

# KIC 009965121

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009965121-01	OBS	No	2.344483	132.895552	23.6	14.975	7.4	7.9	1.58	7071	0.98	3656.03
009965121-02	OBS	No	46.383850	158.097080	176.7	9.784	10.3	8.1	1.58	7071	2.29	68.33
009965121-03	OBS	No	55.446483	167.223038	218.3	5.949	8.3	6.9	1.58	7071	2.54	53.86
009965121-04	OBS	No	89.185717	192.230345	281.1	3.003	8.0	7.8	1.58	7071	2.92	28.58
009965121-05	OBS	No	68.625577	198.282423	365.8	2.469	7.9	8.6	1.58	7071	4.20	40.53

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009965121-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—CENT_UNCERTAIN
009965121-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_FEW_DIFFS
009965121-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_FEW_DIFFS
009965121-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS
009965121-05	OBS	FP	0.00	1	0	0	0	TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT—CENT_FEW_DIFFS

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

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

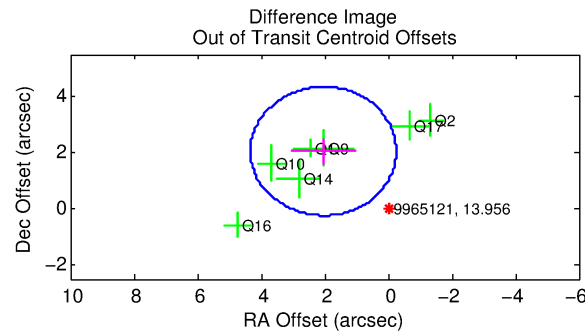
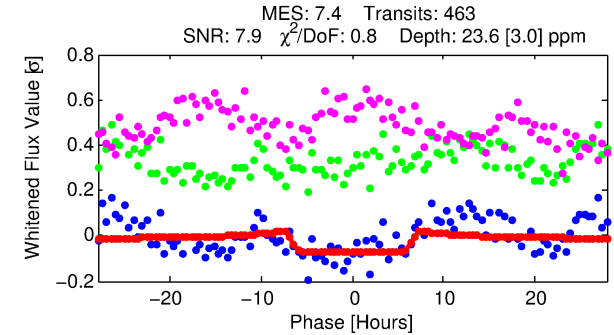
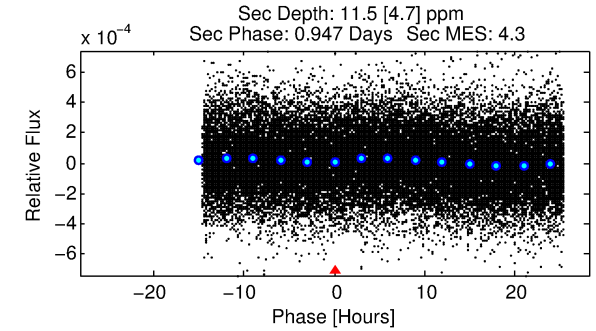
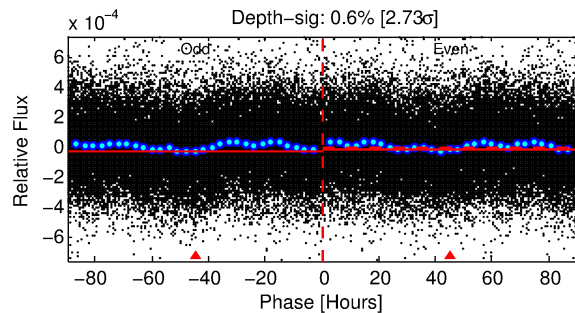
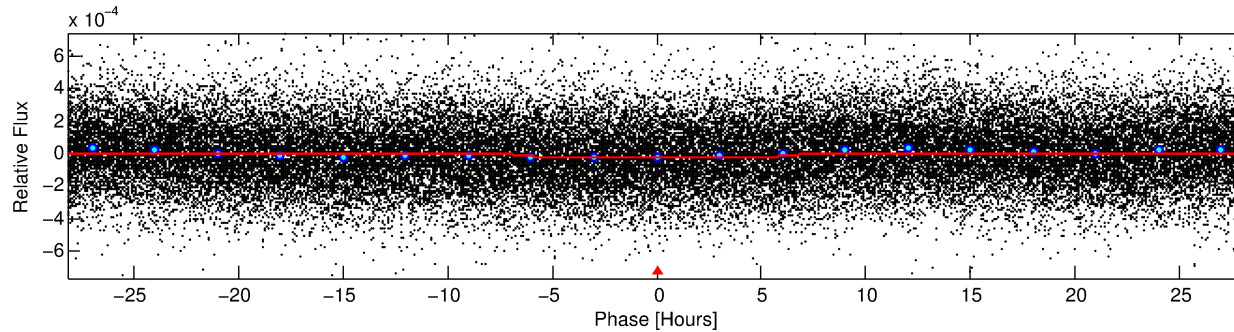
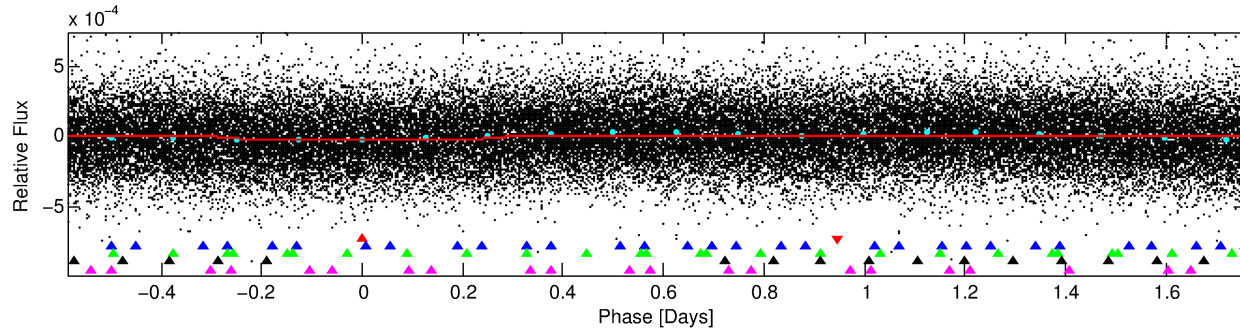
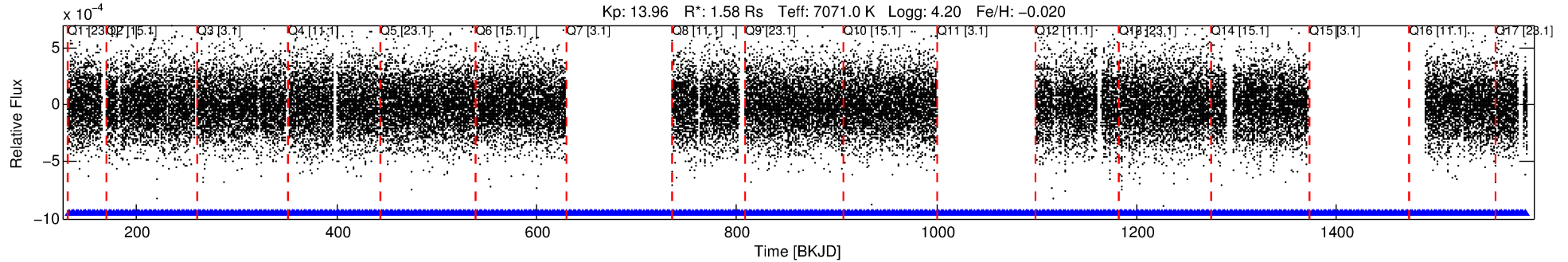
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009965121-01

No Significant Match Found

# DV One-Page Summary

KIC: 9965121 Candidate: 1 of 5 Period: 2.344 d



## DV Fit Results:

Period = 2.34448 [0.00007] d  
Epoch = 132.8956 [0.0205] BKJD  
Rp/R\* = 0.0057 [0.0005]  
a/R\* = 1.03 [0.03]  
b = 0.97 [0.02]  
Seff = 3656.03 [1513.51]  
Teq = 1983 [205] K  
Rp = 0.98 [0.34] Re  
a = 0.0391 [0.0106] AU  
Ag = 10.00 [5.88] [1.53 $\sigma$ ]  
Teffp = 5452 [662] K [5.00 $\sigma$ ]

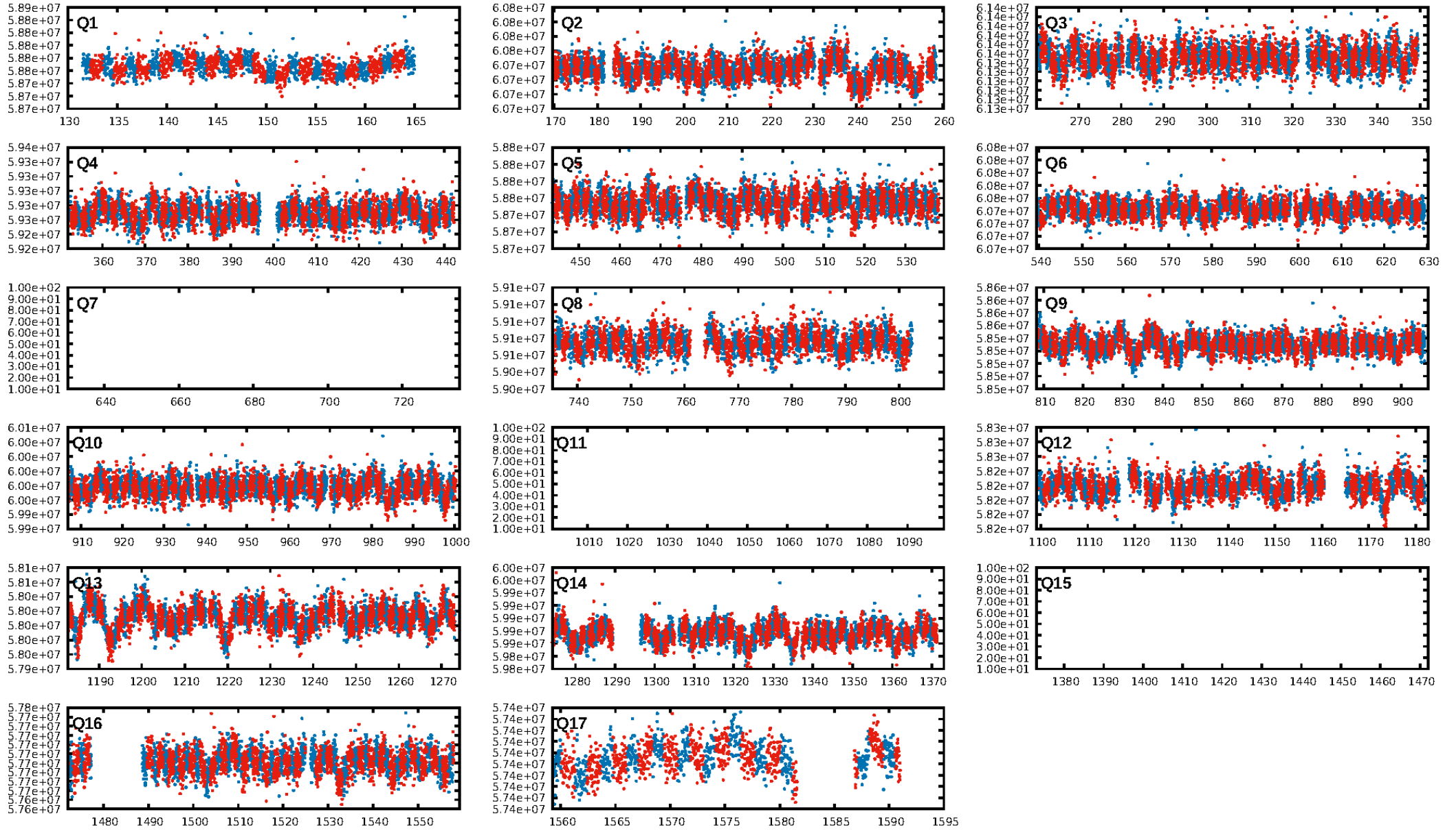
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [59.09 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
**Bootstrap-pfa: 1.51e-10**  
RollingBand-fgt: 1.00 [437/437]  
GhostDiagnostic-chr: 3.26  
Centroid-sig: 37.7%  
Centroid-so: 0.733 arcsec [0.59 $\sigma$ ]  
**OotOffset-rm: 2.894 arcsec [3.79 $\sigma$ ]**  
**KicOffset-rm: 2.862 arcsec [3.81 $\sigma$ ]**  
OotOffset-st: 3/0/1/3 [7]  
KicOffset-st: 3/0/1/3 [7]  
DiffImageQuality-fgm: 0.57 [4/7]  
DiffImageOverlap-fno: 1.00 [14/14]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 03:19:20 Z

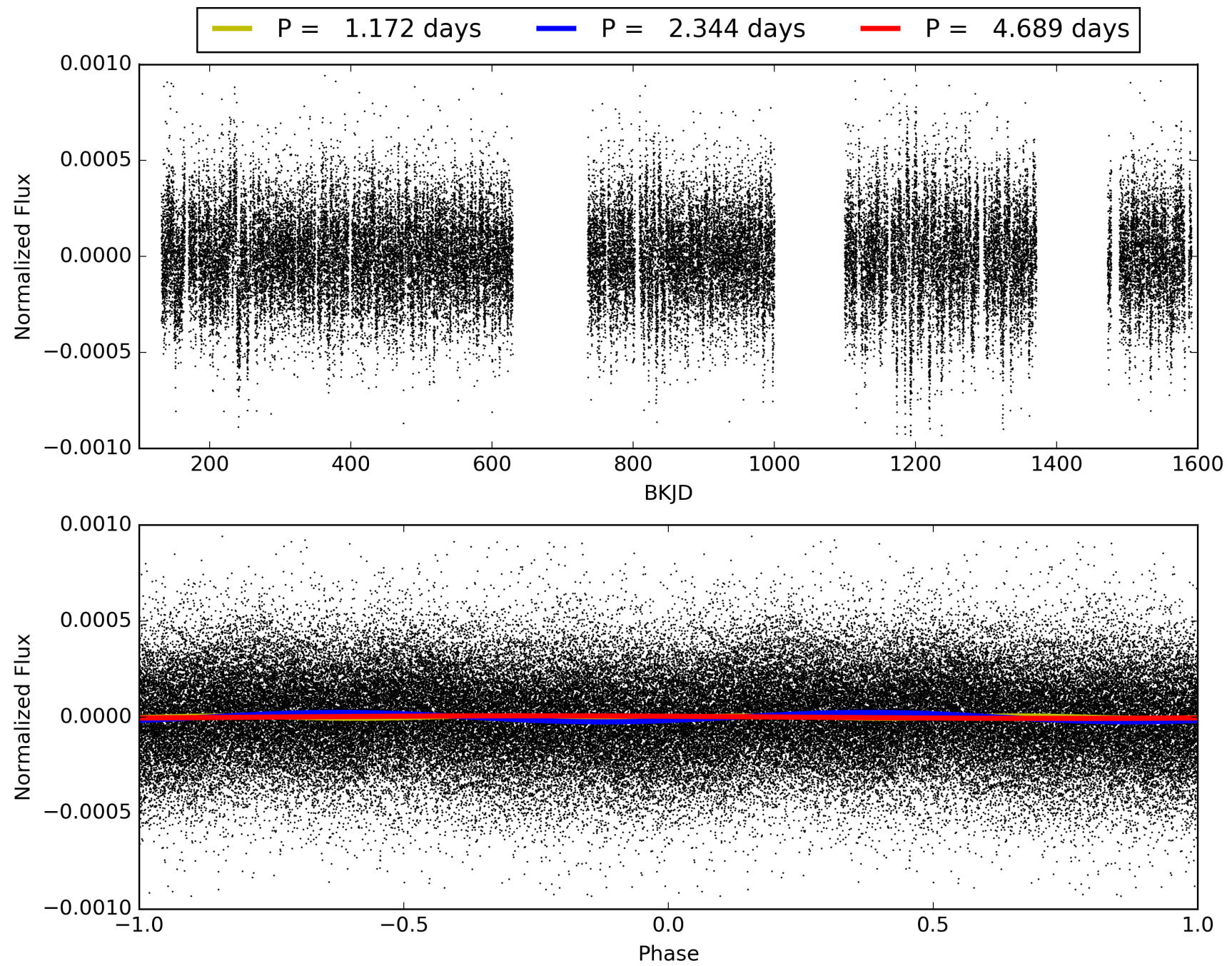
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 009965121-01, PDC Light Curves





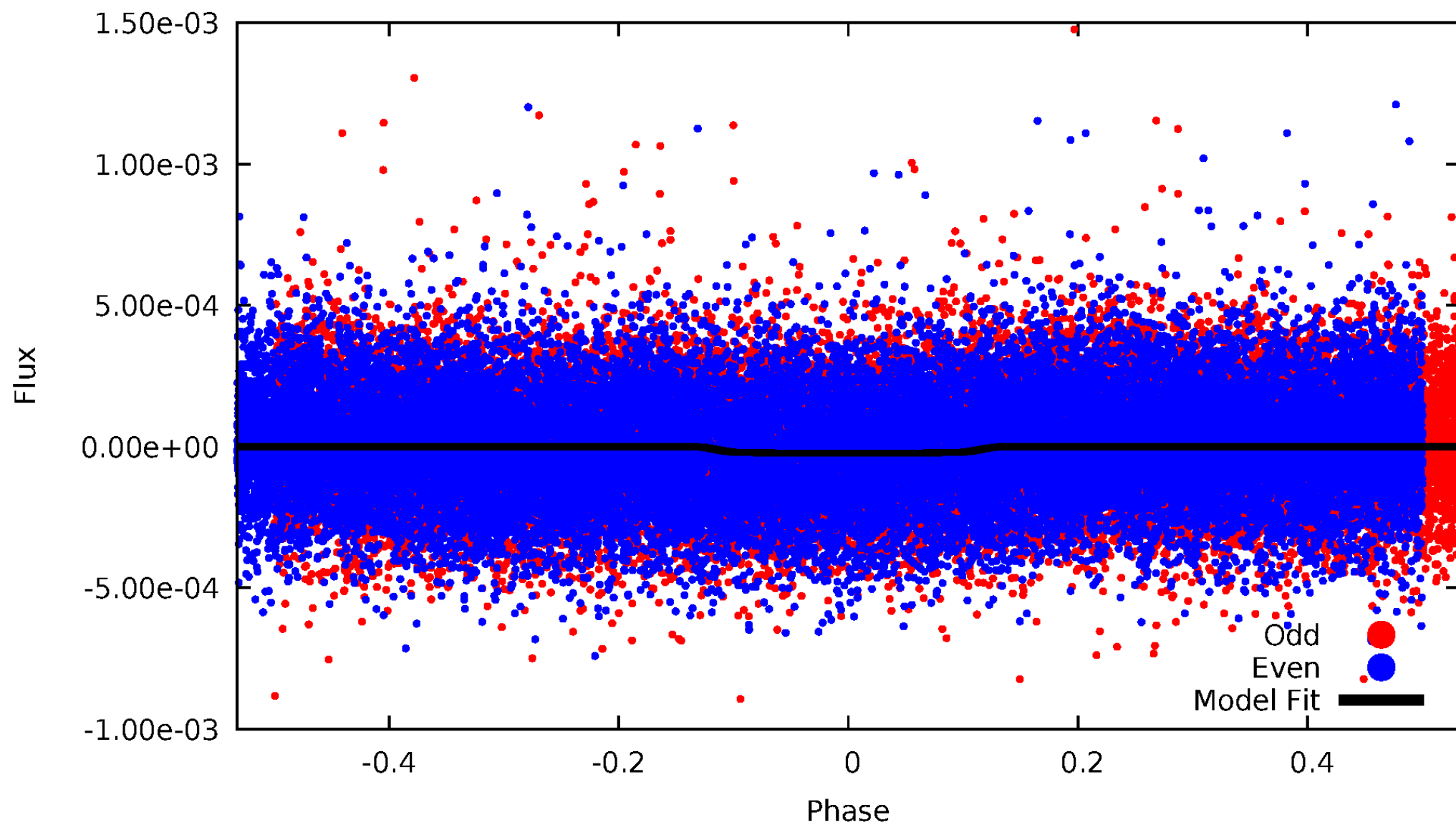
TCE 009965121-01





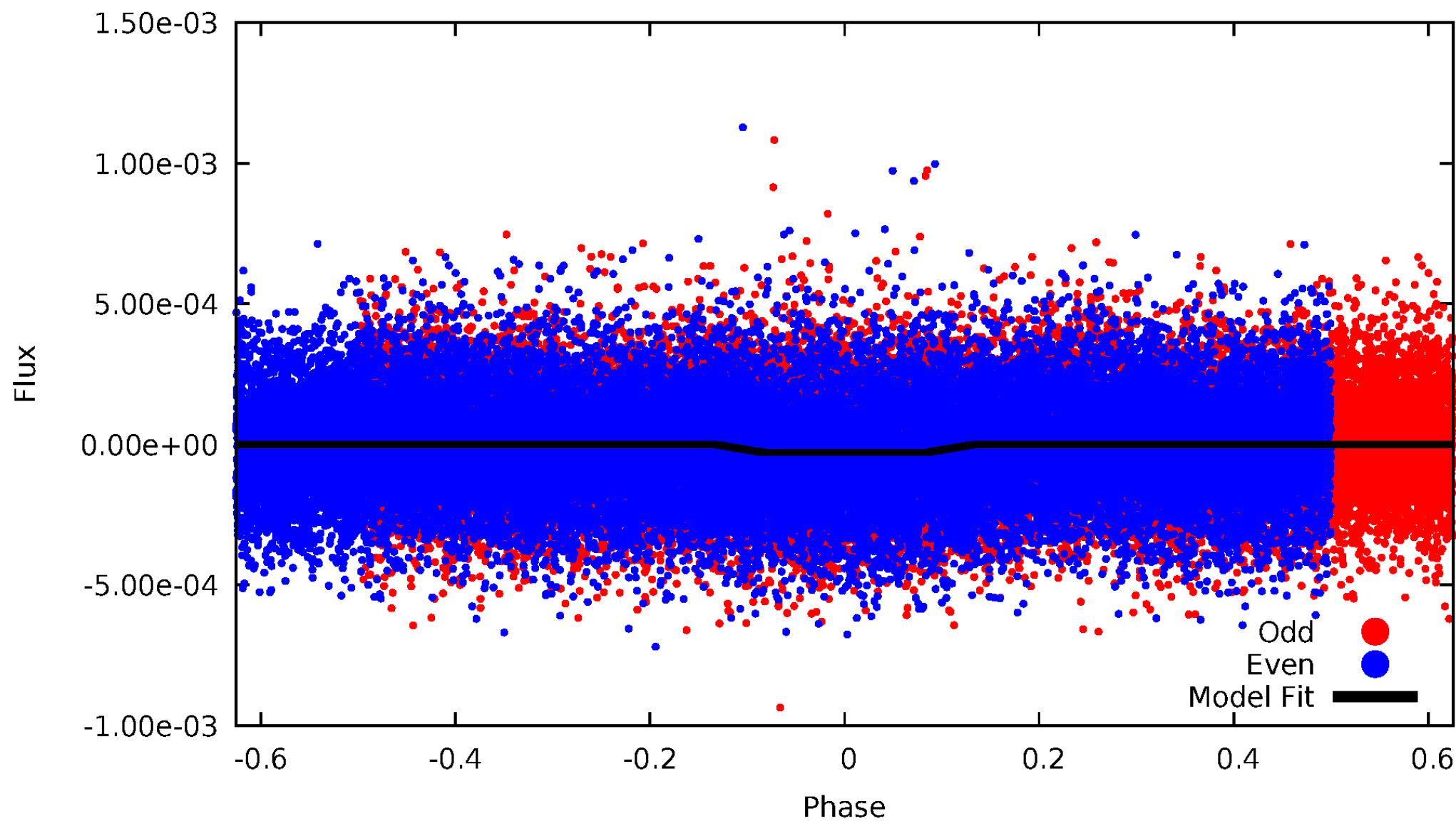
# DV Odd/Even

TCE 009965121-01

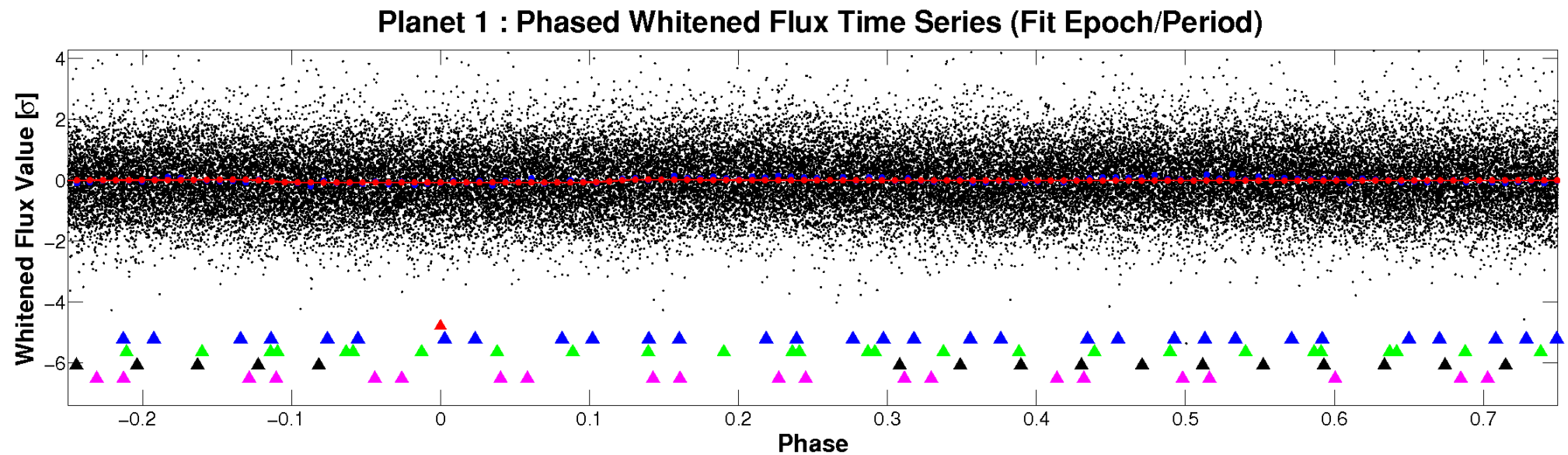
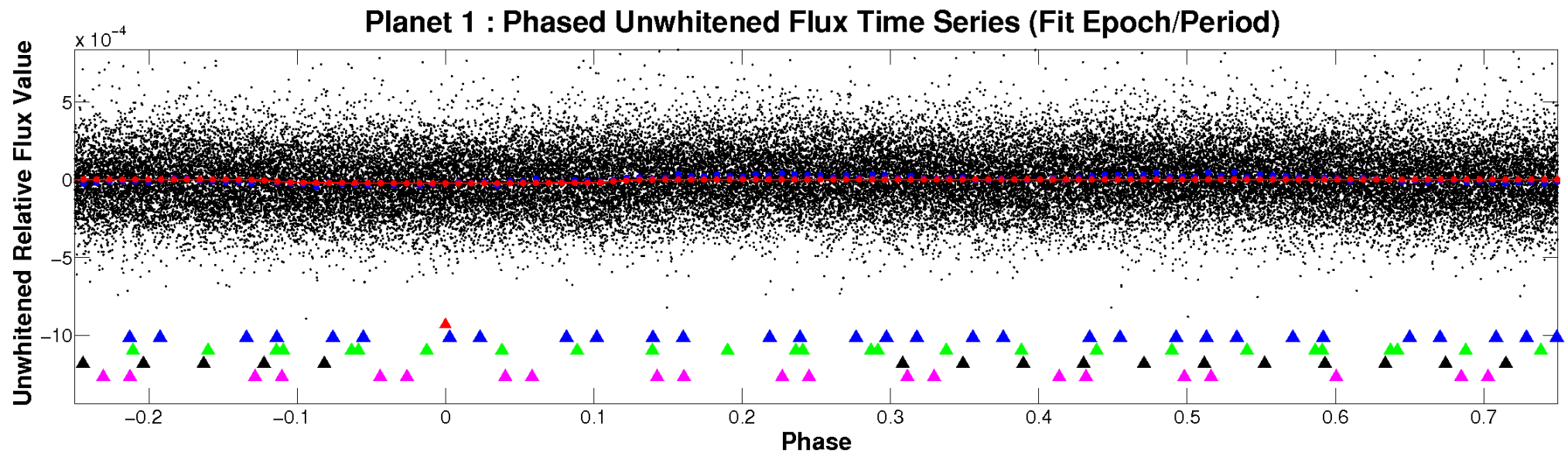


# ALT Odd/Even

TCE 009965121-01



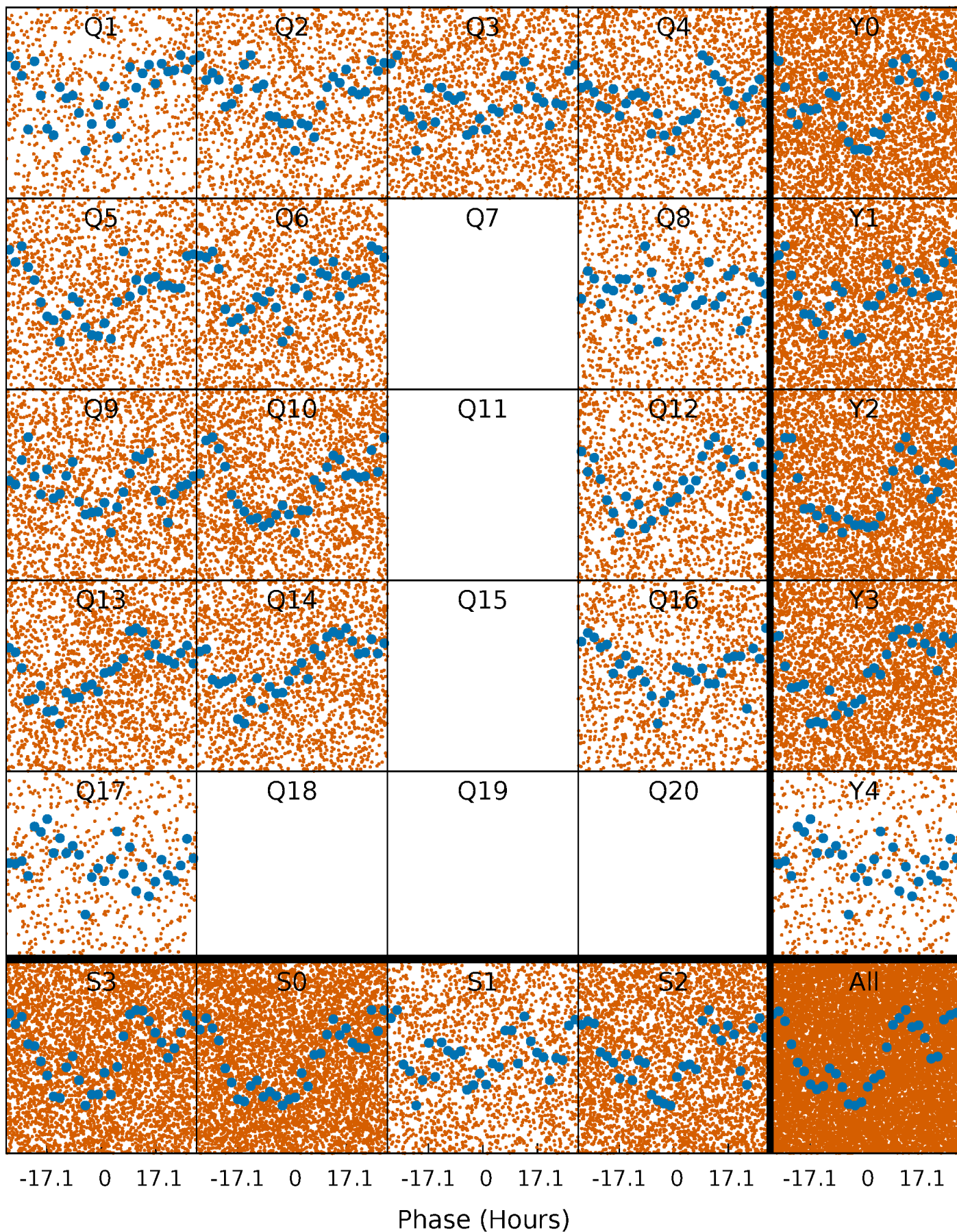
# Non-Whitened Vs. Whitened Light Curve





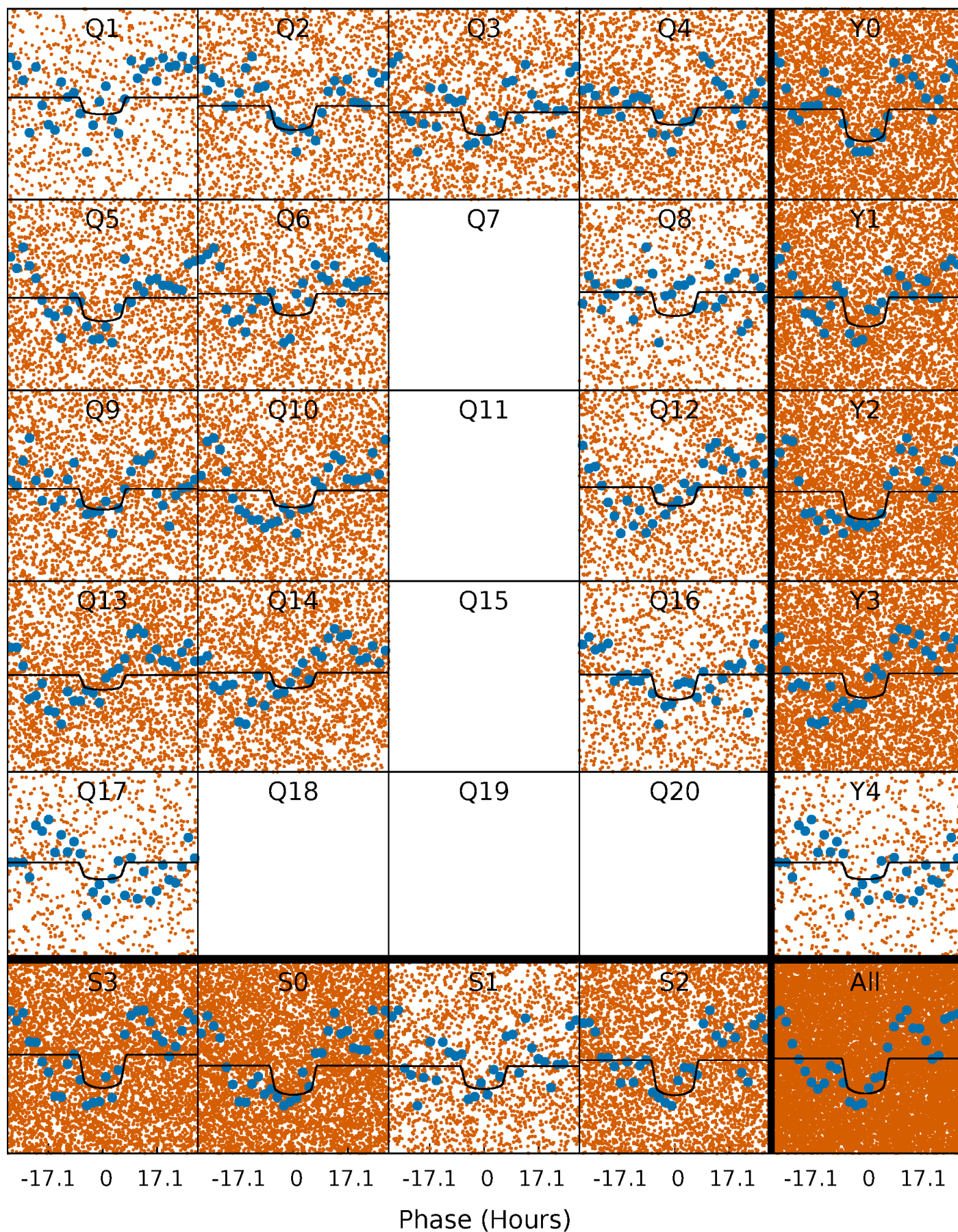
# PDC Quarter-Phased Transit Curves

TCE 009965121-01 P= 2.344483 Days  $T_0=132.895552$  (BKJD)



# DV Quarter-Phased Transit Curves

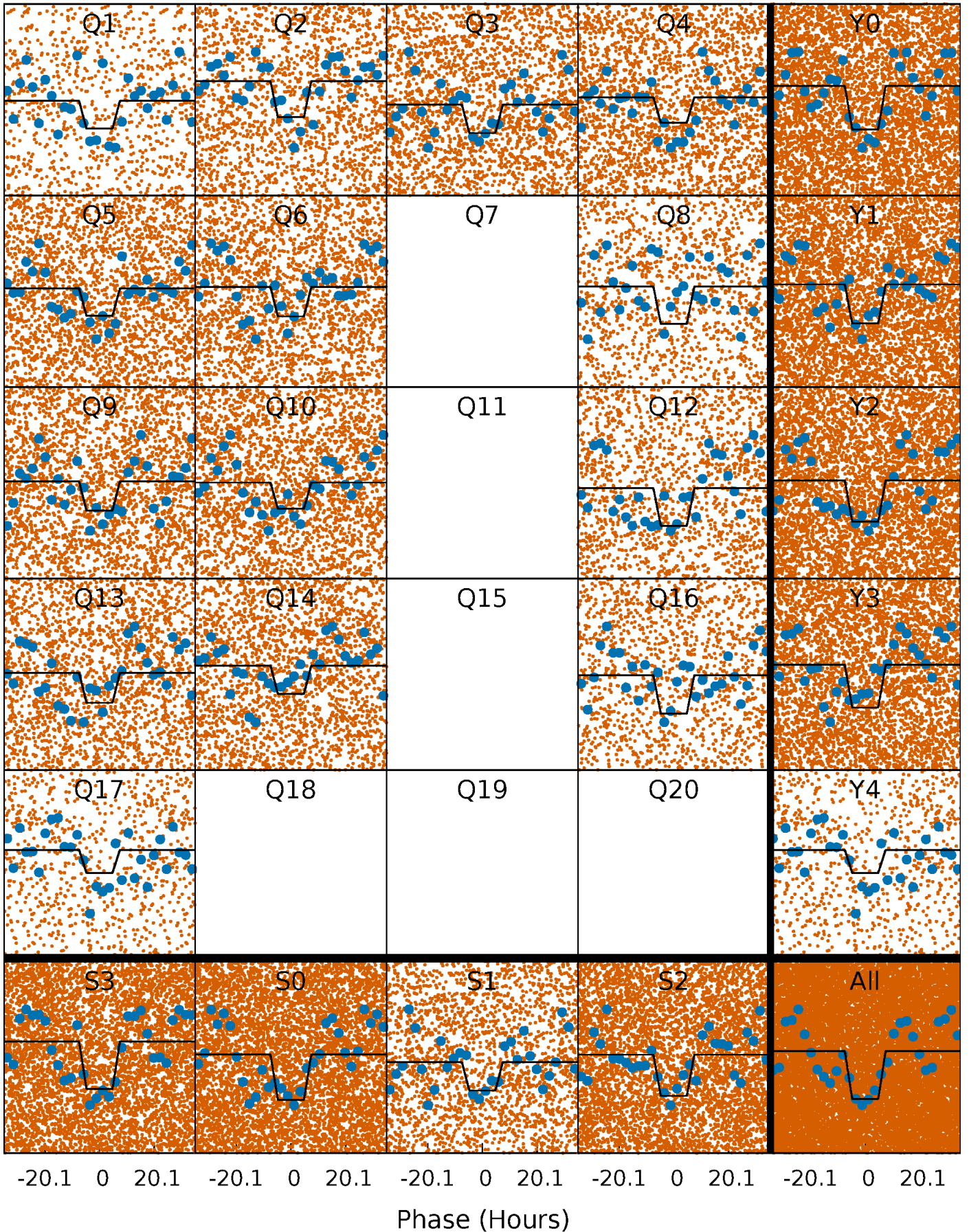
TCE 009965121-01 P= 2.344483 Days  $T_0=132.895552$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

TCE 009965121-01 P= 2.344472 Days  $T_0=132.835137$  (BKJD)

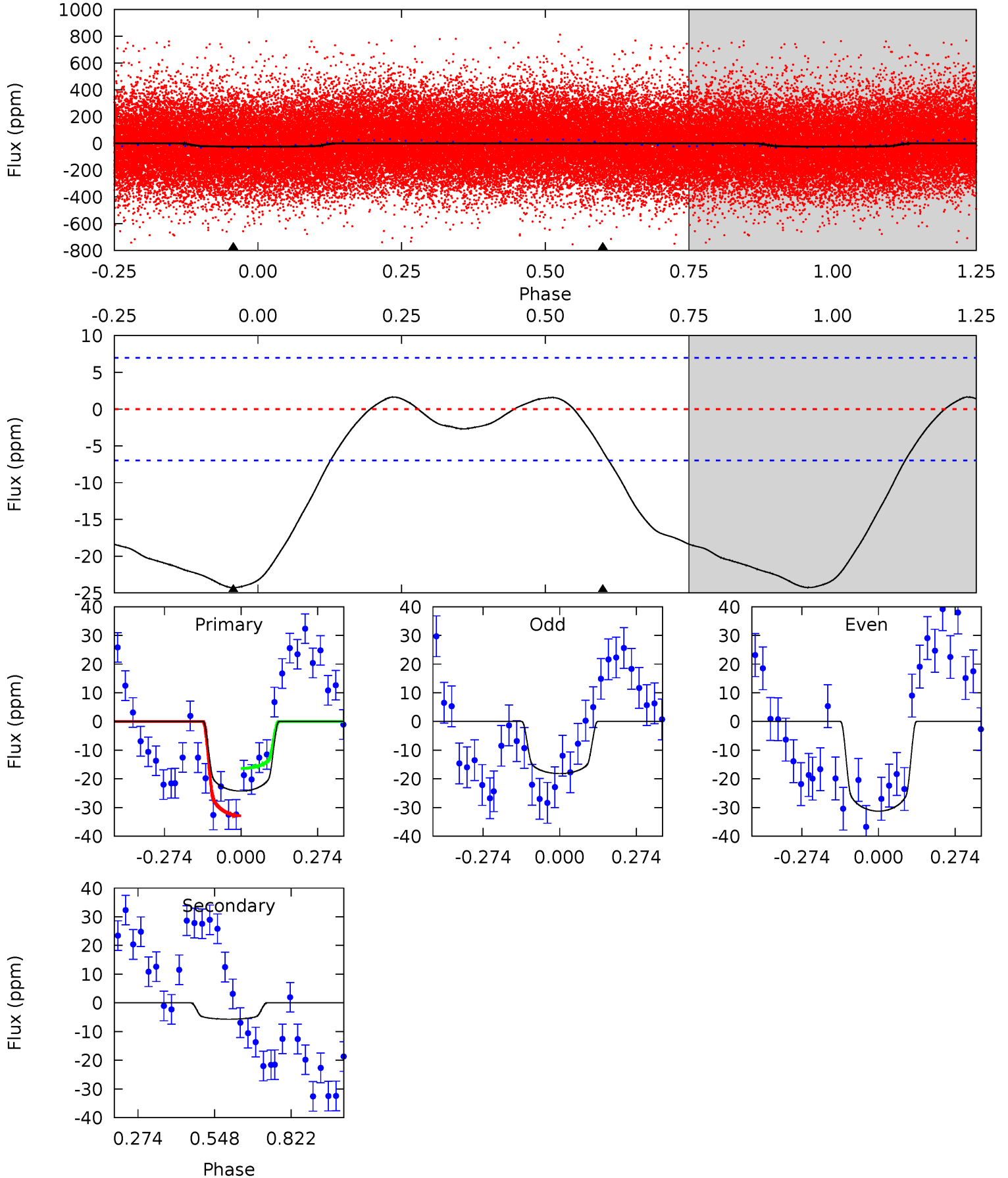




# DV Model-Shift Uniqueness Test

009965121-01, P = 2.344483 Days, E = 130.551069 Days

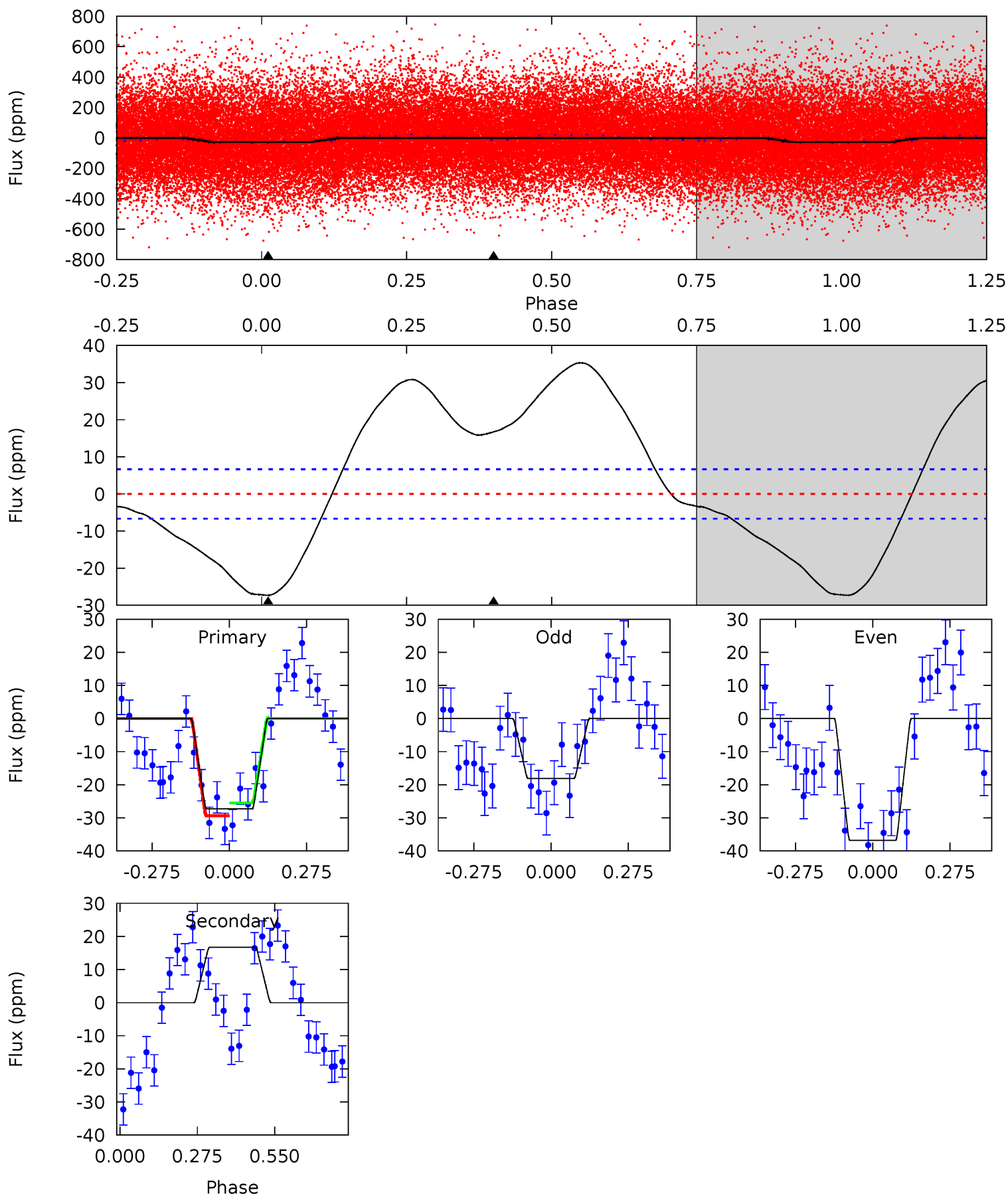
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
15.1	3.55	0	0	4.35	1.09	0.87	15.1	15.1	3.55	3.55	4.09	1.01	0.06	5.08



# Alt Model-Shift Uniqueness Test

009965121-01, P = 2.344472 Days, E = 130.490665 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
17.8	-10.9	0	0	4.35	1.09	3.51	17.8	17.8	-10.9	-10.9	6.11	1.04	0.56	1.25



### Stellar Parameters For KIC 009965121

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$7071^{+197}_{-310}$	$4.202^{+0.105}_{-0.195}$	$-0.020^{+0.250}_{-0.350}$	$1.579^{+0.535}_{-0.288}$	$1.451^{+0.220}_{-0.220}$	$0.519^{+0.270}_{-0.281}$
	+3%/-4%	+2%/-5%	+1250%/-1750%	+34%/-18%	+15%/-15%	+52%/-54%
Source	PHO1	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 009965121-01 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-6 \pm 2$	$1.00^{+0.20}_{-0.13}$	$2797^{+234}_{-169}$	$4593^{+362}_{-358}$	$4.660^{+2.386}_{-1.773}$
Alt.	$17 \pm 2$	$0.93^{+0.18}_{-0.14}$	$2798^{+213}_{-180}$	$-6172^{+378}_{-441}$	$-16.016^{+4.584}_{-6.084}$

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



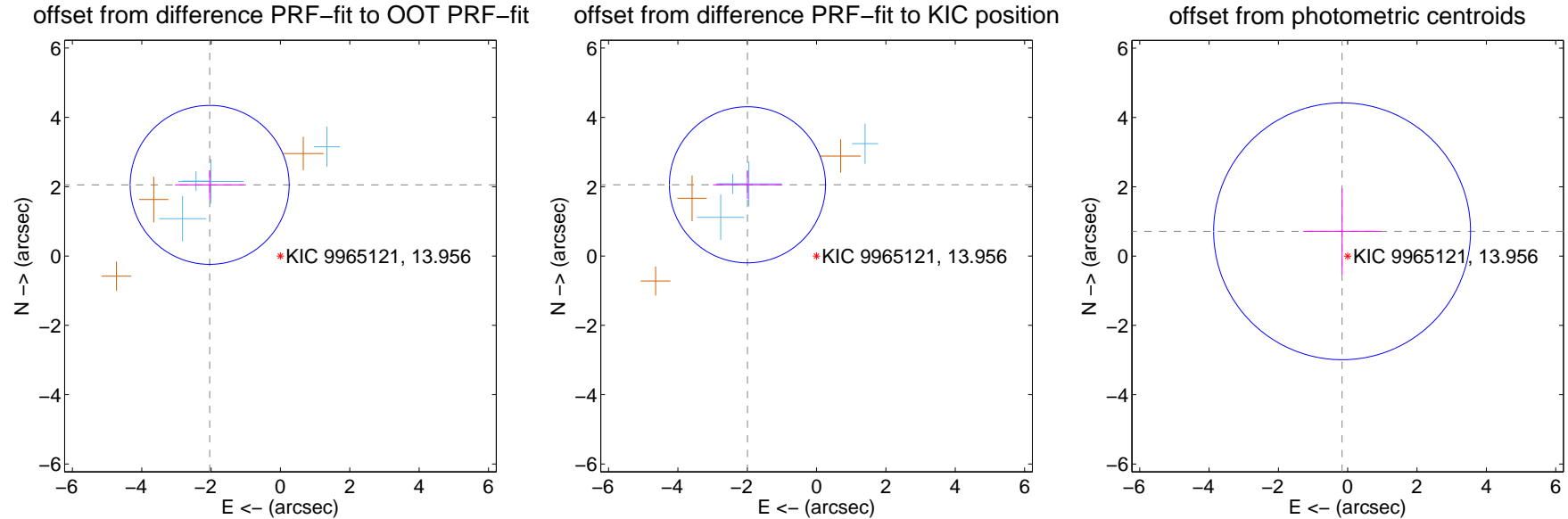
## DV Centroid Data

Supplemental centroid analysis for 009965121-01. Kepler magnitude: 13.96. Transit SNR 7.93

There are 4 quarters with good PRF difference image offsets

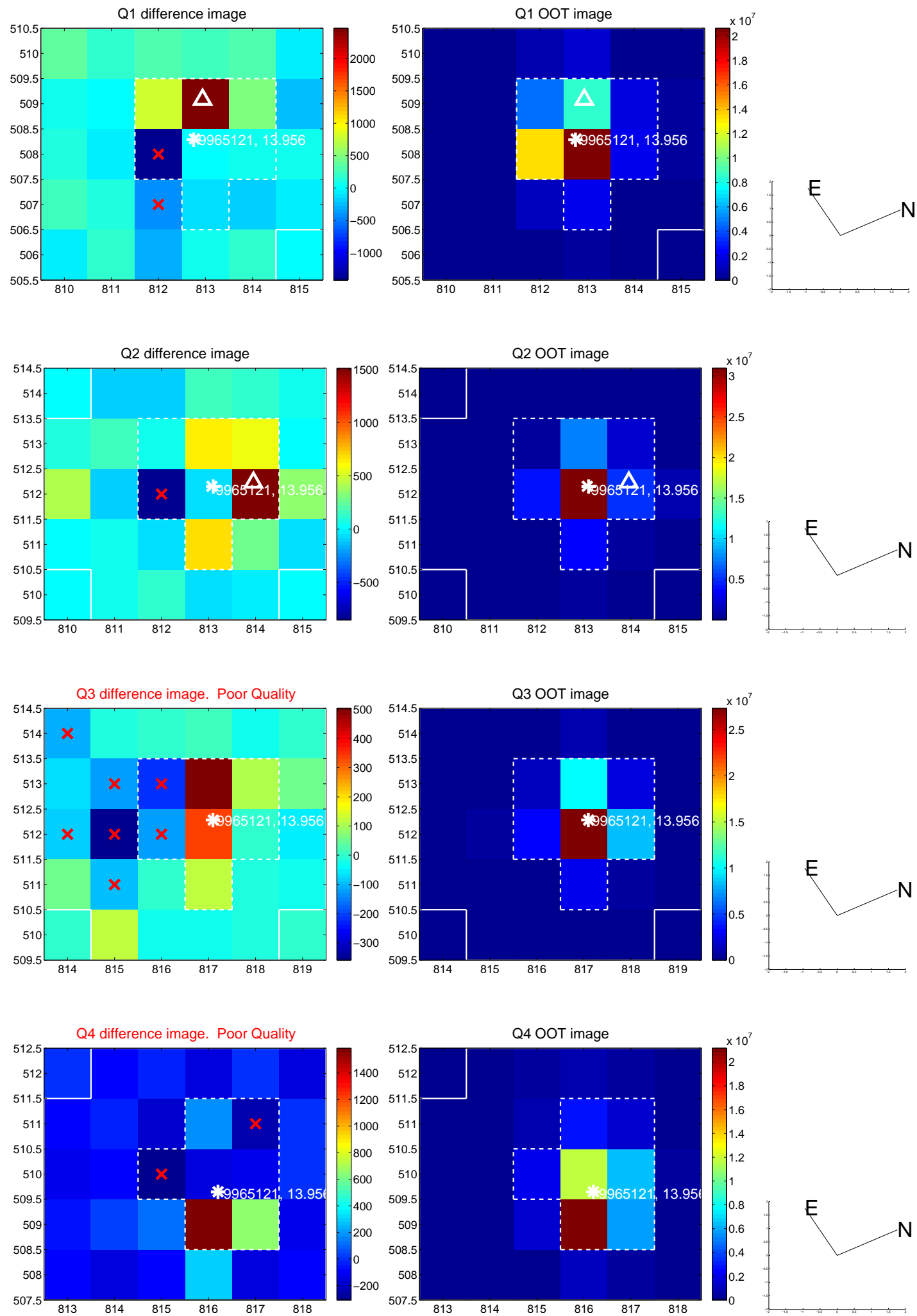
The direct PRF centroid is offset from the target star catalog position by about 0.08 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$2.894 \pm 0.764$	$3.79$	$2.041 \pm 0.996$	$2.052 \pm 0.425$
PRF-fit source offset from KIC position	$2.862 \pm 0.750$	$3.81$	$1.993 \pm 0.992$	$2.054 \pm 0.408$
photometric centroid source offset	$0.73 \pm 1.23$	$0.59$	$0.16 \pm 1.12$	$0.72 \pm 1.24$

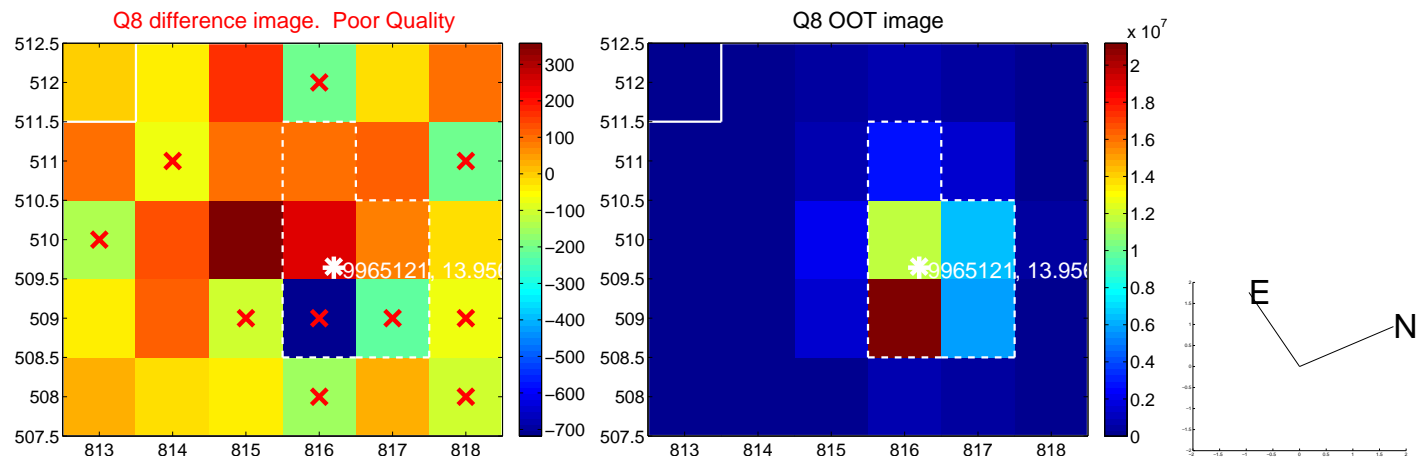
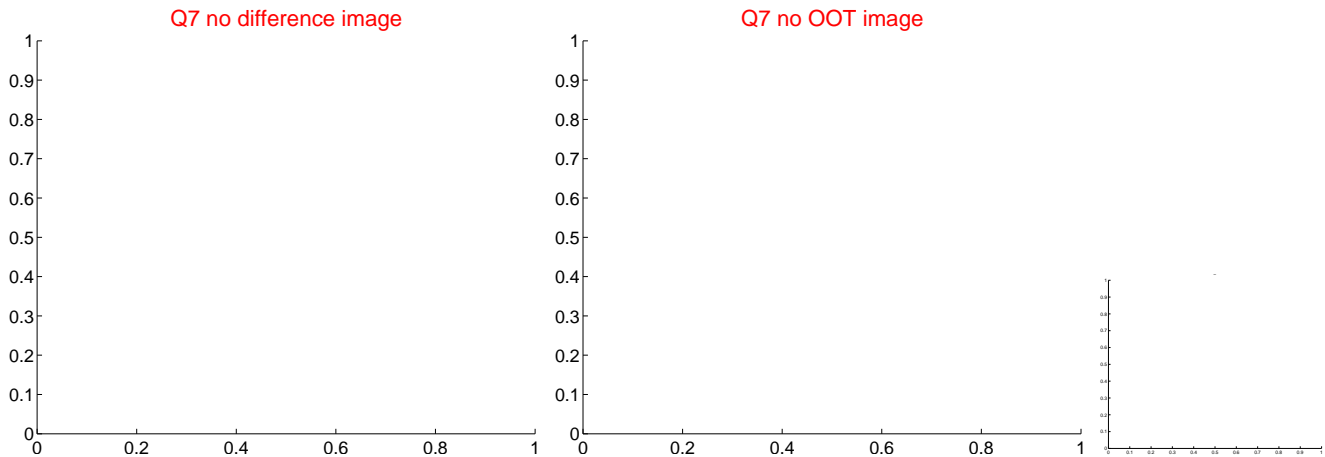
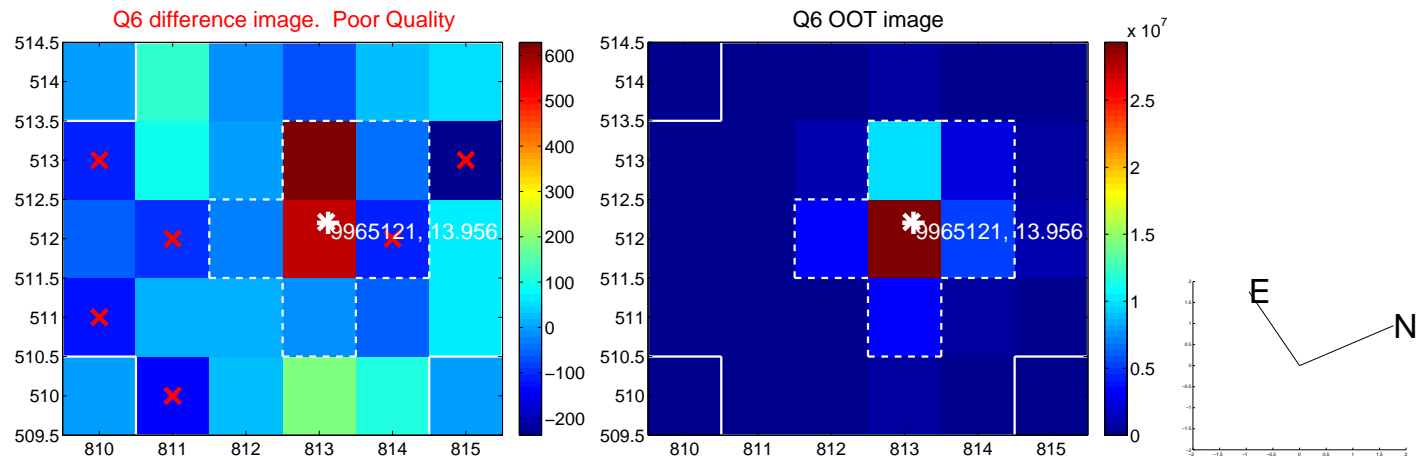
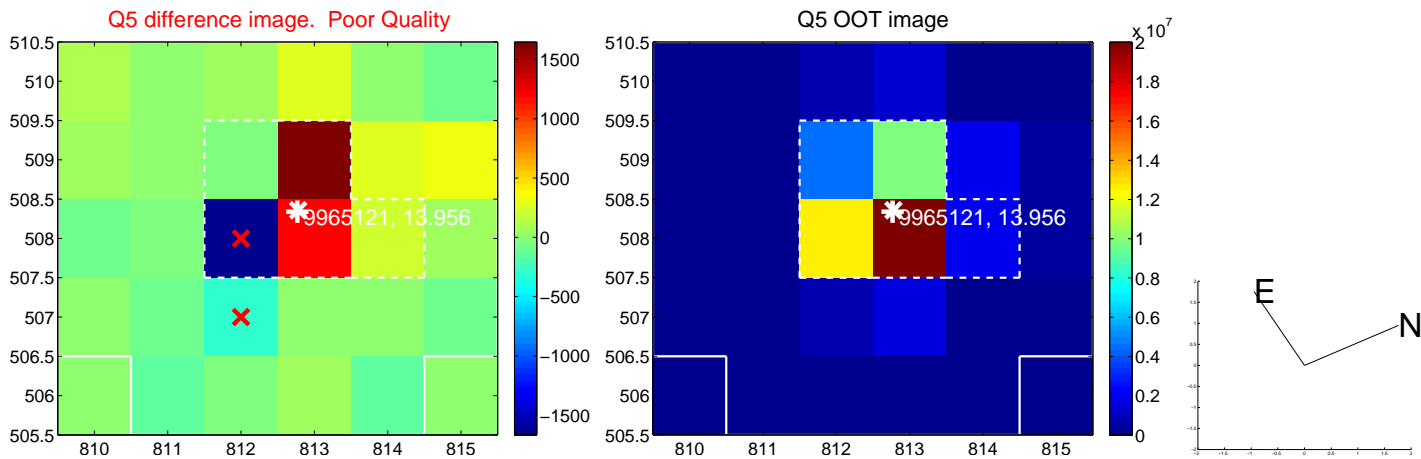


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

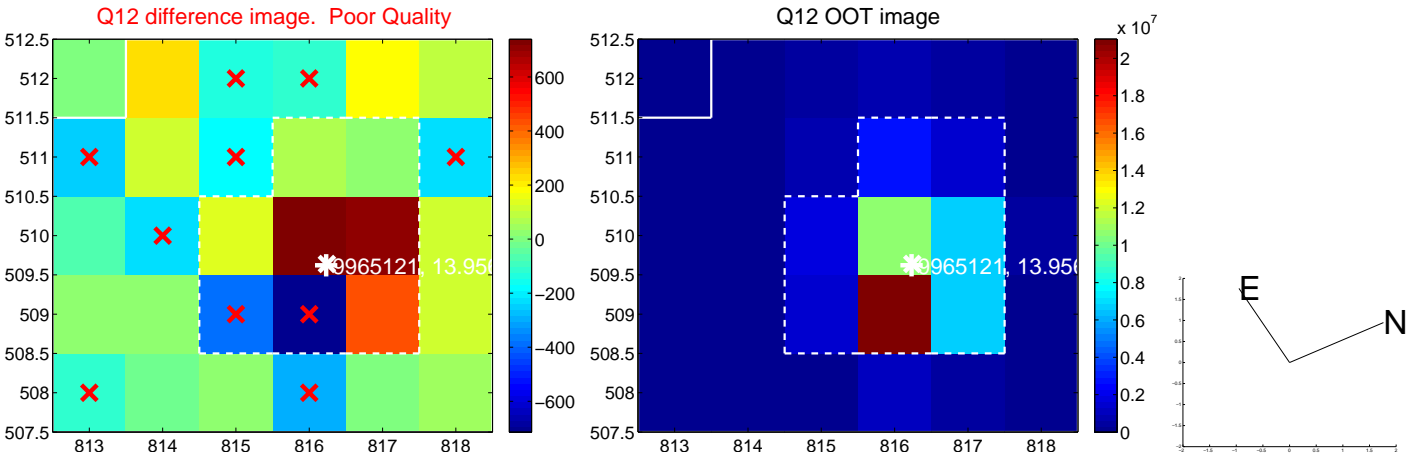
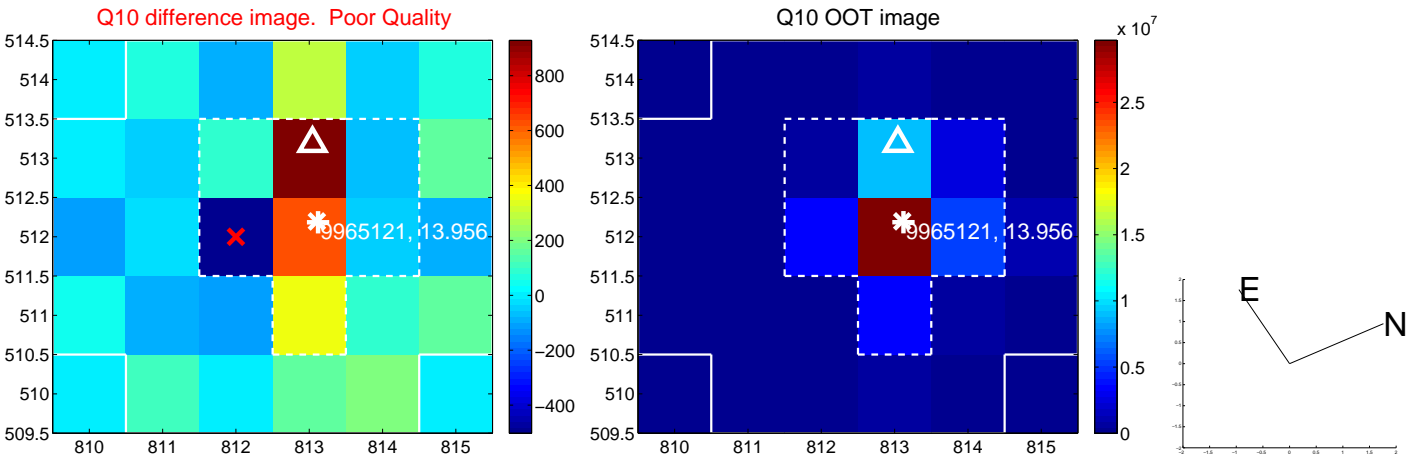
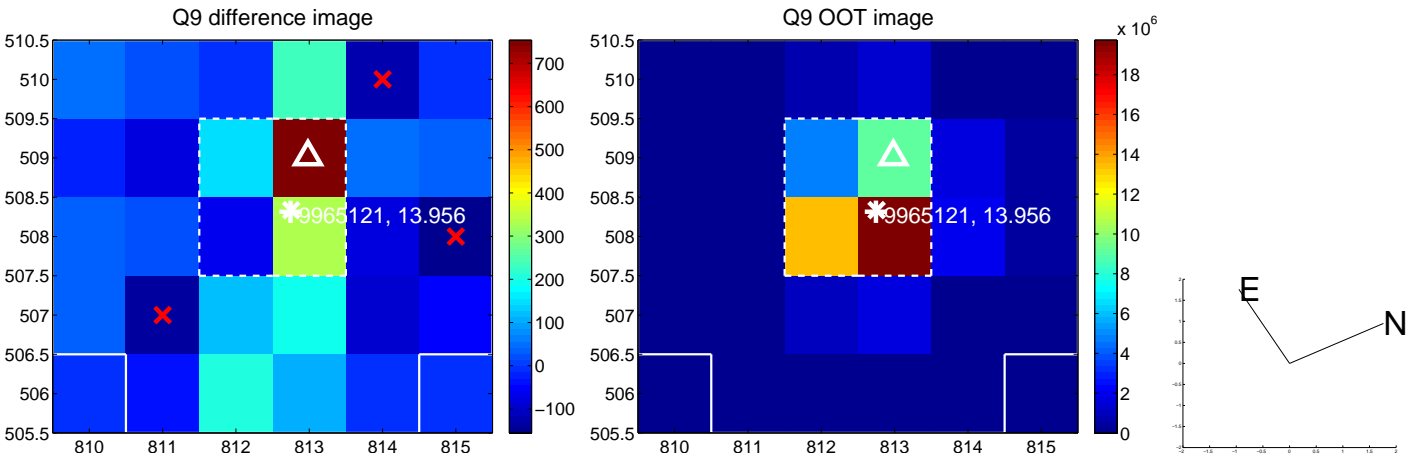


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

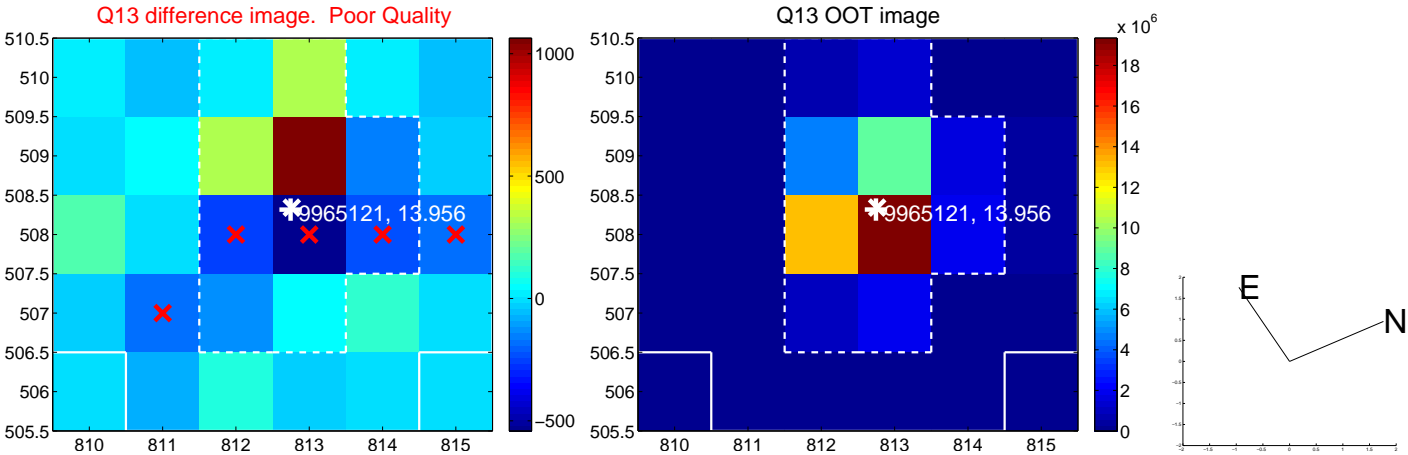




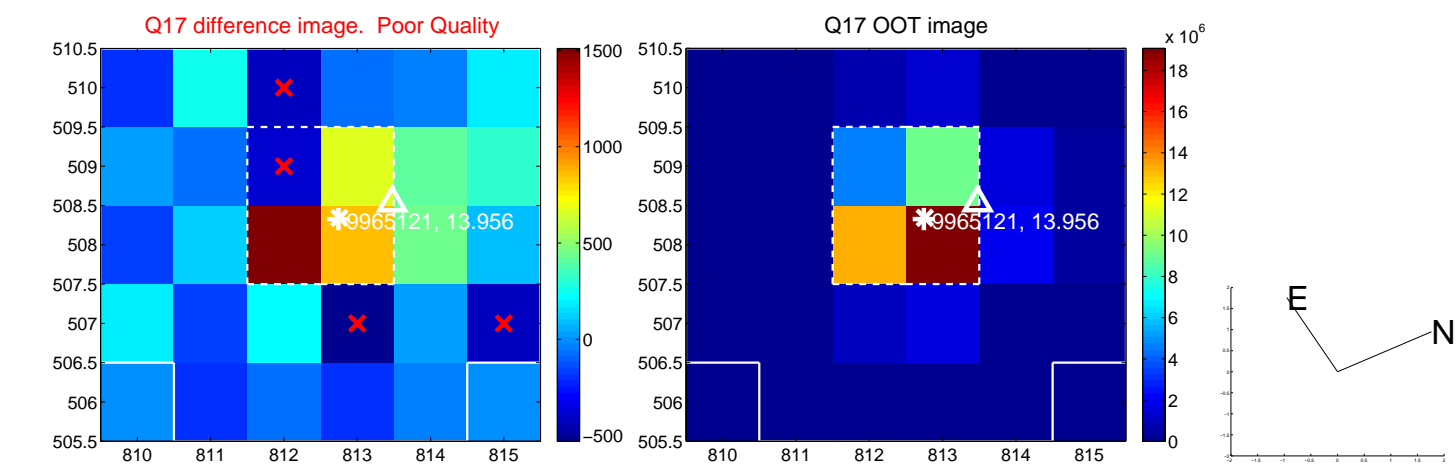
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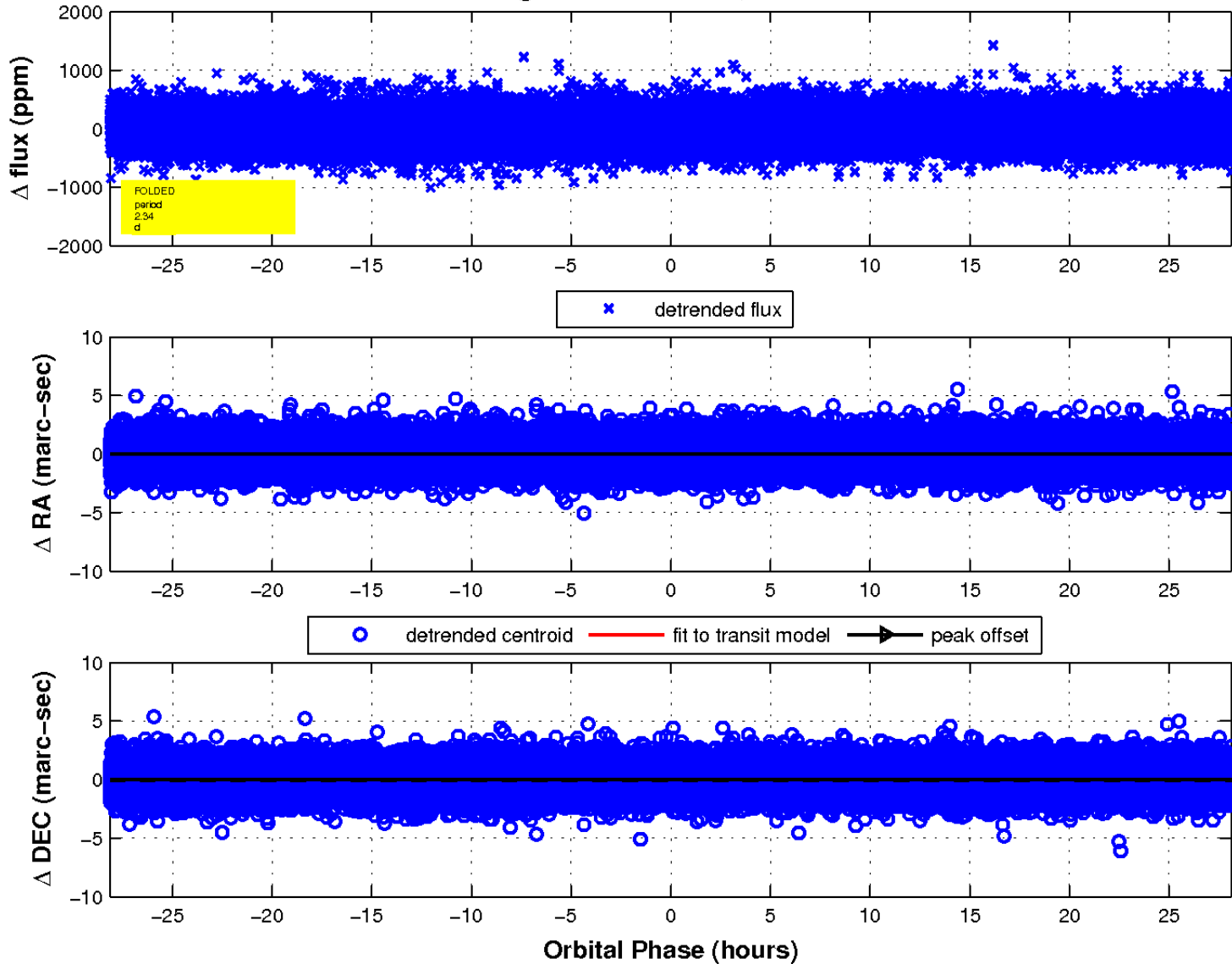
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

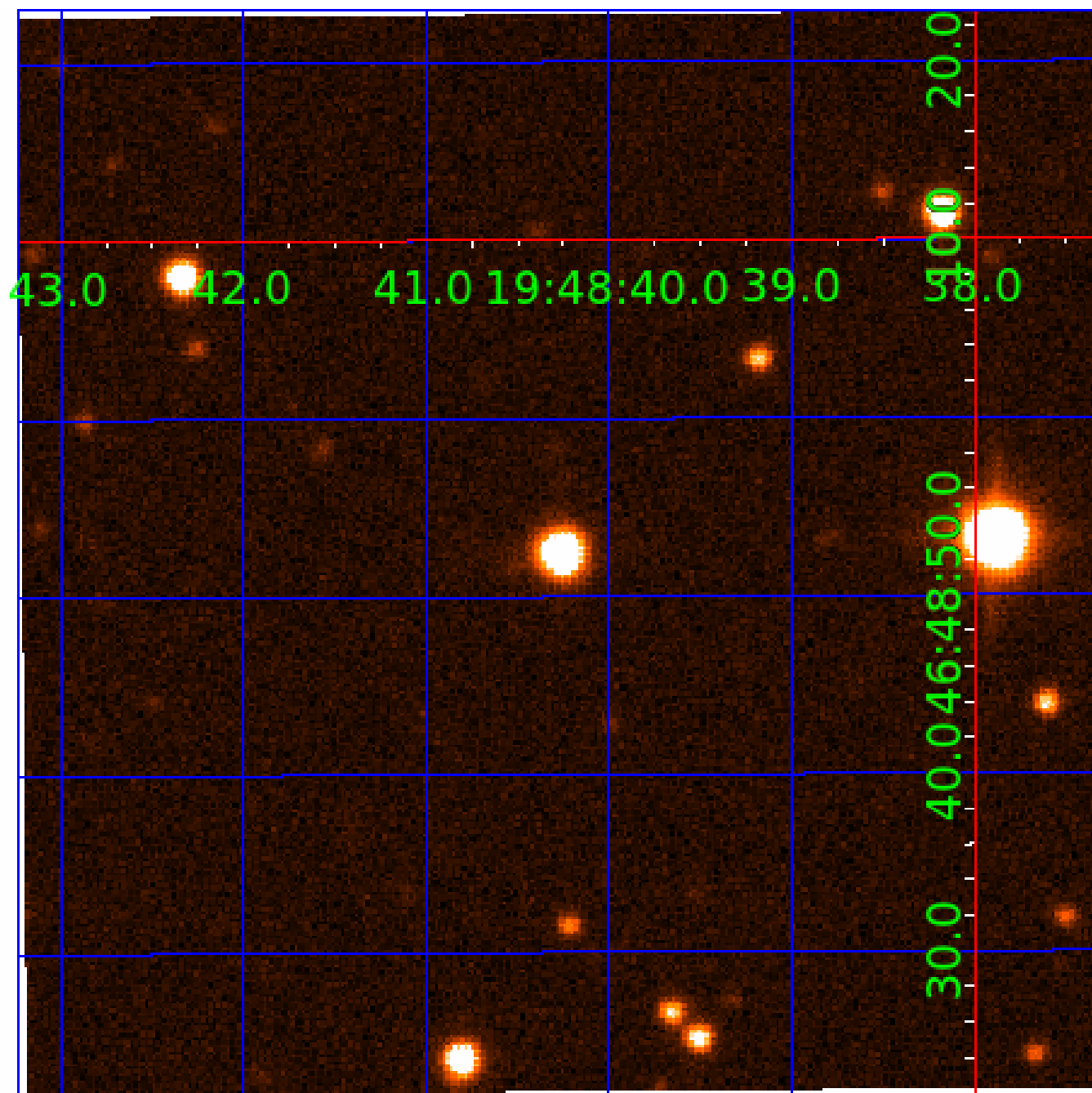


fluxWeightedCentroids, Planet 1 of 5



UKIRT Image

Declination





# KIC 009965121

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009965121-01	OBS	No	2.344483	132.895552	23.6	14.975	7.4	7.9	1.58	7071	0.98	3656.03
009965121-02	OBS	No	46.383850	158.097080	176.7	9.784	10.3	8.1	1.58	7071	2.29	68.33
009965121-03	OBS	No	55.446483	167.223038	218.3	5.949	8.3	6.9	1.58	7071	2.54	53.86
009965121-04	OBS	No	89.185717	192.230345	281.1	3.003	8.0	7.8	1.58	7071	2.92	28.58
009965121-05	OBS	No	68.625577	198.282423	365.8	2.469	7.9	8.6	1.58	7071	4.20	40.53

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009965121-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—CENT_UNCERTAIN
009965121-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_FEW_DIFFS
009965121-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_FEW_DIFFS
009965121-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS
009965121-05	OBS	FP	0.00	1	0	0	0	TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT—CENT_FEW_DIFFS

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

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

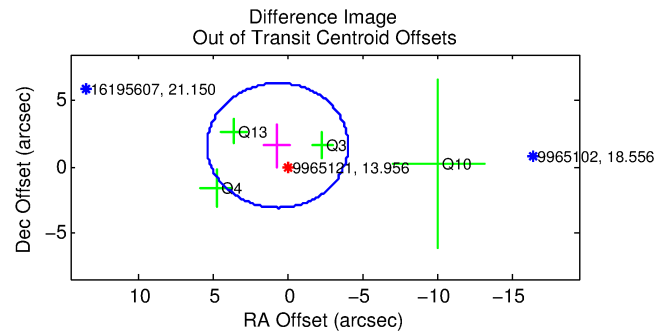
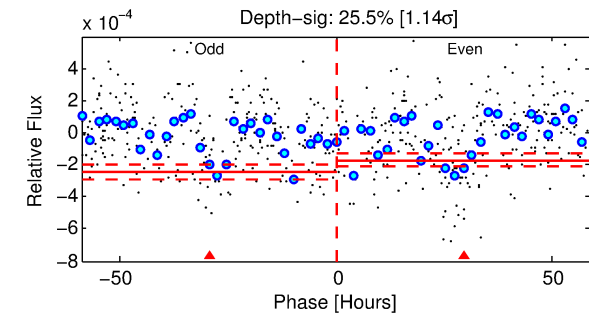
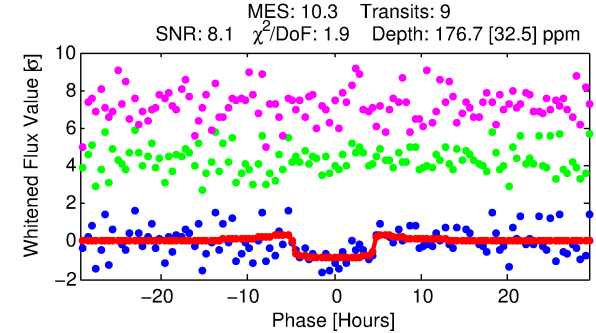
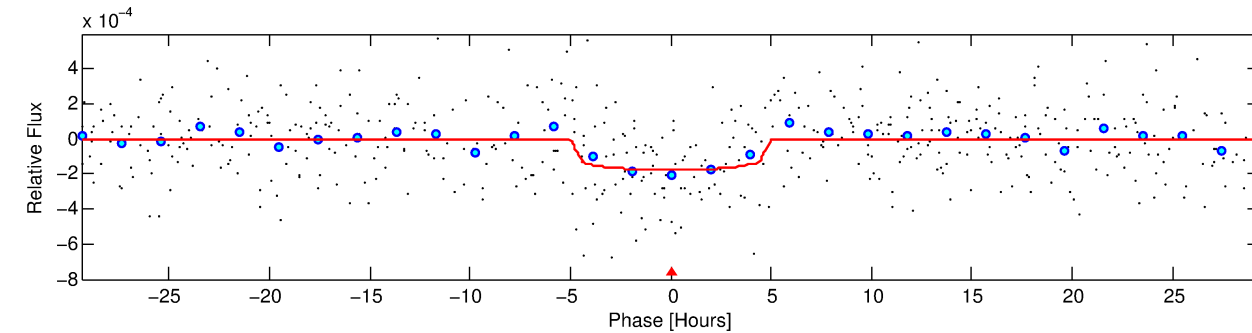
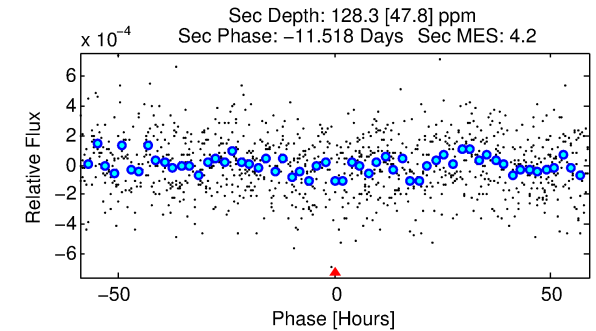
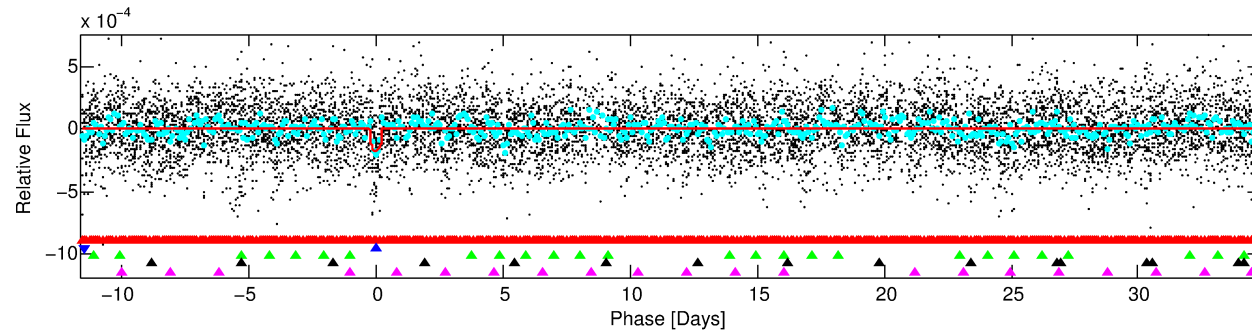
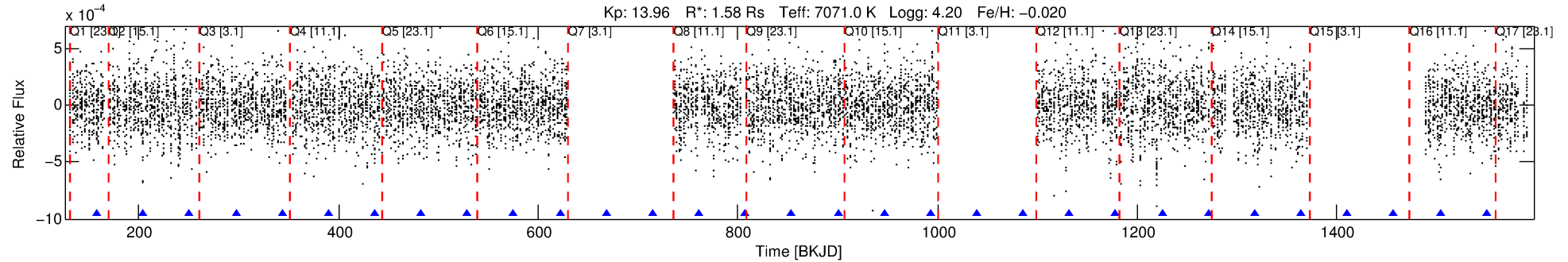
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009965121-02

No Significant Match Found

# DV One-Page Summary

KIC: 9965121 Candidate: 2 of 5 Period: 46.384 d



## DV Fit Results:

Period = 46.38385 [0.00116] d  
Epoch = 158.0971 [0.0223] BKJD  
Rp/R\* = 0.0133 [0.0085]  
a/R\* = 23.96 [90.34]  
b = 0.77 [2.04]  
Seff = 68.33 [28.29]  
Teq = 733 [76] K  
Rp = 2.29 [1.66] Re  
a = 0.2859 [0.0775] AU  
Ag = 1100.76 [1527.22] [0.72σ]  
Teffp = 6529 [2199] K [2.63σ]

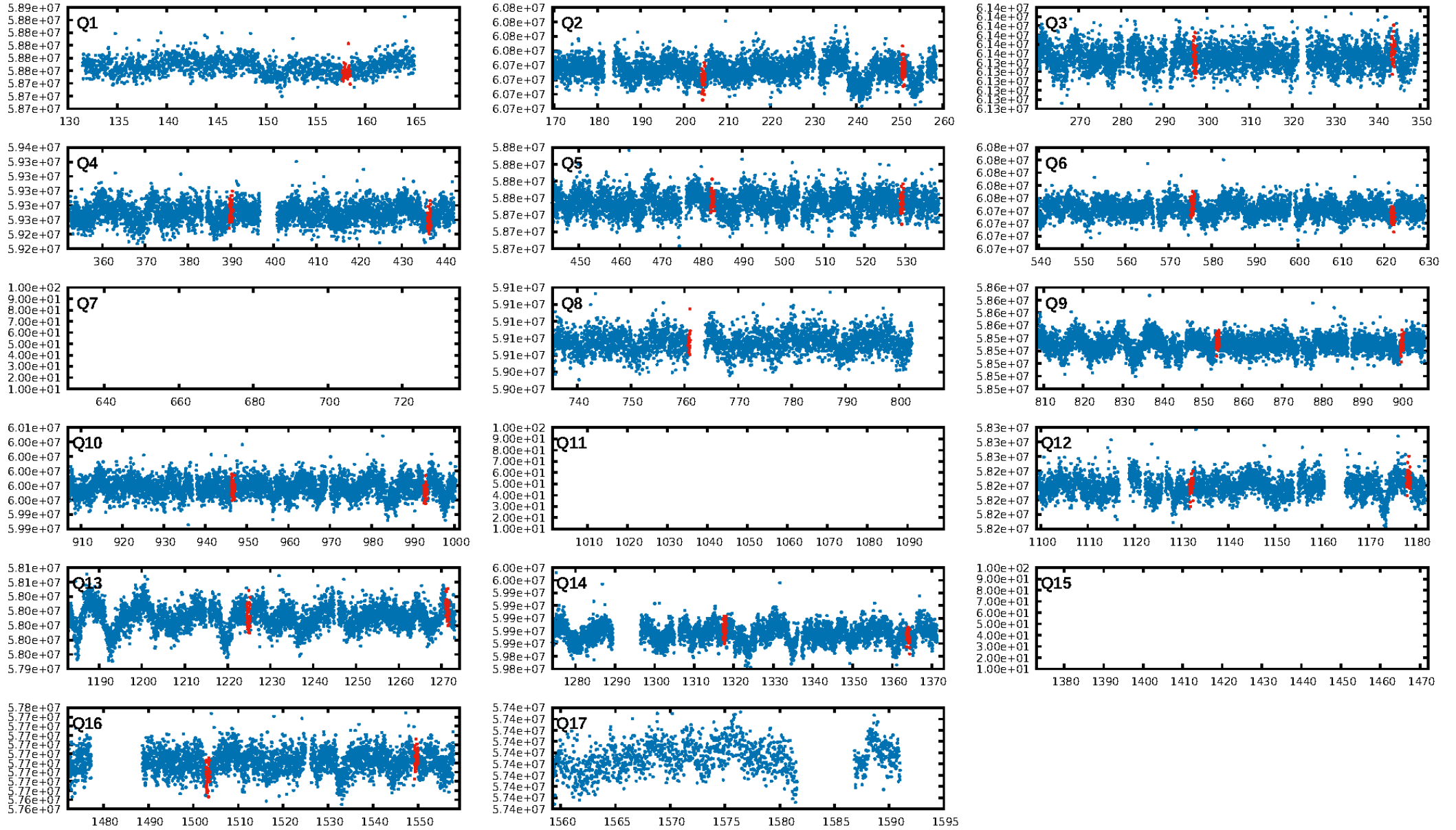
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [59.09σ]  
LongPeriod-sig: 100.0% [19.00σ]  
ModelChiSquare2-sig: 0.1%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 5.73e-15  
RollingBand-fgt: 1.00 [9/9]  
GhostDiagnostic-chr: 0.5638  
Centroid-sig: 43.3%  
Centroid-so: 0.931 arcsec [1.17σ]  
OotOffset-rm: 1.721 arcsec [1.10σ]  
KicOffset-rm: 1.684 arcsec [0.93σ]  
OotOffset-st: 1/1/1/1 [4]  
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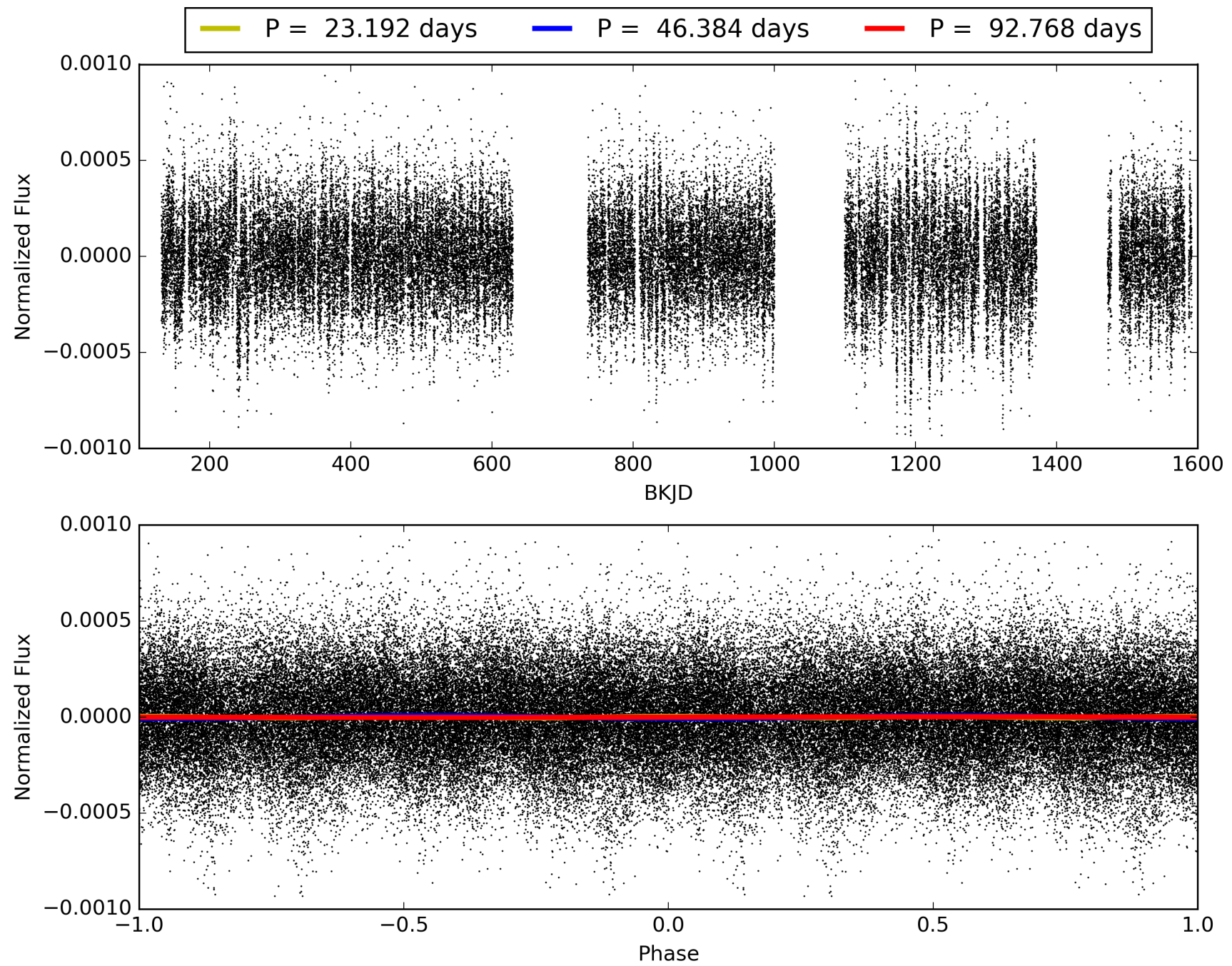
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 03:19:30 Z

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

# TCE 009965121-02, PDC Light Curves



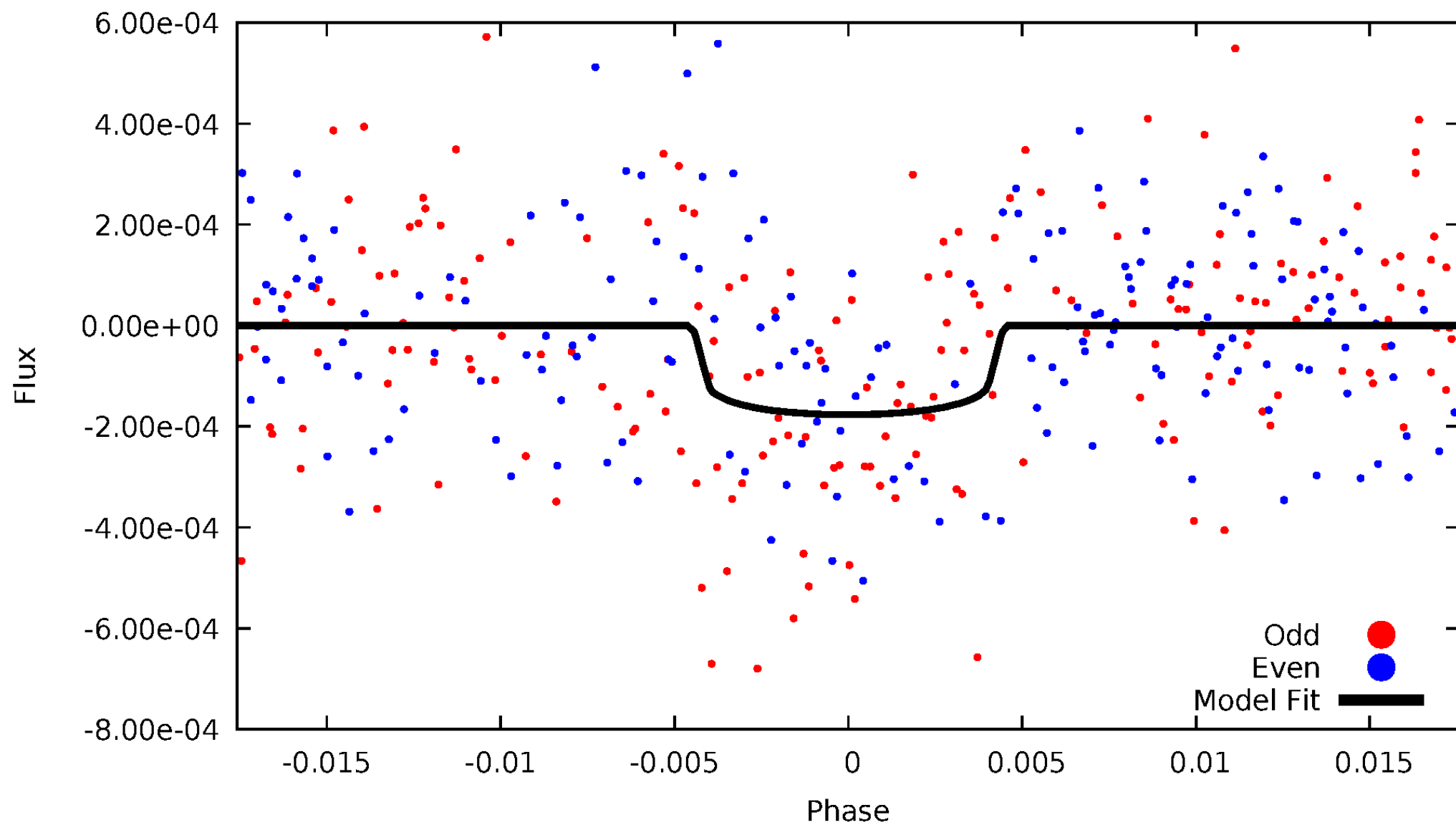
TCE 009965121-02





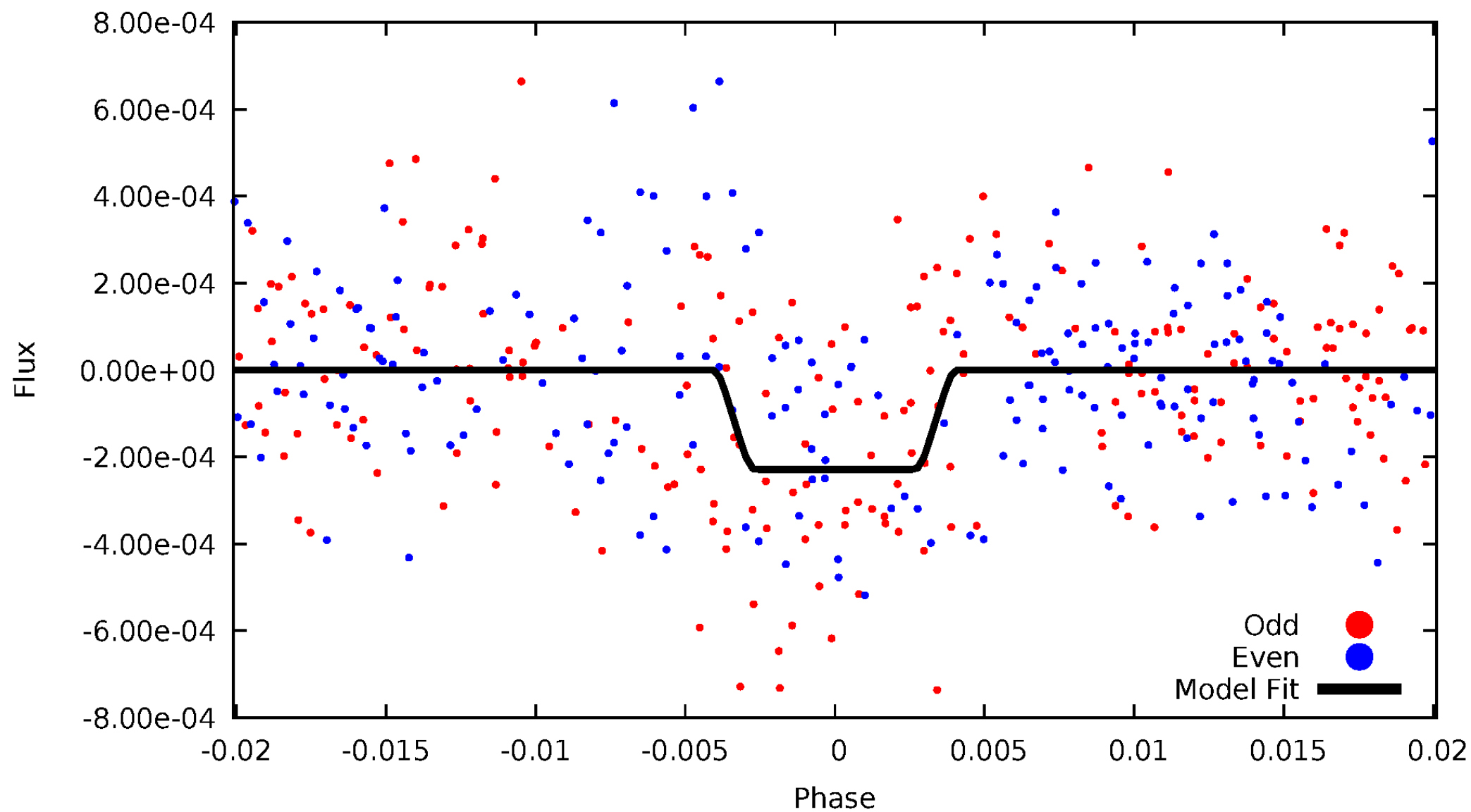
# DV Odd/Even

TCE 009965121-02



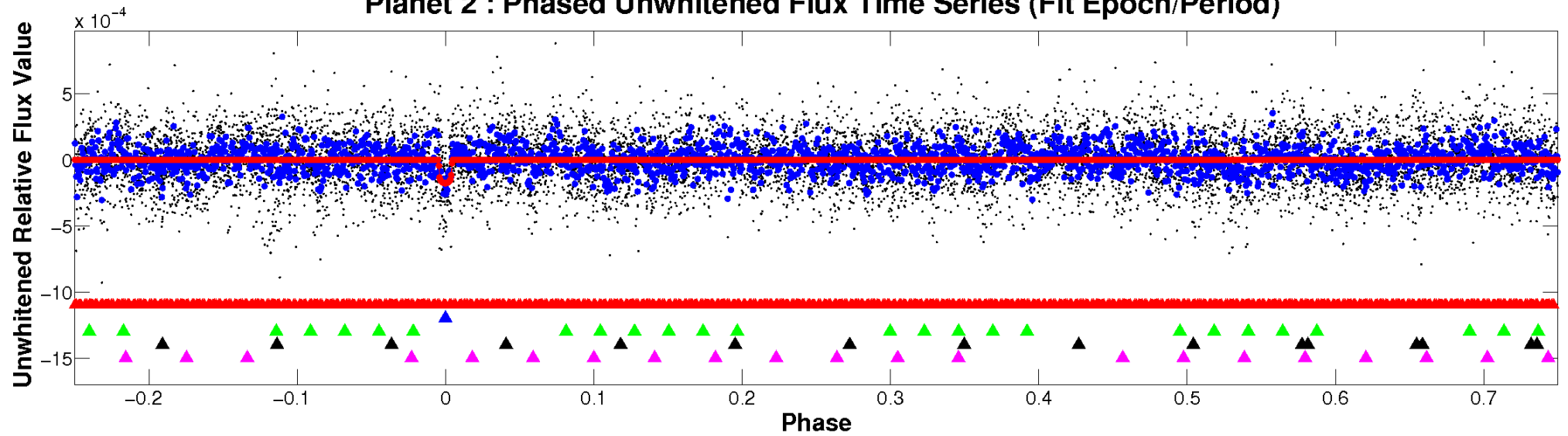
# ALT Odd/Even

TCE 009965121-02

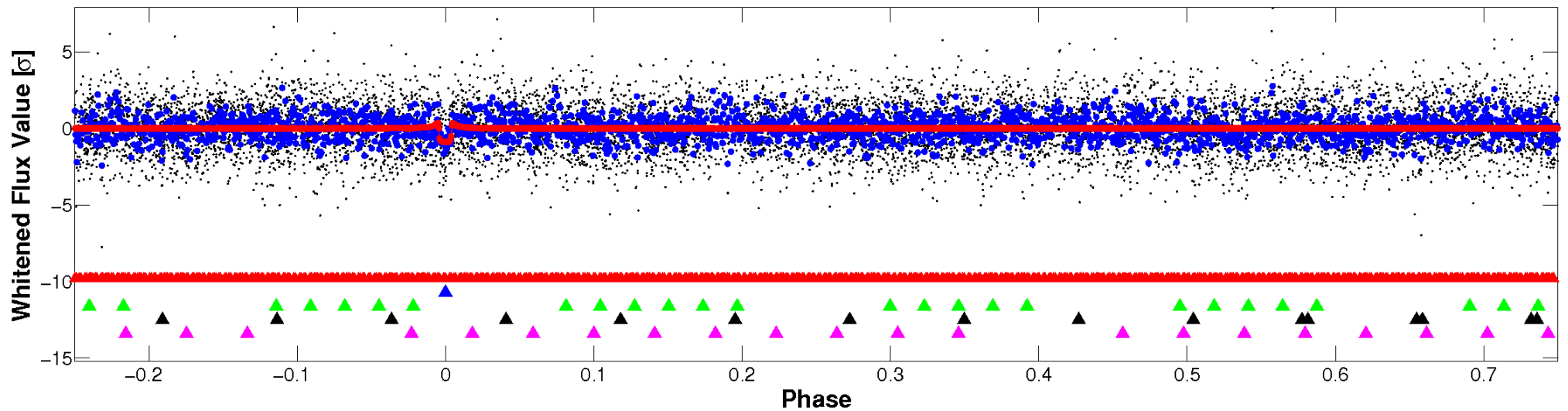


# Non-Whitened Vs. Whitened Light Curve

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

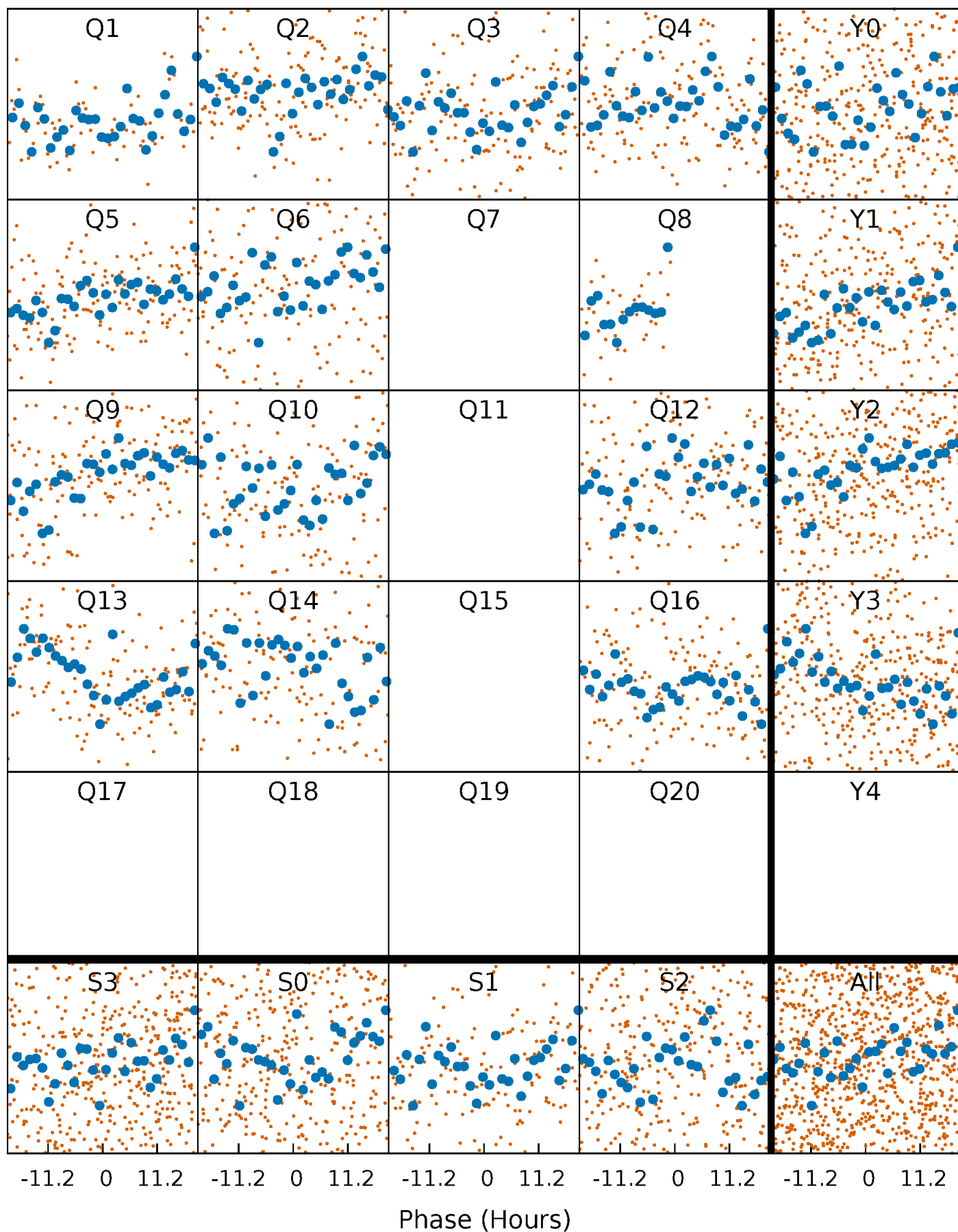


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

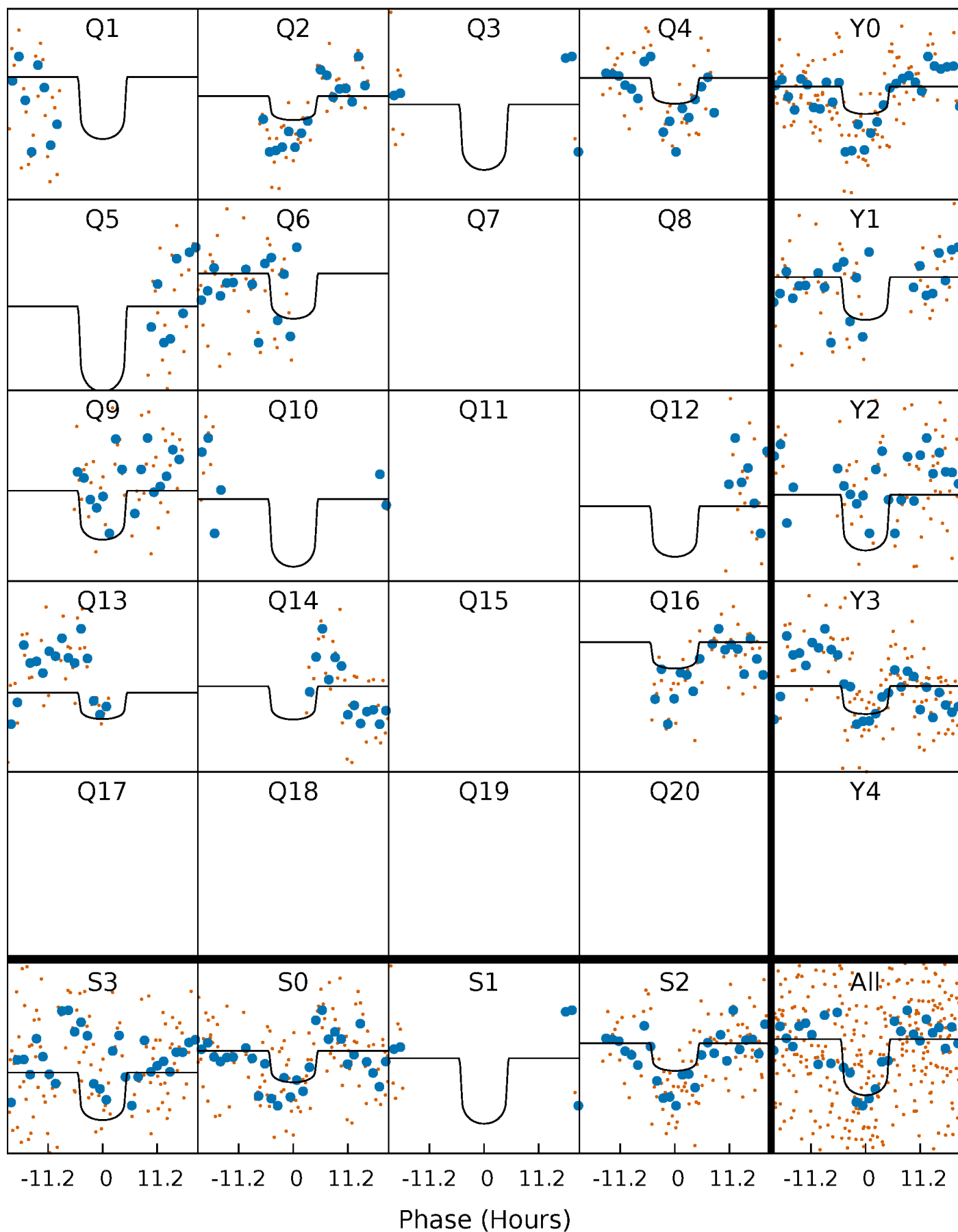
TCE 009965121-02 P= 46.383850 Days  $T_0=158.097080$  (BKJD)





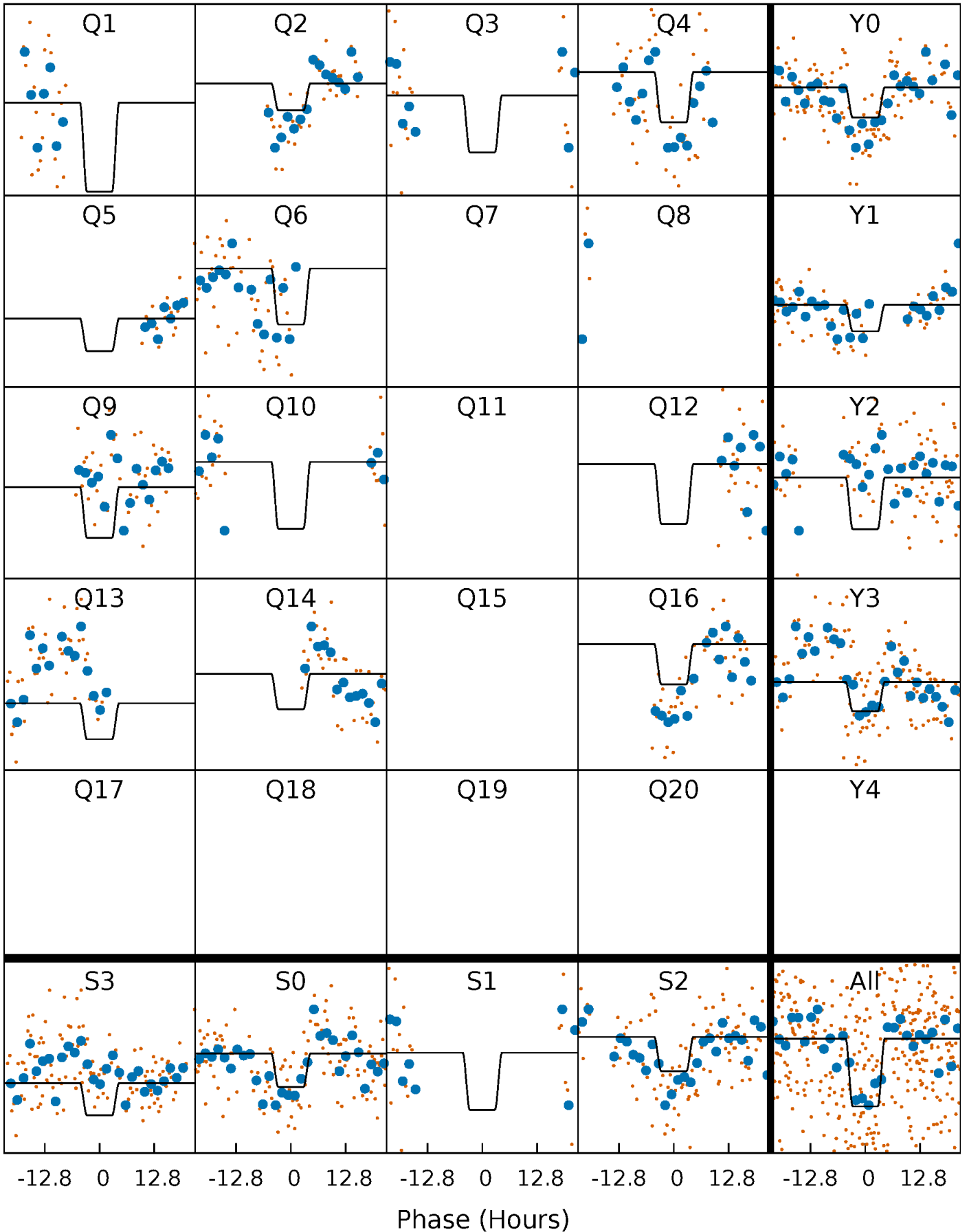
# DV Quarter-Phased Transit Curves

TCE 009965121-02 P= 46.383850 Days  $T_0=158.097080$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

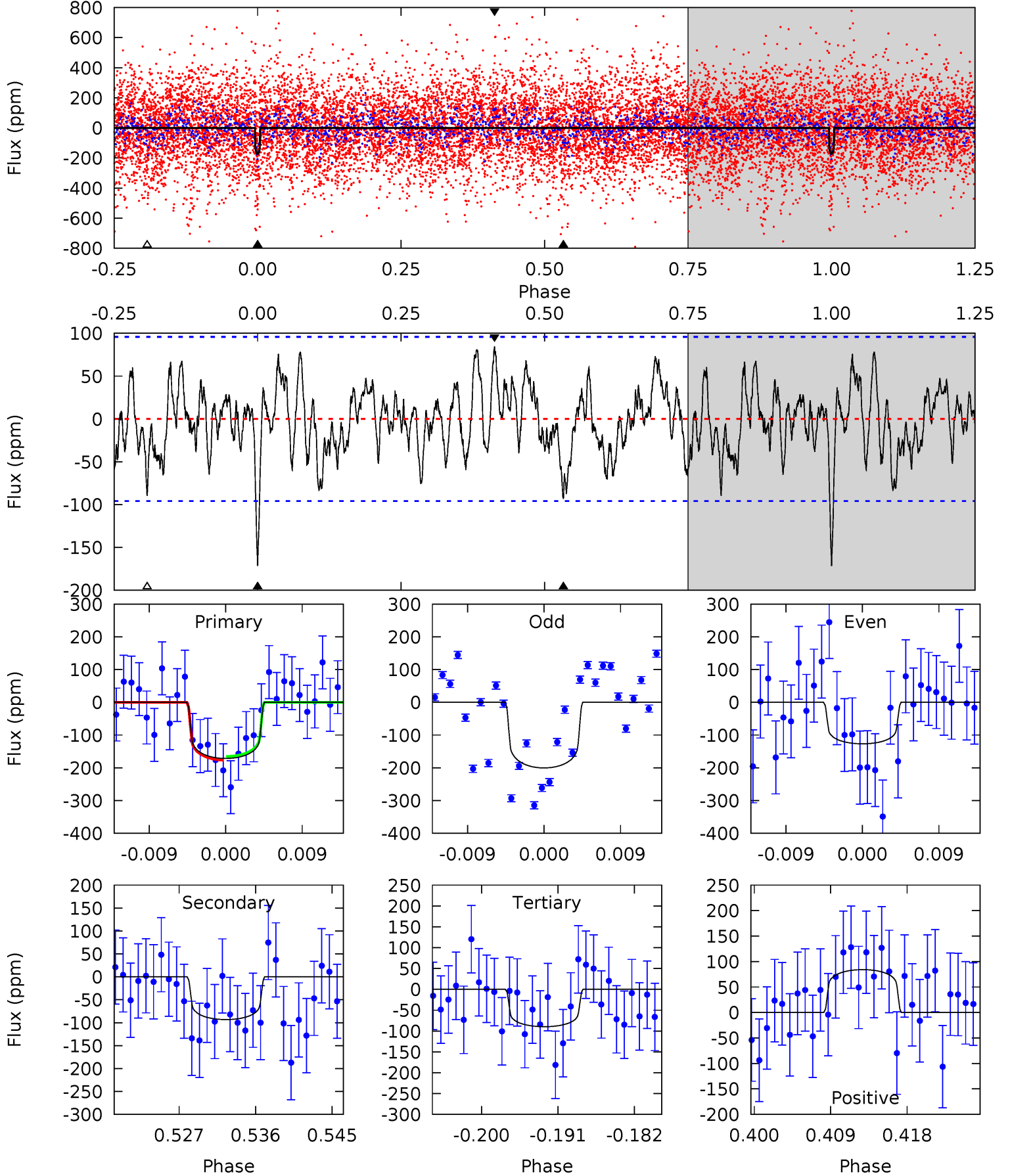
TCE 009965121-02 P= 46.385621 Days  $T_0=158.059436$  (BKJD)



# DV Model-Shift Uniqueness Test

009965121-02, P = 46.383850 Days, E = 111.713230 Days

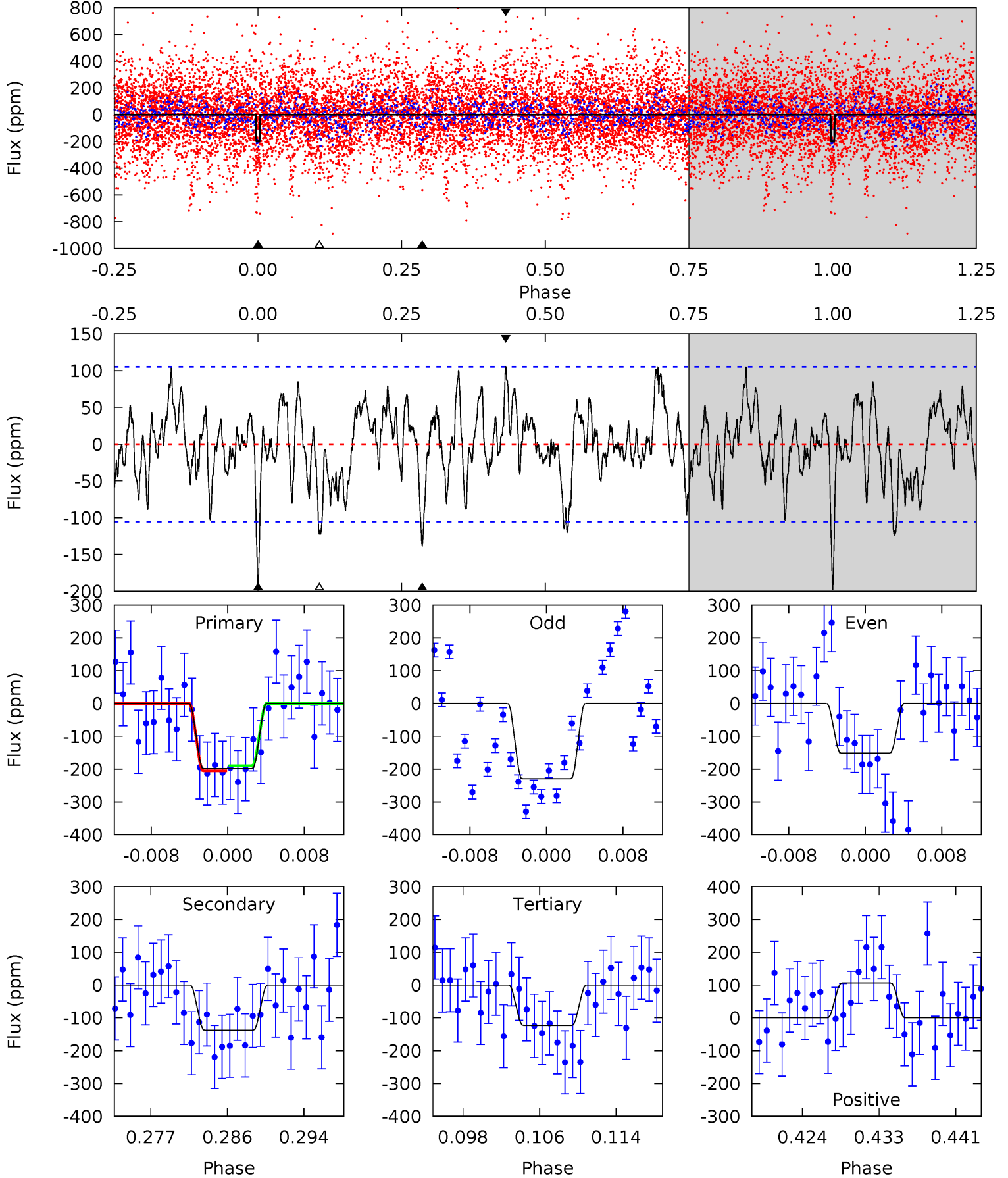
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
9.02	4.90	4.71	4.43	5.04	2.61	1.76	4.31	4.60	0.19	0.48	1.88	1.33	0.33	0.29



# Alt Model-Shift Uniqueness Test

009965121-02, P = 46.385621 Days, E = 111.673815 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
9.55	6.61	5.91	5.12	5.07	2.65	2.01	3.64	4.43	0.70	1.49	1.80	0.78	0.35	0.38





### Stellar Parameters For KIC 009965121

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7071^{+197}_{-310}$	$4.202^{+0.105}_{-0.195}$	$-0.020^{+0.250}_{-0.350}$	$1.579^{+0.535}_{-0.288}$	$1.451^{+0.220}_{-0.220}$	$0.519^{+0.270}_{-0.281}$
	+3%/-4%	+2%/-5%	+1250%/-1750%	+34%/-18%	+15%/-15%	+52%/-54%
Source	PHO1	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 009965121-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-93 \pm 19$	$2.41^{+1.57}_{-1.29}$	$1028^{+86}_{-65}$	$5837^{+3339}_{-1121}$	$715^{+2590}_{-471}$
Alt.	$-137 \pm 21$	$2.80^{+1.60}_{-1.39}$	$1033^{+86}_{-67}$	$5946^{+3117}_{-1050}$	$775^{+2191}_{-471}$

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

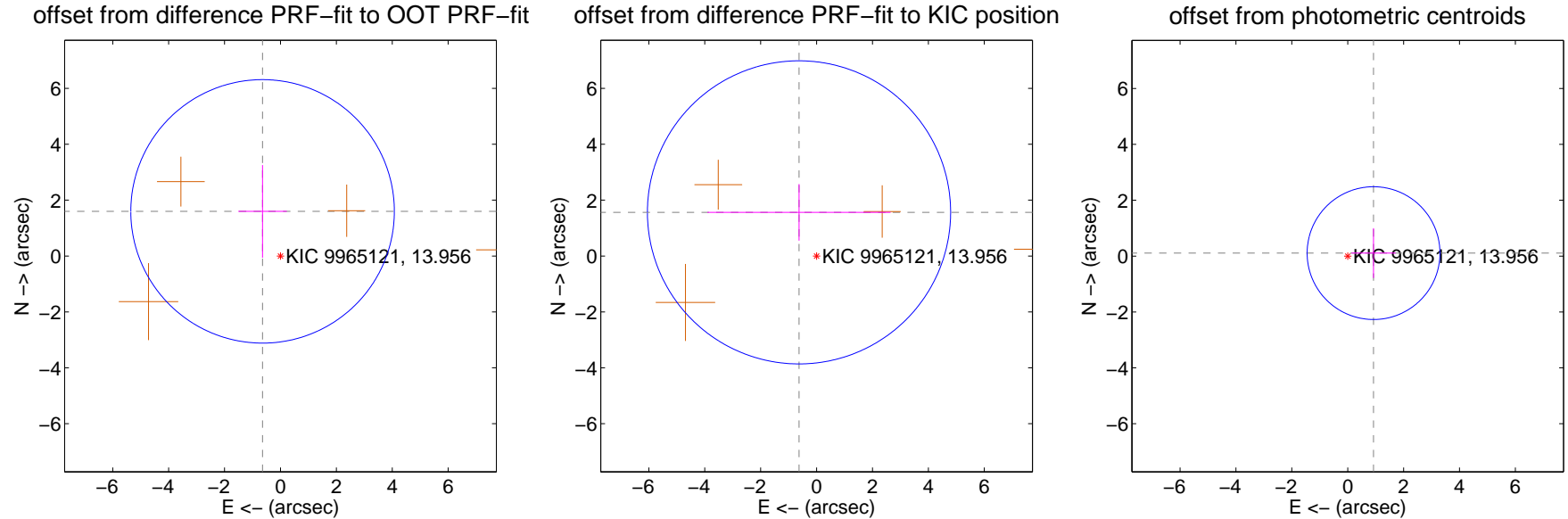
## DV Centroid Data

Supplemental centroid analysis for 009965121-02. Kepler magnitude: 13.96. Transit SNR 8.14

There are 0 quarters with good PRF difference image offsets

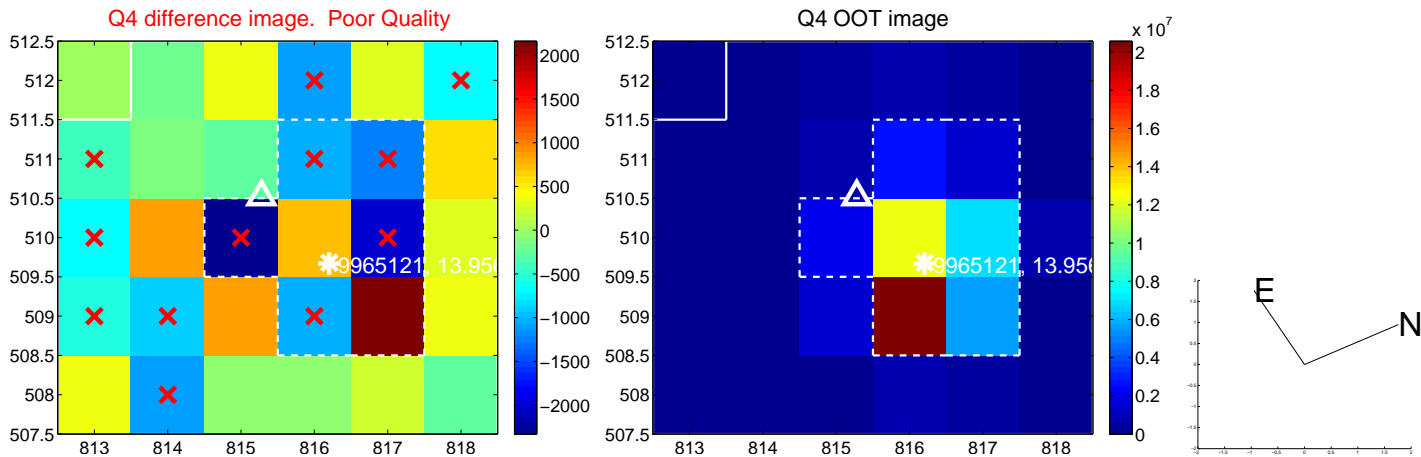
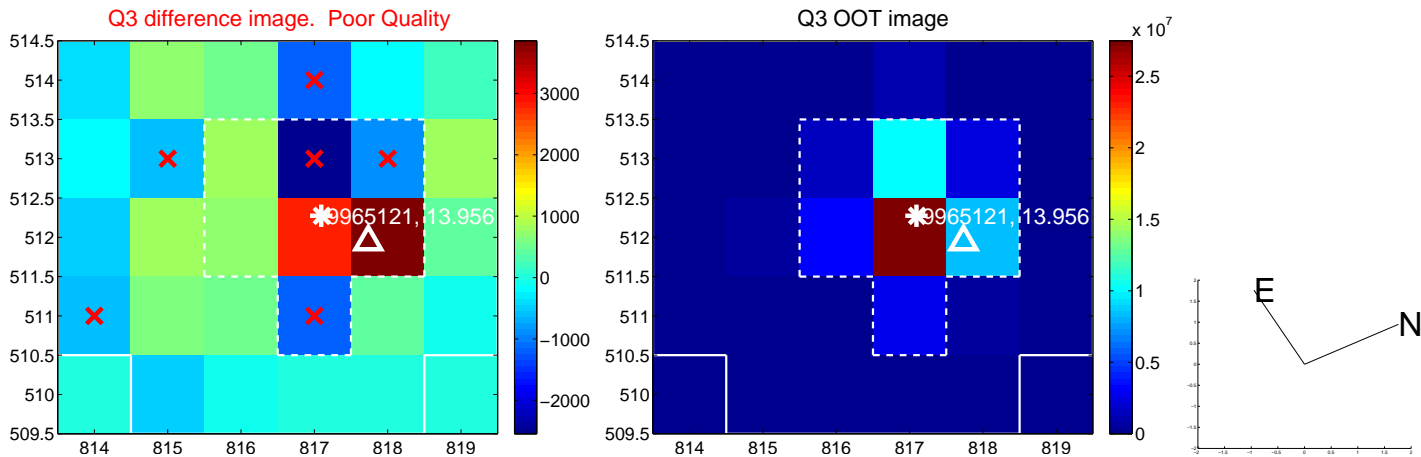
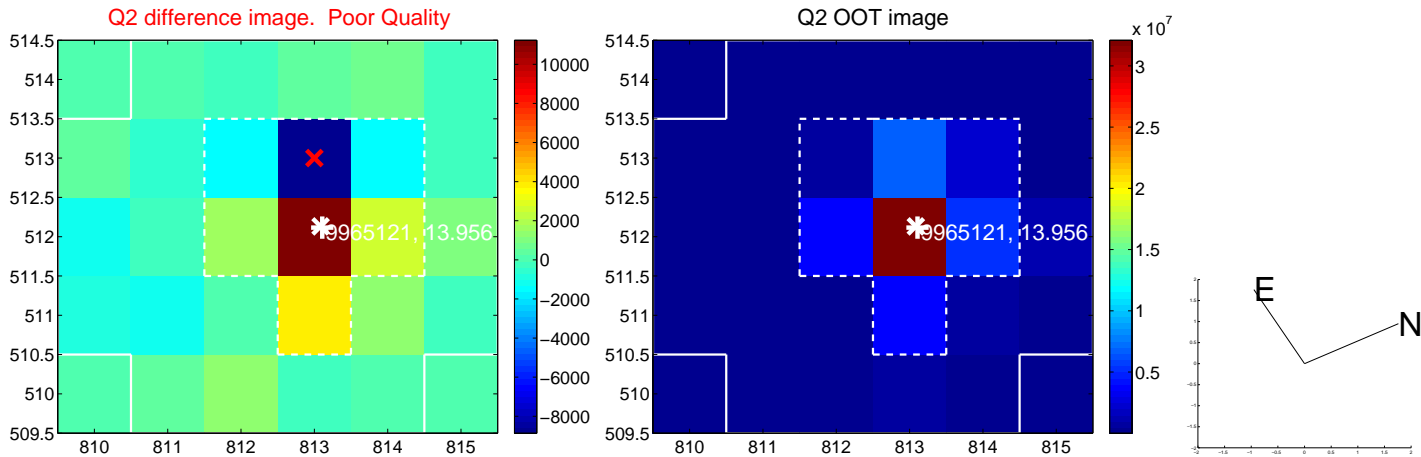
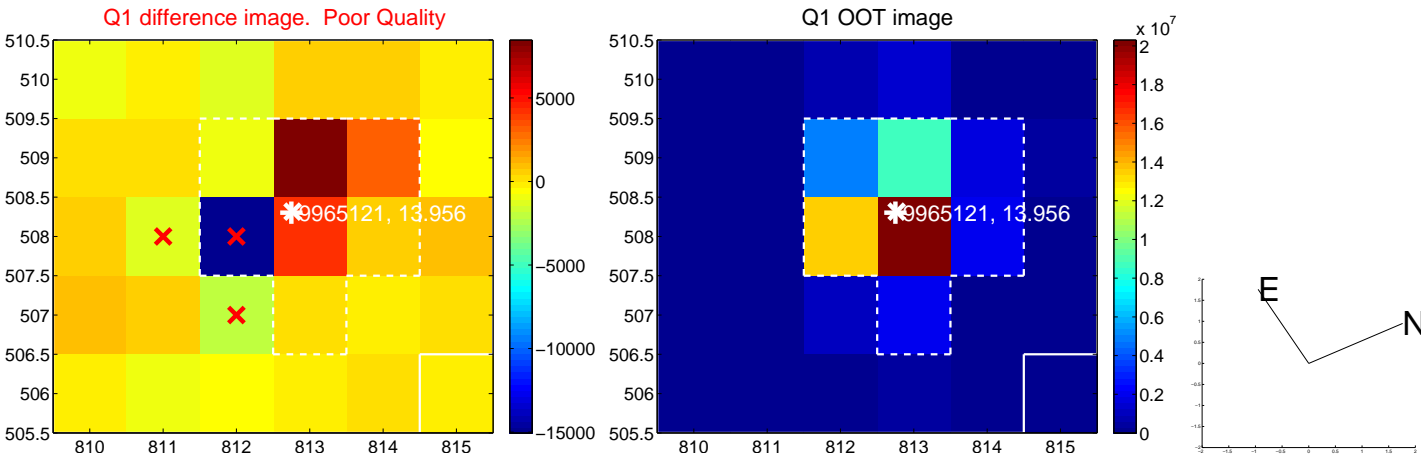
The direct PRF centroid is offset from the target star catalog position by about 0.12 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.721 \pm 1.572$	1.10	$0.640 \pm 0.867$	$1.598 \pm 1.657$
PRF-fit source offset from KIC position	$1.684 \pm 1.808$	0.93	$0.628 \pm 3.277$	$1.562 \pm 1.013$
photometric centroid source offset	$0.93 \pm 0.79$	1.17	$-0.92 \pm 0.79$	$0.11 \pm 0.89$

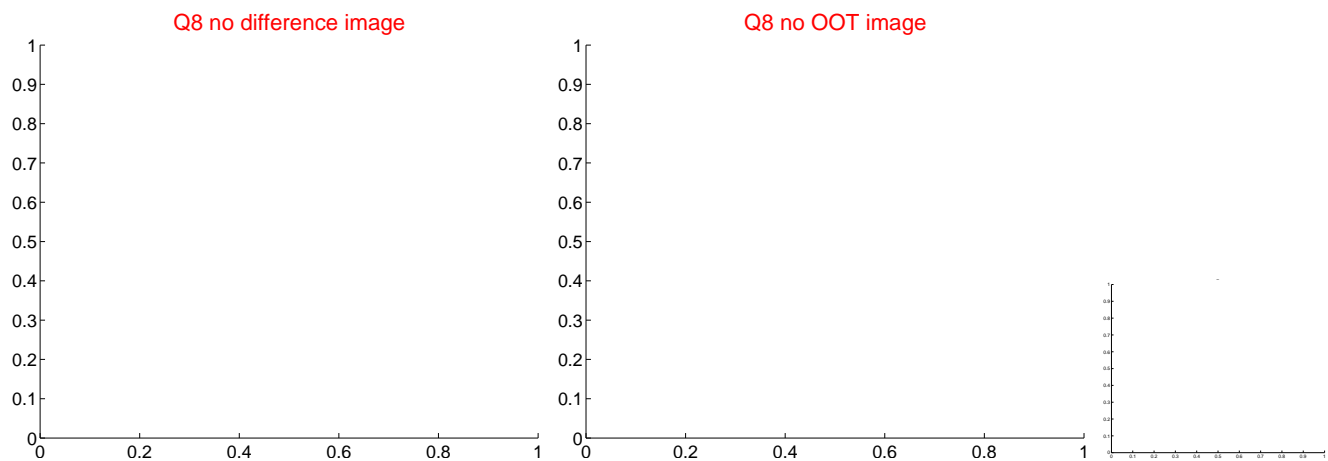
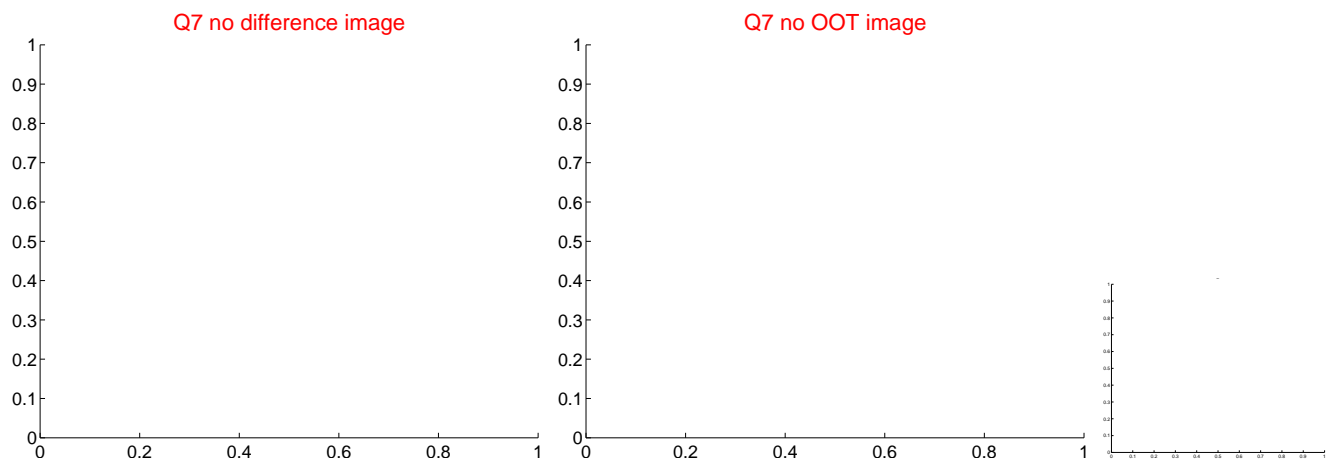
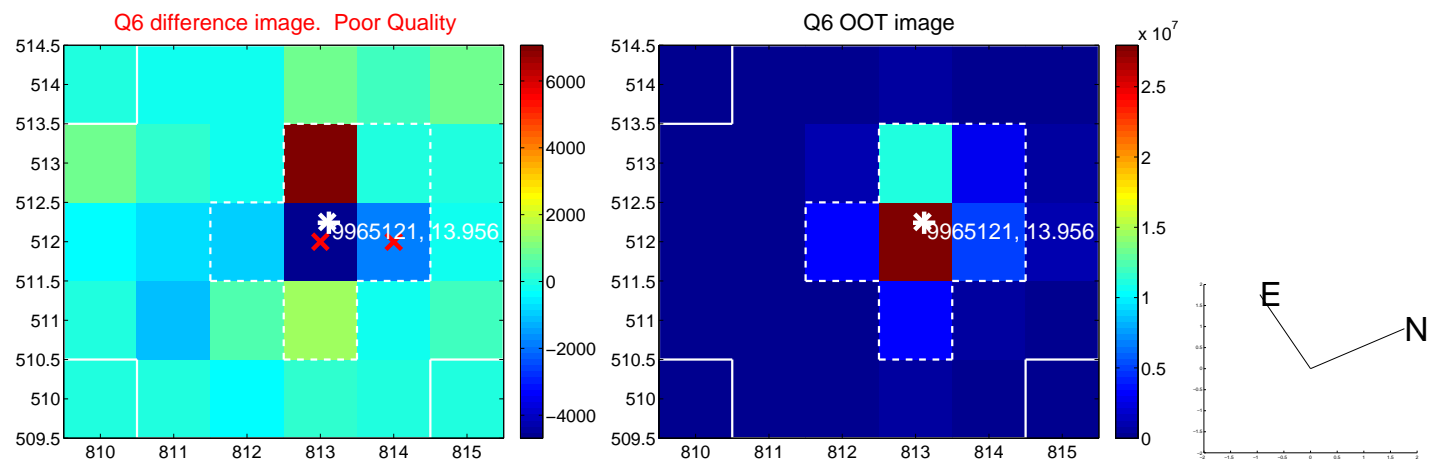
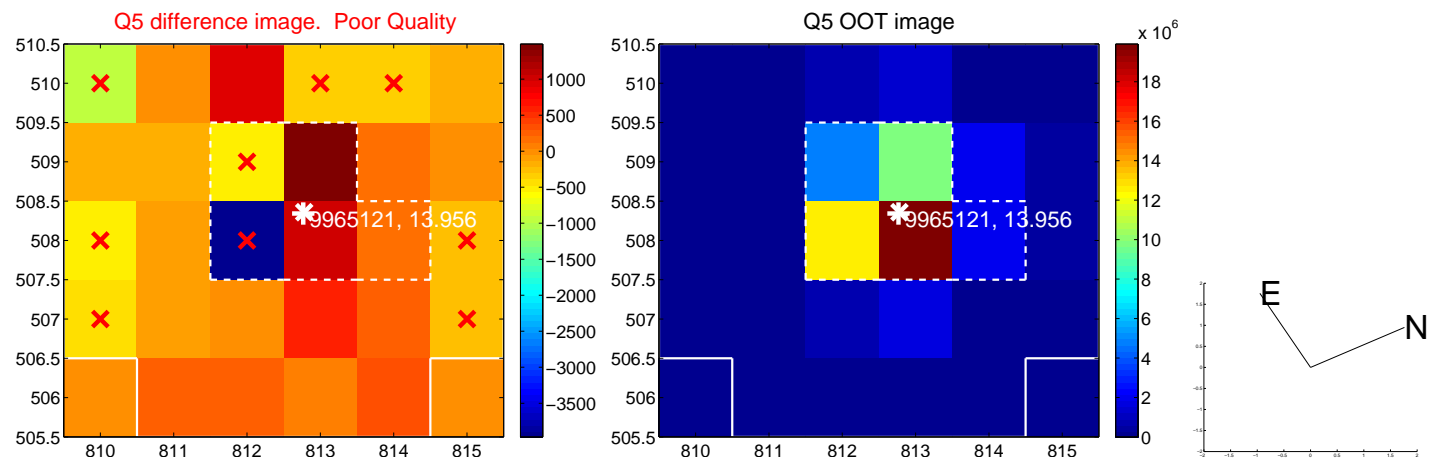


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

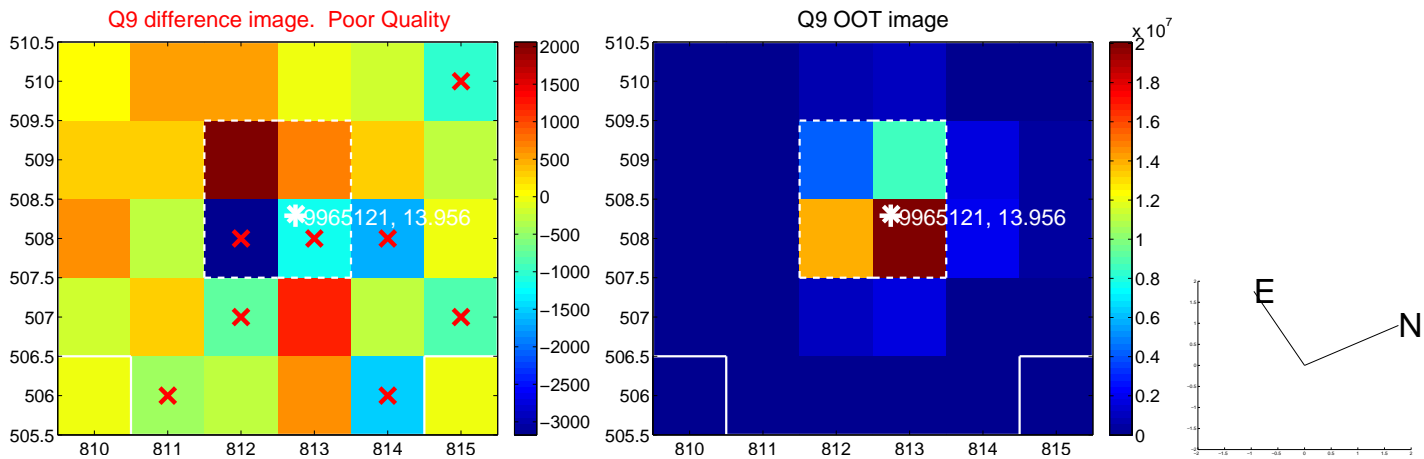
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

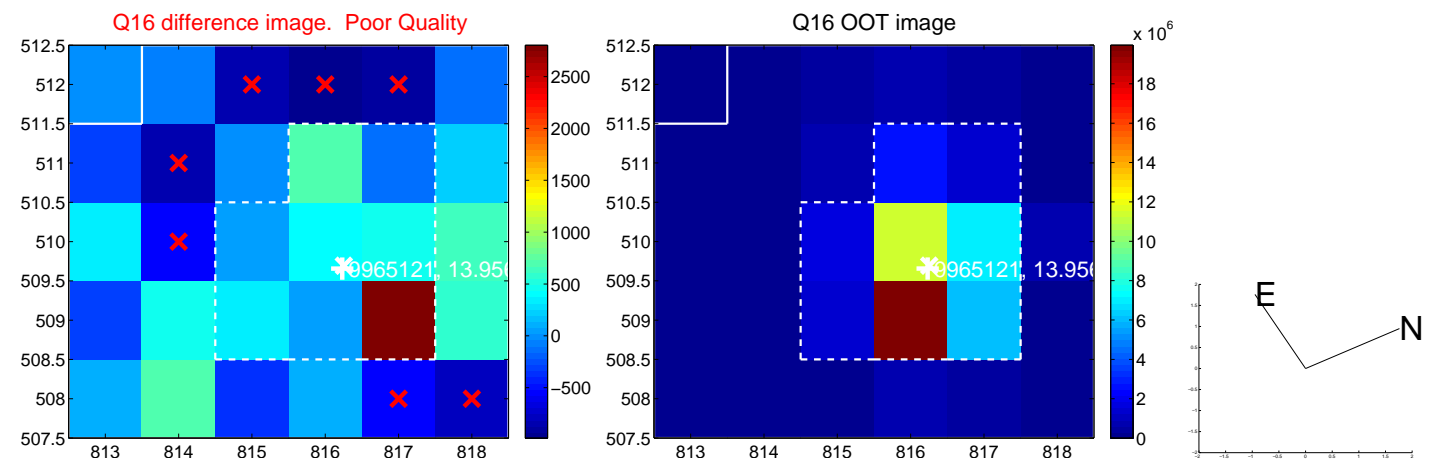
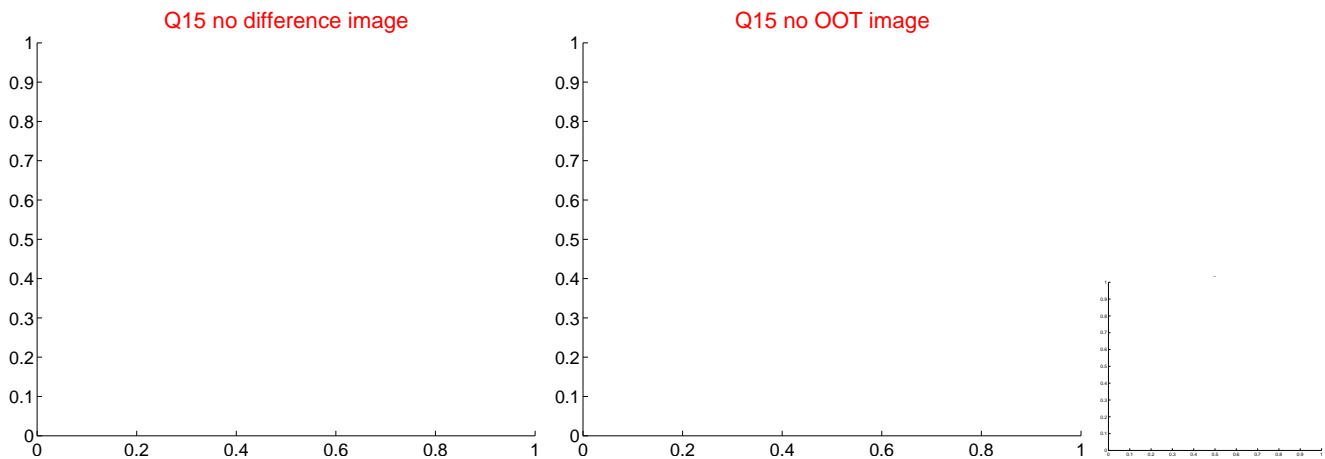
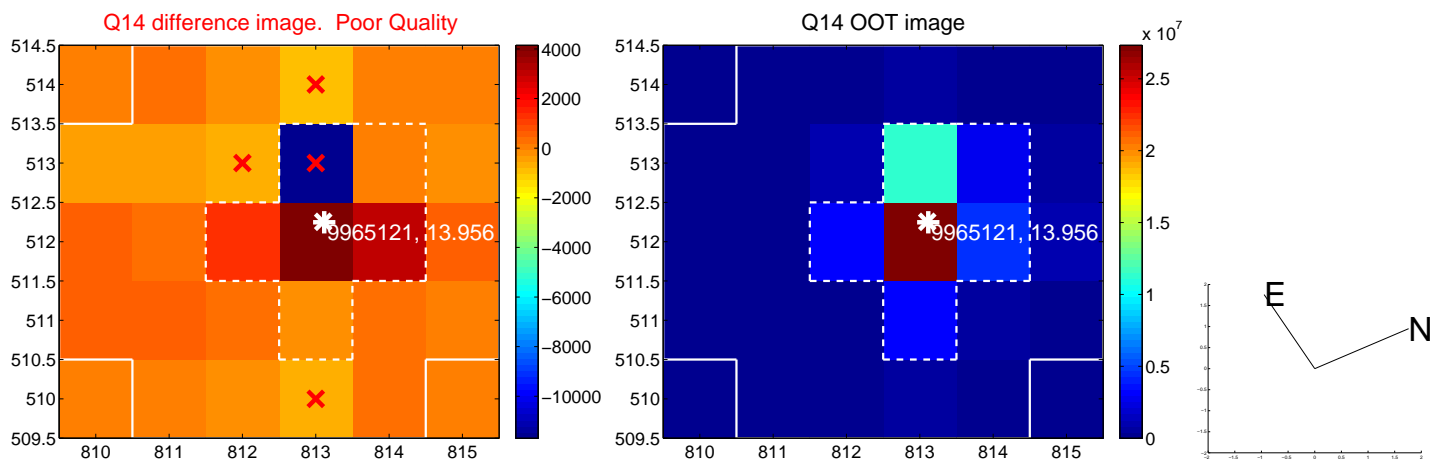
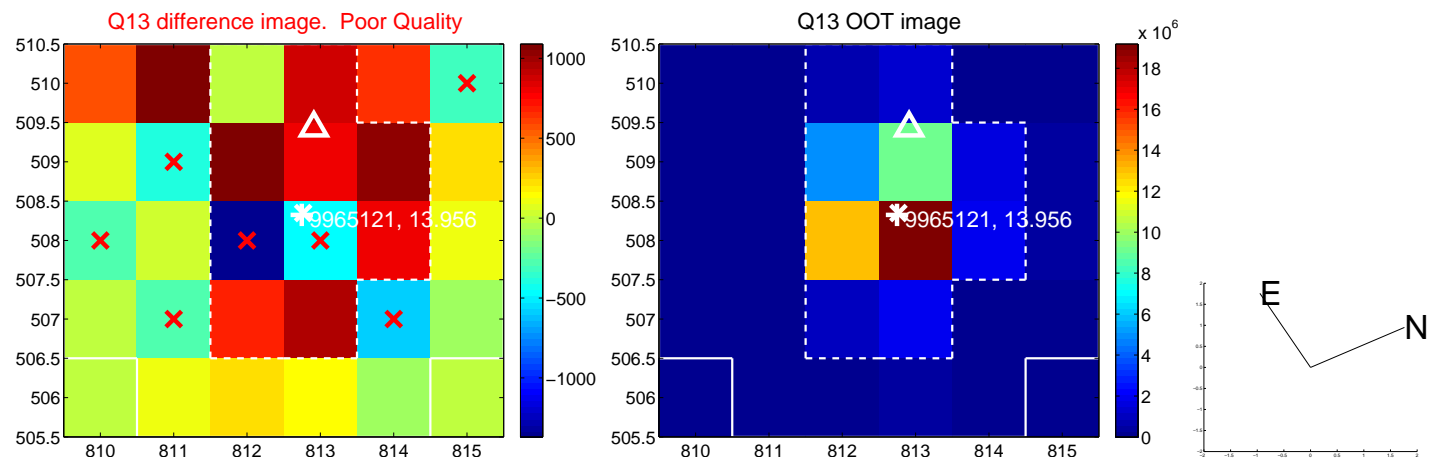


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

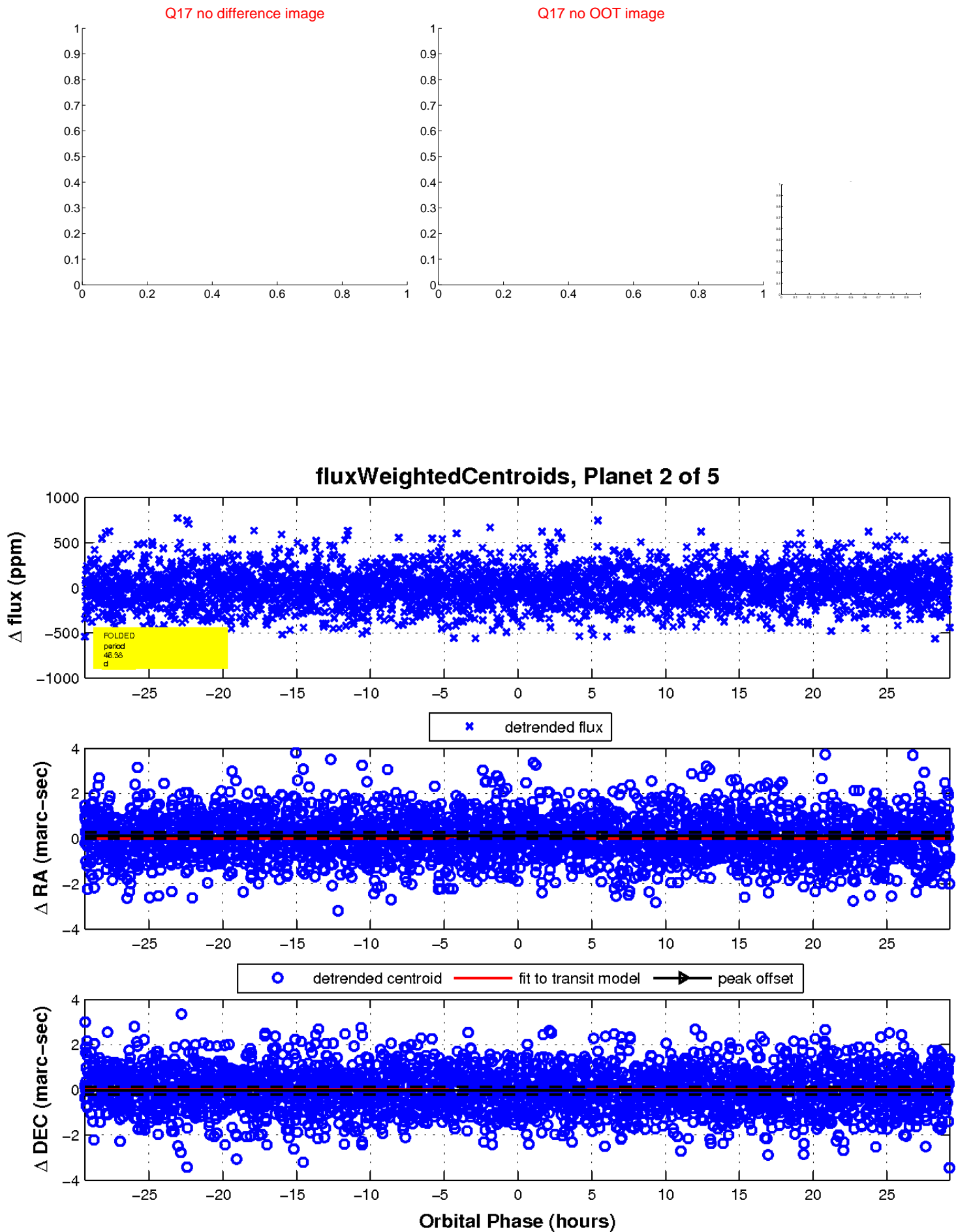




white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

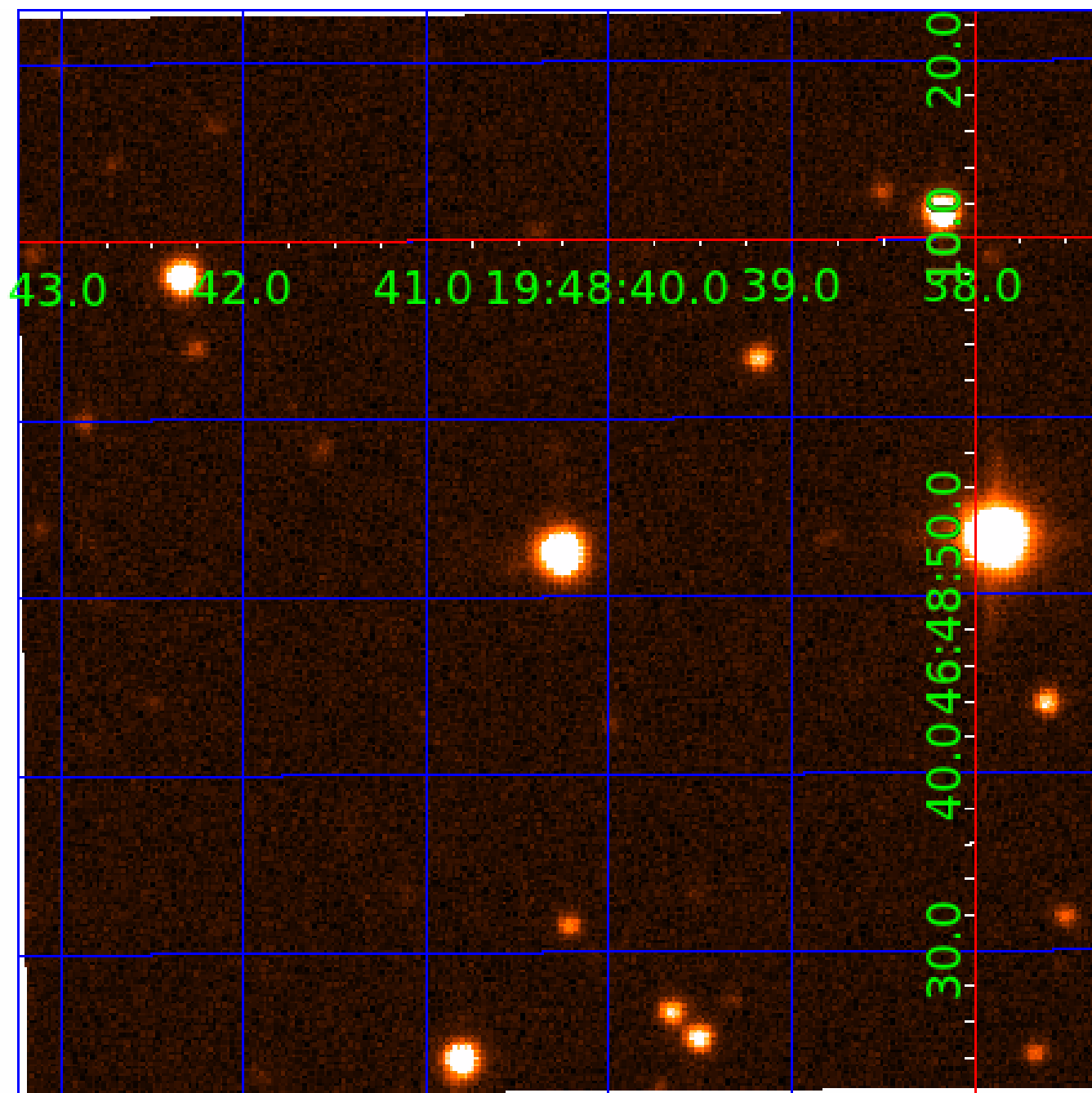


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 009965121

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009965121-01	OBS	No	2.344483	132.895552	23.6	14.975	7.4	7.9	1.58	7071	0.98	3656.03
009965121-02	OBS	No	46.383850	158.097080	176.7	9.784	10.3	8.1	1.58	7071	2.29	68.33
009965121-03	OBS	No	55.446483	167.223038	218.3	5.949	8.3	6.9	1.58	7071	2.54	53.86
009965121-04	OBS	No	89.185717	192.230345	281.1	3.003	8.0	7.8	1.58	7071	2.92	28.58
009965121-05	OBS	No	68.625577	198.282423	365.8	2.469	7.9	8.6	1.58	7071	4.20	40.53

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009965121-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—CENT_UNCERTAIN
009965121-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_FEW_DIFFS
009965121-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_FEW_DIFFS
009965121-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS
009965121-05	OBS	FP	0.00	1	0	0	0	TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT—CENT_FEW_DIFFS

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

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

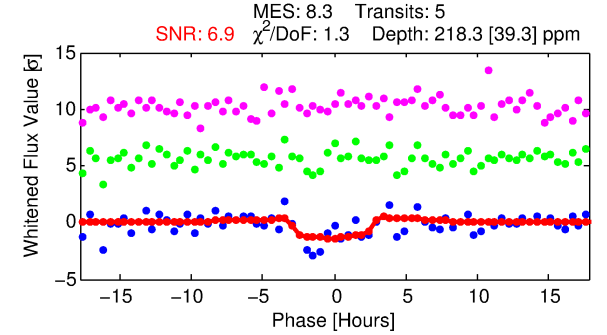
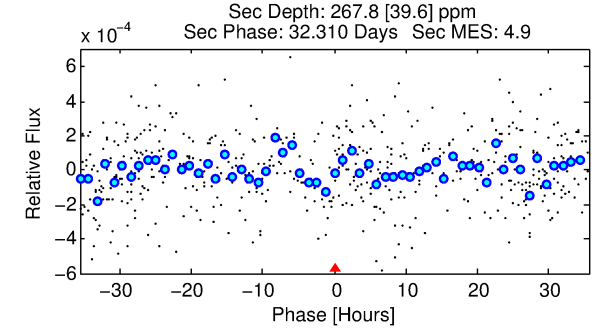
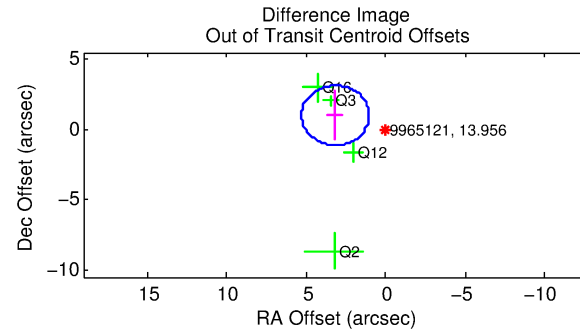
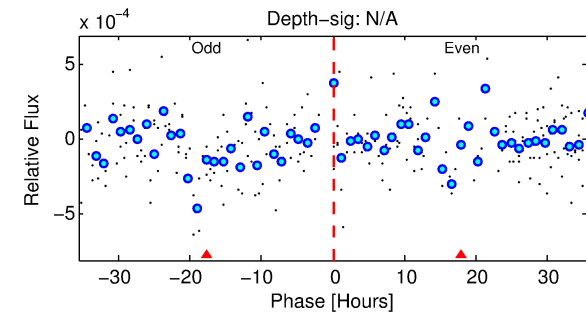
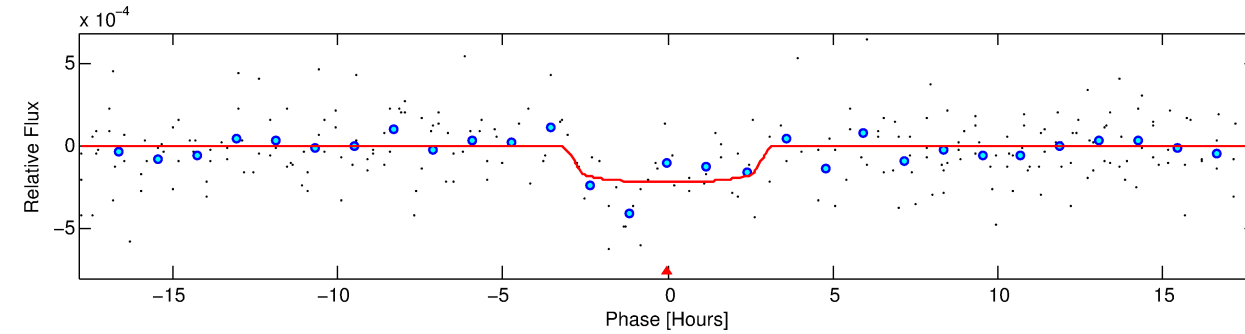
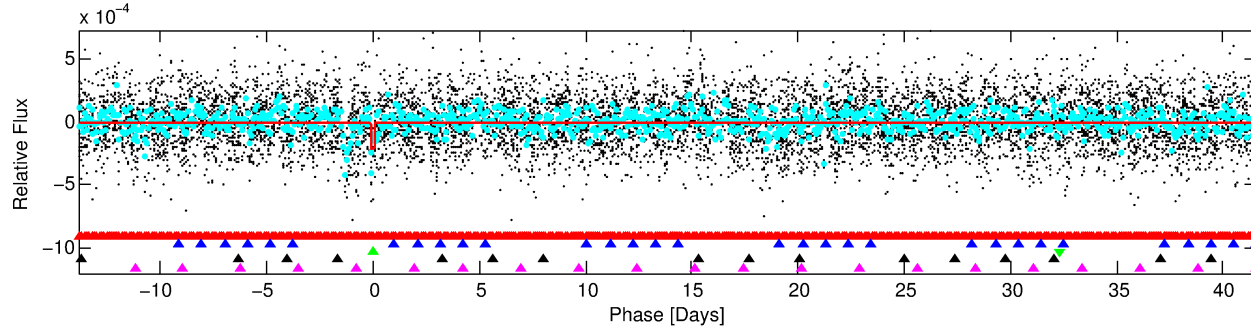
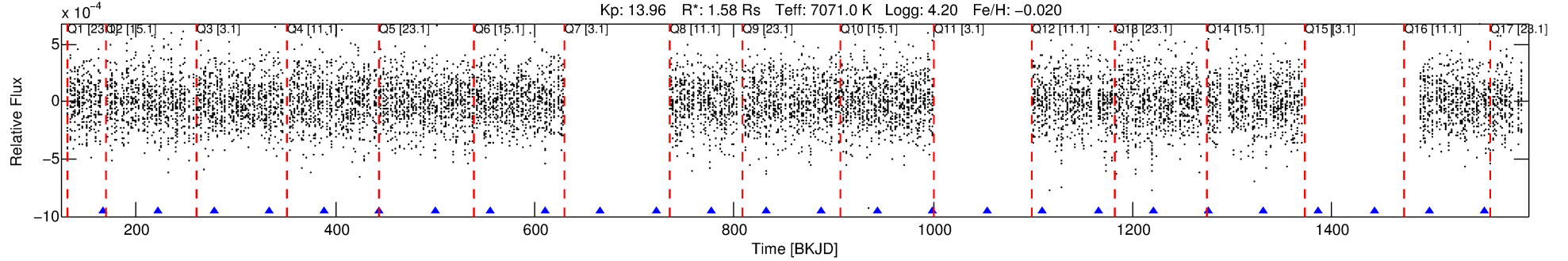
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009965121-03

No Significant Match Found

# DV One-Page Summary

KIC: 9965121 Candidate: 3 of 5 Period: 55.446 d



## DV Fit Results:

Period = 55.44648 [0.00157] d  
Epoch = 167.2230 [0.0189] BKJD  
Rp/R\* = 0.0147 [0.0138]  
a/R\* = 47.78 [265.91]  
b = 0.76 [3.09]  
Seff = 53.86 [22.30]  
Teq = 691 [71] K  
Rp = 2.54 [2.52] Re  
a = 0.3220 [0.0873] AU  
Ag = 2368.07 [4525.38] [0.52] $\sigma$   
Teffp = 7450 [3505] K [1.93] $\sigma$

## DV Diagnostic Results:

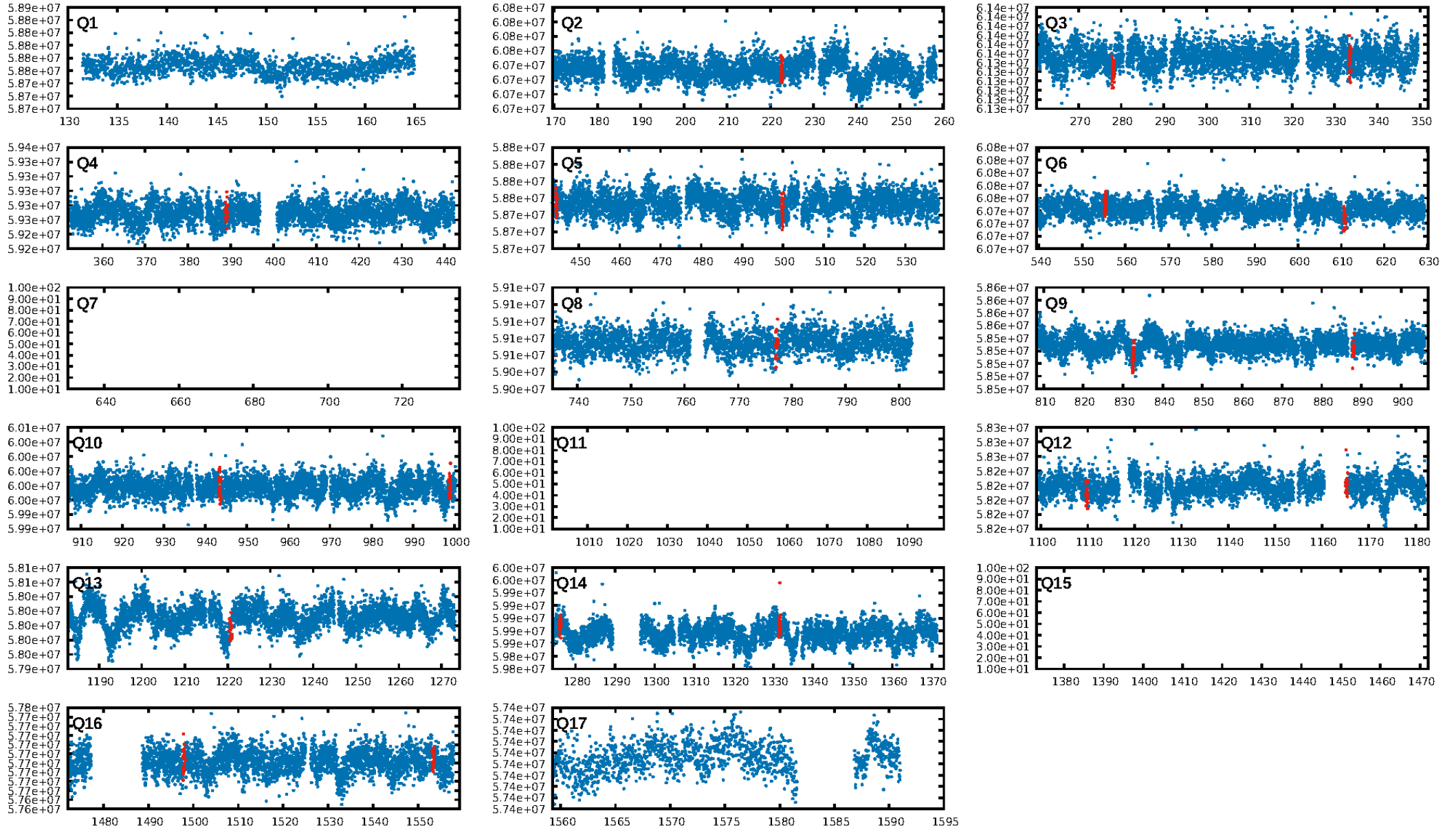
ShortPeriod-sig: 100.0% [19.00] $\sigma$   
LongPeriod-sig: 100.0% [49.11] $\sigma$   
ModelChiSquare2-sig: 98.3%  
ModelChiSquareGof-sig: 99.9%  
Bootstrap-pfa: 1.11e-08  
RollingBand-fgt: 1.00 [5/5]  
GhostDiagnostic-chr: 0.4242  
Centroid-sig: 15.0%  
Centroid-so: 1.089 arcsec [1.22] $\sigma$   
OotOffset-rm: 3.302 arcsec [4.66] $\sigma$   
KicOffset-rm: 3.274 arcsec [3.46] $\sigma$   
OotOffset-st: 1/1/2/0 [4]  
KicOffset-st: 1/1/2/0 [4]  
DiffImageQuality-fgm: 0.50 [2/4]  
DiffImageOverlap-fno: 0.45 [5/11]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 03:19:34 Z

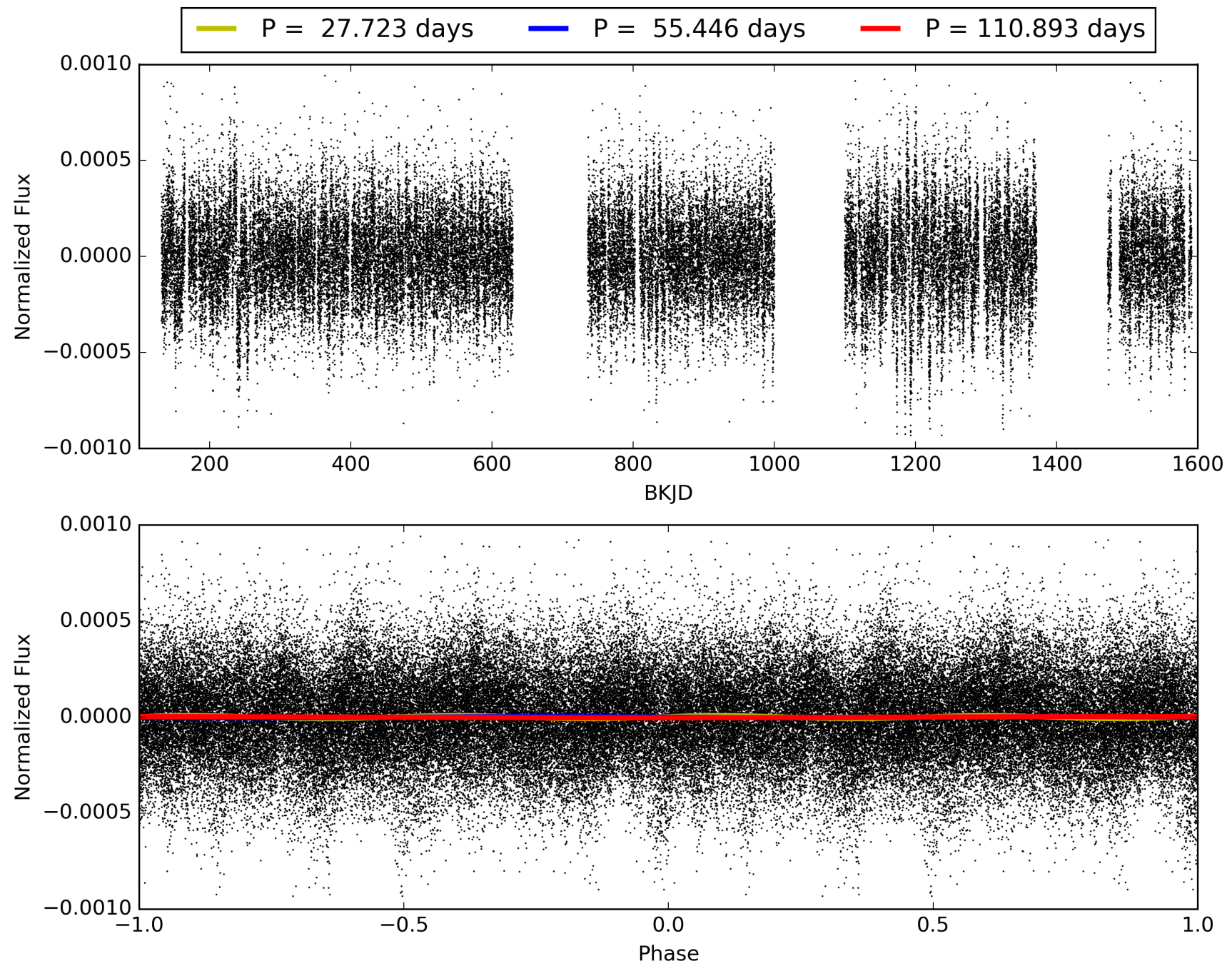
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center



# TCE 009965121-03, PDC Light Curves

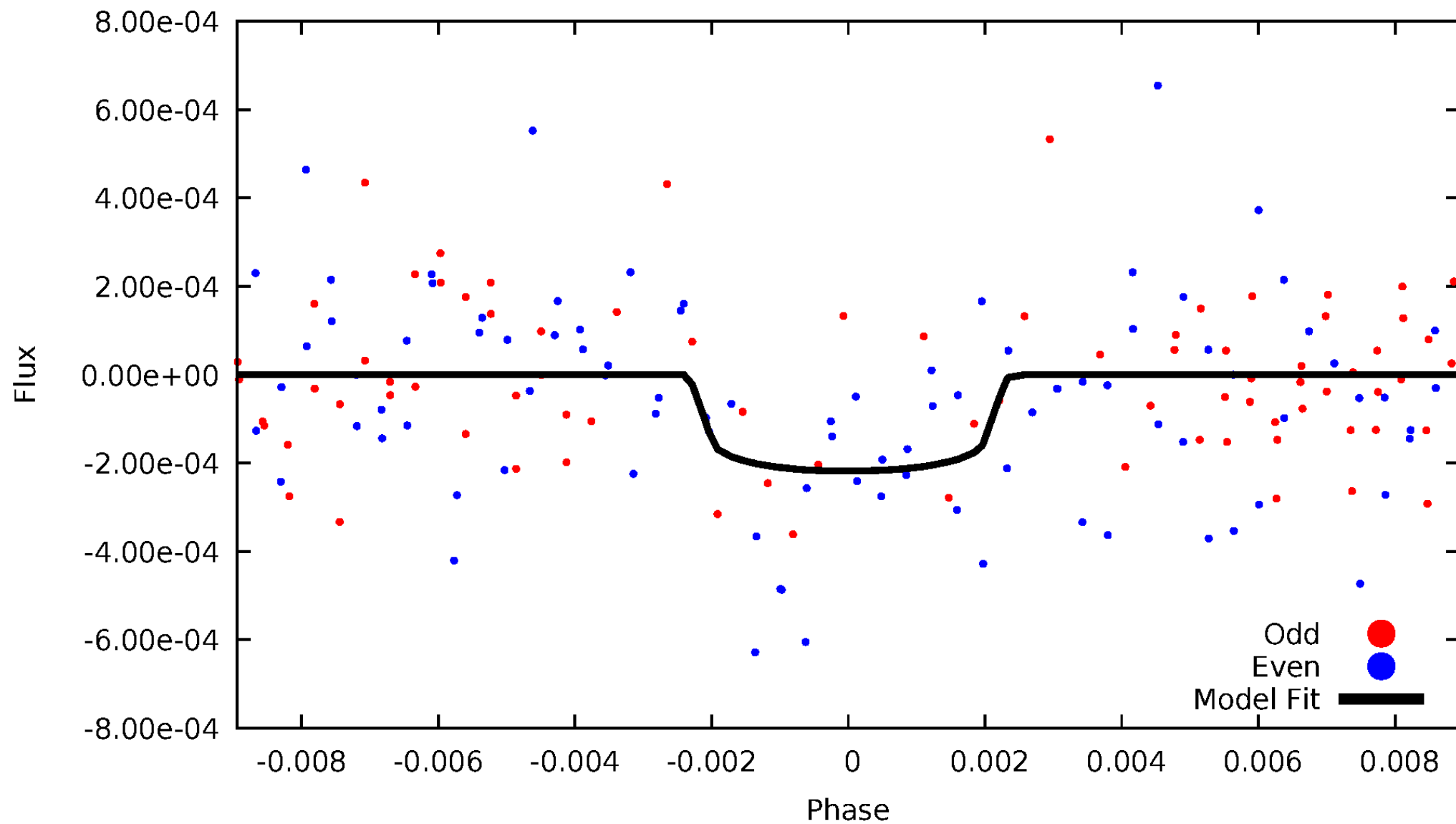


TCE 009965121-03



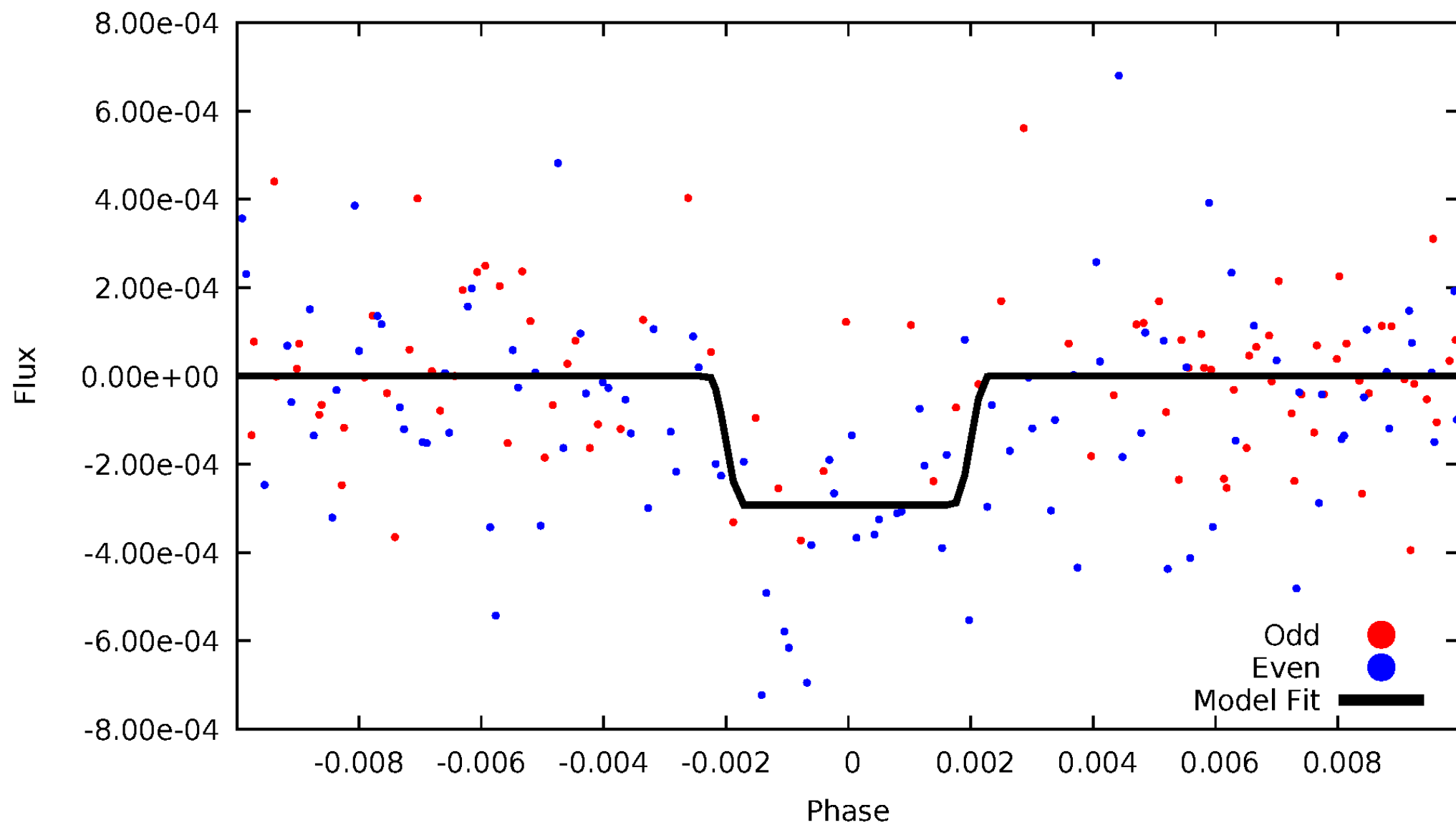
# DV Odd/Even

TCE 009965121-03

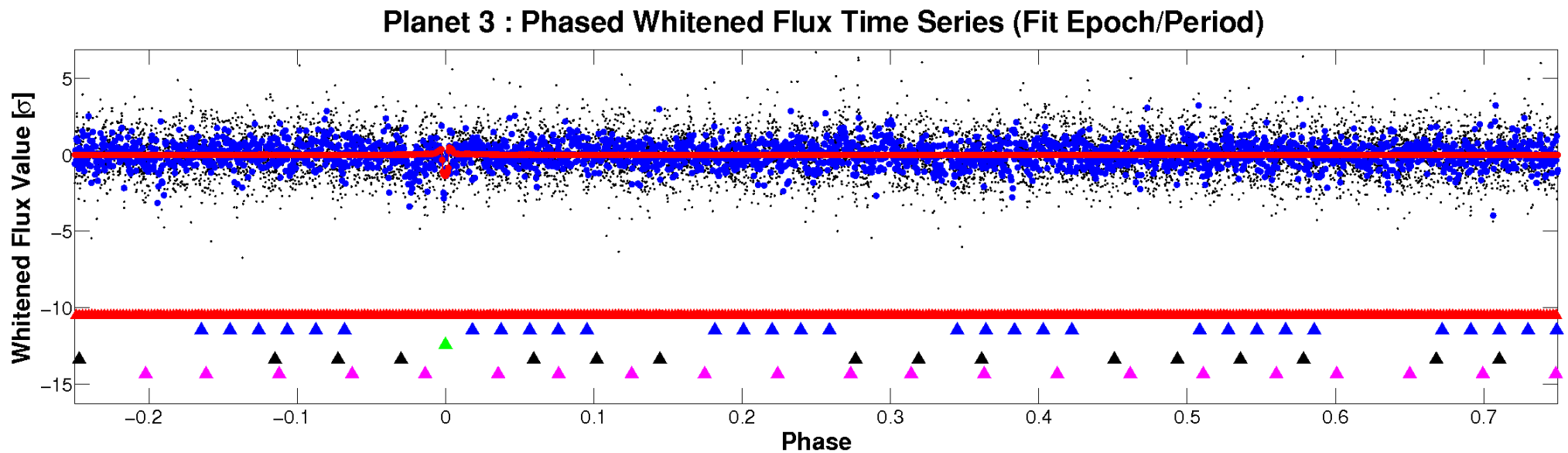
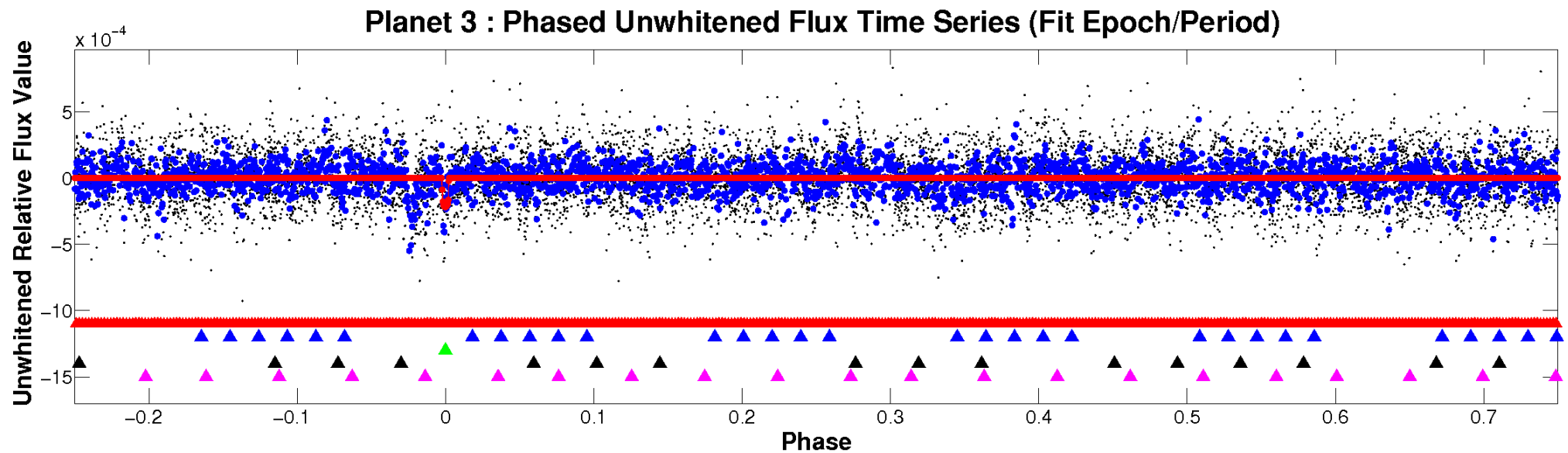


# ALT Odd/Even

TCE 009965121-03



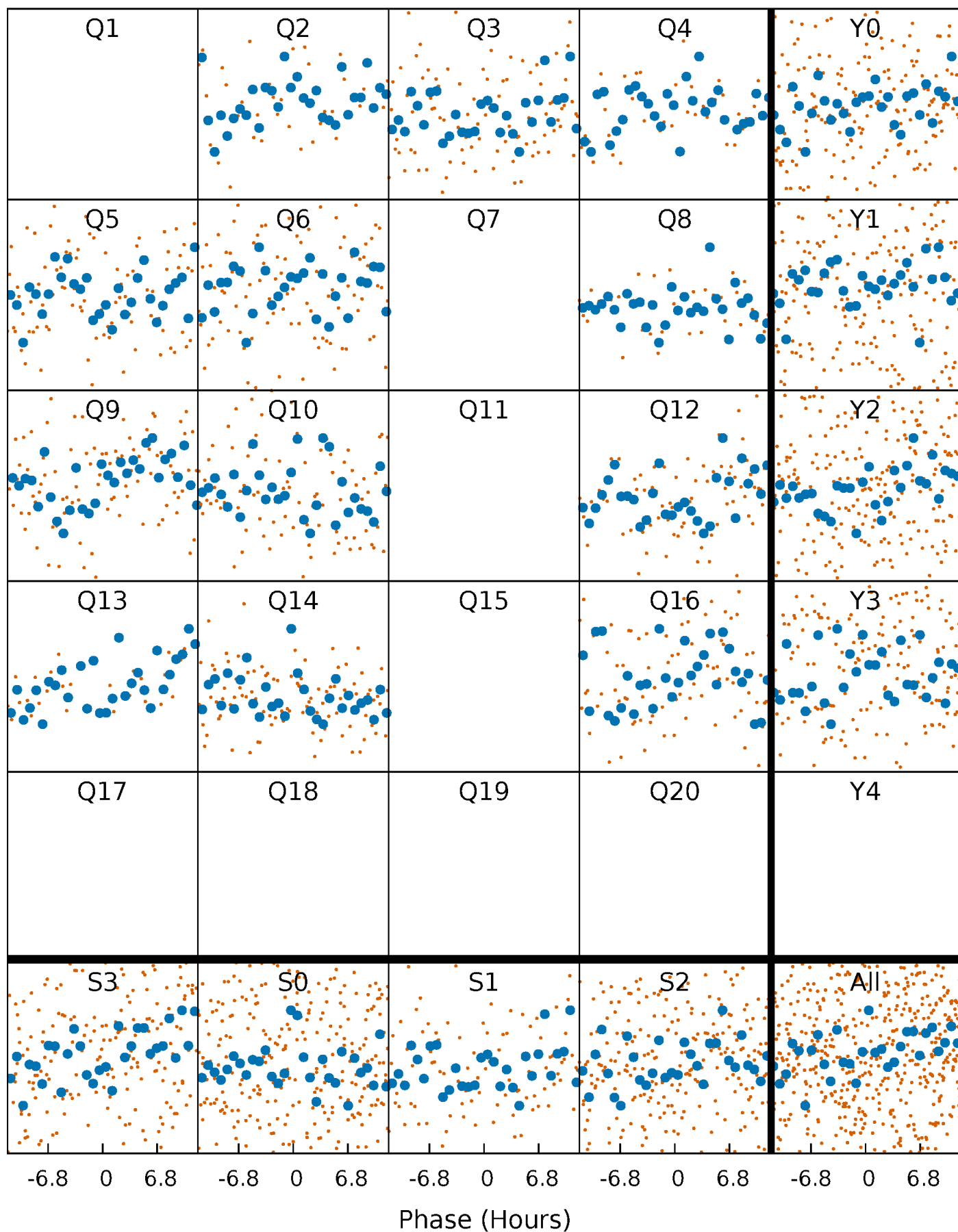
# Non-Whitened Vs. Whitened Light Curve





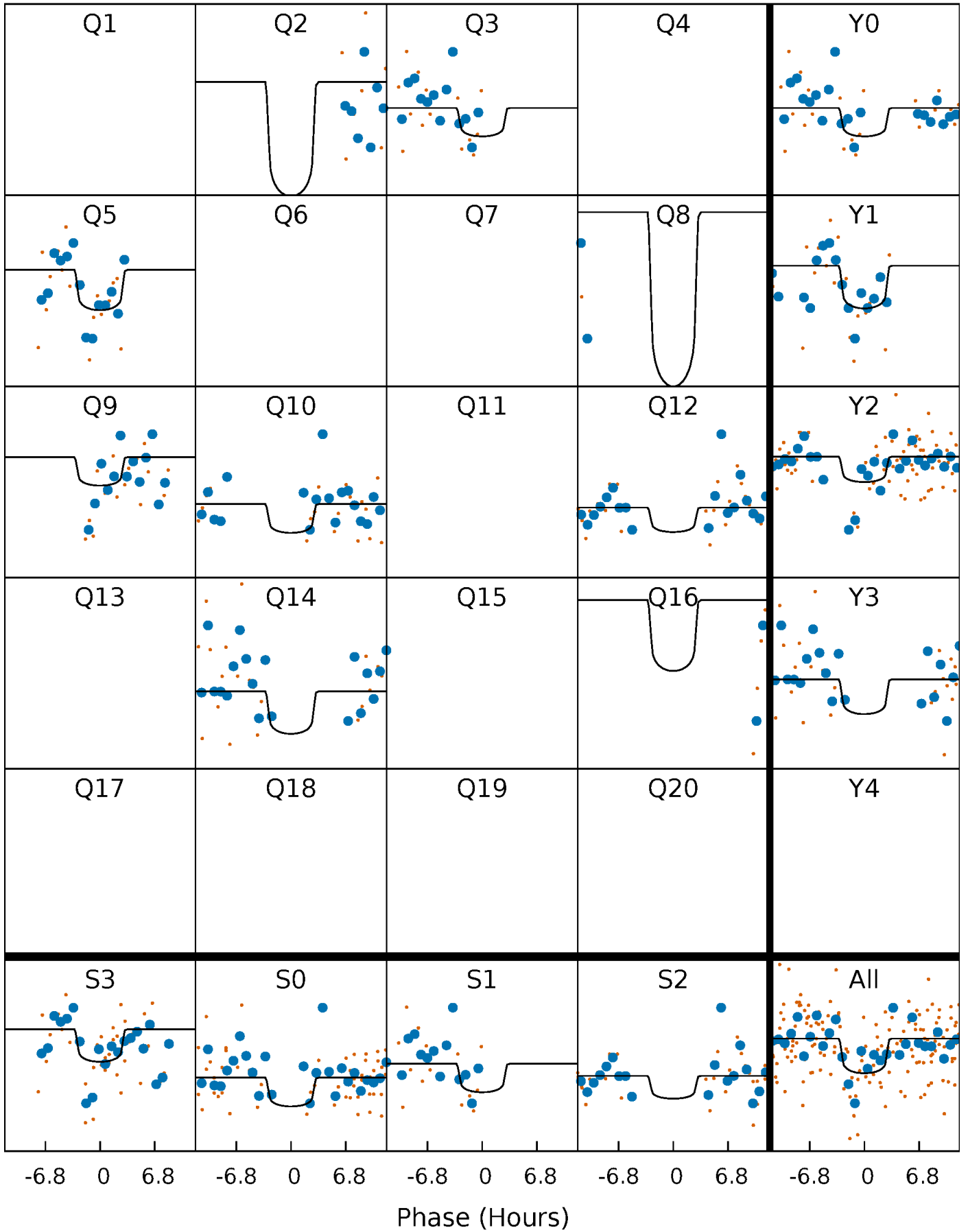
# PDC Quarter-Phased Transit Curves

TCE 009965121-03 P= 55.446483 Days  $T_0=167.223038$  (BKJD)



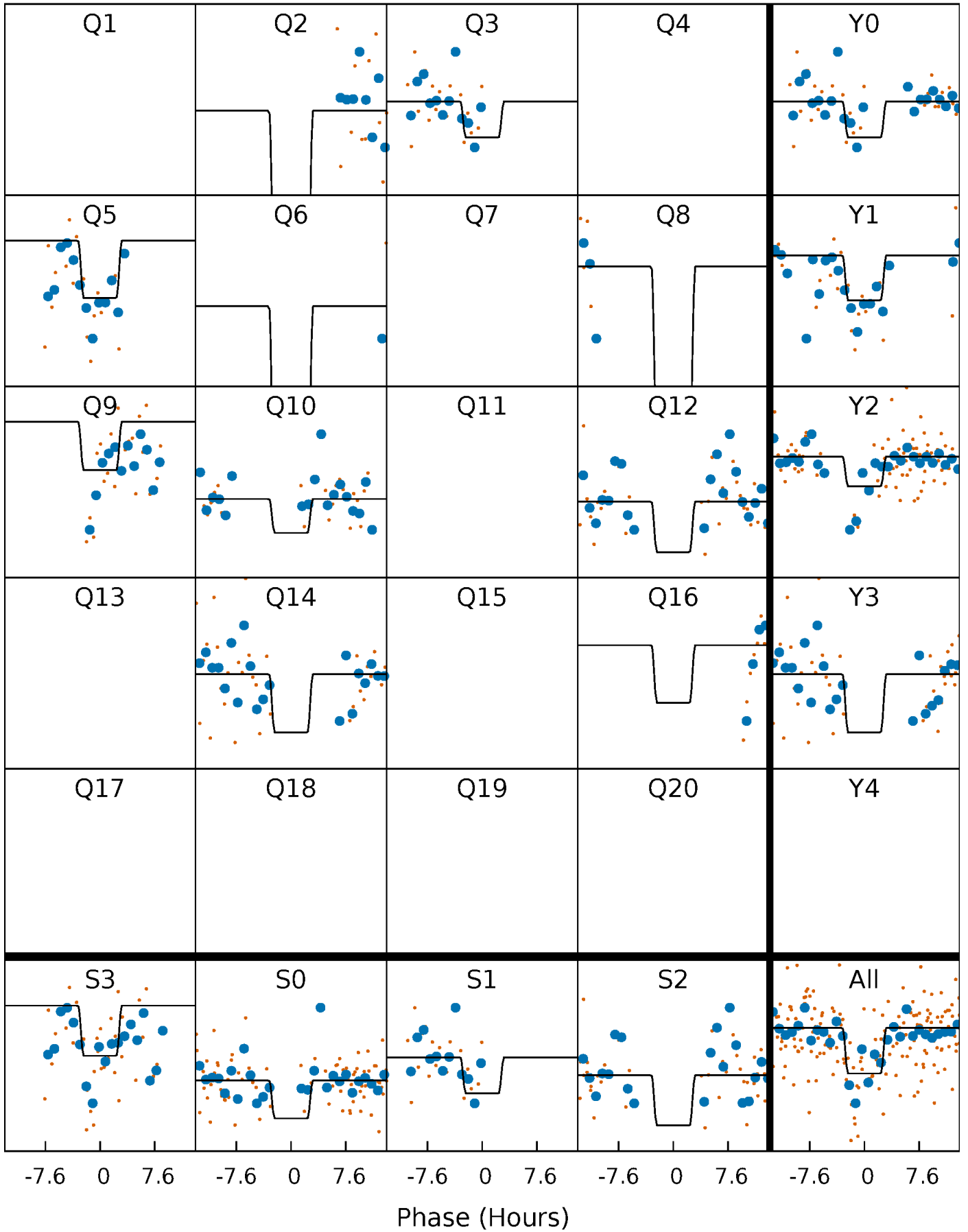
# DV Quarter-Phased Transit Curves

TCE 009965121-03 P= 55.446483 Days  $T_0=167.223038$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

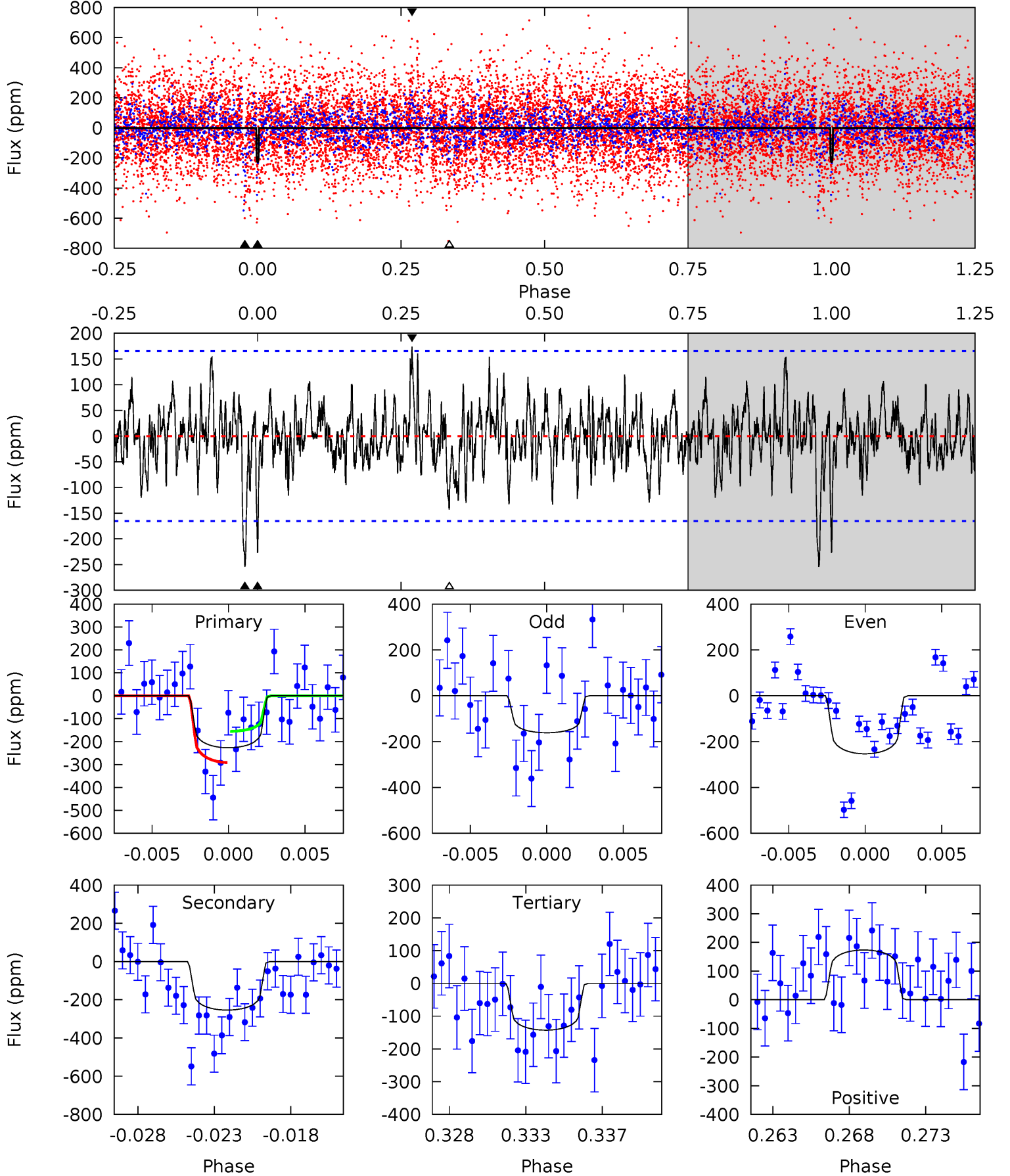
TCE 009965121-03 P= 55.447011 Days  $T_0=167.219609$  (BKJD)



# DV Model-Shift Uniqueness Test

009965121-03, P = 55.446483 Days, E = 111.776555 Days

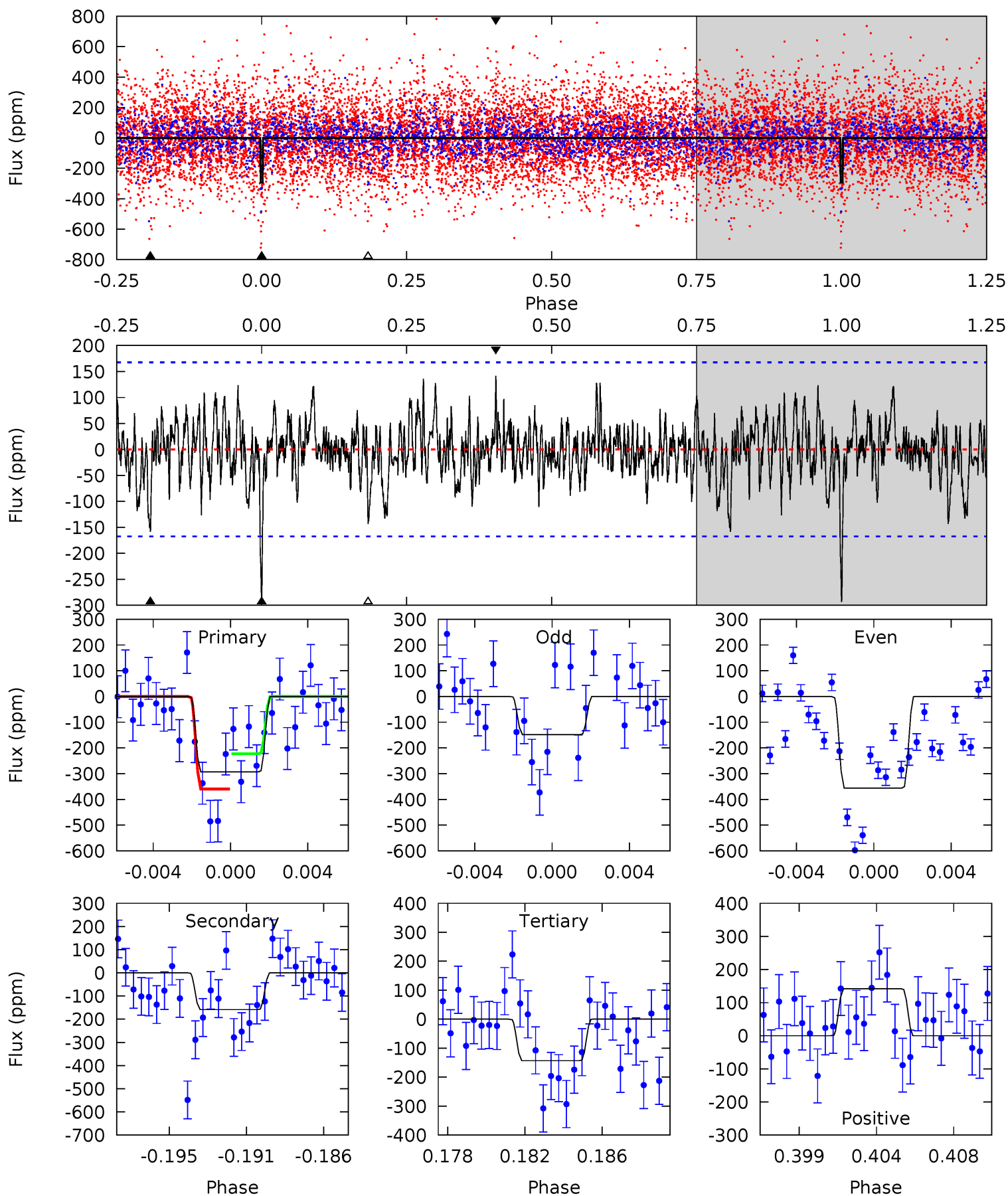
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
7.11	7.96	4.47	5.44	5.17	2.83	1.53	2.64	1.67	3.49	2.52	1.31	0.96	0.41	2.13



# Alt Model-Shift Uniqueness Test

009965121-03, P = 55.447011 Days, E = 111.772598 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
9.08	4.90	4.43	4.39	5.18	2.85	1.30	4.64	4.69	0.47	0.52	3.02	0.89	0.33	2.13



### Stellar Parameters For KIC 009965121

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7071^{+197}_{-310}$	$4.202^{+0.105}_{-0.195}$	$-0.020^{+0.250}_{-0.350}$	$1.579^{+0.535}_{-0.288}$	$1.451^{+0.220}_{-0.220}$	$0.519^{+0.270}_{-0.281}$
	+3%/-4%	+2%/-5%	+1250%/-1750%	+34%/-18%	+15%/-15%	+52%/-54%
Source	PHO1	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 009965121-03 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-254 \pm 32$	$3.04^{+2.51}_{-1.80}$	$971^{+73}_{-63}$	$6722^{+5618}_{-1587}$	$1527^{+7983}_{-1036}$
Alt.	$-158 \pm 32$	$3.38^{+2.47}_{-1.87}$	$977^{+77}_{-62}$	$5670^{+3556}_{-1164}$	$763^{+3271}_{-521}$

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



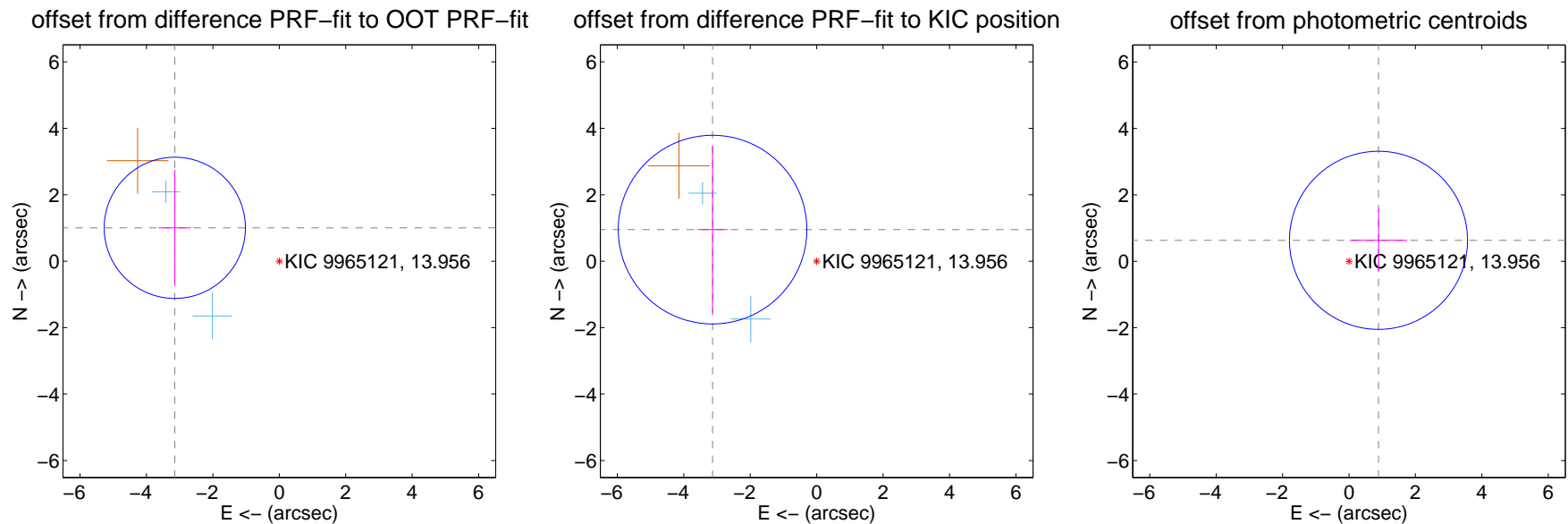
## DV Centroid Data

Supplemental centroid analysis for 009965121-03. Kepler magnitude: 13.96. Transit SNR 6.92

There are 2 quarters with good PRF difference image offsets

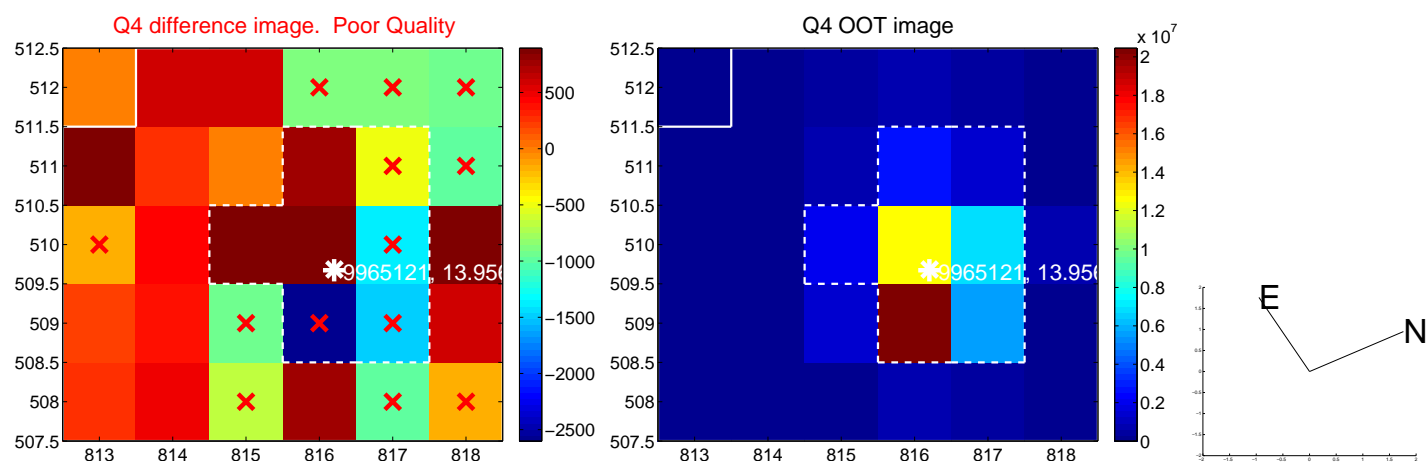
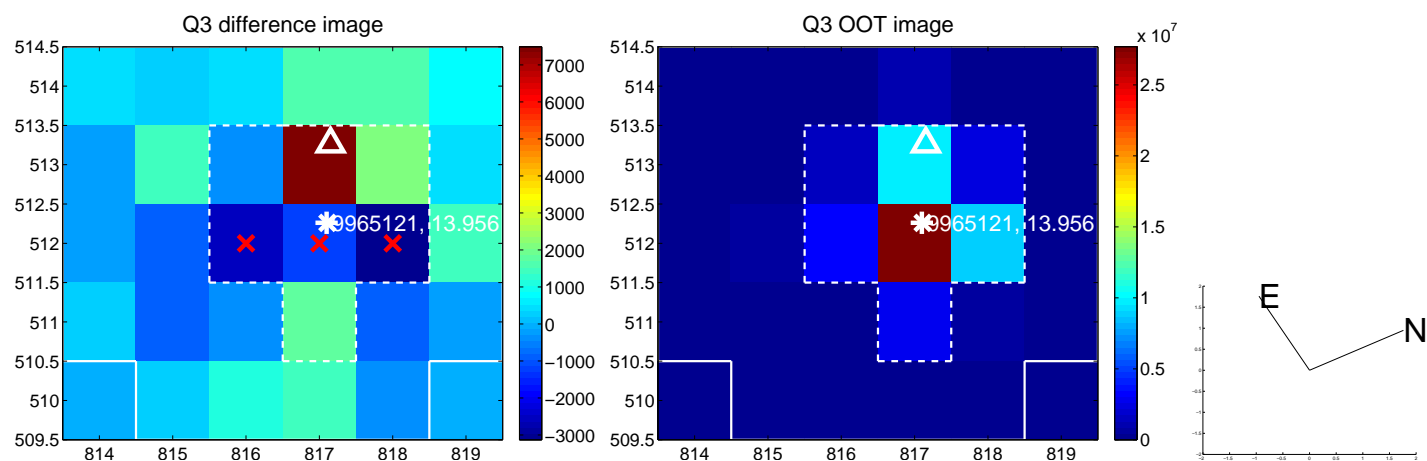
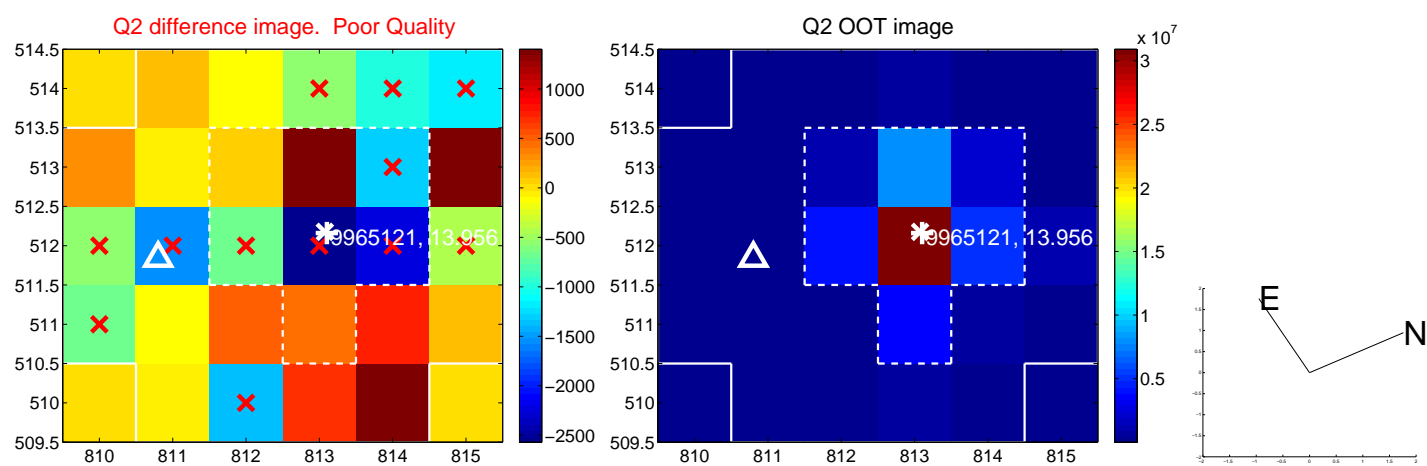
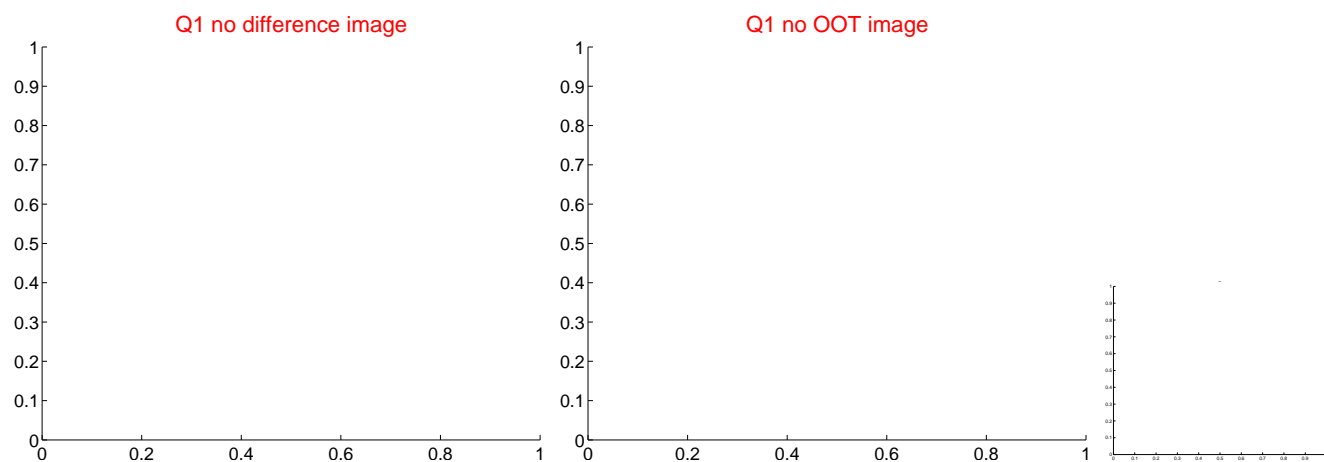
The direct PRF centroid is offset from the target star catalog position by about 0.20 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$3.302 \pm 0.708$	4.66	$3.145 \pm 0.492$	$1.005 \pm 1.744$
PRF-fit source offset from KIC position	$3.274 \pm 0.946$	3.46	$3.133 \pm 0.450$	$0.950 \pm 2.521$
photometric centroid source offset	$1.09 \pm 0.89$	1.22	$-0.89 \pm 0.86$	$0.63 \pm 0.95$

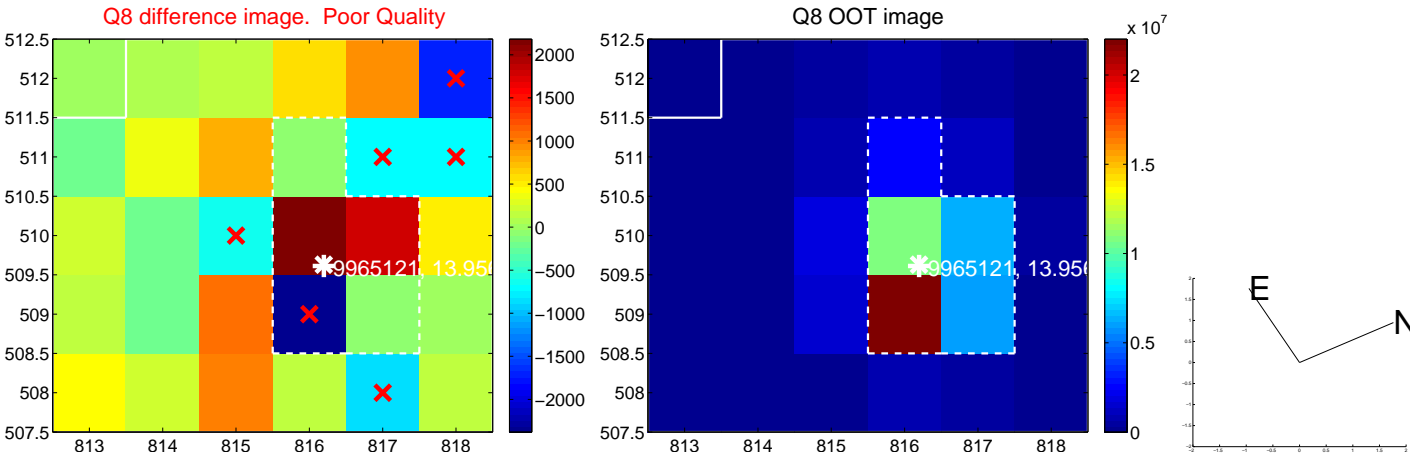
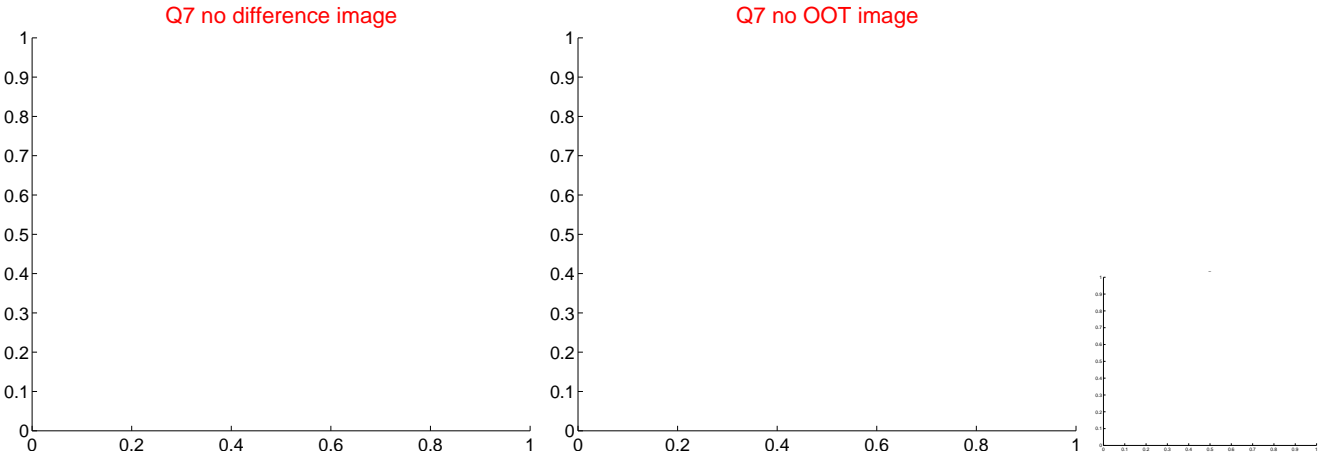
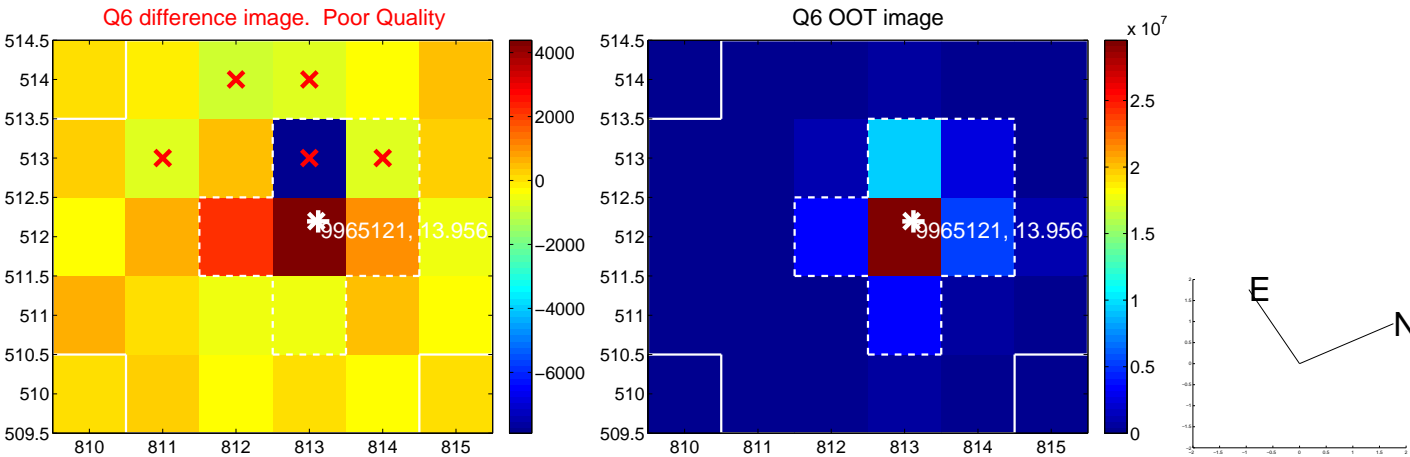
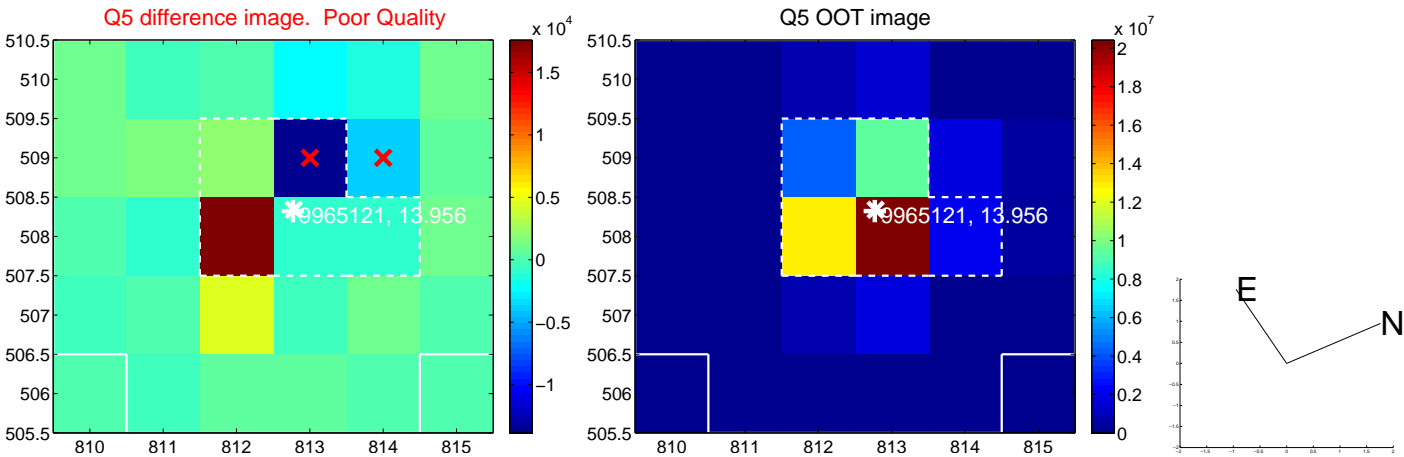


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

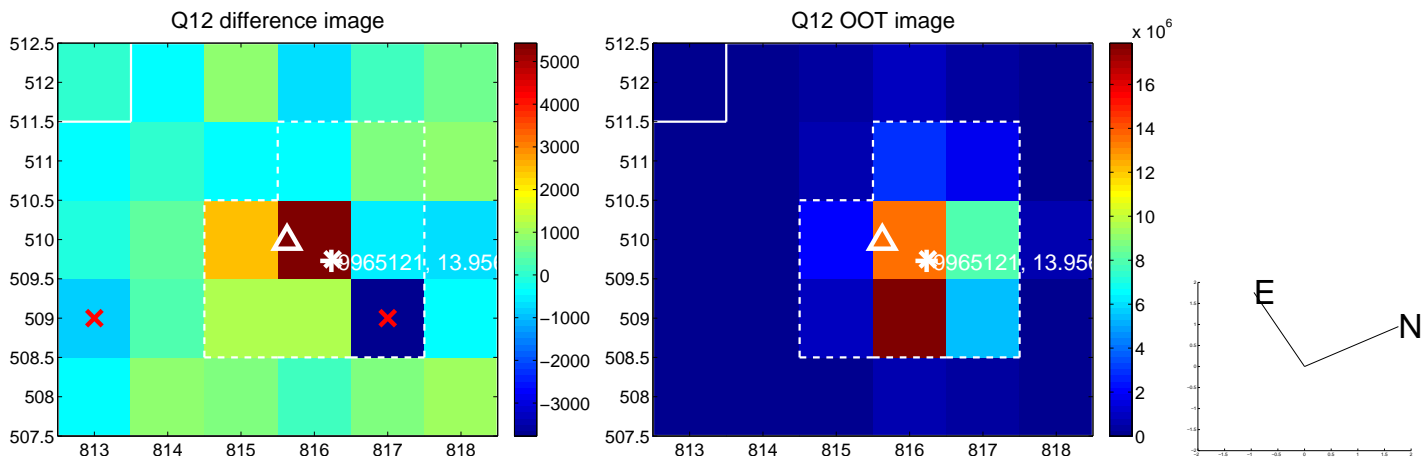
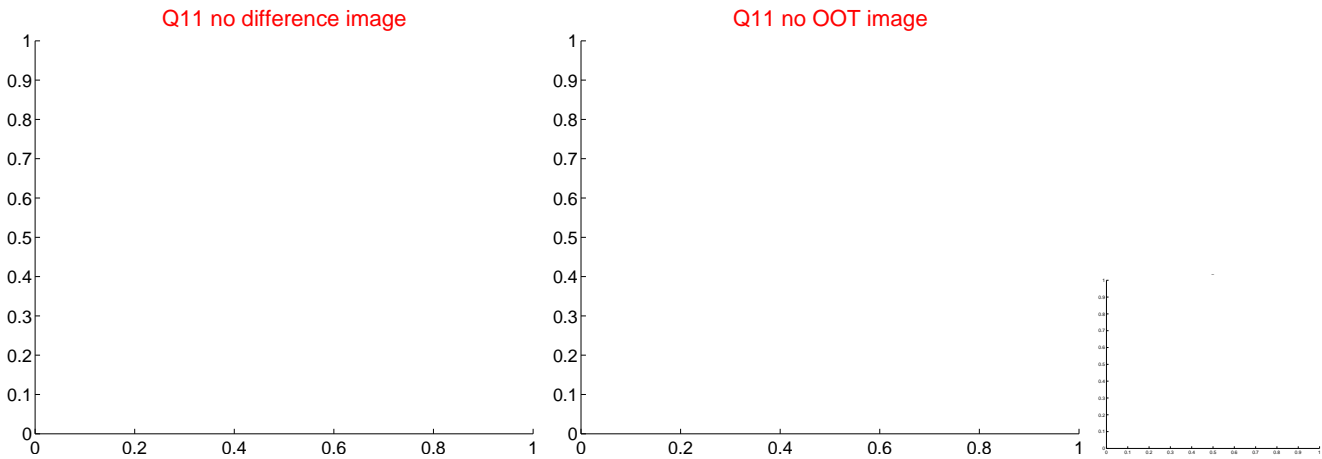
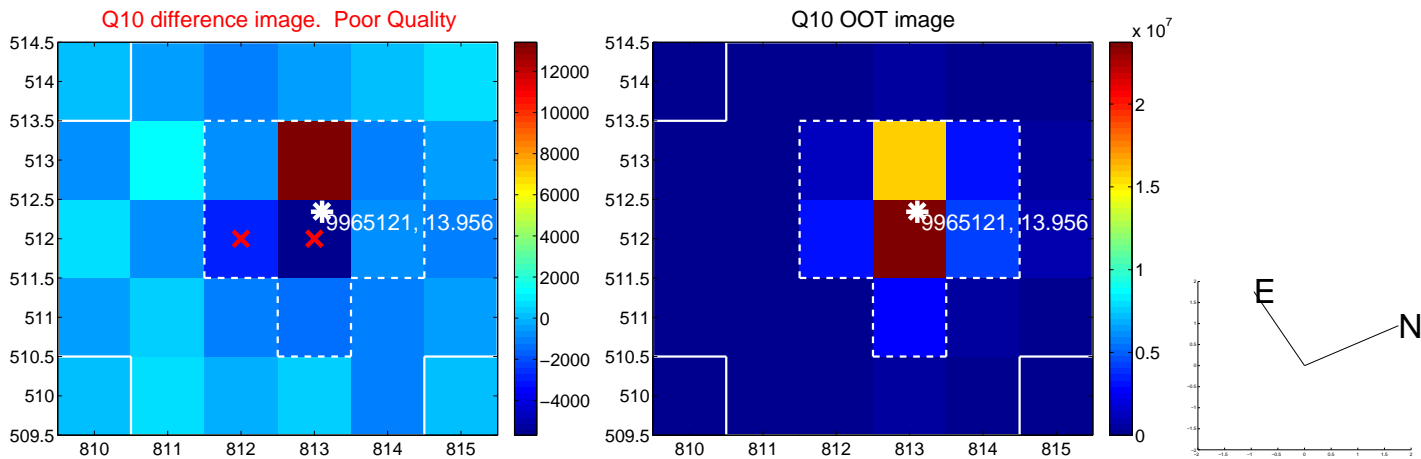
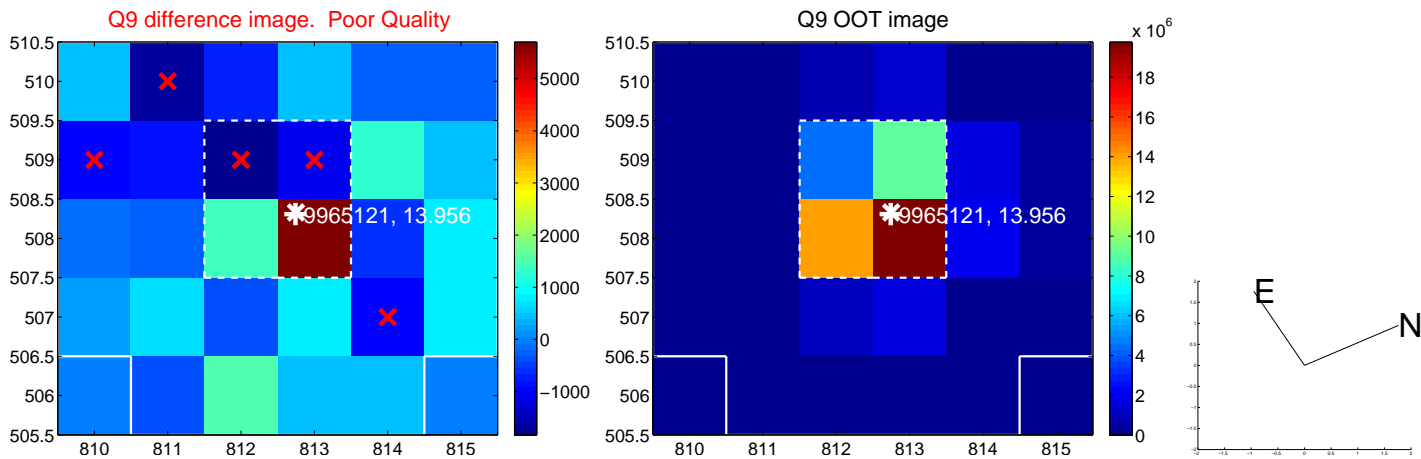
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



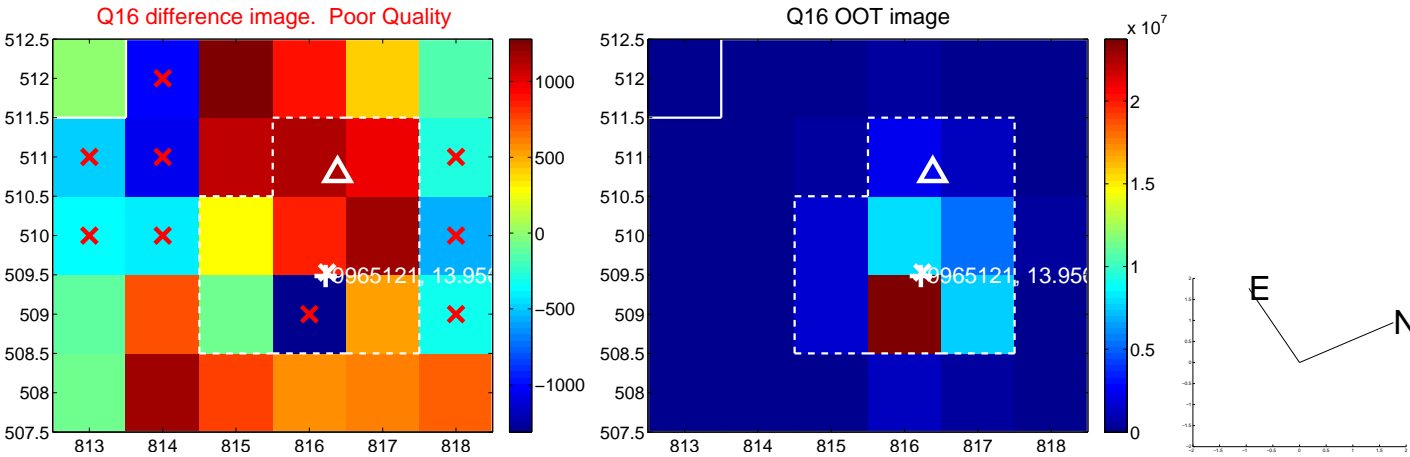
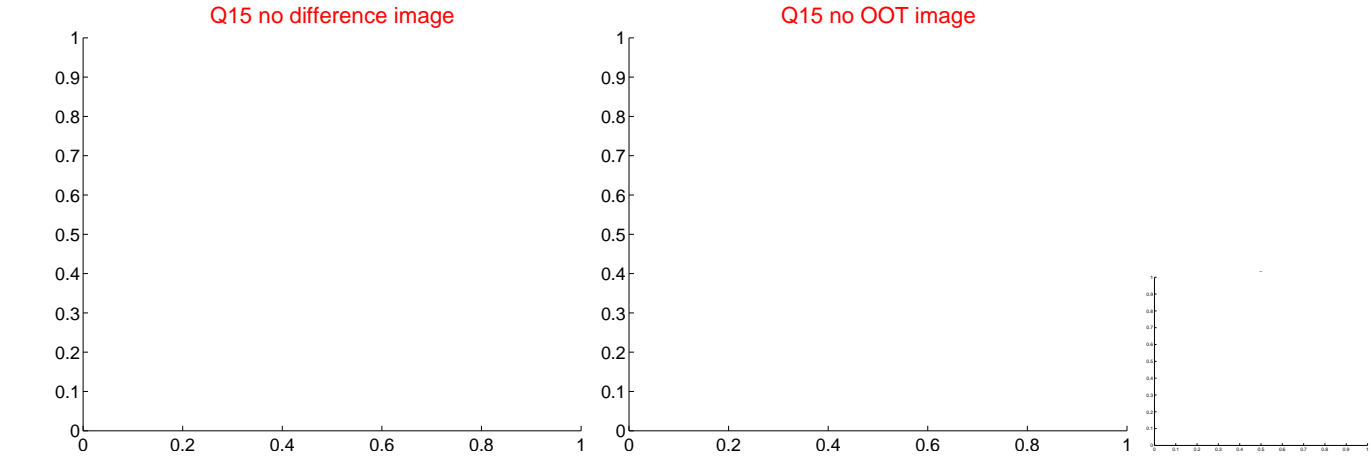
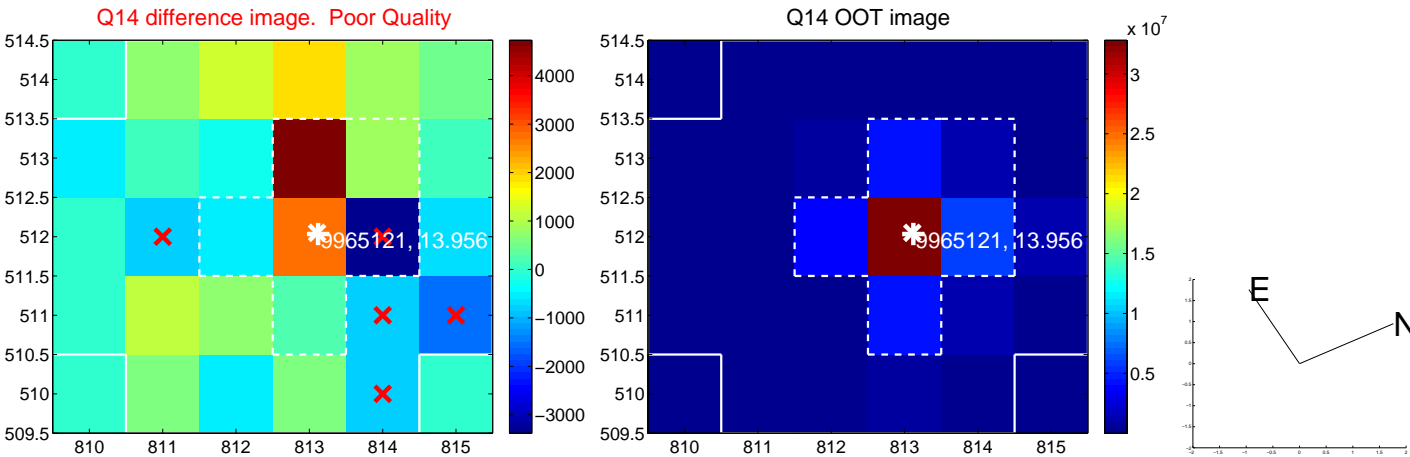
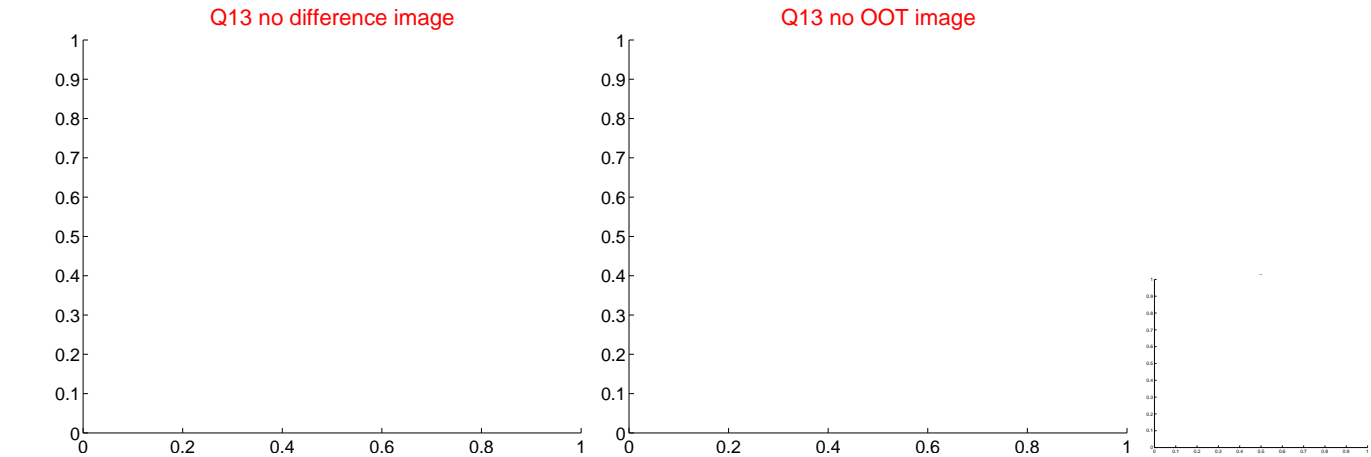
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



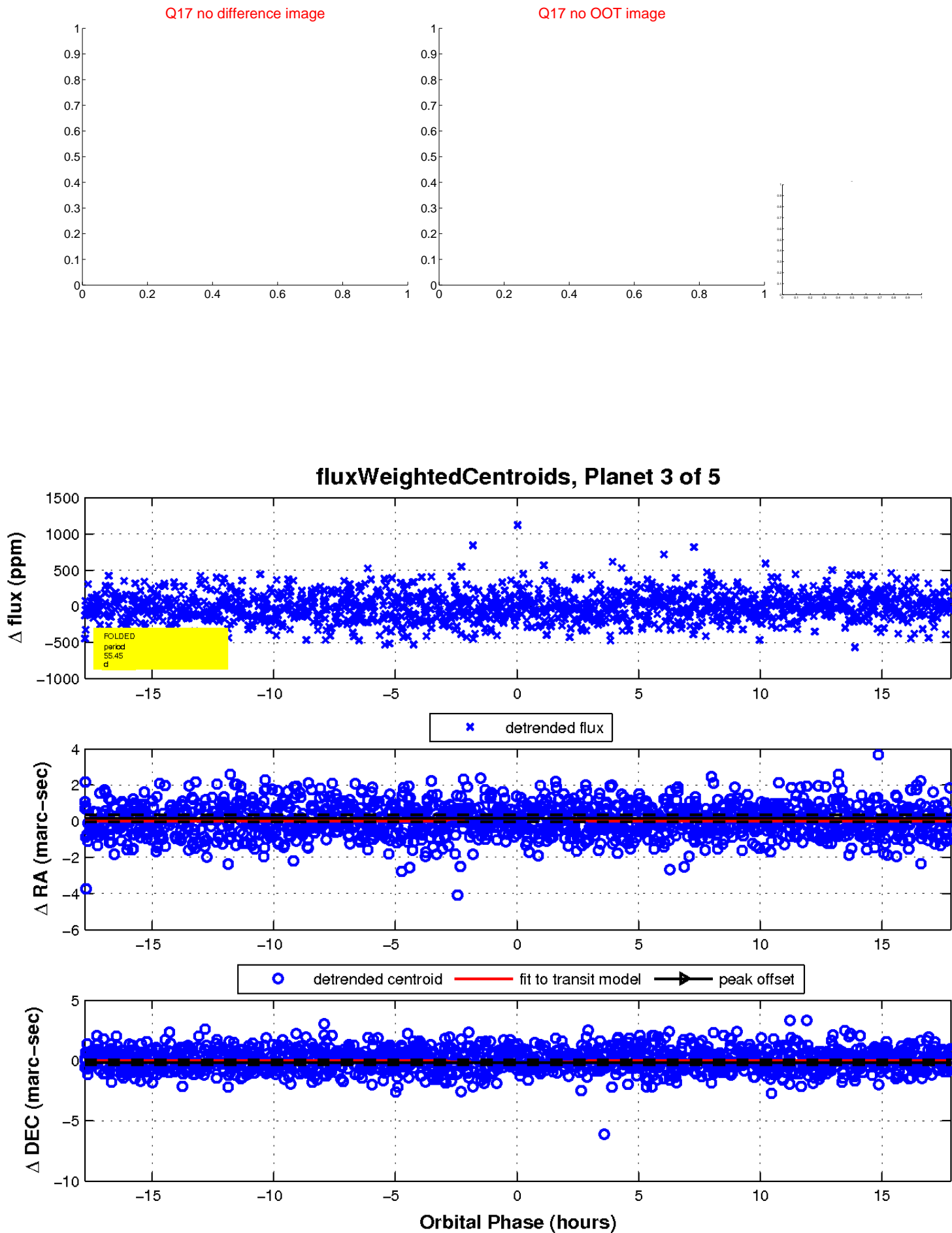
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



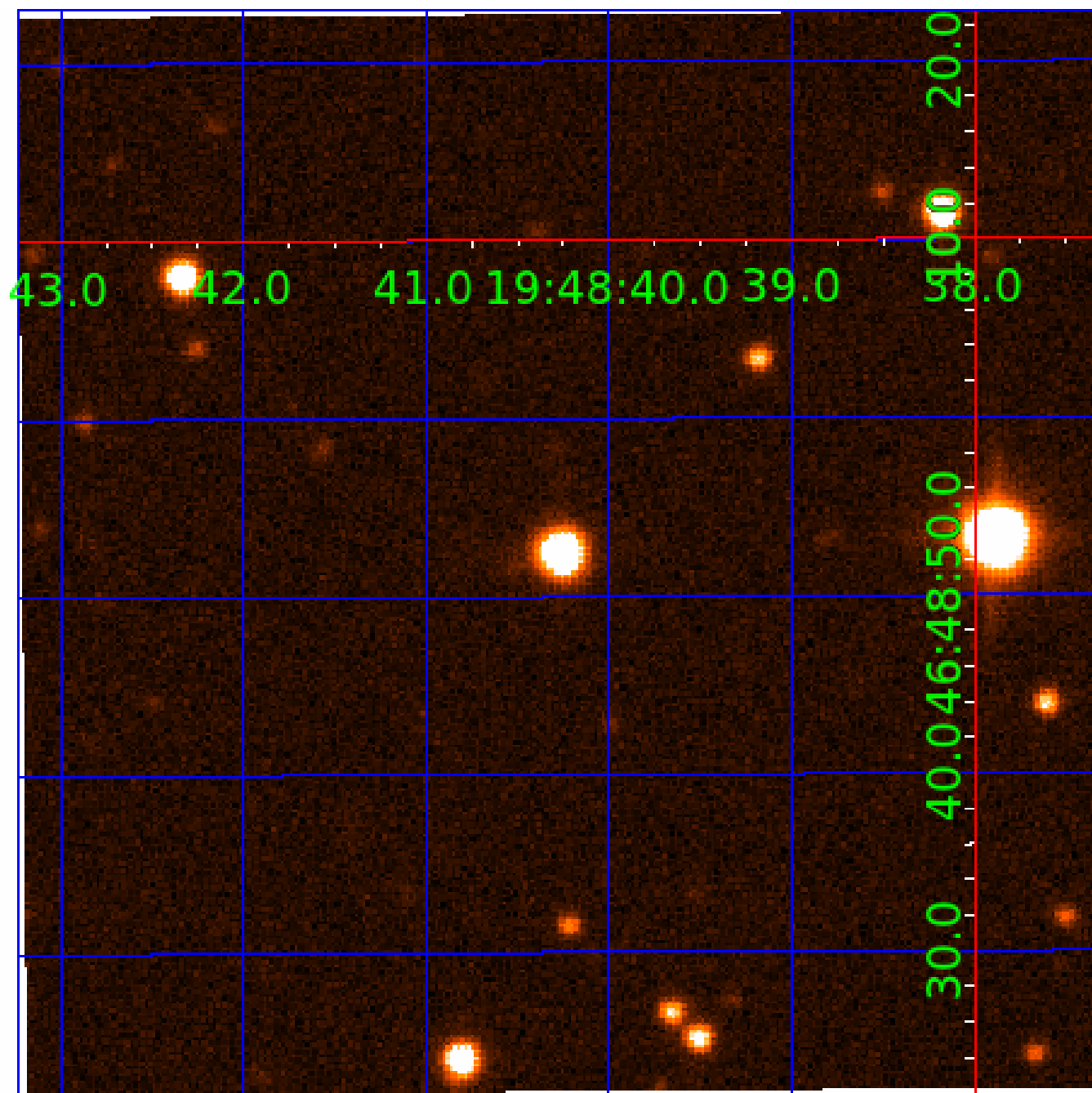
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





UKIRT Image

Declination



# KIC 009965121

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009965121-01	OBS	No	2.344483	132.895552	23.6	14.975	7.4	7.9	1.58	7071	0.98	3656.03
009965121-02	OBS	No	46.383850	158.097080	176.7	9.784	10.3	8.1	1.58	7071	2.29	68.33
009965121-03	OBS	No	55.446483	167.223038	218.3	5.949	8.3	6.9	1.58	7071	2.54	53.86
009965121-04	OBS	No	89.185717	192.230345	281.1	3.003	8.0	7.8	1.58	7071	2.92	28.58
009965121-05	OBS	No	68.625577	198.282423	365.8	2.469	7.9	8.6	1.58	7071	4.20	40.53

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009965121-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—CENT_UNCERTAIN
009965121-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_FEW_DIFFS
009965121-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_FEW_DIFFS
009965121-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS
009965121-05	OBS	FP	0.00	1	0	0	0	TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT—CENT_FEW_DIFFS

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

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

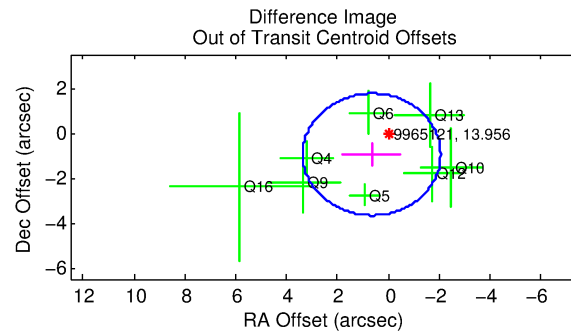
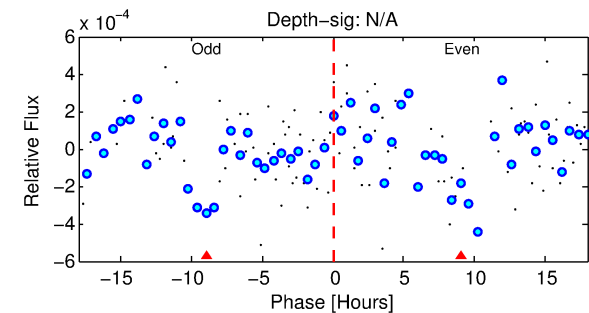
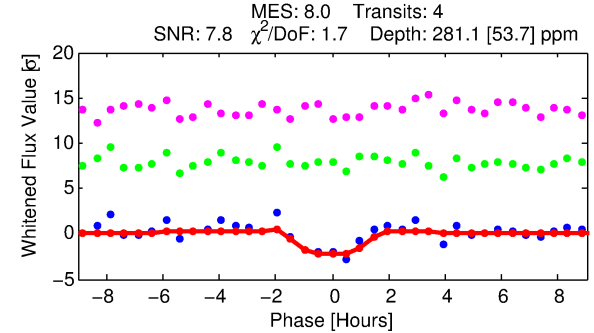
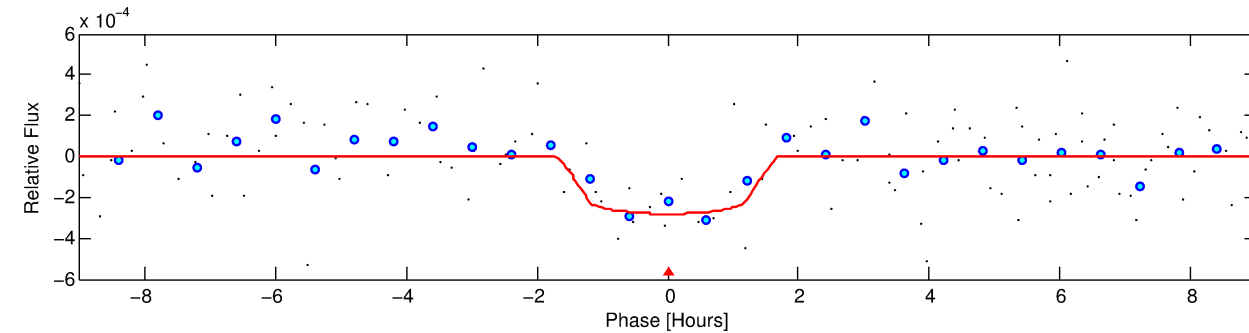
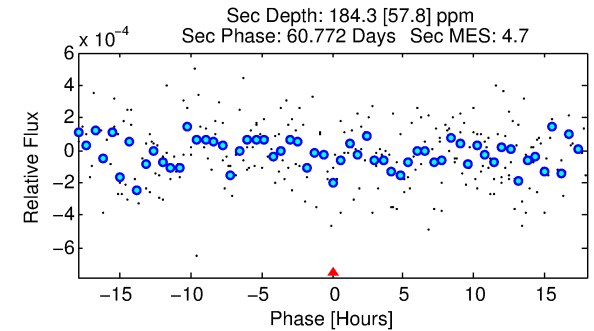
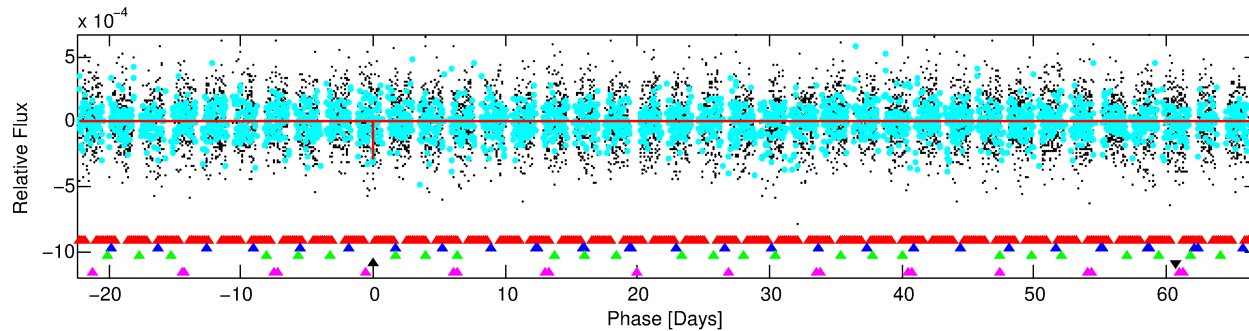
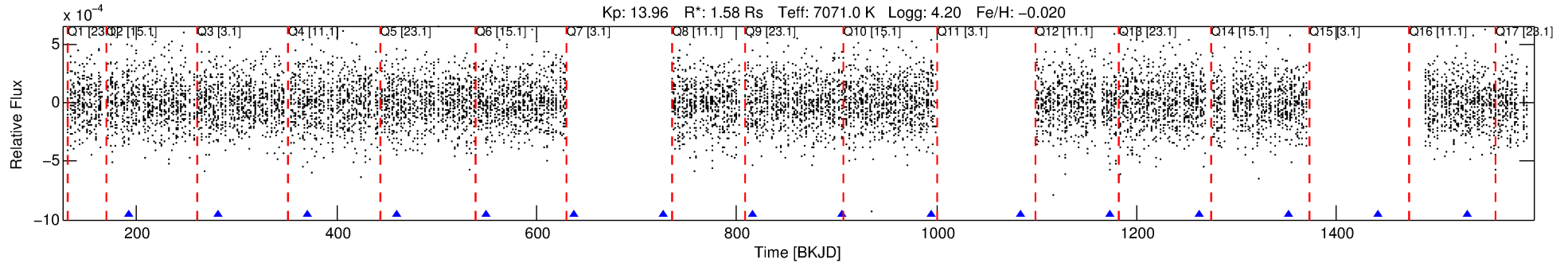
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009965121-04

No Significant Match Found

# DV One-Page Summary

KIC: 9965121 Candidate: 4 of 5 Period: 89.186 d



## DV Fit Results:

Period = 89.18572 [0.00492] d  
Epoch = 192.2303 [0.0208] BKJD  
Rp/R\* = 0.0169 [0.0236]  
a/R\* = 143.46 [1221.59]  
b = 0.80 [3.92]  
Seff = 28.58 [11.83]  
Teff = 590 [61] K  
Rp = 2.92 [4.19] Re  
a = 0.4421 [0.1198] AU  
Ag = 2328.33 [6599.80] [0.35σ]  
Teffp = 6332 [4456] K [1.29σ]

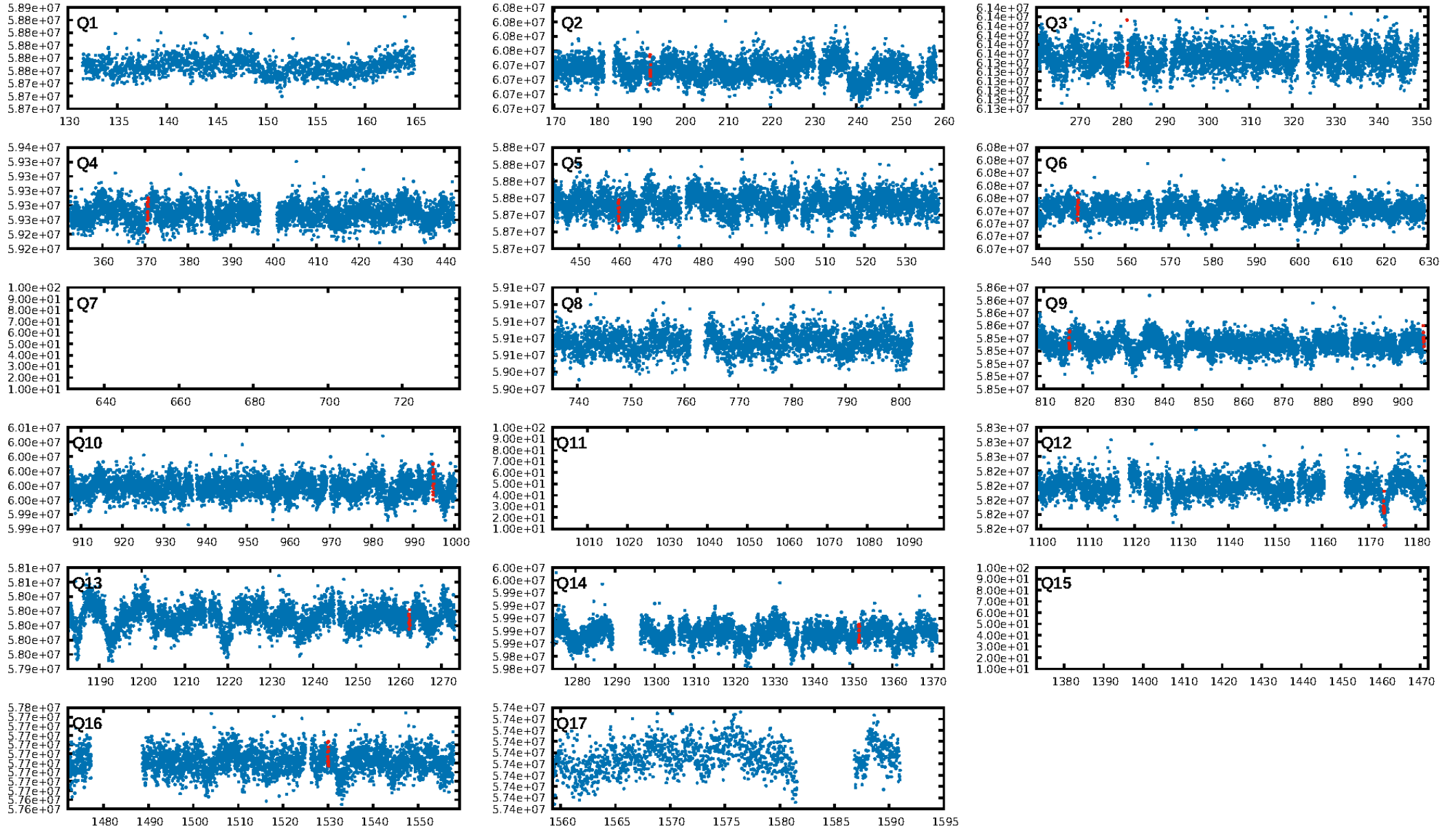
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [126.91σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 1.9%  
ModelChiSquareGof-sig: 99.4%  
**Bootstrap-pfa: 9.35e-08**  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: 1.864  
Centroid-sig: 36.6%  
Centroid-so: 0.918 arcsec [0.74σ]  
OotOffset-rm: 1.157 arcsec [1.28σ]  
OotOffset-st: 2/0/3/3 [8]  
KicOffset-rm: 1.181 arcsec [1.58σ]  
KicOffset-st: 2/0/3/3 [8]  
DiffImageQuality-fgm: 0.38 [3/8]  
DiffImageOverlap-fno: 0.60 [6/10]

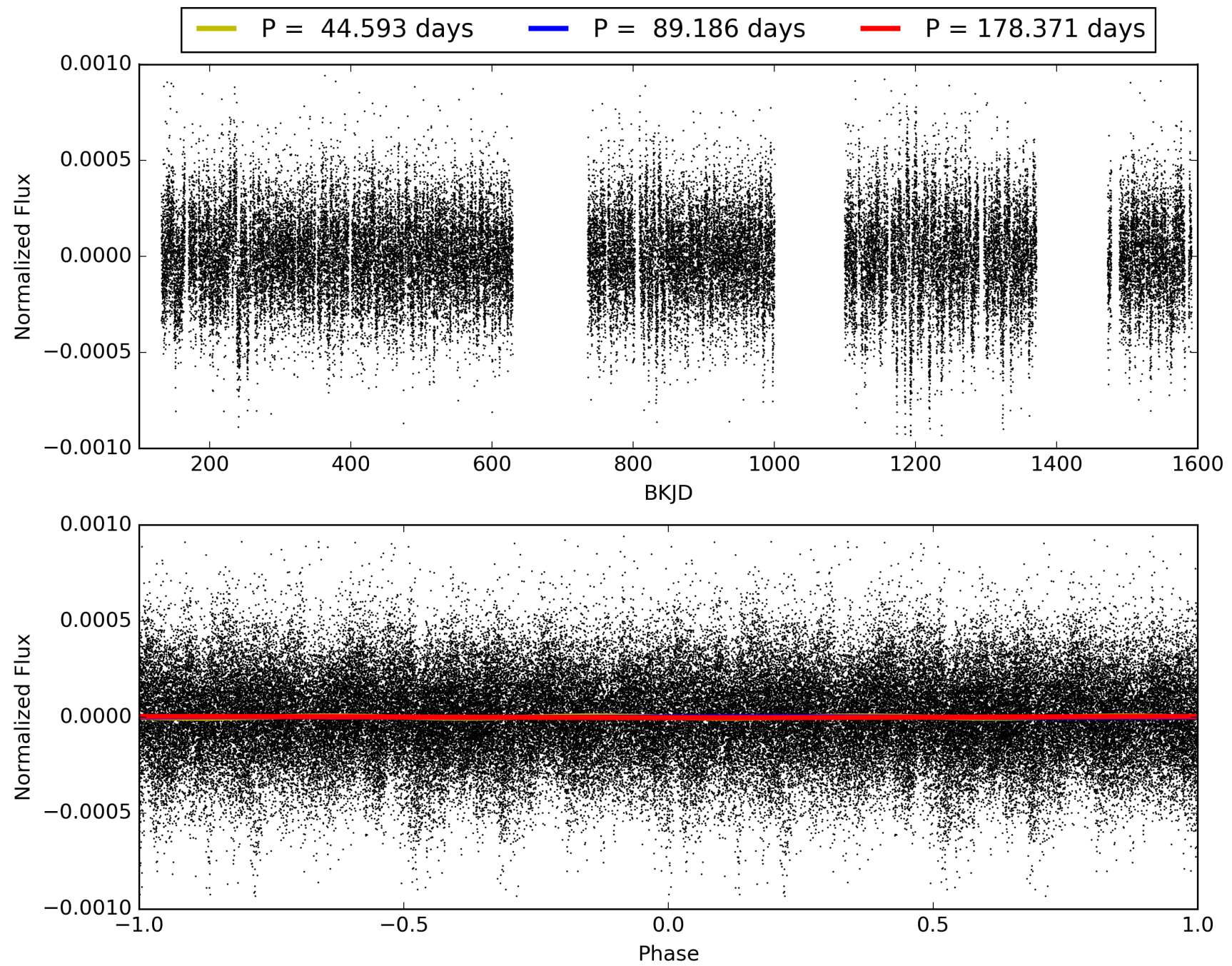
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 03:19:37 Z

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

# TCE 009965121-04, PDC Light Curves

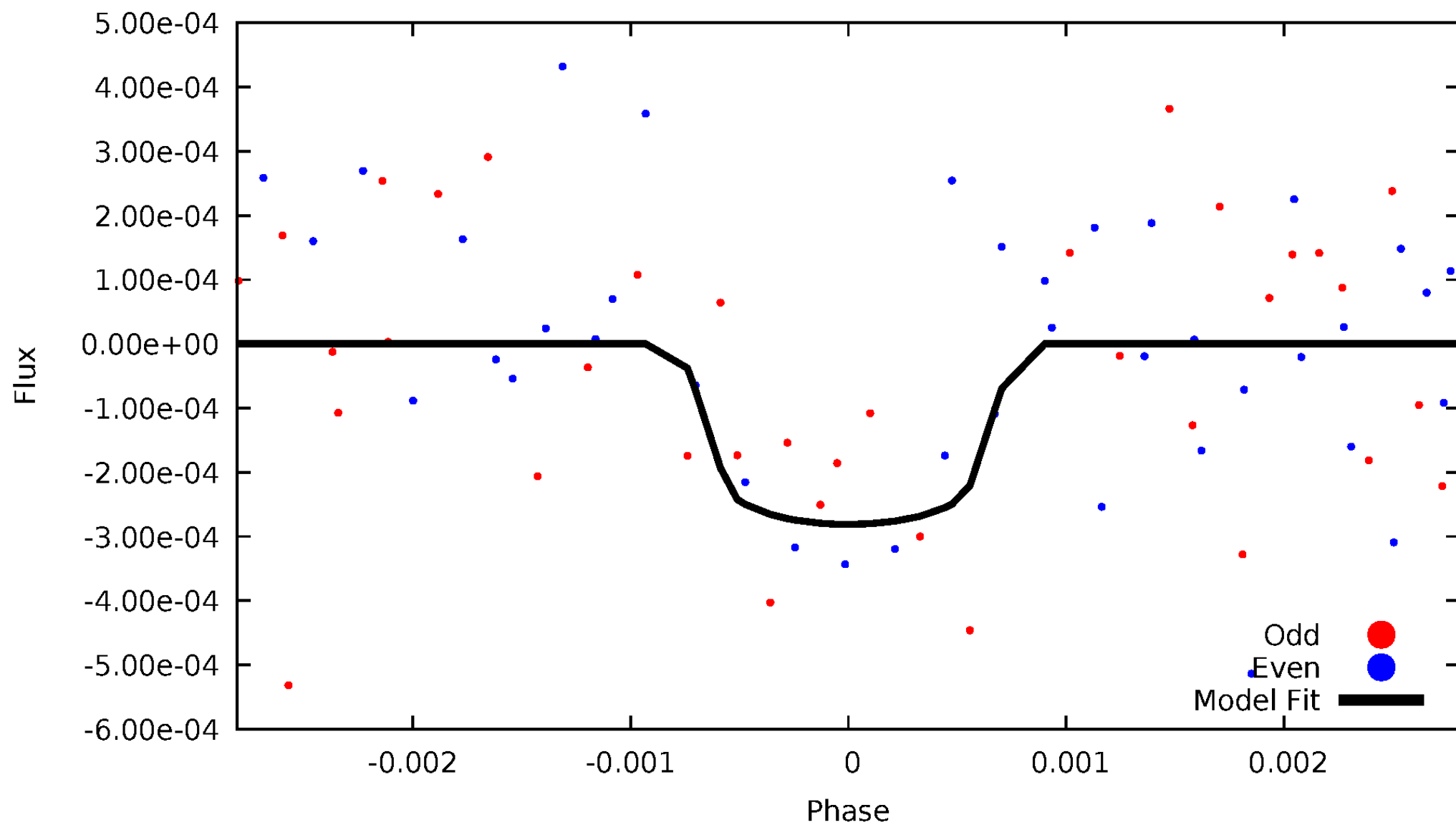


TCE 009965121-04



# DV Odd/Even

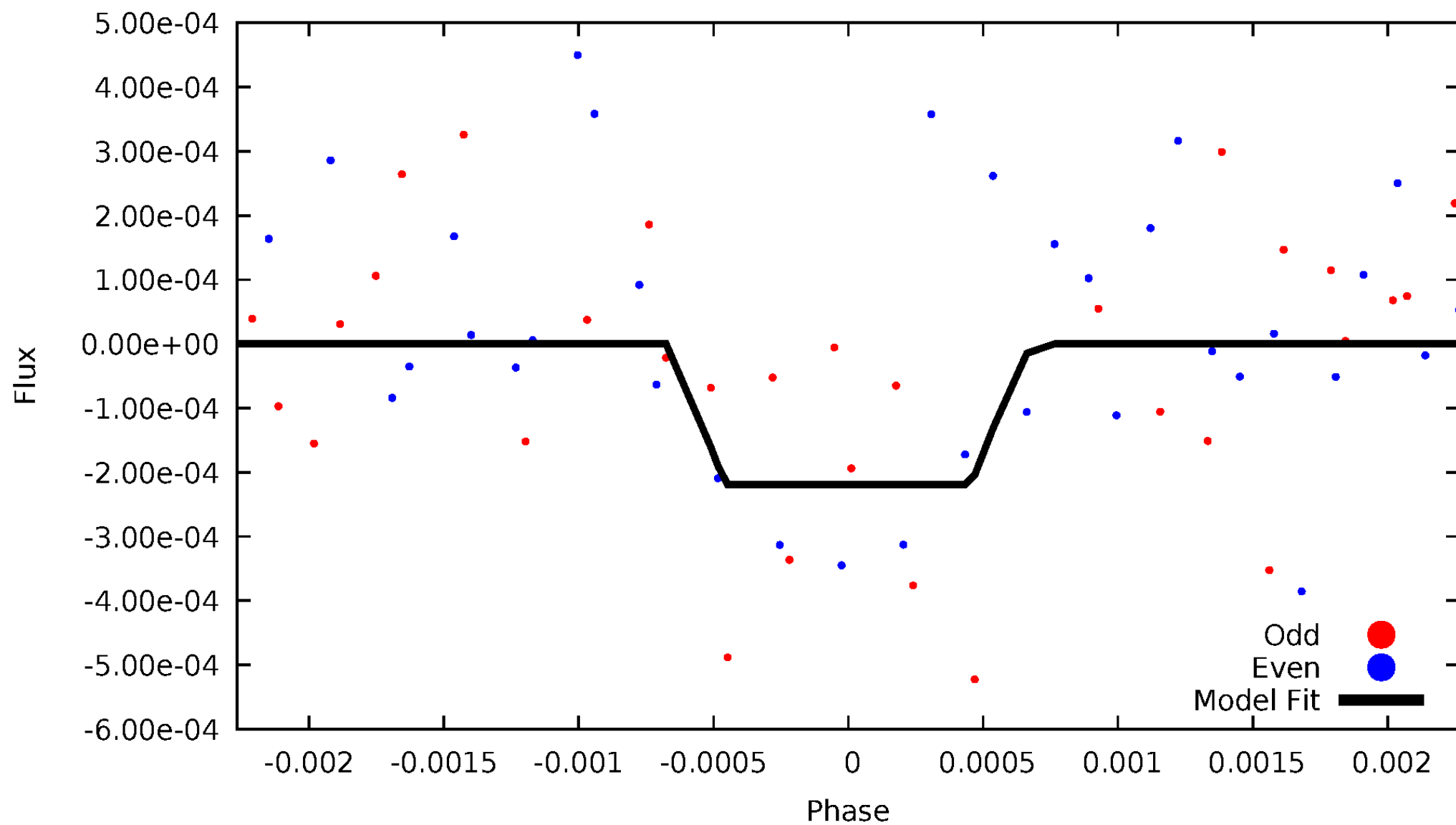
TCE 009965121-04





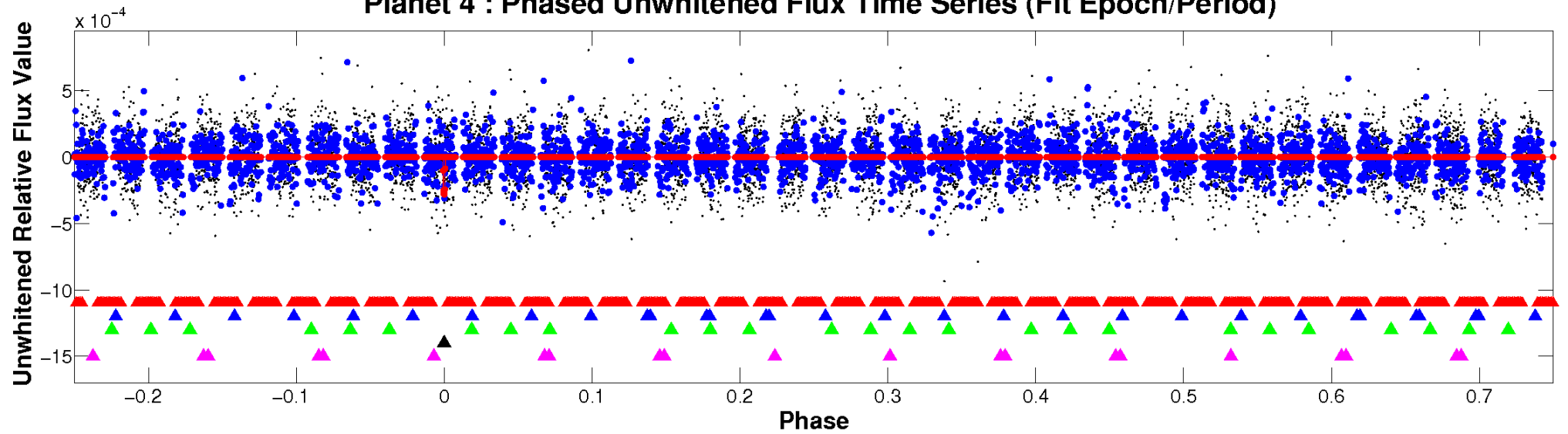
# ALT Odd/Even

TCE 009965121-04

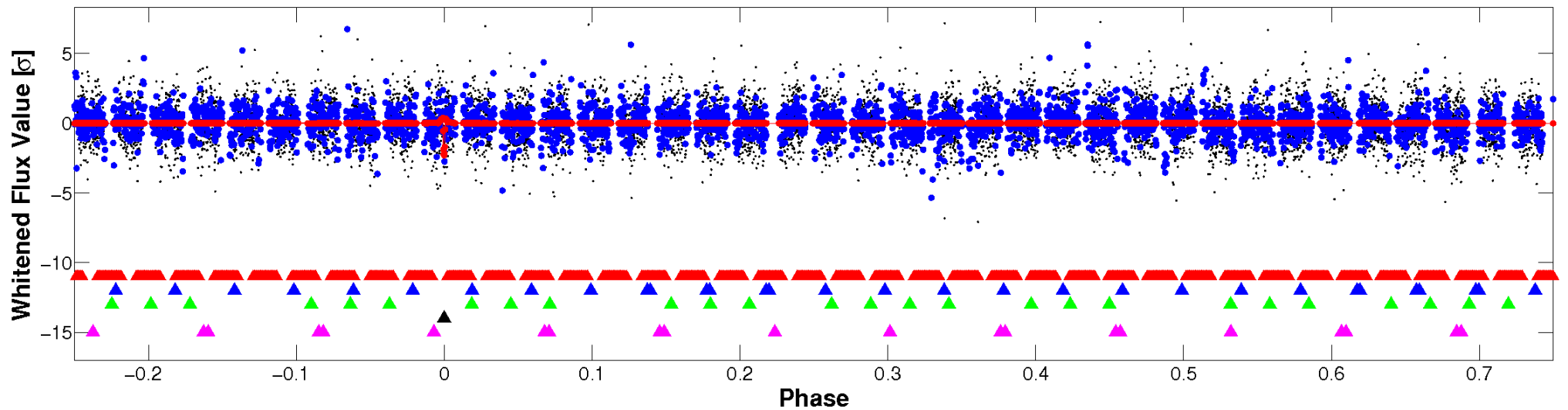


## Non-Whitened Vs. Whitened Light Curve

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

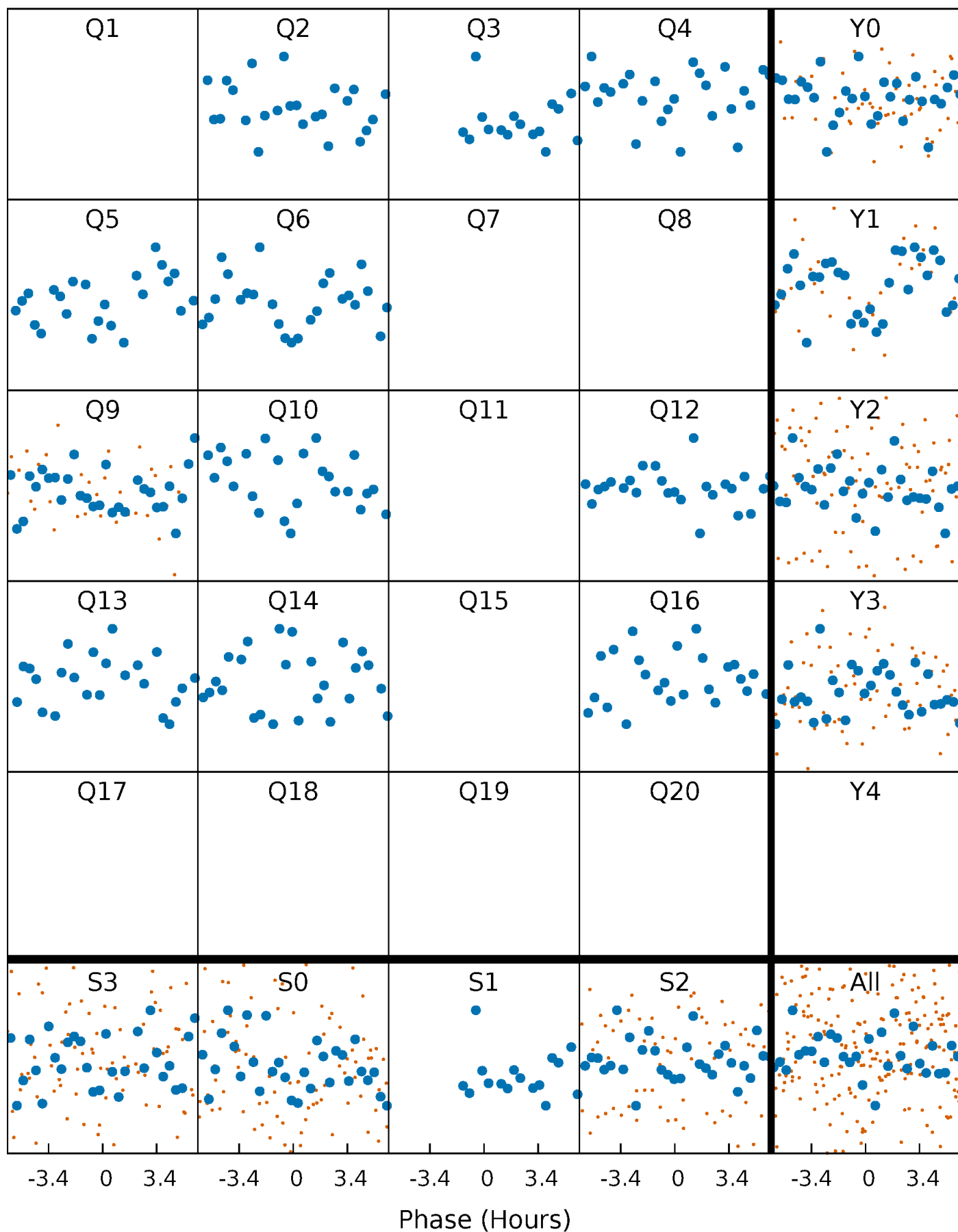


### Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



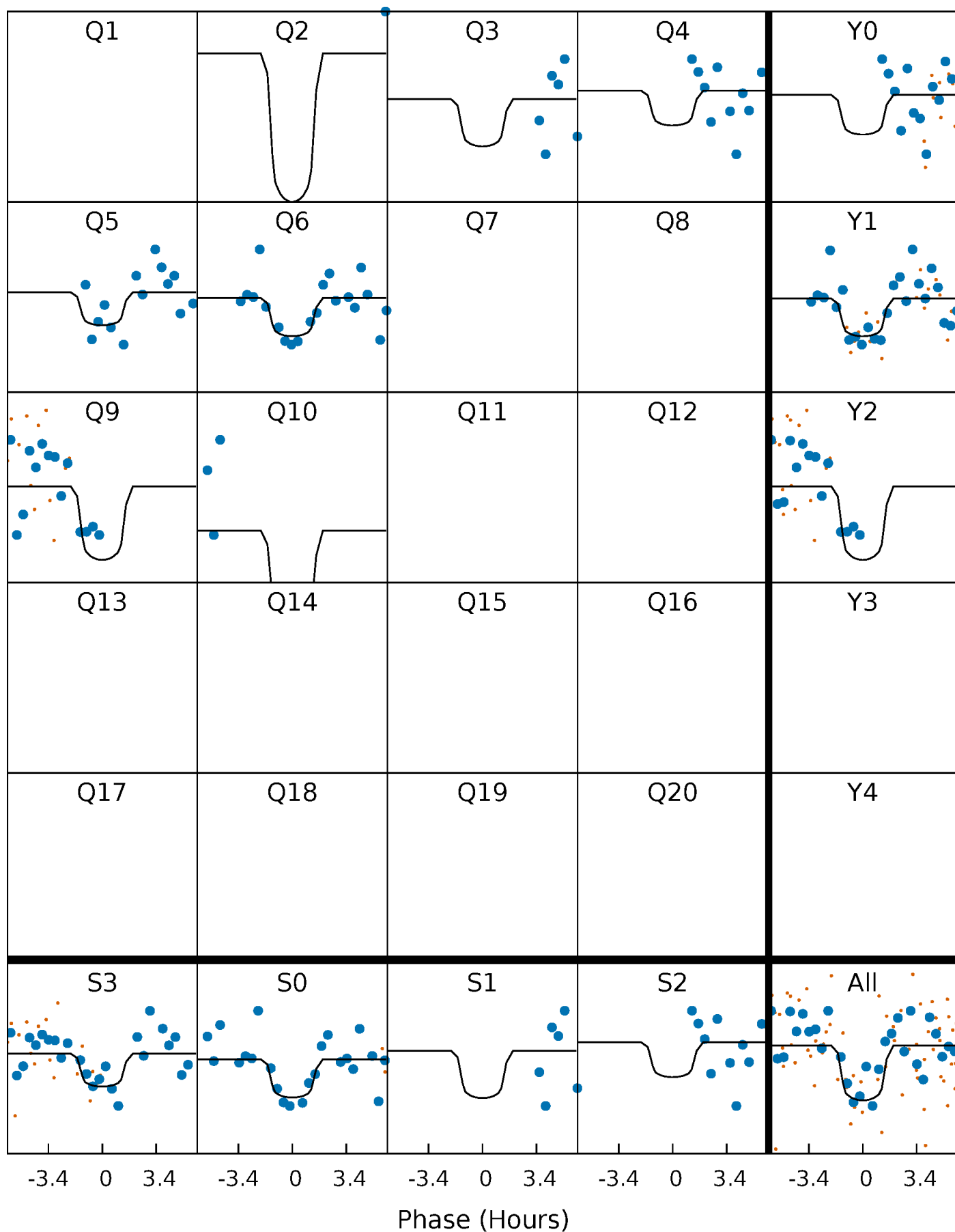
# PDC Quarter-Phased Transit Curves

TCE 009965121-04 P= 89.185717 Days  $T_0=192.230345$  (BKJD)



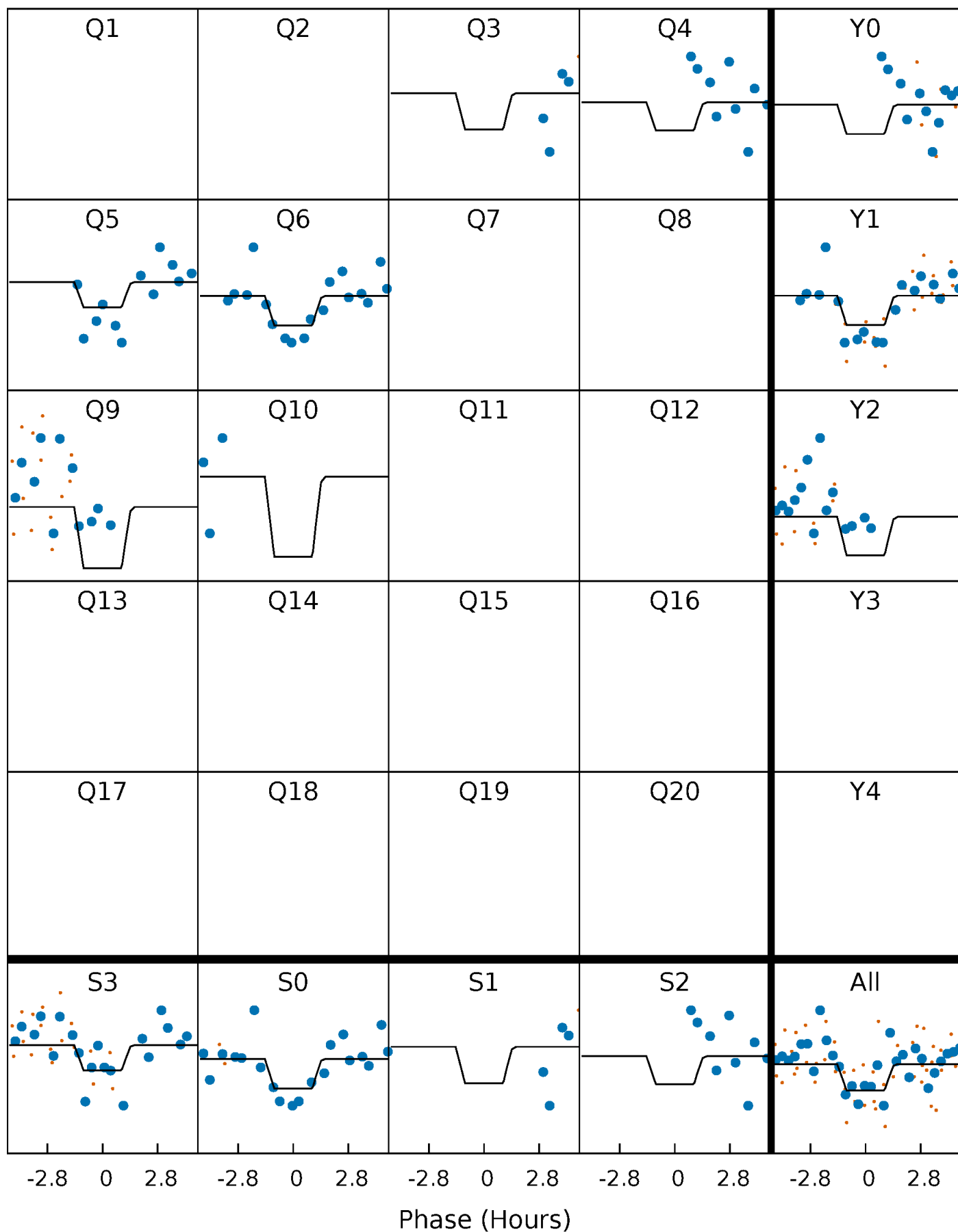
# DV Quarter-Phased Transit Curves

TCE 009965121-04 P= 89.185717 Days  $T_0=192.230345$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

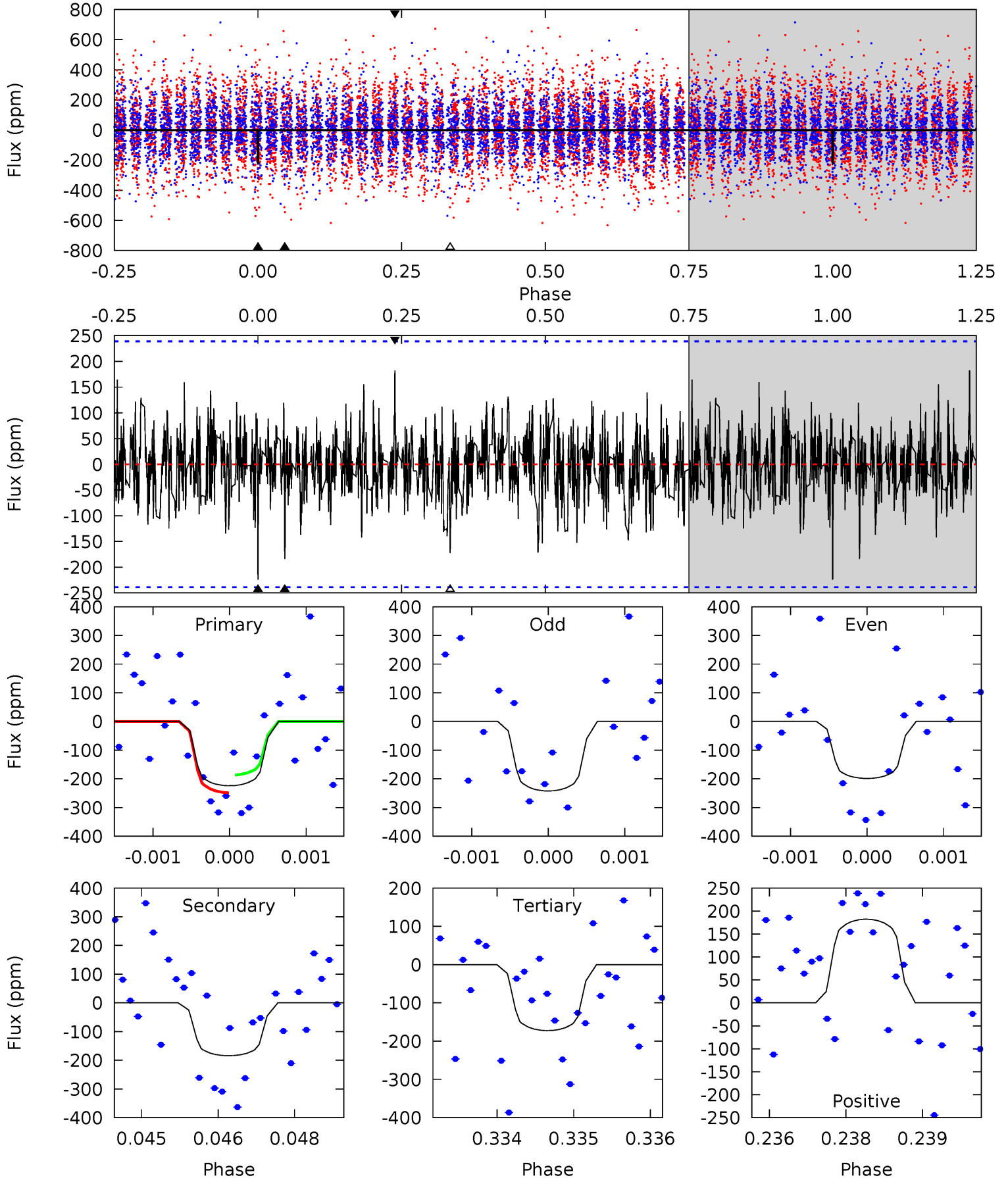
TCE 009965121-04 P= 89.178628 Days  $T_0=192.259596$  (BKJD)



# DV Model-Shift Uniqueness Test

009965121-04, P = 89.185717 Days, E = 103.044628 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
5.06	4.16	3.89	4.12	5.39	3.19	1.11	1.16	0.94	0.26	0.04	0.49	0.48	0.45	0.69

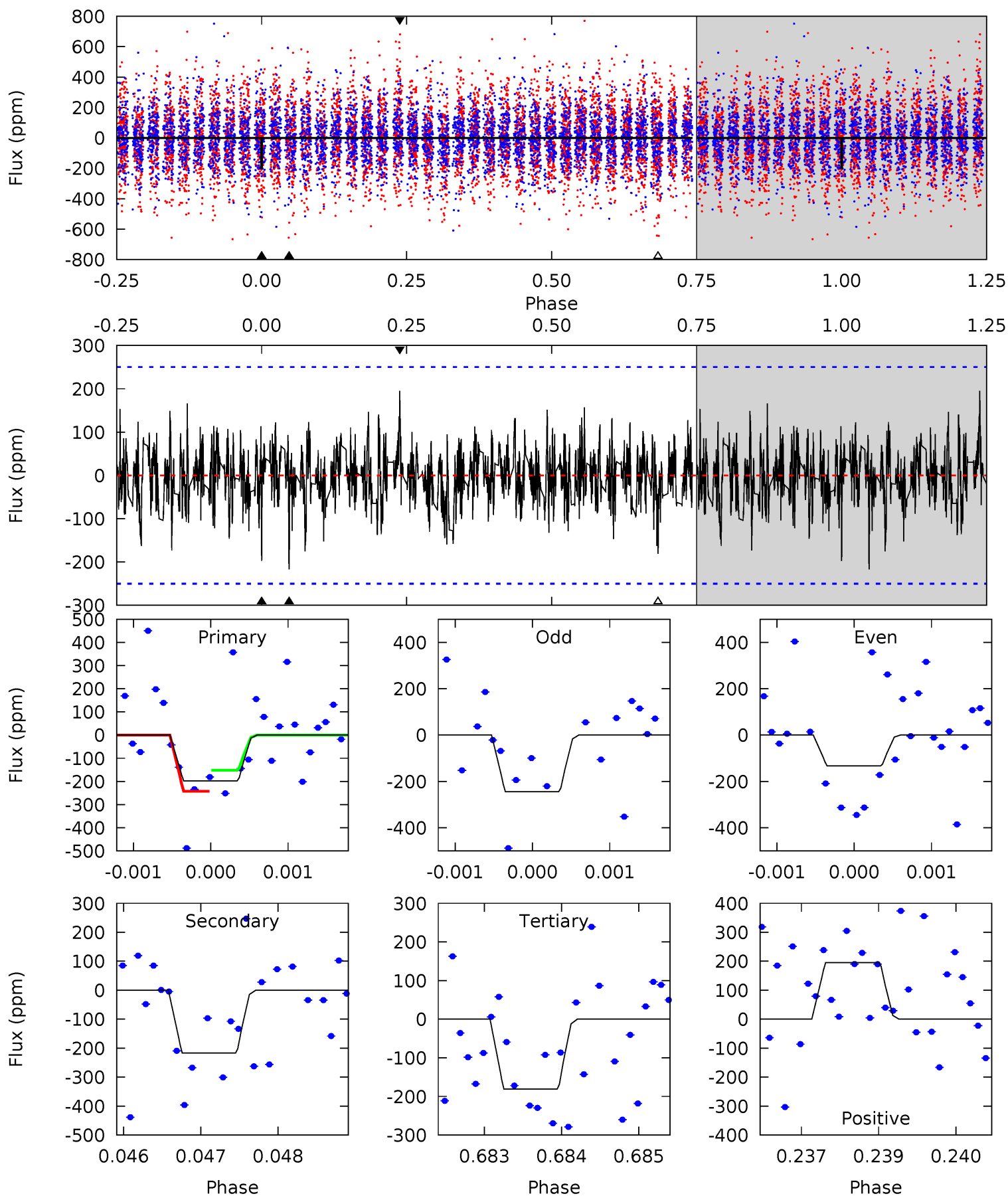




# Alt Model-Shift Uniqueness Test

009965121-04, P = 89.178628 Days, E = 103.080968 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
4.27	4.68	3.90	4.22	5.41	3.22	1.15	0.37	0.05	0.78	0.46	1.24	0.51	0.47	0.98



### Stellar Parameters For KIC 009965121

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$7071^{+197}_{-310}$	$4.202^{+0.105}_{-0.195}$	$-0.020^{+0.250}_{-0.350}$	$1.579^{+0.535}_{-0.288}$	$1.451^{+0.220}_{-0.220}$	$0.519^{+0.270}_{-0.281}$
	+3%/-4%	+2%/-5%	+1250%/-1750%	+34%/-18%	+15%/-15%	+52%/-54%
Source	PHO1	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 009965121-04 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-184 \pm 44$	$4.44^{+3.49}_{-2.86}$	$831^{+66}_{-49}$	$5170^{+3814}_{-1073}$	$946^{+6887}_{-648}$
Alt.	$-217 \pm 46$	$4.15^{+3.75}_{-2.80}$	$835^{+67}_{-54}$	$5539^{+5627}_{-1272}$	$1321^{+10725}_{-962}$

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

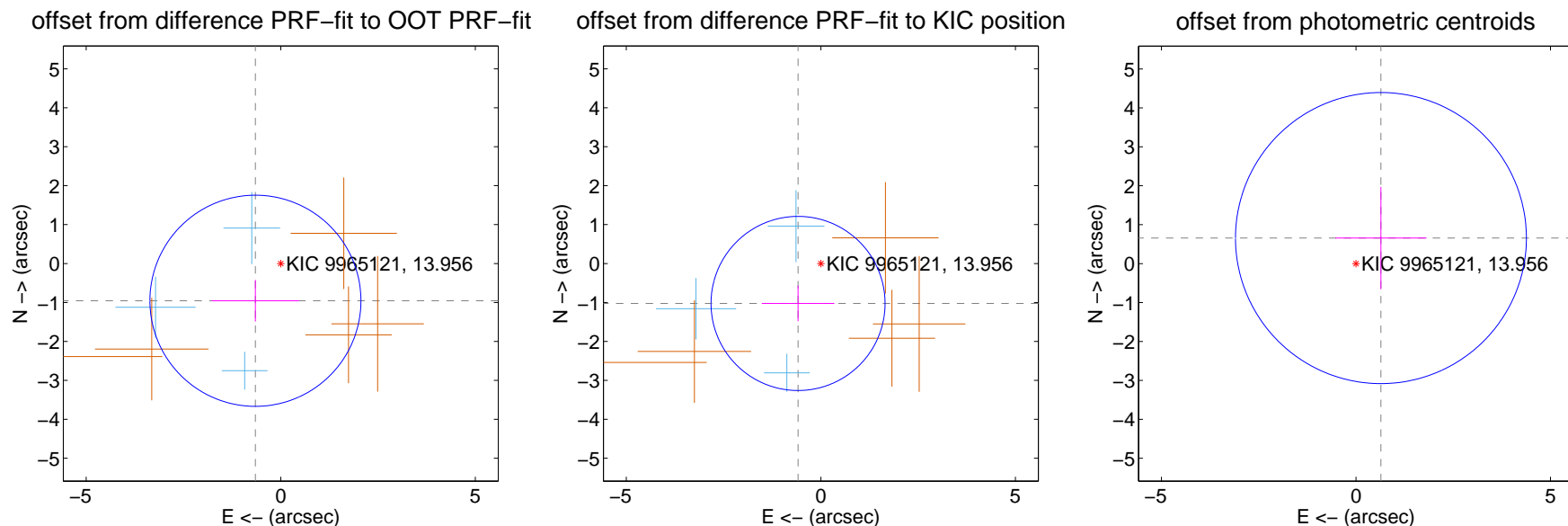
## DV Centroid Data

Supplemental centroid analysis for 009965121-04. Kepler magnitude: 13.96. Transit SNR 7.79

There are 3 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.19 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.157 \pm 0.904$	1.28	$0.651 \pm 1.122$	$-0.957 \pm 0.535$
PRF-fit source offset from KIC position	$1.181 \pm 0.745$	1.58	$0.587 \pm 0.934$	$-1.025 \pm 0.457$
photometric centroid source offset	$0.92 \pm 1.25$	0.74	$-0.64 \pm 1.17$	$0.66 \pm 1.31$



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.

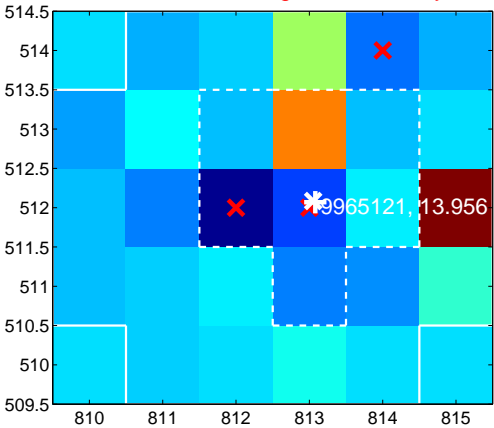
Q1 no difference image



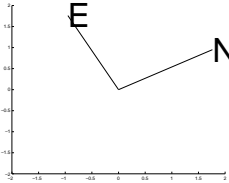
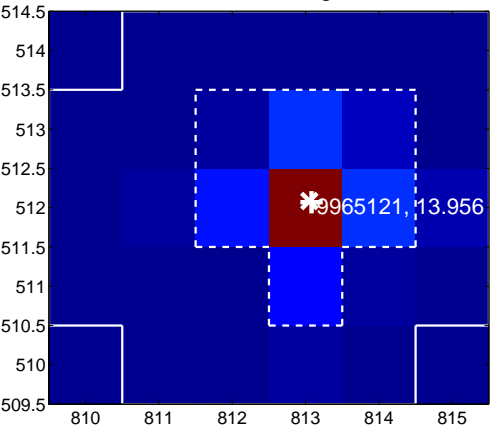
Q1 no OOT image



Q2 difference image. Poor Quality



Q2 OOT image



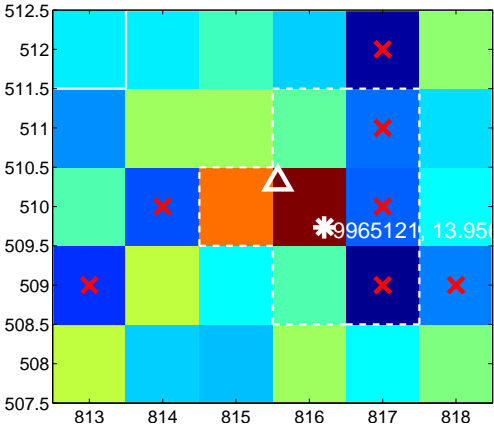
Q3 no difference image



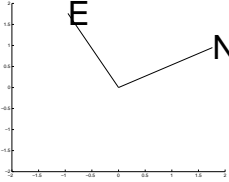
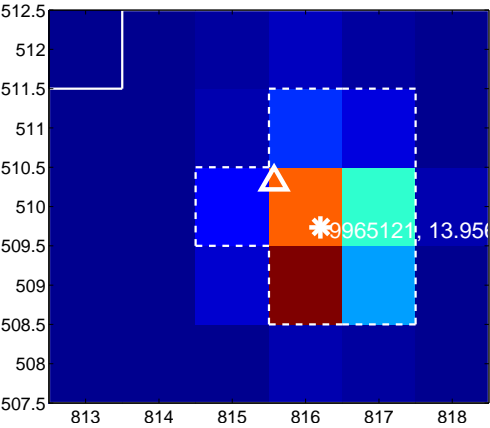
Q3 no OOT image



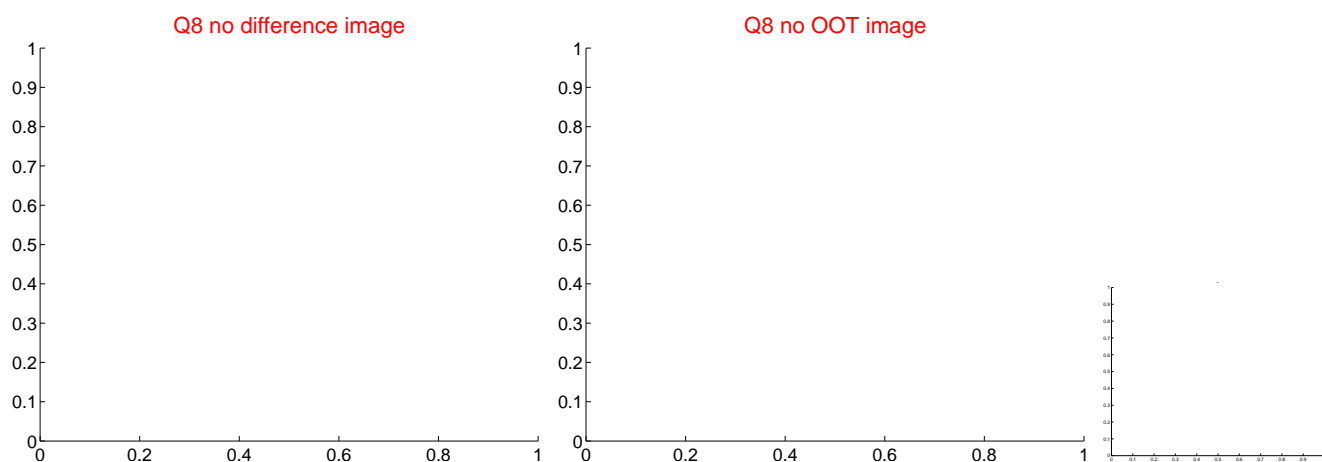
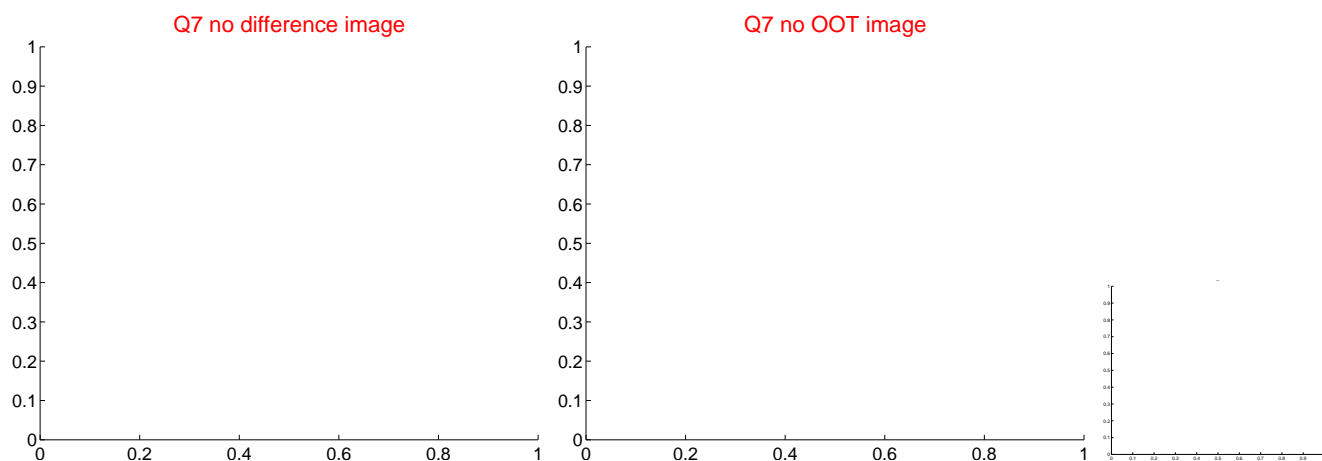
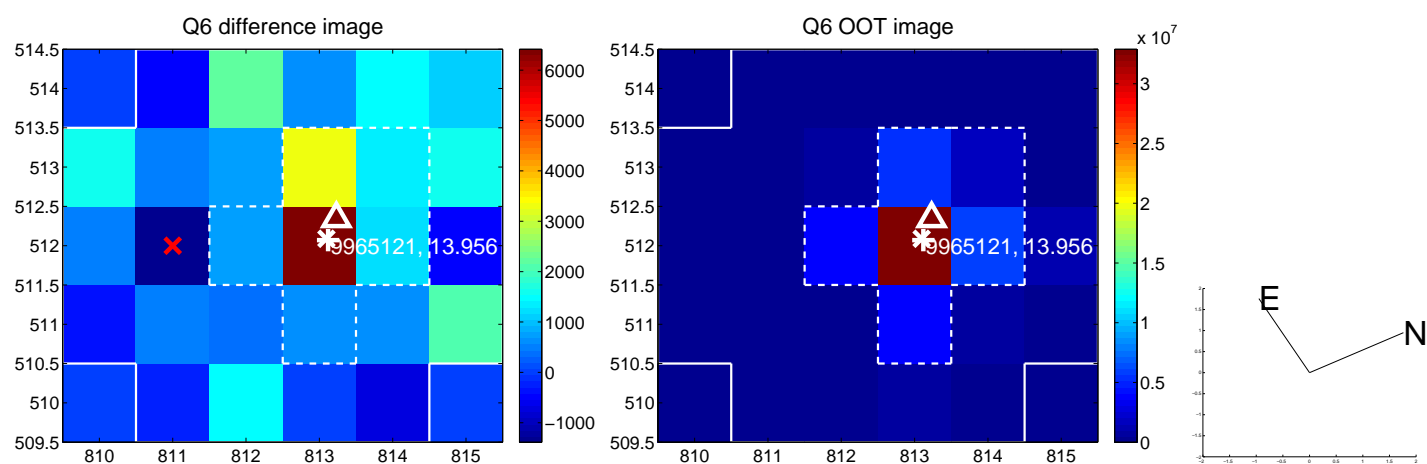
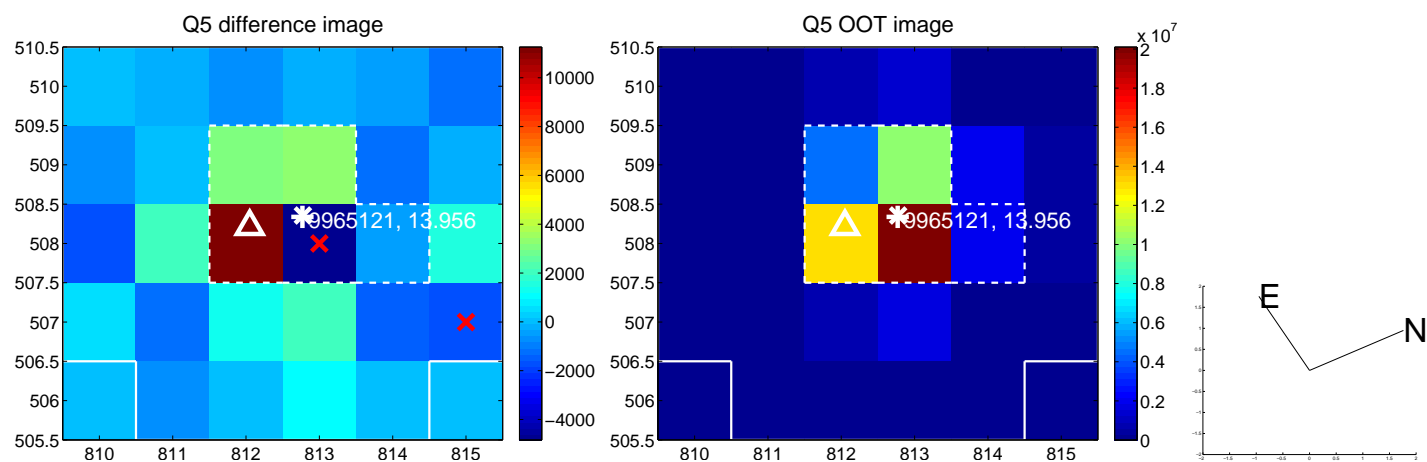
Q4 difference image



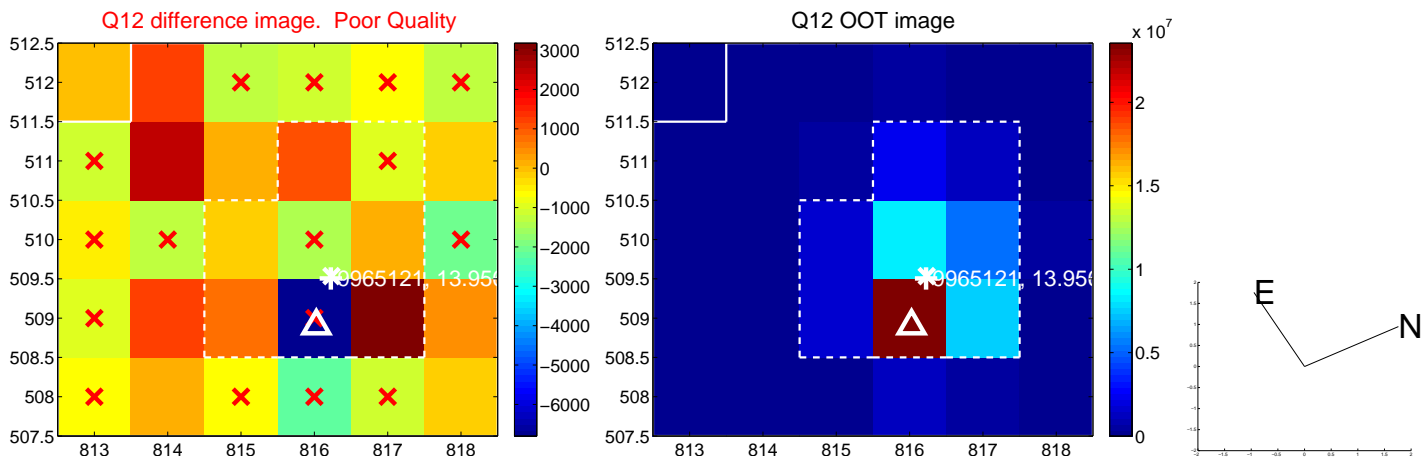
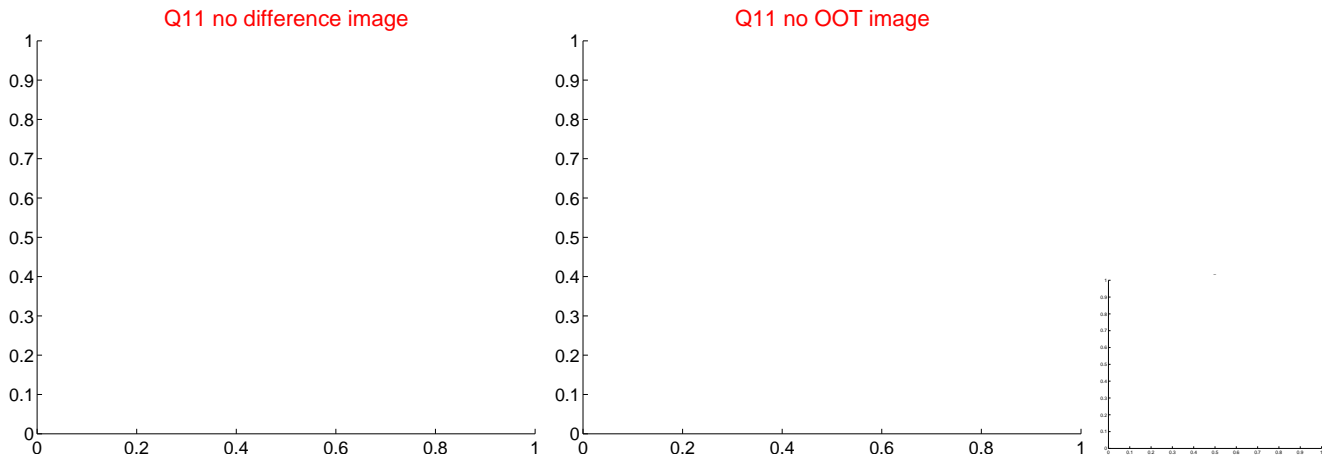
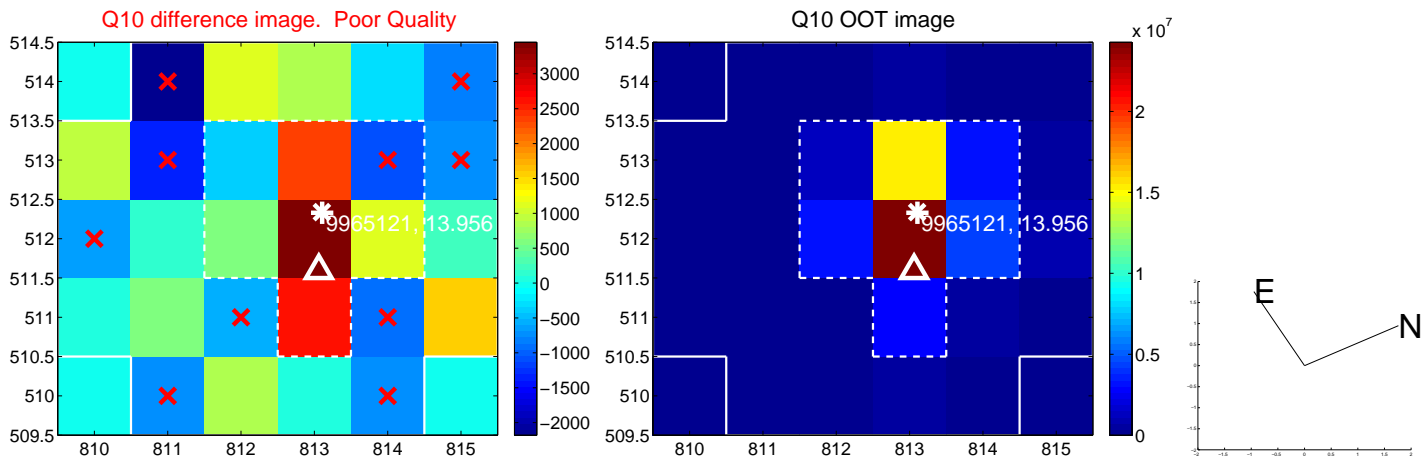
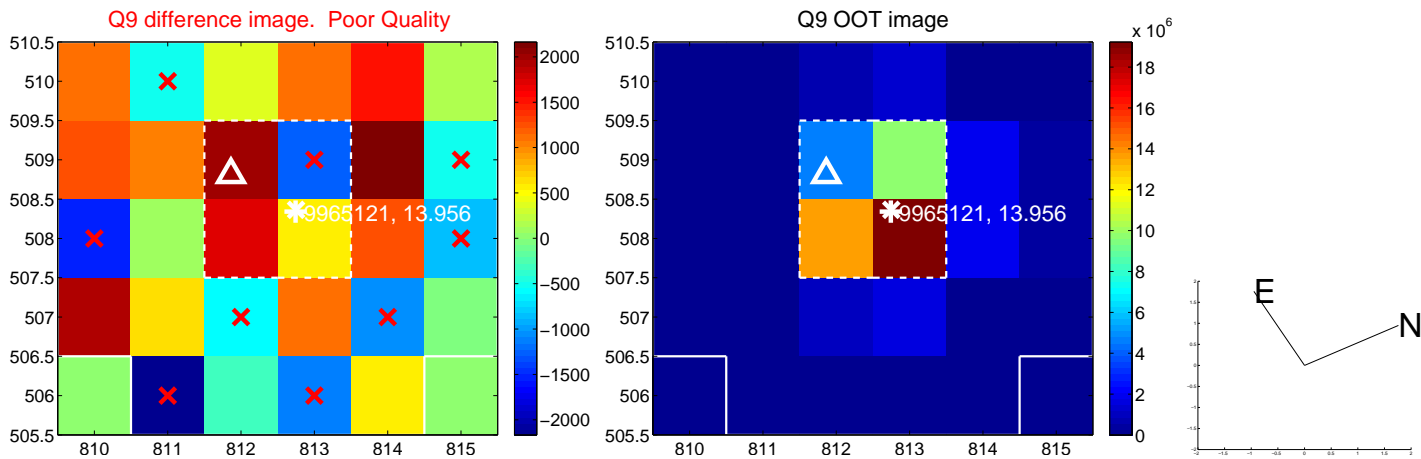
Q4 OOT image



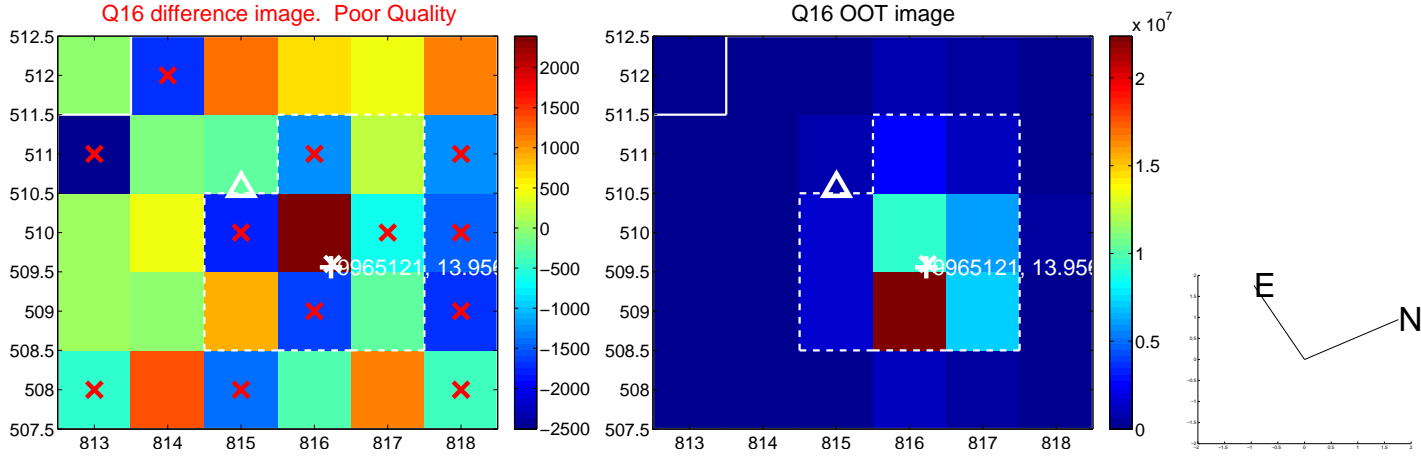
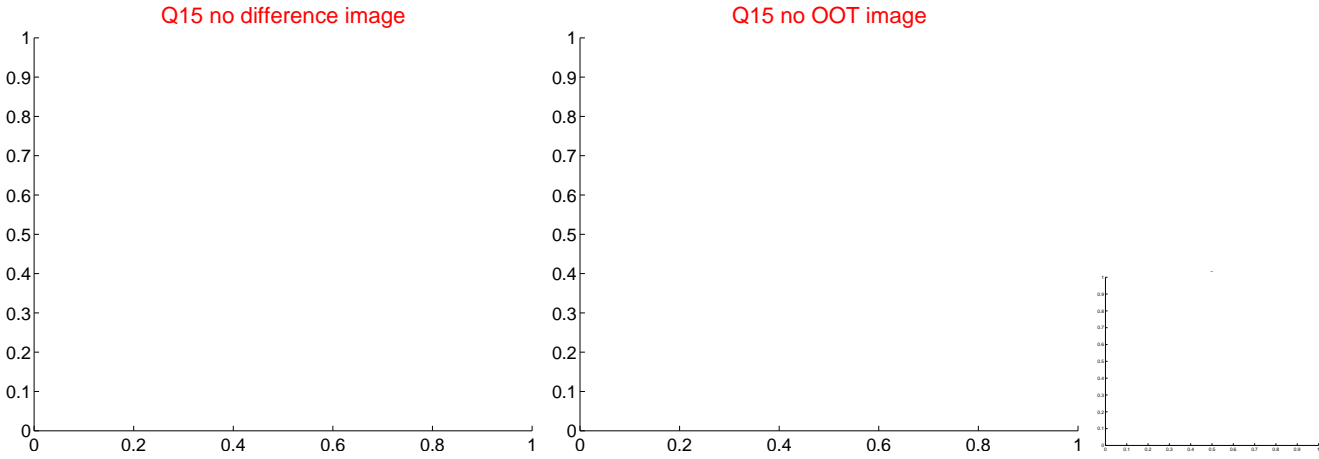
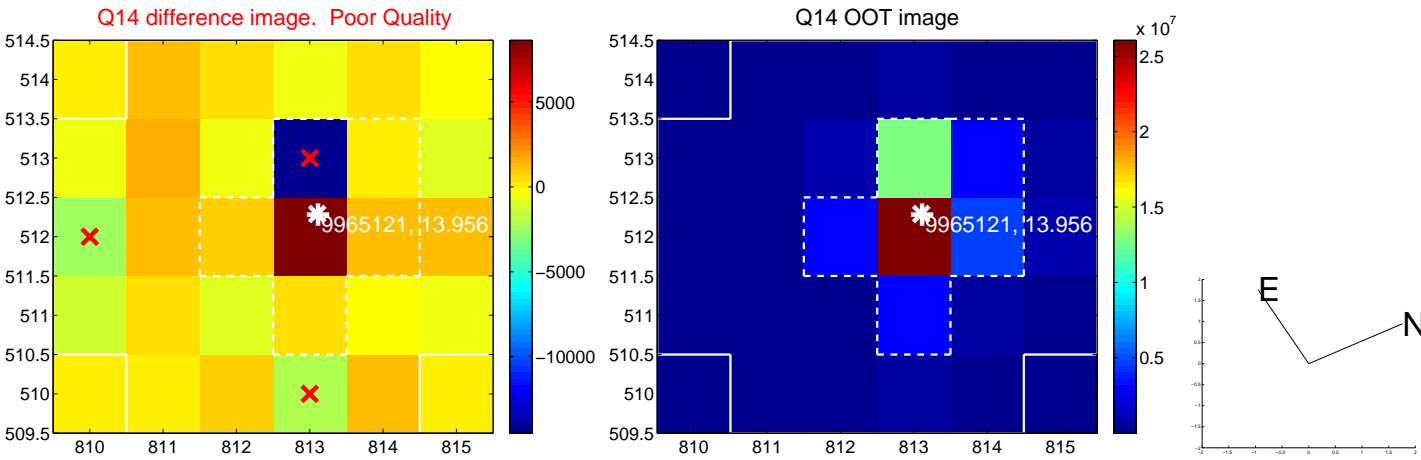
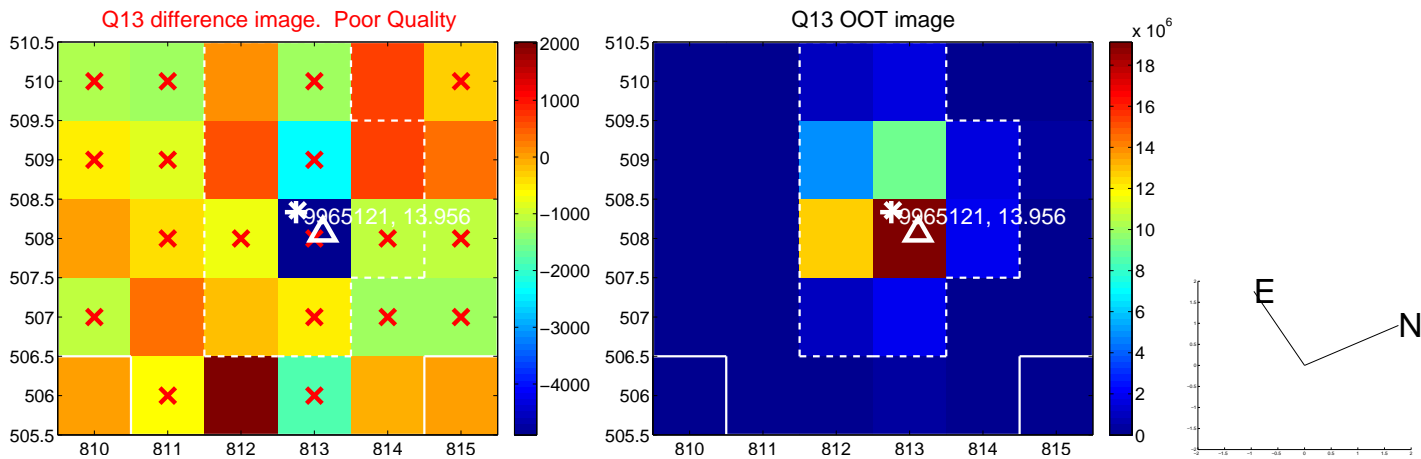
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value



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

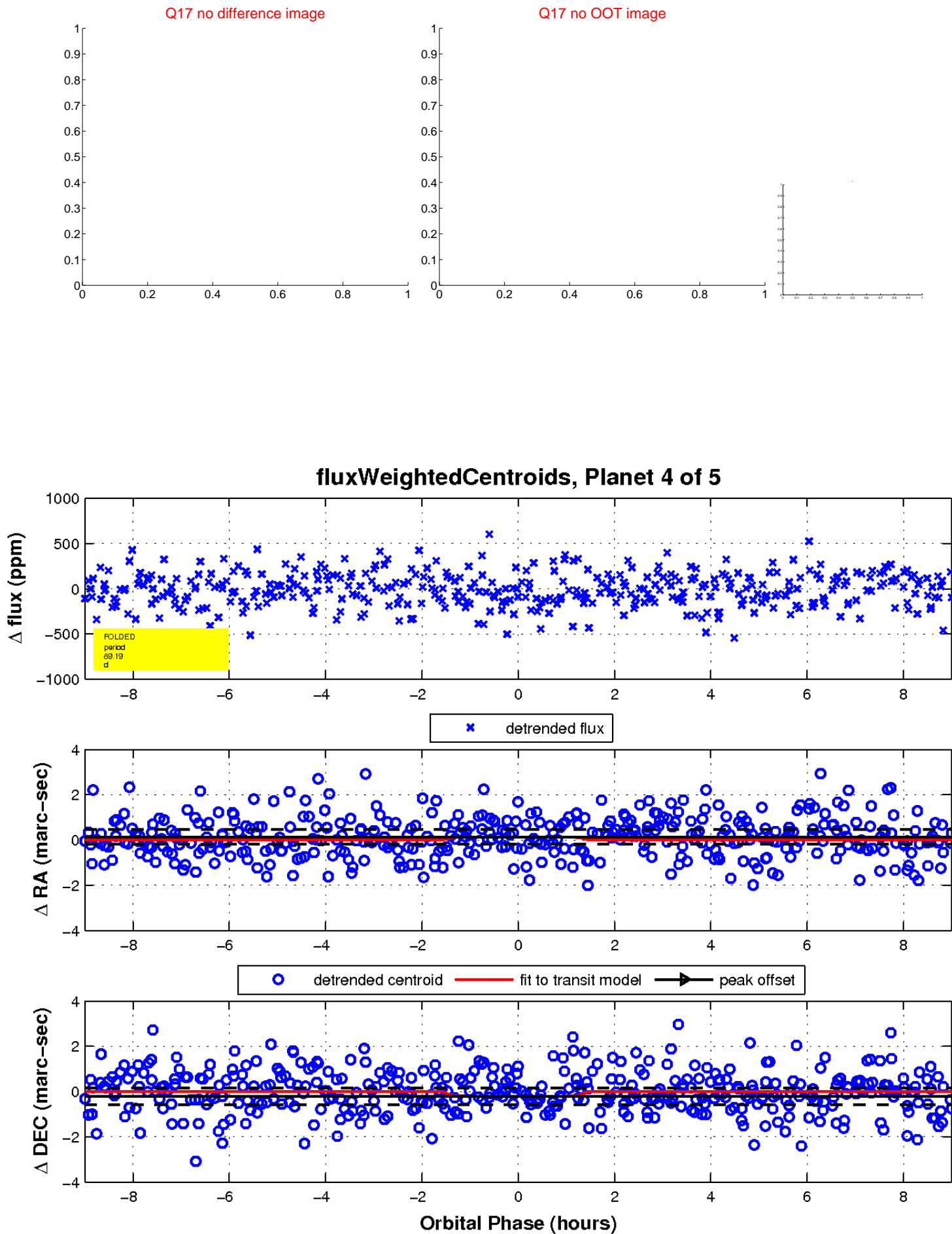


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



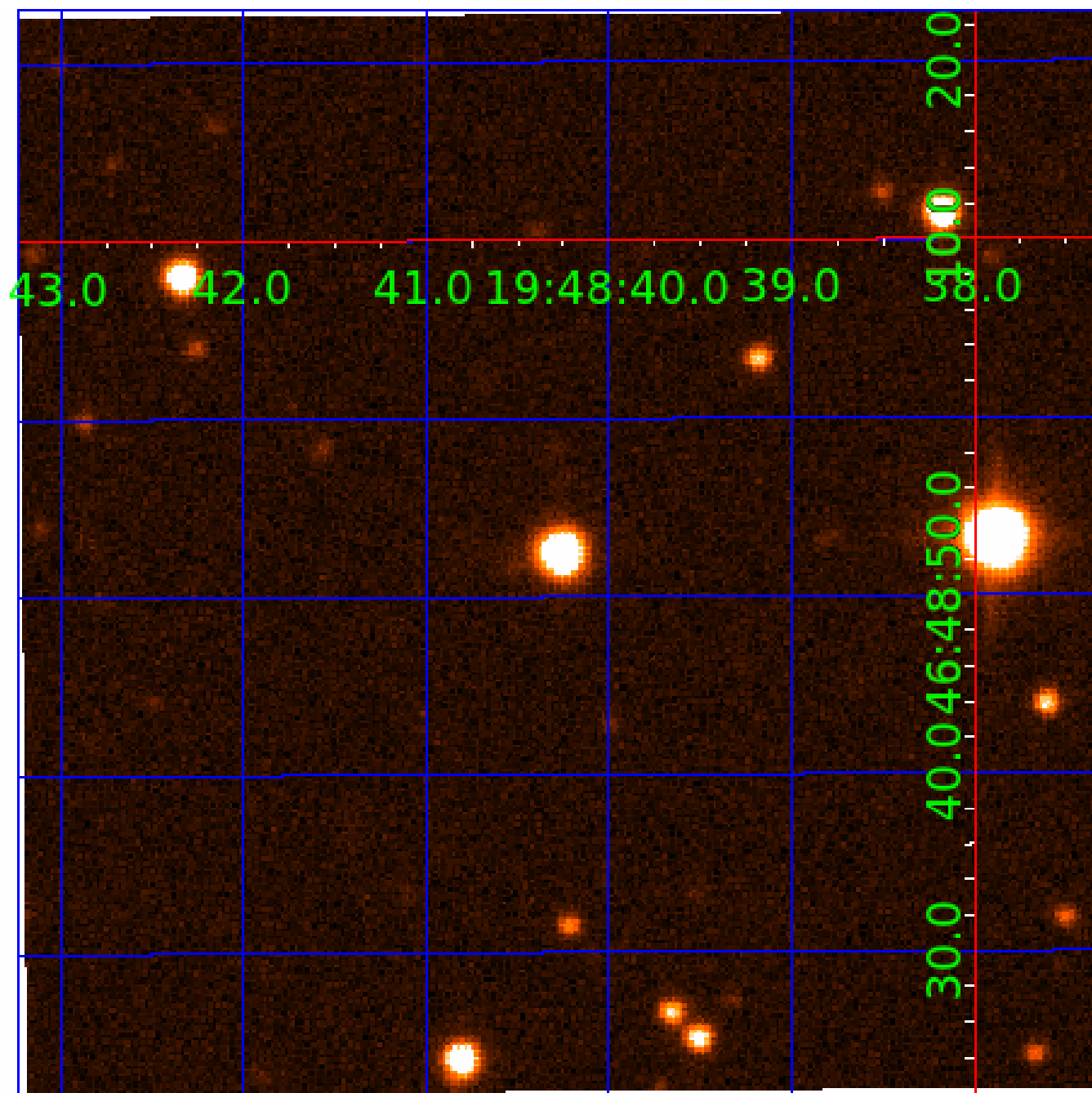


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 009965121

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009965121-01	OBS	No	2.344483	132.895552	23.6	14.975	7.4	7.9	1.58	7071	0.98	3656.03
009965121-02	OBS	No	46.383850	158.097080	176.7	9.784	10.3	8.1	1.58	7071	2.29	68.33
009965121-03	OBS	No	55.446483	167.223038	218.3	5.949	8.3	6.9	1.58	7071	2.54	53.86
009965121-04	OBS	No	89.185717	192.230345	281.1	3.003	8.0	7.8	1.58	7071	2.92	28.58
009965121-05	OBS	No	68.625577	198.282423	365.8	2.469	7.9	8.6	1.58	7071	4.20	40.53

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009965121-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—CENT_UNCERTAIN
009965121-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_FEW_DIFFS
009965121-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_FEW_DIFFS
009965121-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_FEW_DIFFS
009965121-05	OBS	FP	0.00	1	0	0	0	TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT—CENT_FEW_DIFFS

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

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

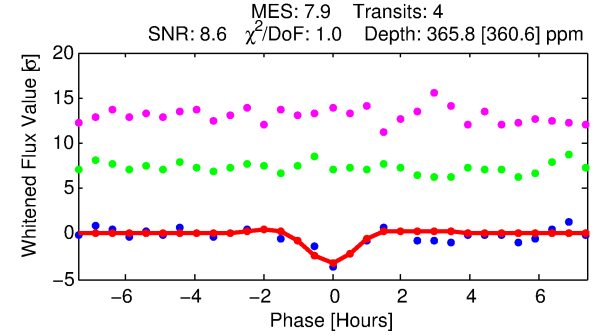
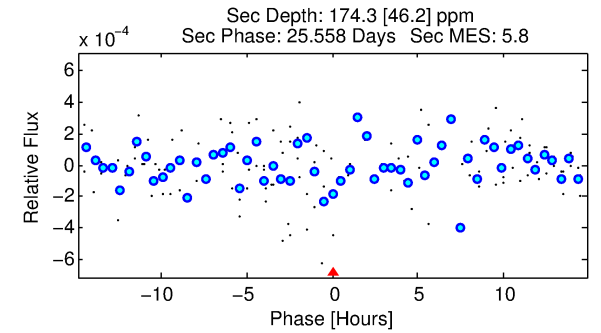
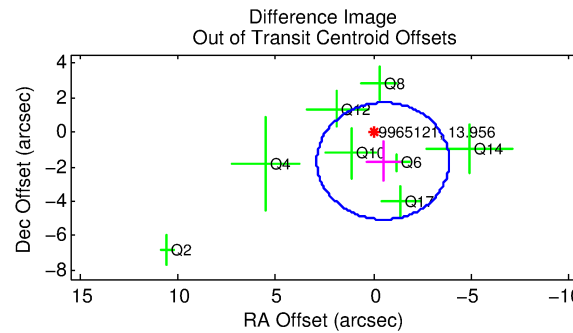
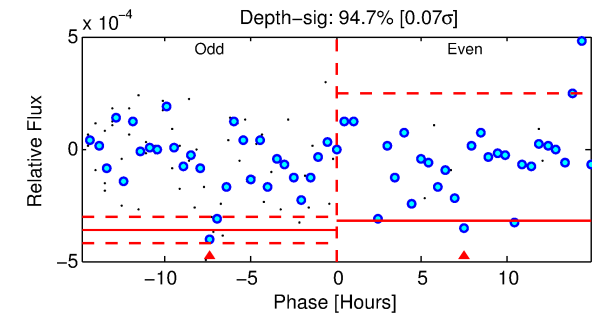
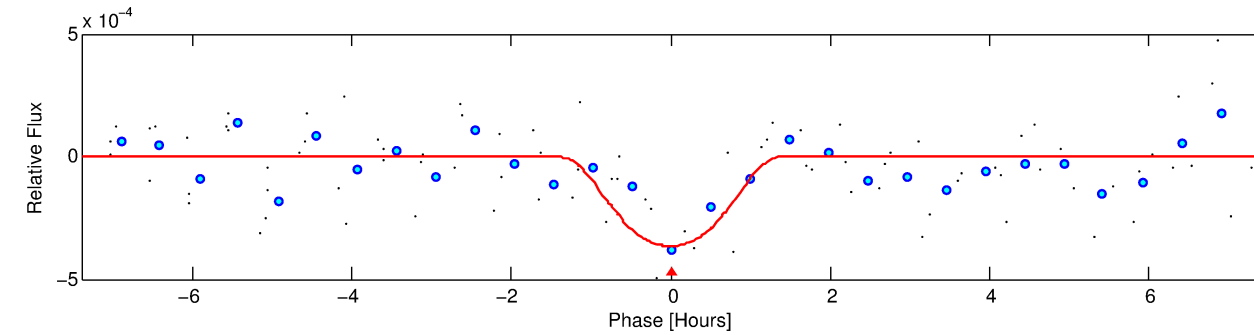
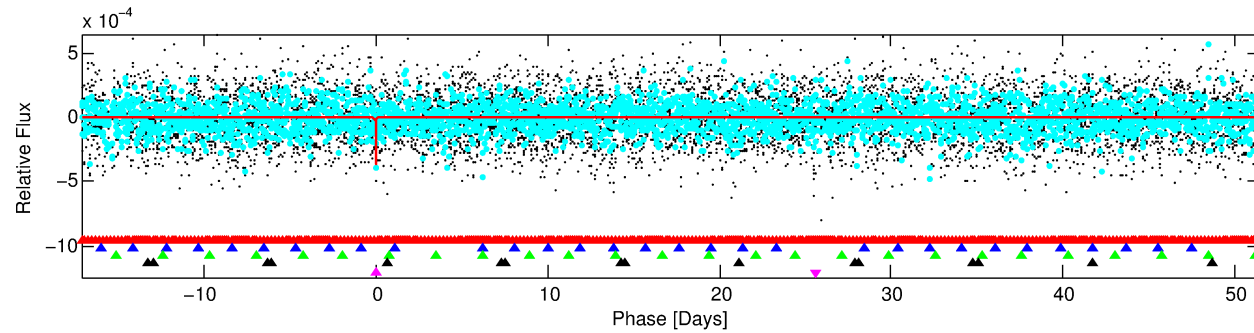
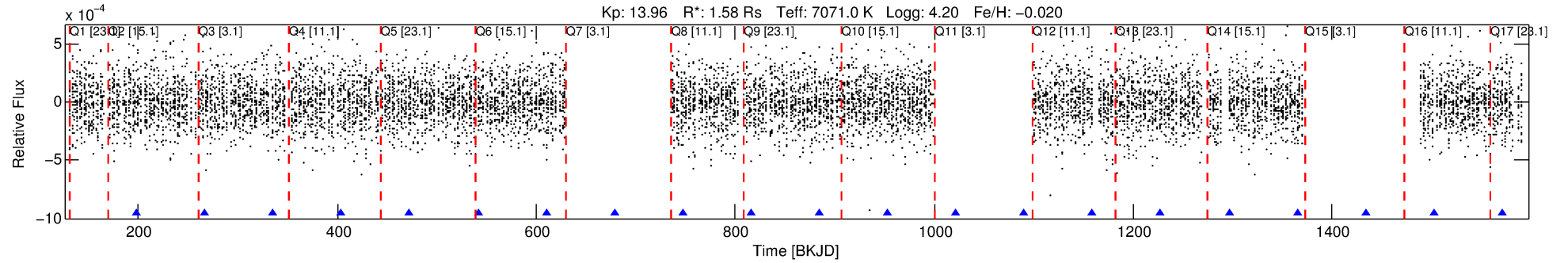
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009965121-05

No Significant Match Found

# DV One-Page Summary

KIC: 9965121 Candidate: 5 of 5 Period: 68.626 d



## DV Fit Results:

Period = 68.62558 [0.00066] d  
Epoch = 198.2824 [0.0070] BKJD  
Rp/R\* = 0.0244 [0.0379]  
a/R\* = 61.61 [63.65]  
b = 0.98 [0.10]  
Seff = 40.53 [16.78]  
Teq = 643 [67] K  
Rp = 4.20 [6.69] Re  
a = 0.3712 [0.1006] AU  
Ag = 749.90 [2360.66] [0.32 $\sigma$ ]  
Teffp = 5205 [4074] K [1.12 $\sigma$ ]

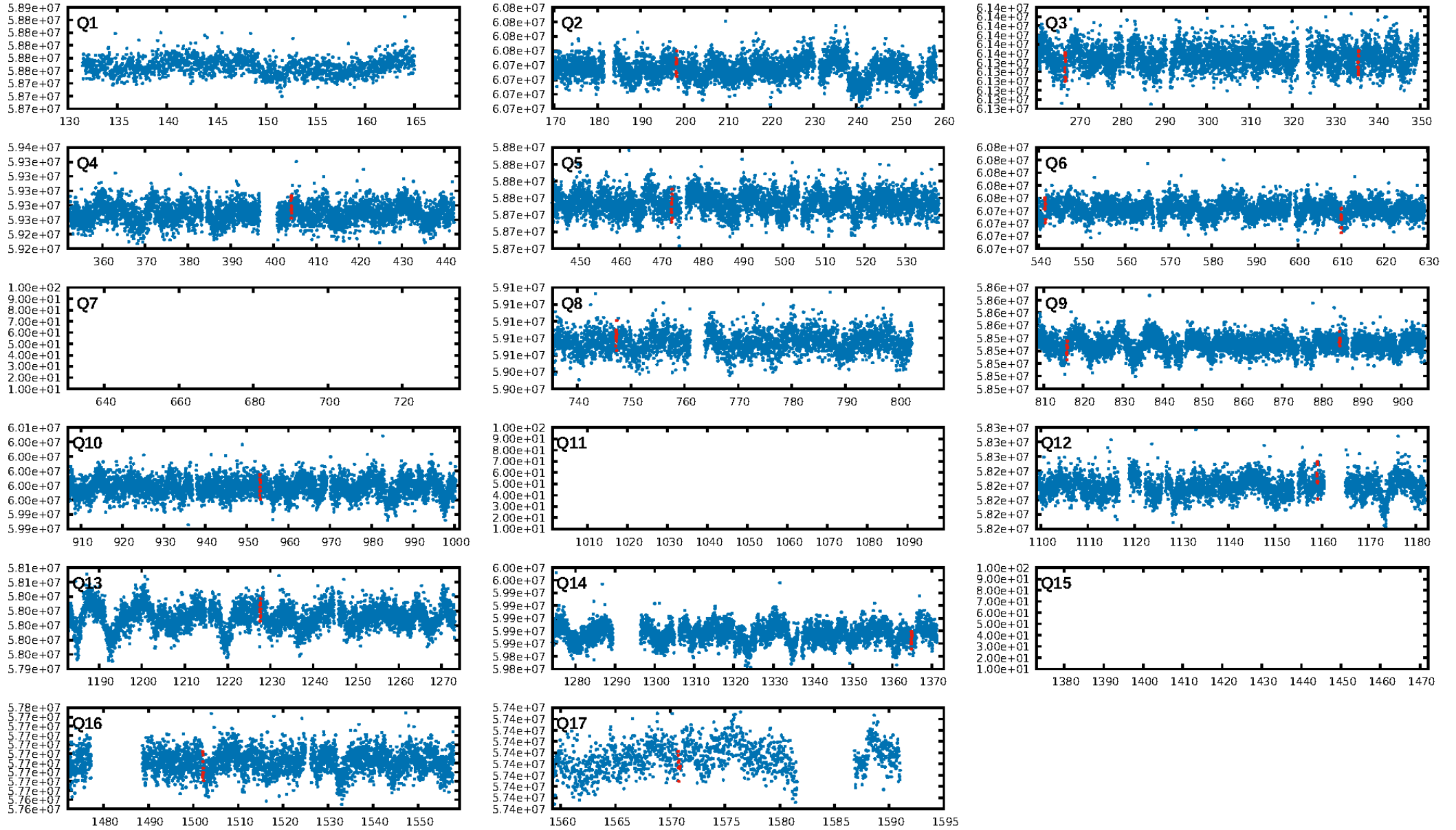
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [49.11 $\sigma$ ]  
LongPeriod-sig: 100.0% [126.91 $\sigma$ ]  
ModelChiSquare2-sig: 10.1%  
ModelChiSquareGof-sig: 97.4%  
**Bootstrap-pfa: 3.96e-08**  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: 1.325  
Centroid-sig: 1.2%  
Centroid-so: 2.619 arcsec [2.48 $\sigma$ ]  
OotOffset-rm: 1.746 arcsec [1.55 $\sigma$ ]  
OotOffset-st: 4/0/3/1 [8]  
KicOffset-rm: 1.774 arcsec [1.60 $\sigma$ ]  
KicOffset-st: 4/0/3/1 [8]  
DiffImageQuality-fgm: 0.25 [2/8]  
DiffImageOverlap-fno: 0.54 [7/13]

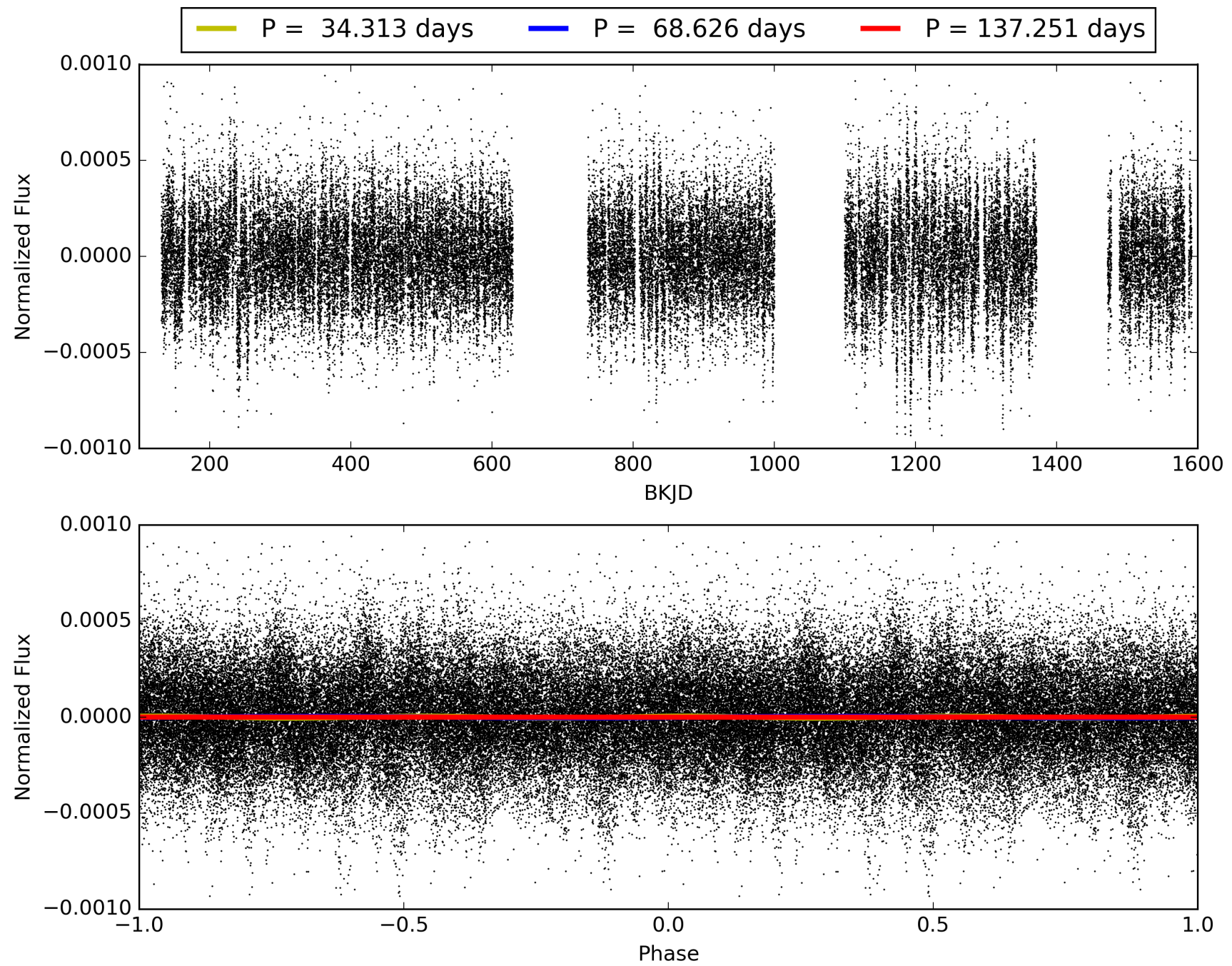
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 03:19:41 Z

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

# TCE 009965121-05, PDC Light Curves



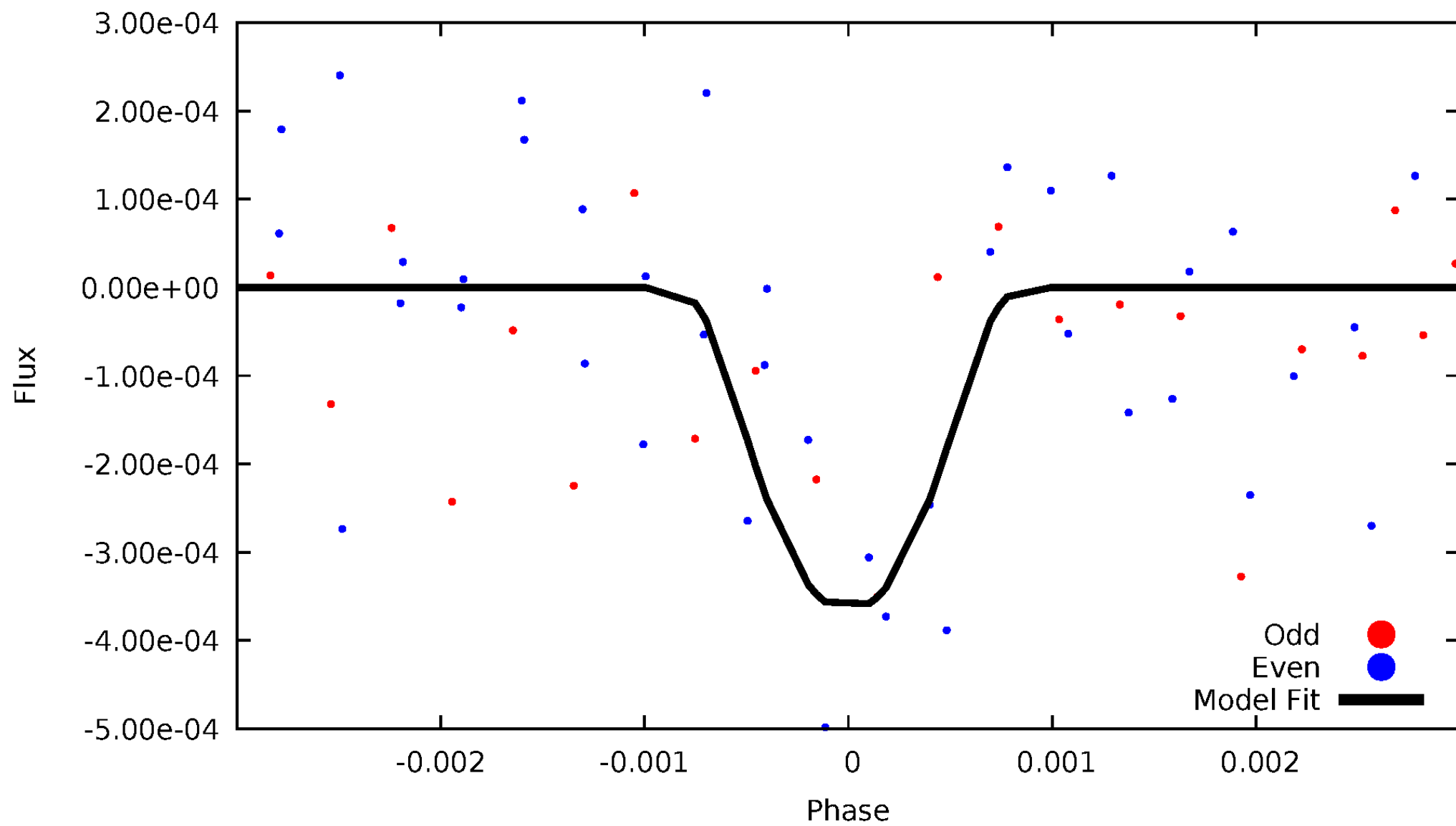
TCE 009965121-05





# DV Odd/Even

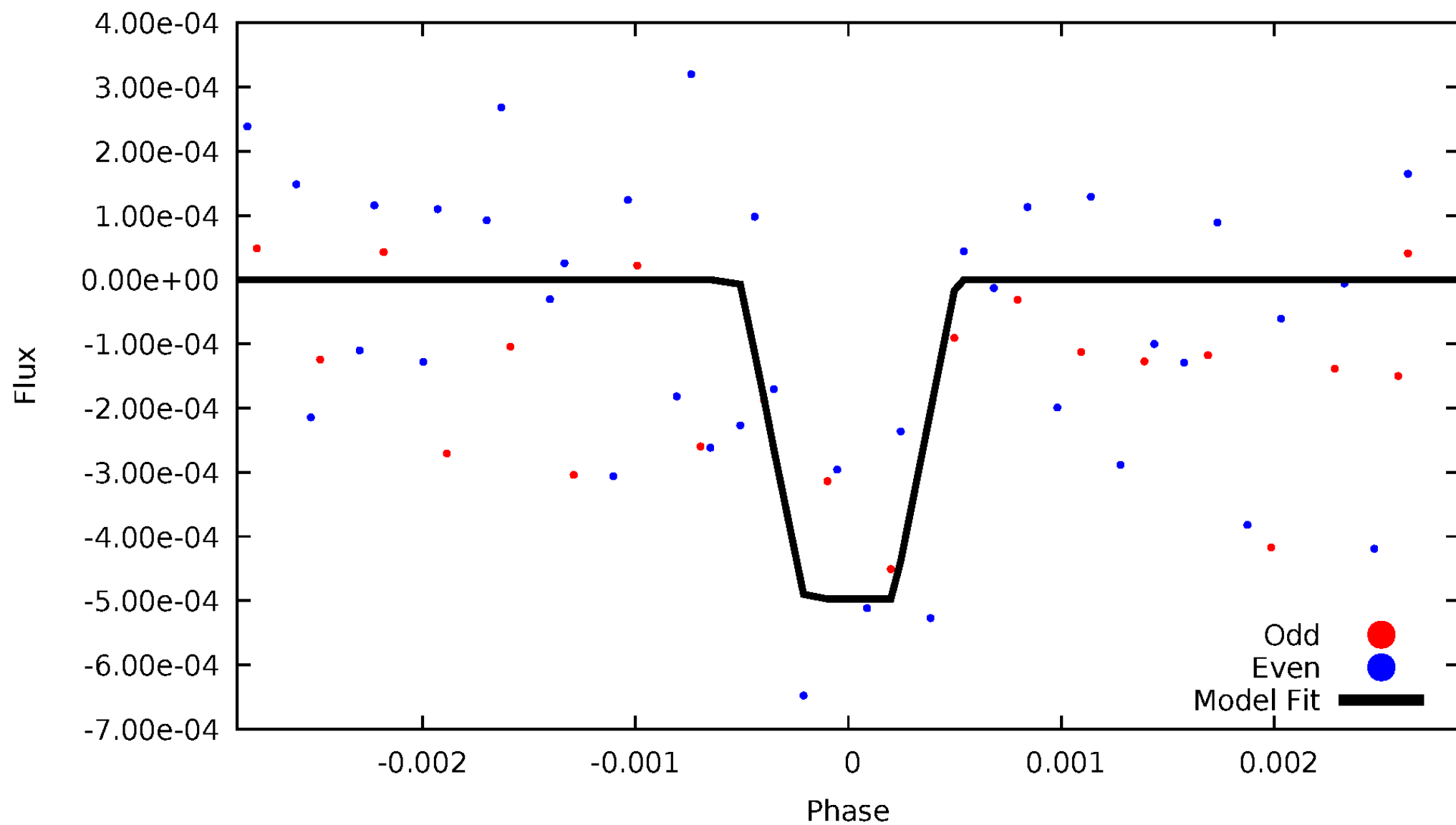
TCE 009965121-05





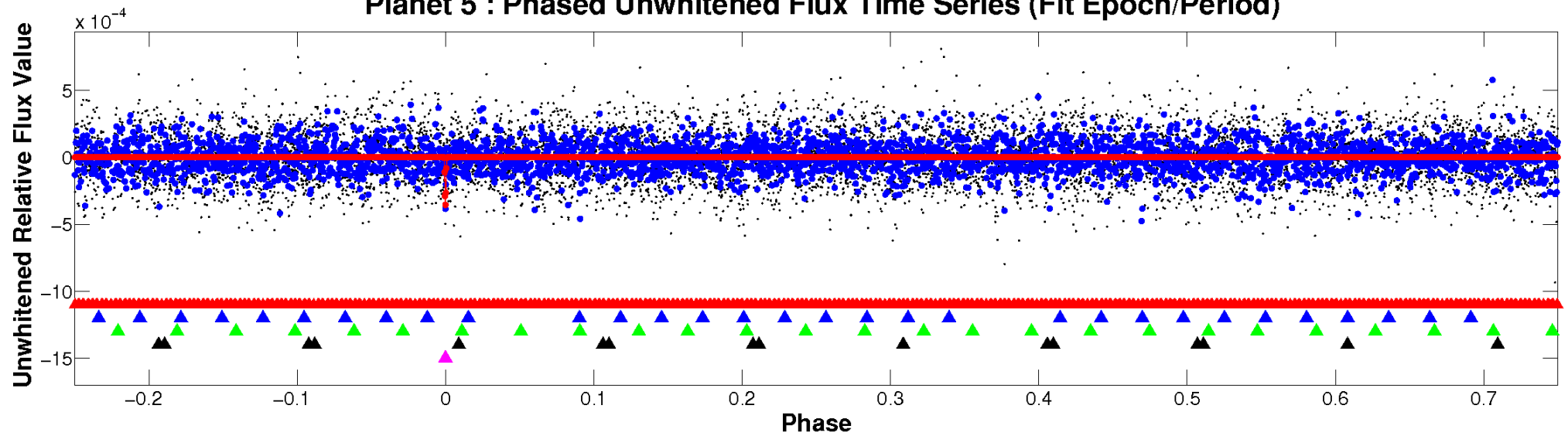
# ALT Odd/Even

TCE 009965121-05

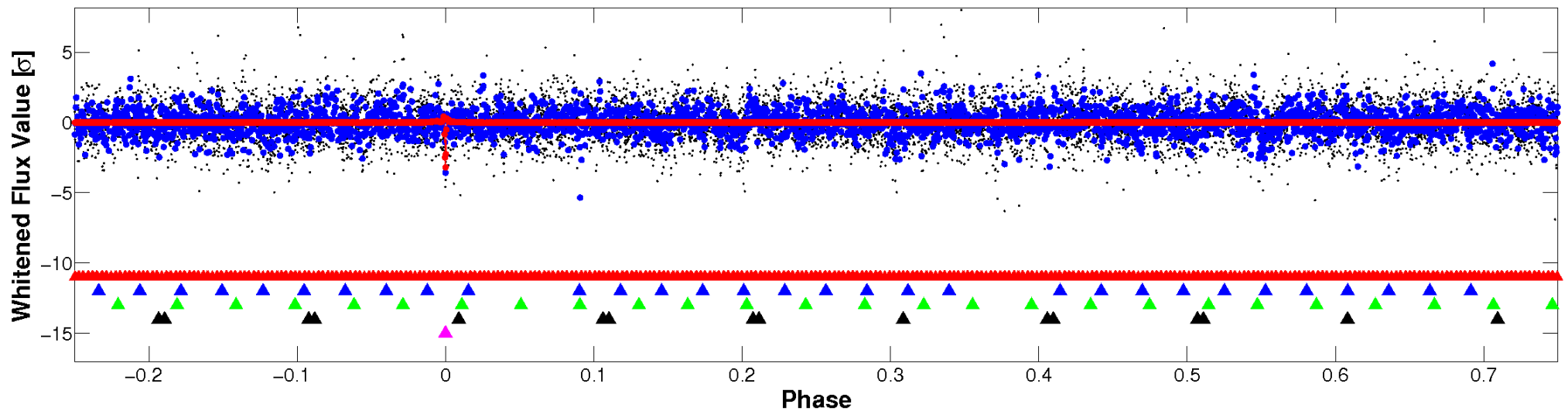


# Non-Whitened Vs. Whitened Light Curve

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

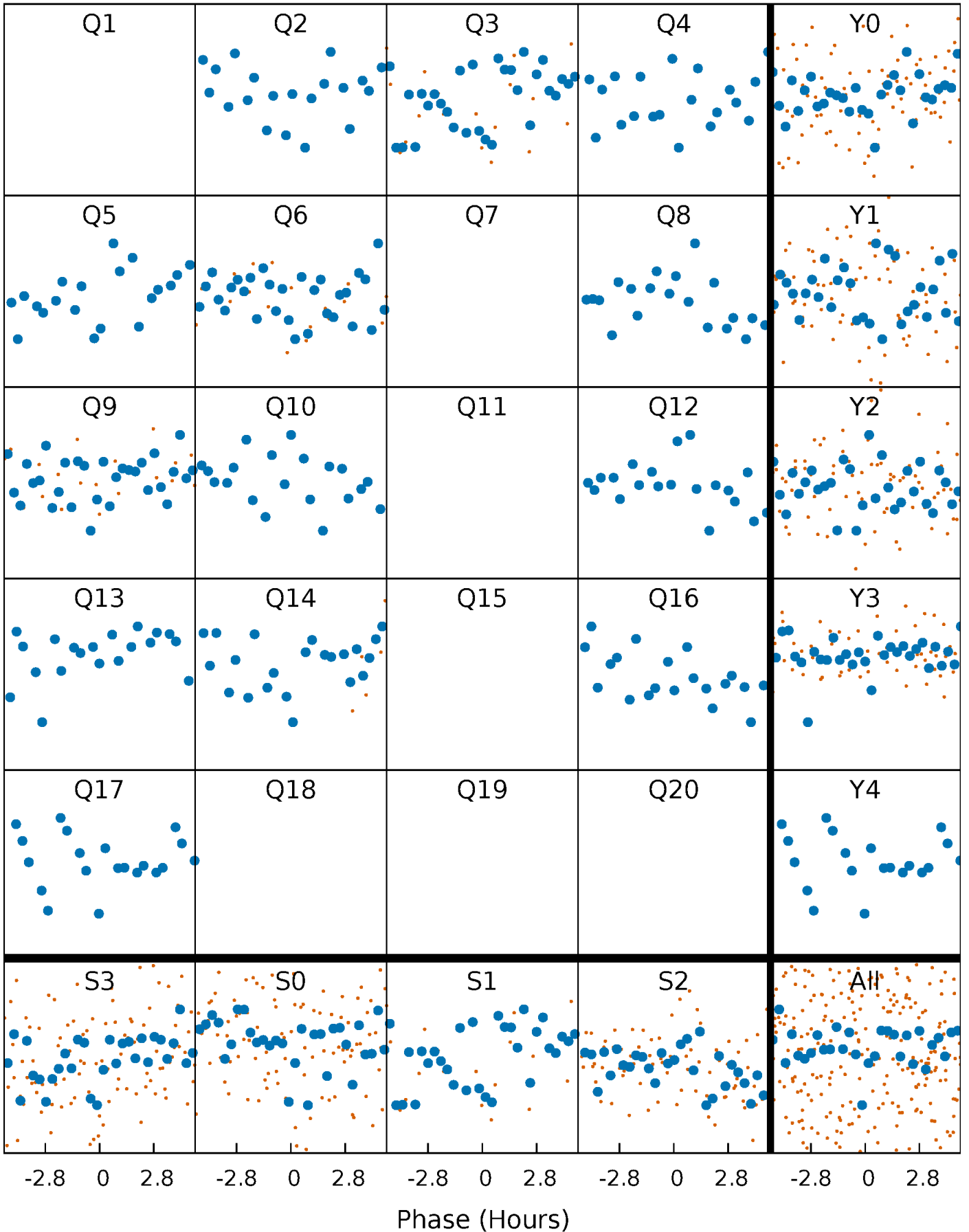


Planet 5 : Phased Whitened Flux Time Series (Fit Epoch/Period)



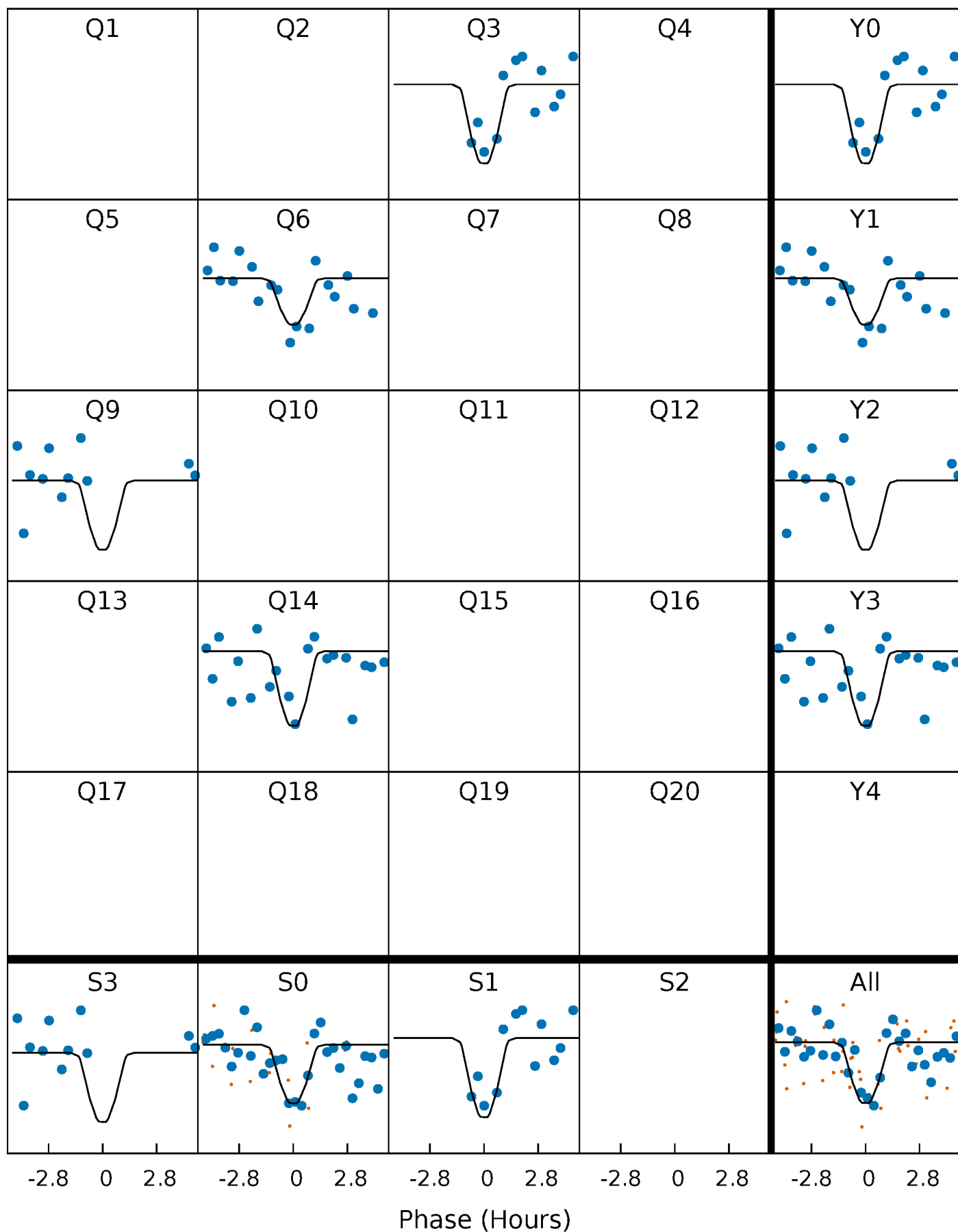
# PDC Quarter-Phased Transit Curves

TCE 009965121-05     $P = 68.625577$  Days     $T_0 = 198.282422$  (BKJD)



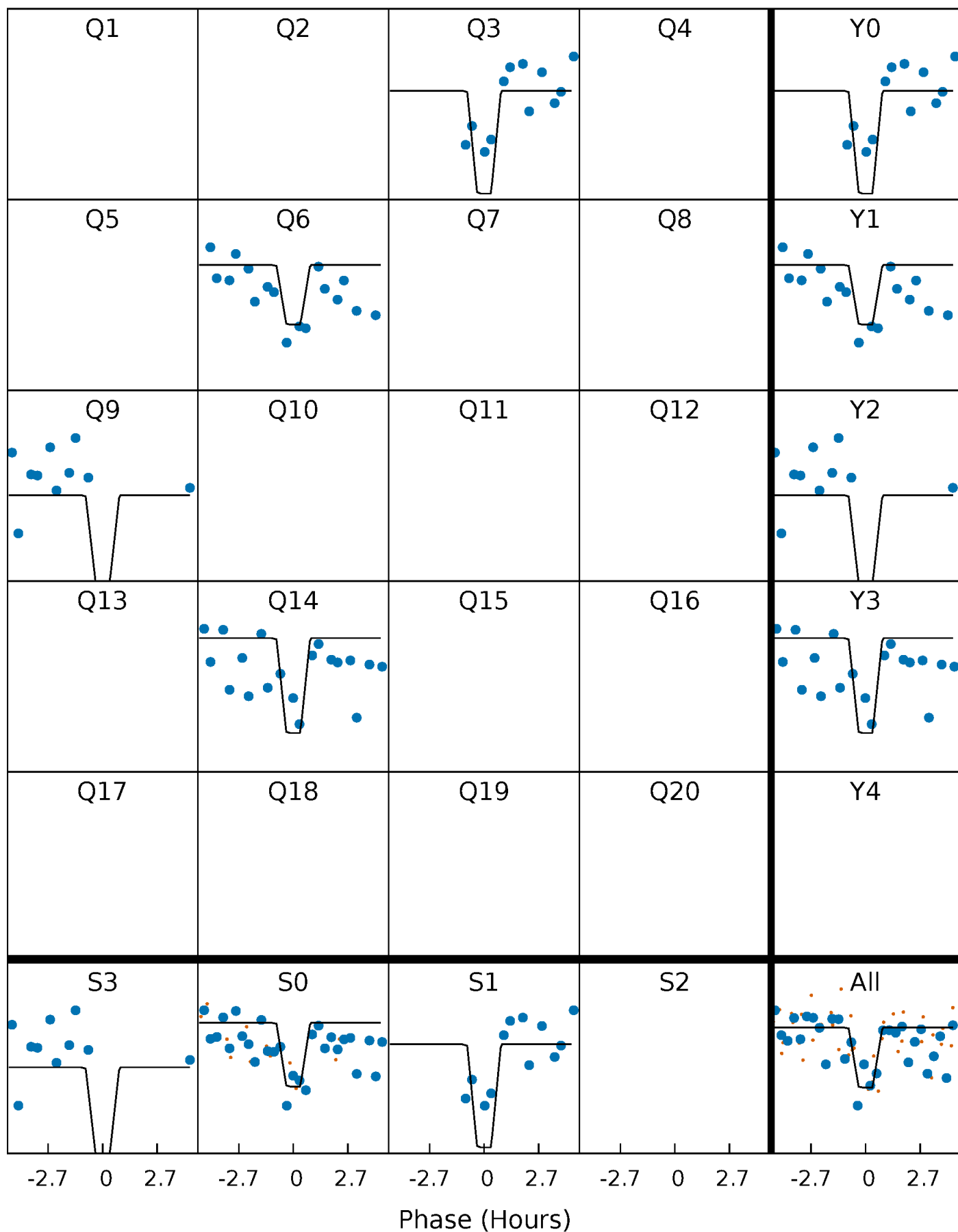
# DV Quarter-Phased Transit Curves

TCE 009965121-05     $P = 68.625577$  Days     $T_0 = 198.282422$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

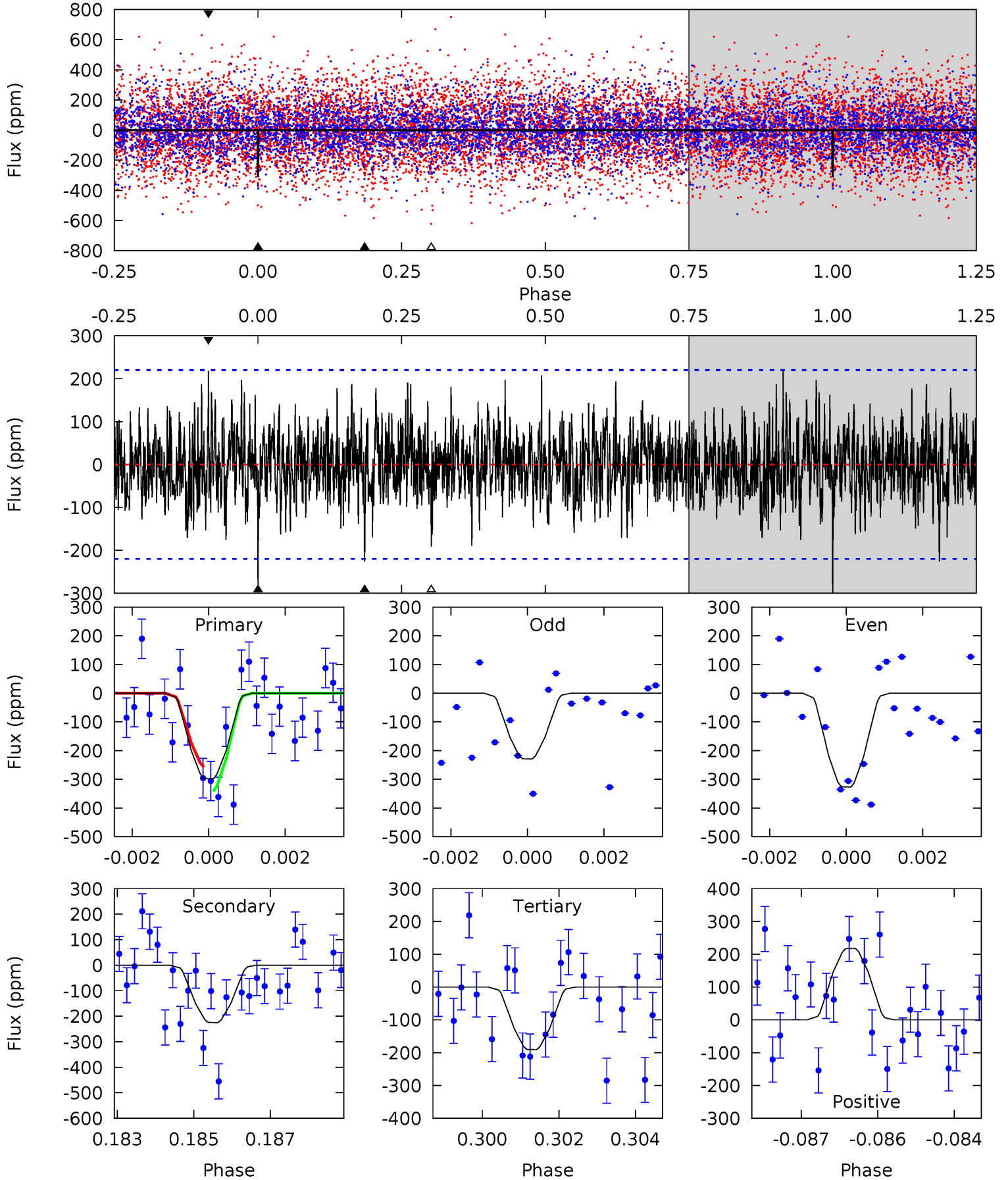
TCE 009965121-05     $P = 68.624606$  Days     $T_0 = 198.294888$  (BKJD)



# DV Model-Shift Uniqueness Test

009965121-05,  $P = 68.625577$  Days,  $E = 129.656845$  Days

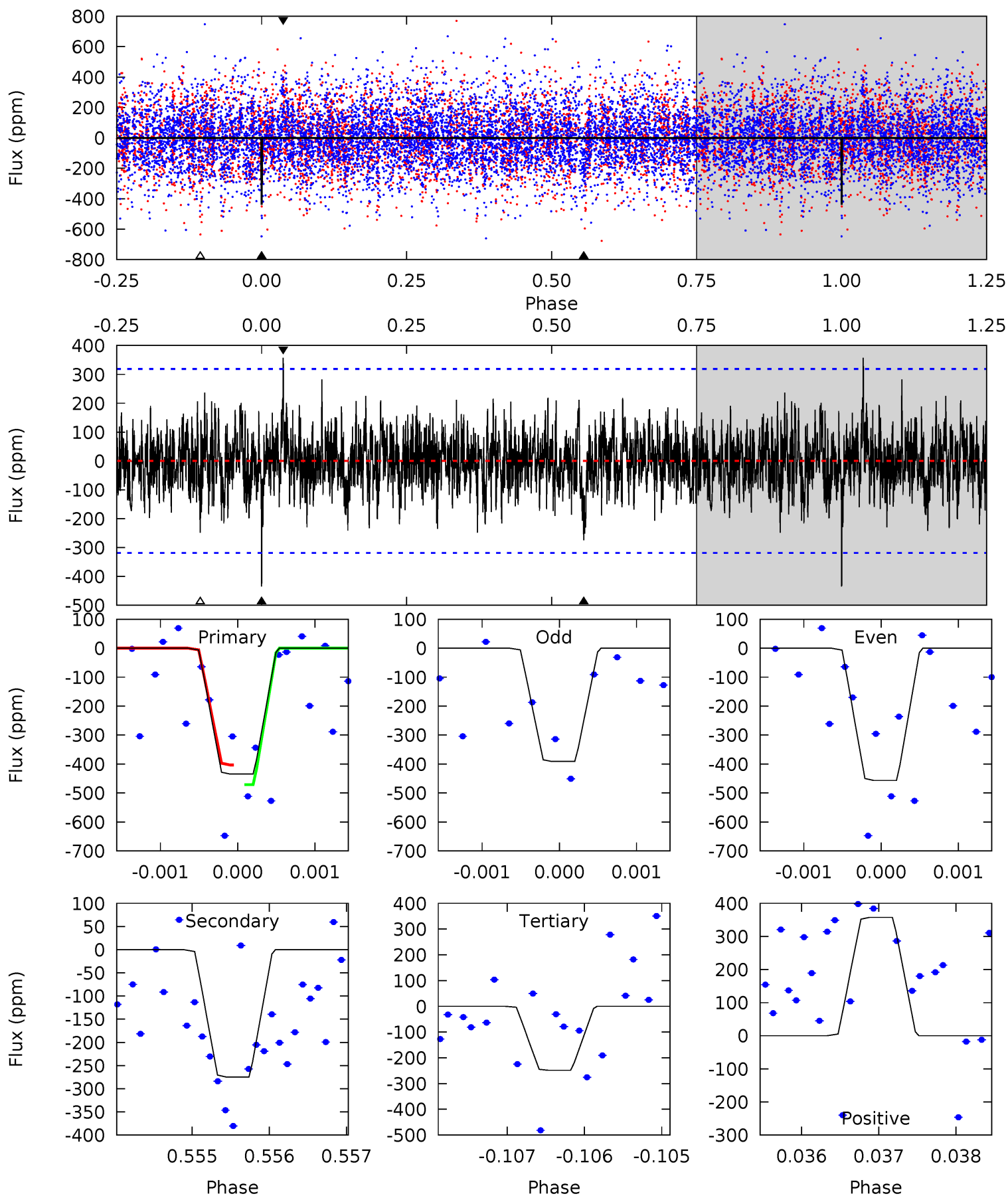
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
7.25	5.49	4.64	5.30	5.35	3.13	1.48	2.60	1.95	0.84	0.18	1.07	0.86	0.42	1.04



# Alt Model-Shift Uniqueness Test

009965121-05, P = 68.624606 Days, E = 129.670282 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
7.43	4.70	4.24	6.11	5.45	3.29	1.34	3.19	1.32	0.45	-1.41	0.52	1.12	0.45	0.57





### Stellar Parameters For KIC 009965121

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$7071^{+197}_{-310}$	$4.202^{+0.105}_{-0.195}$	$-0.020^{+0.250}_{-0.350}$	$1.579^{+0.535}_{-0.288}$	$1.451^{+0.220}_{-0.220}$	$0.519^{+0.270}_{-0.281}$
	+3%/-4%	+2%/-5%	+1250%/-1750%	+34%/-18%	+15%/-15%	+52%/-54%
Source	PHO1	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 009965121-05 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-226 \pm 41$	$6.50^{+6.44}_{-3.97}$	$909^{+71}_{-51}$	$4629^{+2583}_{-1028}$	$394^{+2061}_{-295}$
Alt.	$-275 \pm 59$	$6.43^{+6.16}_{-4.24}$	$902^{+79}_{-55}$	$4812^{+3457}_{-1049}$	$477^{+3810}_{-349}$

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

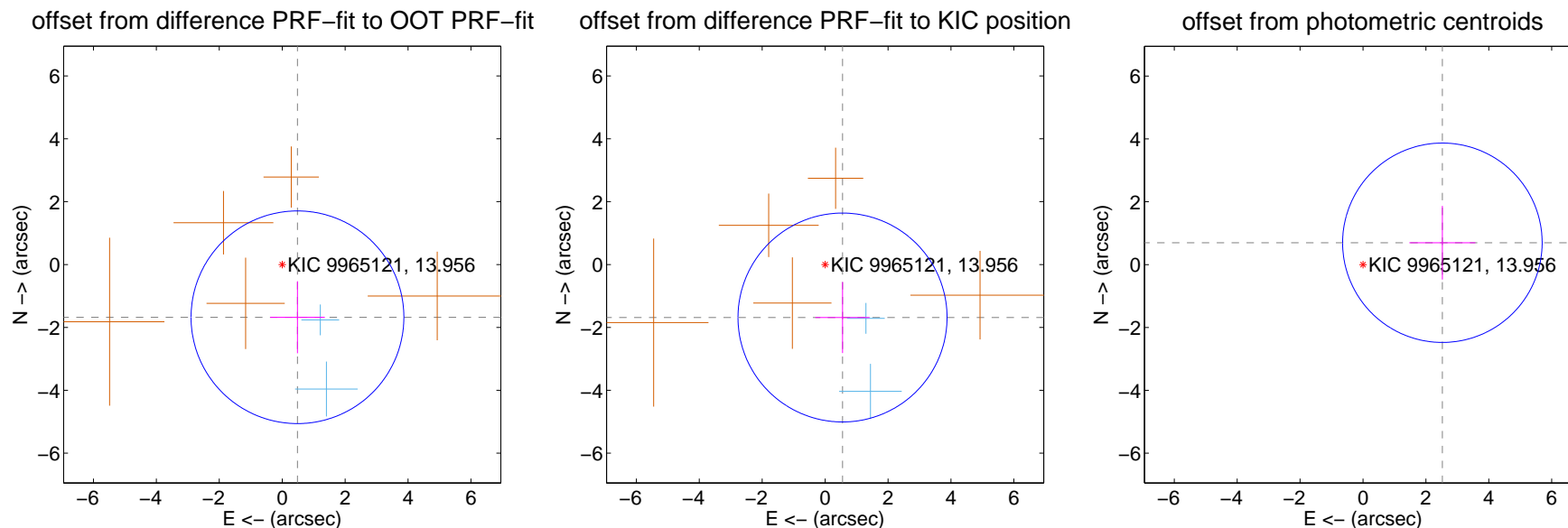
## DV Centroid Data

Supplemental centroid analysis for 009965121-05. Kepler magnitude: 13.96. Transit SNR 8.58

There are 2 quarters with good PRF difference image offsets

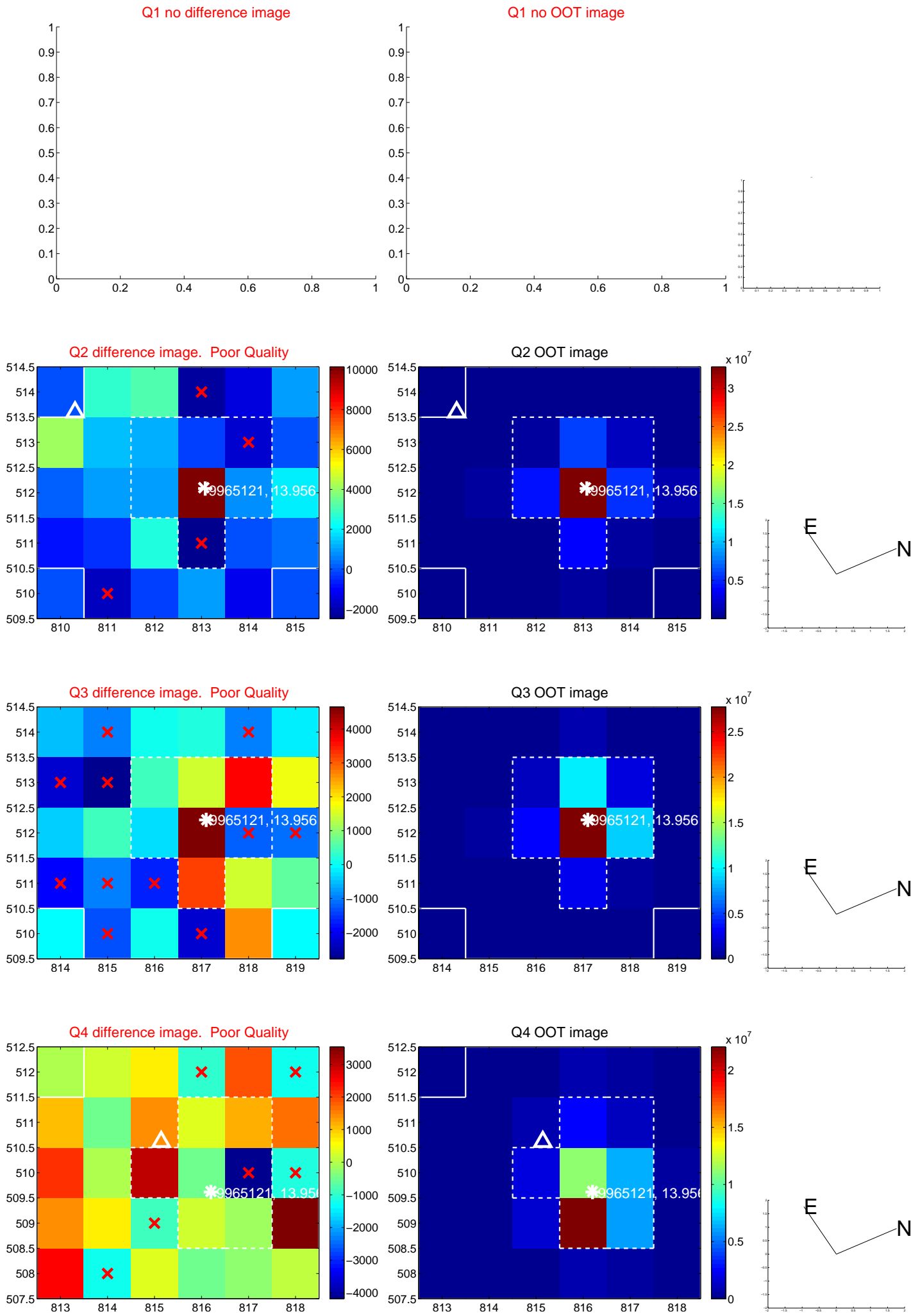
The direct PRF centroid is offset from the target star catalog position by about 0.08 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.746 \pm 1.128$	1.55	$-0.485 \pm 0.867$	$-1.678 \pm 1.147$
PRF-fit source offset from KIC position	$1.774 \pm 1.108$	1.60	$-0.553 \pm 0.863$	$-1.685 \pm 1.131$
photometric centroid source offset	$2.62 \pm 1.06$	2.48	$-2.52 \pm 1.05$	$0.70 \pm 1.17$

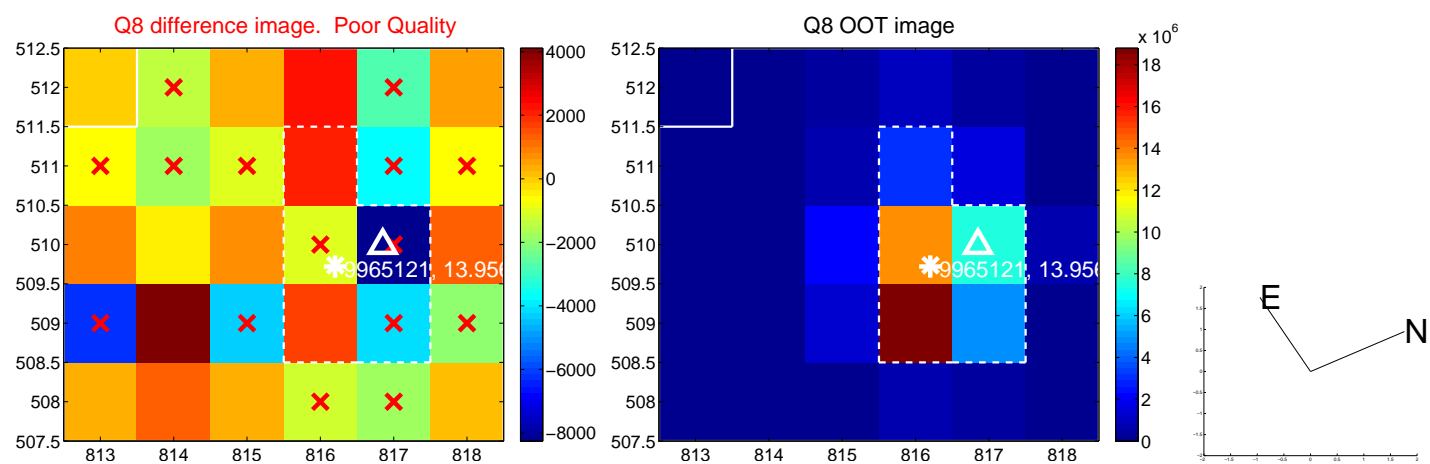
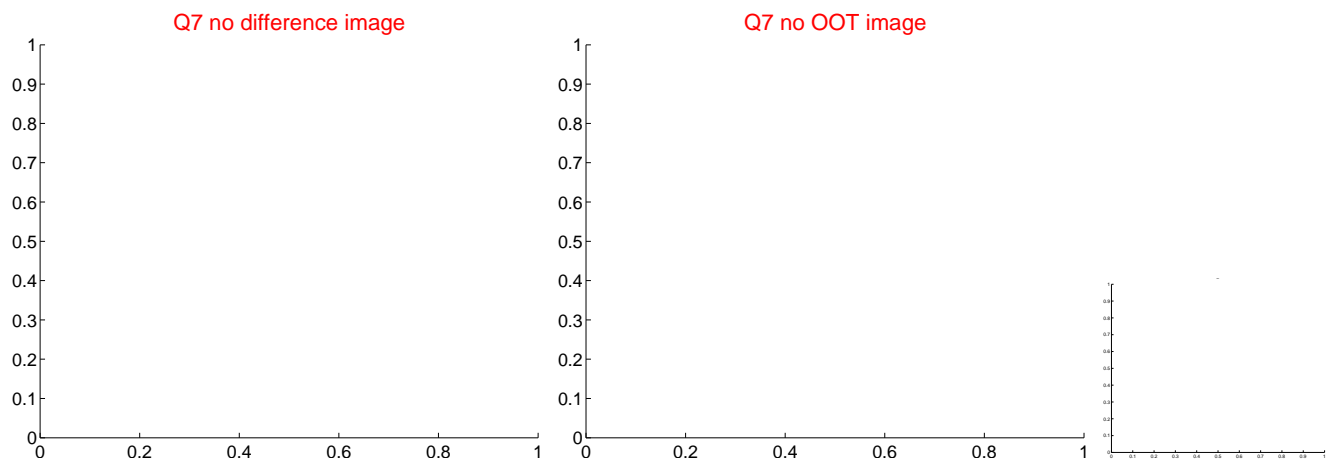
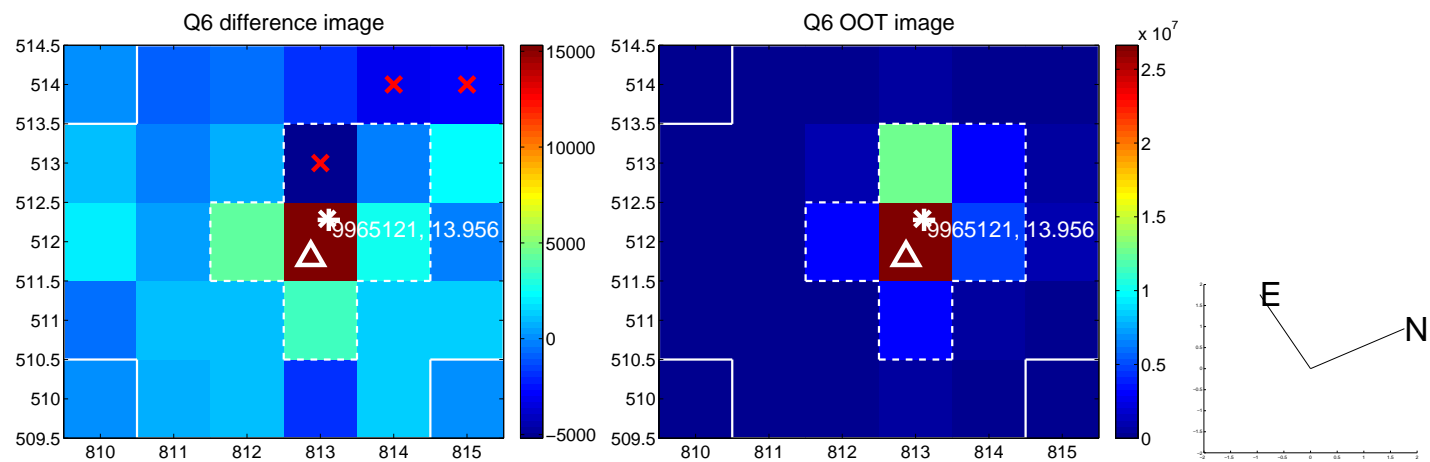
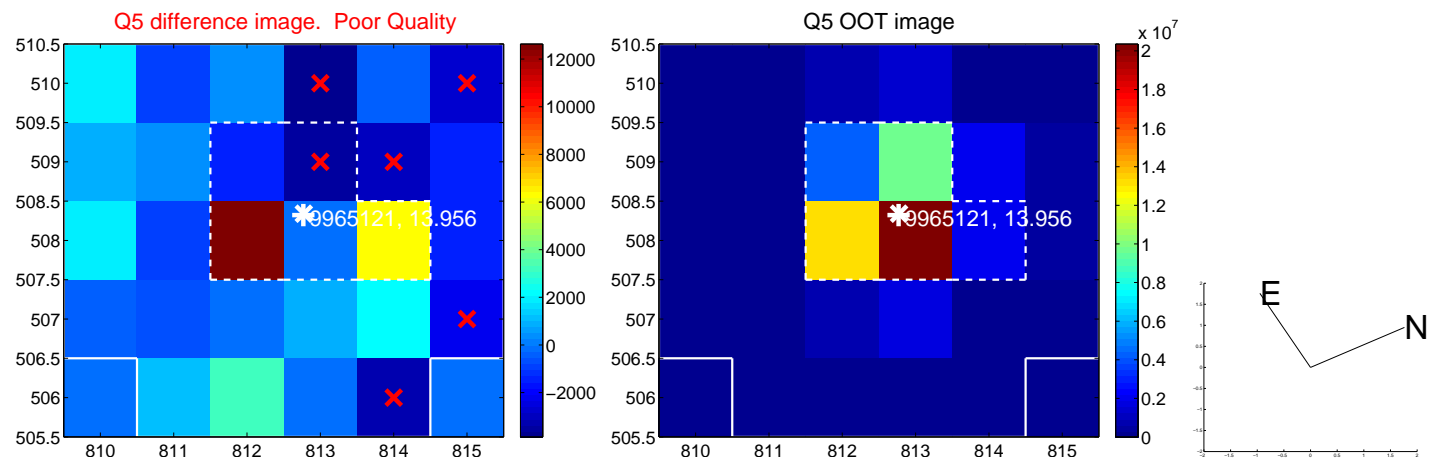


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

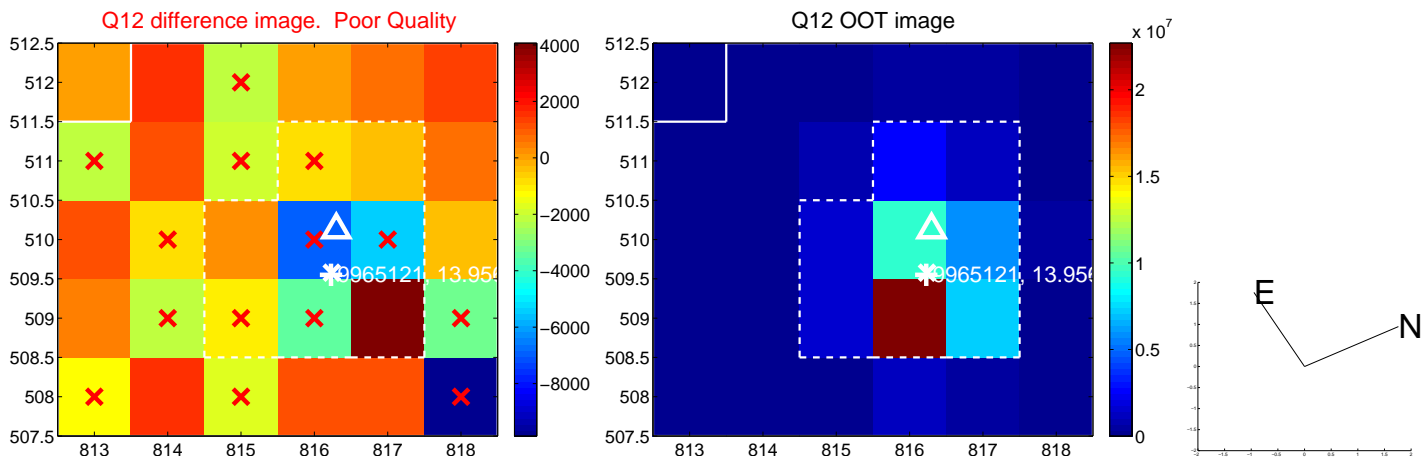
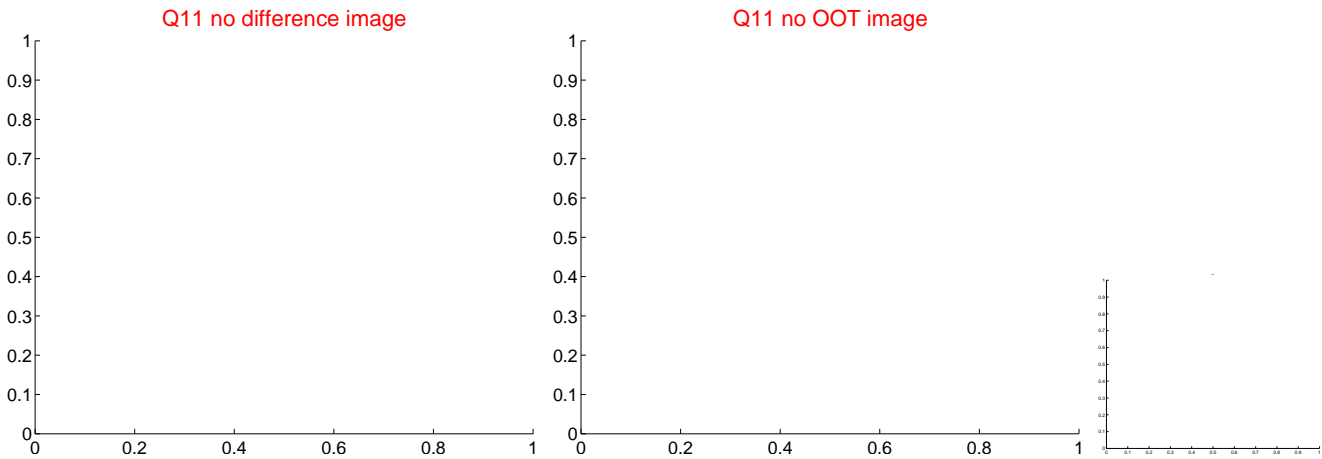
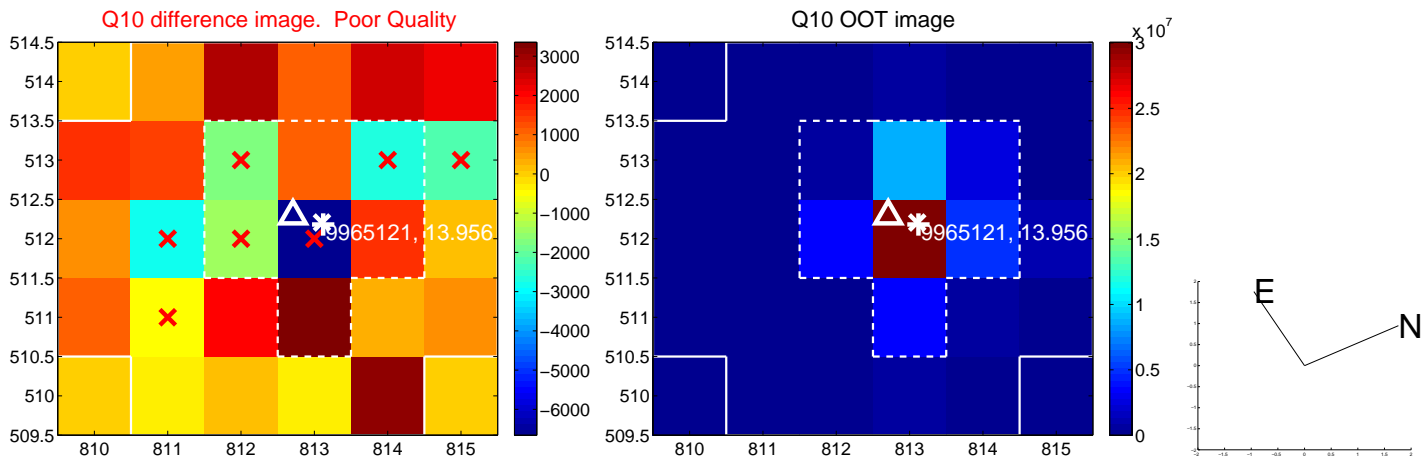
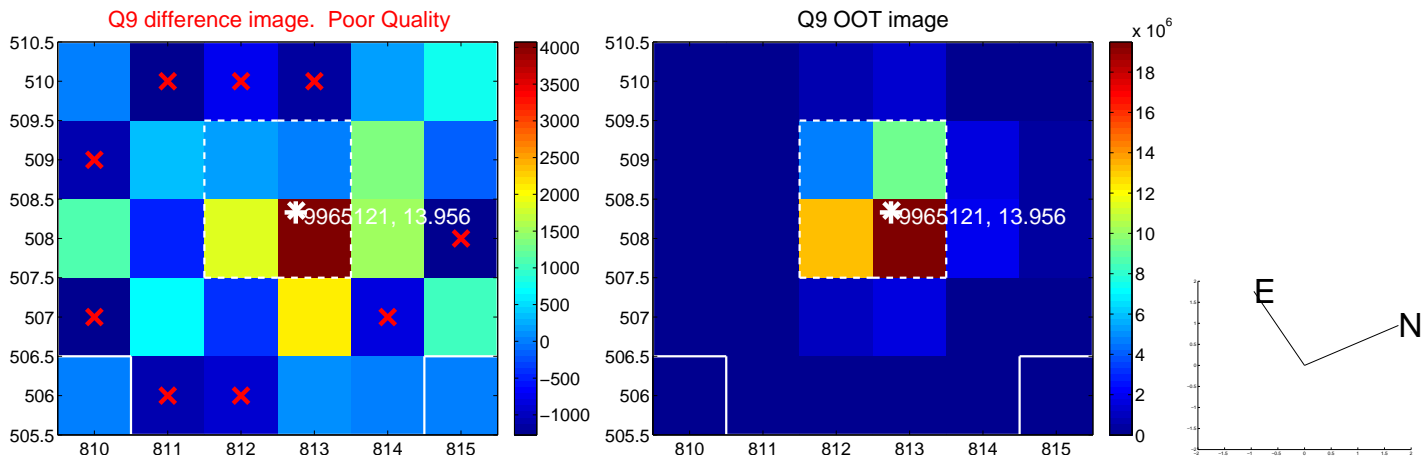
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



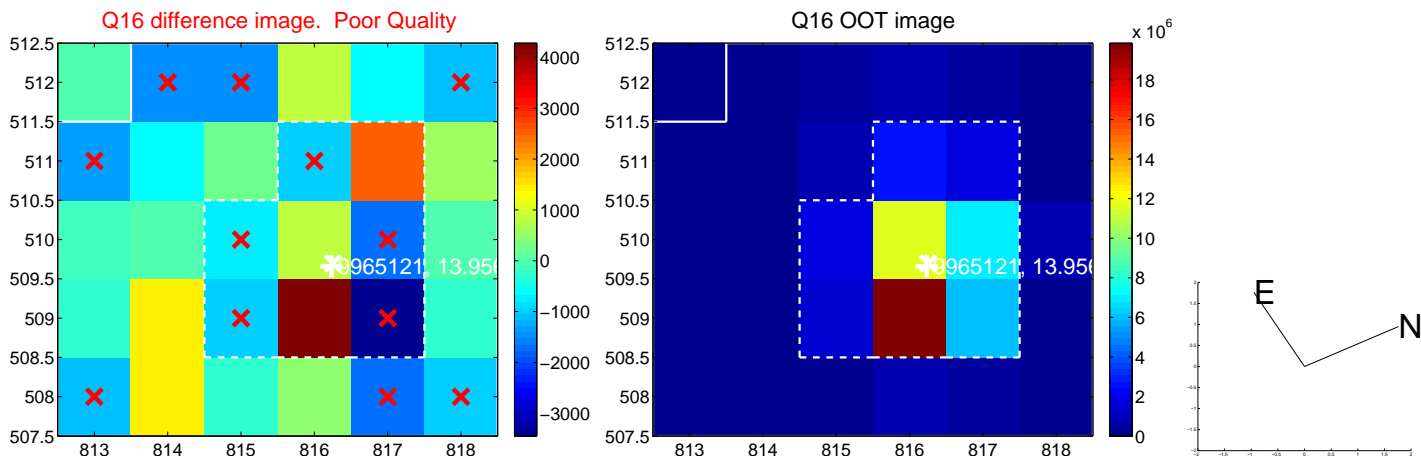
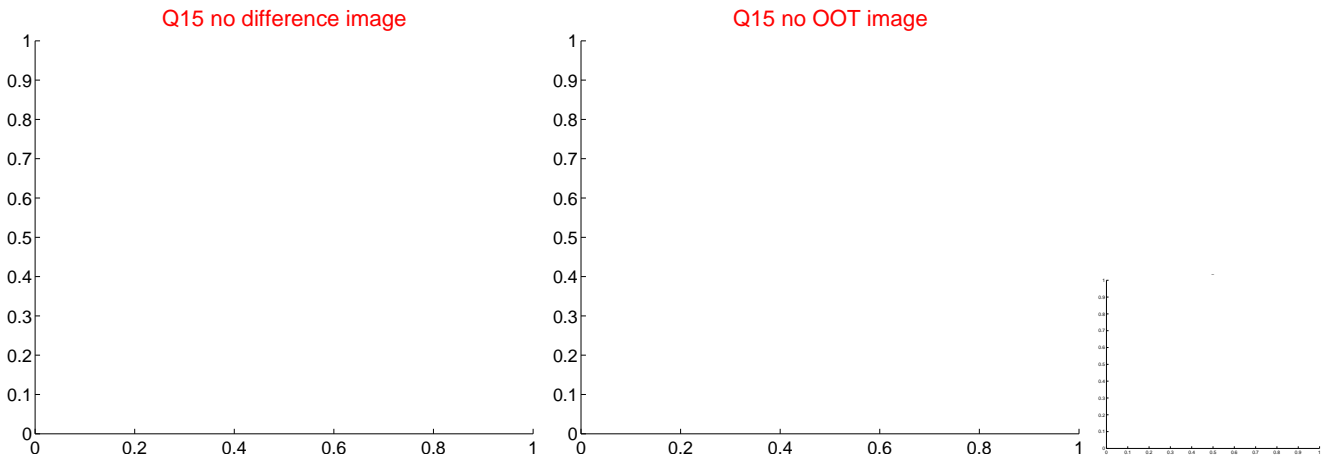
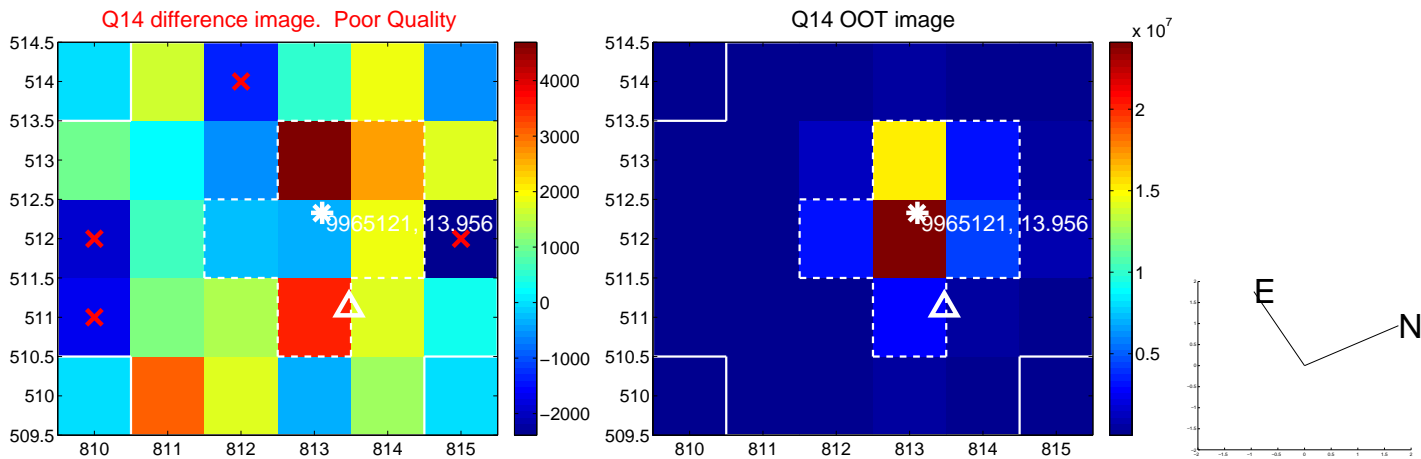
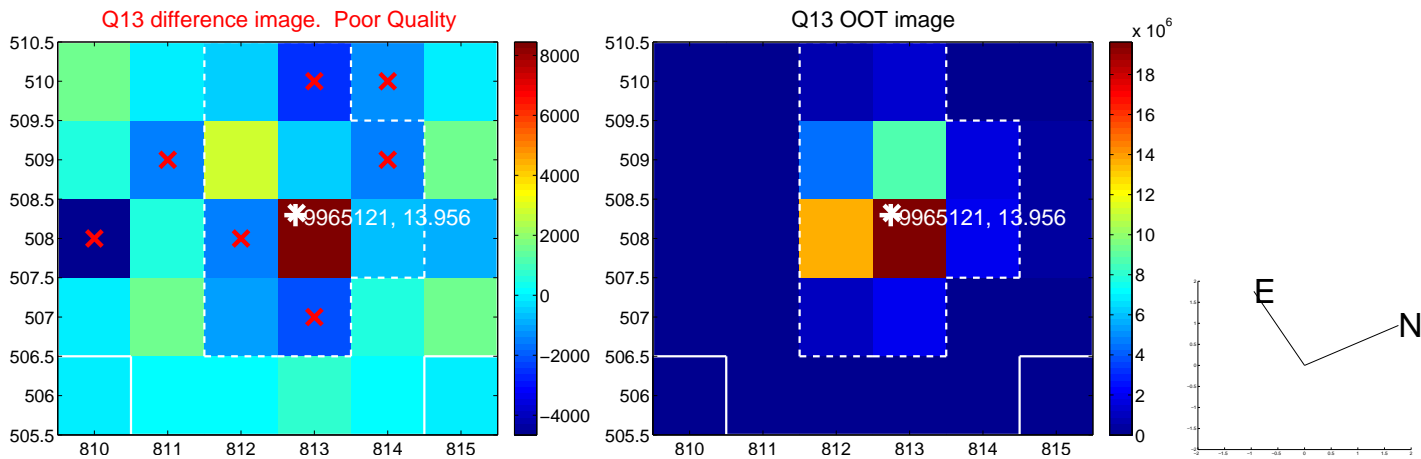
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ×: large negative pixel value.



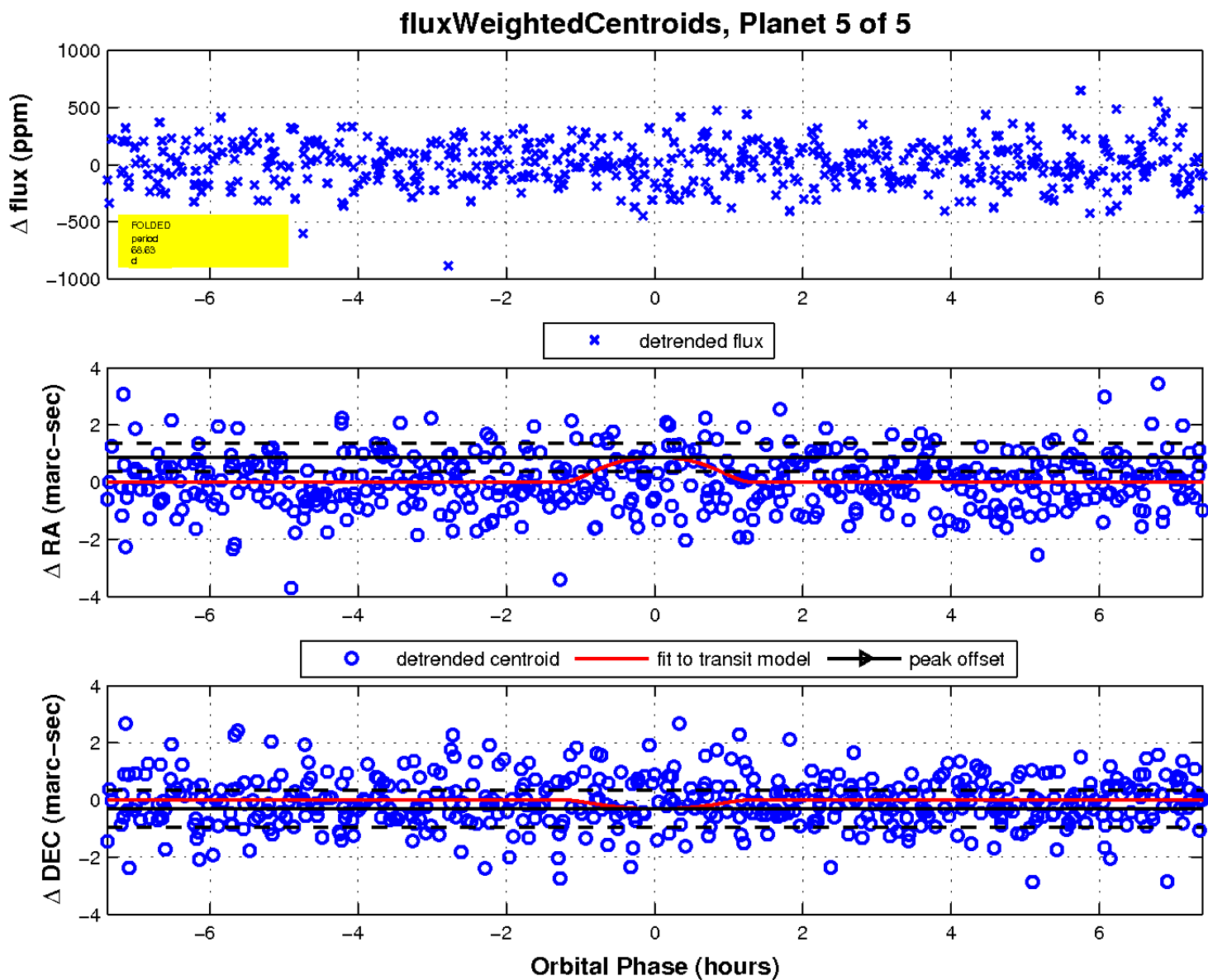
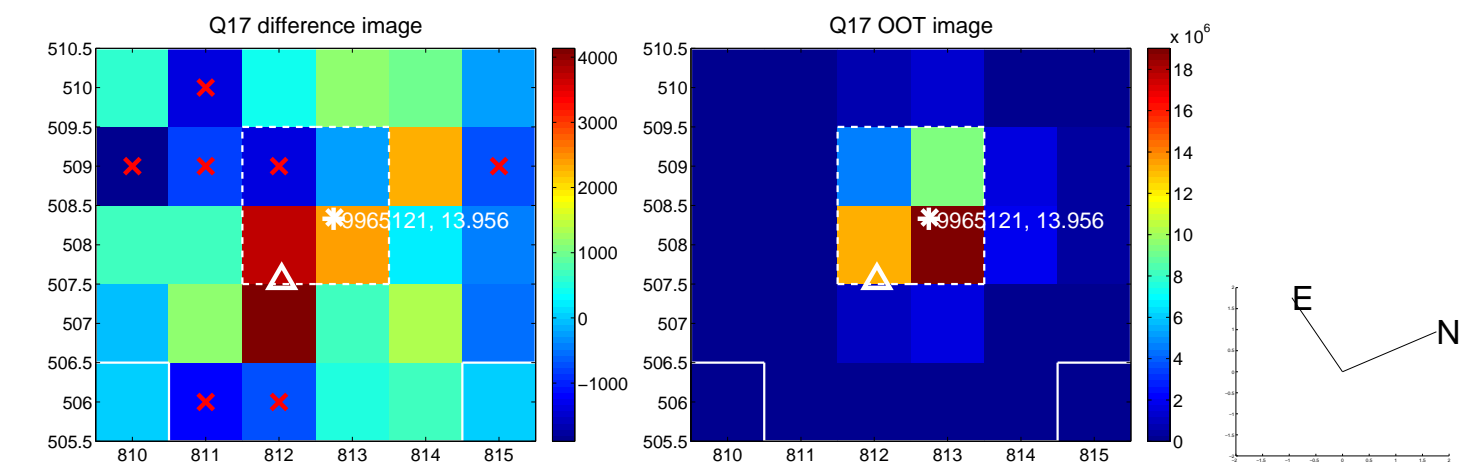
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

