

# KIC 008073771

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
008073771-01	OBS	No	3.461710	134.422413	5.2	18.139	7.9	2.4	2.14	9185	0.56	8614.39
008073771-02	OBS	No	31.209849	153.746649	179.4	22.300	13.8	10.3	2.14	9185	4.83	459.08
008073771-03	OBS	No	398.184598	188.535331	291.9	21.908	9.7	10.3	2.14	9185	5.43	15.40
008073771-04	OBS	No	90.753169	215.949998	156.2	8.002	9.1	9.3	2.14	9185	3.30	110.61
008073771-05	OBS	No	57.905298	171.196957	88.4	16.784	8.8	7.8	2.14	9185	2.12	201.37
008073771-07	OBS	No	40.552881	147.833476	109.0	2.637	8.0	6.9	2.14	9185	2.65	323.78
008073771-08	OBS	No	143.980457	198.100793	110.6	3.000	8.3	-1.0	2.14	9185	2.30	59.78
008073771-09	OBS	No	106.481950	176.873243	121.2	14.100	7.8	7.8	2.14	9185	2.52	89.38

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008073771-01	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—CENT_SATURATED
008073771-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_DV—CENT_SATURATED
008073771-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—CENT_SATURATED
008073771-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—CENT_SATURATED
008073771-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_SATURATED
008073771-07	OBS	FP	0.00	1	0	0	0	TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_SATURATED
008073771-08	OBS	FP	0.00	1	0	0	0	TRANS_GAPPED—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_SATURATED
008073771-09	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_POS_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.

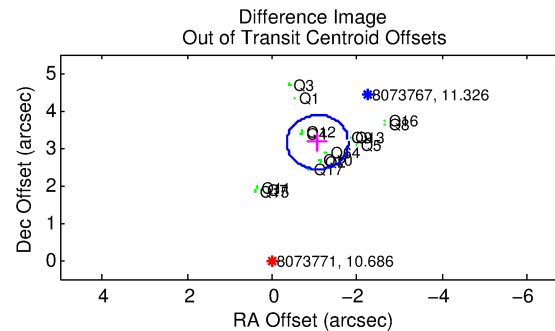
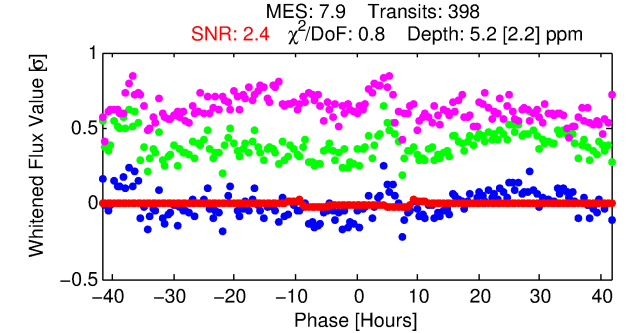
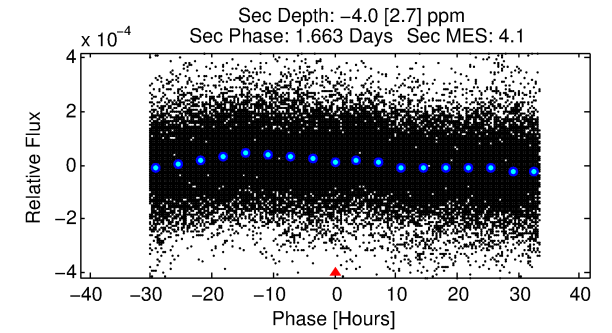
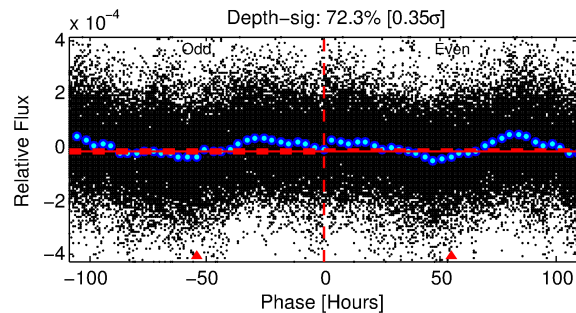
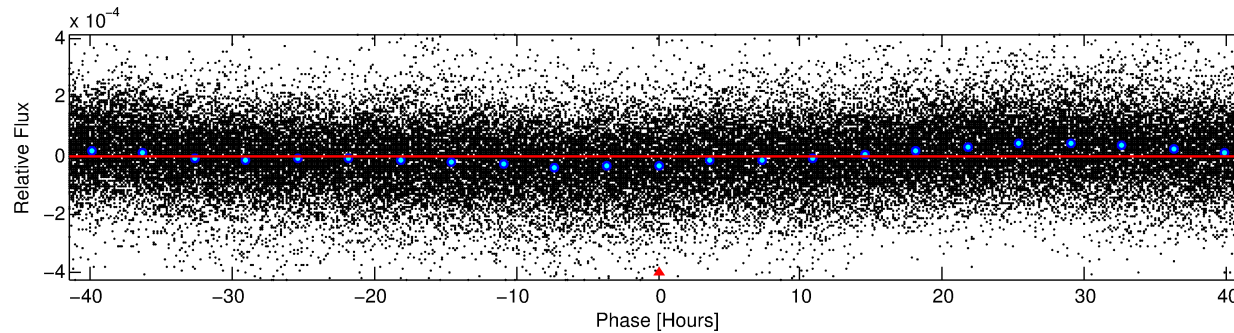
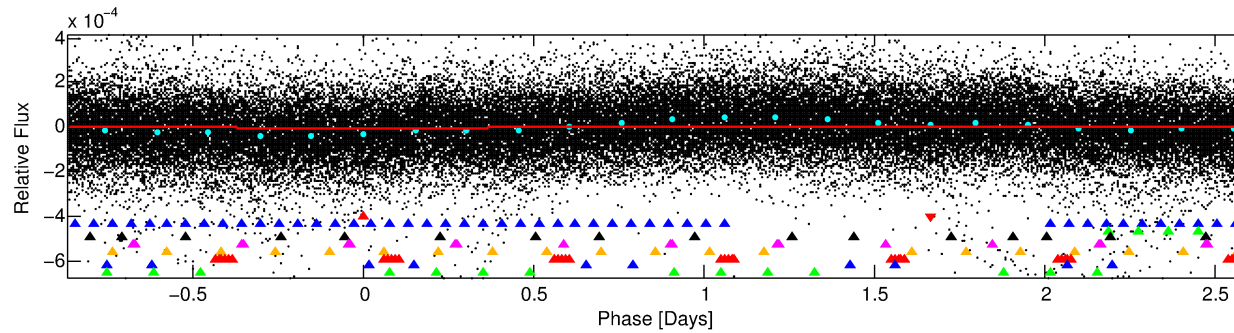
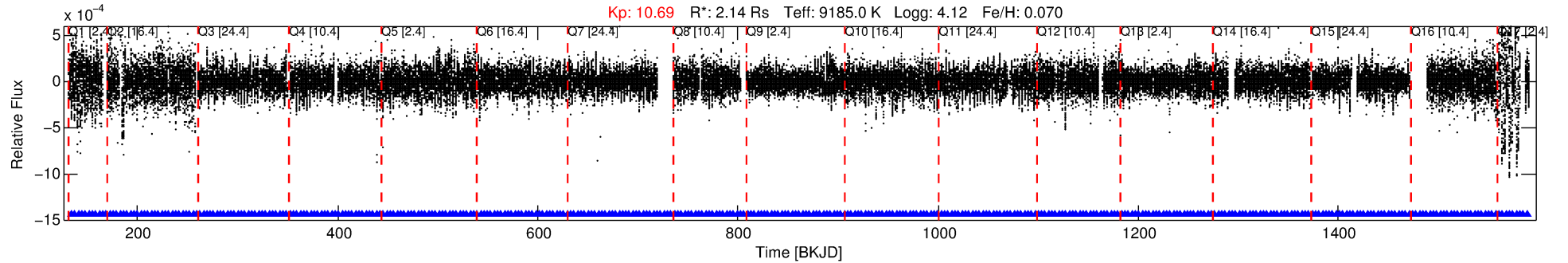
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 008073771-01

No Significant Match Found

# DV One-Page Summary

KIC: 8073771 Candidate: 1 of 9 Period: 3.462 d



## DV Fit Results:

Period = 3.46171 [0.00011] d  
Epoch = 134.4224 [0.0186] BKJD  
Rp/R\* = 0.0024 [0.0007]  
a/R\* = 1.14 [0.37]  
b = 0.90 [0.31]  
Seff = 8614.39 [4183.78]  
Teq = 2457 [298] K  
Rp = 0.56 [0.28] Re  
a = 0.0581 [0.0192] AU  
Ag = N/A  
Teffp = N/A

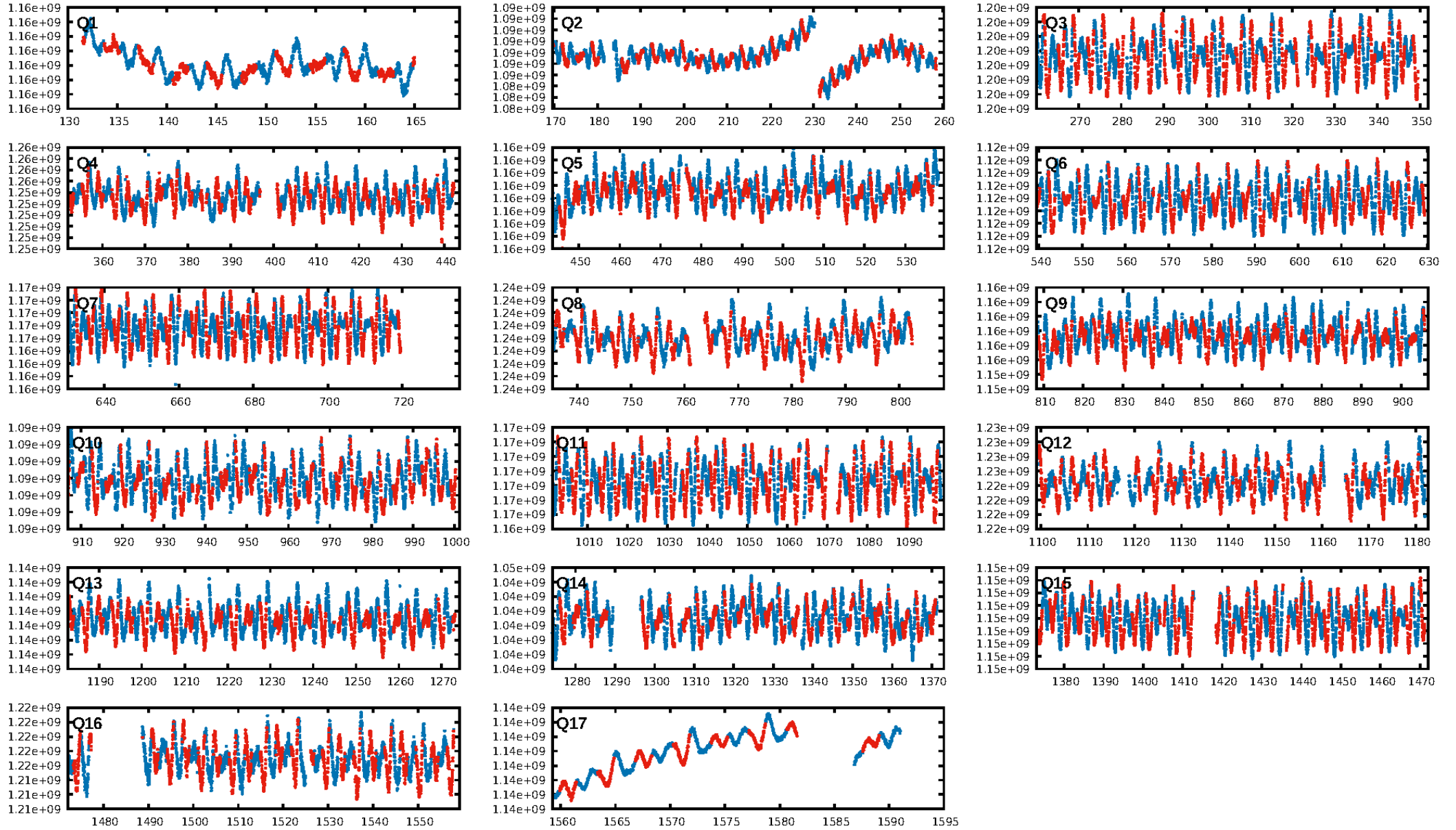
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [23.17 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 3.28e-09  
RollingBand-fgt: 1.00 [381/381]  
GhostDiagnostic-chr: N/A  
Centroid-sig: 0.0%  
Centroid-so: 17.359 arcsec [5.14 $\sigma$ ]  
OotOffset-rm: 3.328 arcsec [13.74 $\sigma$ ]  
KicOffset-rm: 5.198 arcsec [38.94 $\sigma$ ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 1.00 [17/17]  
DiffImageOverlap-fno: 1.00 [17/17]

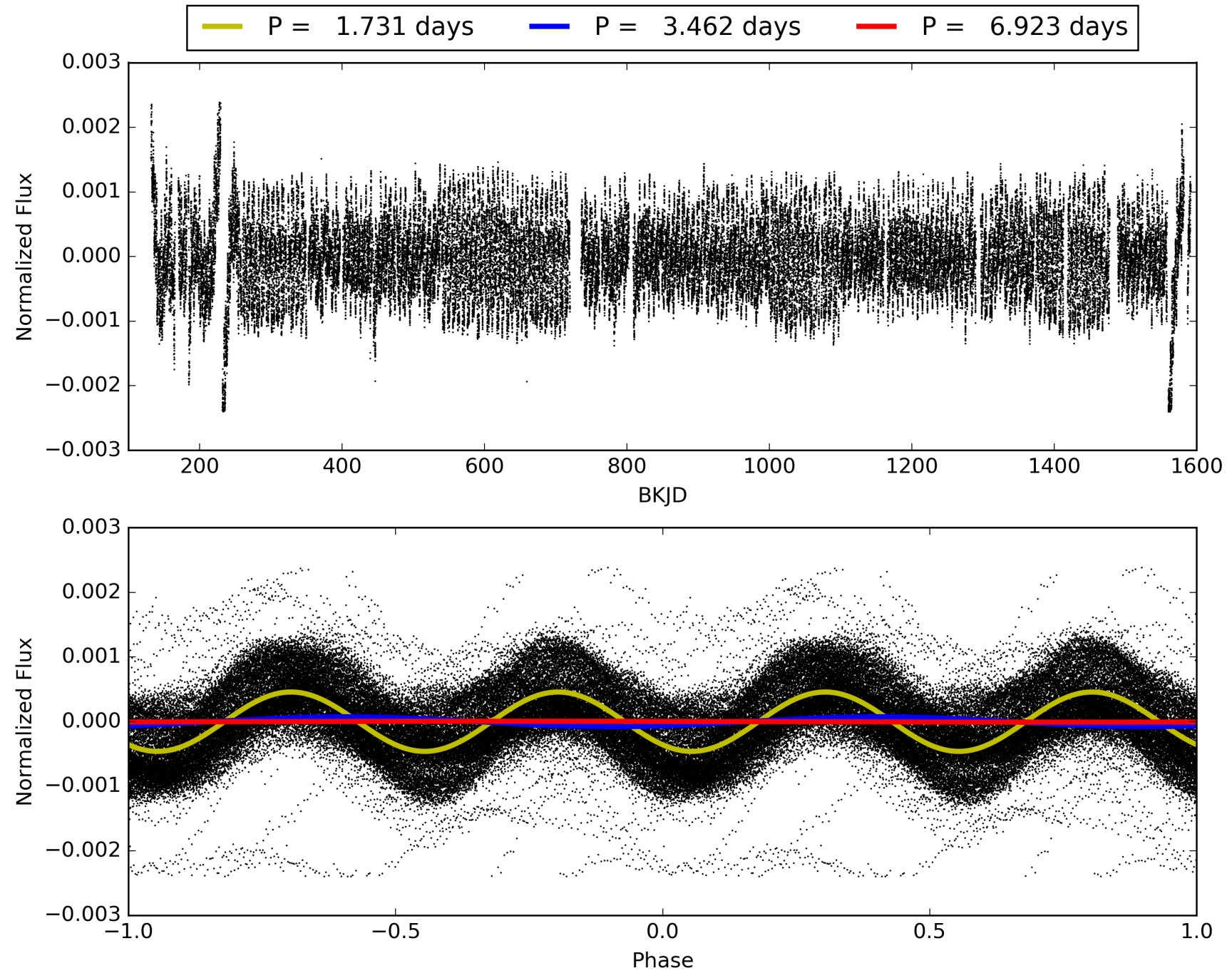
Software Revision: svn-ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 02-Feb-2016 15:03:06 Z

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

# TCE 008073771-01, PDC Light Curves



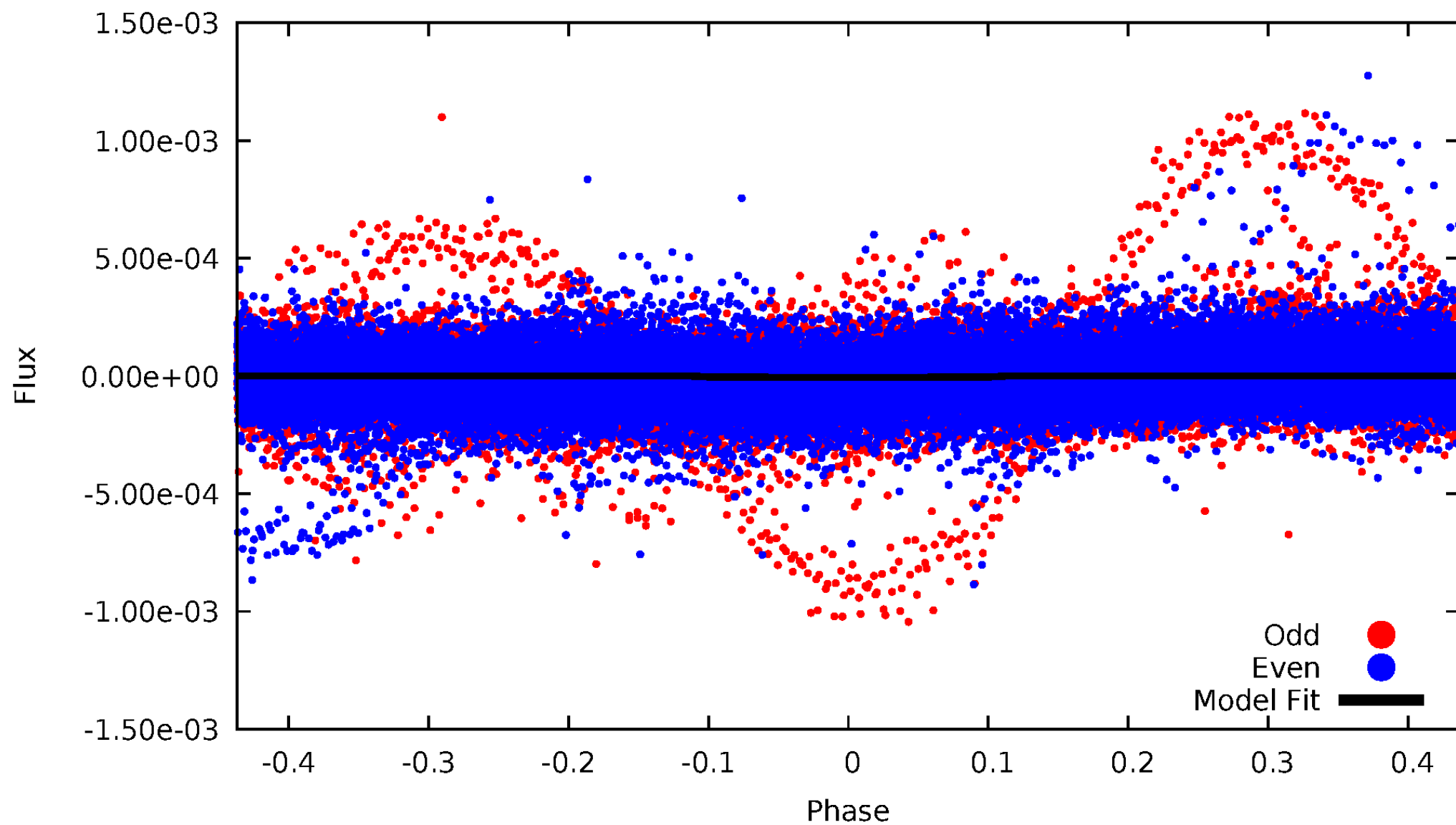
TCE 008073771-01





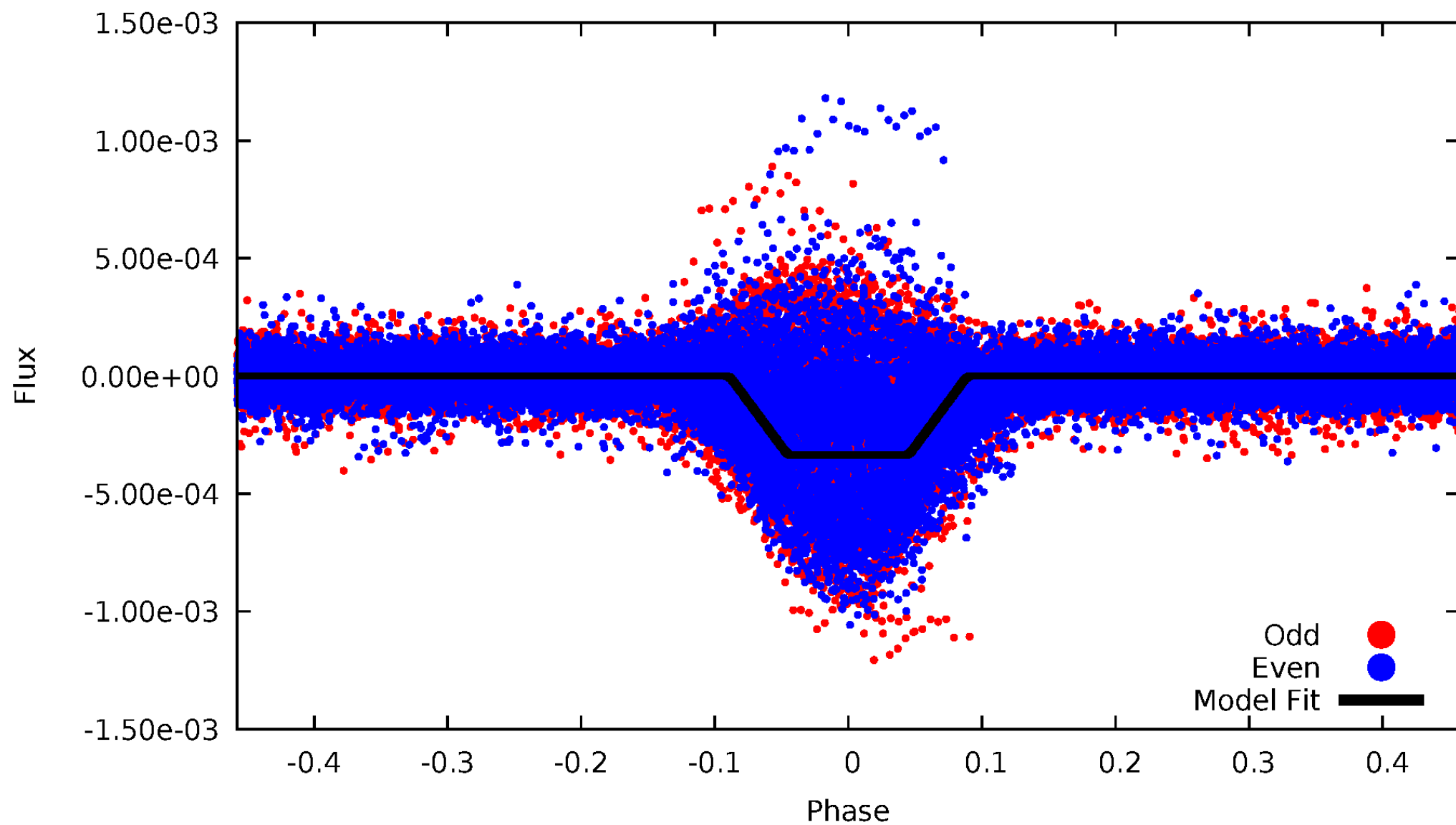
# DV Odd/Even

TCE 008073771-01



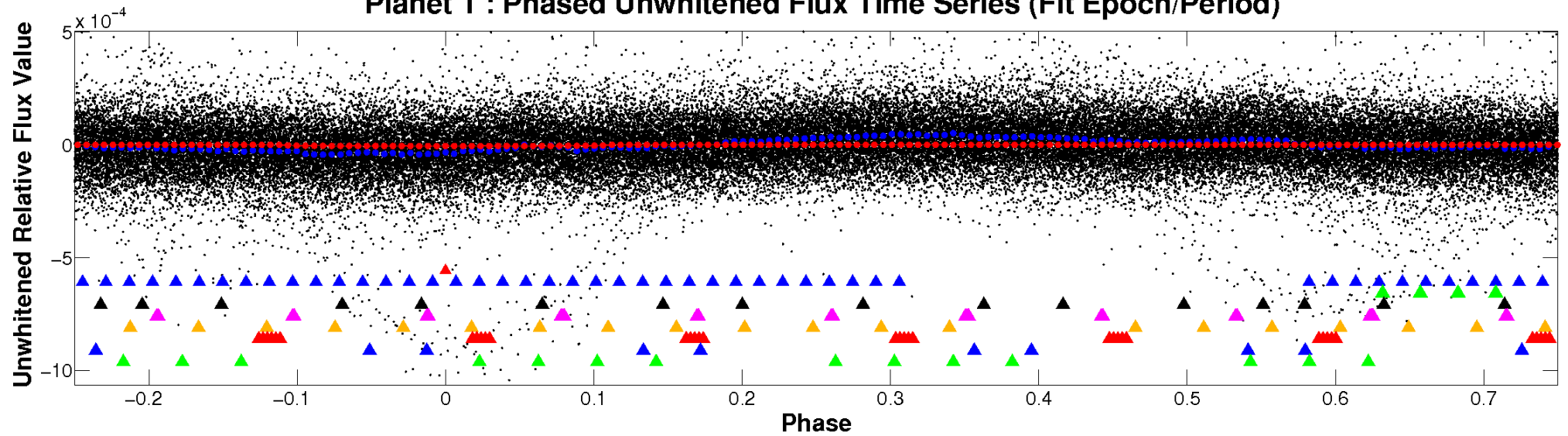
# ALT Odd/Even

TCE 008073771-01

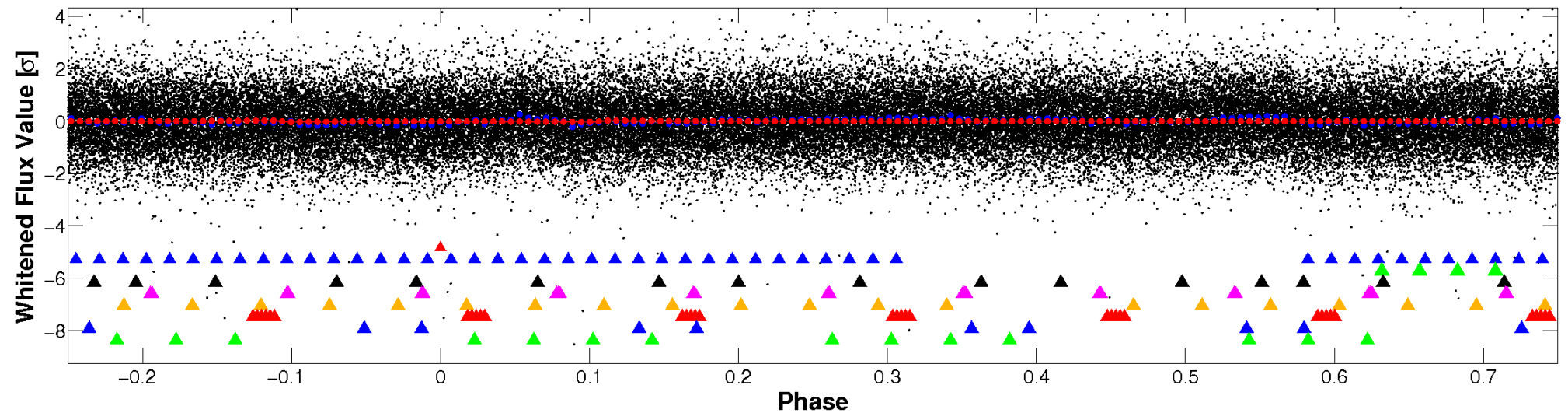


# Non-Whitened Vs. Whitened Light Curve

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

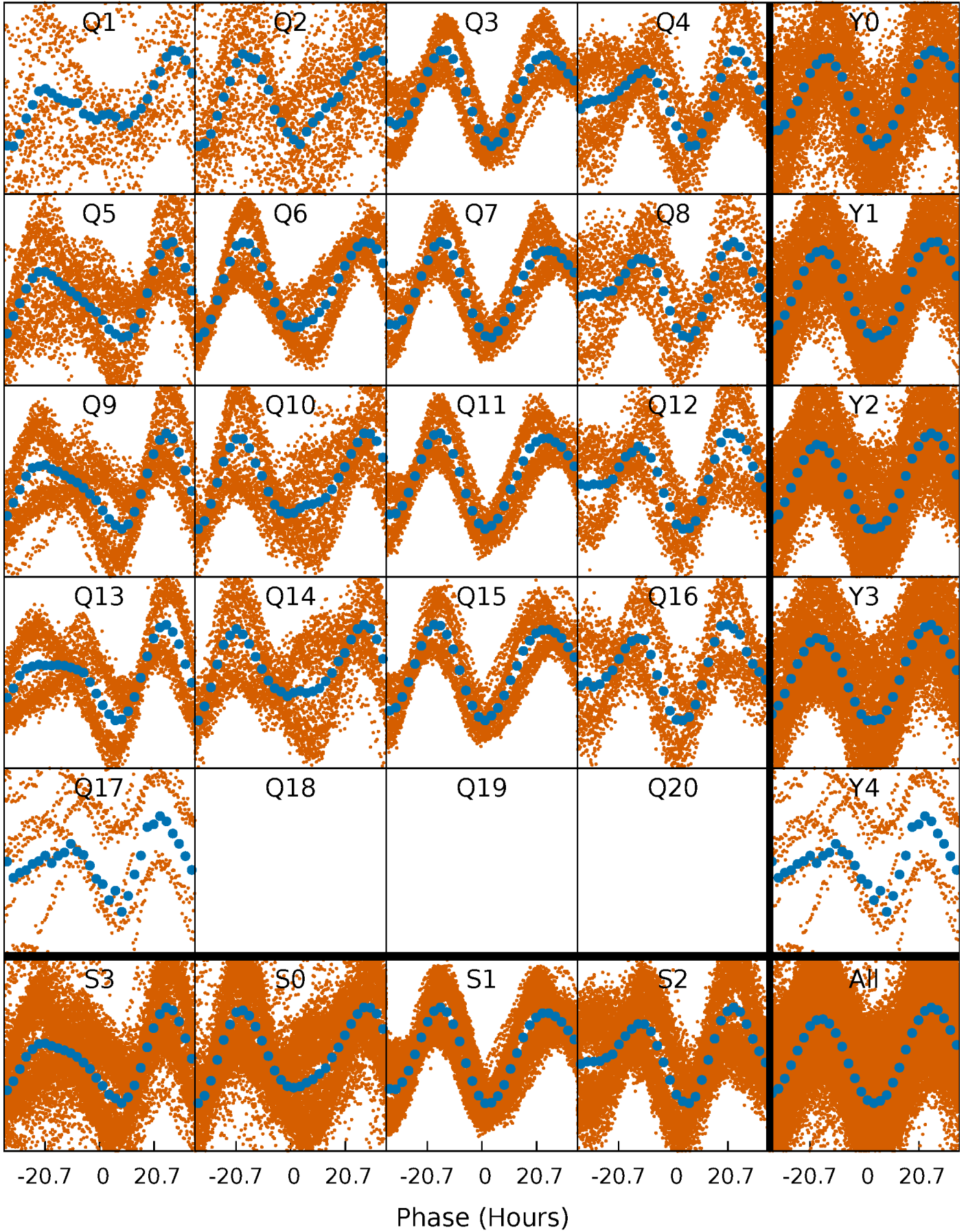


**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

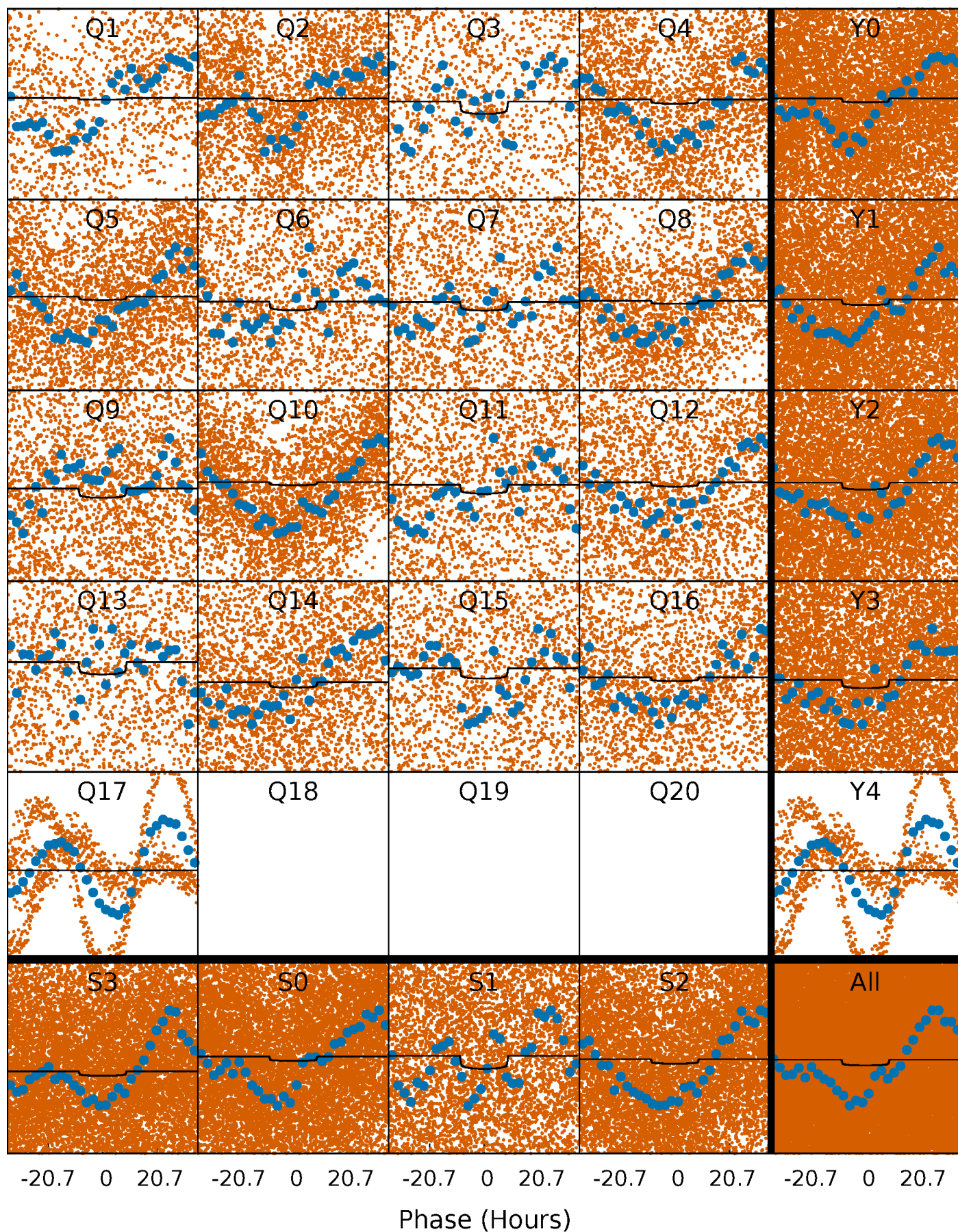
TCE 008073771-01 P= 3.461710 Days  $T_0=134.422413$  (BKJD)





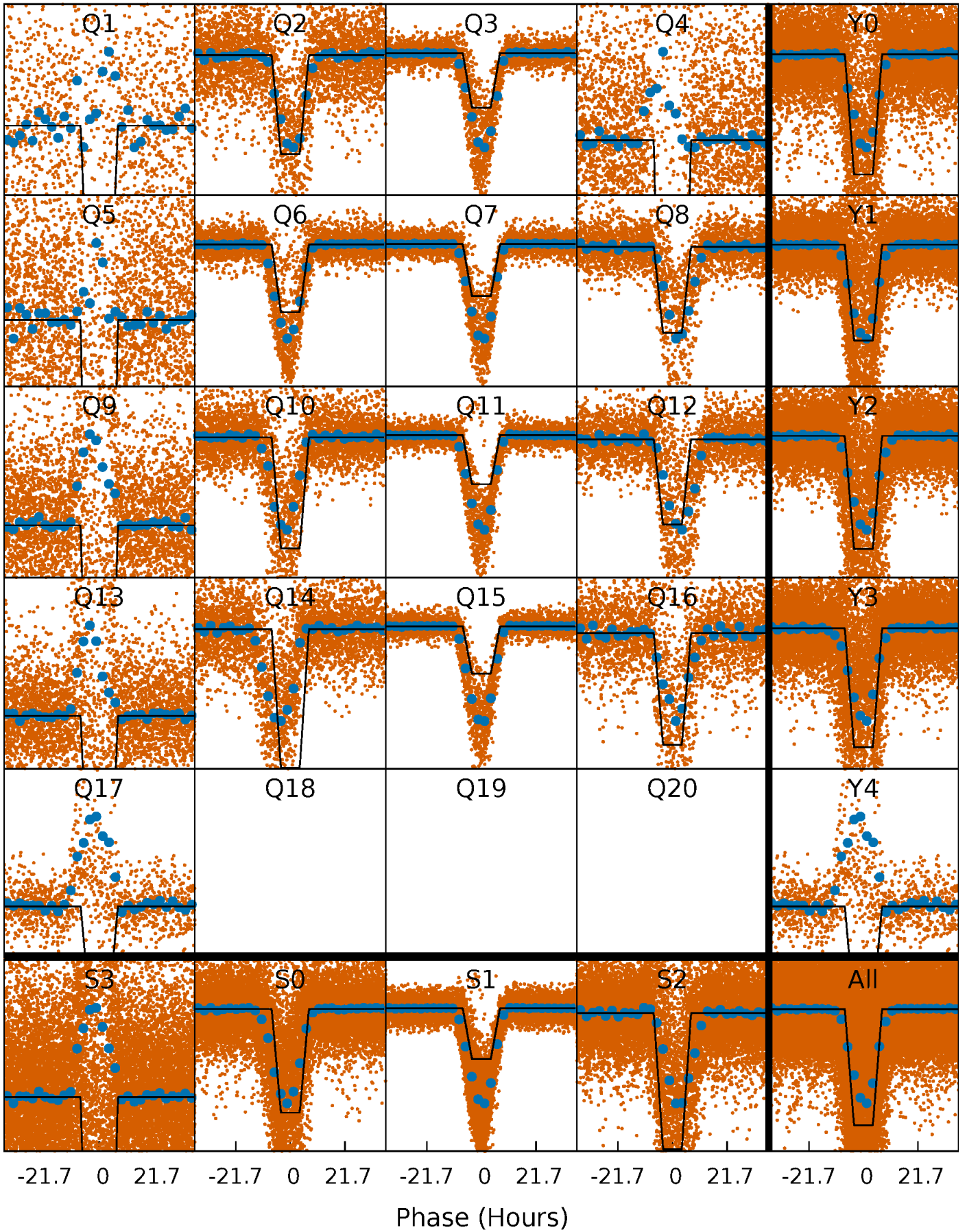
# DV Quarter-Phased Transit Curves

TCE 008073771-01 P= 3.461710 Days  $T_0=134.422413$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

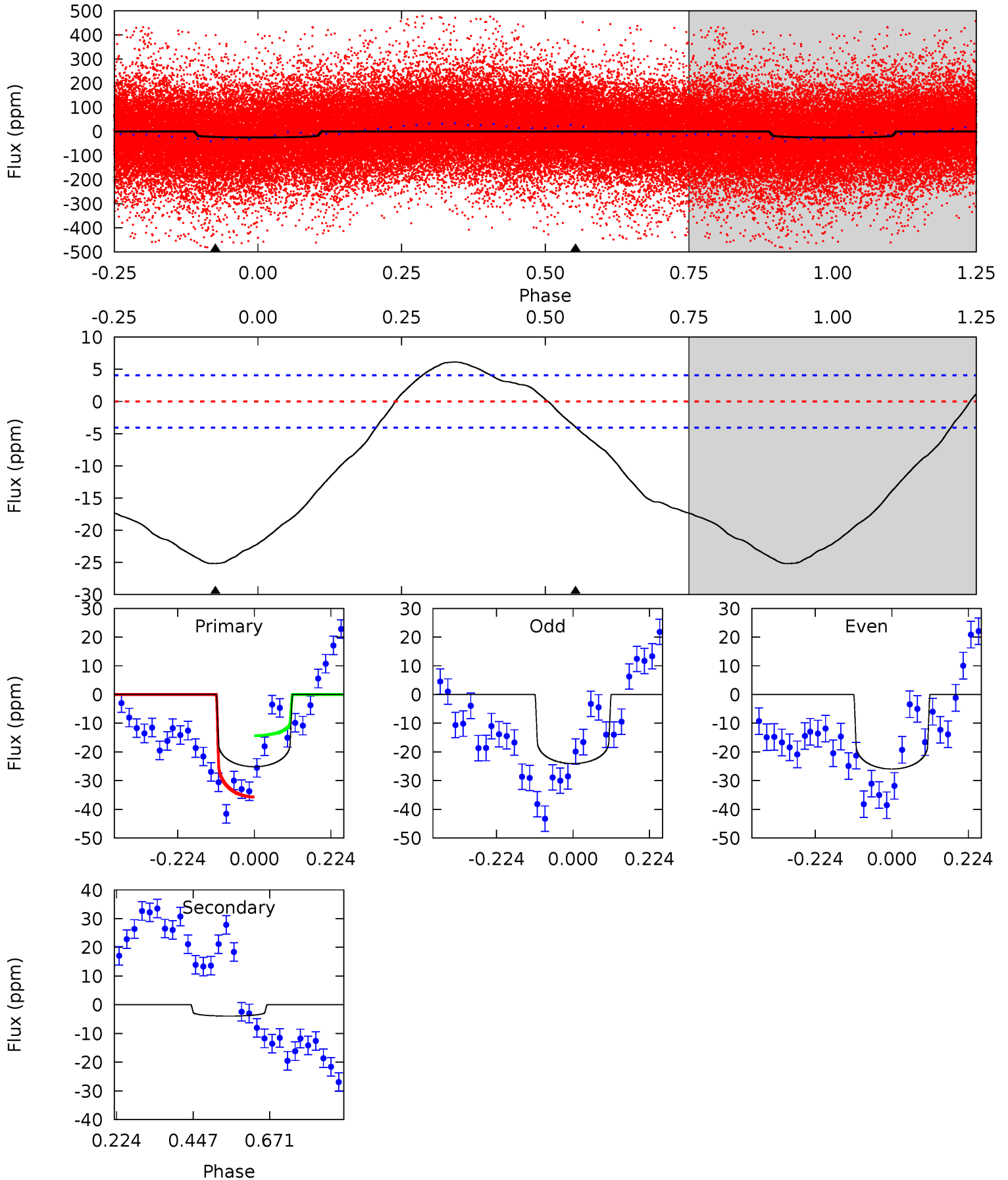
TCE 008073771-01 P= 3.461512 Days  $T_0=134.422984$  (BKJD)



# DV Model-Shift Uniqueness Test

008073771-01, P = 3.461710 Days, E = 130.960703 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
27.2	4.27	0	0	4.39	1.22	5.41	27.2	27.2	4.27	4.27	1.03	1.41	0.20	11.6

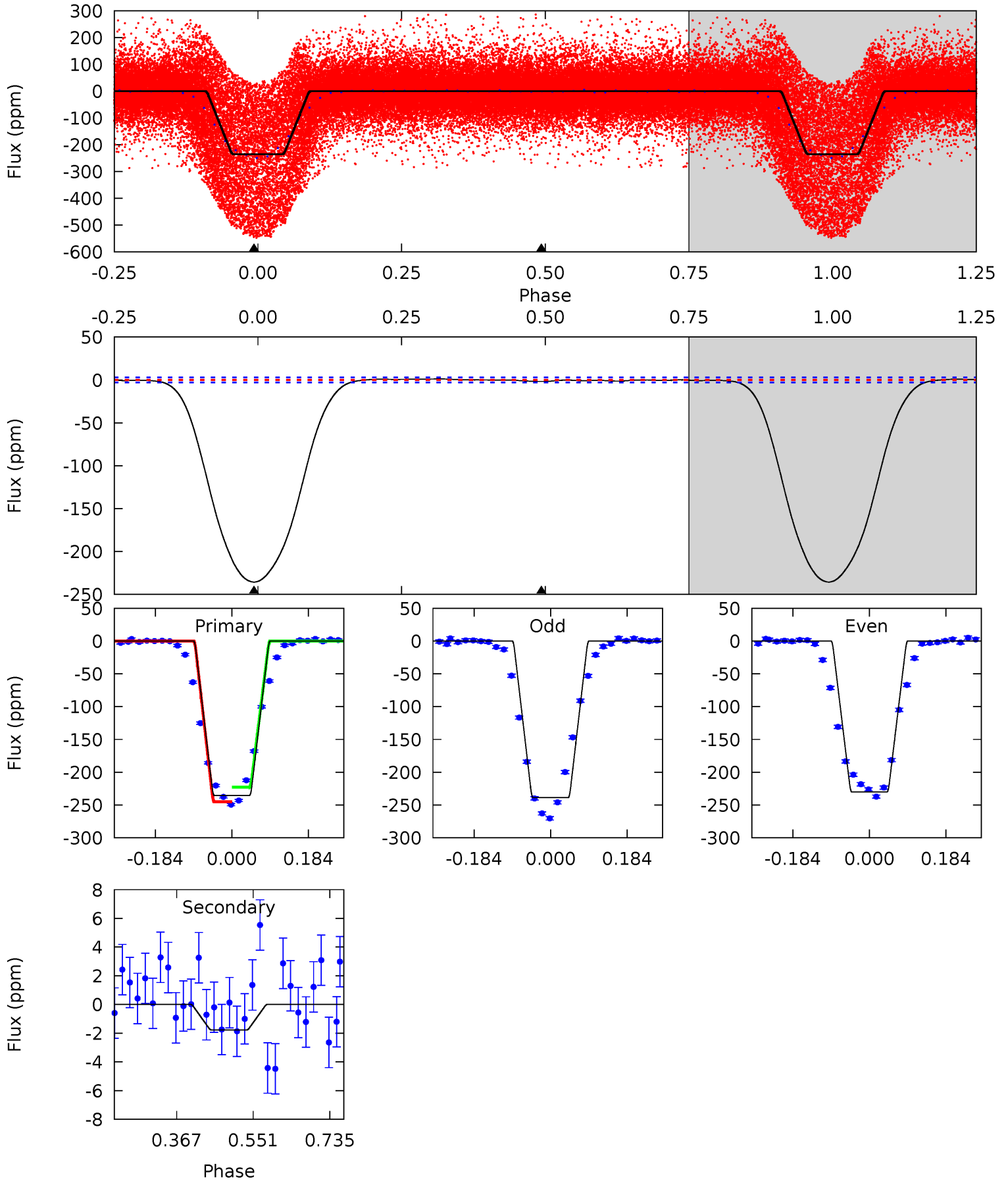




# Alt Model-Shift Uniqueness Test

008073771-01, P = 3.461512 Days, E = 130.961472 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
347.3	2.61	0	0	4.44	1.33	0.91	347.3	347.3	2.61	2.61	6.20	1.01	0.00	0





### Stellar Parameters For KIC 008073771

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$9185^{+257}_{-417}$	$4.118^{+0.099}_{-0.231}$	$0.070^{+0.150}_{-0.650}$	$2.136^{+0.890}_{-0.445}$	$2.180^{+0.427}_{-0.522}$	$0.315^{+0.177}_{-0.176}$
	+3%/-5%	+2%/-6%	+214%/-929%	+42%/-21%	+20%/-24%	+56%/-56%
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 008073771-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-4 \pm 1$	$0.60^{+0.21}_{-0.19}$	$3489^{+316}_{-229}$	$7809^{+2151}_{-1083}$	$19^{+22}_{-9}$
Alt.	$-2 \pm 1$	$4.39^{+0.89}_{-0.59}$	$3491^{+295}_{-231}$	$-2937^{+384}_{-269}$	$0.154^{+0.090}_{-0.068}$

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

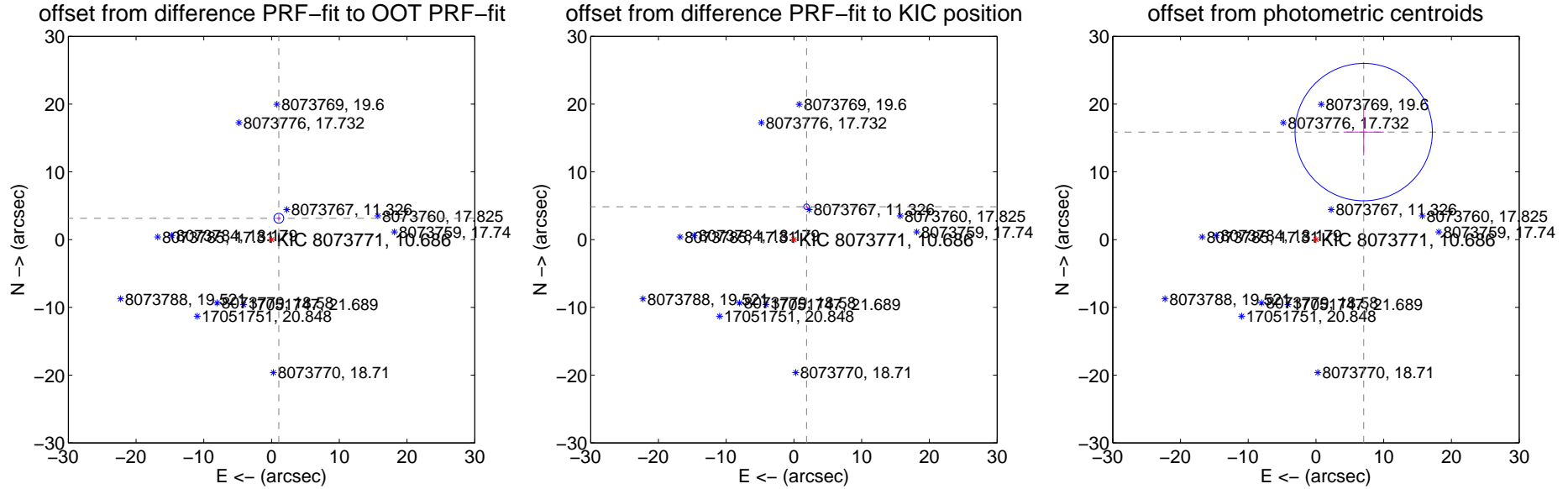
## DV Centroid Data

Supplemental centroid analysis for 008073771-01. **Kepler magnitude: 10.69.** Transit SNR 2.39

There are 17 quarters with good PRF difference image offsets

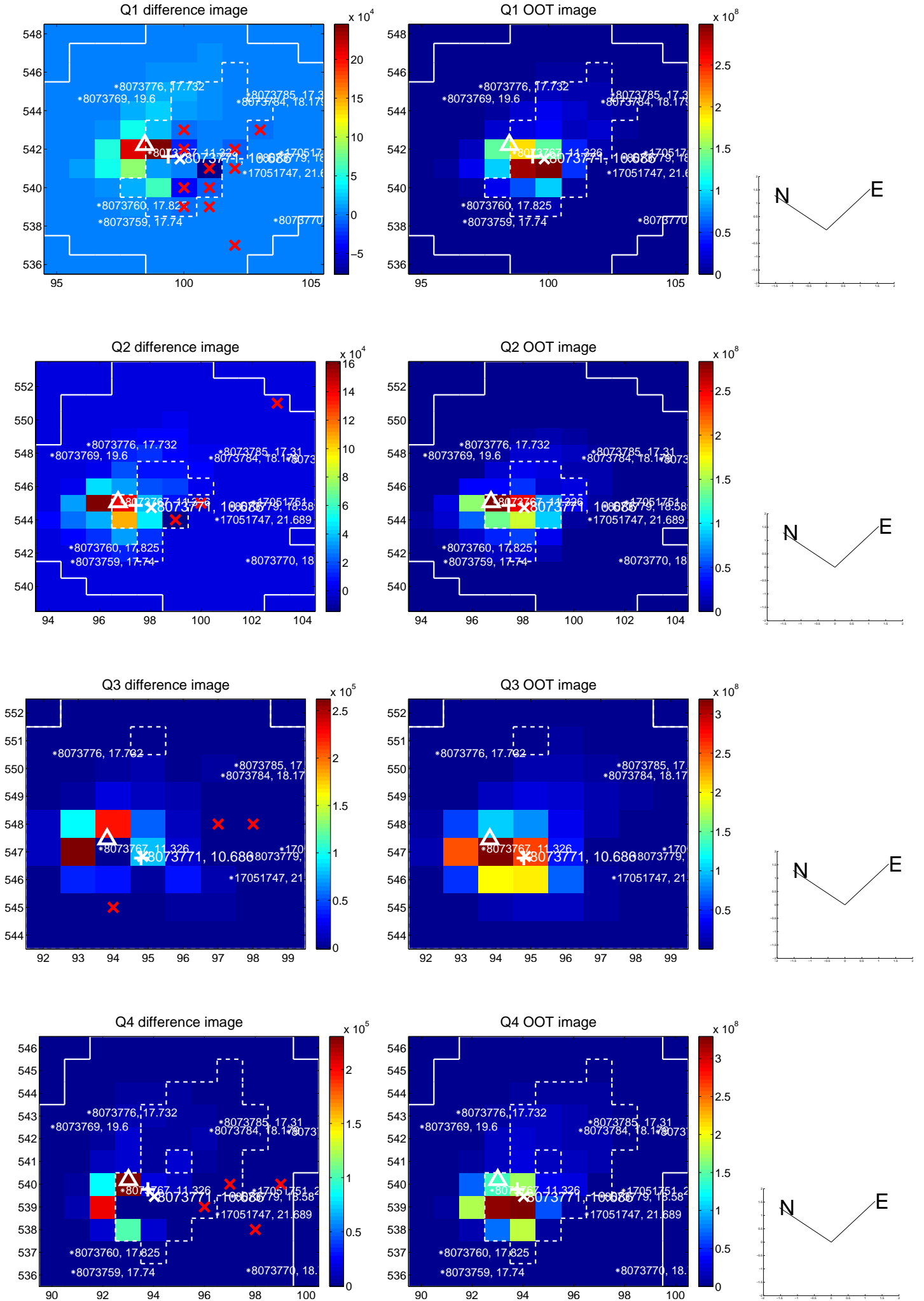
The direct PRF centroid is offset from the target star catalog position by about 1.80 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	<b>3.328 <math>\pm</math> 0.242</b>	<b>13.74</b>	-1.072 $\pm$ 0.235	3.151 $\pm$ 0.214
PRF-fit source offset from KIC position	<b>5.198 <math>\pm</math> 0.133</b>	<b>38.94</b>	-1.861 $\pm$ 0.209	4.853 $\pm$ 0.112
photometric centroid source offset	<b>17.36 <math>\pm</math> 3.38</b>	<b>5.14</b>	-7.05 $\pm$ 2.97	15.86 $\pm$ 3.45

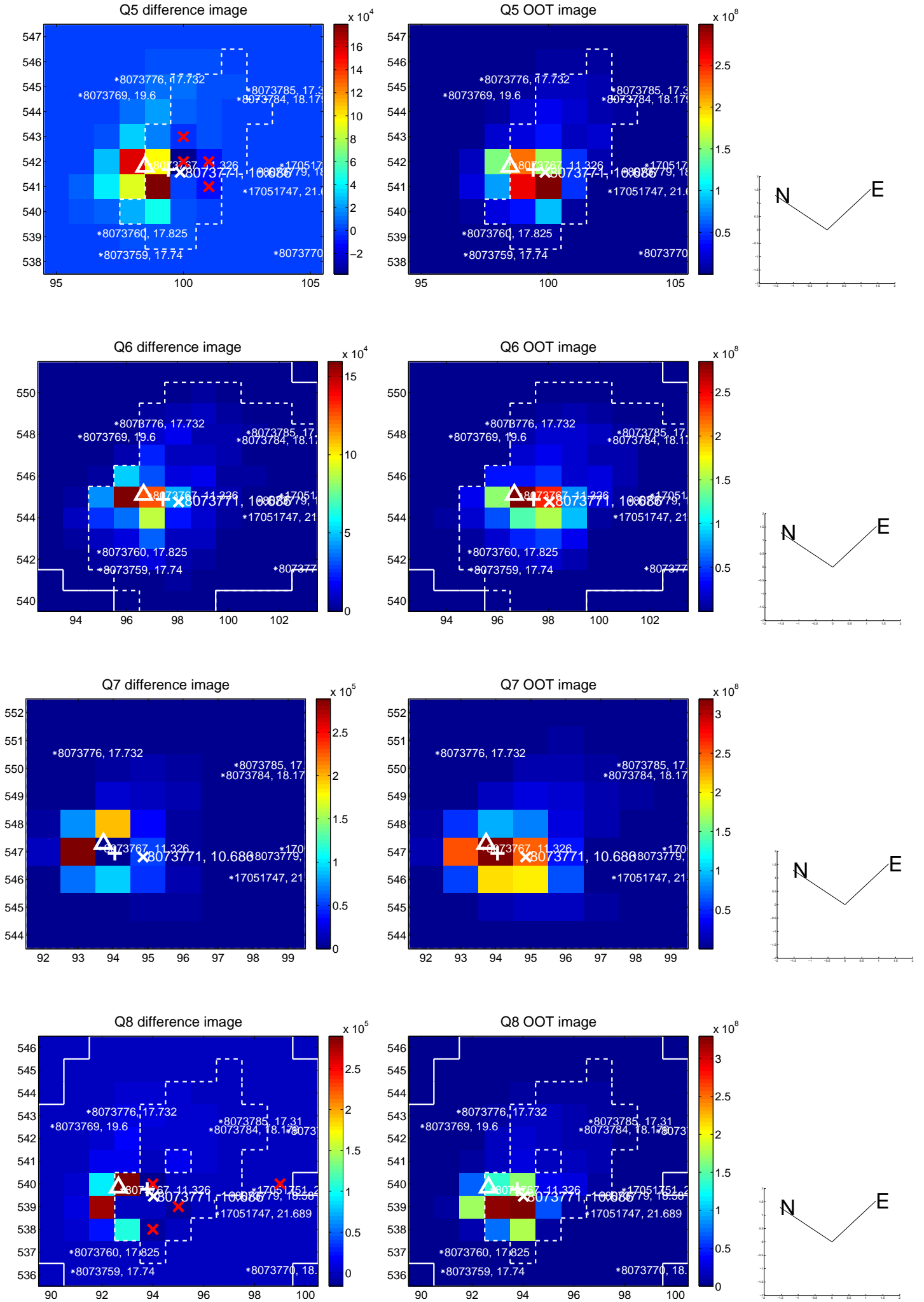


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

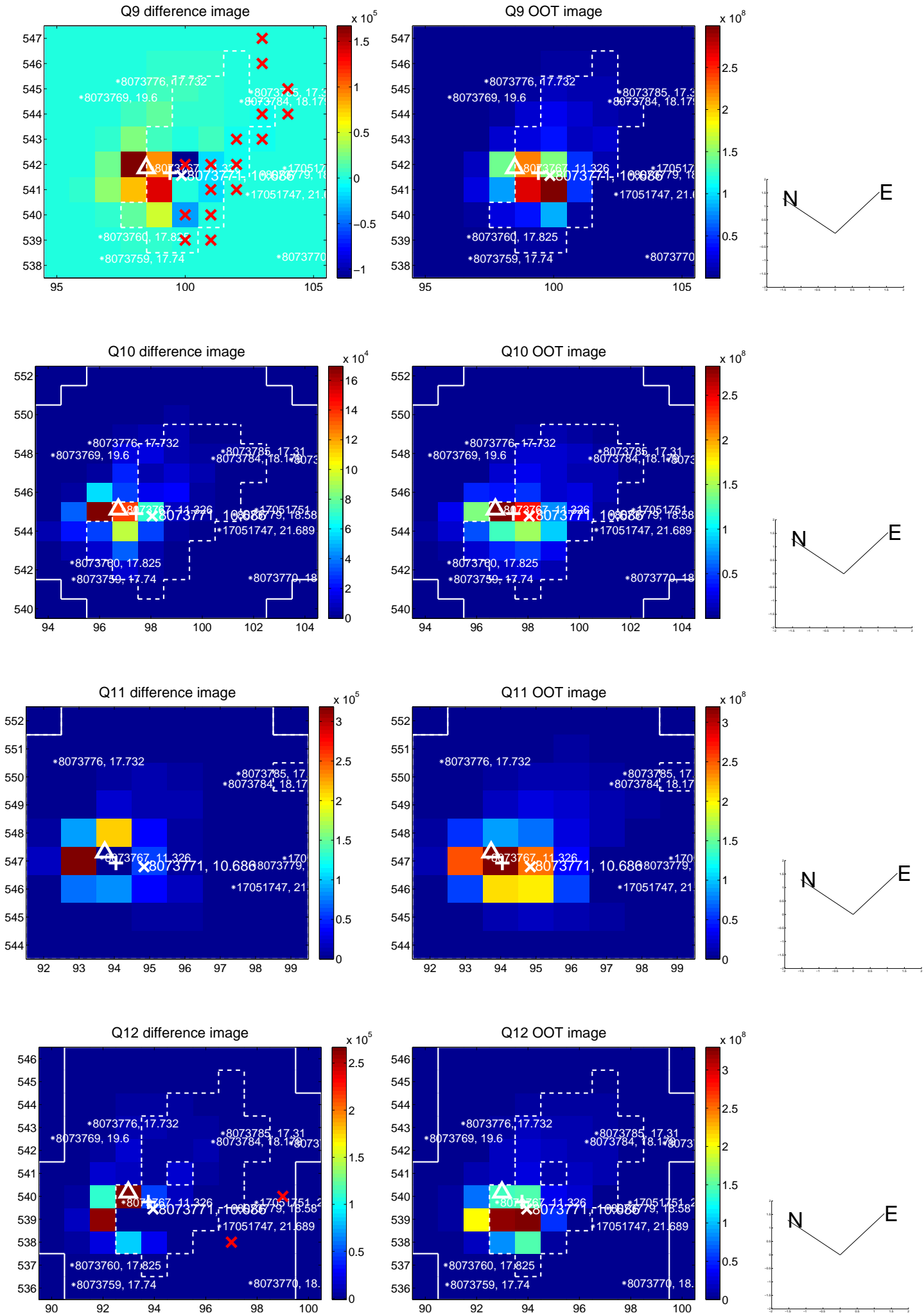


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

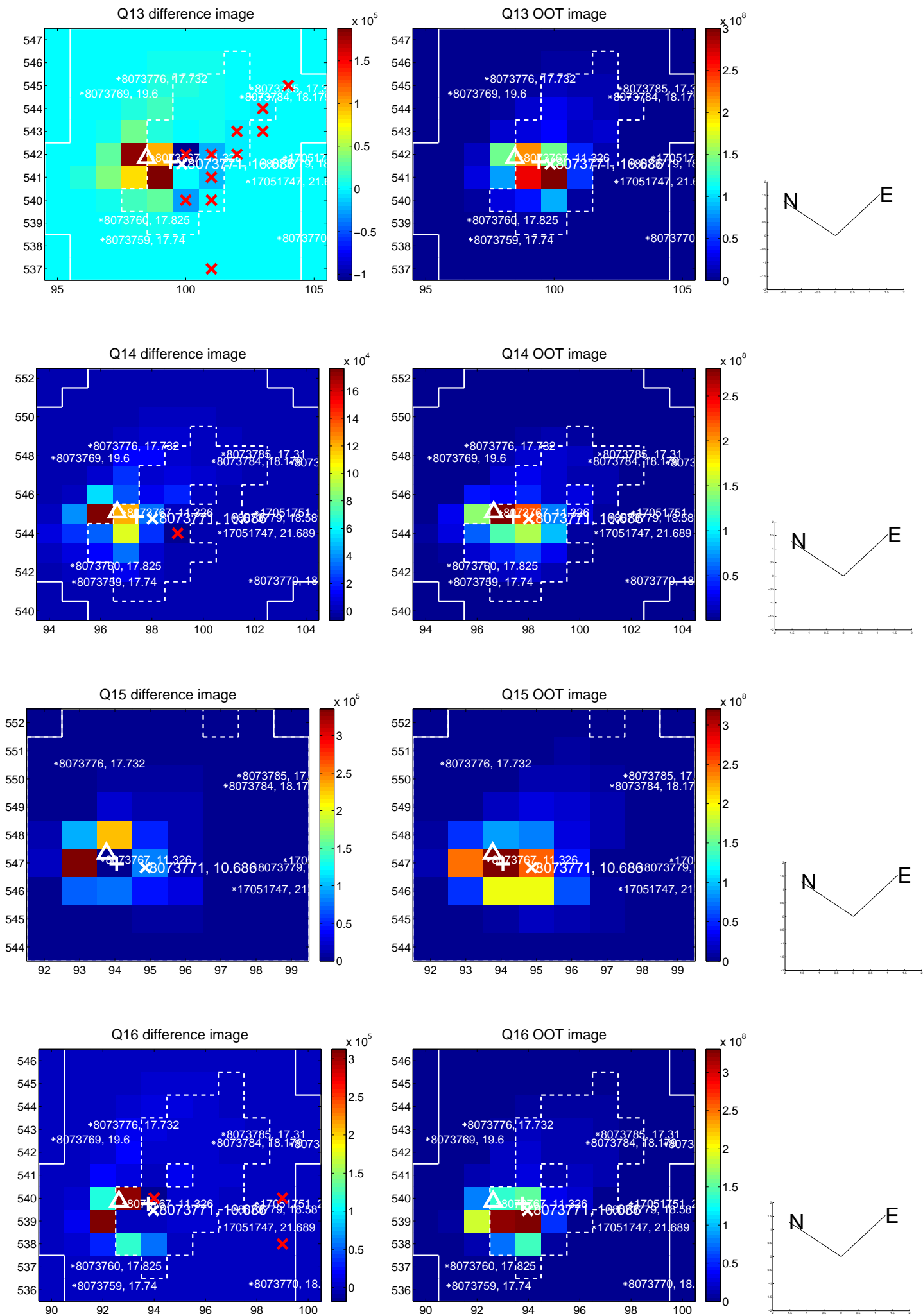




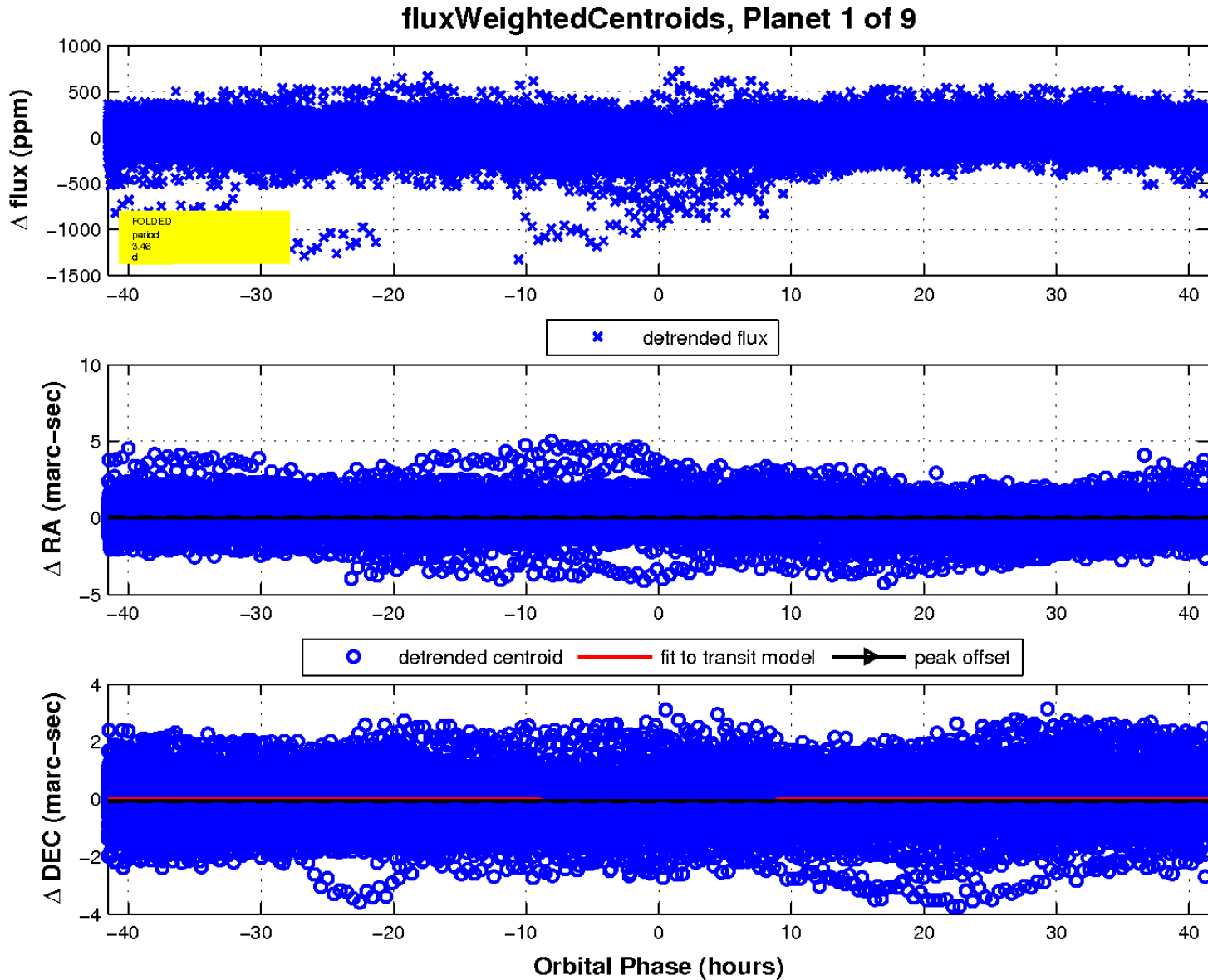
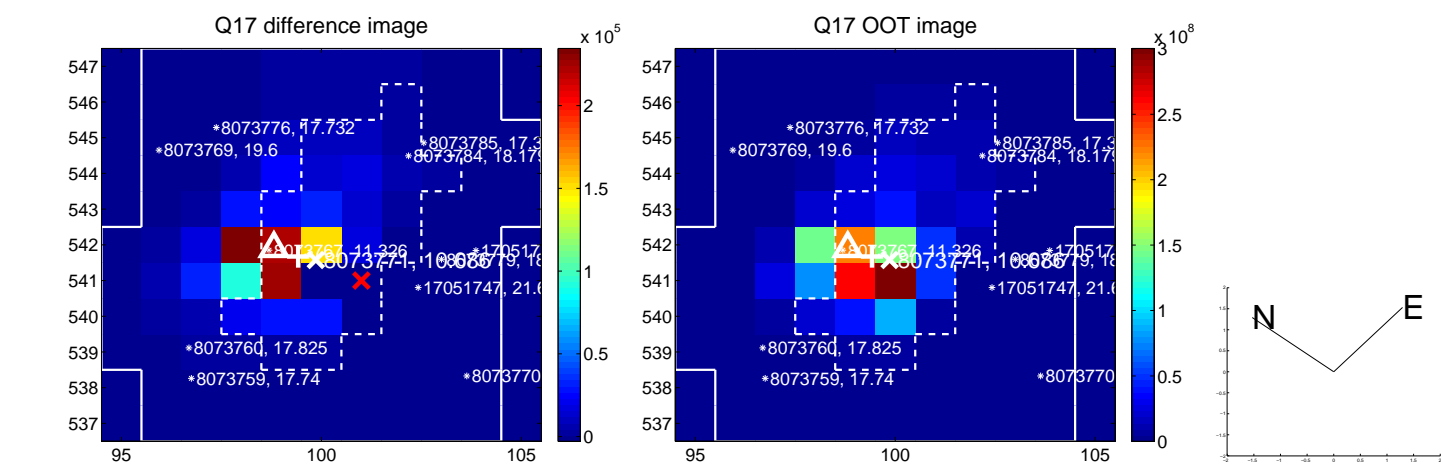
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

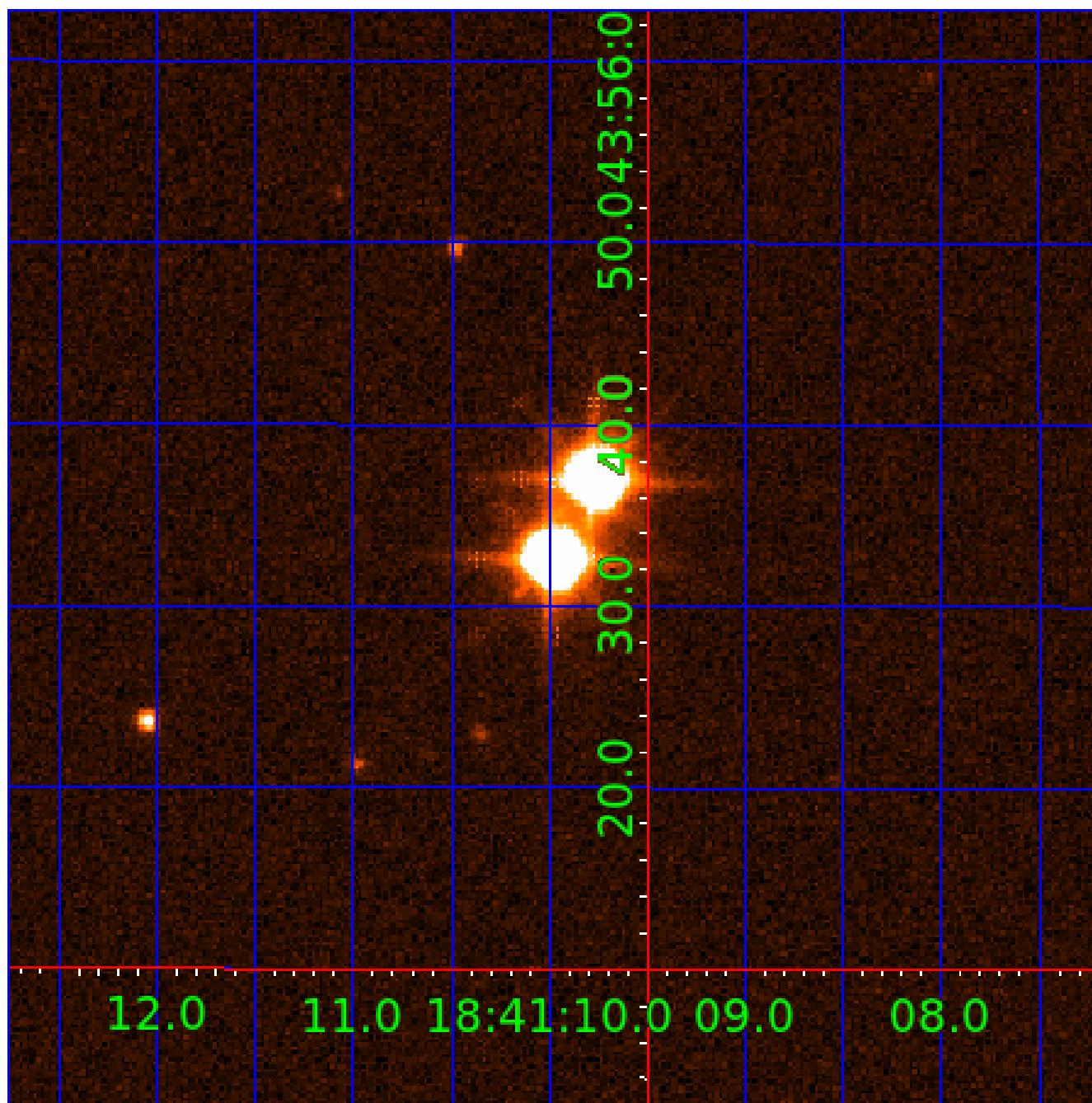


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 008073771

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
008073771-01	OBS	No	3.461710	134.422413	5.2	18.139	7.9	2.4	2.14	9185	0.56	8614.39
008073771-02	OBS	No	31.209849	153.746649	179.4	22.300	13.8	10.3	2.14	9185	4.83	459.08
008073771-03	OBS	No	398.184598	188.535331	291.9	21.908	9.7	10.3	2.14	9185	5.43	15.40
008073771-04	OBS	No	90.753169	215.949998	156.2	8.002	9.1	9.3	2.14	9185	3.30	110.61
008073771-05	OBS	No	57.905298	171.196957	88.4	16.784	8.8	7.8	2.14	9185	2.12	201.37
008073771-07	OBS	No	40.552881	147.833476	109.0	2.637	8.0	6.9	2.14	9185	2.65	323.78
008073771-08	OBS	No	143.980457	198.100793	110.6	3.000	8.3	-1.0	2.14	9185	2.30	59.78
008073771-09	OBS	No	106.481950	176.873243	121.2	14.100	7.8	7.8	2.14	9185	2.52	89.38

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008073771-01	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—CENT_SATURATED
008073771-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_DV—CENT_SATURATED
008073771-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—CENT_SATURATED
008073771-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—CENT_SATURATED
008073771-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_SATURATED
008073771-07	OBS	FP	0.00	1	0	0	0	TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_SATURATED
008073771-08	OBS	FP	0.00	1	0	0	0	TRANS_GAPPED—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_SATURATED
008073771-09	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_POS_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.

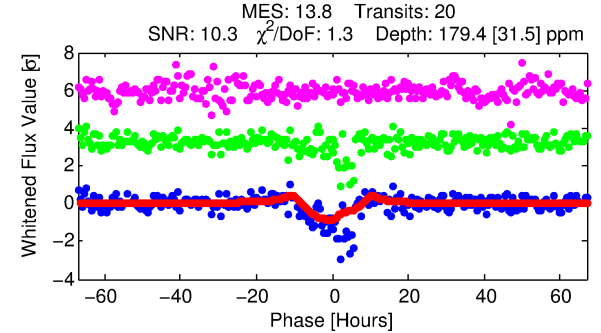
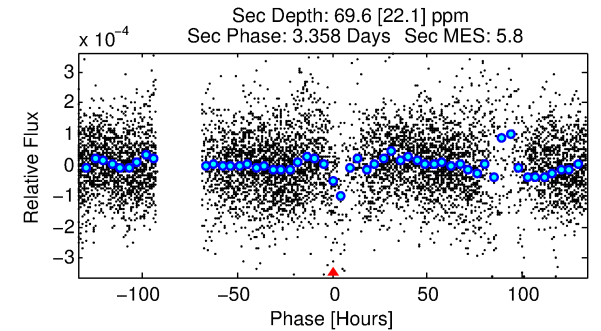
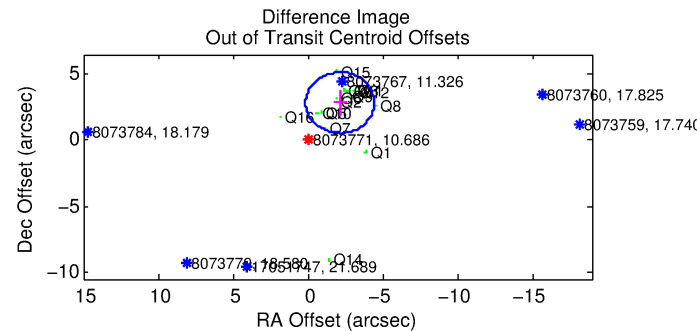
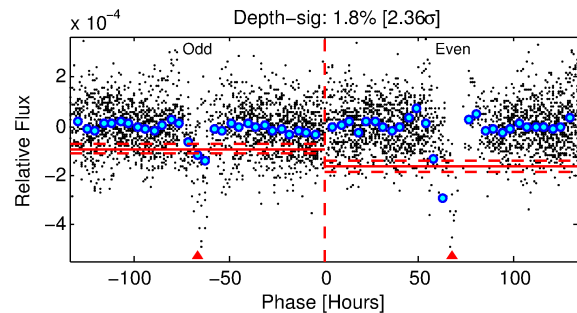
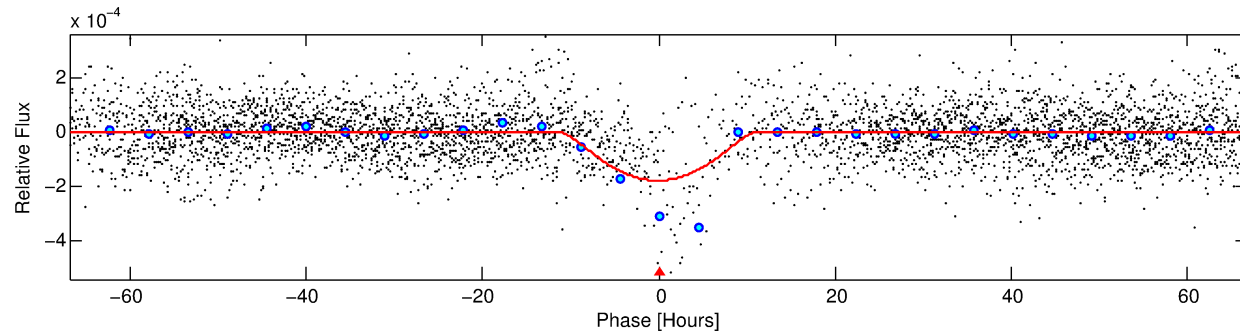
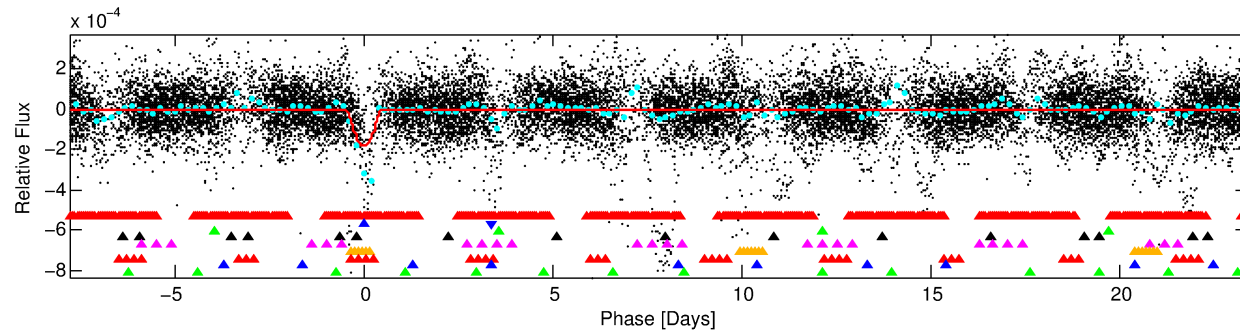
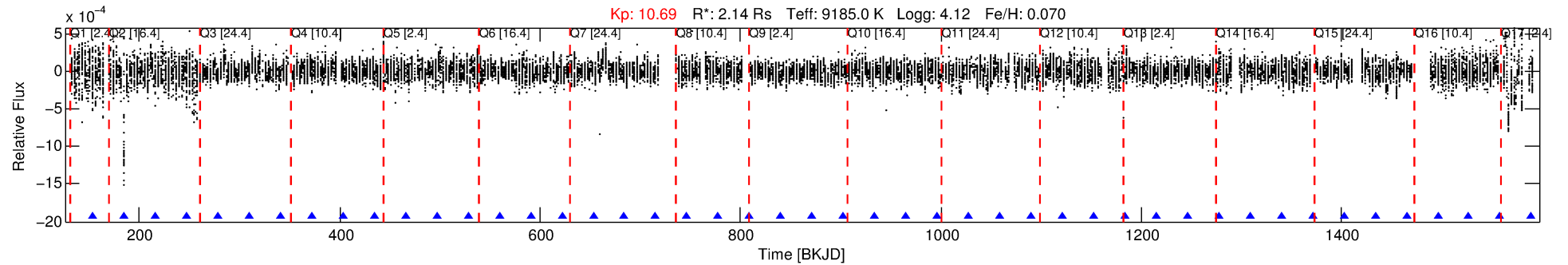
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 008073771-02

No Significant Match Found

# DV One-Page Summary

KIC: 8073771 Candidate: 2 of 9 Period: 31.210 d



## DV Fit Results:

Period = 31.20985 [0.00244] d  
Epoch = 153.7466 [0.0561] BKJD  
Rp/R\* = 0.0207 [0.0205]  
a/R\* = 2.58 [0.64]  
b = 1.00 [0.03]  
Seff = 459.08 [222.96]  
Teq = 1180 [143] K  
Rp = 4.83 [5.19] Re  
a = 0.2517 [0.0830] AU  
Ag = 104.03 [214.02] [0.48 $\sigma$ ]  
Teffp = 5828 [2937] K [1.58 $\sigma$ ]

## DV Diagnostic Results:

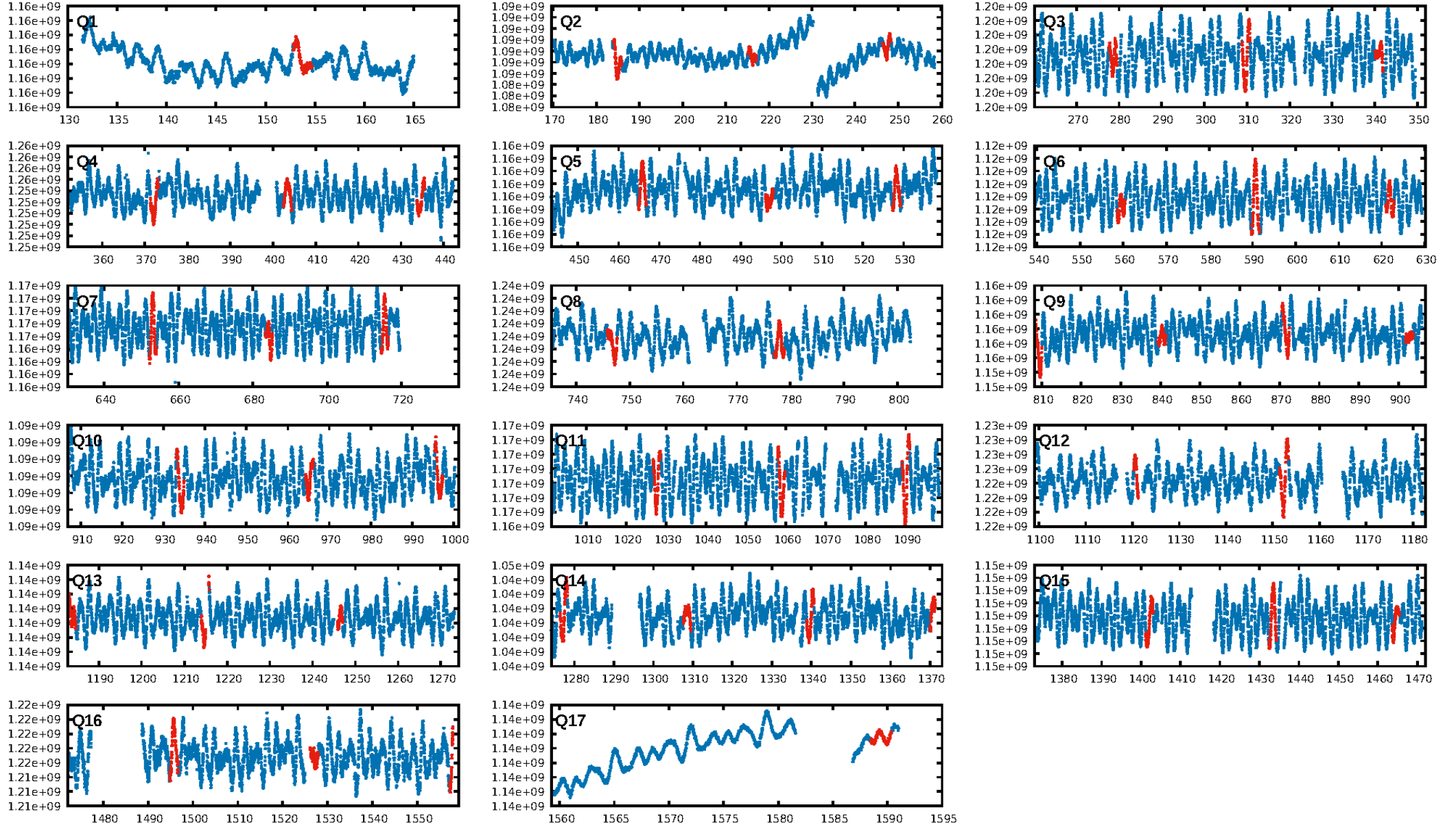
ShortPeriod-sig: 100.0% [23.17 $\sigma$ ]  
LongPeriod-sig: 100.0% [9.99 $\sigma$ ]  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 1.39e-18  
RollingBand-fgt: 1.00 [18/18]  
GhostDiagnostic-chr: N/A  
Centroid-sig: 0.0%  
Centroid-so: 3.421 arcsec [6.50 $\sigma$ ]  
OotOffset-rm: 3.558 arcsec [4.65 $\sigma$ ]  
KicOffset-rm: 5.130 arcsec [7.54 $\sigma$ ]  
OotOffset-st: 4/4/4/3 [15]  
KicOffset-st: 4/4/4/3 [15]  
DiffImageQuality-fgm: 0.33 [5/15]  
DiffImageOverlap-fno: 0.00 [0/16]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 02-Feb-2016 15:03:17 Z

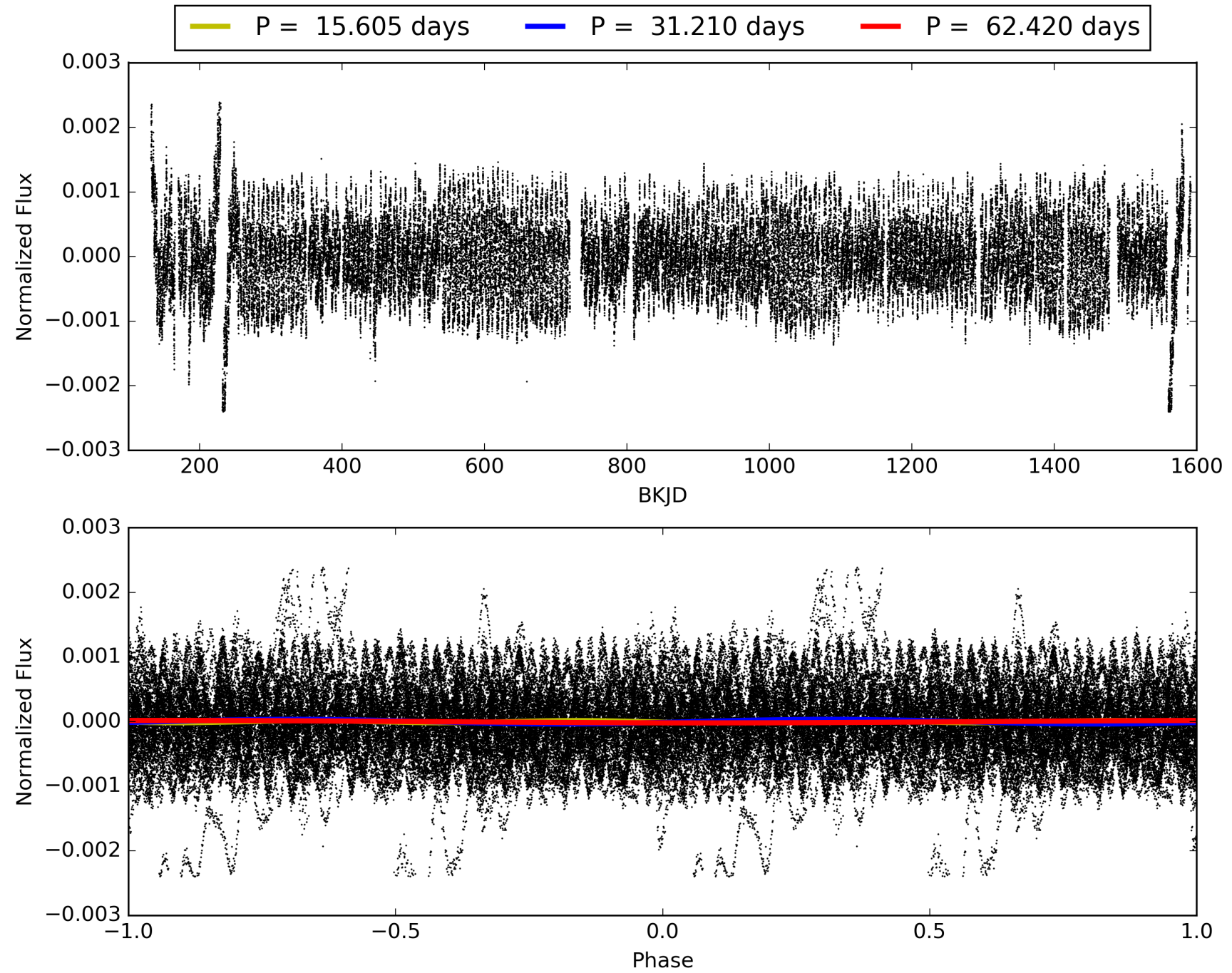
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center



# TCE 008073771-02, PDC Light Curves

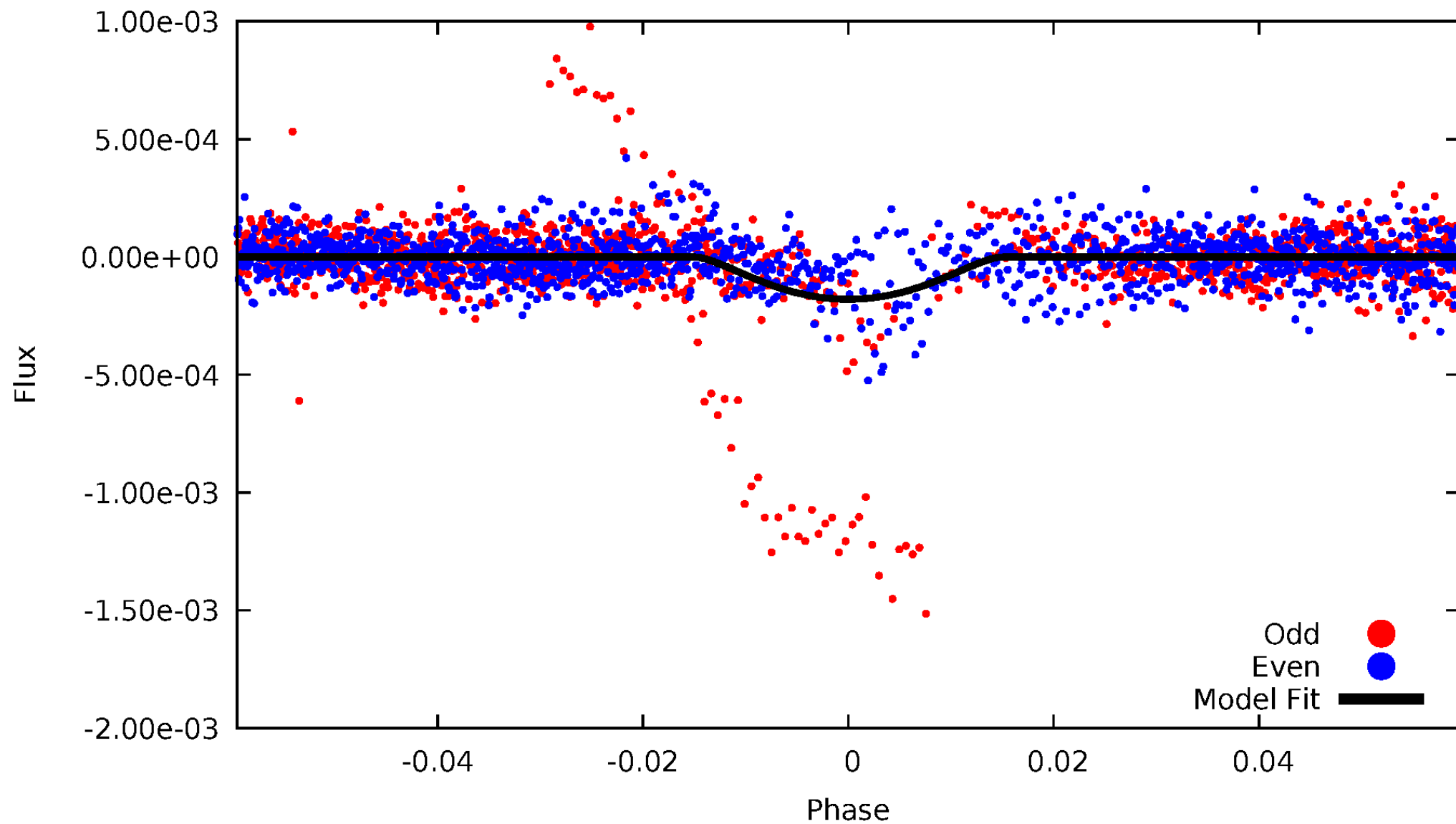


TCE 008073771-02



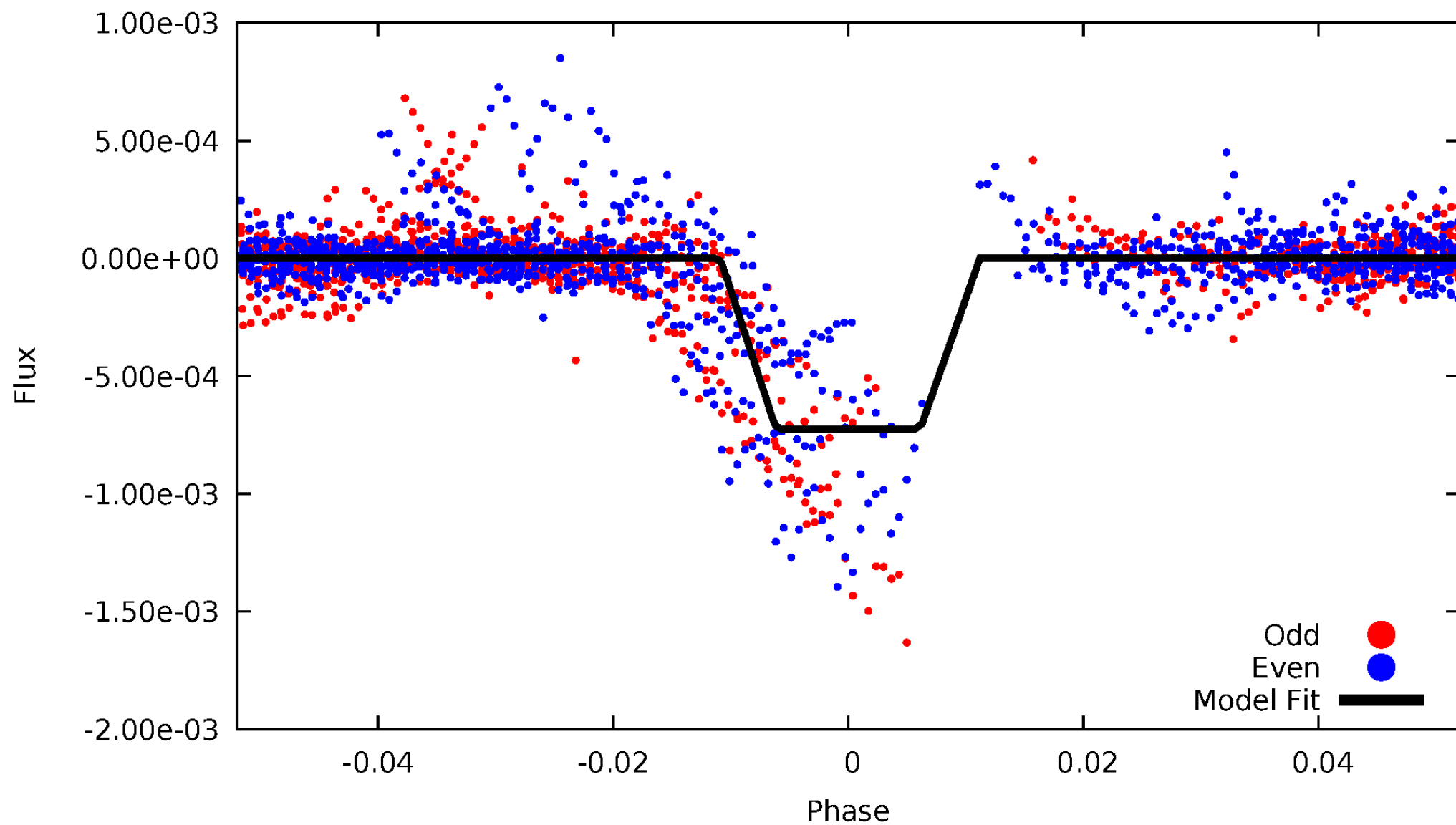
DV Odd/Even

TCE 008073771-02



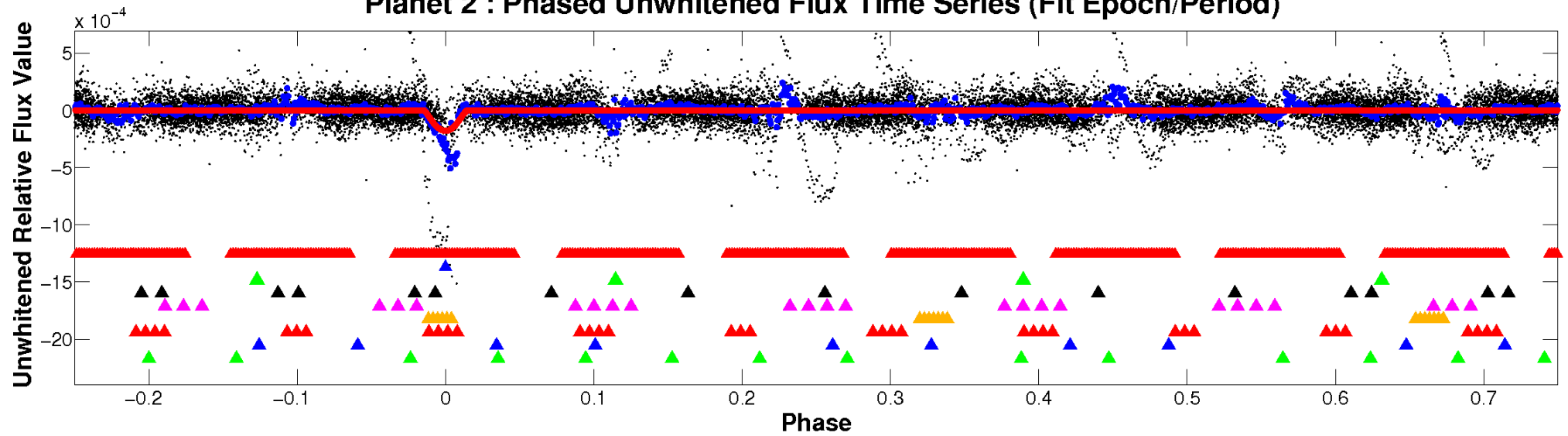
# ALT Odd/Even

TCE 008073771-02

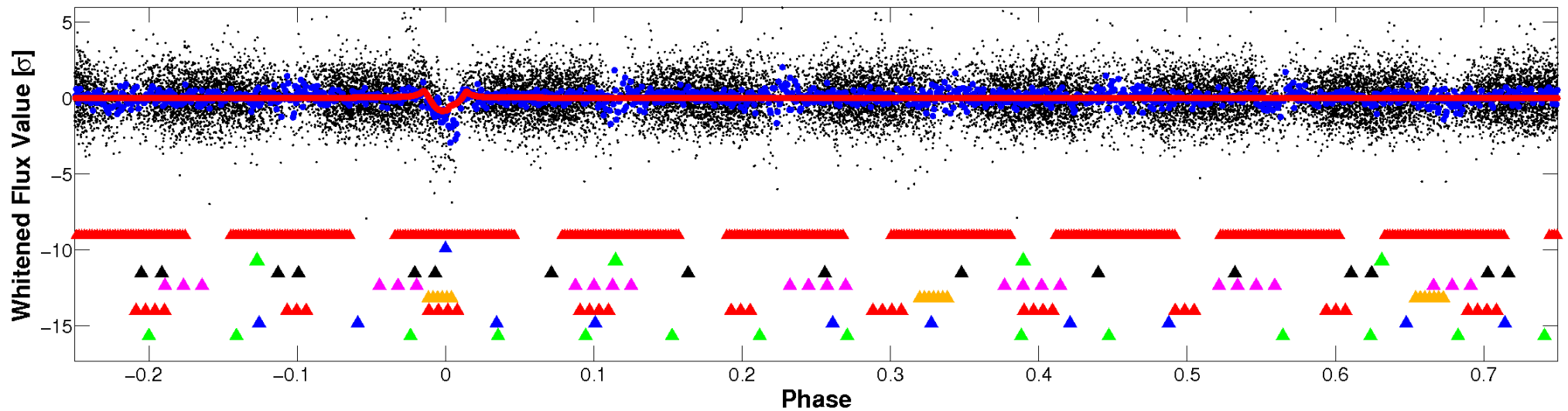


# Non-Whitened Vs. Whitened Light Curve

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



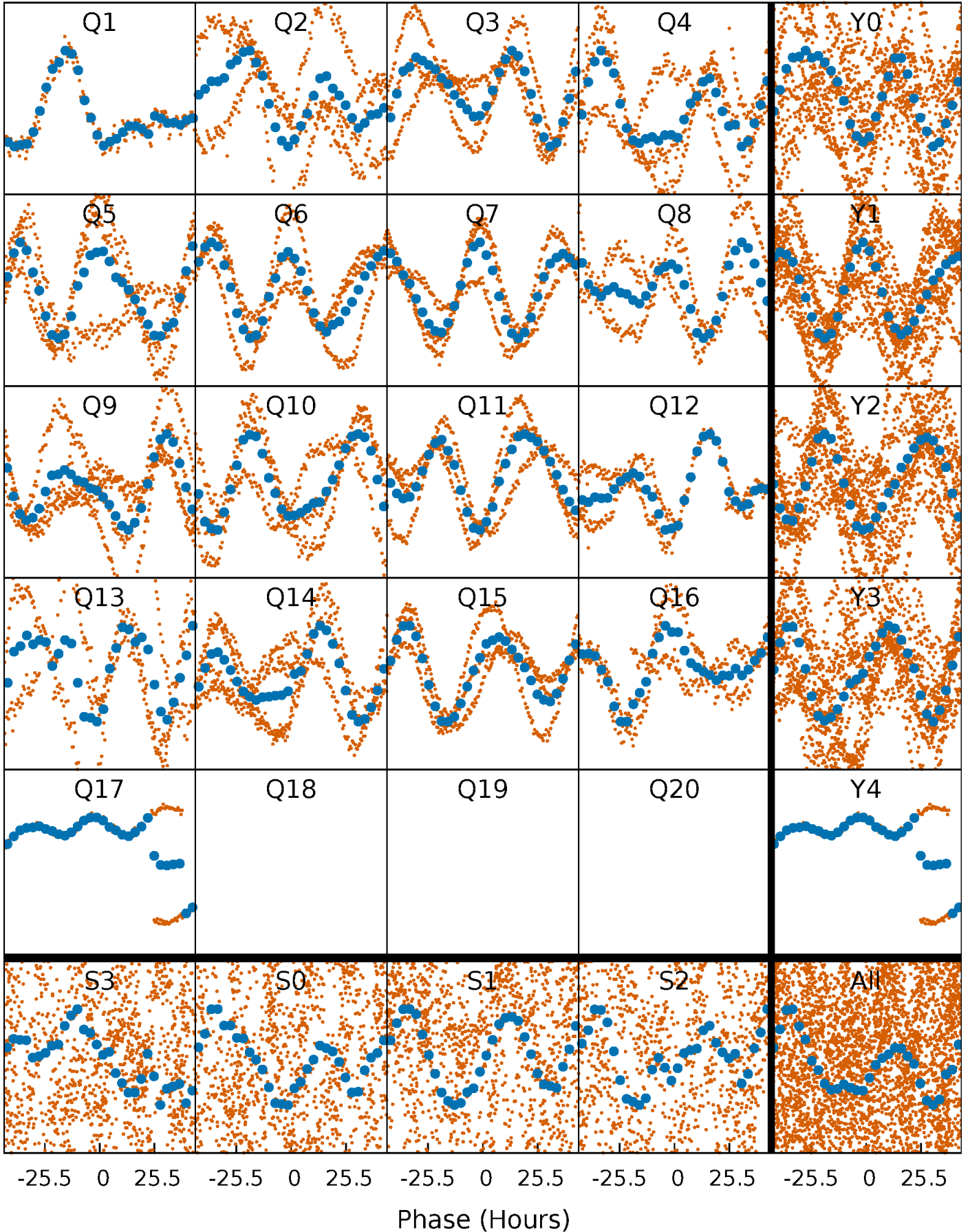
## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)





# PDC Quarter-Phased Transit Curves

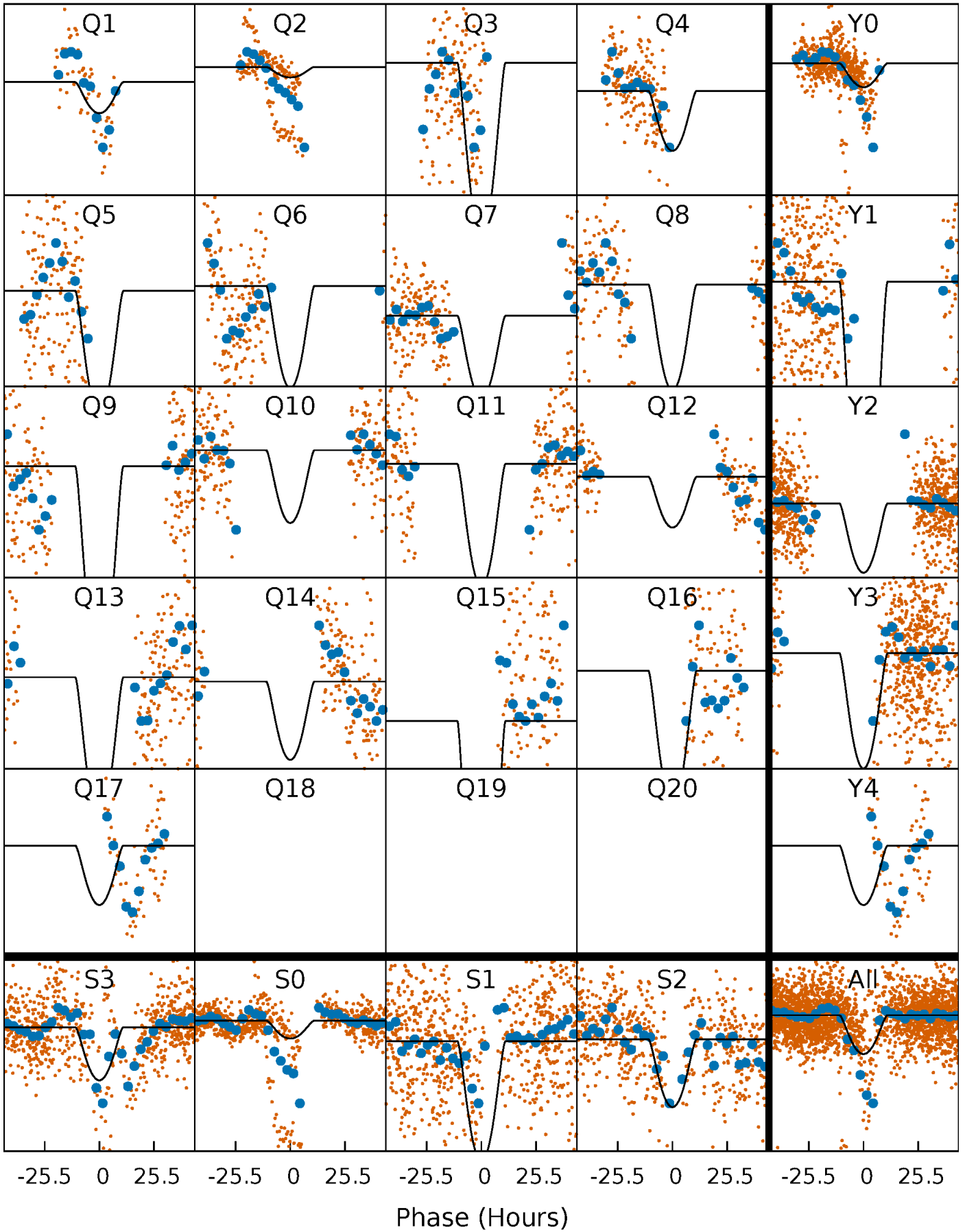
TCE 008073771-02   P= 31.209849 Days    $T_0=153.746649$  (BKJD)





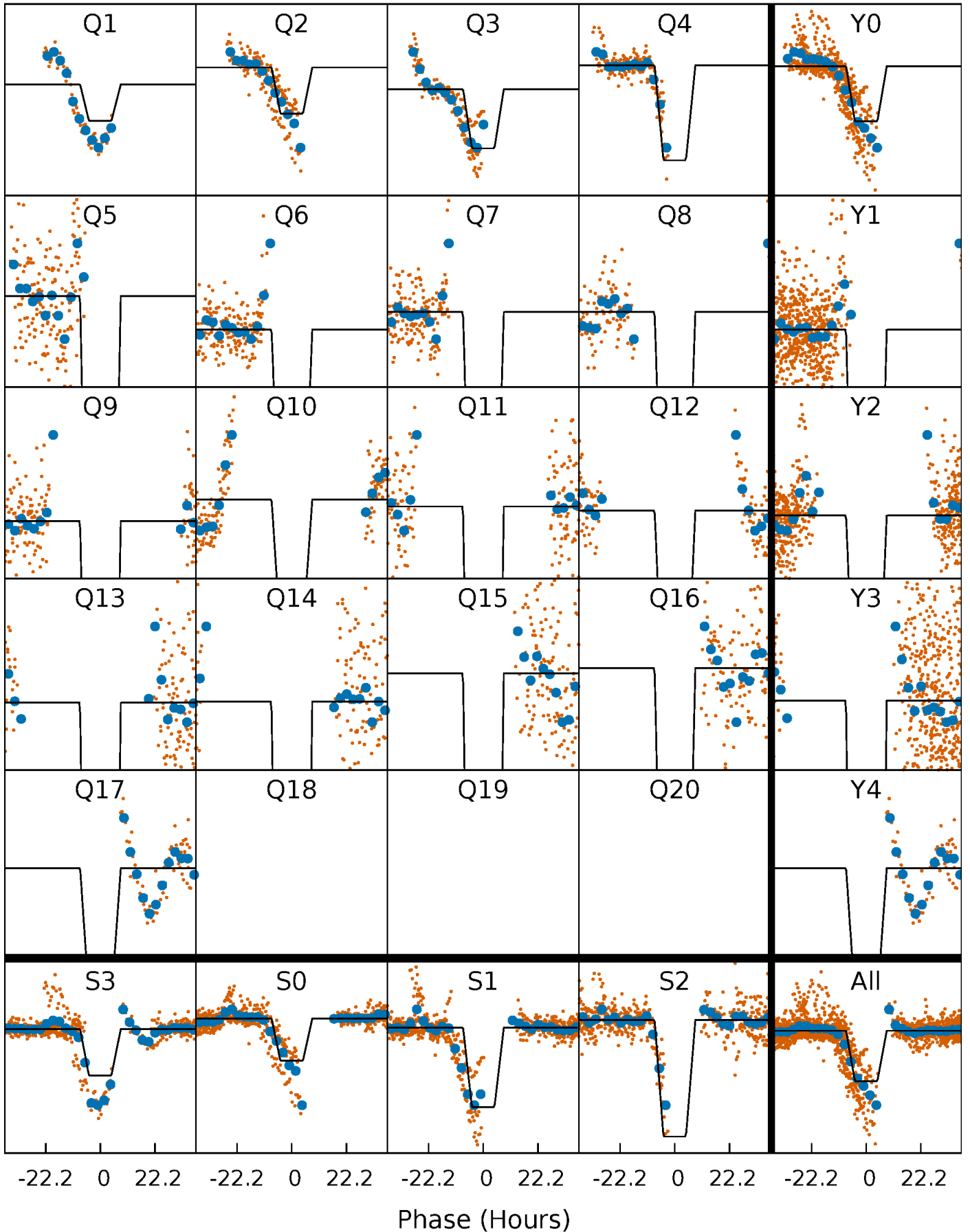
# DV Quarter-Phased Transit Curves

TCE 008073771-02   P= 31.209849 Days    $T_0=153.746649$  (BKJD)



## Alt. Detrend Quarter-Phased Transit Curves

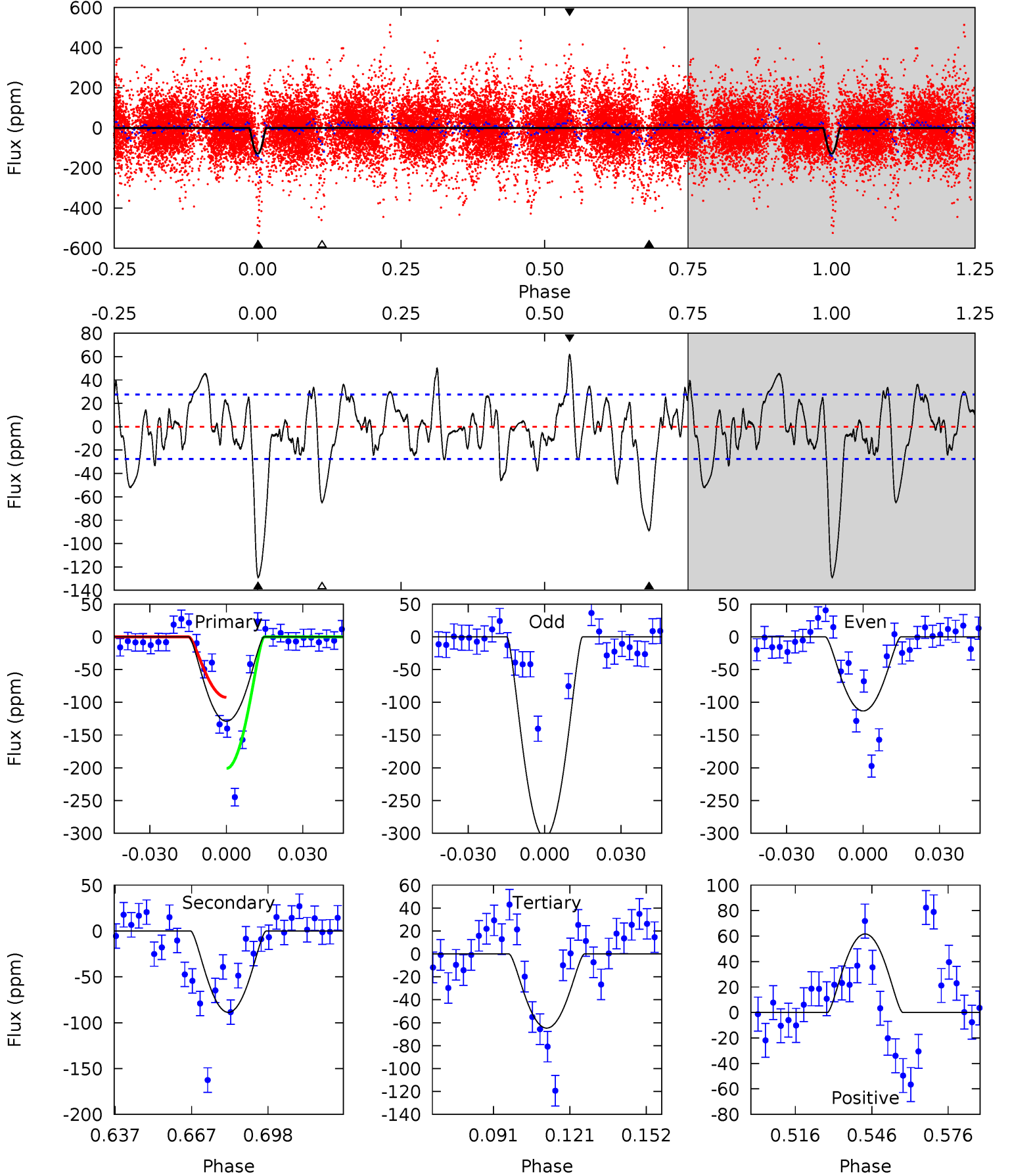
TCE 008073771-02   P= 31.202286 Days    $T_0=153.835683$  (BKJD)



# DV Model-Shift Uniqueness Test

008073771-02, P = 31.209849 Days, E = 122.536800 Days

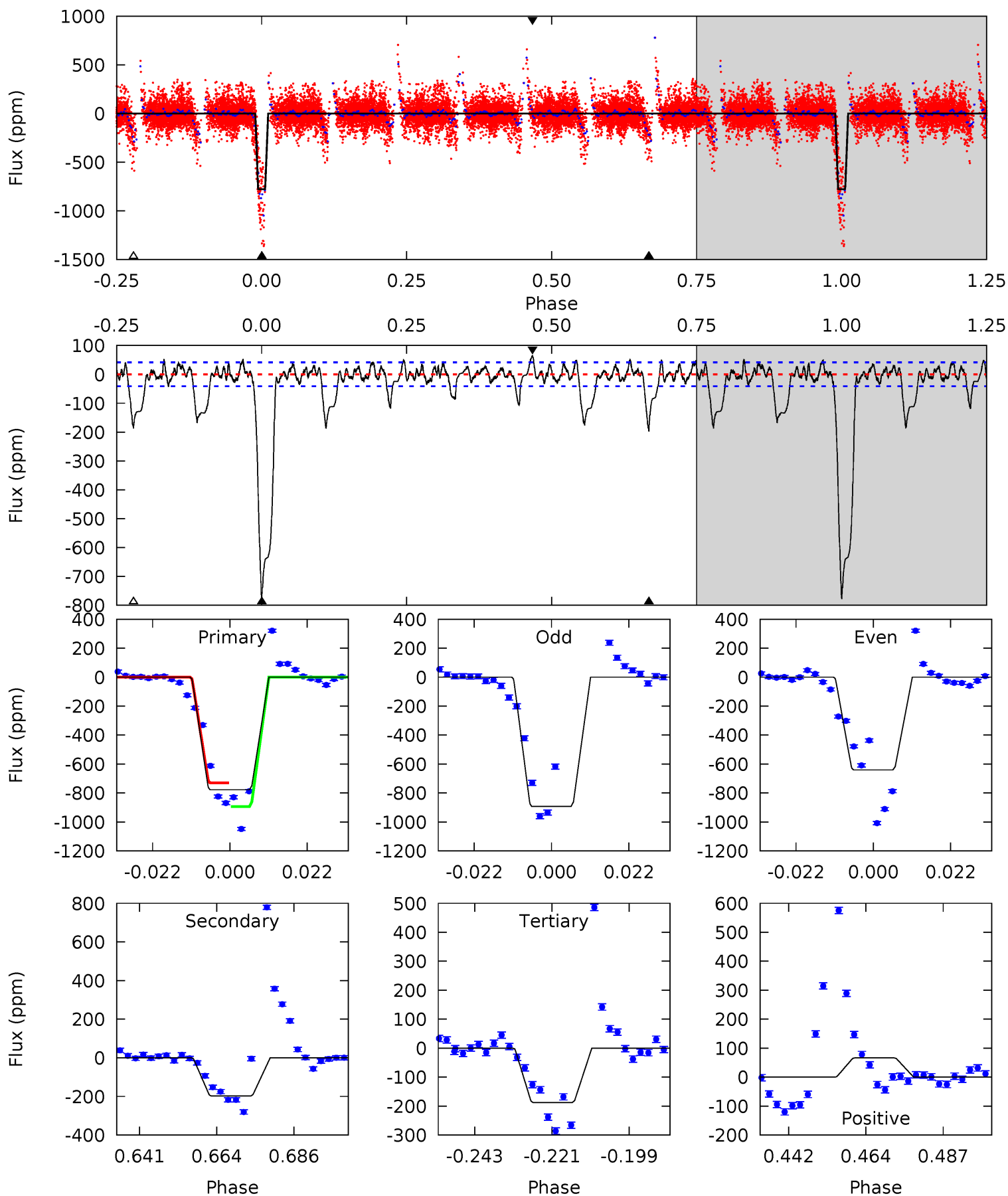
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
22.5	15.5	11.3	10.7	4.81	2.17	3.38	11.2	11.7	4.19	4.72	16.5	1.21	0.32	8.62



# Alt Model-Shift Uniqueness Test

008073771-02, P = 31.202286 Days, E = 122.633397 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
91.5	23.3	22.1	7.82	4.87	2.29	3.35	69.5	83.7	1.20	15.4	15.1	1.01	0.08	0



### Stellar Parameters For KIC 008073771

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$9185^{+257}_{-417}$	$4.118^{+0.099}_{-0.231}$	$0.070^{+0.150}_{-0.650}$	$2.136^{+0.890}_{-0.445}$	$2.180^{+0.427}_{-0.522}$	$0.315^{+0.177}_{-0.176}$
	+3%/-5%	+2%/-6%	+214%/-929%	+42%/-21%	+20%/-24%	+56%/-56%
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 008073771-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-89 \pm 6$	$5.80^{+4.97}_{-3.41}$	$1674^{+145}_{-104}$	$5355^{+3535}_{-1074}$	$87^{+417}_{-61}$
Alt.	$-198 \pm 8$	$7.24^{+4.60}_{-4.28}$	$1680^{+150}_{-119}$	$5936^{+4039}_{-1150}$	$126^{+636}_{-77}$

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



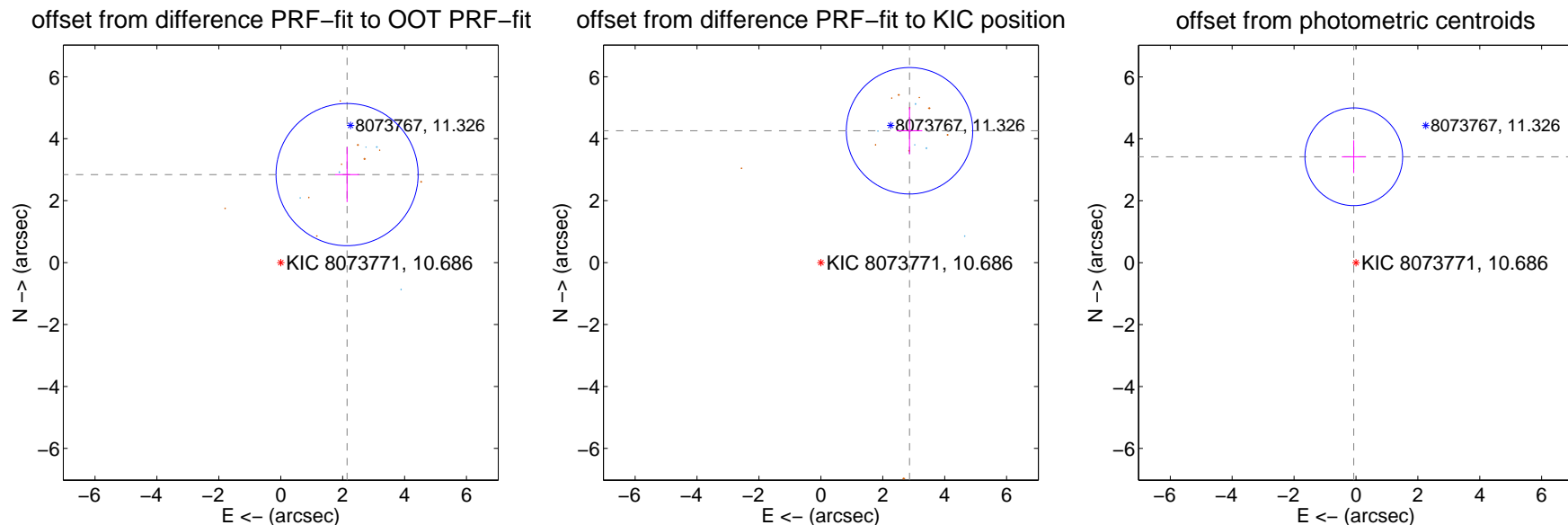
## DV Centroid Data

Supplemental centroid analysis for 008073771-02. **Kepler magnitude: 10.69.** Transit SNR 10.35

There are 5 quarters with good PRF difference image offsets

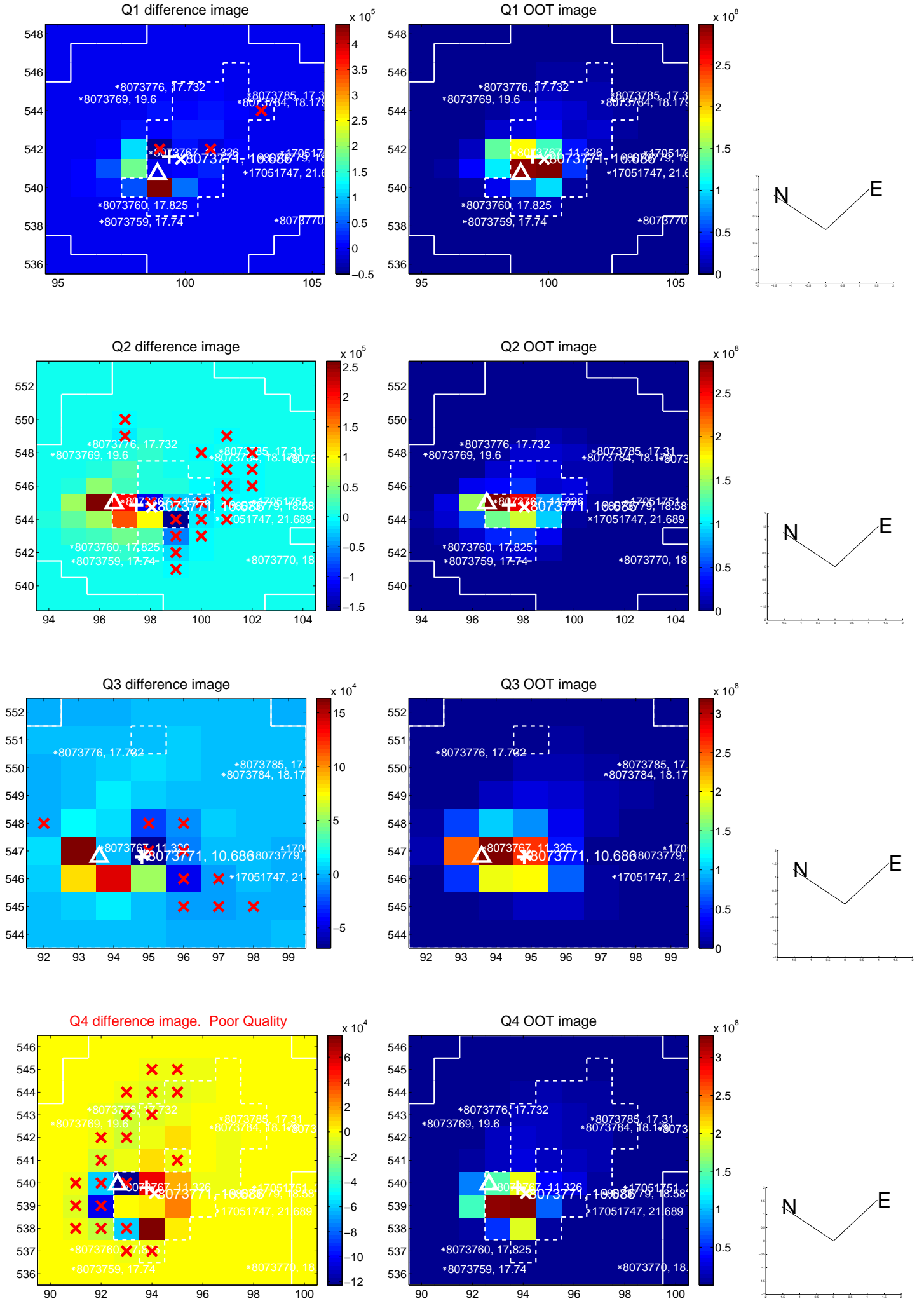
The direct PRF centroid is offset from the target star catalog position by about 1.50 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	<b><math>3.558 \pm 0.765</math></b>	<b>4.65</b>	$-2.142 \pm 0.385$	$2.841 \pm 0.887$
PRF-fit source offset from KIC position	<b><math>5.130 \pm 0.681</math></b>	<b>7.54</b>	$-2.864 \pm 0.411$	$4.256 \pm 0.758$
photometric centroid source offset	<b><math>3.42 \pm 0.53</math></b>	<b>6.50</b>	$0.07 \pm 0.39$	$3.42 \pm 0.53$

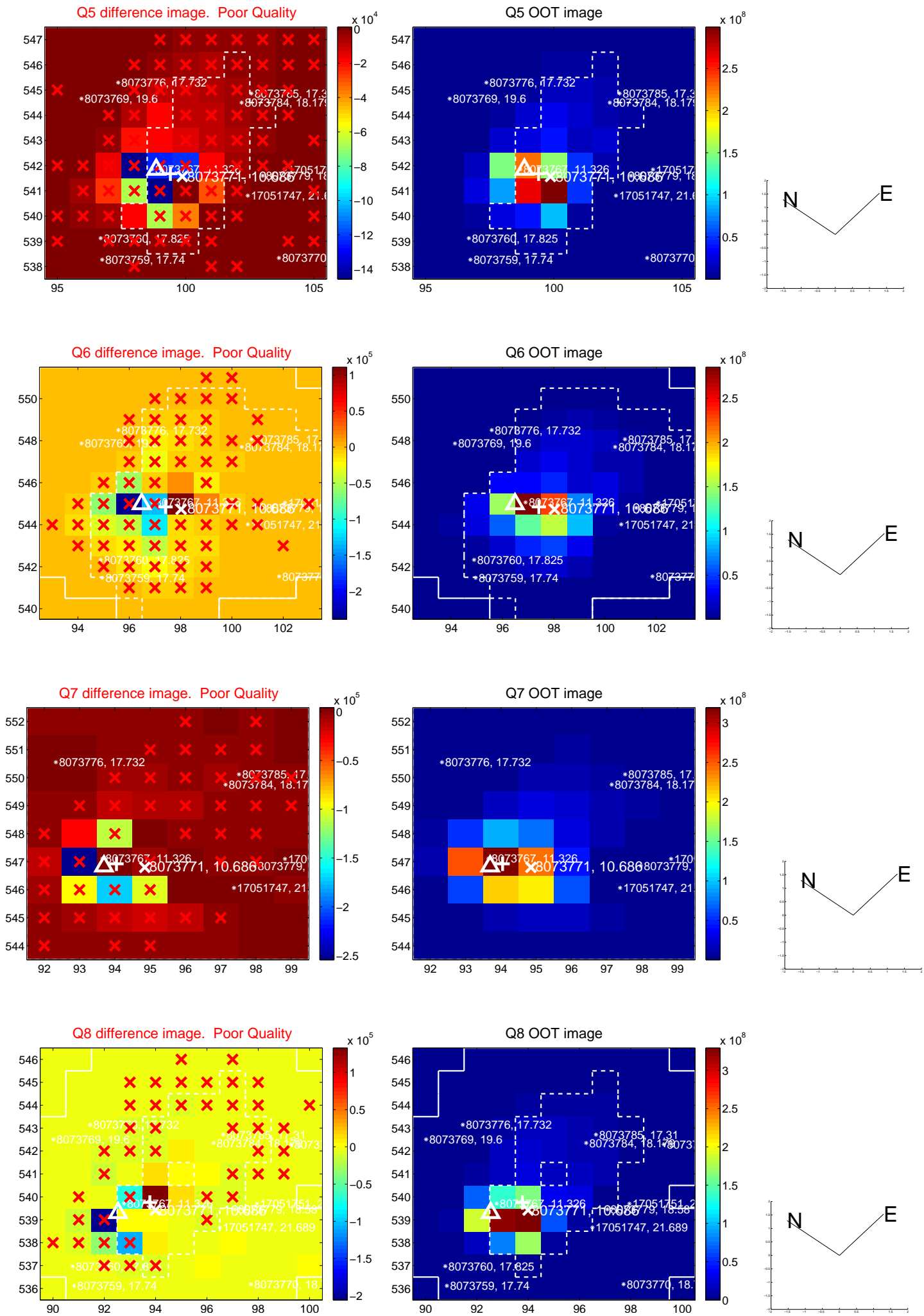


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

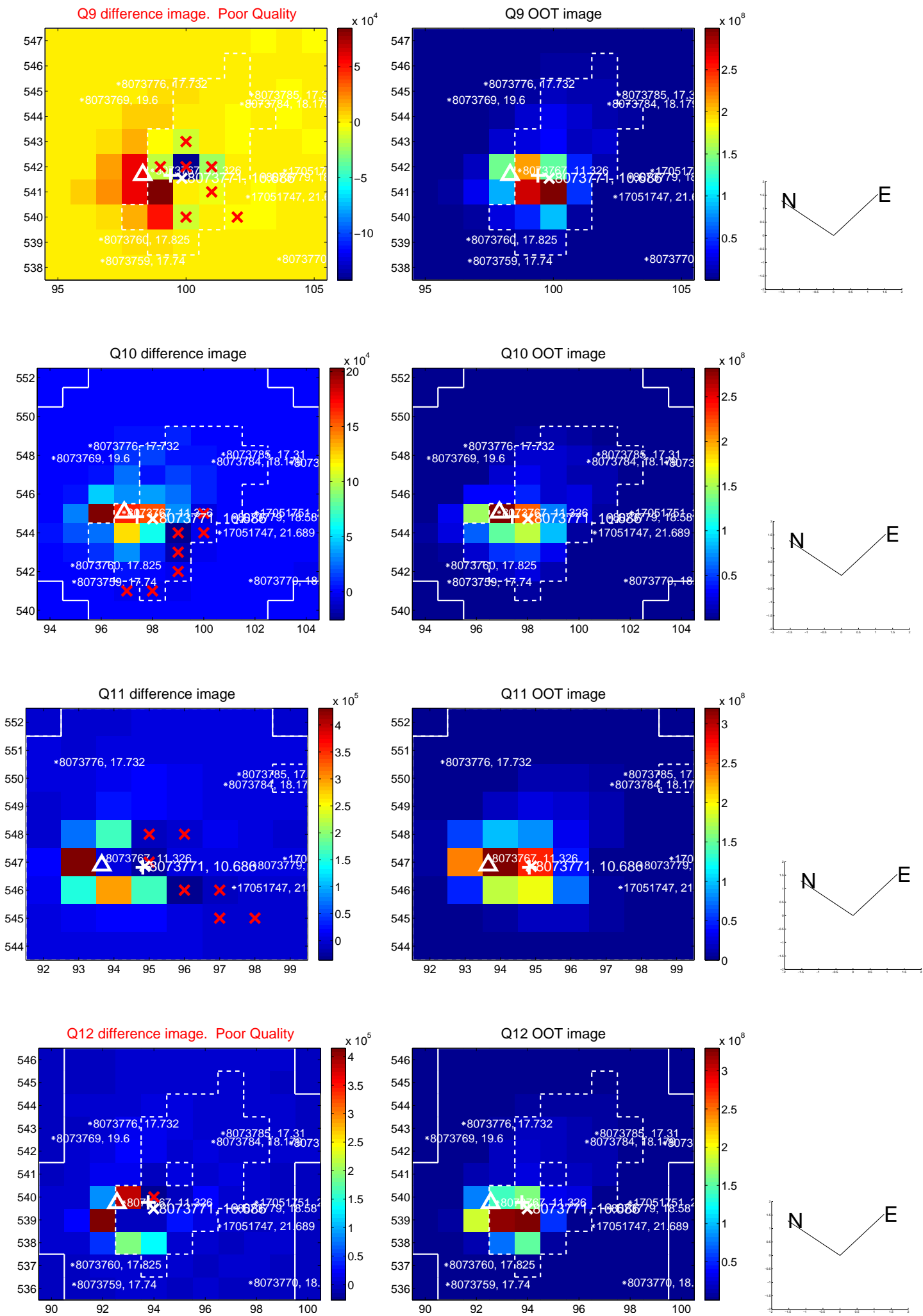
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



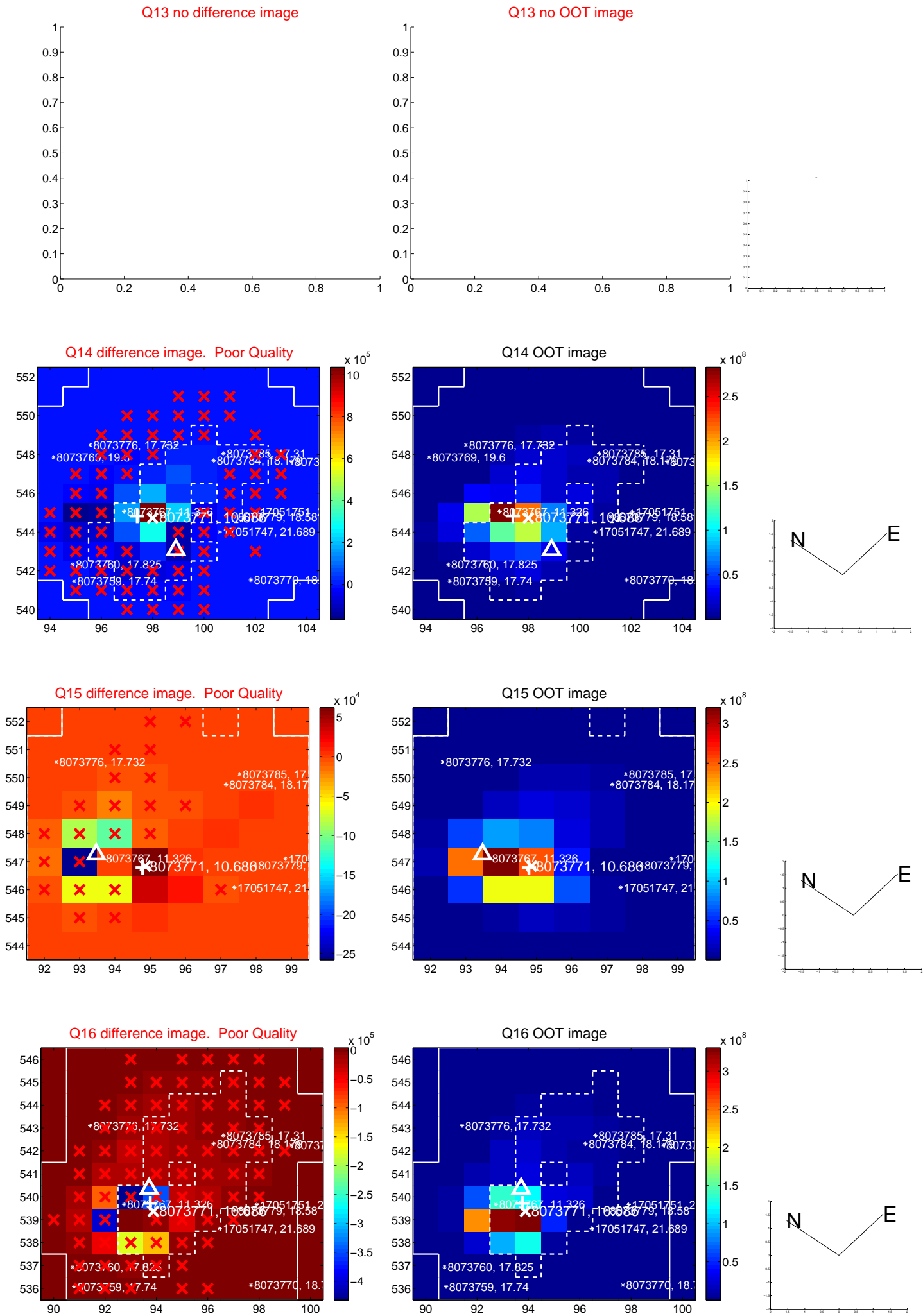
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

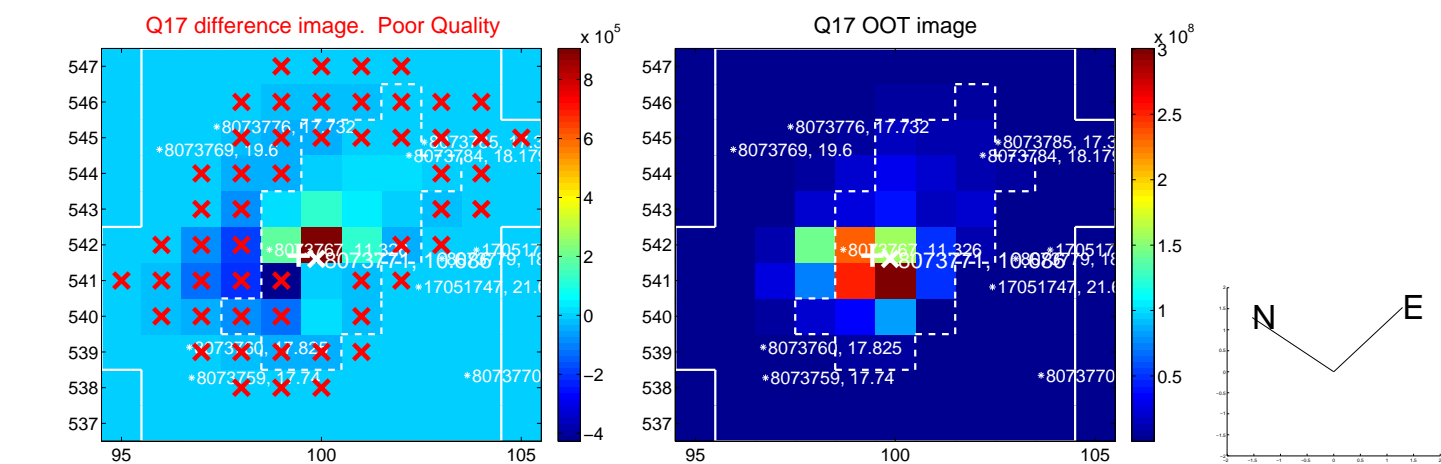


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

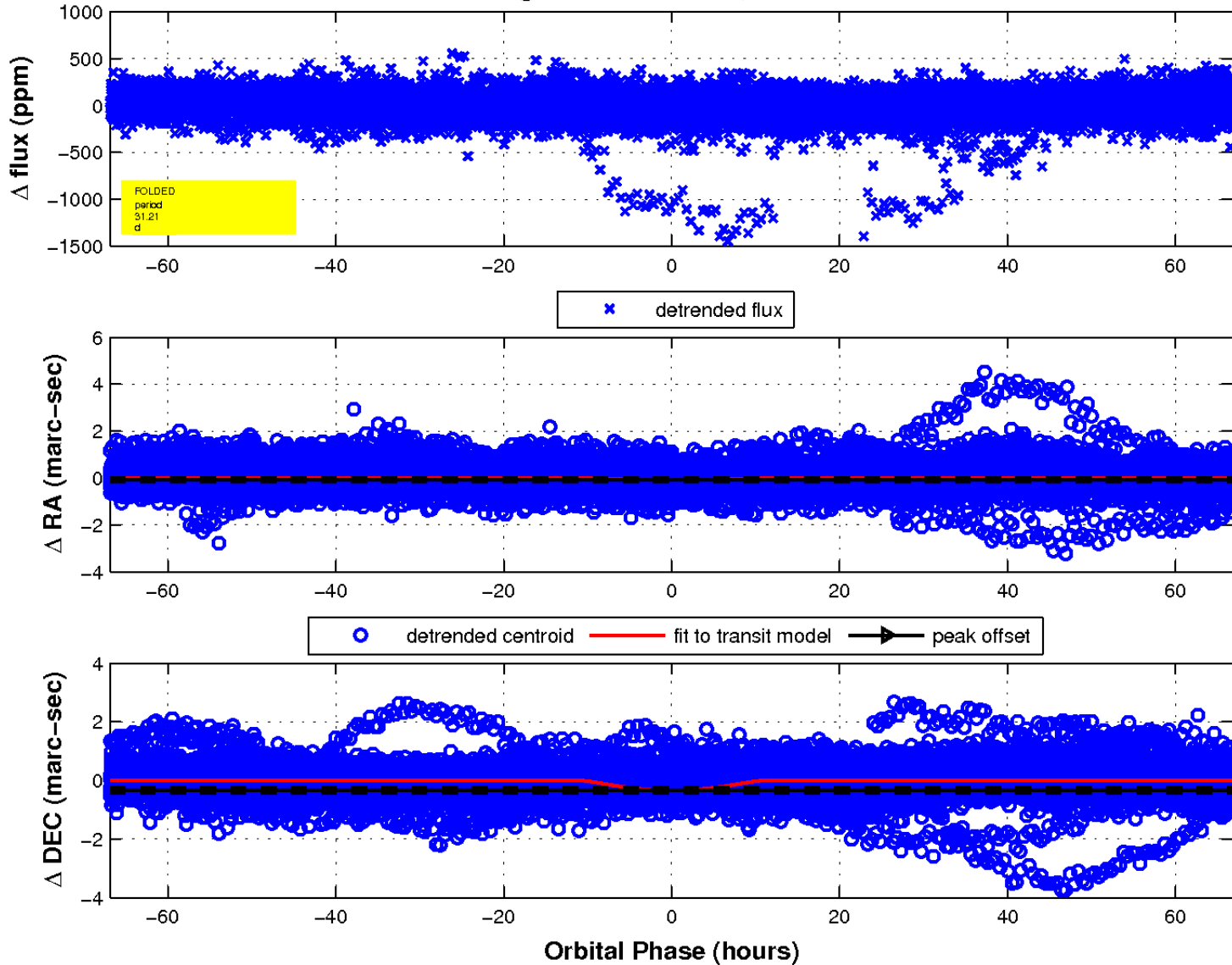




white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

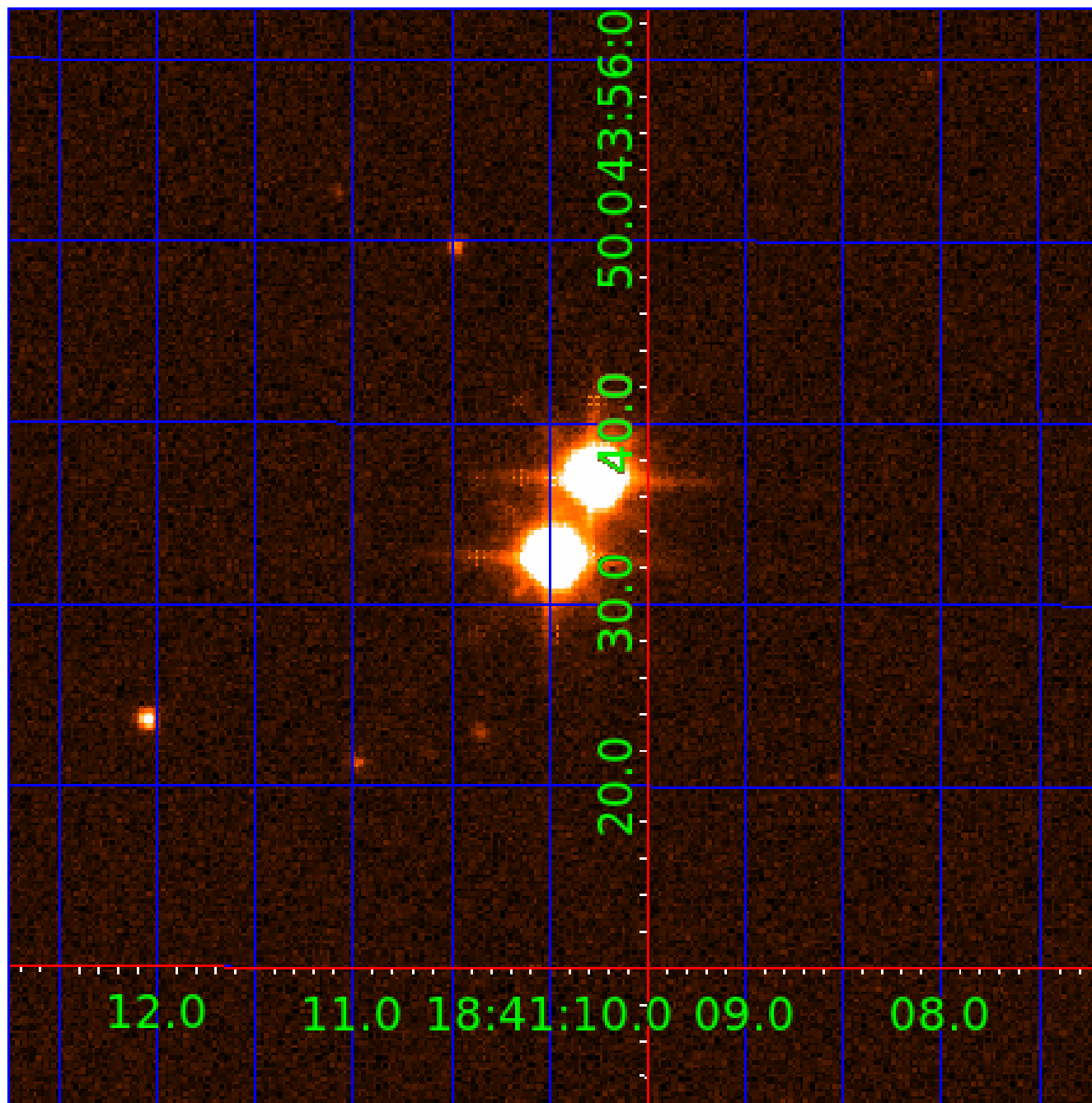


fluxWeightedCentroids, Planet 2 of 9



# UKIRT Image

Declination



# KIC 008073771

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
008073771-01	OBS	No	3.461710	134.422413	5.2	18.139	7.9	2.4	2.14	9185	0.56	8614.39
008073771-02	OBS	No	31.209849	153.746649	179.4	22.300	13.8	10.3	2.14	9185	4.83	459.08
008073771-03	OBS	No	398.184598	188.535331	291.9	21.908	9.7	10.3	2.14	9185	5.43	15.40
008073771-04	OBS	No	90.753169	215.949998	156.2	8.002	9.1	9.3	2.14	9185	3.30	110.61
008073771-05	OBS	No	57.905298	171.196957	88.4	16.784	8.8	7.8	2.14	9185	2.12	201.37
008073771-07	OBS	No	40.552881	147.833476	109.0	2.637	8.0	6.9	2.14	9185	2.65	323.78
008073771-08	OBS	No	143.980457	198.100793	110.6	3.000	8.3	-1.0	2.14	9185	2.30	59.78
008073771-09	OBS	No	106.481950	176.873243	121.2	14.100	7.8	7.8	2.14	9185	2.52	89.38

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008073771-01	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—CENT_SATURATED
008073771-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_DV—CENT_SATURATED
008073771-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—CENT_SATURATED
008073771-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—CENT_SATURATED
008073771-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_SATURATED
008073771-07	OBS	FP	0.00	1	0	0	0	TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_SATURATED
008073771-08	OBS	FP	0.00	1	0	0	0	TRANS_GAPPED—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_SATURATED
008073771-09	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_POS_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.

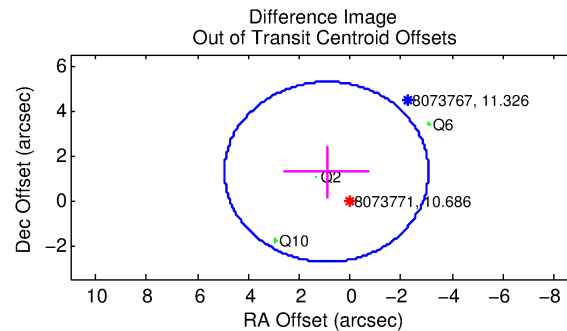
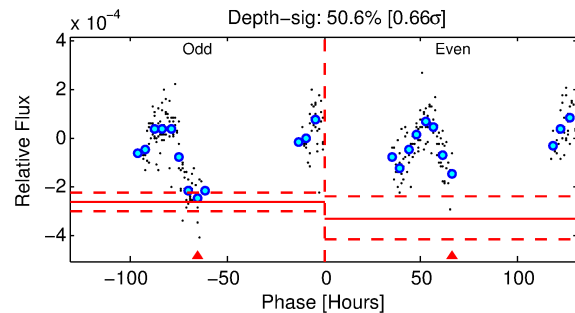
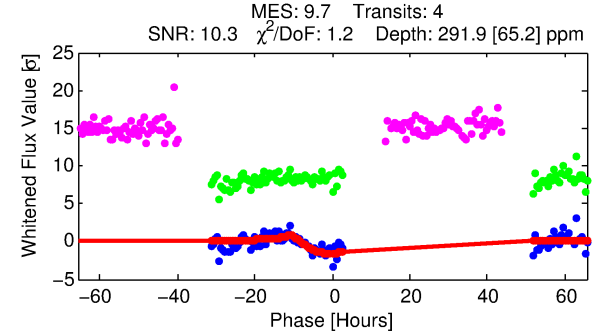
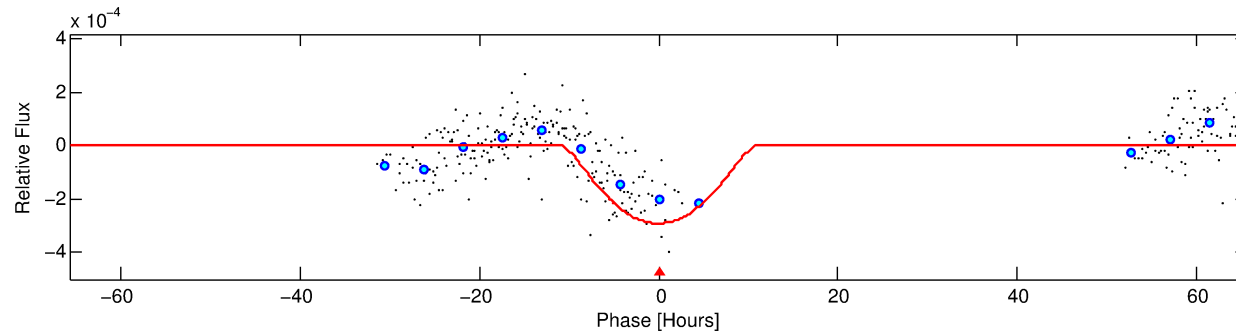
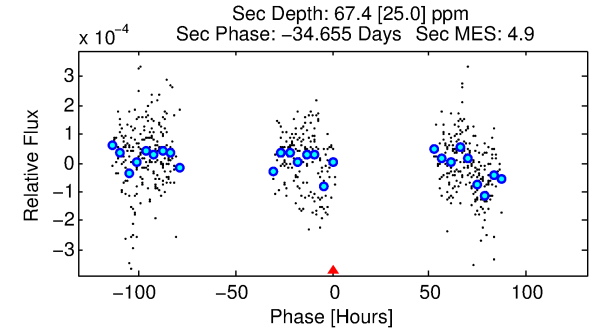
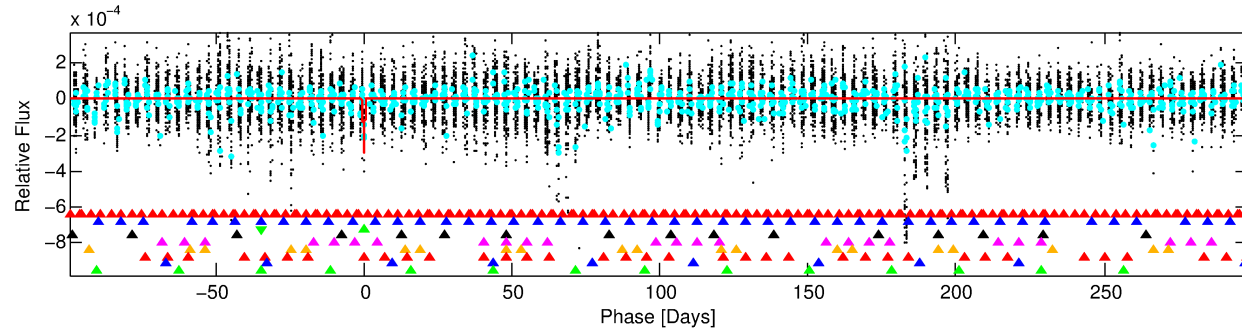
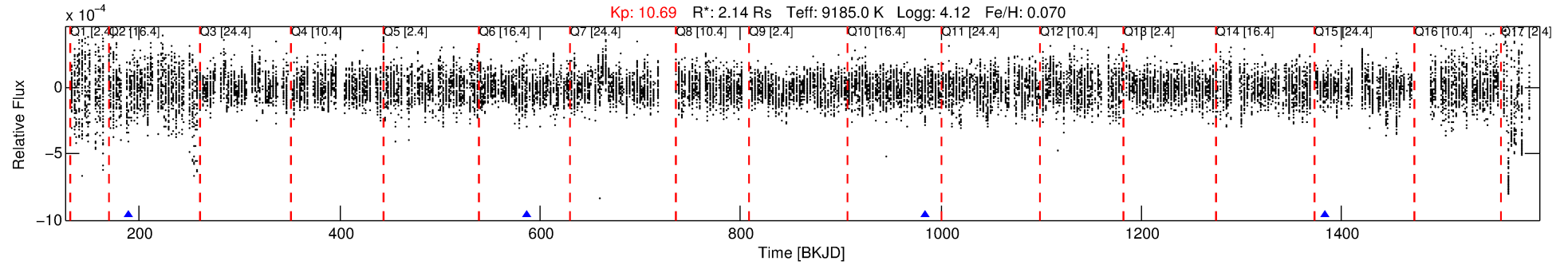
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 008073771-03

No Significant Match Found

# DV One-Page Summary

KIC: 8073771 Candidate: 3 of 9 Period: 398.185 d



## DV Fit Results:

Period = 398.18460 [0.01916] d  
Epoch = 188.5353 [0.0771] BKJD  
Rp/R\* = 0.0233 [0.0160]  
a/R\* = 35.95 [9.35]  
b = 0.99 [0.03]  
Seff = 15.40 [7.48]  
Teq = 505 [61] K  
Rp = 5.43 [4.36] Re  
a = 1.3745 [0.4530] AU  
Ag = 2373.82 [3535.16] [0.67σ]  
Teffp = 5451 [1950] K [2.53σ]

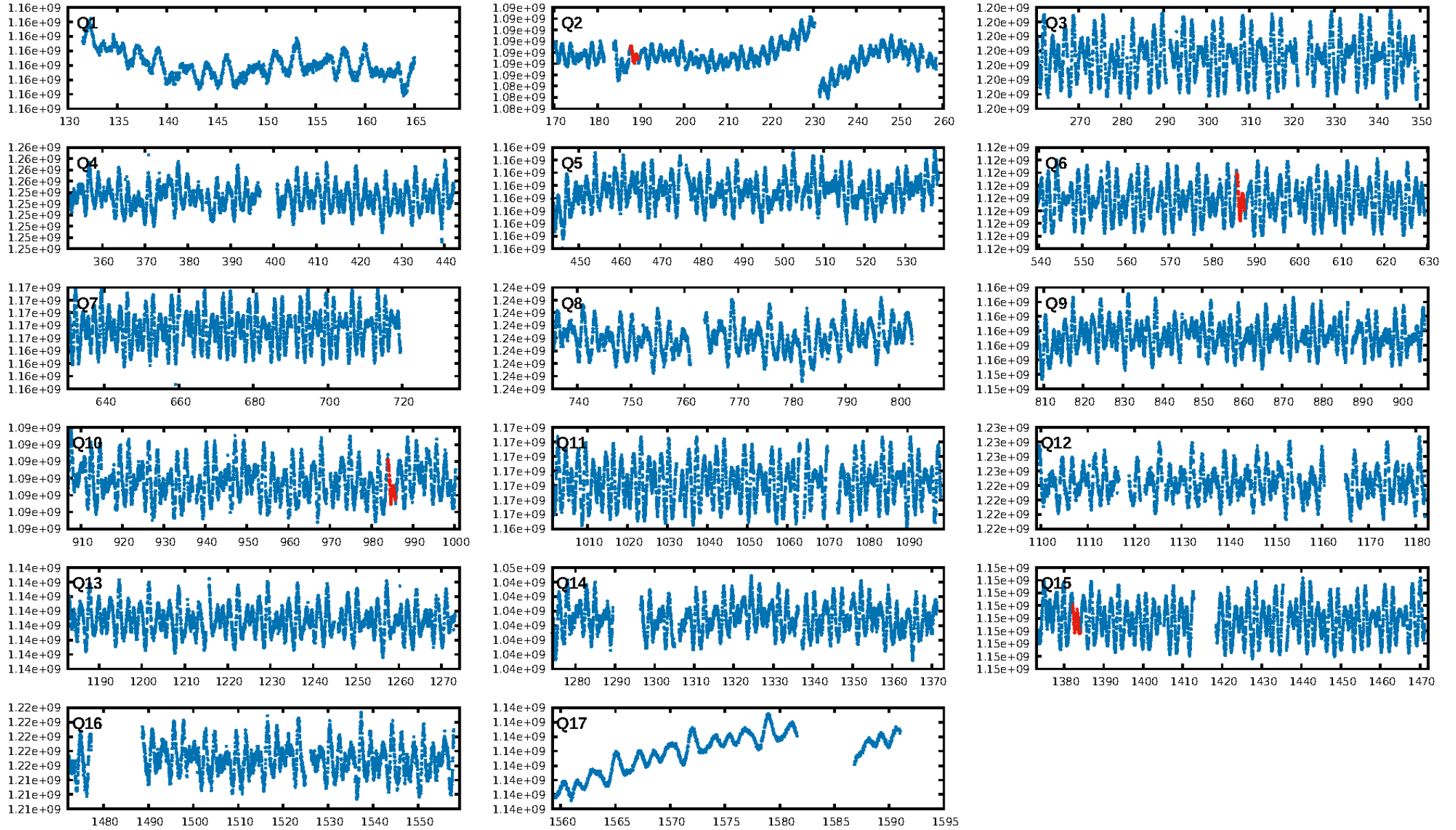
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [275.90σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 4.0%  
ModelChiSquareGof-sig: 100.0%  
**Bootstrap-pfa: 9.07e-09**  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: N/A  
Centroid-sig: 25.0%  
Centroid-so: 2.203 arcsec [2.13σ]  
OotOffset-rm: 1.568 arcsec [1.17σ]  
KicOffset-rm: 2.381 arcsec [1.55σ]  
OotOffset-st: 3/0/0/0 [3]  
KicOffset-st: 3/0/0/0 [3]  
DiffImageQuality-fgm: 0.67 [2/3]  
DiffImageOverlap-fno: 0.00 [0/4]

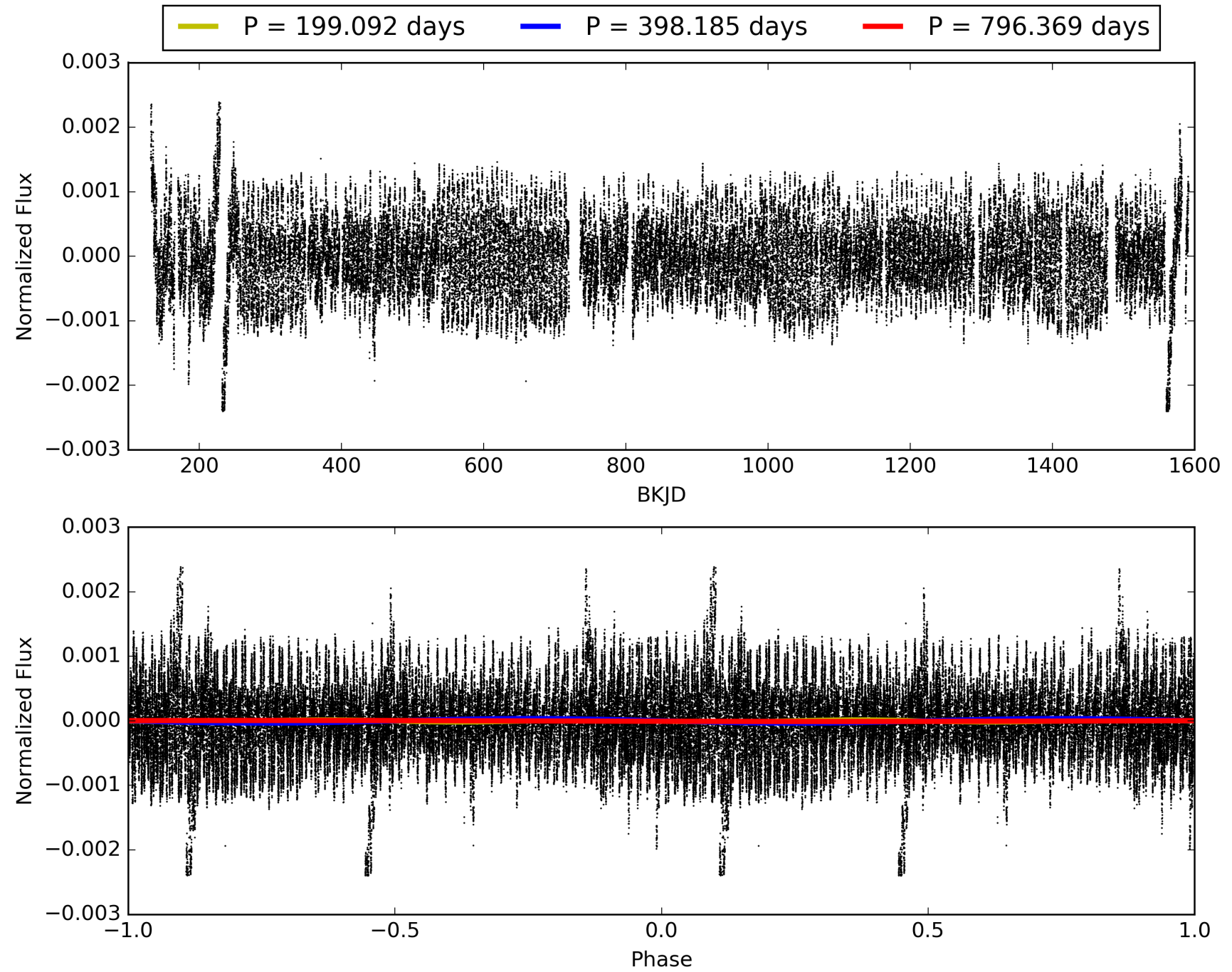
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 02-Feb-2016 15:03:23 Z

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

# TCE 008073771-03, PDC Light Curves



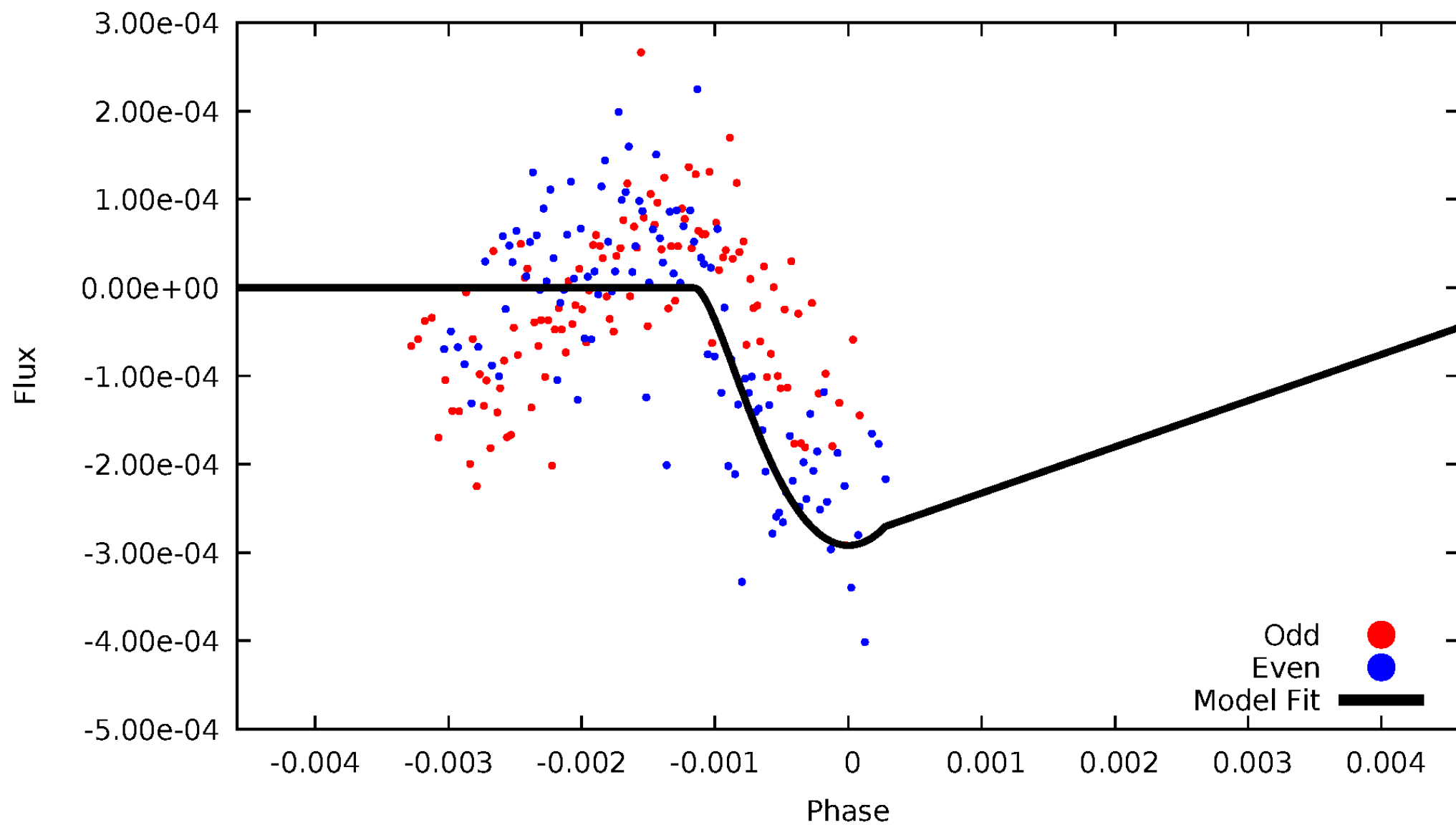
# TCE 008073771-03





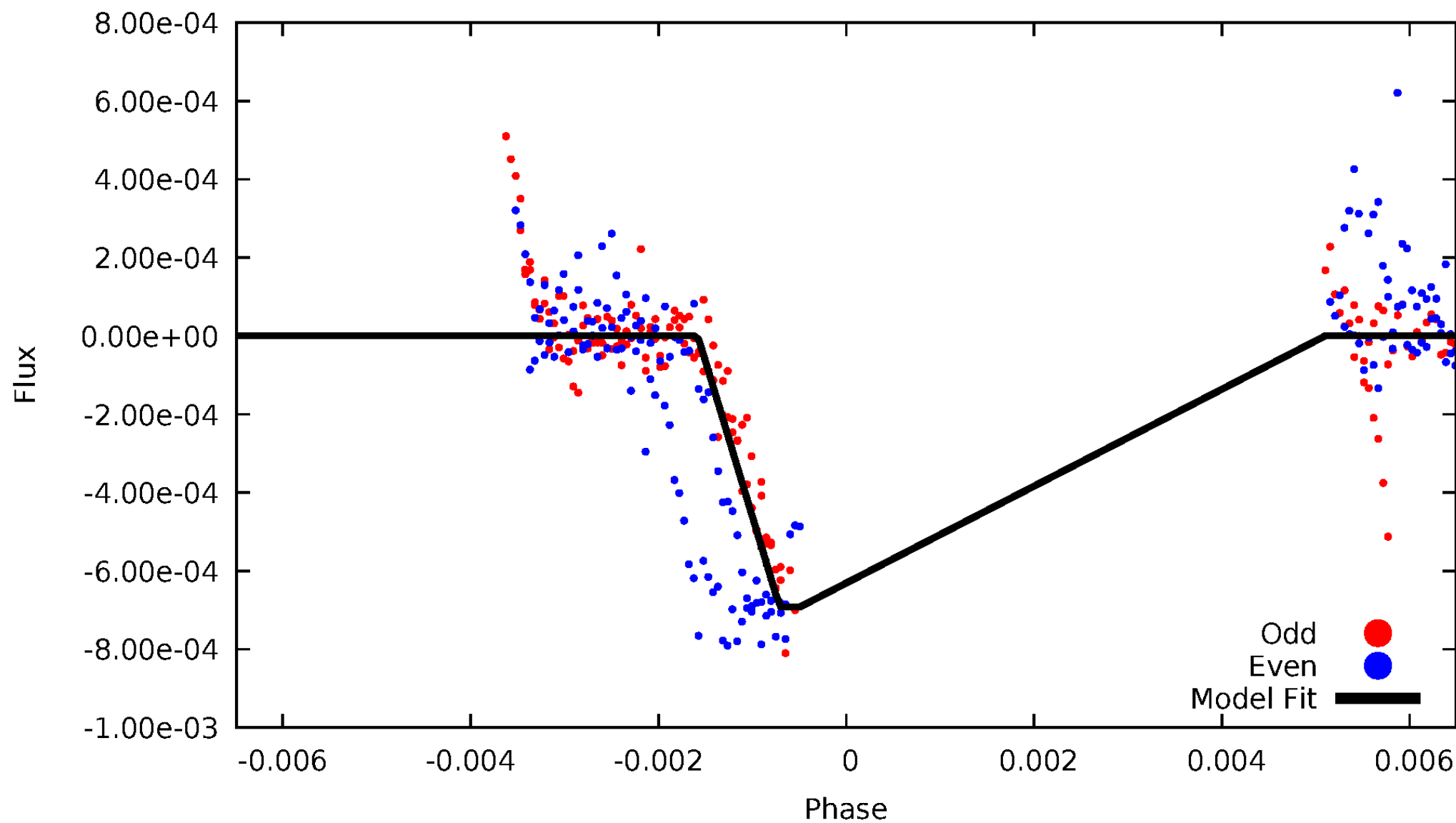
# DV Odd/Even

TCE 008073771-03



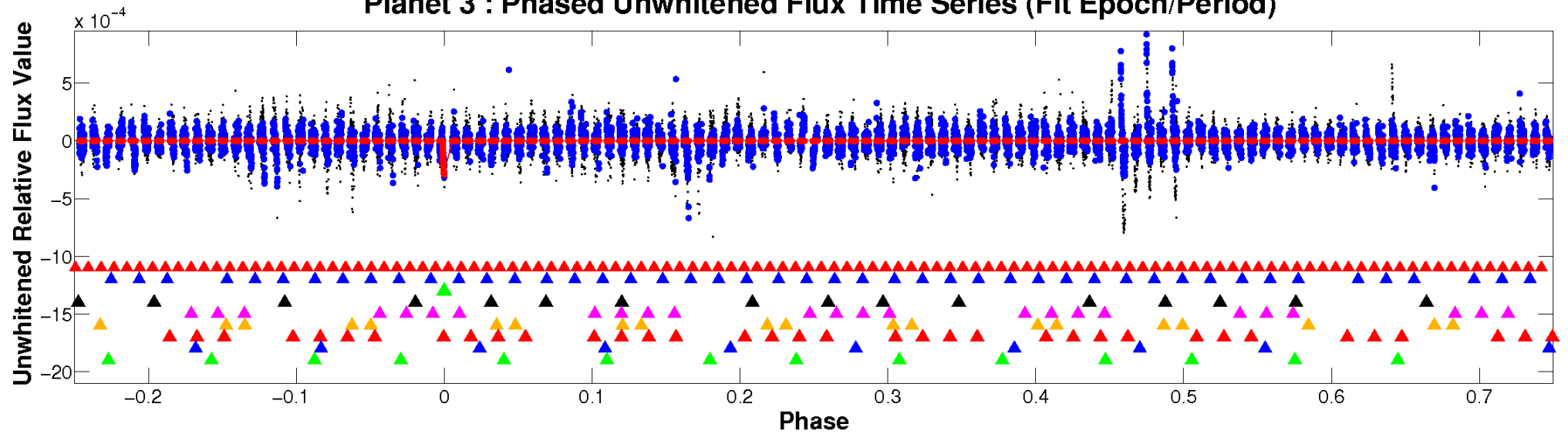
# ALT Odd/Even

TCE 008073771-03

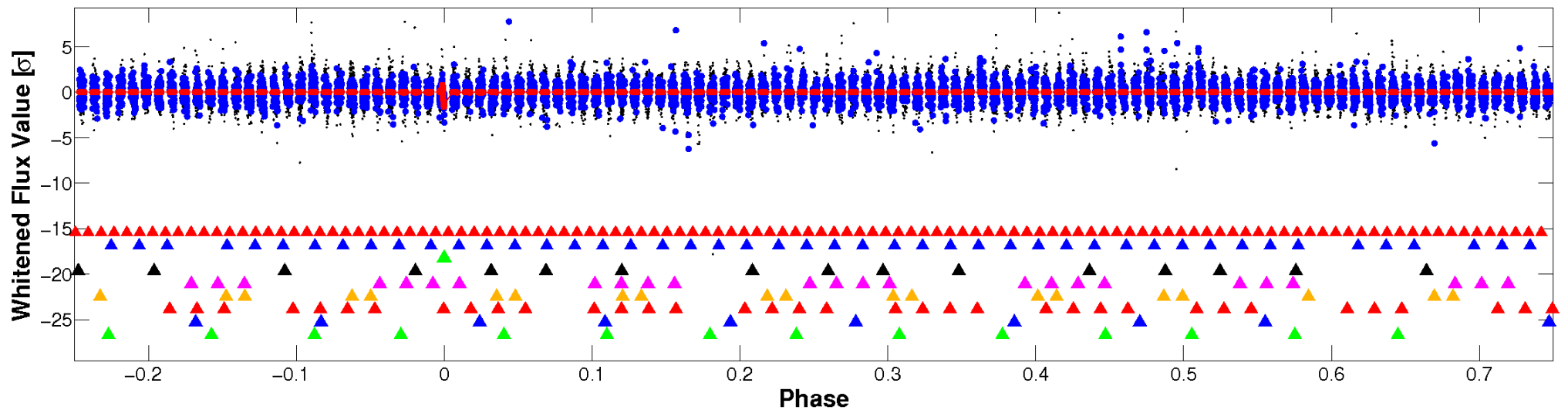


# Non-Whitened Vs. Whitened Light Curve

## Planet 3 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

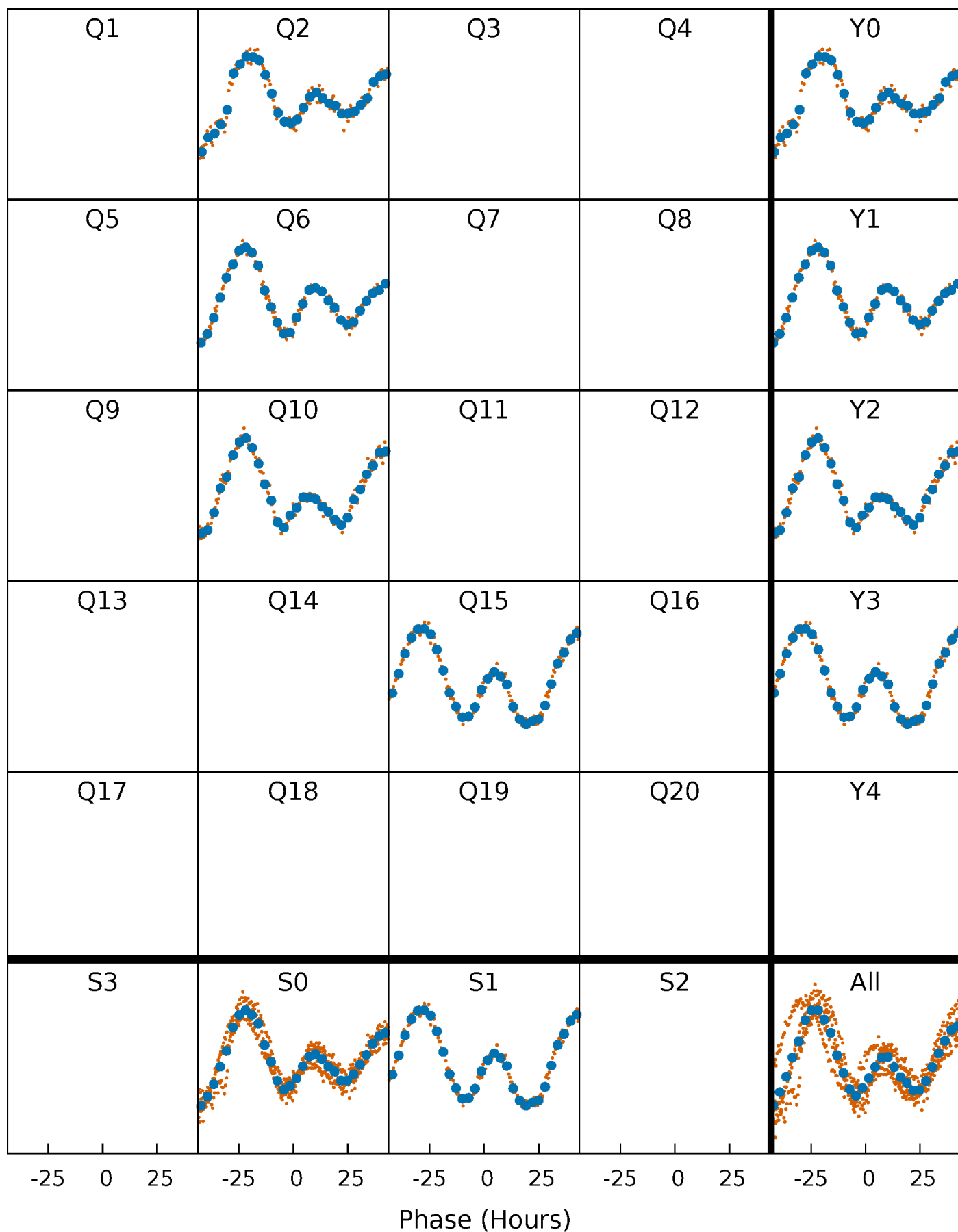


## Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



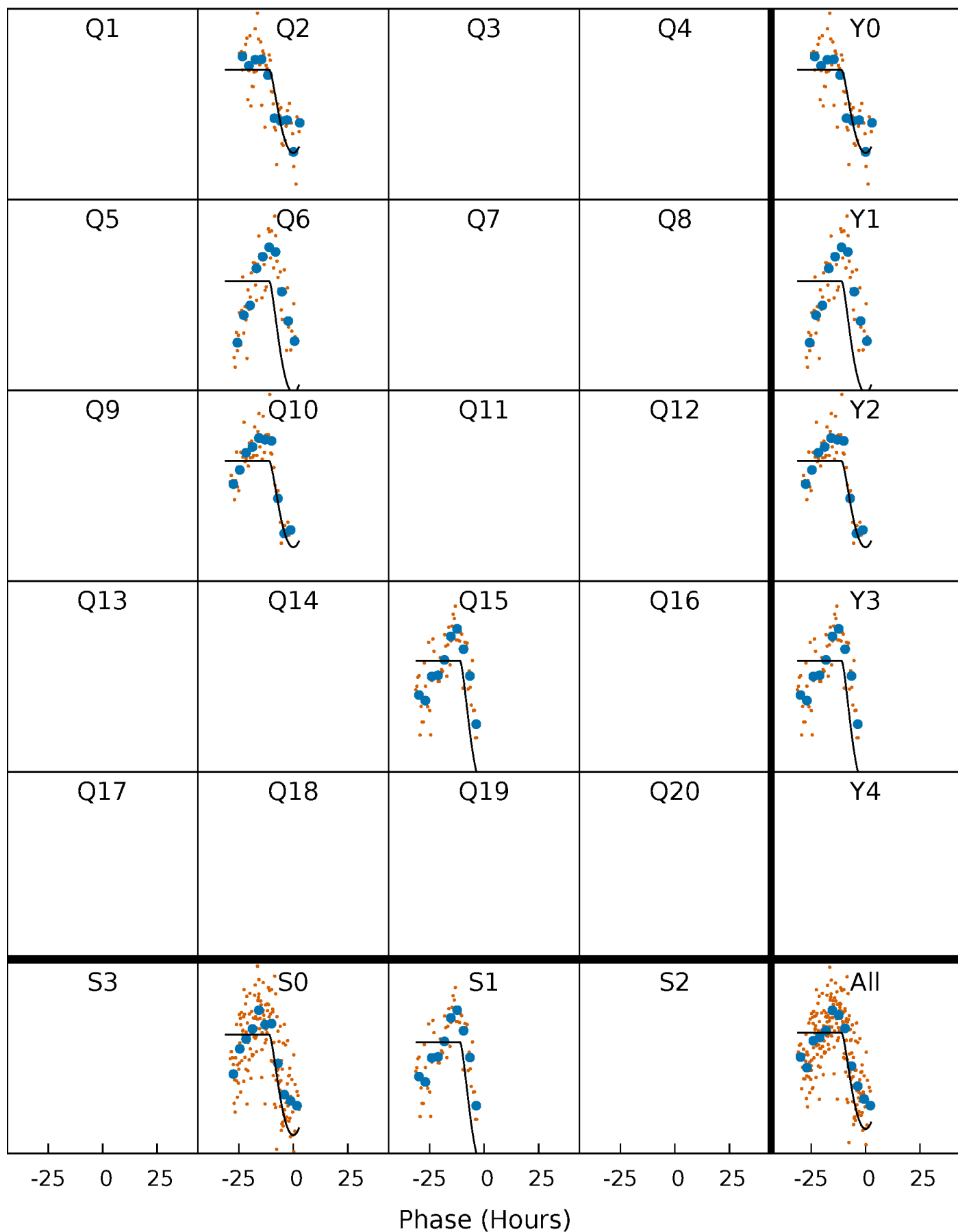
# PDC Quarter-Phased Transit Curves

TCE 008073771-03 P=398.184598 Days  $T_0=188.535331$  (BKJD)



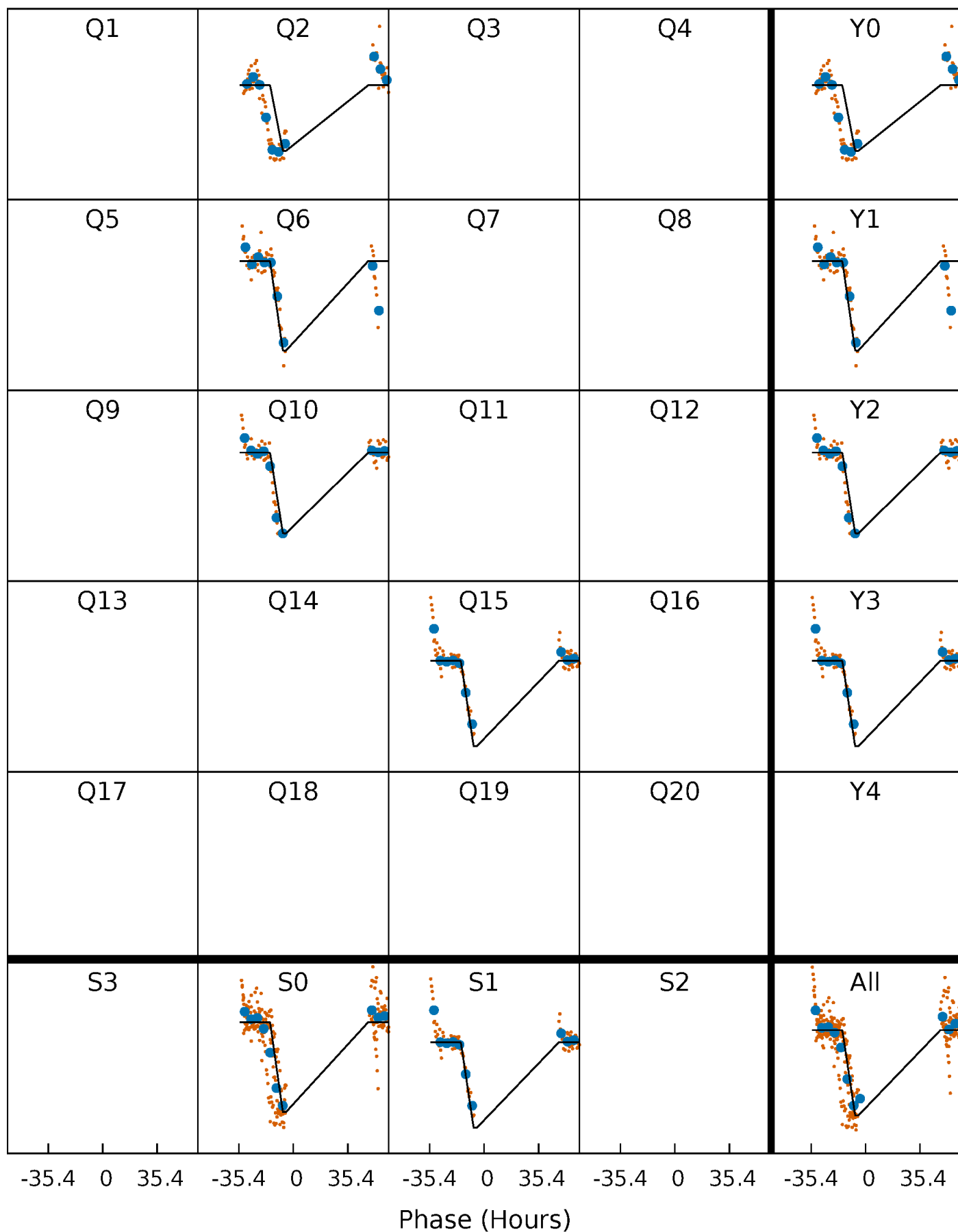
# DV Quarter-Phased Transit Curves

TCE 008073771-03 P=398.184598 Days  $T_0=188.535331$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 008073771-03 P=398.127483 Days  $T_0=188.843383$  (BKJD)

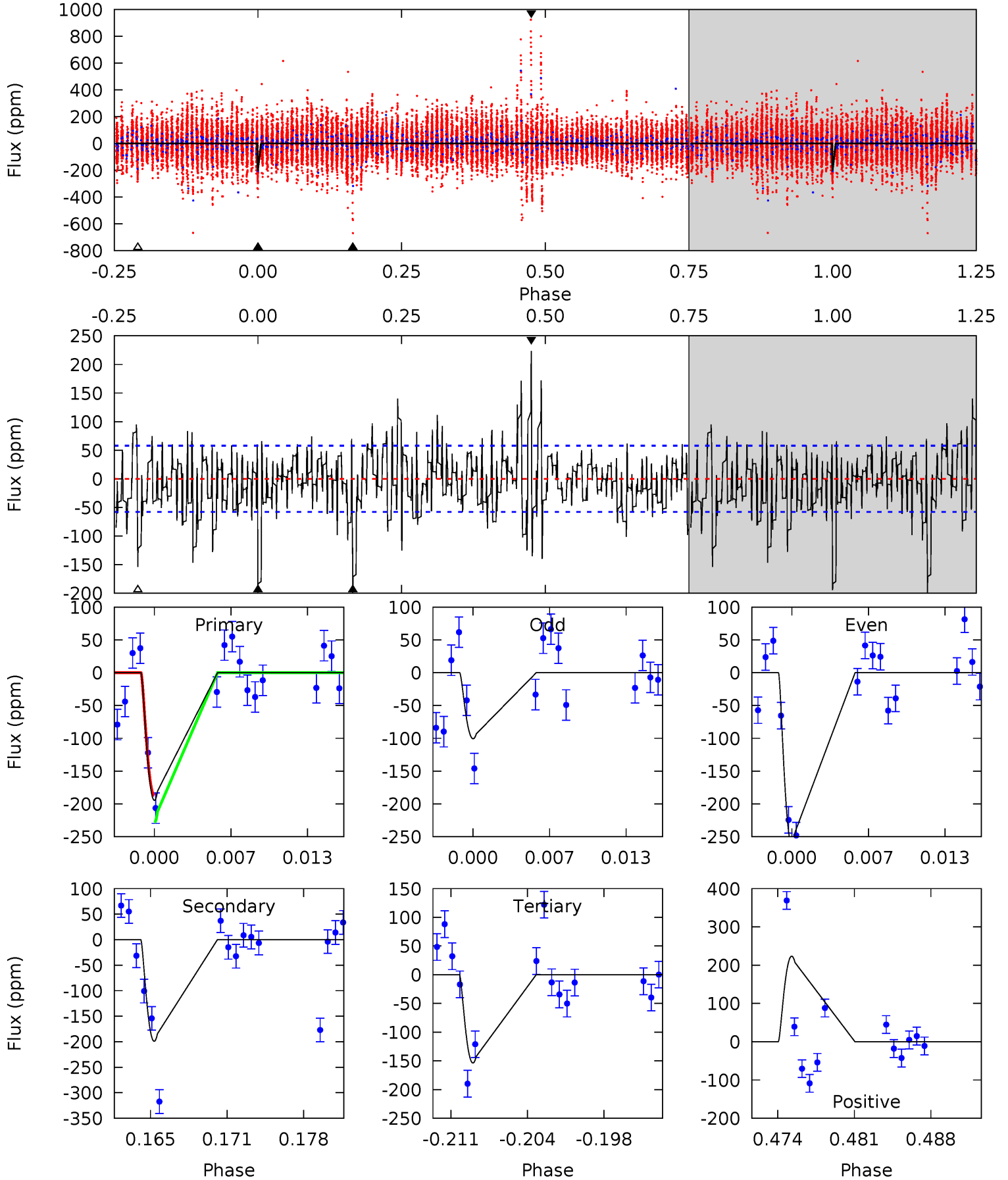




# DV Model-Shift Uniqueness Test

008073771-03, P = 398.184598 Days, E = 188.535331 Days

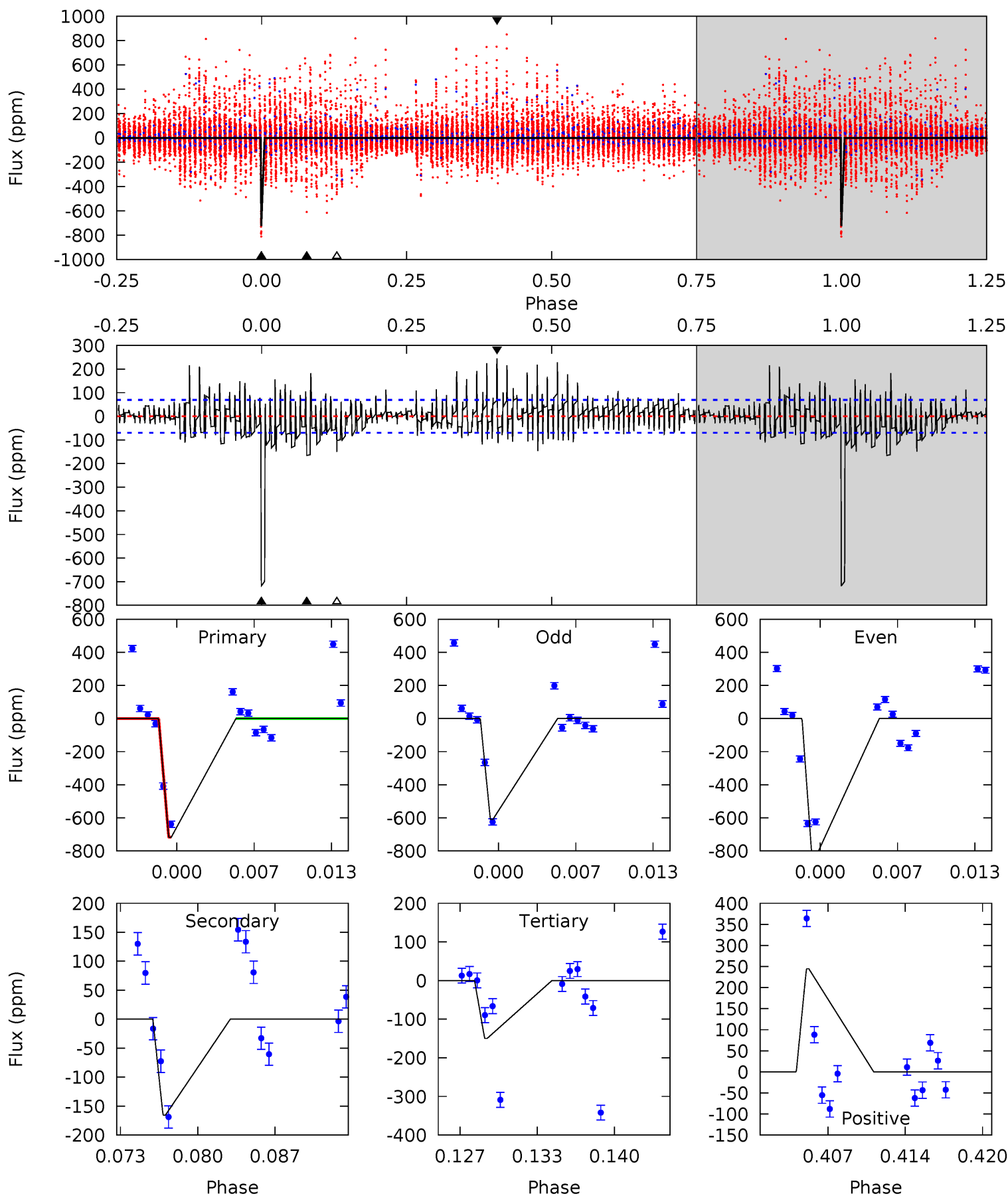
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
17.2	17.6	13.6	19.8	5.11	2.72	3.79	3.61	-2.56	4.01	-2.16	7.08	0.98	0.53	0.98



# Alt Model-Shift Uniqueness Test

008073771-03, P = 398.127483 Days, E = 188.843383 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
52.5	12.1	11.0	17.9	5.10	2.71	4.25	41.5	34.6	1.15	-5.78	7.82	0	0.25	0



### Stellar Parameters For KIC 008073771

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$9185^{+257}_{-417}$	$4.118^{+0.099}_{-0.231}$	$0.070^{+0.150}_{-0.650}$	$2.136^{+0.890}_{-0.445}$	$2.180^{+0.427}_{-0.522}$	$0.315^{+0.177}_{-0.176}$
	+3%/-5%	+2%/-6%	+214%/-929%	+42%/-21%	+20%/-24%	+56%/-56%
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 008073771-03 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-199 \pm 11$	$5.99^{+4.09}_{-3.43}$	$716^{+69}_{-46}$	$6454^{+5007}_{-1283}$	$5432^{+24515}_{-3376}$
Alt.	$-166 \pm 14$	$6.46^{+3.93}_{-3.43}$	$716^{+64}_{-48}$	$6021^{+3021}_{-1184}$	$4022^{+13835}_{-2479}$

$T_{max}$  = 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

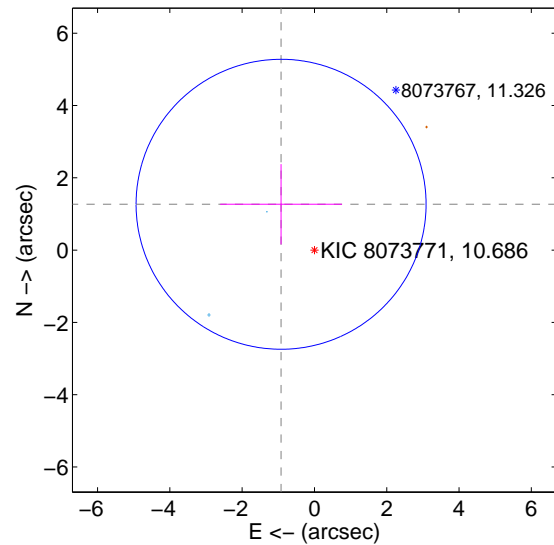
Supplemental centroid analysis for 008073771-03. **Kepler magnitude: 10.69.** Transit SNR 10.29

There are 2 quarters with good PRF difference image offsets

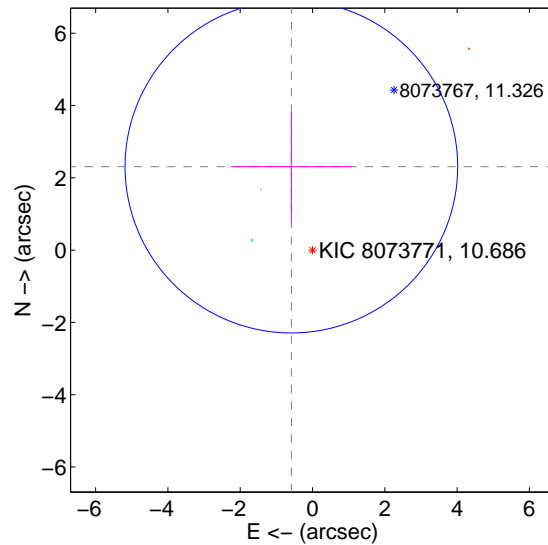
The OOT PRF centroid is offset from the target star catalog position by about 2.41 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.568 \pm 1.337$	1.17	$0.923 \pm 1.684$	$1.268 \pm 1.110$
PRF-fit source offset from KIC position	$2.381 \pm 1.534$	1.55	$0.586 \pm 1.671$	$2.308 \pm 1.524$
photometric centroid source offset	$2.20 \pm 1.04$	2.13	$-1.59 \pm 0.87$	$1.53 \pm 1.18$

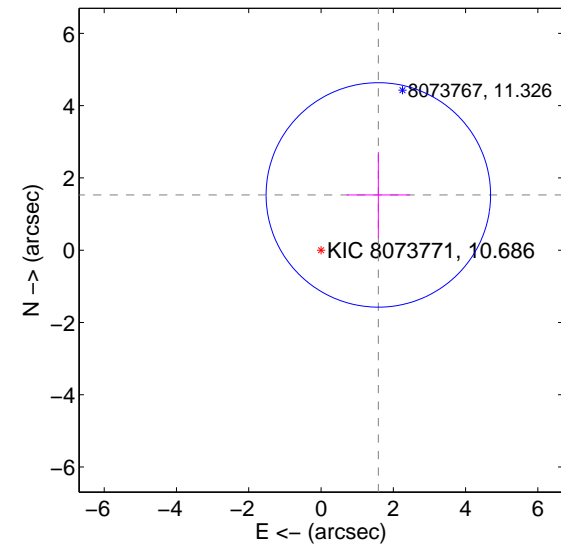
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

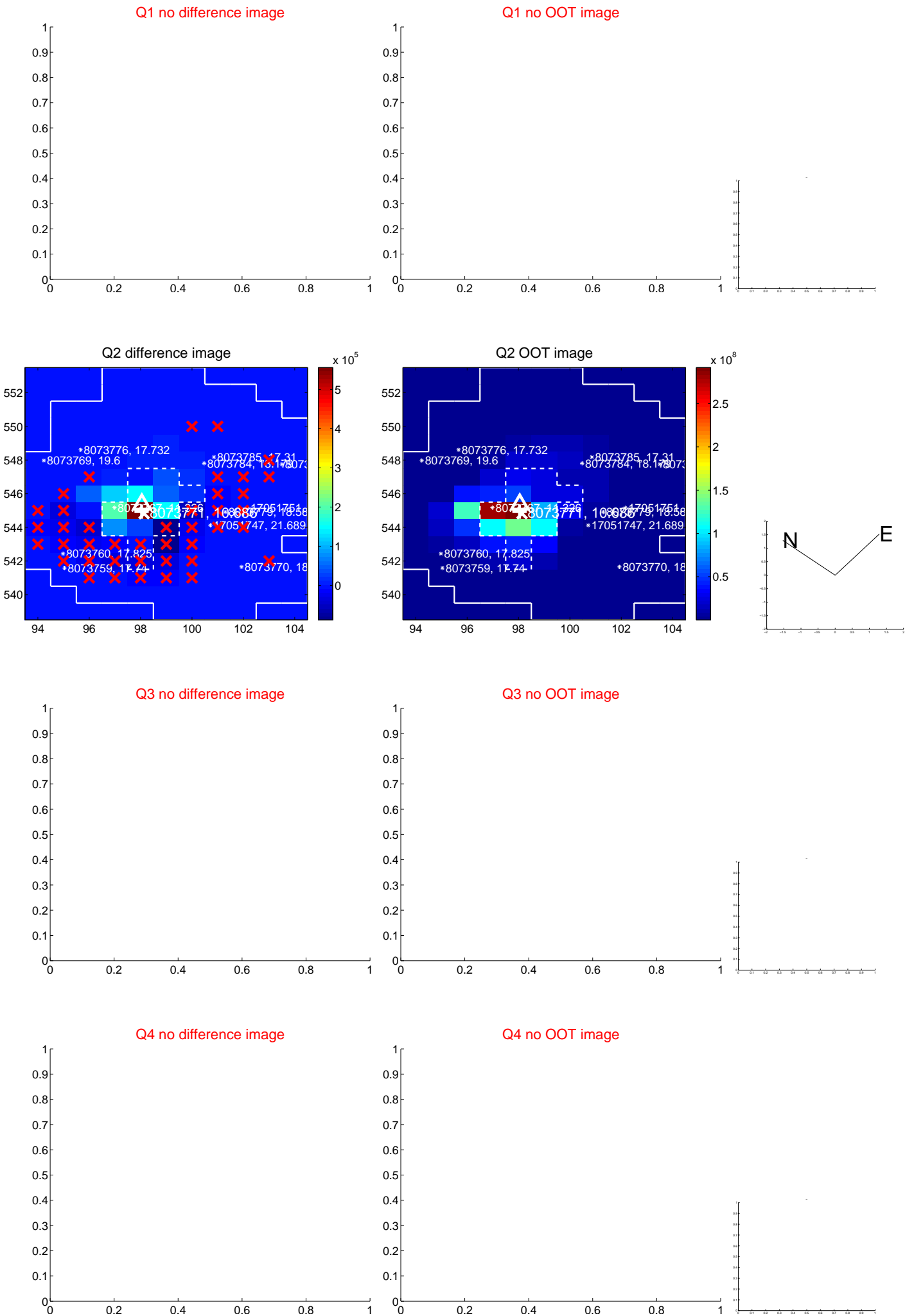


offset from photometric centroids



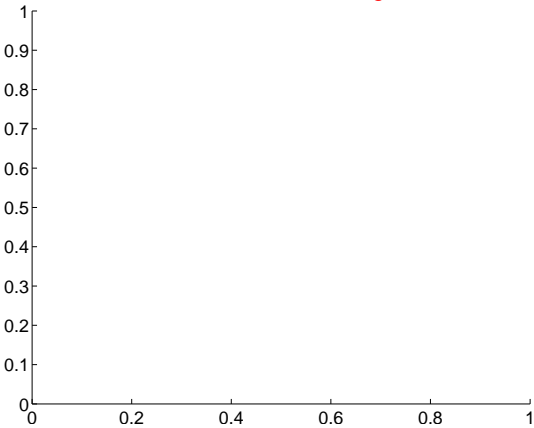
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

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

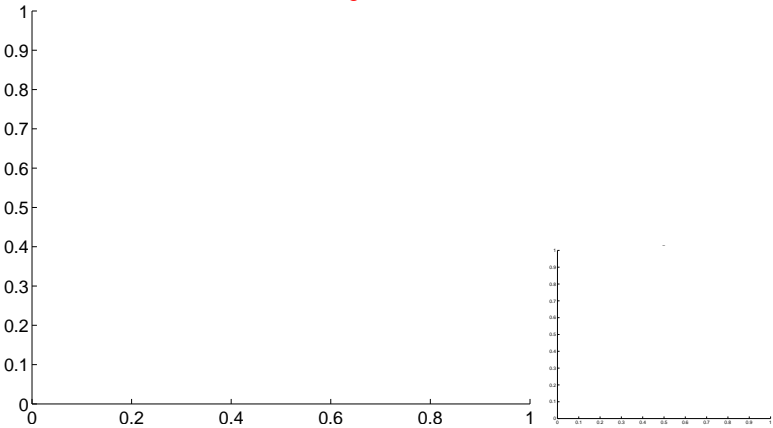


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

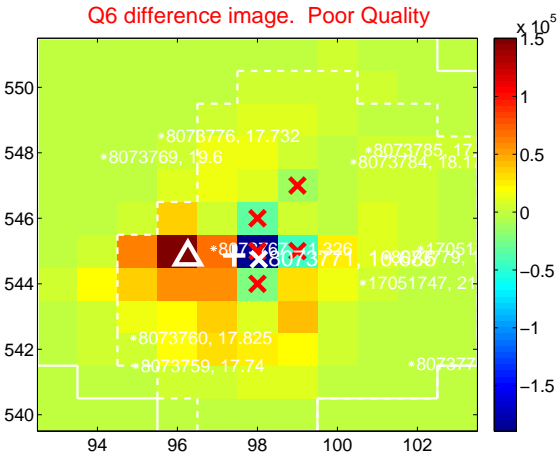
Q5 no difference image



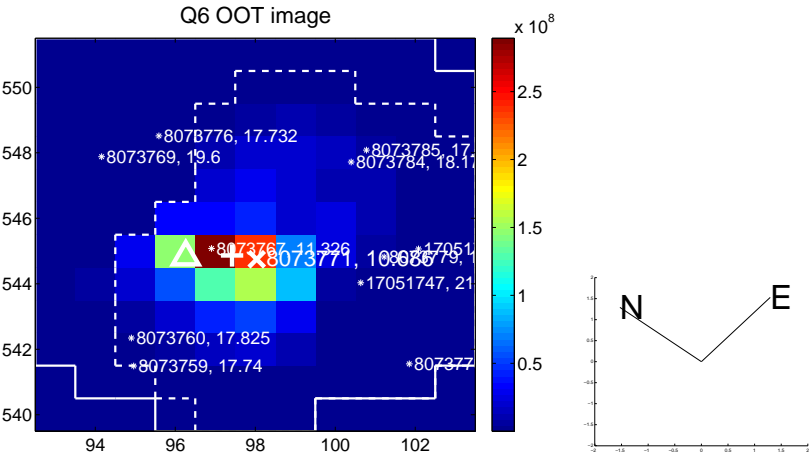
Q5 no OOT image



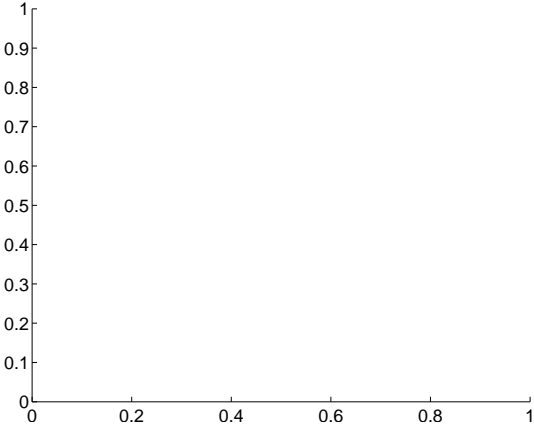
Q6 difference image. Poor Quality



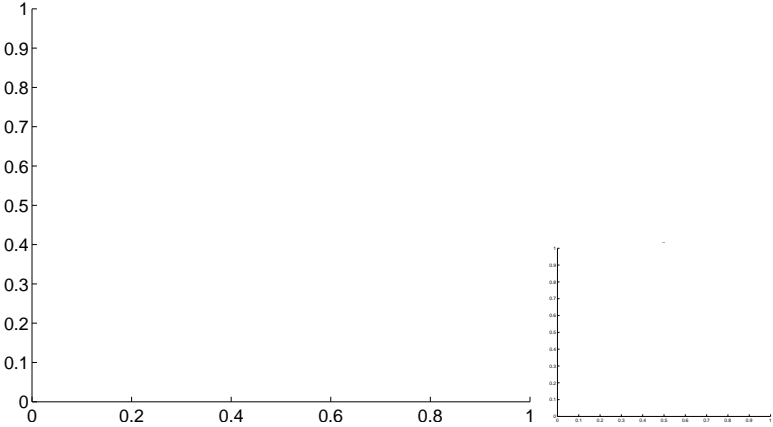
Q6 OOT image



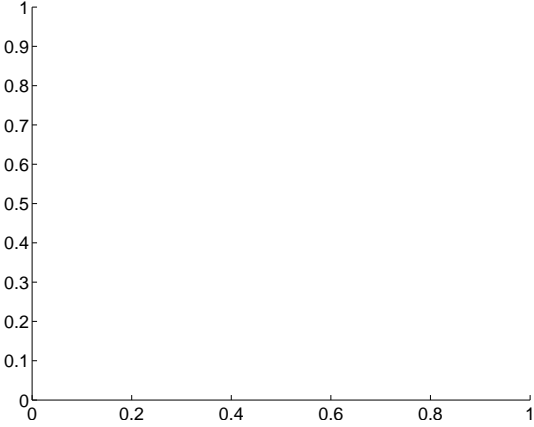
Q7 no difference image



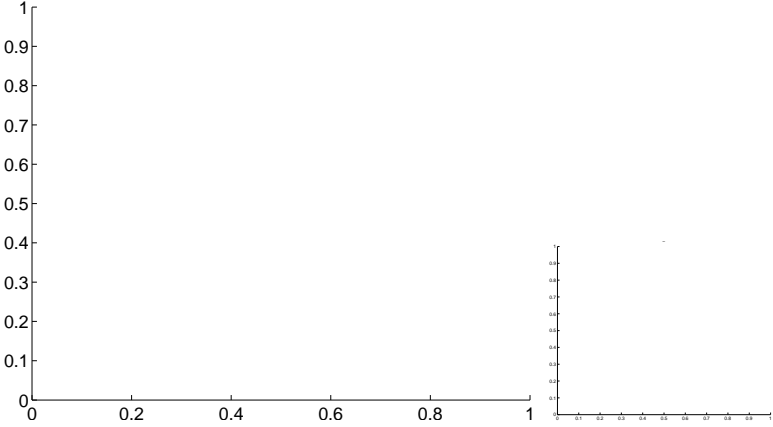
Q7 no OOT image



Q8 no difference image

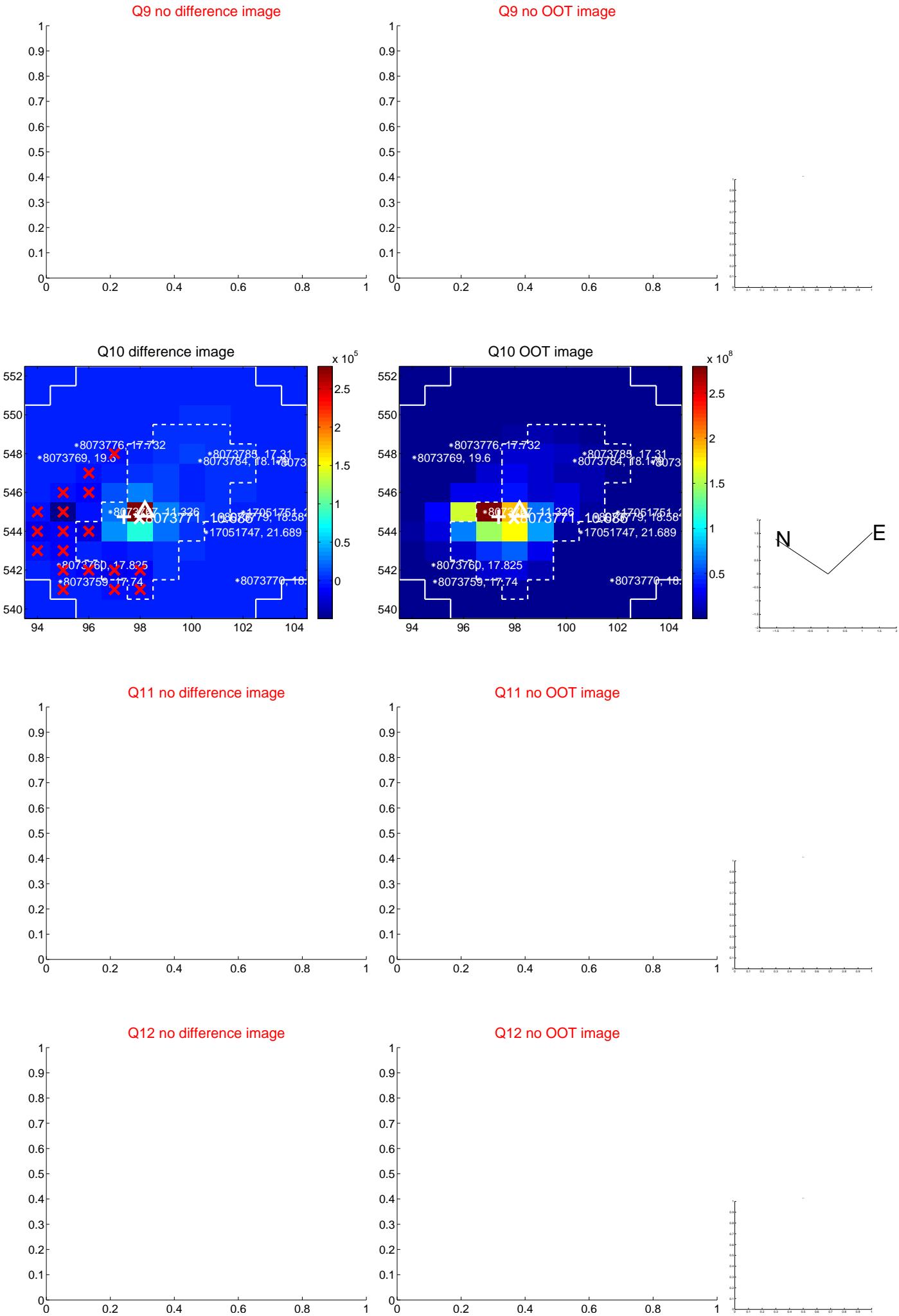


Q8 no OOT image



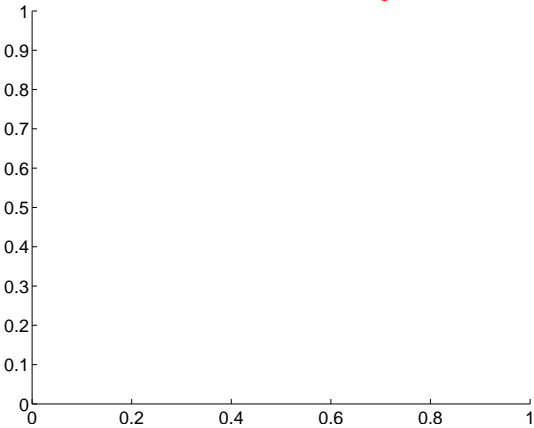


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

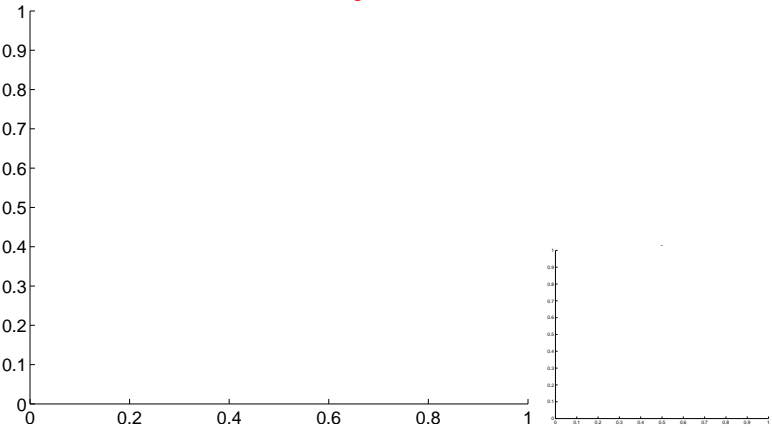


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

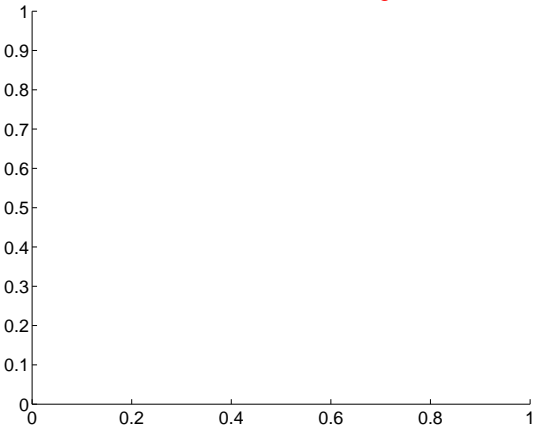
Q13 no difference image



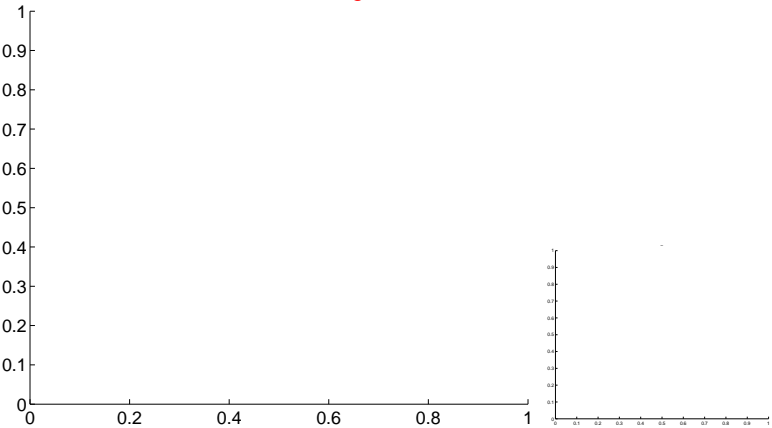
Q13 no OOT image



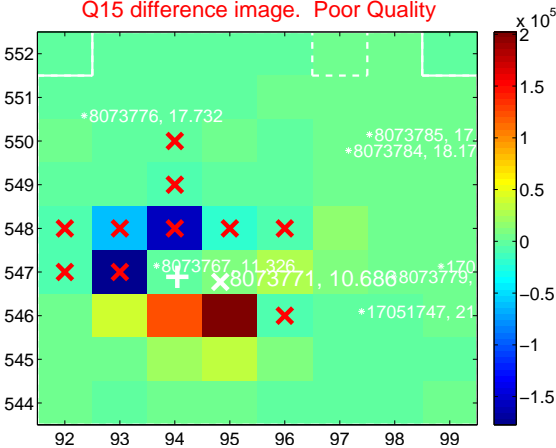
Q14 no difference image



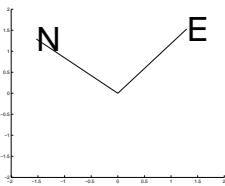
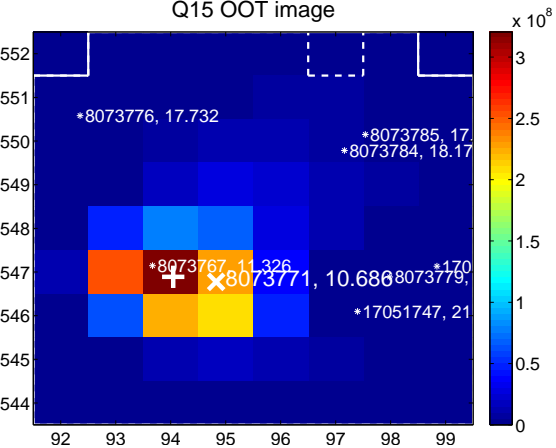
Q14 no OOT image



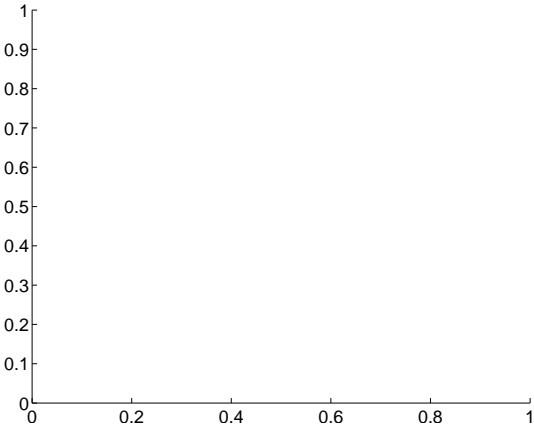
Q15 difference image. Poor Quality



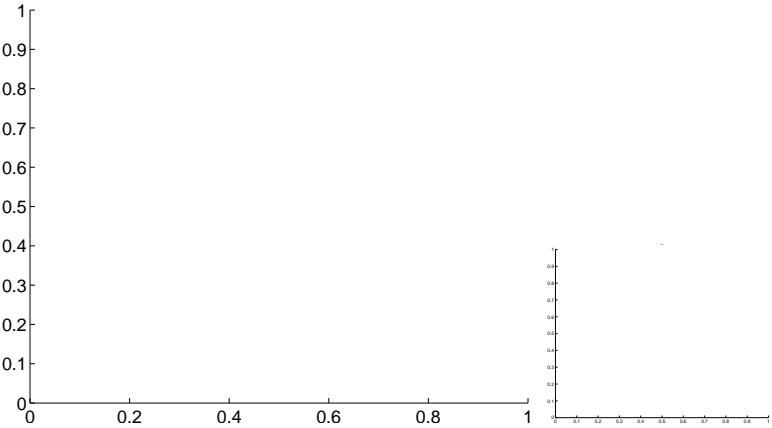
Q15 OOT image



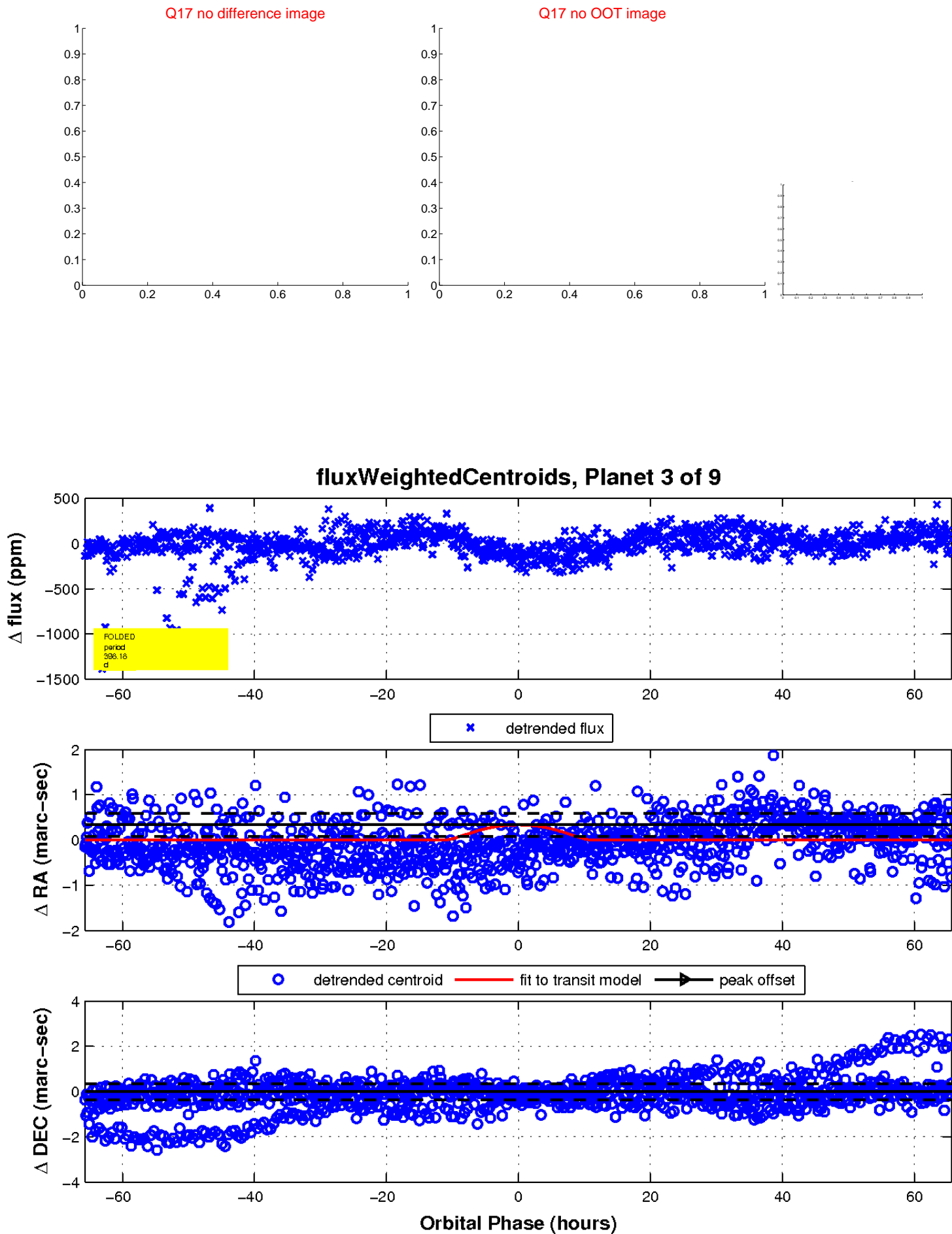
Q16 no difference image



Q16 no OOT image

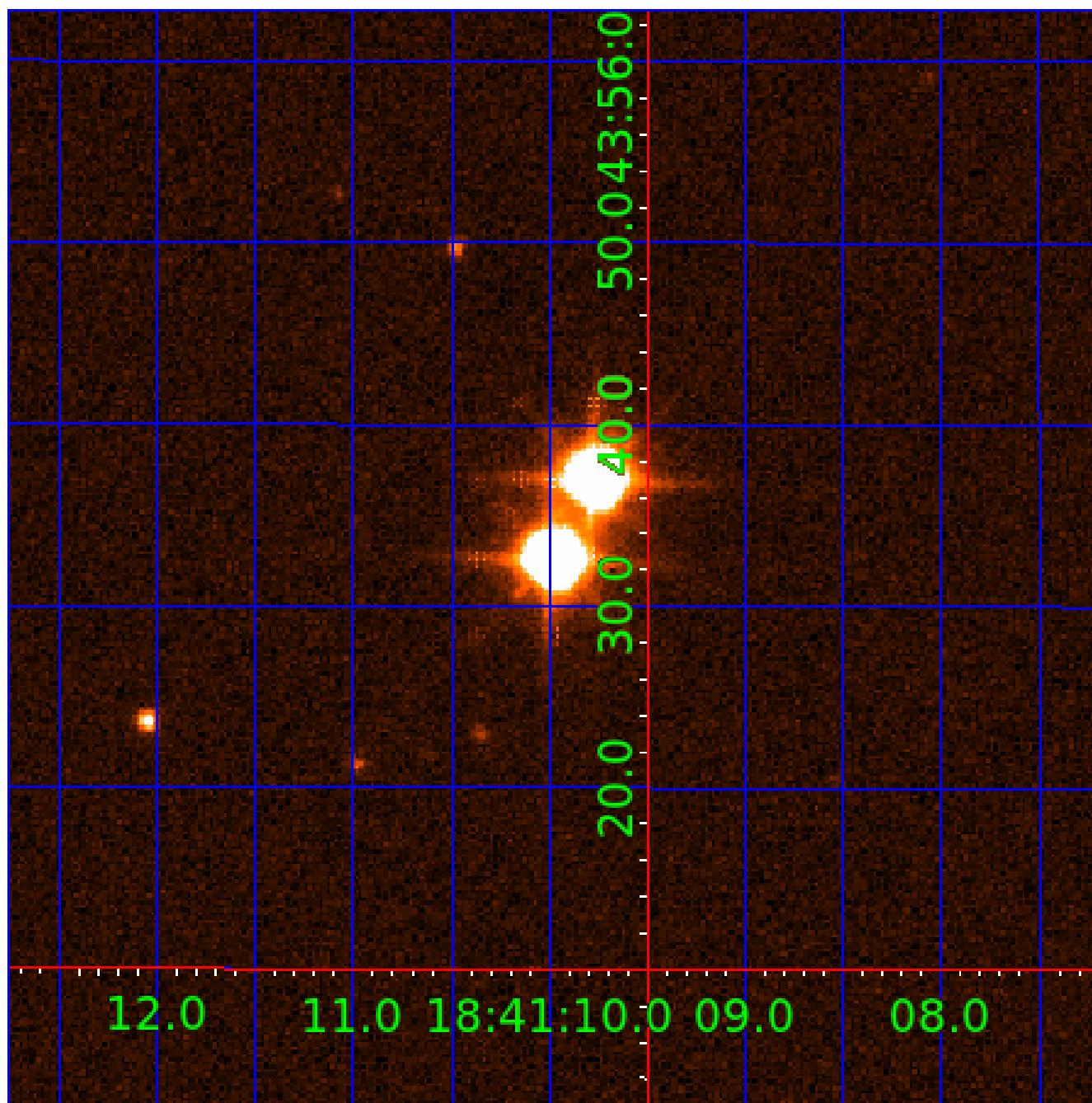


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 008073771

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
008073771-01	OBS	No	3.461710	134.422413	5.2	18.139	7.9	2.4	2.14	9185	0.56	8614.39
008073771-02	OBS	No	31.209849	153.746649	179.4	22.300	13.8	10.3	2.14	9185	4.83	459.08
008073771-03	OBS	No	398.184598	188.535331	291.9	21.908	9.7	10.3	2.14	9185	5.43	15.40
008073771-04	OBS	No	90.753169	215.949998	156.2	8.002	9.1	9.3	2.14	9185	3.30	110.61
008073771-05	OBS	No	57.905298	171.196957	88.4	16.784	8.8	7.8	2.14	9185	2.12	201.37
008073771-07	OBS	No	40.552881	147.833476	109.0	2.637	8.0	6.9	2.14	9185	2.65	323.78
008073771-08	OBS	No	143.980457	198.100793	110.6	3.000	8.3	-1.0	2.14	9185	2.30	59.78
008073771-09	OBS	No	106.481950	176.873243	121.2	14.100	7.8	7.8	2.14	9185	2.52	89.38

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008073771-01	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—CENT_SATURATED
008073771-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_DV—CENT_SATURATED
008073771-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—CENT_SATURATED
008073771-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—CENT_SATURATED
008073771-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_SATURATED
008073771-07	OBS	FP	0.00	1	0	0	0	TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_SATURATED
008073771-08	OBS	FP	0.00	1	0	0	0	TRANS_GAPPED—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_SATURATED
008073771-09	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_POS_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.

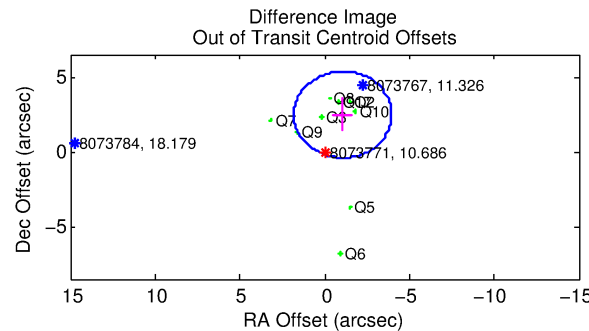
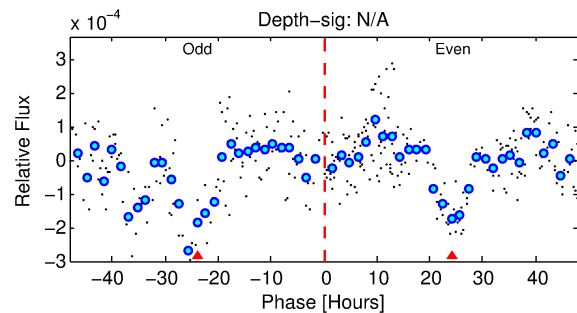
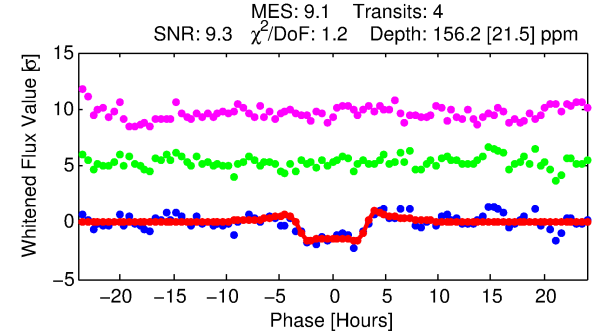
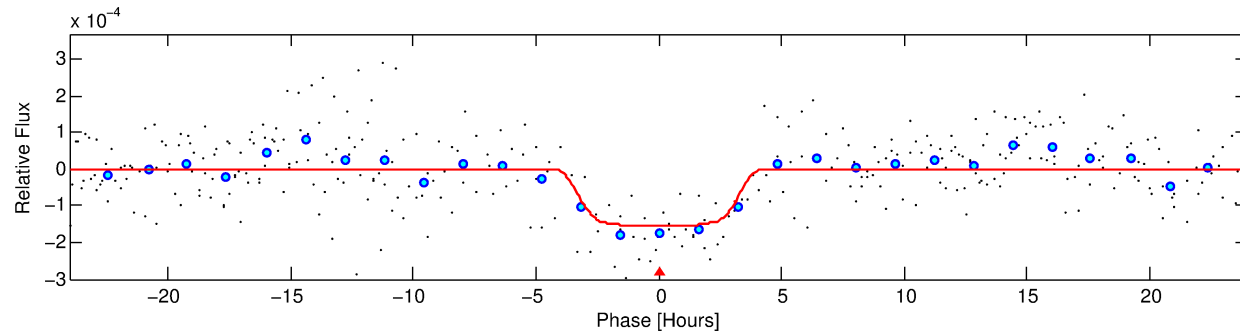
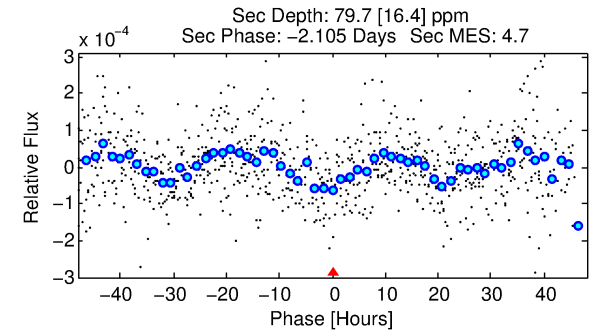
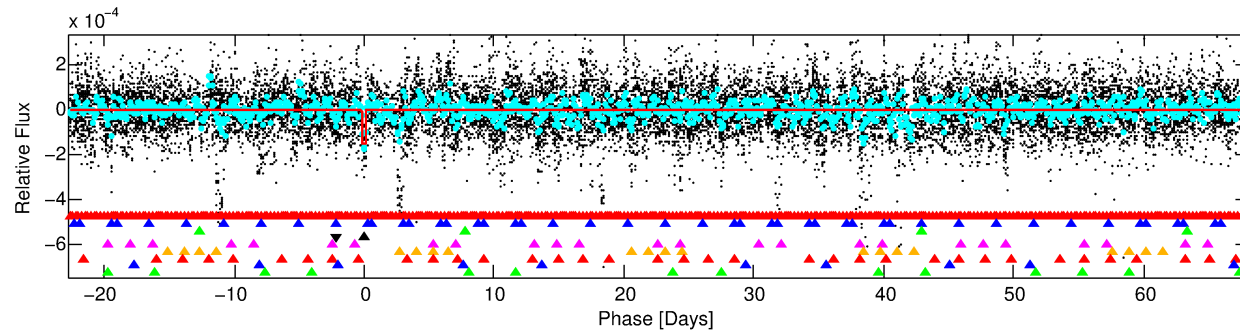
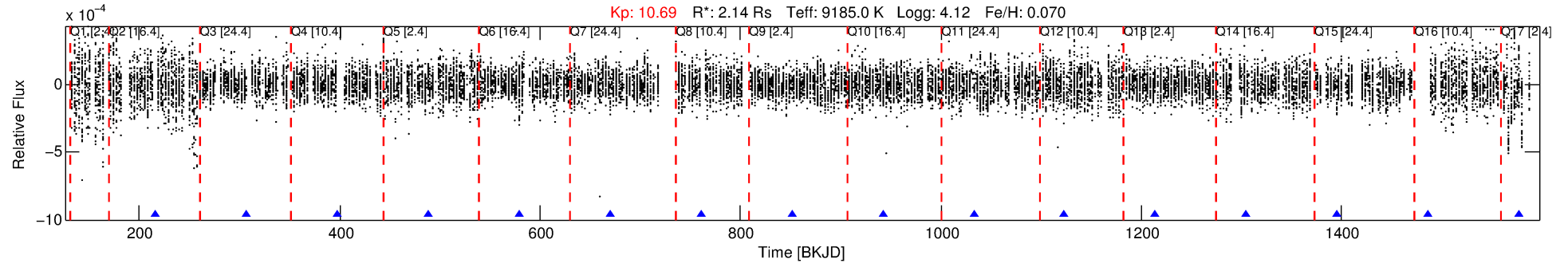
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 008073771-04

No Significant Match Found

# DV One-Page Summary

KIC: 8073771 Candidate: 4 of 9 Period: 90.753 d



## DV Fit Results:

Period = 90.75317 [0.00233] d  
Epoch = 215.9500 [0.0183] BKJD  
Rp/R\* = 0.0141 [0.0012]  
a/R\* = 26.26 [7.81]  
b = 0.97 [0.02]  
Seff = 110.61 [53.72]  
Teq = 827 [100] K  
Rp = 3.30 [1.40] Re  
a = 0.5129 [0.1690] AU  
Ag = 1061.00 [554.35] [1.91σ]  
Teffp = 7297 [586] K [10.89σ]

## DV Diagnostic Results:

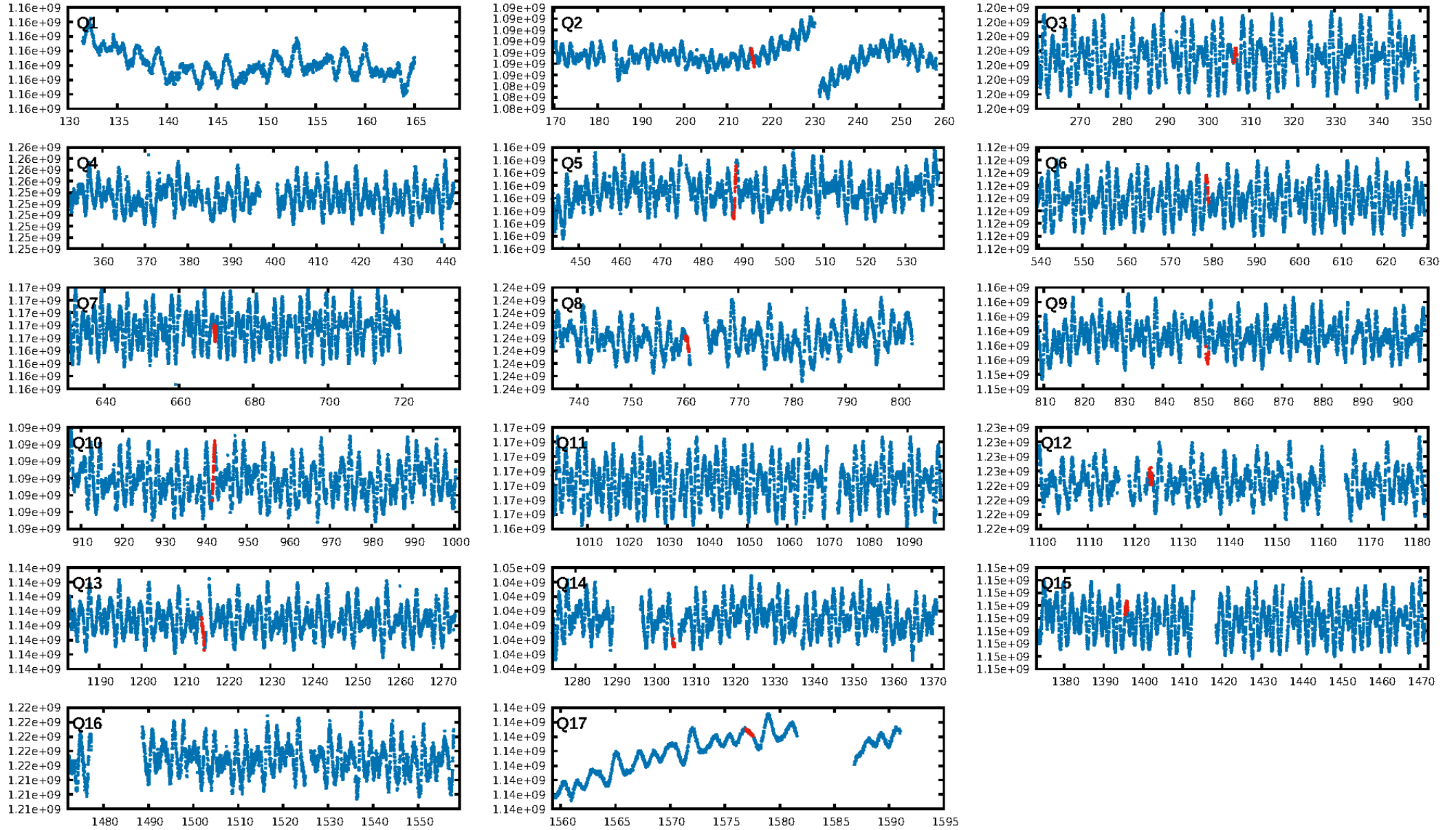
ShortPeriod-sig: 100.0% [46.80σ]  
LongPeriod-sig: 100.0% [23.28σ]  
ModelChiSquare2-sig: 58.2%  
ModelChiSquareGof-sig: 100.0%  
**Bootstrap-pfa: 7.16e-09**  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: N/A  
Centroid-sig: 15.6%  
**Centroid-so: 2.235 arcsec [3.13σ]**  
OotOffset-rm: 2.690 arcsec [2.80σ]  
**KicOffset-rm: 5.174 arcsec [5.15σ]**  
OotOffset-st: 3/2/1/3 [9]  
KicOffset-st: 3/2/1/3 [9]  
DiffImageQuality-fgm: 0.22 [2/9]  
DiffImageOverlap-fno: 0.20 [2/10]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 02-Feb-2016 15:03:26 Z

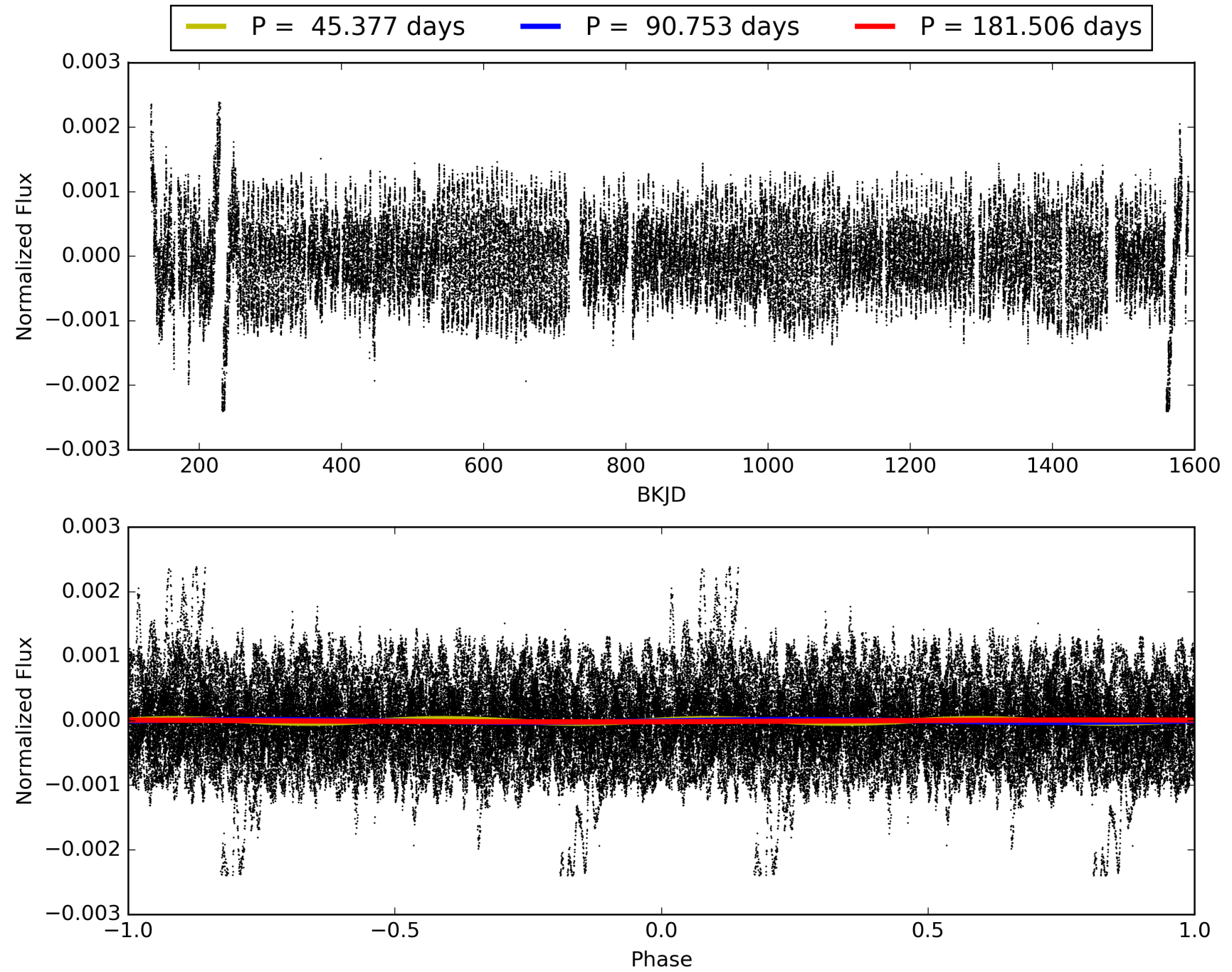
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center



# TCE 008073771-04, PDC Light Curves

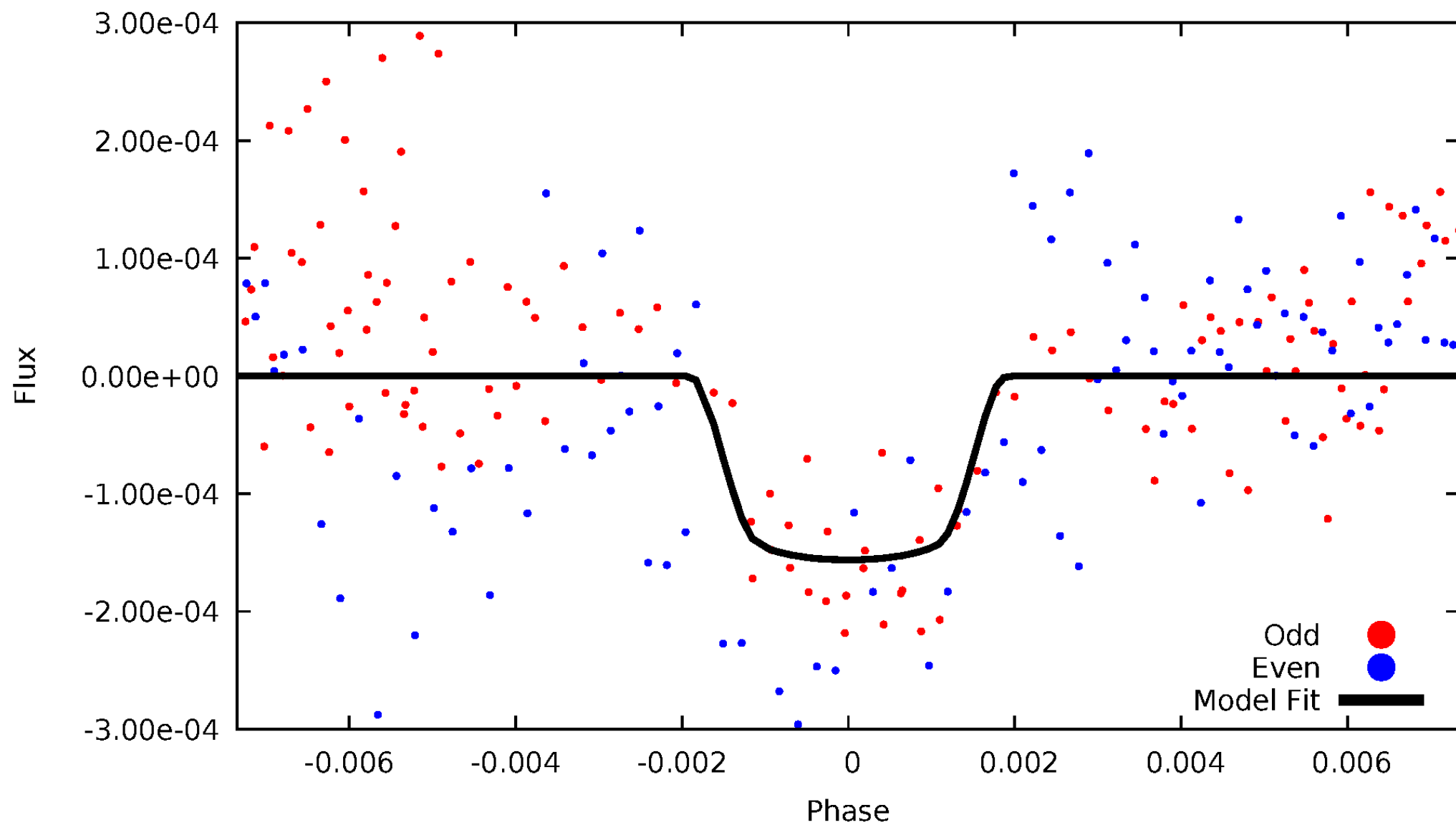


# TCE 008073771-04



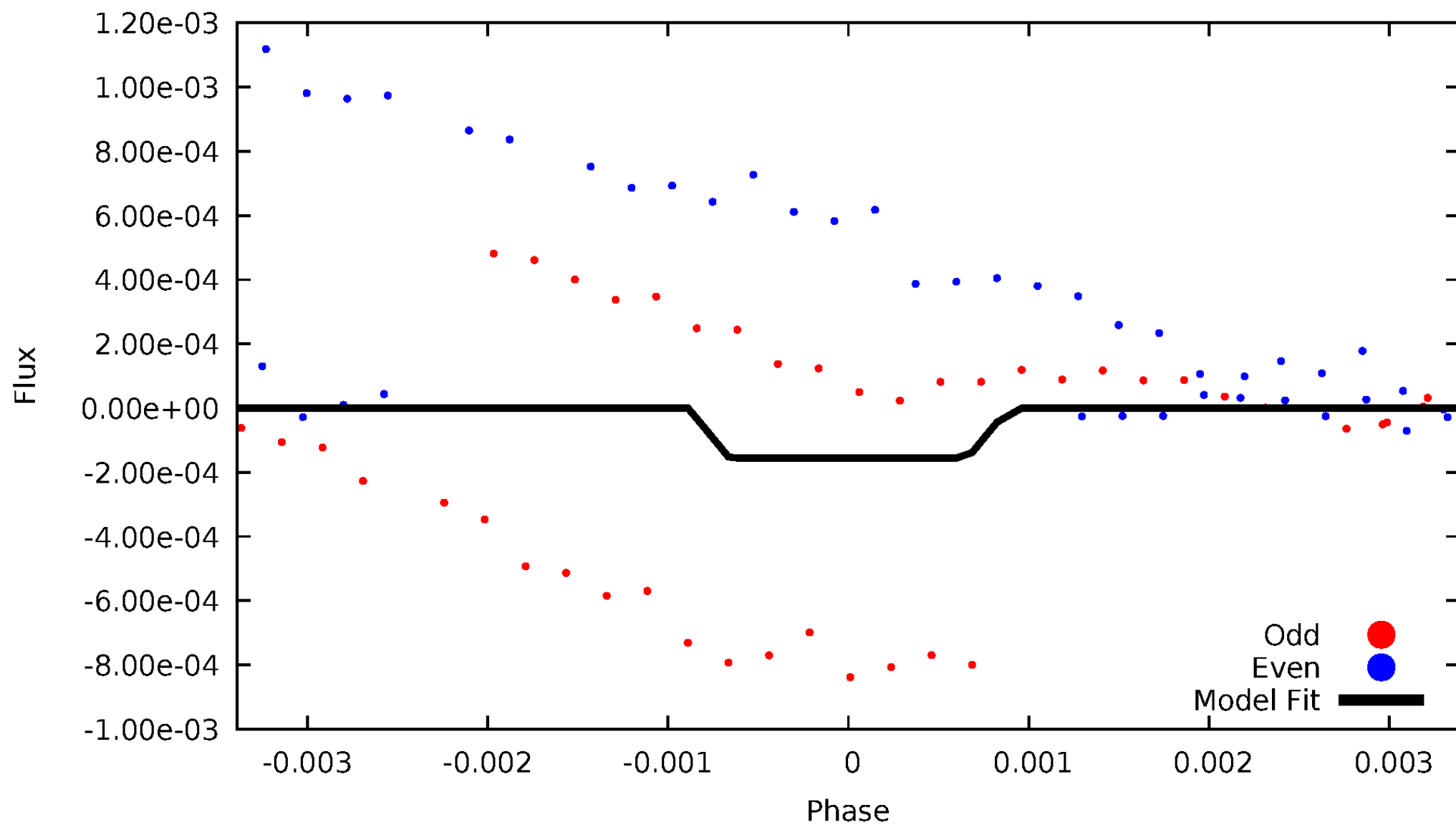
# DV Odd/Even

TCE 008073771-04



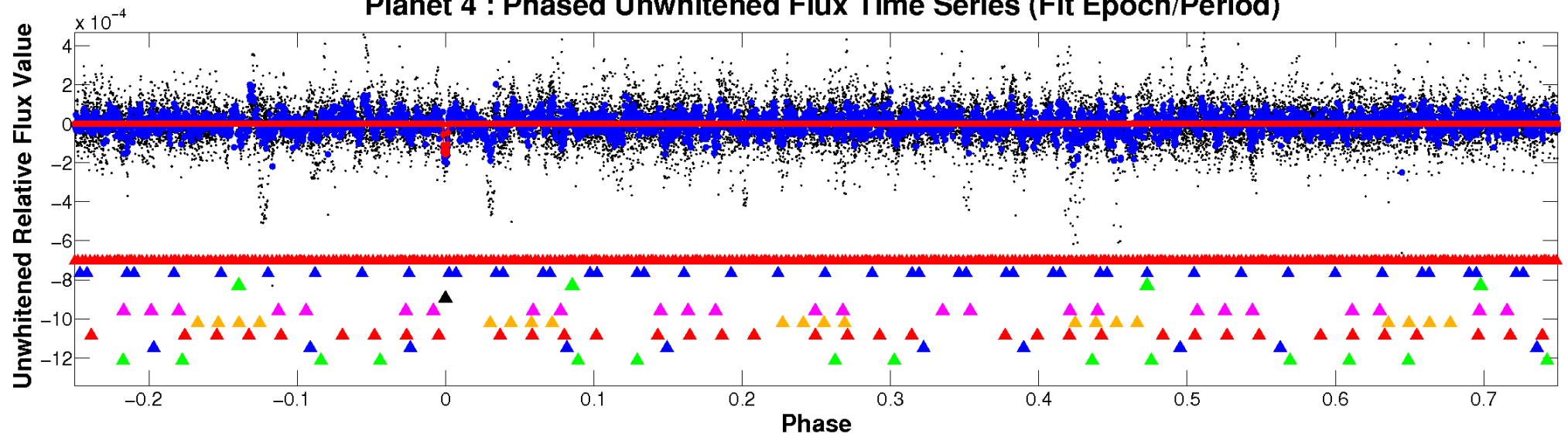
# ALT Odd/Even

TCE 008073771-04

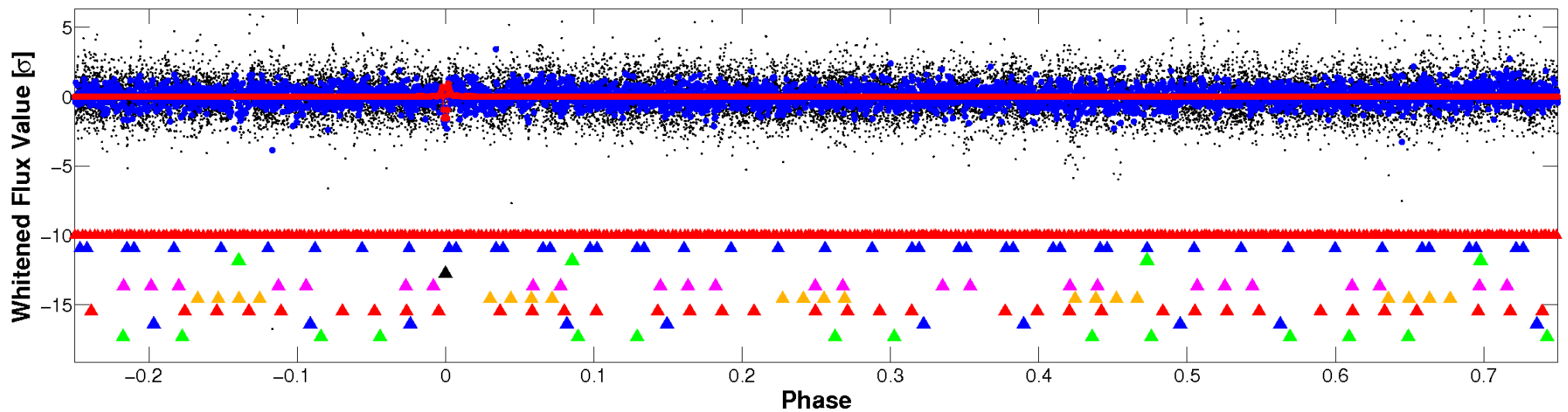


# Non-Whitened Vs. Whitened Light Curve

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

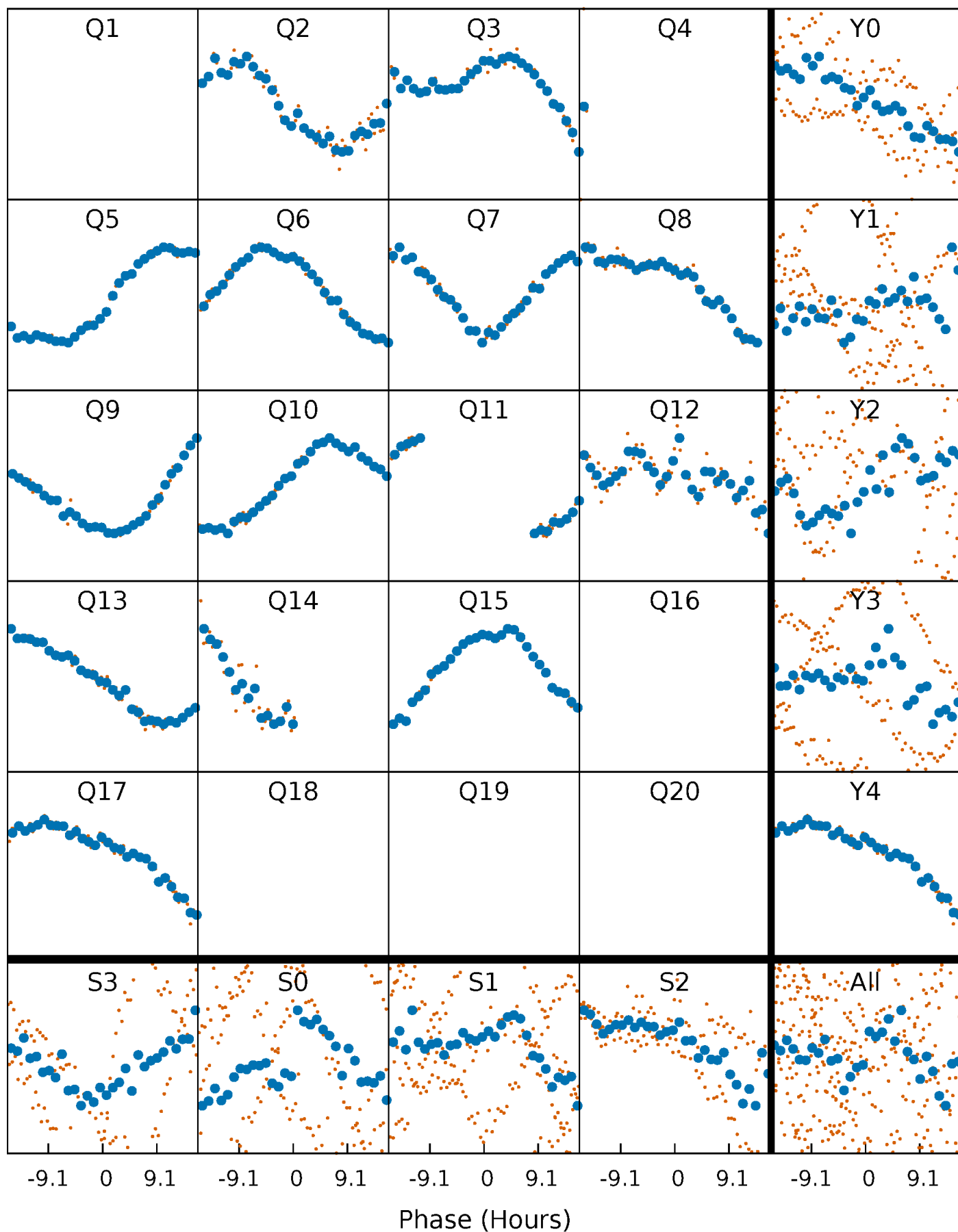


## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



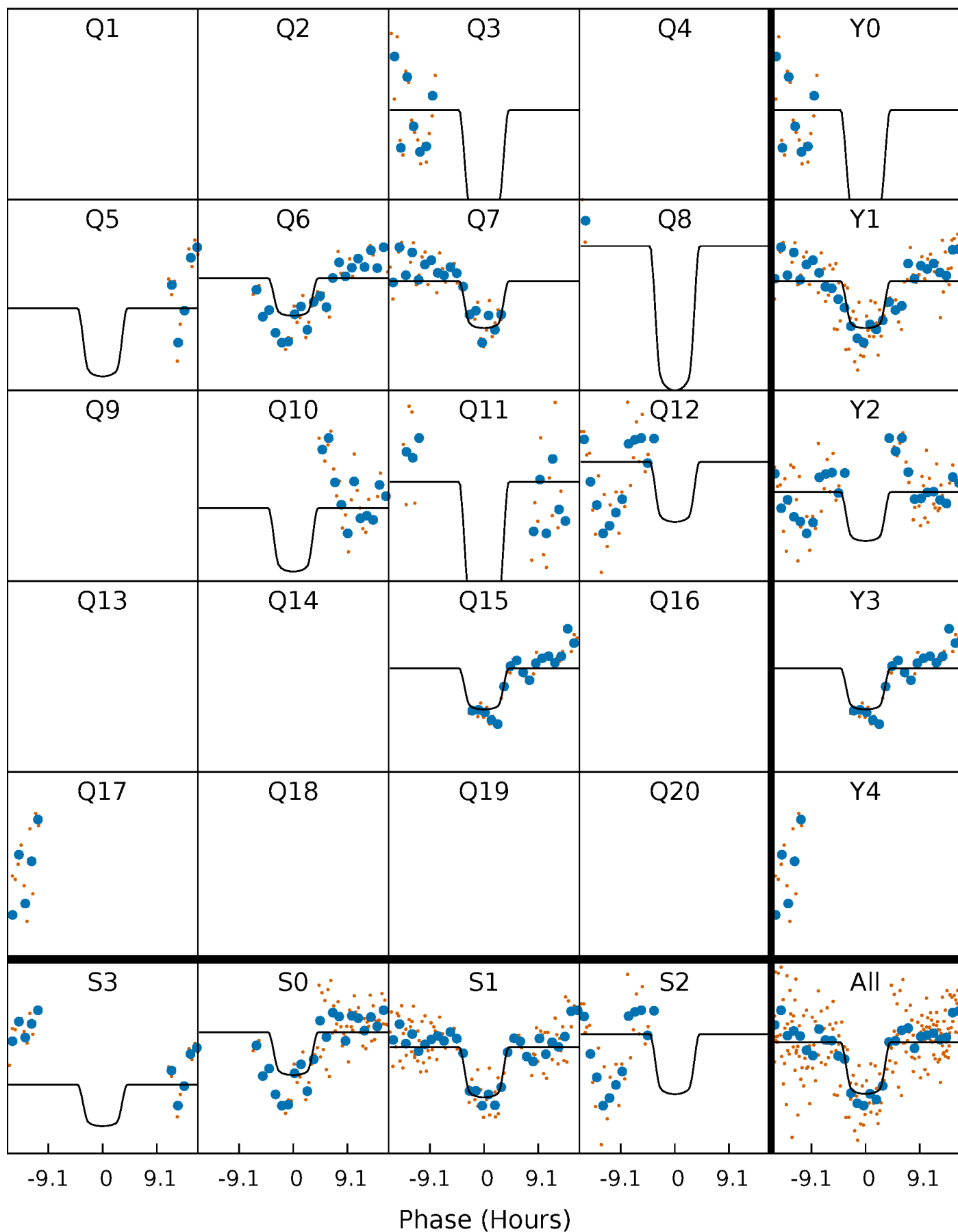
# PDC Quarter-Phased Transit Curves

TCE 008073771-04 P= 90.753169 Days  $T_0=215.949998$  (BKJD)



# DV Quarter-Phased Transit Curves

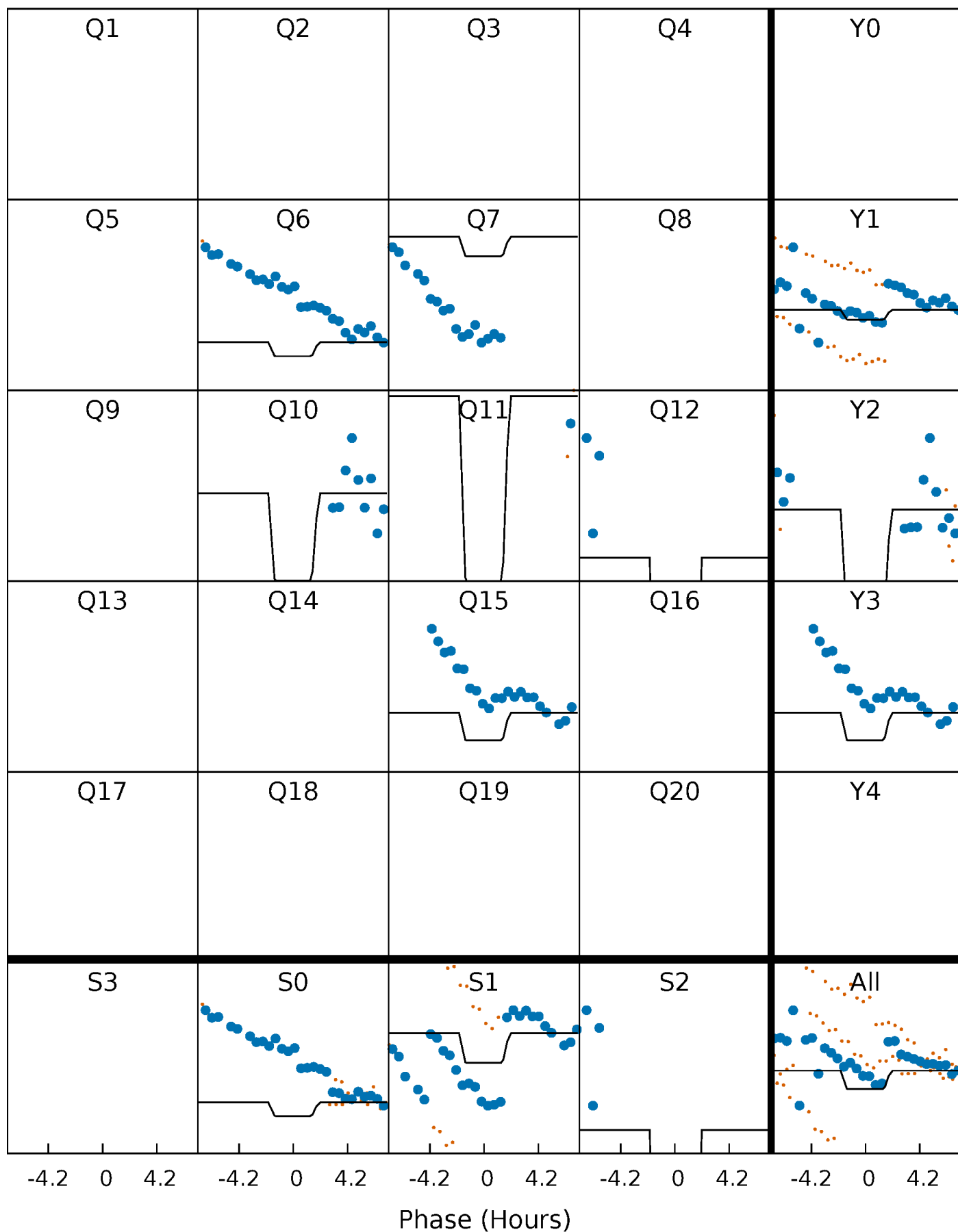
TCE 008073771-04 P= 90.753169 Days  $T_0=215.949998$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

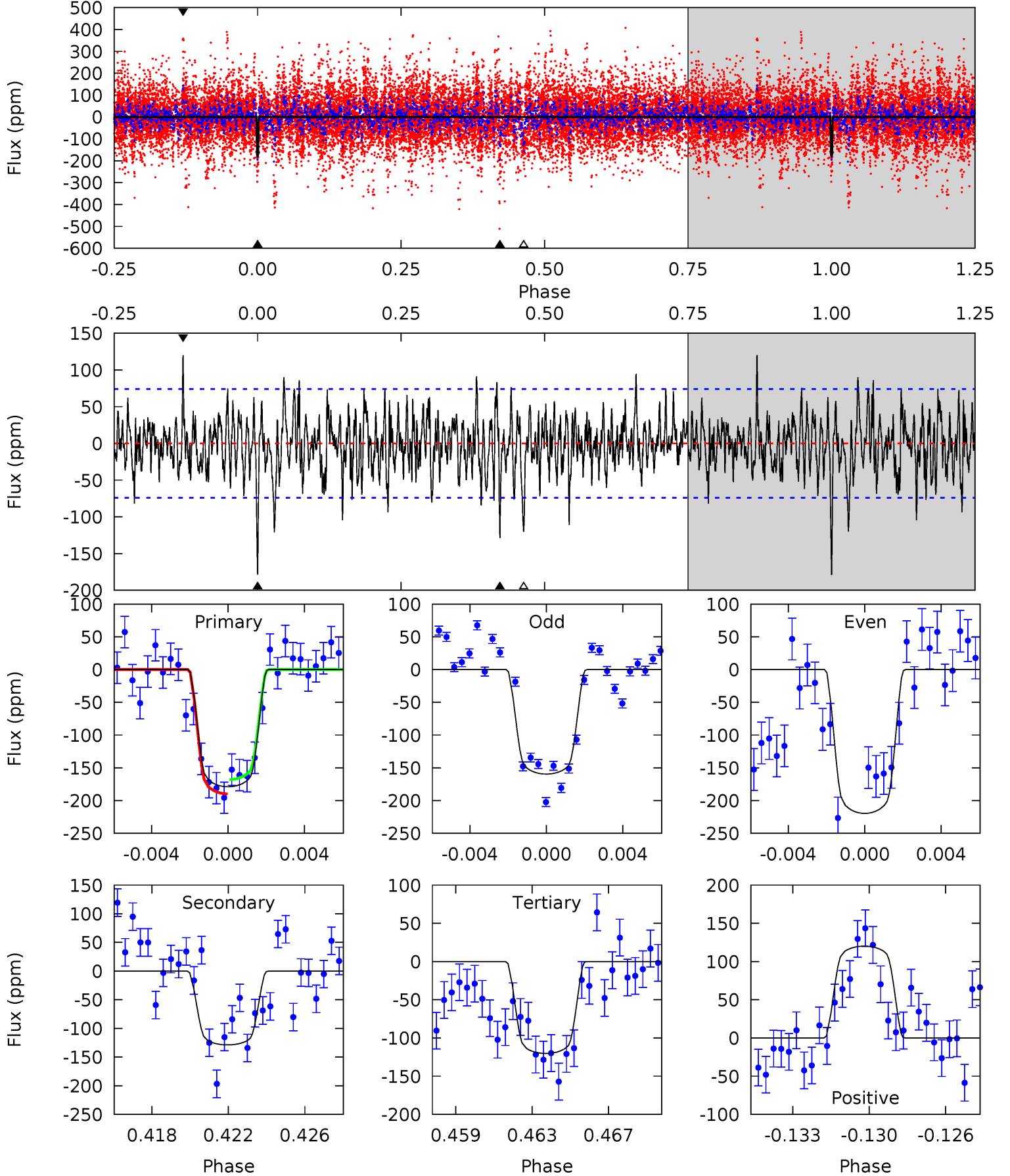
TCE 008073771-04     $P = 90.755360$  Days     $T_0 = 215.995429$  (BKJD)



# DV Model-Shift Uniqueness Test

008073771-04,  $P = 90.753169$  Days,  $E = 125.196829$  Days

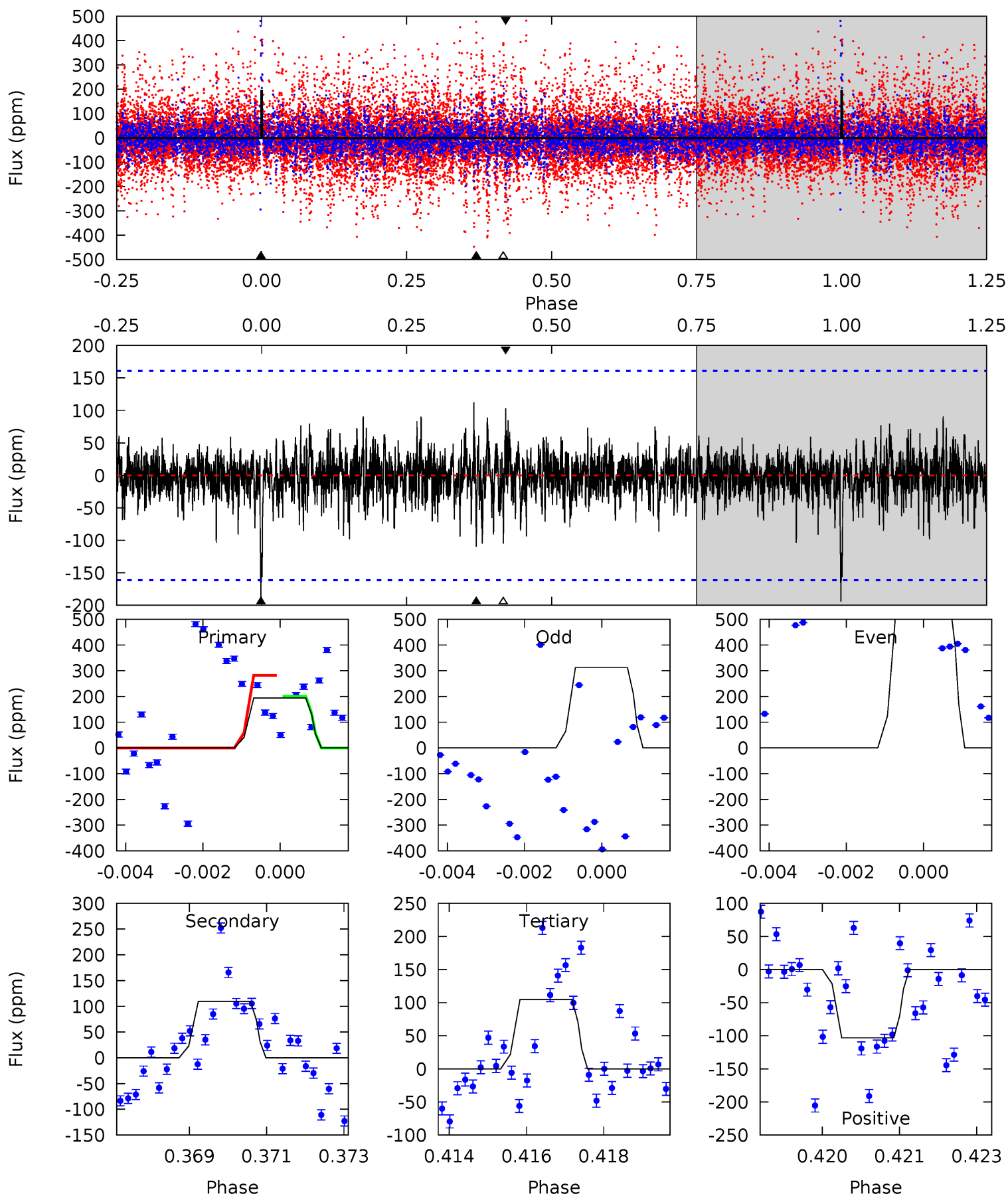
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
12.6	9.07	8.48	8.47	5.21	2.90	2.22	4.13	4.14	0.60	0.61	2.01	0.99	0.40	0.77



# Alt Model-Shift Uniqueness Test

008073771-04, P = 90.755360 Days, E = 125.240069 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
6.44	3.64	3.48	3.42	5.35	3.12	0.83	2.96	3.01	0.16	0.21	5.82	-0.24	0.37	1.41



### Stellar Parameters For KIC 008073771

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$9185^{+257}_{-417}$	$4.118^{+0.099}_{-0.231}$	$0.070^{+0.150}_{-0.650}$	$2.136^{+0.890}_{-0.445}$	$2.180^{+0.427}_{-0.522}$	$0.315^{+0.177}_{-0.176}$
	+3%/-5%	+2%/-6%	+214%/-929%	+42%/-21%	+20%/-24%	+56%/-56%
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 008073771-04 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	-129±14	$3.45^{+0.73}_{-0.55}$	$1182^{+109}_{-77}$	$7925^{+574}_{-519}$	$1518^{+564}_{-456}$
Alt.	-110±30	$2.99^{+0.70}_{-0.48}$	$1176^{+101}_{-77}$	$8080^{+1020}_{-908}$	$1662^{+851}_{-655}$

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

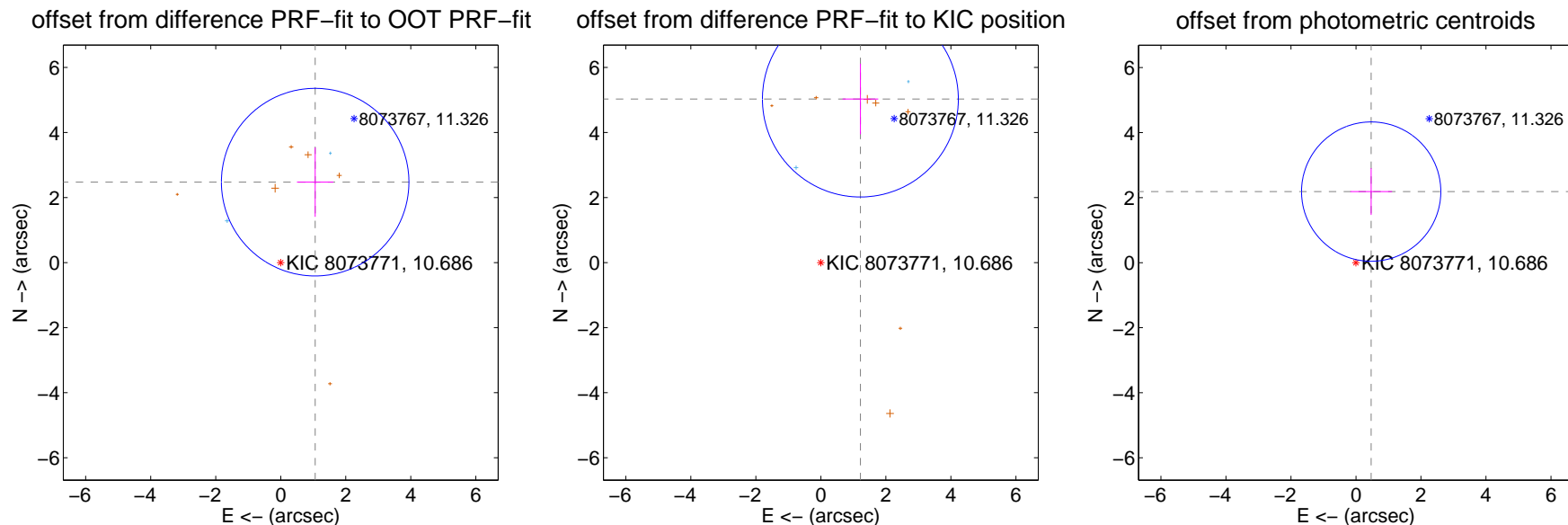
## DV Centroid Data

Supplemental centroid analysis for 008073771-04. **Kepler magnitude: 10.69.** Transit SNR 9.32

**There are 2 quarters with good PRF difference image offsets**

The direct PRF centroid is offset from the target star catalog position by about 1.80 arcsec

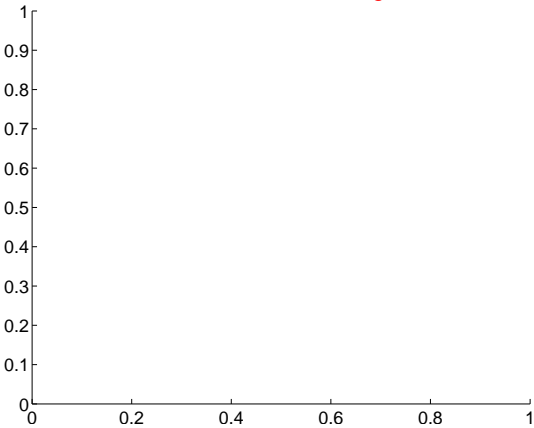
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$2.690 \pm 0.961$	2.80	$-1.059 \pm 0.559$	$2.473 \pm 1.065$
PRF-fit source offset from KIC position	$5.174 \pm 1.004$	5.15	$-1.216 \pm 0.549$	$5.030 \pm 1.084$
photometric centroid source offset	$2.24 \pm 0.71$	3.13	$-0.47 \pm 0.64$	$2.19 \pm 0.72$



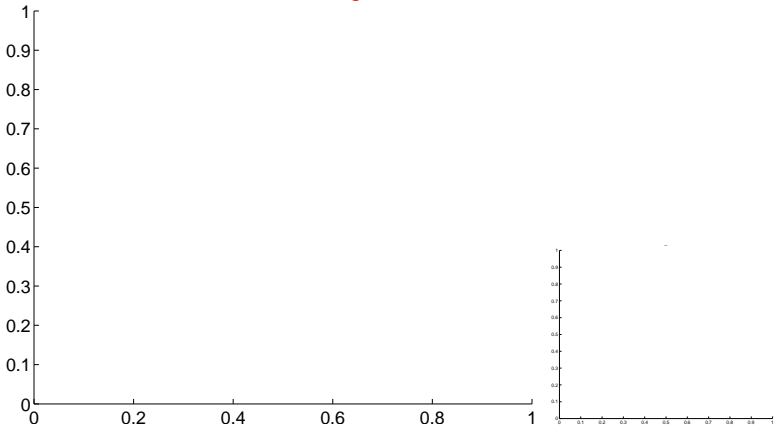
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

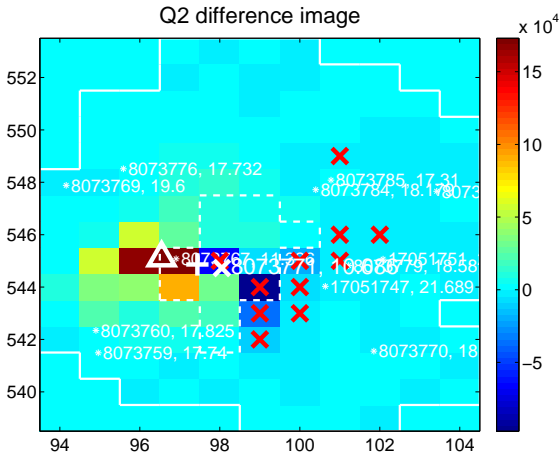
Q1 no difference image



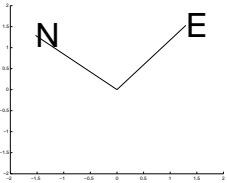
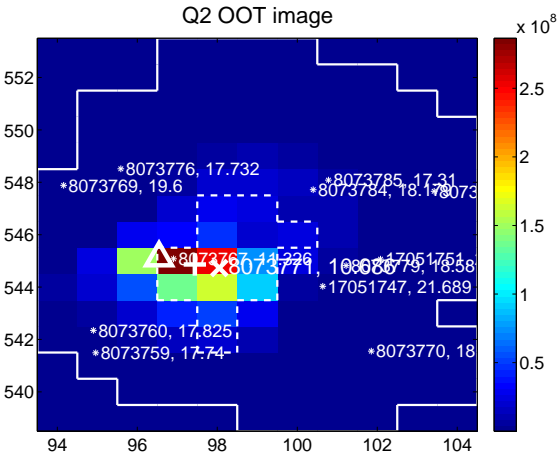
Q1 no OOT image



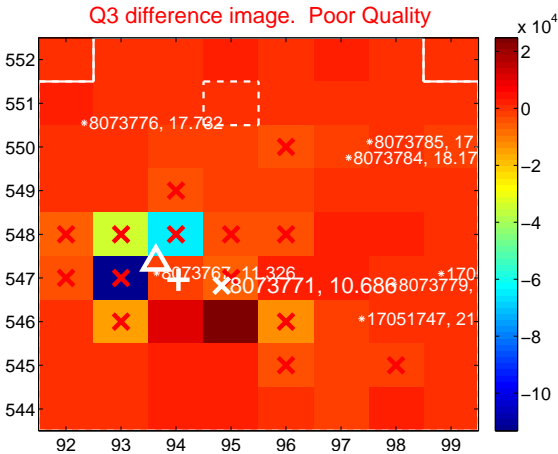
Q2 difference image



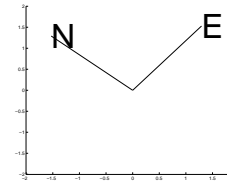
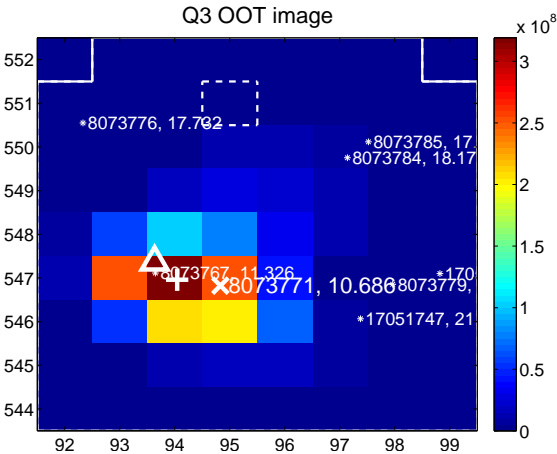
Q2 OOT image



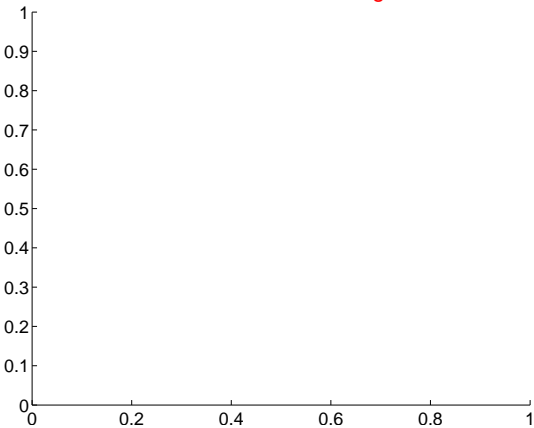
Q3 difference image. Poor Quality



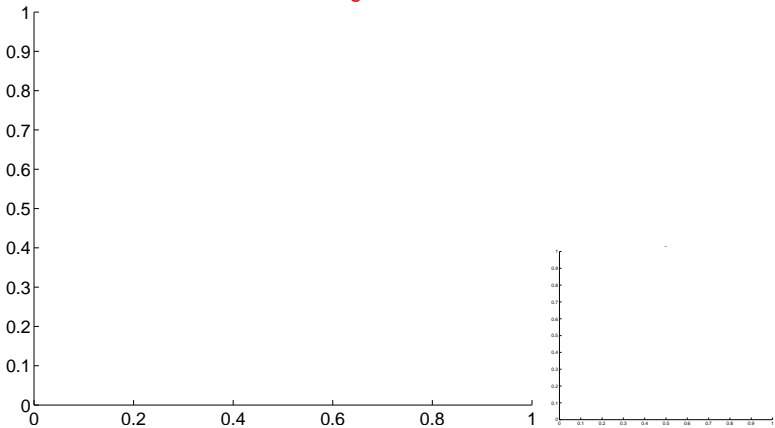
Q3 OOT image



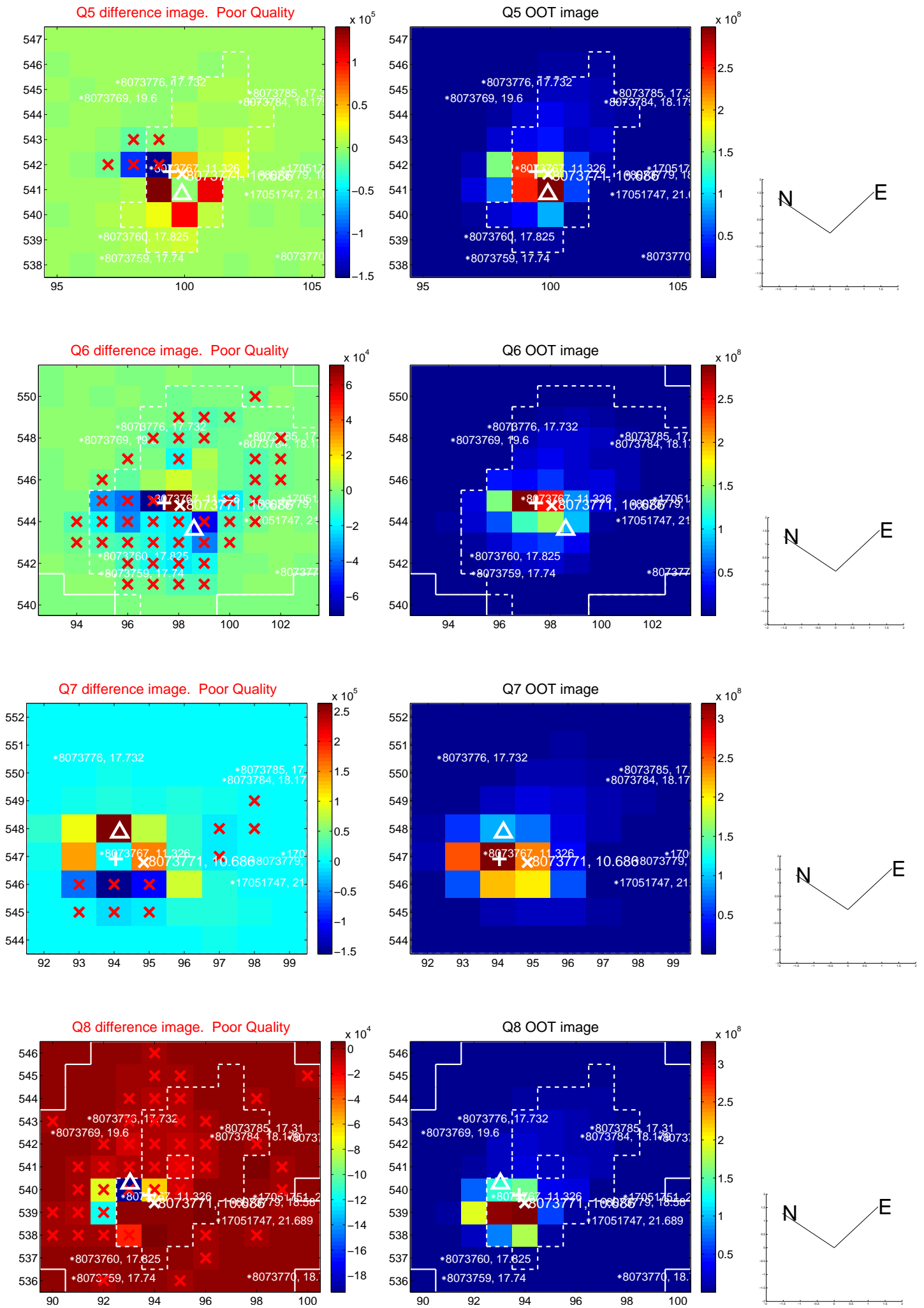
Q4 no difference image



Q4 no OOT image

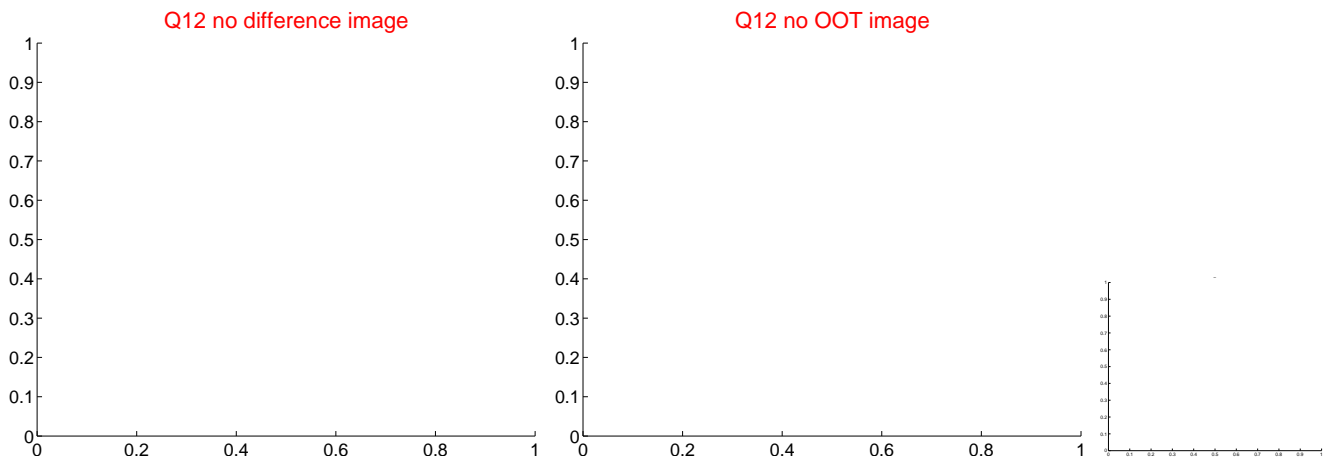
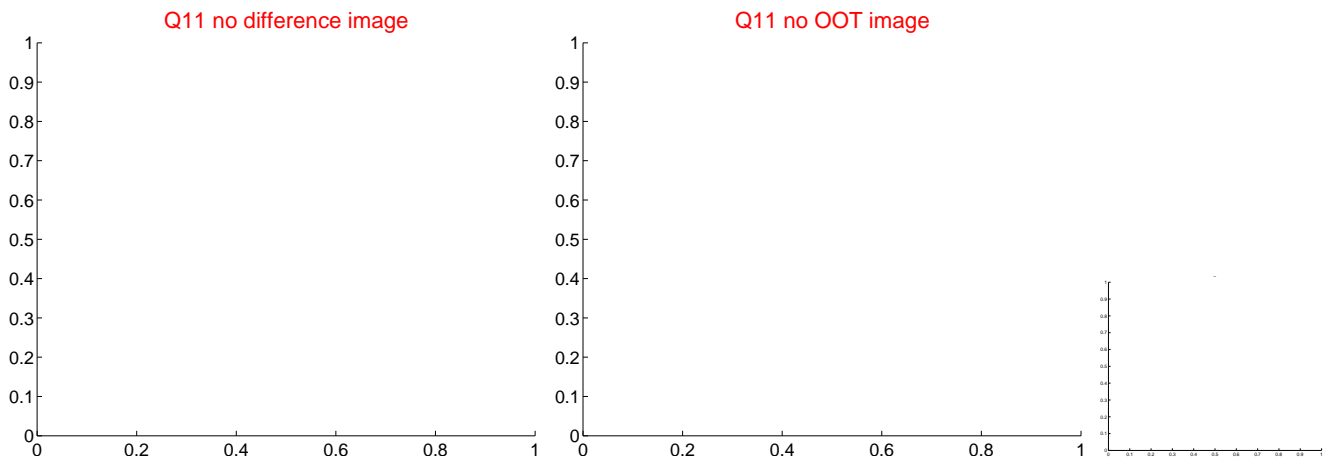
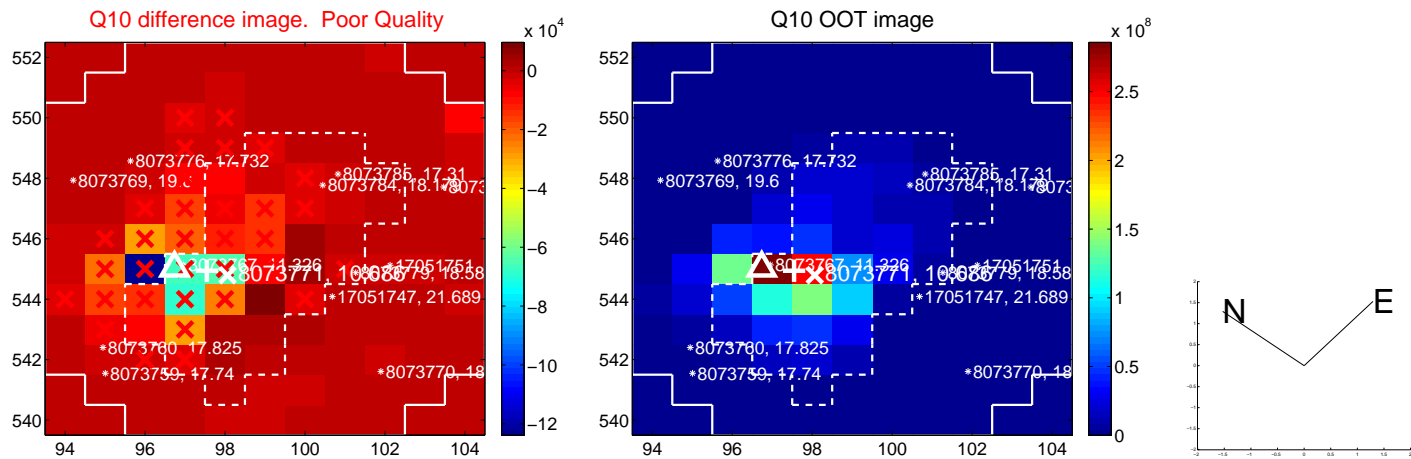
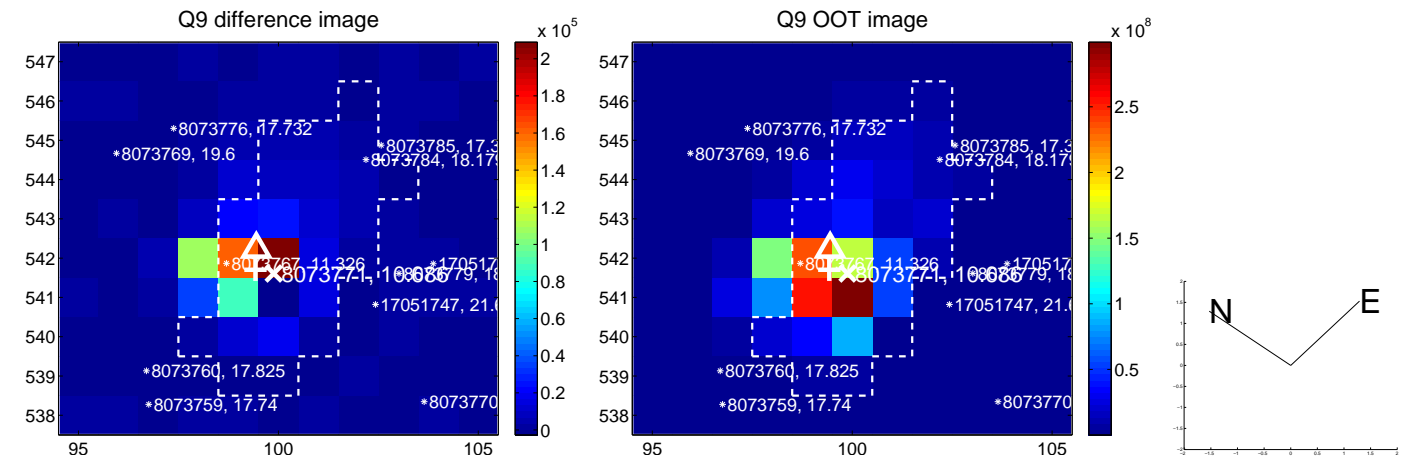


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

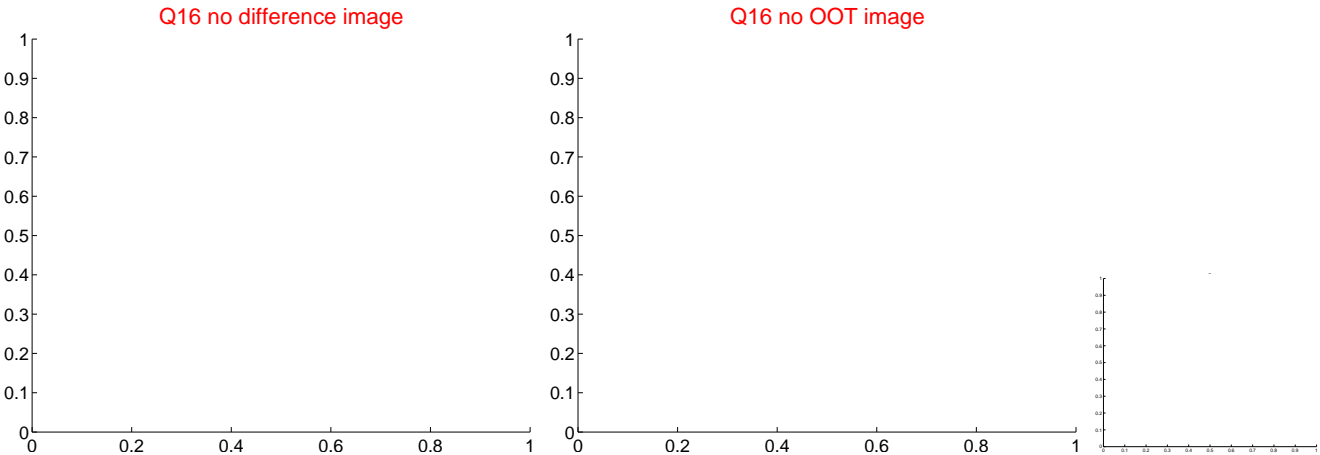
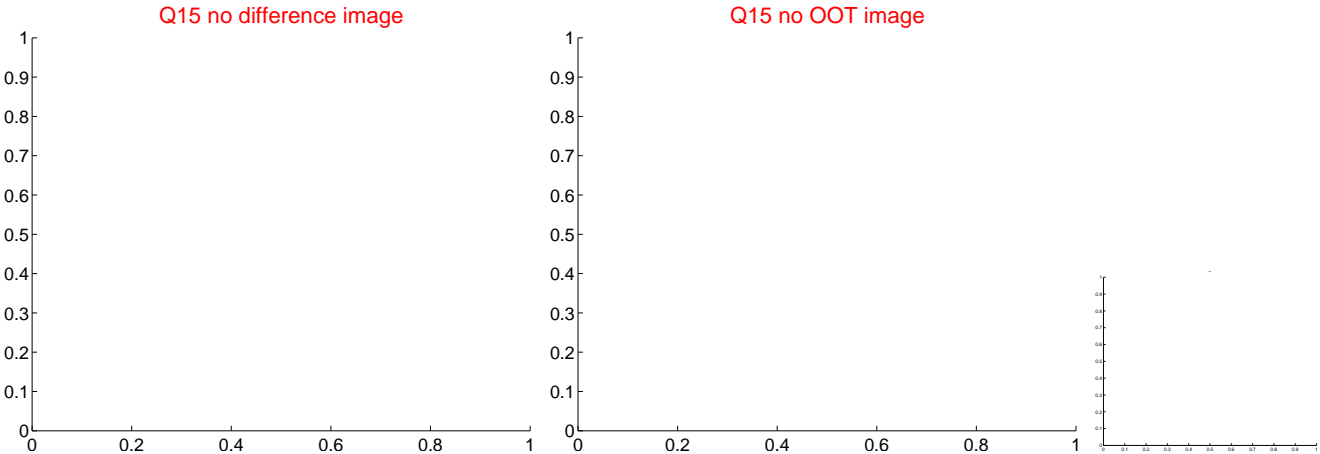
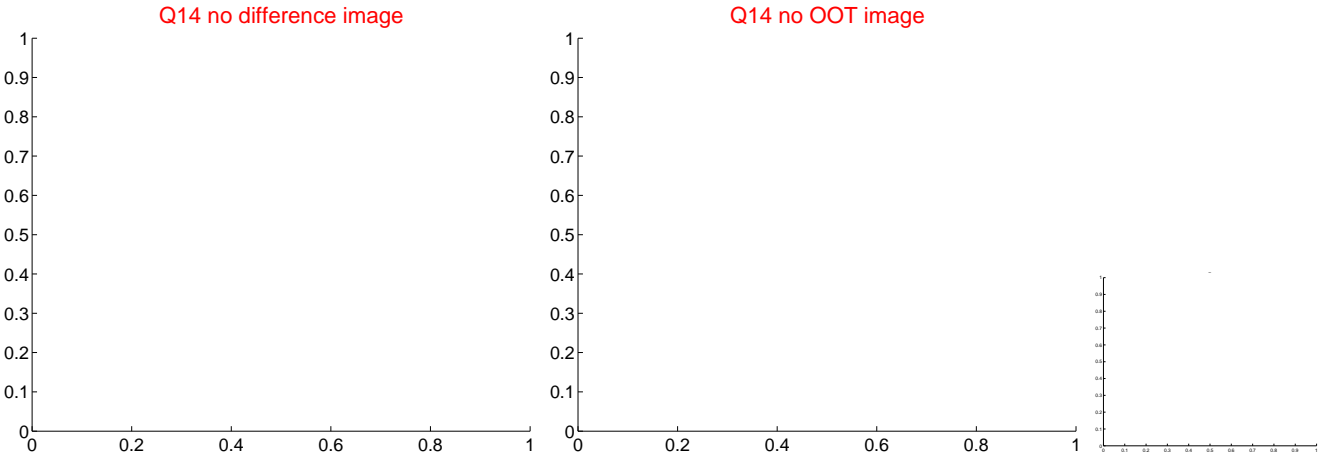
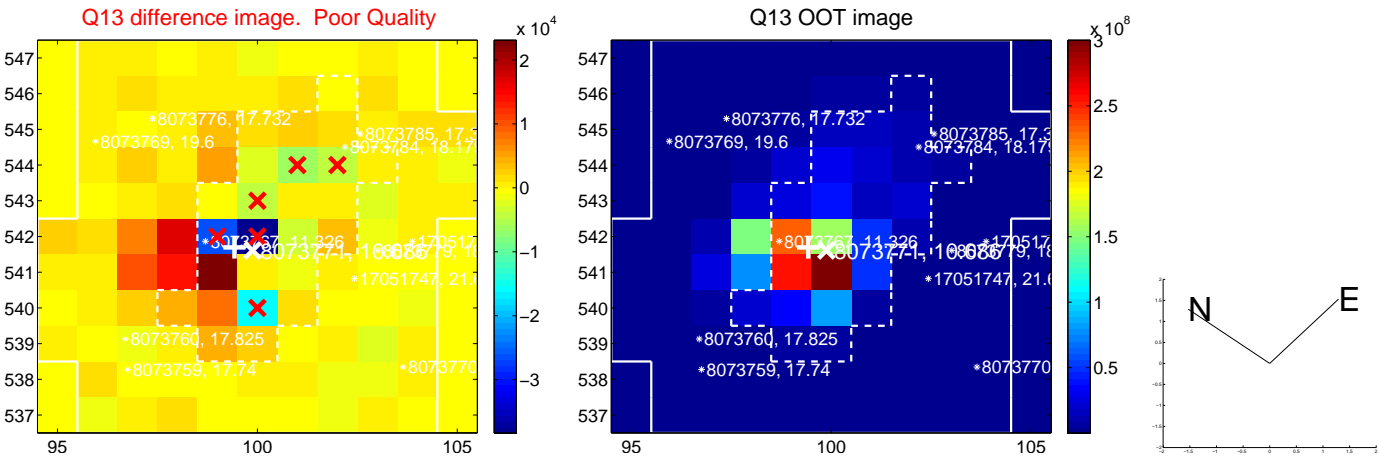




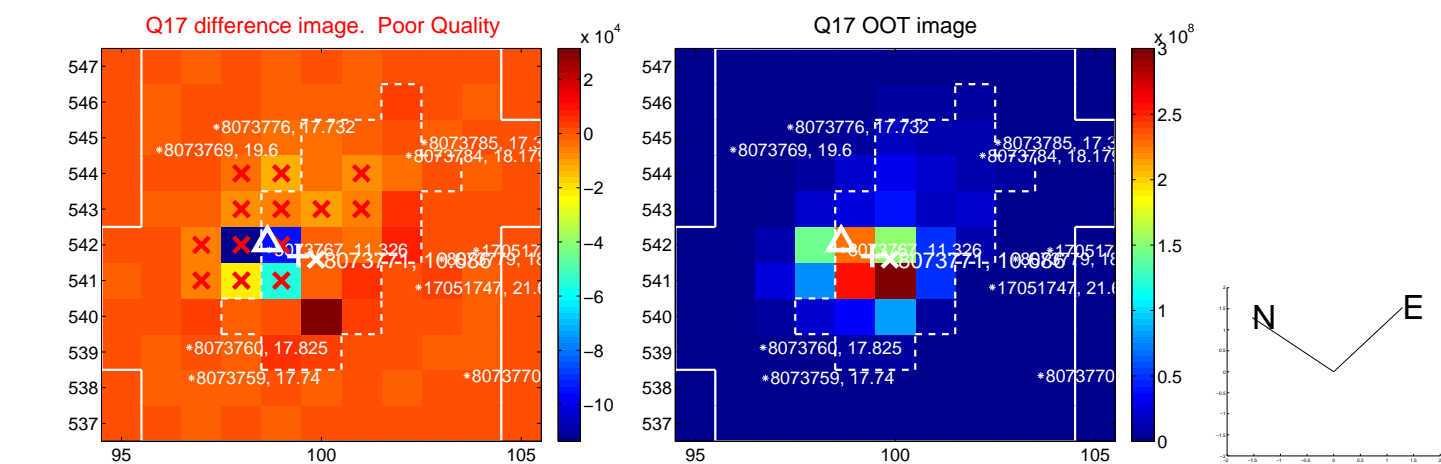
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



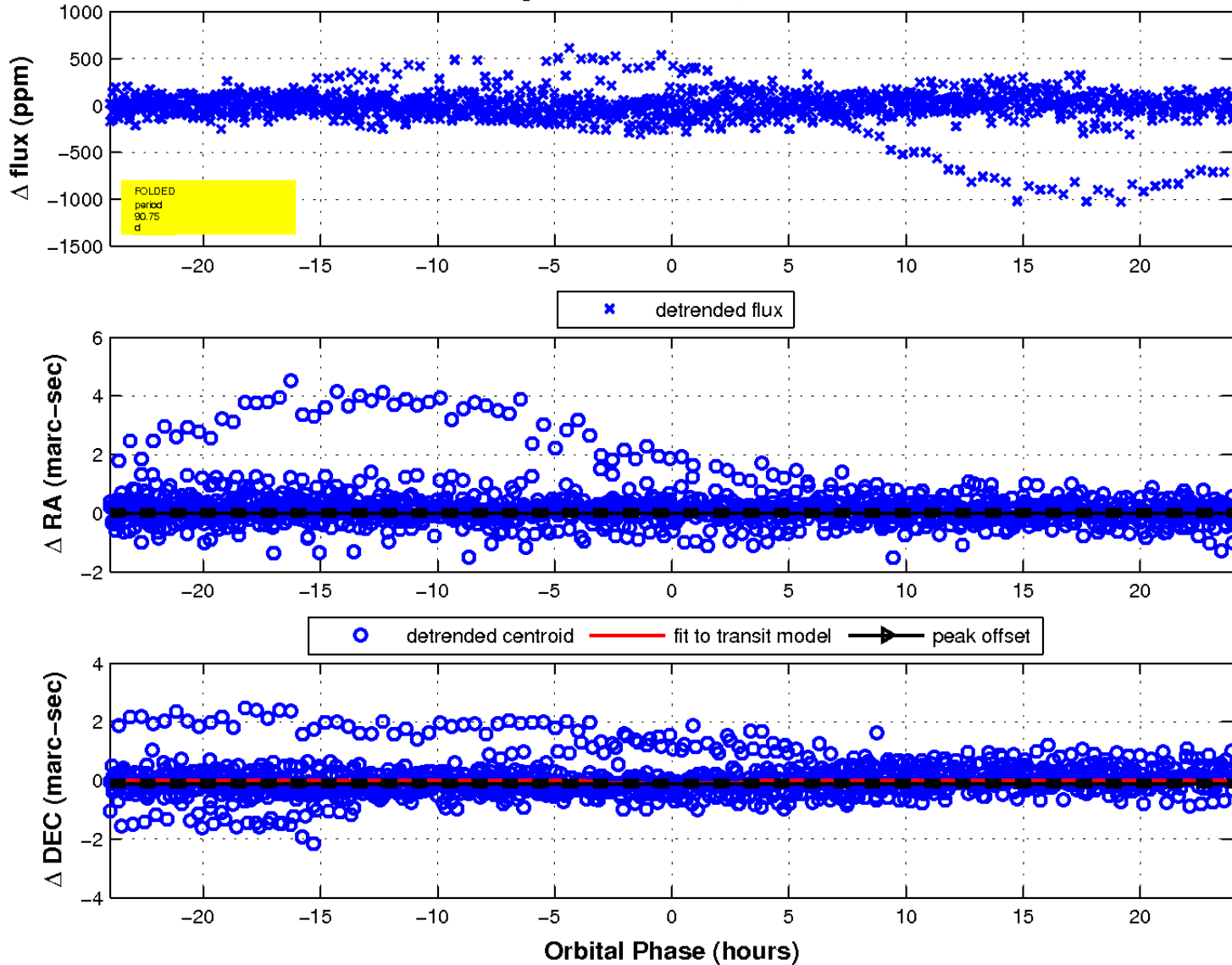
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

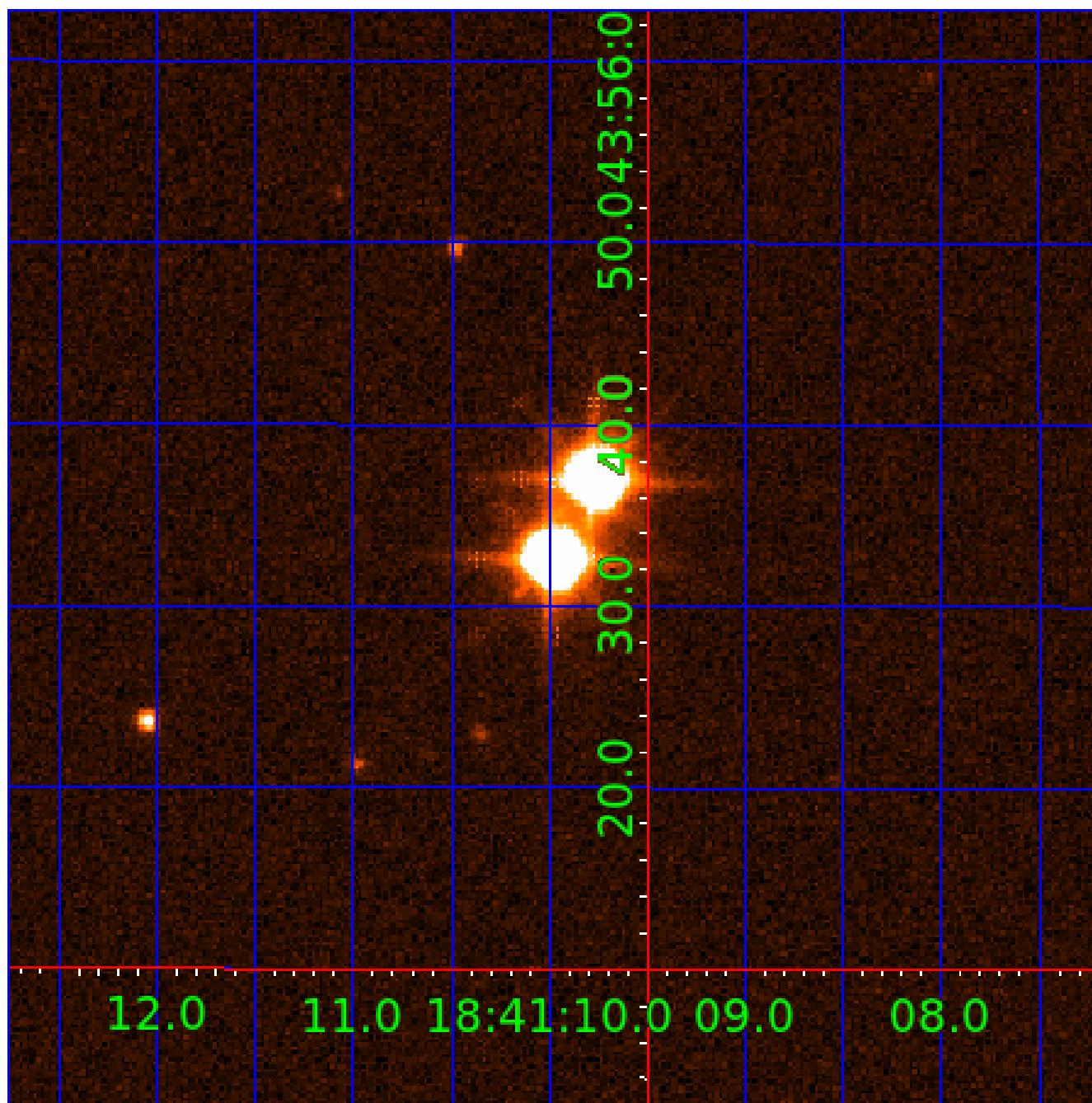


fluxWeightedCentroids, Planet 4 of 9



# UKIRT Image

Declination



# KIC 008073771

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
008073771-01	OBS	No	3.461710	134.422413	5.2	18.139	7.9	2.4	2.14	9185	0.56	8614.39
008073771-02	OBS	No	31.209849	153.746649	179.4	22.300	13.8	10.3	2.14	9185	4.83	459.08
008073771-03	OBS	No	398.184598	188.535331	291.9	21.908	9.7	10.3	2.14	9185	5.43	15.40
008073771-04	OBS	No	90.753169	215.949998	156.2	8.002	9.1	9.3	2.14	9185	3.30	110.61
008073771-05	OBS	No	57.905298	171.196957	88.4	16.784	8.8	7.8	2.14	9185	2.12	201.37
008073771-07	OBS	No	40.552881	147.833476	109.0	2.637	8.0	6.9	2.14	9185	2.65	323.78
008073771-08	OBS	No	143.980457	198.100793	110.6	3.000	8.3	-1.0	2.14	9185	2.30	59.78
008073771-09	OBS	No	106.481950	176.873243	121.2	14.100	7.8	7.8	2.14	9185	2.52	89.38

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008073771-01	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—CENT_SATURATED
008073771-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_DV—CENT_SATURATED
008073771-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—CENT_SATURATED
008073771-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—CENT_SATURATED
008073771-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_SATURATED
008073771-07	OBS	FP	0.00	1	0	0	0	TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_SATURATED
008073771-08	OBS	FP	0.00	1	0	0	0	TRANS_GAPPED—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_SATURATED
008073771-09	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_POS_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.

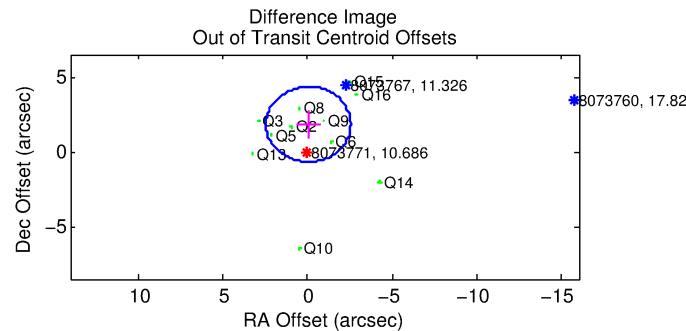
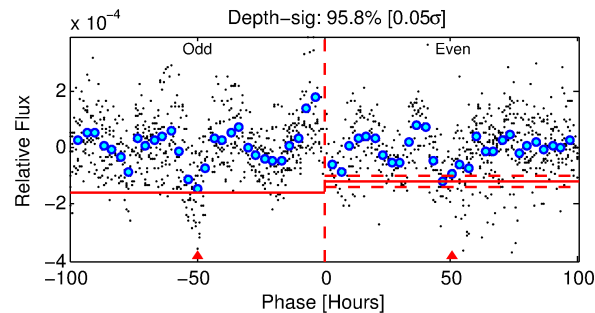
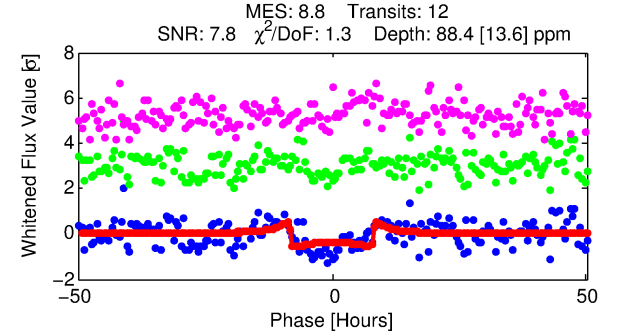
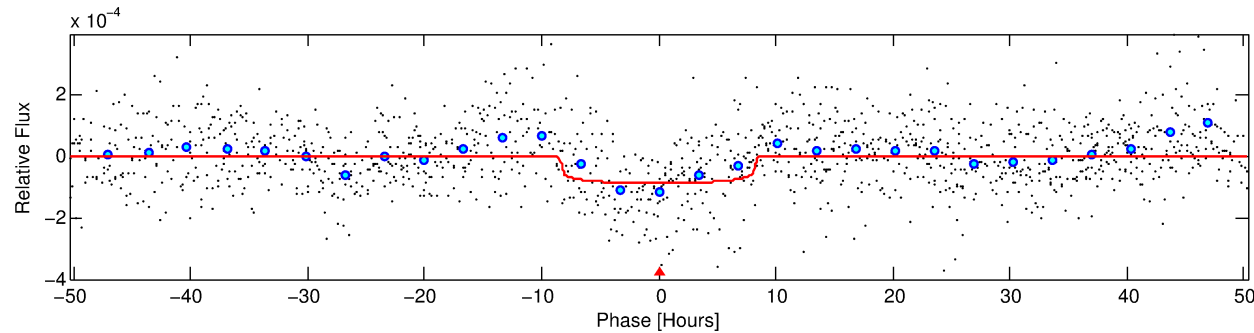
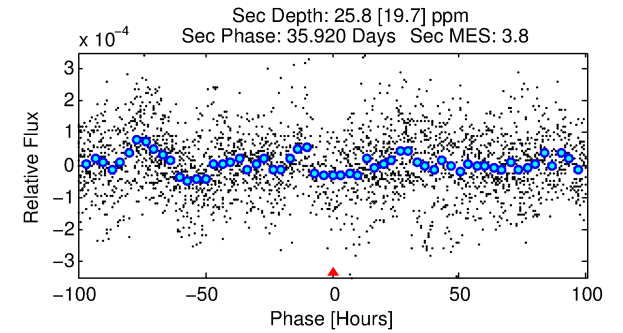
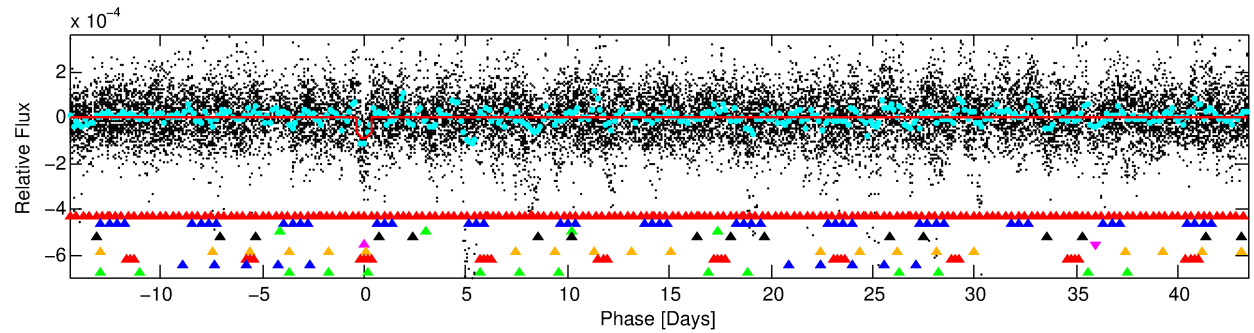
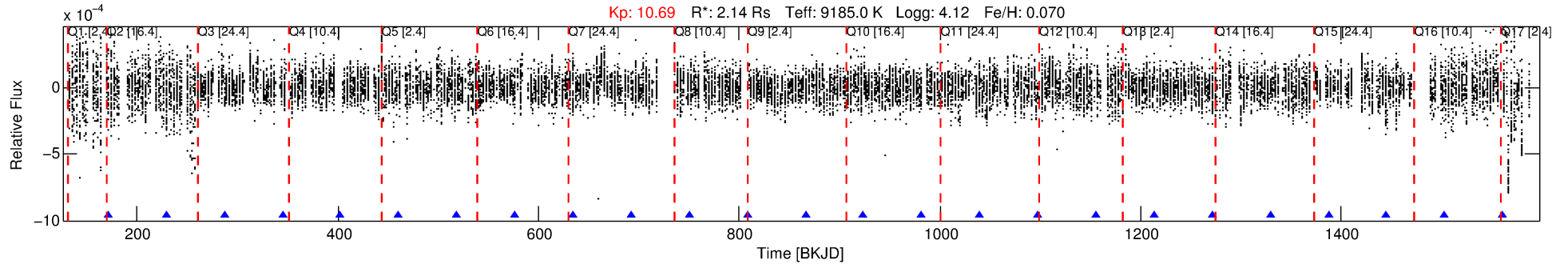
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 008073771-05

No Significant Match Found

# DV One-Page Summary

KIC: 8073771 Candidate: 5 of 9 Period: 57.905 d



## DV Fit Results:

Period = 57.90530 [0.00108] d  
Epoch = 171.1970 [0.0160] BKJD  
Rp/R\* = 0.0091 [0.0022]  
a/R\* = 21.21 [32.92]  
b = 0.61 [1.61]  
Seff = 201.37 [97.80]  
Teff = 961 [117] K  
Rp = 2.12 [1.03] Re  
a = 0.3801 [0.1253] AU  
Ag = 455.31 [461.43] [0.98σ]  
Teffp = 6860 [1588] K [3.71σ]

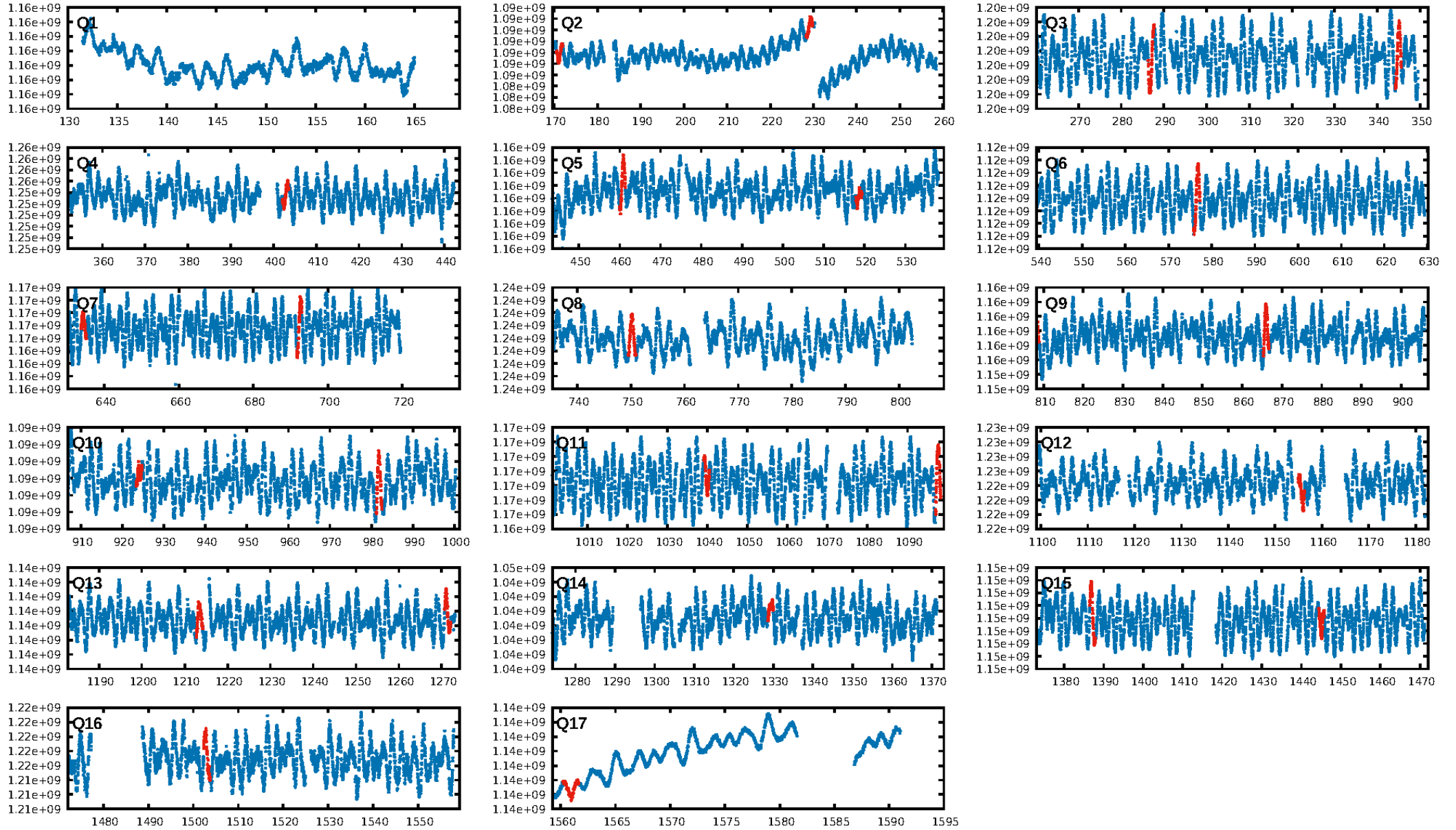
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [24.51σ]  
LongPeriod-sig: 100.0% [20.65σ]  
ModelChiSquare2-sig: 1.7%  
ModelChiSquareGof-sig: 100.0%  
**Bootstrap-pfa: 1.33e-09**  
RollingBand-fgt: 1.00 [12/12]  
GhostDiagnostic-chr: N/A  
Centroid-sig: 0.4%  
**Centroid-so: 3.132 arcsec [3.64σ]**  
OotOffset-rm: 1.832 arcsec [2.19σ]  
**KicOffset-rm: 3.470 arcsec [4.75σ]**  
OotOffset-st: 4/2/2/3 [11]  
KicOffset-st: 4/2/2/3 [11]  
DiffImageQuality-fgm: 0.09 [1/11]  
DiffImageOverlap-fno: 0.00 [0/12]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 02-Feb-2016 15:03:31 Z

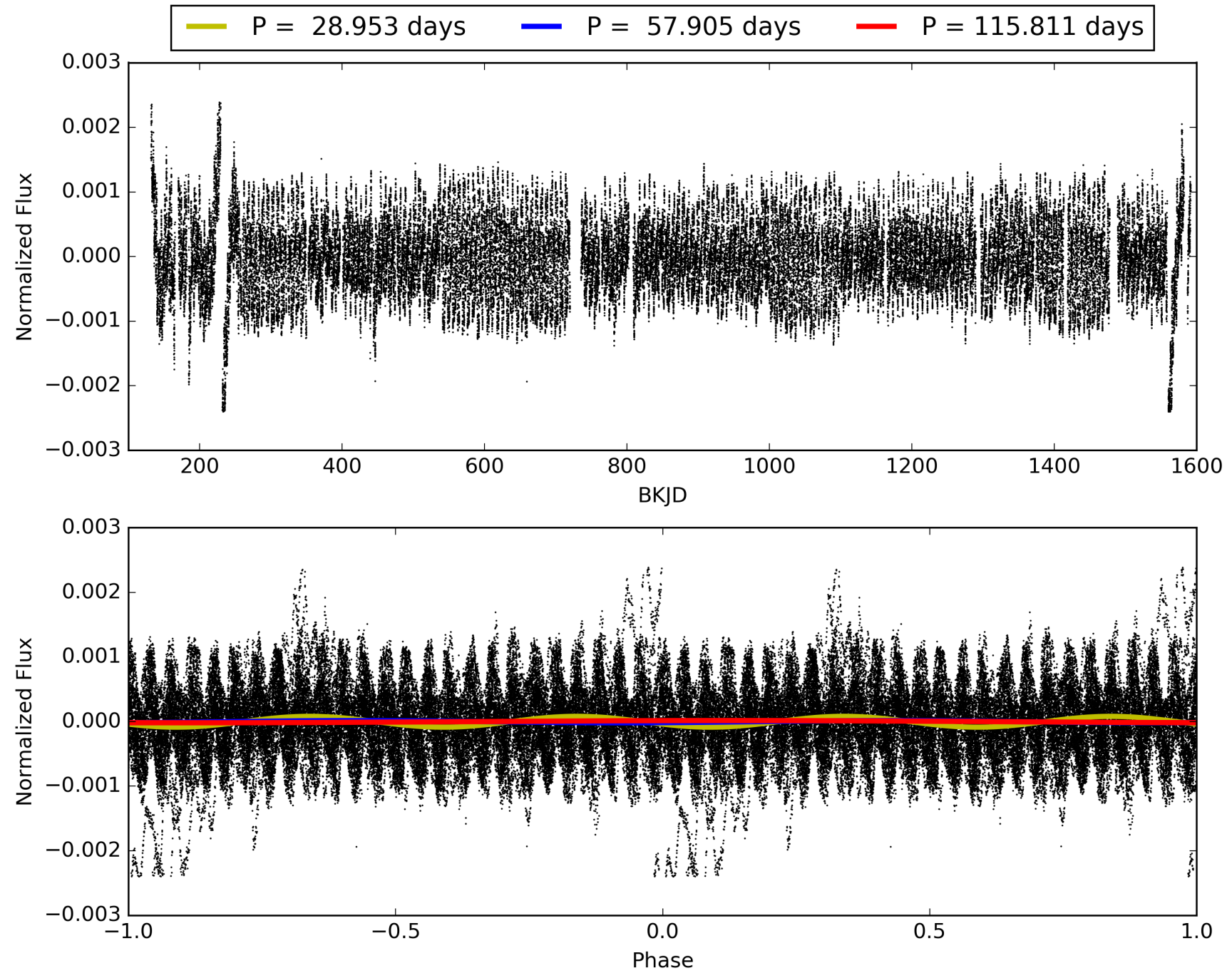
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 008073771-05, PDC Light Curves



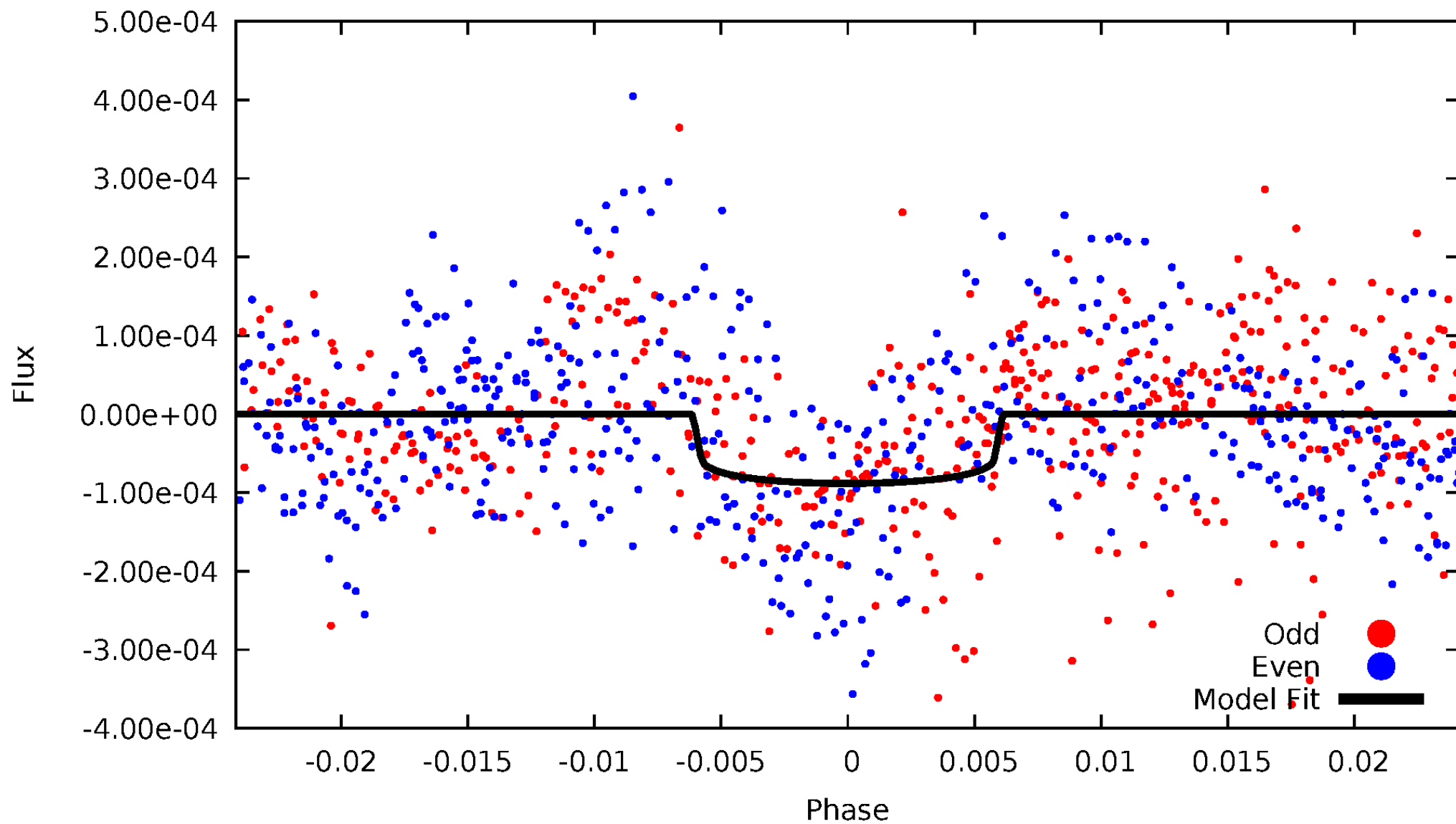


TCE 008073771-05



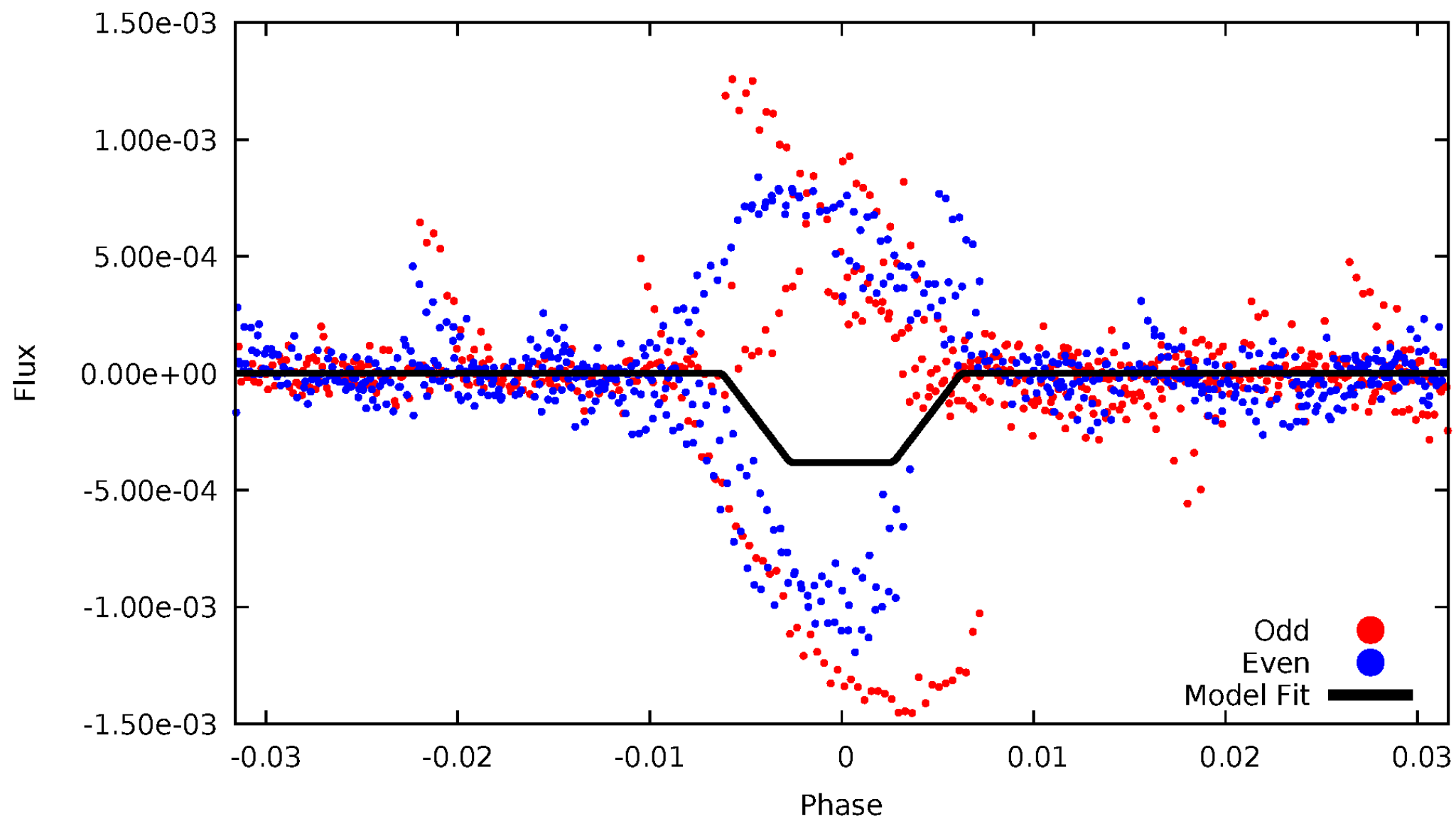
# DV Odd/Even

TCE 008073771-05



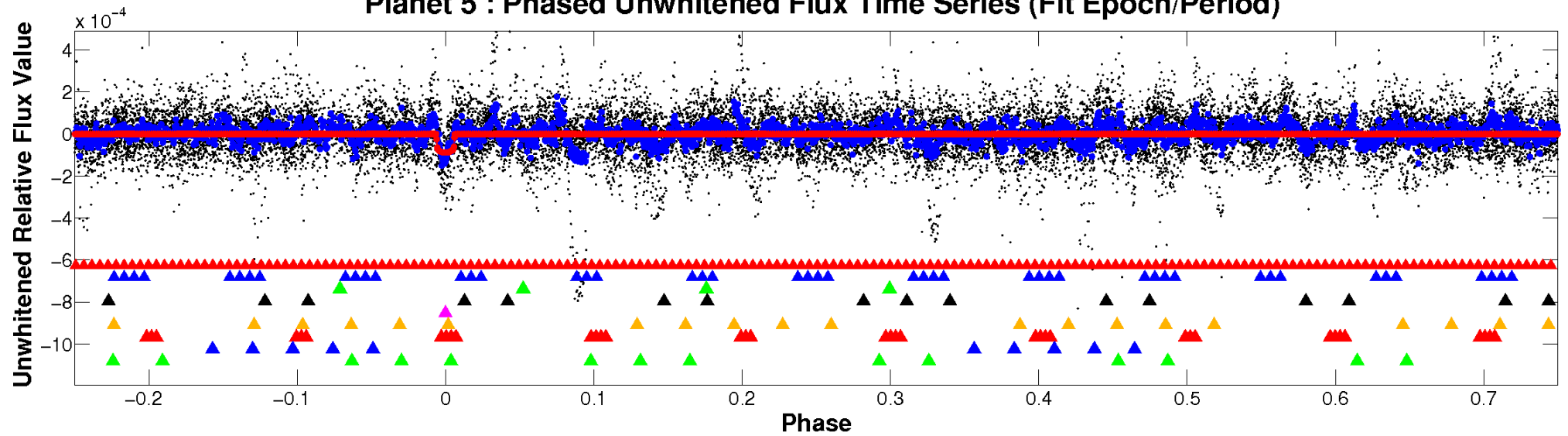
# ALT Odd/Even

TCE 008073771-05

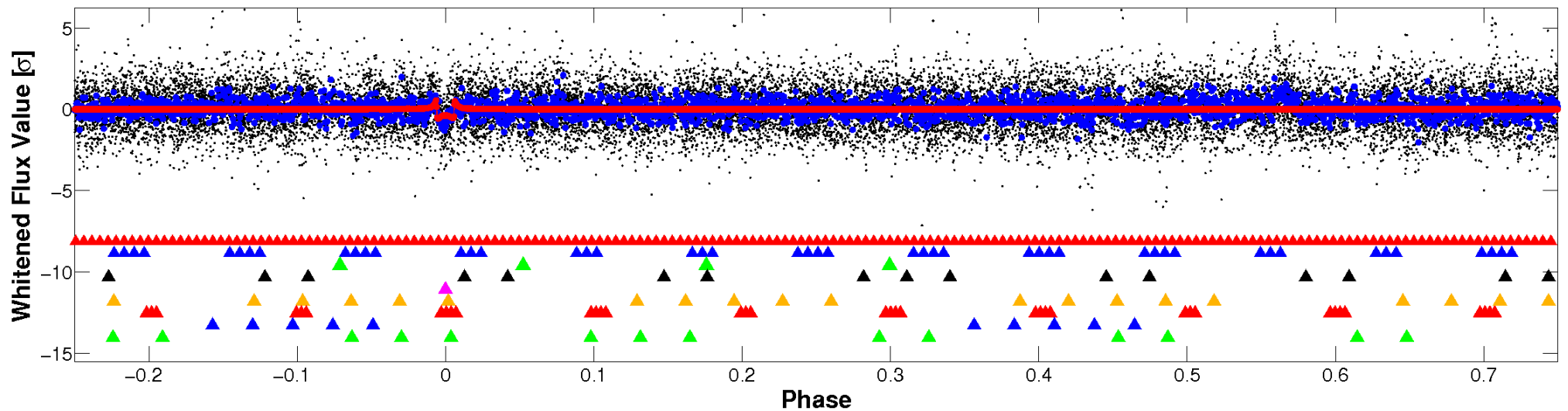


# Non-Whitened Vs. Whitened Light Curve

Planet 5 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

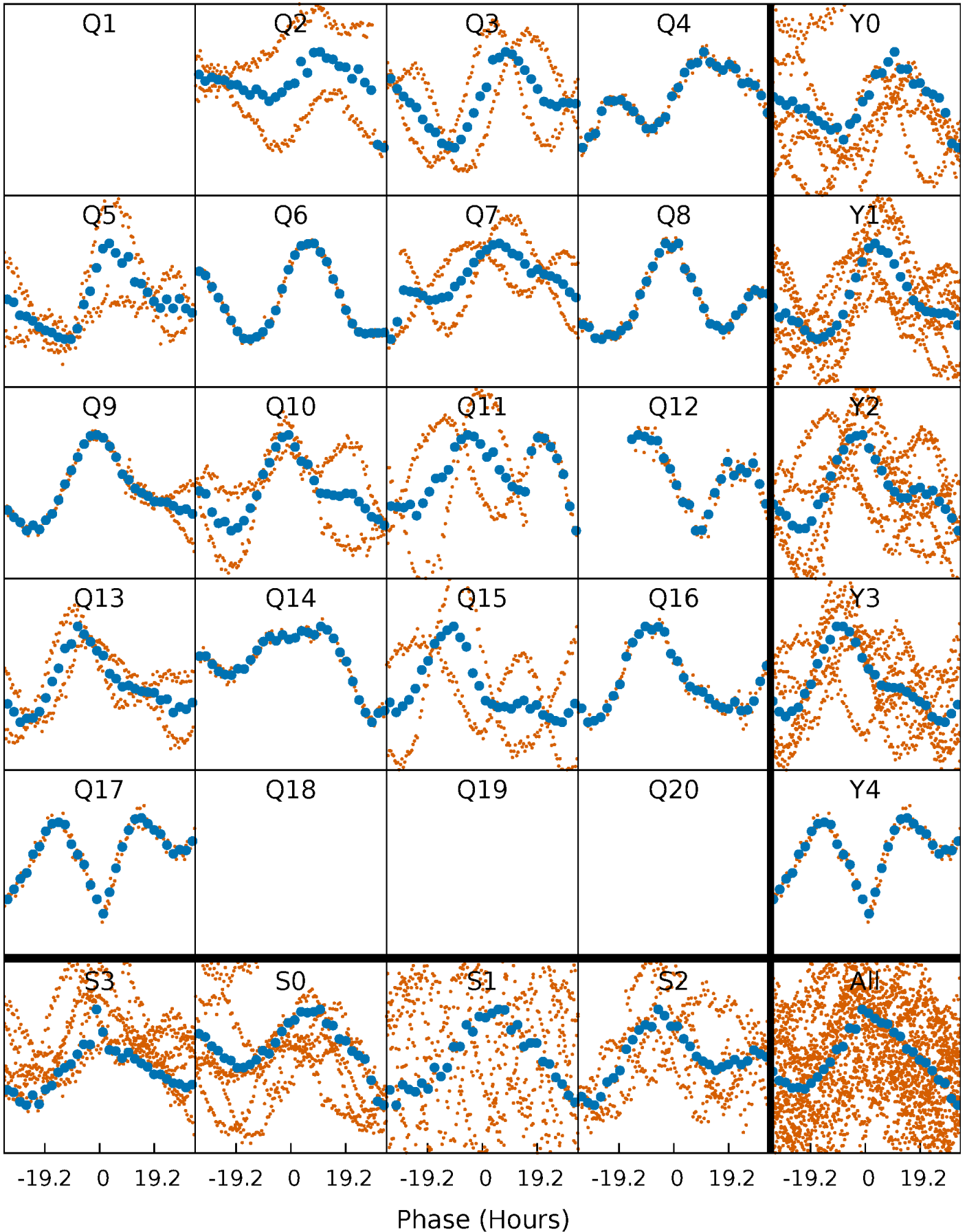


Planet 5 : Phased Whitened Flux Time Series (Fit Epoch/Period)



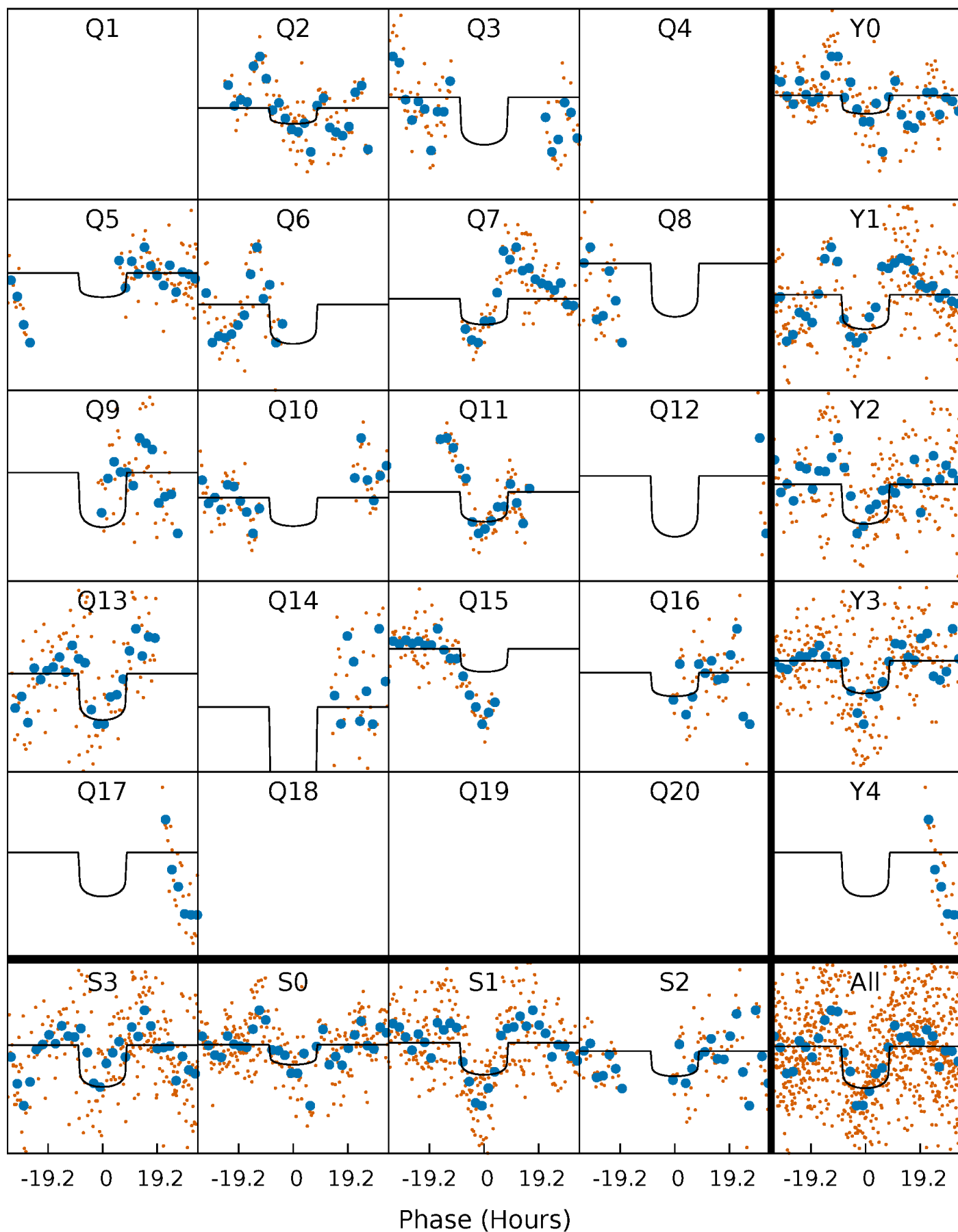
# PDC Quarter-Phased Transit Curves

TCE 008073771-05     $P = 57.905298$  Days     $T_0 = 171.196957$  (BKJD)



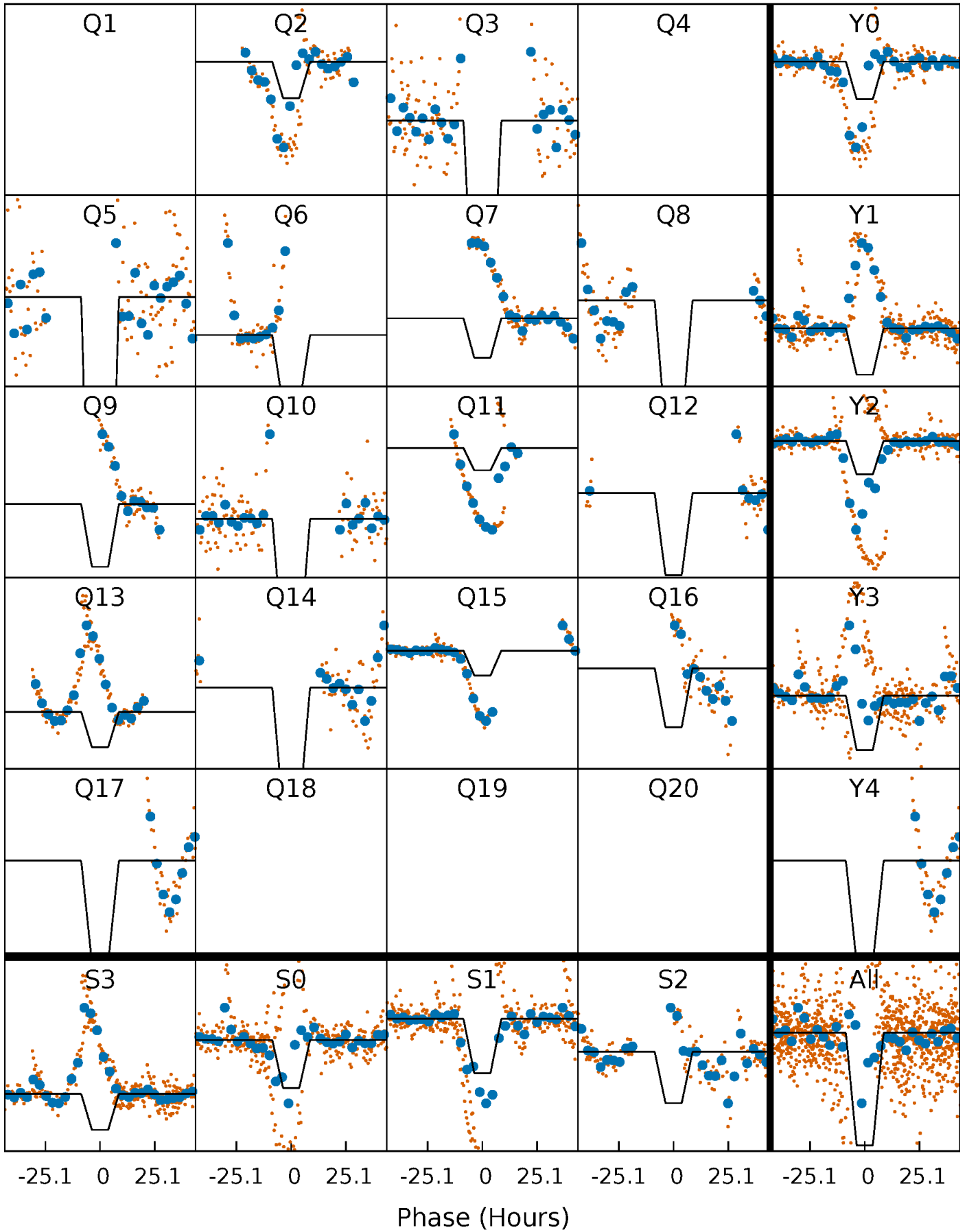
# DV Quarter-Phased Transit Curves

TCE 008073771-05     $P = 57.905298$  Days     $T_0 = 171.196957$  (BKJD)



## Alt. Detrend Quarter-Phased Transit Curves

TCE 008073771-05   P= 57.906901 Days    $T_0=171.132994$  (BKJD)

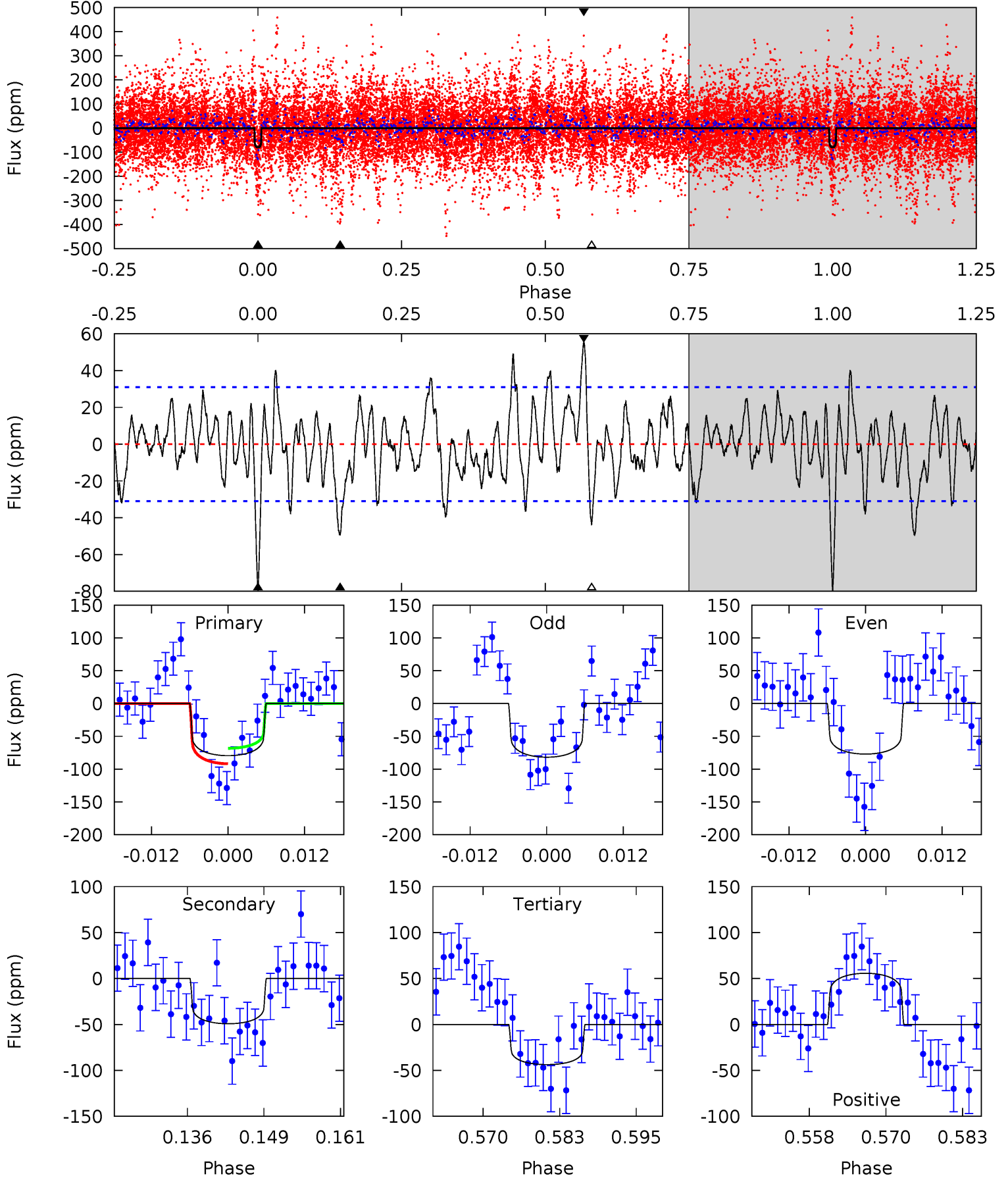




# DV Model-Shift Uniqueness Test

008073771-05, P = 57.905298 Days, E = 113.291659 Days

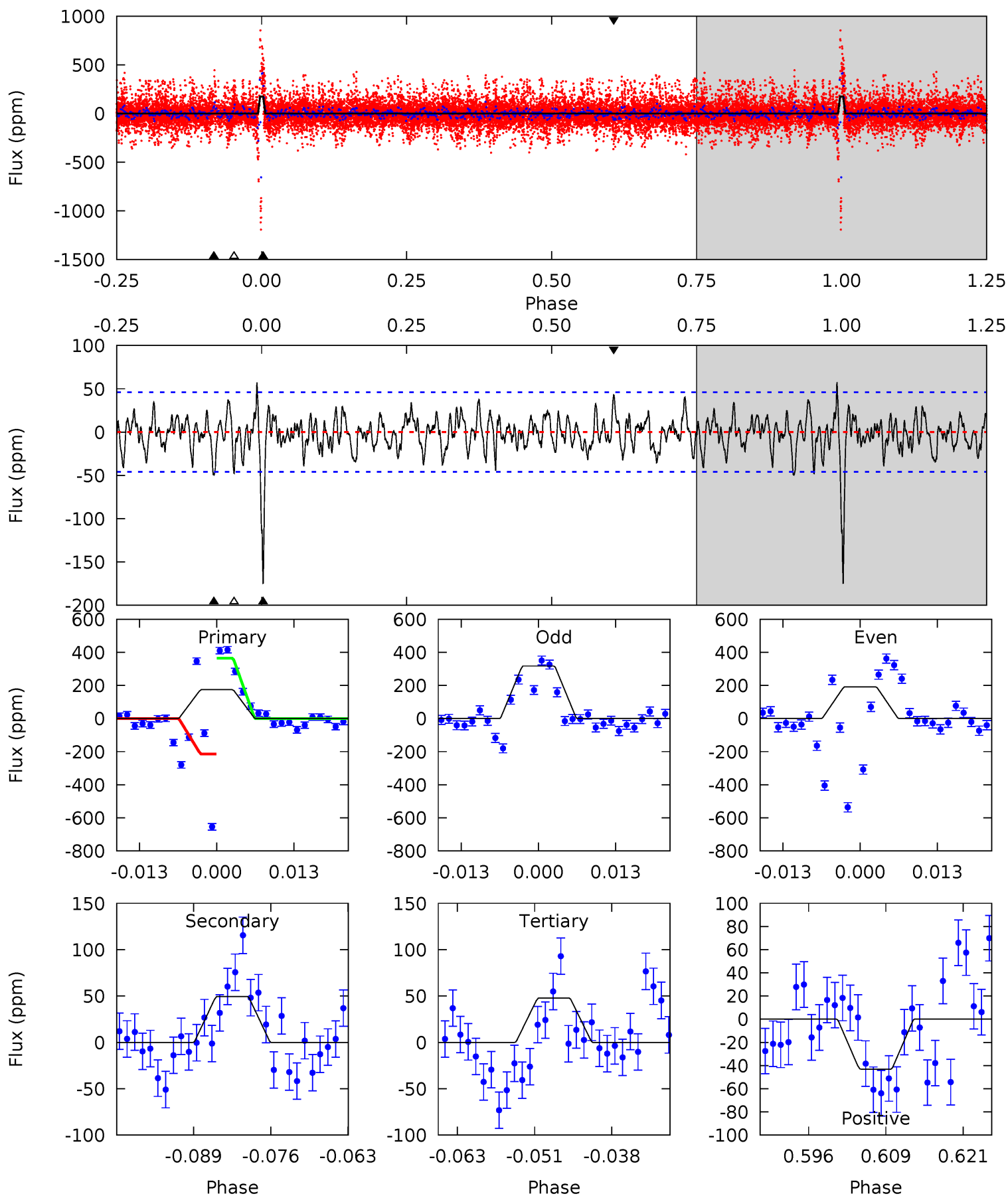
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
12.8	7.92	7.03	8.95	4.98	2.50	2.59	5.75	3.84	0.89	-1.02	0.38	0.83	0.41	1.91



# Alt Model-Shift Uniqueness Test

008073771-05, P = 57.906901 Days, E = 113.226093 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
18.9	5.35	5.17	4.67	4.98	2.49	1.68	13.7	14.2	0.18	0.68	7.63	0.86	0.25	0



### Stellar Parameters For KIC 008073771

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$9185^{+257}_{-417}$	$4.118^{+0.099}_{-0.231}$	$0.070^{+0.150}_{-0.650}$	$2.136^{+0.890}_{-0.445}$	$2.180^{+0.427}_{-0.522}$	$0.315^{+0.177}_{-0.176}$
	+3%/-5%	+2%/-6%	+214%/-929%	+42%/-21%	+20%/-24%	+56%/-56%
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 008073771-05 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-49 \pm 6$	$2.25^{+0.72}_{-0.61}$	$1370^{+117}_{-98}$	$7621^{+1594}_{-905}$	$746^{+676}_{-301}$
Alt.	$-49 \pm 9$	$4.70^{+1.11}_{-0.81}$	$1361^{+137}_{-88}$	$5206^{+404}_{-337}$	$170^{+77}_{-61}$

$T_{max}$  = 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

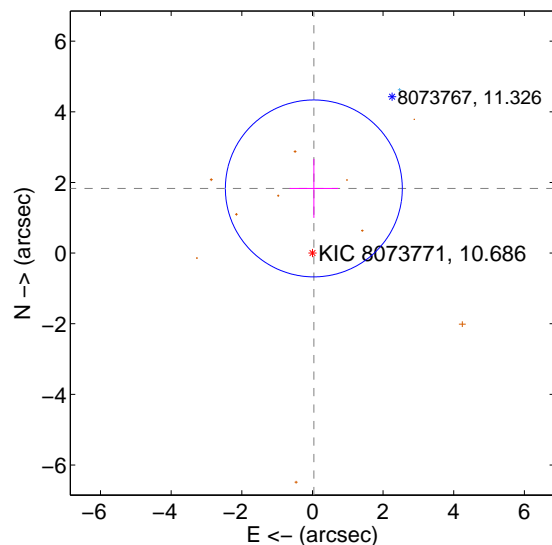
Supplemental centroid analysis for 008073771-05. **Kepler magnitude: 10.69.** Transit SNR 7.82

**There are 1 quarters with good PRF difference image offsets**

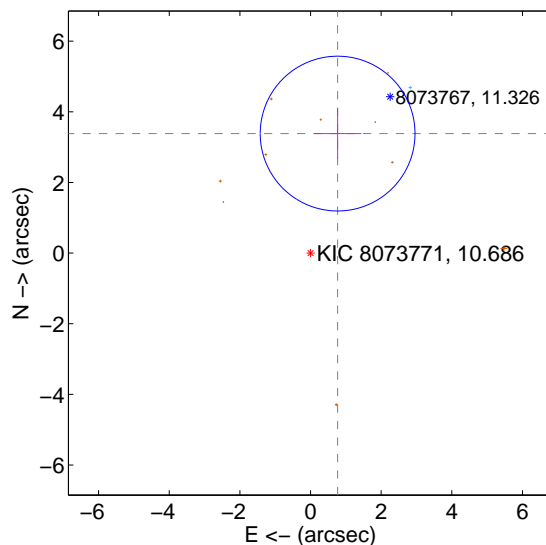
The direct PRF centroid is offset from the target star catalog position by about 1.49 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.832 \pm 0.835$	2.19	$-0.040 \pm 0.688$	$1.832 \pm 0.834$
PRF-fit source offset from KIC position	<b><math>3.470 \pm 0.730</math></b>	<b>4.75</b>	$-0.767 \pm 0.672$	$3.384 \pm 0.713$
photometric centroid source offset	<b><math>3.13 \pm 0.86</math></b>	<b>3.64</b>	$-2.34 \pm 0.78$	$2.08 \pm 0.96$

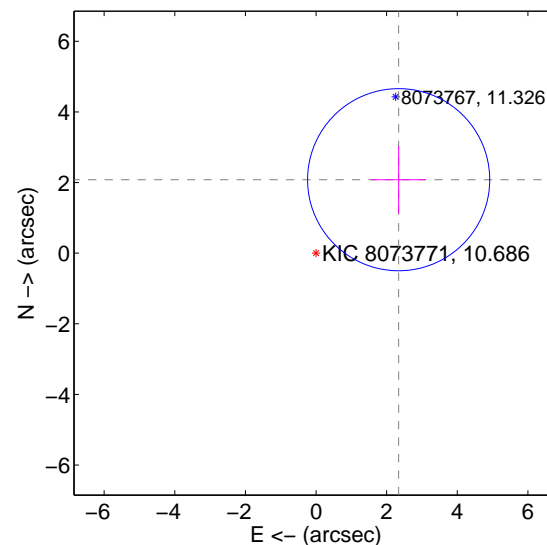
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position



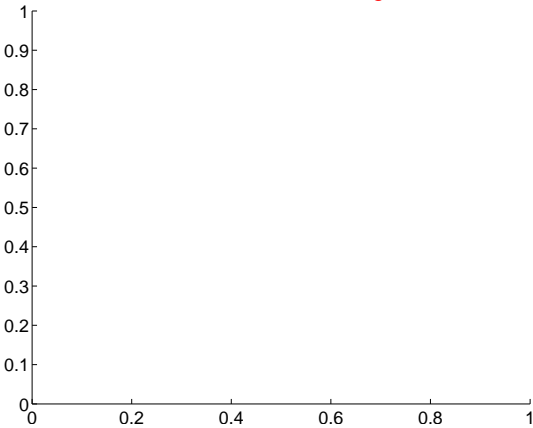
offset from photometric centroids



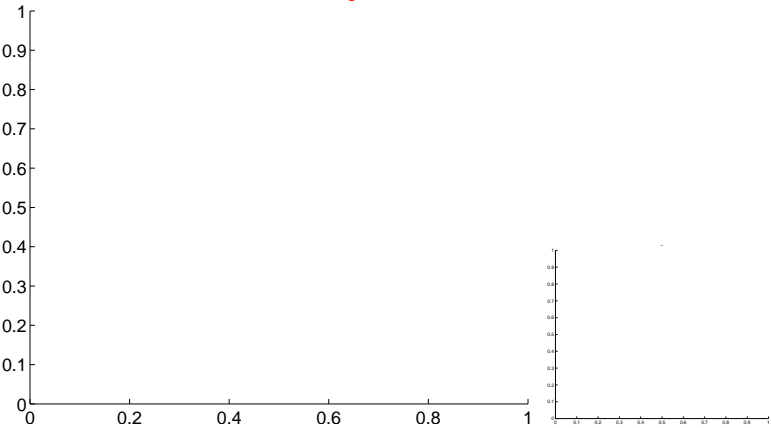
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

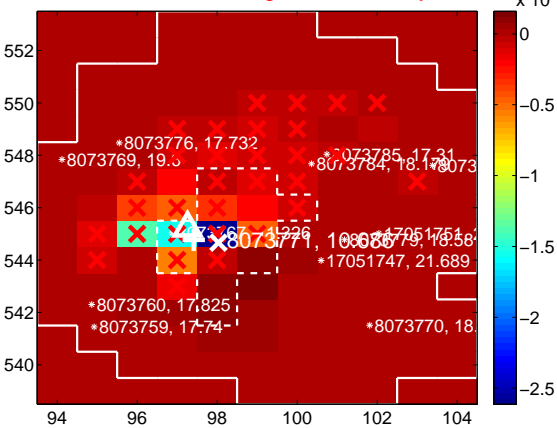
Q1 no difference image



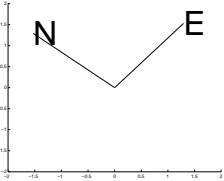
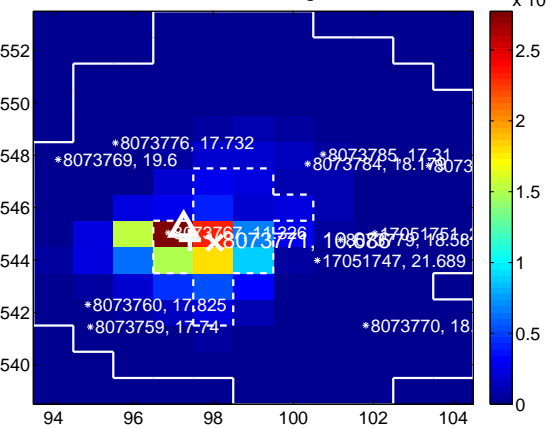
Q1 no OOT image



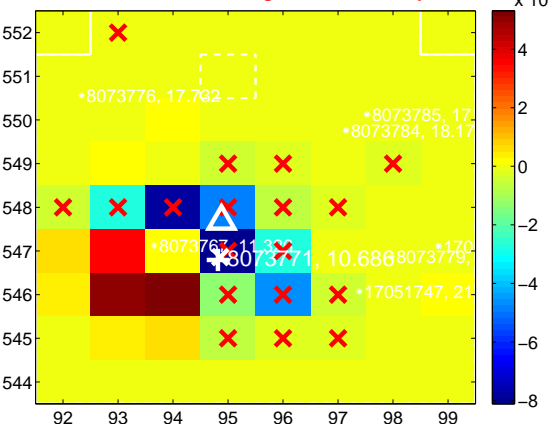
Q2 difference image. Poor Quality



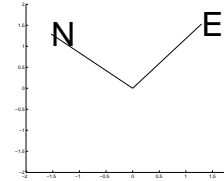
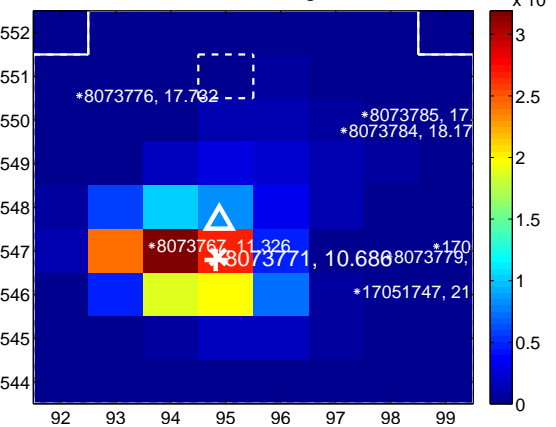
Q2 OOT image



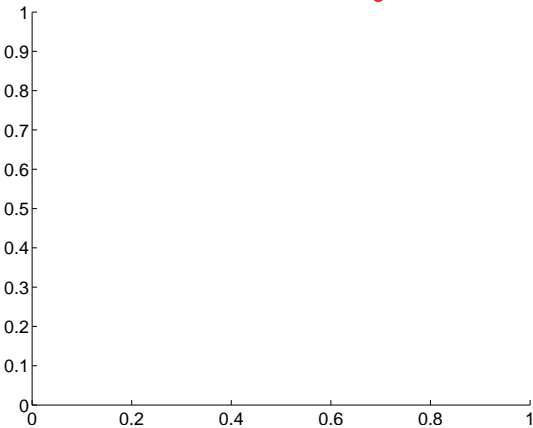
Q3 difference image. Poor Quality



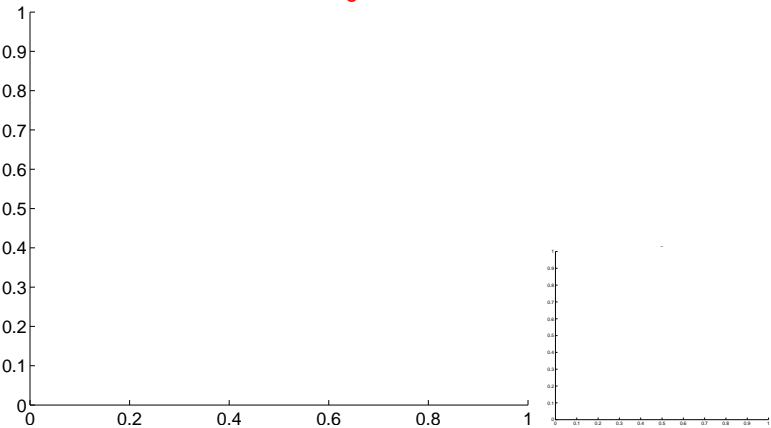
Q3 OOT image



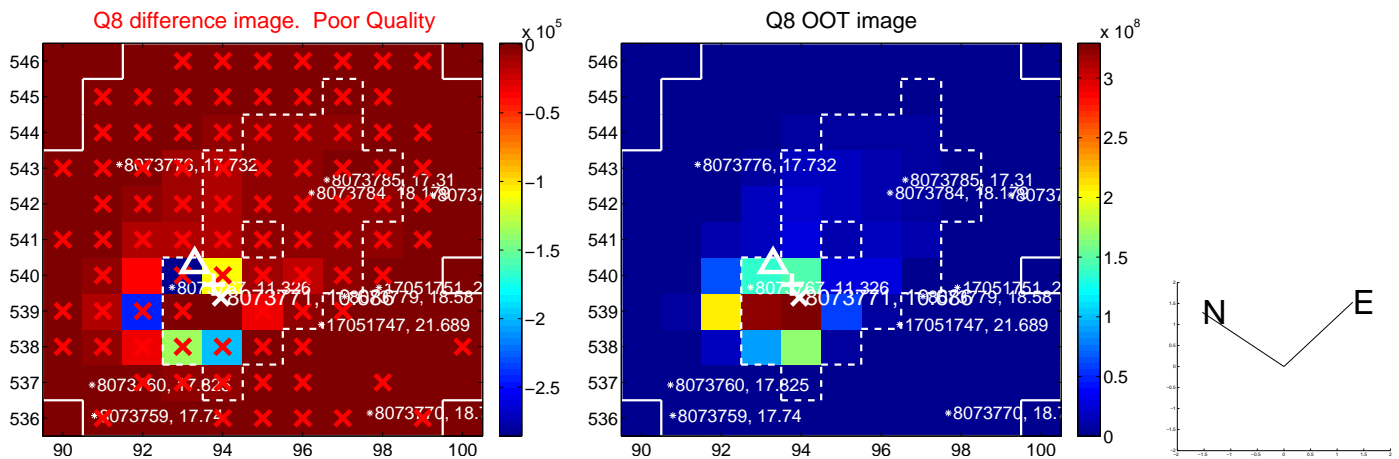
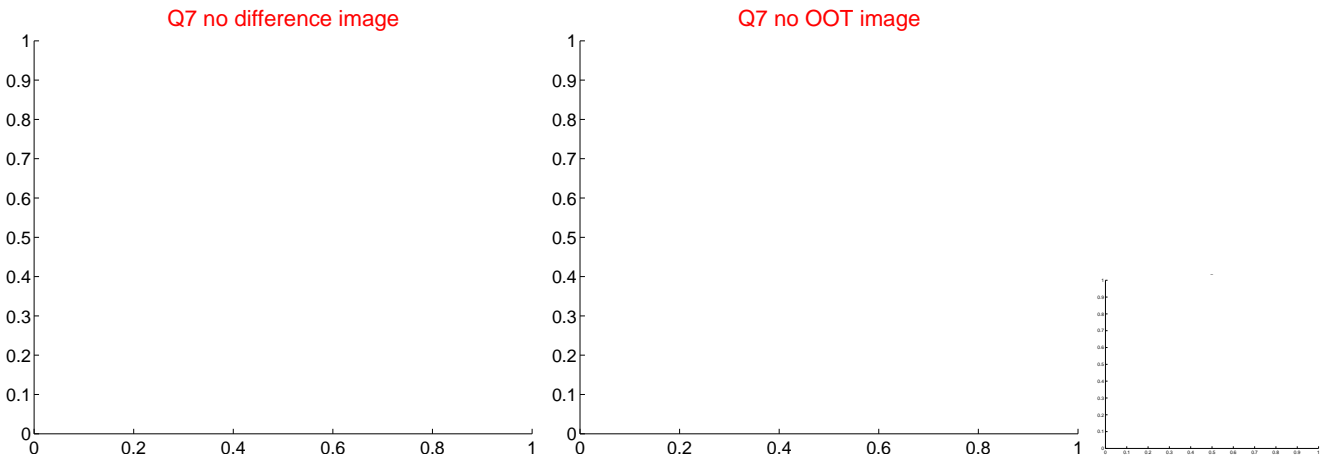
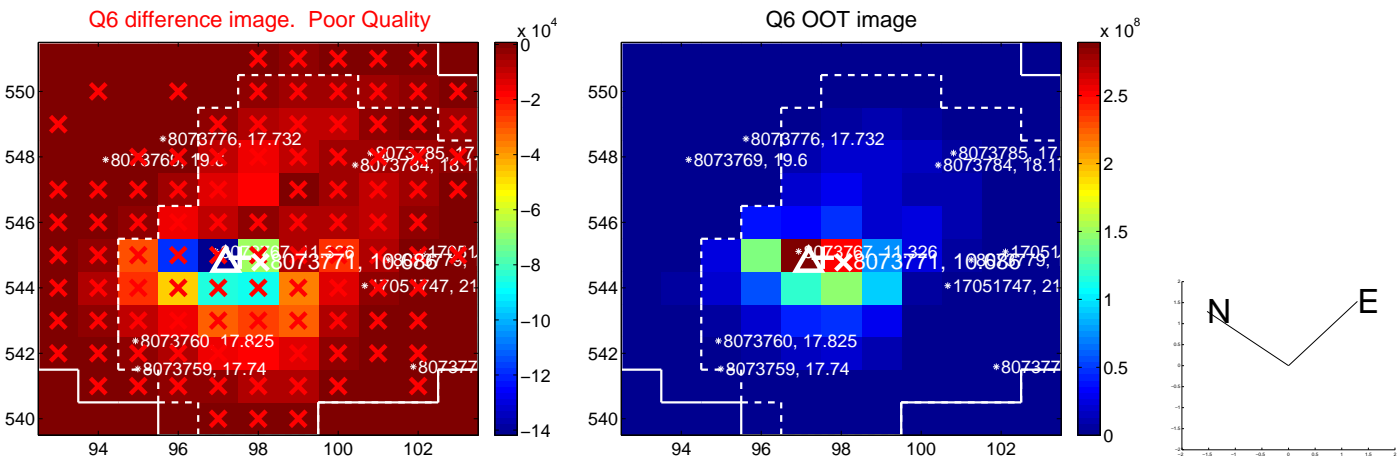
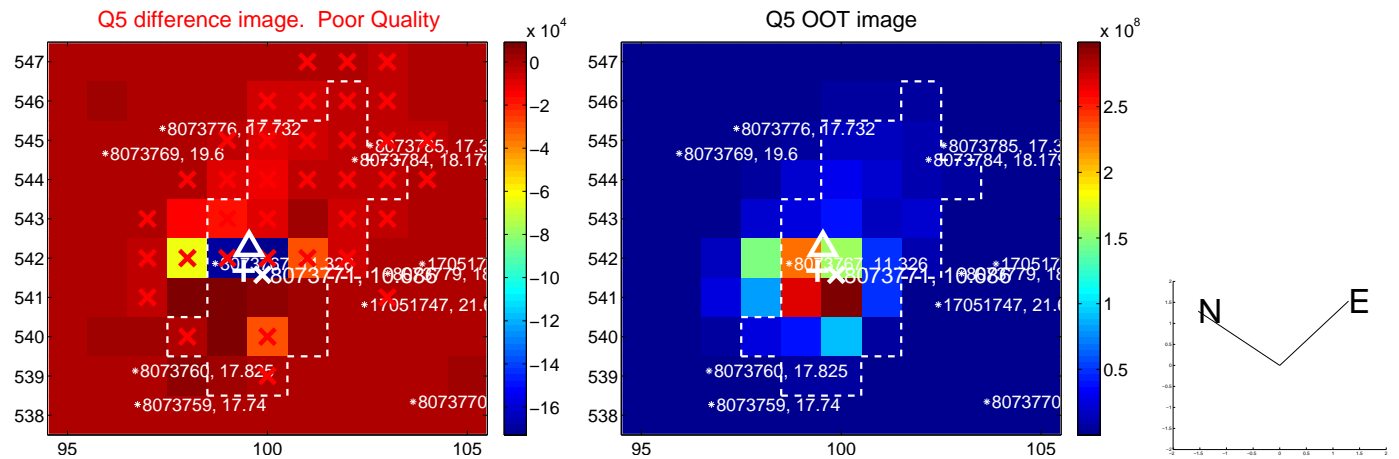
Q4 no difference image



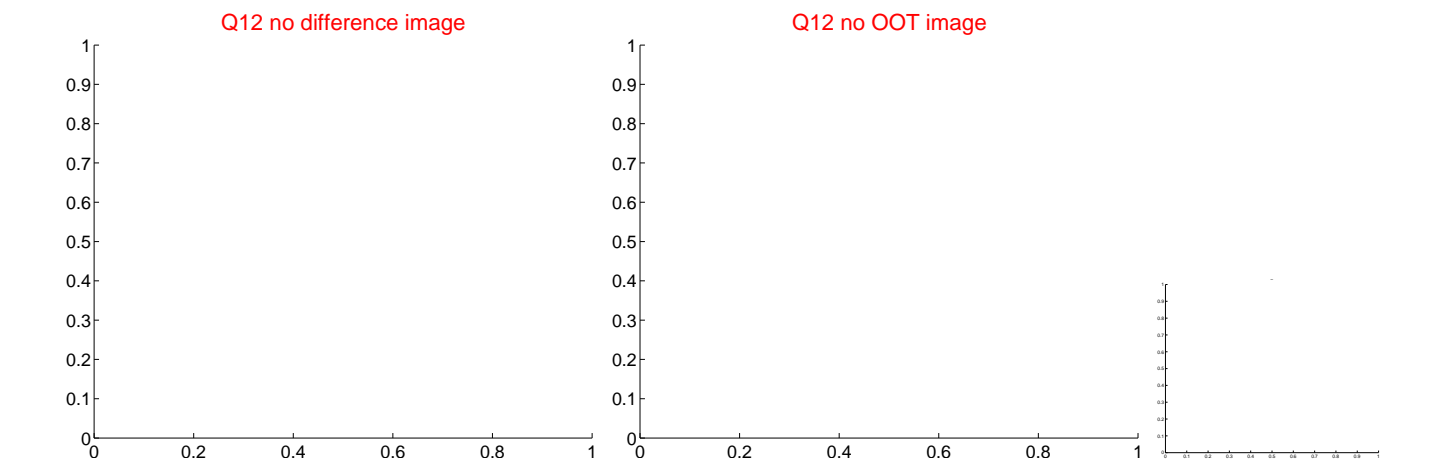
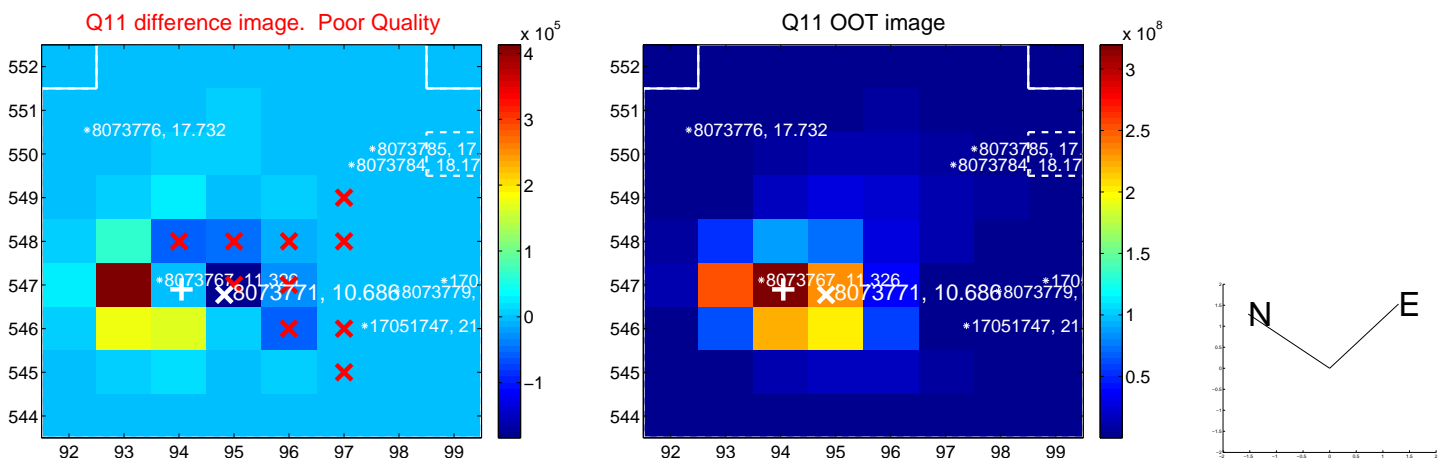
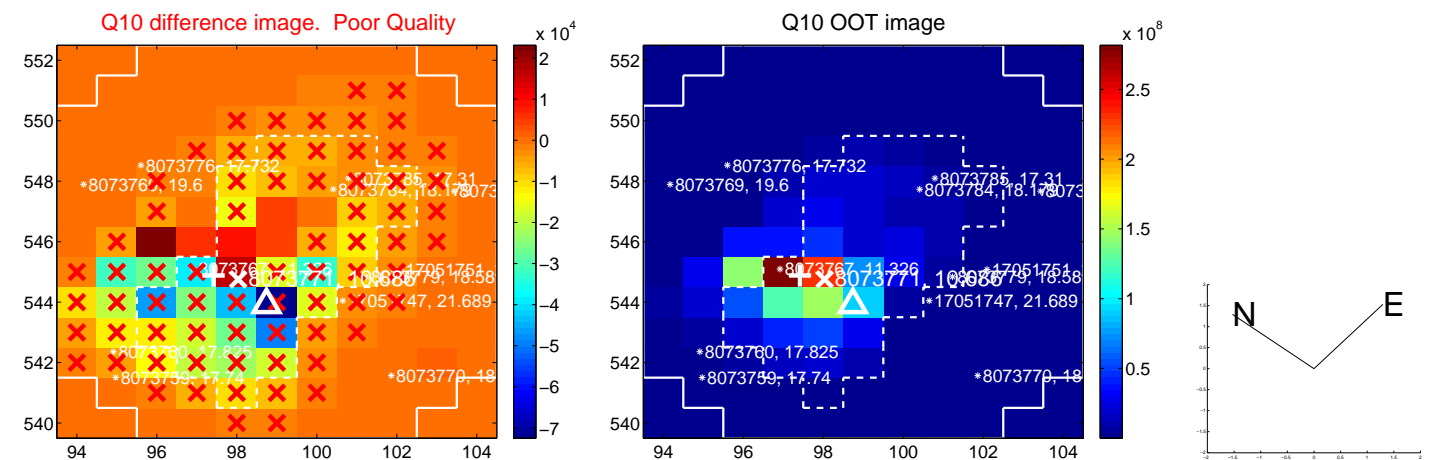
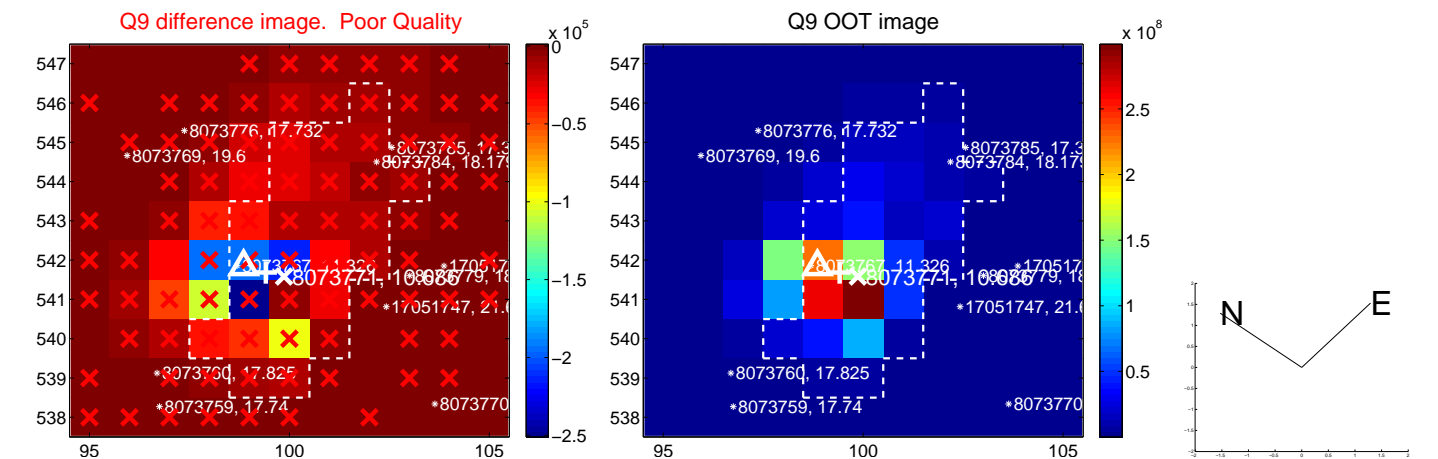
Q4 no OOT image



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

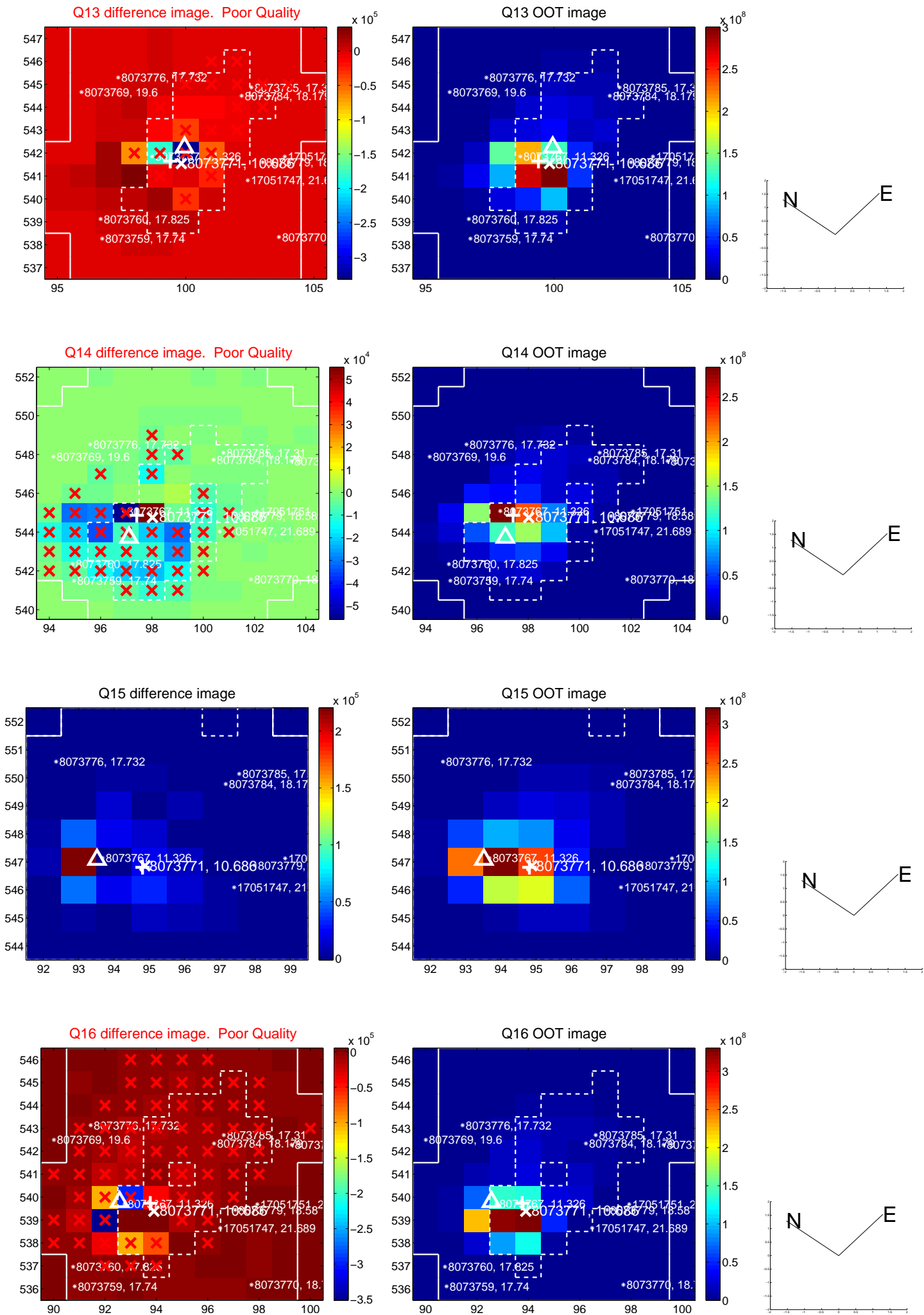


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

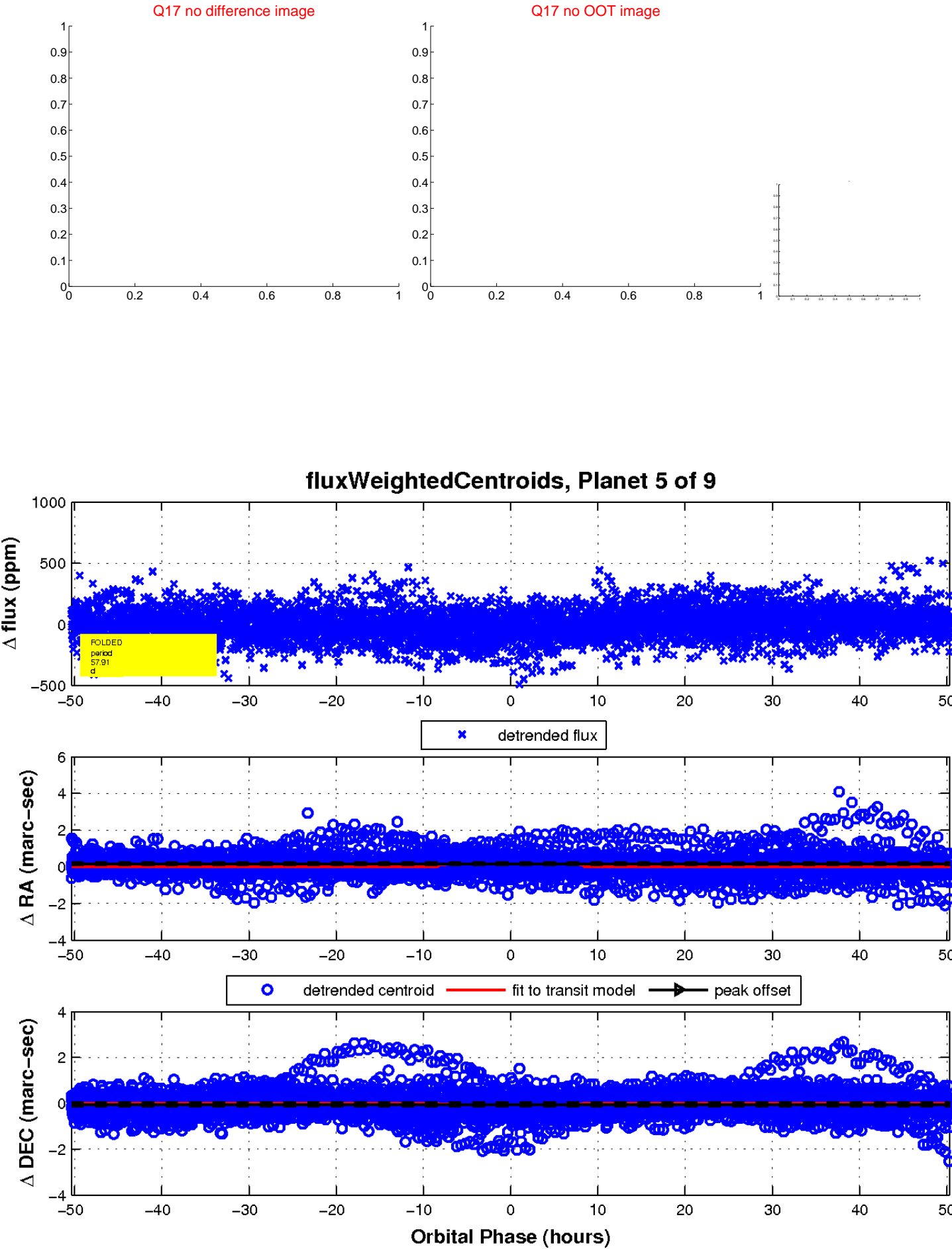




white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

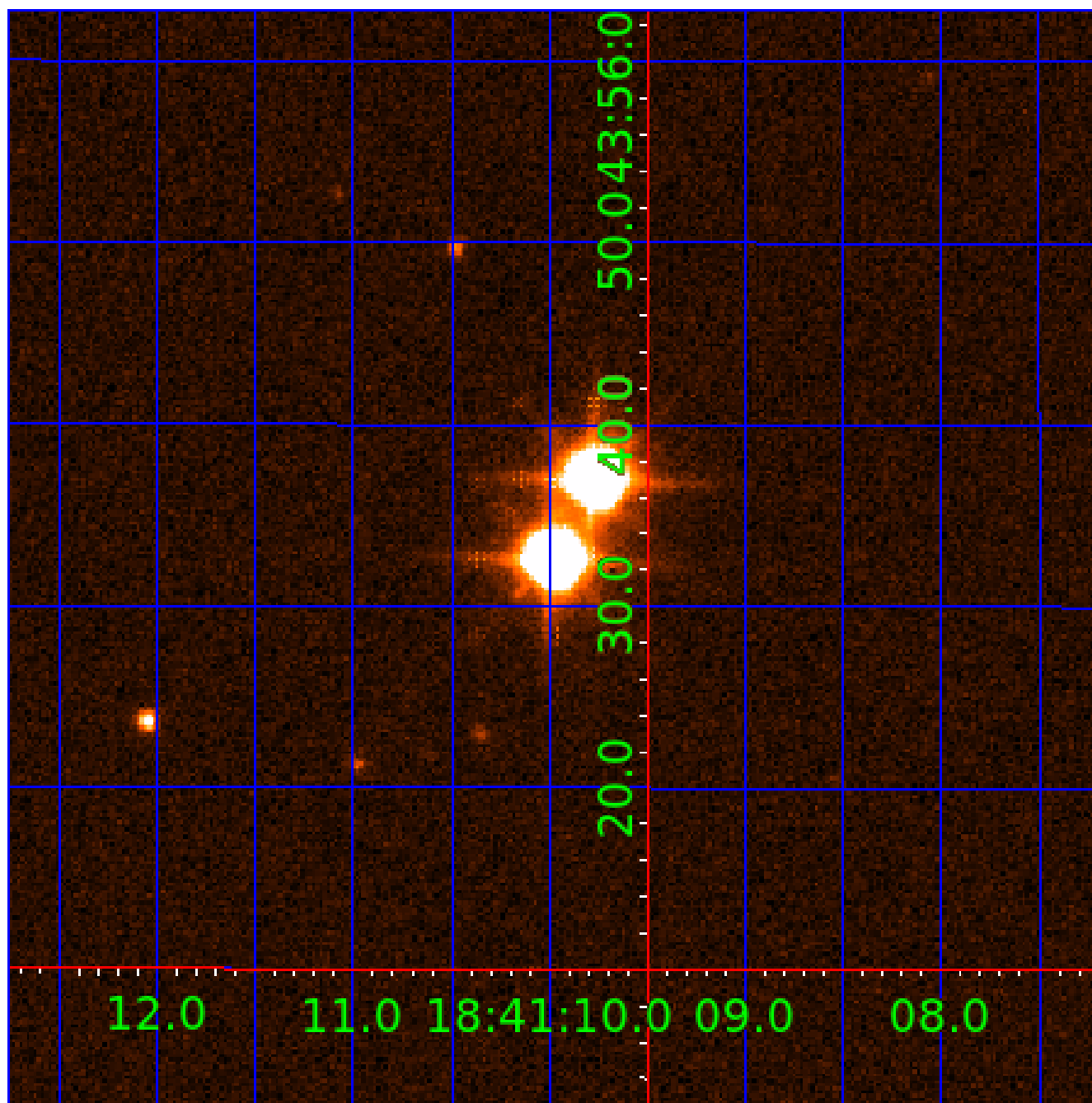


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



# UKIRT Image

Declination



# KIC 008073771

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
008073771-01	OBS	No	3.461710	134.422413	5.2	18.139	7.9	2.4	2.14	9185	0.56	8614.39
008073771-02	OBS	No	31.209849	153.746649	179.4	22.300	13.8	10.3	2.14	9185	4.83	459.08
008073771-03	OBS	No	398.184598	188.535331	291.9	21.908	9.7	10.3	2.14	9185	5.43	15.40
008073771-04	OBS	No	90.753169	215.949998	156.2	8.002	9.1	9.3	2.14	9185	3.30	110.61
008073771-05	OBS	No	57.905298	171.196957	88.4	16.784	8.8	7.8	2.14	9185	2.12	201.37
008073771-07	OBS	No	40.552881	147.833476	109.0	2.637	8.0	6.9	2.14	9185	2.65	323.78
008073771-08	OBS	No	143.980457	198.100793	110.6	3.000	8.3	-1.0	2.14	9185	2.30	59.78
008073771-09	OBS	No	106.481950	176.873243	121.2	14.100	7.8	7.8	2.14	9185	2.52	89.38

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008073771-01	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—CENT_SATURATED
008073771-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_DV—CENT_SATURATED
008073771-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—CENT_SATURATED
008073771-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—CENT_SATURATED
008073771-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_SATURATED
008073771-07	OBS	FP	0.00	1	0	0	0	TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_SATURATED
008073771-08	OBS	FP	0.00	1	0	0	0	TRANS_GAPPED—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_SATURATED
008073771-09	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_POS_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.

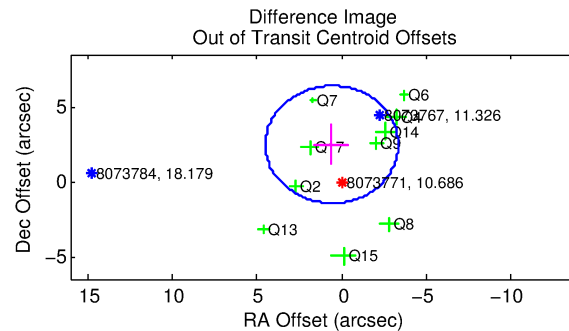
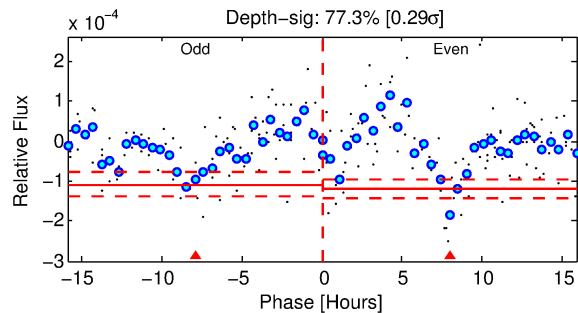
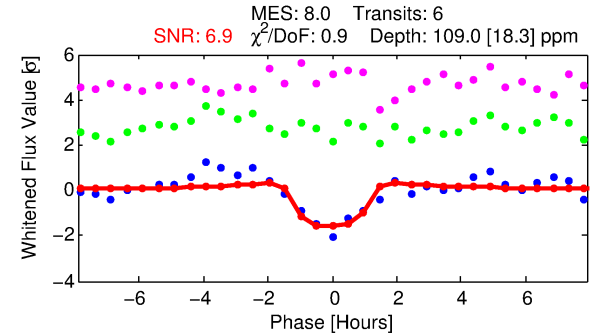
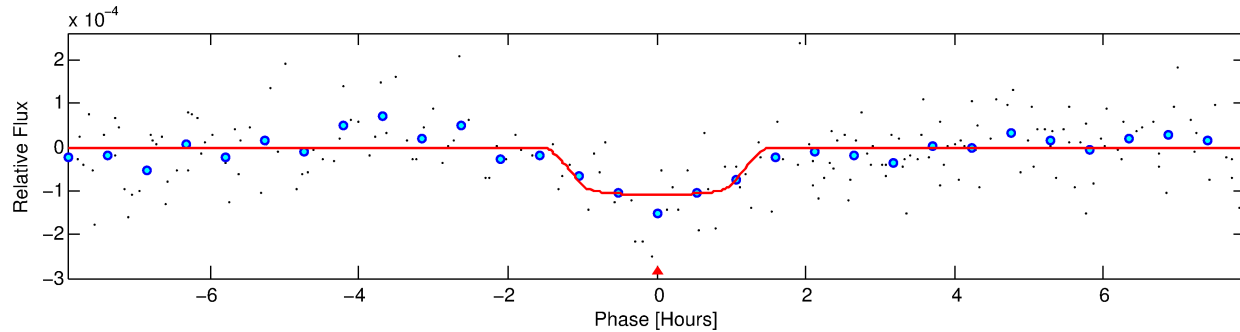
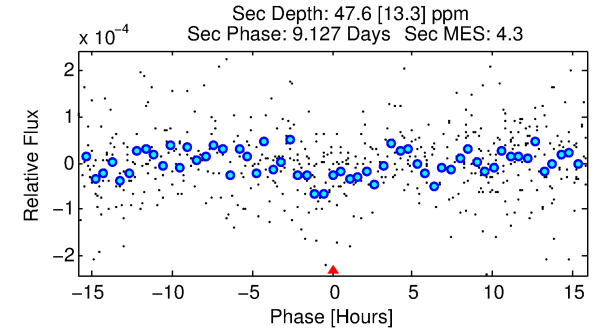
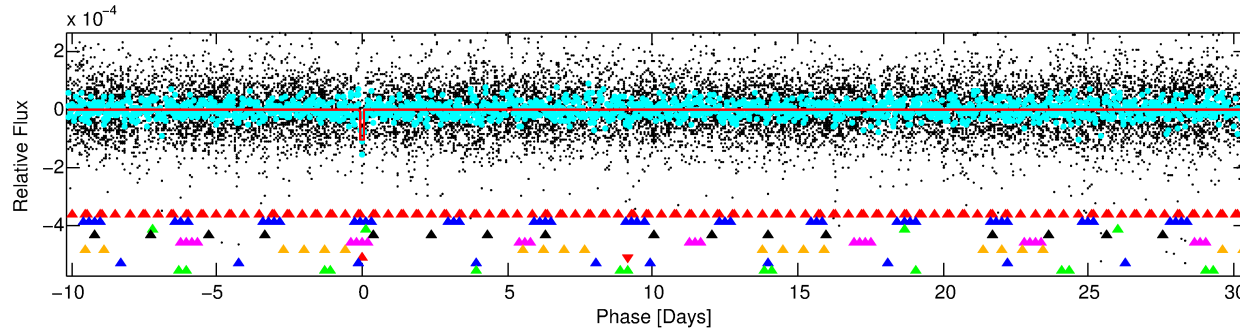
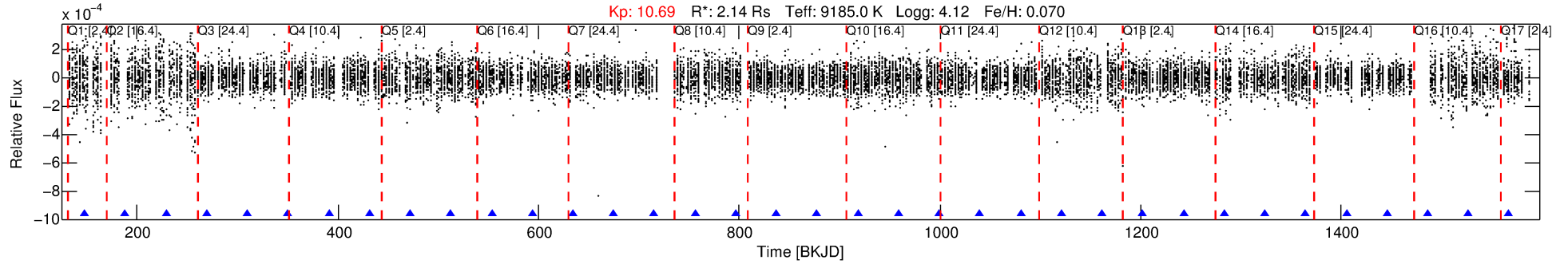
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 008073771-07

No Significant Match Found

# DV One-Page Summary

KIC: 8073771 Candidate: 7 of 9 Period: 40.553 d



## DV Fit Results:

Period = 40.55288 [0.00068] d  
Epoch = 147.8335 [0.0151] BKJD  
Rp/R\* = 0.0114 [0.0060]  
a/R\* = 44.65 [178.64]  
b = 0.94 [0.53]  
Seff = 323.78 [157.25]  
Teq = 1082 [131] K  
Rp = 2.65 [1.79] Re  
a = 0.2998 [0.0988] AU  
Ag = 335.85 [399.06] [0.84σ]  
Teffp = 7159 [1995] K [3.04σ]

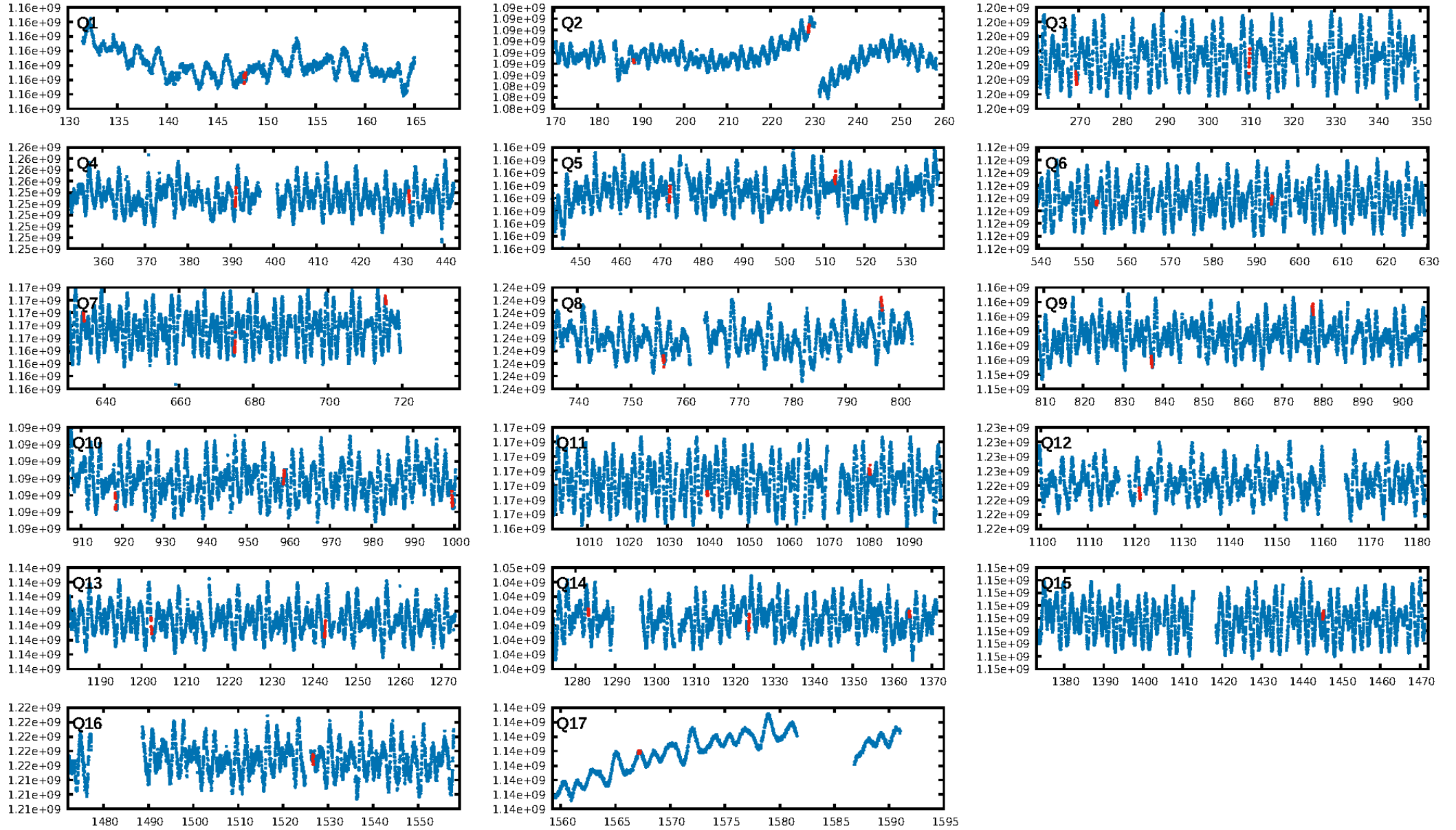
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [9.99σ]  
LongPeriod-sig: 100.0% [24.51σ]  
ModelChiSquare2-sig: 94.6%  
ModelChiSquareGof-sig: 99.3%  
Bootstrap-pfa: 8.57e-09  
RollingBand-fgt: 1.00 [6/6]  
GhostDiagnostic-chr: N/A  
Centroid-sig: 15.4%  
Centroid-so: 1.998 arcsec [2.98σ]  
OotOffset-rm: 2.547 arcsec [1.95σ]  
OotOffset-st: 3/2/2/3 [10]  
KicOffset-rm: 3.700 arcsec [3.01σ]  
KicOffset-st: 3/2/2/3 [10]  
DiffImageQuality-fgm: 0.30 [3/10]  
DiffImageOverlap-fno: 0.47 [7/15]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 02-Feb-2016 15:03:40 Z

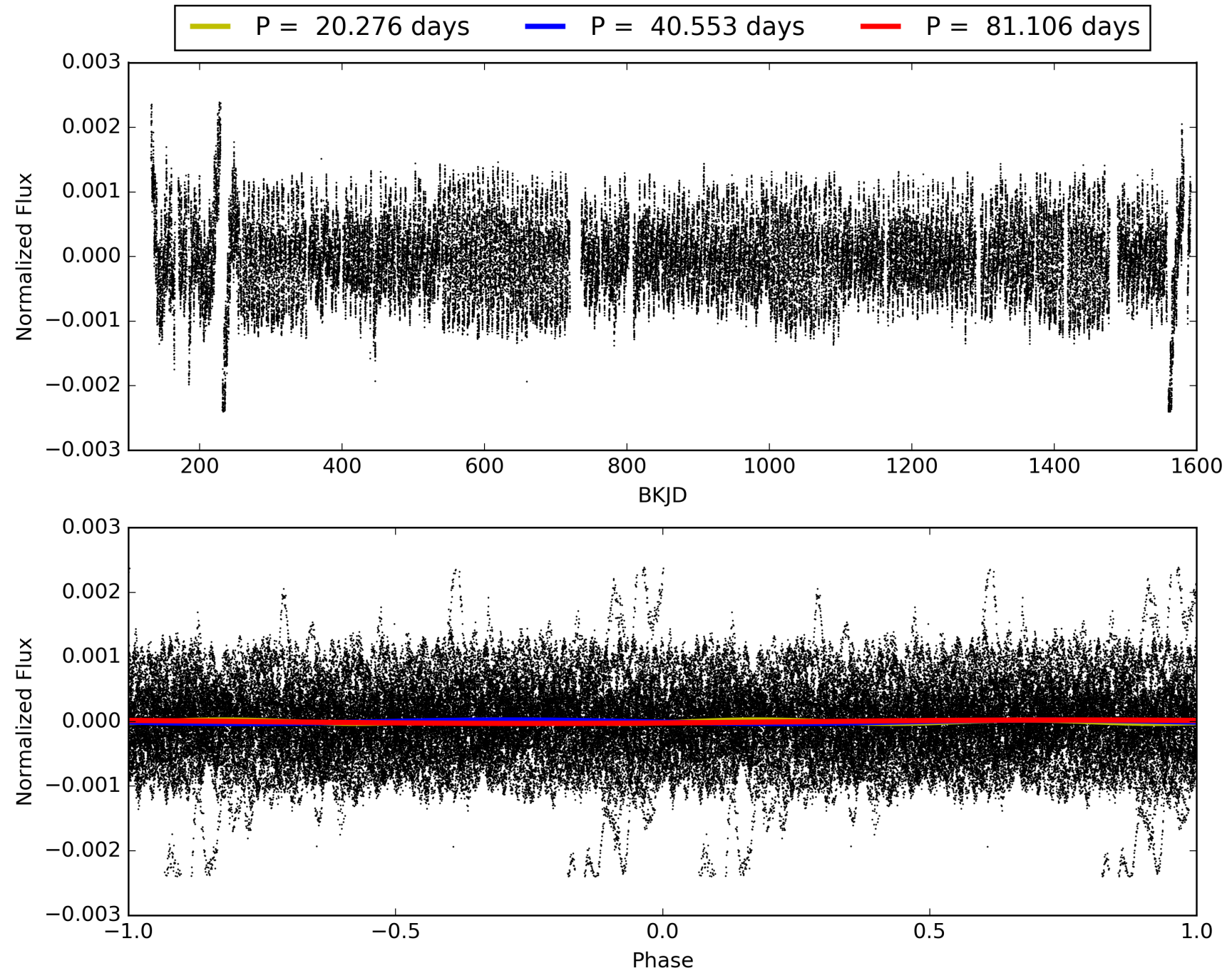
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 008073771-07, PDC Light Curves





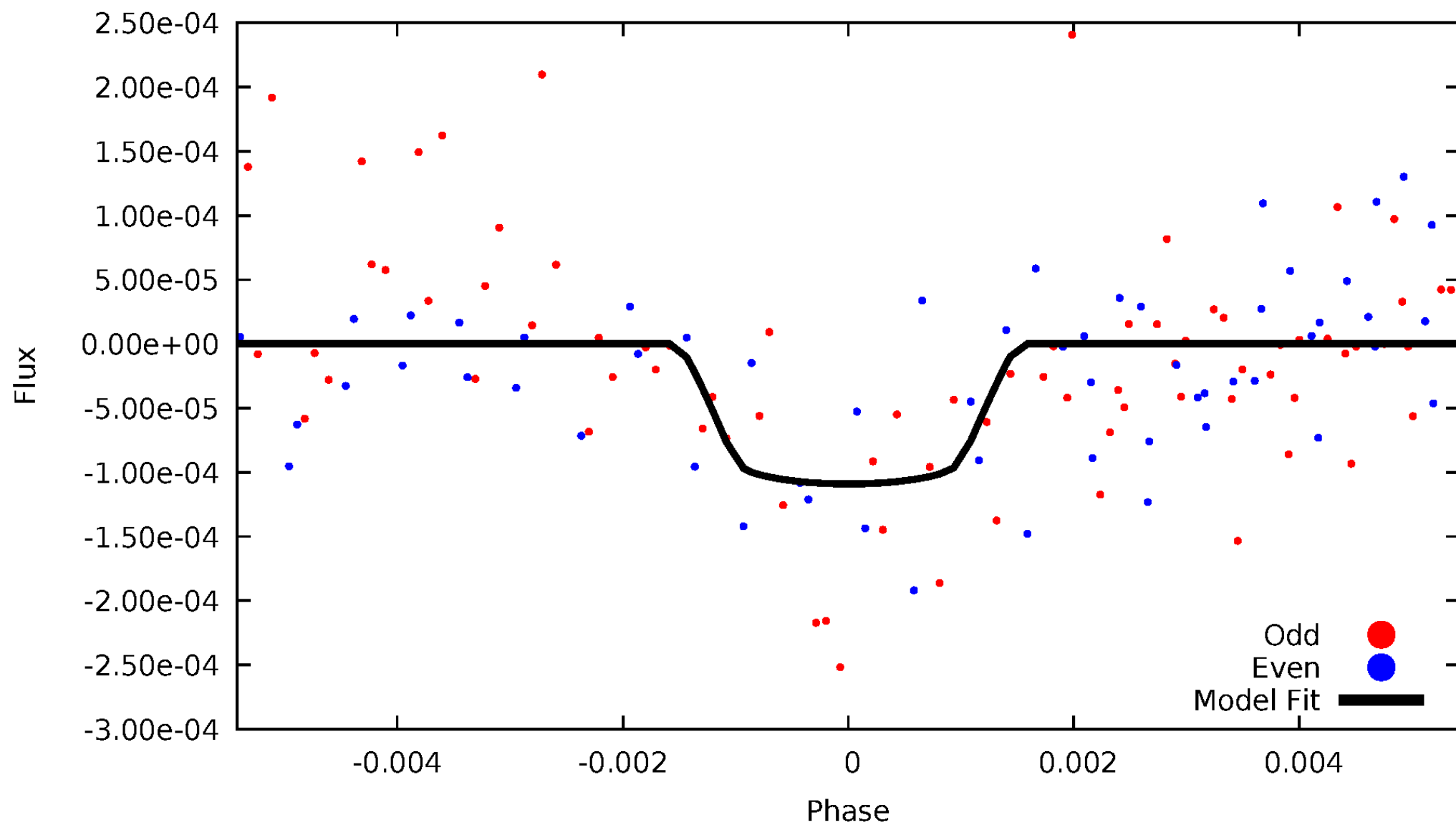
TCE 008073771-07





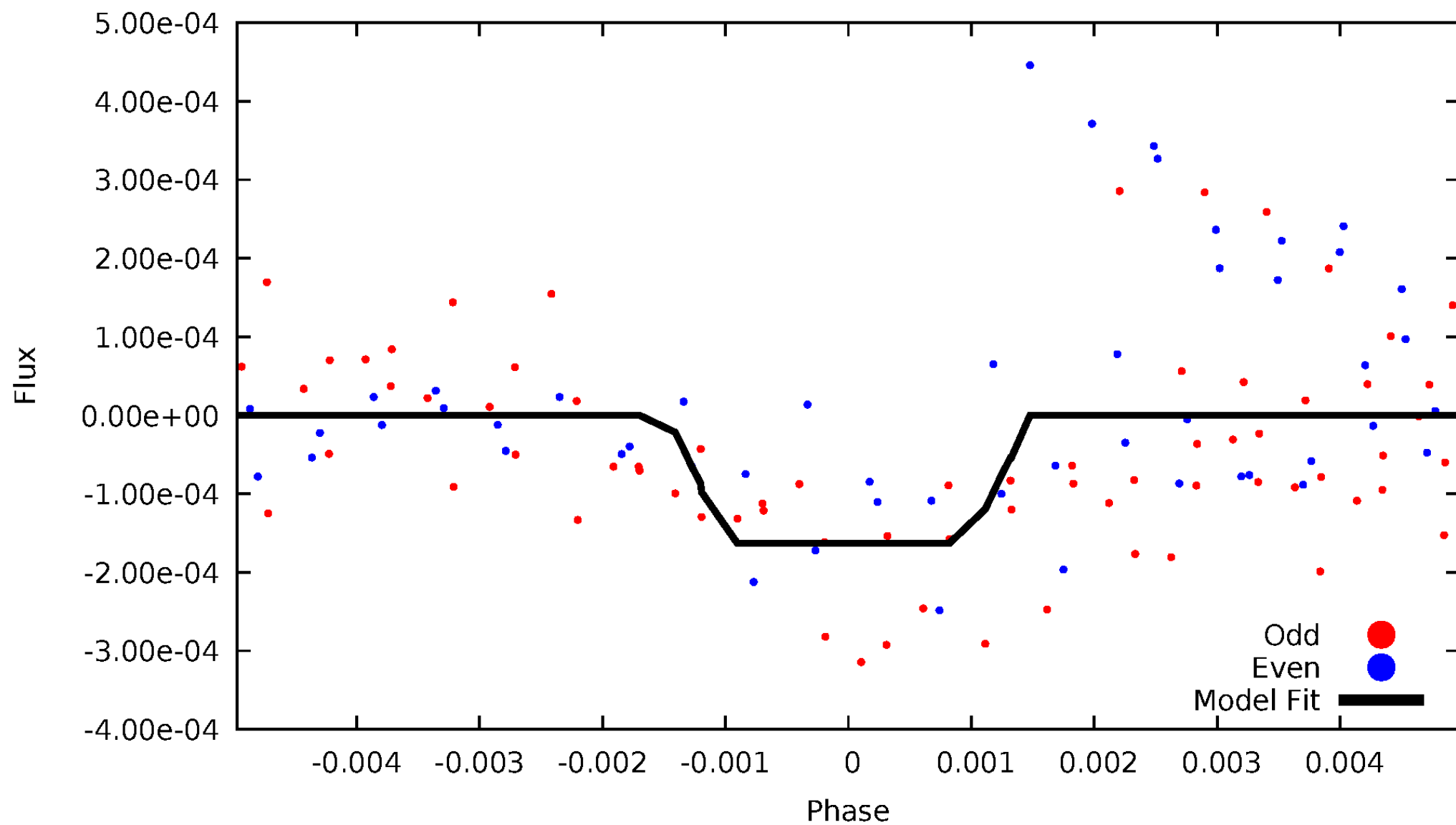
# DV Odd/Even

TCE 008073771-07



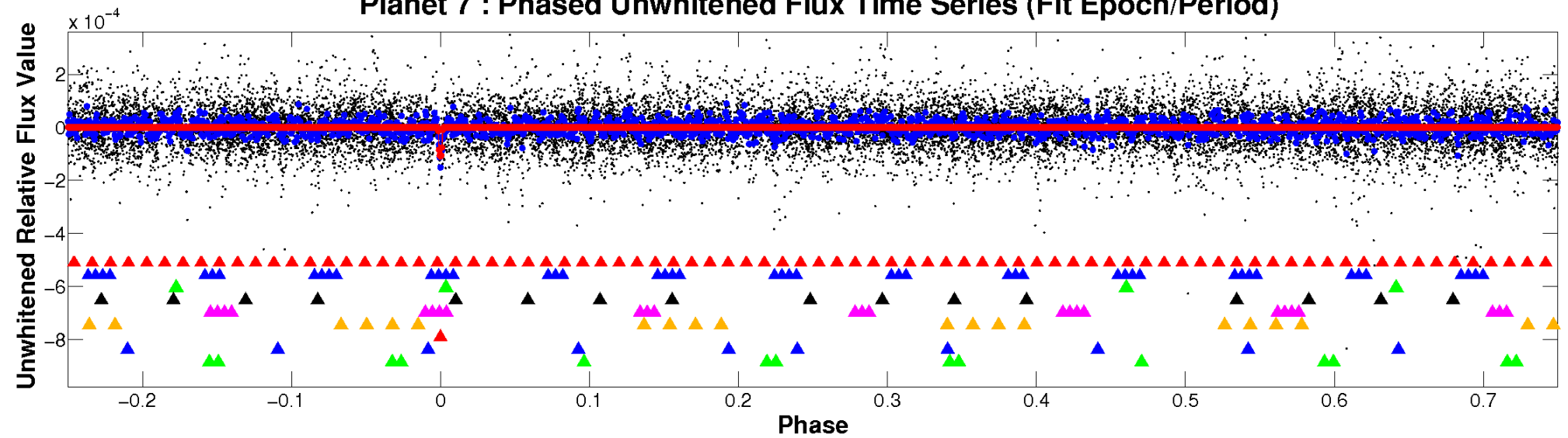
# ALT Odd/Even

TCE 008073771-07

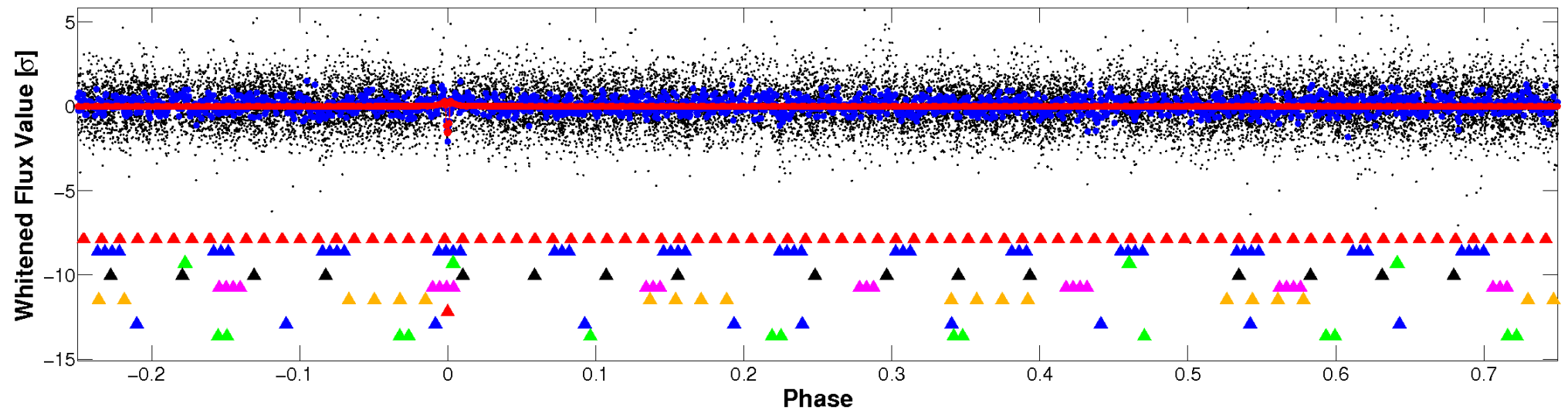


# Non-Whitened Vs. Whitened Light Curve

## Planet 7 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

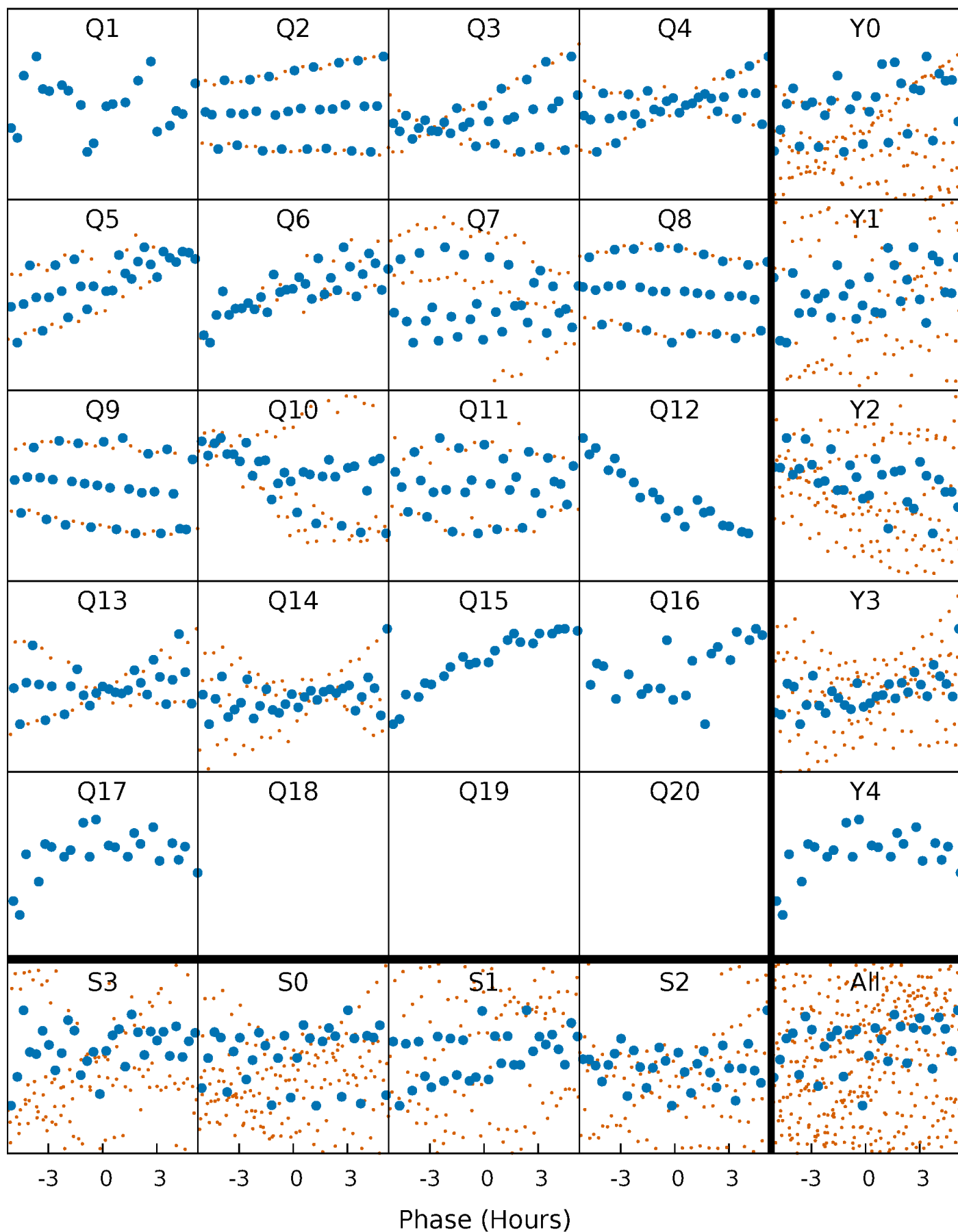


## Planet 7 : Phased Whitened Flux Time Series (Fit Epoch/Period)



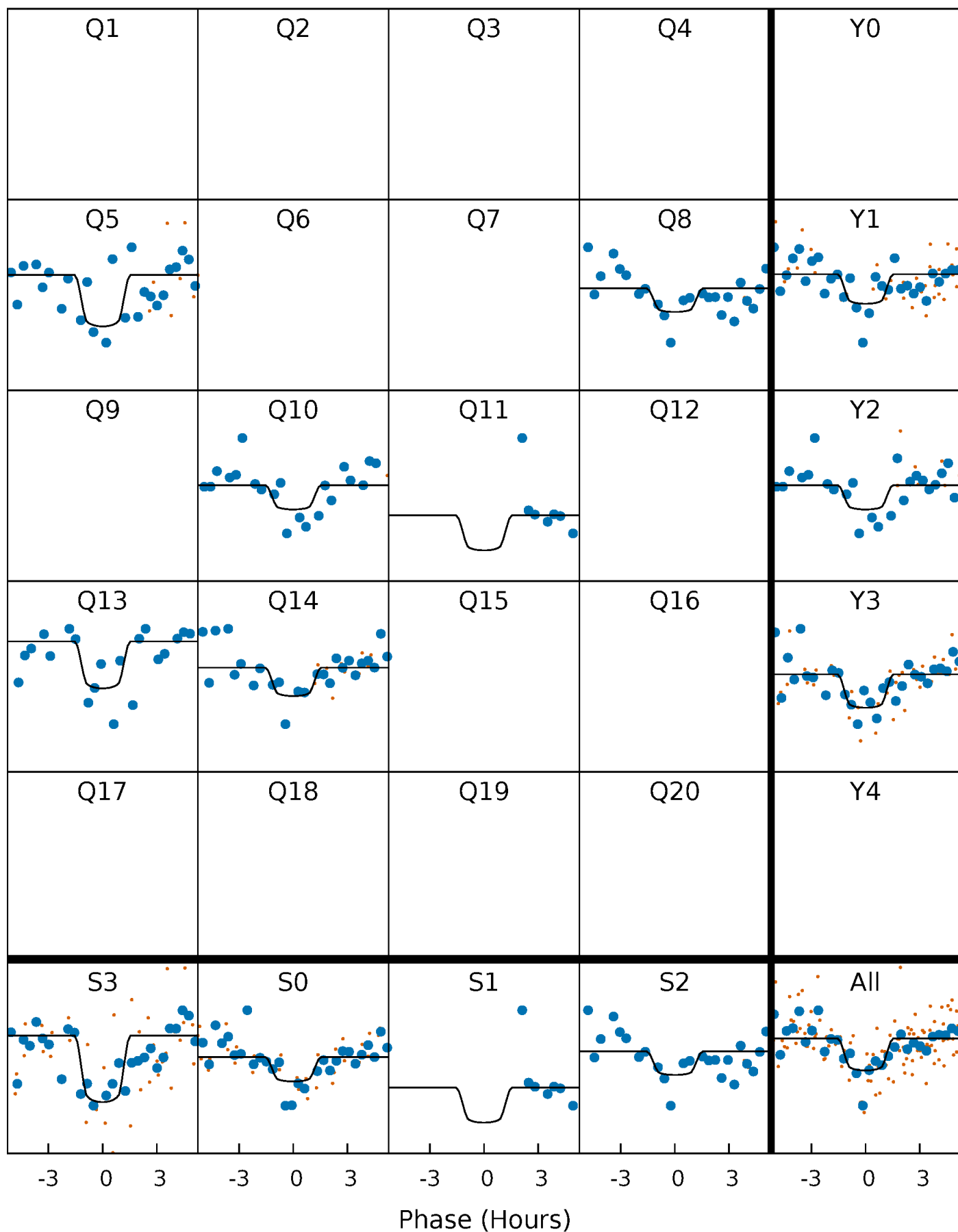
# PDC Quarter-Phased Transit Curves

TCE 008073771-07   P= 40.552881 Days    $T_0=147.833476$  (BKJD)



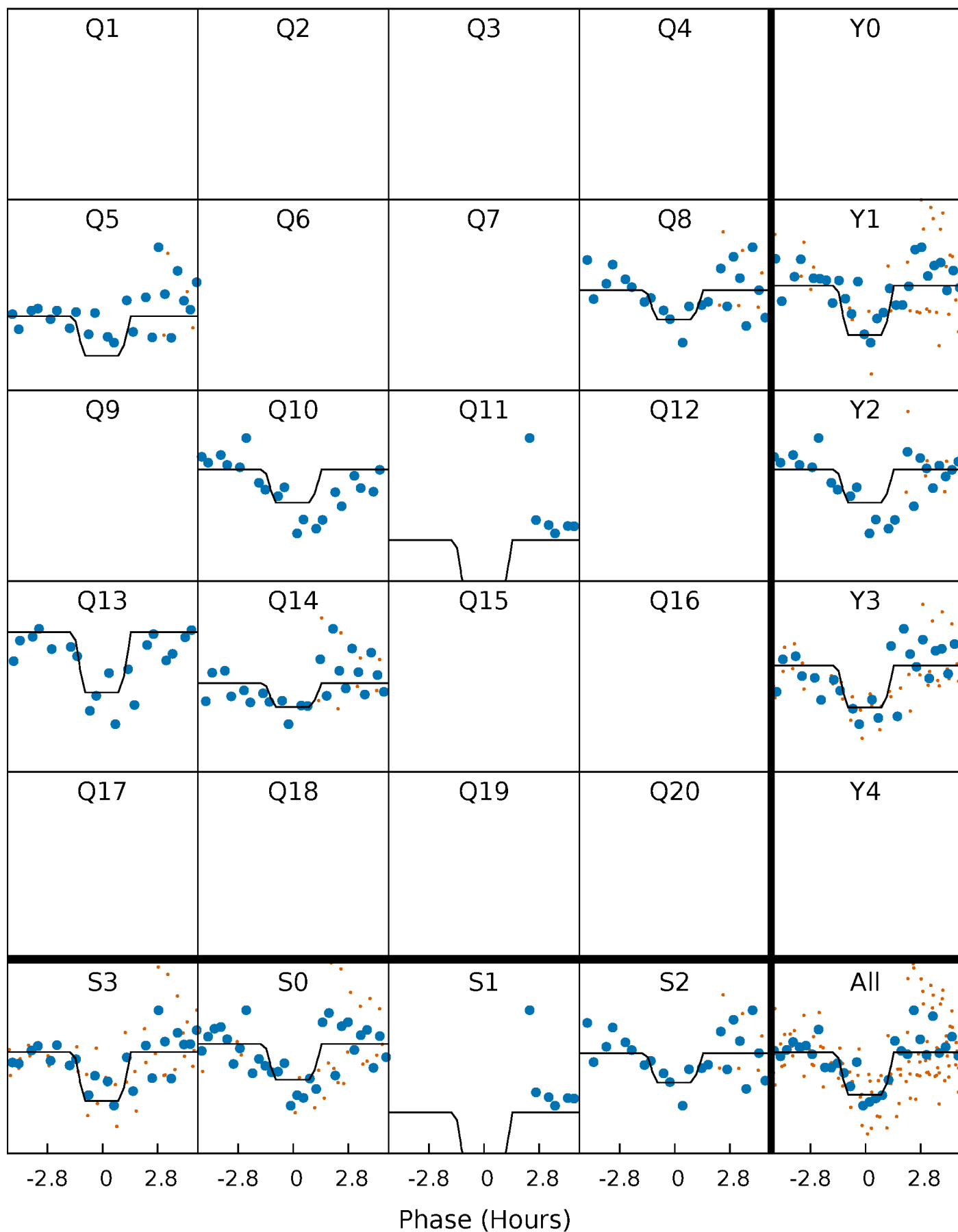
# DV Quarter-Phased Transit Curves

TCE 008073771-07     $P = 40.552881$  Days     $T_0 = 147.833476$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

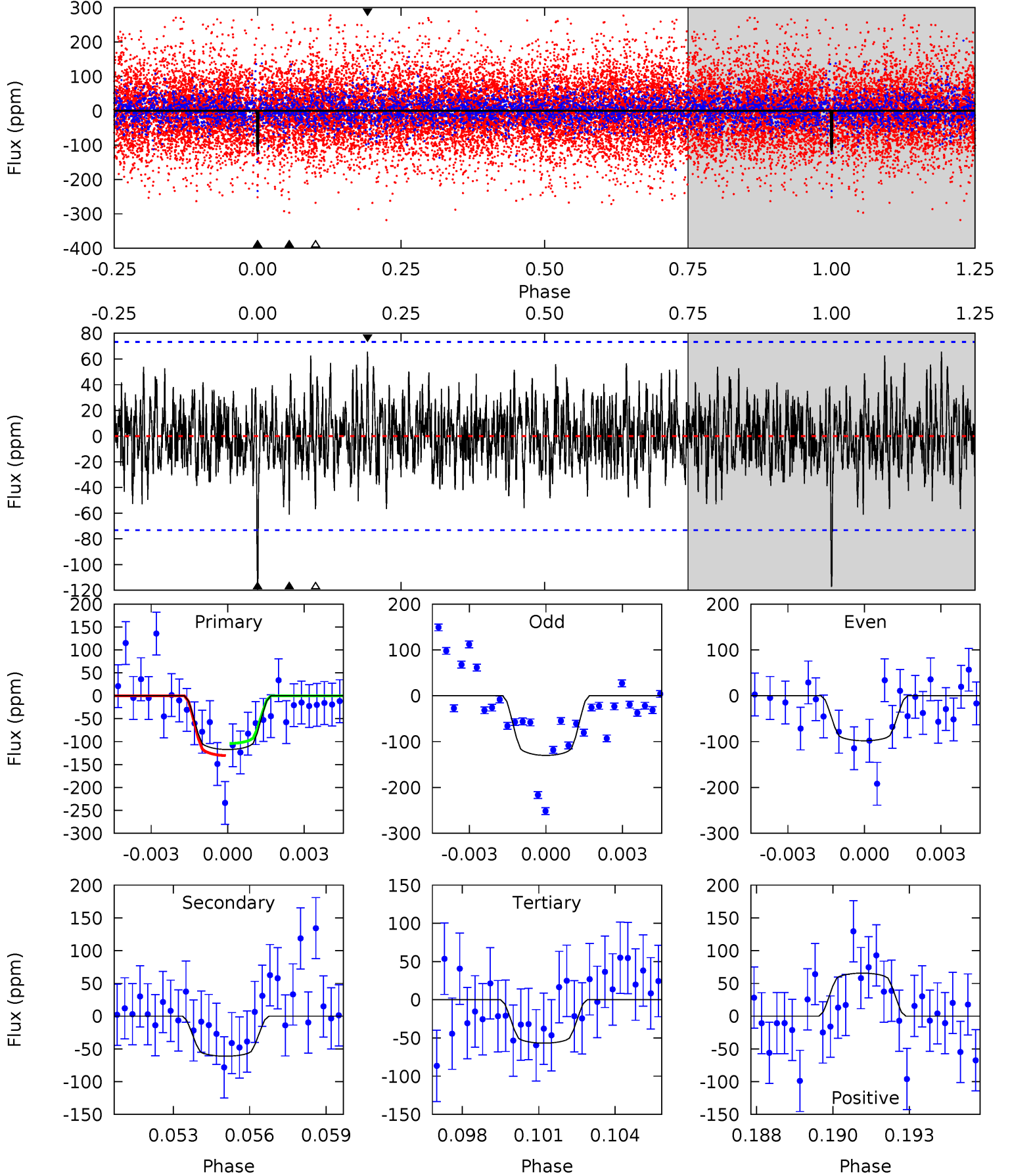
TCE 008073771-07     $P = 40.553704$  Days     $T_0 = 147.805554$  (BKJD)



# DV Model-Shift Uniqueness Test

008073771-07, P = 40.552881 Days, E = 107.280595 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
8.43	4.40	4.08	4.72	5.27	2.99	1.39	4.35	3.71	0.32	-0.32	1.12	0.95	0.36	0.95

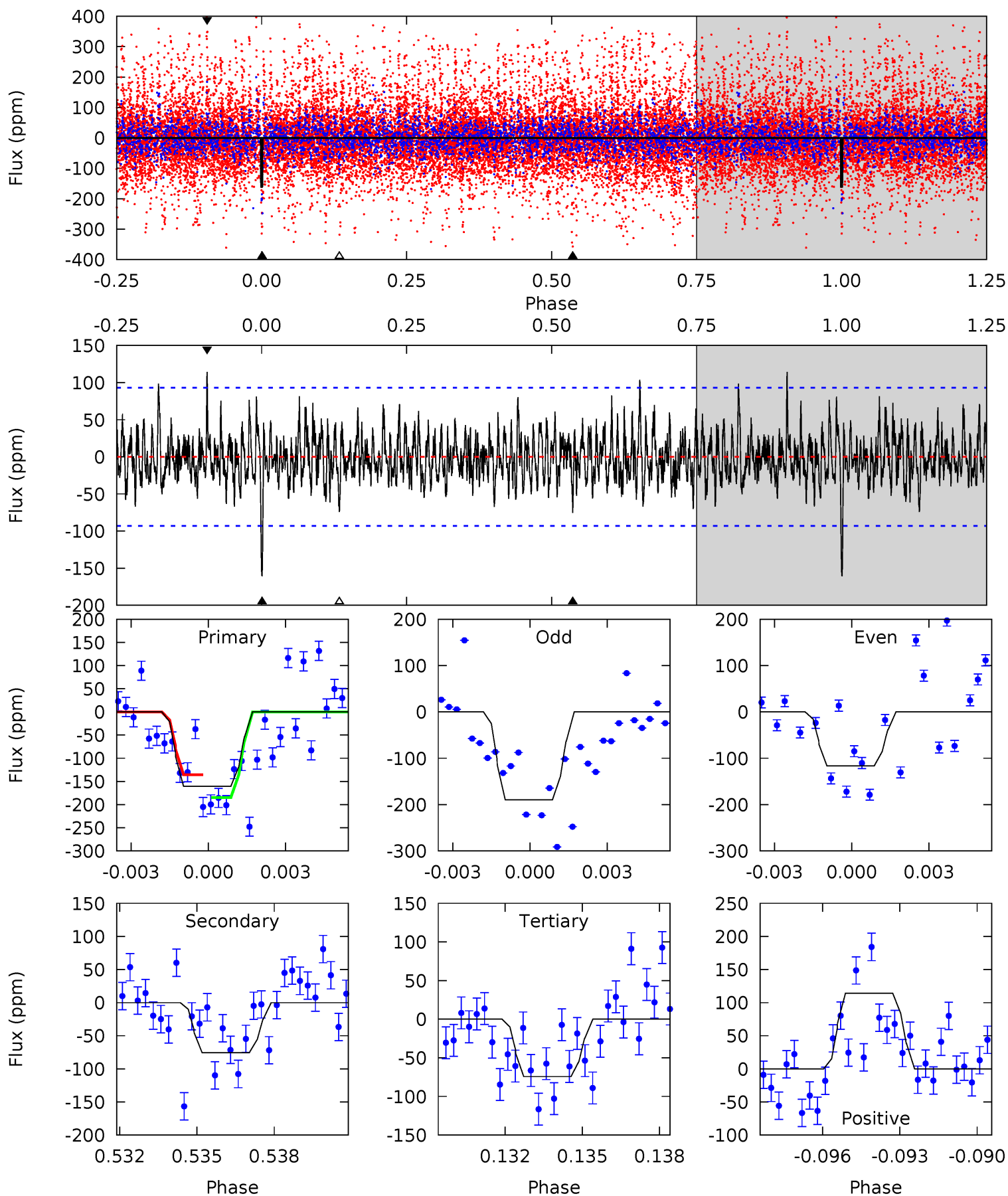




# Alt Model-Shift Uniqueness Test

008073771-07, P = 40.553704 Days, E = 107.251850 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
9.09	4.27	4.20	6.46	5.26	2.99	1.55	4.89	2.63	0.07	-2.19	1.99	0.86	0.42	1.40



### Stellar Parameters For KIC 008073771

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$9185^{+257}_{-417}$	$4.118^{+0.099}_{-0.231}$	$0.070^{+0.150}_{-0.650}$	$2.136^{+0.890}_{-0.445}$	$2.180^{+0.427}_{-0.522}$	$0.315^{+0.177}_{-0.176}$
	+3%/-5%	+2%/-6%	+214%/-929%	+42%/-21%	+20%/-24%	+56%/-56%
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 008073771-07 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-61 \pm 14$	$2.78^{+1.55}_{-1.33}$	$1539^{+135}_{-101}$	$7080^{+4225}_{-1327}$	$368^{+993}_{-215}$
Alt.	$-76 \pm 18$	$3.16^{+1.57}_{-1.44}$	$1537^{+132}_{-103}$	$7111^{+3297}_{-1398}$	$365^{+833}_{-214}$

$T_{max}$  = 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

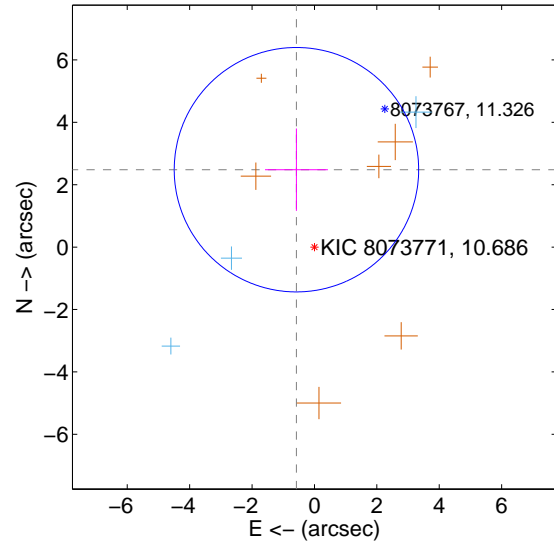
Supplemental centroid analysis for 008073771-07. **Kepler magnitude: 10.69.** Transit SNR 6.91

**There are 3 quarters with good PRF difference image offsets**

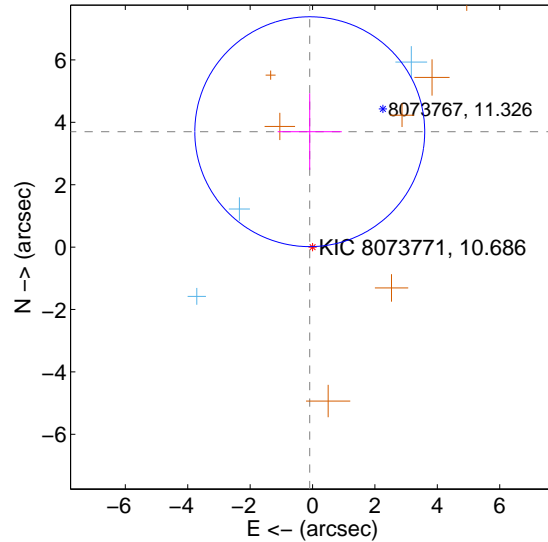
The direct PRF centroid is offset from the target star catalog position by about 1.80 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$2.547 \pm 1.306$	1.95	$0.577 \pm 1.007$	$2.481 \pm 1.320$
PRF-fit source offset from KIC position	<b><math>3.700 \pm 1.228</math></b>	<b>3.01</b>	$0.089 \pm 1.027$	$3.699 \pm 1.228$
photometric centroid source offset	$2.00 \pm 0.67$	2.98	$0.23 \pm 0.71$	$1.98 \pm 0.67$

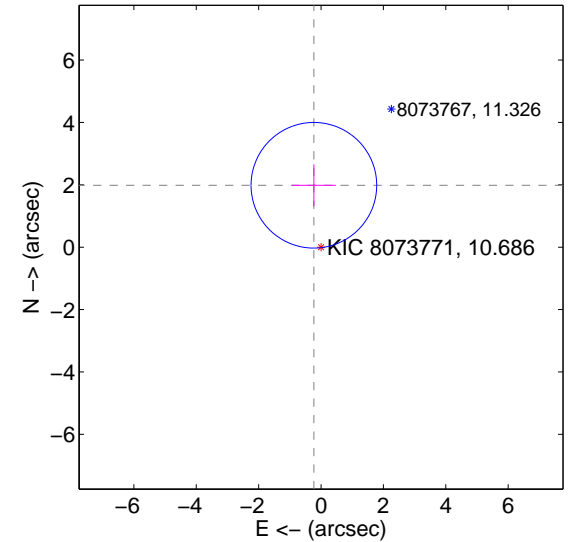
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

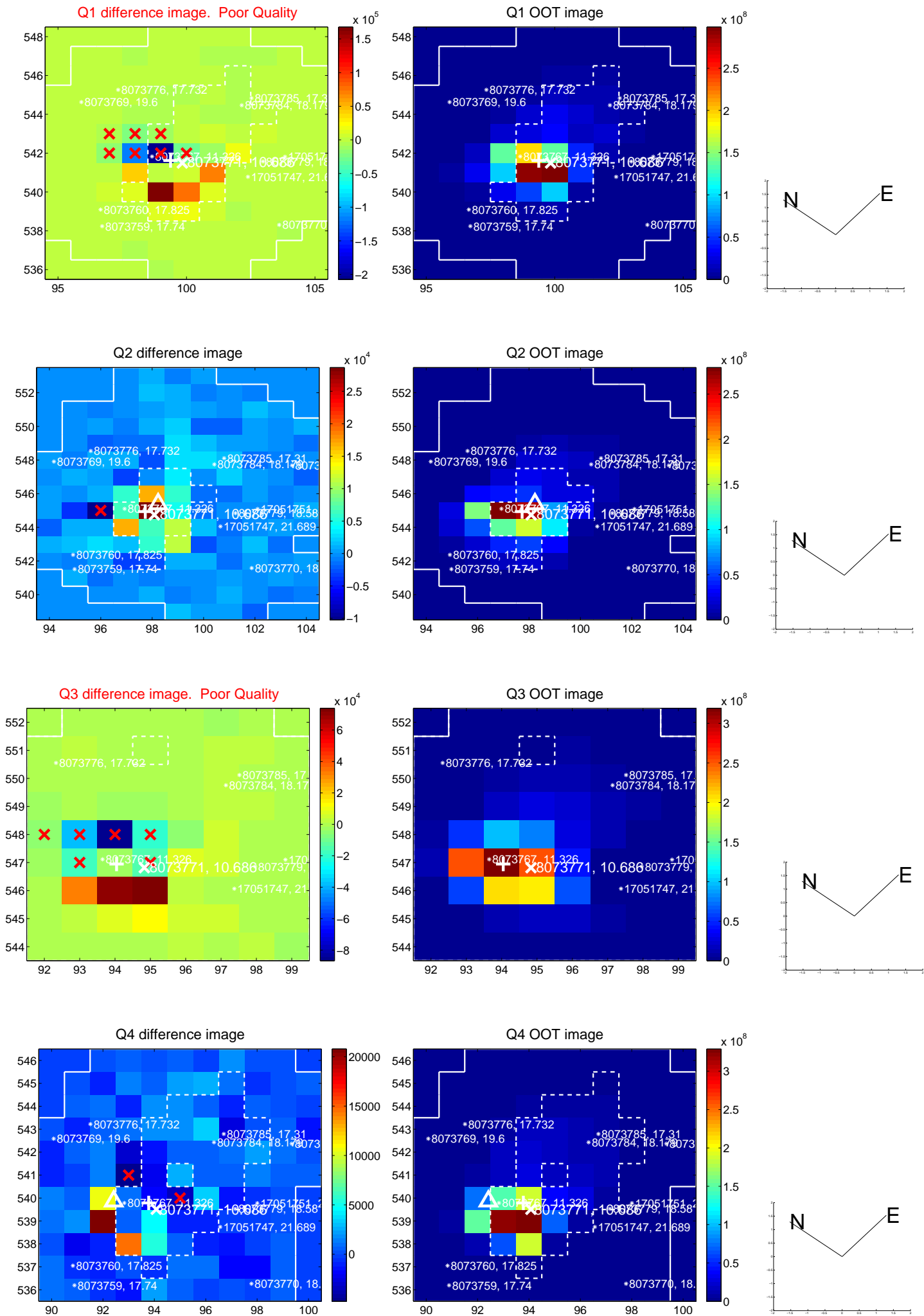


offset from photometric centroids

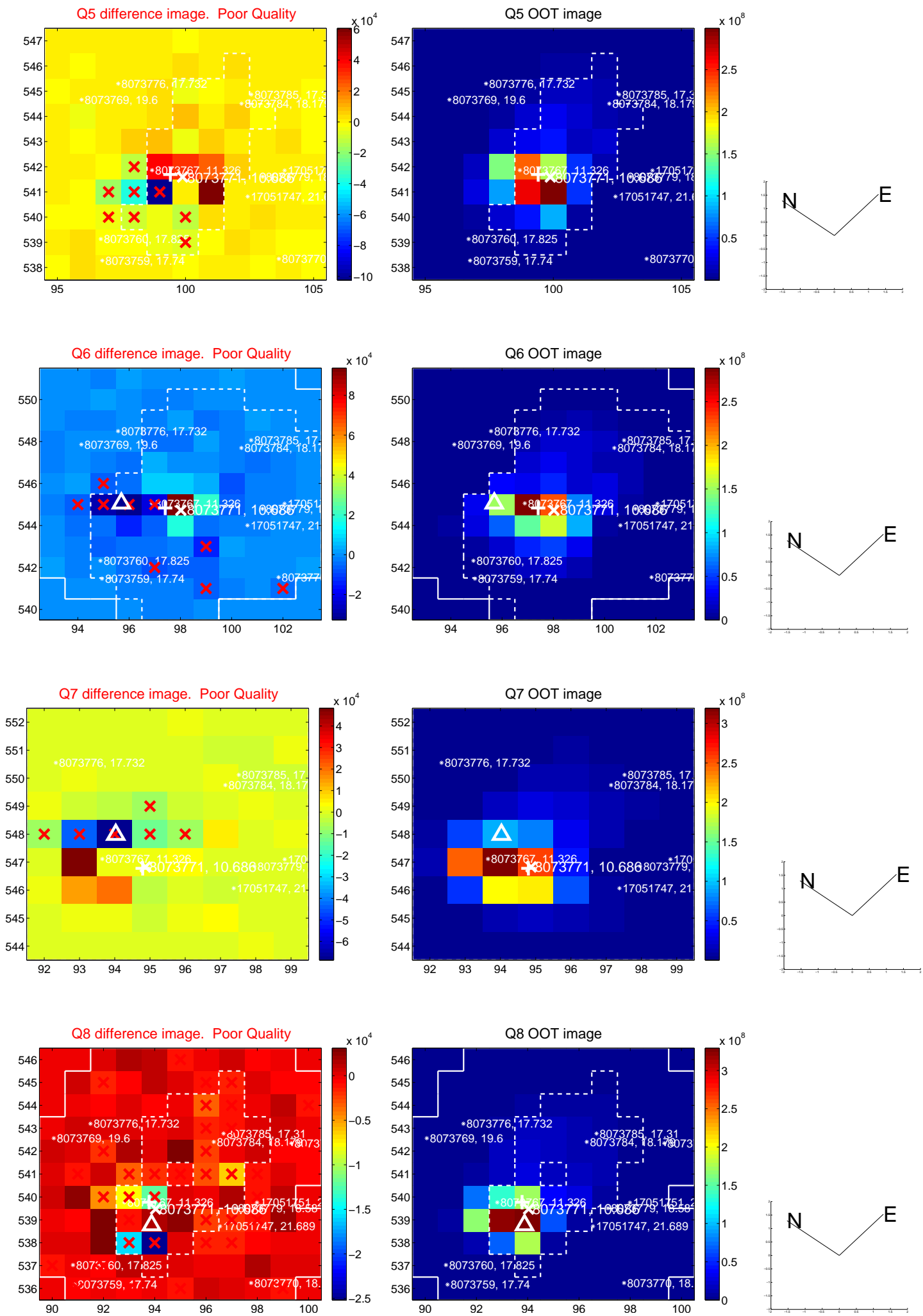


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

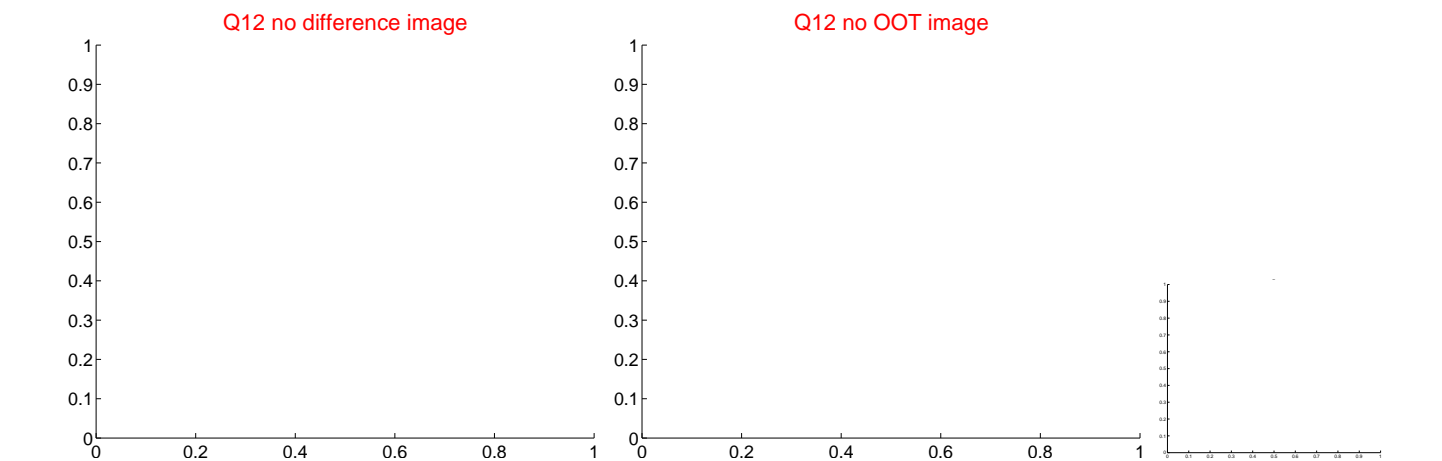
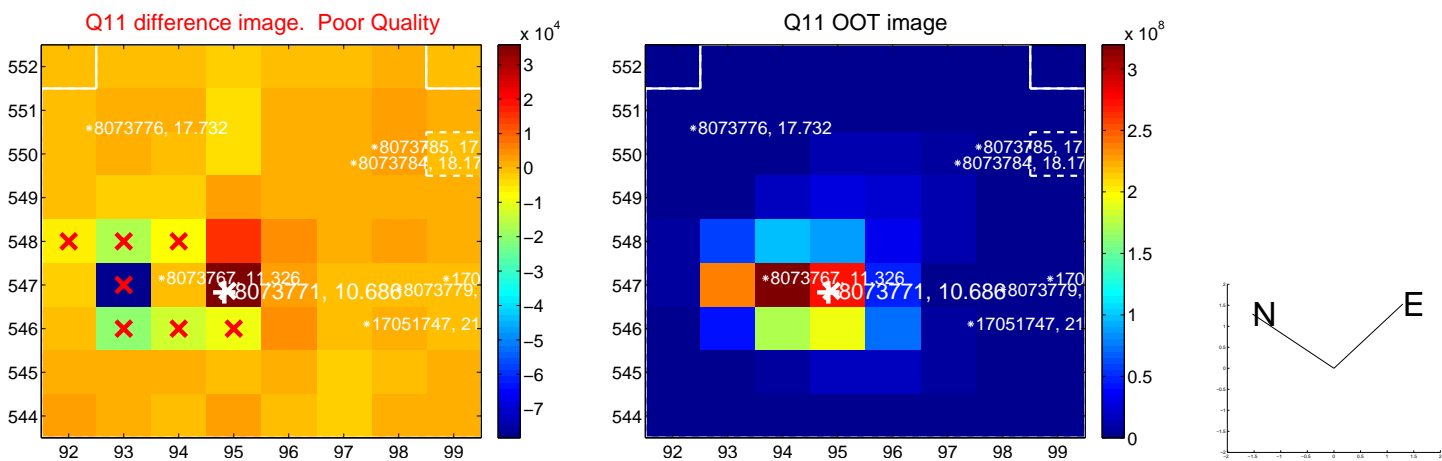
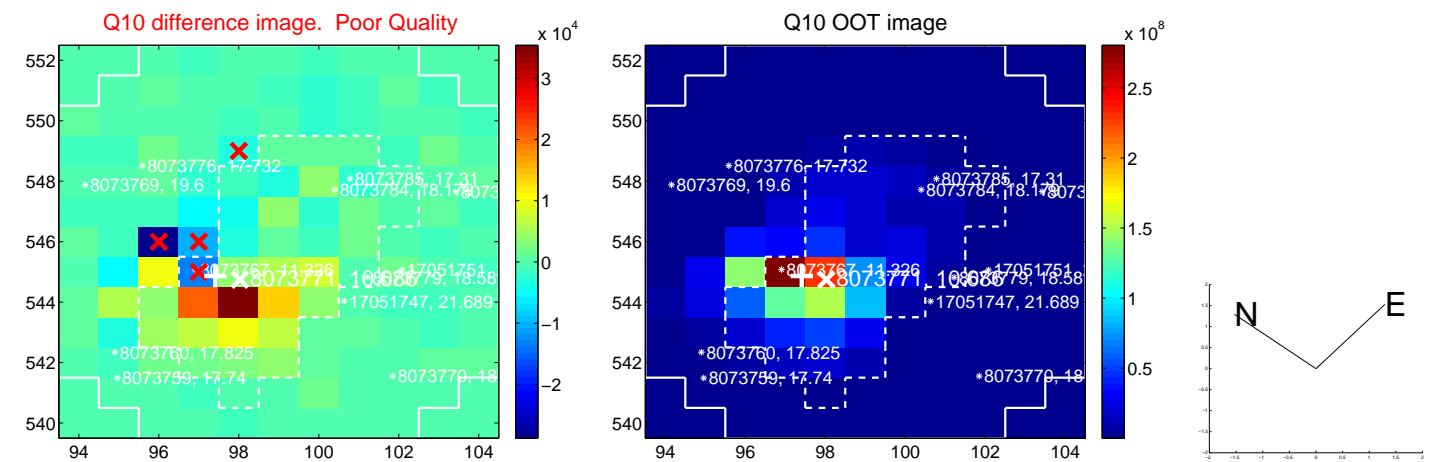
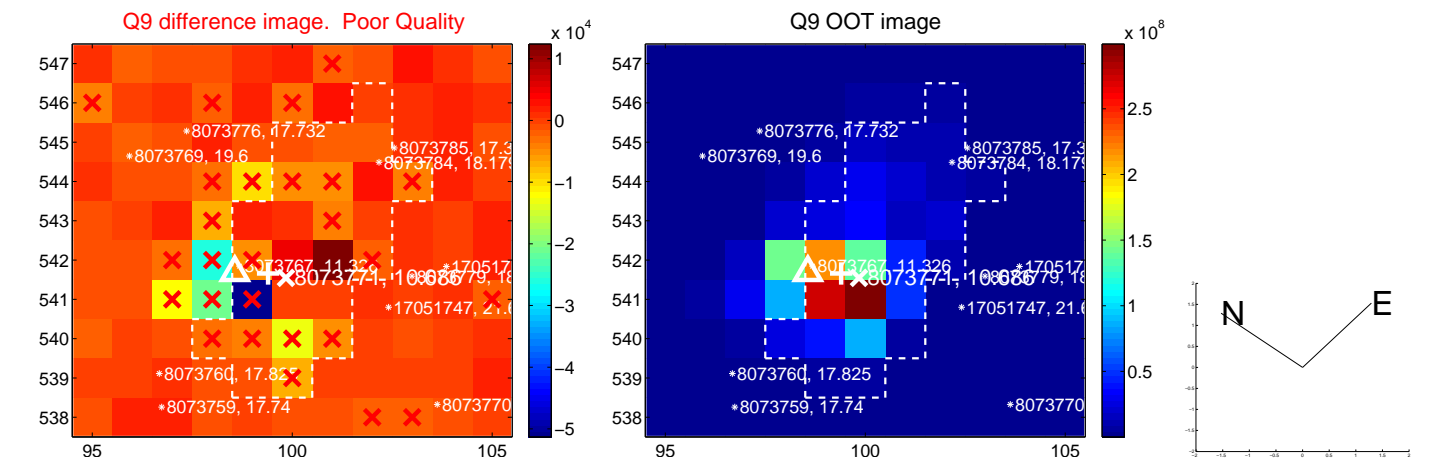
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



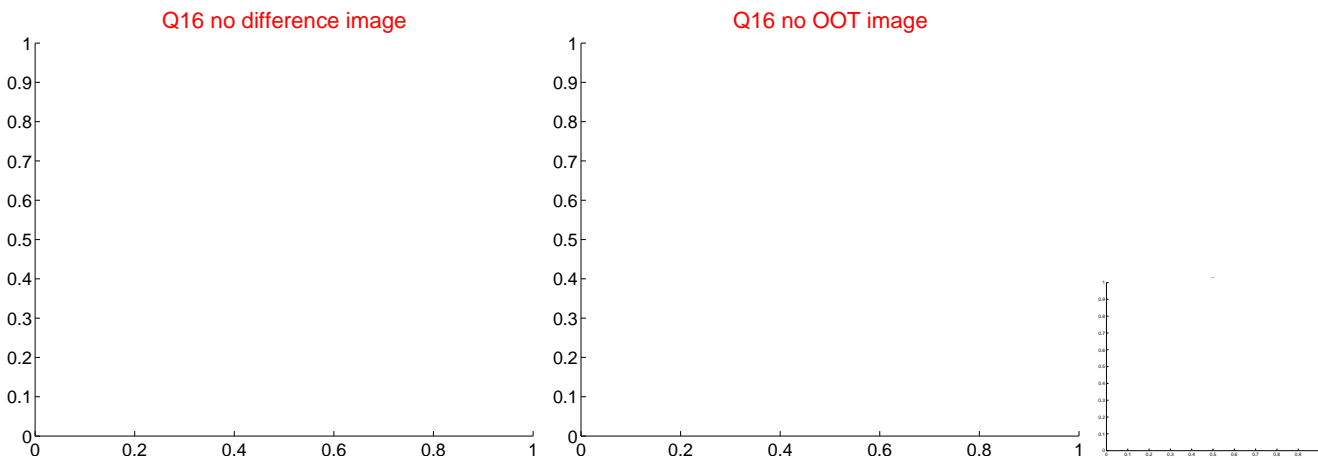
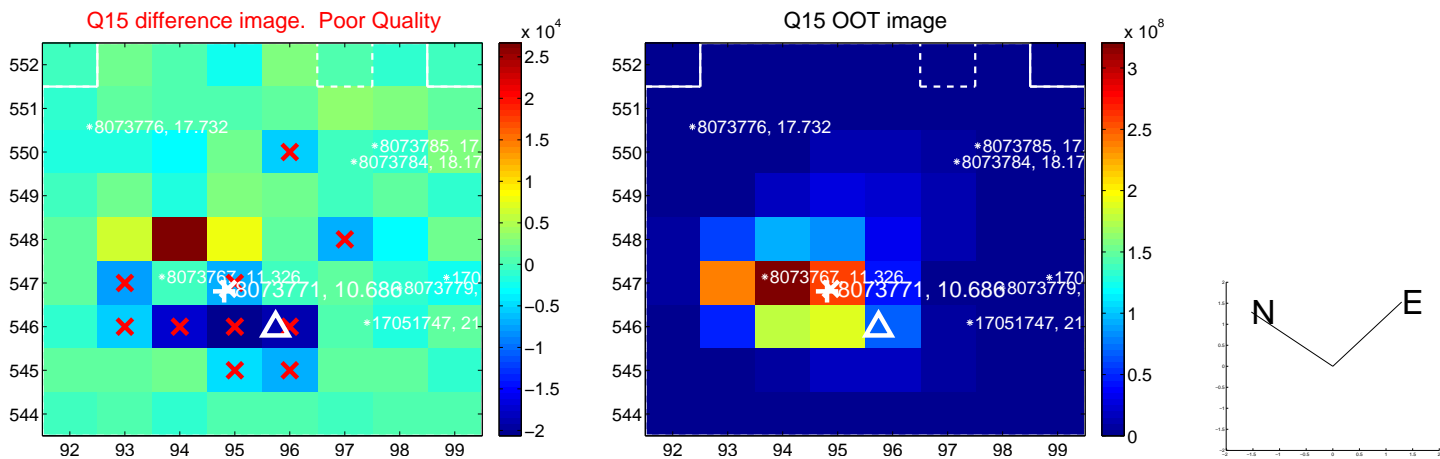
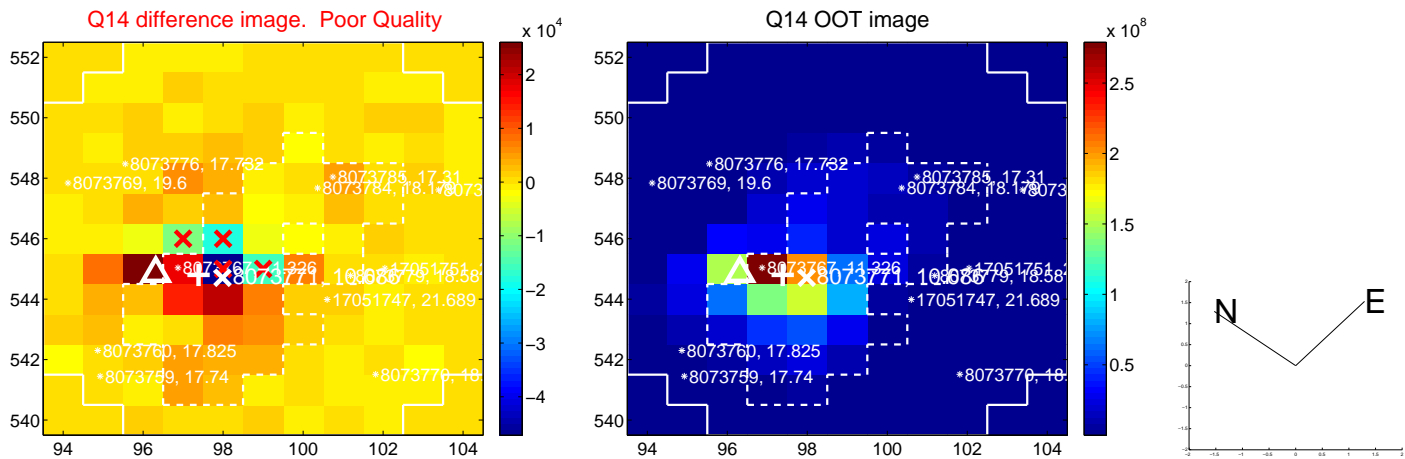
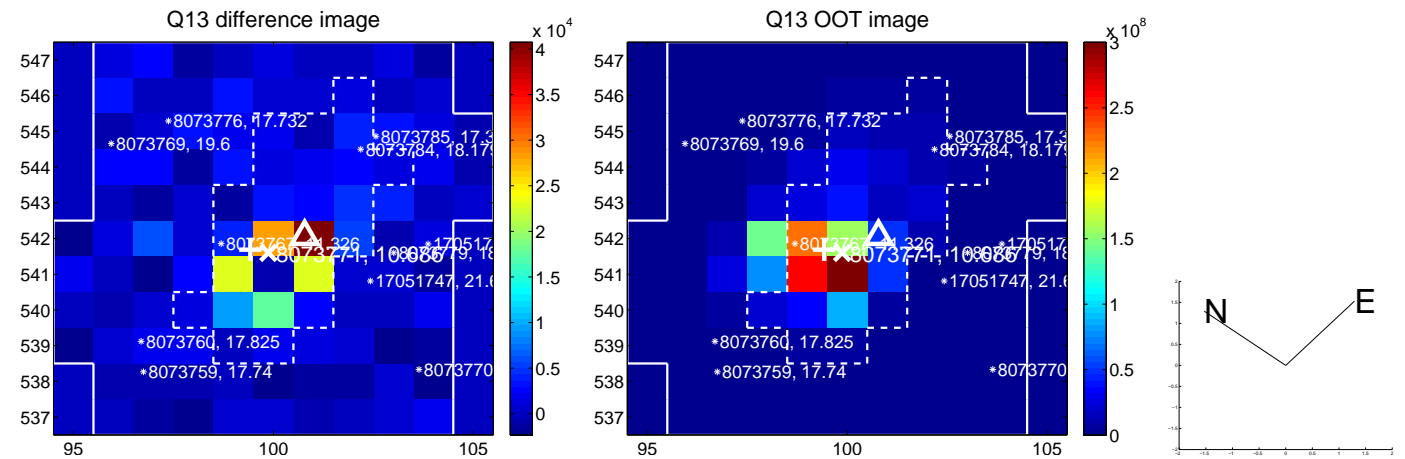
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

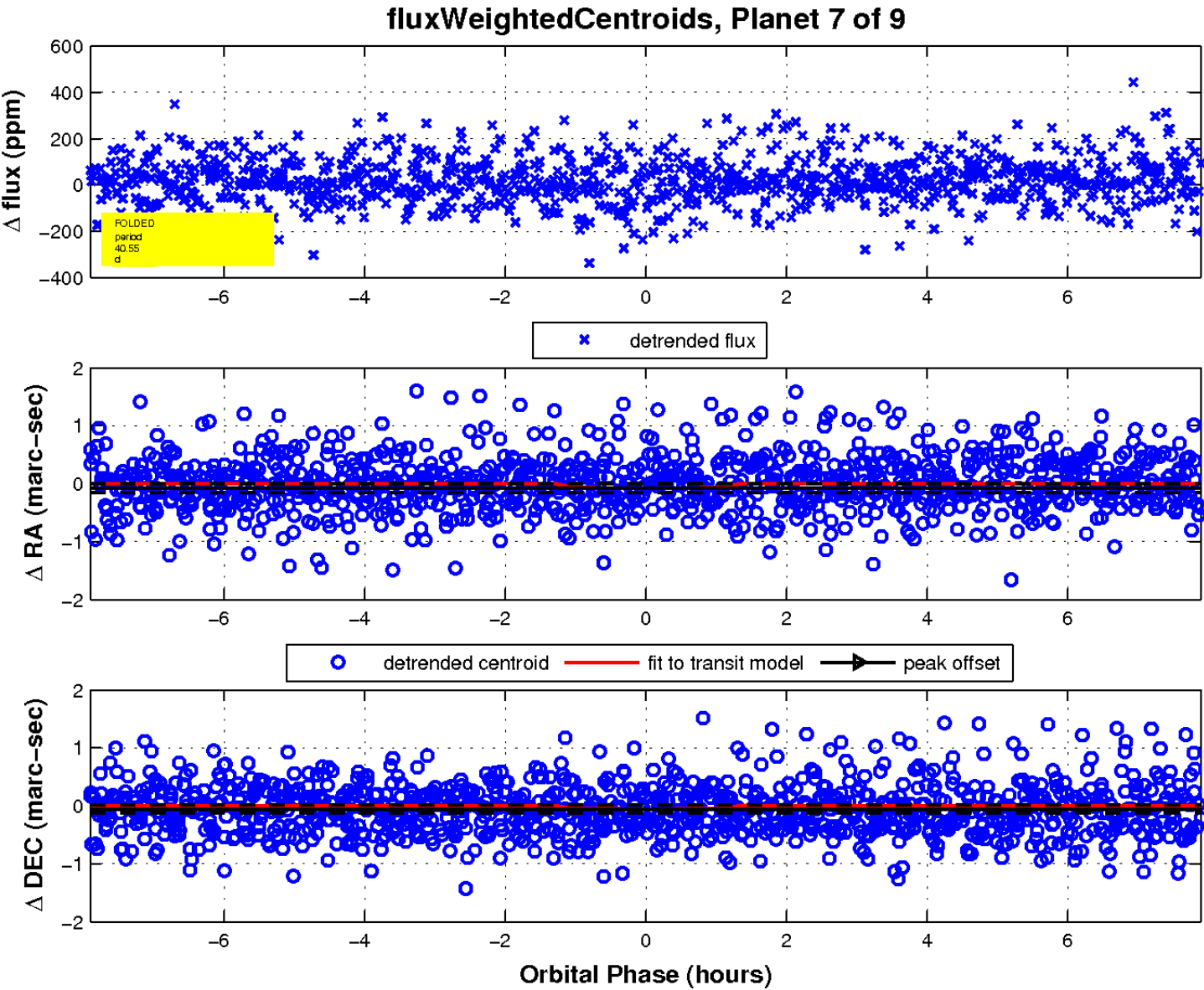
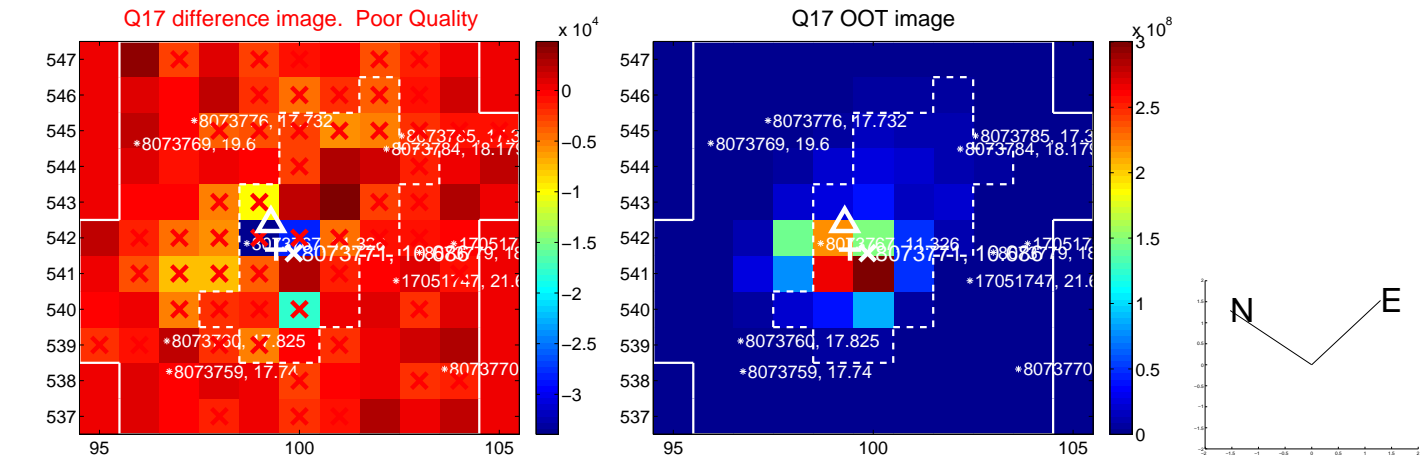


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



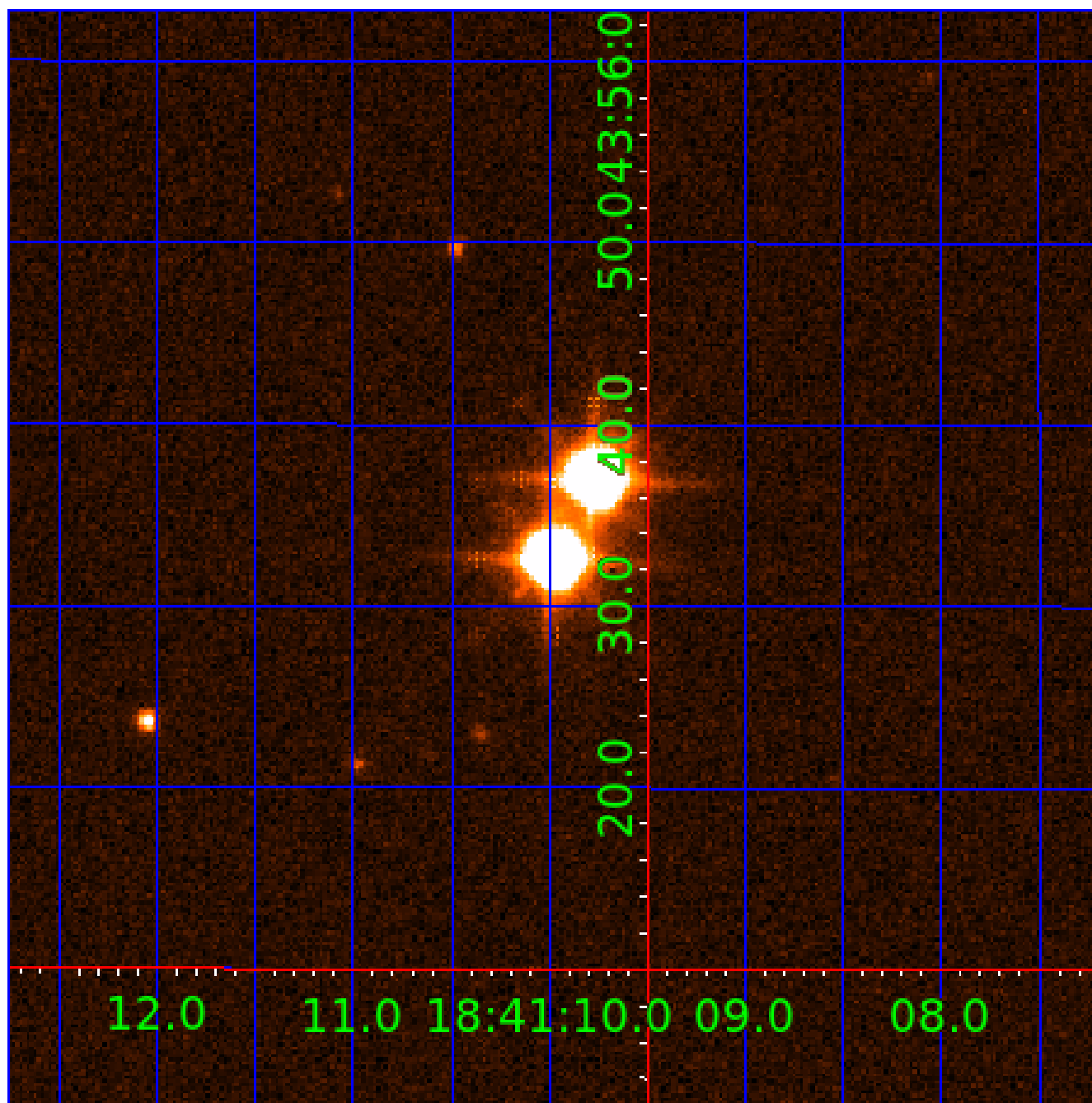


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 008073771

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
008073771-01	OBS	No	3.461710	134.422413	5.2	18.139	7.9	2.4	2.14	9185	0.56	8614.39
008073771-02	OBS	No	31.209849	153.746649	179.4	22.300	13.8	10.3	2.14	9185	4.83	459.08
008073771-03	OBS	No	398.184598	188.535331	291.9	21.908	9.7	10.3	2.14	9185	5.43	15.40
008073771-04	OBS	No	90.753169	215.949998	156.2	8.002	9.1	9.3	2.14	9185	3.30	110.61
008073771-05	OBS	No	57.905298	171.196957	88.4	16.784	8.8	7.8	2.14	9185	2.12	201.37
008073771-07	OBS	No	40.552881	147.833476	109.0	2.637	8.0	6.9	2.14	9185	2.65	323.78
008073771-08	OBS	No	143.980457	198.100793	110.6	3.000	8.3	-1.0	2.14	9185	2.30	59.78
008073771-09	OBS	No	106.481950	176.873243	121.2	14.100	7.8	7.8	2.14	9185	2.52	89.38

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008073771-01	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—CENT_SATURATED
008073771-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_DV—CENT_SATURATED
008073771-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—CENT_SATURATED
008073771-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—CENT_SATURATED
008073771-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_SATURATED
008073771-07	OBS	FP	0.00	1	0	0	0	TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_SATURATED
008073771-08	OBS	FP	0.00	1	0	0	0	TRANS_GAPPED—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_SATURATED
008073771-09	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_POS_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.

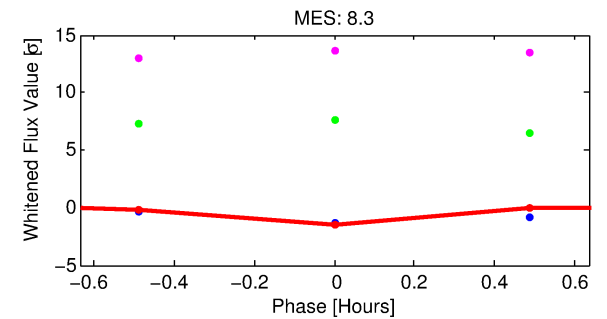
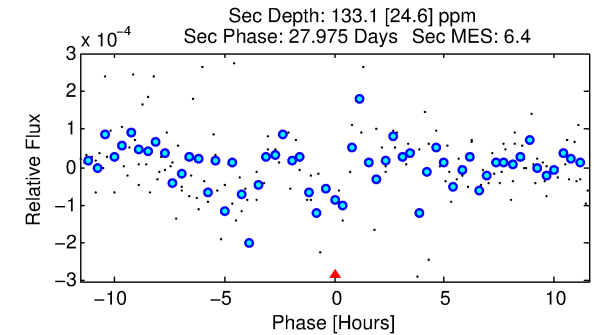
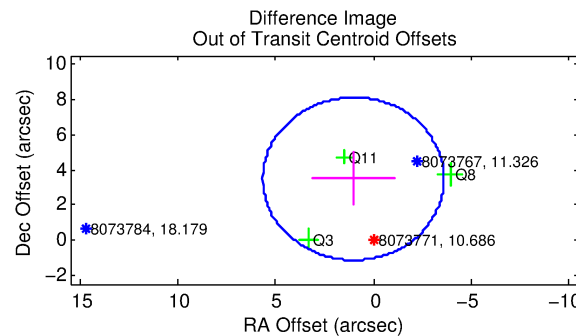
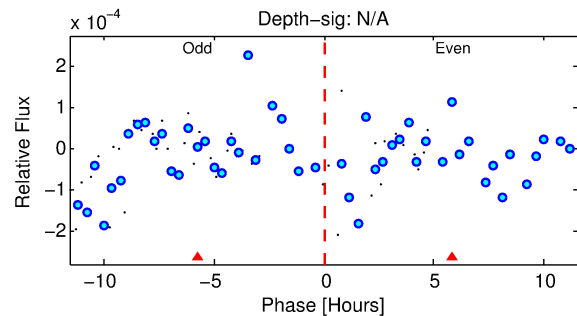
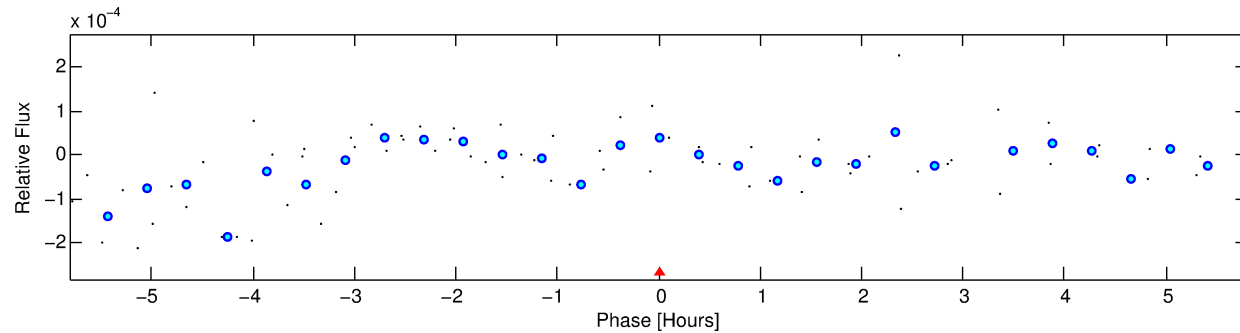
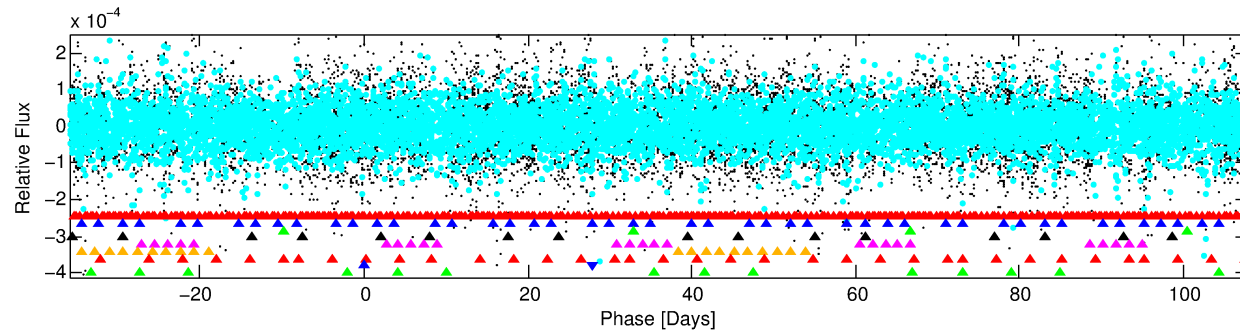
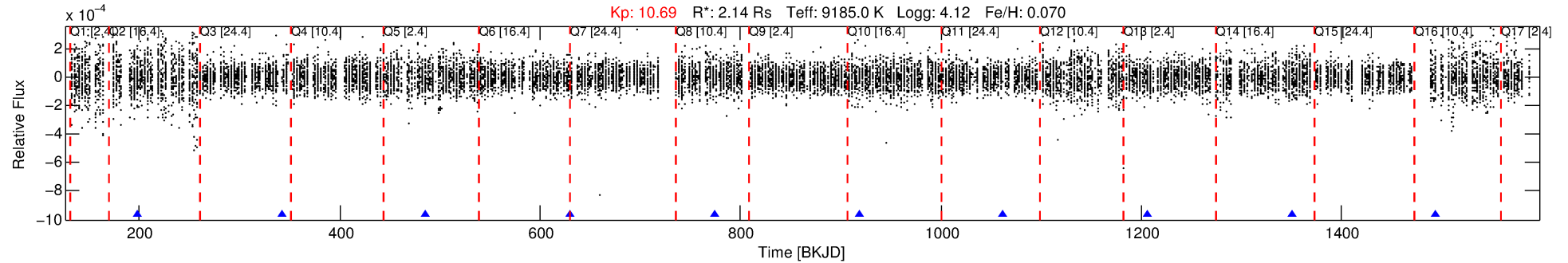
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 008073771-08

No Significant Match Found

# DV One-Page Summary

KIC: 8073771 Candidate: 8 of 9 Period: 143.980 d



## TPS TCE Results:

Period = 143.98046 d  
Epoch = 198.1008 BKJD

DV fit results are unavailable

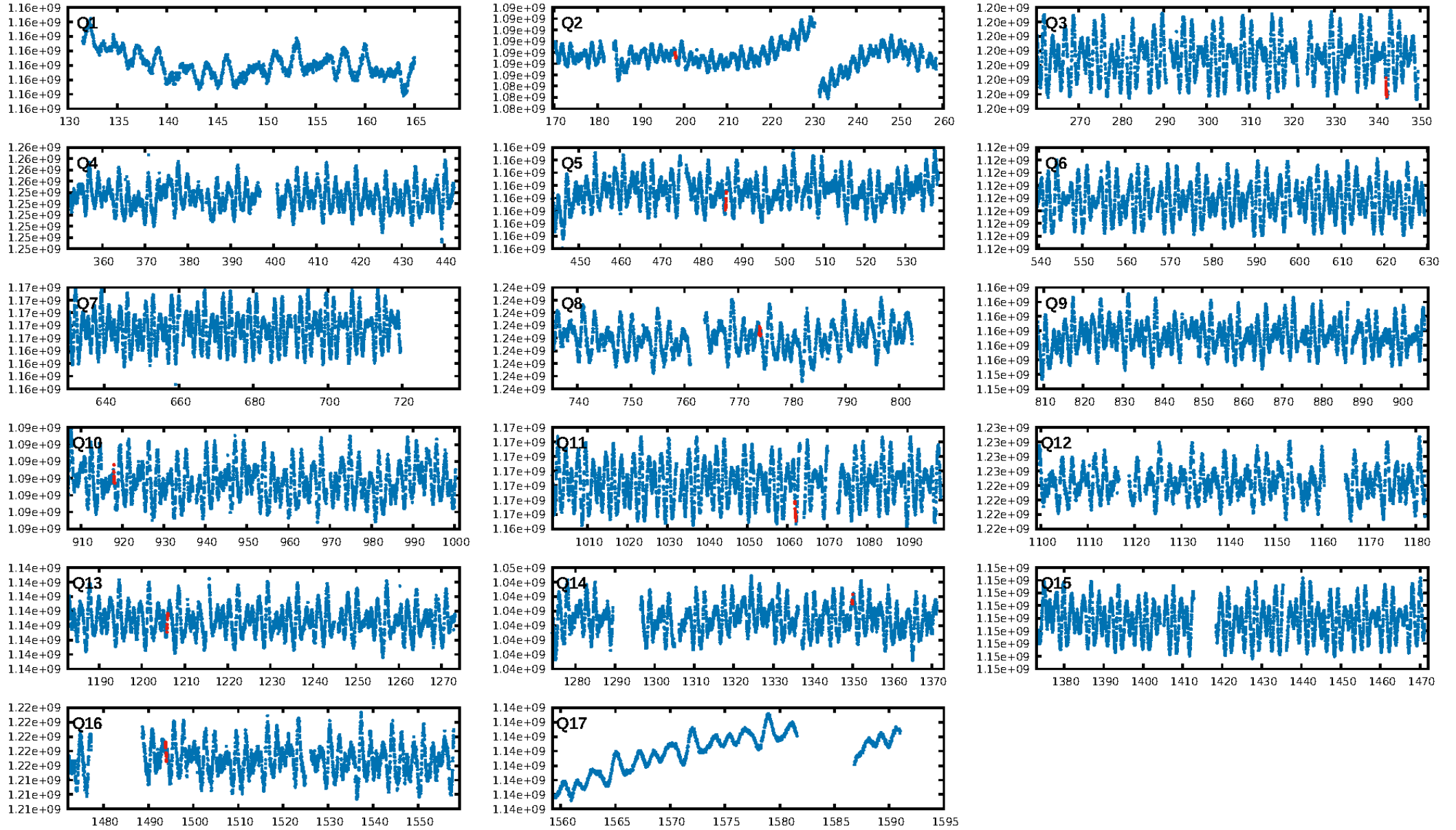
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [62.43σ]  
LongPeriod-sig: 100.0% [275.90σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 7.44e-09  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: N/A  
Centroid-sig: 41.6%  
Centroid-so: 18.062 arcsec [0.82σ]  
OotOffset-rm: 3.635 arcsec [2.36σ]  
KicOffset-rm: 4.039 arcsec [2.25σ]  
OotOffset-st: 0/2/1/0 [3]  
KicOffset-st: 0/2/1/0 [3]  
DiffImageQuality-fgm: 0.33 [1/3]  
DiffImageOverlap-fno: 0.50 [4/8]

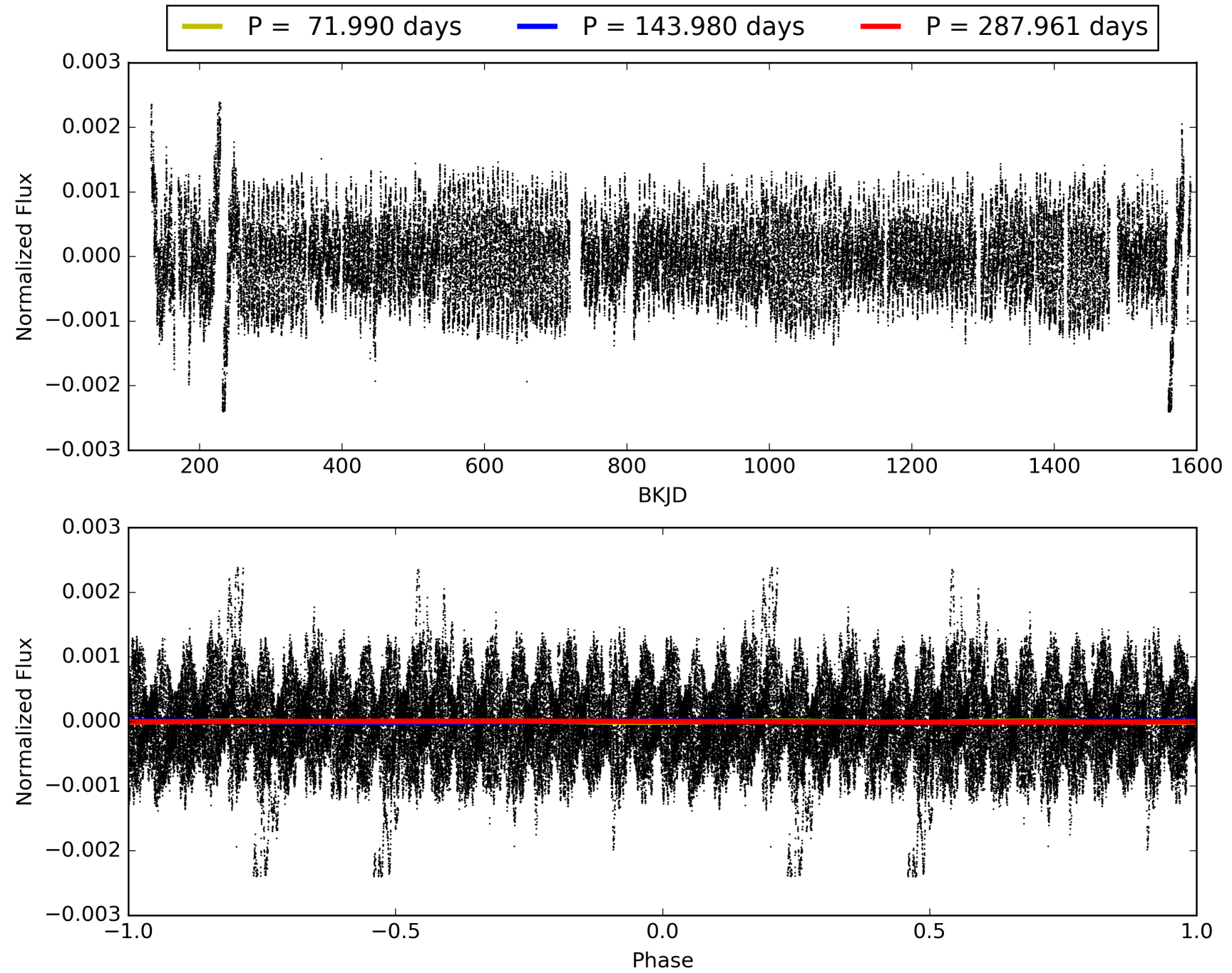
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 02-Feb-2016 15:03:45 Z

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

# TCE 008073771-08, PDC Light Curves

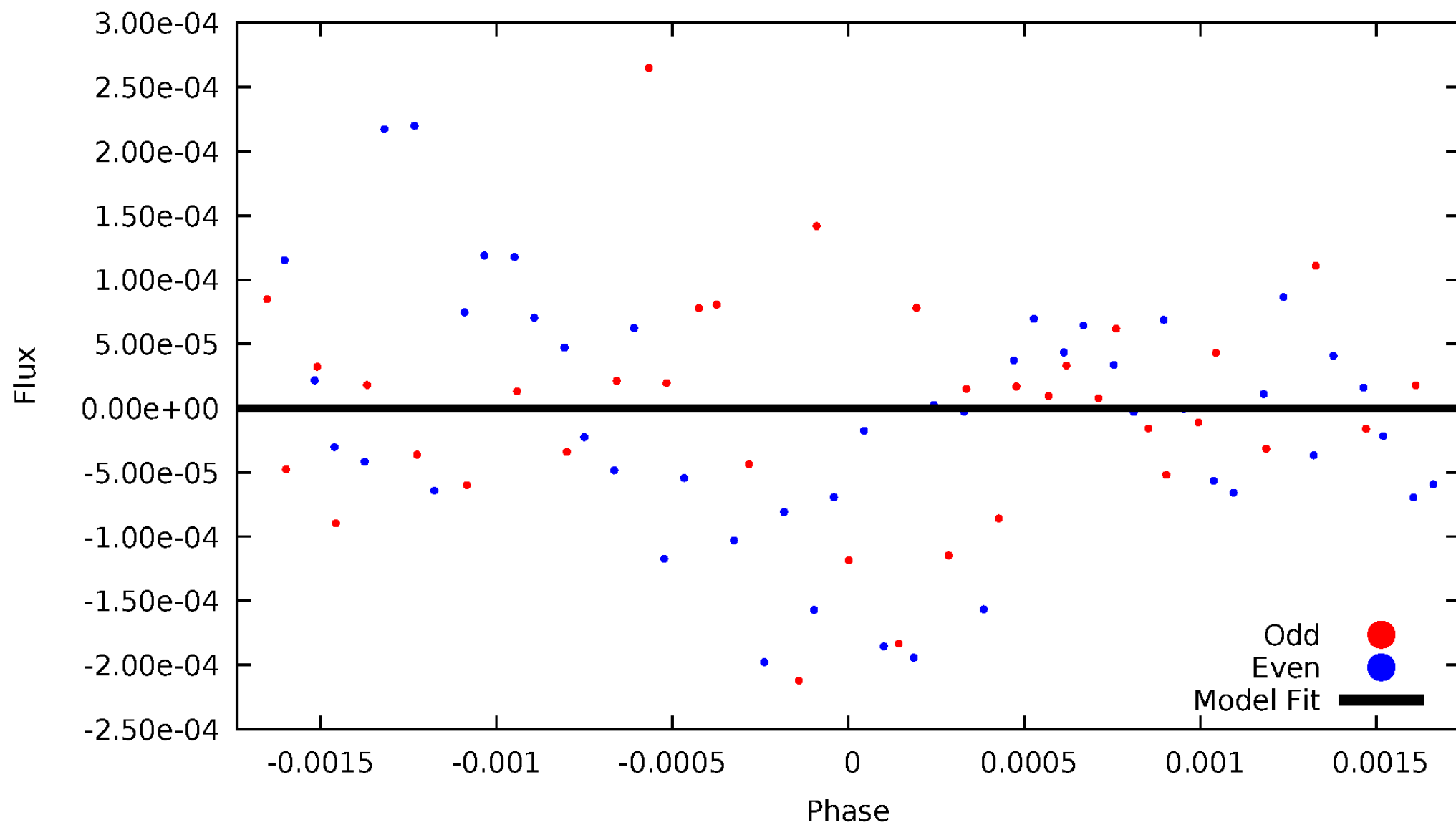


TCE 008073771-08



# DV Odd/Even

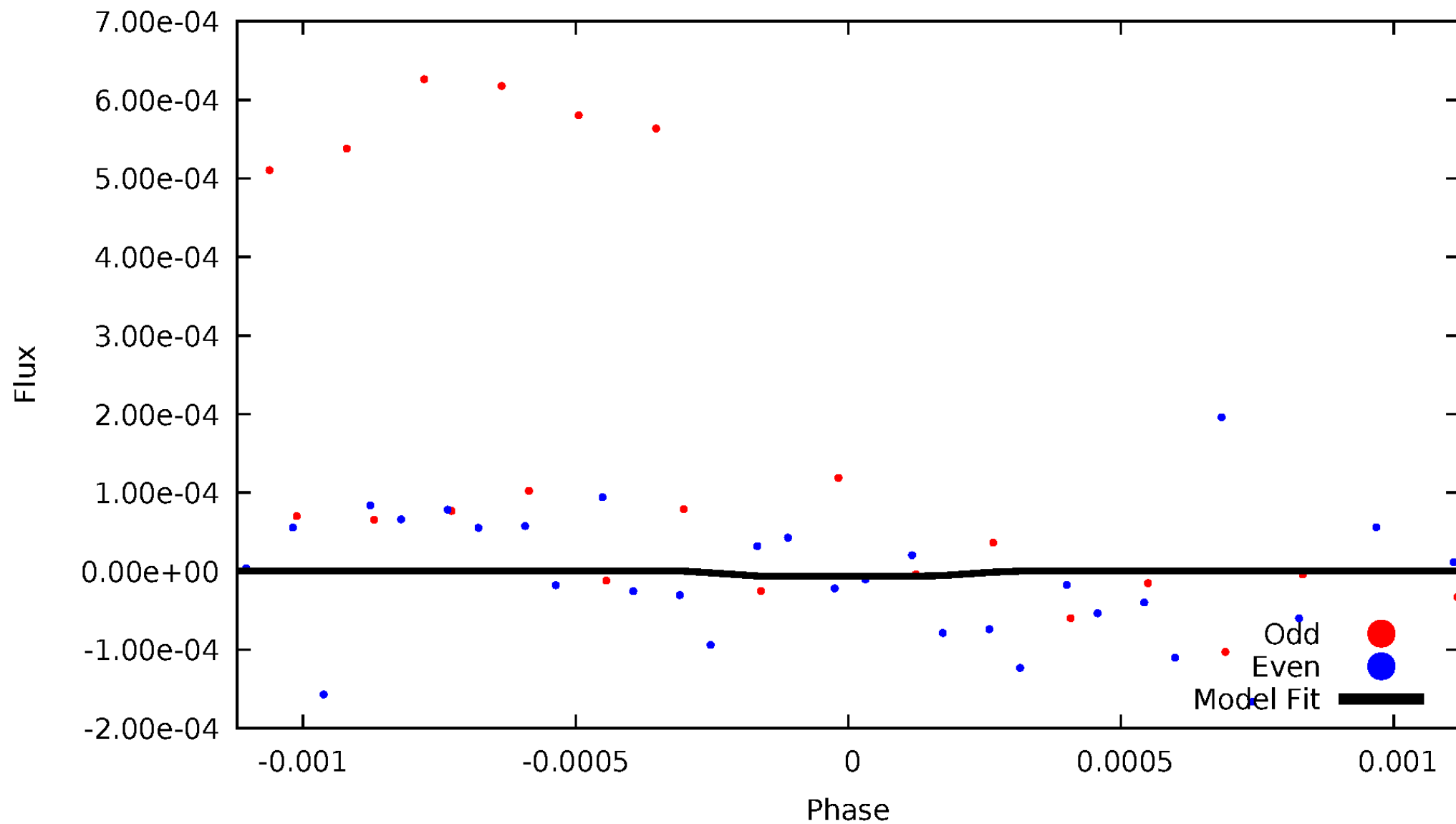
TCE 008073771-08





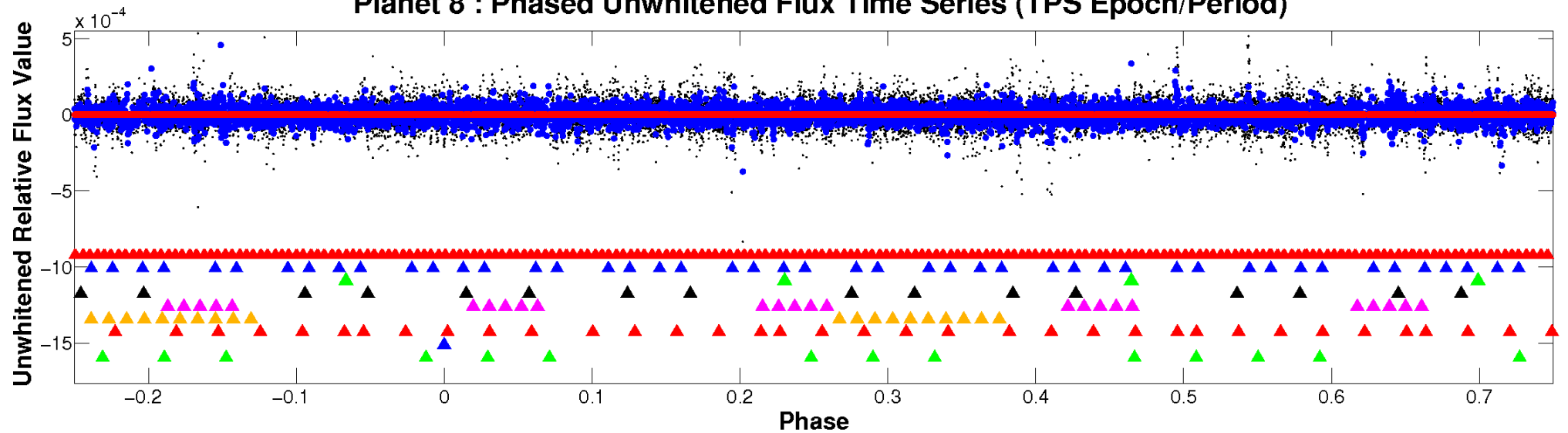
# ALT Odd/Even

TCE 008073771-08

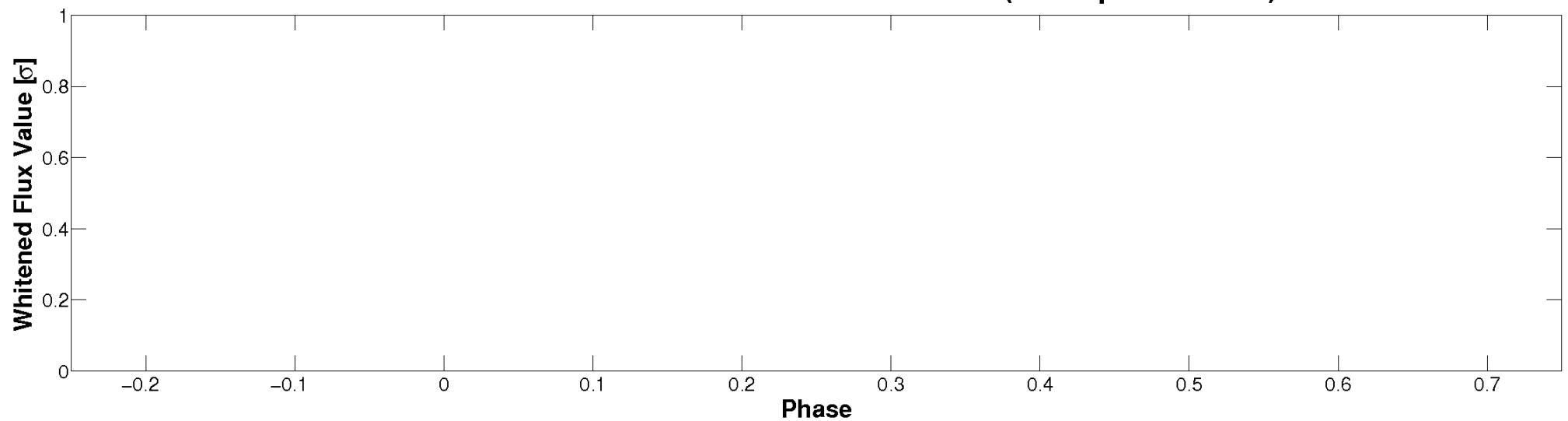


# Non-Whitened Vs. Whitened Light Curve

**Planet 8 : Phased Unwhitened Flux Time Series (TPS Epoch/Period)**

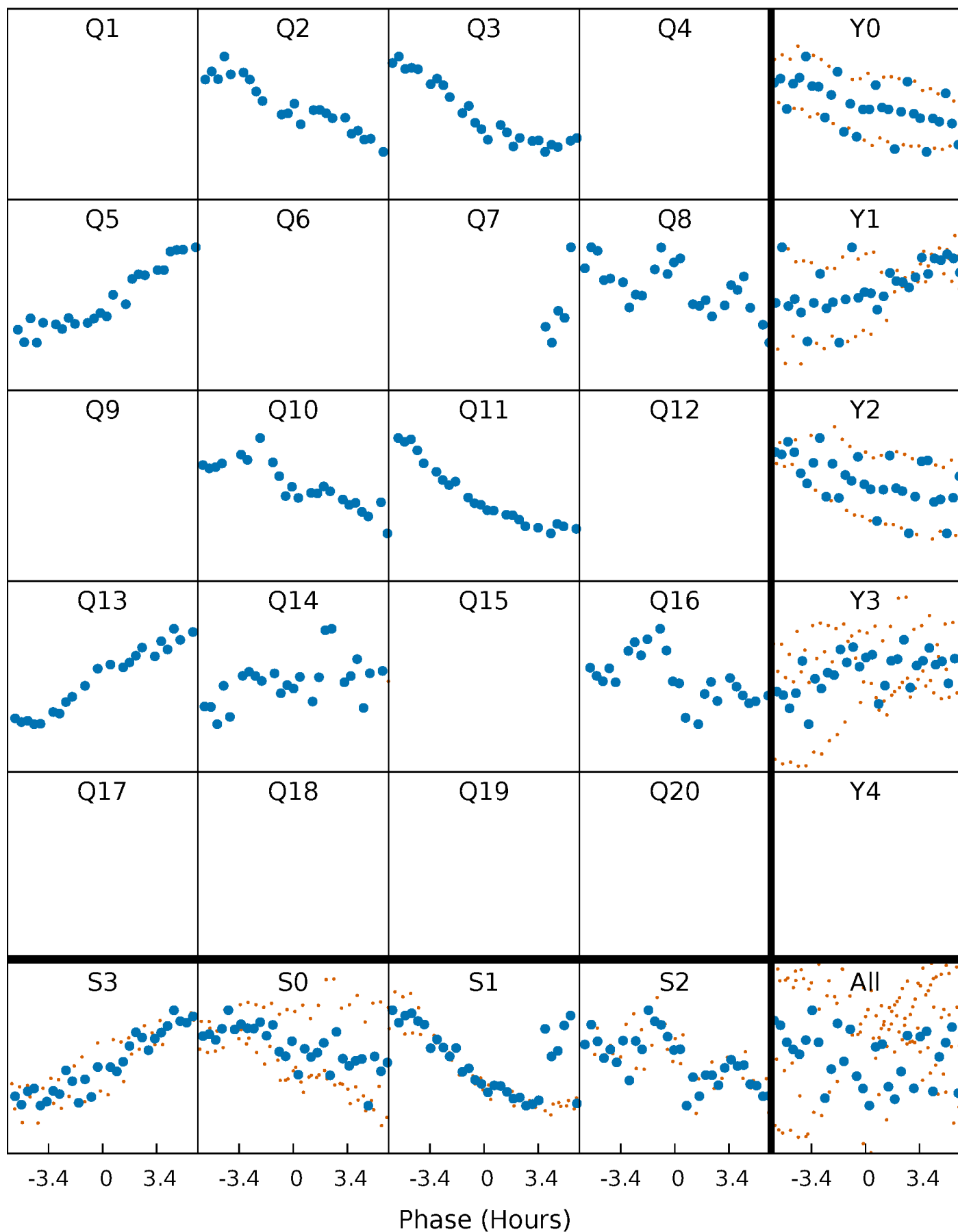


**Planet 8 : Phased Whitened Flux Time Series (TPS Epoch/Period)**



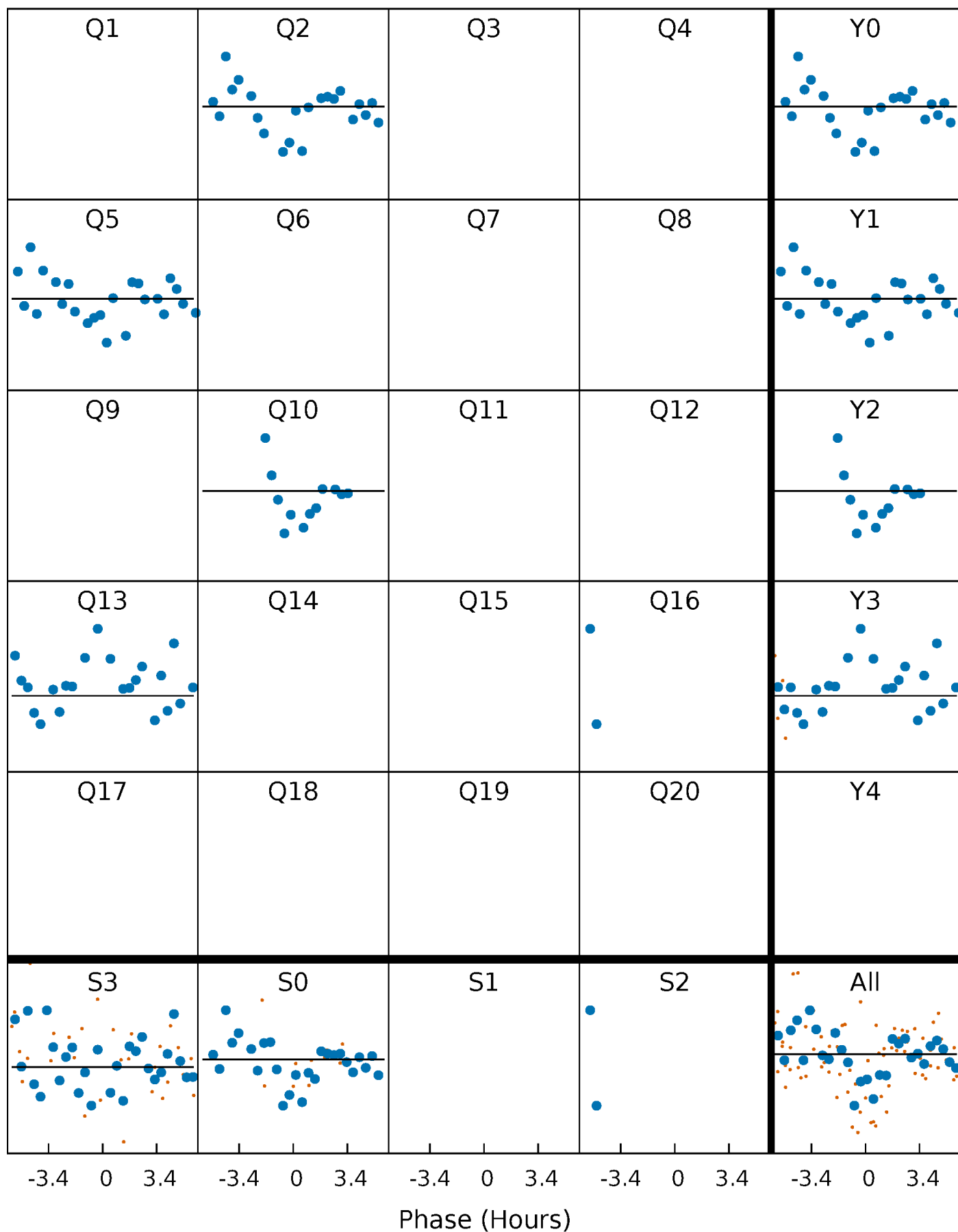
# PDC Quarter-Phased Transit Curves

TCE 008073771-08 P=143.980457 Days  $T_0=198.100793$  (BKJD)



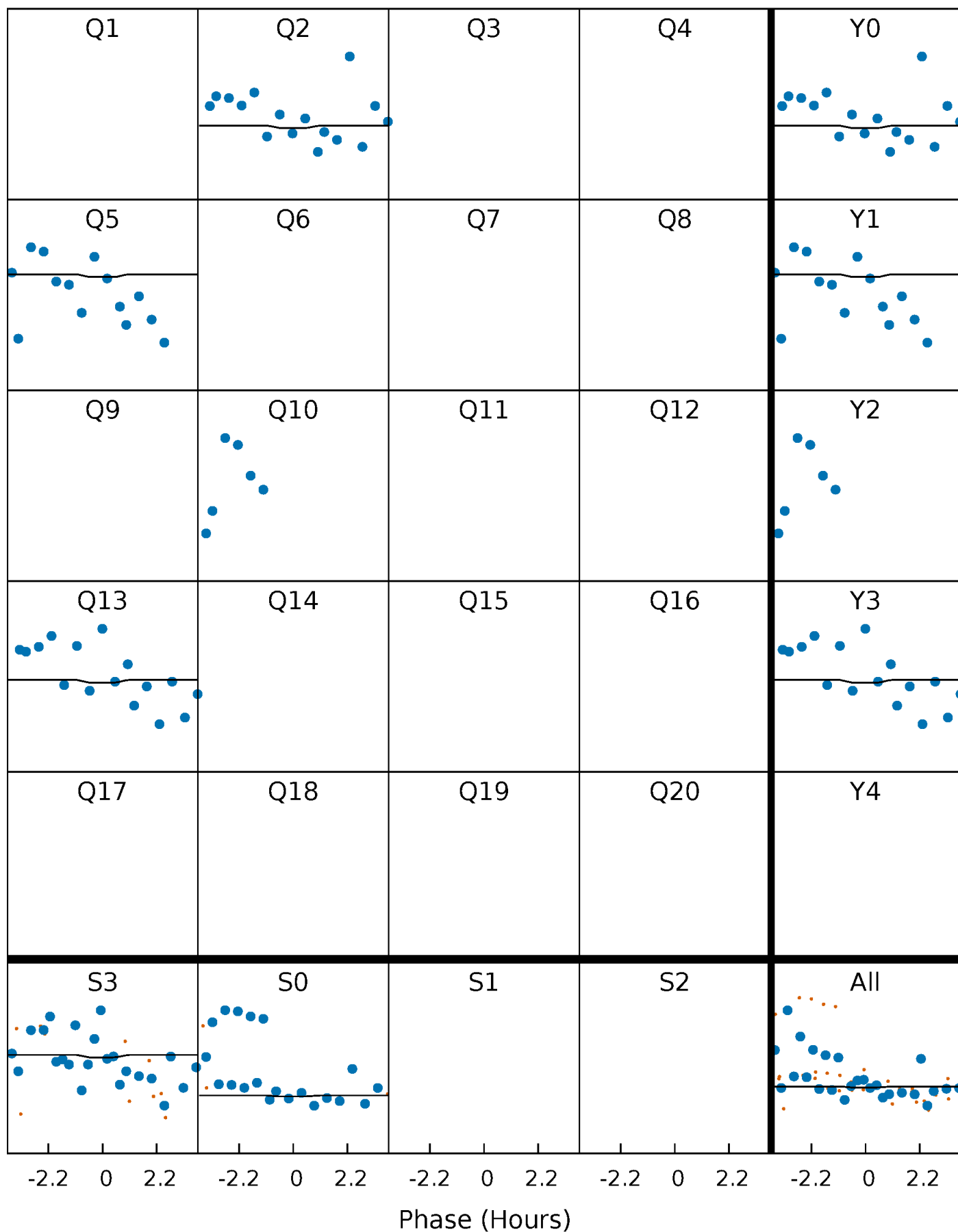
# DV Quarter-Phased Transit Curves

TCE 008073771-08 P=143.980457 Days  $T_0=198.100793$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

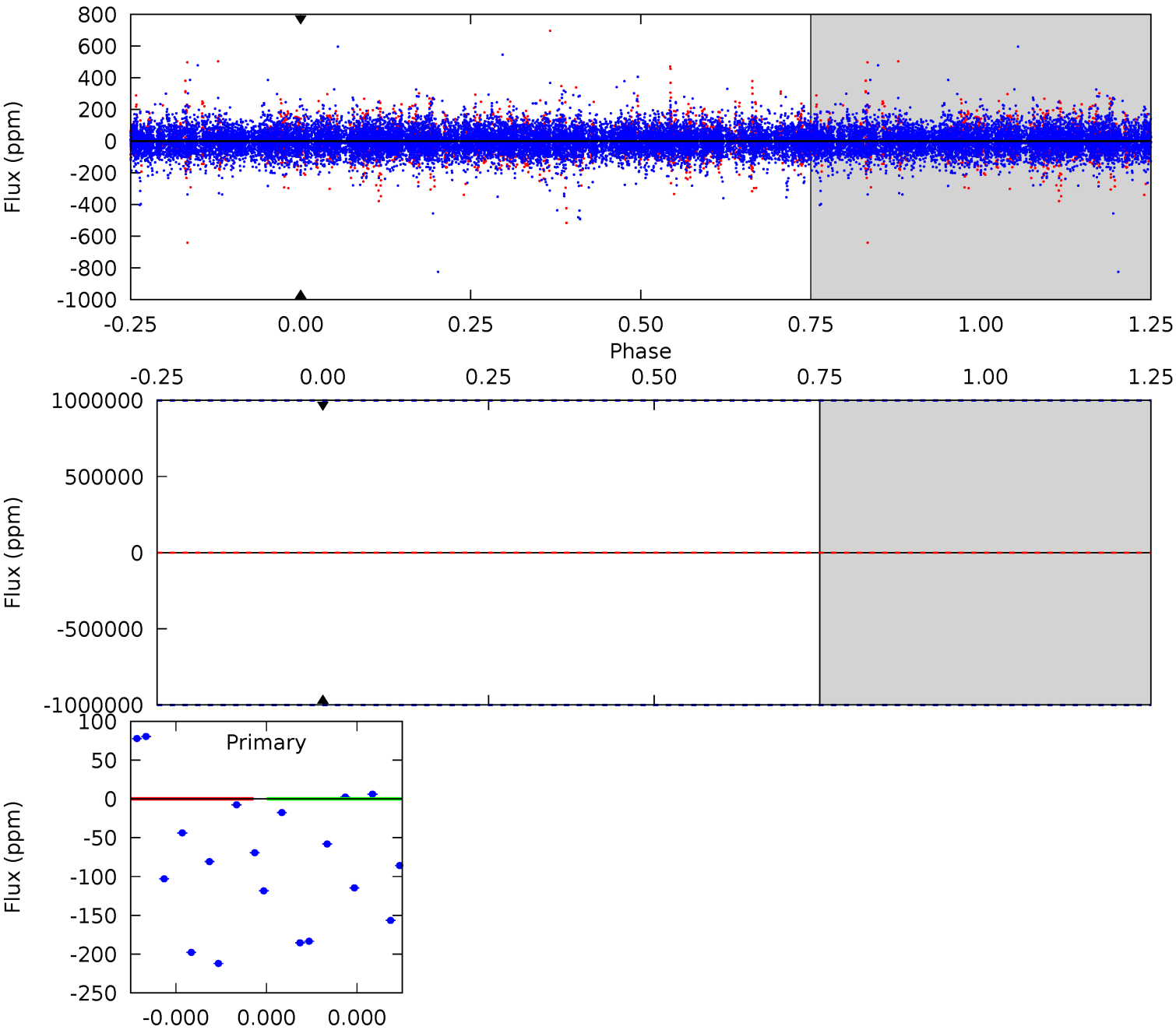
TCE 008073771-08 P=143.980457 Days  $T_0=198.294736$  (BKJD)



# DV Model-Shift Uniqueness Test

008073771-08, P = 143.980457 Days, E = 54.120336 Days

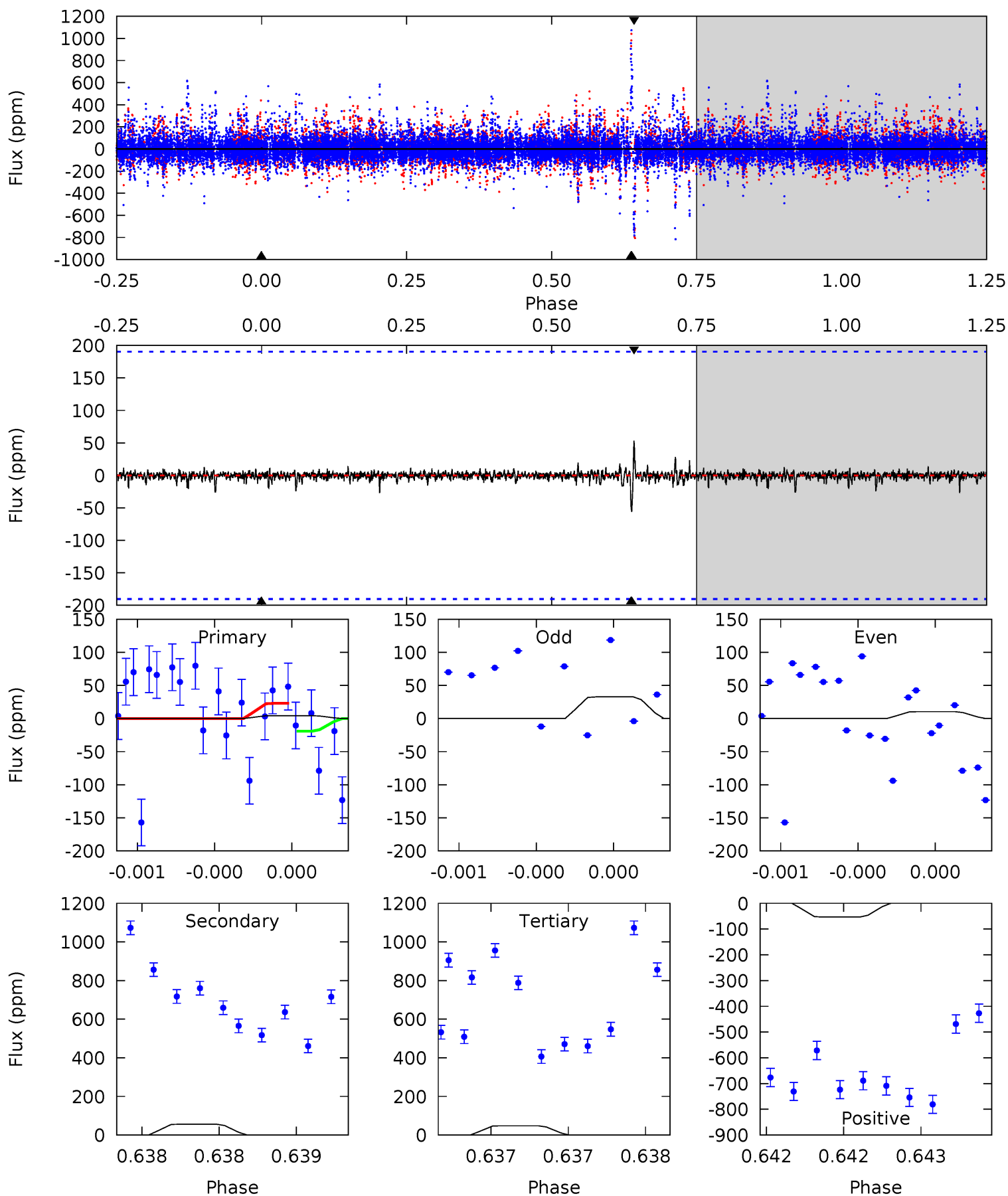
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
0	0	0	0	1.00	1.00	1.00	0	0	0	0	0	0	0	0



# Alt Model-Shift Uniqueness Test

008073771-08, P = 143.980457 Days, E = 54.314279 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
0.13	1.65	1.41	1.56	5.58	3.49	0.13	-1.28	-1.43	0.24	0.09	0.29	1.46	0.49	0.05





### Stellar Parameters For KIC 008073771

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$9185^{+257}_{-417}$	$4.118^{+0.099}_{-0.231}$	$0.070^{+0.150}_{-0.650}$	$2.136^{+0.890}_{-0.445}$	$2.180^{+0.427}_{-0.522}$	$0.315^{+0.177}_{-0.176}$
	+3%/-5%	+2%/-6%	+214%/-929%	+42%/-21%	+20%/-24%	+56%/-56%
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 008073771-08 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$0 \pm 1000000$	$16.68^{+17.89}_{-11.29}$	$1001^{+94}_{-69}$	$-8015^{+74573}_{-55985}$	$-2987.995^{+150015.813}_{-139868.190}$
Alt.	$-56 \pm 34$	$16.45^{+18.70}_{-11.80}$	$1000^{+90}_{-64}$	$3297^{+2010}_{-762}$	$45^{+570}_{-38}$

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

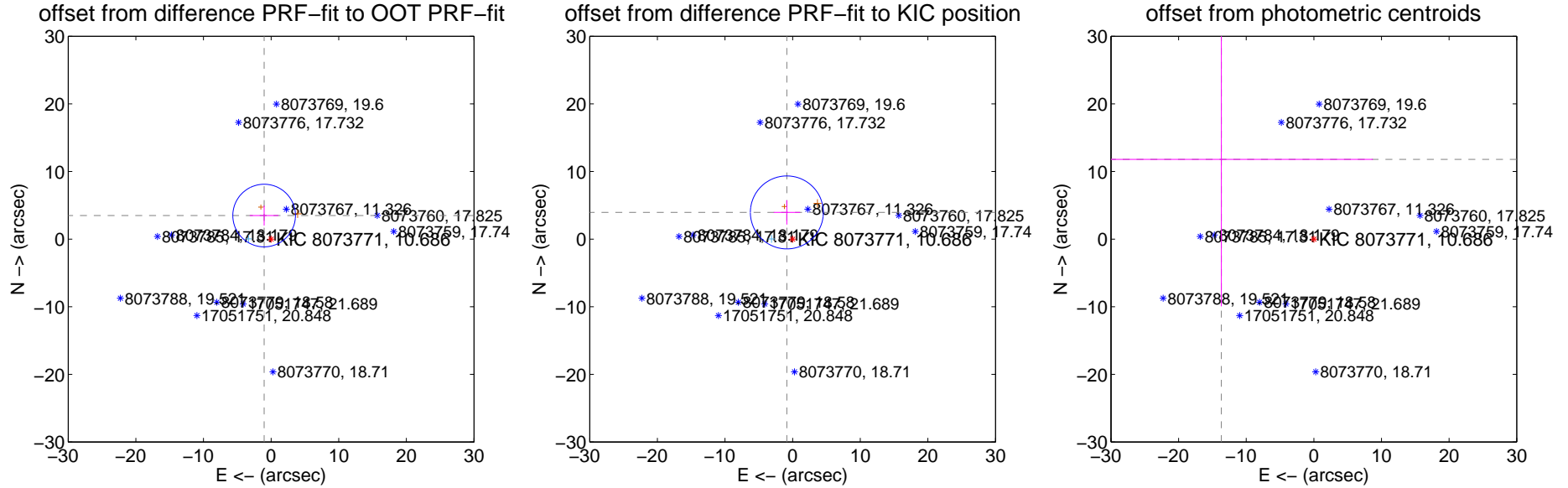
## DV Centroid Data

Supplemental centroid analysis for 008073771-08. **Kepler magnitude: 10.69.** Transit SNR -1.00

**There are 1 quarters with good PRF difference image offsets**

The direct PRF centroid is offset from the target star catalog position by about 0.31 arcsec

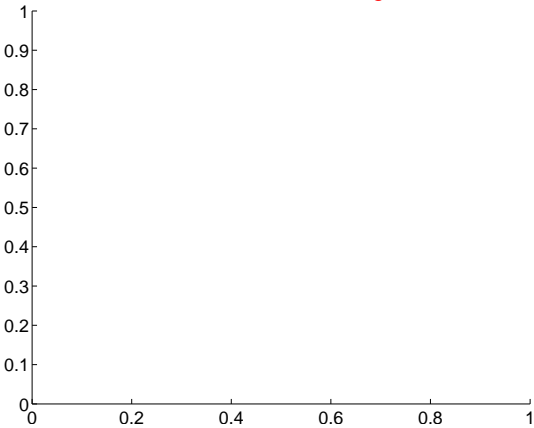
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$3.635 \pm 1.543$	2.36	$1.031 \pm 2.122$	$3.486 \pm 1.482$
PRF-fit source offset from KIC position	$4.039 \pm 1.798$	2.25	$0.853 \pm 1.952$	$3.948 \pm 1.791$
photometric centroid source offset	$18.06 \pm 22.13$	0.82	$13.68 \pm 22.42$	$11.79 \pm 21.73$



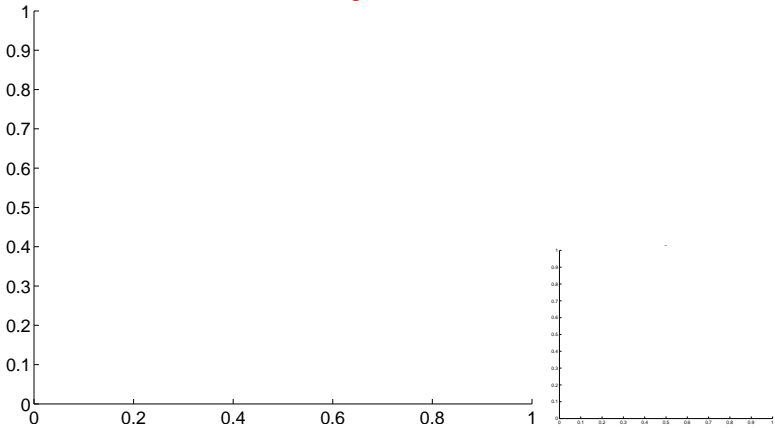
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

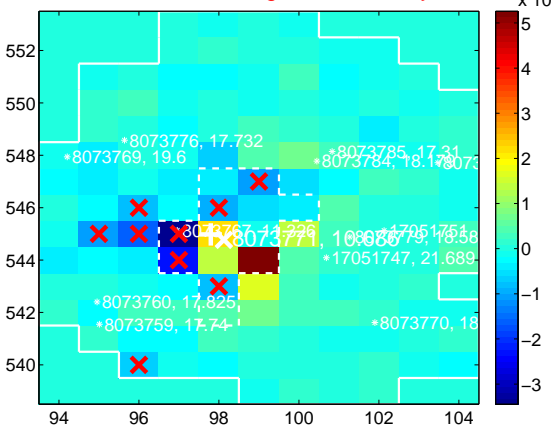
Q1 no difference image



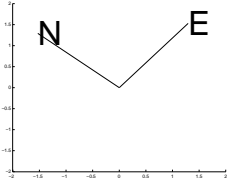
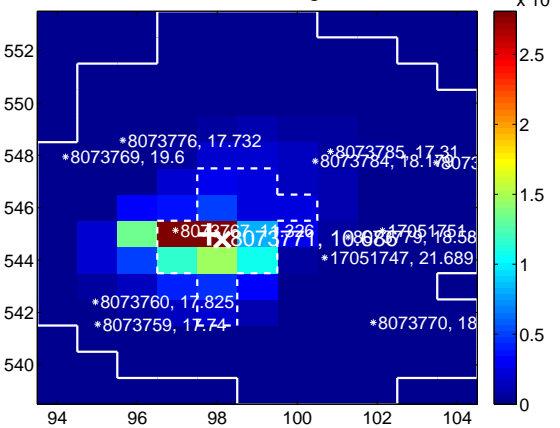
Q1 no OOT image



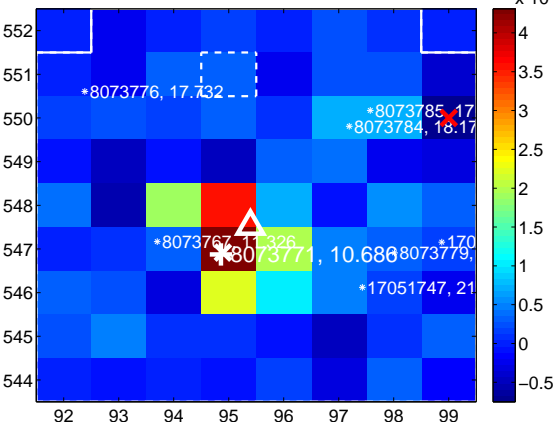
Q2 difference image. Poor Quality



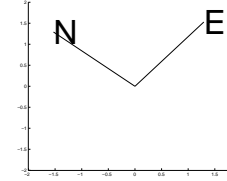
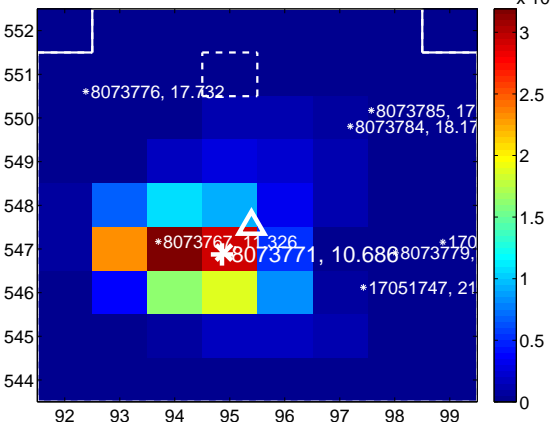
Q2 OOT image



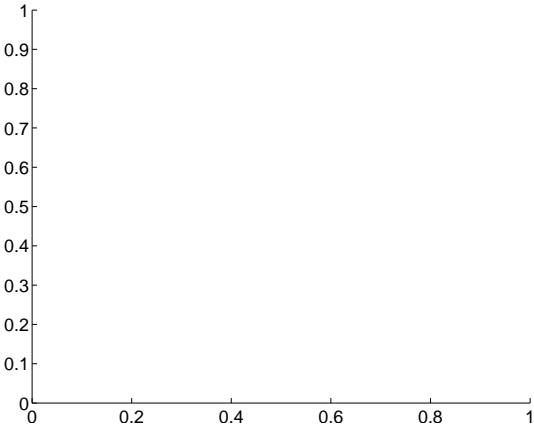
Q3 difference image



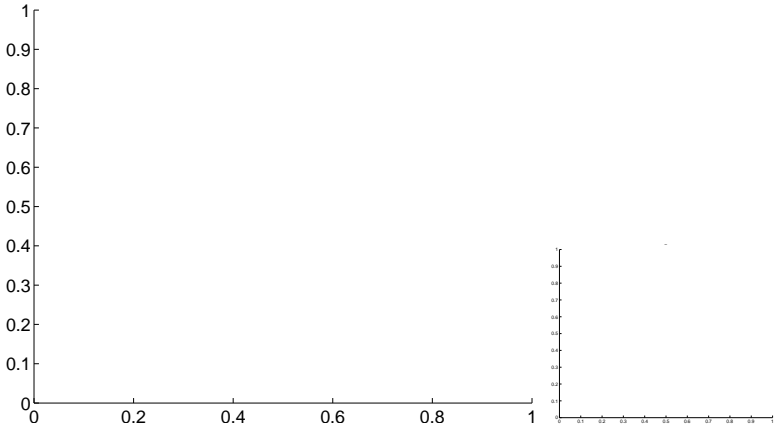
Q3 OOT image



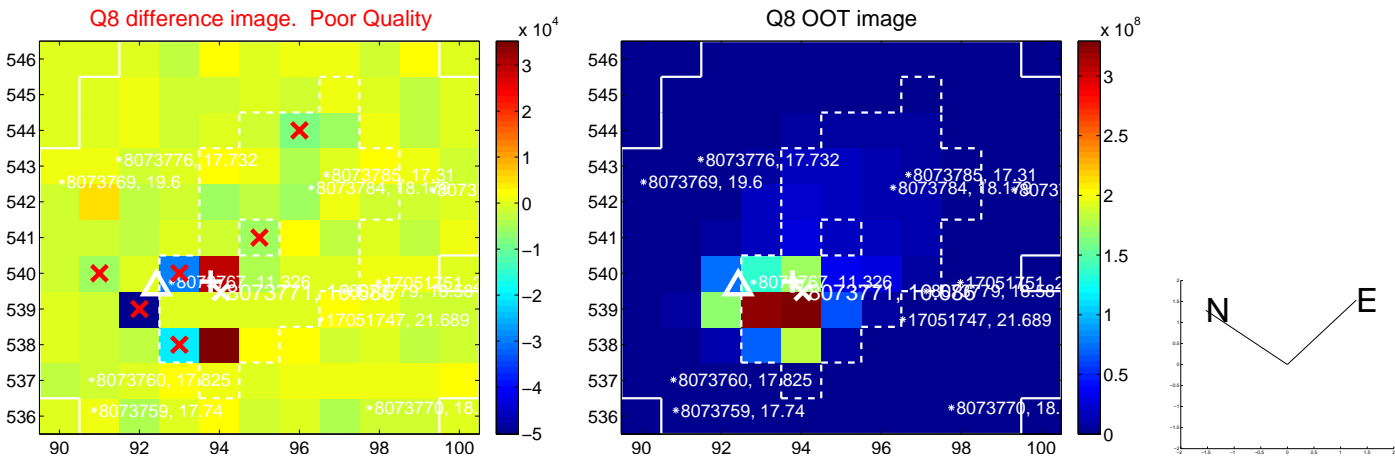
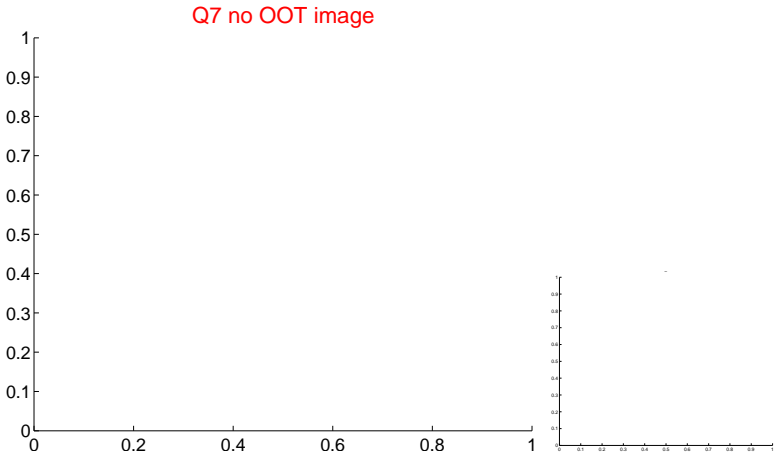
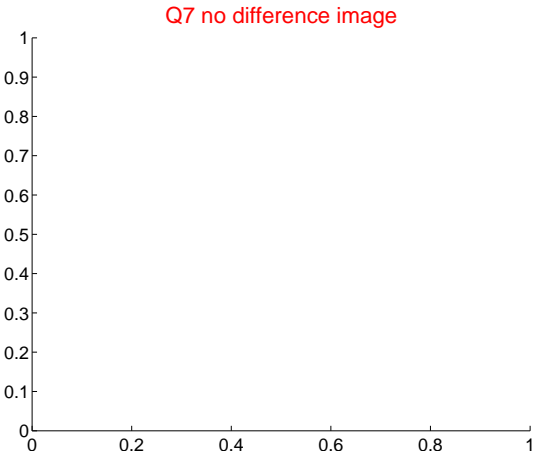
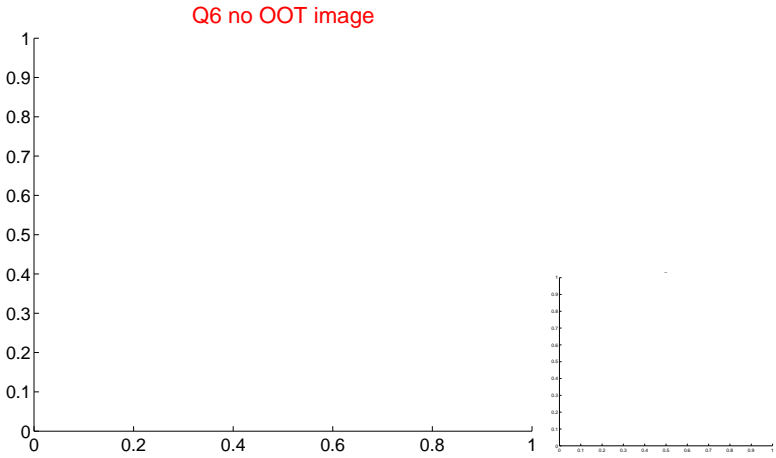
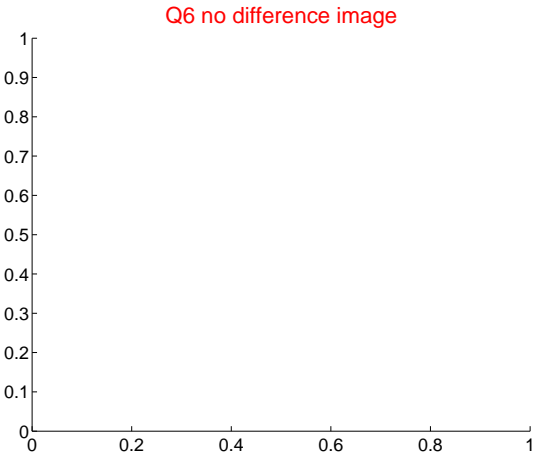
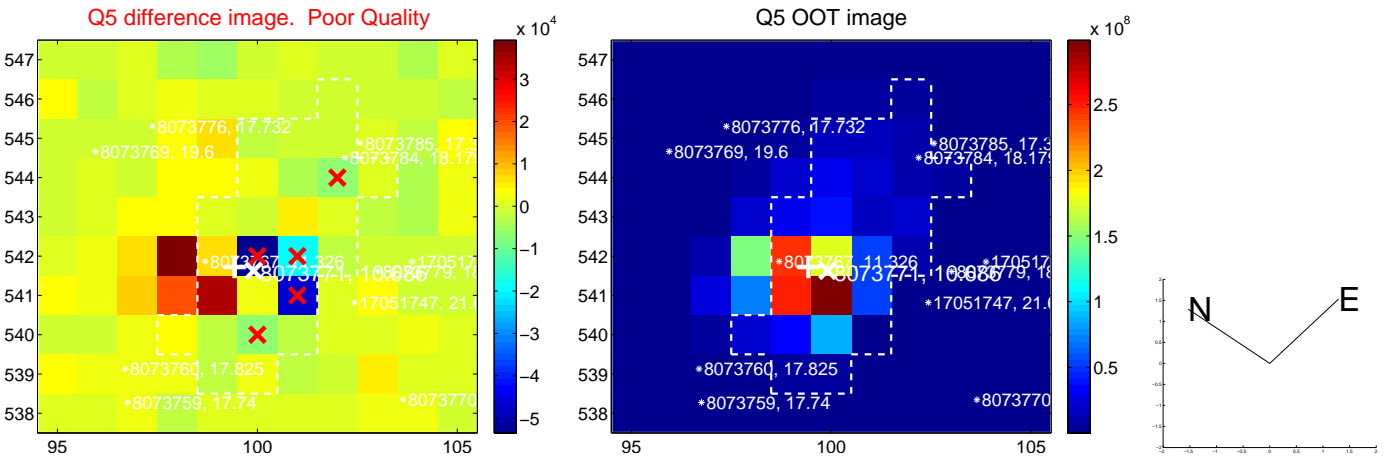
Q4 no difference image



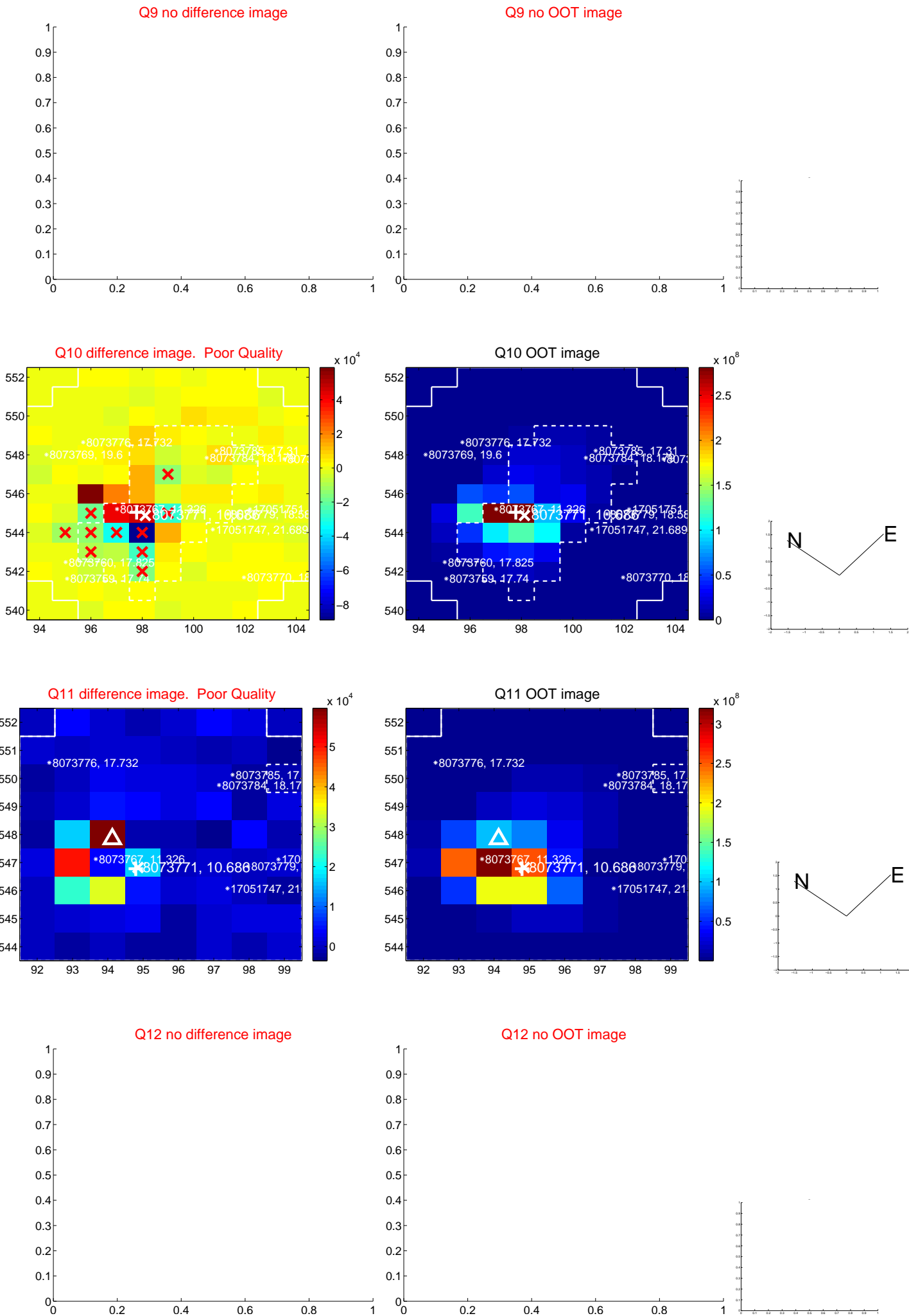
Q4 no OOT image



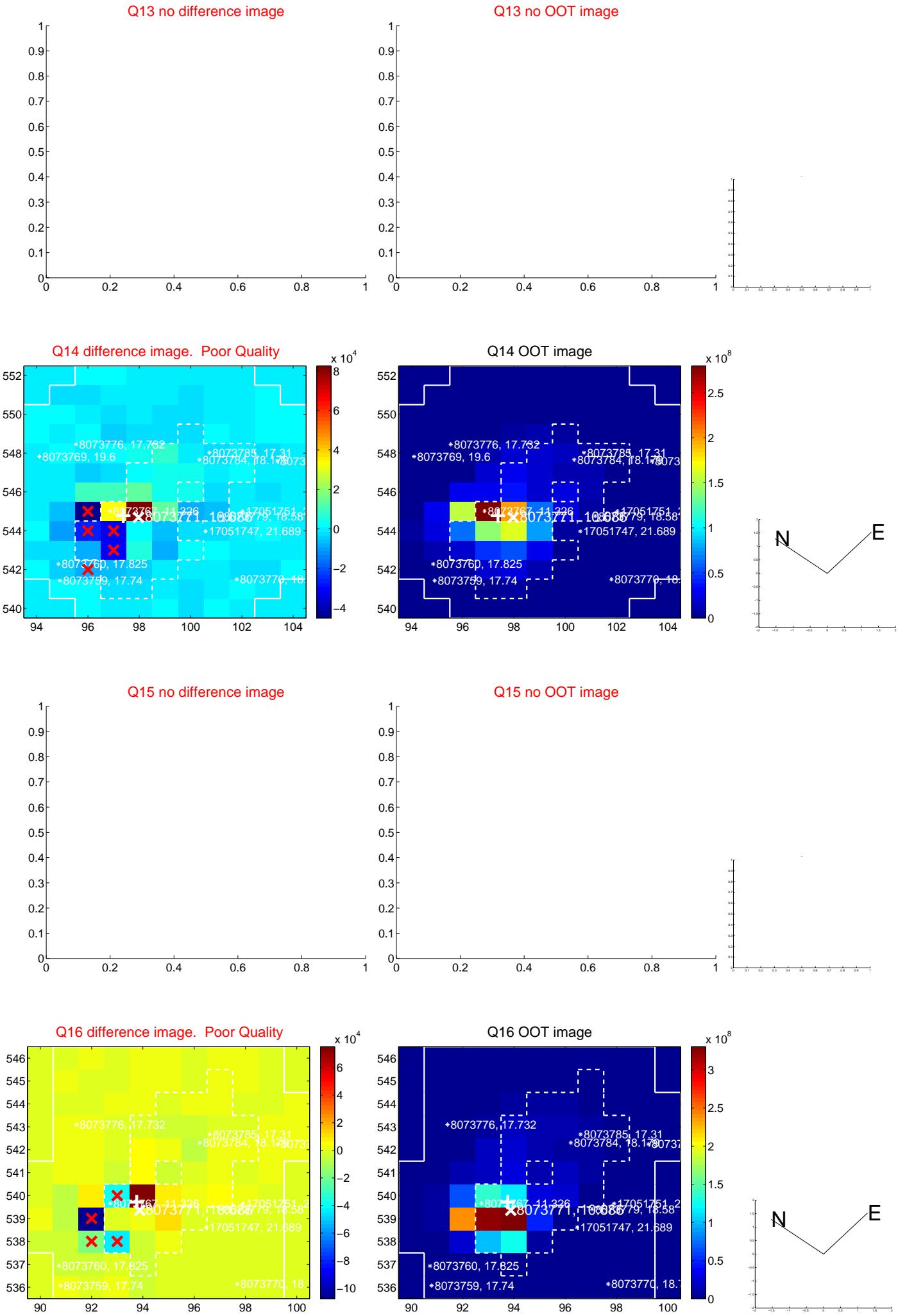
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



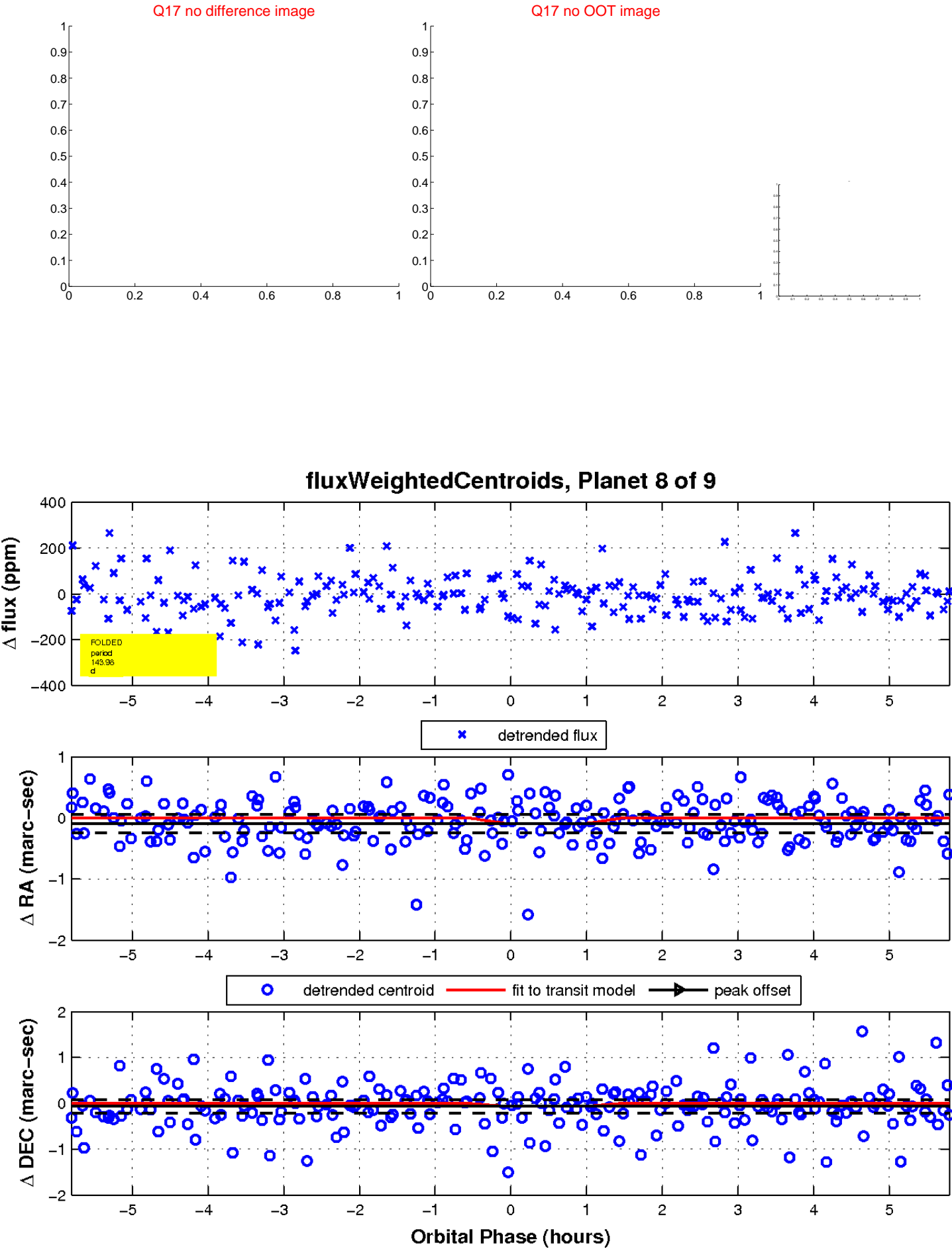
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

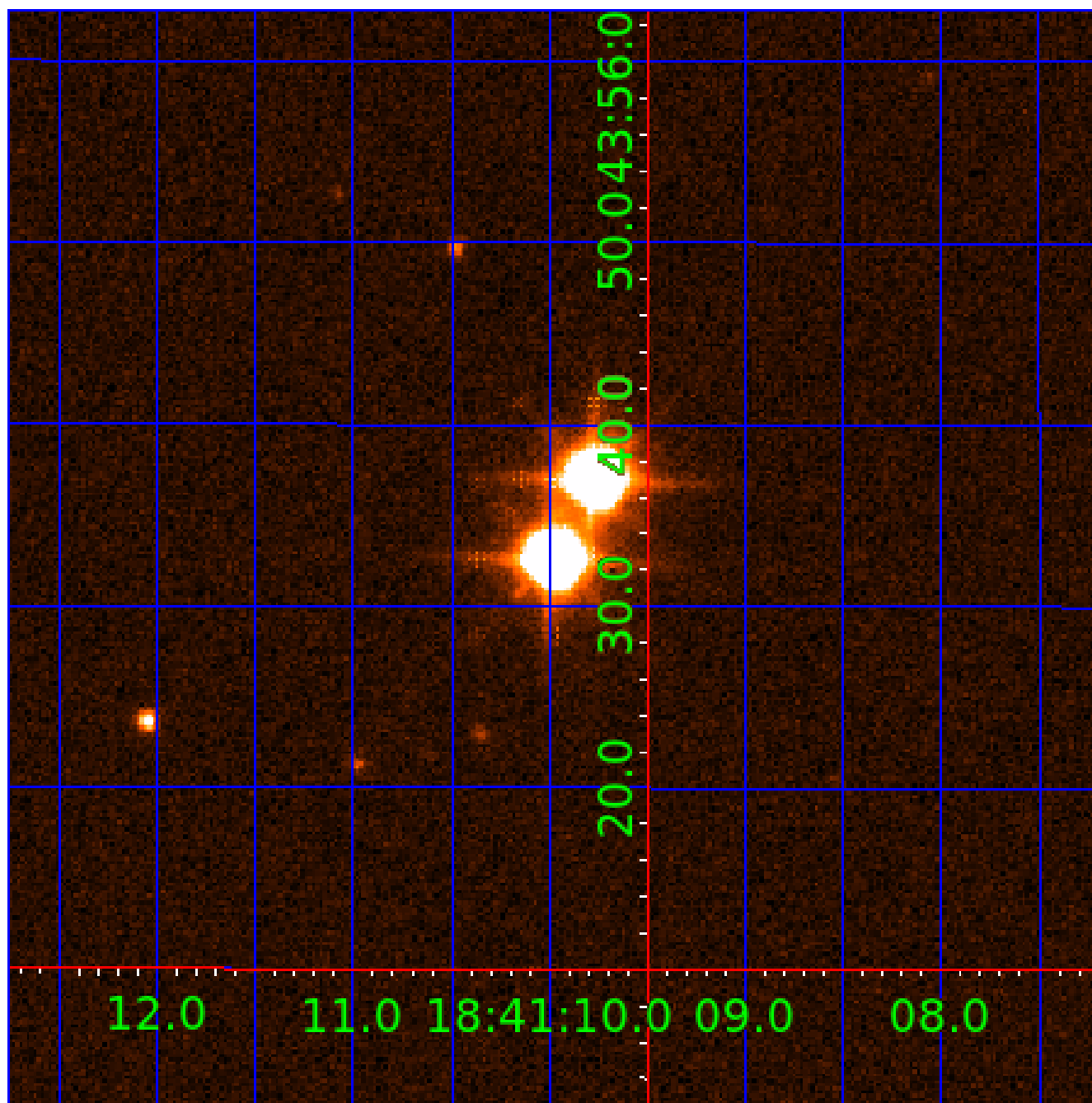


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



# UKIRT Image

Declination





# KIC 008073771

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
008073771-01	OBS	No	3.461710	134.422413	5.2	18.139	7.9	2.4	2.14	9185	0.56	8614.39
008073771-02	OBS	No	31.209849	153.746649	179.4	22.300	13.8	10.3	2.14	9185	4.83	459.08
008073771-03	OBS	No	398.184598	188.535331	291.9	21.908	9.7	10.3	2.14	9185	5.43	15.40
008073771-04	OBS	No	90.753169	215.949998	156.2	8.002	9.1	9.3	2.14	9185	3.30	110.61
008073771-05	OBS	No	57.905298	171.196957	88.4	16.784	8.8	7.8	2.14	9185	2.12	201.37
008073771-07	OBS	No	40.552881	147.833476	109.0	2.637	8.0	6.9	2.14	9185	2.65	323.78
008073771-08	OBS	No	143.980457	198.100793	110.6	3.000	8.3	-1.0	2.14	9185	2.30	59.78
008073771-09	OBS	No	106.481950	176.873243	121.2	14.100	7.8	7.8	2.14	9185	2.52	89.38

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008073771-01	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—CENT_SATURATED
008073771-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_DV—CENT_SATURATED
008073771-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—CENT_SATURATED
008073771-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—CENT_SATURATED
008073771-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_SATURATED
008073771-07	OBS	FP	0.00	1	0	0	0	TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_SATURATED
008073771-08	OBS	FP	0.00	1	0	0	0	TRANS_GAPPED—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_SATURATED
008073771-09	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_POS_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.

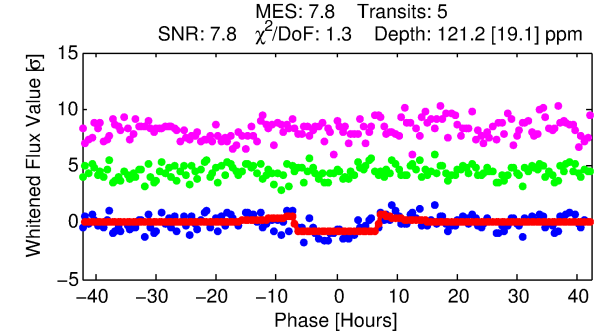
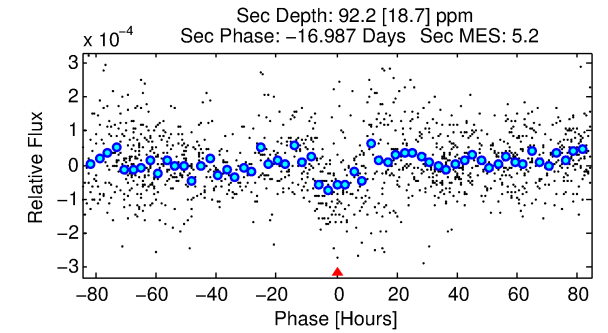
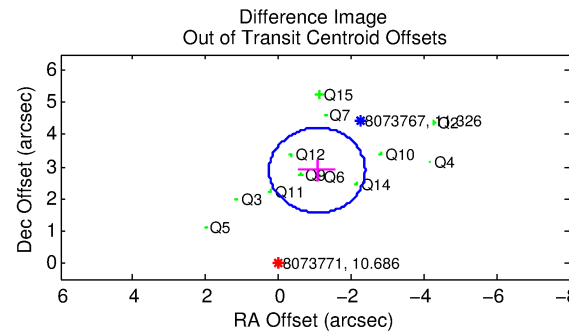
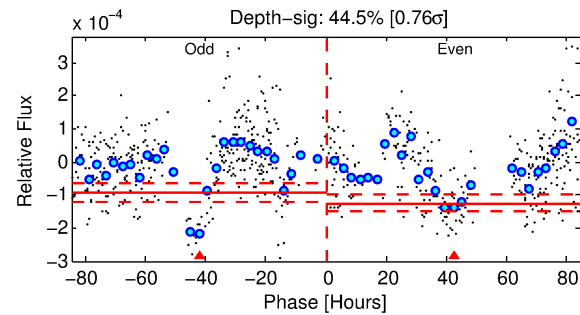
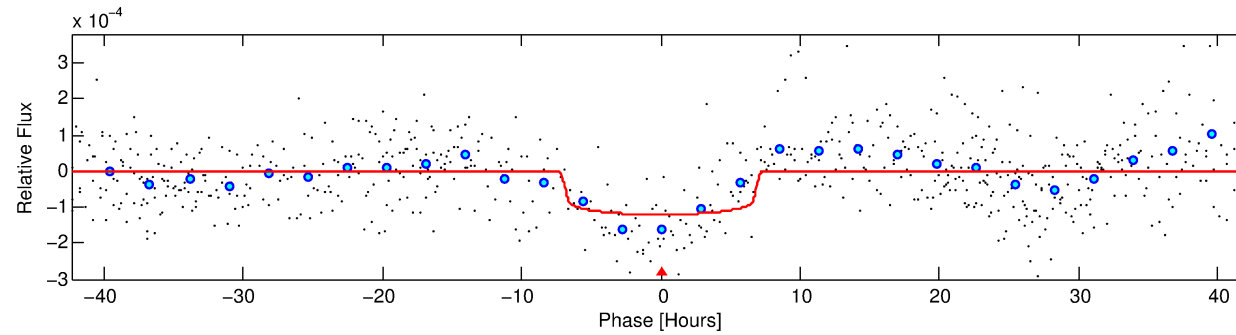
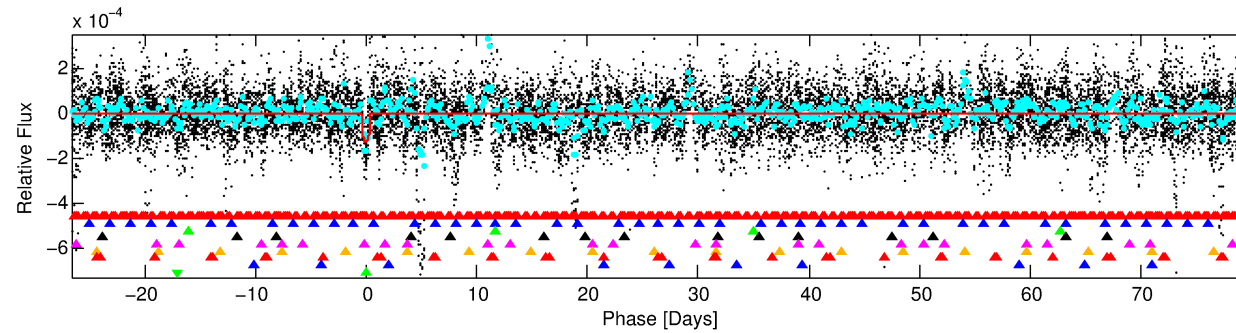
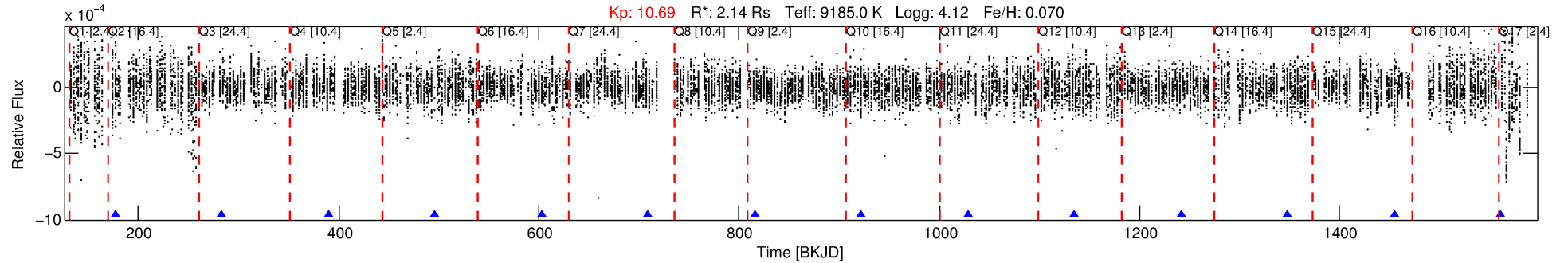
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 008073771-09

No Significant Match Found

# DV One-Page Summary

KIC: 8073771 Candidate: 9 of 9 Period: 106.482 d



## DV Fit Results:

Period = 106.48195 [0.00228] d  
Epoch = 176.8732 [0.0193] BKJD  
Rp/R\* = 0.0108 [0.0025]  
a/R\* = 42.17 [60.05]  
b = 0.70 [1.04]  
Seff = 89.38 [43.41]  
Teq = 784 [95] K  
Rp = 2.52 [1.20] Re  
a = 0.5705 [0.1880] AU  
Ag = 2592.67 [1749.04] [1.48 $\sigma$ ]  
Teffp = 8650 [1155] K [6.79 $\sigma$ ]

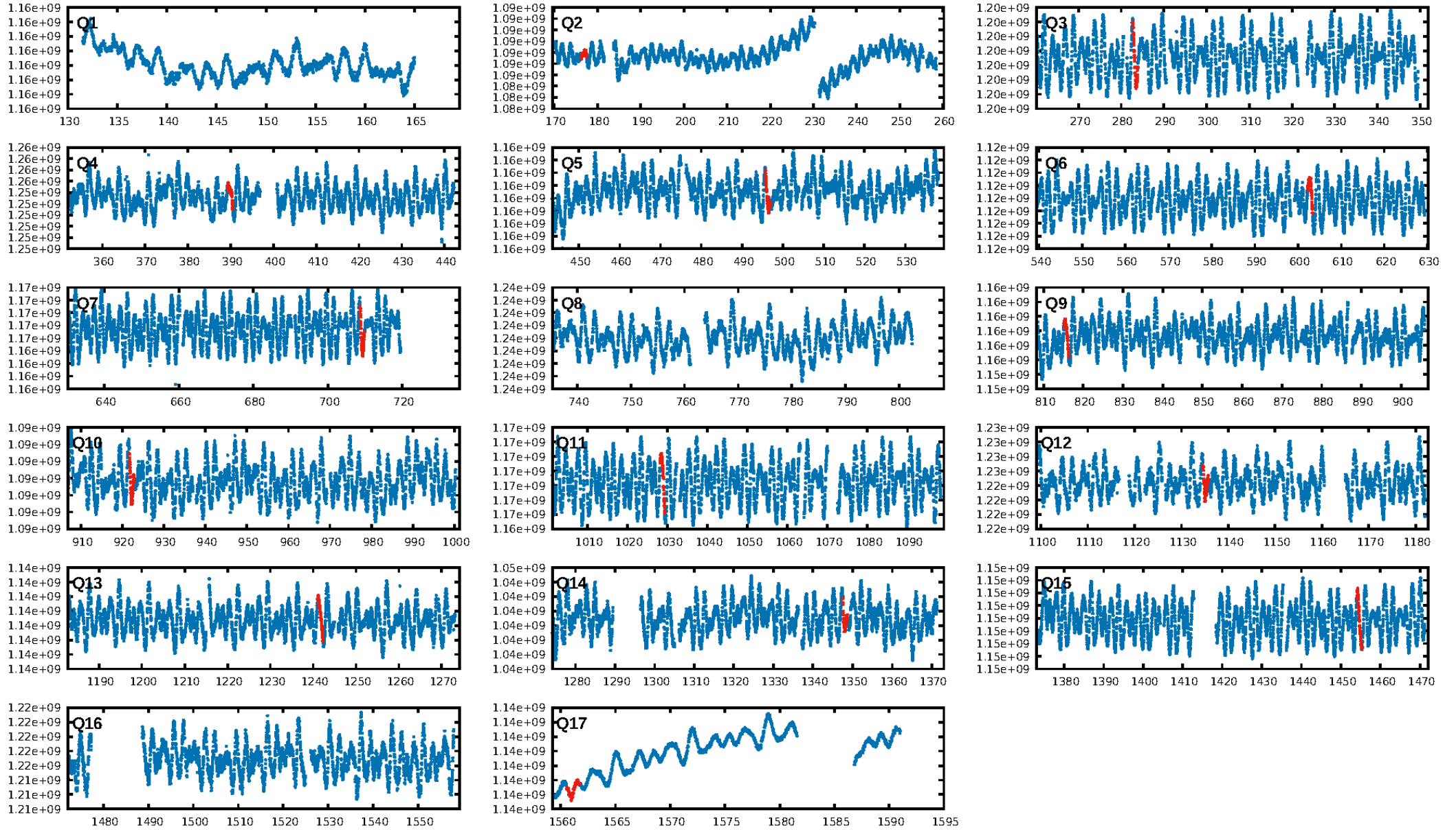
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [23.28 $\sigma$ ]  
LongPeriod-sig: 100.0% [62.43 $\sigma$ ]  
ModelChiSquare2-sig: 18.0%  
ModelChiSquareGof-sig: 100.0%  
**Bootstrap-pfa: 7.24e-07**  
RollingBand-fgt: 1.00 [5/5]  
GhostDiagnostic-chr: N/A  
Centroid-sig: 70.7%  
Centroid-so: 1.407 arcsec [1.54 $\sigma$ ]  
**OotOffset-rm: 3.075 arcsec [6.97 $\sigma$ ]**  
**KicOffset-rm: 5.055 arcsec [18.07 $\sigma$ ]**  
OotOffset-st: 4/4/2/2 [12]  
KicOffset-st: 4/4/2/2 [12]  
DiffImageQuality-fgm: 0.50 [6/12]  
DiffImageOverlap-fno: 0.08 [1/12]

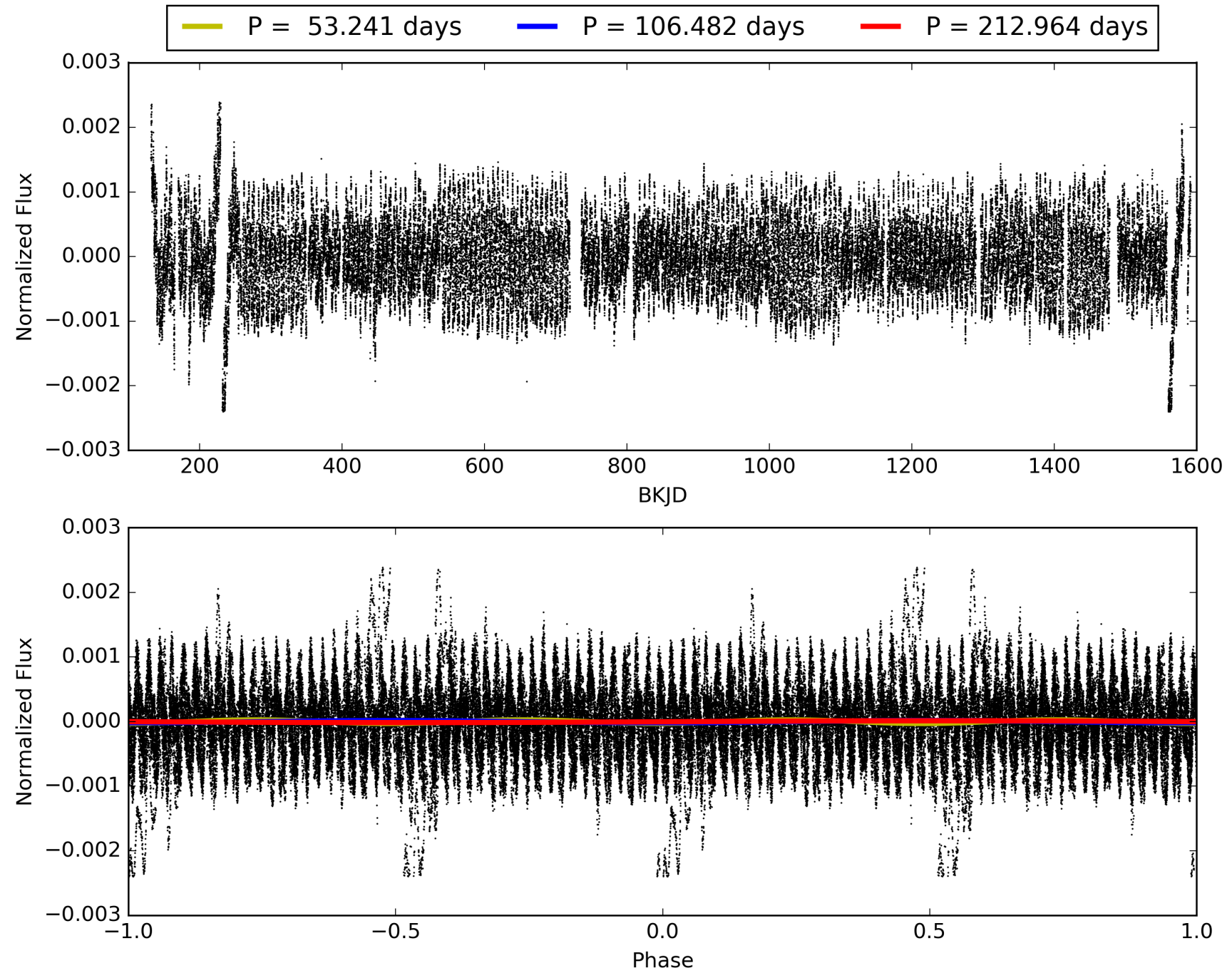
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 02-Feb-2016 15:03:50 Z

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

# TCE 008073771-09, PDC Light Curves

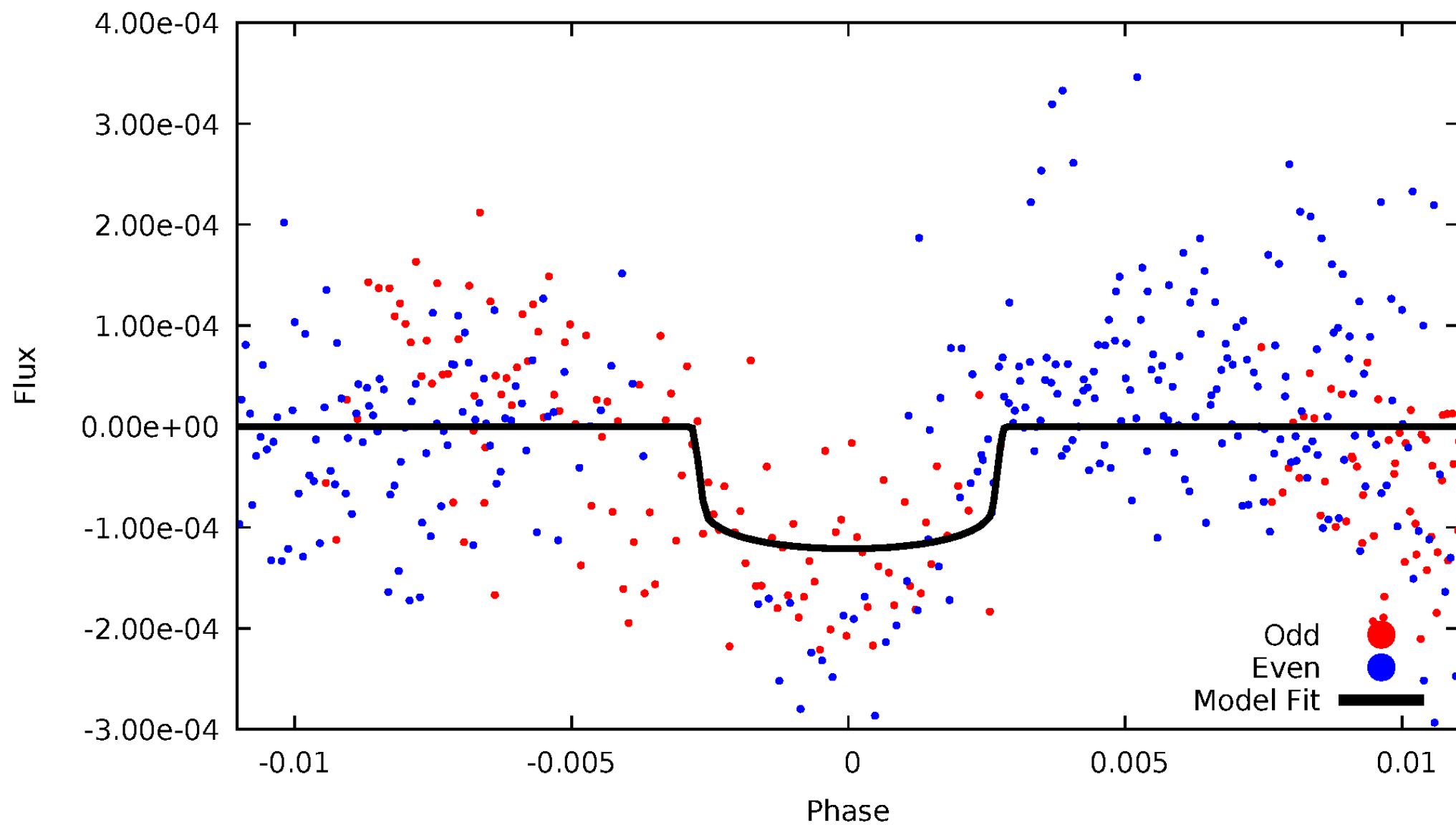


TCE 008073771-09



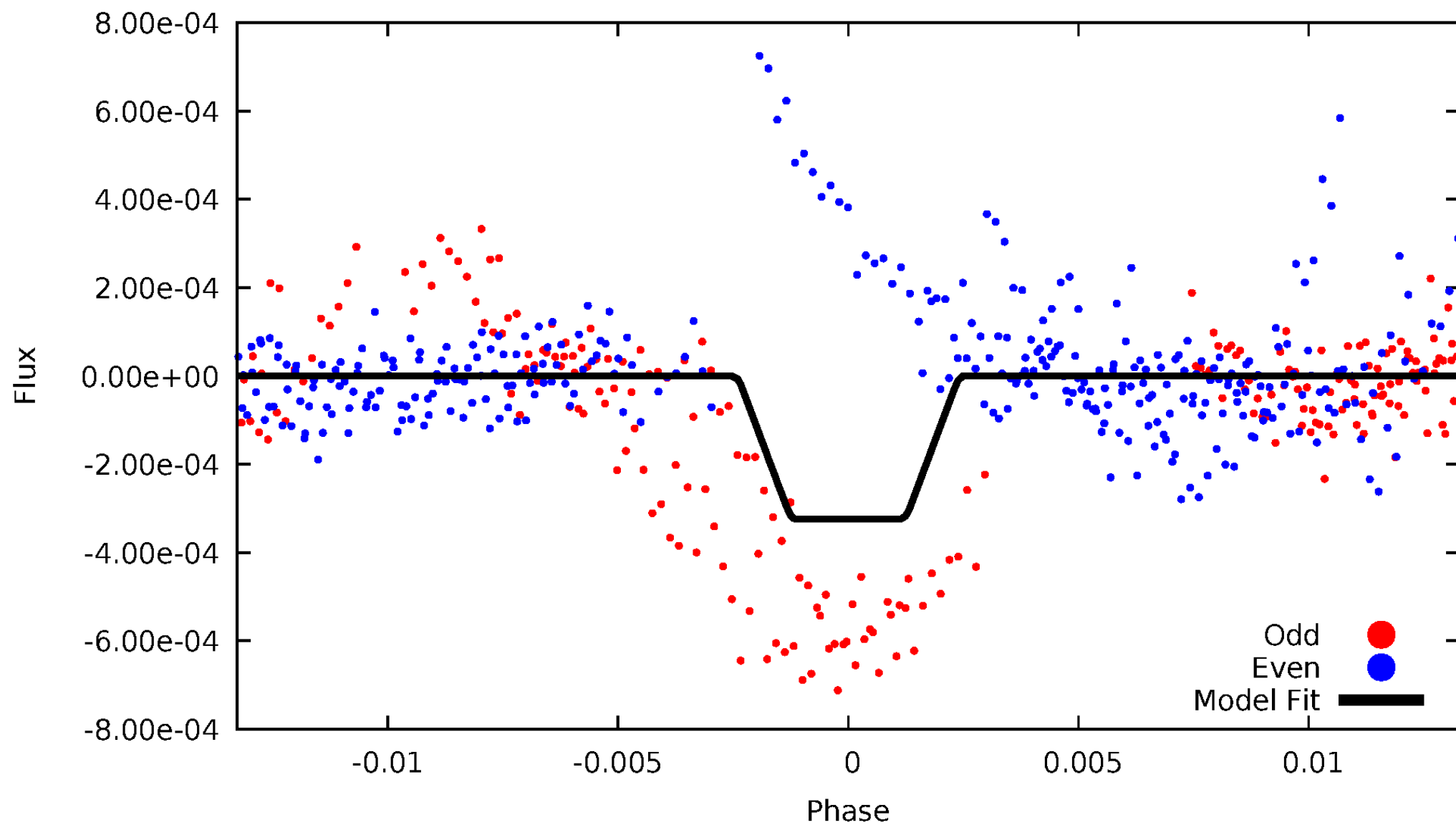
# DV Odd/Even

TCE 008073771-09



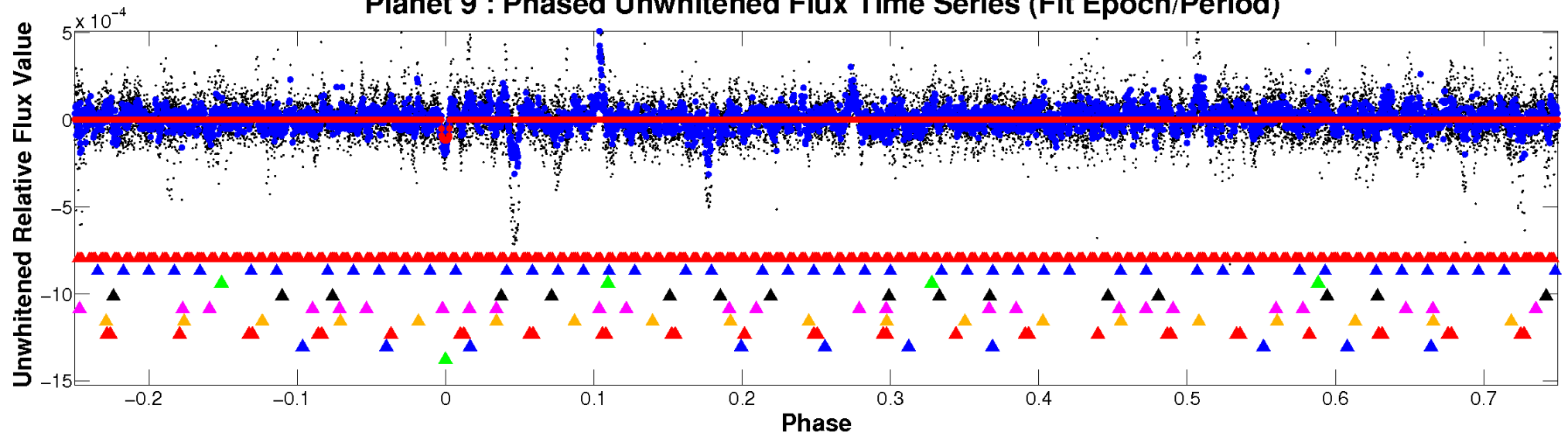
# ALT Odd/Even

TCE 008073771-09

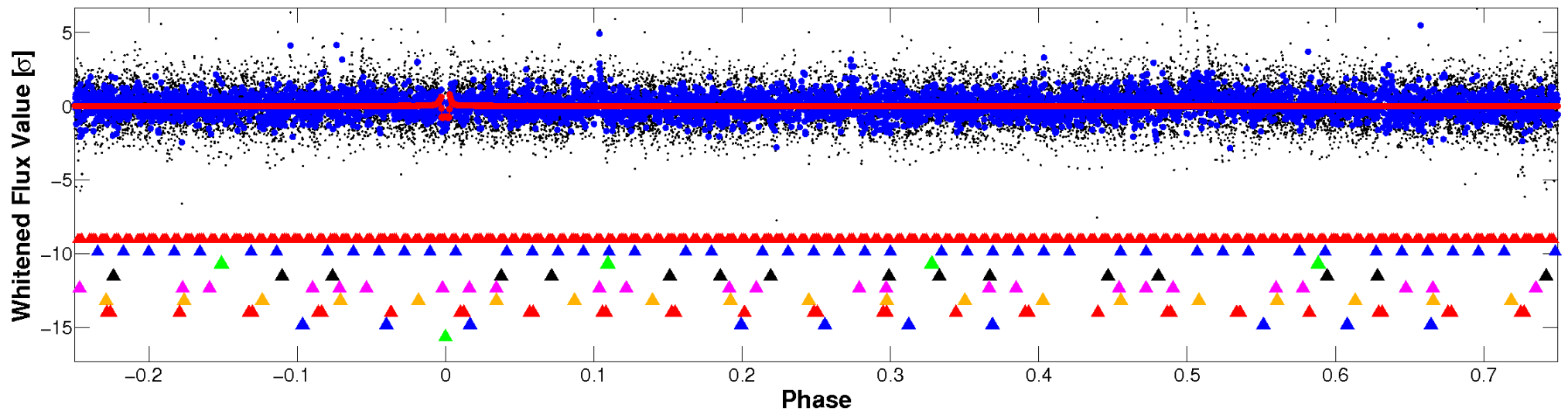


# Non-Whitened Vs. Whitened Light Curve

Planet 9 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)



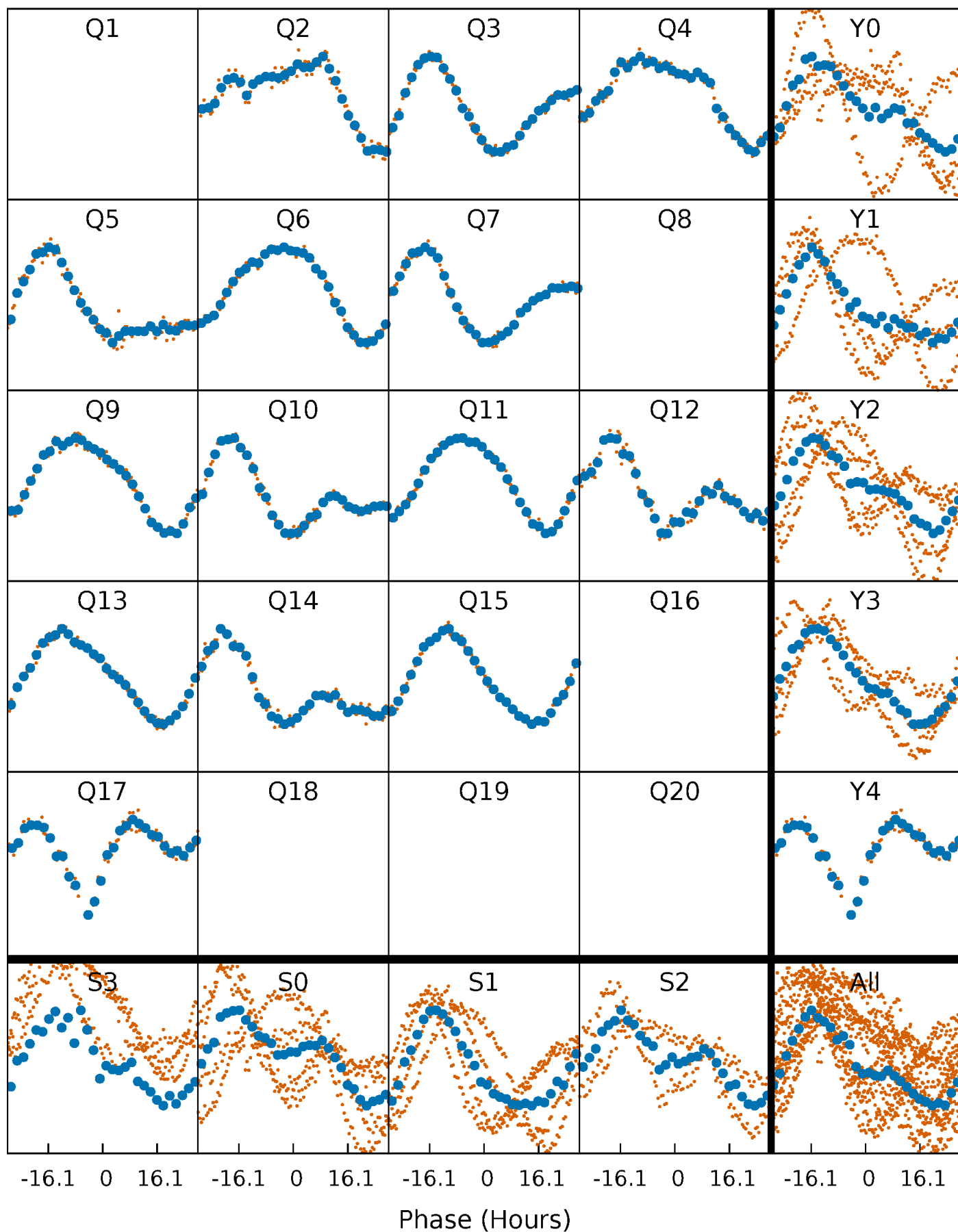
Planet 9 : Phased Whitened Flux Time Series (Fit Epoch/Period)





# PDC Quarter-Phased Transit Curves

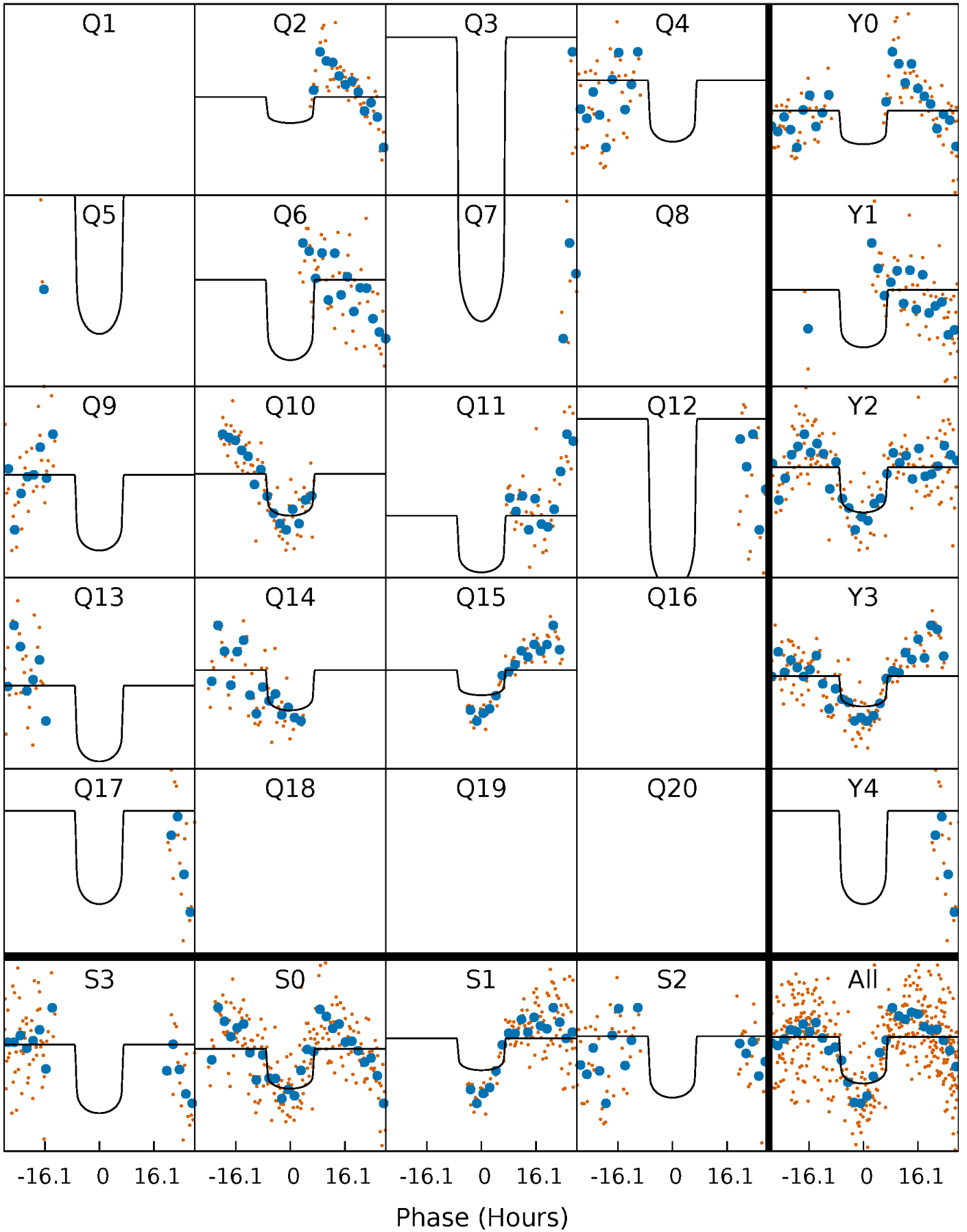
TCE 008073771-09     $P=106.481950$  Days     $T_0=176.873243$  (BKJD)





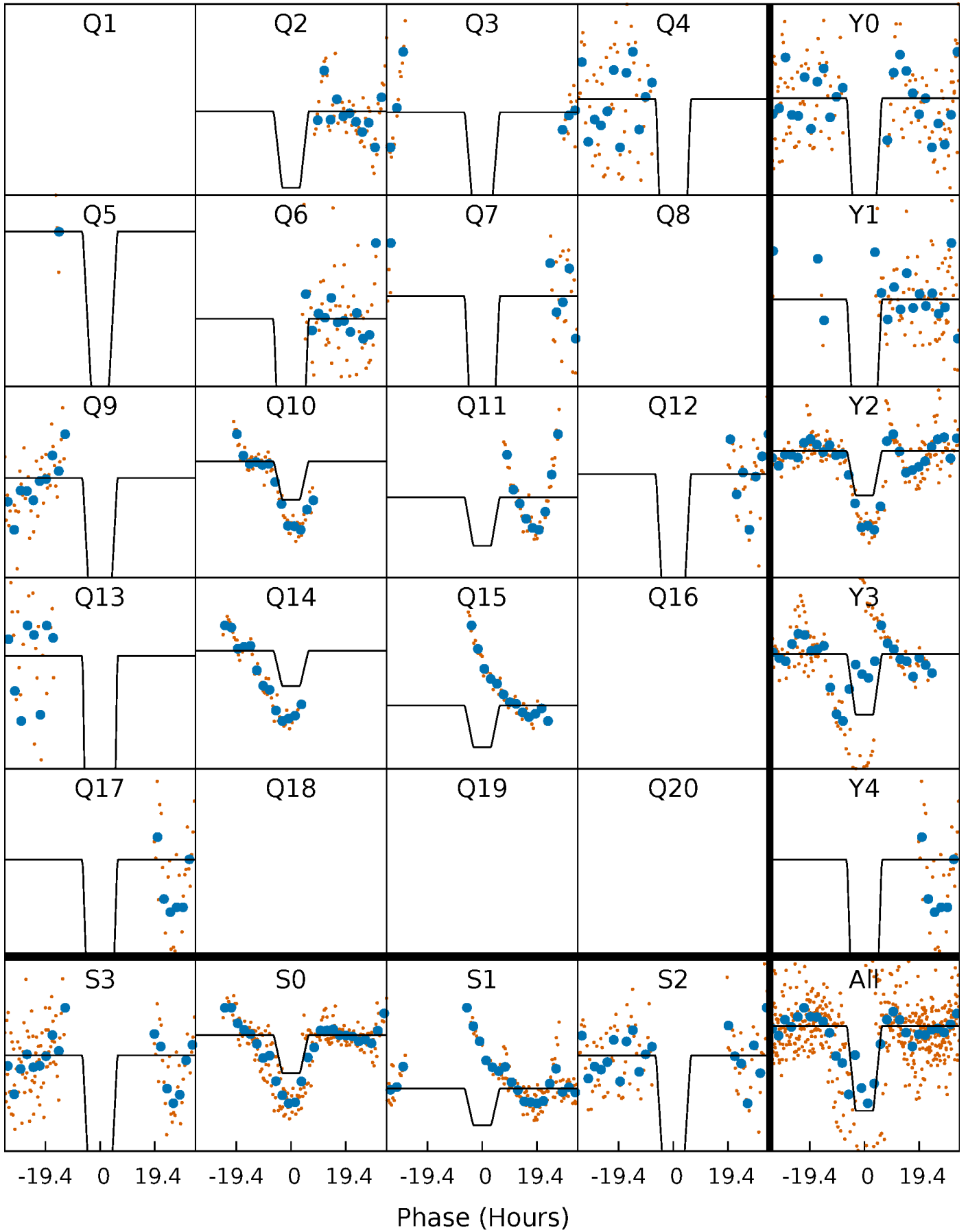
# DV Quarter-Phased Transit Curves

TCE 008073771-09     $P=106.481950$  Days     $T_0=176.873243$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

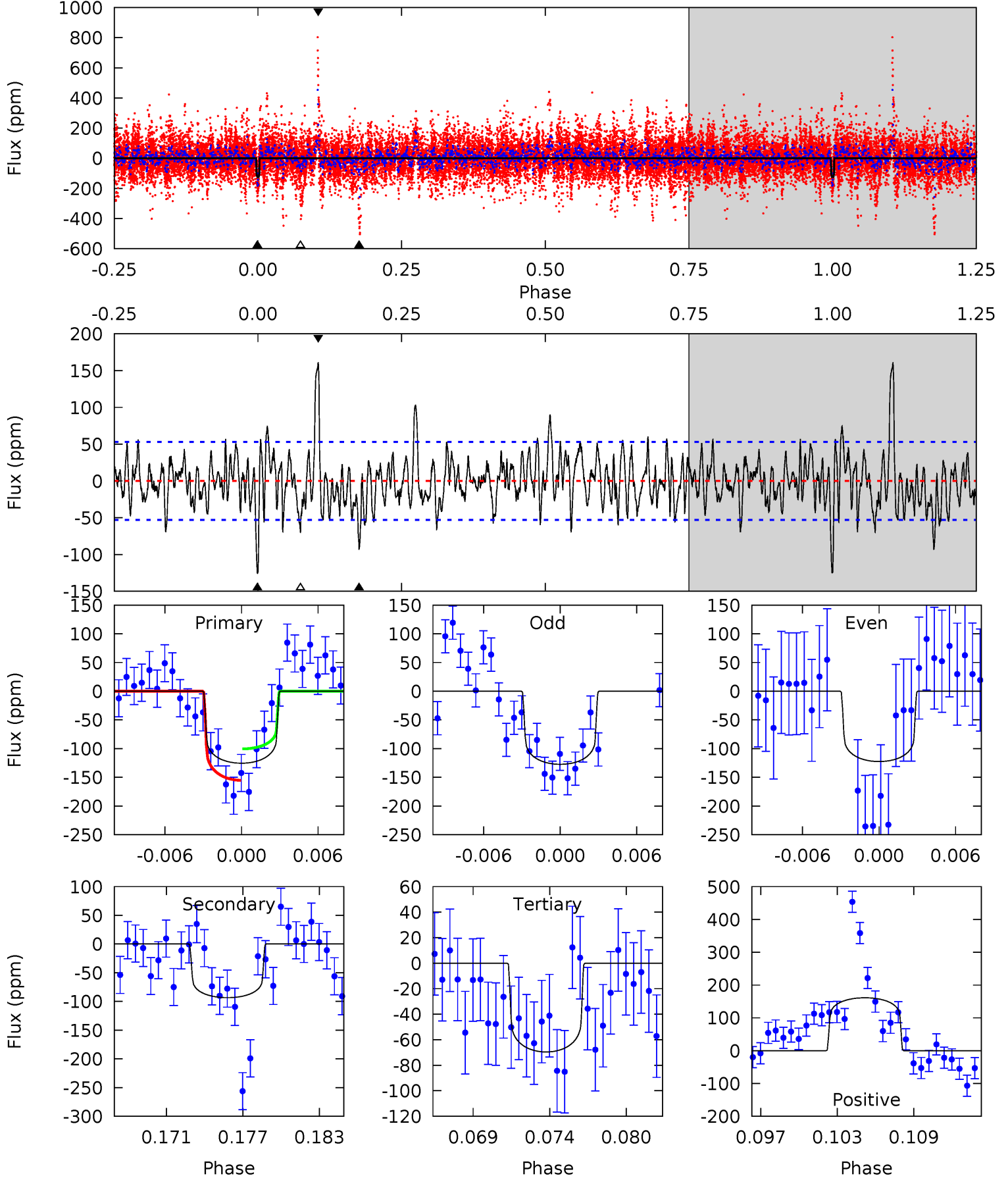
TCE 008073771-09 P=106.492903 Days  $T_0=176.773533$  (BKJD)



# DV Model-Shift Uniqueness Test

008073771-09, P = 106.481950 Days, E = 70.391293 Days

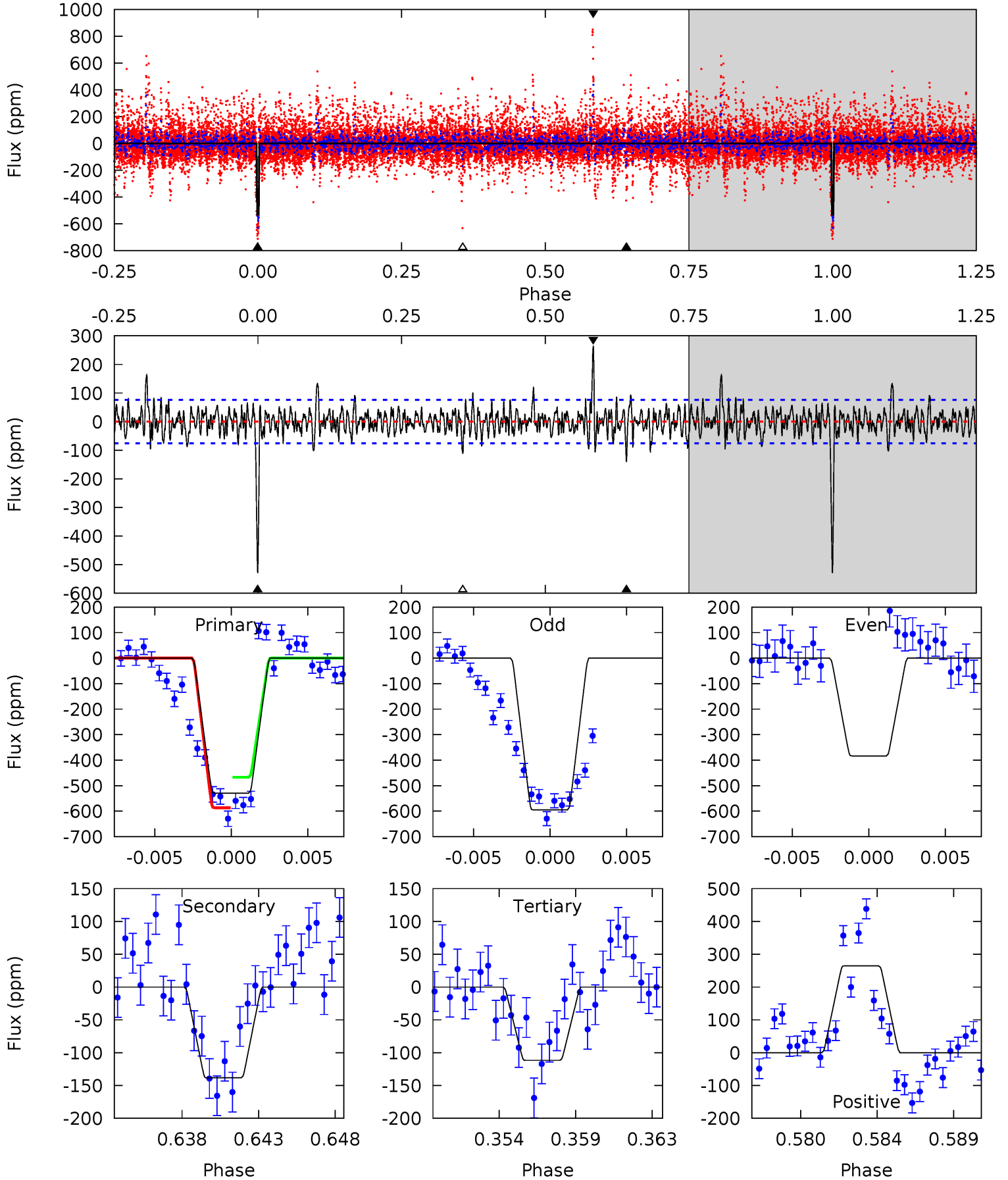
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
12.1	9.05	6.74	15.6	5.13	2.76	2.80	5.41	-3.46	2.31	-6.57	0.23	0.66	0.56	2.64



# Alt Model-Shift Uniqueness Test

008073771-09, P = 106.492903 Days, E = 70.280630 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
35.9	9.38	7.57	17.9	5.16	2.81	2.38	28.3	17.9	1.81	-8.56	7.21	0.76	0.33	0



### Stellar Parameters For KIC 008073771

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$9185^{+257}_{-417}$	$4.118^{+0.099}_{-0.231}$	$0.070^{+0.150}_{-0.650}$	$2.136^{+0.890}_{-0.445}$	$2.180^{+0.427}_{-0.522}$	$0.315^{+0.177}_{-0.176}$
	+3%/-5%	+2%/-6%	+214%/-929%	+42%/-21%	+20%/-24%	+56%/-56%
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 008073771-09 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-93 \pm 10$	$2.58^{+0.78}_{-0.62}$	$1117^{+96}_{-77}$	$8466^{+1651}_{-1018}$	$2433^{+1753}_{-1008}$
Alt.	$-138 \pm 15$	$4.36^{+0.96}_{-0.80}$	$1117^{+103}_{-69}$	$7008^{+630}_{-526}$	$1236^{+565}_{-412}$

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

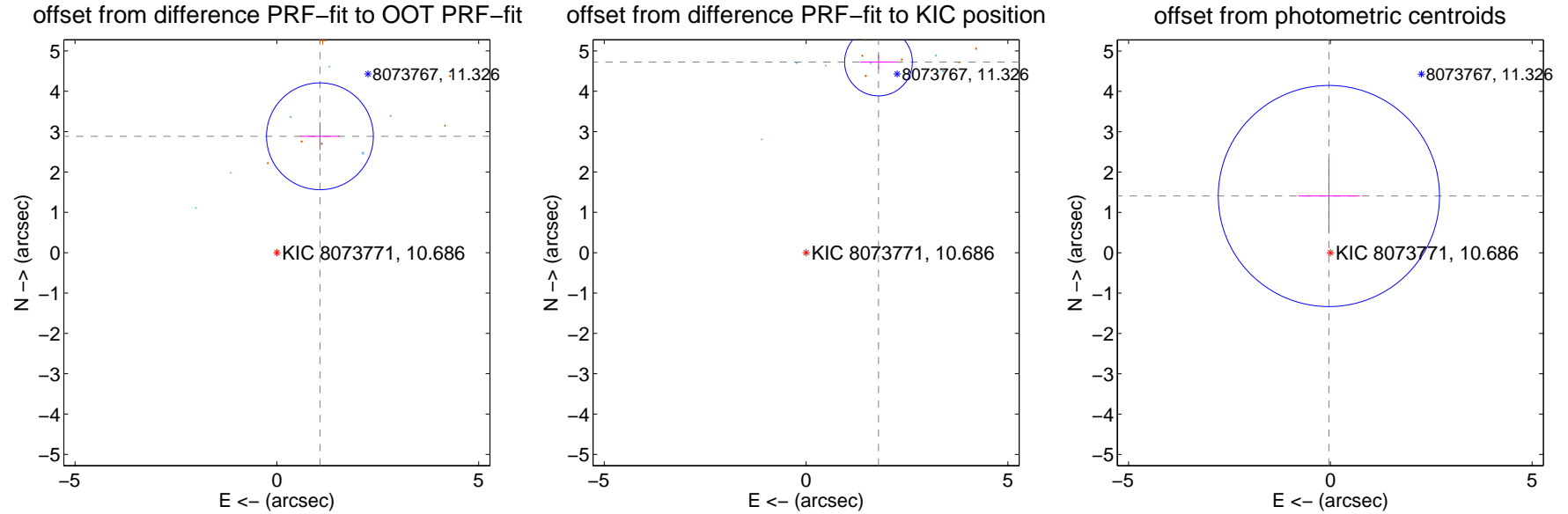
## DV Centroid Data

Supplemental centroid analysis for 008073771-09. **Kepler magnitude: 10.69.** Transit SNR 7.76

There are 6 quarters with good PRF difference image offsets

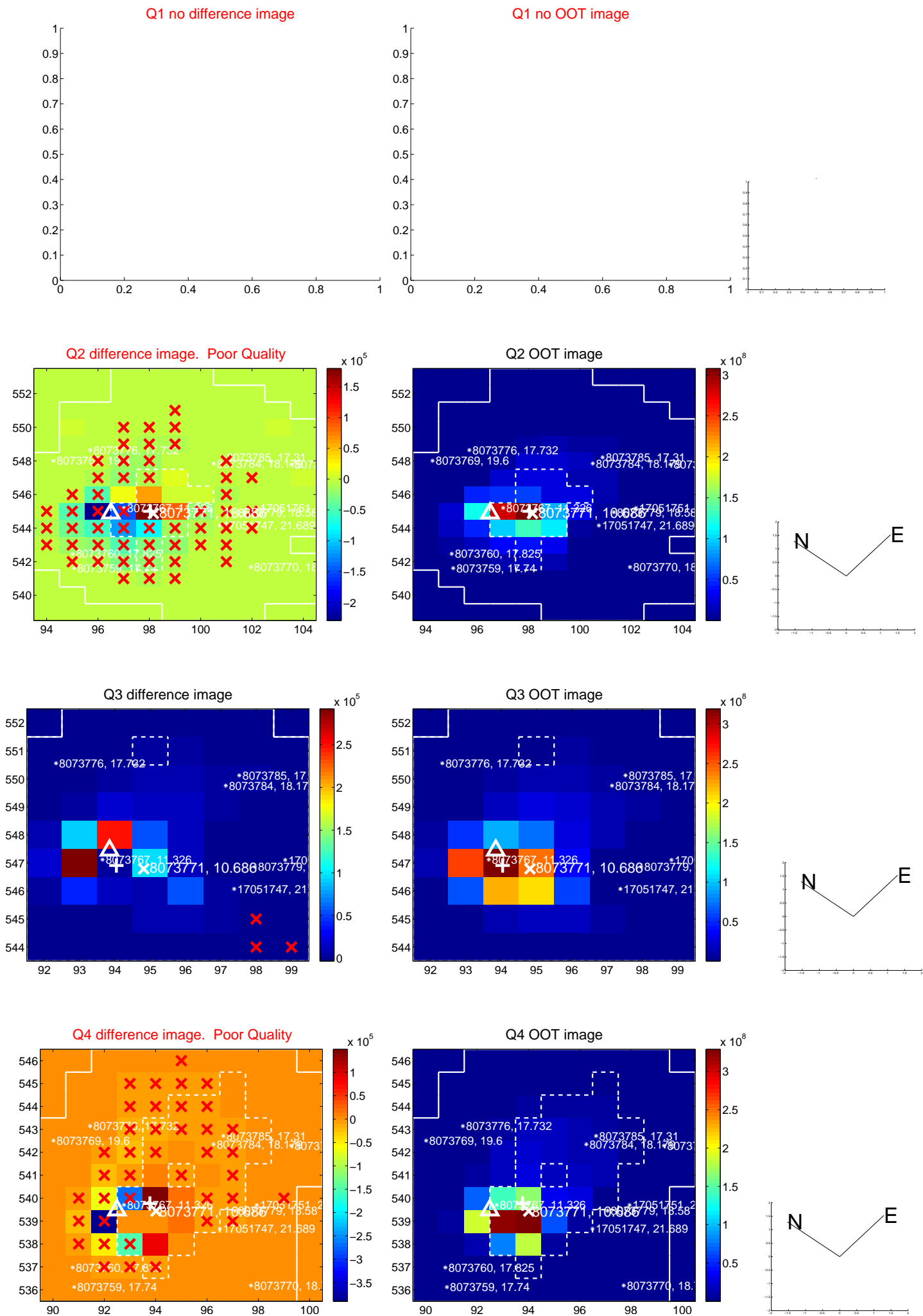
The direct PRF centroid is offset from the target star catalog position by about 0.33 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	<b><math>3.075 \pm 0.441</math></b>	<b>6.97</b>	$-1.067 \pm 0.491$	$2.884 \pm 0.346$
PRF-fit source offset from KIC position	<b><math>5.055 \pm 0.280</math></b>	<b>18.07</b>	$-1.794 \pm 0.448$	$4.725 \pm 0.178$
photometric centroid source offset	$1.41 \pm 0.91$	1.54	$0.04 \pm 0.76$	$1.41 \pm 0.91$

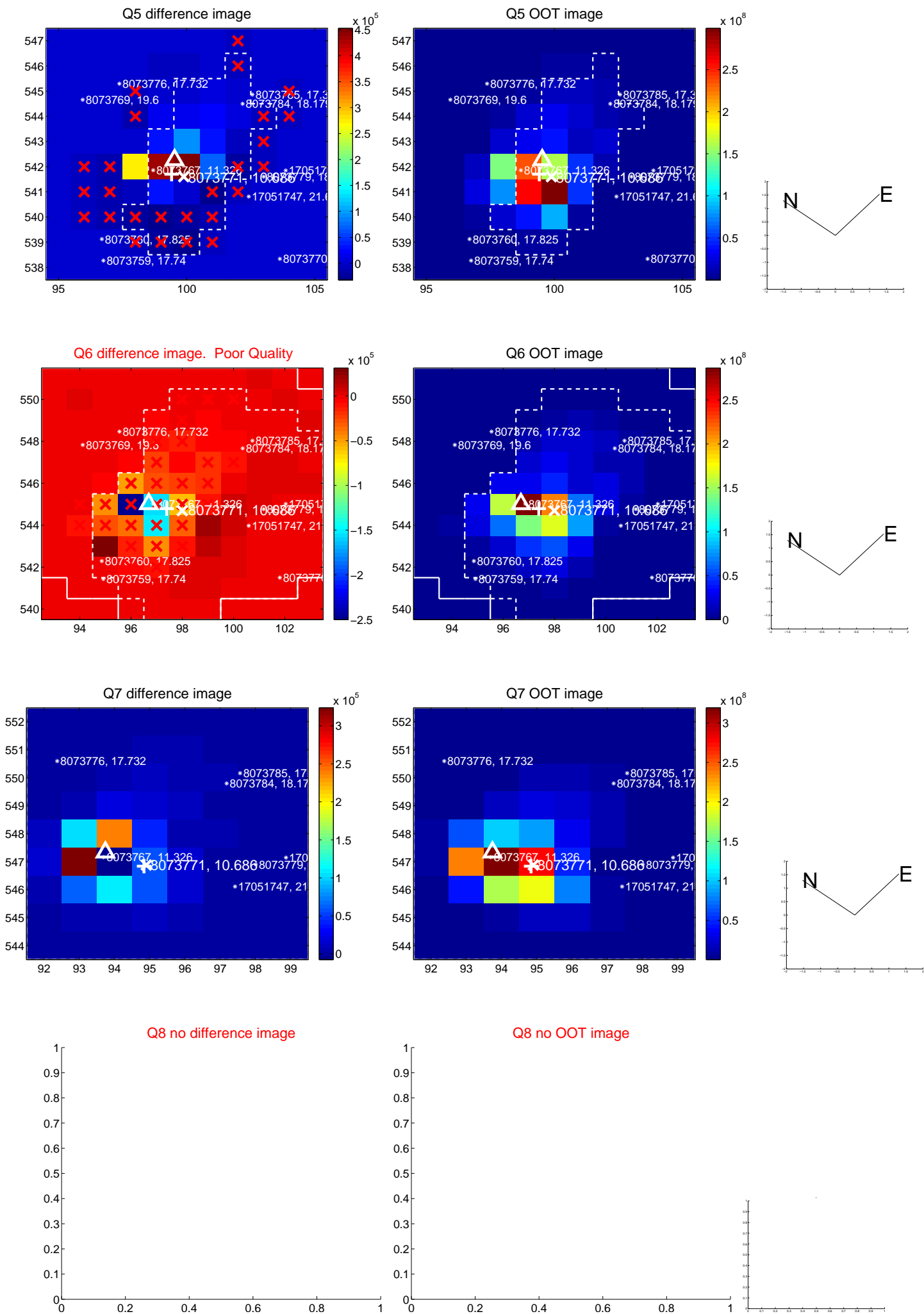


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

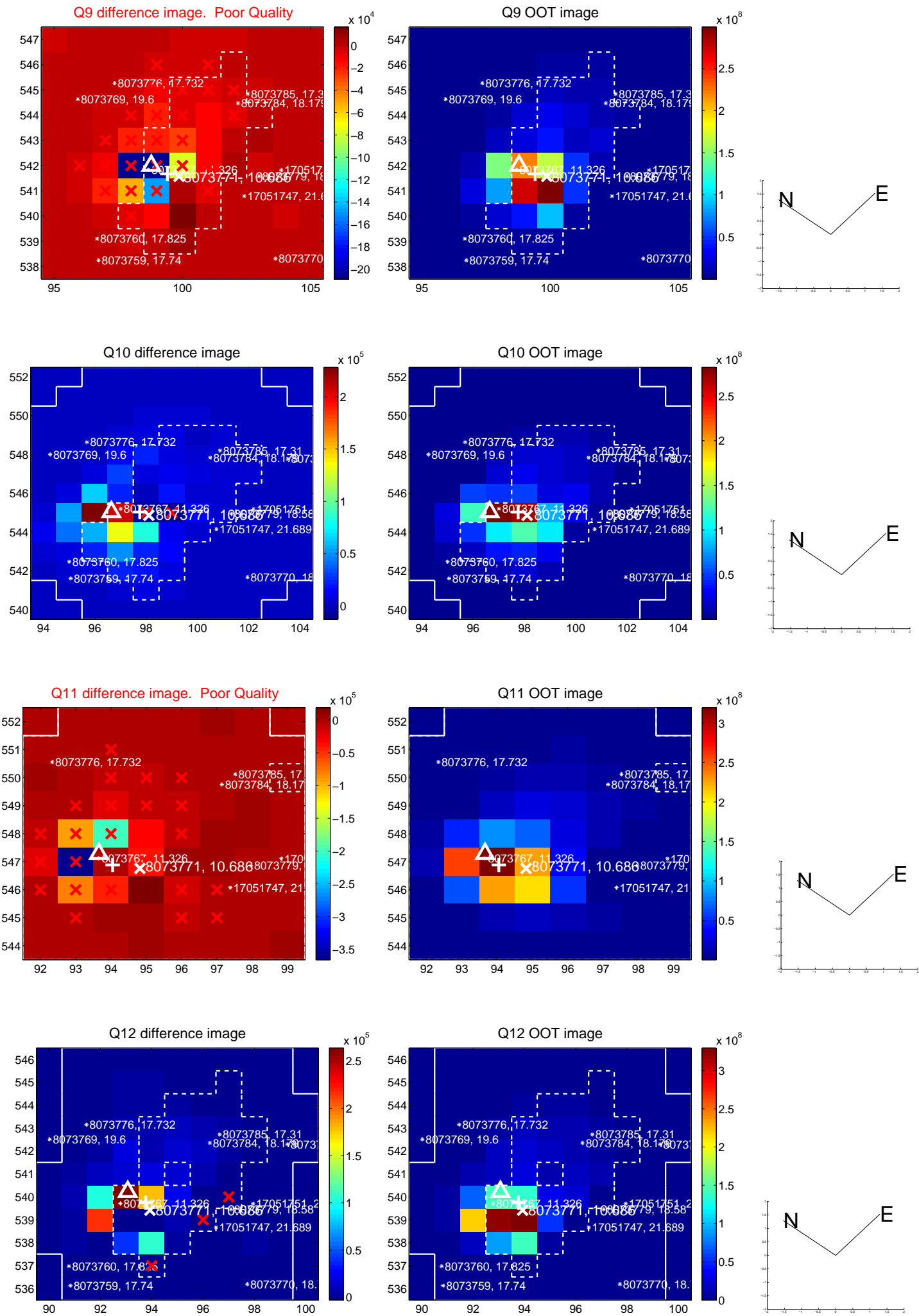


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



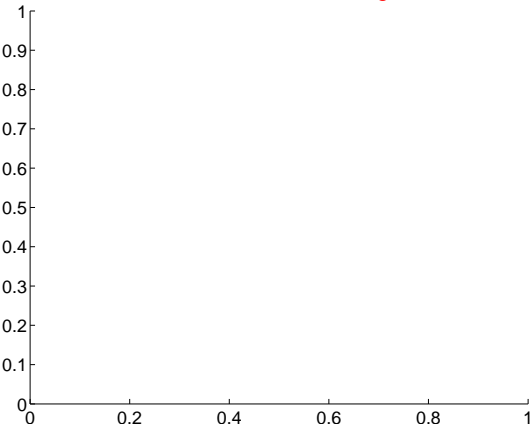


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

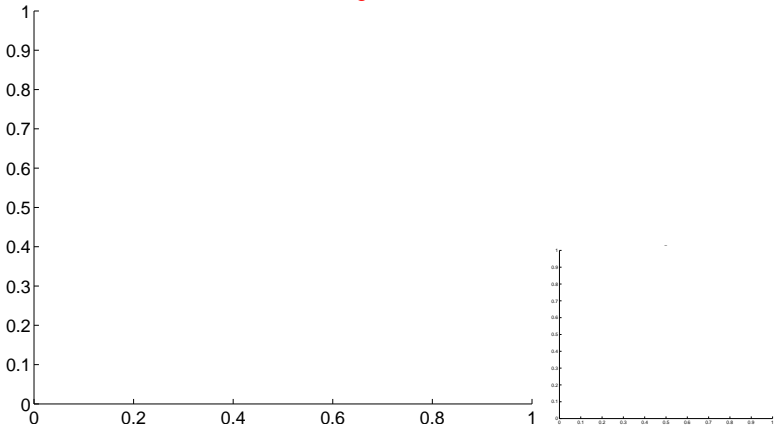


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

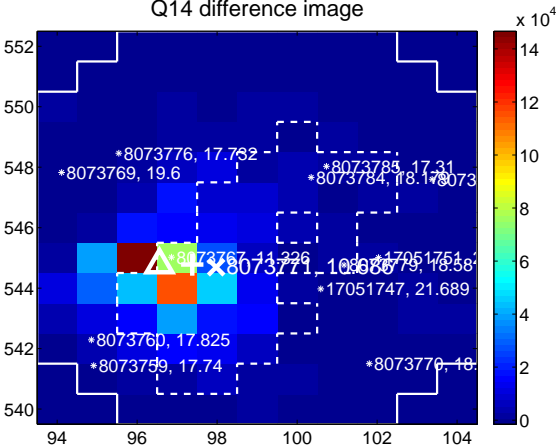
Q13 no difference image



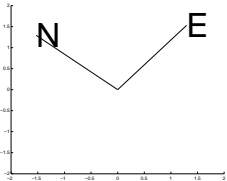
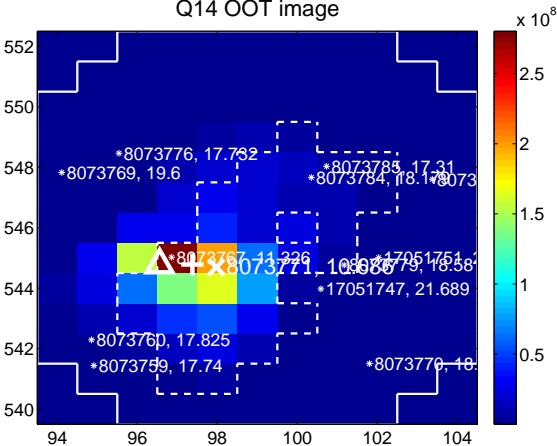
Q13 no OOT image



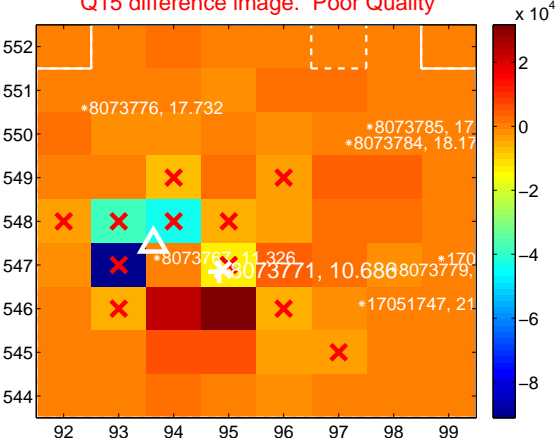
Q14 difference image



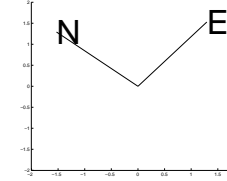
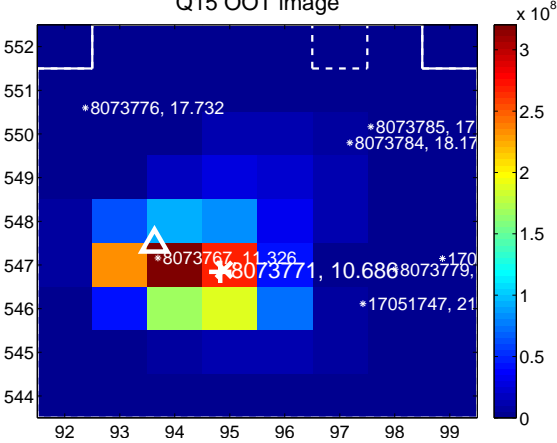
Q14 OOT image



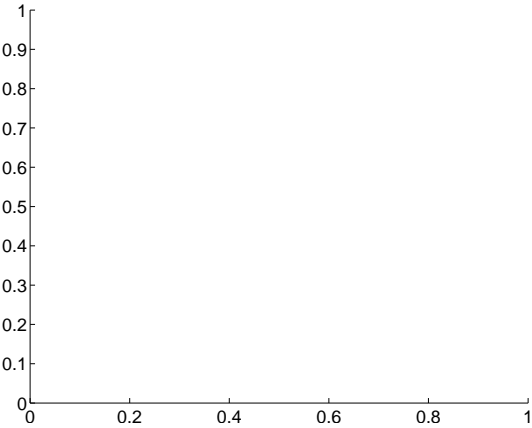
Q15 difference image. Poor Quality



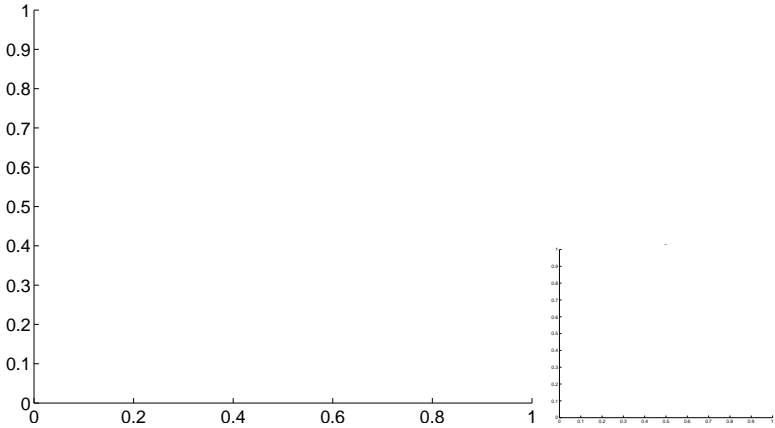
Q15 OOT image



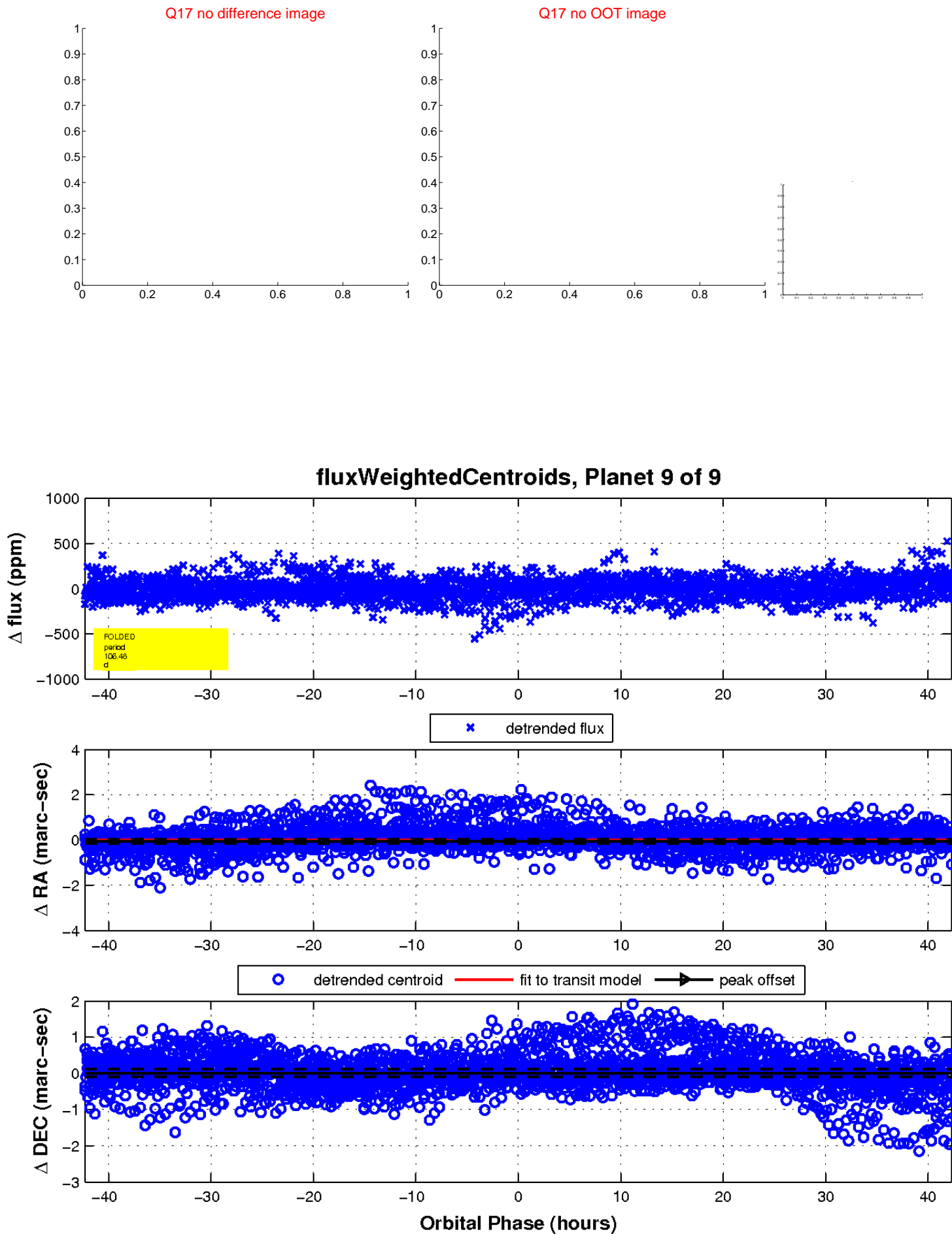
Q16 no difference image



Q16 no OOT image



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



UKIRT Image

Declination

