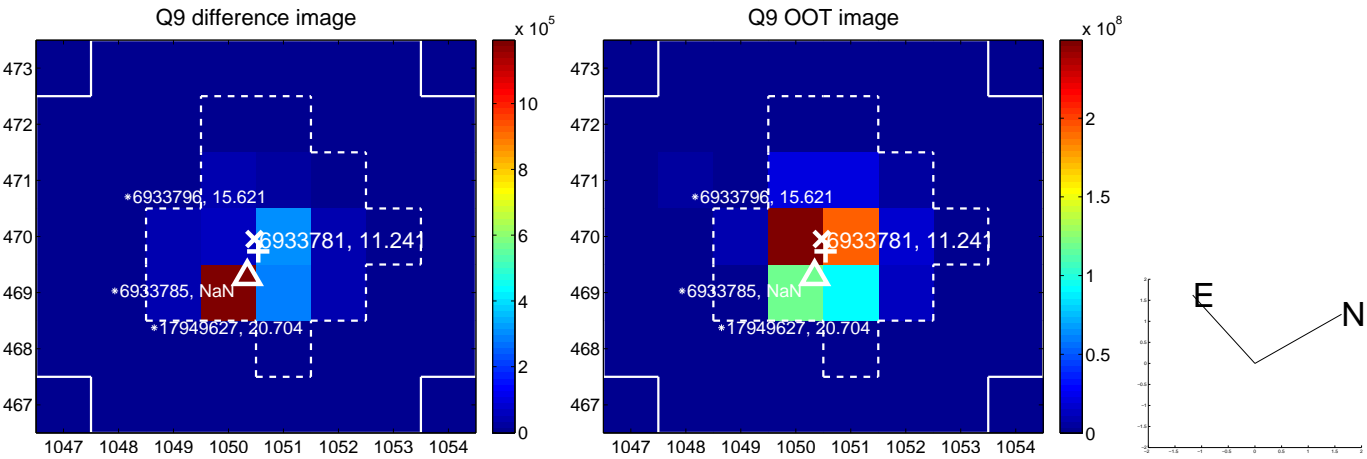


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

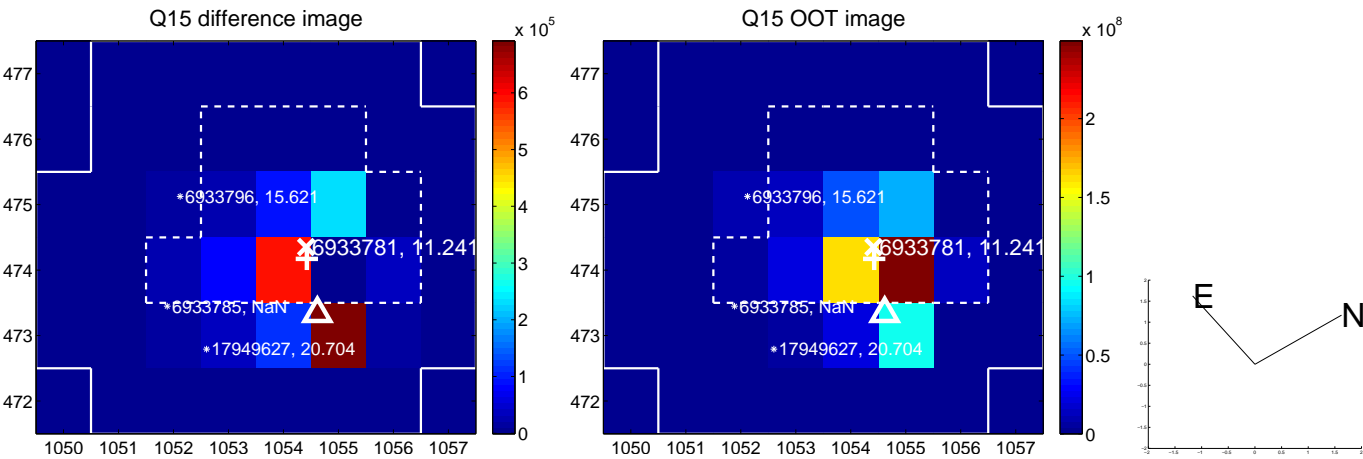




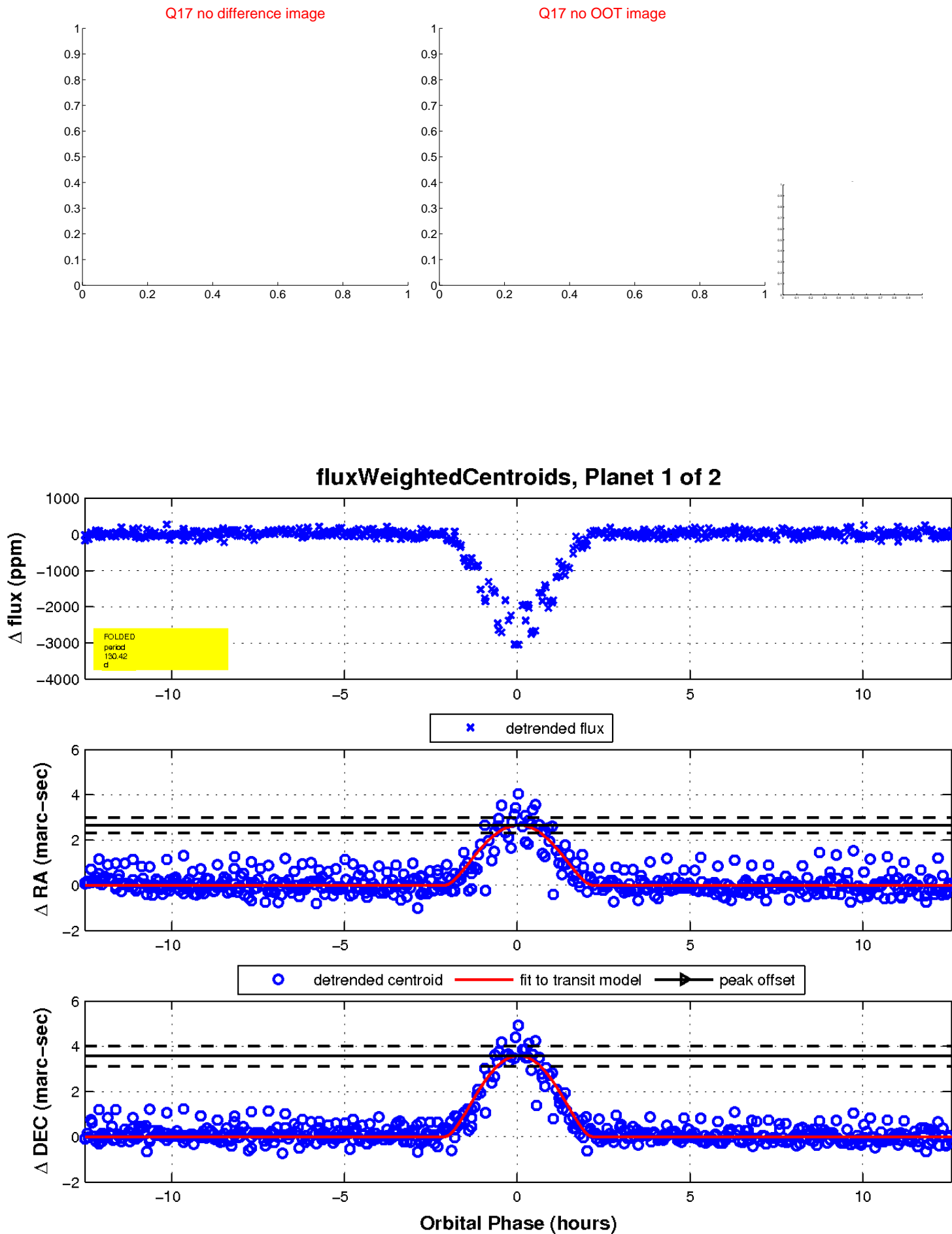
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

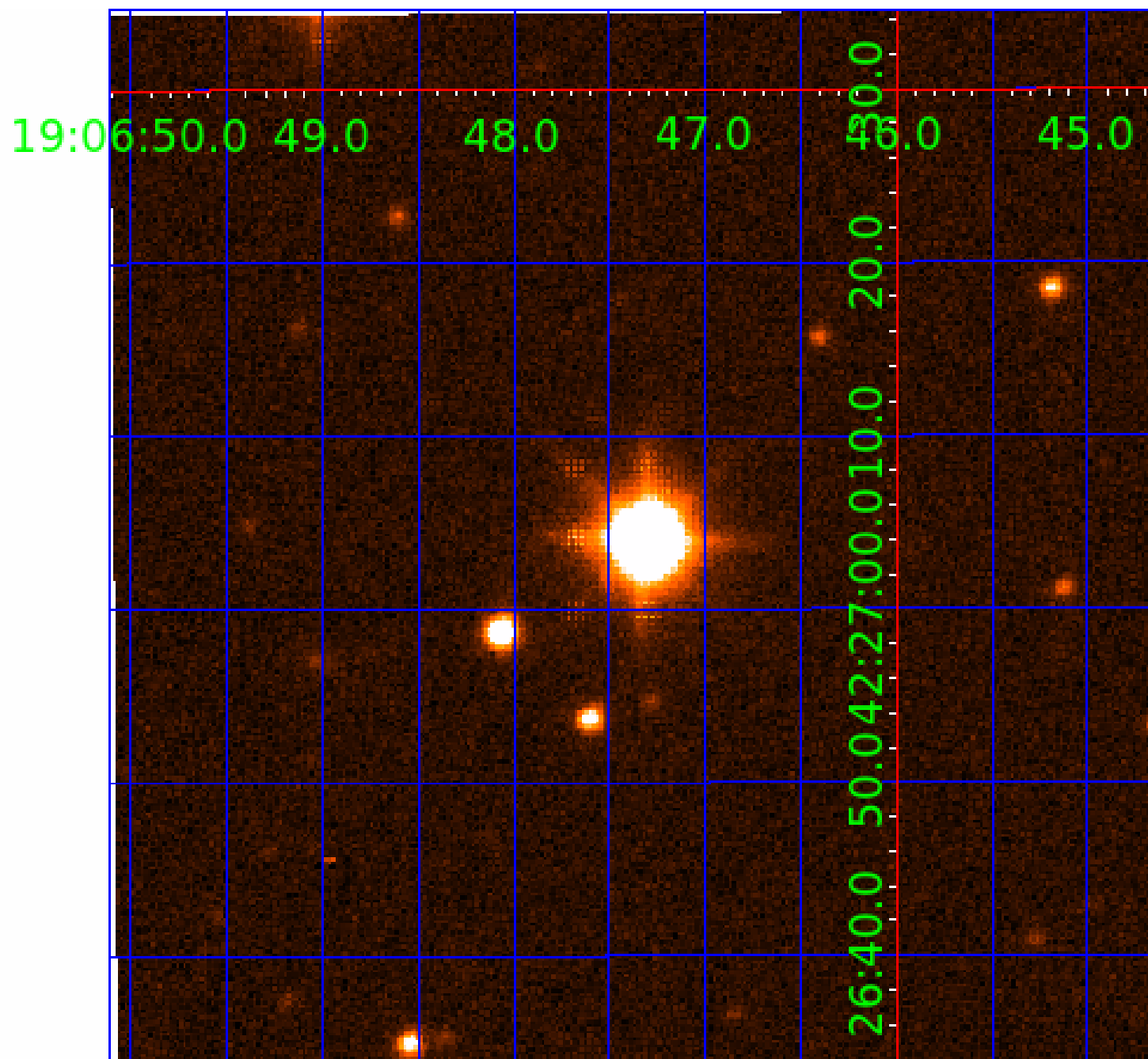


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 006933781

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
006933781-01	OBS	3737.01	130.419498	229.757994	2154.9	4.195	146.0	89.9	1.69	5770	14.62	11.81
006933781-02	OBS	No	130.418857	204.238562	1118.5	7.616	83.1	75.1	1.69	5770	10.74	11.81

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
006933781-01	OBS	FP	0.00	0	1	0	0	MOD_SEC_DV—MOD_SEC_ALT—DEEP_V_SHAPED—HAS_SEC_TCE—CENT_SATURATED
006933781-02	OBS	FP	0.00	1	1	0	0	IS_SEC_TCE—CENT_SATURATED

**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 006933781-02

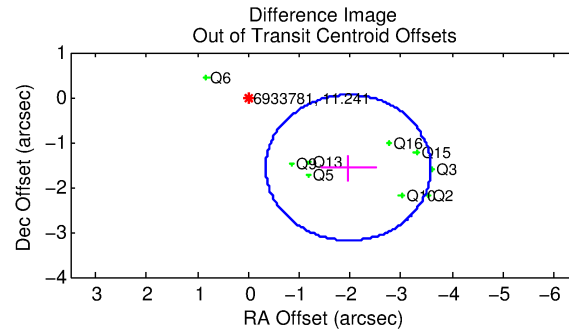
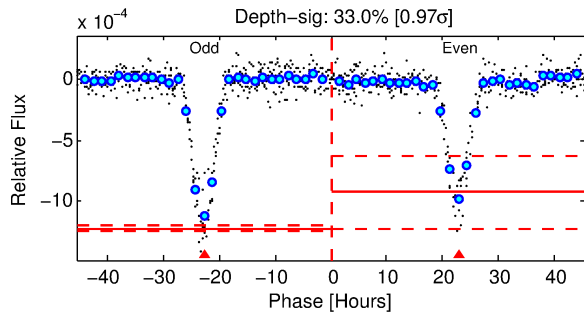
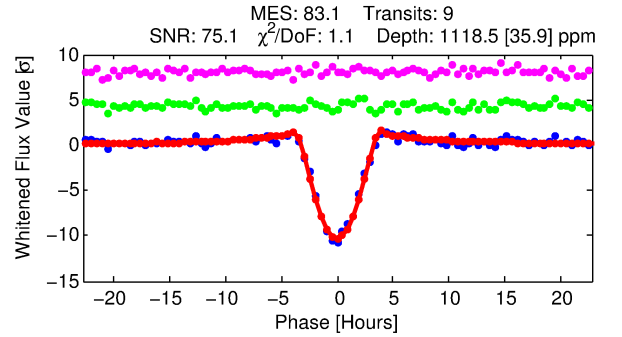
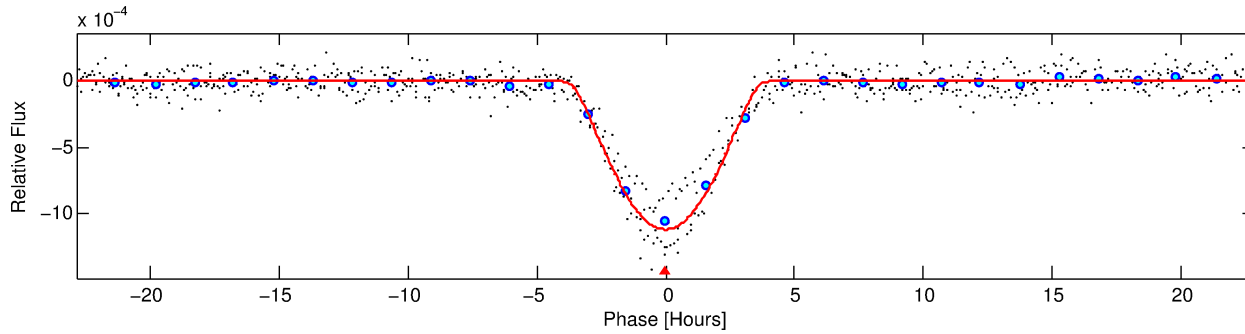
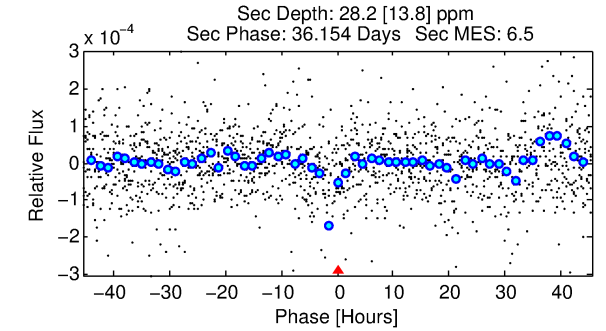
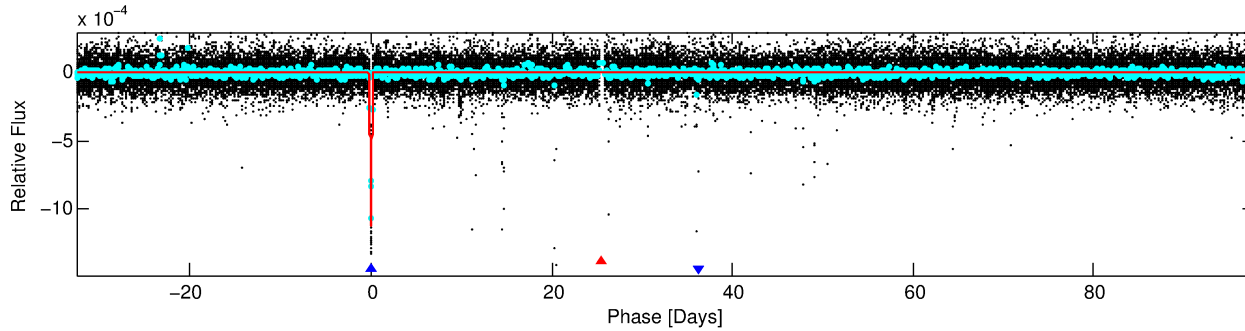
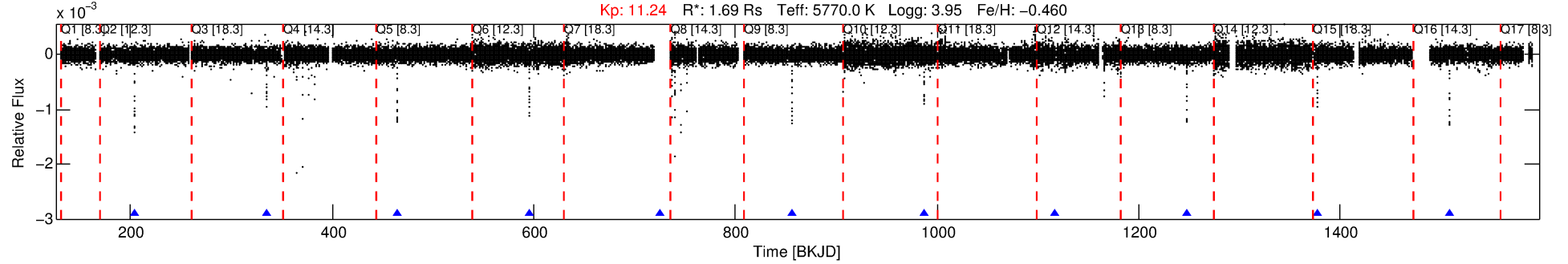
No Significant Match Found

# DV One-Page Summary

KIC: 6933781 Candidate: 2 of 2 Period: 130.419 d

KOI: K03737 Corr: No Ephemeris Match

Kp: 11.24 R\*: 1.69 Rs Teff: 5770.0 K Logg: 3.95 Fe/H: -0.460



## DV Fit Results:

Period = 130.41886 [0.00031] d  
Epoch = 204.2386 [0.0019] BKJD  
Rp/R\* = 0.0584 [0.0243]  
a/R\* = 45.65 [4.47]  
b = 1.00 [0.04]  
Seff = 11.81 [6.40]  
Teq = 473 [64] K  
Rp = 10.74 [5.69] Re  
a = 0.4886 [0.1592] AU  
Ag = 32.10 [35.39] [0.88σ]  
Teffp = 1740 [423] K [2.96σ]

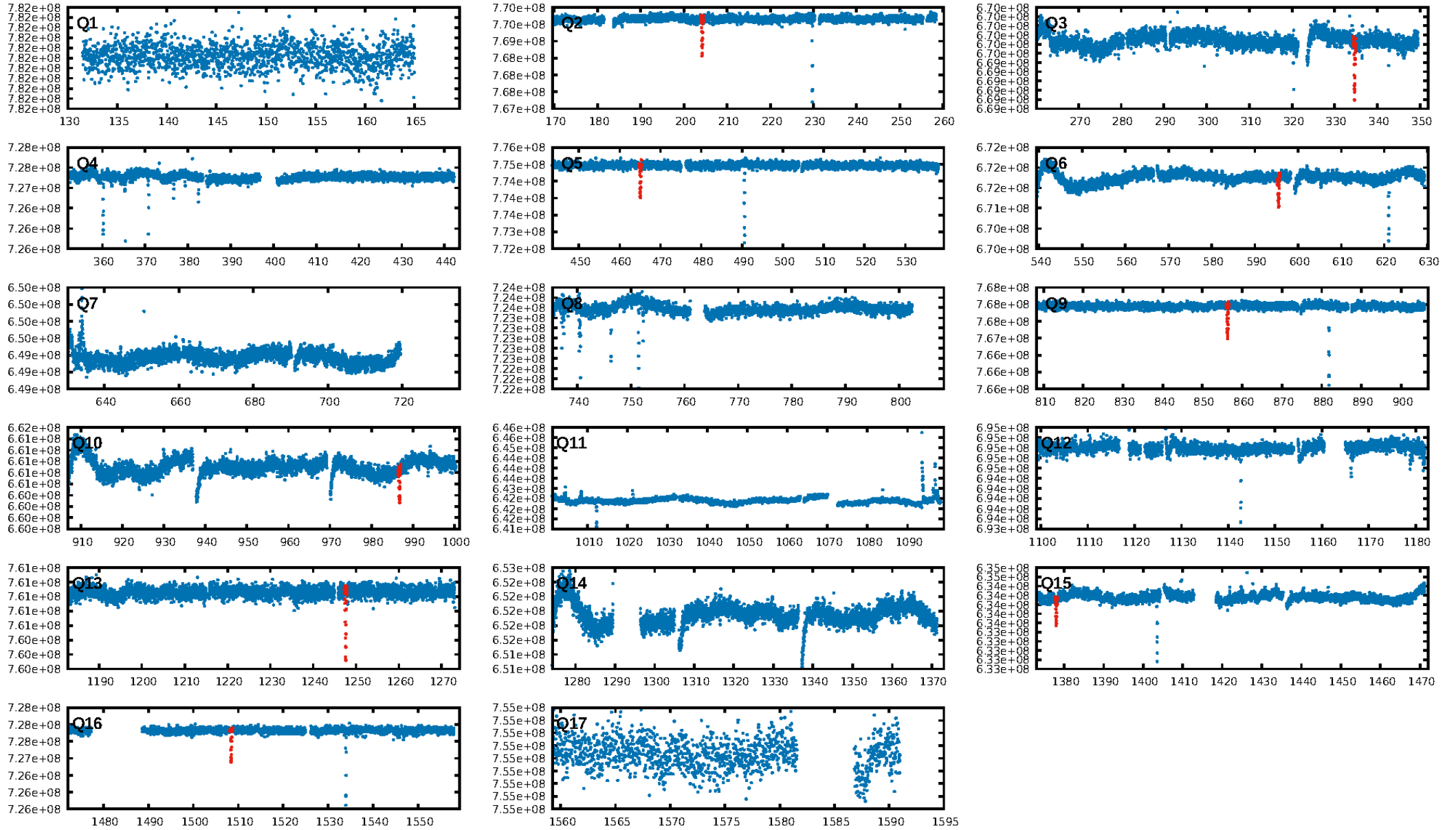
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.1% [0.00σ]  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 46.7%  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [9/9]  
GhostDiagnostic-chr: 1.364  
Centroid-sig: 0.0%  
Centroid-so: 2.282 arcsec [19.19σ]  
OotOffset-rm: 2.515 arcsec [4.65σ]  
KicOffset-rm: 3.251 arcsec [7.20σ]  
OotOffset-st: 3/2/1/3 [9]  
KicOffset-st: 3/2/1/3 [9]  
DiffImageQuality-fgm: 0.56 [5/9]  
DiffImageOverlap-fno: 1.00 [9/9]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 08:05:16 Z

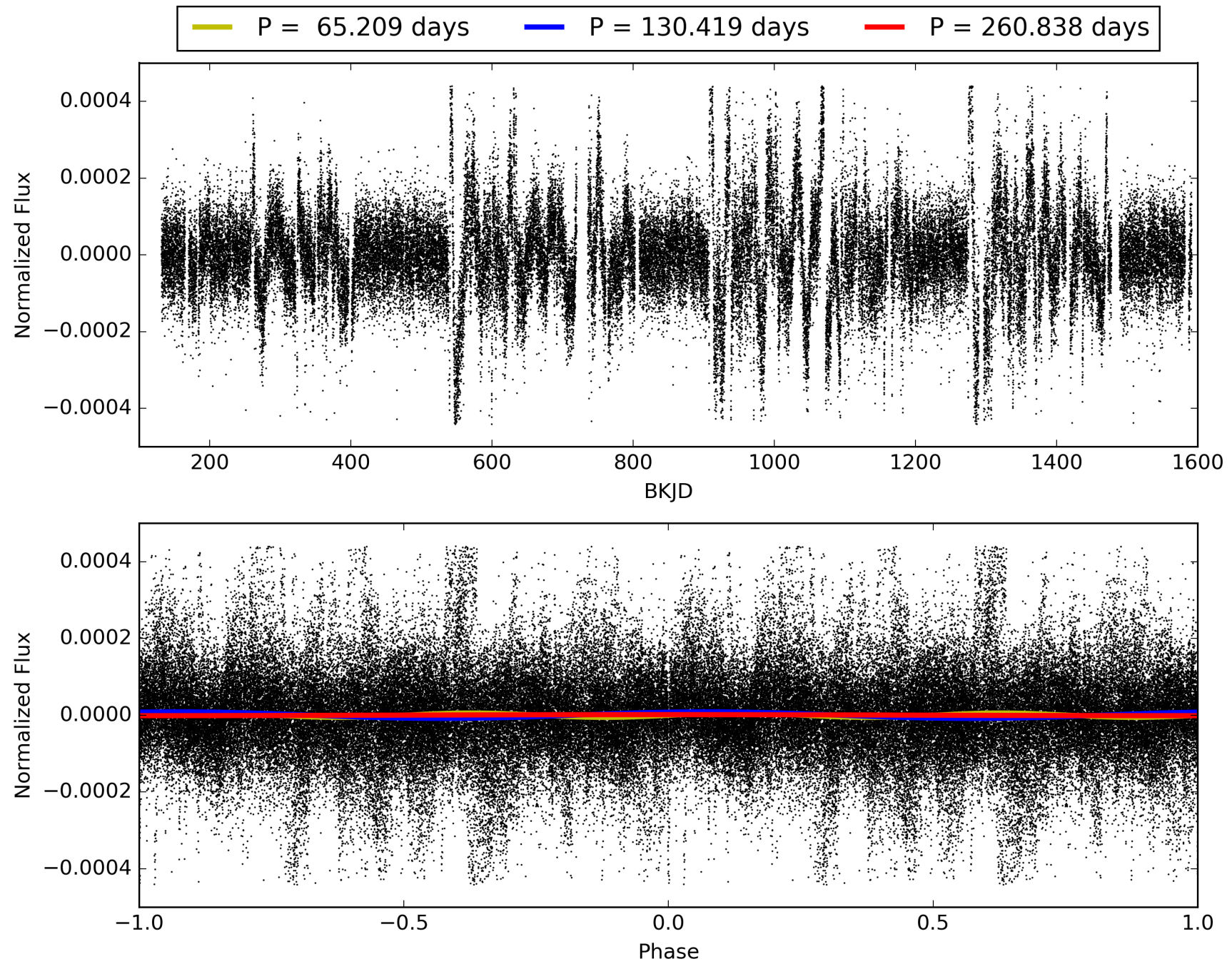
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 006933781-02, PDC Light Curves





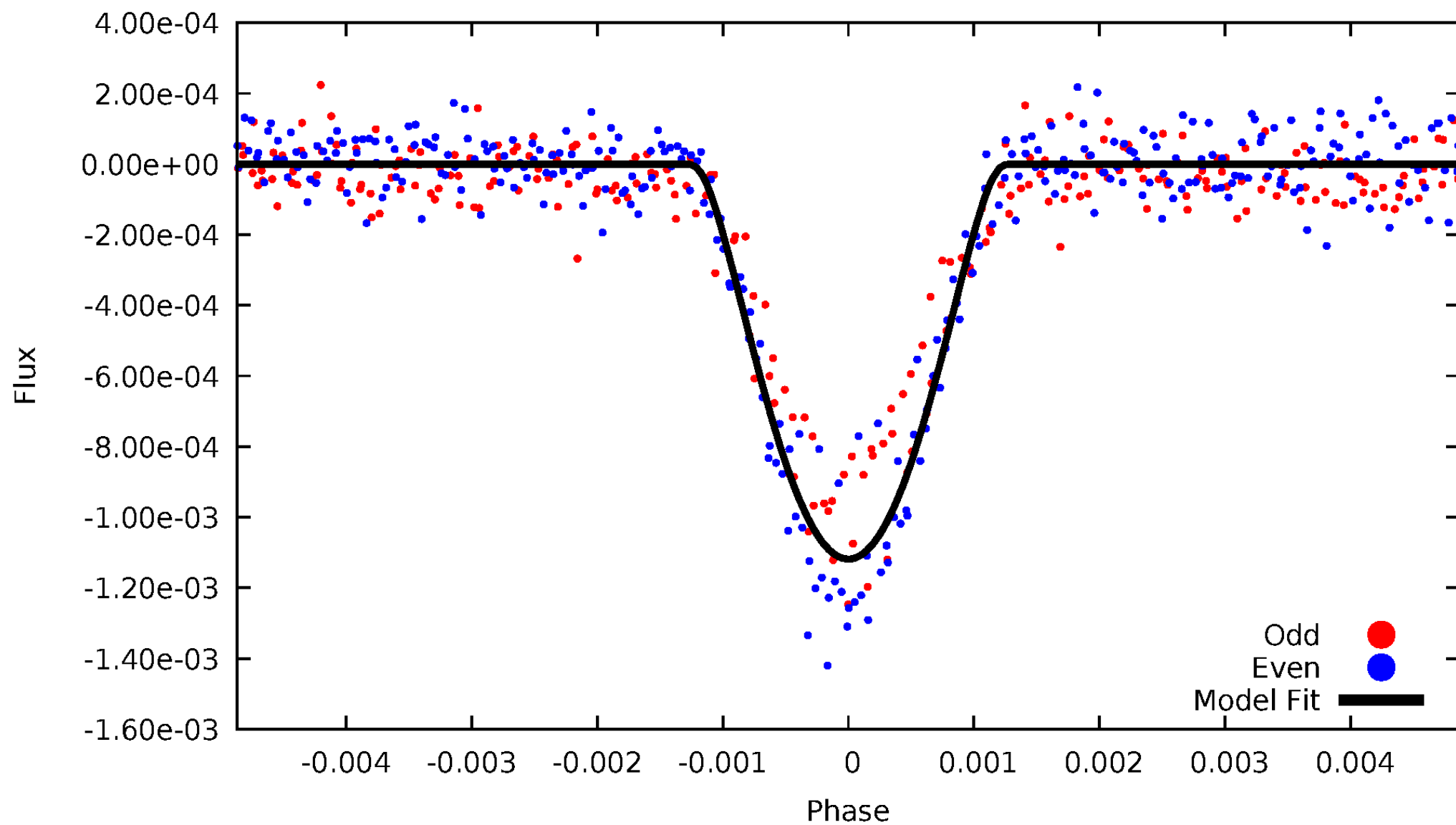
TCE 006933781-02





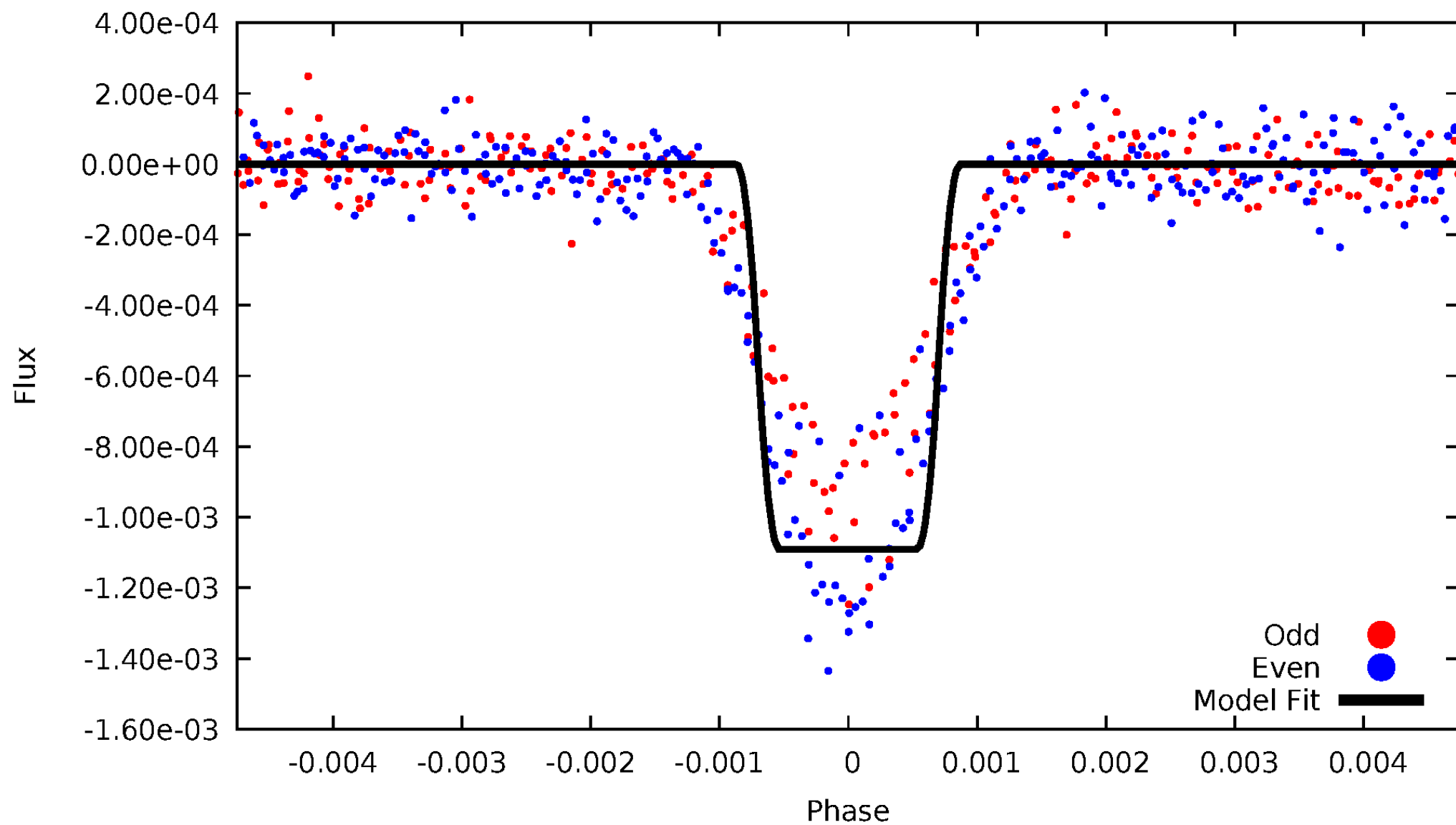
# DV Odd/Even

TCE 006933781-02



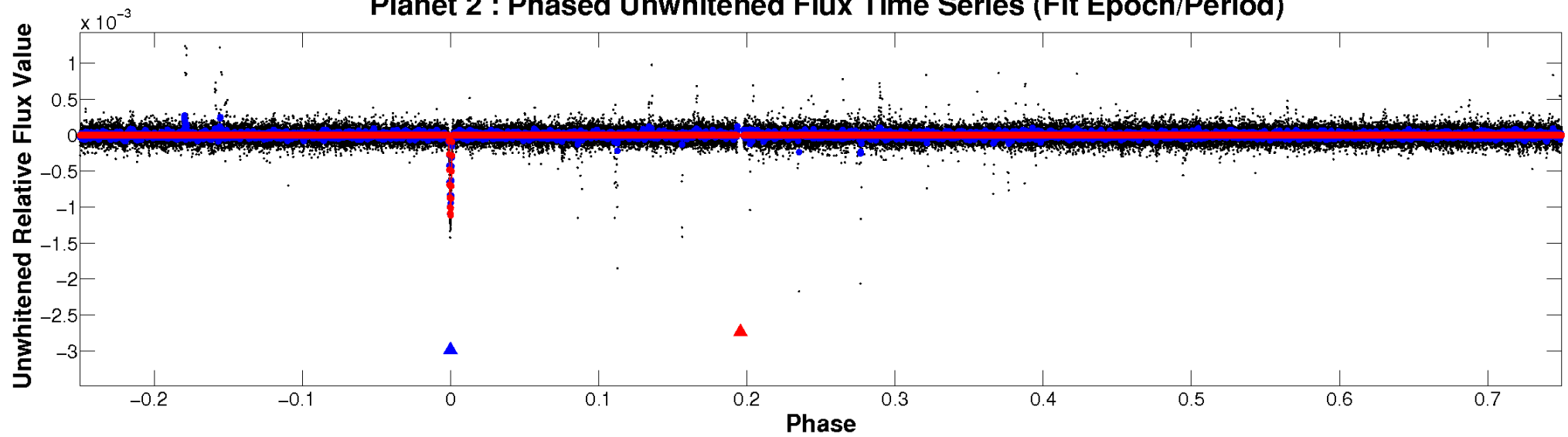
# ALT Odd/Even

TCE 006933781-02

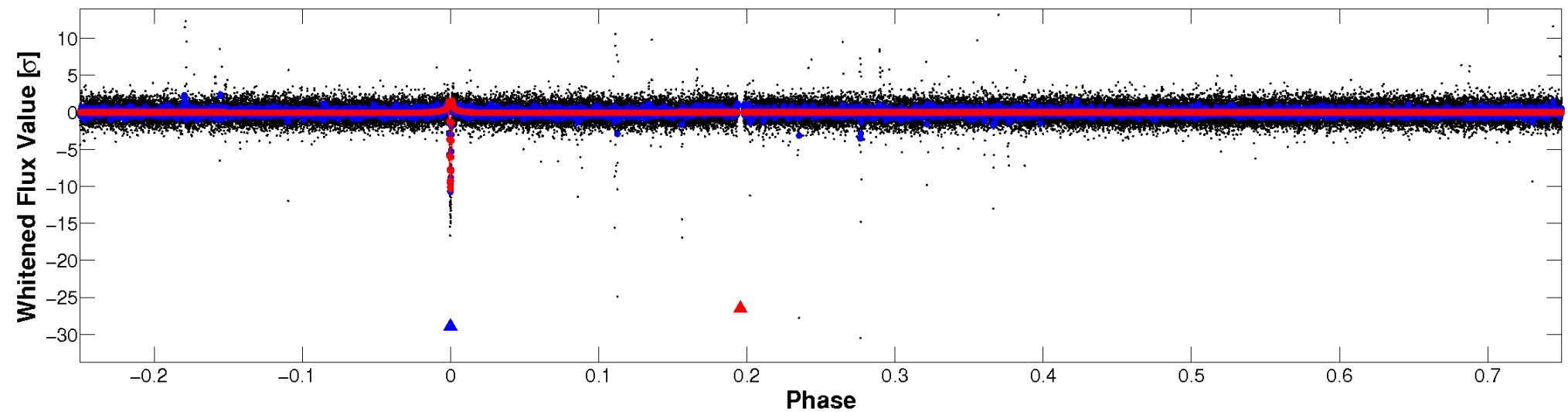


# Non-Whitened Vs. Whitened Light Curve

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

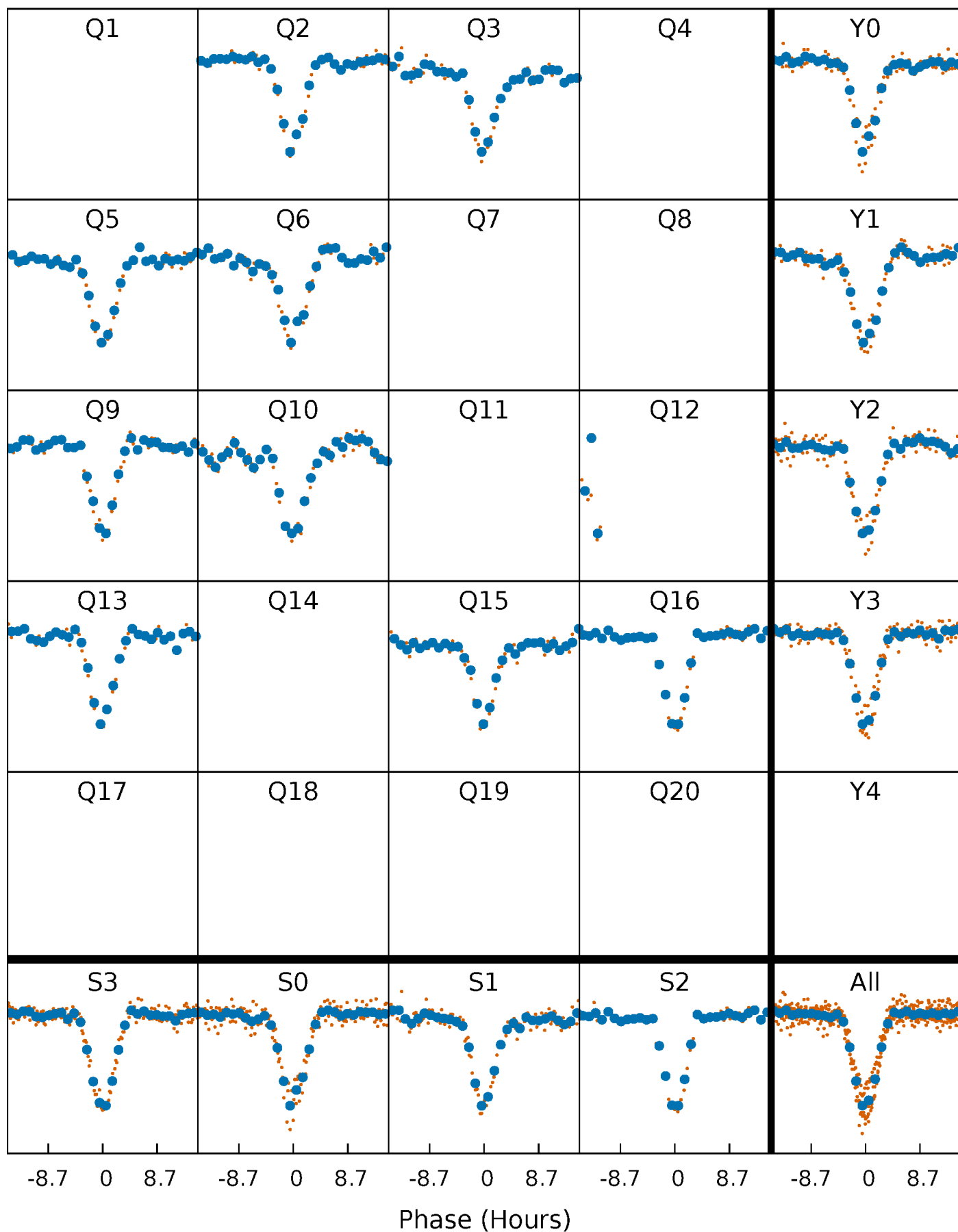


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



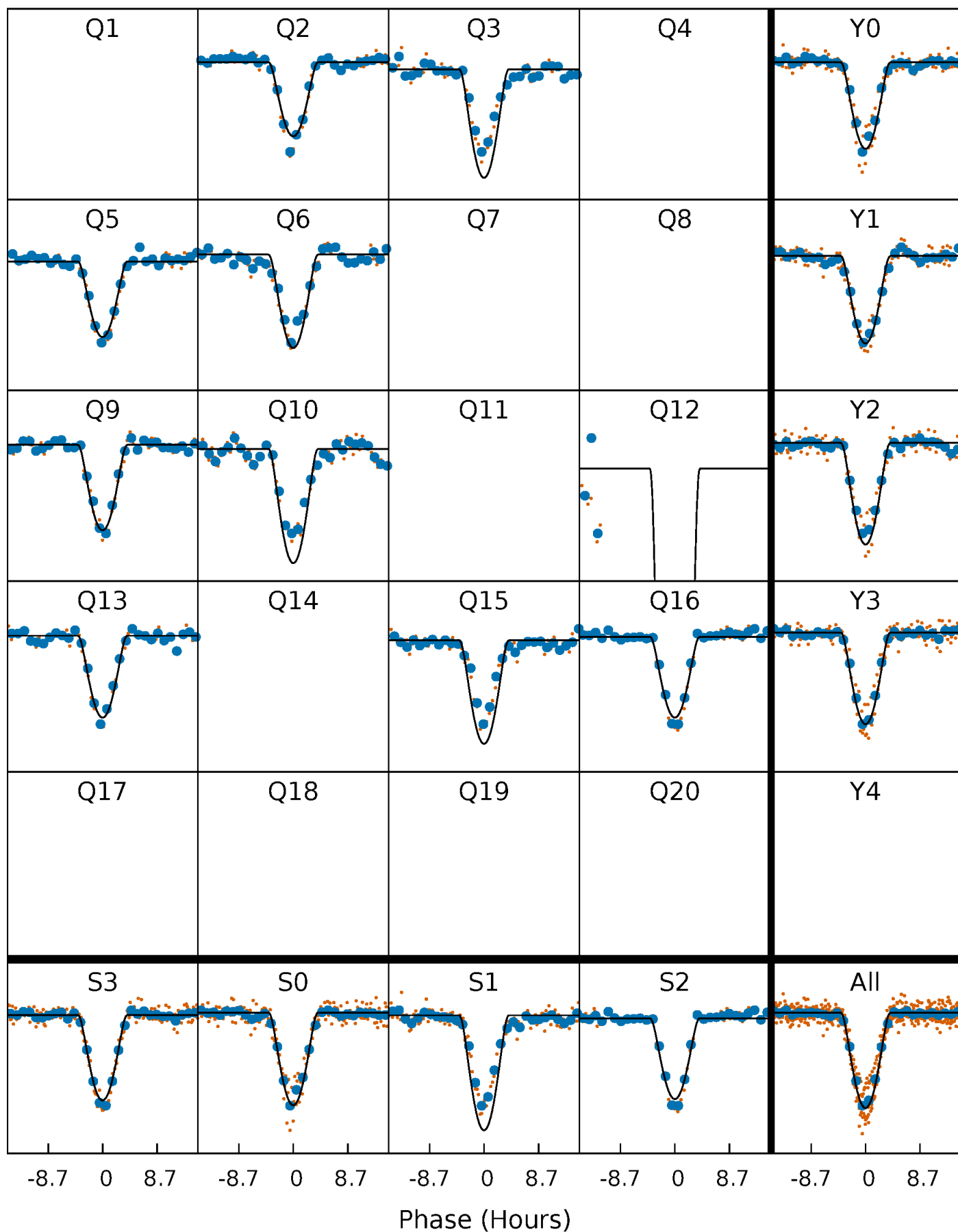
# PDC Quarter-Phased Transit Curves

TCE 006933781-02 P=130.418857 Days  $T_0=204.238562$  (BKJD)



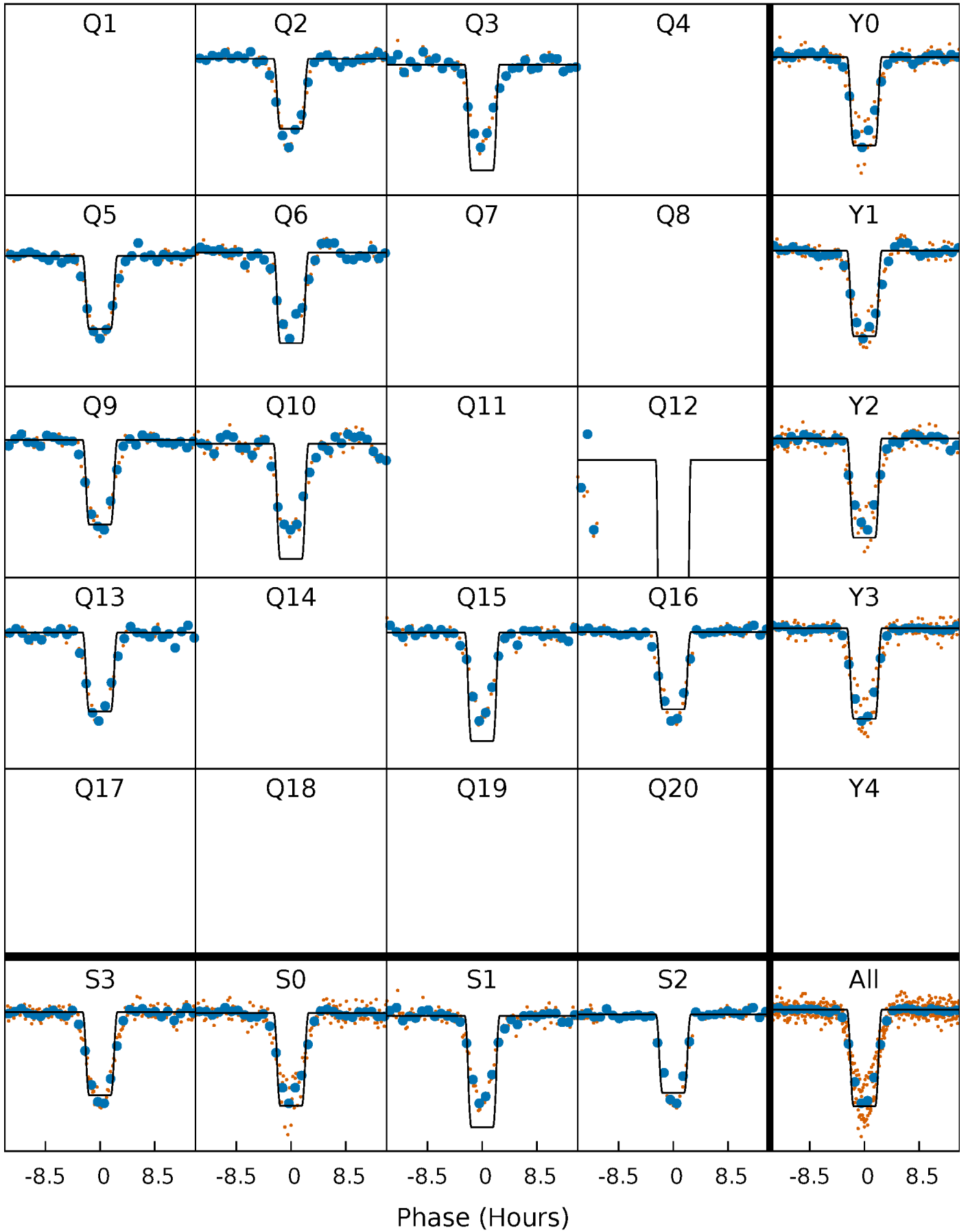
# DV Quarter-Phased Transit Curves

TCE 006933781-02 P=130.418857 Days  $T_0=204.238562$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

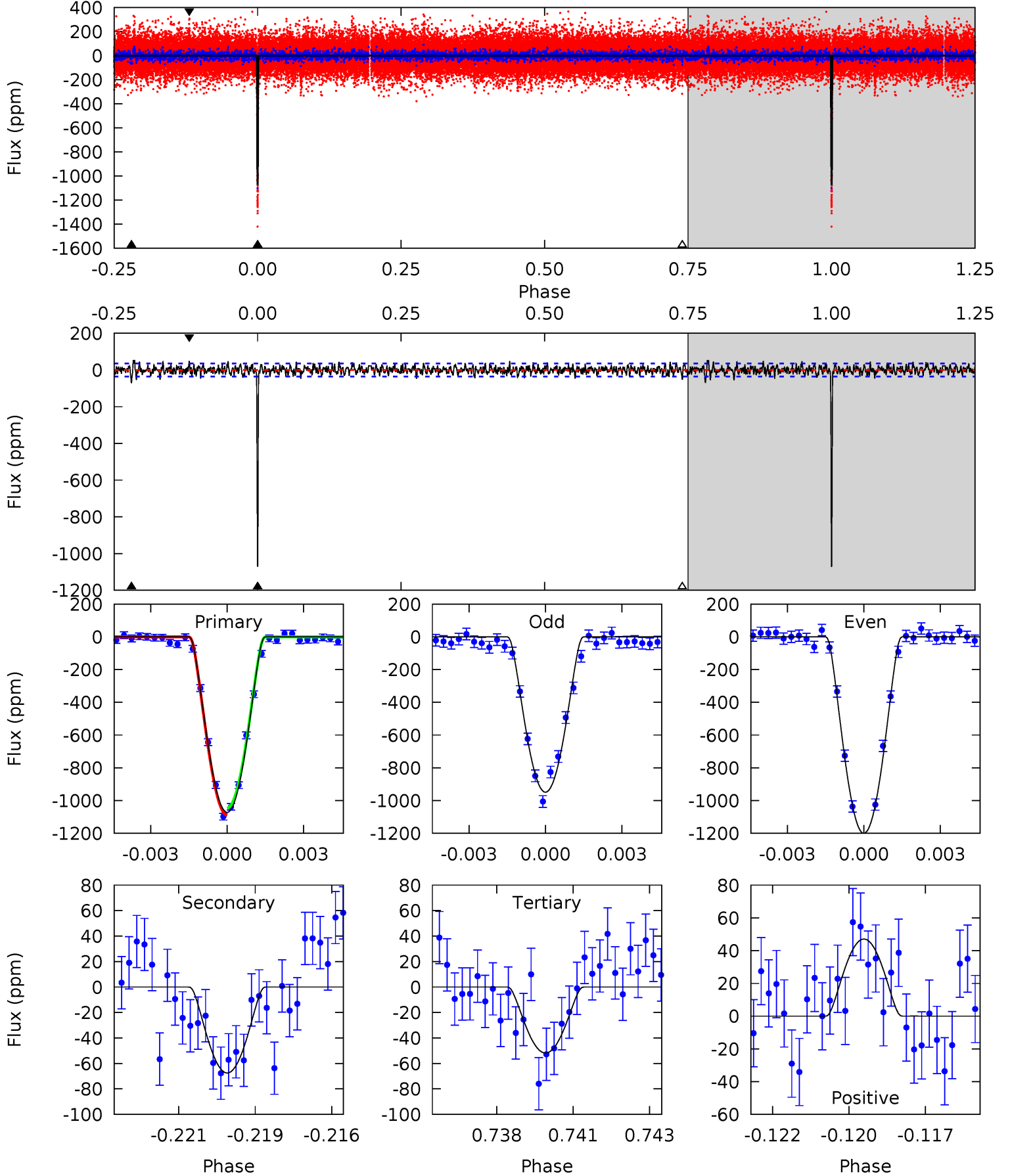
TCE 006933781-02 P=130.418910 Days  $T_0=204.237345$  (BKJD)



# DV Model-Shift Uniqueness Test

006933781-02, P = 130.418857 Days, E = 73.819705 Days

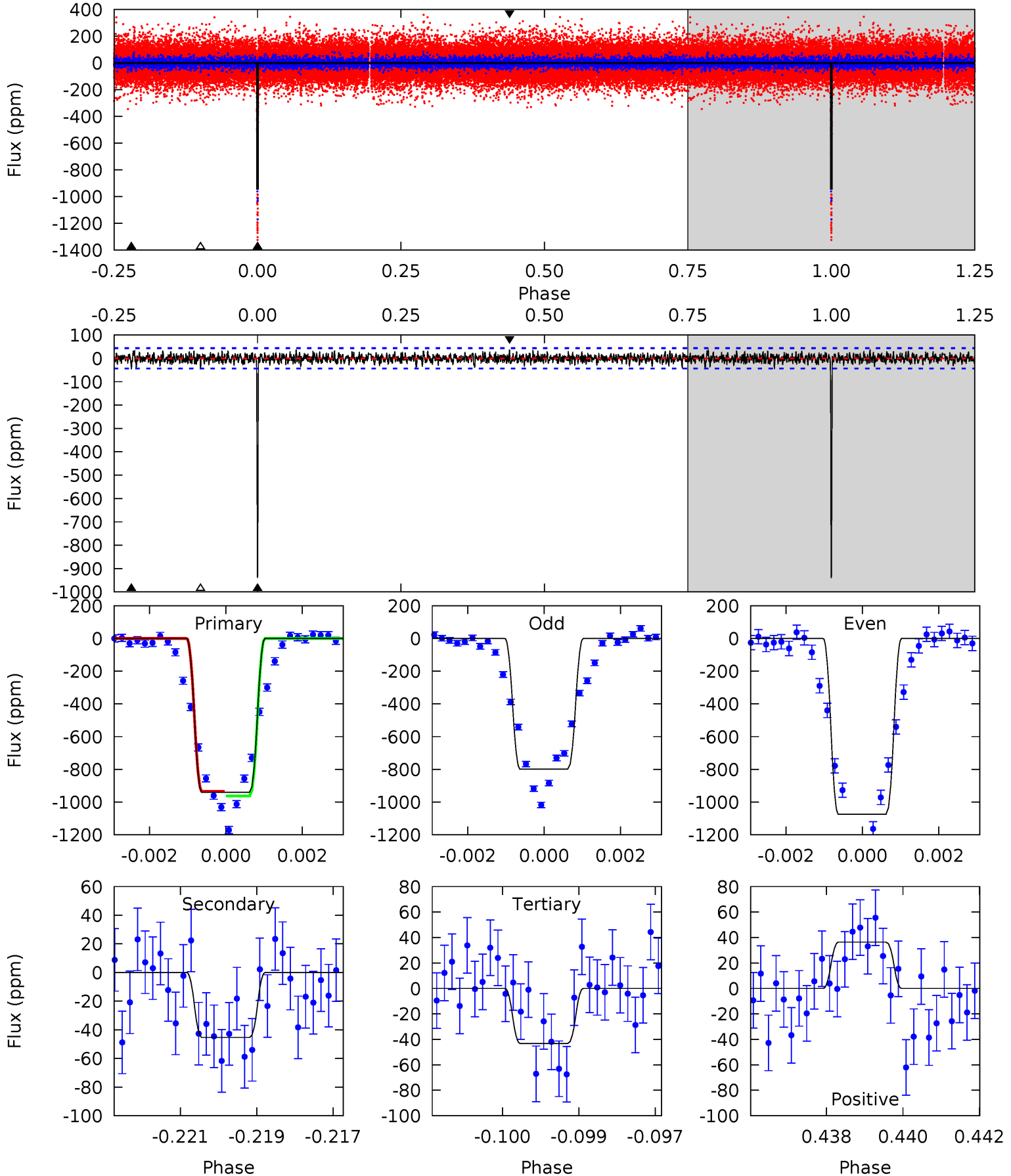
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
159.5	10.0	7.71	7.00	5.28	3.02	2.28	151.8	152.5	2.33	3.03	18.3	0.94	0.05	3.27



# Alt Model-Shift Uniqueness Test

006933781-02, P = 130.418910 Days, E = 73.818435 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
115.9	5.59	5.33	4.49	5.36	3.14	1.43	110.6	111.4	0.26	1.10	16.8	0.93	0.04	1.78





### Stellar Parameters For KIC 006933781

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5770^{+159}_{-130}$	$3.946^{+0.315}_{-0.135}$	$-0.460^{+0.350}_{-0.200}$	$1.685^{+0.368}_{-0.552}$	$0.915^{+0.134}_{-0.089}$	$0.270^{+0.580}_{-0.105}$
	+3%/-2%	+8%/-3%	+76%/-43%	+22%/-33%	+15%/-10%	+215%/-39%
Source	PHO1	FLK73	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 006933781-02 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-67 \pm 7$	$10.49^{+4.98}_{-4.74}$	$653^{+46}_{-56}$	$2887^{+477}_{-264}$	$84^{+178}_{-45}$
Alt.	$-45 \pm 8$	$6.50^{+4.26}_{-3.86}$	$653^{+44}_{-56}$	$3086^{+1004}_{-393}$	$137^{+781}_{-86}$

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

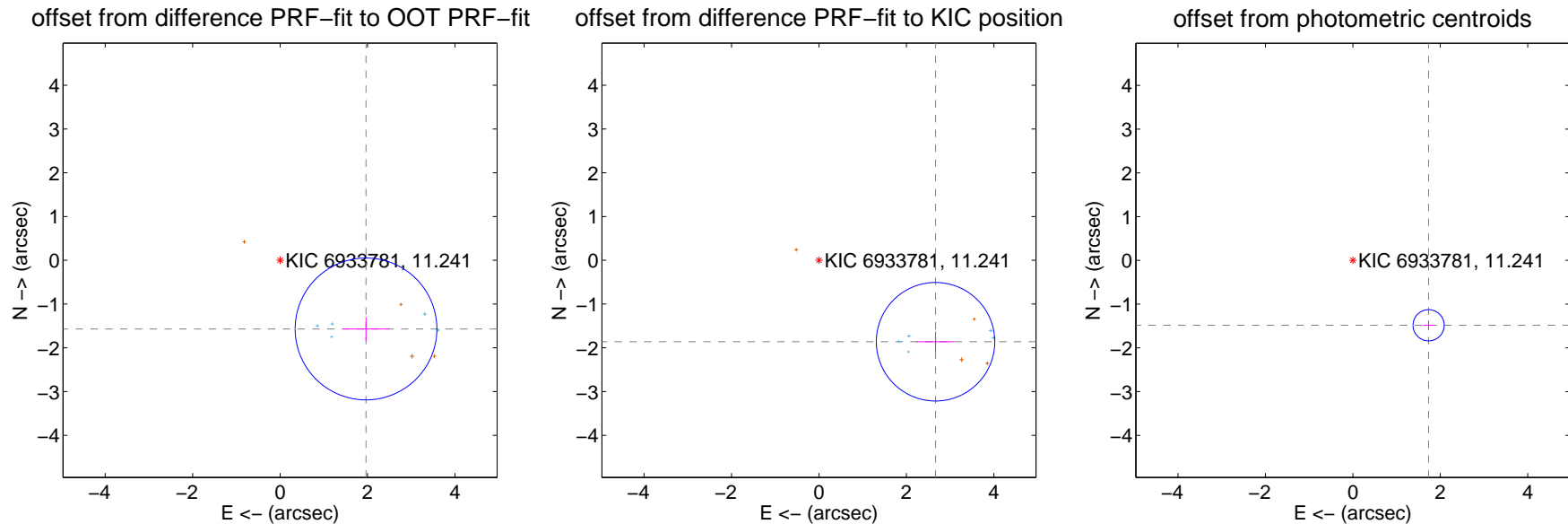
## DV Centroid Data

Supplemental centroid analysis for 006933781-02. **Kepler magnitude: 11.24.** Transit SNR 75.08

There are 5 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.86 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	<b><math>2.515 \pm 0.540</math></b>	<b>4.65</b>	$-1.965 \pm 0.534$	$-1.569 \pm 0.269$
PRF-fit source offset from KIC position	<b><math>3.251 \pm 0.452</math></b>	<b>7.20</b>	$-2.666 \pm 0.434$	$-1.861 \pm 0.232$
photometric centroid source offset	<b><math>2.28 \pm 0.12</math></b>	<b>19.19</b>	$-1.73 \pm 0.12$	$-1.48 \pm 0.11$



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.

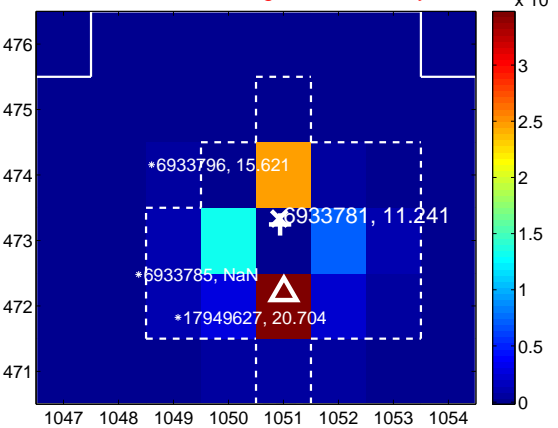
Q1 no difference image



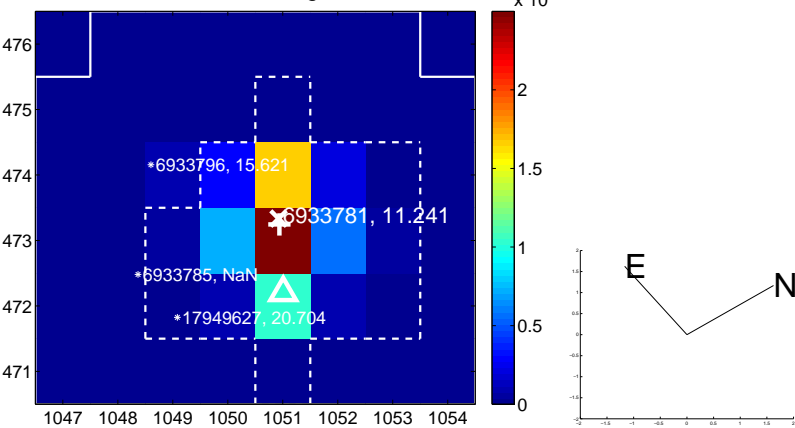
Q1 no OOT image



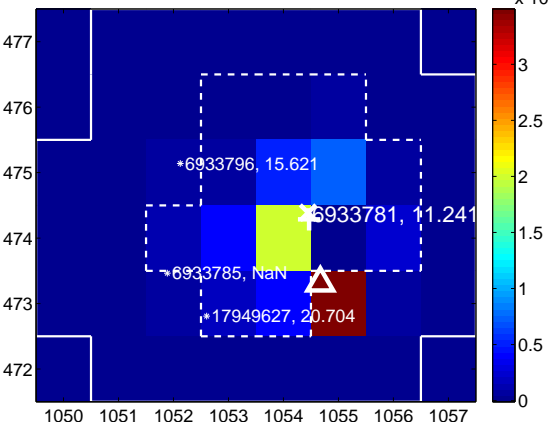
Q2 difference image. Poor Quality



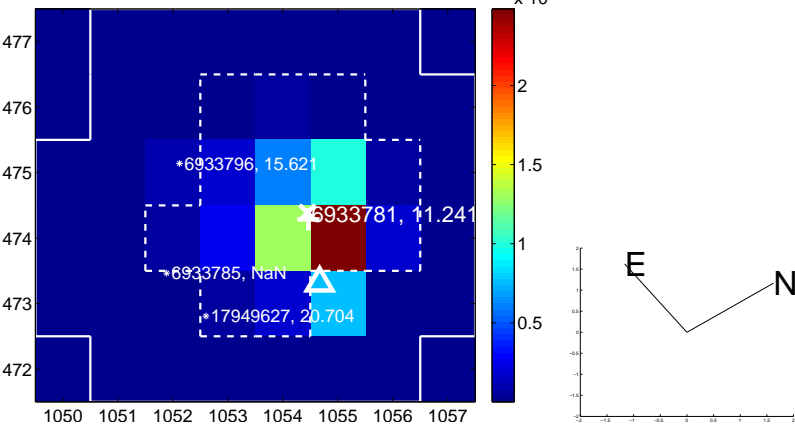
Q2 OOT image



Q3 difference image



Q3 OOT image



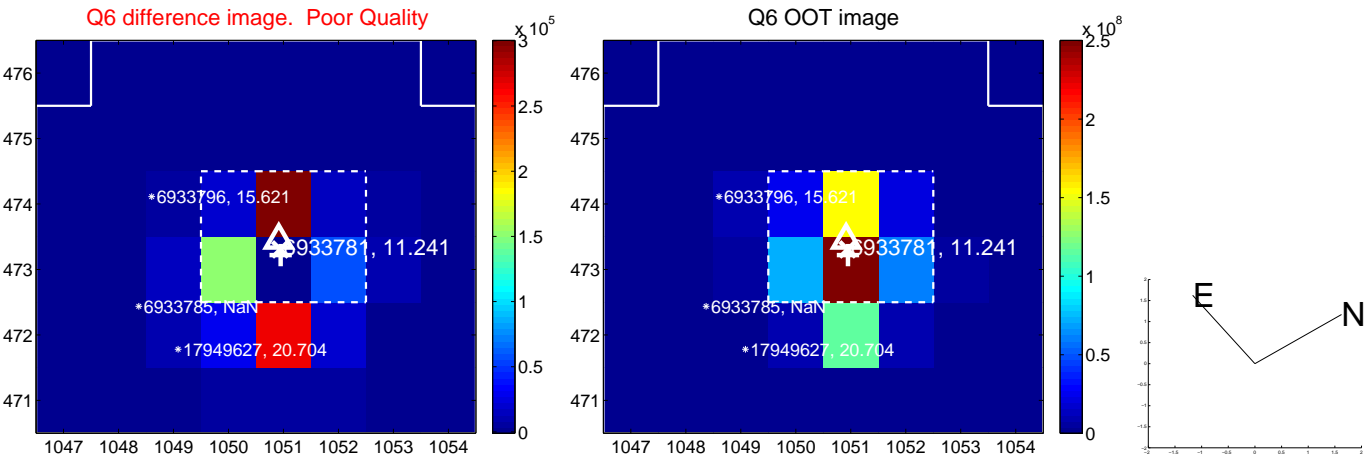
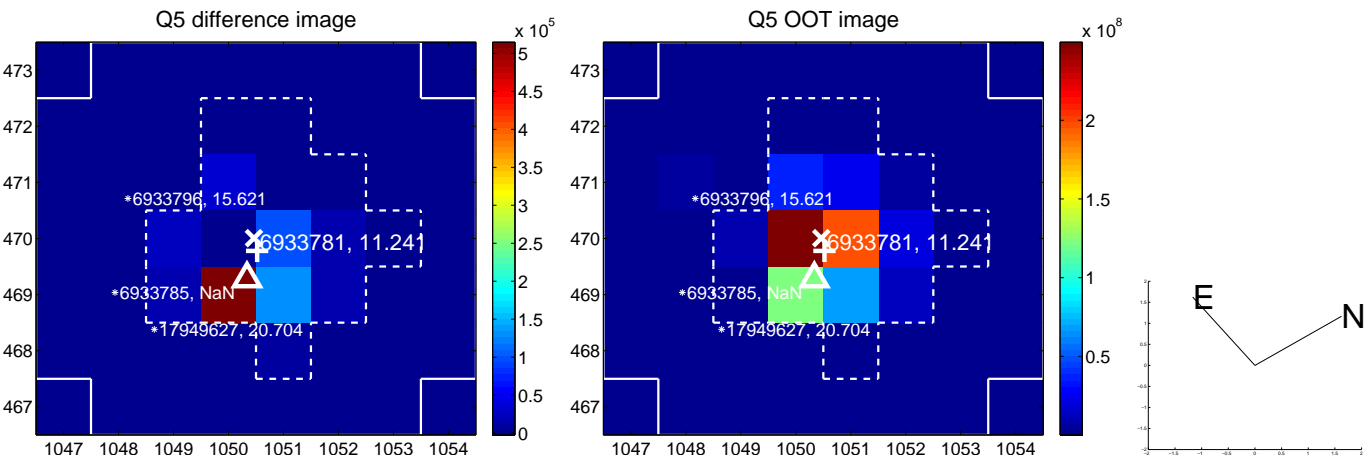
Q4 no difference image



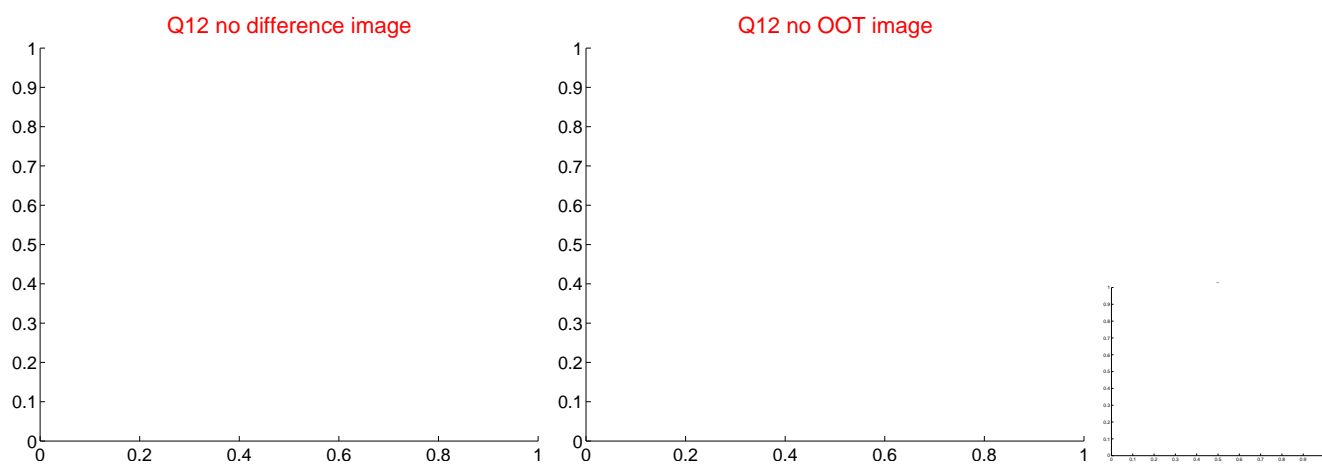
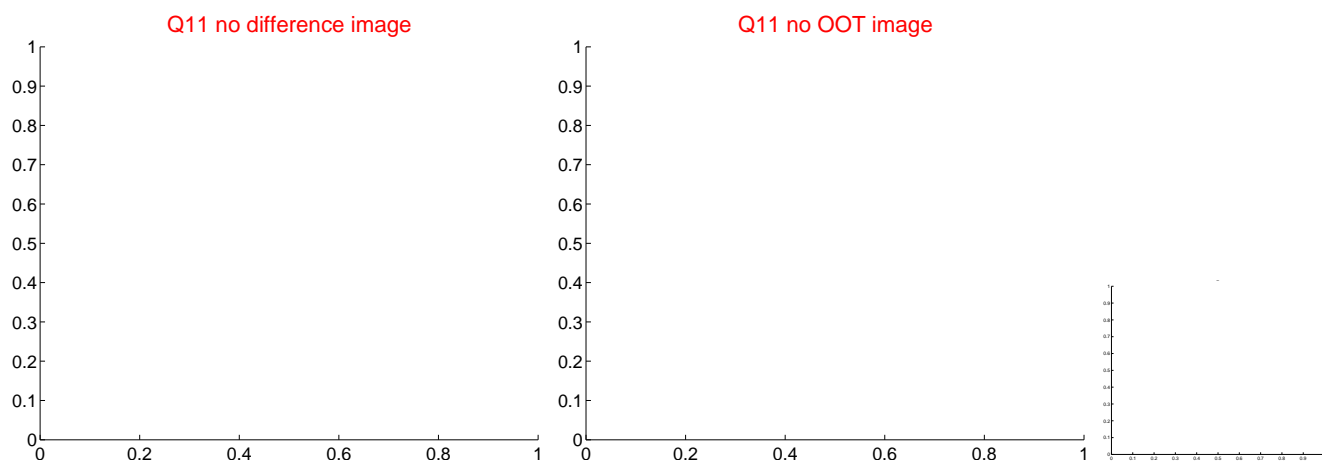
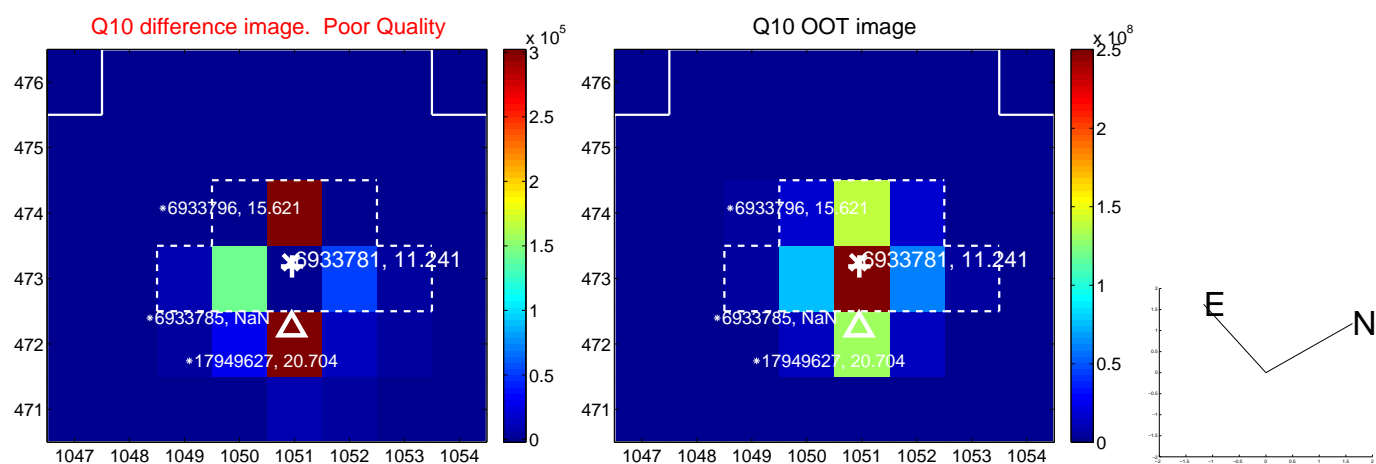
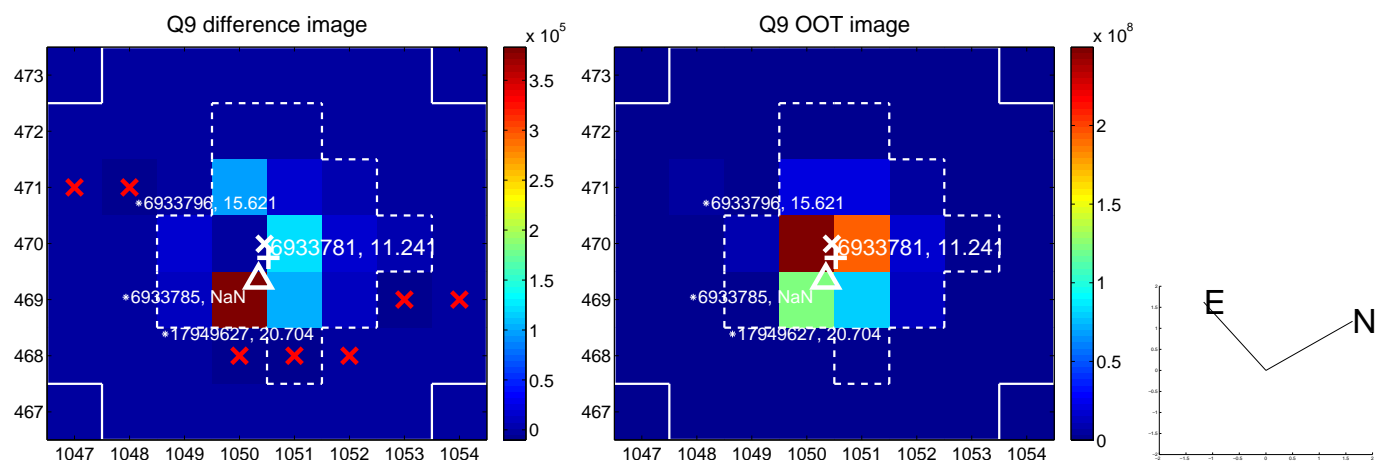
Q4 no OOT image



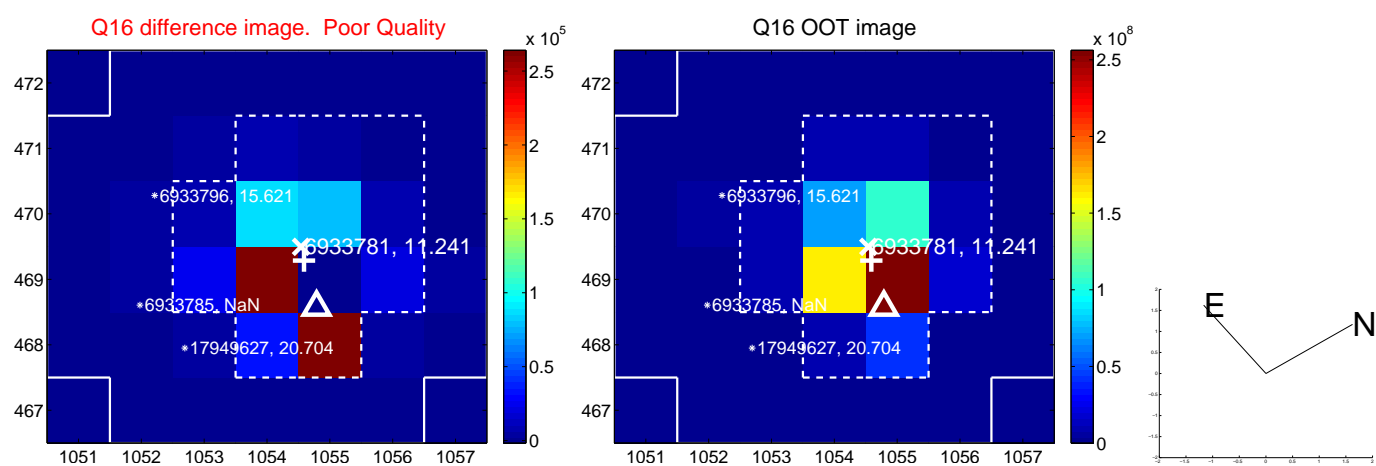
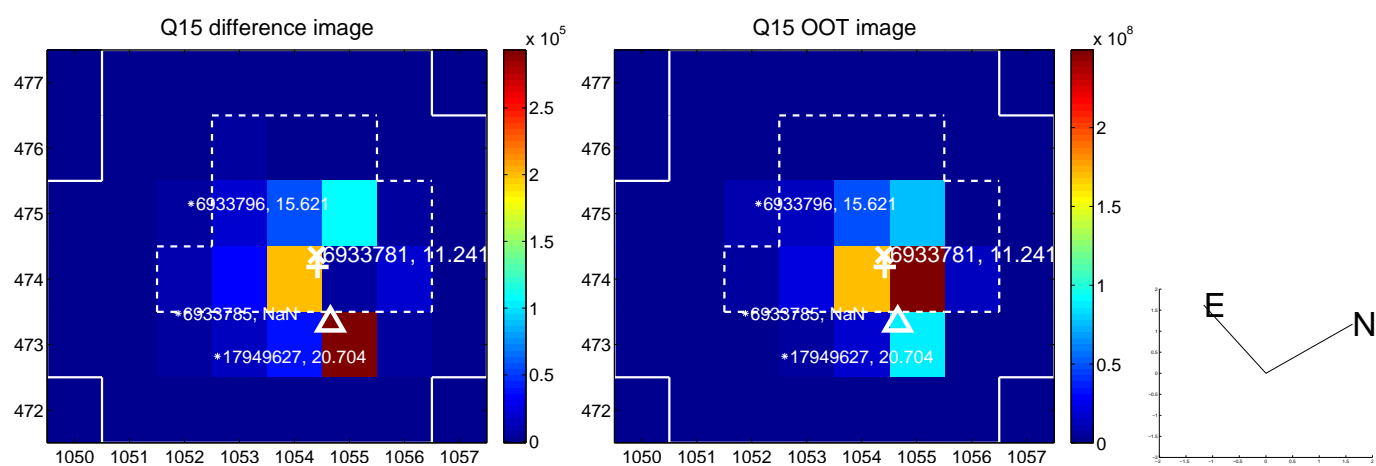
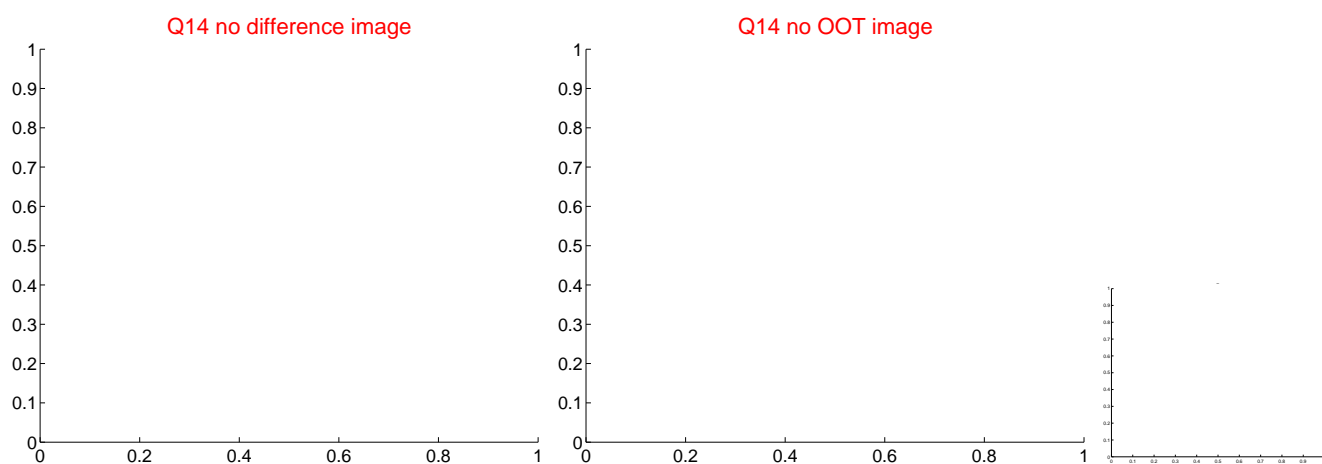
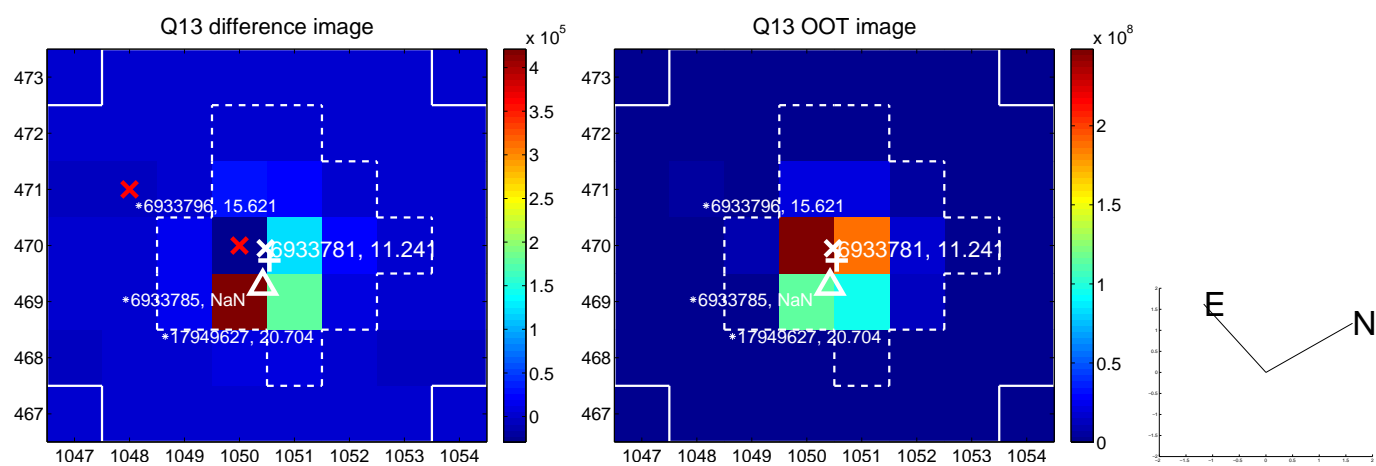
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



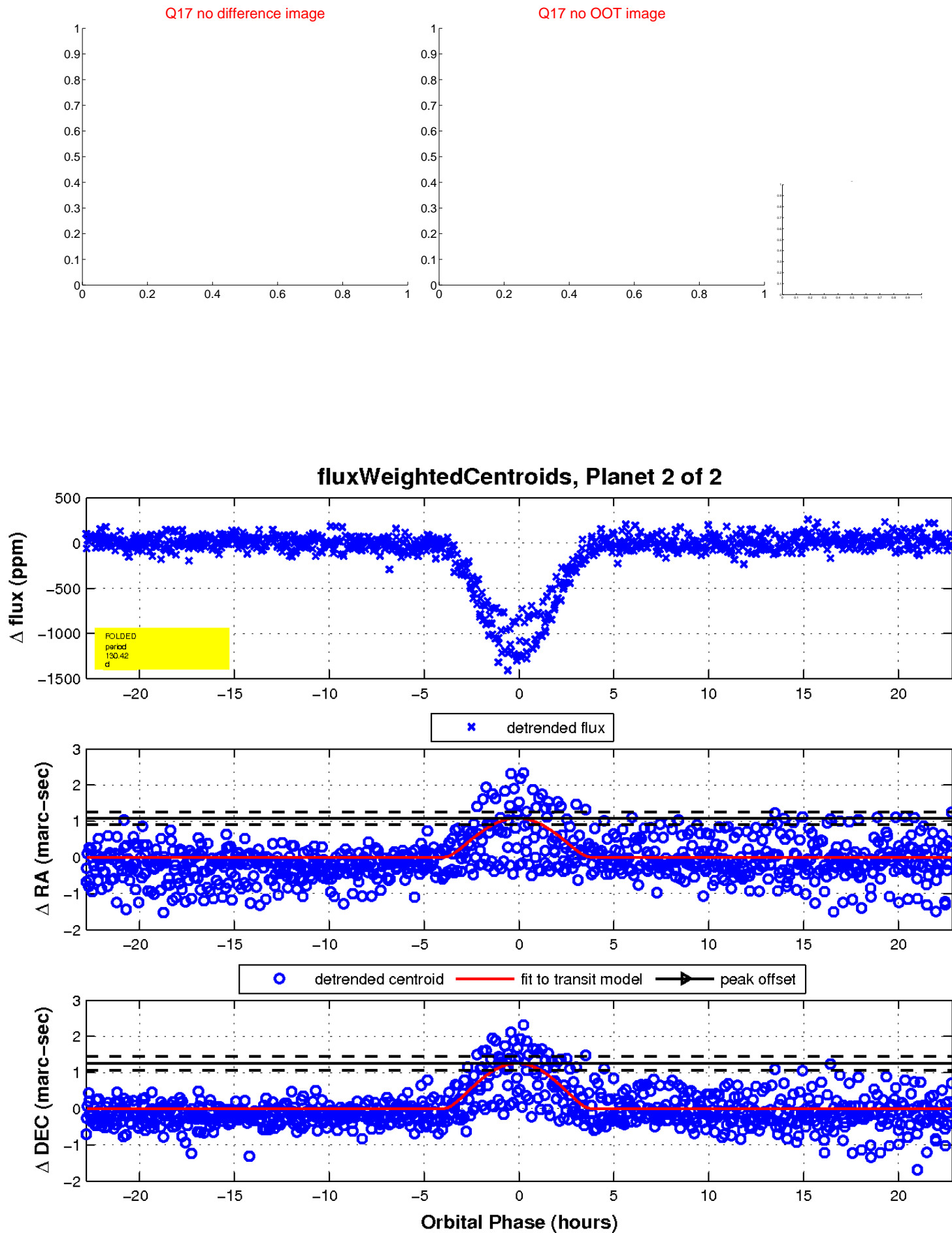
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



white  $\times$ : 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

