

# KIC 012120077

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
012120077-01	OBS	No	0.667703	132.147011	99.3	2.061	10.3	7.9	1.76	7723	2.03	31946.56
012120077-02	OBS	No	0.667705	131.653635	147.8	1.782	12.3	11.3	1.76	7723	2.49	31946.41
012120077-03	OBS	No	0.667711	131.815877	165.7	1.699	12.5	13.8	1.76	7723	2.37	31946.05
012120077-04	OBS	No	22.338254	149.556087	1232.4	2.475	10.0	5.5	1.76	7723	10.96	296.35

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
012120077-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
012120077-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD
012120077-03	OBS	FP	0.00	1	0	0	0	LPP_DV—SAME_NTL_PERIOD
012120077-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT

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

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

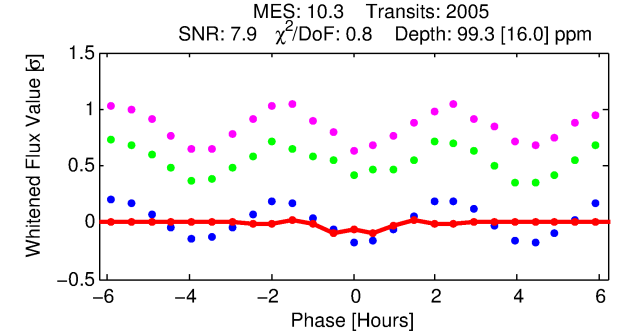
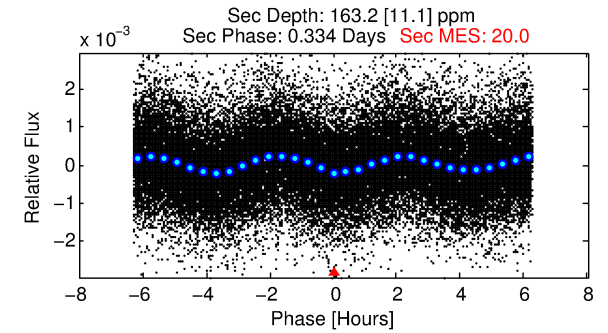
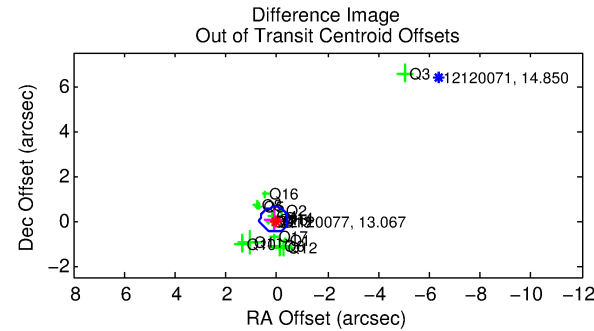
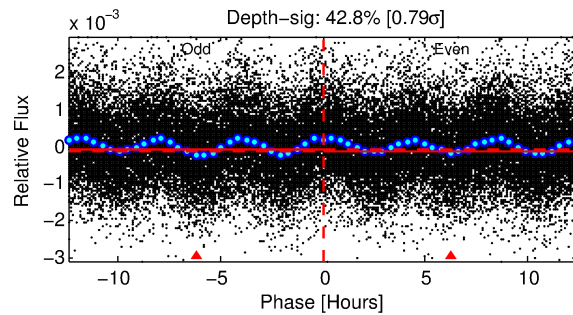
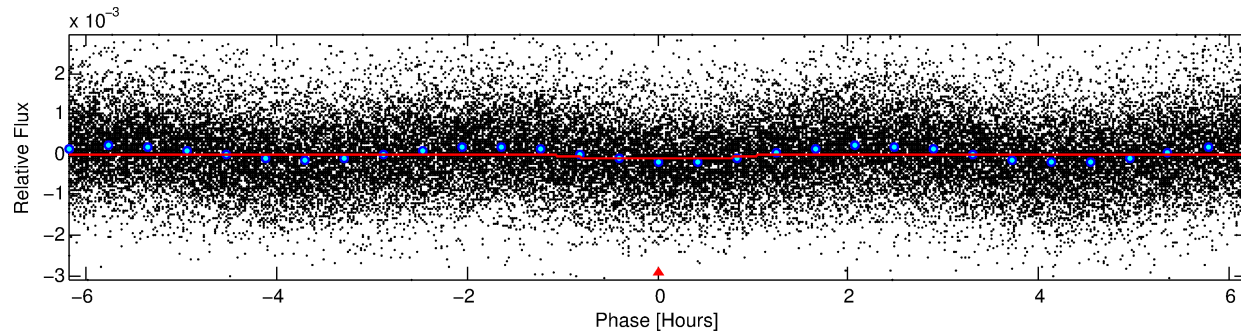
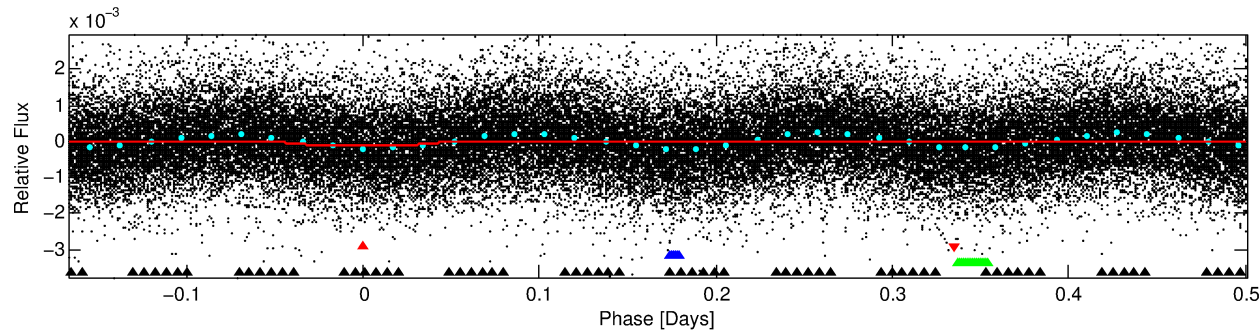
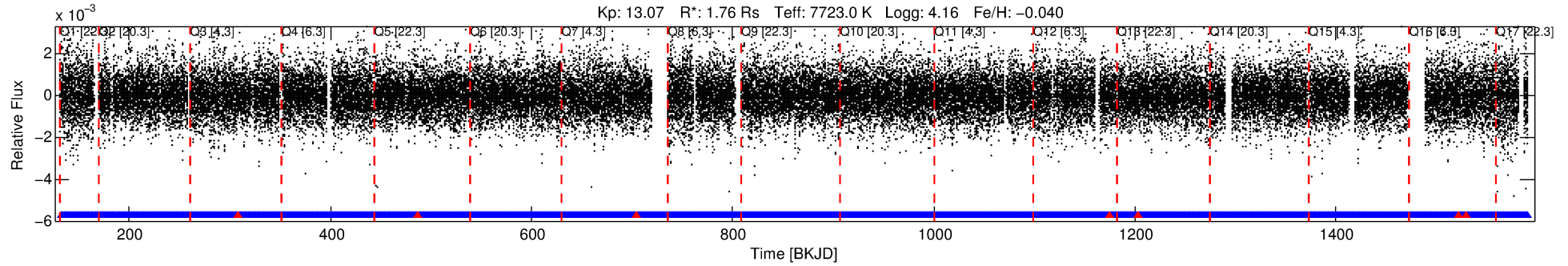
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 012120077-01

No Significant Match Found

# DV One-Page Summary

KIC: 12120077 Candidate: 1 of 4 Period: 0.668 d



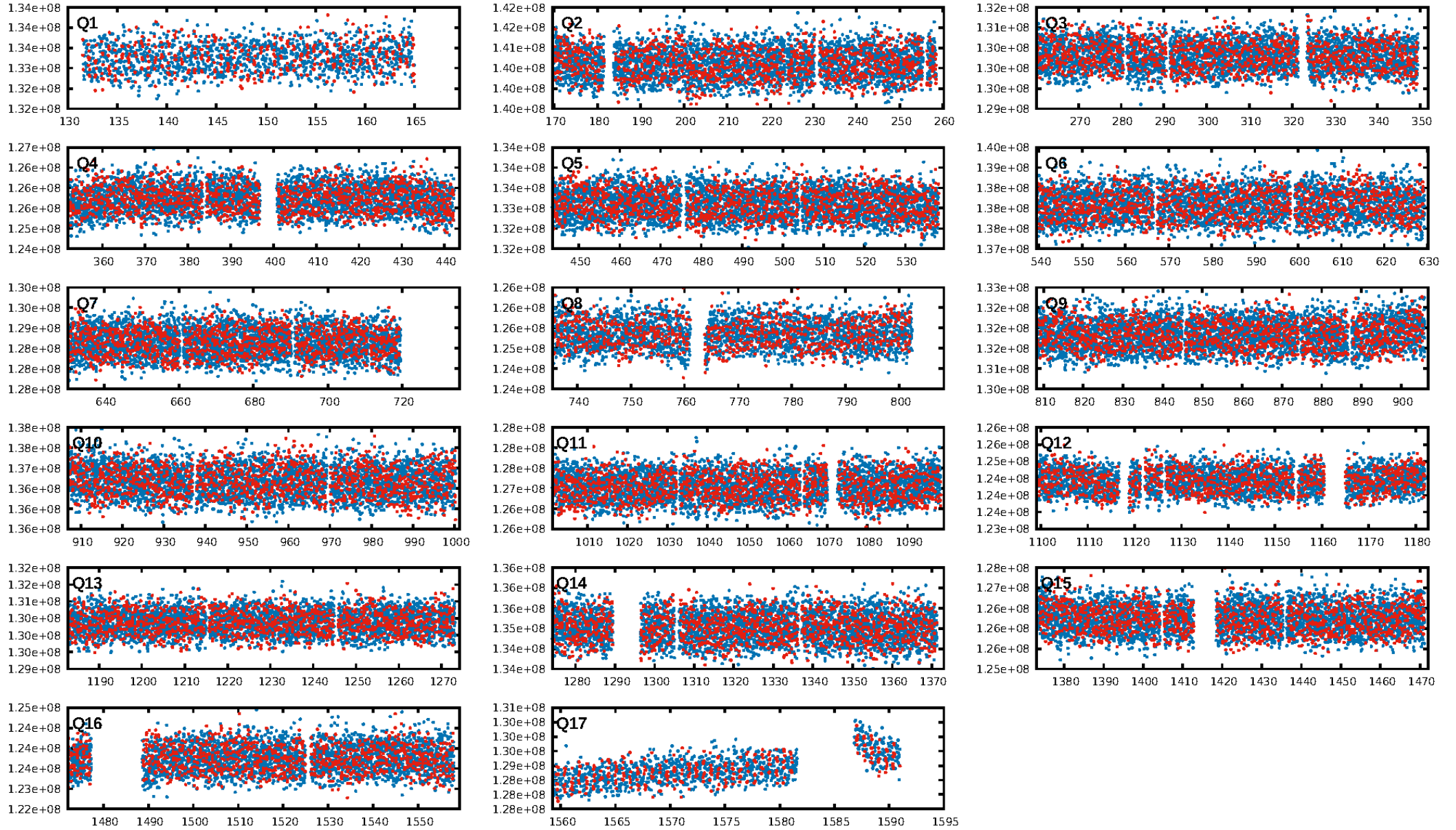
## DV Fit Results:

Period = 0.66770 [0.00001] d  
Epoch = 132.1470 [0.0016] BKJD  
Rp/R\* = 0.0105 [0.0031]  
a/R\* = 1.49 [1.49]  
b = 0.90 [0.40]  
Seff = 31946.55 [12226.84]  
Teq = 3409 [326] K  
Rp = 2.03 [0.83] Re  
a = 0.0176 [0.0042] AU  
Ag = 6.76 [4.63] [1.25 $\sigma$ ]  
**Teffp = 8499 [1305] K [3.78 $\sigma$ ]**

## DV Diagnostic Results:

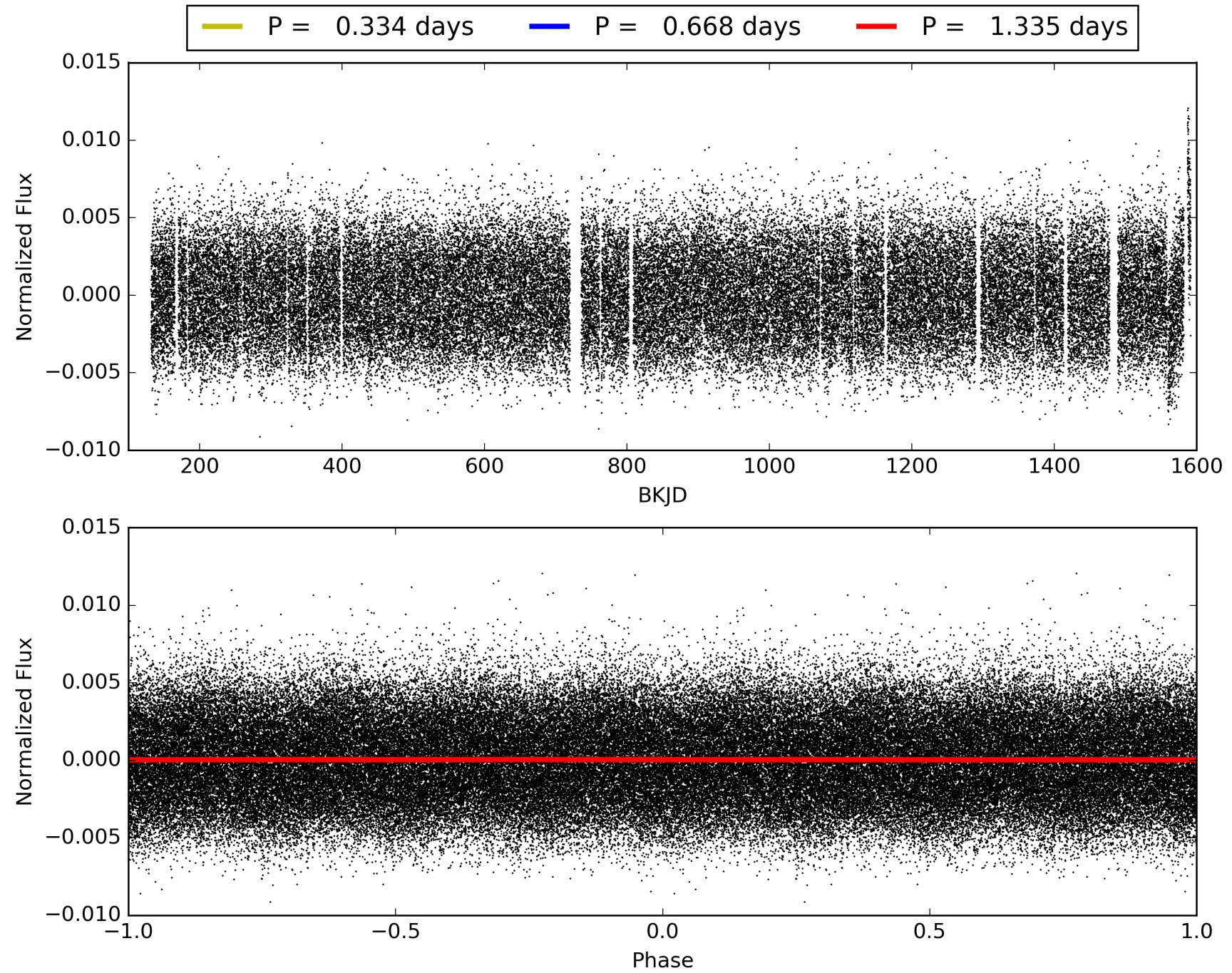
ShortPeriod-sig: N/A  
**LongPeriod-sig: 0.0% [0.00 $\sigma$ ]**  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [1908/1915]  
GhostDiagnostic-chr: -4.794  
Centroid-sig: N/A  
Centroid-so: 0.131 arcsec [0.39 $\sigma$ ]  
OotOffset-rm: 0.124 arcsec [0.68 $\sigma$ ]  
KicOffset-rm: 0.130 arcsec [0.24 $\sigma$ ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 0.65 [11/17]  
DiffImageOverlap-fno: 0.00 [0/17]

# TCE 012120077-01, PDC Light Curves





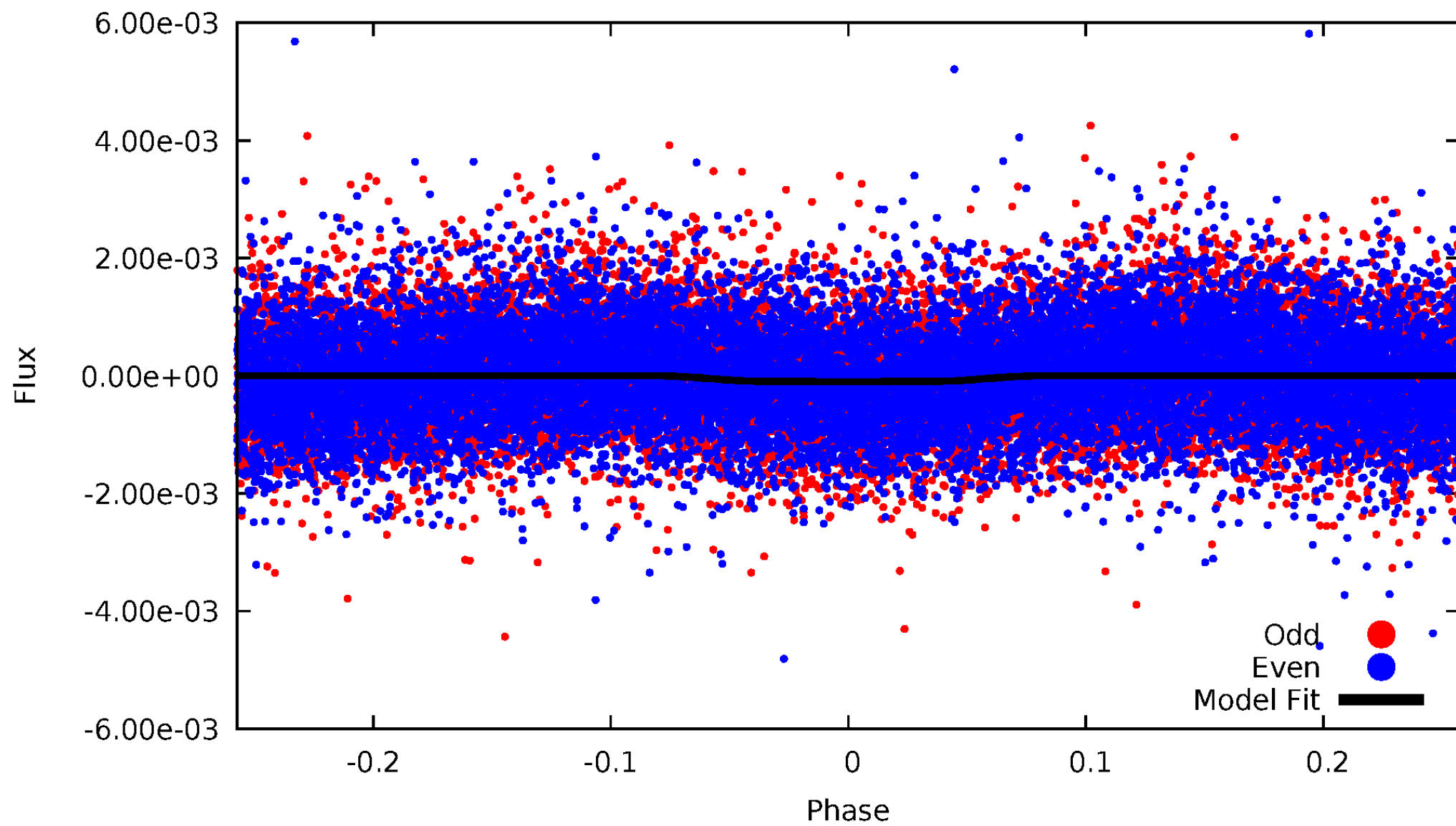
TCE 012120077-01





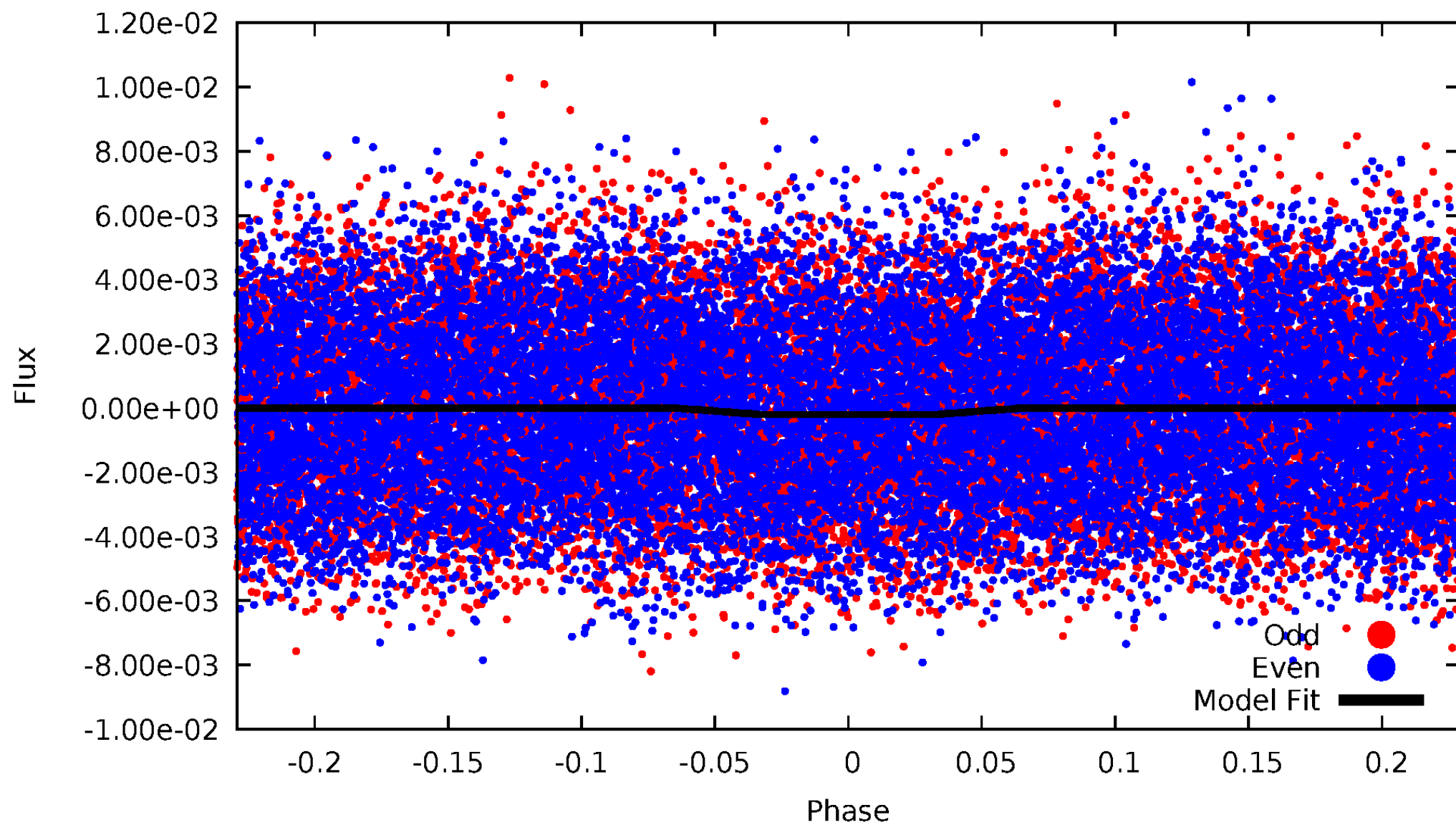
DV Odd/Even

TCE 012120077-01

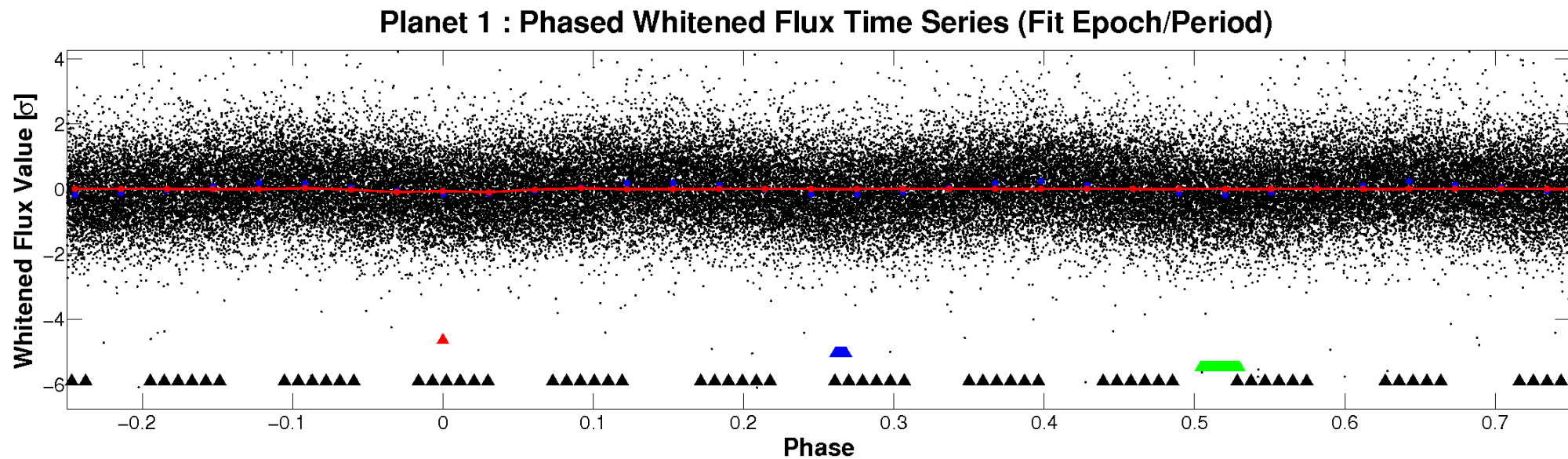
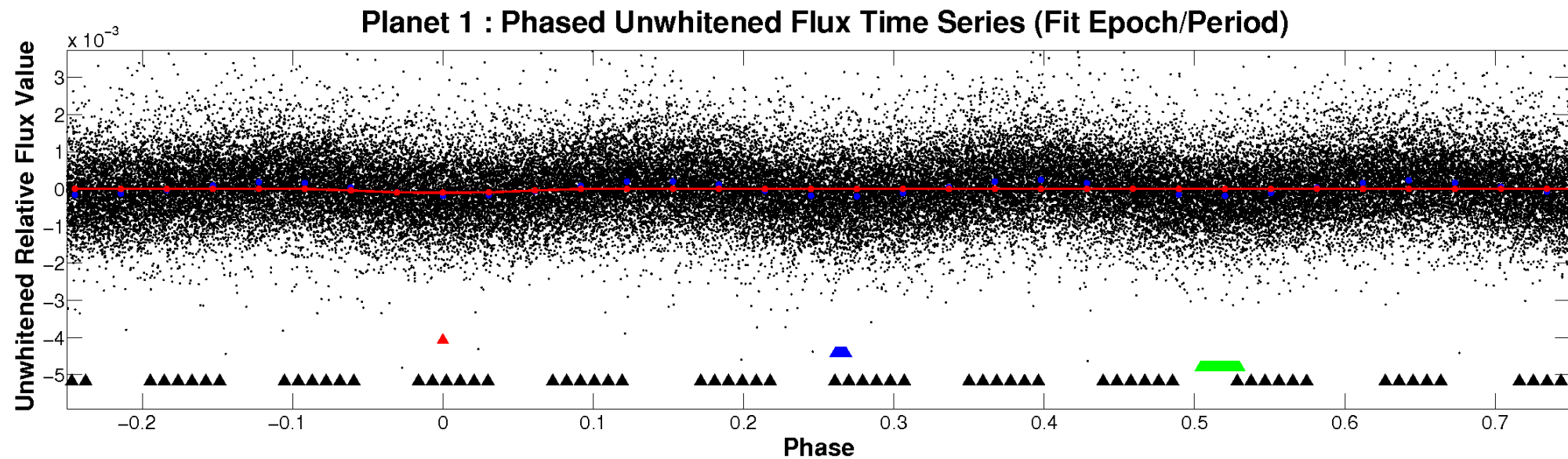


# ALT Odd/Even

TCE 012120077-01



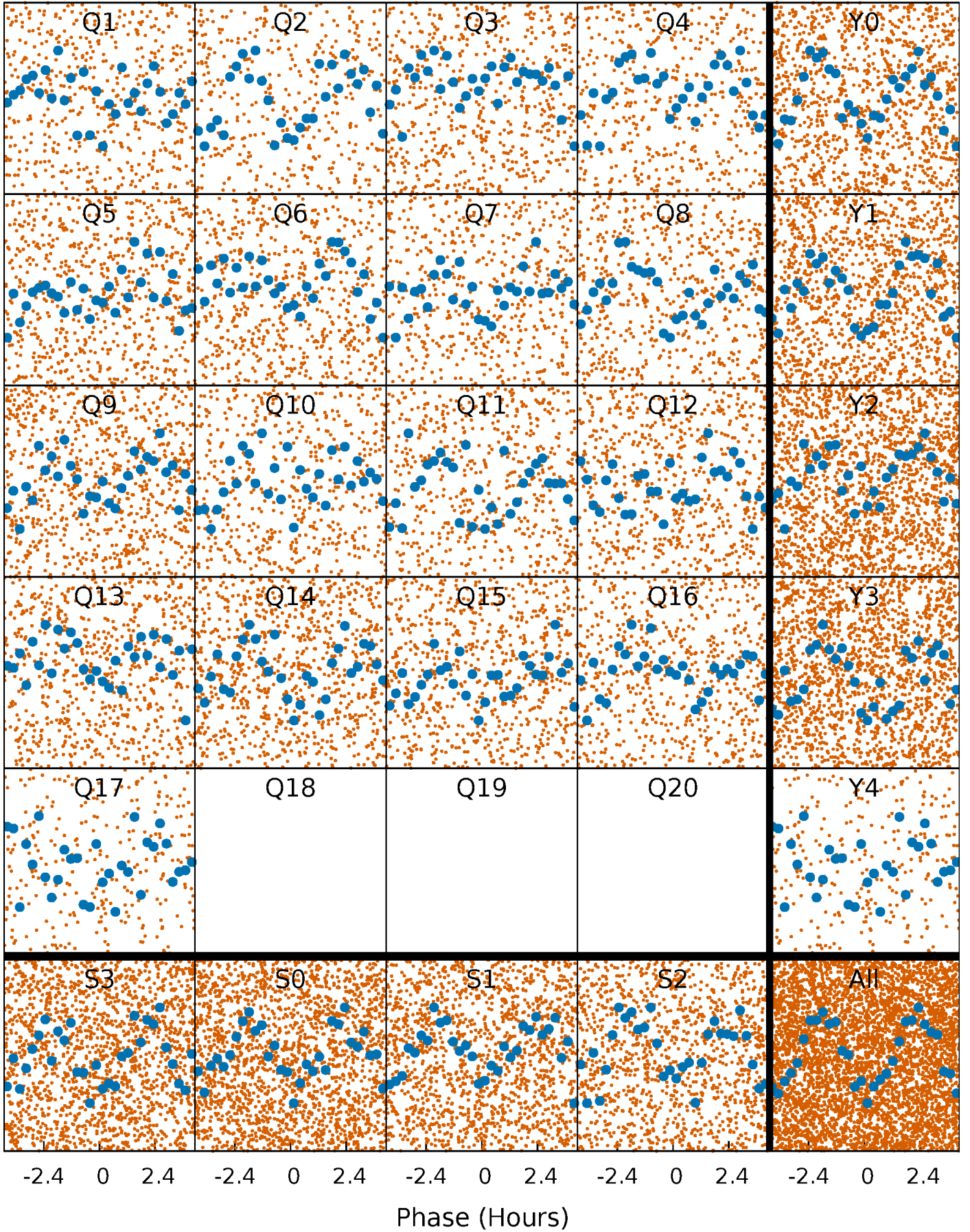
# Non-Whitened Vs. Whitened Light Curve





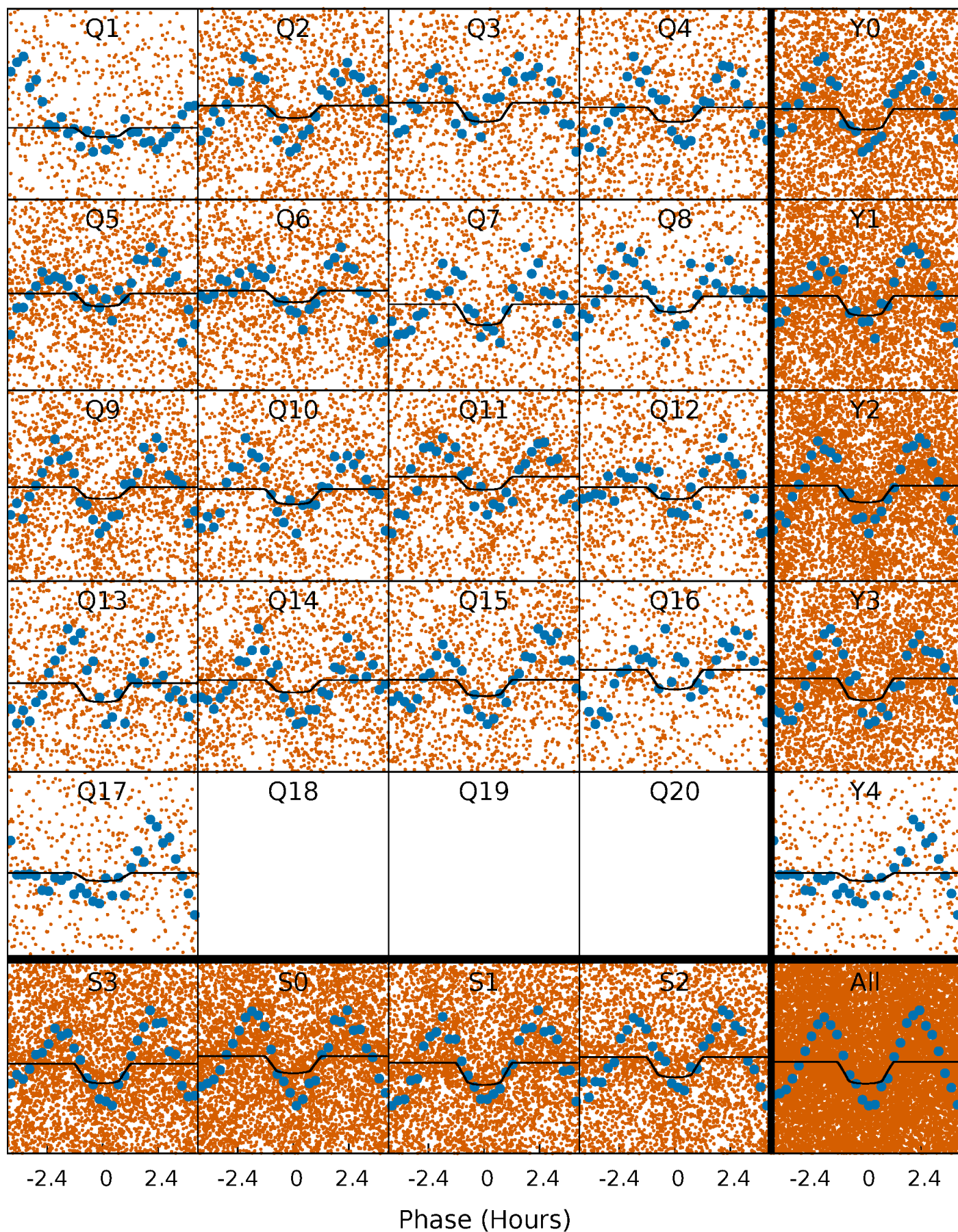
# PDC Quarter-Phased Transit Curves

TCE 012120077-01 P= 0.667703 Days  $T_0=132.147011$  (BKJD)



# DV Quarter-Phased Transit Curves

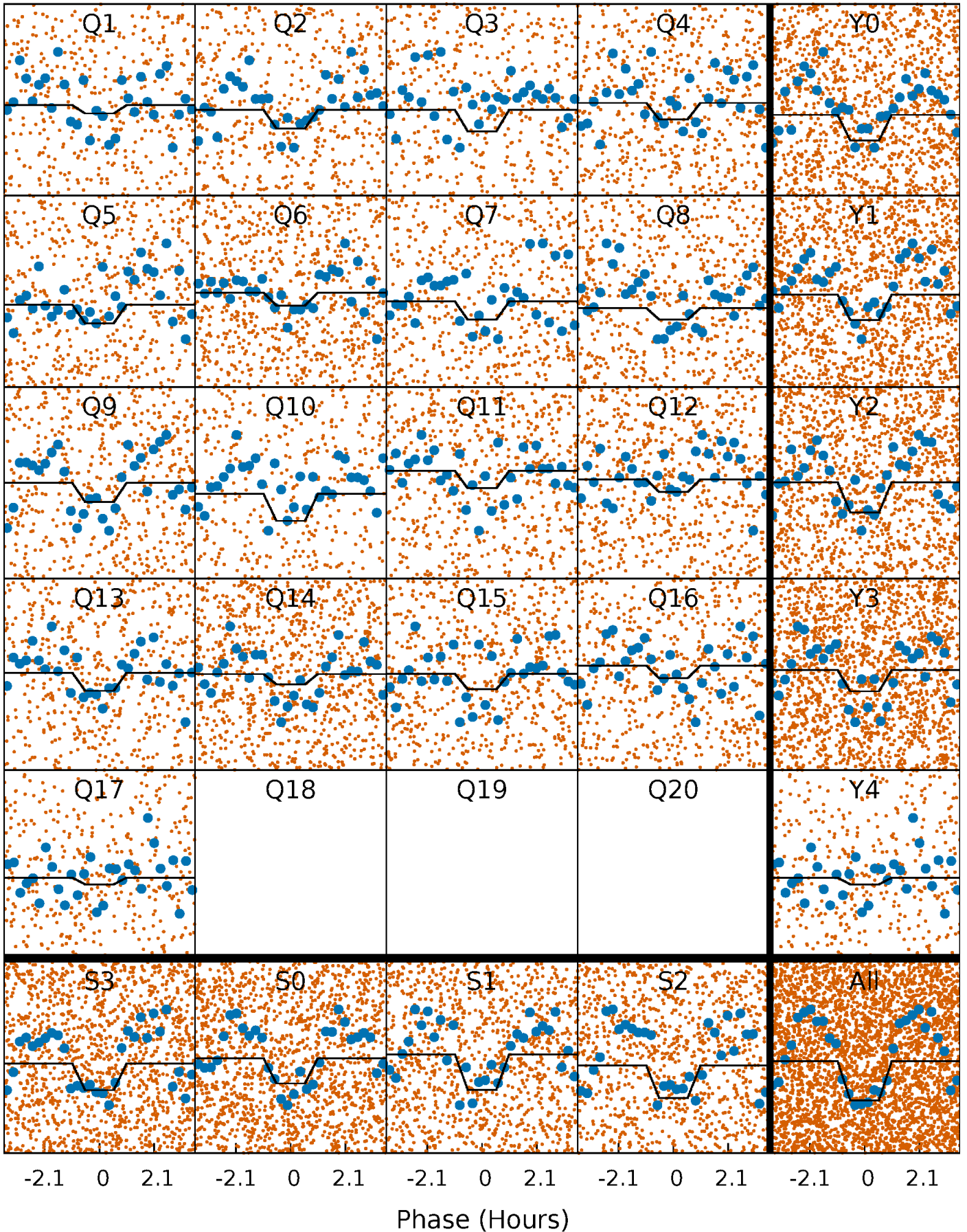
TCE 012120077-01 P= 0.667703 Days  $T_0=132.147011$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

TCE 012120077-01 P= 0.667715 Days  $T_0=132.144231$  (BKJD)

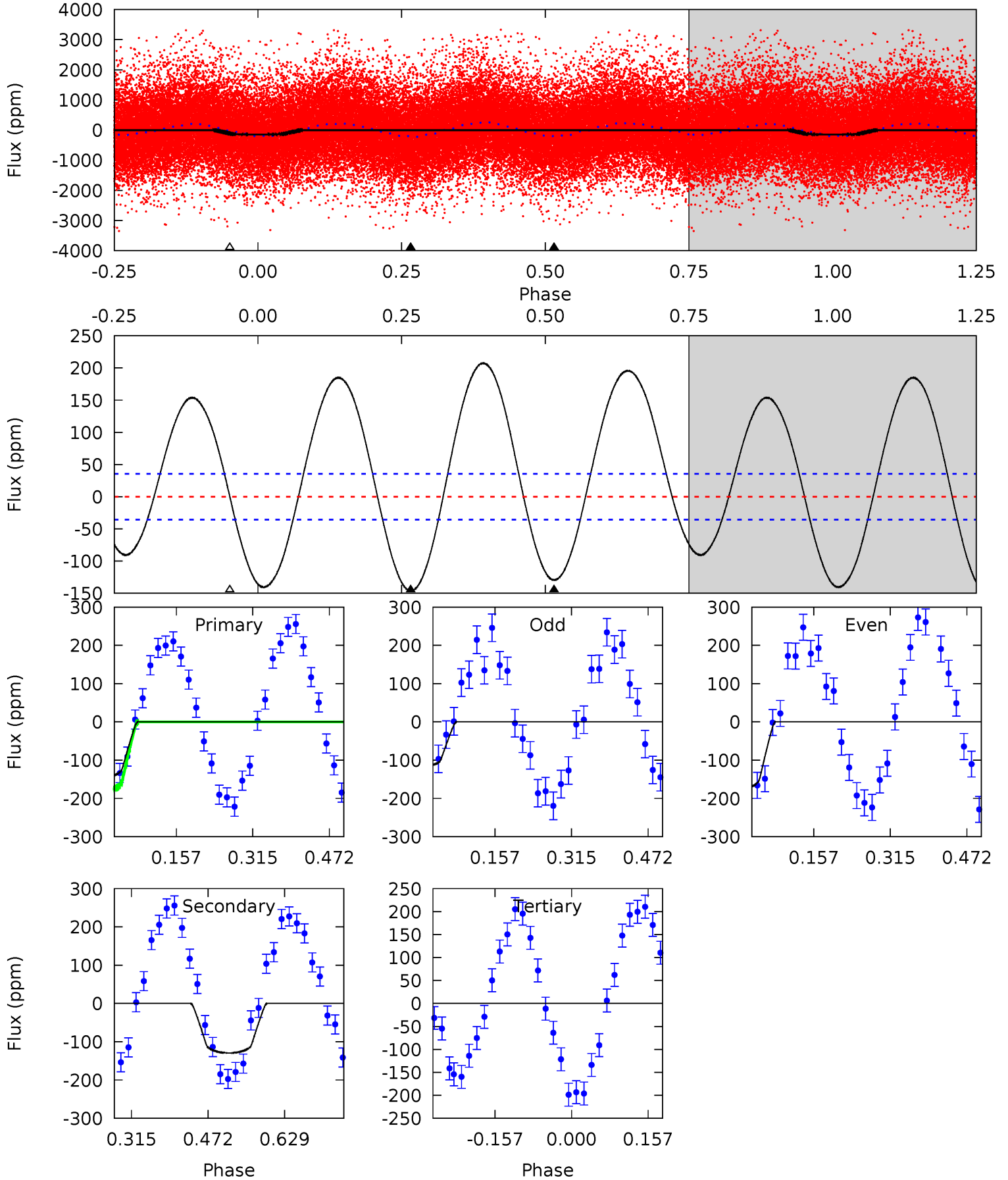




# DV Model-Shift Uniqueness Test

012120077-01, P = 0.667703 Days, E = 131.479308 Days

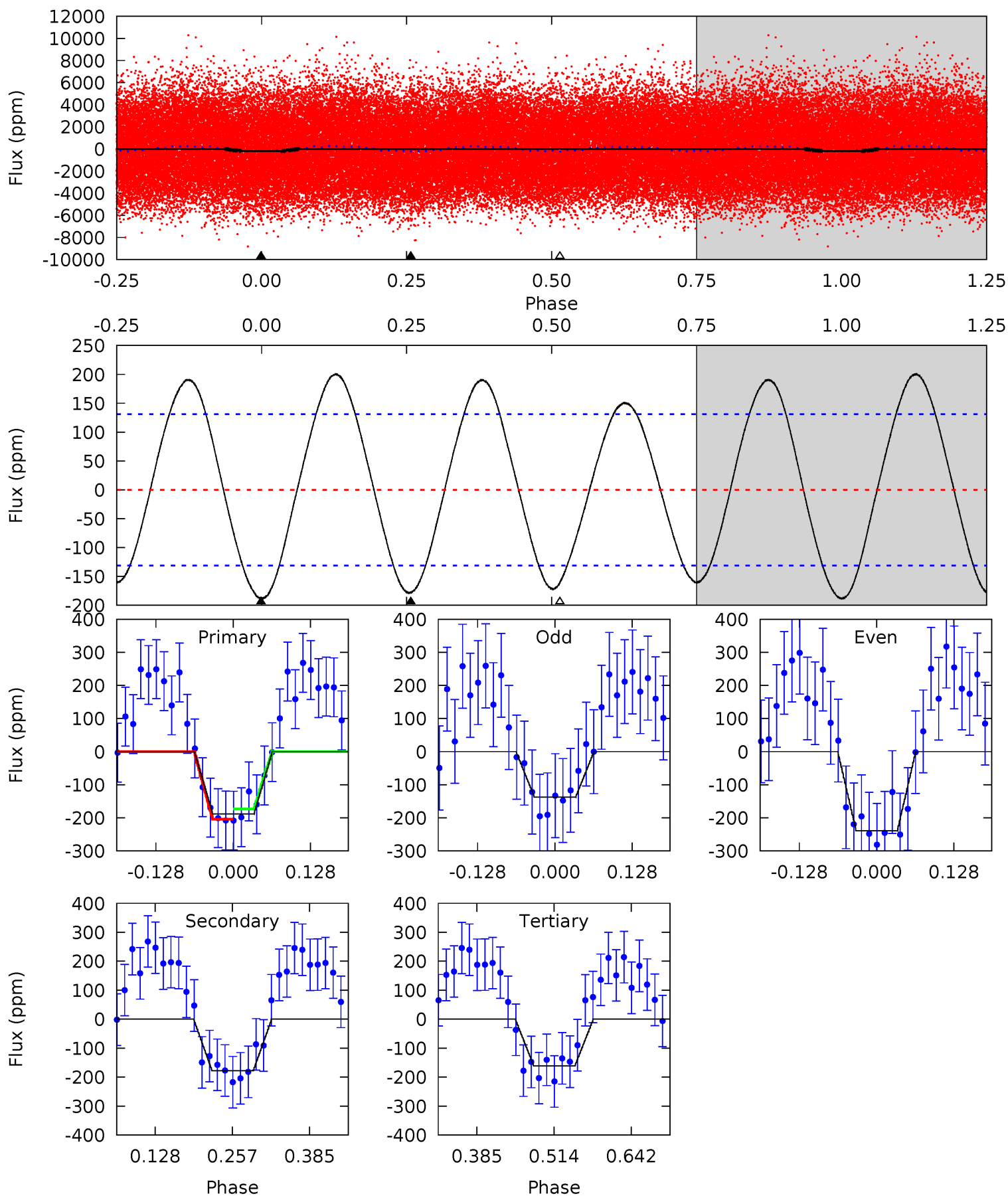
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
18.4	16.3	0	0	4.47	1.41	11.9	18.4	18.4	16.3	16.3	3.72	0.91	0.59	4.82



# Alt Model-Shift Uniqueness Test

012120077-01, P = 0.667715 Days, E = 131.476516 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
6.49	6.14	5.54	0	4.51	1.52	3.98	0.95	6.49	0.59	6.14	1.72	0.96	0.52	0.51



### Stellar Parameters For KIC 012120077

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7723^{+214}_{-322}$	$4.159^{+0.101}_{-0.188}$	$-0.040^{+0.200}_{-0.350}$	$1.765^{+0.498}_{-0.291}$	$1.637^{+0.210}_{-0.231}$	$0.419^{+0.237}_{-0.207}$
	+3%/-4%	+2%/-5%	+500%/-875%	+28%/-16%	+13%/-14%	+57%/-49%
Source	KIC0	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 012120077-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-129 \pm 8$	$2.11^{+0.72}_{-0.64}$	$4818^{+346}_{-282}$	$7829^{+2186}_{-1190}$	$4.897^{+5.369}_{-2.145}$
Alt.	$-178 \pm 29$	$2.74^{+0.67}_{-0.59}$	$4805^{+318}_{-275}$	$7302^{+1200}_{-898}$	$3.985^{+2.367}_{-1.514}$

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



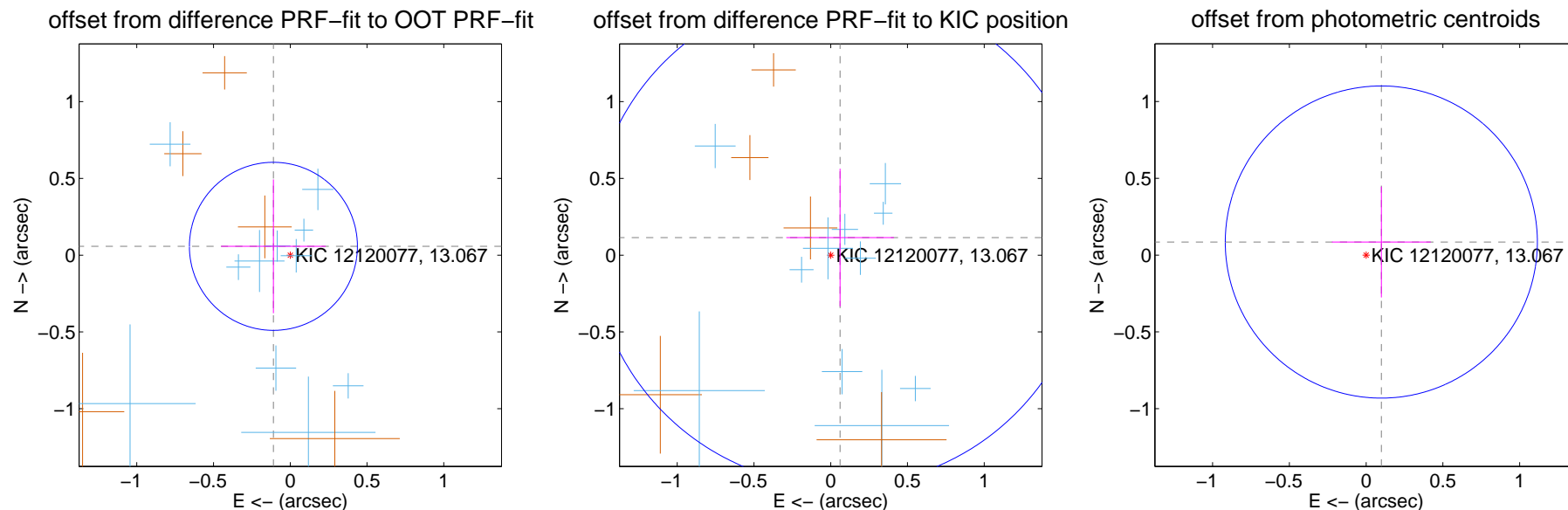
## DV Centroid Data

Supplemental centroid analysis for 012120077-01. Kepler magnitude: 13.07. Transit SNR 7.94

There are 11 quarters with good PRF difference image offsets

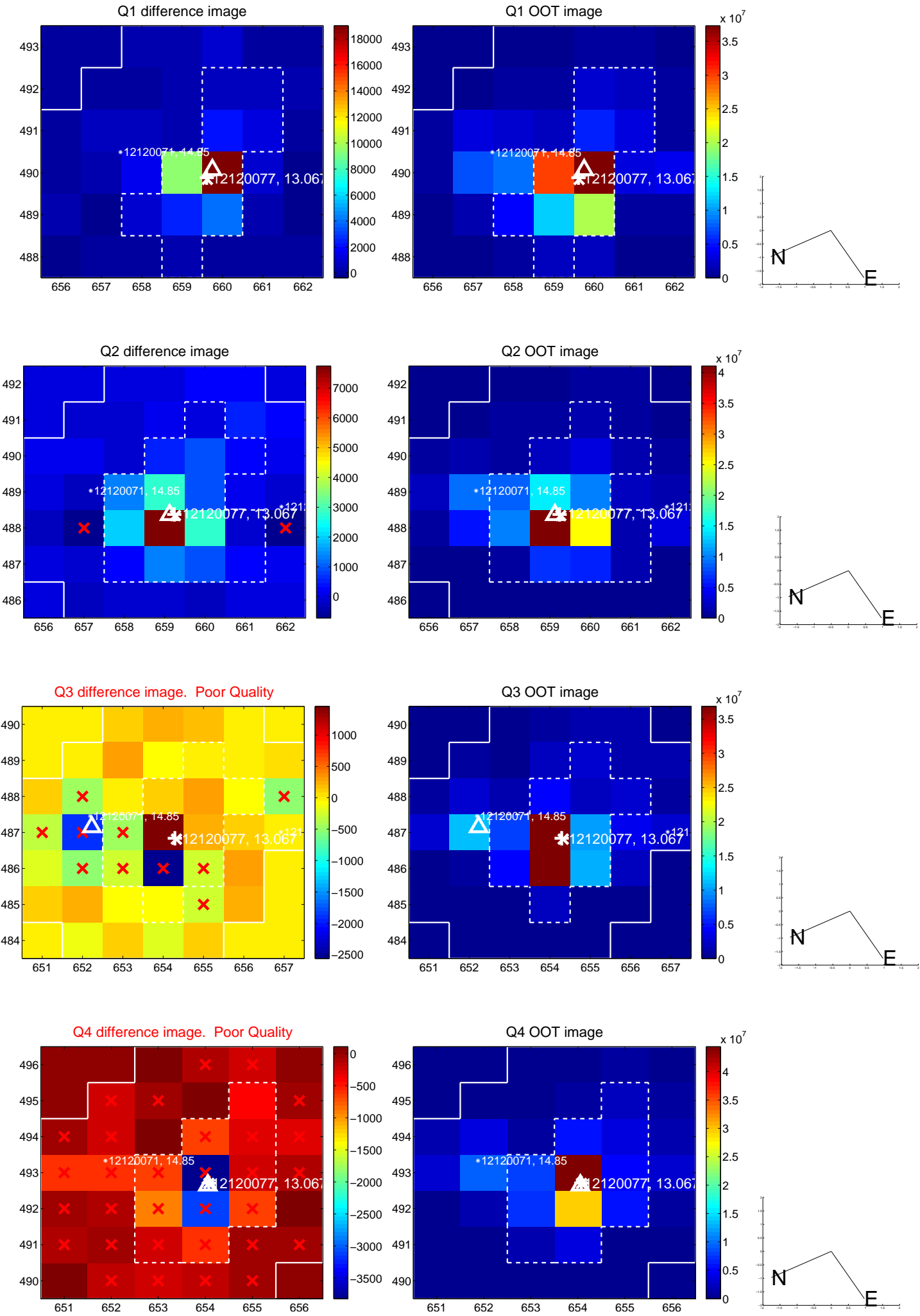
The direct PRF centroid is offset from the target star catalog position by about 0.17 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.124 \pm 0.182$	0.68	$0.110 \pm 0.341$	$0.057 \pm 0.436$
PRF-fit source offset from KIC position	$0.130 \pm 0.540$	0.24	$-0.061 \pm 0.351$	$0.114 \pm 0.448$
photometric centroid source offset	$0.13 \pm 0.34$	0.39	$-0.10 \pm 0.32$	$0.08 \pm 0.36$

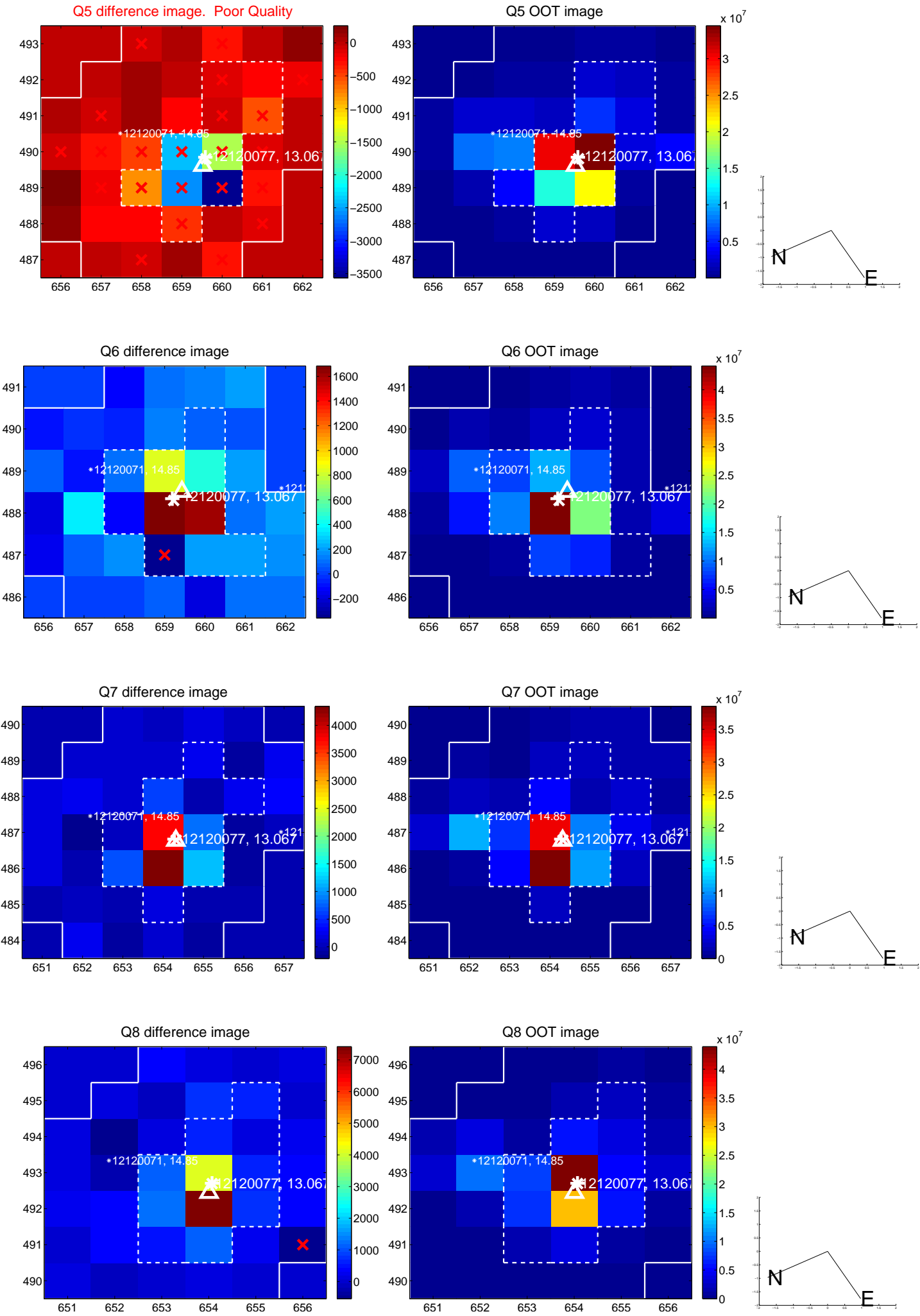


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

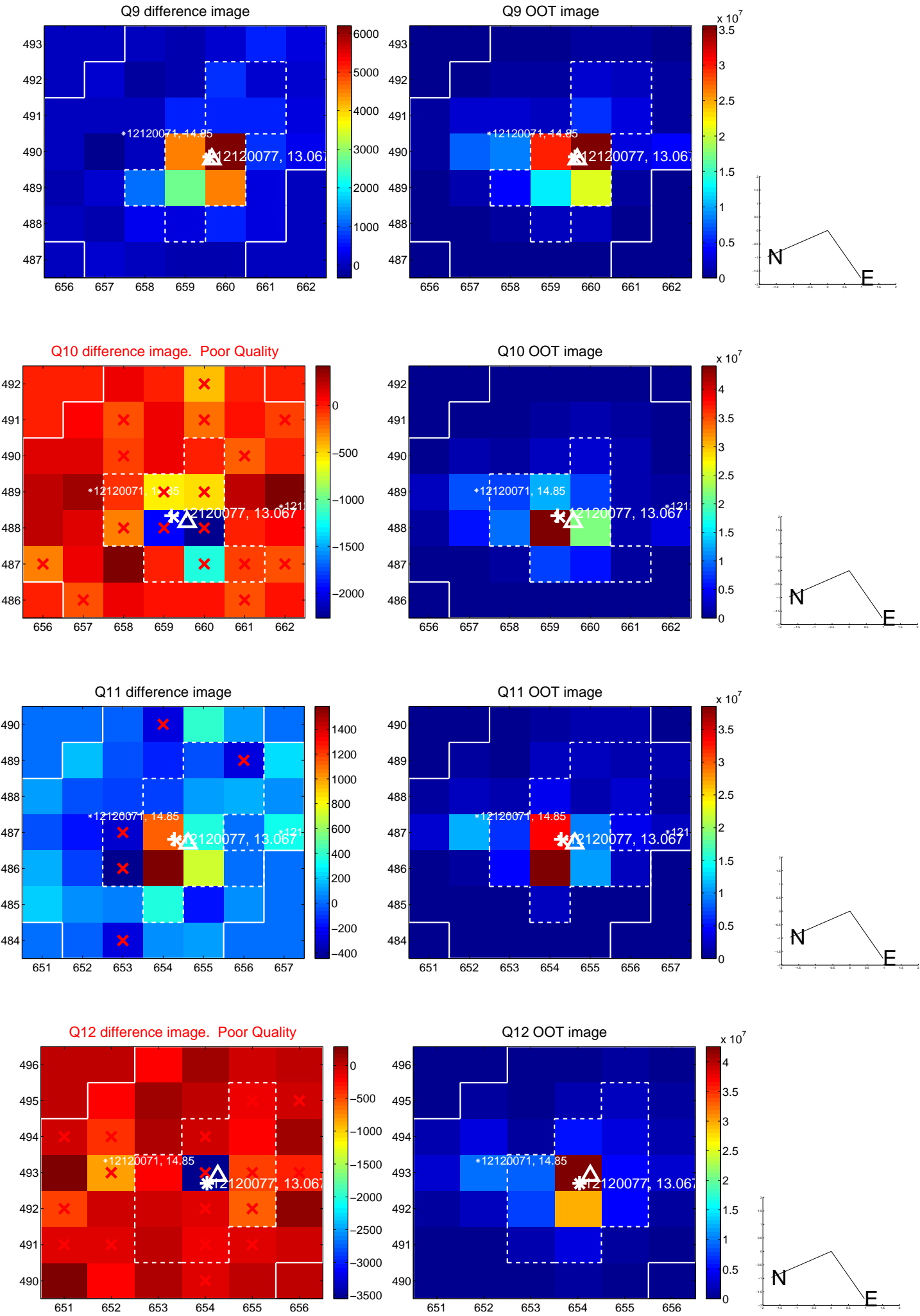


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

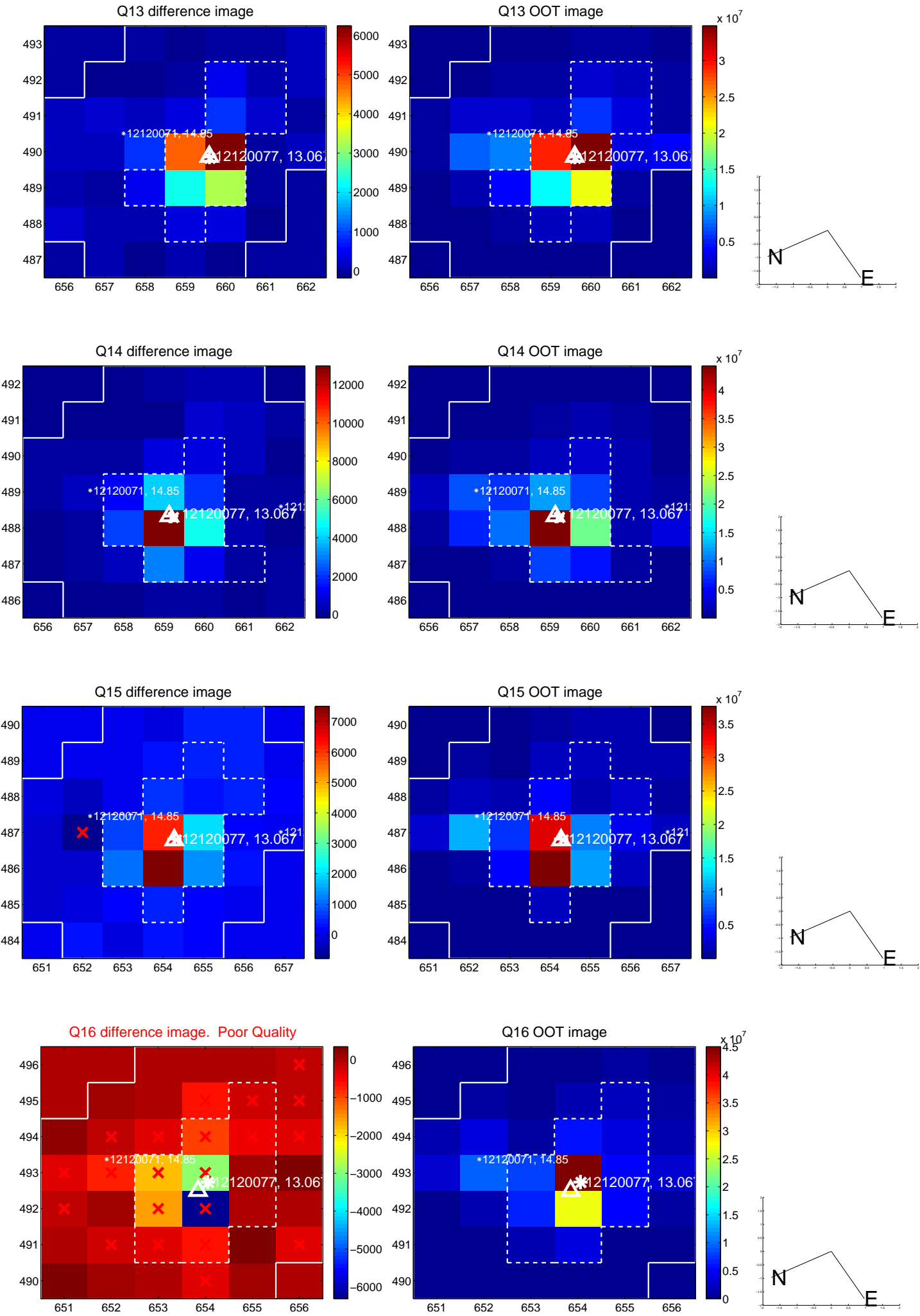




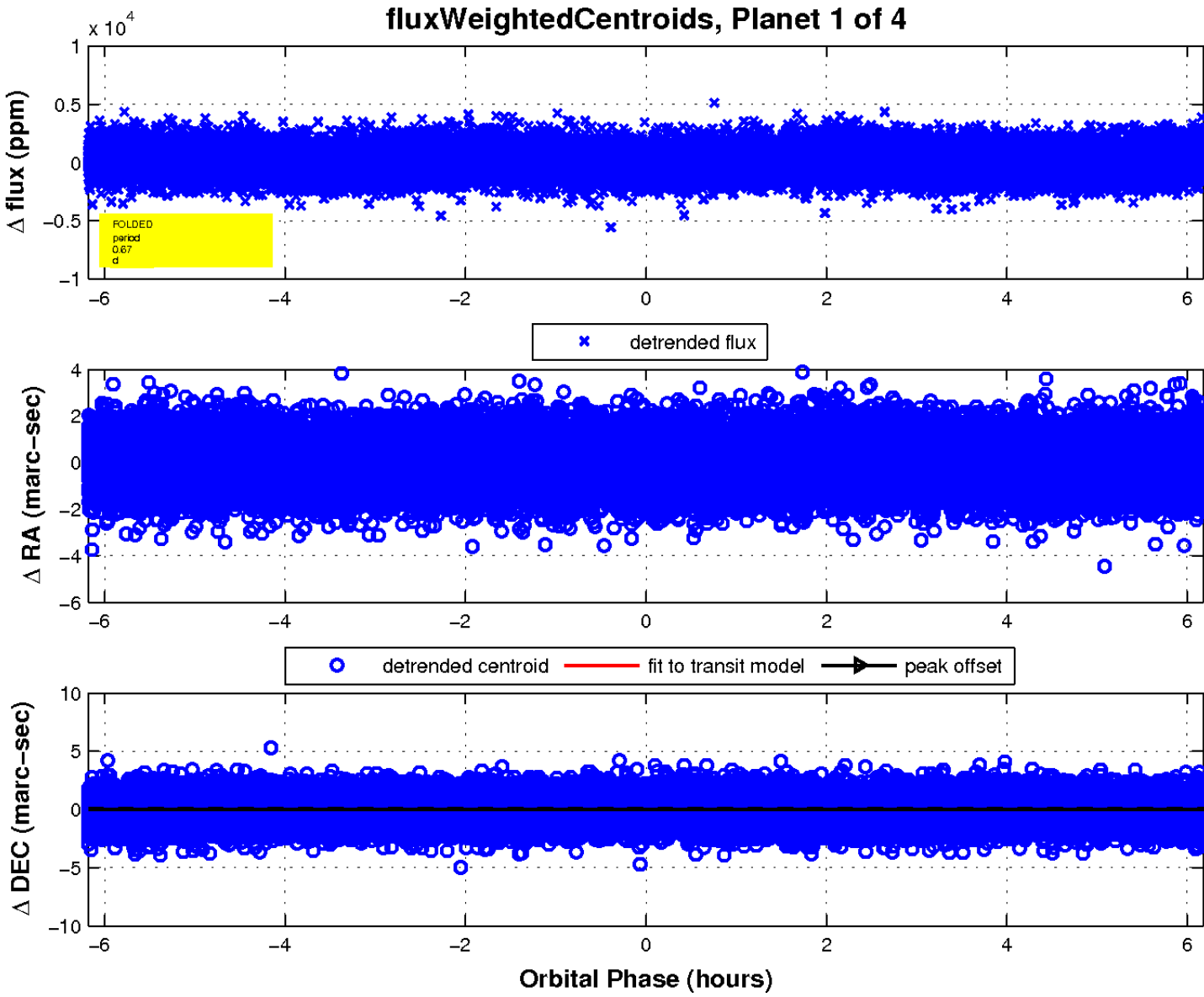
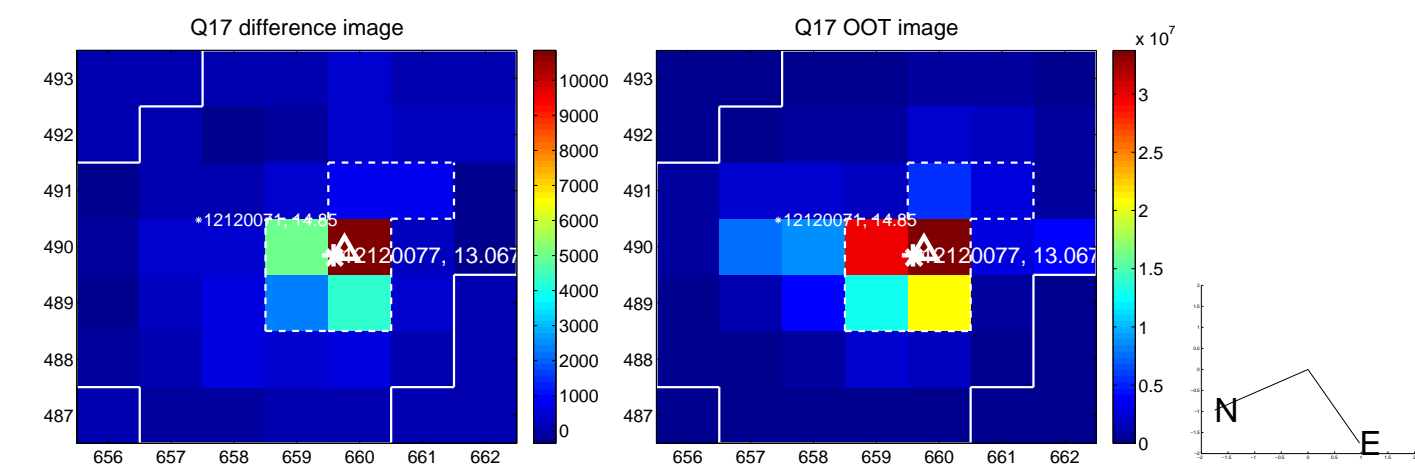
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

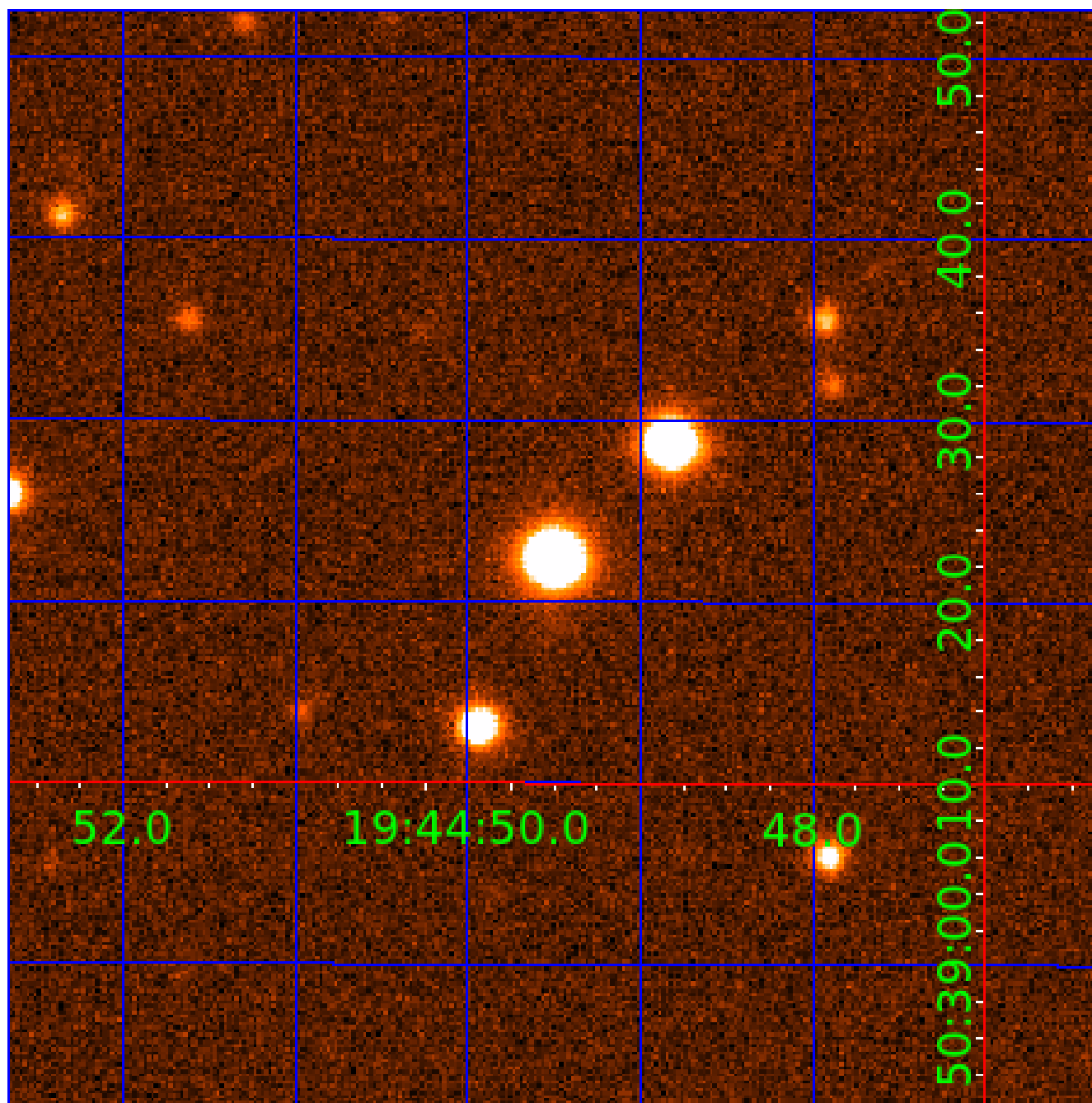


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 012120077

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
012120077-01	OBS	No	0.667703	132.147011	99.3	2.061	10.3	7.9	1.76	7723	2.03	31946.56
012120077-02	OBS	No	0.667705	131.653635	147.8	1.782	12.3	11.3	1.76	7723	2.49	31946.41
012120077-03	OBS	No	0.667711	131.815877	165.7	1.699	12.5	13.8	1.76	7723	2.37	31946.05
012120077-04	OBS	No	22.338254	149.556087	1232.4	2.475	10.0	5.5	1.76	7723	10.96	296.35

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
012120077-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
012120077-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD
012120077-03	OBS	FP	0.00	1	0	0	0	LPP_DV—SAME_NTL_PERIOD
012120077-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT

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

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

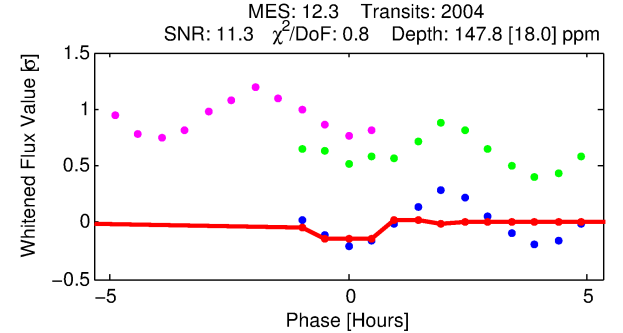
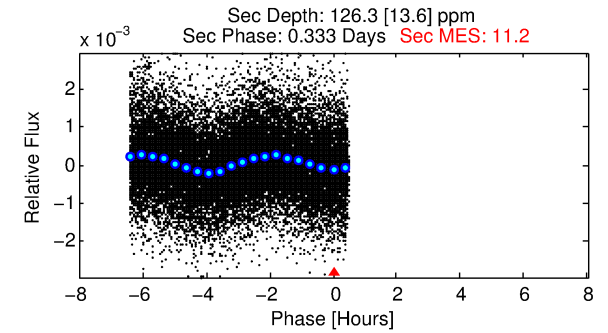
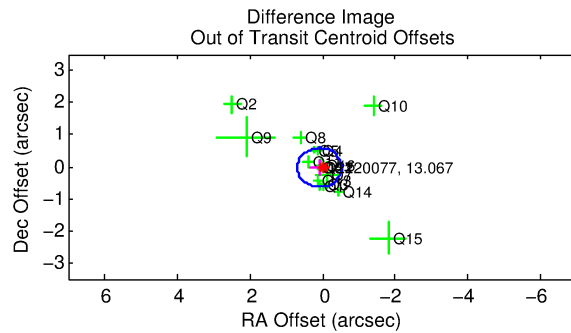
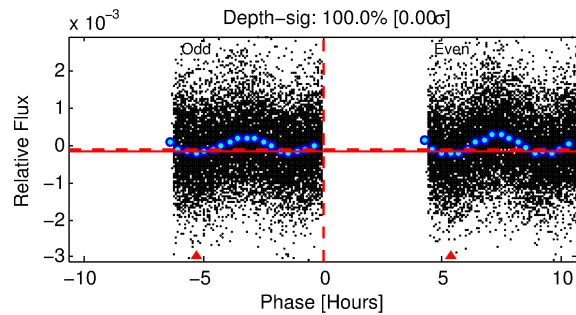
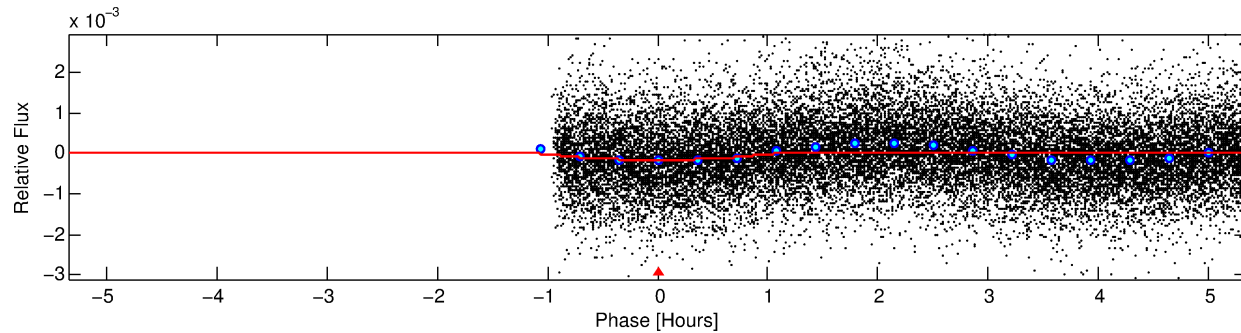
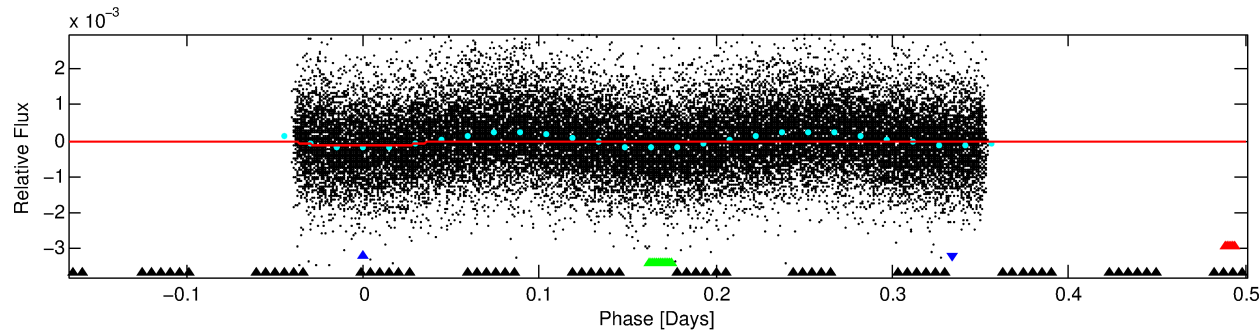
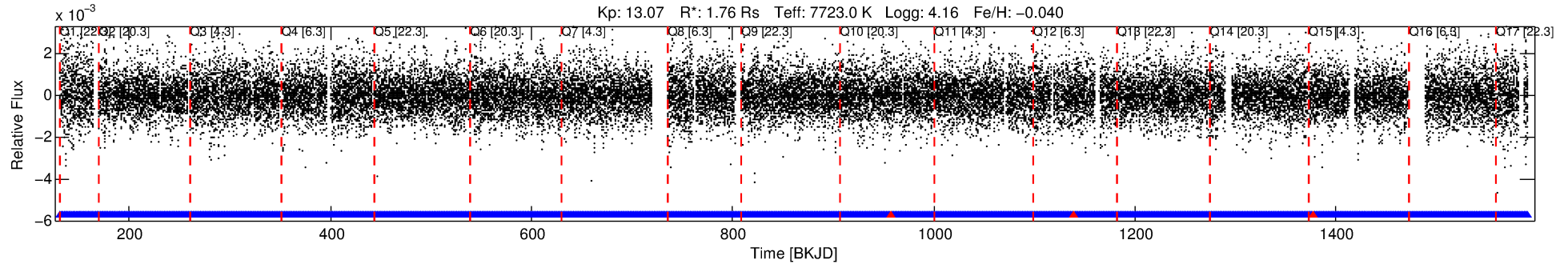
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 012120077-02

No Significant Match Found

# DV One-Page Summary

KIC: 12120077 Candidate: 2 of 4 Period: 0.668 d



## DV Fit Results:

Period = 0.66771 [0.00001] d  
Epoch = 131.6536 [0.0015] BKJD  
Rp/R\* = 0.0129 [0.0038]  
a/R\* = 1.63 [1.92]  
b = 0.90 [0.40]  
Seff = 31946.41 [12226.79]  
Teq = 3409 [326] K  
Rp = 2.49 [1.02] Re  
a = 0.0176 [0.0042] AU  
Ag = 3.49 [2.42] [1.03 $\sigma$ ]  
Teffp = 7206 [1121] K [3.25 $\sigma$ ]

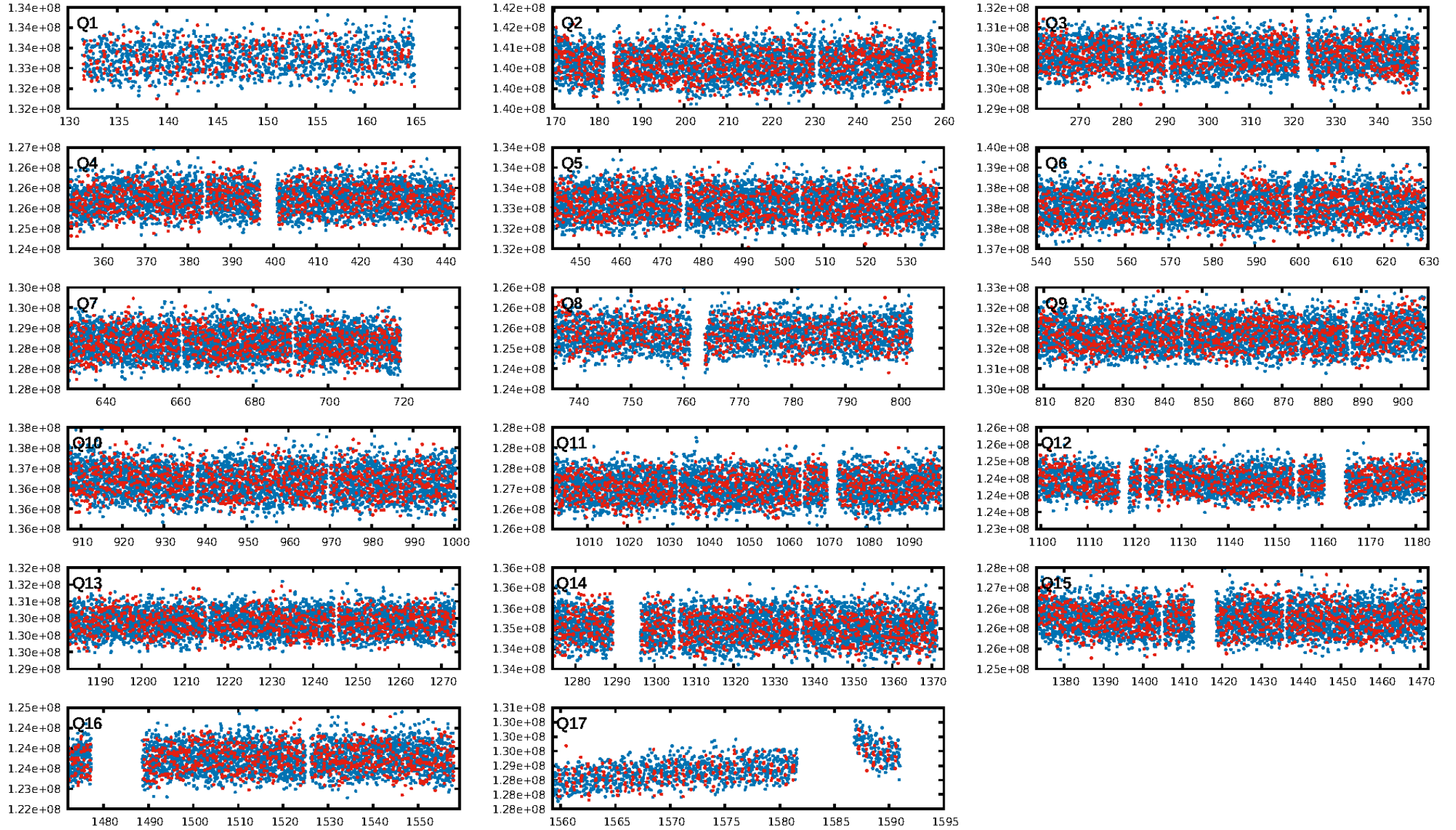
## DV Diagnostic Results:

ShortPeriod-sig: 0.0% [0.00 $\sigma$ ]  
LongPeriod-sig: 0.0% [0.00 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [1911/1914]  
GhostDiagnostic-chr: 15.98  
Centroid-sig: N/A  
Centroid-so: 0.148 arcsec [0.63 $\sigma$ ]  
OotOffset-rm: 0.094 arcsec [0.46 $\sigma$ ]  
KicOffset-rm: 0.049 arcsec [0.19 $\sigma$ ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 0.65 [11/17]  
DiffImageOverlap-fno: 0.00 [0/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 06:04:47 Z

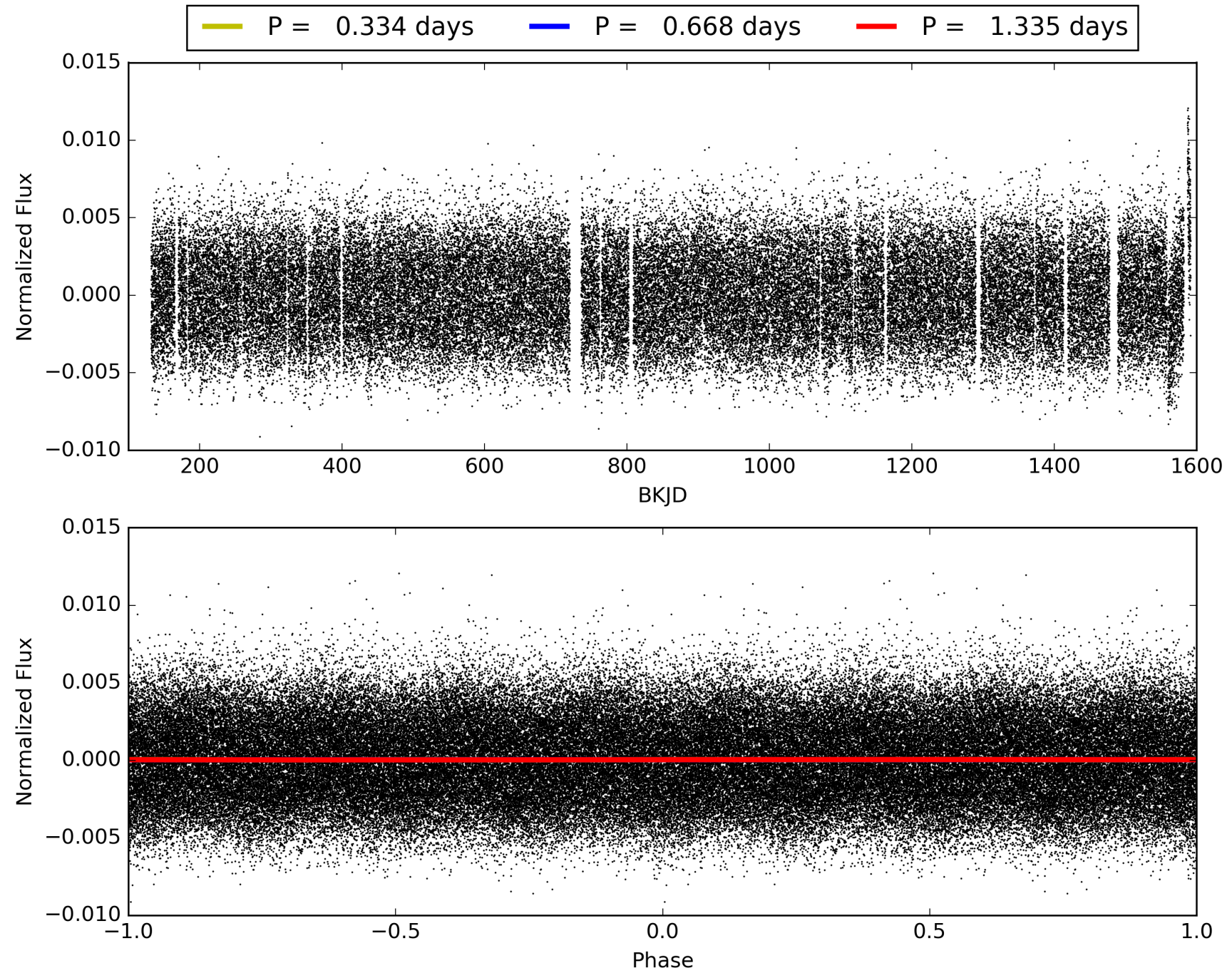
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 012120077-02, PDC Light Curves



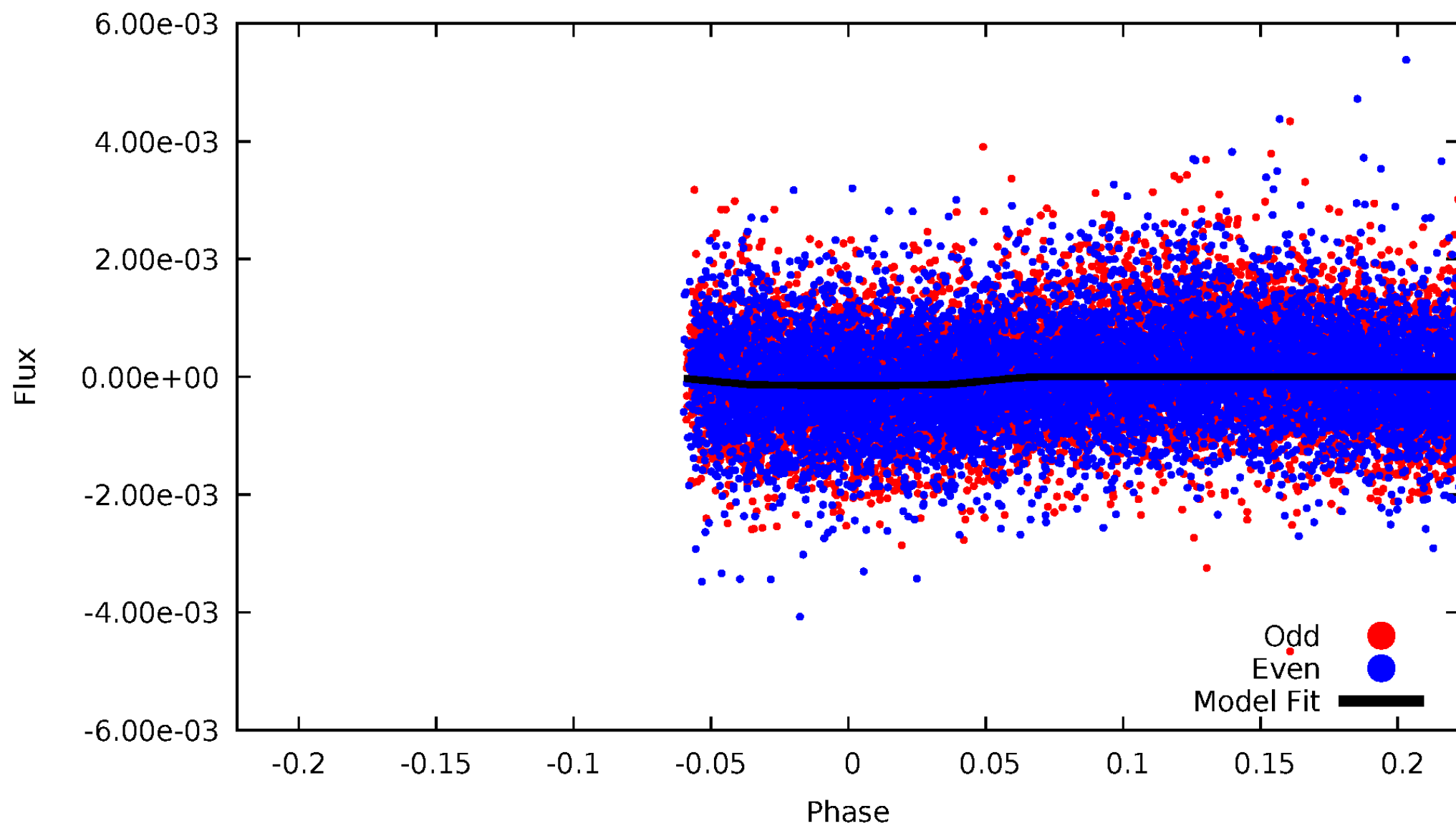


TCE 012120077-02



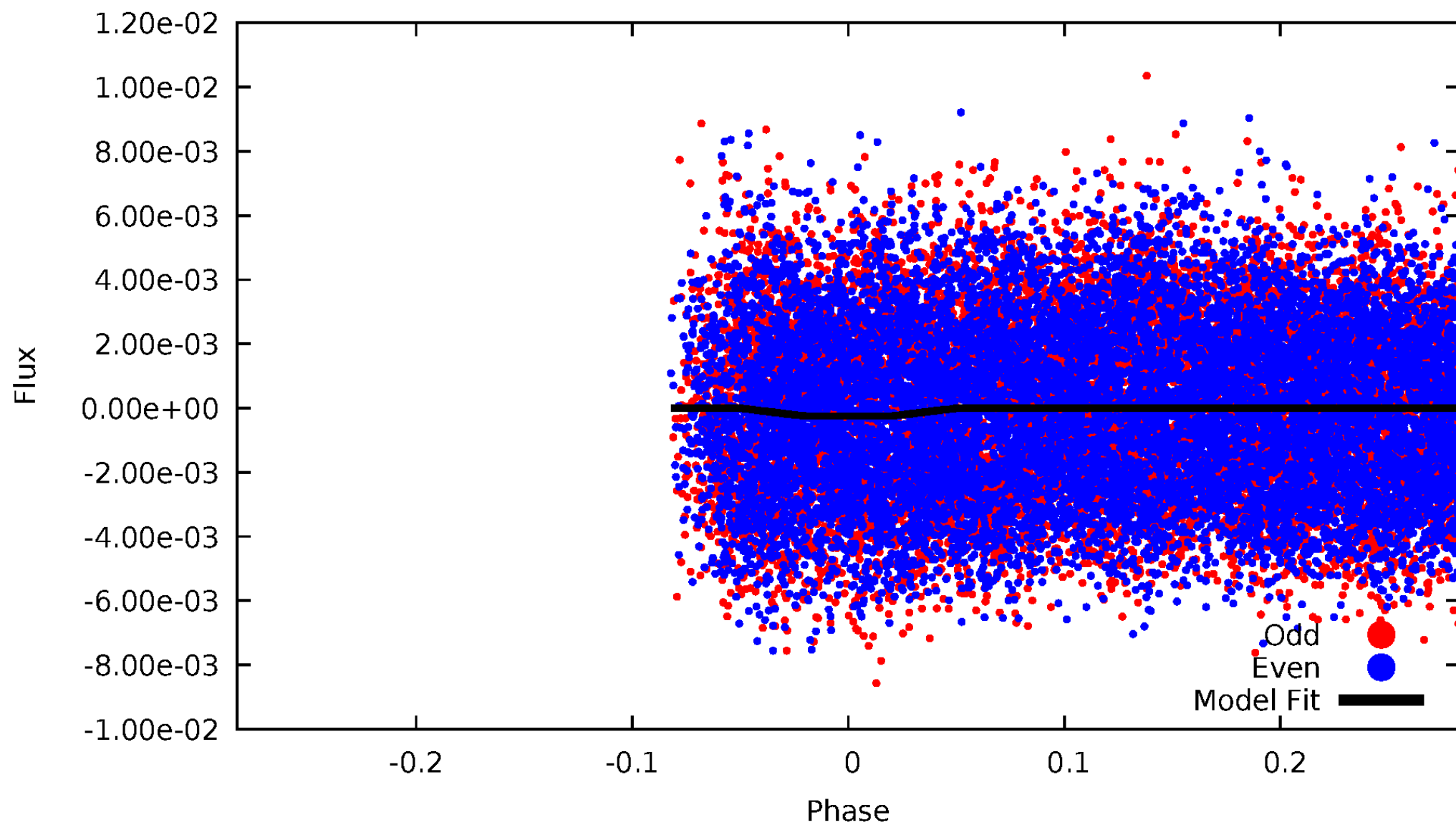
DV Odd/Even

TCE 012120077-02



# ALT Odd/Even

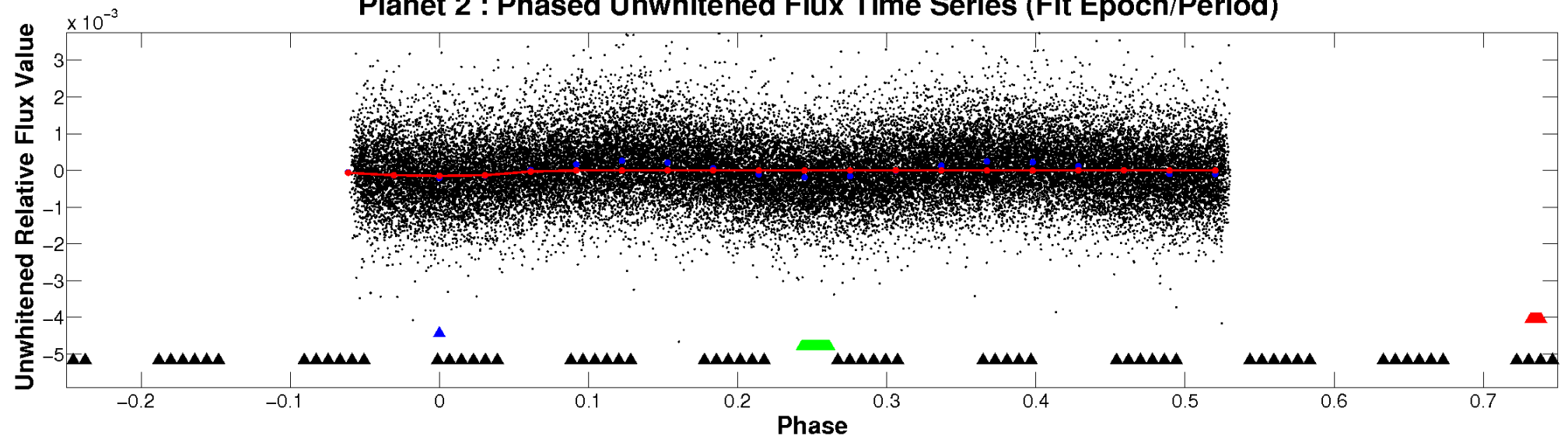
TCE 012120077-02



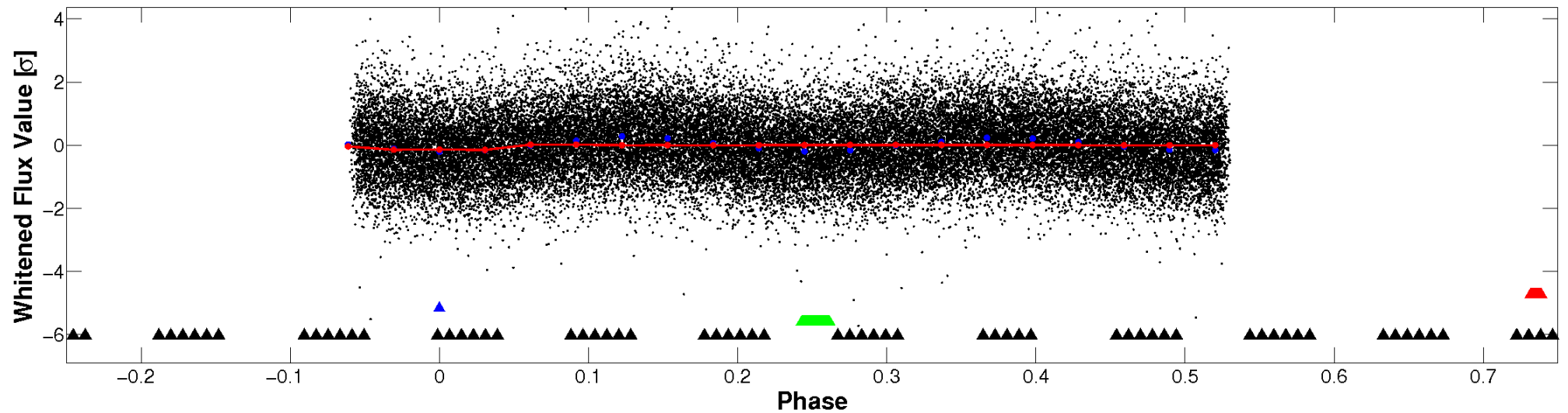


# Non-Whitened Vs. Whitened Light Curve

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

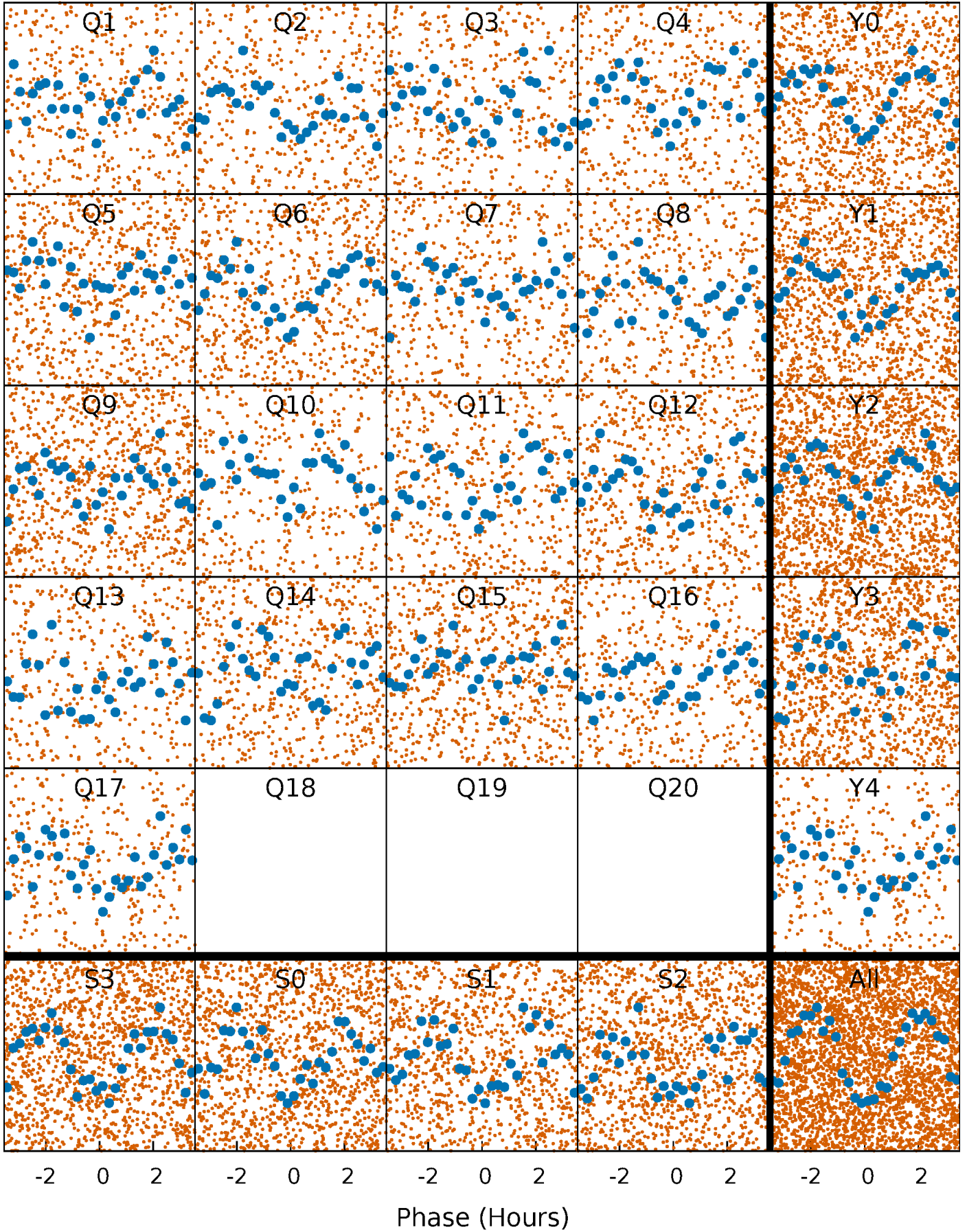


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



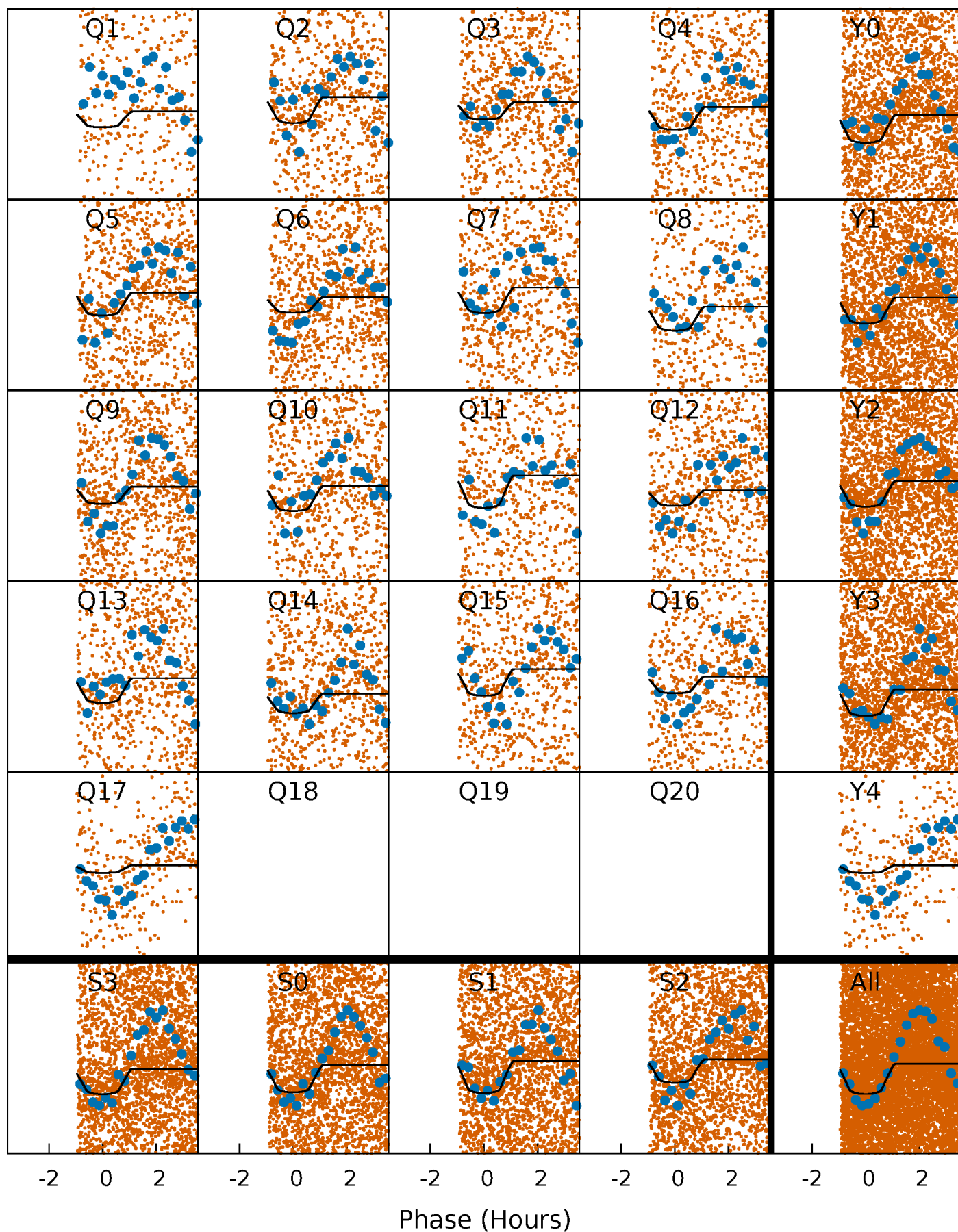
# PDC Quarter-Phased Transit Curves

TCE 012120077-02   P= 0.667705 Days    $T_0=131.653635$  (BKJD)



# DV Quarter-Phased Transit Curves

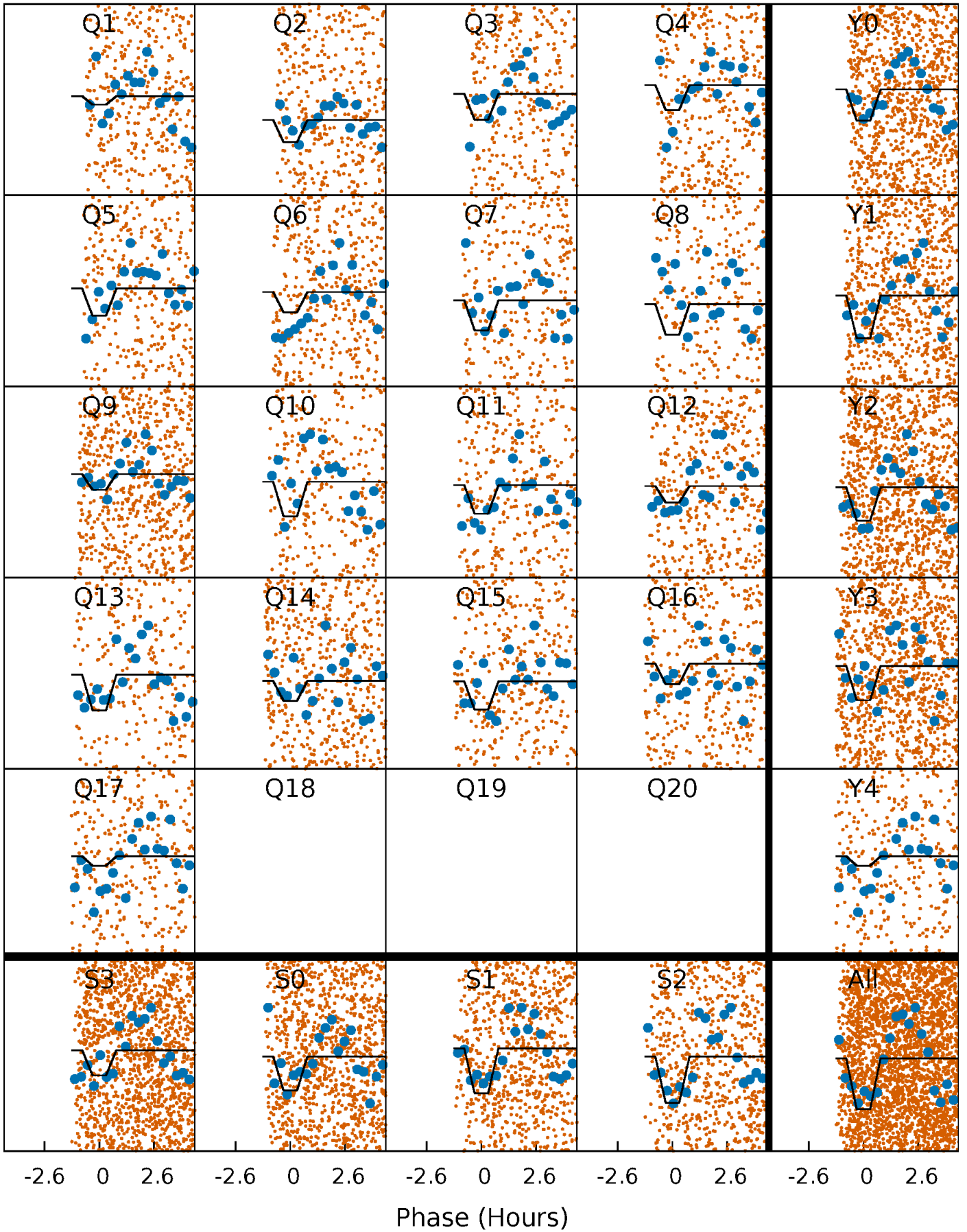
TCE 012120077-02     $P = 0.667705$  Days     $T_0 = 131.653635$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

TCE 012120077-02     $P = 0.667717$  Days     $T_0 = 131.643350$  (BKJD)

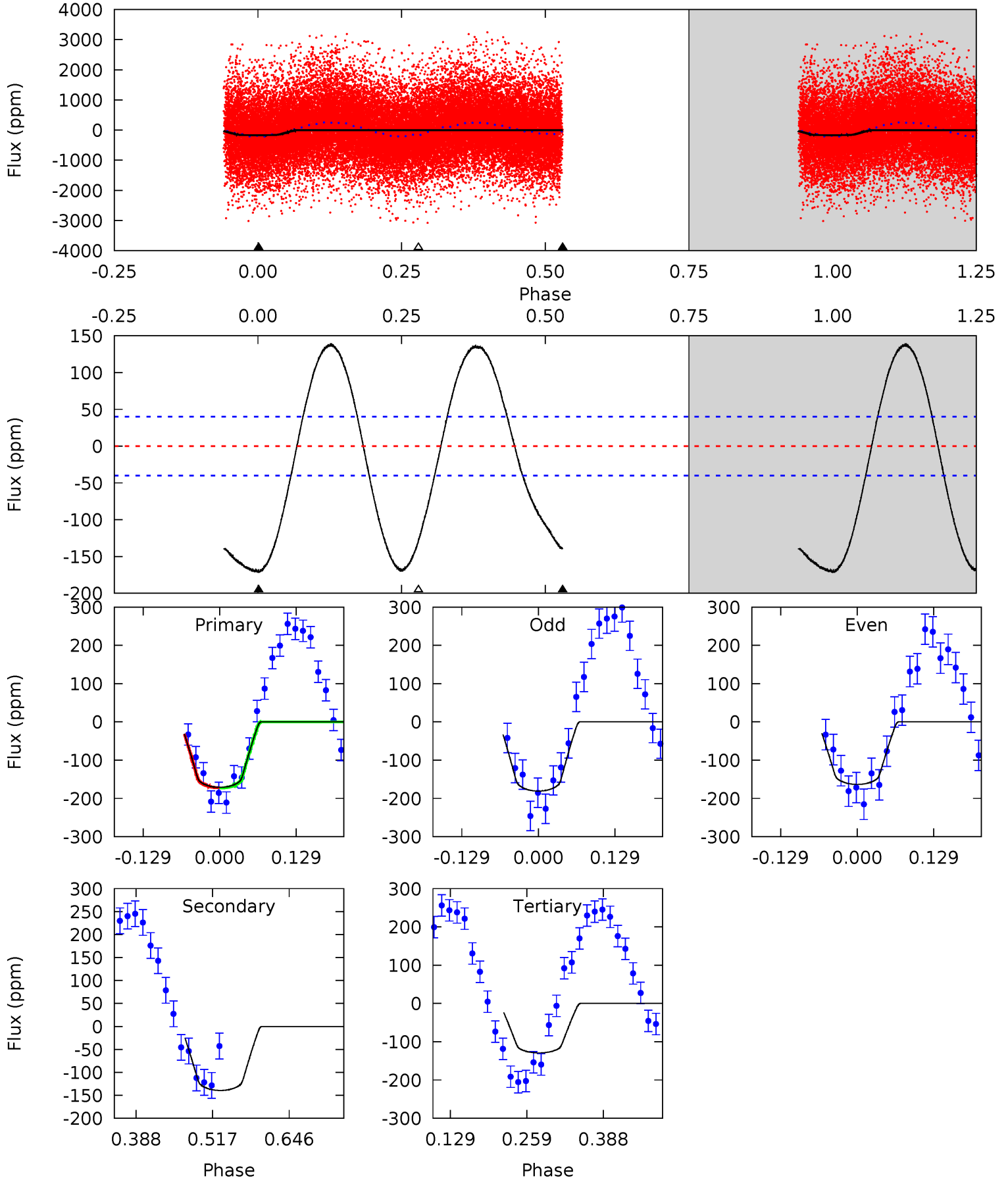




# DV Model-Shift Uniqueness Test

012120077-02, P = 0.667705 Days, E = 130.985930 Days

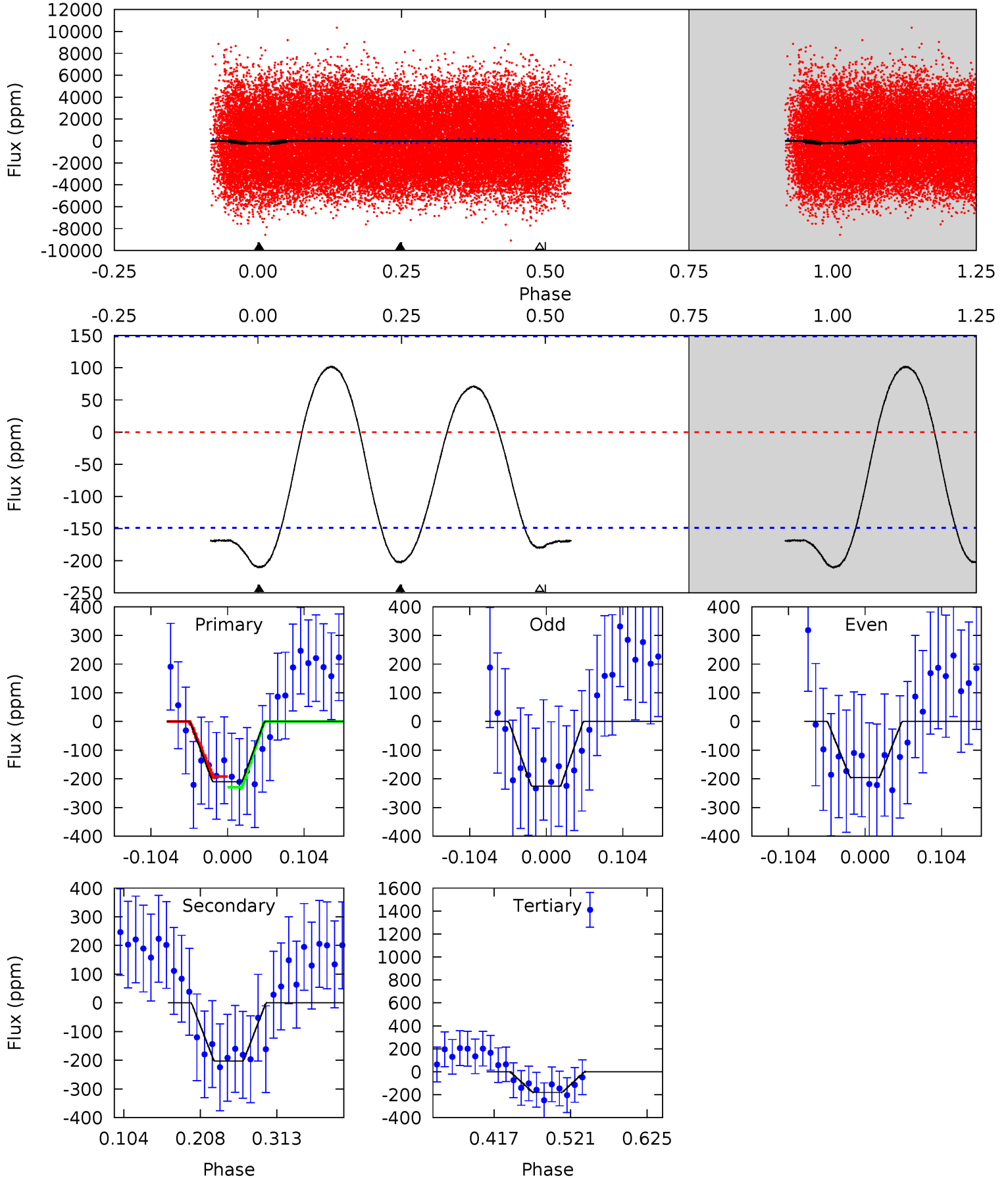
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
19.3	15.7	14.5	0	4.51	1.52	12.3	4.72	19.3	1.15	15.7	0.98	1.05	0.45	0.04



# Alt Model-Shift Uniqueness Test

012120077-02, P = 0.667717 Days, E = 130.975633 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
6.45	6.21	5.52	0	4.56	1.62	3.33	0.93	6.45	0.69	6.21	0.46	0.86	0.33	0.57



### Stellar Parameters For KIC 012120077

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7723^{+214}_{-322}$	$4.159^{+0.101}_{-0.188}$	$-0.040^{+0.200}_{-0.350}$	$1.765^{+0.498}_{-0.291}$	$1.637^{+0.210}_{-0.231}$	$0.419^{+0.237}_{-0.207}$
	+3%/-4%	+2%/-5%	+500%/-875%	+28%/-16%	+13%/-14%	+57%/-49%
Source	KIC0	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 012120077-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-139 \pm 9$	$2.52^{+0.86}_{-0.77}$	$4817^{+343}_{-282}$	$7194^{+1894}_{-1119}$	$3.697^{+3.958}_{-1.692}$
Alt.	$-203 \pm 33$	$3.16^{+0.86}_{-0.88}$	$4812^{+357}_{-308}$	$6983^{+1466}_{-893}$	$3.445^{+2.923}_{-1.403}$

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

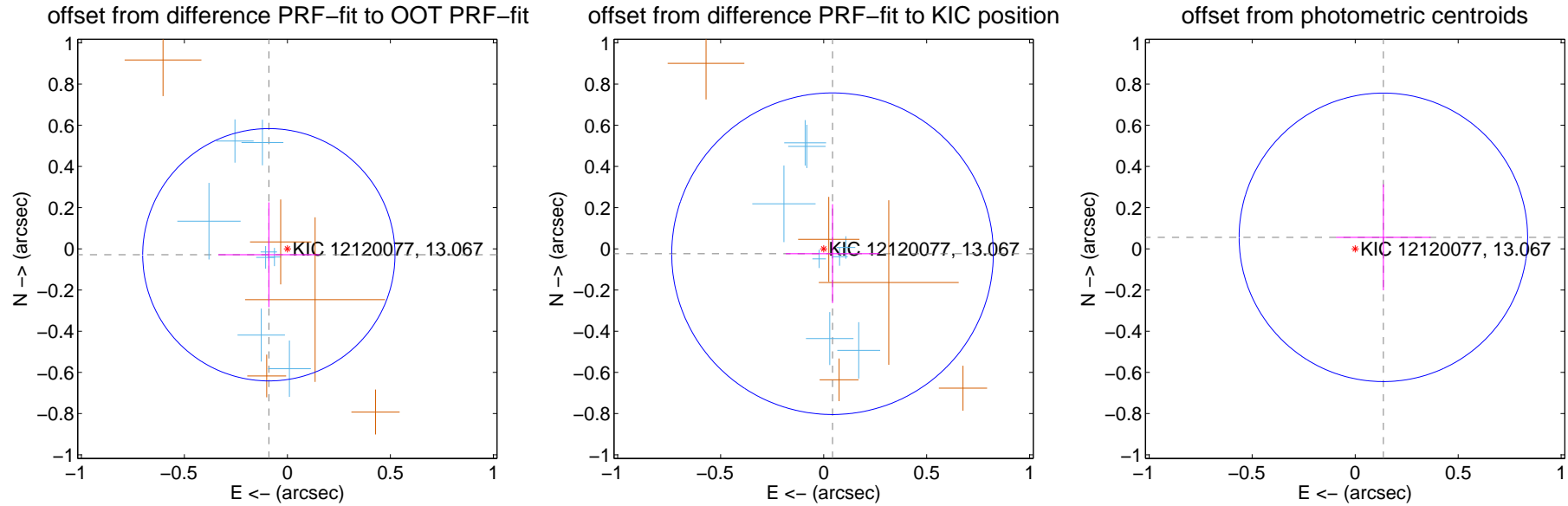
## DV Centroid Data

Supplemental centroid analysis for 012120077-02. Kepler magnitude: 13.07. Transit SNR 11.31

There are 11 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.17 arcsec

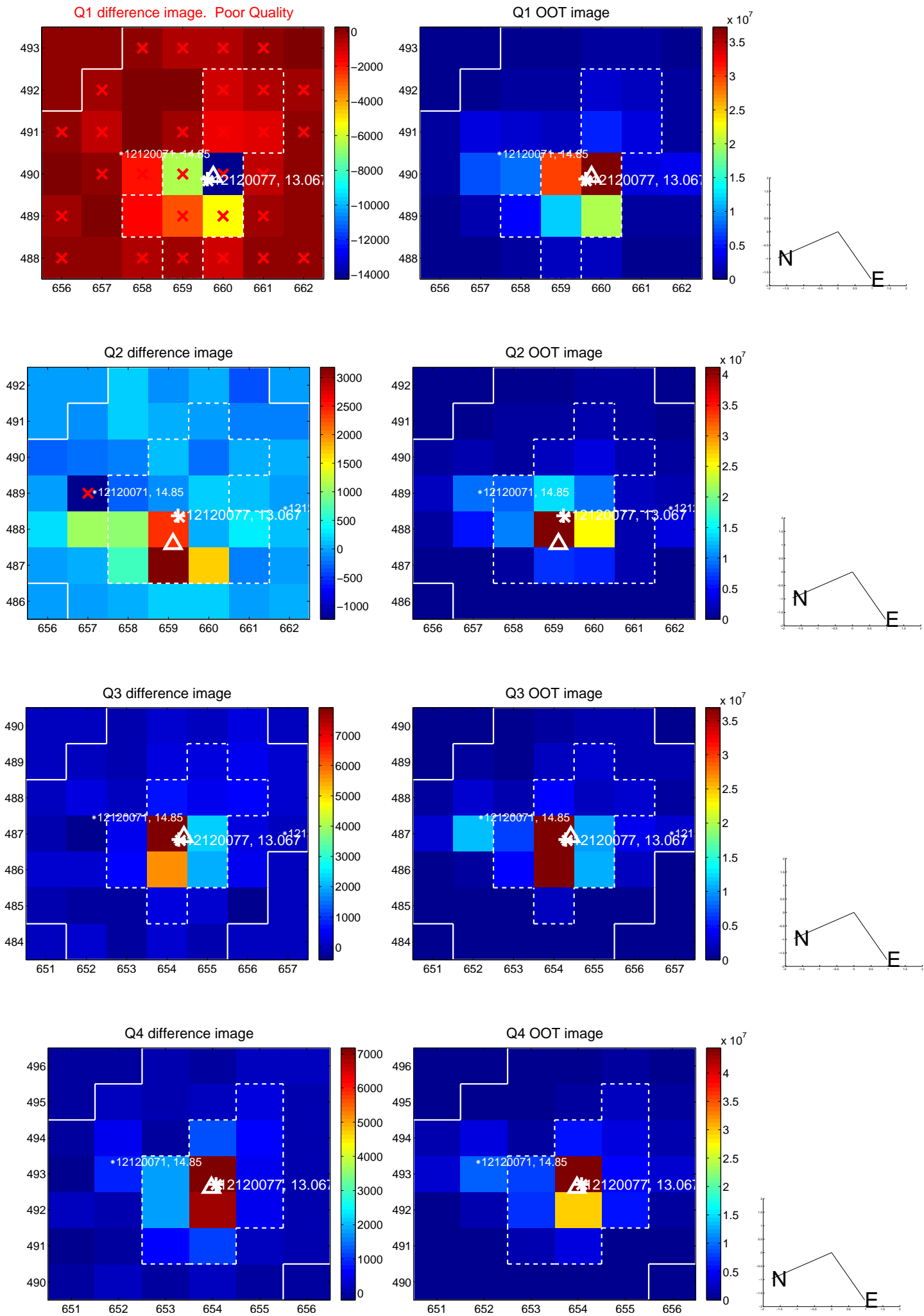
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.094 \pm 0.204$	0.46	$0.090 \pm 0.246$	$-0.029 \pm 0.255$
PRF-fit source offset from KIC position	$0.049 \pm 0.260$	0.19	$-0.043 \pm 0.227$	$-0.024 \pm 0.240$
photometric centroid source offset	$0.15 \pm 0.23$	0.63	$-0.14 \pm 0.23$	$0.06 \pm 0.26$



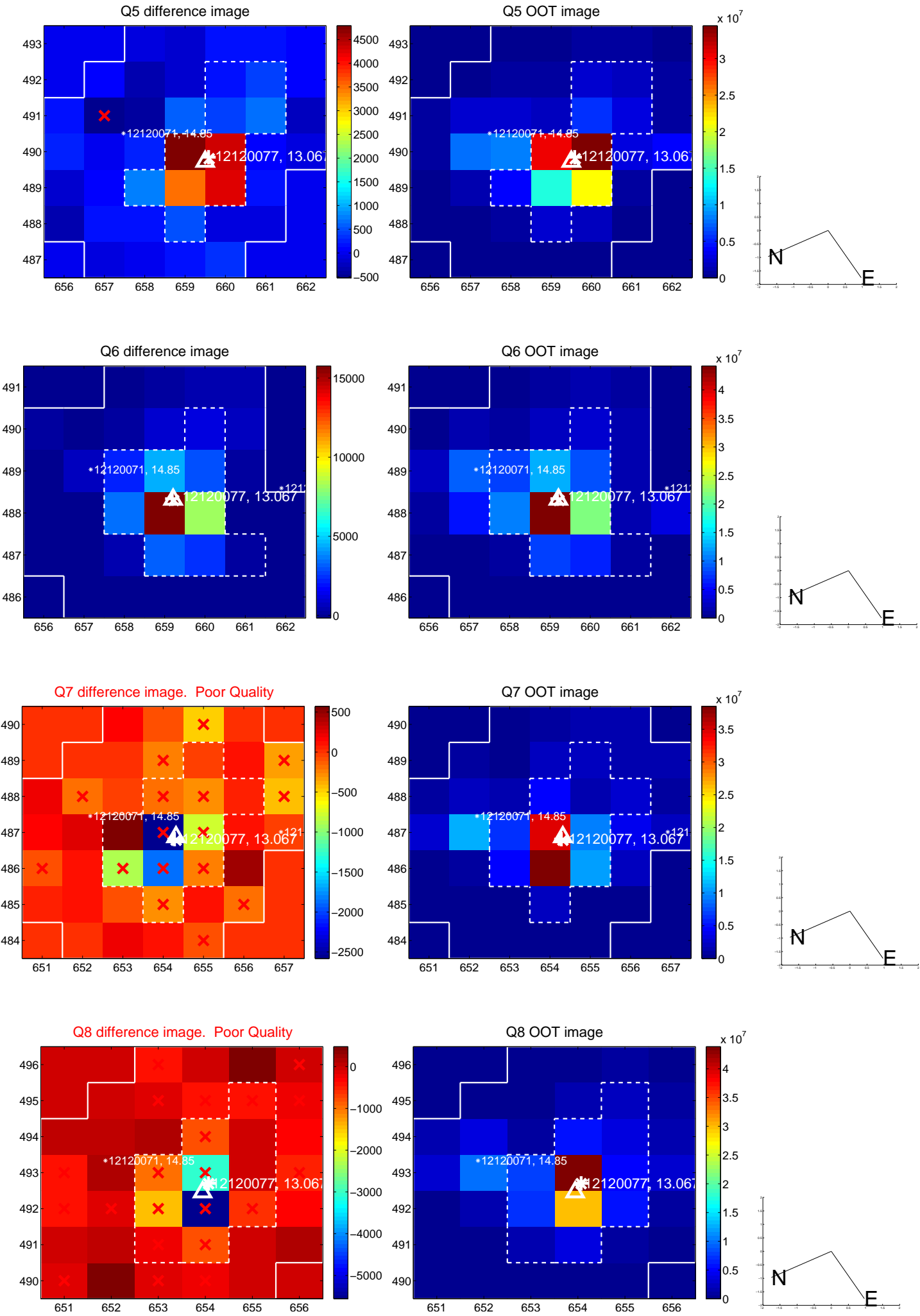
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



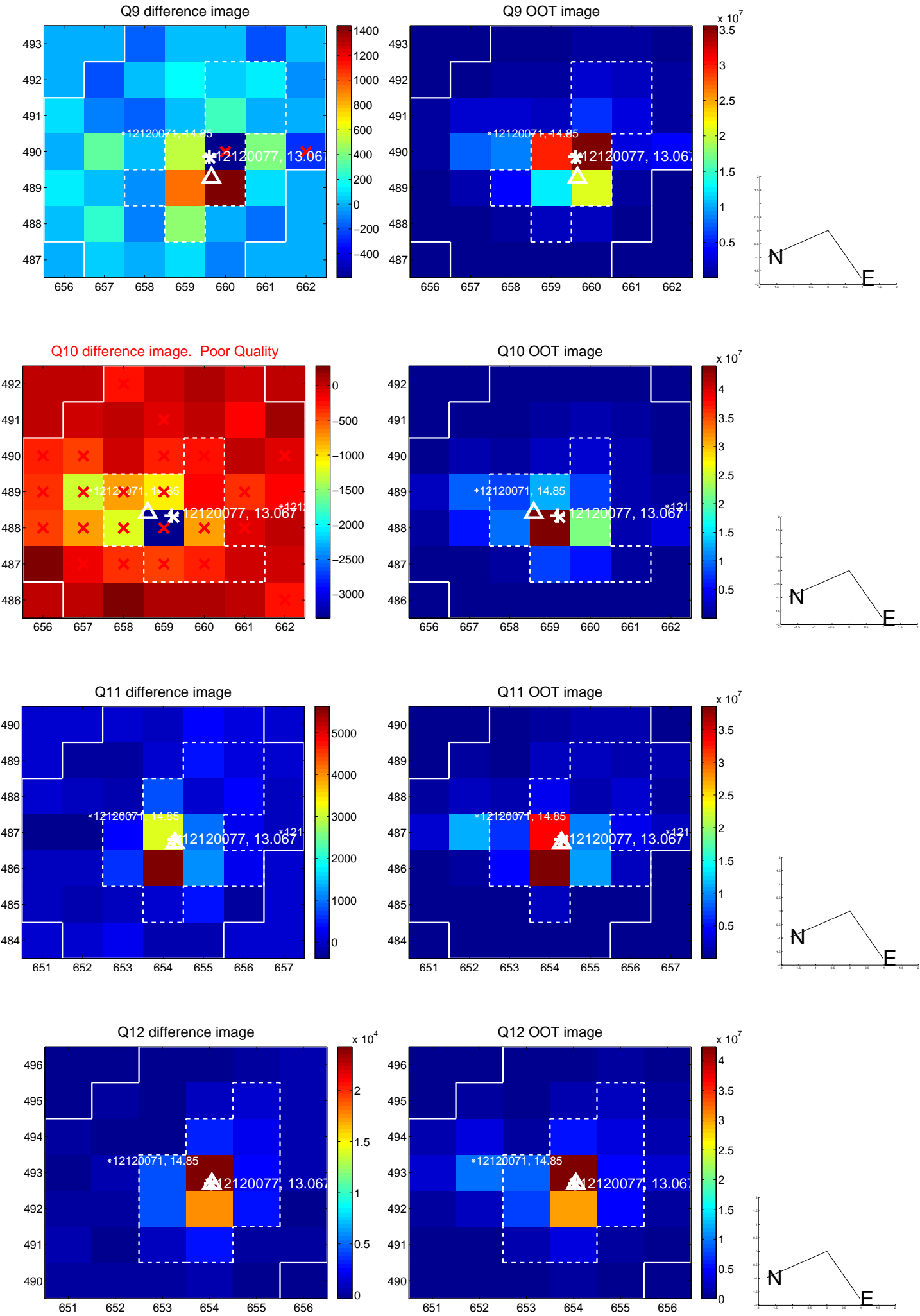
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



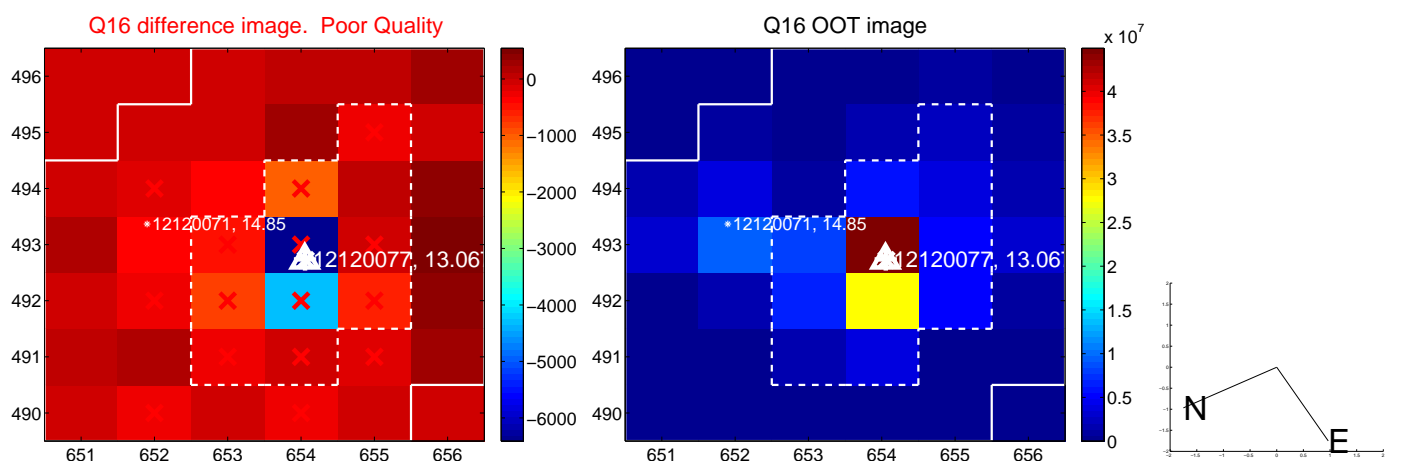
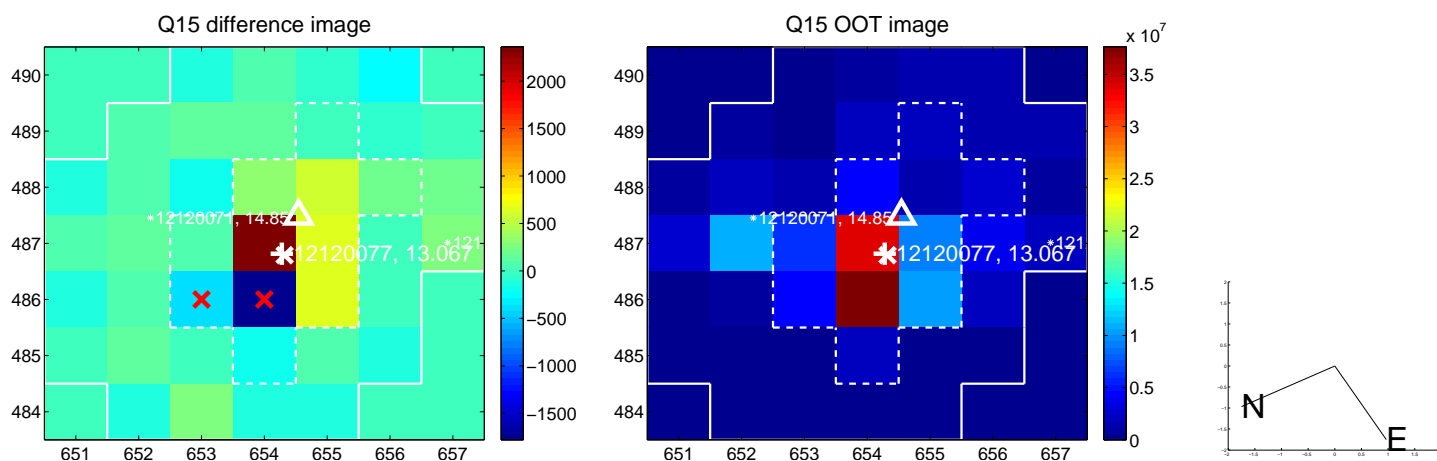
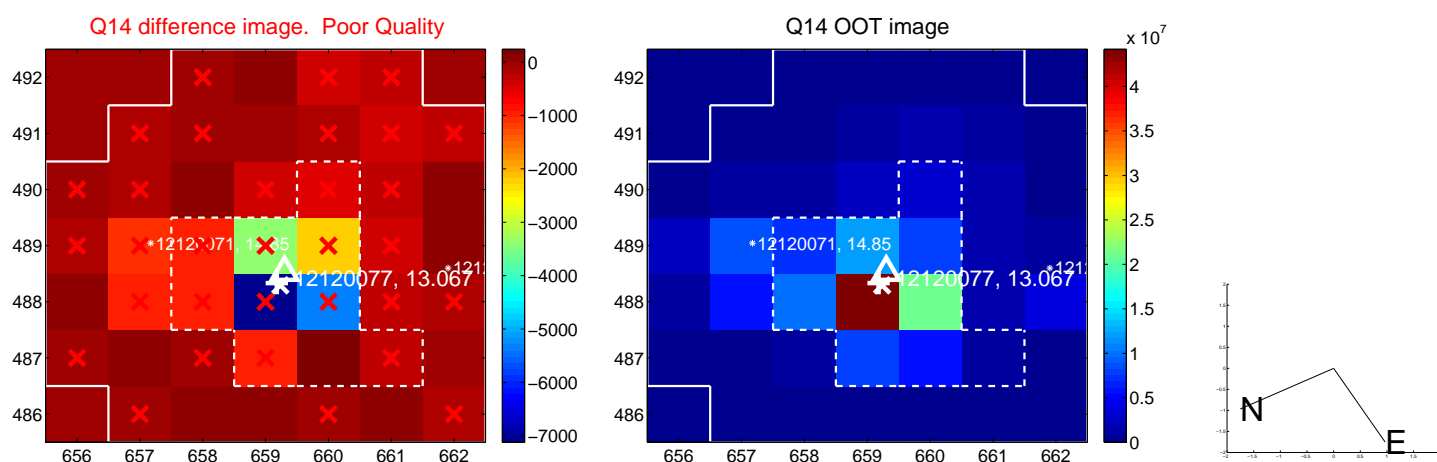
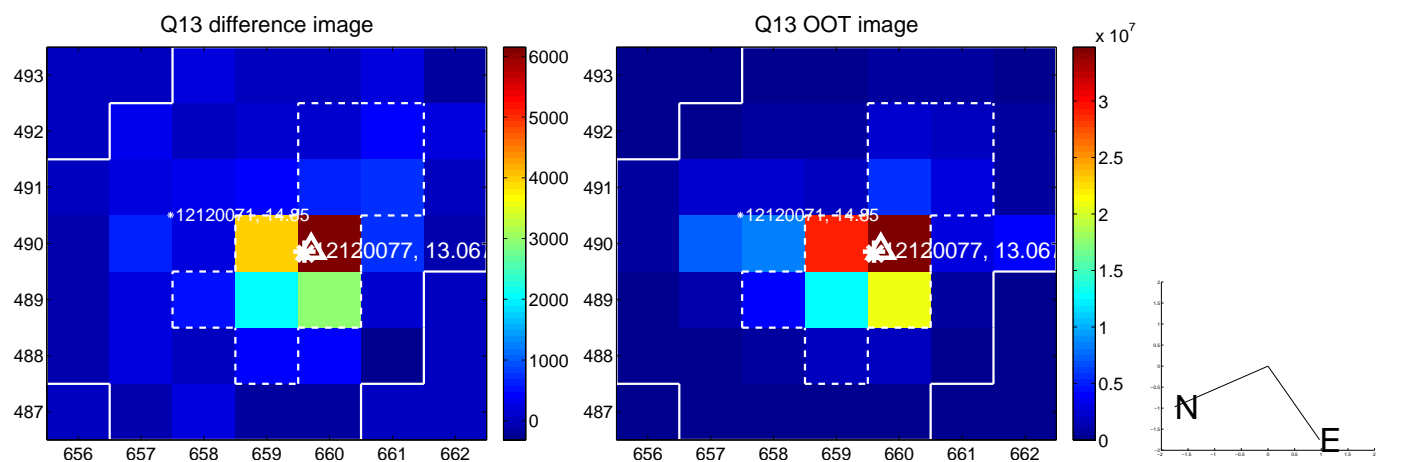
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



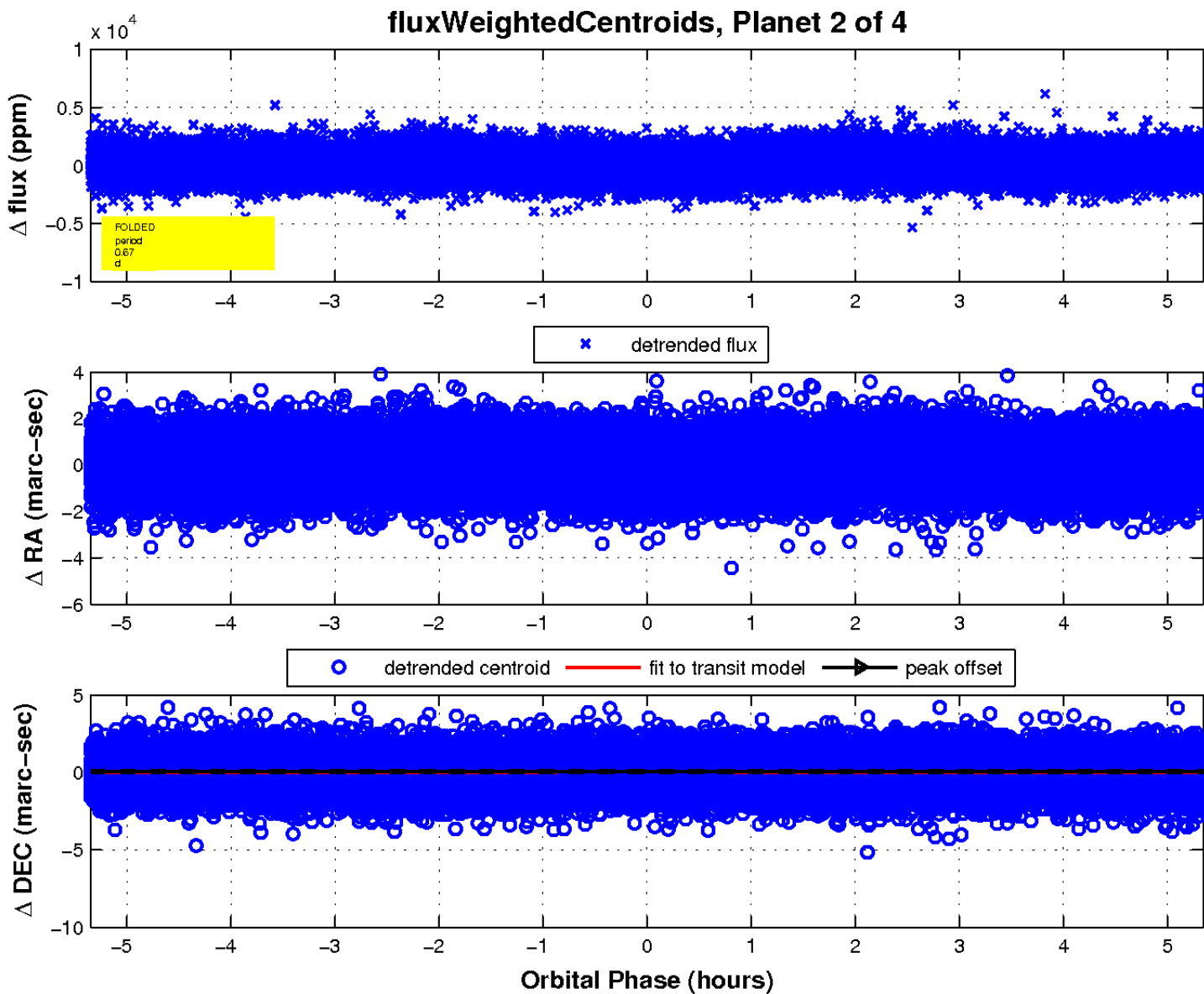
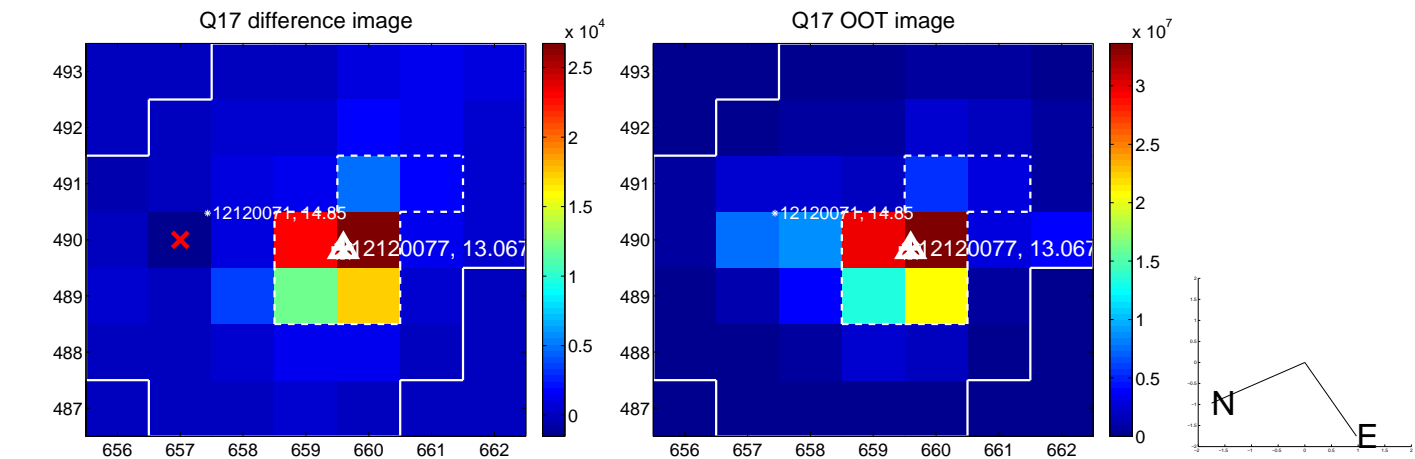
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



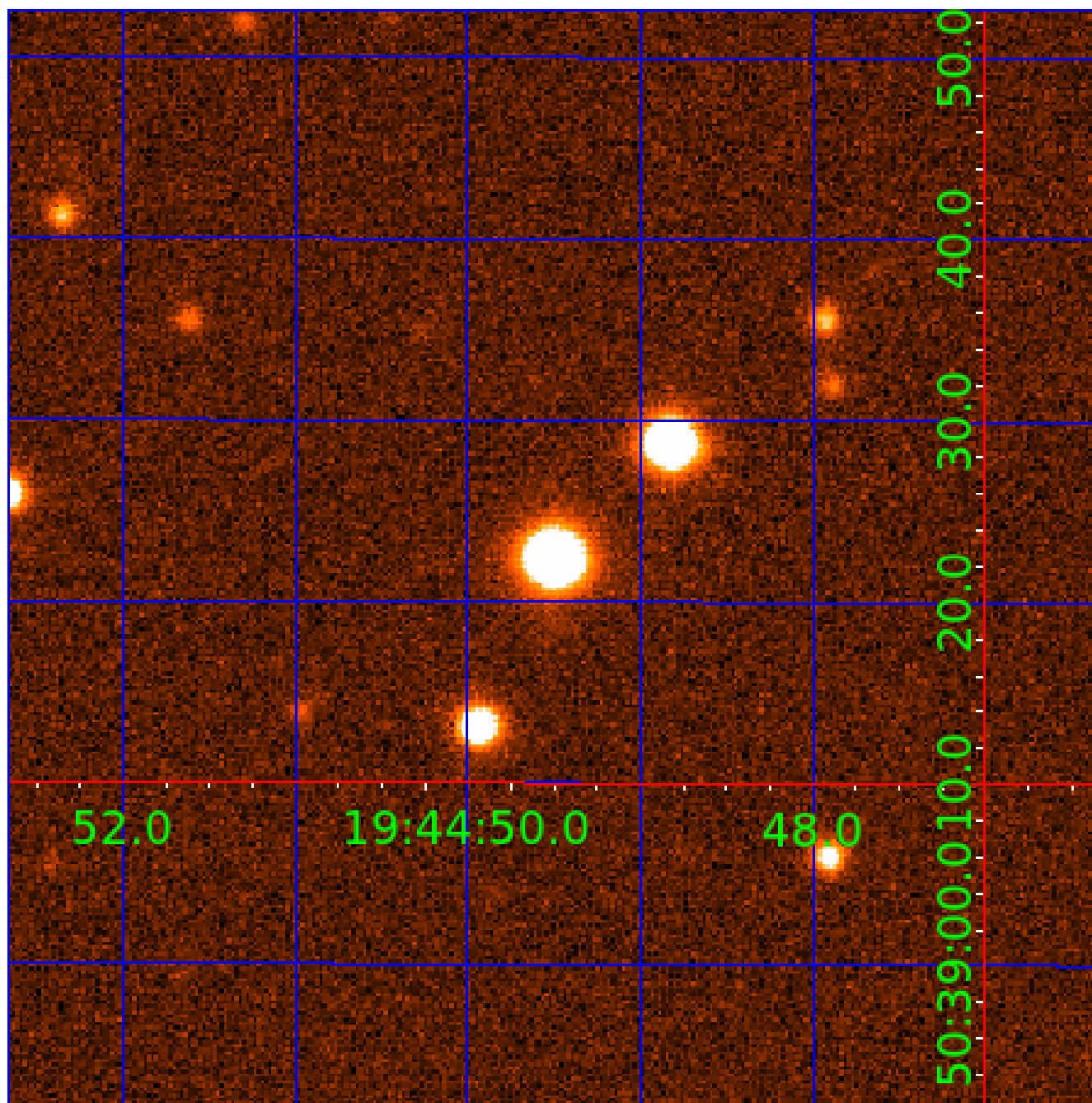
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





UKIRT Image

Declination



# KIC 012120077

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
012120077-01	OBS	No	0.667703	132.147011	99.3	2.061	10.3	7.9	1.76	7723	2.03	31946.56
012120077-02	OBS	No	0.667705	131.653635	147.8	1.782	12.3	11.3	1.76	7723	2.49	31946.41
012120077-03	OBS	No	0.667711	131.815877	165.7	1.699	12.5	13.8	1.76	7723	2.37	31946.05
012120077-04	OBS	No	22.338254	149.556087	1232.4	2.475	10.0	5.5	1.76	7723	10.96	296.35

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
012120077-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
012120077-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD
012120077-03	OBS	FP	0.00	1	0	0	0	LPP_DV—SAME_NTL_PERIOD
012120077-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT

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

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

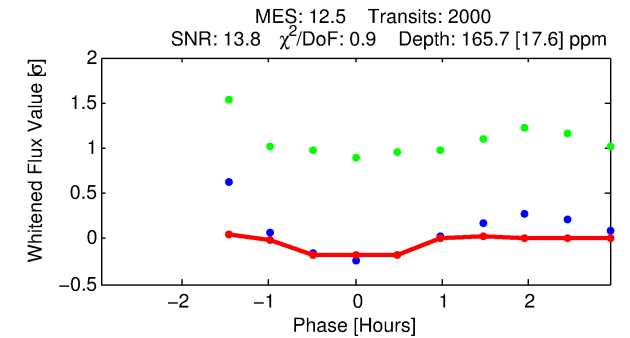
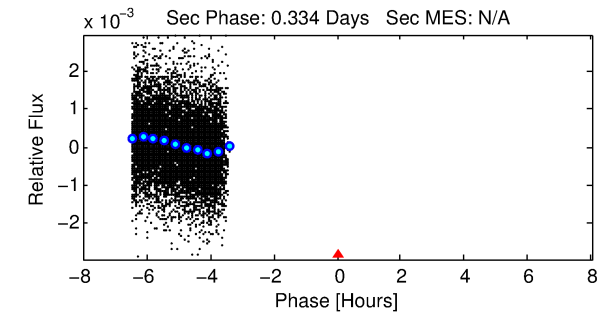
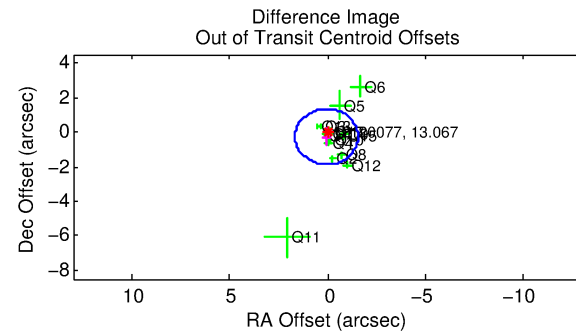
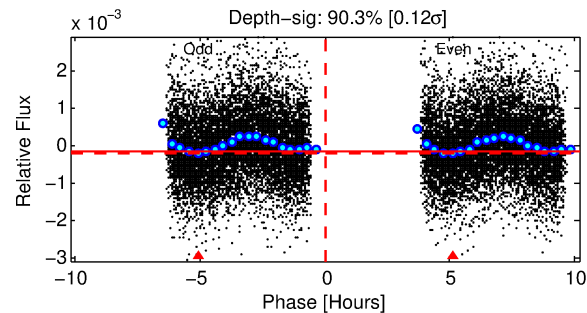
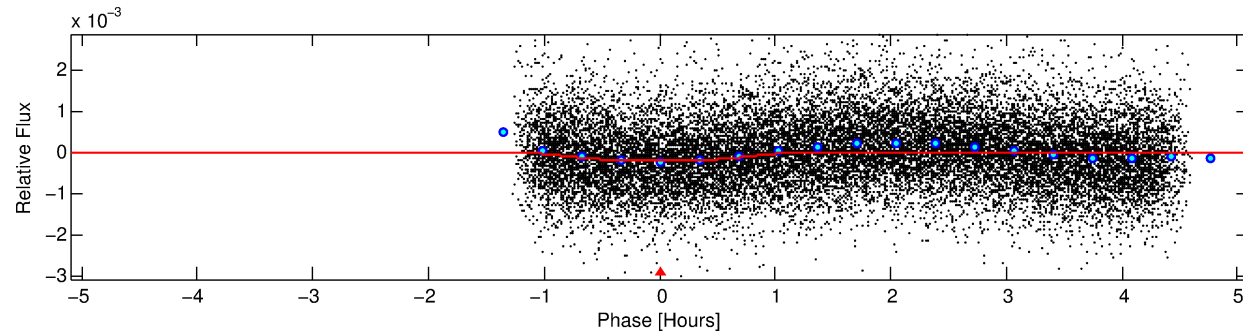
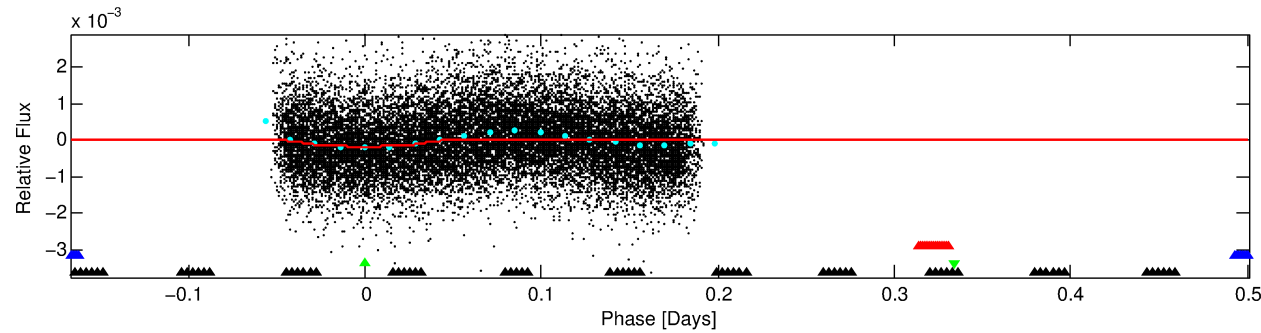
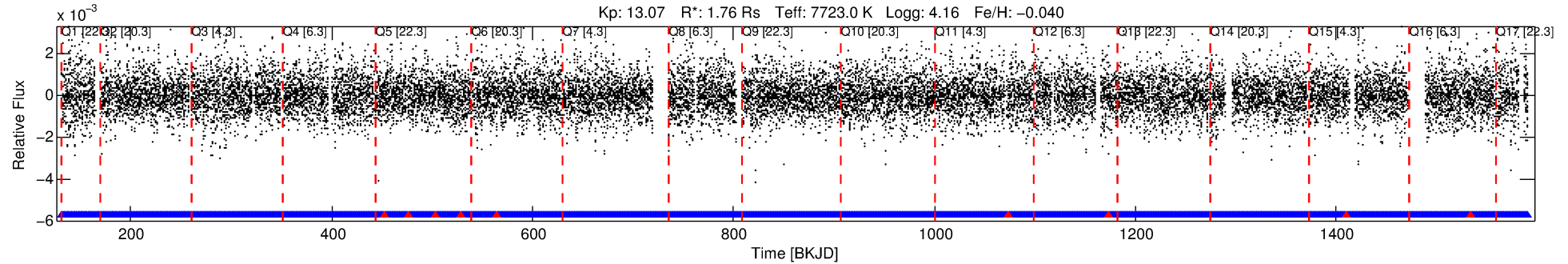
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 012120077-03

No Significant Match Found

# DV One-Page Summary

KIC: 12120077 Candidate: 3 of 4 Period: 0.668 d



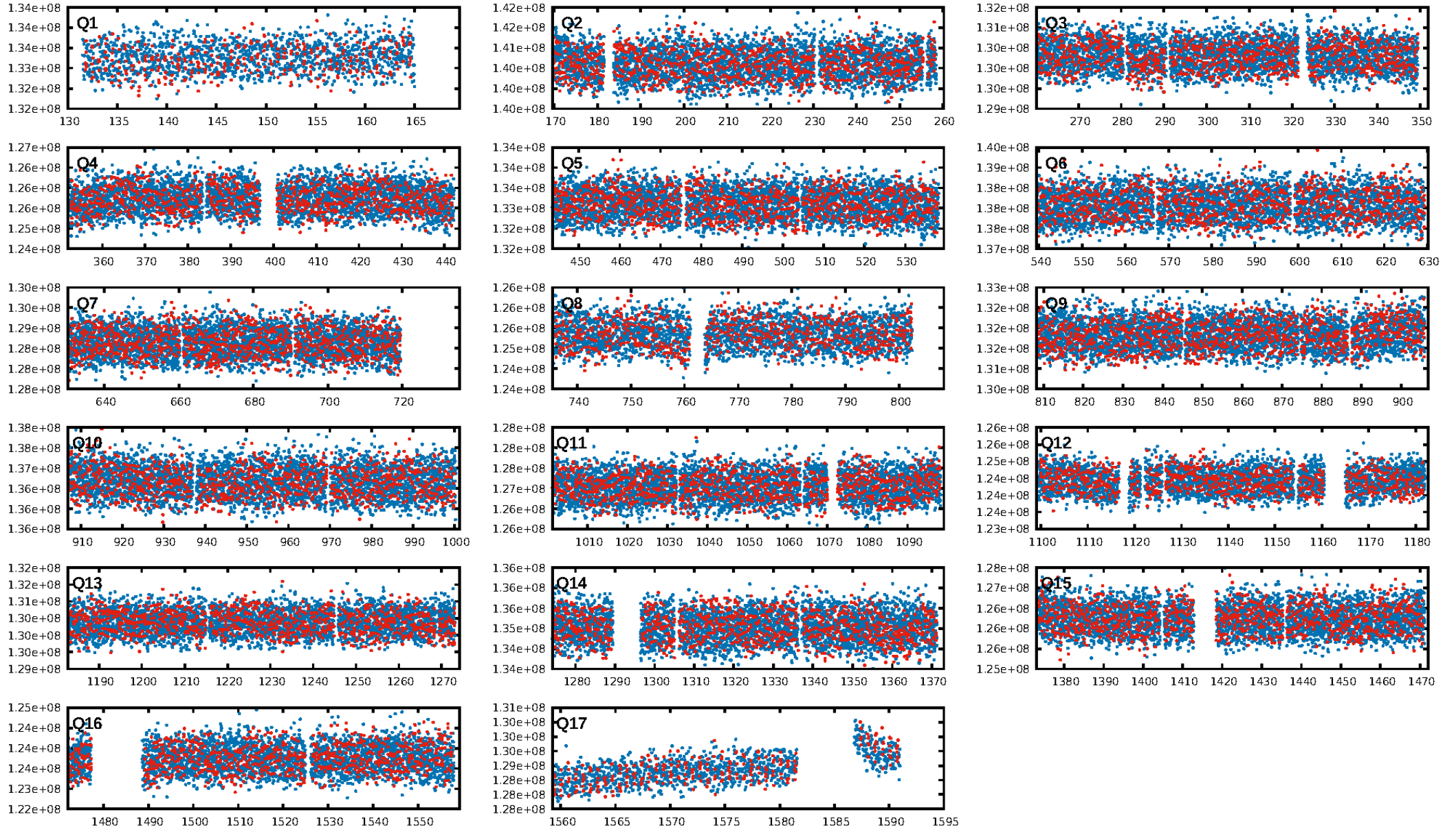
## DV Fit Results:

Period = 0.66771 [0.00001] d  
Epoch = 131.8159 [0.0013] BKJD  
Rp/R\* = 0.0123 [0.0032]  
a/R\* = 2.70 [3.69]  
b = 0.52 [2.22]  
Seff = 31946.05 [12226.65]  
Teq = 3409 [326] K  
Rp = 2.37 [0.91] Re  
a = 0.0176 [0.0042] AU

## DV Diagnostic Results:

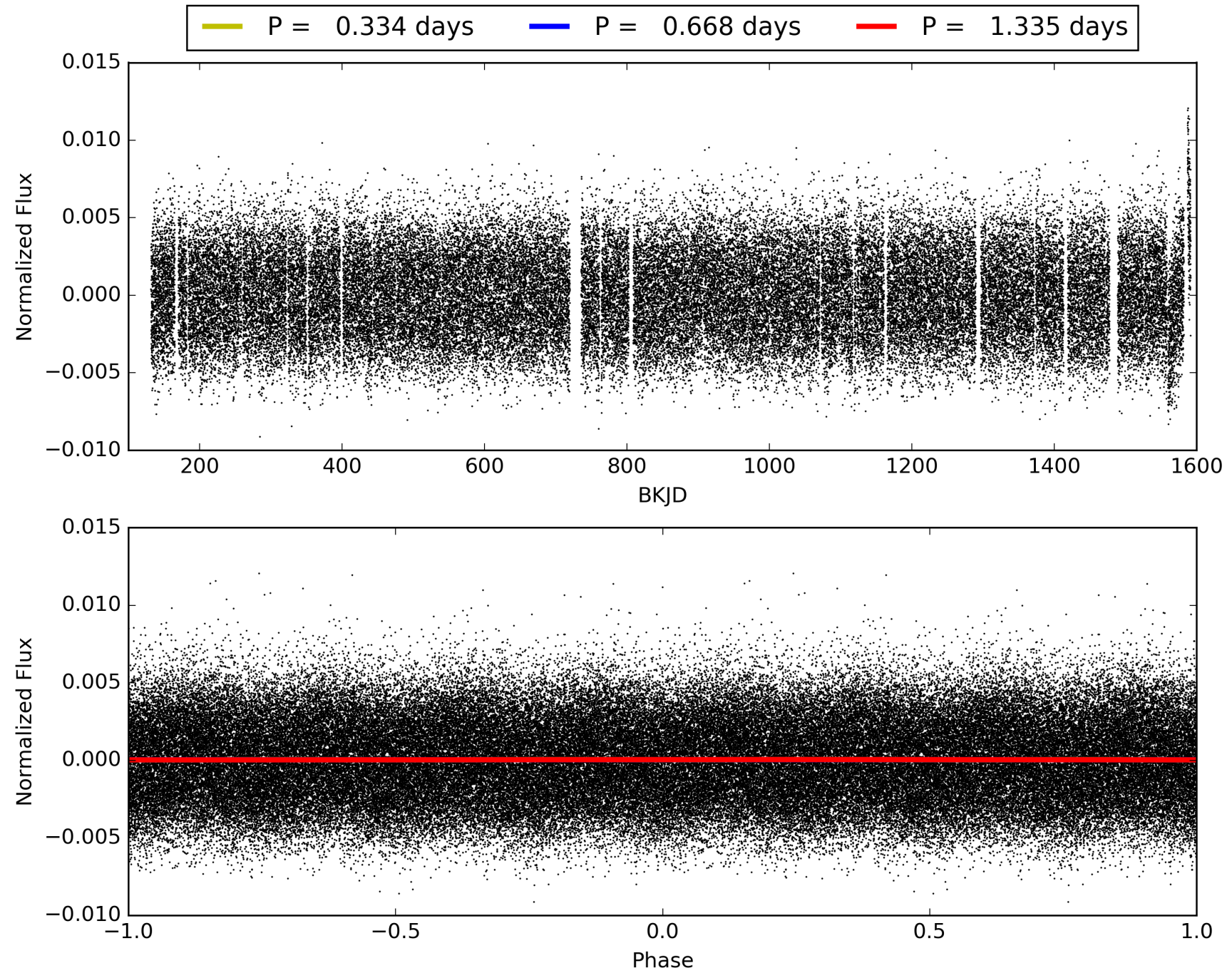
ShortPeriod-sig: 0.0% [0.00 $\sigma$ ]  
LongPeriod-sig: 100.0% [173.24 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [1901/1910]  
GhostDiagnostic-chr: 0.7293  
Centroid-sig: N/A  
Centroid-so: 0.093 arcsec [0.41 $\sigma$ ]  
OotOffset-rm: 0.273 arcsec [0.51 $\sigma$ ]  
KicOffset-rm: 0.283 arcsec [0.76 $\sigma$ ]  
OotOffset-st: 3/4/3/5 [15]  
KicOffset-st: 3/4/3/5 [15]  
DiffImageQuality-fgm: 0.67 [10/15]  
DiffImageOverlap-fno: 0.00 [0/17]

# TCE 012120077-03, PDC Light Curves





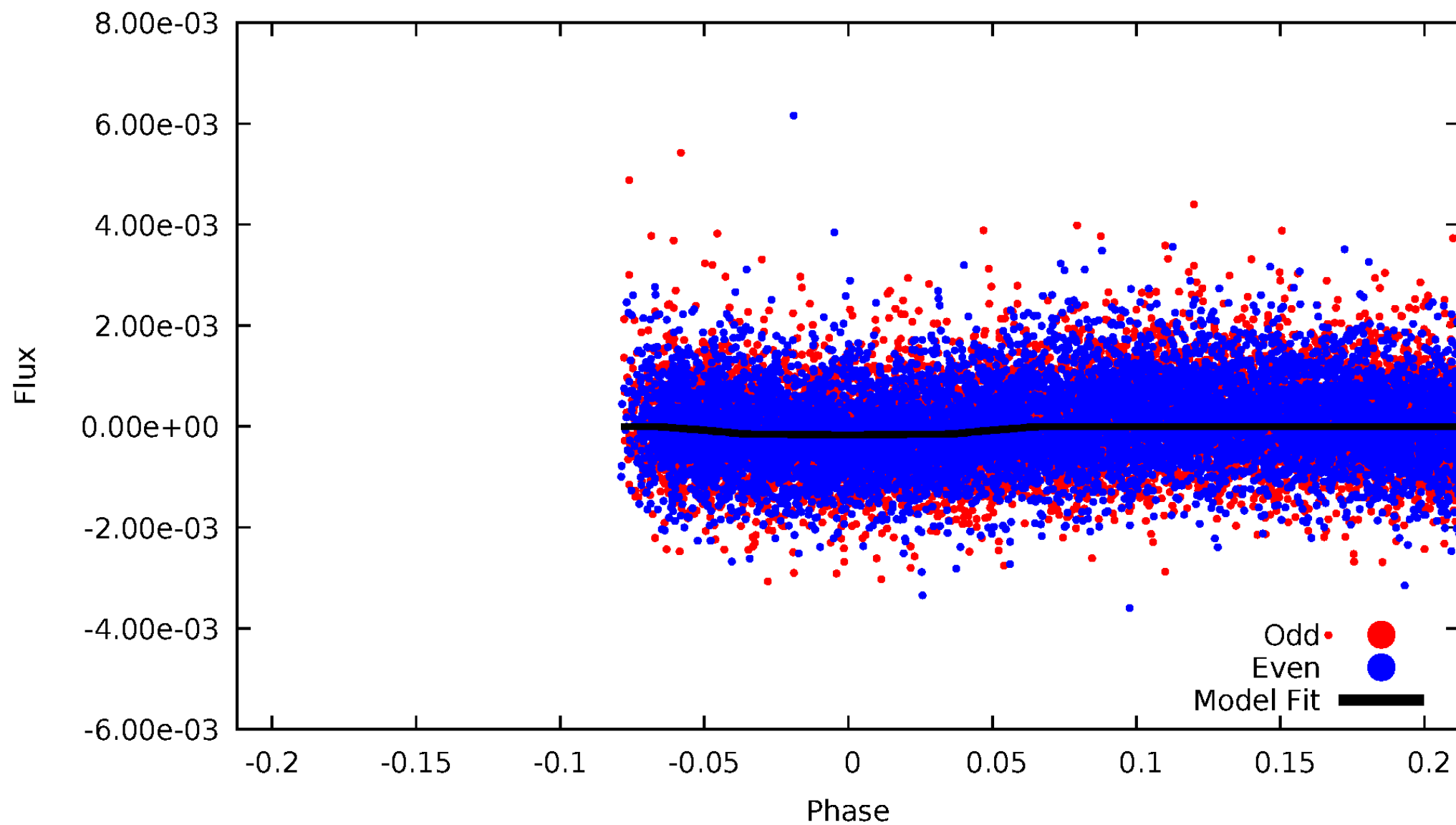
TCE 012120077-03





# DV Odd/Even

TCE 012120077-03

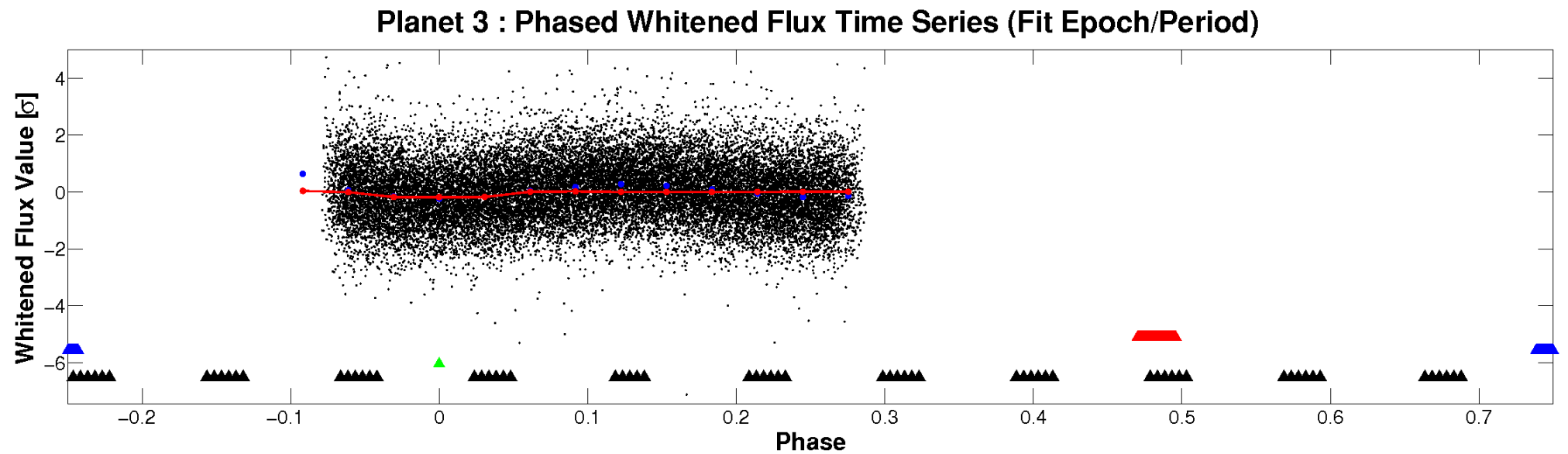
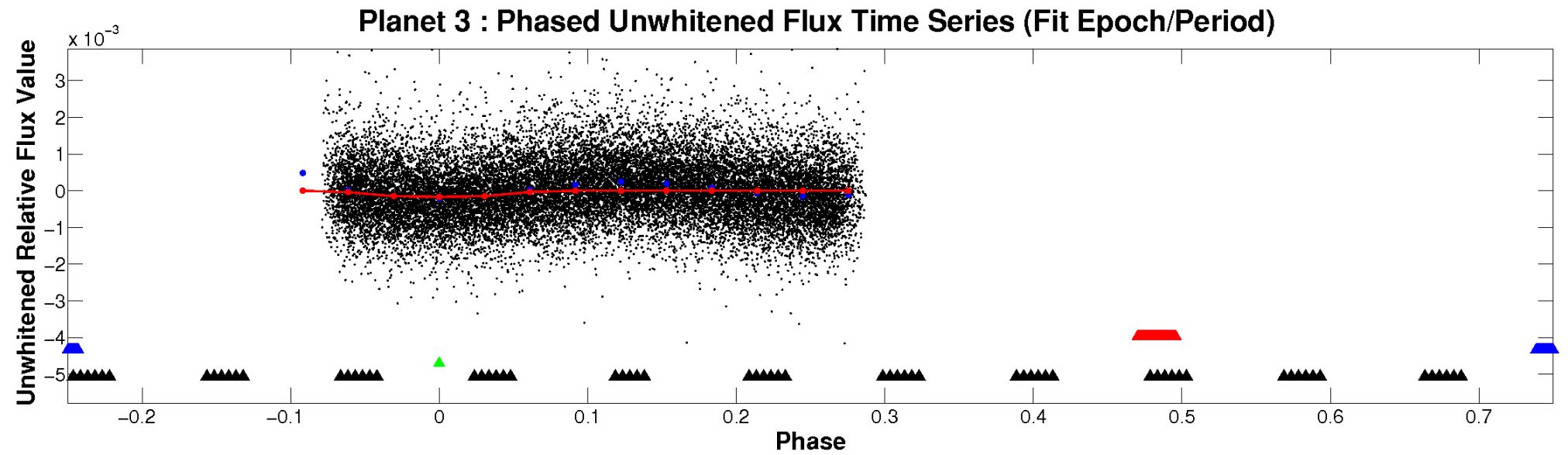




ALT Odd/Even

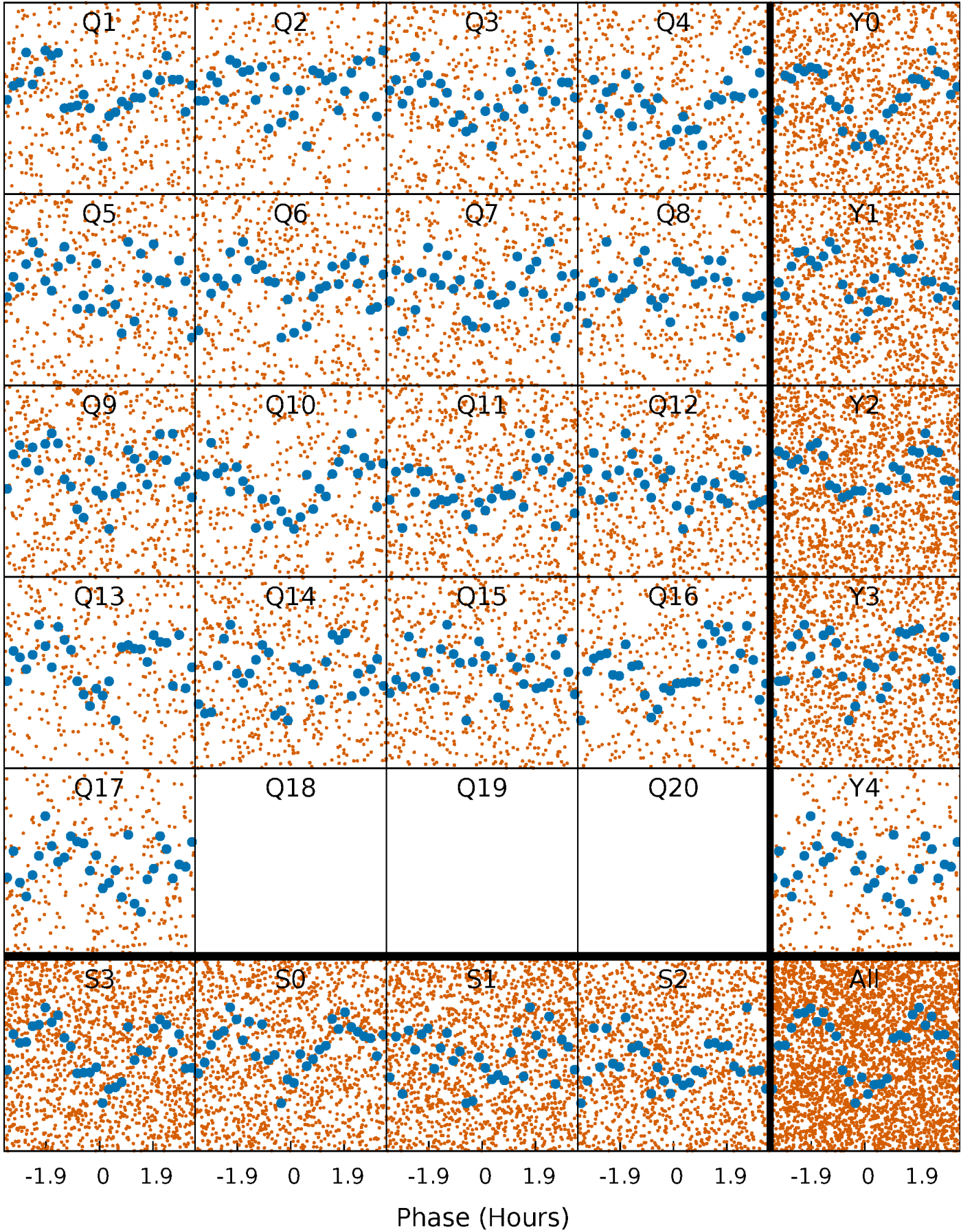
This plot does not exist for this TCE.

# Non-Whitened Vs. Whitened Light Curve



# PDC Quarter-Phased Transit Curves

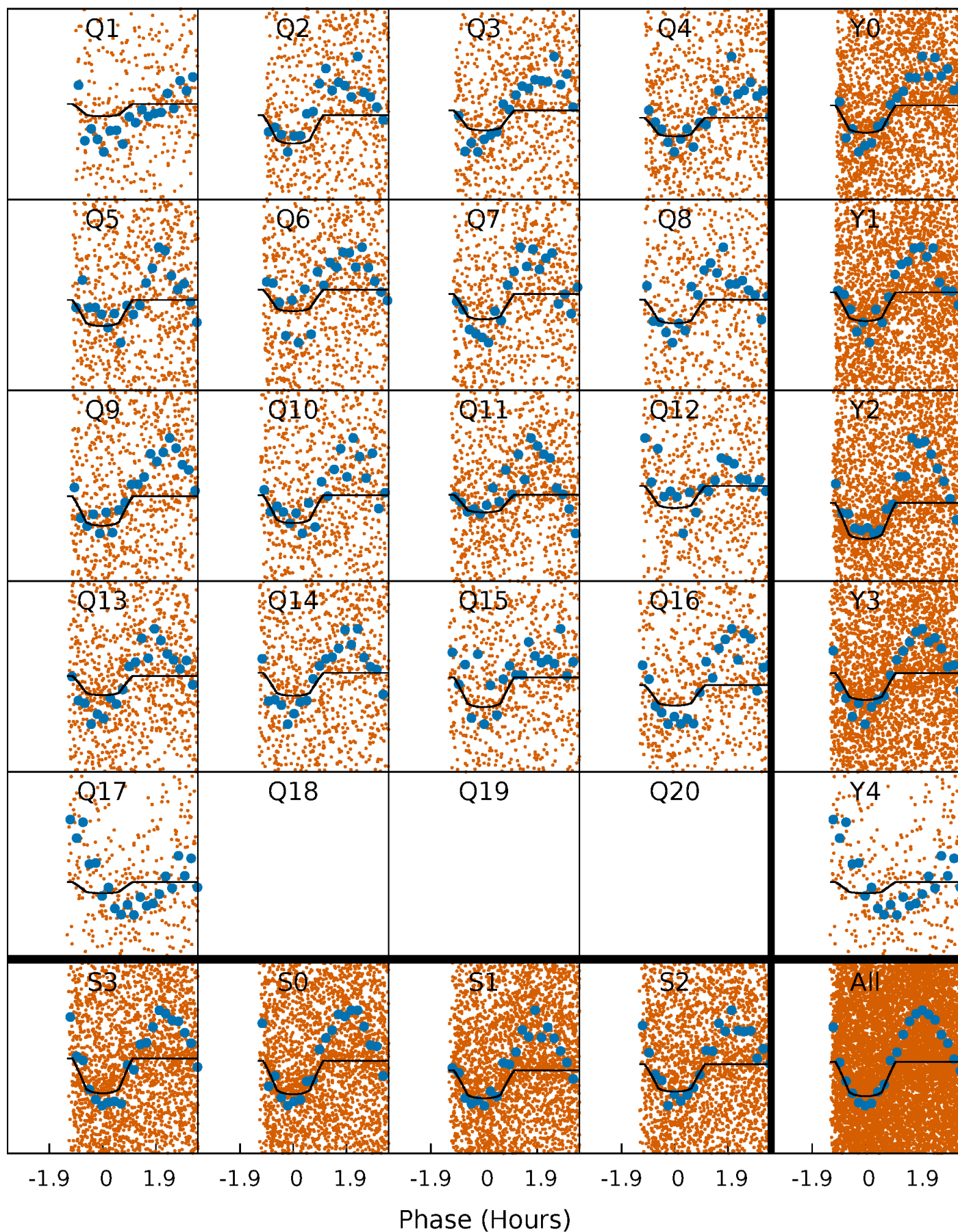
TCE 012120077-03 P= 0.667711 Days  $T_0=131.815877$  (BKJD)





# DV Quarter-Phased Transit Curves

TCE 012120077-03 P= 0.667711 Days  $T_0=131.815877$  (BKJD)

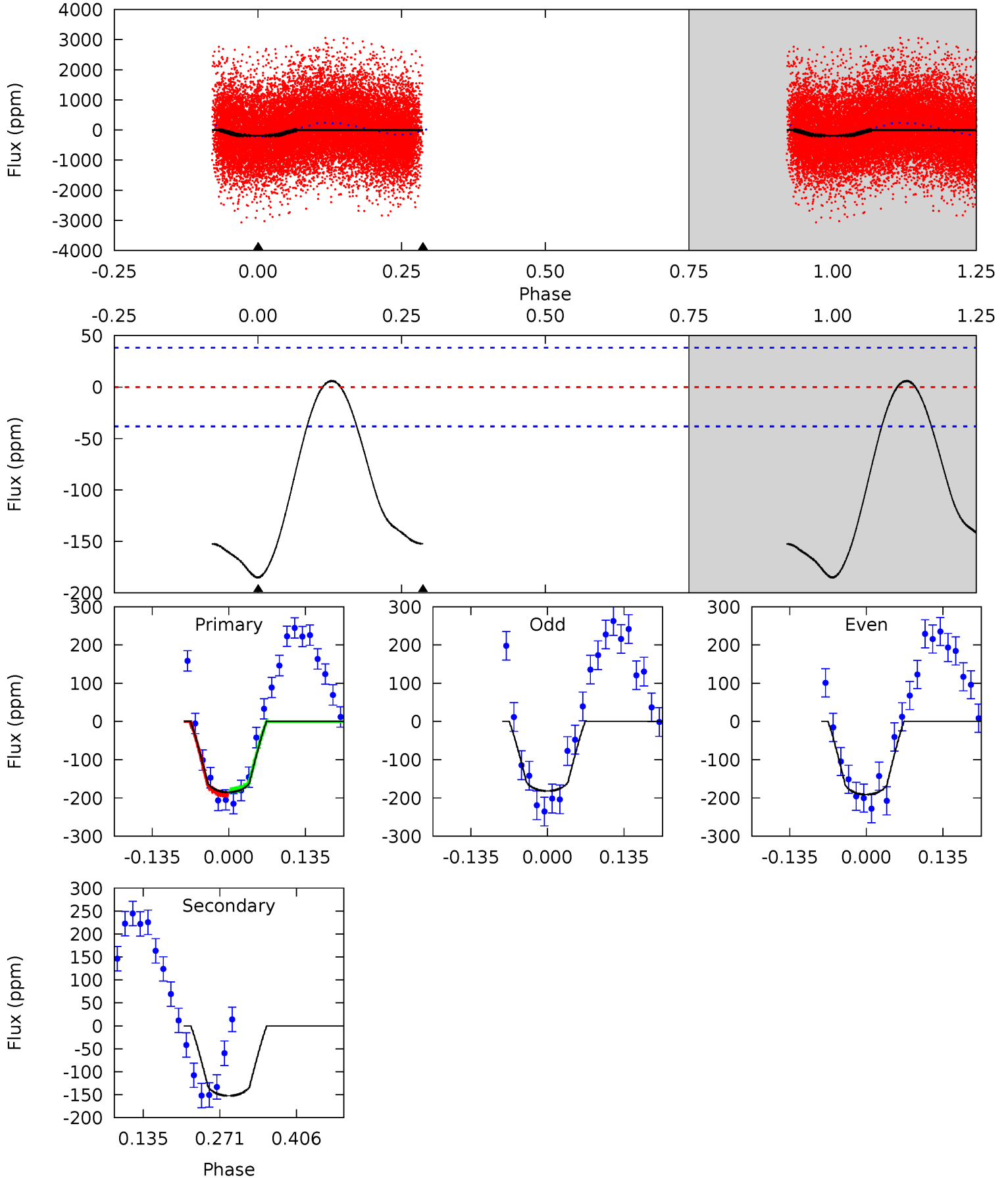


This plot does not exist for this TCE.

# DV Model-Shift Uniqueness Test

012120077-03, P = 0.667711 Days, E = 131.148166 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
21.8	17.9	0	0	4.50	1.49	0.93	21.8	21.8	17.9	17.9	0.54	0.90	0.03	0.63



## Alt Model-Shift Uniqueness Test

This plot does not exist for this TCE.

### Stellar Parameters For KIC 012120077

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7723^{+214}_{-322}$	$4.159^{+0.101}_{-0.188}$	$-0.040^{+0.200}_{-0.350}$	$1.765^{+0.498}_{-0.291}$	$1.637^{+0.210}_{-0.231}$	$0.419^{+0.237}_{-0.207}$
	+3%/-4%	+2%/-5%	+500%/-875%	+28%/-16%	+13%/-14%	+57%/-49%
Source	KIC0	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 012120077-03 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-152 \pm 8$	$2.44^{+0.78}_{-0.68}$	$4802^{+368}_{-292}$	$7573^{+1554}_{-1080}$	$4.334^{+3.838}_{-1.823}$
Alt.	N/A	N/A	N/A	N/A	N/A

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



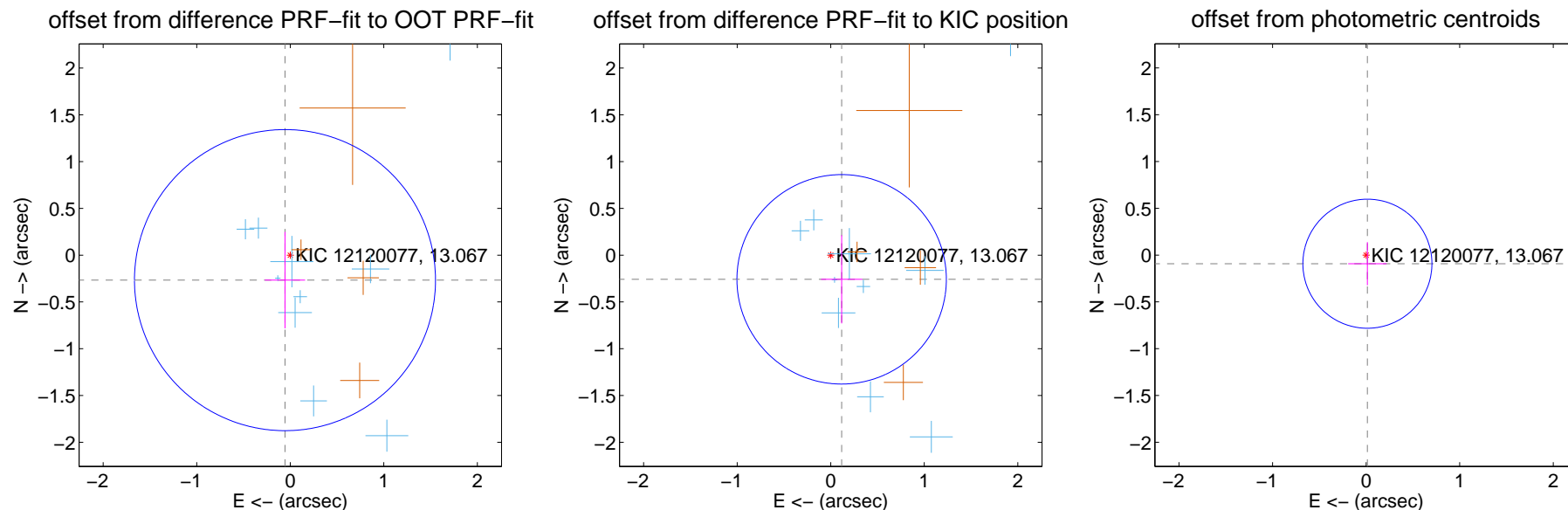
## DV Centroid Data

Supplemental centroid analysis for 012120077-03. Kepler magnitude: 13.07. Transit SNR 13.84

There are 10 quarters with good PRF difference image offsets

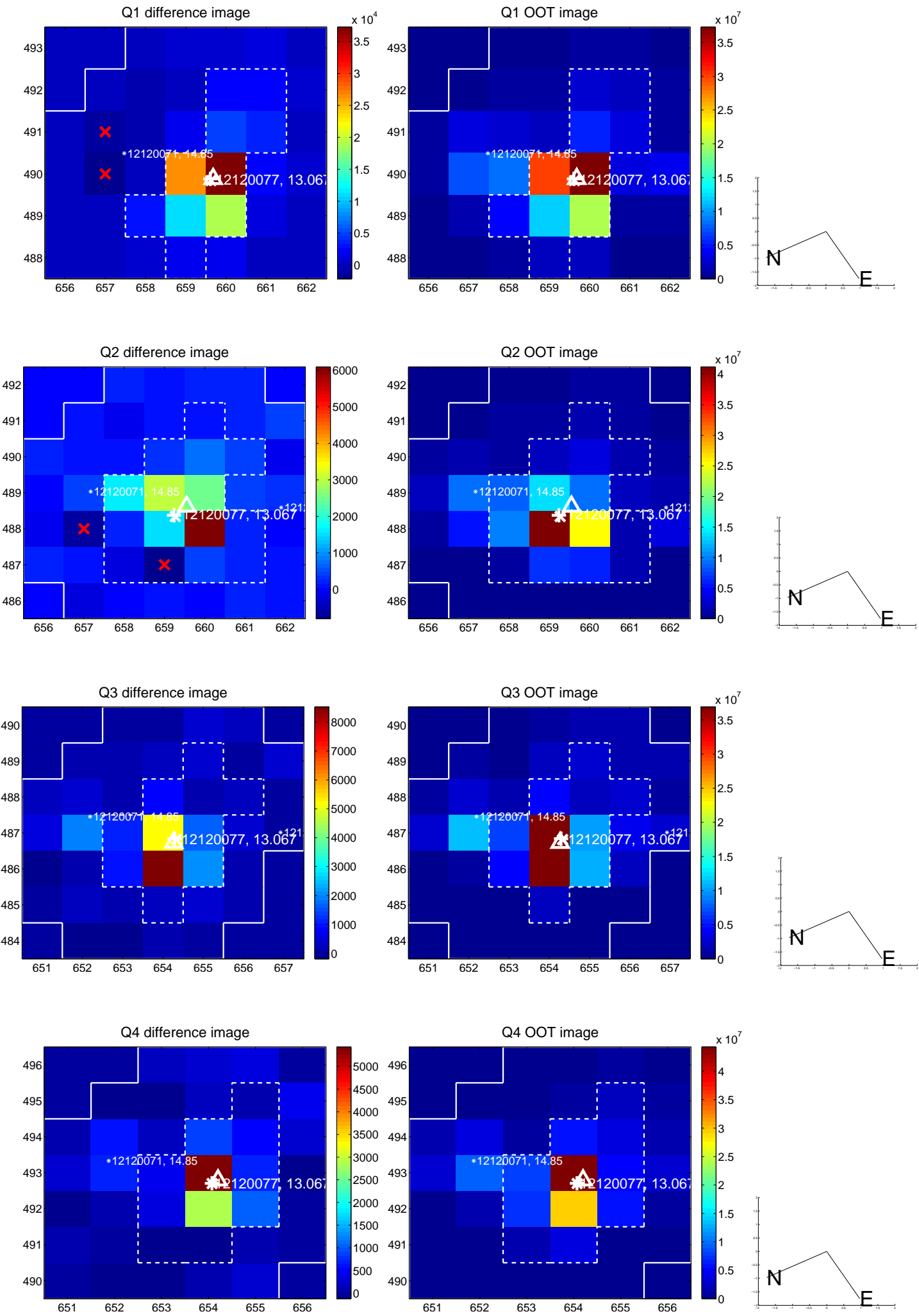
The direct PRF centroid is offset from the target star catalog position by about 0.17 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.273 \pm 0.536$	0.51	$0.056 \pm 0.216$	$-0.267 \pm 0.515$
PRF-fit source offset from KIC position	$0.283 \pm 0.373$	0.76	$-0.117 \pm 0.220$	$-0.258 \pm 0.471$
photometric centroid source offset	$0.09 \pm 0.23$	0.41	$-0.01 \pm 0.21$	$-0.09 \pm 0.23$

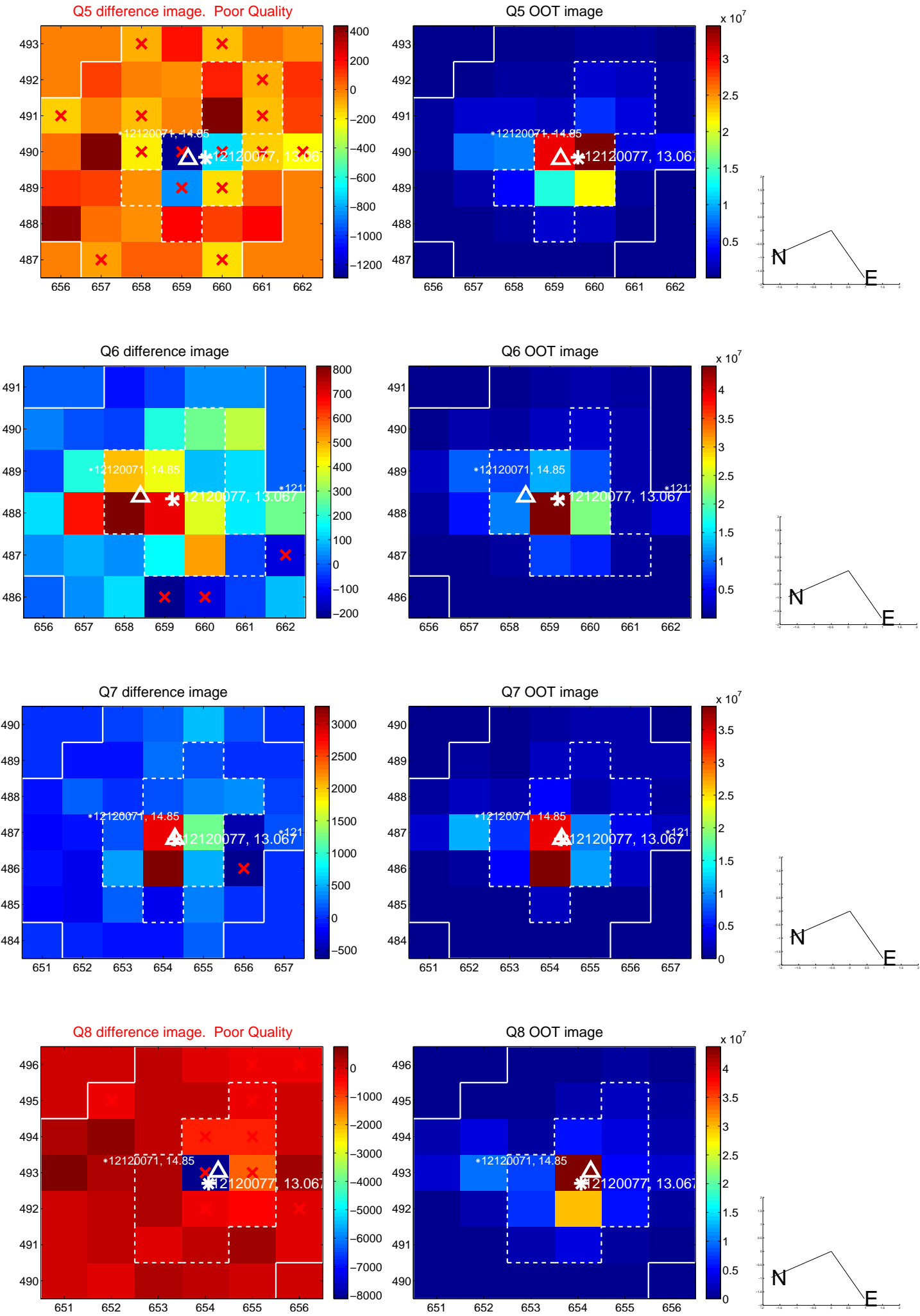


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

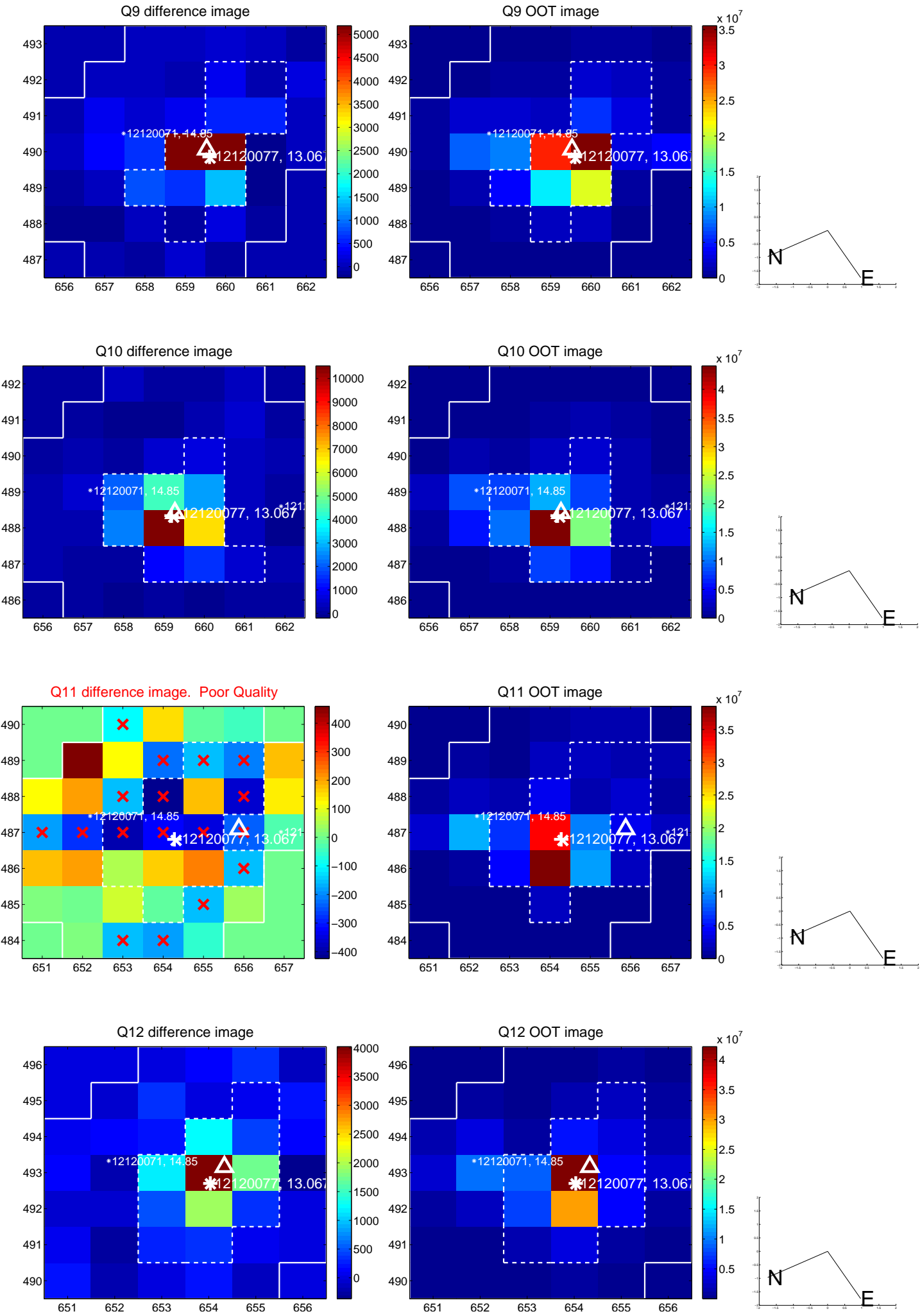
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



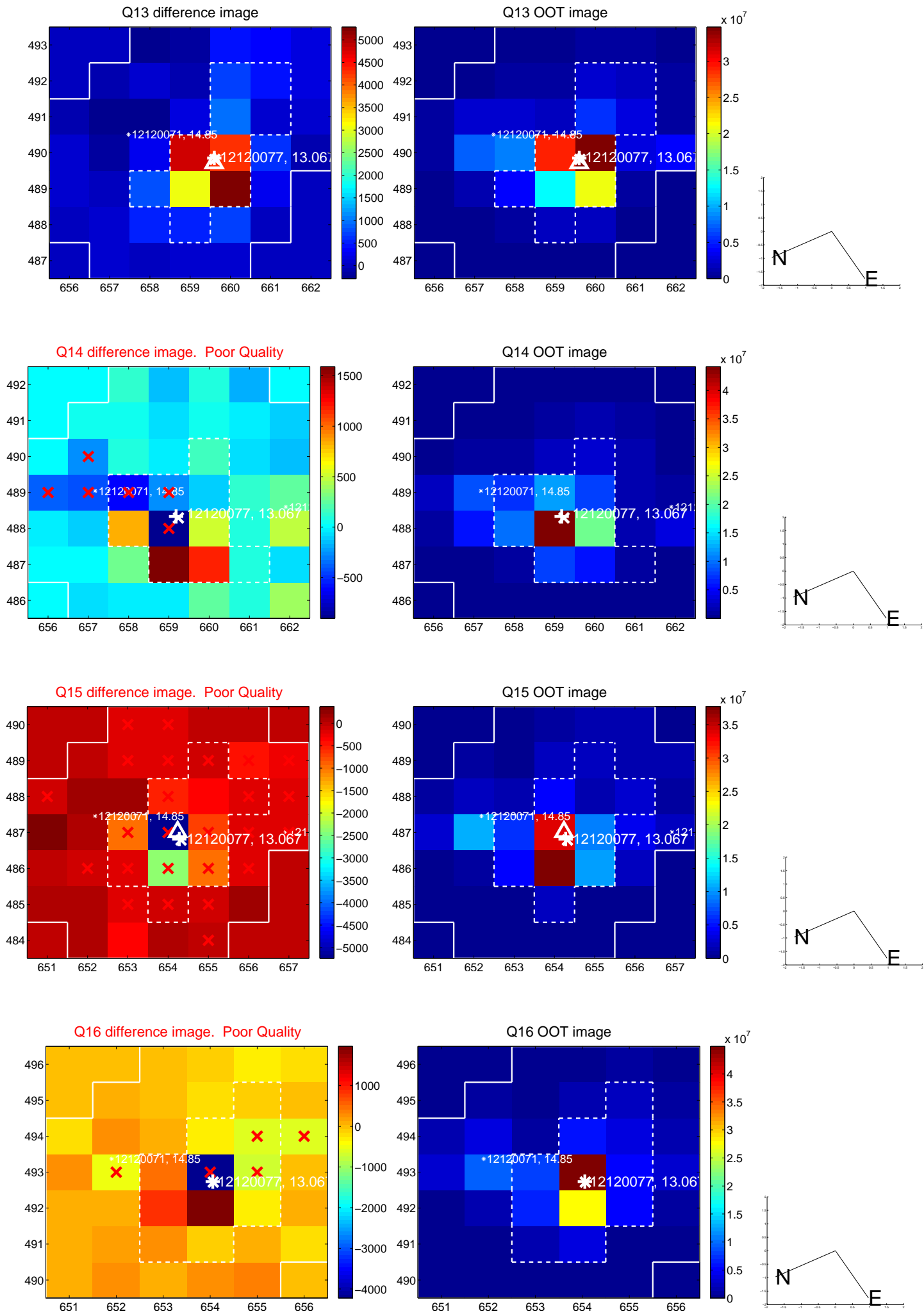
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

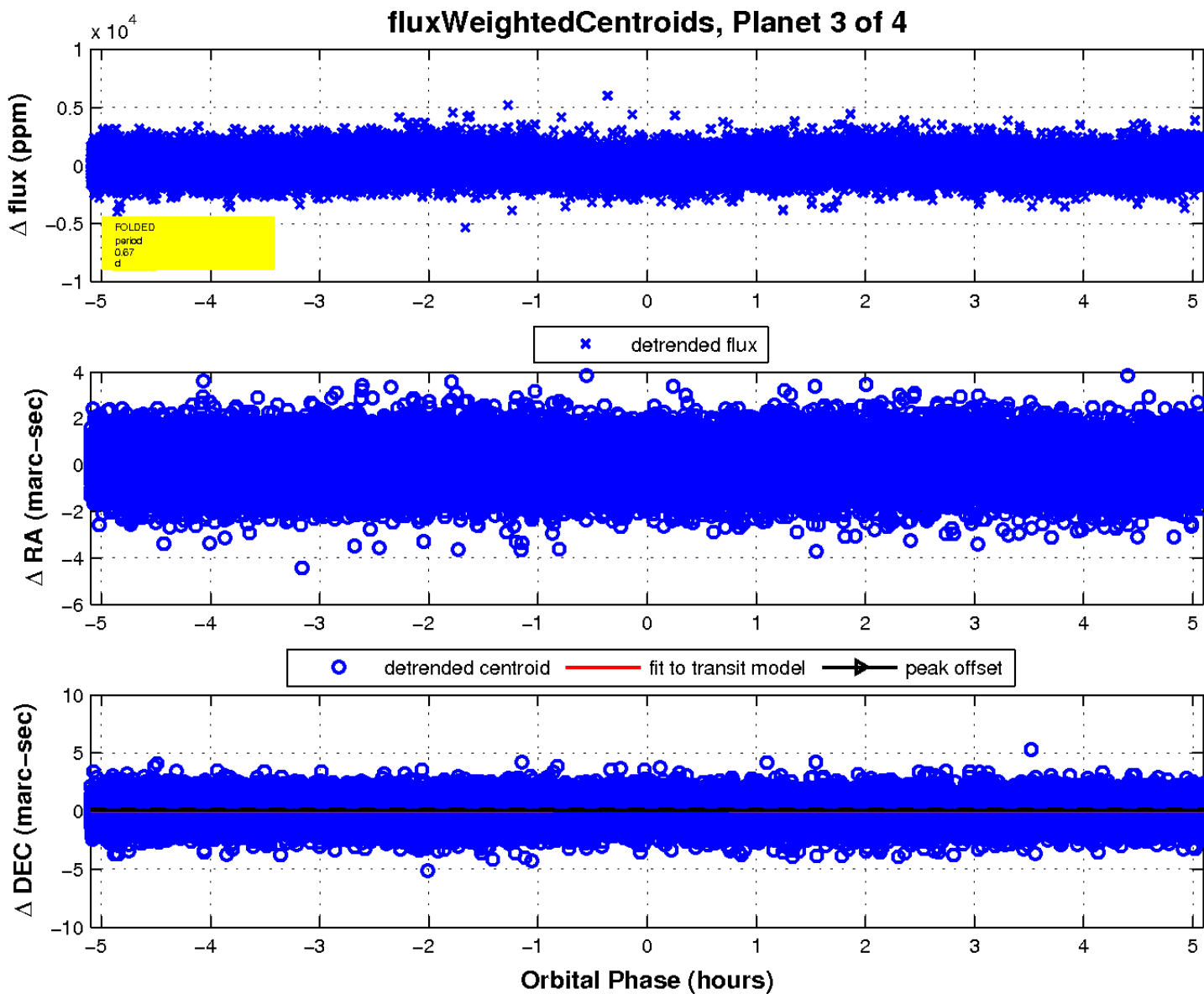
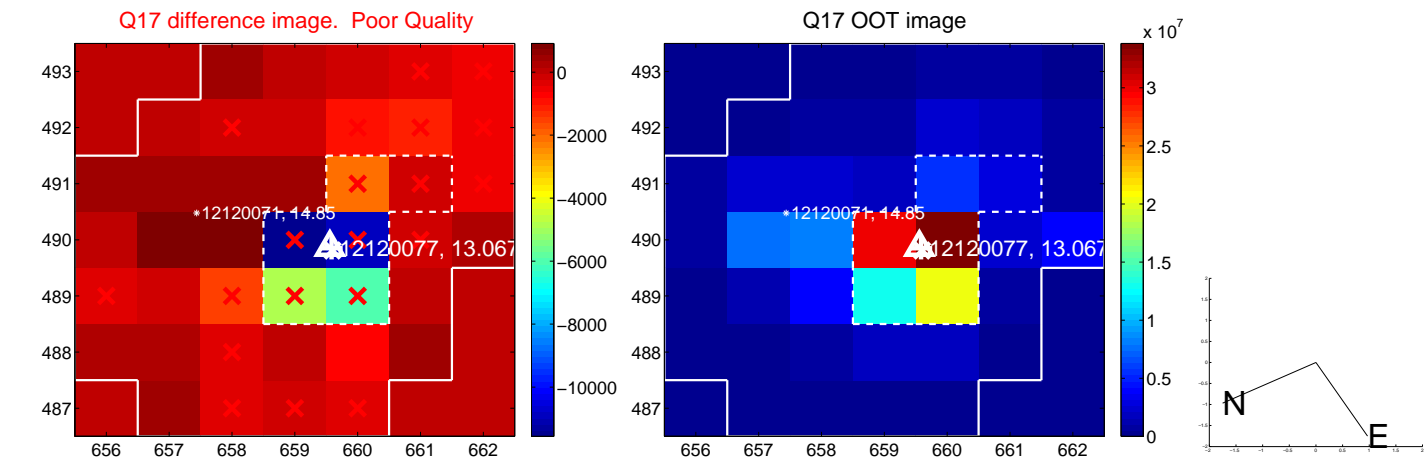


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



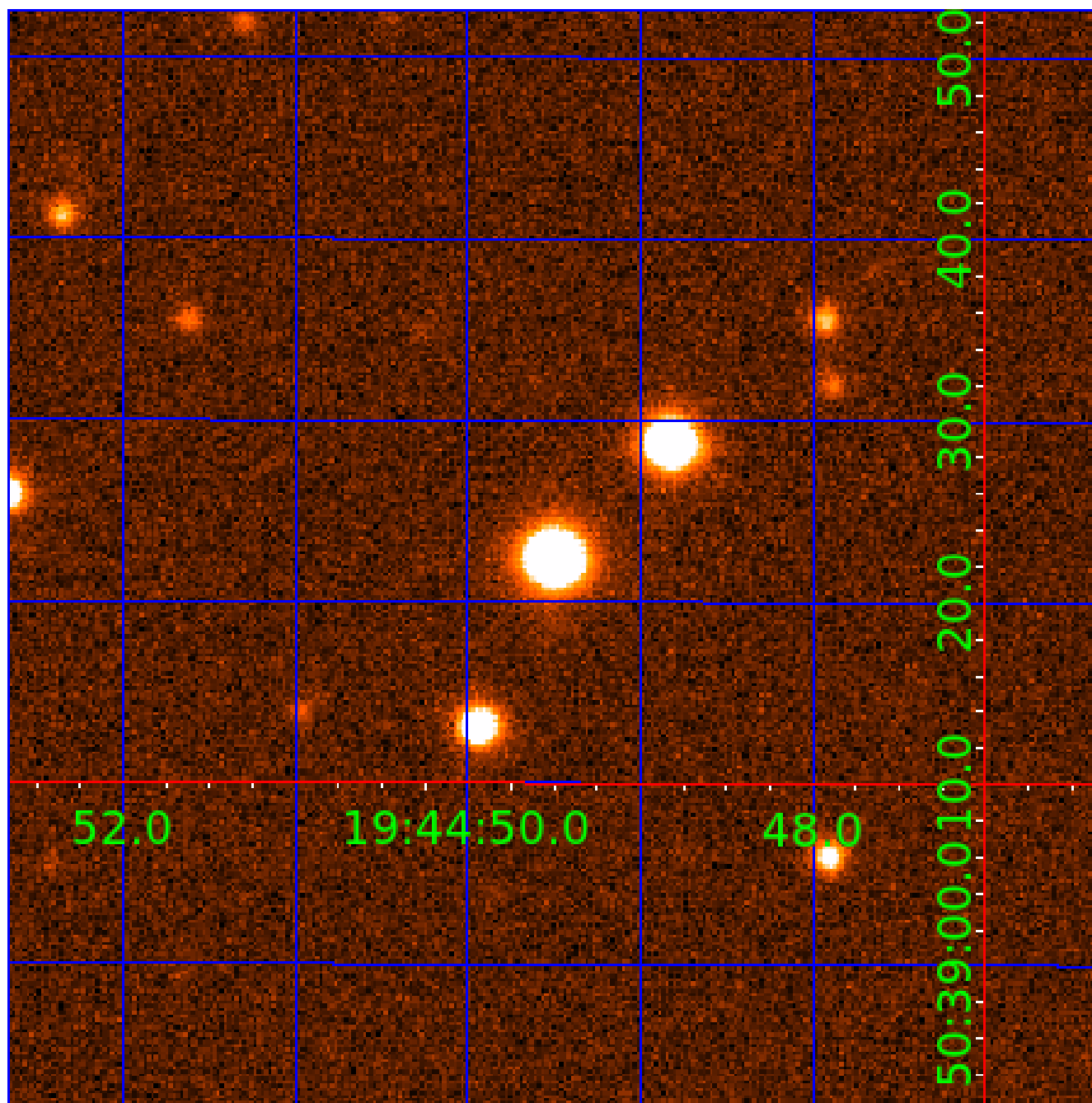


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 012120077

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
012120077-01	OBS	No	0.667703	132.147011	99.3	2.061	10.3	7.9	1.76	7723	2.03	31946.56
012120077-02	OBS	No	0.667705	131.653635	147.8	1.782	12.3	11.3	1.76	7723	2.49	31946.41
012120077-03	OBS	No	0.667711	131.815877	165.7	1.699	12.5	13.8	1.76	7723	2.37	31946.05
012120077-04	OBS	No	22.338254	149.556087	1232.4	2.475	10.0	5.5	1.76	7723	10.96	296.35

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
012120077-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
012120077-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD
012120077-03	OBS	FP	0.00	1	0	0	0	LPP_DV—SAME_NTL_PERIOD
012120077-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT

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

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

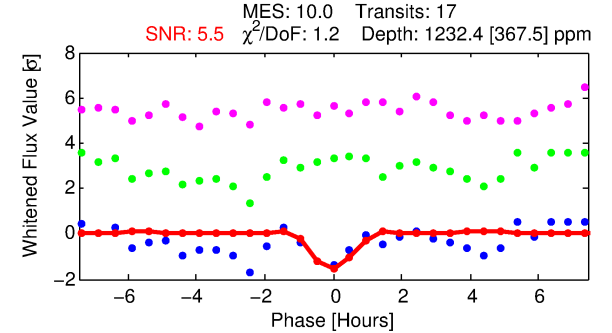
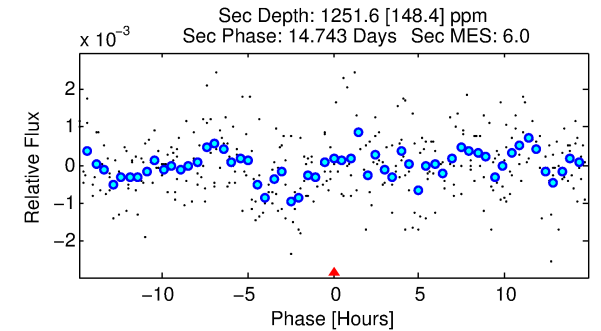
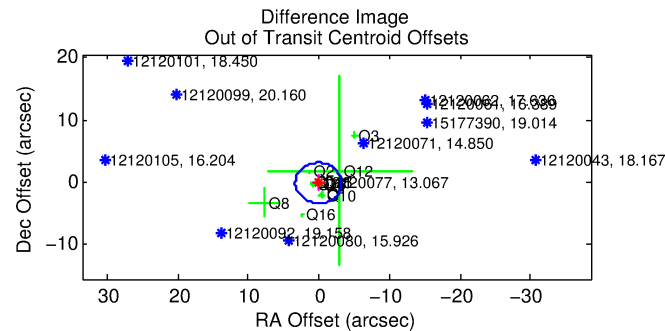
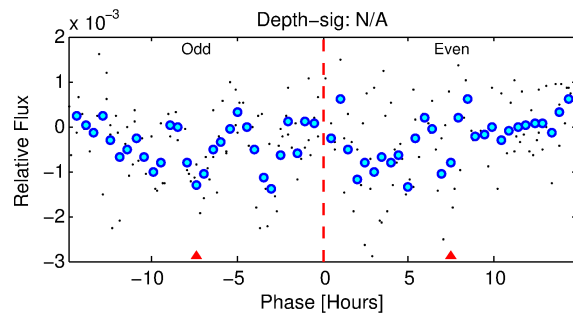
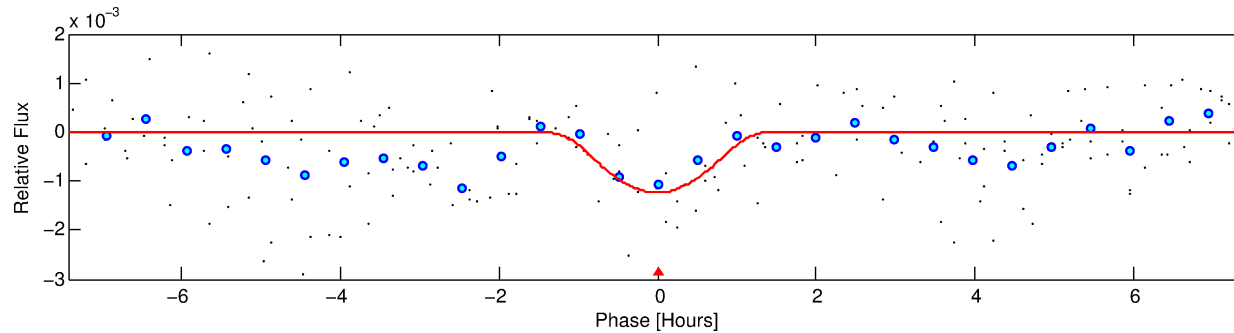
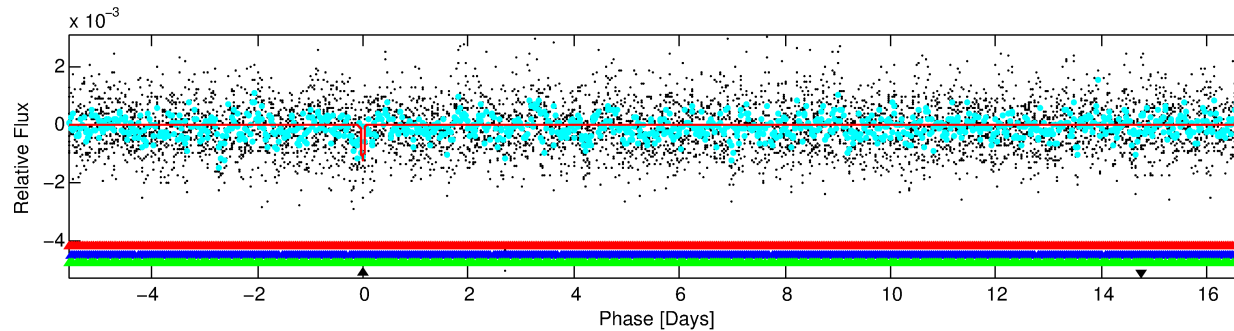
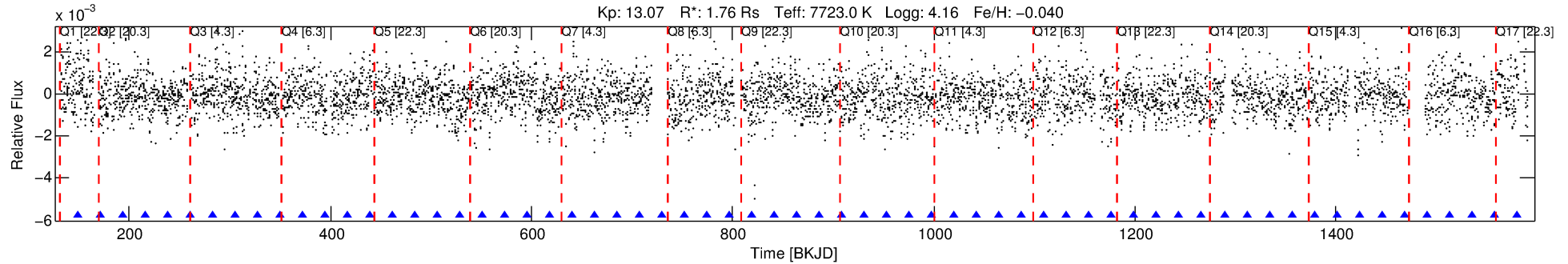
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 012120077-04

No Significant Match Found

# DV One-Page Summary

KIC: 12120077 Candidate: 4 of 4 Period: 22.338 d



## DV Fit Results:

Period = 22.33825 [0.00038] d  
Epoch = 149.5561 [0.0138] BKJD  
Rp/R\* = 0.0569 [0.4064]  
a/R\* = 24.39 [44.93]  
b = 1.00 [0.62]  
Seff = 296.35 [113.42]  
Teq = 1058 [101] K  
Rp = 10.96 [78.34] Re  
a = 0.1830 [0.0434] AU  
Ag = 191.96 [2742.24] [0.07σ]  
Teffp = 6089 [21740] K [0.23σ]

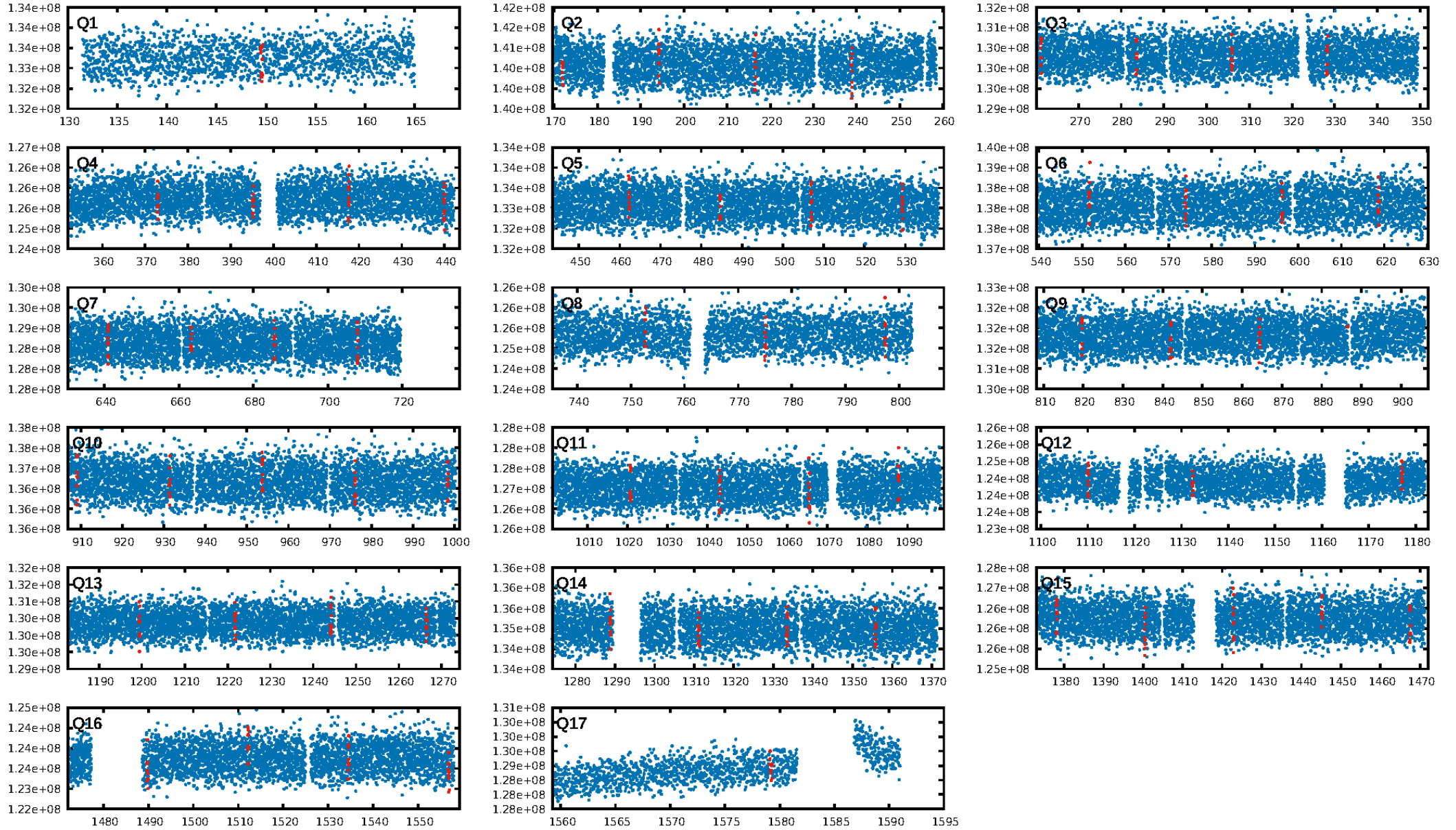
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [173.24σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 62.3%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [17/17]  
GhostDiagnostic-chr: 1.817  
Centroid-sig: N/A  
Centroid-so: 0.677 arcsec [3.46σ]  
OotOffset-rm: 0.160 arcsec [0.15σ]  
KicOffset-rm: 0.105 arcsec [0.11σ]  
OotOffset-st: 3/4/4/2 [13]  
KicOffset-st: 3/4/4/2 [13]  
DiffImageQuality-fgm: 0.31 [4/13]  
DiffImageOverlap-fno: 0.00 [0/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 06:05:01 Z

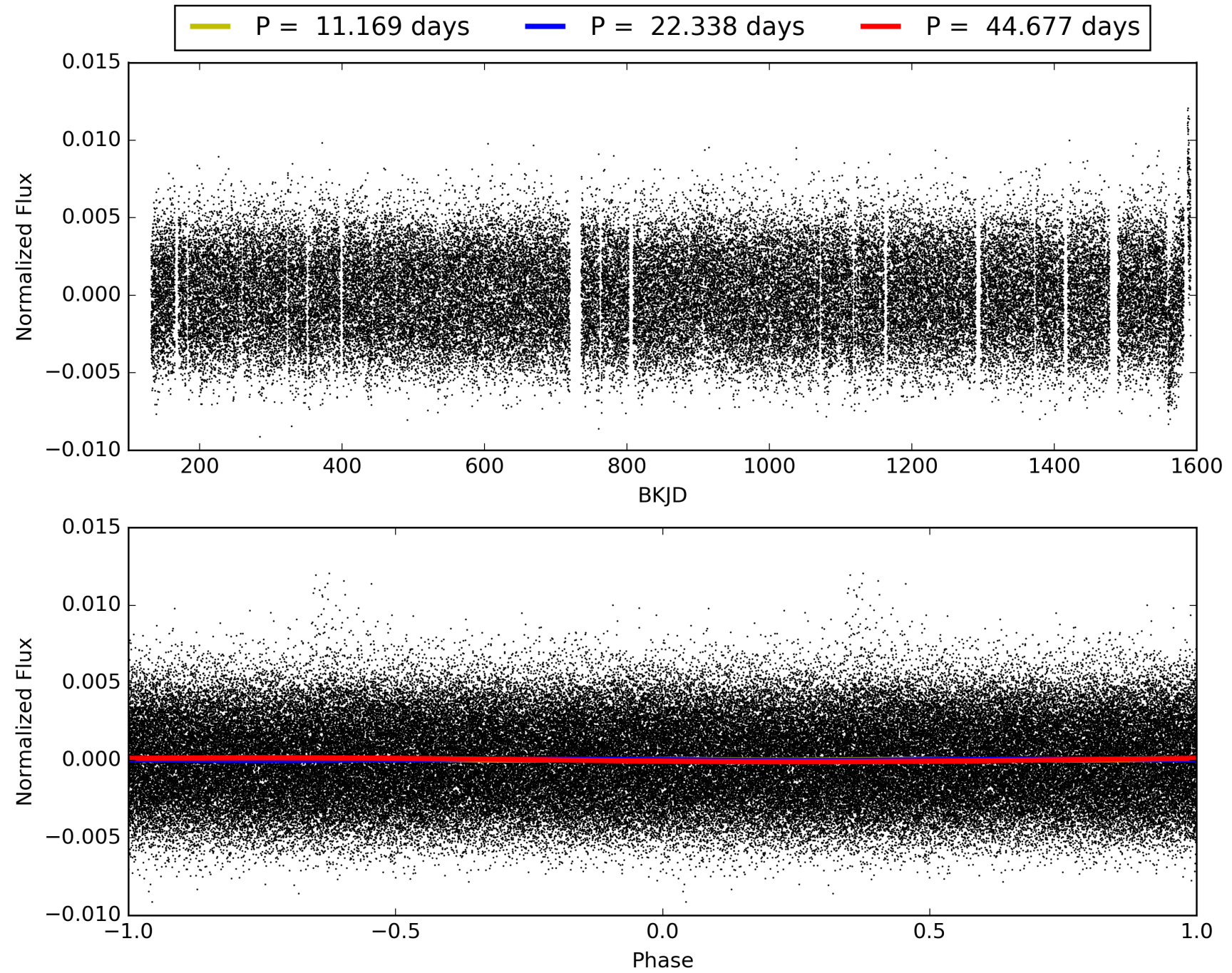
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 012120077-04, PDC Light Curves



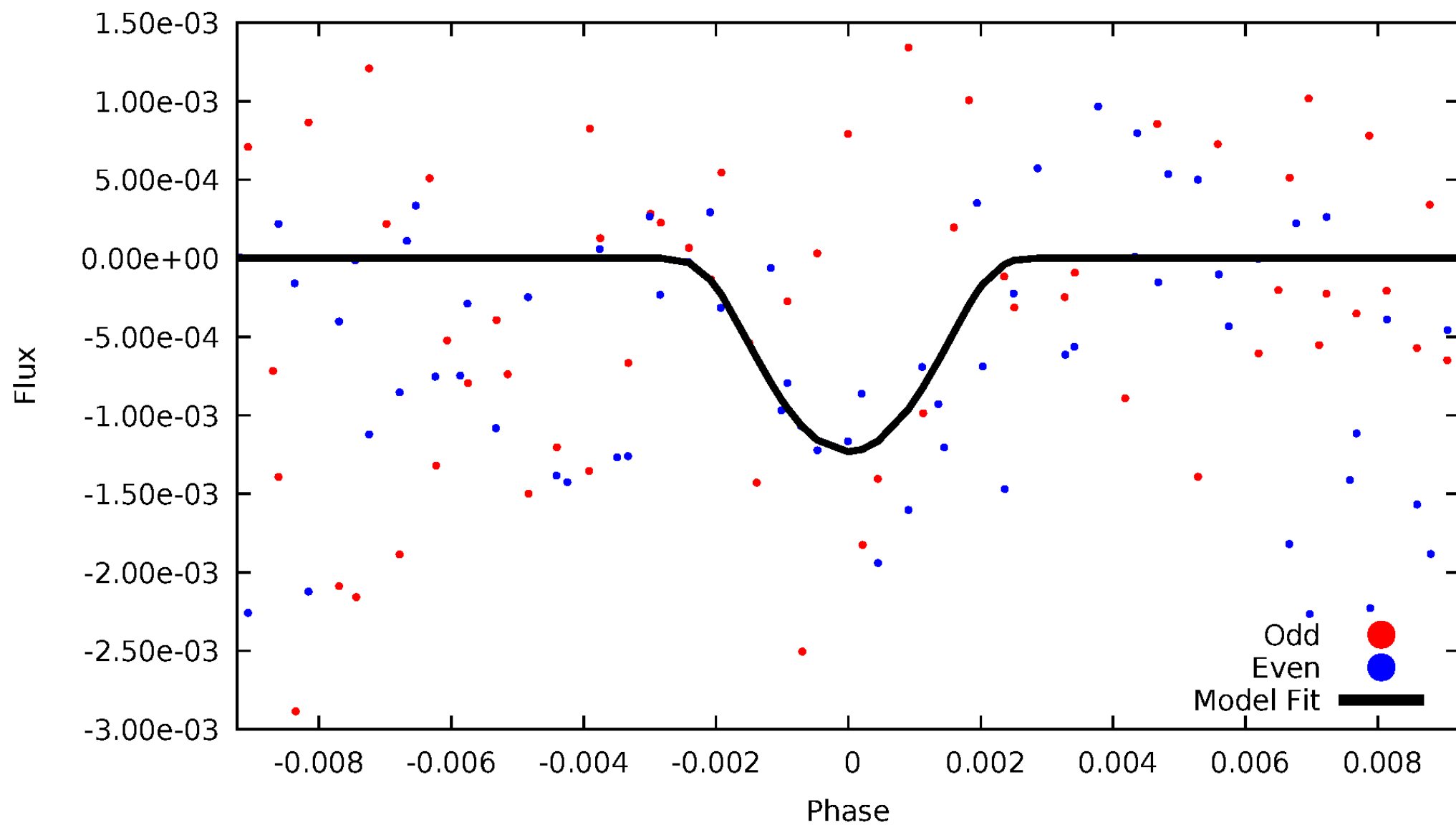


TCE 012120077-04



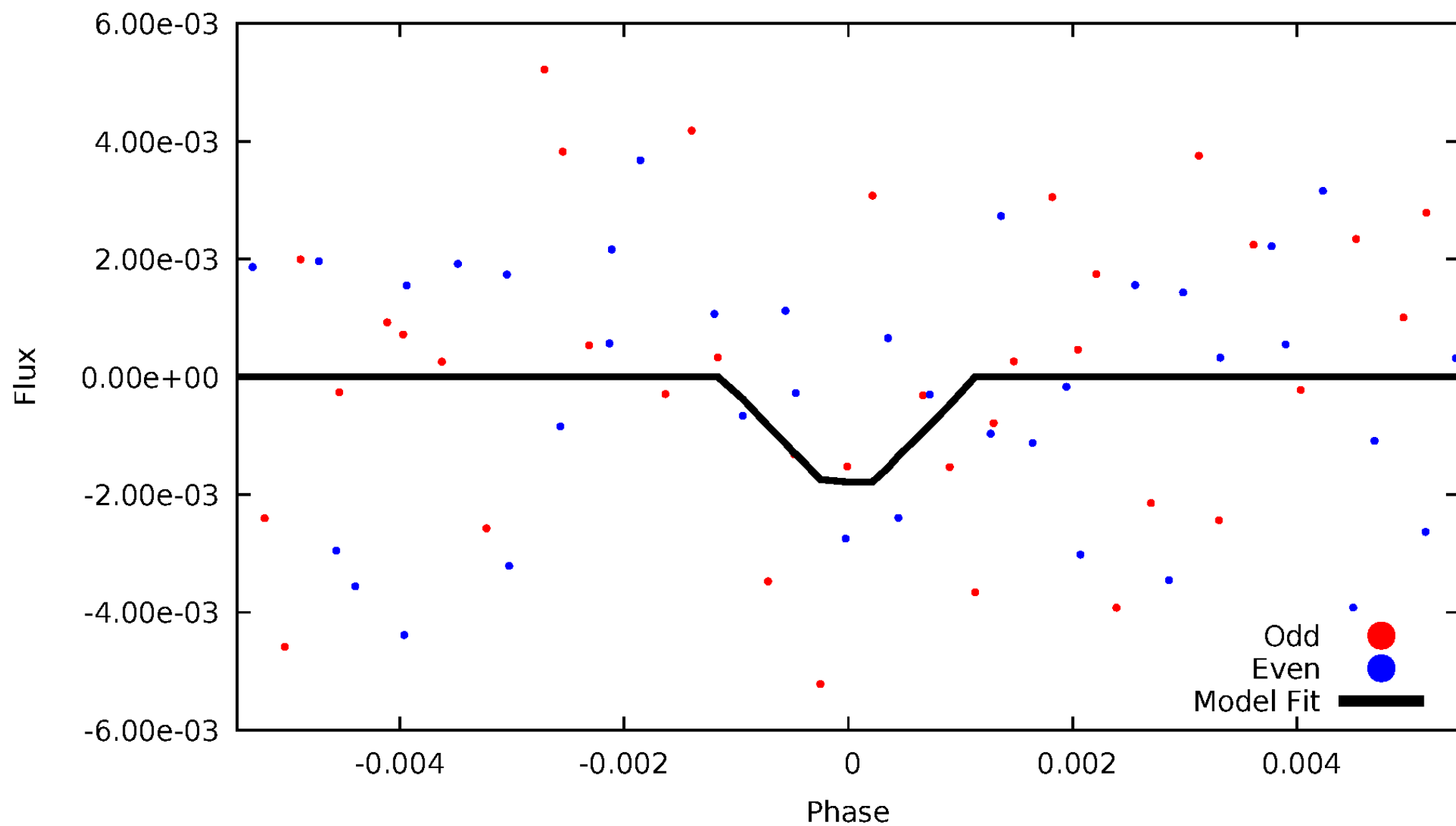
# DV Odd/Even

TCE 012120077-04



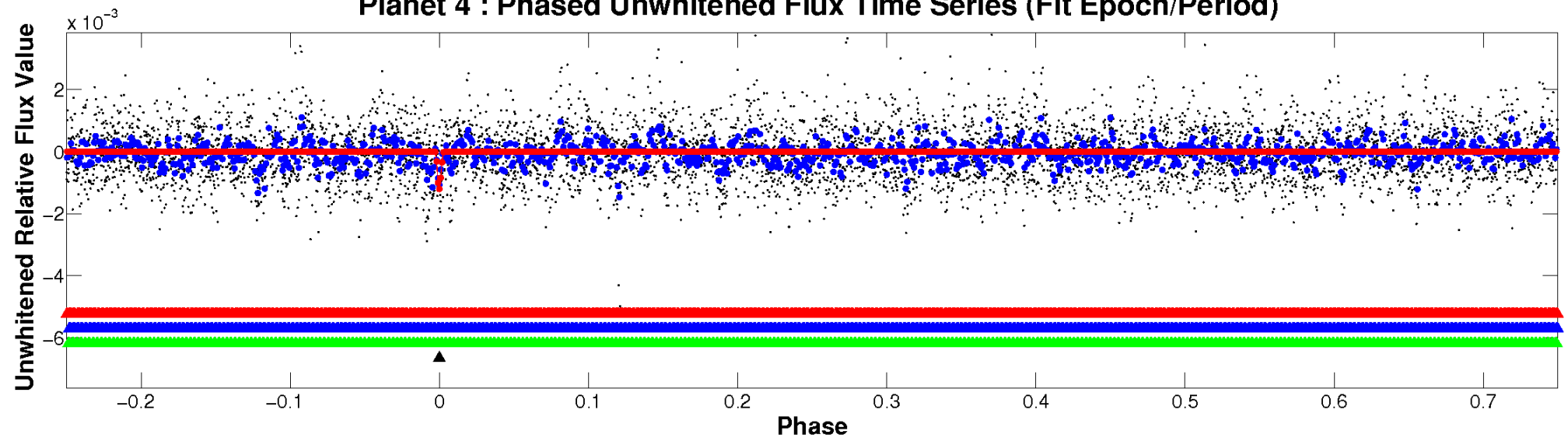
# ALT Odd/Even

TCE 012120077-04

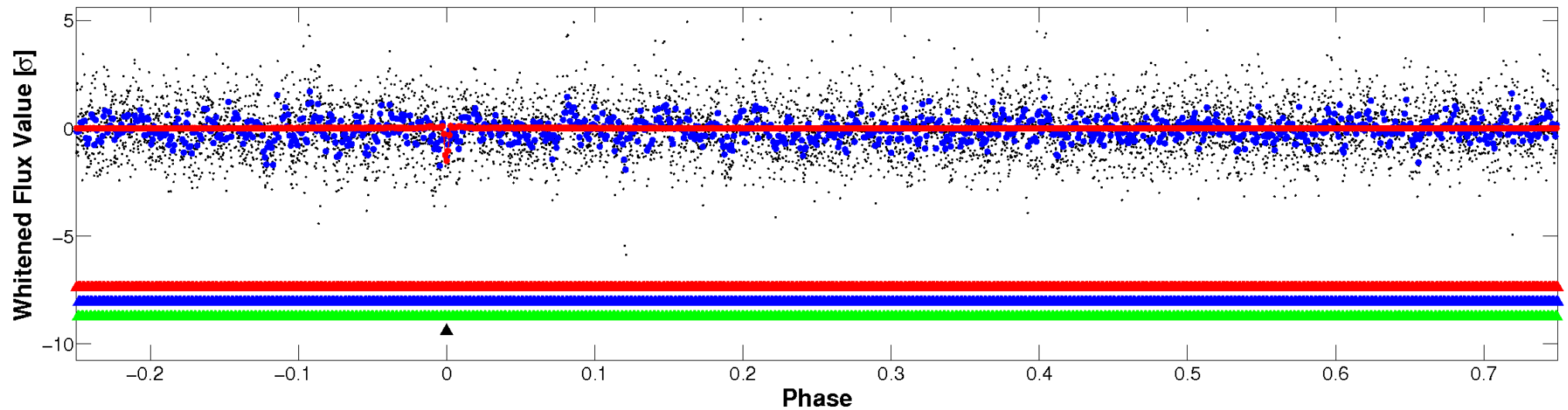


# Non-Whitened Vs. Whitened Light Curve

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

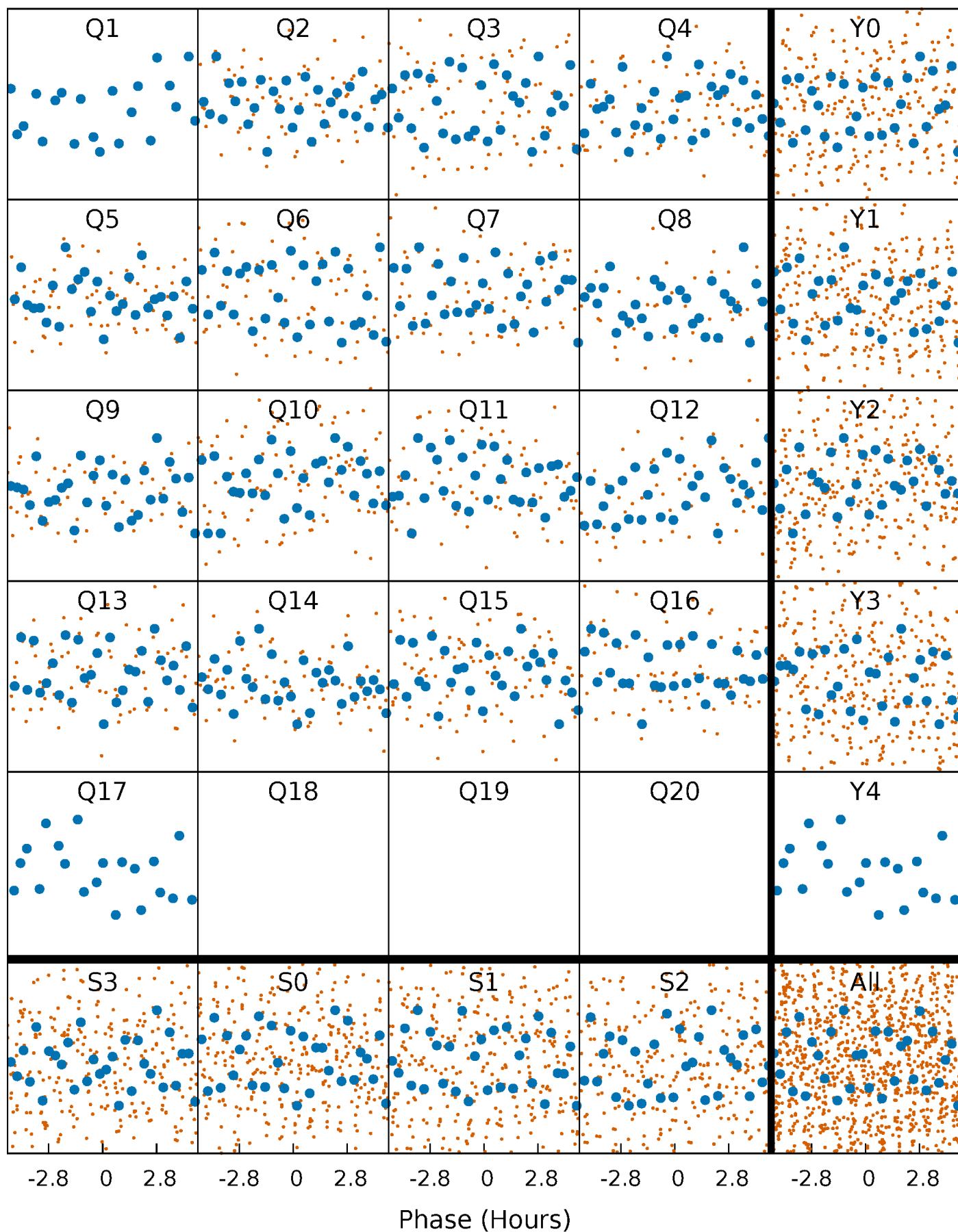


## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



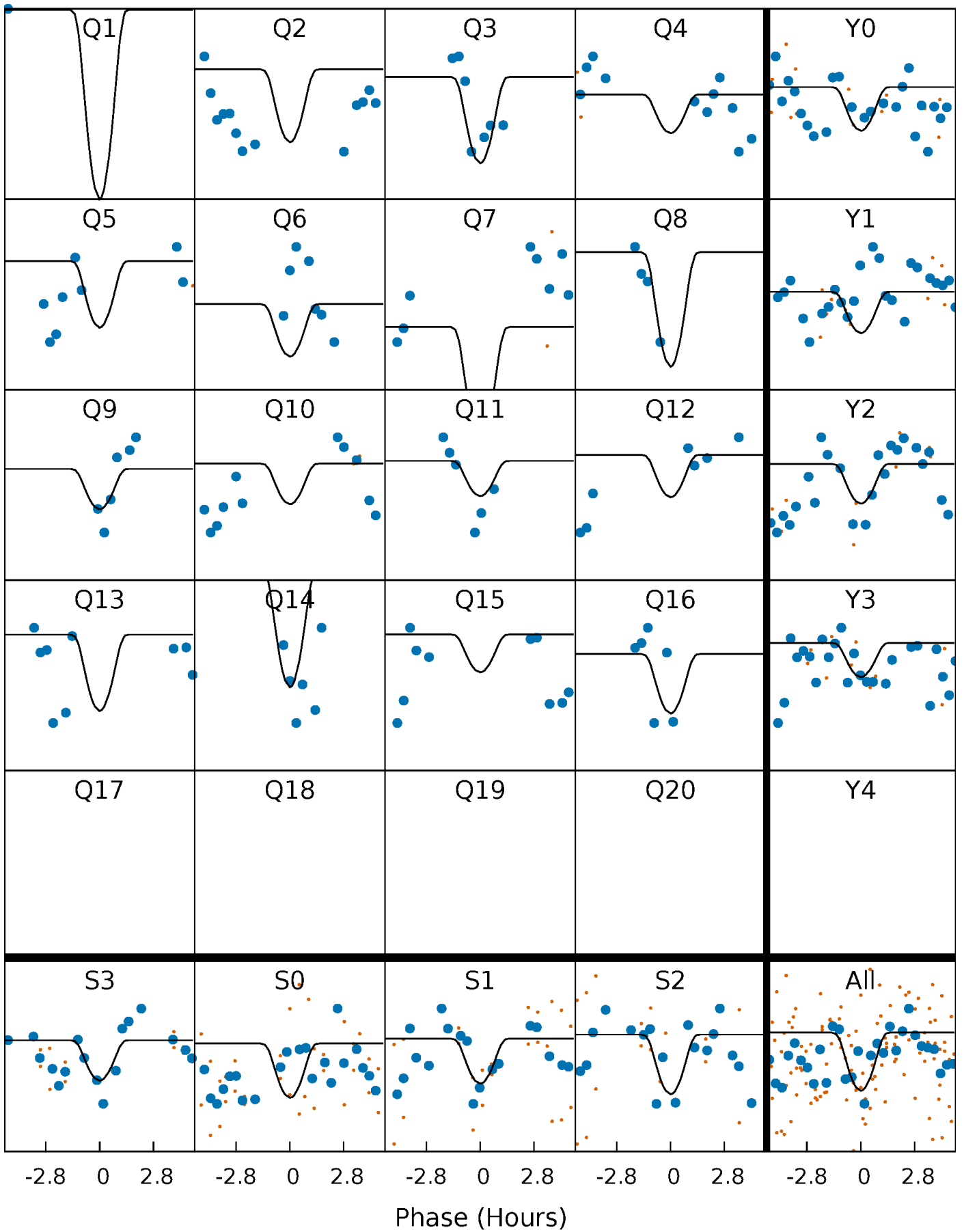
# PDC Quarter-Phased Transit Curves

TCE 012120077-04   P= 22.338254 Days    $T_0=149.556087$  (BKJD)



# DV Quarter-Phased Transit Curves

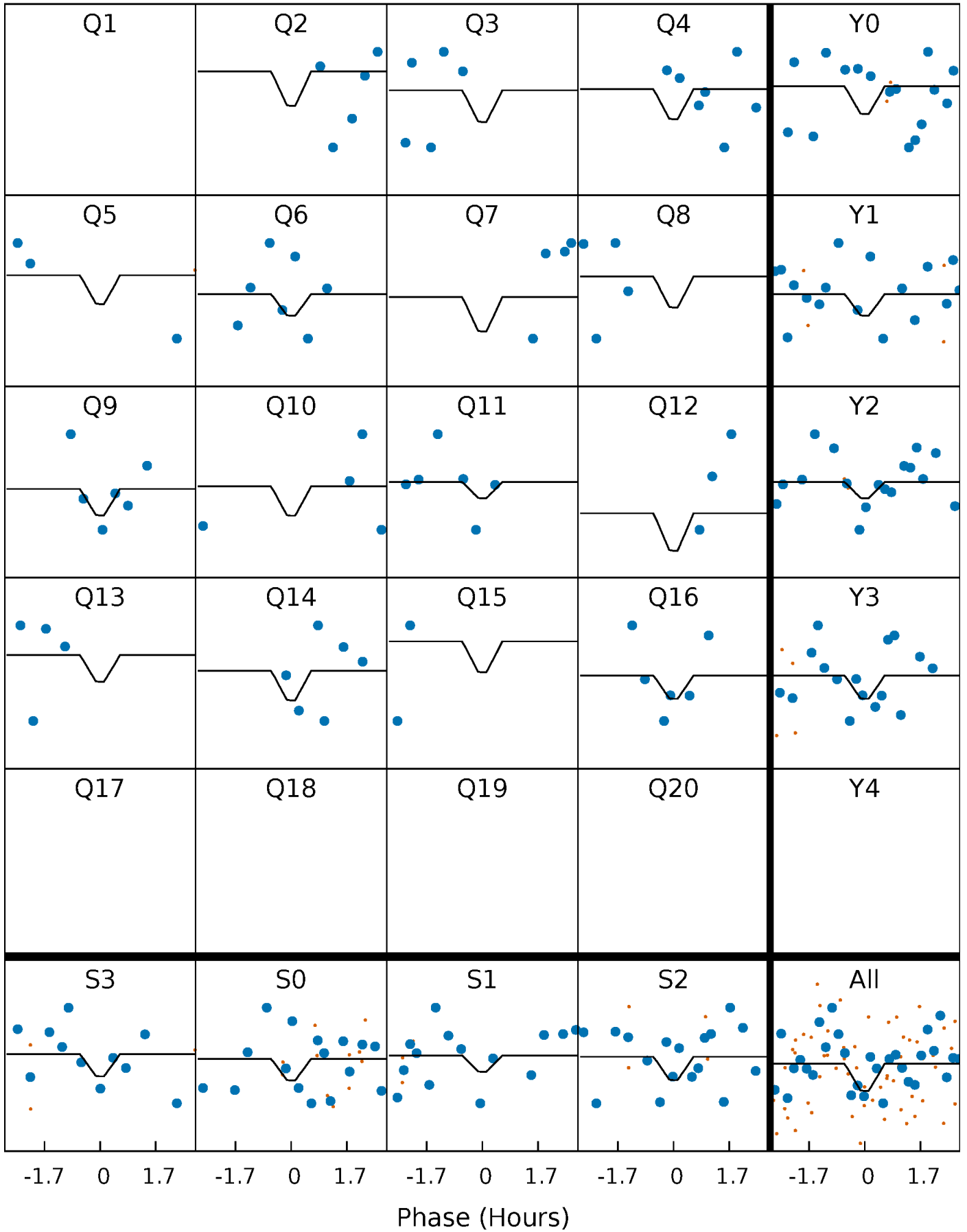
TCE 012120077-04     $P = 22.338254$  Days     $T_0 = 149.556087$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

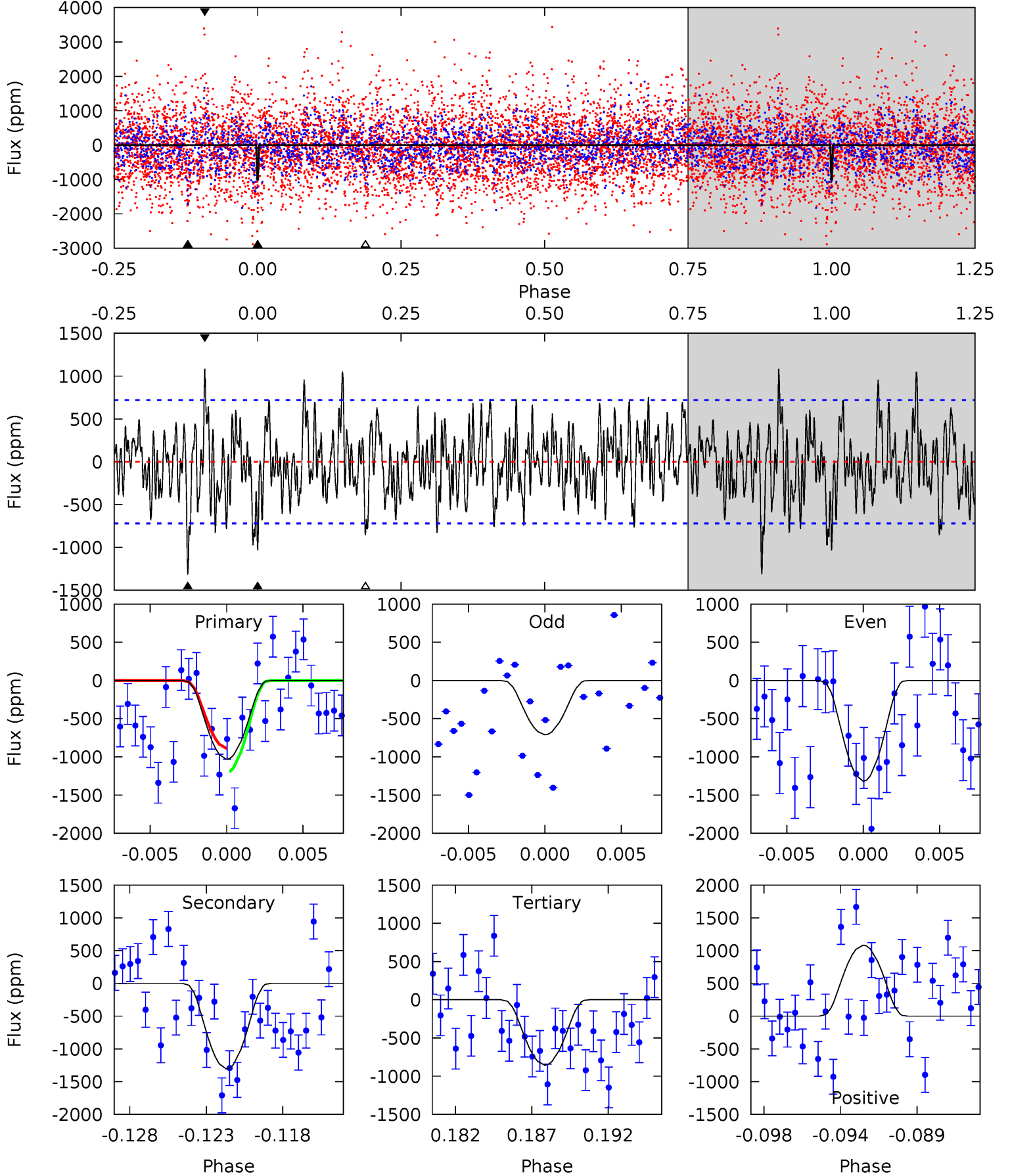
TCE 012120077-04   P= 22.336388 Days    $T_0=149.643044$  (BKJD)



# DV Model-Shift Uniqueness Test

012120077-04, P = 22.338254 Days, E = 127.217833 Days

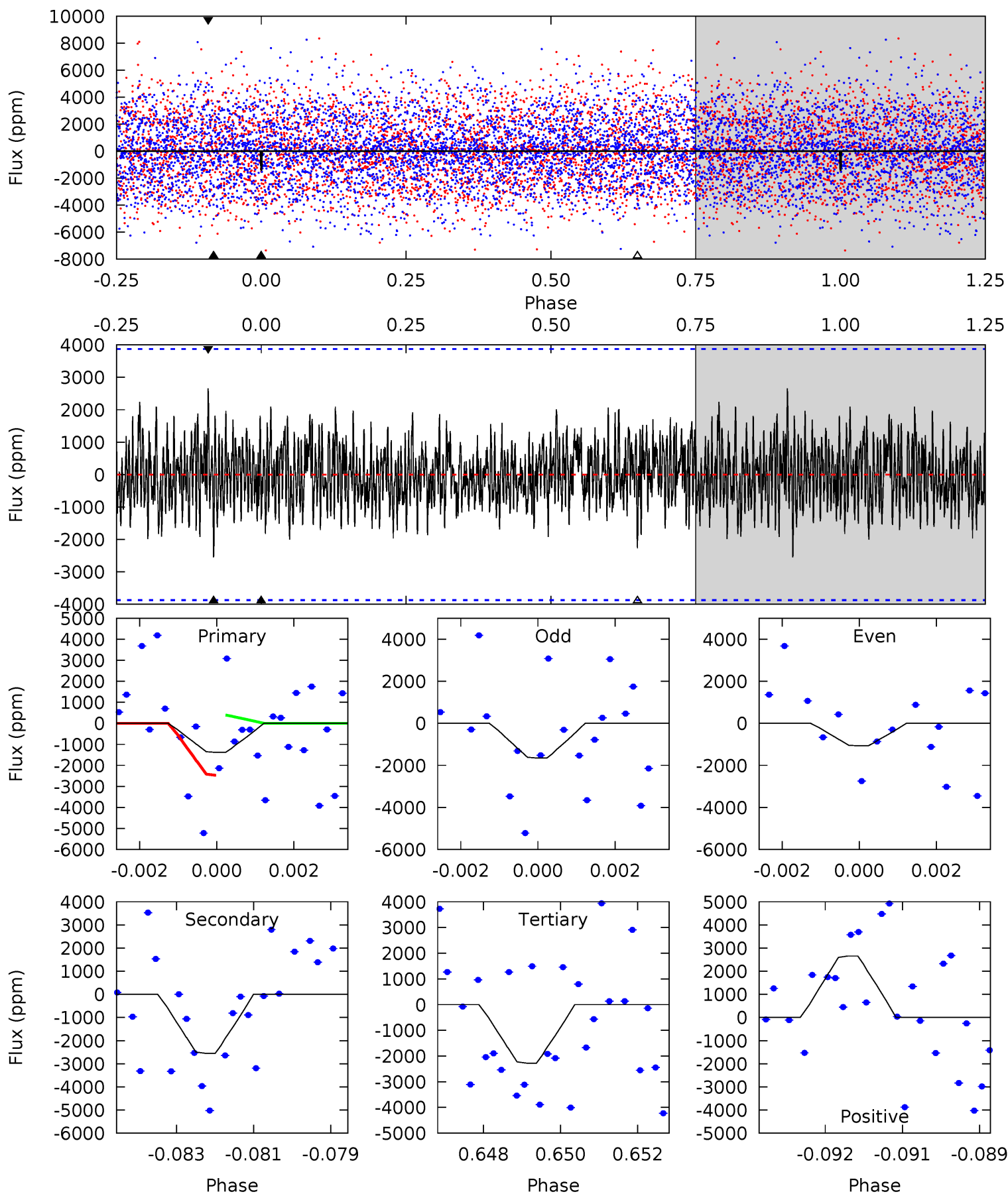
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
7.40	9.36	6.14	7.77	5.16	2.81	2.37	1.26	-0.37	3.22	1.59	2.18	0.85	0.45	1.10



# Alt Model-Shift Uniqueness Test

012120077-04, P = 22.336388 Days, E = 127.306656 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
1.90	3.51	3.14	3.66	5.34	3.11	1.10	-1.23	-1.76	0.38	-0.15	0.40	1.05	0.51	1.43



### Stellar Parameters For KIC 012120077

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7723^{+214}_{-322}$	$4.159^{+0.101}_{-0.188}$	$-0.040^{+0.200}_{-0.350}$	$1.765^{+0.498}_{-0.291}$	$1.637^{+0.210}_{-0.231}$	$0.419^{+0.237}_{-0.207}$
	+3%/-4%	+2%/-5%	+500%/-875%	+28%/-16%	+13%/-14%	+57%/-49%
Source	KIC0	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 012120077-04 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-1306 \pm 140$	$56.09^{+63.60}_{-38.22}$	$1500^{+98}_{-95}$	$3225^{+1664}_{-645}$	$7.465^{+66.681}_{-5.851}$
Alt.	$-2548 \pm 725$	$57.93^{+60.62}_{-40.47}$	$1491^{+103}_{-90}$	$3532^{+2175}_{-679}$	$13^{+135}_{-10}$

$T_{max}$  = 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

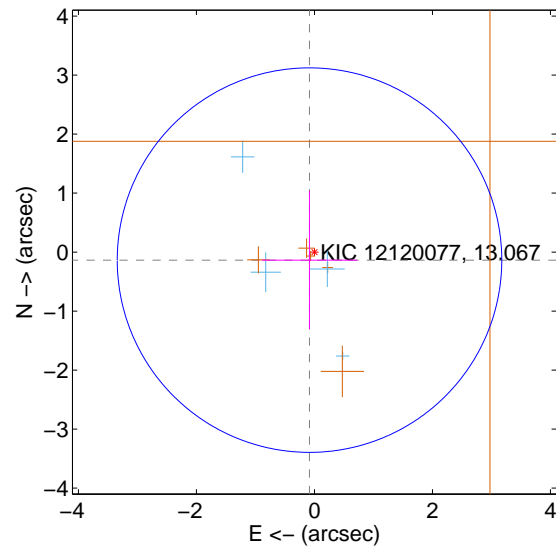
Supplemental centroid analysis for 012120077-04. Kepler magnitude: 13.07. Transit SNR 5.52

There are 4 quarters with good PRF difference image offsets

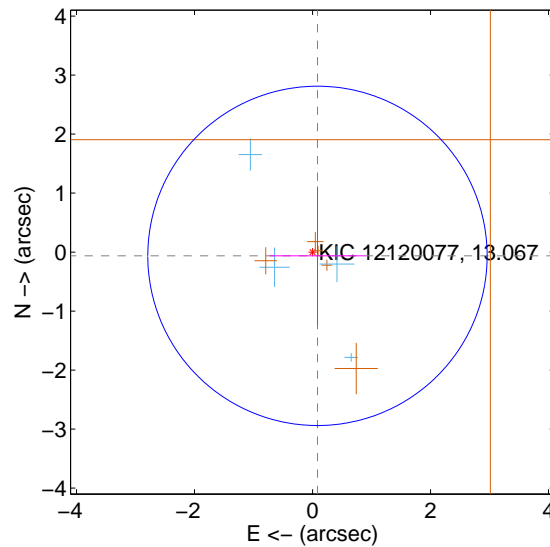
The direct PRF centroid is offset from the target star catalog position by about 0.07 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.160 \pm 1.086$	0.15	$0.084 \pm 0.808$	$-0.136 \pm 1.174$
PRF-fit source offset from KIC position	$0.105 \pm 0.959$	0.11	$-0.084 \pm 0.808$	$-0.064 \pm 1.174$
photometric centroid source offset	$0.68 \pm 0.20$	<b>3.46</b>	$-0.42 \pm 0.18$	$0.53 \pm 0.20$

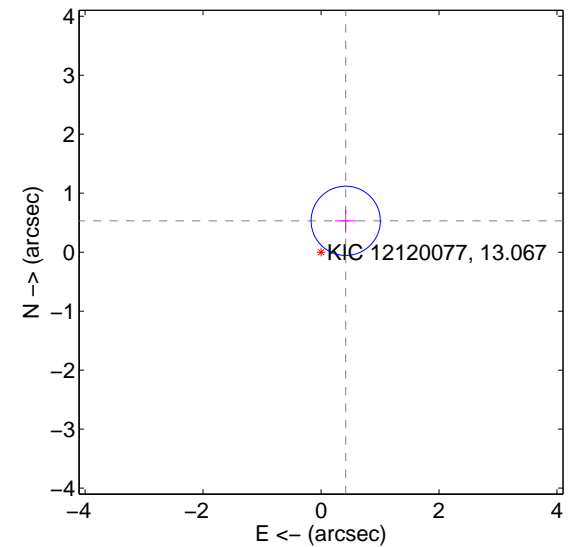
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

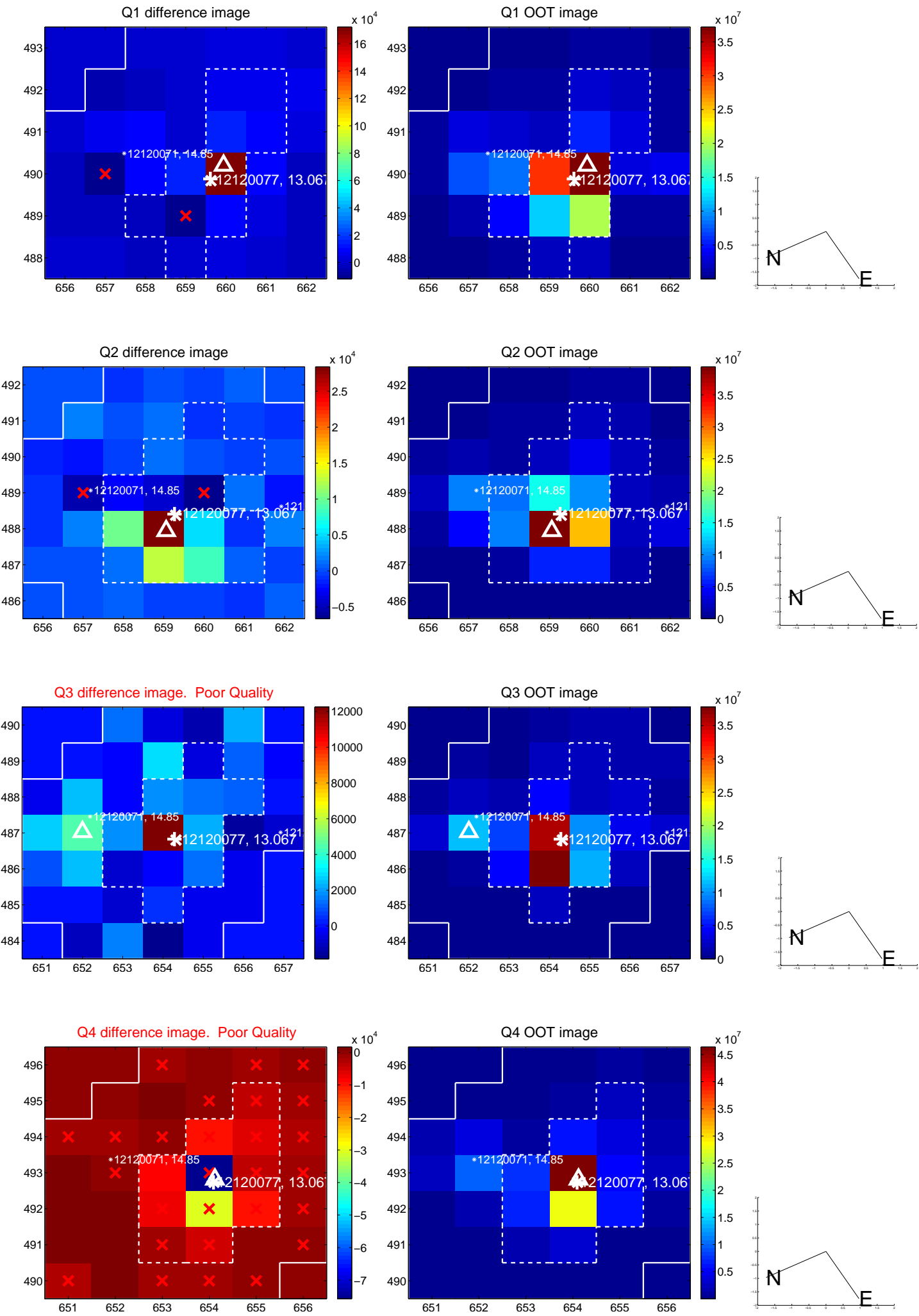


offset from photometric centroids



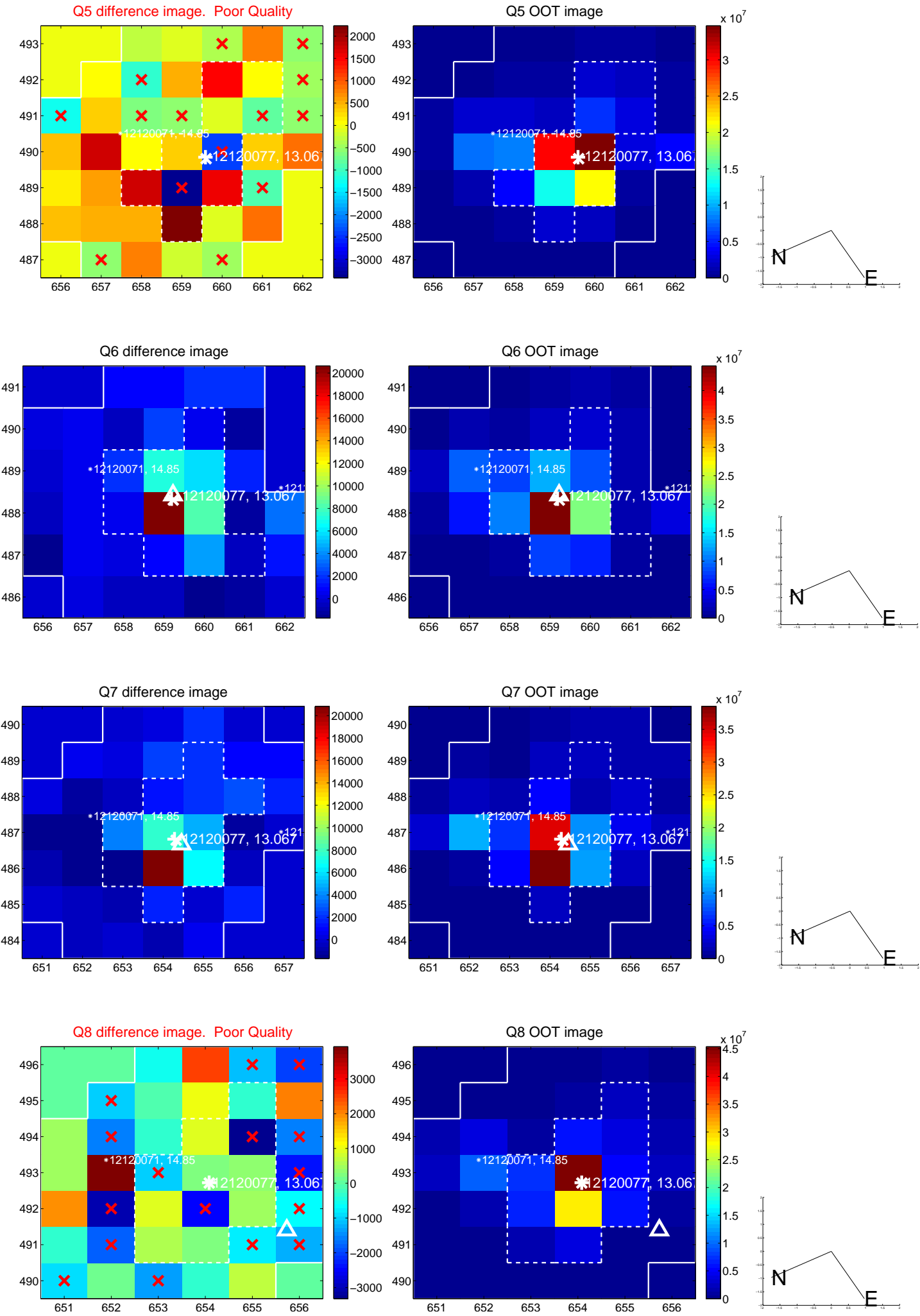
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

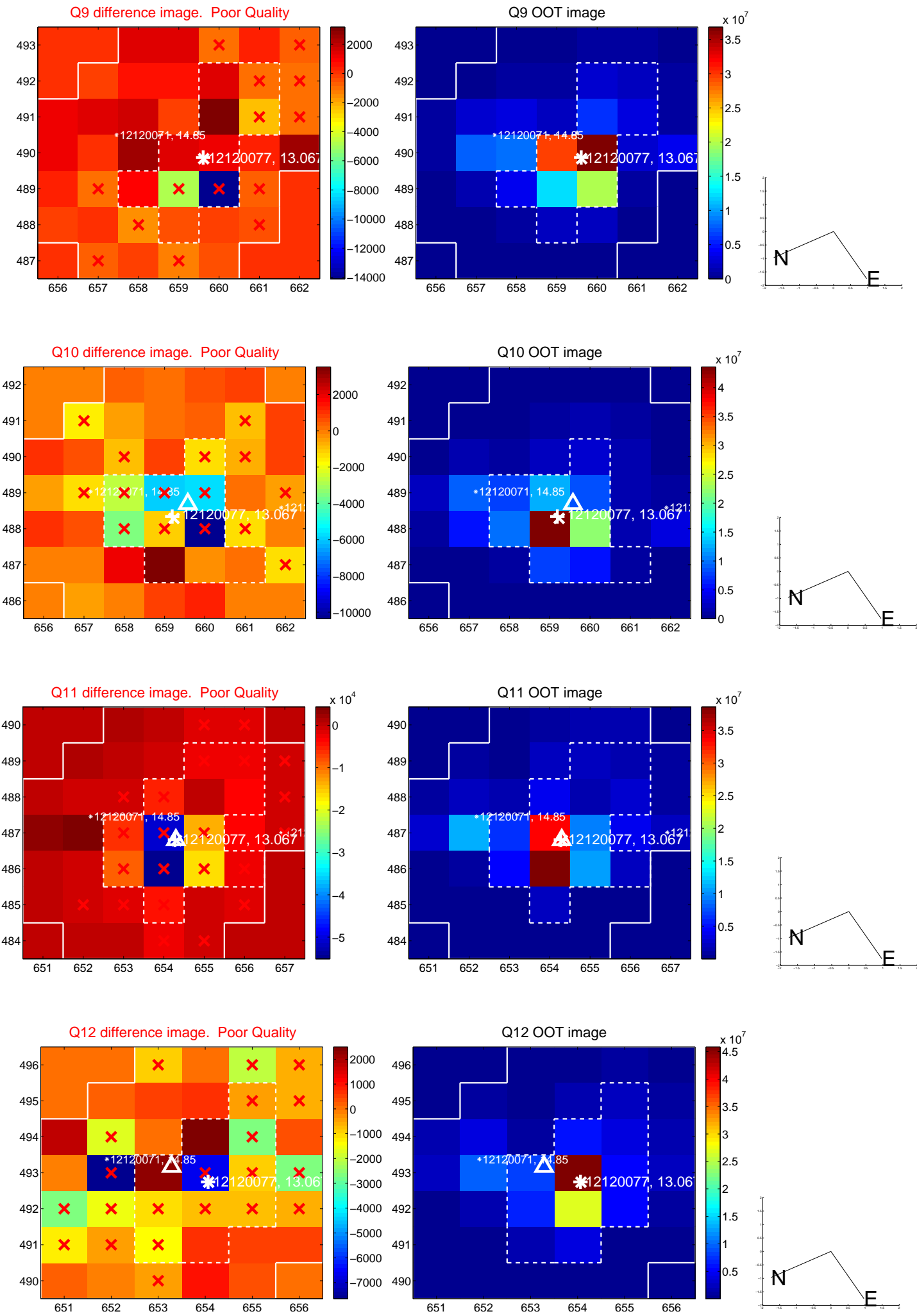




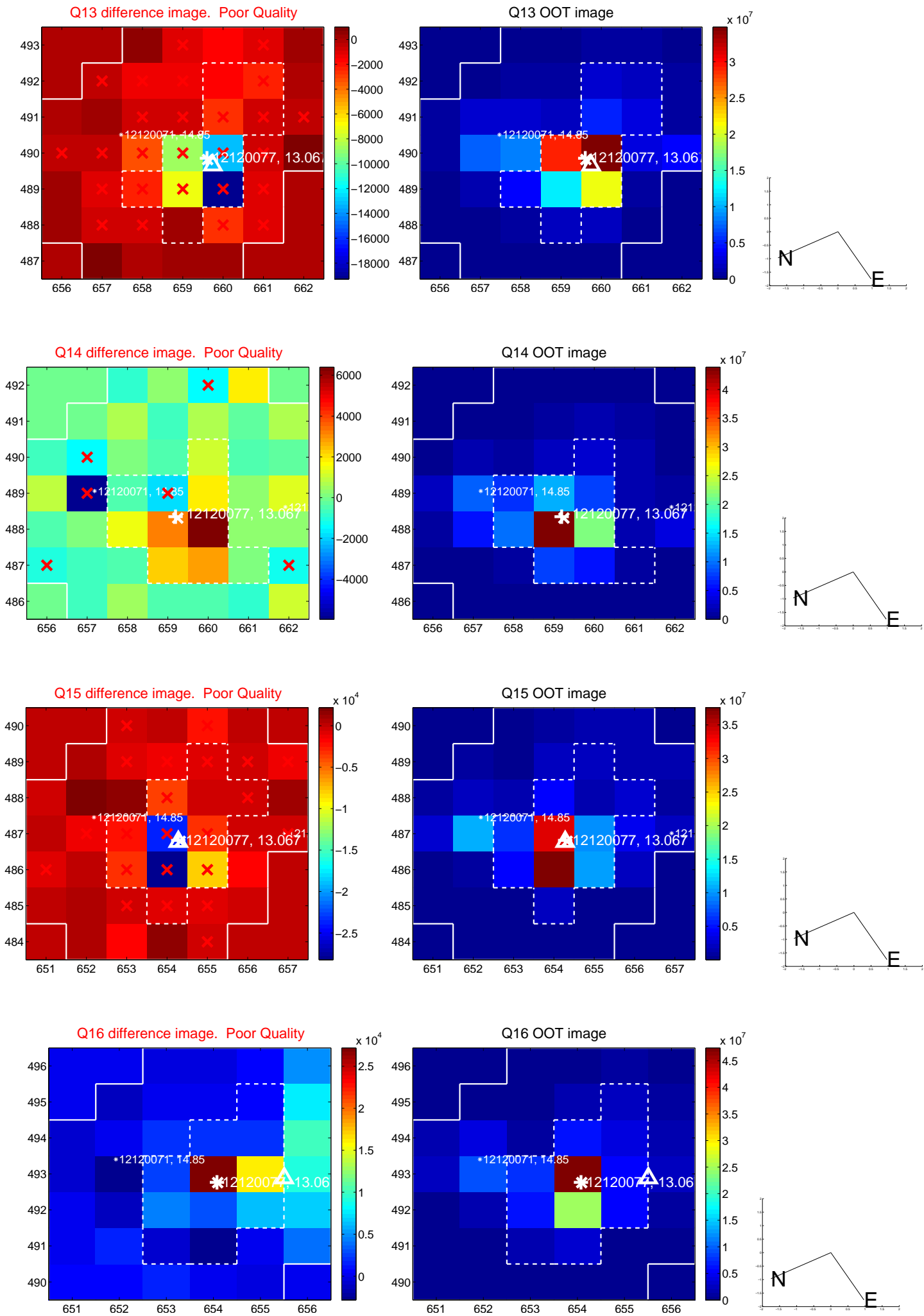
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



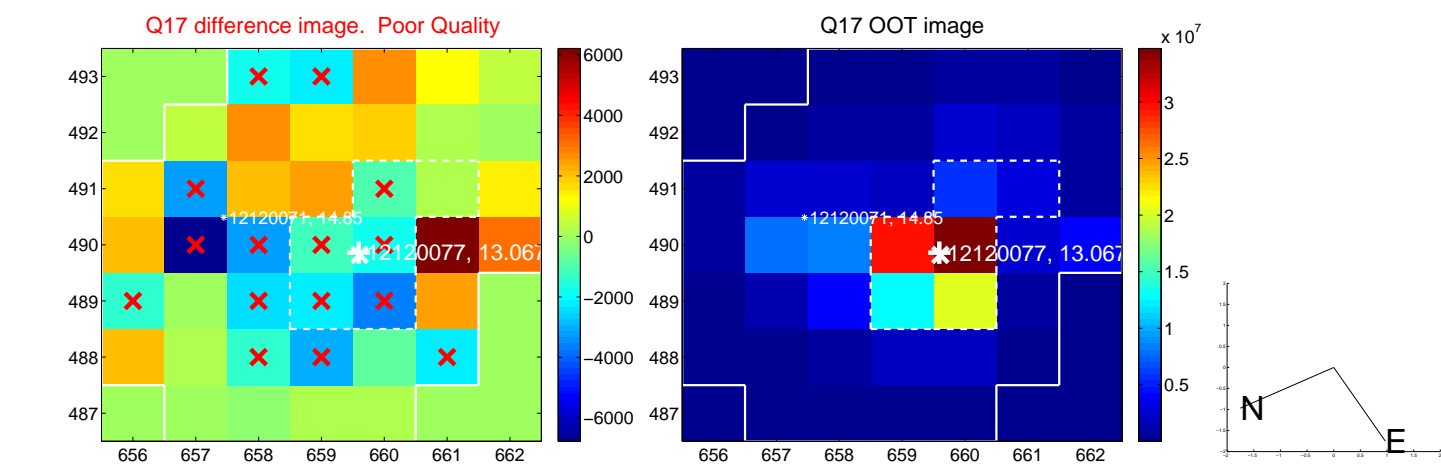
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



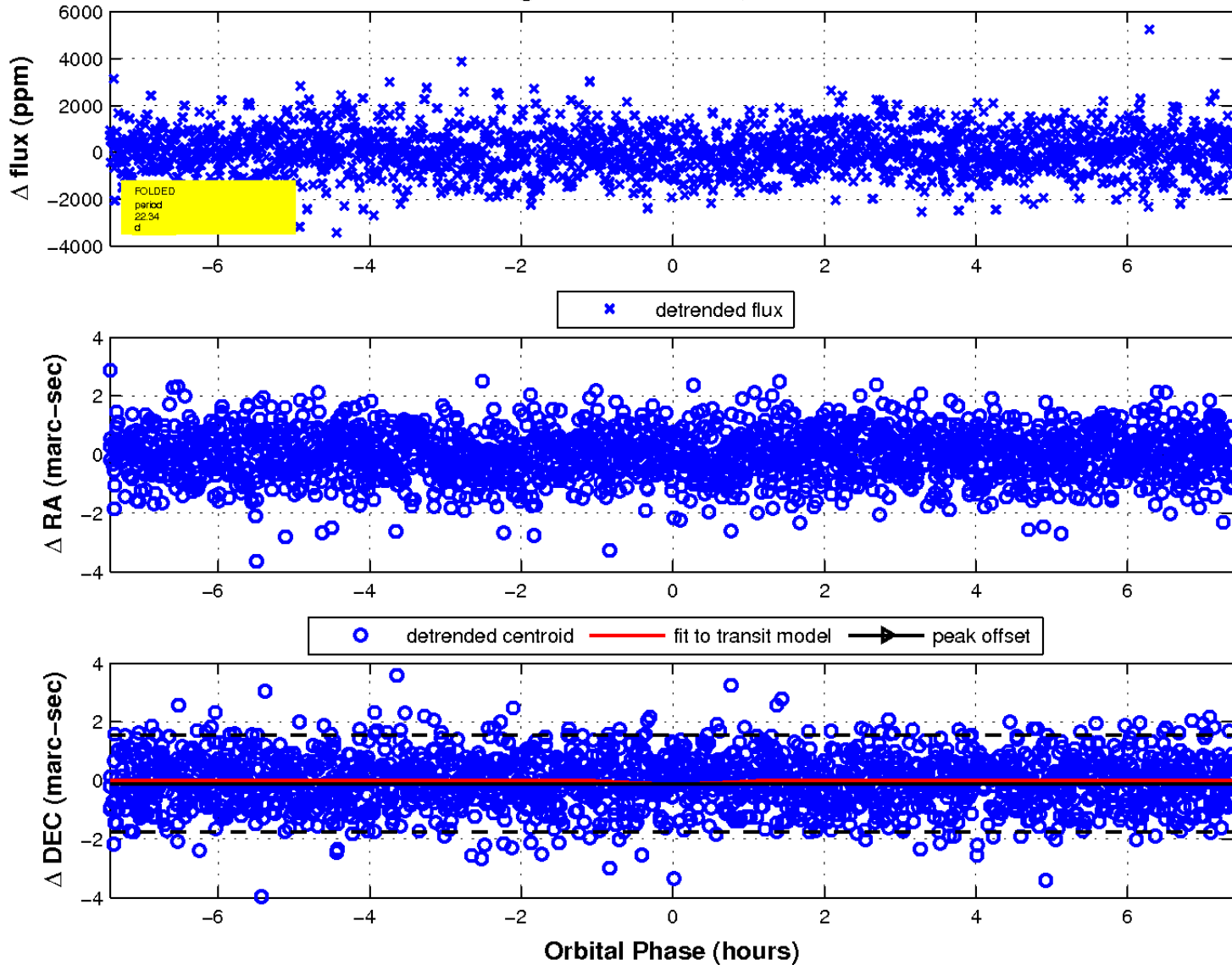
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



fluxWeightedCentroids, Planet 4 of 4



UKIRT Image

Declination

