

# KIC 004665568

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004665568-01	OBS	No	380.075911	135.954435	1161.2	4.743	17.4	5.9	1.61	6046	5.66	3.12
004665568-02	OBS	No	304.093263	361.640018	3014.6	7.694	18.2	10.0	1.61	6046	11.01	4.20
004665568-03	OBS	No	174.366829	193.977661	718.8	2.098	13.5	6.4	1.61	6046	4.90	8.81
004665568-04	OBS	No	177.590702	184.444065	955.4	3.082	12.6	6.1	1.61	6046	5.15	8.60

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004665568-01	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS—HALO_GHOST
004665568-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS
004665568-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_MEAS
004665568-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV

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

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

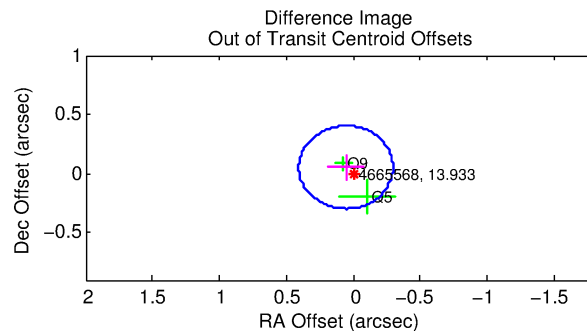
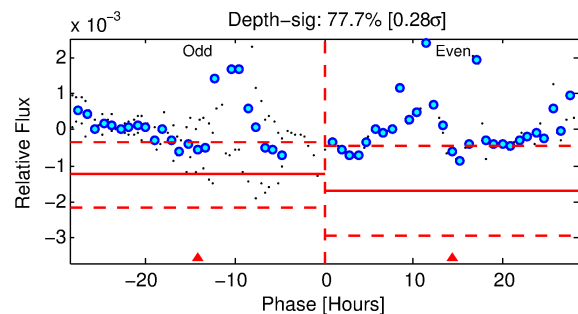
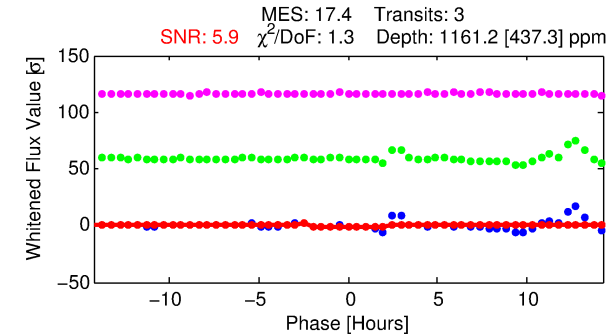
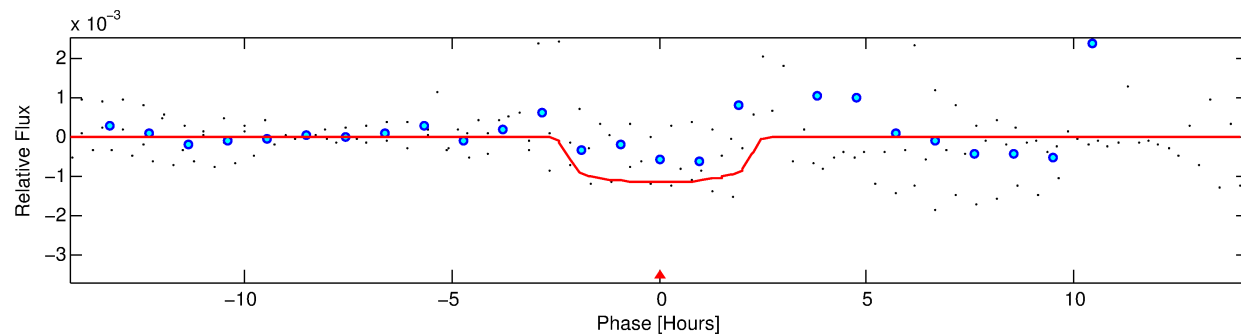
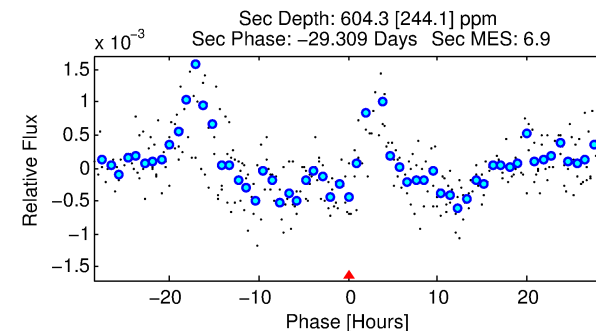
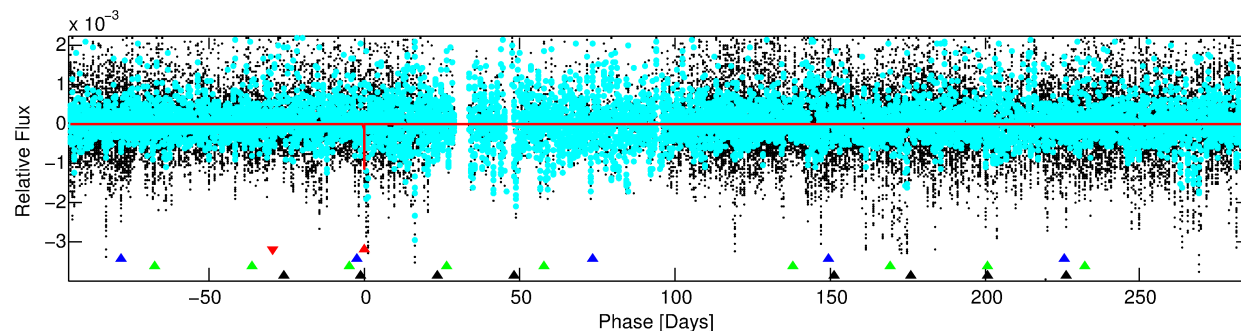
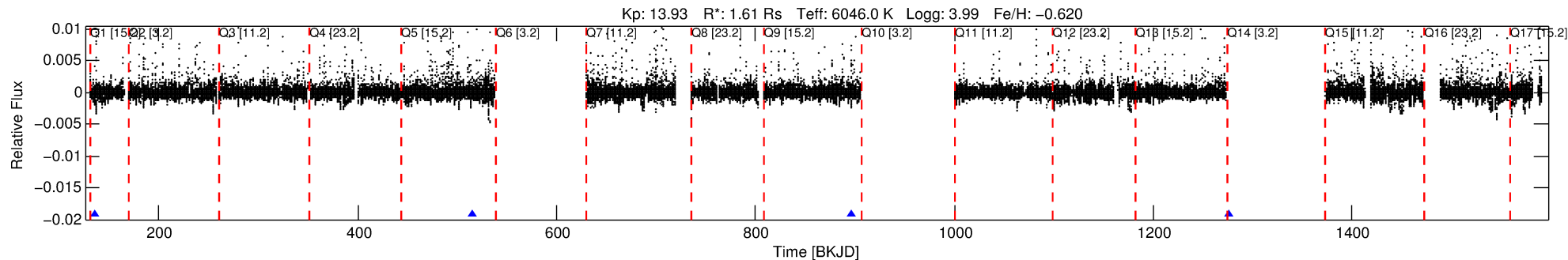
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 004665568-01

No Significant Match Found

# DV One-Page Summary

KIC: 4665568 Candidate: 1 of 4 Period: 380.076 d



## DV Fit Results:

Period = 380.07591 [0.00886] d  
Epoch = 135.9544 [0.0126] BKJD  
Rp/R\* = 0.0323 [0.0375]  
a/R\* = 546.35 [3120.42]  
b = 0.52 [8.10]  
Seff = 3.12 [2.53]  
Teq = 339 [69] K  
Rp = 5.66 [7.03] Re  
a = 0.9969 [0.4714] AU  
Ag = 10298.78 [25687.75] [0.40σ]  
Teff = 5278 [3120] K [1.58σ]

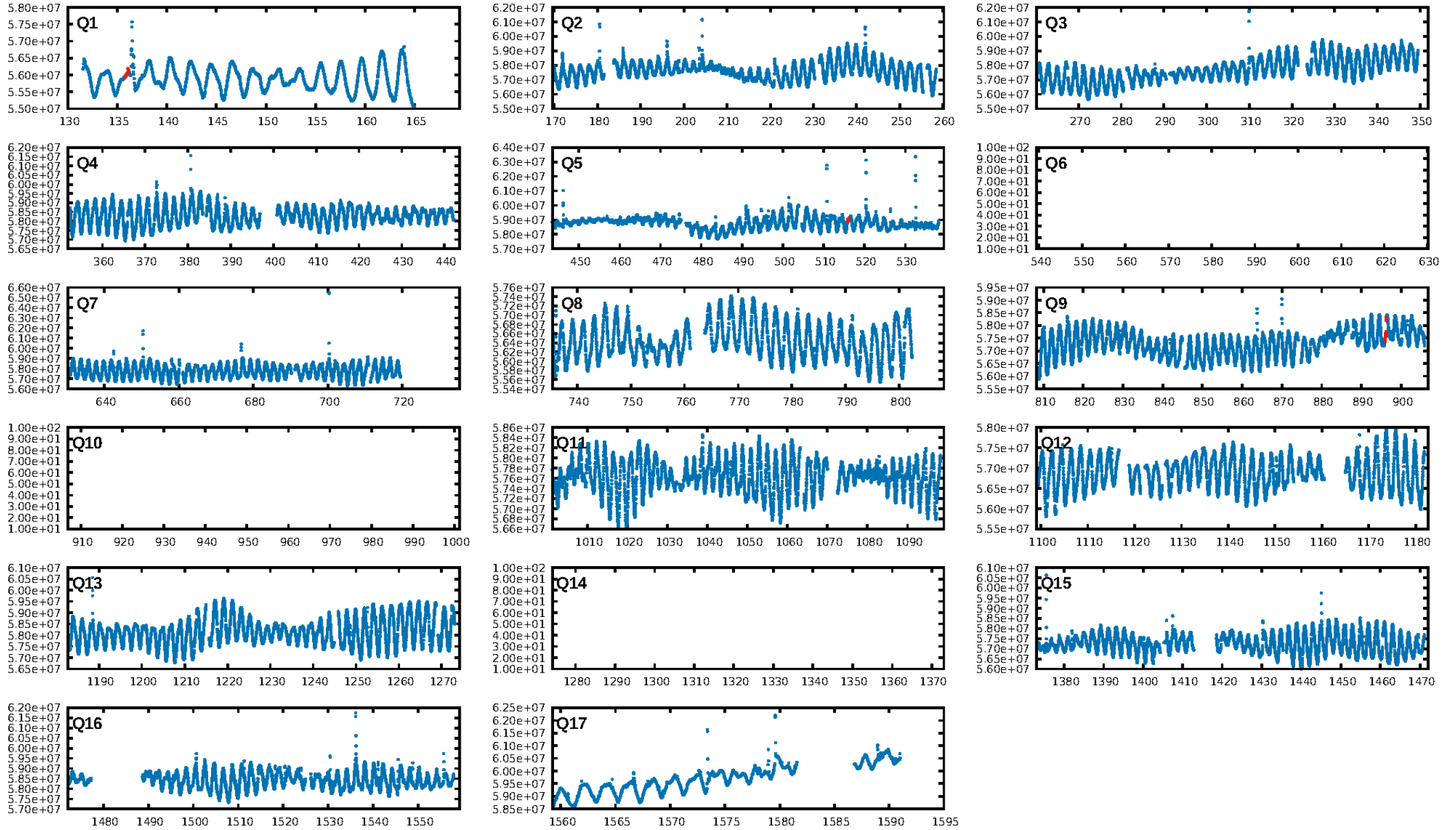
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [201.76σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 32.0%  
ModelChiSquareGof-sig: 95.6%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [2/2]  
GhostDiagnostic-chr: 0.2061  
Centroid-sig: 19.1%  
Centroid-so: 1.302 arcsec [1.07σ]  
OotOffset-rm: 0.078 arcsec [0.67σ]  
KicOffset-rm: 0.148 arcsec [1.10σ]  
OotOffset-st: 0/0/0/2 [2]  
KicOffset-st: 0/0/0/2 [2]  
DiffImageQuality-fgm: 0.50 [1/2]  
DiffImageOverlap-fno: 1.00 [3/3]

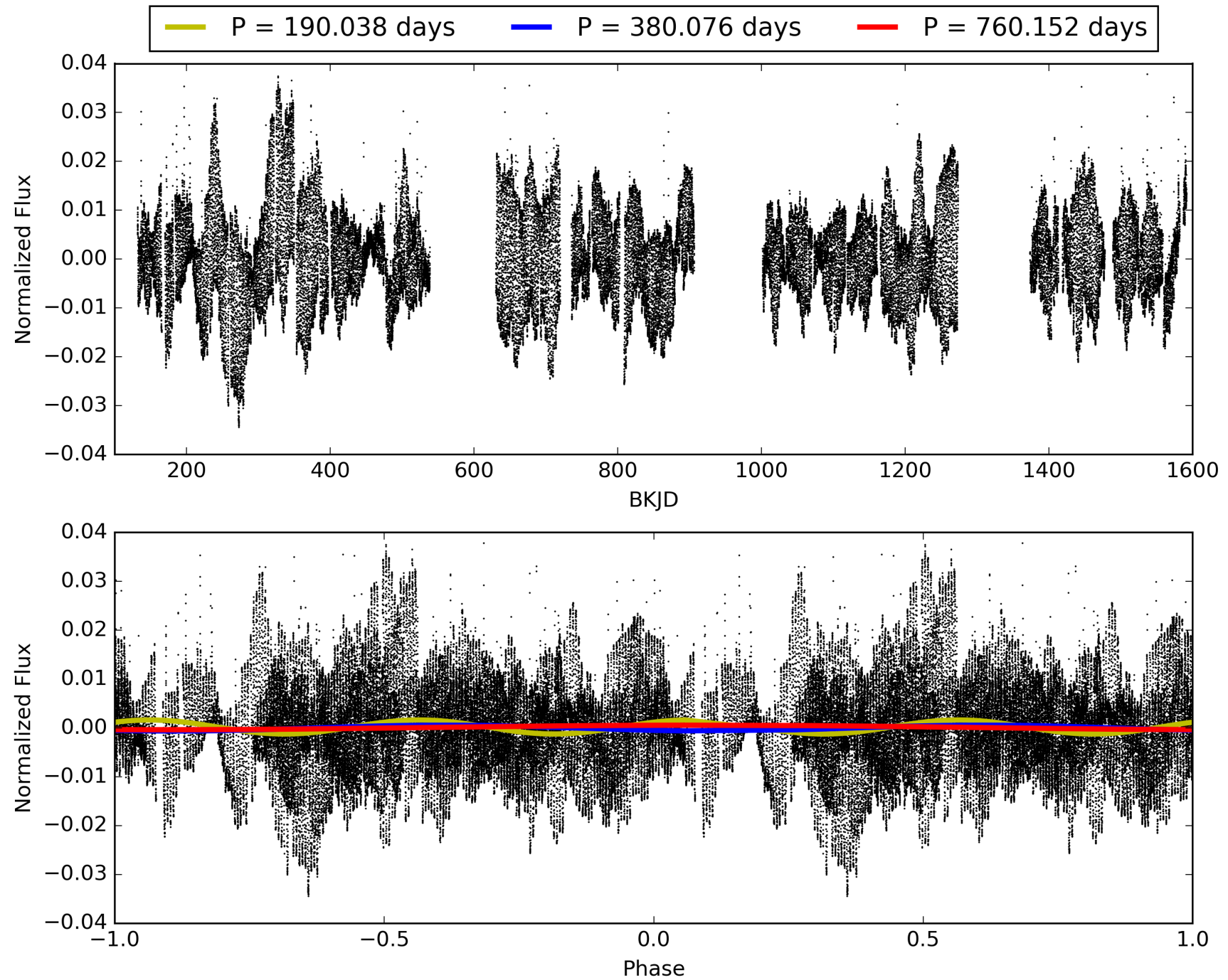
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 05:02:58 Z

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

# TCE 004665568-01, PDC Light Curves



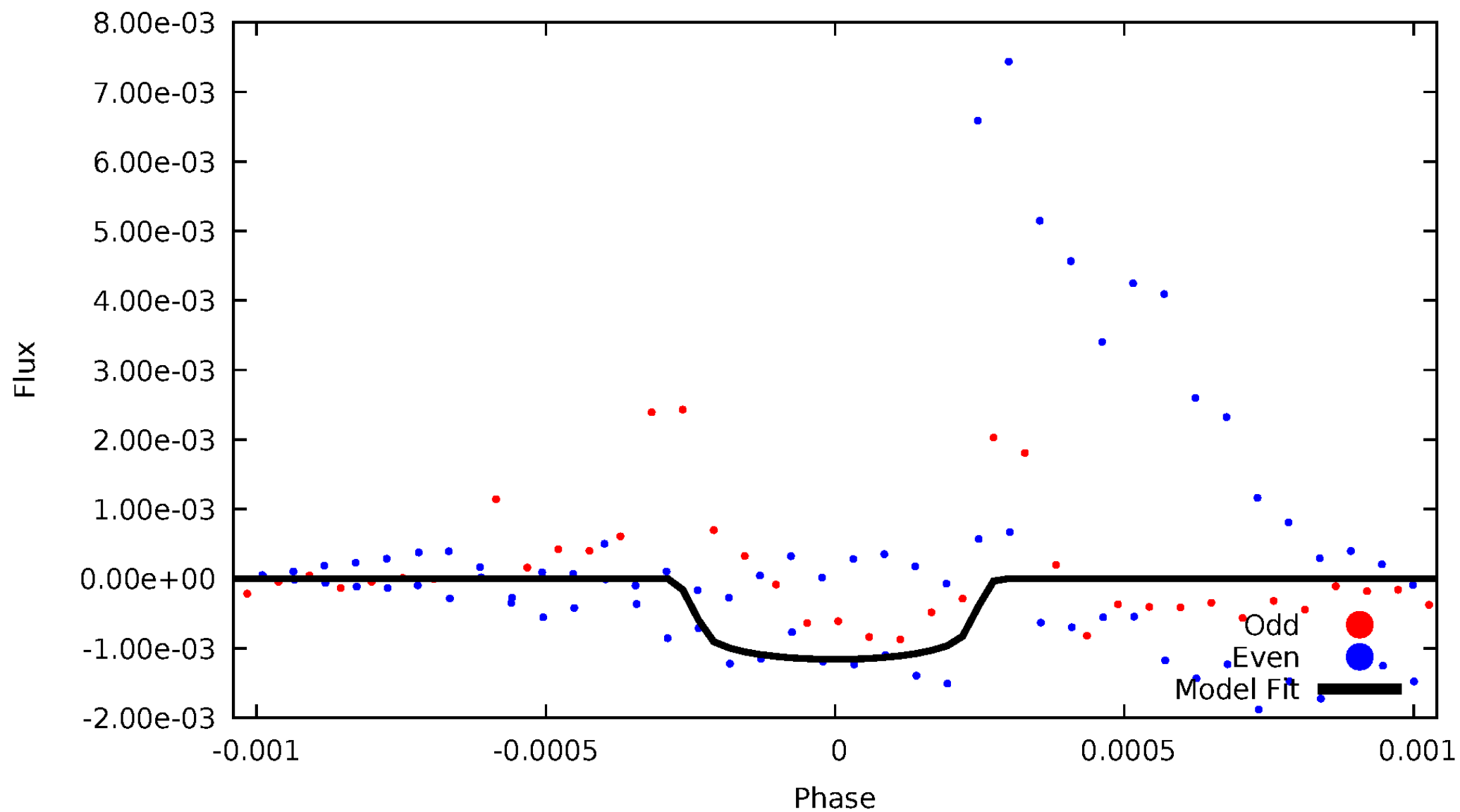
TCE 004665568-01





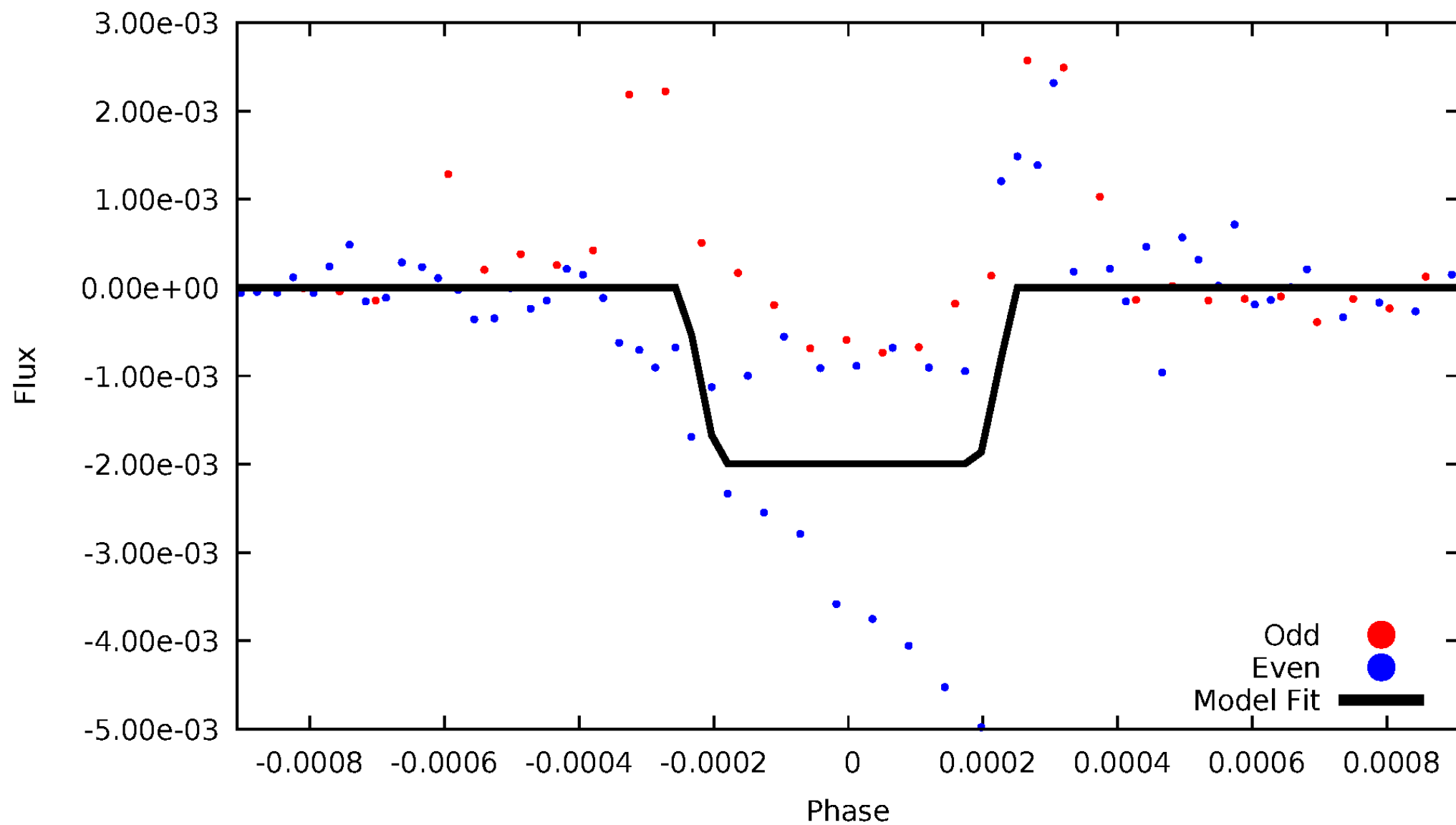
# DV Odd/Even

TCE 004665568-01



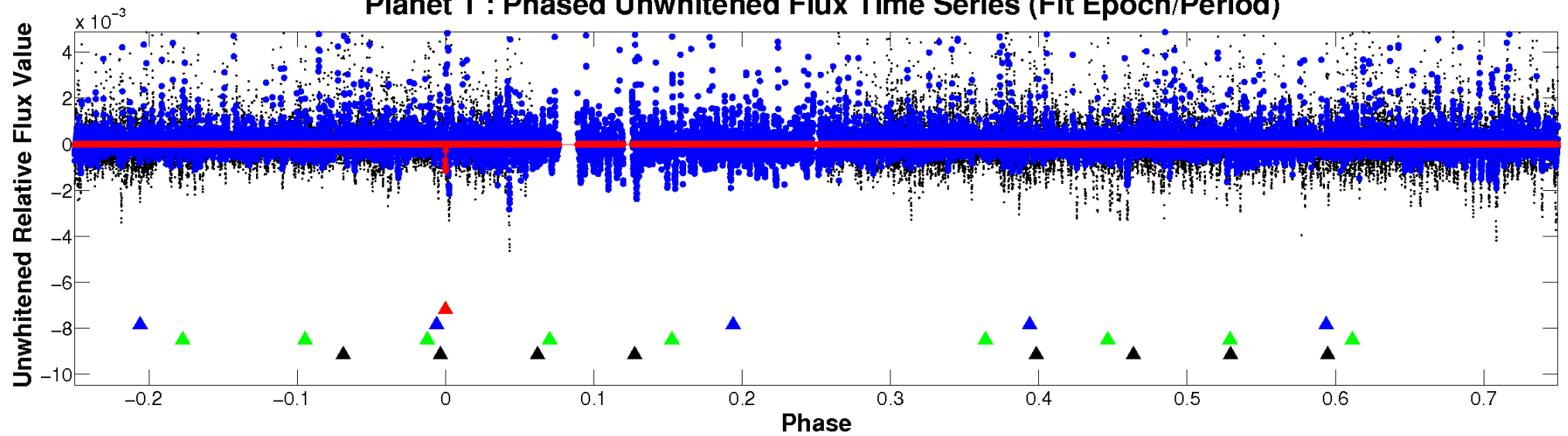
# ALT Odd/Even

TCE 004665568-01

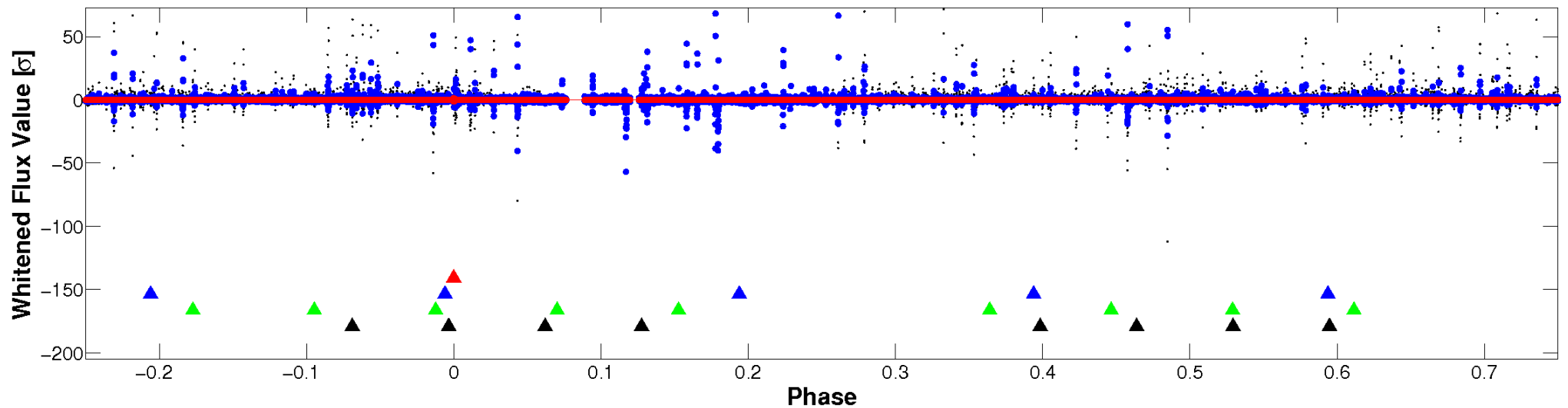


# Non-Whitened Vs. Whitened Light Curve

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

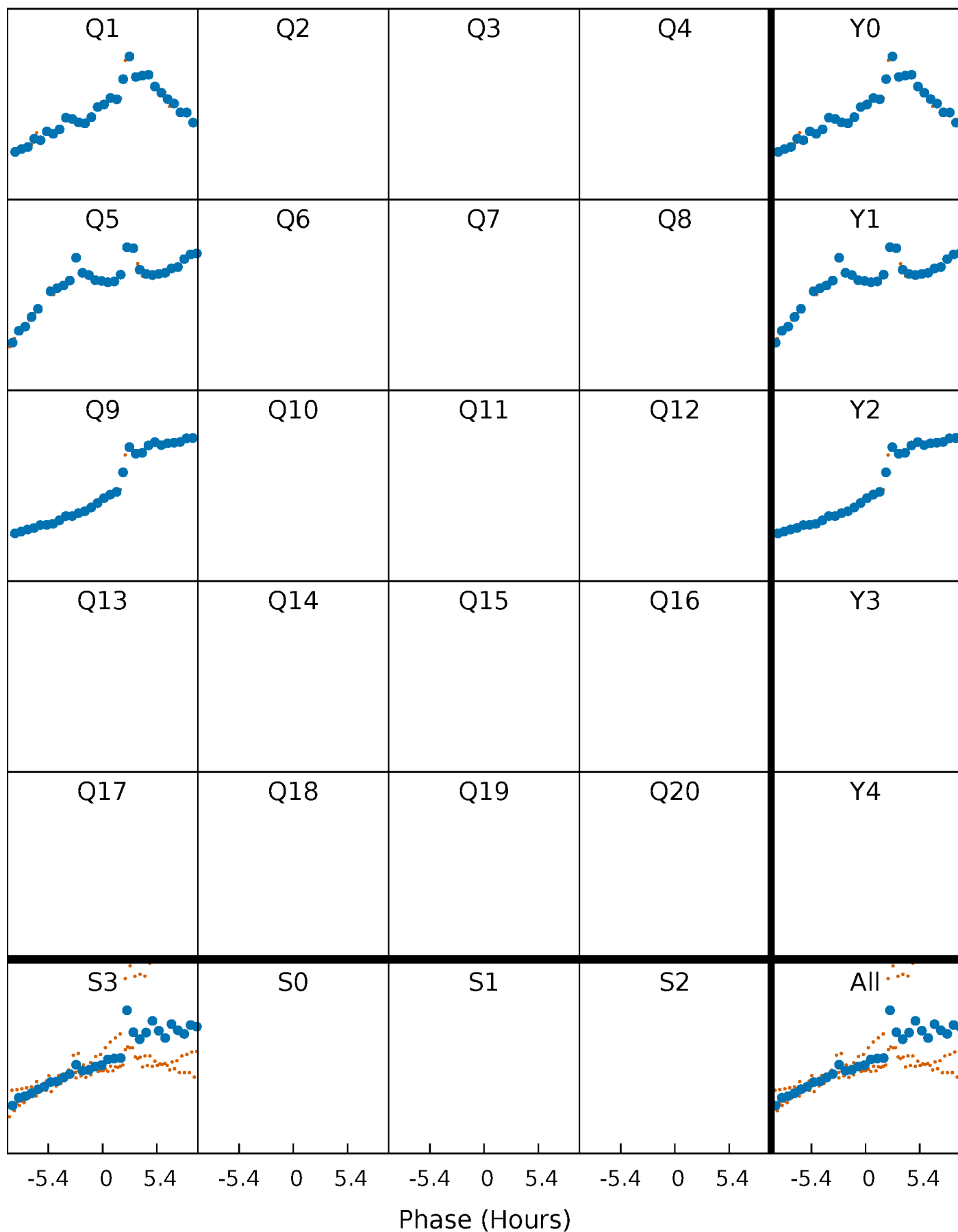


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



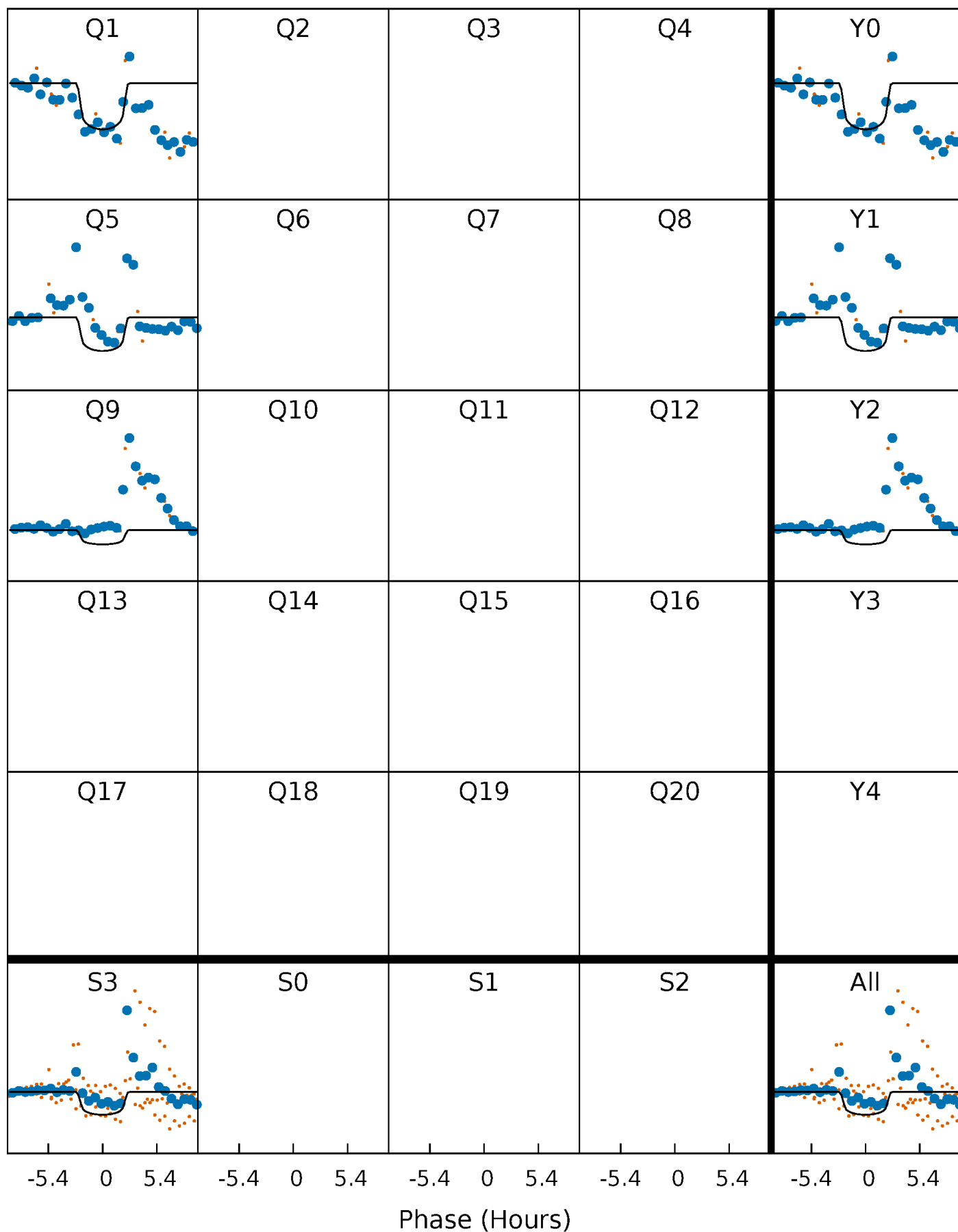
# PDC Quarter-Phased Transit Curves

TCE 004665568-01 P=380.075911 Days  $T_0=135.954435$  (BKJD)



# DV Quarter-Phased Transit Curves

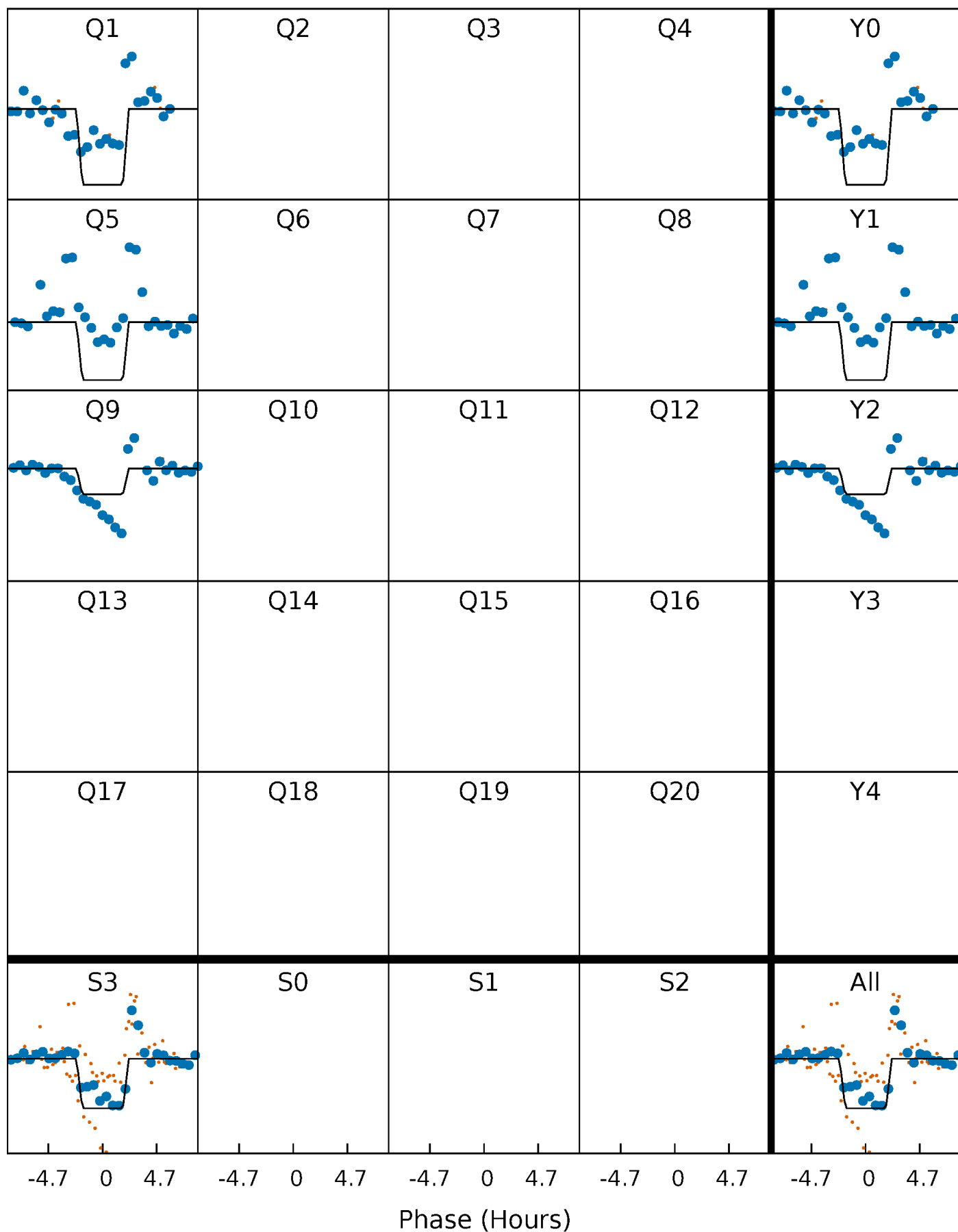
TCE 004665568-01 P=380.075911 Days  $T_0=135.954435$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

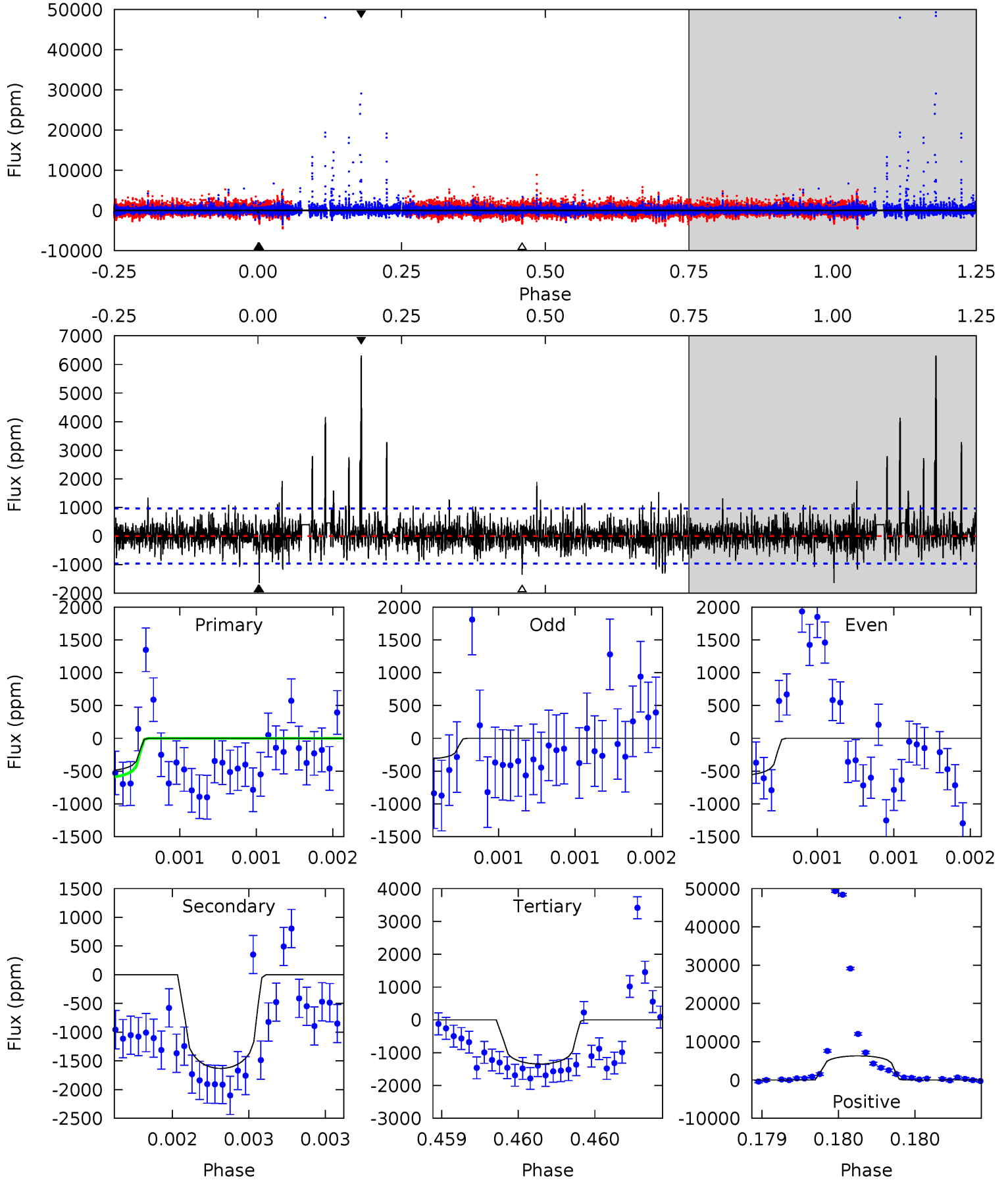
TCE 004665568-01 P=380.071027 Days  $T_0=135.962449$  (BKJD)



# DV Model-Shift Uniqueness Test

004665568-01, P = 380.075911 Days, E = 135.954435 Days

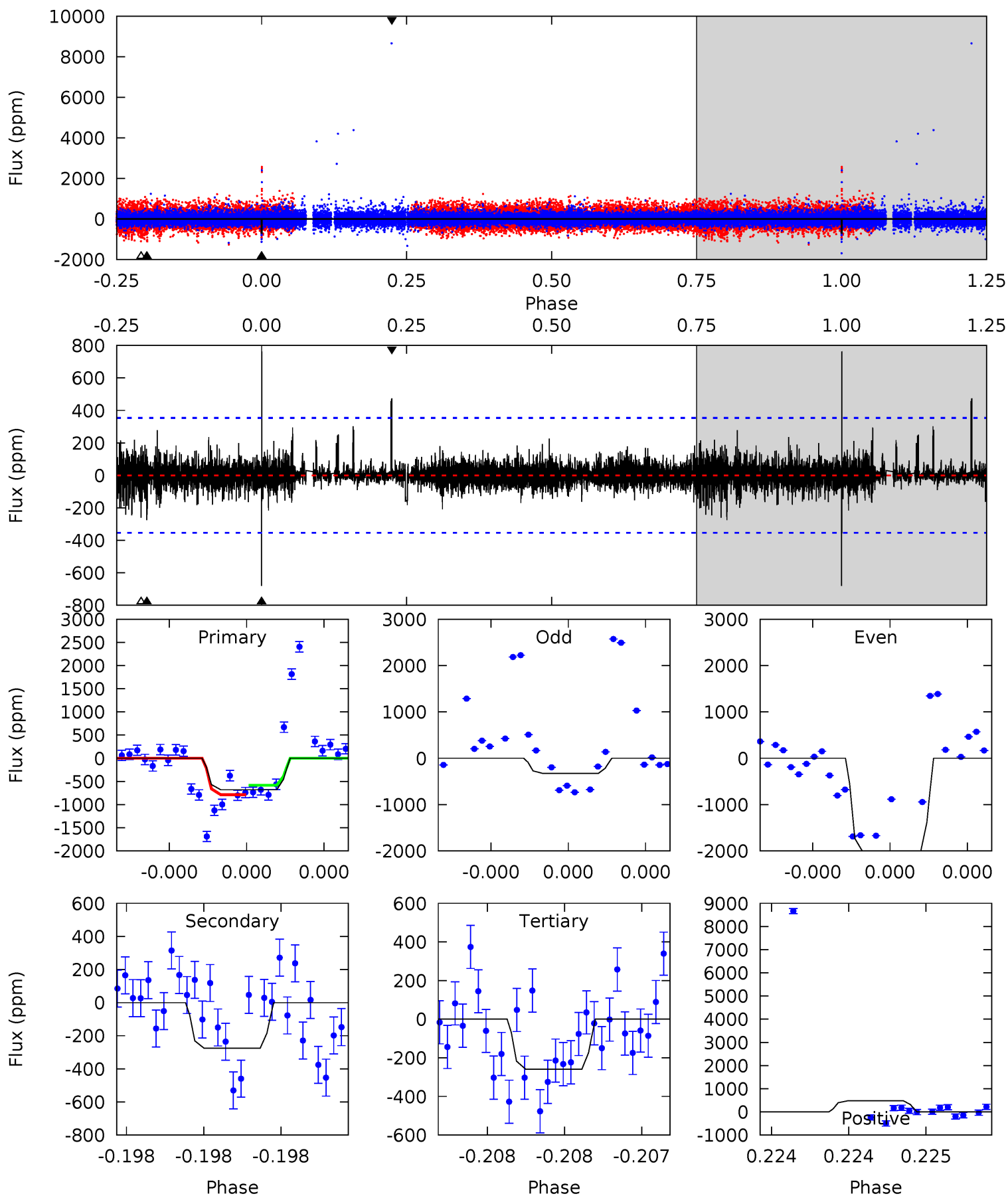
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
2.87	9.45	7.79	36.5	5.57	3.47	2.16	-4.93	-33.7	1.66	-27.1	0.57	1.17	0.79	0.61



# Alt Model-Shift Uniqueness Test

004665568-01, P = 380.071027 Days, E = 135.962449 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
10.8	4.37	4.11	7.51	5.59	3.51	0.80	6.65	3.25	0.26	-3.14	14.7	1.96	0.53	1.62



### Stellar Parameters For KIC 004665568

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6046^{+181}_{-181}$	$3.986^{+0.487}_{-0.162}$	$-0.620^{+0.300}_{-0.250}$	$1.609^{+0.466}_{-0.699}$	$0.915^{+0.118}_{-0.118}$	$0.309^{+1.396}_{-0.132}$
	+3%/-3%	+12%/-4%	+48%/-40%	+29%/-43%	+13%/-13%	+451%/-43%
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 004665568-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-1632 \pm 173$	$6.57^{+6.05}_{-4.12}$	$463^{+40}_{-61}$	$6023^{+5102}_{-1457}$	$21192^{+135781}_{-15530}$
Alt.	$-276 \pm 63$	$8.05^{+6.18}_{-5.02}$	$463^{+40}_{-60}$	$3836^{+1681}_{-603}$	$2367^{+13987}_{-1635}$

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

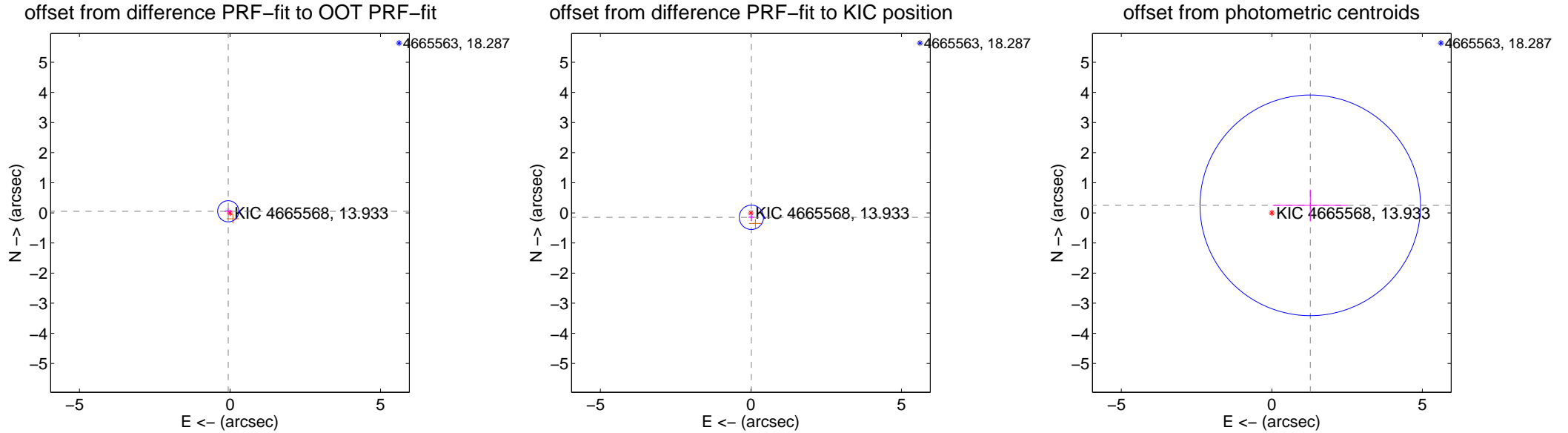
## DV Centroid Data

Supplemental centroid analysis for 004665568-01. Kepler magnitude: 13.93. Transit SNR 5.87

There are 1 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.22 arcsec

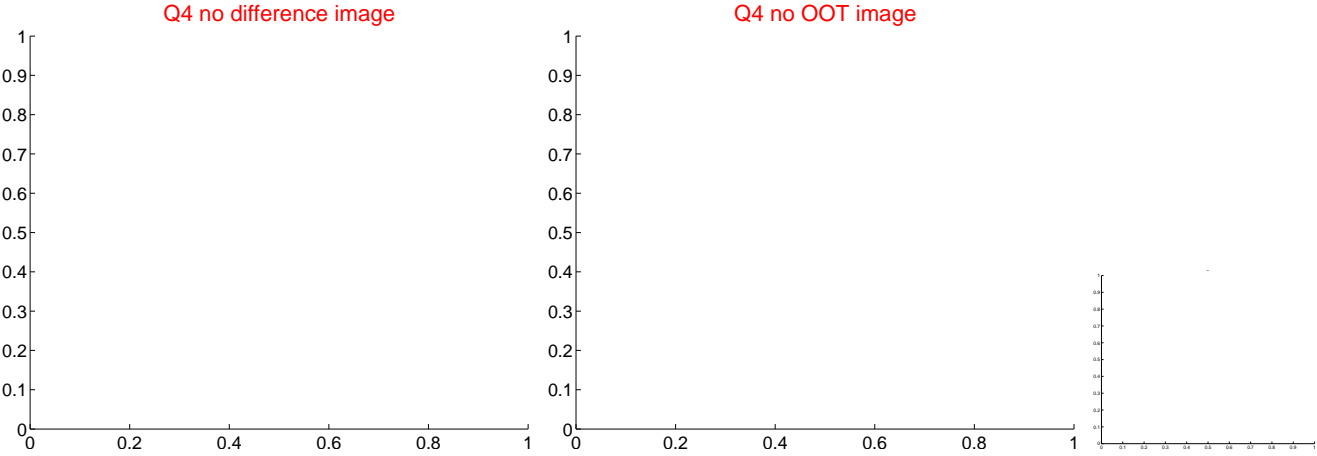
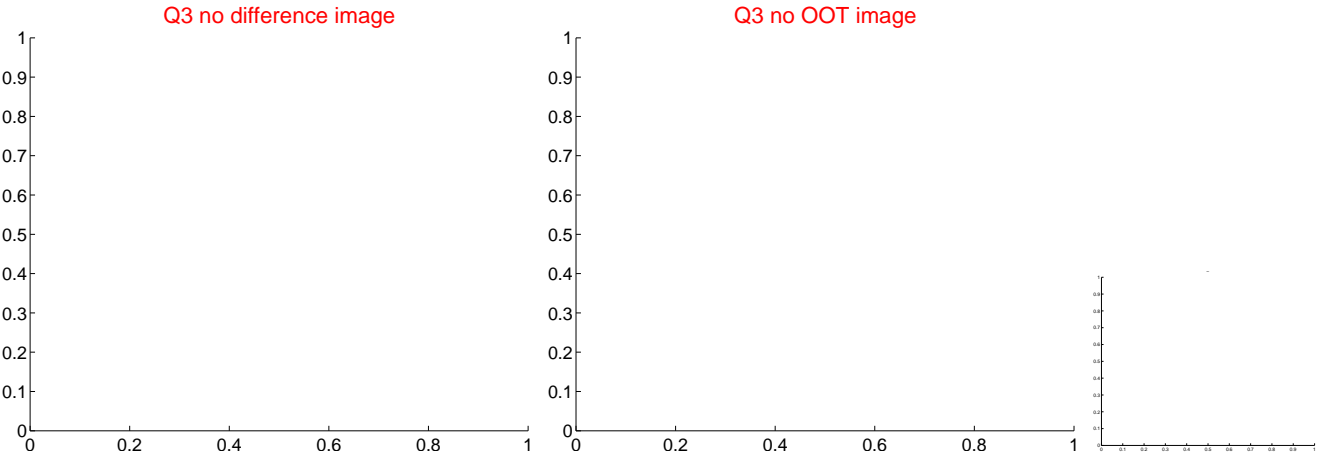
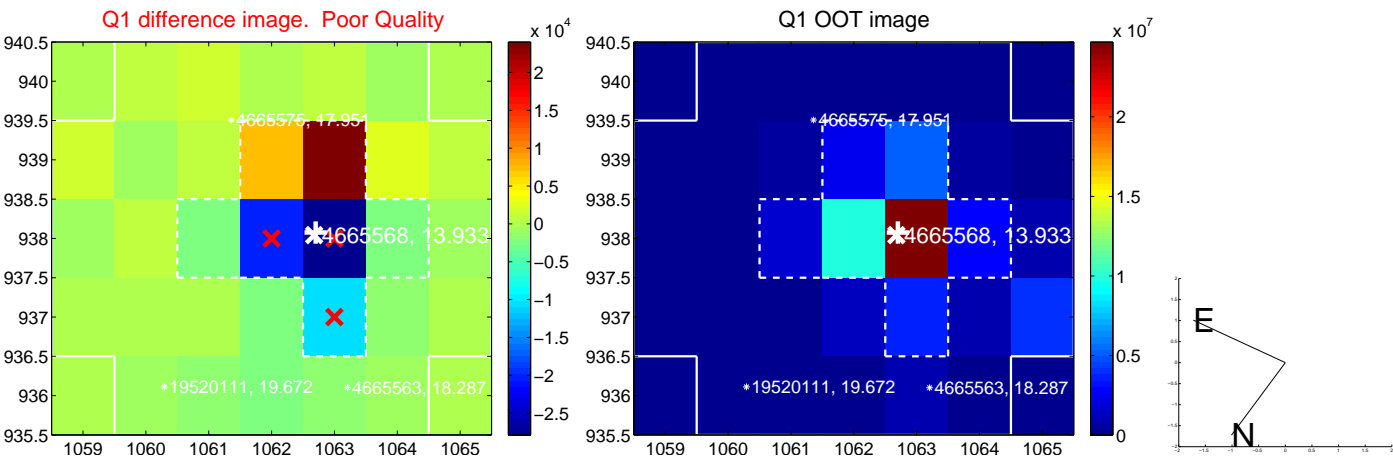
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.078 \pm 0.117$	0.67	$0.058 \pm 0.128$	$0.053 \pm 0.103$
PRF-fit source offset from KIC position	$0.148 \pm 0.135$	1.10	$-0.016 \pm 0.096$	$-0.148 \pm 0.129$
photometric centroid source offset	$1.30 \pm 1.22$	1.07	$-1.28 \pm 1.24$	$0.25 \pm 0.53$



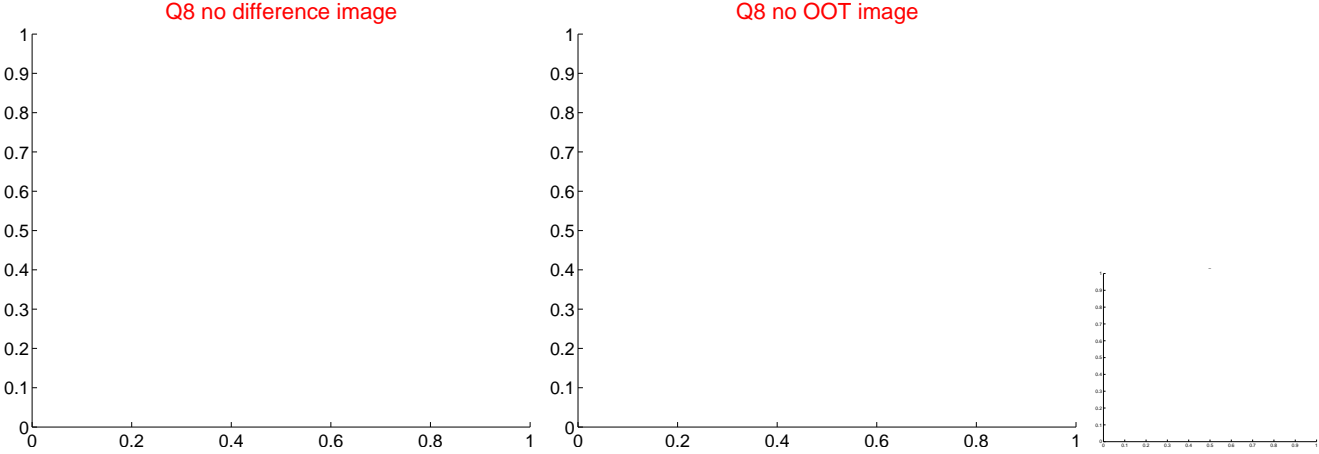
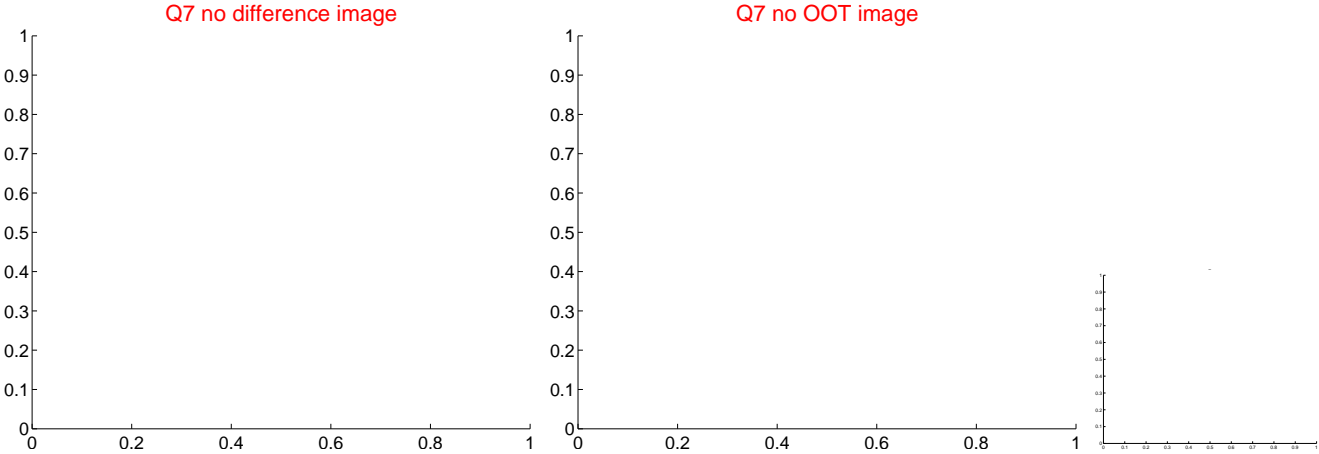
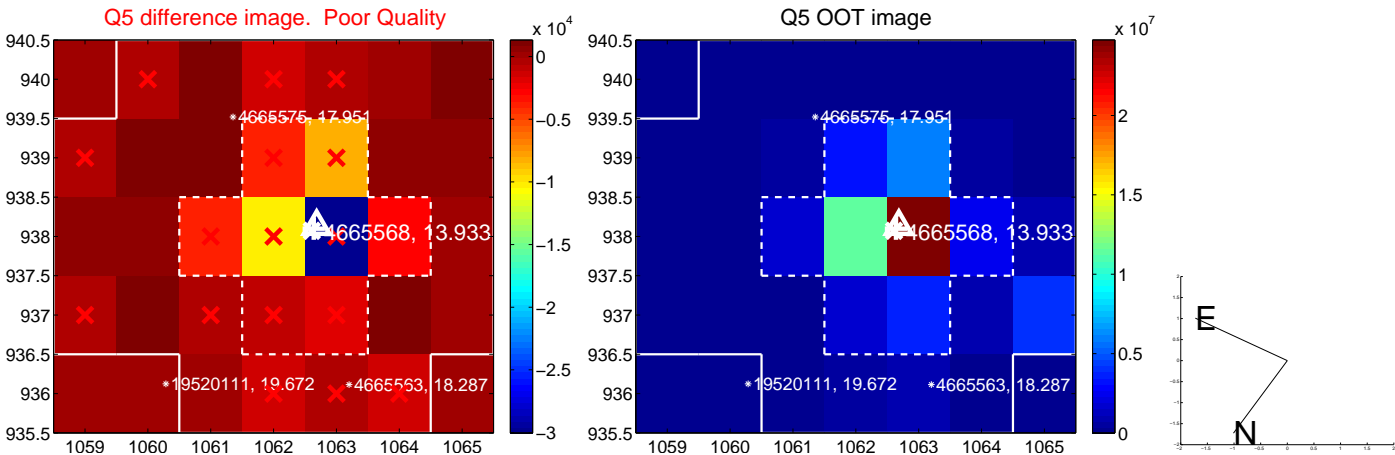
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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



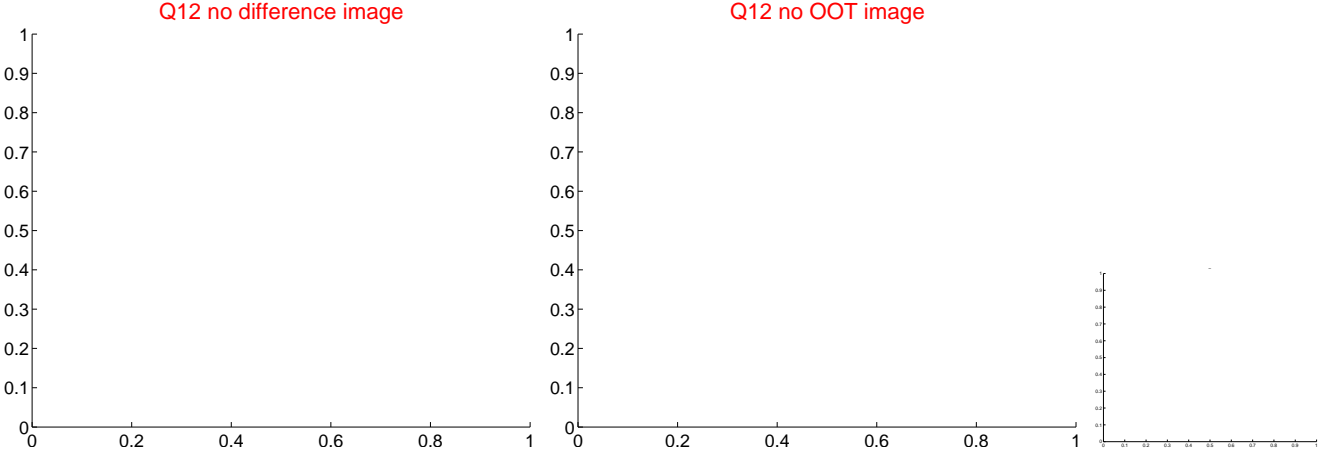
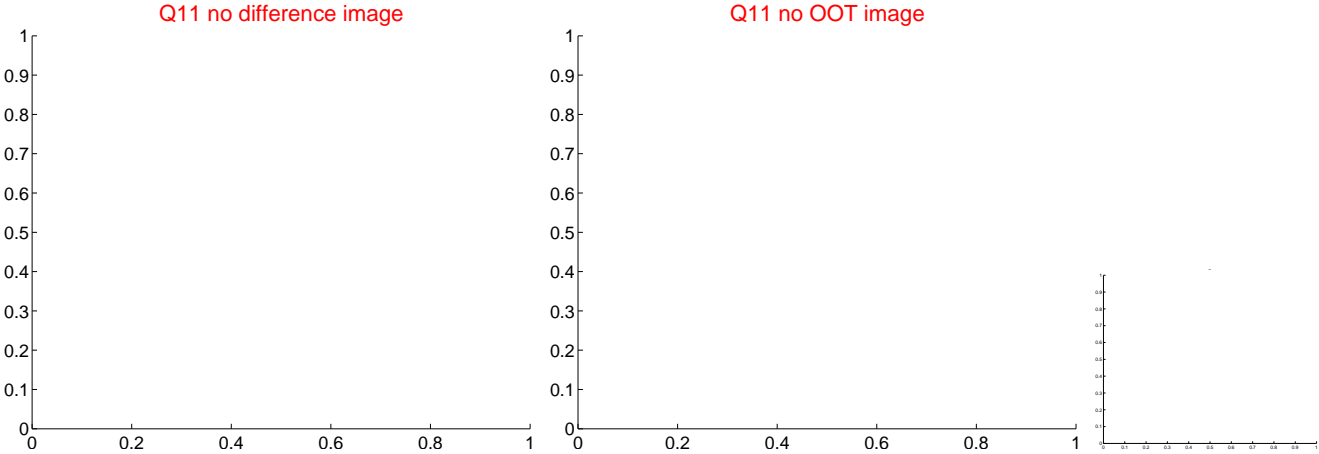
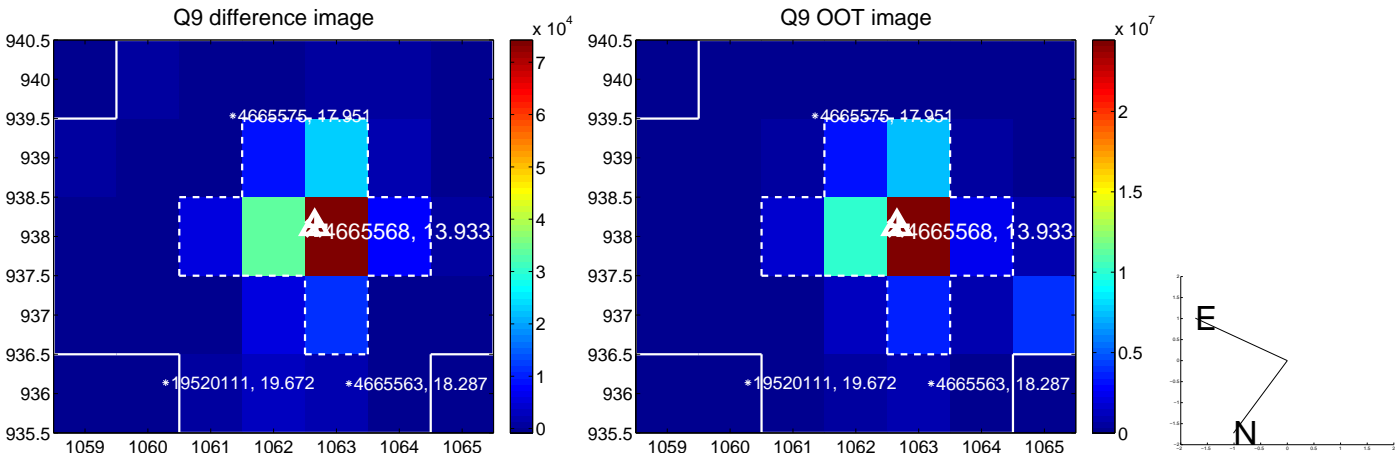
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



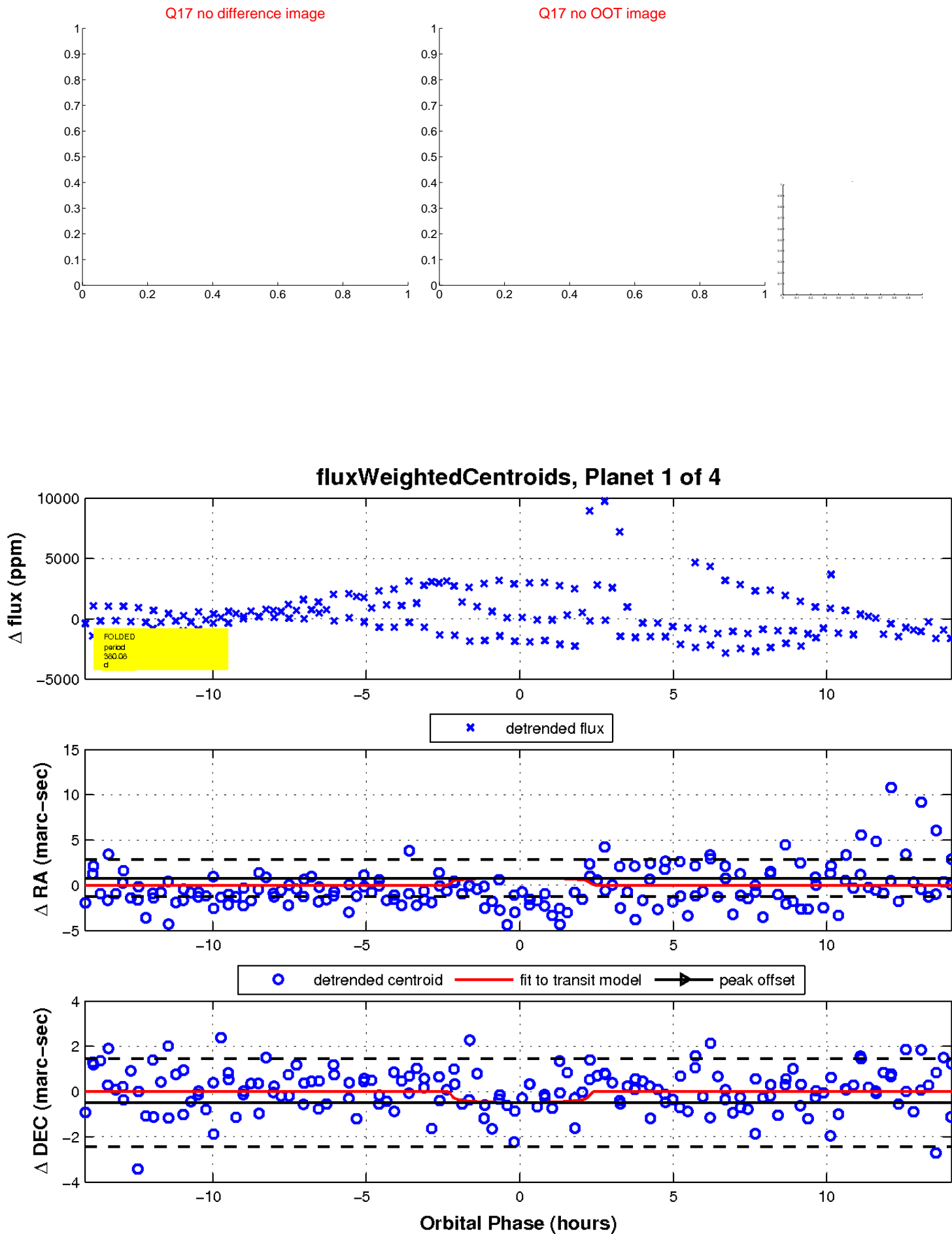
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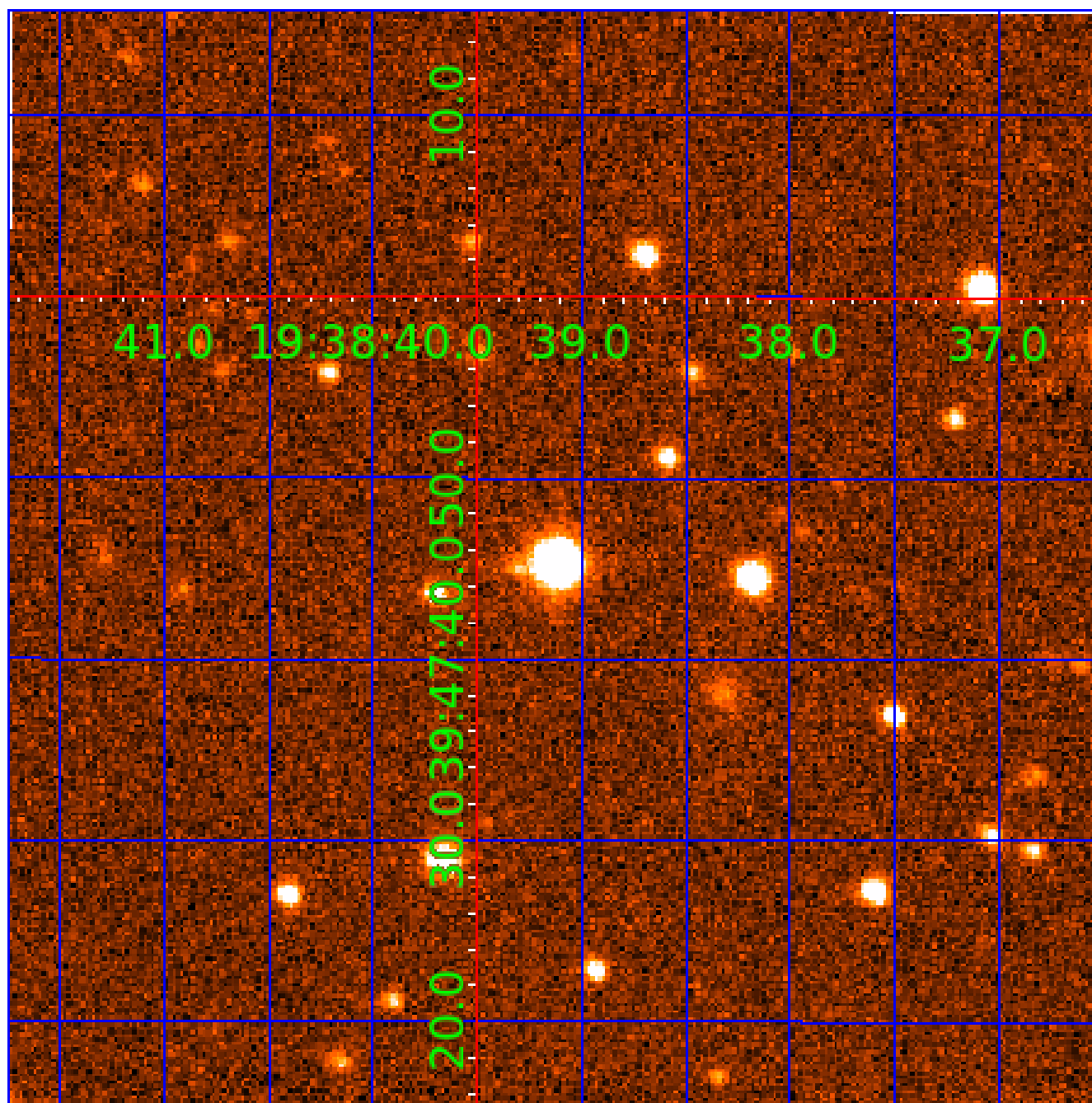
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





# UKIRT Image

Declination



# KIC 004665568

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004665568-01	OBS	No	380.075911	135.954435	1161.2	4.743	17.4	5.9	1.61	6046	5.66	3.12
004665568-02	OBS	No	304.093263	361.640018	3014.6	7.694	18.2	10.0	1.61	6046	11.01	4.20
004665568-03	OBS	No	174.366829	193.977661	718.8	2.098	13.5	6.4	1.61	6046	4.90	8.81
004665568-04	OBS	No	177.590702	184.444065	955.4	3.082	12.6	6.1	1.61	6046	5.15	8.60

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004665568-01	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS—HALO_GHOST
004665568-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS
004665568-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_MEAS
004665568-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV

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

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

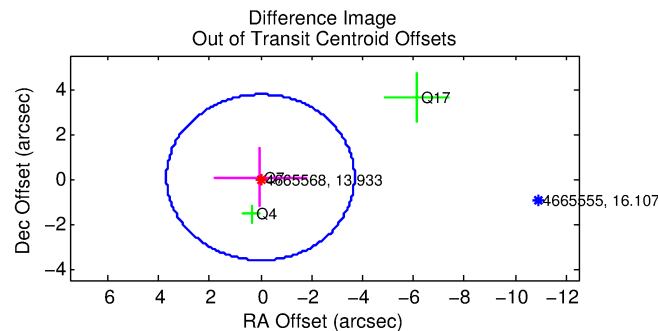
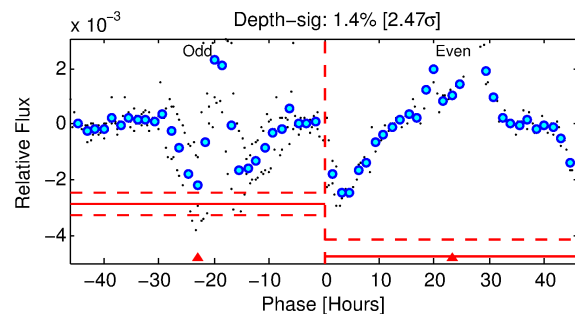
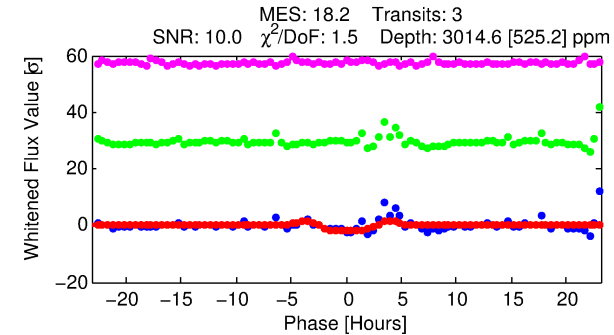
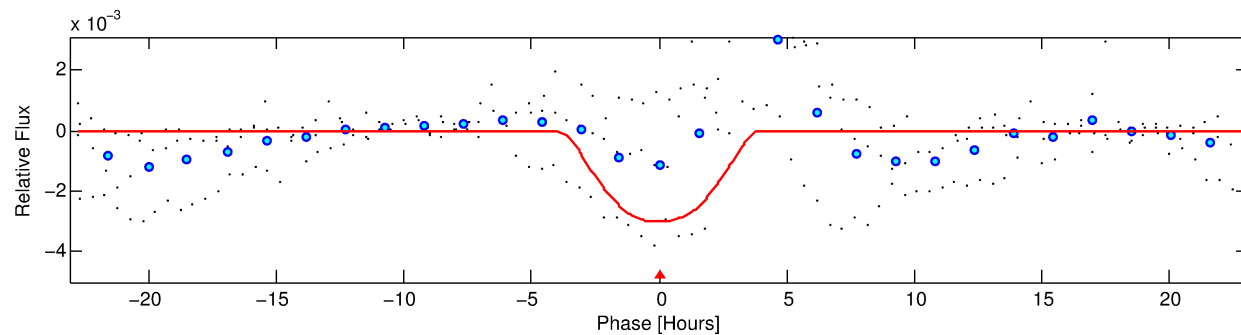
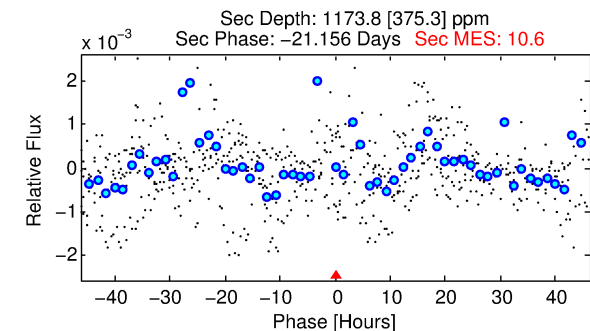
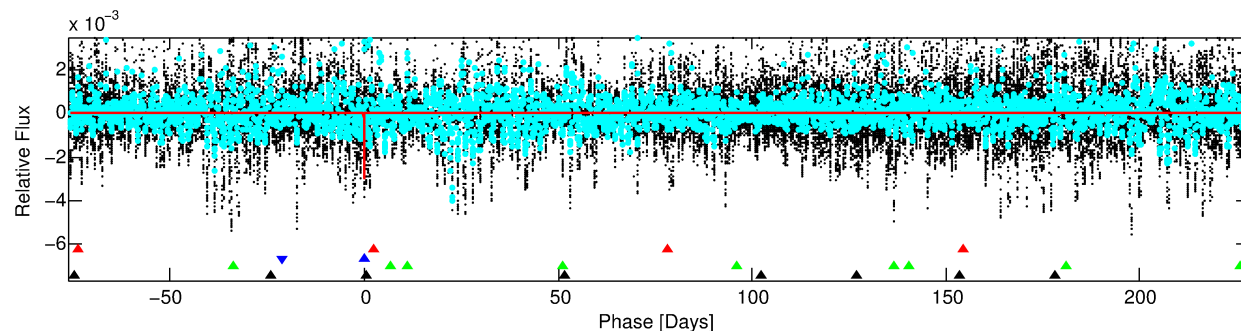
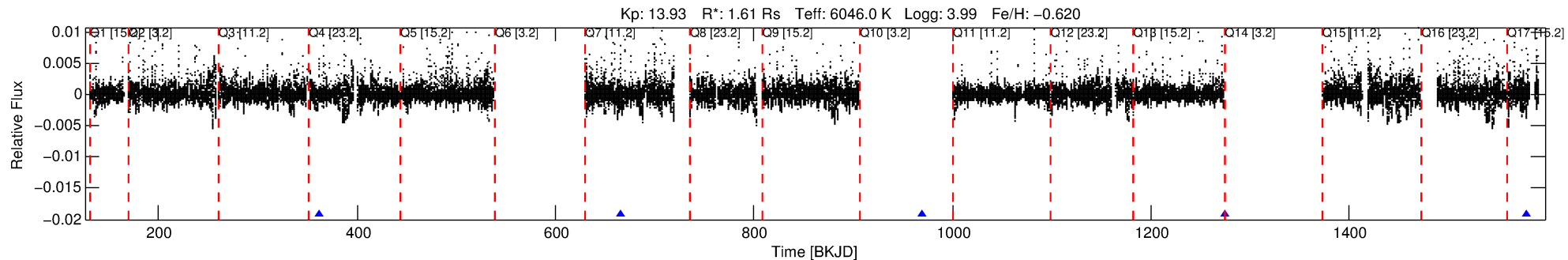
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 004665568-02

No Significant Match Found

# DV One-Page Summary

KIC: 4665568 Candidate: 2 of 4 Period: 304.093 d



## DV Fit Results:

Period = 304.09326 [0.00402] d  
Epoch = 361.6400 [0.0080] BKJD  
Rp/R\* = 0.0627 [0.0086]  
a/R\* = 149.06 [15.59]  
b = 0.94 [0.02]  
Seff = 4.20 [3.40]  
Teq = 365 [74] K  
Rp = 11.01 [5.02] Re  
a = 0.8592 [0.4063] AU  
Ag = 3931.02 [3560.84] [1.10σ]  
Teff = 4469 [490] K [8.29σ]

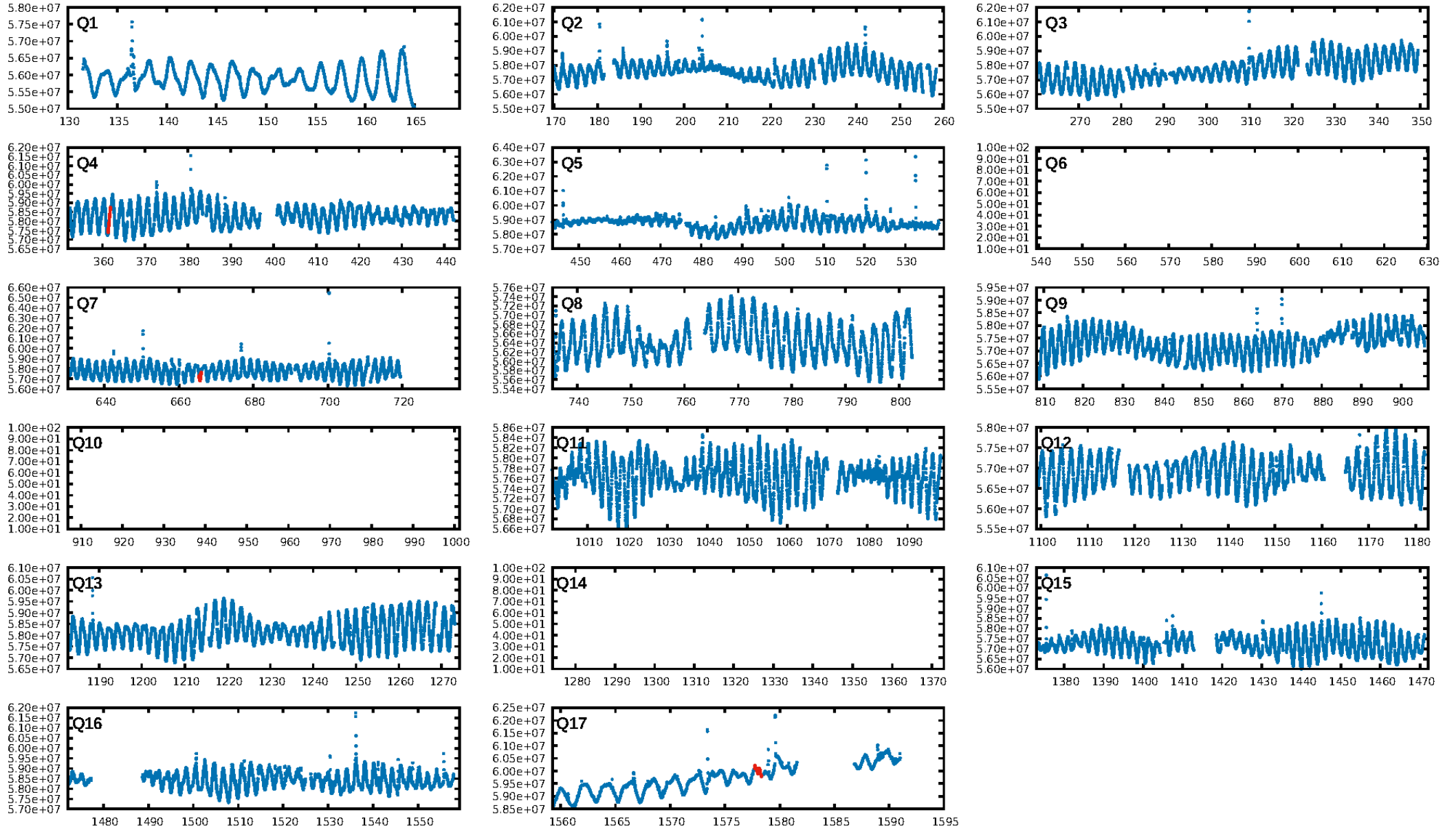
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [366.29σ]  
LongPeriod-sig: 100.0% [201.76σ]  
ModelChiSquare2-sig: 62.4%  
ModelChiSquareGof-sig: 56.9%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [2/2]  
GhostDiagnostic-chr: -2.107  
Centroid-sig: 34.8%  
Centroid-so: 0.302 arcsec [0.95σ]  
OotOffset-rm: 0.068 arcsec [0.06σ]  
KicOffset-rm: 0.184 arcsec [0.11σ]  
OotOffset-st: 0/1/1/1 [3]  
KicOffset-st: 0/1/1/1 [3]  
DiffImageQuality-fgm: 0.33 [1/3]  
DiffImageOverlap-fno: 0.67 [2/3]

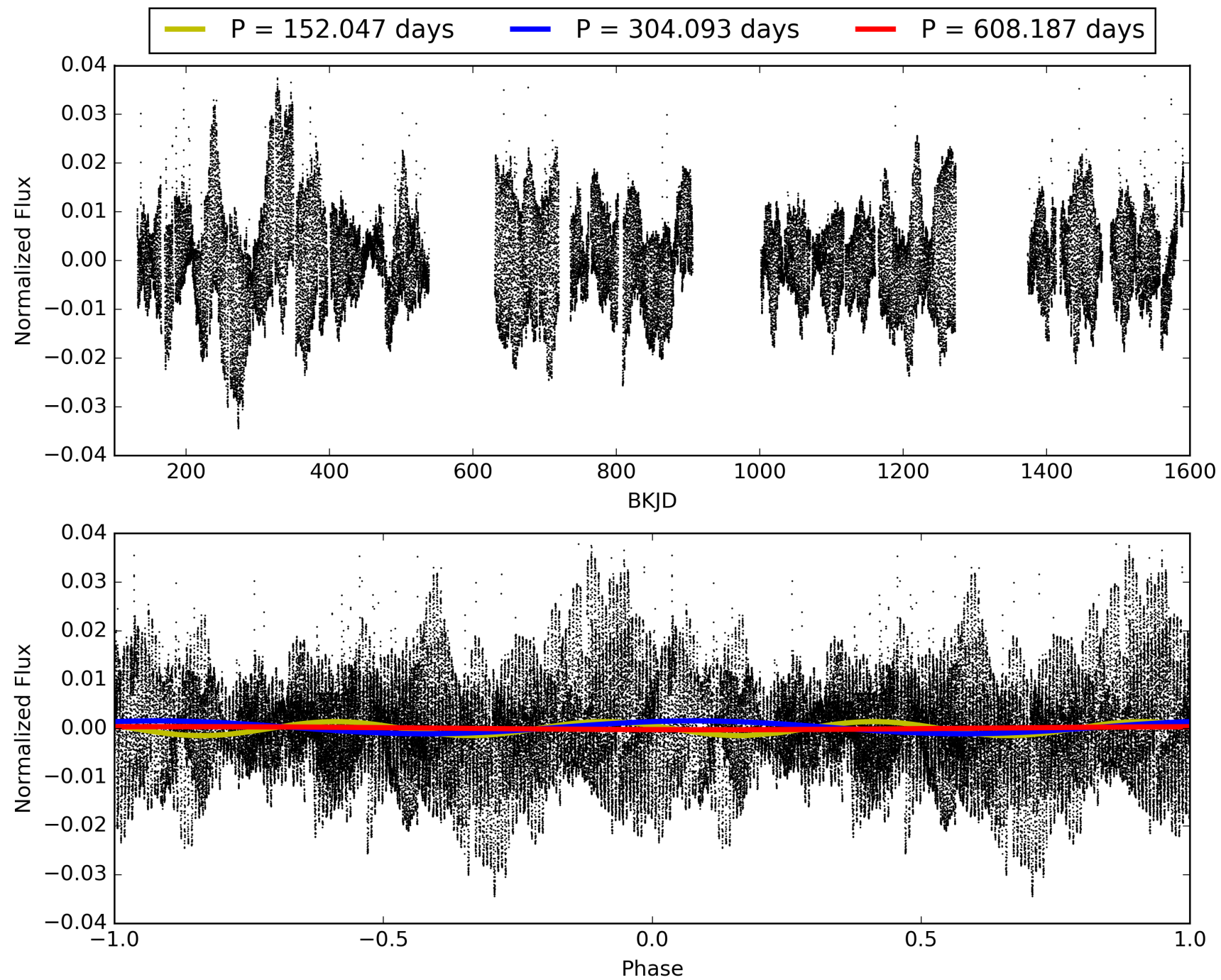
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 05:03:06 Z

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

# TCE 004665568-02, PDC Light Curves



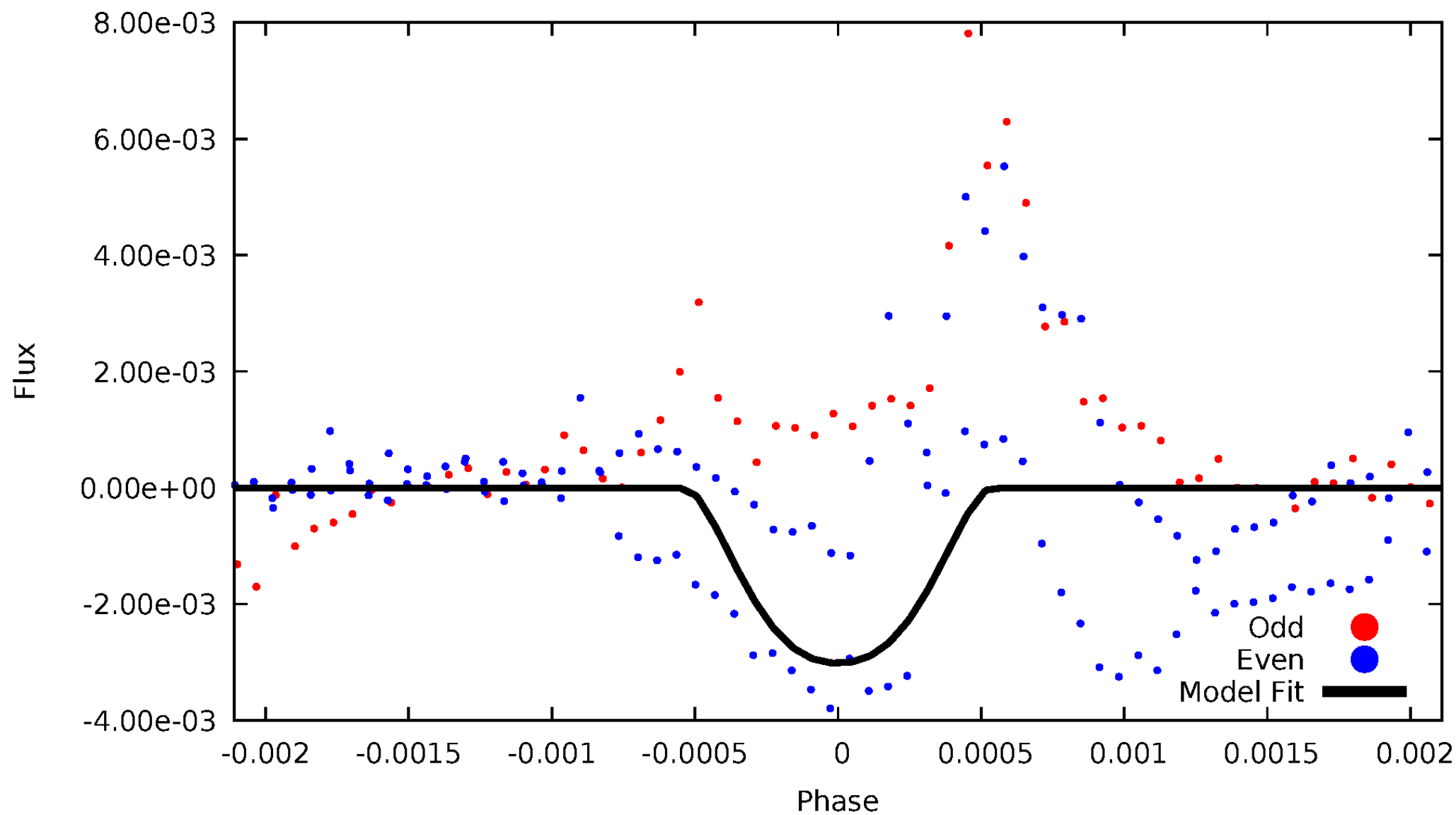
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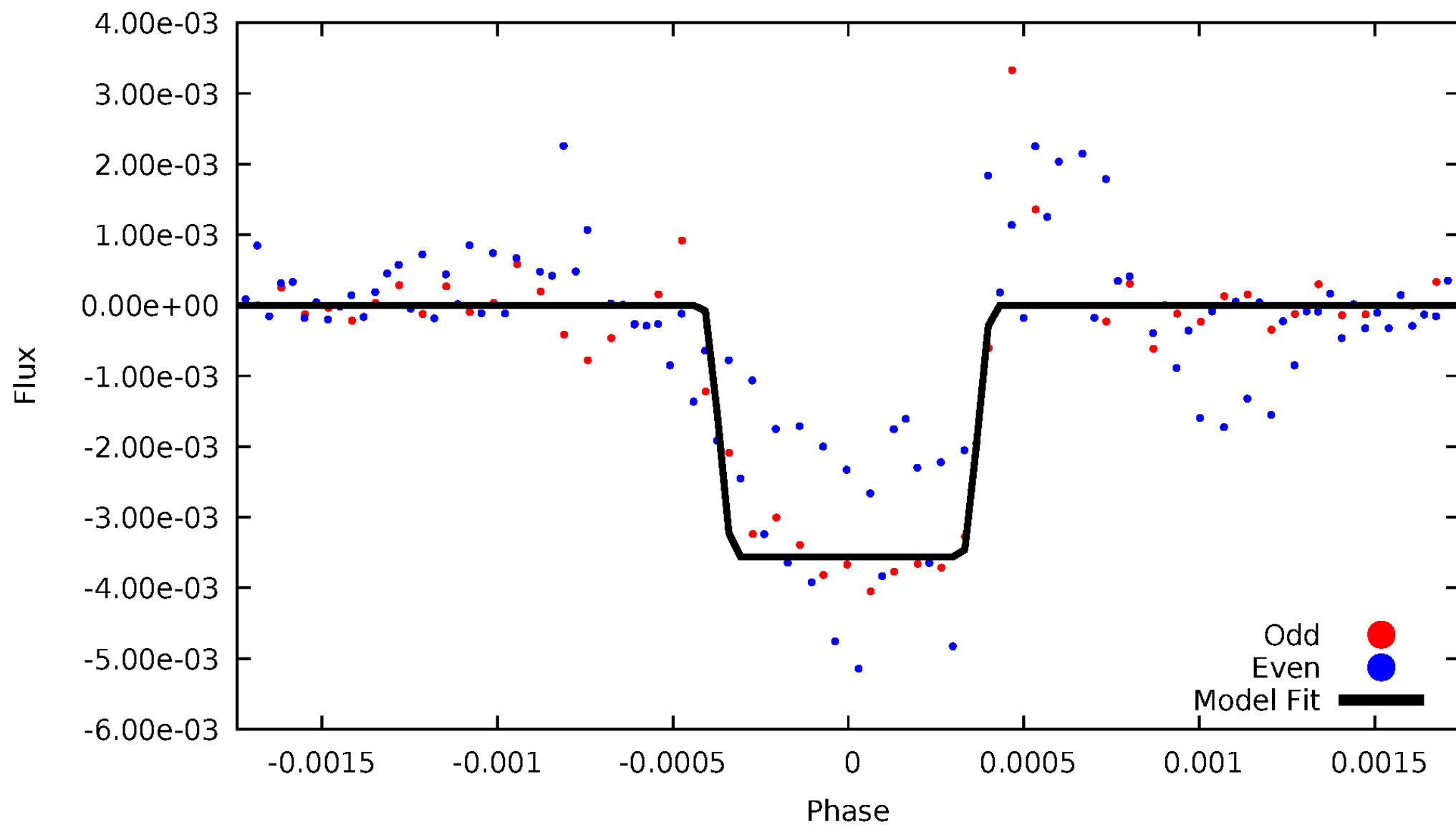
# DV Odd/Even

TCE 004665568-02



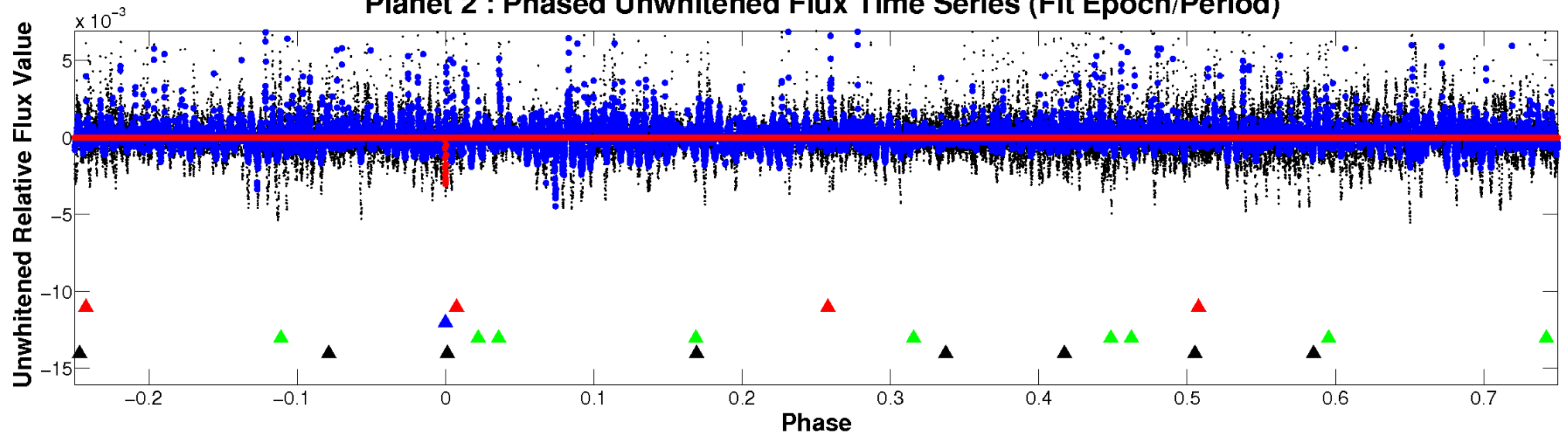
# ALT Odd/Even

TCE 004665568-02

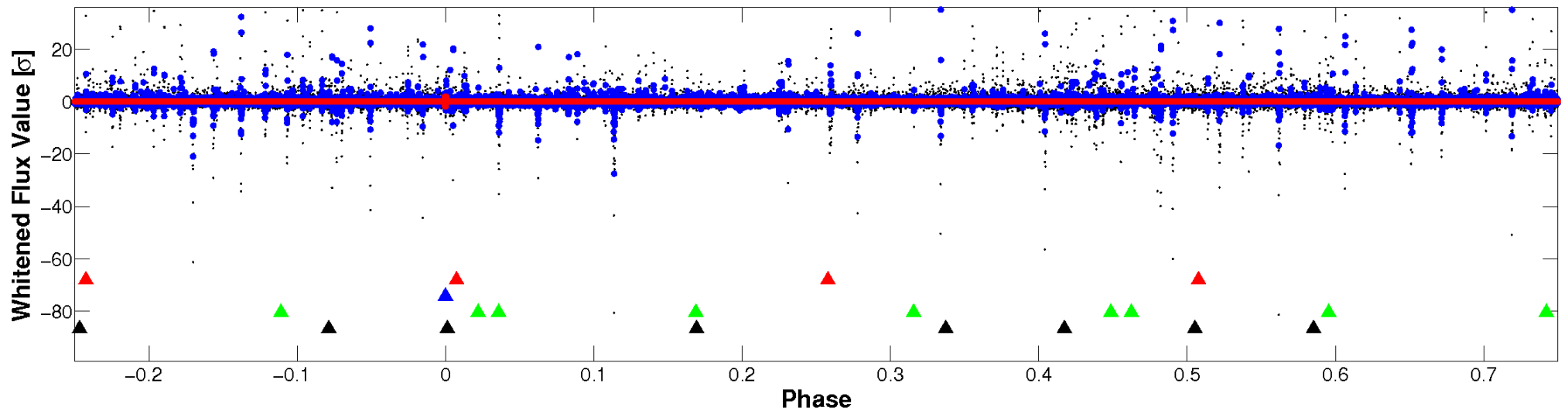


# Non-Whitened Vs. Whitened Light Curve

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

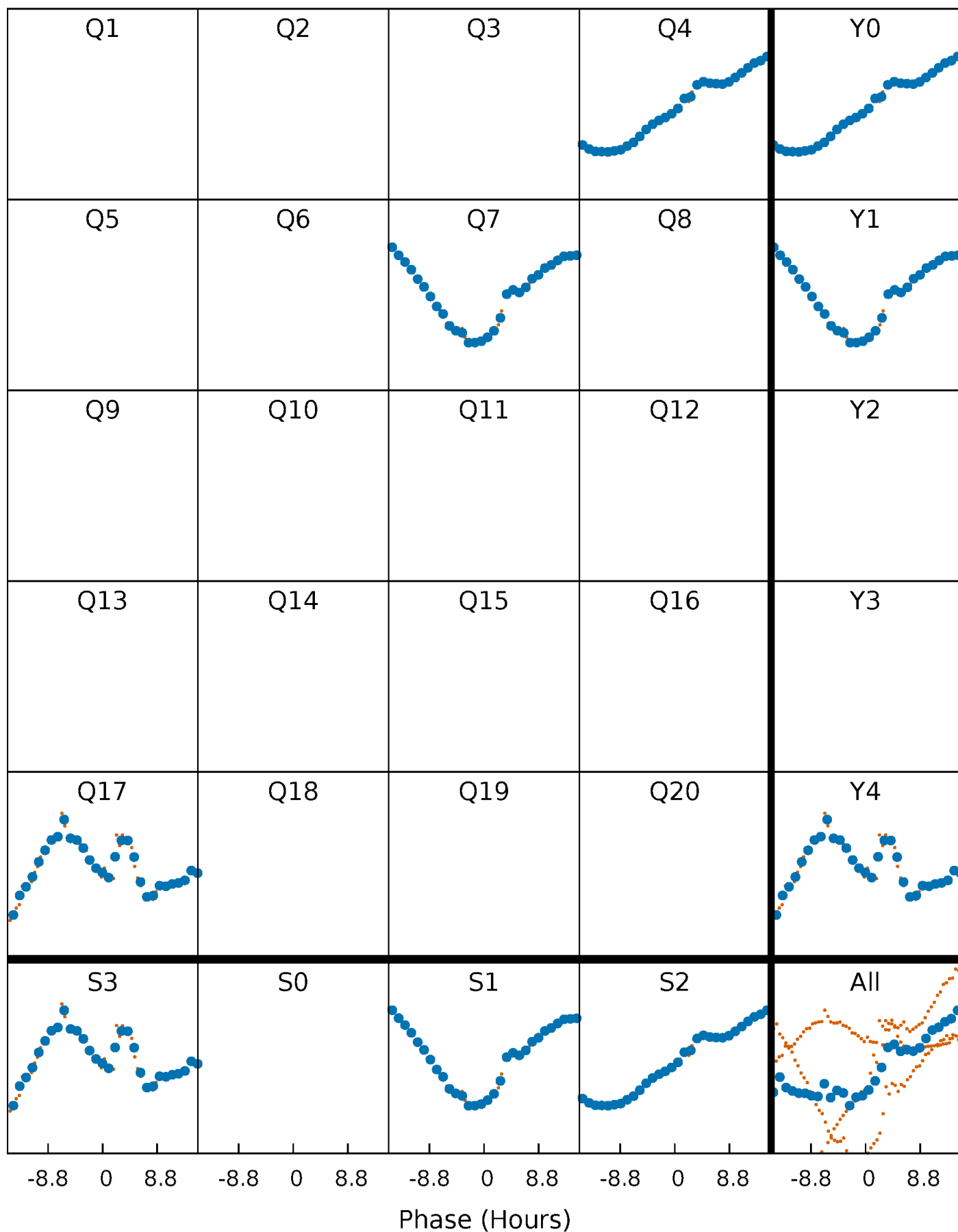


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



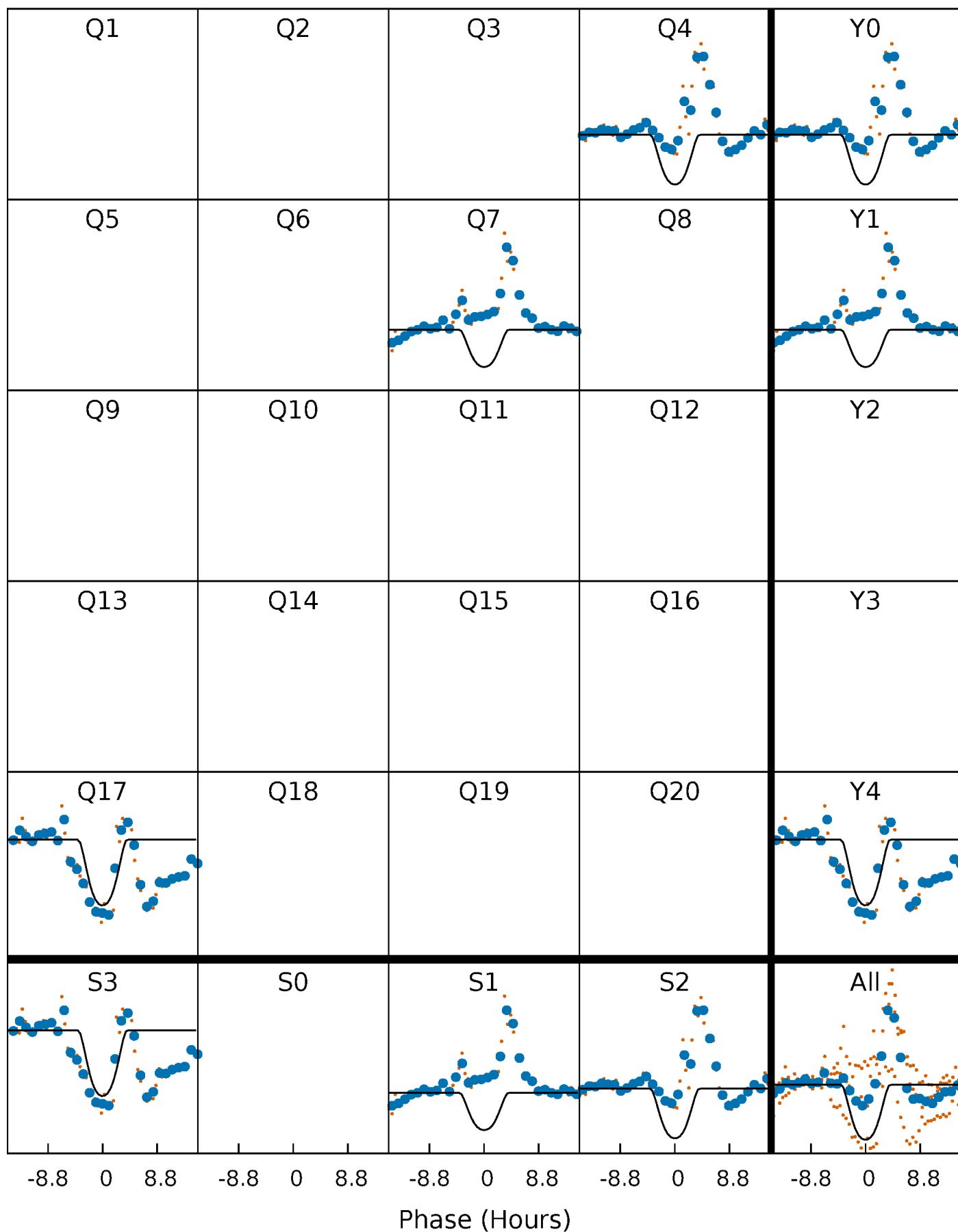
# PDC Quarter-Phased Transit Curves

TCE 004665568-02     $P=304.093262$  Days     $T_0=361.640018$  (BKJD)



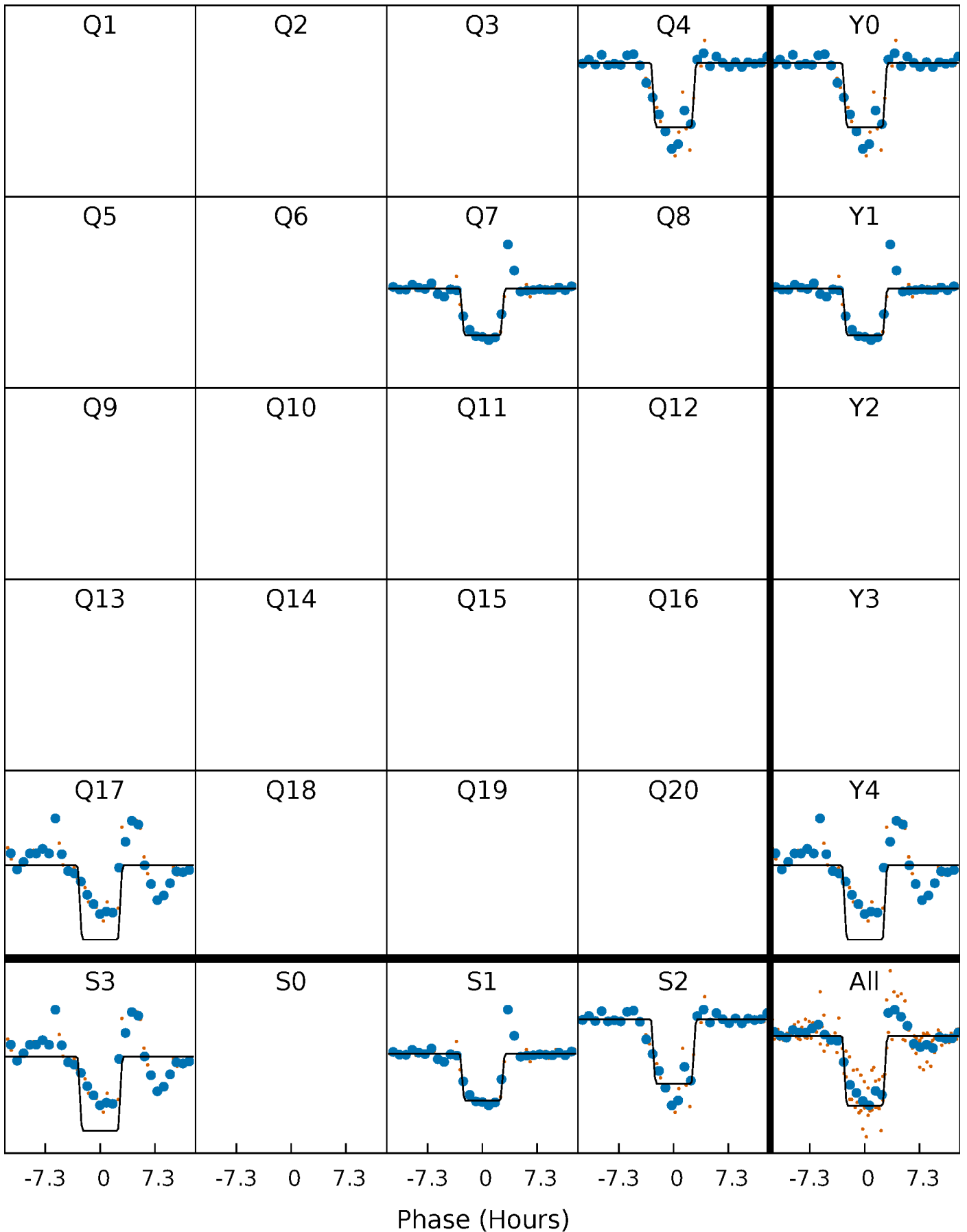
# DV Quarter-Phased Transit Curves

TCE 004665568-02     $P=304.093262$  Days     $T_0=361.640018$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

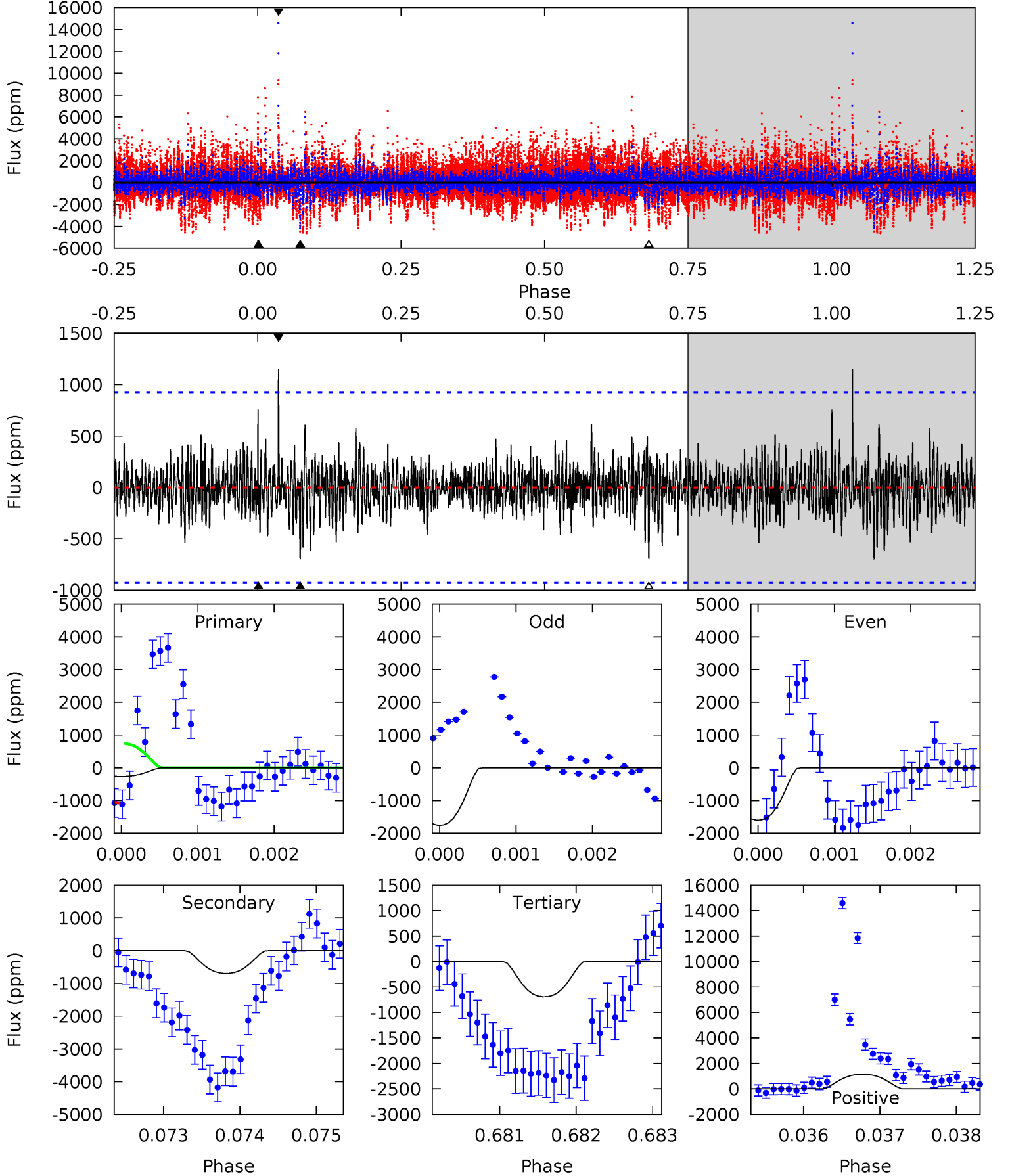
TCE 004665568-02     $P=304.085429$  Days     $T_0=361.644181$  (BKJD)



# DV Model-Shift Uniqueness Test

004665568-02,  $P = 304.093262$  Days,  $E = 57.546756$  Days

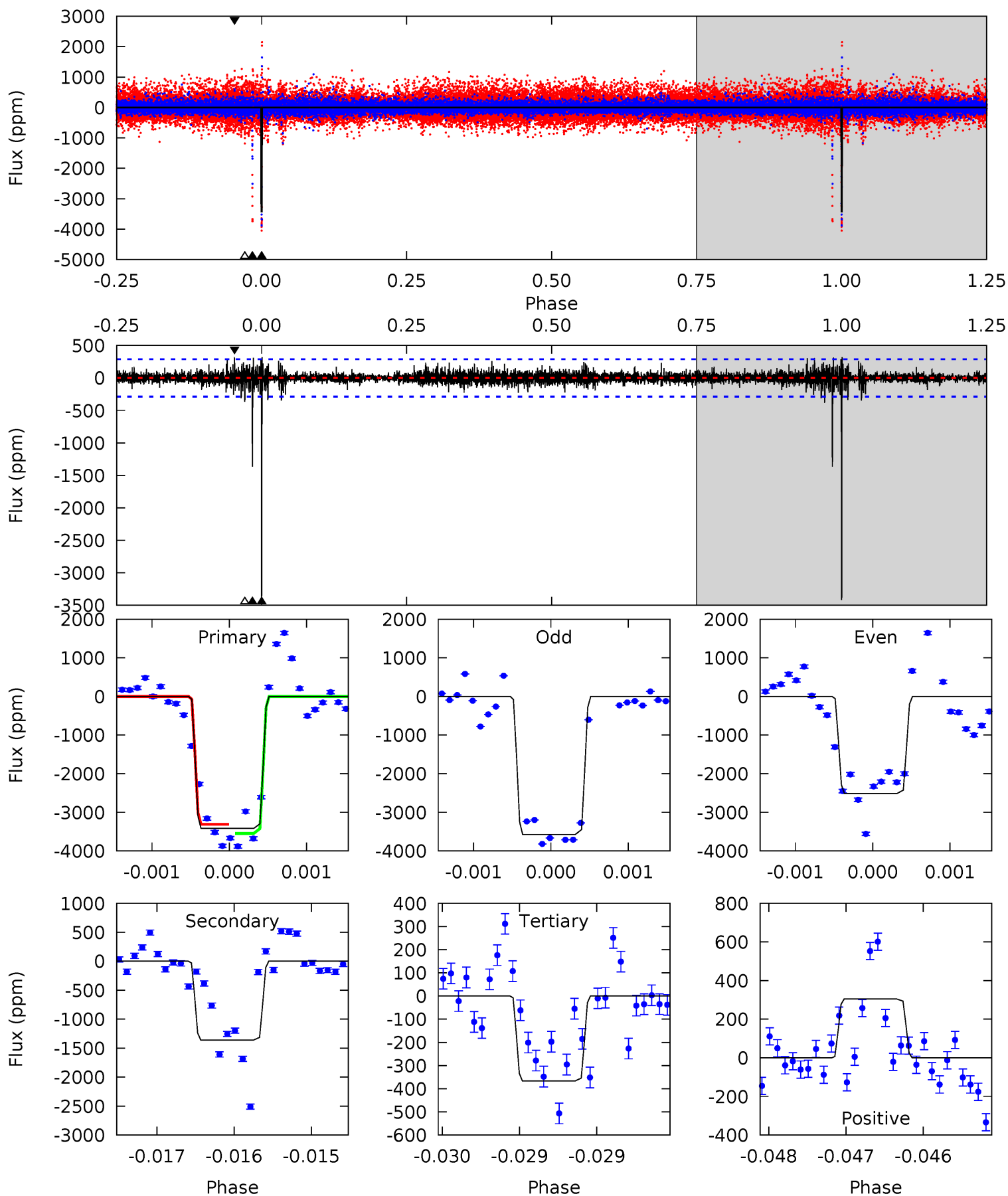
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
1.55	4.09	4.07	6.75	5.45	3.29	1.00	-2.52	-5.20	0.02	-2.66	0.38	-2.34	0.62	0.99



# Alt Model-Shift Uniqueness Test

004665568-02, P = 304.085429 Days, E = 57.558752 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
65.1	25.9	6.99	5.80	5.48	3.34	1.07	58.1	59.3	19.0	20.1	10.2	0.87	0.09	2.25





### Stellar Parameters For KIC 004665568

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$6046^{+181}_{-181}$	$3.986^{+0.487}_{-0.162}$	$-0.620^{+0.300}_{-0.250}$	$1.609^{+0.466}_{-0.699}$	$0.915^{+0.118}_{-0.118}$	$0.309^{+1.396}_{-0.132}$
	+3%/-3%	+12%/-4%	+48%/-40%	+29%/-43%	+13%/-13%	+451%/-43%
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 004665568-02 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-696 \pm 170$	$10.26^{+2.47}_{-2.69}$	$499^{+46}_{-64}$	$4184^{+340}_{-281}$	$2643^{+2365}_{-1090}$
Alt.	$-1362 \pm 53$	$9.88^{+2.53}_{-2.63}$	$499^{+43}_{-64}$	$4876^{+346}_{-317}$	$5742^{+4622}_{-2073}$

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

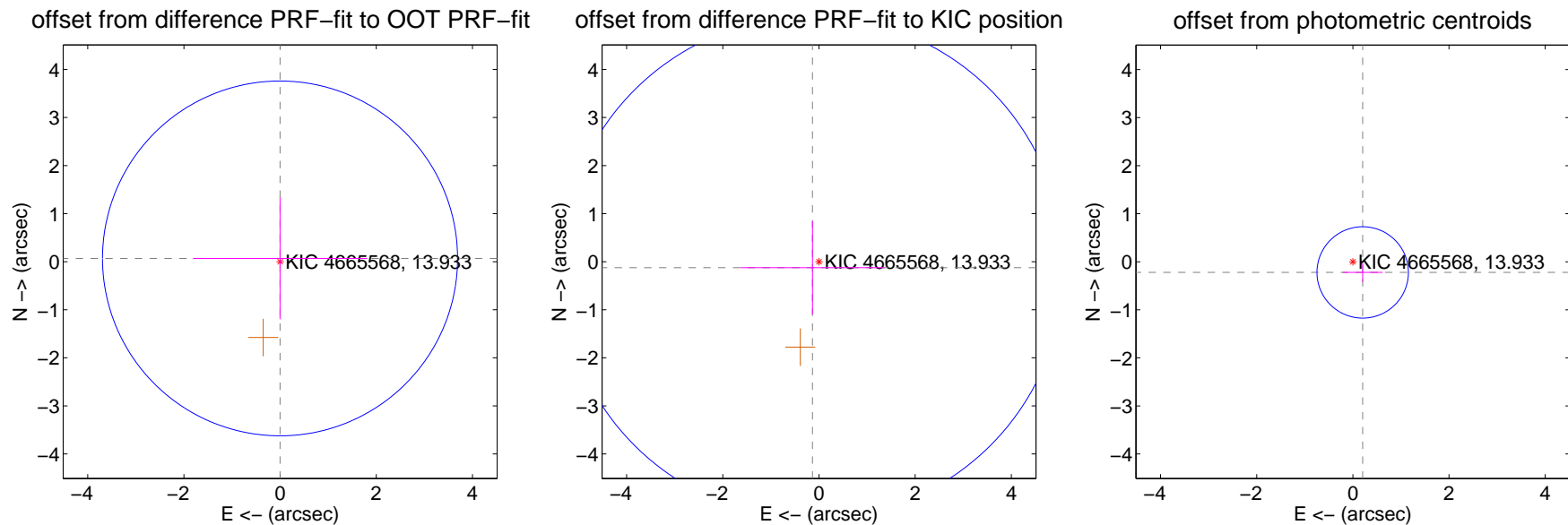
## DV Centroid Data

Supplemental centroid analysis for 004665568-02. Kepler magnitude: 13.93. Transit SNR 10.01

There are 1 quarters with good PRF difference image offsets

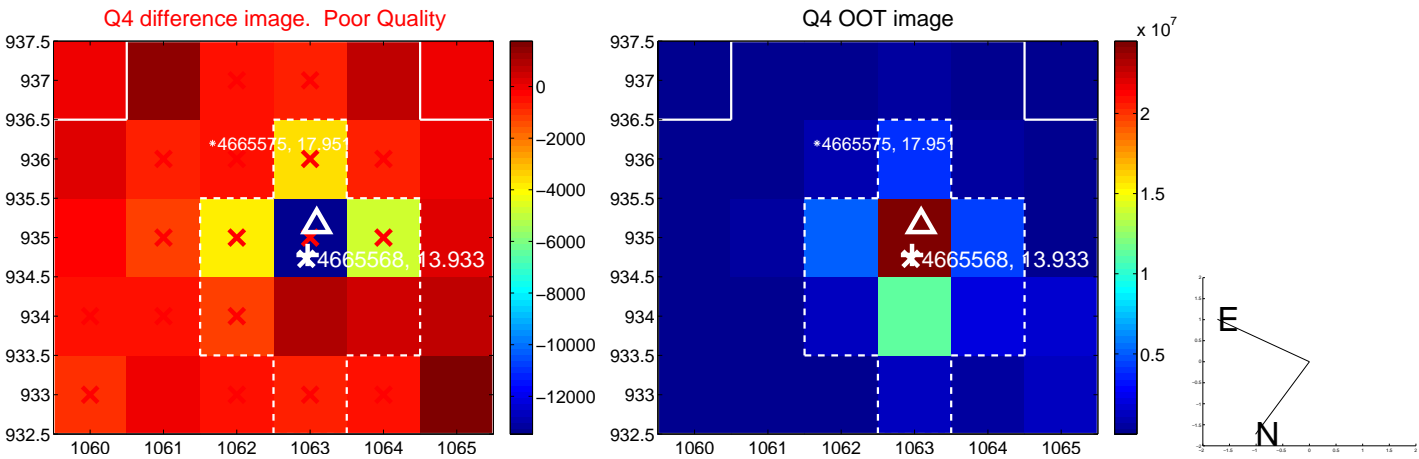
The direct PRF centroid is offset from the target star catalog position by about 0.20 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.068 \pm 1.230$	0.06	$0.001 \pm 1.811$	$0.068 \pm 1.265$
PRF-fit source offset from KIC position	$0.184 \pm 1.744$	0.11	$0.135 \pm 1.497$	$-0.124 \pm 0.969$
photometric centroid source offset	$0.30 \pm 0.32$	0.95	$-0.20 \pm 0.41$	$-0.22 \pm 0.20$



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.

Q5 no difference image



Q5 no OOT image



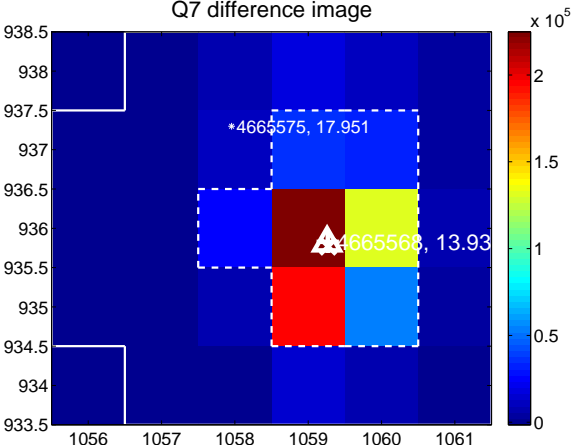
Q6 no difference image



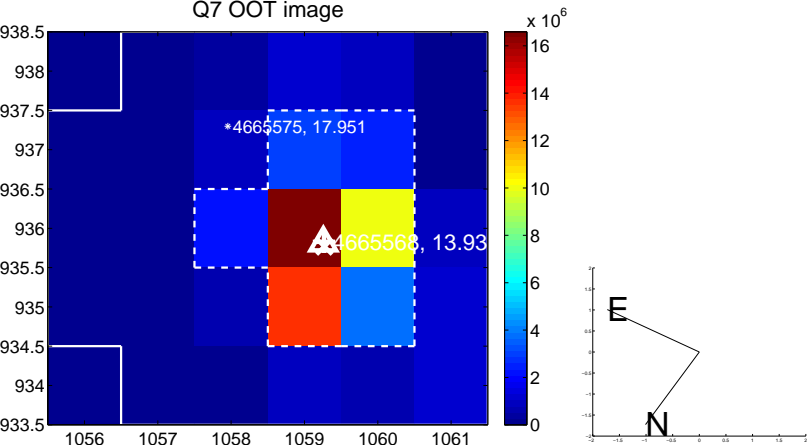
Q6 no OOT image



Q7 difference image



Q7 OOT image



Q8 no difference image



Q8 no OOT image



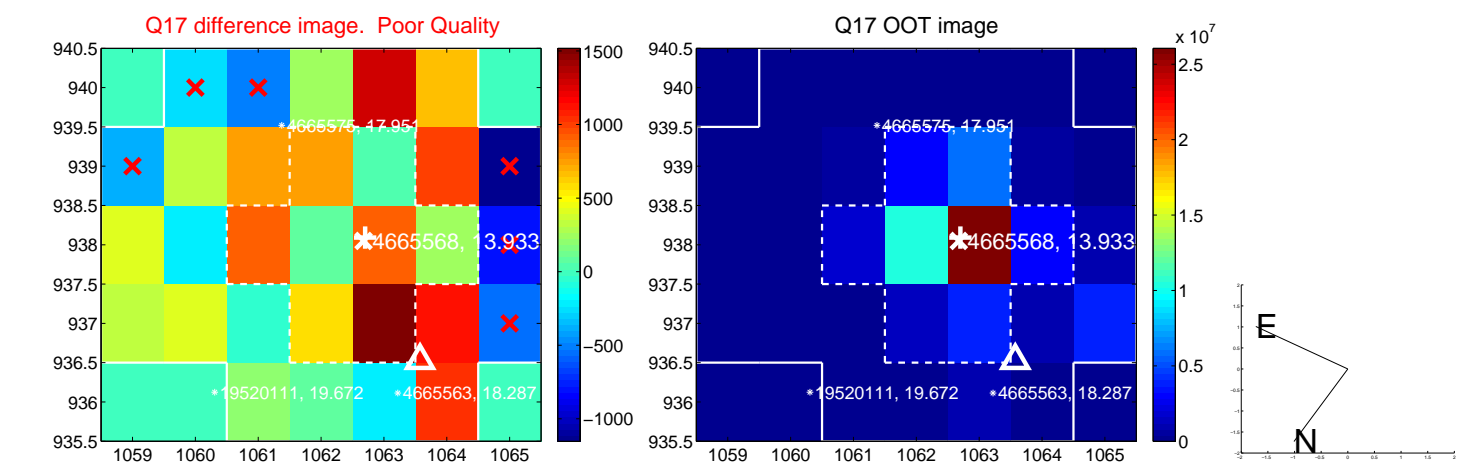
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



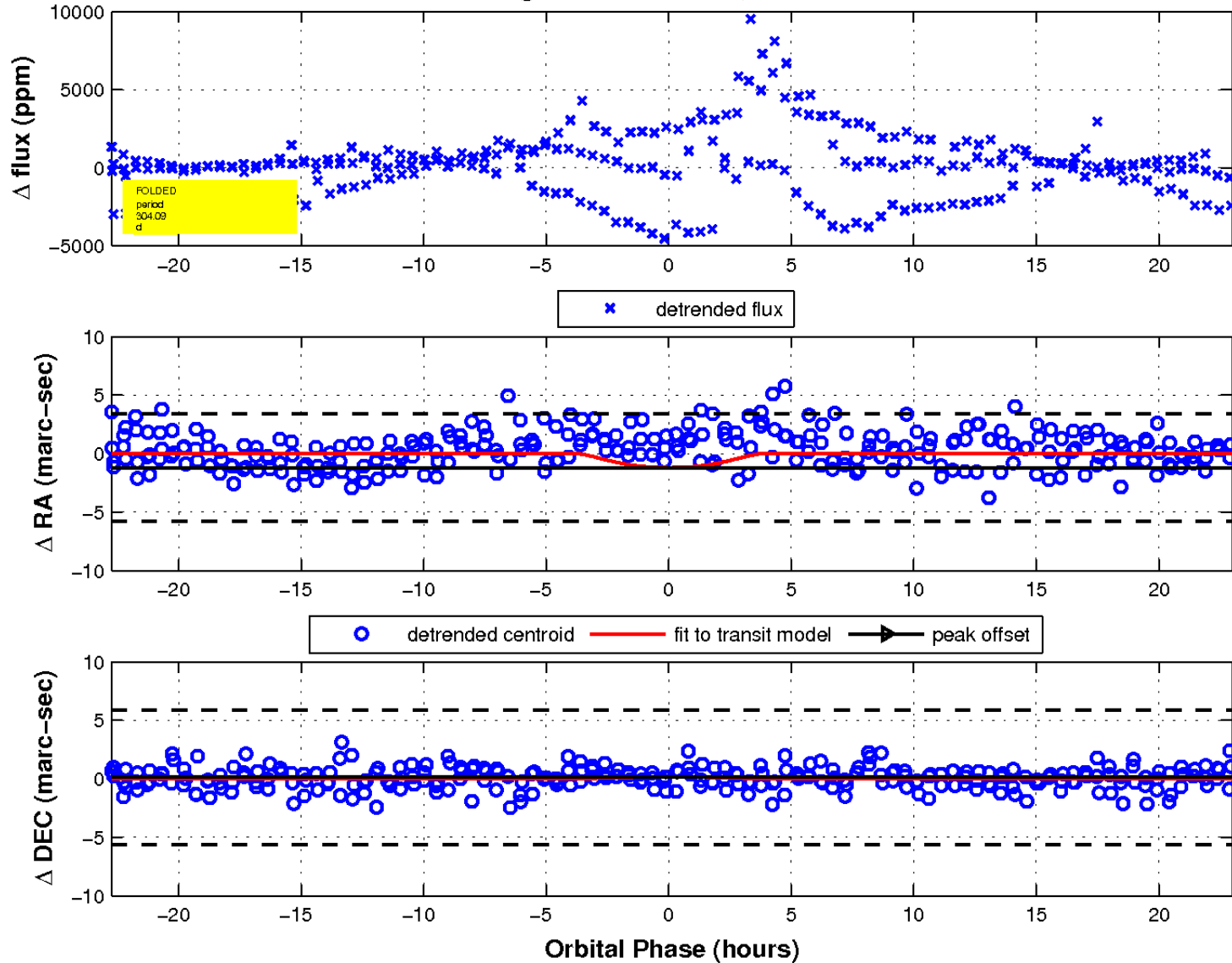
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

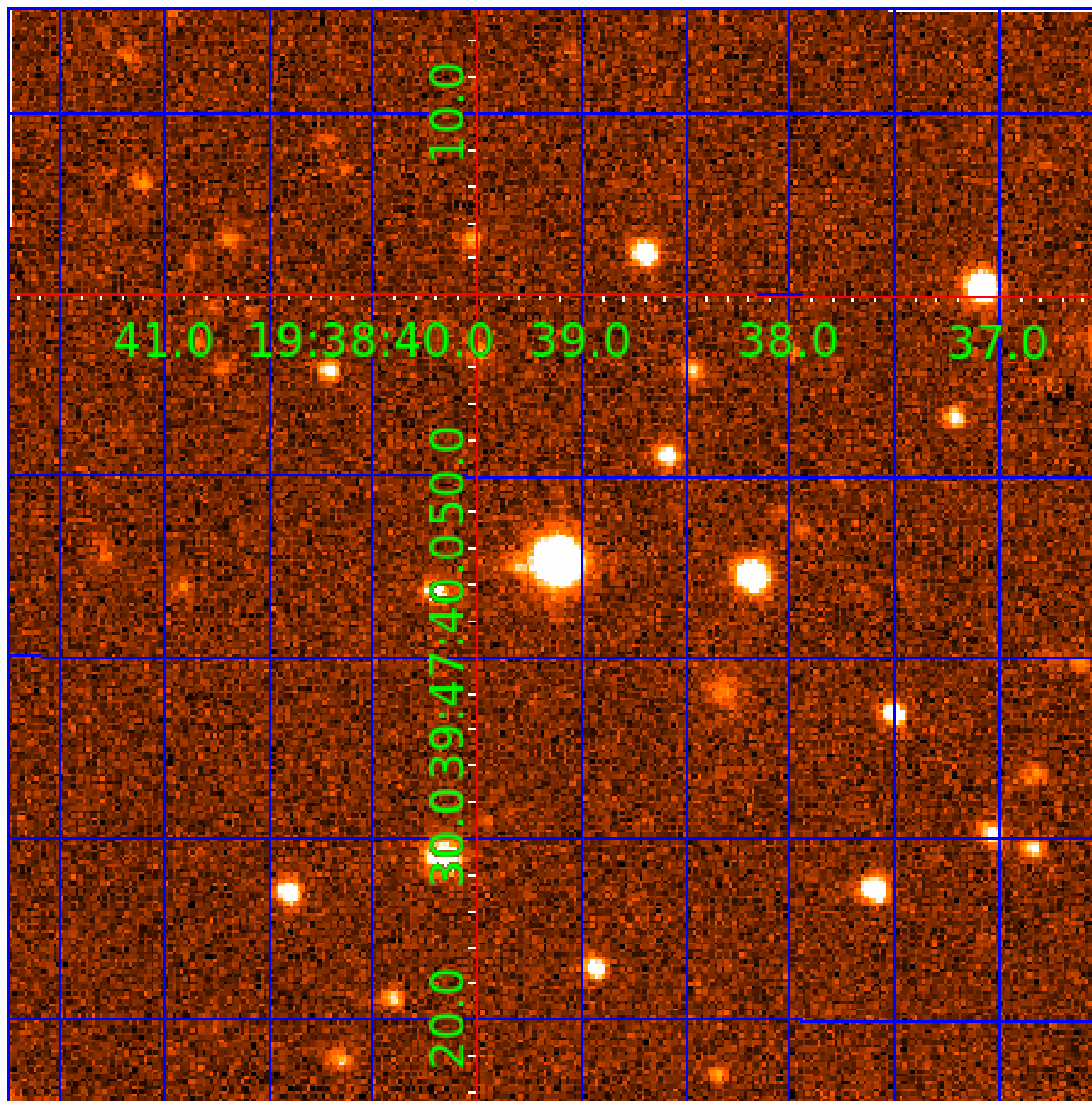


fluxWeightedCentroids, Planet 2 of 4



UKIRT Image

Declination





# KIC 004665568

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004665568-01	OBS	No	380.075911	135.954435	1161.2	4.743	17.4	5.9	1.61	6046	5.66	3.12
004665568-02	OBS	No	304.093263	361.640018	3014.6	7.694	18.2	10.0	1.61	6046	11.01	4.20
004665568-03	OBS	No	174.366829	193.977661	718.8	2.098	13.5	6.4	1.61	6046	4.90	8.81
004665568-04	OBS	No	177.590702	184.444065	955.4	3.082	12.6	6.1	1.61	6046	5.15	8.60

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004665568-01	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS—HALO_GHOST
004665568-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS
004665568-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_MEAS
004665568-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV

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

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

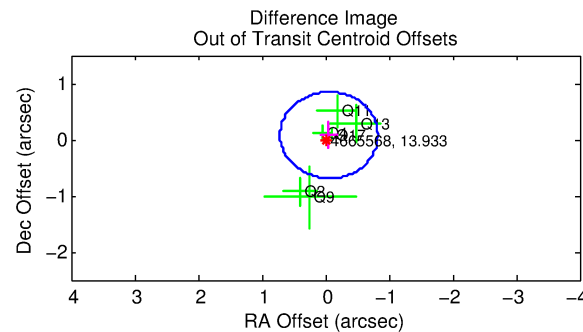
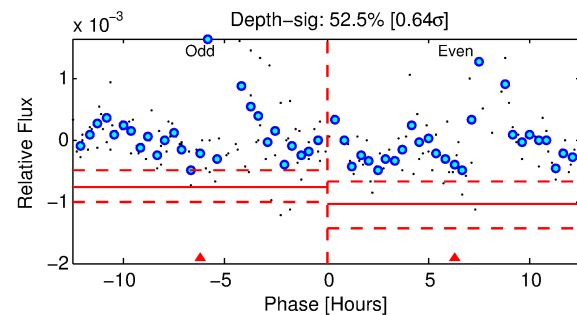
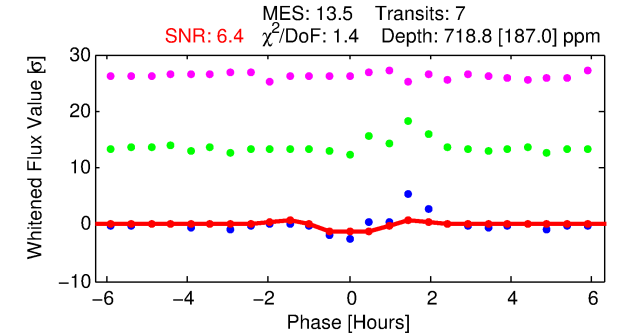
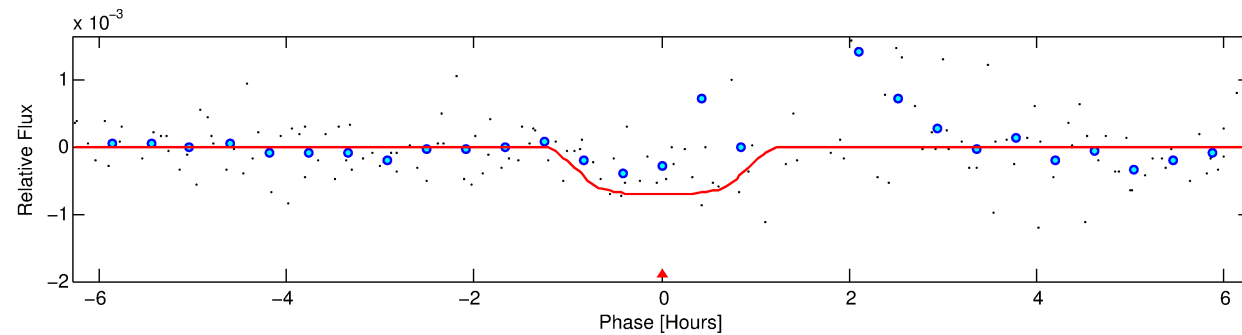
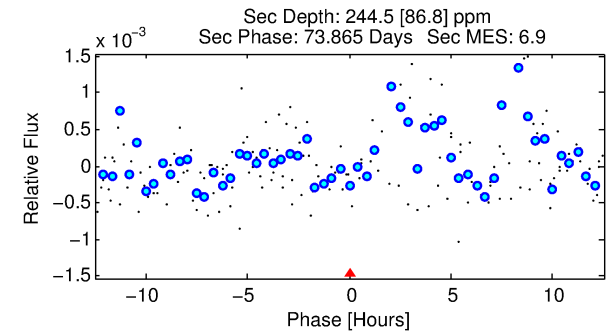
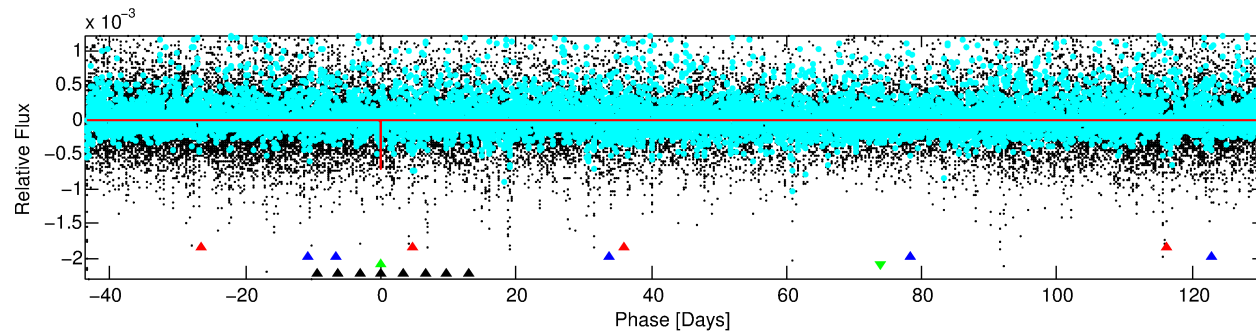
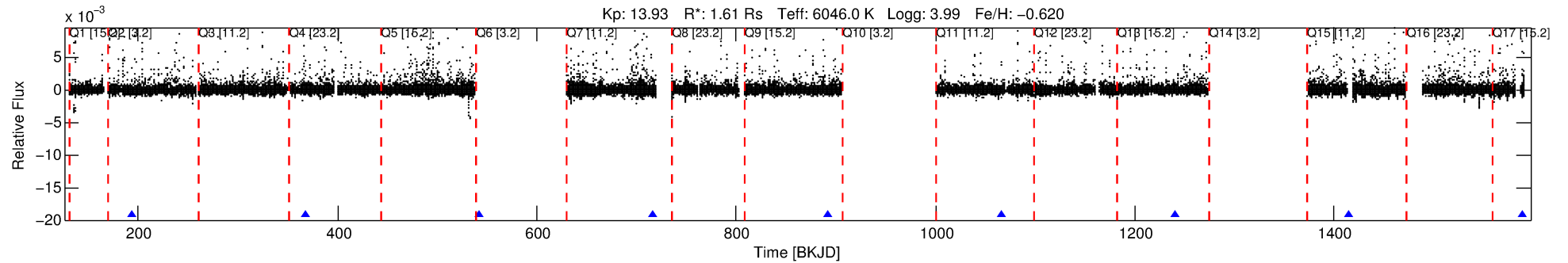
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 004665568-03

No Significant Match Found

# DV One-Page Summary

KIC: 4665568 Candidate: 3 of 4 Period: 174.367 d



## DV Fit Results:

Period = 174.36683 [0.00193] d  
Epoch = 193.9777 [0.0096] BKJD  
Rp/R\* = 0.0279 [0.0264]  
a/R\* = 365.91 [1769.41]  
b = 0.85 [1.58]  
Seff = 8.81 [7.14]  
Teq = 439 [89] K  
Rp = 4.90 [5.11] Re  
a = 0.5930 [0.2804] AU  
Ag = 1969.12 [4111.58] [0.48σ]  
Teffp = 4525 [2185] K [1.87σ]

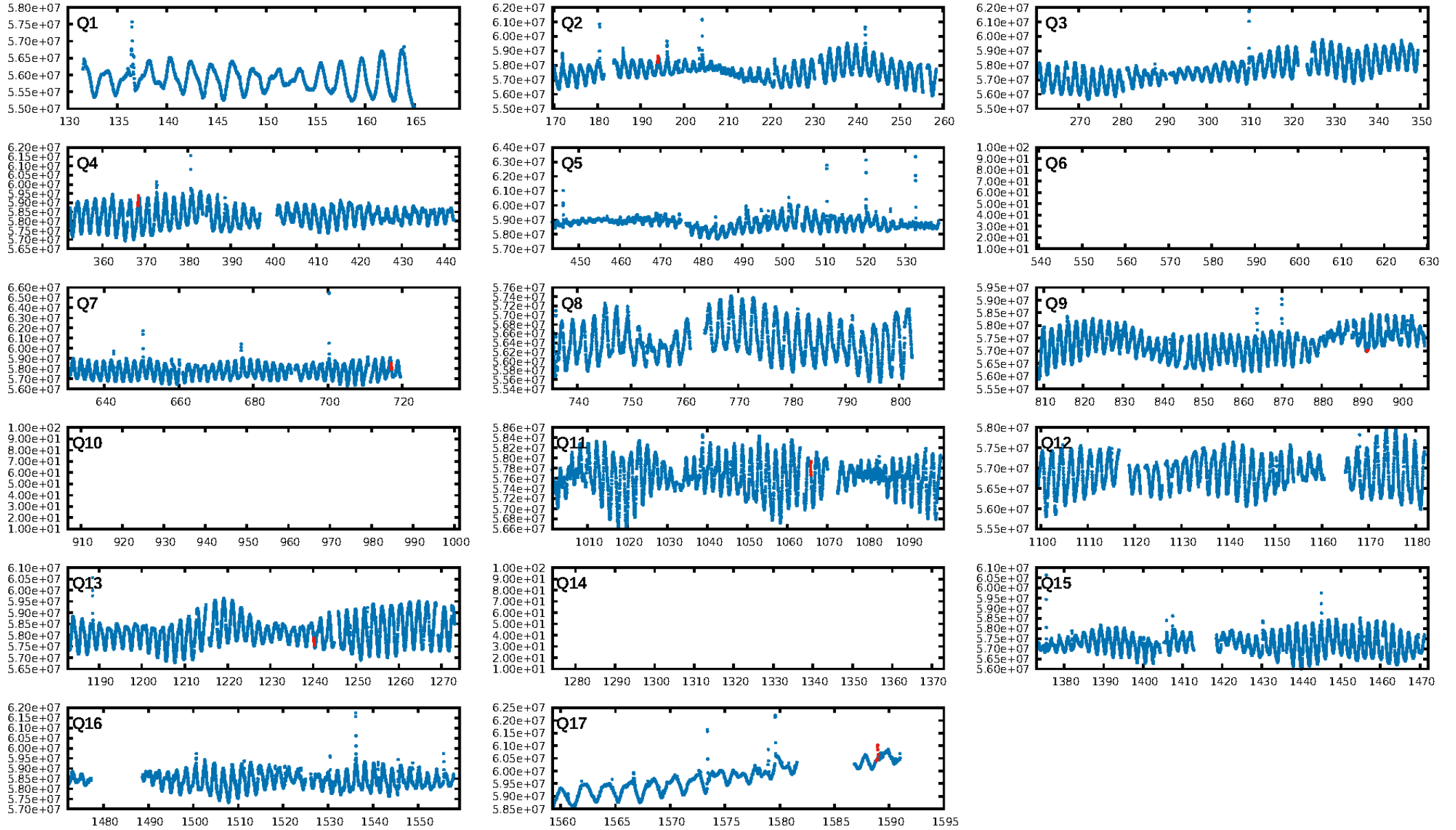
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [20.75σ]  
ModelChiSquare2-sig: 1.8%  
ModelChiSquareGof-sig: 48.2%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [6/6]  
GhostDiagnostic-chr: 1.118  
Centroid-sig: 22.7%  
Centroid-so: 0.928 arcsec [0.77σ]  
OotOffset-rm: 0.096 arcsec [0.38σ]  
KicOffset-rm: 0.139 arcsec [0.69σ]  
OotOffset-st: 1/1/1/3 [6]  
KicOffset-st: 1/1/1/3 [6]  
DiffImageQuality-fgm: 0.33 [2/6]  
DiffImageOverlap-fno: 0.86 [6/7]

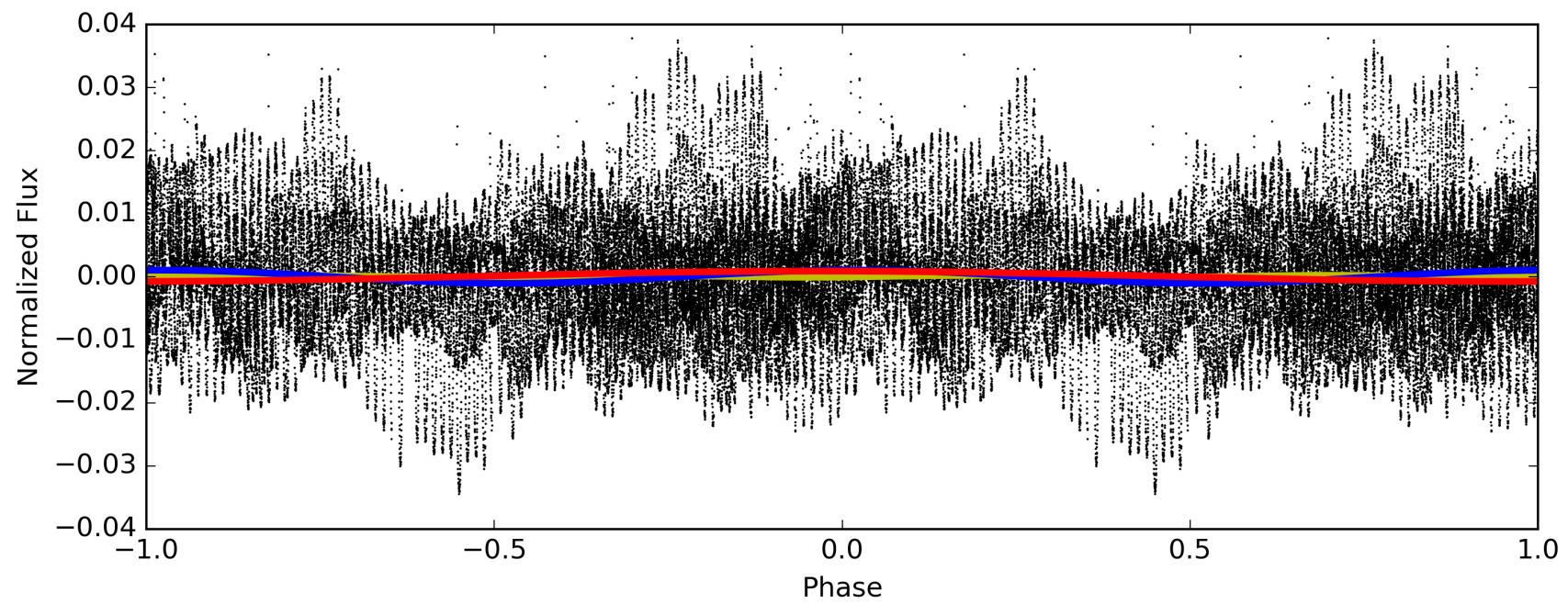
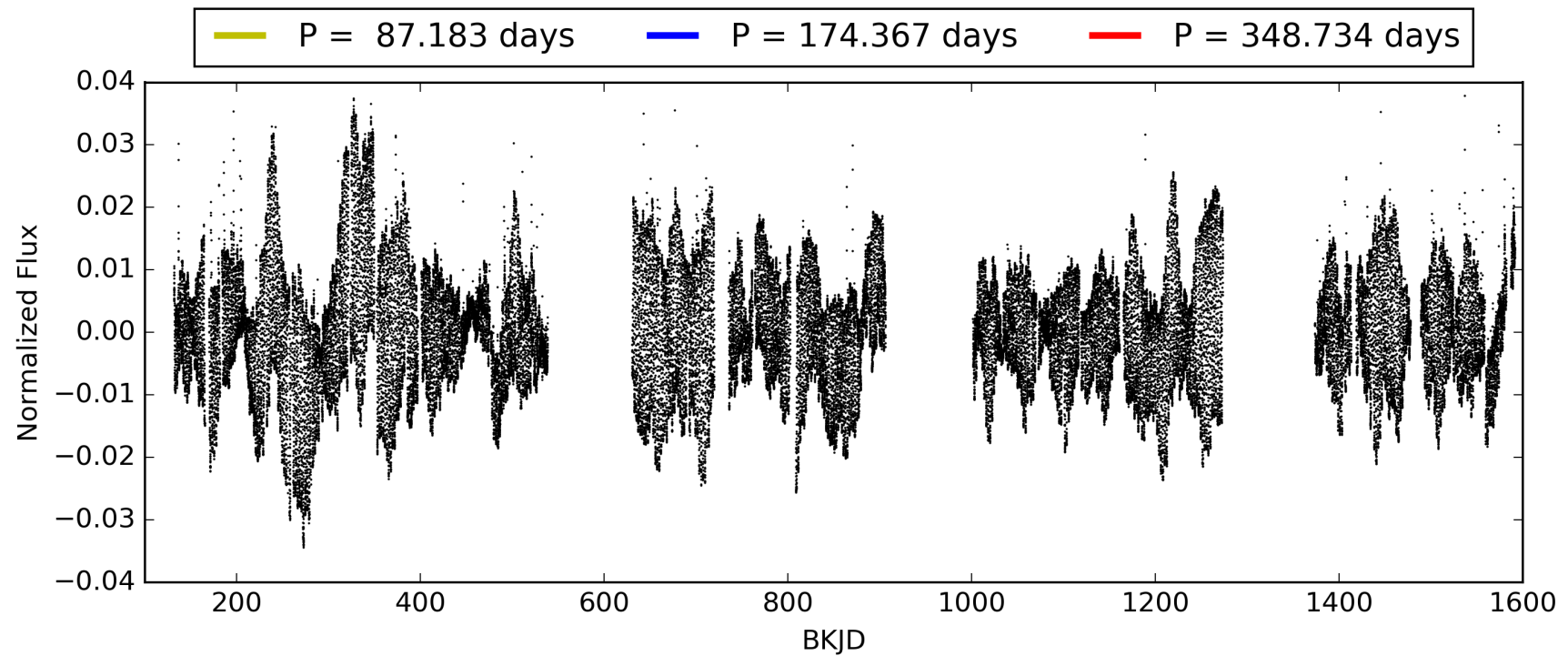
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 05:03:18 Z

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

# TCE 004665568-03, PDC Light Curves

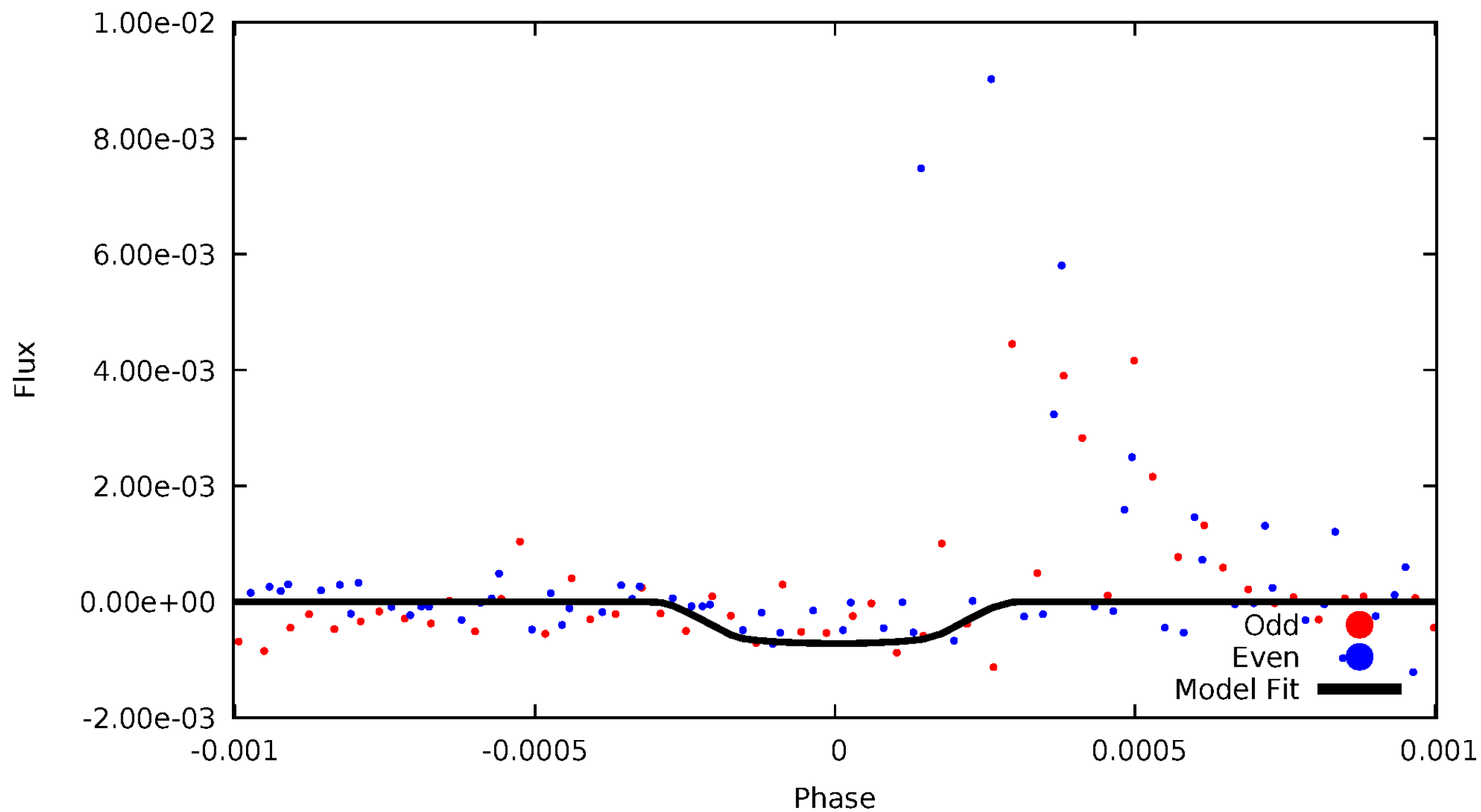


TCE 004665568-03



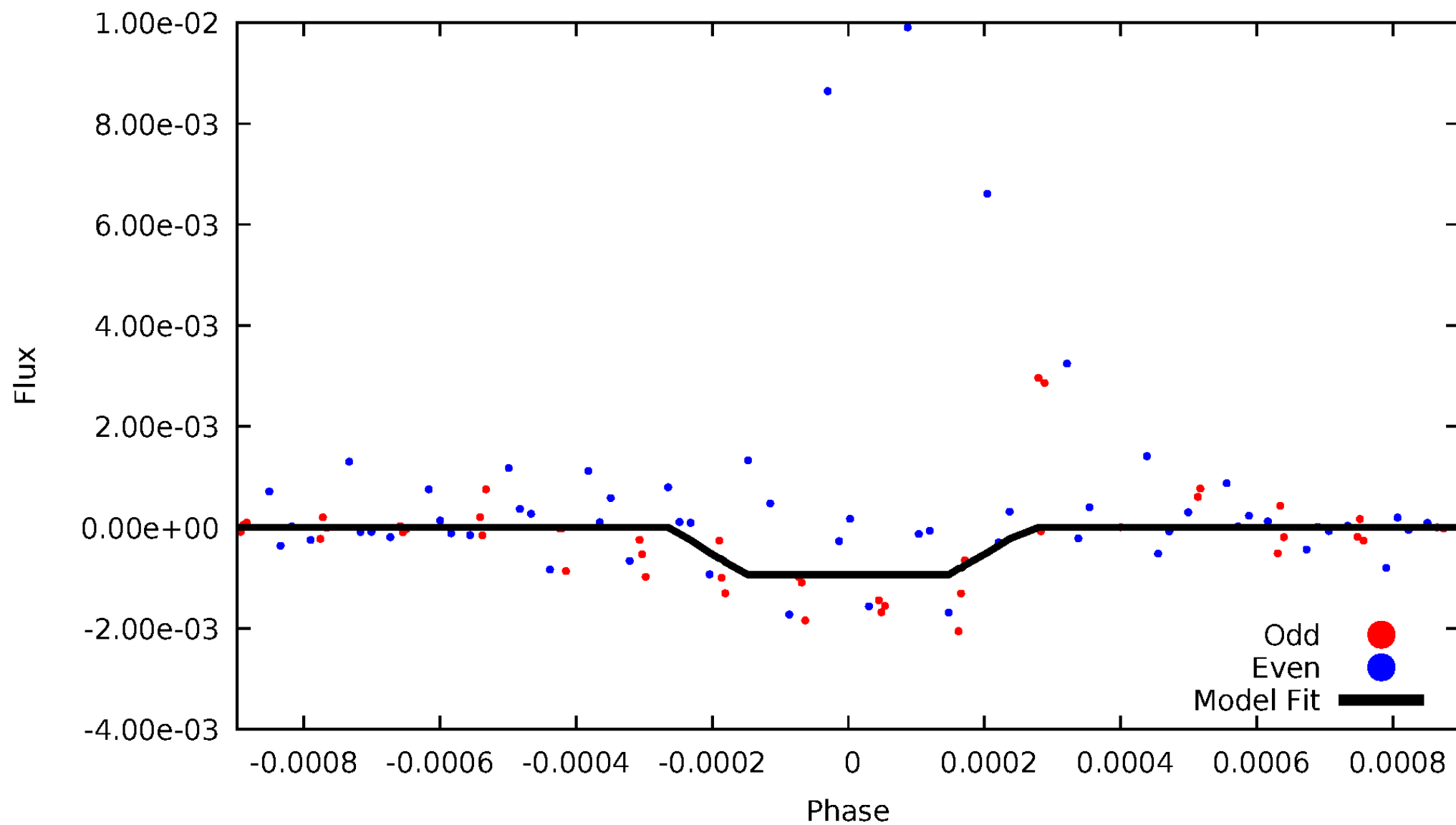
# DV Odd/Even

TCE 004665568-03



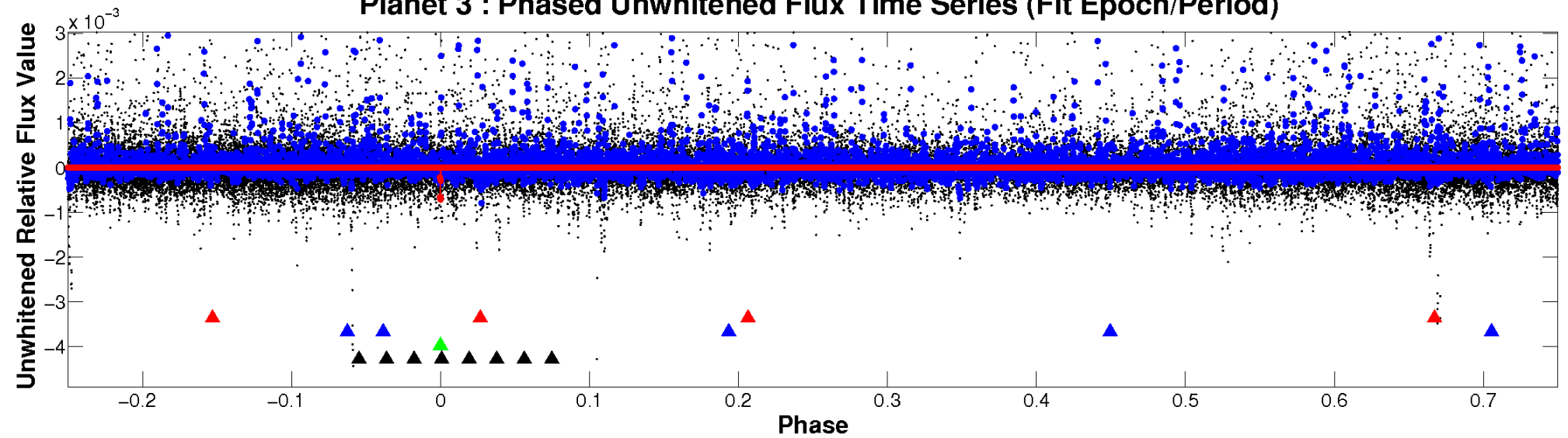
# ALT Odd/Even

TCE 004665568-03

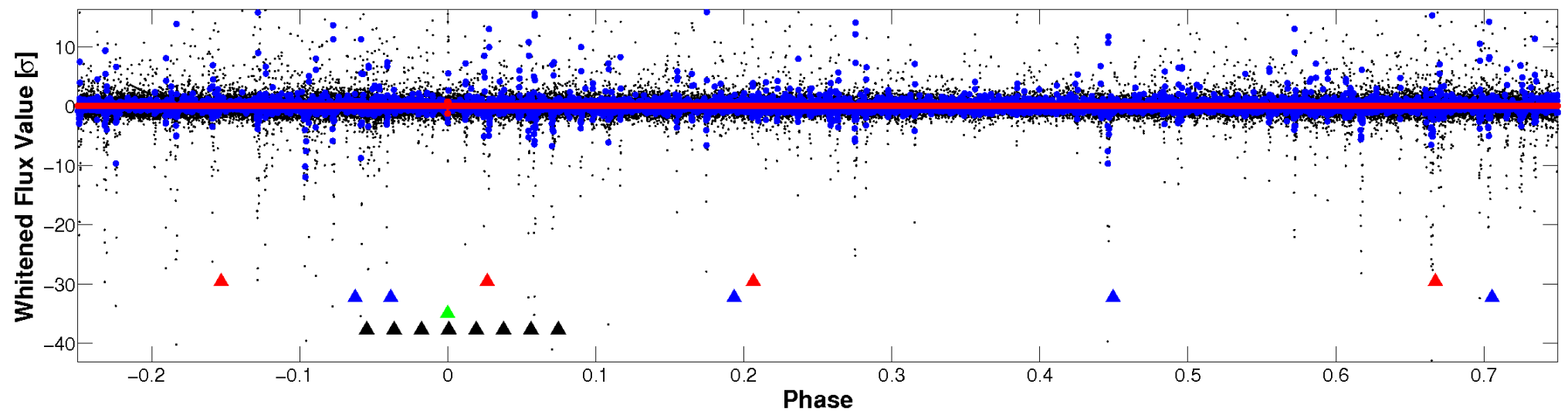


# Non-Whitened Vs. Whitened Light Curve

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

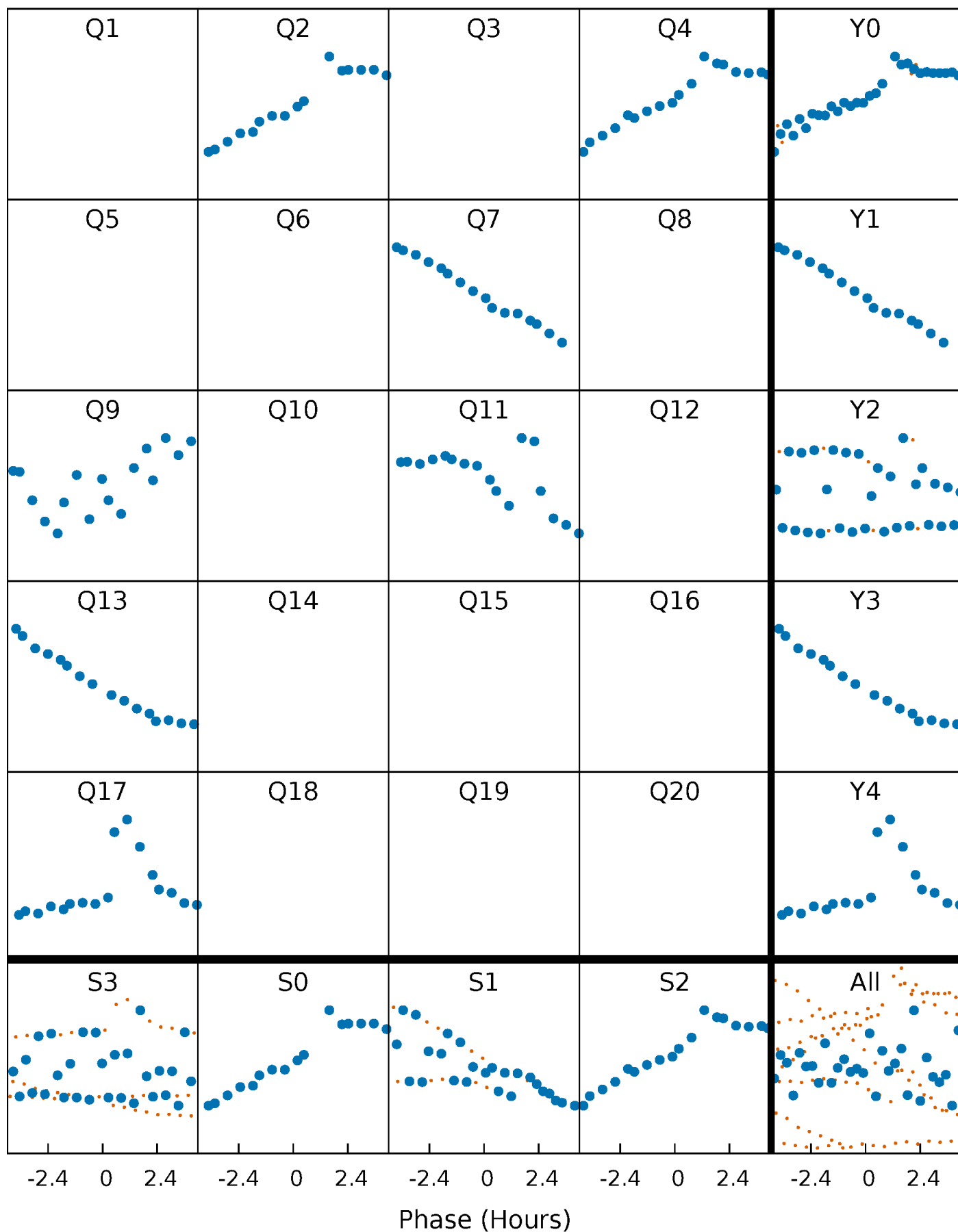


Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

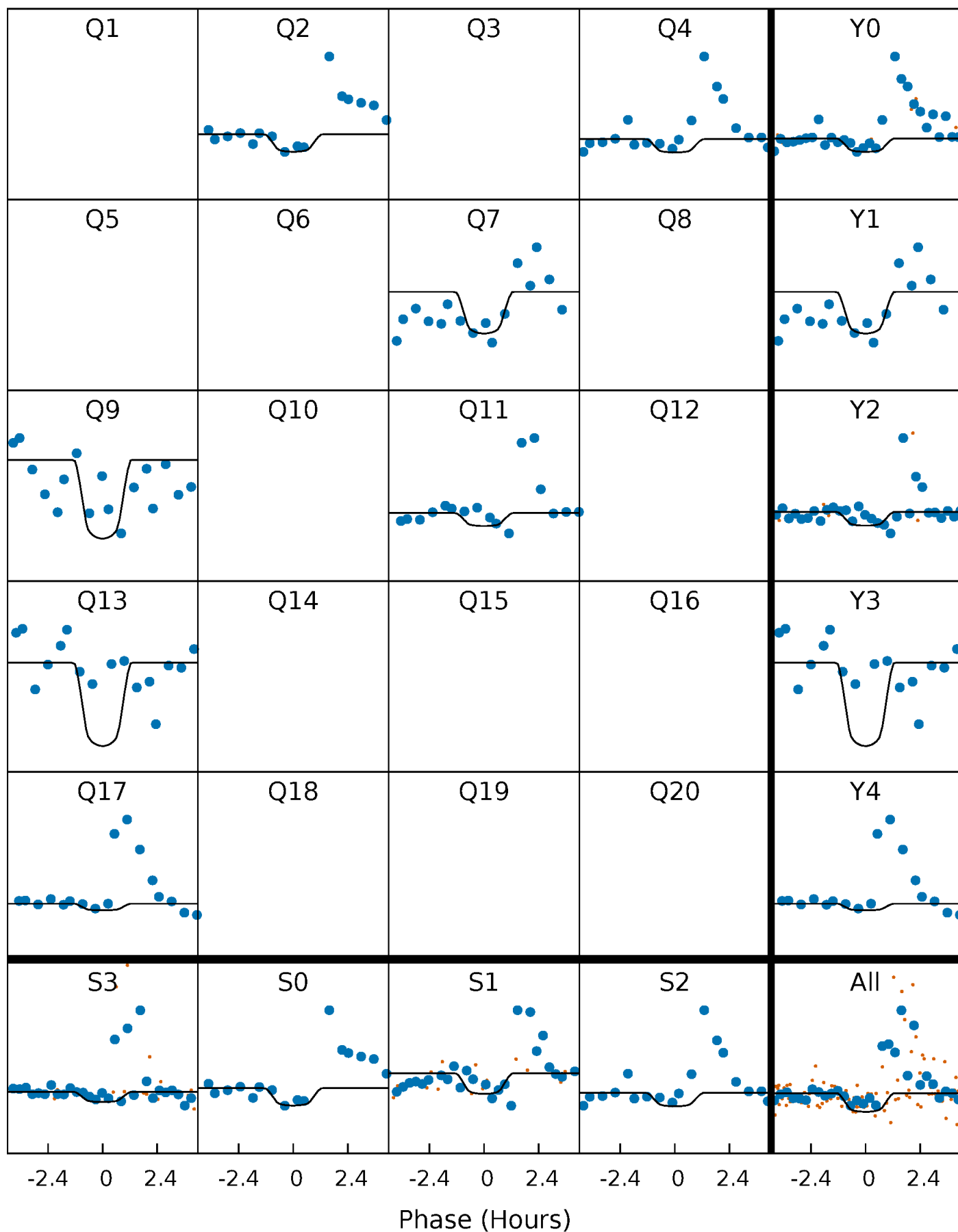
TCE 004665568-03     $P=174.366829$  Days     $T_0=193.977661$  (BKJD)





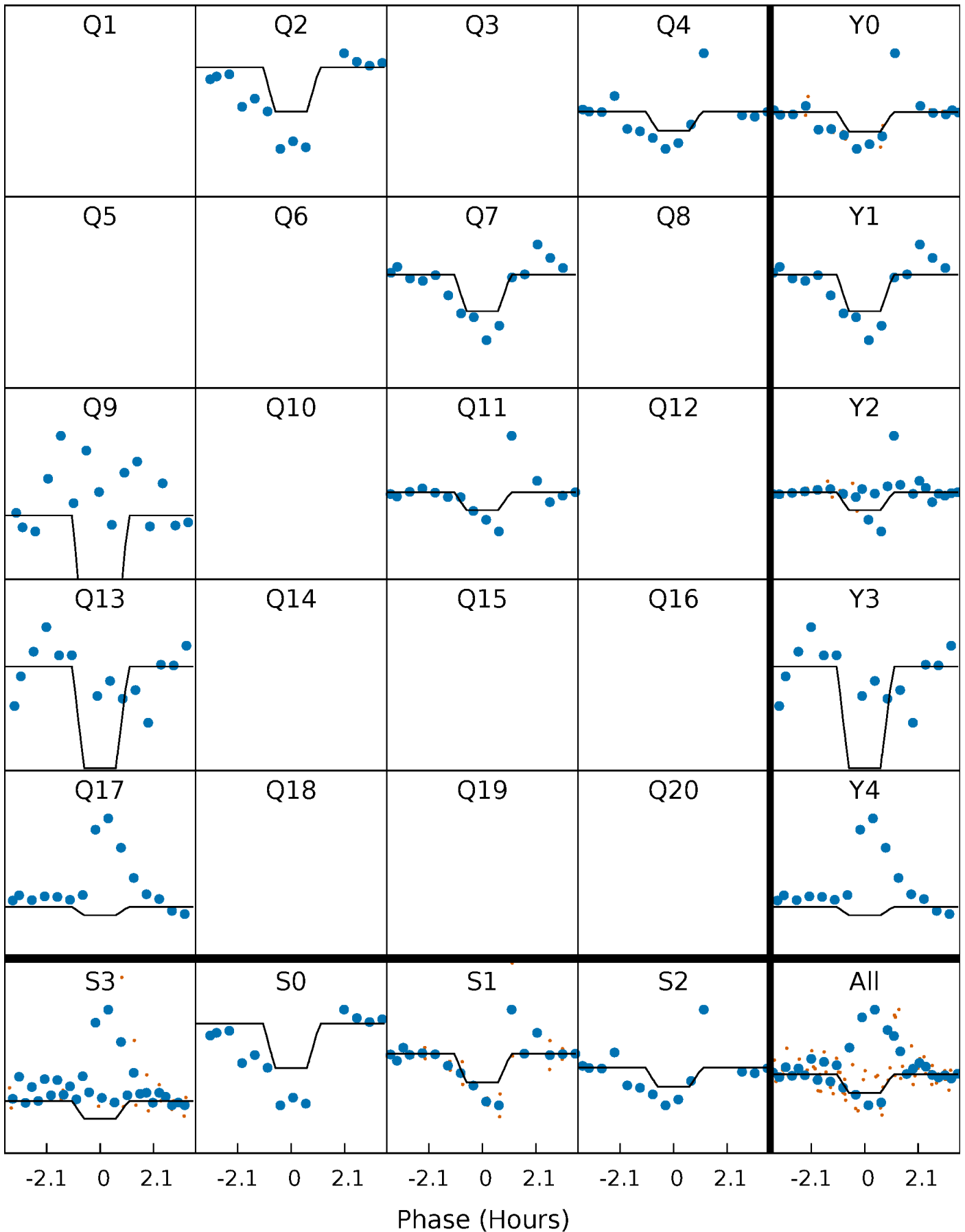
# DV Quarter-Phased Transit Curves

TCE 004665568-03 P=174.366829 Days  $T_0=193.977661$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

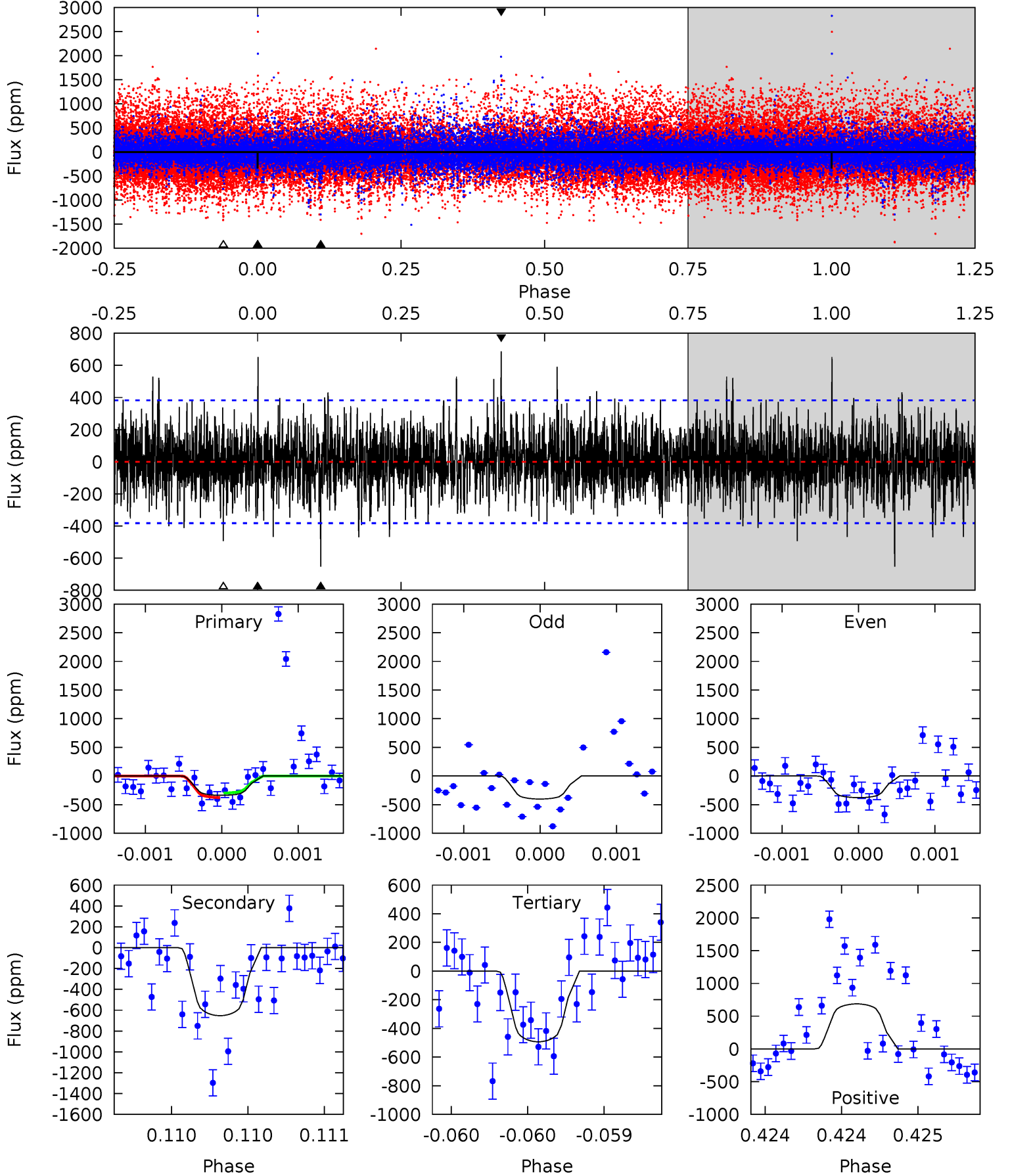
TCE 004665568-03 P=174.370978 Days  $T_0=193.974734$  (BKJD)



# DV Model-Shift Uniqueness Test

004665568-03, P = 174.366829 Days, E = 19.610832 Days

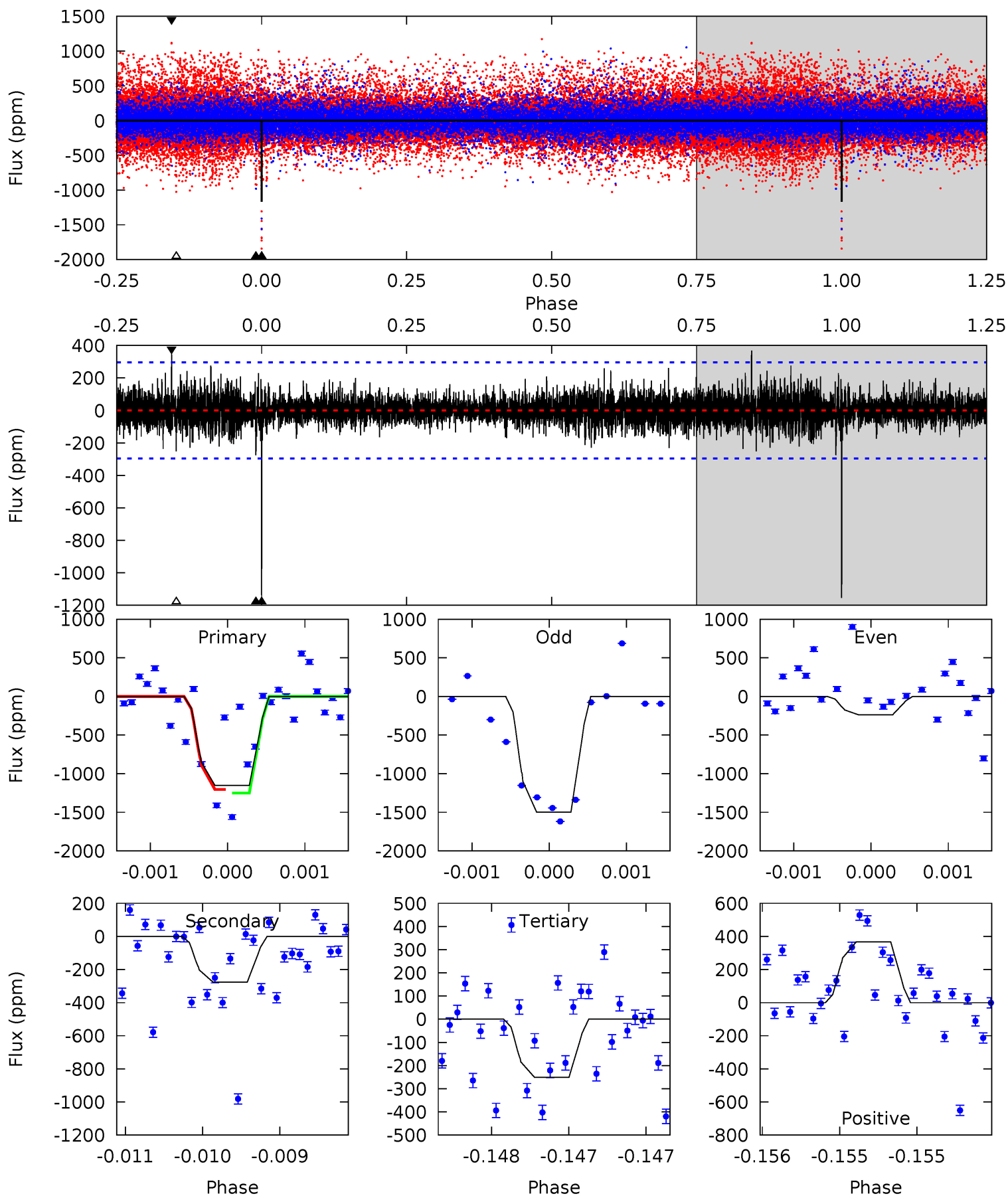
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
4.91	9.47	7.16	9.97	5.55	3.44	1.93	-2.25	-5.06	2.31	-0.50	0.15	-0.32	0.51	0.58



# Alt Model-Shift Uniqueness Test

004665568-03, P = 174.370978 Days, E = 19.603756 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
21.6	5.18	4.72	6.90	5.56	3.47	1.17	16.9	14.7	0.46	-1.72	11.4	-0.11	0.24	0.43



### Stellar Parameters For KIC 004665568

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$6046^{+181}_{-181}$	$3.986^{+0.487}_{-0.162}$	$-0.620^{+0.300}_{-0.250}$	$1.609^{+0.466}_{-0.699}$	$0.915^{+0.118}_{-0.118}$	$0.309^{+1.396}_{-0.132}$
	+3%/-3%	+12%/-4%	+48%/-40%	+29%/-43%	+13%/-13%	+451%/-43%
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 004665568-03 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-652 \pm 69$	$5.36^{+4.18}_{-3.46}$	$601^{+55}_{-64}$	$5412^{+4214}_{-1143}$	$4418^{+31008}_{-3061}$
Alt.	$-276 \pm 53$	$5.54^{+4.94}_{-3.64}$	$605^{+52}_{-75}$	$4416^{+2618}_{-787}$	$1688^{+12528}_{-1202}$

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

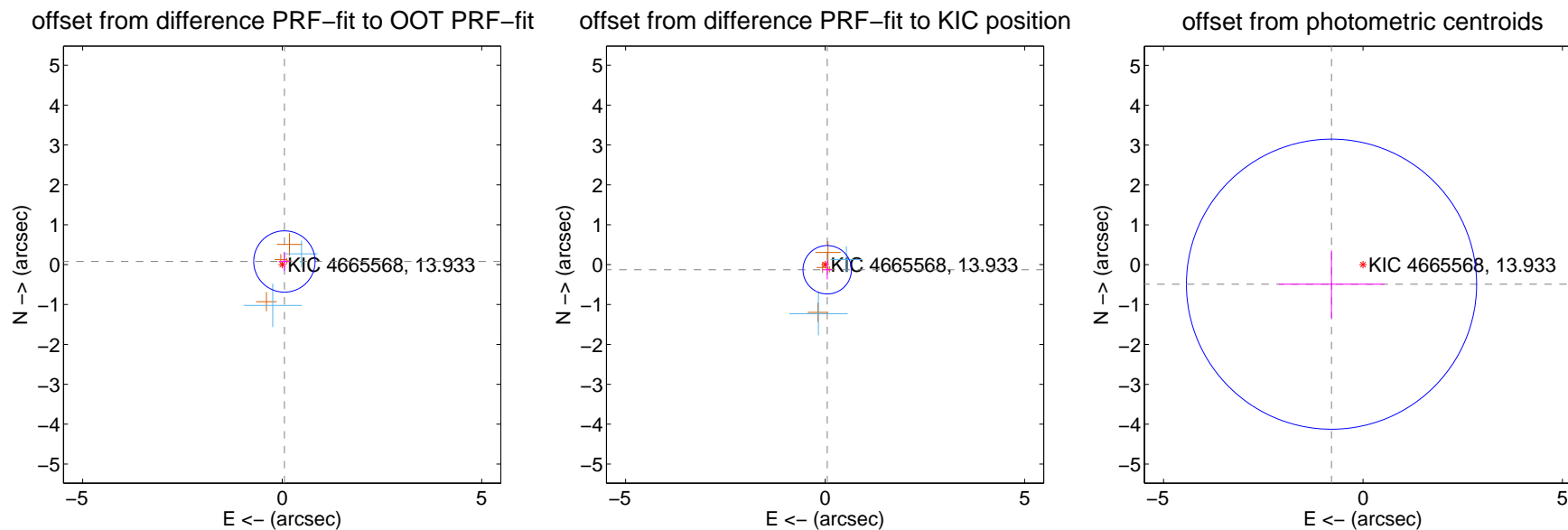
## DV Centroid Data

Supplemental centroid analysis for 004665568-03. Kepler magnitude: 13.93. Transit SNR 6.36

There are 2 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.21 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.096 \pm 0.256$	0.38	$-0.055 \pm 0.136$	$0.079 \pm 0.239$
PRF-fit source offset from KIC position	$0.139 \pm 0.202$	0.69	$-0.053 \pm 0.118$	$-0.128 \pm 0.241$
photometric centroid source offset	$0.93 \pm 1.21$	0.77	$0.79 \pm 1.33$	$-0.49 \pm 0.85$



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.

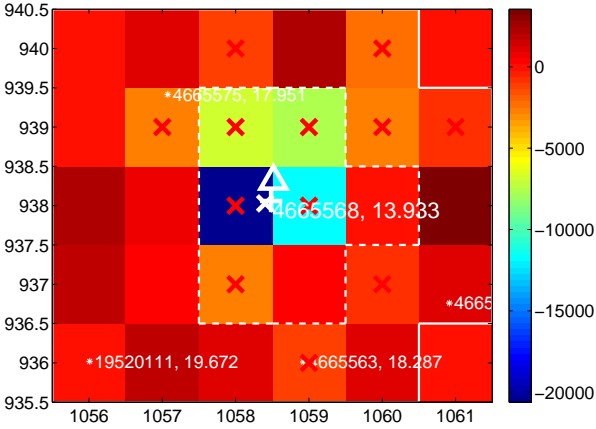
Q1 no difference image



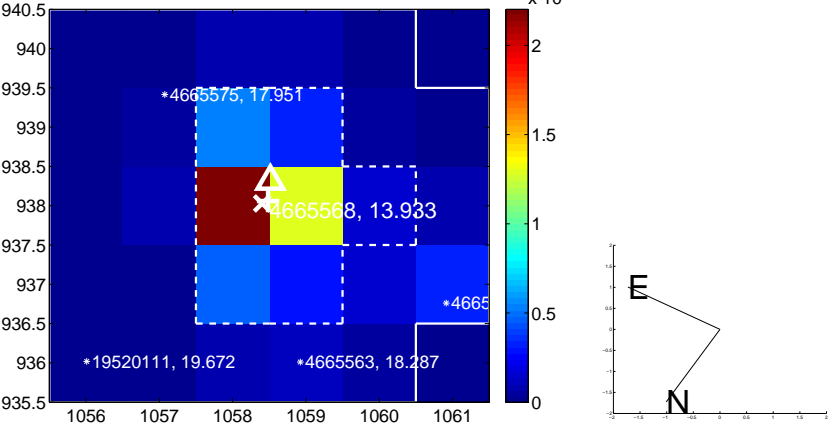
Q1 no OOT image



Q2 difference image. Poor Quality



Q2 OOT image



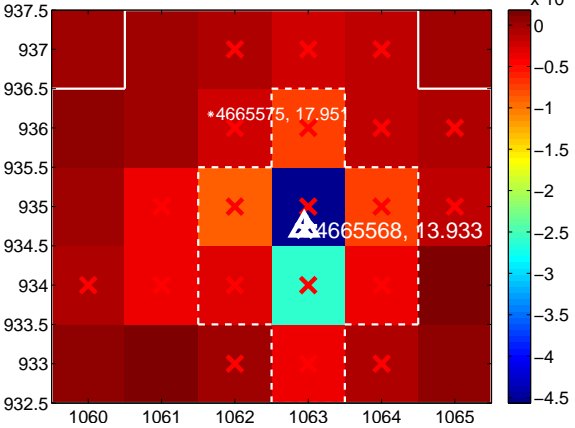
Q3 no difference image



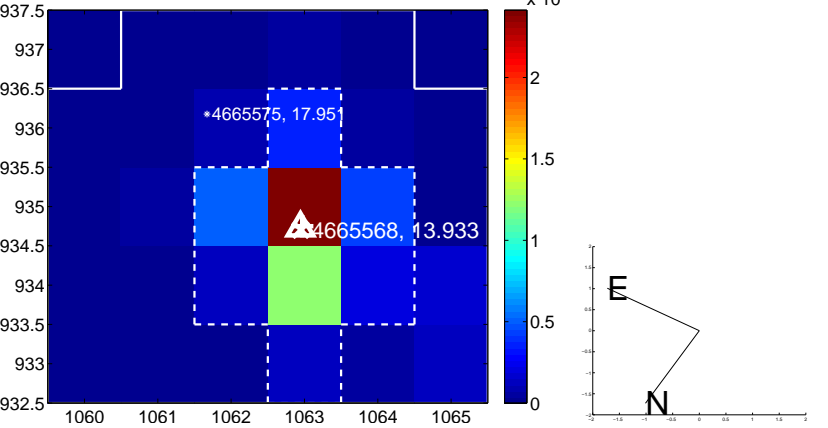
Q3 no OOT image



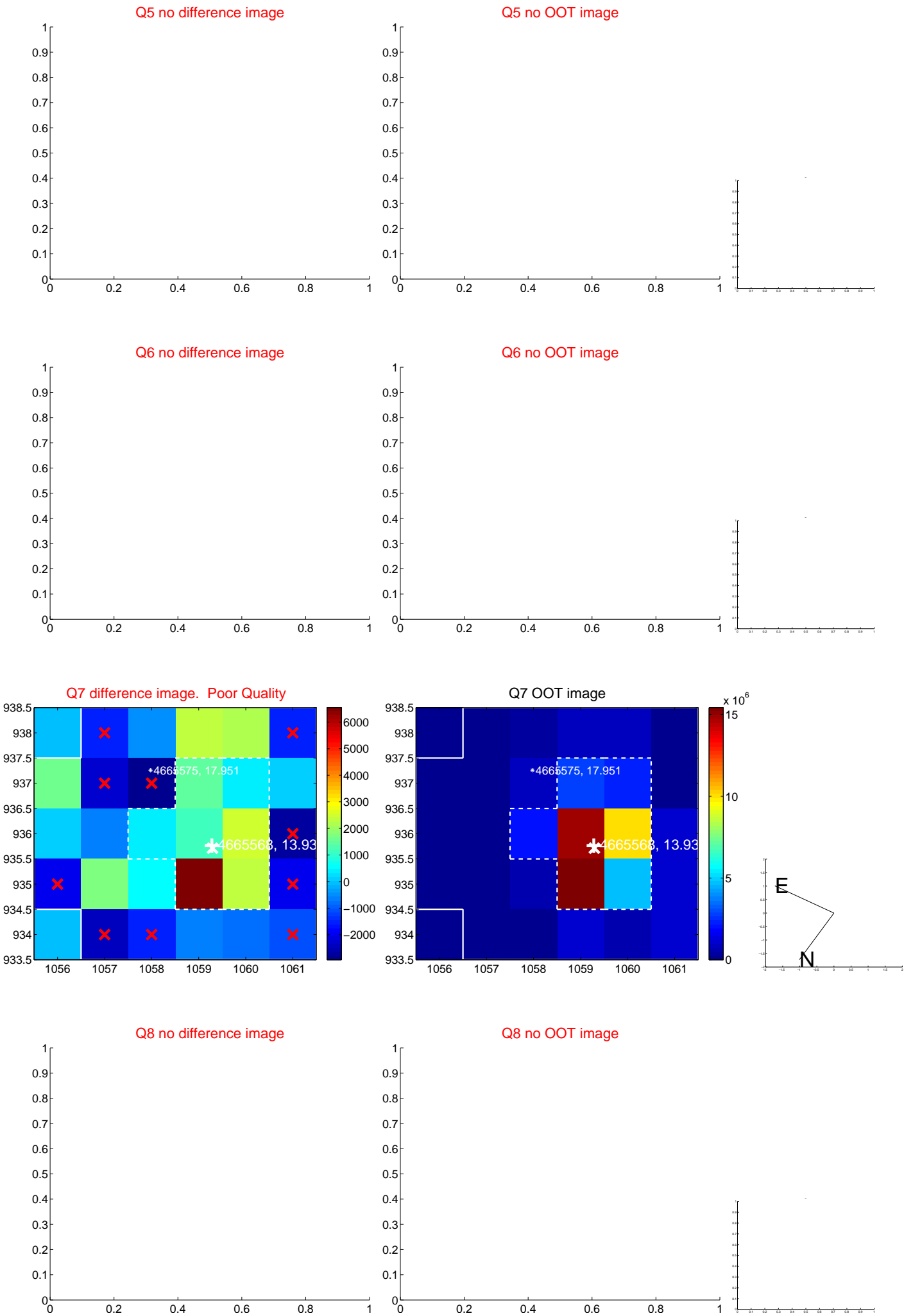
Q4 difference image. Poor Quality



Q4 OOT image

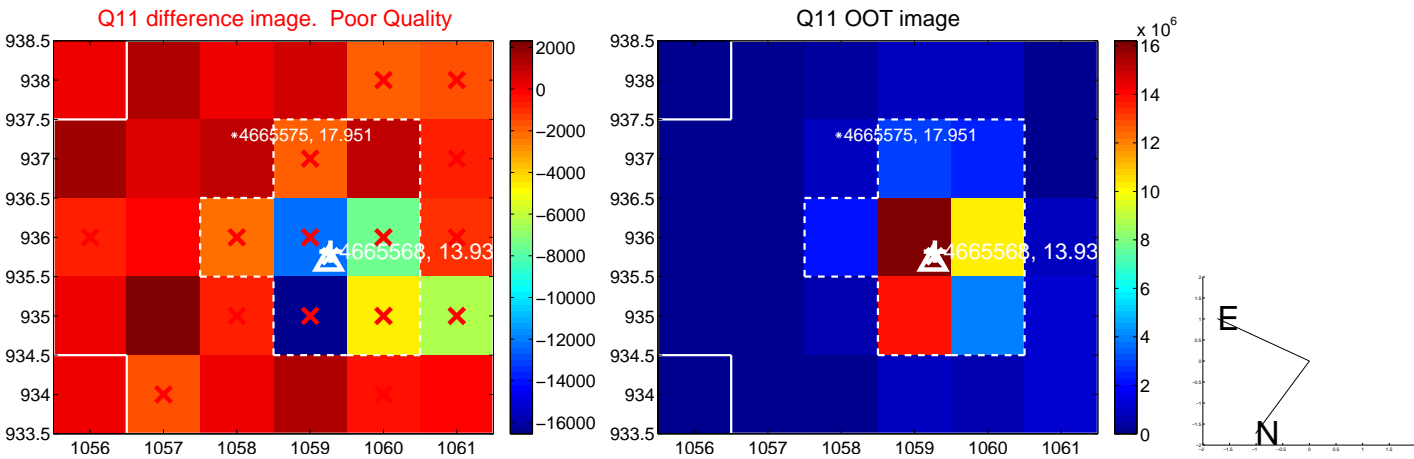
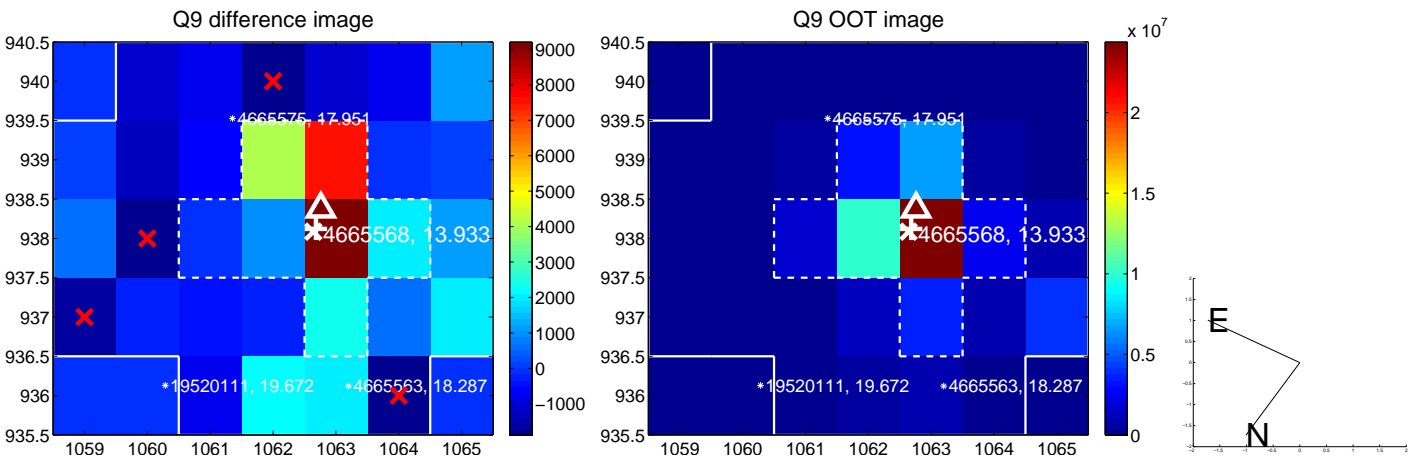


white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.

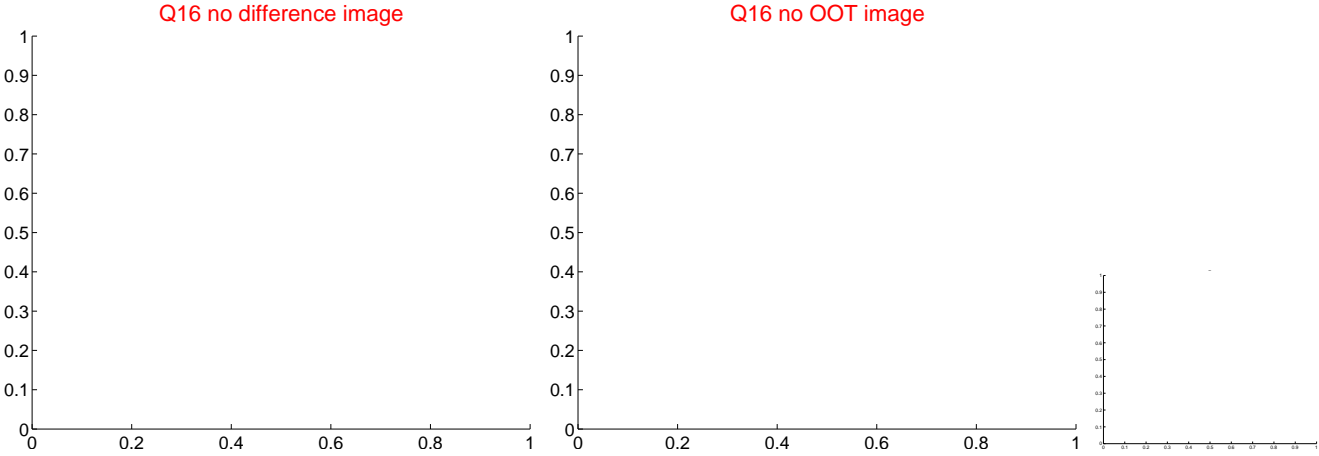
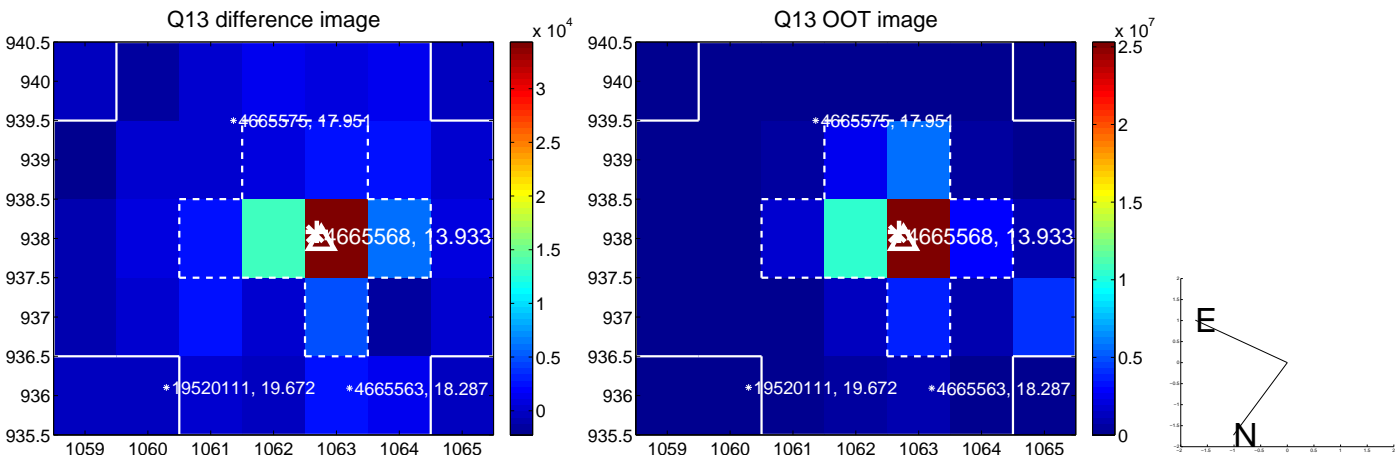




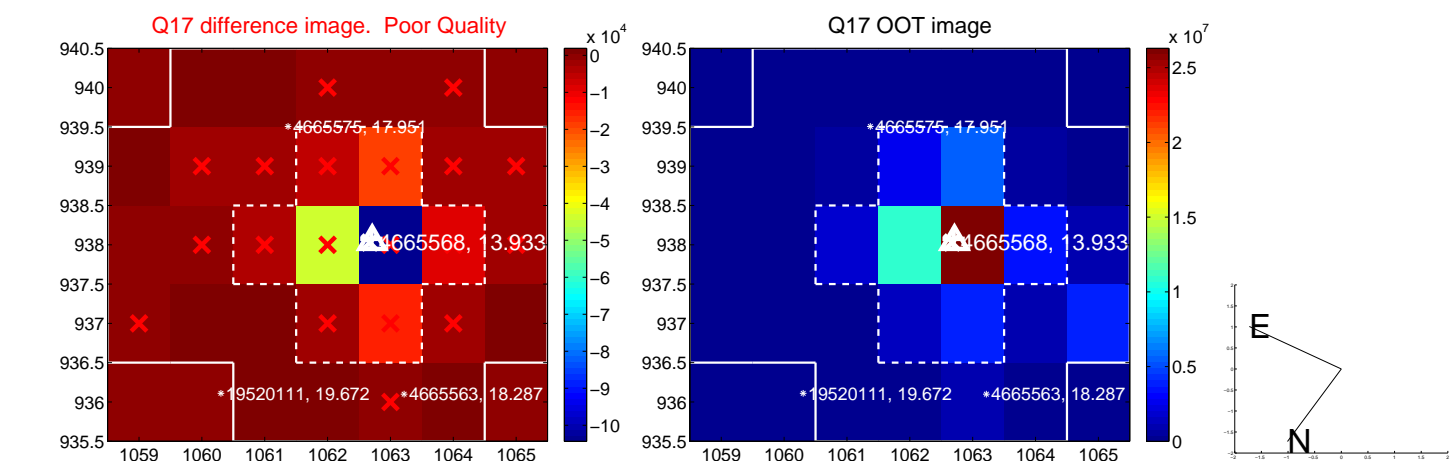
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



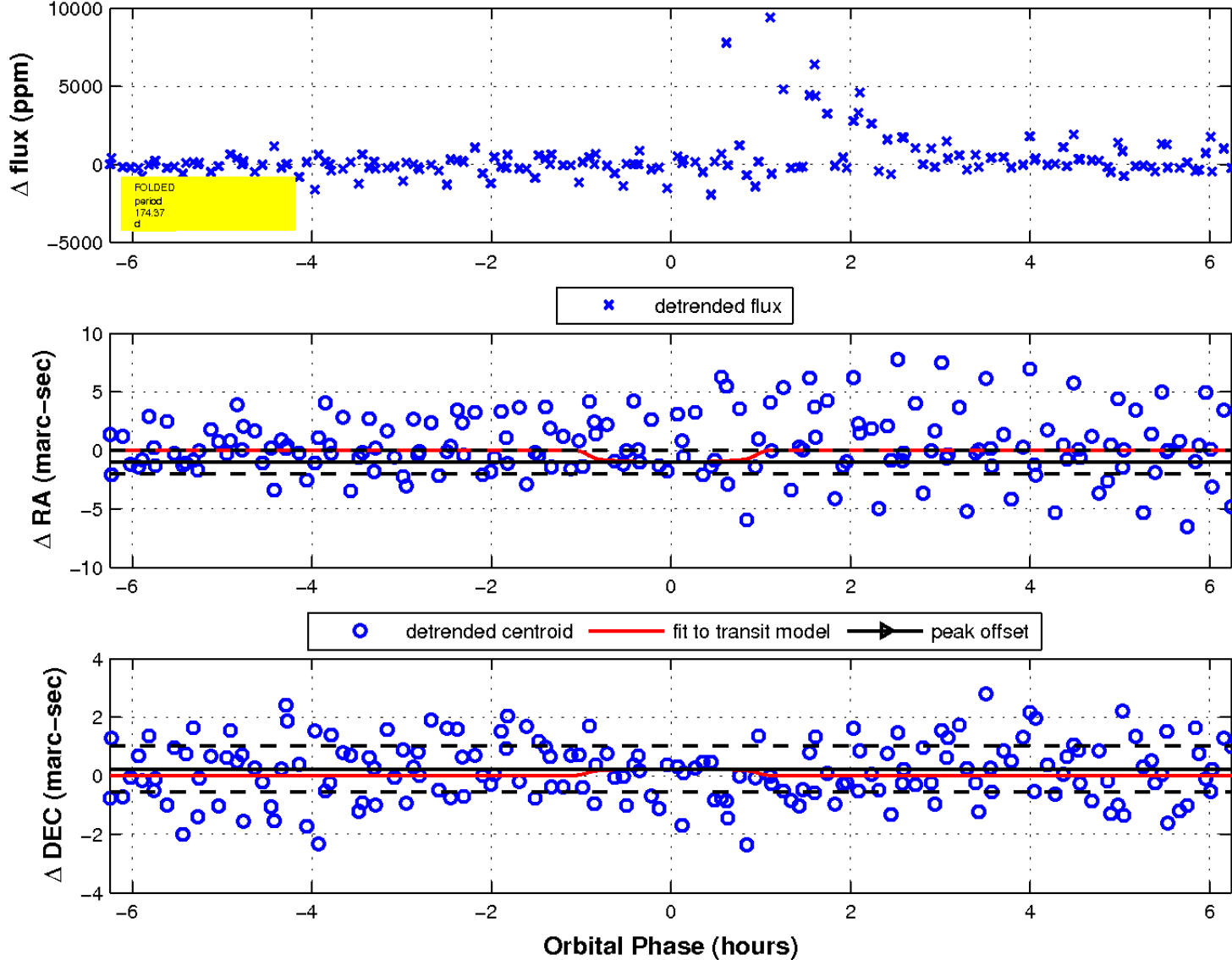
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

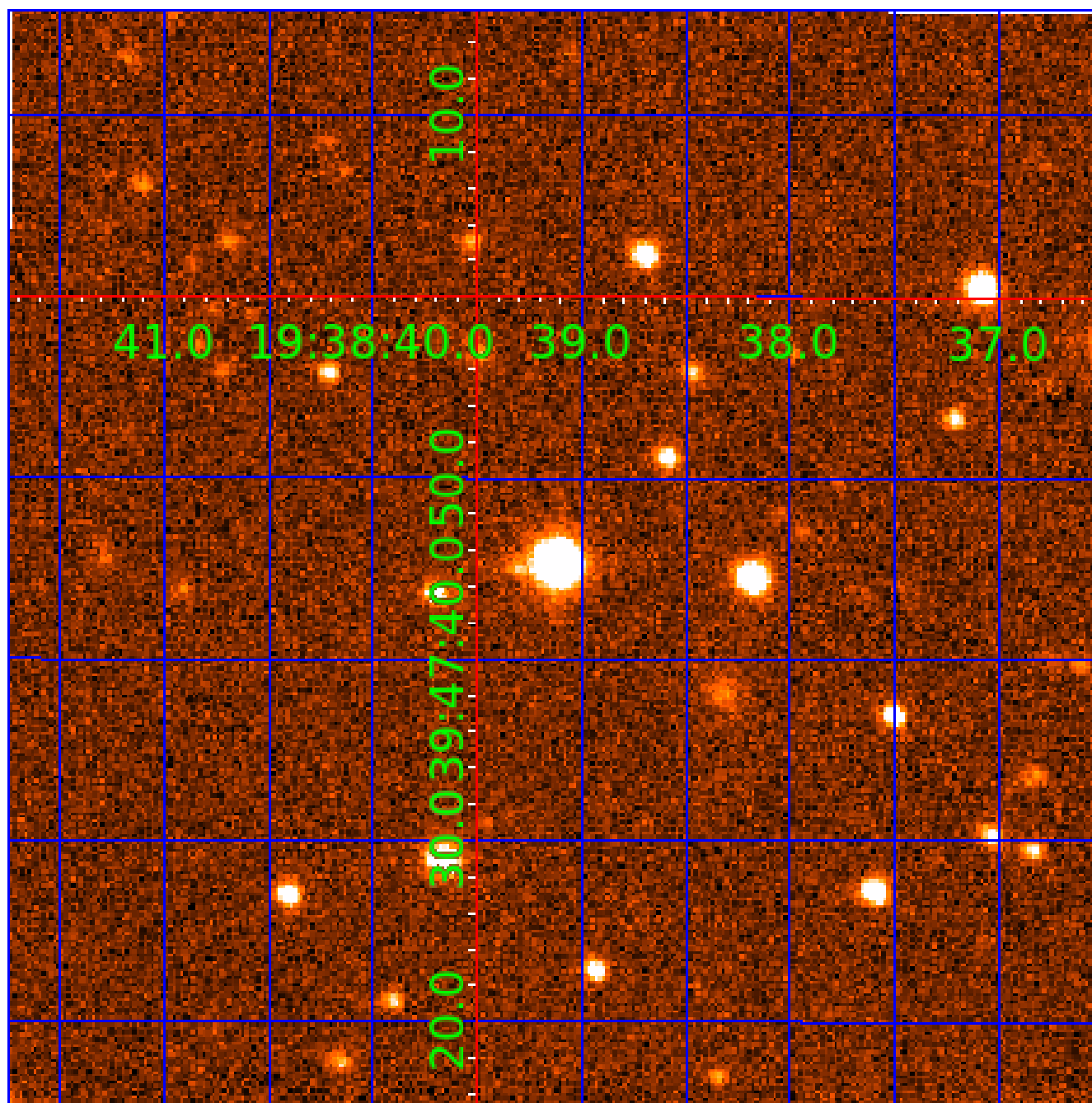


fluxWeightedCentroids, Planet 3 of 4



# UKIRT Image

Declination



# KIC 004665568

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004665568-01	OBS	No	380.075911	135.954435	1161.2	4.743	17.4	5.9	1.61	6046	5.66	3.12
004665568-02	OBS	No	304.093263	361.640018	3014.6	7.694	18.2	10.0	1.61	6046	11.01	4.20
004665568-03	OBS	No	174.366829	193.977661	718.8	2.098	13.5	6.4	1.61	6046	4.90	8.81
004665568-04	OBS	No	177.590702	184.444065	955.4	3.082	12.6	6.1	1.61	6046	5.15	8.60

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004665568-01	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS—HALO_GHOST
004665568-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS
004665568-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_MEAS
004665568-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV

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

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

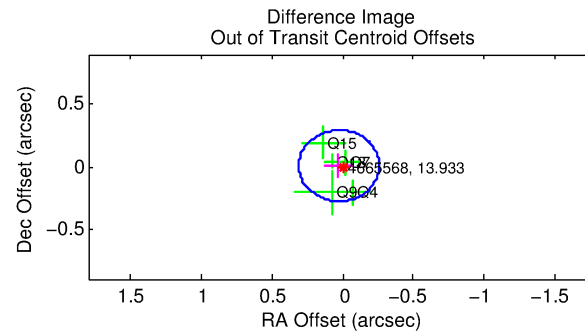
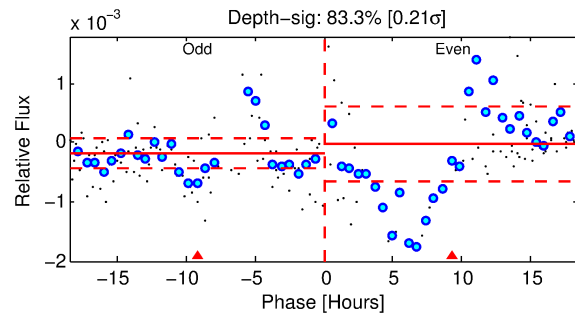
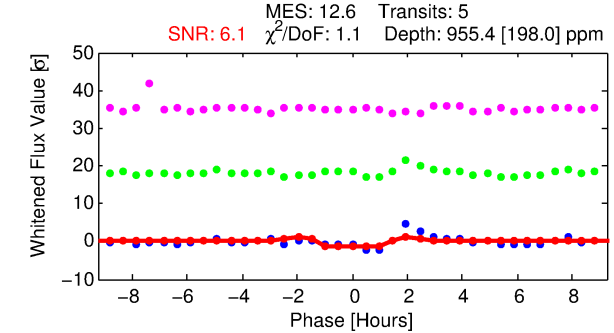
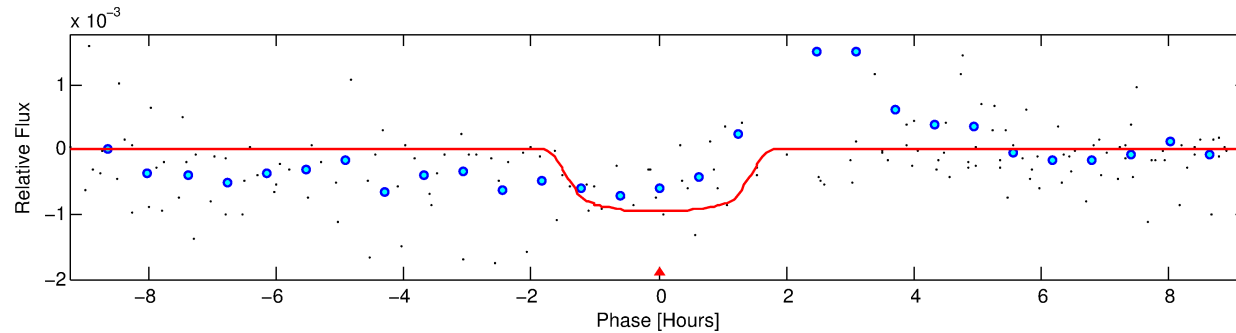
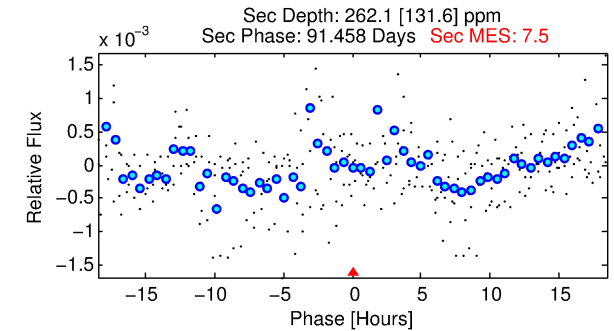
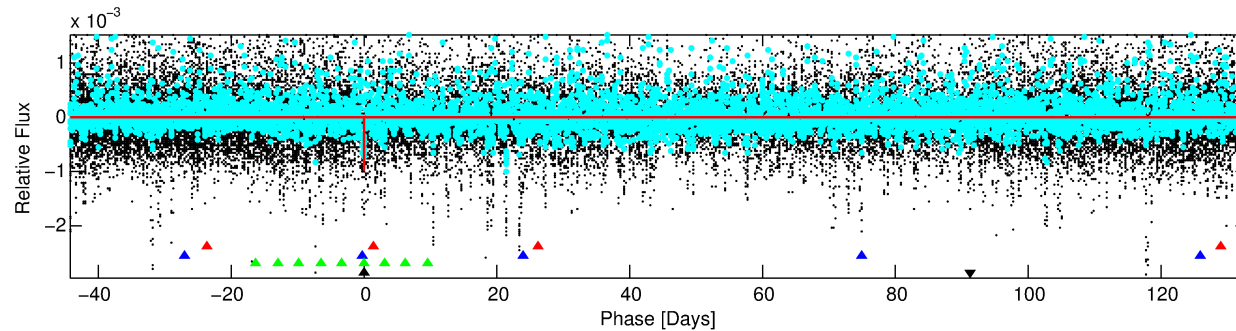
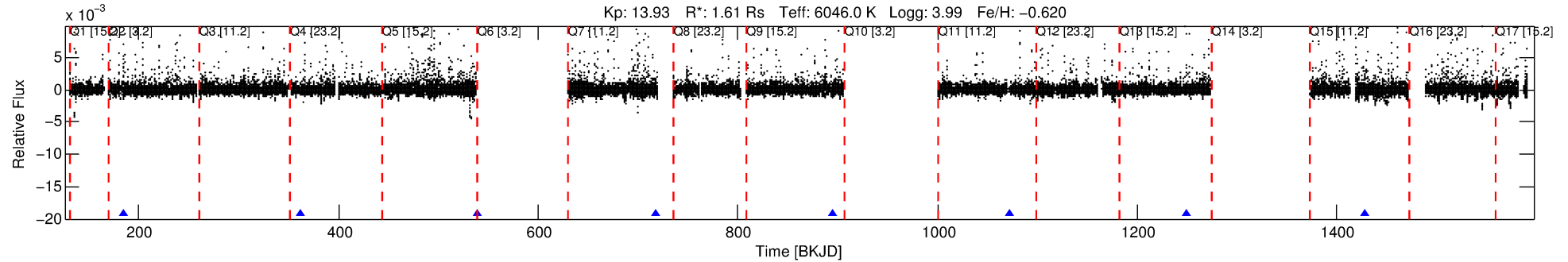
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 004665568-04

No Significant Match Found

# DV One-Page Summary

KIC: 4665568 Candidate: 4 of 4 Period: 177.591 d



## DV Fit Results:

Period = 177.59070 [0.00133] d  
Epoch = 184.4441 [0.0069] BKJD  
Rp/R\* = 0.0293 [0.0576]  
a/R\* = 389.12 [3944.55]  
b = 0.53 [14.00]  
Seff = 8.60 [6.97]  
Teq = 437 [88] K  
Rp = 5.15 [10.36] Re  
a = 0.6003 [0.2838] AU  
Ag = 1961.86 [7935.96] [0.25 $\sigma$ ]  
Teffp = 4493 [4456] K [0.91 $\sigma$ ]

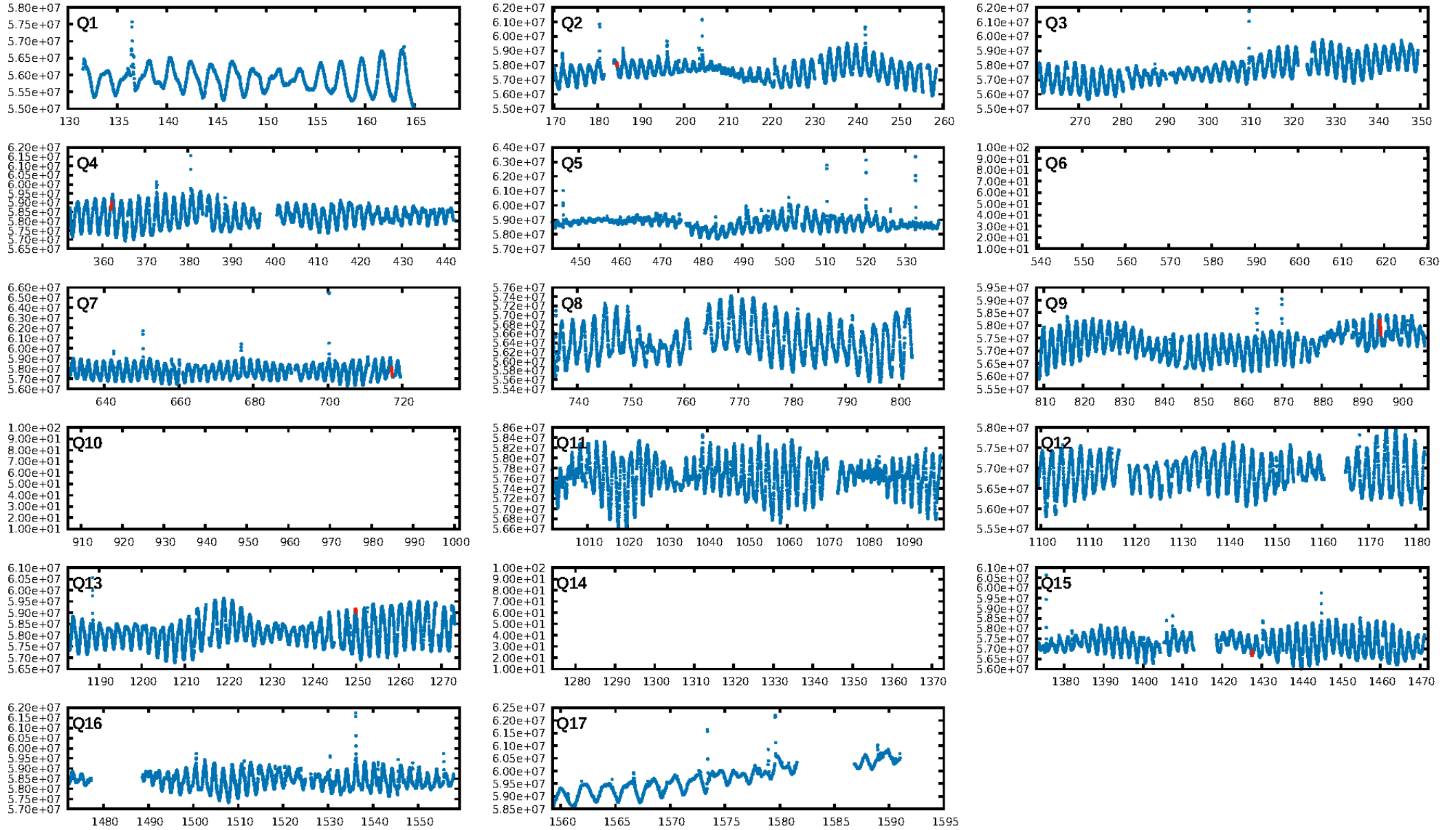
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [20.75 $\sigma$ ]  
LongPeriod-sig: 100.0% [366.29 $\sigma$ ]  
ModelChiSquare2-sig: 12.3%  
ModelChiSquareGof-sig: 98.7%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [5/5]  
GhostDiagnostic-chr: 0.9576  
Centroid-sig: 39.5%  
Centroid-so: 0.177 arcsec [0.23 $\sigma$ ]  
OotOffset-rm: 0.028 arcsec [0.30 $\sigma$ ]  
OotOffset-st: 0/2/1/2 [5]  
KicOffset-rm: 0.146 arcsec [1.51 $\sigma$ ]  
KicOffset-st: 0/2/1/2 [5]  
DiffImageQuality-fgm: 0.80 [4/5]  
DiffImageOverlap-fno: 0.60 [3/5]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 05:03:28 Z

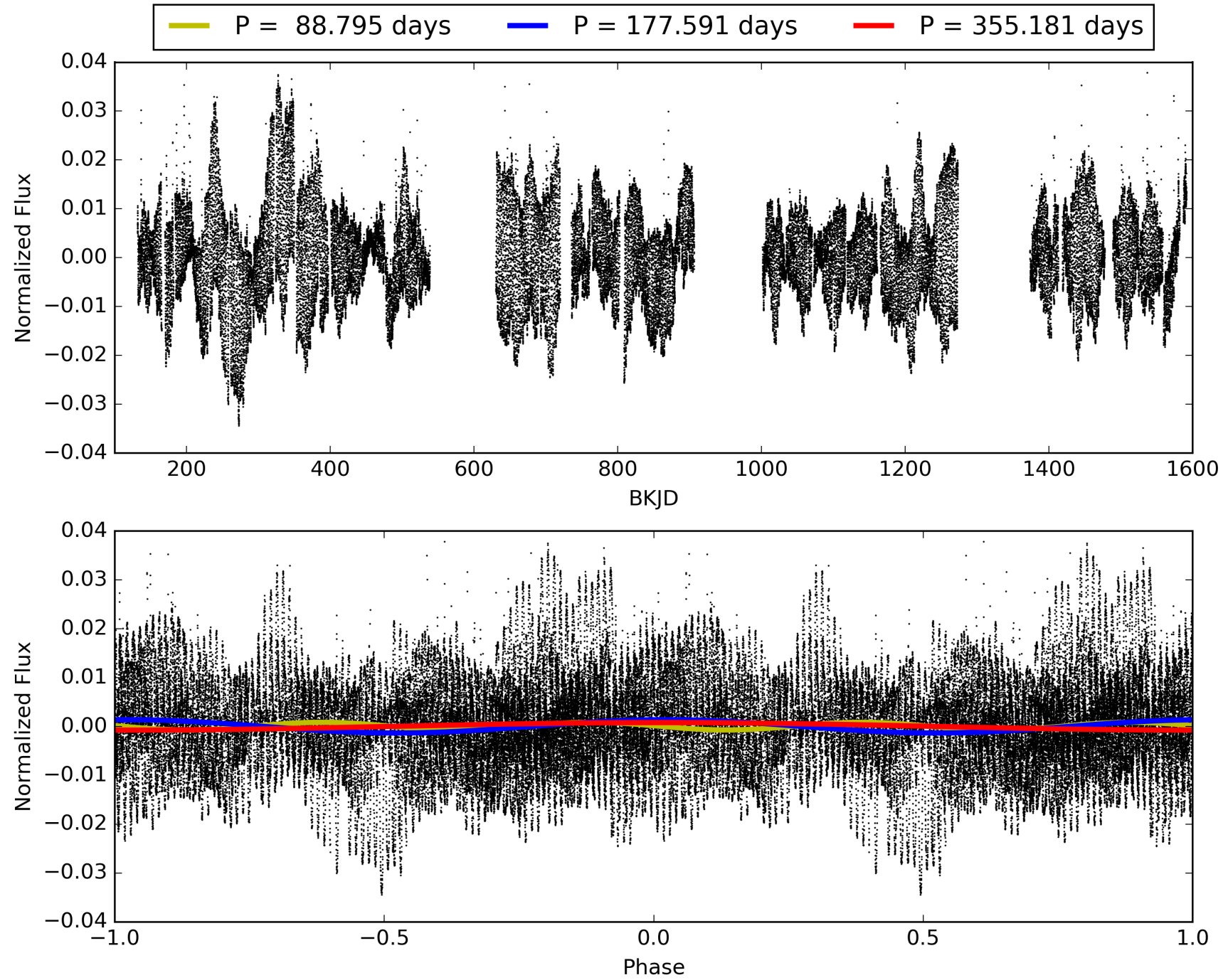
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 004665568-04, PDC Light Curves





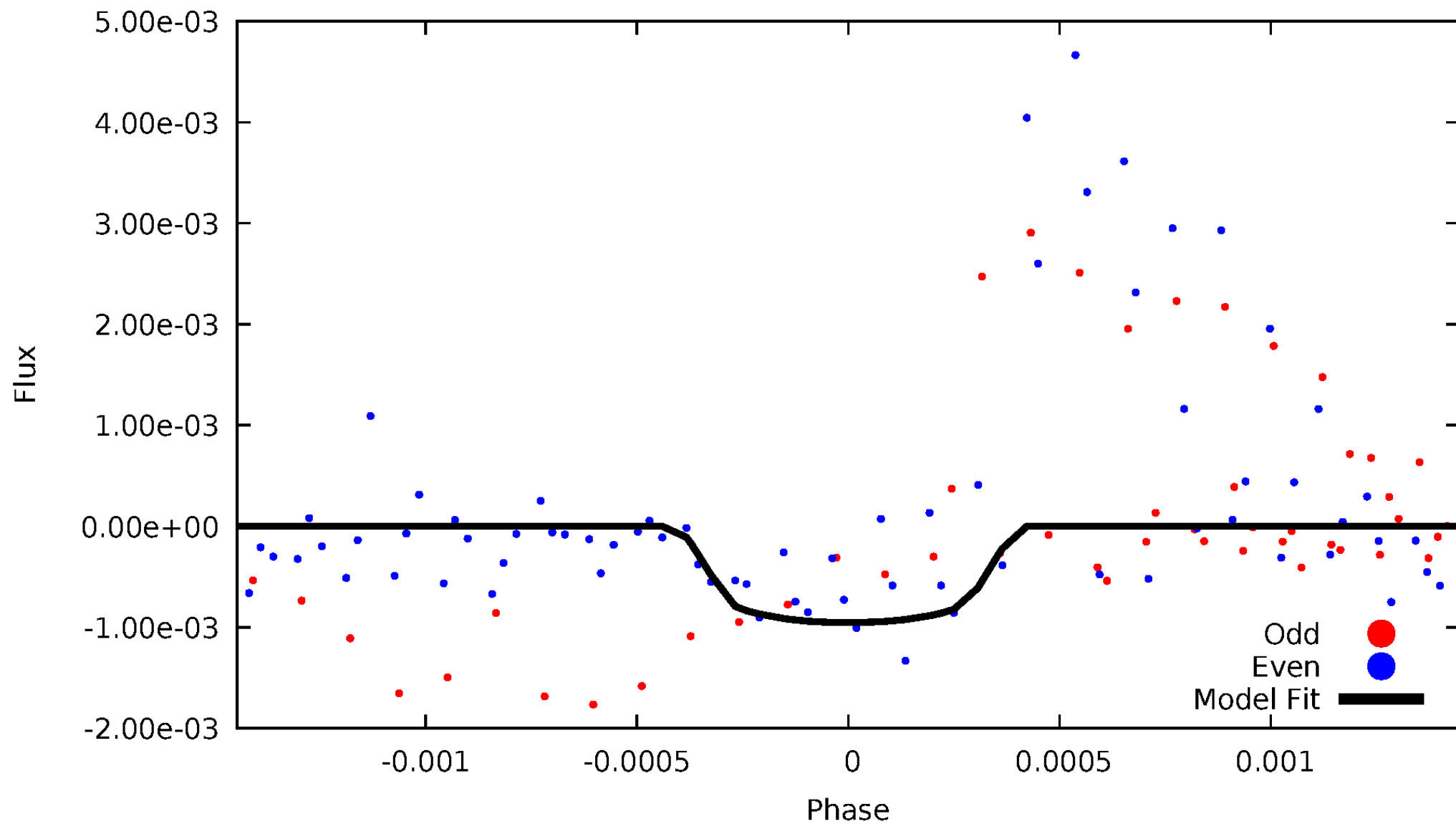
TCE 004665568-04





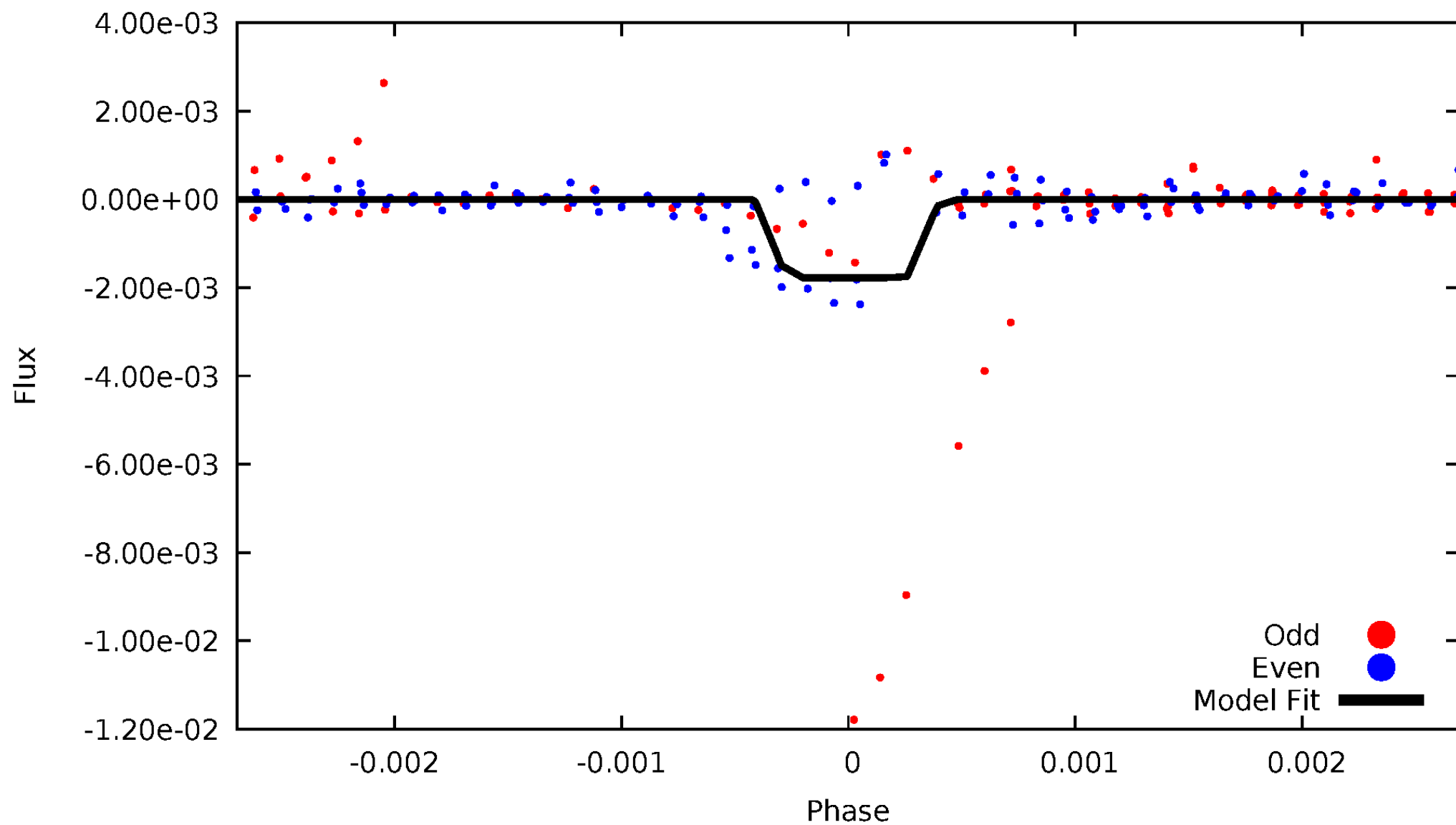
# DV Odd/Even

TCE 004665568-04



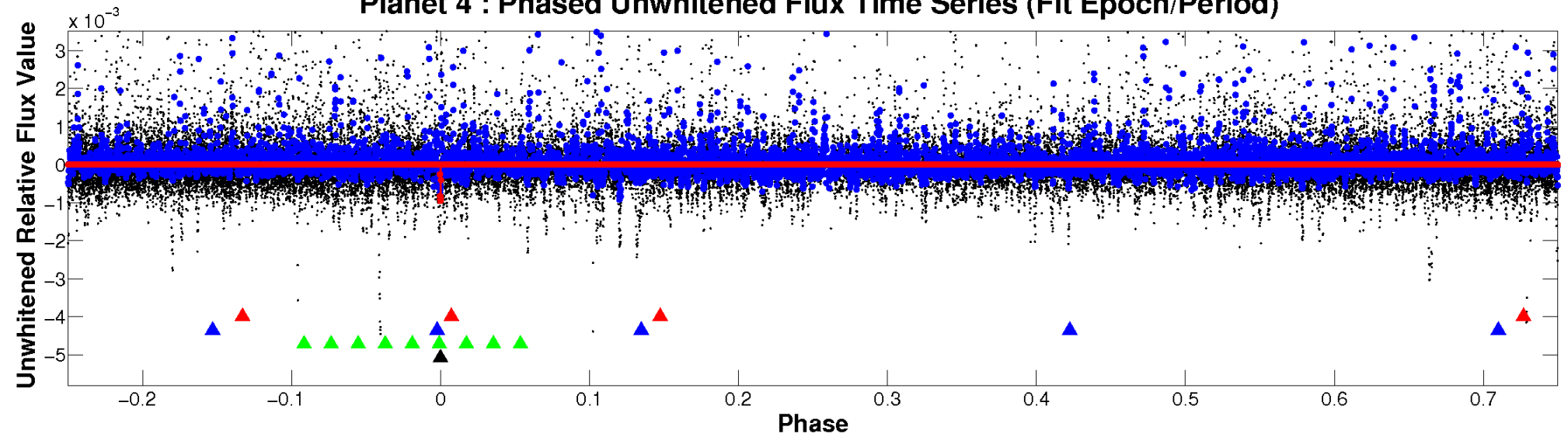
# ALT Odd/Even

TCE 004665568-04

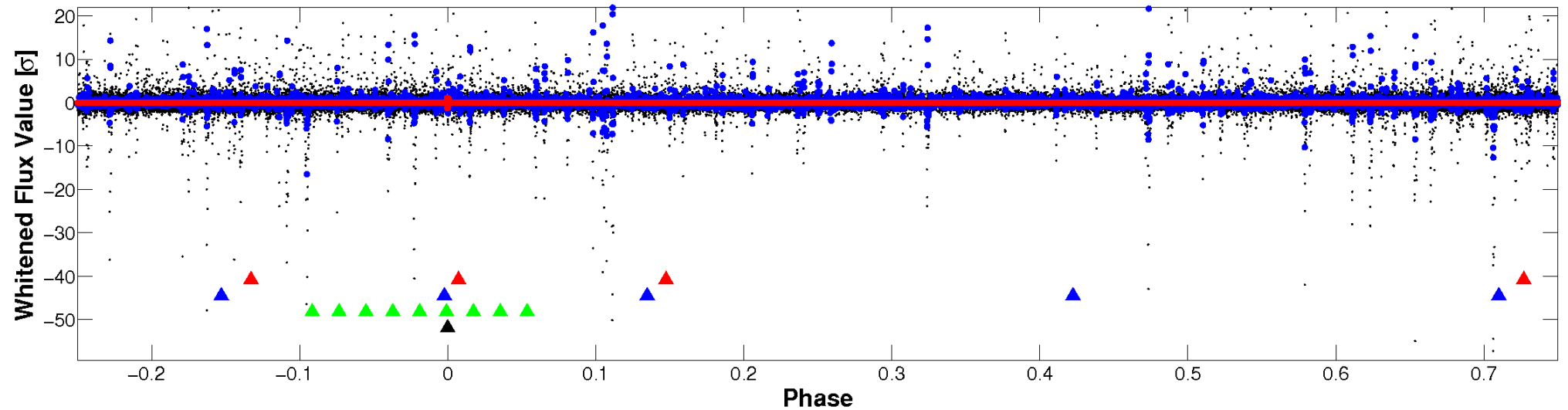


# Non-Whitened Vs. Whitened Light Curve

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

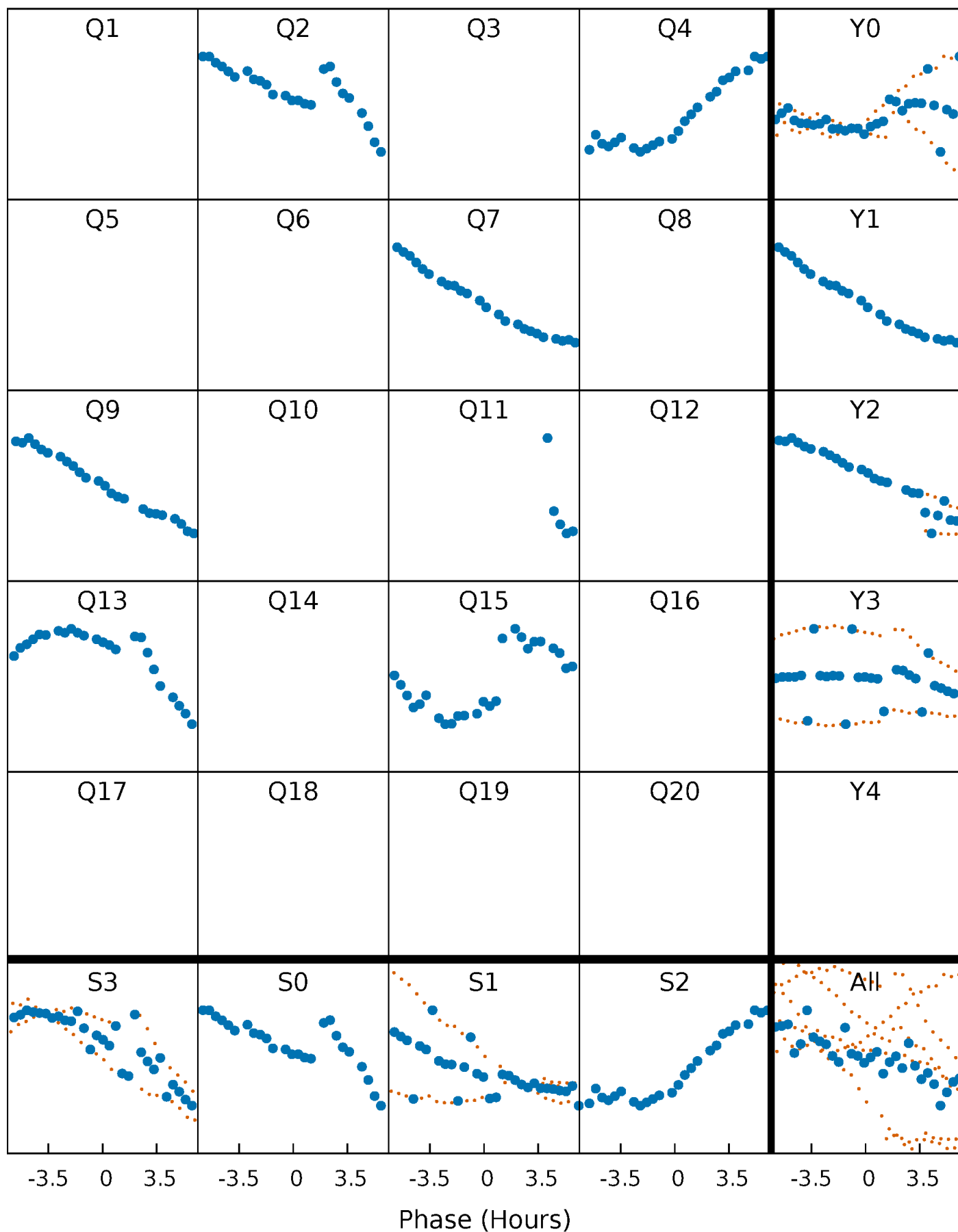


## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



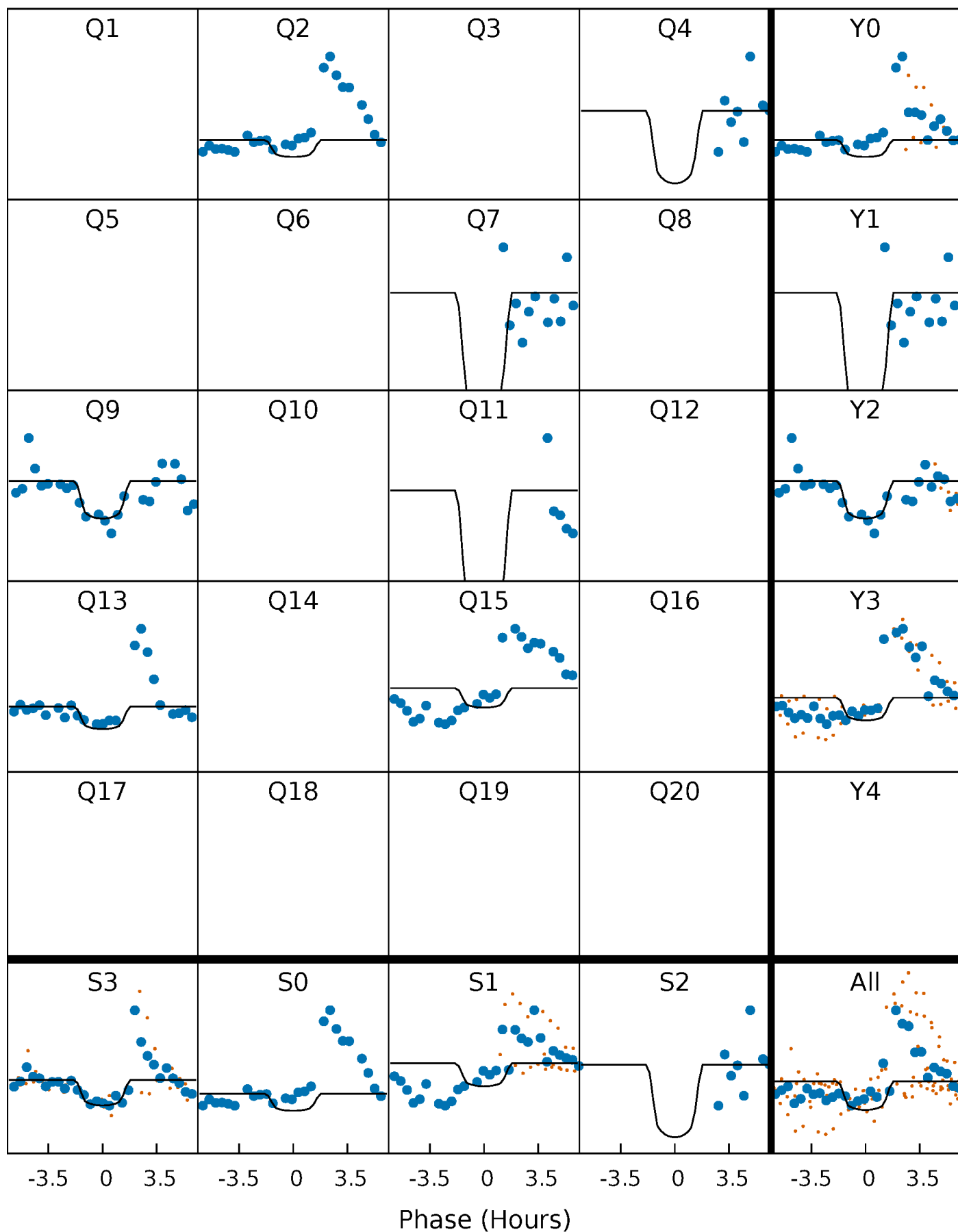
# PDC Quarter-Phased Transit Curves

TCE 004665568-04 P=177.590702 Days  $T_0=184.444064$  (BKJD)



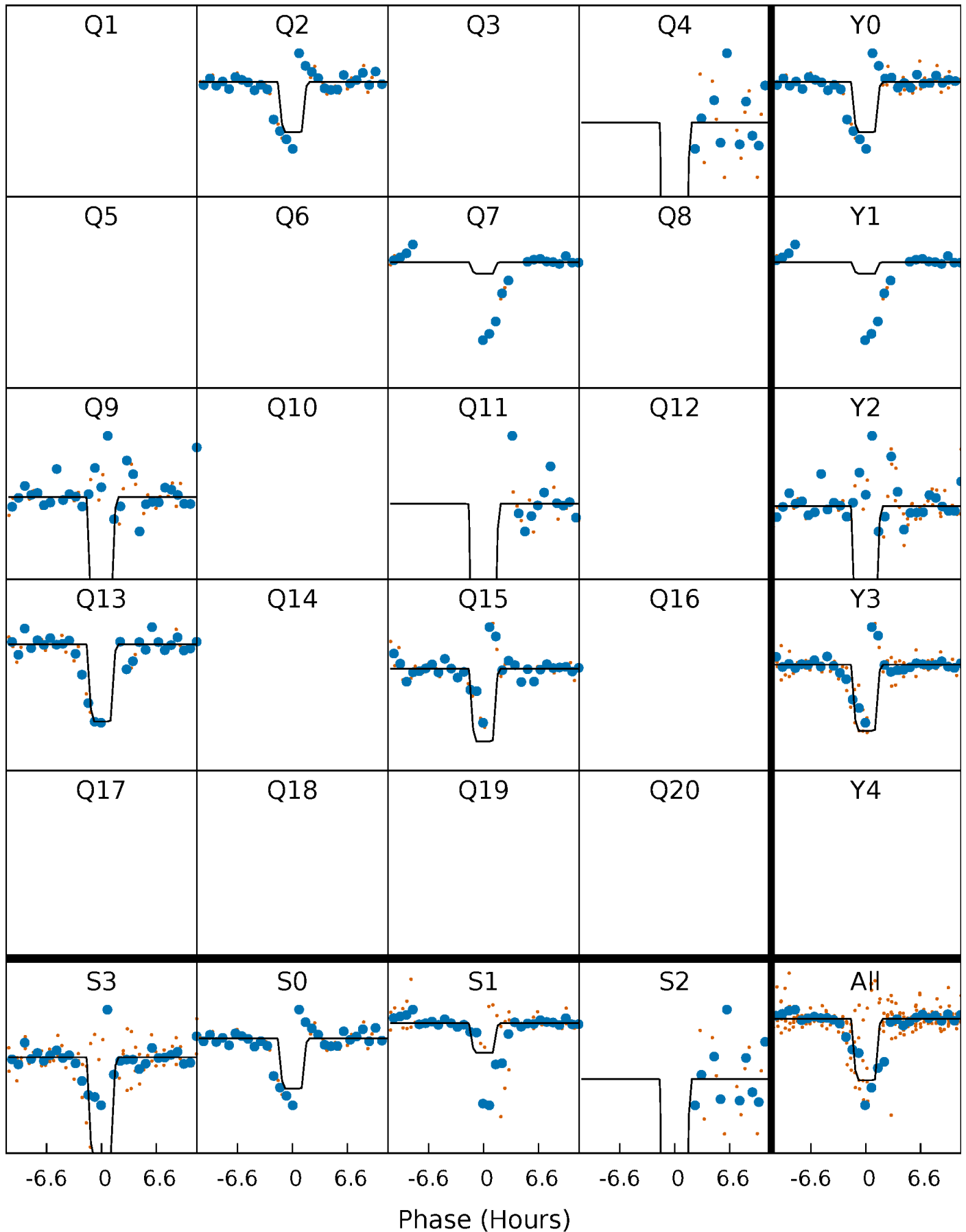
# DV Quarter-Phased Transit Curves

TCE 004665568-04     $P=177.590702$  Days     $T_0=184.444064$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

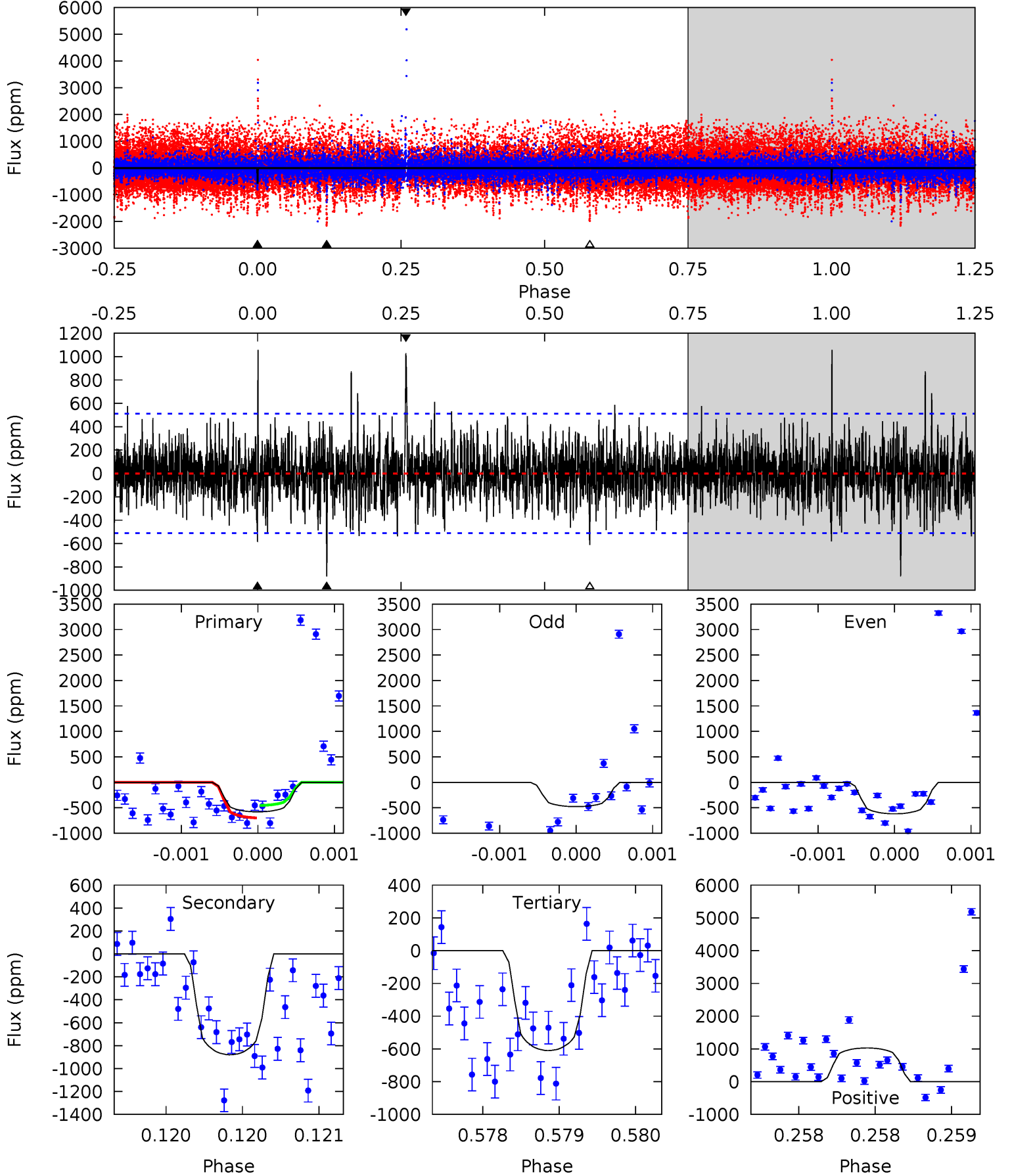
TCE 004665568-04 P=177.588572 Days  $T_0=184.489463$  (BKJD)



# DV Model-Shift Uniqueness Test

004665568-04, P = 177.590702 Days, E = 6.853362 Days

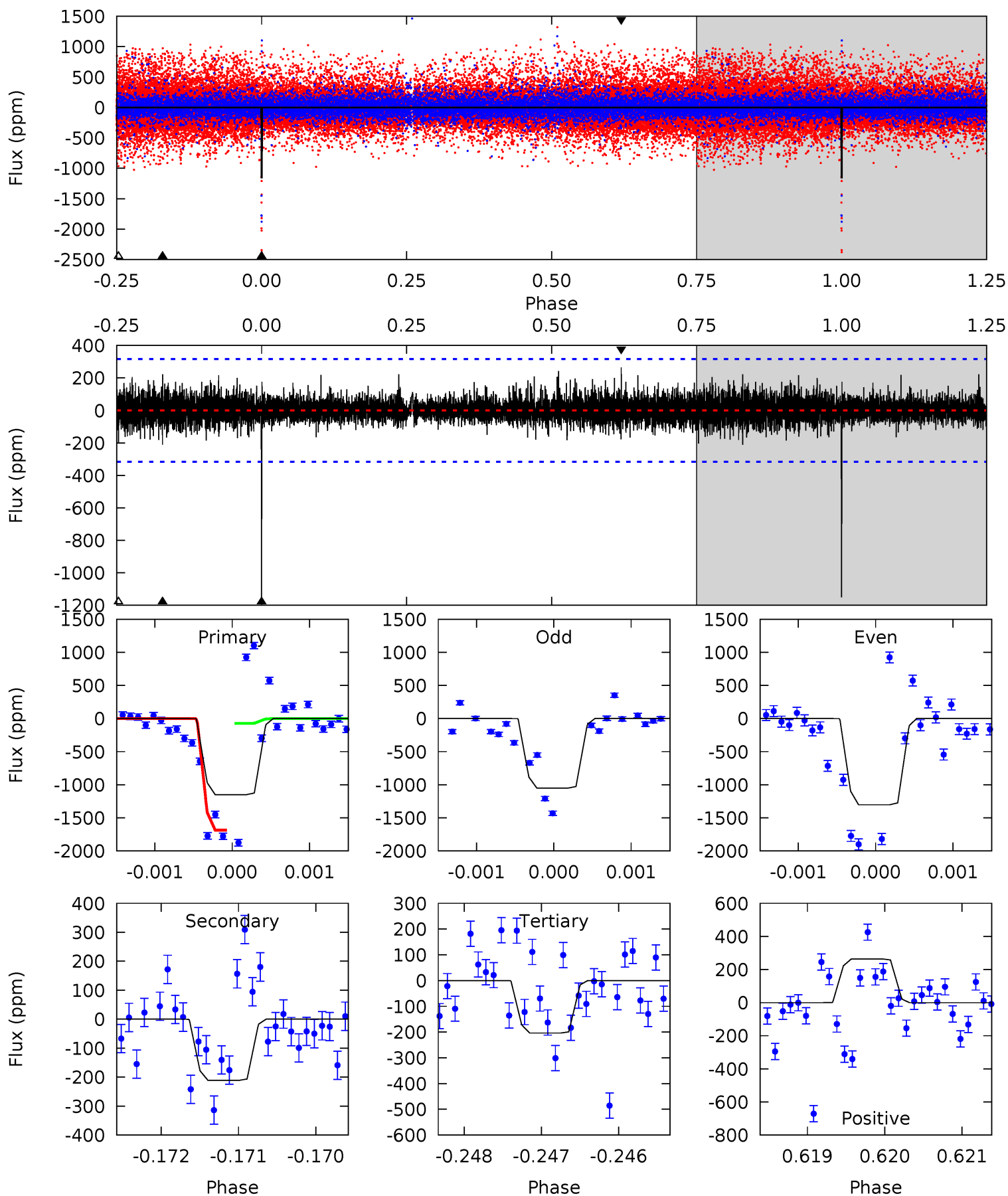
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
6.24	9.48	6.57	11.1	5.50	3.37	1.77	-0.33	-4.83	2.90	-1.59	0.61	1.28	0.55	1.33



# Alt Model-Shift Uniqueness Test

004665568-04, P = 177.588572 Days, E = 6.900891 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
19.9	3.65	3.52	4.56	5.47	3.32	0.89	16.4	15.3	0.13	-0.91	1.87	1.77	0.19	13.8





### Stellar Parameters For KIC 004665568

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$6046^{+181}_{-181}$	$3.986^{+0.487}_{-0.162}$	$-0.620^{+0.300}_{-0.250}$	$1.609^{+0.466}_{-0.699}$	$0.915^{+0.118}_{-0.118}$	$0.309^{+1.396}_{-0.132}$
	+3%/-3%	+12%/-4%	+48%/-40%	+29%/-43%	+13%/-13%	+451%/-43%
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 004665568-04 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-880 \pm 93$	$8.28^{+8.92}_{-5.56}$	$597^{+51}_{-78}$	$4681^{+3461}_{-1012}$	$2514^{+21208}_{-1931}$
Alt.	$-211 \pm 58$	$9.45^{+8.99}_{-6.20}$	$598^{+52}_{-78}$	$3458^{+1459}_{-582}$	$457^{+3101}_{-346}$

$T_{max}$  = 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

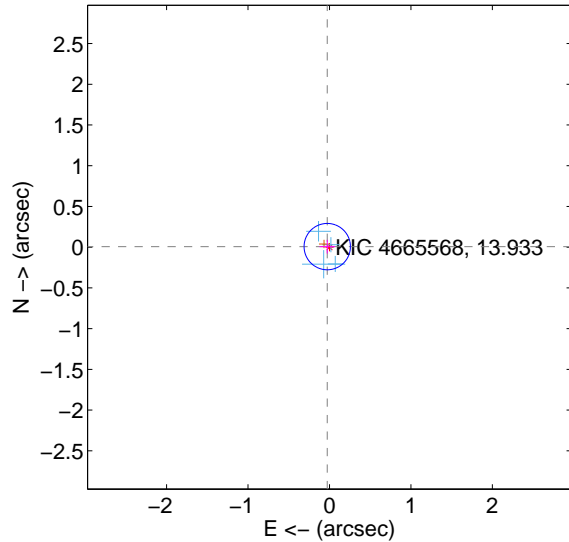
Supplemental centroid analysis for 004665568-04. Kepler magnitude: 13.93. Transit SNR 6.08

There are 4 quarters with good PRF difference image offsets

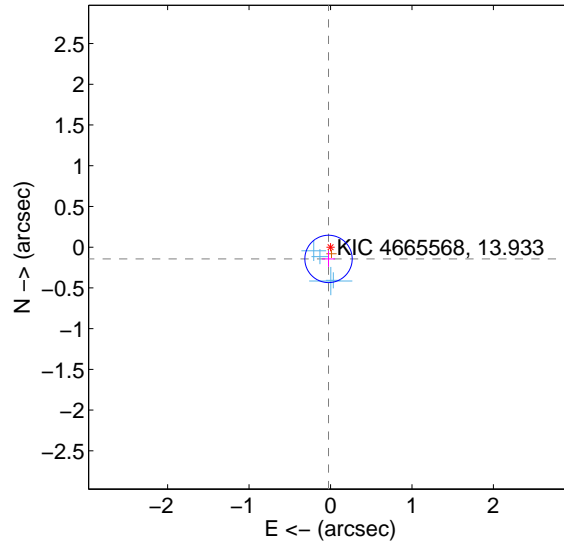
The direct PRF centroid is offset from the target star catalog position by about 0.25 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.028 \pm 0.095$	0.30	$0.027 \pm 0.095$	$0.007 \pm 0.084$
PRF-fit source offset from KIC position	$0.146 \pm 0.097$	1.51	$0.024 \pm 0.080$	$-0.144 \pm 0.097$
photometric centroid source offset	$0.18 \pm 0.77$	0.23	$-0.12 \pm 0.98$	$0.13 \pm 0.54$

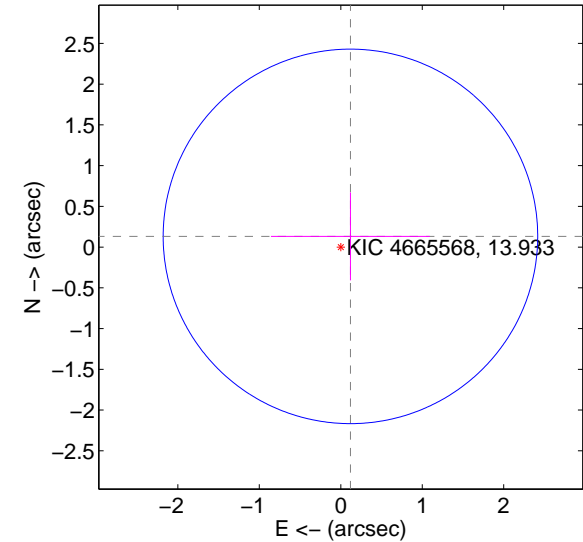
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

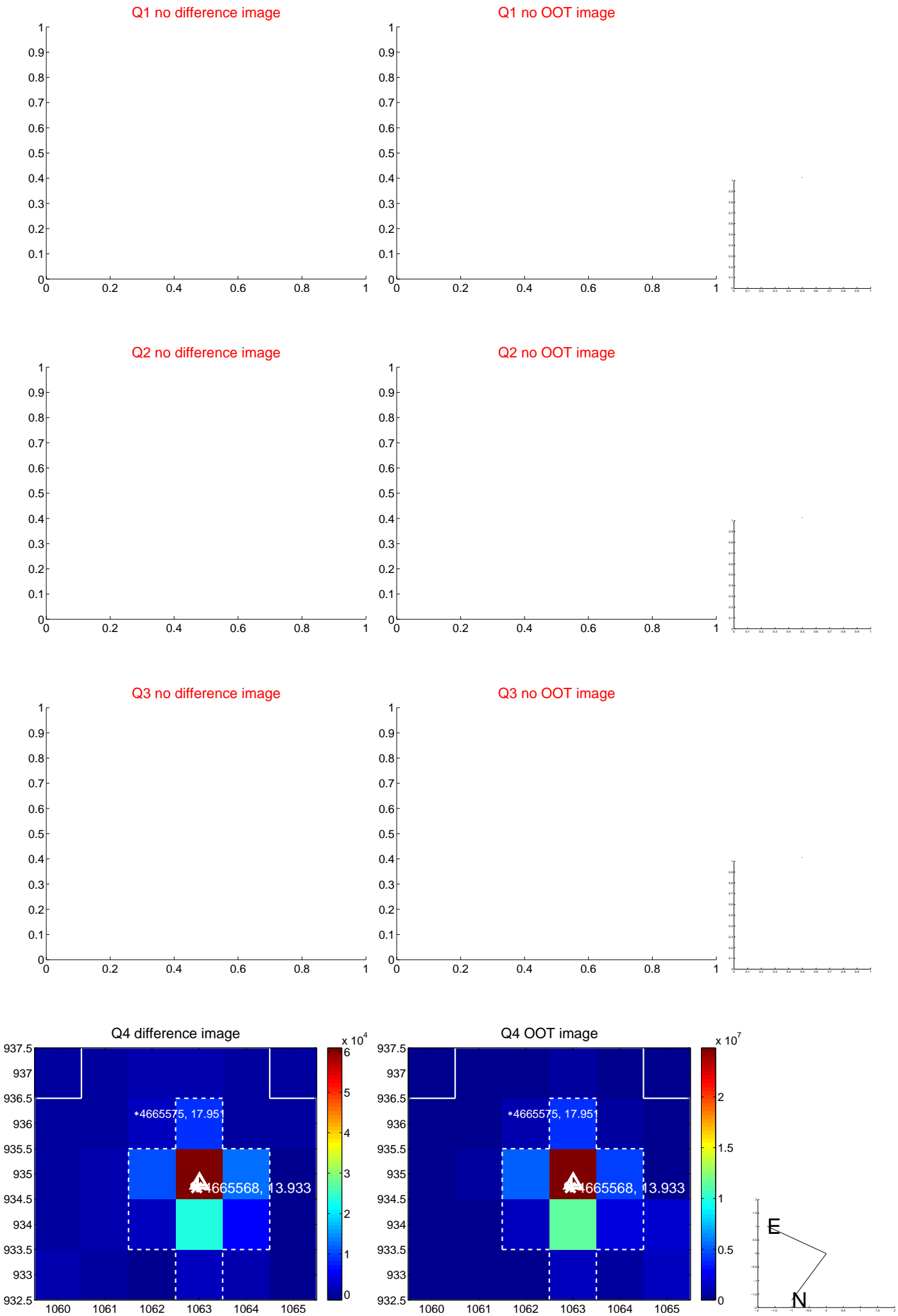


offset from photometric centroids

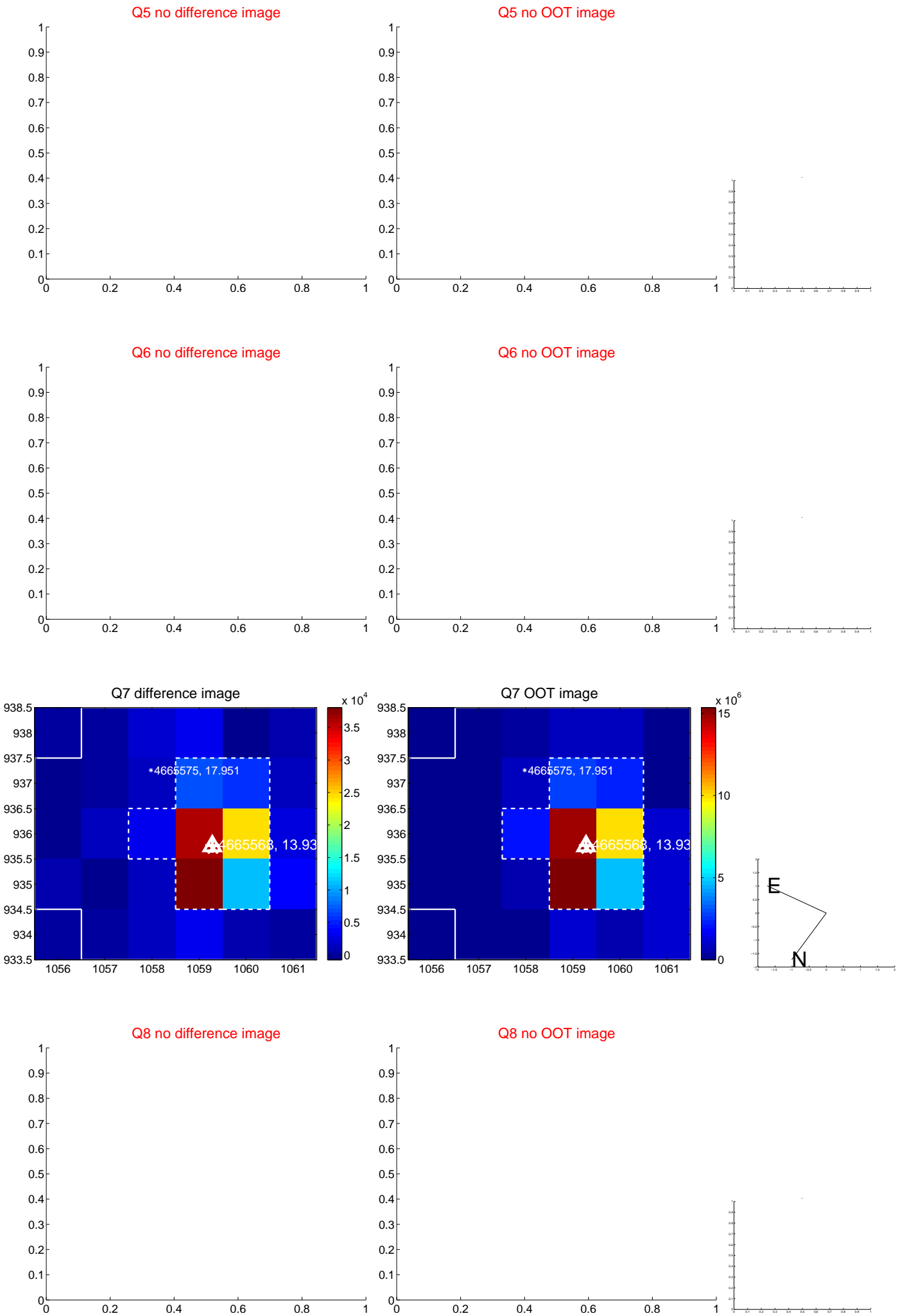


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

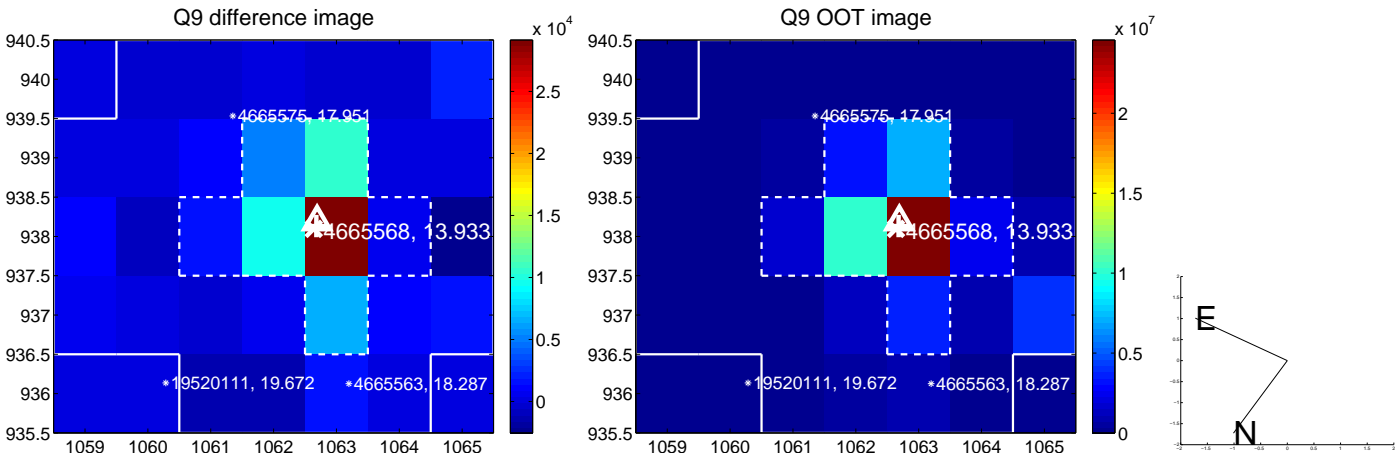
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



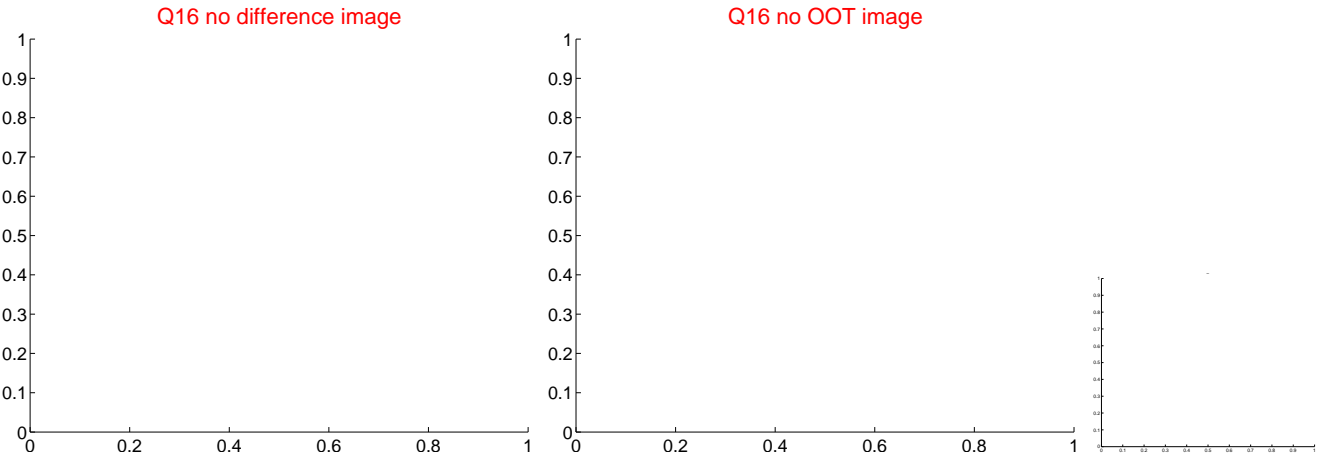
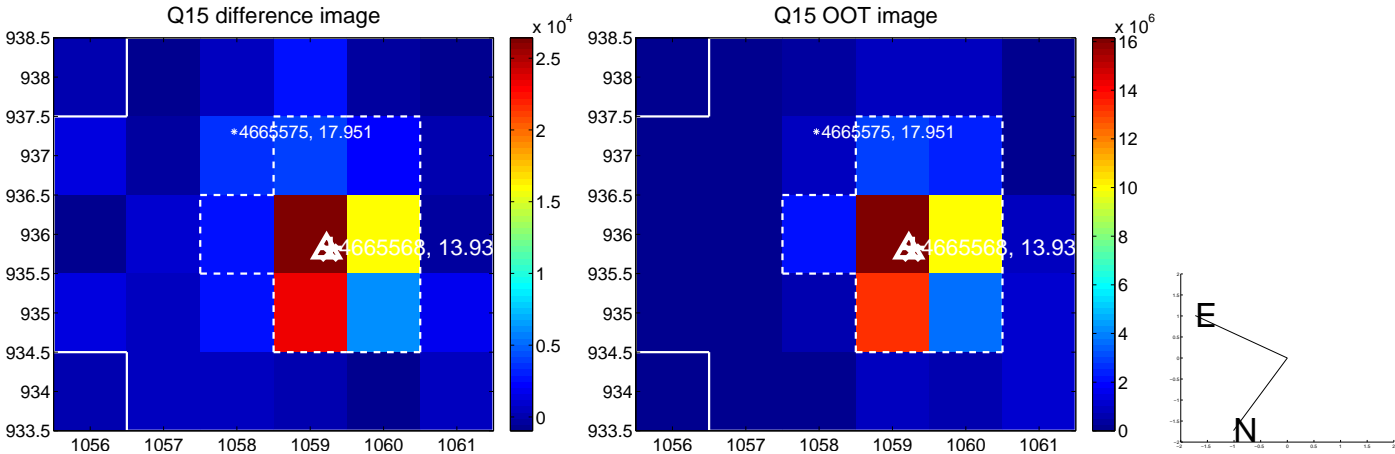
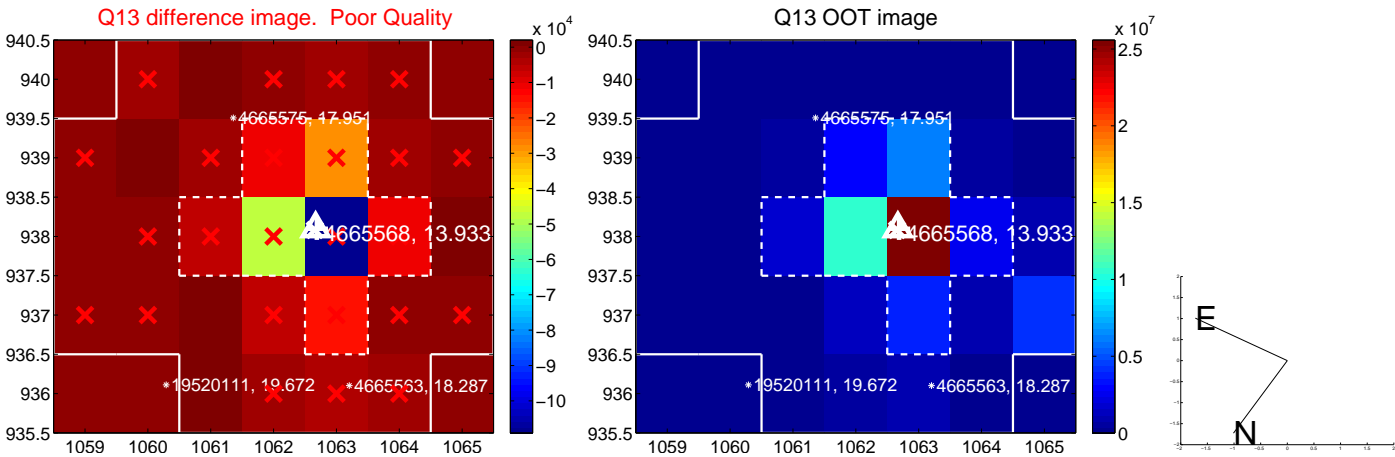
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



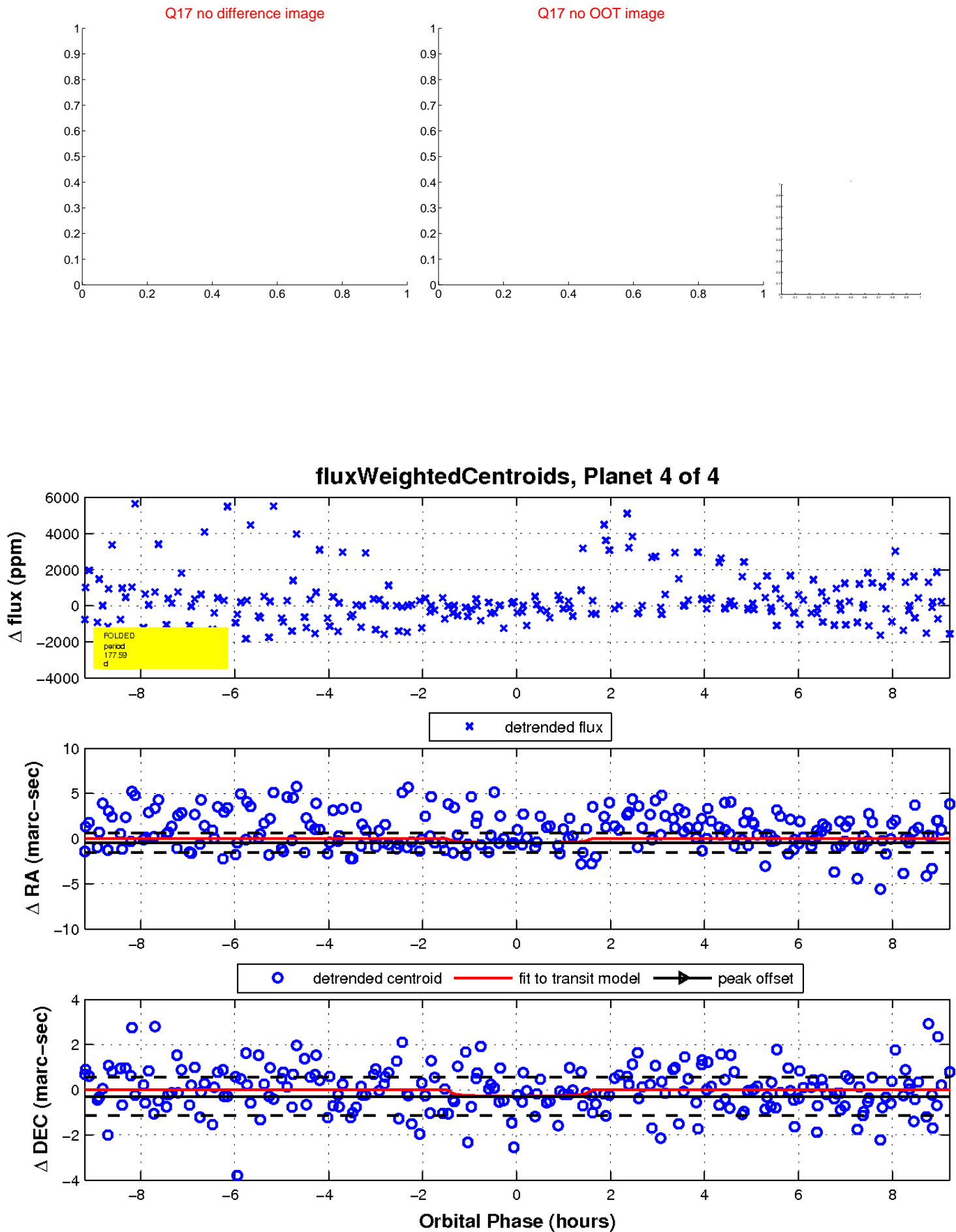
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



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



UKIRT Image

Declination

