

# KIC 005305451

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
005305451-01	OBS	3843.01	161.256520	189.082978	2398.8	23.314	32.6	35.5	0.80	5570	4.66	1.80
005305451-02	OBS	No	161.276900	216.276072	914.0	45.487	10.7	17.4	0.80	5570	2.94	1.80

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
005305451-01	OBS	FP	0.00	1	0	1	1	INDIV_TRANS_MARSHALL_SKYE—HALO_GHOST—EPHEM_MATCH
005305451-02	OBS	FP	0.00	1	0	1	1	INDIV_TRANS_MARSHALL_SKYE—SAME_NTL_PERIOD—CENT_FEW_DIFFS—HALO_GHOST—EPHEM_MATCH

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

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

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

## Ephemeris Match Information For 005305451-01

TCE (1)	KIC	Parent (2)	Parent KIC	$P_1:P_2$	Dist ( $''$ )	$\Delta$ Row	$\Delta$ Col	$m_2$	$m_1$	$D_2/D_1$	Mechanism	Flag	$\sigma_P$	$\sigma_T$
005305451-01	5305451	005217733-pri	5217733	1:1	100.2	21	-14	7.39	15.40	42.06	Direct-PRF	0	0.35	0.57

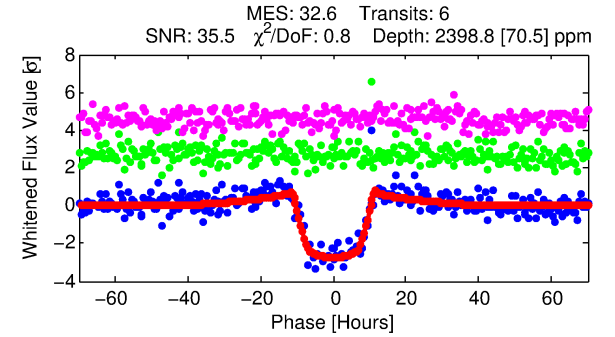
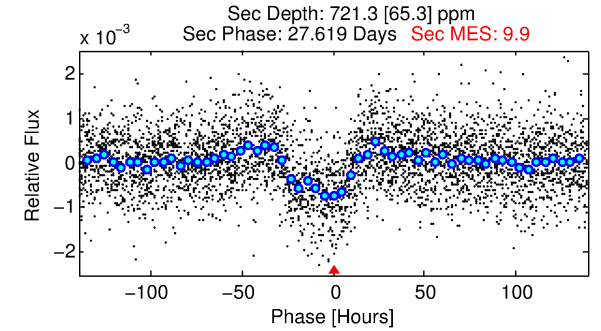
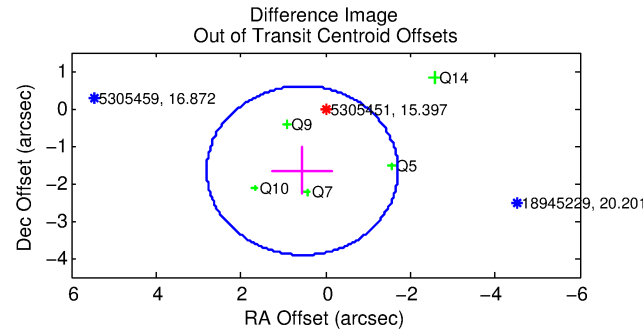
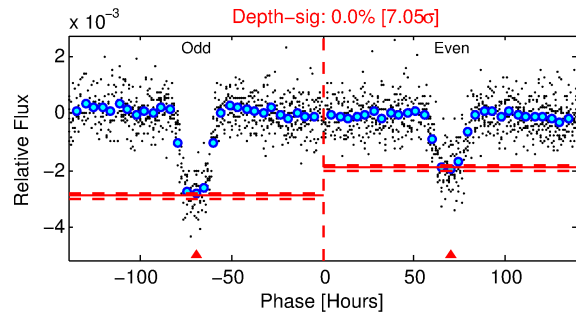
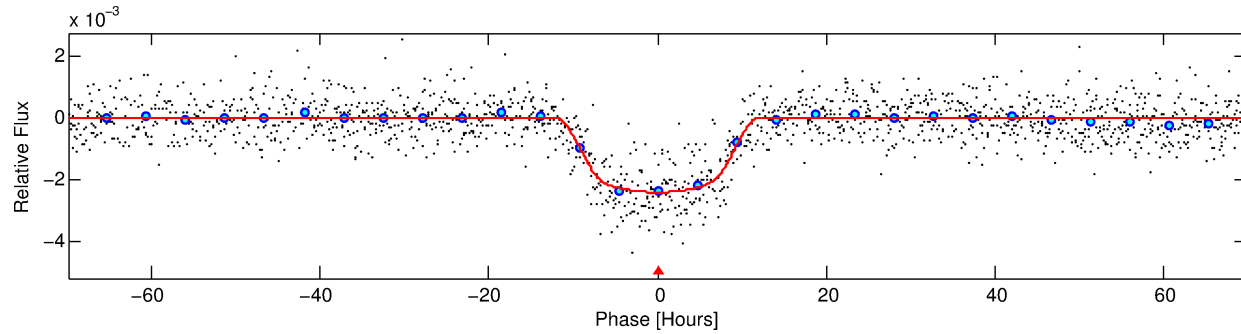
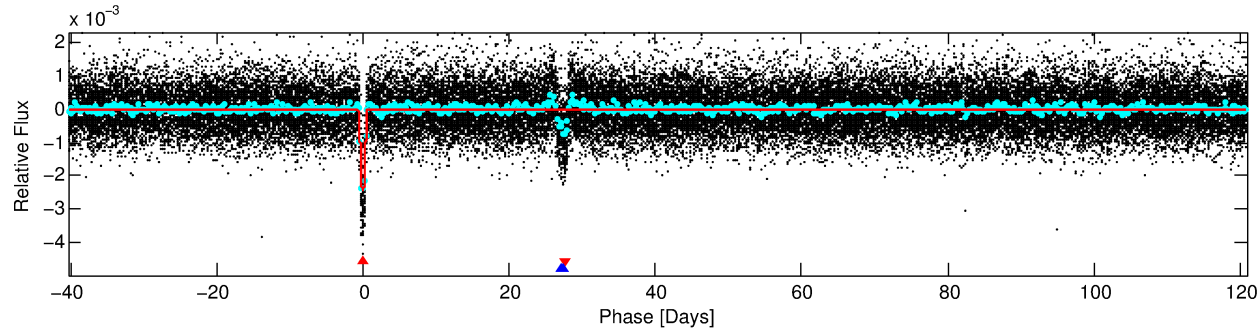
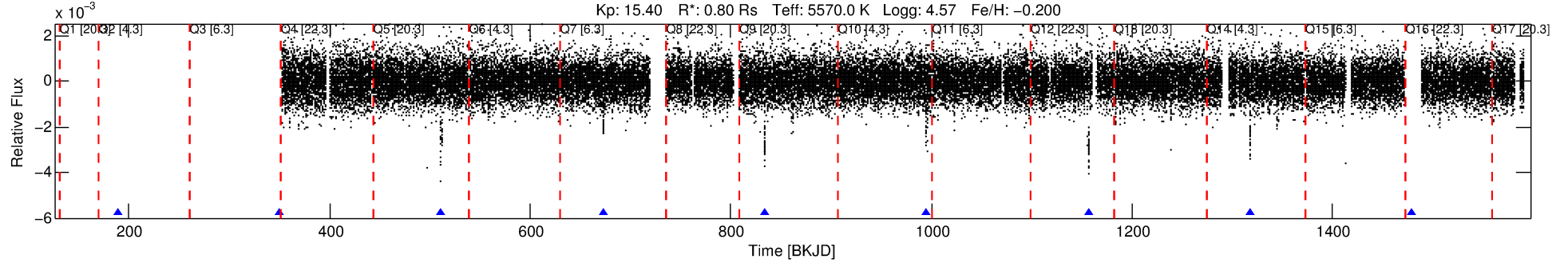
**Notes:**  $P_1:P_2$  is the period ratio. Dist is the distance in arcseconds.  $\Delta$ Row and  $\Delta$ Col are the number of pixels apart in row and column.  $m_2$  and  $m_1$  are the magnitudes of the parent and child.  $D_2/D_1$  is the parent's transit depth divided by the child's.  $\sigma_P$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

# DV One-Page Summary

KIC: 5305451 Candidate: 1 of 2 Period: 161.257 d

KOI: K03843.01 Corr: 0.960

Kp: 15.40 R\*: 0.80 Rs Teff: 5570.0 K Logg: 4.57 Fe/H: -0.200



## DV Fit Results:

Period = 161.25652 [0.00356] d  
Epoch = 189.0830 [0.0172] BKJD  
Rp/R\* = 0.0532 [0.0013]  
a/R\* = 29.68 [2.05]  
b = 0.89 [0.02]  
Seff = 1.80 [0.58]  
Teq = 295 [24] K  
Rp = 4.66 [1.17] Re  
a = 0.5557 [0.1151] AU  
Ag = 5643.12 [1773.02] [3.18σ]  
Teffp = 3958 [164] K [22.04σ]

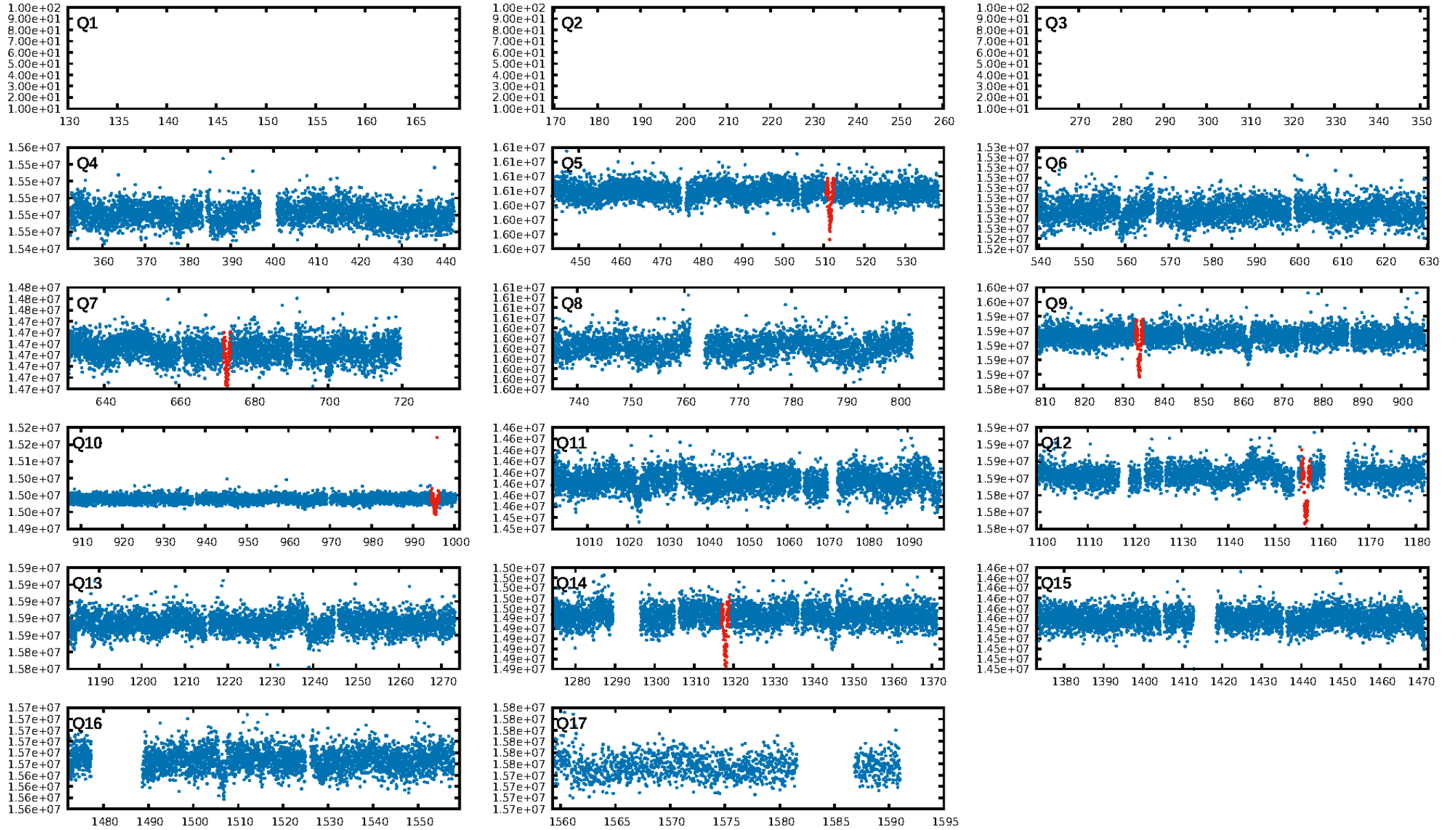
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.8% [0.01σ]  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 1.52e-110  
RollingBand-fgt: 1.00 [6/6]  
GhostDiagnostic-chr: 0.02488  
Centroid-sig: 0.0%  
Centroid-so: 2.531 arcsec [10.33σ]  
OotOffset-rm: 1.746 arcsec [2.32σ]  
KicOffset-rm: 1.961 arcsec [2.38σ]  
OotOffset-st: 2/1/0/2 [5]  
KicOffset-st: 2/1/0/2 [5]  
DiffImageQuality-fgm: 0.00 [0/5]  
DiffImageOverlap-fno: 1.00 [5/5]

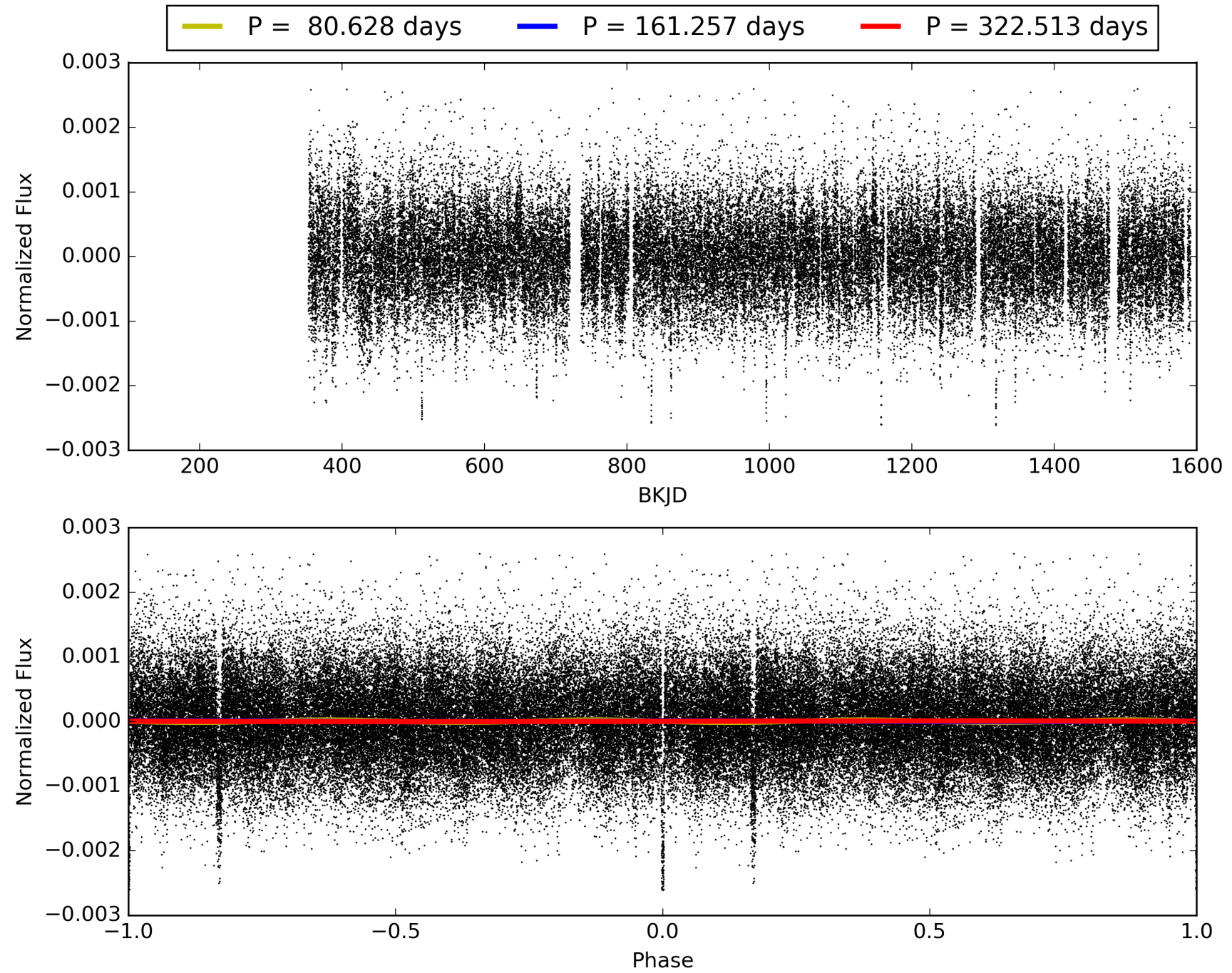
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 11:00:31 Z

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

# TCE 005305451-01, PDC Light Curves

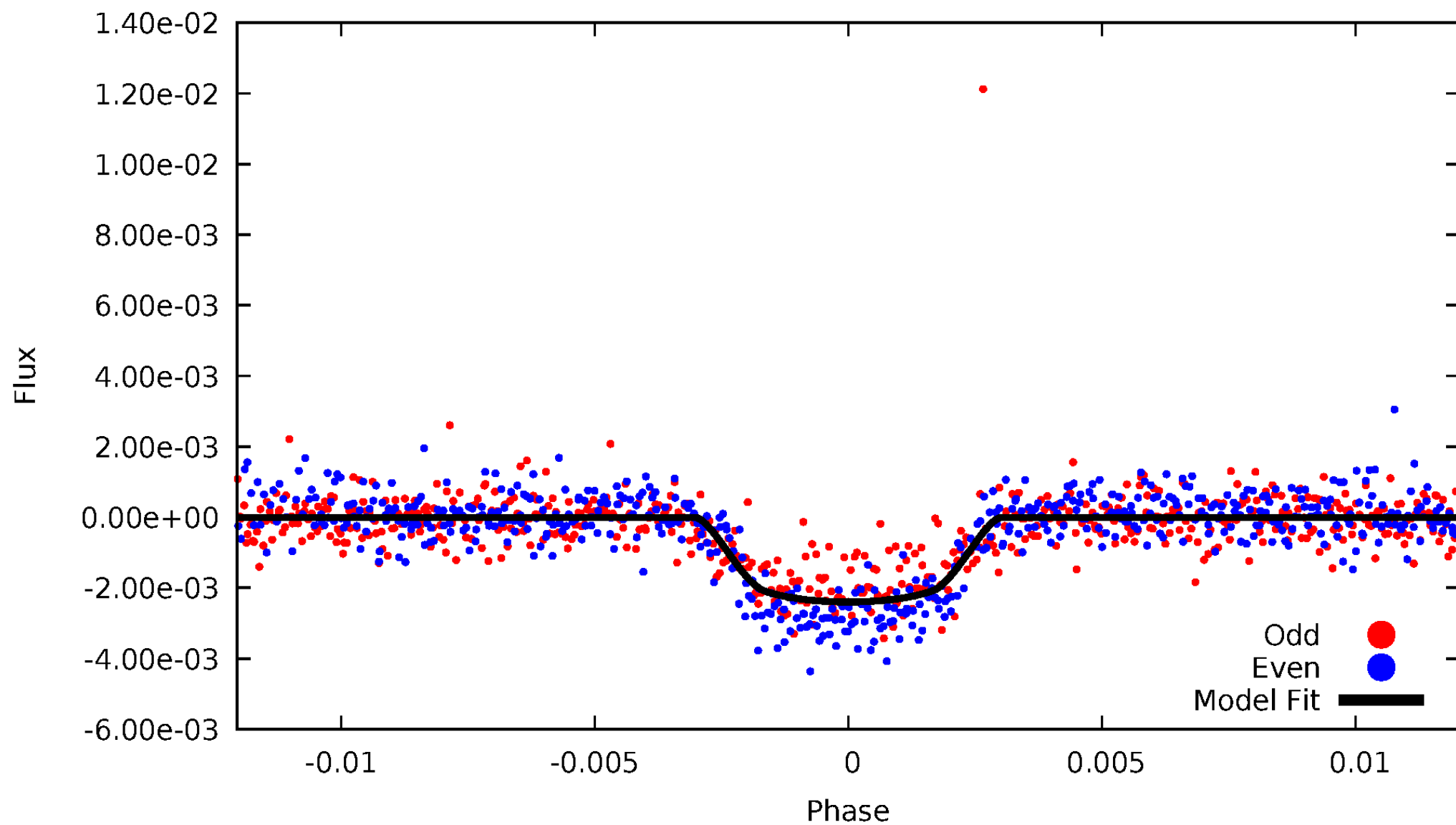


TCE 005305451-01



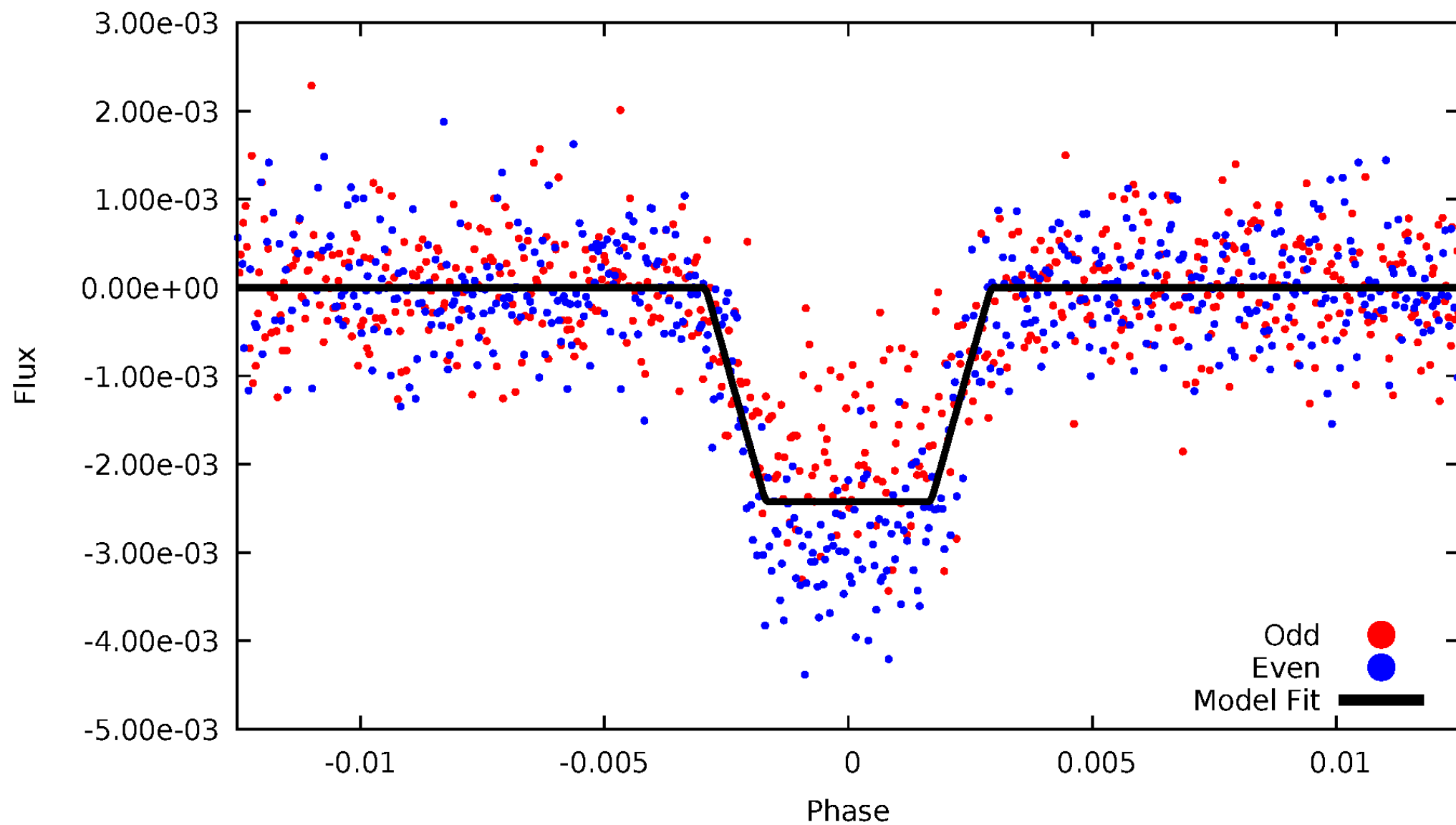
# DV Odd/Even

TCE 005305451-01



# ALT Odd/Even

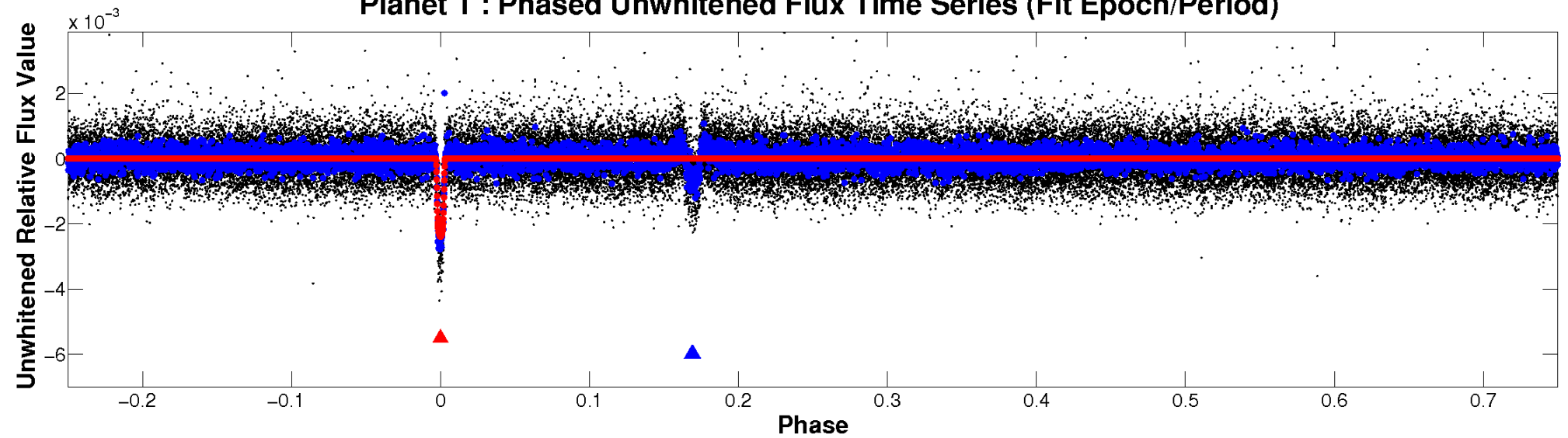
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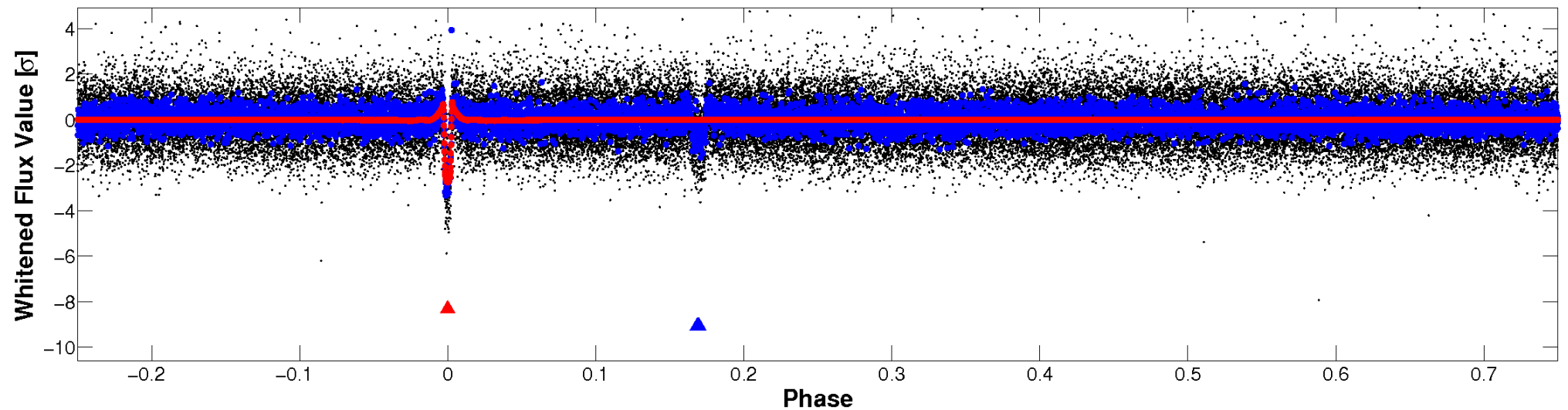


# Non-Whitened Vs. Whitened Light Curve

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

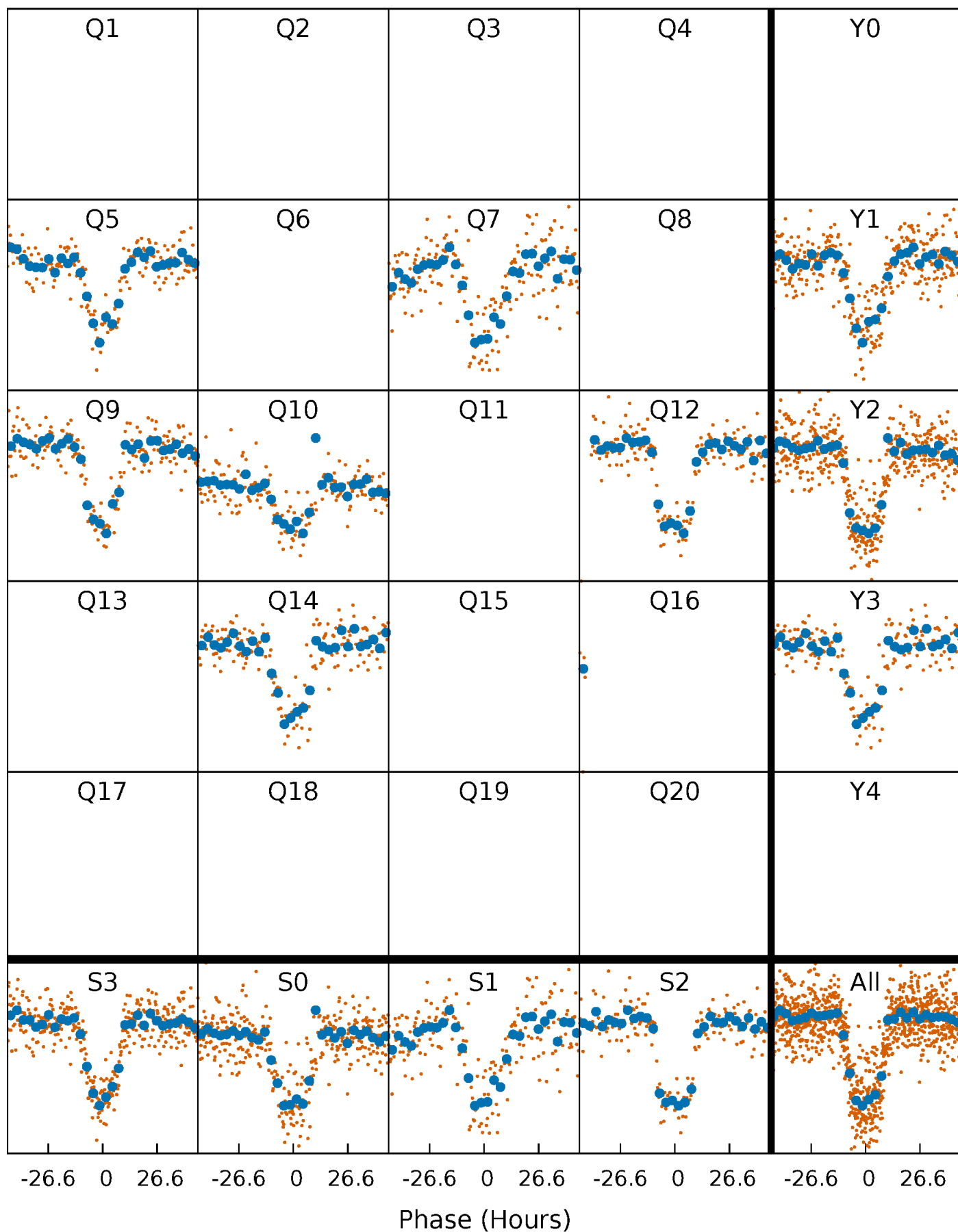


**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

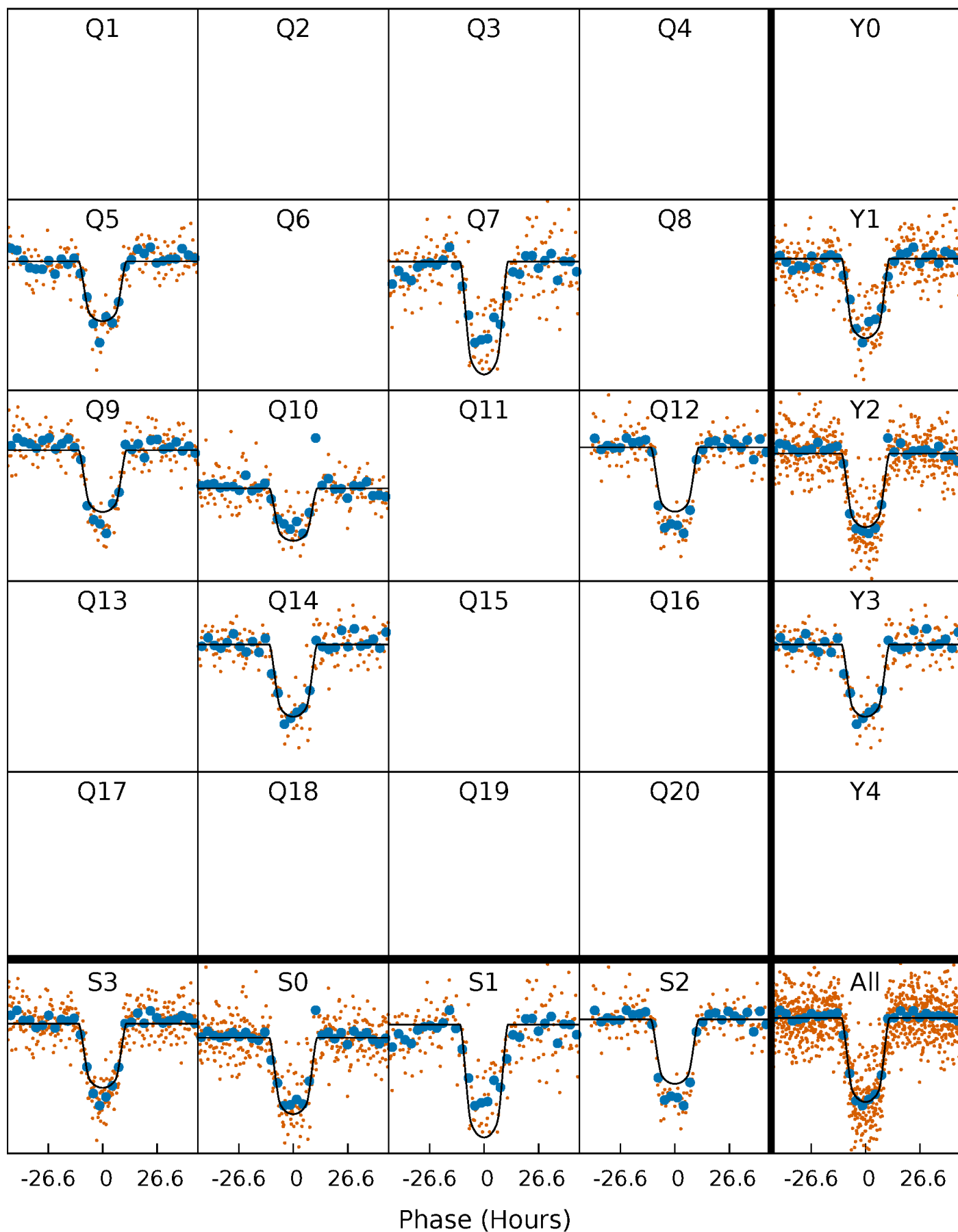
TCE 005305451-01 P=161.256520 Days  $T_0=189.082977$  (BKJD)





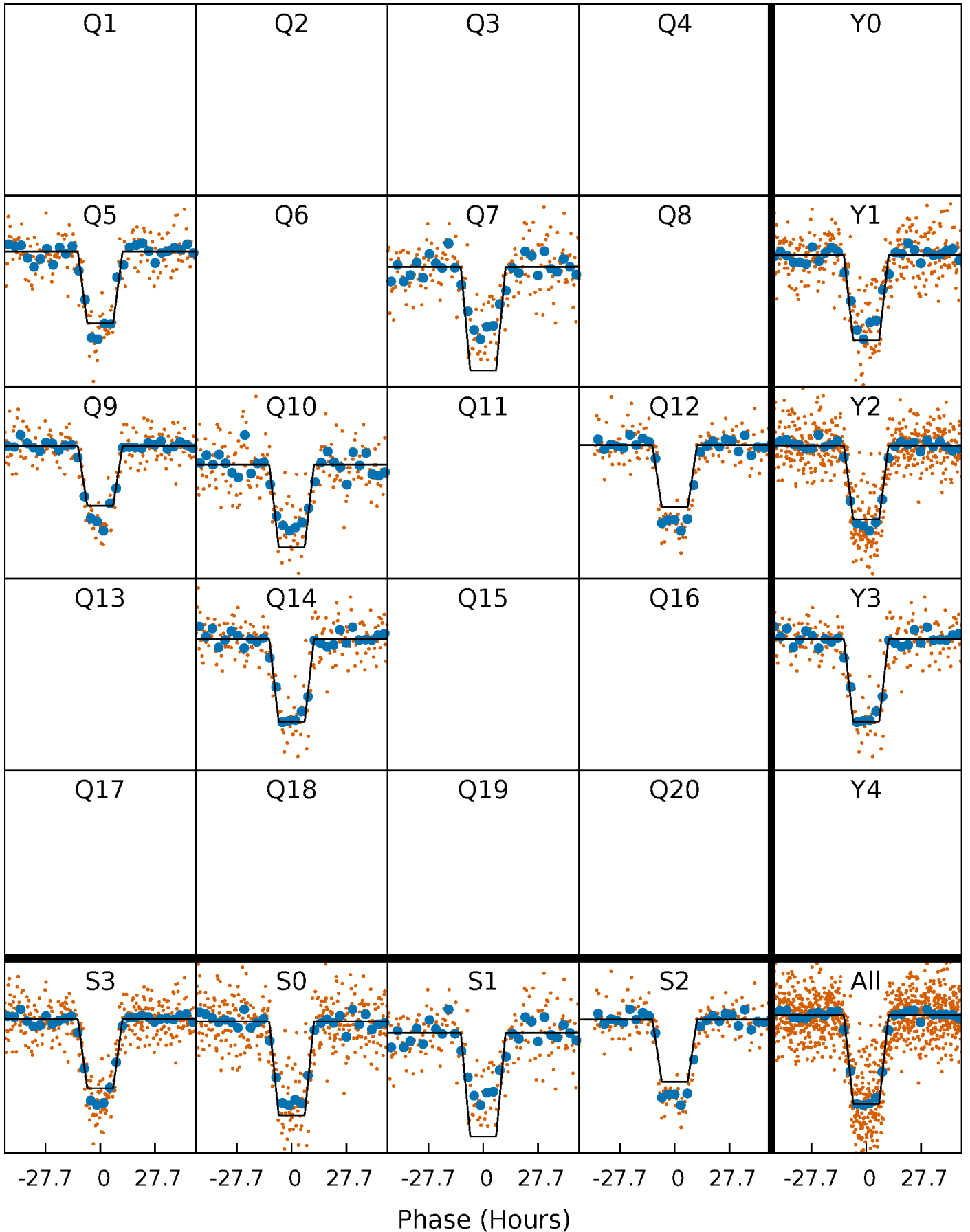
# DV Quarter-Phased Transit Curves

TCE 005305451-01 P=161.256520 Days  $T_0=189.082977$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

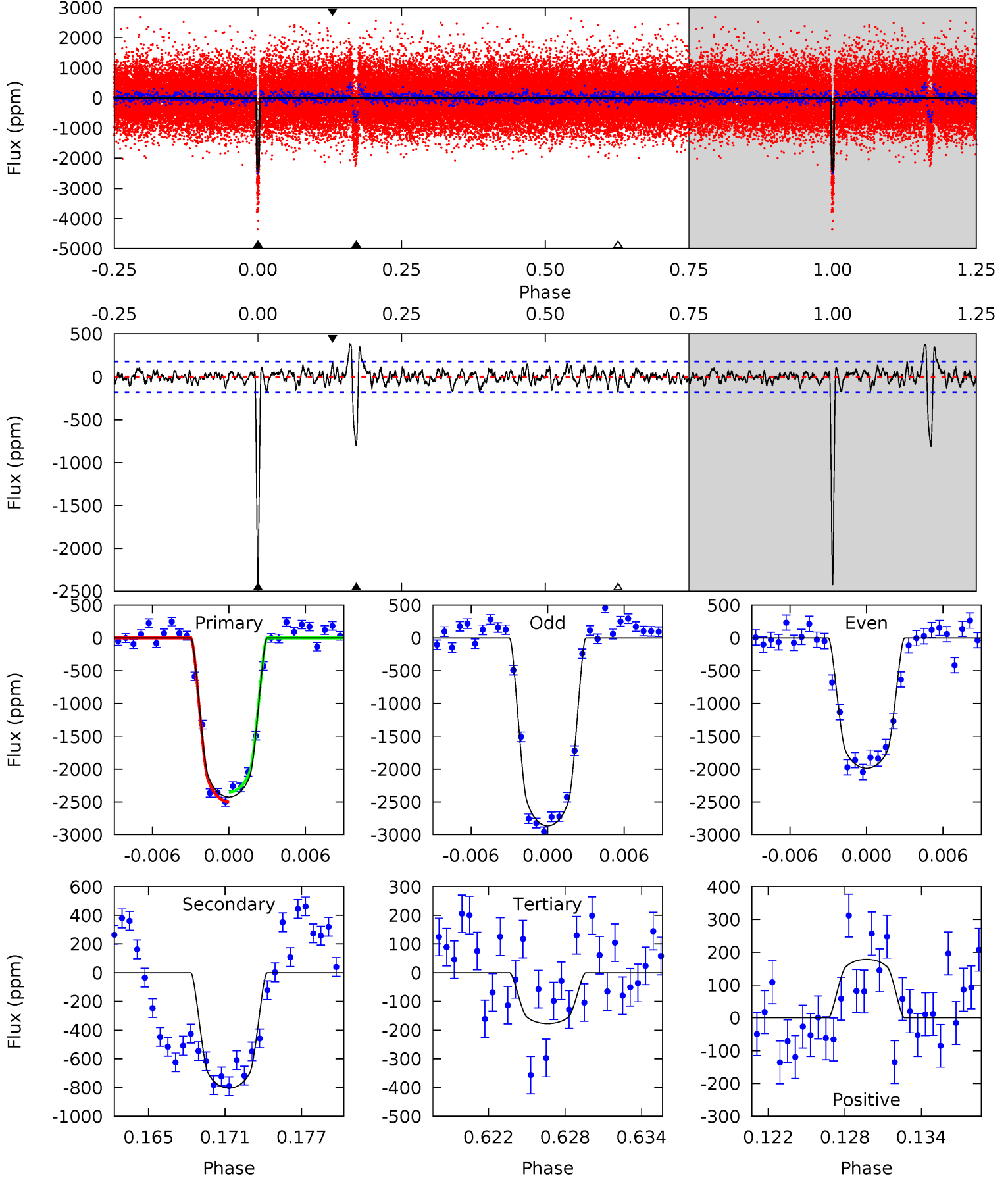
TCE 005305451-01 P=161.248033 Days  $T_0=189.122387$  (BKJD)



# DV Model-Shift Uniqueness Test

005305451-01, P = 161.256520 Days, E = 189.082977 Days

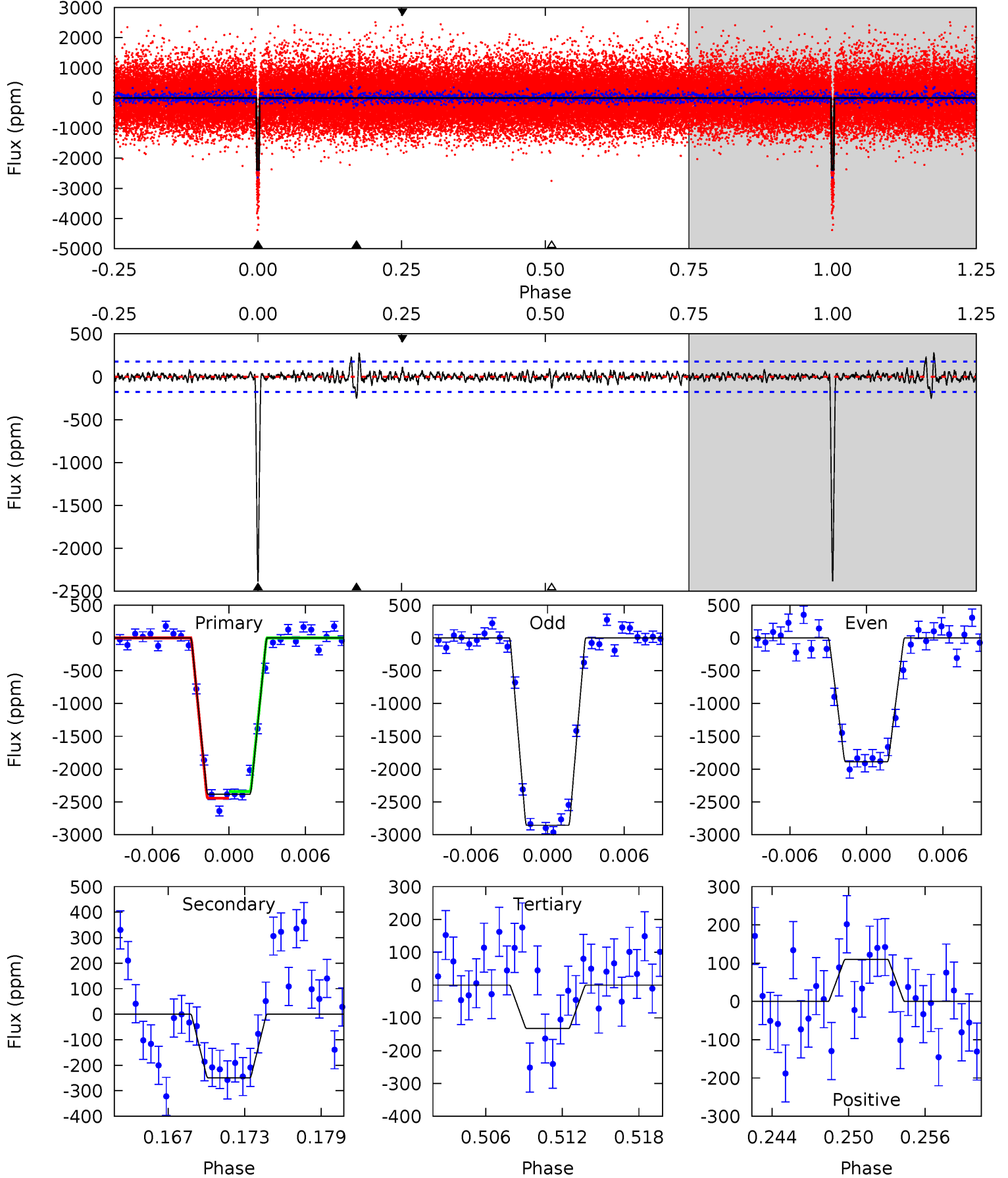
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
69.7	23.1	5.09	5.13	5.12	2.74	1.93	64.6	64.5	18.0	18.0	12.6	0.95	0.14	2.12



# Alt Model-Shift Uniqueness Test

005305451-01, P = 161.248033 Days, E = 189.122387 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
69.2	7.23	3.85	3.20	5.12	2.75	0.97	65.4	66.0	3.39	4.04	14.1	0.98	0.10	1.45



### Stellar Parameters For KIC 005305451

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5570^{+182}_{-182}$	$4.573^{+0.040}_{-0.160}$	$-0.200^{+0.300}_{-0.300}$	$0.803^{+0.201}_{-0.067}$	$0.880^{+0.092}_{-0.092}$	$2.392^{+0.497}_{-1.032}$
	+3%/-3%	+1%/-3%	+150%/-150%	+25%/-8%	+10%/-10%	+21%/-43%
Source	KIC0	KIC0	KIC0	DSEP		

KIC = Kepler Input Catalog; PHO = Photometry; SPE = Spectroscopy; AST = Asteroseismology  
 TRA = Transits; DESP = Dartmouth Models; MULT = Multiple Models

### Secondary Eclipse Parameters for KIC 005305451-01 / KOI 3843.01

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-804 \pm 35$	$4.75^{+0.66}_{-0.31}$	$420^{+26}_{-20}$	$4283^{+138}_{-115}$	$5889^{+872}_{-1171}$
Alt.	$-249 \pm 34$	$4.43^{+0.54}_{-0.31}$	$420^{+25}_{-19}$	$3594^{+108}_{-131}$	$2079^{+448}_{-430}$

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

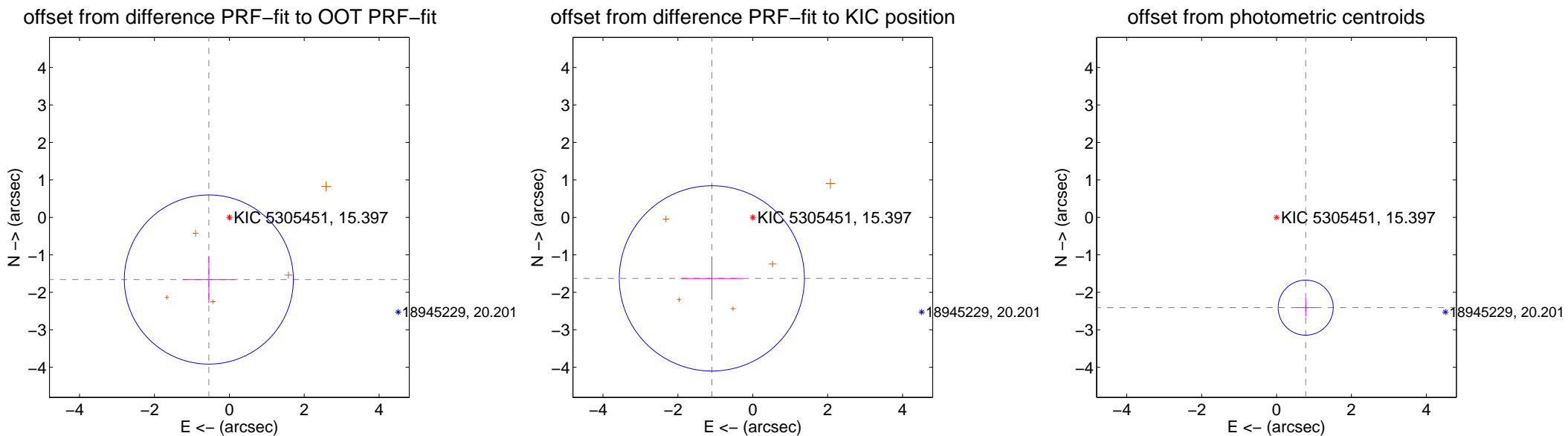
## DV Centroid Data

Supplemental centroid analysis for 005305451-01. Kepler magnitude: 15.40. Transit SNR 35.53

There are 0 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.52 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.746 \pm 0.752$	2.32	$0.547 \pm 0.693$	$-1.658 \pm 0.621$
PRF-fit source offset from KIC position	$1.961 \pm 0.824$	2.38	$1.093 \pm 0.828$	$-1.628 \pm 0.566$
photometric centroid source offset	$2.53 \pm 0.24$	10.33	$-0.78 \pm 0.28$	$-2.41 \pm 0.24$



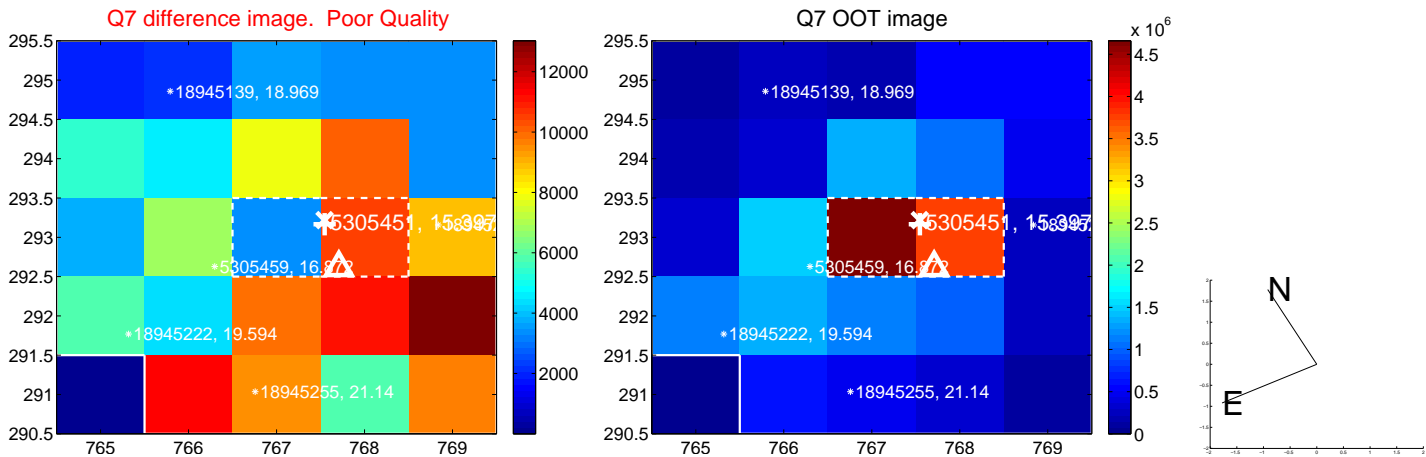
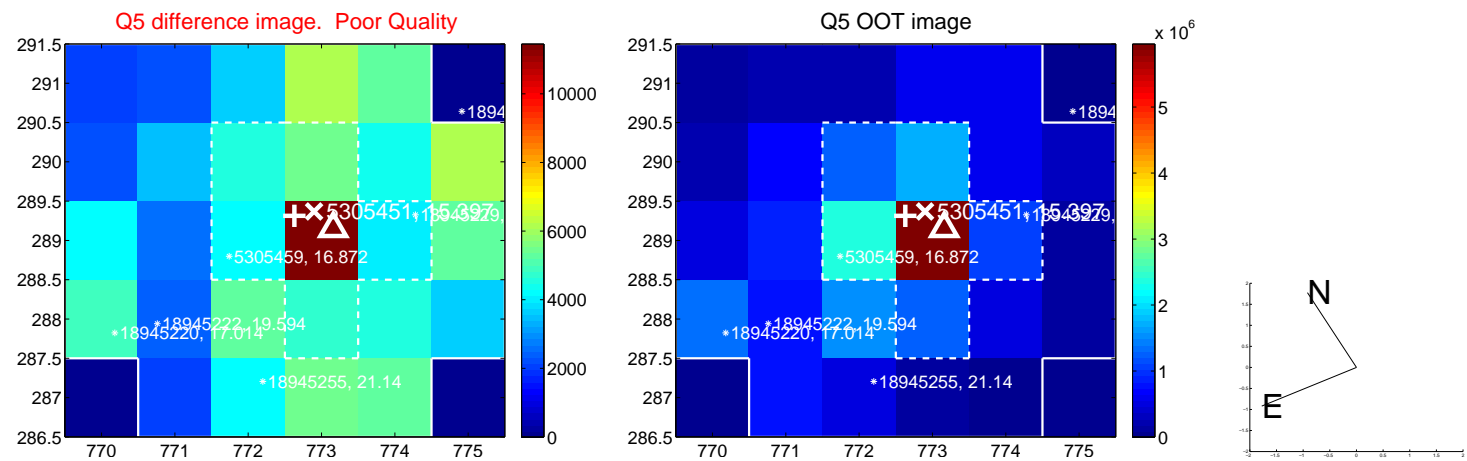
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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



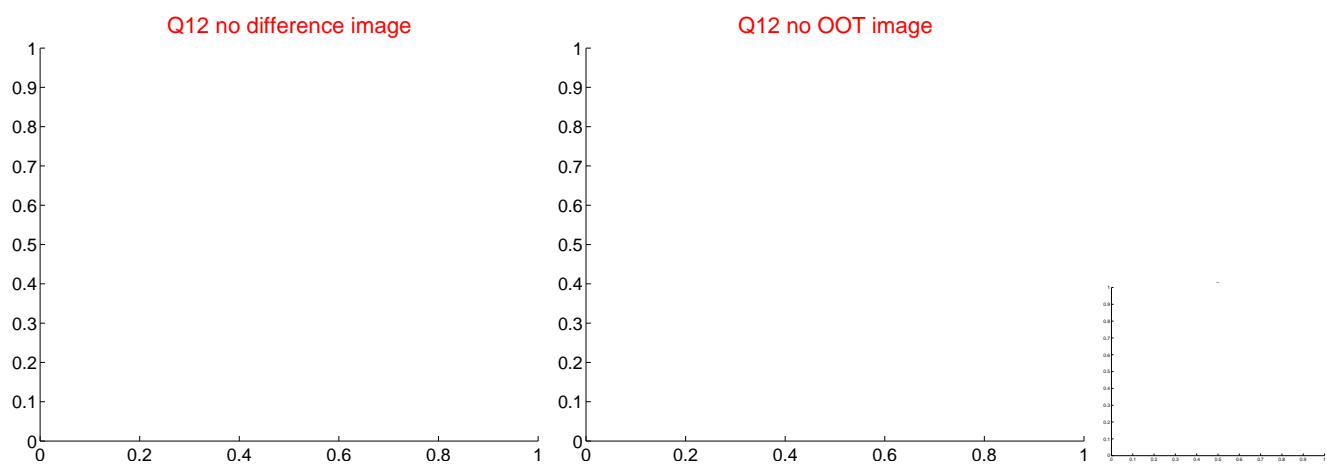
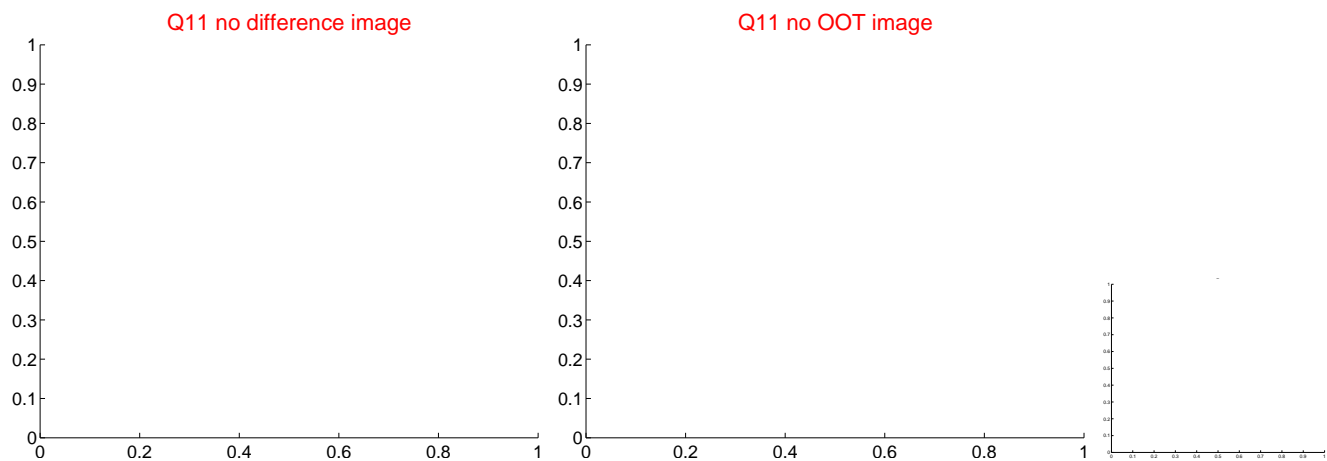
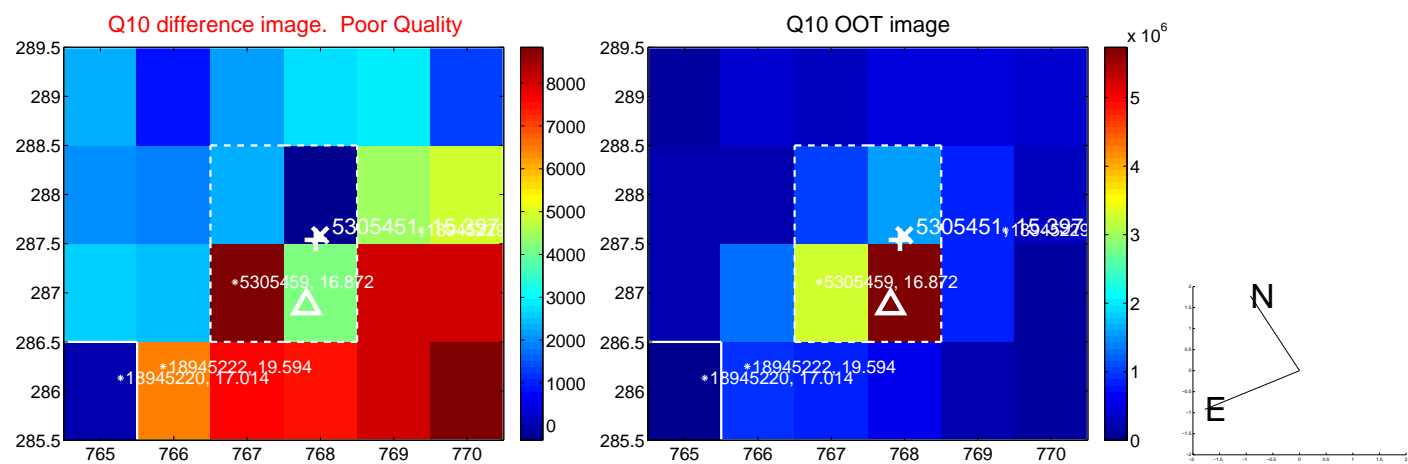
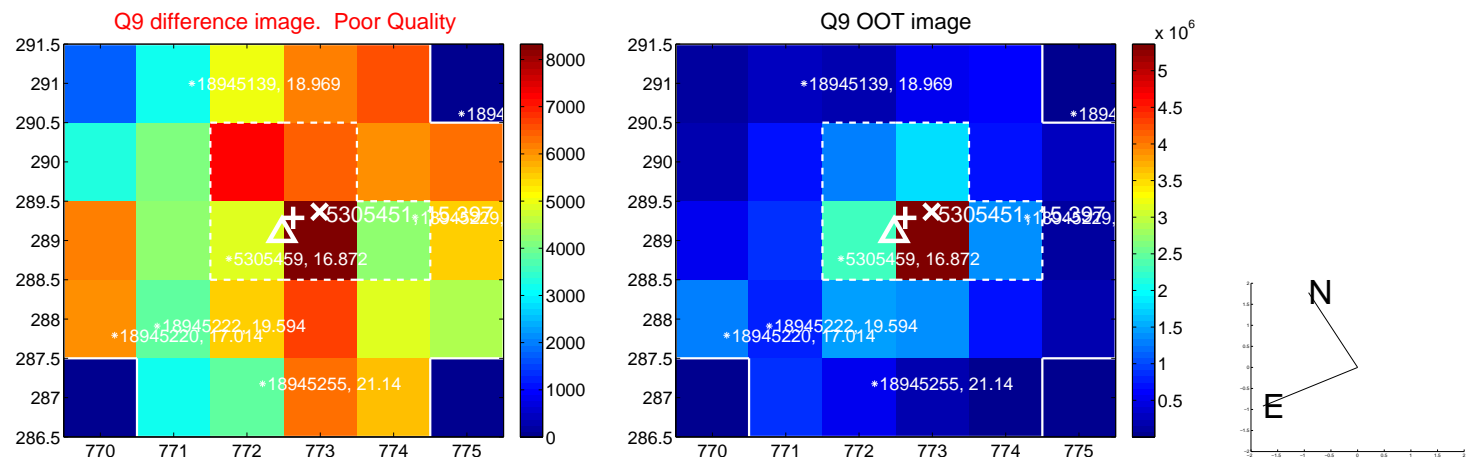
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



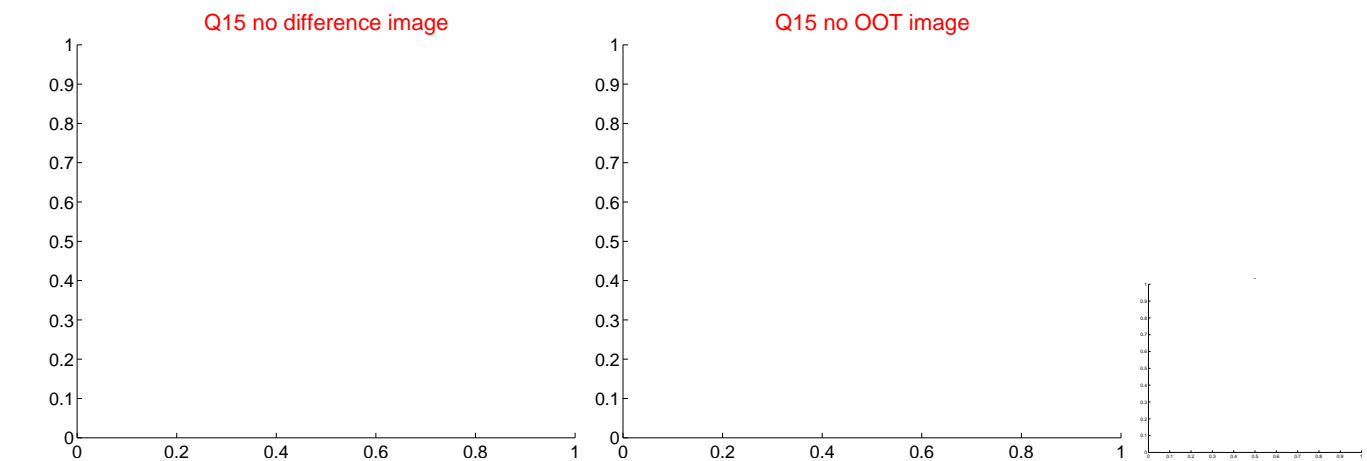
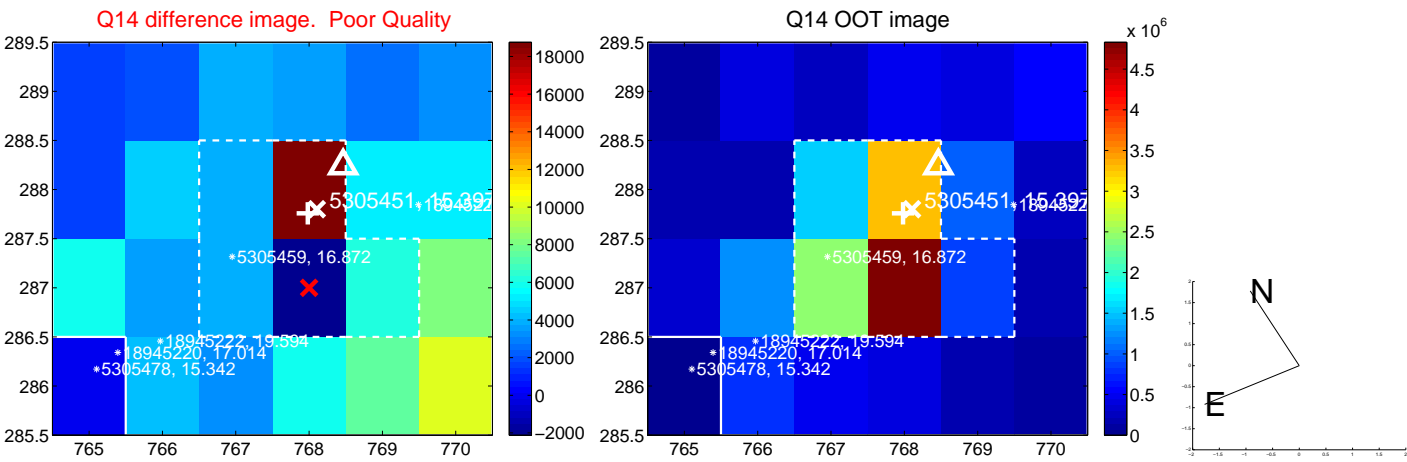
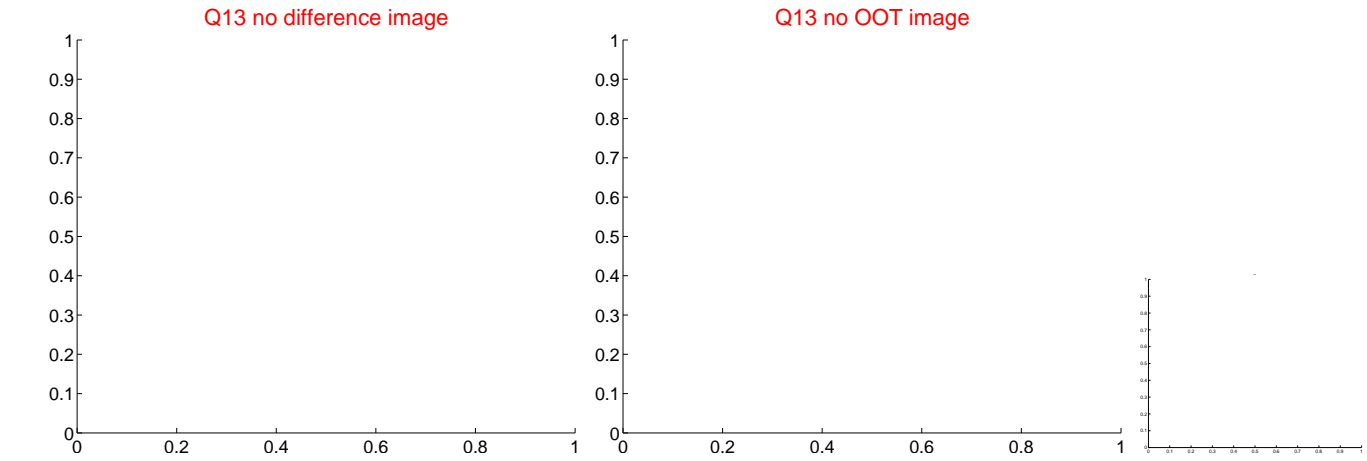
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



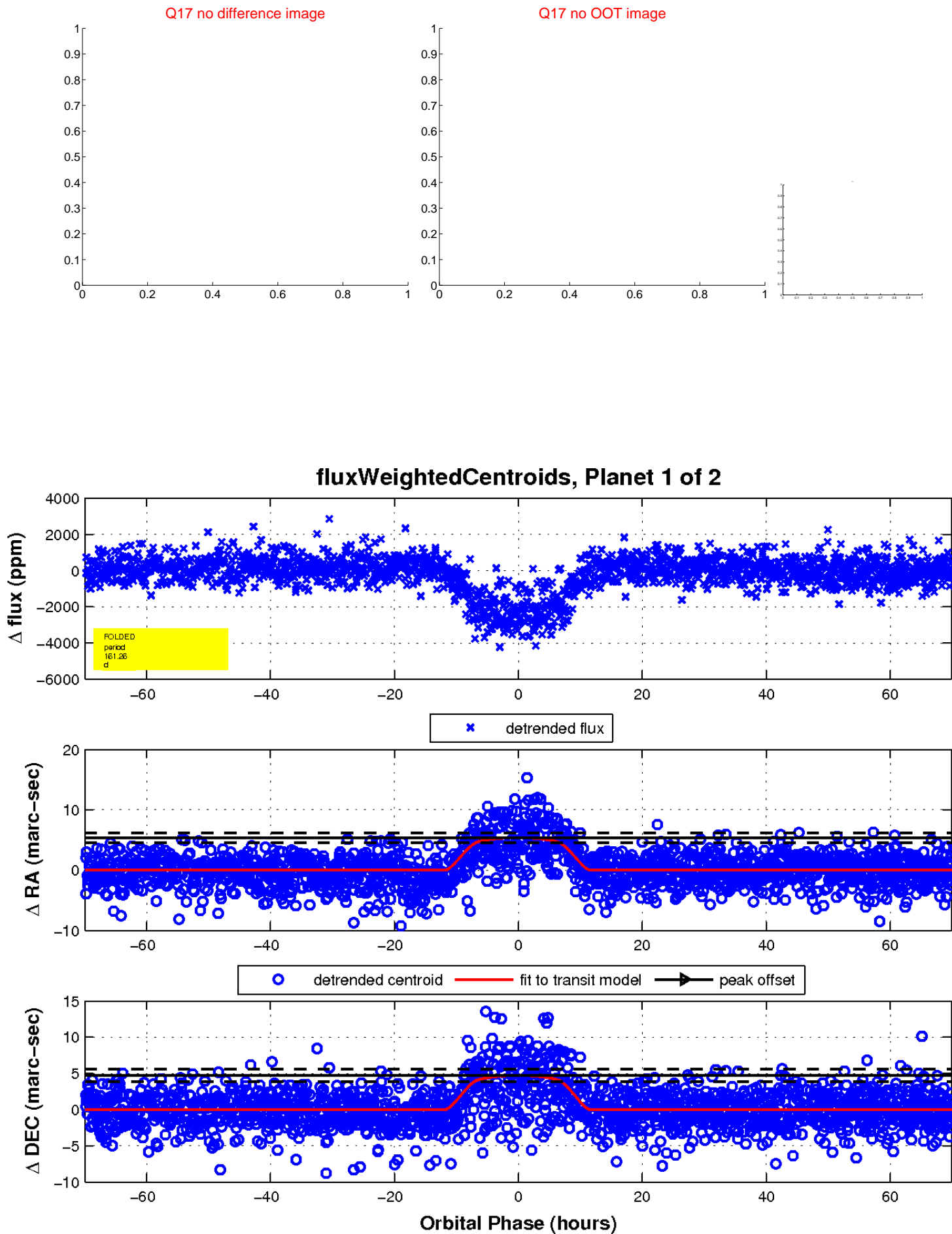
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

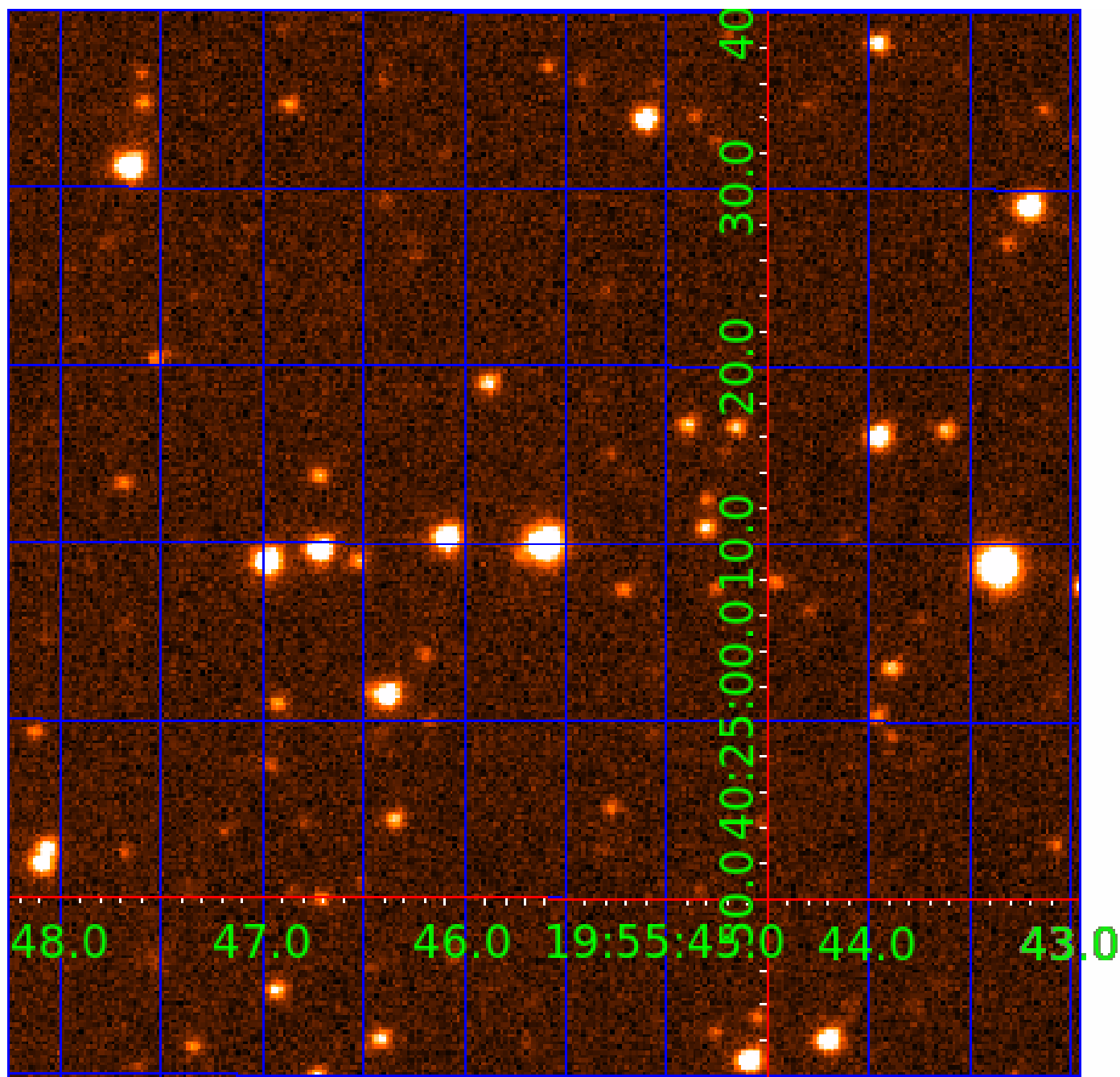


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 005305451

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
005305451-01	OBS	3843.01	161.256520	189.082978	2398.8	23.314	32.6	35.5	0.80	5570	4.66	1.80
005305451-02	OBS	No	161.276900	216.276072	914.0	45.487	10.7	17.4	0.80	5570	2.94	1.80

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
005305451-01	OBS	FP	0.00	1	0	1	1	INDIV_TRANS_MARSHALL_SKYE—HALO_GHOST—EPHEM_MATCH
005305451-02	OBS	FP	0.00	1	0	1	1	INDIV_TRANS_MARSHALL_SKYE—SAME_NTL_PERIOD—CENT_FEW_DIFFS—HALO_GHOST—EPHEM_MATCH

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

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

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

## Ephemeris Match Information For 005305451-02

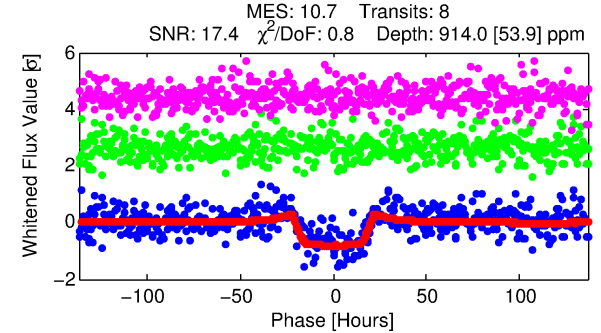
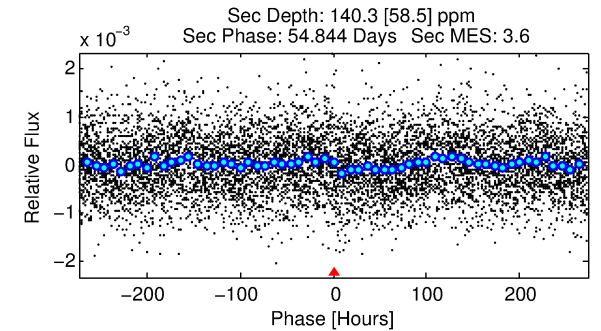
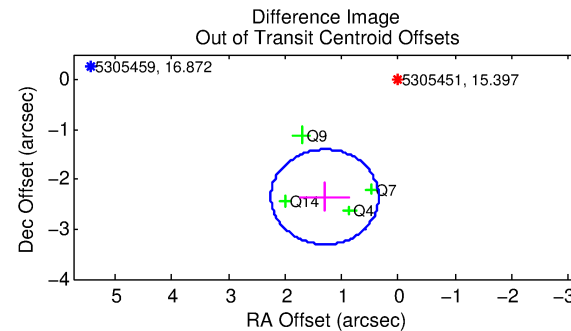
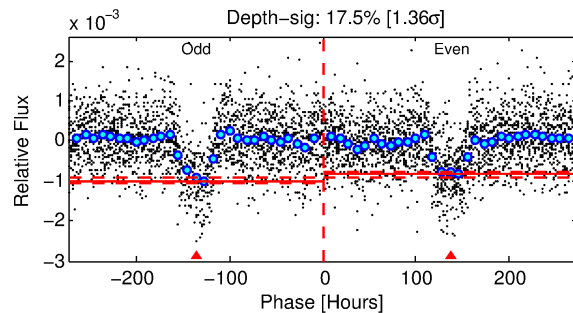
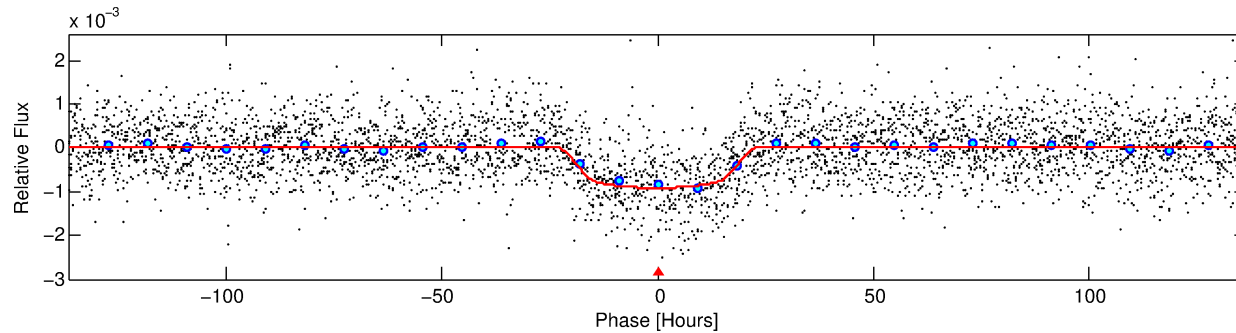
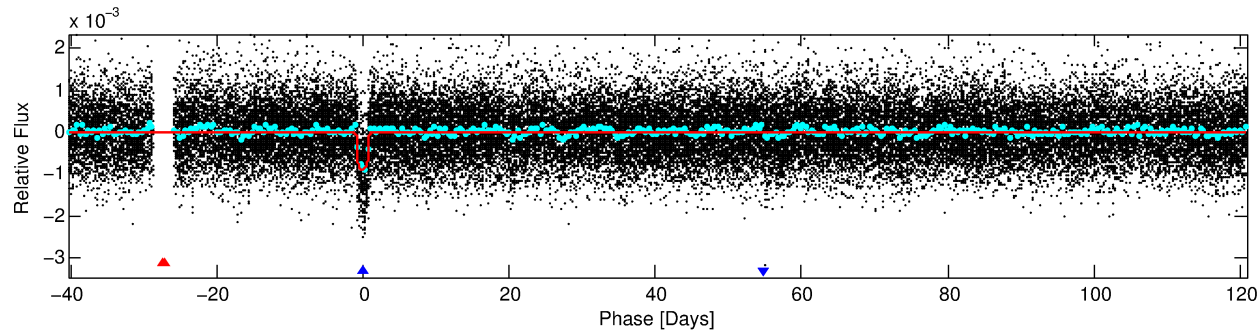
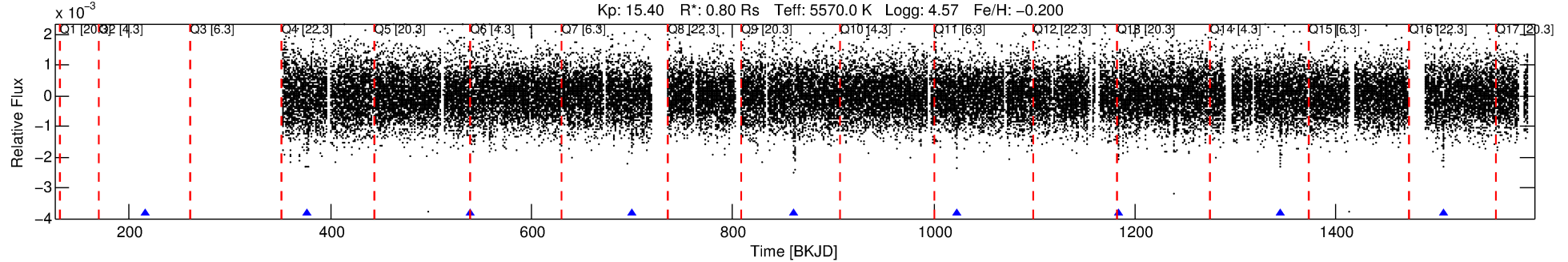
TCE (1)	KIC	Parent (2)	Parent KIC	$P_1:P_2$	Dist ( $''$ )	$\Delta$ Row	$\Delta$ Col	$m_2$	$m_1$	$D_2/D_1$	Mechanism	Flag	$\sigma_P$	$\sigma_T$
005305451-02	5305451	005217733-sec	5217733	1:1	100.2	21	-14	7.39	15.40	52.41	Direct-PRF	0	2.05	1.81

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

# DV One-Page Summary

KIC: 5305451 Candidate: 2 of 2 Period: 161.277 d  
KOI: K03843 Corr: No Ephemeris Match

Kp: 15.40 R\*: 0.80 Rs Teff: 5570.0 K Logg: 4.57 Fe/H: -0.200



## DV Fit Results:

Period = 161.27690 [0.00870] d  
Epoch = 216.2761 [0.0439] BKJD  
Rp/R\* = 0.0336 [0.0015]  
a/R\* = 13.09 [1.63]  
b = 0.91 [0.02]  
Seff = 1.80 [0.58]  
Teq = 295 [24] K  
Rp = 2.94 [0.75] Re  
a = 0.5558 [0.1151] AU  
Ag = 2751.58 [1428.74] [1.93σ]  
Teffp = 3308 [368] K [8.16σ]

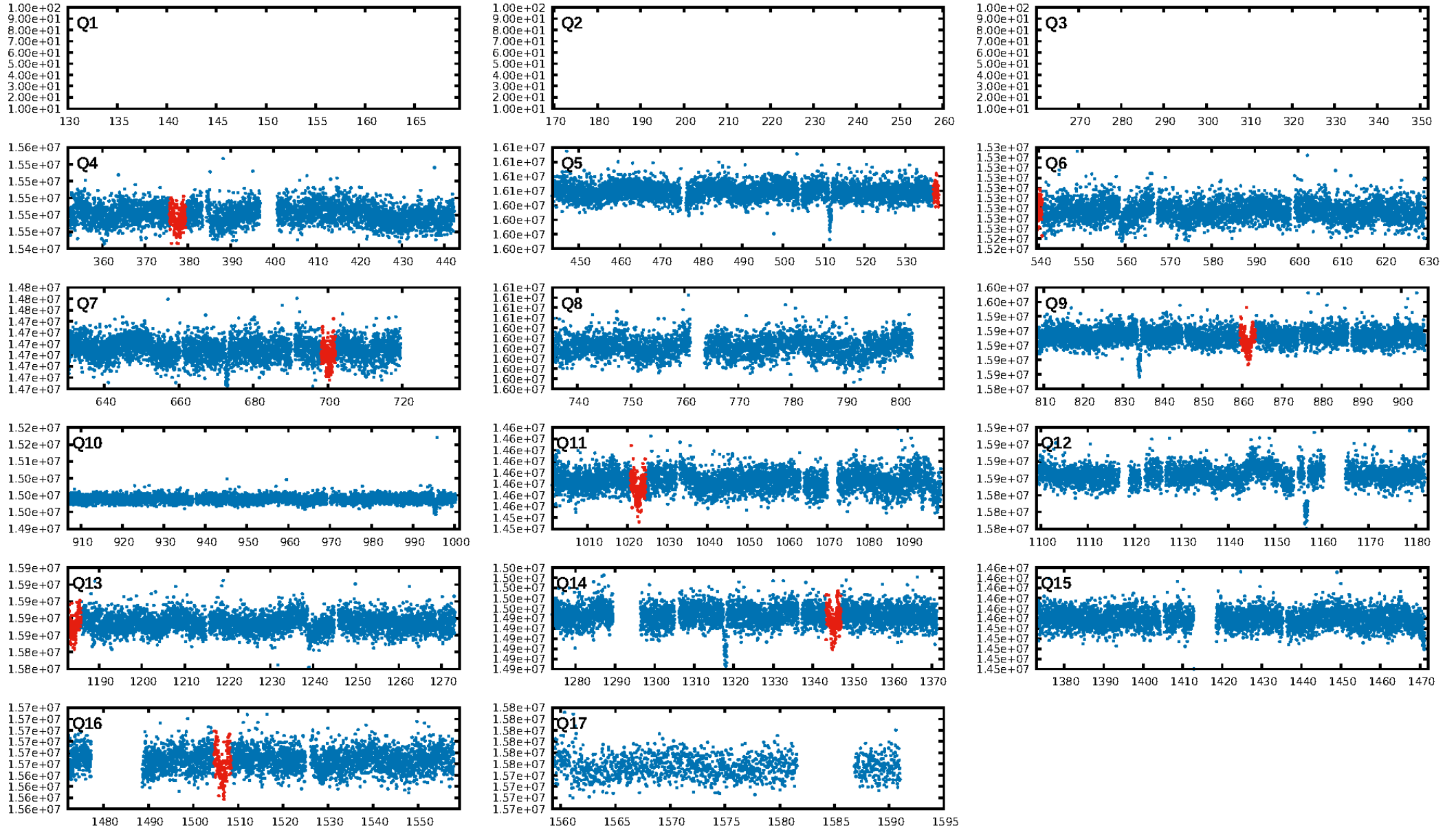
## DV Diagnostic Results:

ShortPeriod-sig: 0.8% [0.01σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 21.8%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 7.26e-17  
RollingBand-fgt: 1.00 [8/8]  
GhostDiagnostic-chr: -0.08895  
Centroid-sig: 0.0%  
Centroid-so: 1.872 arcsec [4.22σ]  
OotOffset-rm: 2.693 arcsec [8.49σ]  
KicOffset-rm: 2.996 arcsec [8.00σ]  
OotOffset-st: 1/1/1/1 [4]  
KicOffset-st: 1/1/1/1 [4]  
DiffImageQuality-fgm: 0.00 [0/4]  
DiffImageOverlap-fno: 1.00 [4/4]

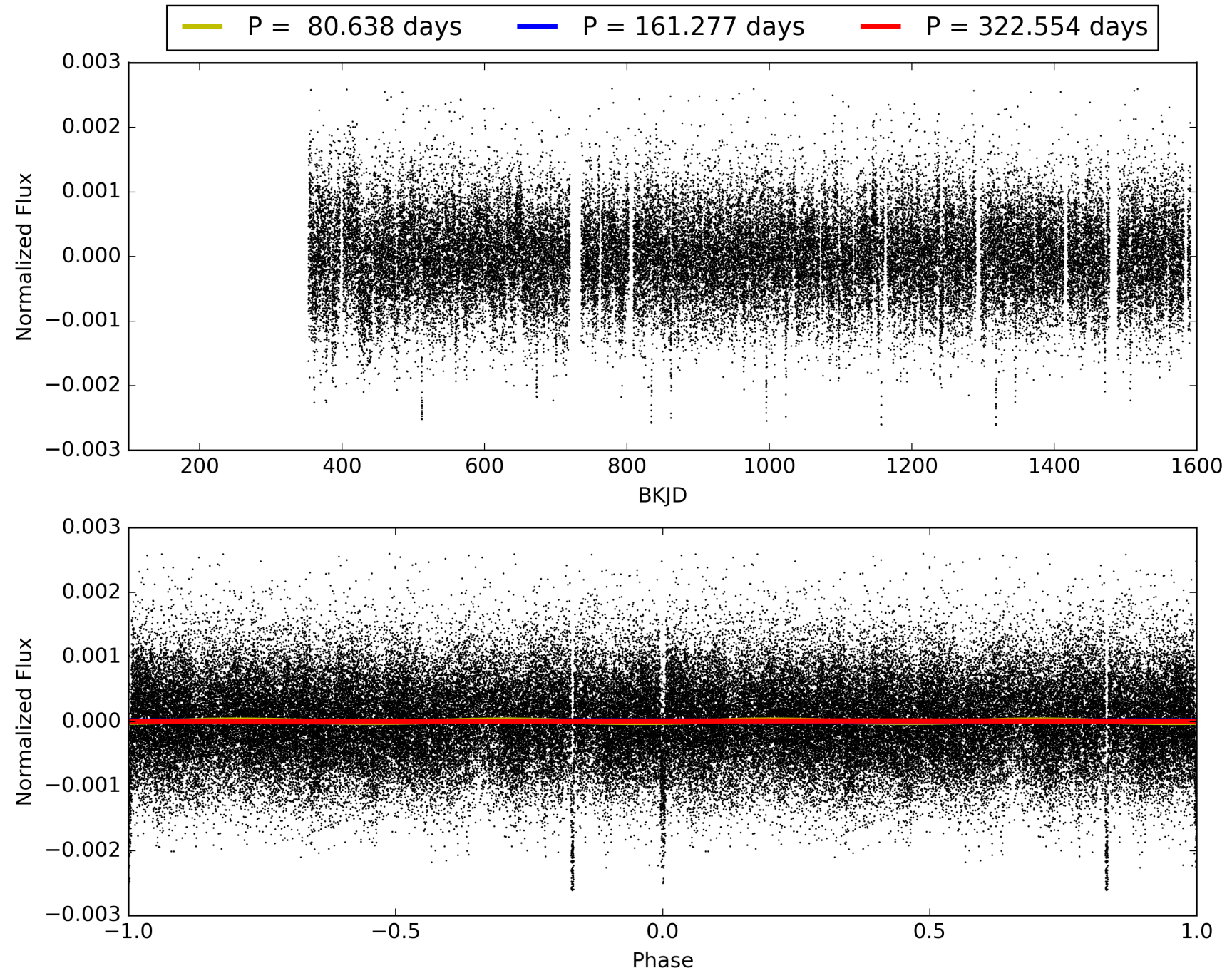
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 11:00:40 Z

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

# TCE 005305451-02, PDC Light Curves

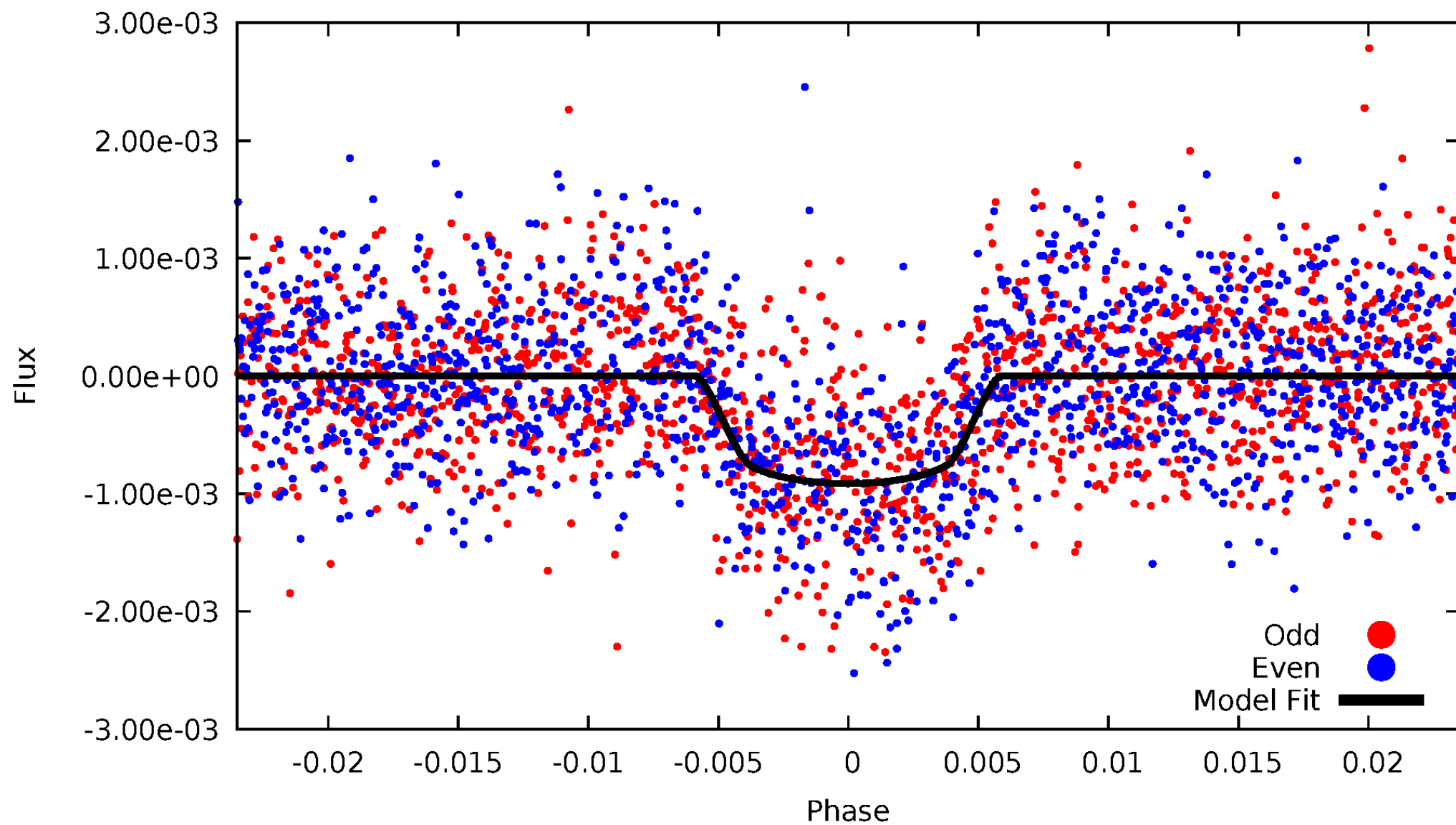


TCE 005305451-02



# DV Odd/Even

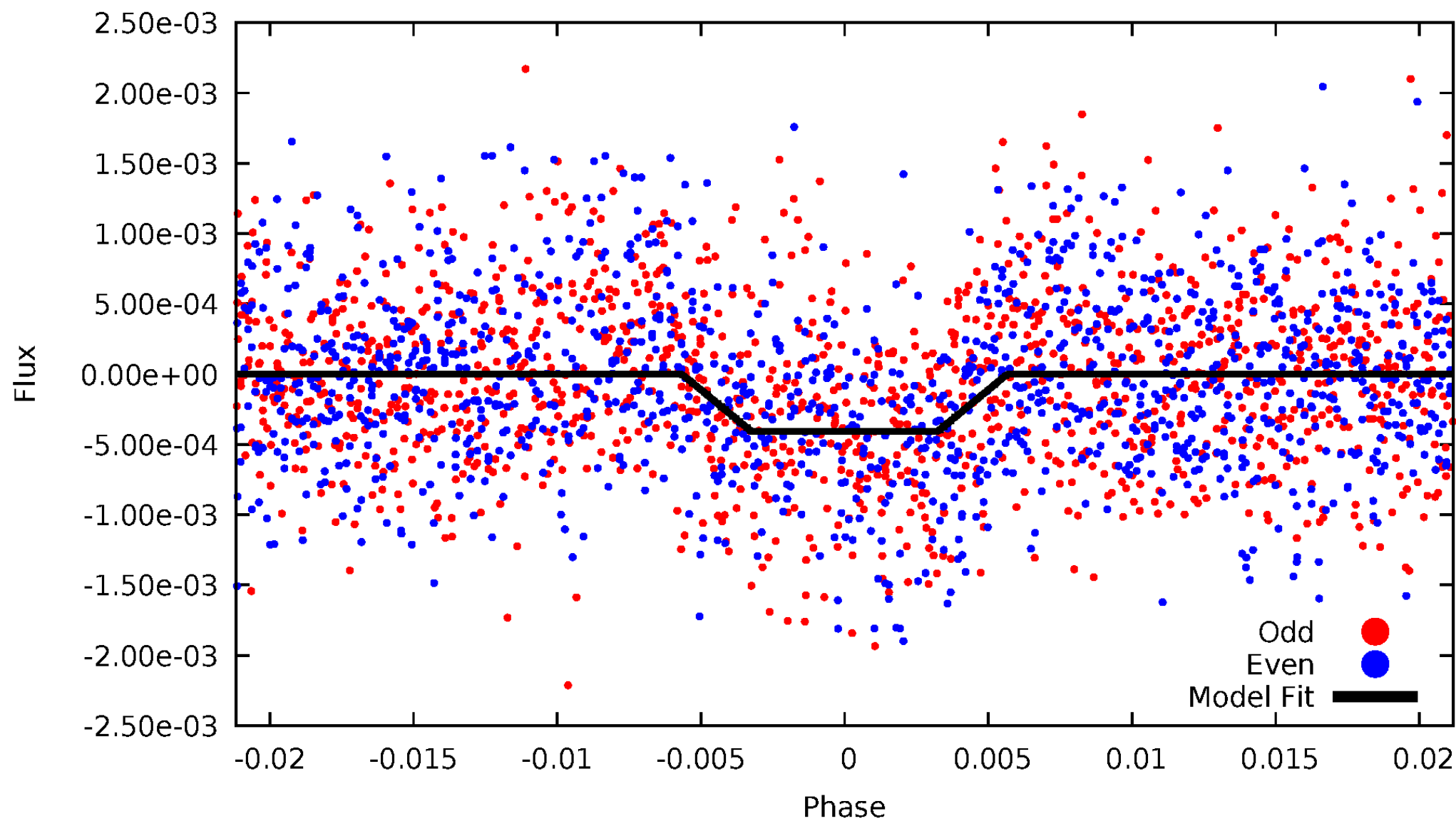
TCE 005305451-02





# ALT Odd/Even

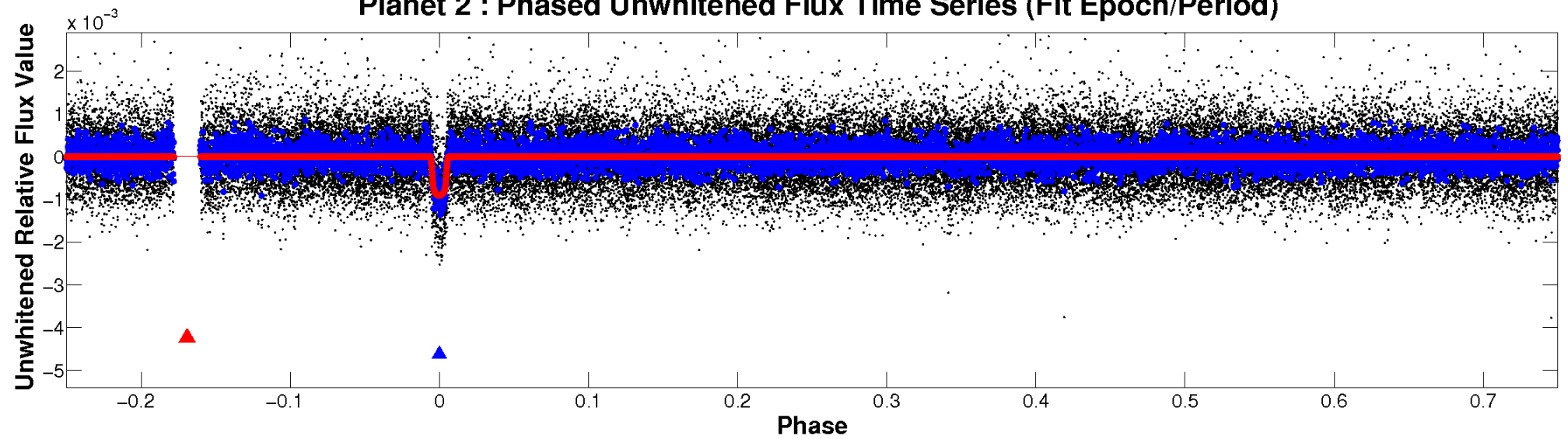
TCE 005305451-02



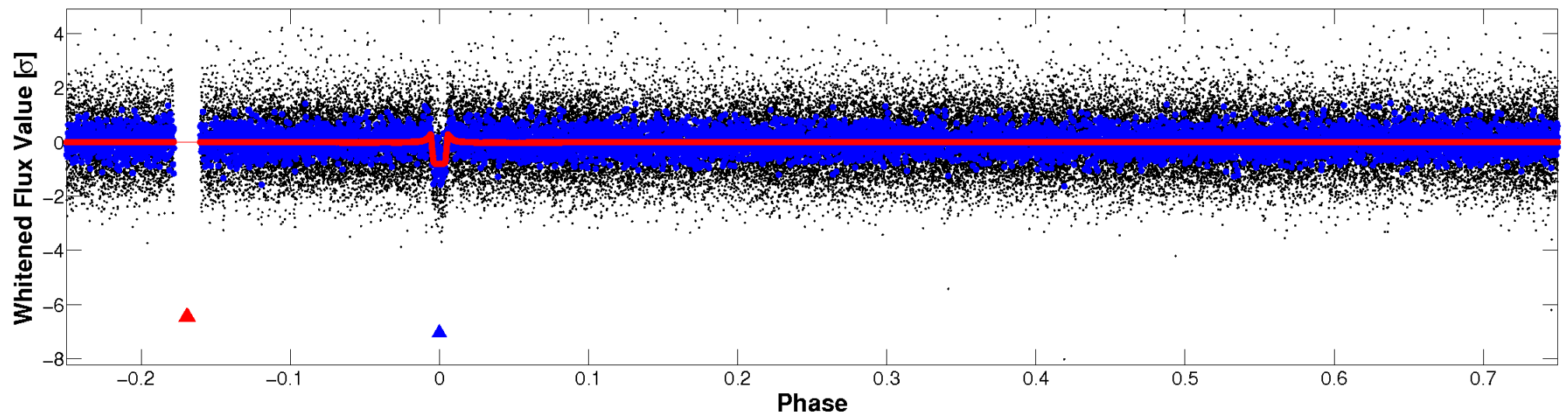


# Non-Whitened Vs. Whitened Light Curve

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

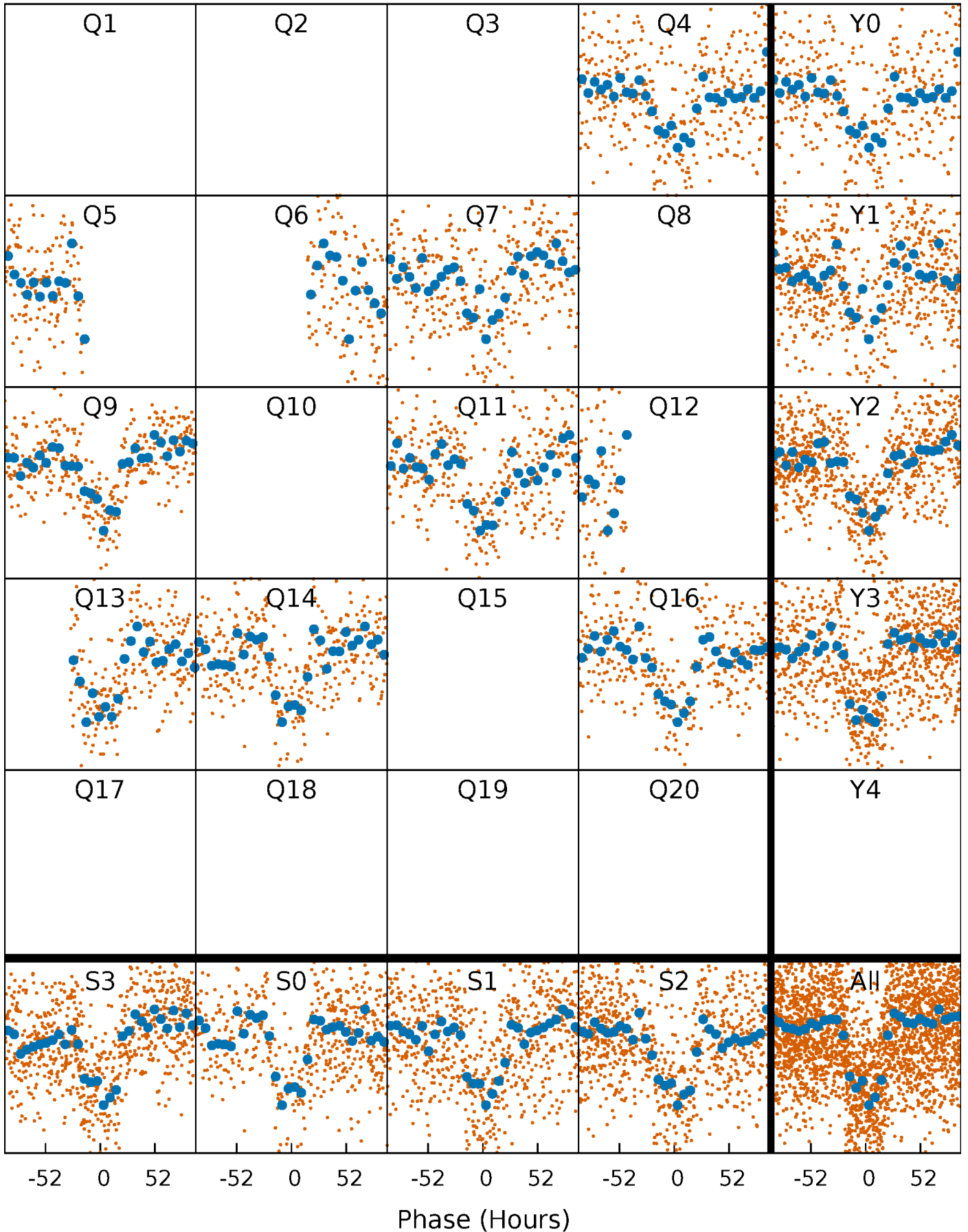


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



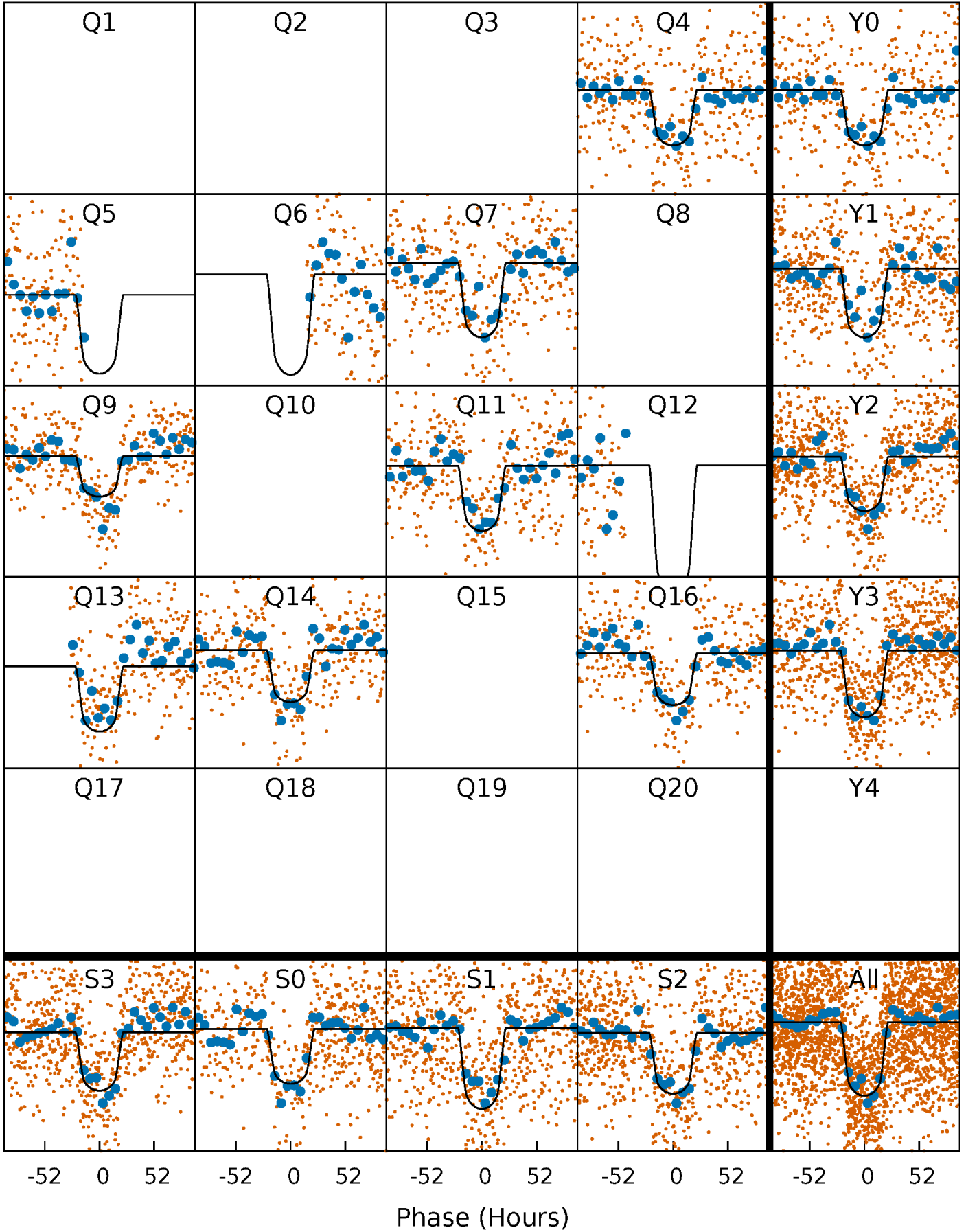
# PDC Quarter-Phased Transit Curves

TCE 005305451-02 P=161.276900 Days  $T_0=216.276072$  (BKJD)



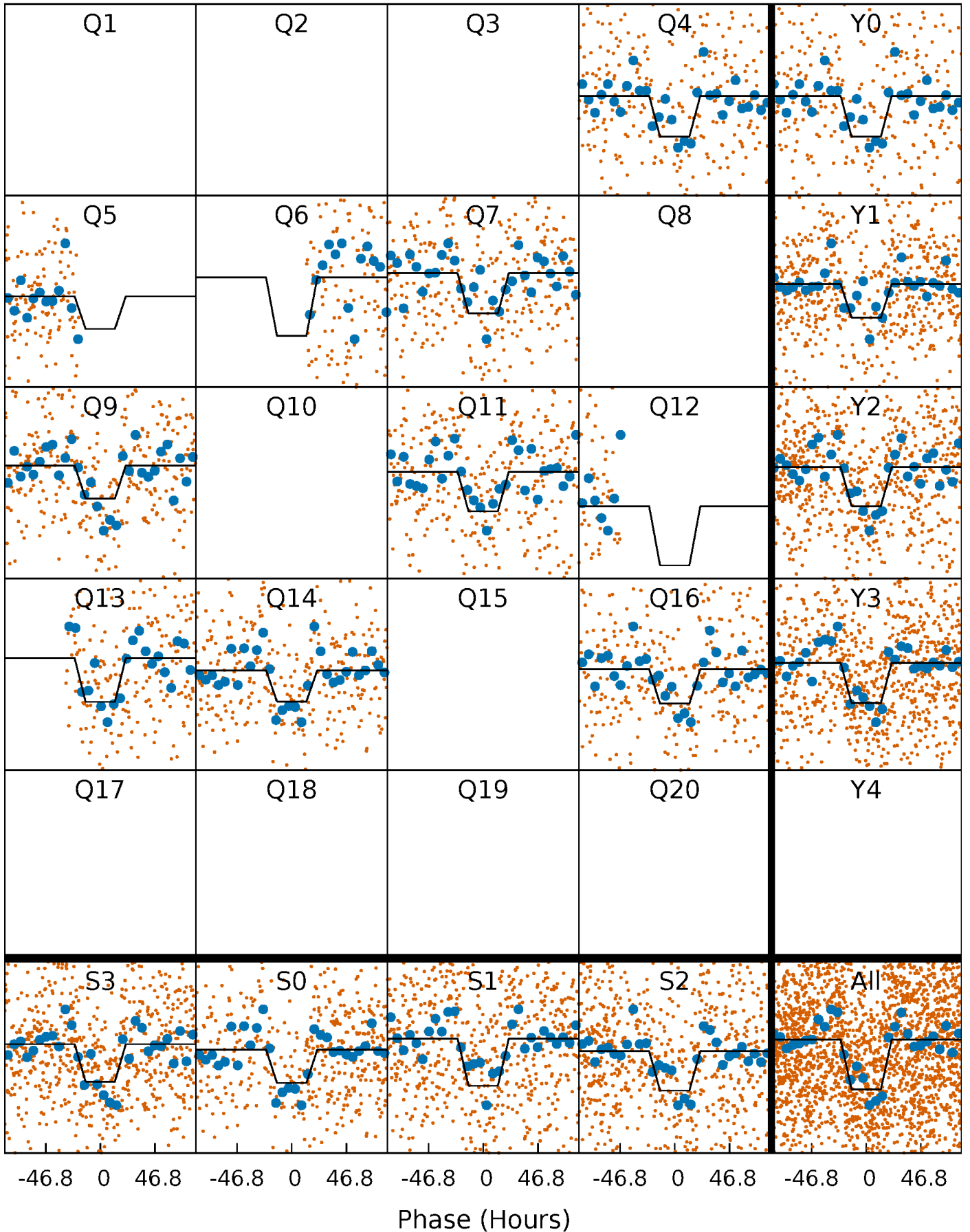
# DV Quarter-Phased Transit Curves

TCE 005305451-02 P=161.276900 Days  $T_0=216.276072$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

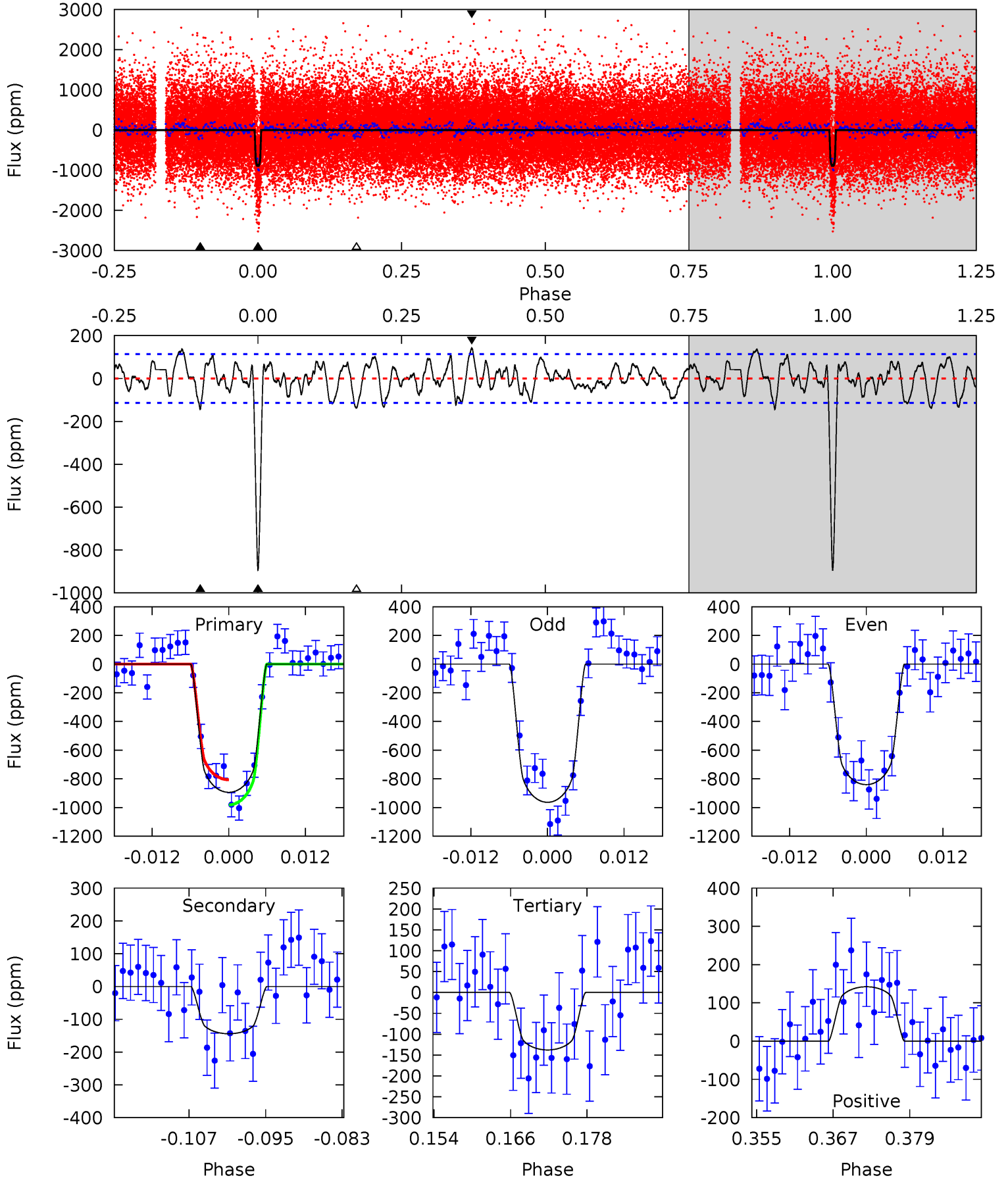
TCE 005305451-02 P=161.261655 Days  $T_0=216.409436$  (BKJD)



# DV Model-Shift Uniqueness Test

005305451-02, P = 161.276900 Days, E = 216.276072 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
39.2	6.32	6.05	6.23	4.99	2.52	2.34	33.2	33.0	0.28	0.09	2.70	1.03	0.14	3.85

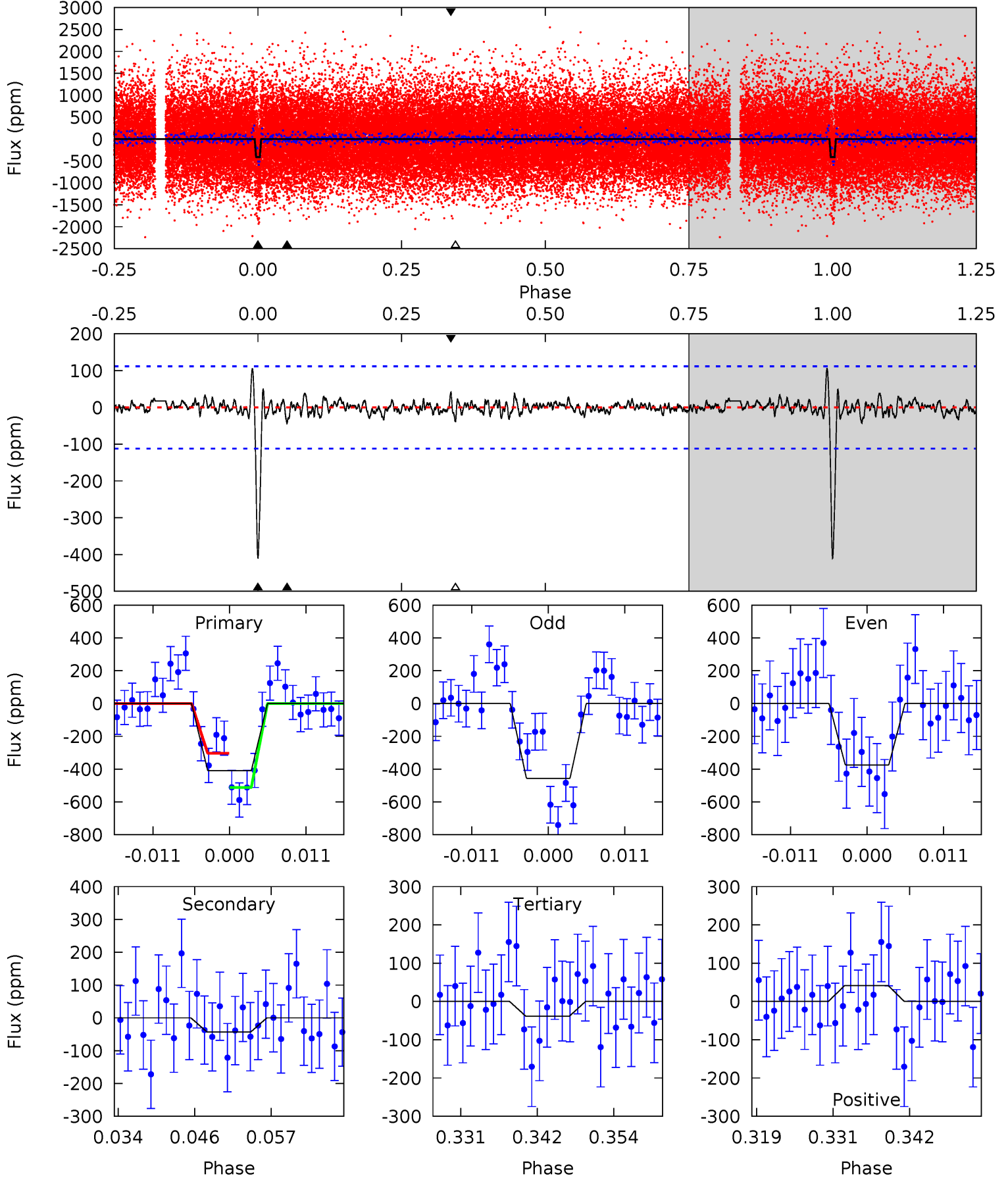




# Alt Model-Shift Uniqueness Test

005305451-02, P = 161.261655 Days, E = 216.409436 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
18.3	1.93	1.73	1.85	5.00	2.53	0.54	16.6	16.5	0.21	0.08	1.83	1.04	0.20	4.65





### Stellar Parameters For KIC 005305451

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5570^{+182}_{-182}$	$4.573^{+0.040}_{-0.160}$	$-0.200^{+0.300}_{-0.300}$	$0.803^{+0.201}_{-0.067}$	$0.880^{+0.092}_{-0.092}$	$2.392^{+0.497}_{-1.032}$
	+3%/-3%	+1%/-3%	+150%/-150%	+25%/-8%	+10%/-10%	+21%/-43%
Source	KIC0	KIC0	KIC0	DSEP		

KIC = Kepler Input Catalog; PHO = Photometry; SPE = Spectroscopy; AST = Asteroseismology  
 TRA = Transits; DESP = Dartmouth Models; MULT = Multiple Models

### Secondary Eclipse Parameters for KIC 005305451-02 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-144 \pm 23$	$3.03^{+0.37}_{-0.24}$	$422^{+25}_{-20}$	$3724^{+148}_{-133}$	$2605^{+572}_{-599}$
Alt.	$-43 \pm 22$	$1.81^{+0.28}_{-0.18}$	$420^{+25}_{-19}$	$3612^{+288}_{-447}$	$2114^{+1350}_{-1171}$

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

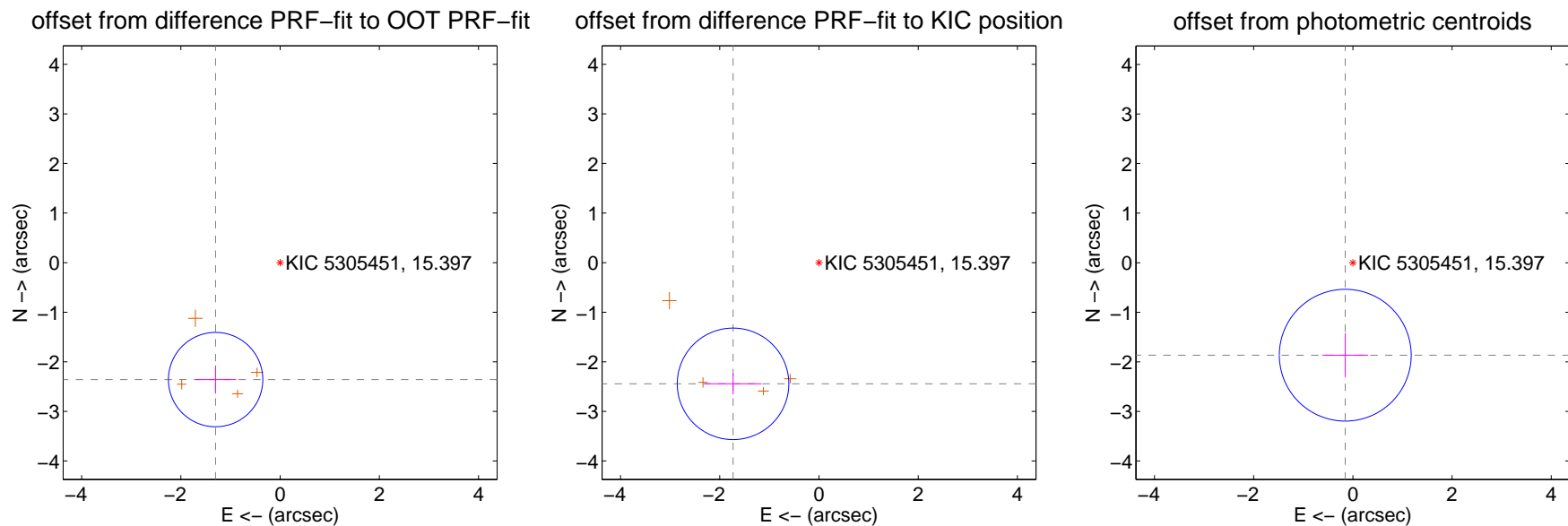
## DV Centroid Data

Supplemental centroid analysis for 005305451-02. Kepler magnitude: 15.40. Transit SNR 17.42

There are 0 quarters with good PRF difference image offsets

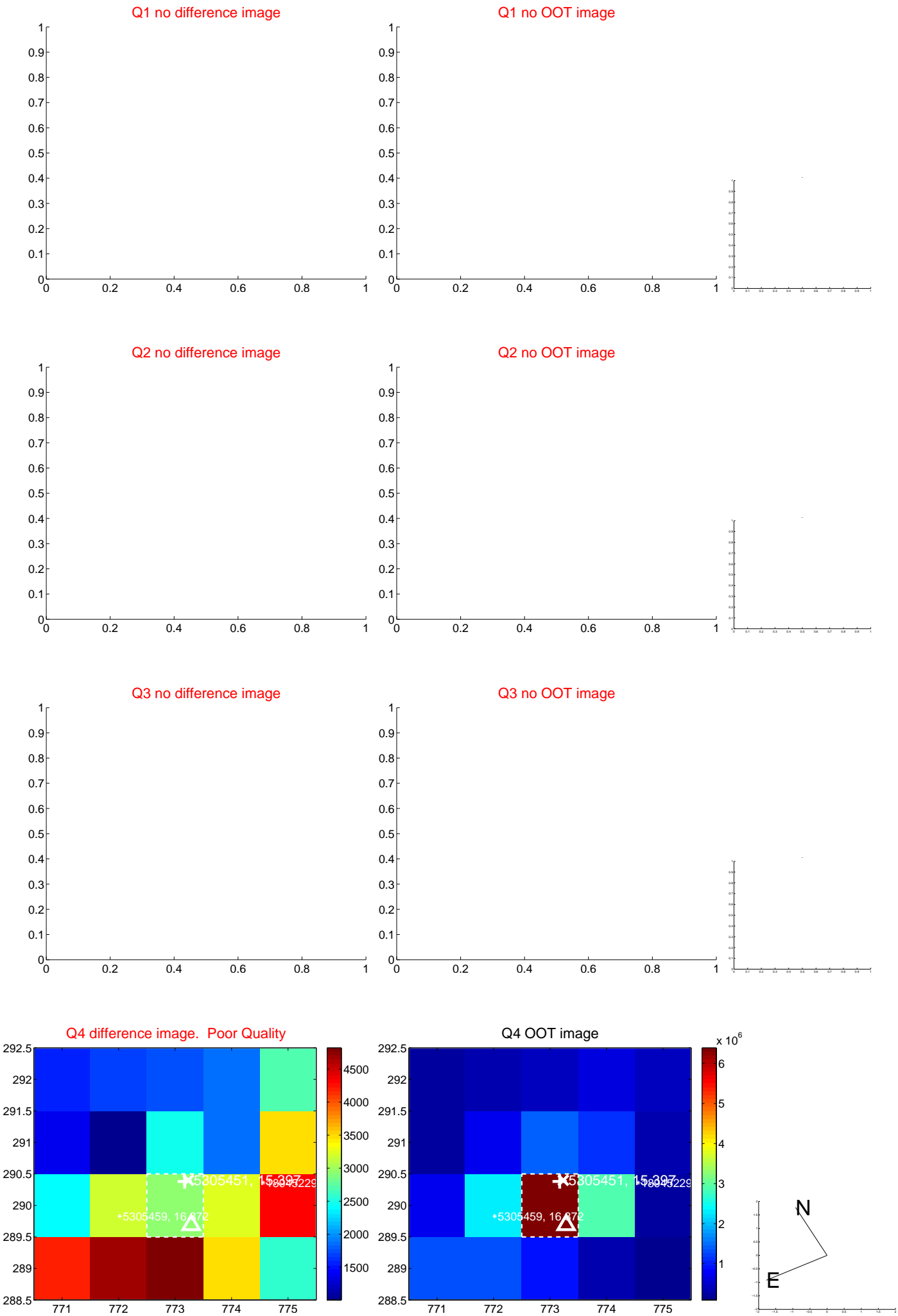
The direct PRF centroid is offset from the target star catalog position by about 0.36 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$2.693 \pm 0.317$	8.49	$1.300 \pm 0.415$	$-2.358 \pm 0.281$
PRF-fit source offset from KIC position	$2.996 \pm 0.375$	8.00	$1.732 \pm 0.575$	$-2.444 \pm 0.212$
photometric centroid source offset	$1.87 \pm 0.44$	4.22	$0.15 \pm 0.46$	$-1.87 \pm 0.44$



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.

Q5 no difference image



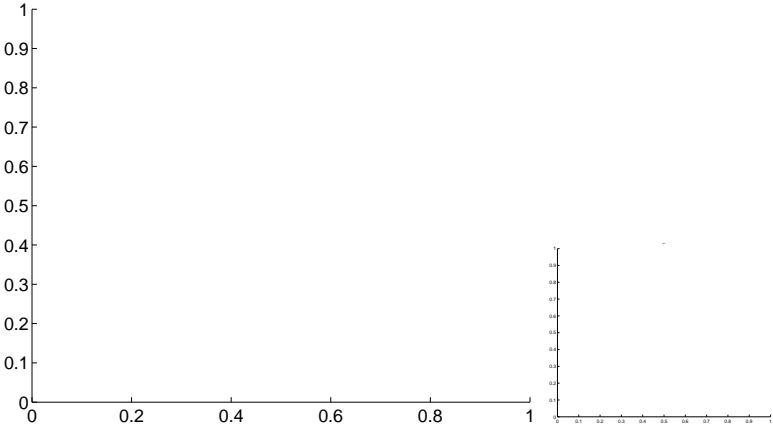
Q5 no OOT image



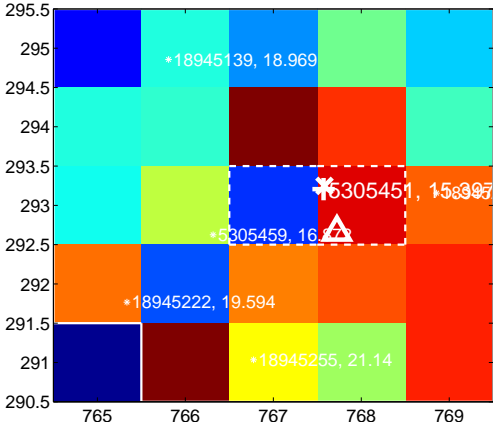
Q6 no difference image



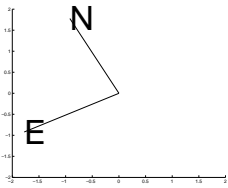
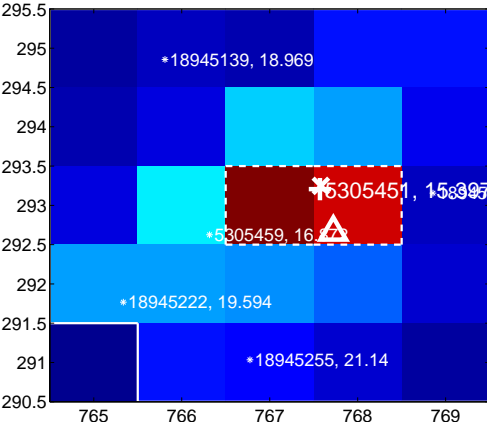
Q6 no OOT image



Q7 difference image. Poor Quality



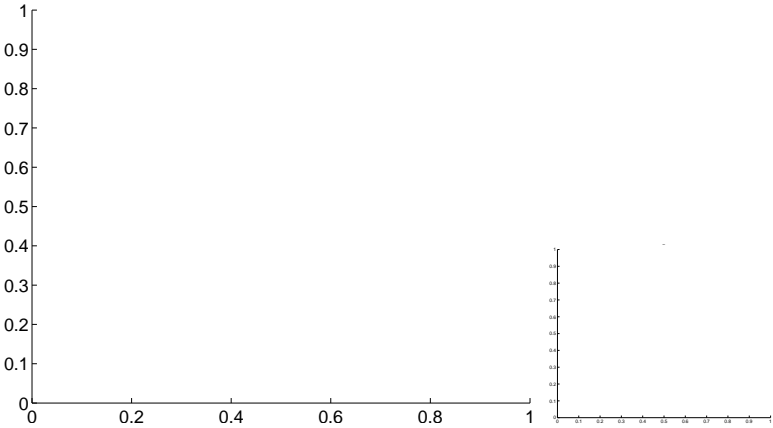
Q7 OOT image



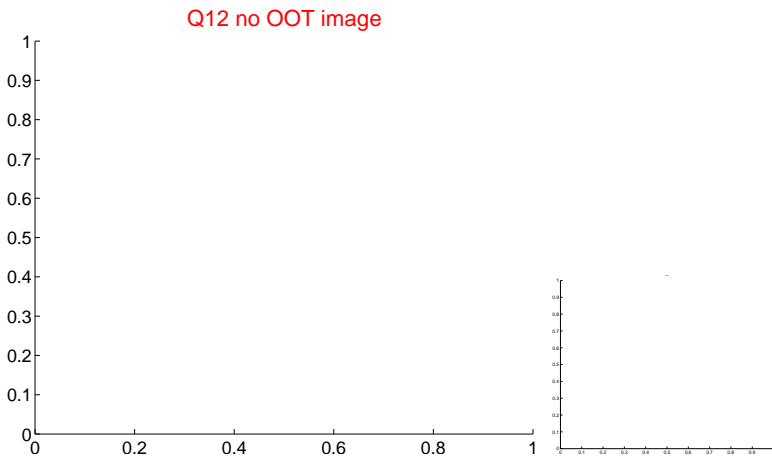
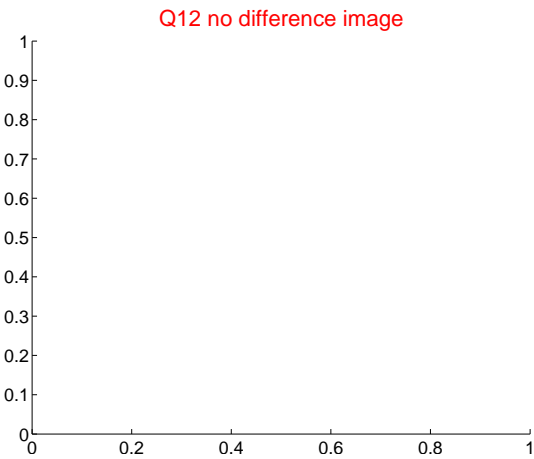
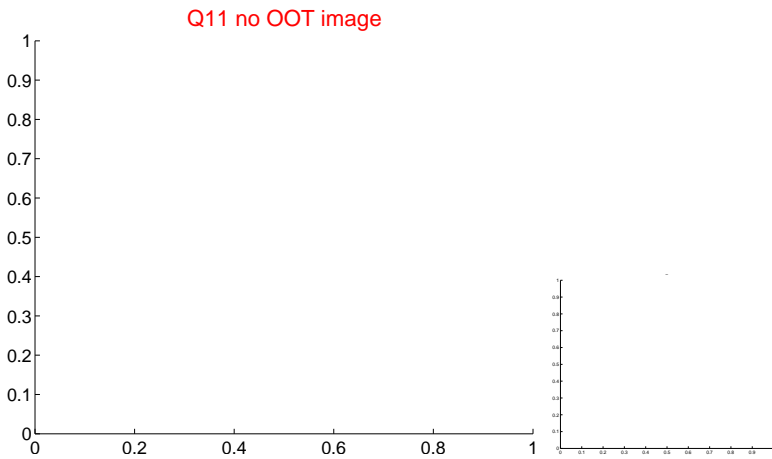
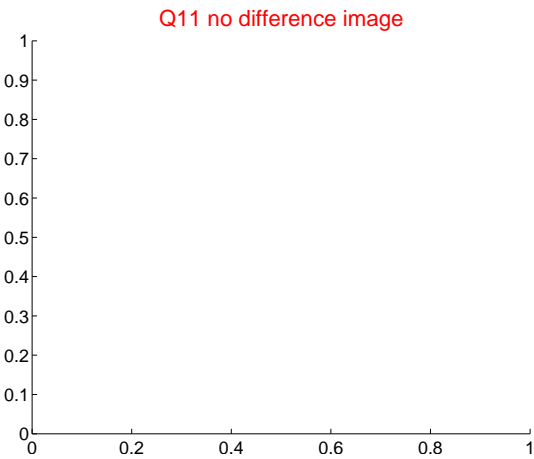
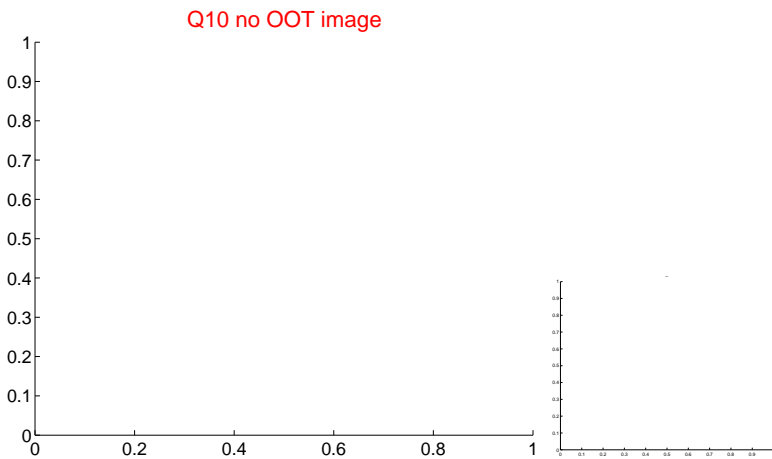
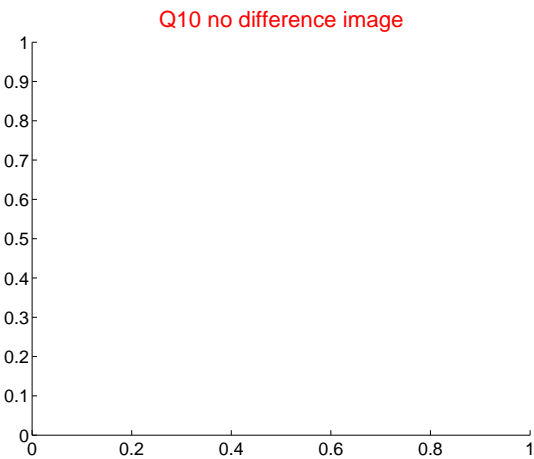
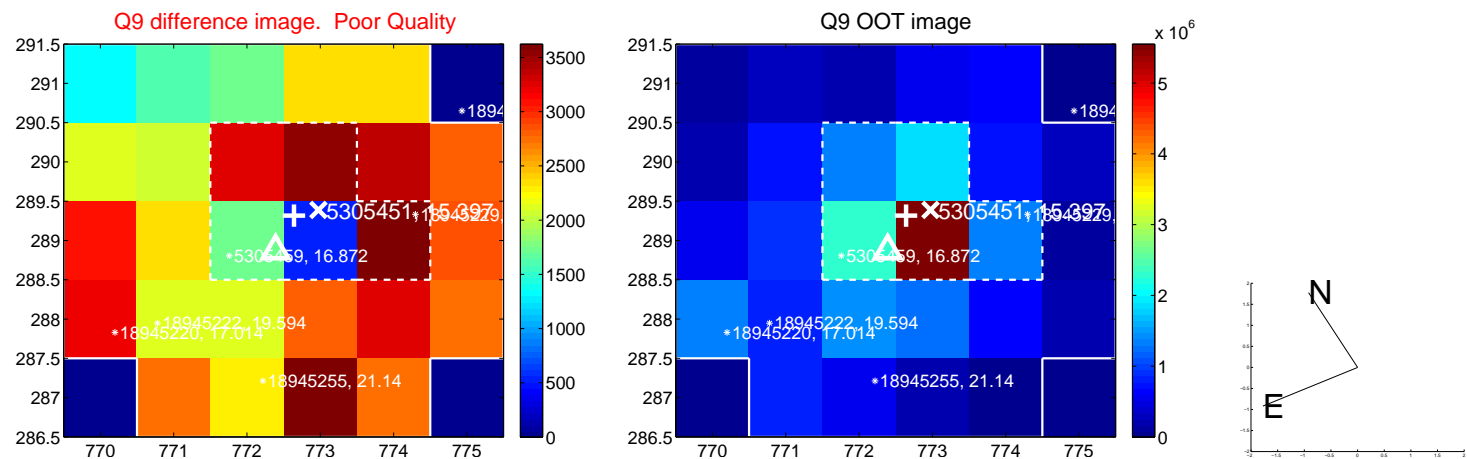
Q8 no difference image



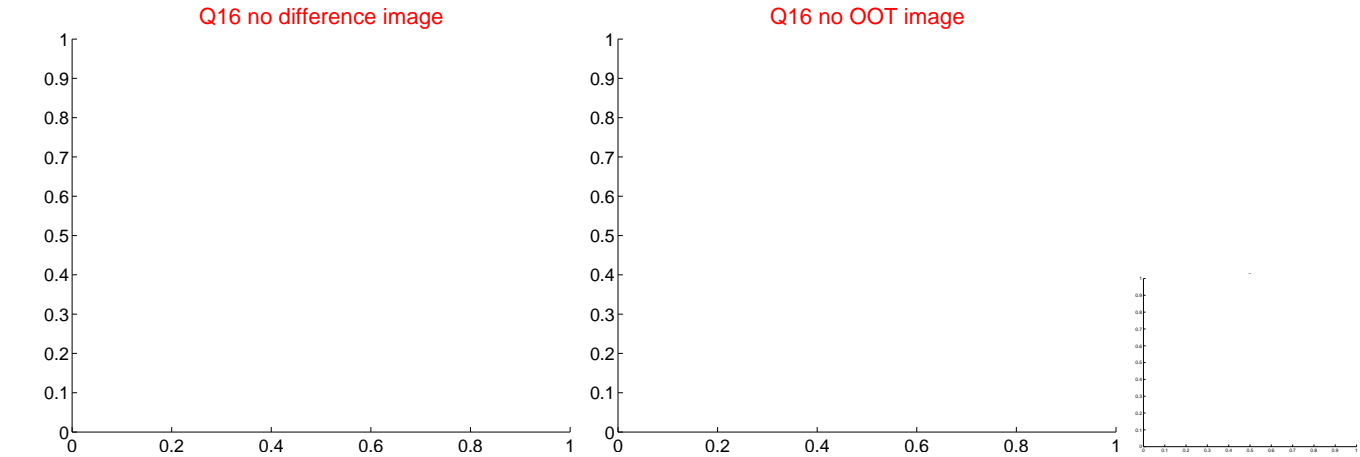
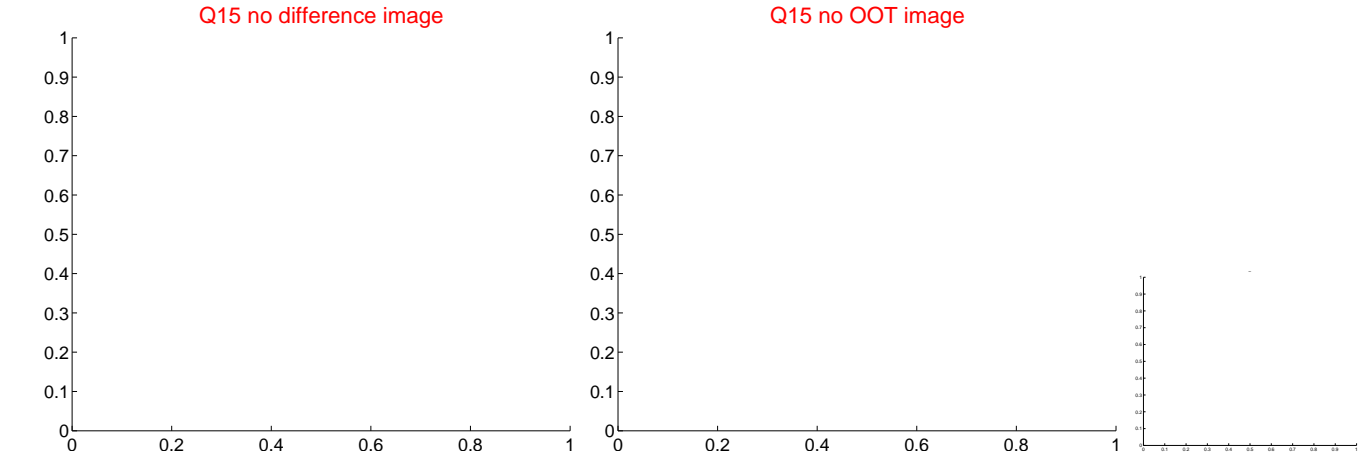
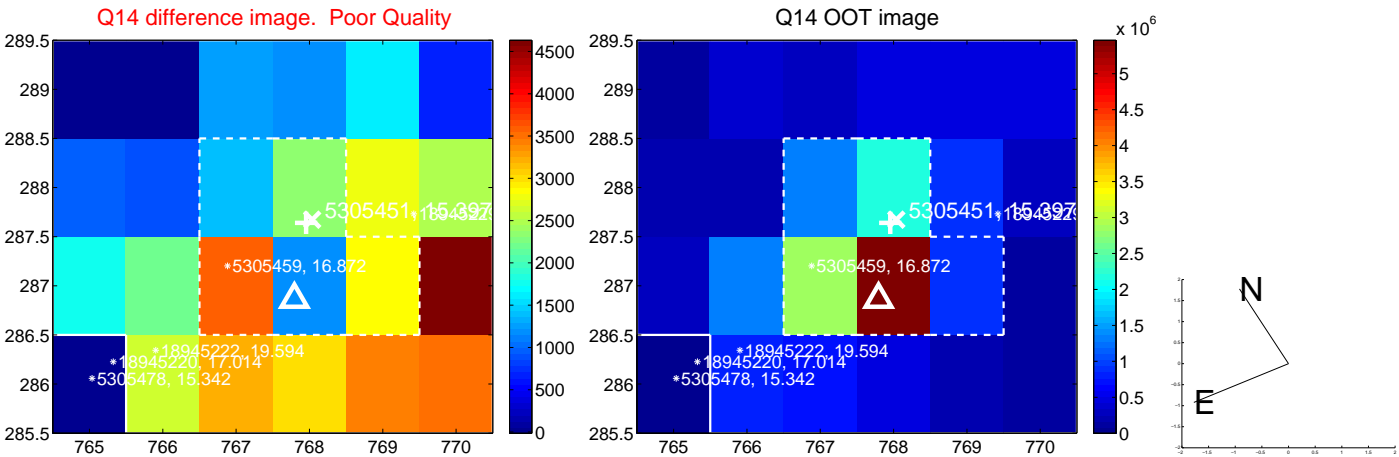
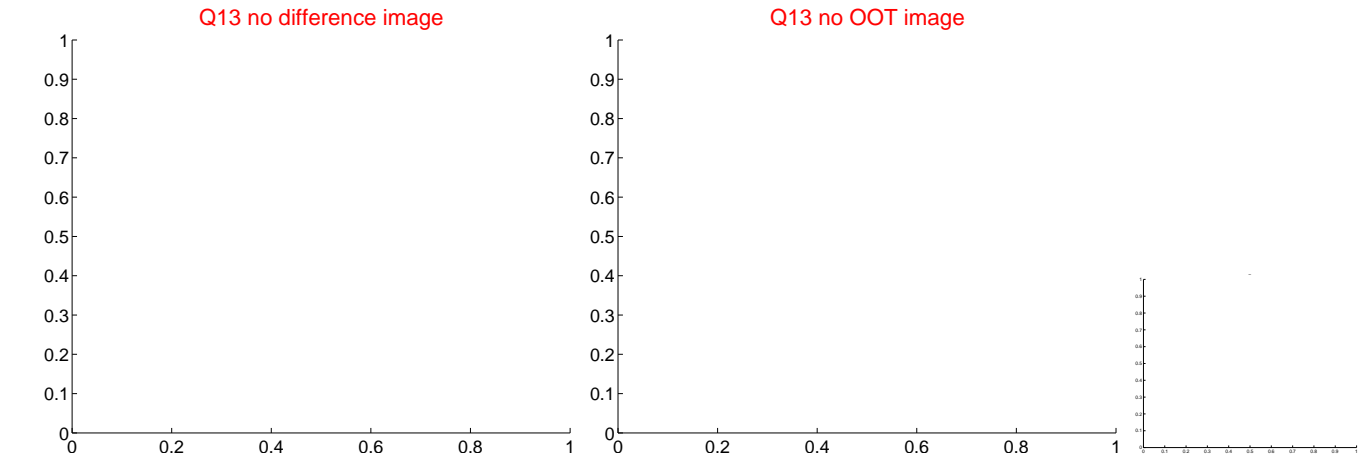
Q8 no OOT image



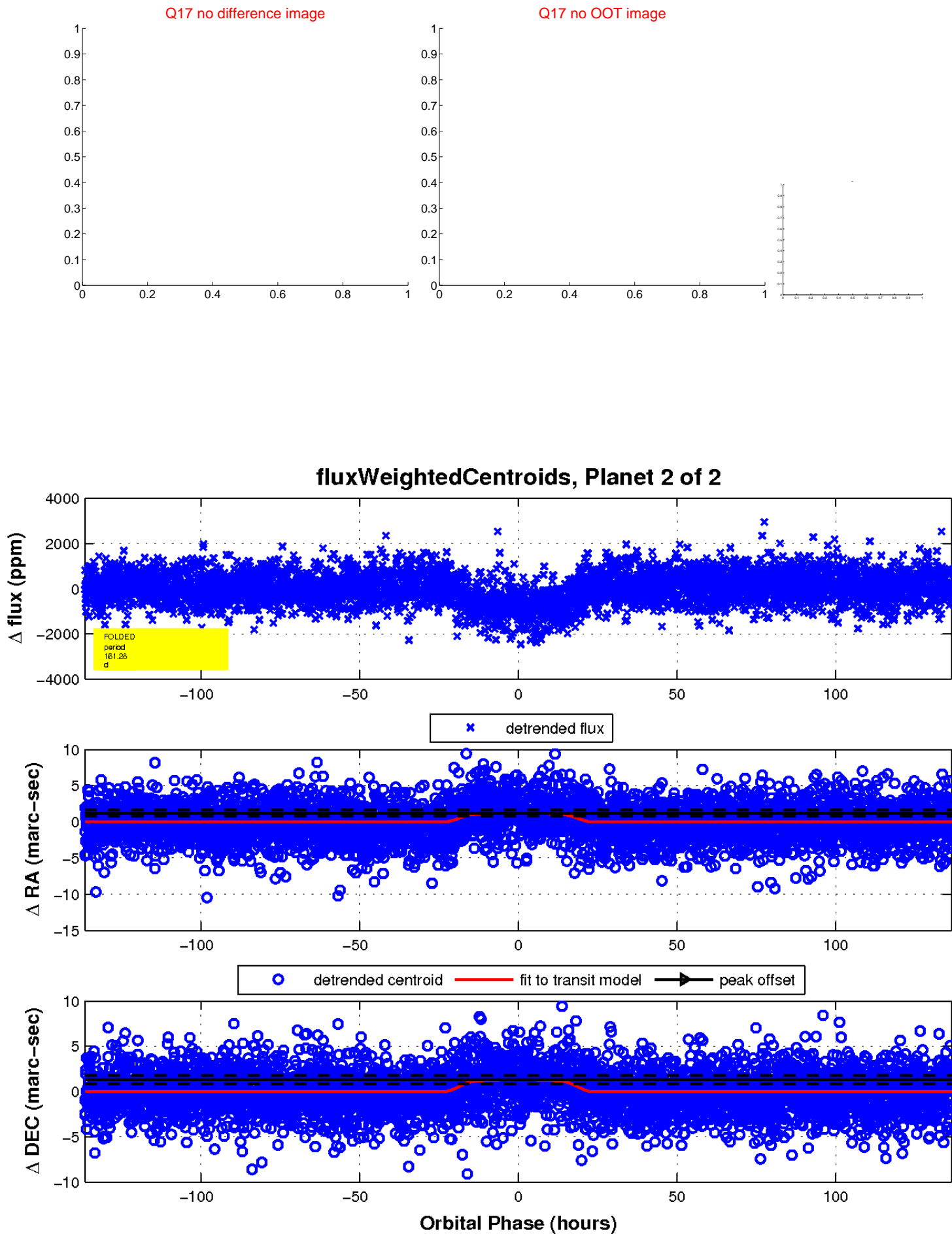
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ×: large negative pixel value.



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.



UKIRT Image

Declination

