

# KIC 006777016

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
006777016-01	OBS	No	0.629957	132.205974	9.7	1.669	13.5	3.8	1.06	5708	0.36	5851.76
006777016-02	OBS	No	0.629294	132.428565	10.0	0.651	9.7	2.2	1.06	5708	0.57	5859.98

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
006777016-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—CENT_SATURATED
006777016-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE_ZUMA_TRACKER—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—CENT_SATURATED

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

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

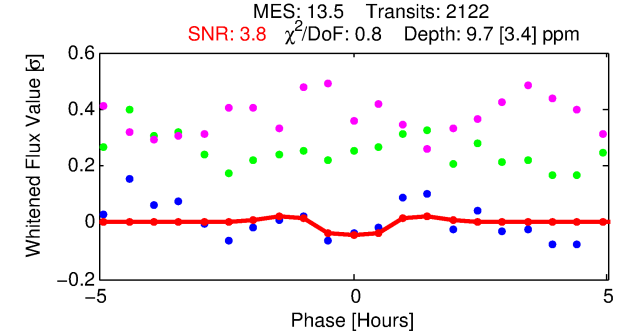
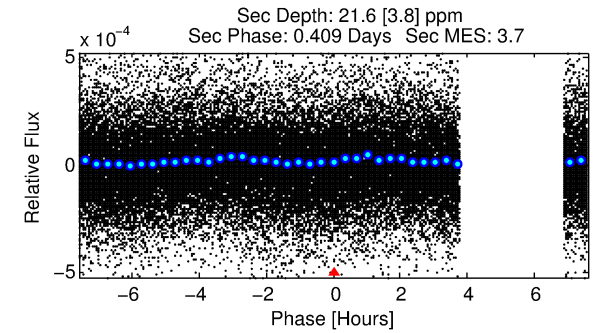
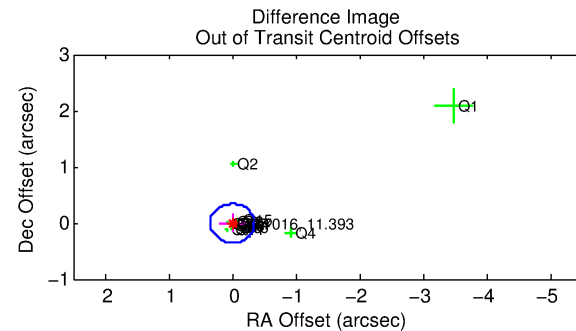
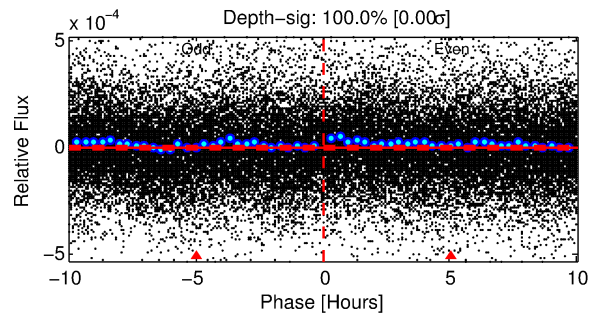
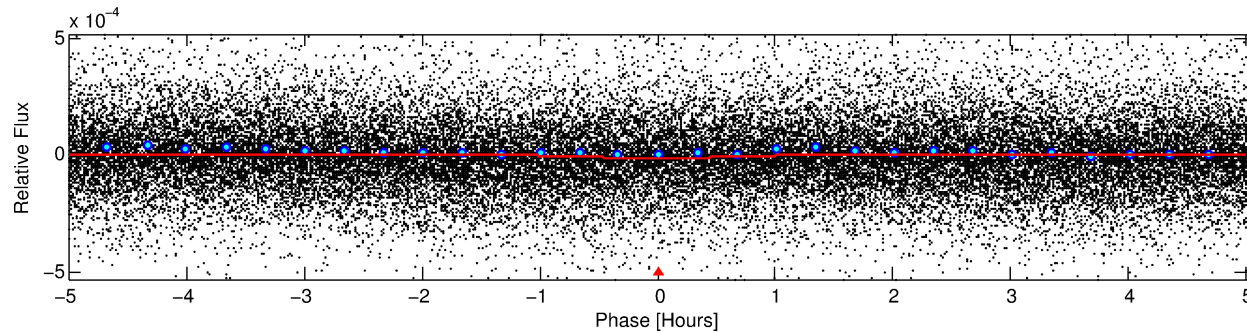
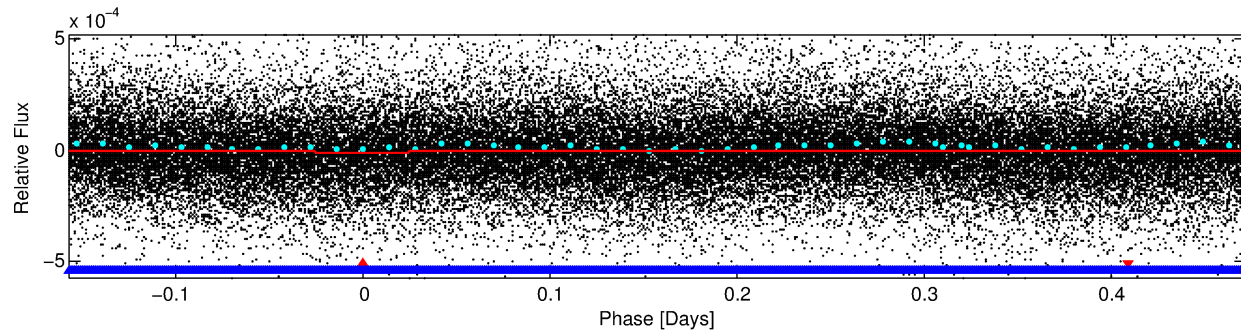
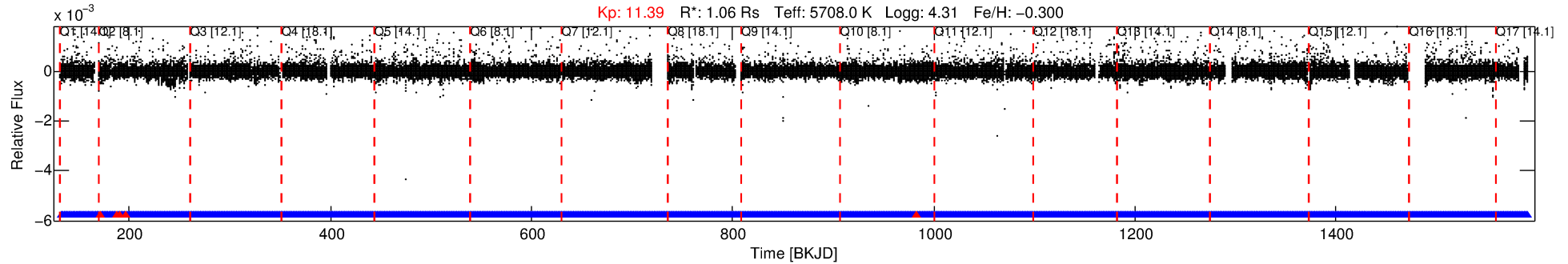
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 006777016-01

No Significant Match Found

# DV One-Page Summary

KIC: 6777016 Candidate: 1 of 2 Period: 0.630 d



## DV Fit Results:

Period = 0.62996 [0.00002] d  
Epoch = 132.2060 [0.0040] BKJD  
Rp/R\* = 0.0031 [0.0009]  
a/R\* = 2.16 [1.93]  
b = 0.73 [0.74]  
Seff = 5851.75 [2524.39]  
Teq = 2230 [241] K  
Rp = 0.36 [0.15] Re  
a = 0.0135 [0.0037] AU  
Ag = 17.12 [12.89] [1.25 $\sigma$ ]  
Teffp = 7014 [1131] K [4.14 $\sigma$ ]

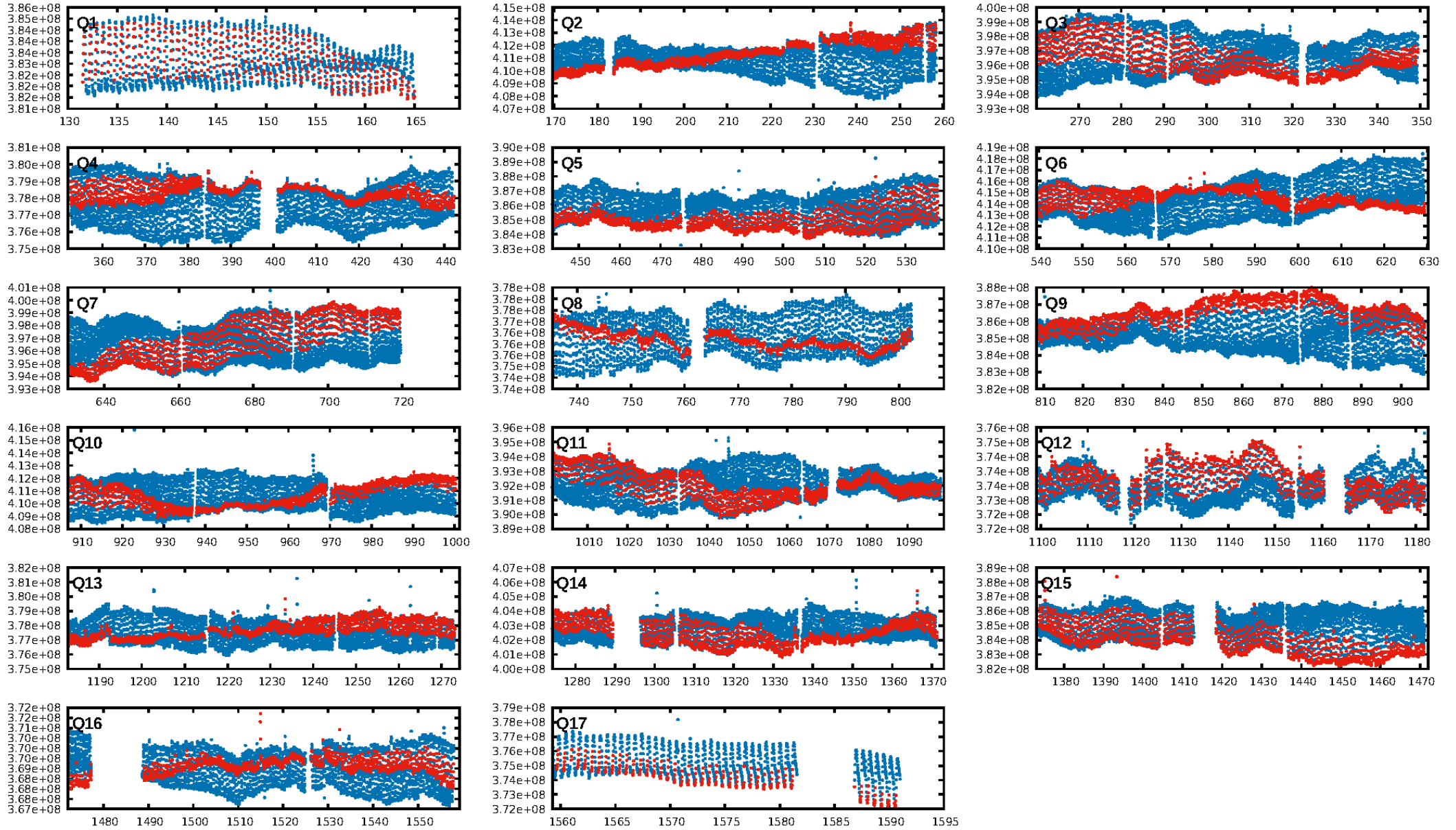
## DV Diagnostic Results:

ShortPeriod-sig: 0.7% [0.01 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 1.32e-37  
RollingBand-fgt: 1.00 [2022/2027]  
**GhostDiagnostic-chr: 0.3387**  
Centroid-sig: 1.5%  
Centroid-so: 2.568 arcsec [1.92 $\sigma$ ]  
OotOffset-rm: 0.010 arcsec [0.09 $\sigma$ ]  
KicOffset-rm: 0.108 arcsec [0.47 $\sigma$ ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 0.53 [9/17]  
DiffImageOverlap-fno: 0.24 [4/17]

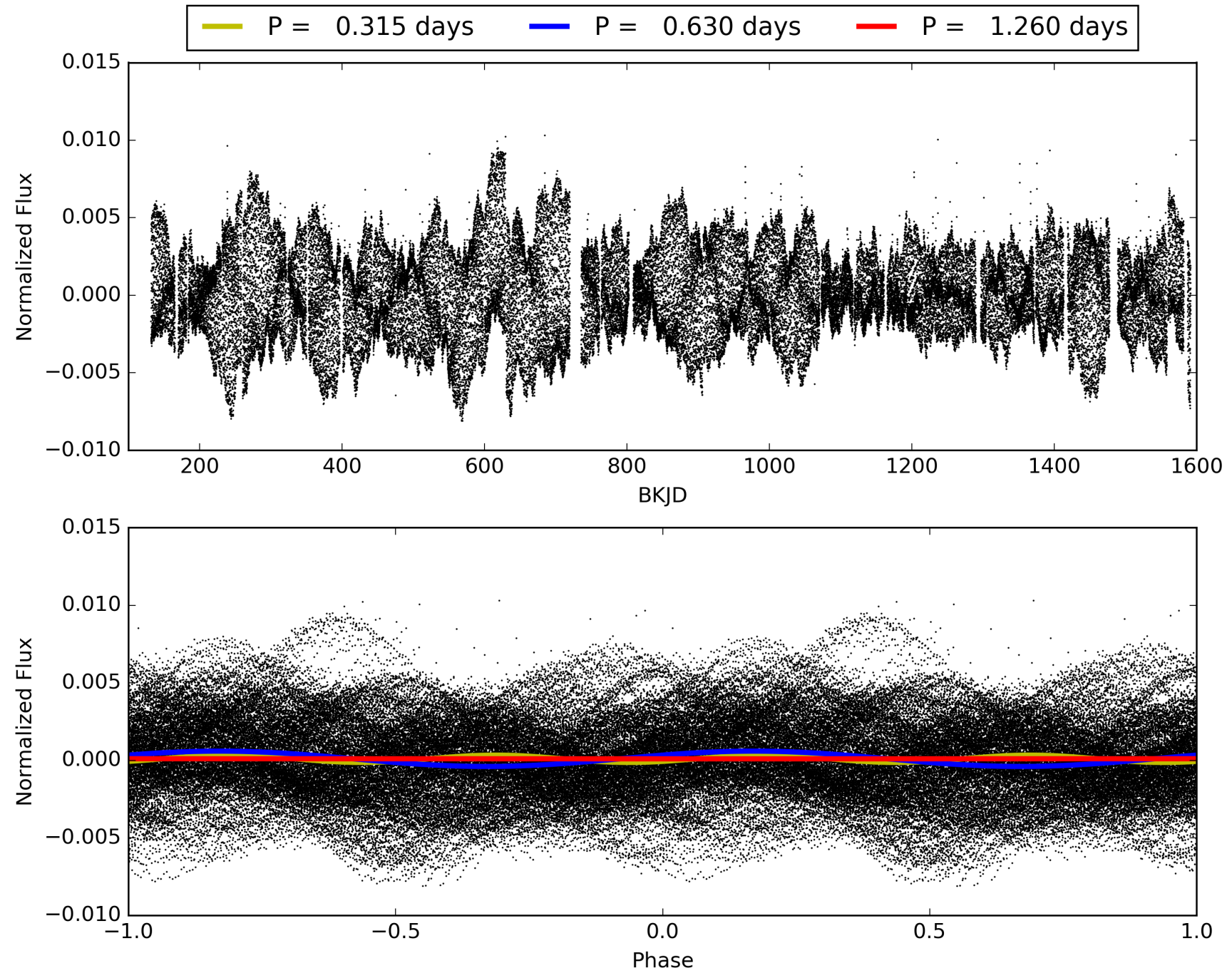
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 22:41:56 Z

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

# TCE 006777016-01, PDC Light Curves

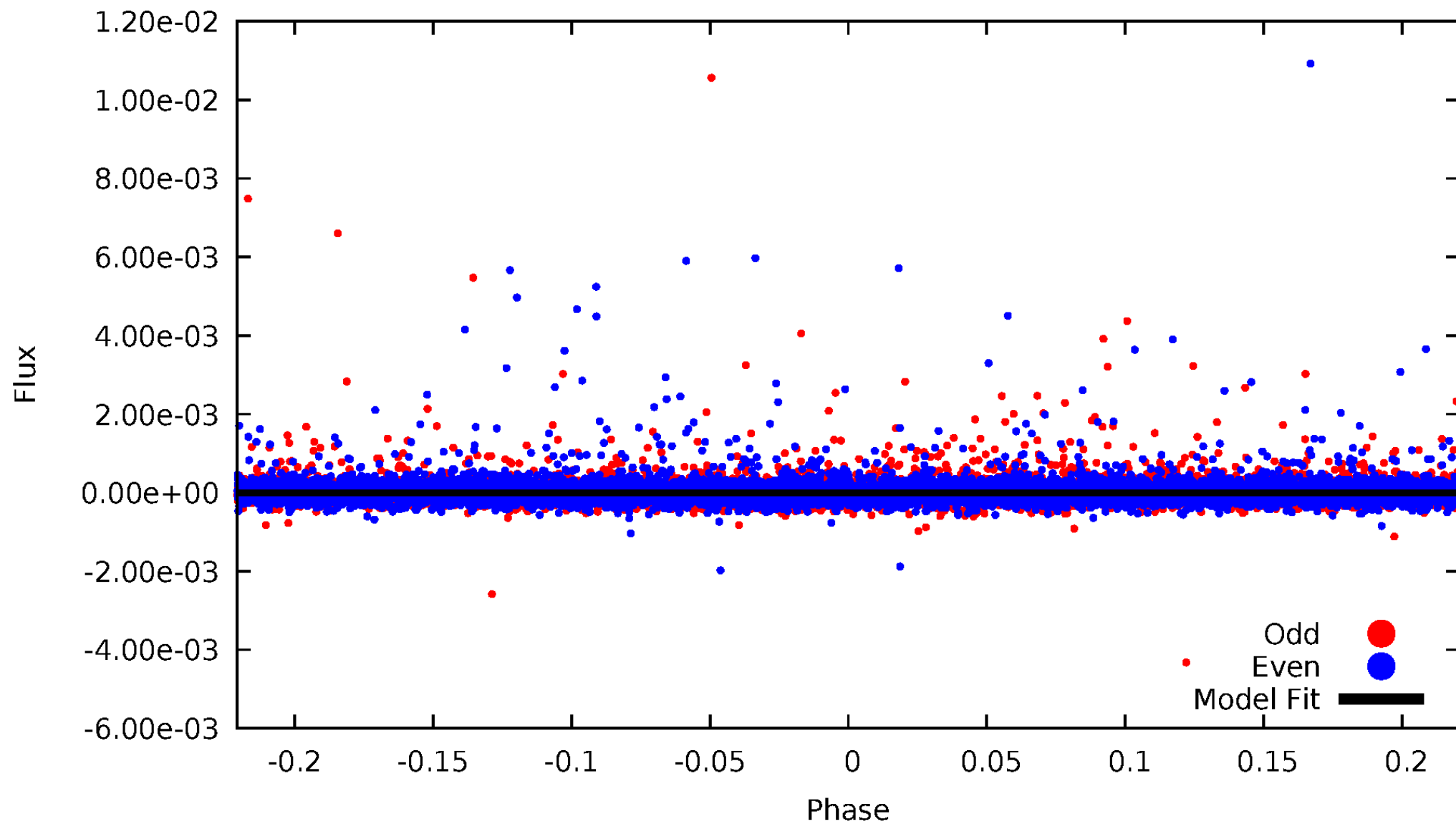


TCE 006777016-01



# DV Odd/Even

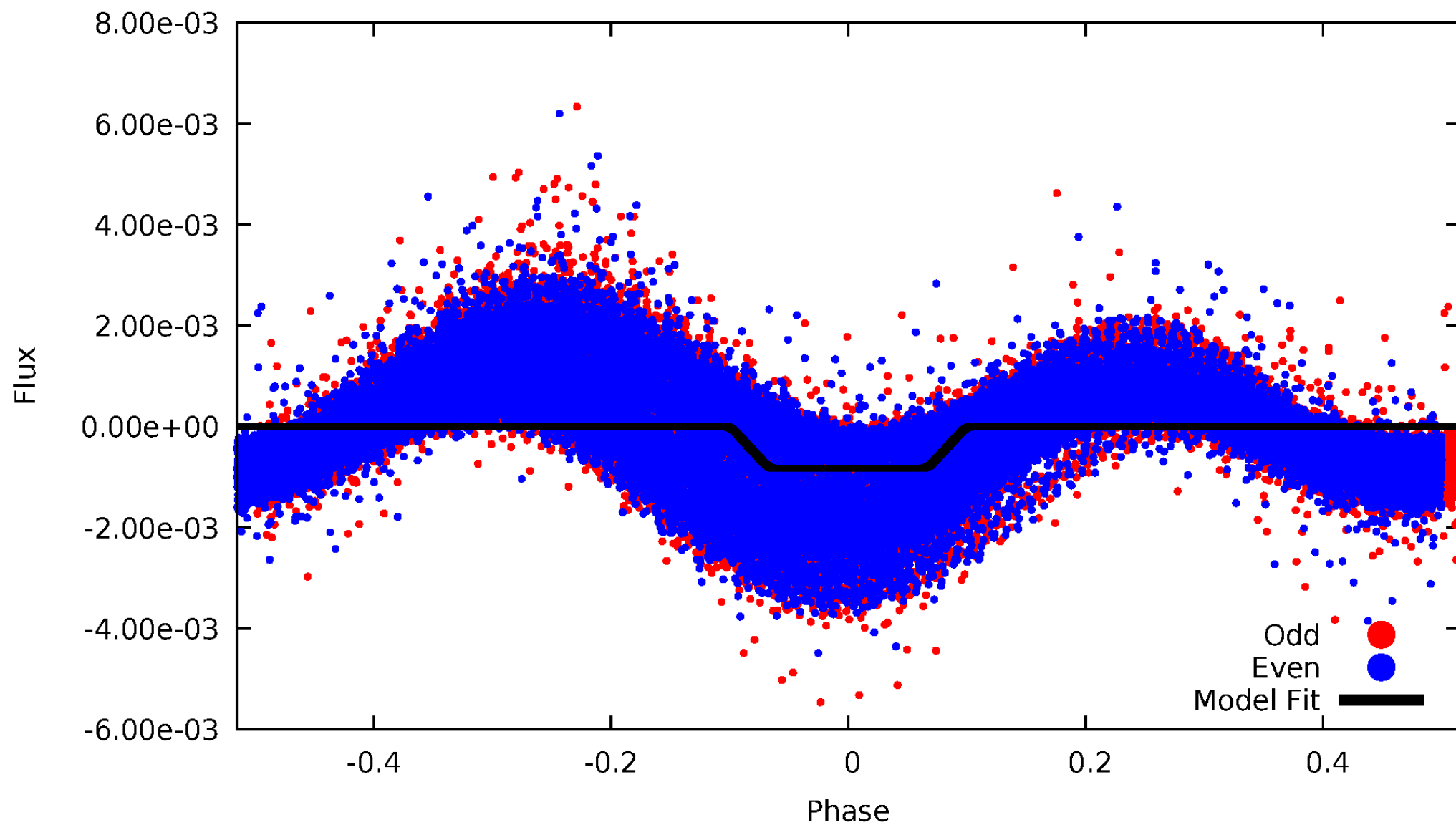
TCE 006777016-01





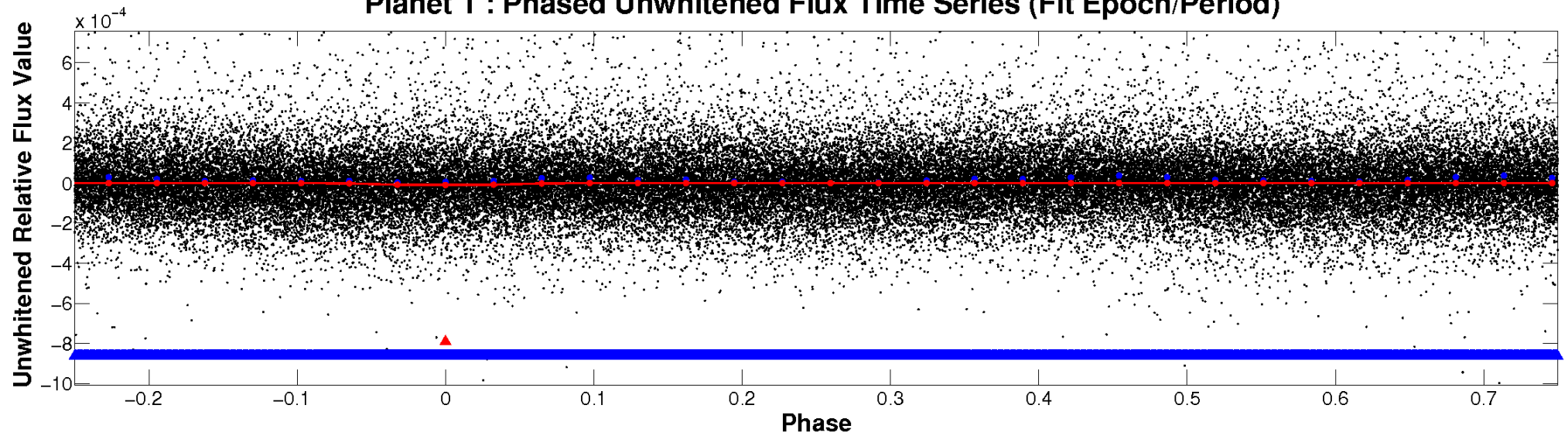
# ALT Odd/Even

TCE 006777016-01

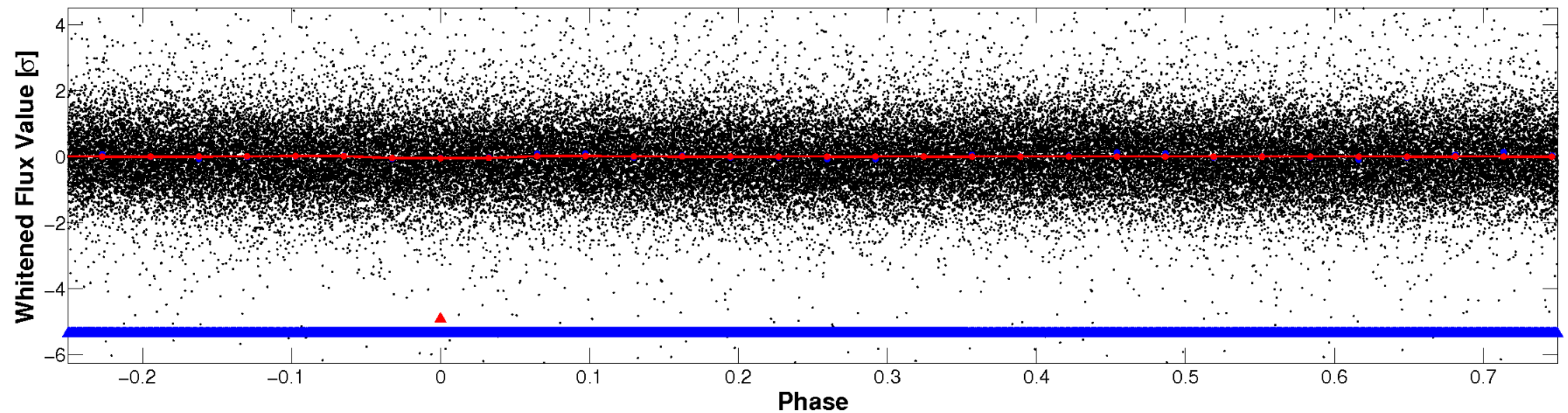


# Non-Whitened Vs. Whitened Light Curve

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

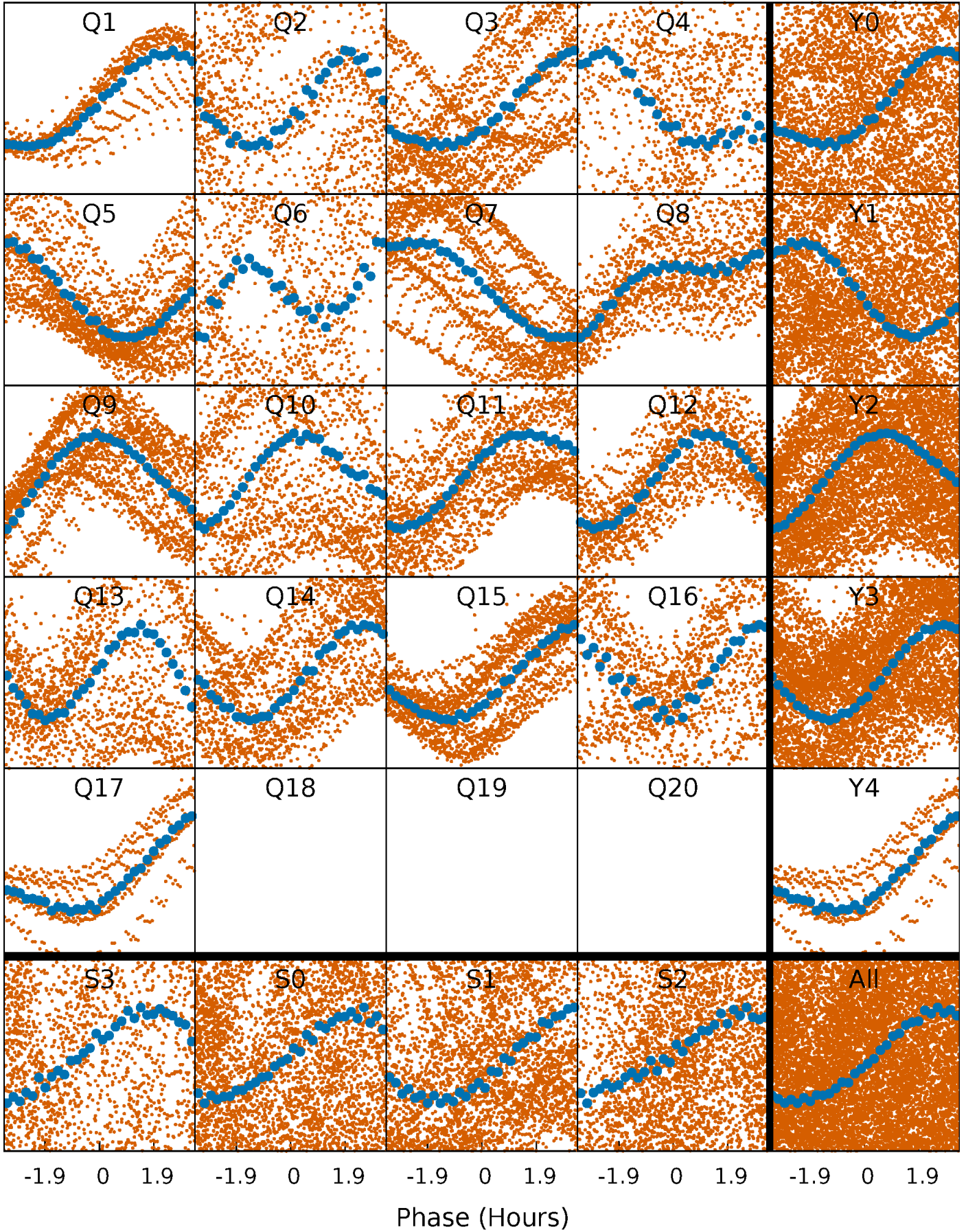


**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

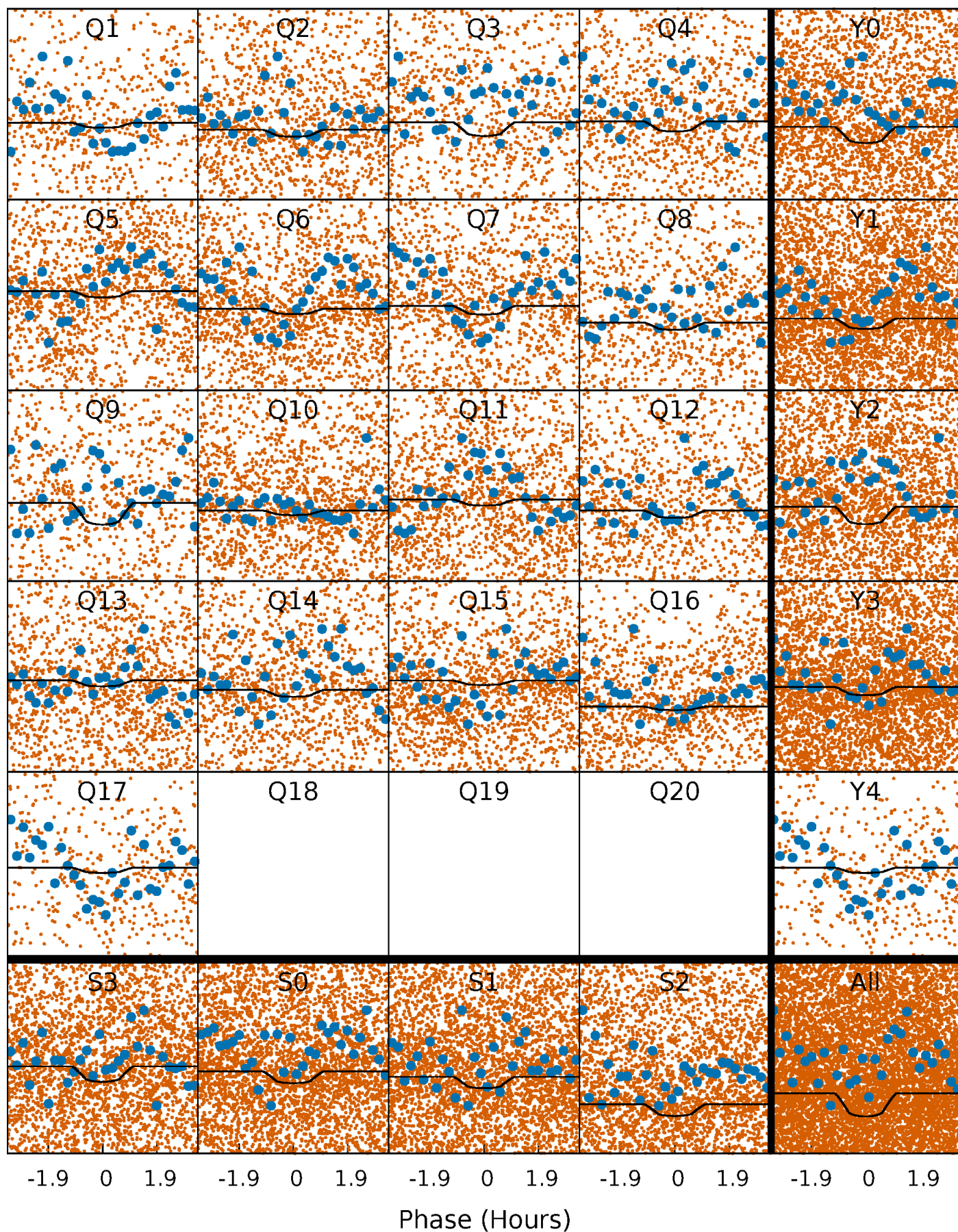
TCE 006777016-01   P= 0.629957 Days    $T_0=132.205974$  (BKJD)





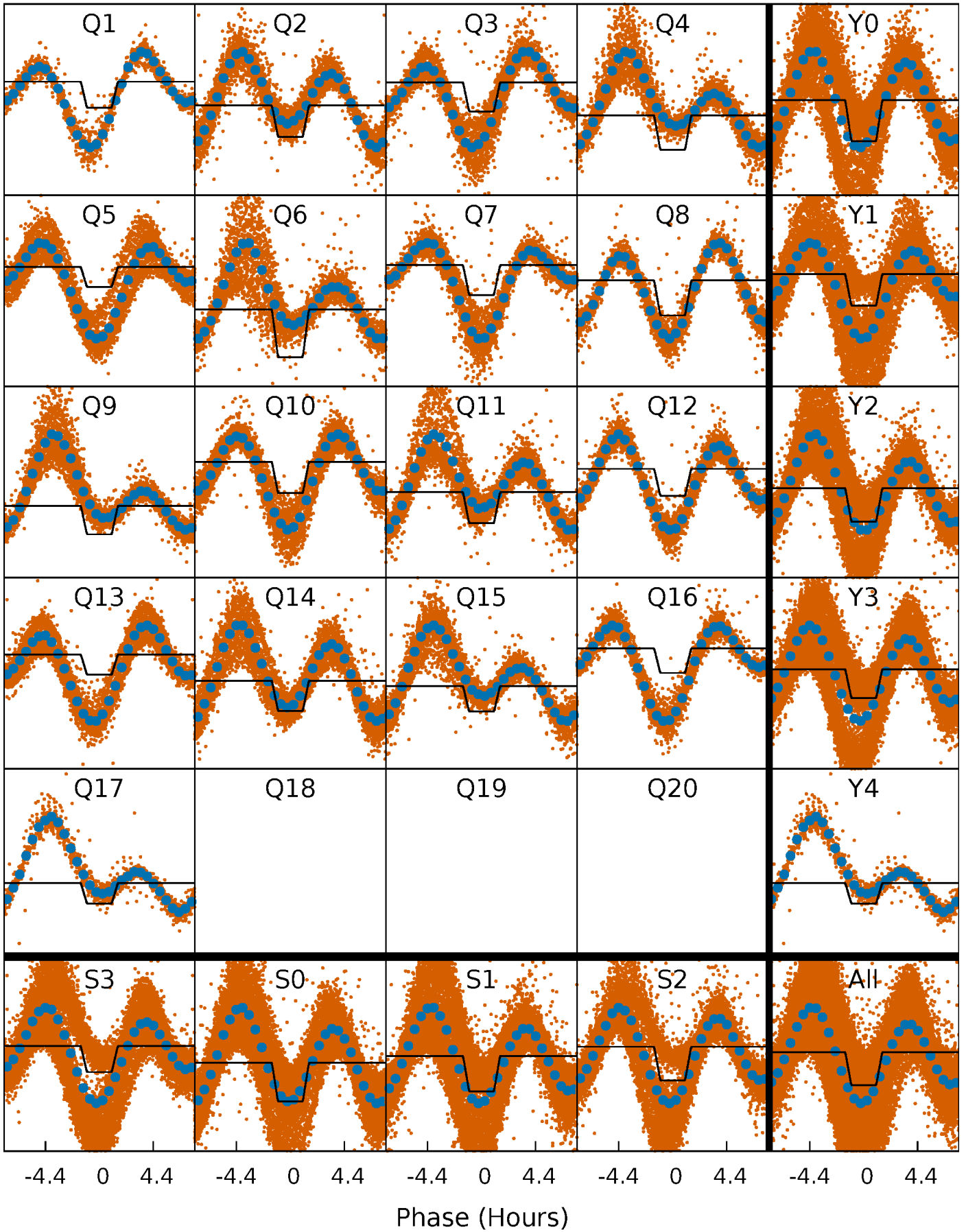
# DV Quarter-Phased Transit Curves

TCE 006777016-01 P= 0.629957 Days  $T_0=132.205974$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

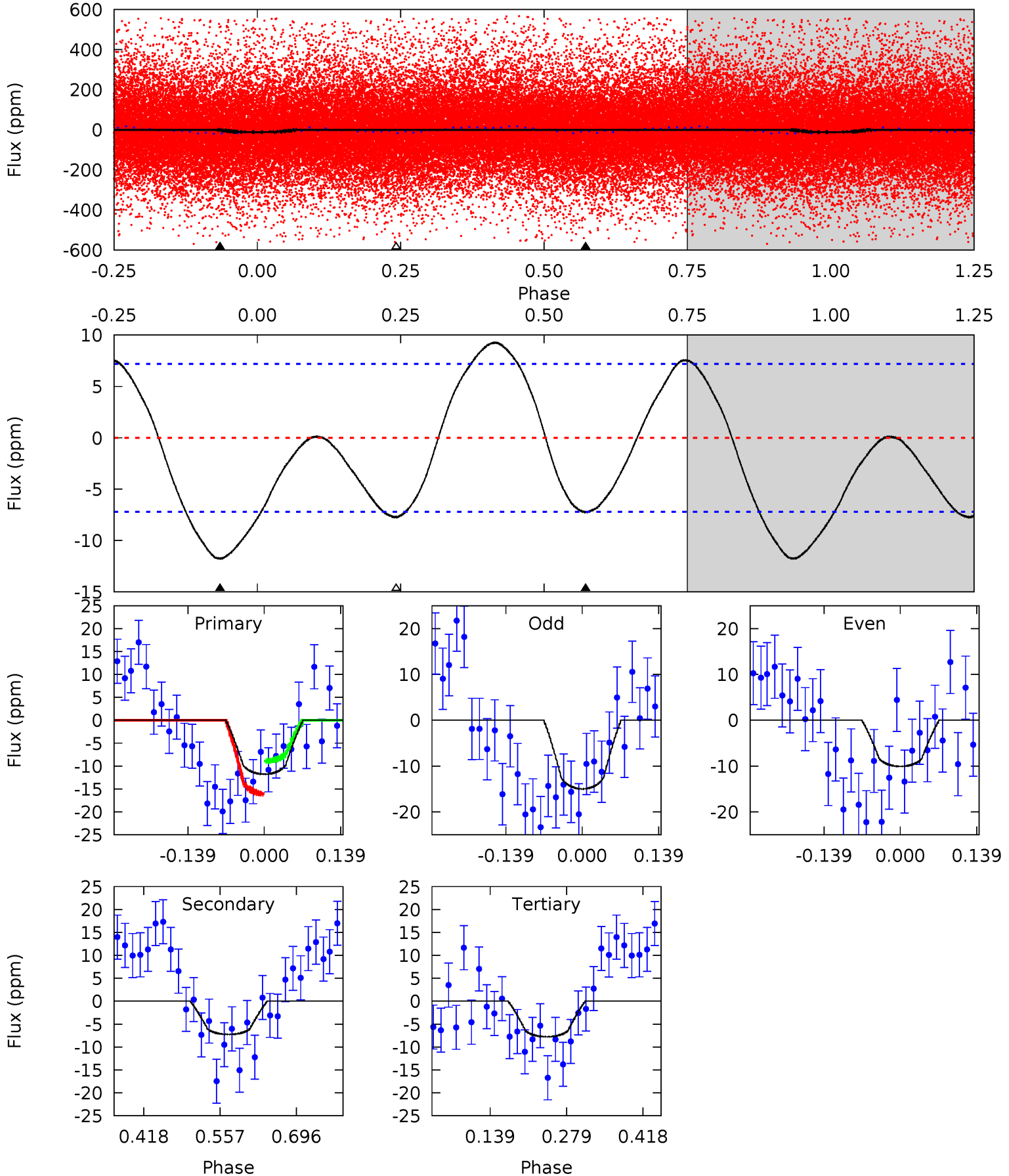
TCE 006777016-01 P= 0.630129 Days  $T_0=132.158529$  (BKJD)



# DV Model-Shift Uniqueness Test

006777016-01, P = 0.629957 Days, E = 130.946060 Days

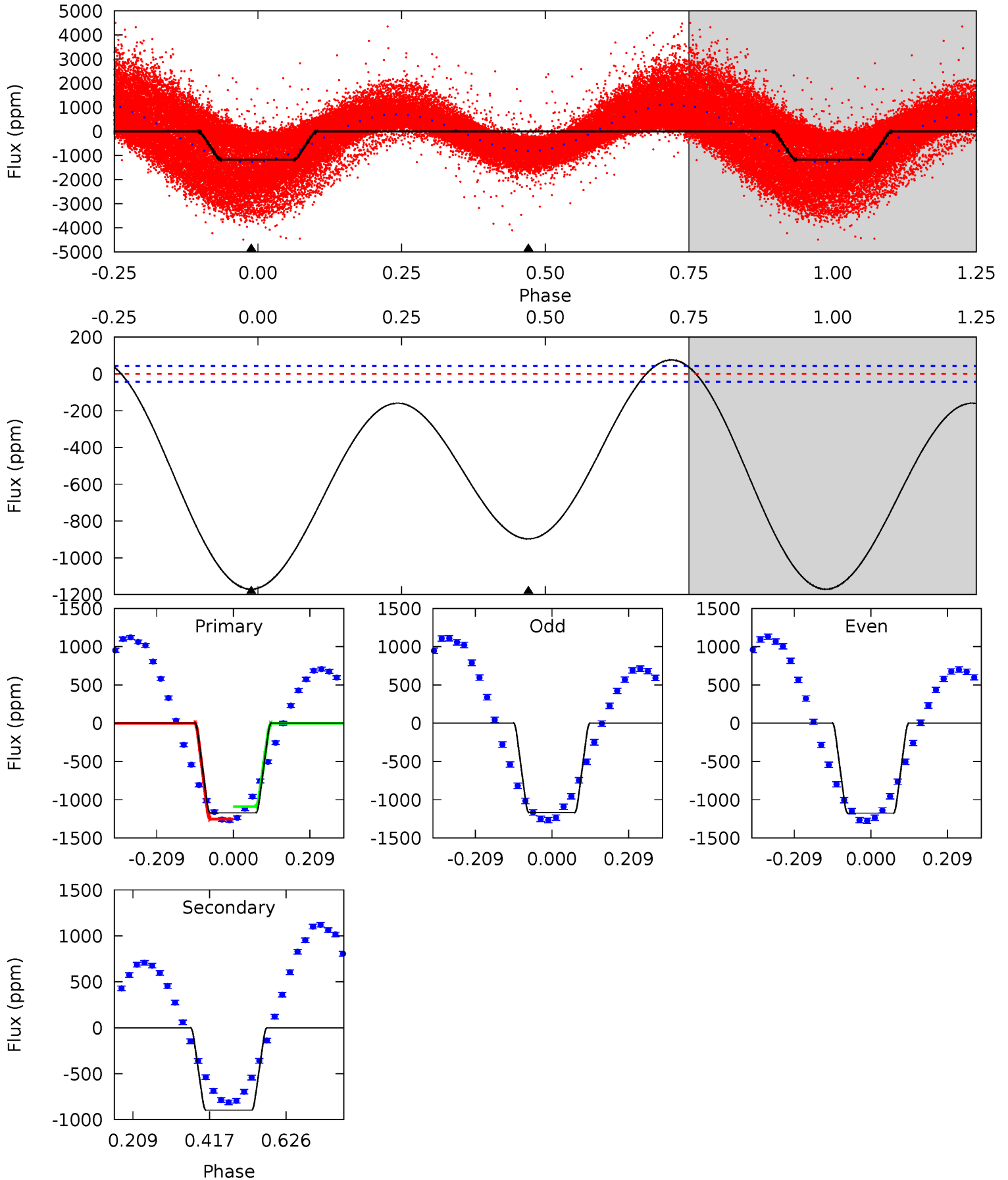
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
7.35	4.54	4.85	0	4.49	1.48	3.55	2.50	7.35	-0.31	4.54	1.54	-2.41	0.44	2.27



# Alt Model-Shift Uniqueness Test

006777016-01, P = 0.630129 Days, E = 130.898271 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
121.0	92.7	0	0	4.41	1.26	11.4	121.0	121.0	92.7	92.7	0.39	1.21	0.06	8.67





### Stellar Parameters For KIC 006777016

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5708^{+189}_{-172}$	$4.306^{+0.231}_{-0.210}$	$-0.300^{+0.300}_{-0.300}$	$1.060^{+0.329}_{-0.246}$	$0.829^{+0.130}_{-0.070}$	$0.981^{+1.081}_{-0.511}$
	+3%/-3%	+5%/-5%	+100%/-100%	+31%/-23%	+16%/-8%	+110%/-52%
Source	PHO54	PHO54	PHO54	DSEP		

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

### Secondary Eclipse Parameters for KIC 006777016-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-7 \pm 2$	$0.36^{+0.12}_{-0.12}$	$3117^{+253}_{-248}$	$5280^{+1042}_{-666}$	$5.729^{+7.214}_{-2.786}$
Alt.	$-897 \pm 10$	$3.35^{+0.58}_{-0.50}$	$3110^{+274}_{-249}$	$5771^{+233}_{-212}$	$8.176^{+3.071}_{-2.163}$

$T_{max}$  = Theoretical Maximum Planetary Temperature

$T_{obs}$  = Observed Planetary Temperature (Assuming  $A=0.3$ )

$A_{obs}$  = Observed Albedo (Assuming  $T=0$ )

If a secondary eclipse is present, the system is likely an EB if  $T_{obs} \gg T_{max}$  AND  $A_{obs} \gg 1.0$

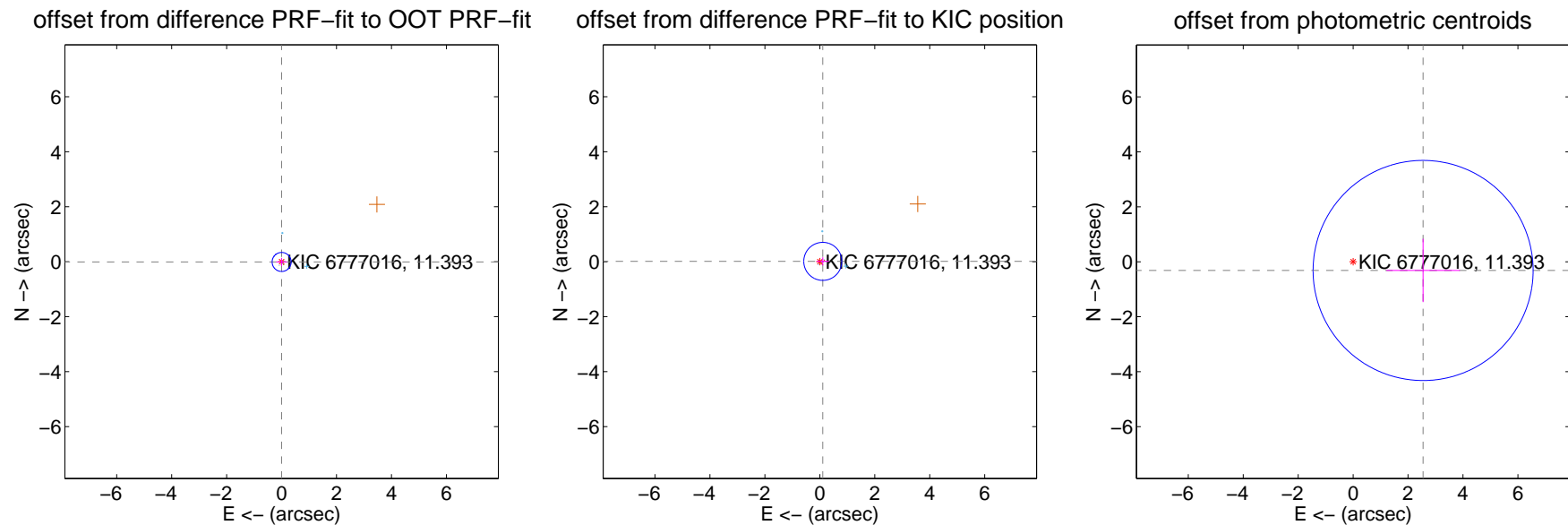
## DV Centroid Data

Supplemental centroid analysis for 006777016-01. **Kepler magnitude: 11.39.** Transit SNR 3.84

There are 9 quarters with good PRF difference image offsets

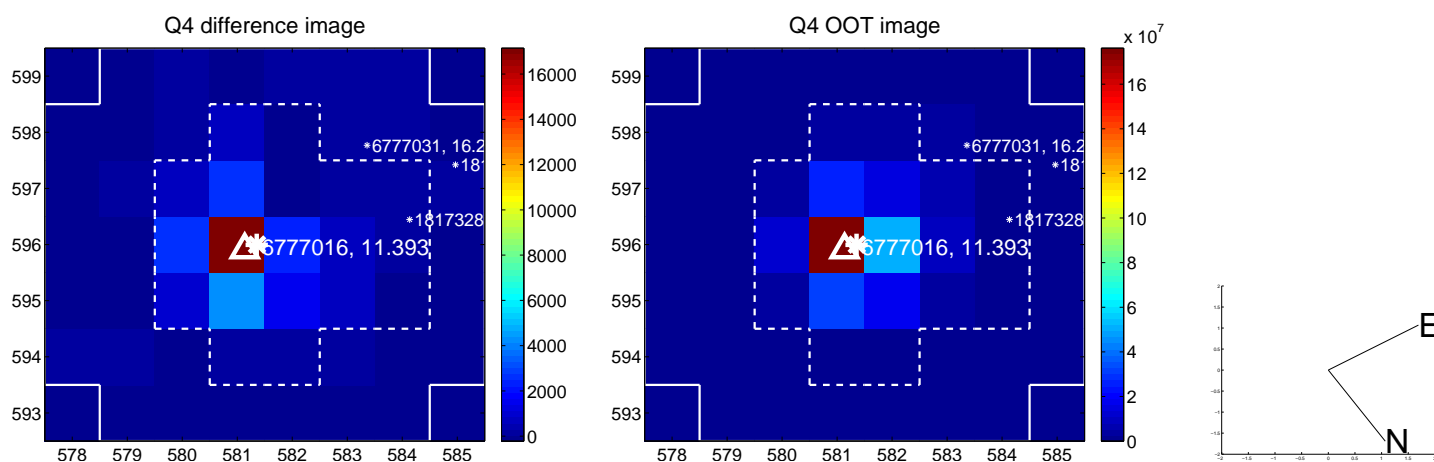
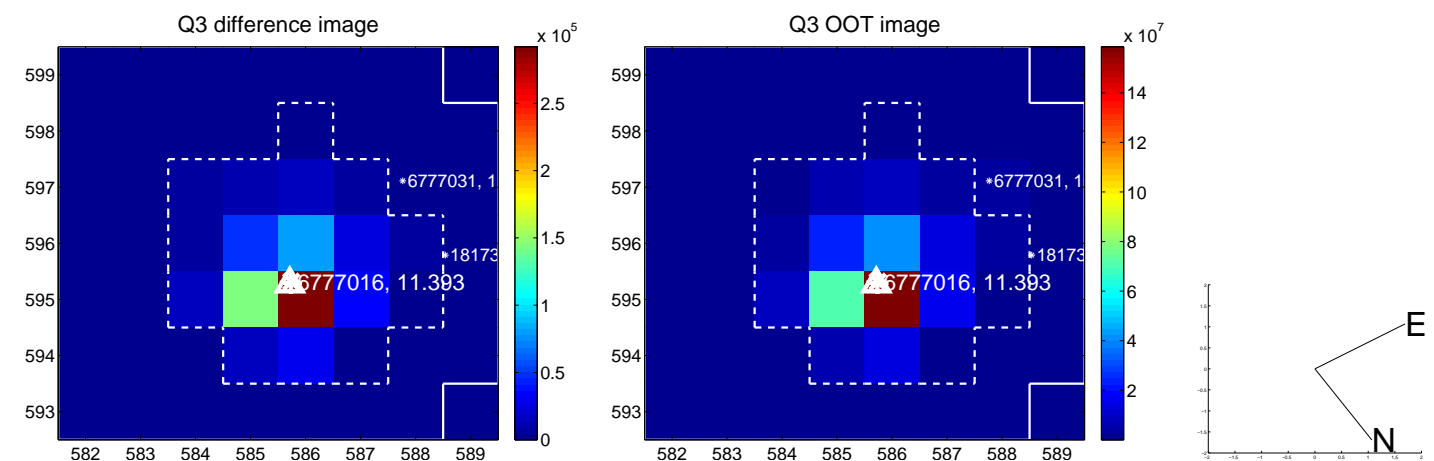
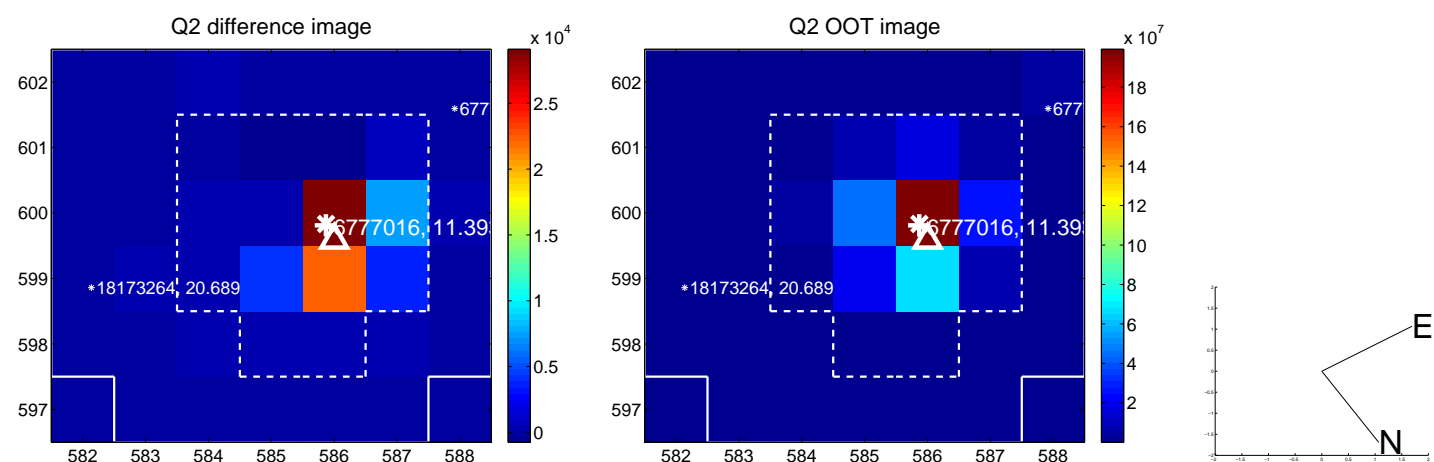
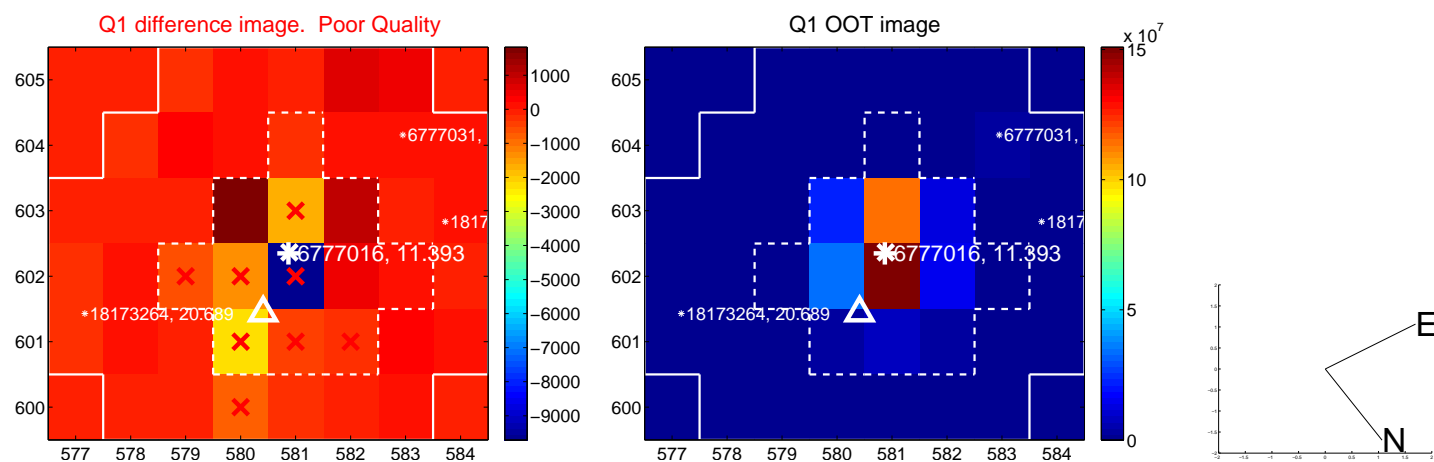
The direct PRF centroid is offset from the target star catalog position by about 0.13 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.010 \pm 0.115$	0.09	$-0.002 \pm 0.198$	$-0.010 \pm 0.145$
PRF-fit source offset from KIC position	$0.108 \pm 0.231$	0.47	$-0.107 \pm 0.220$	$0.012 \pm 0.152$
photometric centroid source offset	$2.57 \pm 1.33$	1.92	$-2.55 \pm 1.34$	$-0.32 \pm 1.15$

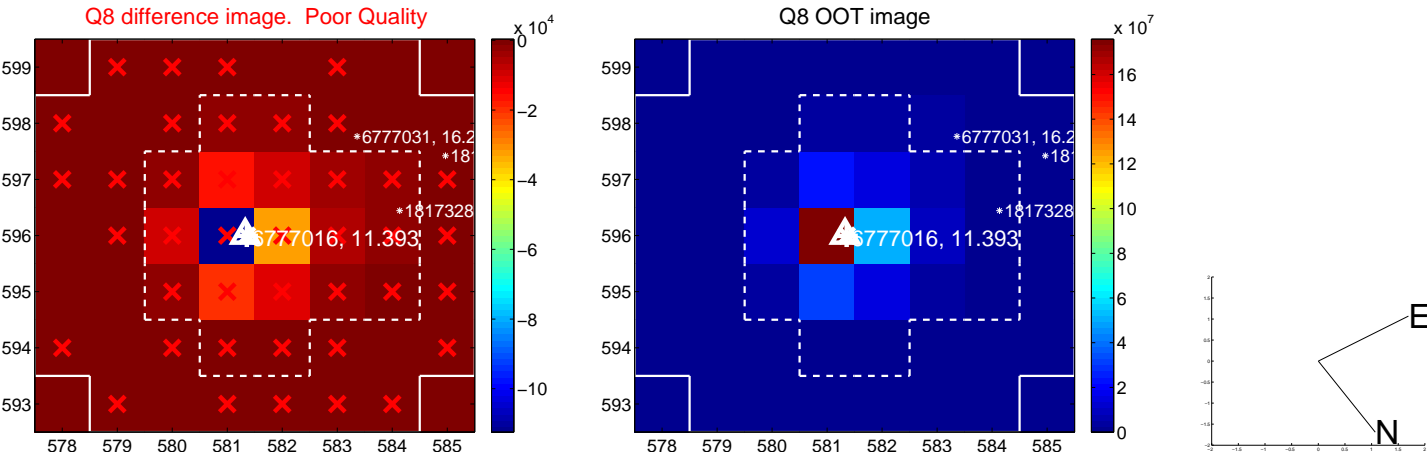
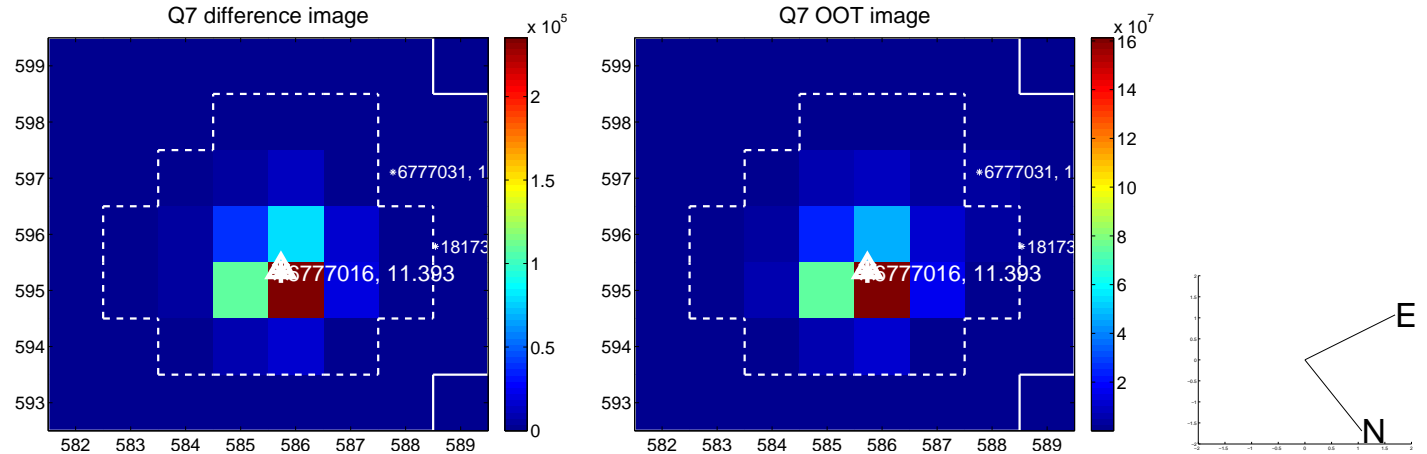
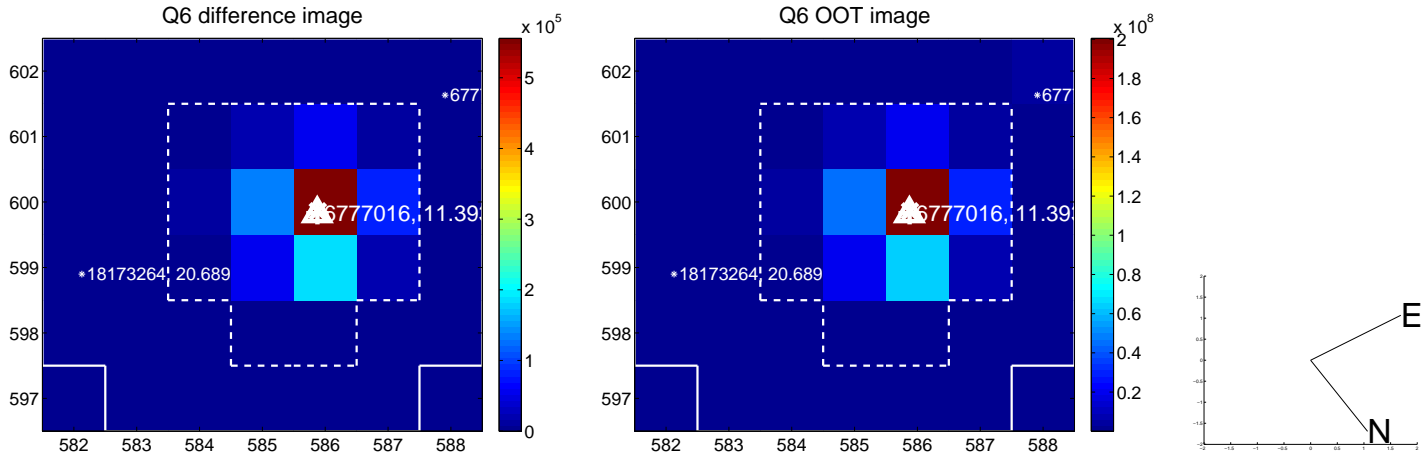
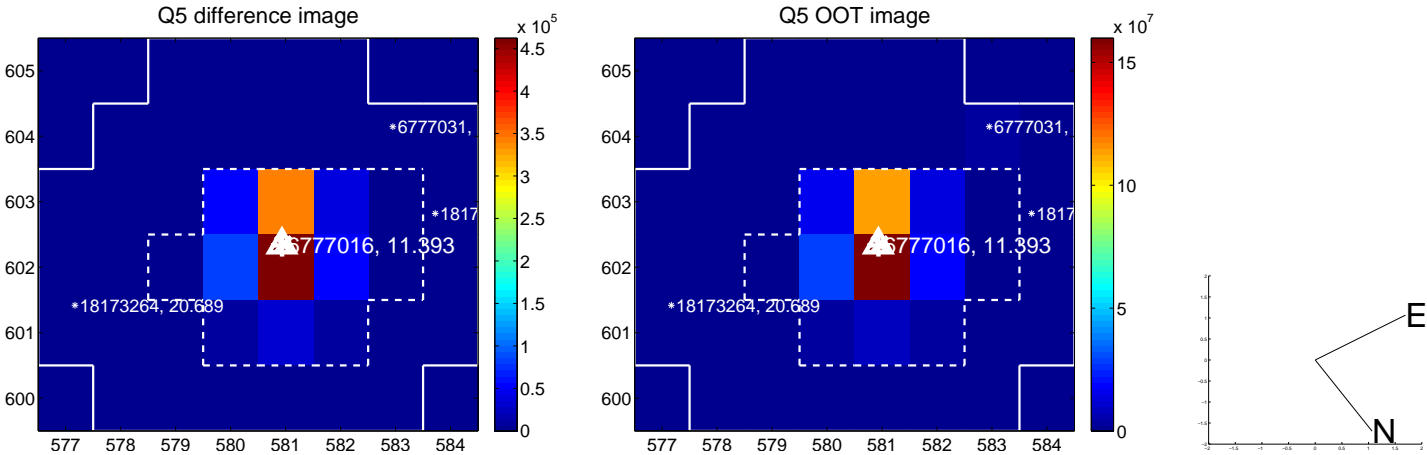


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

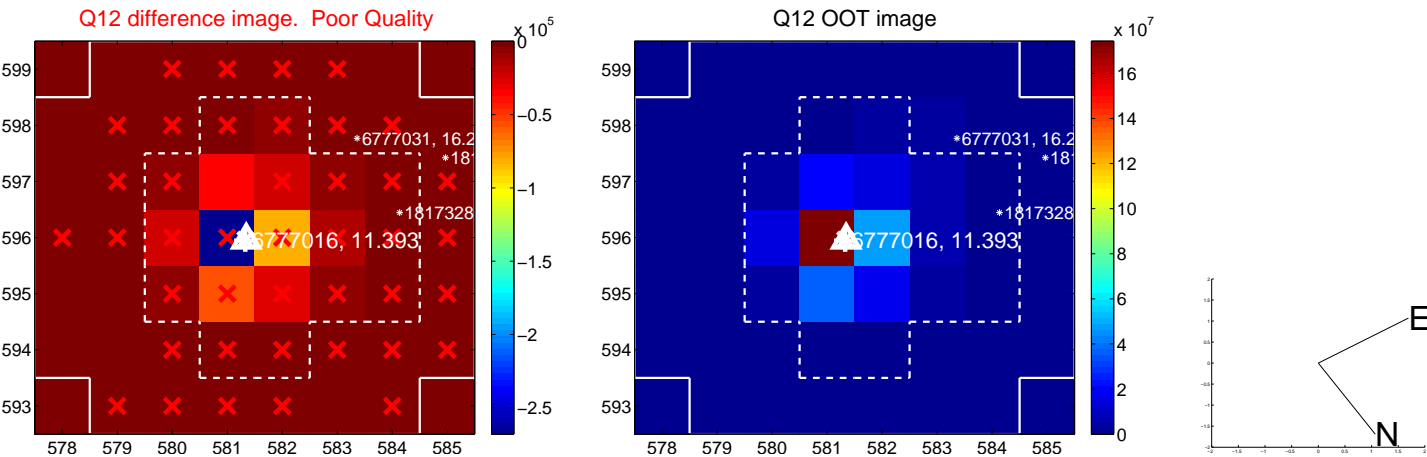
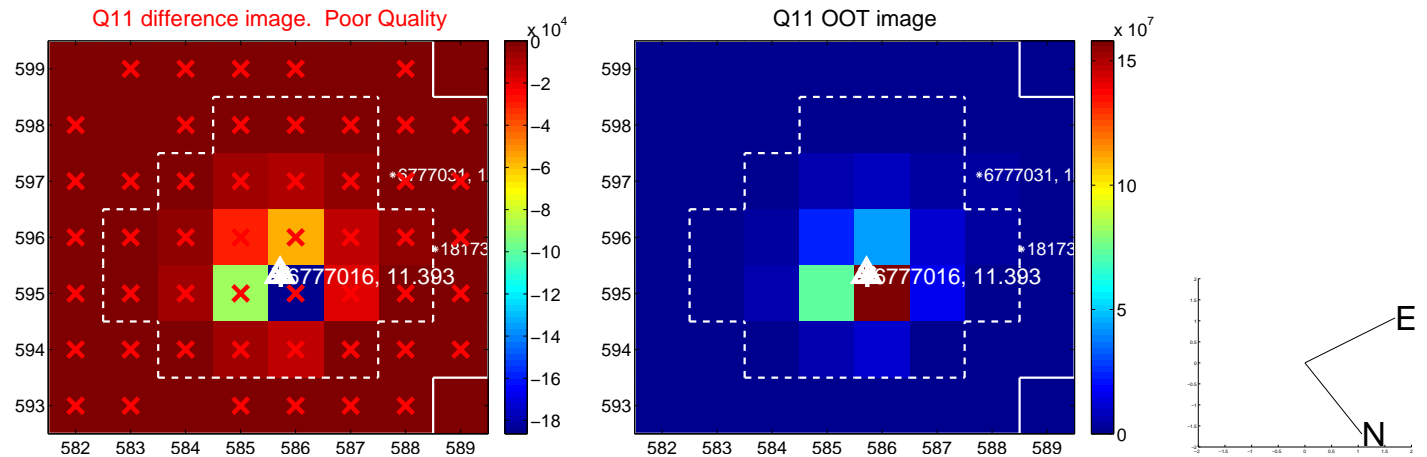
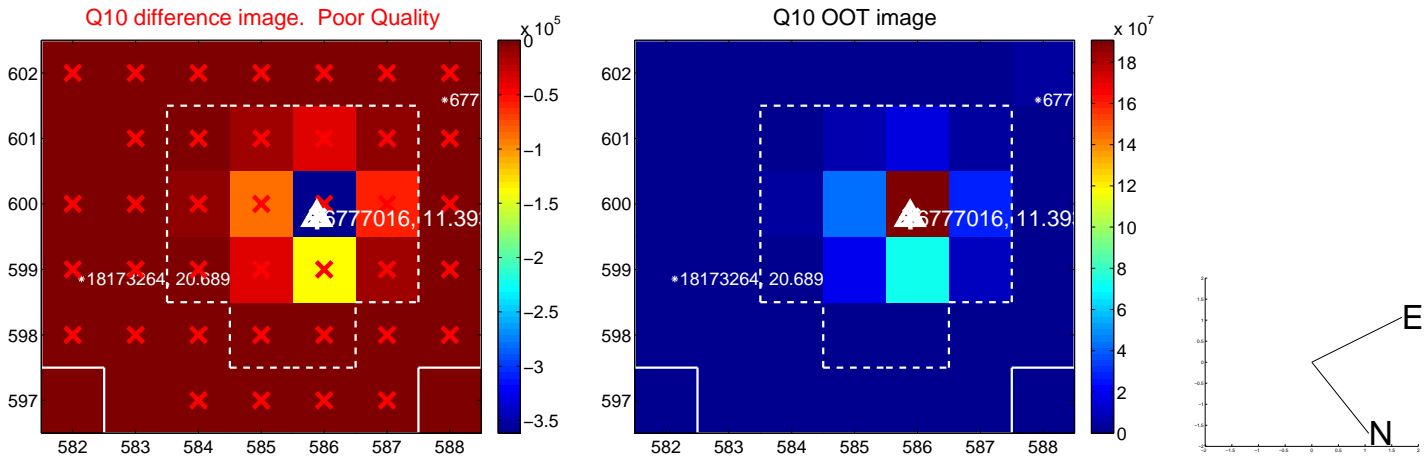
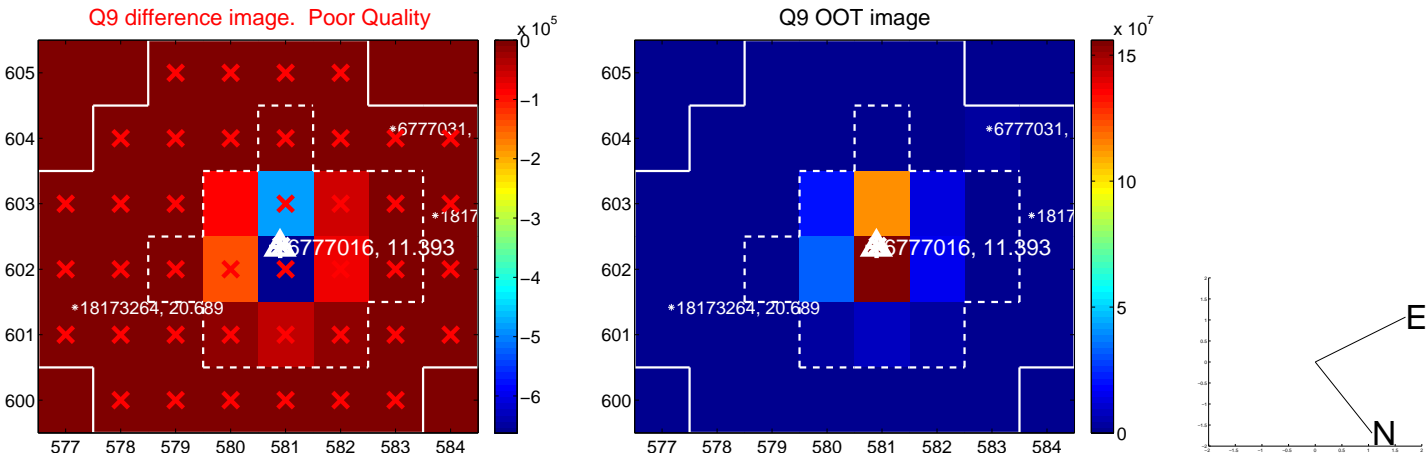


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

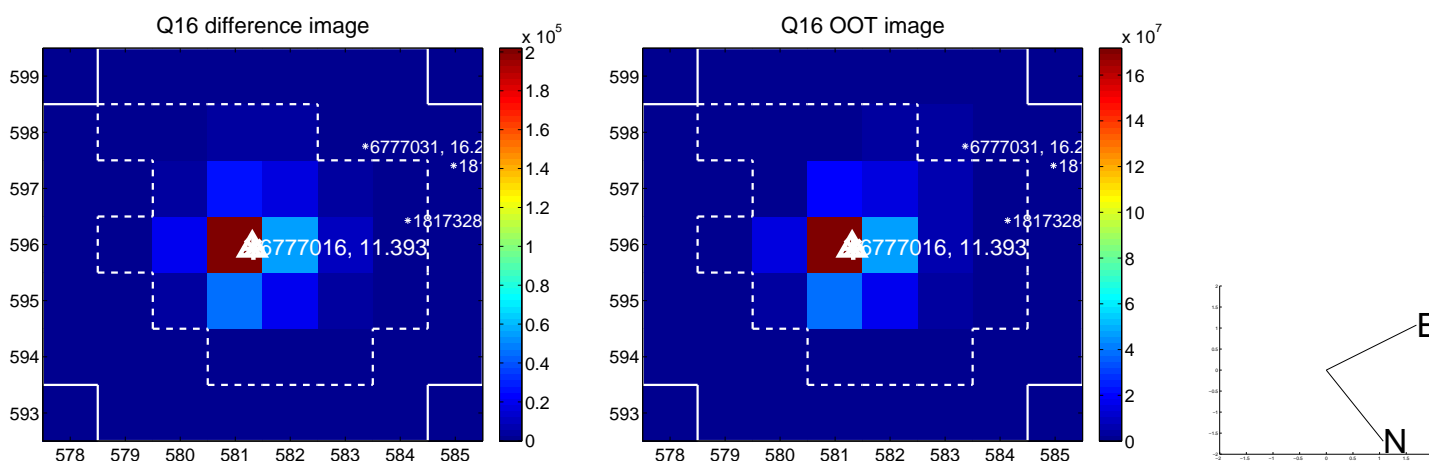
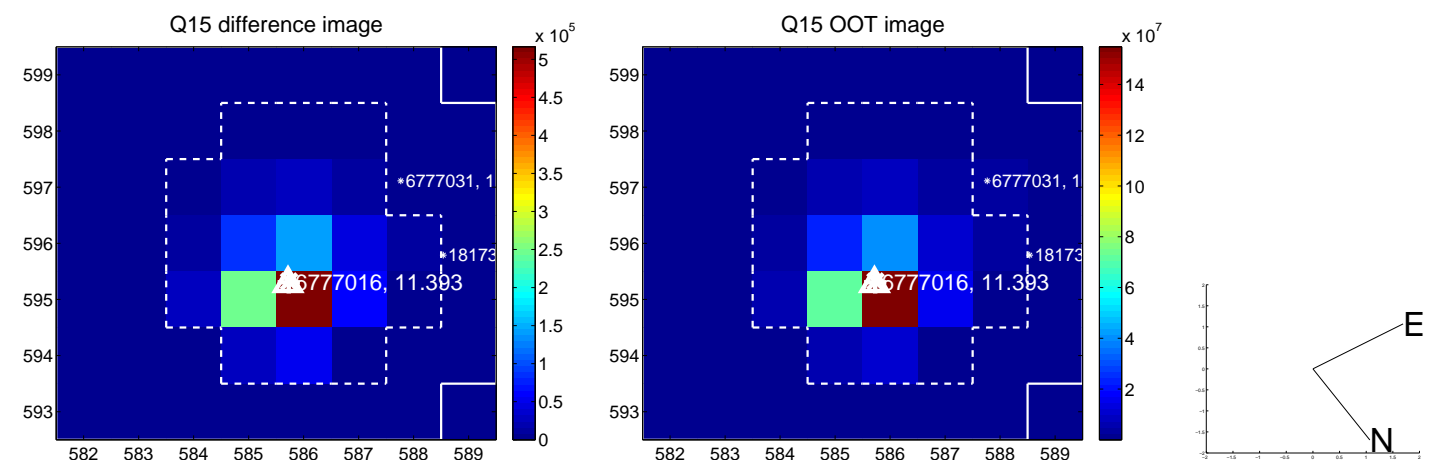
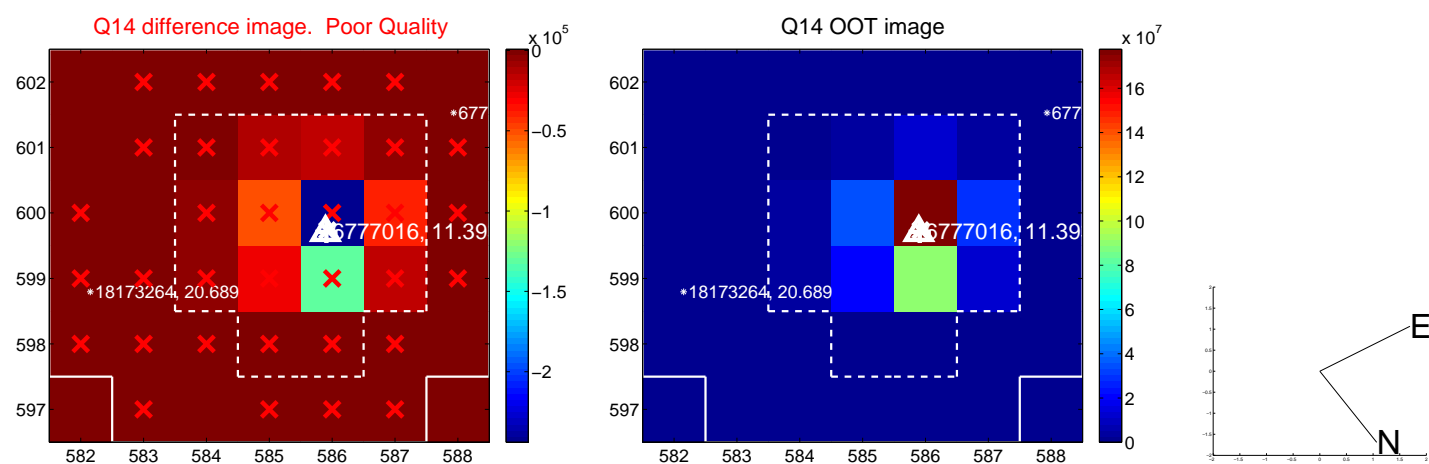
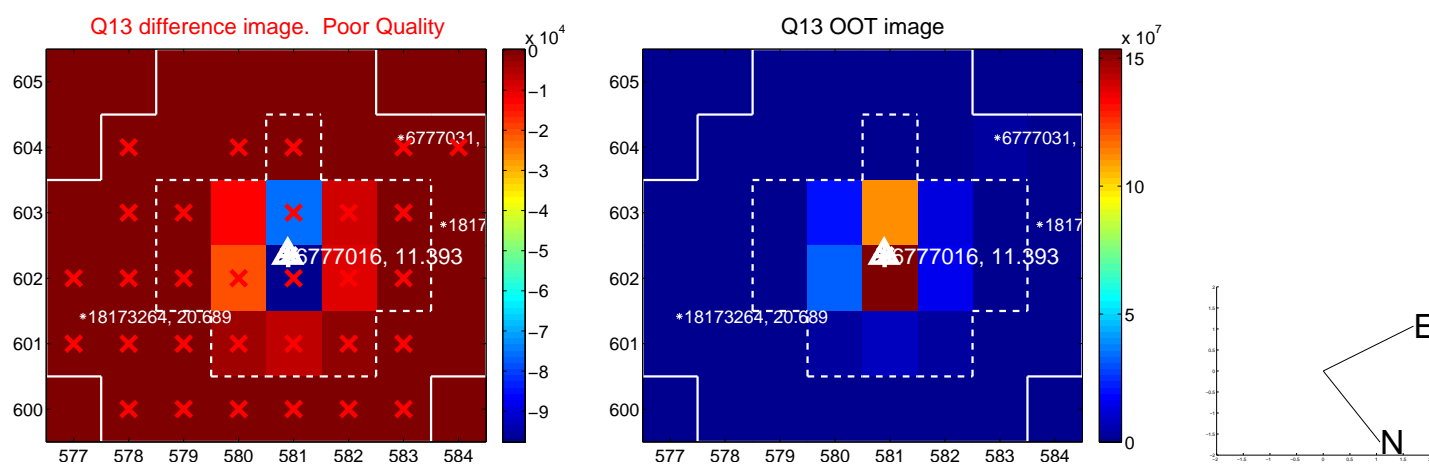




white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



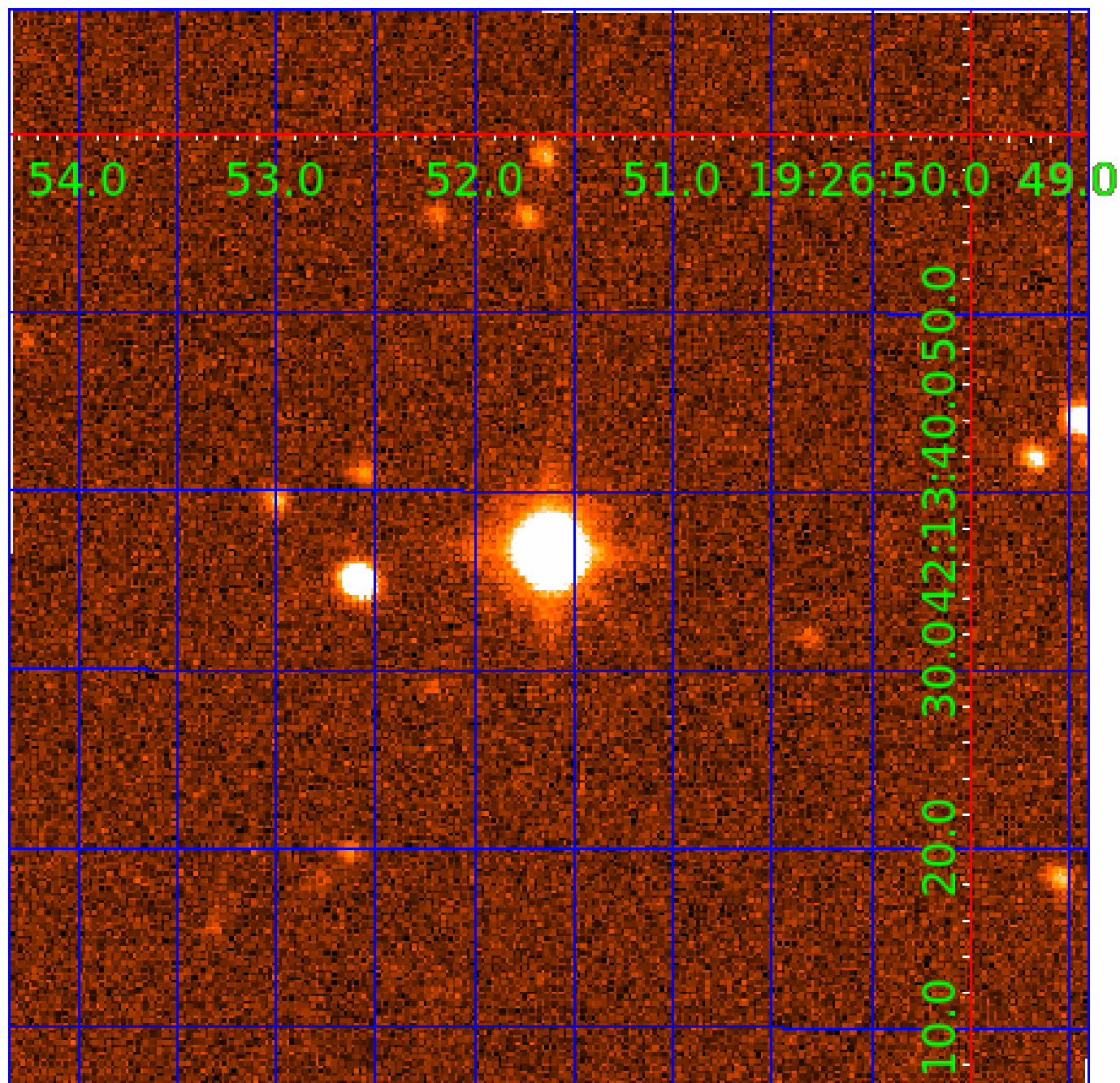
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





UKIRT Image

Declination





# KIC 006777016

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
006777016-01	OBS	No	0.629957	132.205974	9.7	1.669	13.5	3.8	1.06	5708	0.36	5851.76
006777016-02	OBS	No	0.629294	132.428565	10.0	0.651	9.7	2.2	1.06	5708	0.57	5859.98

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
006777016-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—CENT_SATURATED
006777016-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE_ZUMA_TRACKER—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—CENT_SATURATED

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

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

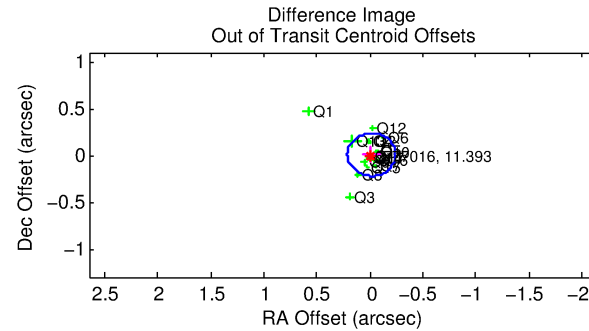
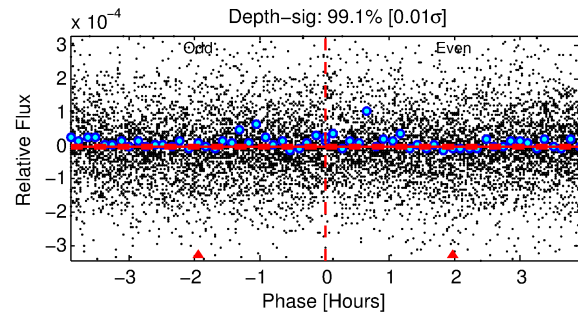
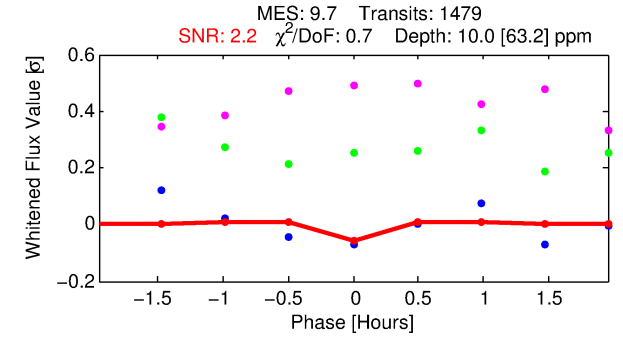
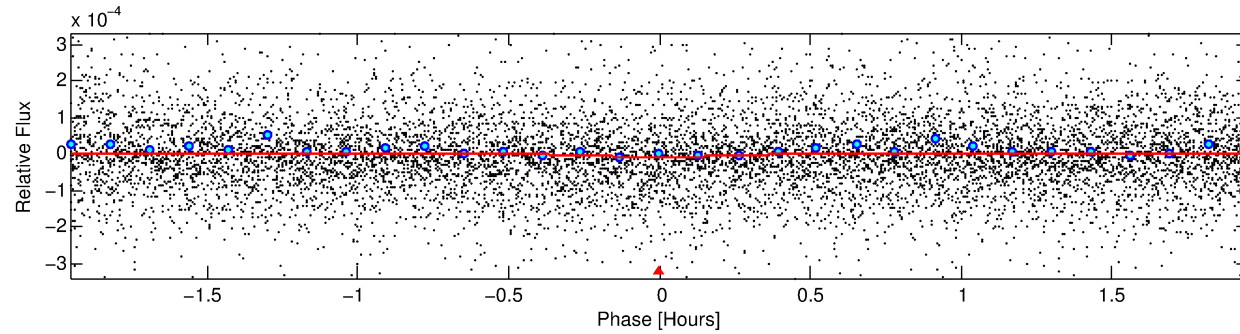
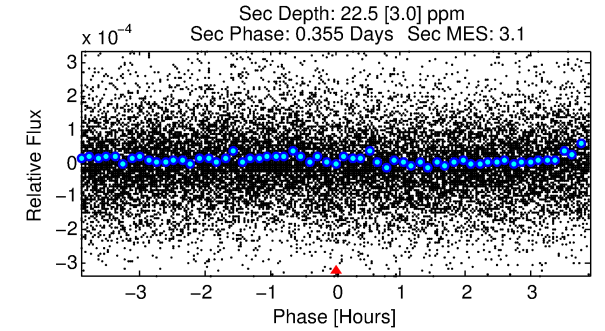
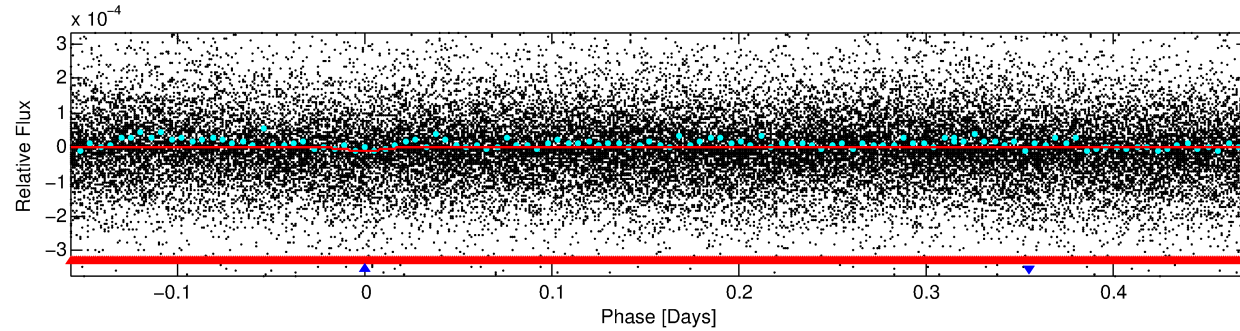
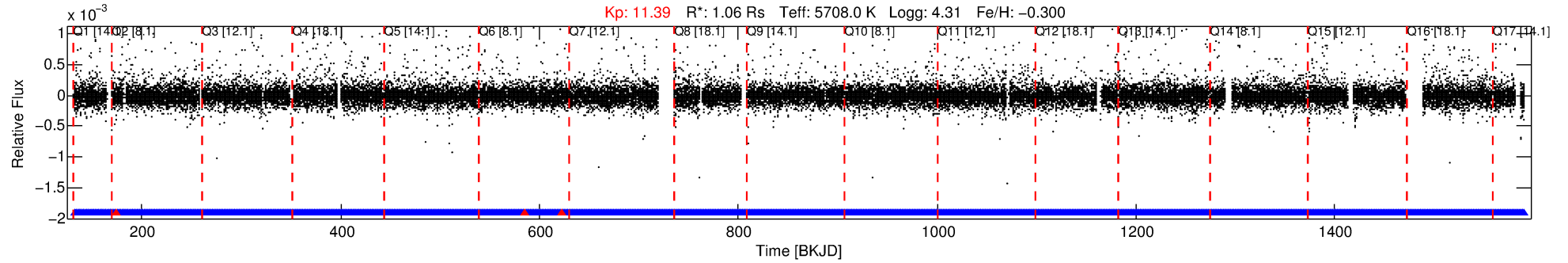
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 006777016-02

No Significant Match Found

# DV One-Page Summary

KIC: 6777016 Candidate: 2 of 2 Period: 0.629 d



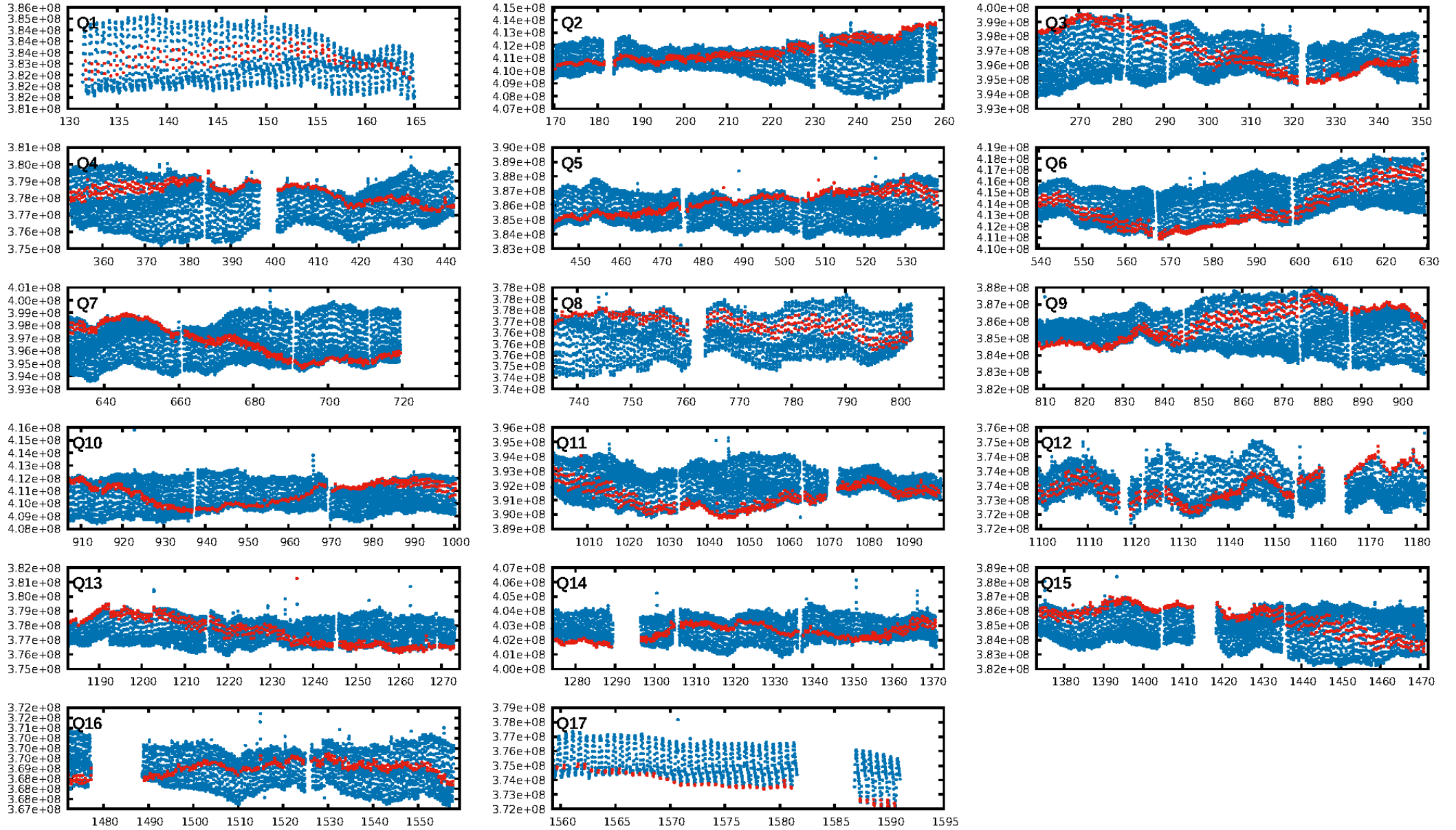
## DV Fit Results:

Period = 0.62929 [0.00004] d  
Epoch = 132.4286 [0.0042] BKJD  
Rp/R\* = 0.0050 [0.0211]  
a/R\* = 1.42 [3.11]  
b = 1.00 [0.08]  
Seff = 5859.98 [2527.94]  
Teq = 2231 [241] K  
Rp = 0.57 [2.44] Re  
a = 0.0135 [0.0037] AU  
Ag = 6.82 [57.96] [0.10σ]  
Teffp = 5575 [11828] K [0.28σ]

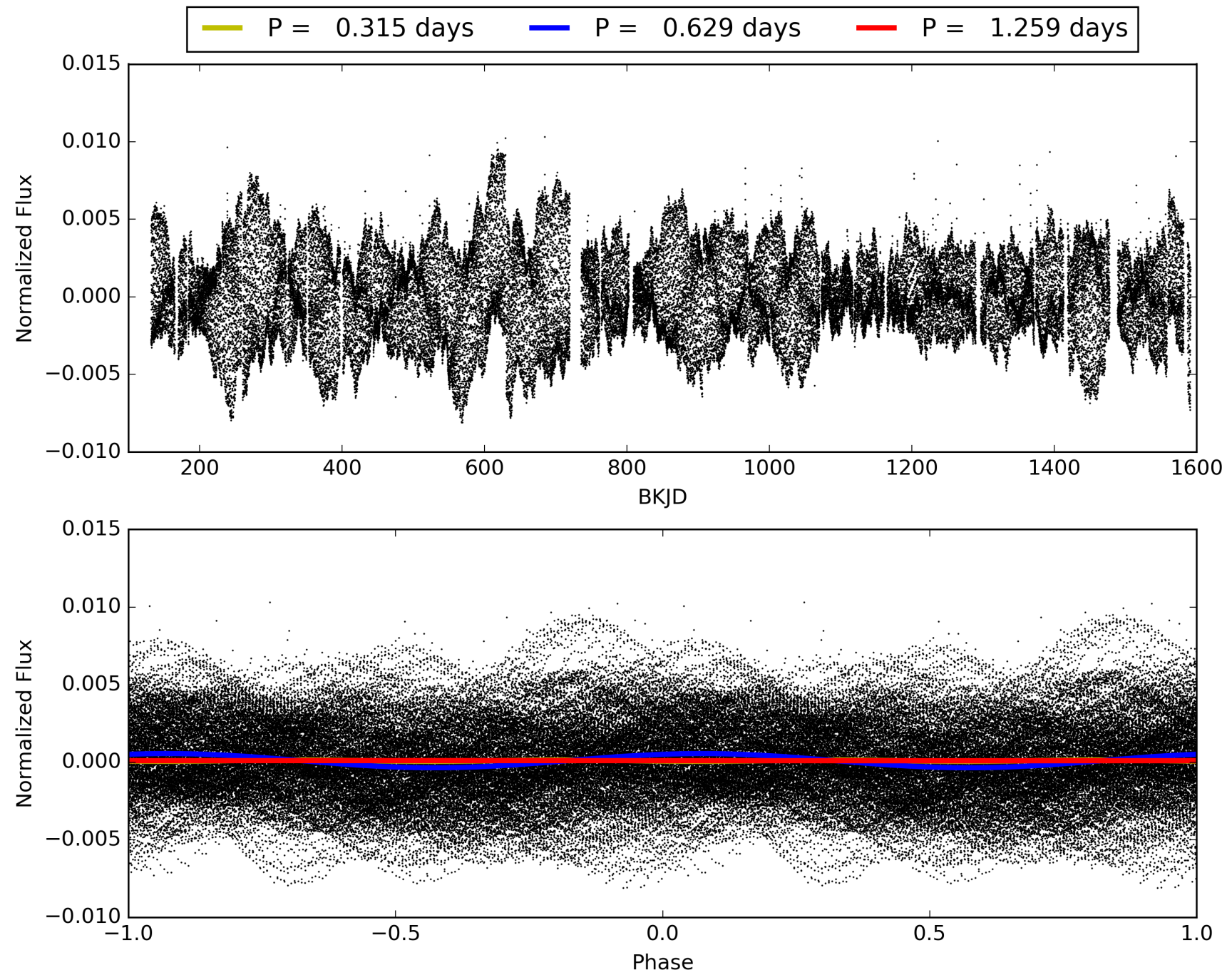
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.7% [0.01σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 2.33e-21  
RollingBand-fgt: 1.00 [1423/1426]  
GhostDiagnostic-chr: 0.7338  
Centroid-sig: 33.2%  
Centroid-so: 1.955 arcsec [0.93σ]  
OotOffset-rm: 0.015 arcsec [0.20σ]  
KicOffset-rm: 0.087 arcsec [1.15σ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 0.35 [6/17]  
DiffImageOverlap-fno: 0.24 [4/17]

# TCE 006777016-02, PDC Light Curves

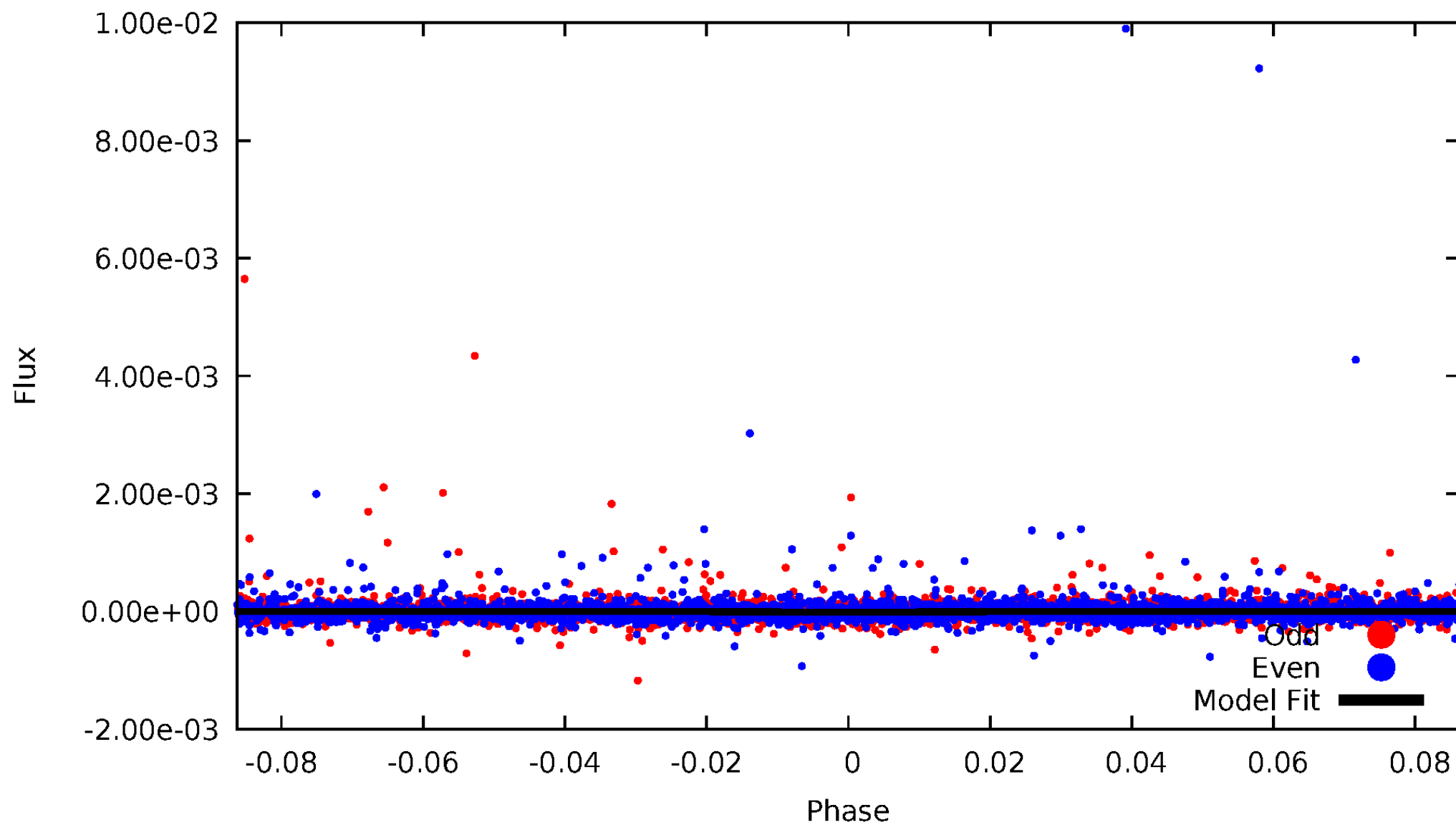


TCE 006777016-02



# DV Odd/Even

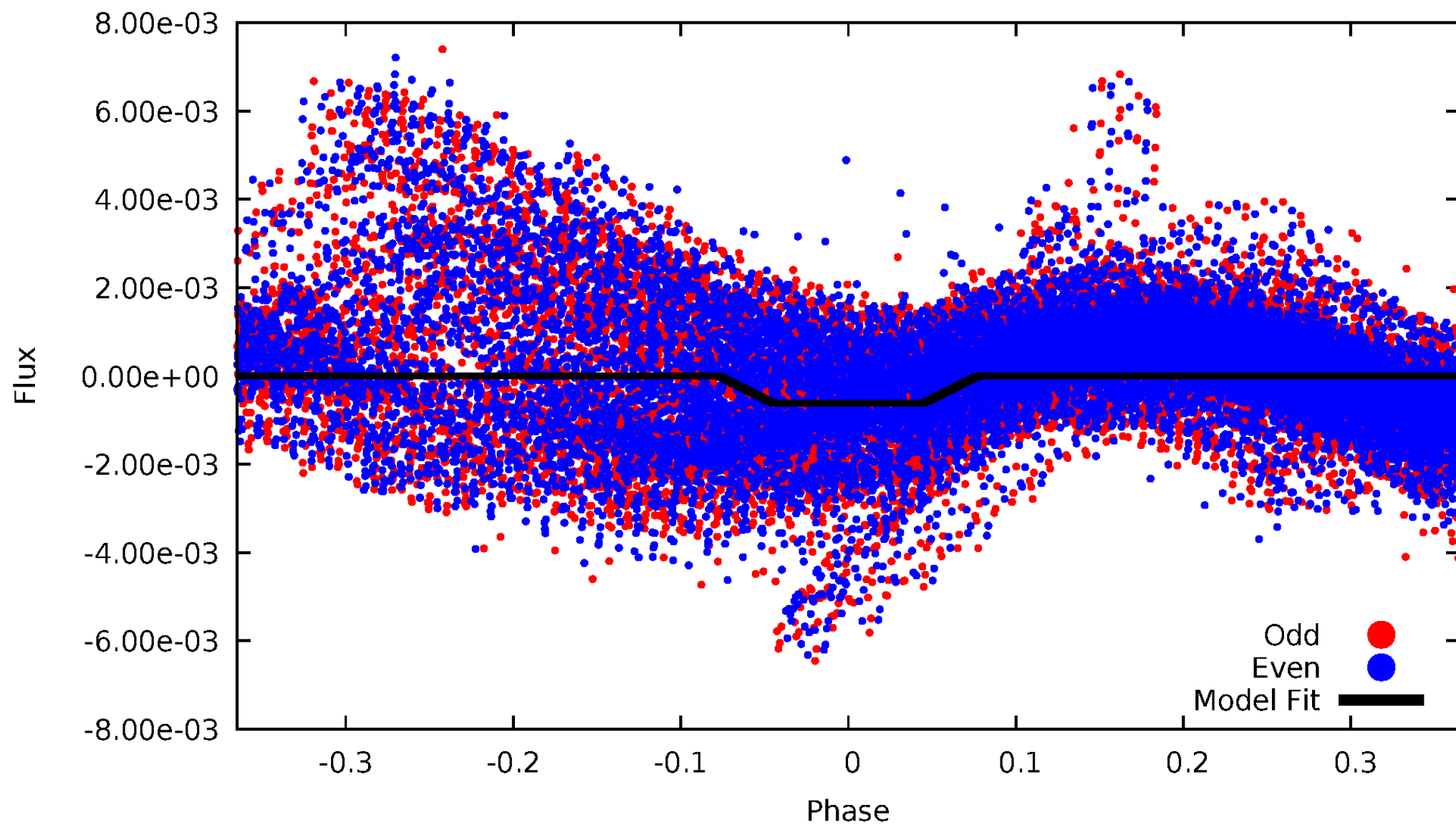
TCE 006777016-02





# ALT Odd/Even

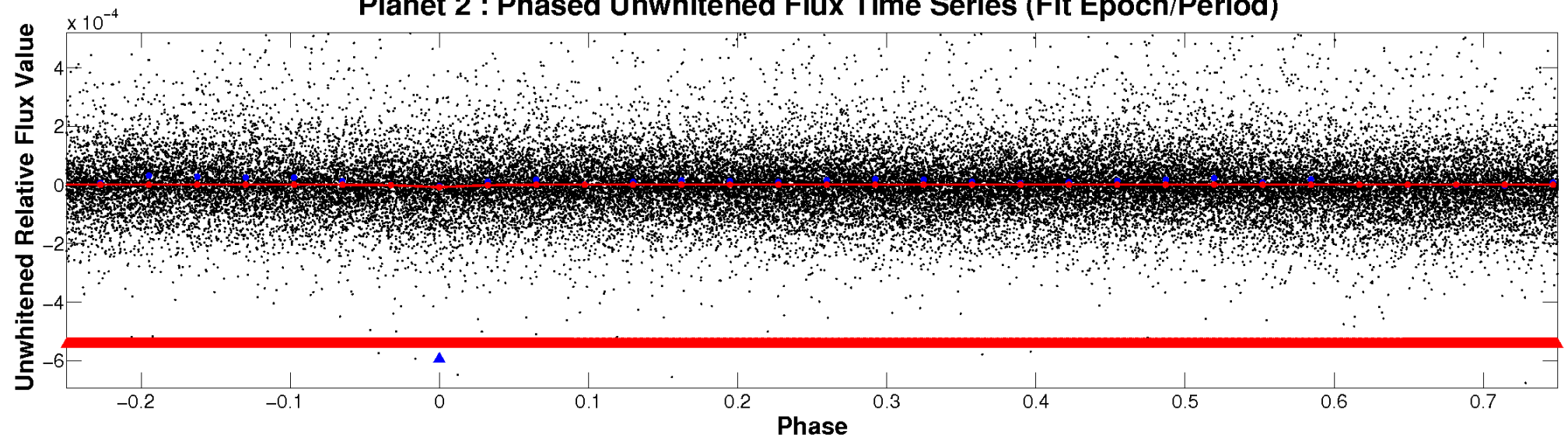
TCE 006777016-02



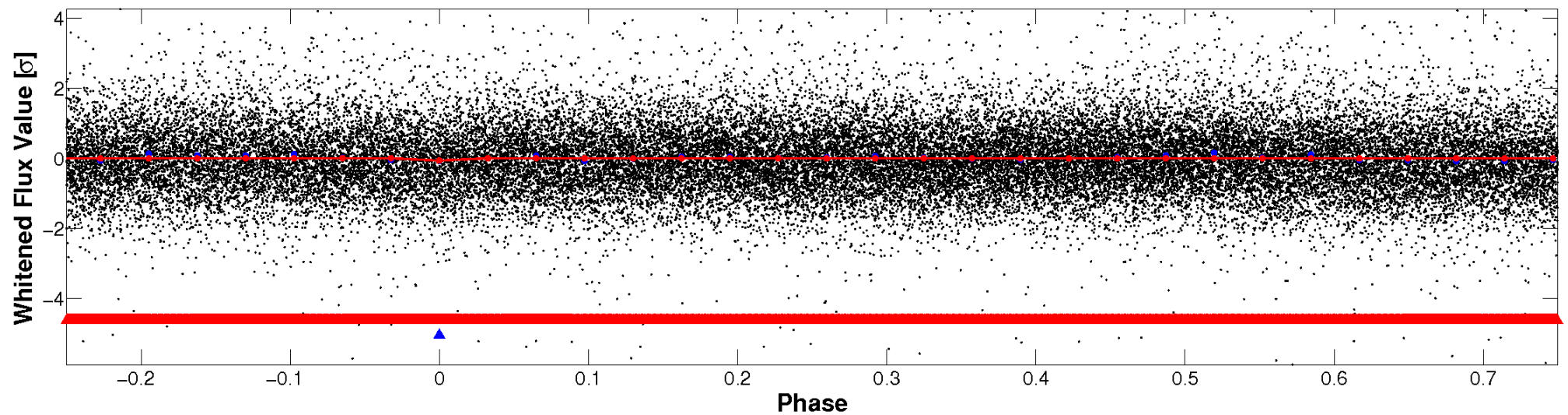


# Non-Whitened Vs. Whitened Light Curve

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

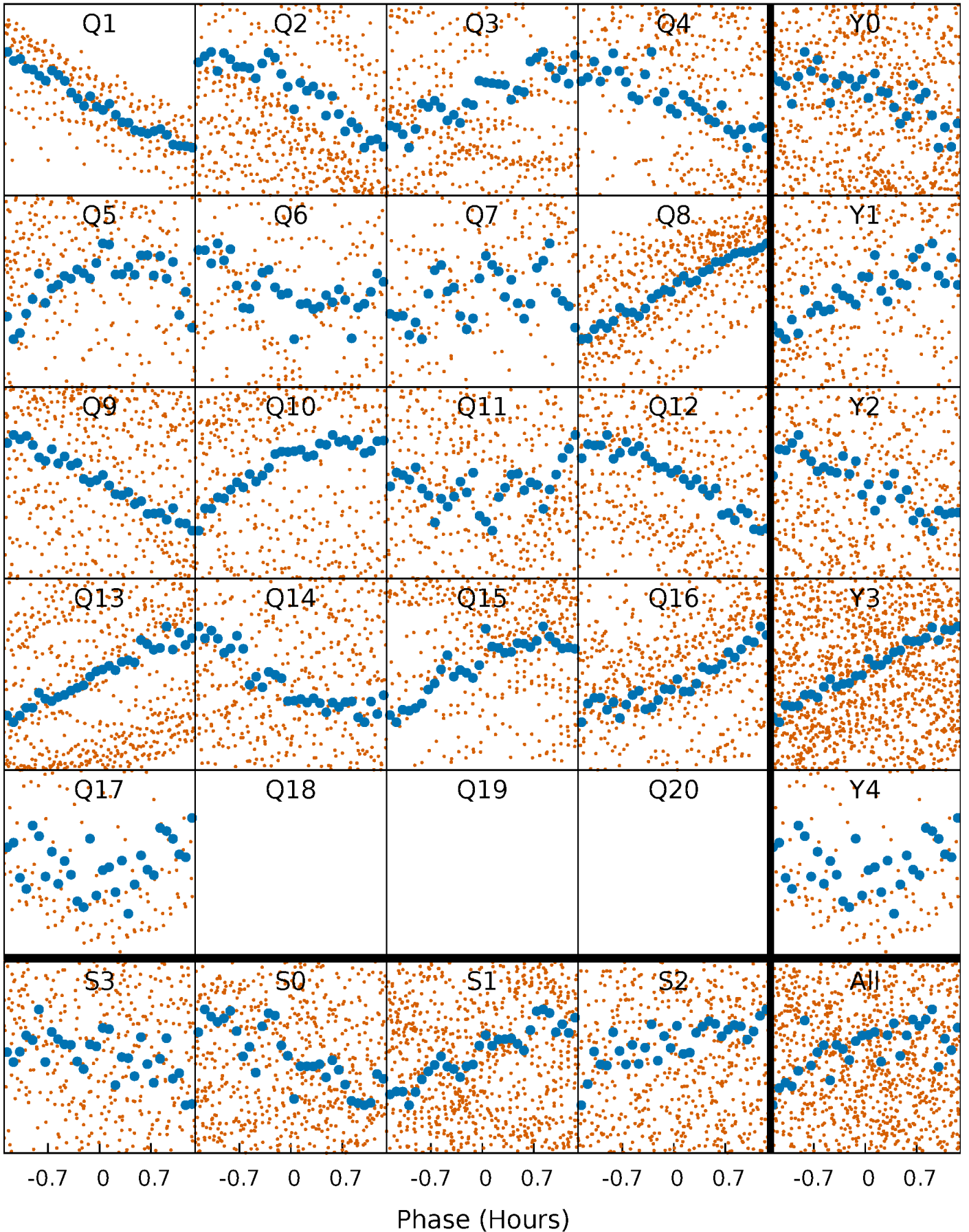


**Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



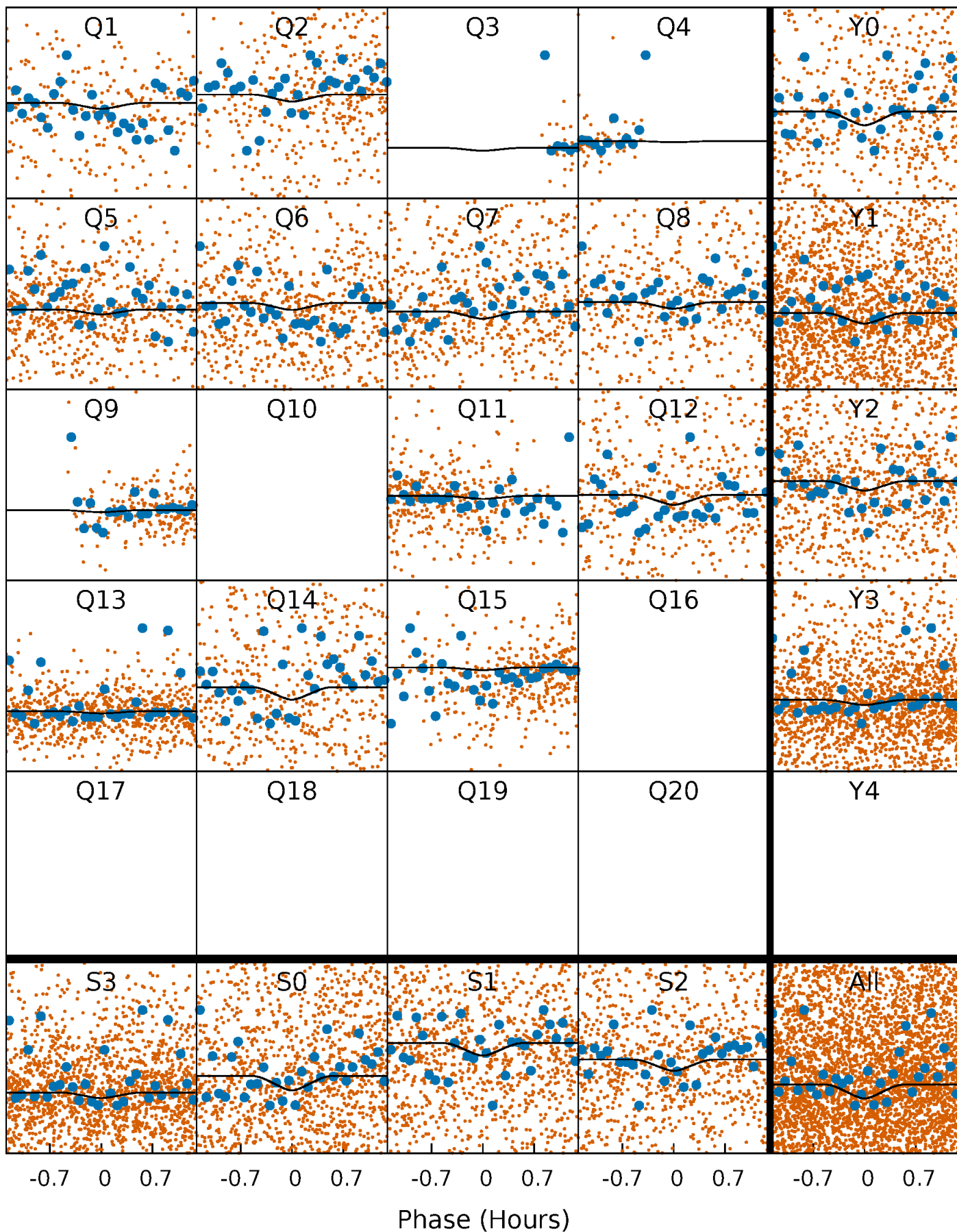
# PDC Quarter-Phased Transit Curves

TCE 006777016-02   P= 0.629294 Days    $T_0=132.428565$  (BKJD)



# DV Quarter-Phased Transit Curves

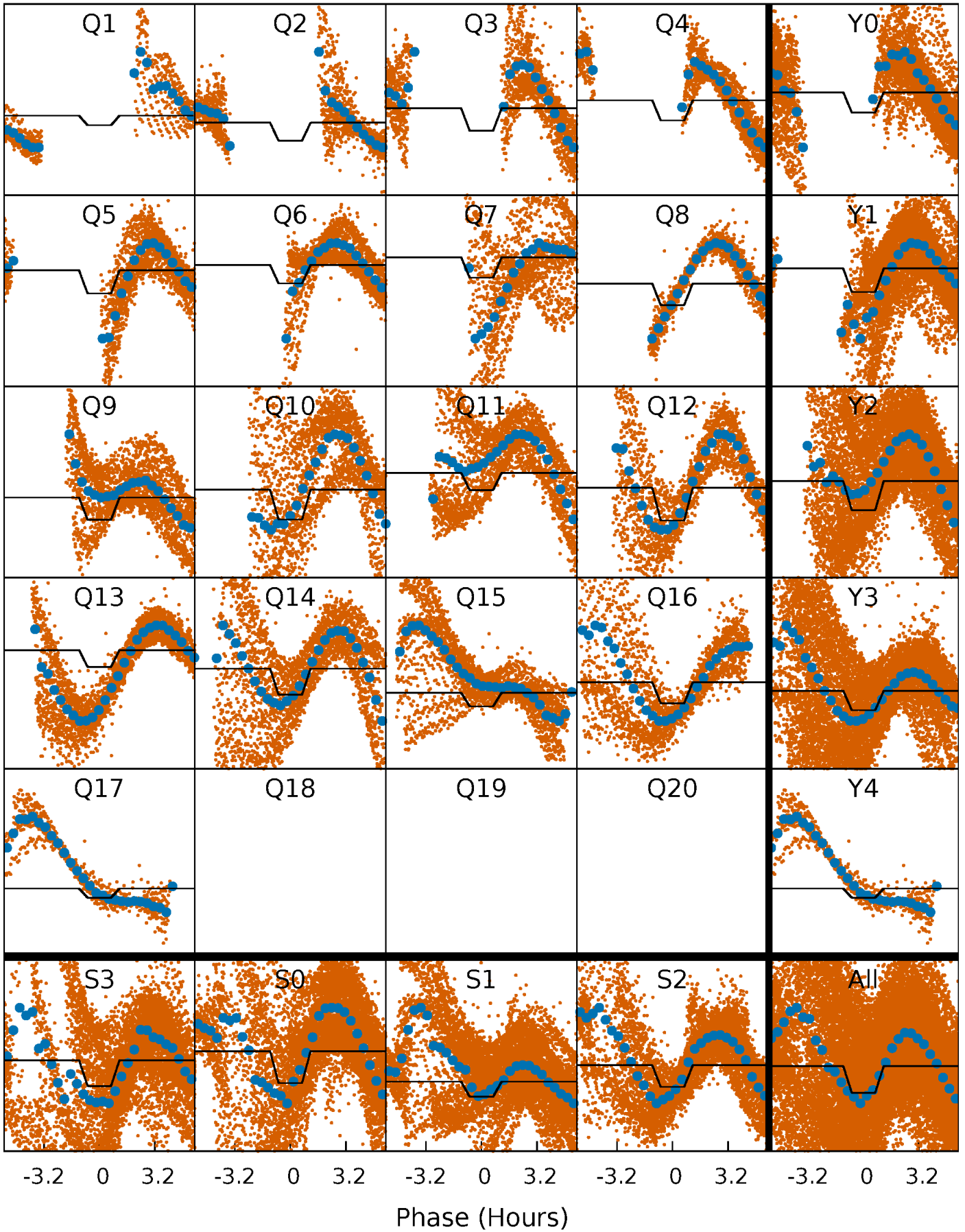
TCE 006777016-02 P= 0.629294 Days  $T_0=132.428565$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

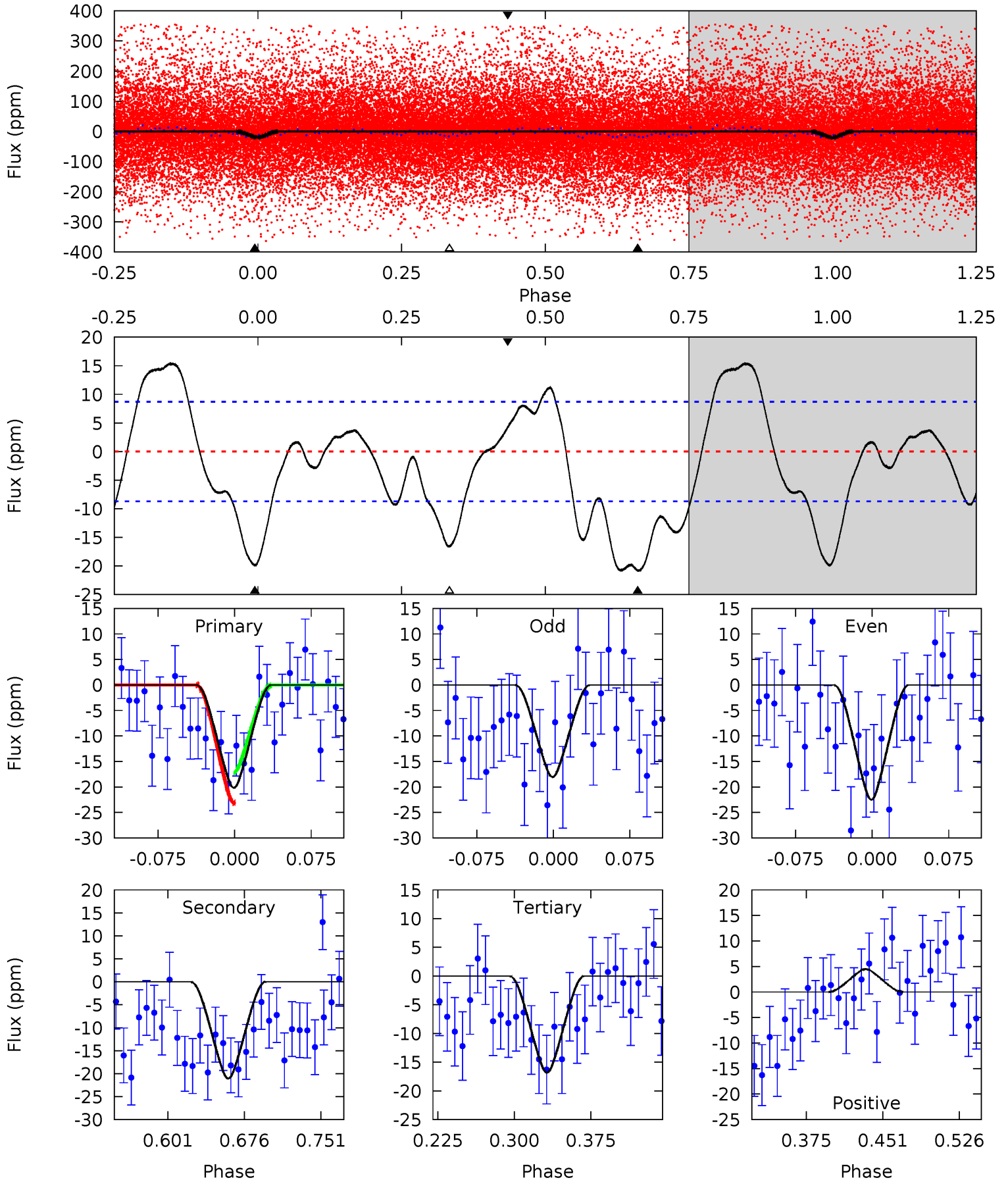
TCE 006777016-02     $P = 0.630100$  Days     $T_0 = 132.227374$  (BKJD)



# DV Model-Shift Uniqueness Test

006777016-02, P = 0.629294 Days, E = 131.169977 Days

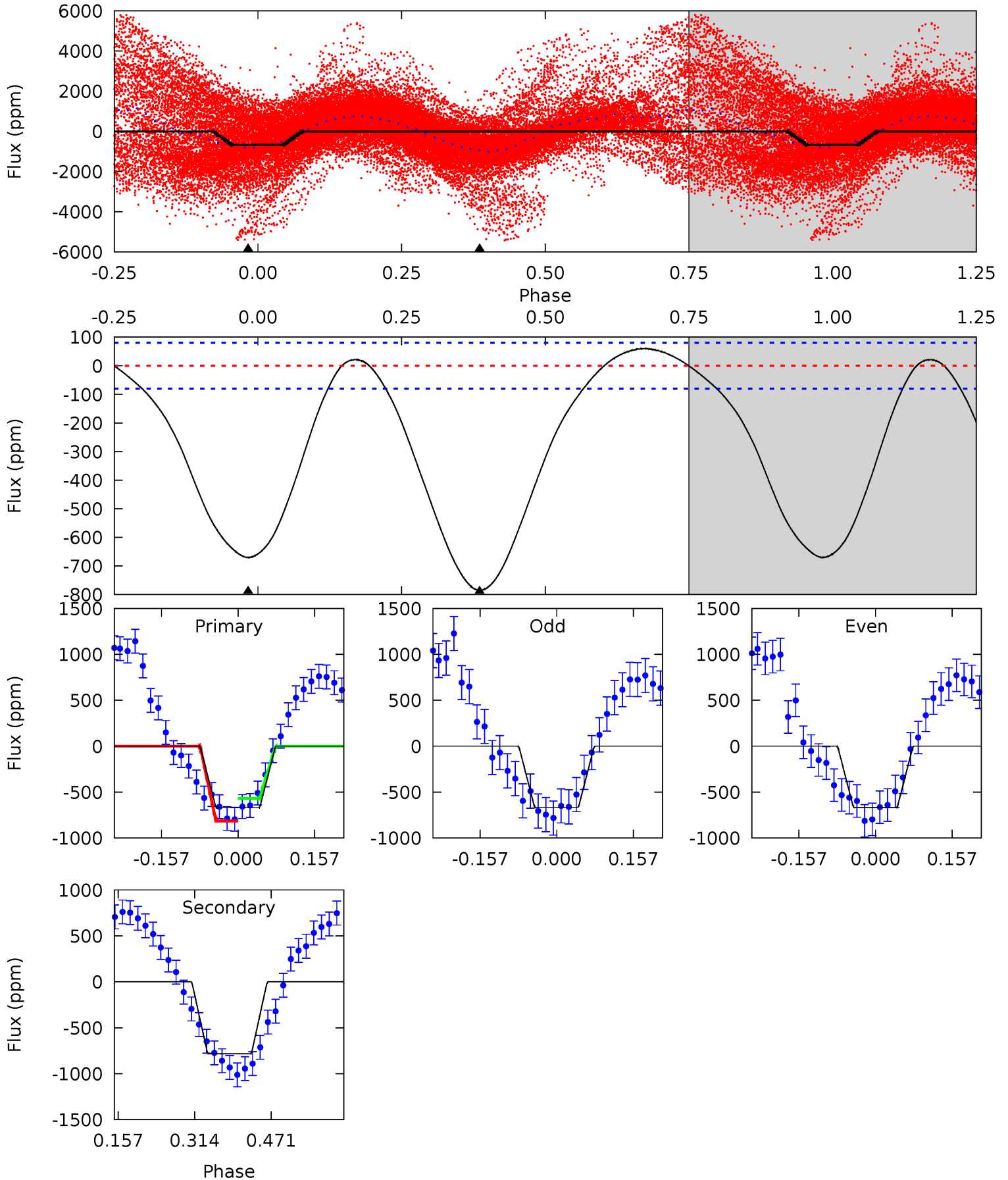
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
10.7	11.2	8.91	2.38	4.62	1.78	4.41	1.76	8.29	2.25	8.78	1.19	0.08	0.43	0



# Alt Model-Shift Uniqueness Test

006777016-02, P = 0.630100 Days, E = 131.597274 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
37.5	43.9	0	0	4.47	1.42	2.85	37.5	37.5	43.9	43.9	0.01	1.12	0.07	5.44





### Stellar Parameters For KIC 006777016

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5708^{+189}_{-172}$	$4.306^{+0.231}_{-0.210}$	$-0.300^{+0.300}_{-0.300}$	$1.060^{+0.329}_{-0.246}$	$0.829^{+0.130}_{-0.070}$	$0.981^{+1.081}_{-0.511}$
	+3%/-3%	+5%/-5%	+100%/-100%	+31%/-23%	+16%/-8%	+110%/-52%
Source	PHO54	PHO54	PHO54	DSEP		

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

### Secondary Eclipse Parameters for KIC 006777016-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-21 \pm 2$	$1.89^{+1.91}_{-1.29}$	$3095^{+288}_{-233}$	$3115^{+2187}_{-5994}$	$0.583^{+5.456}_{-0.437}$
Alt.	$-785 \pm 18$	$3.47^{+2.36}_{-2.14}$	$3135^{+261}_{-236}$	$5528^{+4183}_{-1176}$	$6.928^{+37.227}_{-4.594}$

$T_{\text{max}}$  = 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

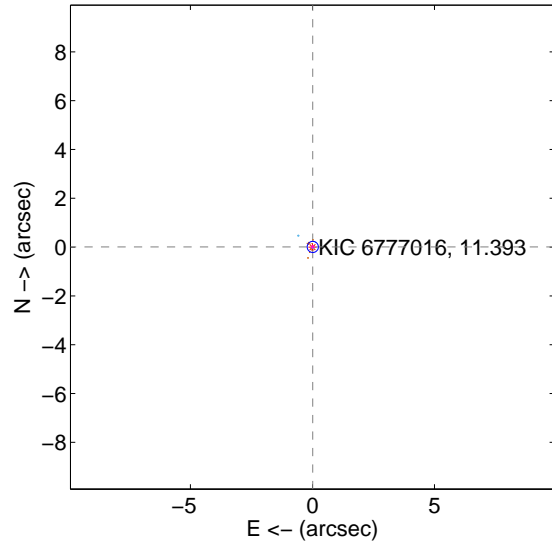
Supplemental centroid analysis for 006777016-02. **Kepler magnitude: 11.39.** Transit SNR 2.24

There are 6 quarters with good PRF difference image offsets

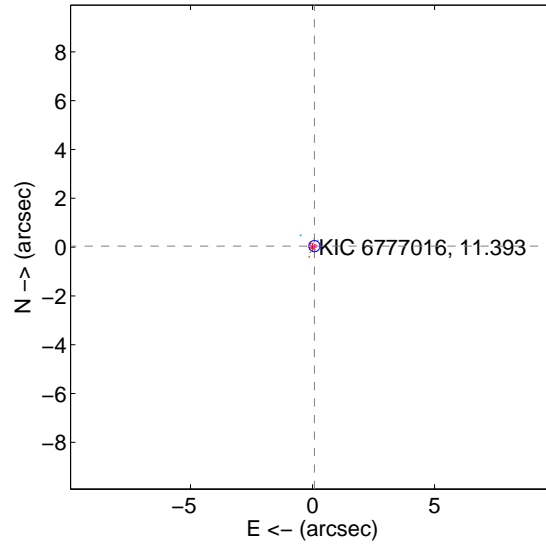
The direct PRF centroid is offset from the target star catalog position by about 0.13 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.015 \pm 0.076$	0.20	$-0.014 \pm 0.077$	$0.007 \pm 0.082$
PRF-fit source offset from KIC position	$0.087 \pm 0.076$	1.15	$-0.078 \pm 0.076$	$0.039 \pm 0.083$
photometric centroid source offset	$1.95 \pm 2.10$	0.93	$1.62 \pm 2.17$	$-1.09 \pm 1.94$

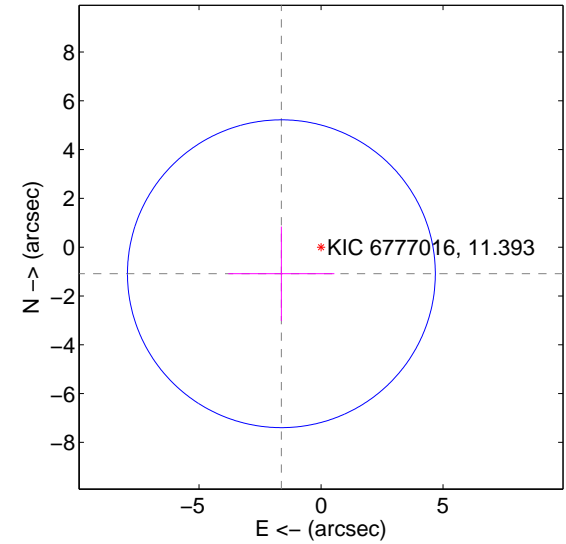
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position



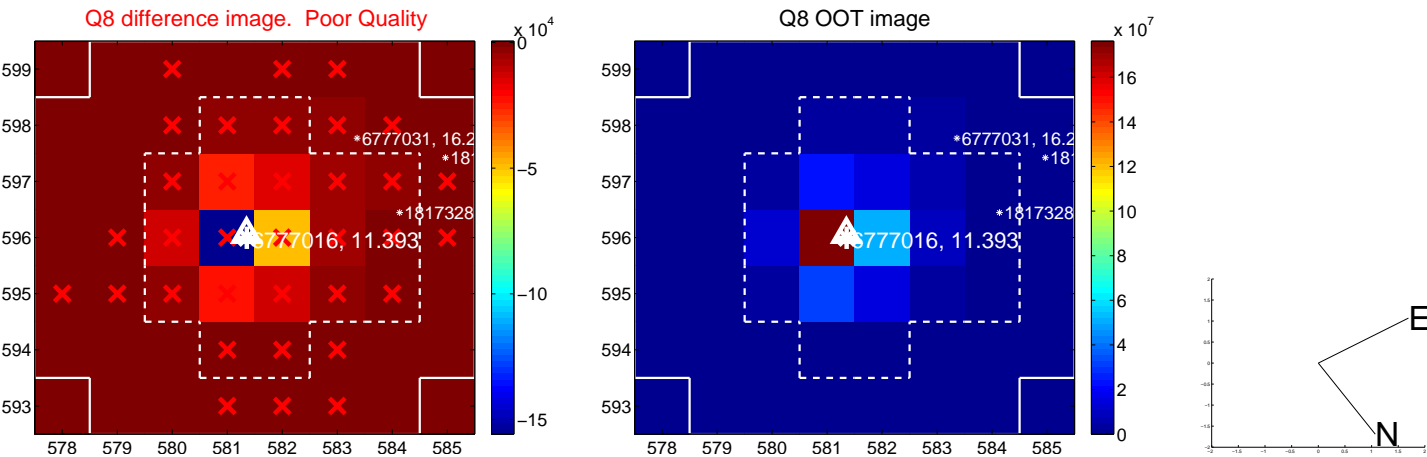
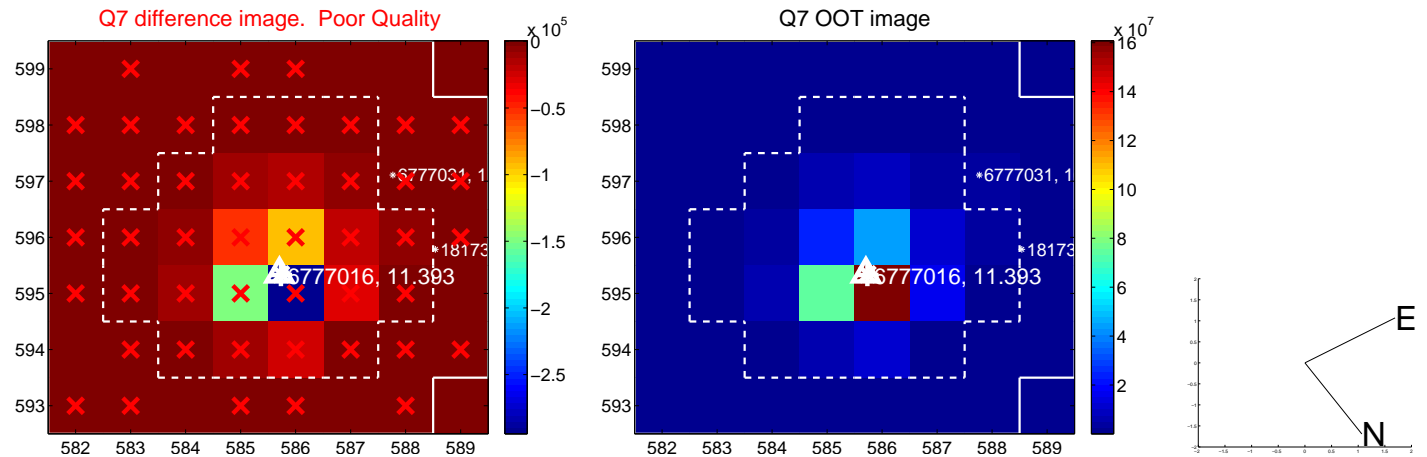
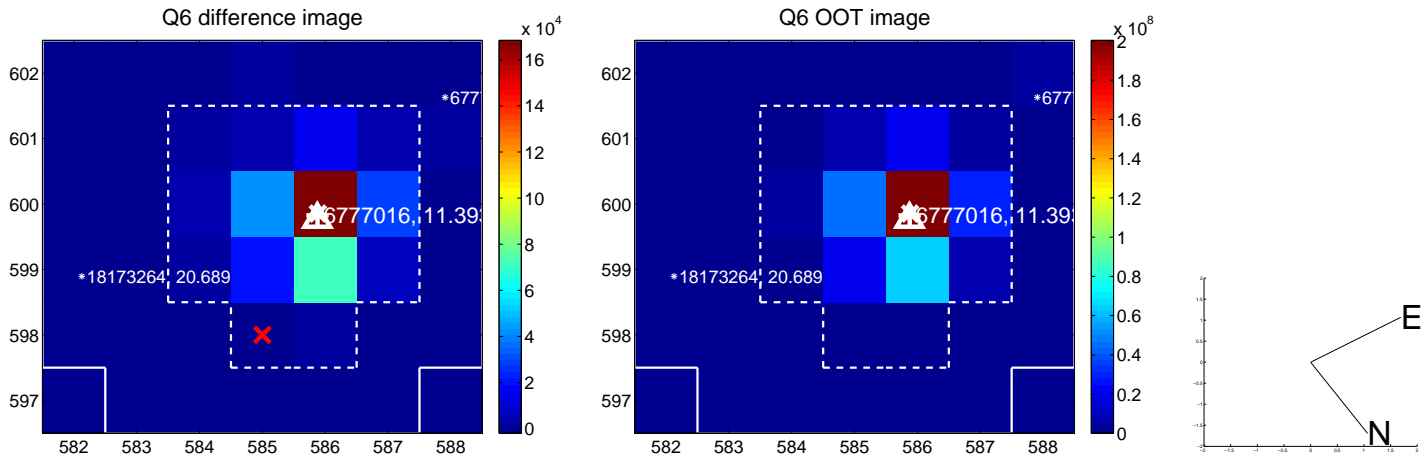
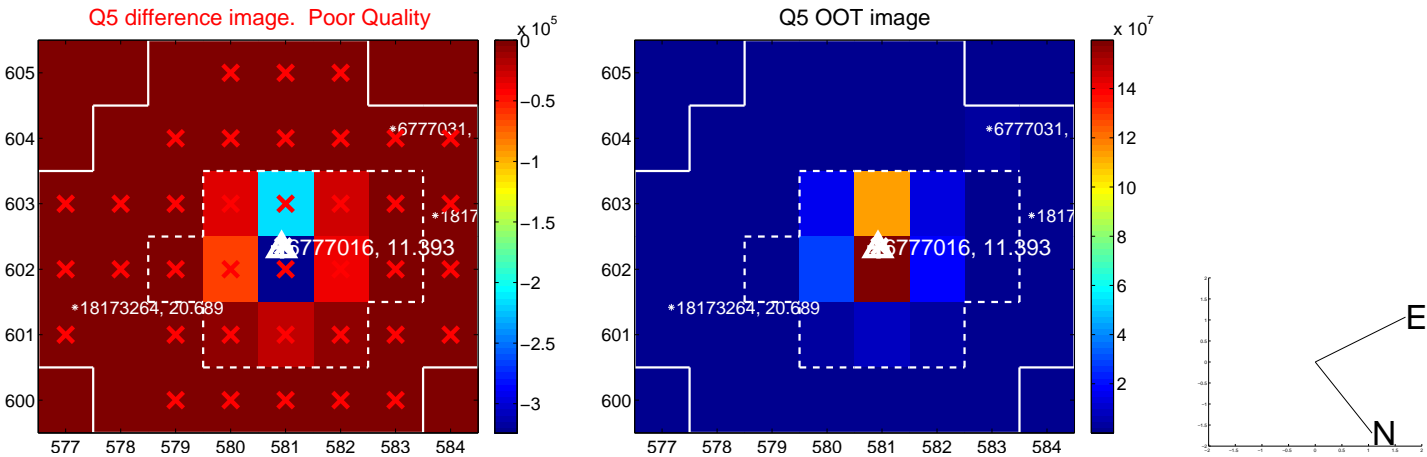
offset from photometric centroids



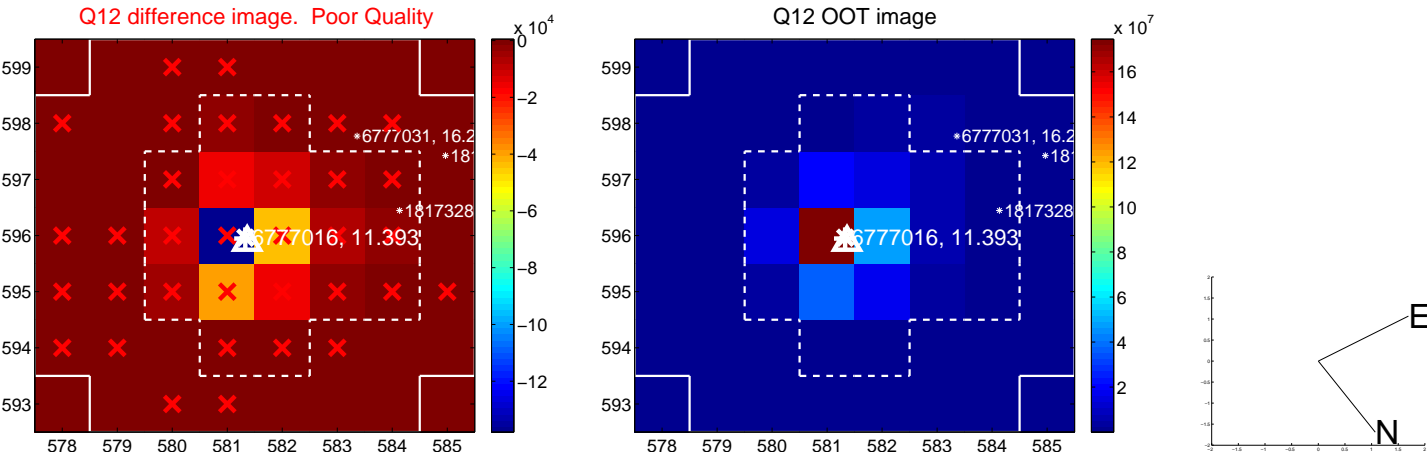
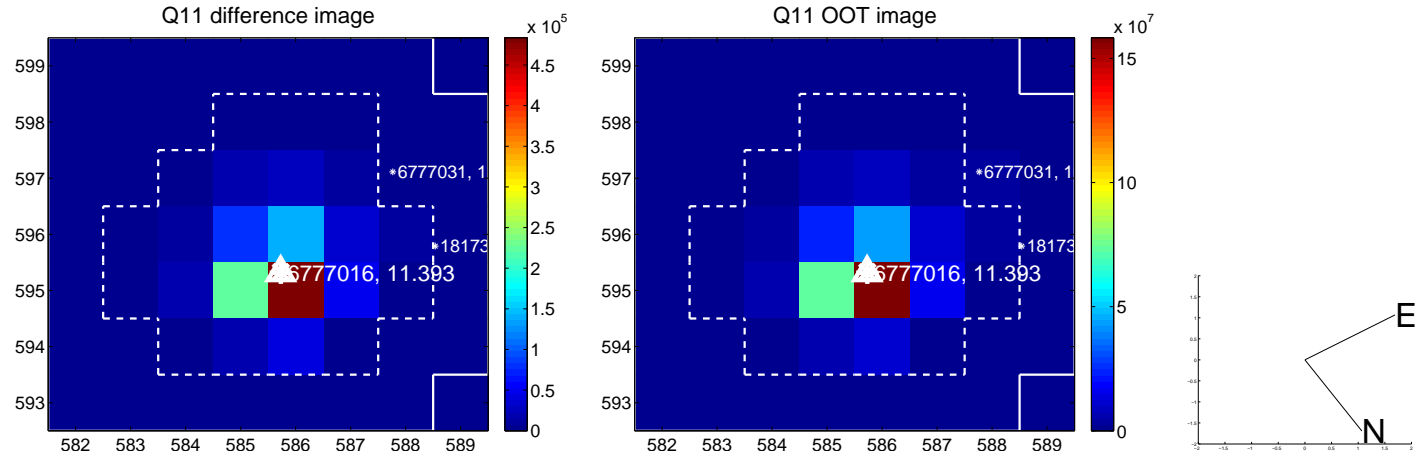
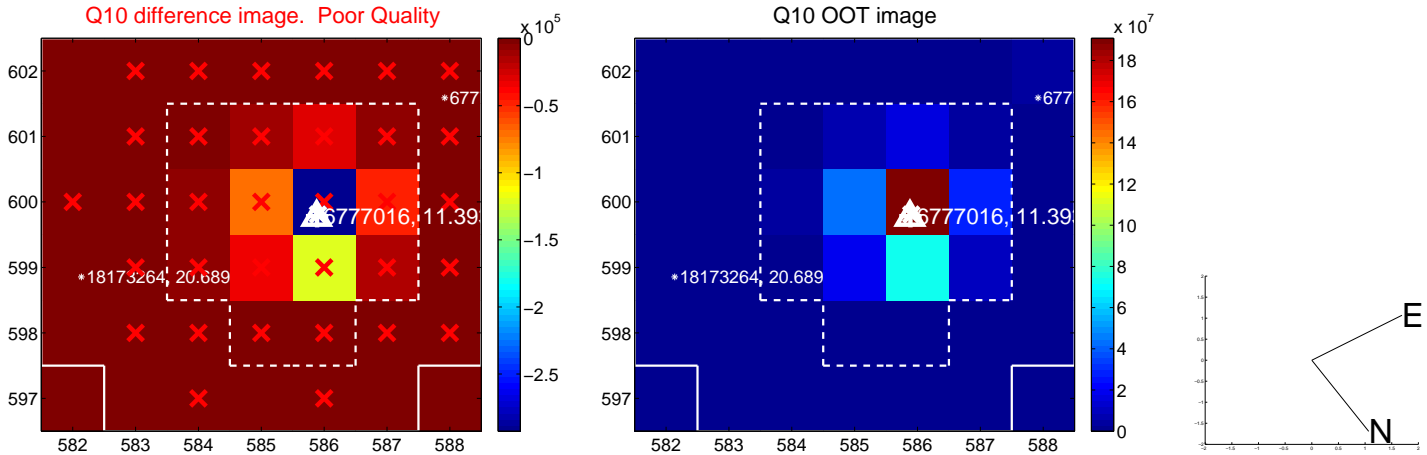
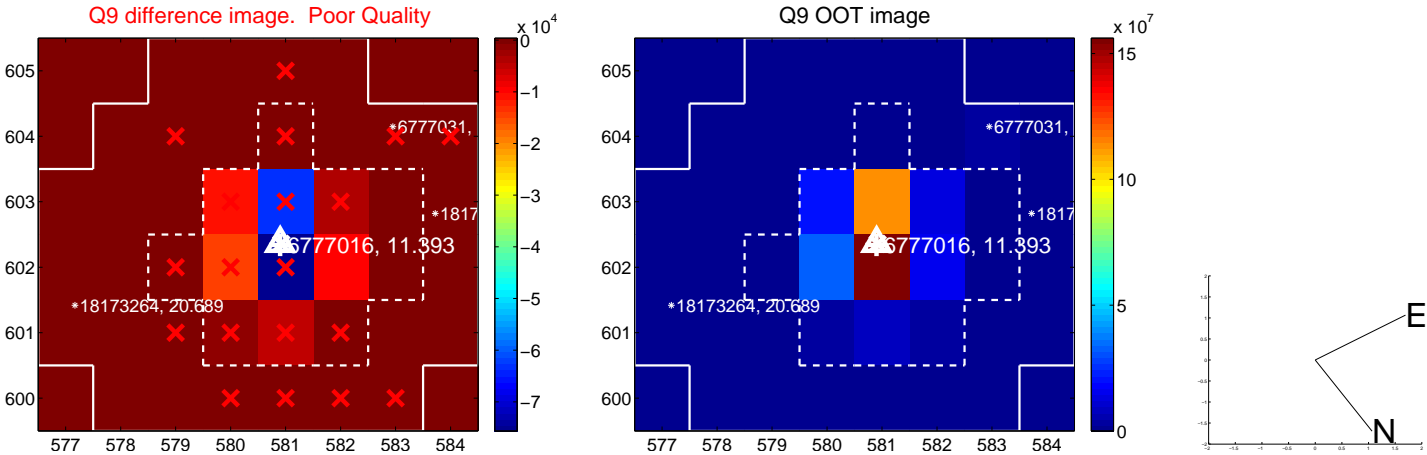
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



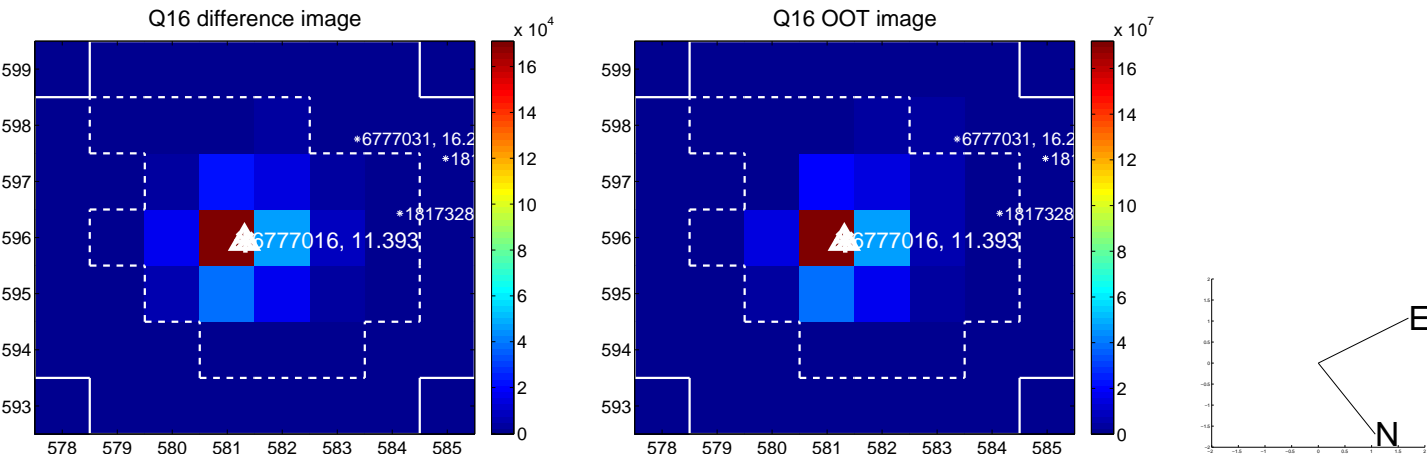
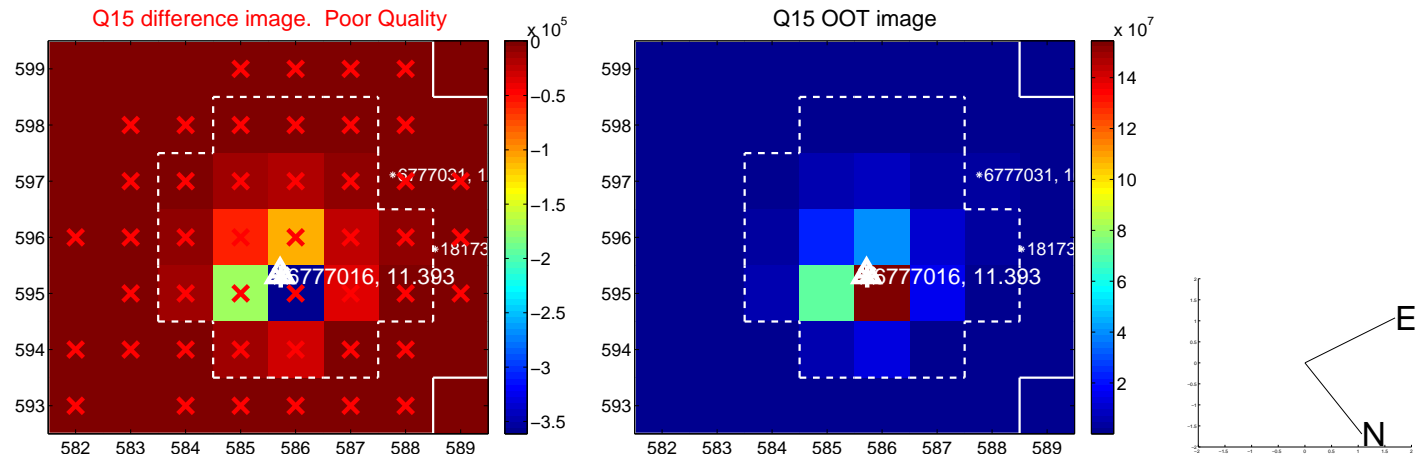
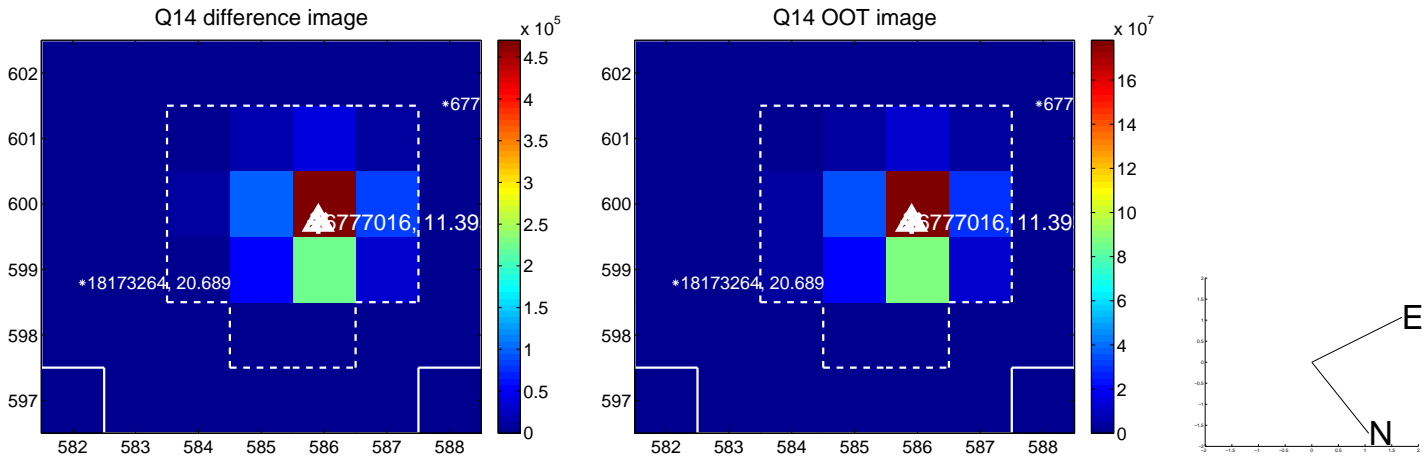
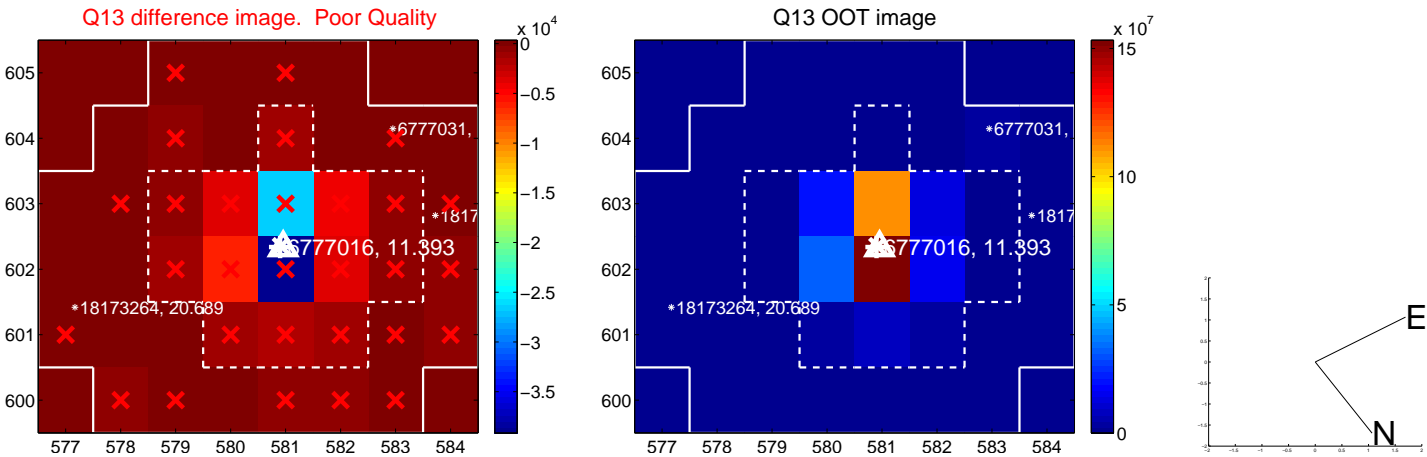
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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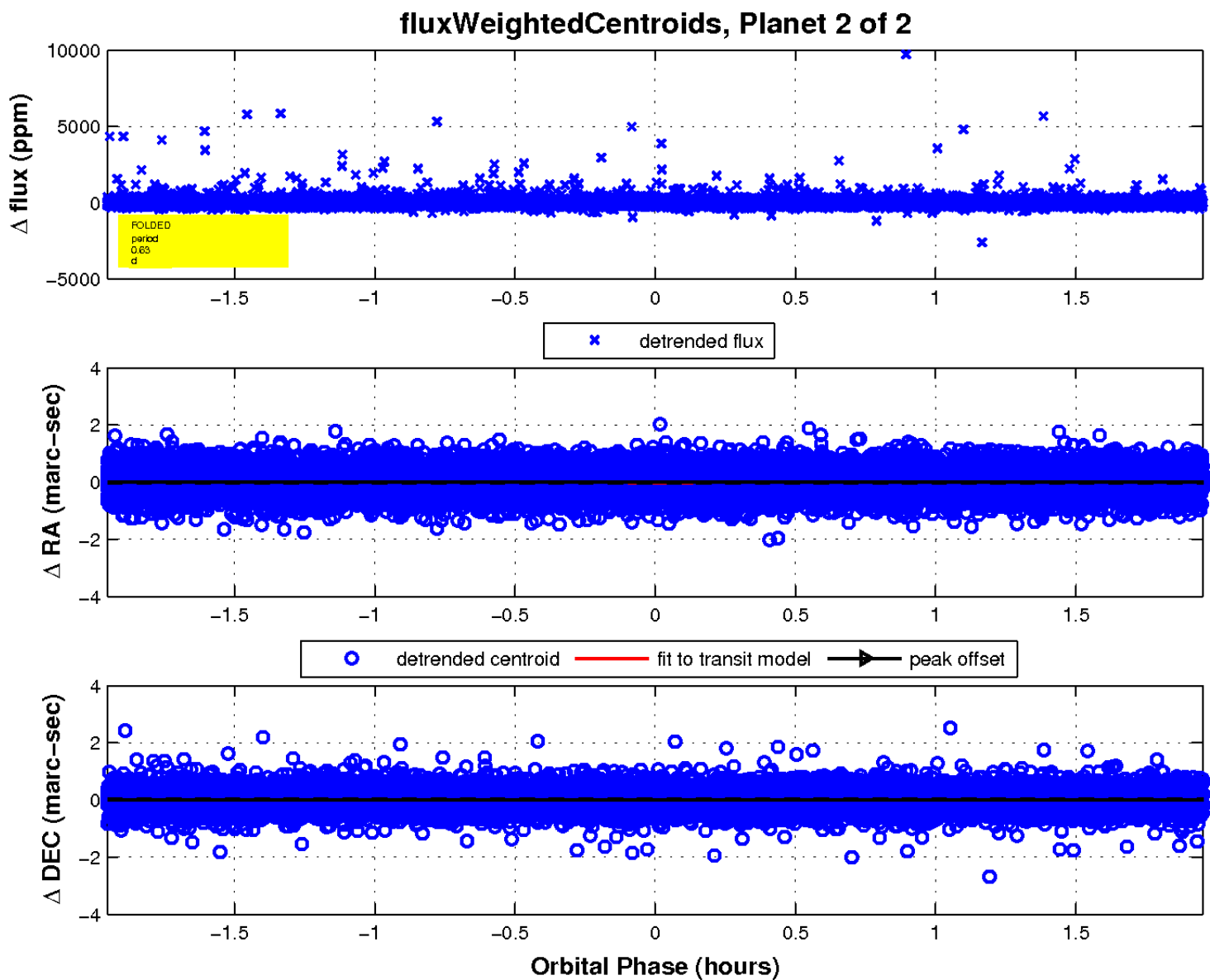
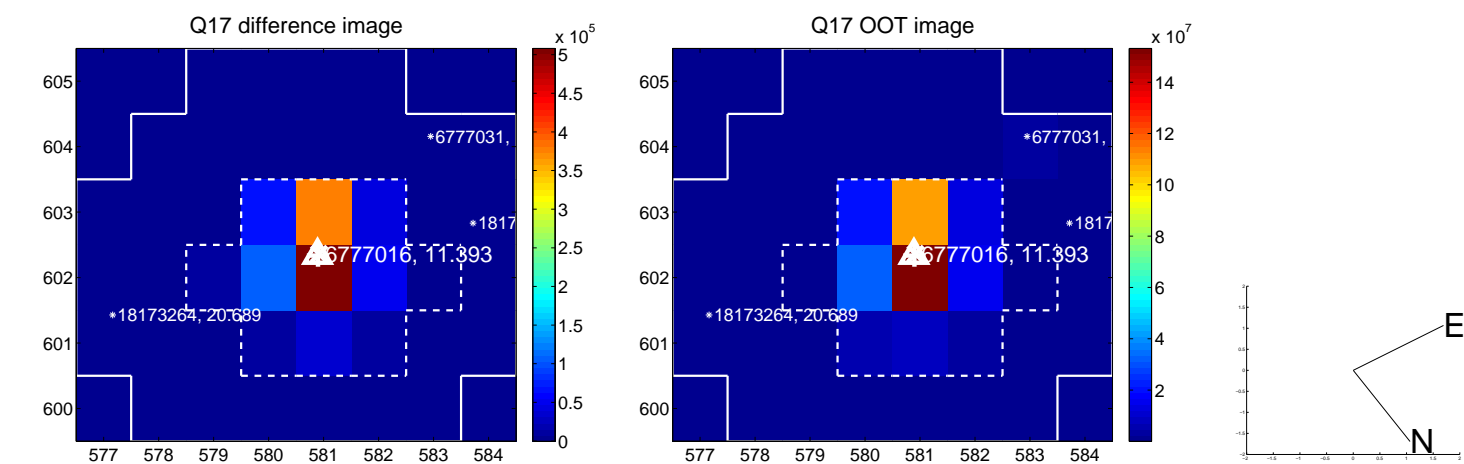


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





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



UKIRT Image

Declination

