

# KIC 009053086

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009053086-01	OBS	3751.01	1.274828	131.634580	40305.1	2.508	2156.5	1429.9	1.28	6211	27.89	3980.81
009053086-02	OBS	No	1.274844	132.254744	13032.3	1.500	775.7	-1.0	1.28	6211	14.72	3980.74

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009053086-01	OBS	FP	0.00	0	1	0	0	SWEET_EB—MOD_SEC_DV—MOD_SEC_ALT—MOD_ODDEVEN_DV—HAS_SEC_TCE
009053086-02	OBS	FP	0.00	1	1	0	0	IS_SEC_TCE—CENT_NOFITS

**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.

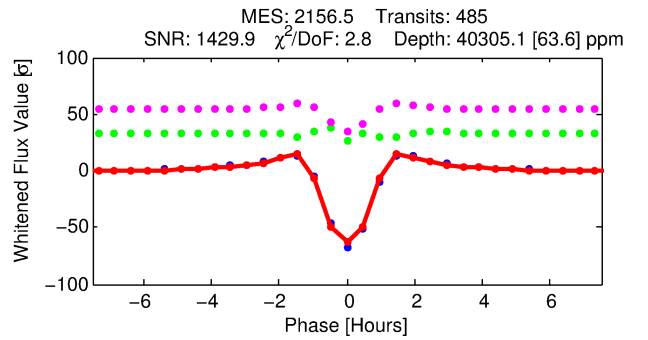
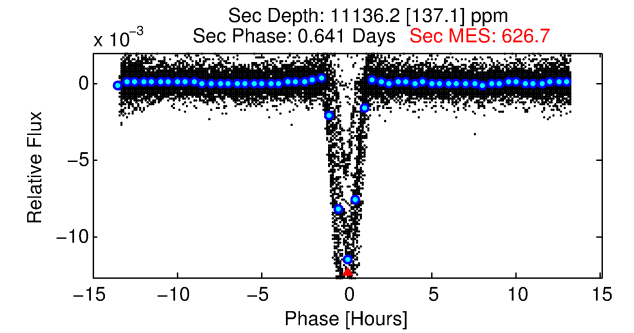
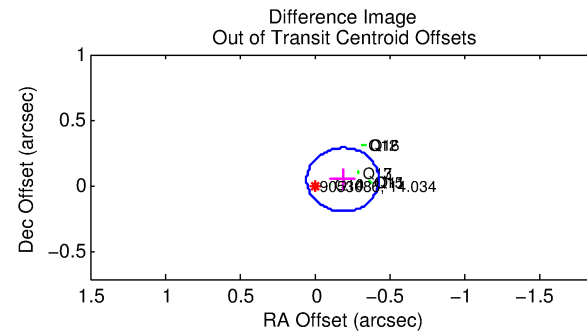
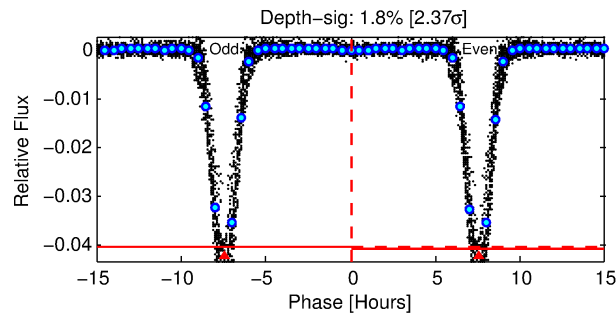
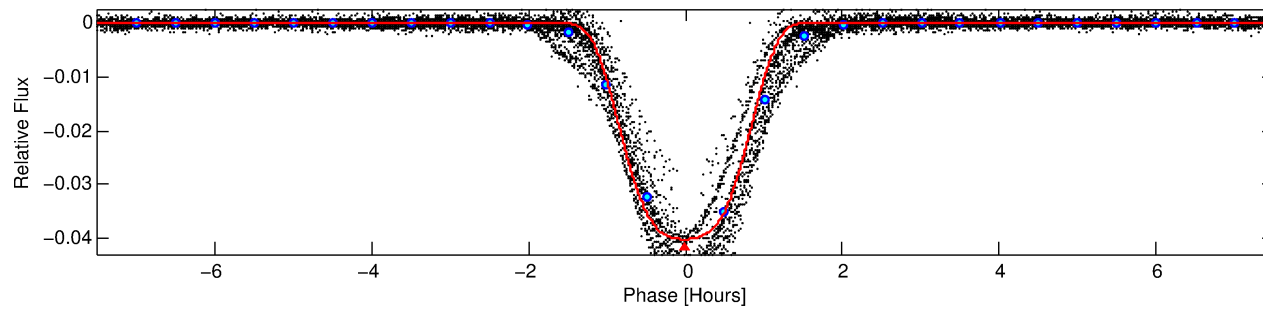
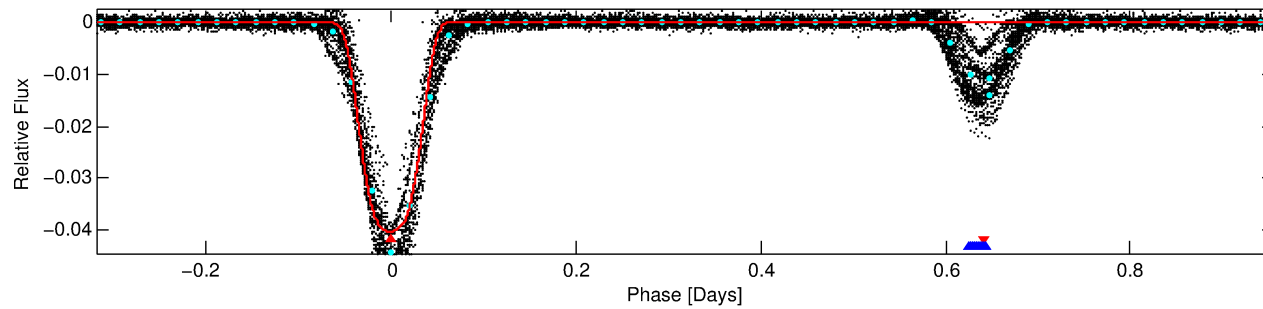
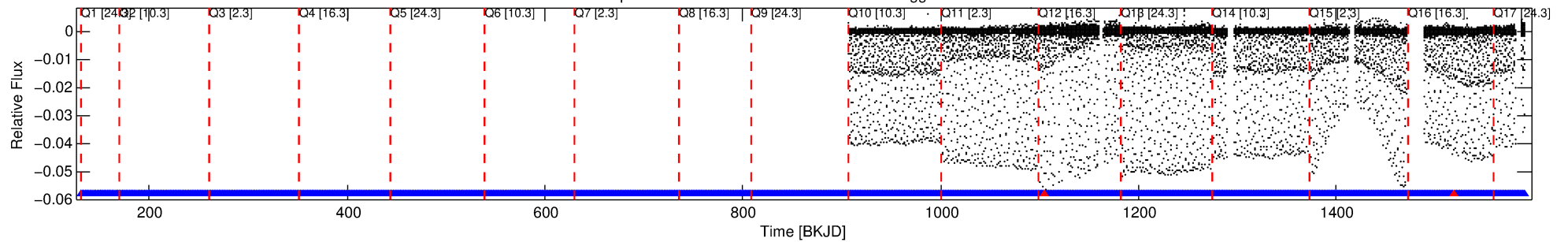
## Ephemeris Match Information For 009053086-01

No Significant Match Found

# DV One-Page Summary

KIC: 9053086 Candidate: 1 of 2 Period: 1.275 d  
KOI: K03751.01 Corr: 0.957

Kp: 14.03 R\*: 1.28 Rs Teff: 6211.0 K Logg: 4.25 Fe/H: -0.160



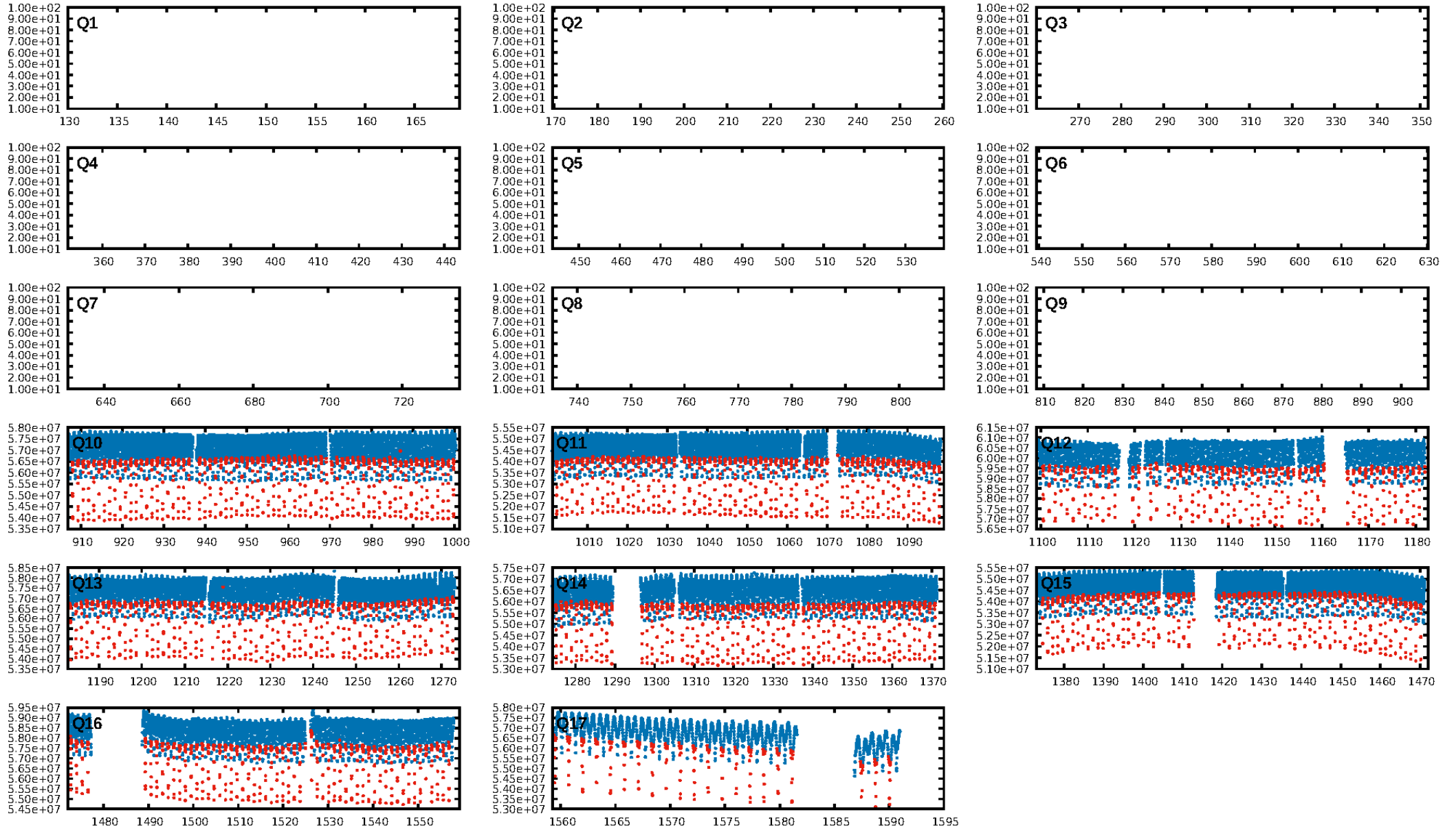
## DV Fit Results:

Period = 1.27483 [0.00000] d  
Epoch = 131.6346 [0.0000] BKJD  
Rp/R\* = 0.1995 [0.0002]  
a/R\* = 3.85 [0.01]  
b = 0.71 [0.00]  
Seff = 3980.81 [1527.36]  
Teff = 2025 [194] K  
Rp = 27.89 [8.62] Re  
a = 0.0234 [0.0059] AU  
Ag = 4.33 [1.52] [2.19σ]  
Teffp = 4517 [176] K [9.51σ]

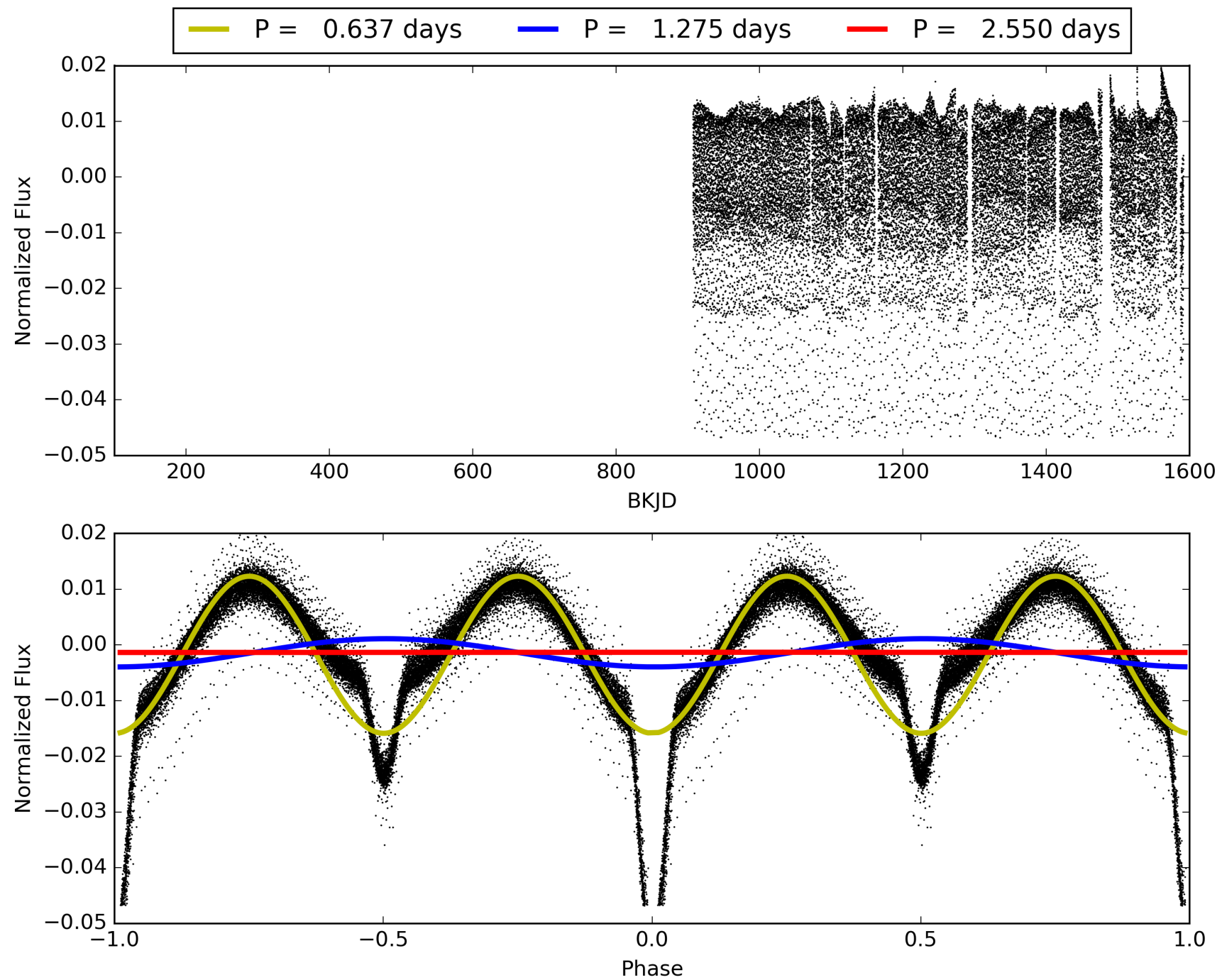
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.0% [0.00σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [462/464]  
GhostDiagnostic-chr: 1.441  
Centroid-sig: N/A  
Centroid-so: 0.787 arcsec [306.47σ]  
OotOffset-rm: 0.197 arcsec [2.45σ]  
KicOffset-rm: 0.302 arcsec [3.51σ]  
OotOffset-st: 2/2/2/2 [8]  
KicOffset-st: 2/2/2/2 [8]  
DiffImageQuality-fgm: 1.00 [8/8]  
DiffImageOverlap-fno: 1.00 [8/8]

# TCE 009053086-01, PDC Light Curves

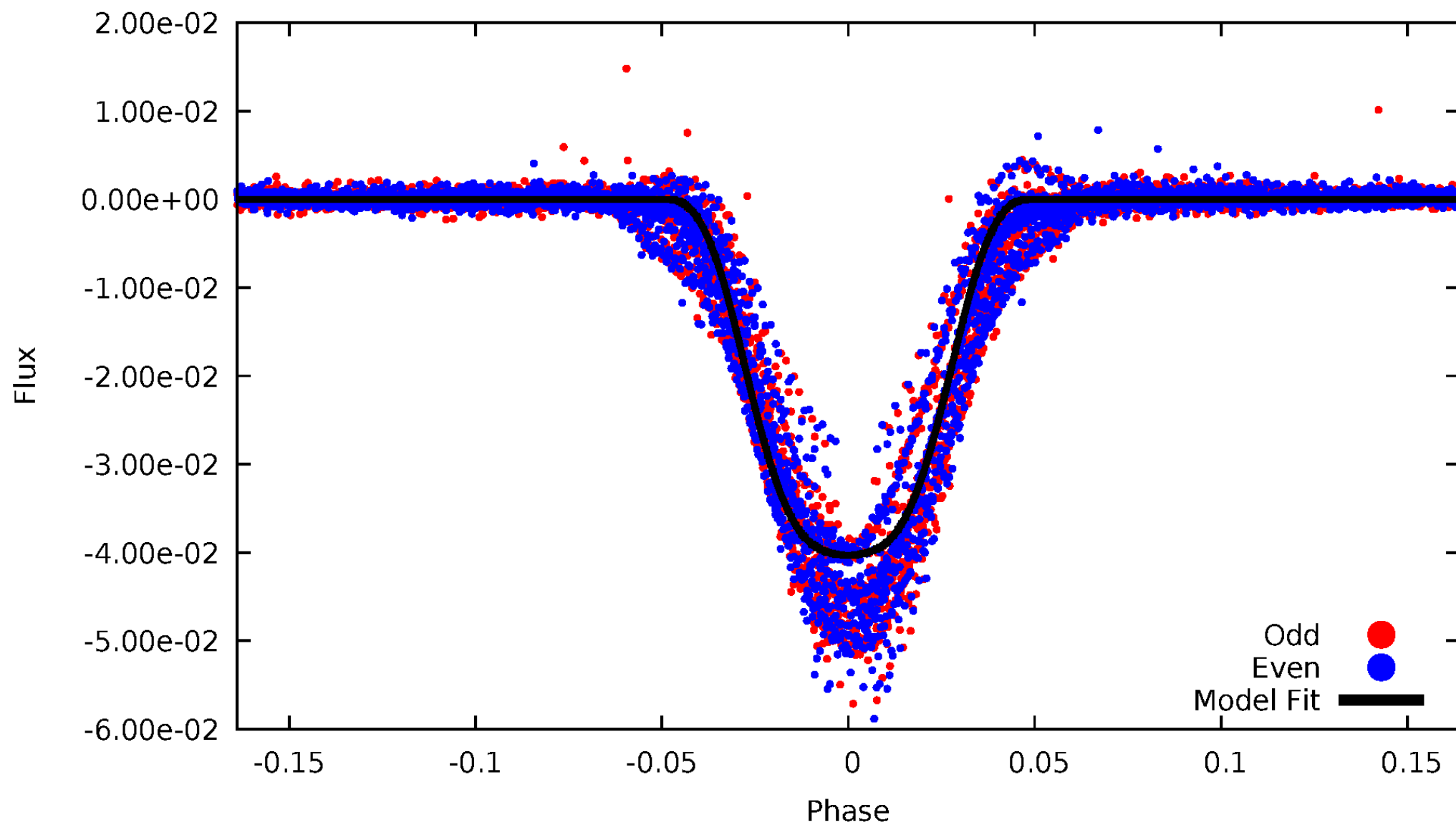


TCE 009053086-01



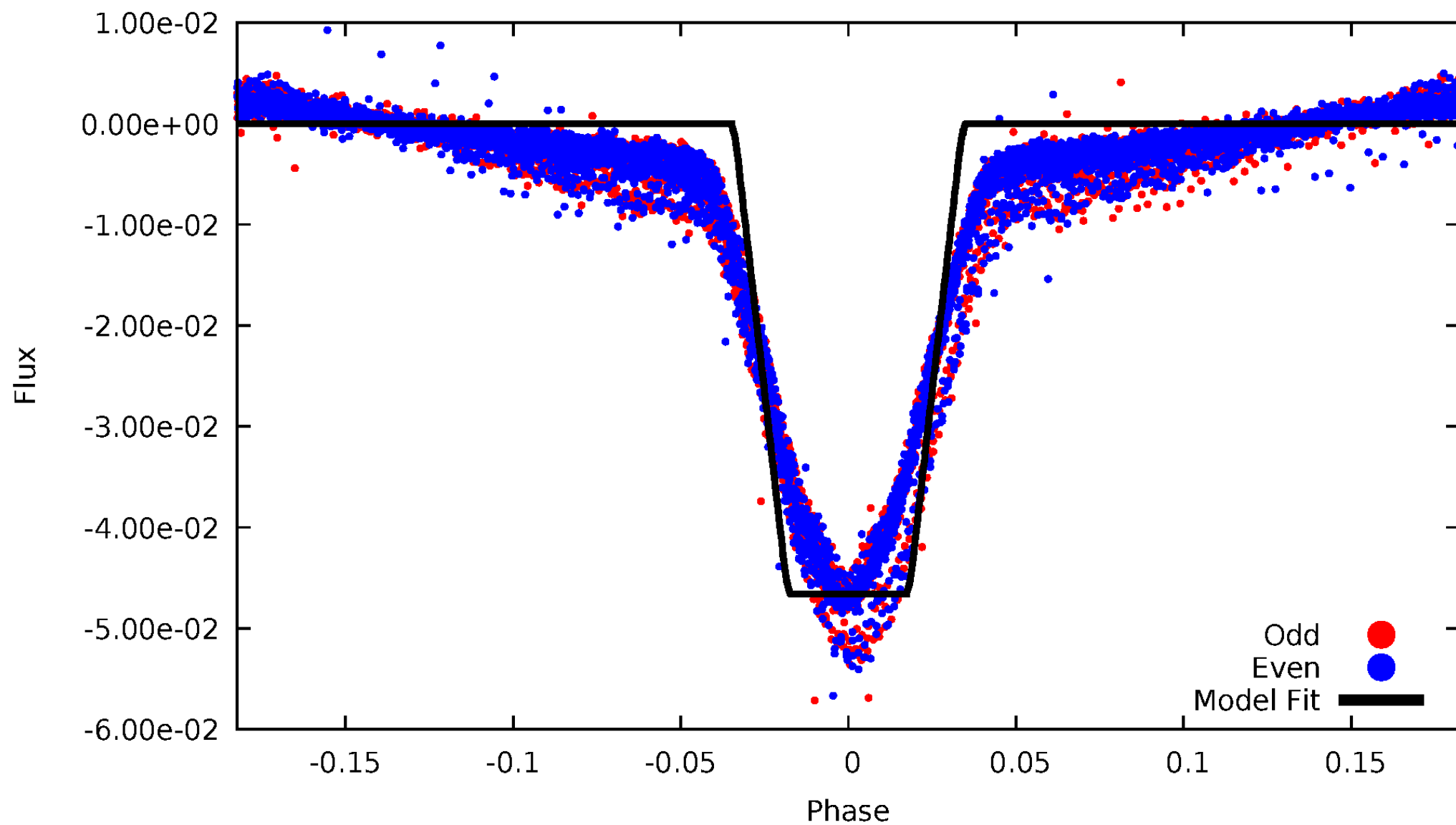
# DV Odd/Even

TCE 009053086-01



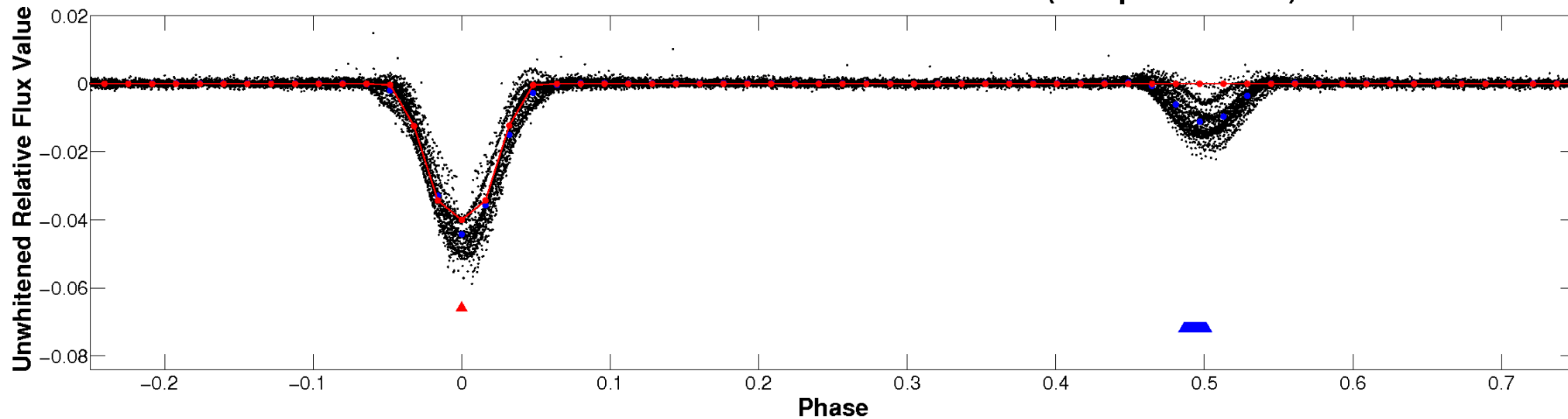
# ALT Odd/Even

TCE 009053086-01

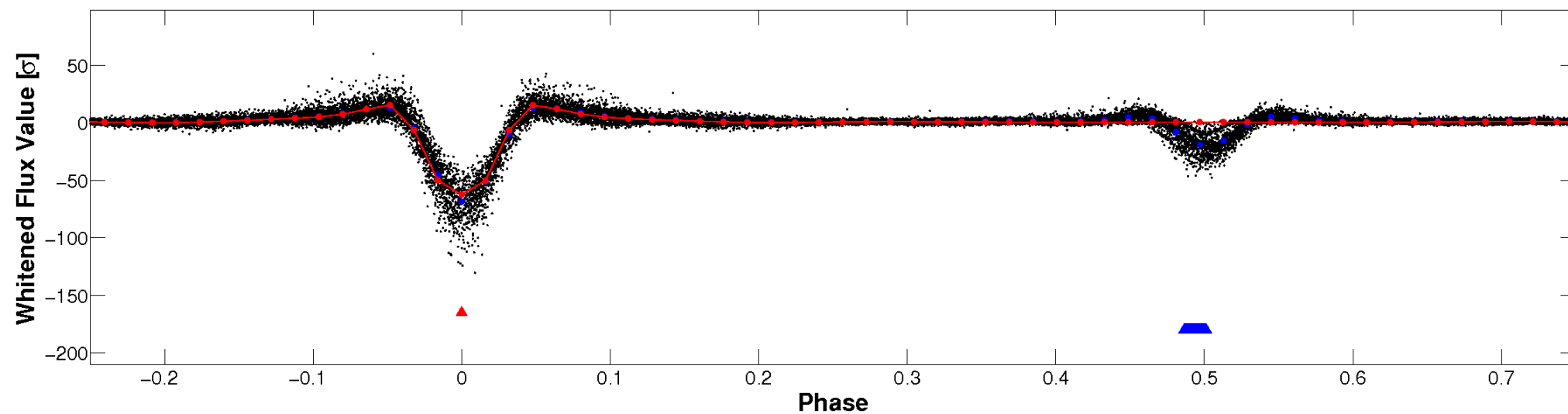


# Non-Whitened Vs. Whitened Light Curve

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

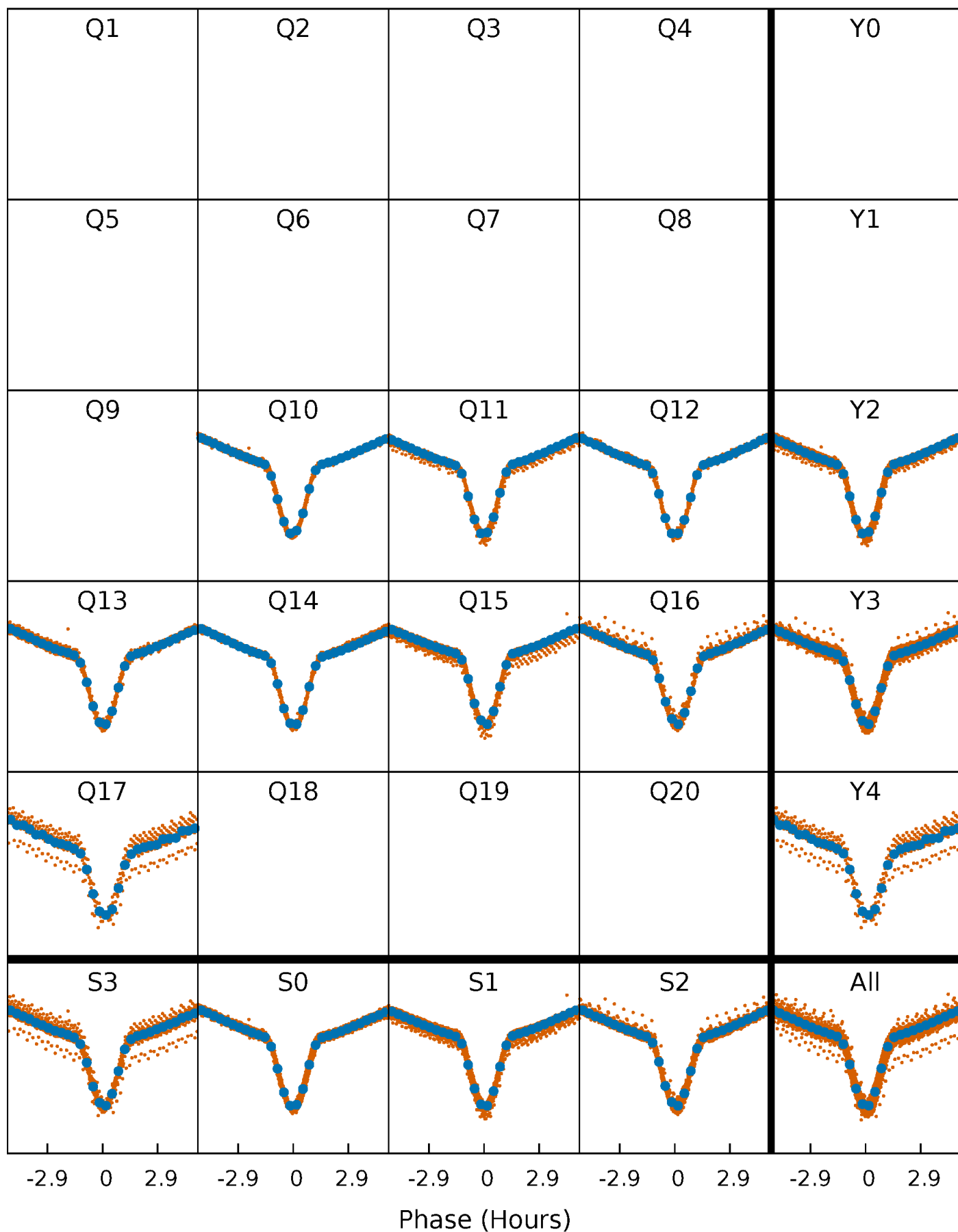


## Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

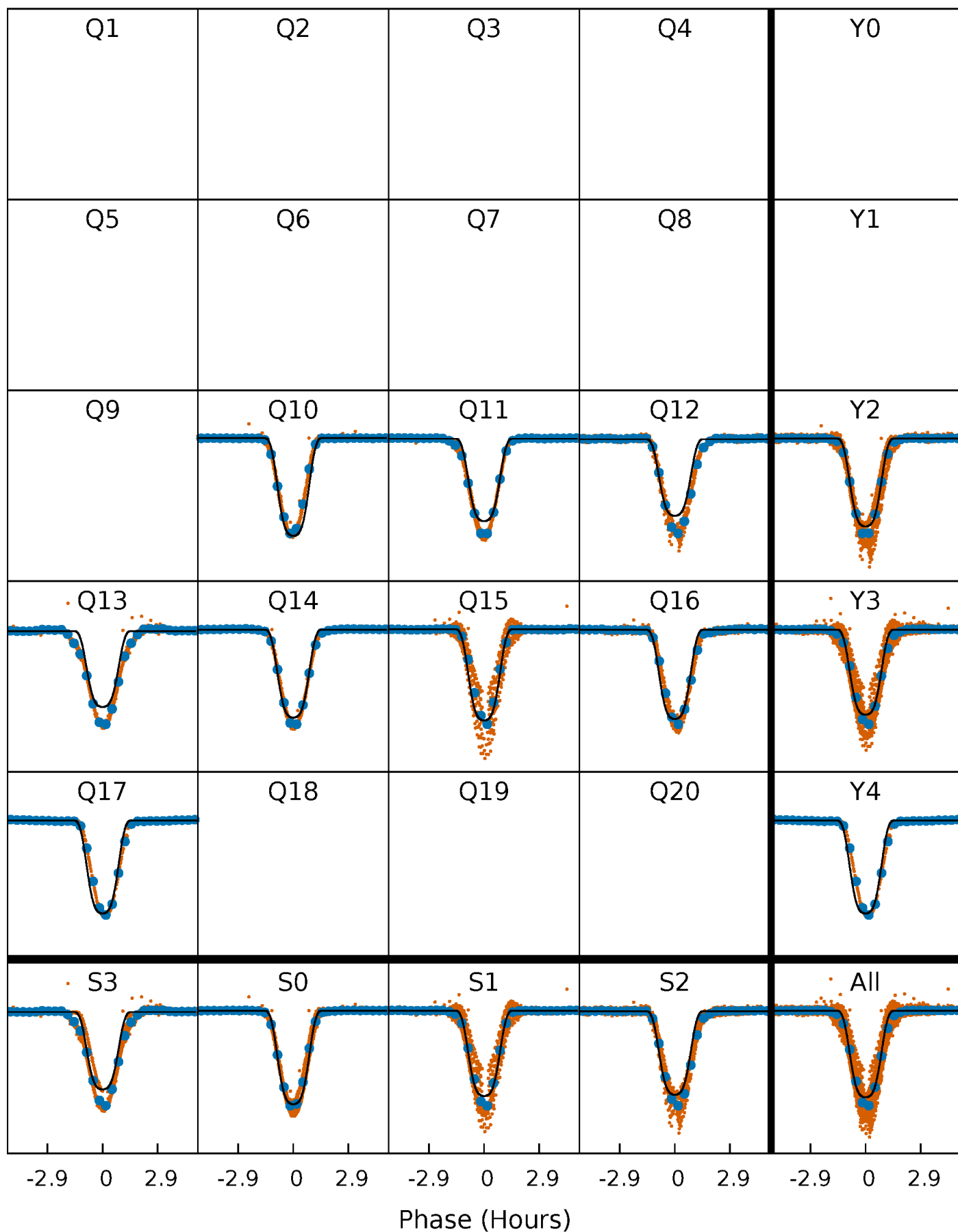
TCE 009053086-01 P= 1.274828 Days  $T_0=131.634580$  (BKJD)





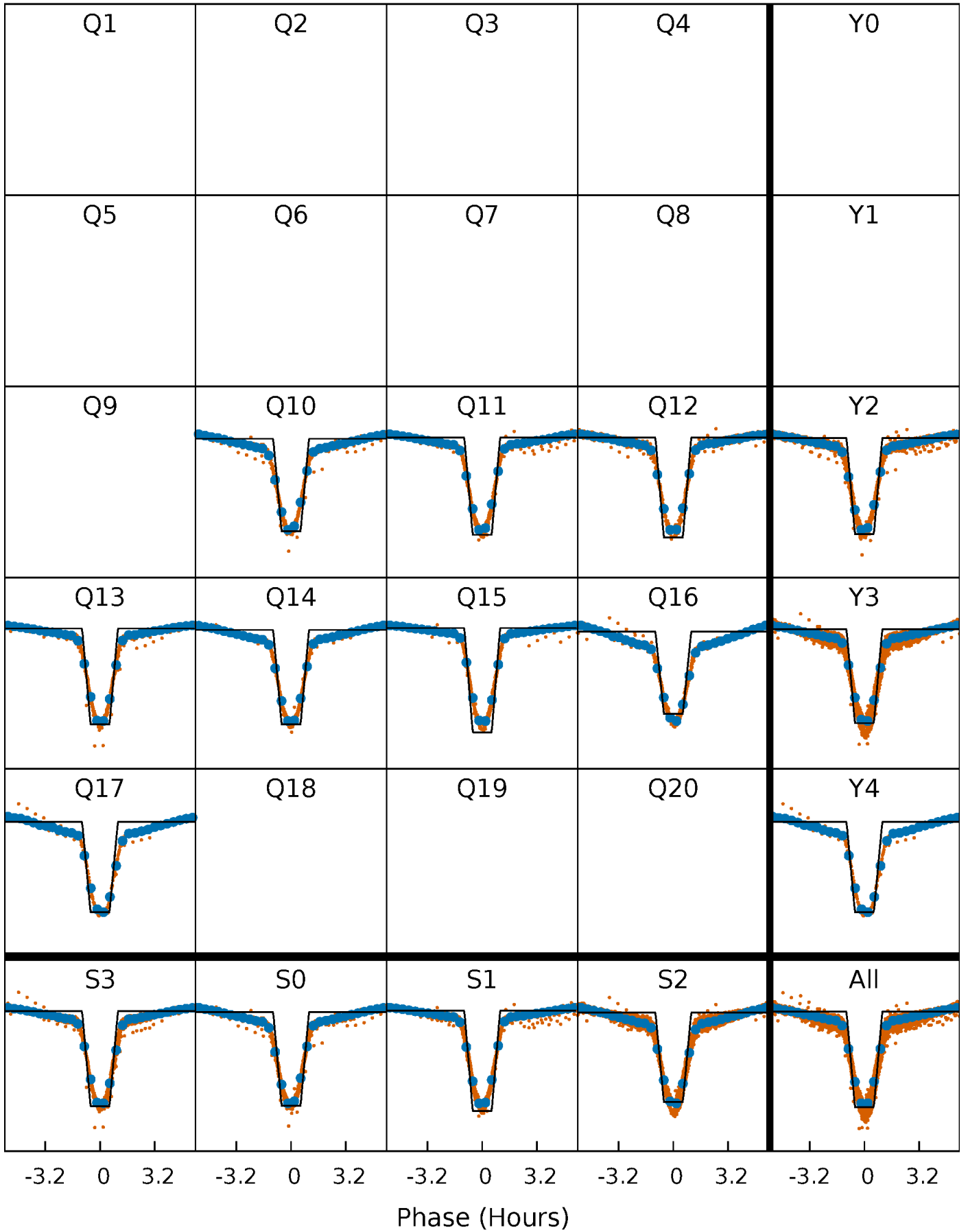
# DV Quarter-Phased Transit Curves

TCE 009053086-01 P= 1.274828 Days  $T_0=131.634580$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

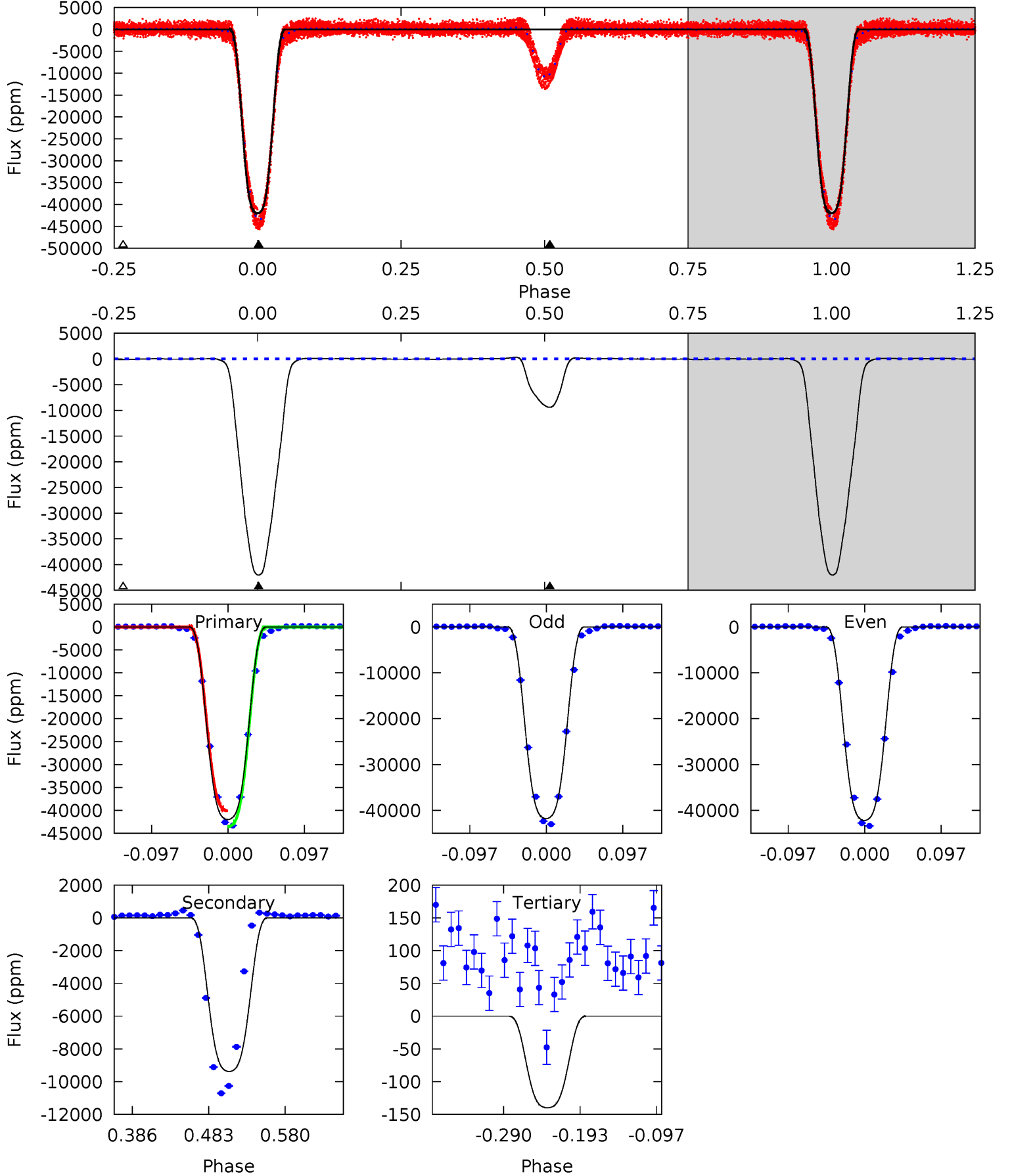
TCE 009053086-01   P= 1.274833 Days    $T_0=131.630856$  (BKJD)



# DV Model-Shift Uniqueness Test

009053086-01, P = 1.274828 Days, E = 131.634580 Days

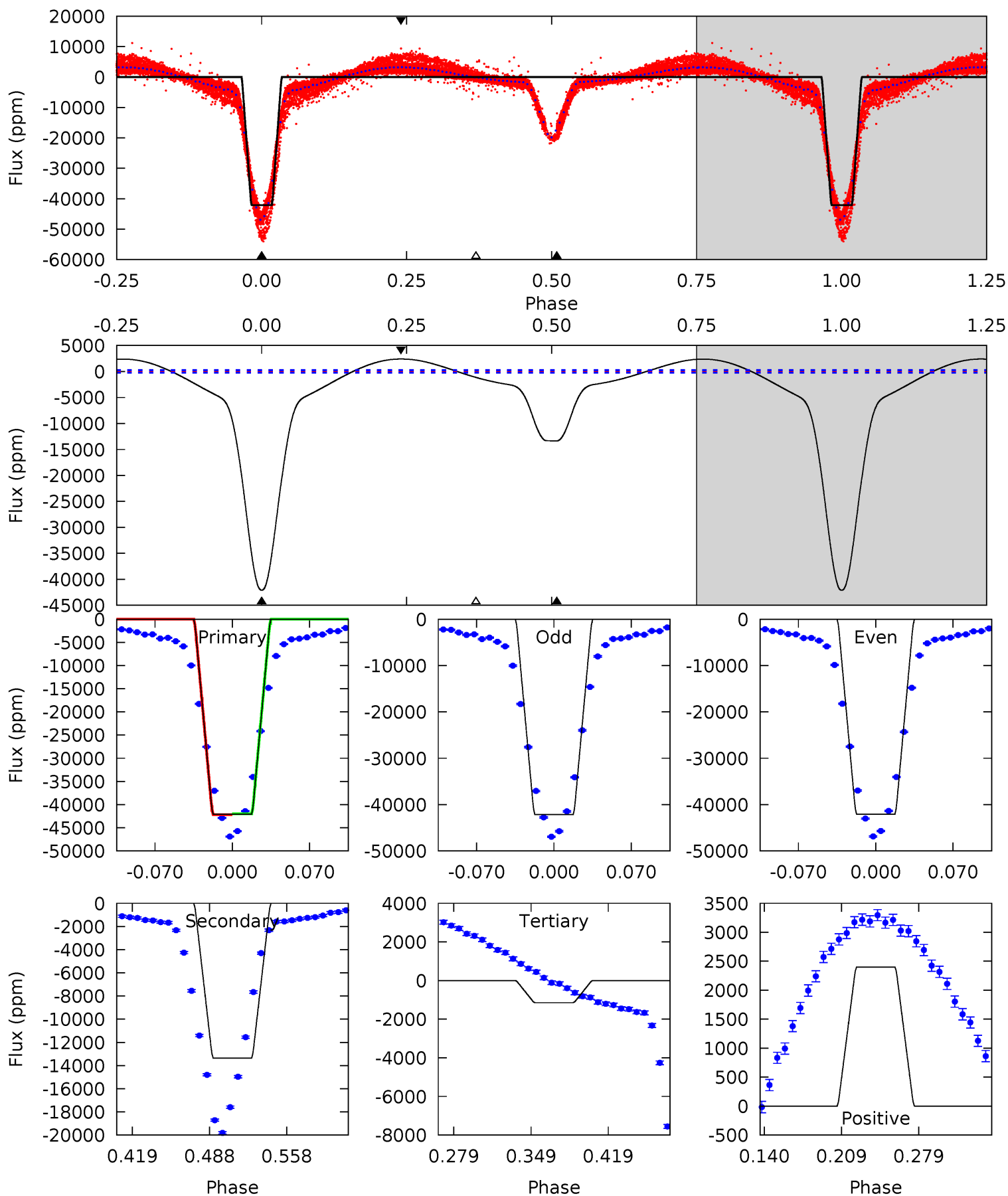
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
2743	612.4	9.13	0	4.57	1.66	3.55	2734	2743	603.3	612.4	12.9	0.99	0.01	0



# Alt Model-Shift Uniqueness Test

009053086-01, P = 1.274833 Days, E = 131.630856 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
800.8	254.2	21.7	45.7	4.64	1.81	39.0	779.1	755.2	232.5	208.5	0.91	1.01	0.05	1.51



### Stellar Parameters For KIC 009053086

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6211^{+197}_{-241}$	$4.247^{+0.185}_{-0.185}$	$-0.160^{+0.250}_{-0.300}$	$1.281^{+0.396}_{-0.264}$	$1.055^{+0.169}_{-0.139}$	$0.707^{+0.661}_{-0.339}$
	+3%/-4%	+4%/-4%	+156%/-188%	+31%/-21%	+16%/-13%	+94%/-48%
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 009053086-01 / KOI 3751.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-9383 \pm 15$	$27.70^{+4.87}_{-3.35}$	$2821^{+228}_{-197}$	$4432^{+116}_{-132}$	$3.711^{+0.988}_{-0.931}$
Alt.	$-13364 \pm 53$	$30.06^{+5.17}_{-3.64}$	$2813^{+243}_{-195}$	$4625^{+127}_{-134}$	$4.528^{+1.112}_{-1.150}$

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

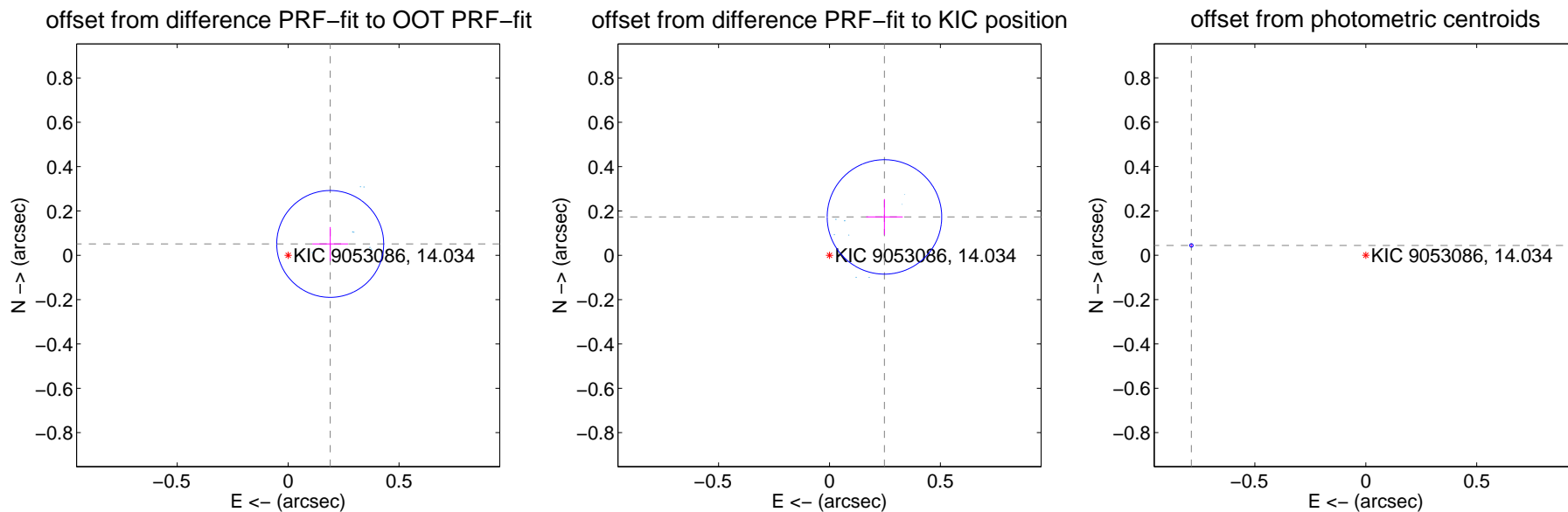
## DV Centroid Data

Supplemental centroid analysis for 009053086-01. Kepler magnitude: 14.03. Transit SNR 1429.94

There are 8 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.23 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.197 \pm 0.080$	2.45	$-0.190 \pm 0.081$	$0.051 \pm 0.077$
PRF-fit source offset from KIC position	$0.302 \pm 0.086$	3.51	$-0.248 \pm 0.082$	$0.173 \pm 0.081$
photometric centroid source offset	$0.79 \pm 0.00$	306.47	$0.79 \pm 0.00$	$0.04 \pm 0.00$



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.

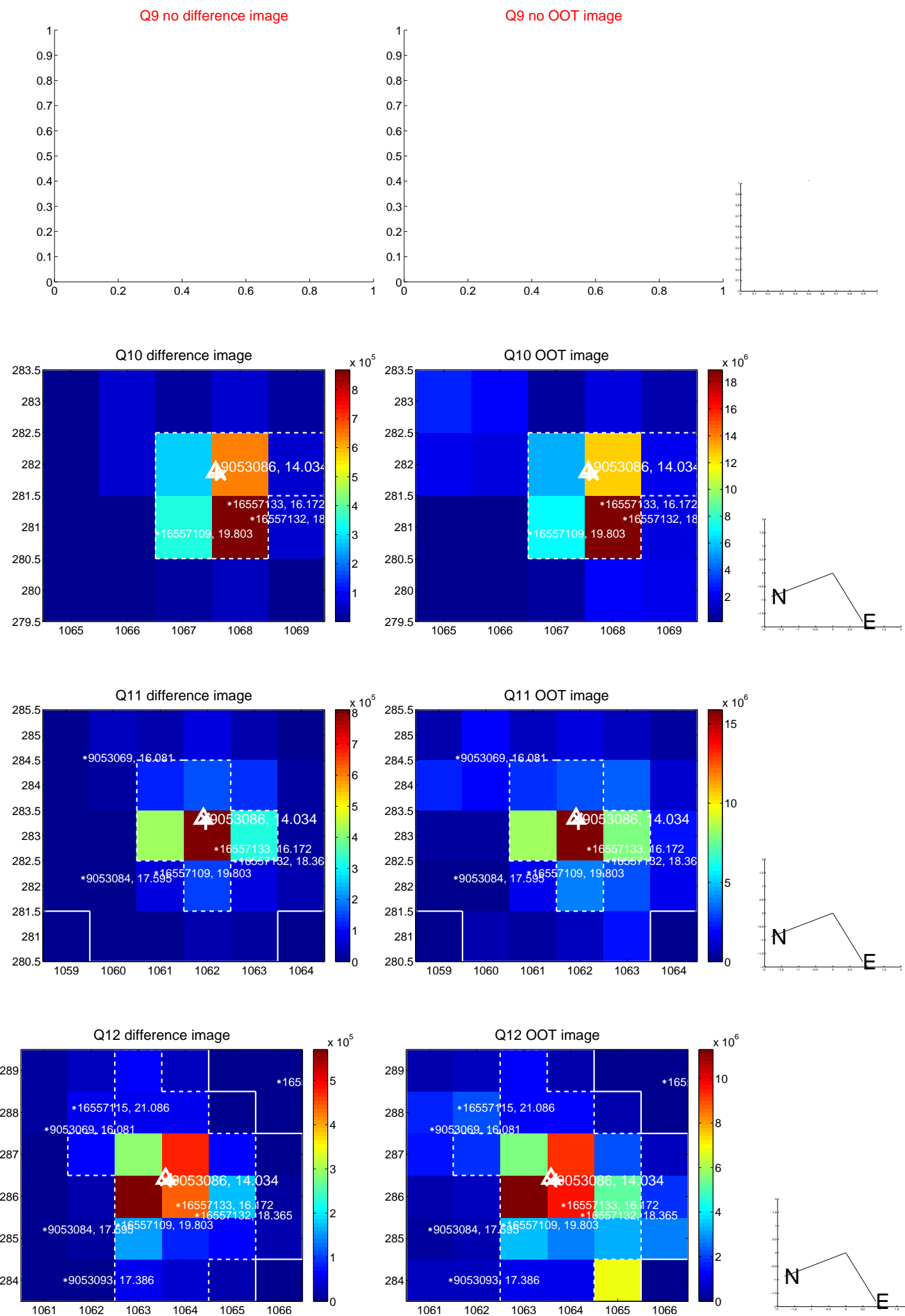


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

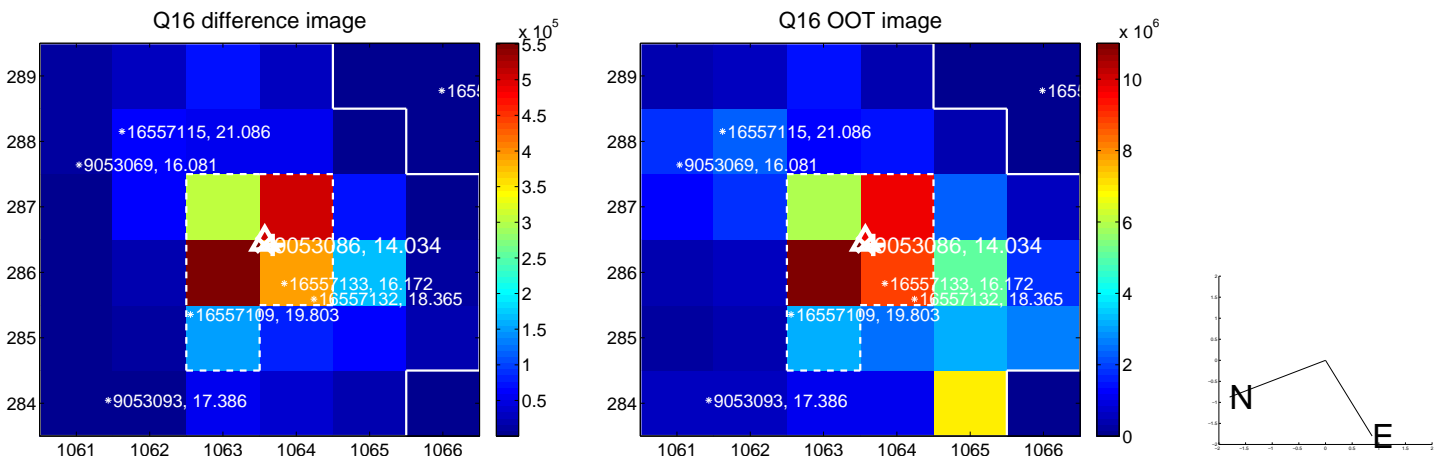
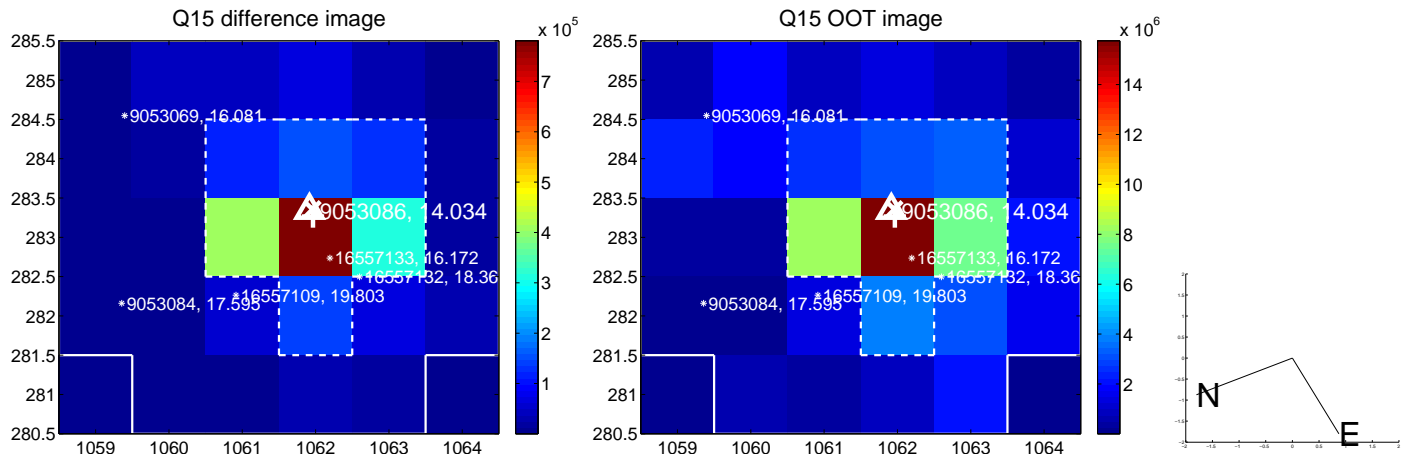
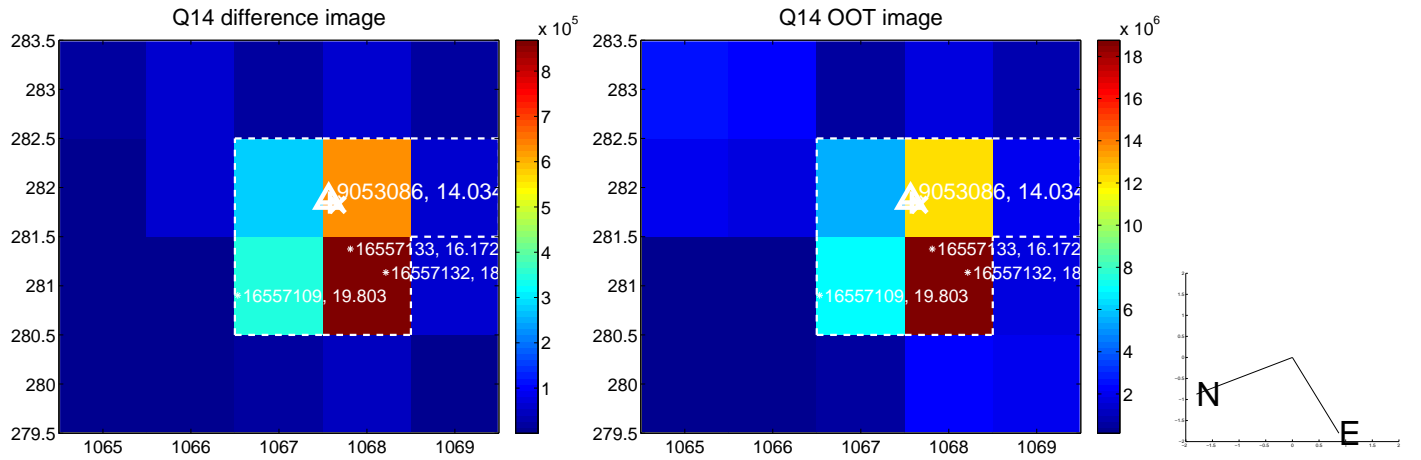
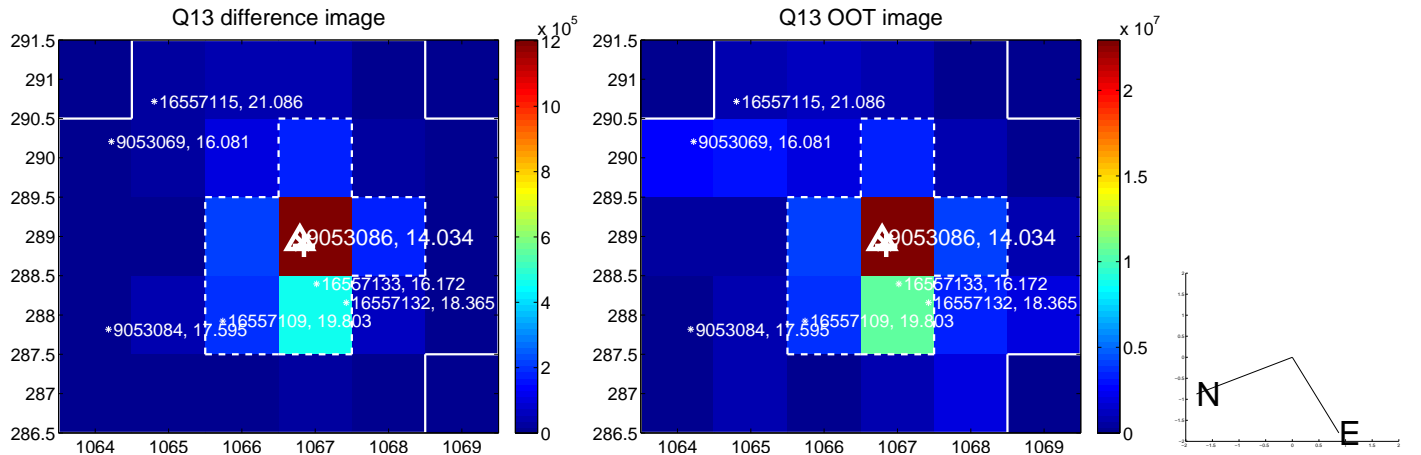




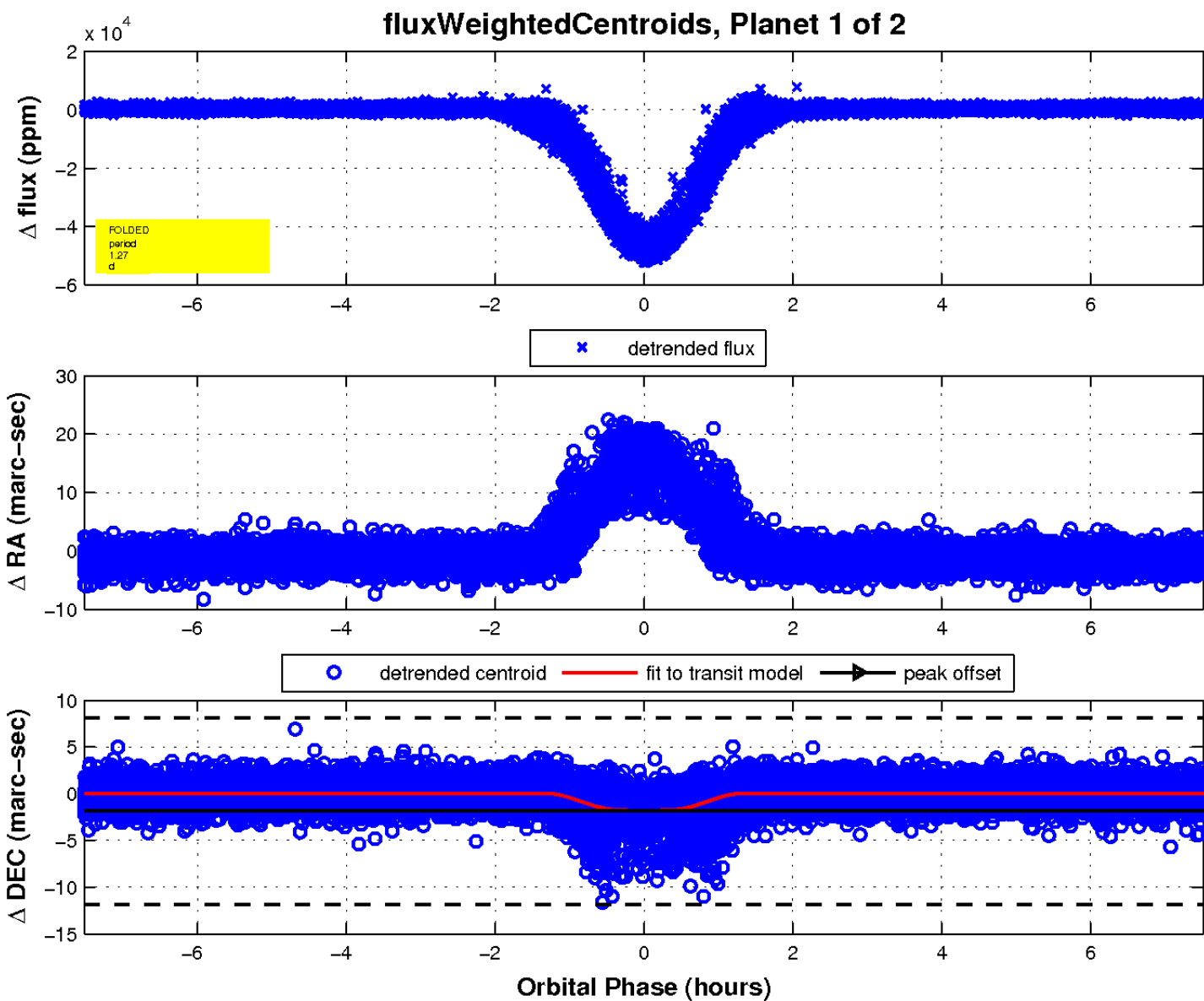
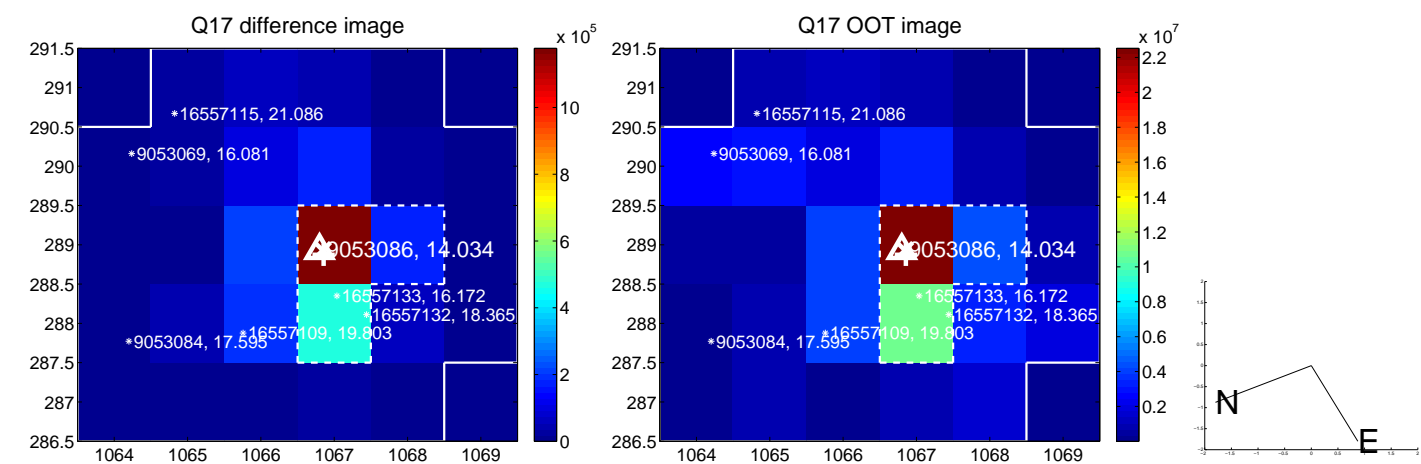
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



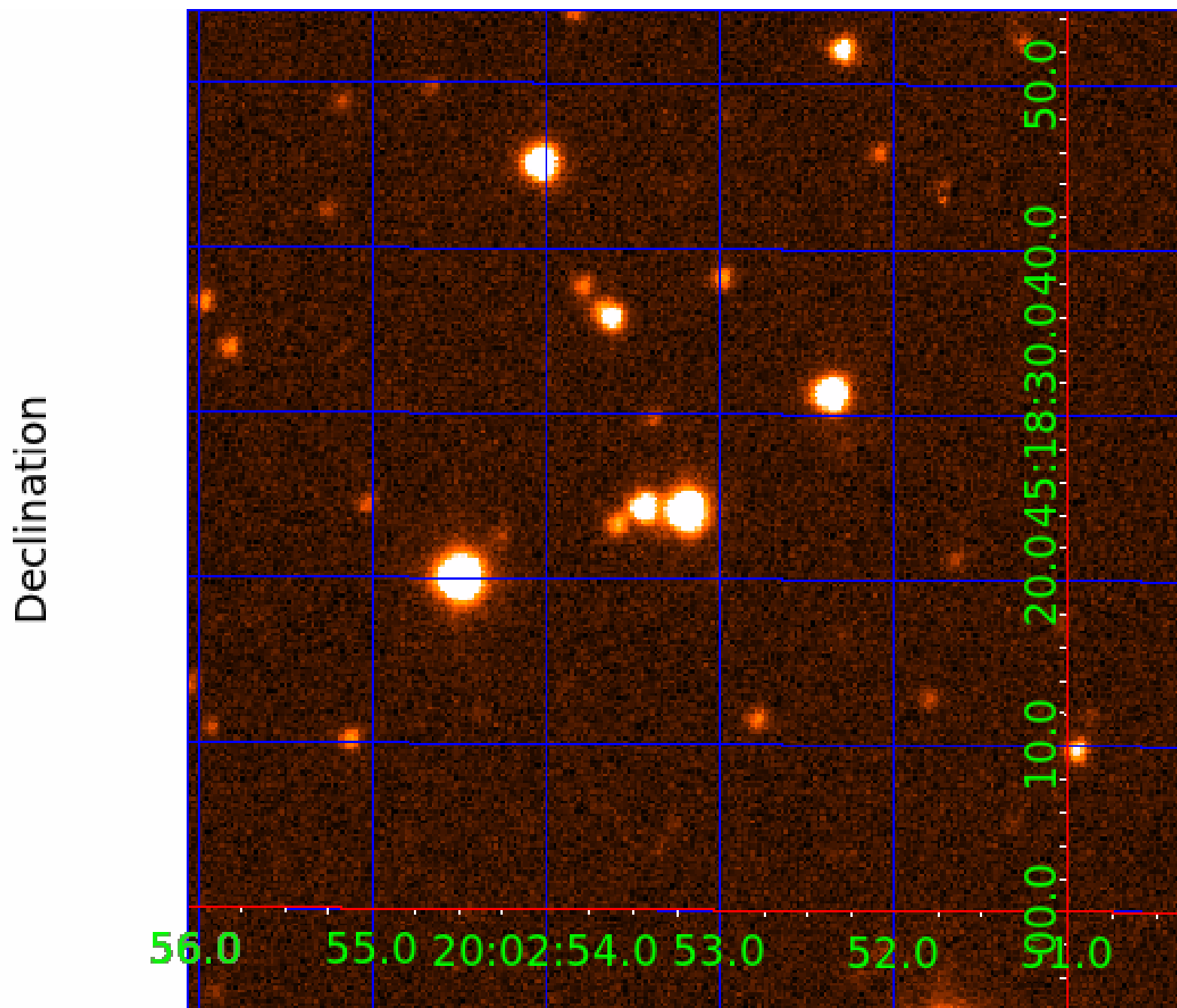
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



UKIRT Image



# KIC 009053086

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009053086-01	OBS	3751.01	1.274828	131.634580	40305.1	2.508	2156.5	1429.9	1.28	6211	27.89	3980.81
009053086-02	OBS	No	1.274844	132.254744	13032.3	1.500	775.7	-1.0	1.28	6211	14.72	3980.74

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009053086-01	OBS	FP	0.00	0	1	0	0	SWEET_EB—MOD_SEC_DV—MOD_SEC_ALT—MOD_ODDEVEN_DV—HAS_SEC_TCE
009053086-02	OBS	FP	0.00	1	1	0	0	IS_SEC_TCE—CENT_NOFITS

**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 009053086-02

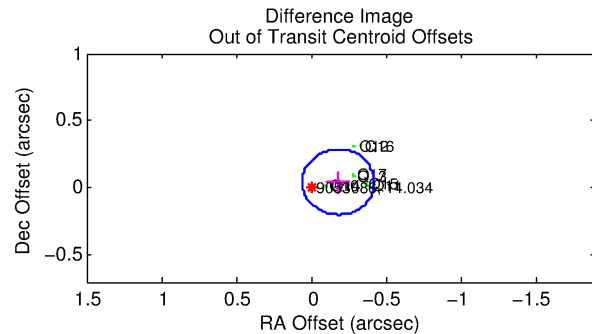
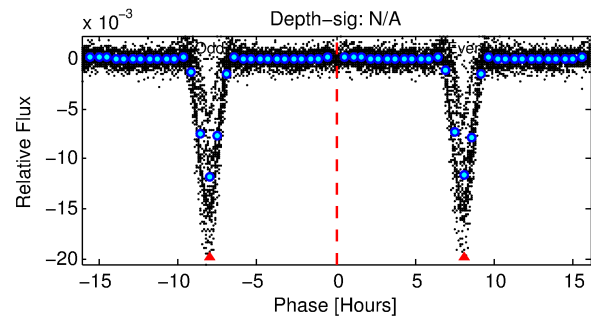
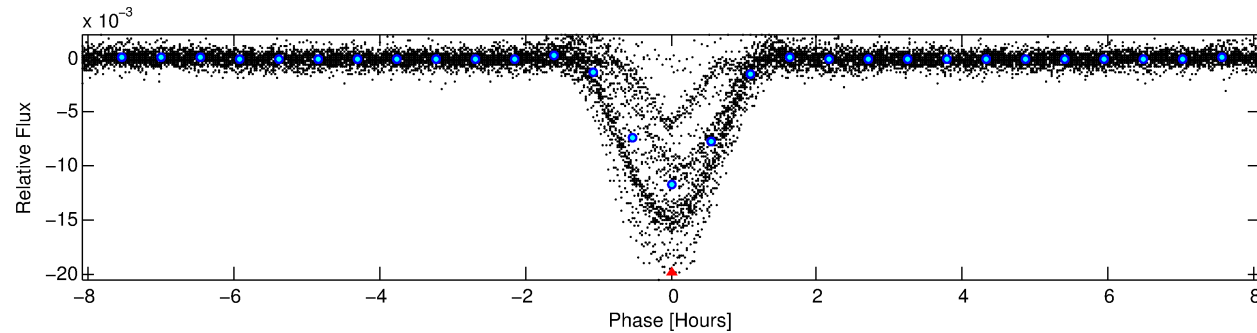
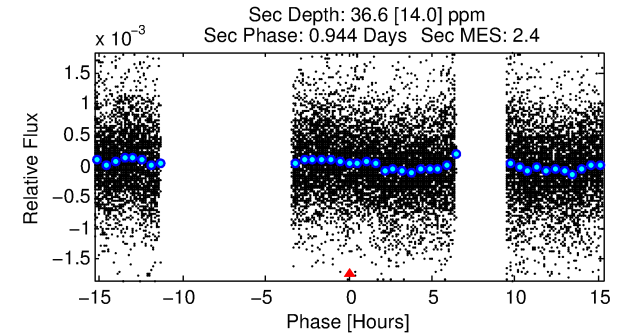
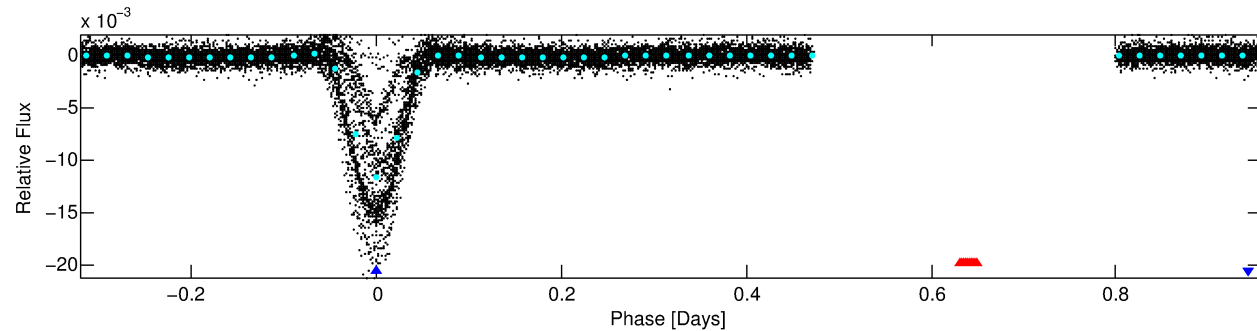
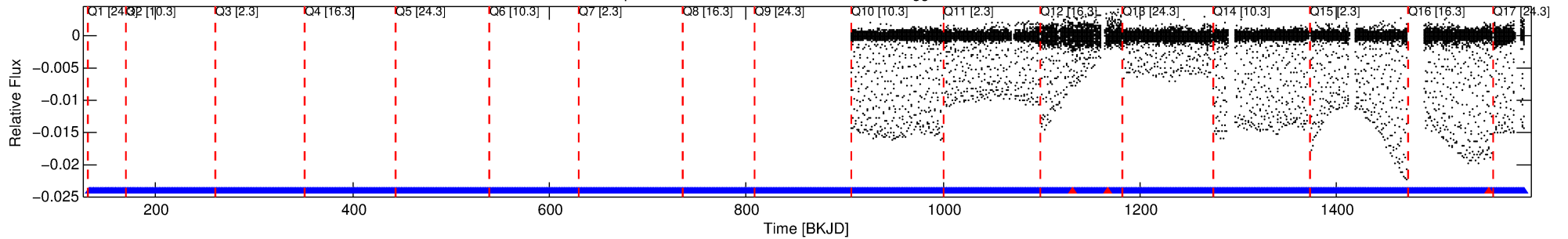
No Significant Match Found

# DV One-Page Summary

KIC: 9053086 Candidate: 2 of 2 Period: 1.275 d

KOI: K03751 Corr: No Ephemeris Match

Kp: 14.03 R\*: 1.28 Rs Teff: 6211.0 K Logg: 4.25 Fe/H: -0.160



## TPS TCE Results:

Period = 1.27484 d  
Epoch = 132.2547 BKJD

DV fit results are unavailable

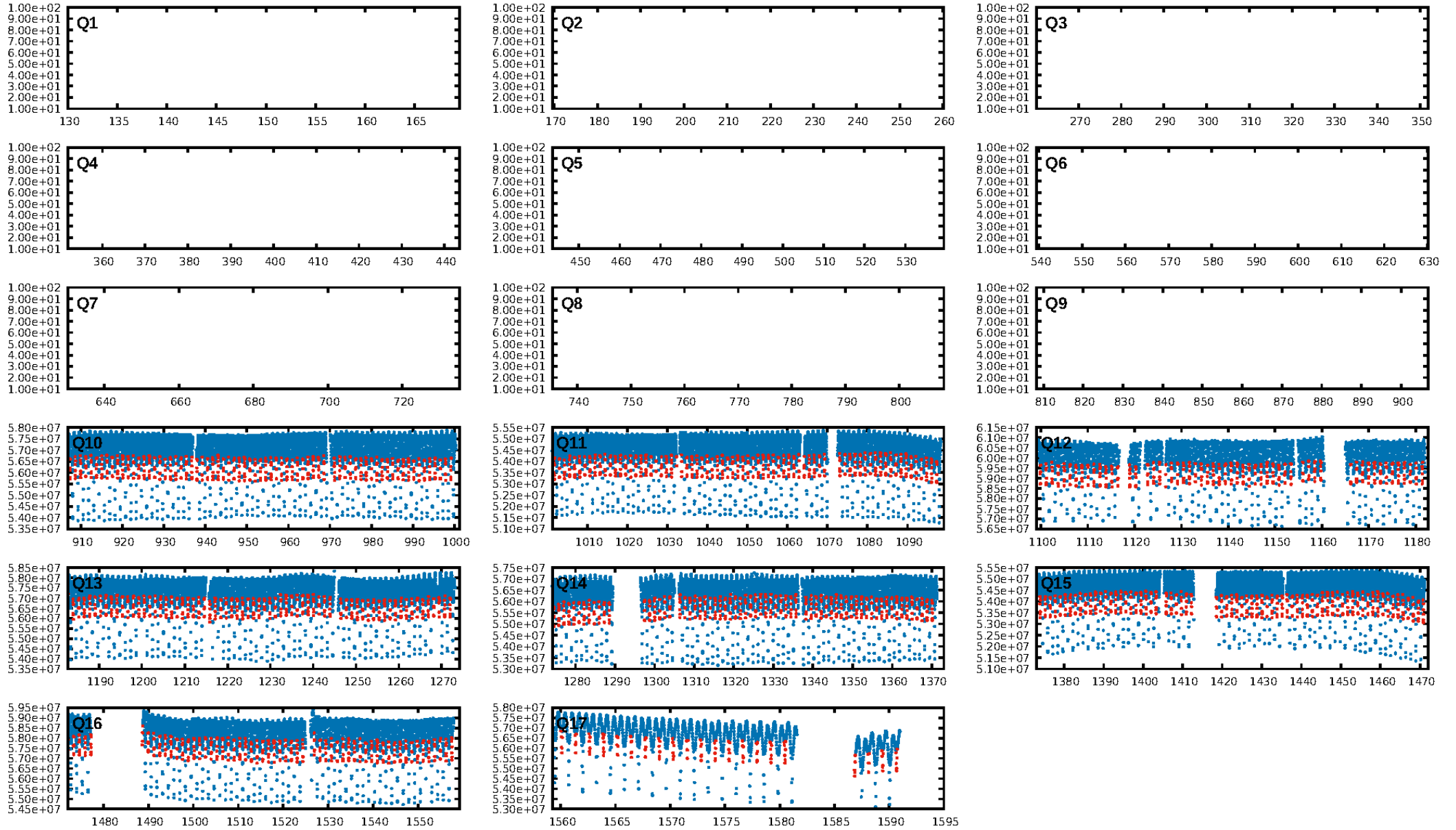
## DV Diagnostic Results:

ShortPeriod-sig: 0.0% [0.00 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 0.99 [463/466]  
GhostDiagnostic-chr: 5.76  
Centroid-sig: N/A  
Centroid-so: 1.122 arcsec [210.44 $\sigma$ ]  
OotOffset-rm: 0.187 arcsec [2.31 $\sigma$ ]  
KicOffset-rm: 0.283 arcsec [3.22 $\sigma$ ]  
OotOffset-st: 2/2/2/2 [8]  
KicOffset-st: 2/2/2/2 [8]  
DiffImageQuality-fgm: 1.00 [8/8]  
DiffImageOverlap-fno: 1.00 [8/8]

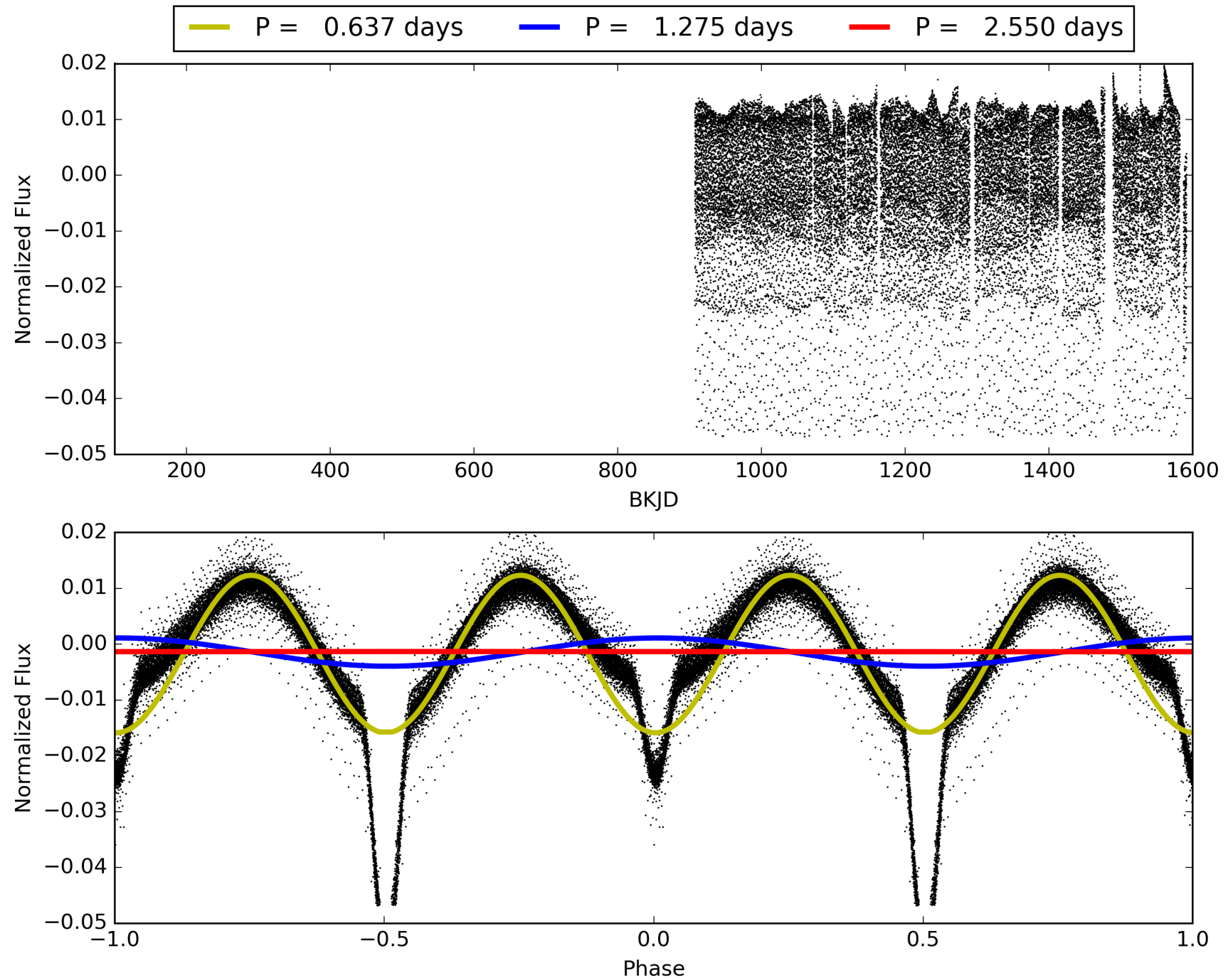
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 13:18:17 Z

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

# TCE 009053086-02, PDC Light Curves



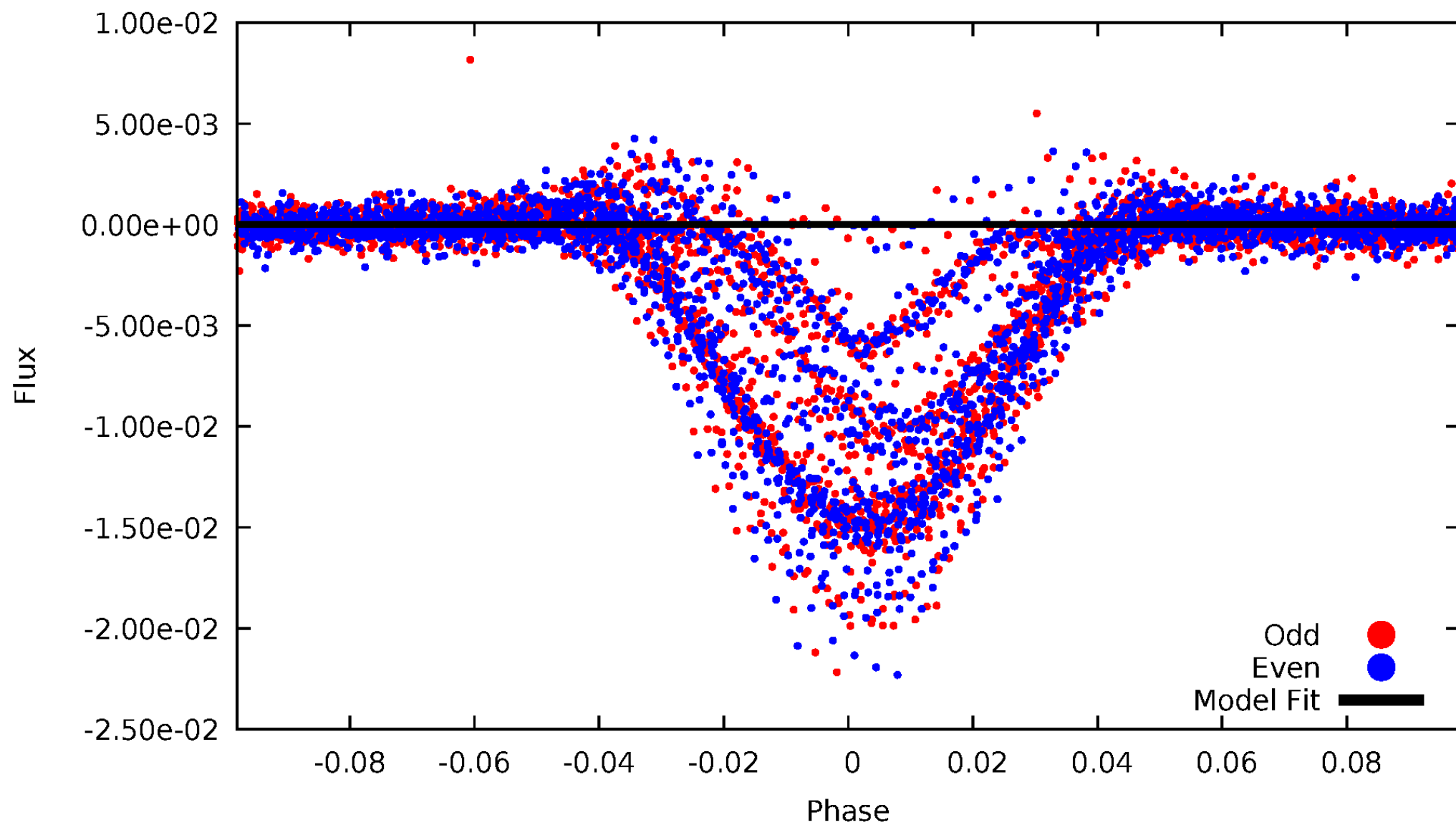
TCE 009053086-02





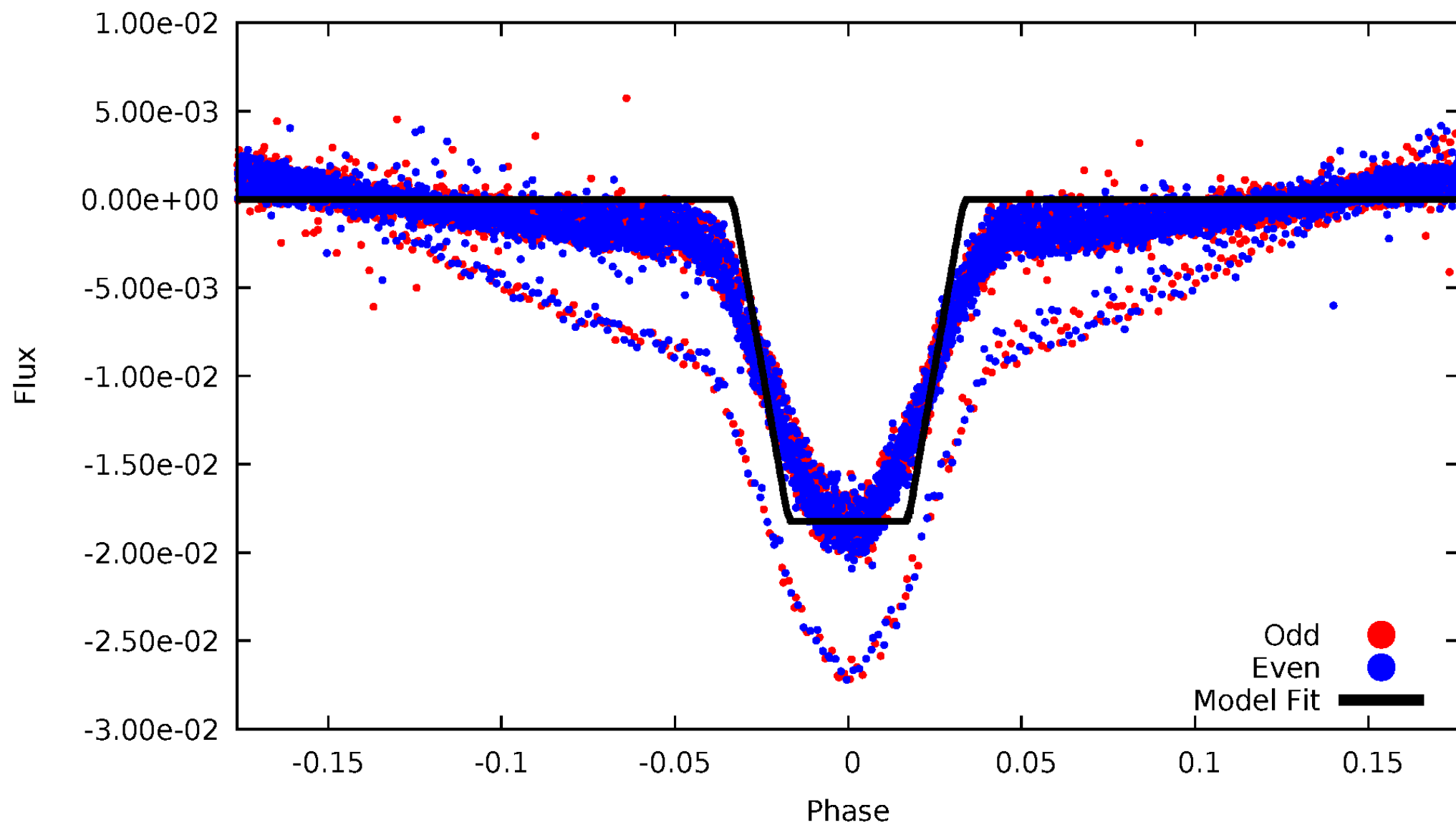
# DV Odd/Even

TCE 009053086-02



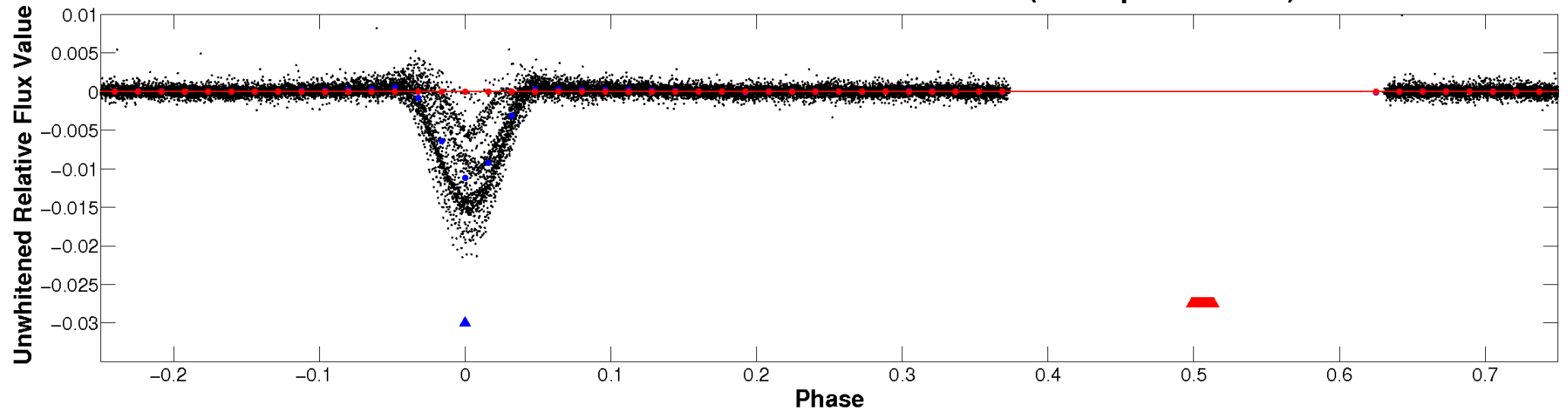
# ALT Odd/Even

TCE 009053086-02

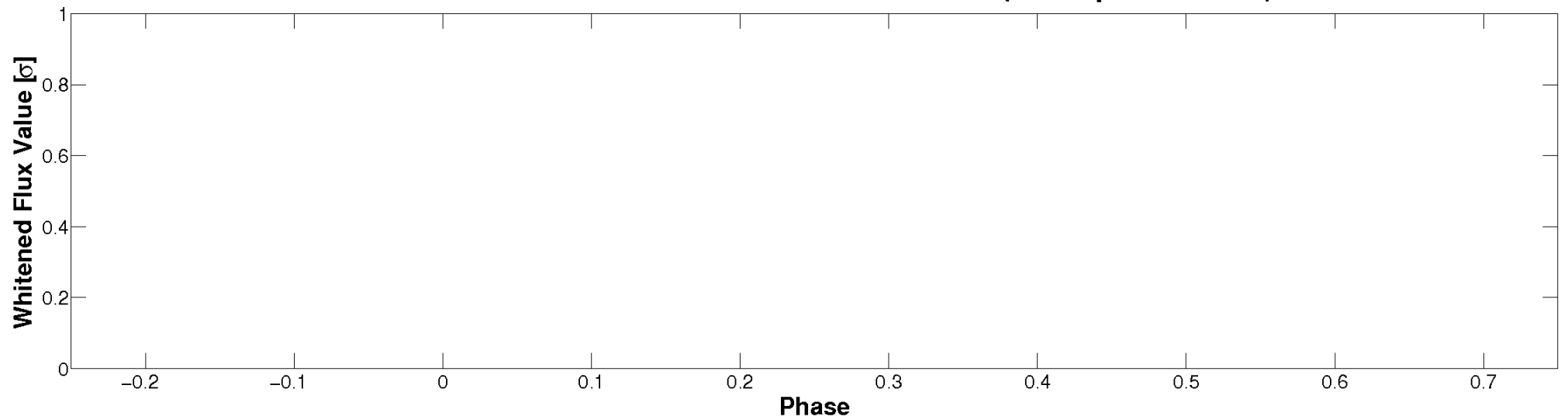


# Non-Whitened Vs. Whitened Light Curve

**Planet 2 : Phased Unwhitened Flux Time Series (TPS Epoch/Period)**

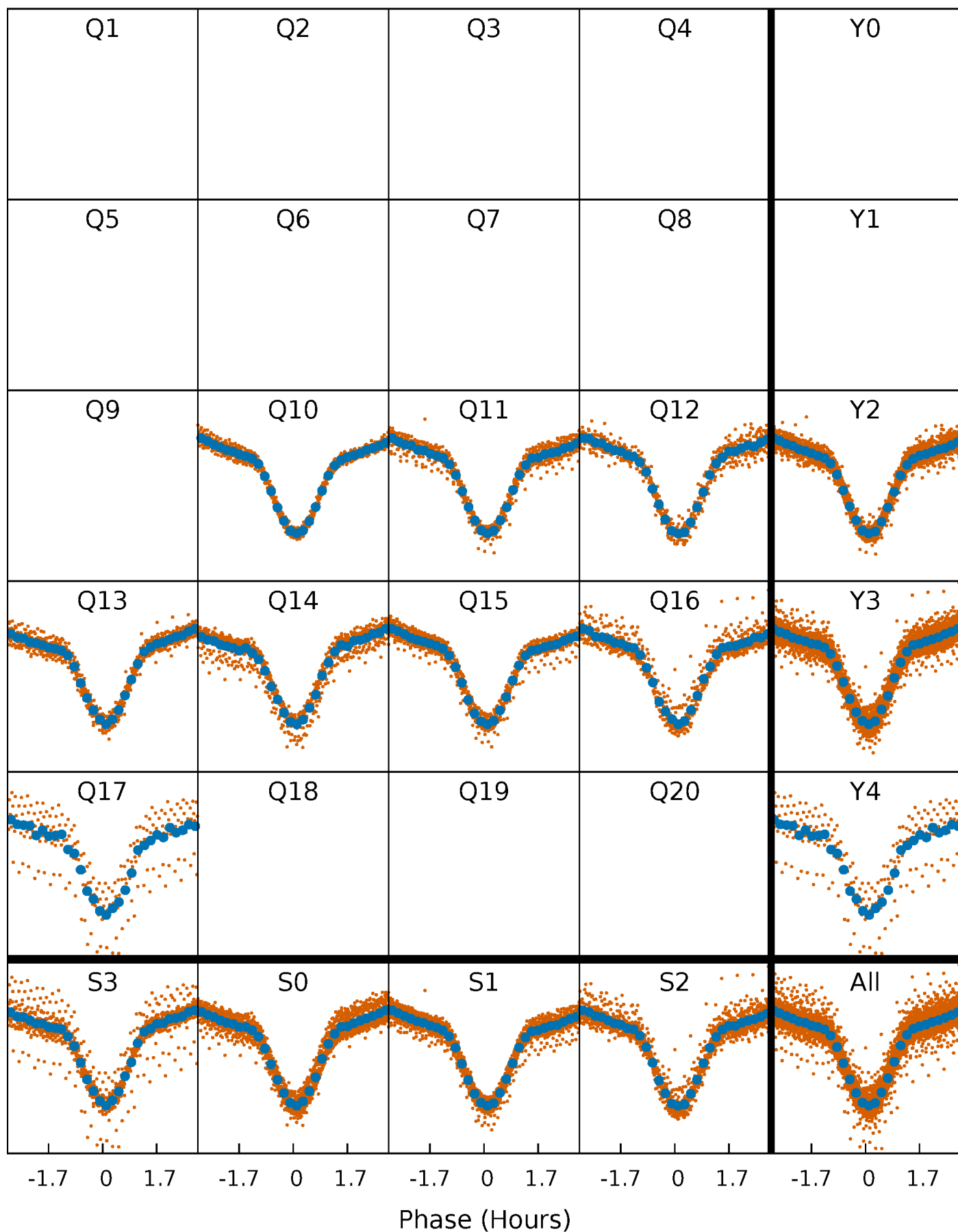


**Planet 2 : Phased Whitened Flux Time Series (TPS Epoch/Period)**



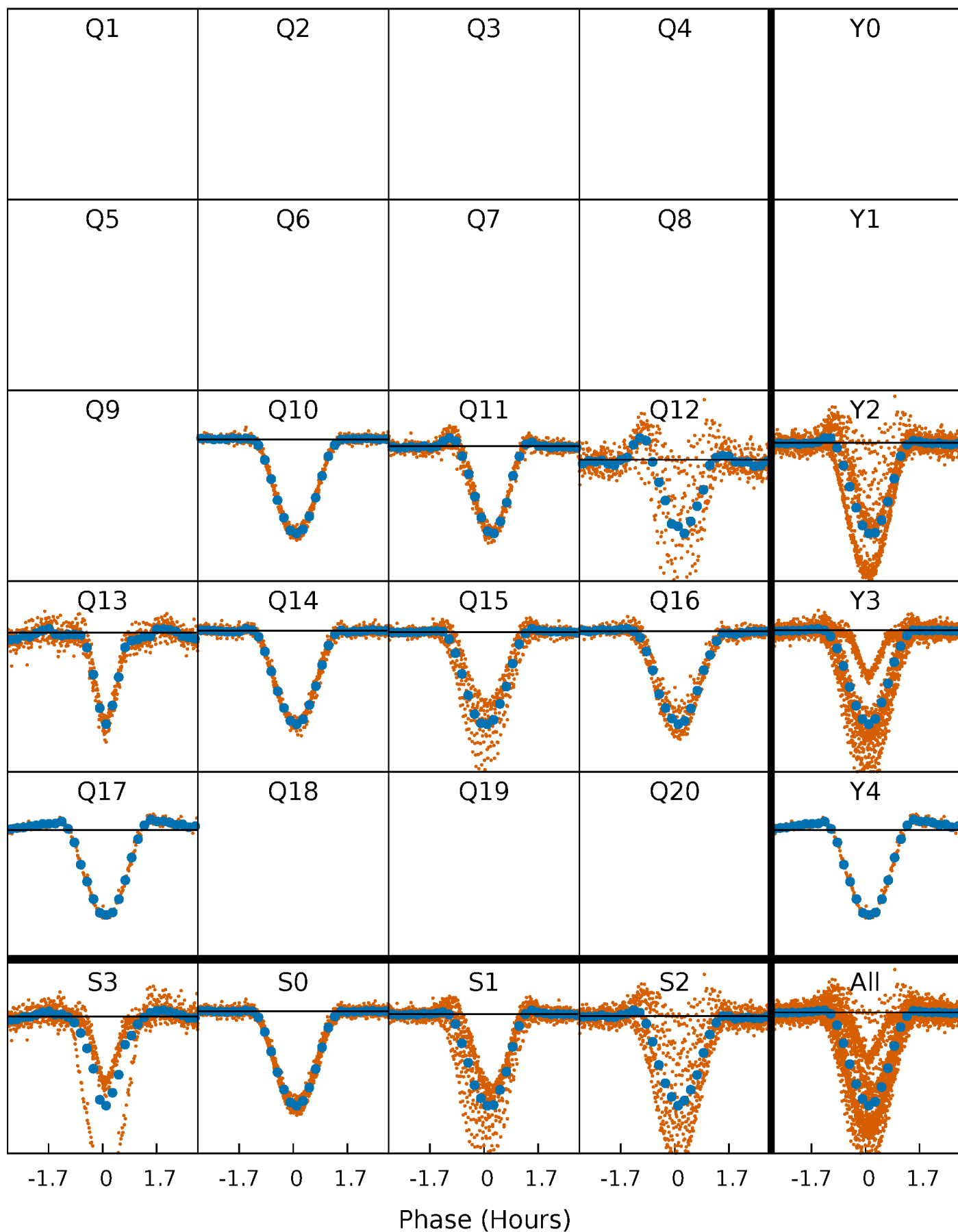
# PDC Quarter-Phased Transit Curves

TCE 009053086-02   P= 1.274844 Days    $T_0=132.254744$  (BKJD)



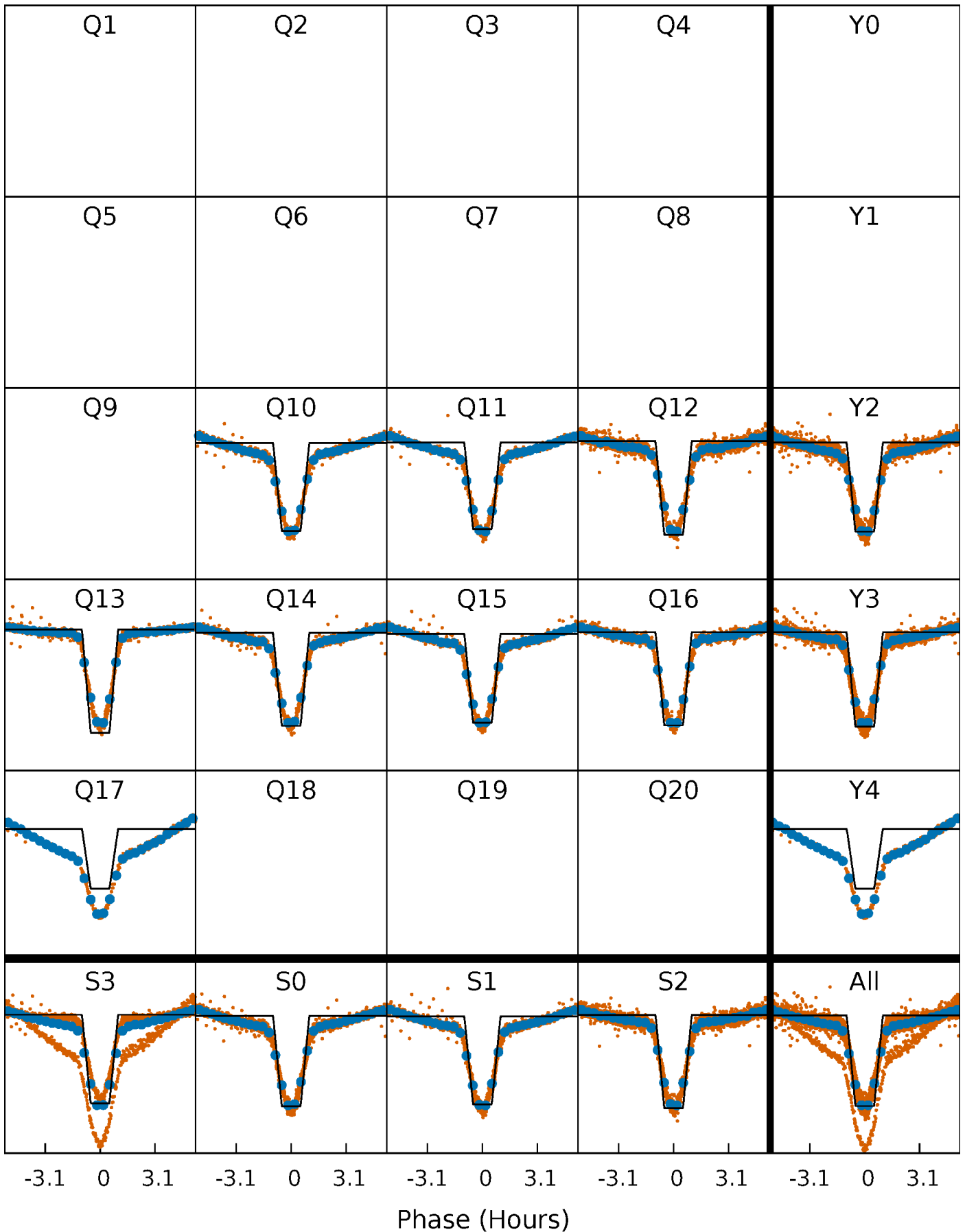
# DV Quarter-Phased Transit Curves

TCE 009053086-02   P= 1.274844 Days    $T_0=132.254744$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

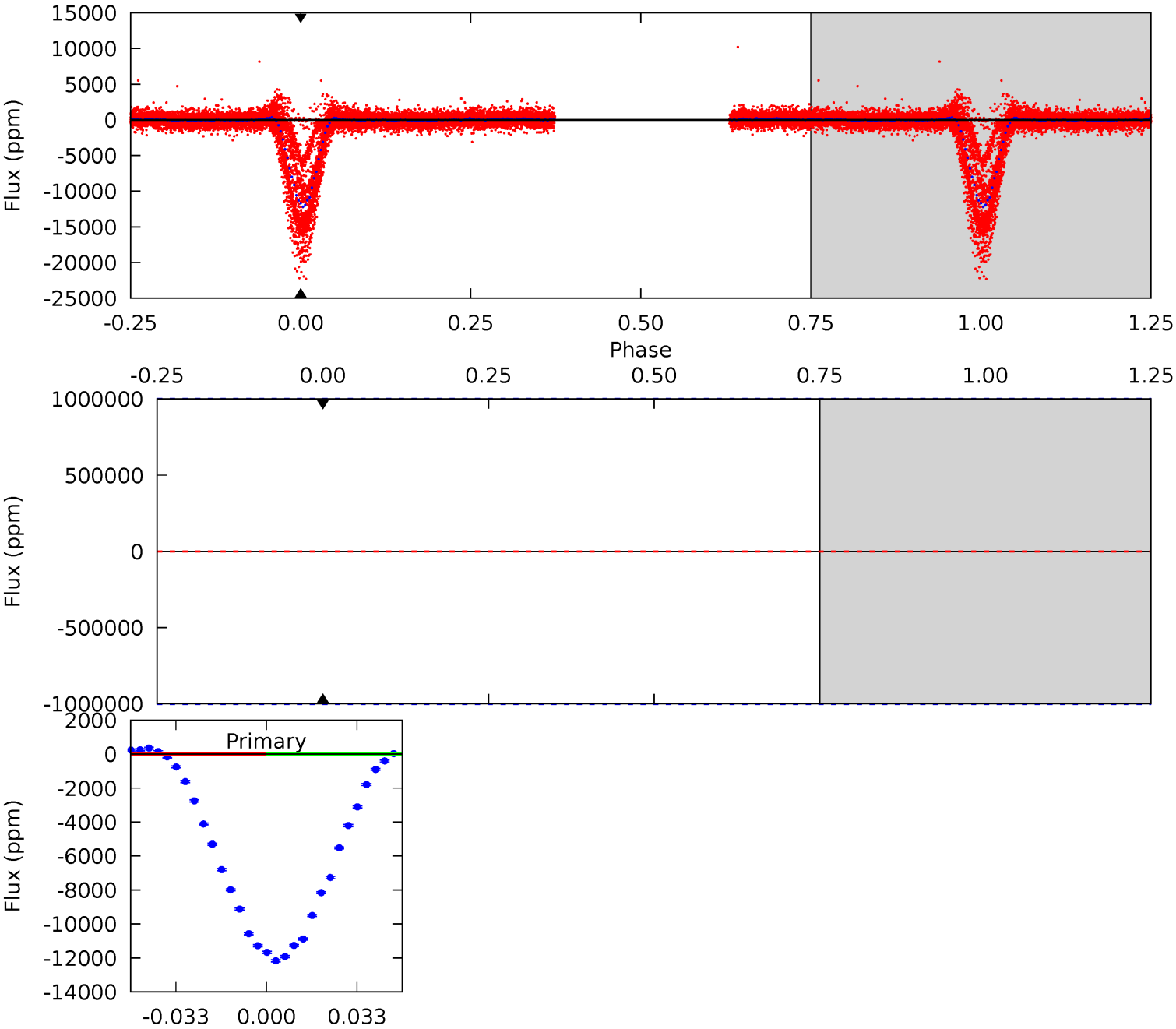
TCE 009053086-02     $P = 1.274844$  Days     $T_0 = 132.259000$  (BKJD)



# DV Model-Shift Uniqueness Test

009053086-02, P = 1.274844 Days, E = 132.254744 Days

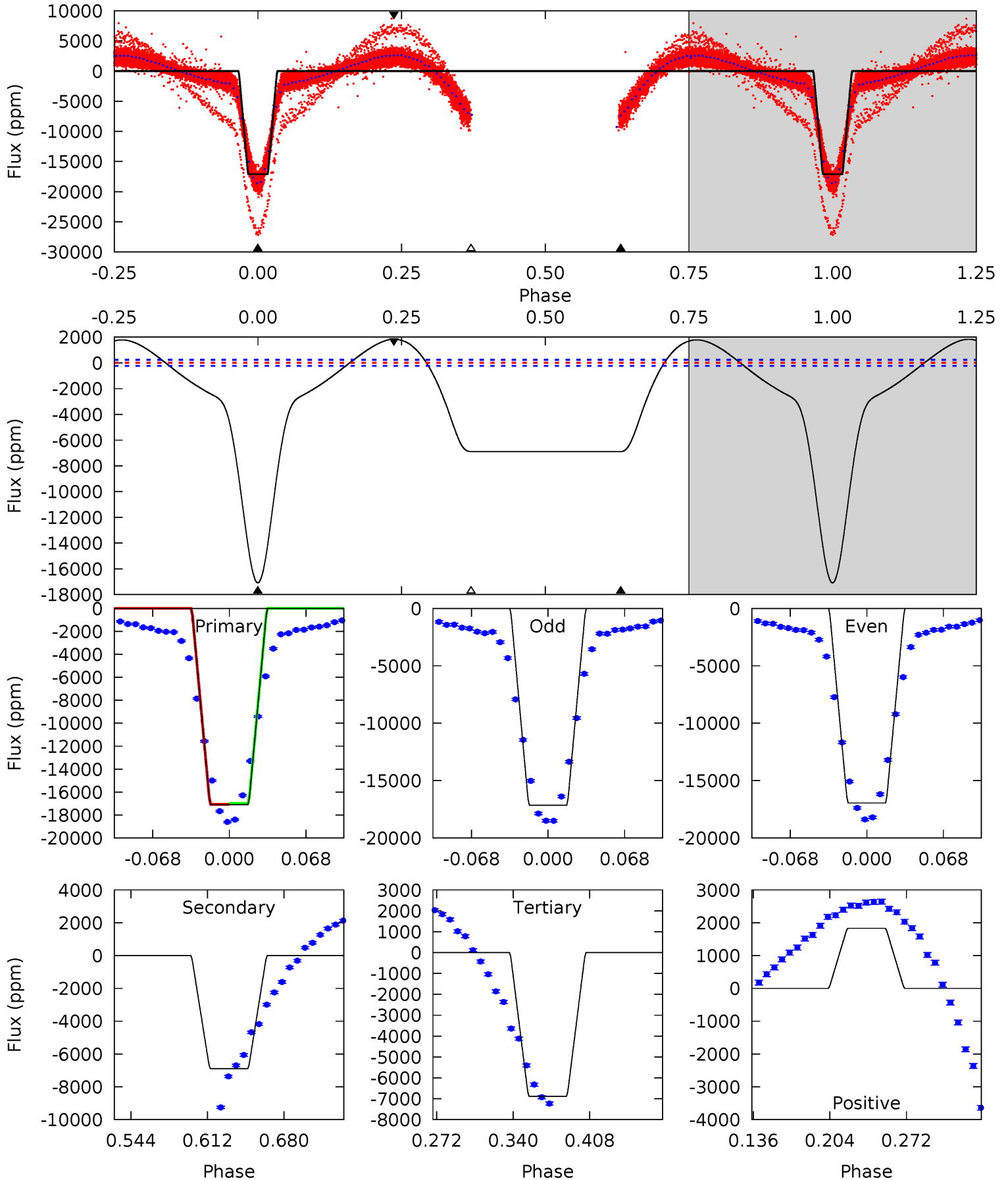
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
0	0	0	0	1.00	1.00	1.00	0	0	0	0	0	0	0	0



# Alt Model-Shift Uniqueness Test

009053086-02, P = 1.274844 Days, E = 132.259000 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
339.4	136.9	136.8	36.4	4.65	1.82	40.4	202.6	303.0	0.07	100.5	1.88	1.02	0.10	1.13





### Stellar Parameters For KIC 009053086

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6211^{+197}_{-241}$	$4.247^{+0.185}_{-0.185}$	$-0.160^{+0.250}_{-0.300}$	$1.281^{+0.396}_{-0.264}$	$1.055^{+0.169}_{-0.139}$	$0.707^{+0.661}_{-0.339}$
	+3%/-4%	+4%/-4%	+156%/-188%	+31%/-21%	+16%/-13%	+94%/-48%
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 009053086-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$0 \pm 1000000$	$17.50^{+12.77}_{-10.63}$	$2819^{+222}_{-223}$	$-3958^{+18026}_{-9292}$	$-1.526^{+174.114}_{-157.739}$
Alt.	$-6891 \pm 50$	$20.75^{+13.78}_{-11.90}$	$2817^{+199}_{-202}$	$4692^{+2392}_{-892}$	$4.841^{+22.266}_{-3.119}$

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

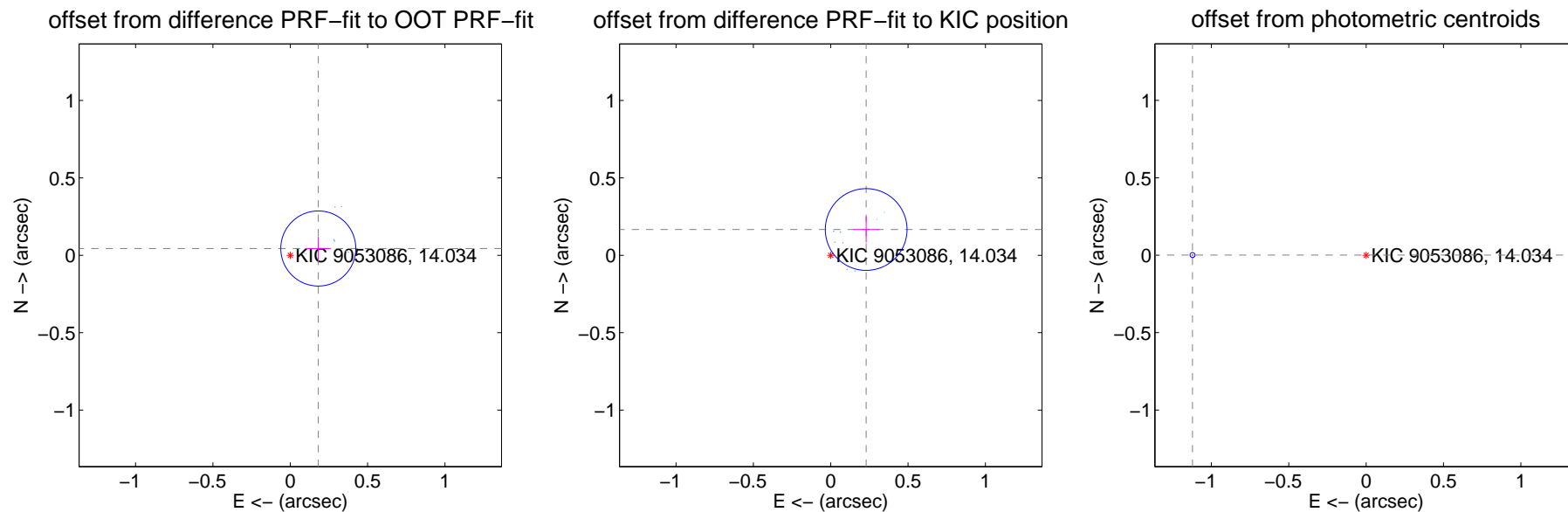
## DV Centroid Data

Supplemental centroid analysis for 009053086-02. Kepler magnitude: 14.03. Transit SNR -1.00

There are 8 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.23 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.187 \pm 0.081$	2.31	$-0.181 \pm 0.081$	$0.044 \pm 0.076$
PRF-fit source offset from KIC position	<b><math>0.283 \pm 0.088</math></b>	<b>3.22</b>	$-0.229 \pm 0.082$	$0.167 \pm 0.084$
photometric centroid source offset	<b><math>1.12 \pm 0.01</math></b>	<b>210.44</b>	$1.12 \pm 0.01$	$0.00 \pm 0.00$



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.

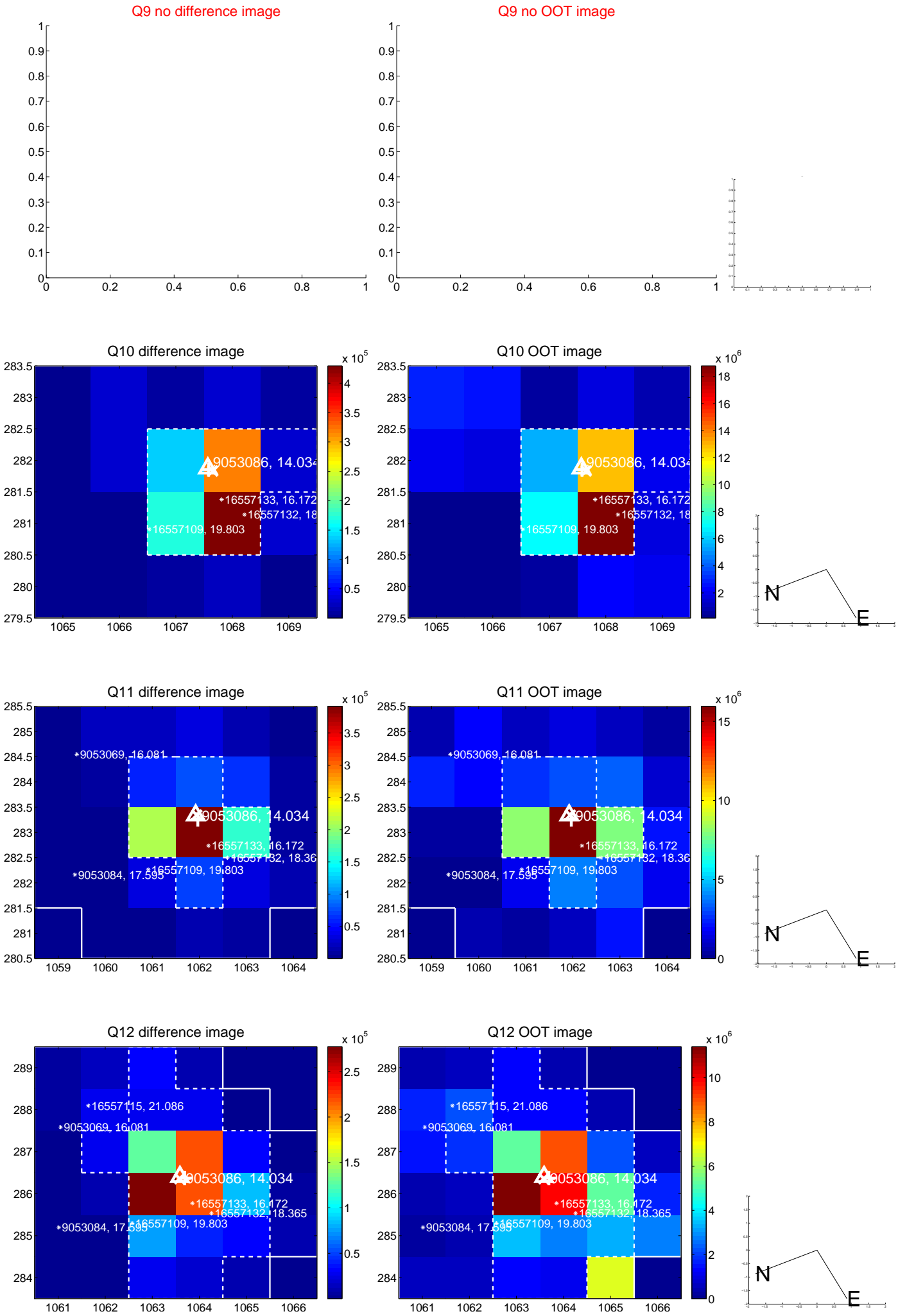
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



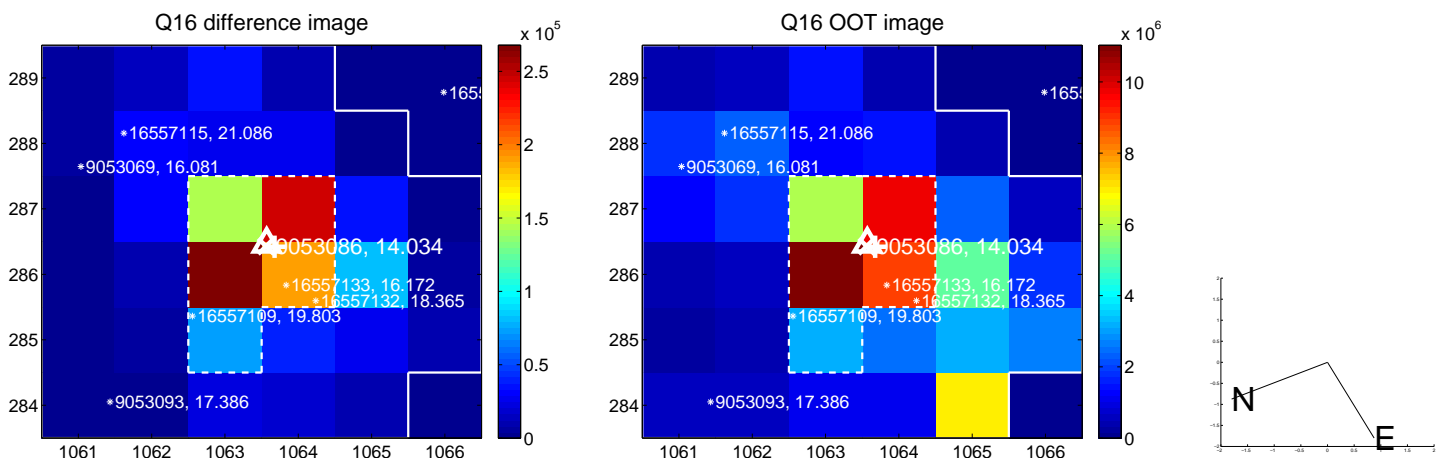
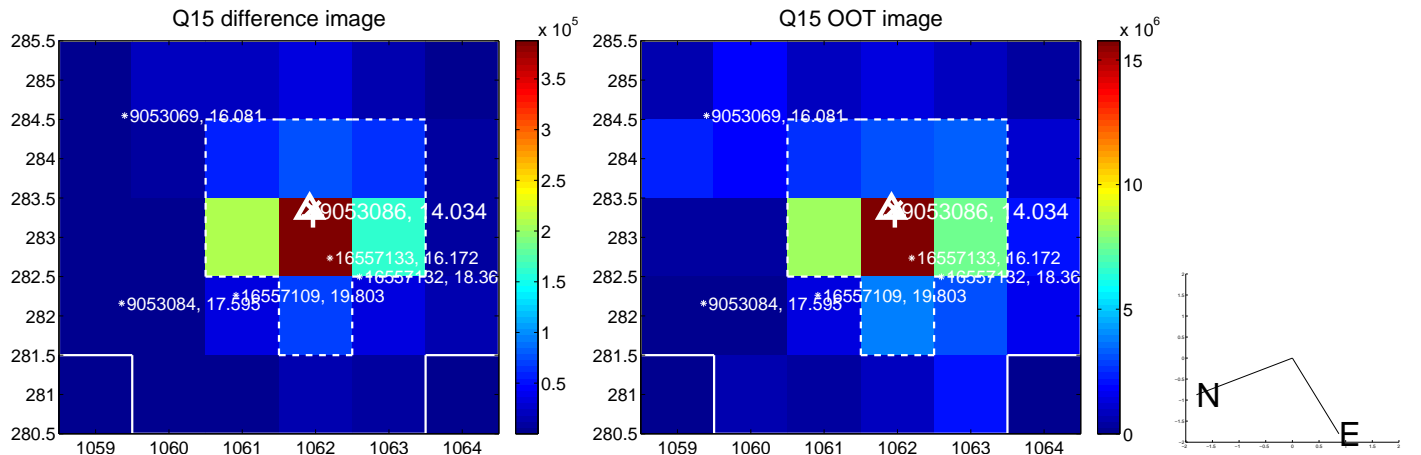
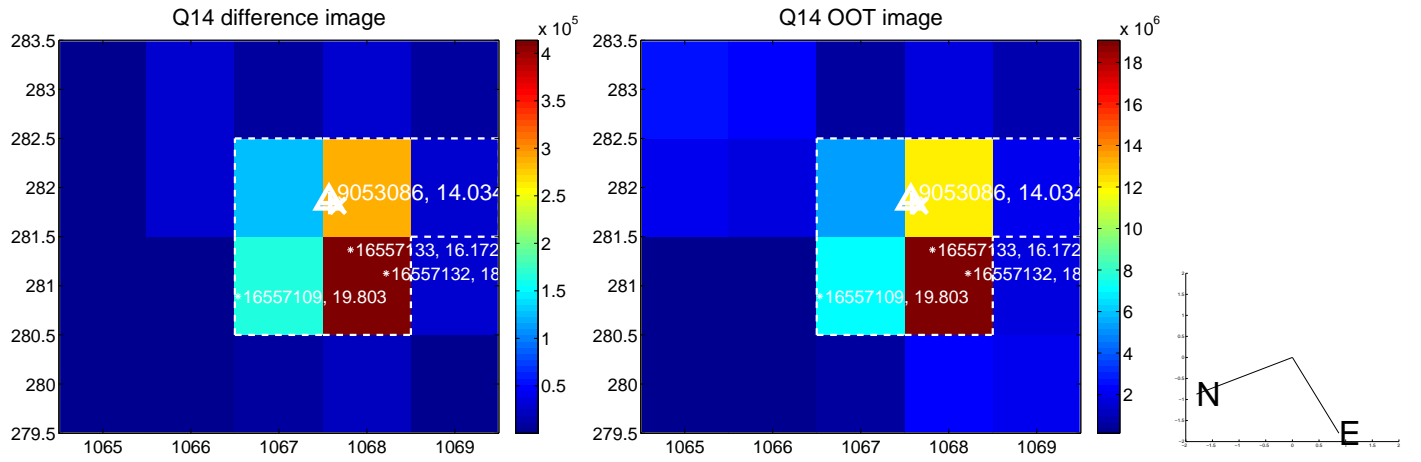
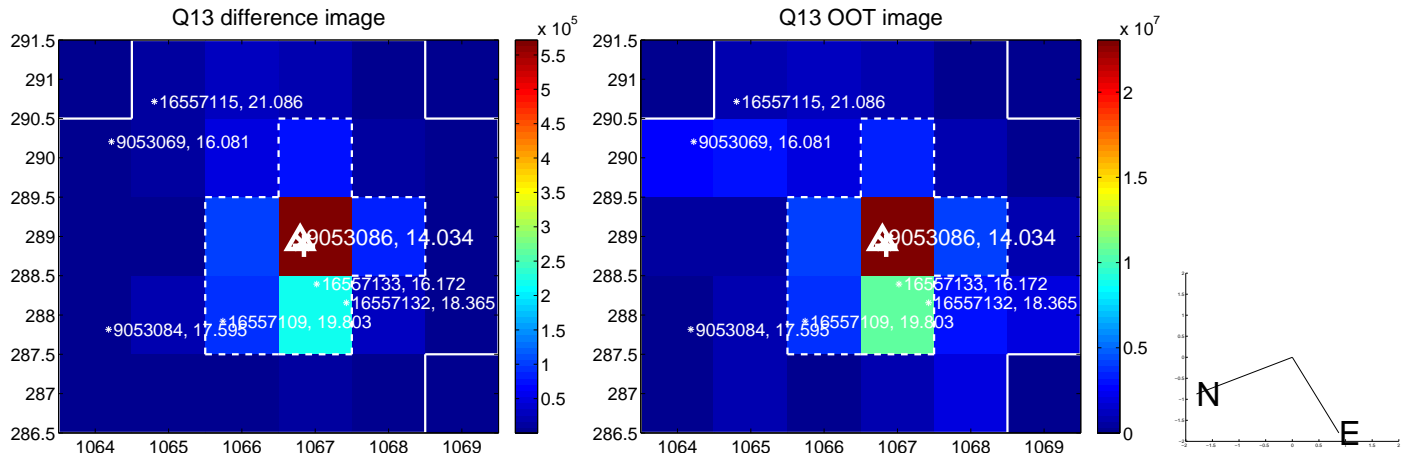
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



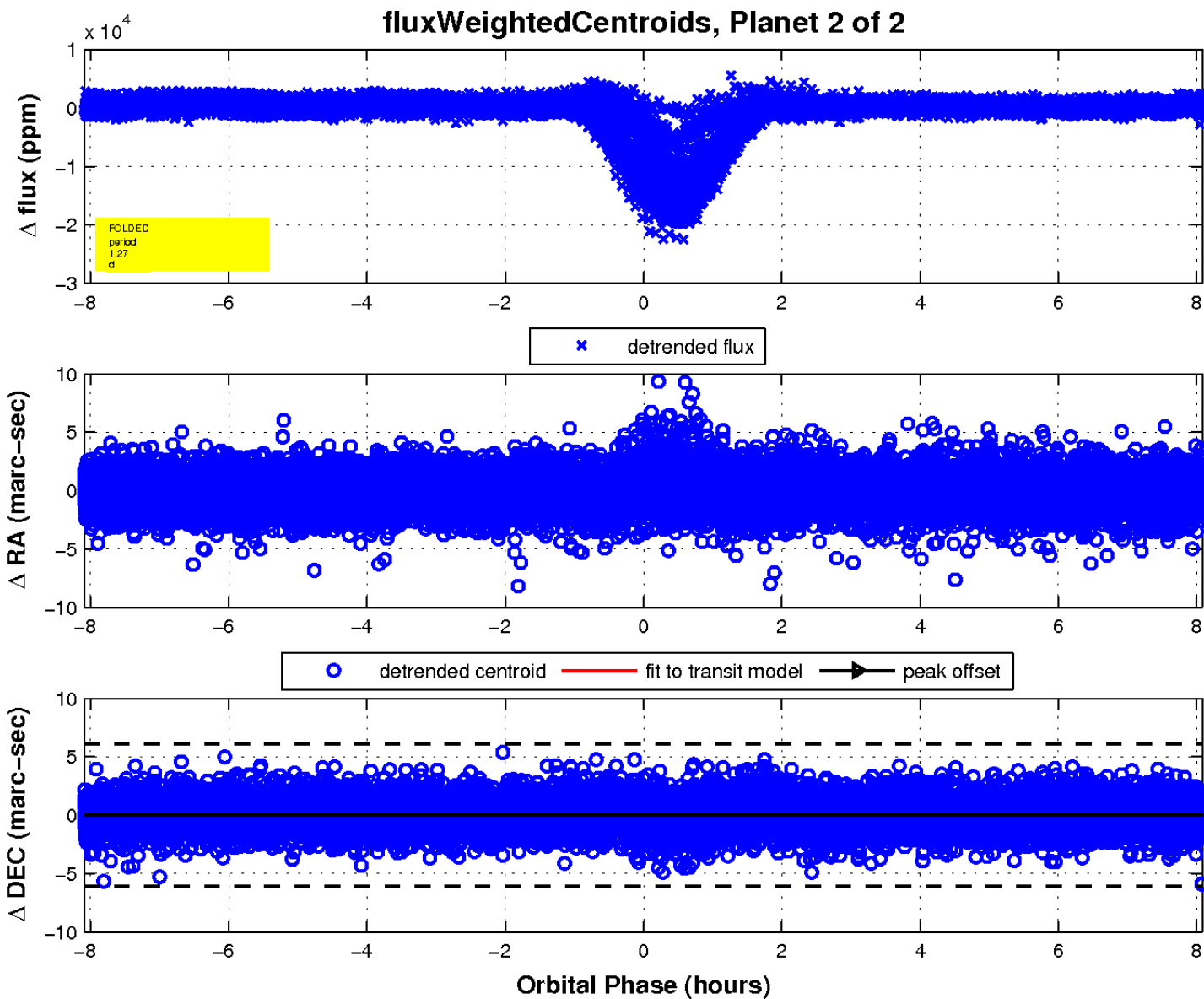
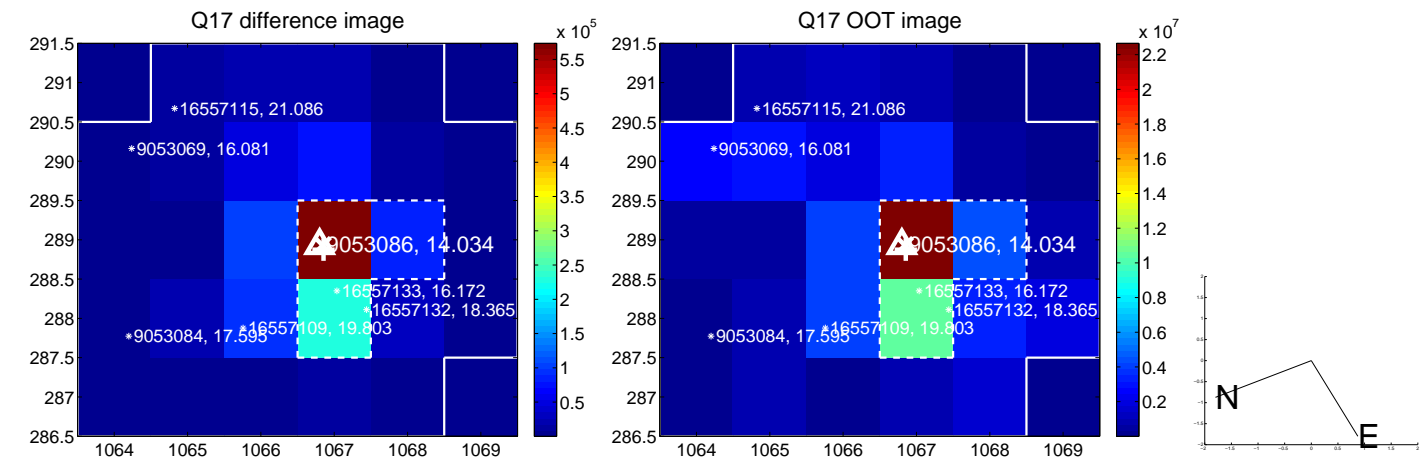
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

