

# KIC 003456780

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
003456780-01	OBS	No	0.627966	131.732143	169.1	1.282	12.5	12.4	2.35	7865	3.57	58426.47
003456780-02	OBS	No	0.627967	131.874807	247.3	1.246	11.0	16.1	2.35	7865	4.31	58426.34
003456780-03	OBS	No	0.627959	131.573763	193.8	1.237	10.6	13.5	2.35	7865	3.82	58427.38
003456780-04	OBS	No	7.997527	133.193357	174.5	3.500	8.0	-1.0	2.35	7865	3.15	1964.49

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
003456780-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT
003456780-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—SAME_NTL_PERIOD
003456780-03	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD
003456780-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_ZUMA—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_ALT—CENT_NOFITS

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

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

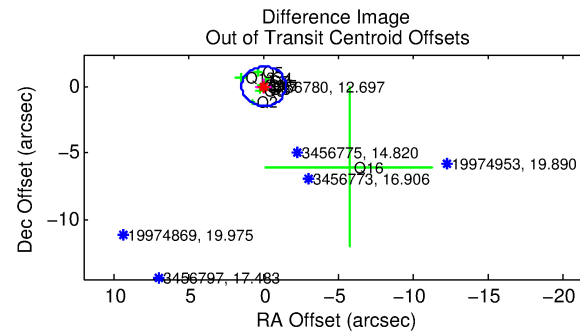
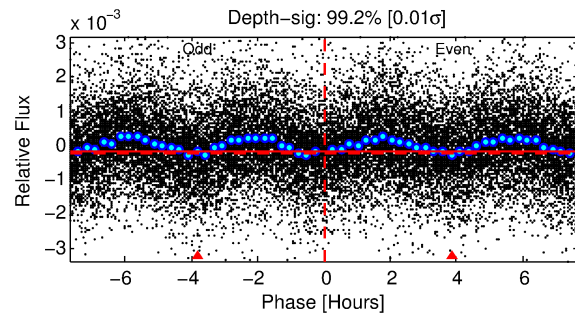
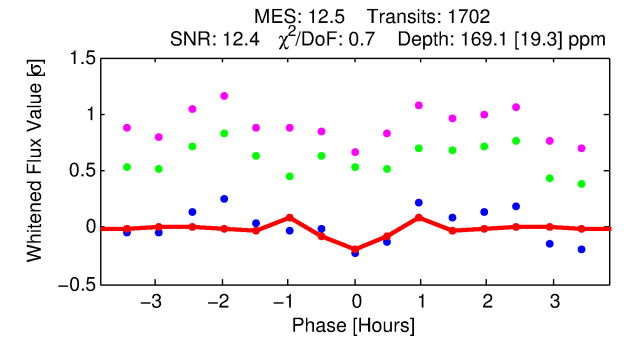
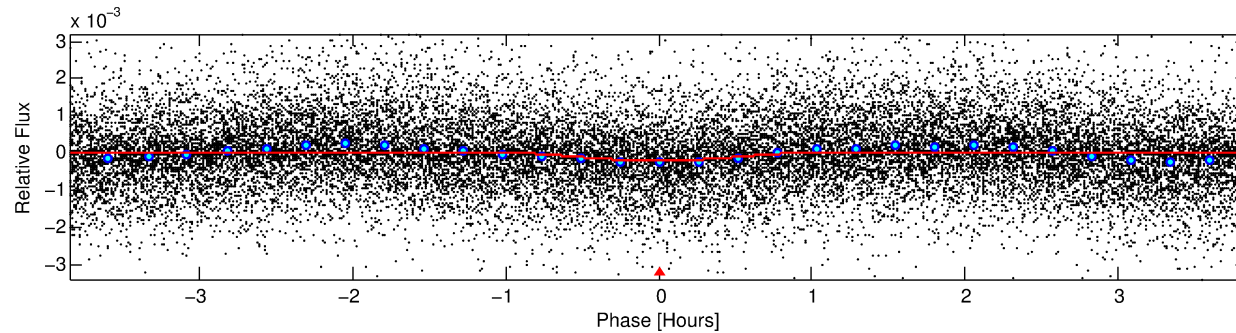
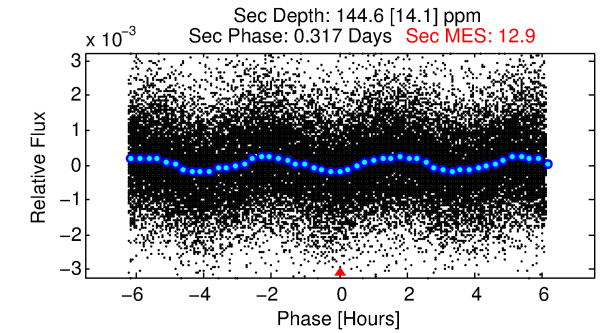
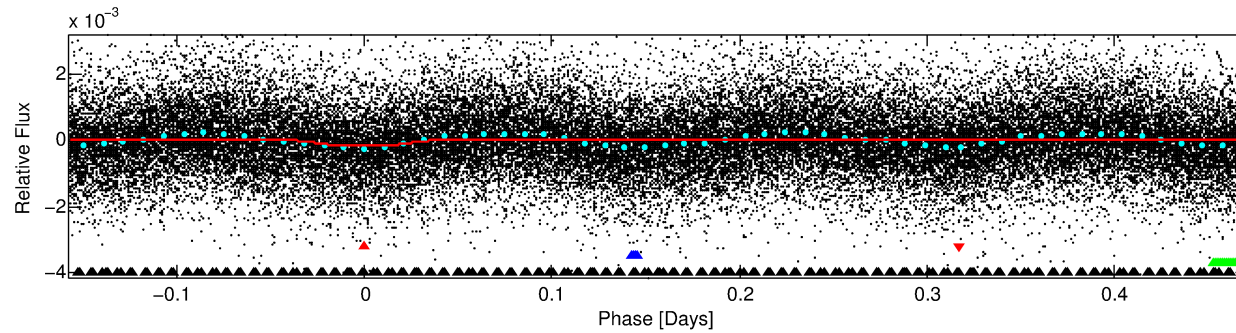
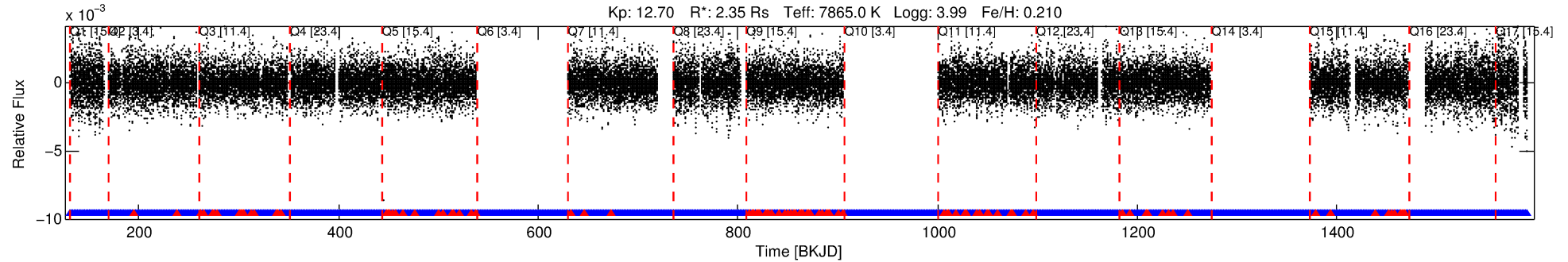
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 003456780-01

No Significant Match Found

# DV One-Page Summary

KIC: 3456780 Candidate: 1 of 4 Period: 0.628 d



## DV Fit Results:

Period = 0.62797 [0.00001] d  
Epoch = 131.7321 [0.0008] BKJD  
Rp/R\* = 0.0139 [0.0026]  
a/R\* = 1.98 [1.64]  
b = 0.90 [0.23]  
Seff = 58426.47 [21108.66]  
Teff = 3964 [358] K  
Rp = 3.57 [1.09] Re  
a = 0.0180 [0.0038] AU  
Ag = 2.03 [1.02] [1.01σ]  
Teffp = 7315 [785] K [3.88σ]

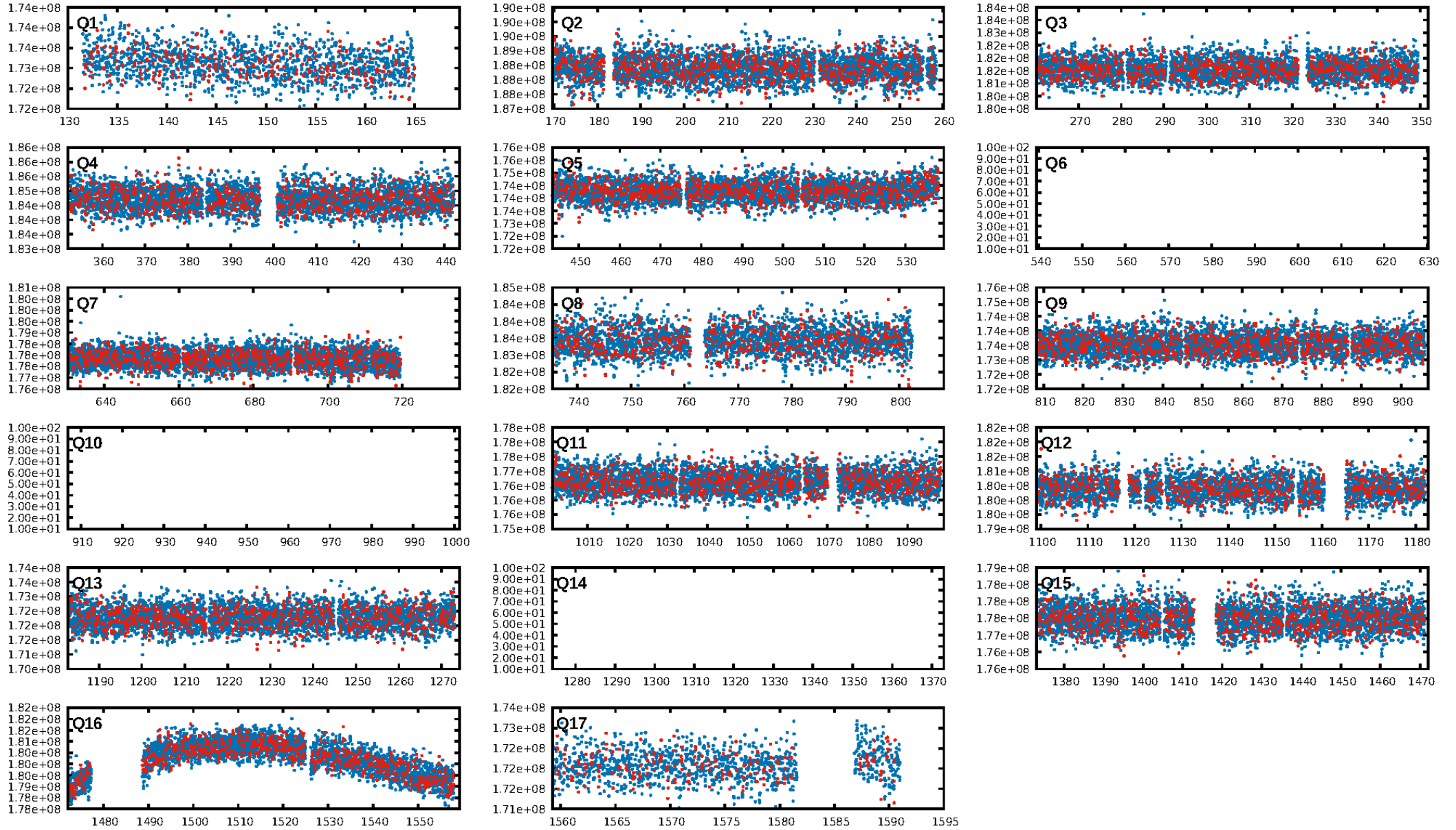
## DV Diagnostic Results:

ShortPeriod-sig: 0.0% [0.00σ]  
LongPeriod-sig: 0.0% [0.00σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 0.94 [1505/1607]  
GhostDiagnostic-chr: 1.48  
Centroid-sig: 0.1%  
Centroid-so: 0.488 arcsec [2.61σ]  
OotOffset-rm: 0.099 arcsec [0.20σ]  
KicOffset-rm: 0.215 arcsec [0.42σ]  
OotOffset-st: 1/3/3/5 [12]  
KicOffset-st: 1/3/3/5 [12]  
DiffImageQuality-fgm: 0.92 [11/12]  
DiffImageOverlap-fno: 0.00 [0/14]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 21:30:32 Z

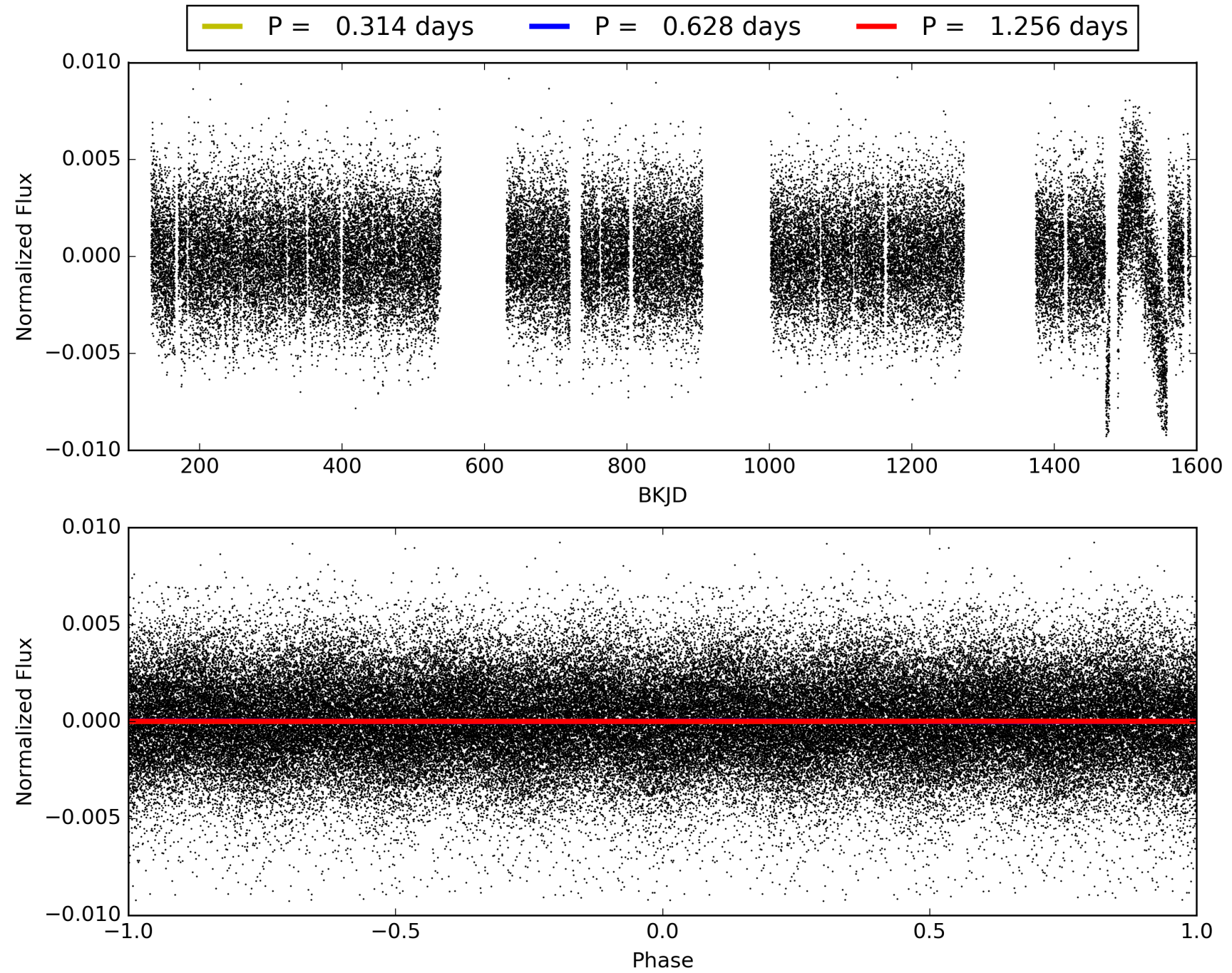
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 003456780-01, PDC Light Curves





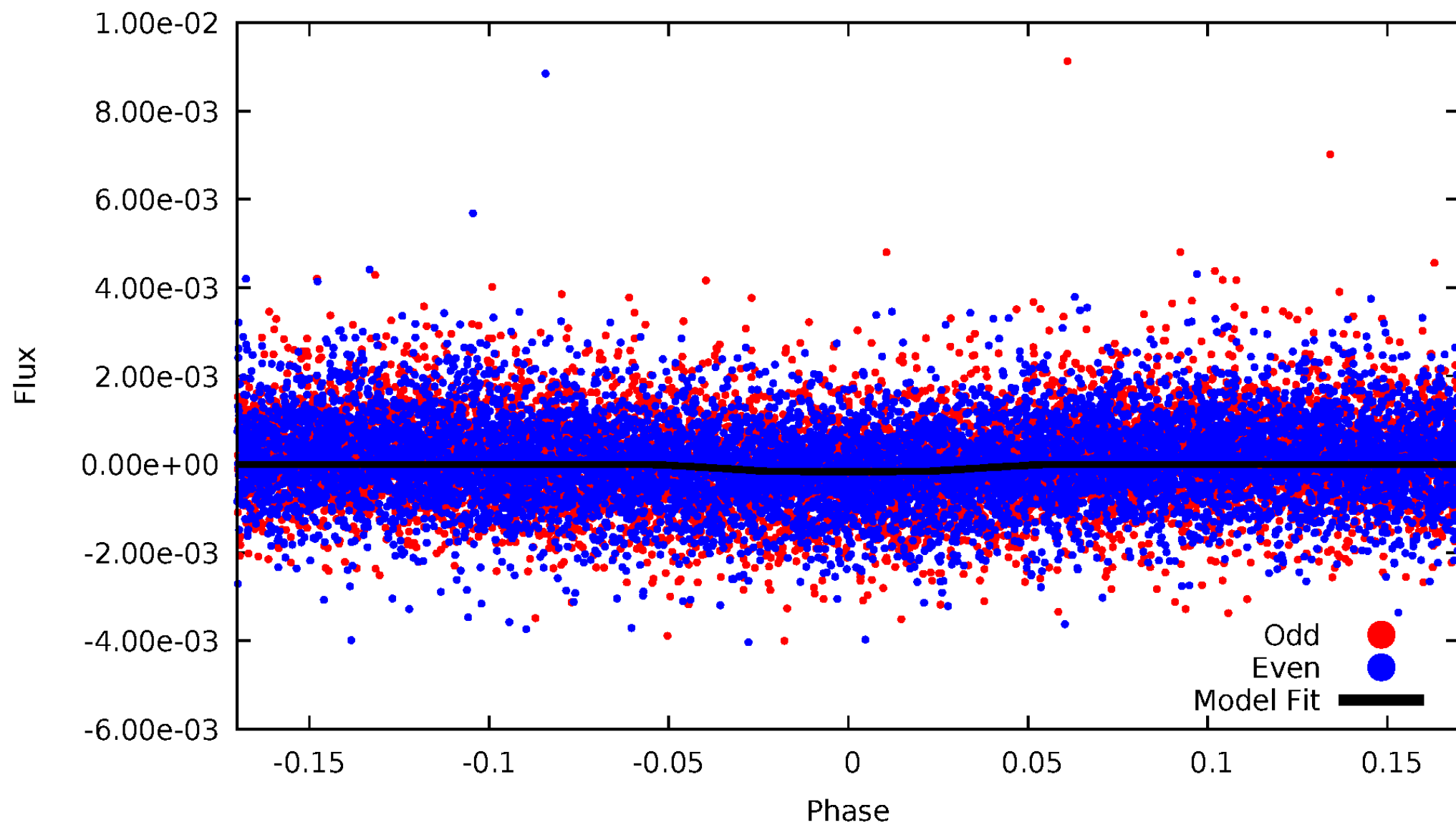
TCE 003456780-01





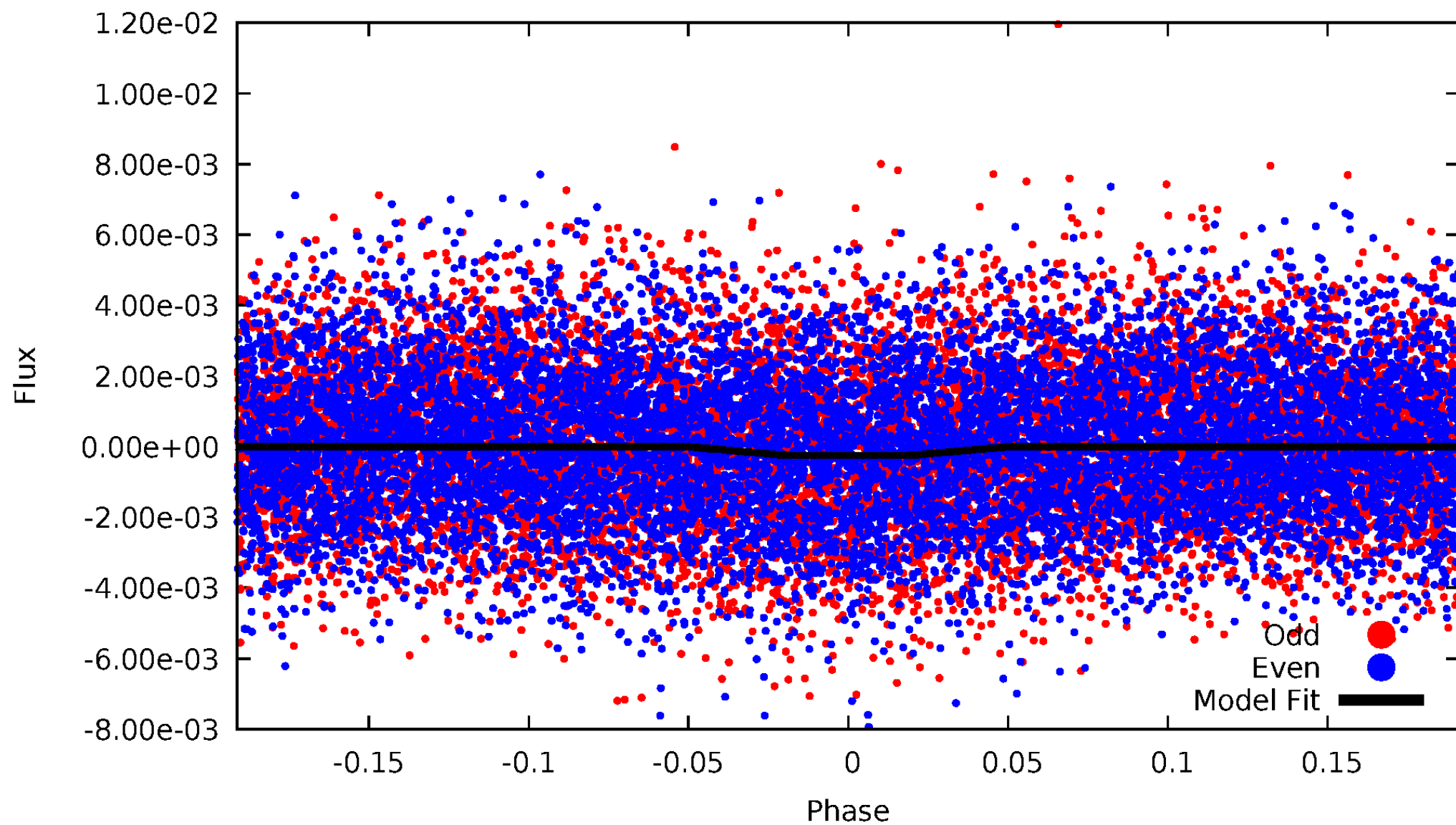
# DV Odd/Even

TCE 003456780-01



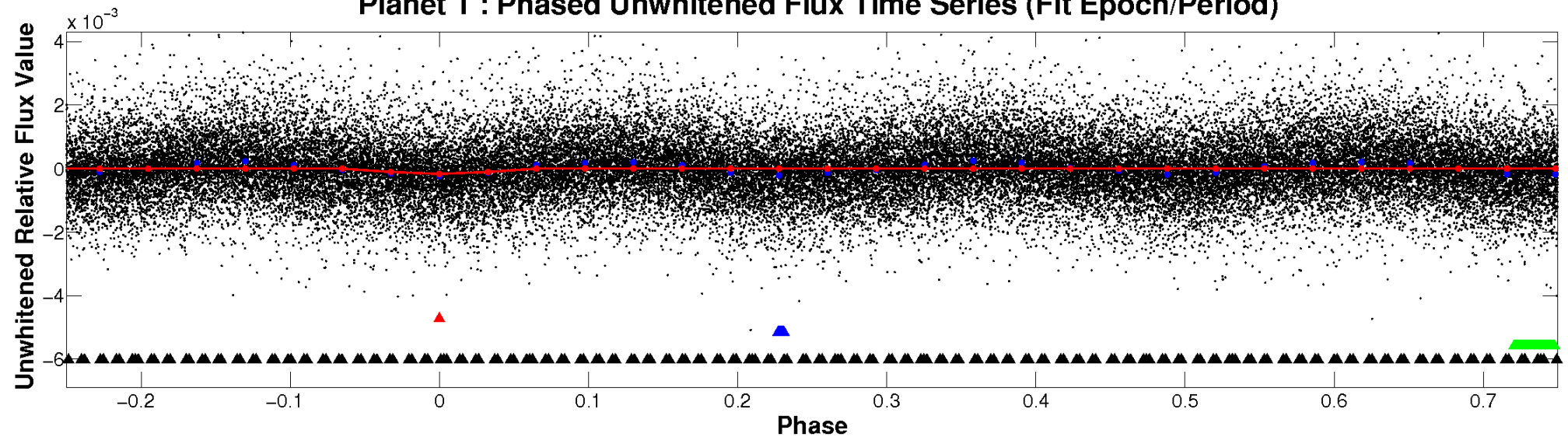
# ALT Odd/Even

TCE 003456780-01

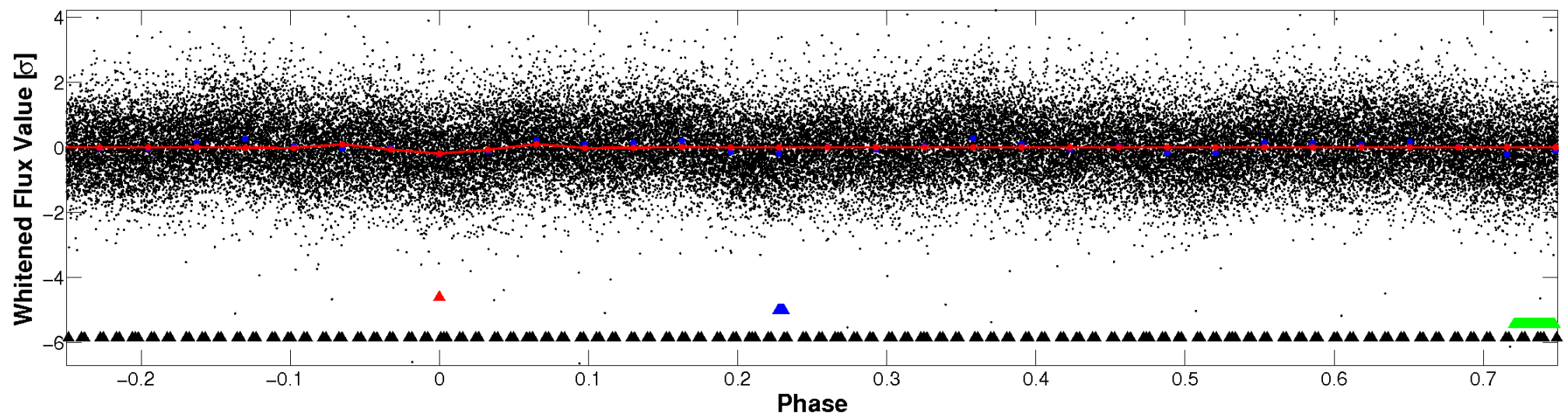


# Non-Whitened Vs. Whitened Light Curve

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



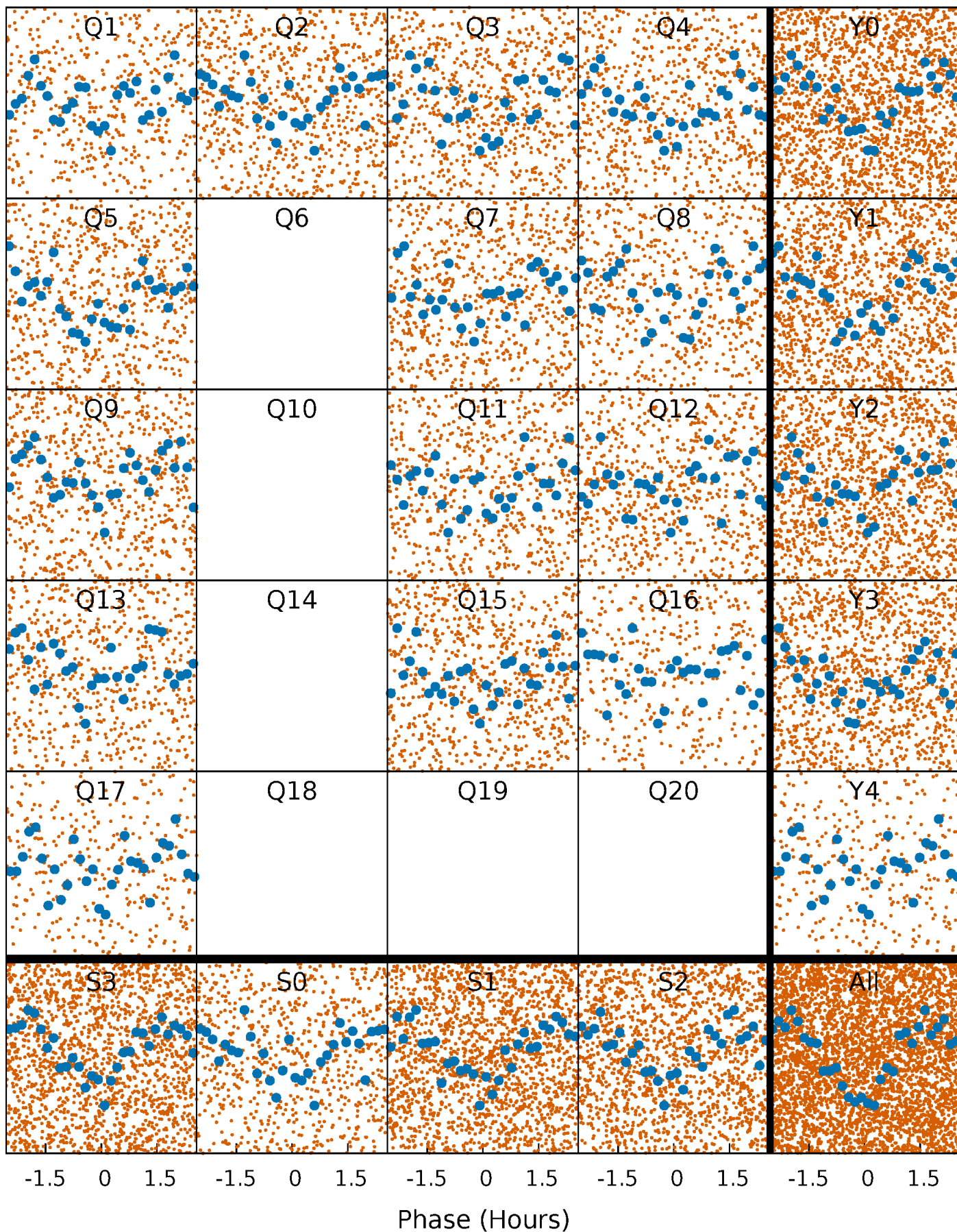
**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**





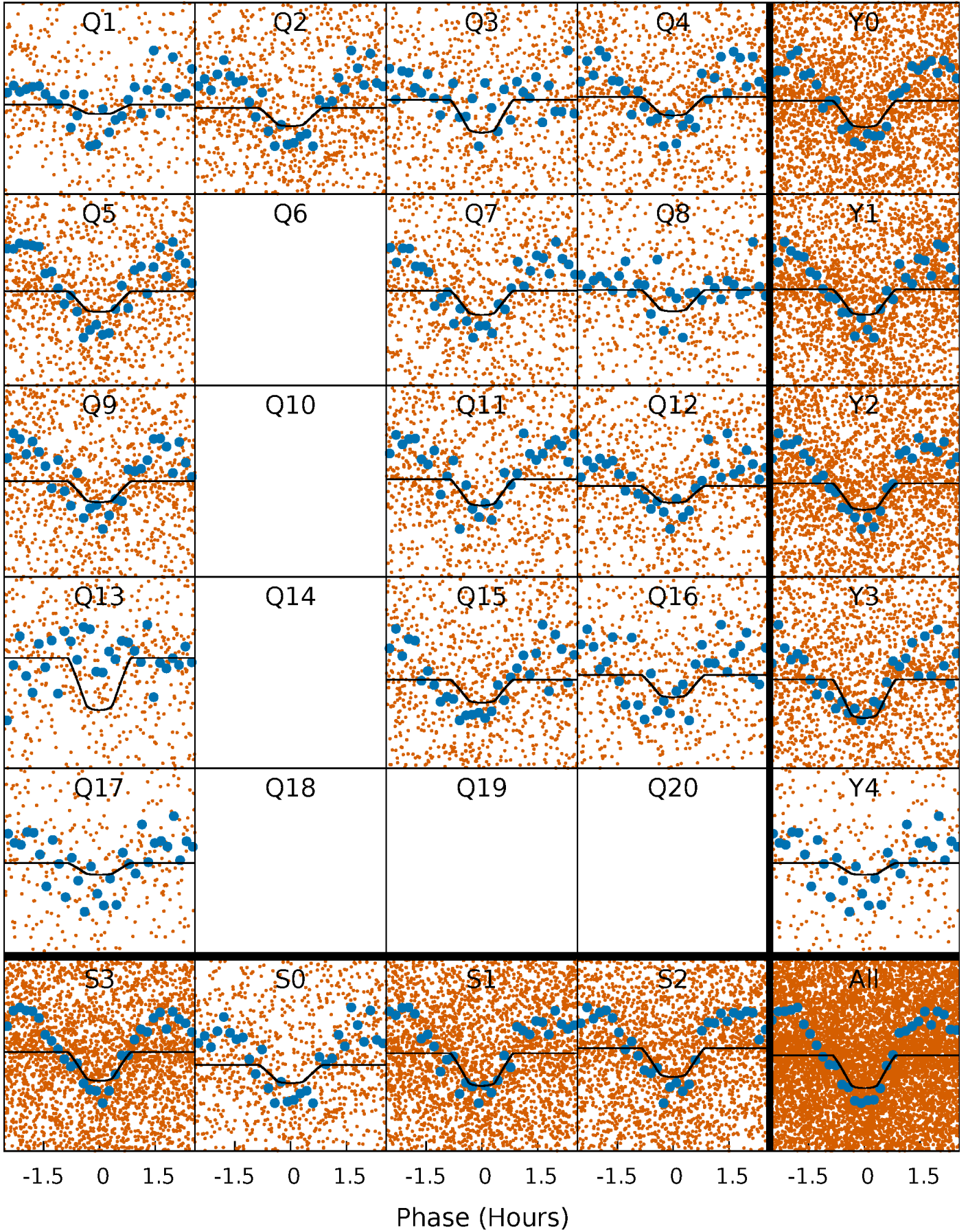
# PDC Quarter-Phased Transit Curves

TCE 003456780-01 P= 0.627966 Days  $T_0=131.732143$  (BKJD)



# DV Quarter-Phased Transit Curves

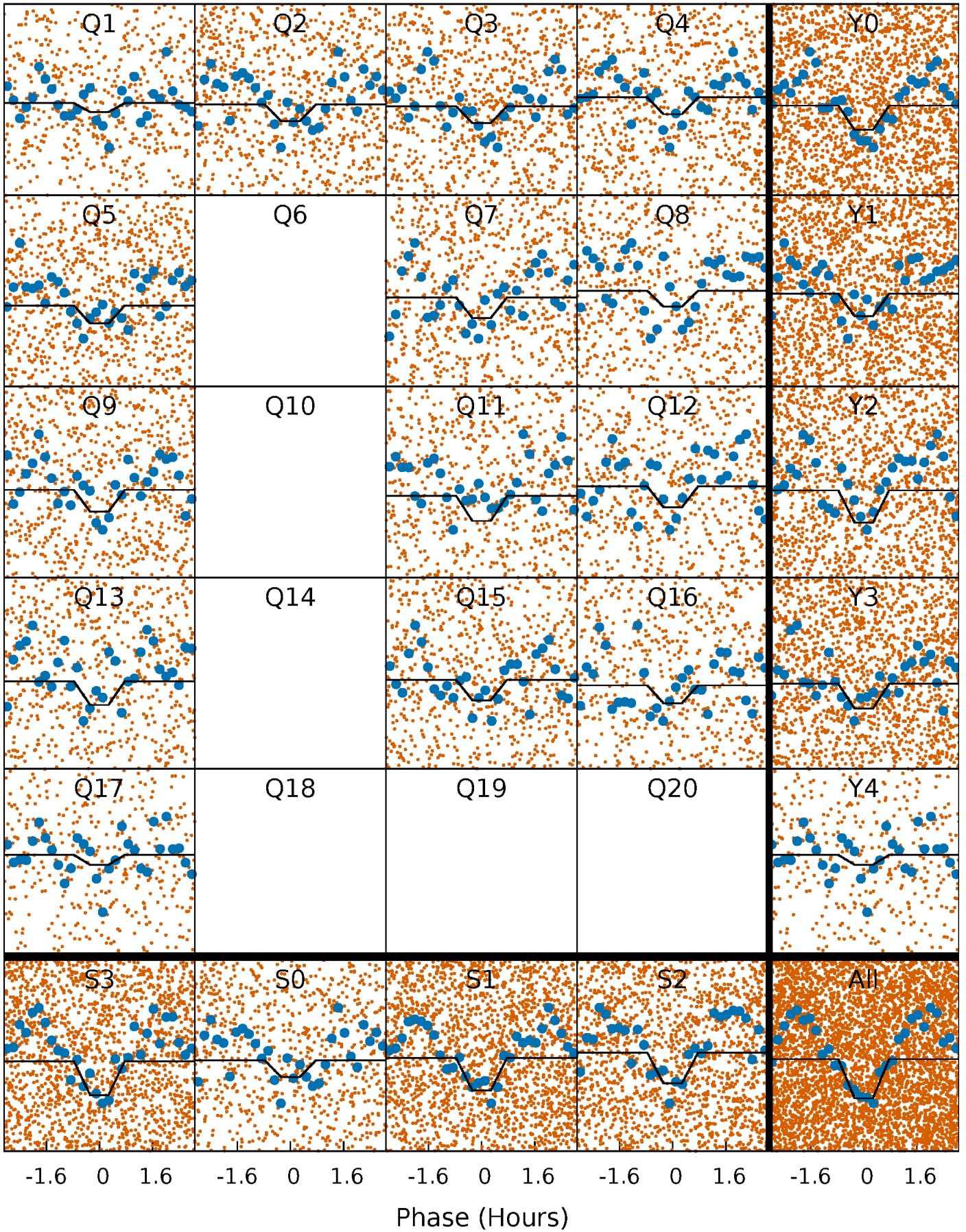
TCE 003456780-01   P= 0.627966 Days    $T_0=131.732143$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

TCE 003456780-01 P= 0.627967 Days  $T_0=131.727471$  (BKJD)

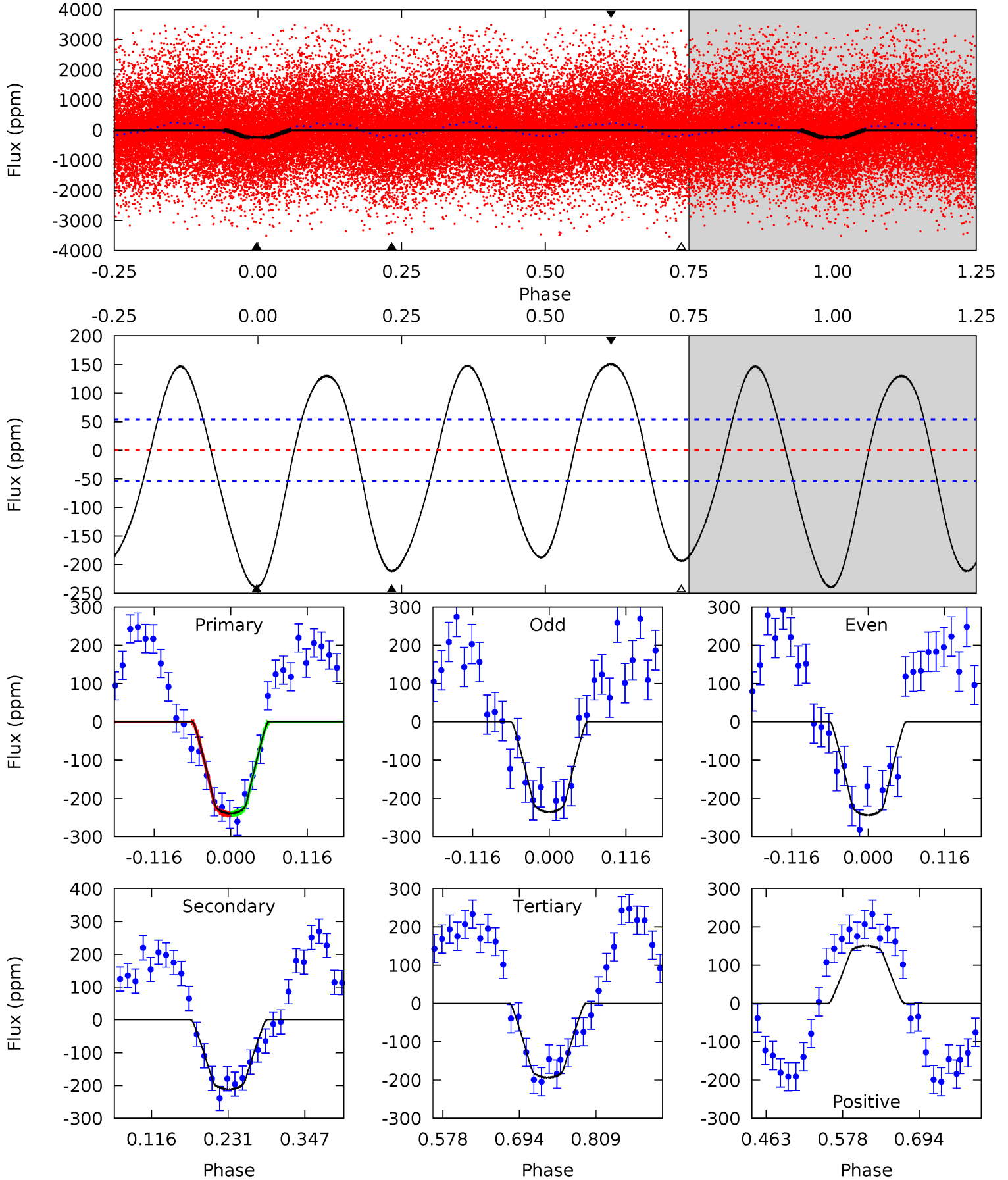




# DV Model-Shift Uniqueness Test

003456780-01, P = 0.627966 Days, E = 131.104177 Days

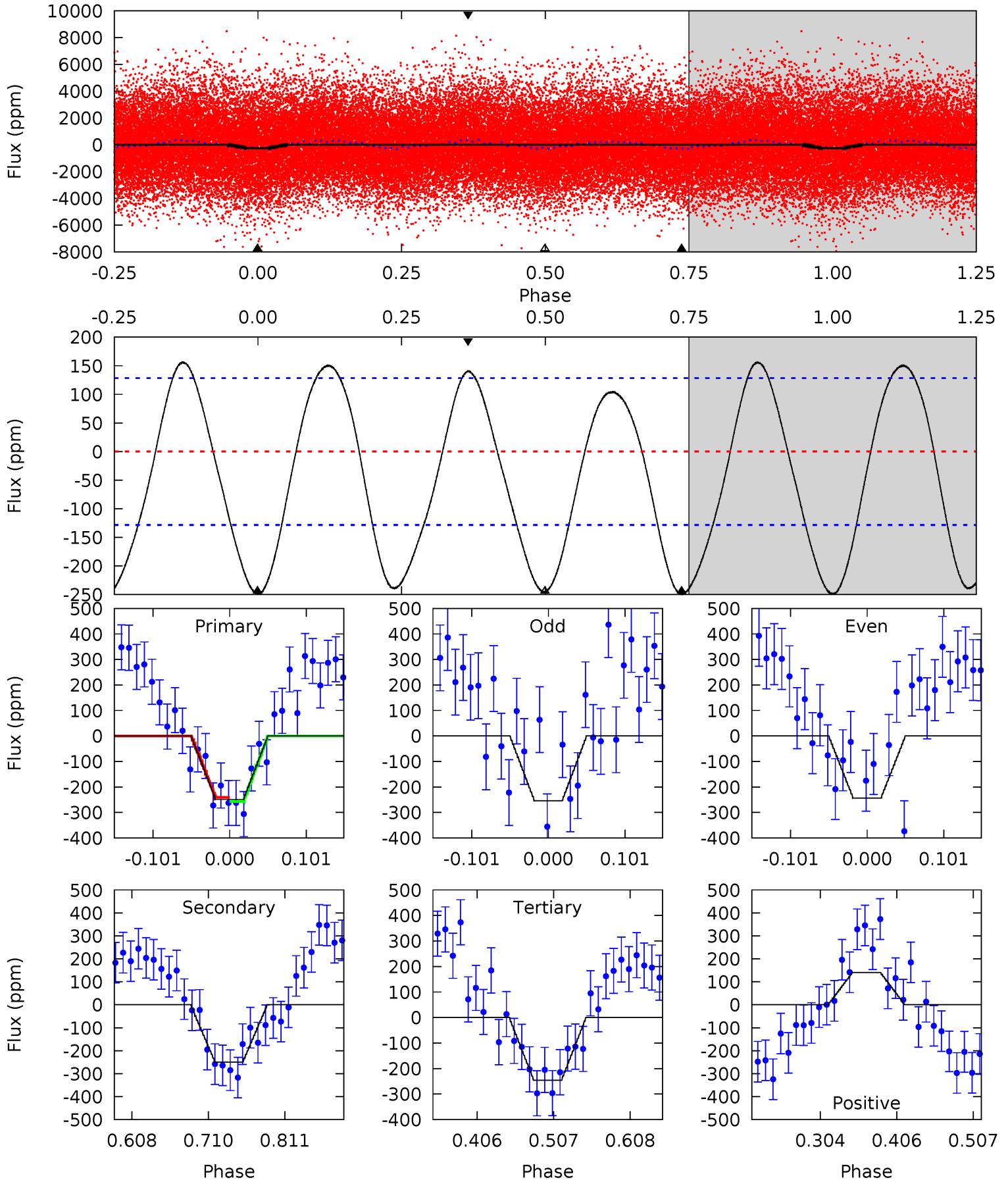
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
20.0	17.6	16.1	12.5	4.53	1.57	10.2	3.81	7.42	1.46	5.07	0.34	1.05	0.39	0.04



# Alt Model-Shift Uniqueness Test

003456780-01, P = 0.627967 Days, E = 131.099504 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
8.83	8.86	8.72	5.00	4.56	1.64	4.89	0.11	3.83	0.14	3.86	0.18	1.39	0.38	0.28



### Stellar Parameters For KIC 003456780

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$7865^{+216}_{-351}$	$3.991^{+0.176}_{-0.144}$	$0.210^{+0.150}_{-0.400}$	$2.351^{+0.565}_{-0.565}$	$1.974^{+0.249}_{-0.373}$	$0.214^{+0.204}_{-0.089}$
	+3%/-4%	+4%/-4%	+71%/-190%	+24%/-24%	+13%/-19%	+95%/-42%
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 003456780-01 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-211 \pm 12$	$3.56^{+0.82}_{-0.82}$	$5495^{+387}_{-431}$	$7702^{+1293}_{-864}$	$2.930^{+2.012}_{-0.990}$
Alt.	$-250 \pm 28$	$4.10^{+0.78}_{-0.83}$	$5491^{+379}_{-385}$	$7454^{+1043}_{-797}$	$2.672^{+1.445}_{-0.846}$

$T_{\text{max}}$  = Theoretical Maximum Planetary Temperature

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

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

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



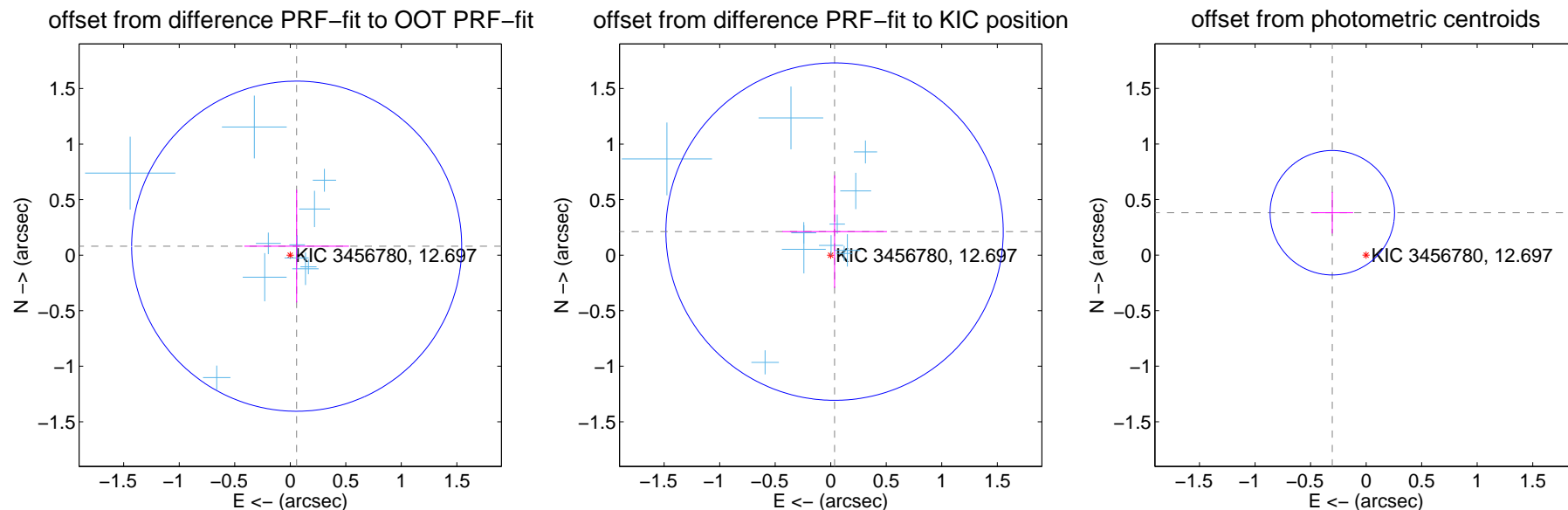
## DV Centroid Data

Supplemental centroid analysis for 003456780-01. Kepler magnitude: 12.70. Transit SNR 12.43

There are 11 quarters with good PRF difference image offsets

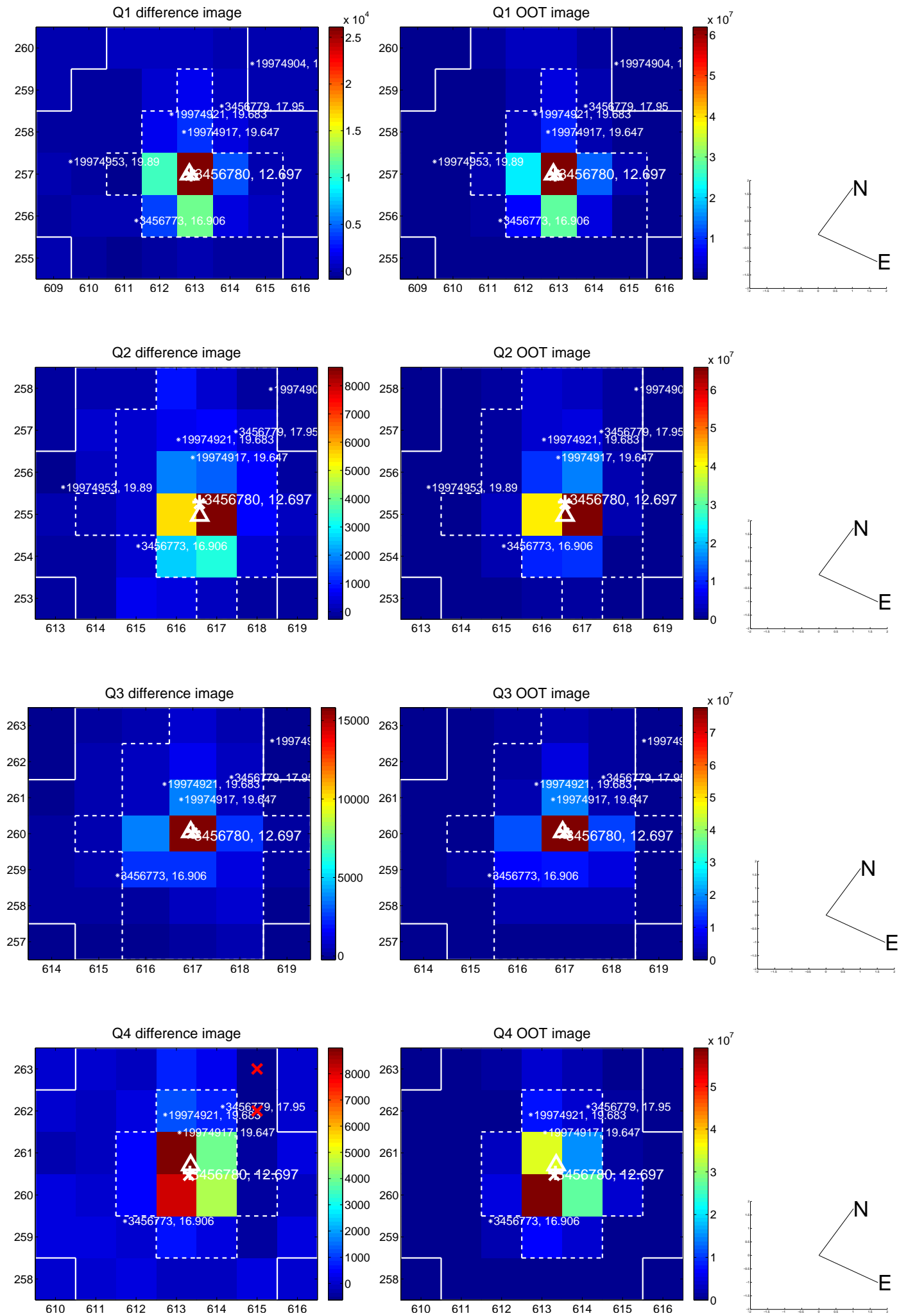
The direct PRF centroid is offset from the target star catalog position by about 0.13 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.099 \pm 0.495$	0.20	$-0.058 \pm 0.471$	$0.081 \pm 0.507$
PRF-fit source offset from KIC position	$0.215 \pm 0.506$	0.42	$-0.035 \pm 0.471$	$0.212 \pm 0.507$
photometric centroid source offset	$0.49 \pm 0.19$	2.61	$0.30 \pm 0.19$	$0.38 \pm 0.19$

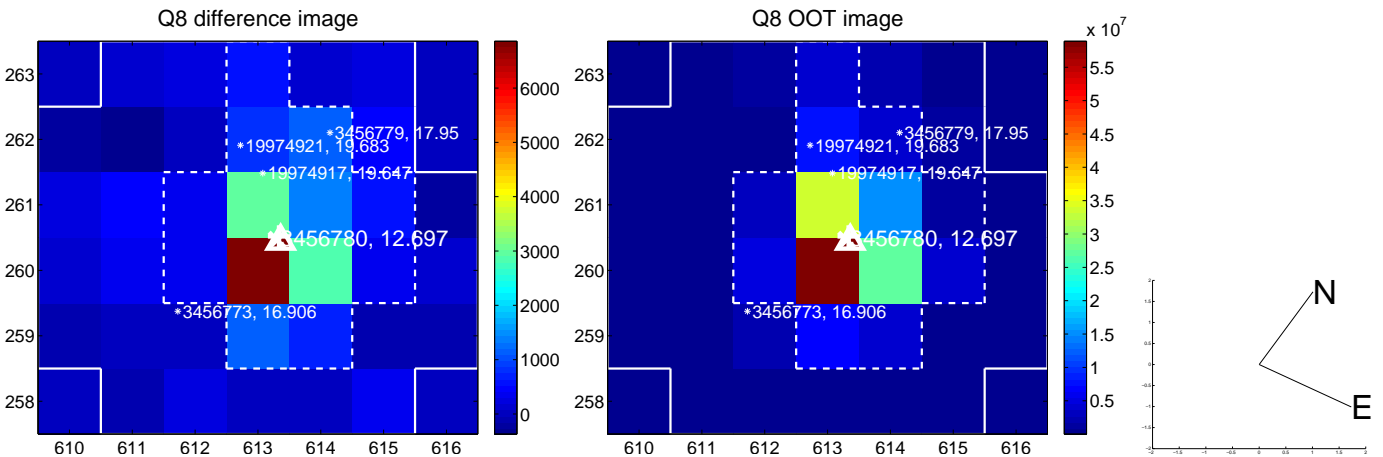
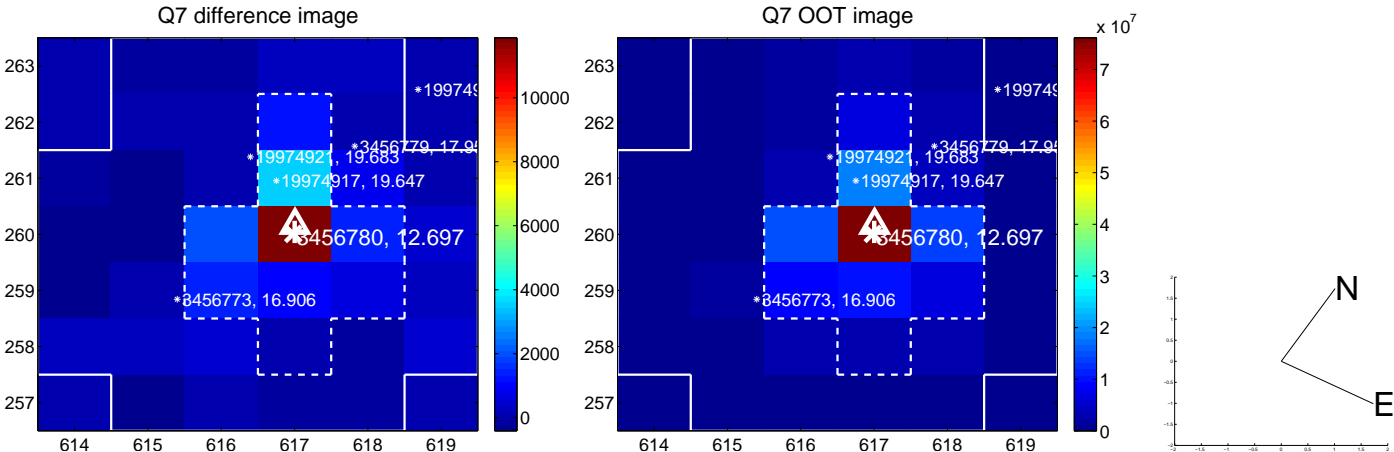
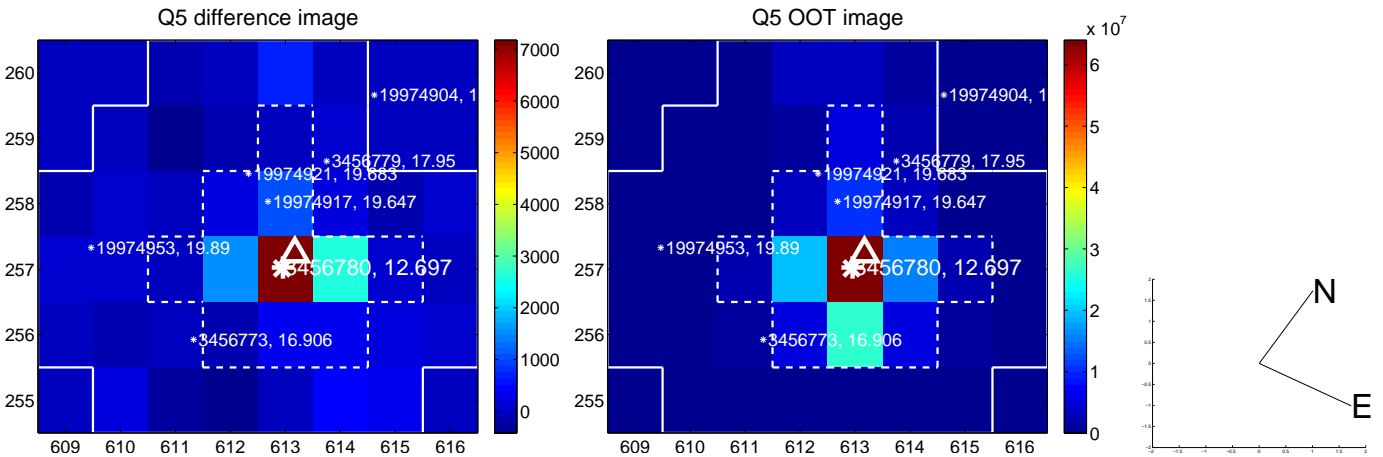


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

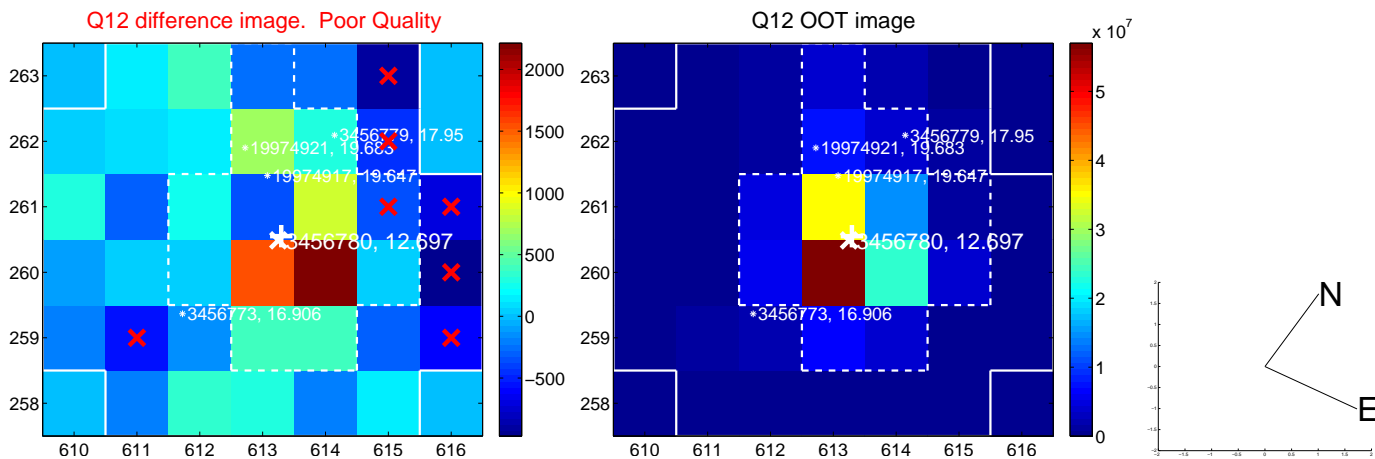
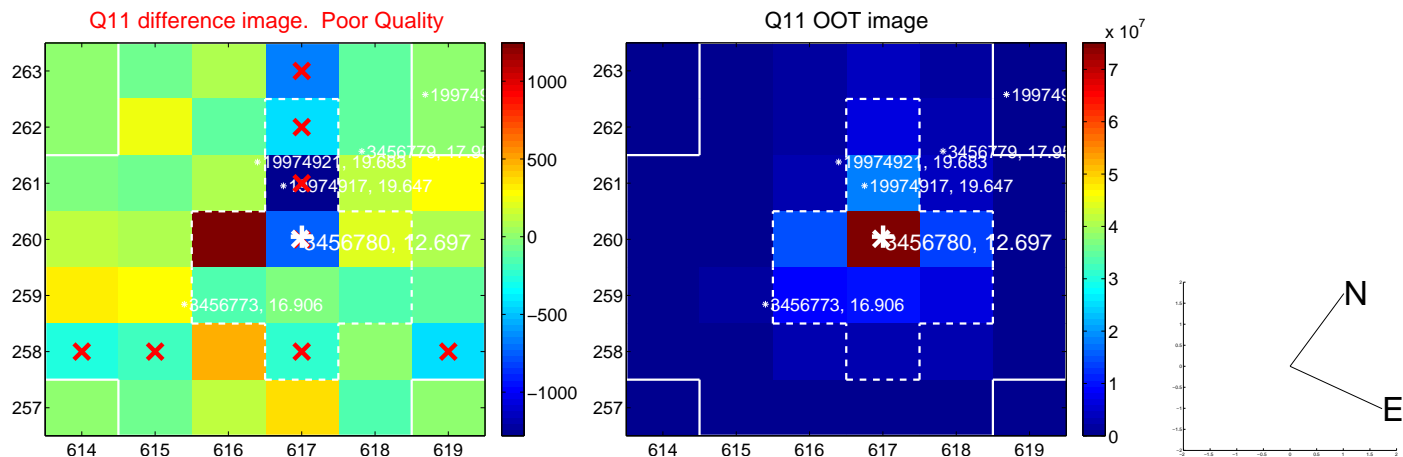
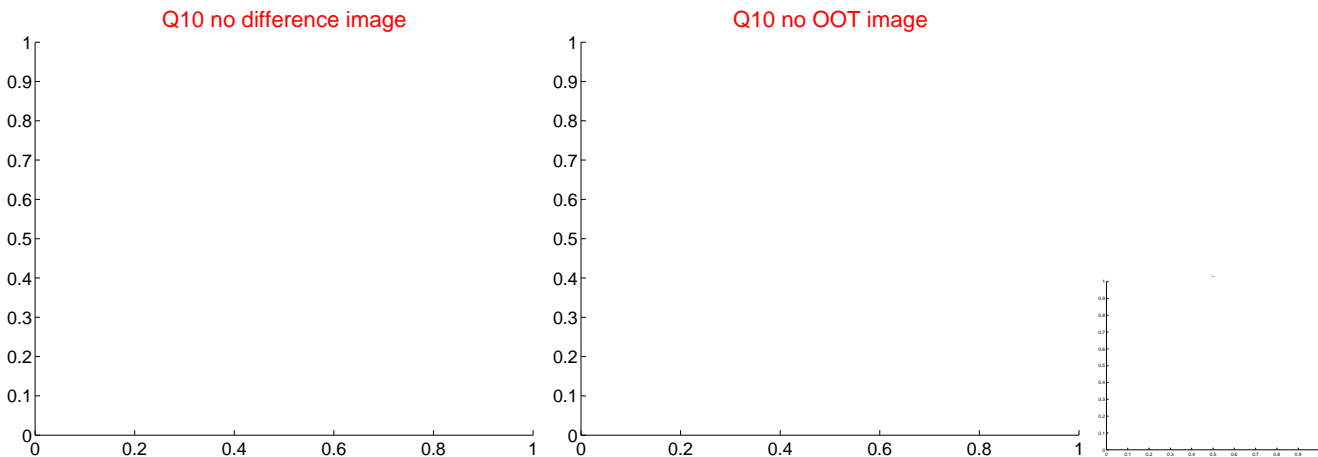
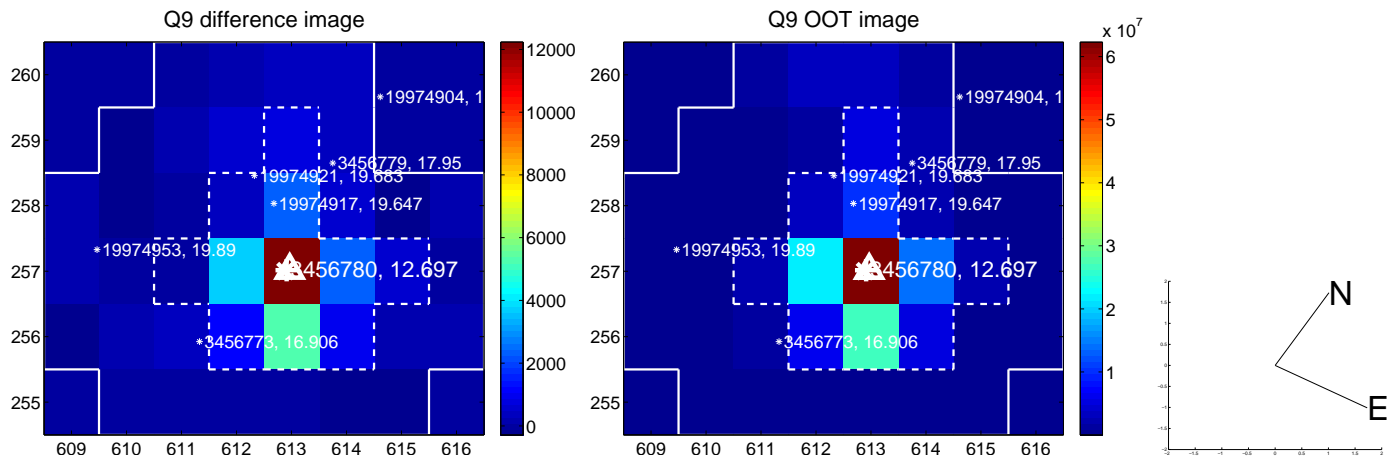


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

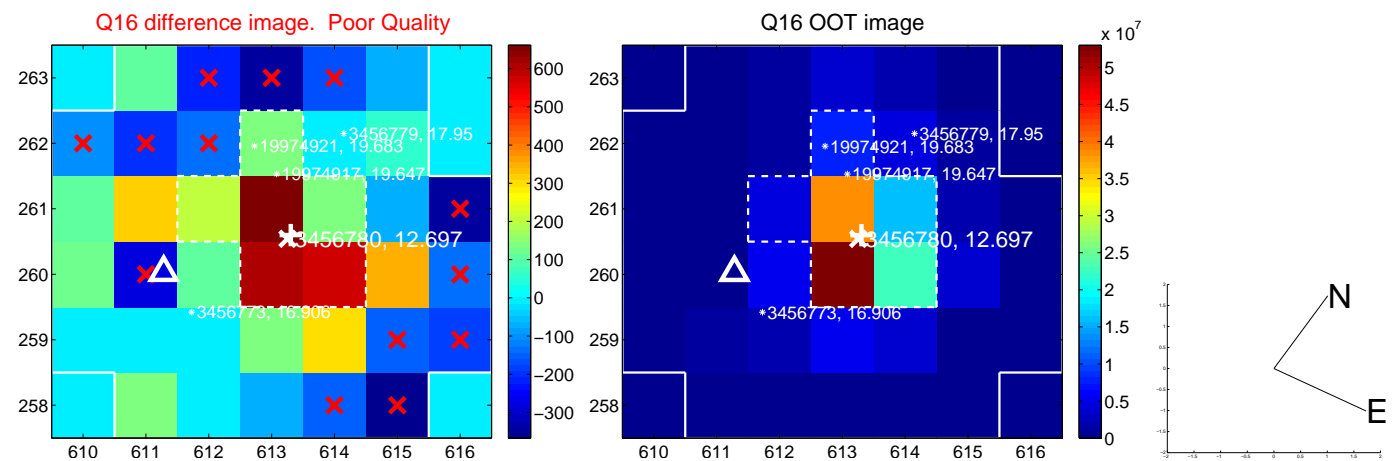
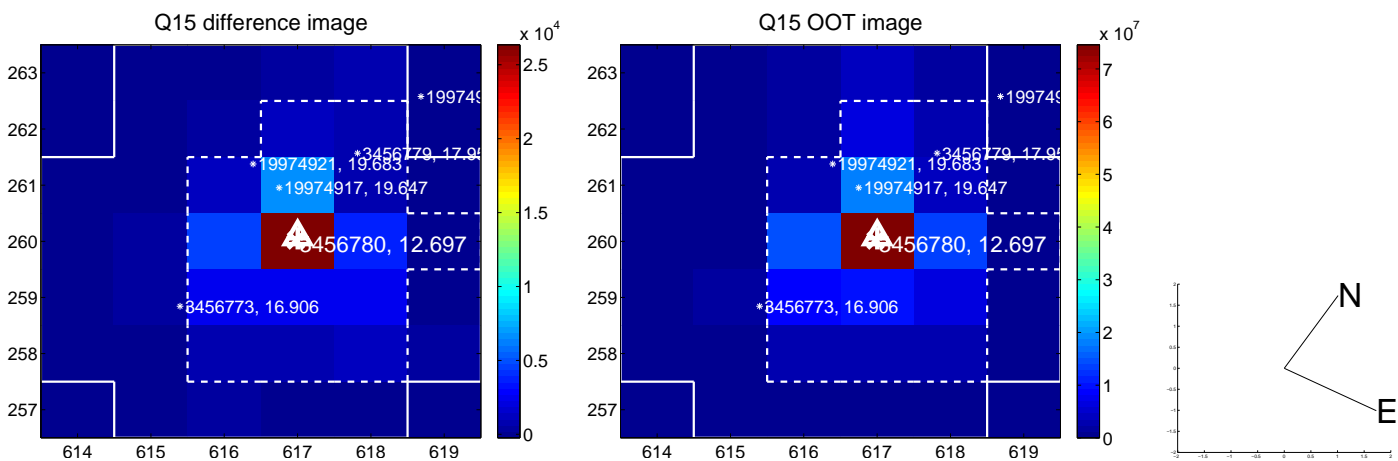
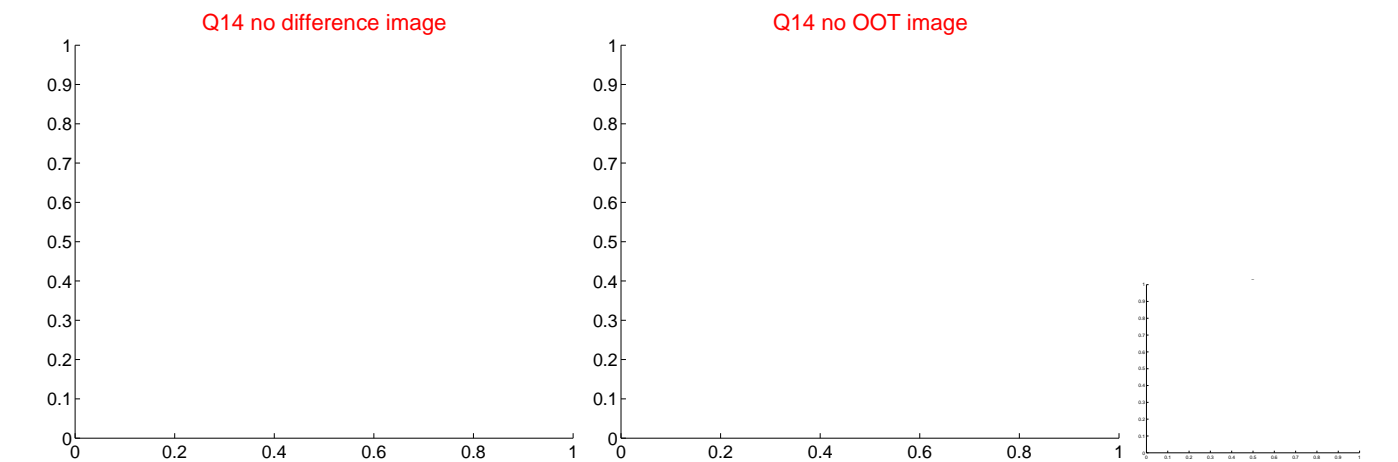
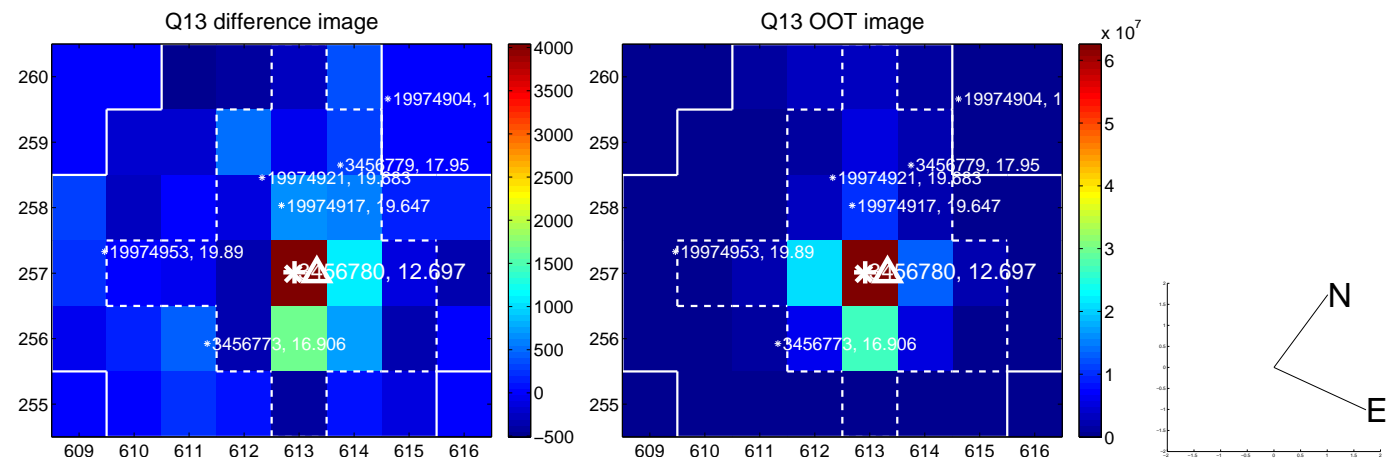




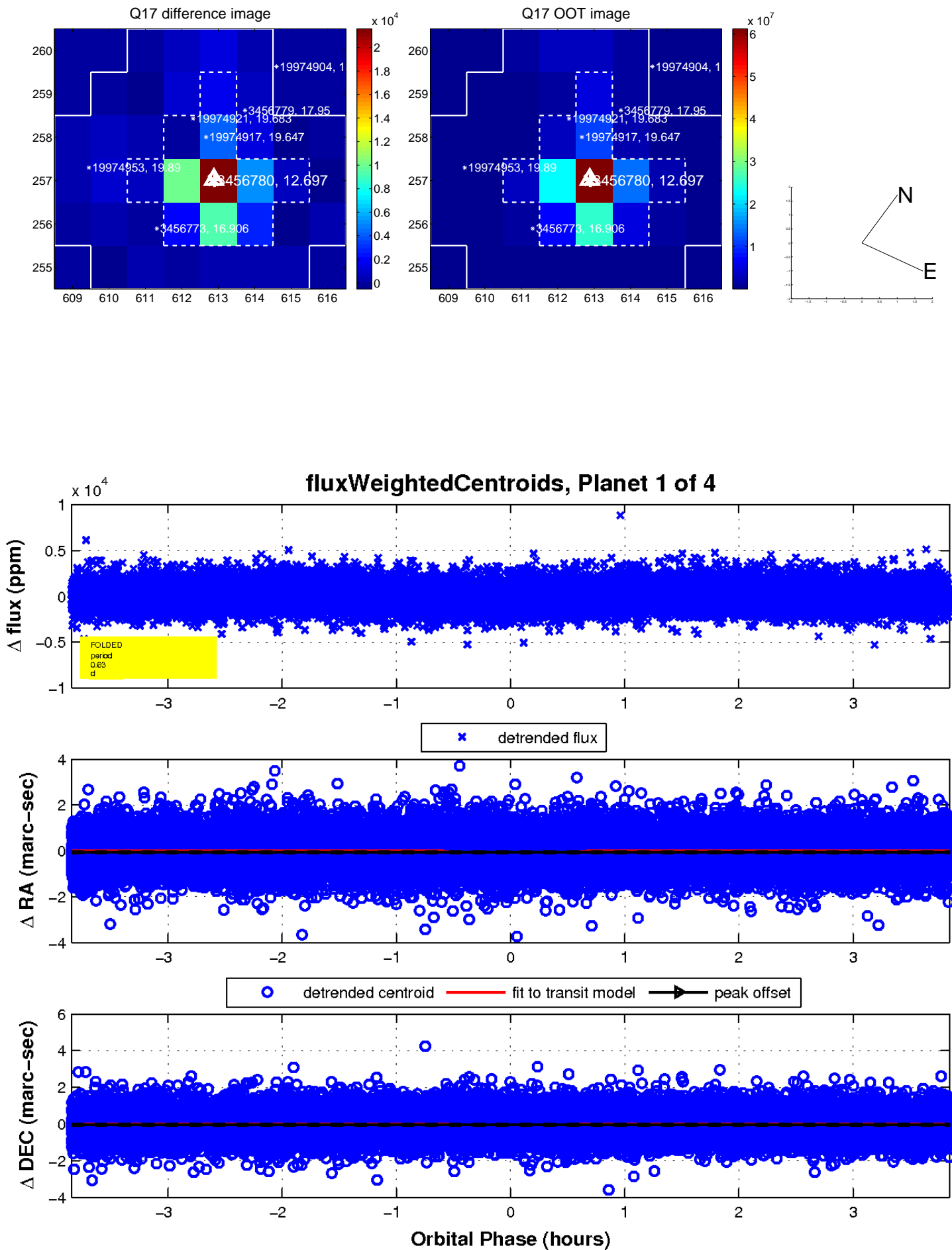
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white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

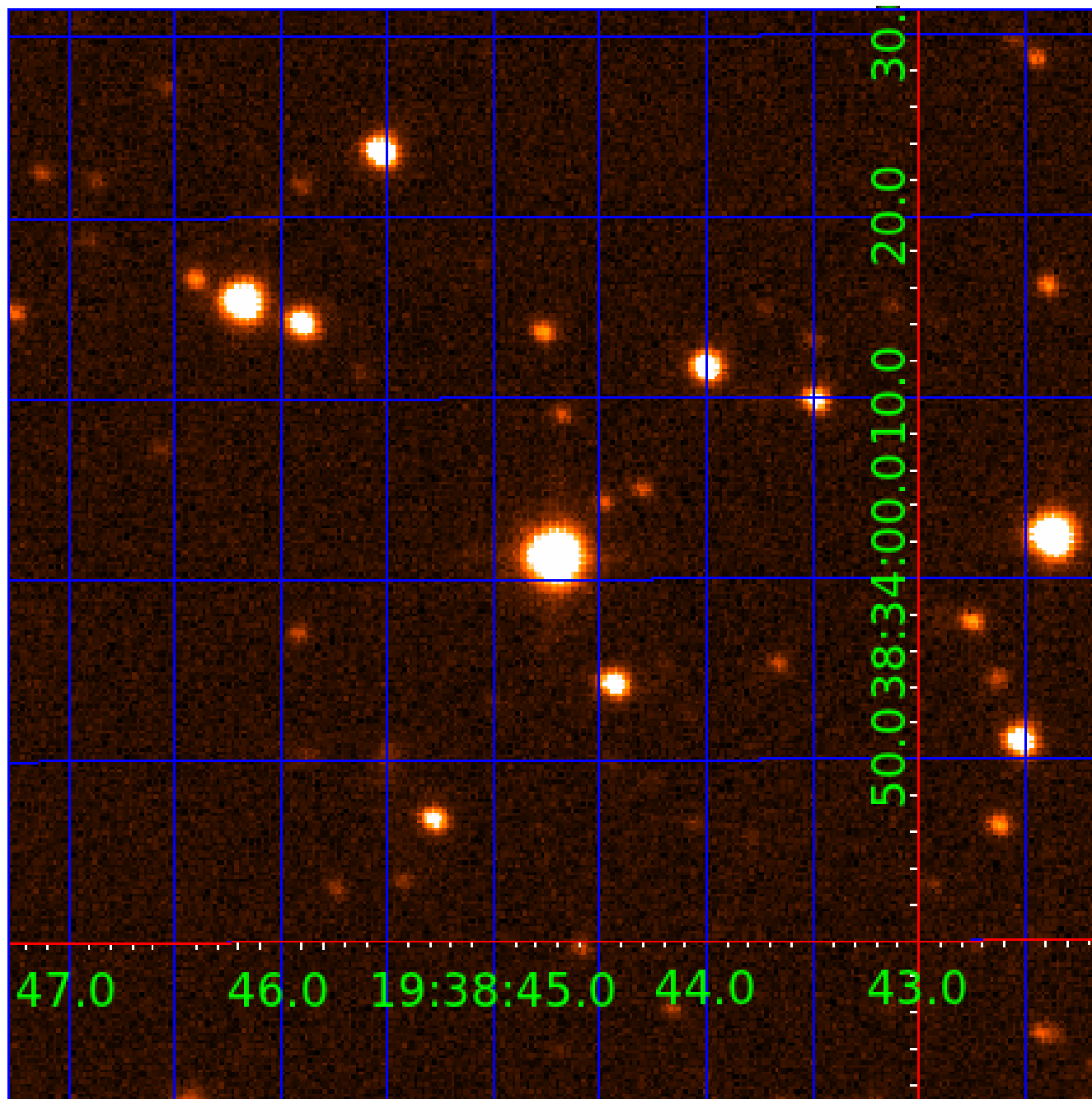


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 003456780

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
003456780-01	OBS	No	0.627966	131.732143	169.1	1.282	12.5	12.4	2.35	7865	3.57	58426.47
003456780-02	OBS	No	0.627967	131.874807	247.3	1.246	11.0	16.1	2.35	7865	4.31	58426.34
003456780-03	OBS	No	0.627959	131.573763	193.8	1.237	10.6	13.5	2.35	7865	3.82	58427.38
003456780-04	OBS	No	7.997527	133.193357	174.5	3.500	8.0	-1.0	2.35	7865	3.15	1964.49

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
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003456780-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—SAME_NTL_PERIOD
003456780-03	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD
003456780-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_ZUMA—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_ALT—CENT_NOFITS

**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.

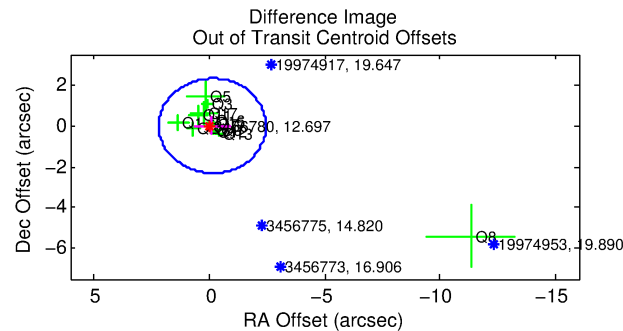
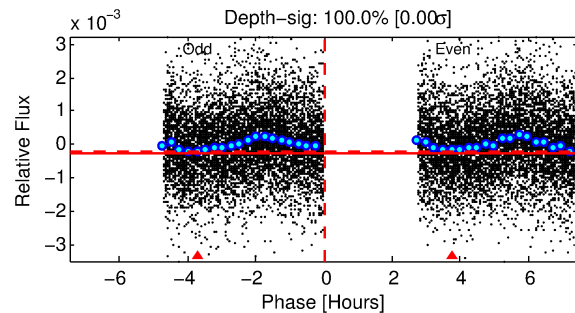
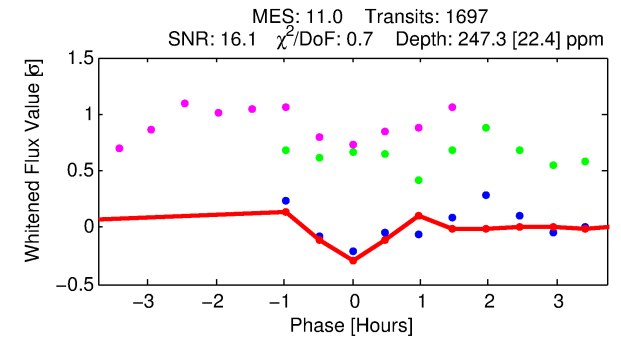
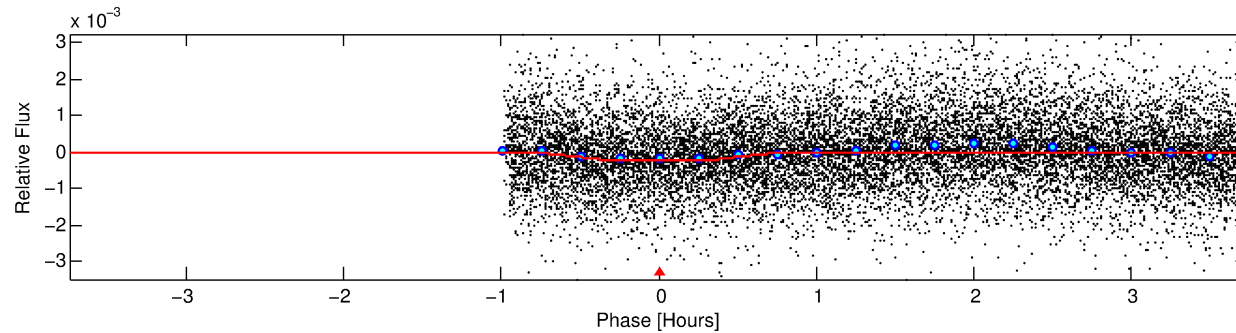
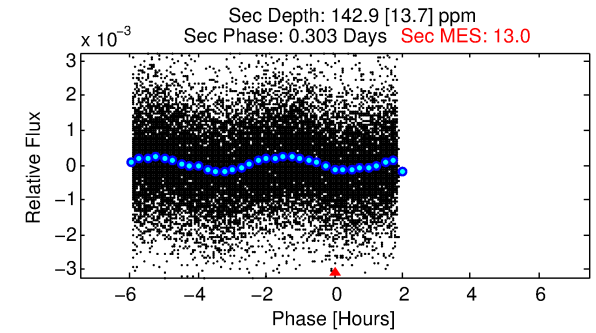
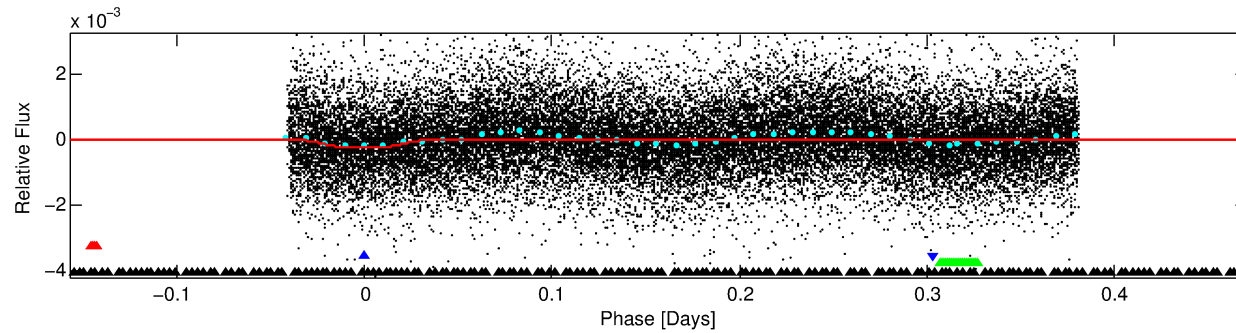
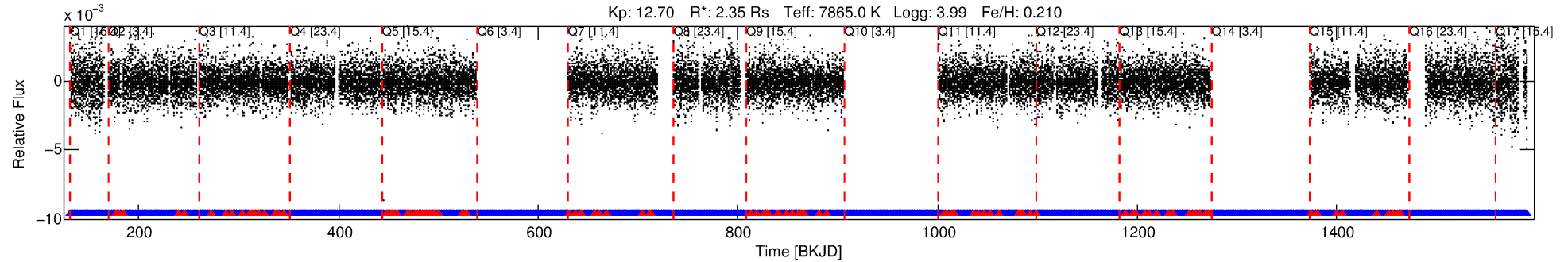
Ephemeris Match Information For 003456780-02

No Significant Match Found



# DV One-Page Summary

KIC: 3456780 Candidate: 2 of 4 Period: 0.628 d



## DV Fit Results:

Period = 0.62797 [0.00001] d  
Epoch = 131.8748 [0.0007] BKJD  
Rp/R\* = 0.0168 [0.0033]  
a/R\* = 2.05 [1.85]  
b = 0.90 [0.25]  
Seff = 58426.34 [21108.61]  
Teq = 3964 [358] K  
Rp = 4.31 [1.34] Re  
a = 0.0180 [0.0038] AU  
Ag = 1.37 [0.71] [0.53σ]  
Teffp = 6633 [738] K [3.25σ]

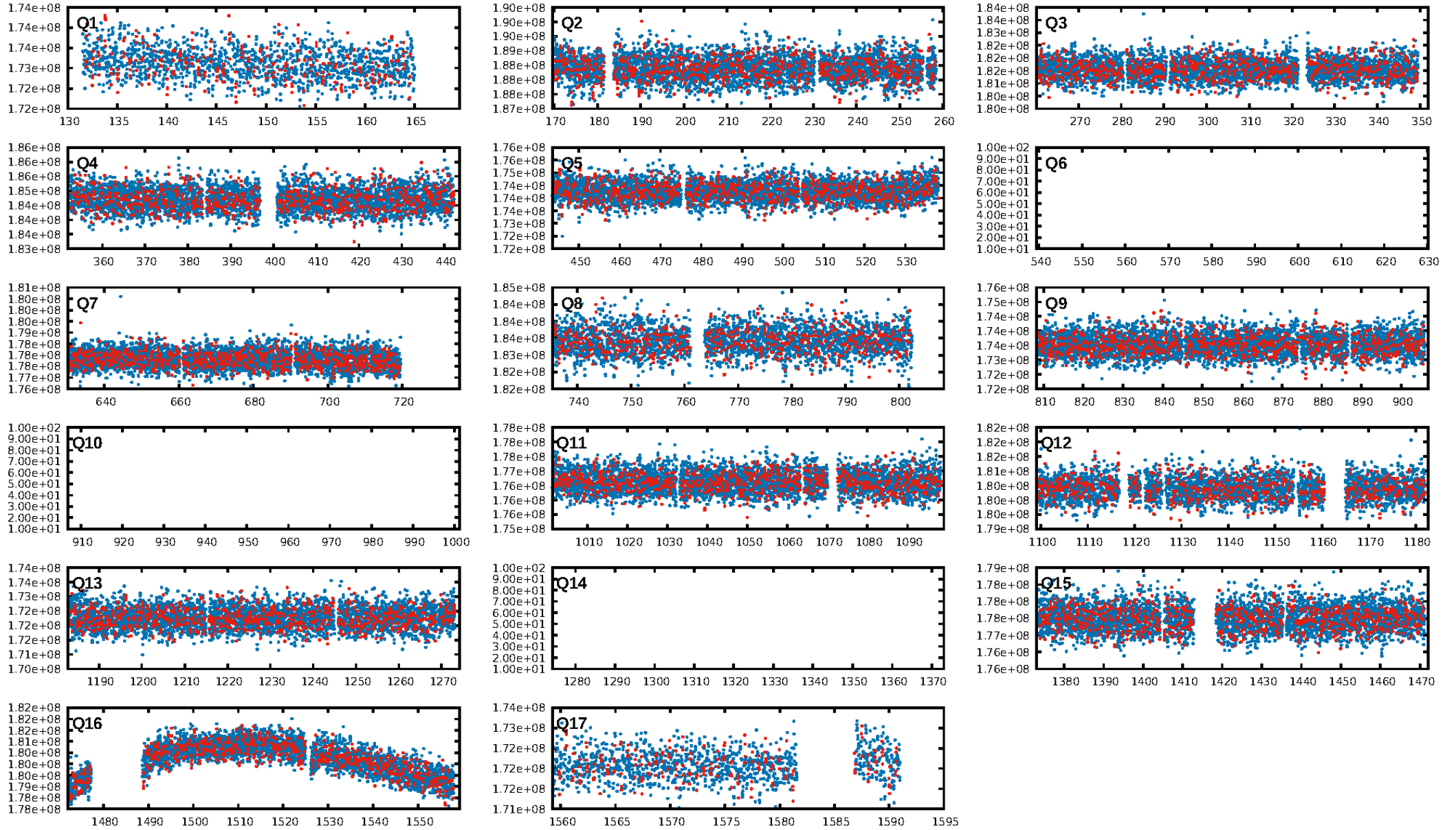
## DV Diagnostic Results:

ShortPeriod-sig: 0.0% [0.00σ]  
LongPeriod-sig: 100.0% [47.61σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 0.93 [1495/1601]  
GhostDiagnostic-chr: 1.692  
Centroid-sig: 0.0%  
Centroid-so: 0.240 arcsec [1.83σ]  
OotOffset-rm: 0.141 arcsec [0.18σ]  
KicOffset-rm: 0.130 arcsec [0.27σ]  
OotOffset-st: 1/4/4/5 [14]  
KicOffset-st: 1/4/4/5 [14]  
DiffImageQuality-fgm: 0.93 [13/14]  
DiffImageOverlap-fno: 0.00 [0/14]

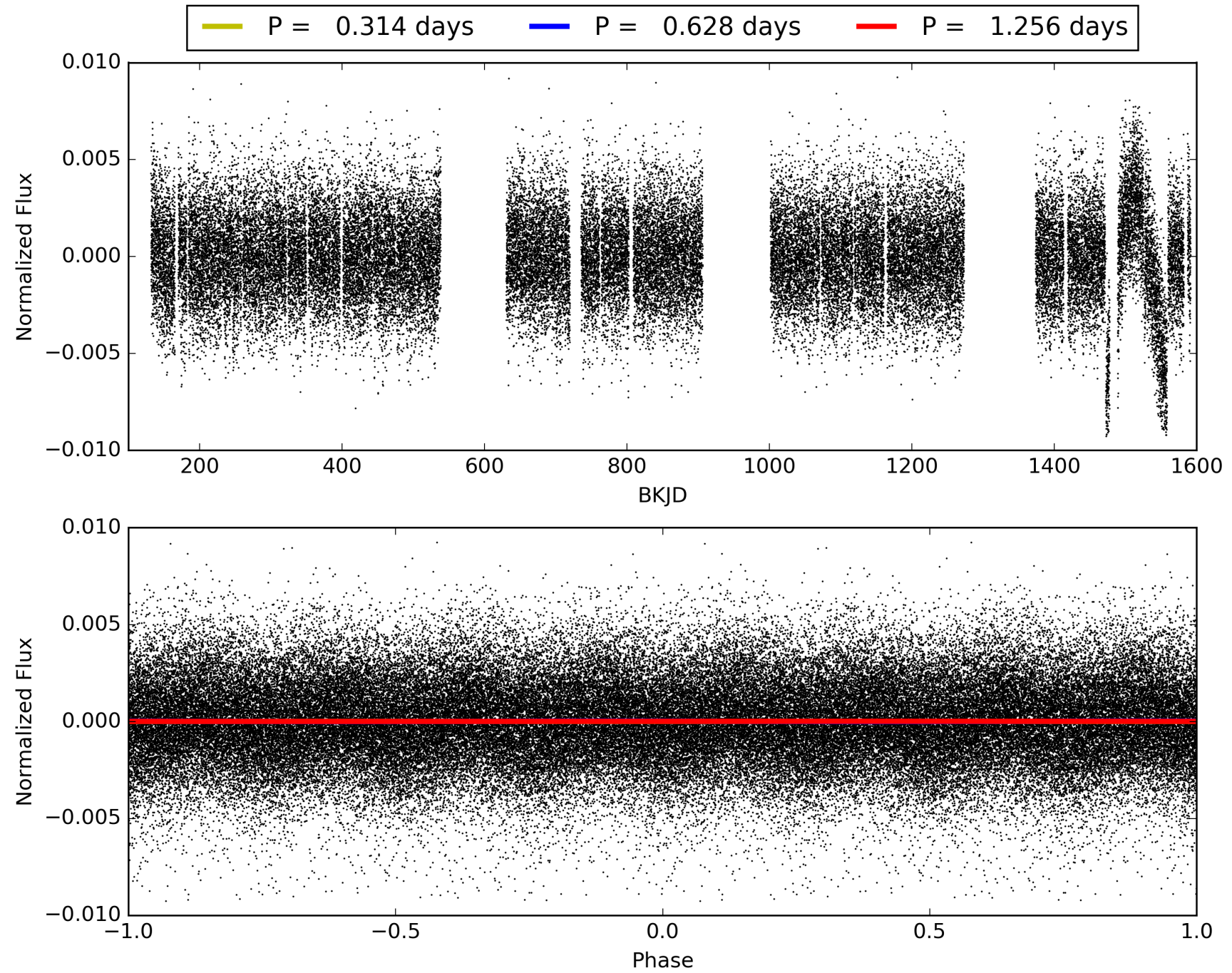
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 21:30:42 Z

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

# TCE 003456780-02, PDC Light Curves

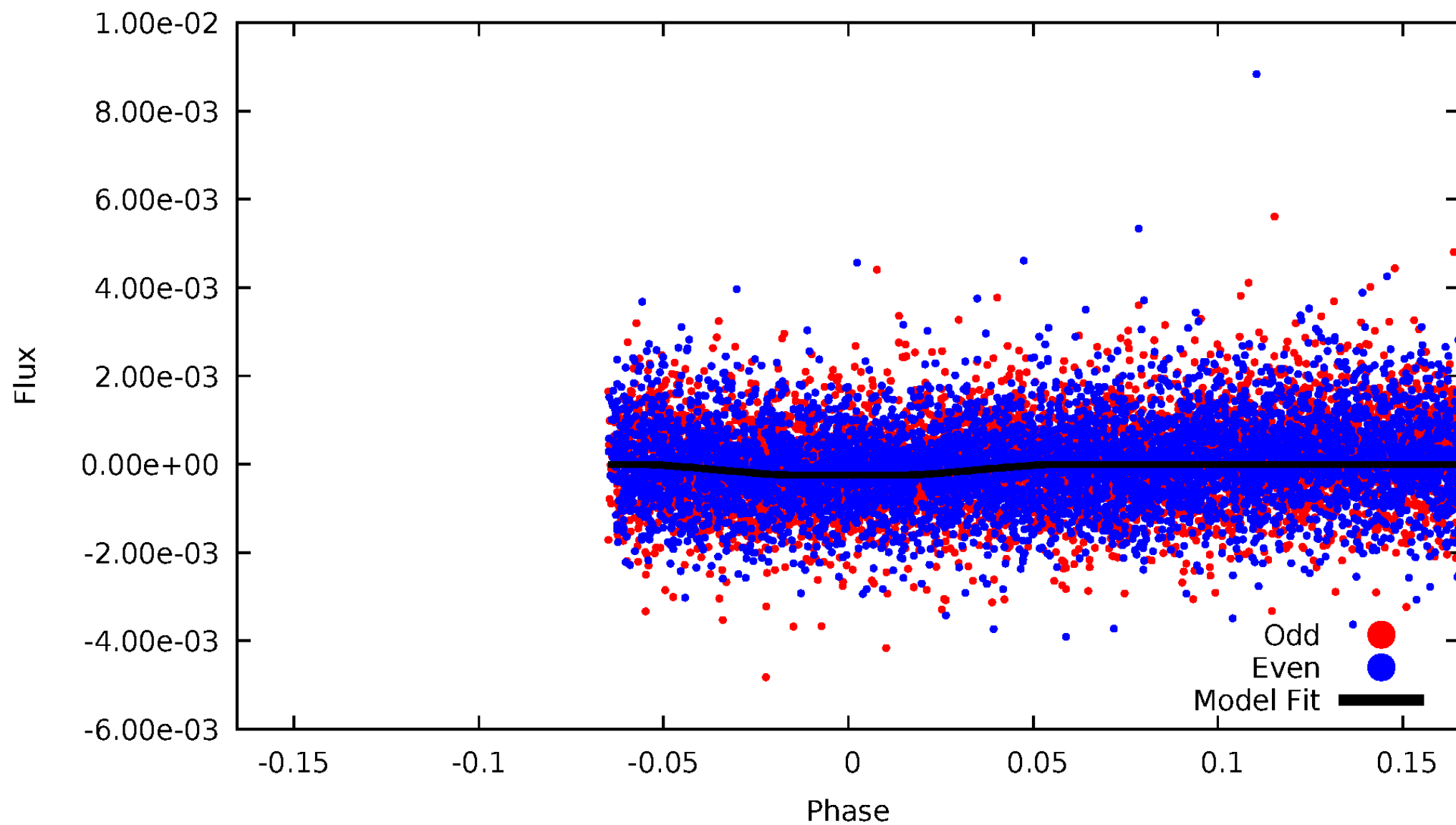


TCE 003456780-02



# DV Odd/Even

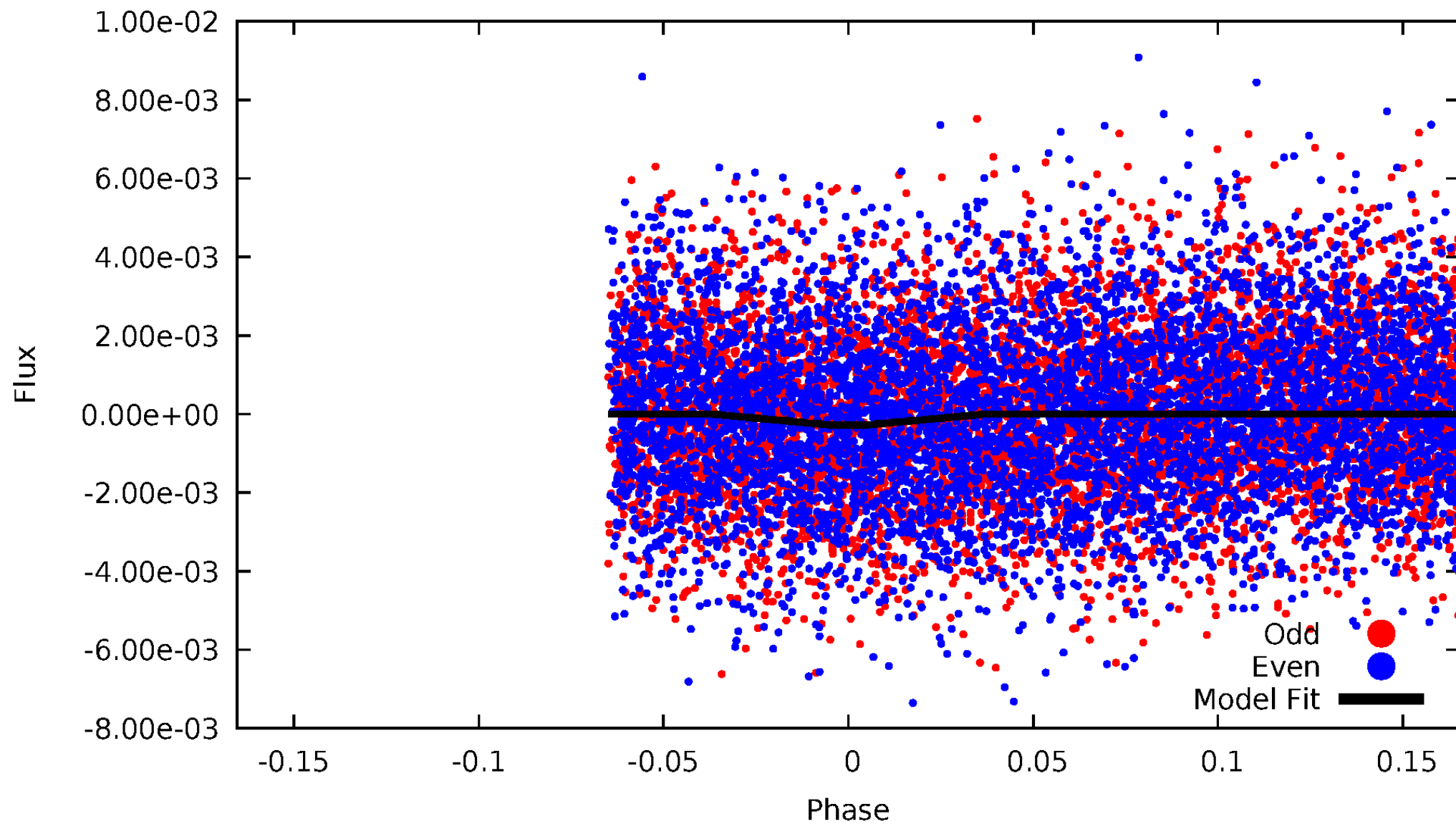
TCE 003456780-02





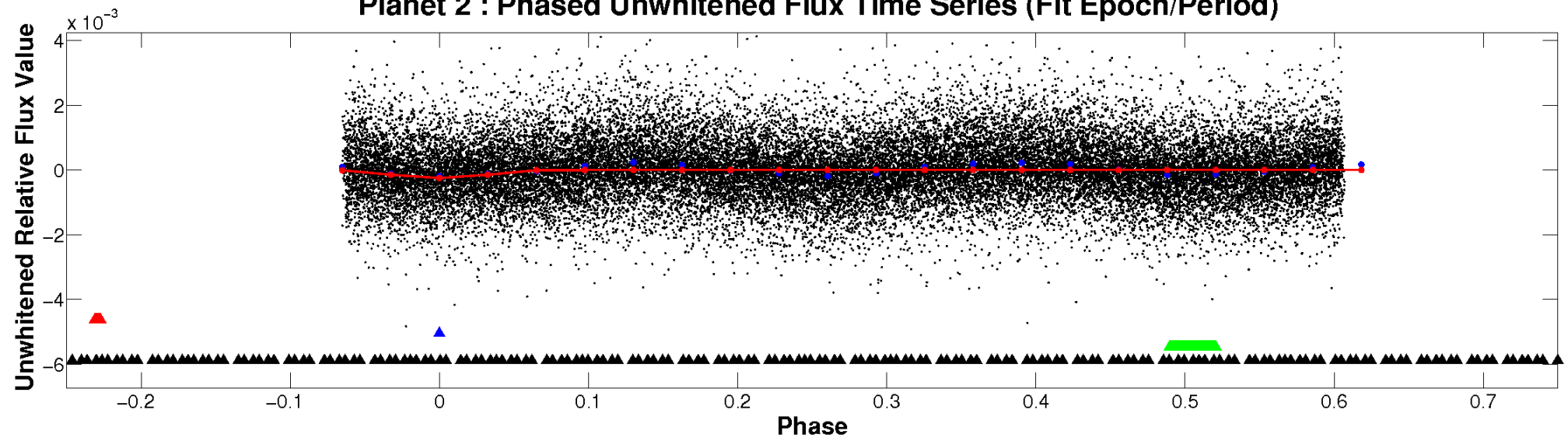
# ALT Odd/Even

TCE 003456780-02

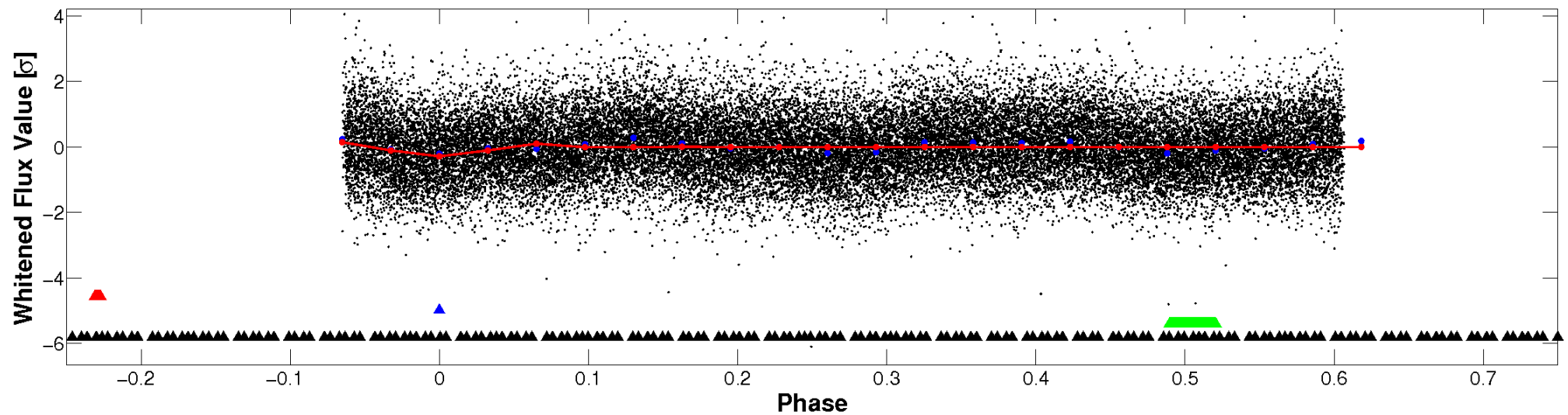


# Non-Whitened Vs. Whitened Light Curve

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

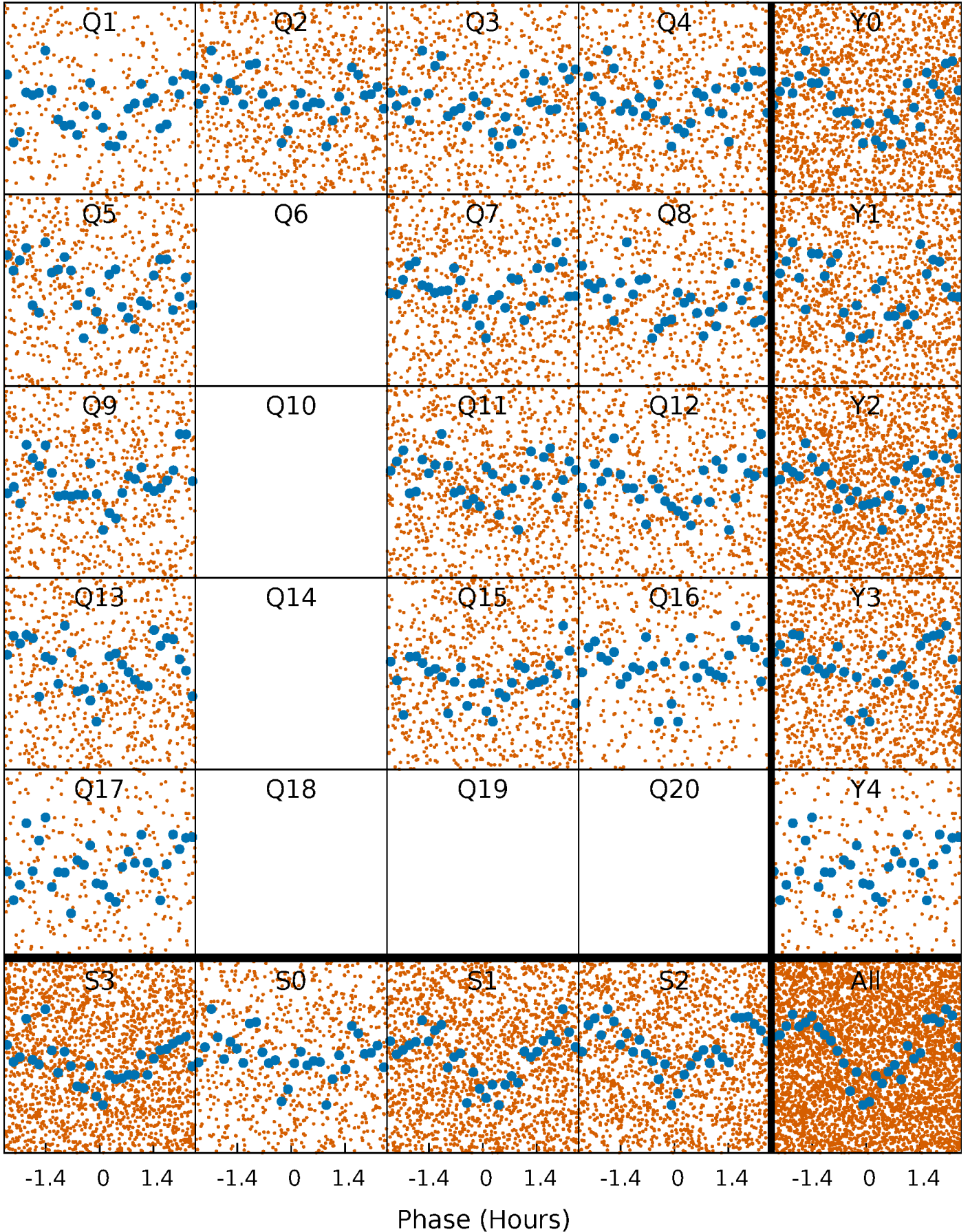


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



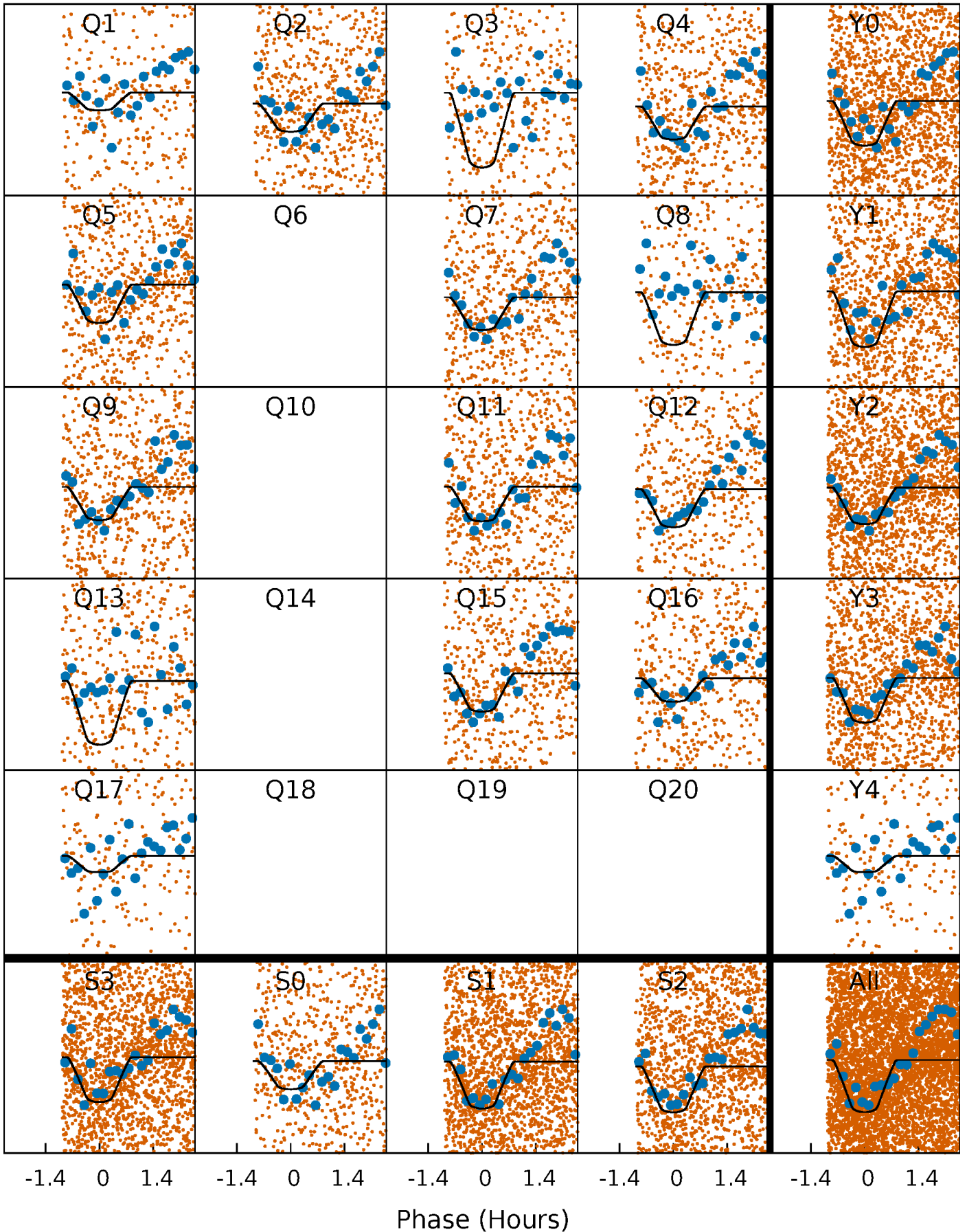
# PDC Quarter-Phased Transit Curves

TCE 003456780-02   P= 0.627967 Days    $T_0=131.874807$  (BKJD)



# DV Quarter-Phased Transit Curves

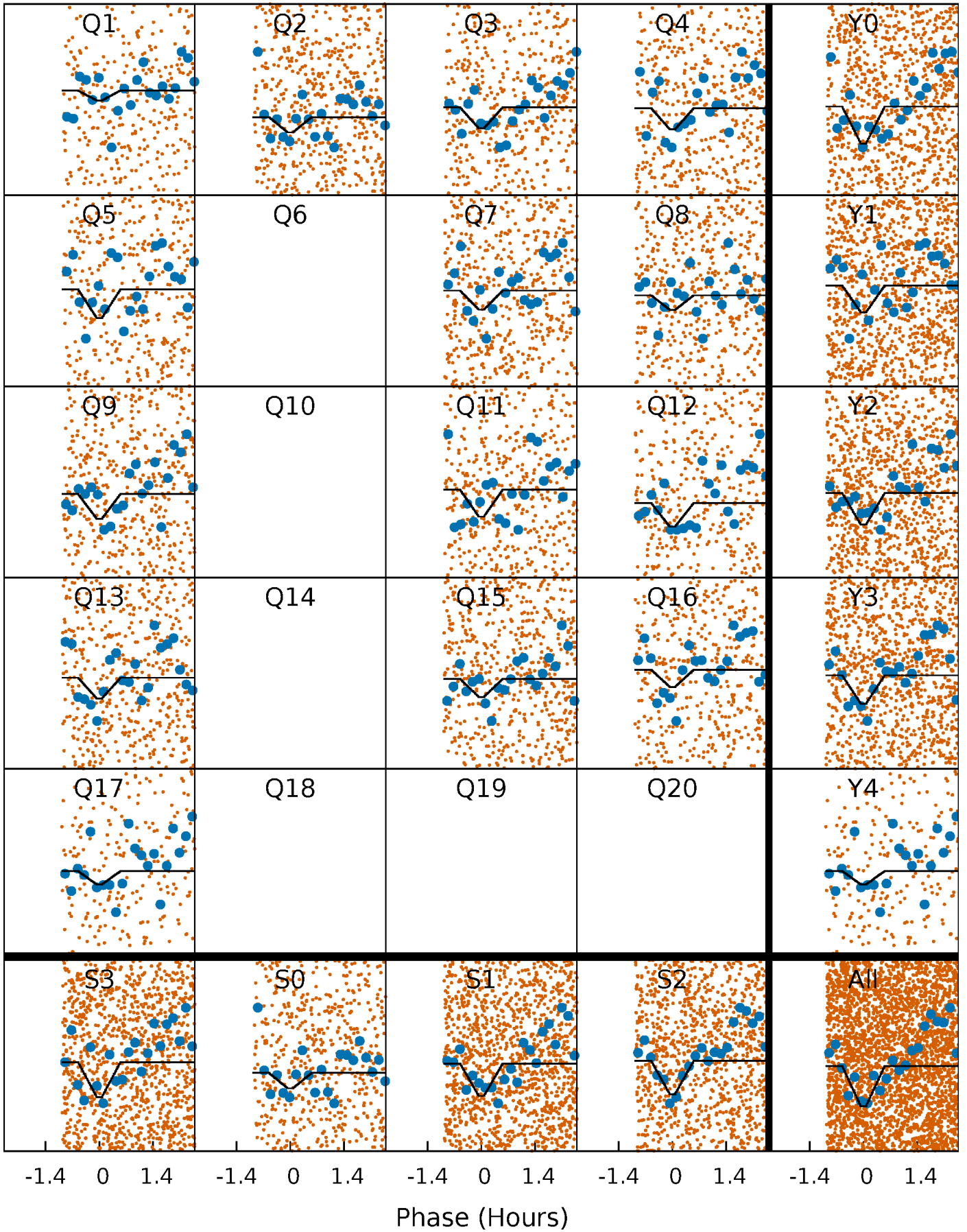
TCE 003456780-02    P= 0.627967 Days     $T_0=131.874807$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

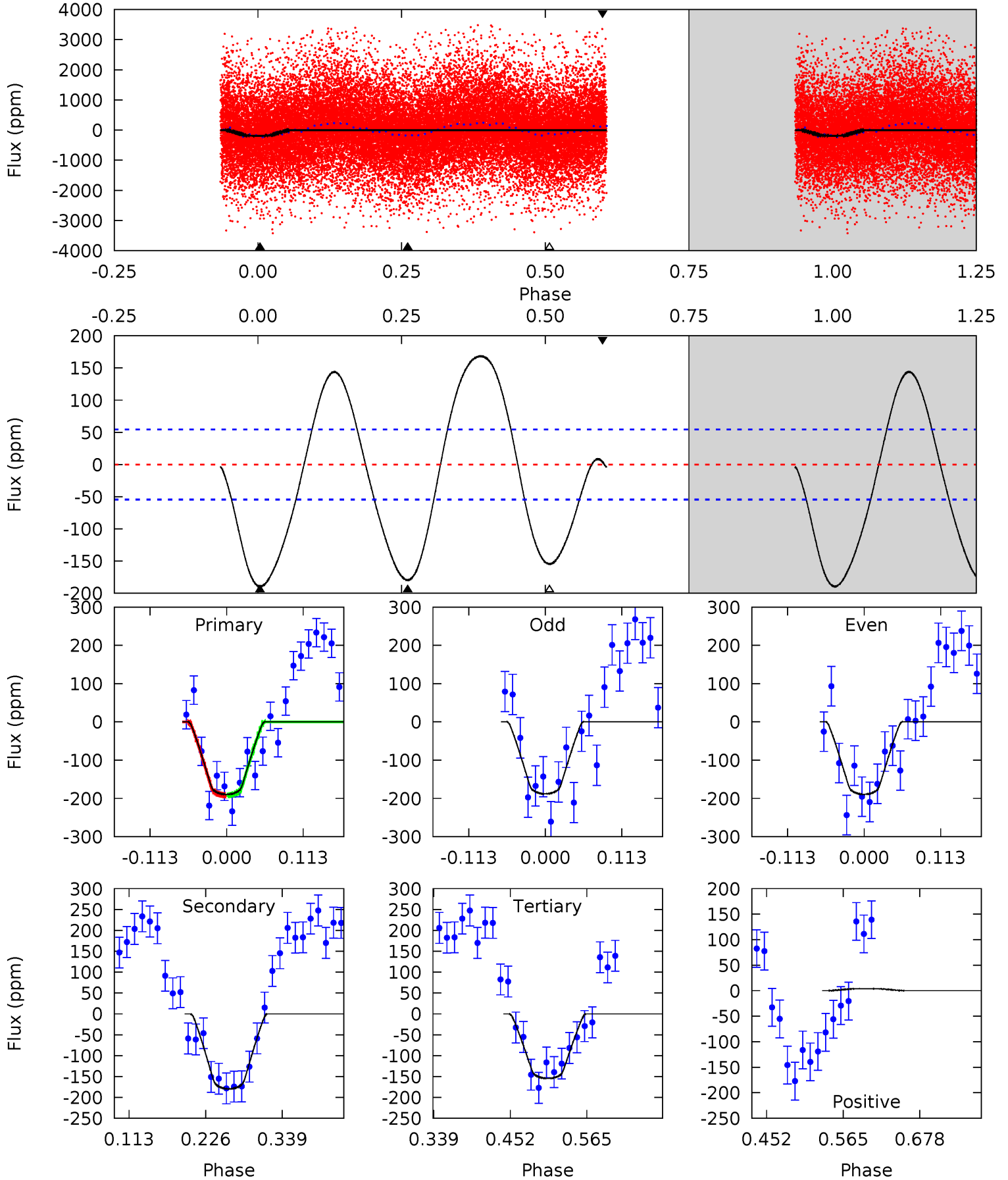
TCE 003456780-02    P= 0.627967 Days     $T_0=131.874807$  (BKJD)



# DV Model-Shift Uniqueness Test

003456780-02, P = 0.627967 Days, E = 131.246840 Days

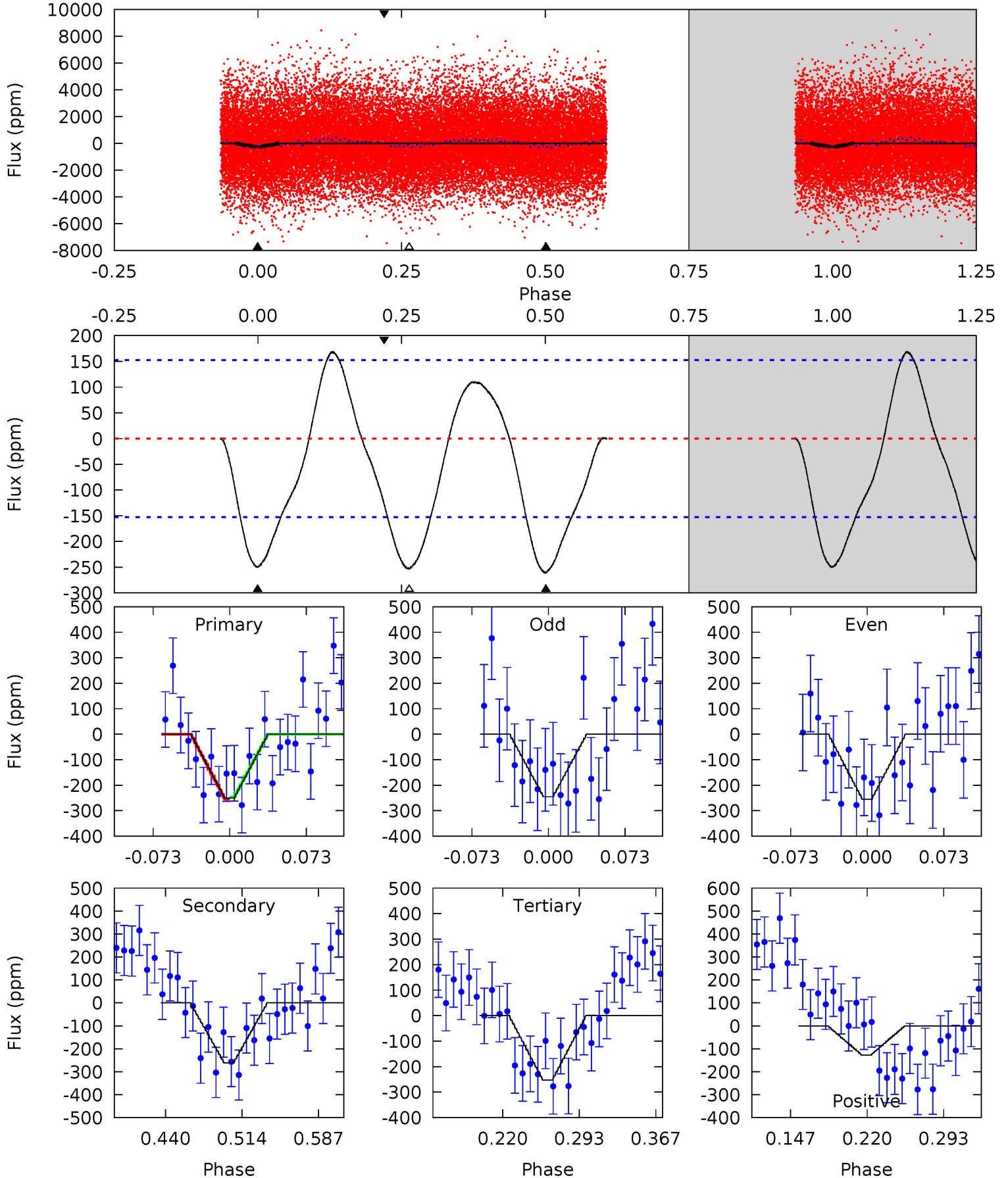
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
15.8	15.0	12.9	0.33	4.54	1.58	9.51	2.91	15.5	2.08	14.6	0.05	0.95	0.47	0.01



# Alt Model-Shift Uniqueness Test

003456780-02, P = 0.627967 Days, E = 131.246840 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
7.59	7.92	7.67	-3.85	4.63	1.79	3.76	-0.08	11.4	0.25	11.8	0.14	1.02	0.39	0.11



### Stellar Parameters For KIC 003456780

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$7865^{+216}_{-351}$	$3.991^{+0.176}_{-0.144}$	$0.210^{+0.150}_{-0.400}$	$2.351^{+0.565}_{-0.565}$	$1.974^{+0.249}_{-0.373}$	$0.214^{+0.204}_{-0.089}$
	+3%/-4%	+4%/-4%	+71%/-190%	+24%/-24%	+13%/-19%	+95%/-42%
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 003456780-02 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-180 \pm 12$	$4.31^{+0.98}_{-1.00}$	$5496^{+394}_{-390}$	$6482^{+1010}_{-688}$	$1.741^{+1.090}_{-0.613}$
Alt.	$-261 \pm 33$	$4.25^{+1.01}_{-0.99}$	$5489^{+379}_{-384}$	$7339^{+1224}_{-854}$	$2.577^{+1.667}_{-0.915}$

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



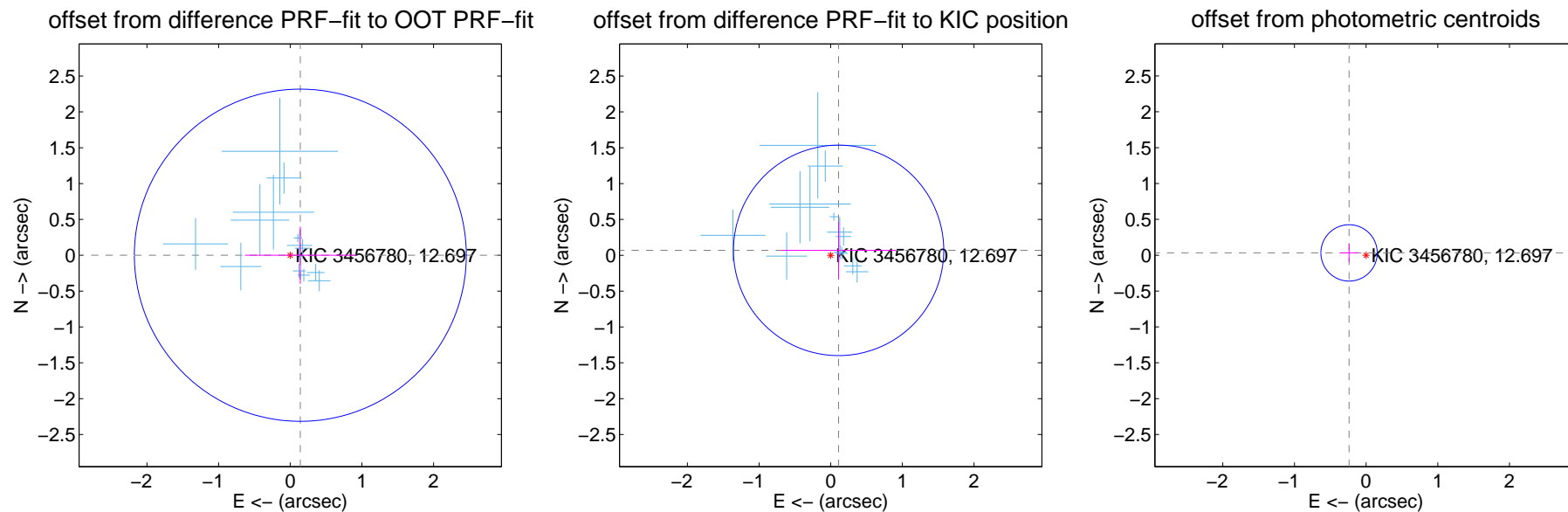
## DV Centroid Data

Supplemental centroid analysis for 003456780-02. Kepler magnitude: 12.70. Transit SNR 16.07

There are 13 quarters with good PRF difference image offsets

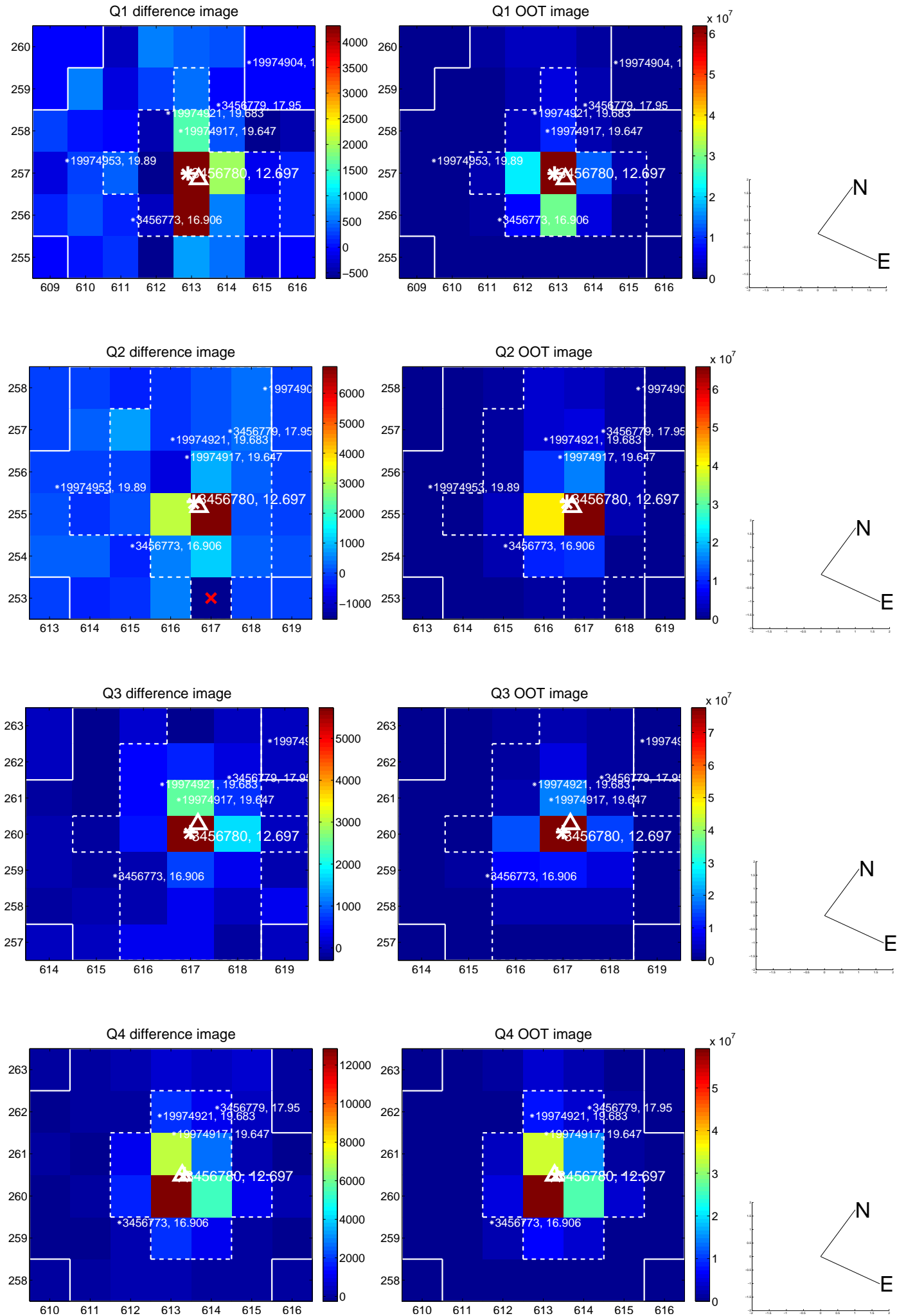
The direct PRF centroid is offset from the target star catalog position by about 0.13 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.141 \pm 0.772$	0.18	$-0.141 \pm 0.774$	$0.001 \pm 0.400$
PRF-fit source offset from KIC position	$0.130 \pm 0.489$	0.27	$-0.110 \pm 0.799$	$0.069 \pm 0.403$
photometric centroid source offset	$0.24 \pm 0.13$	1.83	$0.24 \pm 0.13$	$0.03 \pm 0.13$

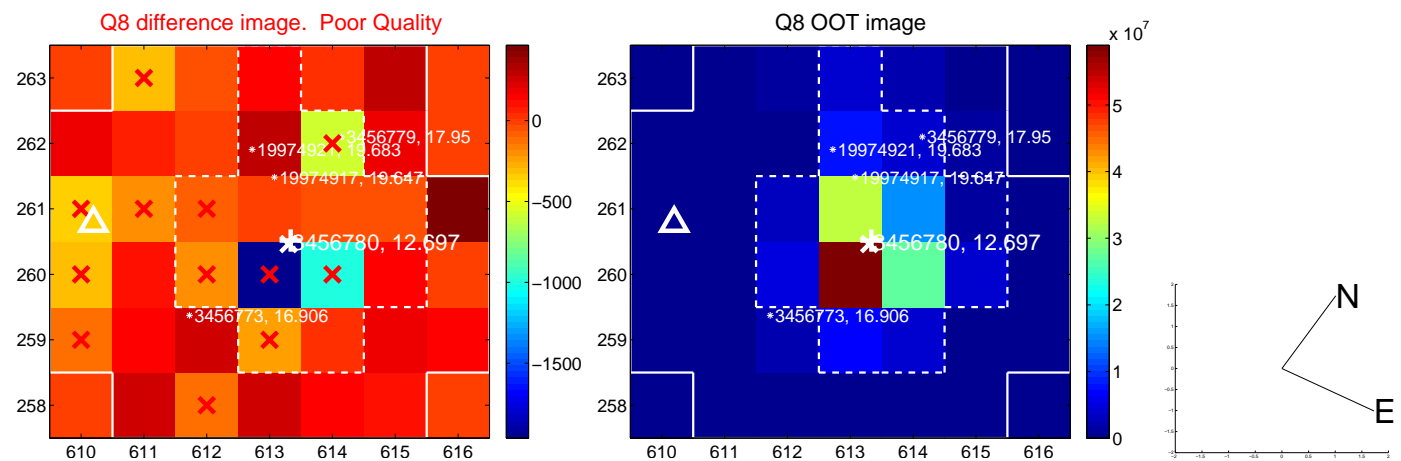
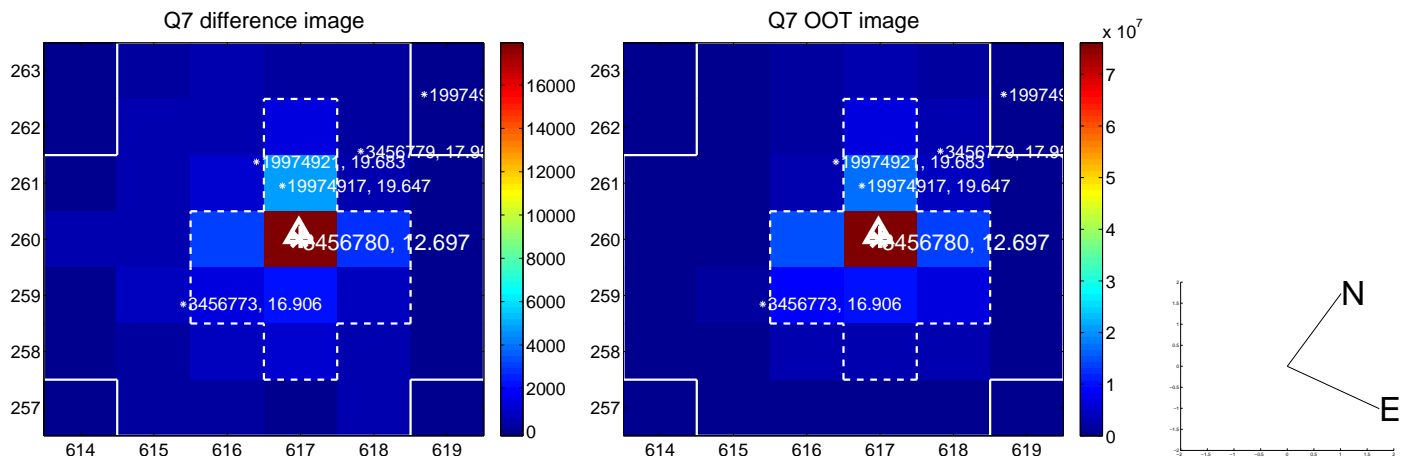
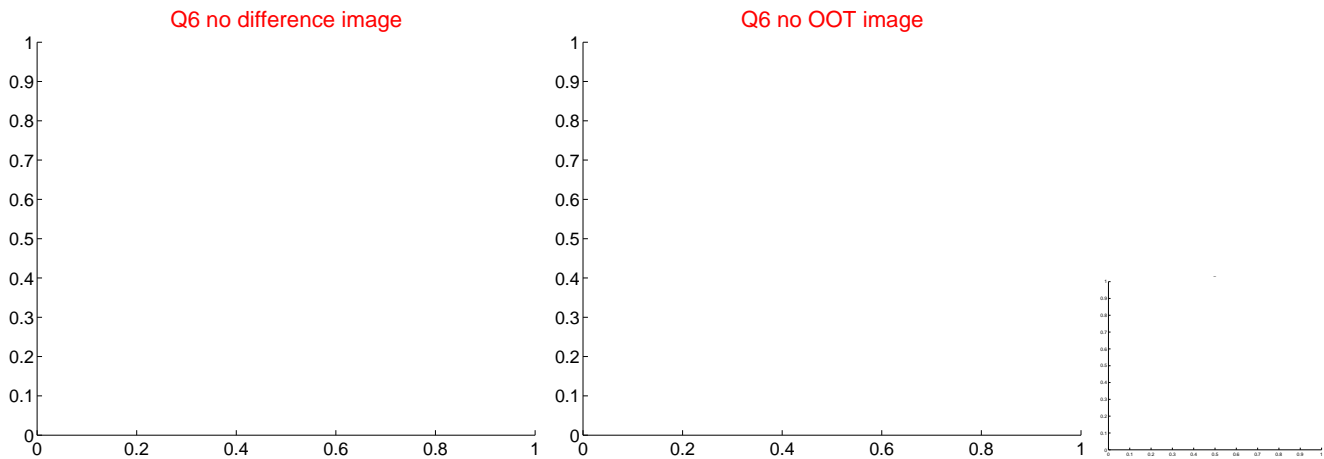
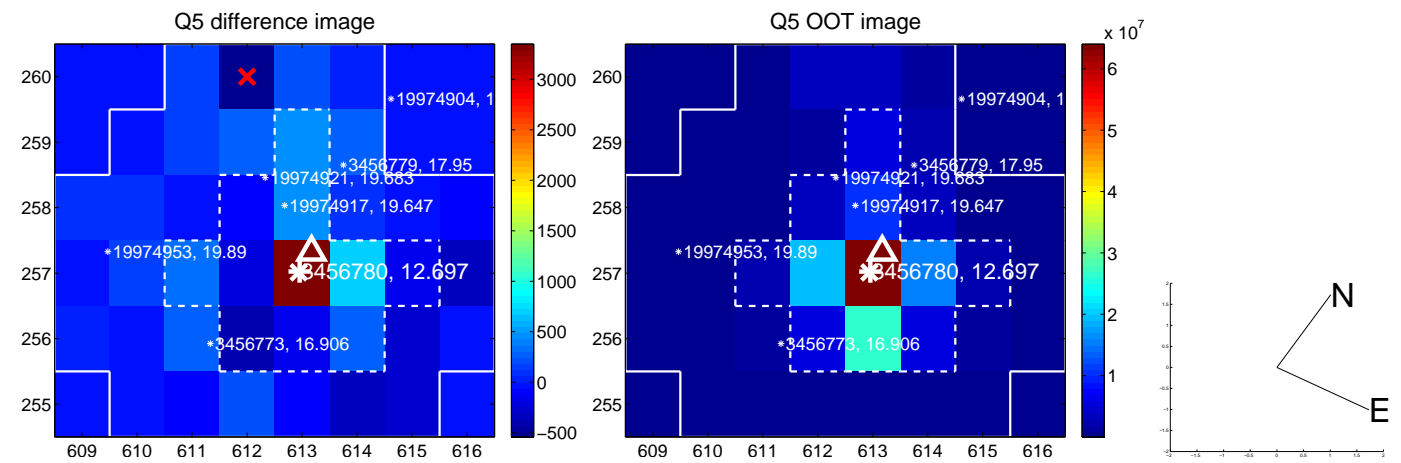


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

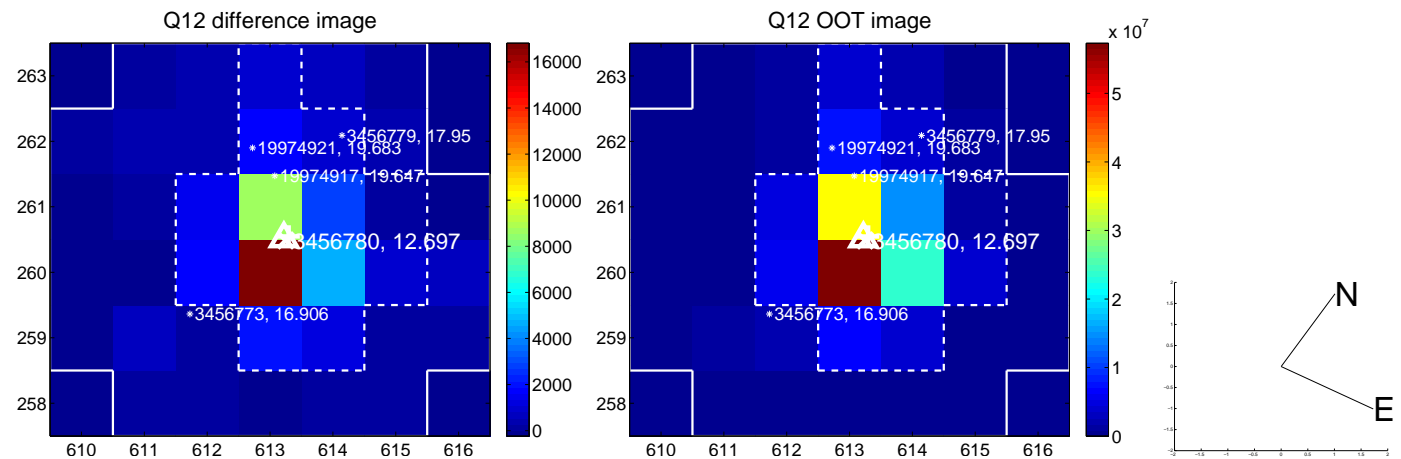
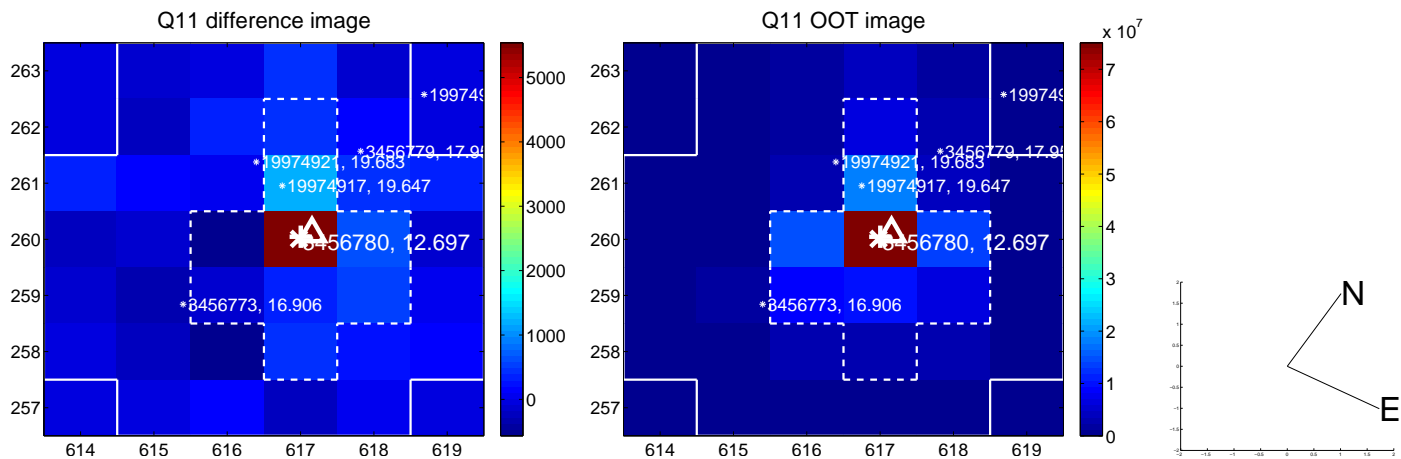
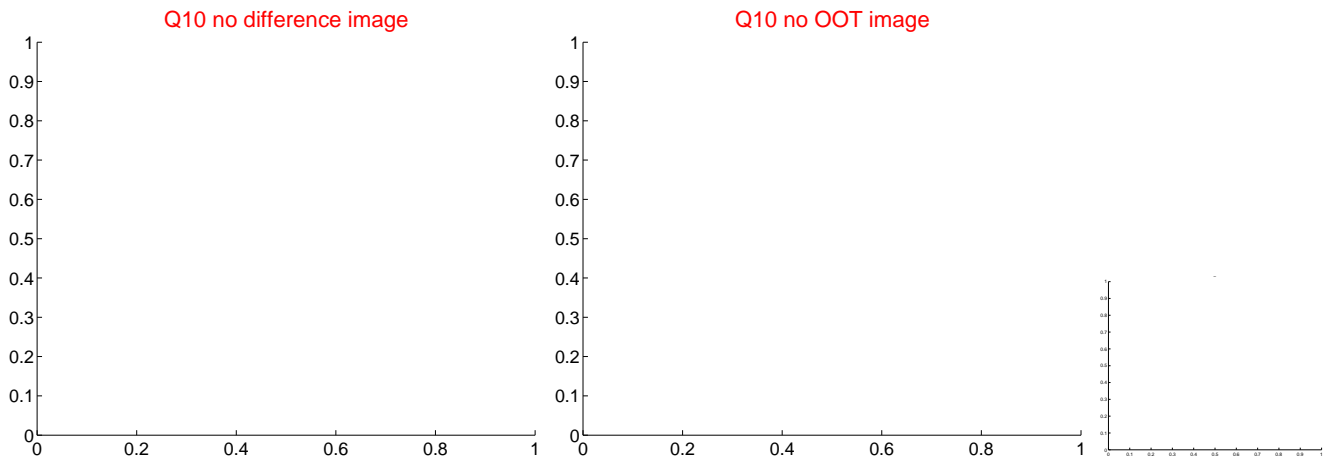
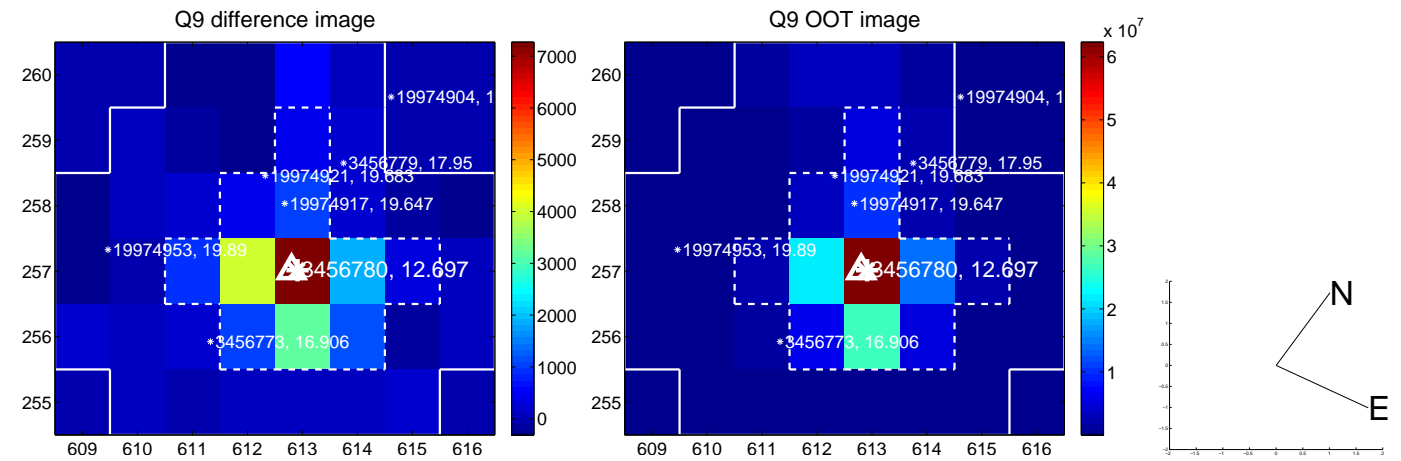
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



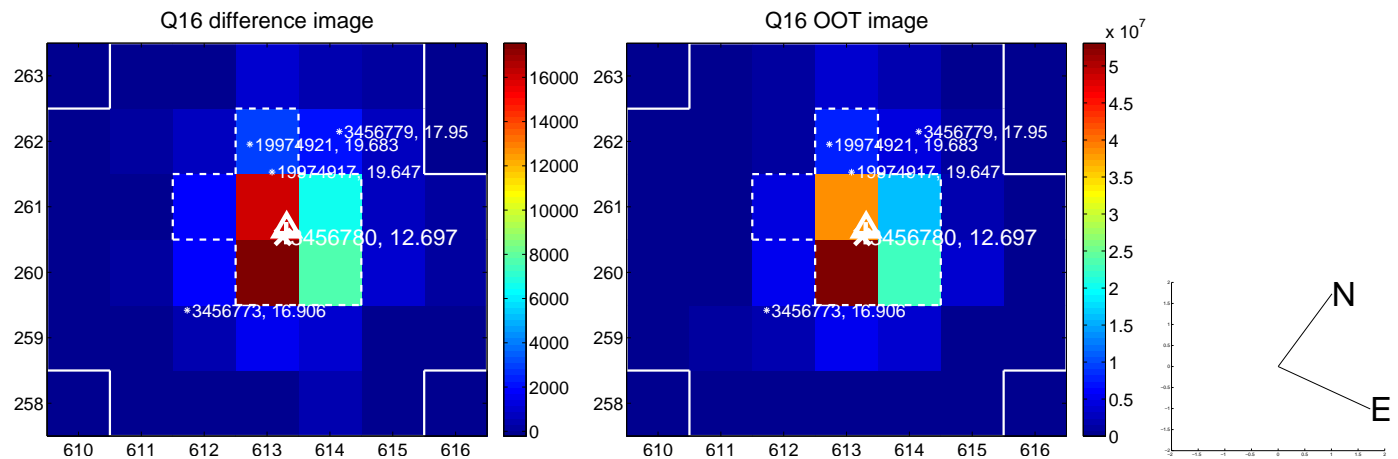
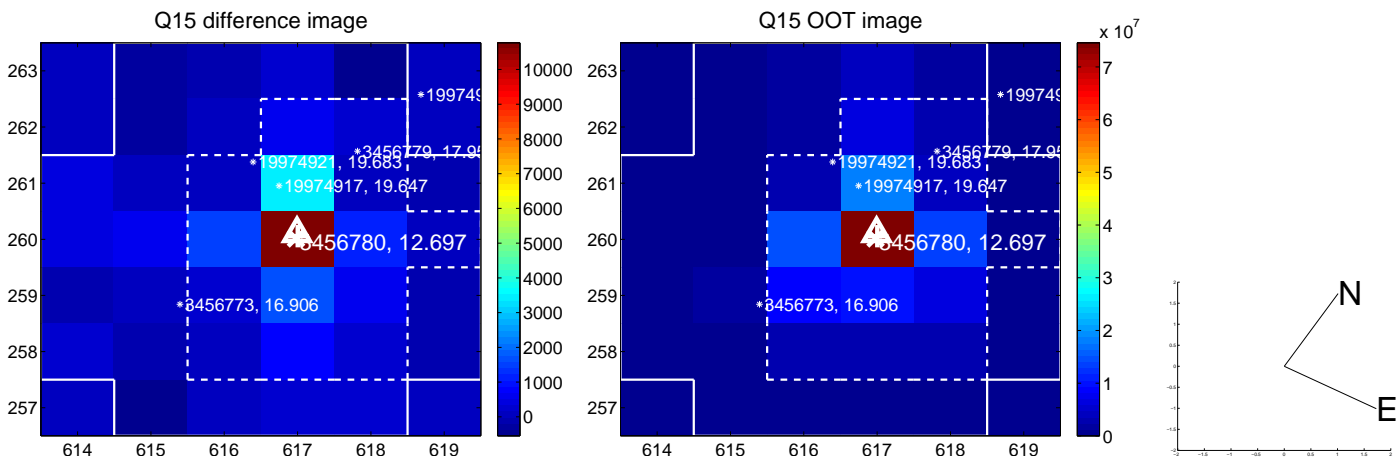
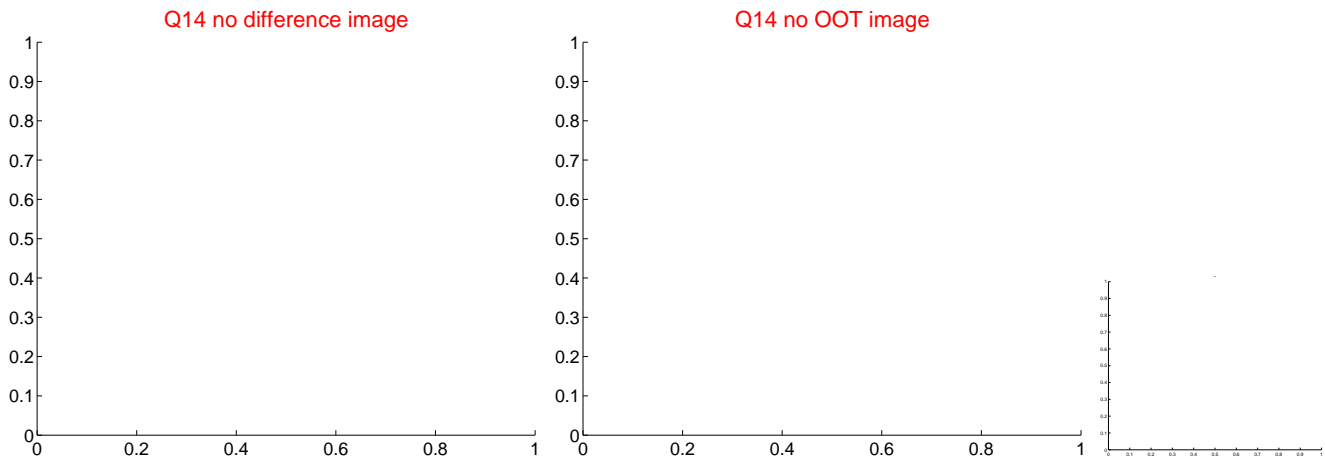
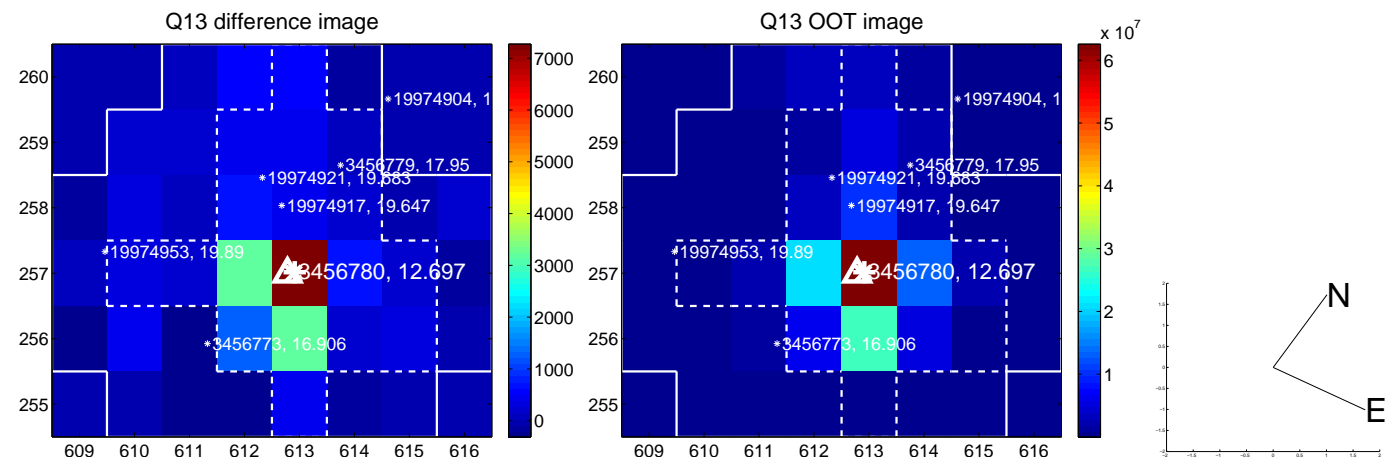
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

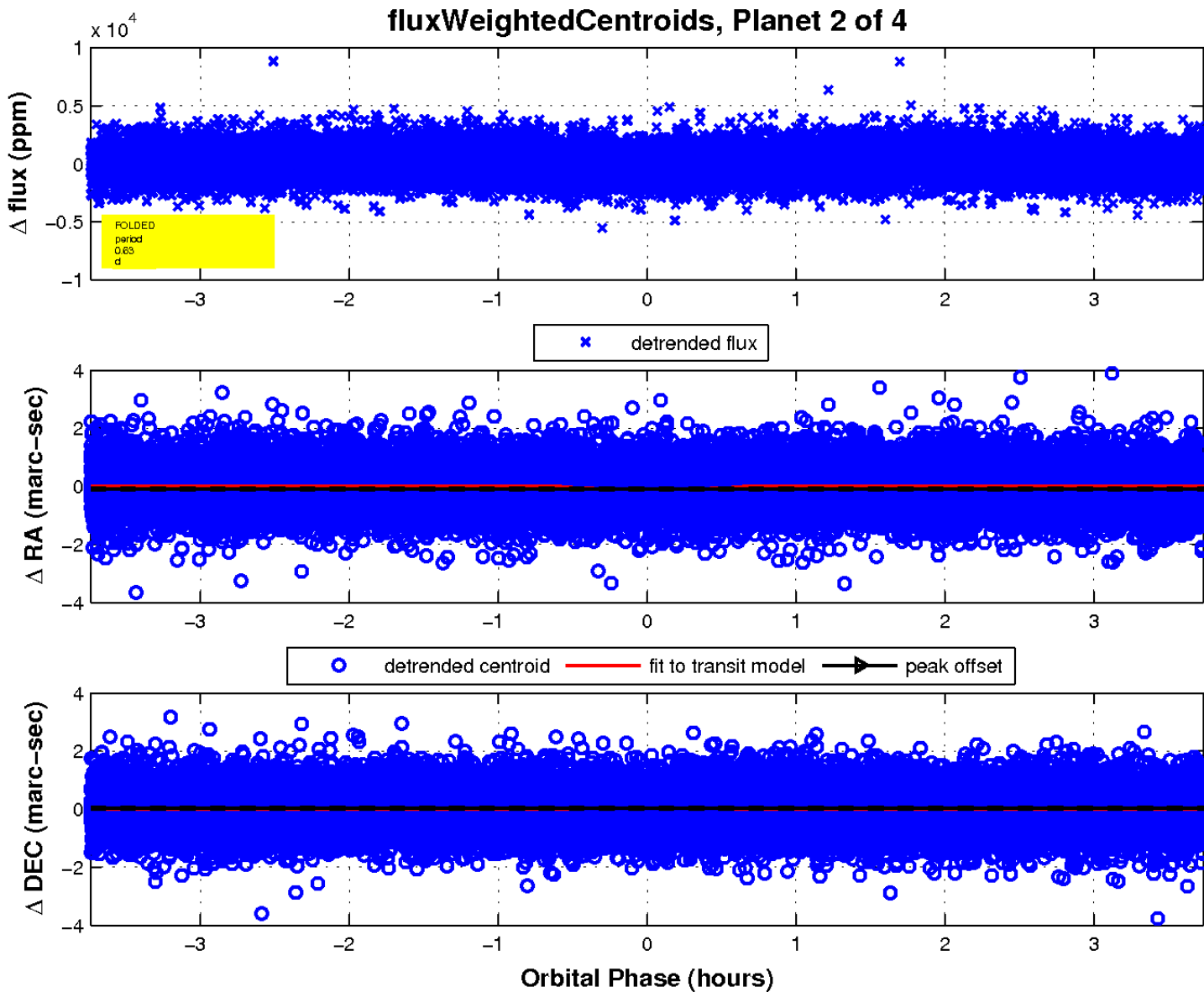
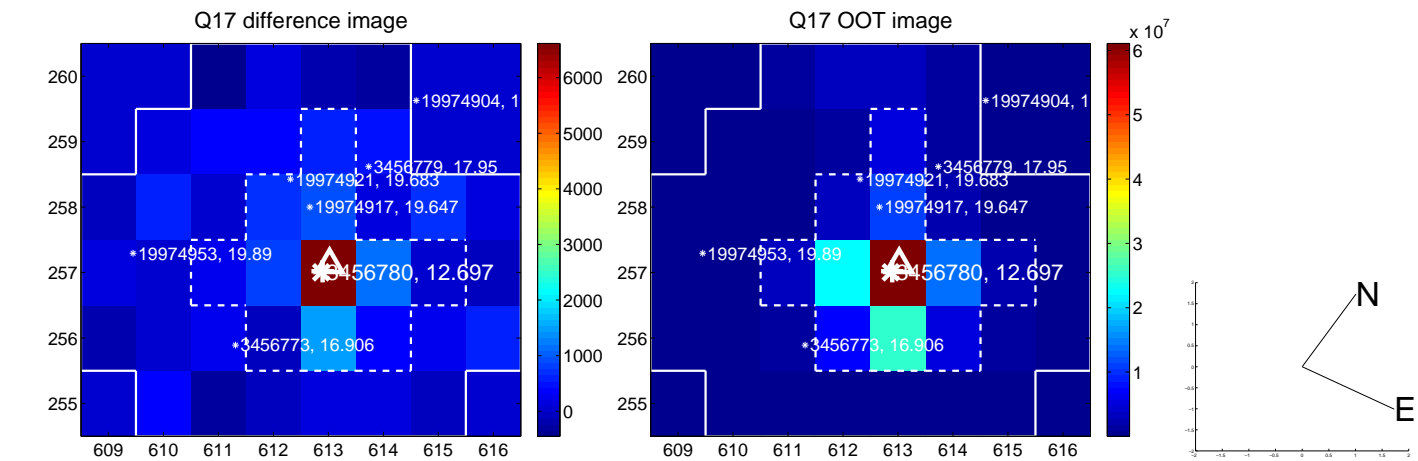


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



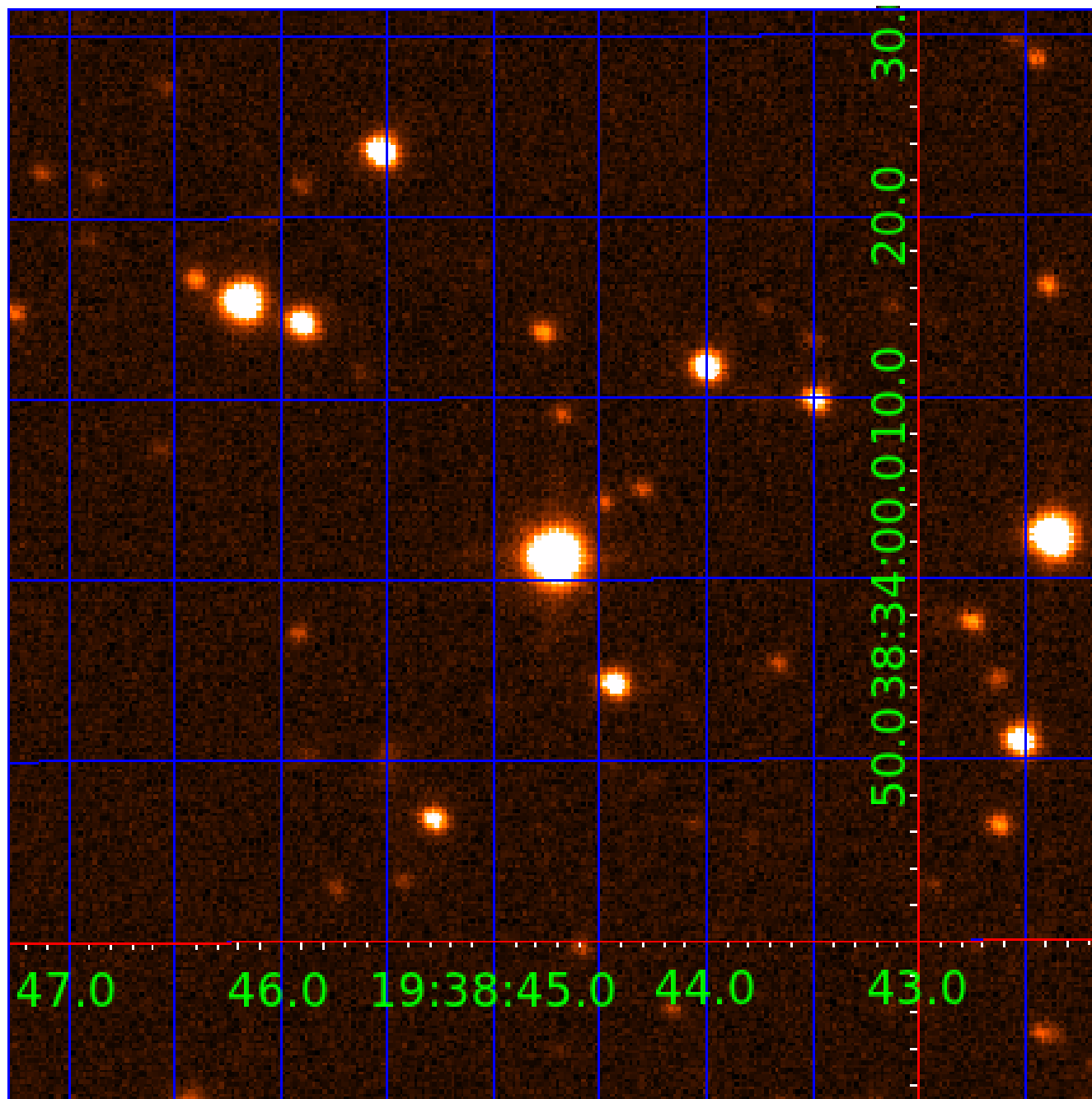


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 003456780

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
003456780-01	OBS	No	0.627966	131.732143	169.1	1.282	12.5	12.4	2.35	7865	3.57	58426.47
003456780-02	OBS	No	0.627967	131.874807	247.3	1.246	11.0	16.1	2.35	7865	4.31	58426.34
003456780-03	OBS	No	0.627959	131.573763	193.8	1.237	10.6	13.5	2.35	7865	3.82	58427.38
003456780-04	OBS	No	7.997527	133.193357	174.5	3.500	8.0	-1.0	2.35	7865	3.15	1964.49

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
003456780-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT
003456780-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—SAME_NTL_PERIOD
003456780-03	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD
003456780-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_ZUMA—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_ALT—CENT_NOFITS

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

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

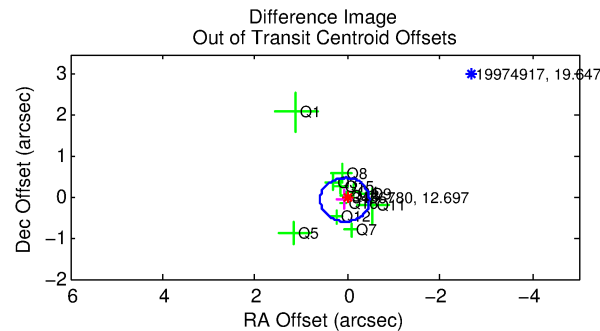
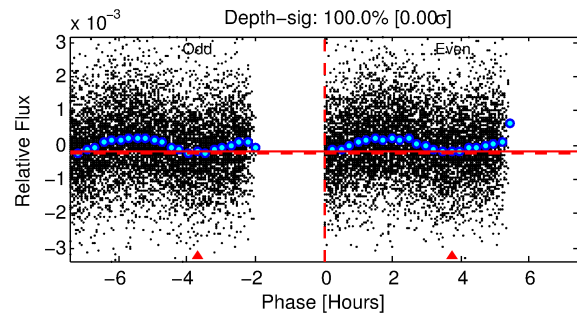
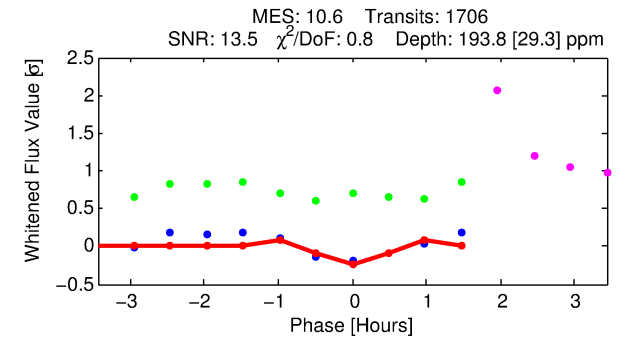
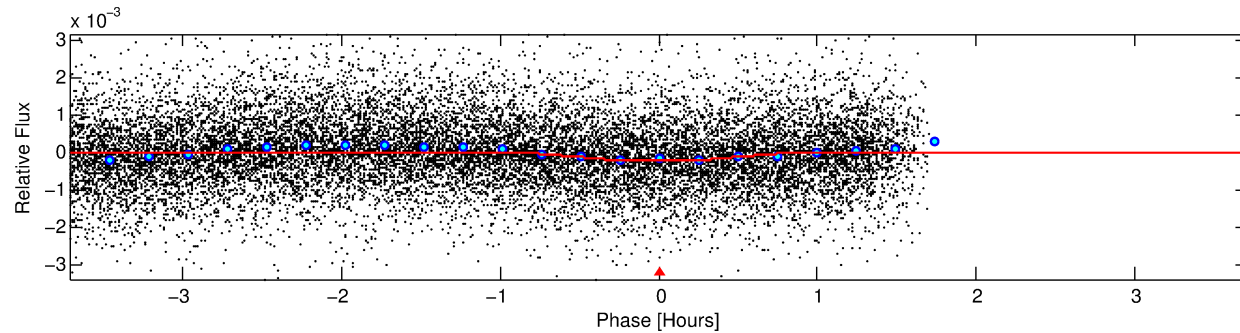
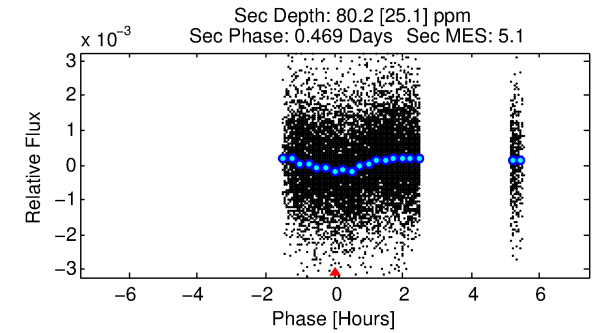
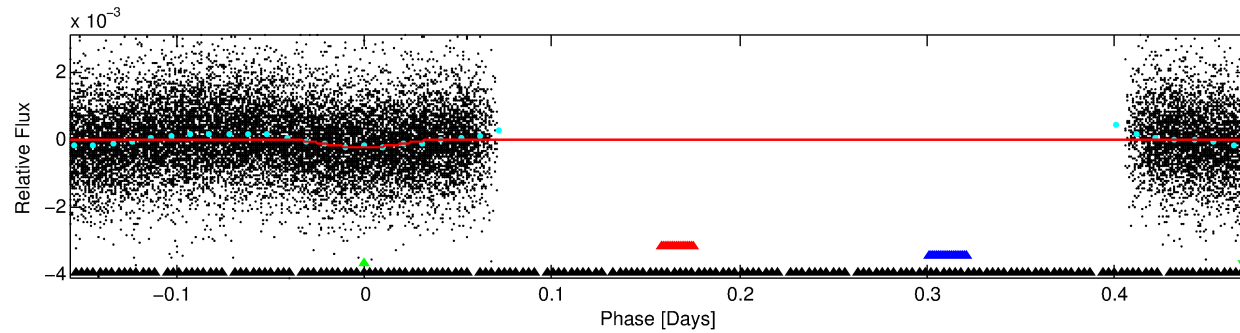
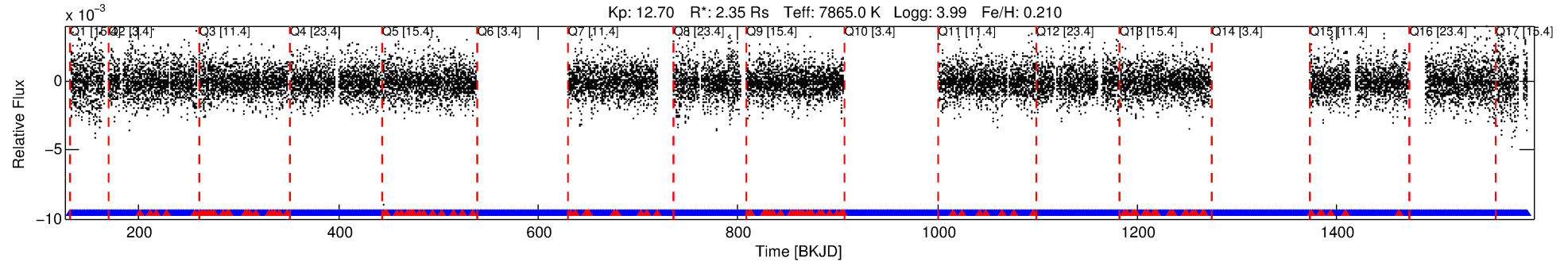
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 003456780-03

No Significant Match Found

# DV One-Page Summary

KIC: 3456780 Candidate: 3 of 4 Period: 0.628 d



## DV Fit Results:

Period = 0.62796 [0.00001] d  
Epoch = 131.5738 [0.0009] BKJD  
Rp/R\* = 0.0149 [0.0034]  
a/R\* = 2.05 [2.09]  
b = 0.90 [0.29]  
Seff = 58427.38 [21108.99]  
Teq = 3964 [358] K  
Rp = 3.82 [1.27] Re  
a = 0.0180 [0.0038] AU  
Ag = 0.98 [0.63] [-0.03σ]  
Teffp = 6103 [887] K [2.23σ]

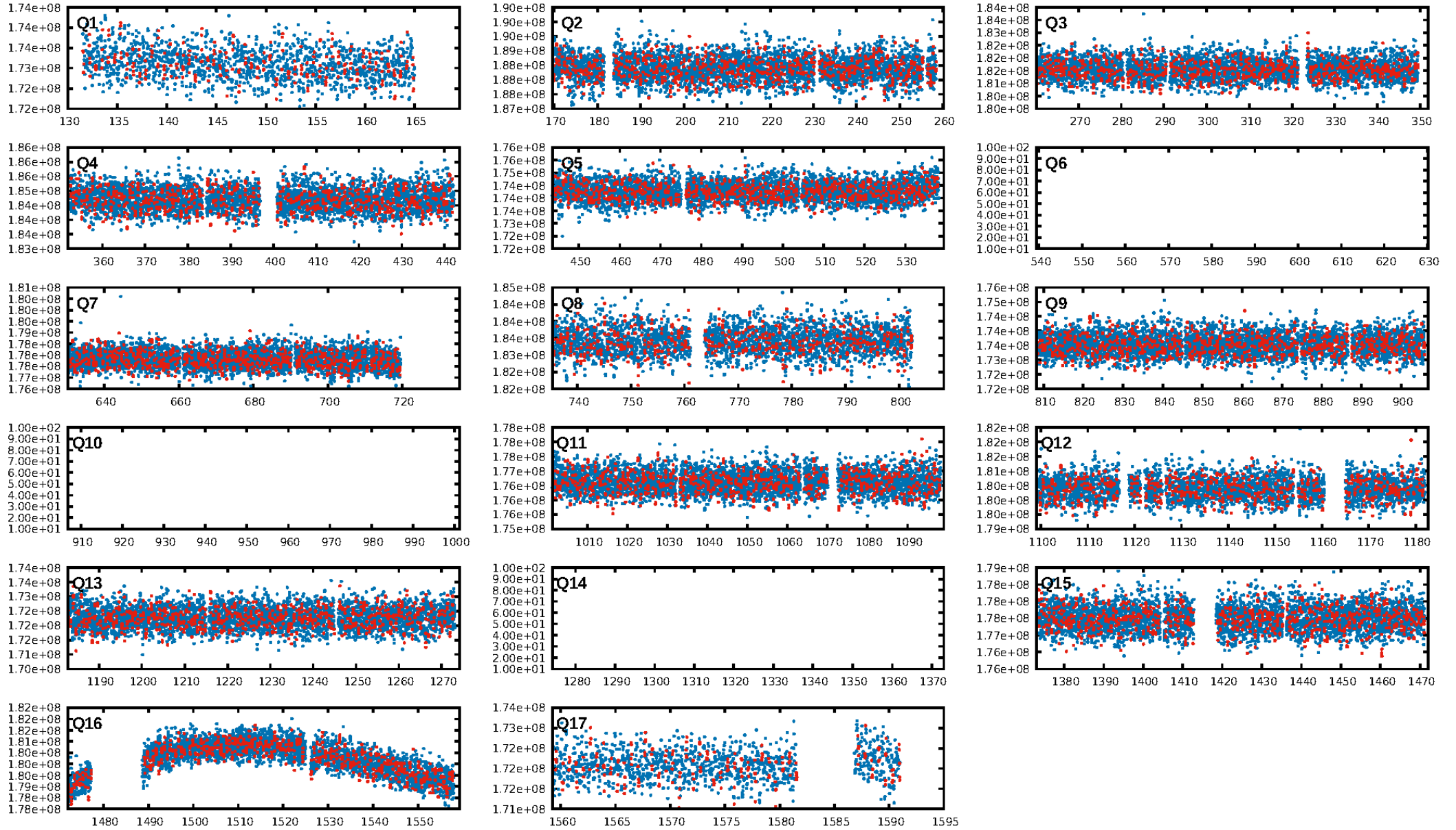
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.0% [0.00σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 0.93 [1500/1609]  
GhostDiagnostic-chr: 1.236  
Centroid-sig: 68.6%  
Centroid-so: 0.137 arcsec [0.82σ]  
OotOffset-rm: 0.086 arcsec [0.48σ]  
OotOffset-st: 0/4/4/4 [12]  
KicOffset-rm: 0.188 arcsec [0.74σ]  
KicOffset-st: 0/4/4/4 [12]  
DiffImageQuality-fgm: 1.00 [12/12]  
DiffImageOverlap-fno: 0.00 [0/14]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 21:30:49 Z

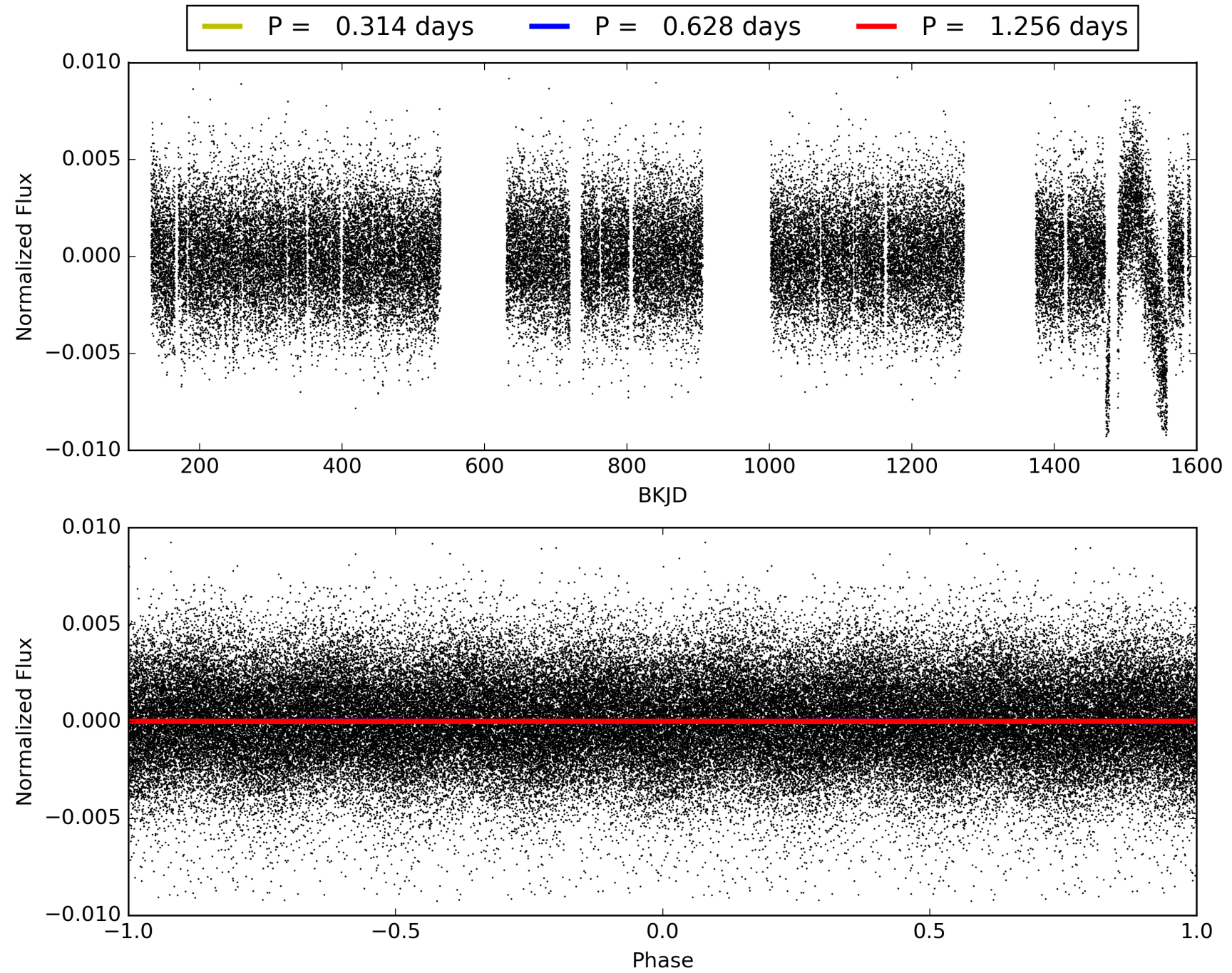
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 003456780-03, PDC Light Curves



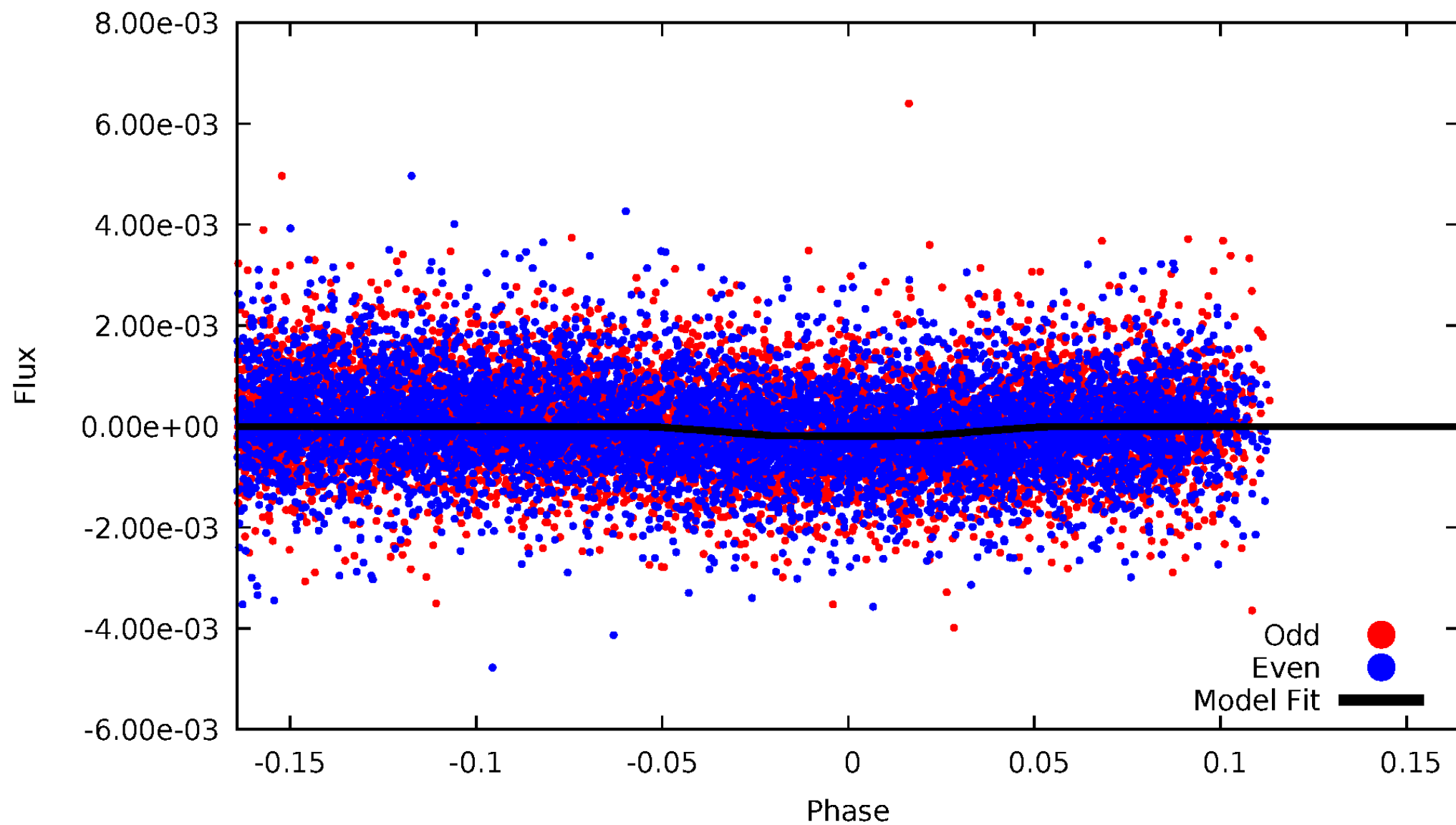


TCE 003456780-03



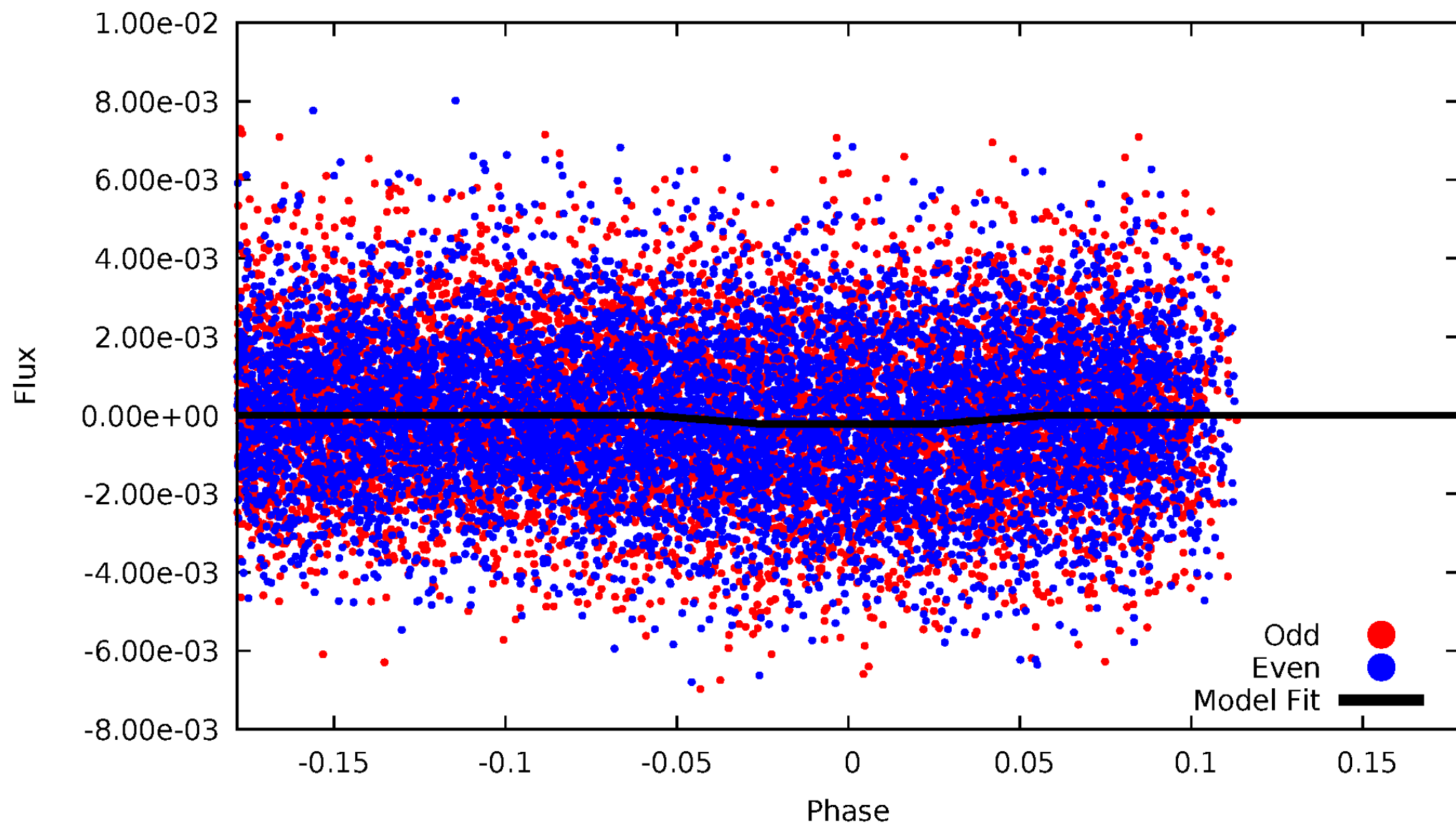
# DV Odd/Even

TCE 003456780-03



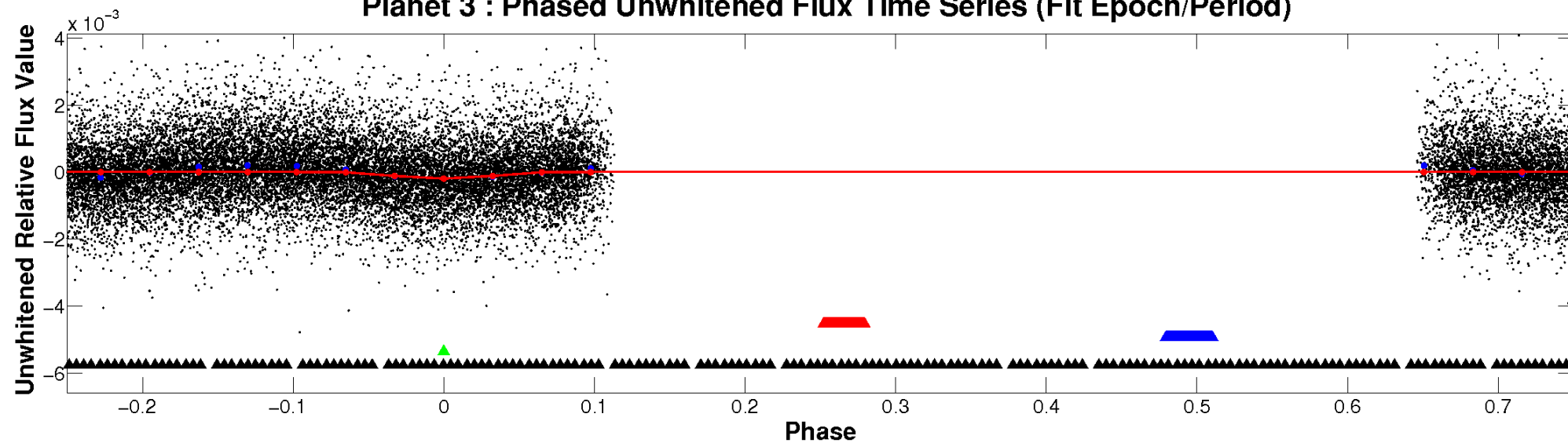
# ALT Odd/Even

TCE 003456780-03

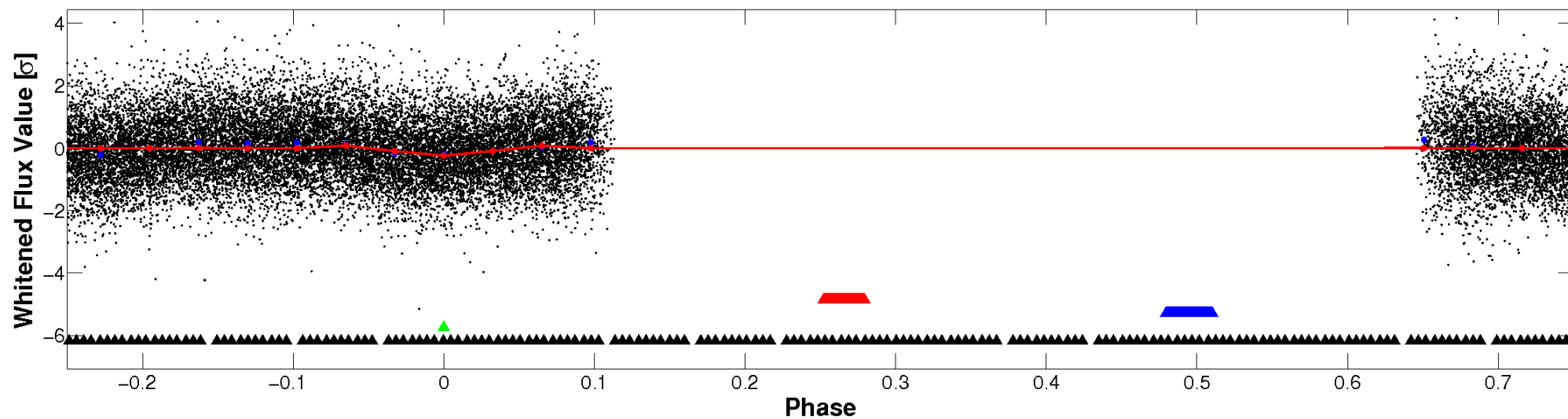


# Non-Whitened Vs. Whitened Light Curve

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



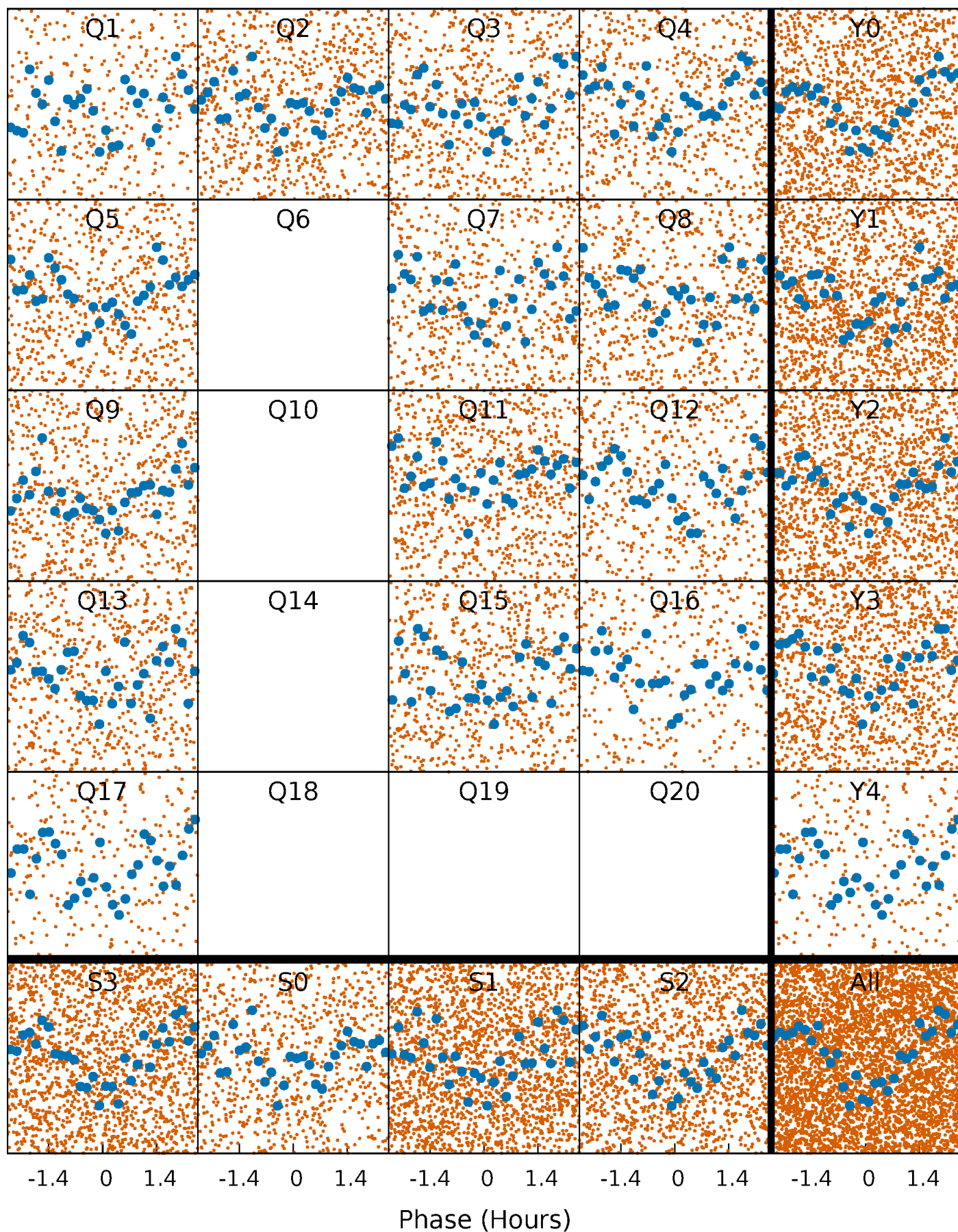
**Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)**





# PDC Quarter-Phased Transit Curves

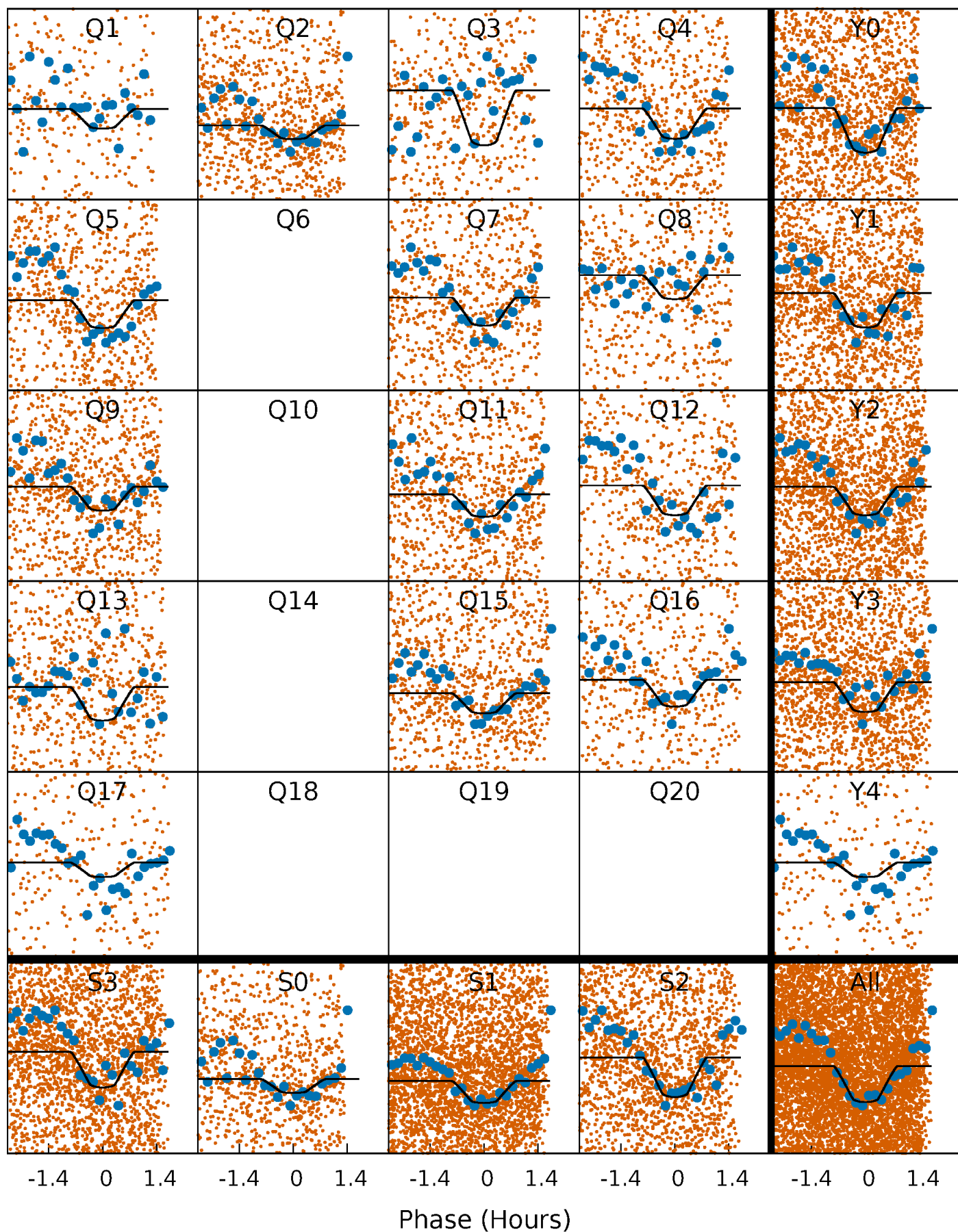
TCE 003456780-03 P= 0.627959 Days  $T_0=131.573763$  (BKJD)





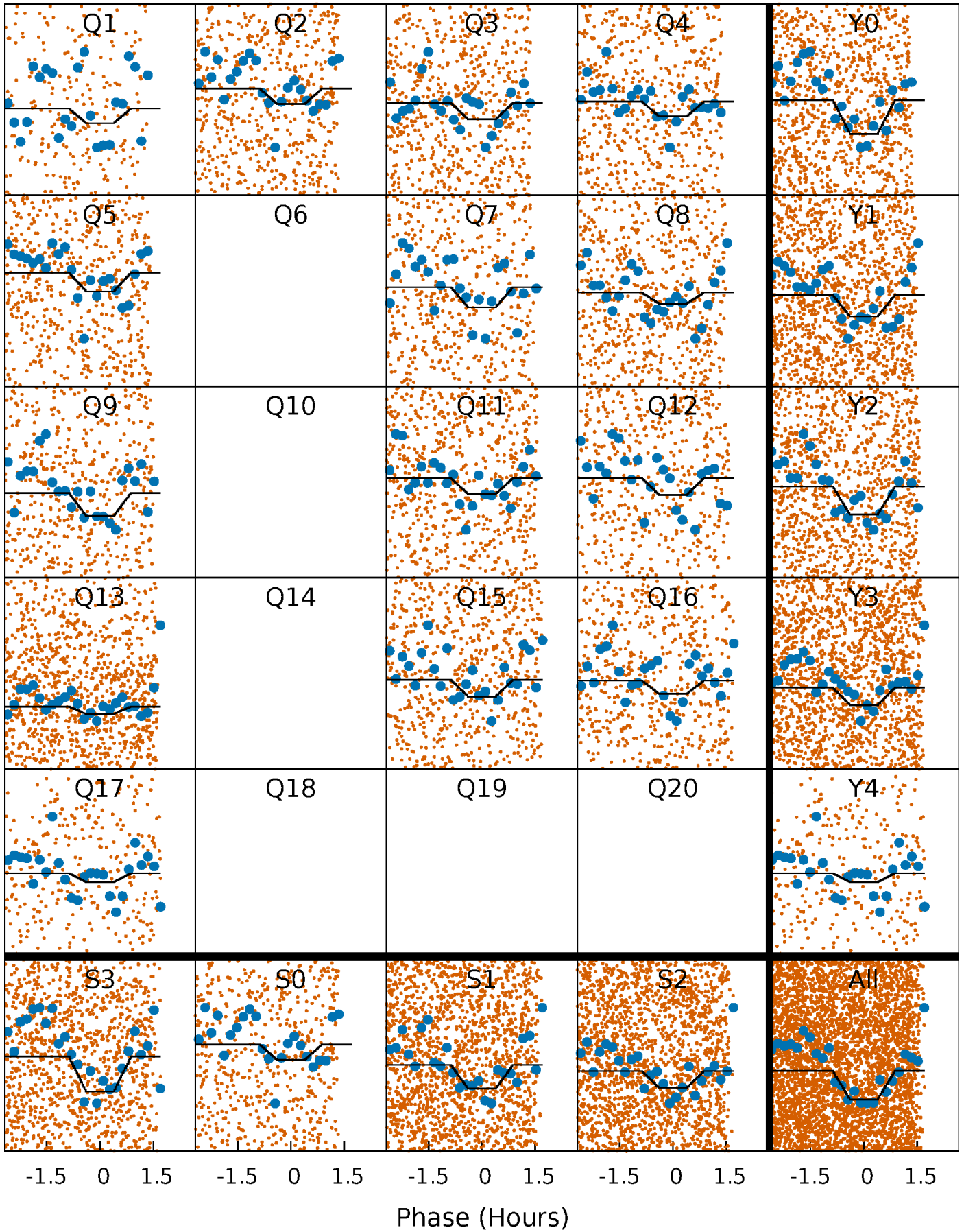
# DV Quarter-Phased Transit Curves

TCE 003456780-03     $P = 0.627959$  Days     $T_0 = 131.573763$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

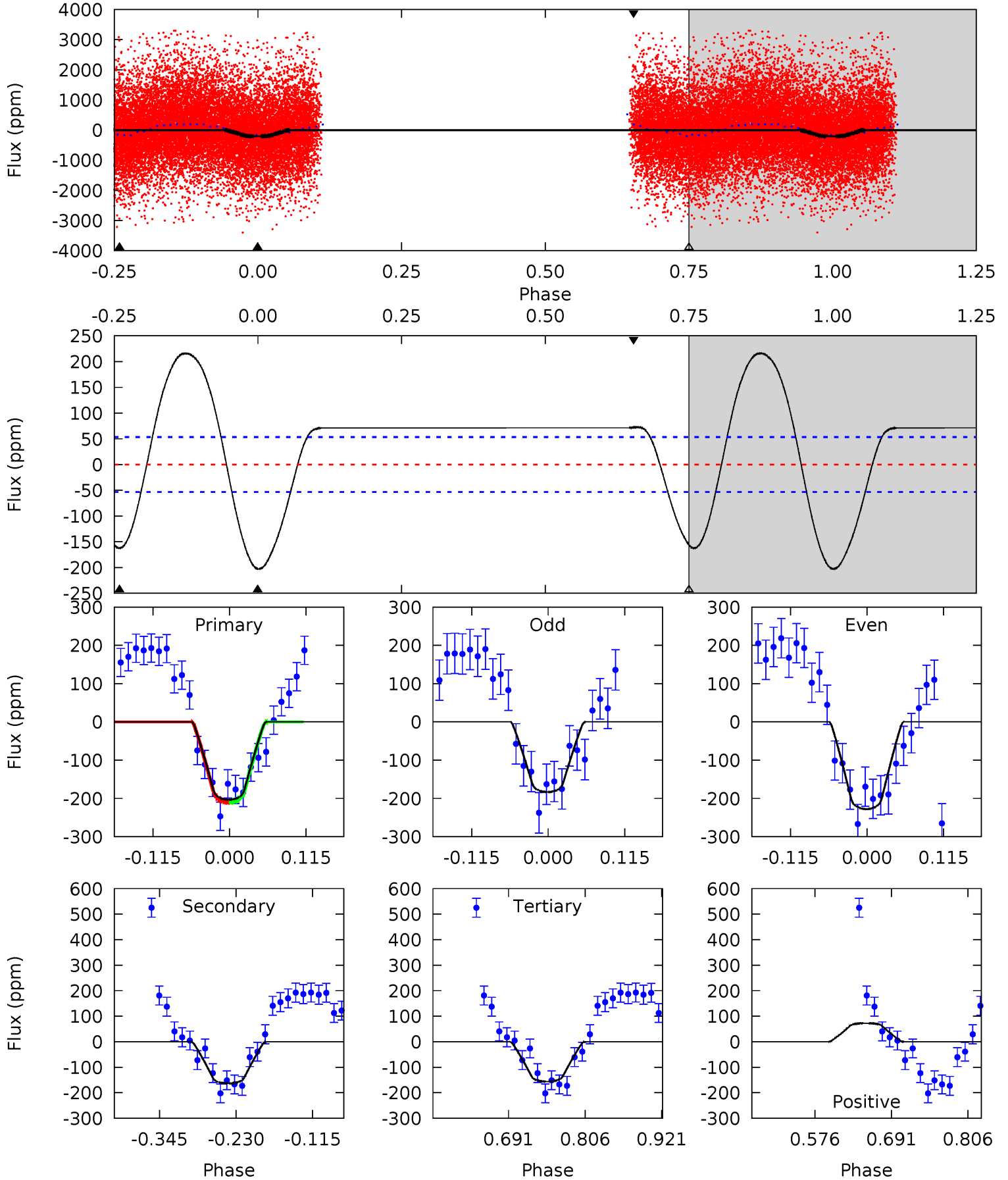
TCE 003456780-03     $P = 0.627959$  Days     $T_0 = 131.573763$  (BKJD)



# DV Model-Shift Uniqueness Test

003456780-03, P = 0.627959 Days, E = 130.945804 Days

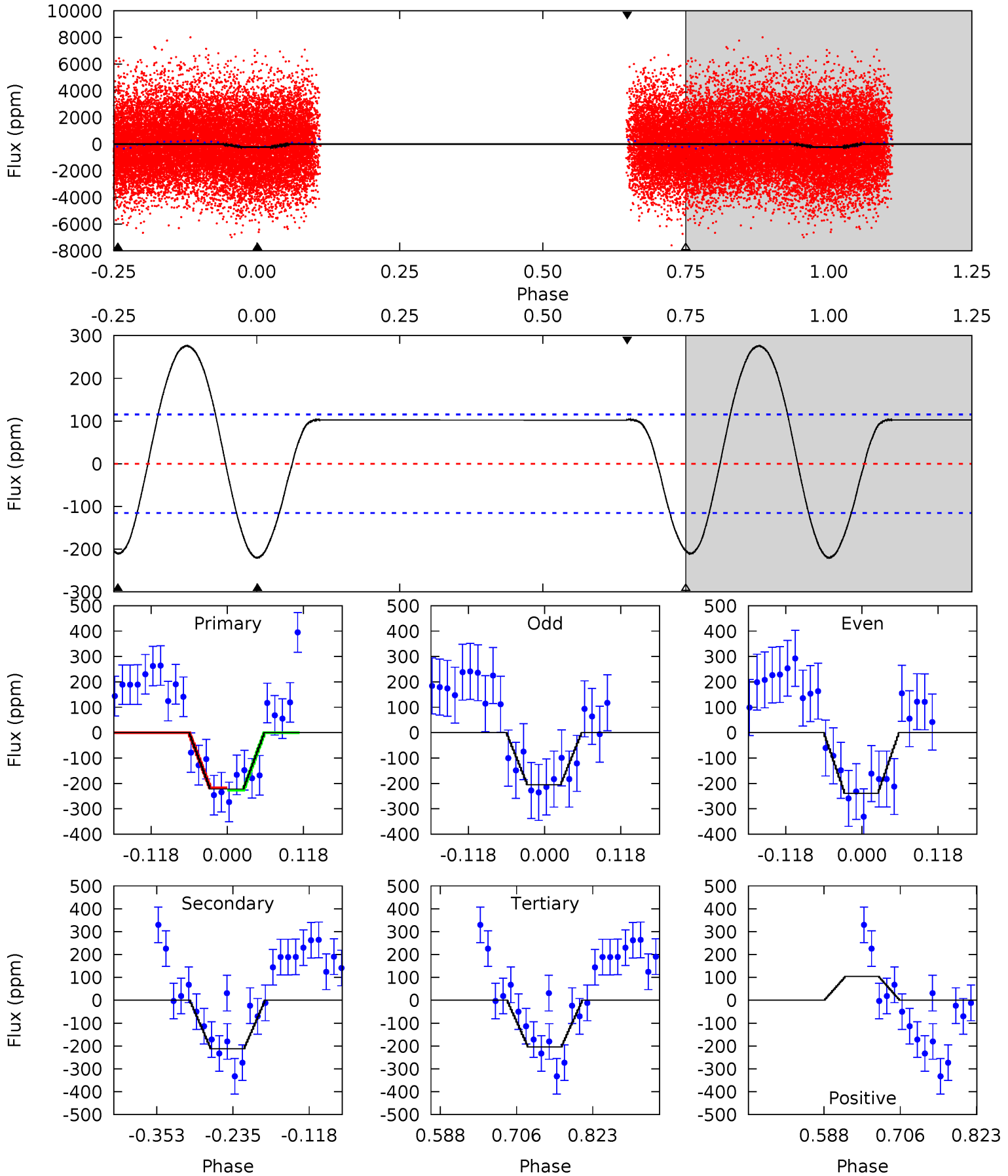
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
17.3	13.9	13.3	6.18	4.54	1.58	8.88	4.01	11.1	0.59	7.69	1.91	0.91	0.52	0.01



# Alt Model-Shift Uniqueness Test

003456780-03, P = 0.627959 Days, E = 130.945804 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
8.73	8.36	8.05	4.10	4.53	1.56	5.31	0.68	4.63	0.31	4.26	0.66	0.76	0.56	0.19



### Stellar Parameters For KIC 003456780

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$7865^{+216}_{-351}$	$3.991^{+0.176}_{-0.144}$	$0.210^{+0.150}_{-0.400}$	$2.351^{+0.565}_{-0.565}$	$1.974^{+0.249}_{-0.373}$	$0.214^{+0.204}_{-0.089}$
	+3%/-4%	+4%/-4%	+71%/-190%	+24%/-24%	+13%/-19%	+95%/-42%
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 003456780-03 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-163 \pm 12$	$3.78^{+1.01}_{-0.95}$	$5519^{+364}_{-379}$	$6842^{+1194}_{-916}$	$1.992^{+1.476}_{-0.740}$
Alt.	$-212 \pm 25$	$3.73^{+0.98}_{-0.98}$	$5478^{+371}_{-364}$	$7465^{+1433}_{-1018}$	$2.658^{+2.038}_{-1.017}$

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



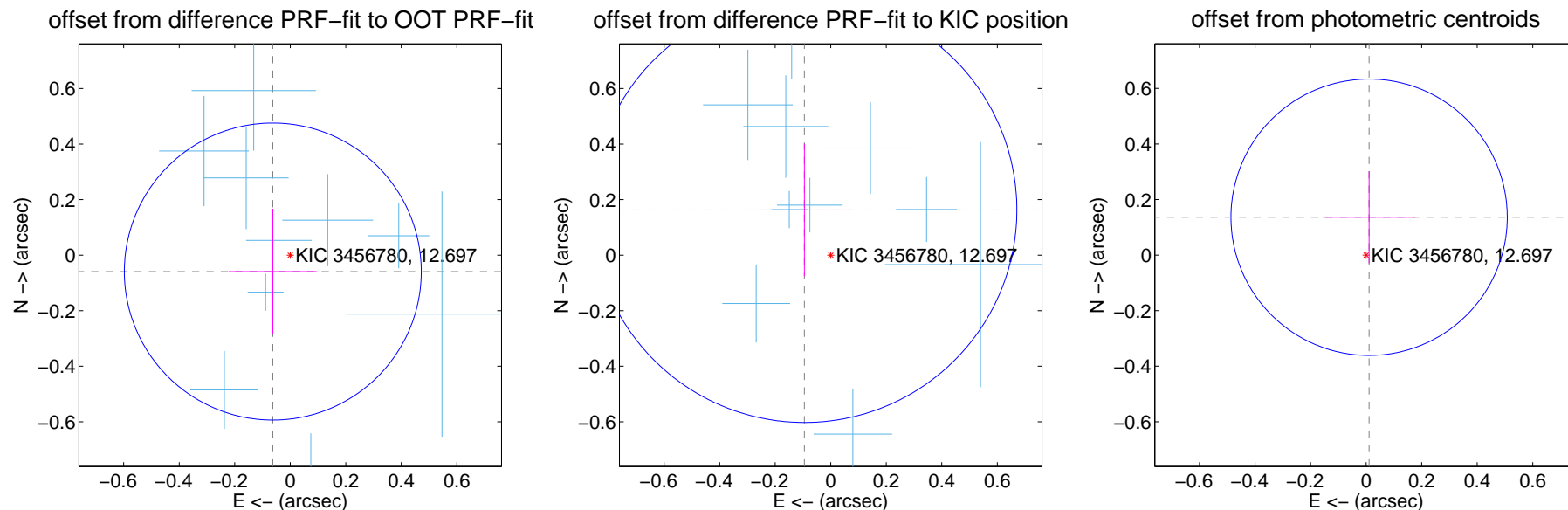
## DV Centroid Data

Supplemental centroid analysis for 003456780-03. Kepler magnitude: 12.70. Transit SNR 13.54

There are 12 quarters with good PRF difference image offsets

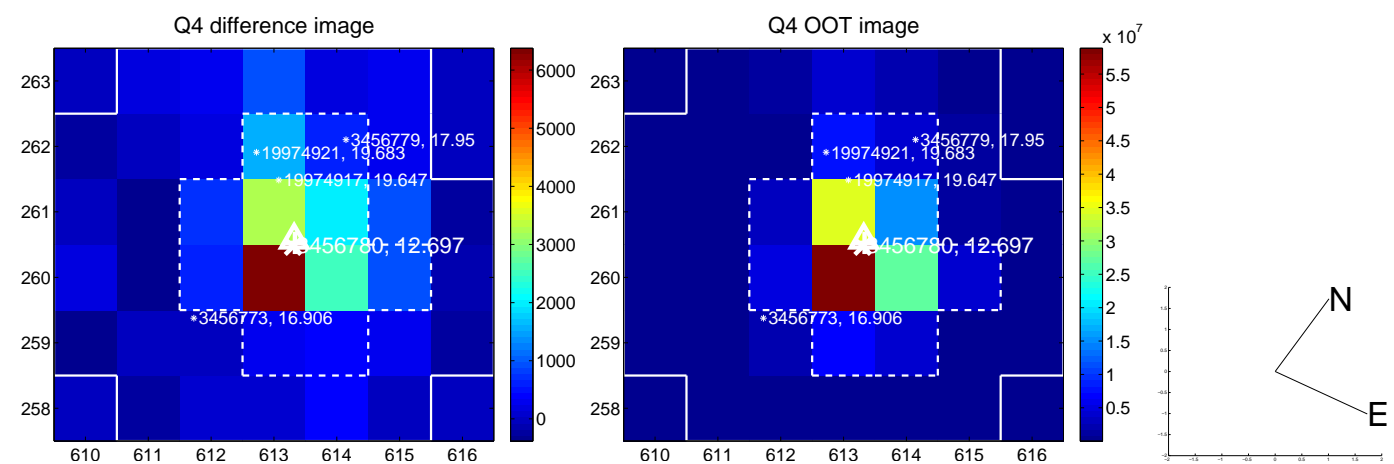
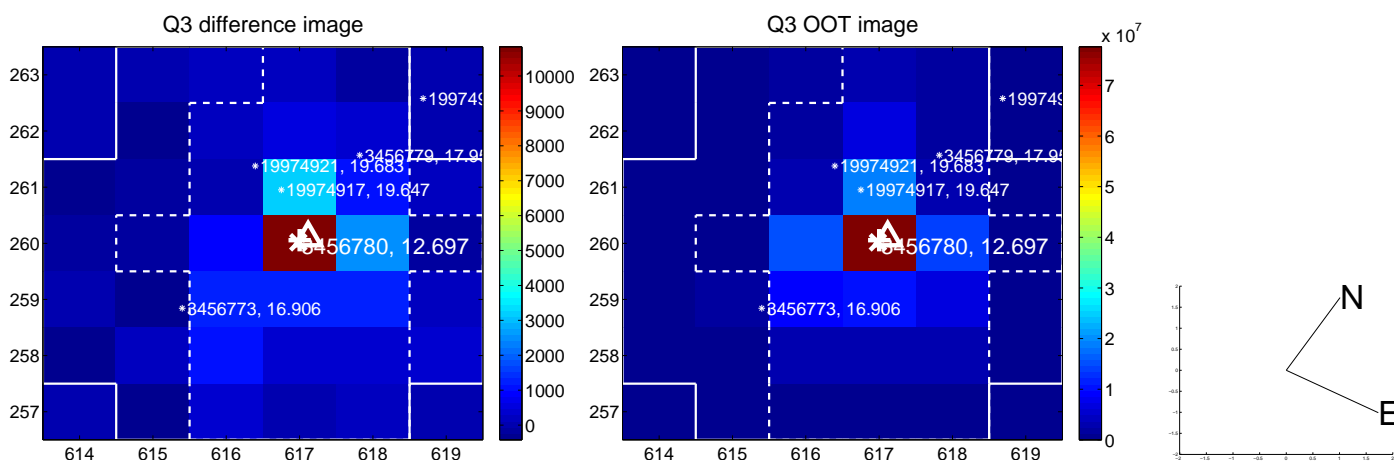
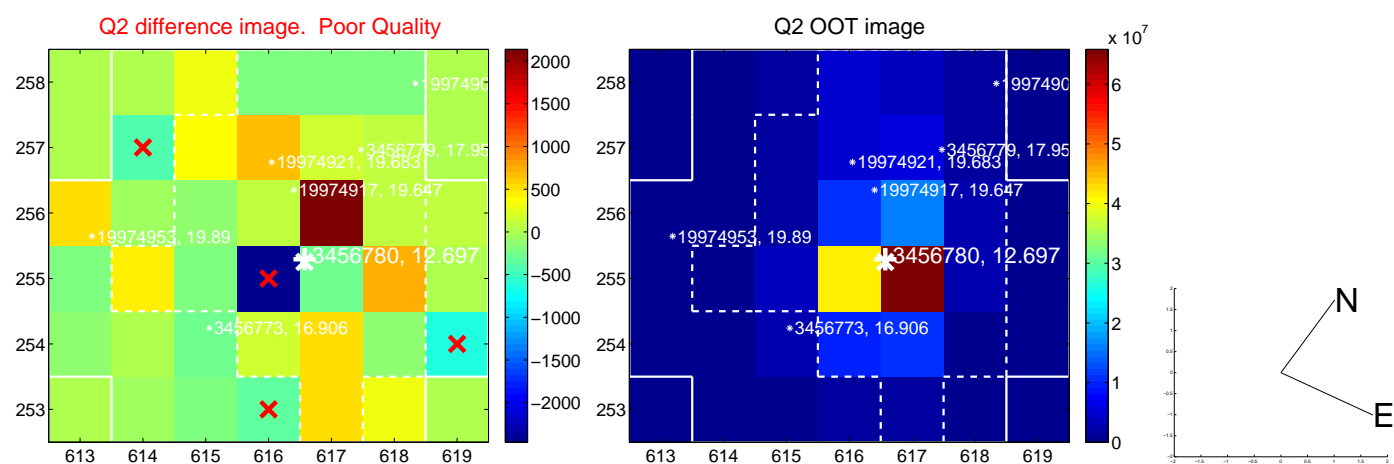
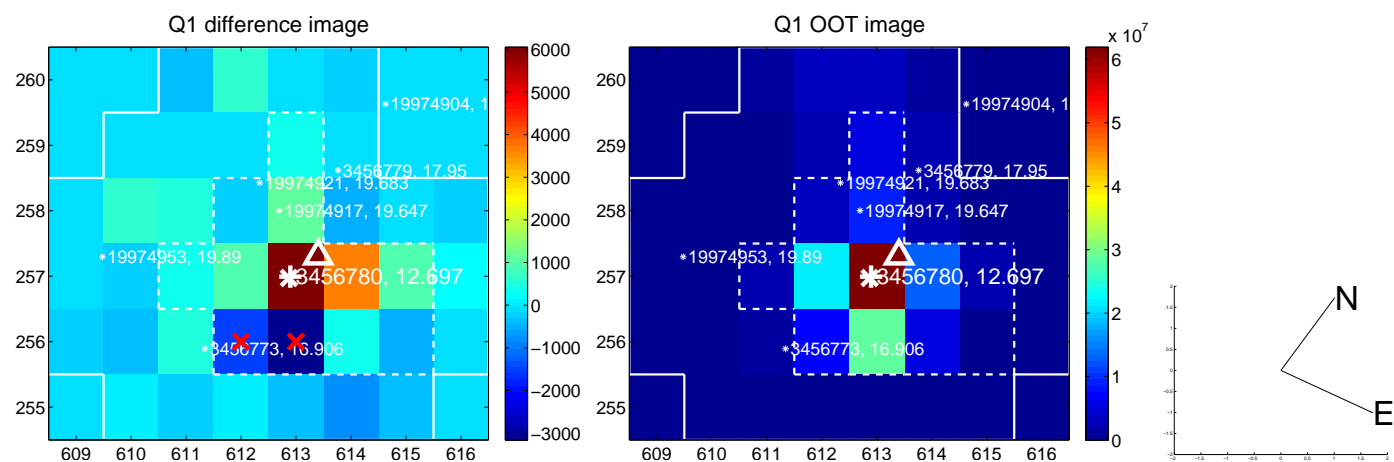
The direct PRF centroid is offset from the target star catalog position by about 0.30 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.086 \pm 0.178$	0.48	$0.063 \pm 0.159$	$-0.059 \pm 0.226$
PRF-fit source offset from KIC position	$0.188 \pm 0.255$	0.74	$0.095 \pm 0.169$	$0.163 \pm 0.239$
photometric centroid source offset	$0.14 \pm 0.17$	0.82	$-0.01 \pm 0.17$	$0.14 \pm 0.17$

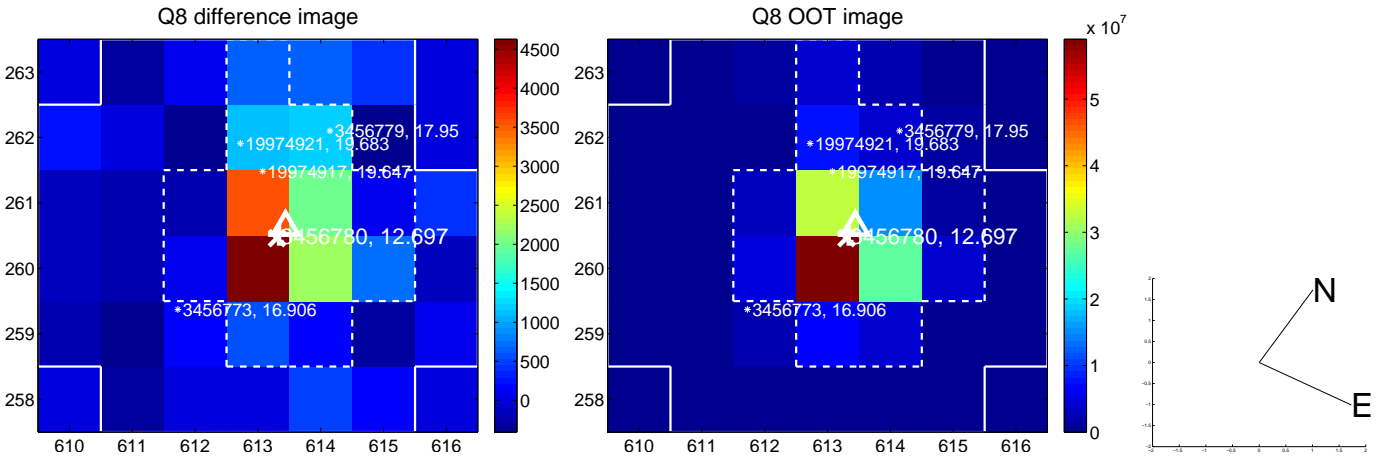
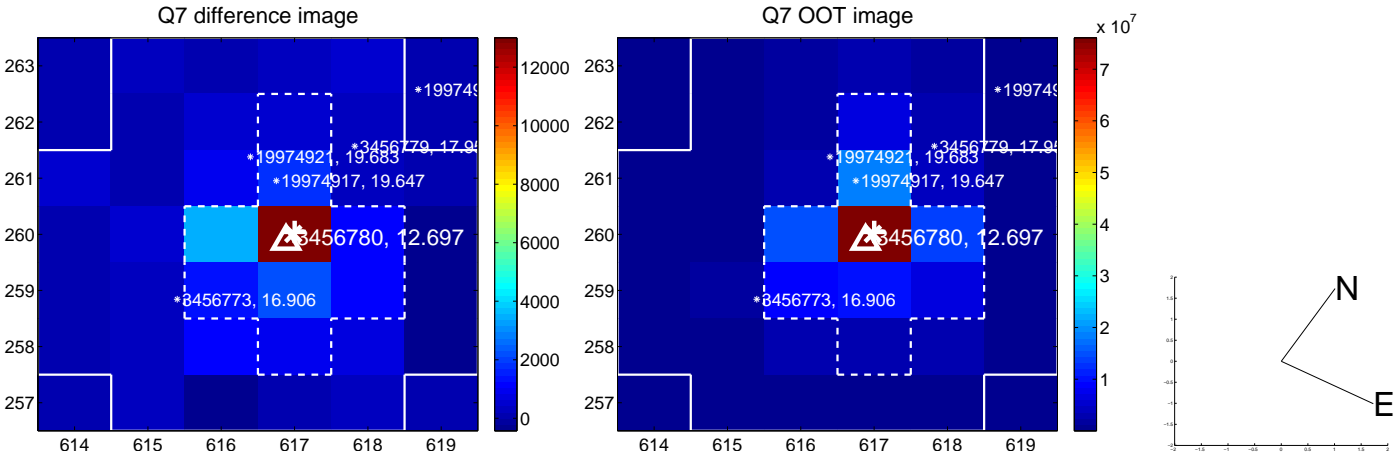
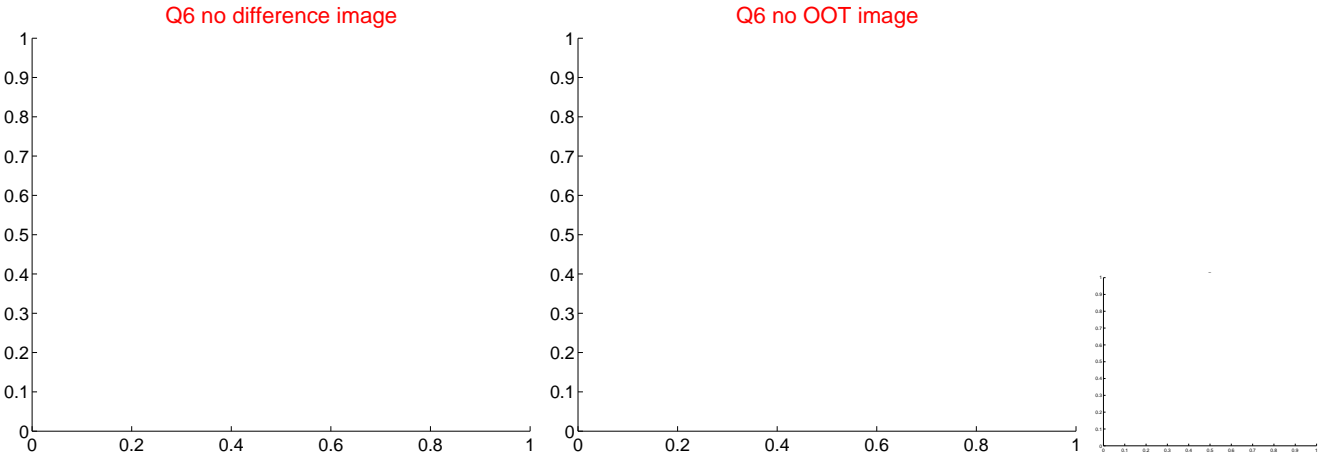
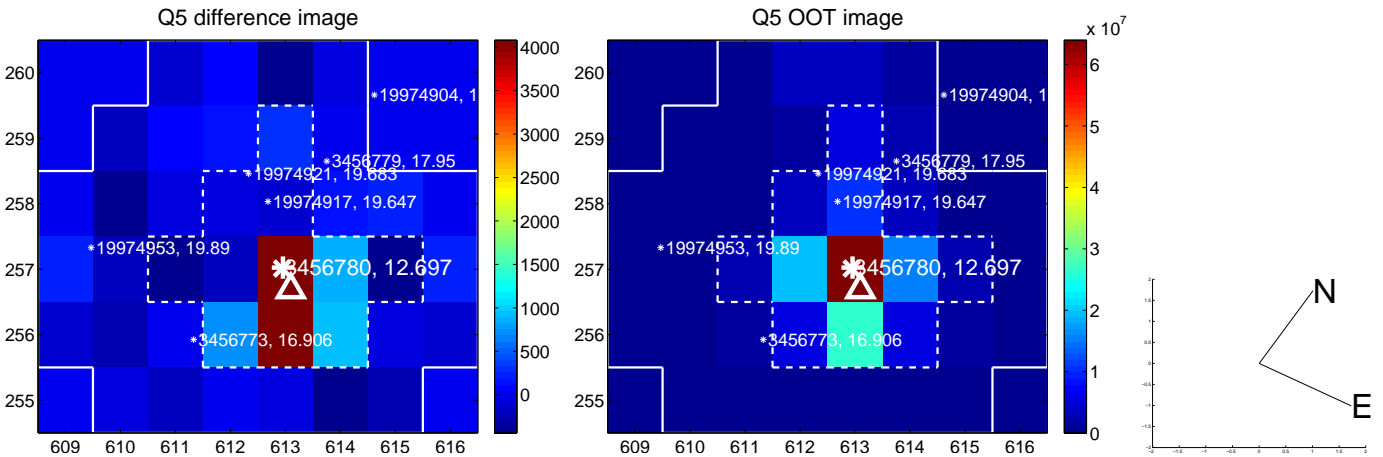


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

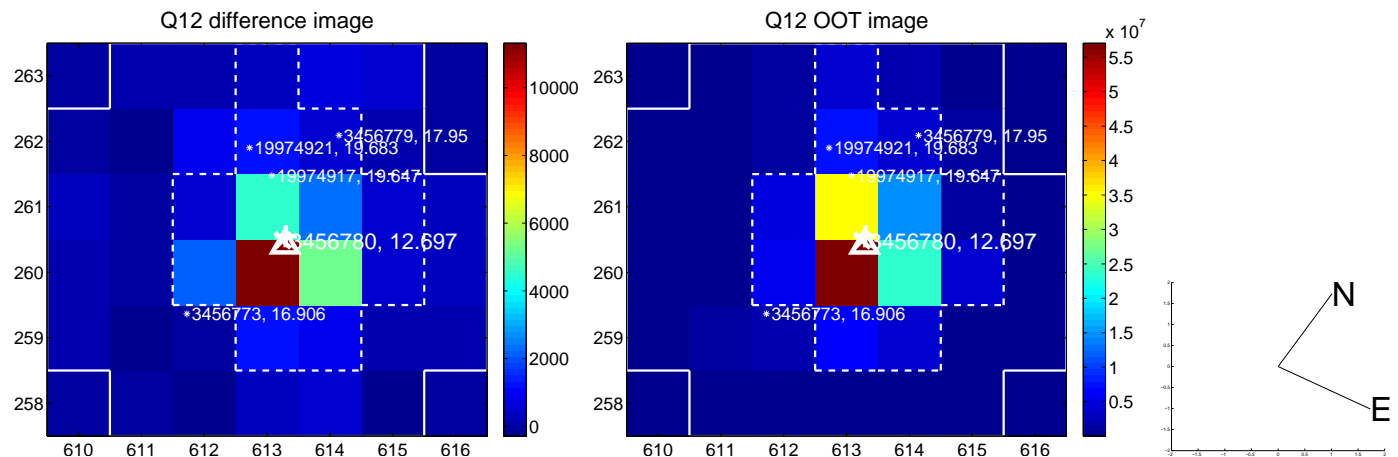
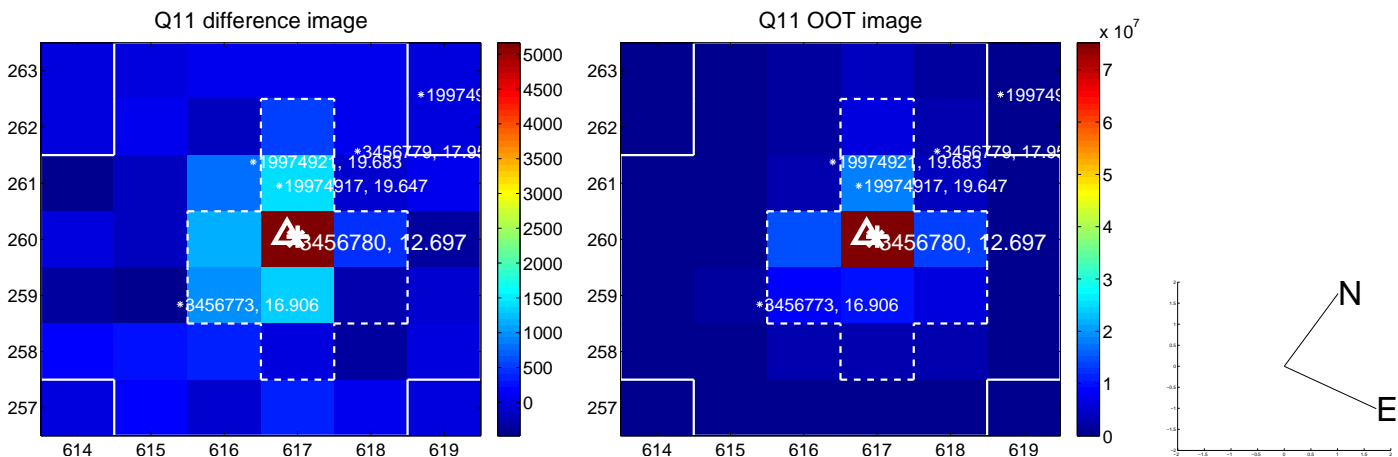
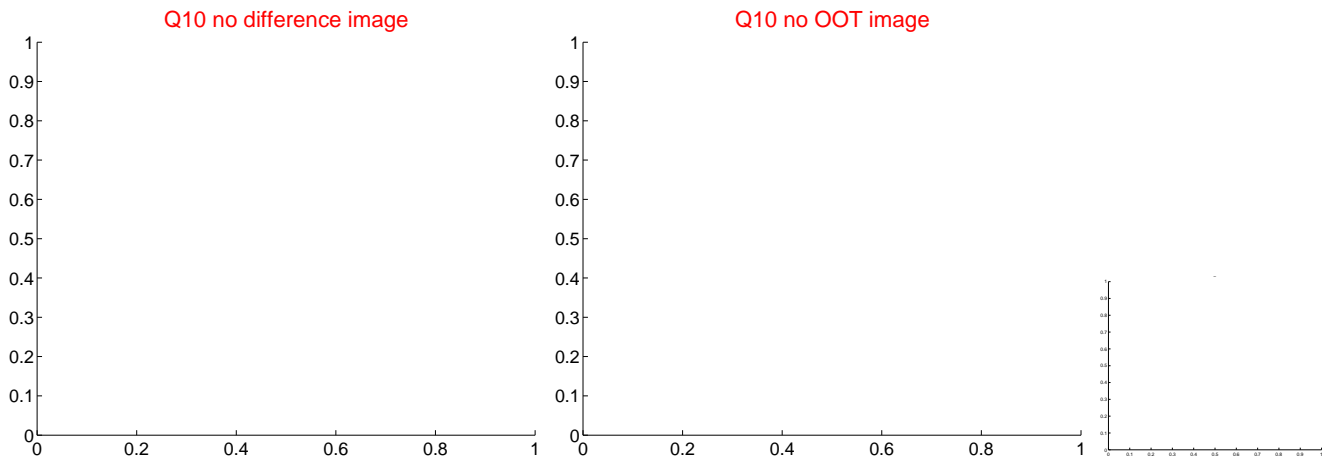
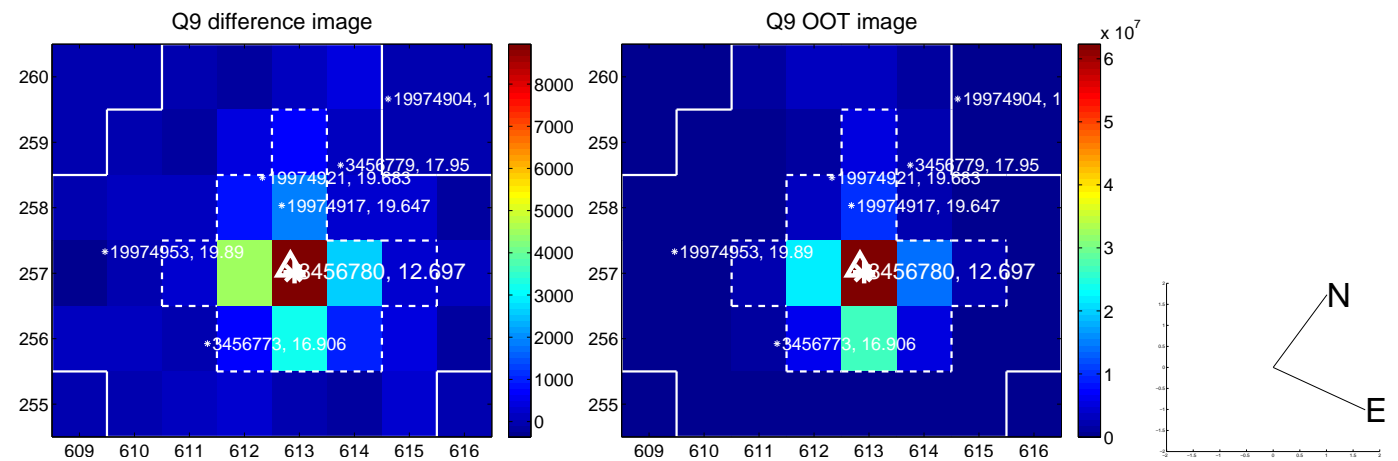
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



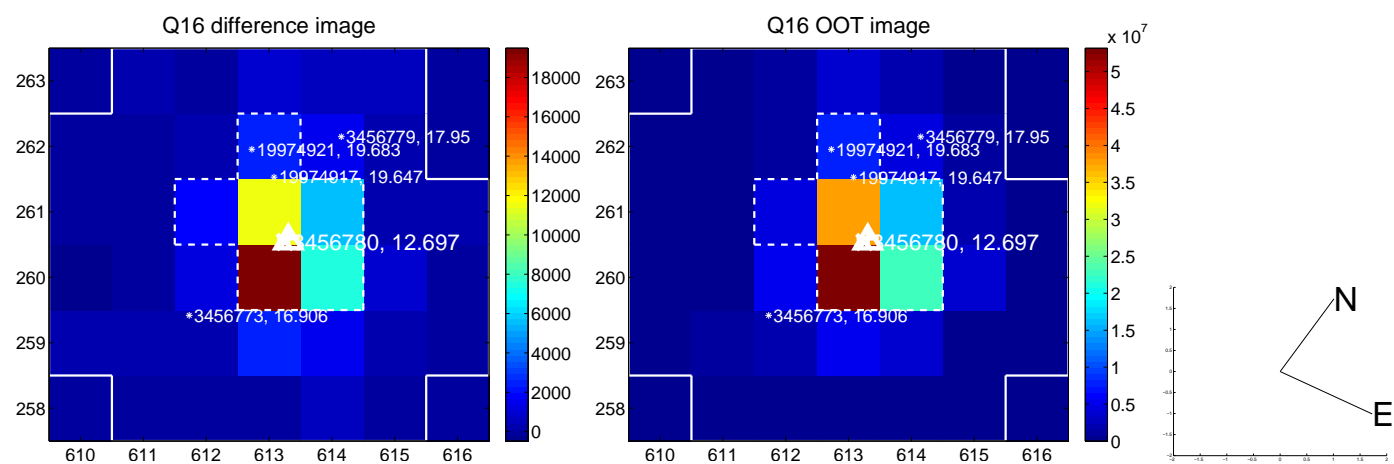
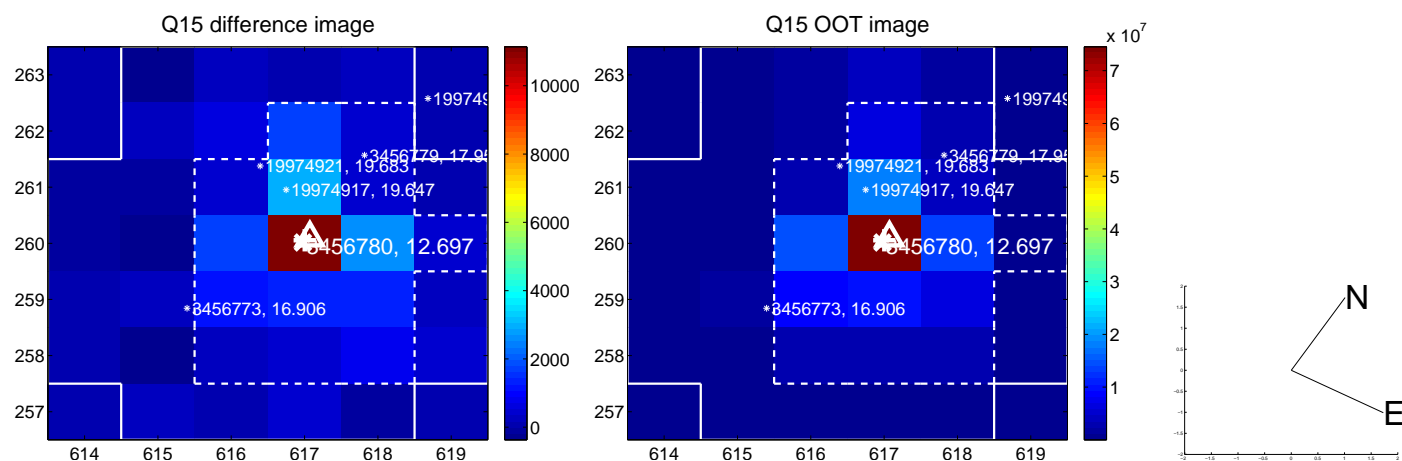
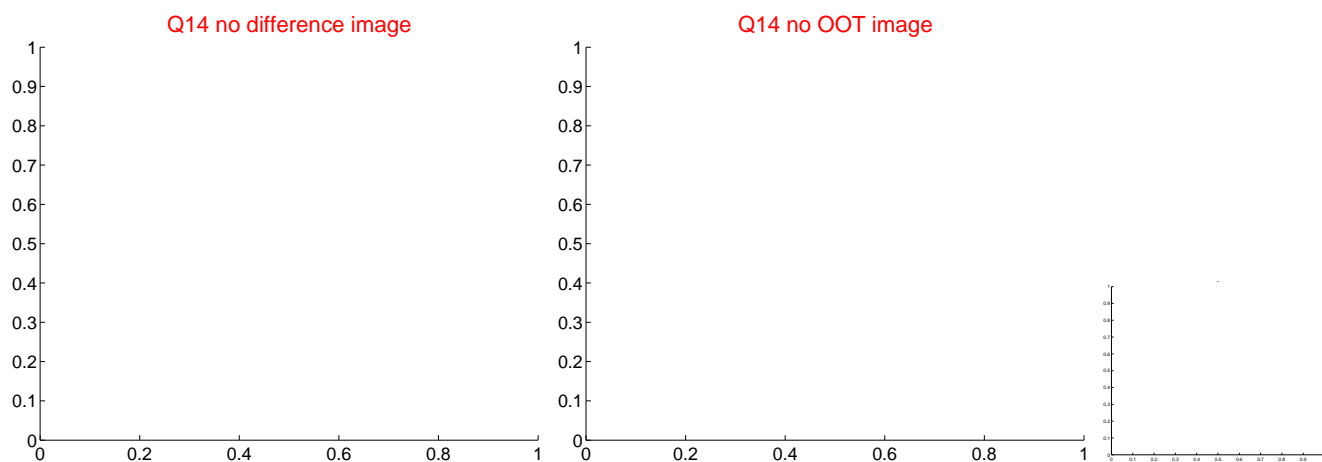
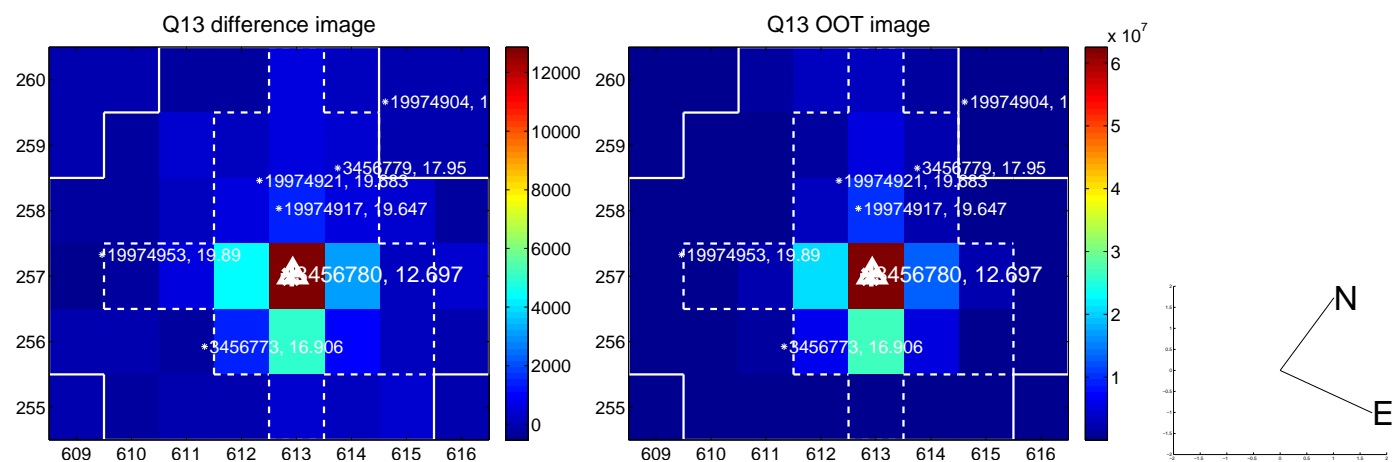
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

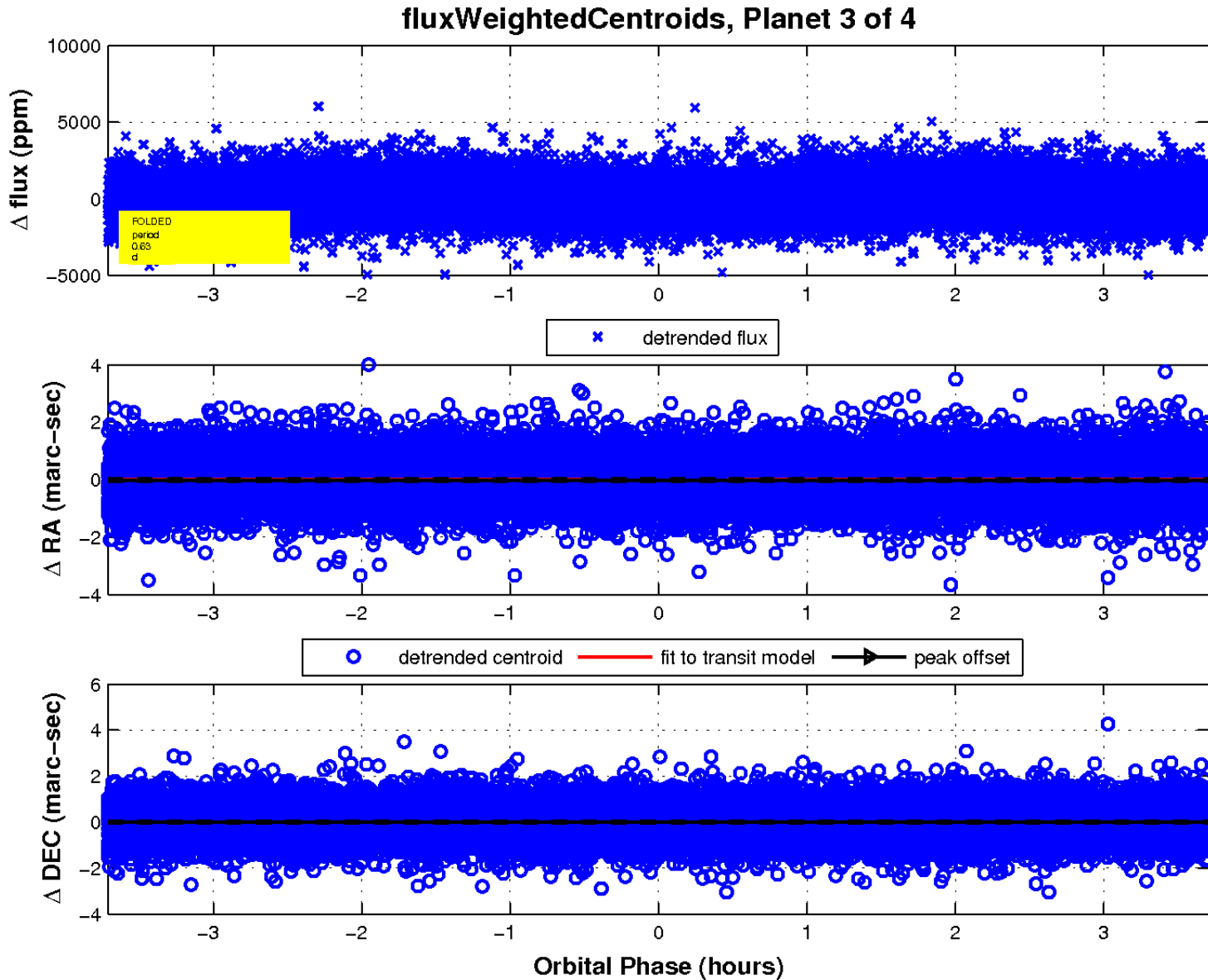
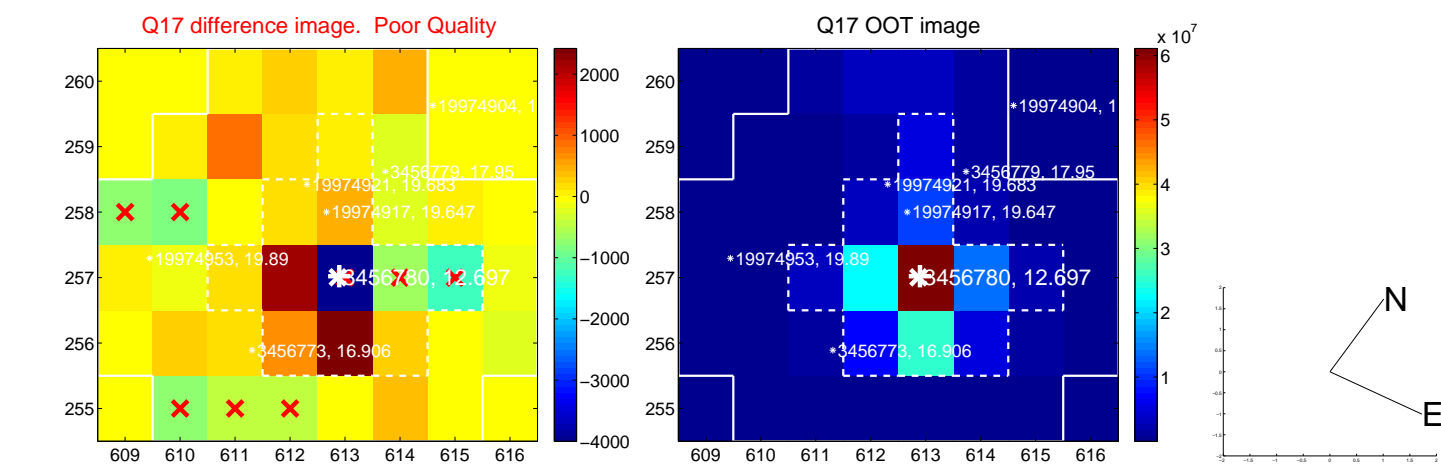


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



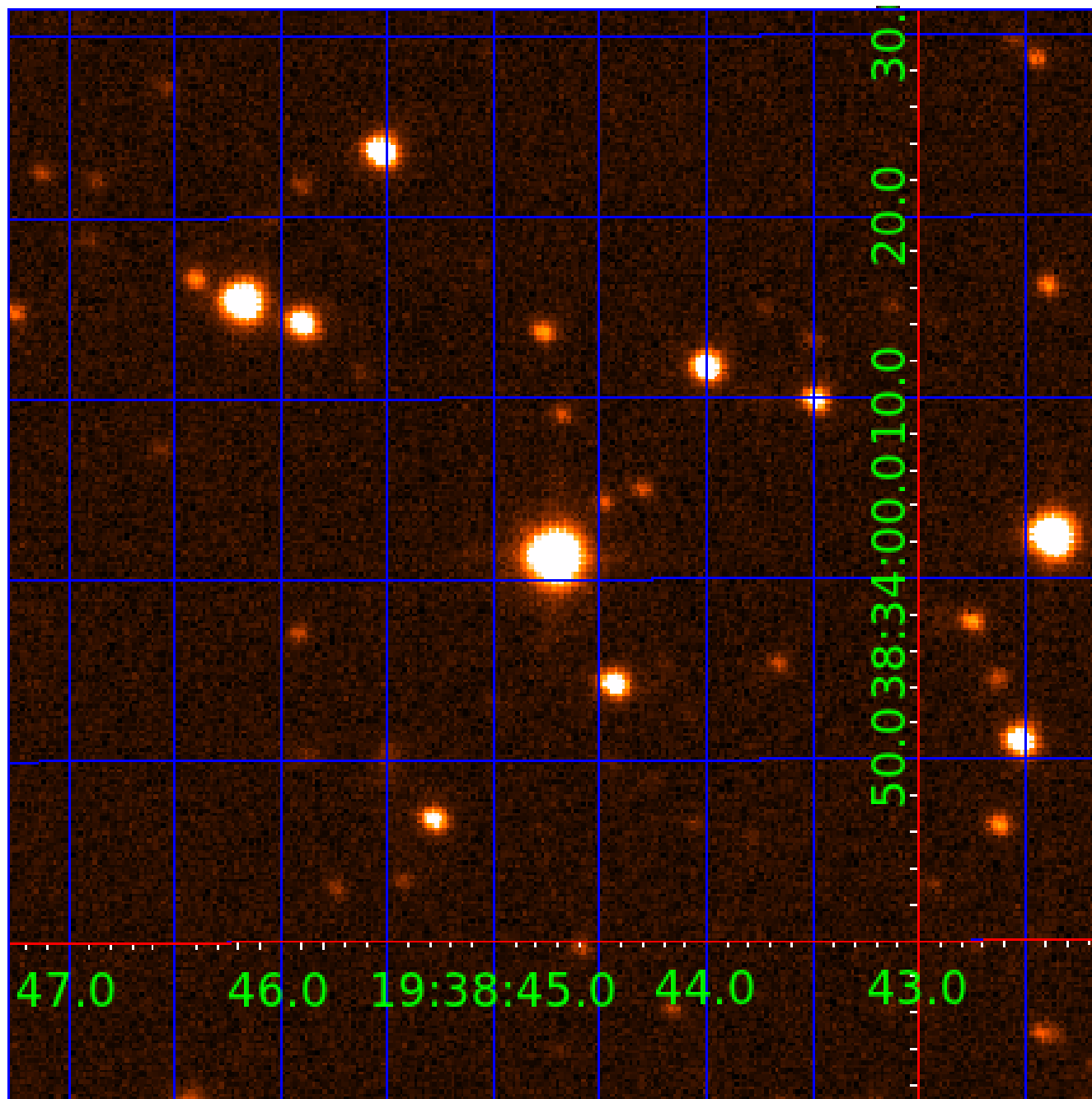


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 003456780

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
003456780-01	OBS	No	0.627966	131.732143	169.1	1.282	12.5	12.4	2.35	7865	3.57	58426.47
003456780-02	OBS	No	0.627967	131.874807	247.3	1.246	11.0	16.1	2.35	7865	4.31	58426.34
003456780-03	OBS	No	0.627959	131.573763	193.8	1.237	10.6	13.5	2.35	7865	3.82	58427.38
003456780-04	OBS	No	7.997527	133.193357	174.5	3.500	8.0	-1.0	2.35	7865	3.15	1964.49

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
003456780-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT
003456780-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—SAME_NTL_PERIOD
003456780-03	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD
003456780-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_ZUMA—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_ALT—CENT_NOFITS

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

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

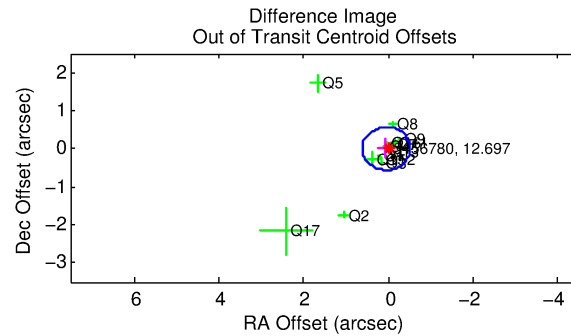
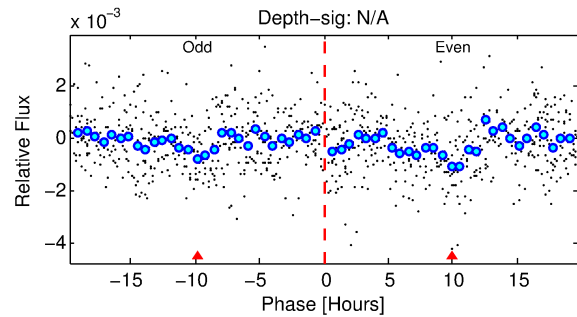
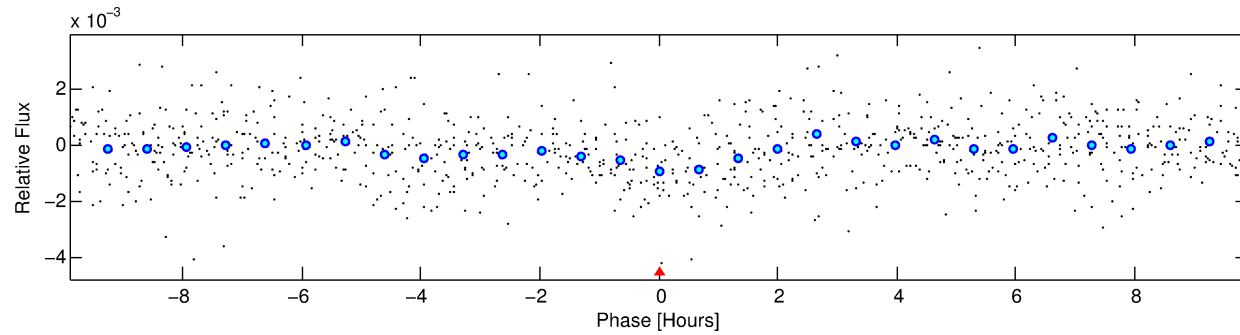
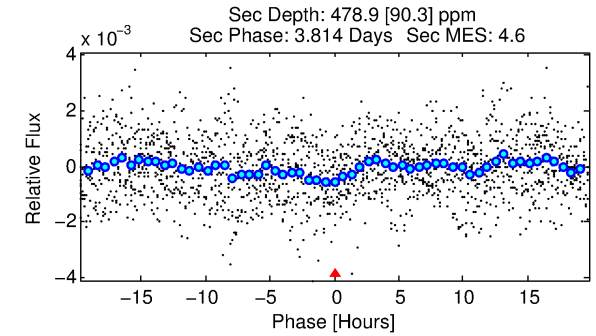
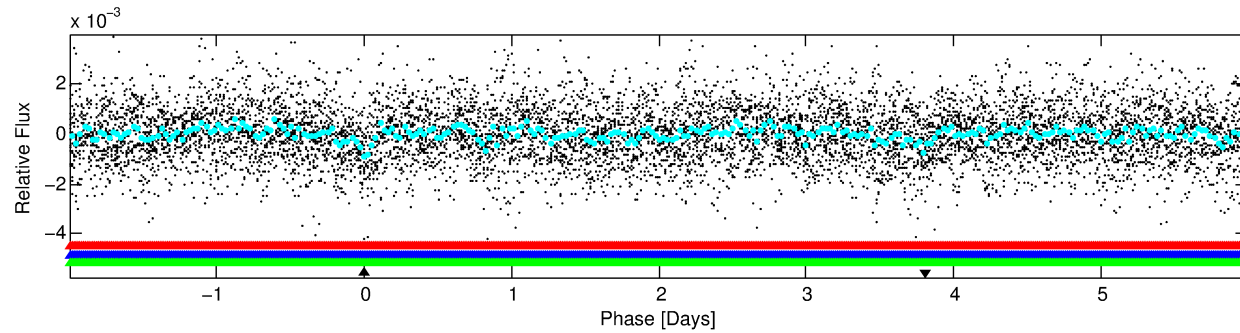
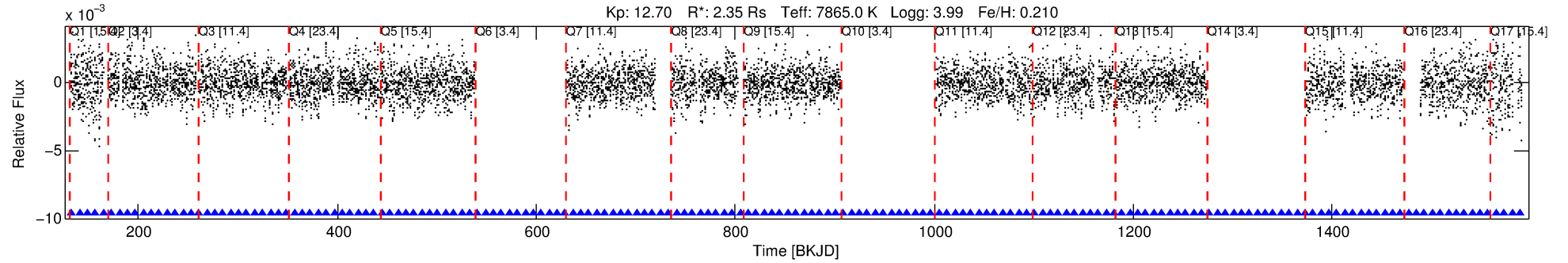
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 003456780-04

No Significant Match Found

# DV One-Page Summary

KIC: 3456780 Candidate: 4 of 4 Period: 7.998 d



## TPS TCE Results:

Period = 7.99753 d  
Epoch = 133.1934 BKJD

DV fit results are unavailable

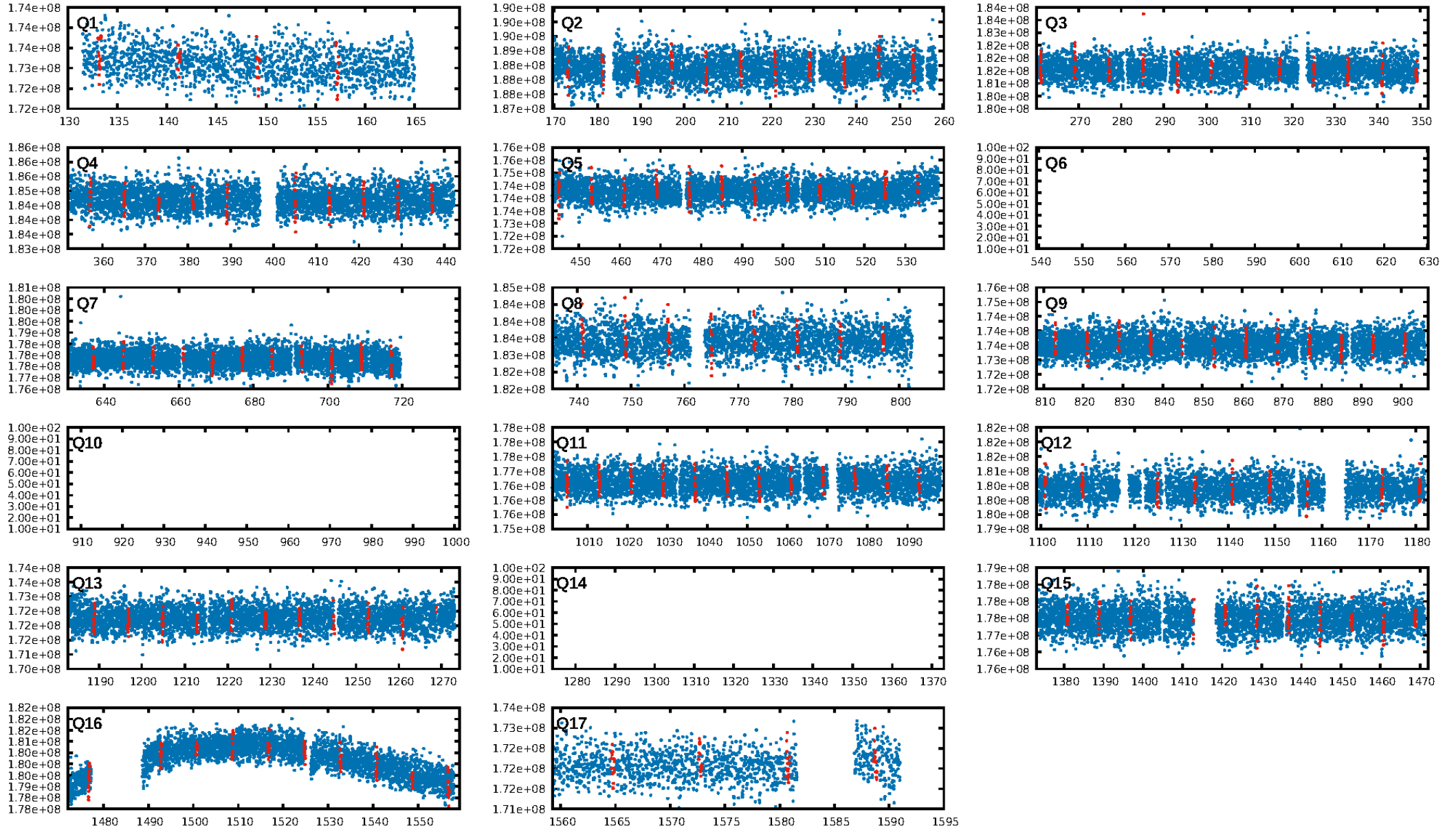
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [47.61 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [49/49]  
GhostDiagnostic-chr: 2.782  
Centroid-sig: 80.7%  
Centroid-so: 0.193 arcsec [2.24 $\sigma$ ]  
OotOffset-rm: 0.053 arcsec [0.28 $\sigma$ ]  
KicOffset-rm: 0.218 arcsec [1.09 $\sigma$ ]  
OotOffset-st: 1/4/4/5 [14]  
KicOffset-st: 1/4/4/5 [14]  
DiffImageQuality-fgm: 0.36 [5/14]  
DiffImageOverlap-fno: 0.00 [0/14]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 21:30:55 Z

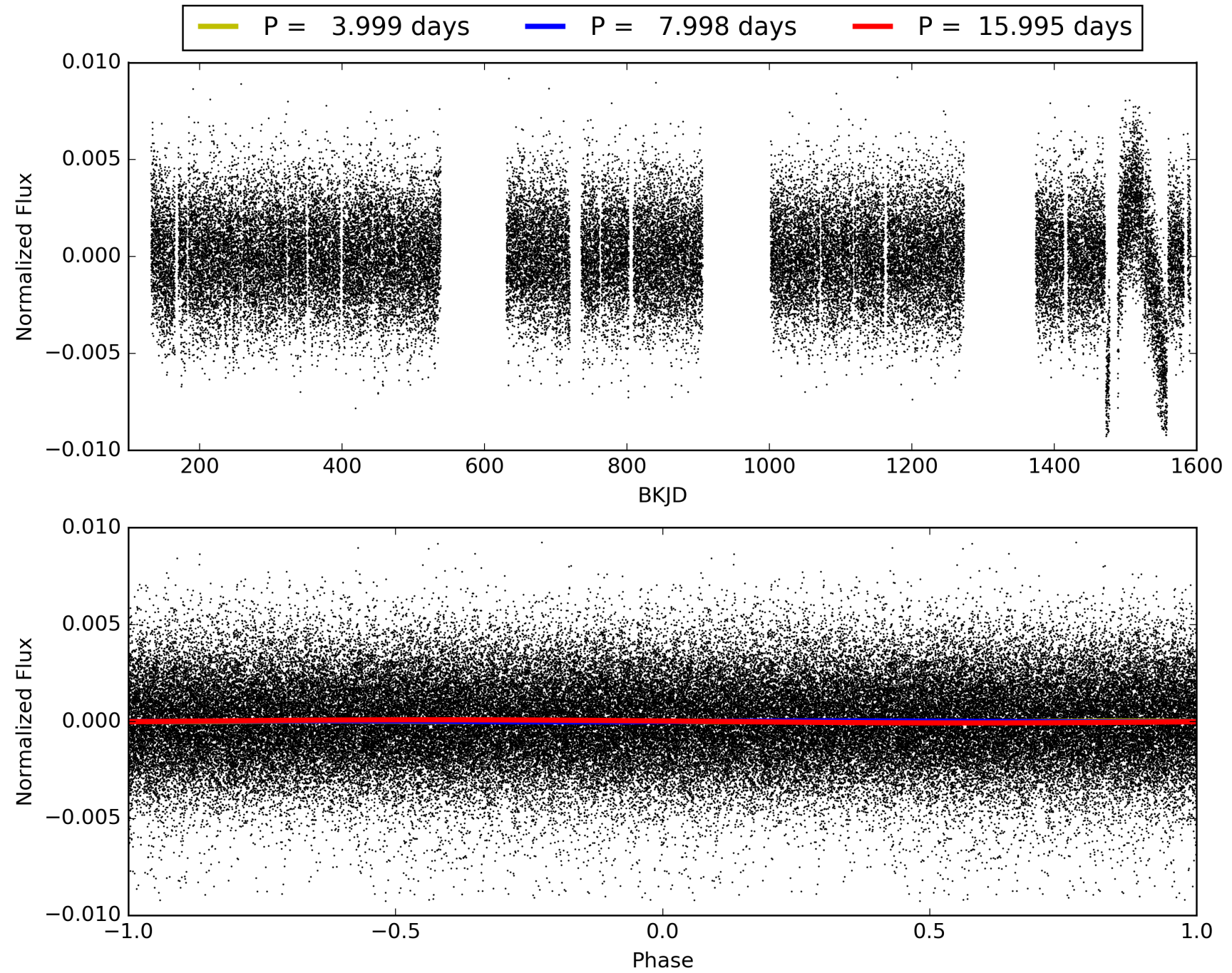
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 003456780-04, PDC Light Curves



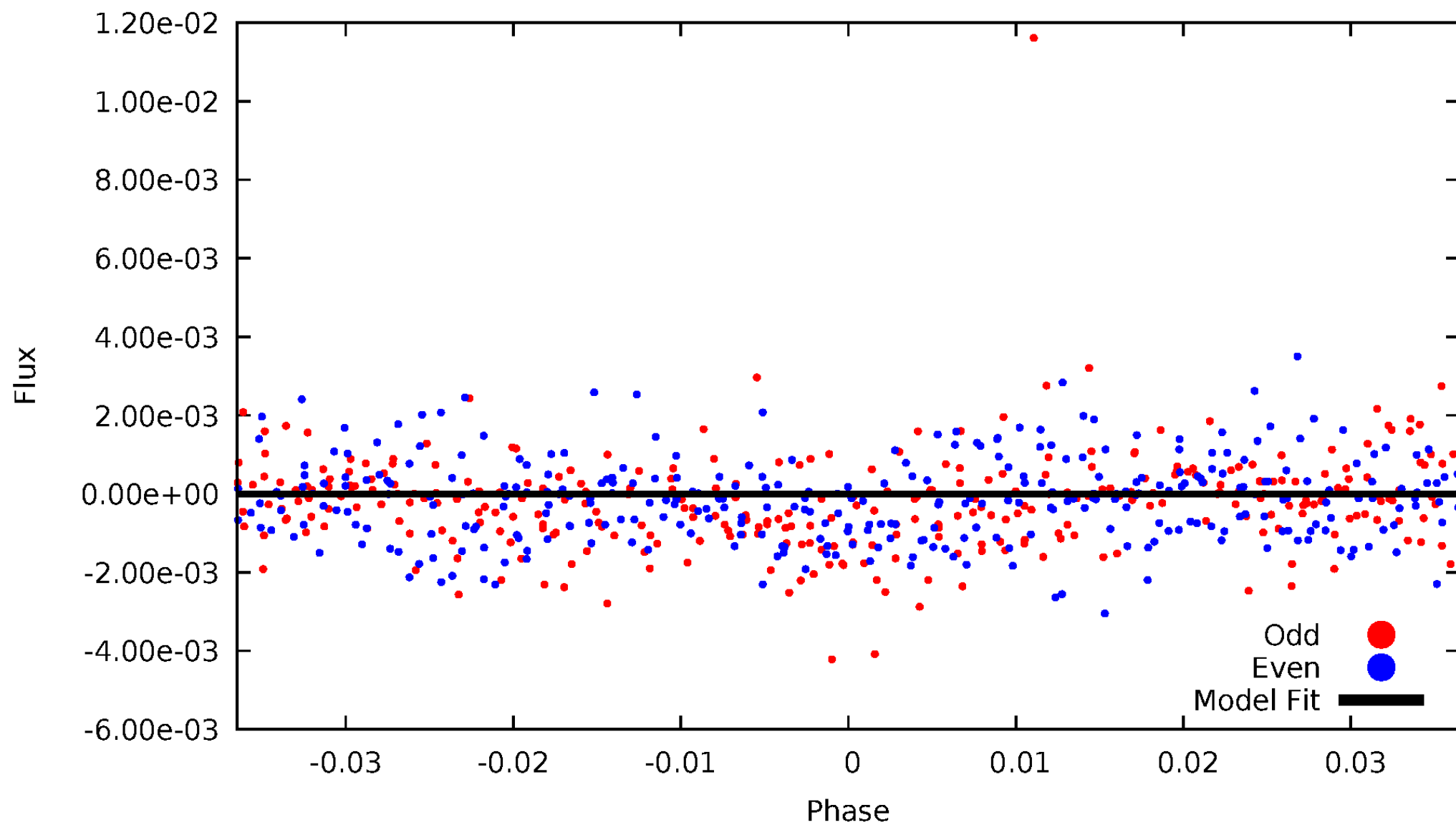


TCE 003456780-04



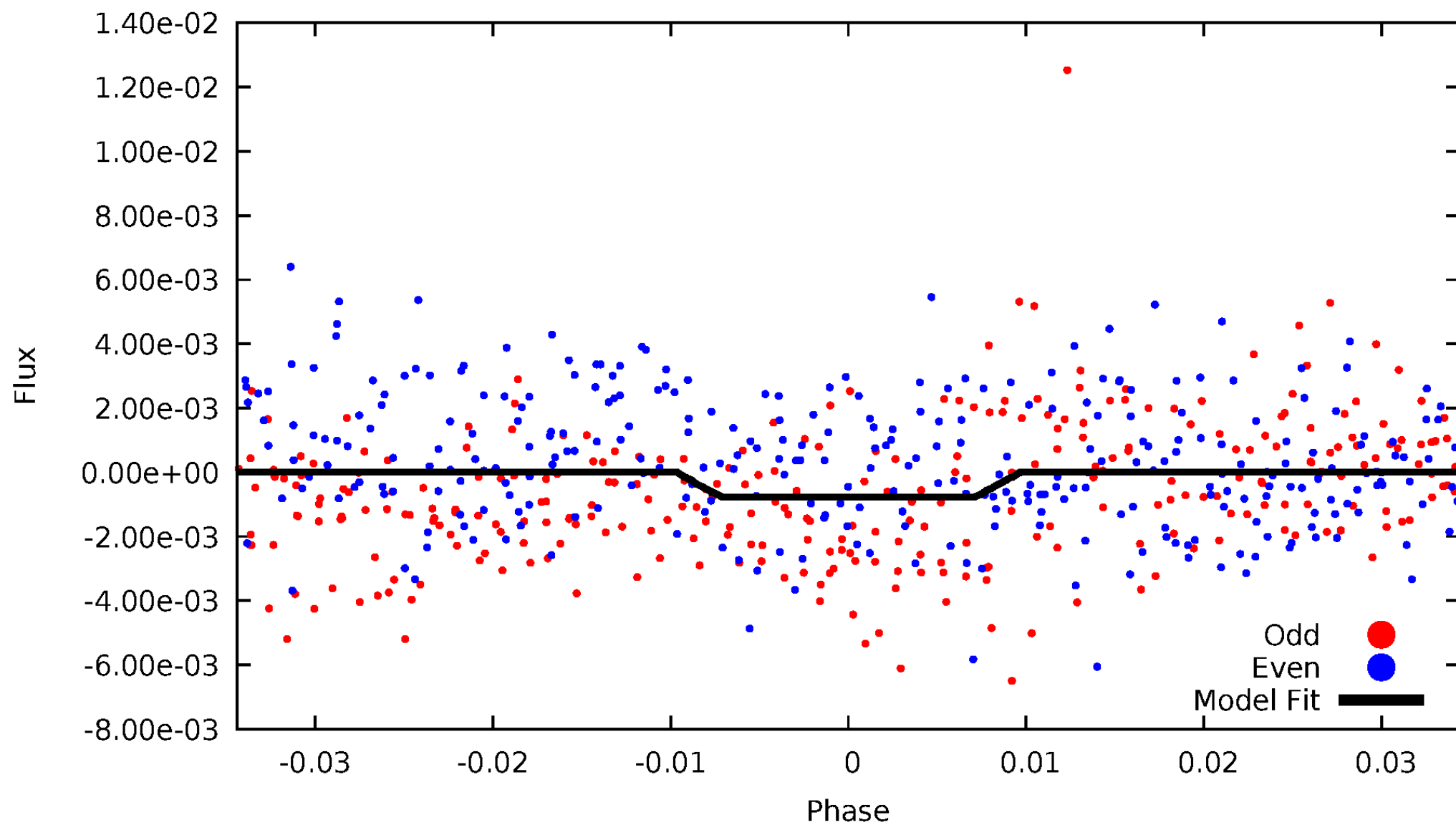
# DV Odd/Even

TCE 003456780-04



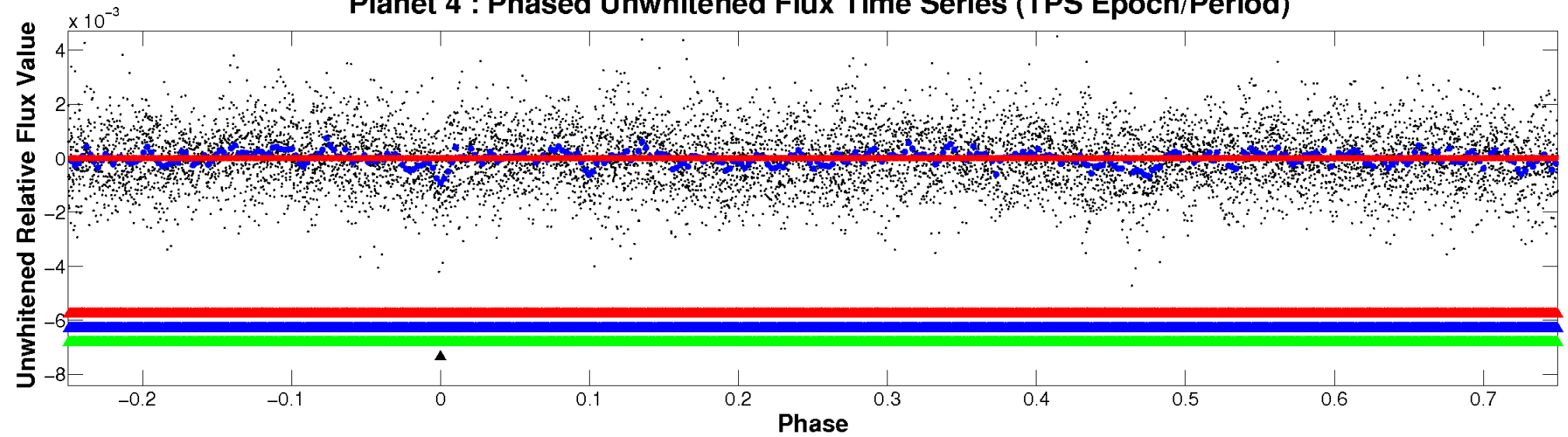
# ALT Odd/Even

TCE 003456780-04

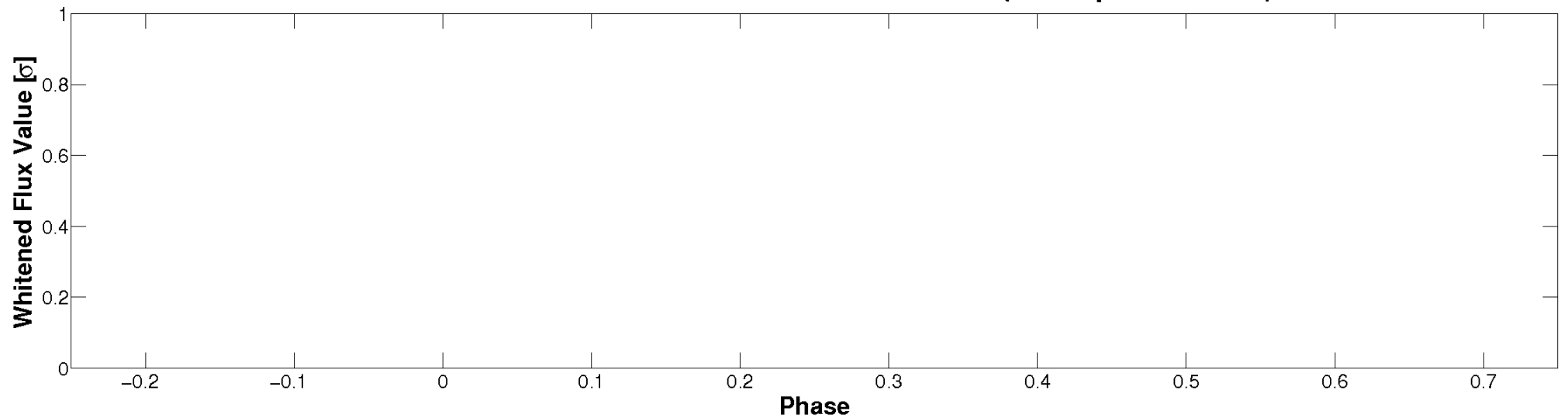


# Non-Whitened Vs. Whitened Light Curve

**Planet 4 : Phased Unwhitened Flux Time Series (TPS Epoch/Period)**

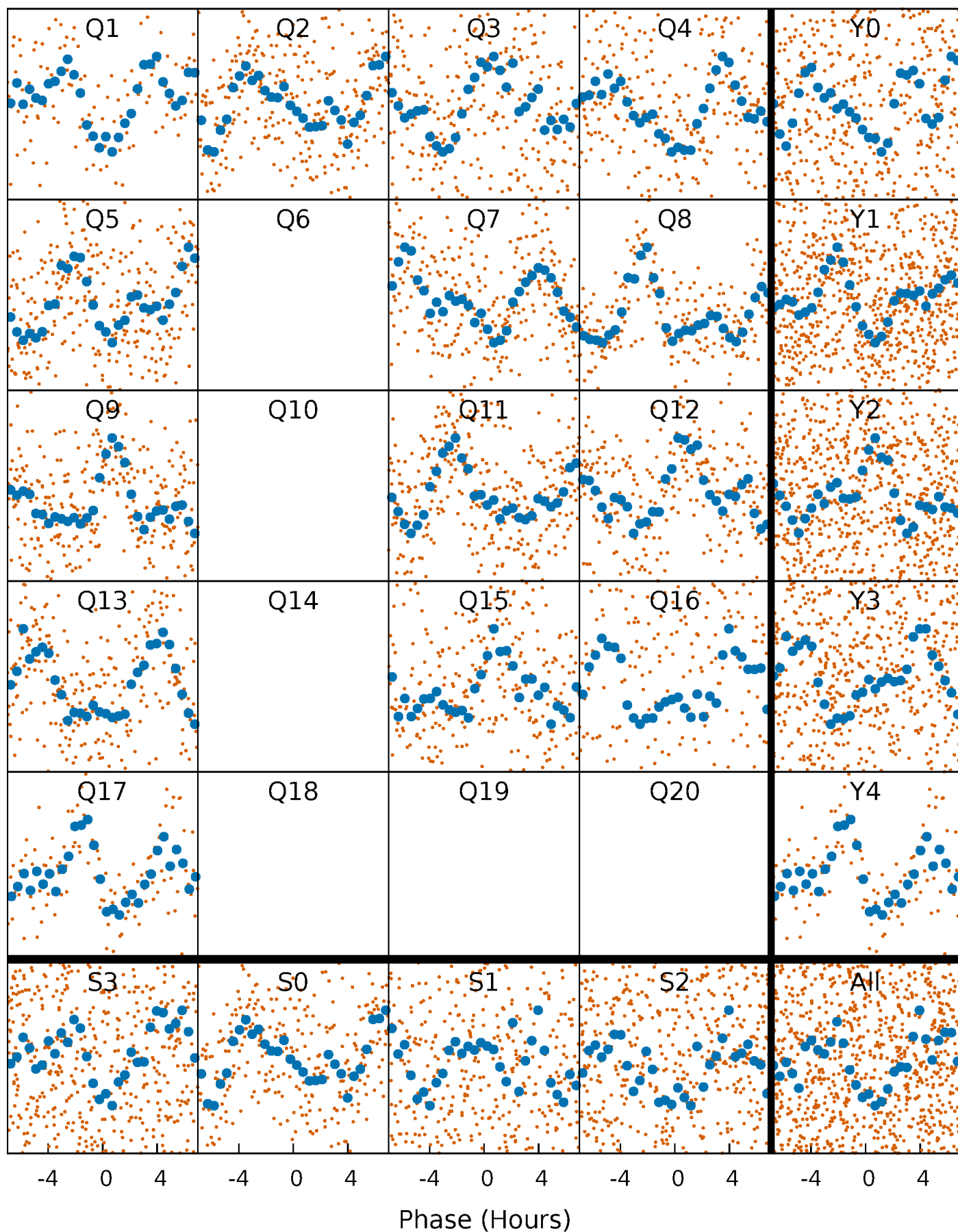


**Planet 4 : Phased Whitened Flux Time Series (TPS Epoch/Period)**



# PDC Quarter-Phased Transit Curves

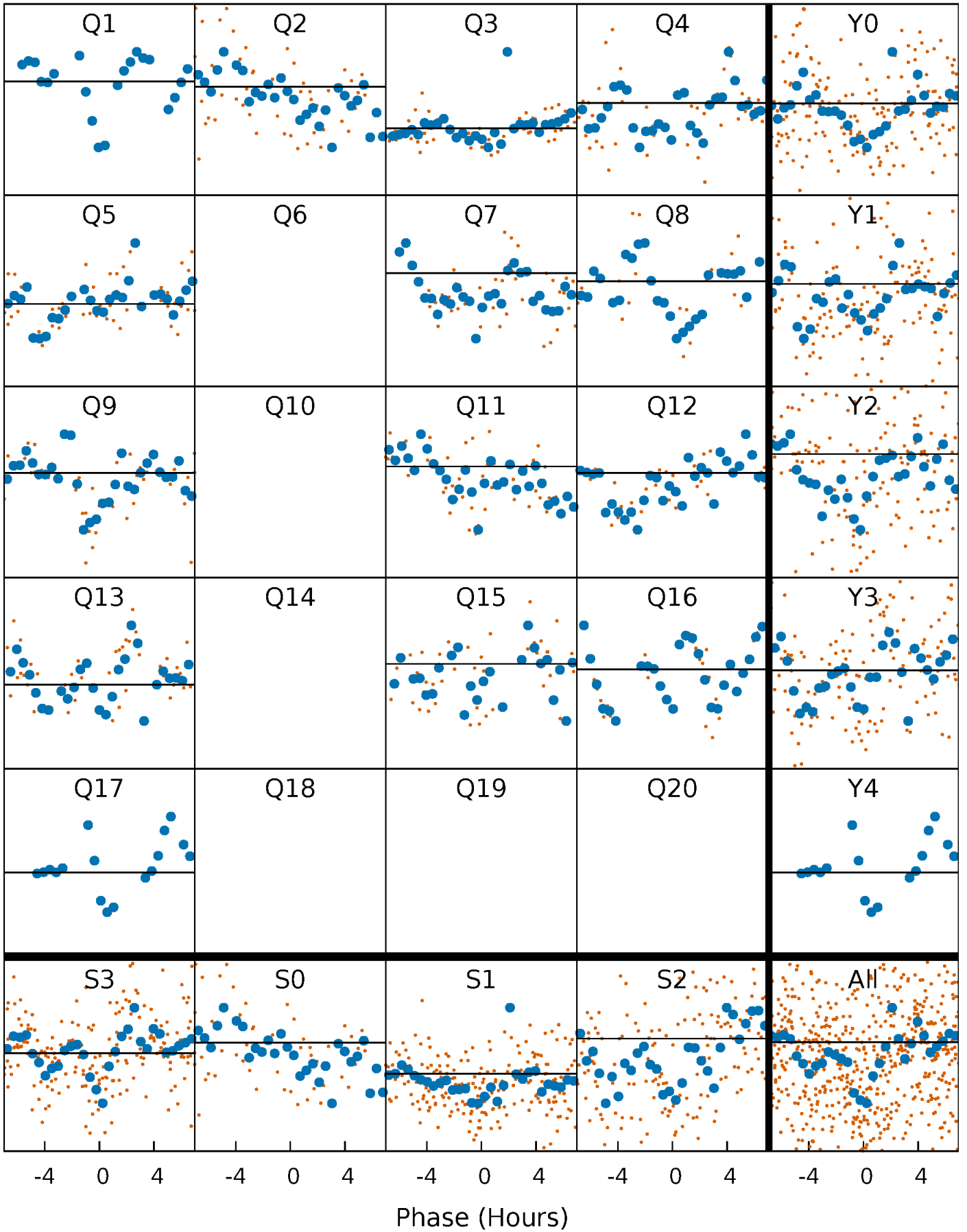
TCE 003456780-04 P= 7.997527 Days  $T_0=133.193357$  (BKJD)





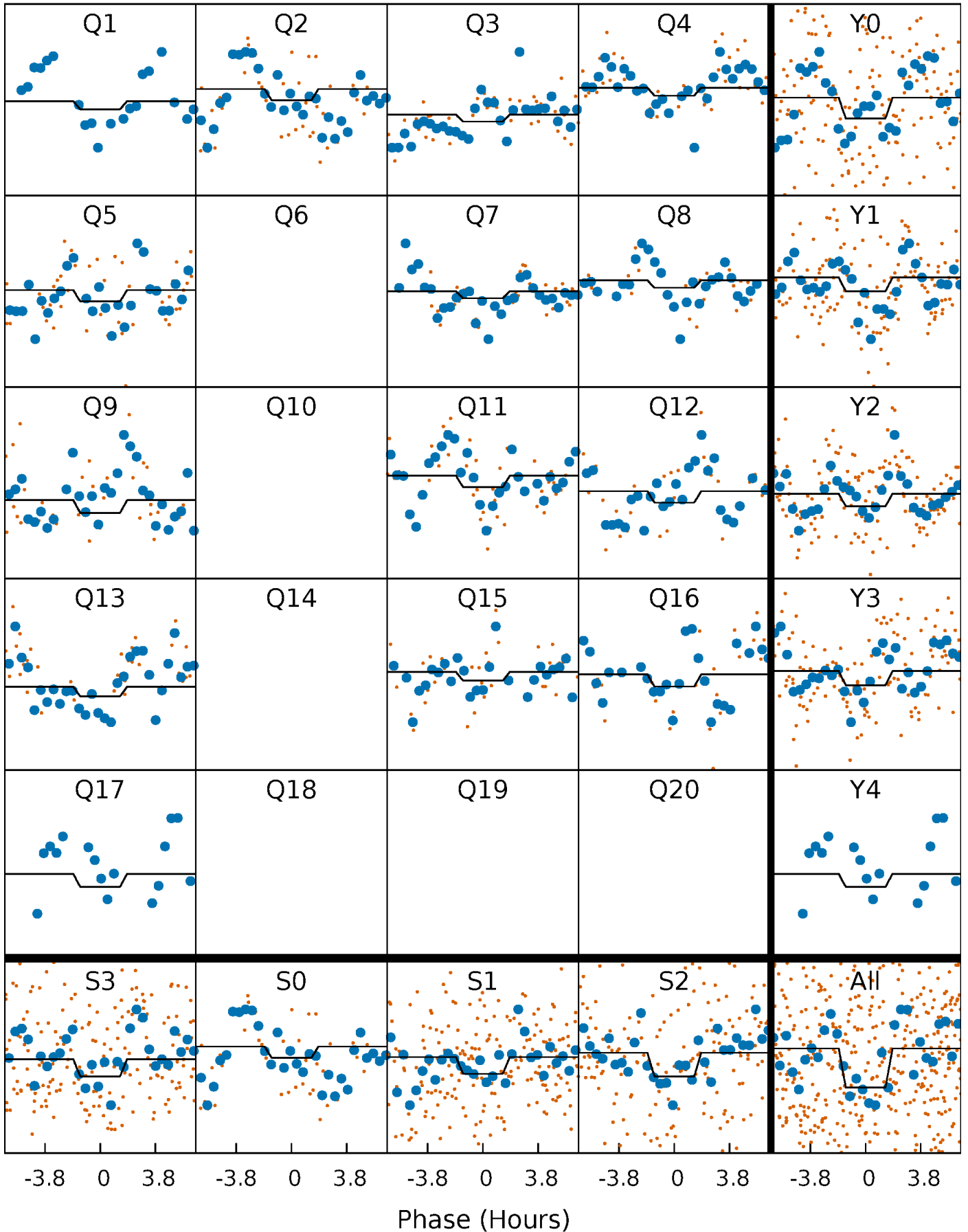
# DV Quarter-Phased Transit Curves

TCE 003456780-04     $P = 7.997527$  Days     $T_0 = 133.193357$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

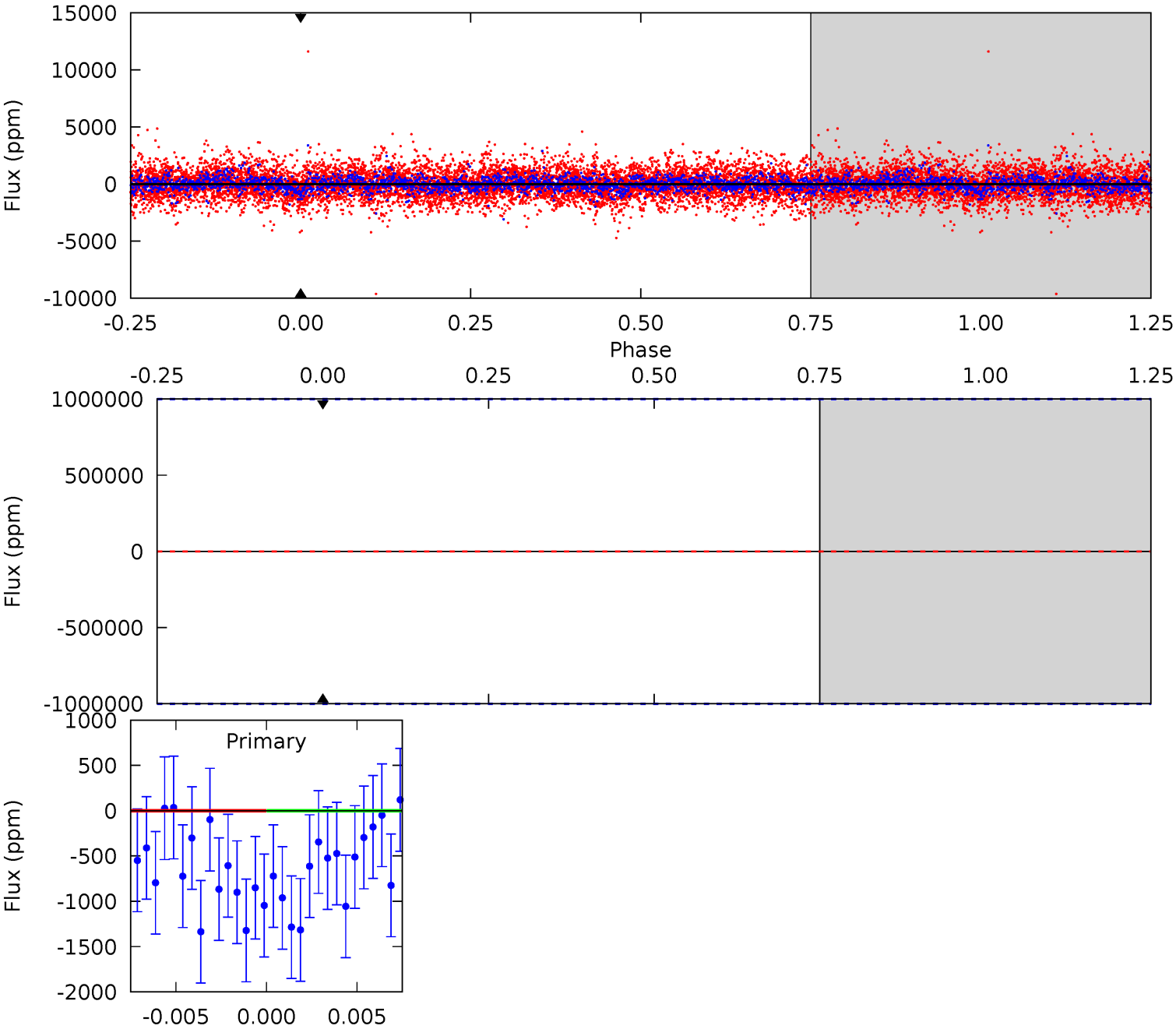
TCE 003456780-04     $P = 7.997527$  Days     $T_0 = 133.183425$  (BKJD)



# DV Model-Shift Uniqueness Test

003456780-04, P = 7.997527 Days, E = 125.195830 Days

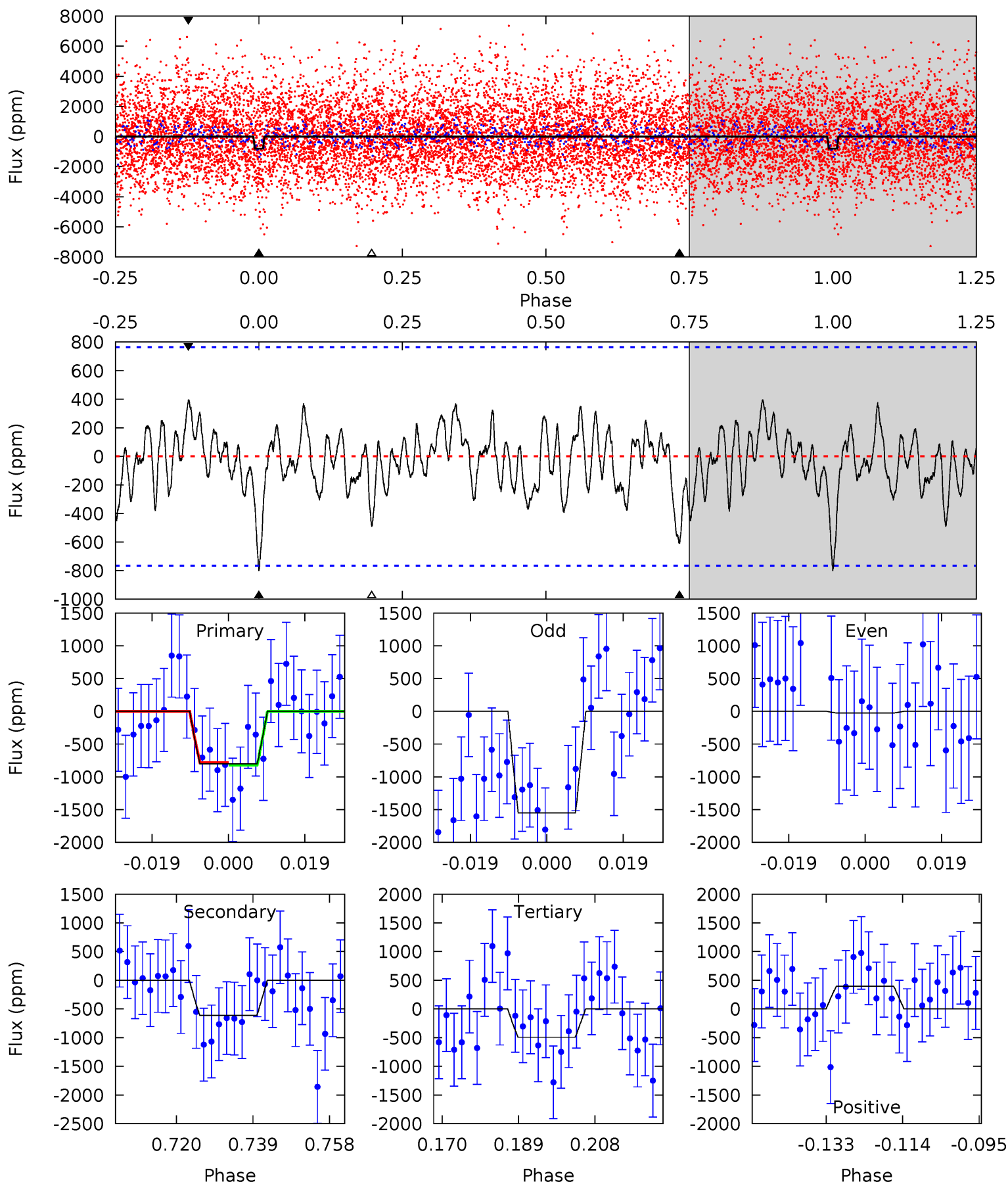
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
0	0	0	0	1.00	1.00	1.00	0	0	0	0	0	0	0	0



# Alt Model-Shift Uniqueness Test

003456780-04, P = 7.997527 Days, E = 125.185898 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
5.14	3.92	3.15	2.54	4.90	2.35	1.12	1.99	2.61	0.76	1.38	4.90	1.32	0.33	0.12



### Stellar Parameters For KIC 003456780

	$T_{\text{eff}}(K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7865^{+216}_{-351}$	$3.991^{+0.176}_{-0.144}$	$0.210^{+0.150}_{-0.400}$	$2.351^{+0.565}_{-0.565}$	$1.974^{+0.249}_{-0.373}$	$0.214^{+0.204}_{-0.089}$
	+3%/-4%	+4%/-4%	+71%/-190%	+24%/-24%	+13%/-19%	+95%/-42%
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 003456780-04 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$0 \pm 1000000$	$19.60^{+18.21}_{-13.55}$	$2352^{+164}_{-152}$	$4701^{+39496}_{-44644}$	$10^{+2683}_{-2237}$
Alt.	$-611 \pm 156$	$21.41^{+19.74}_{-15.05}$	$2361^{+152}_{-172}$	$4316^{+3227}_{-942}$	$6.933^{+69.167}_{-5.143}$

$T_{\text{max}}$  = Theoretical Maximum Planetary Temperature

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

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

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



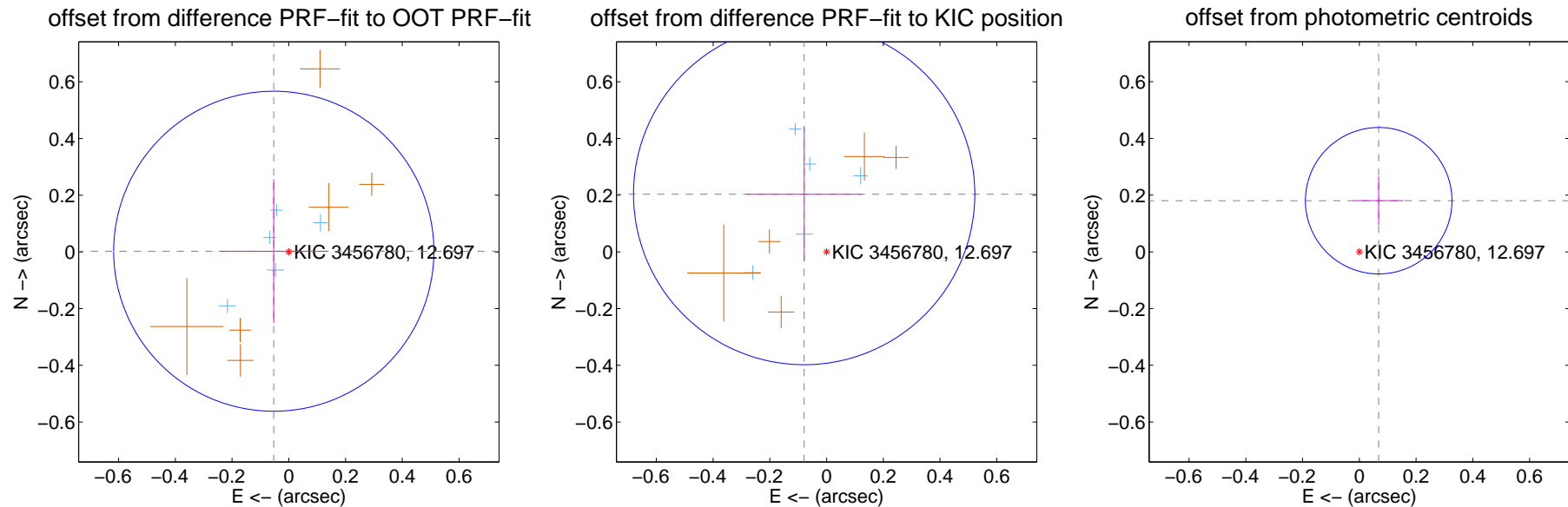
## DV Centroid Data

Supplemental centroid analysis for 003456780-04. Kepler magnitude: 12.70. Transit SNR -1.00

There are 5 quarters with good PRF difference image offsets

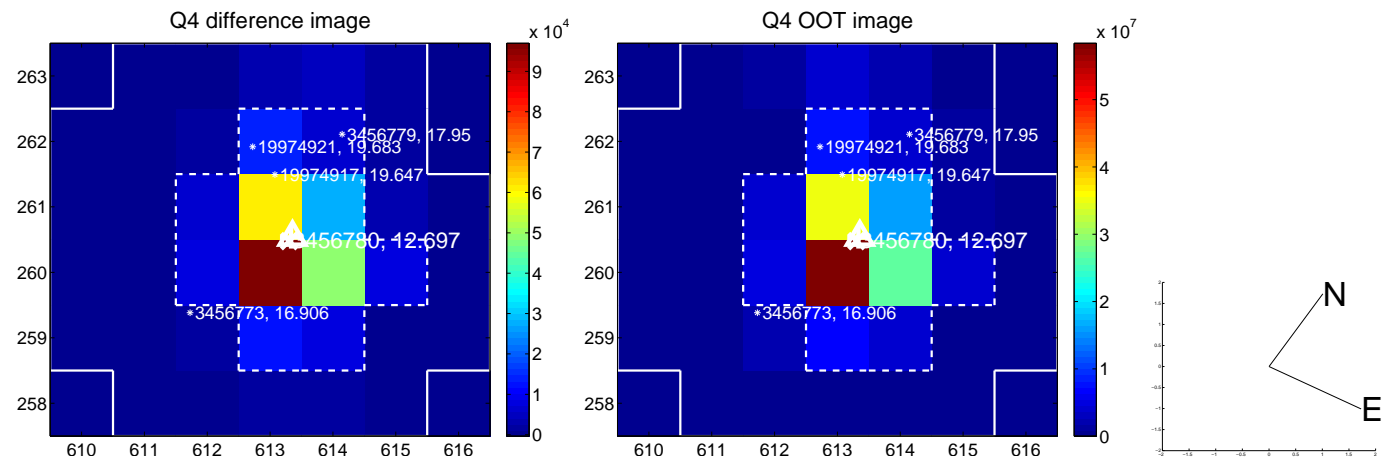
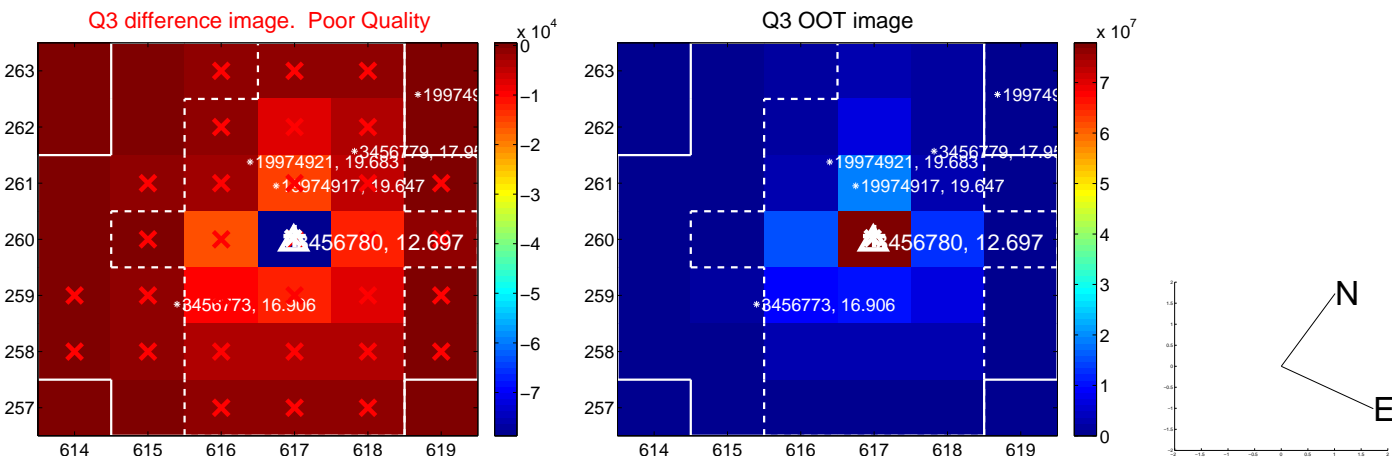
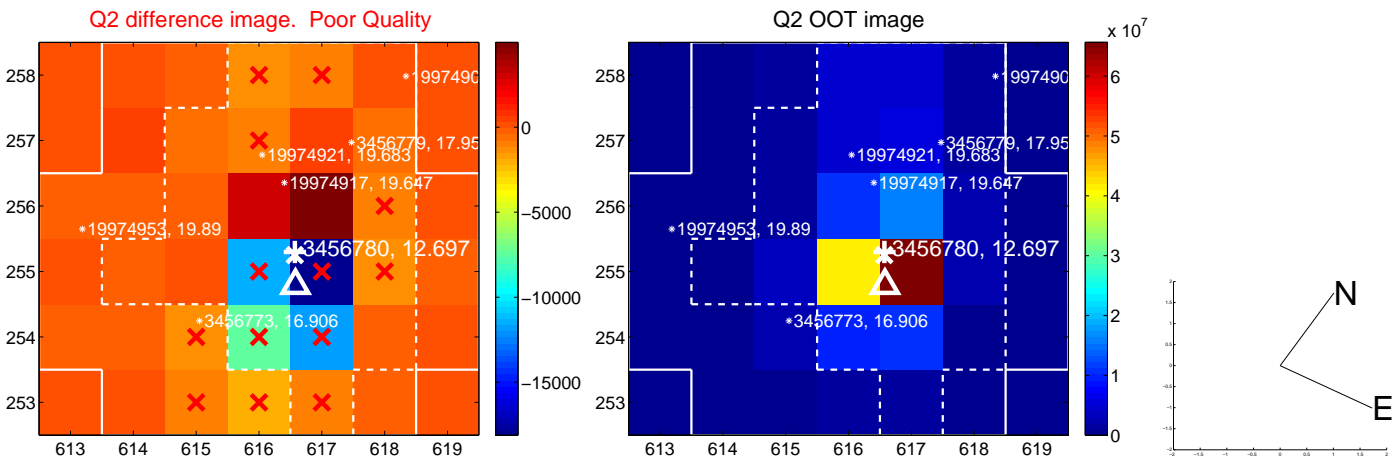
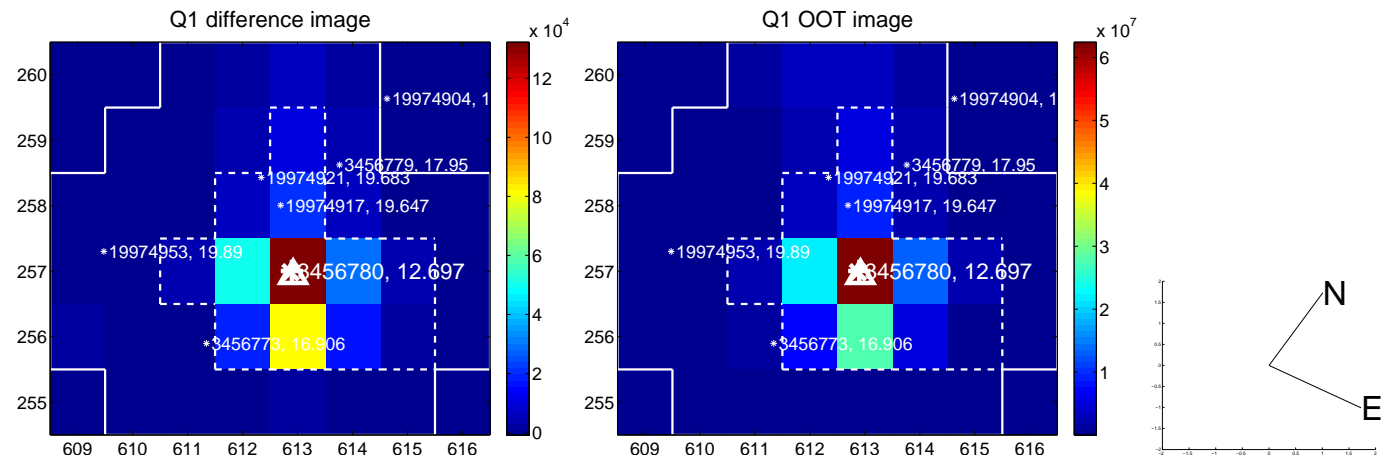
The direct PRF centroid is offset from the target star catalog position by about 0.12 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.053 \pm 0.188$	0.28	$0.053 \pm 0.192$	$0.002 \pm 0.254$
PRF-fit source offset from KIC position	$0.218 \pm 0.200$	1.09	$0.079 \pm 0.203$	$0.204 \pm 0.236$
photometric centroid source offset	$0.19 \pm 0.09$	2.24	$-0.07 \pm 0.09$	$0.18 \pm 0.09$

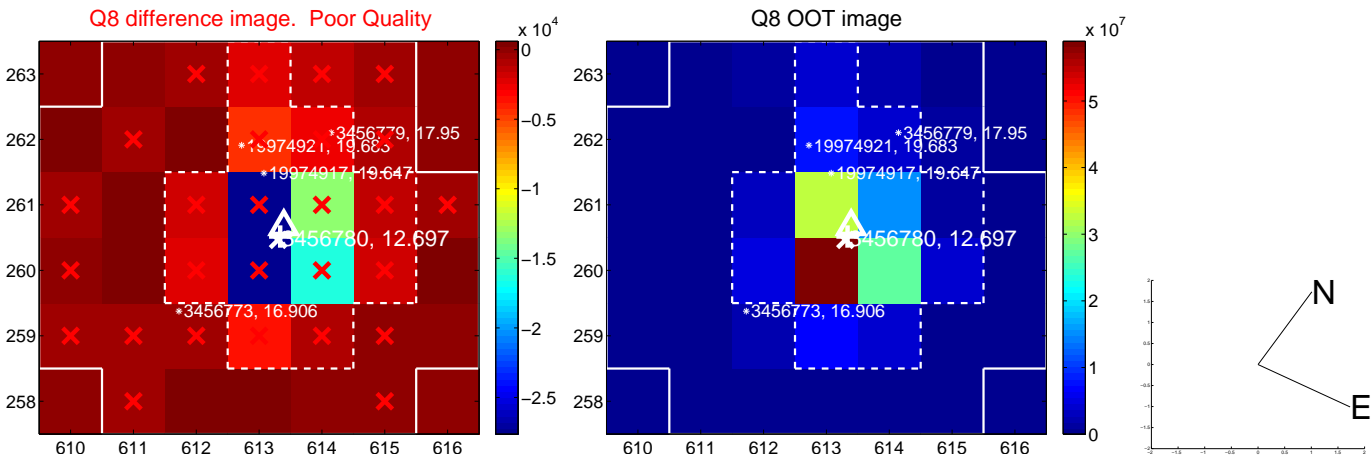
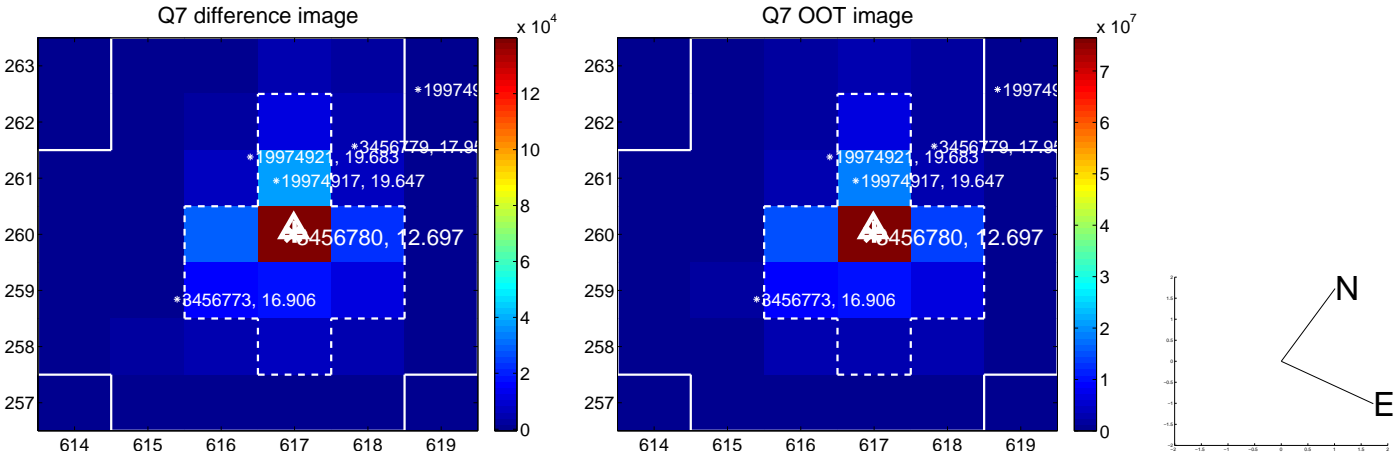
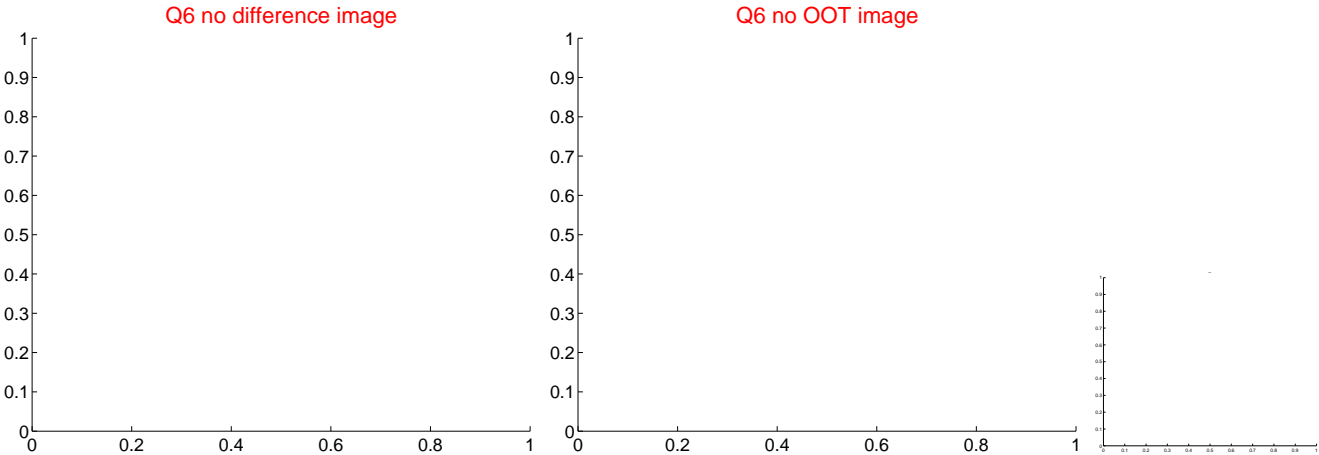
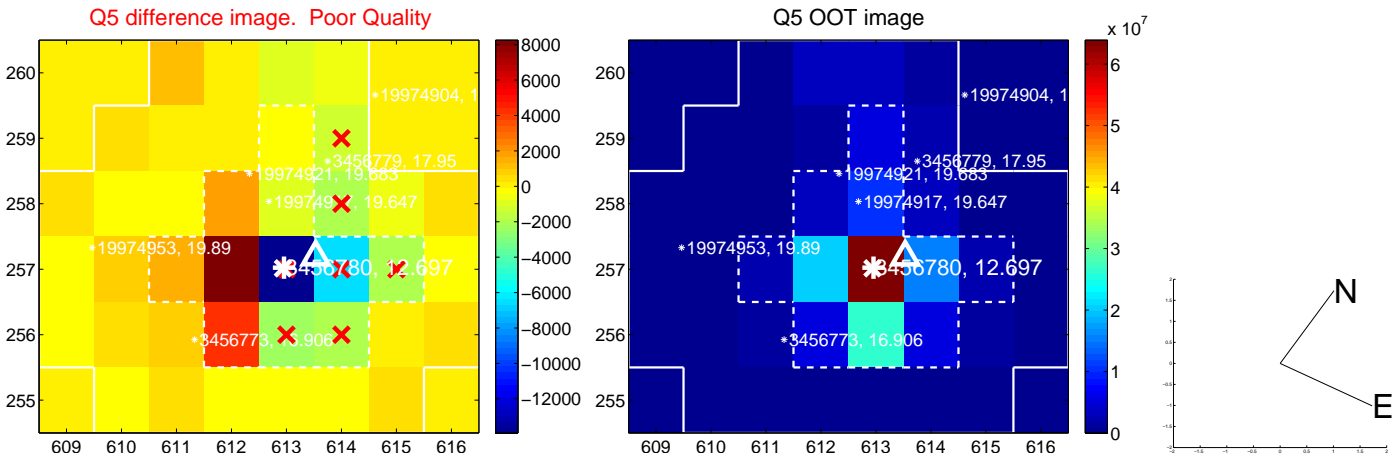


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

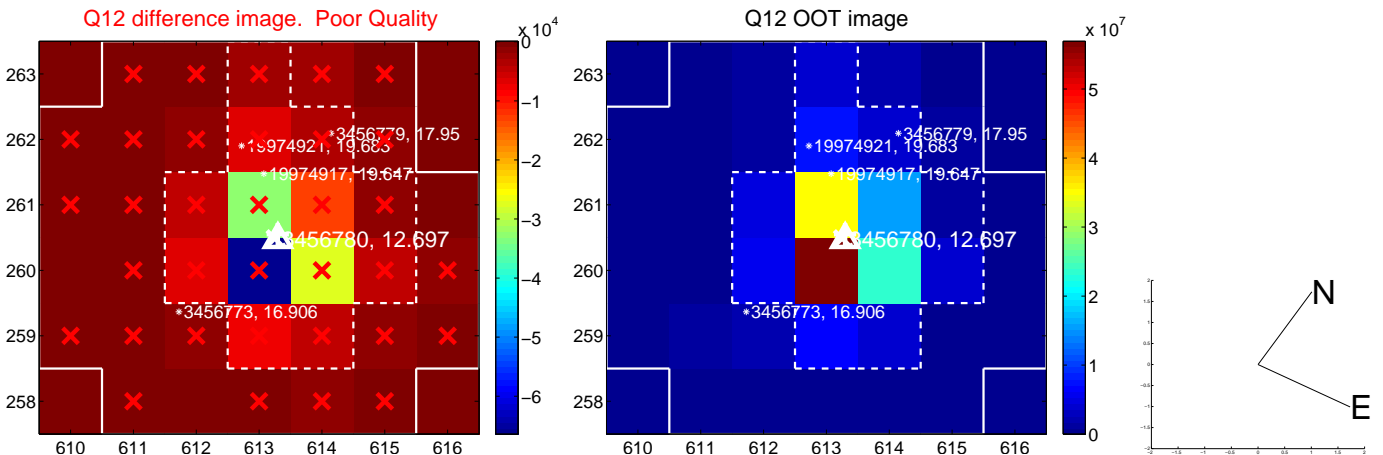
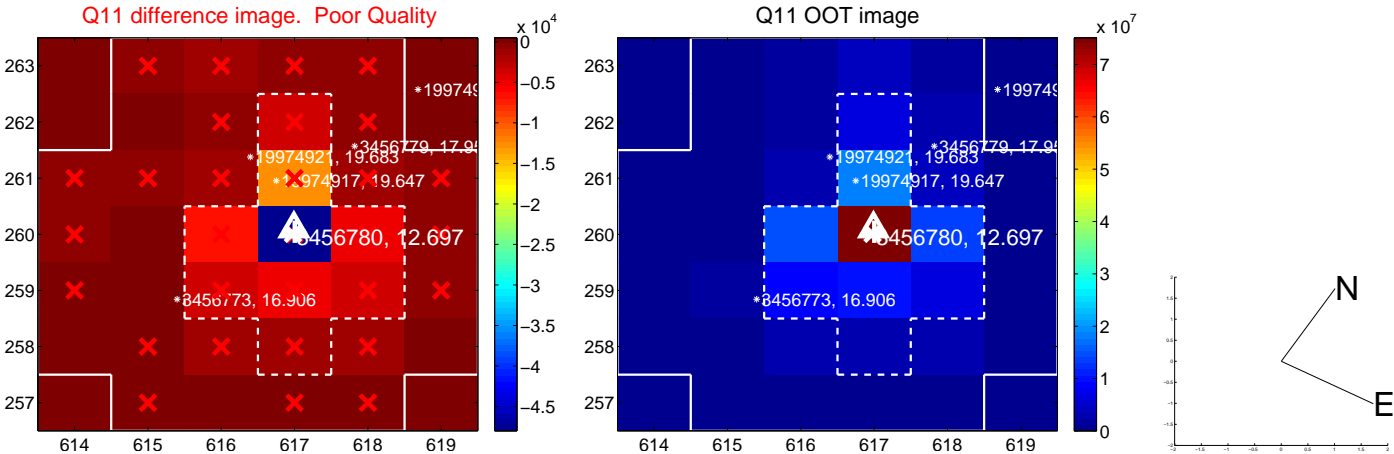
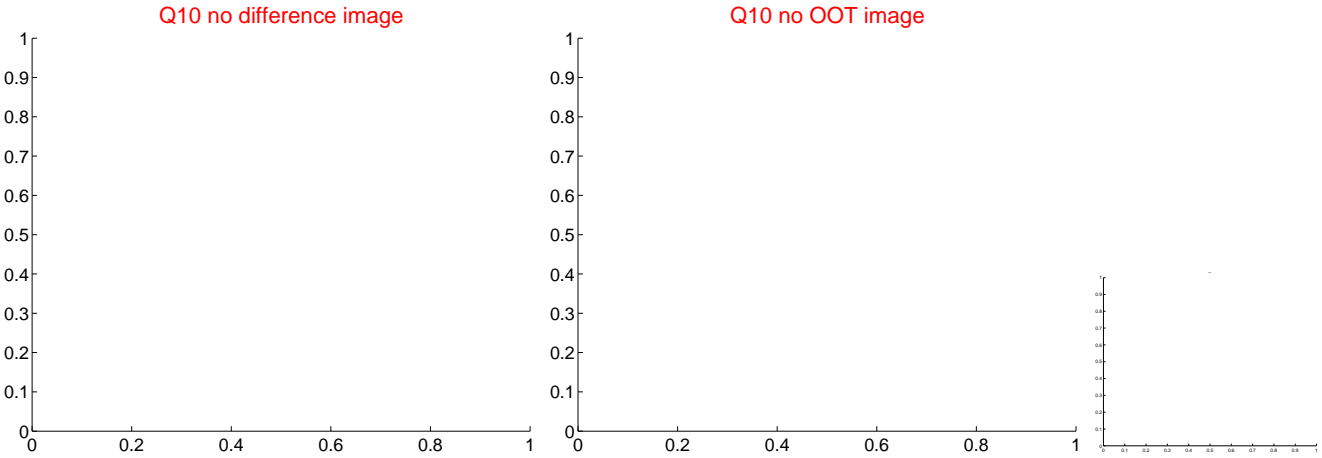
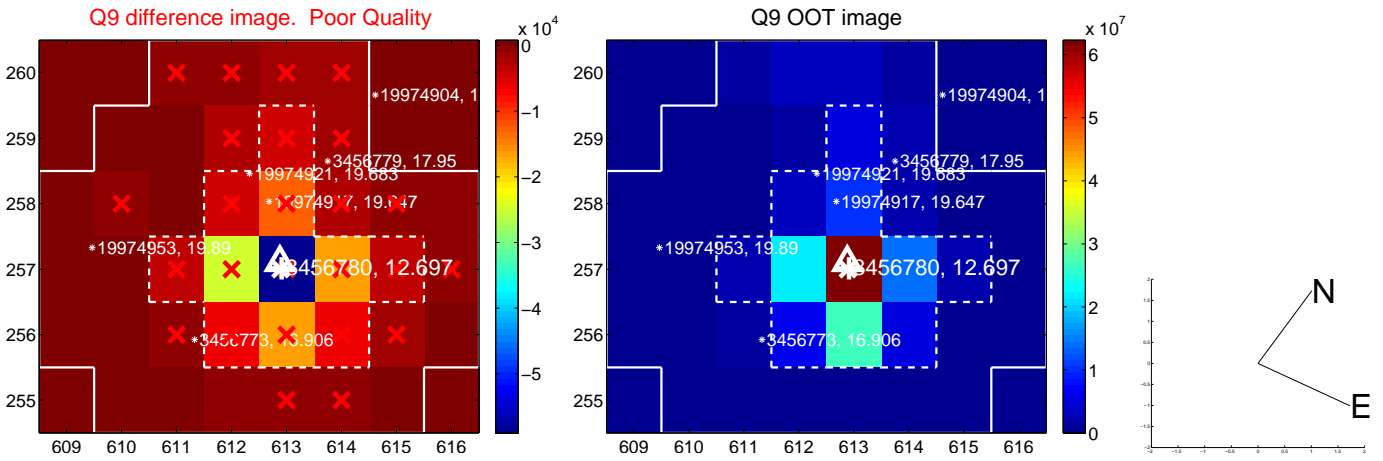
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



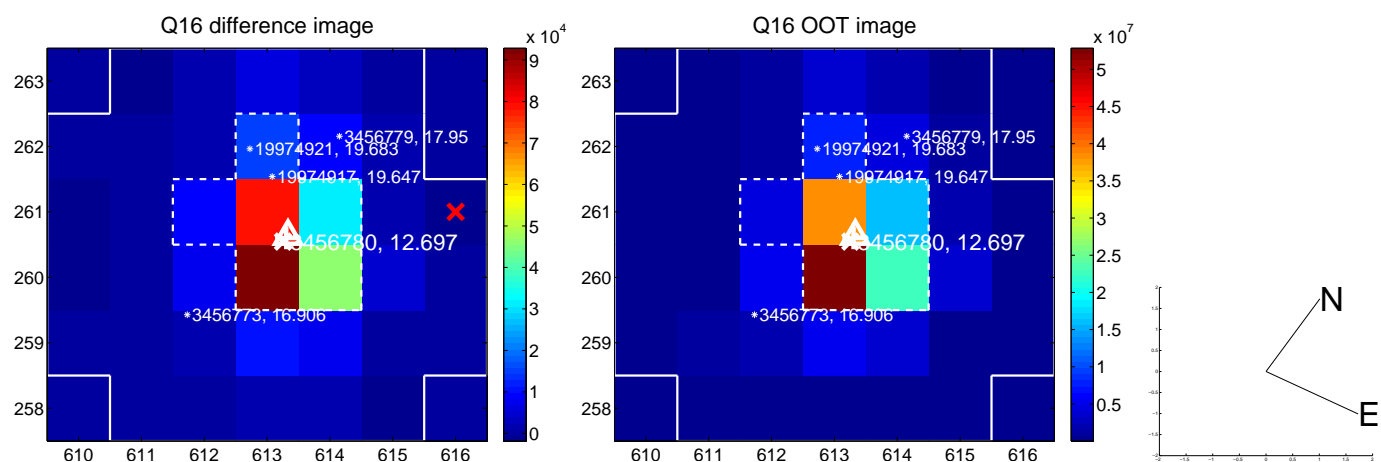
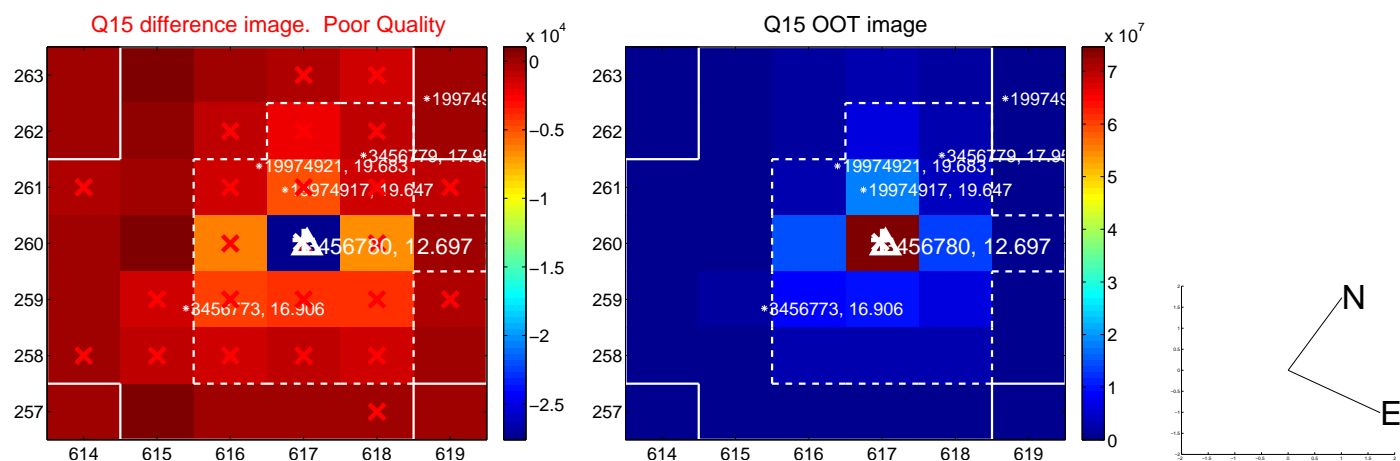
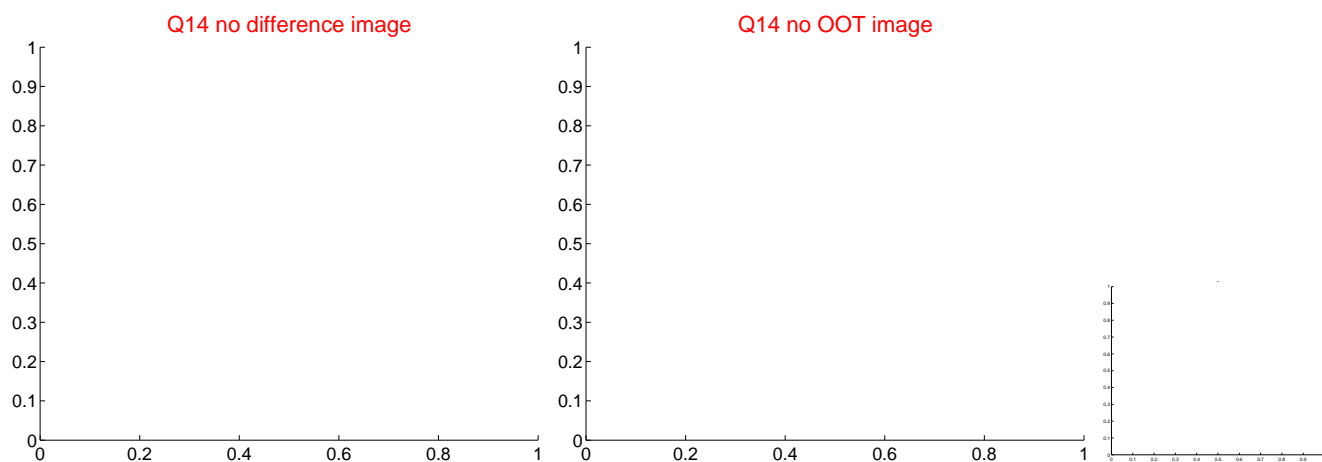
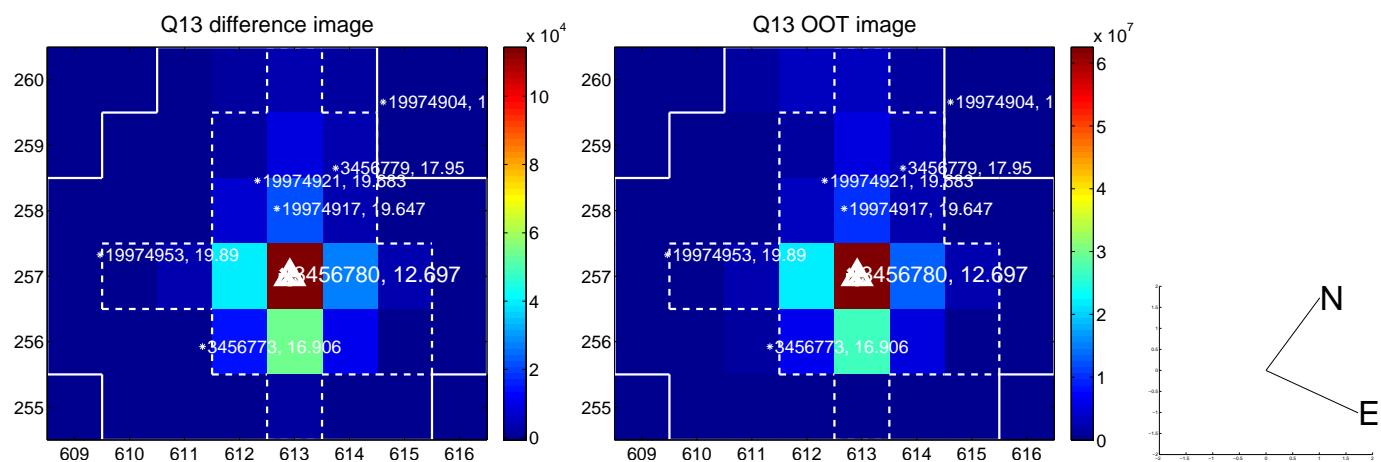
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

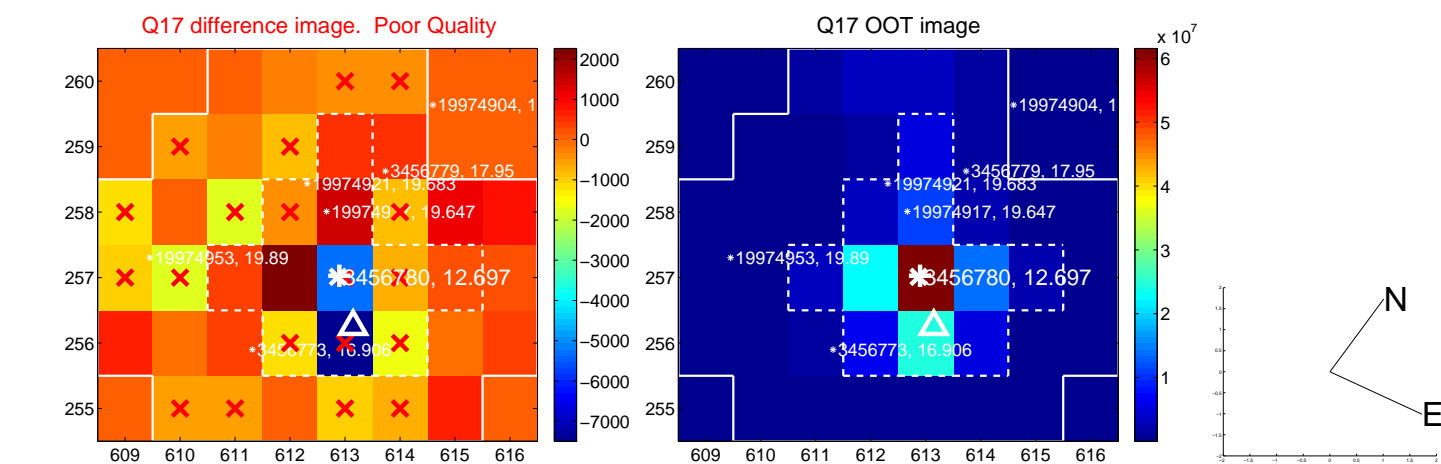


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

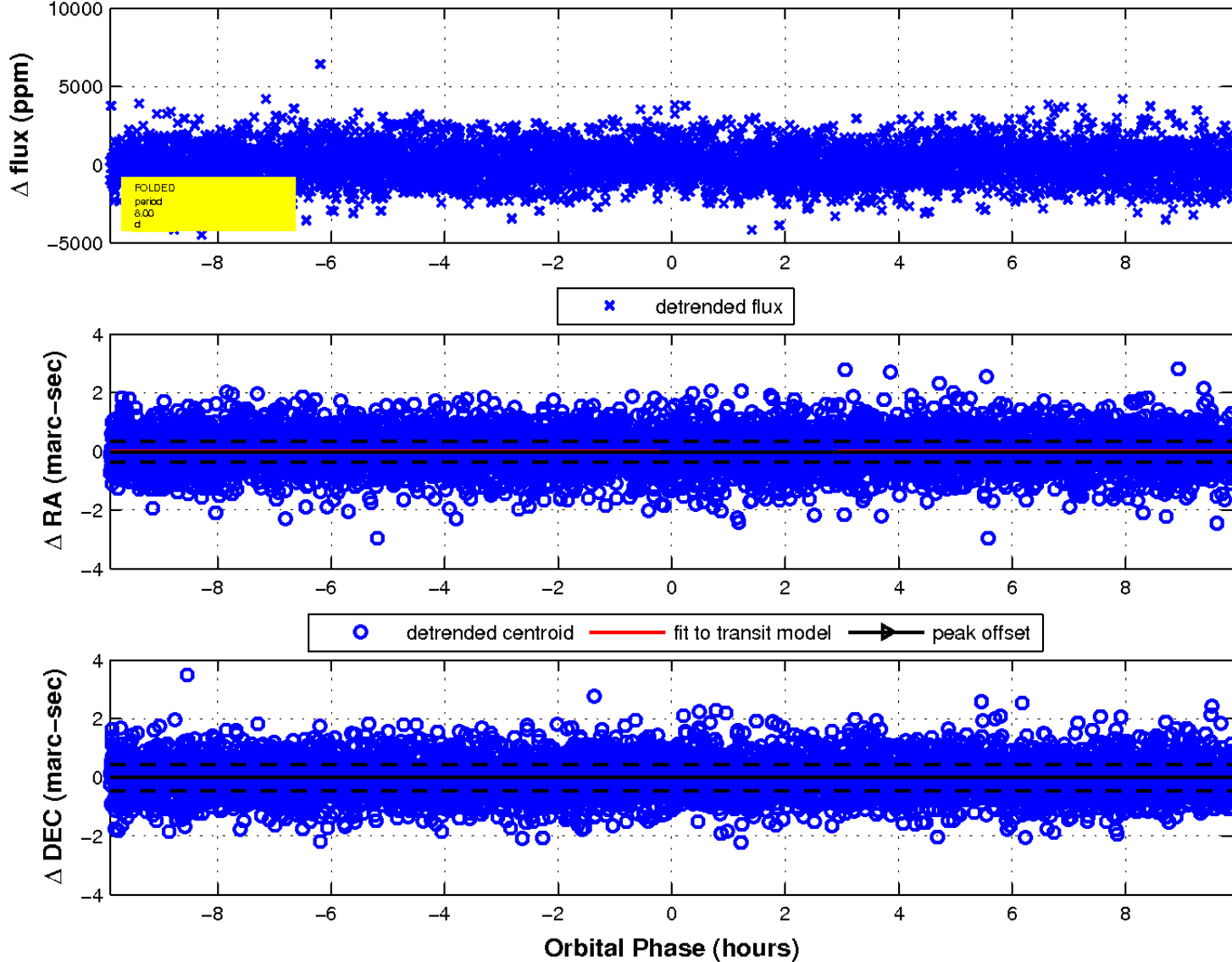




white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



fluxWeightedCentroids, Planet 4 of 4



UKIRT Image

Declination

