

# KIC 010006972

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010006972-01	OBS	No	377.658730	255.660239	360.5	3.801	7.9	9.0	0.70	5197	1.72	0.40
010006972-02	OBS	No	368.066859	288.270358	161.7	17.430	8.2	6.0	0.70	5197	0.98	0.42

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010006972-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—INCONSISTENT_TRANS—CENT_FEW_DIFFS
010006972-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—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.

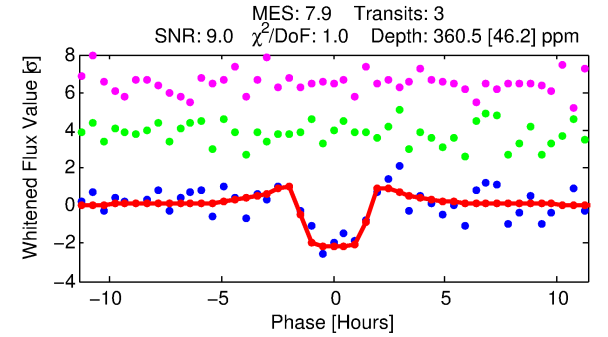
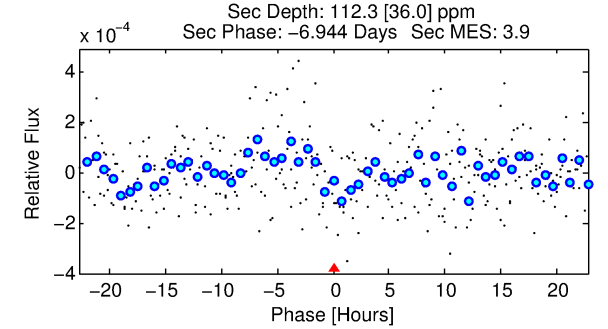
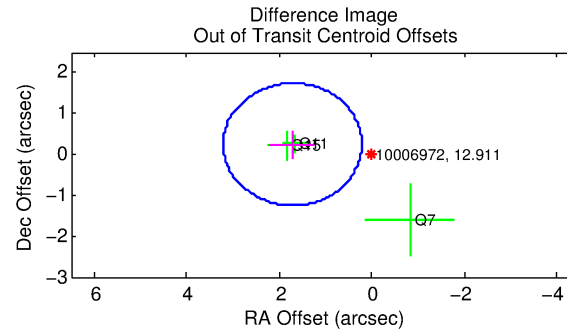
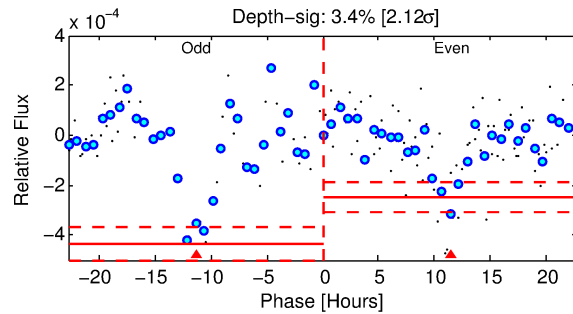
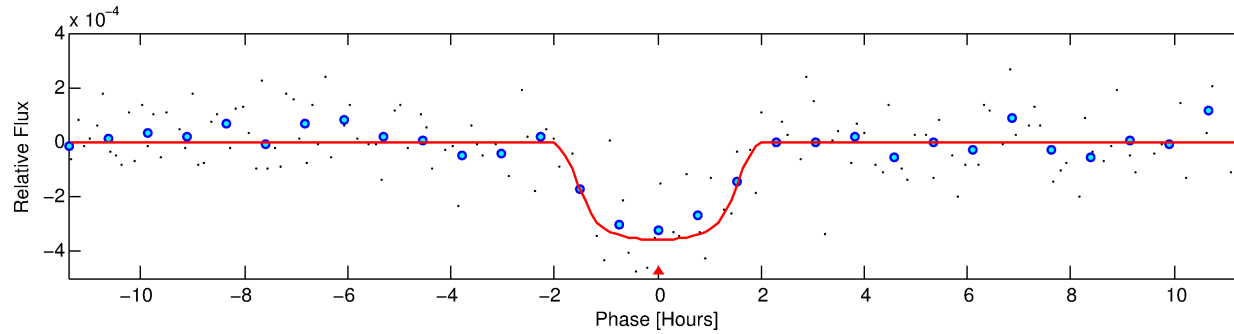
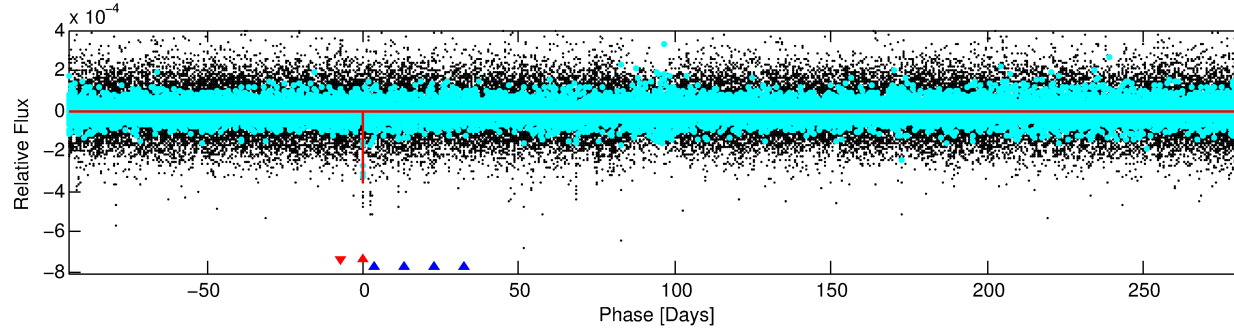
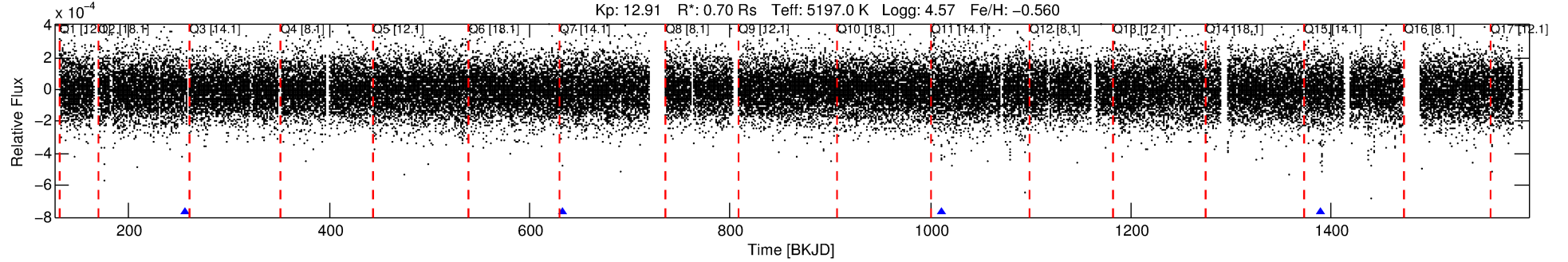
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 010006972-01

No Significant Match Found

# DV One-Page Summary

KIC: 10006972 Candidate: 1 of 2 Period: 377.659 d



## DV Fit Results:

Period = 377.65873 [0.00547] d  
Epoch = 255.6602 [0.0111] BKJD  
Rp/R\* = 0.0223 [0.0033]  
a/R\* = 291.77 [166.49]  
b = 0.95 [0.06]  
Seff = 0.40 [0.07]  
Teq = 203 [9] K  
Rp = 1.72 [0.32] Re  
a = 0.8979 [0.0833] AU  
Ag = 16862.88 [7759.38] [2.17 $\sigma$ ]  
Teffp = 3579 [407] K [8.29 $\sigma$ ]

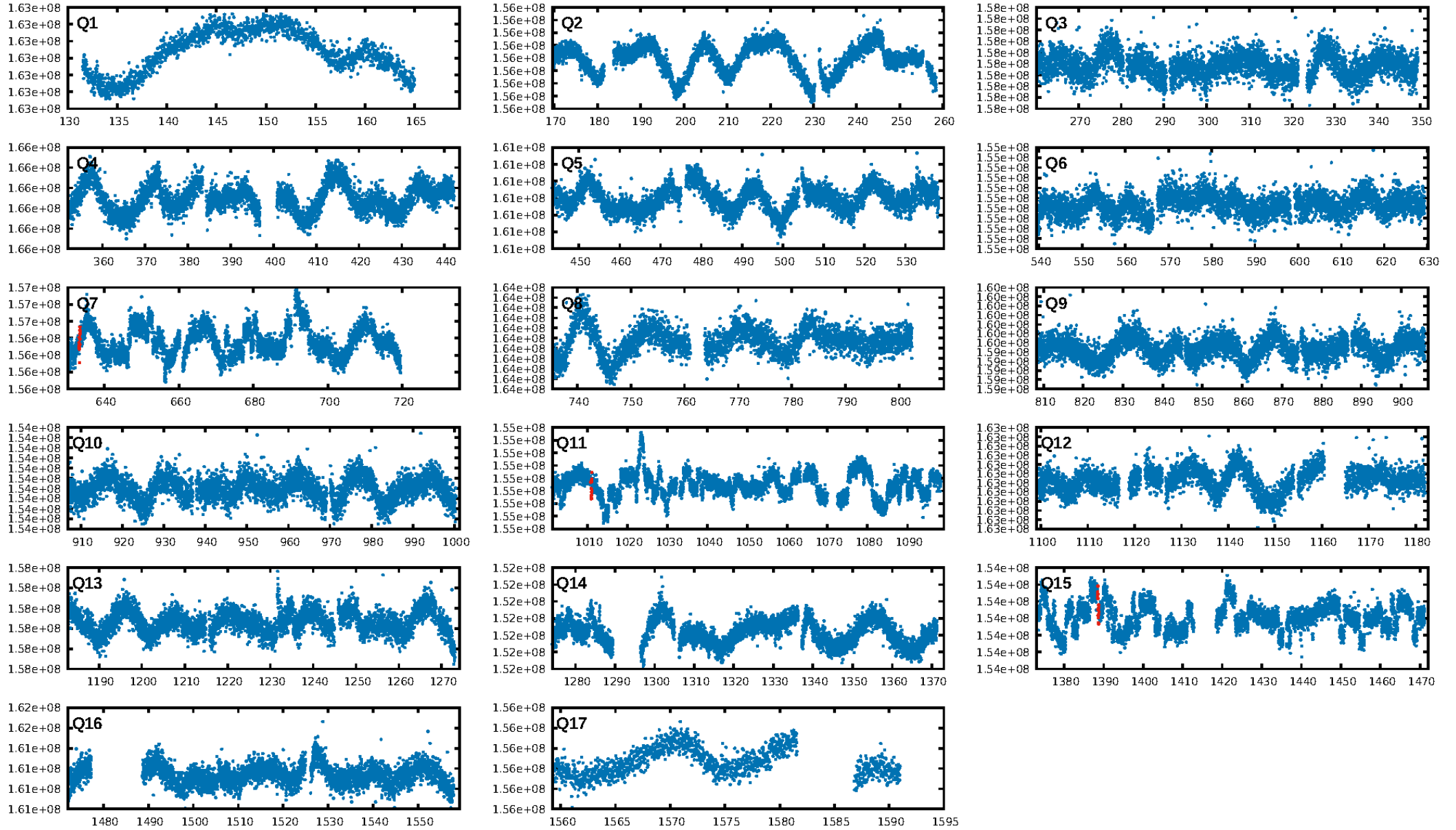
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [12.90 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 34.6%  
ModelChiSquareGof-sig: 97.0%  
**Bootstrap-pfa: 2.30e-10**  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: 10.93  
Centroid-sig: 1.8%  
Centroid-so: 1.899 arcsec [1.61 $\sigma$ ]  
**OotOffset-rm: 1.732 arcsec [3.47 $\sigma$ ]**  
OotOffset-st: 0/3/0/0 [3]  
KicOffset-rm: 1.896 arcsec [2.04 $\sigma$ ]  
KicOffset-st: 0/3/0/0 [3]  
DiffImageQuality-fgm: 1.00 [3/3]  
DiffImageOverlap-fno: 1.00 [3/3]

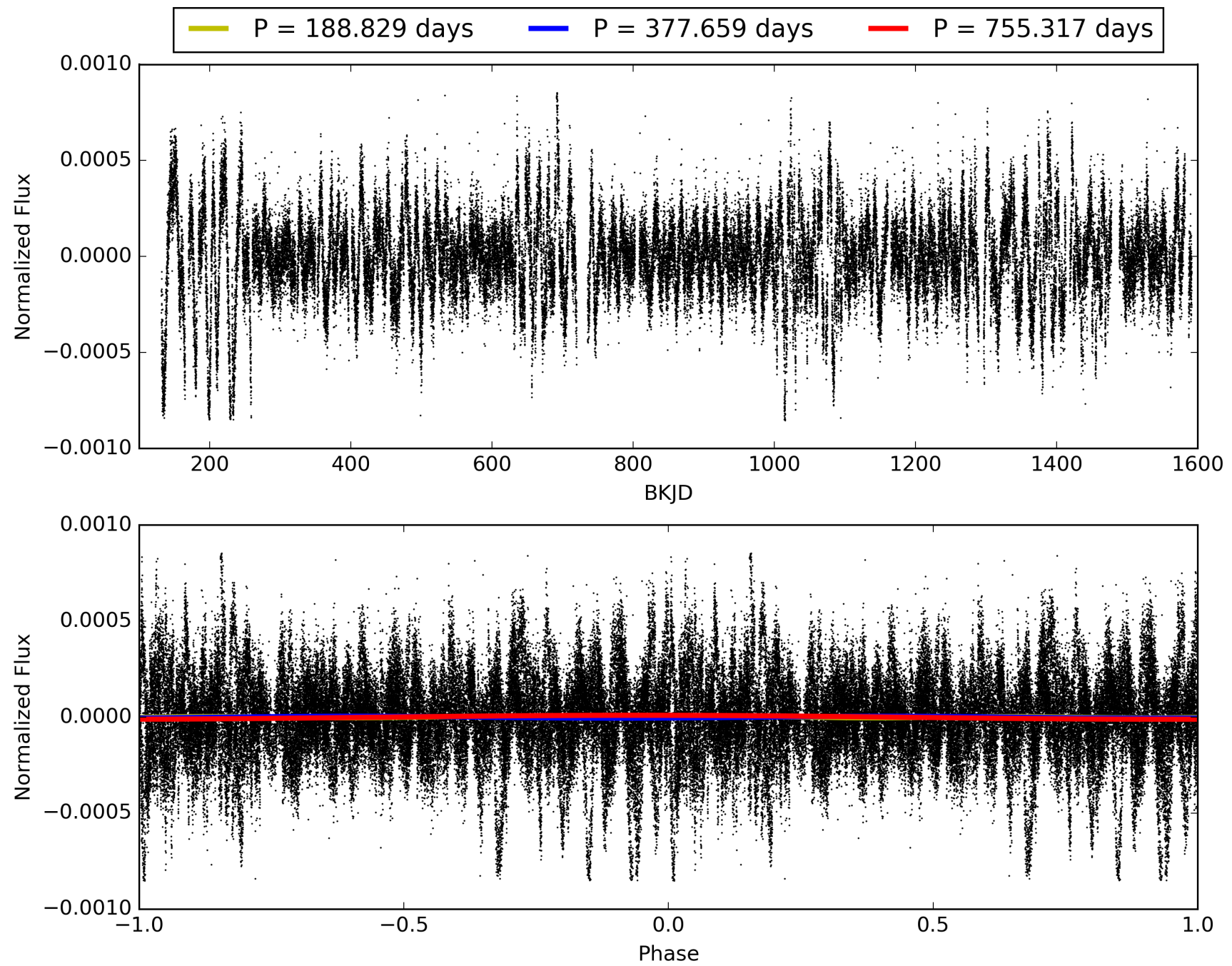
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 00:20:34 Z

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

# TCE 010006972-01, PDC Light Curves

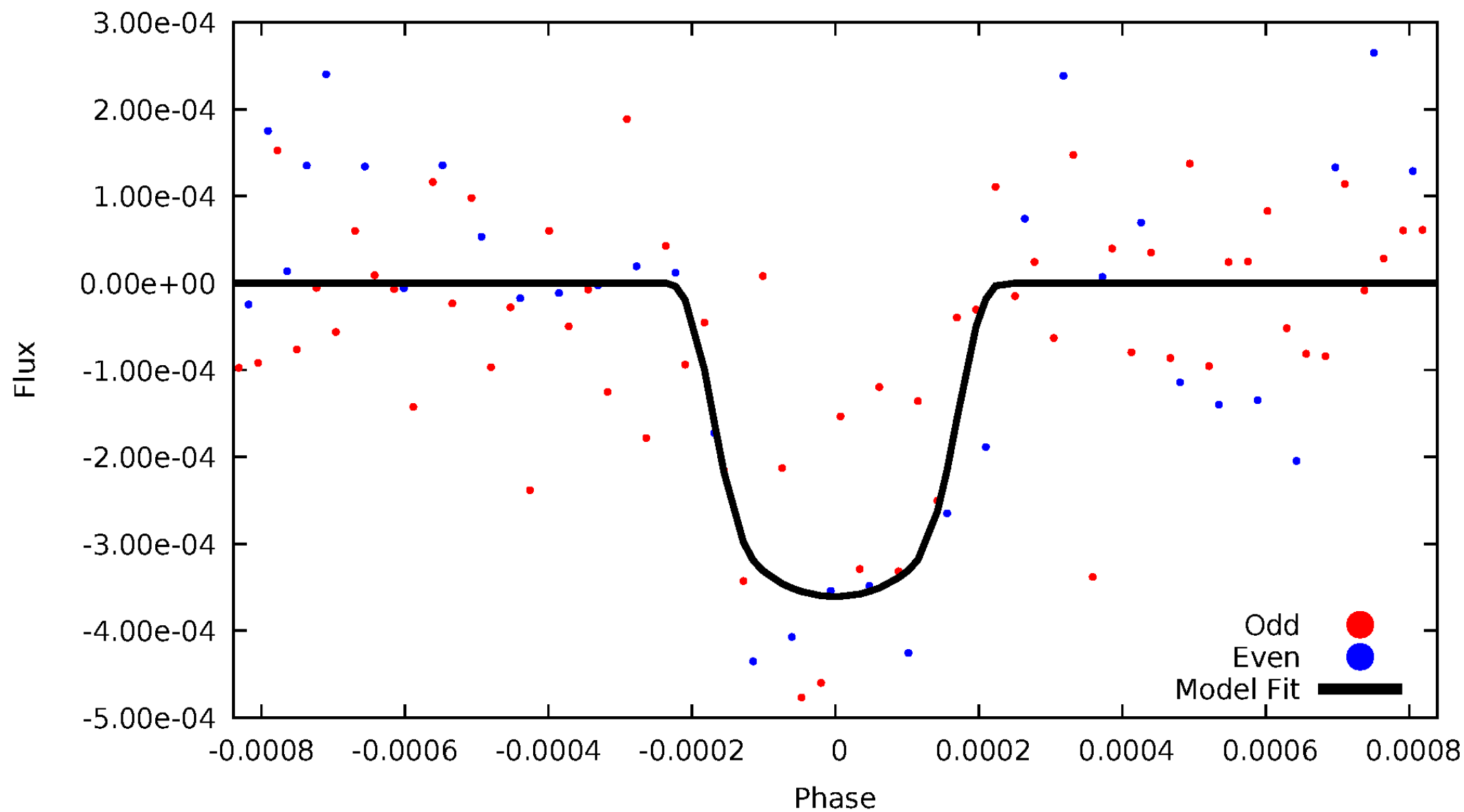


TCE 010006972-01



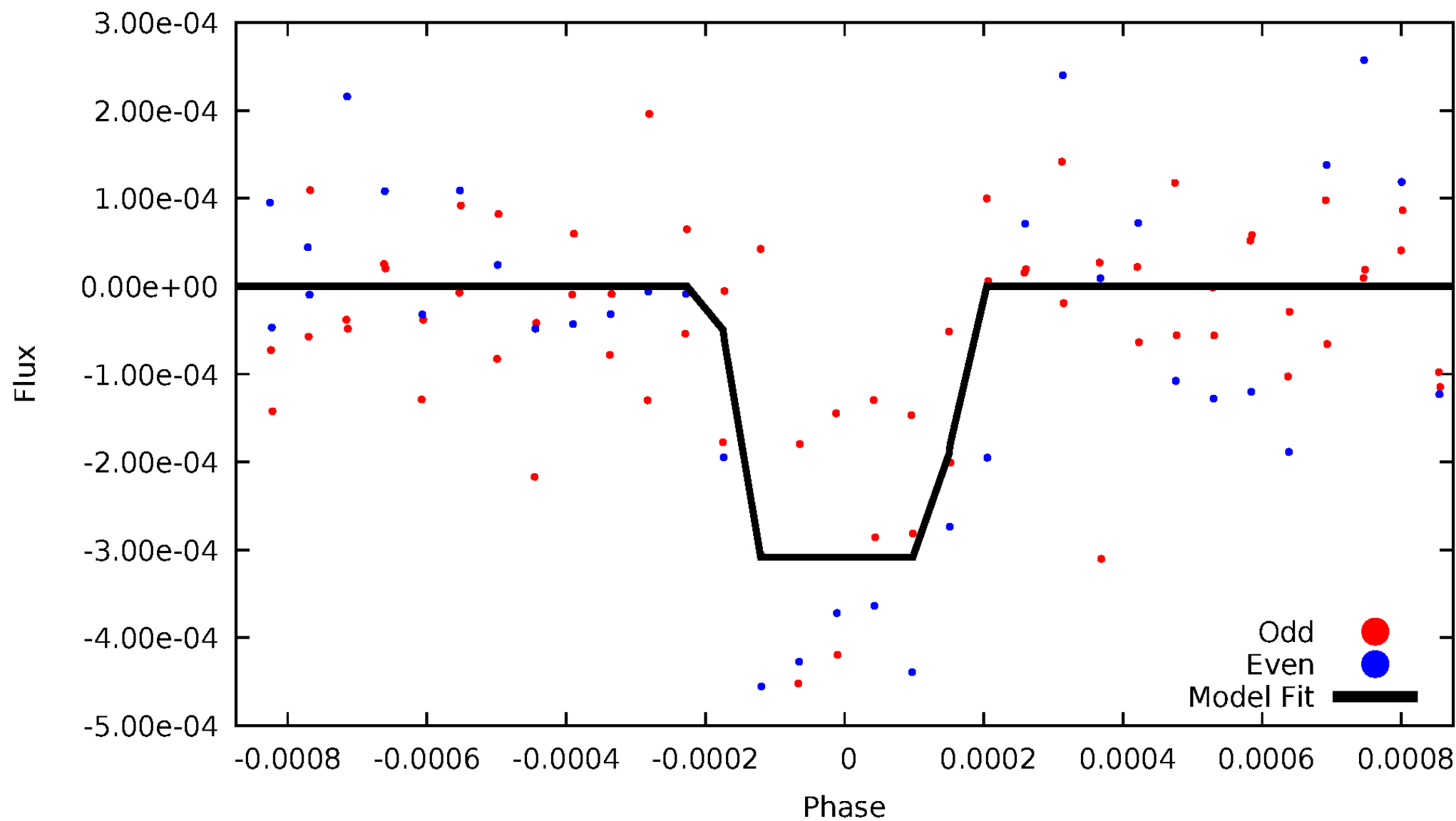
# DV Odd/Even

TCE 010006972-01

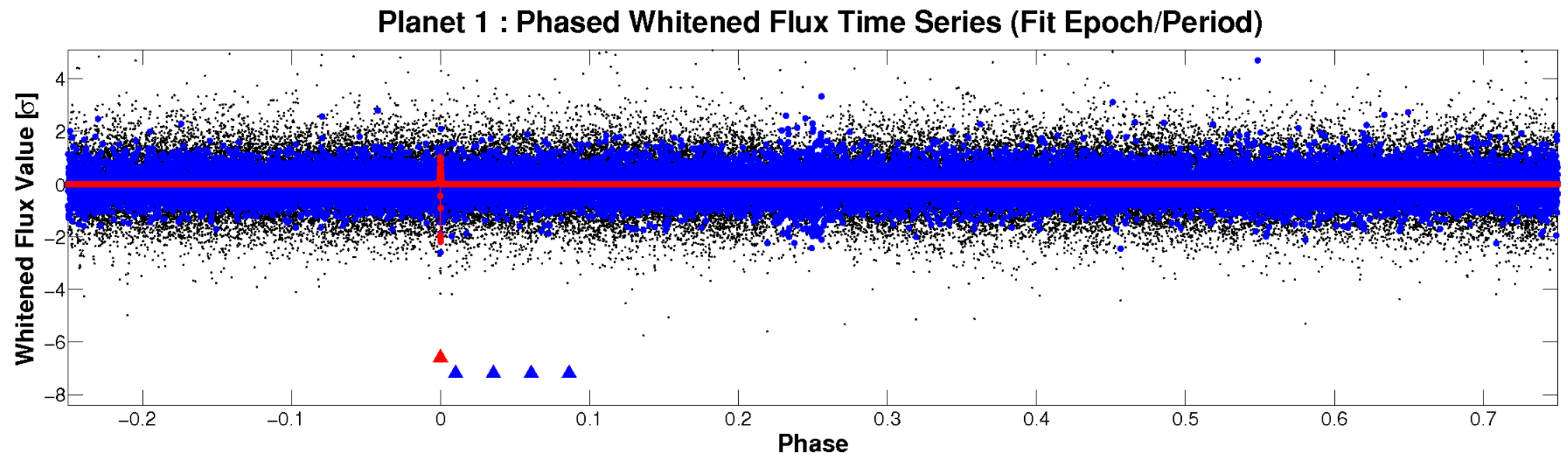
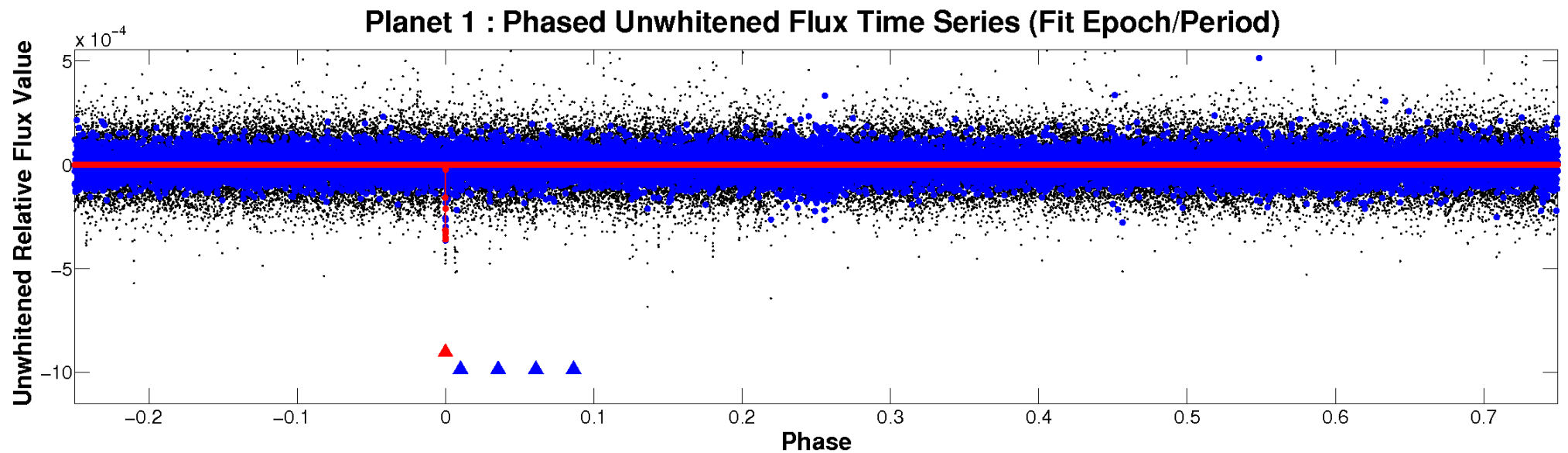


# ALT Odd/Even

TCE 010006972-01

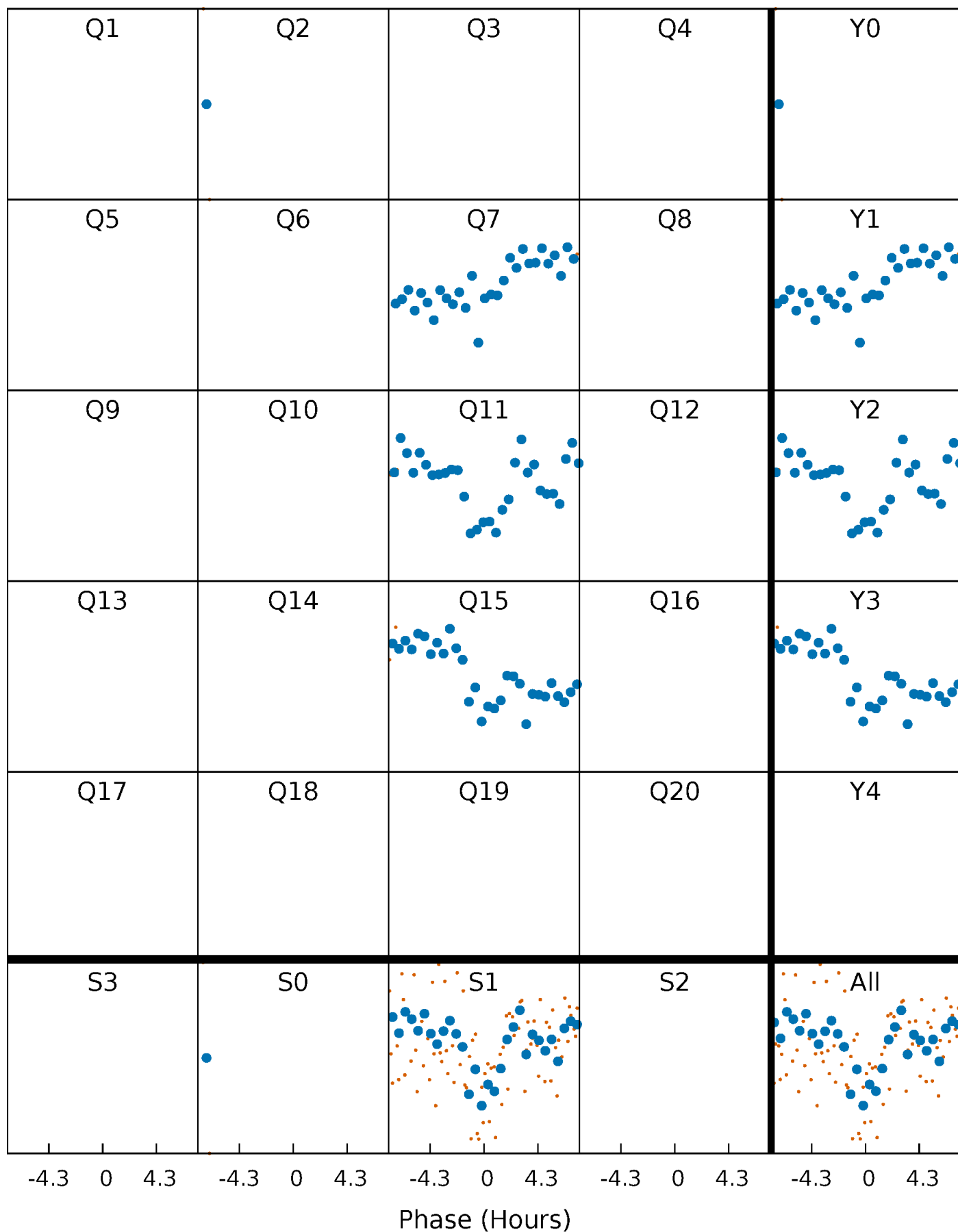


# Non-Whitened Vs. Whitened Light Curve



# PDC Quarter-Phased Transit Curves

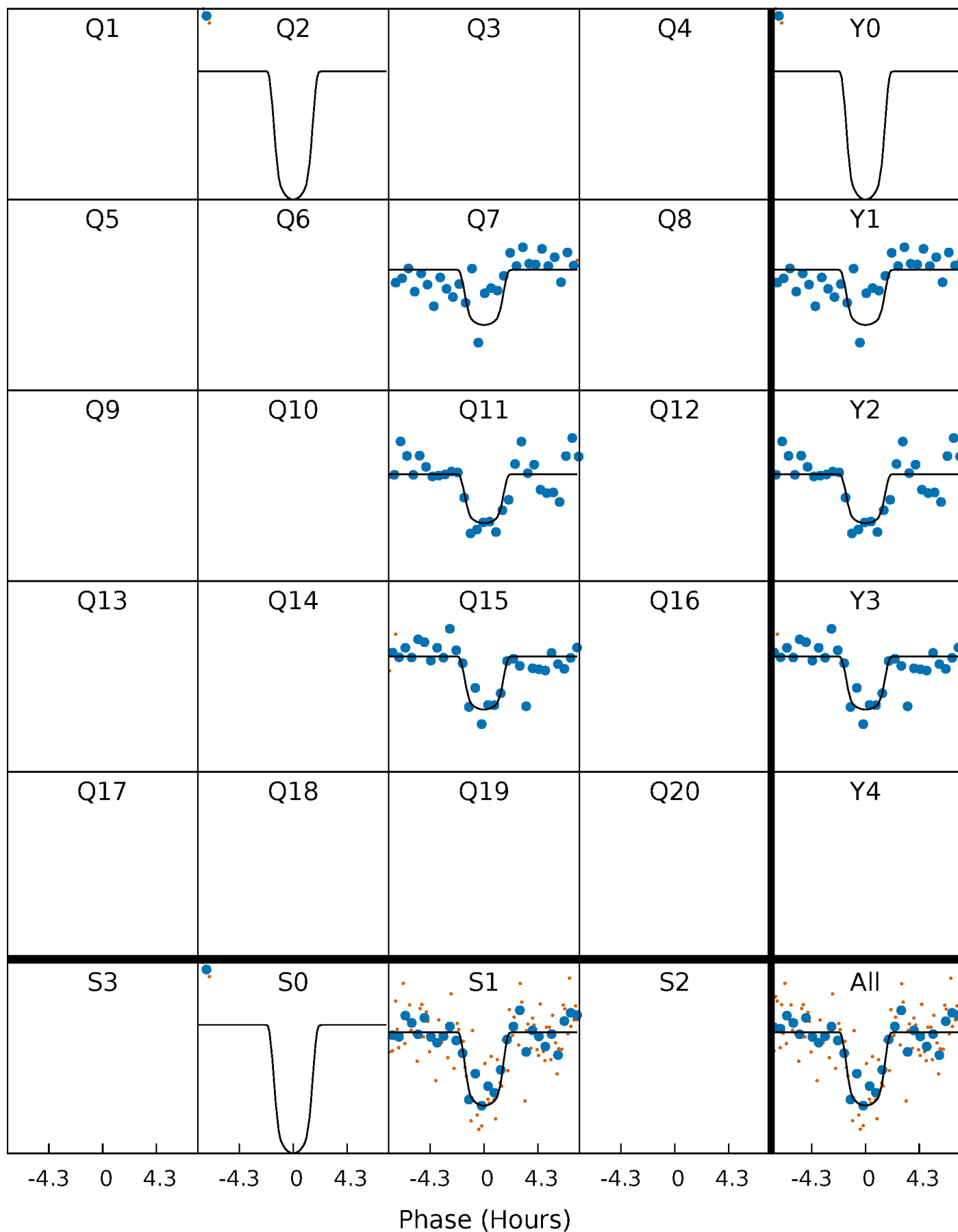
TCE 010006972-01 P=377.658729 Days  $T_0=255.660239$  (BKJD)





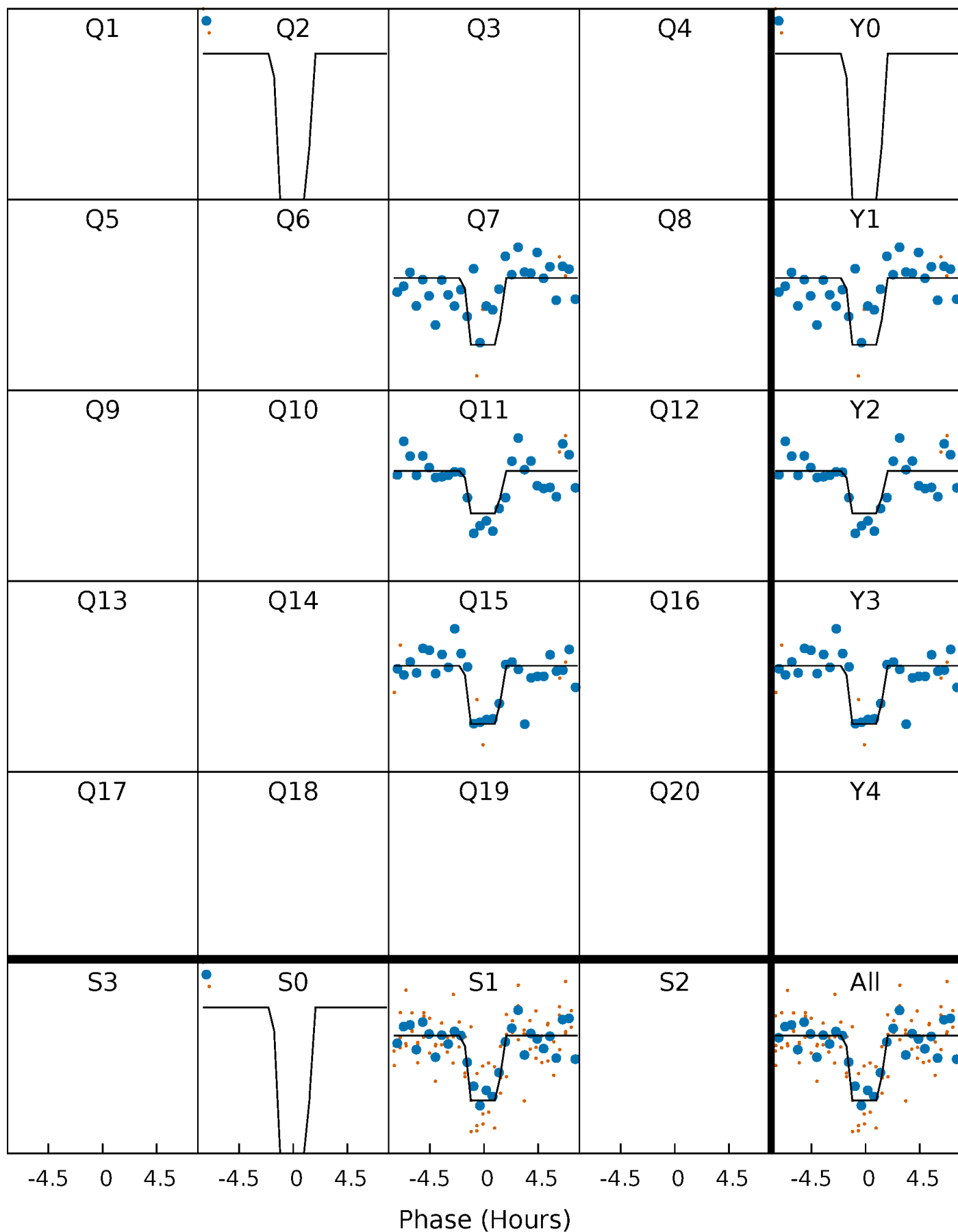
# DV Quarter-Phased Transit Curves

TCE 010006972-01 P=377.658729 Days  $T_0=255.660239$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

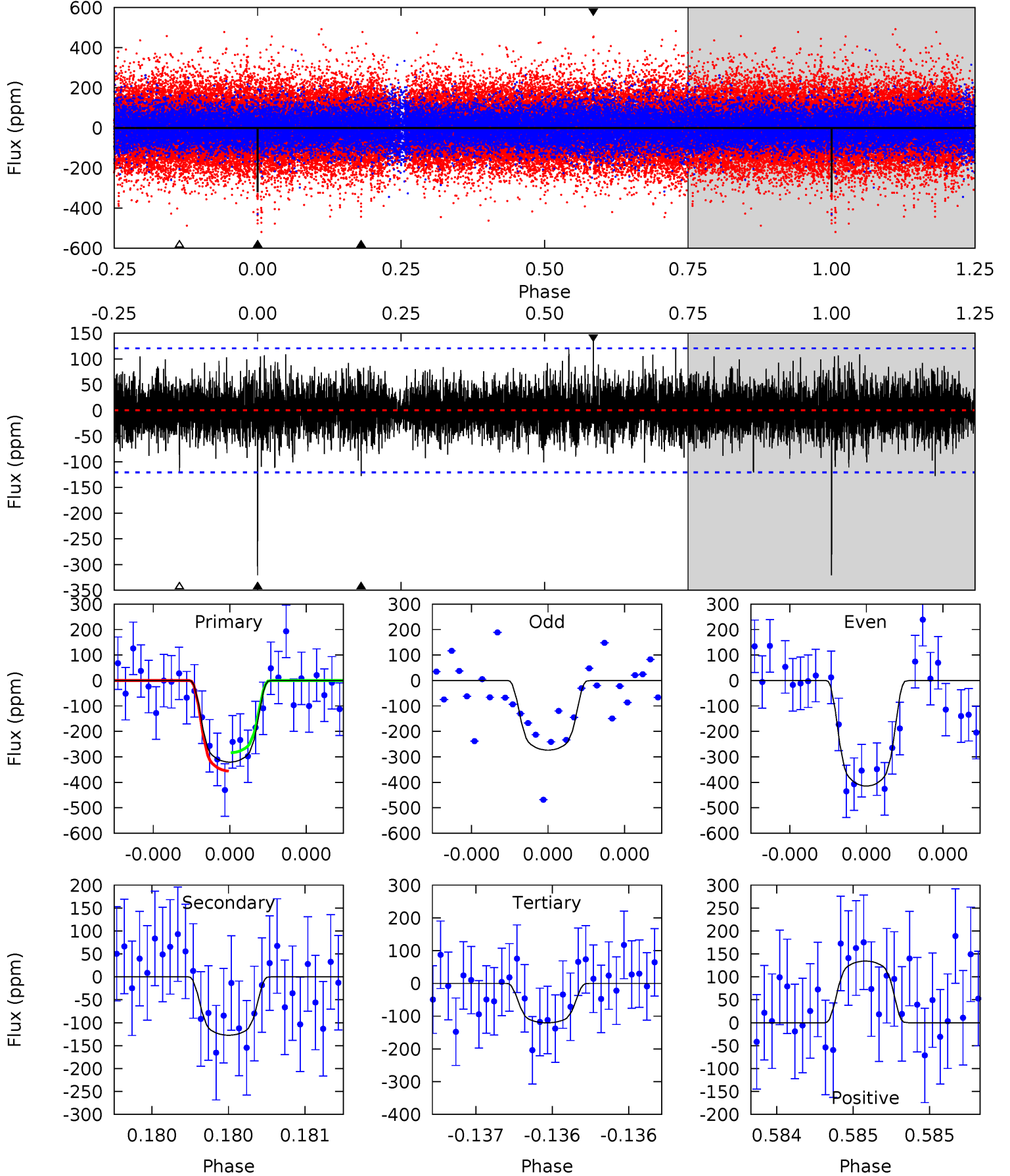
TCE 010006972-01 P=377.653190 Days  $T_0=255.673125$  (BKJD)



# DV Model-Shift Uniqueness Test

010006972-01, P = 377.658729 Days, E = 255.660239 Days

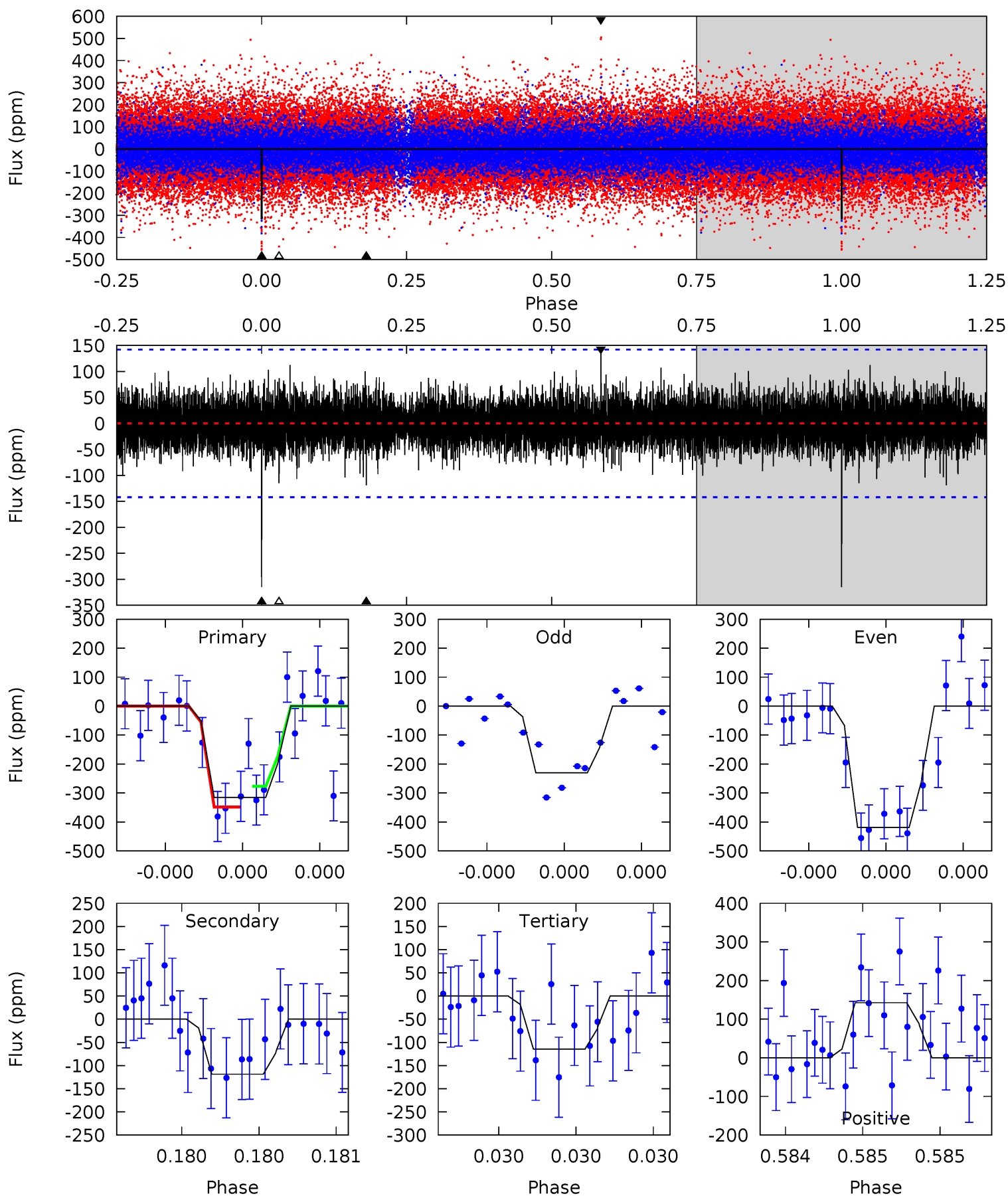
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
14.9	5.91	5.58	6.23	5.59	3.51	1.38	9.28	8.63	0.32	-0.32	3.10	0.92	0.30	1.66



# Alt Model-Shift Uniqueness Test

010006972-01, P = 377.653190 Days, E = 255.673125 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
12.5	4.72	4.56	5.67	5.65	3.59	1.12	7.97	6.86	0.16	-0.96	3.66	0.99	0.31	1.42



### Stellar Parameters For KIC 010006972

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5197^{+156}_{-140}$	$4.572^{+0.078}_{-0.052}$	$-0.560^{+0.350}_{-0.300}$	$0.705^{+0.075}_{-0.069}$	$0.676^{+0.090}_{-0.032}$	$2.718^{+0.913}_{-0.530}$
	+3%/-3%	+2%/-1%	+62%/-54%	+11%/-10%	+13%/-5%	+34%/-20%
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 010006972-01 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-127 \pm 22$	$1.72^{+0.30}_{-0.26}$	$283^{+11}_{-10}$	$3975^{+270}_{-240}$	$19329^{+8358}_{-5862}$
Alt.	$-119 \pm 25$	$1.34^{+0.29}_{-0.25}$	$282^{+12}_{-11}$	$4285^{+412}_{-342}$	$29689^{+17461}_{-11140}$

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

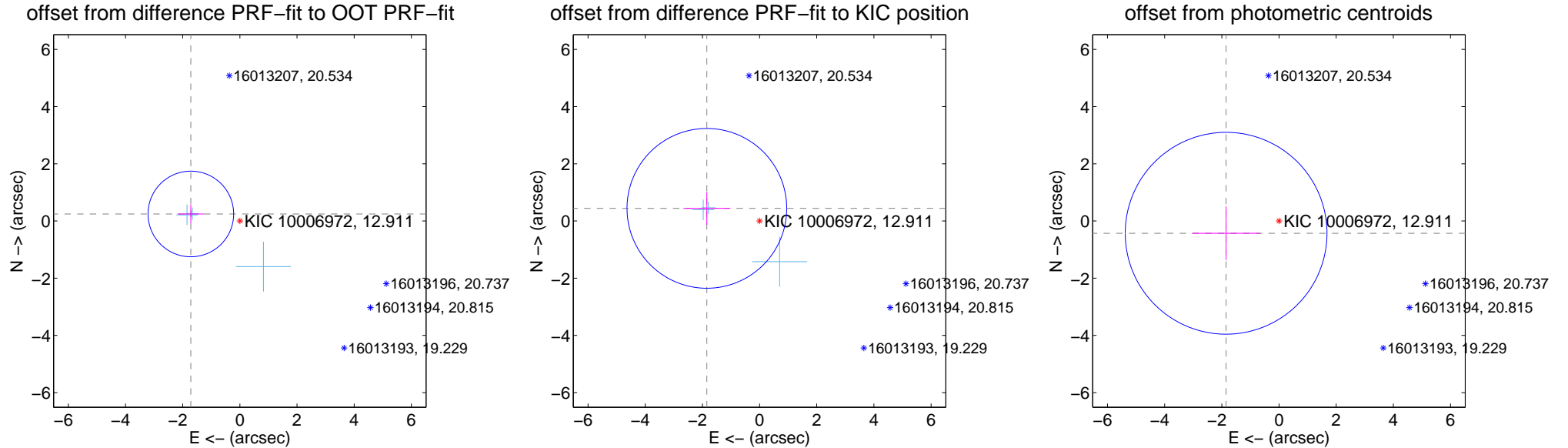
## DV Centroid Data

Supplemental centroid analysis for 010006972-01. Kepler magnitude: 12.91. Transit SNR 9.01

There are 3 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.22 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.732 \pm 0.499$	3.47	$1.715 \pm 0.458$	$0.246 \pm 0.329$
PRF-fit source offset from KIC position	$1.896 \pm 0.931$	2.04	$1.843 \pm 0.823$	$0.442 \pm 0.569$
photometric centroid source offset	$1.90 \pm 1.18$	1.61	$1.85 \pm 1.19$	$-0.43 \pm 0.94$

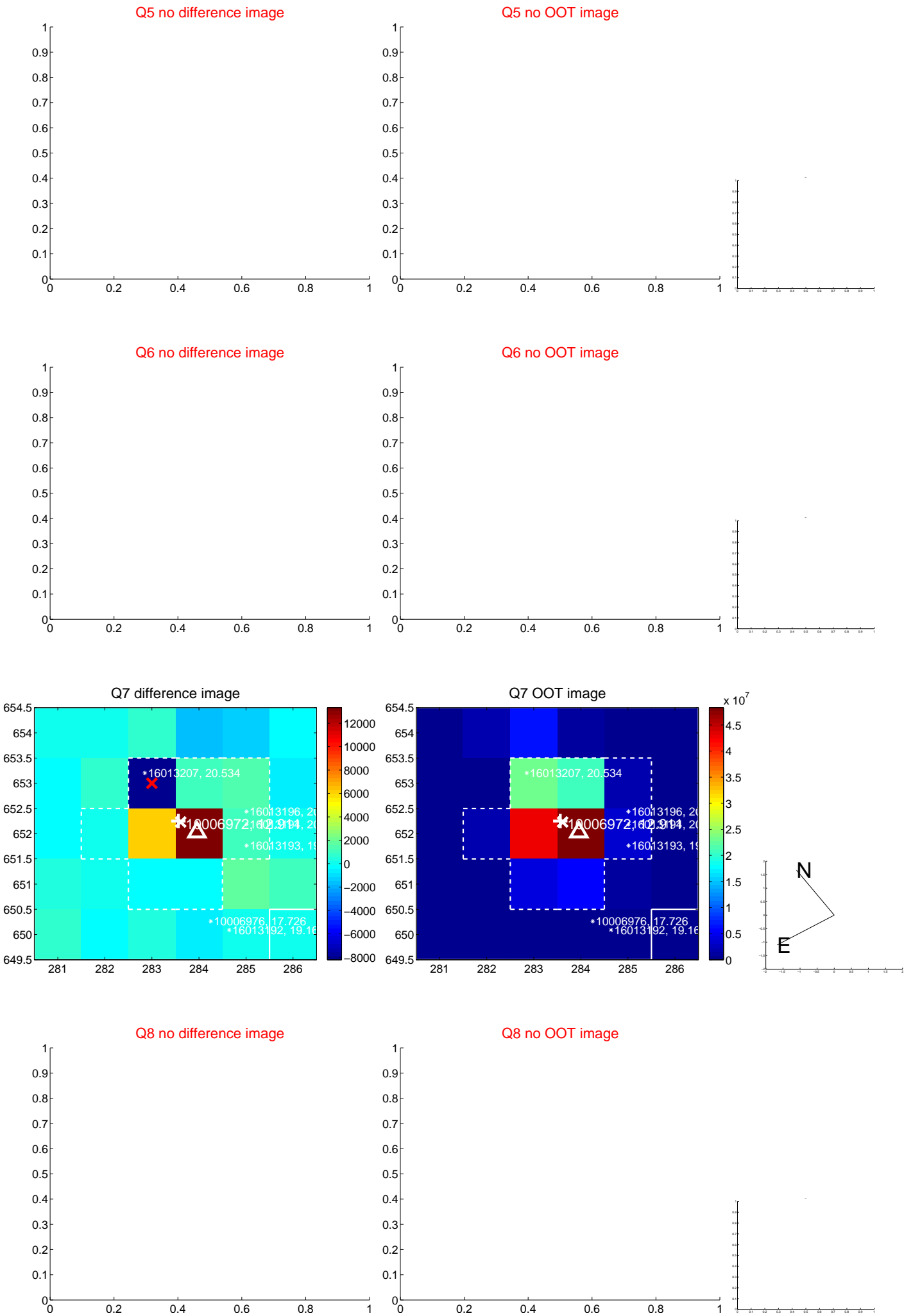


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

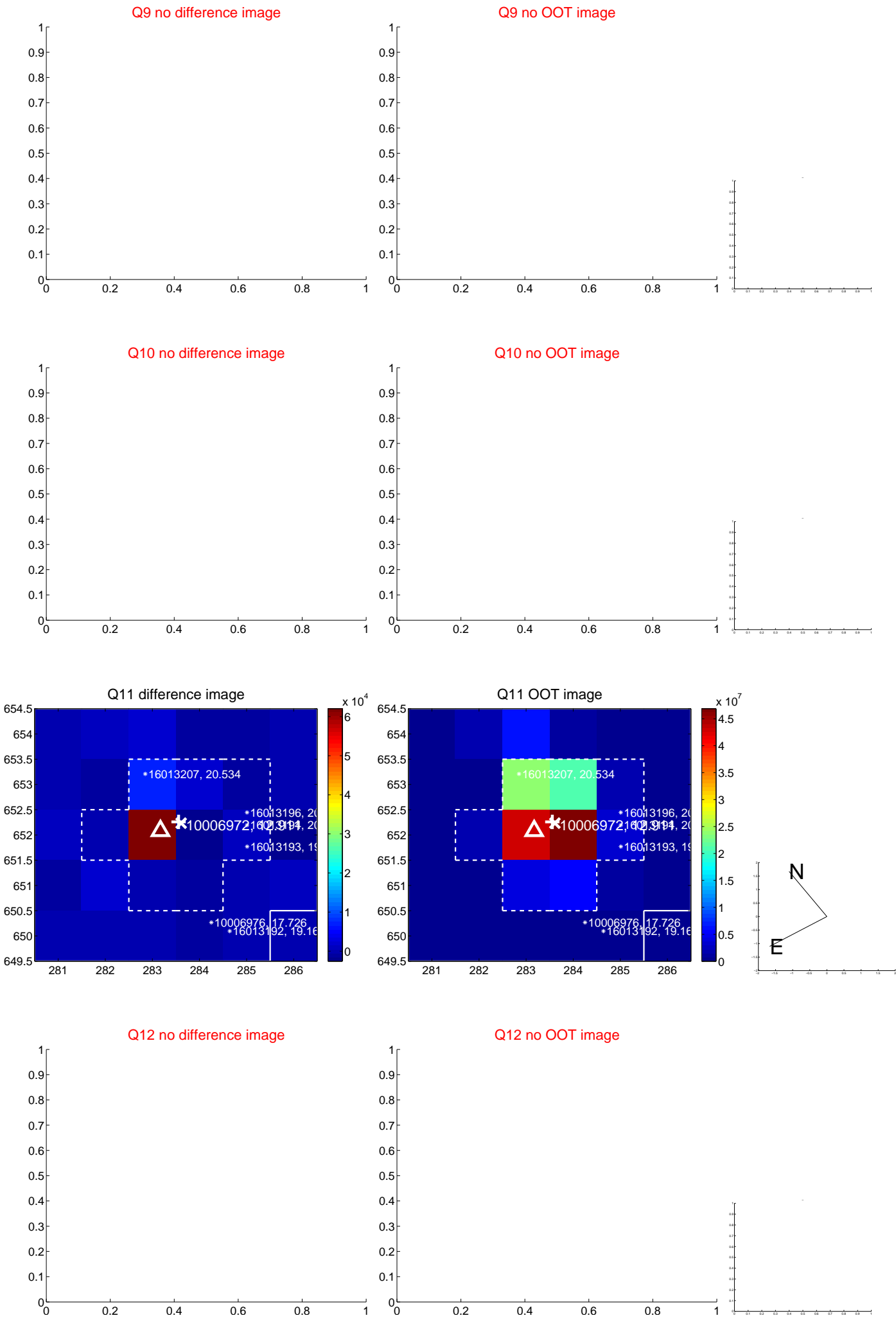


white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.

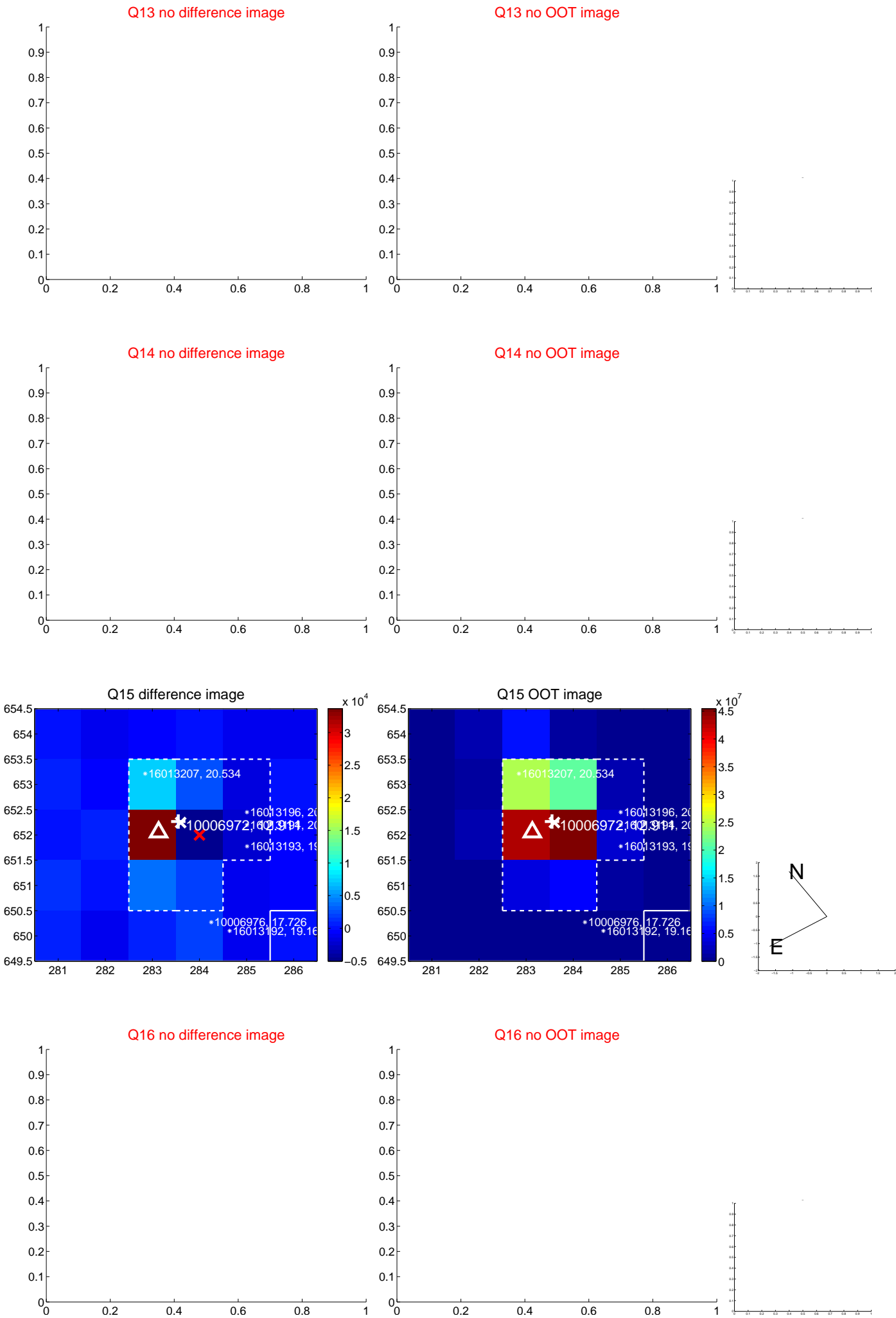




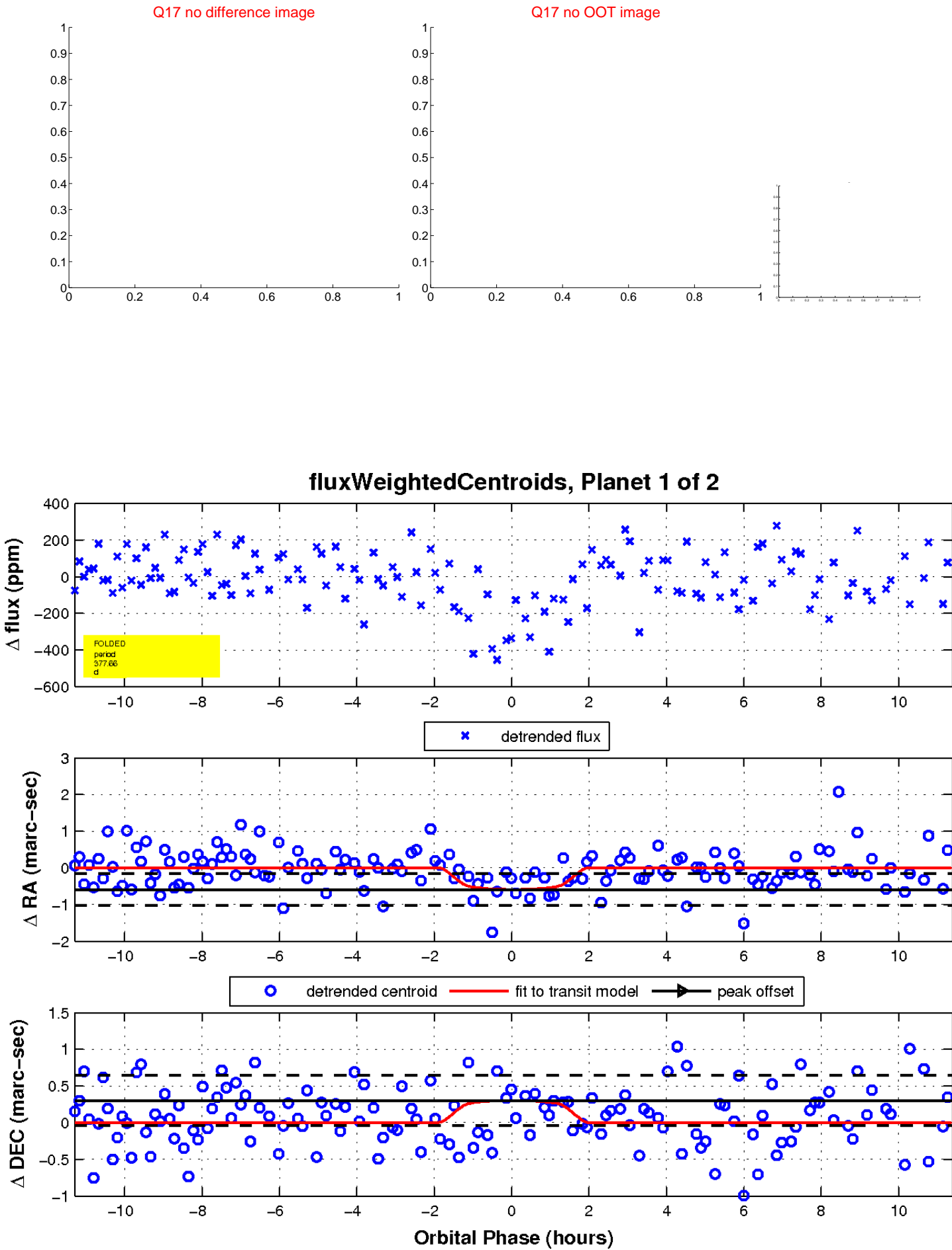
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

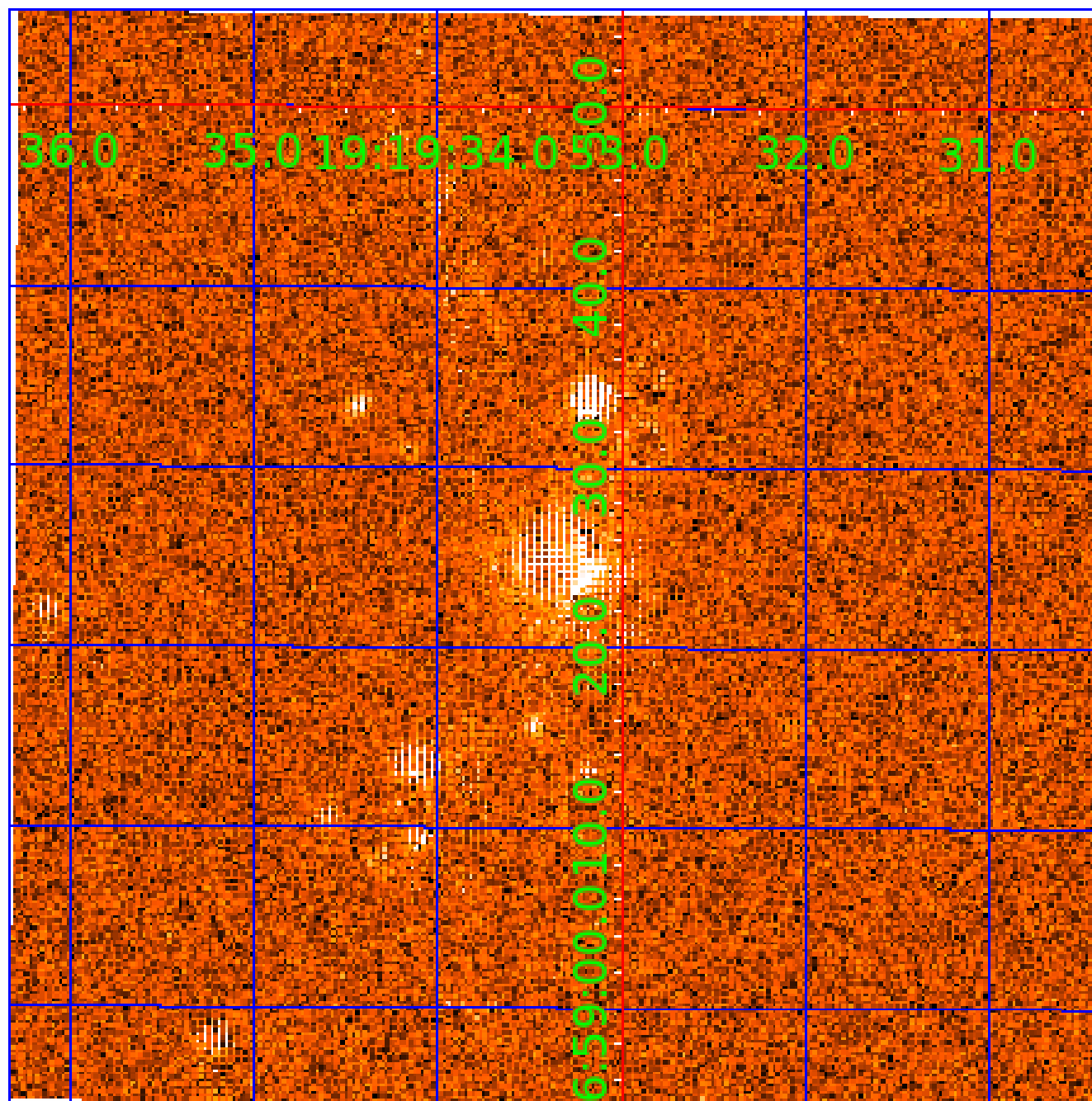


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



# UKIRT Image

Declination



# KIC 010006972

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010006972-01	OBS	No	377.658730	255.660239	360.5	3.801	7.9	9.0	0.70	5197	1.72	0.40
010006972-02	OBS	No	368.066859	288.270358	161.7	17.430	8.2	6.0	0.70	5197	0.98	0.42

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010006972-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—INCONSISTENT_TRANS—CENT_FEW_DIFFS
010006972-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—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.

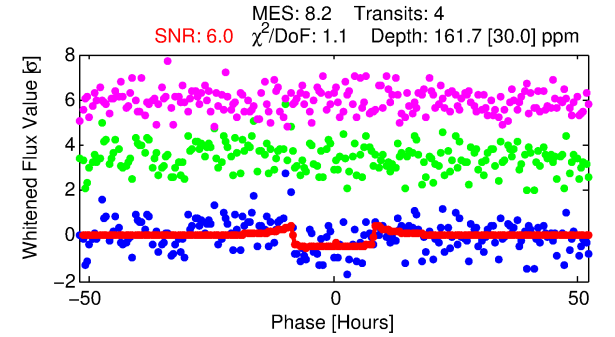
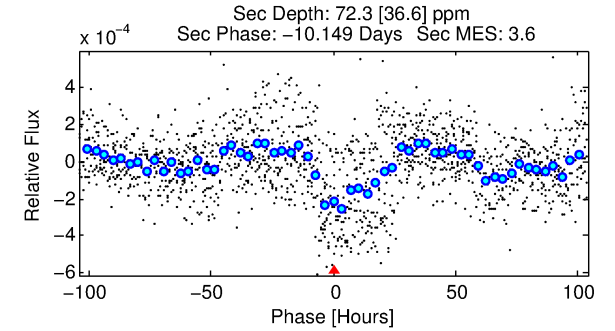
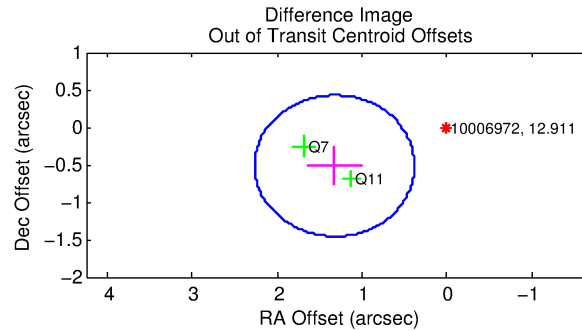
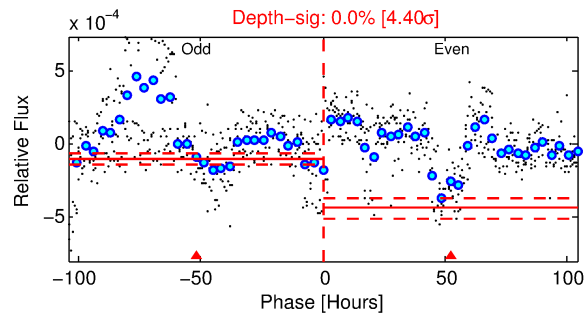
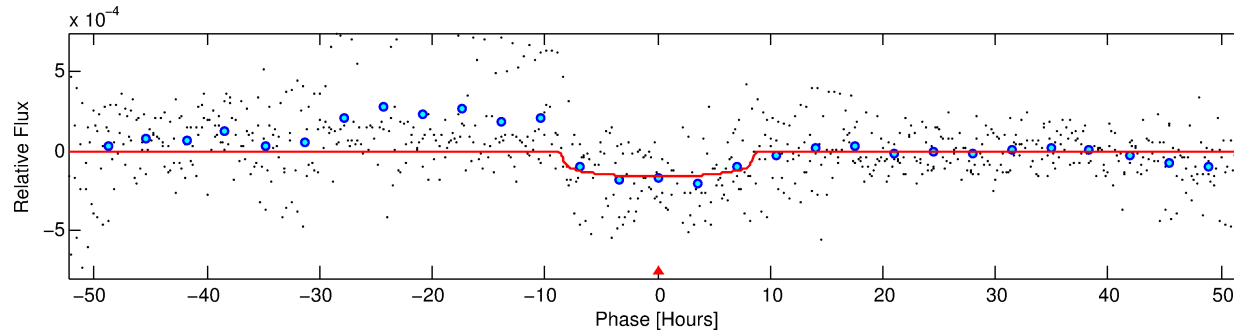
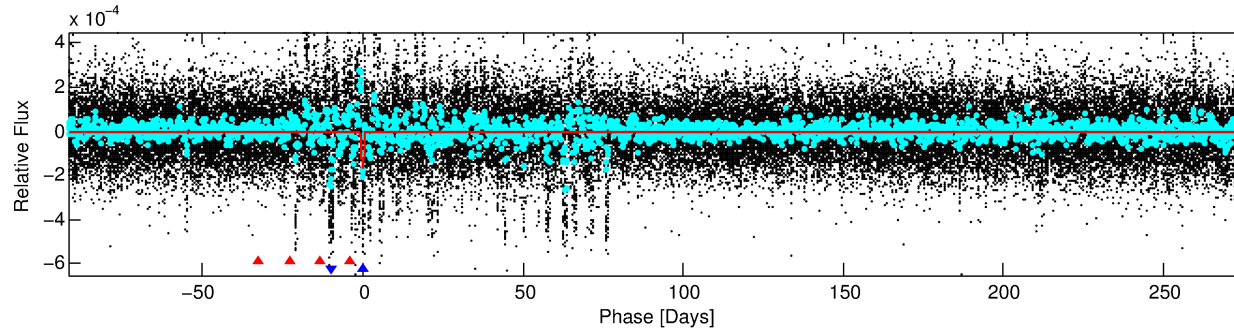
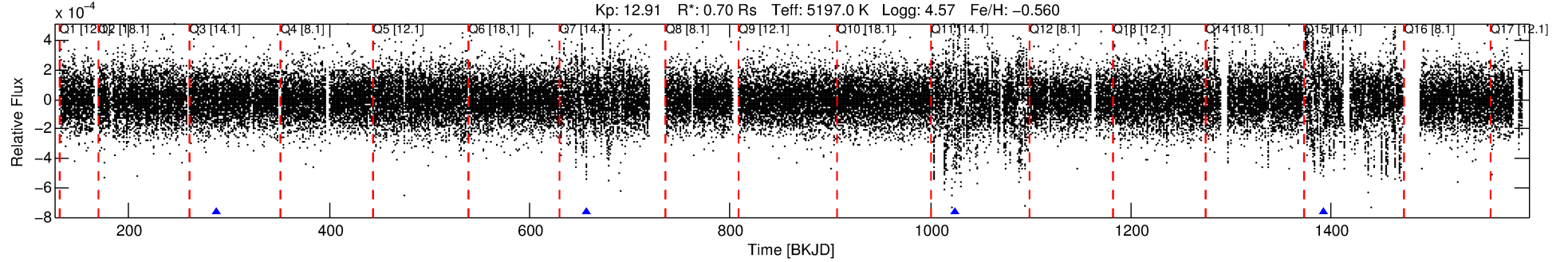
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 010006972-02

No Significant Match Found

# DV One-Page Summary

KIC: 10006972 Candidate: 2 of 2 Period: 368.067 d



## DV Fit Results:

Period = 368.06686 [0.01078] d  
Epoch = 288.2704 [0.0209] BKJD  
Rp/R\* = 0.0127 [0.0041]  
a/R\* = 109.07 [135.60]  
b = 0.75 [0.71]  
Seff = 0.42 [0.08]  
Teq = 205 [9] K  
Rp = 0.98 [0.33] Re  
a = 0.8826 [0.0819] AU  
Ag = 32556.24 [26980.49] [1.21σ]  
Teffp = 4256 [879] K [4.61σ]

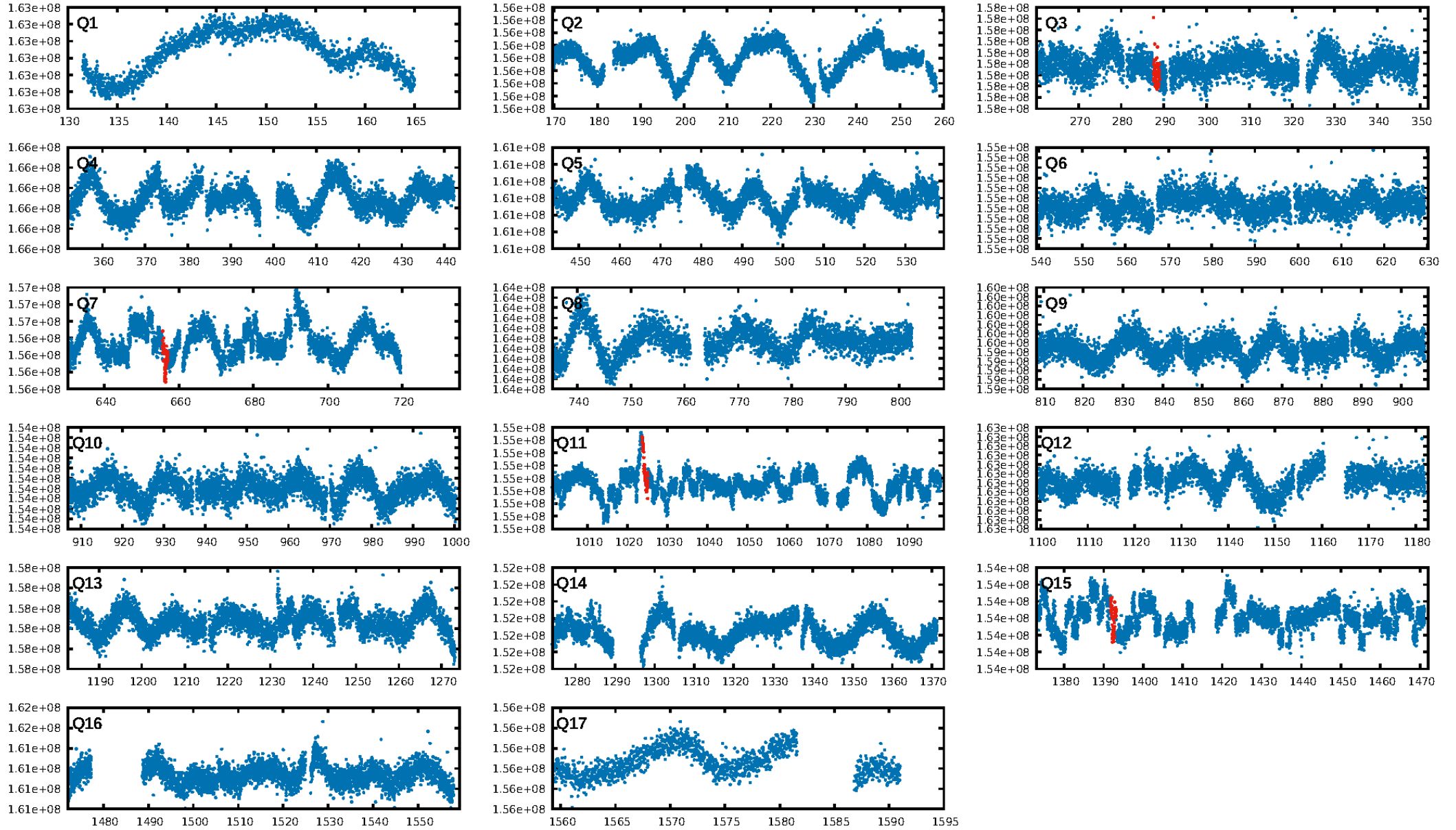
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [12.90σ]  
ModelChiSquare2-sig: 0.2%  
ModelChiSquareGof-sig: 96.3%  
Bootstrap-pfa: 1.02e-10  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: -0.7017  
Centroid-sig: 0.6%  
Centroid-so: 3.424 arcsec [2.83σ]  
OotOffset-rm: 1.417 arcsec [4.51σ]  
KicOffset-rm: 1.481 arcsec [4.67σ]  
OotOffset-st: 0/2/0/0 [2]  
KicOffset-st: 0/2/0/0 [2]  
DiffImageQuality-fgm: 1.00 [2/2]  
DiffImageOverlap-fno: 1.00 [3/3]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 00:20:43 Z

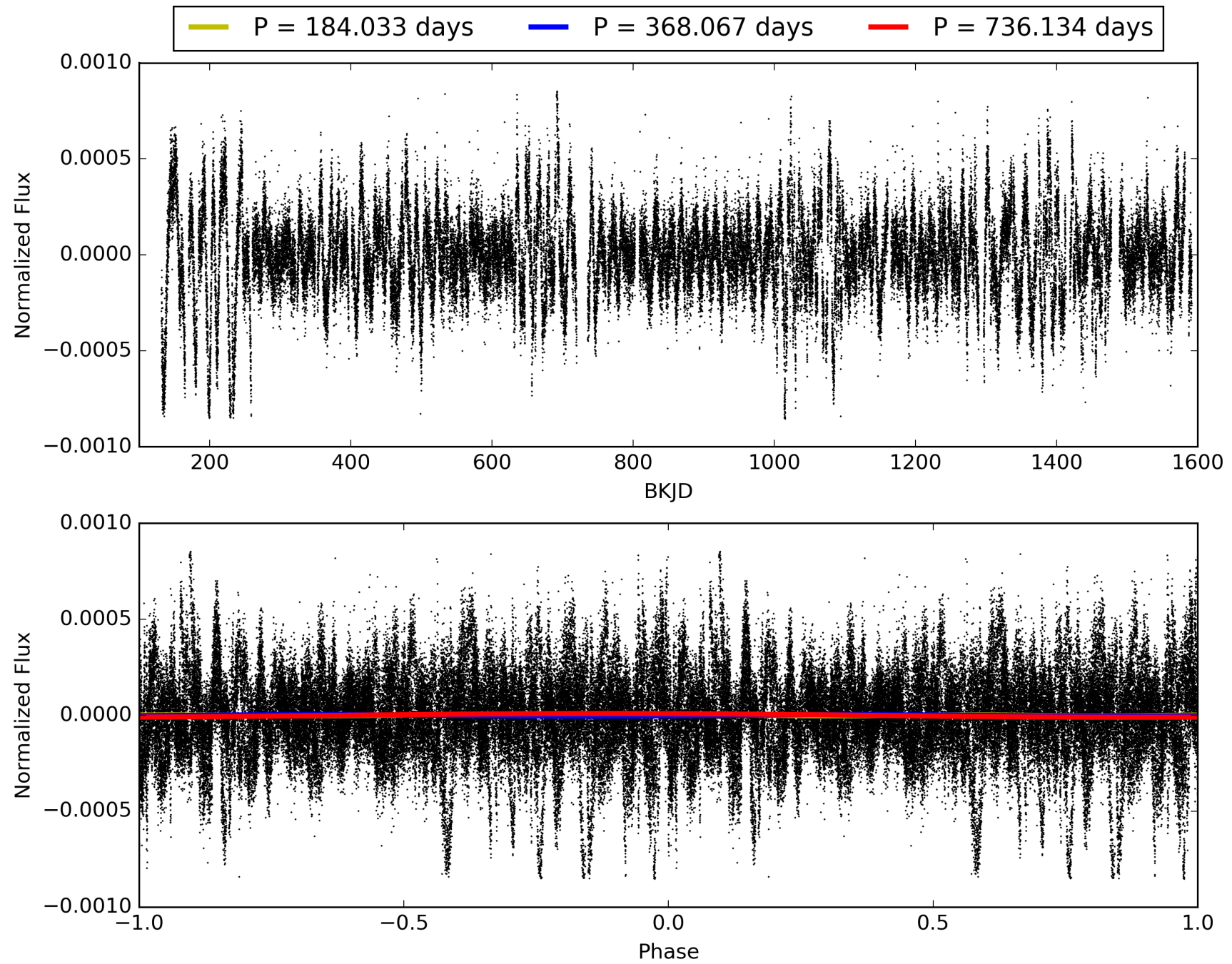
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 010006972-02, PDC Light Curves





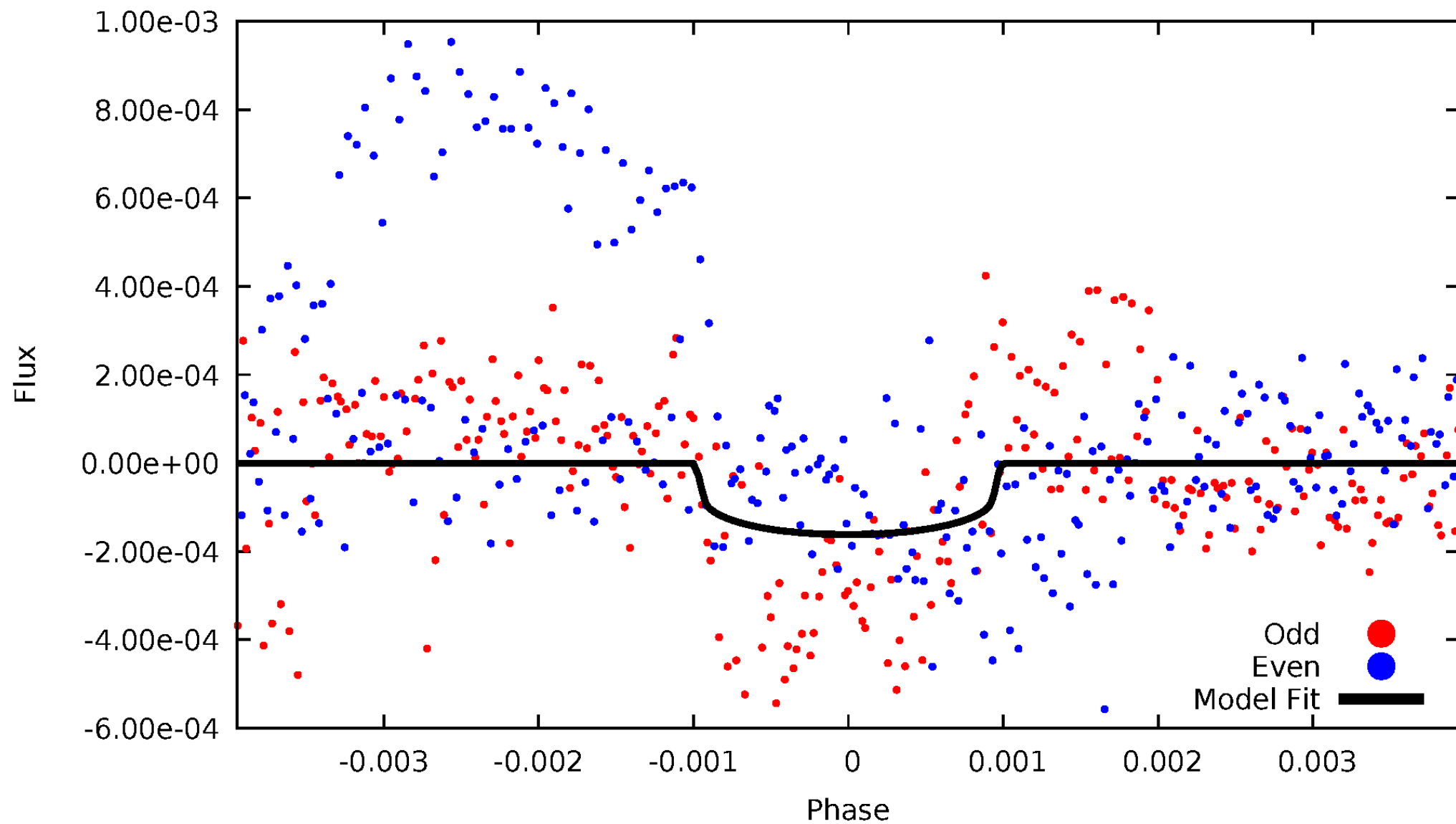
TCE 010006972-02





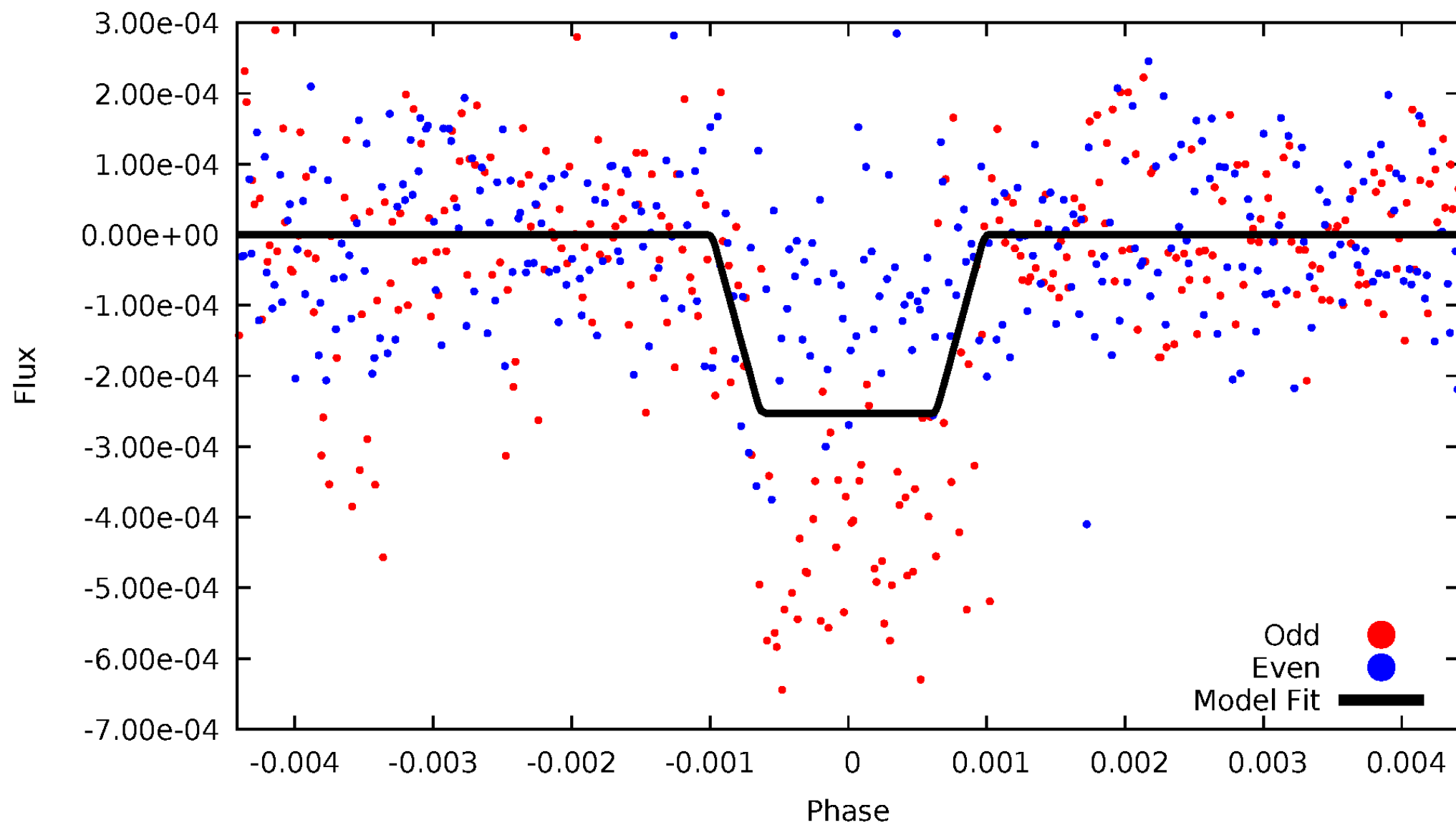
# DV Odd/Even

TCE 010006972-02



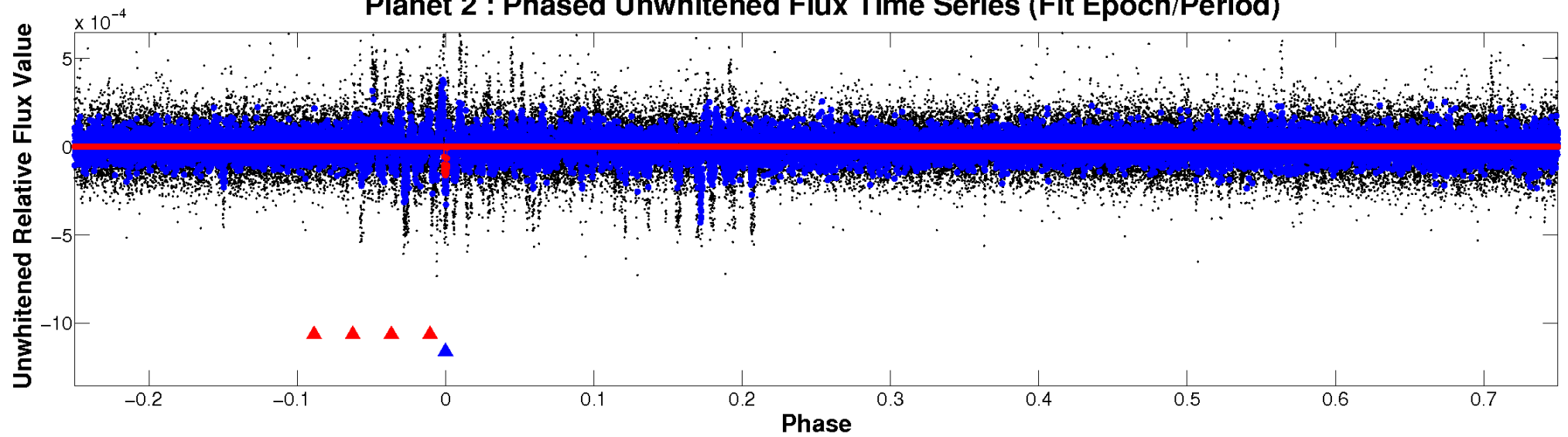
# ALT Odd/Even

TCE 010006972-02

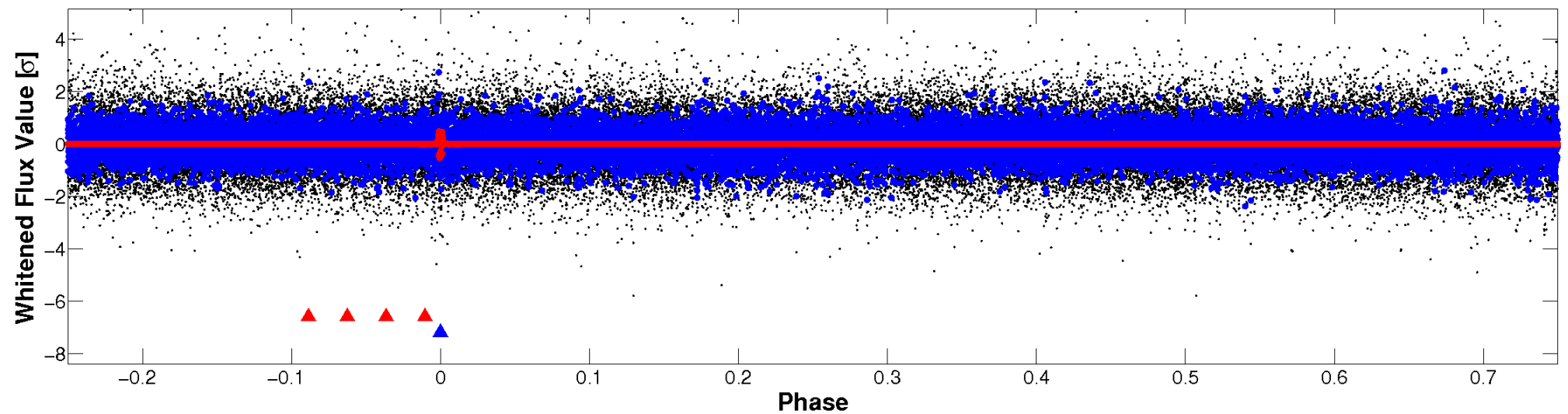


# Non-Whitened Vs. Whitened Light Curve

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

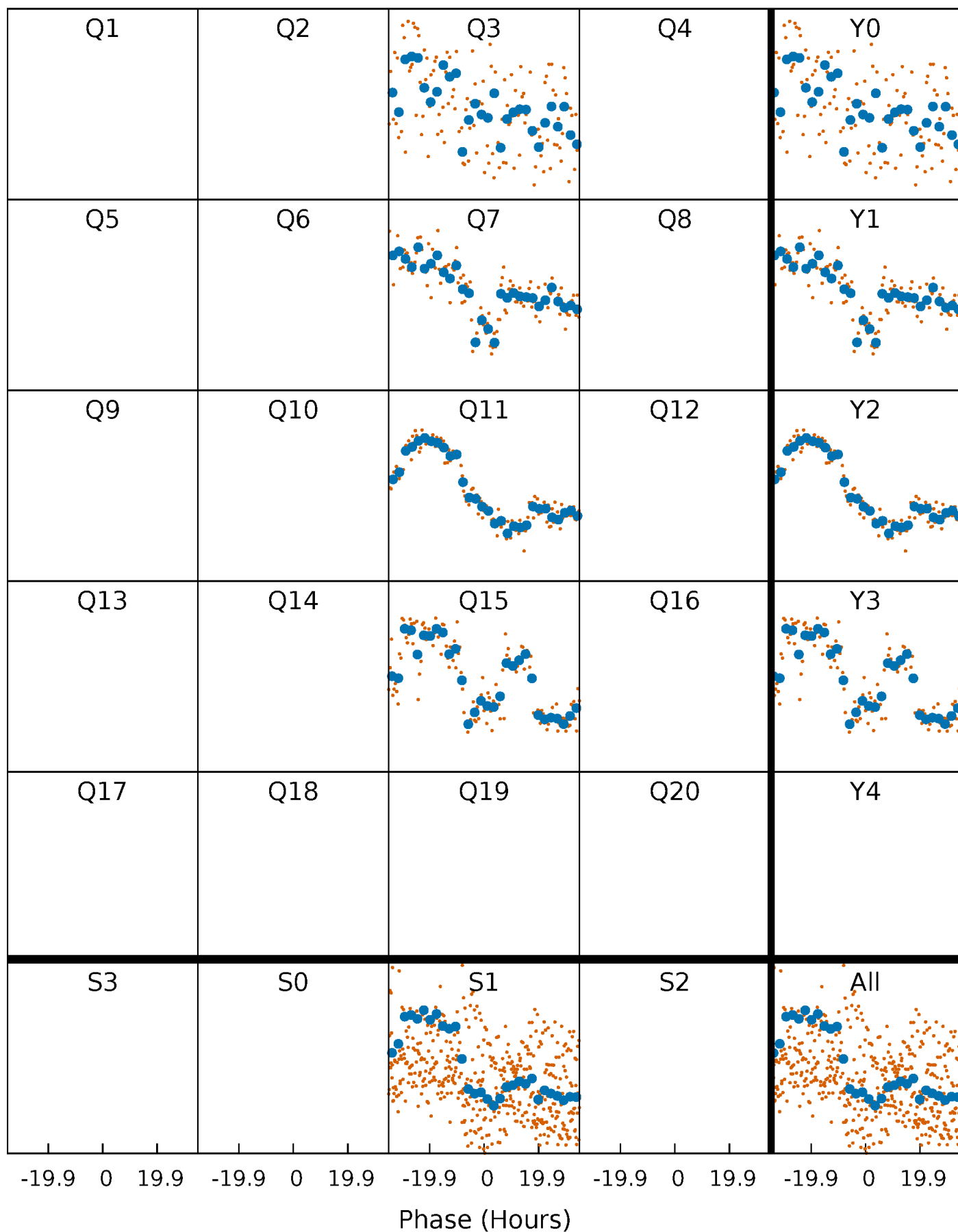


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



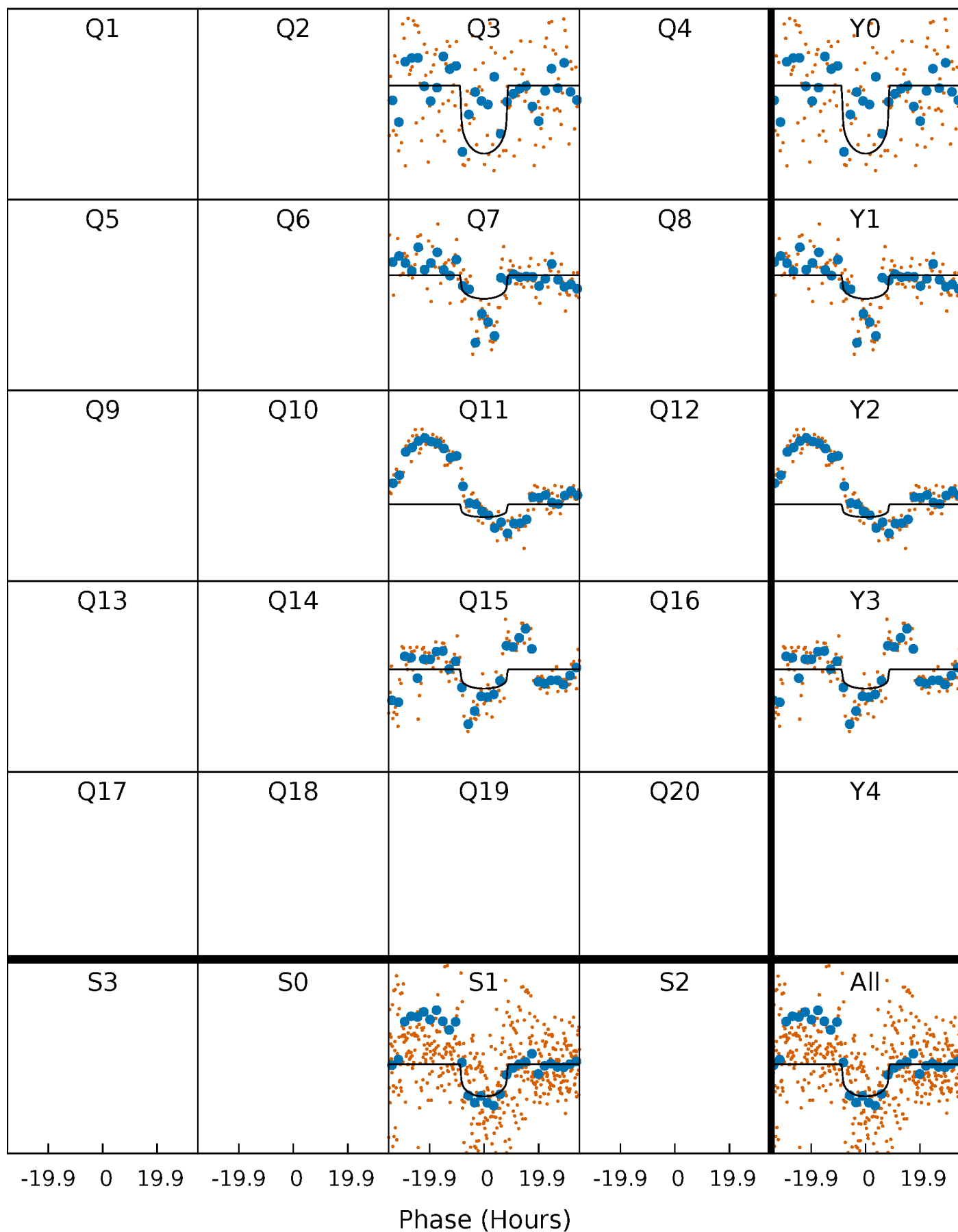
# PDC Quarter-Phased Transit Curves

TCE 010006972-02     $P=368.066859$  Days     $T_0=288.270357$  (BKJD)



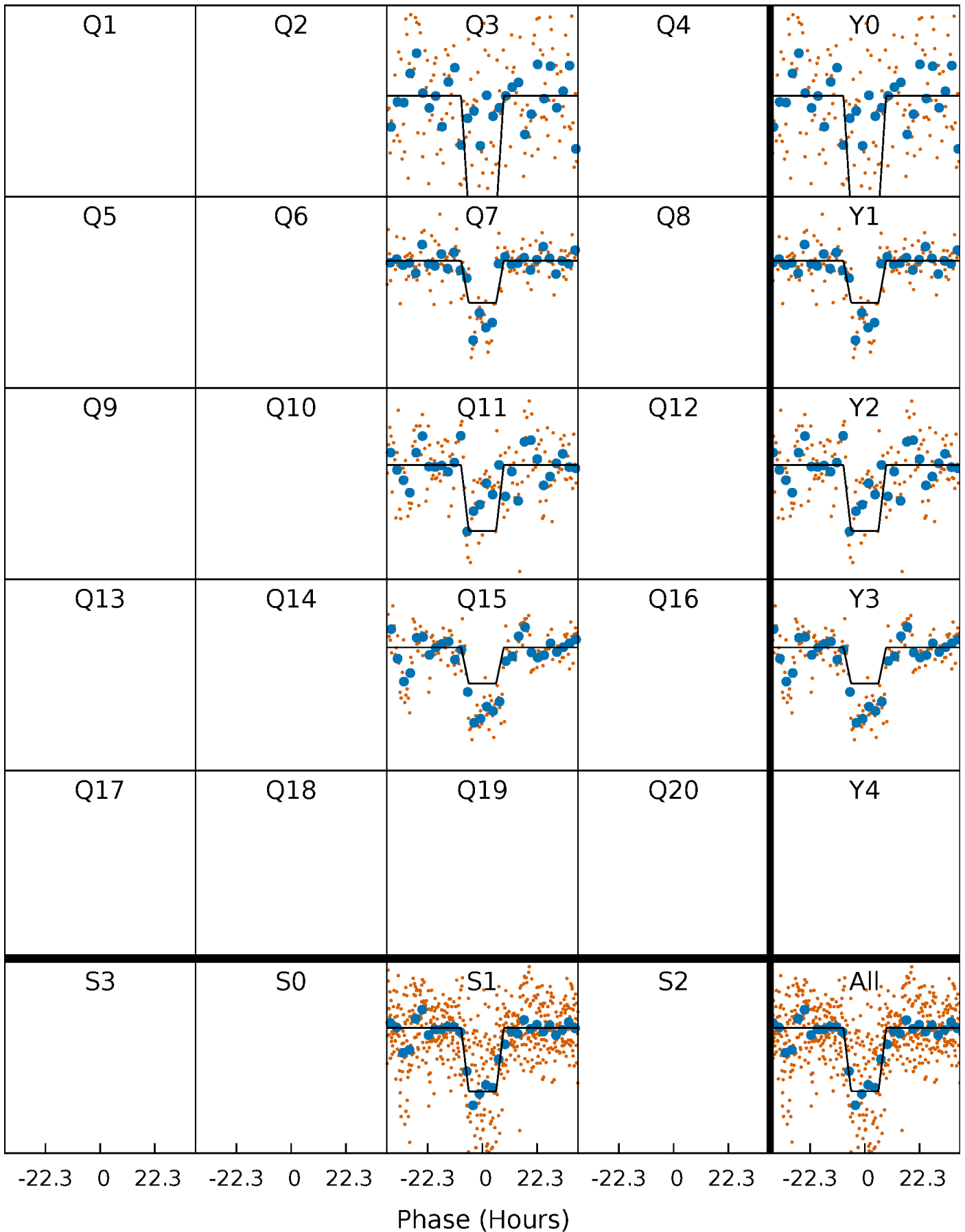
# DV Quarter-Phased Transit Curves

TCE 010006972-02     $P=368.066859$  Days     $T_0=288.270357$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

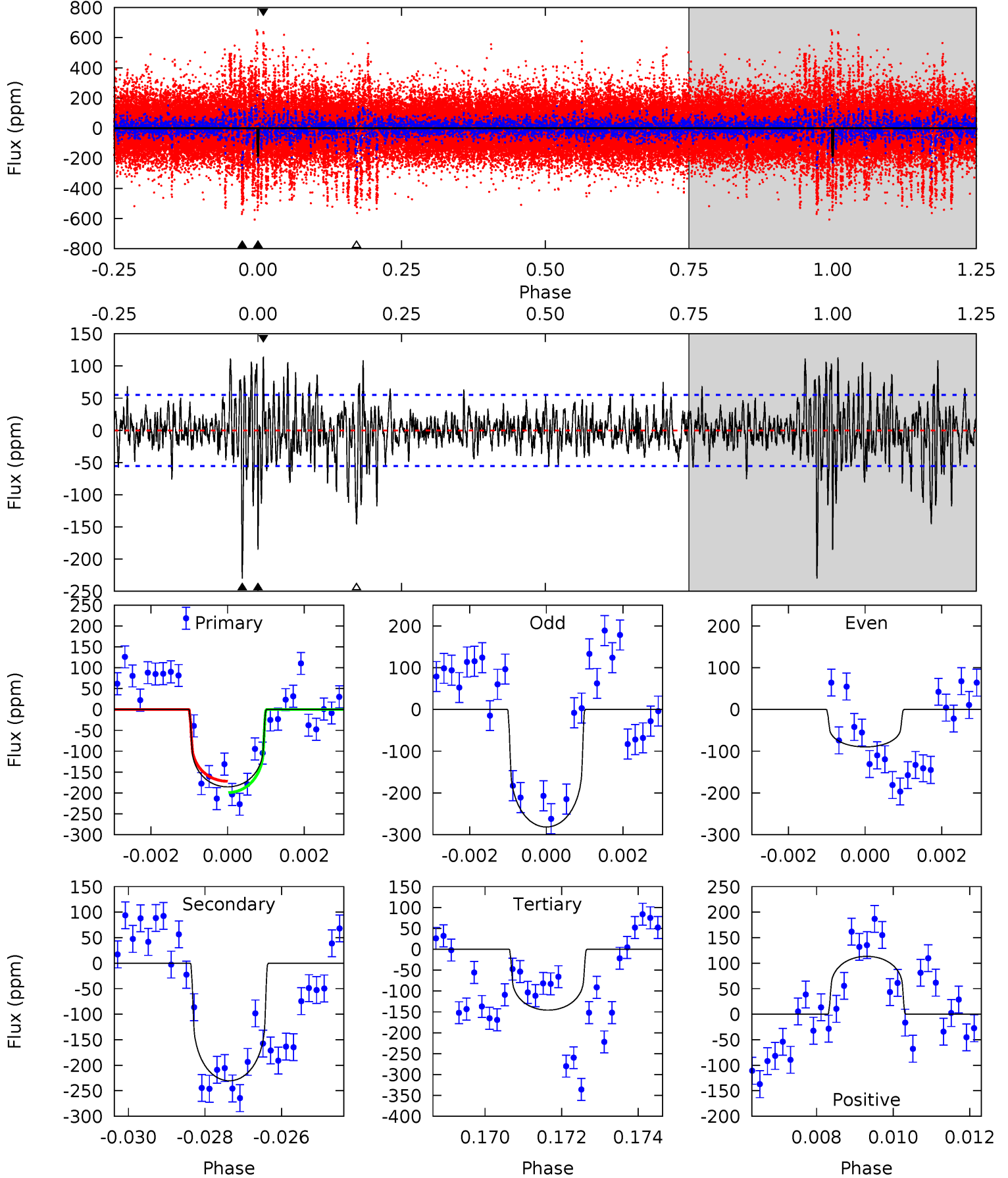
TCE 010006972-02     $P=368.022038$  Days     $T_0=288.334313$  (BKJD)



# DV Model-Shift Uniqueness Test

010006972-02, P = 368.066859 Days, E = 288.270357 Days

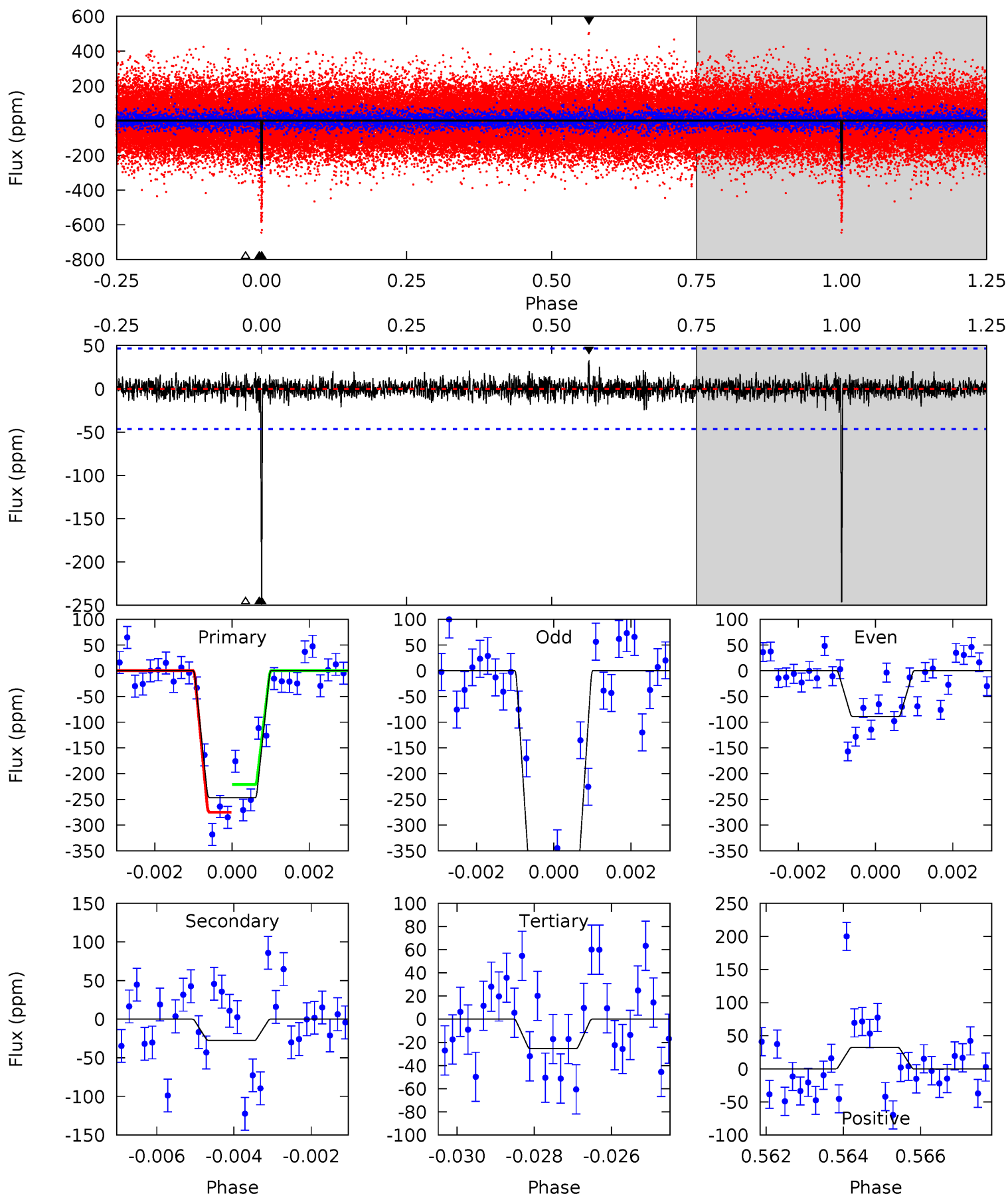
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
17.9	22.2	14.1	10.9	5.33	3.09	2.80	3.83	6.95	8.17	11.3	9.06	0.94	0.33	1.32



# Alt Model-Shift Uniqueness Test

010006972-02, P = 368.022038 Days, E = 288.334313 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
28.2	3.14	2.90	3.69	5.33	3.09	0.74	25.3	24.5	0.24	-0.55	18.1	1.04	0.12	3.09





### Stellar Parameters For KIC 010006972

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5197^{+156}_{-140}$	$4.572^{+0.078}_{-0.052}$	$-0.560^{+0.350}_{-0.300}$	$0.705^{+0.075}_{-0.069}$	$0.676^{+0.090}_{-0.032}$	$2.718^{+0.913}_{-0.530}$
	+3%/-3%	+2%/-1%	+62%/-54%	+11%/-10%	+13%/-5%	+34%/-20%
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 010006972-02 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-230 \pm 10$	$0.95^{+0.32}_{-0.30}$	$285^{+12}_{-10}$	$5741^{+1306}_{-707}$	$113517^{+125060}_{-49929}$
Alt.	$-27 \pm 9$	$1.24^{+0.30}_{-0.33}$	$285^{+11}_{-11}$	$3434^{+388}_{-311}$	$7622^{+7320}_{-3383}$

$T_{\text{max}}$  = 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

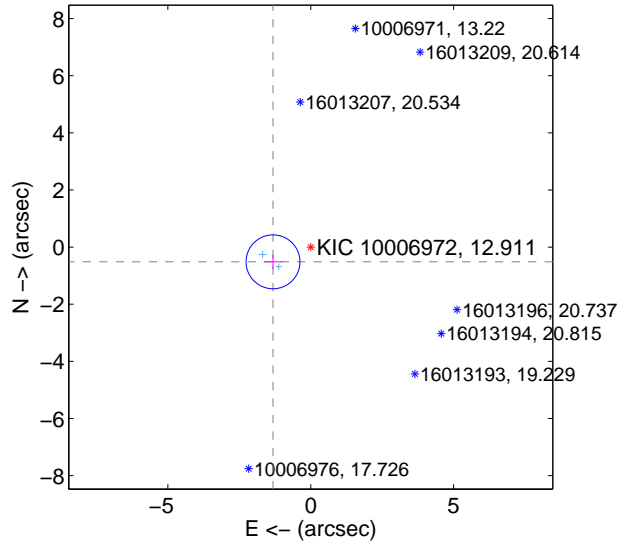
Supplemental centroid analysis for 010006972-02. Kepler magnitude: 12.91. Transit SNR 5.99

There are 2 quarters with good PRF difference image offsets

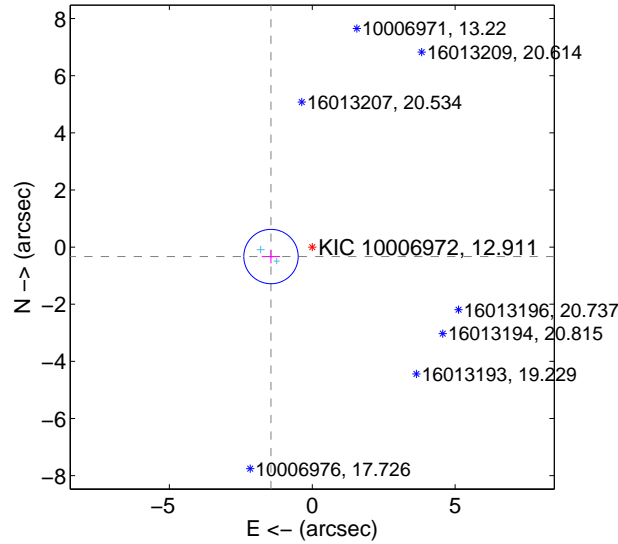
The direct PRF centroid is offset from the target star catalog position by about 0.23 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.417 \pm 0.314$	4.51	$1.320 \pm 0.323$	$-0.516 \pm 0.253$
PRF-fit source offset from KIC position	$1.481 \pm 0.317$	4.67	$1.444 \pm 0.321$	$-0.331 \pm 0.239$
photometric centroid source offset	$3.42 \pm 1.21$	2.83	$3.42 \pm 1.21$	$0.07 \pm 0.97$

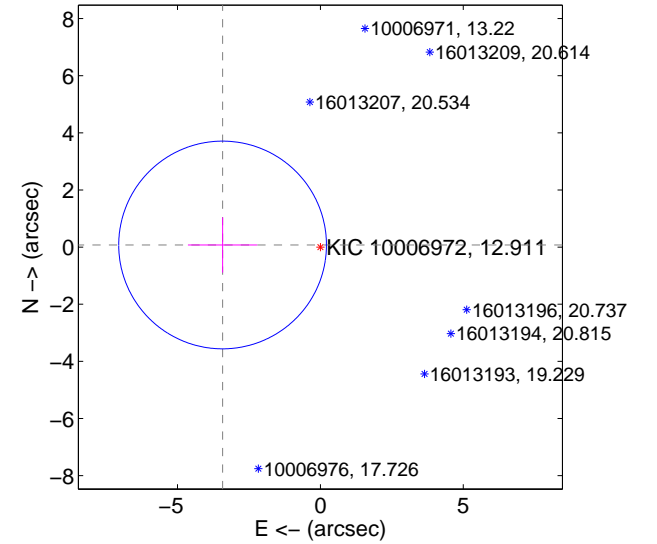
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

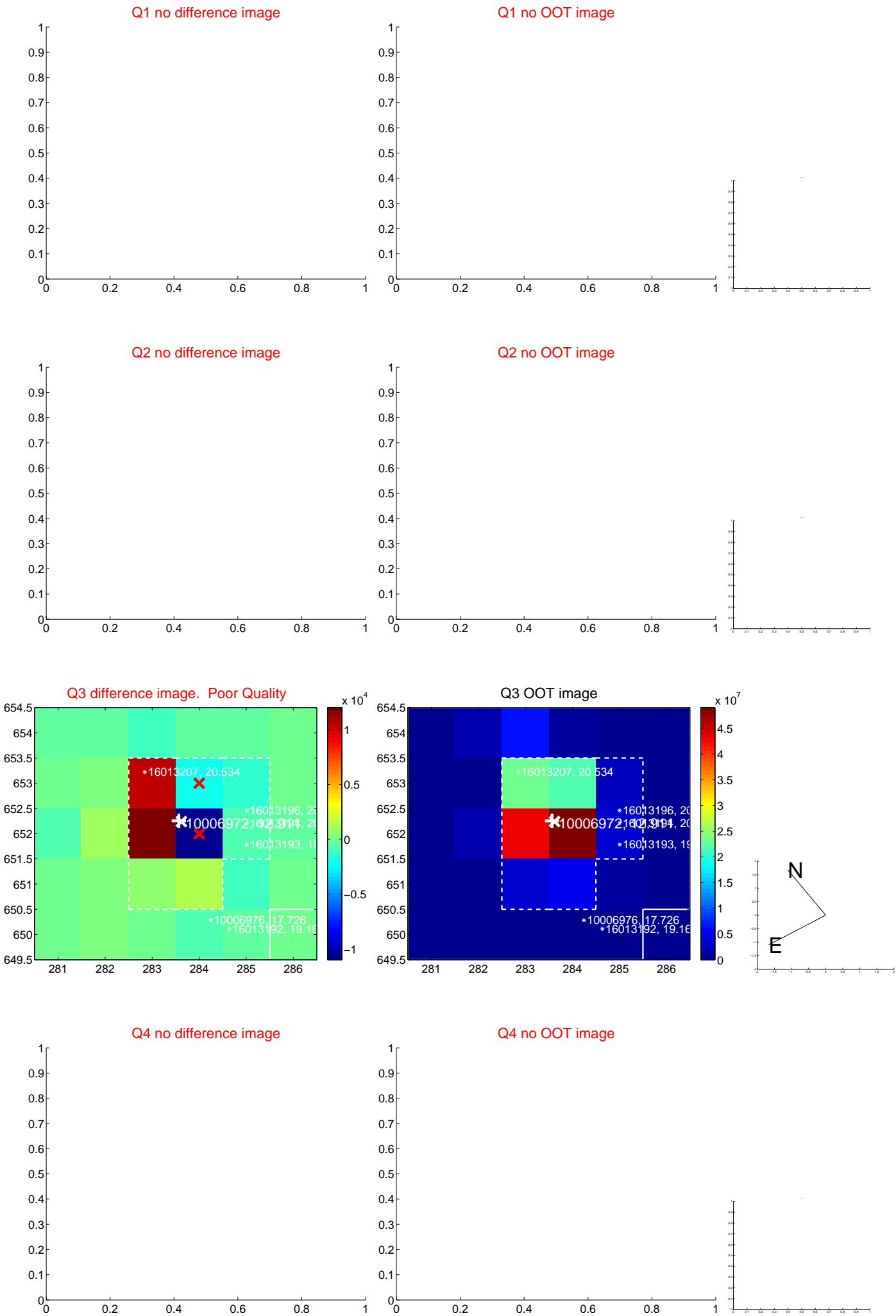


offset from photometric centroids



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.

Q5 no difference image



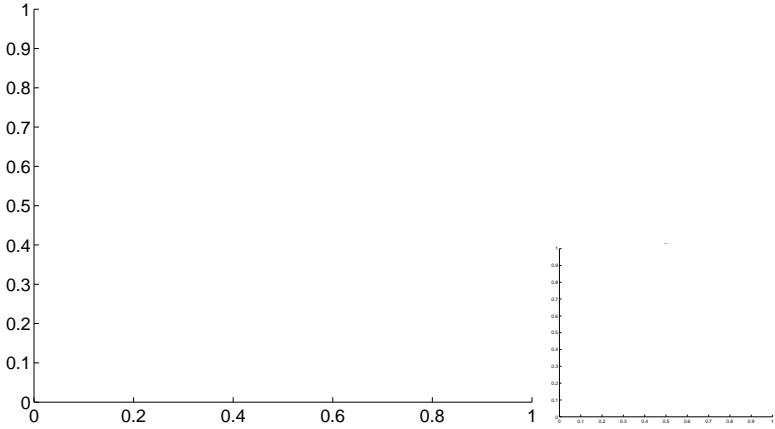
Q5 no OOT image



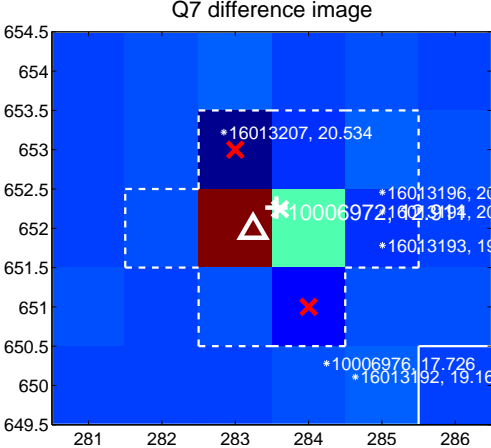
Q6 no difference image



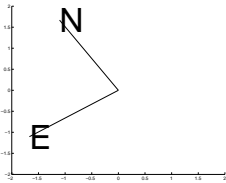
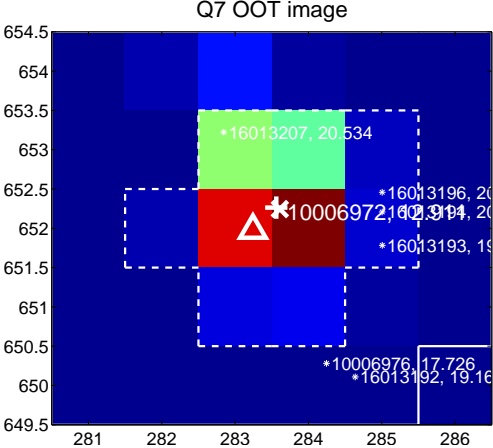
Q6 no OOT image



Q7 difference image



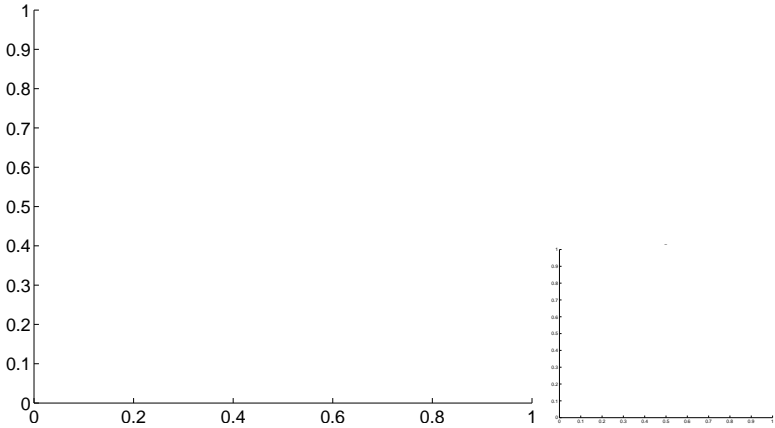
Q7 OOT image



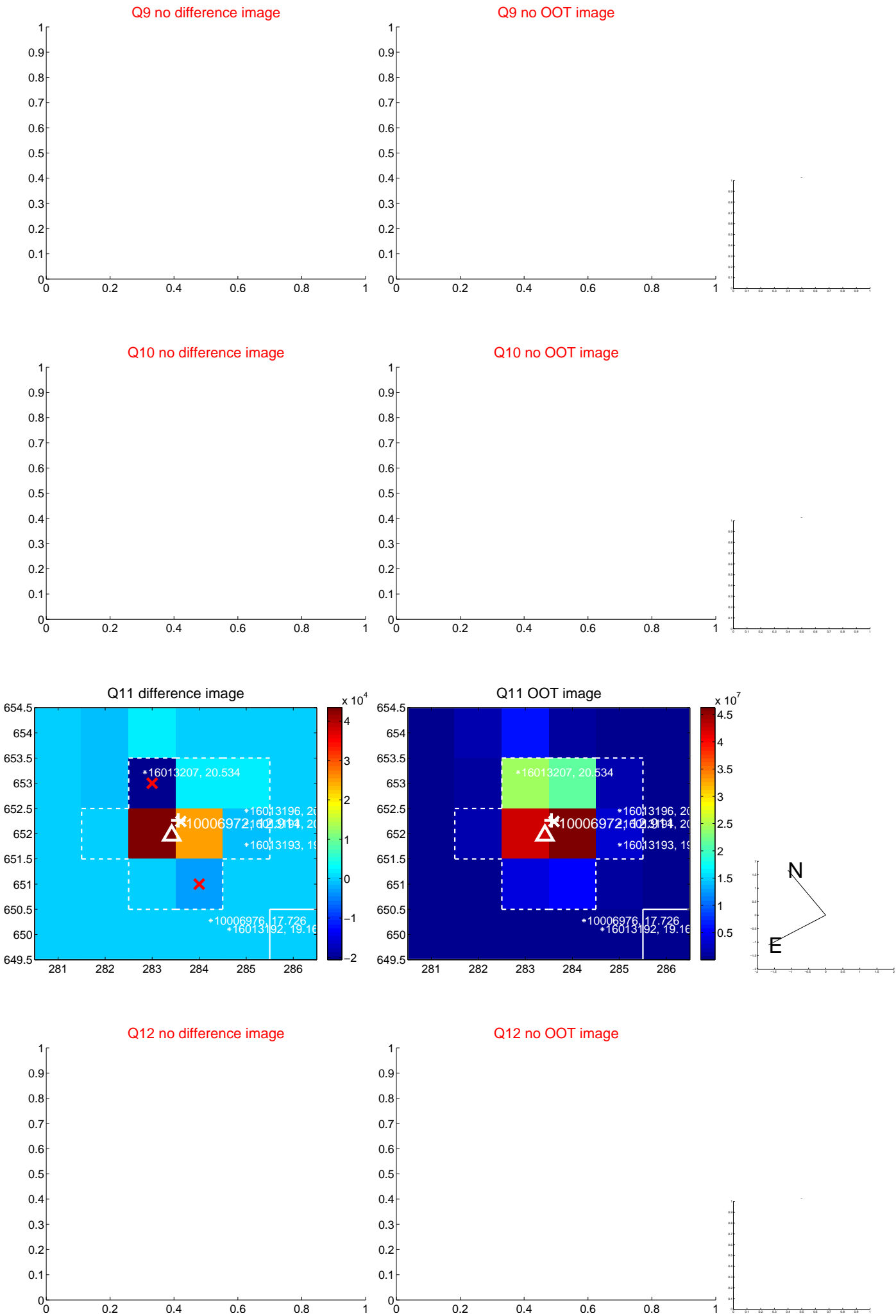
Q8 no difference image



Q8 no OOT image



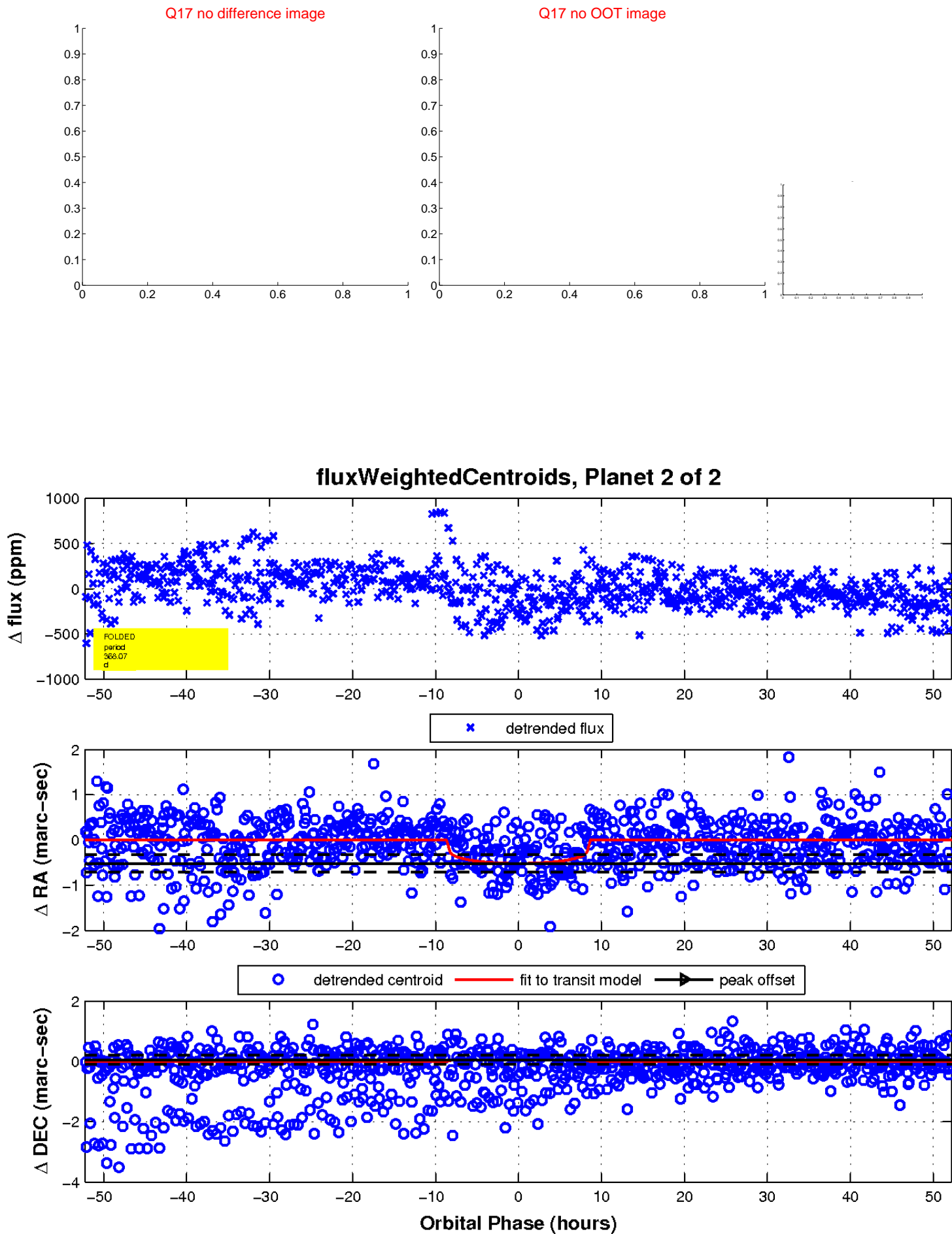
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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.



UKIRT Image

Declination

