

# KIC 007020182

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
007020182-01	OBS	No	497.687822	368.939930	363.9	10.102	8.2	6.9	0.77	5491	1.64	0.39
007020182-02	OBS	No	0.547333	132.009305	8.6	6.568	75.9	2.9	0.77	5491	0.22	3424.92

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
007020182-01	OBS	FP	0.00	1	0	0	0	ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS
007020182-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT

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

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

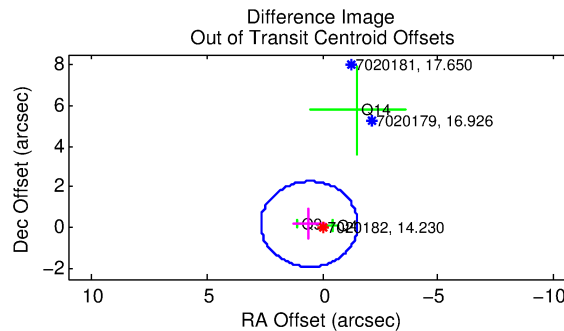
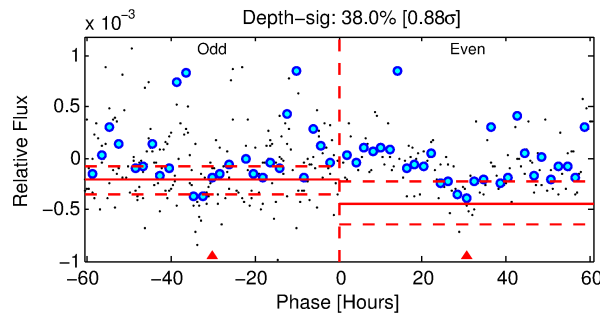
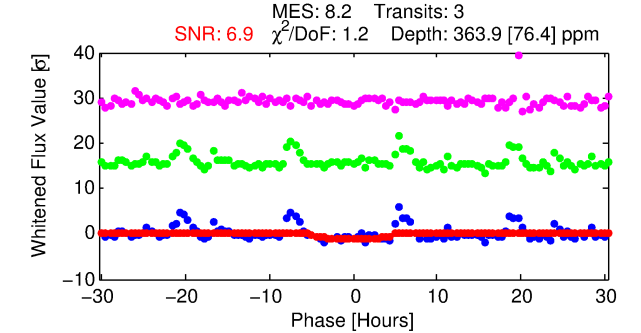
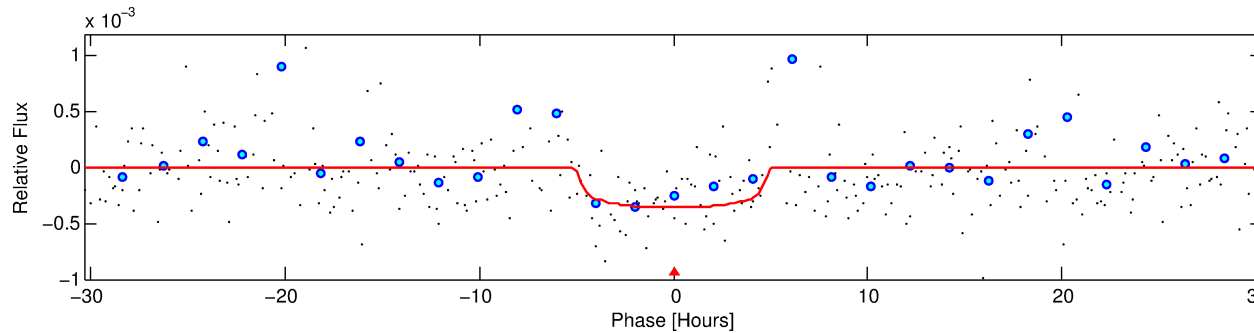
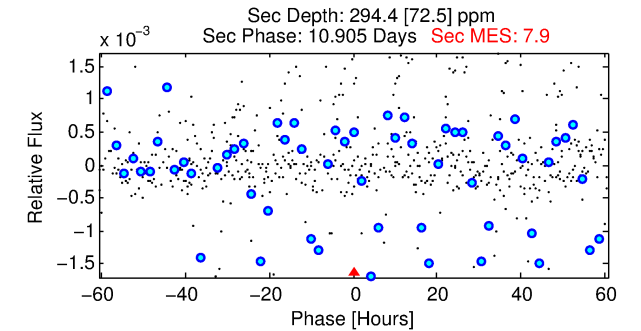
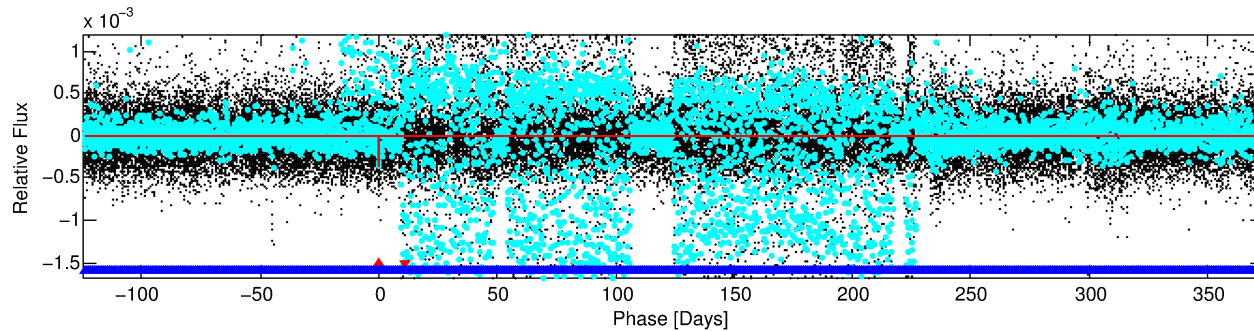
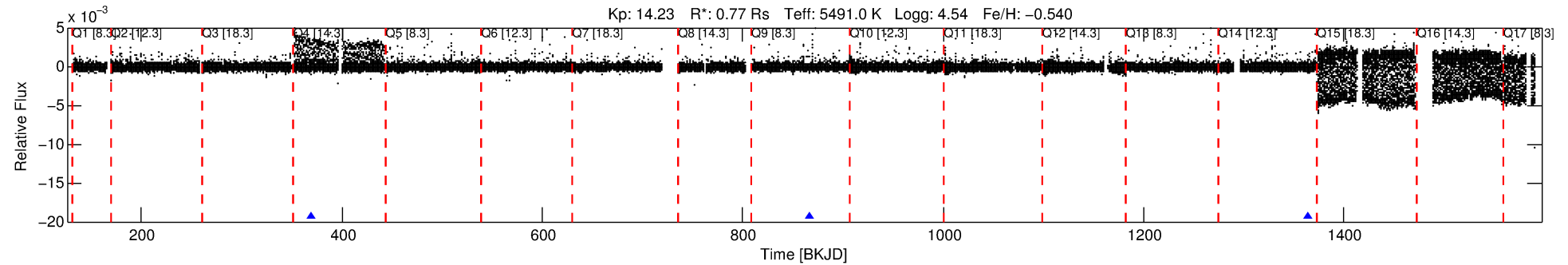
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 007020182-01

No Significant Match Found

# DV One-Page Summary

KIC: 7020182 Candidate: 1 of 2 Period: 497.688 d



## DV Fit Results:

Period = 497.68782 [0.01905] d  
Epoch = 368.9399 [0.0223] BKJD  
Rp/R\* = 0.0196 [0.0082]  
a/R\* = 227.57 [406.54]  
b = 0.82 [0.72]  
Seff = 0.39 [0.08]  
Teq = 201 [11] K  
Rp = 1.64 [0.72] Re  
a = 1.1087 [0.1393] AU  
Ag = 74132.57 [65742.71] [1.13σ]  
Teffp = 5137 [1125] K [4.39σ]

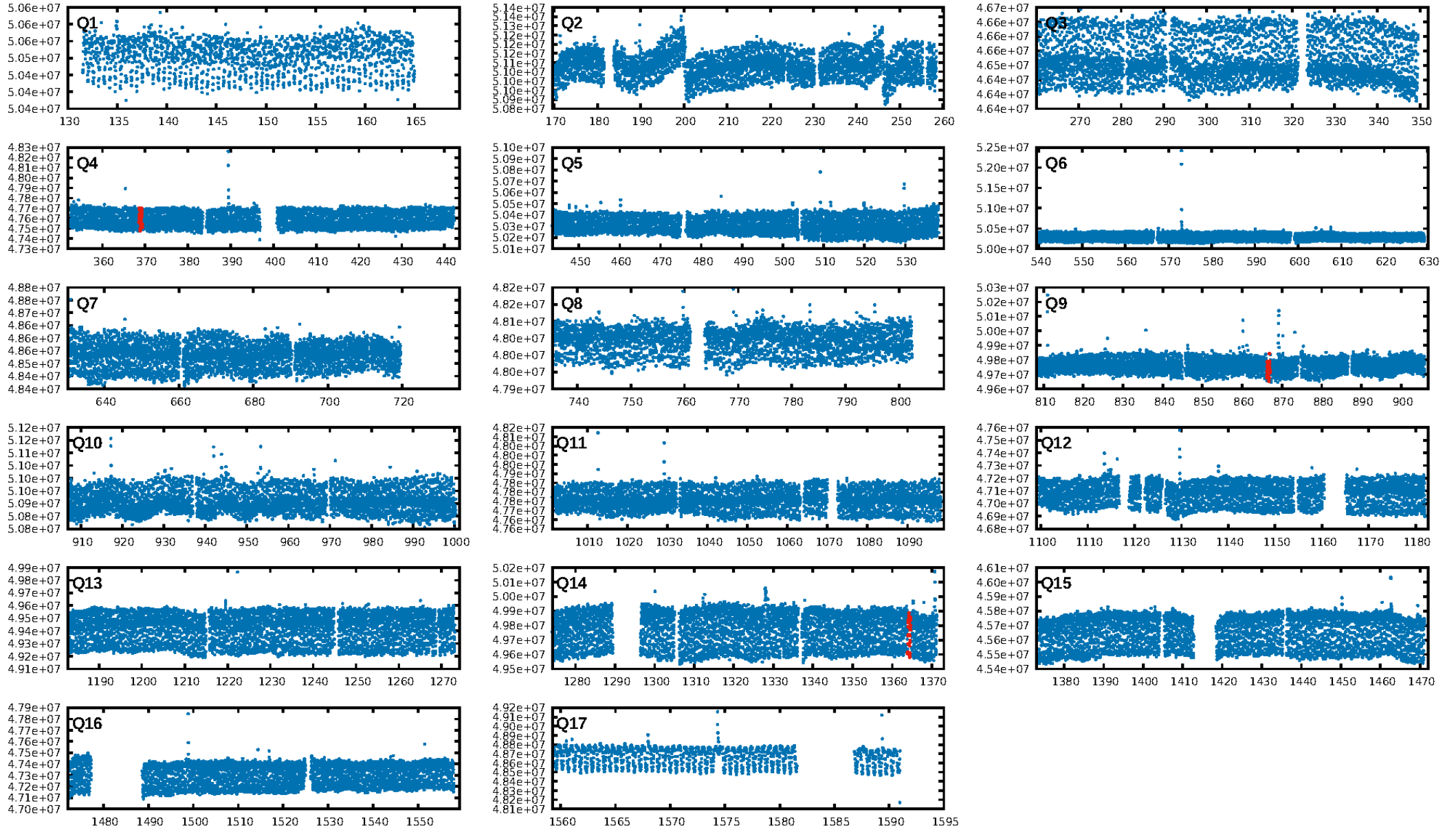
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [990.20σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 49.0%  
ModelChiSquareGof-sig: 89.5%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: 3.611  
Centroid-sig: 5.0%  
Centroid-so: 1.772 arcsec [1.48σ]  
OotOffset-rm: 0.599 arcsec [0.86σ]  
OotOffset-st: 1/0/1/1 [3]  
KicOffset-rm: 0.397 arcsec [0.38σ]  
KicOffset-st: 1/0/1/1 [3]  
DiffImageQuality-fgm: 0.67 [2/3]  
DiffImageOverlap-fno: 0.00 [0/3]

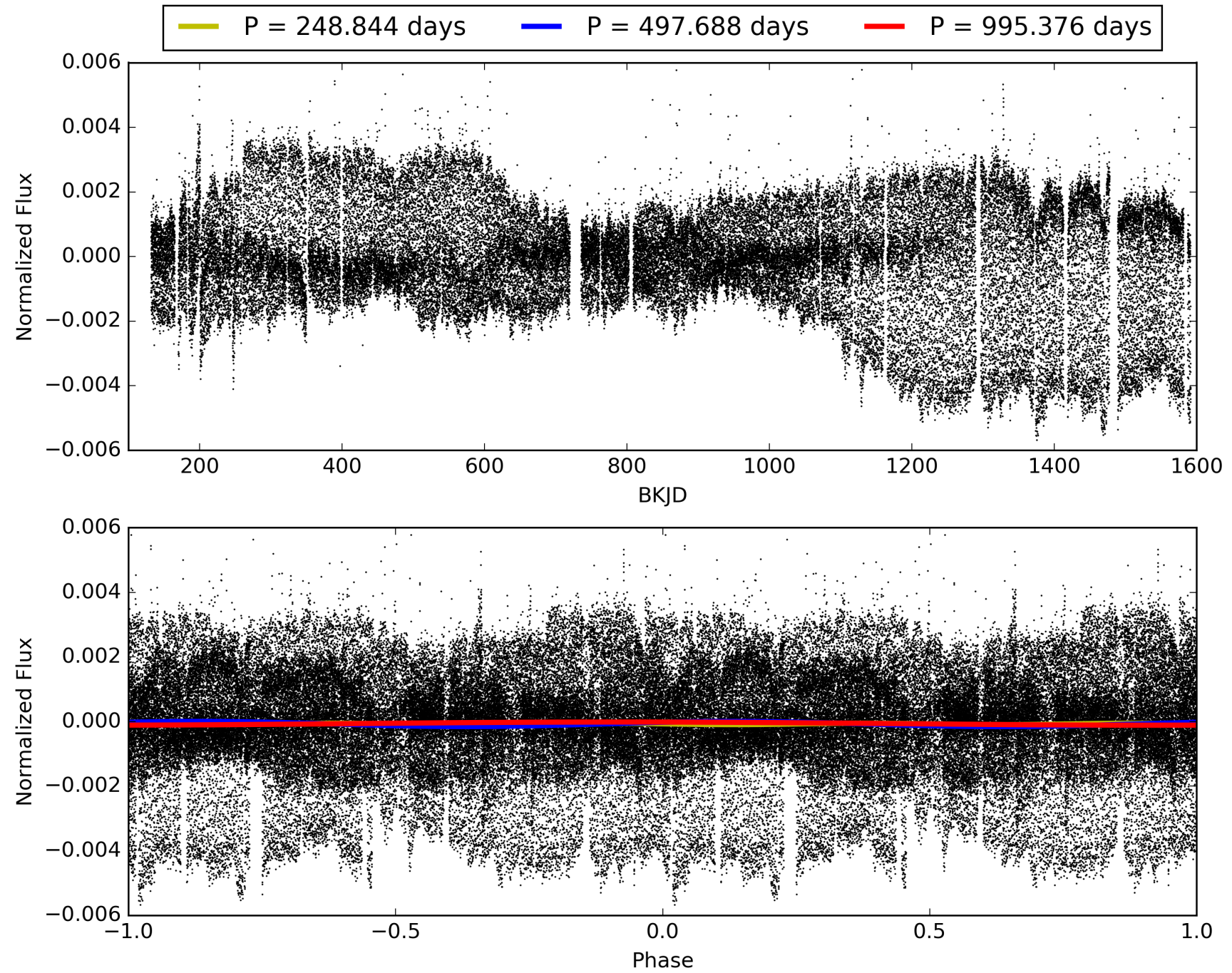
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 14:56:38 Z

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

# TCE 007020182-01, PDC Light Curves

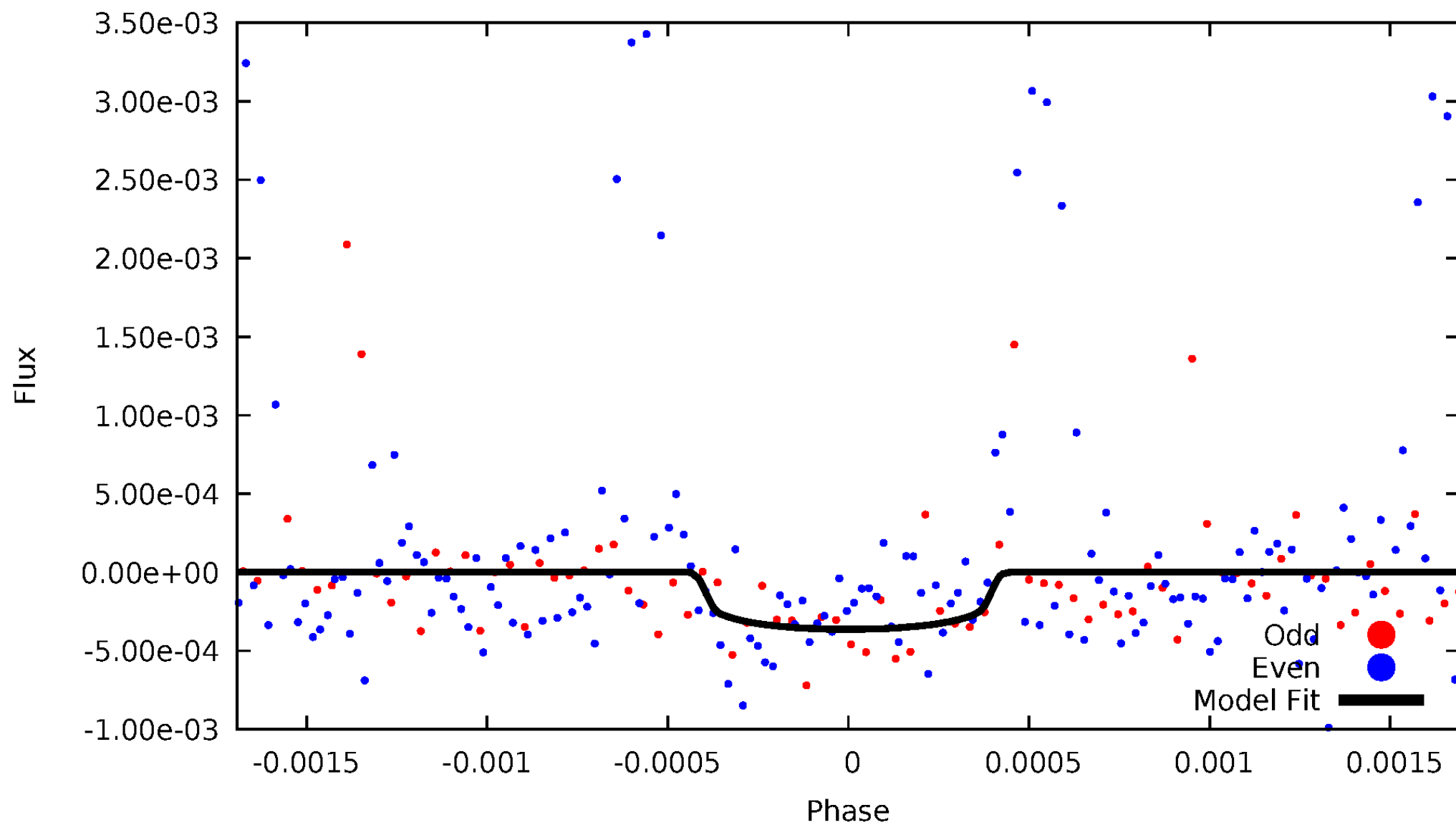


TCE 007020182-01



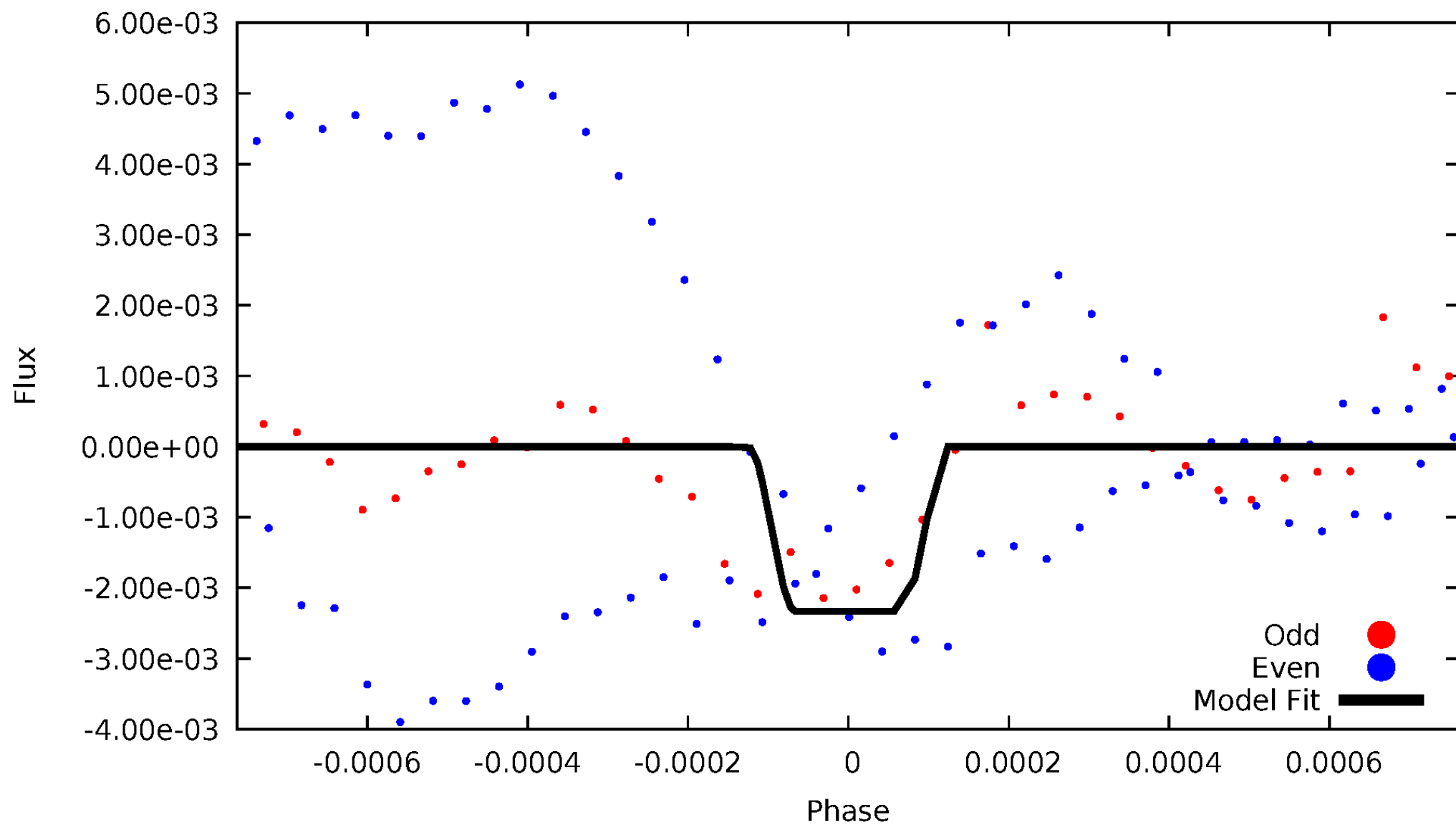
# DV Odd/Even

TCE 007020182-01



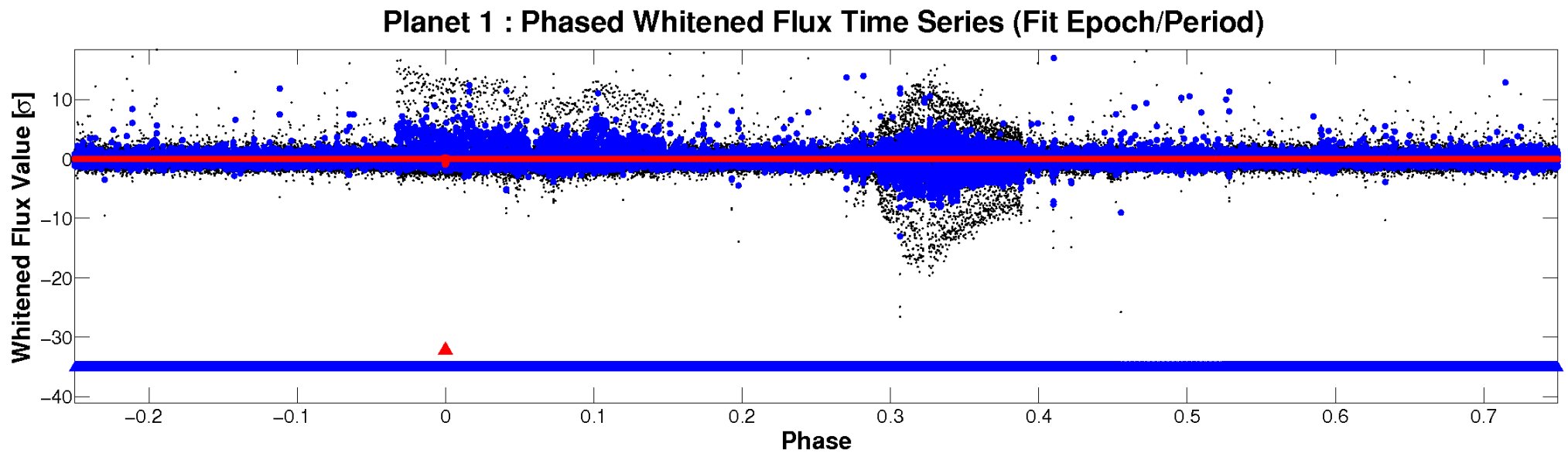
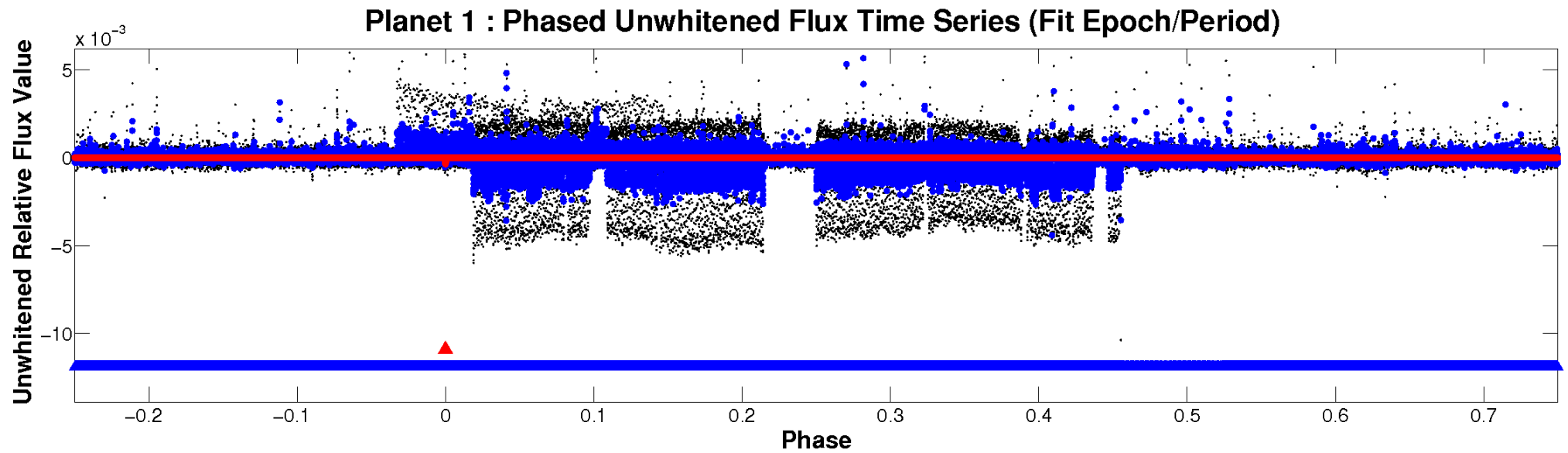
# ALT Odd/Even

TCE 007020182-01



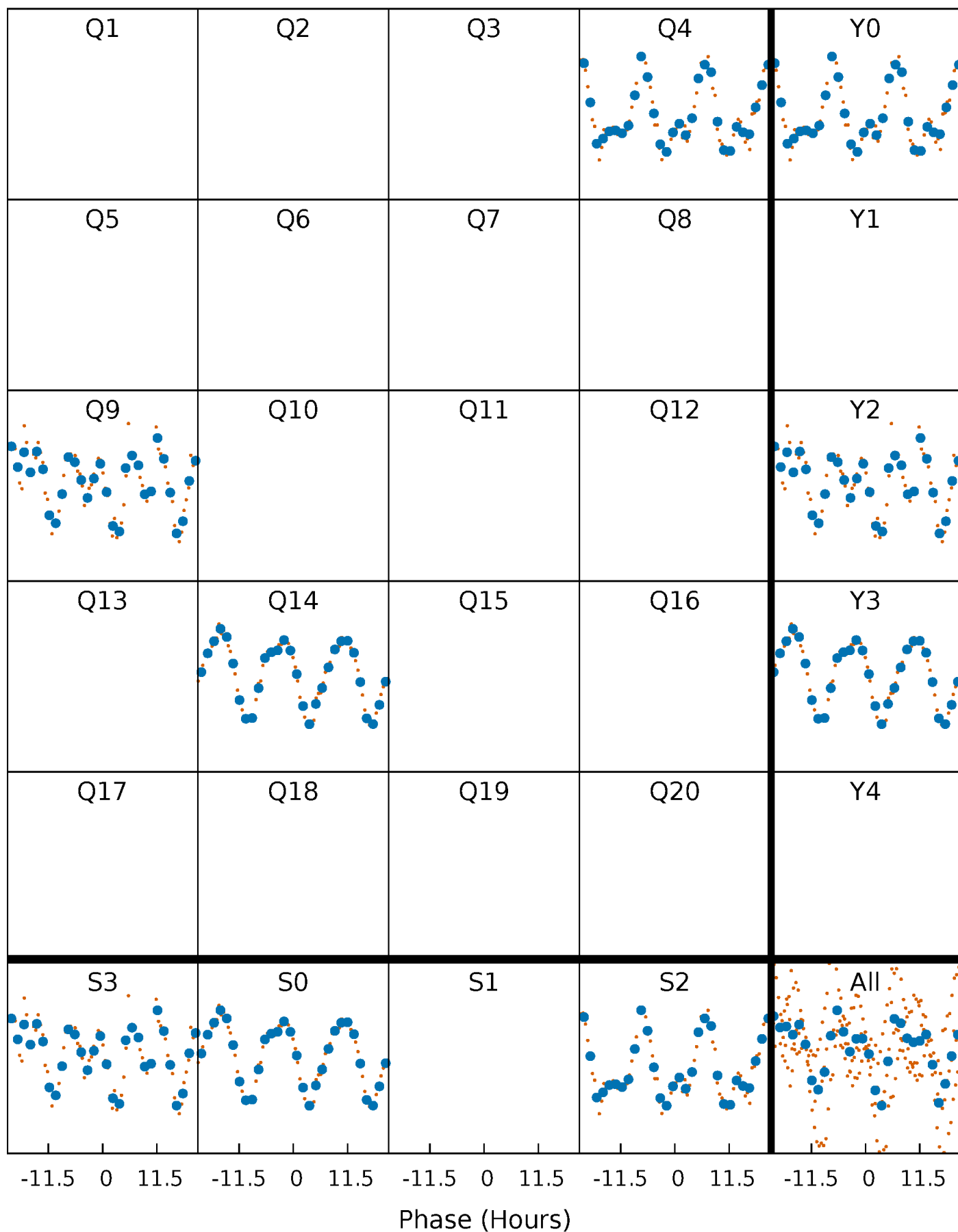


# Non-Whitened Vs. Whitened Light Curve



# PDC Quarter-Phased Transit Curves

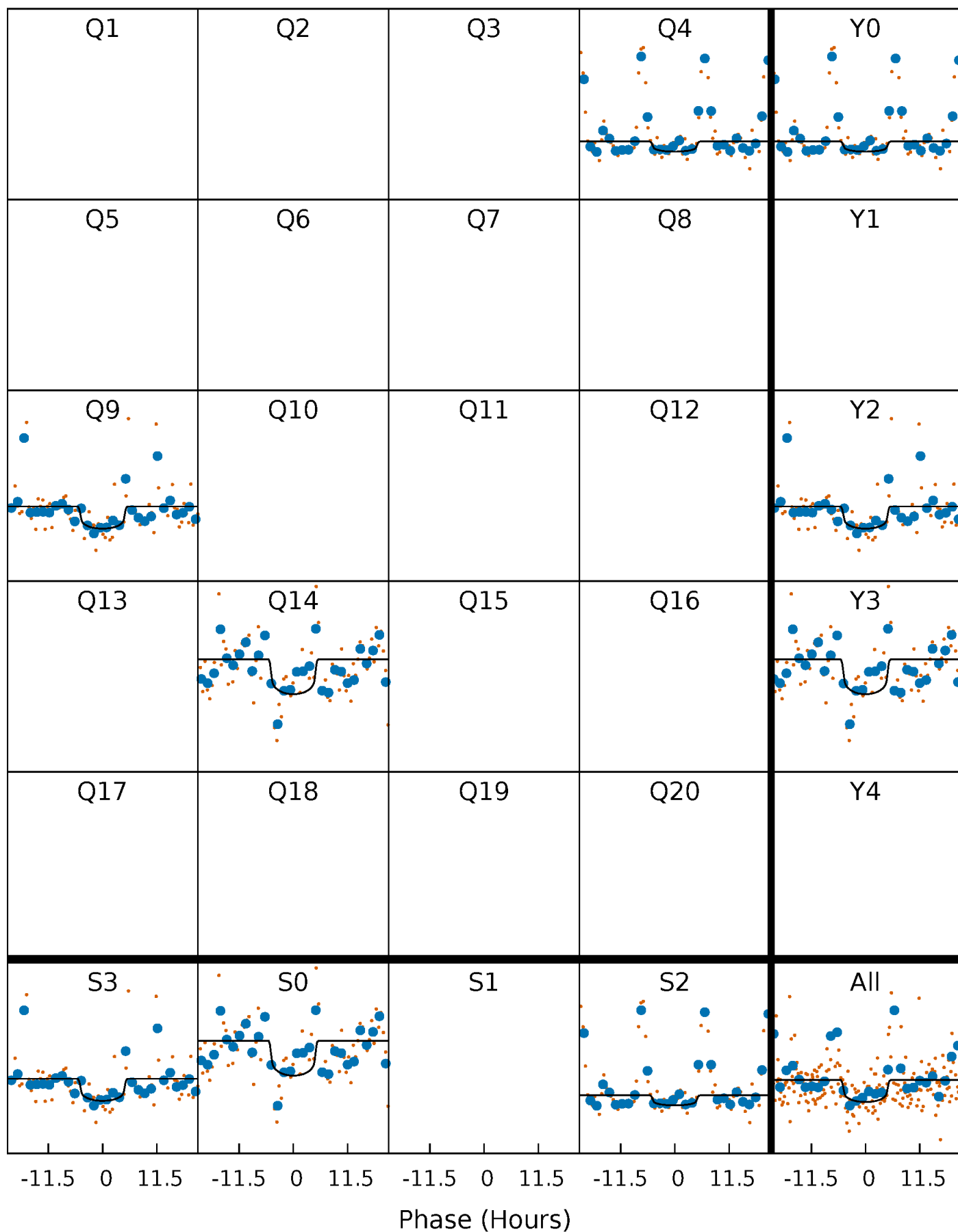
TCE 007020182-01 P=497.687822 Days  $T_0=368.939930$  (BKJD)





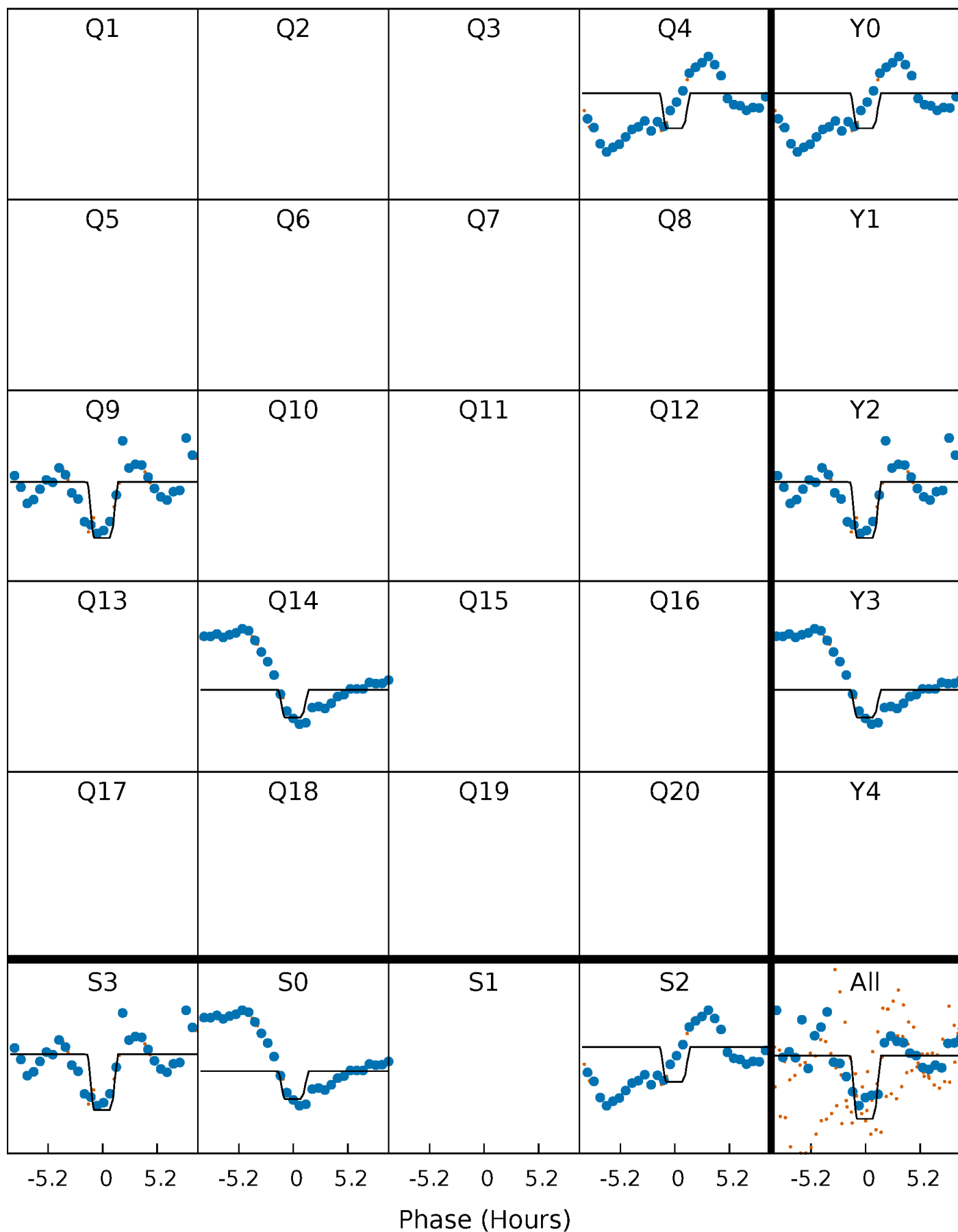
# DV Quarter-Phased Transit Curves

TCE 007020182-01     $P=497.687822$  Days     $T_0=368.939930$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

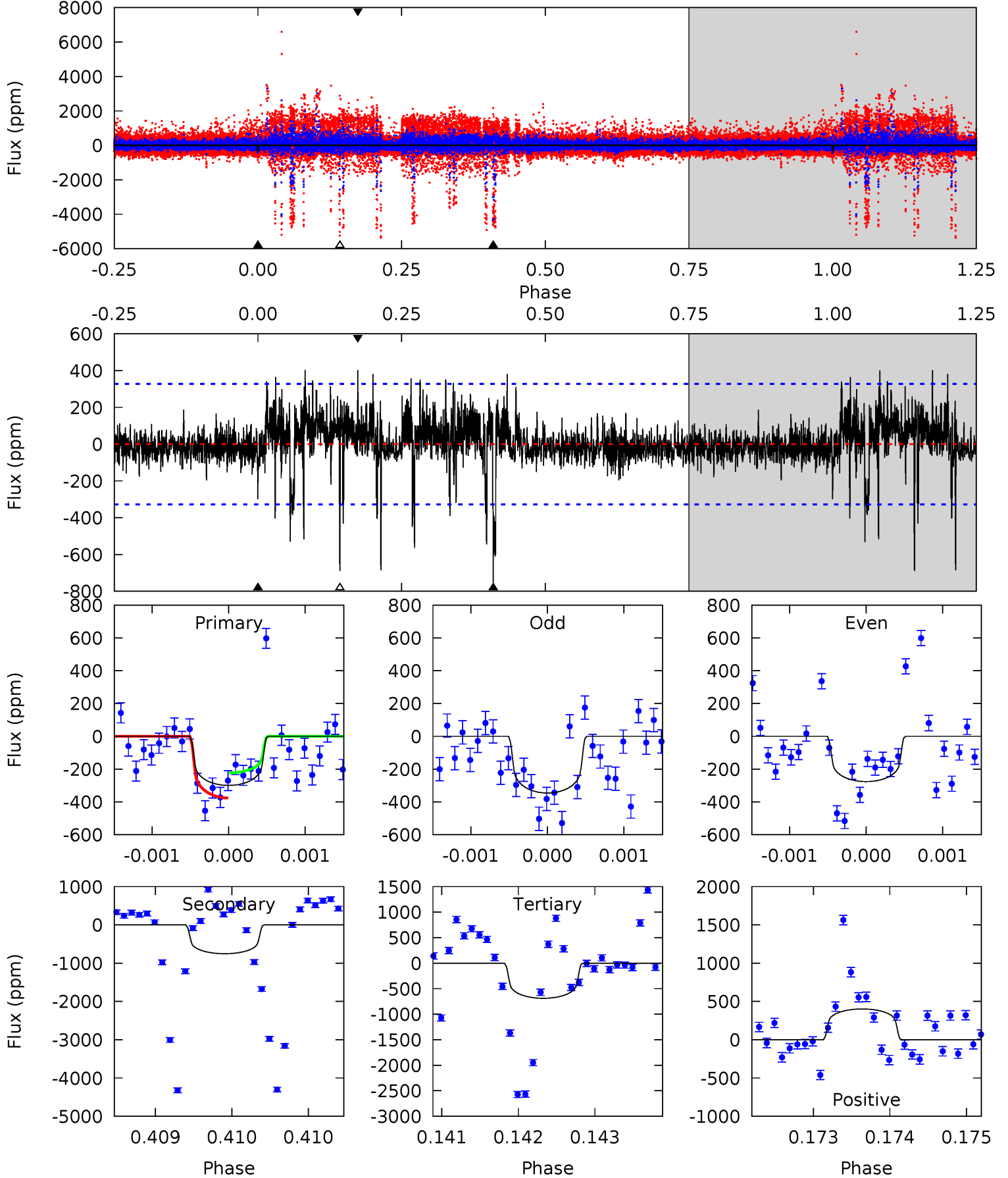
TCE 007020182-01 P=497.666165 Days  $T_0=369.103339$  (BKJD)



# DV Model-Shift Uniqueness Test

007020182-01, P = 497.687822 Days, E = 368.939930 Days

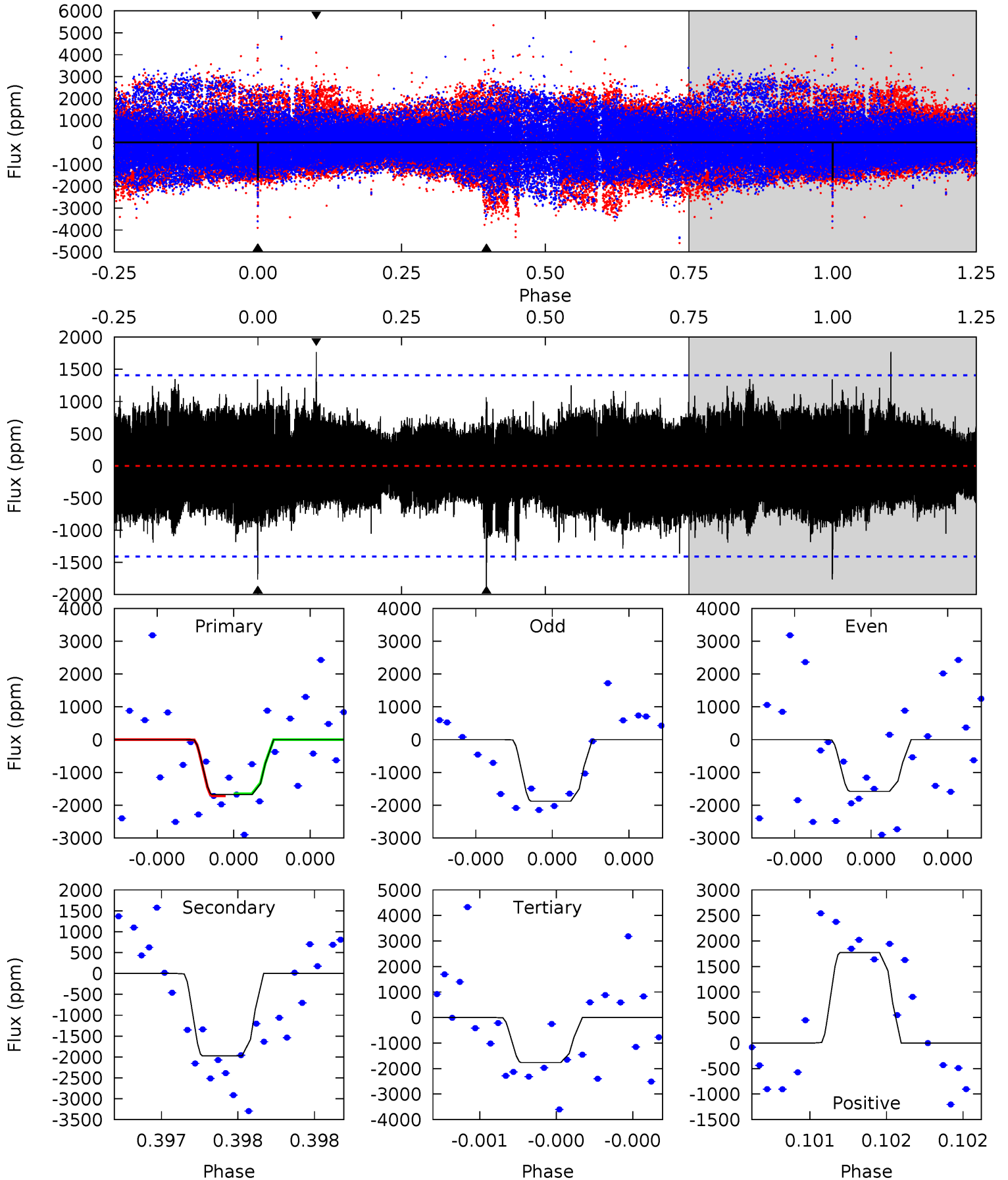
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
5.00	12.6	11.5	6.71	5.48	3.33	1.66	-6.50	-1.71	1.07	5.85	0.37	1.03	0.35	1.16



# Alt Model-Shift Uniqueness Test

007020182-01, P = 497.666165 Days, E = 369.103339 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
6.80	8.00	7.15	7.17	5.70	3.68	1.86	-0.35	-0.38	0.85	0.83	0.60	0.89	0.47	0.13



### Stellar Parameters For KIC 007020182

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5491^{+163}_{-147}$	$4.535^{+0.081}_{-0.099}$	$-0.540^{+0.300}_{-0.300}$	$0.766^{+0.115}_{-0.084}$	$0.734^{+0.103}_{-0.044}$	$2.300^{+0.778}_{-0.690}$
	+3%/-3%	+2%/-2%	+56%/-56%	+15%/-11%	+14%/-6%	+34%/-30%
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 007020182-01 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-752 \pm 60$	$1.64^{+0.70}_{-0.61}$	$283^{+13}_{-12}$	$6497^{+2068}_{-1041}$	$191539^{+290620}_{-98792}$
Alt.	$-1975 \pm 247$	$4.13^{+0.76}_{-0.75}$	$282^{+13}_{-12}$	$5282^{+519}_{-379}$	$80709^{+39077}_{-23609}$

$T_{\text{max}}$  = 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

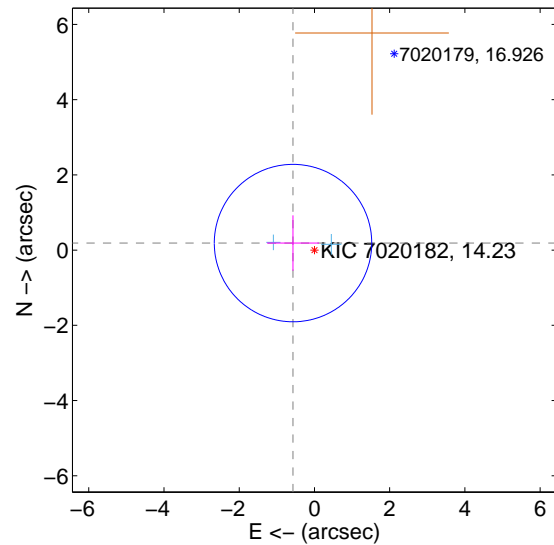
Supplemental centroid analysis for 007020182-01. Kepler magnitude: 14.23. Transit SNR 6.87

There are 2 quarters with good PRF difference image offsets

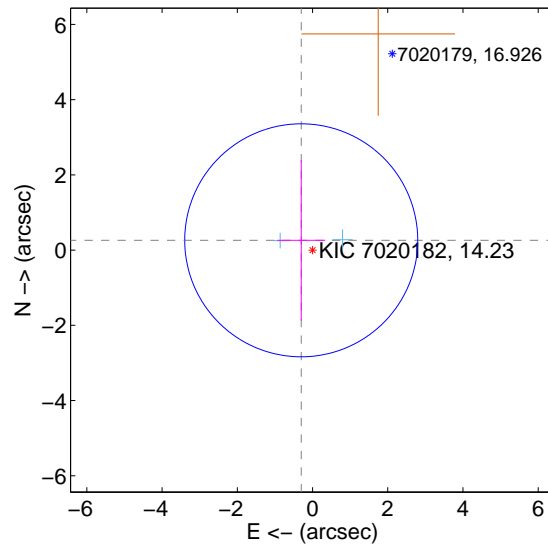
The direct PRF centroid is offset from the target star catalog position by about 0.22 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.599 \pm 0.697$	0.86	$0.570 \pm 0.693$	$0.187 \pm 0.736$
PRF-fit source offset from KIC position	$0.397 \pm 1.032$	0.38	$0.301 \pm 0.640$	$0.260 \pm 2.130$
photometric centroid source offset	$1.77 \pm 1.20$	1.48	$1.48 \pm 1.19$	$0.98 \pm 1.22$

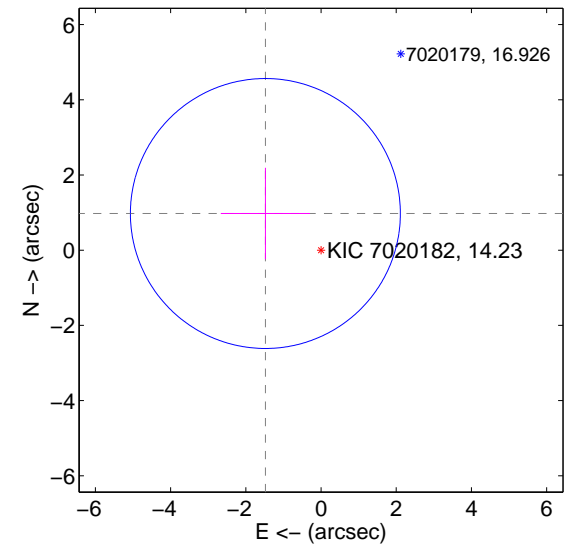
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

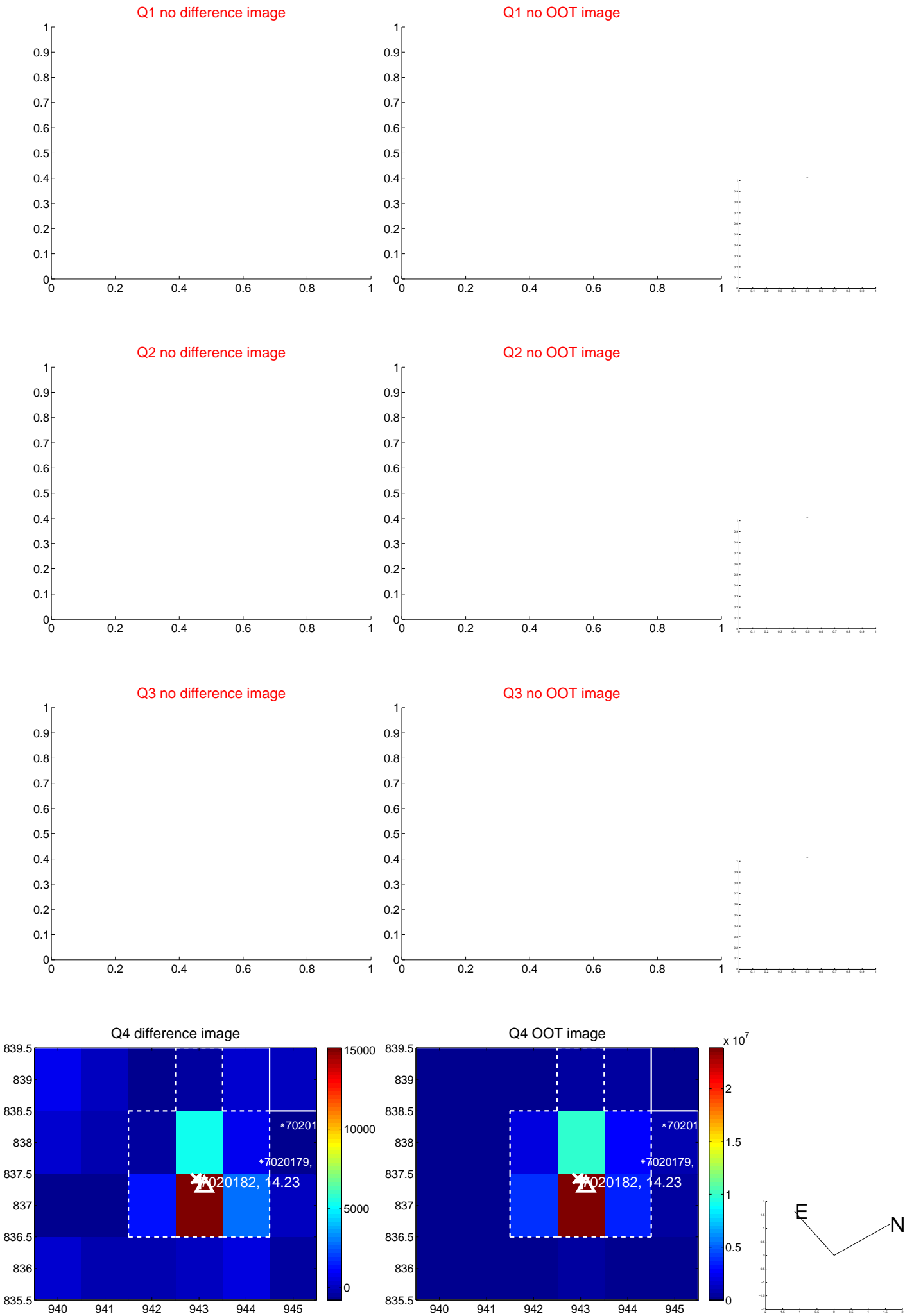


offset from photometric centroids



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.

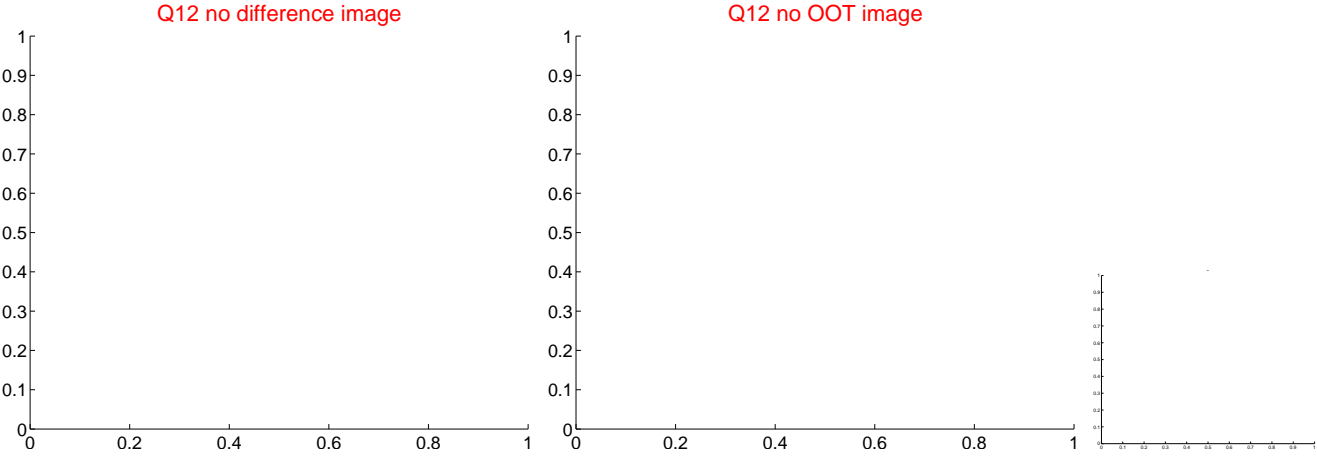
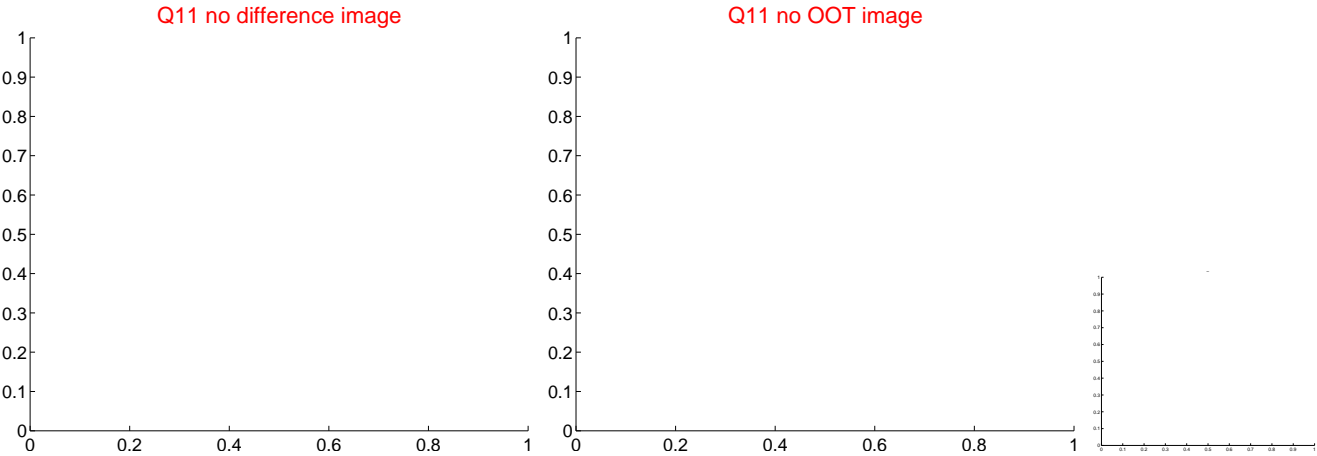
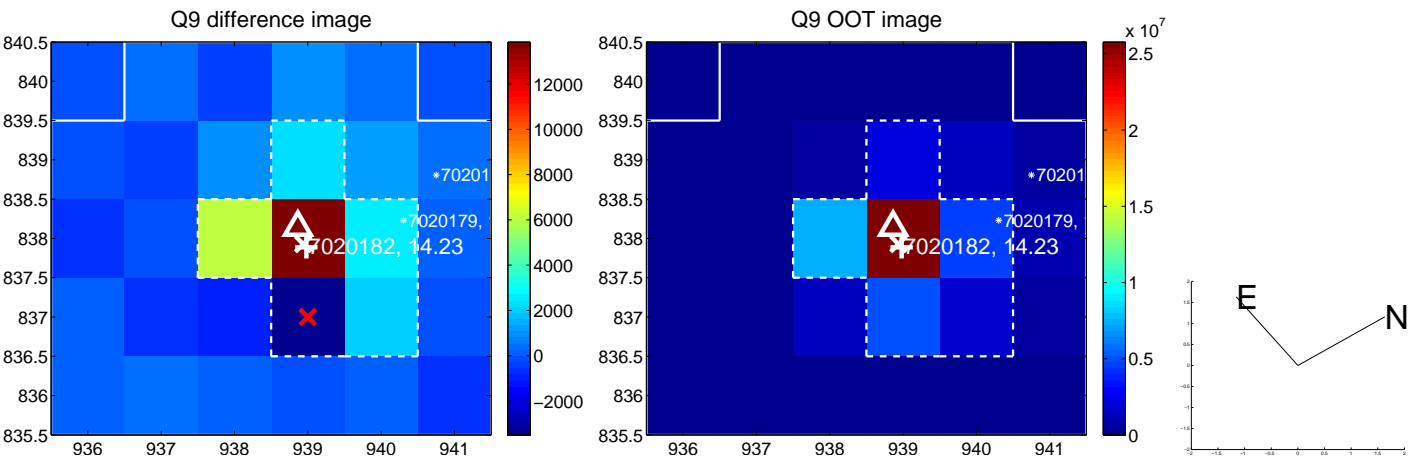




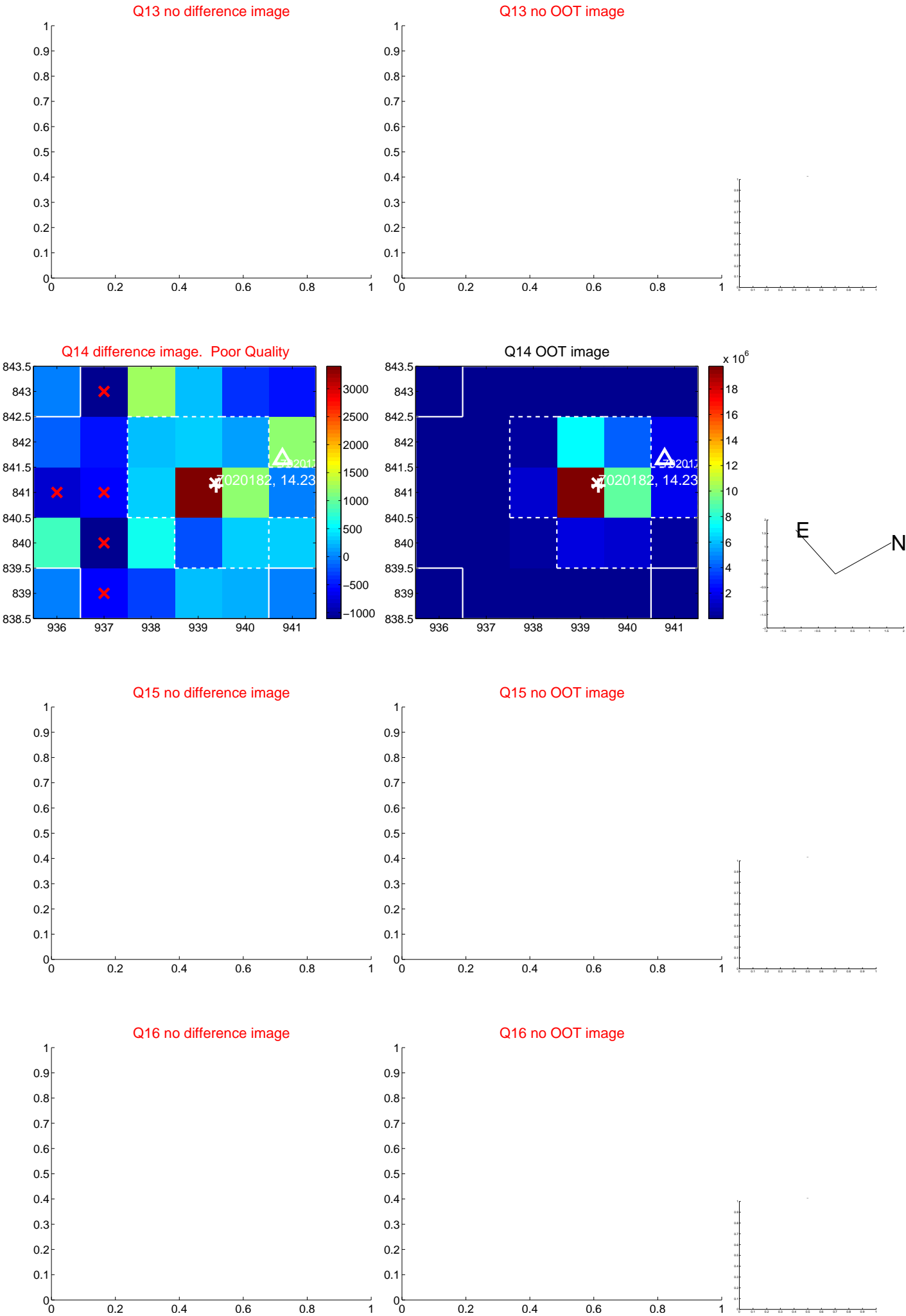
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



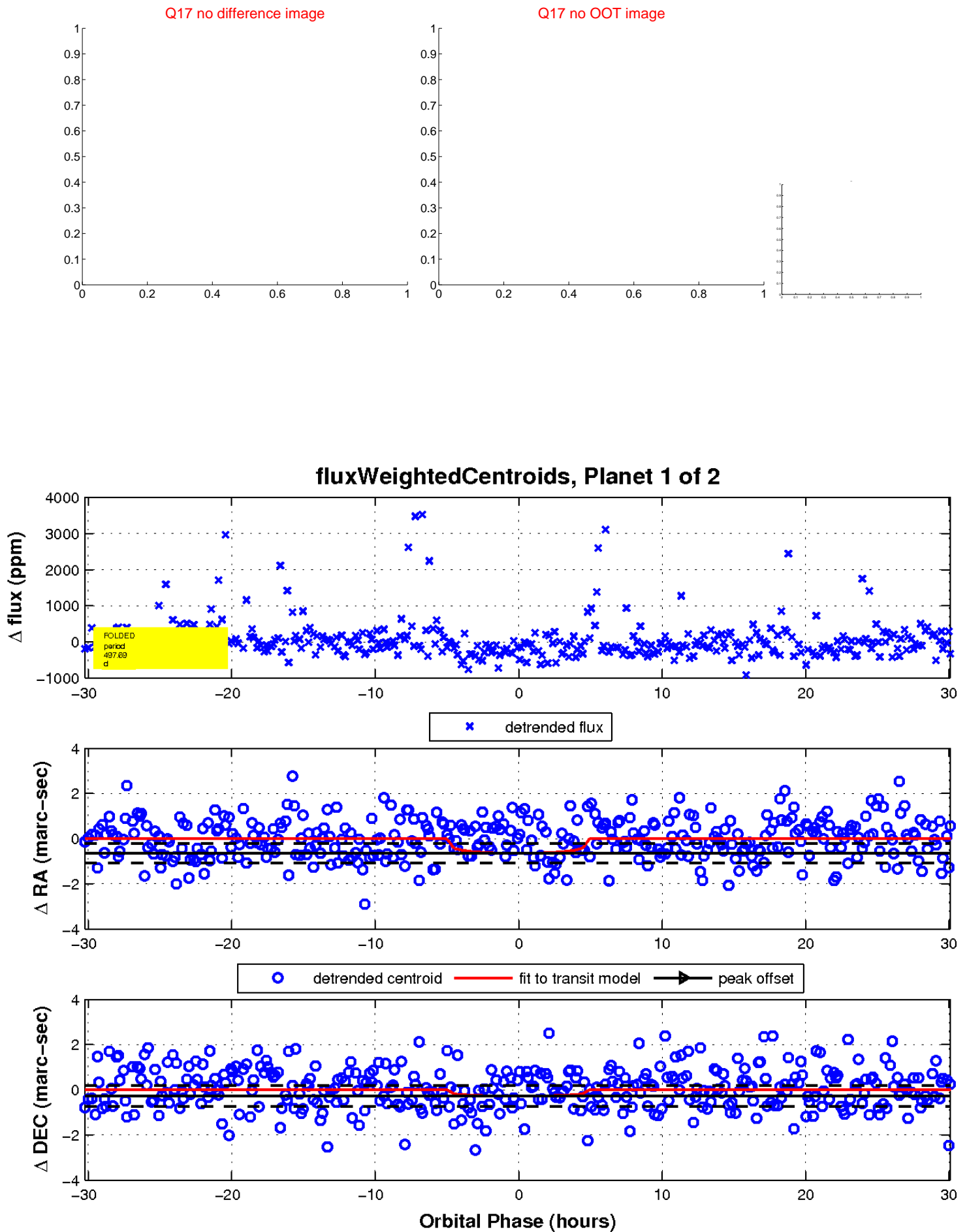
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

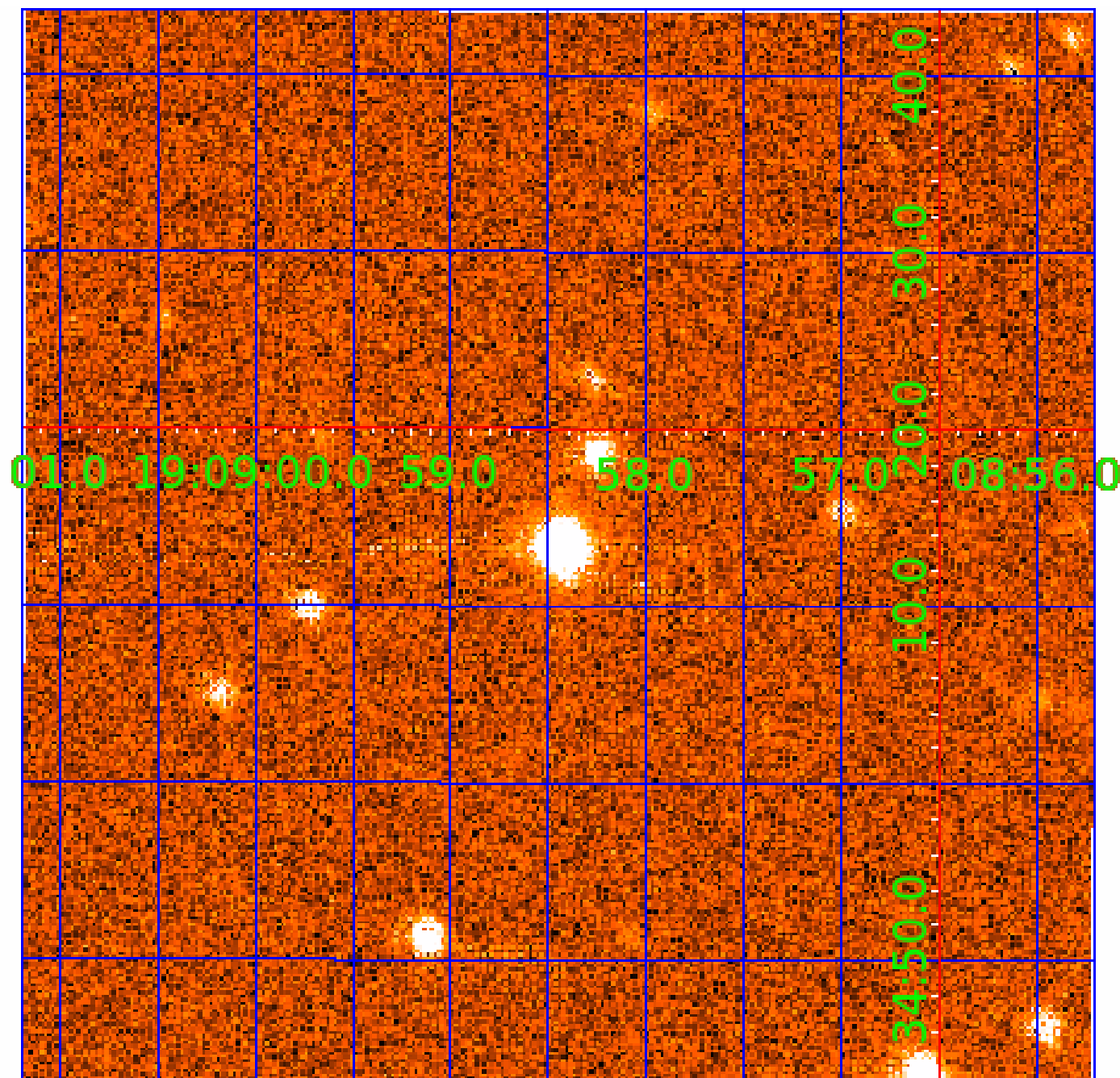


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 007020182

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
007020182-01	OBS	No	497.687822	368.939930	363.9	10.102	8.2	6.9	0.77	5491	1.64	0.39
007020182-02	OBS	No	0.547333	132.009305	8.6	6.568	75.9	2.9	0.77	5491	0.22	3424.92

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
007020182-01	OBS	FP	0.00	1	0	0	0	ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS
007020182-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT

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

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

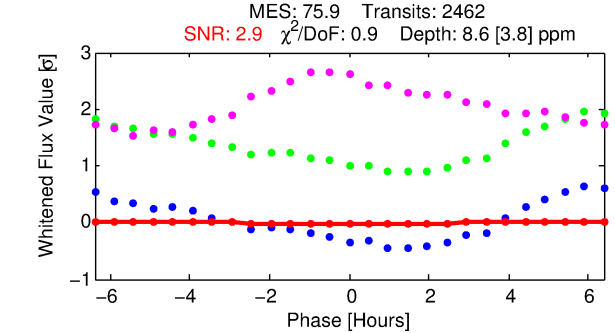
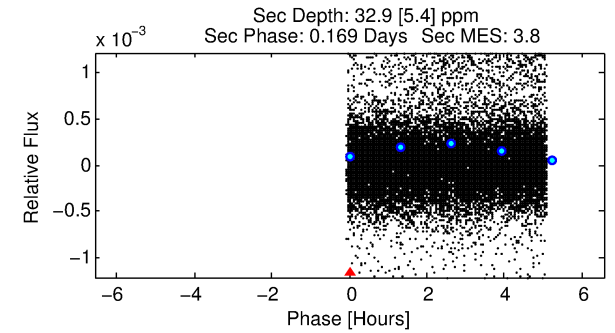
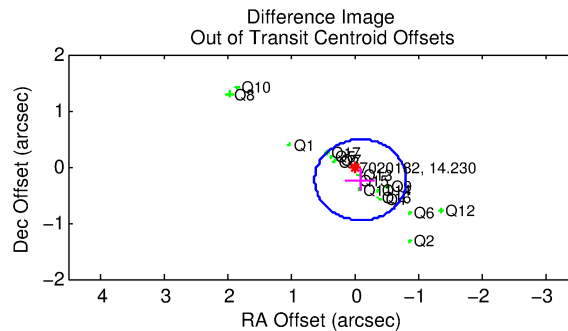
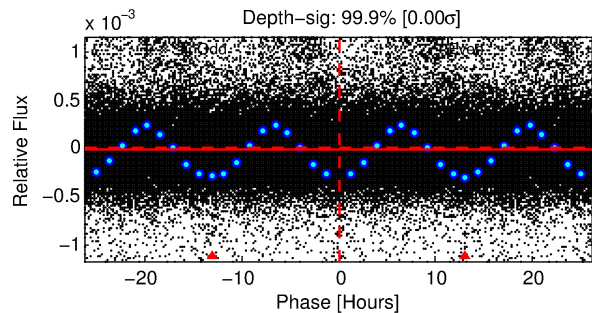
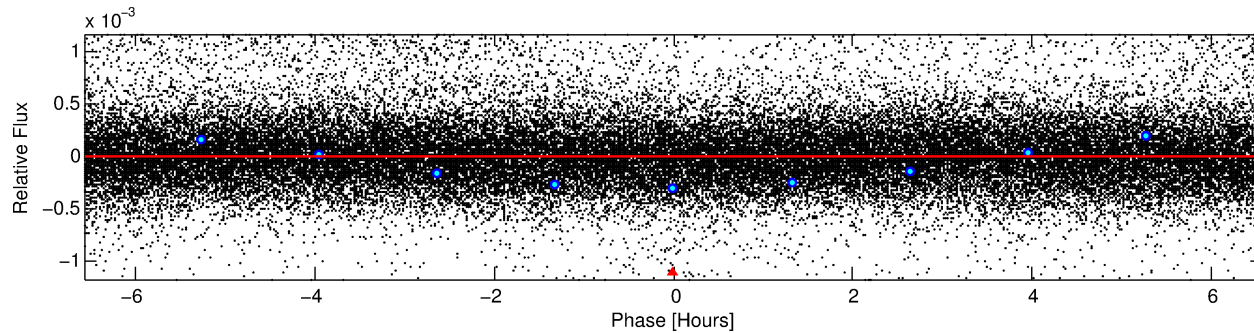
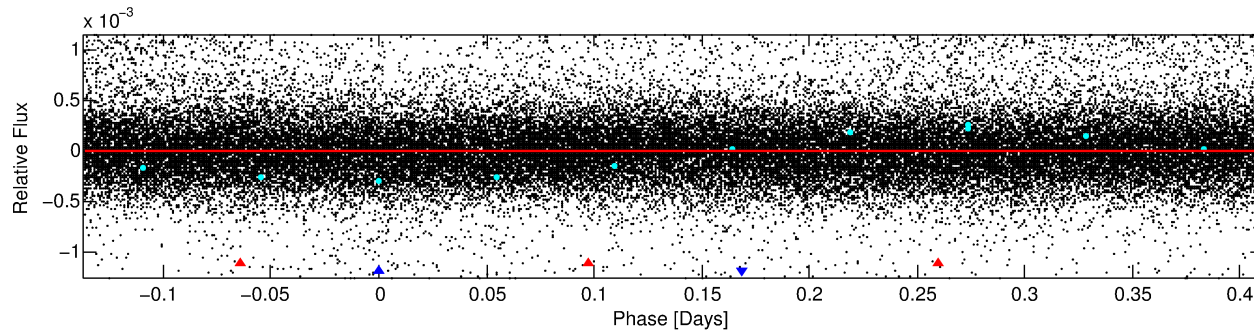
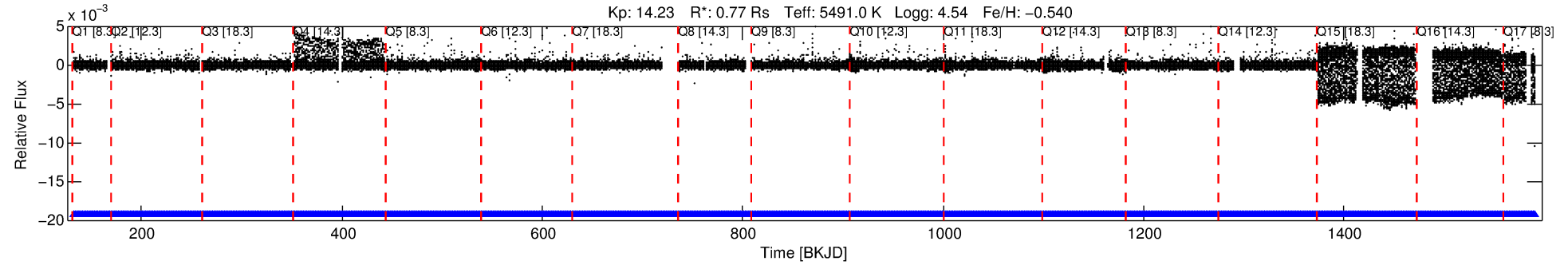
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 007020182-02

No Significant Match Found

# DV One-Page Summary

KIC: 7020182 Candidate: 2 of 2 Period: 0.547 d



## DV Fit Results:

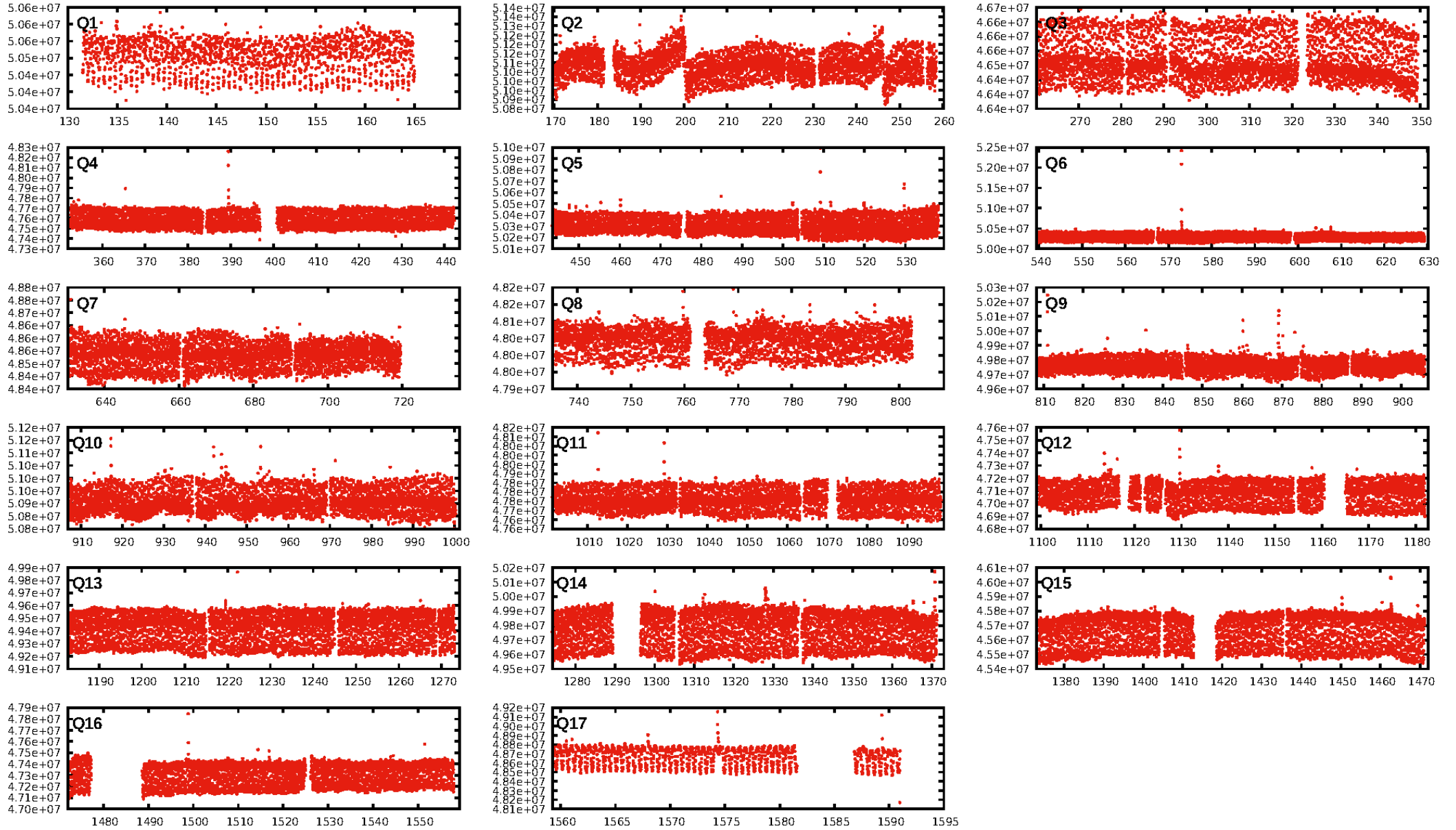
Period = 0.54733 [0.00004] d  
Epoch = 132.0093 [0.0182] BKJD  
Rp/R\* = 0.0027 [0.0053]  
a/R\* = 1.00 [0.02]  
b = 0.02 [489.96]  
Seff = 3424.92 [744.17]  
Teq = 1951 [106] K  
Rp = 0.22 [0.45] Re  
a = 0.0118 [0.0015] AU  
Ag = 51.30 [206.02] [0.24 $\sigma$ ]  
Teffp = 8072 [8099] K [0.76 $\sigma$ ]

## DV Diagnostic Results:

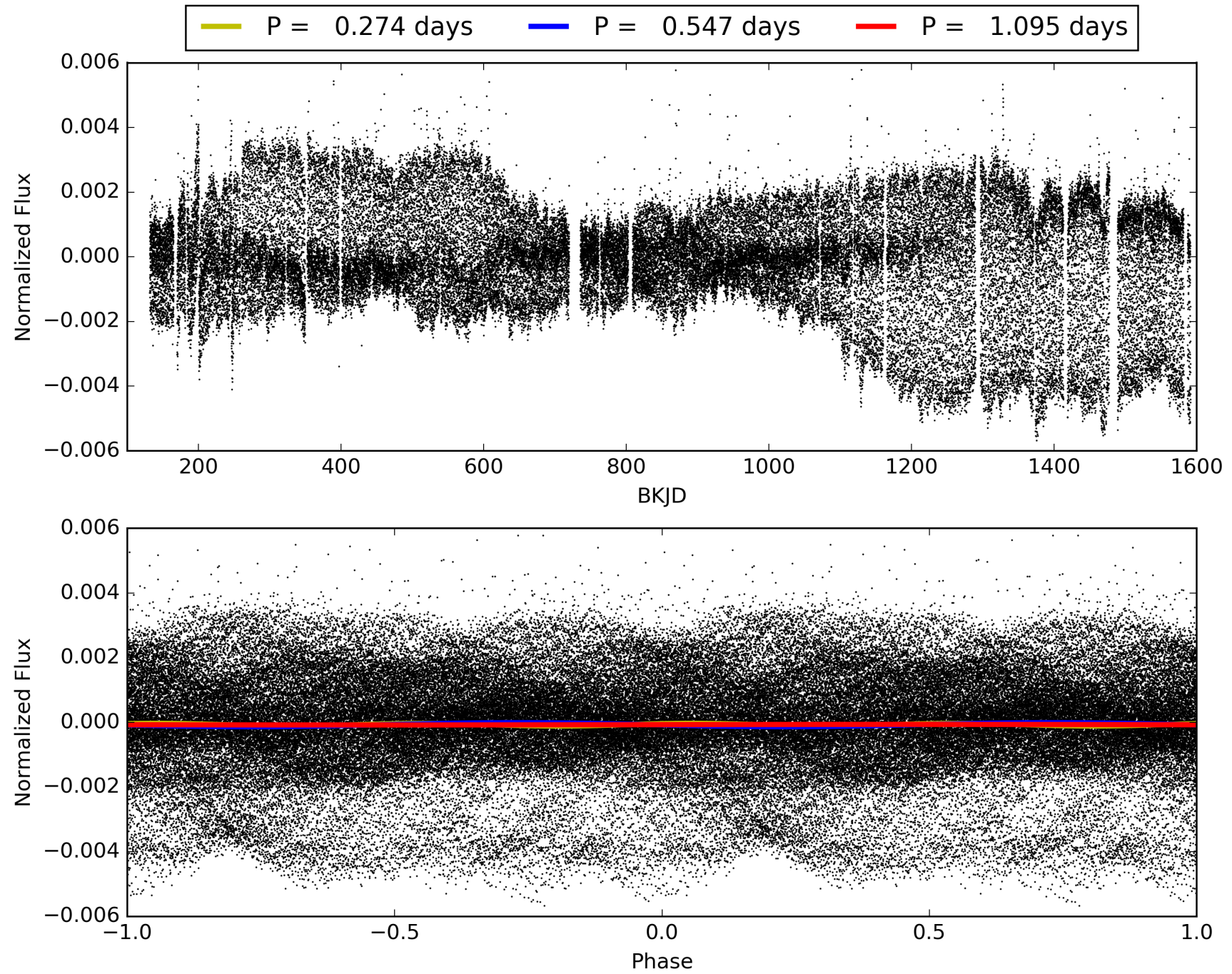
ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [990.20 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [2351/2351]  
GhostDiagnostic-chr: 2.567  
Centroid-sig: 75.3%  
Centroid-so: 0.974 arcsec [0.41 $\sigma$ ]  
OotOffset-rm: 0.256 arcsec [1.06 $\sigma$ ]  
KicOffset-rm: 0.419 arcsec [1.59 $\sigma$ ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 0.47 [8/17]  
DiffImageOverlap-fno: 1.00 [17/17]



# TCE 007020182-02, PDC Light Curves

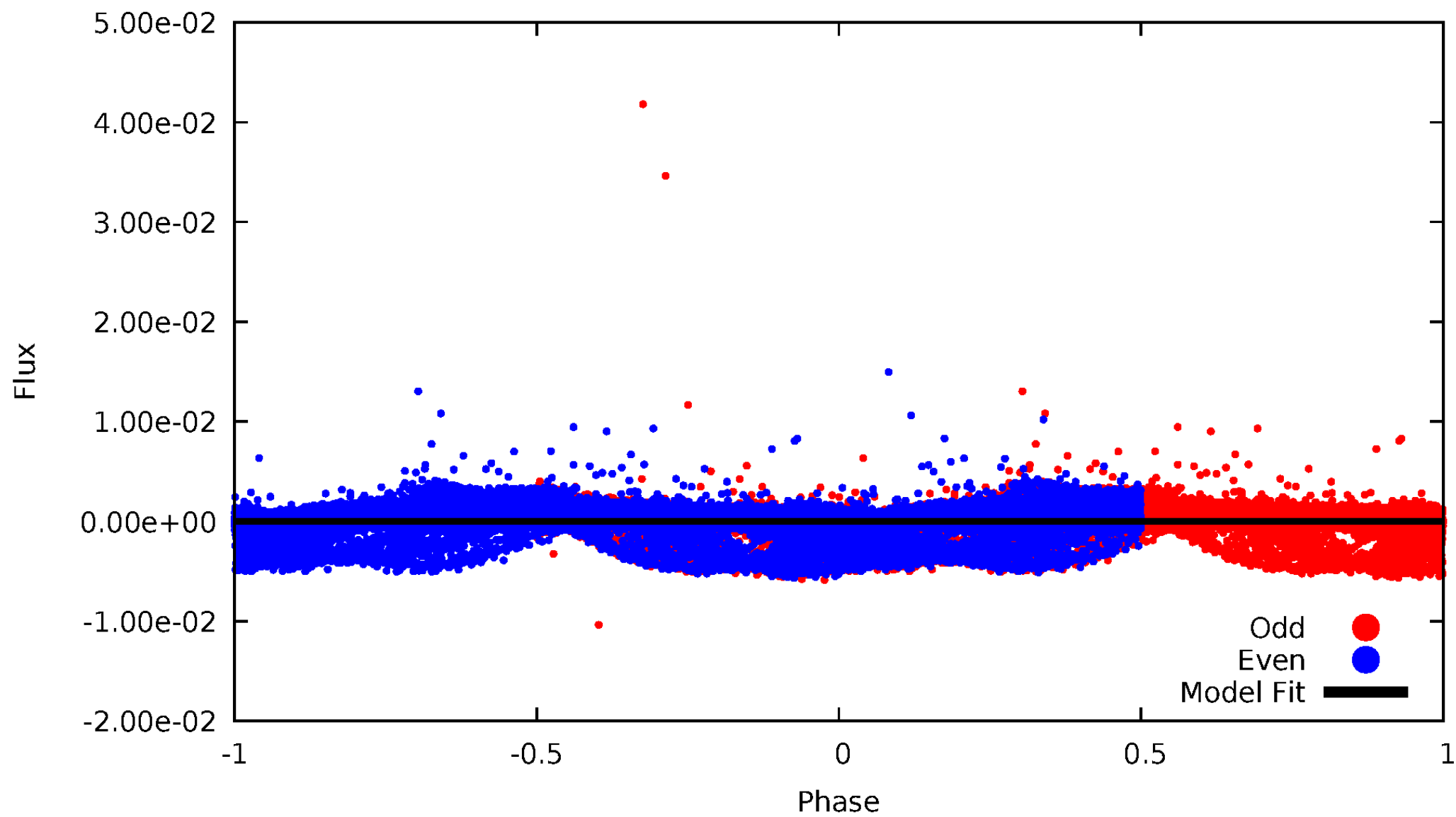


TCE 007020182-02



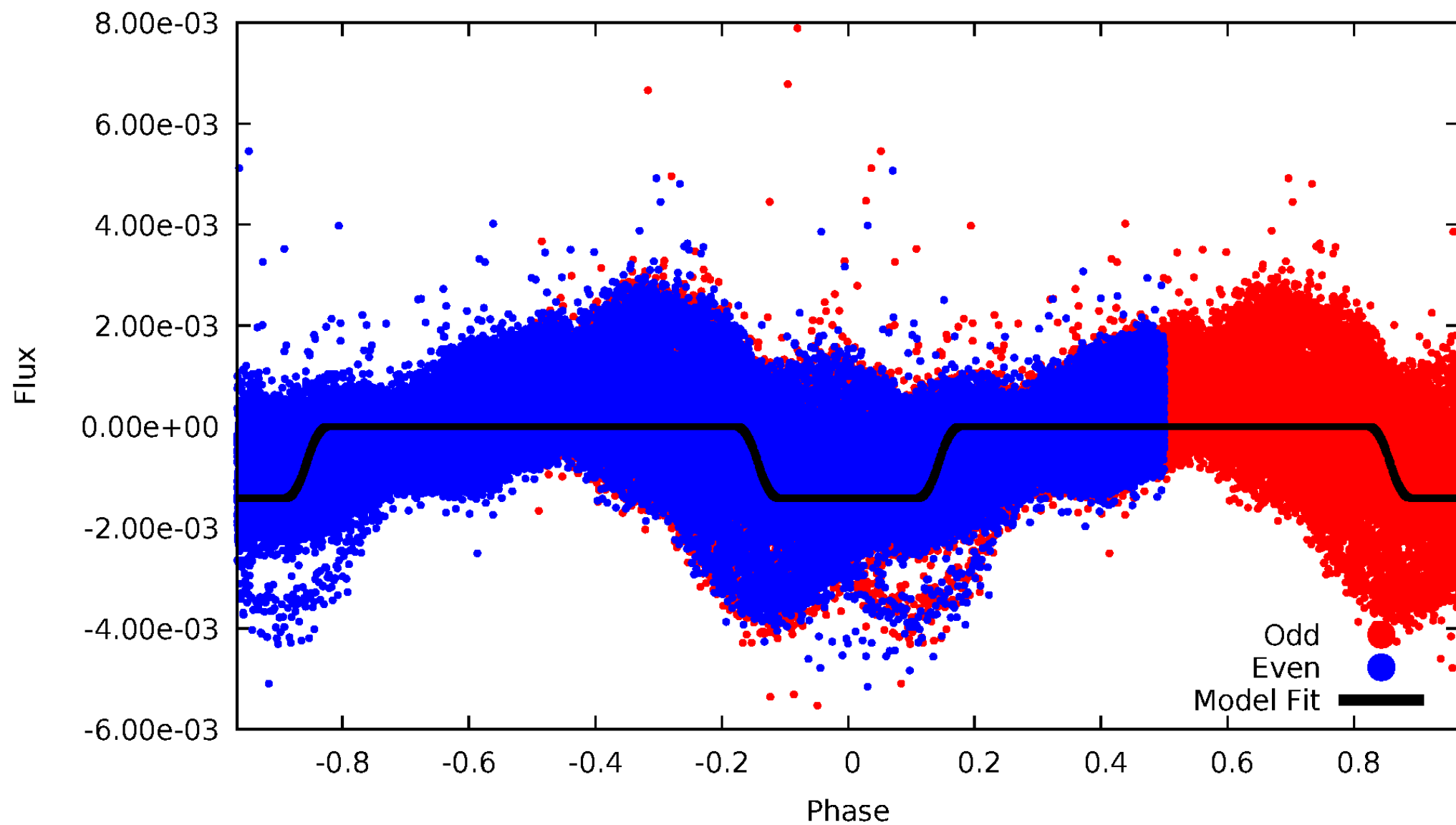
# DV Odd/Even

TCE 007020182-02



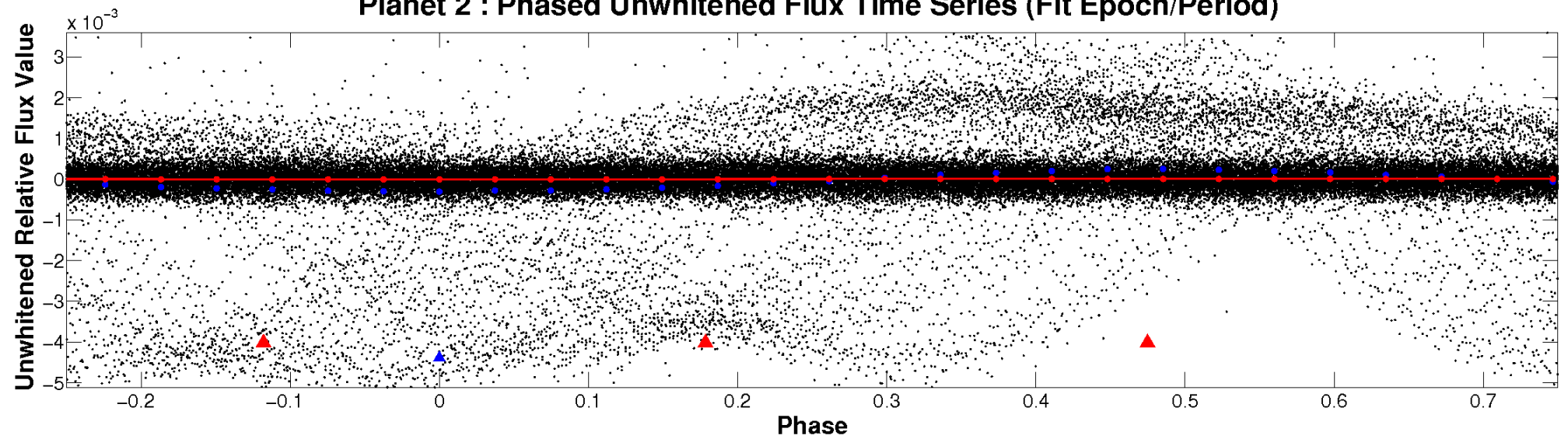
# ALT Odd/Even

TCE 007020182-02

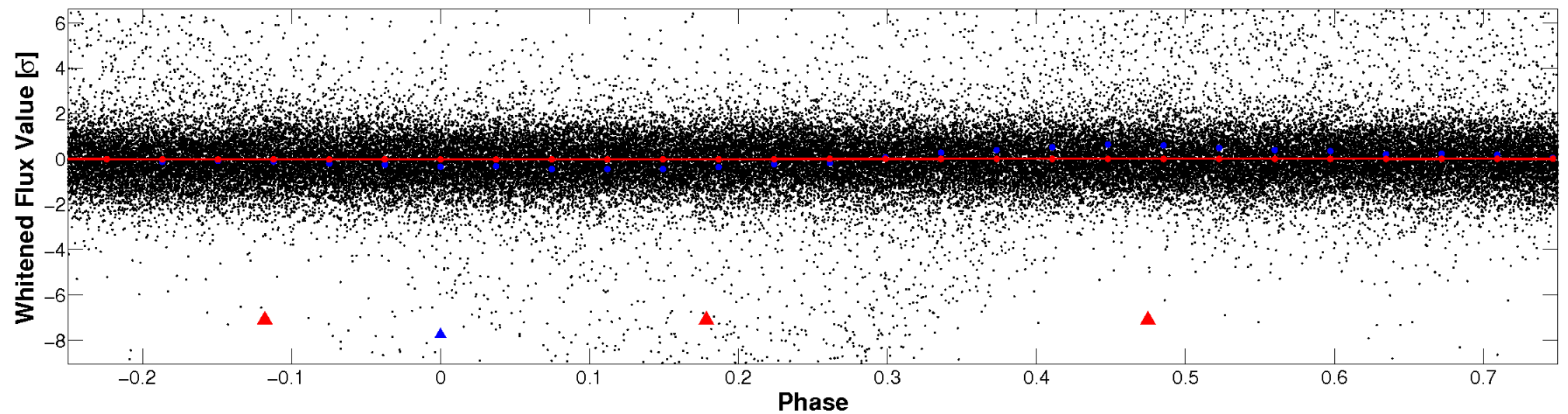


# Non-Whitened Vs. Whitened Light Curve

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



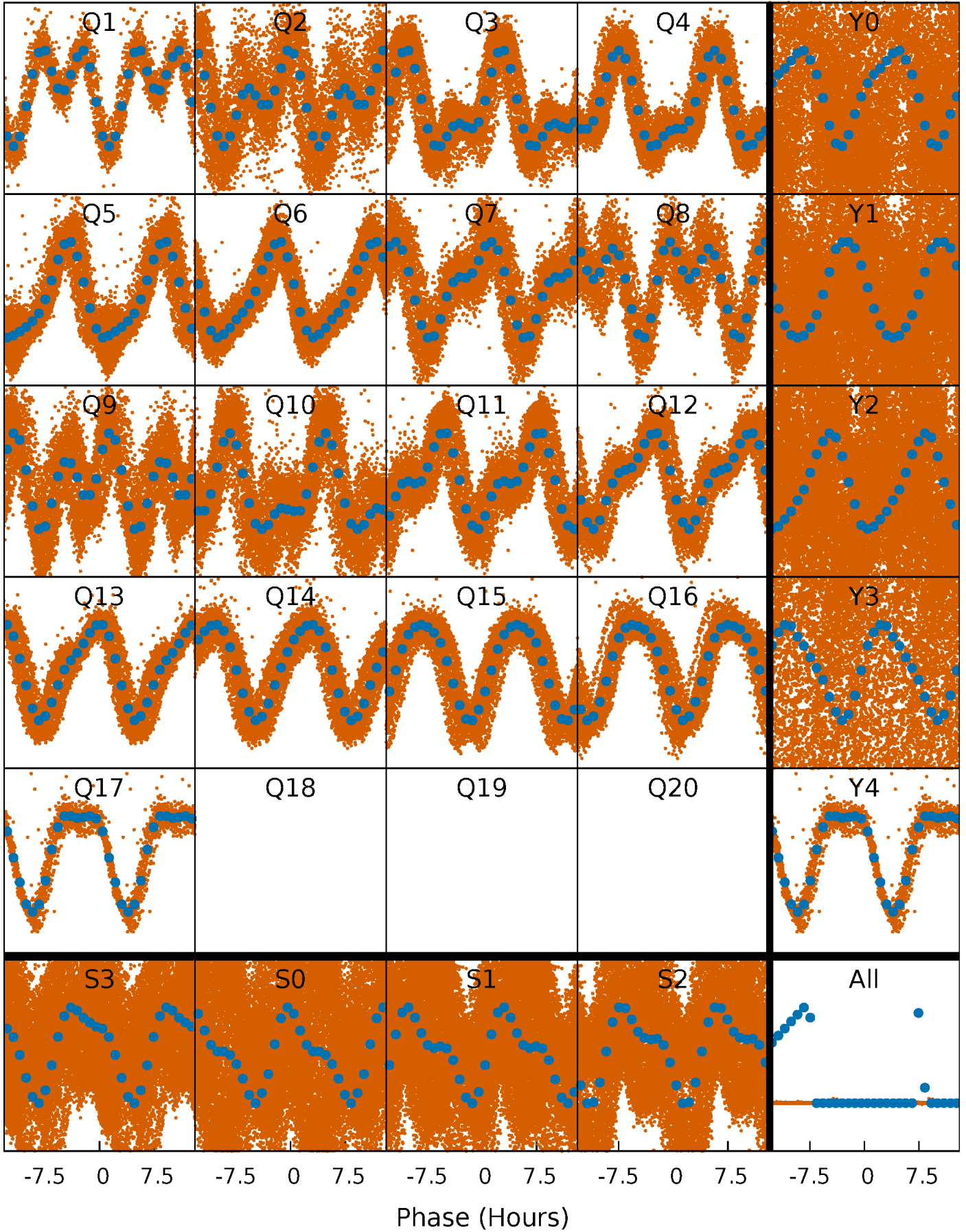
## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)





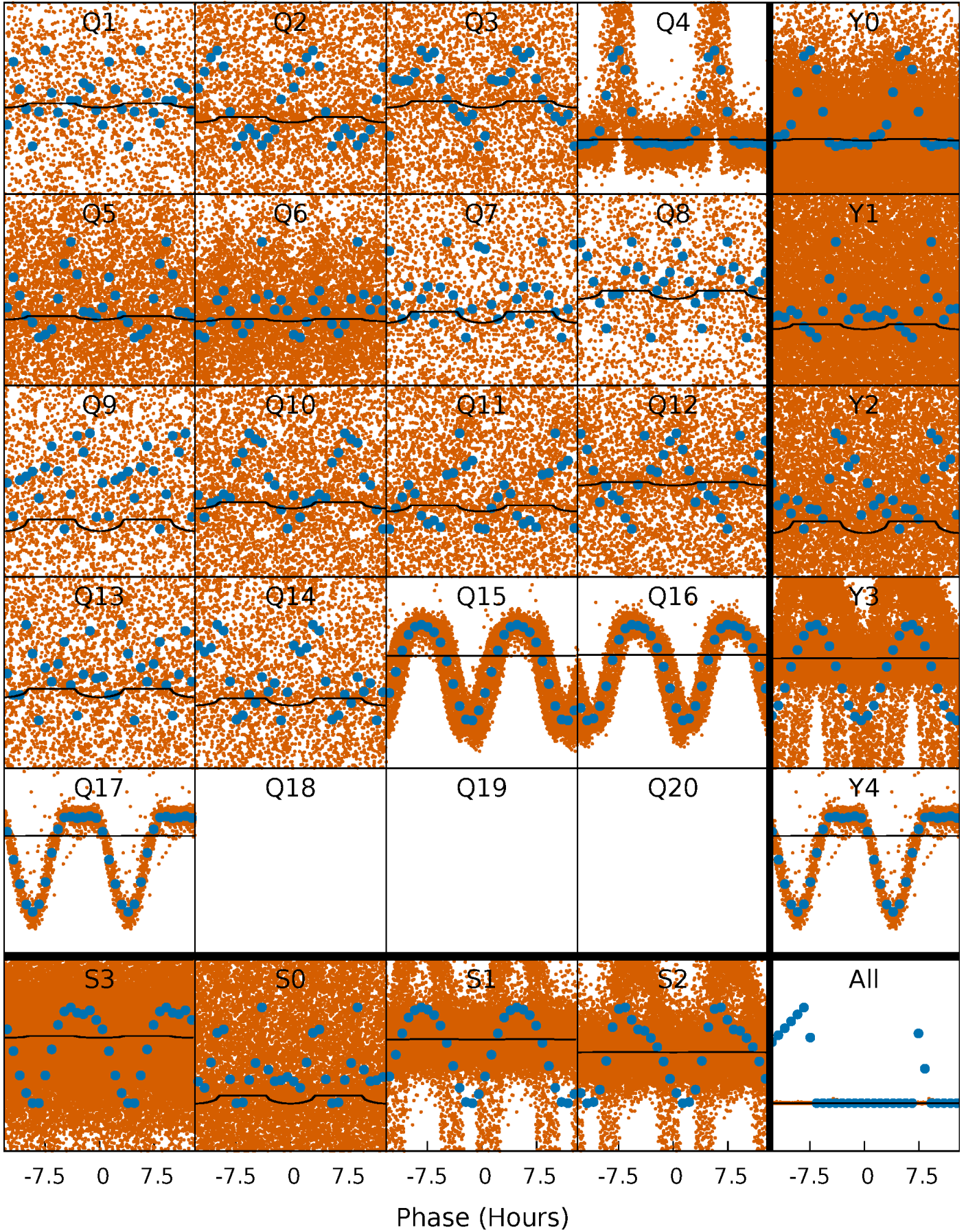
# PDC Quarter-Phased Transit Curves

TCE 007020182-02     $P = 0.547333$  Days     $T_0 = 132.009305$  (BKJD)



# DV Quarter-Phased Transit Curves

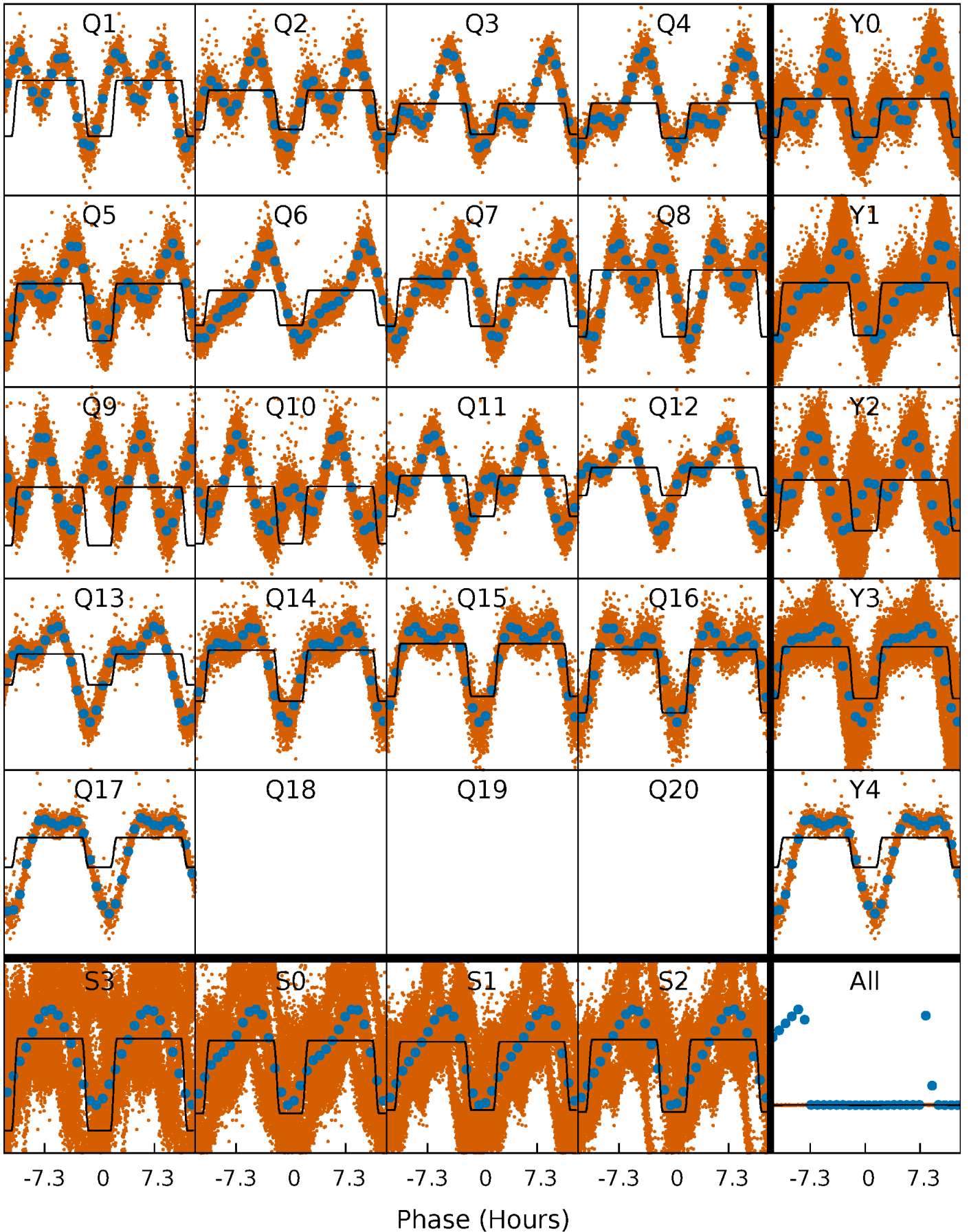
TCE 007020182-02   P= 0.547333 Days    $T_0=132.009305$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

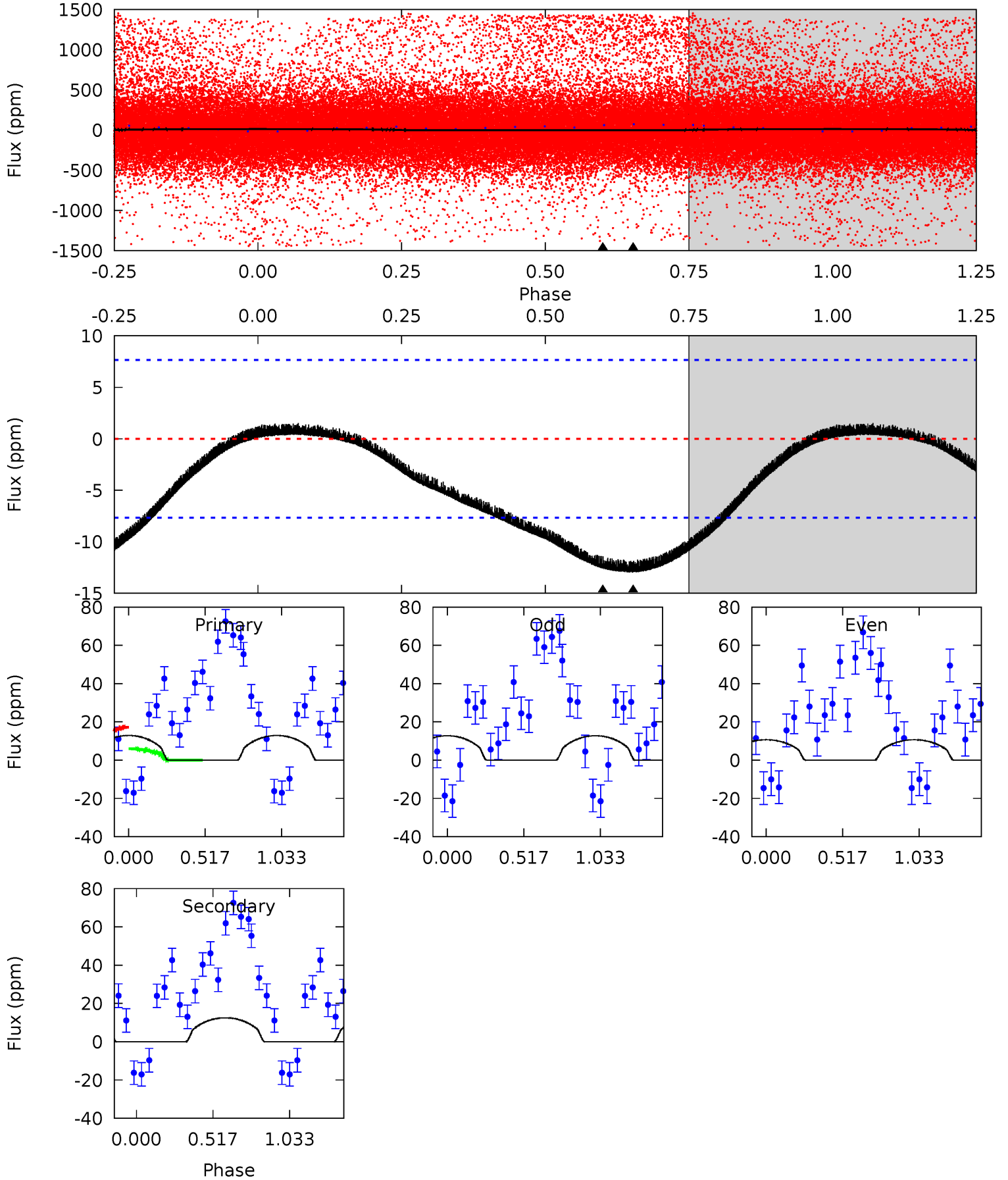
TCE 007020182-02   P= 0.547962 Days    $T_0=131.559774$  (BKJD)



# DV Model-Shift Uniqueness Test

007020182-02, P = 0.547333 Days, E = 131.461972 Days

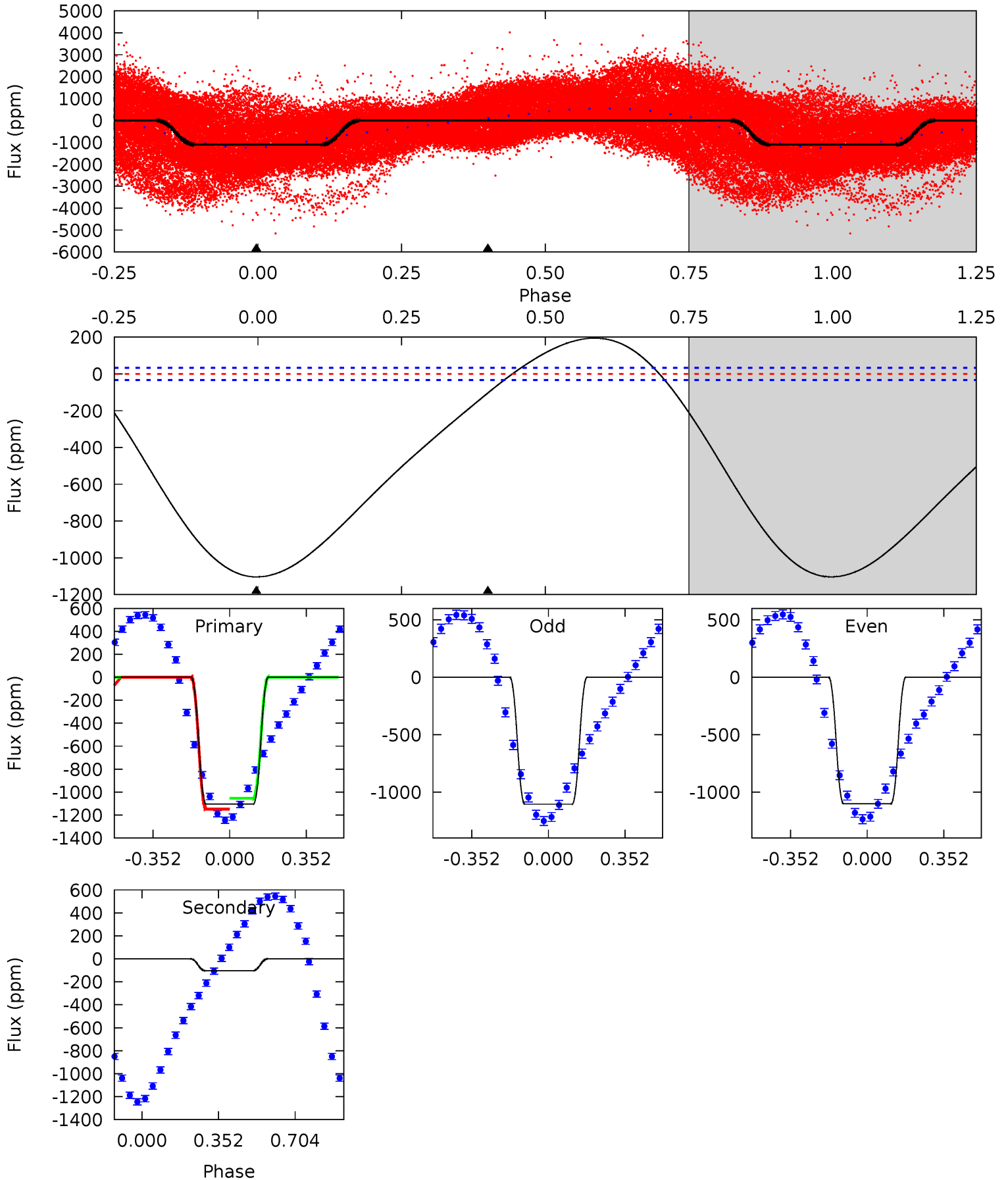
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
7.08	6.87	0	0	4.21	0.65	0.23	7.08	7.08	6.87	6.87	0.59	15.2	0.10	3.11



# Alt Model-Shift Uniqueness Test

007020182-02, P = 0.547962 Days, E = 131.011812 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
142.4	13.4	0	0	4.29	0.93	13.0	142.4	142.4	13.4	13.4	0.25	0.93	0.15	7.42



### Stellar Parameters For KIC 007020182

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$\rho_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5491^{+163}_{-147}$	$4.535^{+0.081}_{-0.099}$	$-0.540^{+0.300}_{-0.300}$	$0.766^{+0.115}_{-0.084}$	$0.734^{+0.103}_{-0.044}$	$2.300^{+0.778}_{-0.690}$
	+3%/-3%	+2%/-2%	+56%/-56%	+15%/-11%	+14%/-6%	+34%/-30%
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 007020182-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-13 \pm 2$	$0.41^{+0.38}_{-0.27}$	$2733^{+123}_{-117}$	$4723^{+3700}_{-1100}$	$5.737^{+47.382}_{-4.207}$
Alt.	$-104 \pm 8$	$3.22^{+0.55}_{-0.50}$	$2742^{+114}_{-109}$	$3138^{+222}_{-236}$	$0.790^{+0.293}_{-0.220}$

$T_{\text{max}}$  = 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

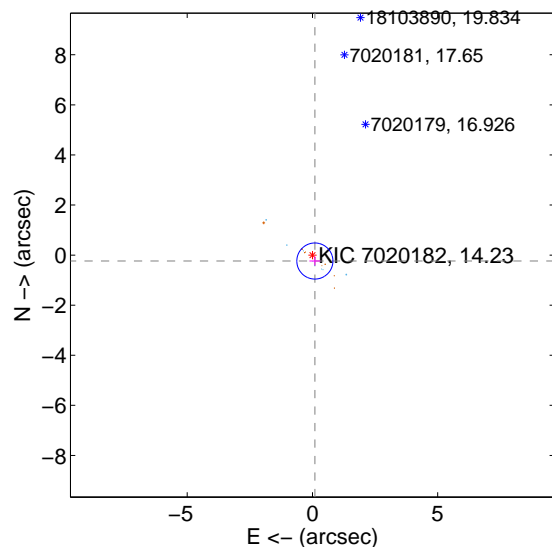
Supplemental centroid analysis for 007020182-02. Kepler magnitude: 14.23. Transit SNR 2.91

There are 8 quarters with good PRF difference image offsets

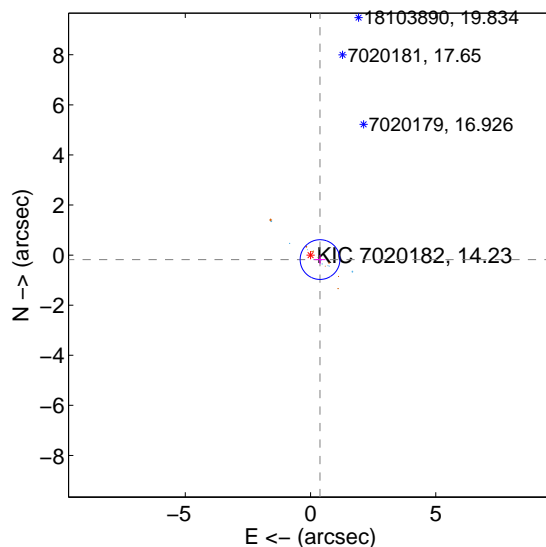
The direct PRF centroid is offset from the target star catalog position by about 0.27 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.256 \pm 0.240$	1.06	$-0.097 \pm 0.217$	$-0.236 \pm 0.179$
PRF-fit source offset from KIC position	$0.419 \pm 0.264$	1.59	$-0.379 \pm 0.218$	$-0.179 \pm 0.179$
photometric centroid source offset	$0.97 \pm 2.36$	0.41	$0.94 \pm 2.37$	$0.25 \pm 2.26$

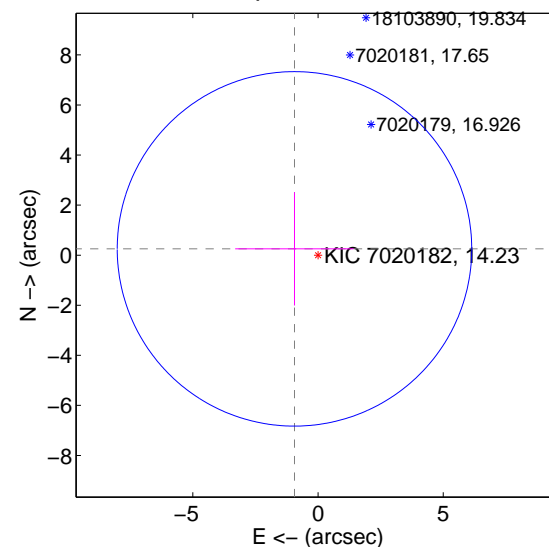
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

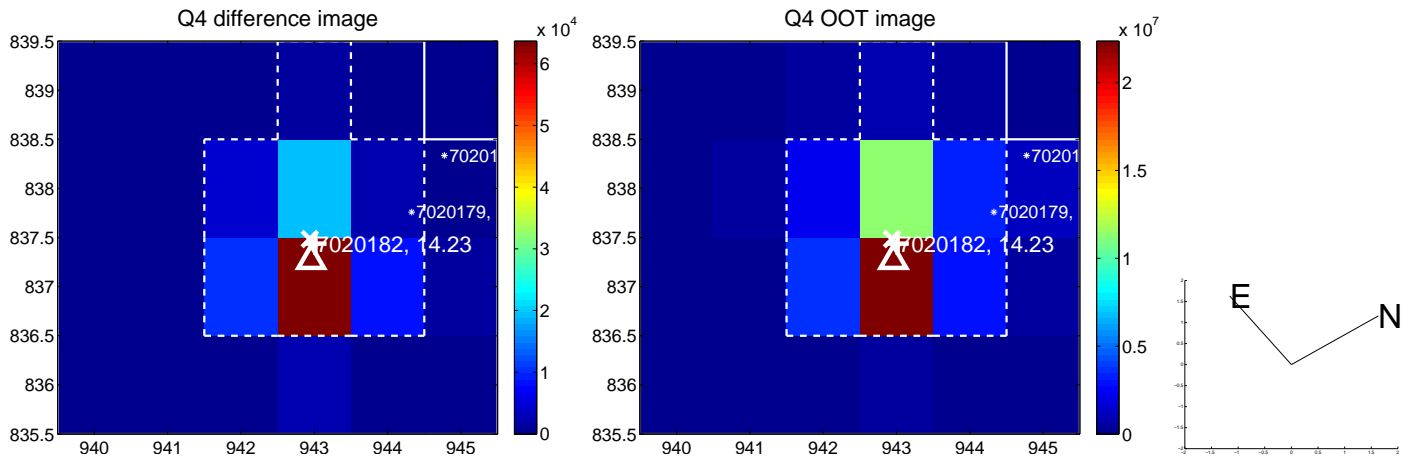
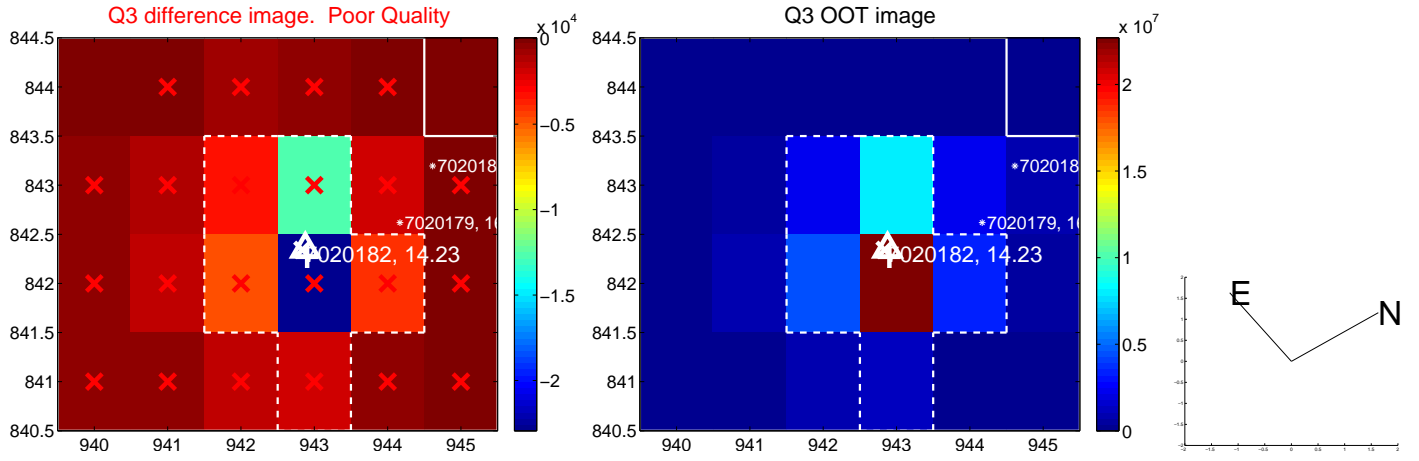
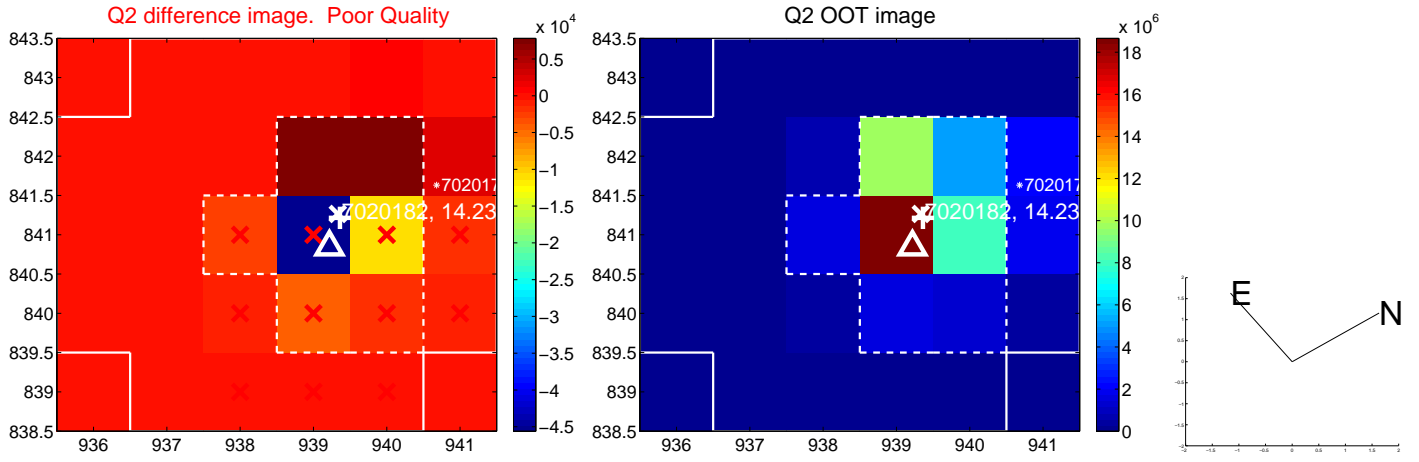
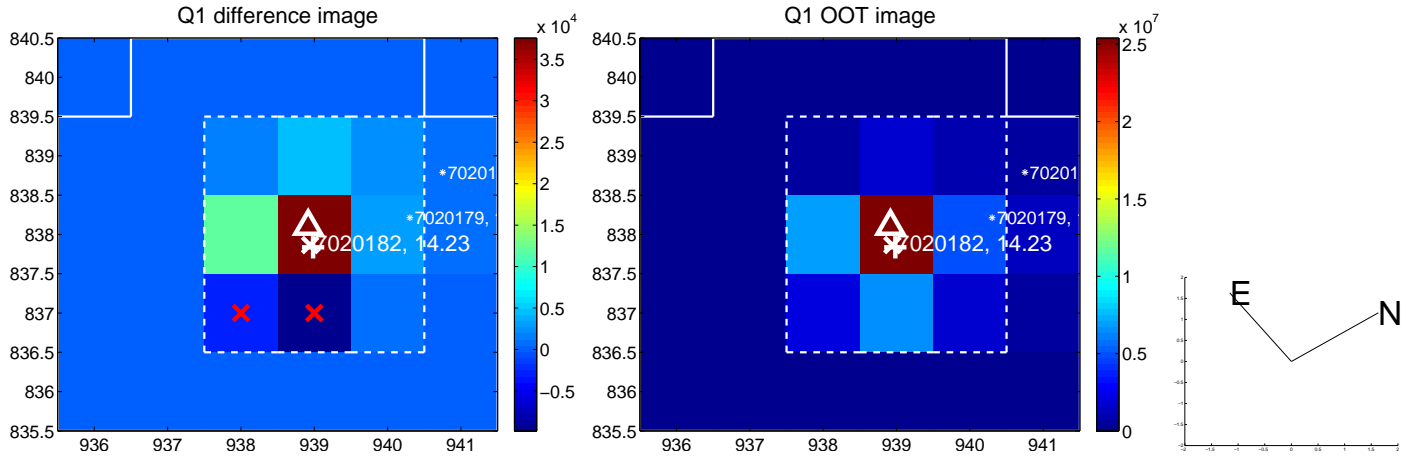


offset from photometric centroids

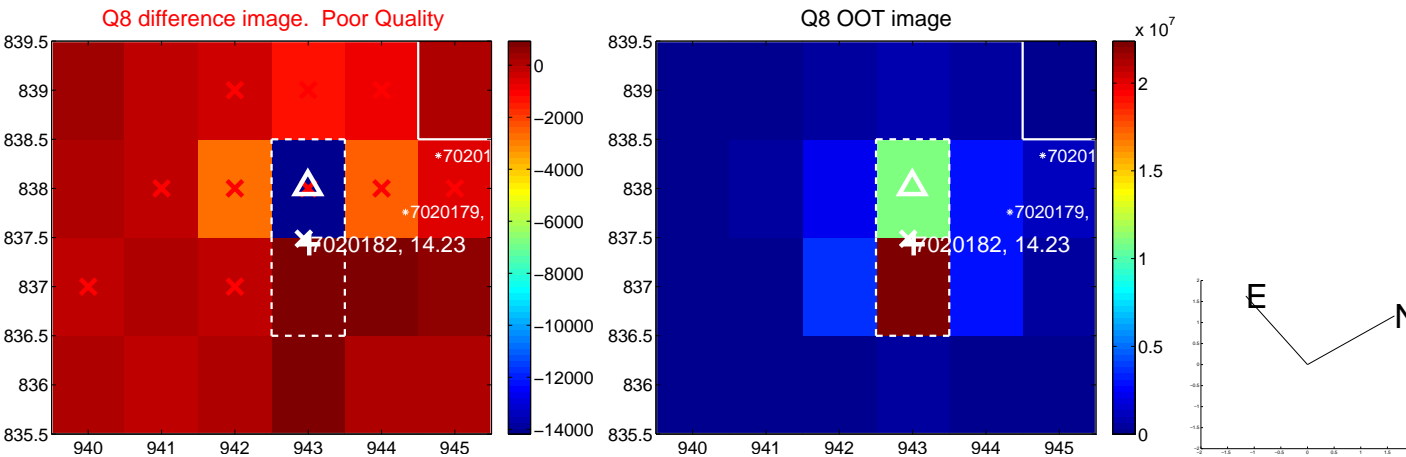
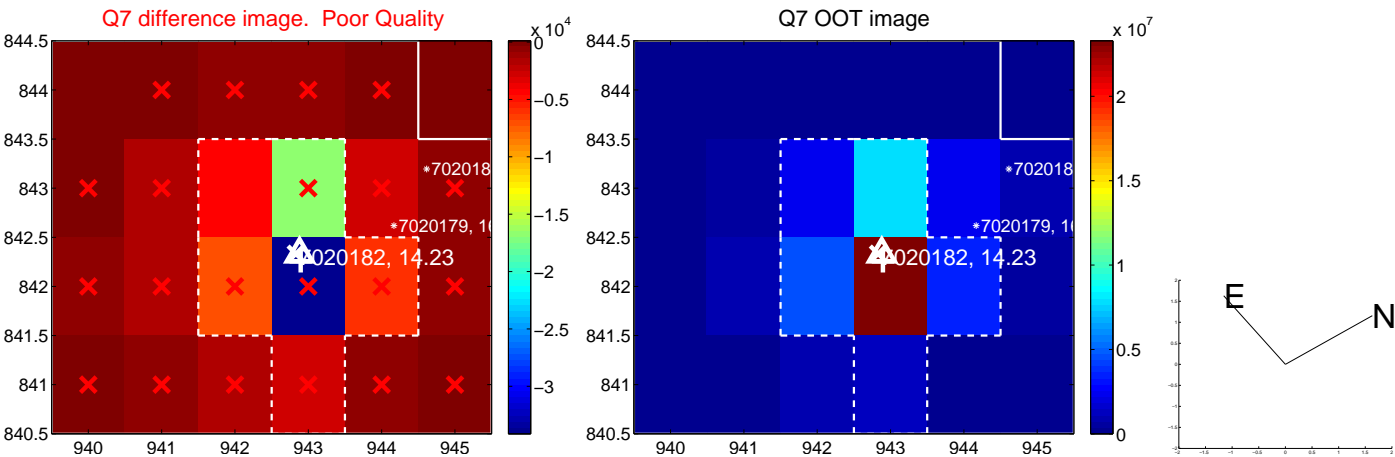
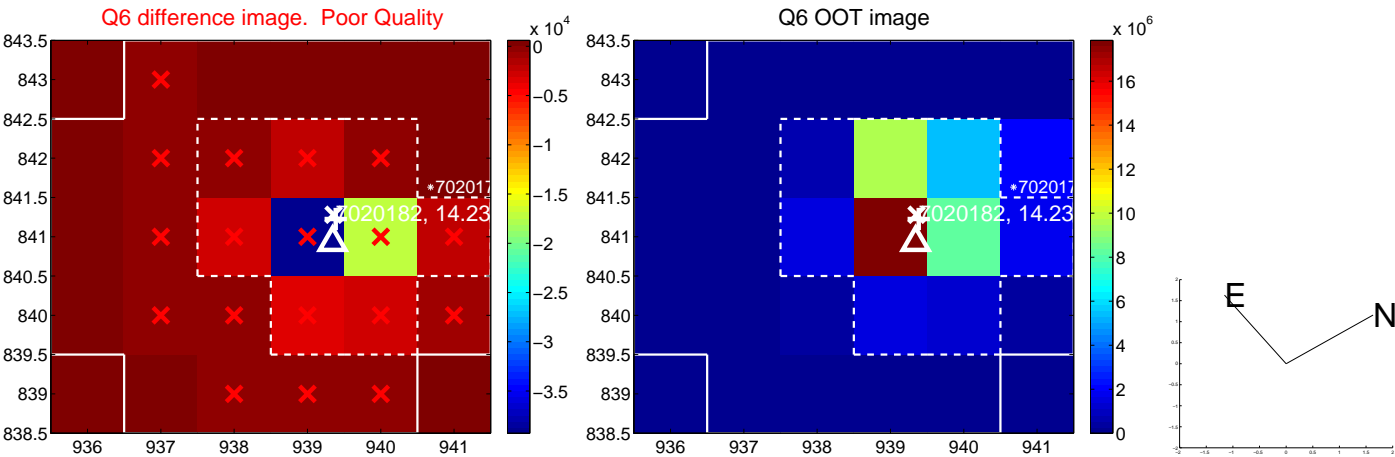
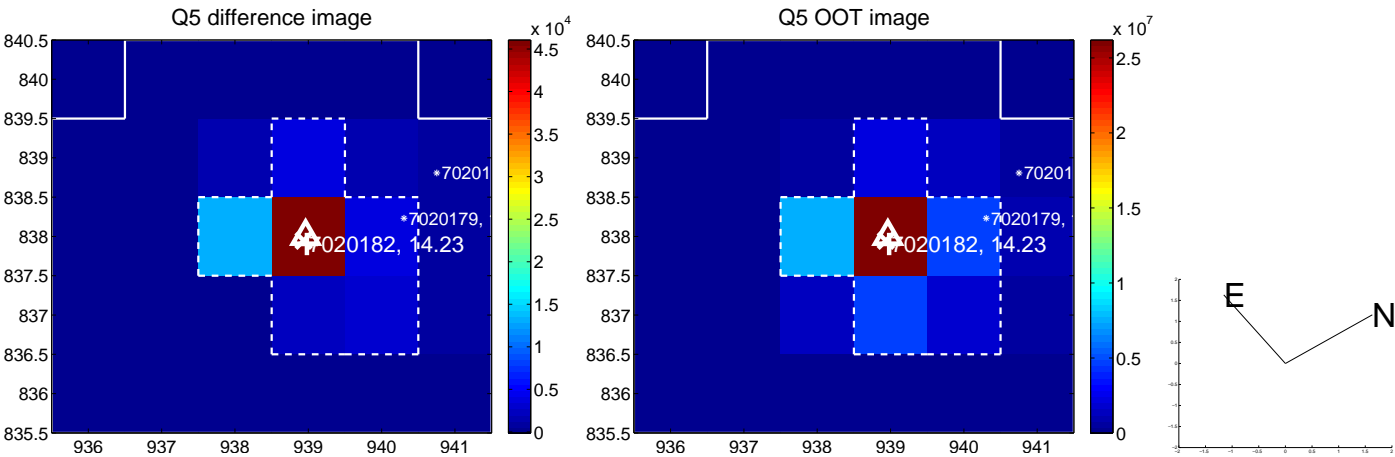


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets**; **Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

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

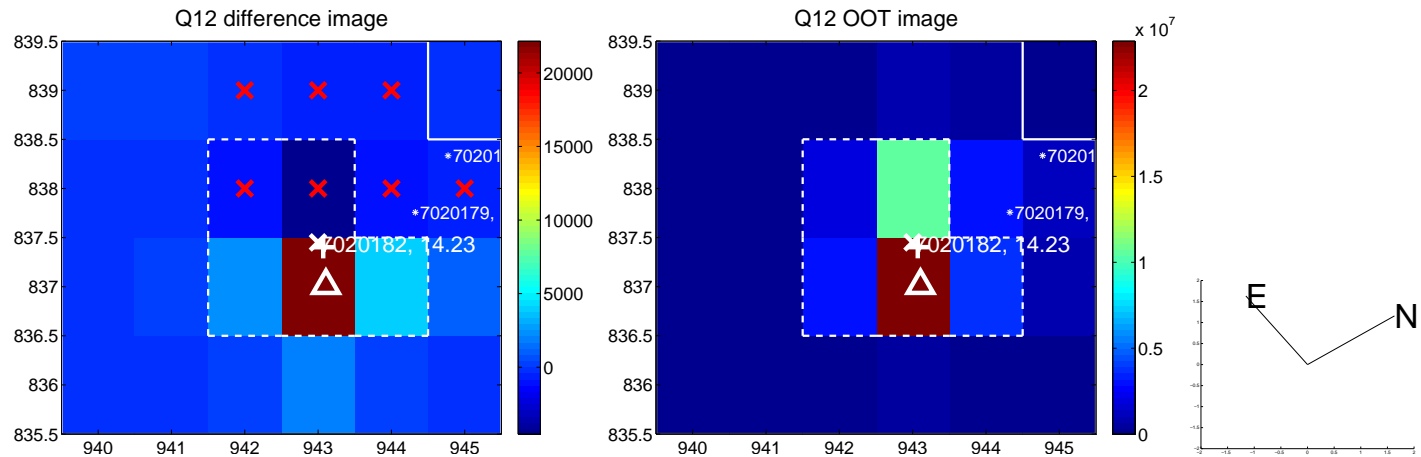
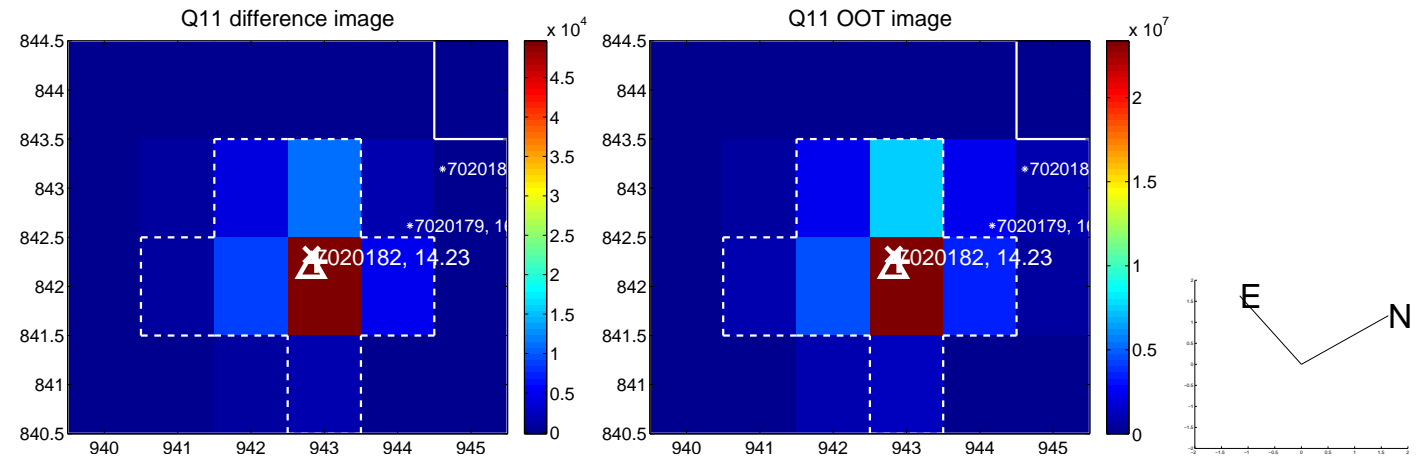
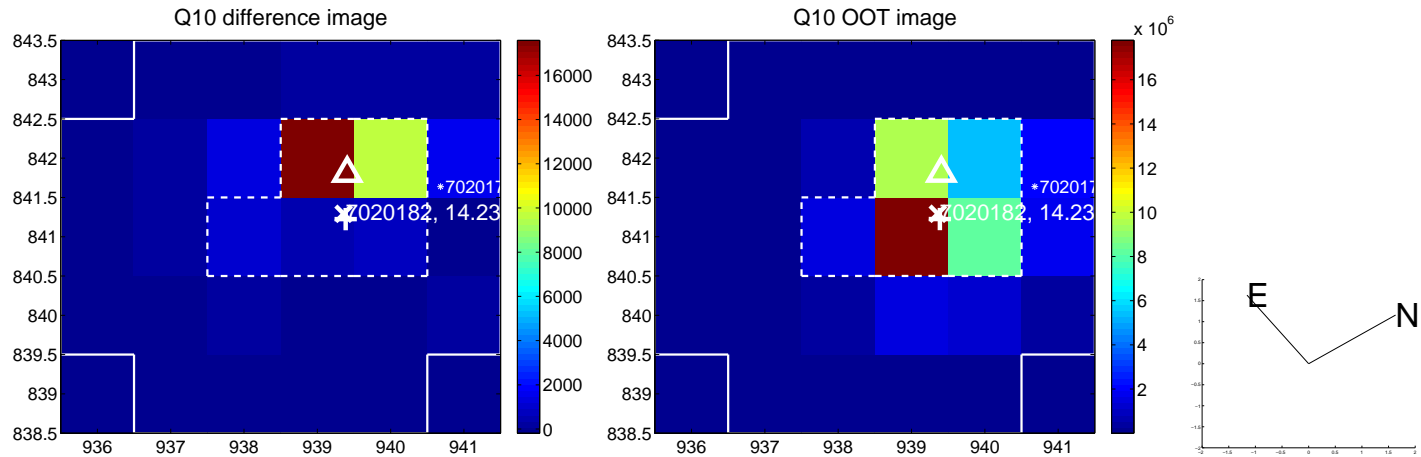
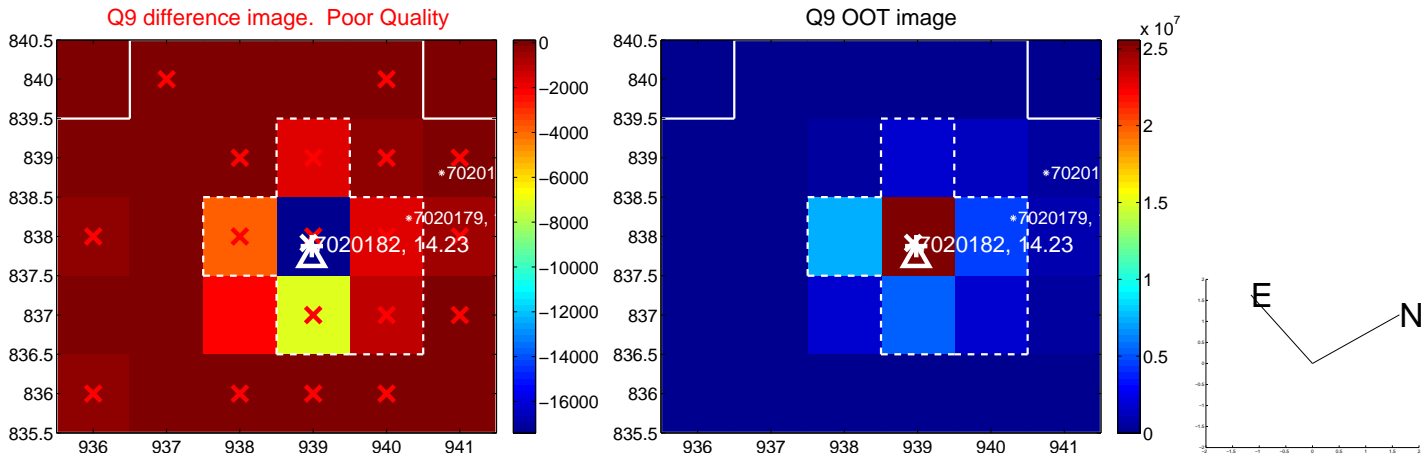


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

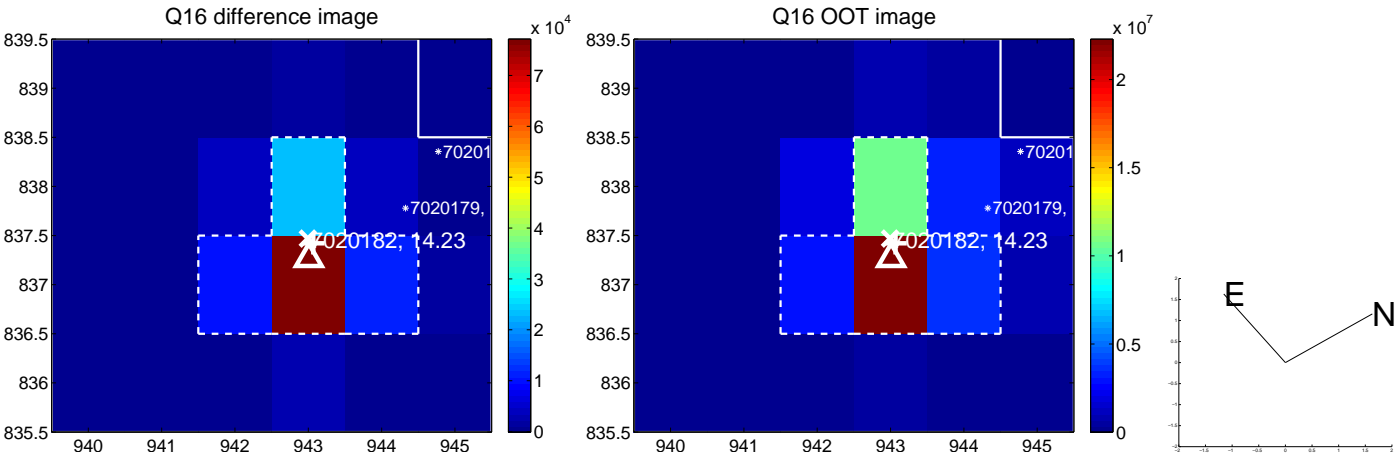
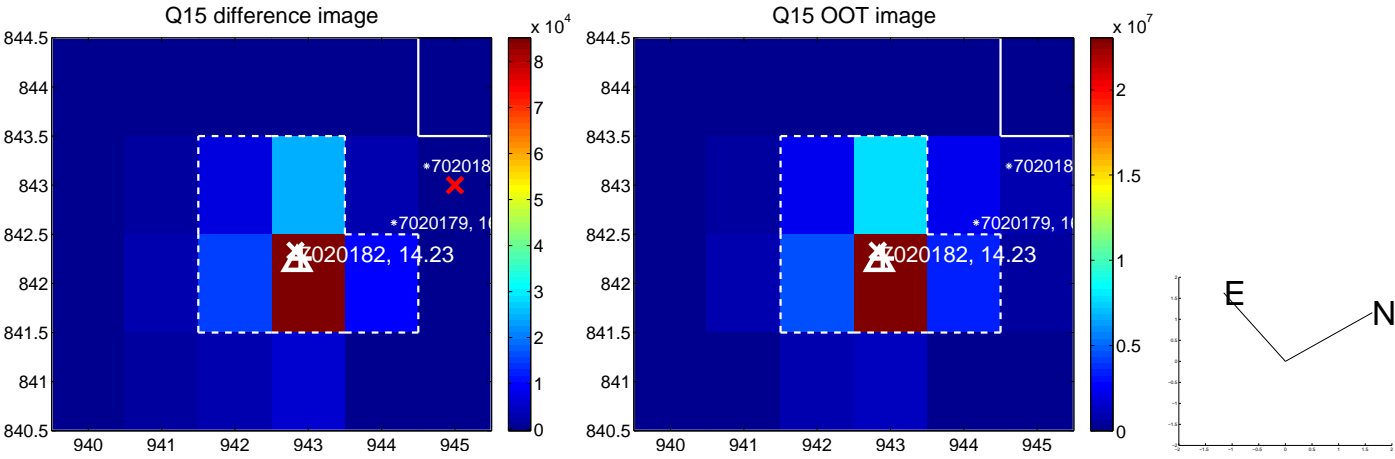
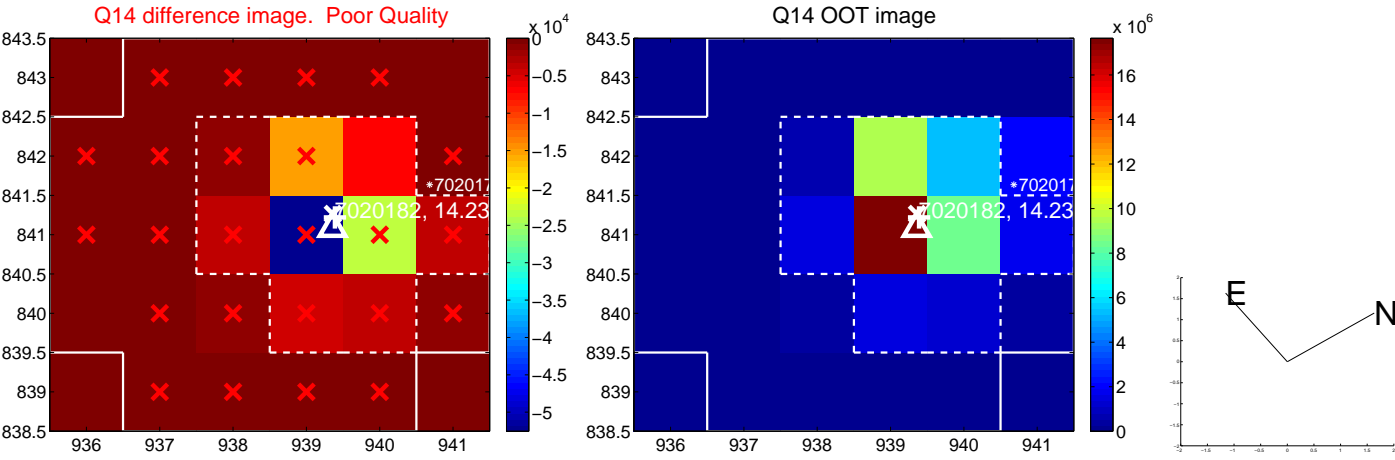
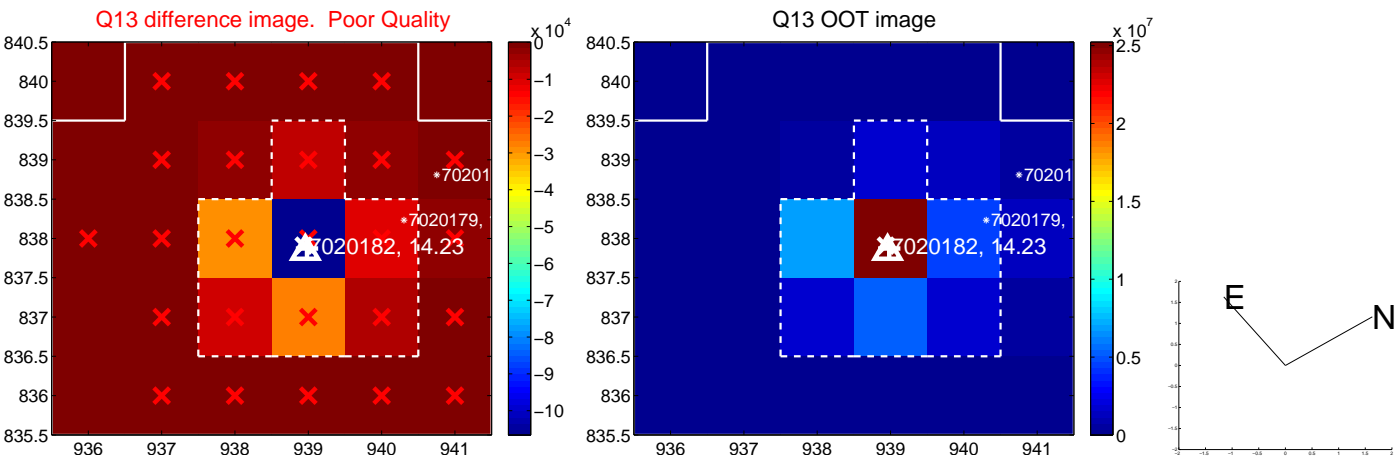




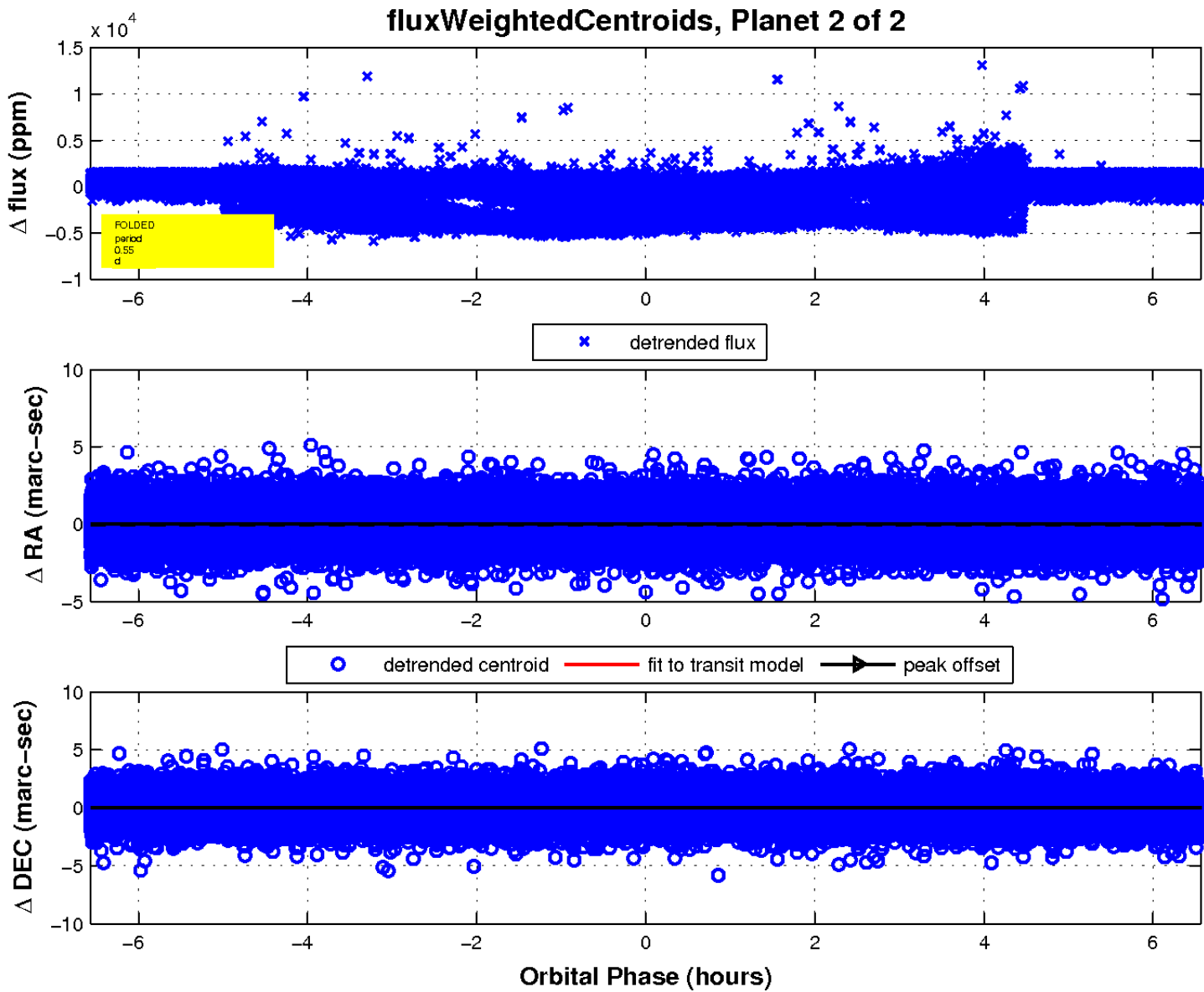
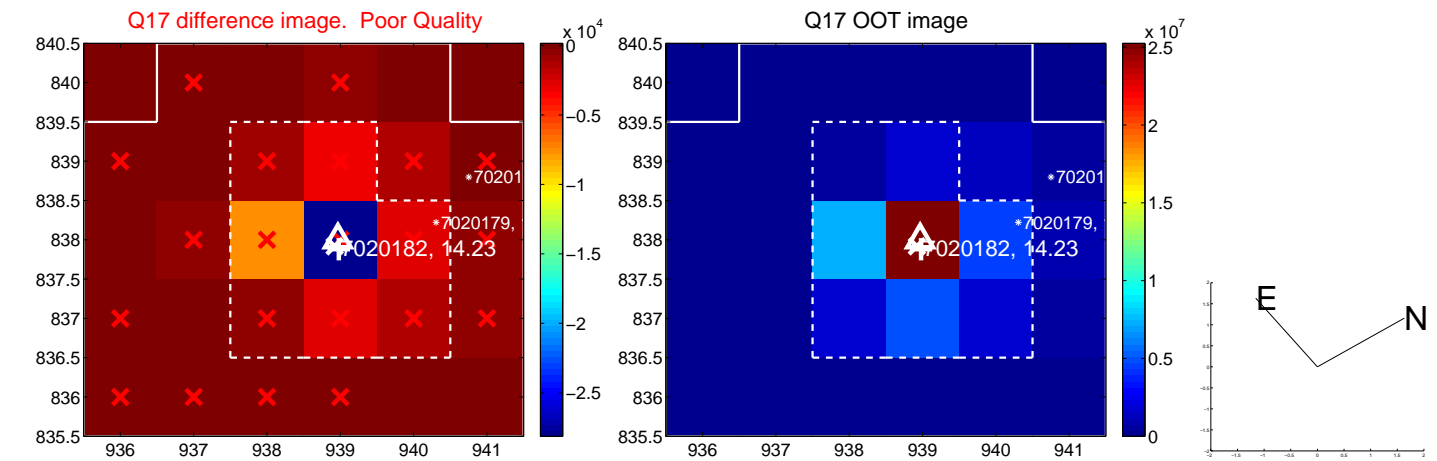
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

