

# KIC 010028792

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010028792-01	OBS	1574.01	114.736338	165.153539	4812.8	12.140	196.2	190.9	1.70	5597	12.36	12.15
010028792-02	OBS	1574.02	191.229502	286.265701	1049.9	23.207	27.2	28.3	1.70	5597	10.77	6.15
010028792-03	OBS	1574.03	5.833893	132.639474	89.7	4.742	9.3	11.0	1.70	5597	1.79	645.01
010028792-04	OBS	1574.04	8.976960	133.467212	81.1	5.361	7.4	7.9	1.70	5597	1.84	363.08

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010028792-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
010028792-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_SKYE--CENT_FEW_DIFFS
010028792-03	OBS	PC	0.95	0	0	0	0	NO_COMMENT
010028792-04	OBS	PC	0.95	0	0	0	0	NO_COMMENT

**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.

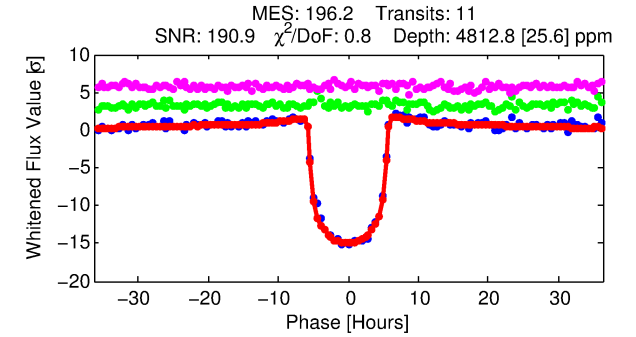
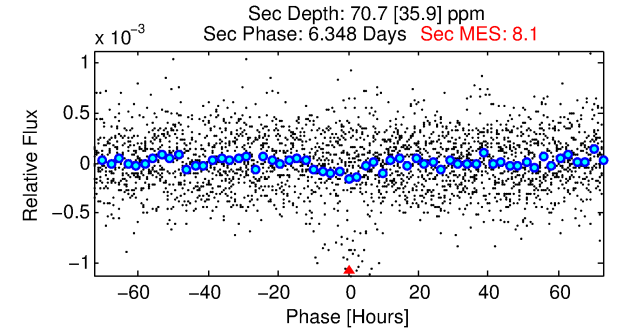
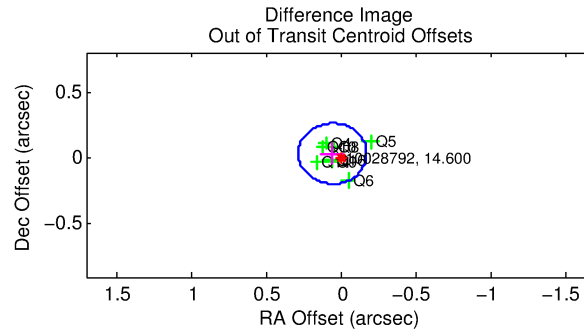
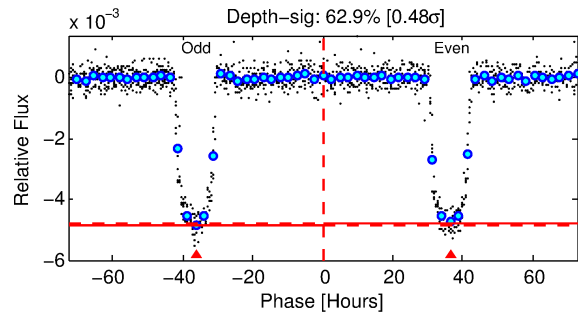
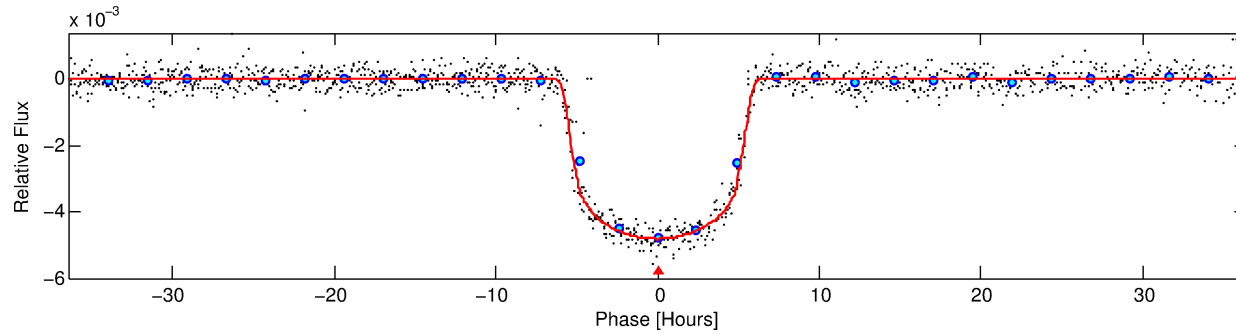
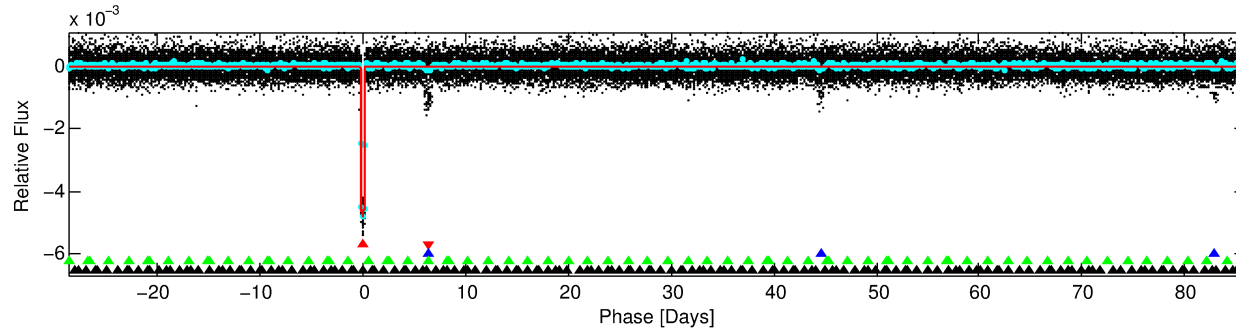
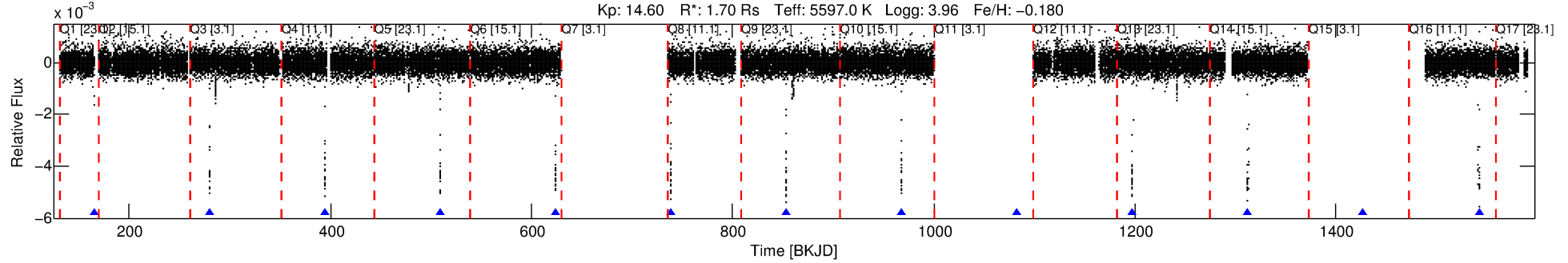
Ephemeris Match Information For 010028792-01

No Significant Match Found

# DV One-Page Summary

KIC: 10028792 Candidate: 1 of 4 Period: 114.736 d  
KOI: K01574.01 Name: Kepler-87b Corr: 0.989

Kp: 14.60 R\*: 1.70 Rs Teff: 5597.0 K Logg: 3.96 Fe/H: -0.180



## DV Fit Results:

Period = 114.73634 [0.00016] d  
Epoch = 165.1535 [0.0011] BKJD  
Rp/R\* = 0.0667 [0.0006]  
a/R\* = 61.91 [2.12]  
b = 0.63 [0.03]  
Seff = 12.15 [1.57]  
Teq = 476 [15] K  
Rp = 12.36 [1.07] Re  
a = 0.4570 [0.0325] AU  
Ag = 53.17 [27.57] [1.89σ]  
Teff = 1988 [256] K [5.90σ]

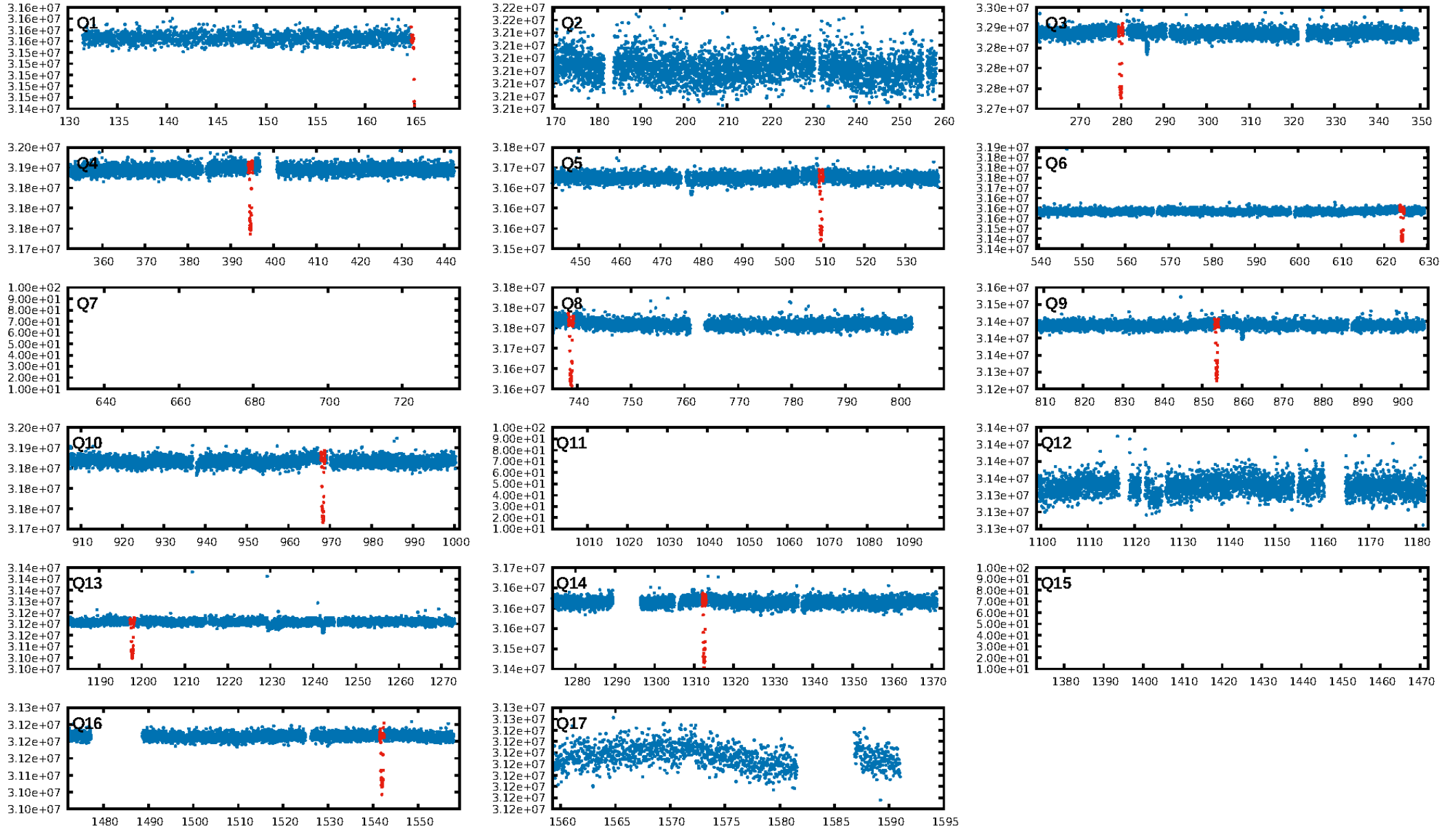
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [191.26σ]  
LongPeriod-sig: 100.0% [70.10σ]  
ModelChiSquare2-sig: 81.3%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [10/10]  
GhostDiagnostic-chr: 7.48  
Centroid-sig: 0.0%  
Centroid-so: 0.491 arcsec [6.80σ]  
OotOffset-rm: 0.064 arcsec [0.84σ]  
OotOffset-st: 3/0/3/2 [8]  
KicOffset-rm: 0.148 arcsec [1.85σ]  
KicOffset-st: 3/0/3/2 [8]  
DiffImageQuality-fgm: 1.00 [8/8]  
DiffImageOverlap-fno: 0.50 [4/8]

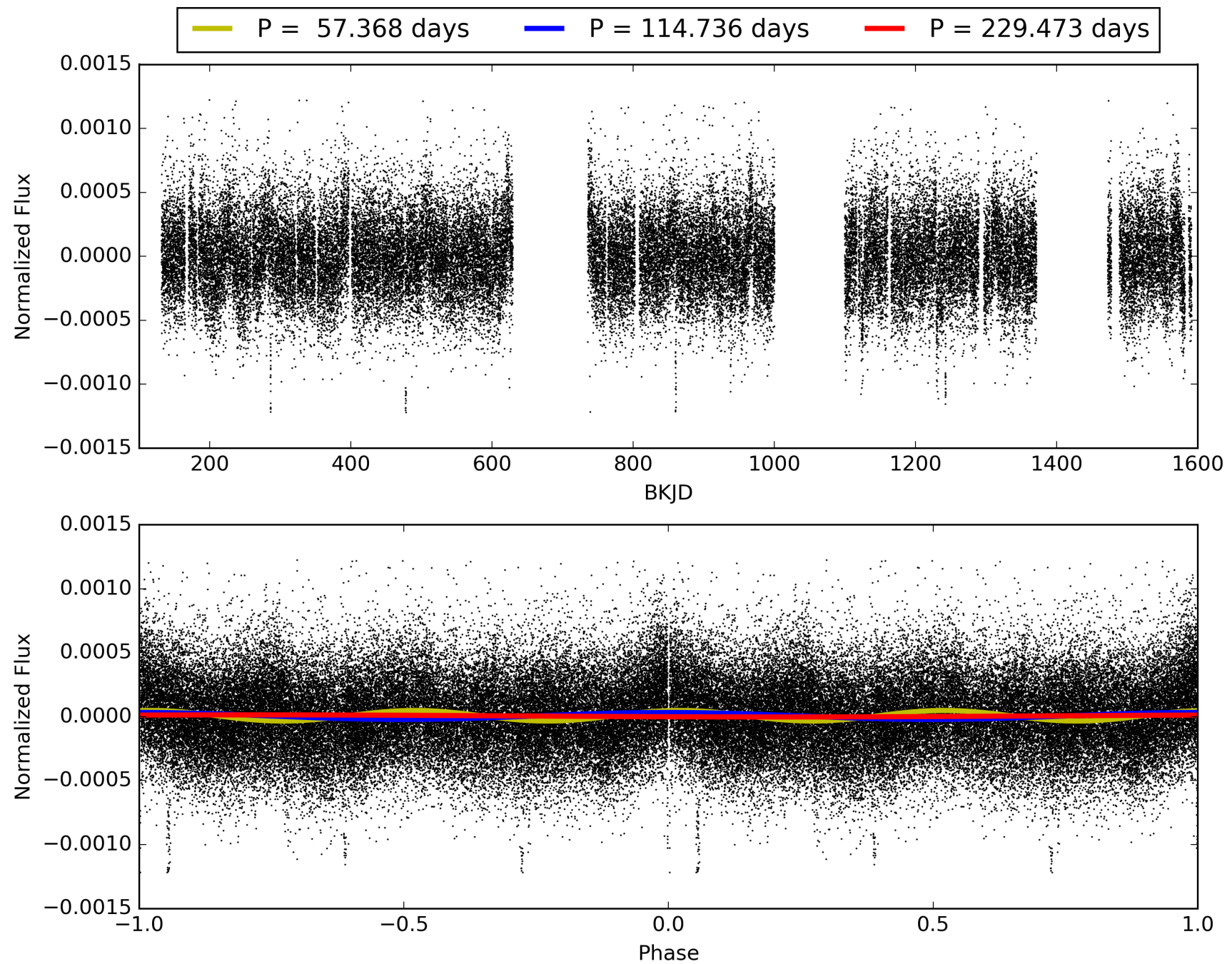
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 20:36:33 Z

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

# TCE 010028792-01, PDC Light Curves



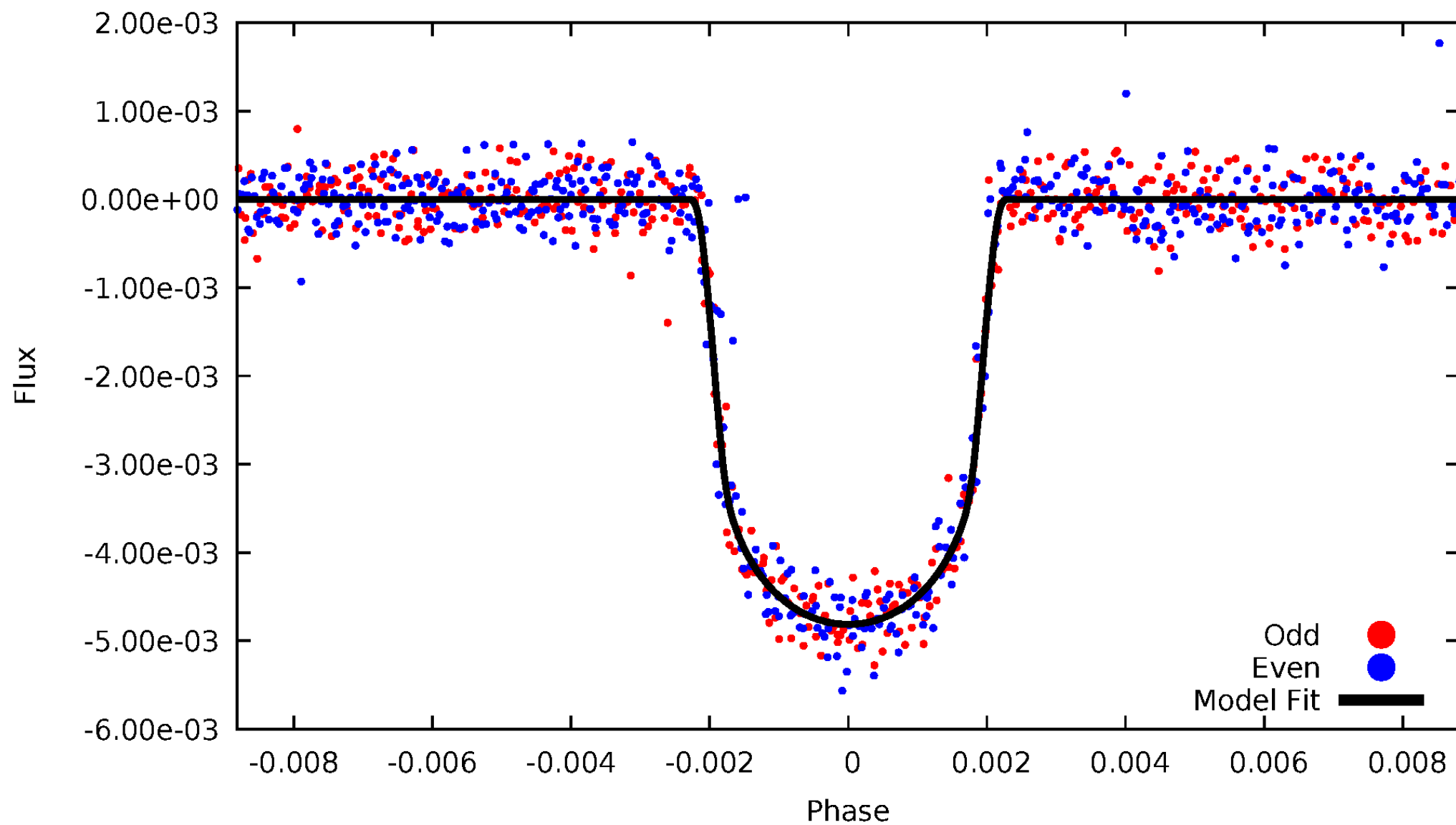
# TCE 010028792-01





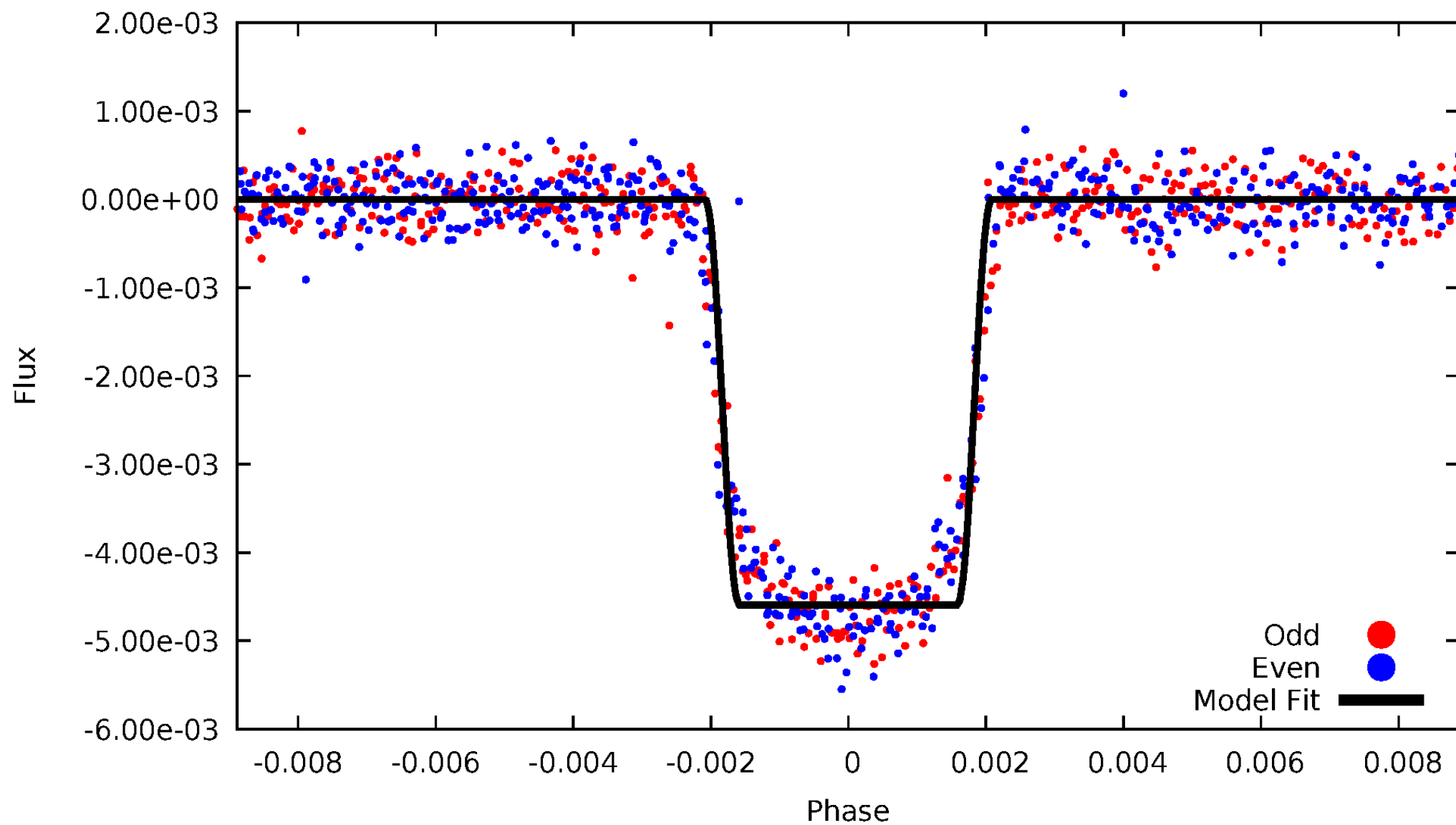
# DV Odd/Even

TCE 010028792-01



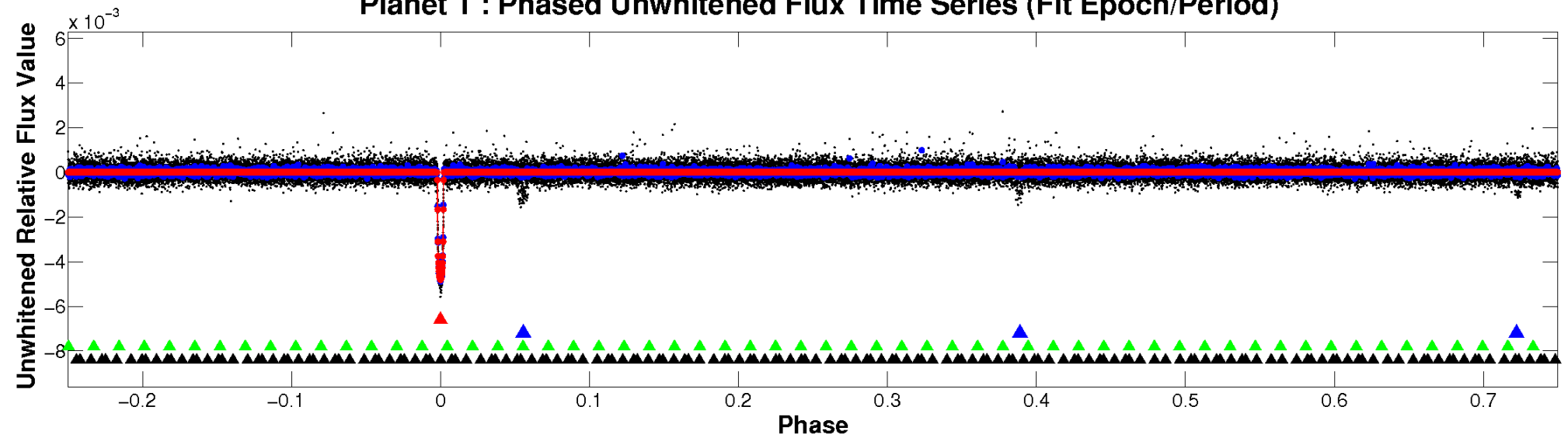
# ALT Odd/Even

TCE 010028792-01

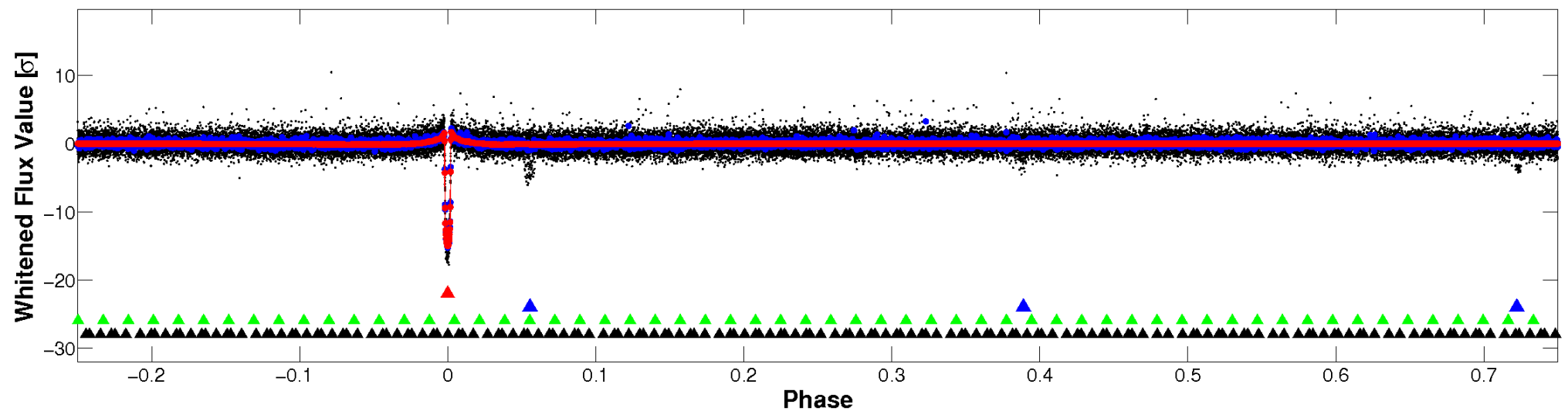


# Non-Whitened Vs. Whitened Light Curve

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

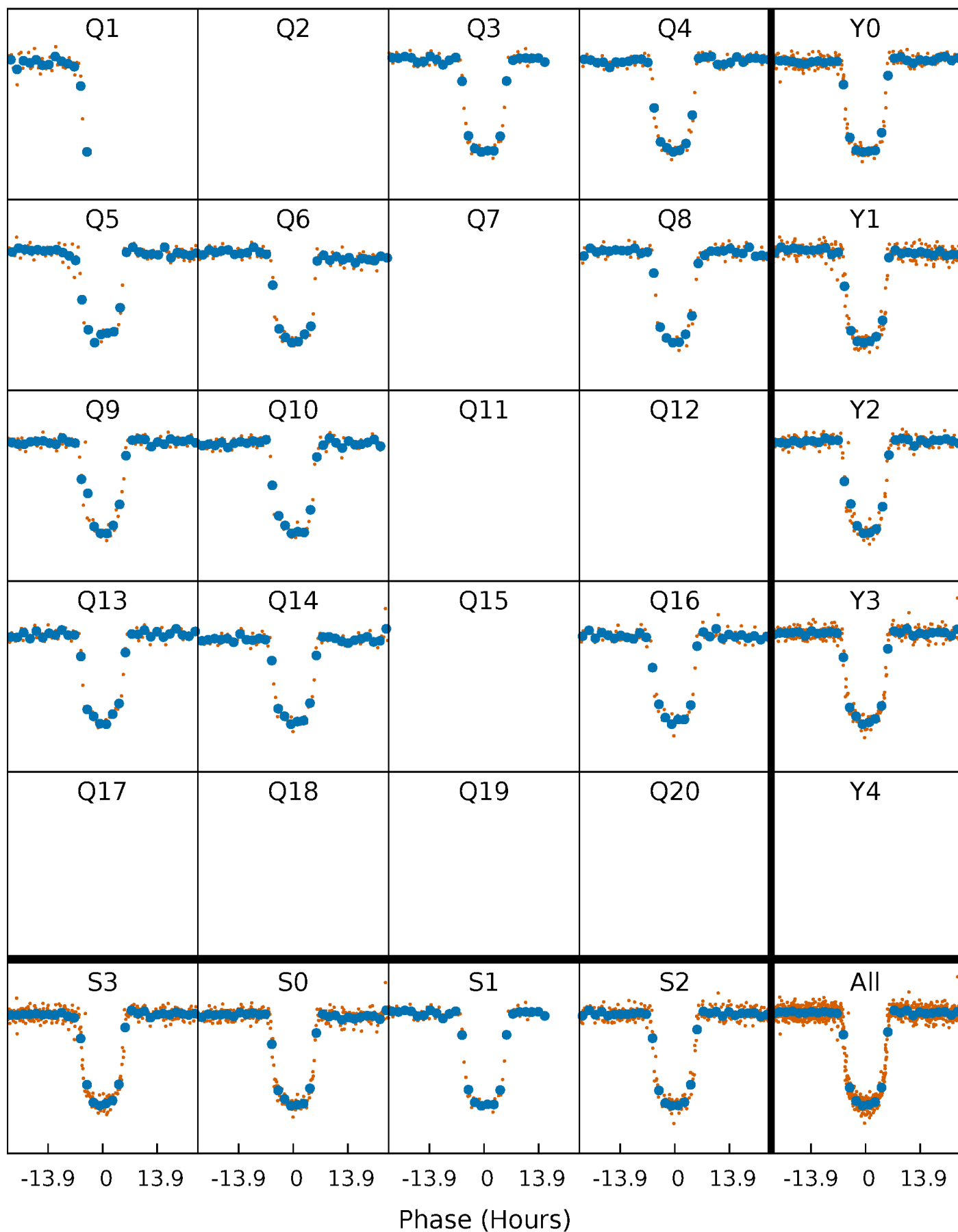


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



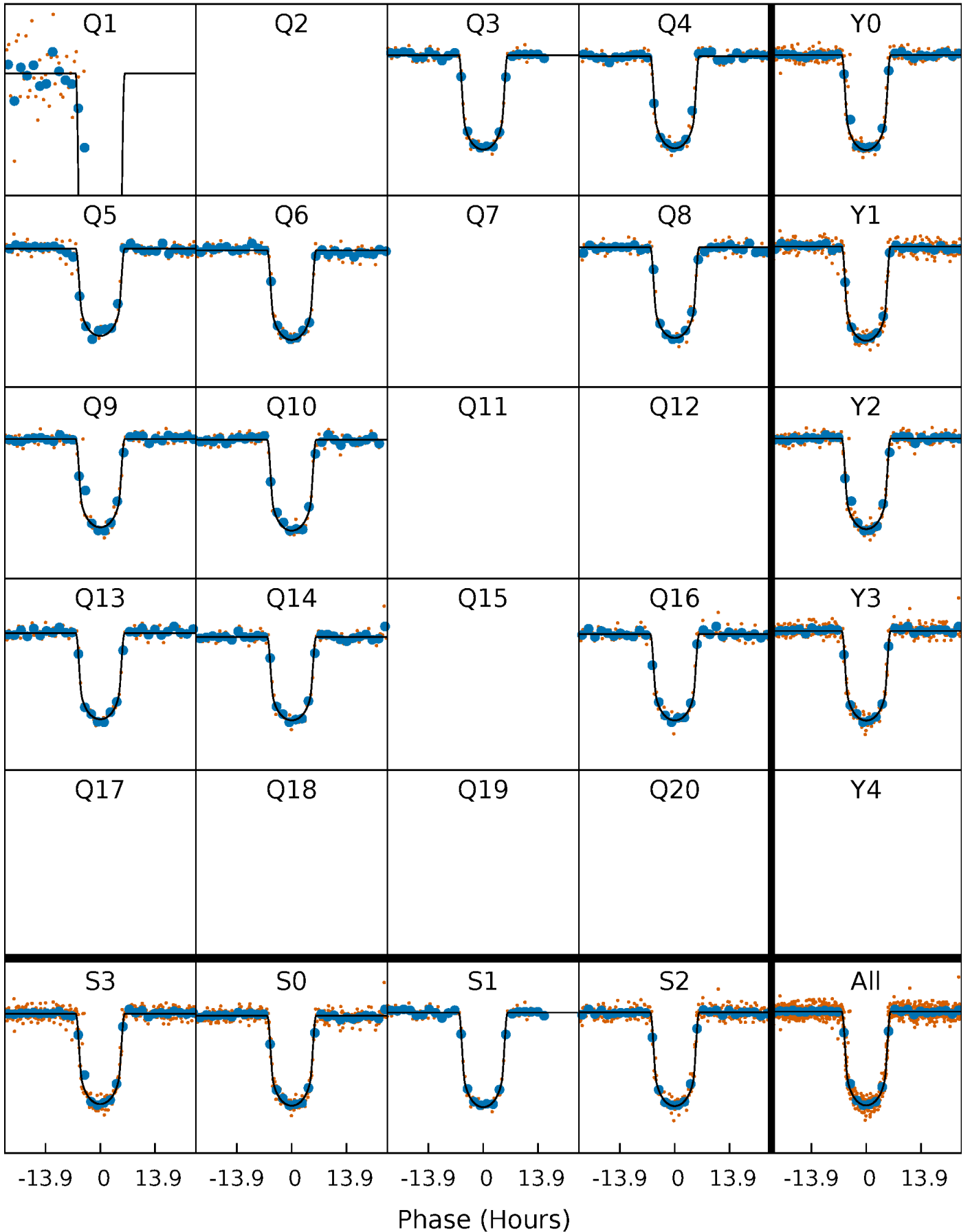
# PDC Quarter-Phased Transit Curves

TCE 010028792-01 P=114.736338 Days  $T_0=165.153539$  (BKJD)



# DV Quarter-Phased Transit Curves

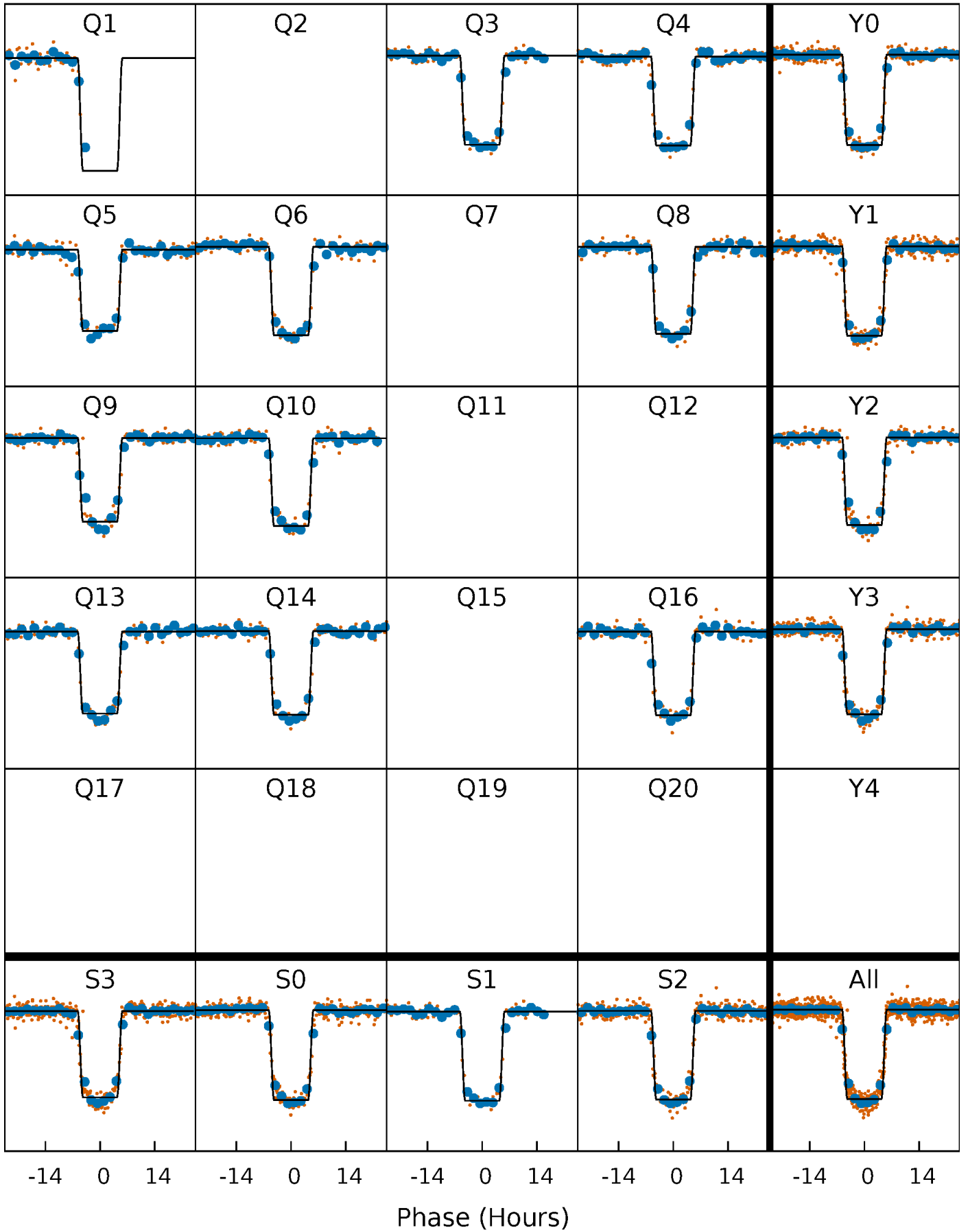
TCE 010028792-01 P=114.736338 Days  $T_0=165.153539$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

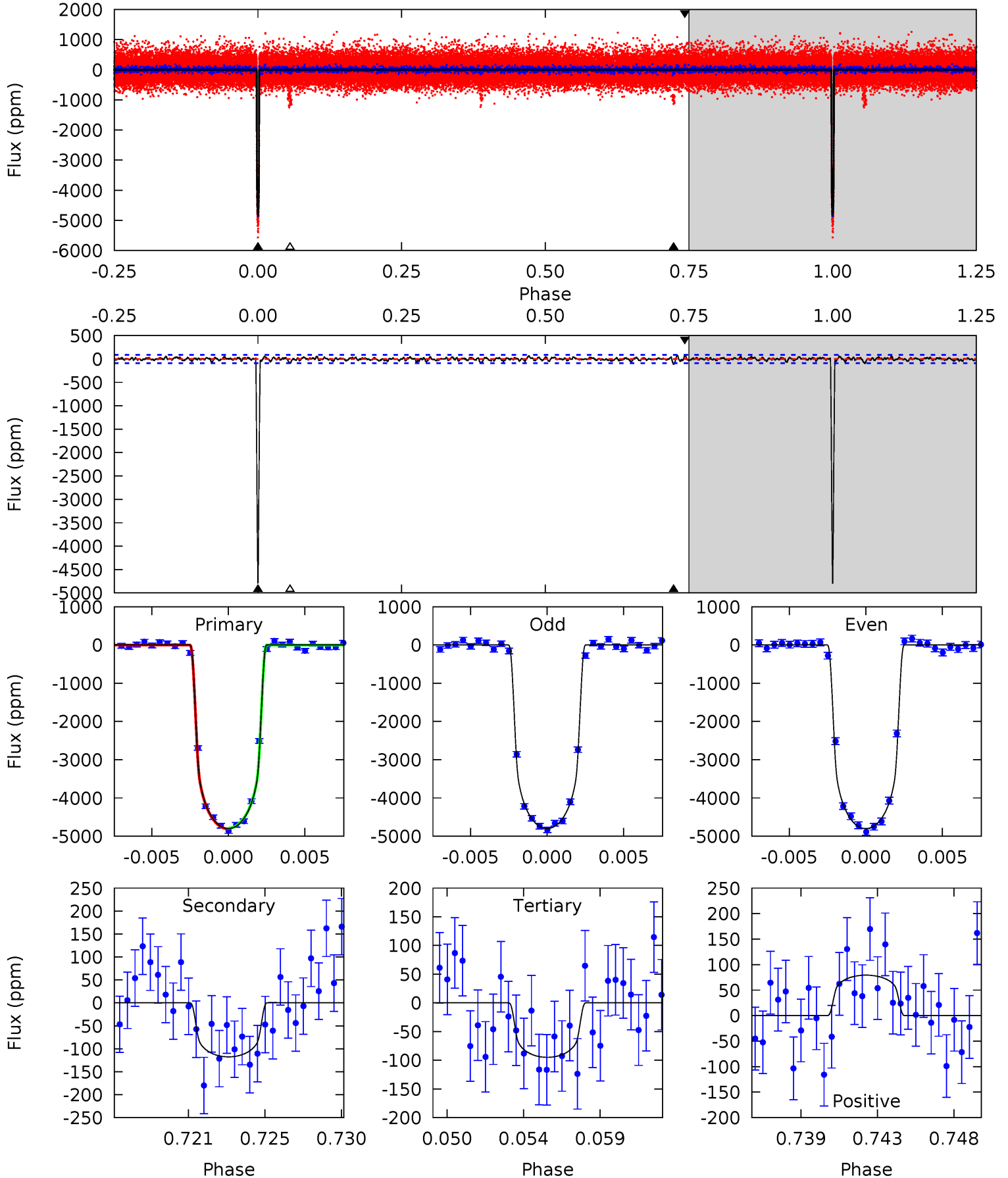
TCE 010028792-01 P=114.736494 Days  $T_0=165.152695$  (BKJD)



# DV Model-Shift Uniqueness Test

010028792-01,  $P = 114.736338$  Days,  $E = 50.417201$  Days

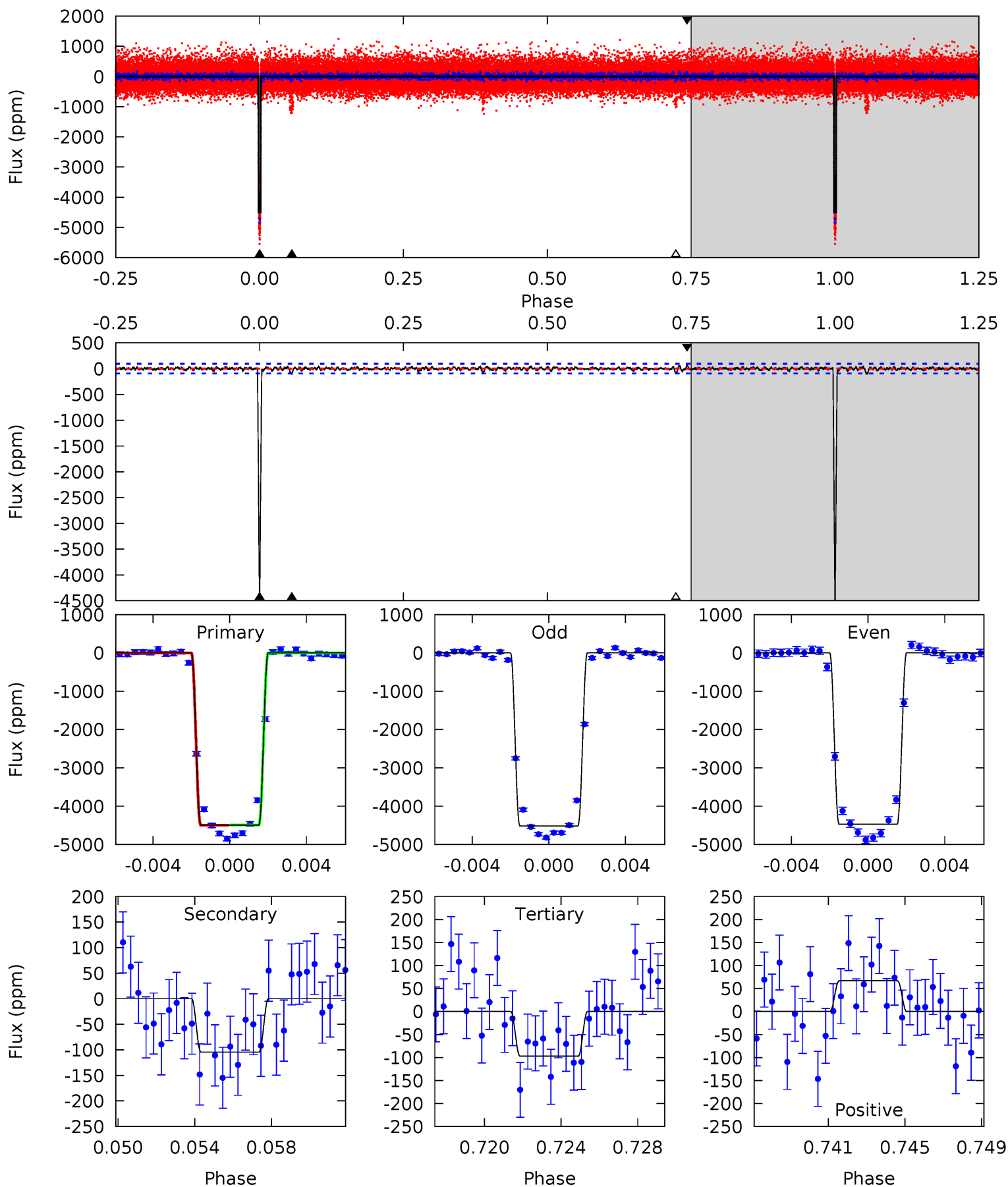
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
274.6	6.73	5.43	4.54	5.18	2.84	1.33	269.2	270.1	1.30	2.19	0.08	0.93	0.02	0.62



# Alt Model-Shift Uniqueness Test

010028792-01, P = 114.736494 Days, E = 50.416201 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
249.9	5.80	5.40	3.71	5.19	2.87	1.02	244.5	246.2	0.40	2.09	1.19	0.99	0.01	0.32



### Stellar Parameters For KIC 010028792

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5597^{+112}_{-101}$	$3.963^{+0.054}_{-0.045}$	$-0.180^{+0.150}_{-0.150}$	$1.699^{+0.147}_{-0.123}$	$0.969^{+0.084}_{-0.063}$	$0.278^{+0.060}_{-0.045}$
	+2%/-2%	+1%/-1%	+83%/-83%	+9%/-7%	+9%/-7%	+21%/-16%
Source	SPE65	TRA65	SPE65	DSEP		

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

### Secondary Eclipse Parameters for KIC 010028792-01 / KOI 1574.01

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-118 \pm 17$	$12.36^{+0.64}_{-0.58}$	$664^{+18}_{-18}$	$2940^{+68}_{-74}$	$89^{+15}_{-15}$
Alt.	$-104 \pm 18$	$12.51^{+0.66}_{-0.57}$	$664^{+19}_{-19}$	$2881^{+74}_{-84}$	$76^{+14}_{-14}$

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

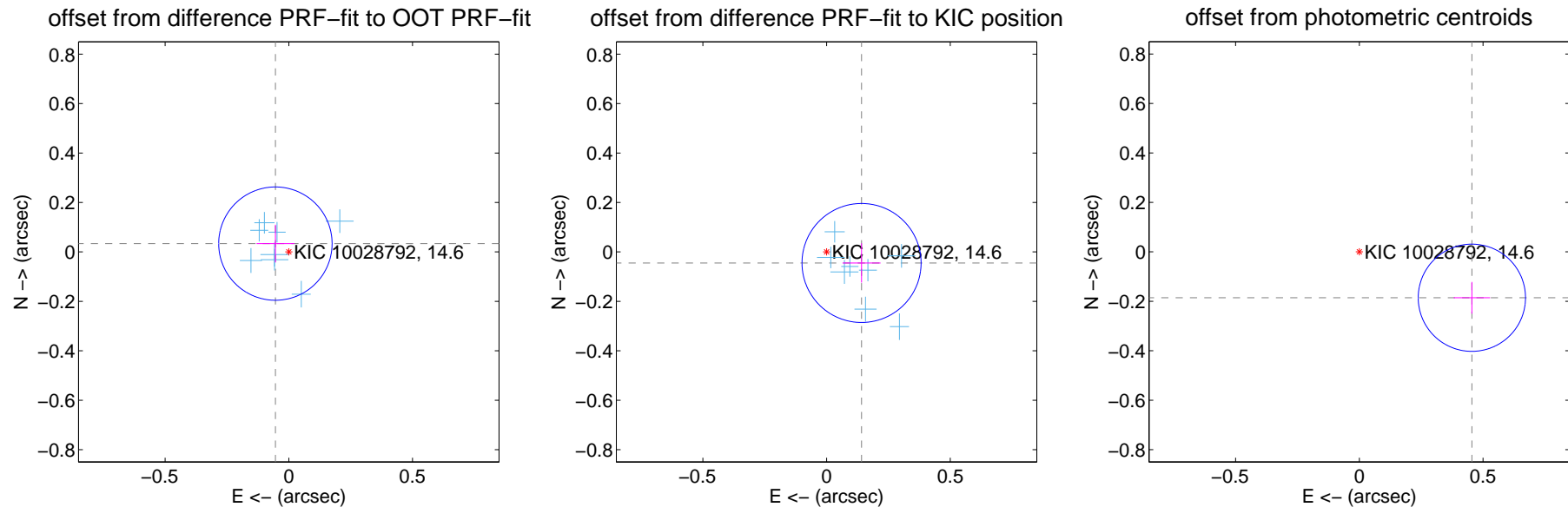
## DV Centroid Data

Supplemental centroid analysis for 010028792-01. Kepler magnitude: 14.60. Transit SNR 190.85

There are 8 quarters with good PRF difference image offsets

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

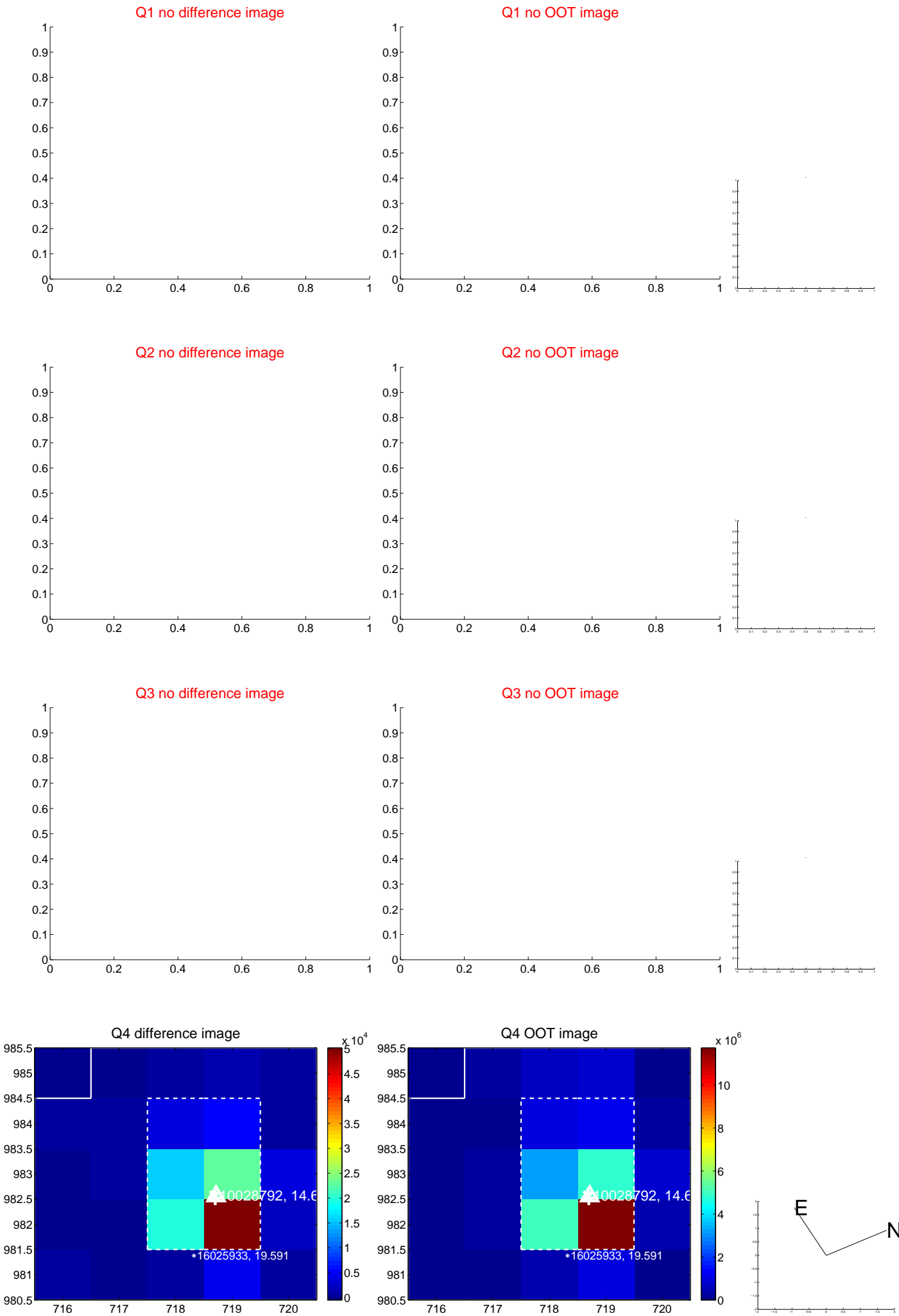
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.064 \pm 0.076$	0.84	$0.054 \pm 0.076$	$0.034 \pm 0.076$
PRF-fit source offset from KIC position	$0.148 \pm 0.080$	1.85	$-0.141 \pm 0.077$	$-0.045 \pm 0.079$
photometric centroid source offset	$0.49 \pm 0.07$	6.80	$-0.45 \pm 0.07$	$-0.19 \pm 0.06$



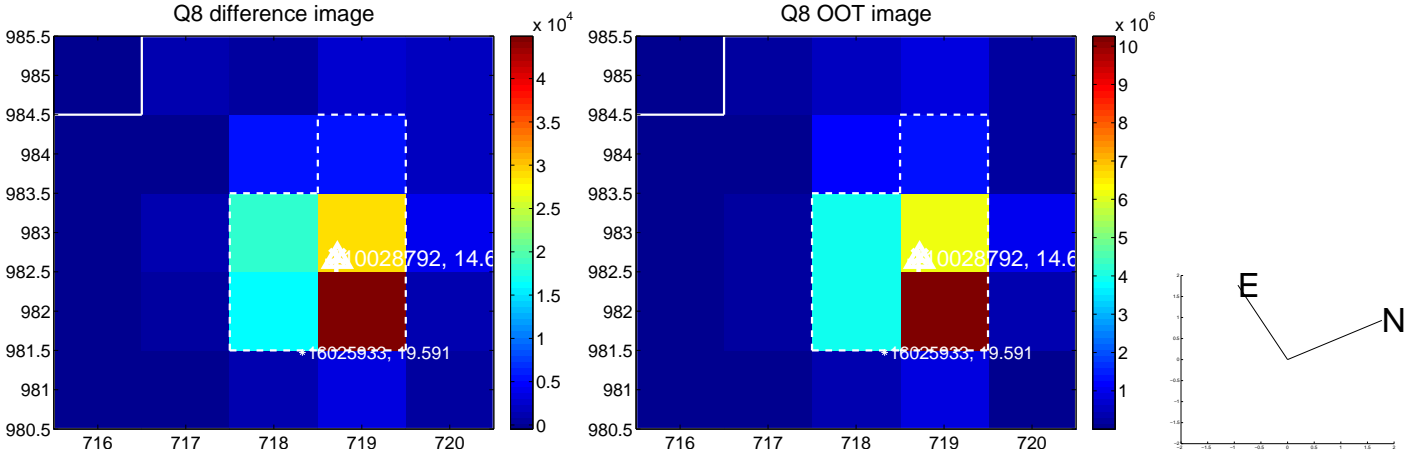
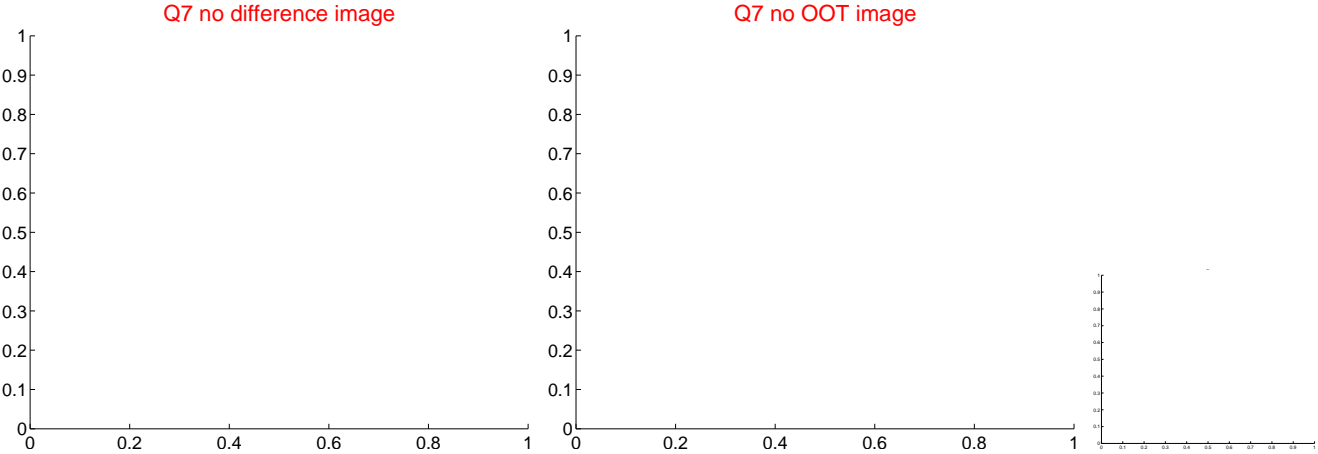
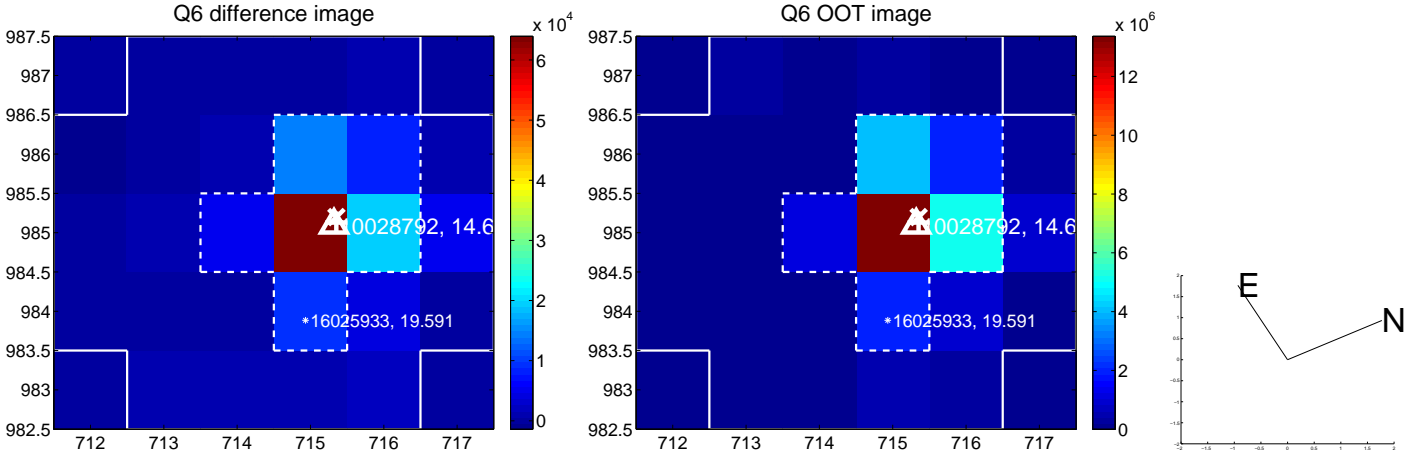
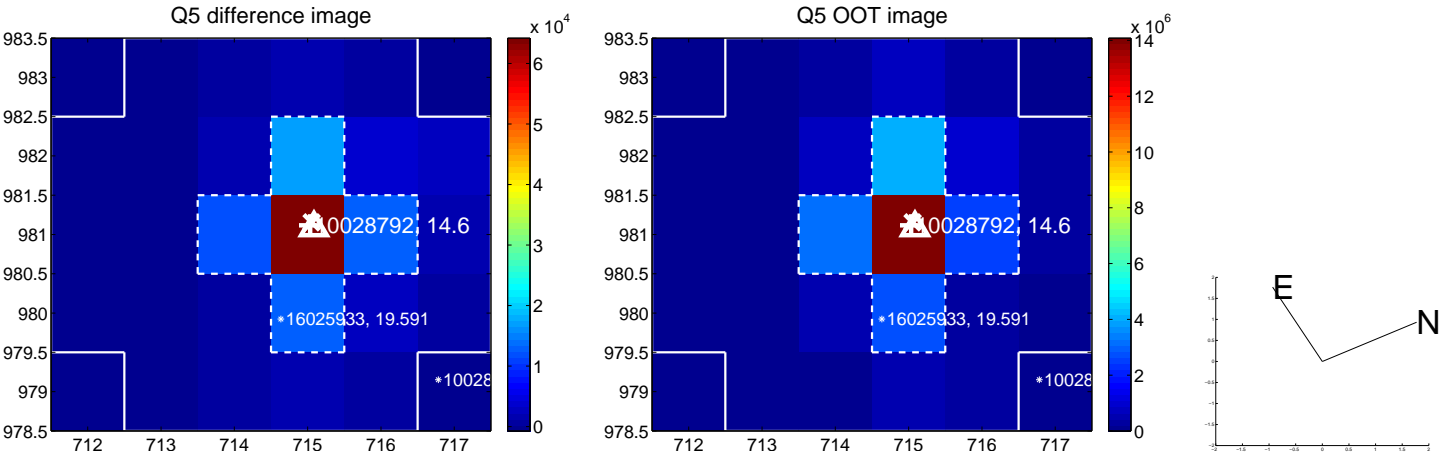
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



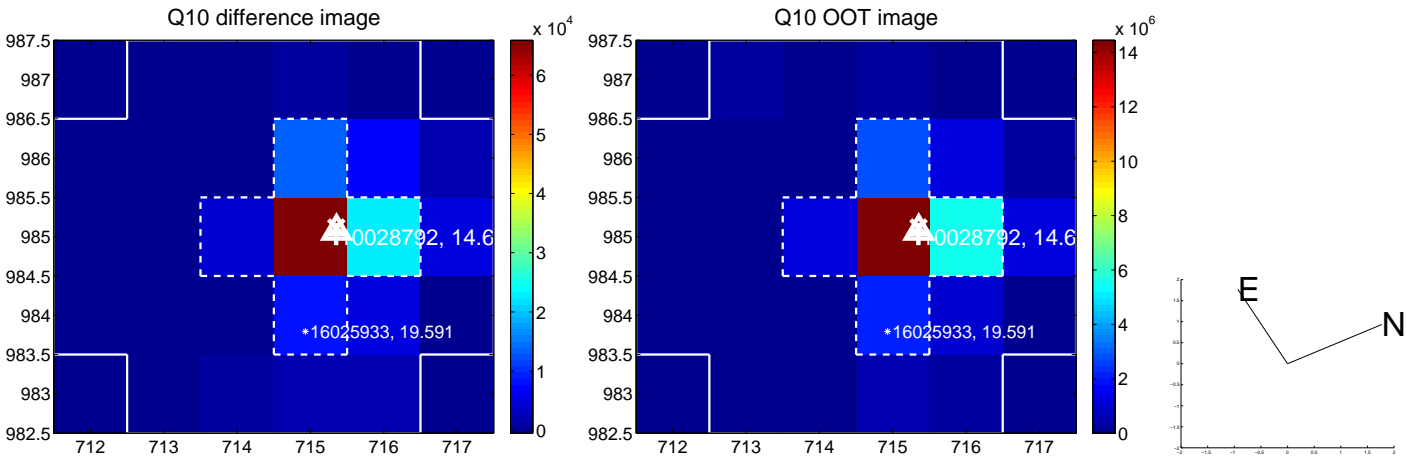
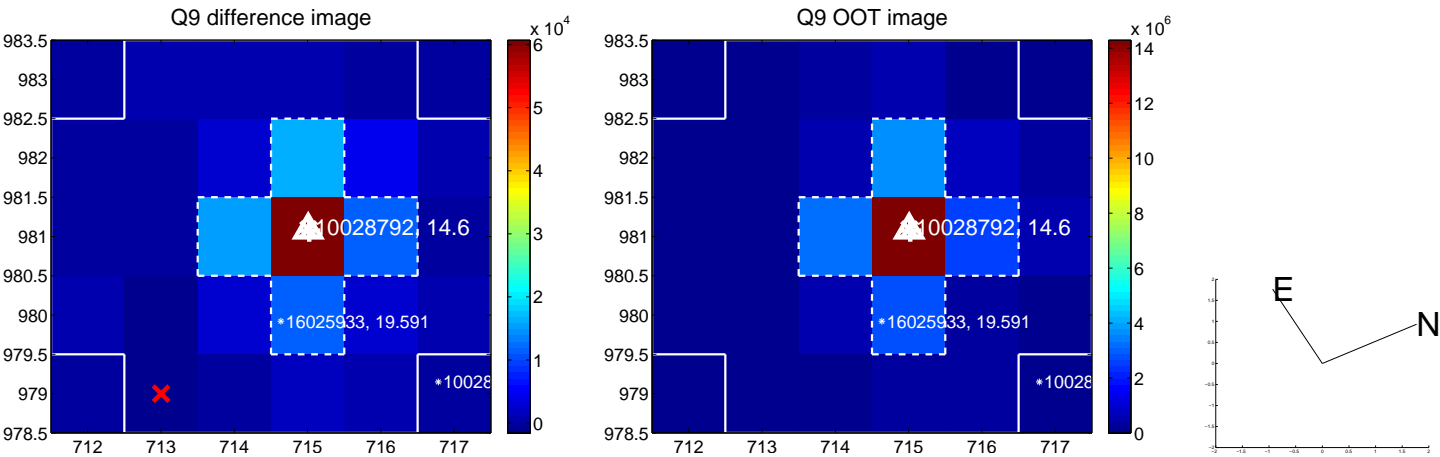
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



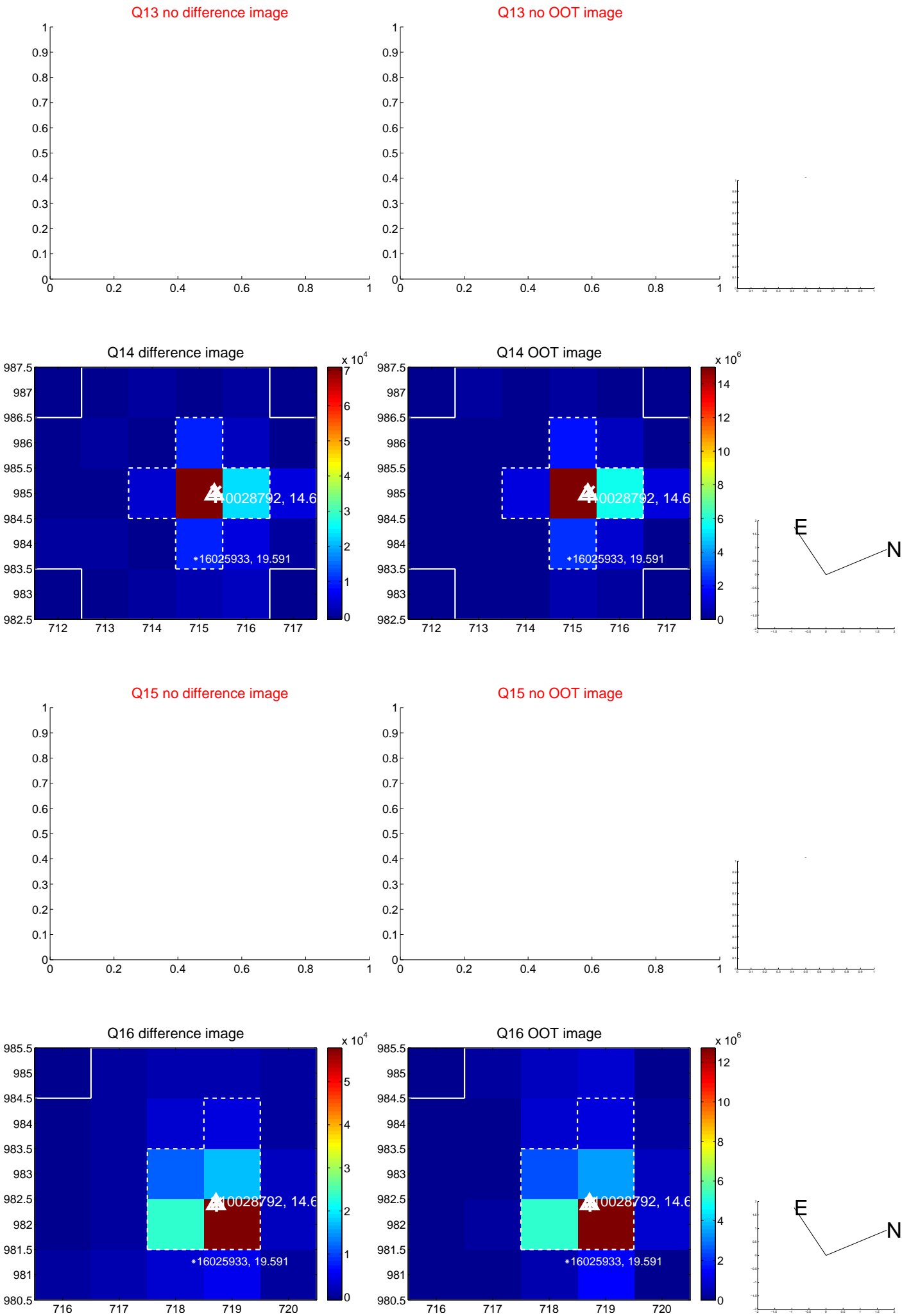
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



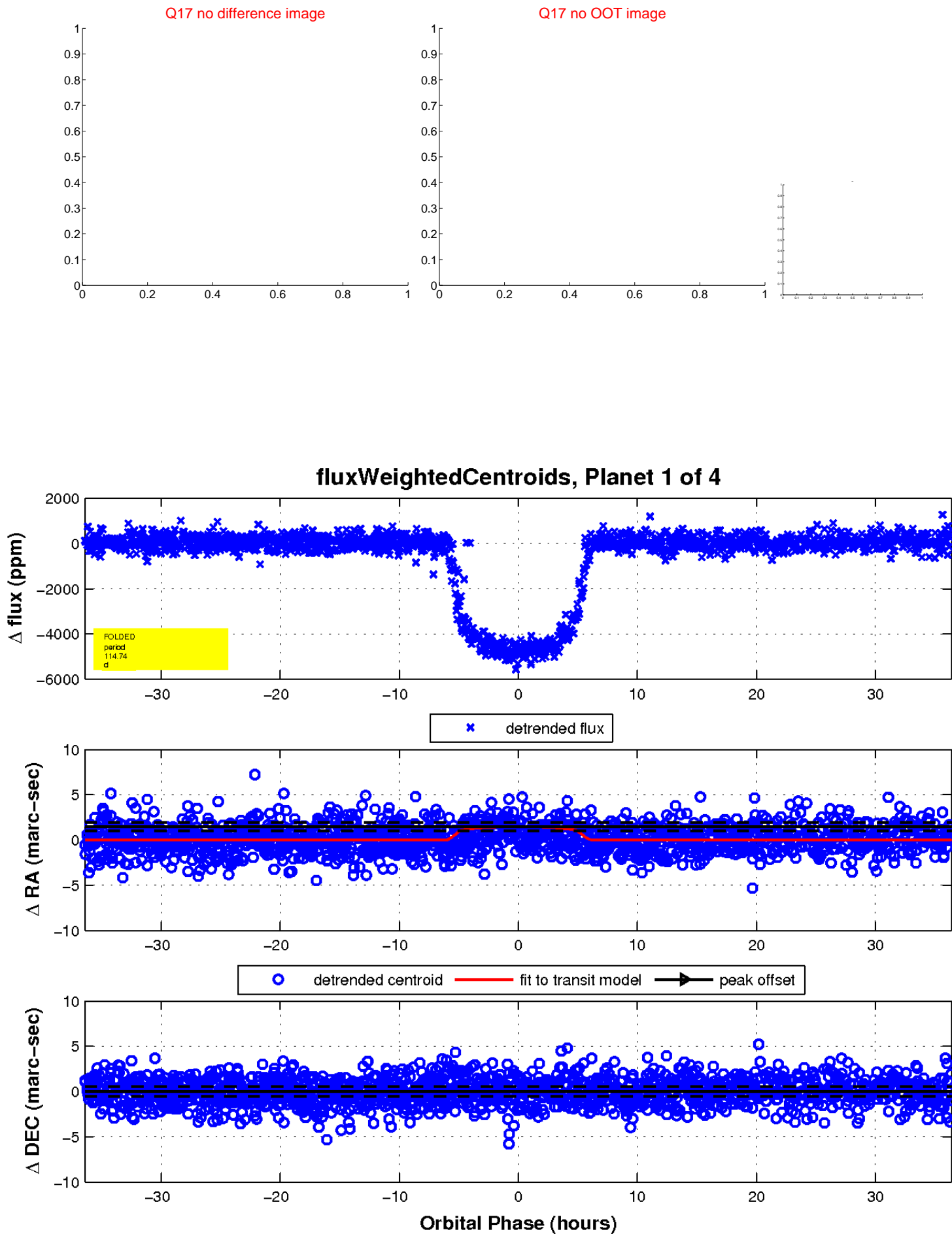
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



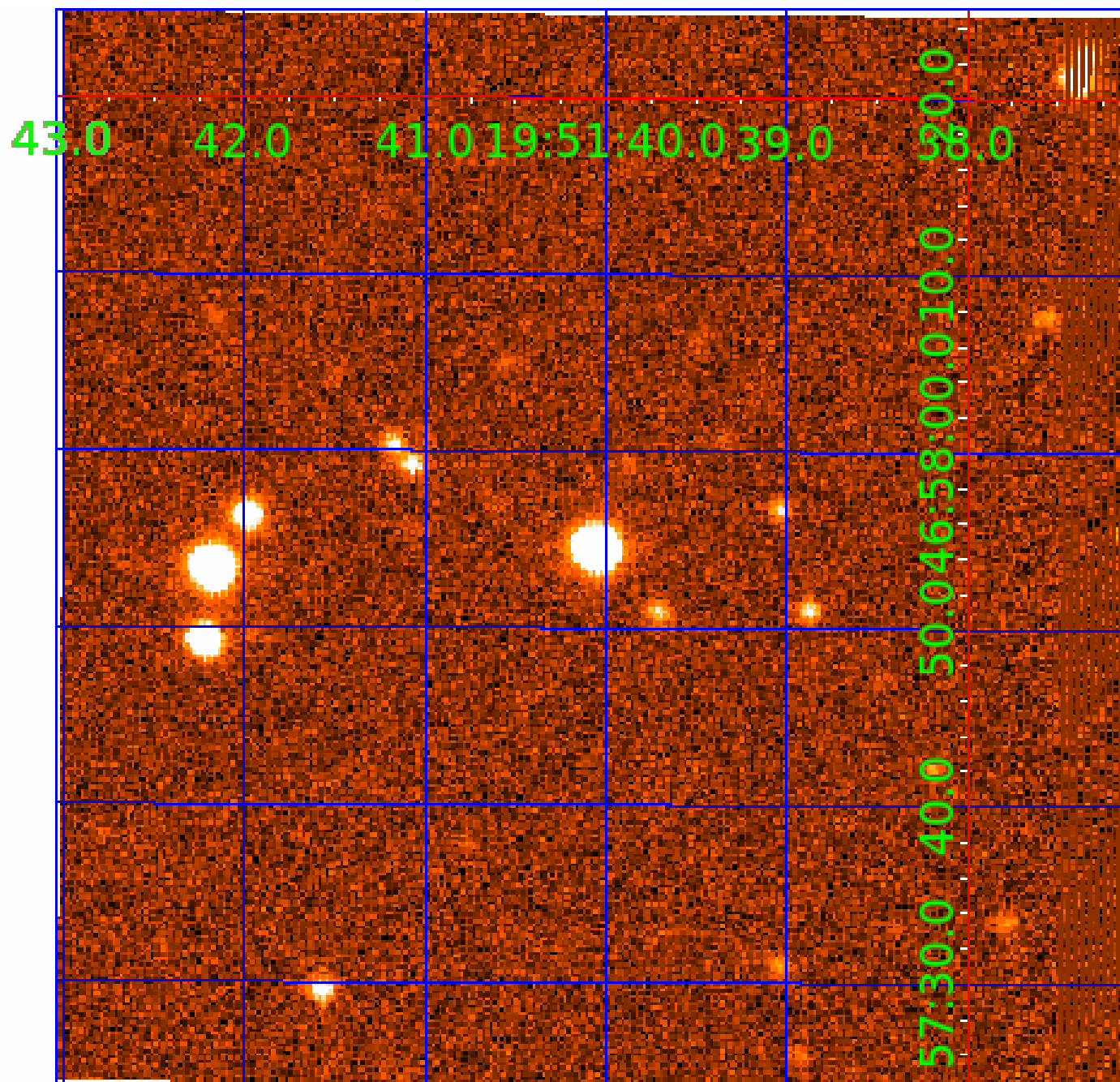
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





# UKIRT Image

Declination



# KIC 010028792

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010028792-01	OBS	1574.01	114.736338	165.153539	4812.8	12.140	196.2	190.9	1.70	5597	12.36	12.15
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010028792-04	OBS	1574.04	8.976960	133.467212	81.1	5.361	7.4	7.9	1.70	5597	1.84	363.08

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010028792-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
010028792-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_SKYE--CENT_FEW_DIFFS
010028792-03	OBS	PC	0.95	0	0	0	0	NO_COMMENT
010028792-04	OBS	PC	0.95	0	0	0	0	NO_COMMENT

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

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

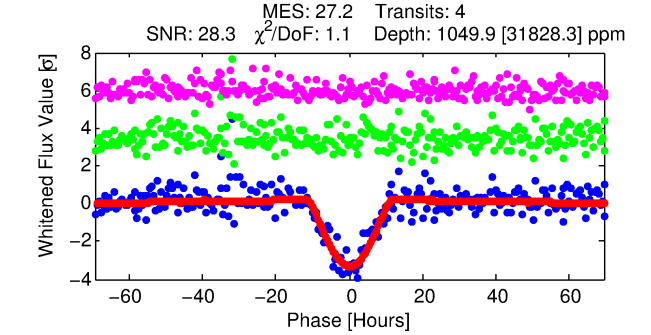
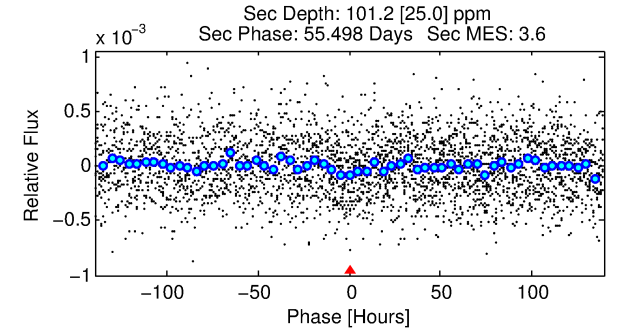
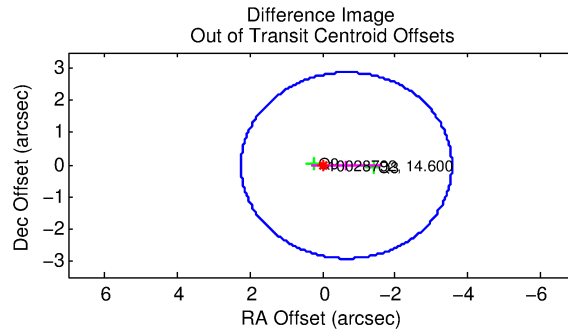
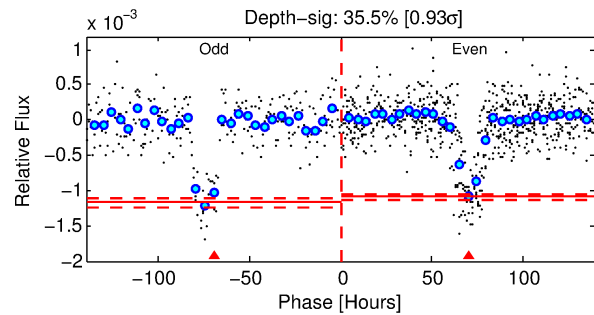
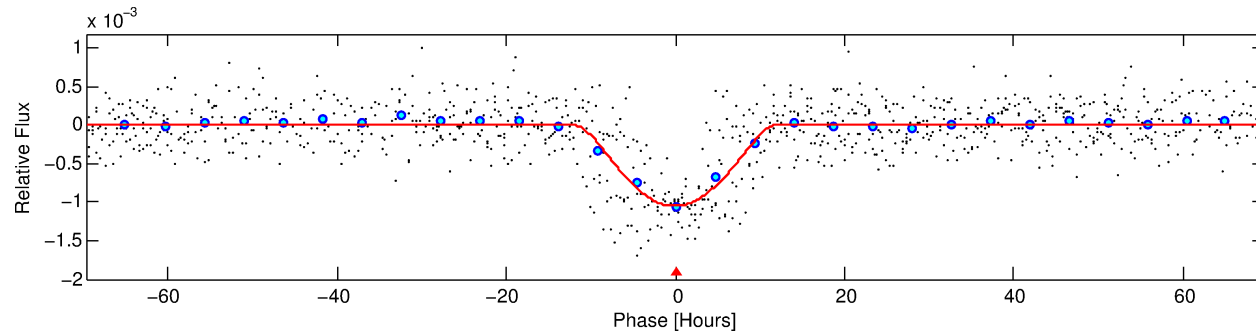
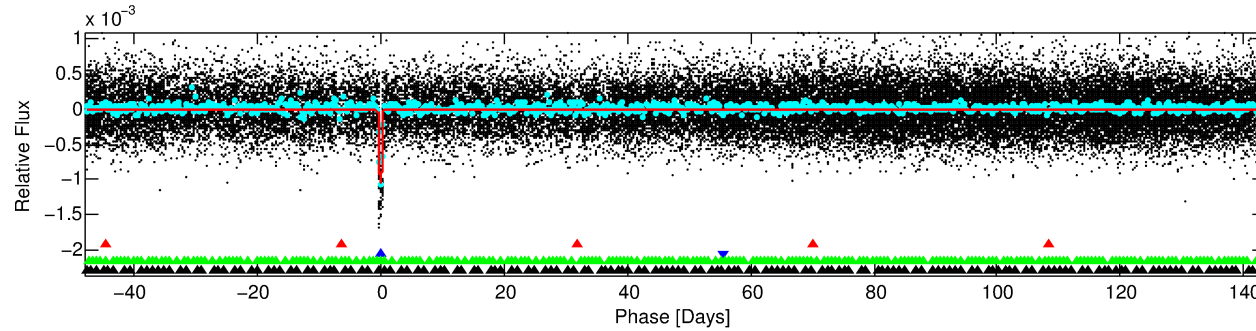
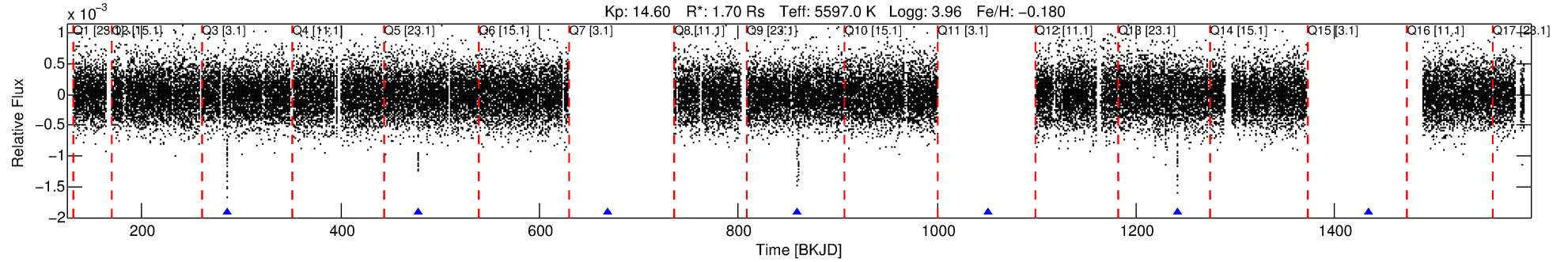
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 010028792-02

No Significant Match Found

# DV One-Page Summary

KIC: 10028792 Candidate: 2 of 4 Period: 191.230 d  
KOI: K01574 Name: Kepler-87 Corr: No Ephemeris Match



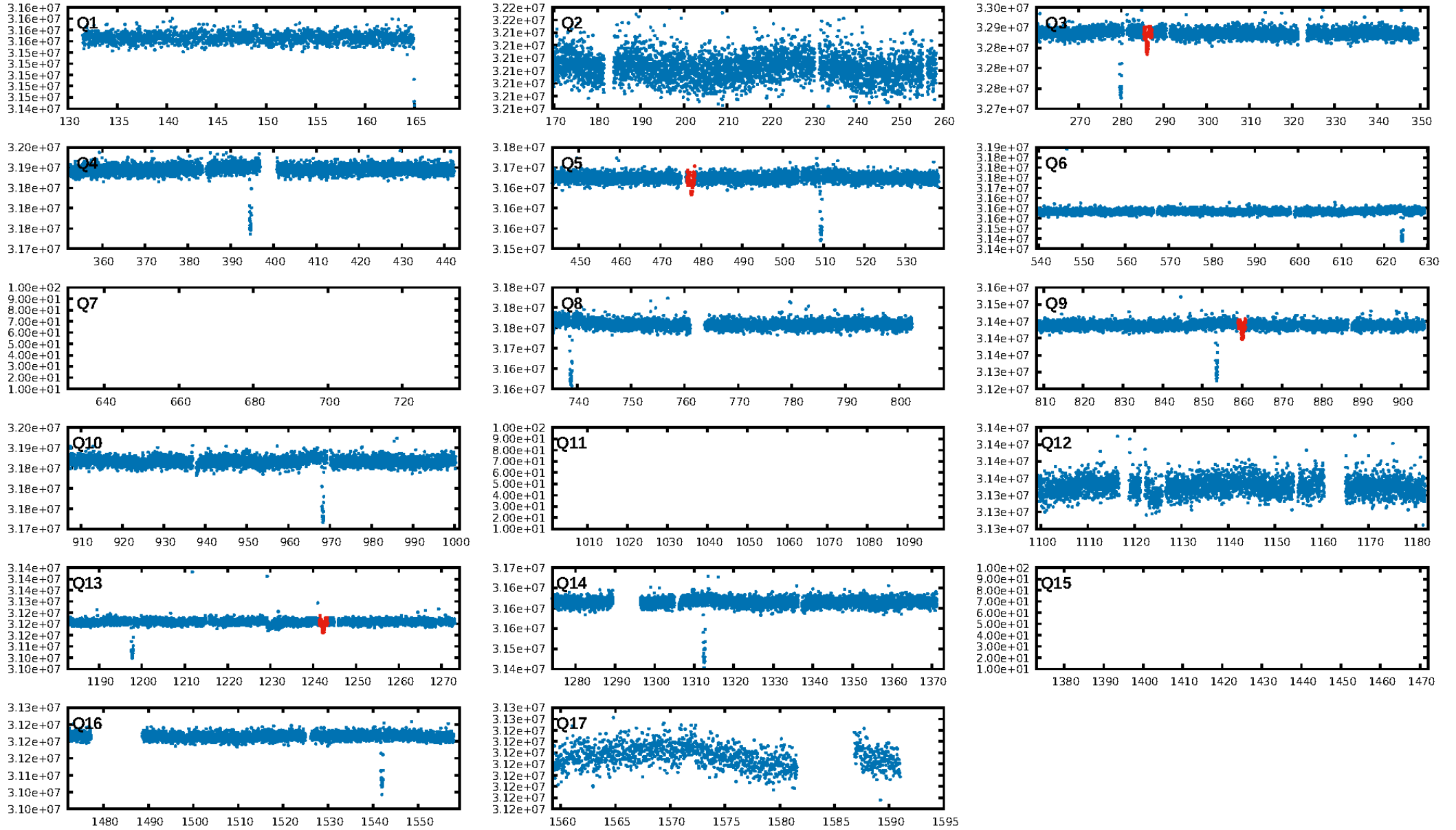
## DV Fit Results:

Period = 191.22950 [0.00569] d  
Epoch = 286.2657 [0.0159] BKJD  
Rp/R\* = 0.0581 [0.0895]  
a/R\* = 21.79 [7.79]  
b = 1.00 [1.05]  
Seff = 6.15 [0.79]  
Teq = 402 [13] K  
Rp = 10.77 [16.62] Re  
a = 0.6425 [0.0456] AU  
Ag = 198.38 [613.86] [0.32 $\sigma$ ]  
Teffp = 2330 [1802] K [1.07 $\sigma$ ]

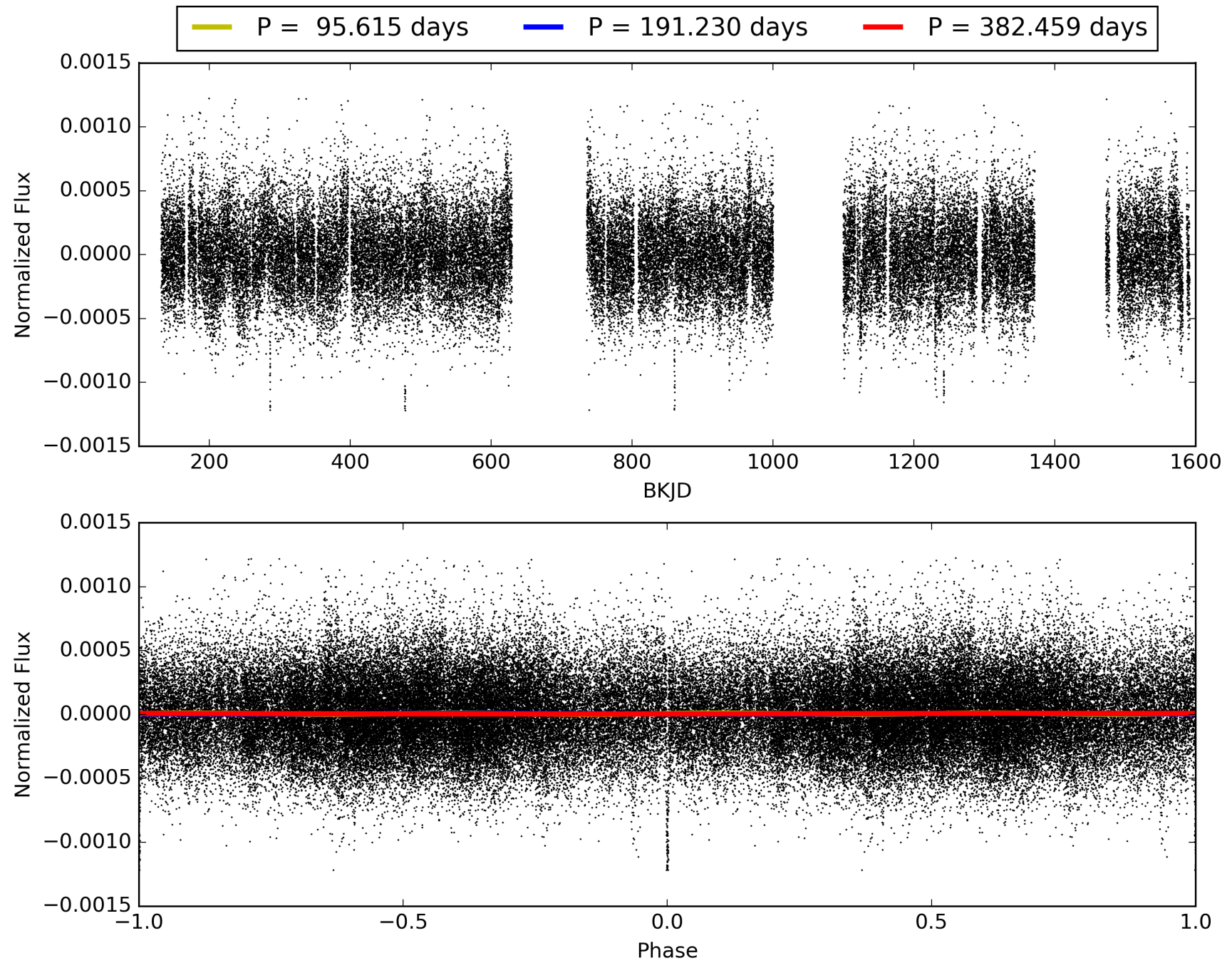
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [70.10 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 63.9%  
ModelChiSquareGof-sig: 68.0%  
Bootstrap-pfa: 4.04e-167  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: 2.645  
Centroid-sig: 34.2%  
Centroid-so: 0.177 arcsec [0.43 $\sigma$ ]  
OotOffset-rm: 0.662 arcsec [0.69 $\sigma$ ]  
KicOffset-rm: 0.738 arcsec [0.78 $\sigma$ ]  
OotOffset-st: 0/1/0/1 [2]  
KicOffset-st: 0/1/0/1 [2]  
DiffImageQuality-fgm: 1.00 [2/2]  
DiffImageOverlap-fno: 0.00 [0/2]

# TCE 010028792-02, PDC Light Curves



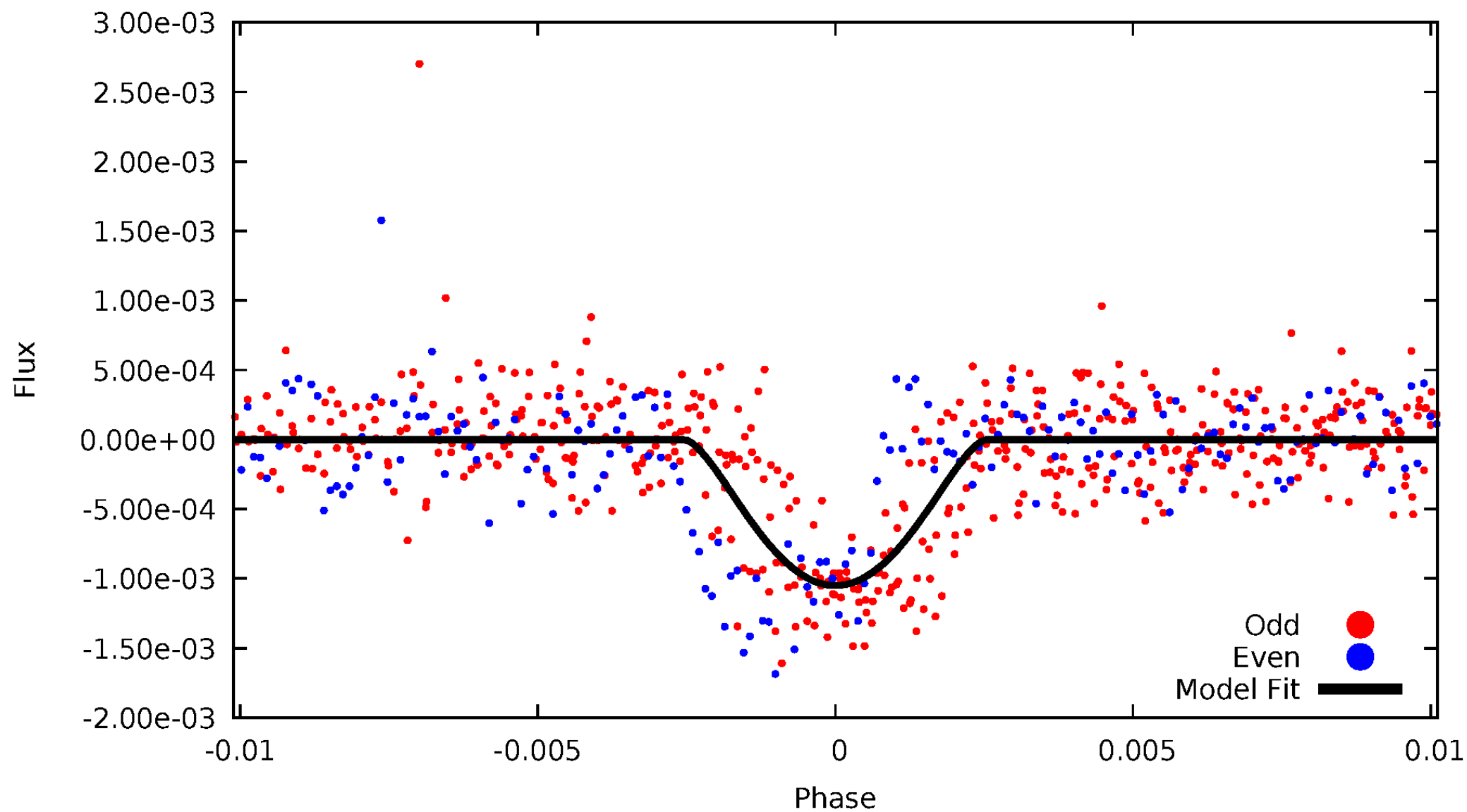
TCE 010028792-02





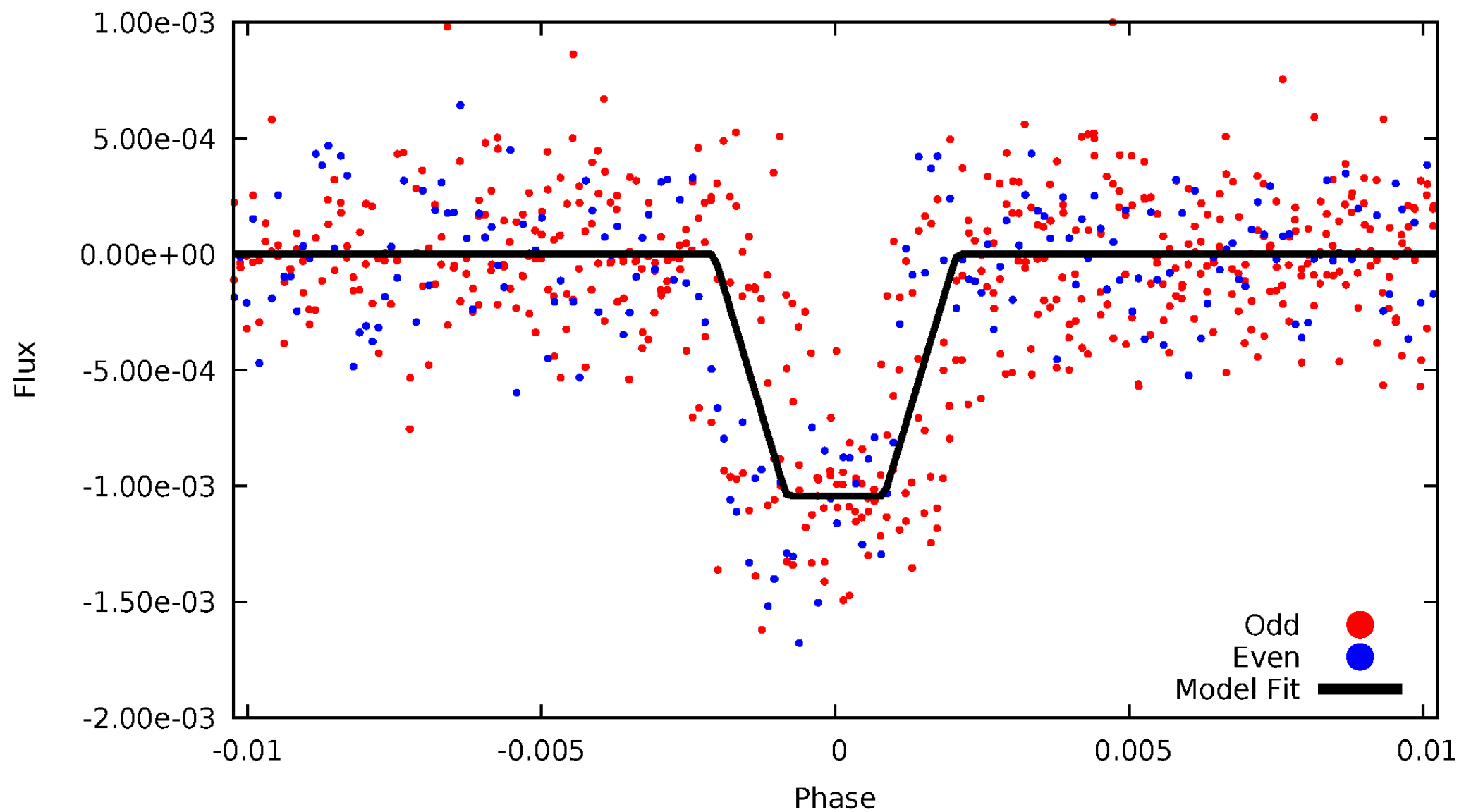
# DV Odd/Even

TCE 010028792-02



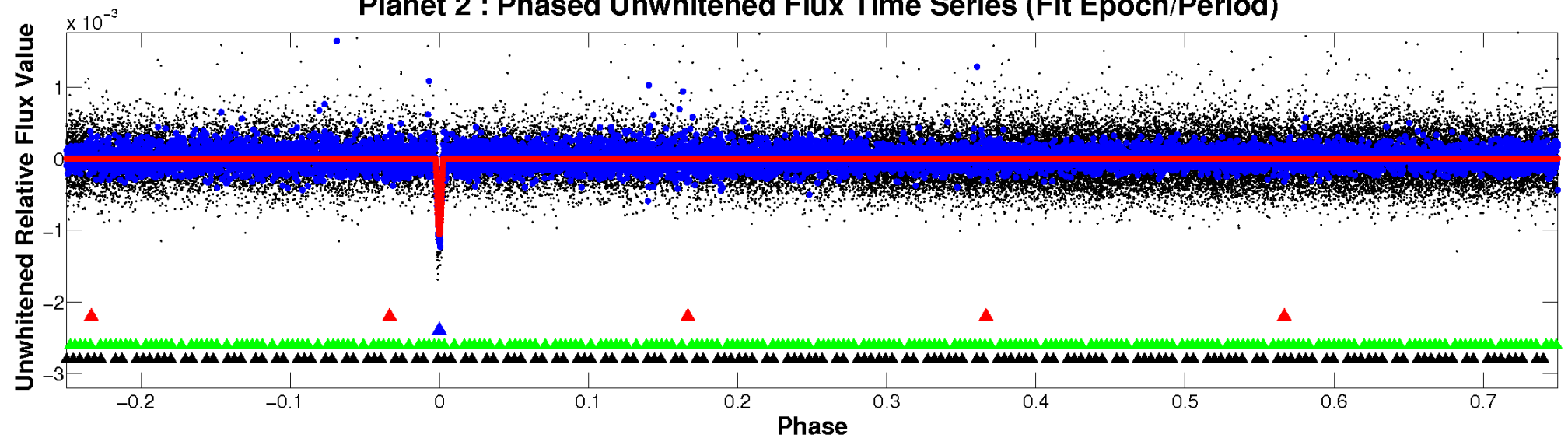
# ALT Odd/Even

TCE 010028792-02

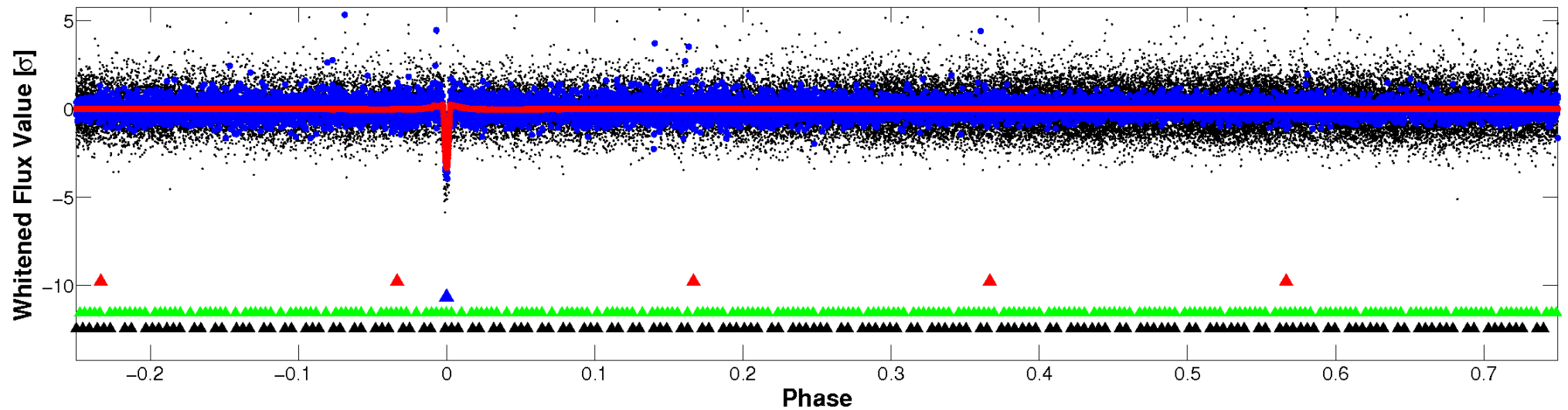


# Non-Whitened Vs. Whitened Light Curve

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

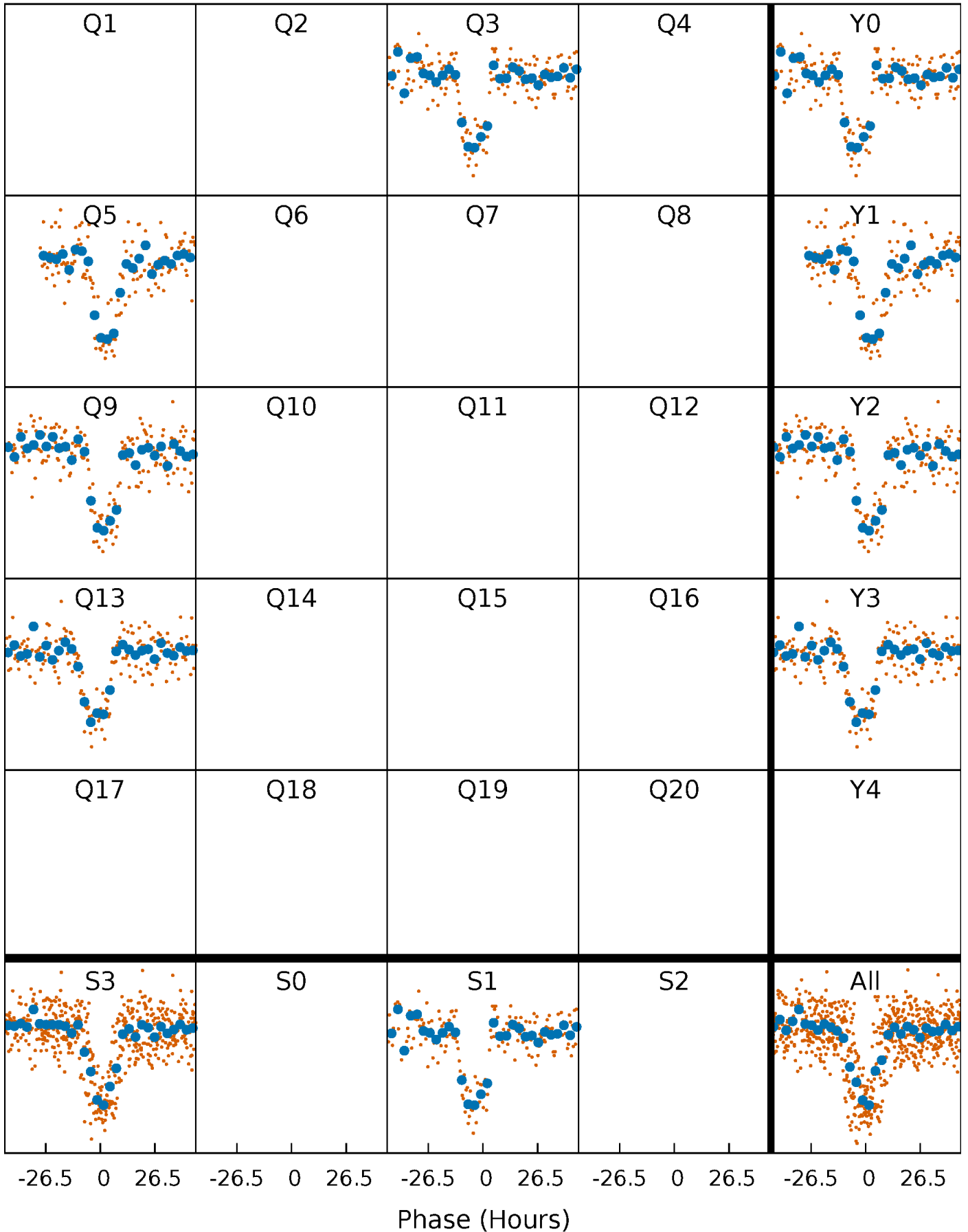


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



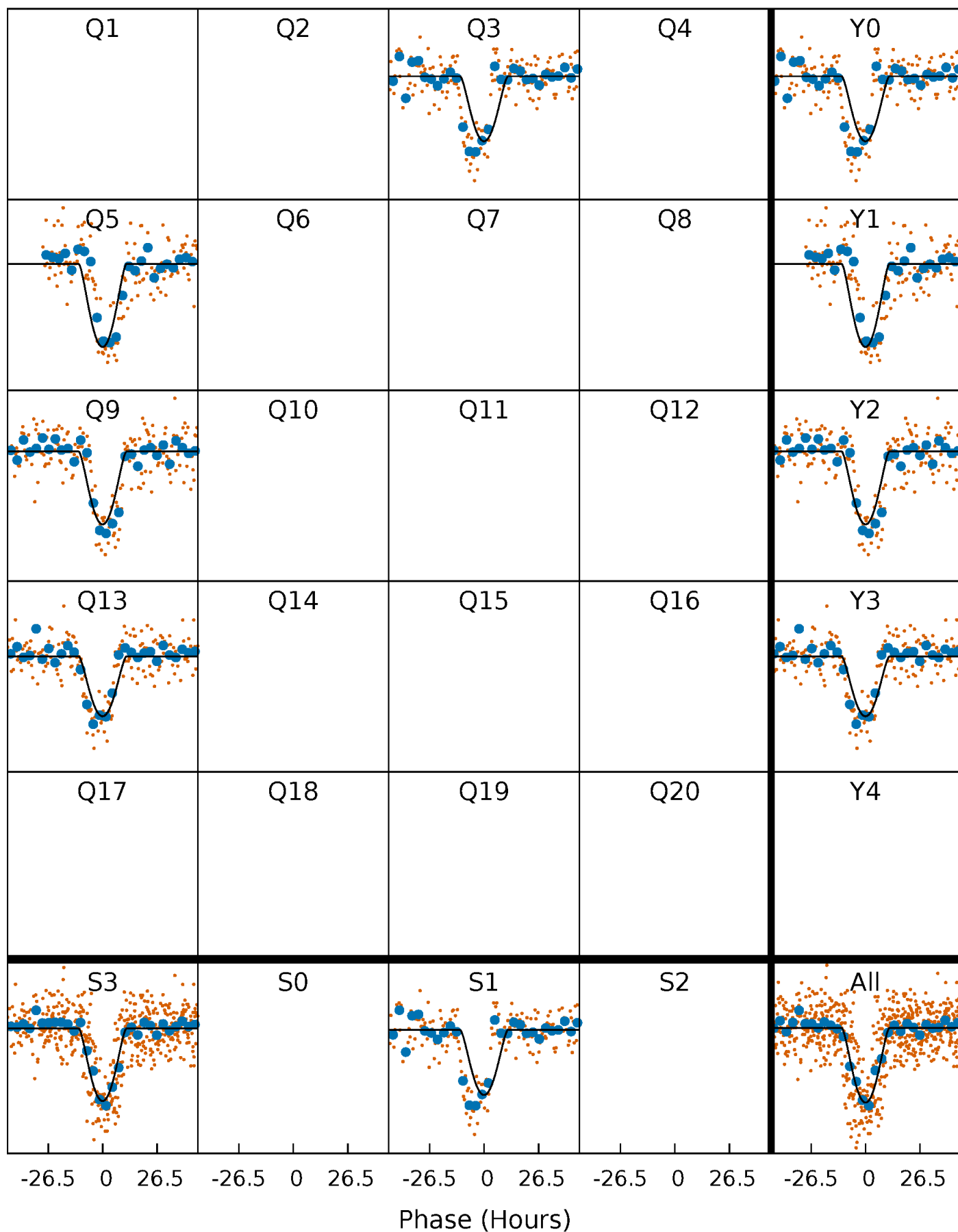
# PDC Quarter-Phased Transit Curves

TCE 010028792-02     $P=191.229502$  Days     $T_0=286.265701$  (BKJD)



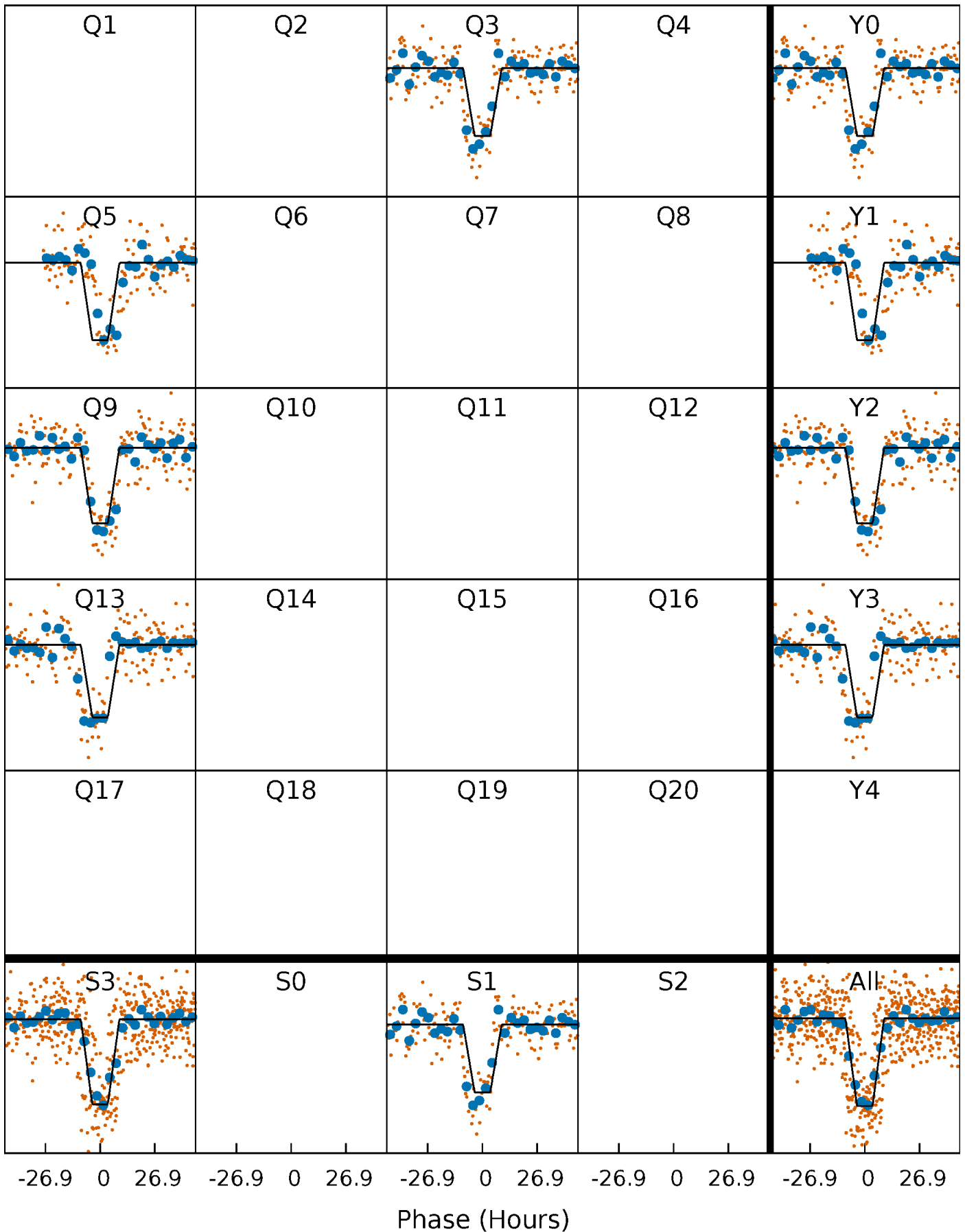
# DV Quarter-Phased Transit Curves

TCE 010028792-02     $P=191.229502$  Days     $T_0=286.265701$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

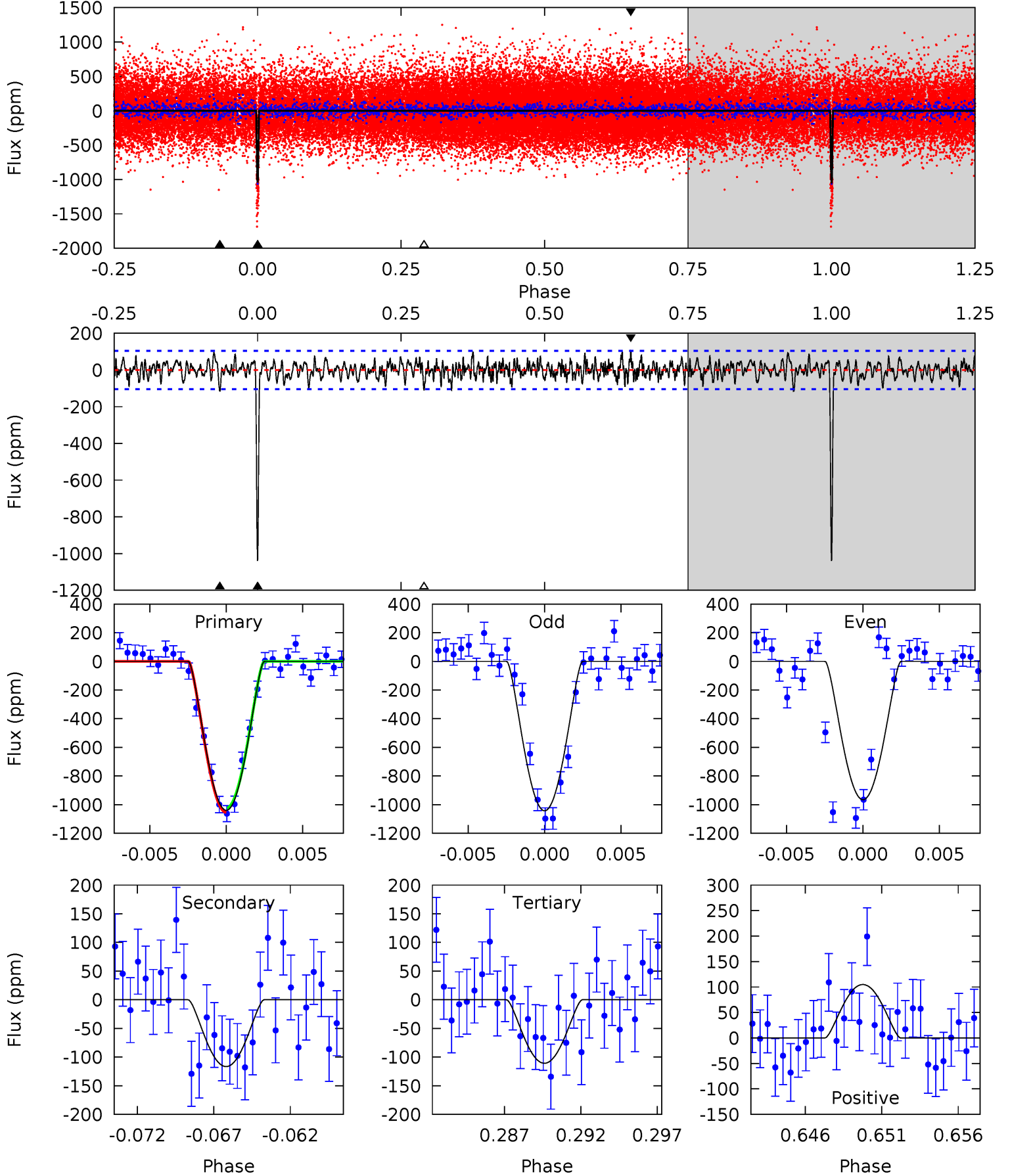
TCE 010028792-02 P=191.258122 Days  $T_0=286.189828$  (BKJD)



# DV Model-Shift Uniqueness Test

010028792-02, P = 191.229502 Days, E = 95.036199 Days

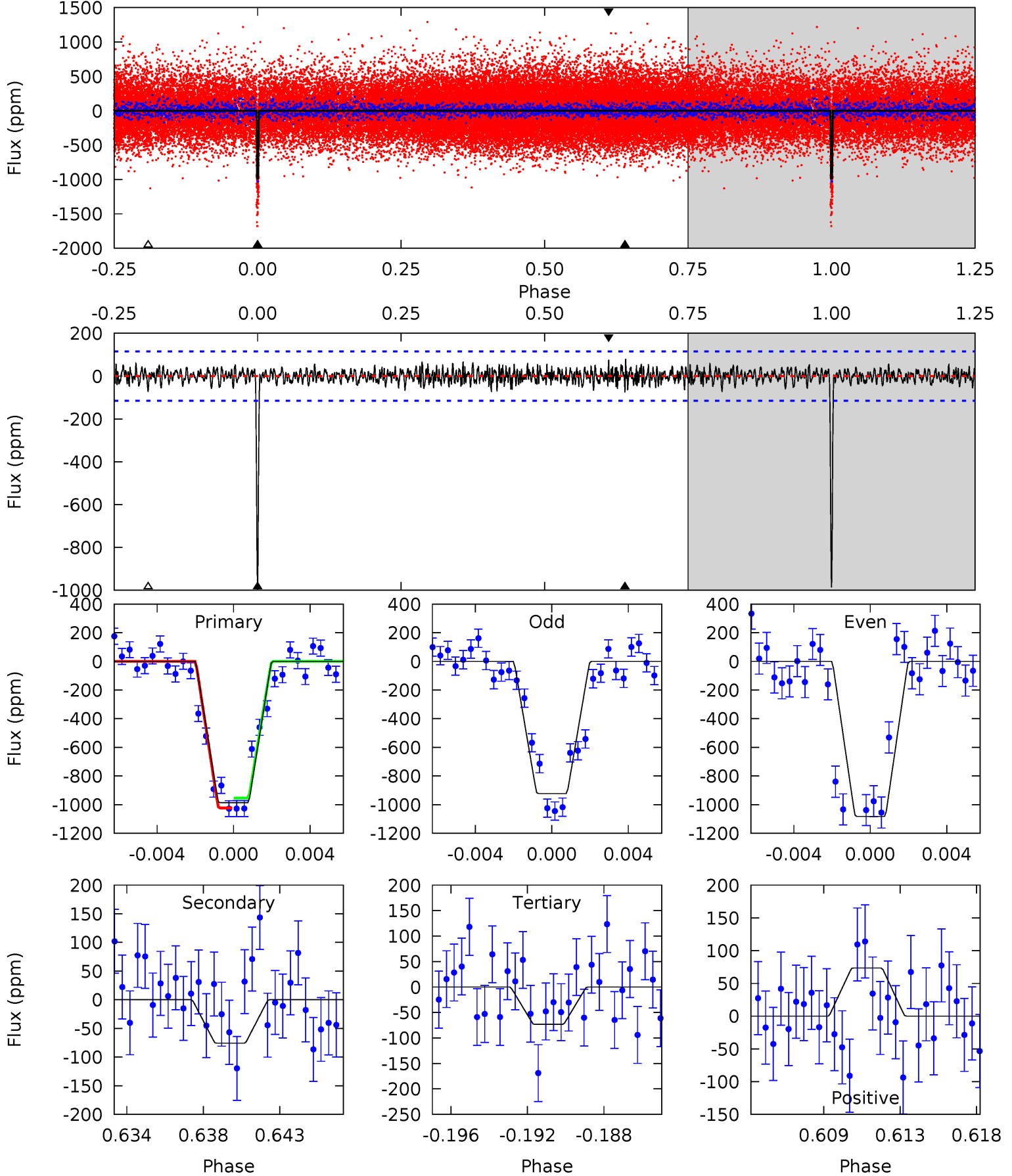
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
51.3	5.75	5.47	5.17	5.15	2.80	1.71	45.8	46.1	0.28	0.58	1.63	0.98	0.09	0.74



# Alt Model-Shift Uniqueness Test

010028792-02,  $P = 191.258122$  Days,  $E = 94.931706$  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
44.6	3.42	3.31	3.32	5.19	2.86	1.10	41.3	41.3	0.11	0.10	3.12	0.94	0.08	1.58





### Stellar Parameters For KIC 010028792

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5597^{+112}_{-101}$	$3.963^{+0.054}_{-0.045}$	$-0.180^{+0.150}_{-0.150}$	$1.699^{+0.147}_{-0.123}$	$0.969^{+0.084}_{-0.063}$	$0.278^{+0.060}_{-0.045}$
	+2%/-2%	+1%/-1%	+83%/-83%	+9%/-7%	+9%/-7%	+21%/-16%
Source	SPE65	TRA65	SPE65	DSEP		

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

### Secondary Eclipse Parameters for KIC 010028792-02 / KOI 1574.02

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-117 \pm 20$	$15.61^{+14.98}_{-10.29}$	$561^{+17}_{-16}$	$2753^{+1050}_{-430}$	$110^{+871}_{-83}$
Alt.	$-76 \pm 22$	$13.41^{+13.97}_{-8.87}$	$560^{+14}_{-15}$	$2701^{+1020}_{-438}$	$94^{+769}_{-73}$

$T_{\text{max}}$  = 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

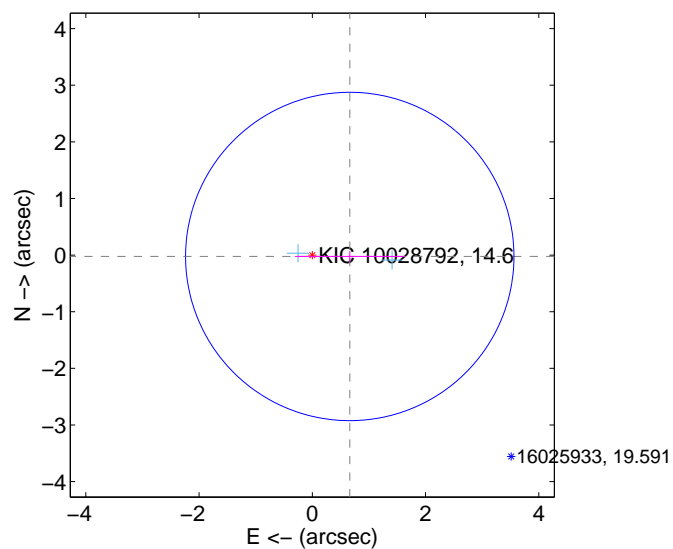
Supplemental centroid analysis for 010028792-02. Kepler magnitude: 14.60. Transit SNR 28.29

There are 2 quarters with good PRF difference image offsets

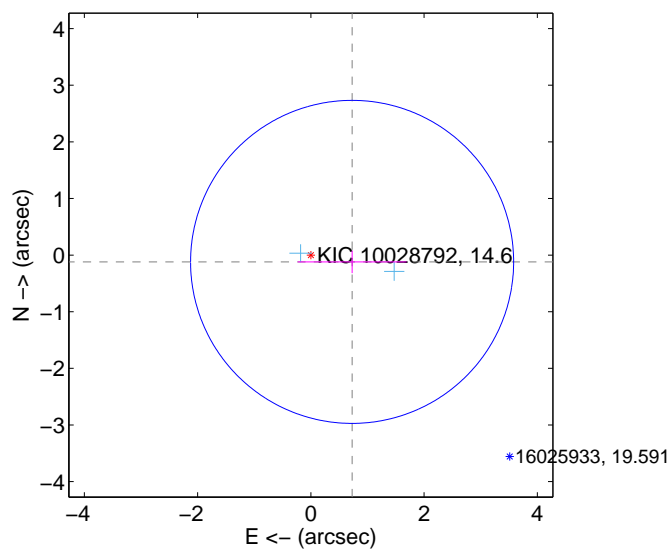
The direct PRF centroid is offset from the target star catalog position by about 0.07 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.662 \pm 0.966$	0.69	$-0.662 \pm 0.967$	$-0.024 \pm 0.097$
PRF-fit source offset from KIC position	$0.738 \pm 0.951$	0.78	$-0.728 \pm 0.963$	$-0.120 \pm 0.199$
photometric centroid source offset	$0.18 \pm 0.41$	0.43	$-0.11 \pm 0.44$	$0.14 \pm 0.39$

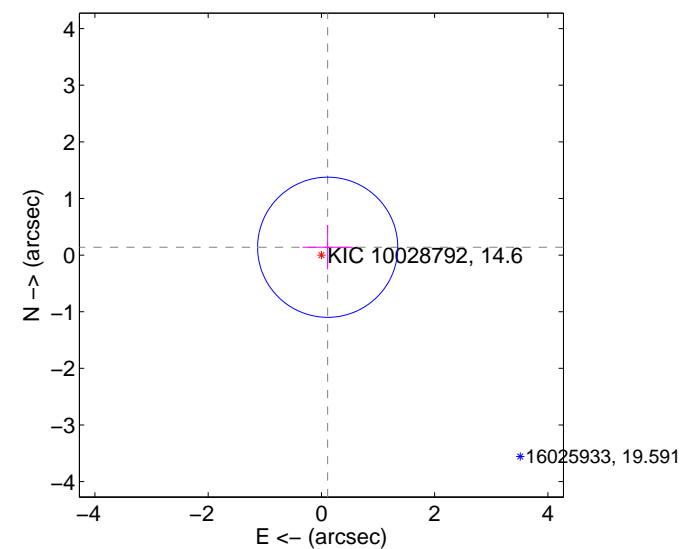
offset from difference PRF-fit to OOT PRF-fit



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



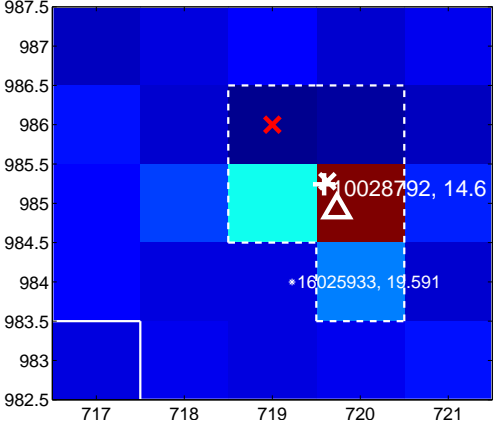
Q2 no difference image



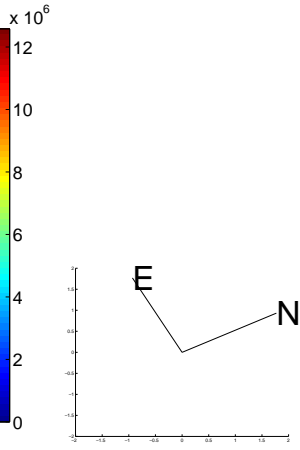
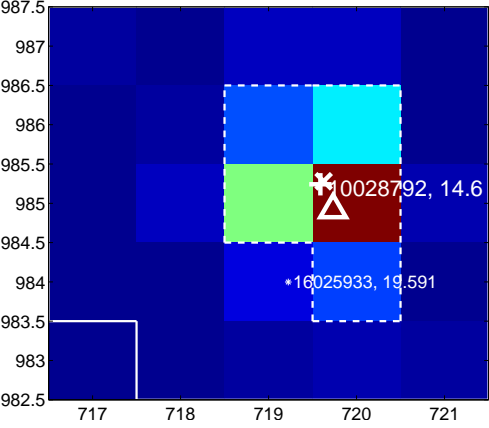
Q2 no OOT image



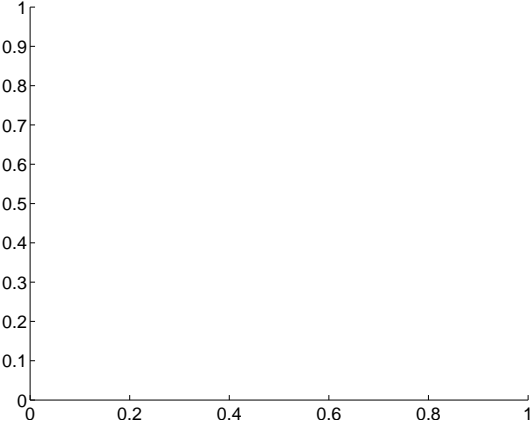
Q3 difference image



Q3 OOT image



Q4 no difference image



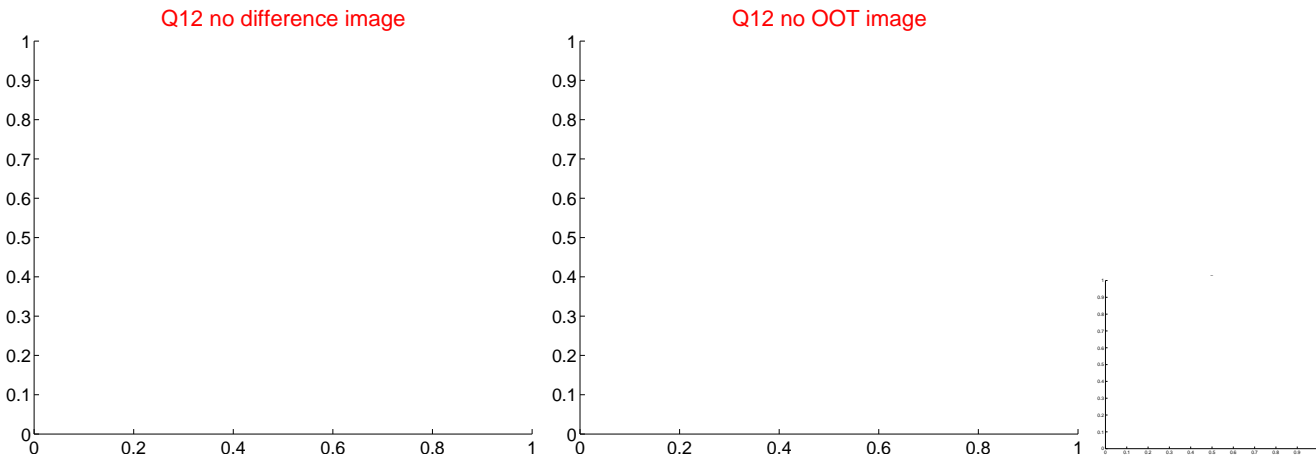
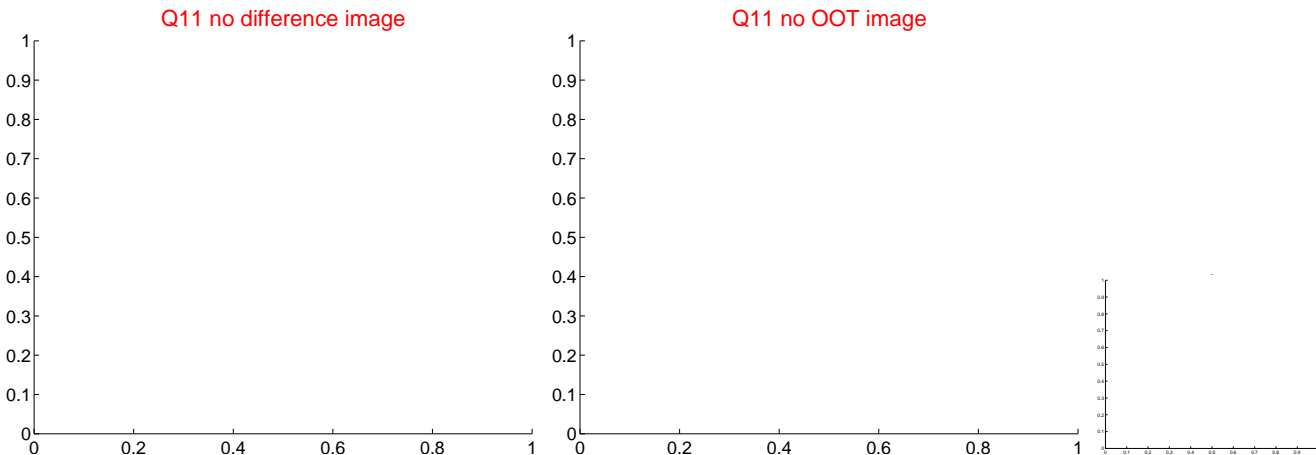
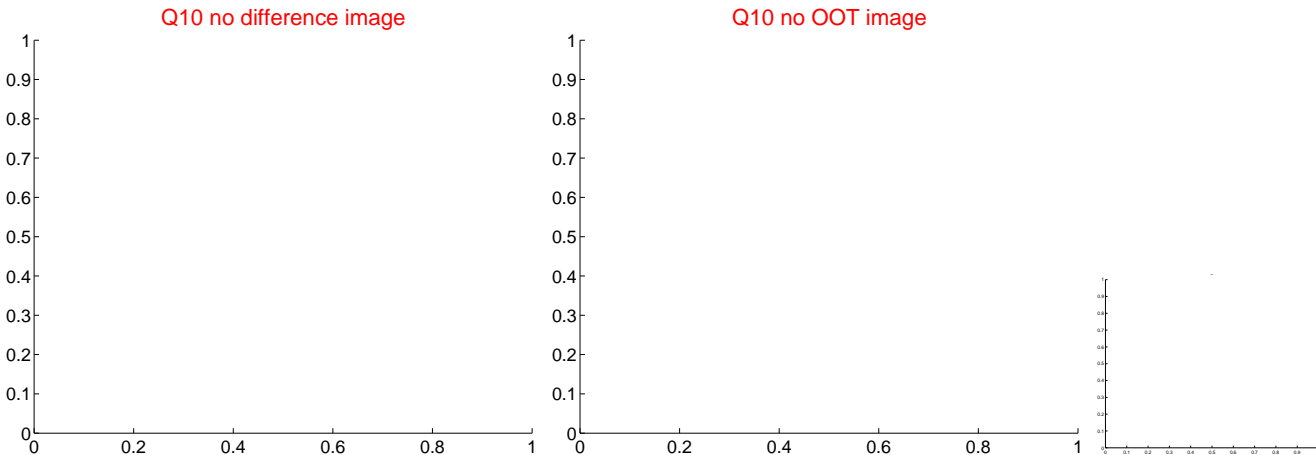
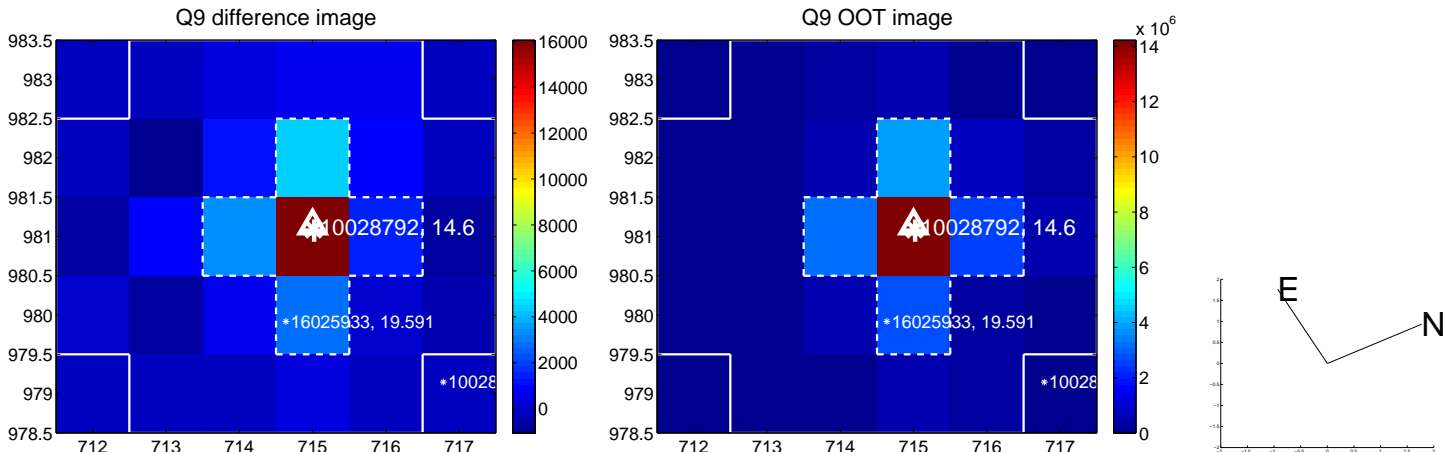
Q4 no OOT image



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



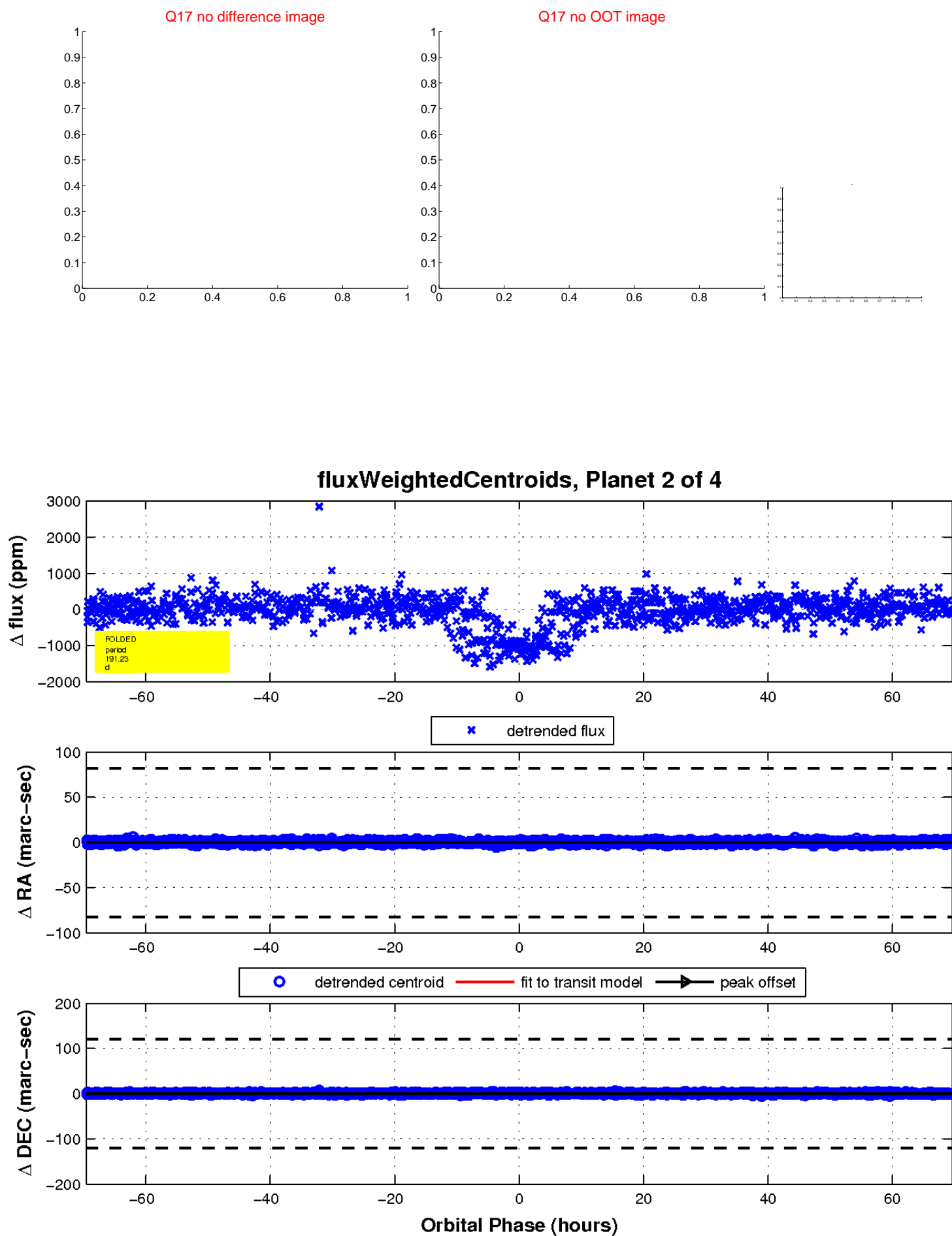
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value



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

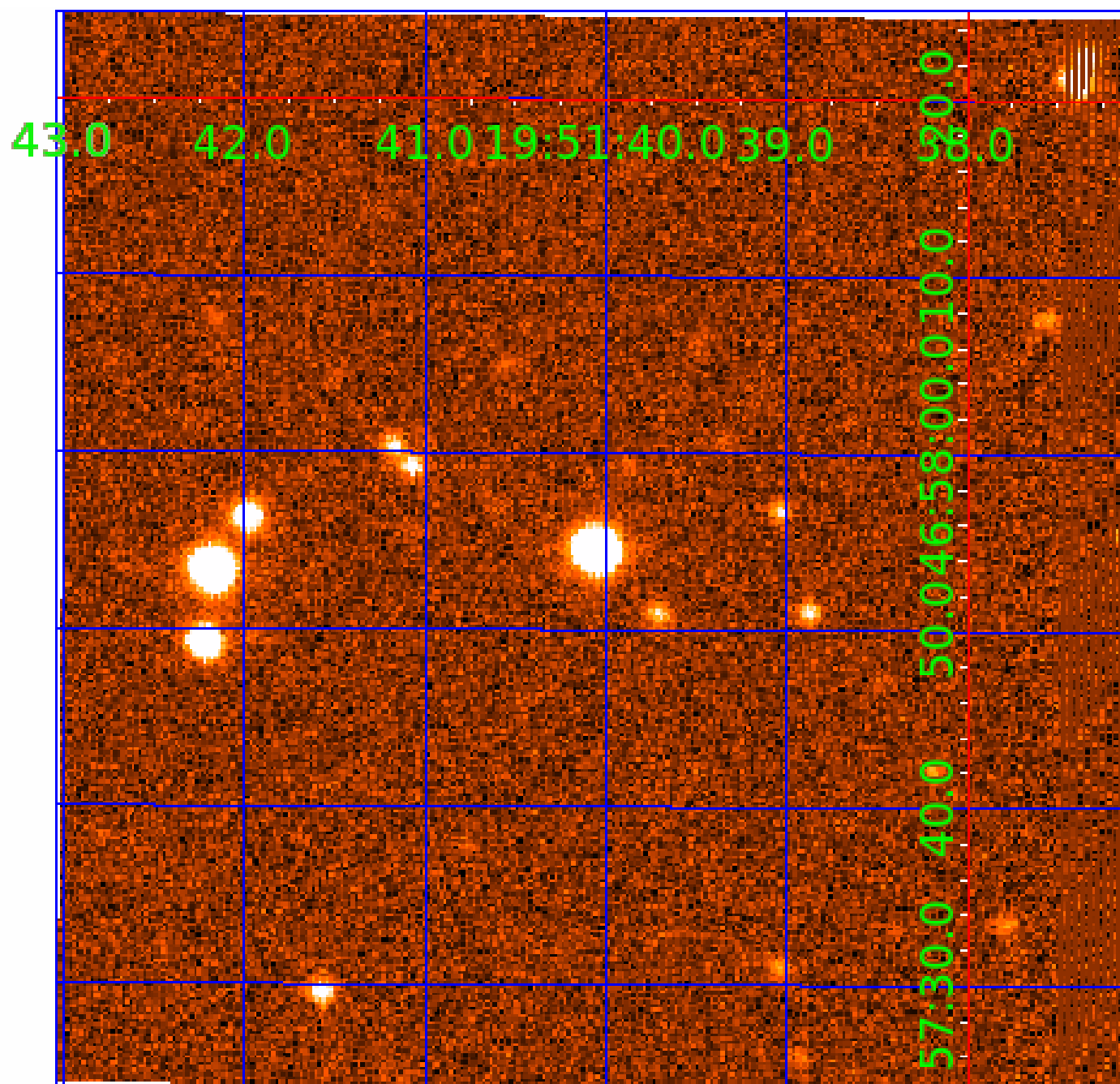


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 010028792

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010028792-01	OBS	1574.01	114.736338	165.153539	4812.8	12.140	196.2	190.9	1.70	5597	12.36	12.15
010028792-02	OBS	1574.02	191.229502	286.265701	1049.9	23.207	27.2	28.3	1.70	5597	10.77	6.15
010028792-03	OBS	1574.03	5.833893	132.639474	89.7	4.742	9.3	11.0	1.70	5597	1.79	645.01
010028792-04	OBS	1574.04	8.976960	133.467212	81.1	5.361	7.4	7.9	1.70	5597	1.84	363.08

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010028792-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
010028792-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_SKYE--CENT_FEW_DIFFS
010028792-03	OBS	PC	0.95	0	0	0	0	NO_COMMENT
010028792-04	OBS	PC	0.95	0	0	0	0	NO_COMMENT

**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.

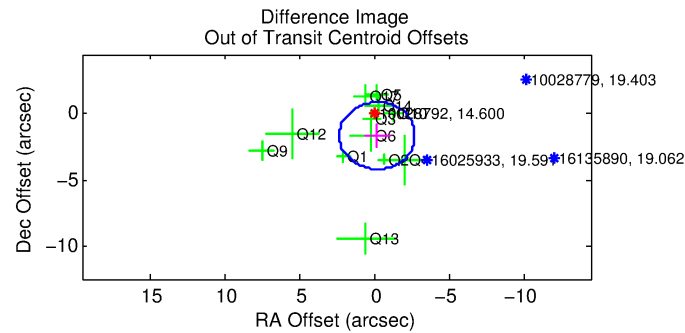
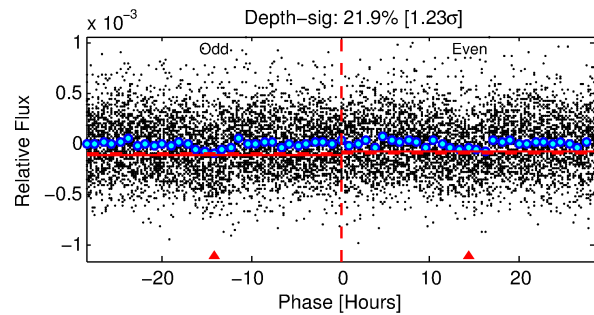
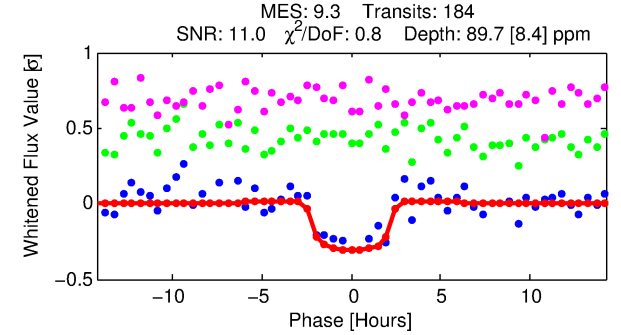
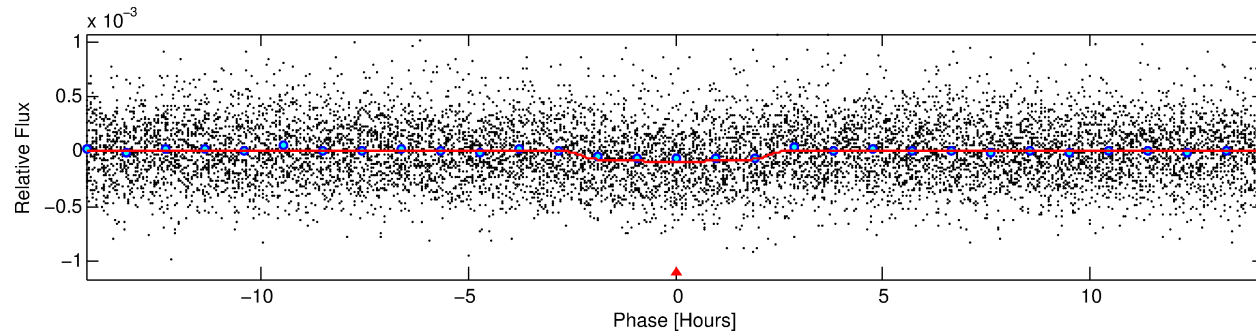
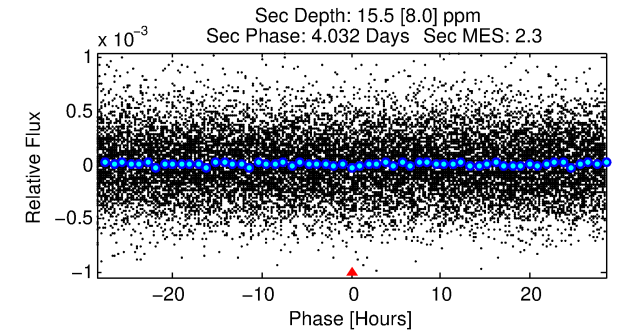
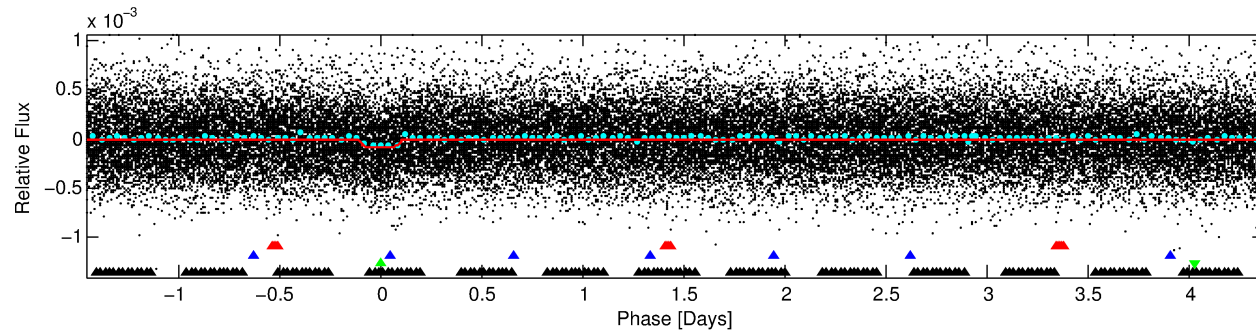
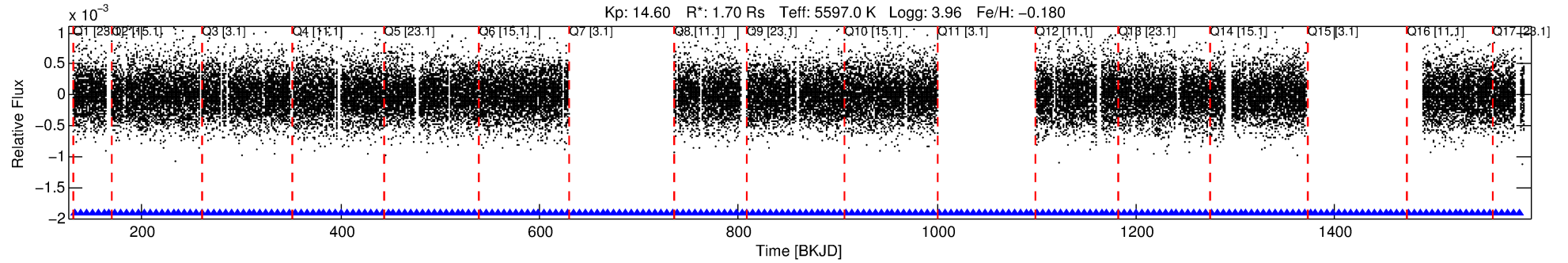
## Ephemeris Match Information For 010028792-03

No Significant Match Found

# DV One-Page Summary

KIC: 10028792 Candidate: 3 of 4 Period: 5.834 d

KOI: K01574.03 Corr: 0.988



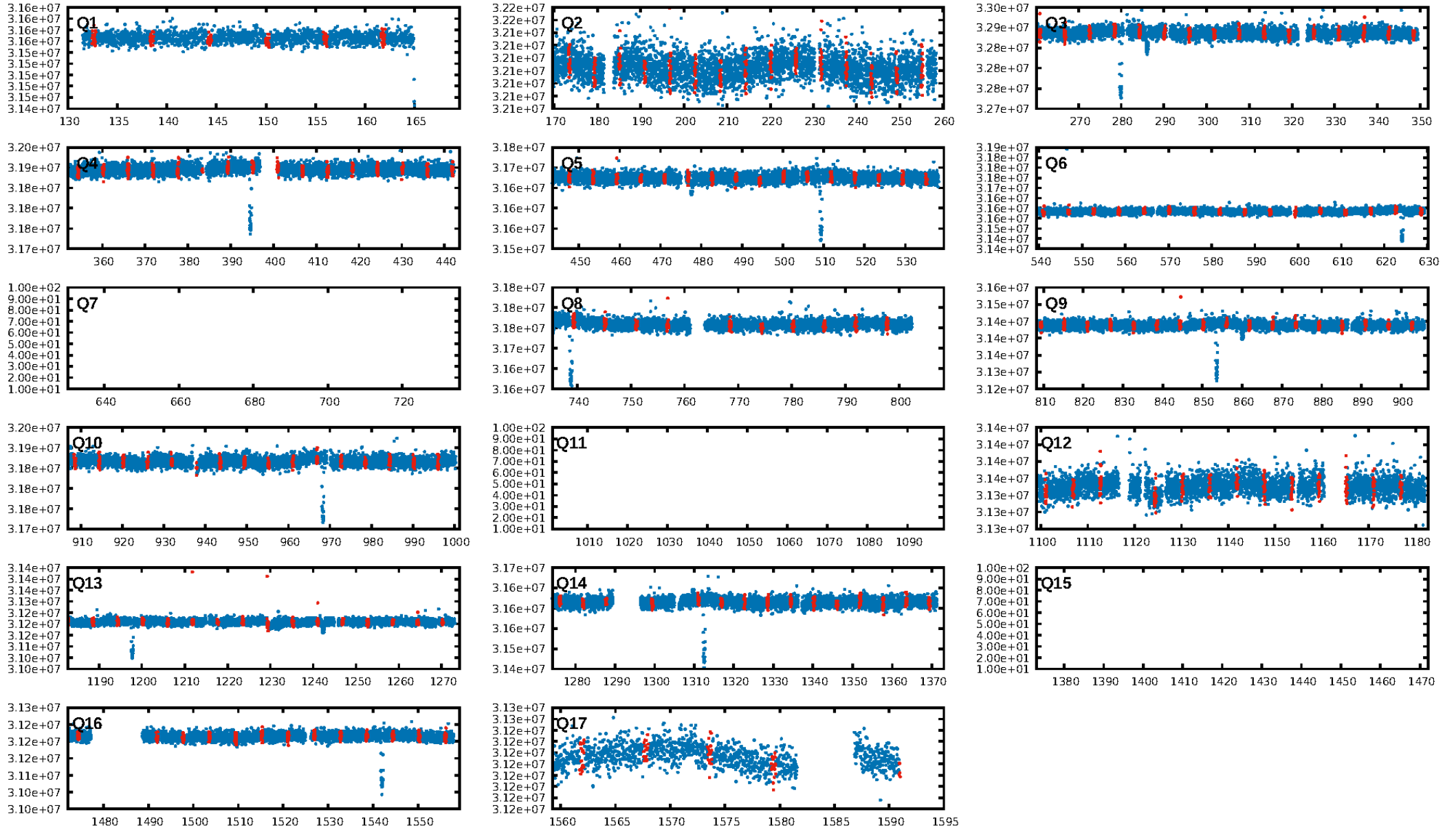
## DV Fit Results:

Period = 5.83389 [0.00006] d  
Epoch = 132.6395 [0.0069] BKJD  
Rp/R\* = 0.0097 [0.0061]  
a/R\* = 5.78 [15.79]  
b = 0.81 [1.24]  
Seff = 645.01 [83.12]  
Teff = 1285 [41] K  
Rp = 1.79 [1.14] Re  
a = 0.0627 [0.0045] AU  
Ag = 10.45 [14.27] [0.66σ]  
Teffp = 3572 [1219] K [1.88σ]

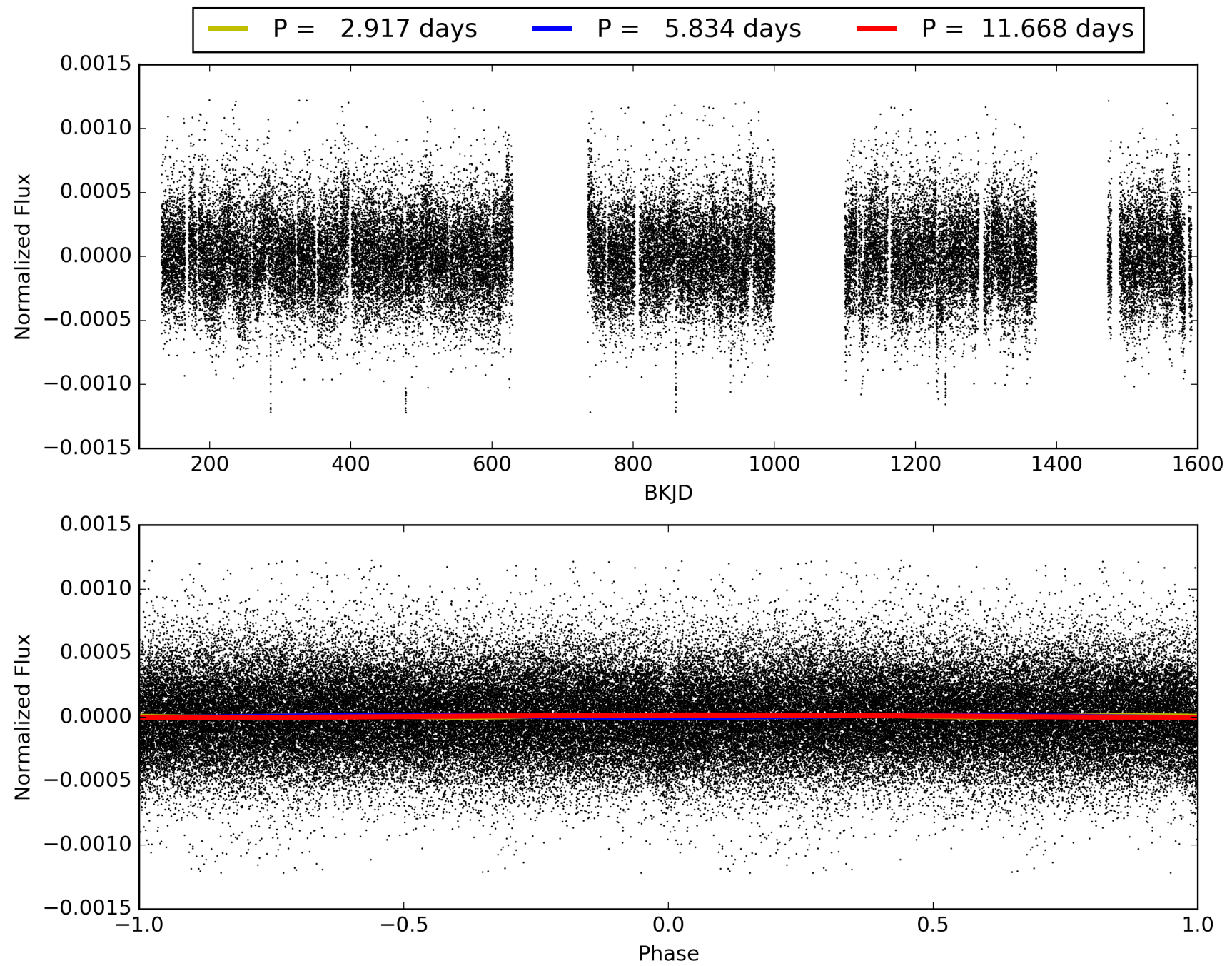
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [10.54σ]  
ModelChiSquare2-sig: 100.0%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 4.74e-20  
RollingBand-fgt: 1.00 [174/174]  
GhostDiagnostic-chr: 2.625  
Centroid-sig: 35.4%  
Centroid-so: 1.110 arcsec [0.84σ]  
OotOffset-rm: 1.666 arcsec [1.97σ]  
KicOffset-rm: 1.845 arcsec [2.16σ]  
OotOffset-st: 4/1/2/5 [12]  
KicOffset-st: 4/1/2/5 [12]  
DiffImageQuality-fgm: 0.58 [7/12]  
DiffImageOverlap-fno: 1.00 [14/14]

# TCE 010028792-03, PDC Light Curves

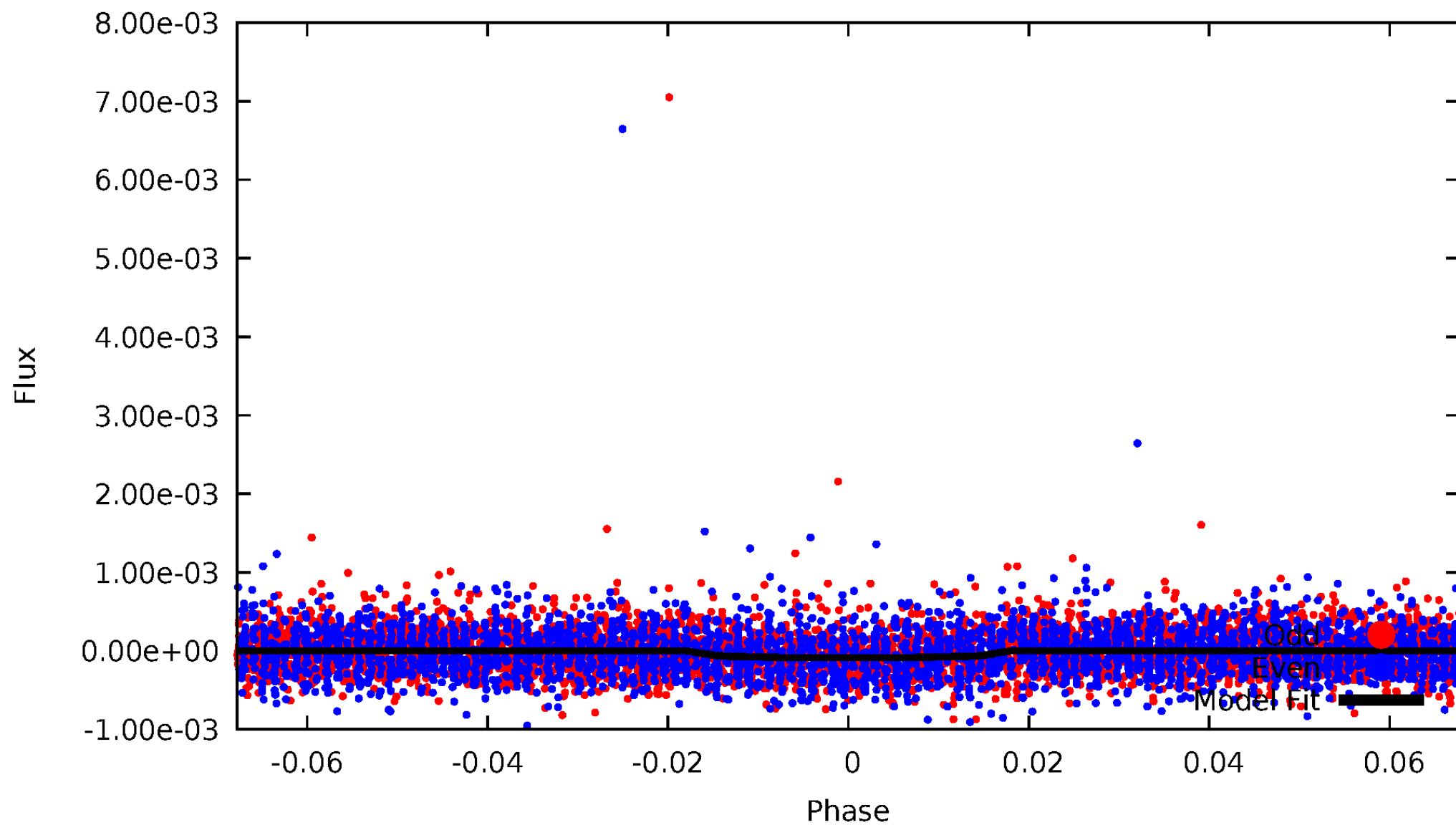


TCE 010028792-03



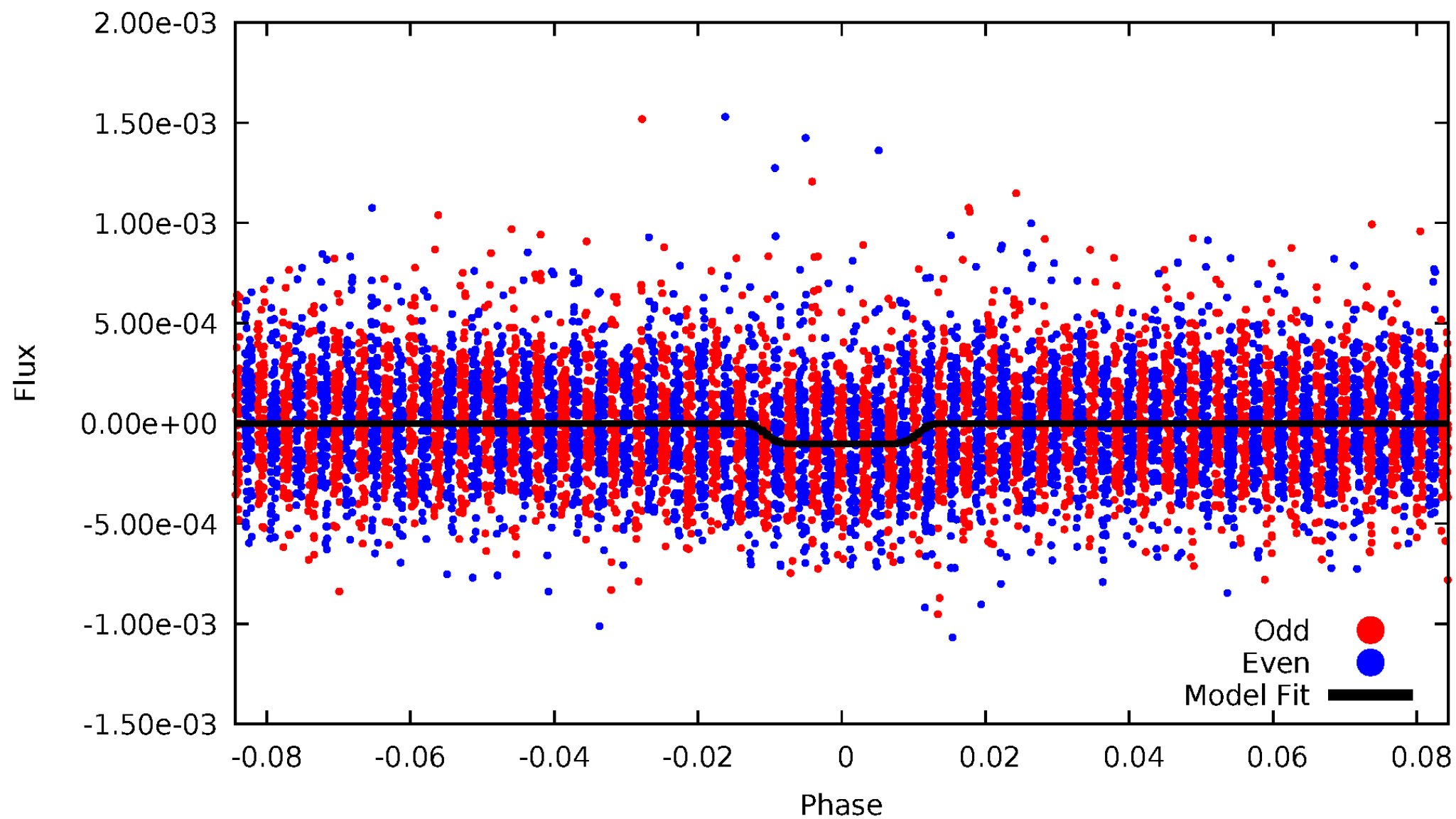
# DV Odd/Even

TCE 010028792-03



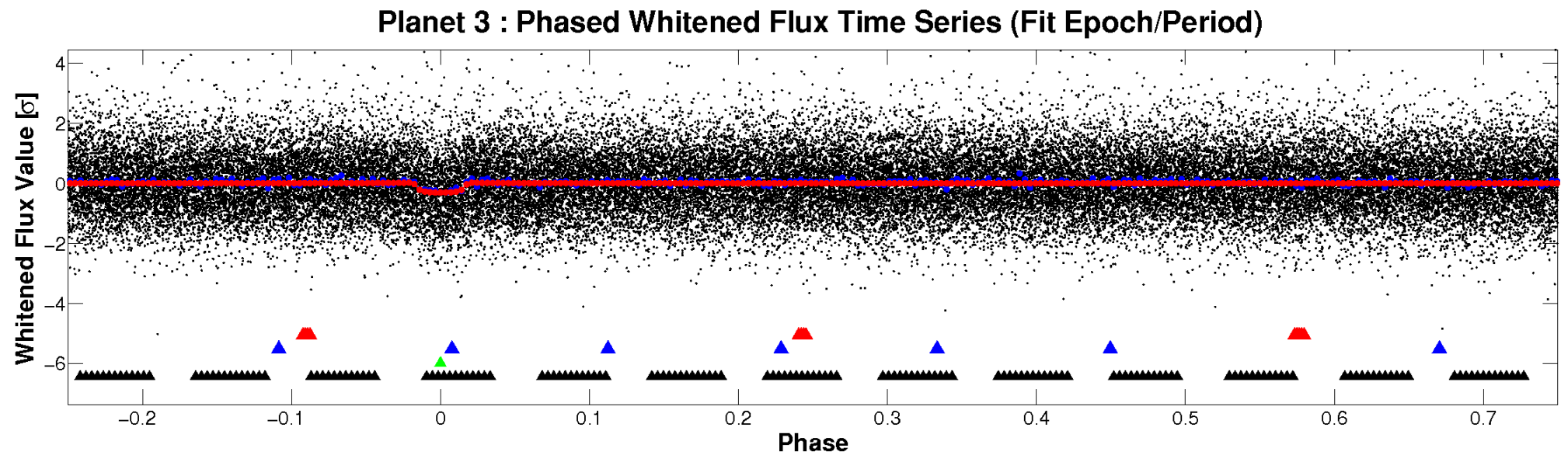
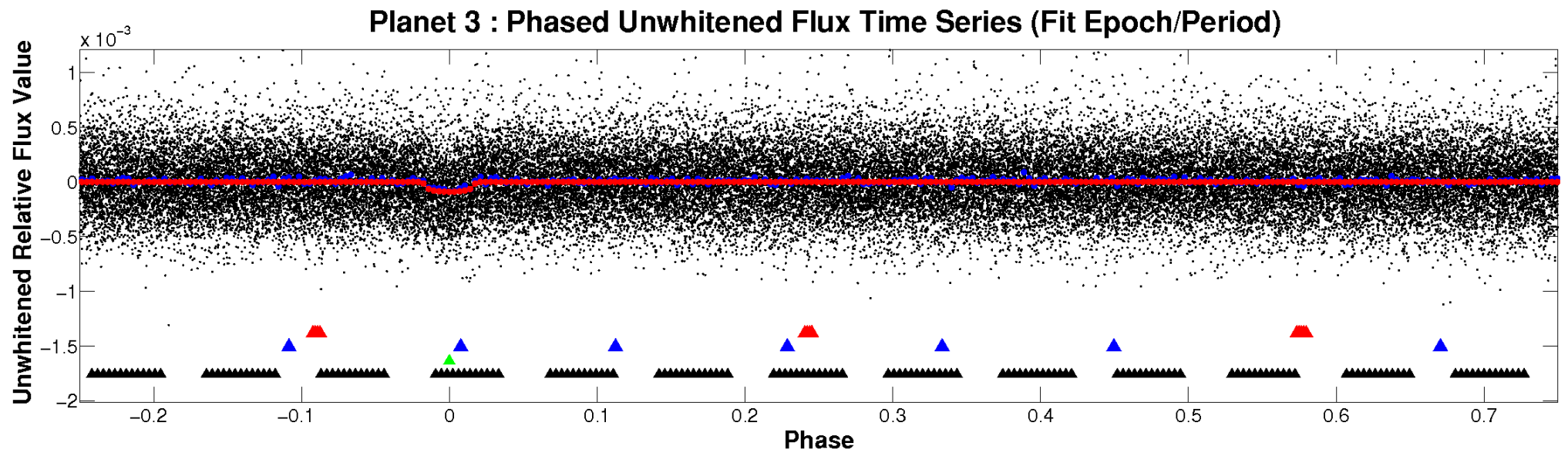
# ALT Odd/Even

TCE 010028792-03



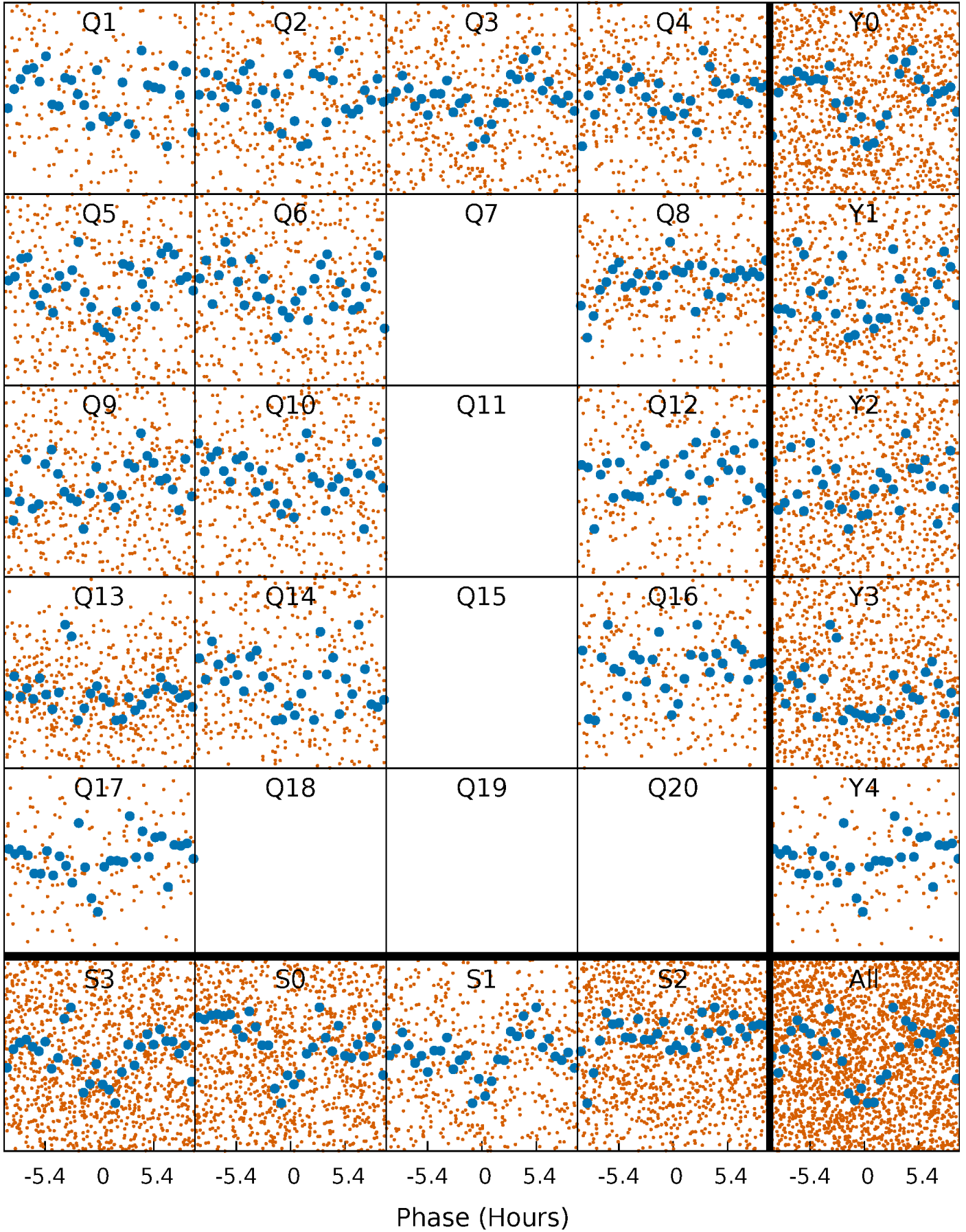


# Non-Whitened Vs. Whitened Light Curve



# PDC Quarter-Phased Transit Curves

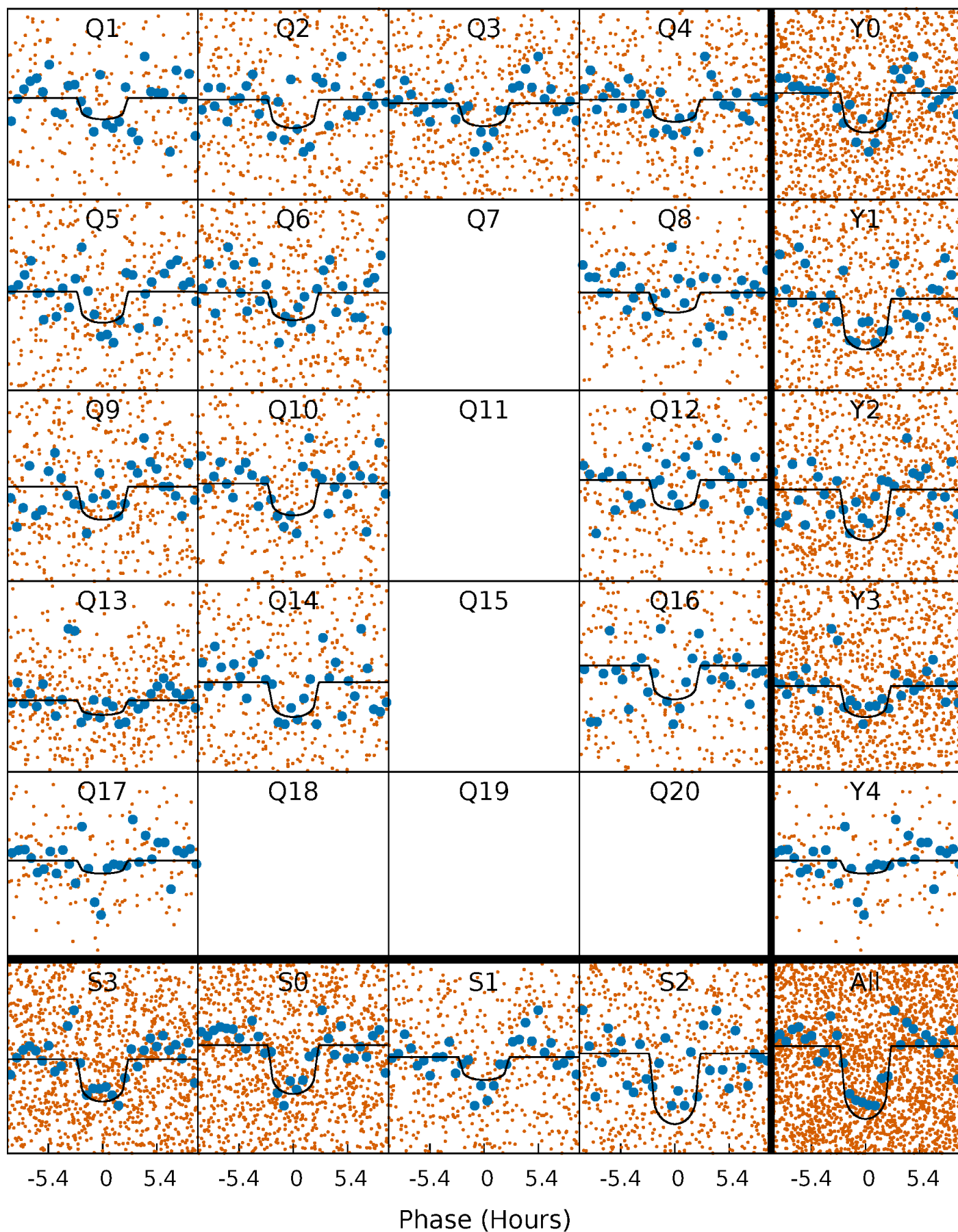
TCE 010028792-03   P= 5.833893 Days    $T_0=132.639474$  (BKJD)





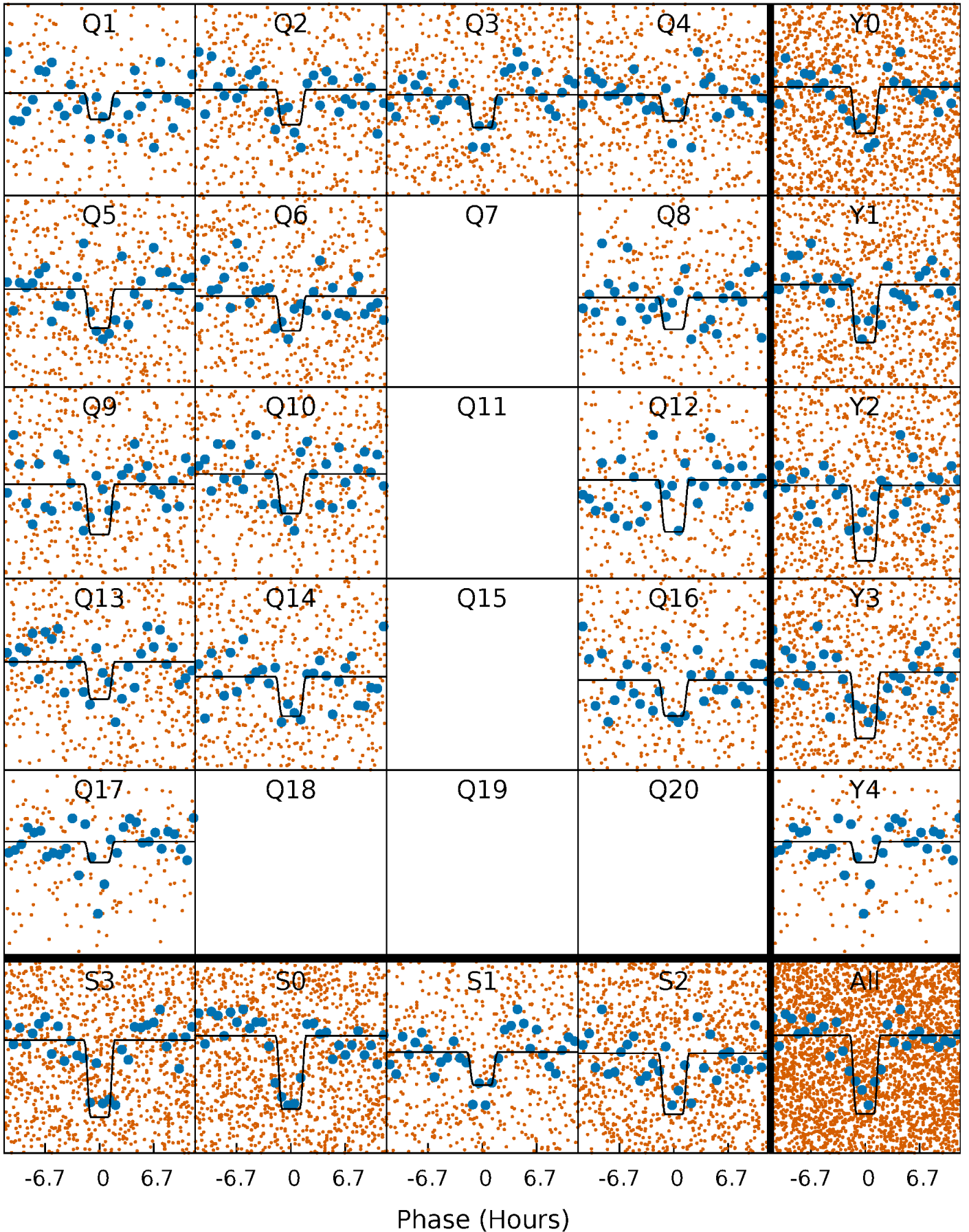
# DV Quarter-Phased Transit Curves

TCE 010028792-03 P= 5.833893 Days  $T_0=132.639474$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

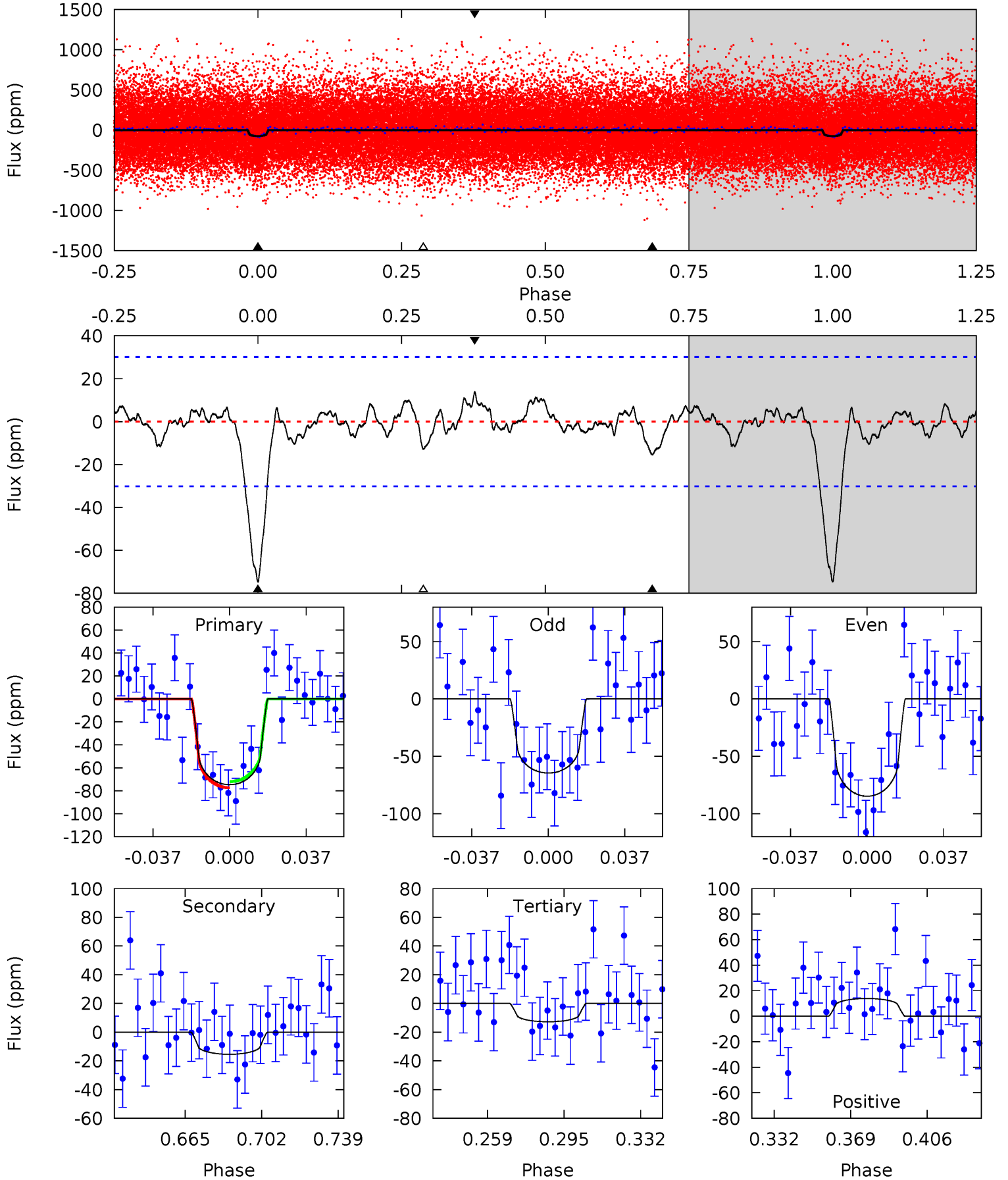
TCE 010028792-03   P= 5.833796 Days    $T_0=132.646449$  (BKJD)



# DV Model-Shift Uniqueness Test

010028792-03, P = 5.833893 Days, E = 126.805581 Days

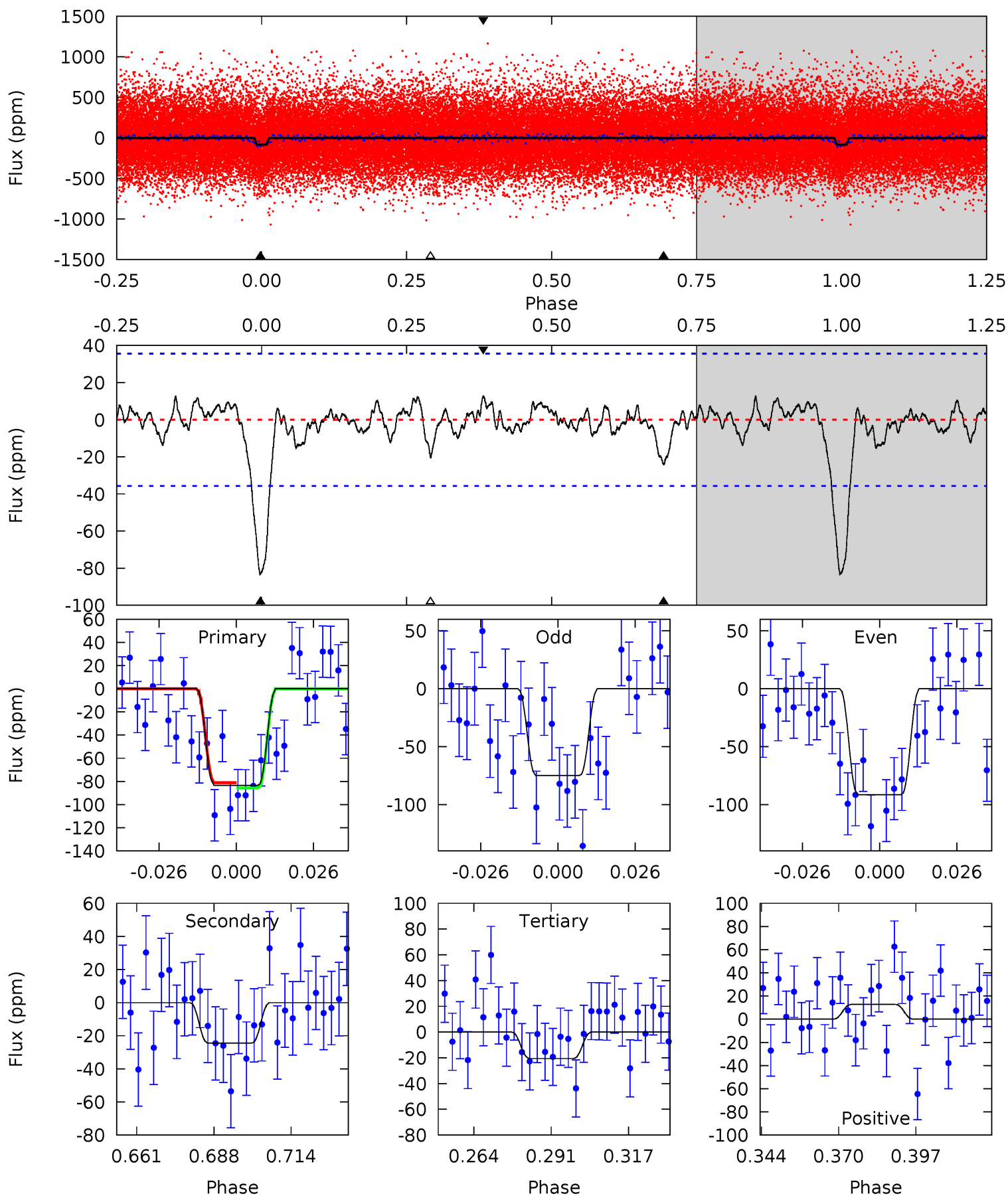
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
11.8	2.44	2.02	2.20	4.77	2.09	0.79	9.81	9.64	0.42	0.24	1.60	0.89	0.16	0.42



# Alt Model-Shift Uniqueness Test

010028792-03, P = 5.833796 Days, E = 126.812653 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
11.3	3.32	2.79	1.73	4.84	2.22	0.79	8.52	9.58	0.53	1.59	1.11	0.78	0.13	0.31



### Stellar Parameters For KIC 010028792

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5597^{+112}_{-101}$	$3.963^{+0.054}_{-0.045}$	$-0.180^{+0.150}_{-0.150}$	$1.699^{+0.147}_{-0.123}$	$0.969^{+0.084}_{-0.063}$	$0.278^{+0.060}_{-0.045}$
	+2%/-2%	+1%/-1%	+83%/-83%	+9%/-7%	+9%/-7%	+21%/-16%
Source	SPE65	TRA65	SPE65	DSEP		

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

### Secondary Eclipse Parameters for KIC 010028792-03 / KOI 1574.03

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-15 \pm 6$	$1.91^{+1.15}_{-0.99}$	$1793^{+49}_{-48}$	$3732^{+1192}_{-579}$	$8.331^{+27.857}_{-5.343}$
Alt.	$-24 \pm 7$	$1.92^{+1.08}_{-1.04}$	$1794^{+48}_{-48}$	$4100^{+1600}_{-641}$	$14^{+51}_{-9}$

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

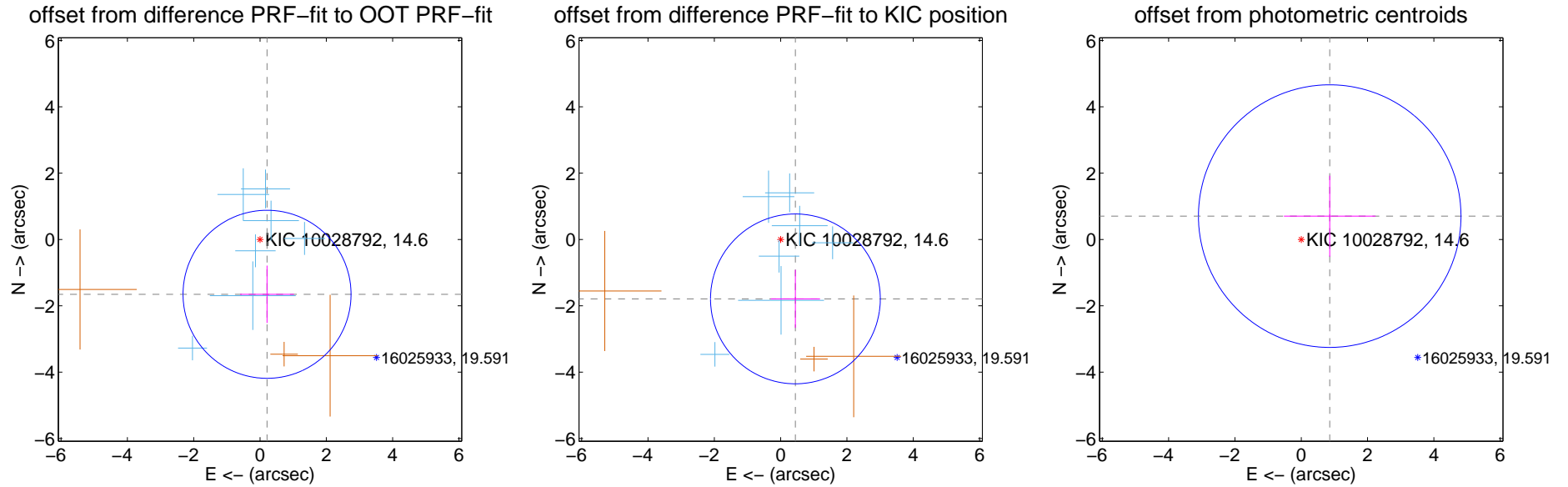
## DV Centroid Data

Supplemental centroid analysis for 010028792-03. Kepler magnitude: 14.60. Transit SNR 10.99

There are 7 quarters with good PRF difference image offsets

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

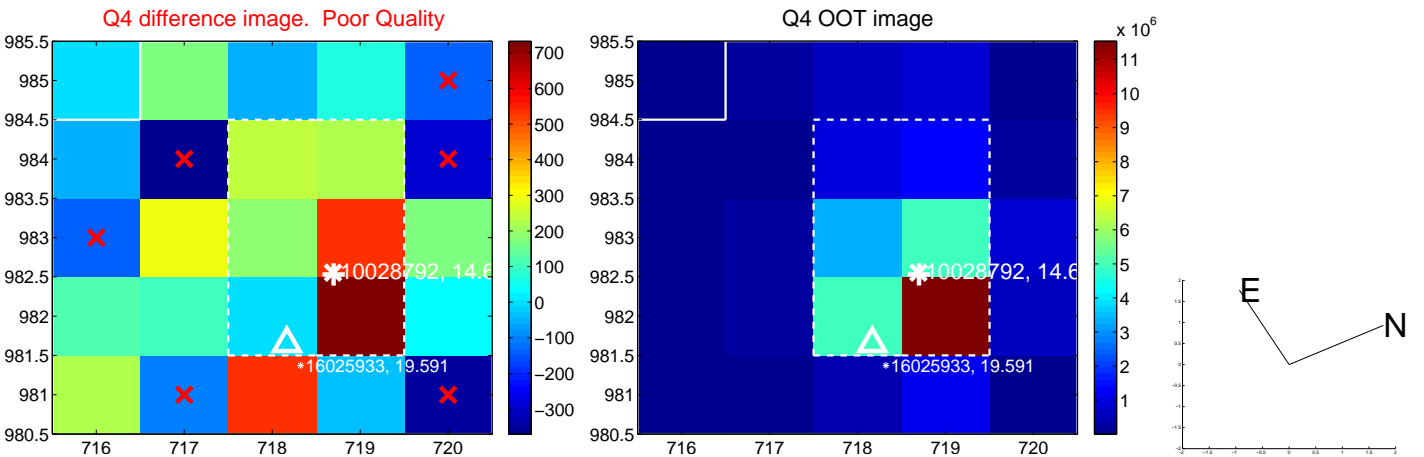
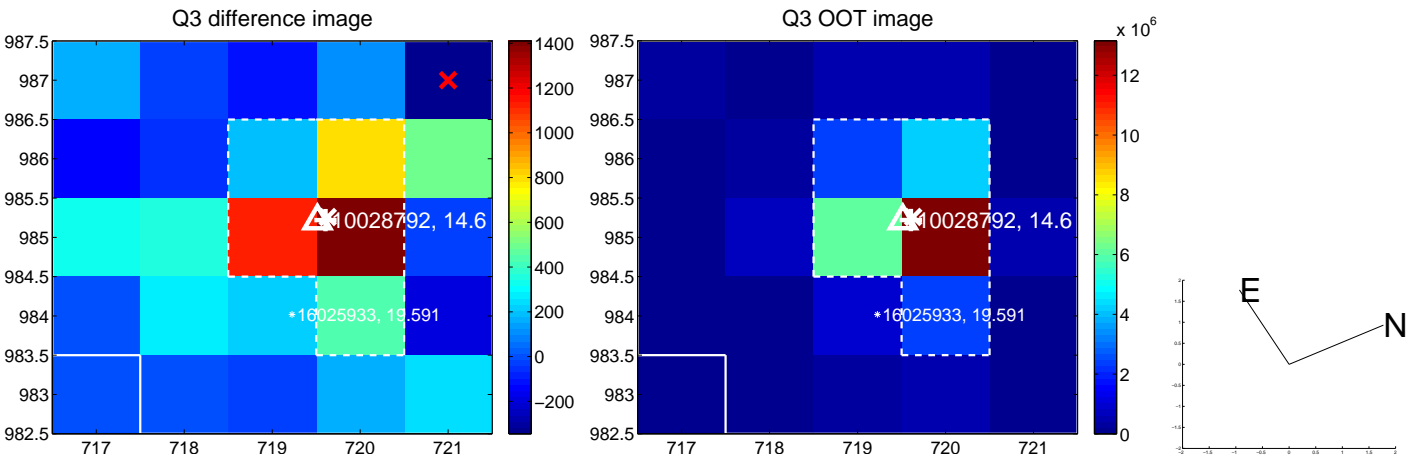
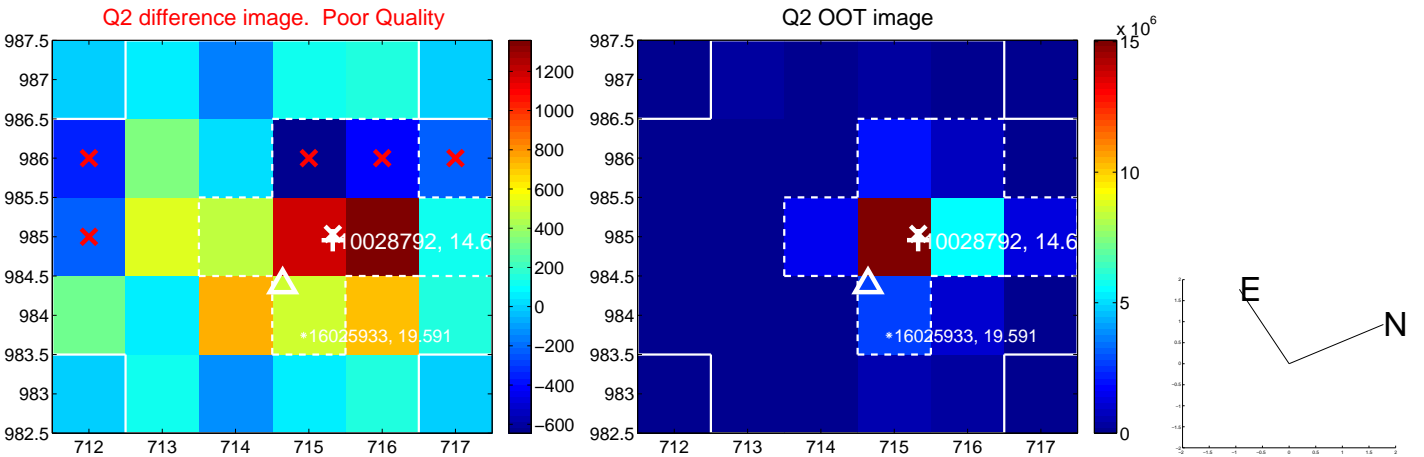
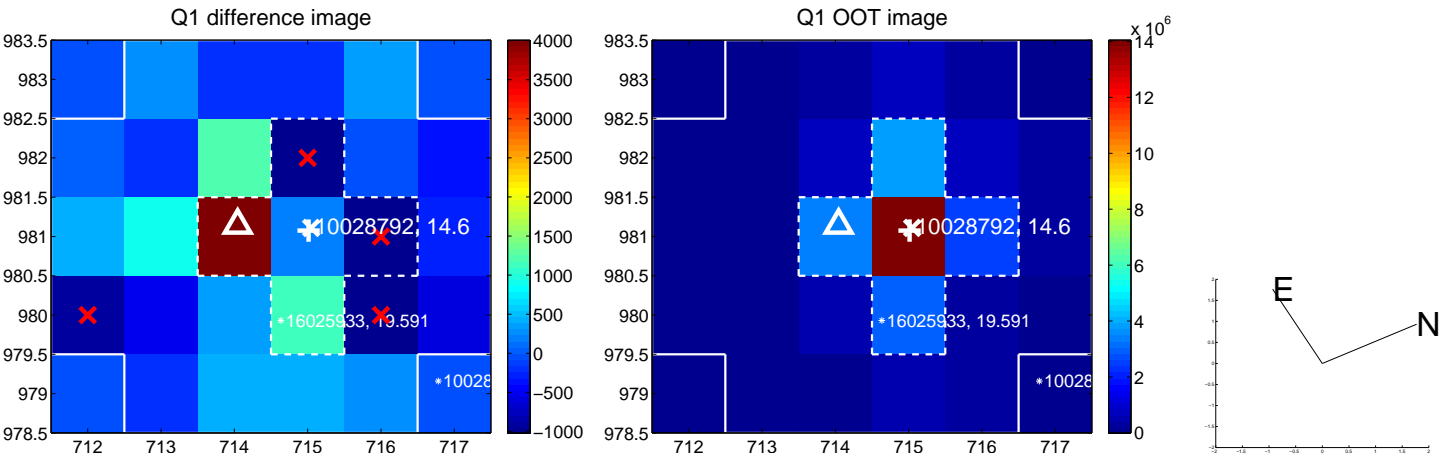
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.666 \pm 0.844$	1.97	$-0.212 \pm 0.811$	$-1.653 \pm 0.864$
PRF-fit source offset from KIC position	$1.845 \pm 0.853$	2.16	$-0.445 \pm 0.743$	$-1.791 \pm 0.873$
photometric centroid source offset	$1.11 \pm 1.32$	0.84	$-0.86 \pm 1.38$	$0.70 \pm 1.22$



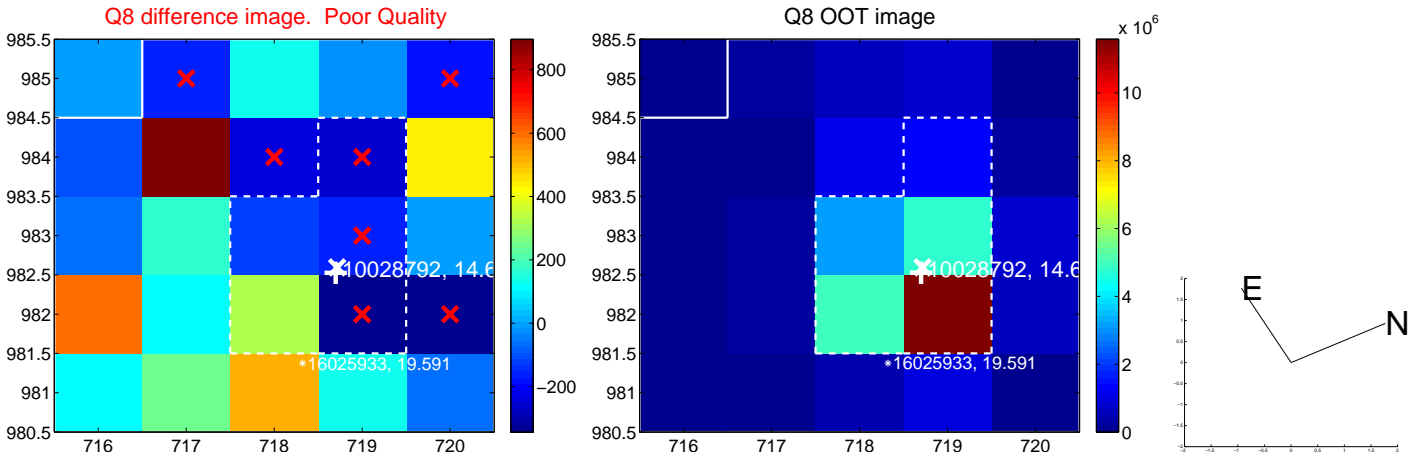
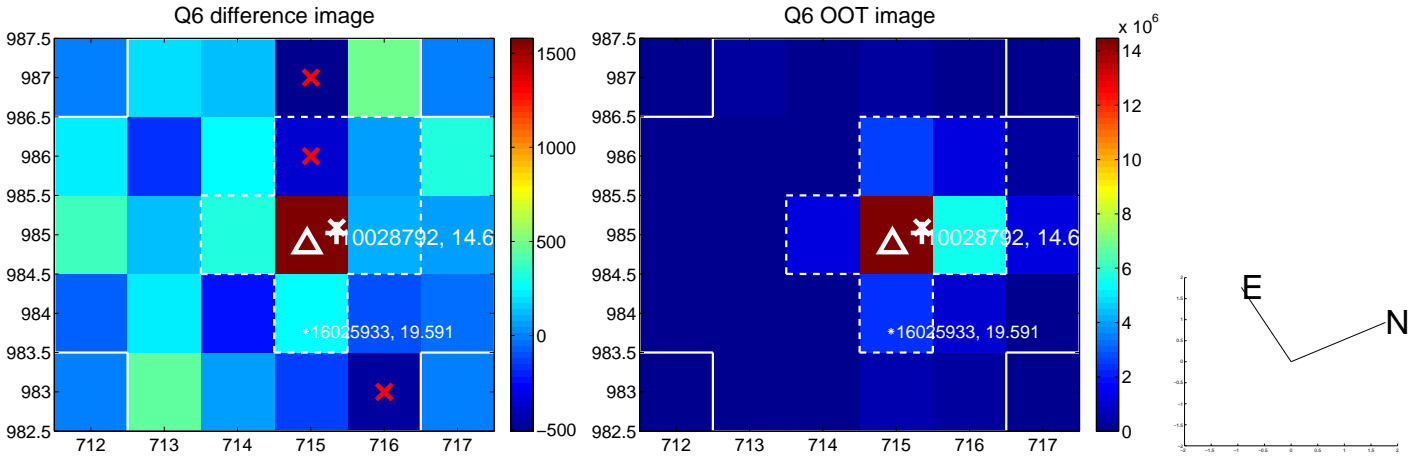
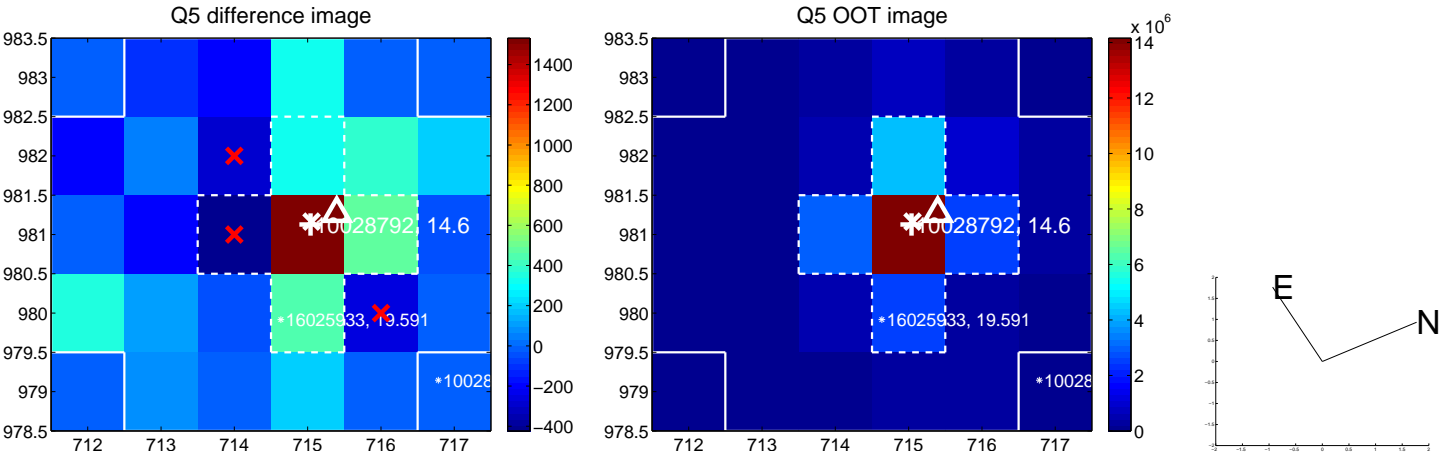
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets**; **Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

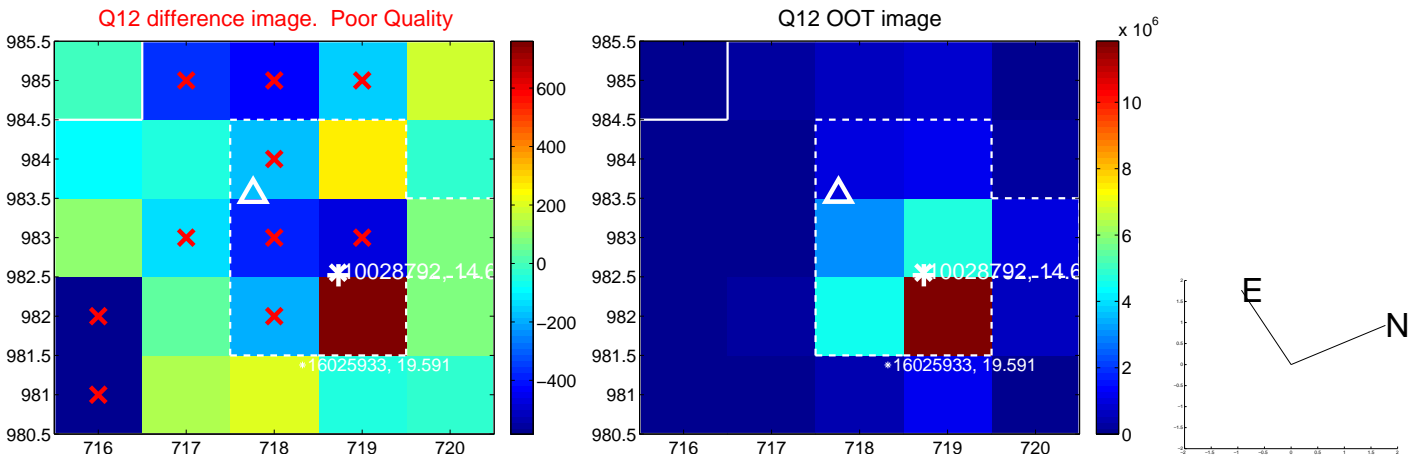
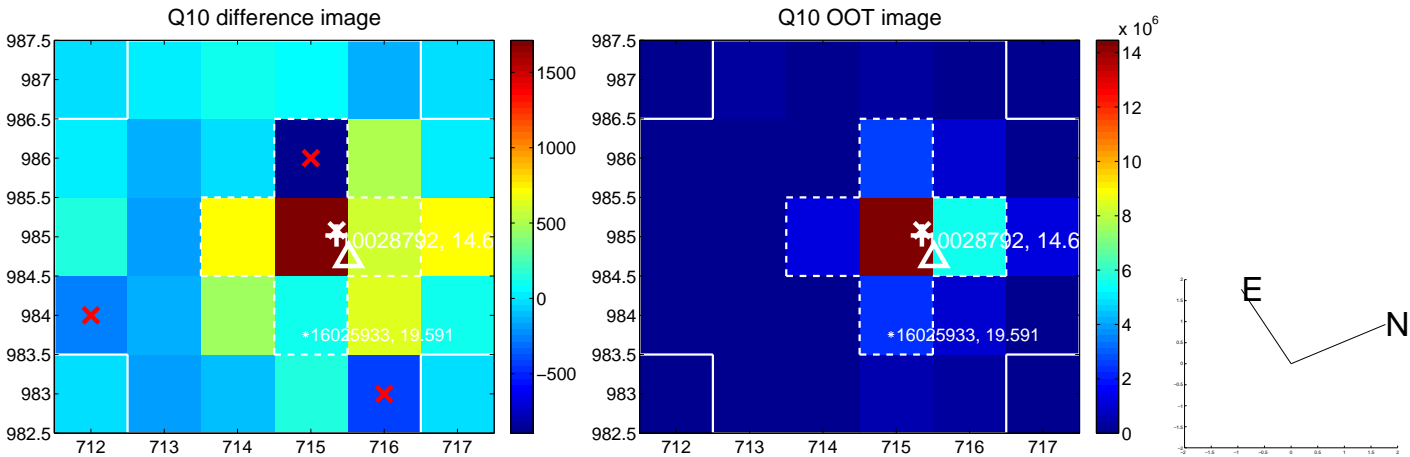
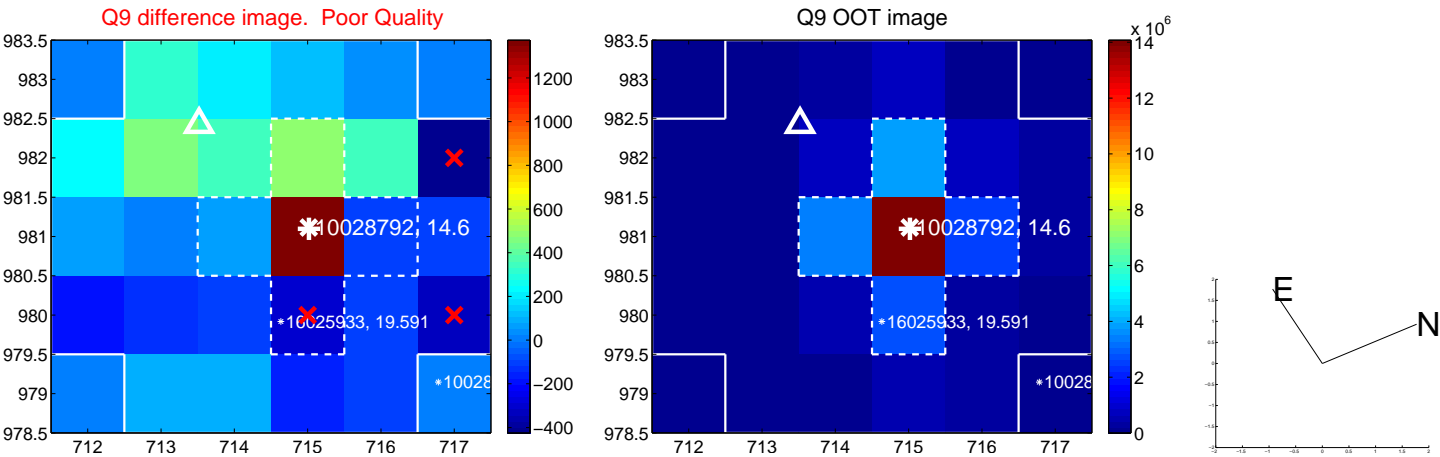


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

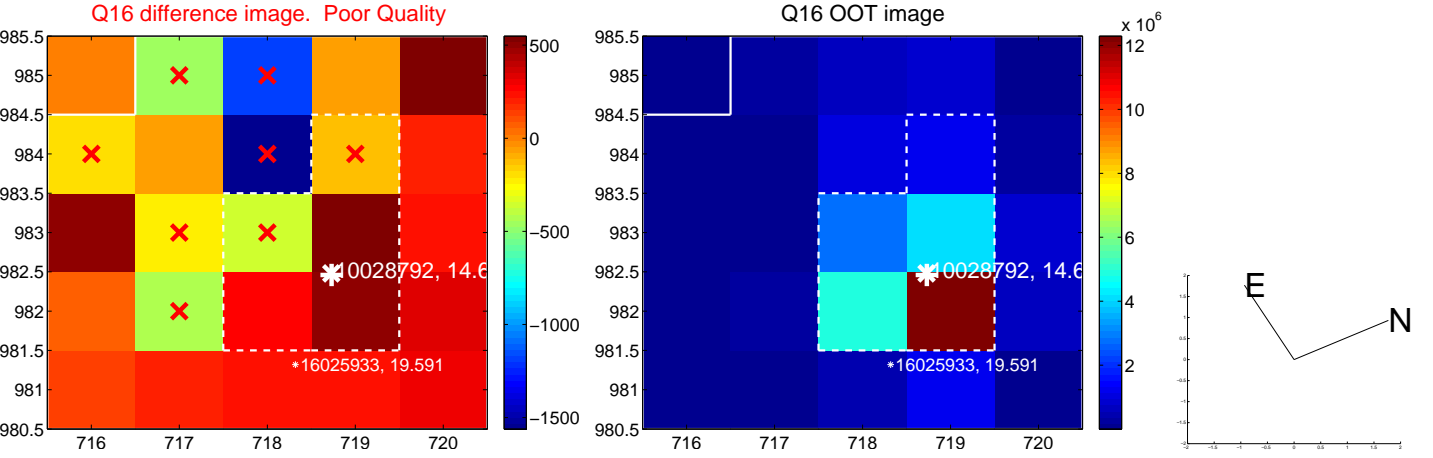
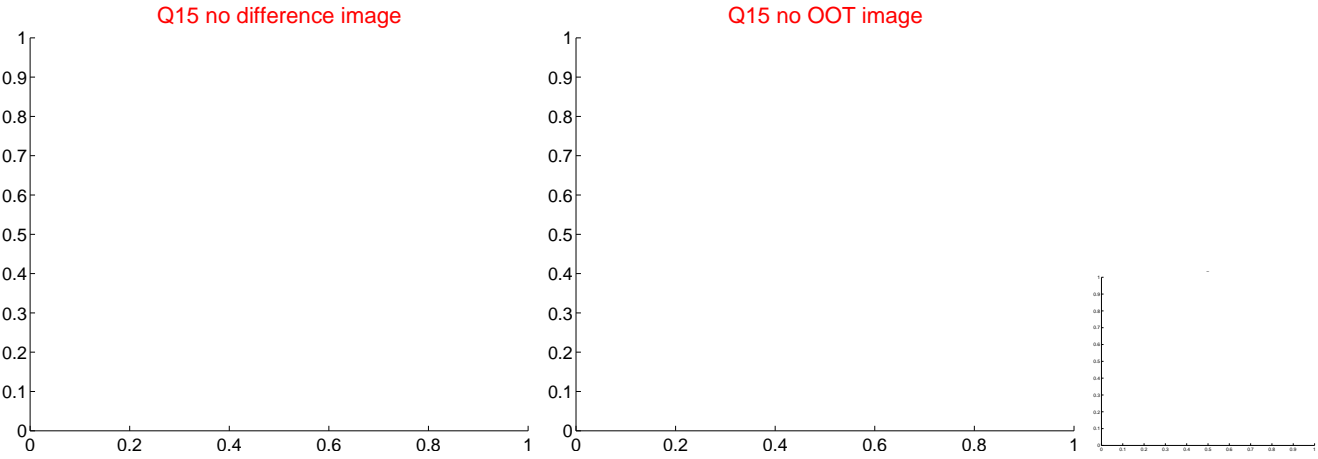
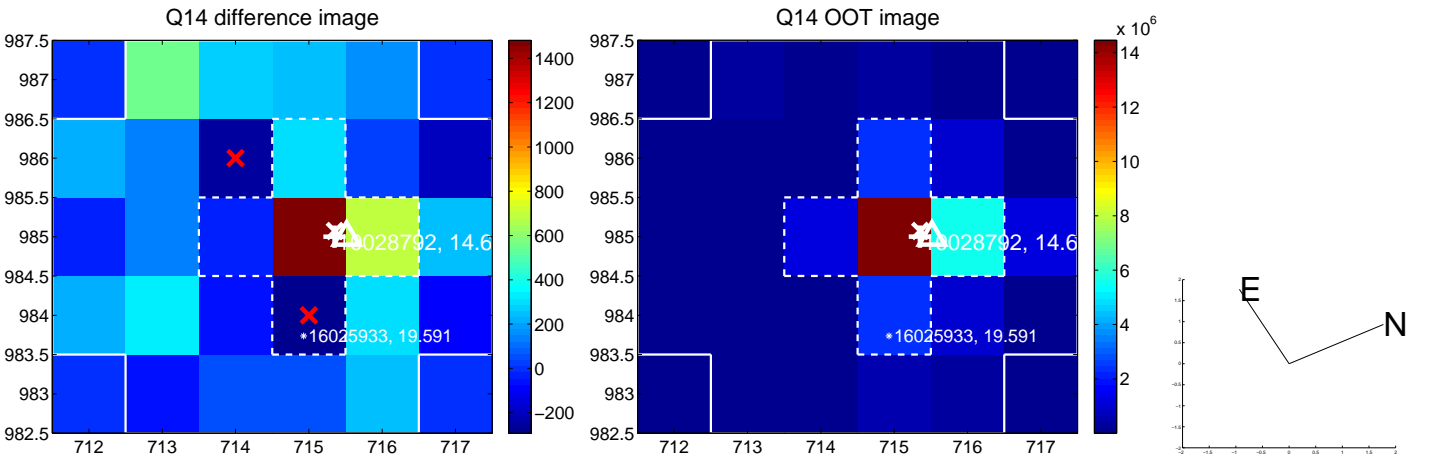
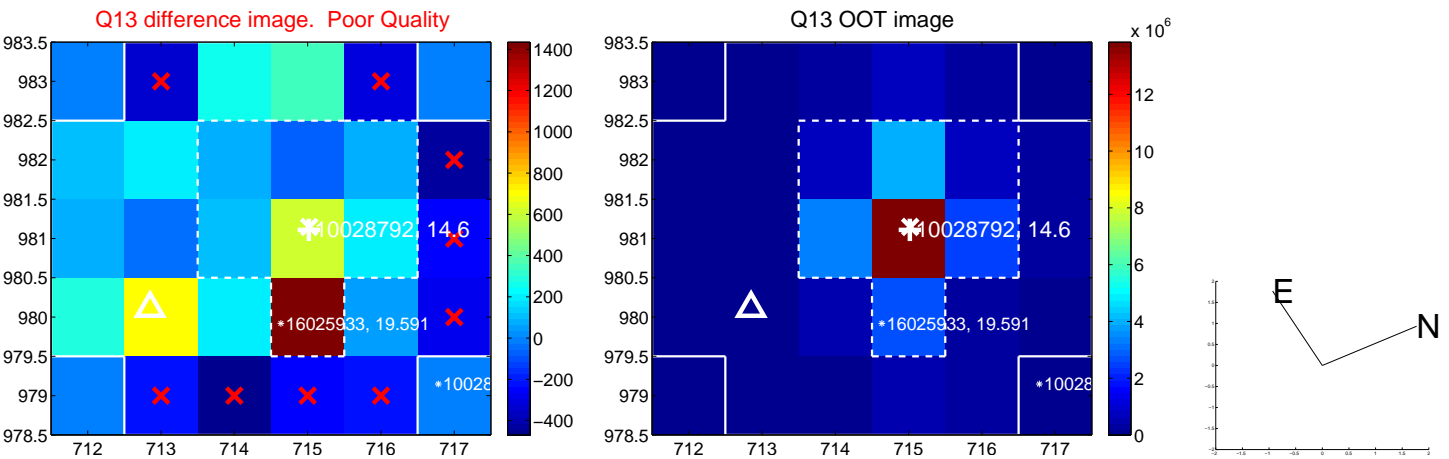




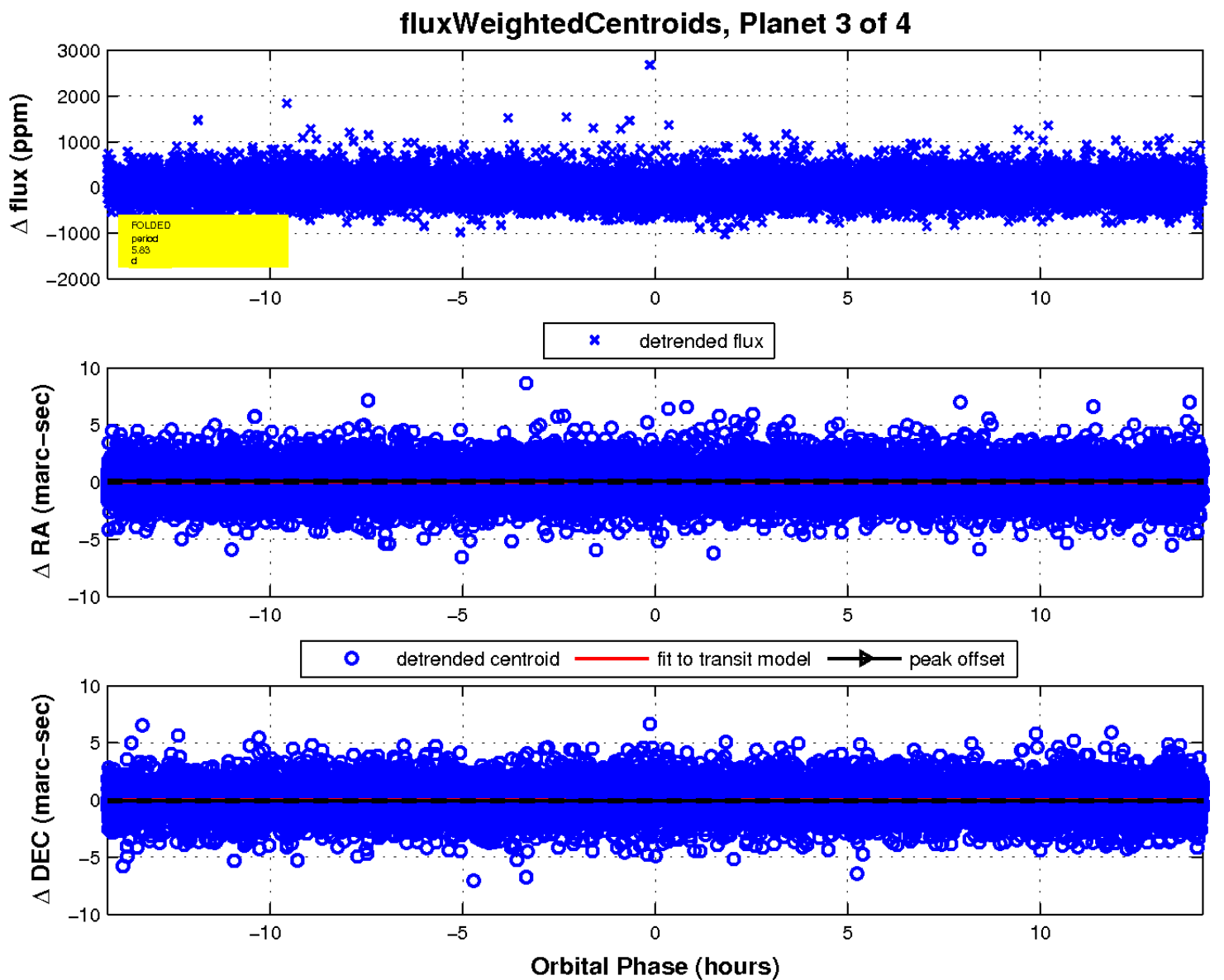
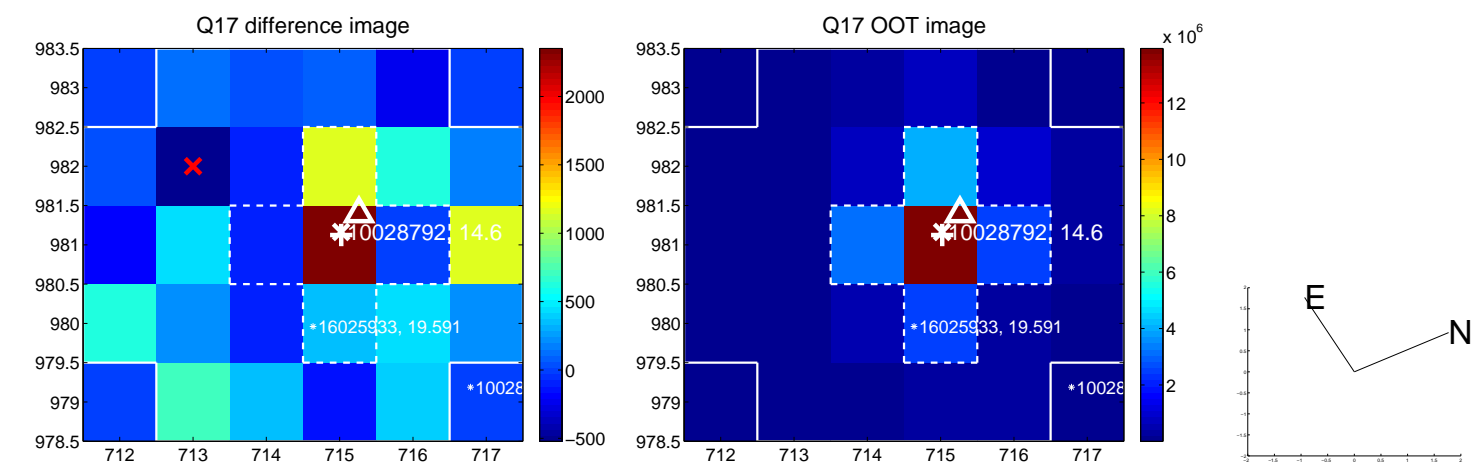
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

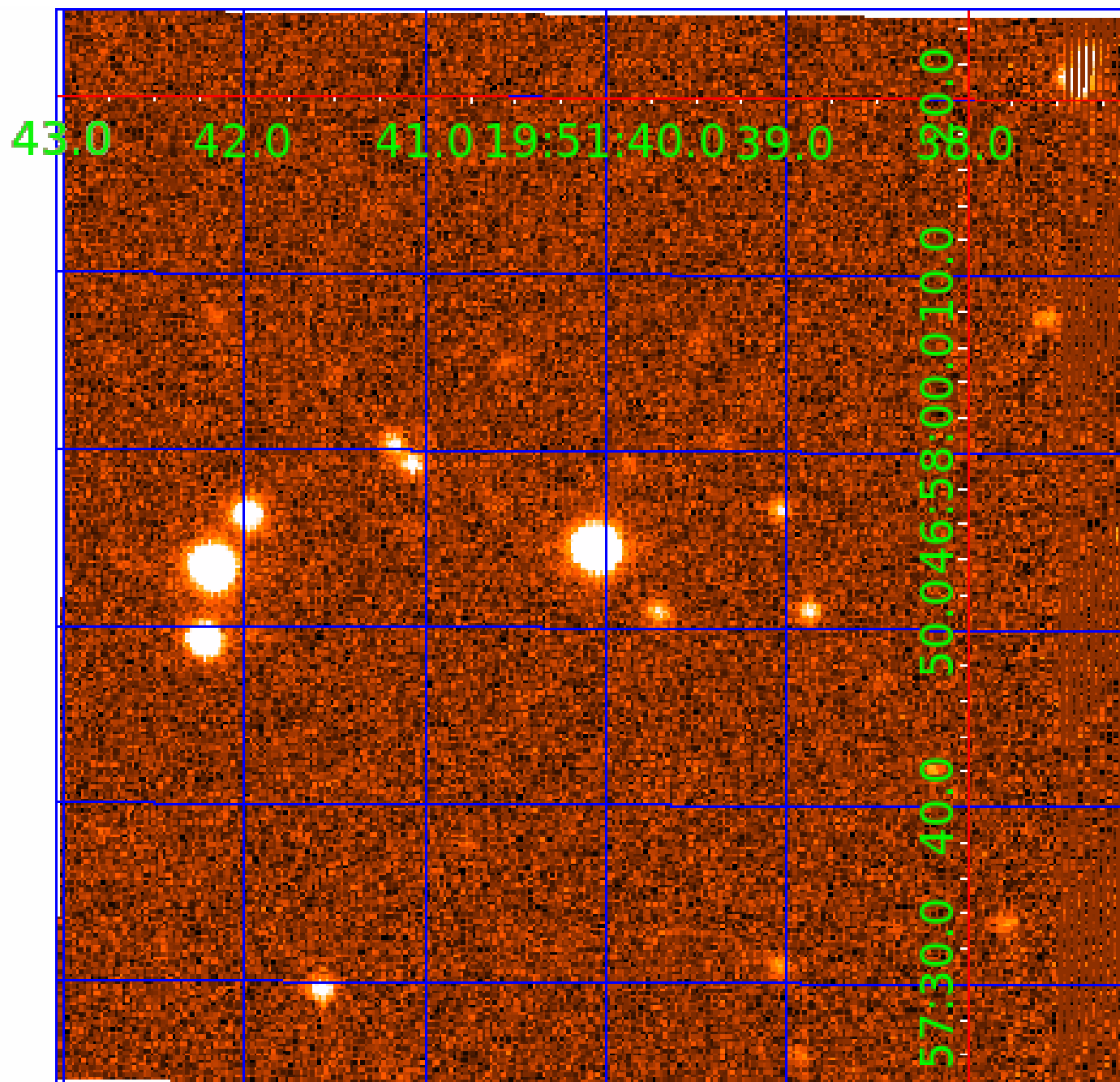


white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.



# UKIRT Image

Declination



# KIC 010028792

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010028792-01	OBS	1574.01	114.736338	165.153539	4812.8	12.140	196.2	190.9	1.70	5597	12.36	12.15
010028792-02	OBS	1574.02	191.229502	286.265701	1049.9	23.207	27.2	28.3	1.70	5597	10.77	6.15
010028792-03	OBS	1574.03	5.833893	132.639474	89.7	4.742	9.3	11.0	1.70	5597	1.79	645.01
010028792-04	OBS	1574.04	8.976960	133.467212	81.1	5.361	7.4	7.9	1.70	5597	1.84	363.08

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010028792-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
010028792-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_SKYE--CENT_FEW_DIFFS
010028792-03	OBS	PC	0.95	0	0	0	0	NO_COMMENT
010028792-04	OBS	PC	0.95	0	0	0	0	NO_COMMENT

**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.

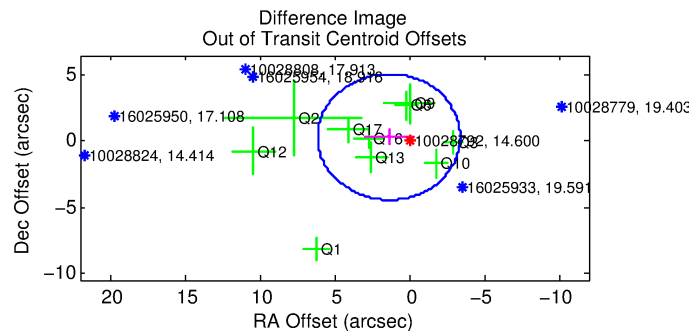
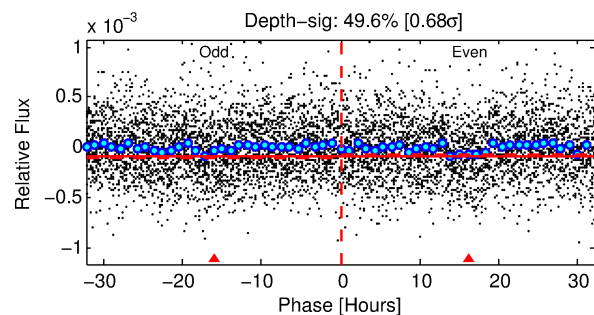
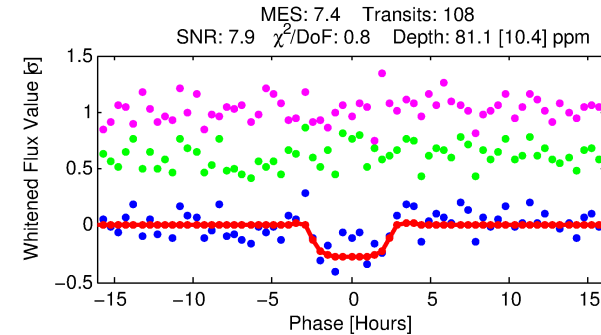
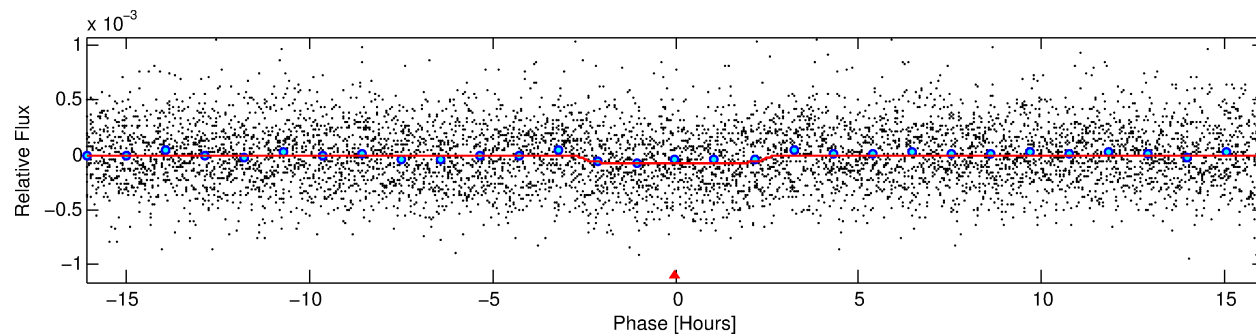
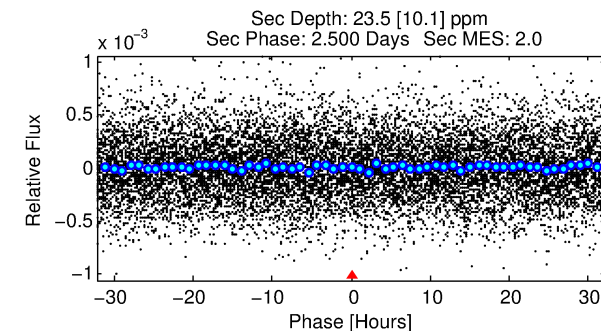
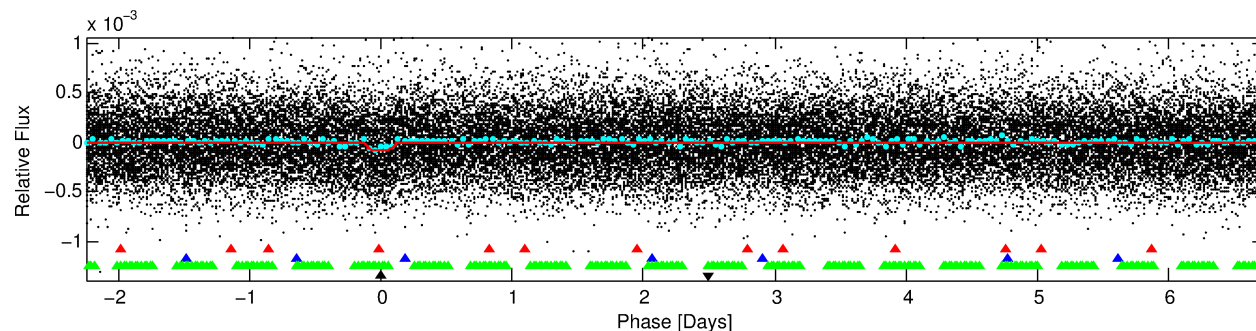
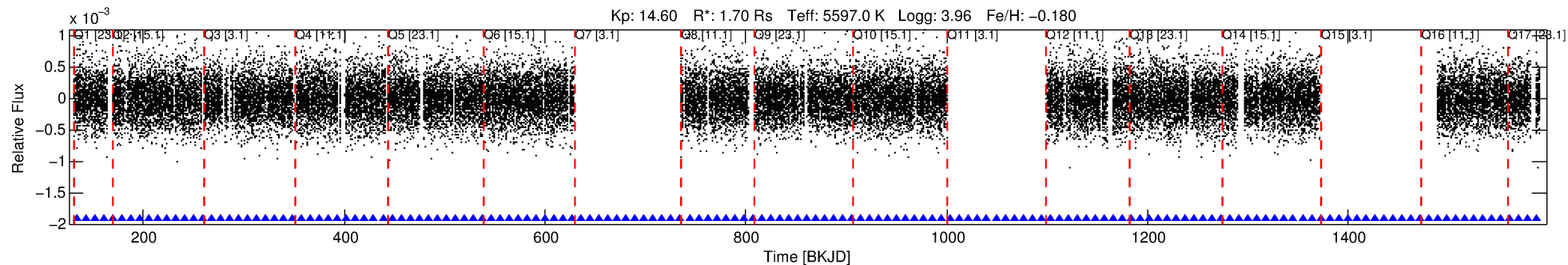
Ephemeris Match Information For 010028792-04

No Significant Match Found

# DV One-Page Summary

KIC: 10028792 Candidate: 4 of 4 Period: 8.977 d

KOI: K01574.04 Corr: 0.925



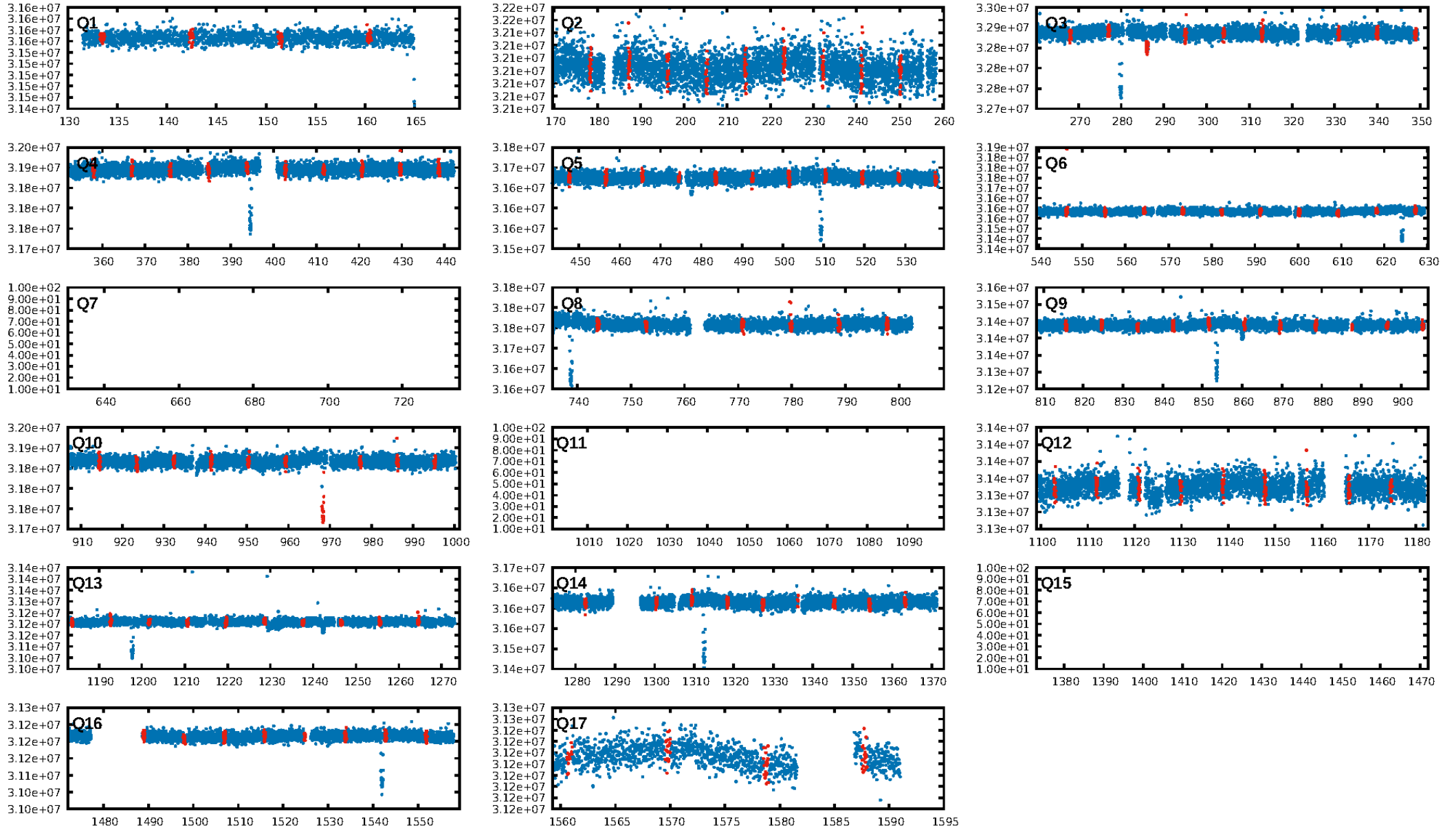
## DV Fit Results:

Period = 8.97696 [0.00014] d  
Epoch = 133.4672 [0.0120] BKJD  
Rp/R\* = 0.0099 [0.0054]  
a/R\* = 5.75 [14.53]  
b = 0.91 [0.52]  
Seff = 363.08 [46.79]  
Teff = 1113 [36] K  
Rp = 1.84 [1.01] Re  
a = 0.0836 [0.0059] AU  
Ag = 26.86 [31.62] [0.82σ]  
Teffp = 3918 [1152] K [2.43σ]

## DV Diagnostic Results:

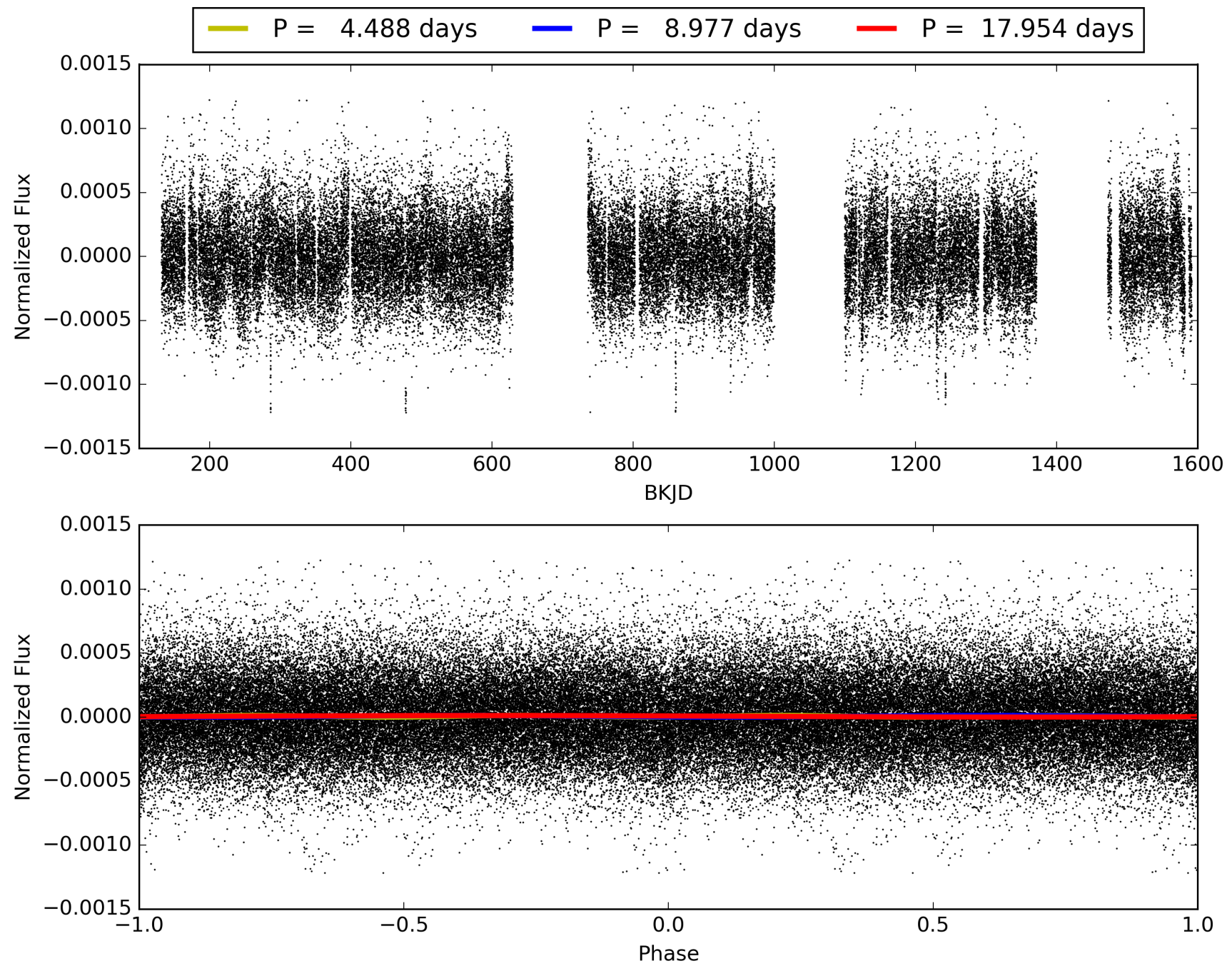
ShortPeriod-sig: 100.0% [10.54σ]  
LongPeriod-sig: 100.0% [191.26σ]  
ModelChiSquare2-sig: 99.6%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 1.71e-13  
RollingBand-fgt: 1.00 [100/100]  
GhostDiagnostic-chr: 3.982  
Centroid-sig: 3.4%  
Centroid-so: 2.617 arcsec [1.61σ]  
OotOffset-rm: 1.395 arcsec [0.88σ]  
KicOffset-rm: 0.986 arcsec [0.65σ]  
OotOffset-st: 3/1/2/4 [10]  
KicOffset-st: 3/1/2/4 [10]  
DiffImageQuality-fgm: 0.40 [4/10]  
DiffImageOverlap-fno: 1.00 [14/14]

# TCE 010028792-04, PDC Light Curves





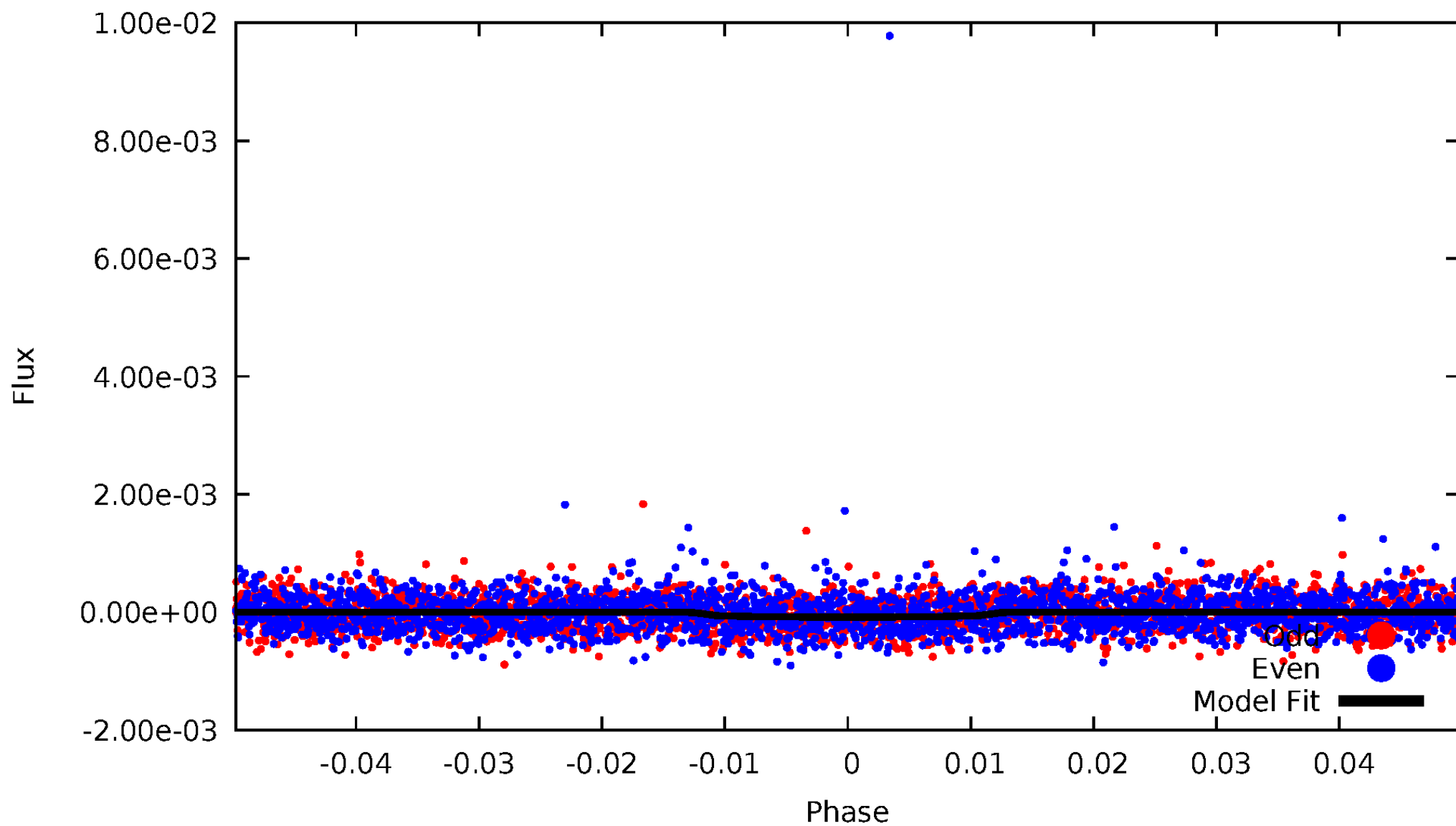
TCE 010028792-04





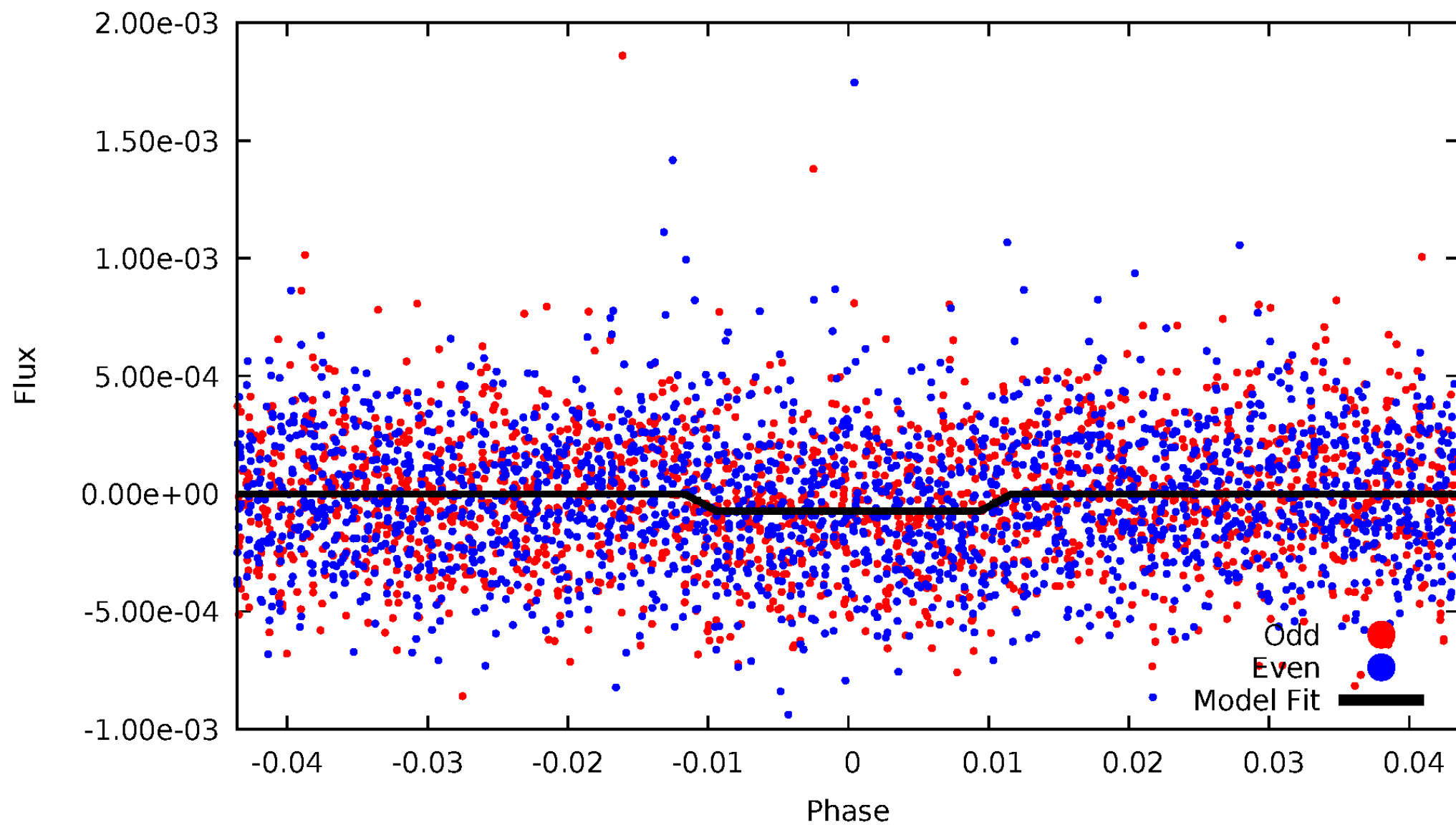
# DV Odd/Even

TCE 010028792-04



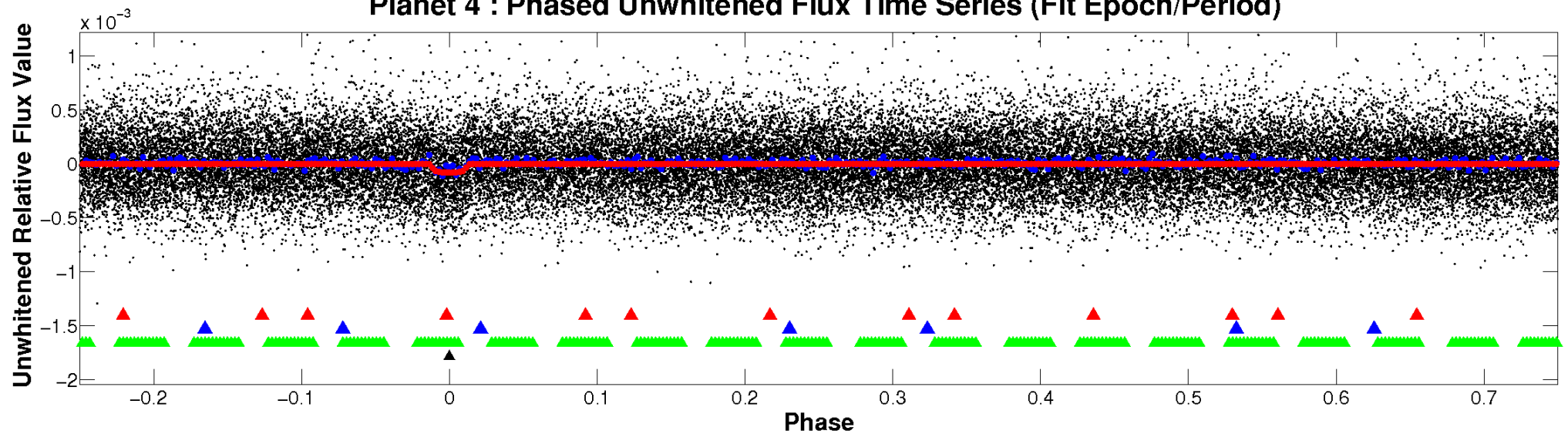
# ALT Odd/Even

TCE 010028792-04

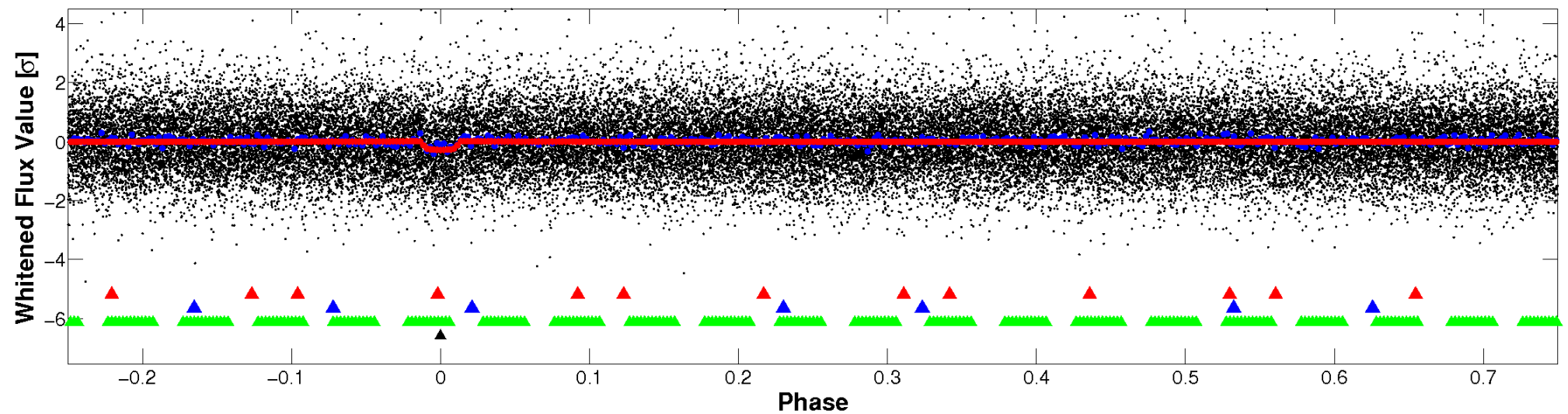


# Non-Whitened Vs. Whitened Light Curve

## Planet 4 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

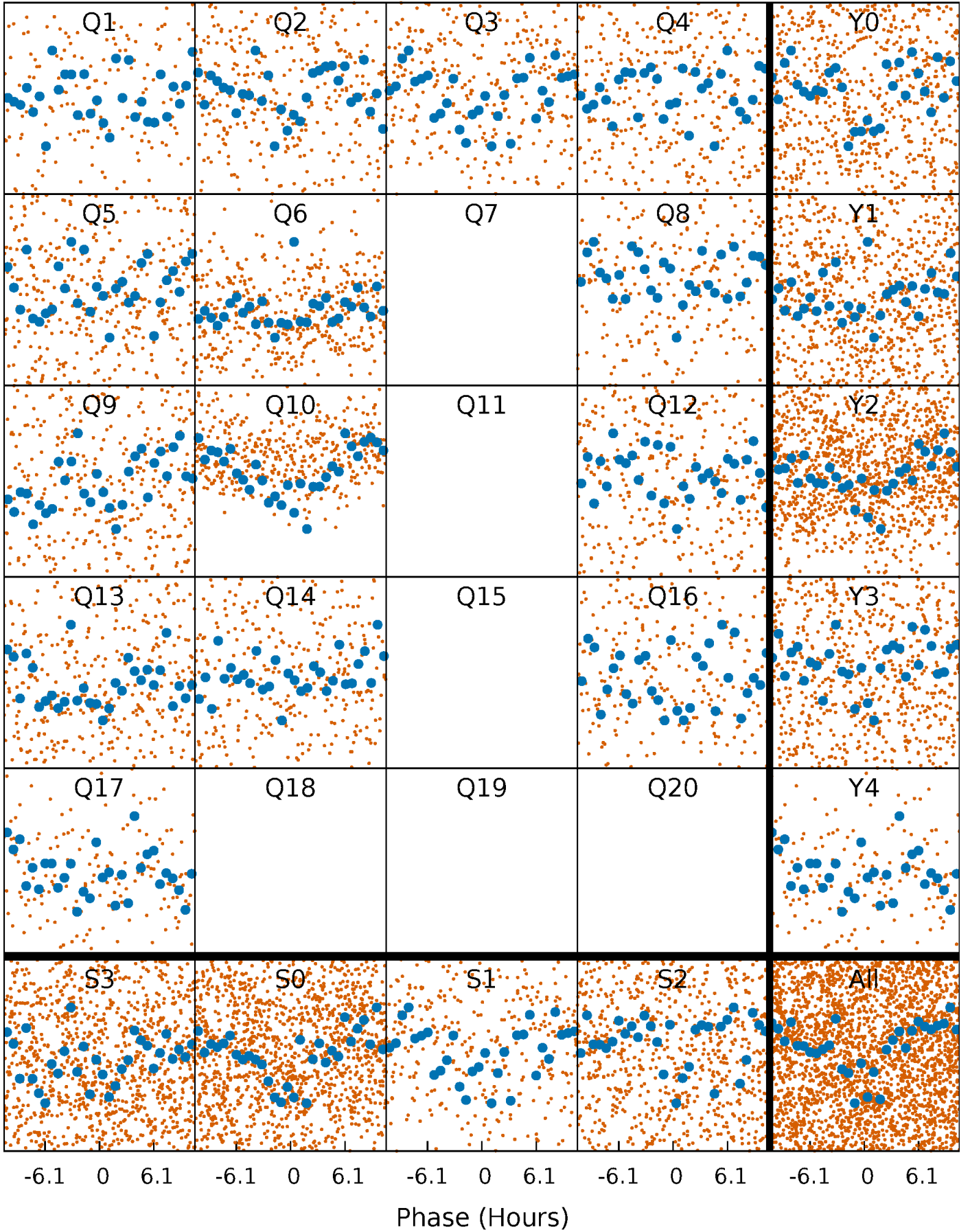


## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



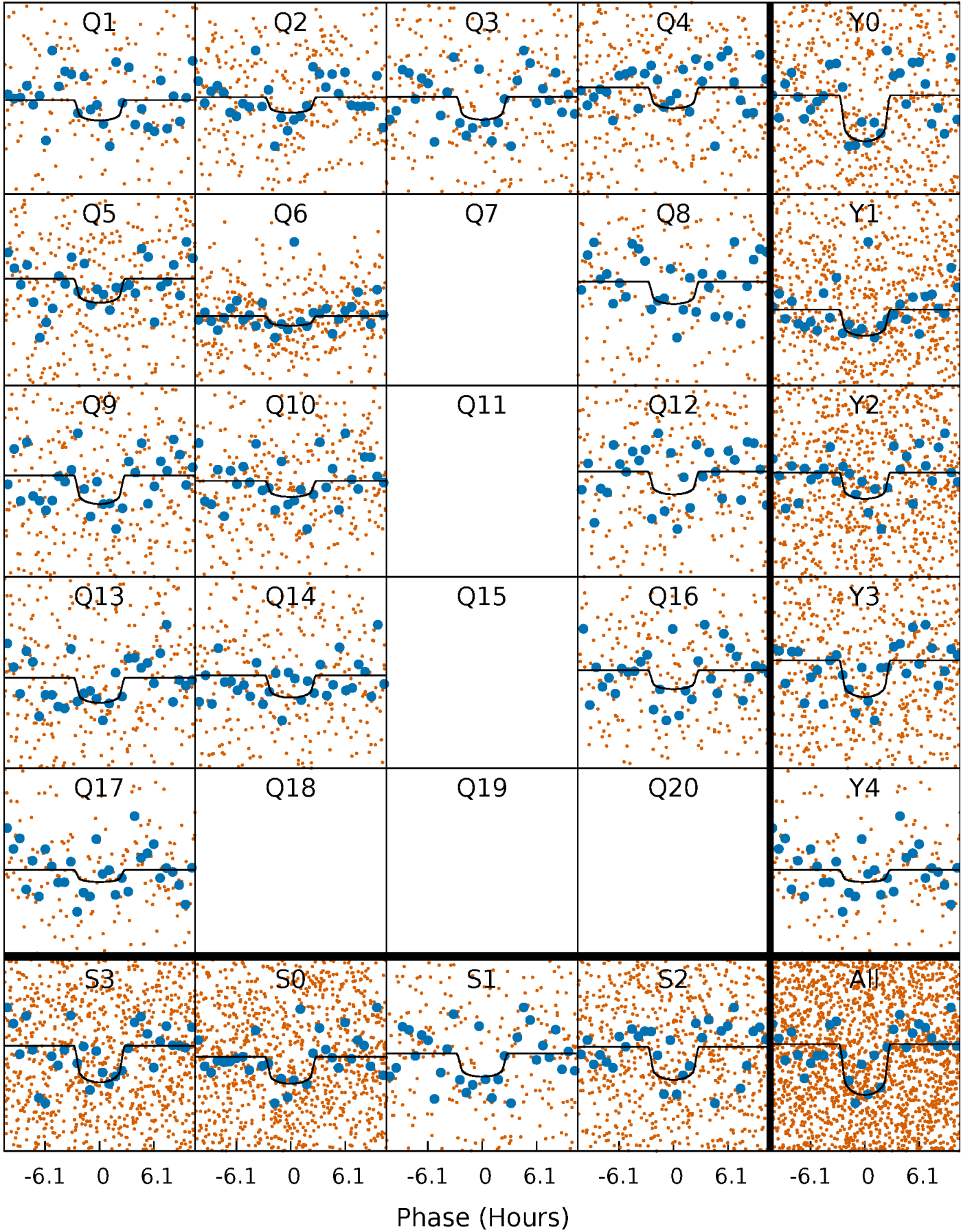
# PDC Quarter-Phased Transit Curves

TCE 010028792-04     $P = 8.976960$  Days     $T_0 = 133.467212$  (BKJD)



# DV Quarter-Phased Transit Curves

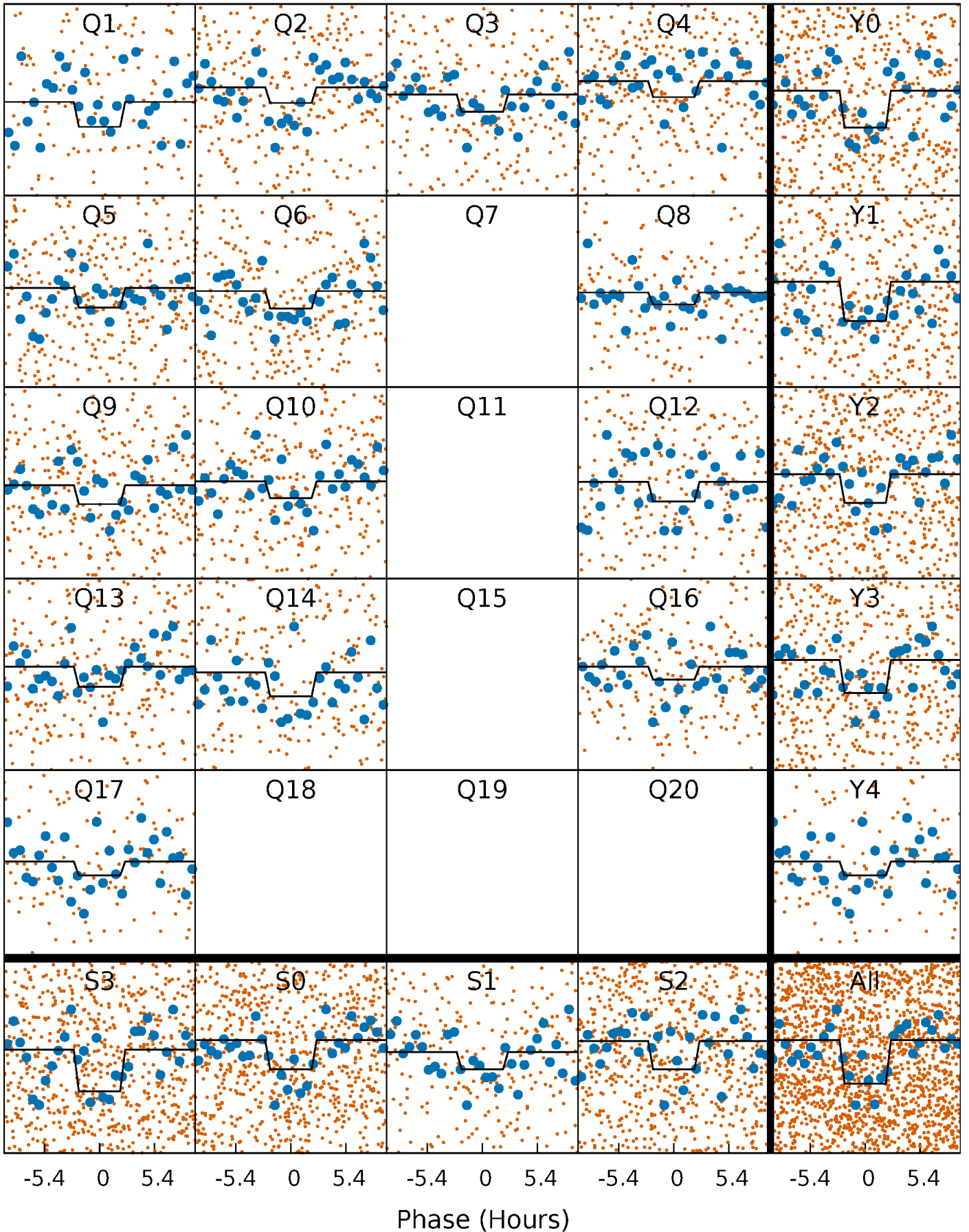
TCE 010028792-04     $P = 8.976960$  Days     $T_0 = 133.467212$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

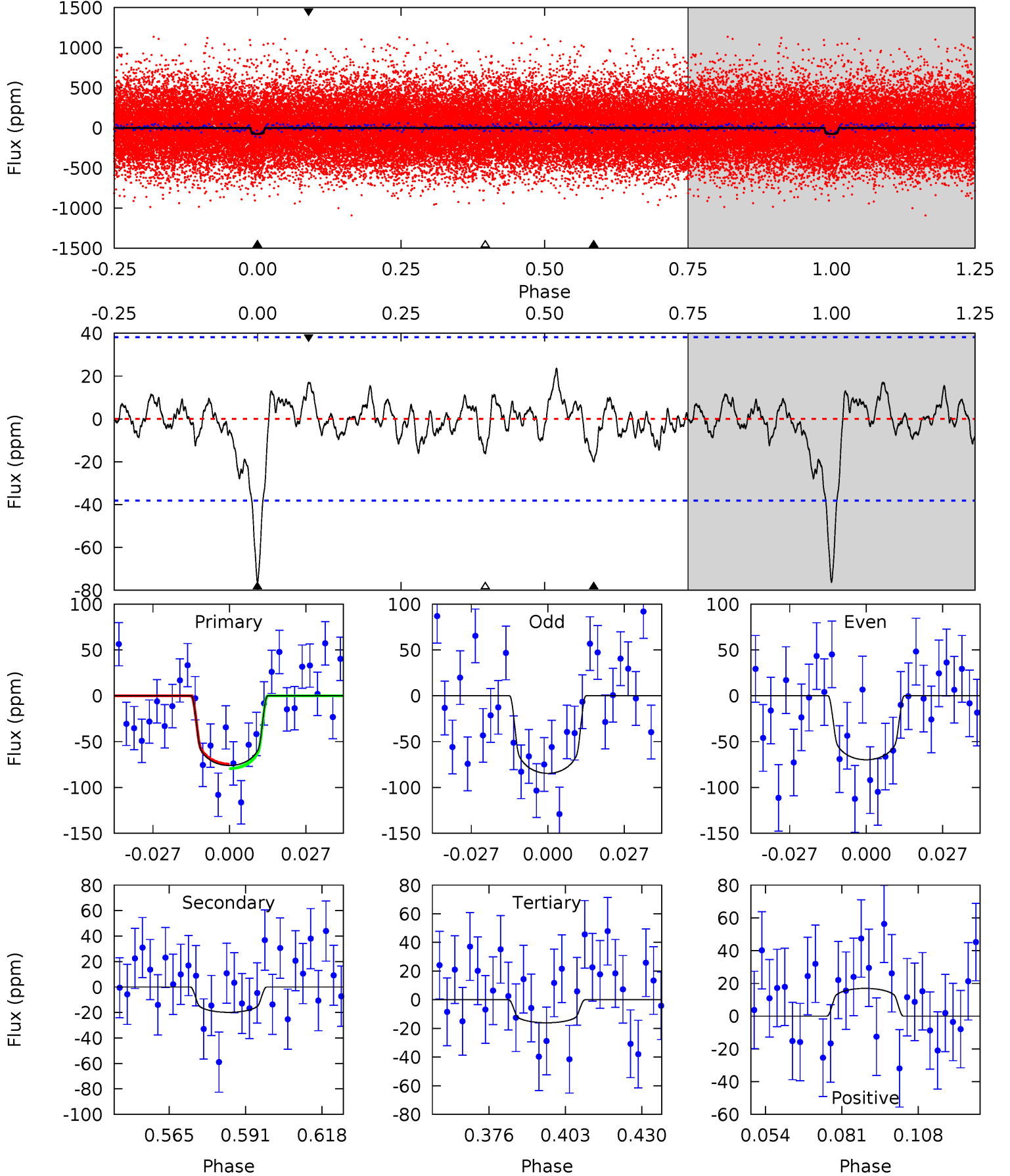
TCE 010028792-04 P= 8.977009 Days  $T_0=133.457567$  (BKJD)



# DV Model-Shift Uniqueness Test

010028792-04, P = 8.976960 Days, E = 124.490252 Days

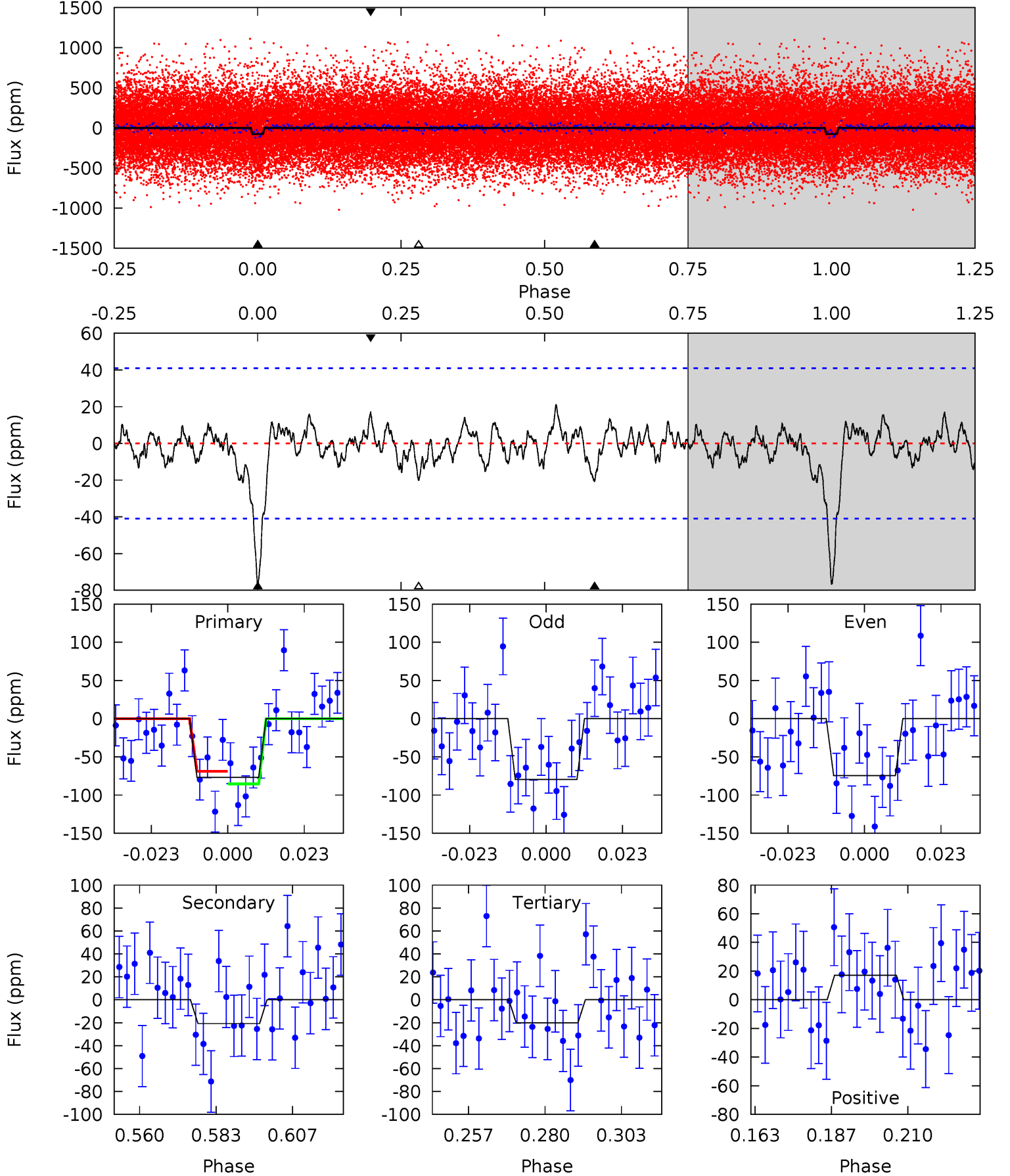
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
9.64	2.52	2.04	2.15	4.83	2.21	0.90	7.61	7.50	0.48	0.37	0.94	0.81	0.24	0.30



# Alt Model-Shift Uniqueness Test

010028792-04, P = 8.977009 Days, E = 124.480558 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
9.12	2.46	2.40	2.04	4.86	2.27	0.83	6.73	7.08	0.06	0.42	0.29	0.80	0.21	0.97





### Stellar Parameters For KIC 010028792

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5597^{+112}_{-101}$	$3.963^{+0.054}_{-0.045}$	$-0.180^{+0.150}_{-0.150}$	$1.699^{+0.147}_{-0.123}$	$0.969^{+0.084}_{-0.063}$	$0.278^{+0.060}_{-0.045}$
	+2%/-2%	+1%/-1%	+83%/-83%	+9%/-7%	+9%/-7%	+21%/-16%
Source	SPE65	TRA65	SPE65	DSEP		

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

### Secondary Eclipse Parameters for KIC 010028792-04 / KOI 1574.04

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-20 \pm 8$	$1.85^{+1.02}_{-0.92}$	$1556^{+40}_{-43}$	$3999^{+1273}_{-604}$	$22^{+62}_{-14}$
Alt.	$-21 \pm 8$	$1.67^{+0.96}_{-0.91}$	$1554^{+43}_{-43}$	$4186^{+1558}_{-713}$	$27^{+104}_{-17}$

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

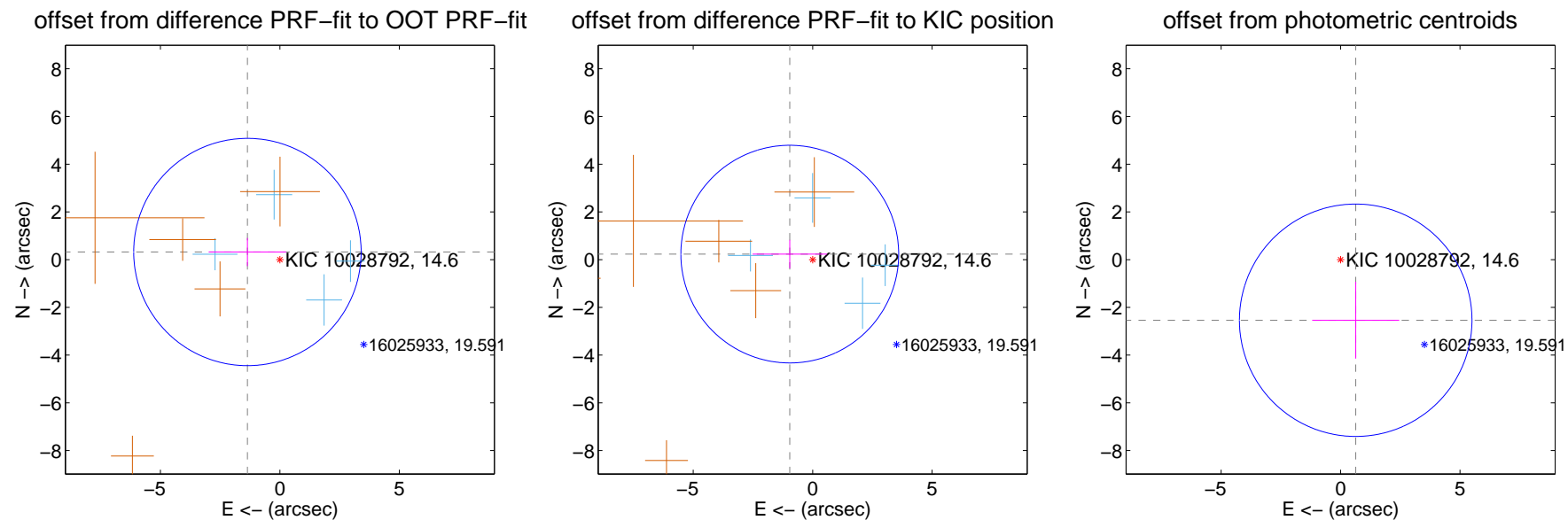
## DV Centroid Data

Supplemental centroid analysis for 010028792-04. Kepler magnitude: 14.60. Transit SNR 7.90

There are 4 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.16 arcsec

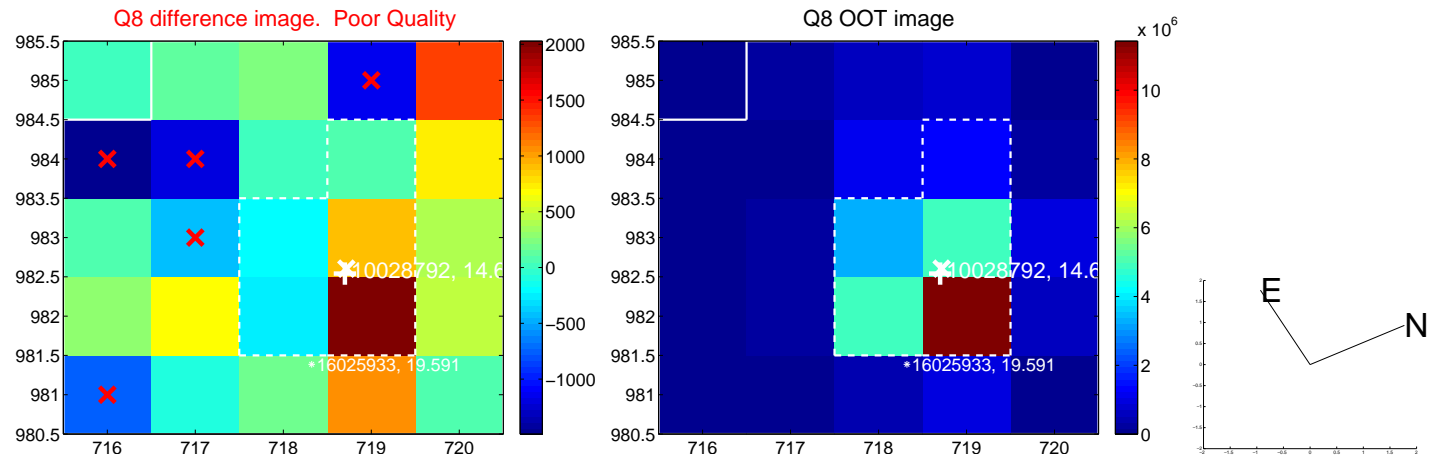
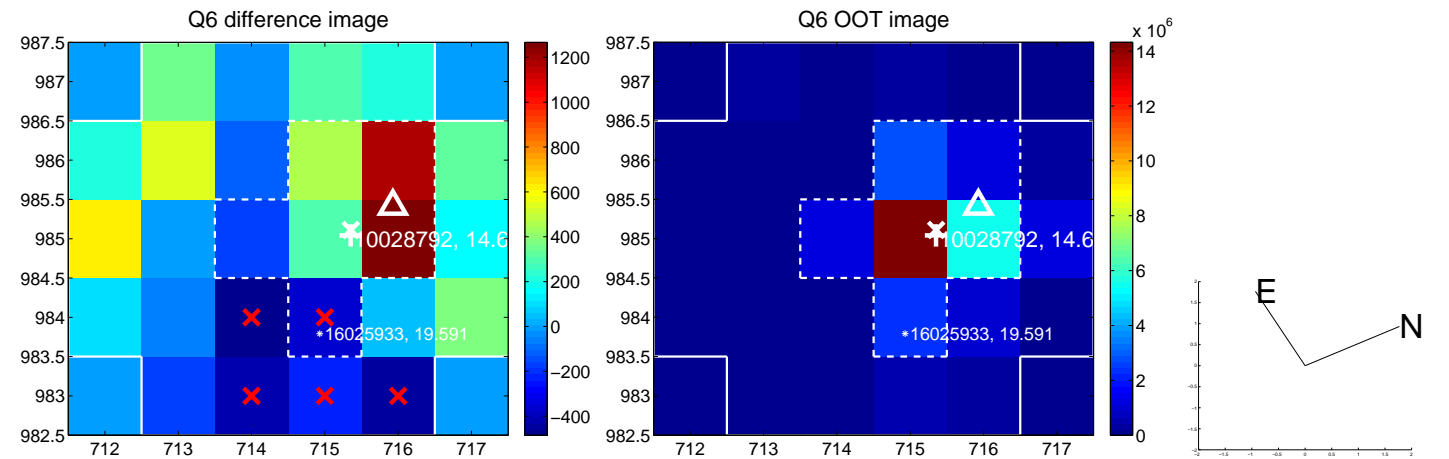
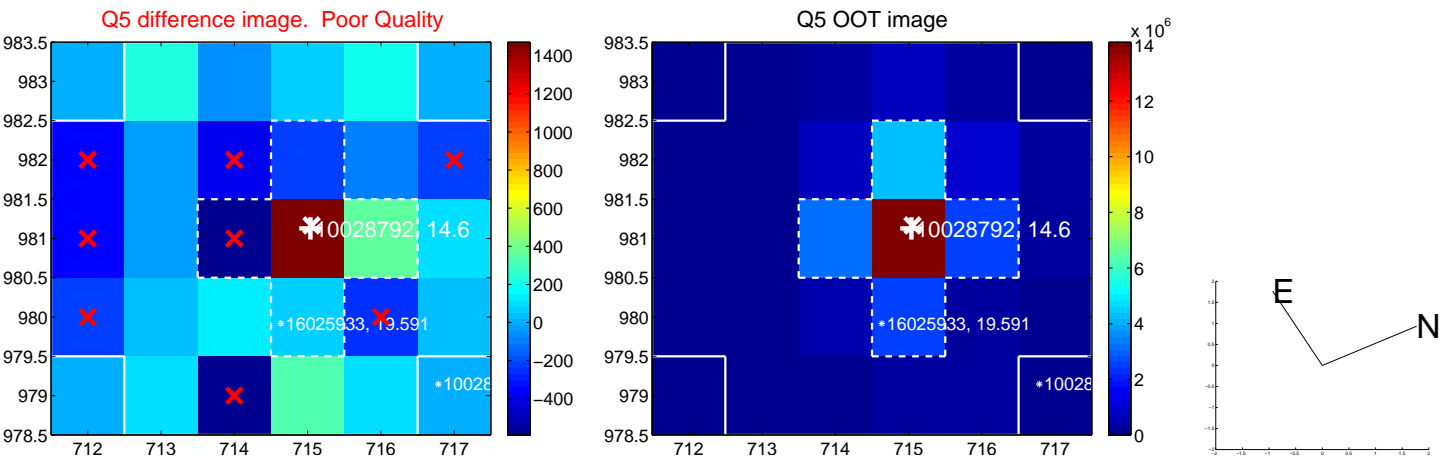
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.395 \pm 1.587$	0.88	$1.358 \pm 1.625$	$0.320 \pm 0.589$
PRF-fit source offset from KIC position	$0.986 \pm 1.520$	0.65	$0.958 \pm 1.557$	$0.232 \pm 0.595$
photometric centroid source offset	$2.62 \pm 1.62$	1.61	$-0.63 \pm 1.82$	$-2.54 \pm 1.61$



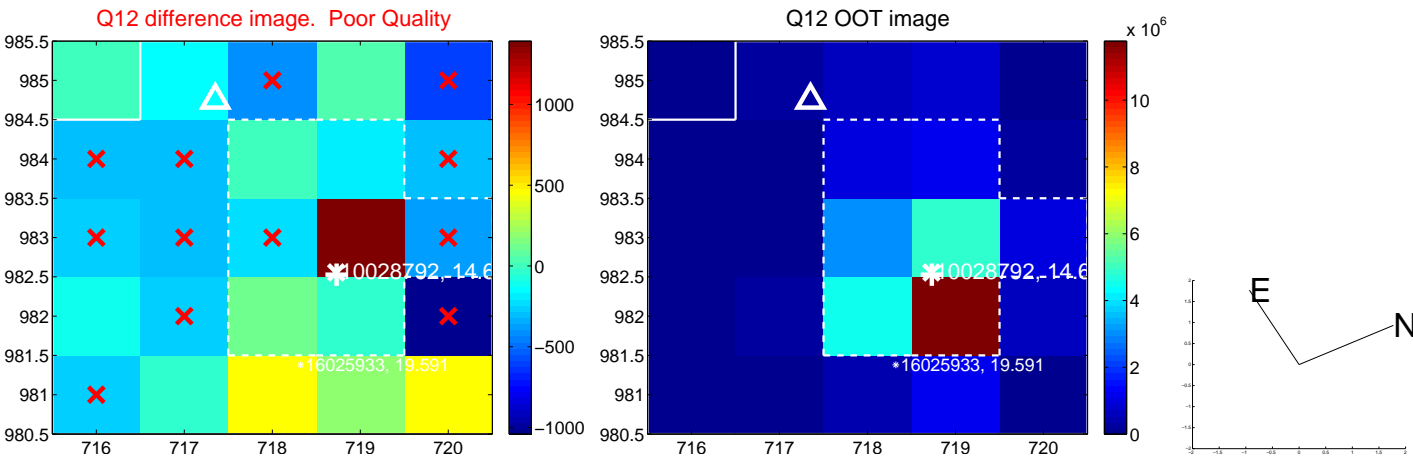
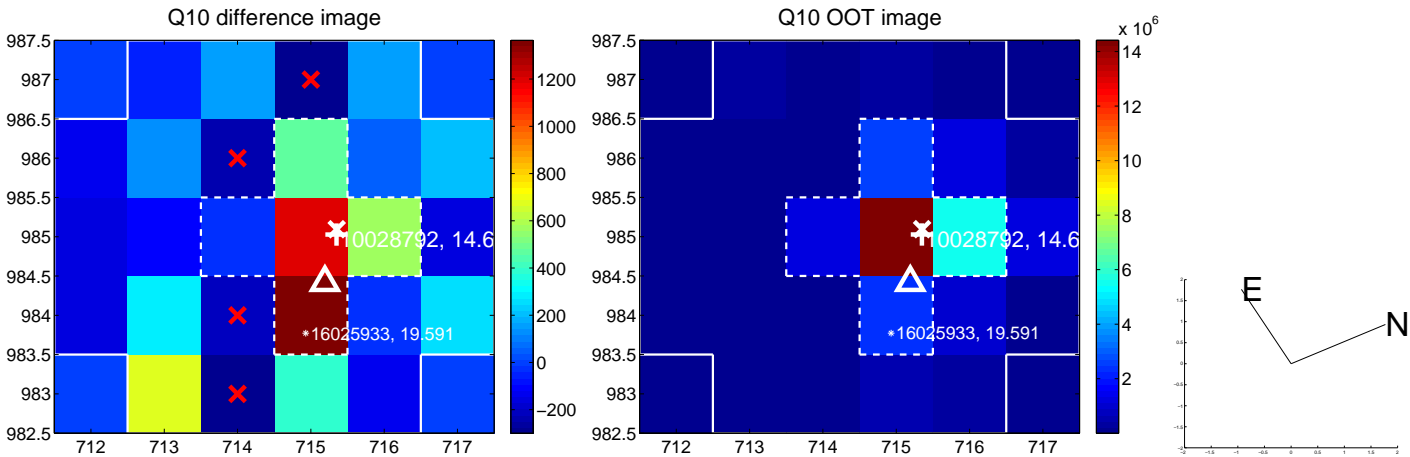
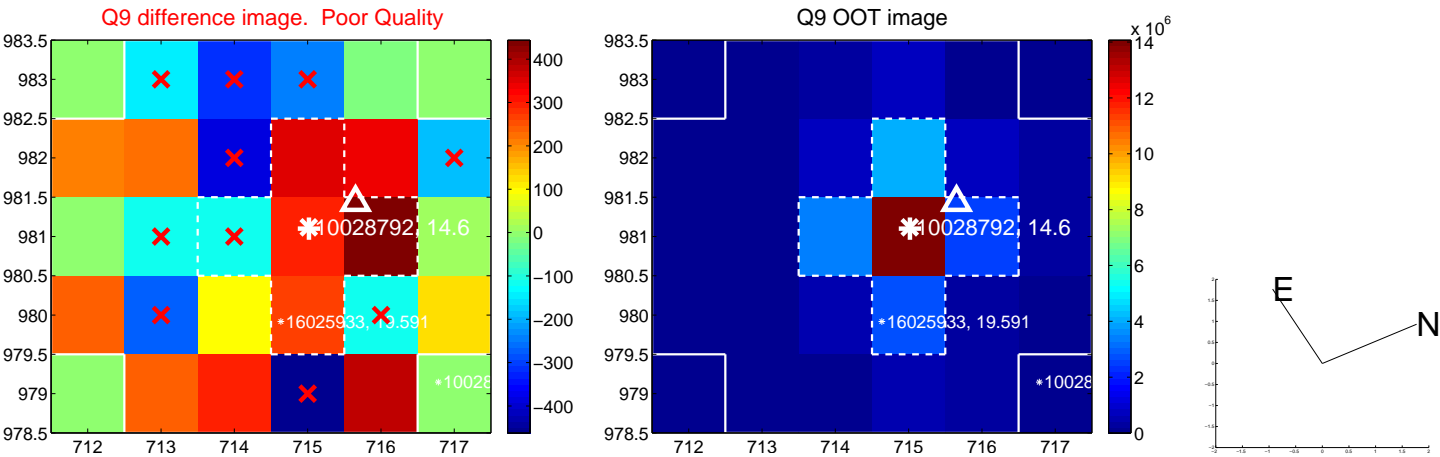
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



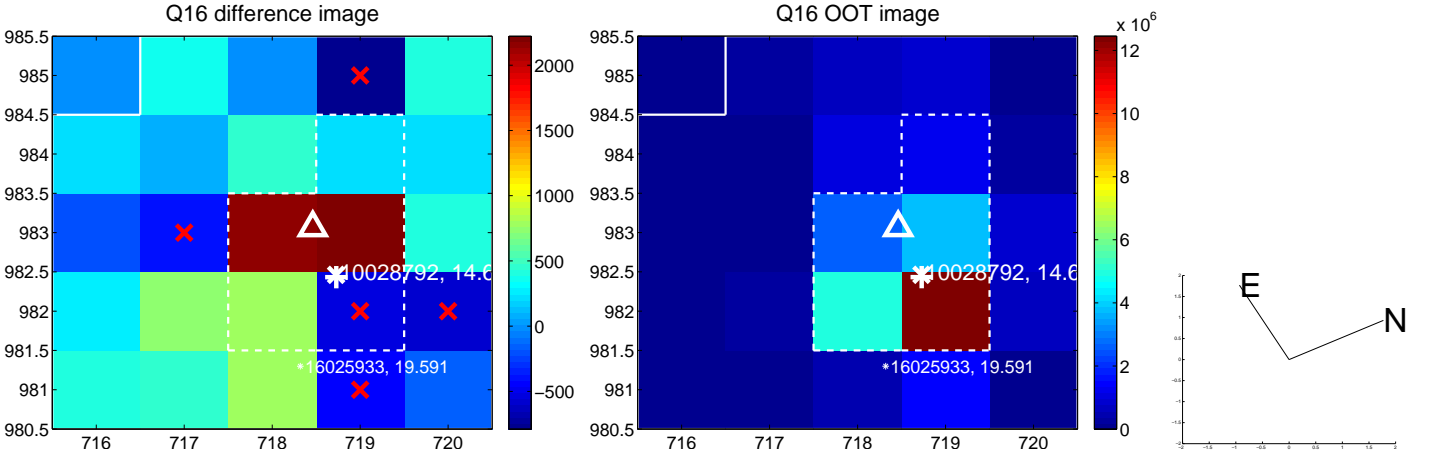
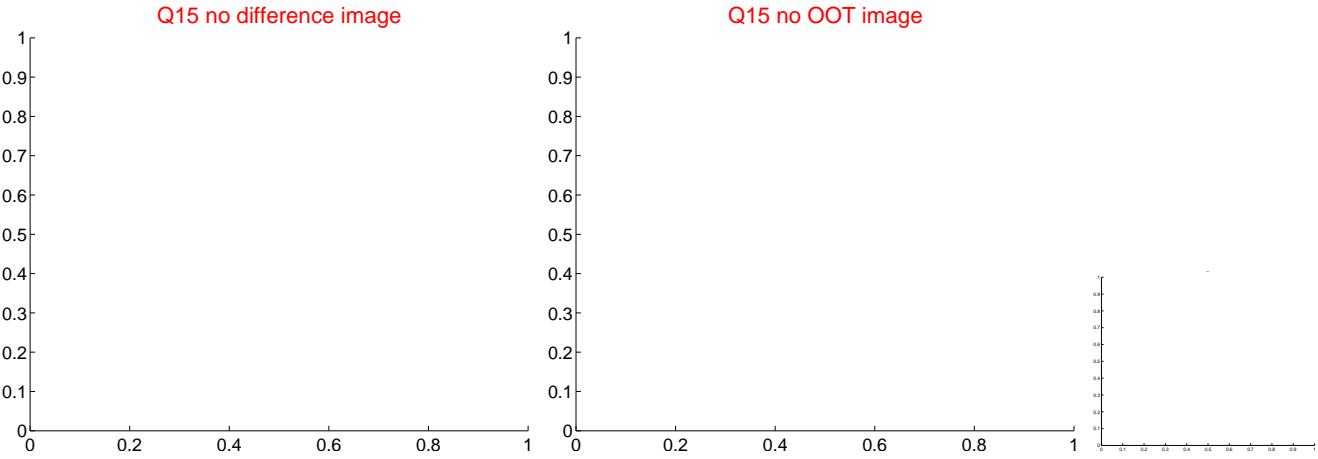
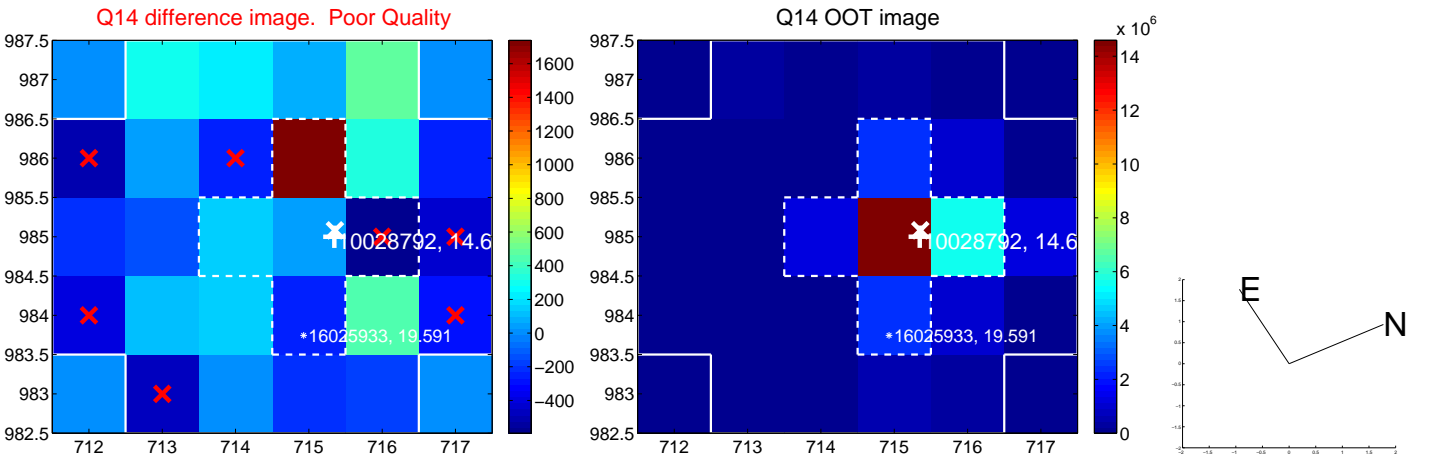
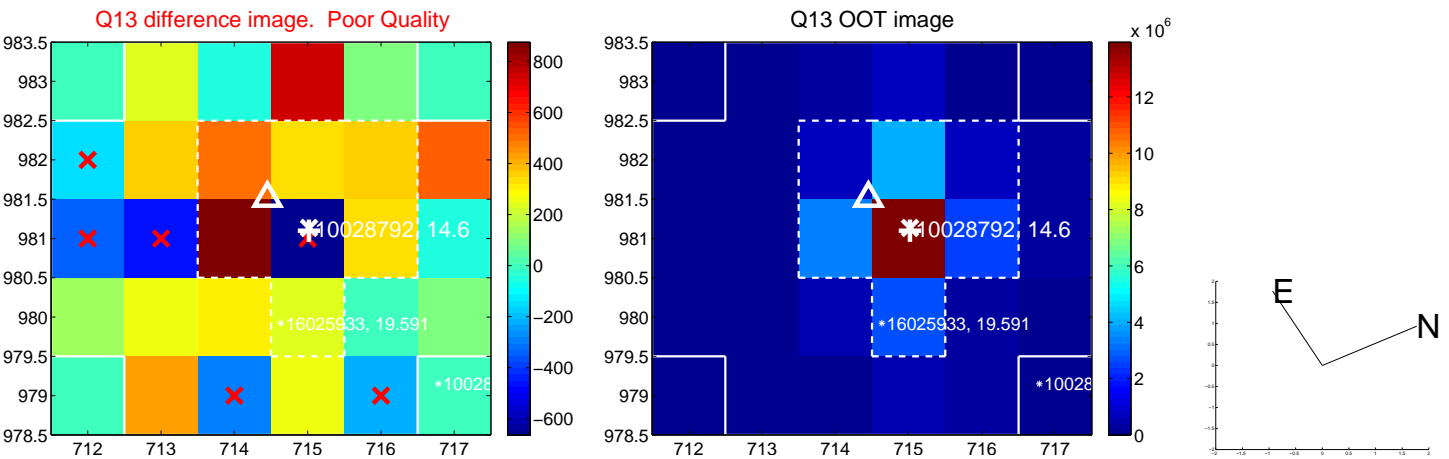
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



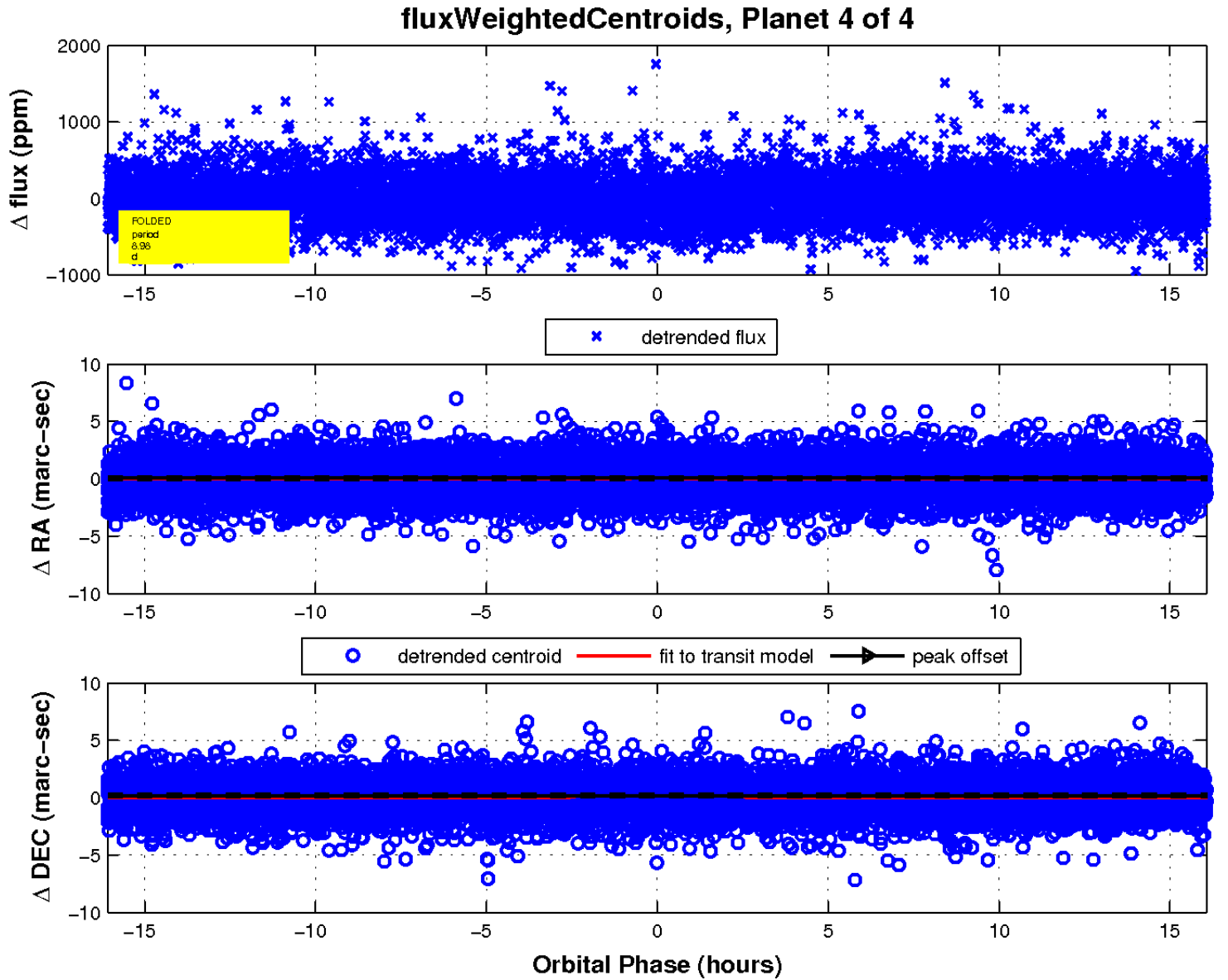
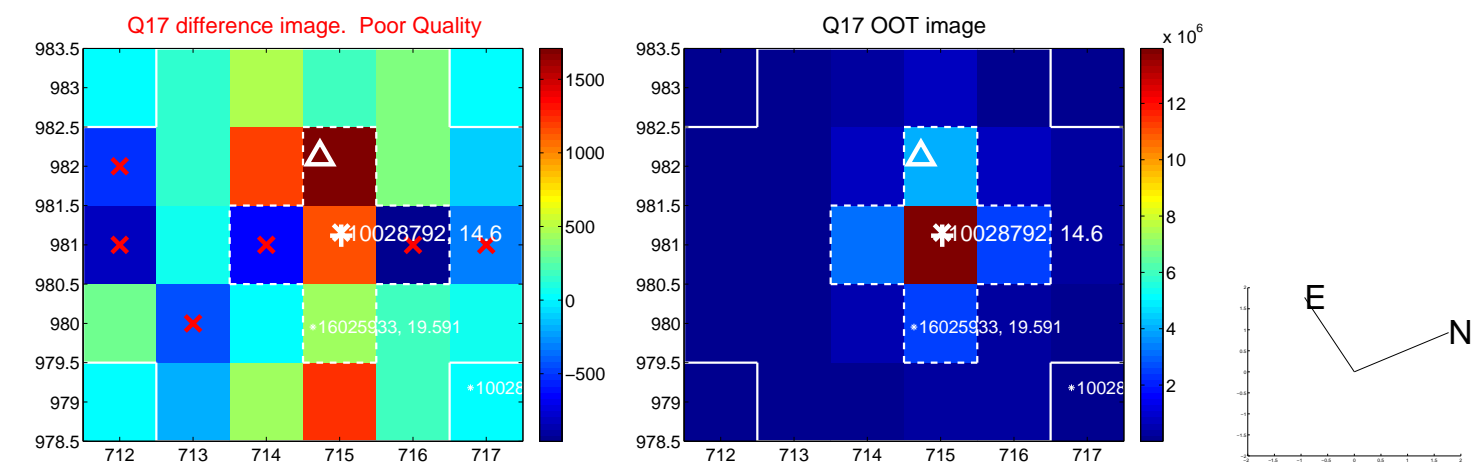
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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.



UKIRT Image

Declination

