

# KIC 010777060

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010777060-01	OBS	No	0.965110	132.321687	26.7	2.903	9.9	9.1	66.51	3973	43.81	0.00
010777060-02	OBS	No	0.965067	131.867456	16.9	4.199	8.9	6.8	66.51	3973	26.56	0.00

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010777060-01	OBS	FP	0.00	1	0	1	1	LPP_DV—CENT_SATURATED—HALO_GHOST—EPHEM_MATCH
010777060-02	OBS	FP	0.00	1	0	1	1	LPP_DV—SAME_NTL_PERIOD—CENT_SATURATED—HALO_GHOST—EPHEM_MATCH

**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.

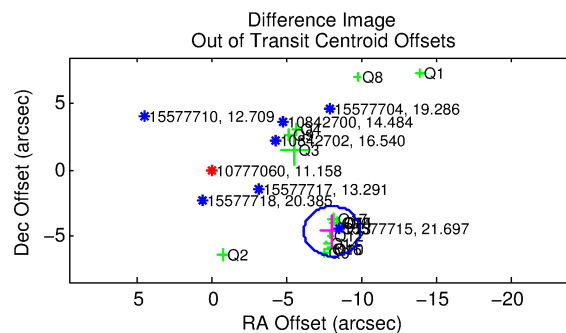
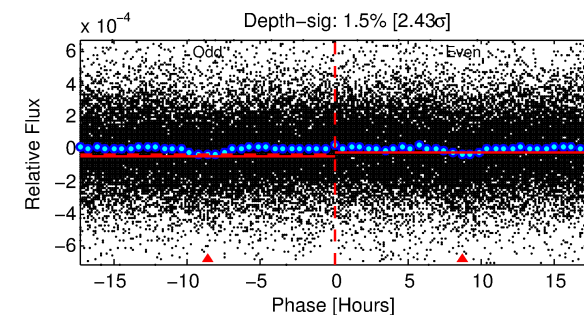
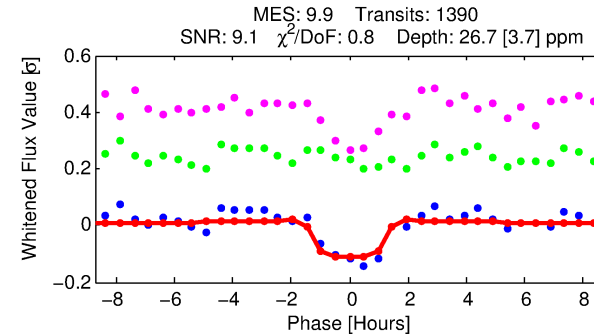
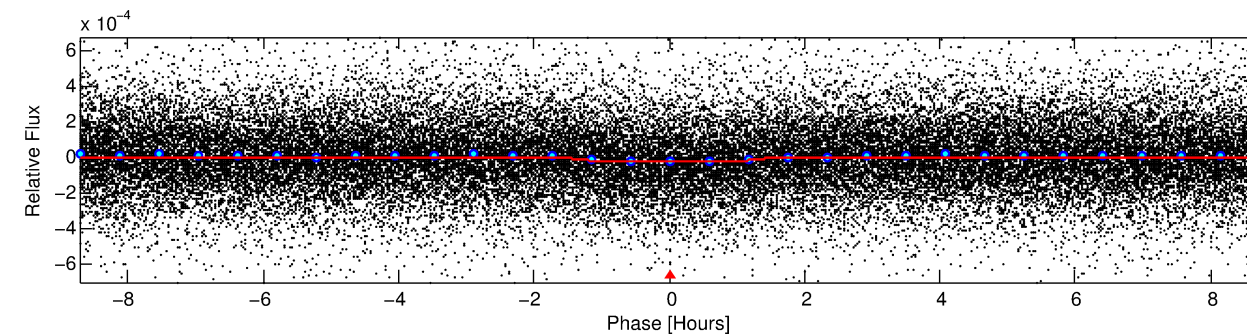
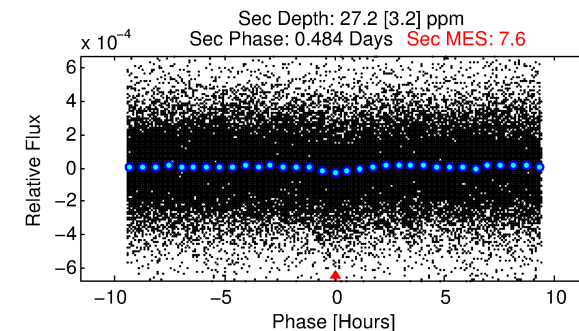
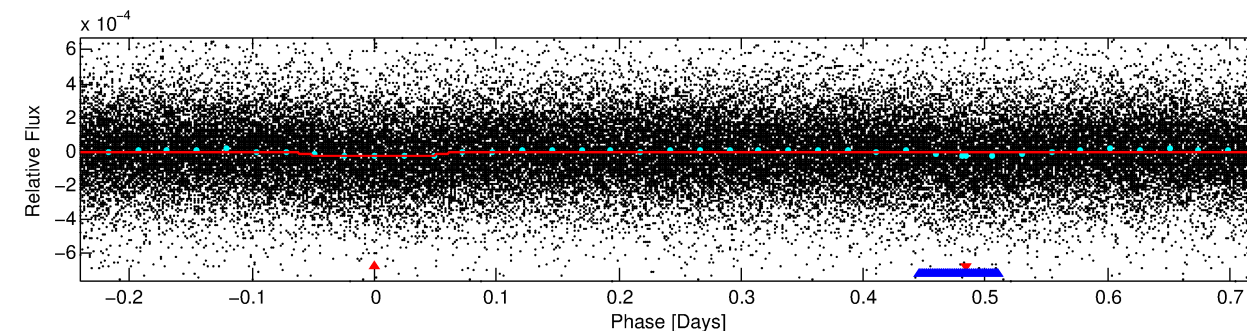
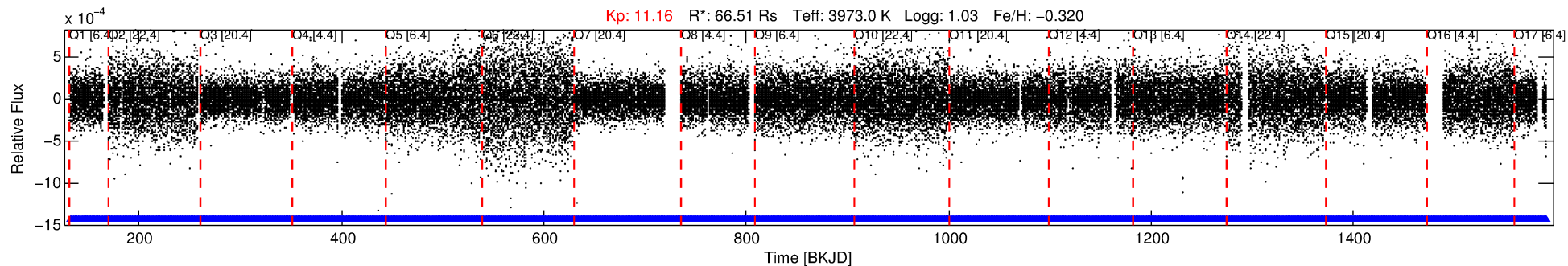
## Ephemeris Match Information For 010777060-01

TCE (1)	KIC	Parent (2)	Parent KIC	$P_1:P_2$	Dist ( $\mu$ )	$\Delta$ Row	$\Delta$ Col	$m_2$	$m_1$	$D_2/D_1$	Mechanism	Flag	$\sigma_P$	$\sigma_T$
010777060-01	10777060	010842687-02	10842687	1:1	51.5	11	5	13.19	11.15	0.70	Direct-PRF	1	0.83	0.42

**Notes:**  $P_1:P_2$  is the period ratio. Dist is the distance in arcseconds.  $\Delta$ Row and  $\Delta$ Col are the number of pixels apart in row and column.  $m_2$  and  $m_1$  are the magnitudes of the parent and child.  $D_2/D_1$  is the parent's transit depth divided by the child's.  $\sigma_P$  and  $\sigma_T$  are the significance of the match in period and epoch. For a match to be considered significant  $\sigma_P < 5.0$  and  $\sigma_T < 5.0$ . Matches which have  $\sigma_P$  and  $\sigma_T$  very close to this cutoff should receive extra scrutiny, especially if the period ratio is very large.

# DV One-Page Summary

KIC: 10777060 Candidate: 1 of 2 Period: 0.965 d



## DV Fit Results:

Period = 0.96511 [0.00001] d  
Epoch = 132.3217 [0.0035] BKJD  
Rp/R\* = 0.0060 [0.0037]  
a/R\* = 1.45 [1.59]  
b = 0.91 [0.42]  
Seff = N/A  
Teq = N/A  
**Rp = 43.81 [28.16] Re**  
a = N/A  
Ag = N/A  
Teffp = N/A

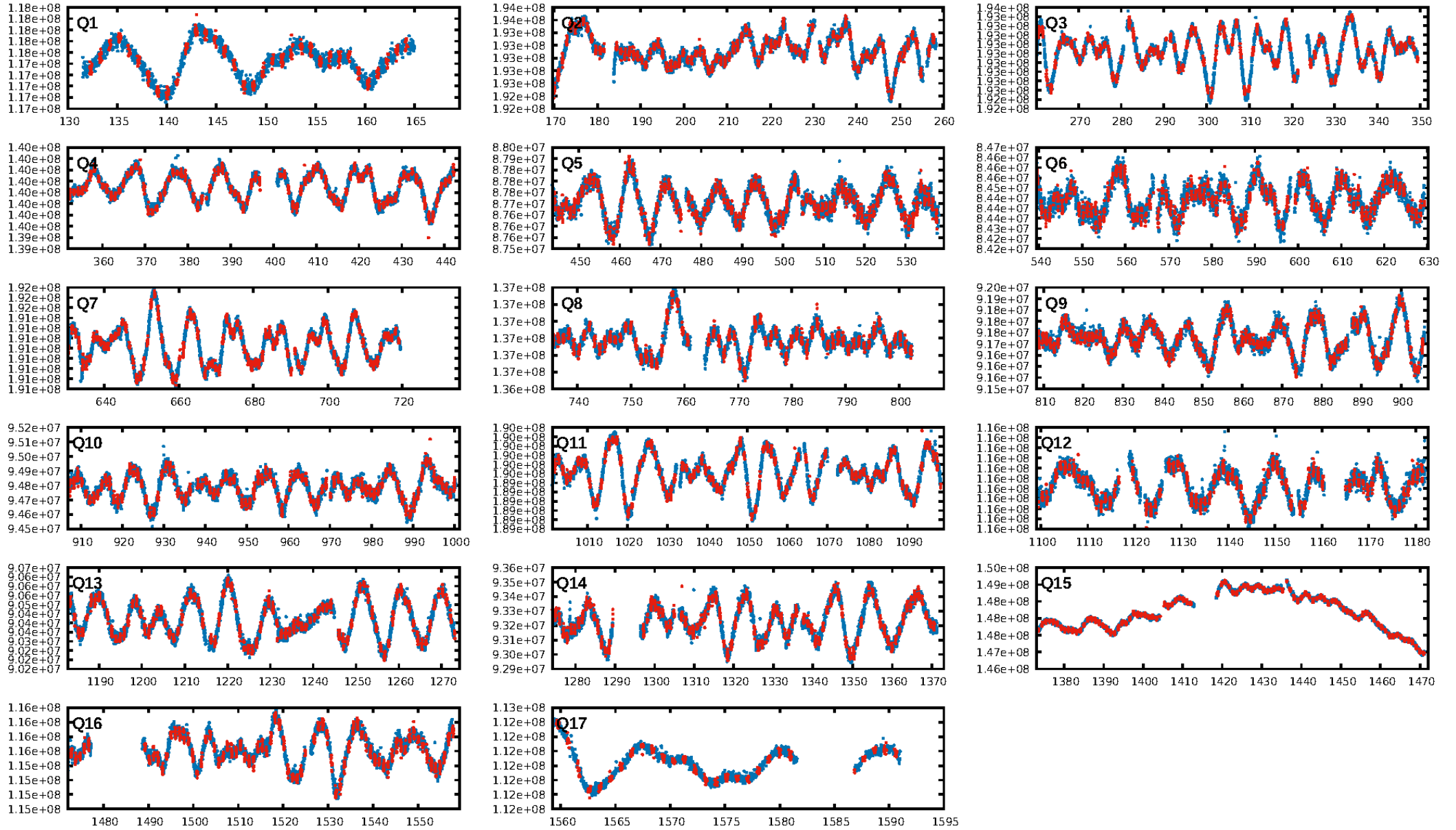
## DV Diagnostic Results:

**ShortPeriod-sig: 0.0% [0.00σ]**  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 6.43e-32  
RollingBand-fgt: 1.00 [1329/1329]  
**GhostDiagnostic-chr: 0.1943**  
**Centroid-sig: 0.0%**  
Centroid-so: 1.341 arcsec [1.19σ]  
**OotOffset-rm: 9.315 arcsec [14.81σ]**  
**KicOffset-rm: 3.890 arcsec [6.39σ]**  
OotOffset-st: 4/4/4/4 [16]  
KicOffset-st: 4/4/4/4 [16]  
DiffImageQuality-fgm: 0.56 [9/16]  
DiffImageOverlap-fno: 1.00 [17/17]




Software Revision: svn-ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 15:00:44 Z

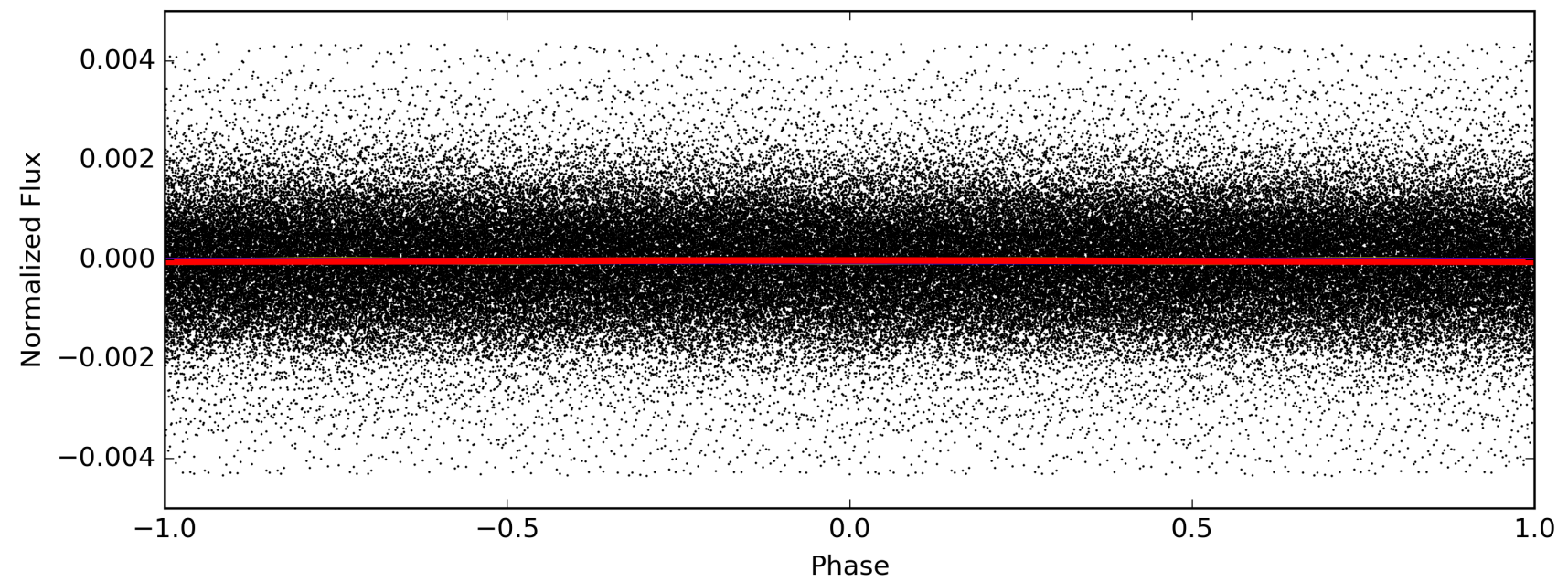
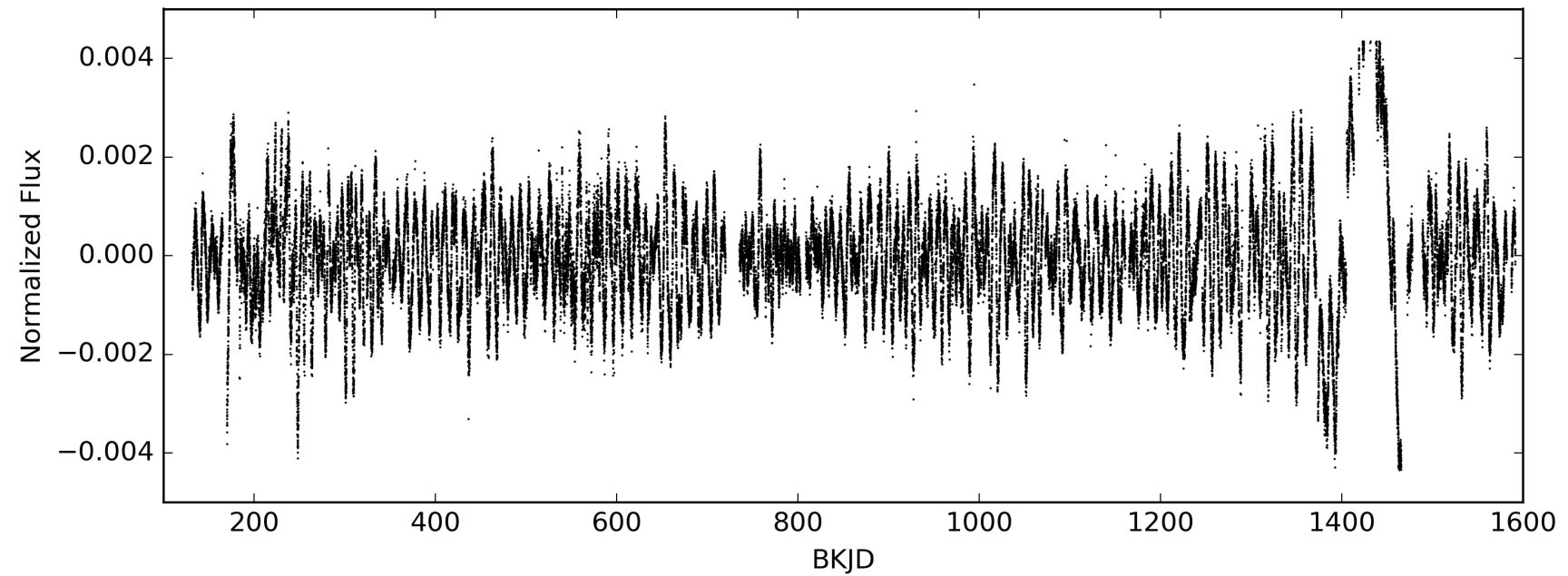
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 010777060-01, PDC Light Curves



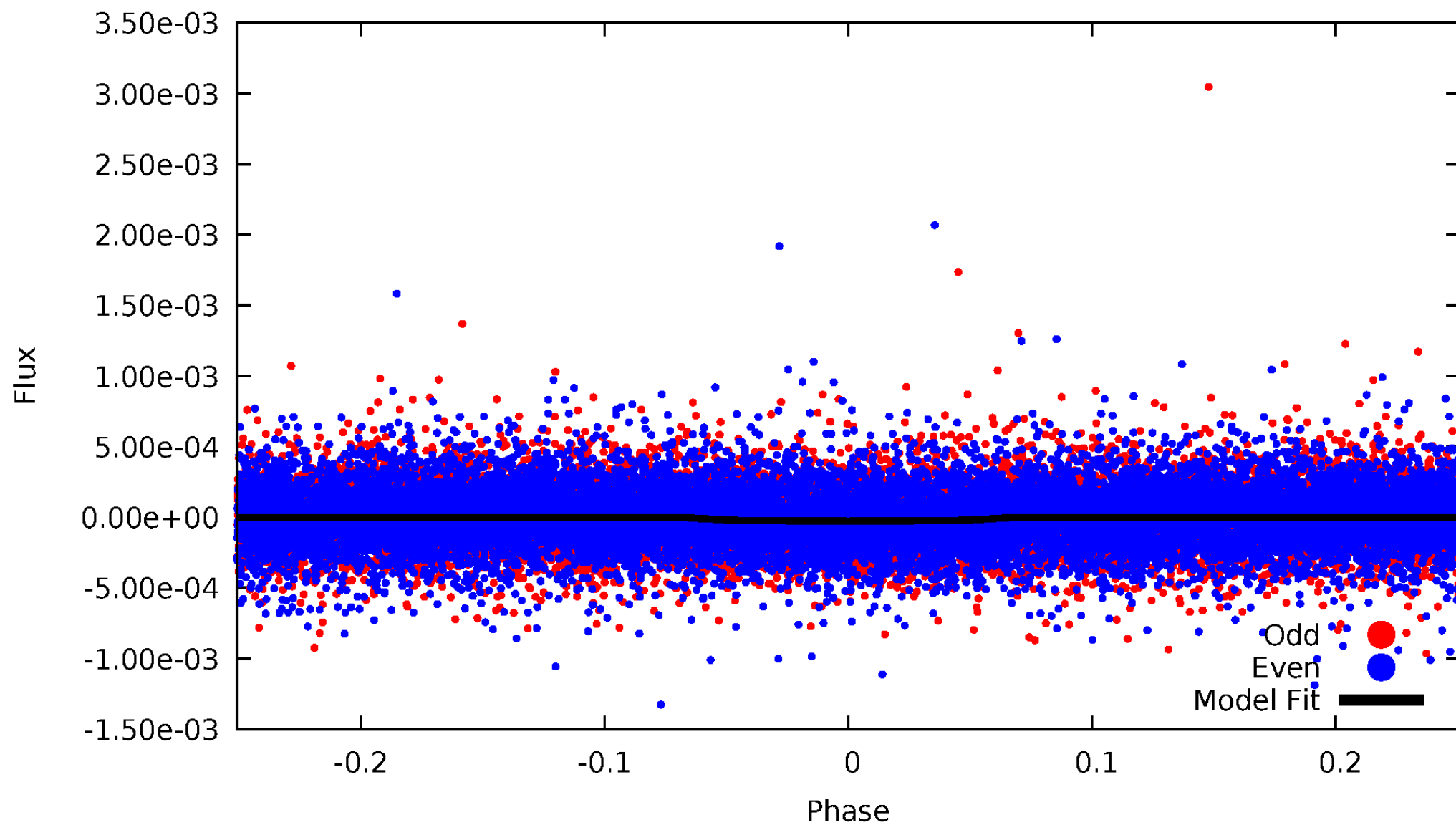
TCE 010777060-01

 P = 0.483 days     P = 0.965 days     P = 1.930 days



# DV Odd/Even

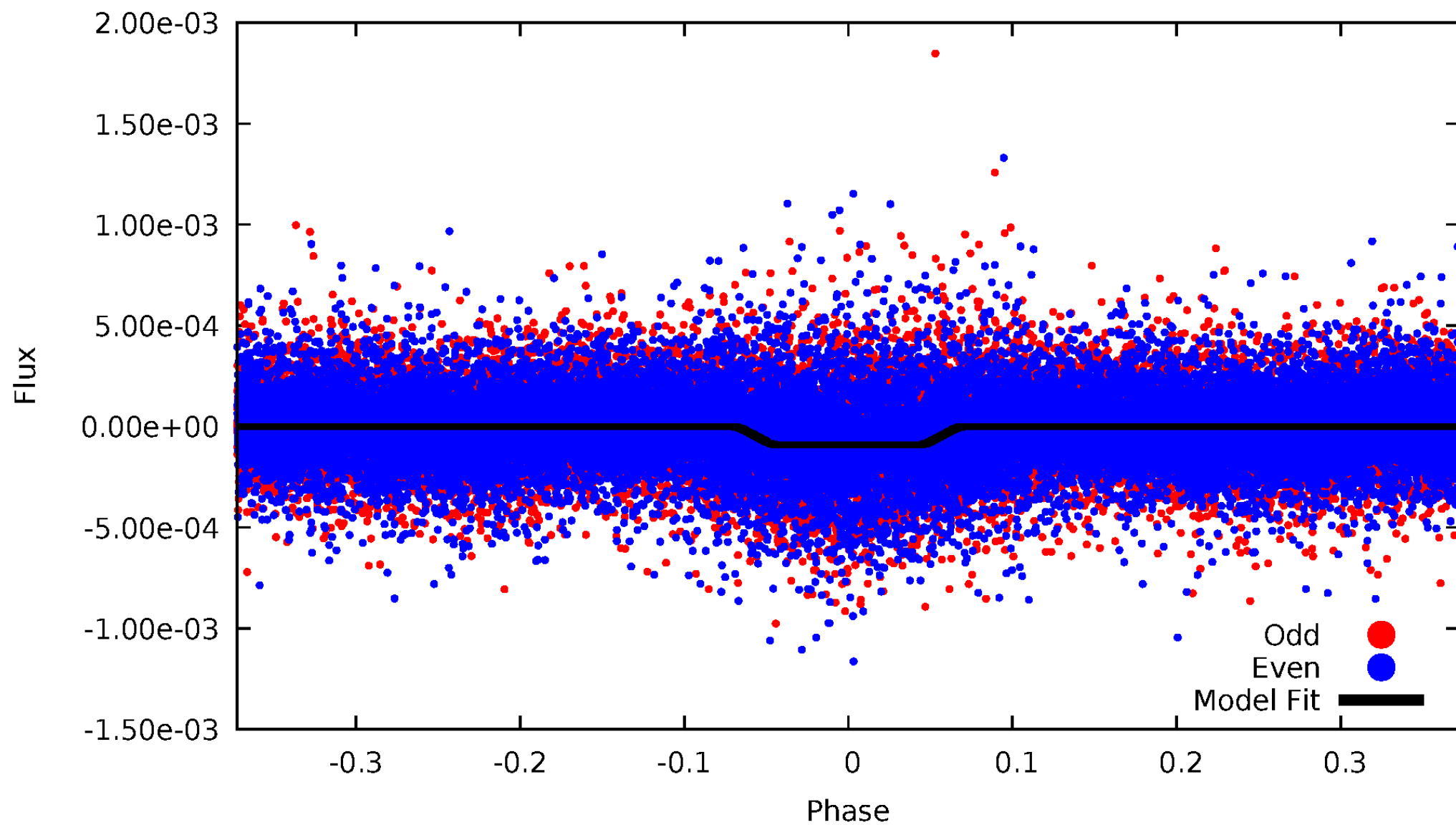
TCE 010777060-01



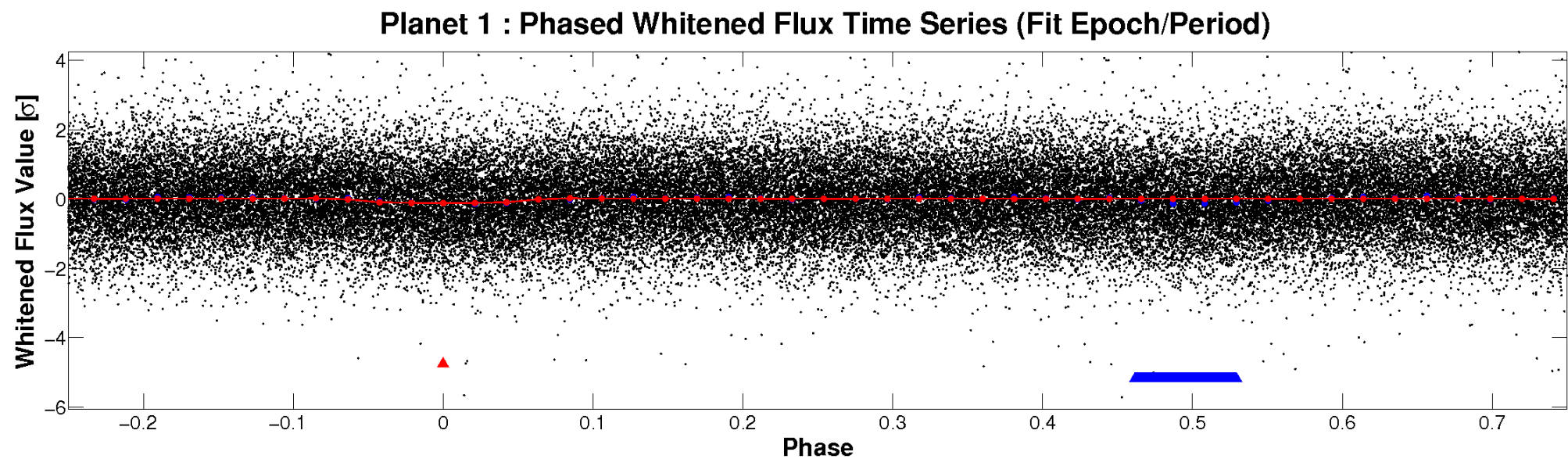
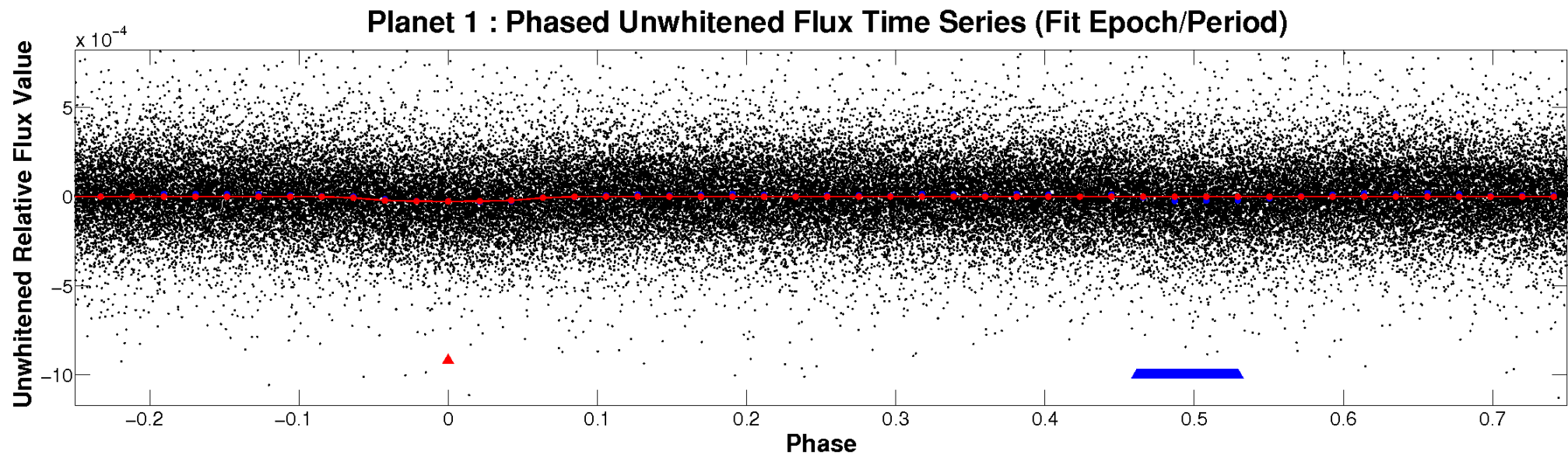


# ALT Odd/Even

TCE 010777060-01

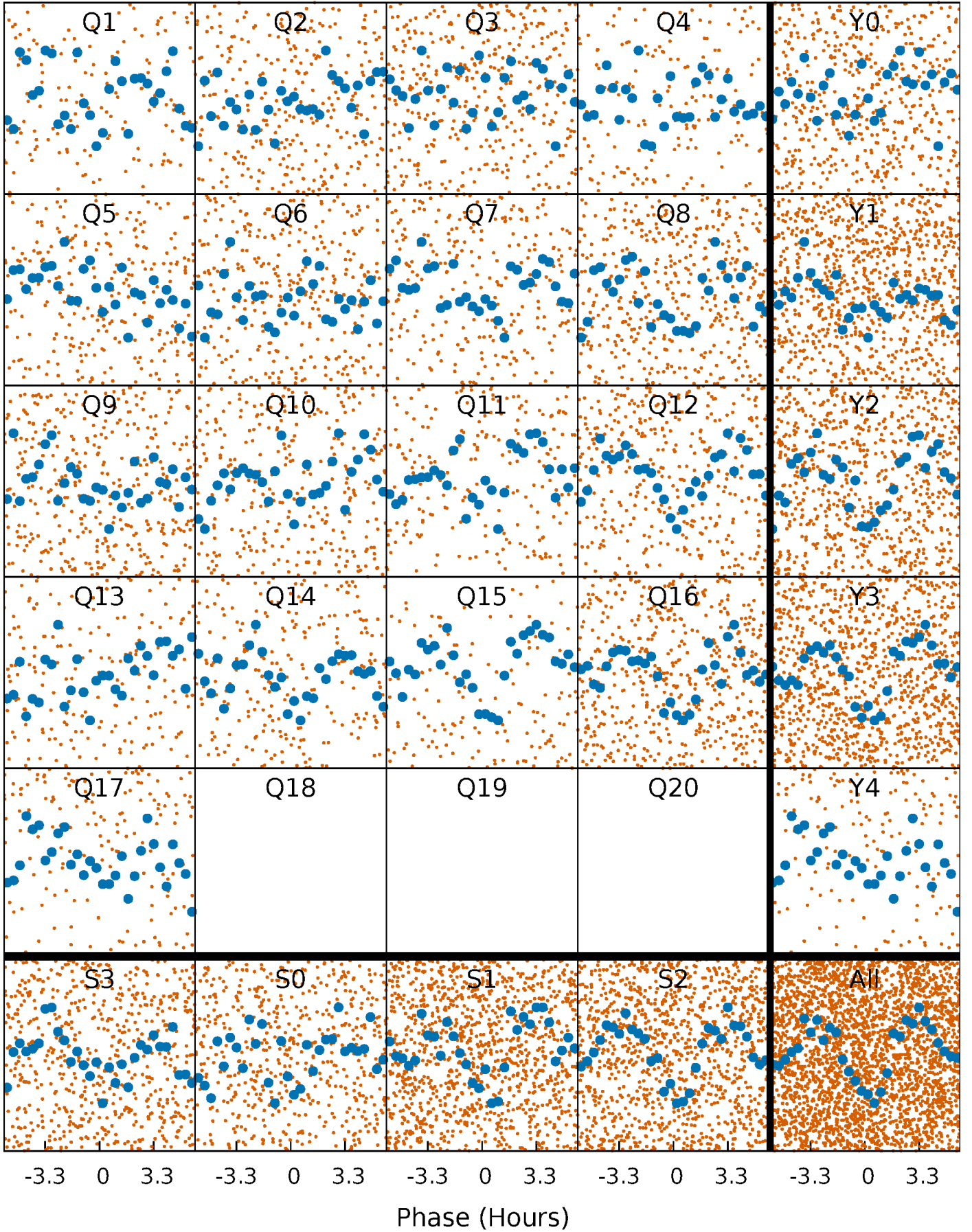


# Non-Whitened Vs. Whitened Light Curve



# PDC Quarter-Phased Transit Curves

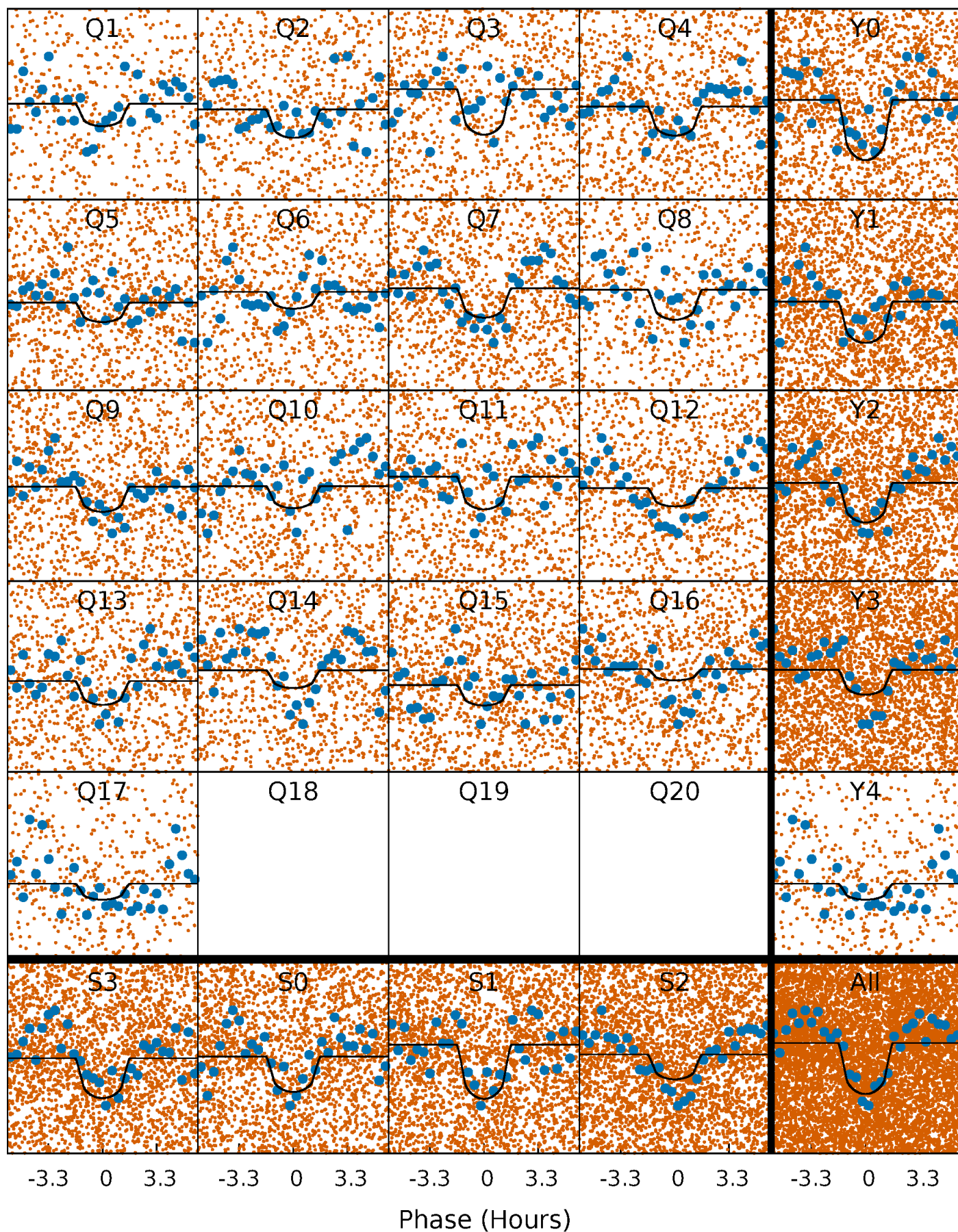
TCE 010777060-01   P= 0.965110 Days    $T_0=132.321687$  (BKJD)





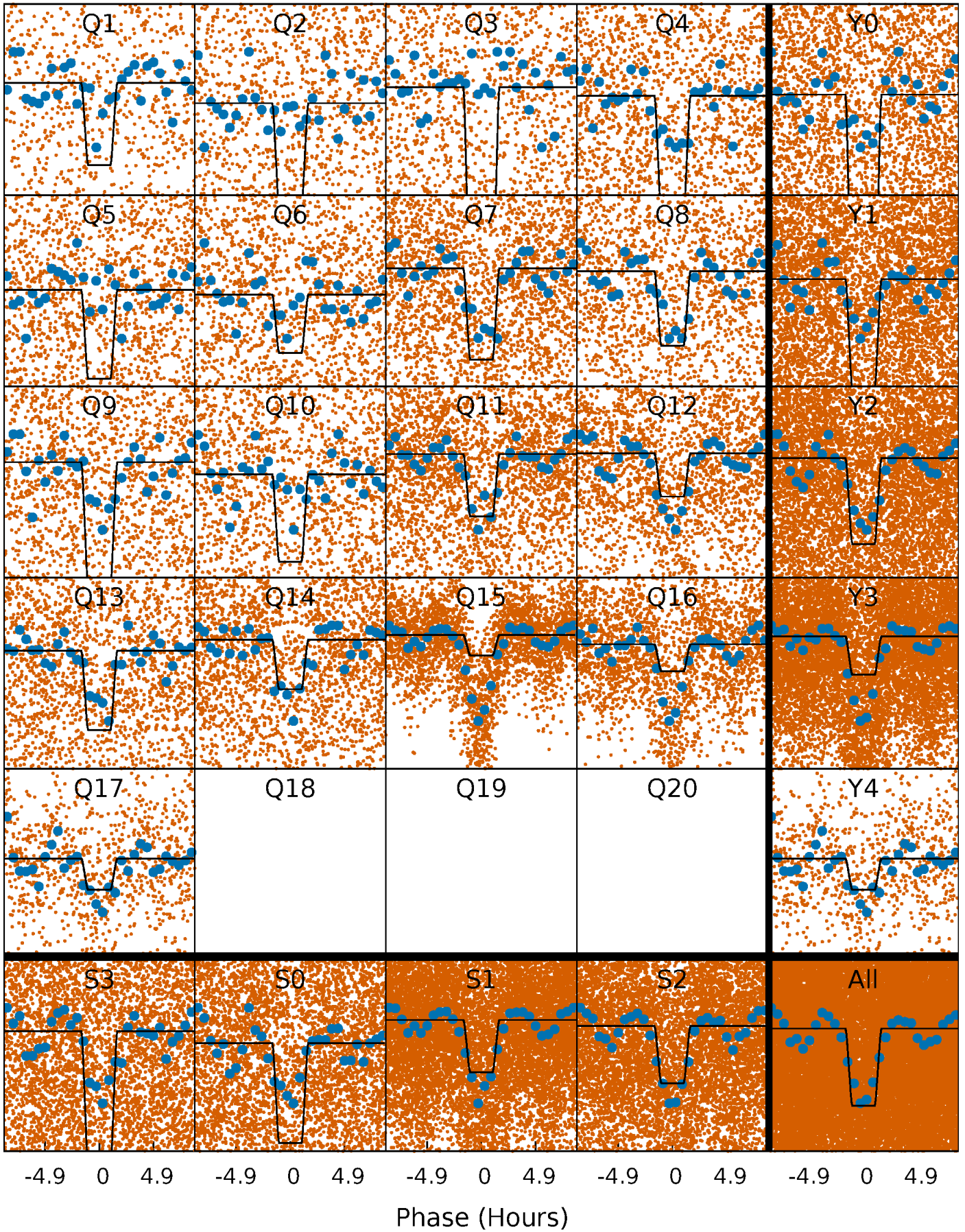
# DV Quarter-Phased Transit Curves

TCE 010777060-01 P= 0.965110 Days  $T_0=132.321687$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 010777060-01 P= 0.965138 Days  $T_0=132.300033$  (BKJD)

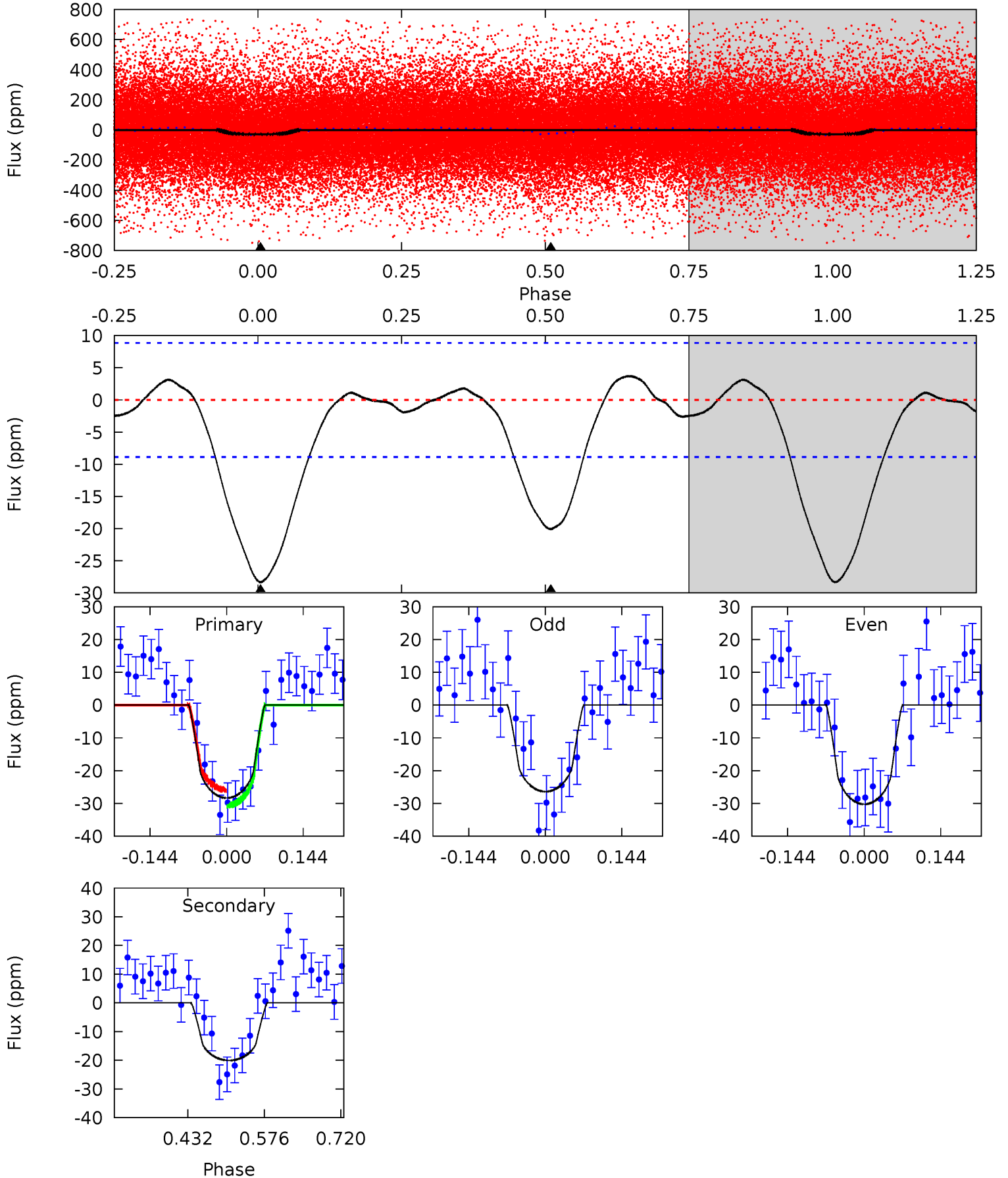




# DV Model-Shift Uniqueness Test

010777060-01, P = 0.965110 Days, E = 131.356577 Days

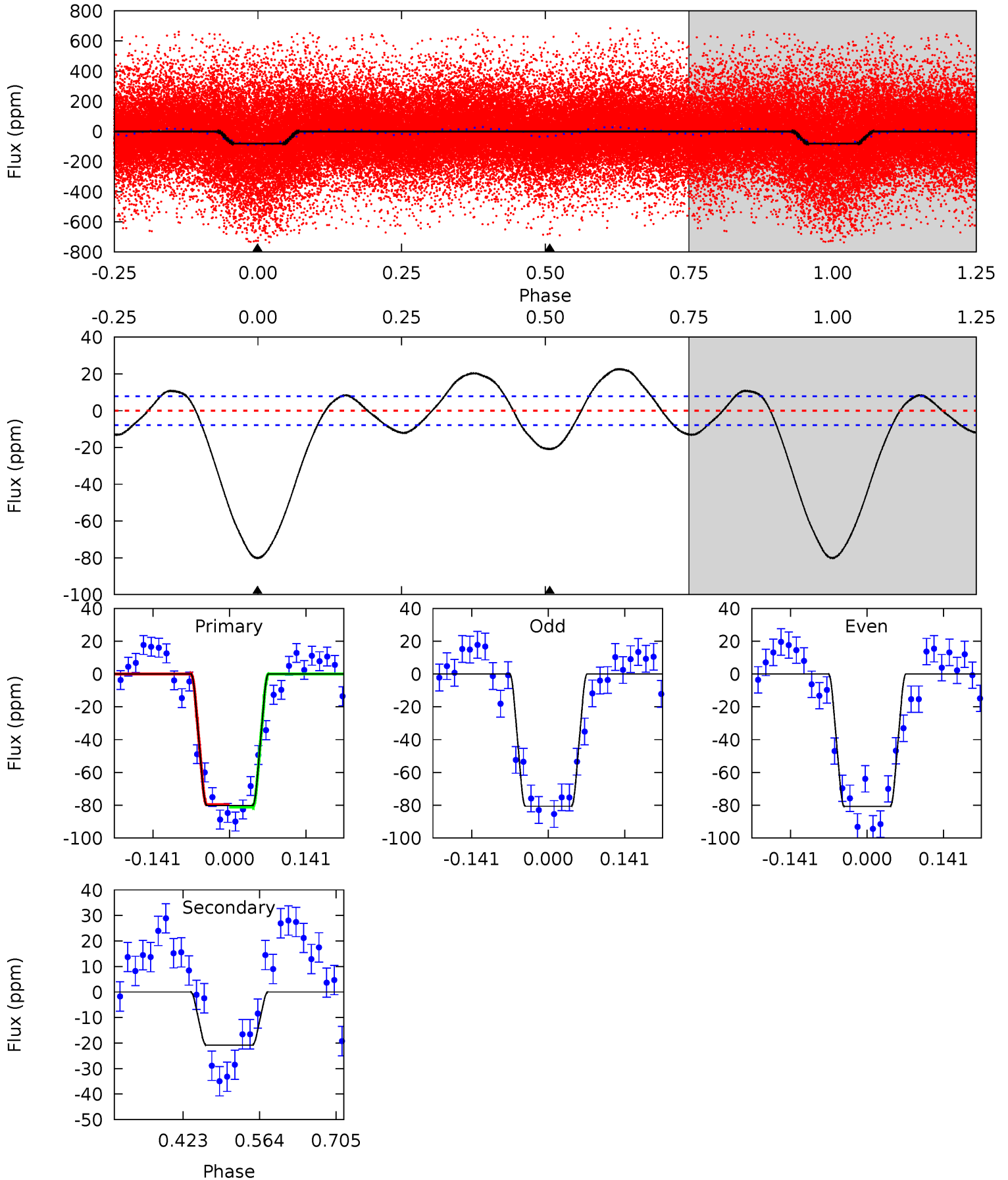
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
14.3	10.2	0	0	4.49	1.46	0.83	14.3	14.3	10.2	10.2	0.98	1.00	0.12	1.21



# Alt Model-Shift Uniqueness Test

010777060-01, P = 0.965138 Days, E = 131.334895 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
45.7	11.9	0	0	4.49	1.47	5.51	45.7	45.7	11.9	11.9	0.05	1.11	0.22	0.46





### Stellar Parameters For KIC 010777060

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$3973^{+89}_{-109}$	$1.032^{+0.030}_{-0.030}$	$-0.320^{+0.200}_{-0.250}$	$66.513^{+2.409}_{-13.653}$	$1.738^{+0.070}_{-0.628}$	$0.000^{+0.000}_{-0.000}$
	+2%/-3%	+3%/-3%	+62%/-78%	+4%/-21%	+4%/-36%	+29%/-8%
Source	PHO54	AST54	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 010777060-01 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-20 \pm 2$	$45.21^{+25.97}_{-22.62}$	$13206^{+347}_{-418}$	$-11060^{+815}_{-684}$	$0.003^{+0.009}_{-0.002}$
Alt.	$-21 \pm 2$	$67.63^{+27.32}_{-26.58}$	$13204^{+306}_{-382}$	$-11140^{+683}_{-569}$	$0.001^{+0.002}_{-0.001}$

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

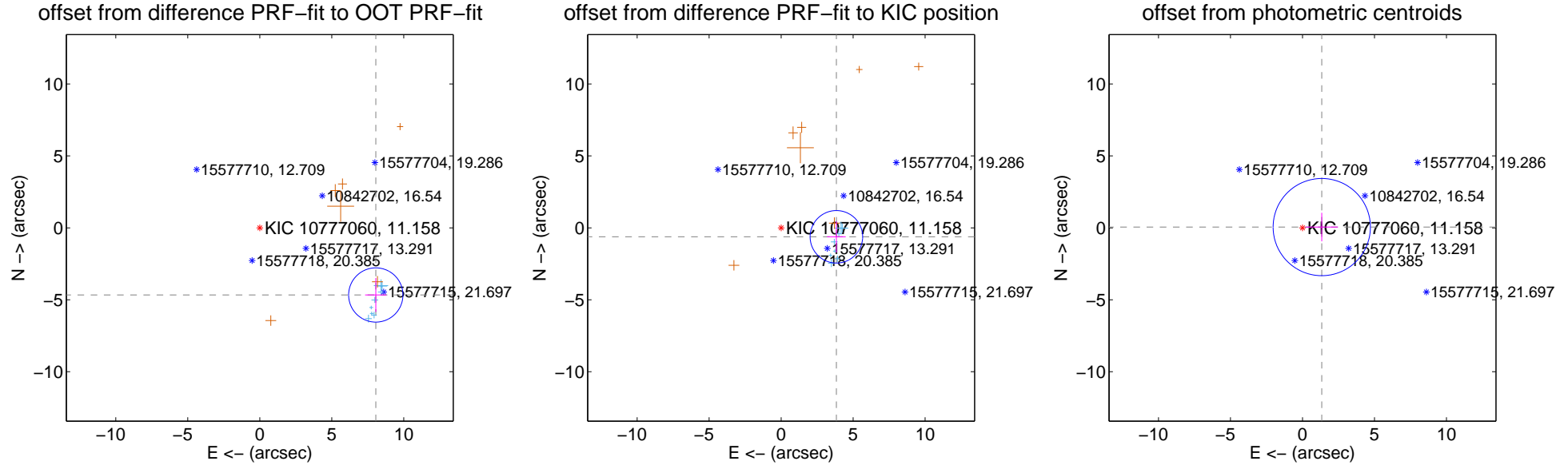
## DV Centroid Data

Supplemental centroid analysis for 010777060-01. **Kepler magnitude: 11.16.** Transit SNR 9.05

There are 9 quarters with good PRF difference image offsets

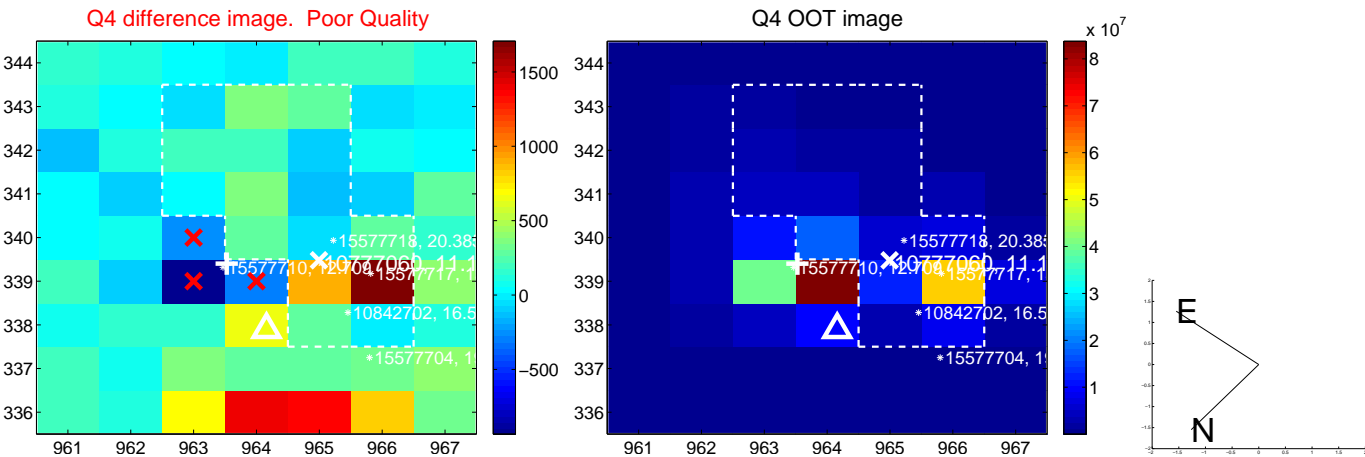
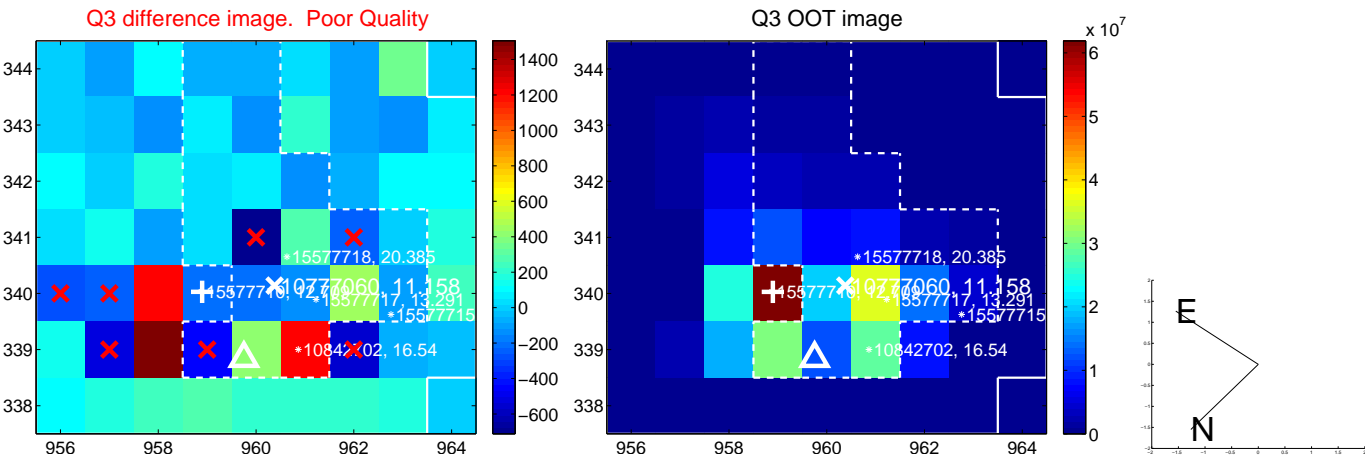
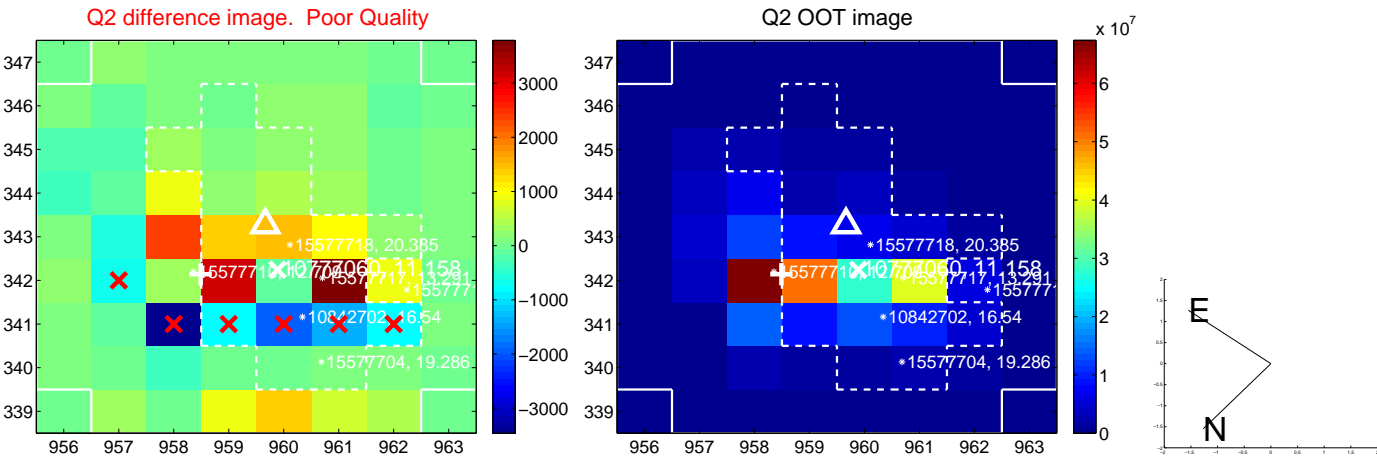
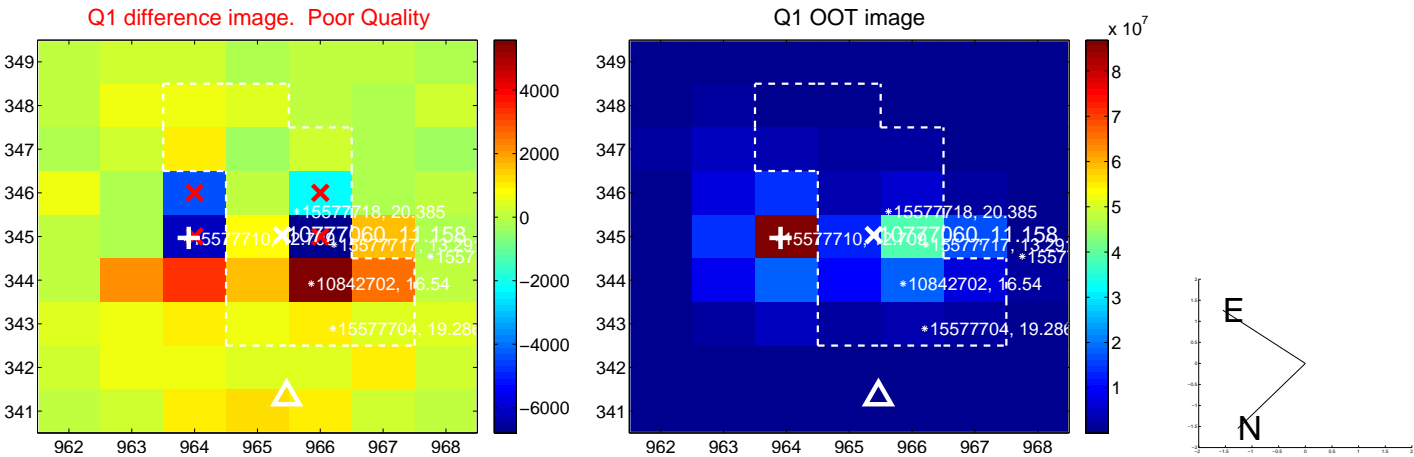
The OOT PRF centroid is offset from the target star catalog position by about 6.05 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	<b><math>9.315 \pm 0.629</math></b>	<b>14.81</b>	$-8.060 \pm 0.740$	$-4.668 \pm 1.179$
PRF-fit source offset from KIC position	<b><math>3.890 \pm 0.608</math></b>	<b>6.39</b>	$-3.840 \pm 0.647$	$-0.623 \pm 1.085$
photometric centroid source offset	$1.34 \pm 1.13$	1.19	$-1.34 \pm 1.13$	$0.05 \pm 0.99$

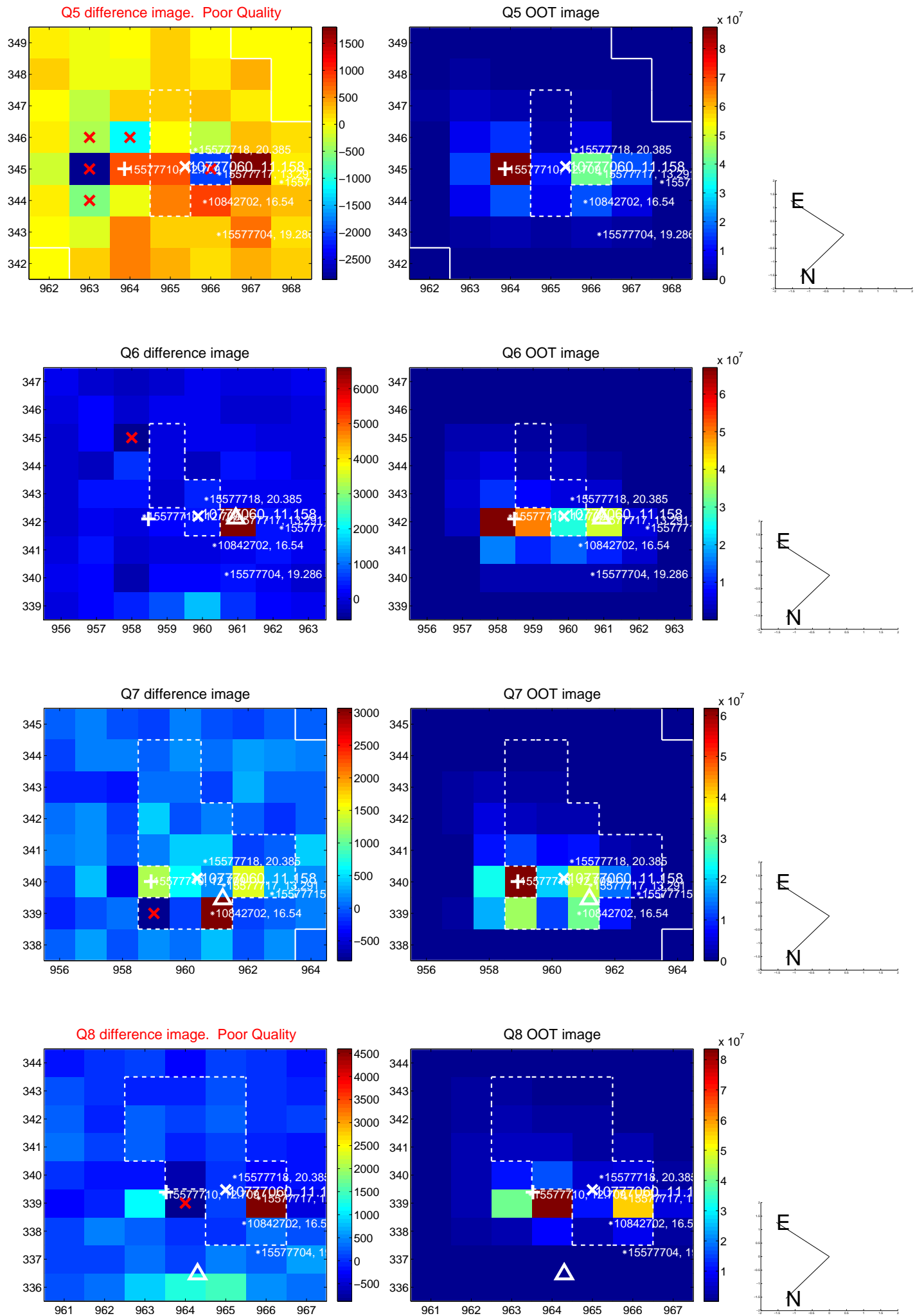


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

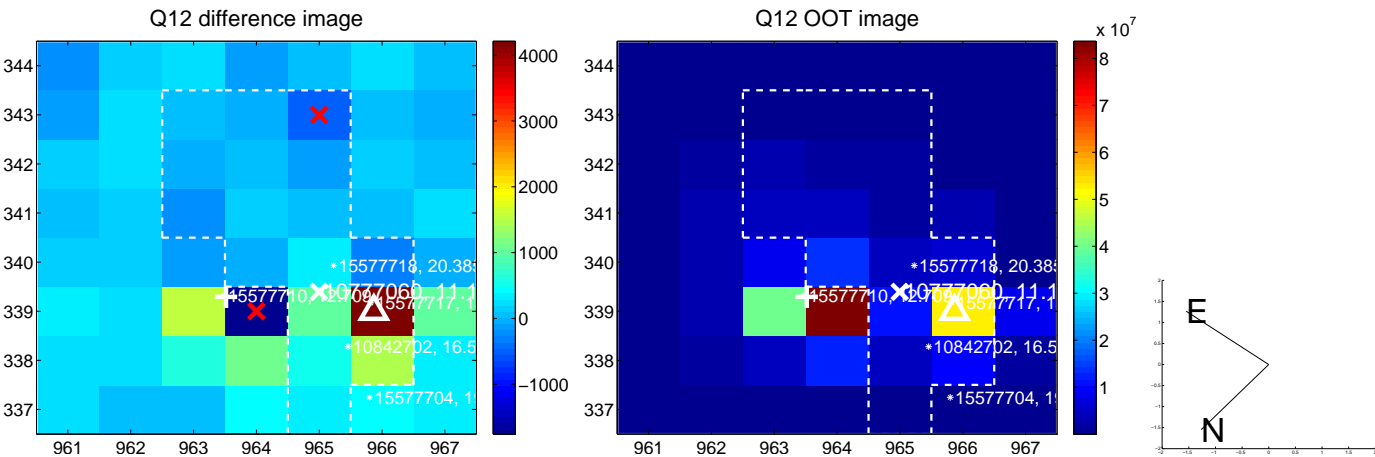
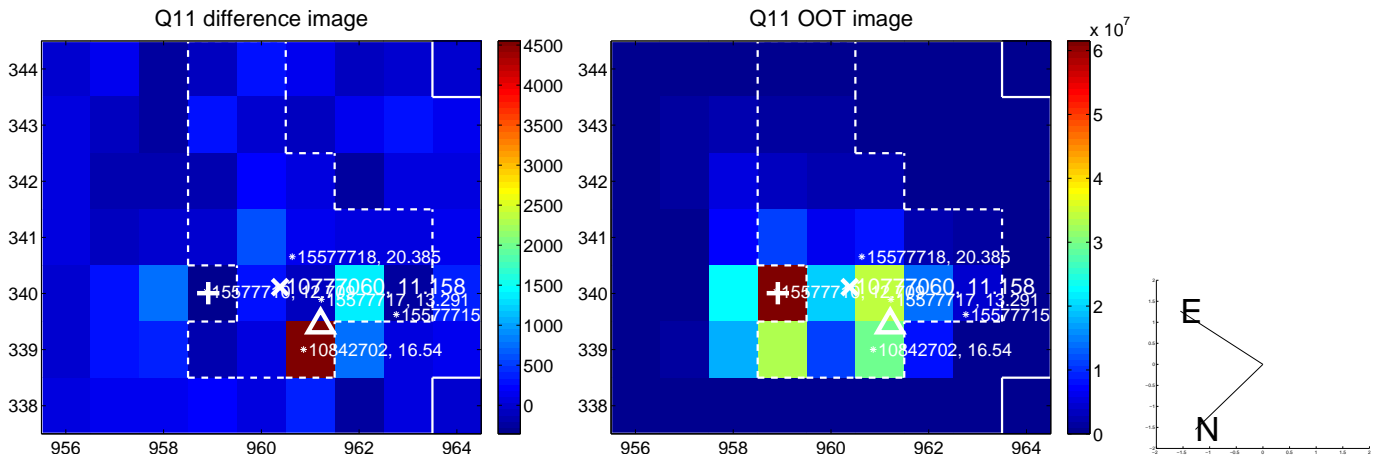
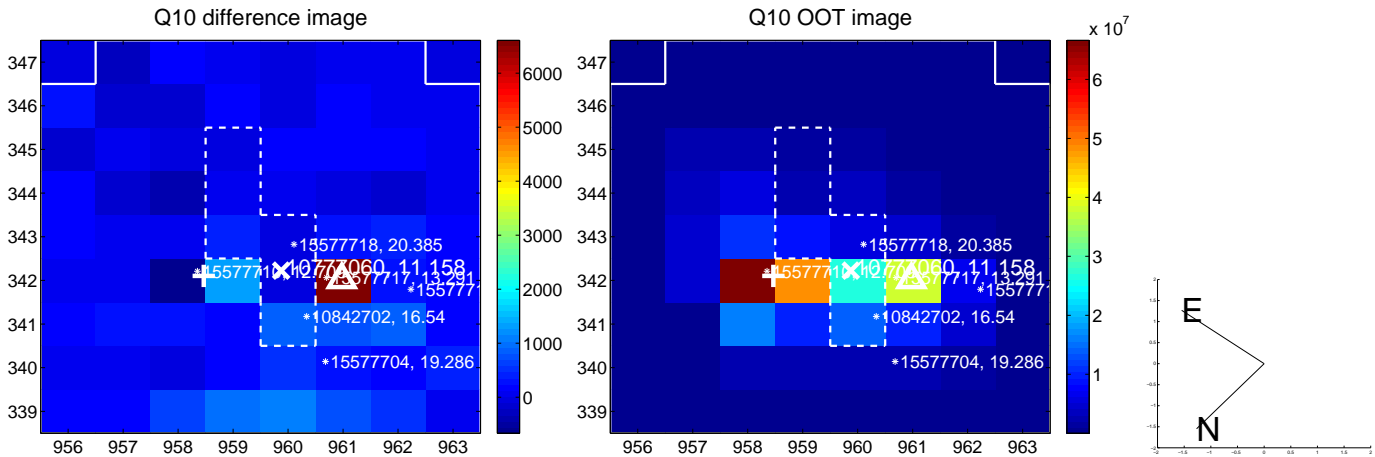
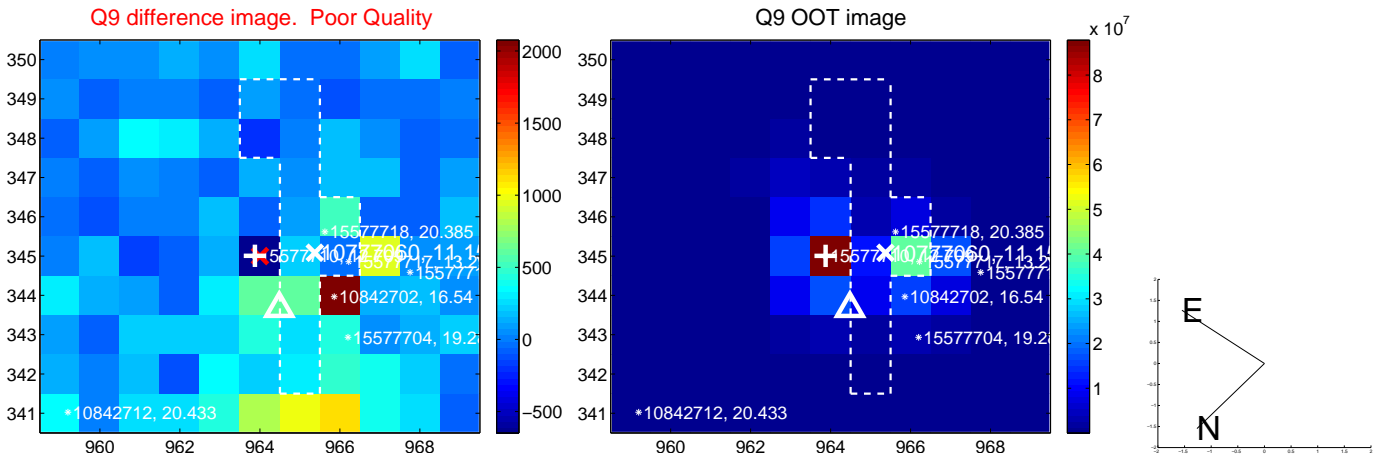


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

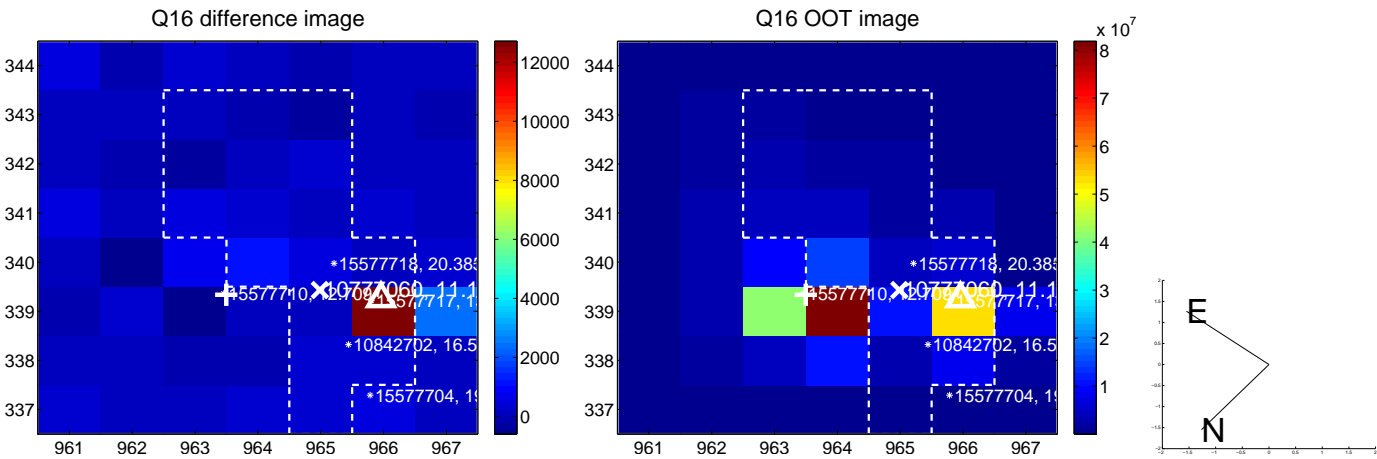
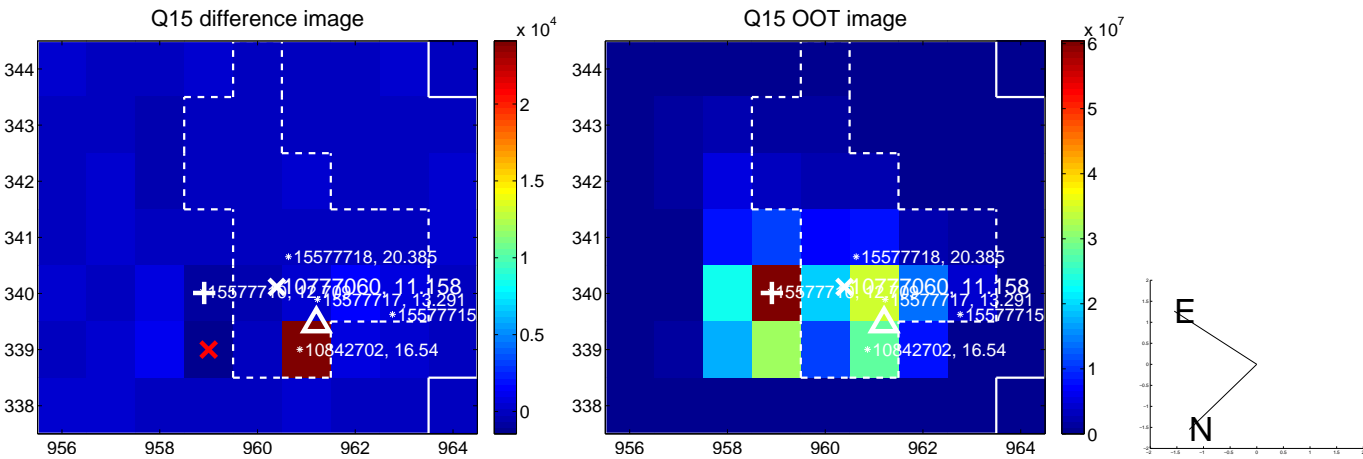
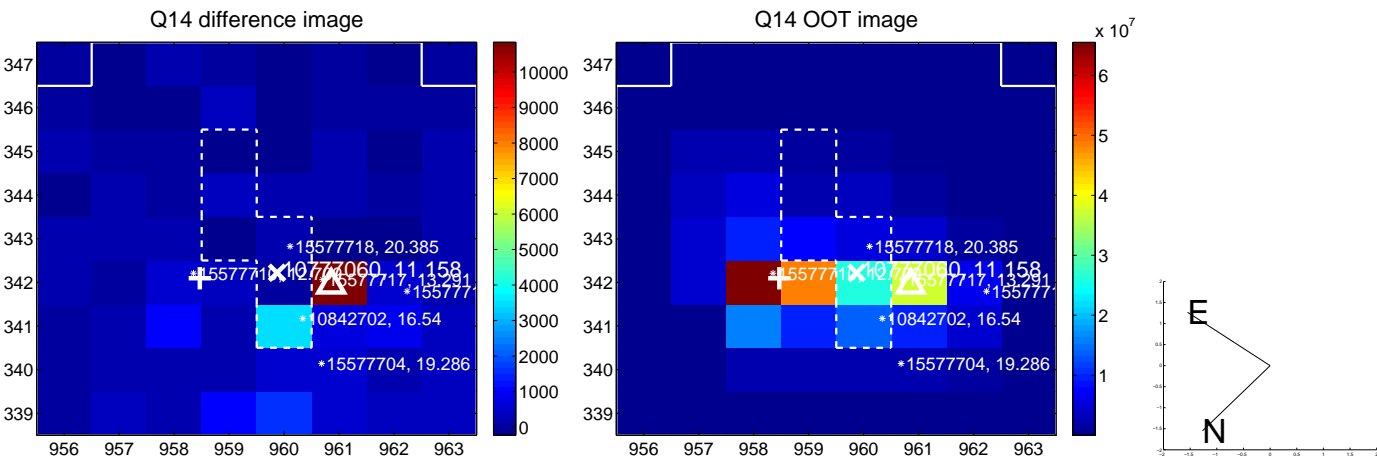
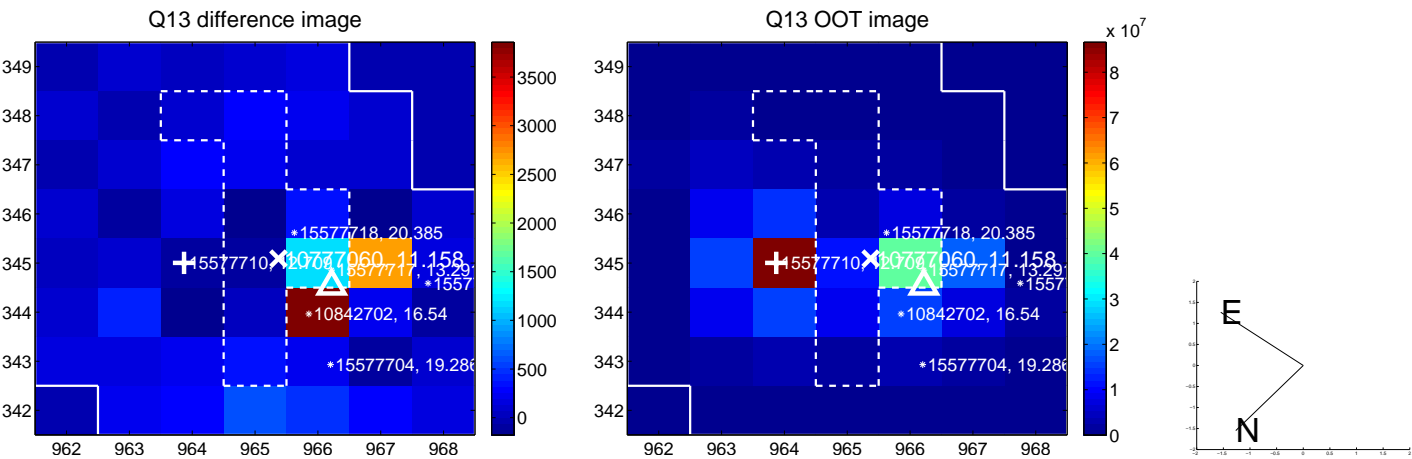




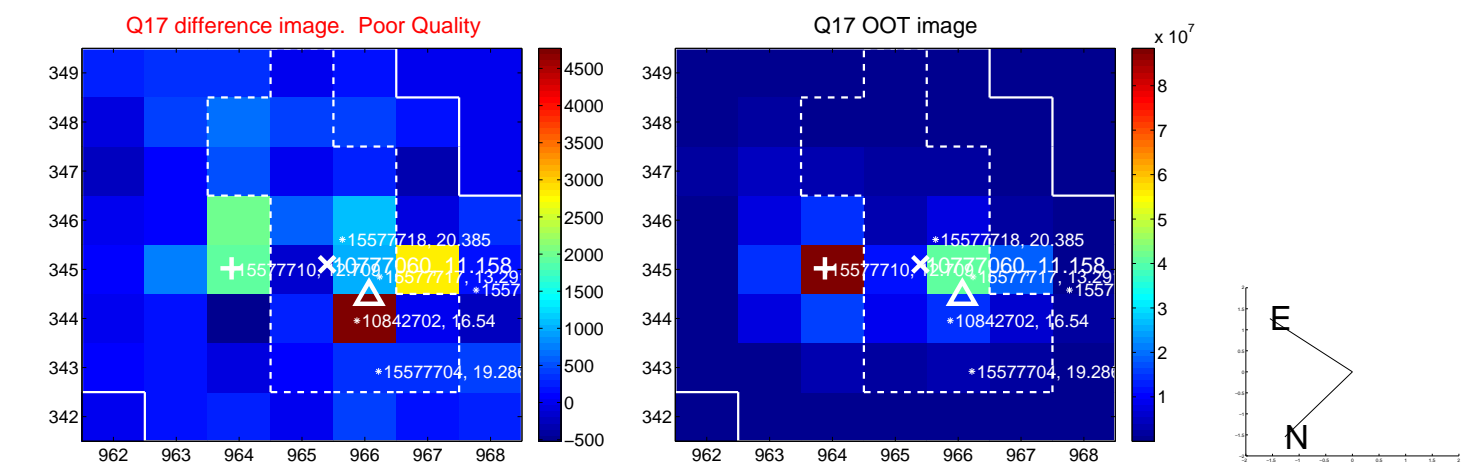
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



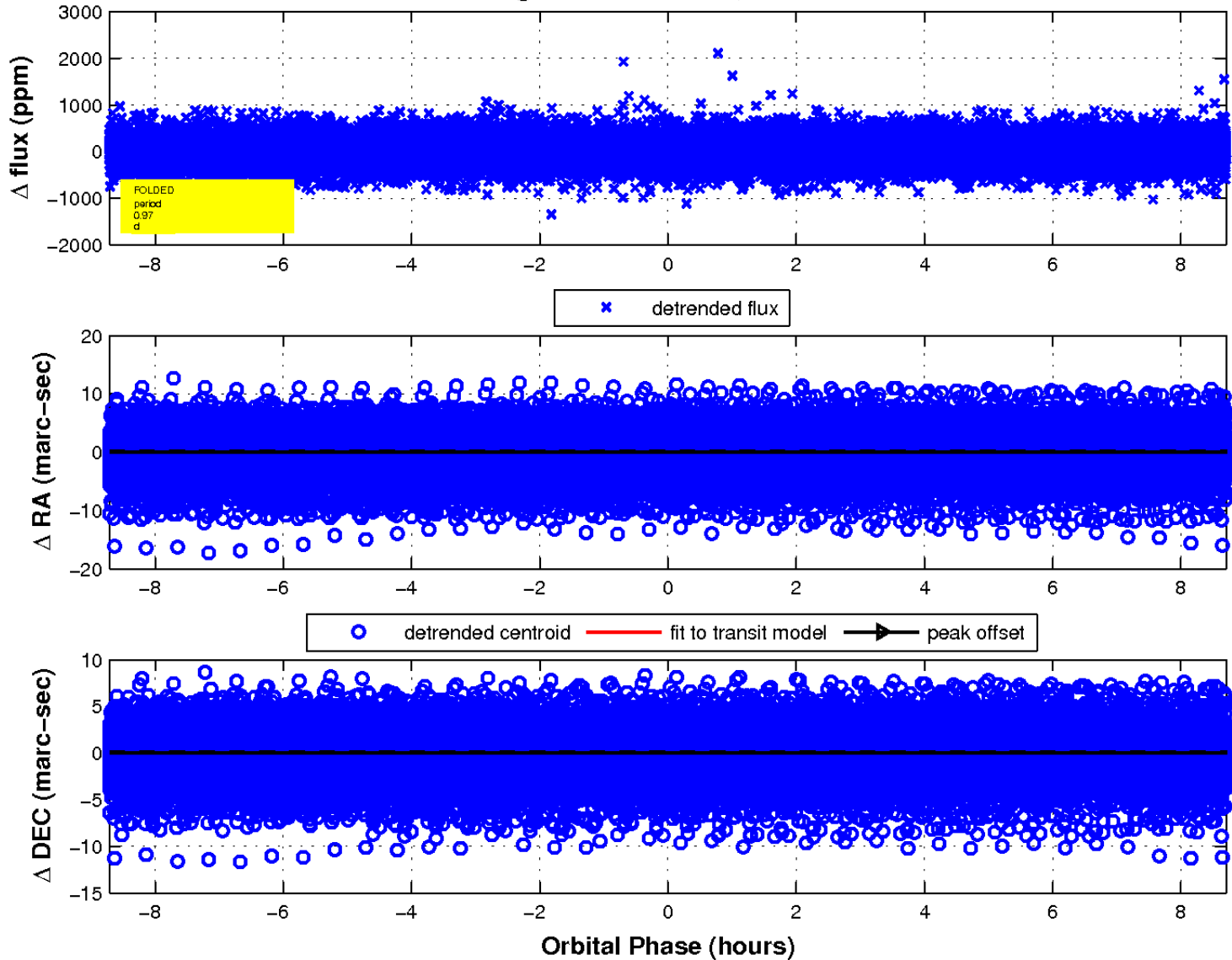
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

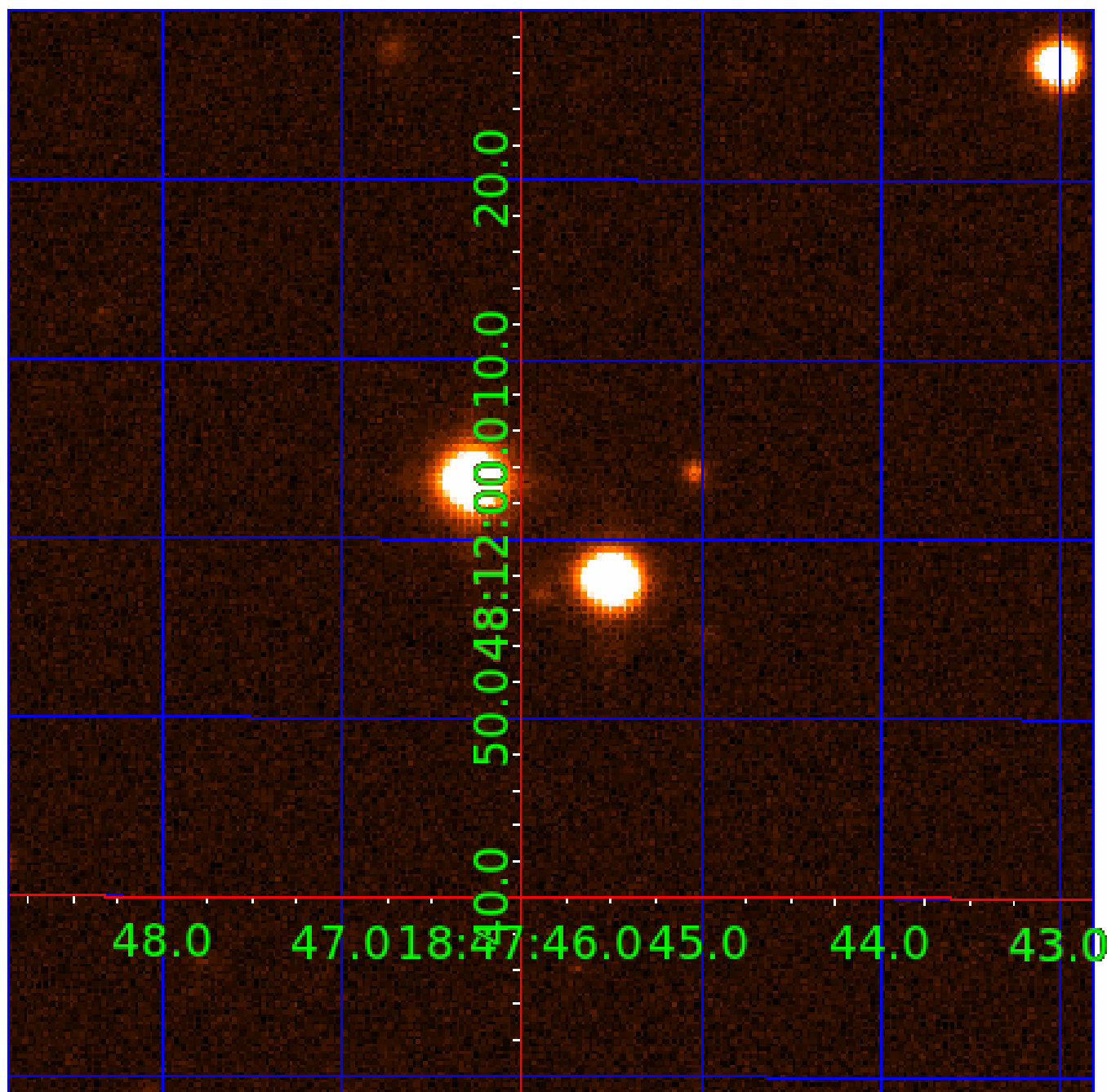


fluxWeightedCentroids, Planet 1 of 2



UKIRT Image

Declination





# KIC 010777060

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010777060-01	OBS	No	0.965110	132.321687	26.7	2.903	9.9	9.1	66.51	3973	43.81	0.00
010777060-02	OBS	No	0.965067	131.867456	16.9	4.199	8.9	6.8	66.51	3973	26.56	0.00

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010777060-01	OBS	FP	0.00	1	0	1	1	LPP_DV—CENT_SATURATED—HALO_GHOST—EPHEM_MATCH
010777060-02	OBS	FP	0.00	1	0	1	1	LPP_DV—SAME_NTL_PERIOD—CENT_SATURATED—HALO_GHOST—EPHEM_MATCH

**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.

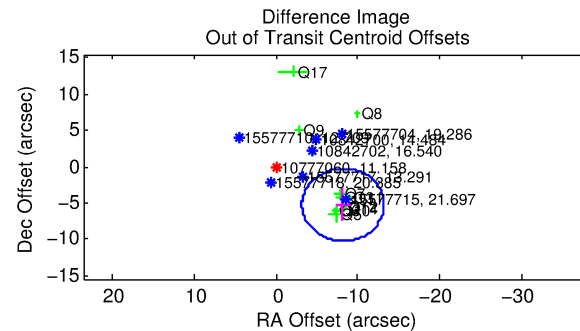
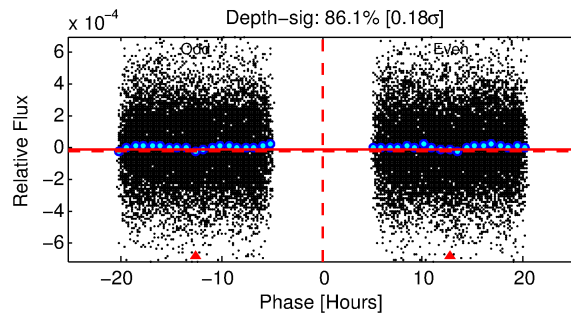
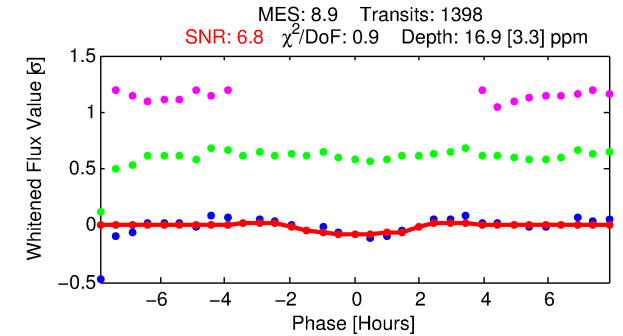
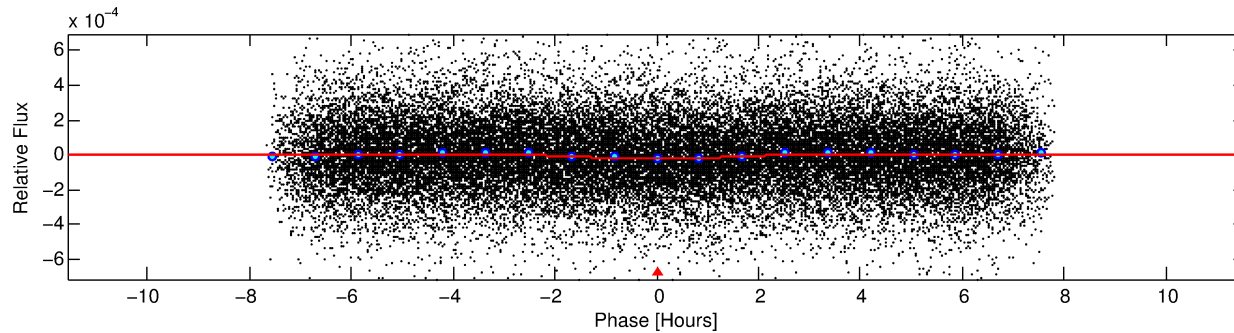
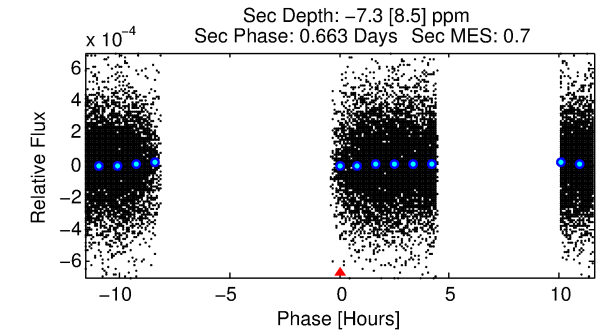
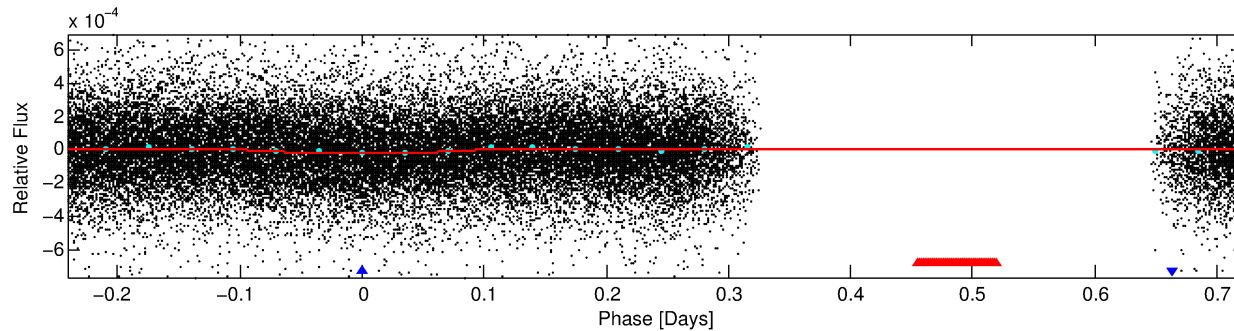
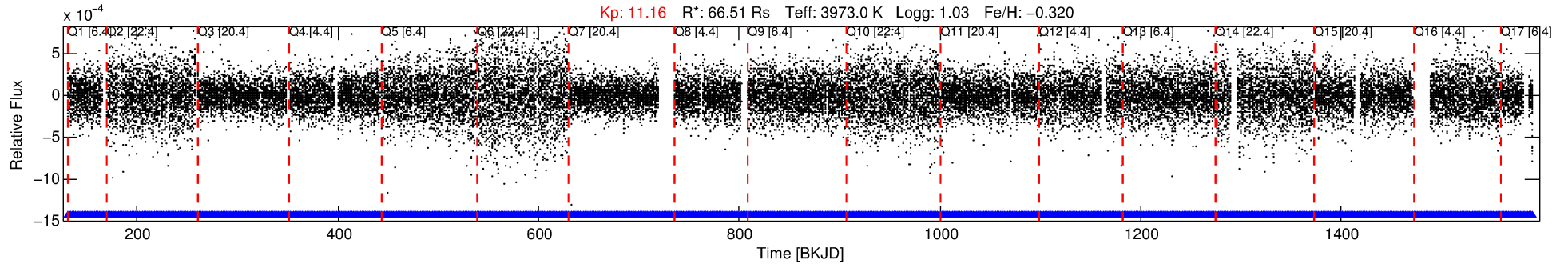
## Ephemeris Match Information For 010777060-02

TCE (1)	KIC	Parent (2)	Parent KIC	$P_1:P_2$	Dist ( $\mu$ )	$\Delta$ Row	$\Delta$ Col	$m_2$	$m_1$	$D_2/D_1$	Mechanism	Flag	$\sigma_P$	$\sigma_T$
010777060-02	10777060	010842687-01	10842687	1:1	51.5	11	5	13.19	11.15	1.12	Direct-PRF	1	4.51	2.67

**Notes:**  $P_1:P_2$  is the period ratio. Dist is the distance in arcseconds.  $\Delta$ Row and  $\Delta$ Col are the number of pixels apart in row and column.  $m_2$  and  $m_1$  are the magnitudes of the parent and child.  $D_2/D_1$  is the parent's transit depth divided by the child's.  $\sigma_P$  and  $\sigma_T$  are the significance of the match in period and epoch. For a match to be considered significant  $\sigma_P < 5.0$  and  $\sigma_T < 5.0$ . Matches which have  $\sigma_P$  and  $\sigma_T$  very close to this cutoff should receive extra scrutiny, especially if the period ratio is very large.

# DV One-Page Summary

KIC: 10777060 Candidate: 2 of 2 Period: 0.965 d



## DV Fit Results:

Period = 0.96507 [0.00002] d  
Epoch = 131.8675 [0.0070] BKJD  
Rp/R\* = 0.0037 [0.0031]  
a/R\* = 1.75 [2.48]  
b = 0.41 [4.43]  
Seff = N/A  
Teq = N/A  
Rp = 26.56 [22.89] Re  
a = N/A  
Ag = N/A  
Teffp = N/A

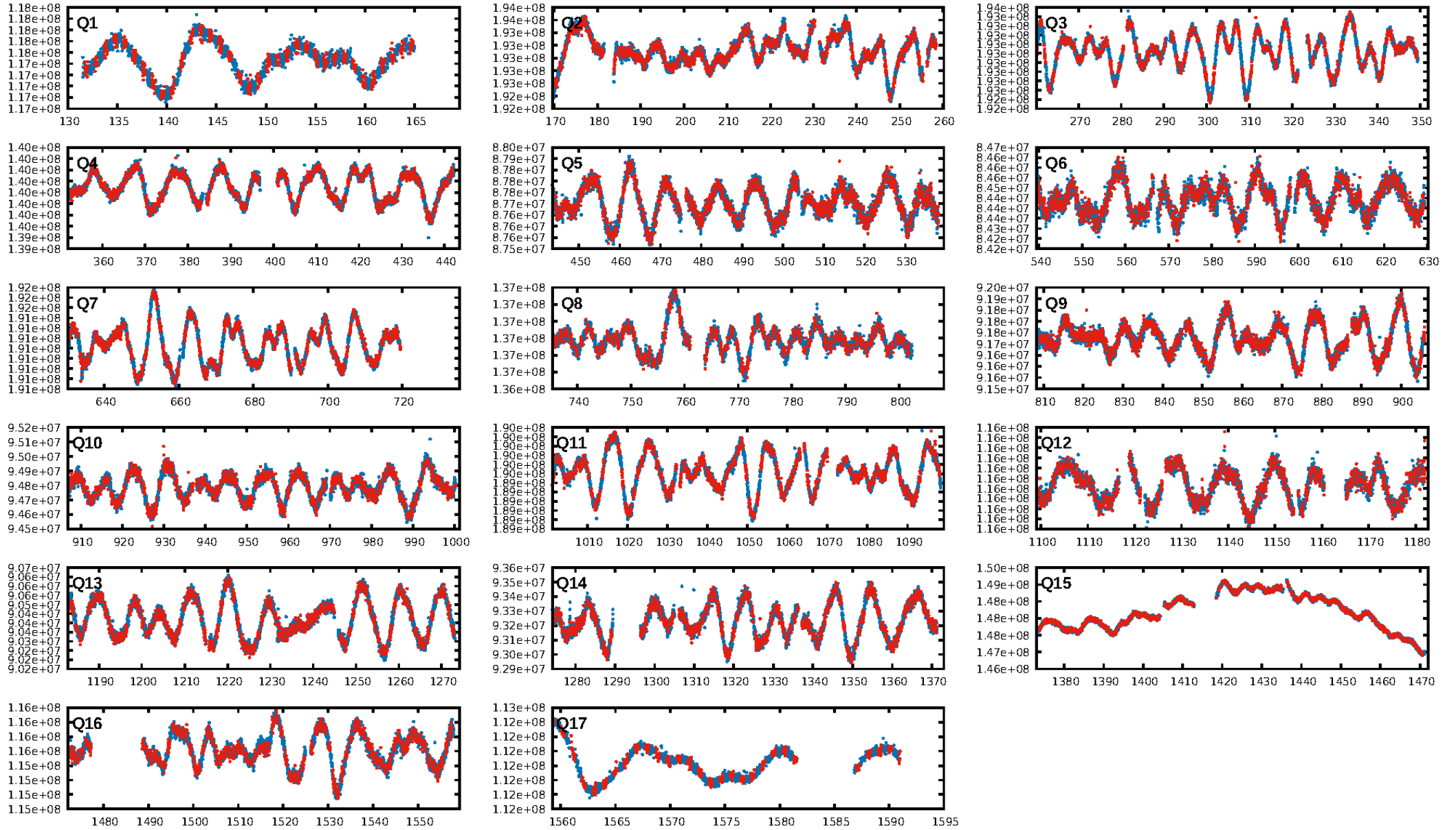
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.0% [0.00σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 3.16e-23  
RollingBand-fgt: 1.00 [1334/1334]  
GhostDiagnostic-chr: 0.06688  
Centroid-sig: 0.0%  
Centroid-so: 4.793 arcsec [2.74σ]  
OotOffset-rm: 9.700 arcsec [5.81σ]  
KicOffset-rm: 4.177 arcsec [4.06σ]  
OotOffset-st: 3/2/2/4 [11]  
KicOffset-st: 3/2/2/4 [11]  
DiffImageQuality-fgm: 0.55 [6/11]  
DiffImageOverlap-fno: 1.00 [17/17]




Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 15:00:57 Z

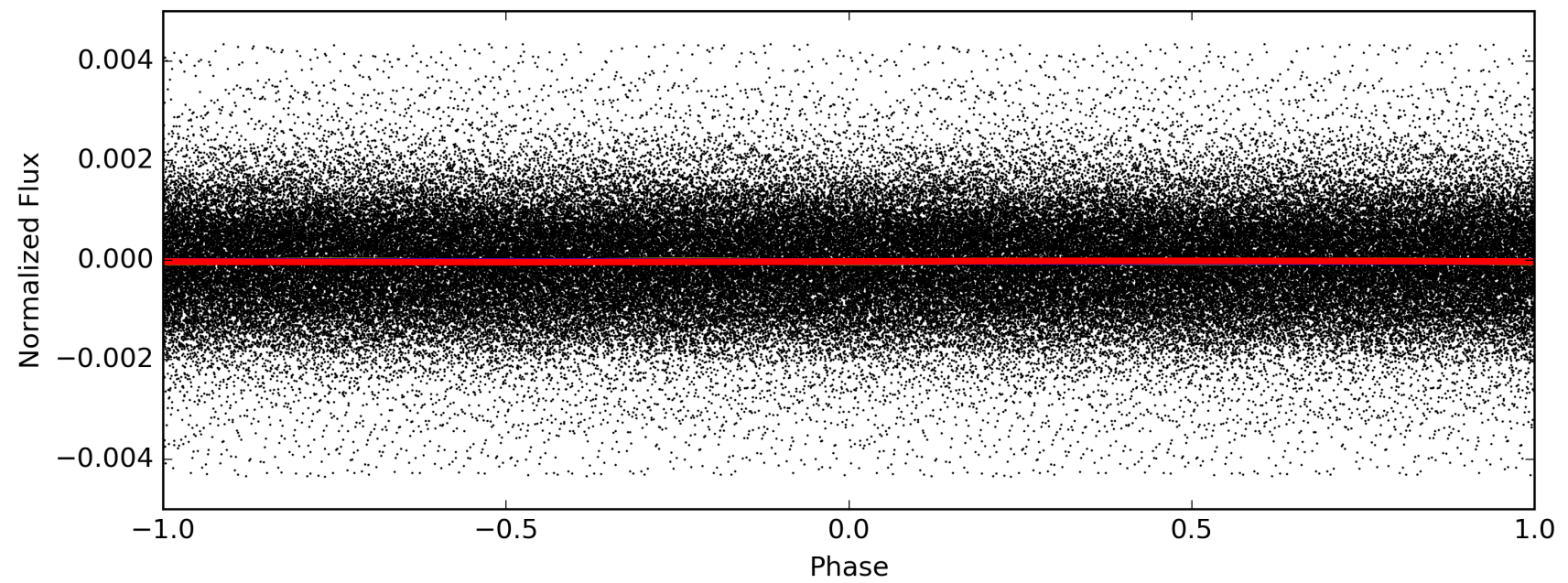
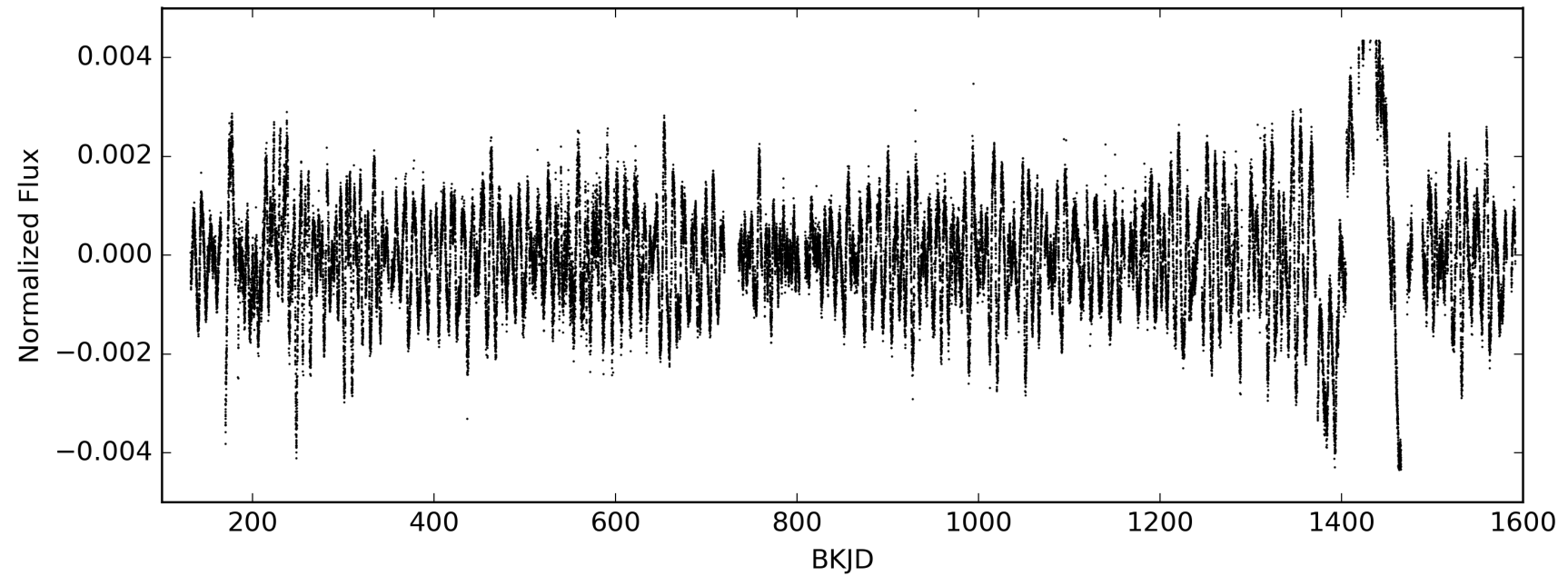
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 010777060-02, PDC Light Curves



TCE 010777060-02

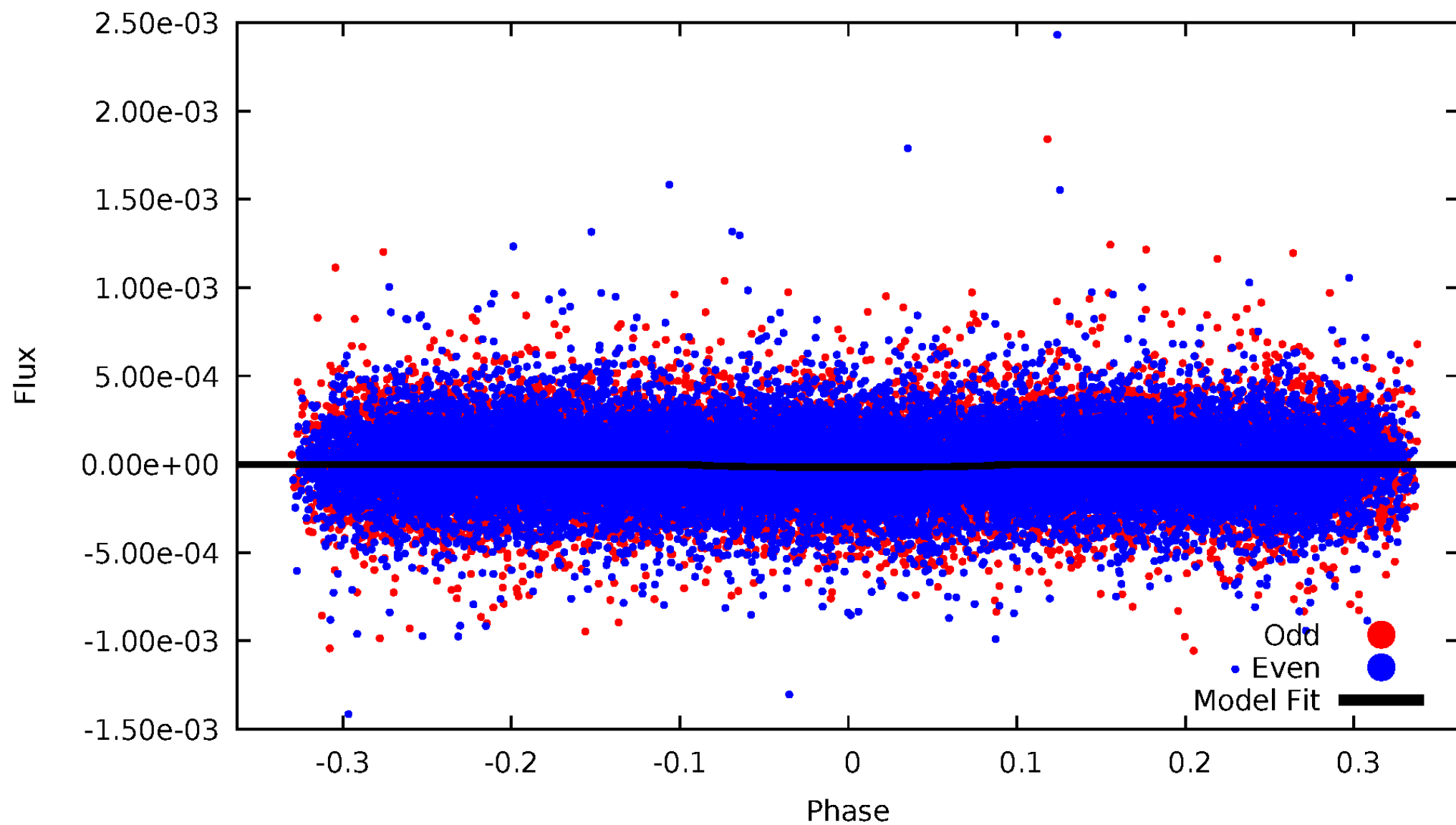
 P = 0.483 days     P = 0.965 days     P = 1.930 days





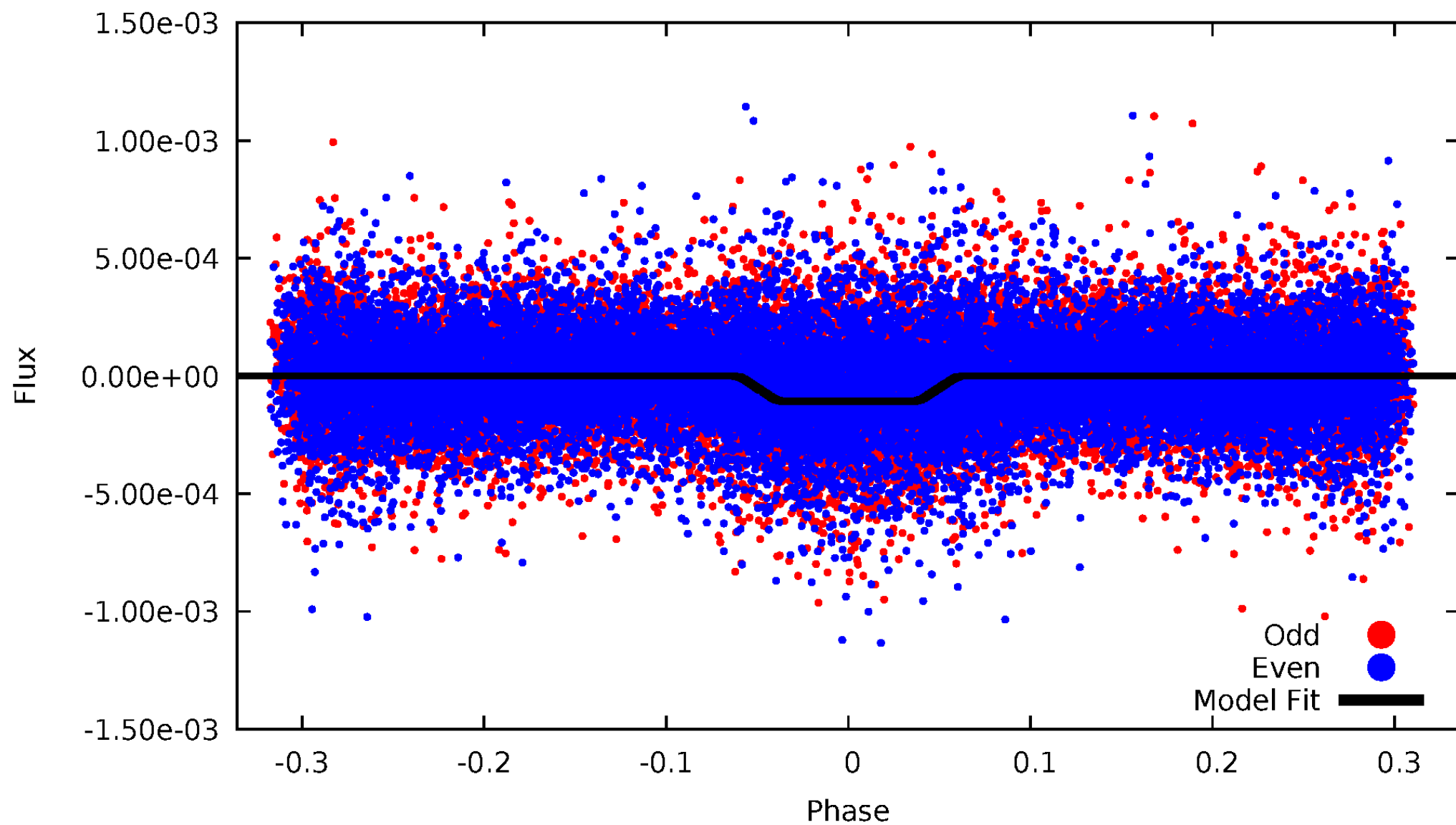
# DV Odd/Even

TCE 010777060-02



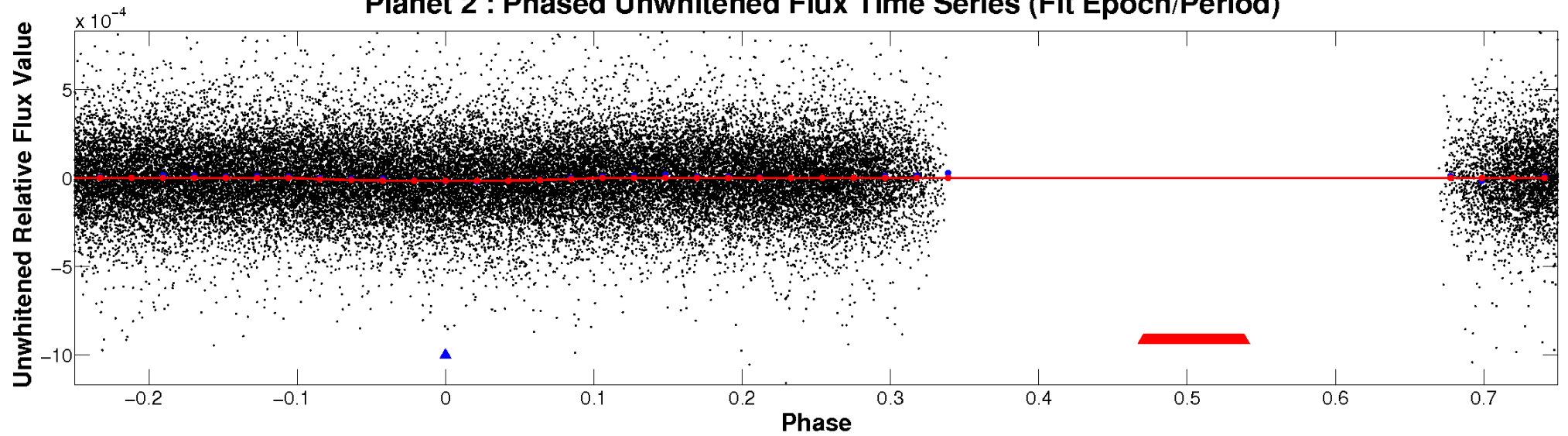
# ALT Odd/Even

TCE 010777060-02

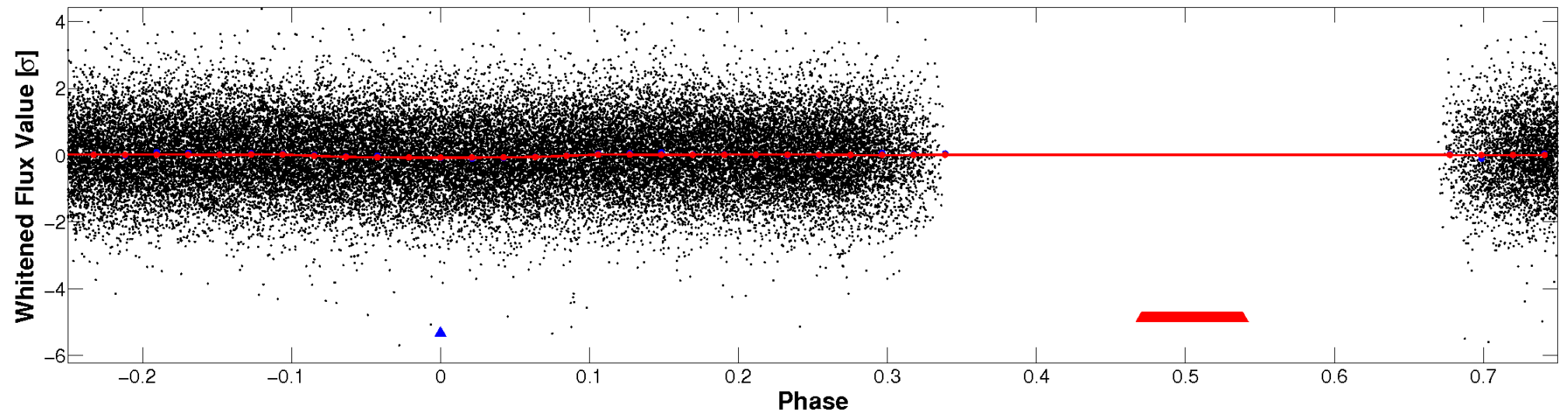


# Non-Whitened Vs. Whitened Light Curve

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

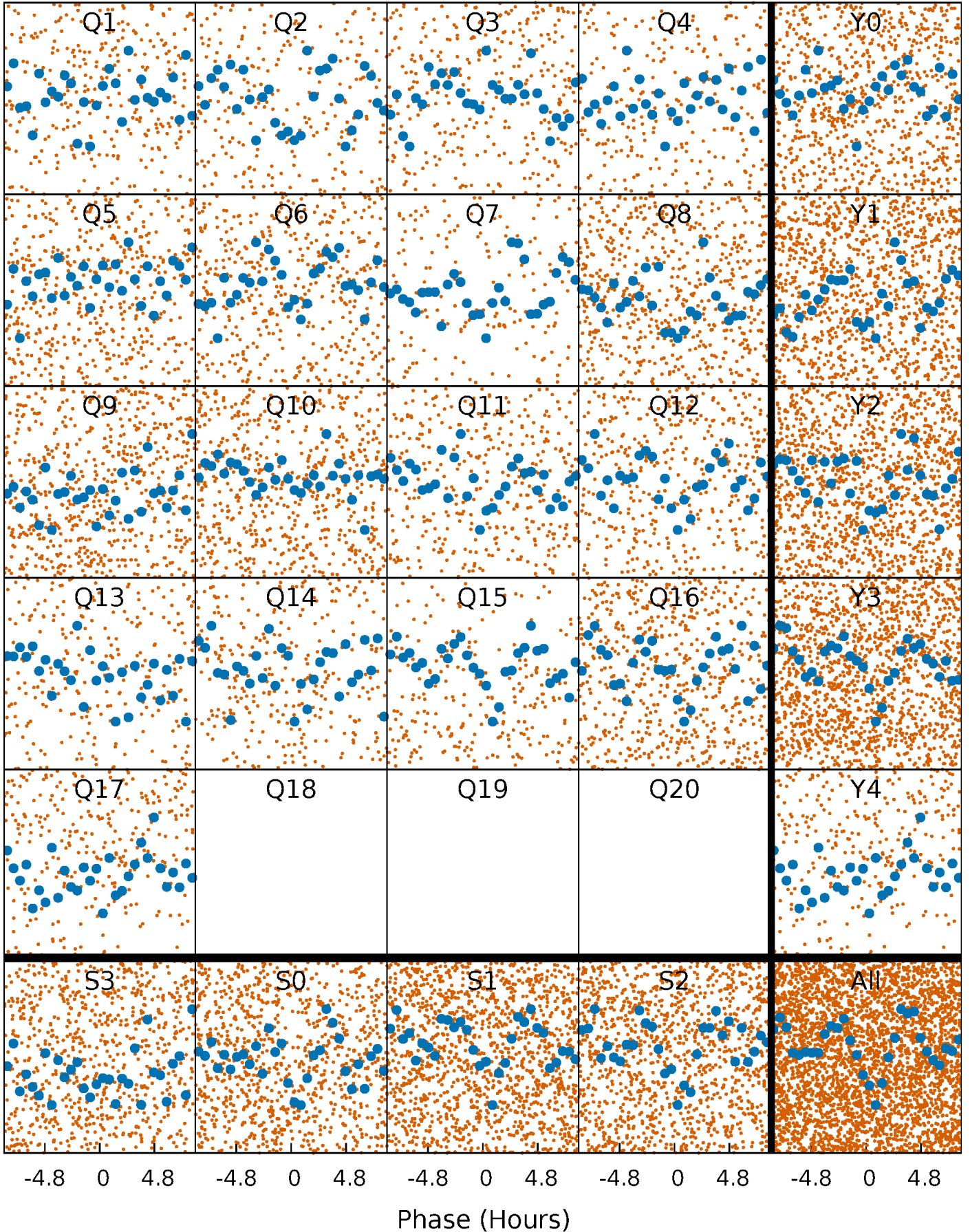


**Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

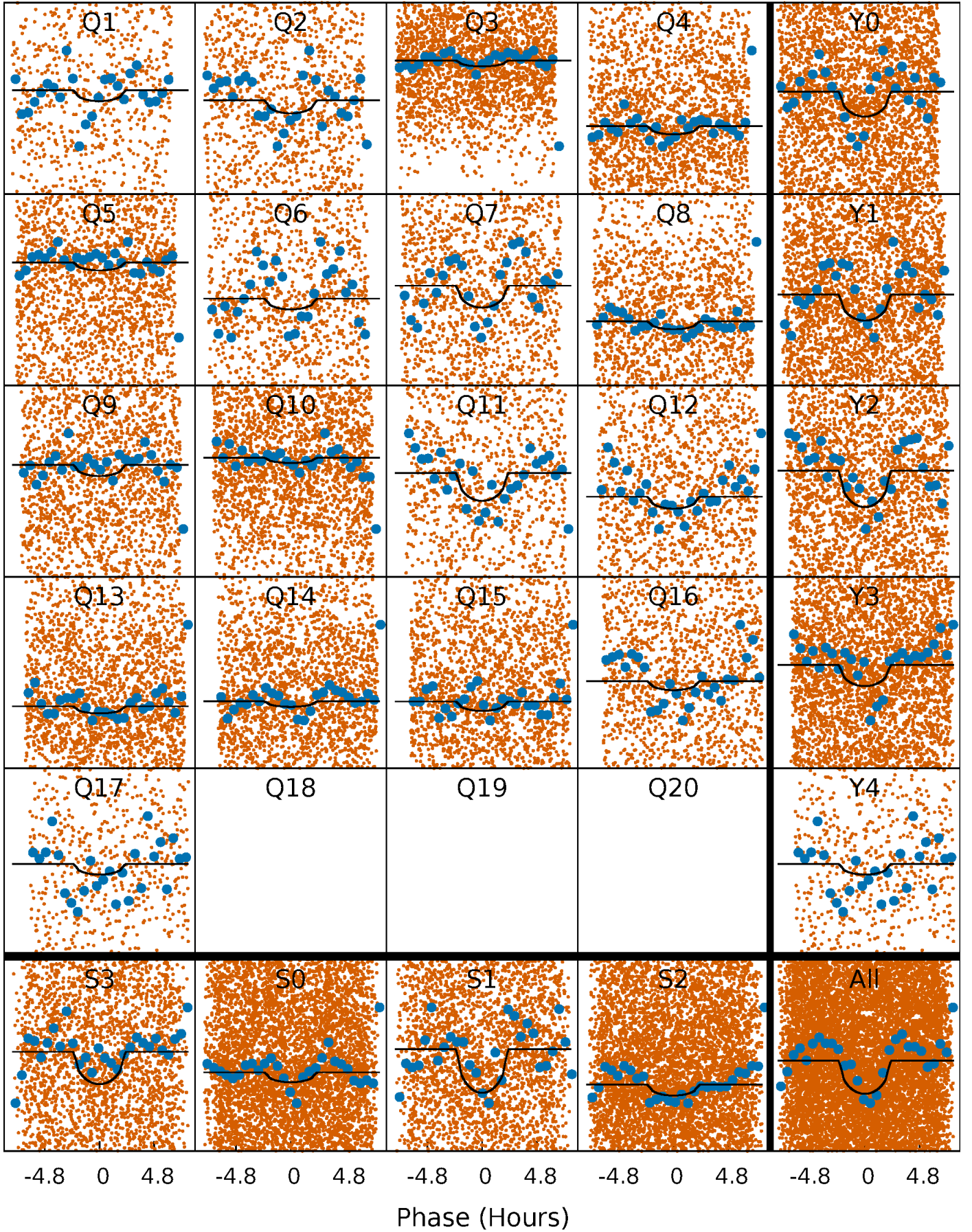
TCE 010777060-02   P= 0.965067 Days    $T_0=131.867456$  (BKJD)





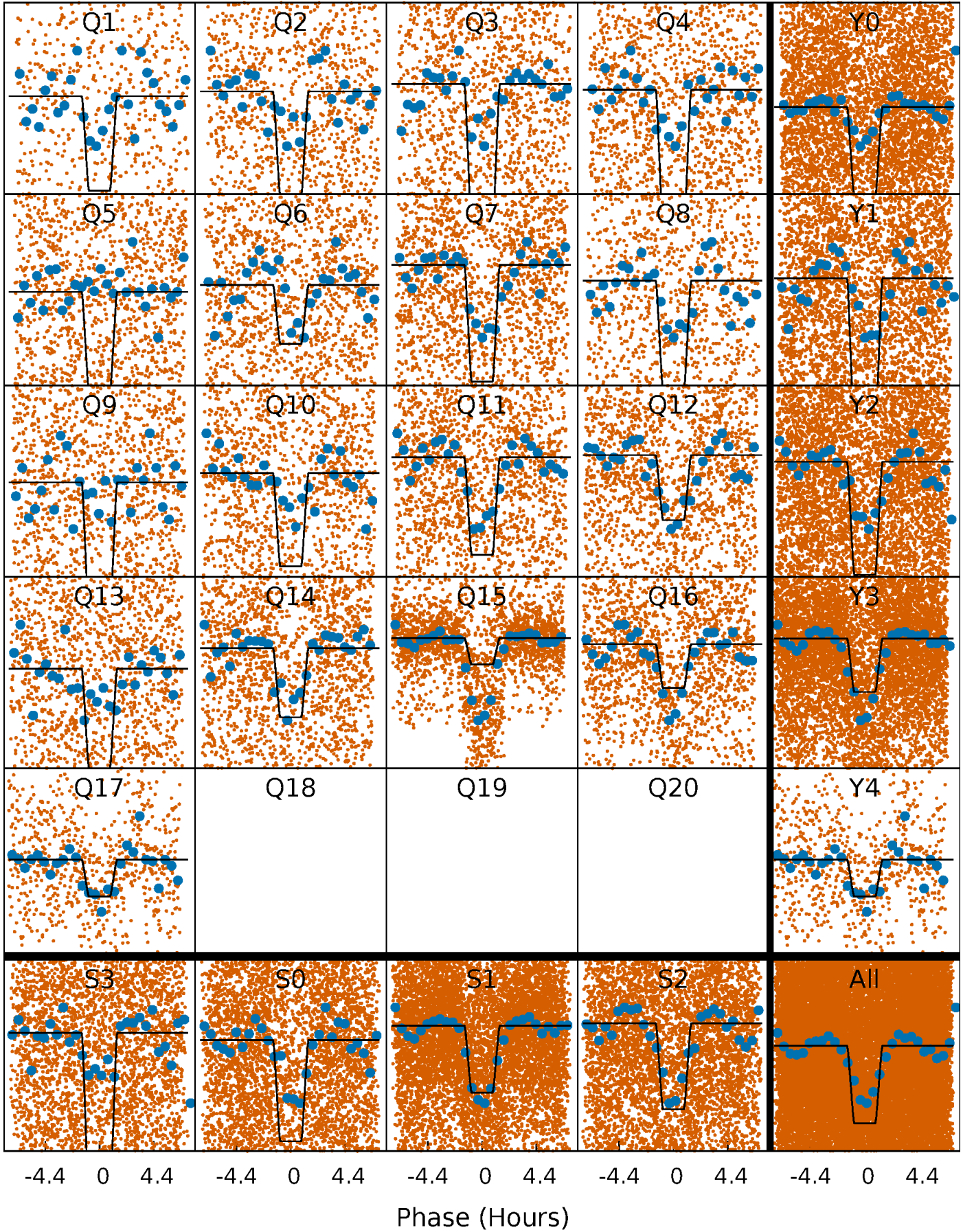
# DV Quarter-Phased Transit Curves

TCE 010777060-02   P= 0.965067 Days    $T_0=131.867456$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 010777060-02     $P = 0.965128$  Days     $T_0 = 131.829163$  (BKJD)

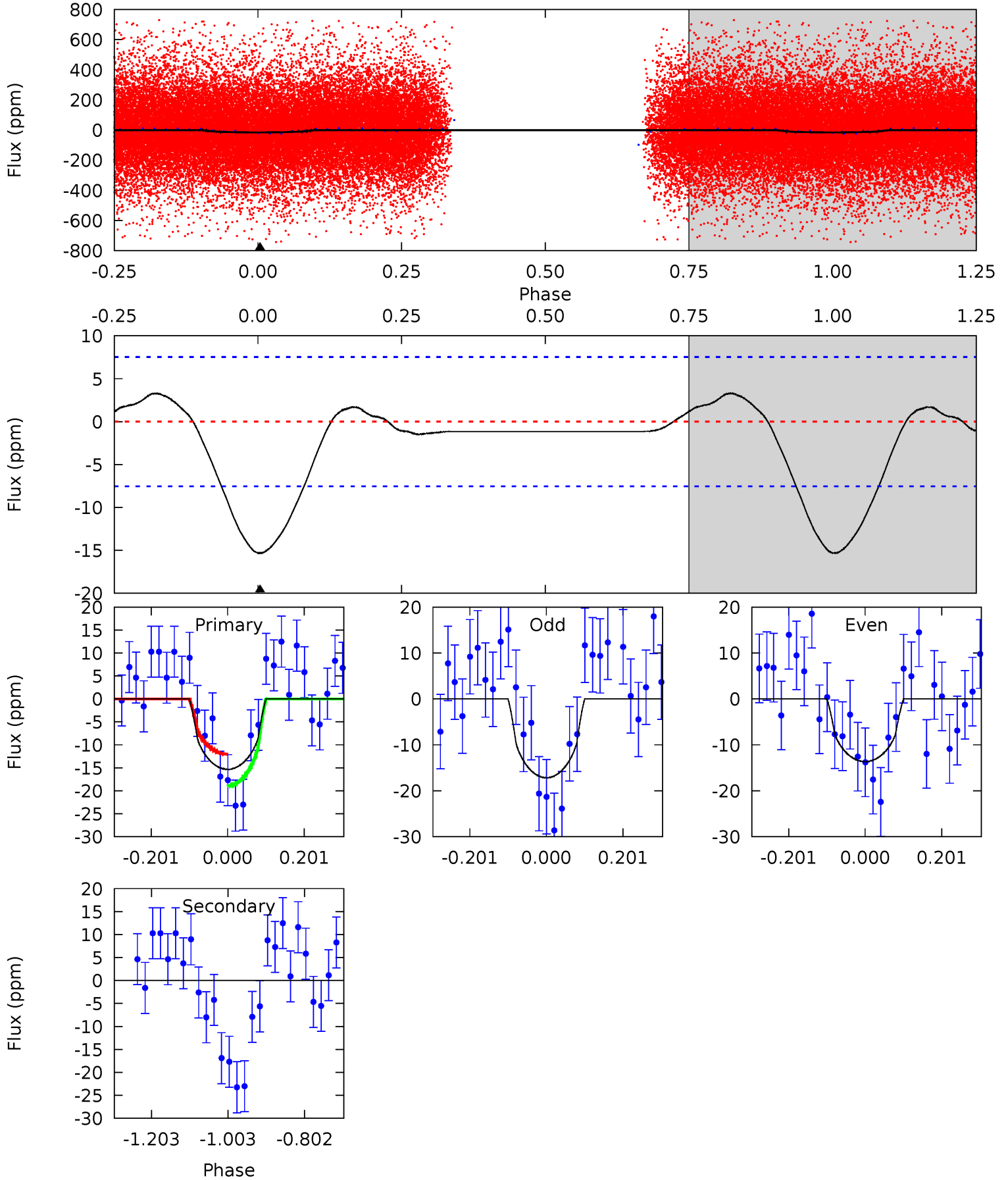




# DV Model-Shift Uniqueness Test

010777060-02, P = 0.965067 Days, E = 130.902389 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
8.99	0	0	0	4.42	1.28	0.76	8.99	8.99	0	0	1.04	0.87	0.18	2.04

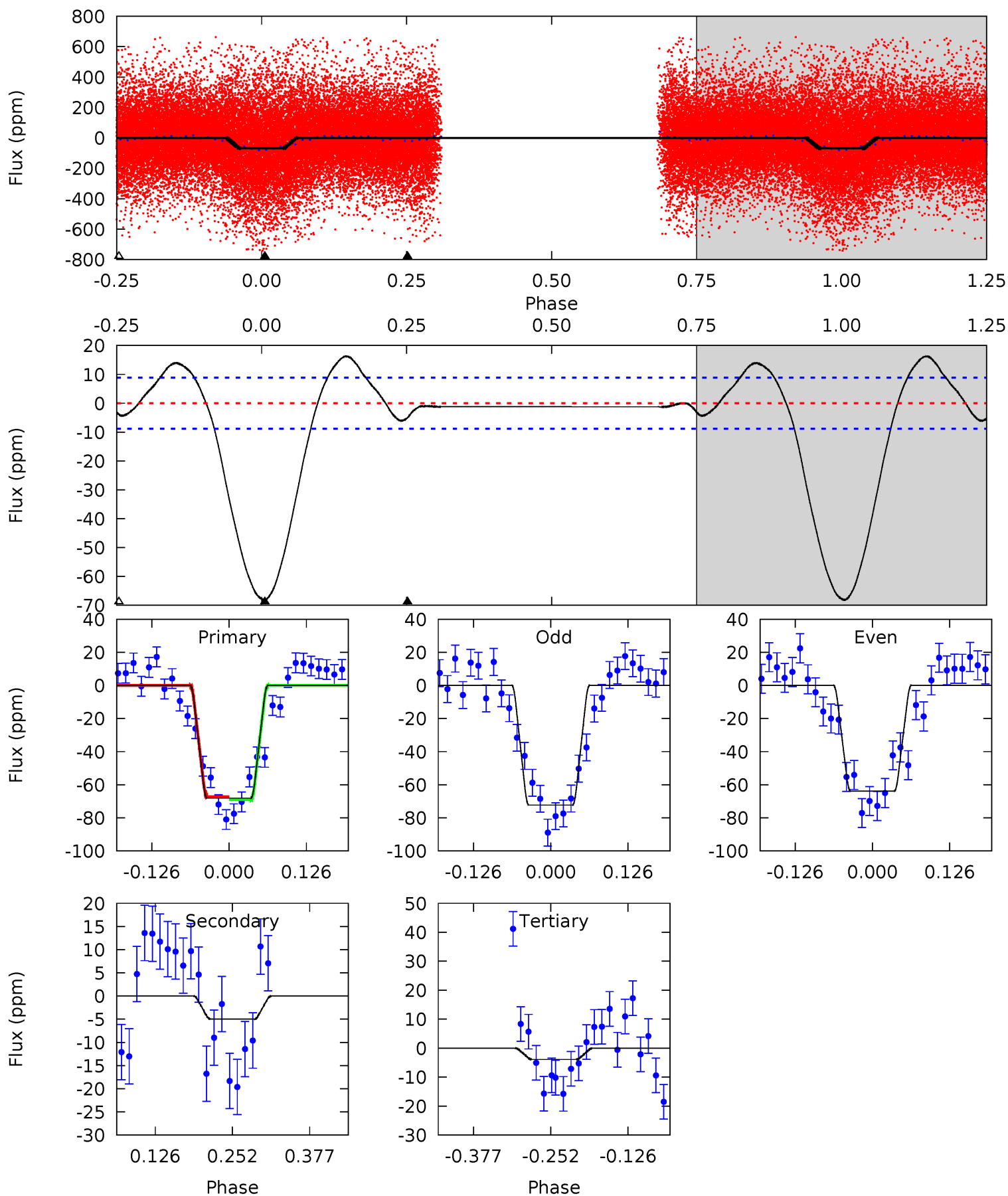




# Alt Model-Shift Uniqueness Test

010777060-02, P = 0.965128 Days, E = 130.864035 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
34.8	2.55	2.00	0	4.52	1.53	3.22	32.8	34.8	0.55	2.55	2.16	1.20	0.19	0.50



### Stellar Parameters For KIC 010777060

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$3973^{+89}_{-109}$	$1.032^{+0.030}_{-0.030}$	$-0.320^{+0.200}_{-0.250}$	$66.513^{+2.409}_{-13.653}$	$1.738^{+0.070}_{-0.628}$	$0.000^{+0.000}_{-0.000}$
	+2%/-3%	+3%/-3%	+62%/-78%	+4%/-21%	+4%/-36%	+29%/-8%
Source	PHO54	AST54	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 010777060-02 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$0 \pm 2$	$28.66^{+20.94}_{-16.88}$	$13171^{+332}_{-377}$	$-11144^{+689}_{-640}$	$0.000^{+0.001}_{-0.001}$
Alt.	$-5 \pm 2$	$75.29^{+22.65}_{-22.14}$	$13195^{+312}_{-392}$	$-11167^{+694}_{-588}$	$0.000^{+0.000}_{-0.000}$

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

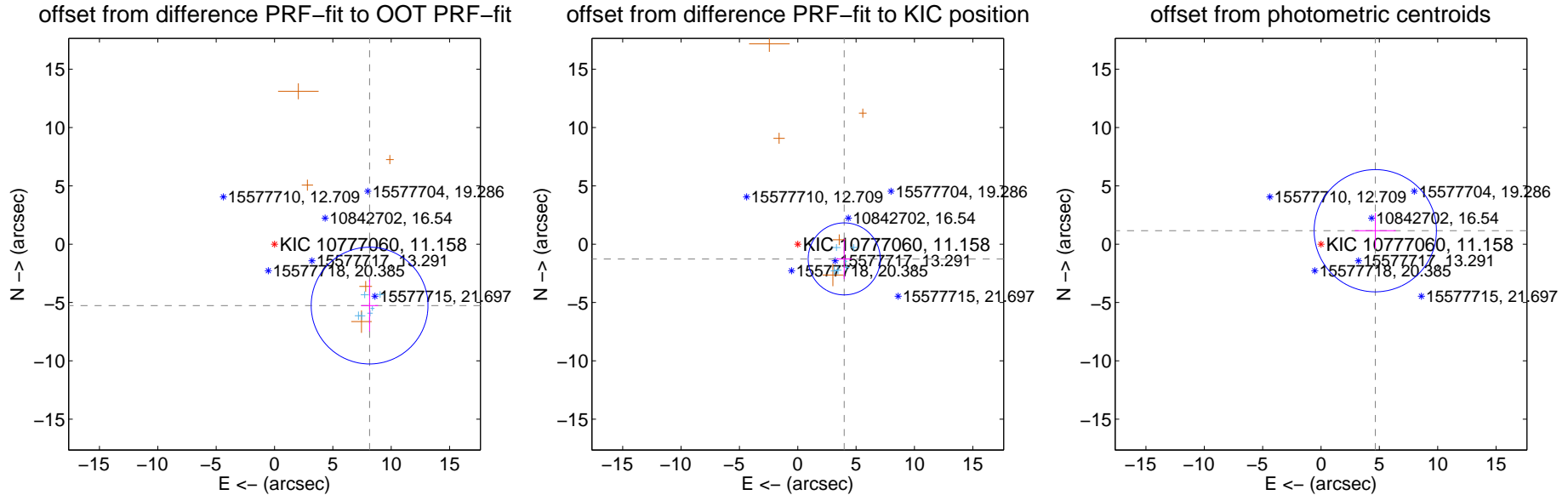
## DV Centroid Data

Supplemental centroid analysis for 010777060-02. **Kepler magnitude: 11.16.** Transit SNR 6.78

There are 6 quarters with good PRF difference image offsets

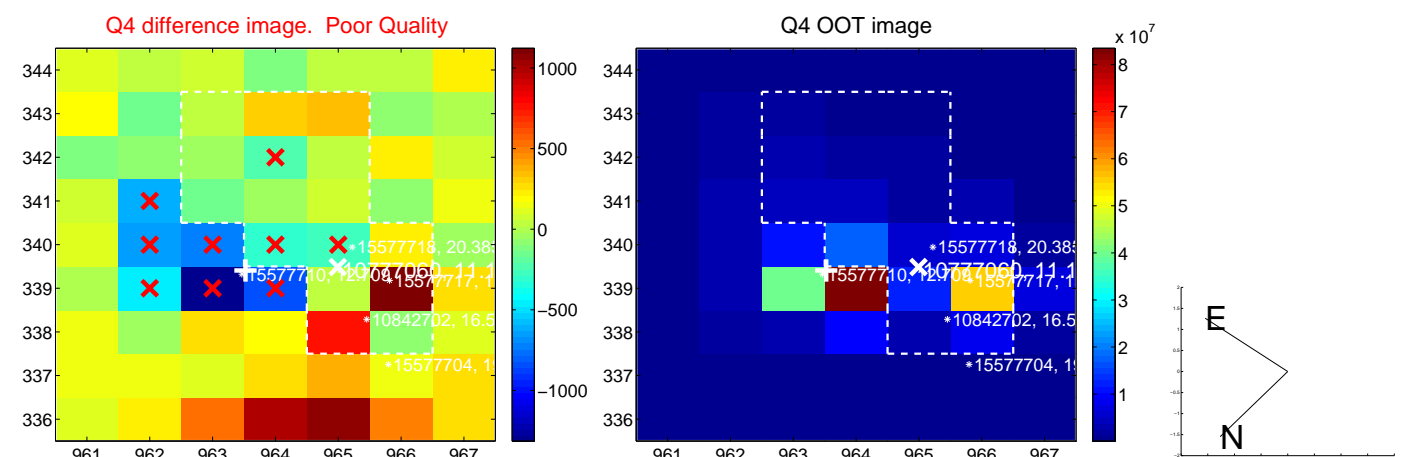
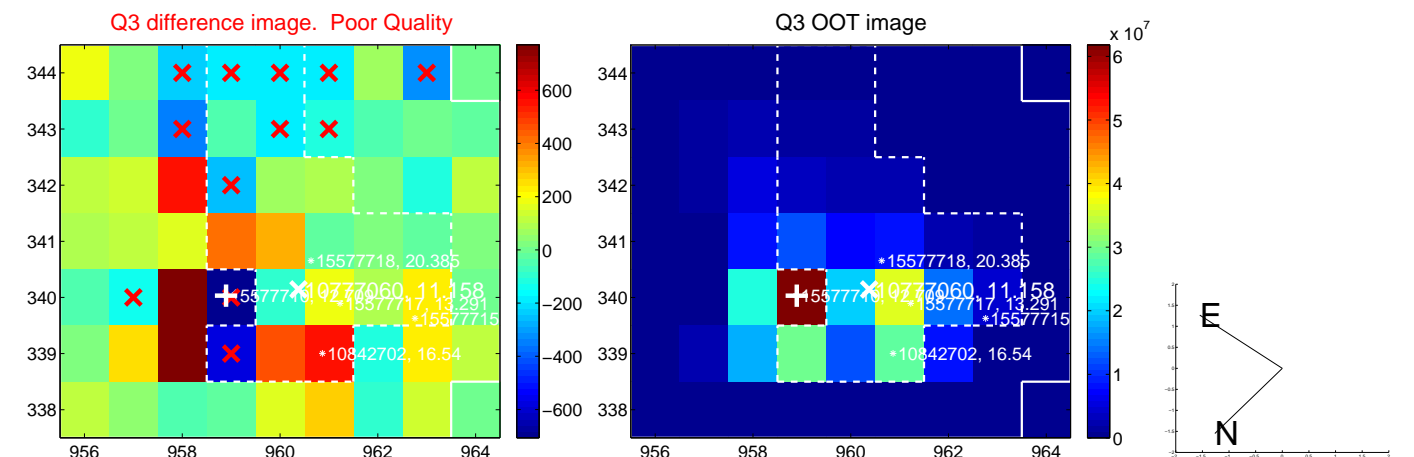
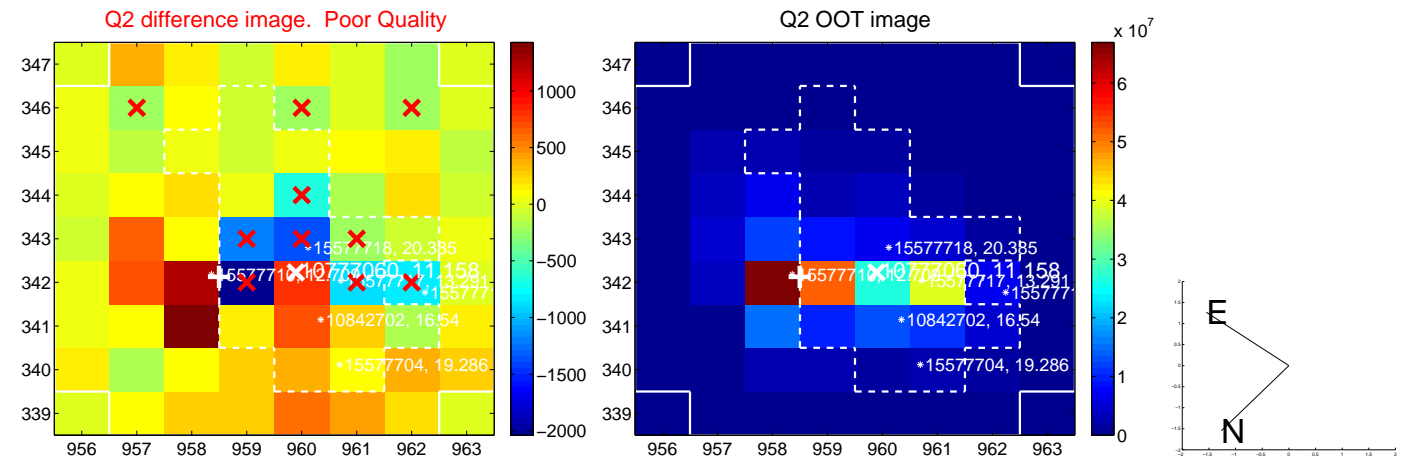
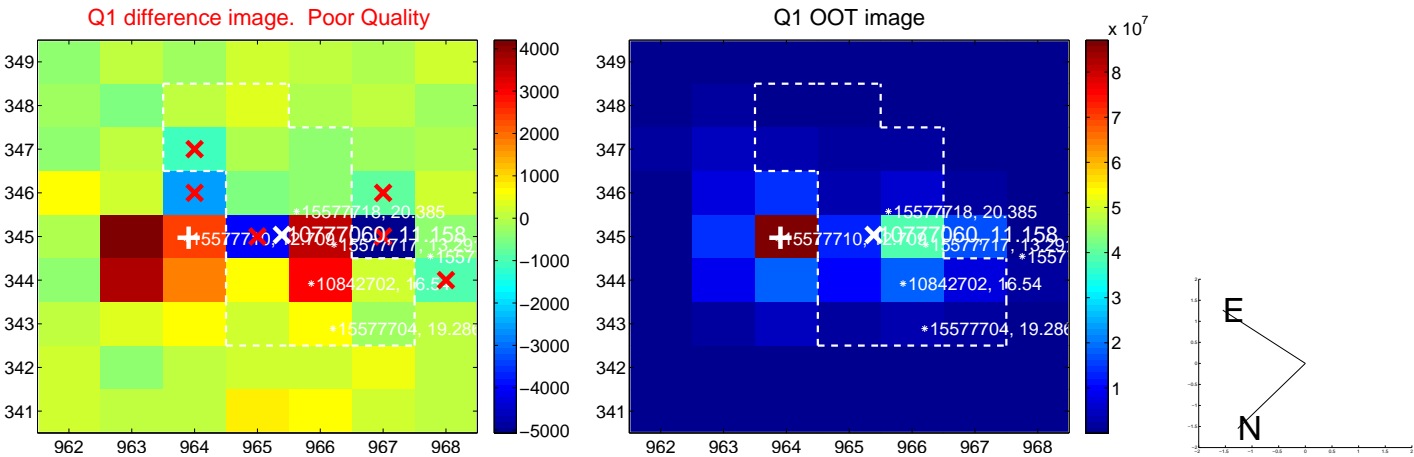
The OOT PRF centroid is offset from the target star catalog position by about 6.05 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	<b><math>9.700 \pm 1.668</math></b>	<b>5.81</b>	$-8.147 \pm 0.733$	$-5.265 \pm 2.216$
PRF-fit source offset from KIC position	<b><math>4.177 \pm 1.029</math></b>	<b>4.06</b>	$-3.982 \pm 0.668$	$-1.261 \pm 1.735$
photometric centroid source offset	$4.79 \pm 1.75$	2.74	$-4.65 \pm 1.76$	$1.15 \pm 1.52$

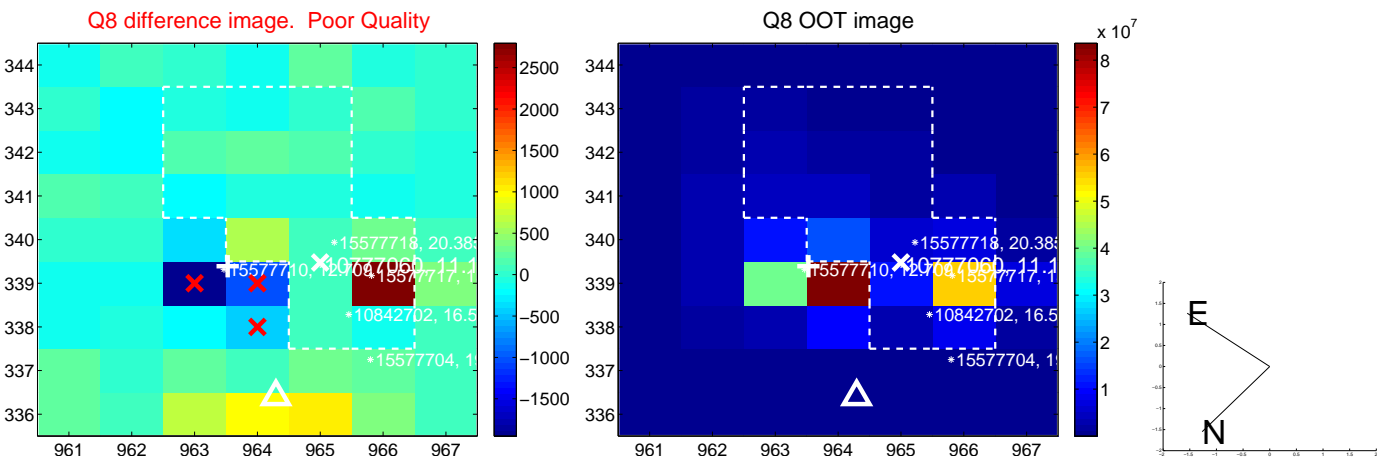
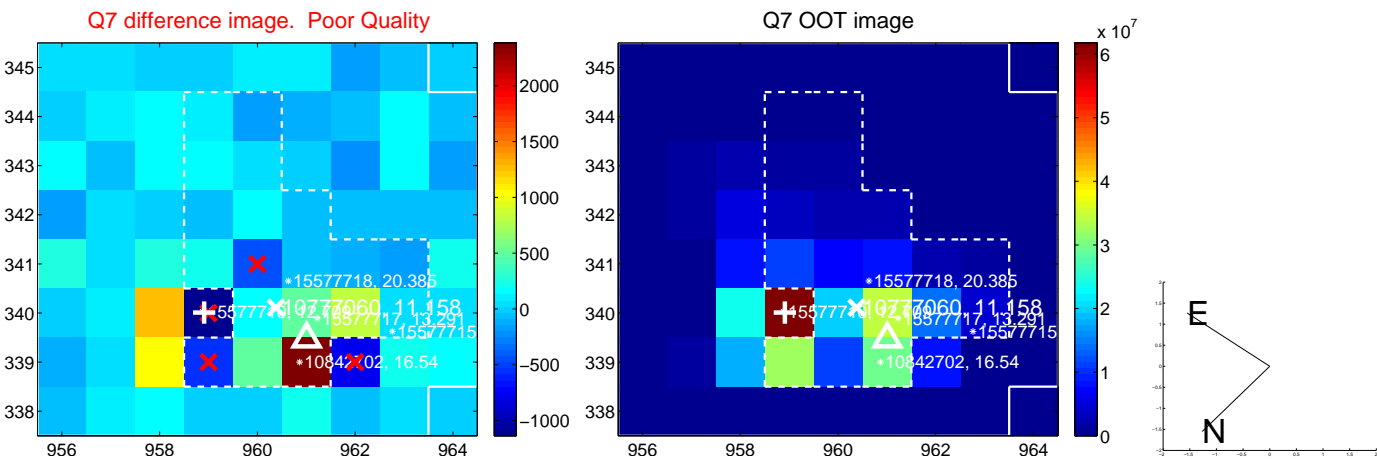
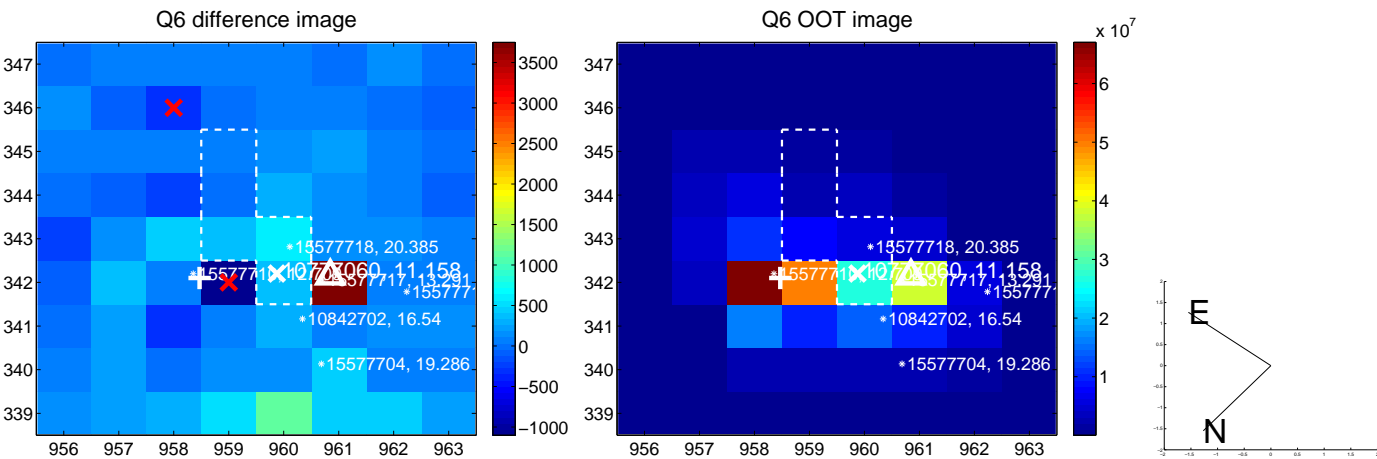
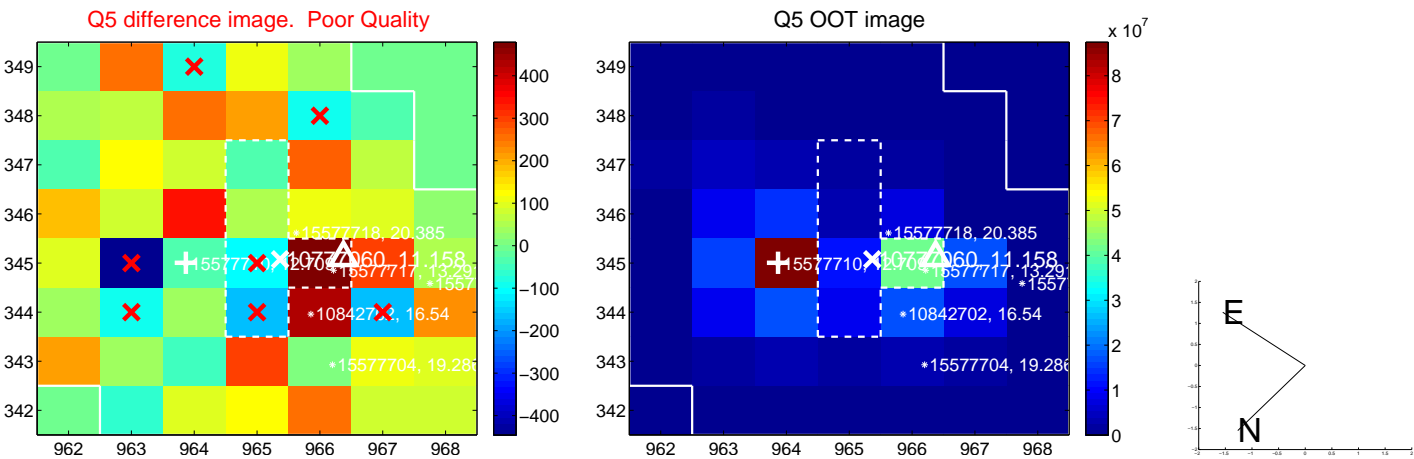


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

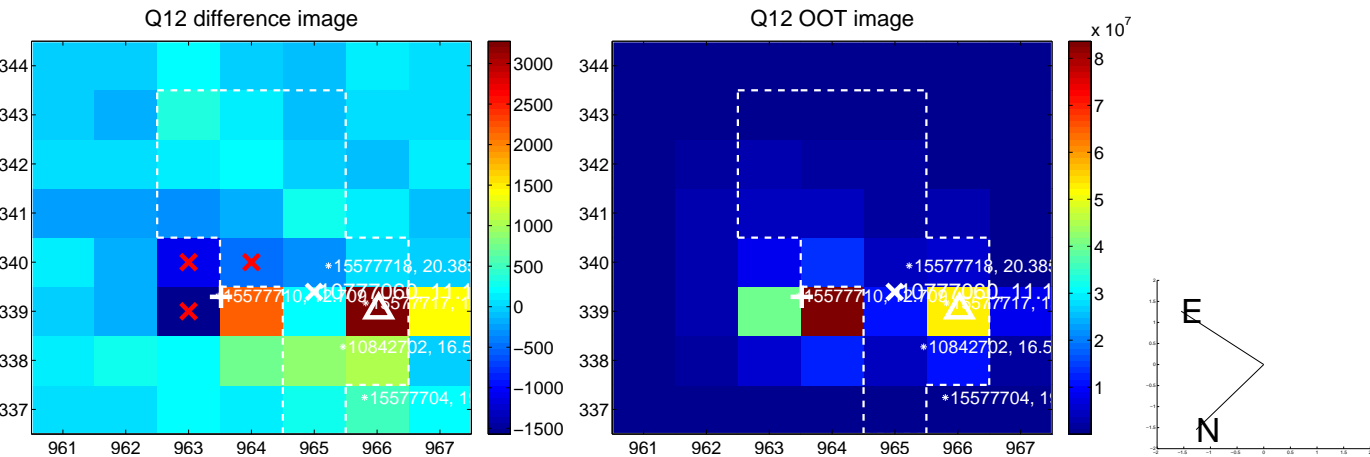
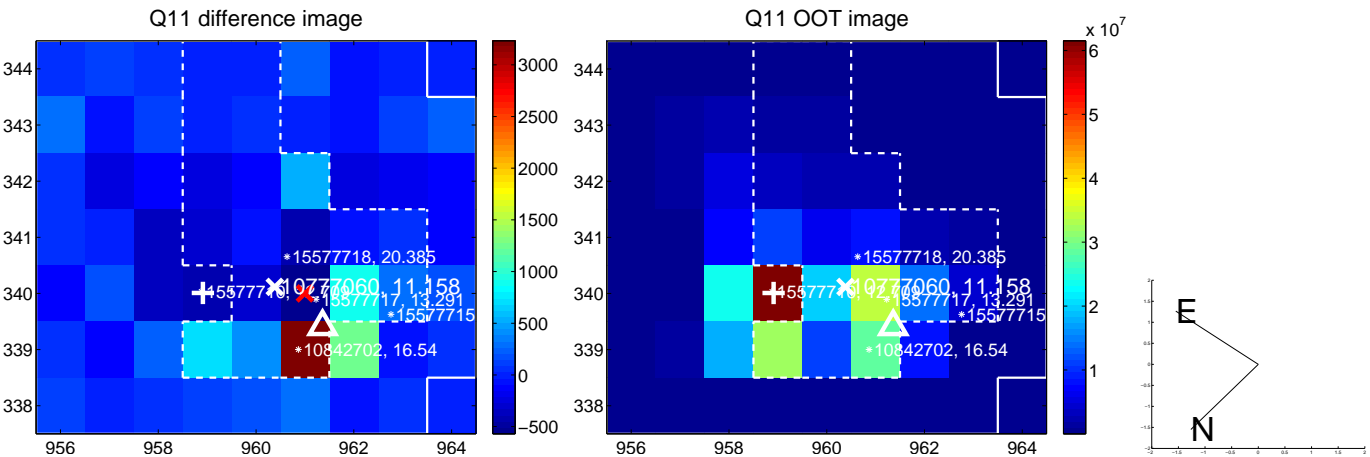
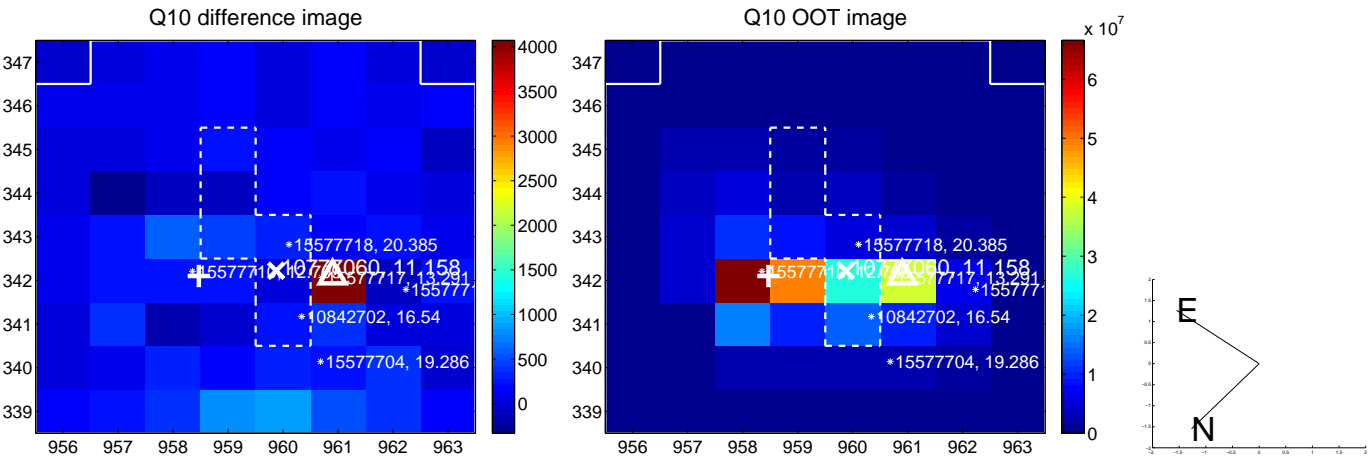
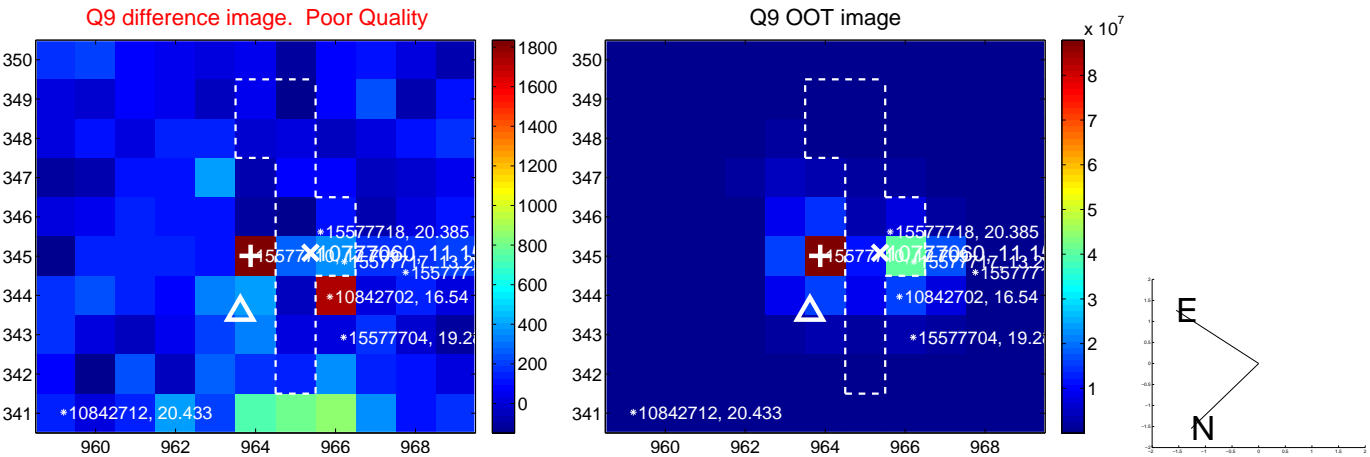
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



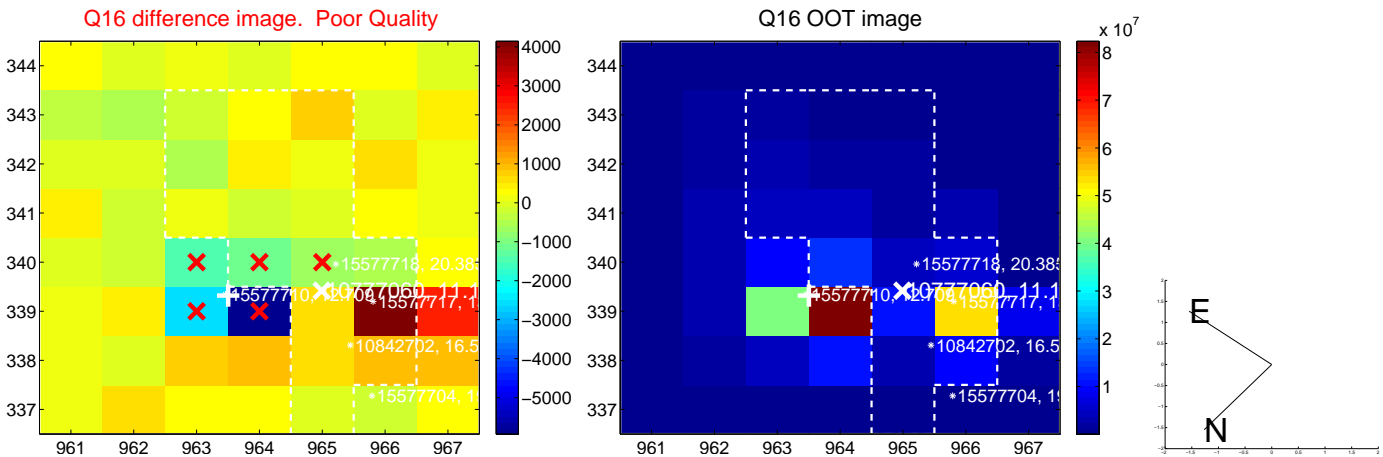
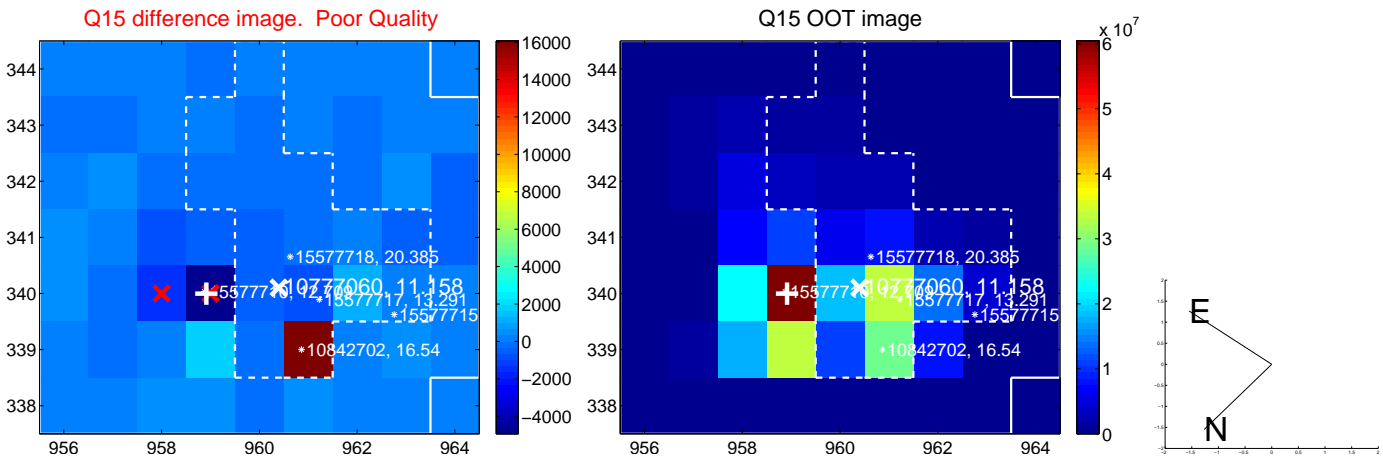
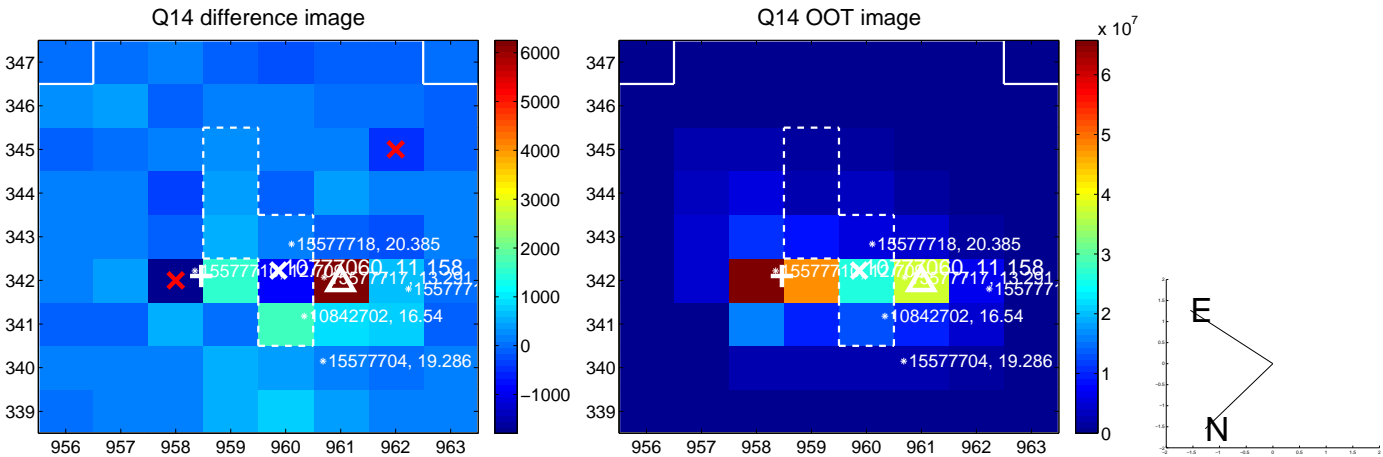
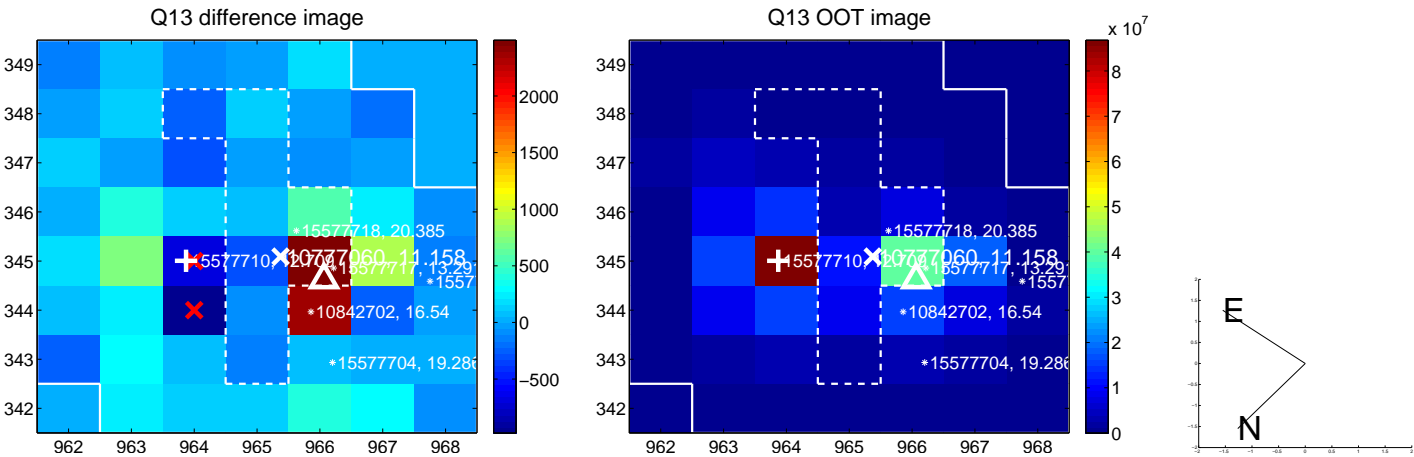
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

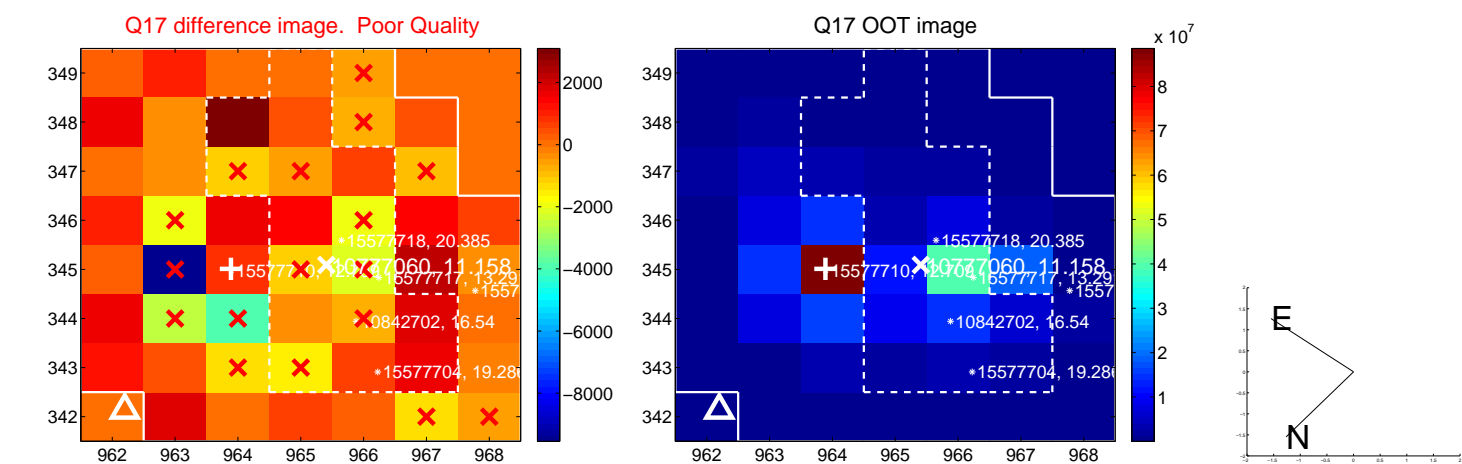


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

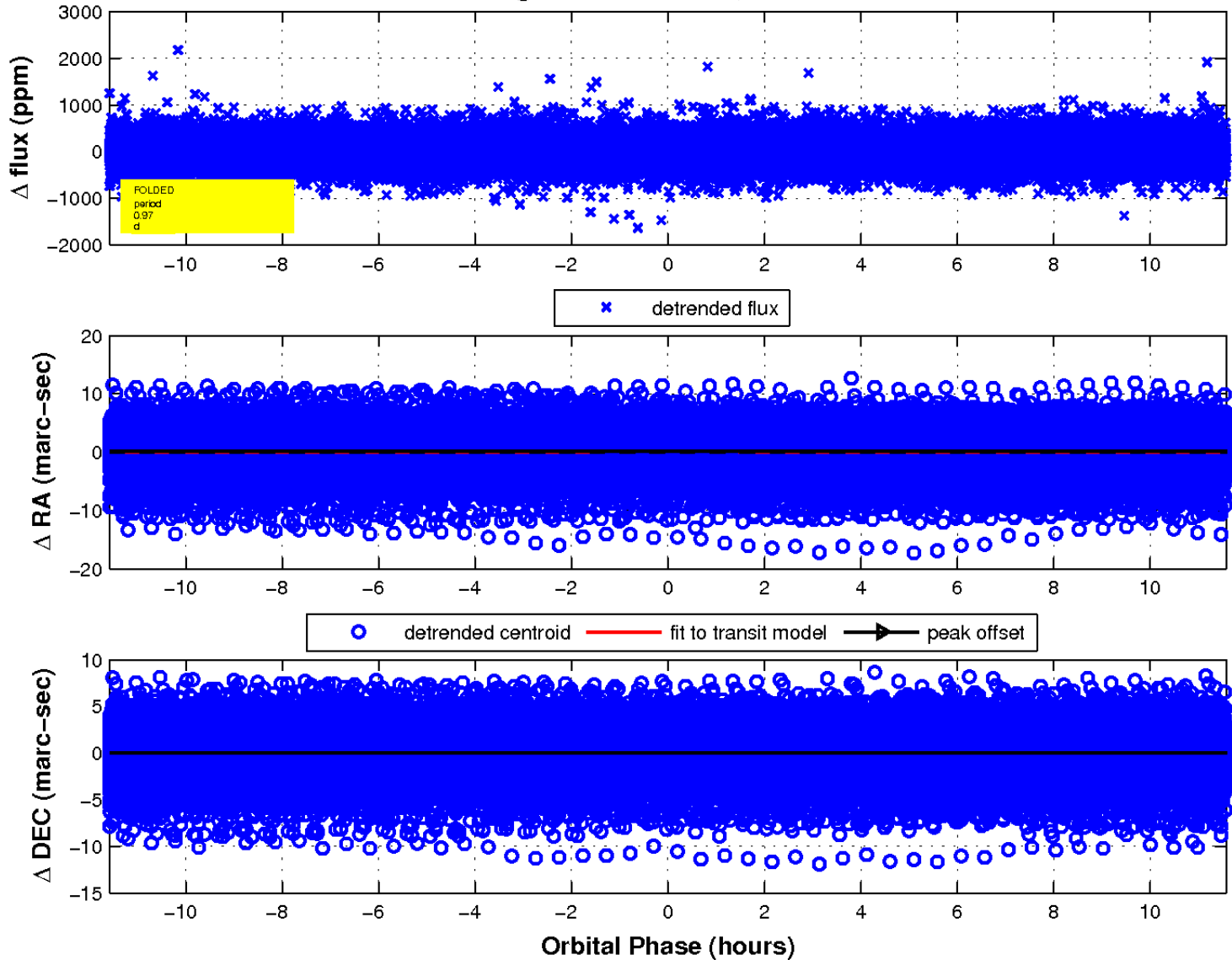




white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



fluxWeightedCentroids, Planet 2 of 2



UKIRT Image

Declination

