

# KIC 003660581

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
003660581-01	OBS	No	402.032229	270.814503	884.8	29.631	9.2	8.2	3.83	6655	14.32	16.22
003660581-02	OBS	7662.01	4.725176	131.999871	79.2	3.874	8.5	9.6	3.83	6655	4.00	6069.28

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
003660581-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL—LPP_DV—ALL_TRANS_CHASES—CENT_FEW_DIFFS
003660581-02	OBS	PC	0.98	0	0	0	0	NO_COMMENT

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

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

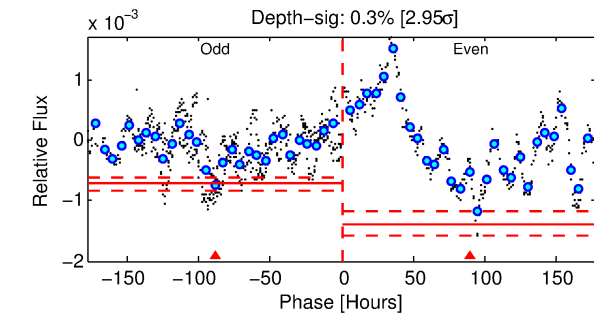
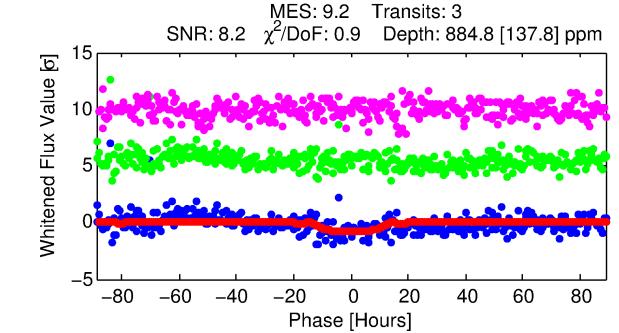
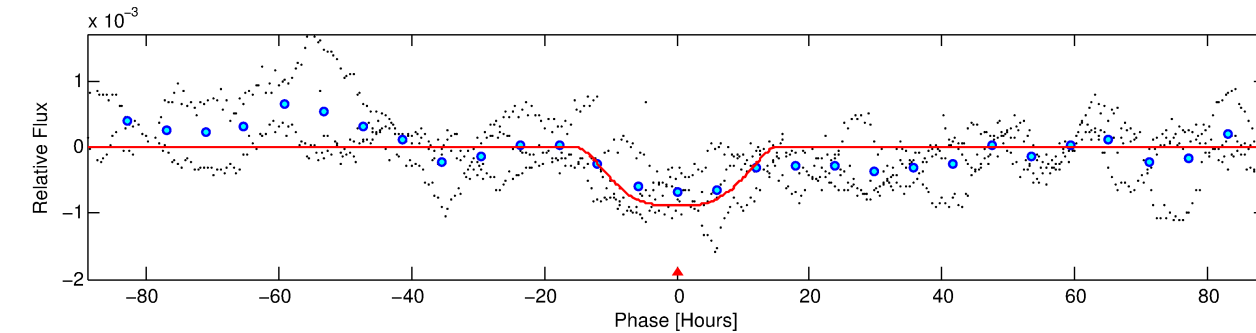
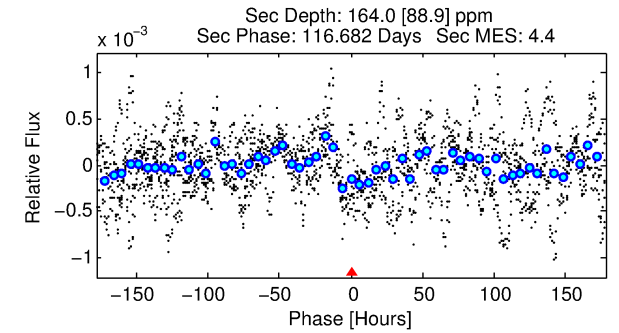
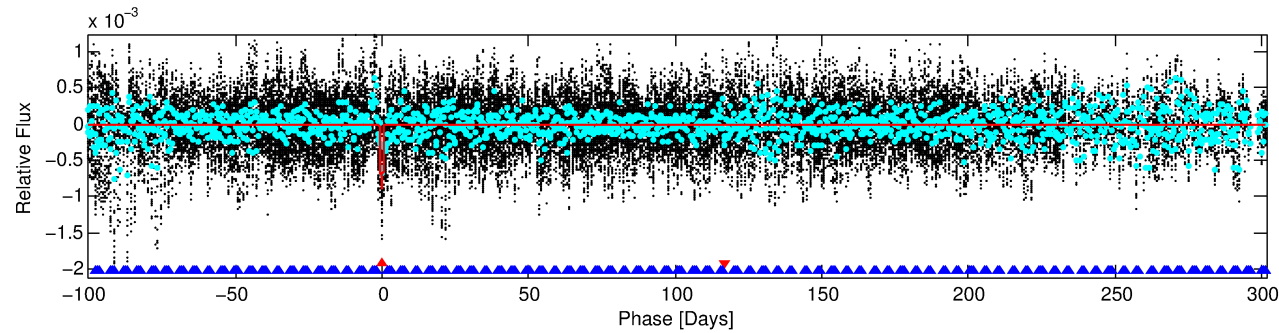
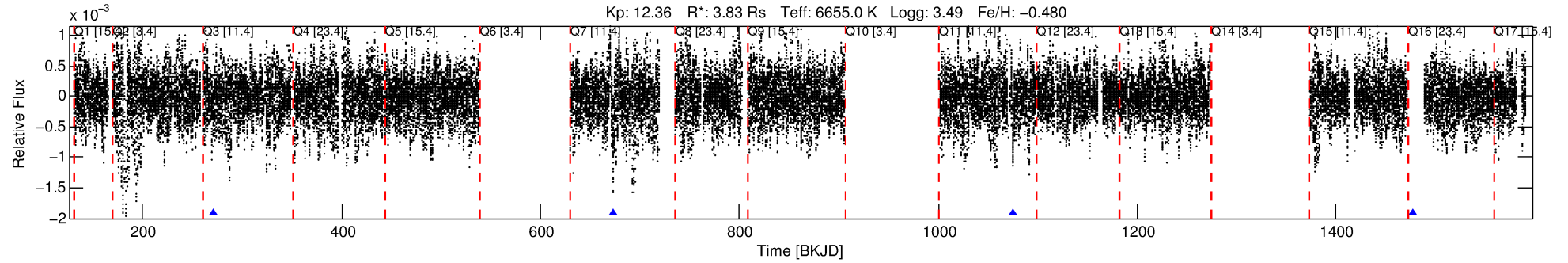
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 003660581-01

No Significant Match Found

# DV One-Page Summary

KIC: 3660581 Candidate: 1 of 2 Period: 402.032 d



## DV Fit Results:

Period = 402.03223 [0.04202] d  
Epoch = 270.8145 [0.0548] BKJD  
Rp/R\* = 0.0342 [0.0033]  
a/R\* = 39.92 [4.87]  
b = 0.96 [0.01]  
Seff = 16.22 [10.61]  
Teq = 512 [84] K  
Rp = 14.32 [6.23] Re  
a = 1.2611 [0.5098] AU  
Ag = 699.94 [603.67] [1.16 $\sigma$ ]  
Teffp = 4069 [598] K [5.90 $\sigma$ ]

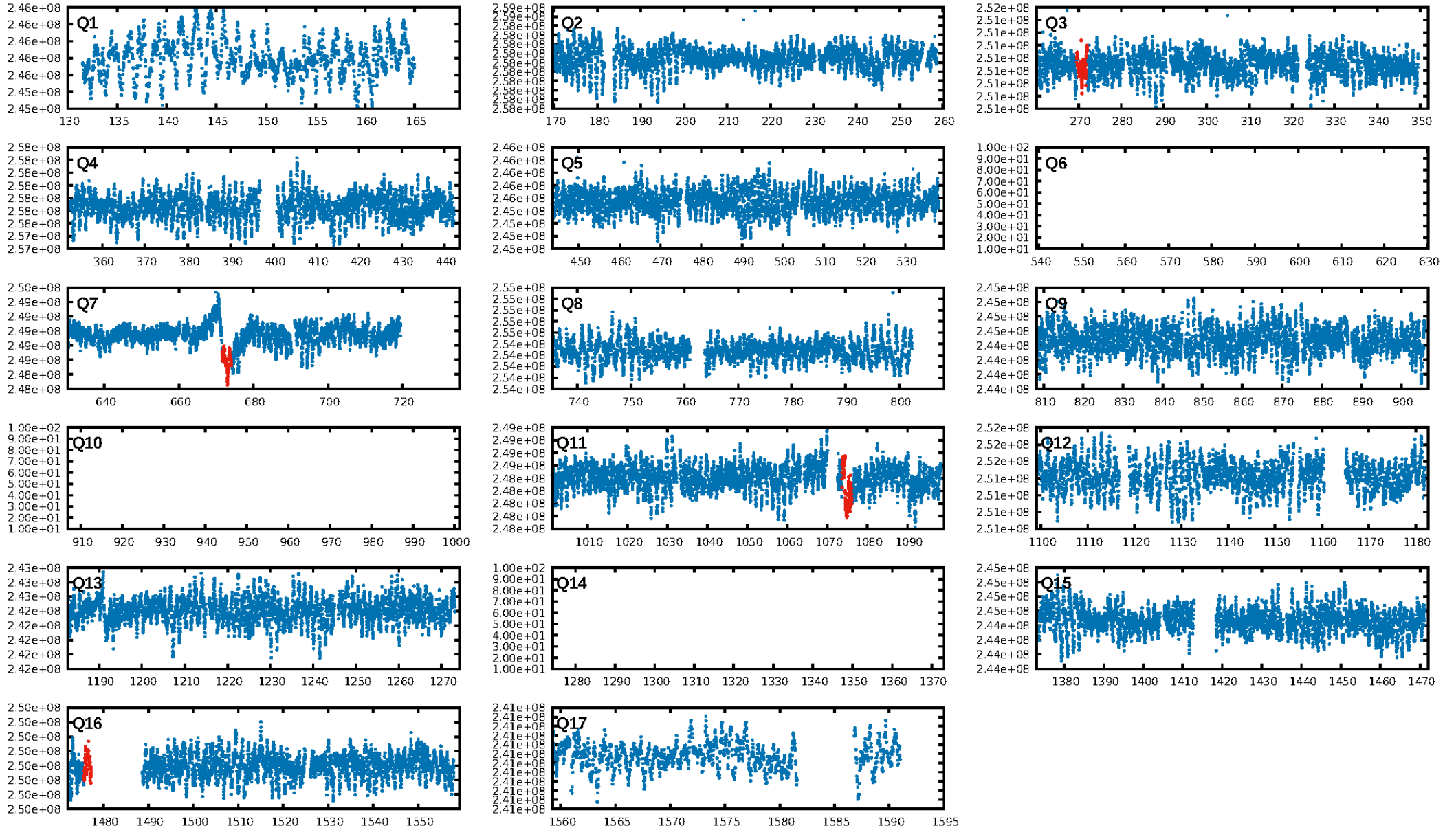
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [319.08 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 0.2%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 6.87e-14  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: 1.032  
Centroid-sig: 58.3%  
Centroid-so: 0.221 arcsec [0.68 $\sigma$ ]  
OotOffset-rm: N/A  
KicOffset-rm: N/A  
OotOffset-st: 0/0/0 [0]  
KicOffset-st: 0/0/0 [0]  
DiffImageQuality-fgm: N/A  
DiffImageOverlap-fno: 1.00 [1/1]

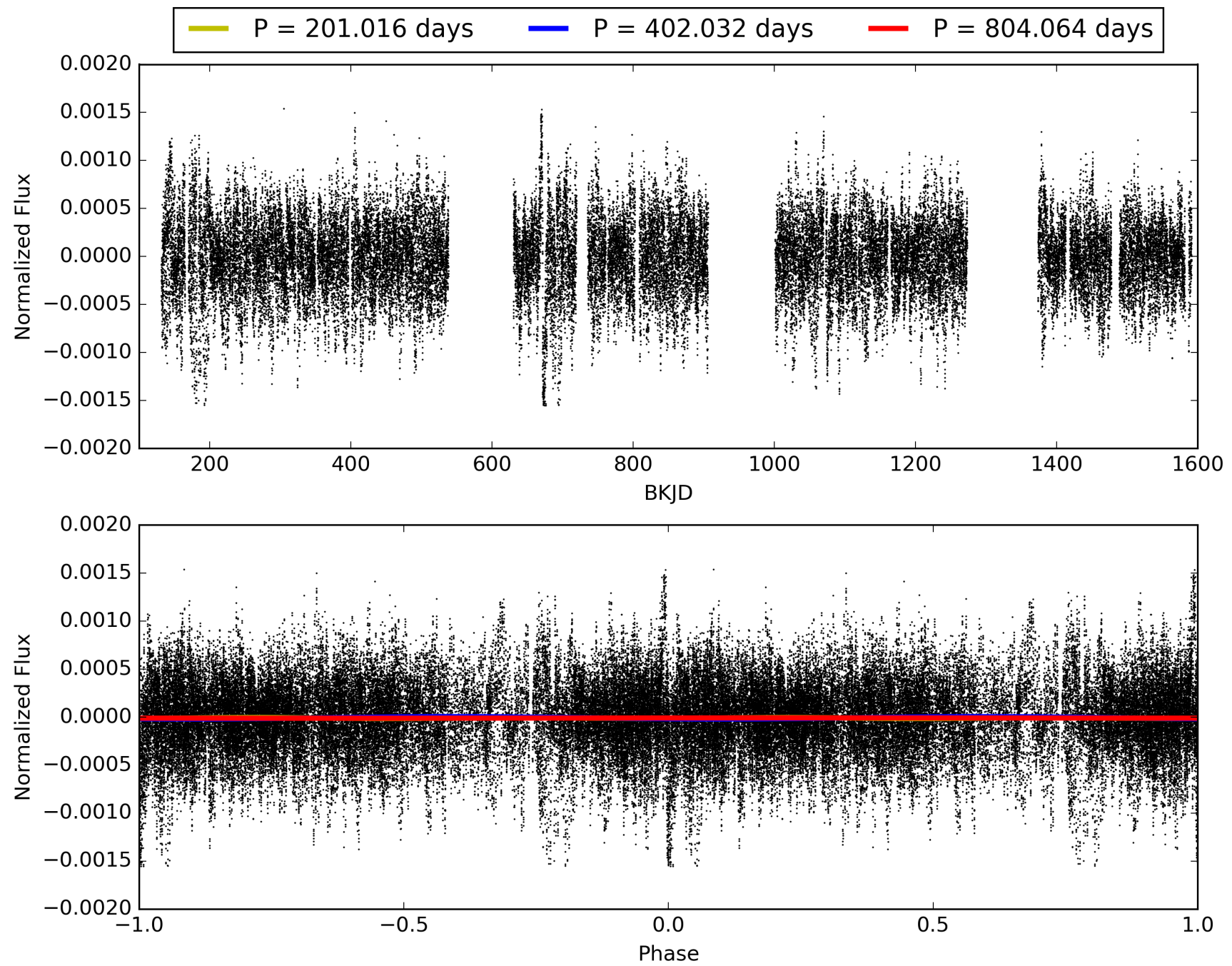
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 15:55:36 Z

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

# TCE 003660581-01, PDC Light Curves

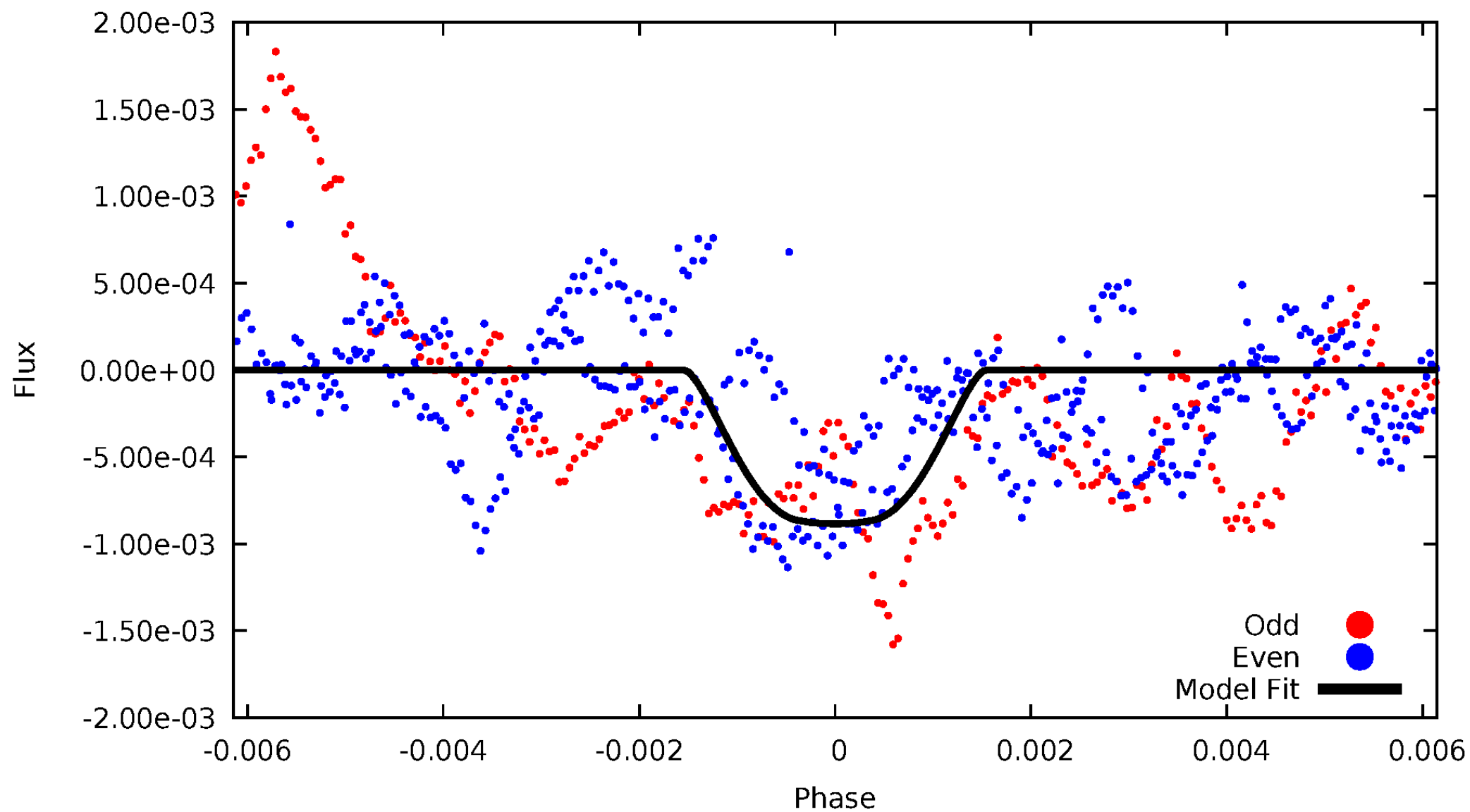


TCE 003660581-01



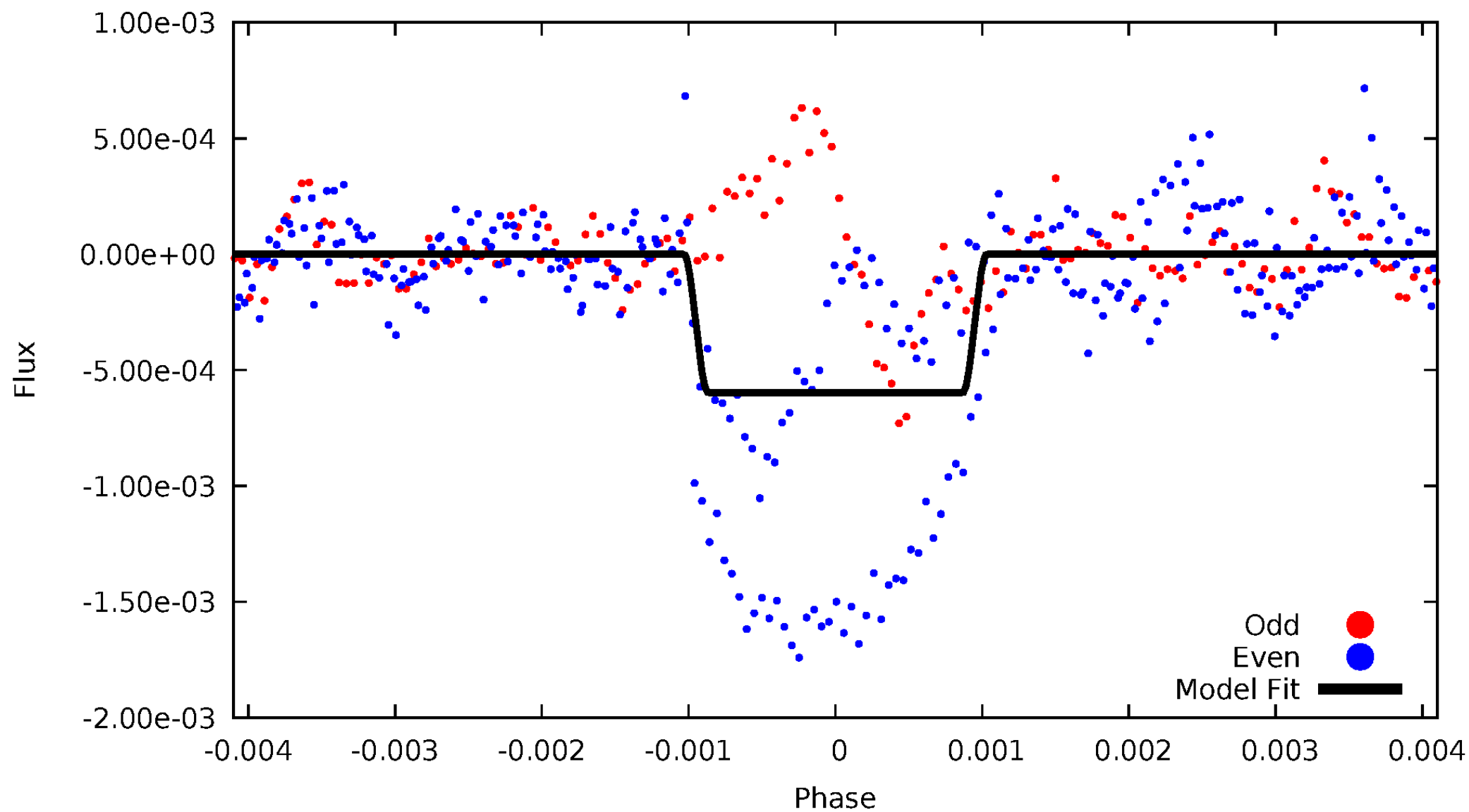
# DV Odd/Even

TCE 003660581-01



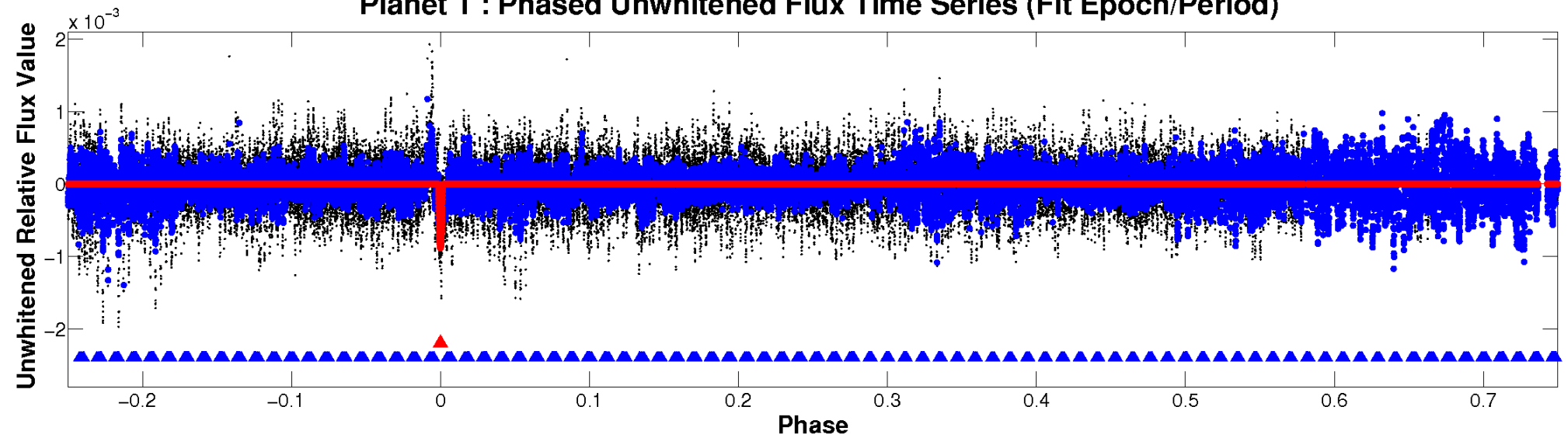
# ALT Odd/Even

TCE 003660581-01

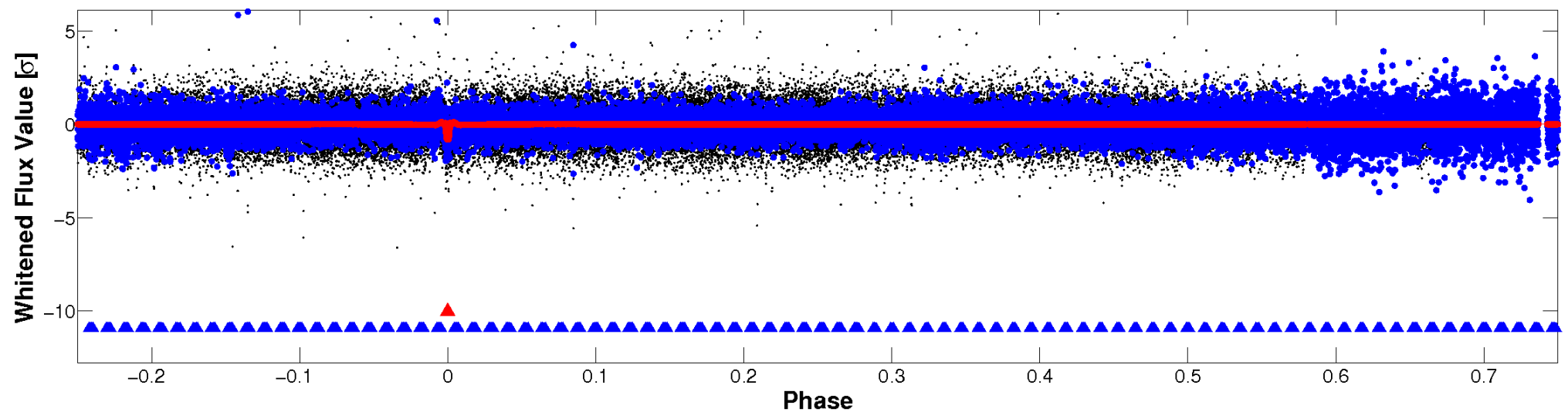


# Non-Whitened Vs. Whitened Light Curve

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



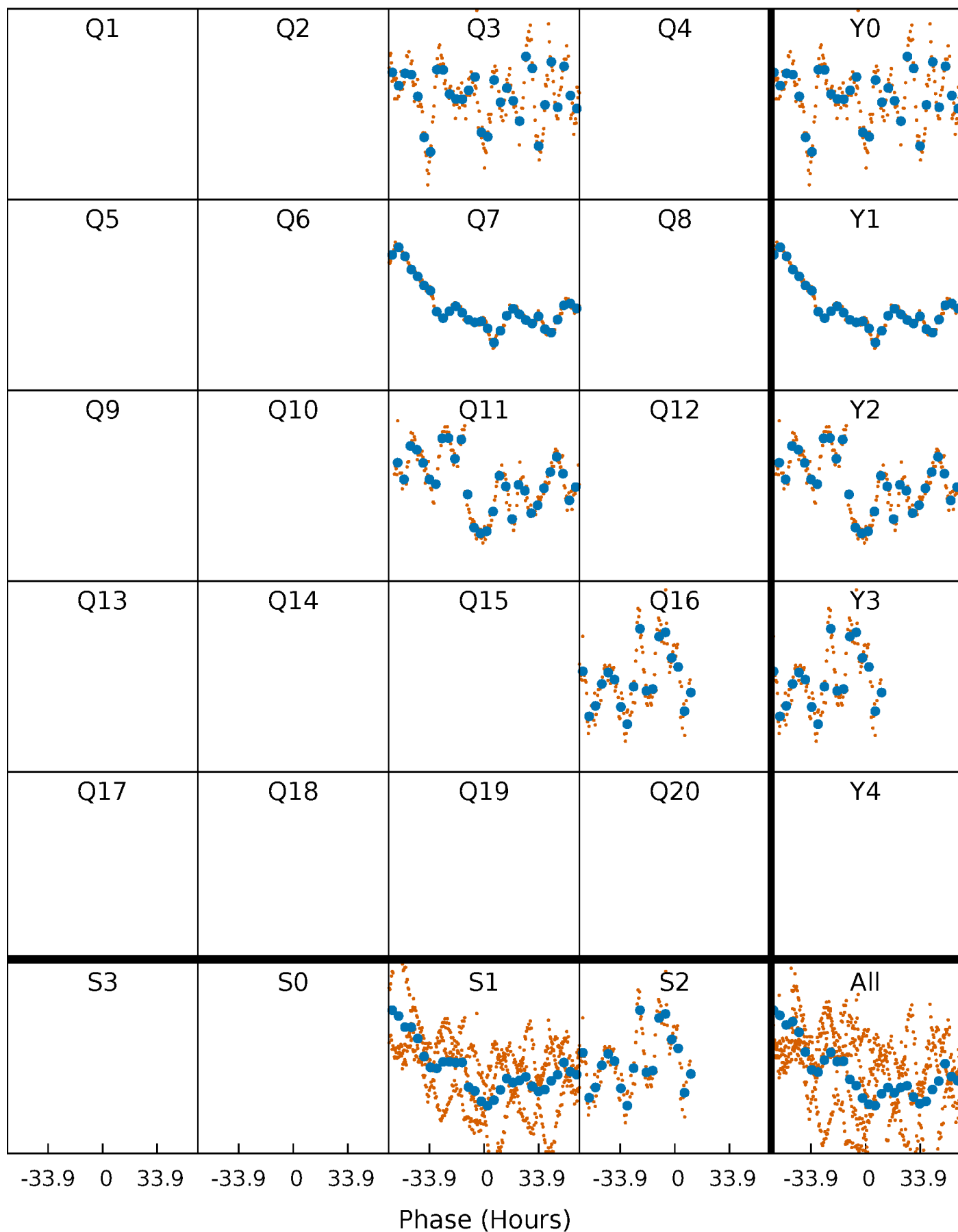
Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)





# PDC Quarter-Phased Transit Curves

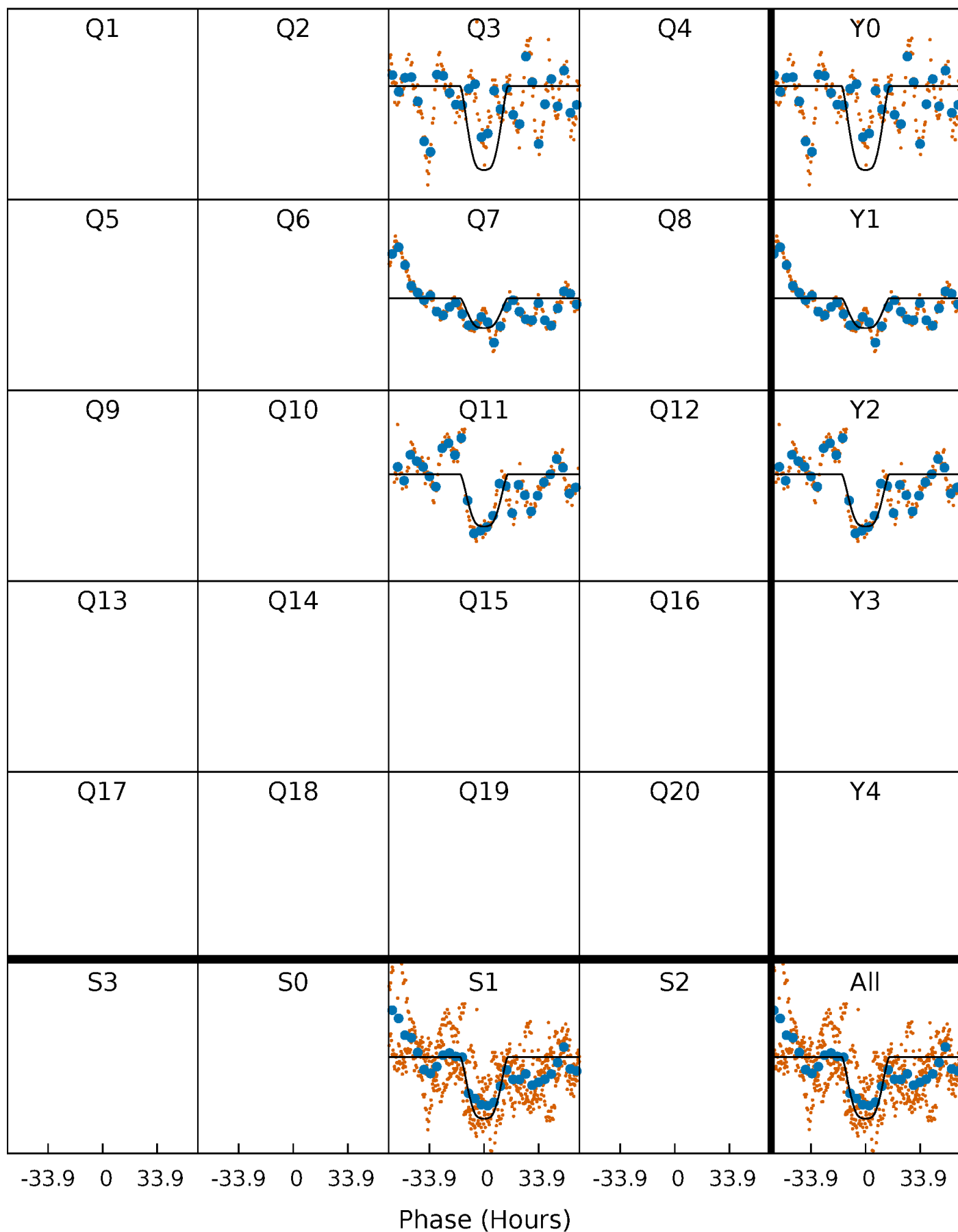
TCE 003660581-01 P=402.032229 Days  $T_0=270.814503$  (BKJD)





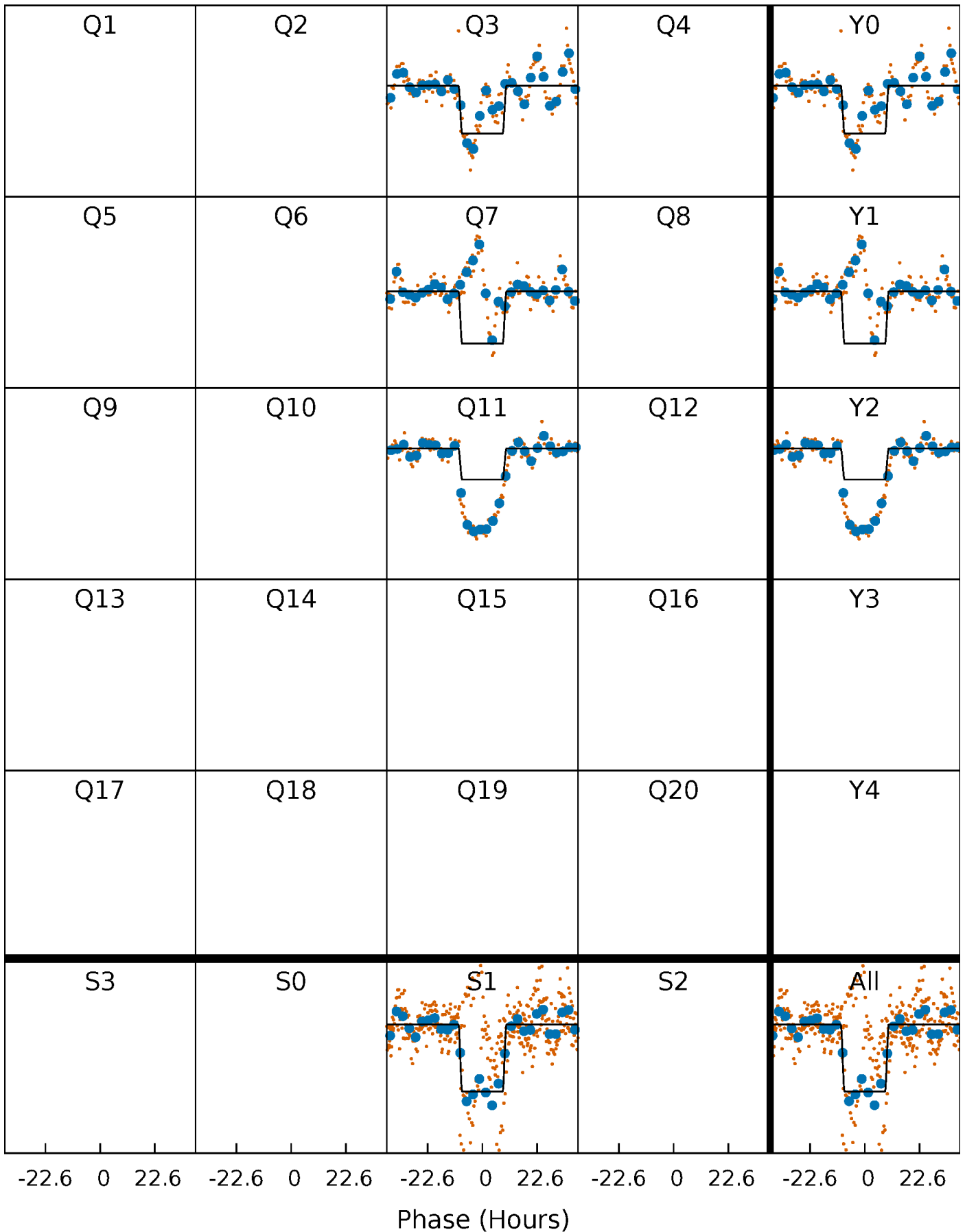
# DV Quarter-Phased Transit Curves

TCE 003660581-01     $P=402.032229$  Days     $T_0=270.814503$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

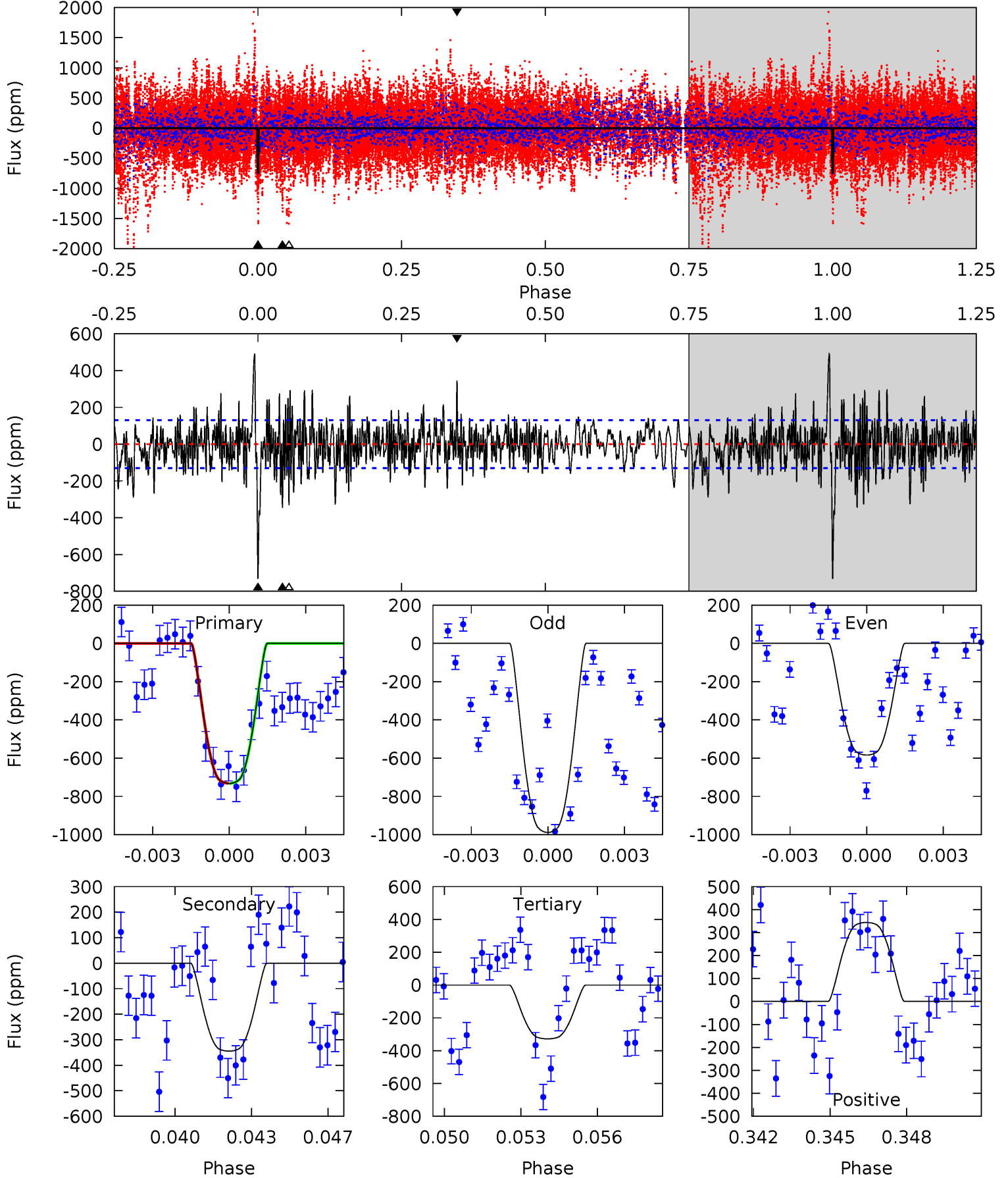
TCE 003660581-01 P=401.873636 Days  $T_0=271.036749$  (BKJD)



# DV Model-Shift Uniqueness Test

003660581-01, P = 402.032229 Days, E = 270.814503 Days

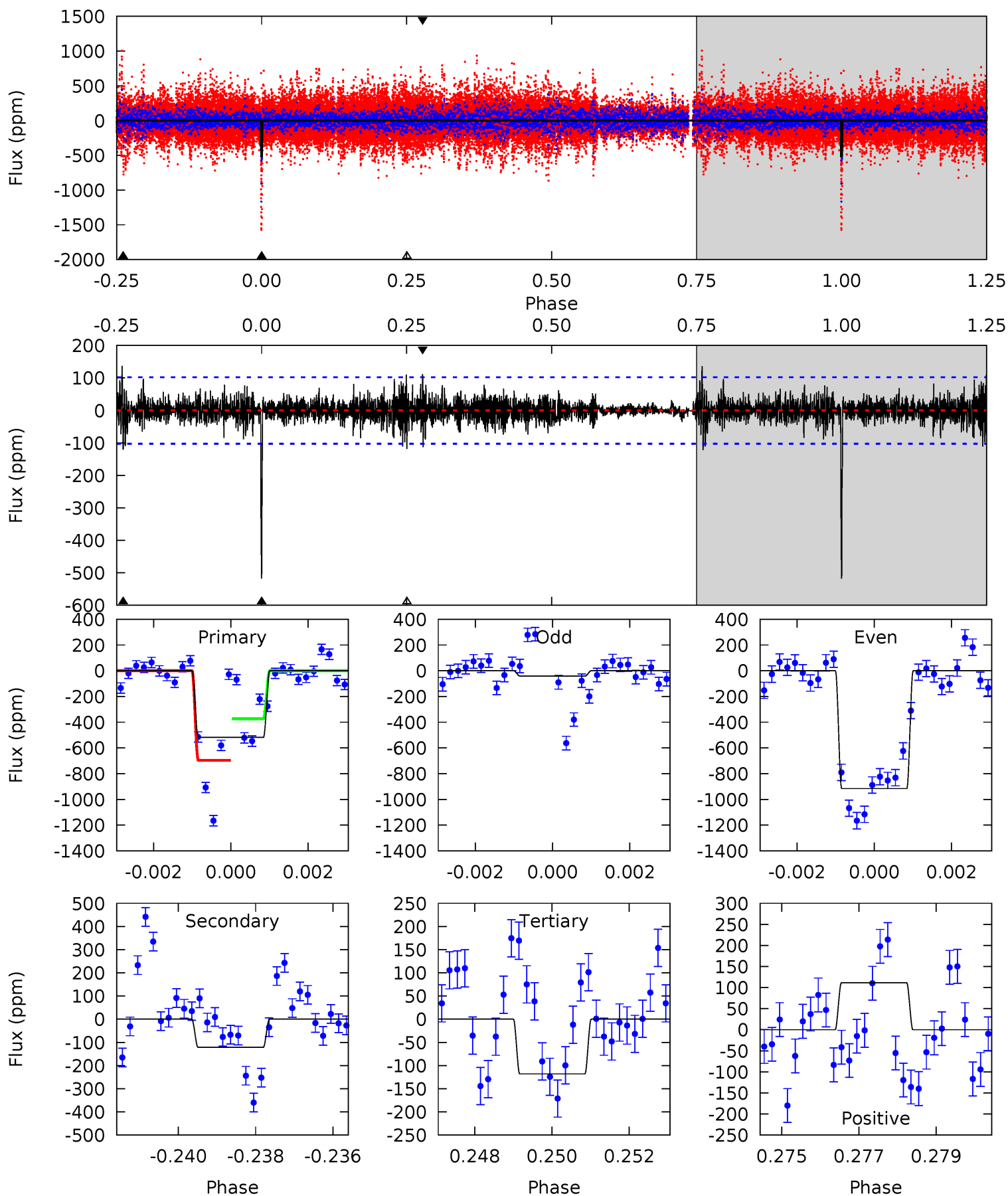
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
29.4	13.9	13.2	13.8	5.25	2.96	3.82	16.3	15.6	0.68	0.04	7.73	0.82	0.40	0.01



# Alt Model-Shift Uniqueness Test

003660581-01, P = 401.873636 Days, E = 271.036749 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
26.9	6.31	6.13	5.81	5.32	3.08	1.33	20.8	21.1	0.18	0.50	24.2	1.41	0.21	8.01



### Stellar Parameters For KIC 003660581

	$T_{\text{eff}} (K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6655^{+160}_{-200}$	$3.490^{+0.376}_{-0.094}$	$-0.480^{+0.400}_{-0.300}$	$3.831^{+0.542}_{-1.627}$	$1.653^{+0.219}_{-0.438}$	$0.041^{+0.135}_{-0.013}$
	+2%/-3%	+11%/-3%	+83%/-62%	+14%/-42%	+13%/-26%	+326%/-31%
Source	PHO1	FLK73	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 003660581-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-345 \pm 25$	$13.48^{+2.52}_{-3.36}$	$697^{+45}_{-79}$	$4977^{+249}_{-221}$	$1683^{+1078}_{-490}$
Alt.	$-121 \pm 19$	$9.71^{+2.01}_{-2.15}$	$703^{+38}_{-70}$	$4598^{+318}_{-274}$	$1148^{+693}_{-402}$

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

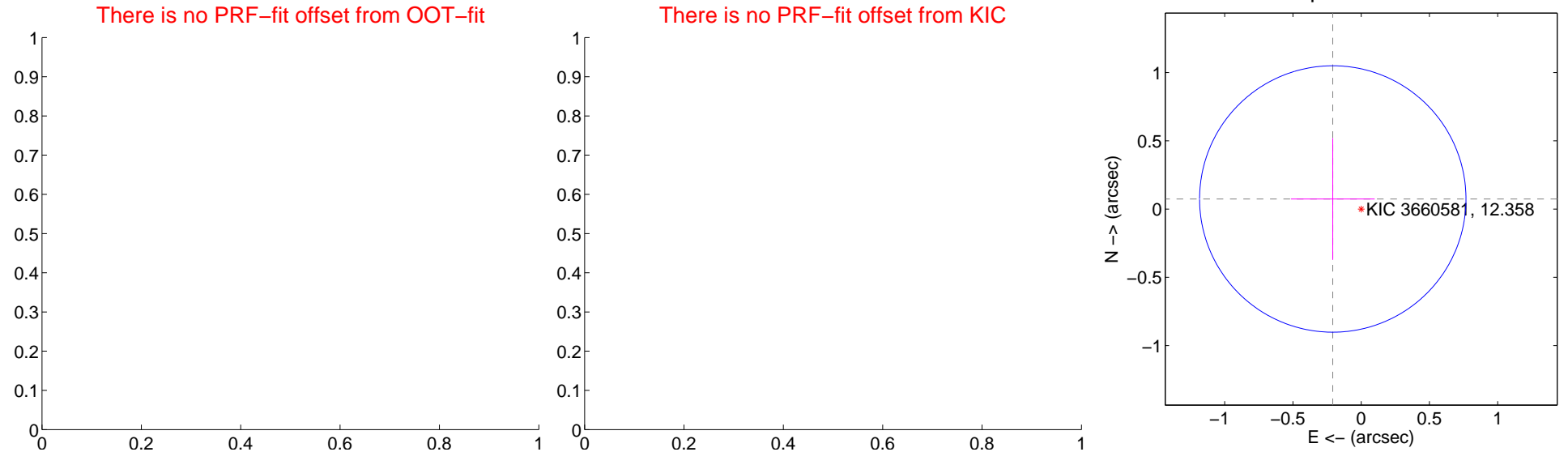
## DV Centroid Data

Supplemental centroid analysis for 003660581-01. Kepler magnitude: 12.36. Transit SNR 8.15

There are 0 quarters with good PRF difference image offsets

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

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	—	—	—	—
PRF-fit source offset from KIC position	—	—	—	—
photometric centroid source offset	$0.22 \pm 0.33$	0.68	$0.21 \pm 0.31$	$0.07 \pm 0.45$



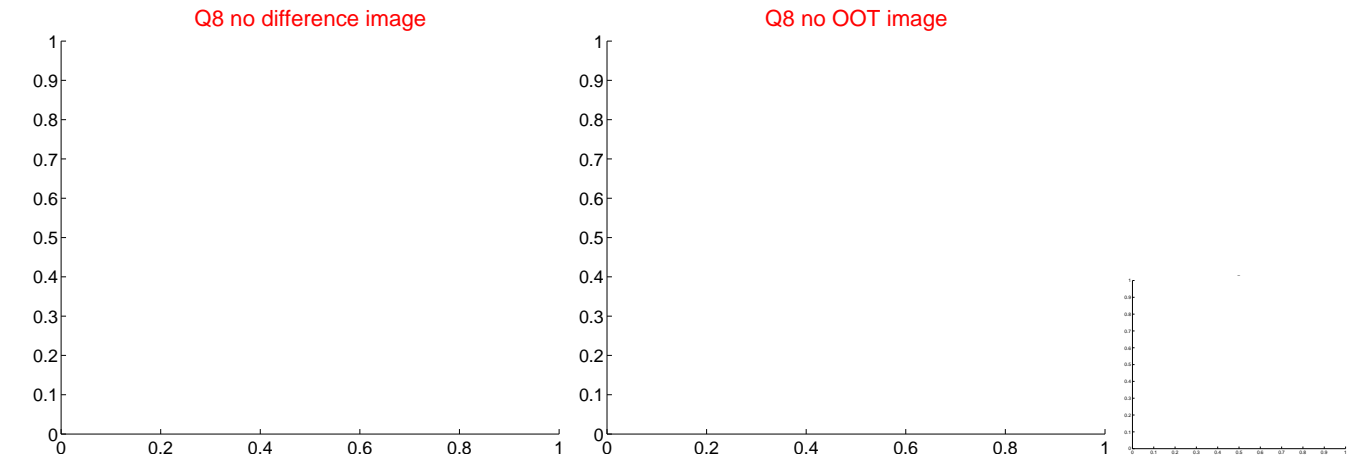
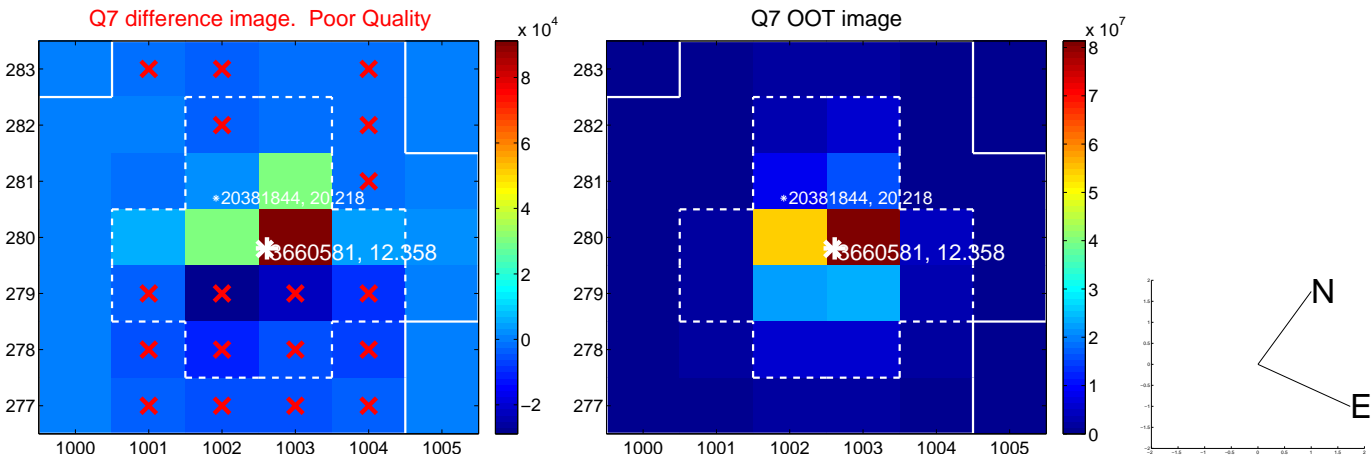
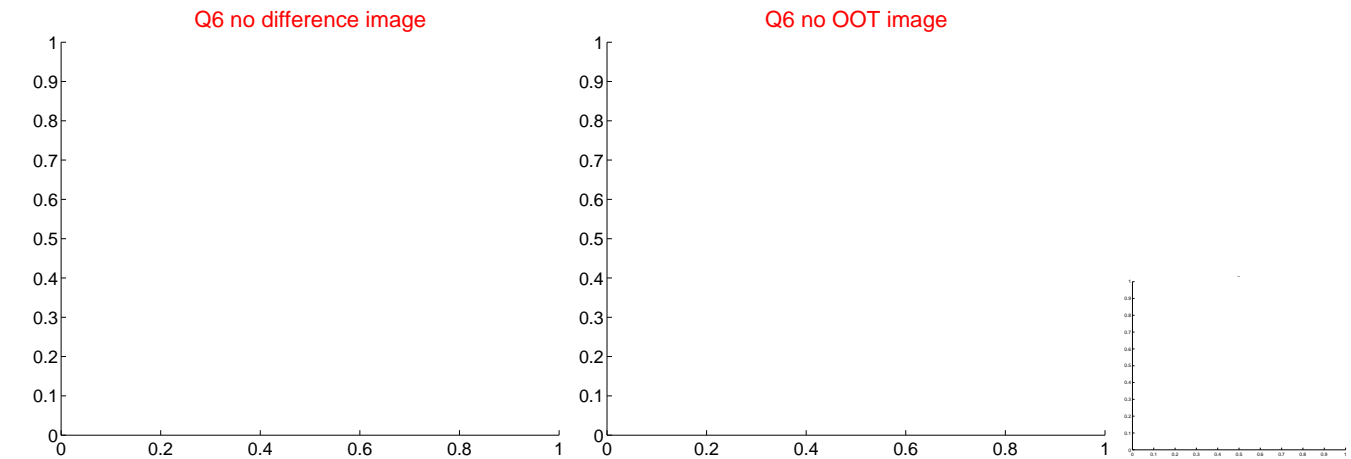
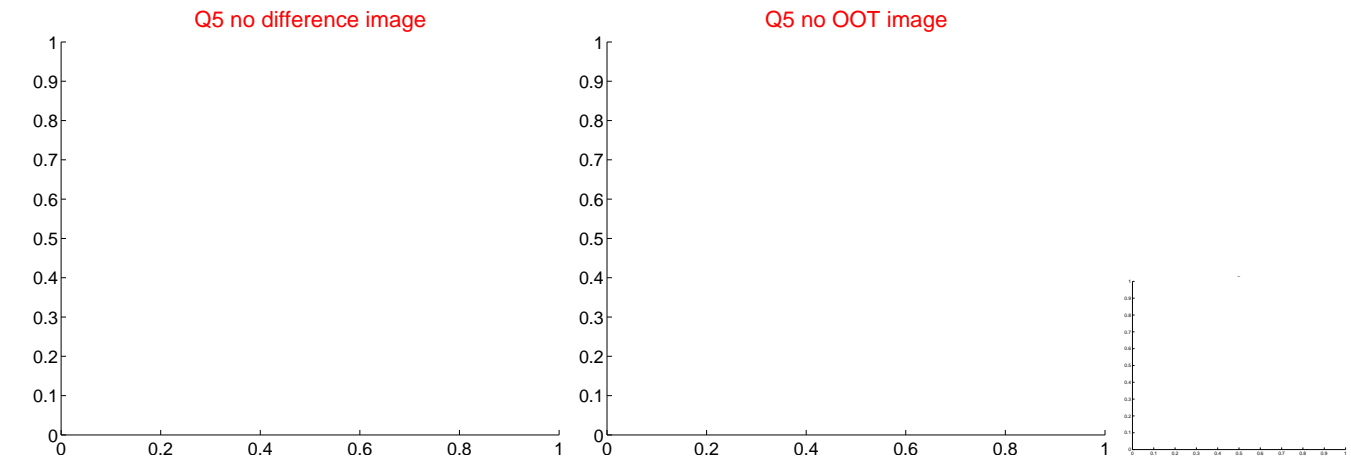
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

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





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



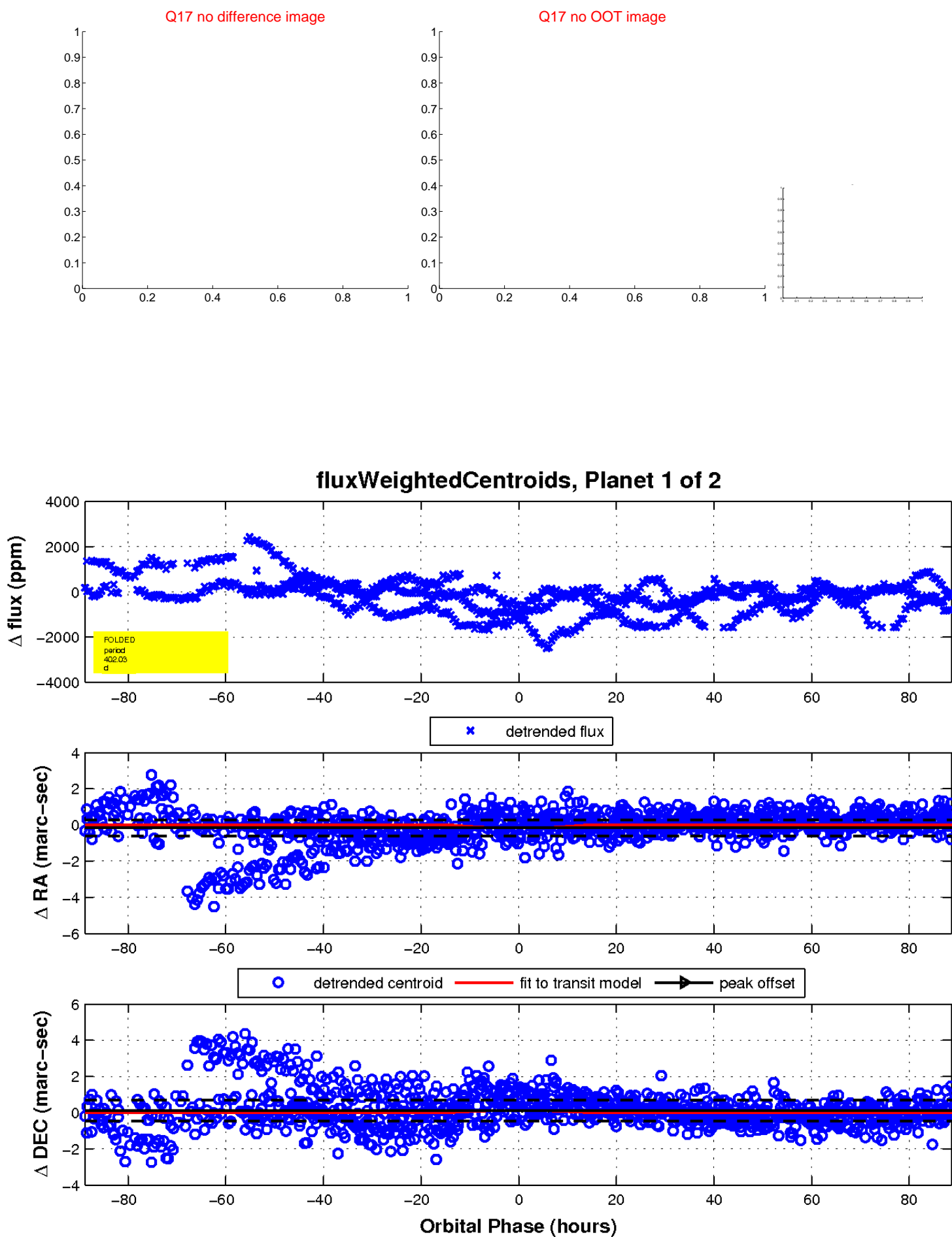
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

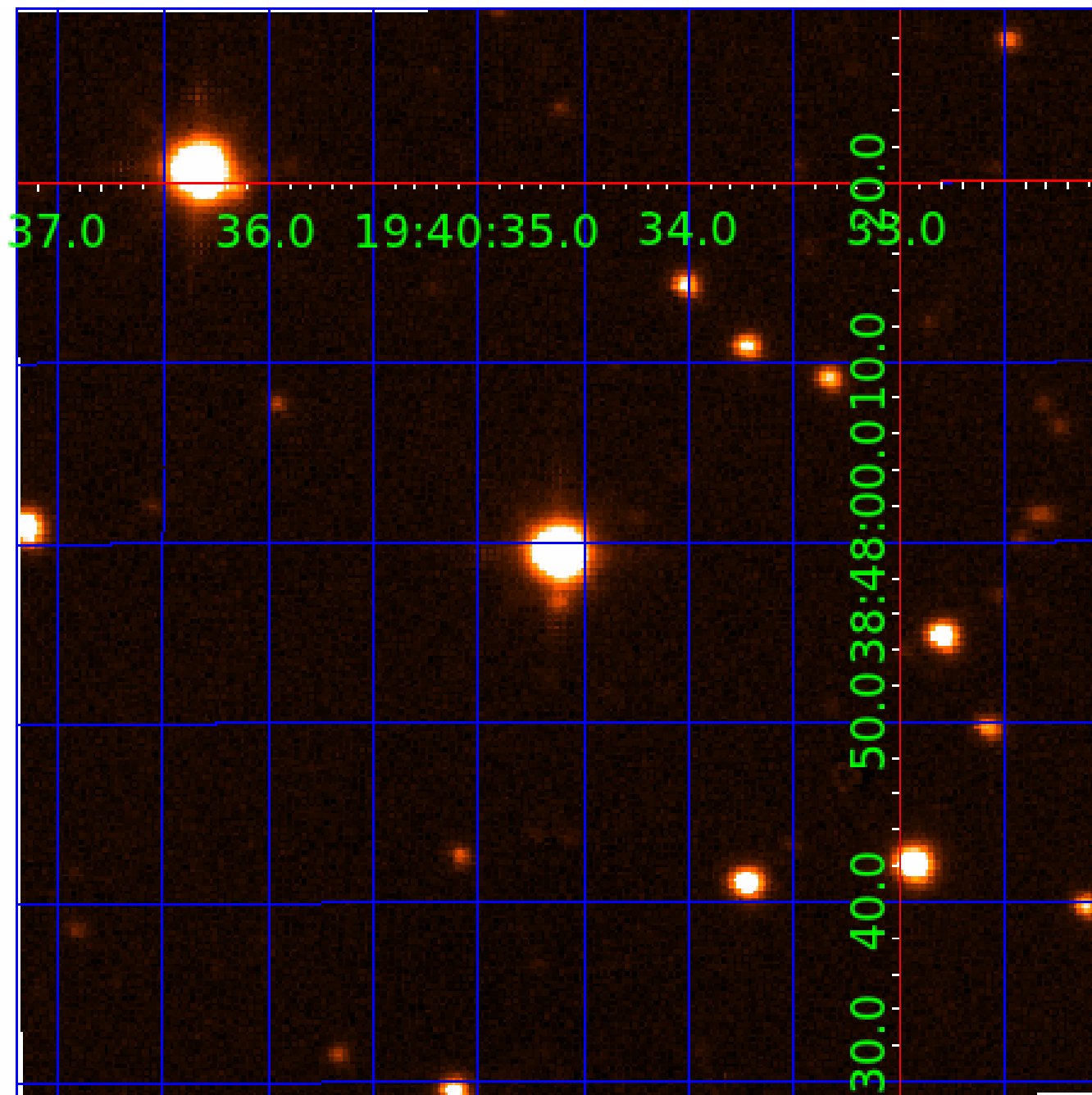


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 003660581

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
003660581-01	OBS	No	402.032229	270.814503	884.8	29.631	9.2	8.2	3.83	6655	14.32	16.22
003660581-02	OBS	7662.01	4.725176	131.999871	79.2	3.874	8.5	9.6	3.83	6655	4.00	6069.28

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
003660581-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL—LPP_DV—ALL_TRANS_CHASES—CENT_FEW_DIFFS
003660581-02	OBS	PC	0.98	0	0	0	0	NO_COMMENT

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

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

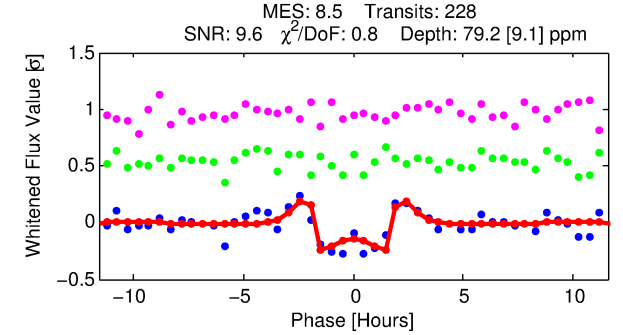
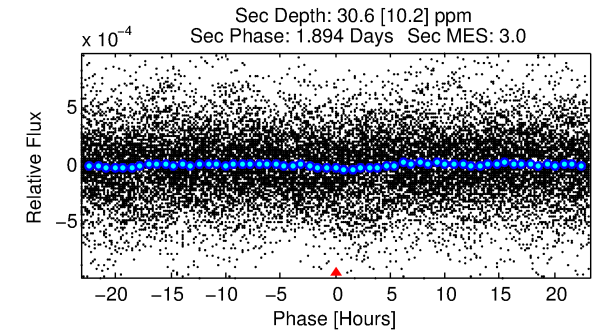
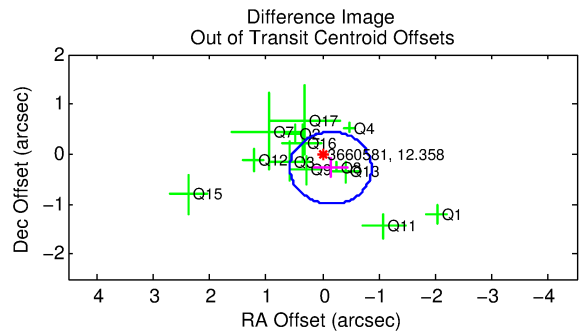
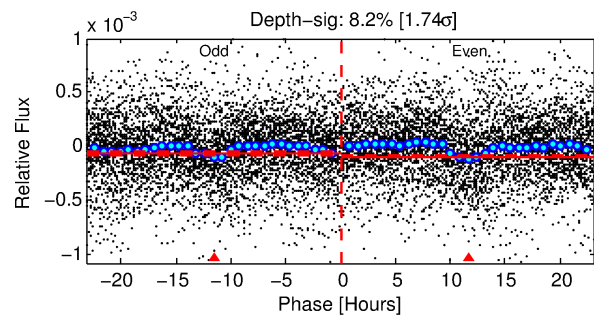
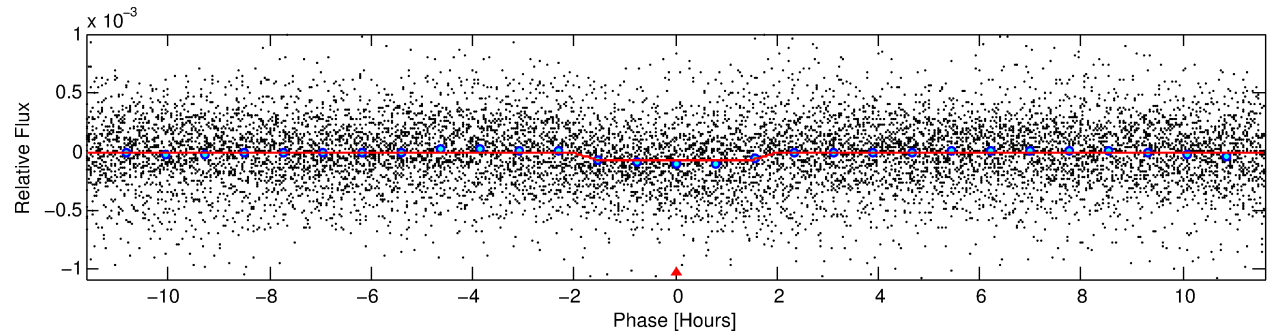
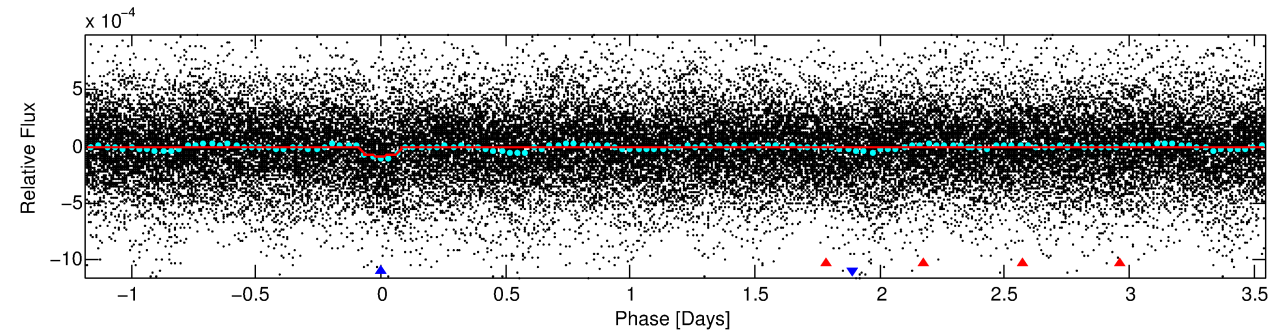
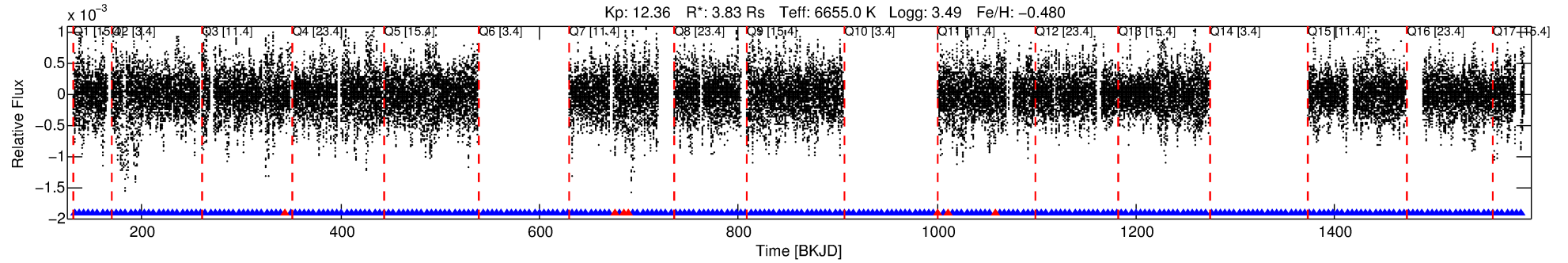
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 003660581-02

No Significant Match Found

# DV One-Page Summary

KIC: 3660581 Candidate: 2 of 2 Period: 4.725 d



## DV Fit Results:

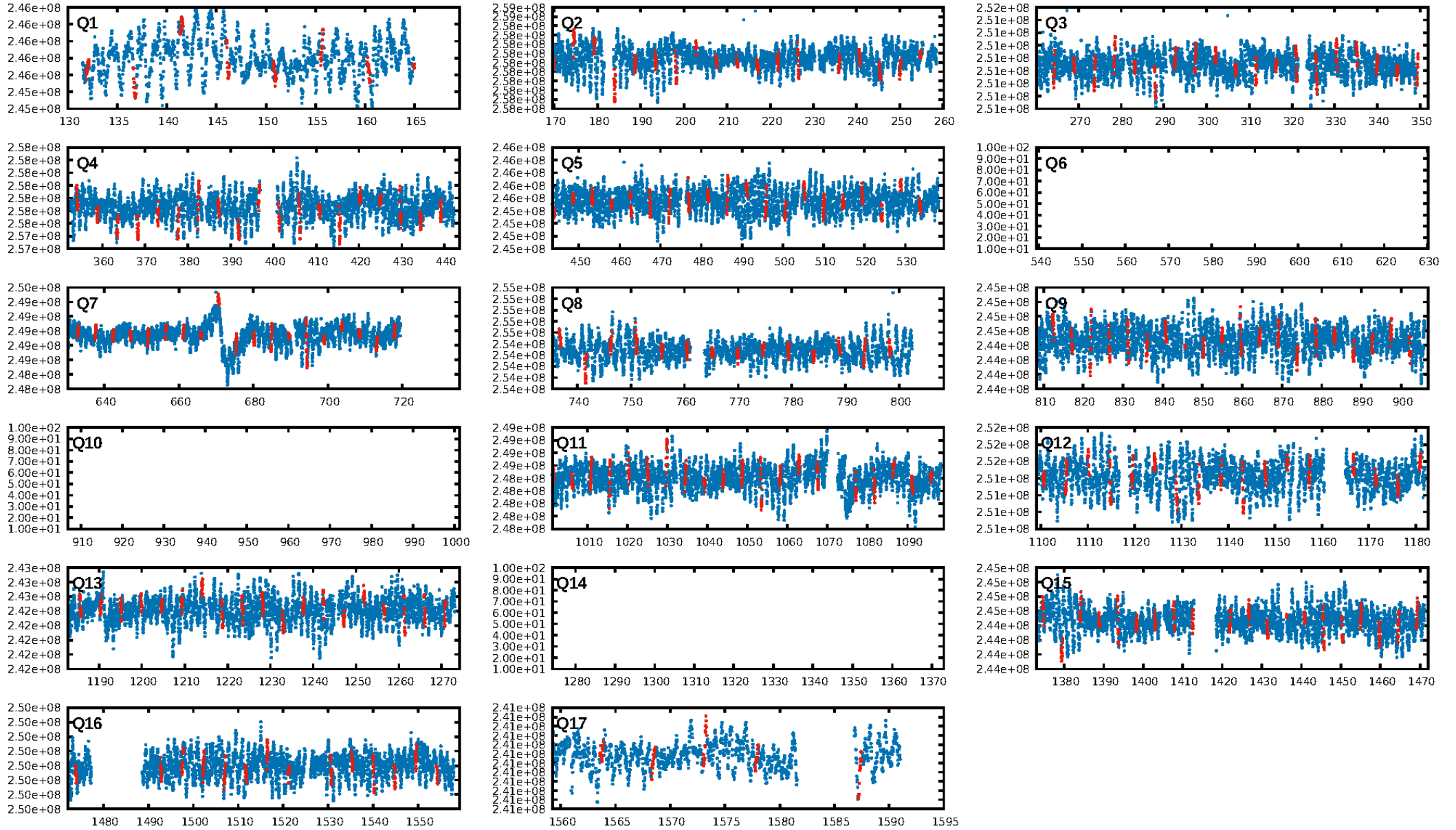
Period = 4.72518 [0.00002] d  
Epoch = 131.9999 [0.0022] BKJD  
Rp/R\* = 0.0096 [0.0016]  
a/R\* = 4.22 [3.55]  
b = 0.91 [0.17]  
Seff = 6069.28 [3969.47]  
Teq = 2251 [368] K  
Rp = 4.00 [1.82] Re  
a = 0.0652 [0.0264] AU  
Ag = 4.47 [3.57] [0.97 $\sigma$ ]  
Teffp = 5060 [618] K [3.91 $\sigma$ ]

## DV Diagnostic Results:

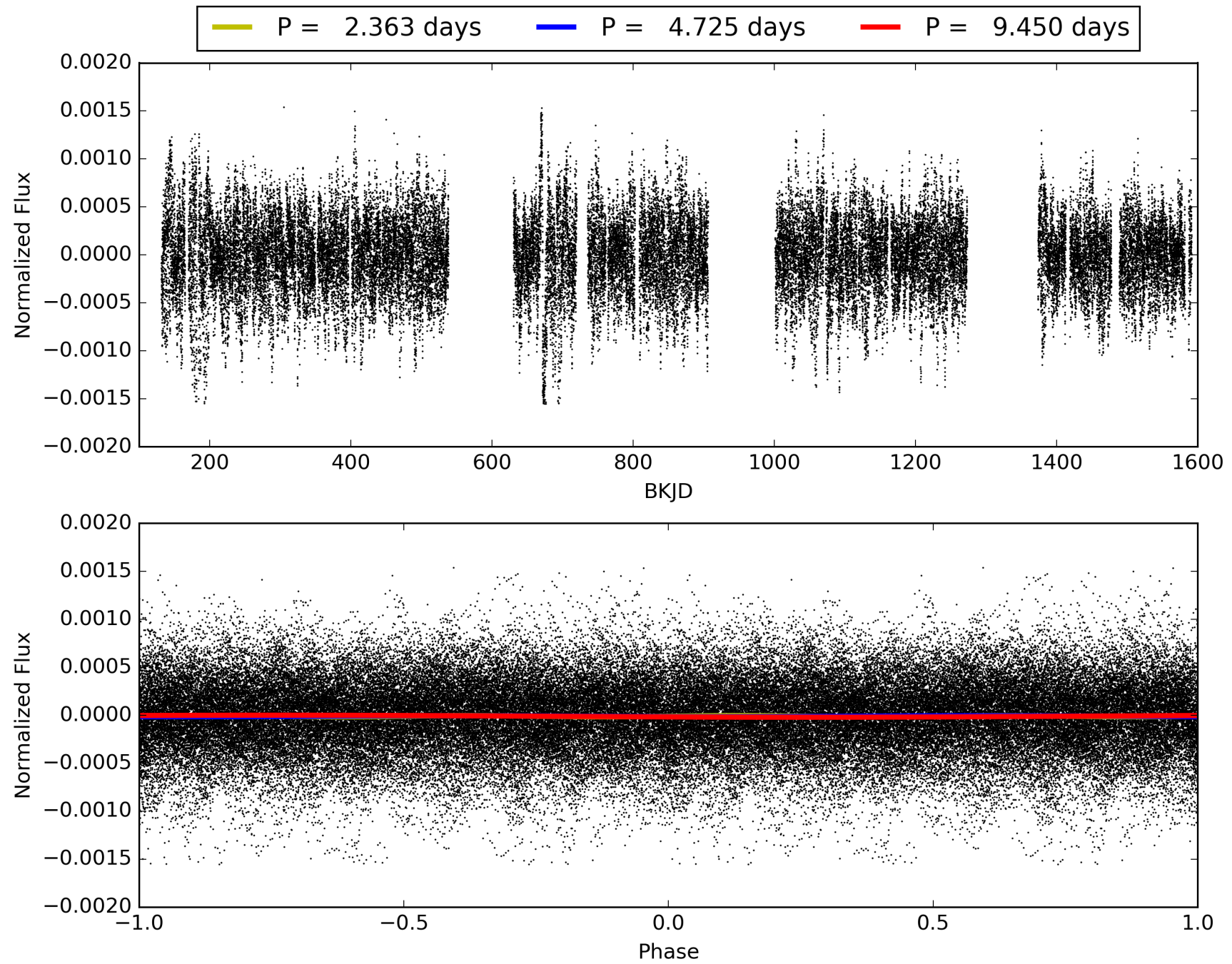
ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [319.08 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 3.72e-17  
RollingBand-fgt: 0.97 [209/216]  
GhostDiagnostic-chr: 2.139  
Centroid-sig: 10.2%  
Centroid-so: 0.696 arcsec [1.33 $\sigma$ ]  
OotOffset-rm: 0.314 arcsec [1.30 $\sigma$ ]  
KicOffset-rm: 0.147 arcsec [0.65 $\sigma$ ]  
OotOffset-st: 1/4/4/4 [13]  
KicOffset-st: 1/4/4/4 [13]  
DiffImageQuality-fgm: 0.77 [10/13]  
DiffImageOverlap-fno: 1.00 [14/14]



# TCE 003660581-02, PDC Light Curves

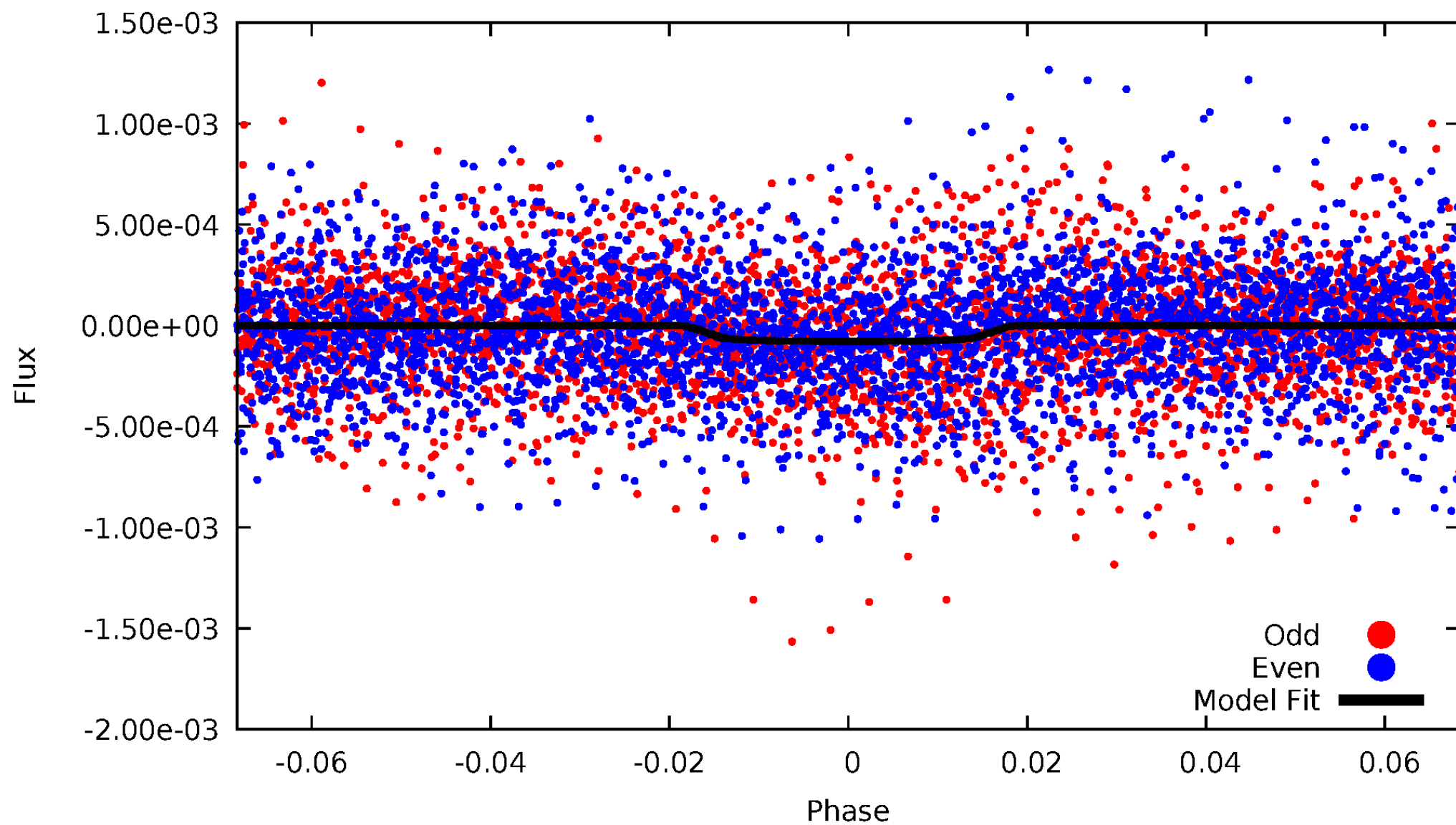


TCE 003660581-02



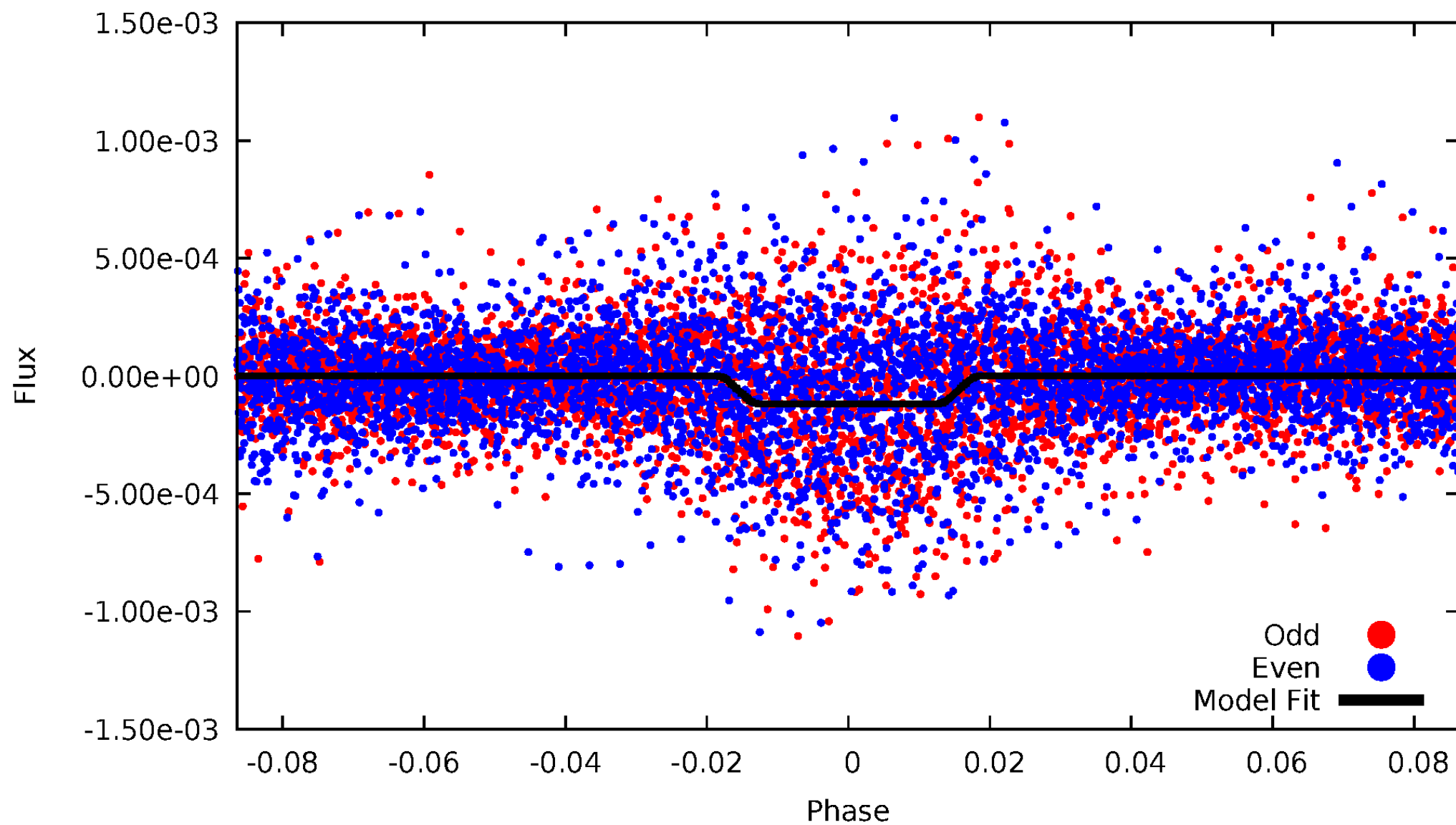
DV Odd/Even

TCE 003660581-02



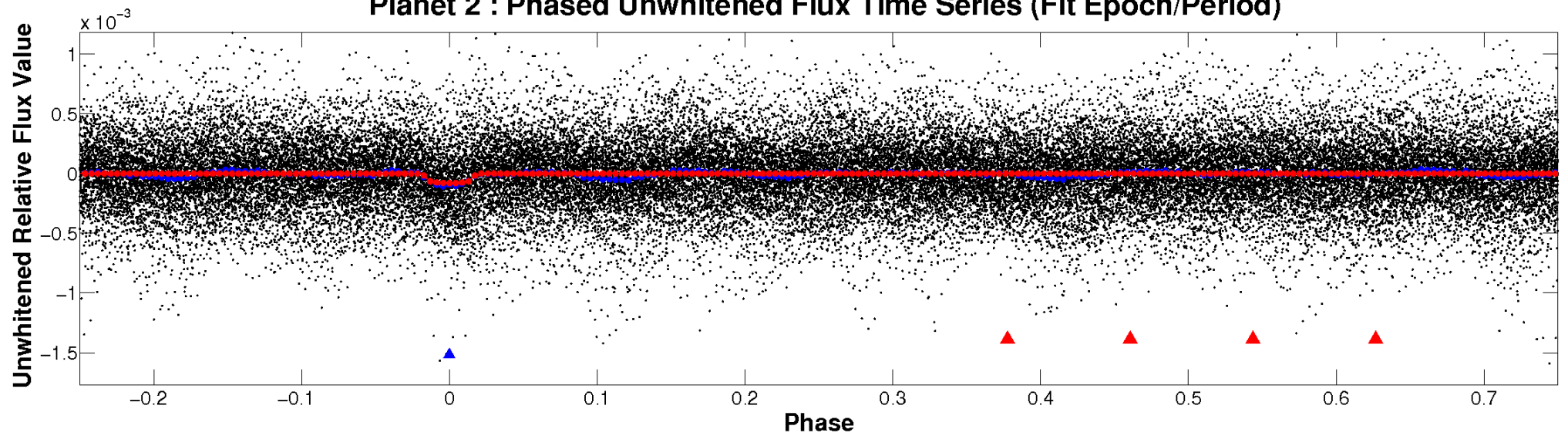
# ALT Odd/Even

TCE 003660581-02

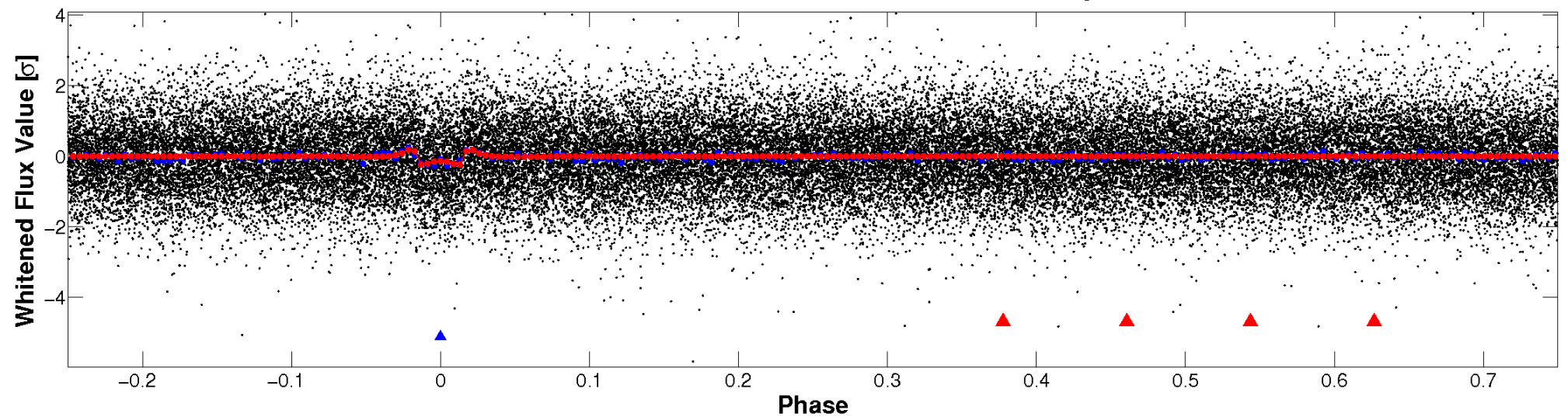


# Non-Whitened Vs. Whitened Light Curve

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



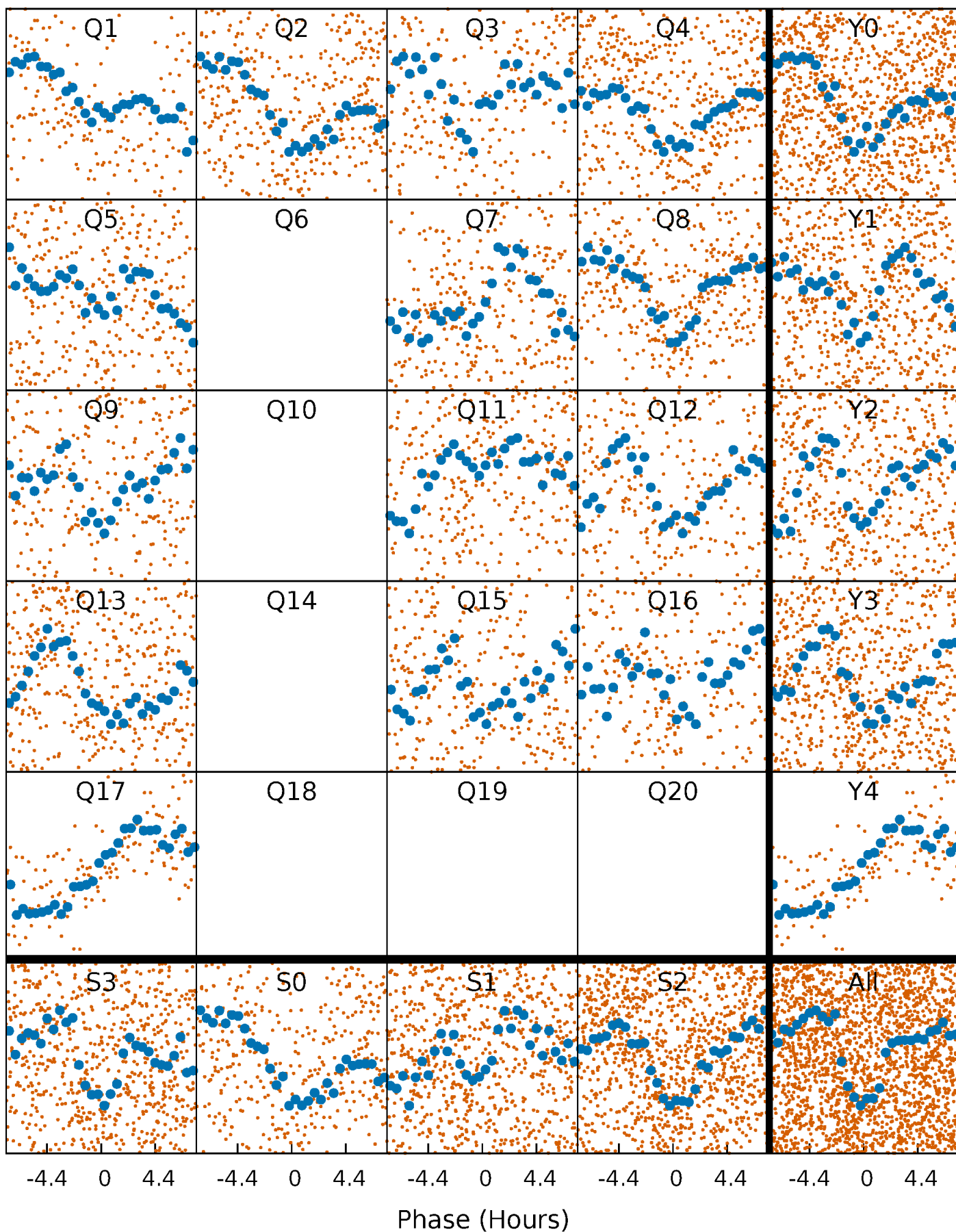
## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)





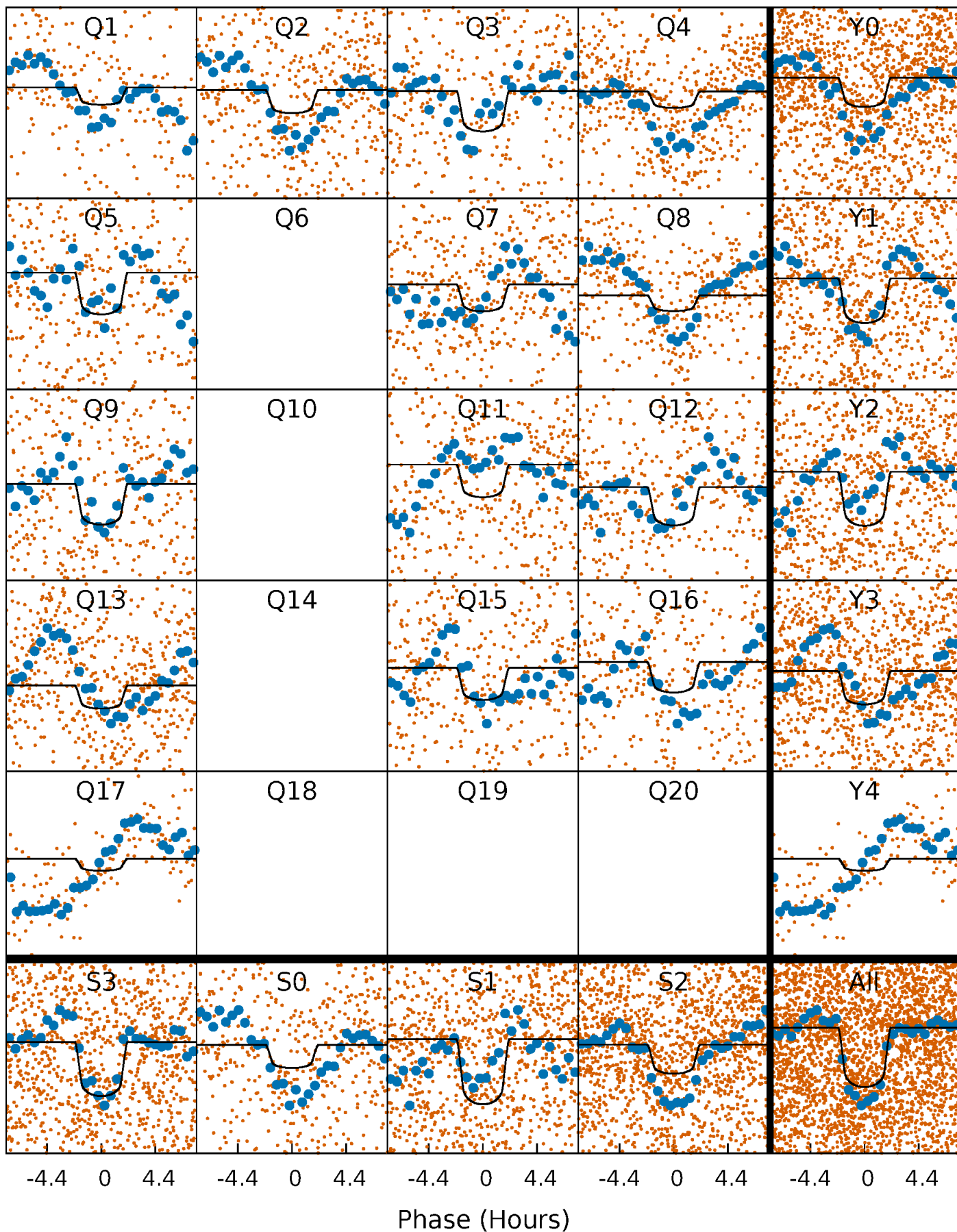
# PDC Quarter-Phased Transit Curves

TCE 003660581-02   P= 4.725176 Days    $T_0=131.999871$  (BKJD)



# DV Quarter-Phased Transit Curves

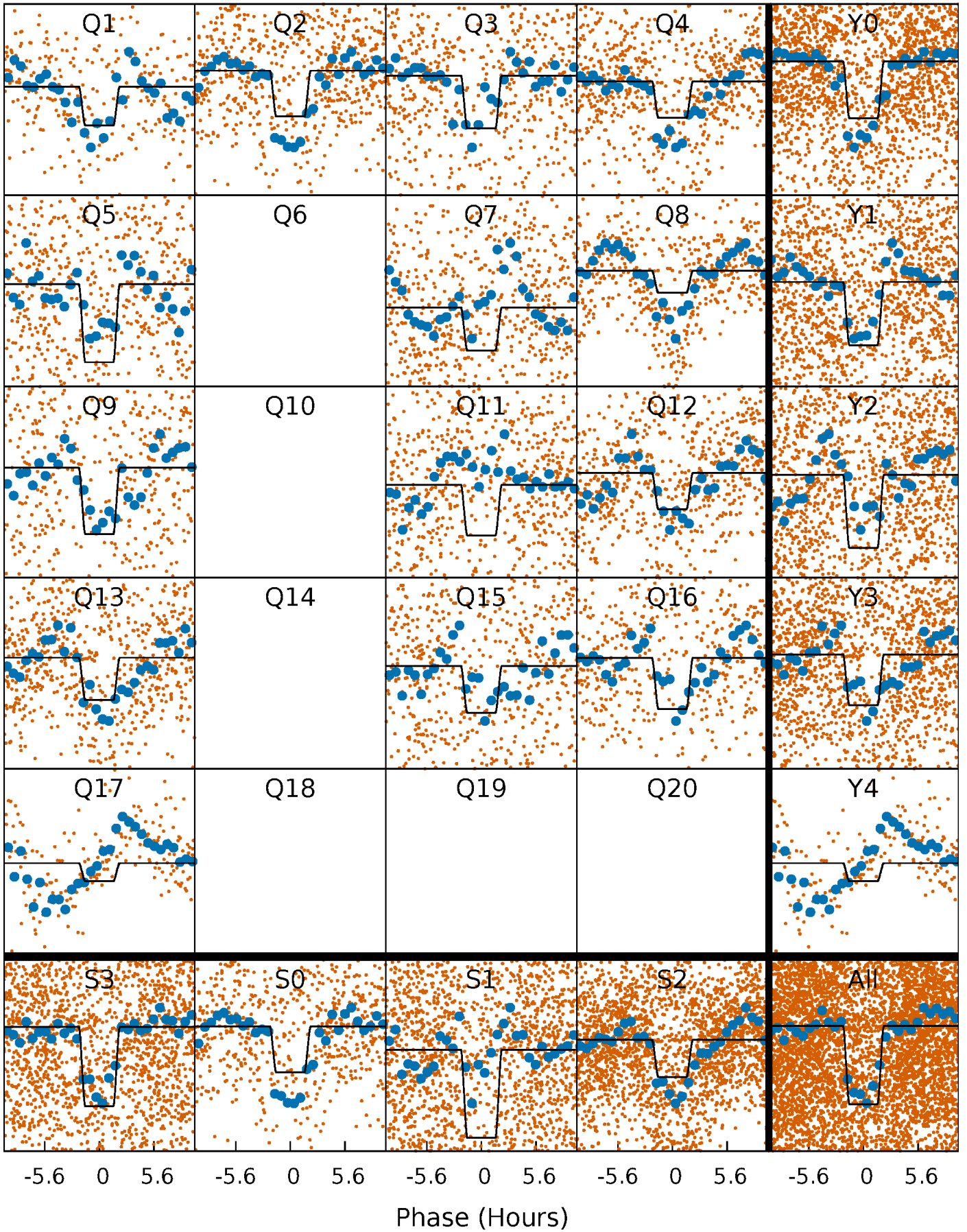
TCE 003660581-02   P= 4.725176 Days    $T_0=131.999871$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

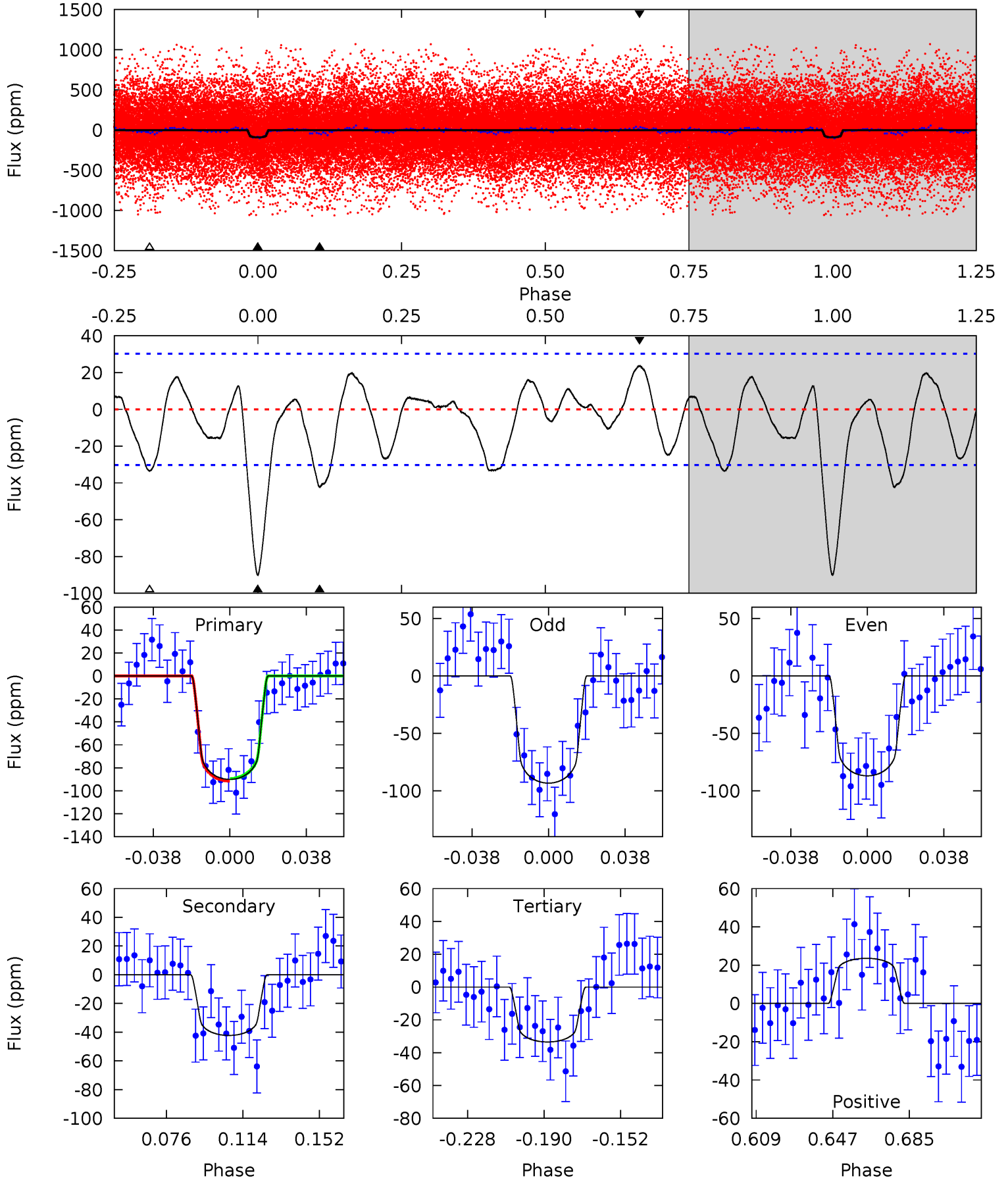
TCE 003660581-02 P= 4.725160 Days  $T_0=132.003799$  (BKJD)



# DV Model-Shift Uniqueness Test

003660581-02, P = 4.725176 Days, E = 127.274695 Days

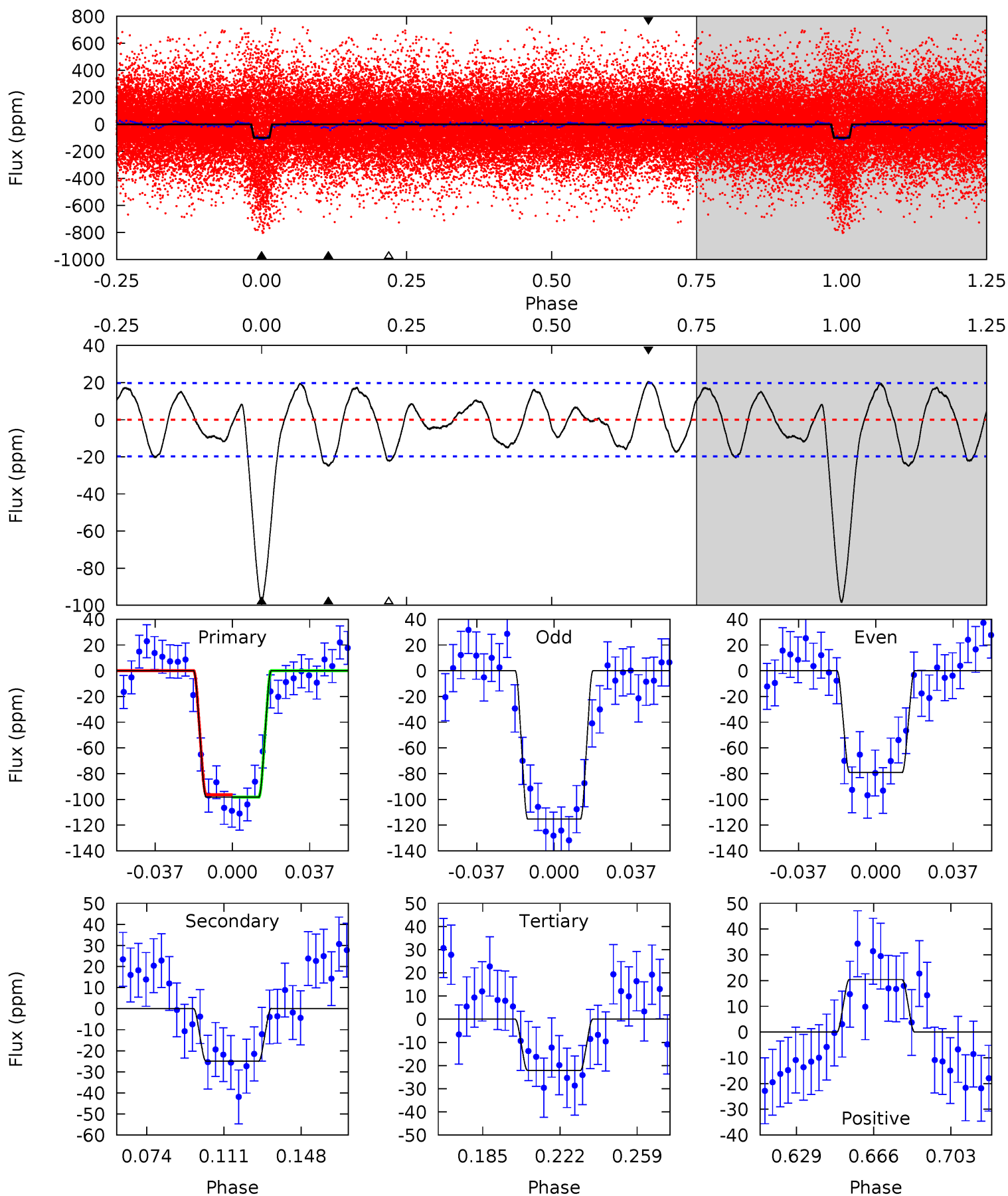
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
14.2	6.66	5.27	3.71	4.76	2.07	2.15	8.91	10.5	1.39	2.94	0.50	0.98	0.21	0.16



# Alt Model-Shift Uniqueness Test

003660581-02, P = 4.725160 Days, E = 127.278639 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
23.7	6.02	5.35	4.93	4.77	2.09	2.54	18.4	18.8	0.67	1.09	4.39	0.97	0.17	0.23



### Stellar Parameters For KIC 003660581

	$T_{\text{eff}} (K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6655^{+160}_{-200}$	$3.490^{+0.376}_{-0.094}$	$-0.480^{+0.400}_{-0.300}$	$3.831^{+0.542}_{-1.627}$	$1.653^{+0.219}_{-0.438}$	$0.041^{+0.135}_{-0.013}$
	+2%/-3%	+11%/-3%	+83%/-62%	+14%/-42%	+13%/-26%	+326%/-31%
Source	PHO1	FLK73	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 003660581-02 / KOI 7662.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-42 \pm 6$	$3.72^{+0.94}_{-1.02}$	$3067^{+192}_{-304}$	$5426^{+579}_{-429}$	$7.183^{+5.523}_{-2.716}$
Alt.	$-25 \pm 4$	$4.19^{+1.02}_{-0.98}$	$3079^{+187}_{-332}$	$4555^{+387}_{-336}$	$3.250^{+2.031}_{-1.198}$

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

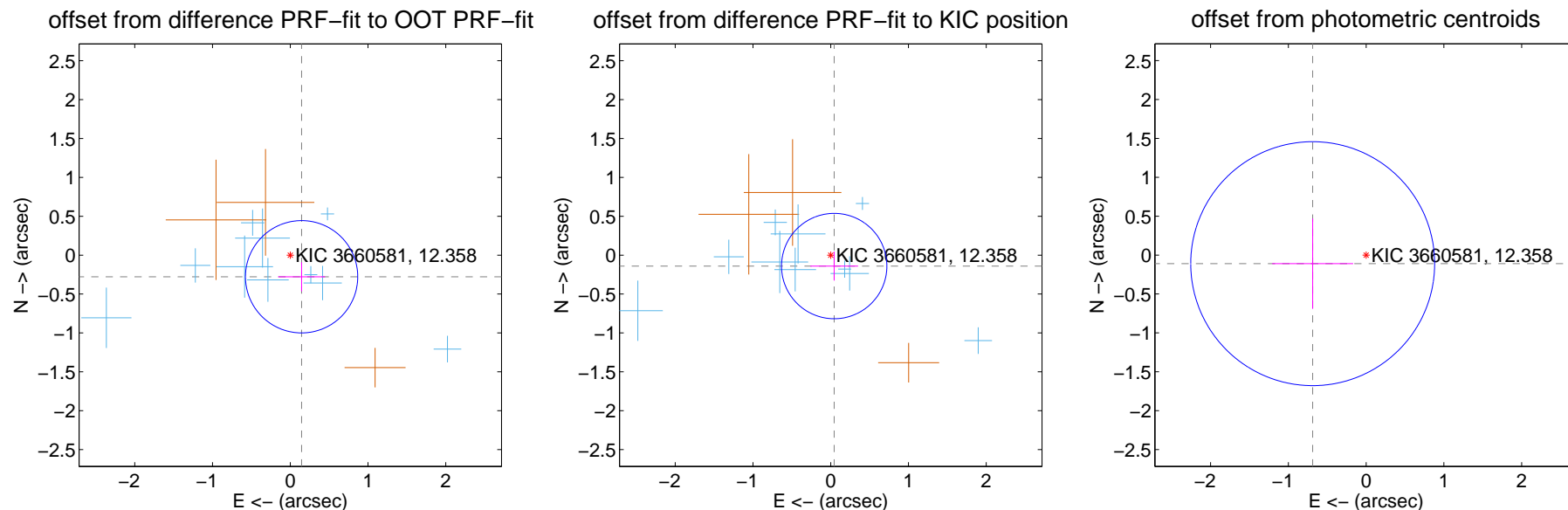
## DV Centroid Data

Supplemental centroid analysis for 003660581-02. Kepler magnitude: 12.36. Transit SNR 9.59

There are 10 quarters with good PRF difference image offsets

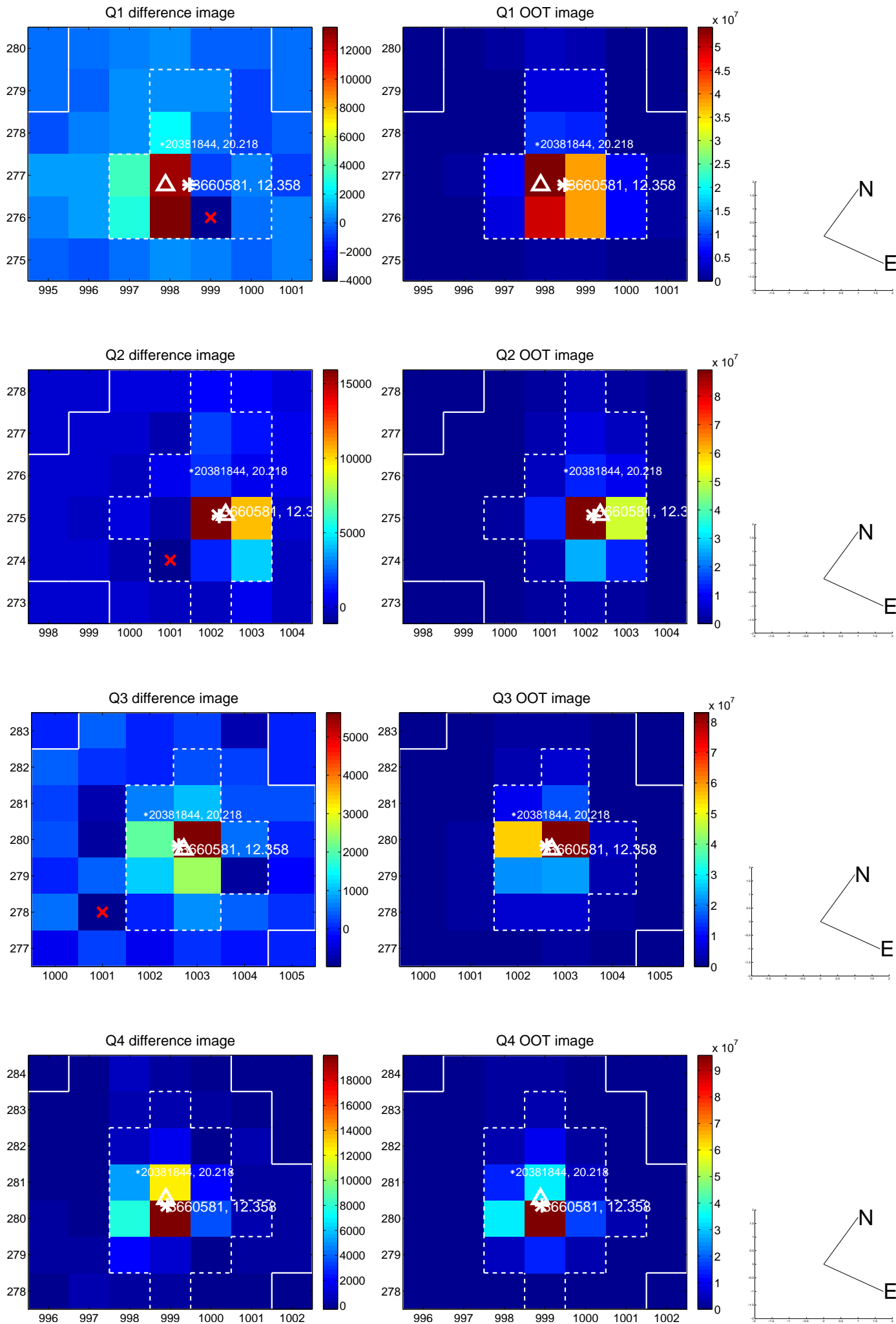
The direct PRF centroid is offset from the target star catalog position by about 0.21 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.314 \pm 0.241$	1.30	$-0.146 \pm 0.302$	$-0.278 \pm 0.186$
PRF-fit source offset from KIC position	$0.147 \pm 0.226$	0.65	$-0.045 \pm 0.307$	$-0.140 \pm 0.187$
photometric centroid source offset	$0.70 \pm 0.52$	1.33	$0.69 \pm 0.52$	$-0.11 \pm 0.58$

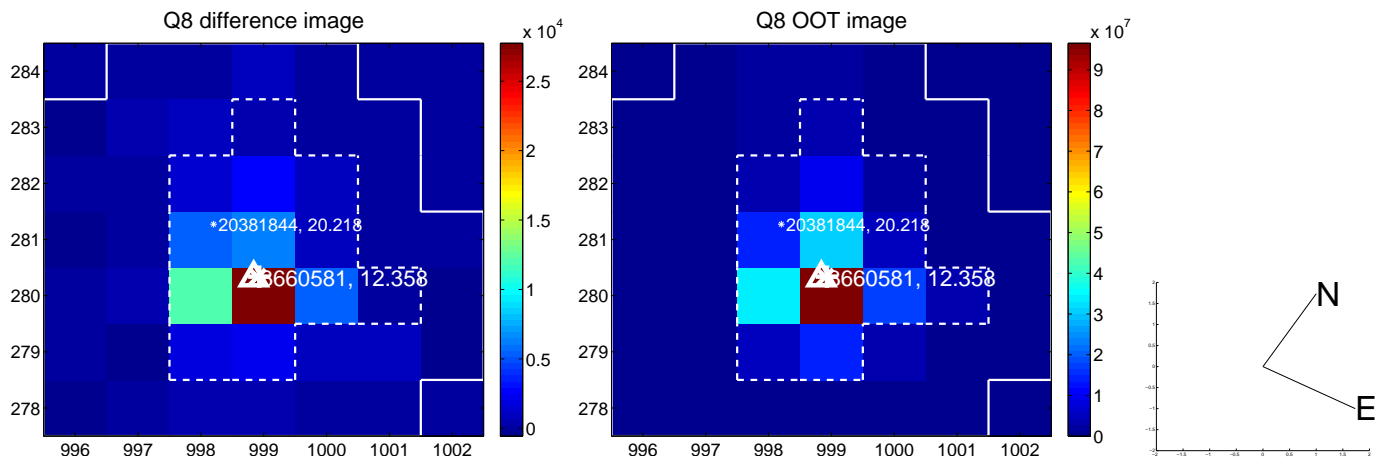
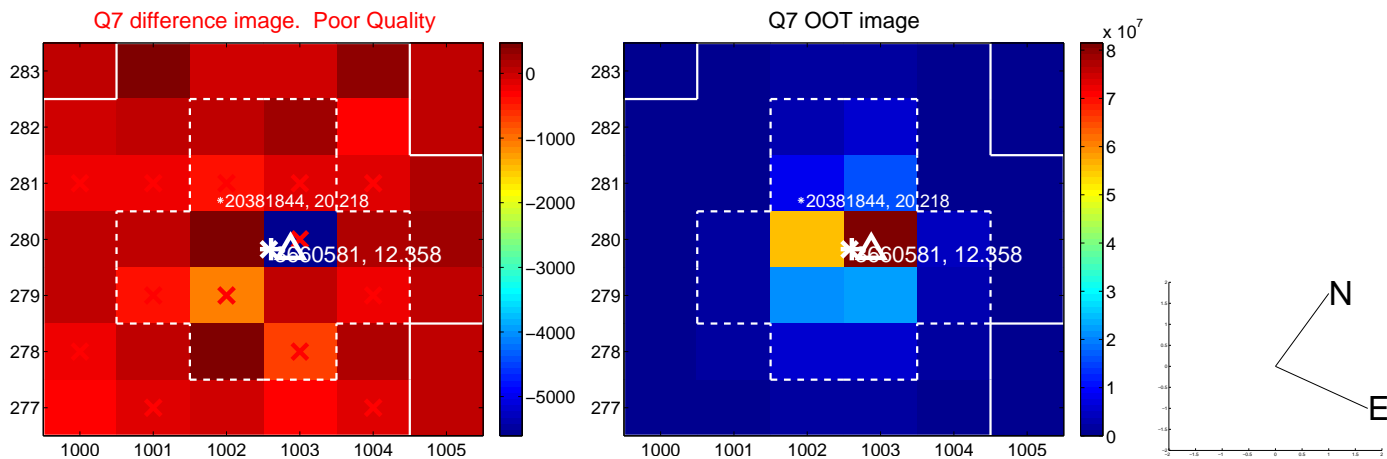
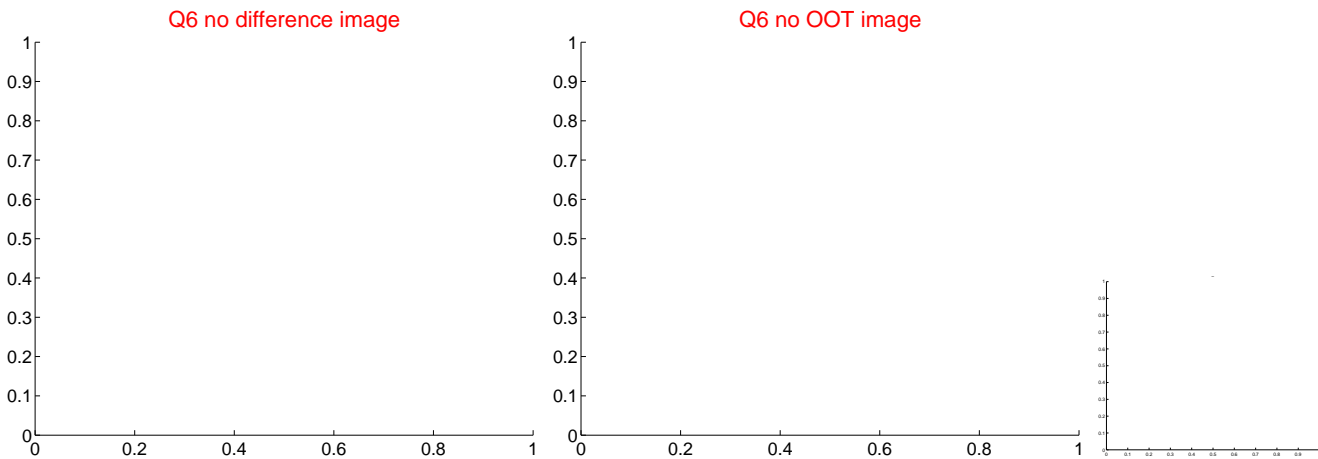
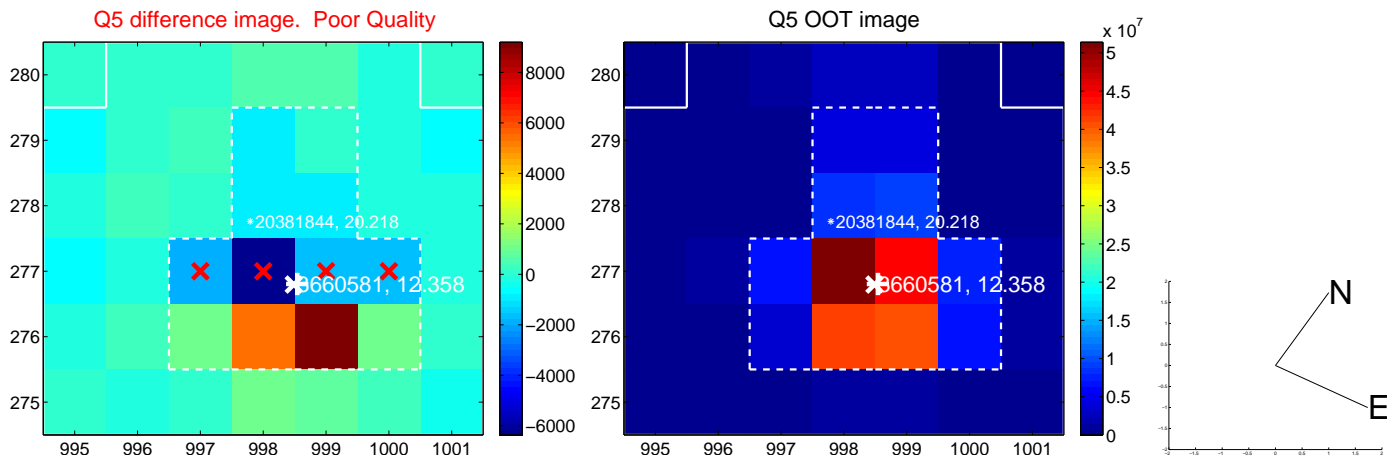


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

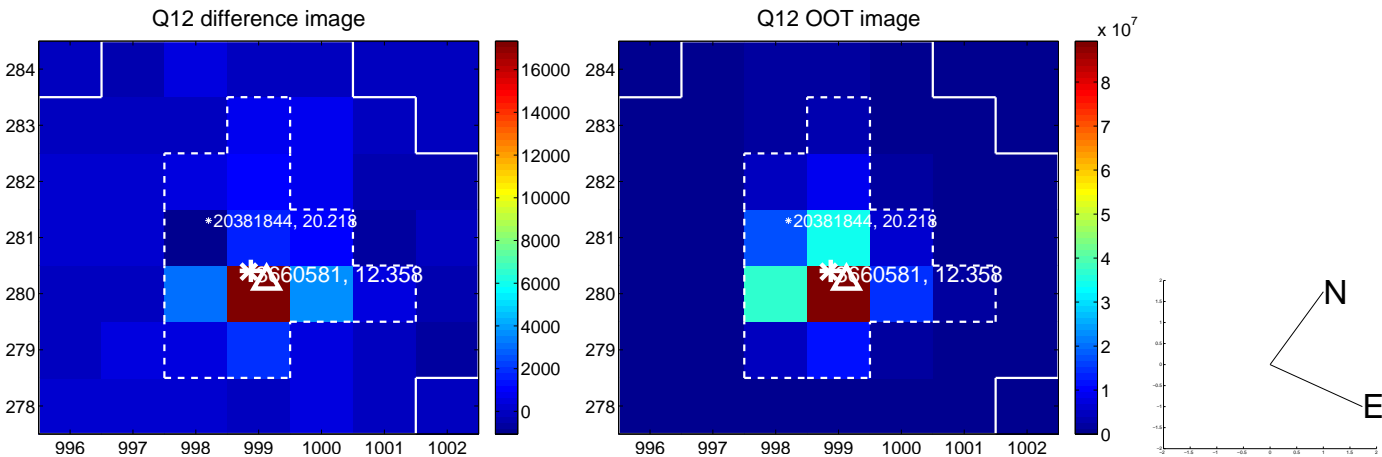
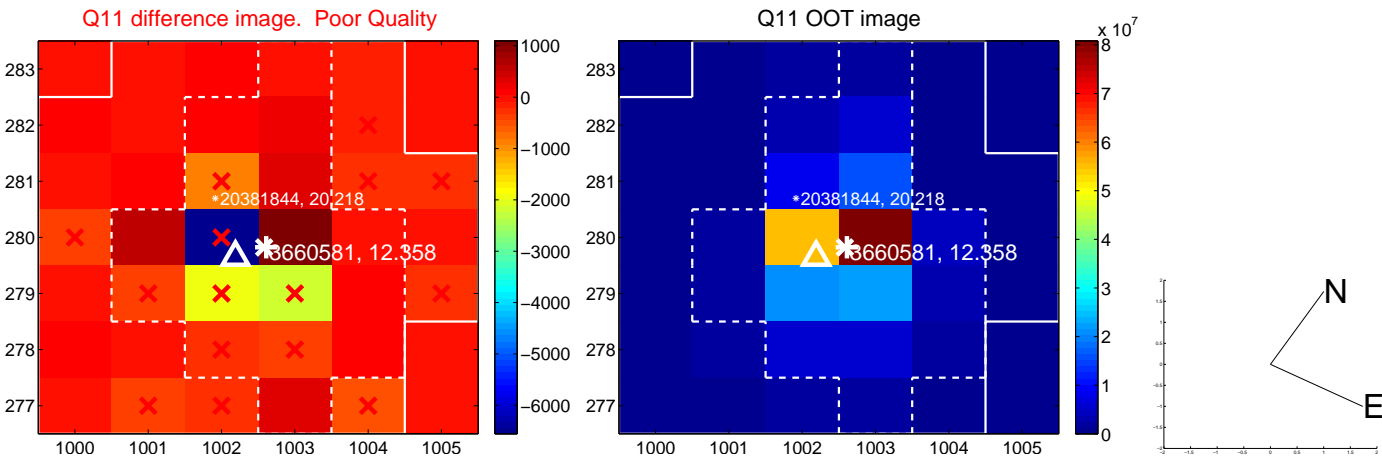
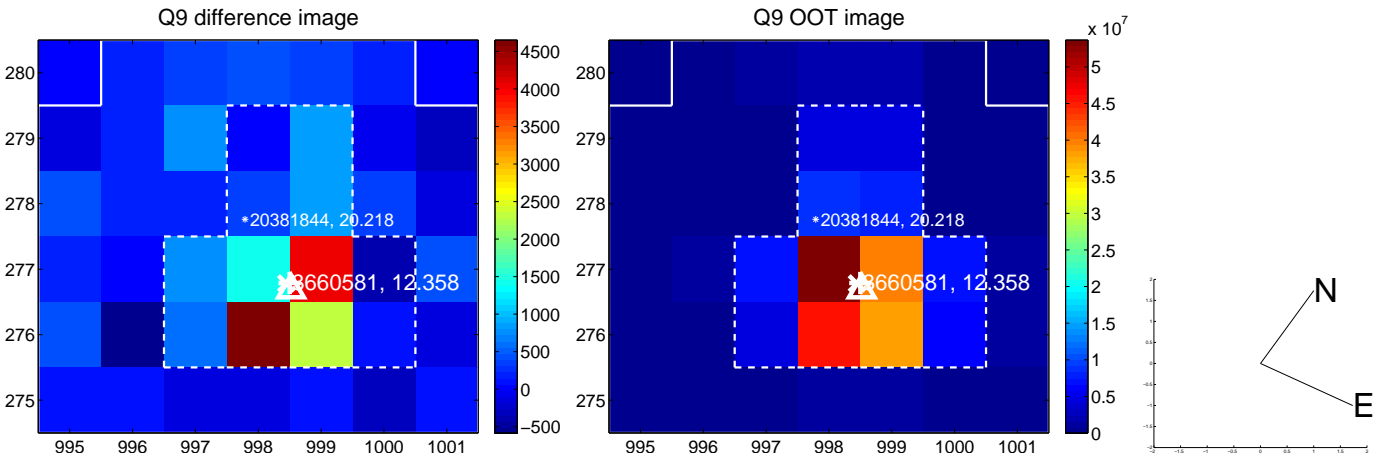


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

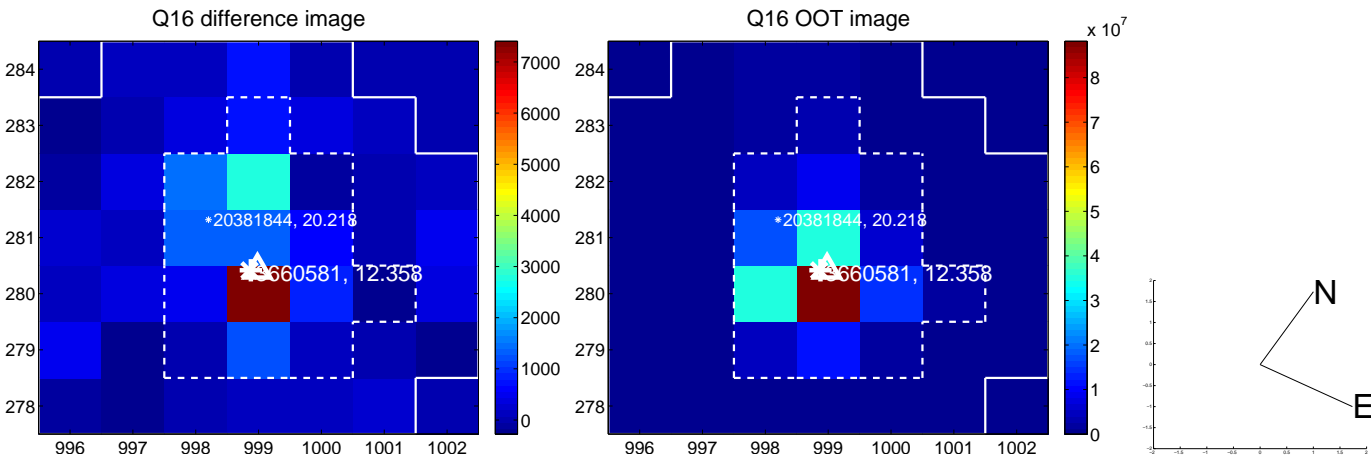
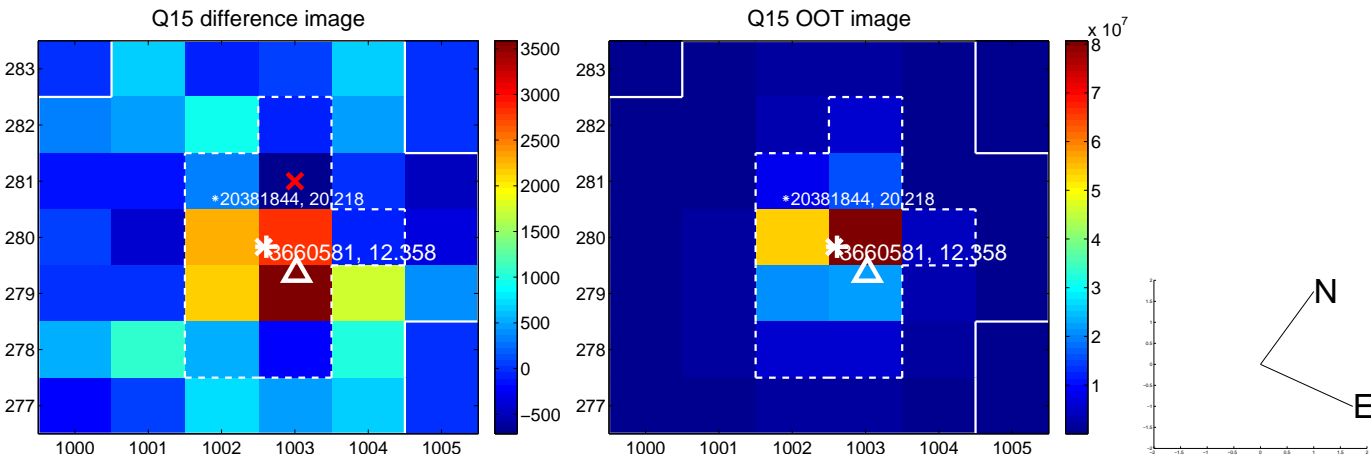
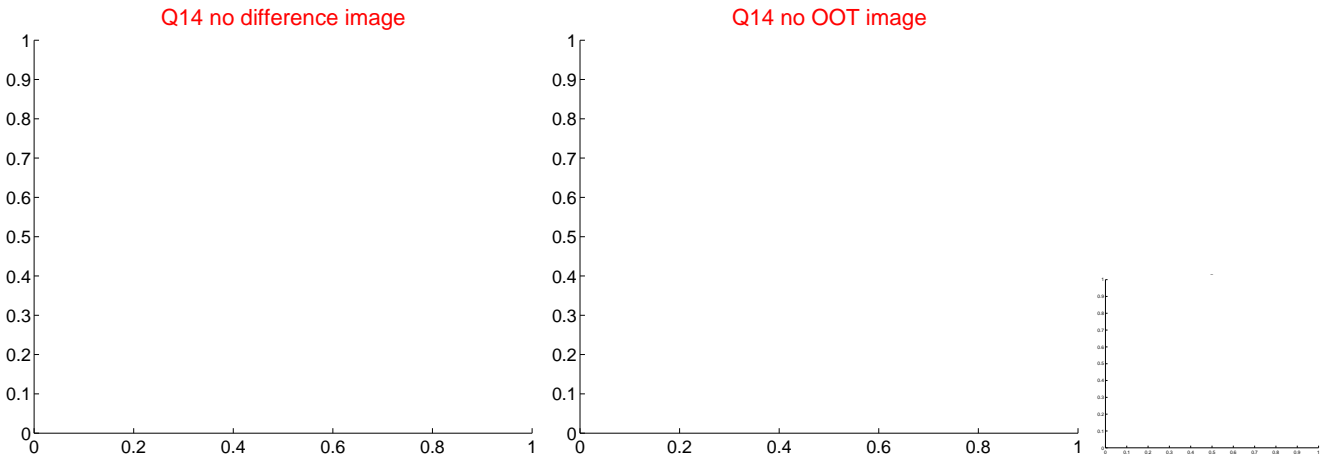
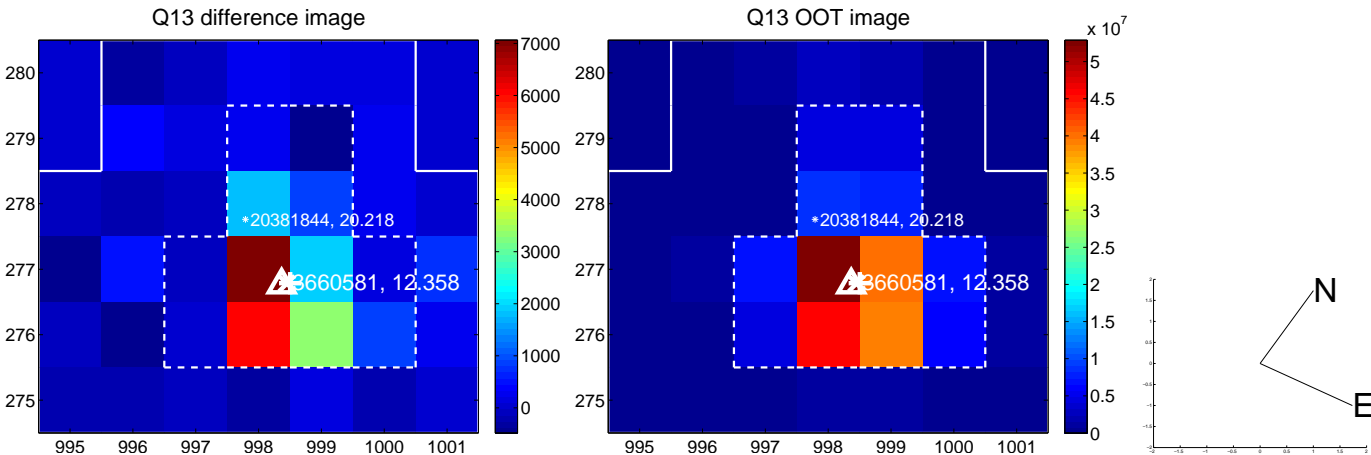




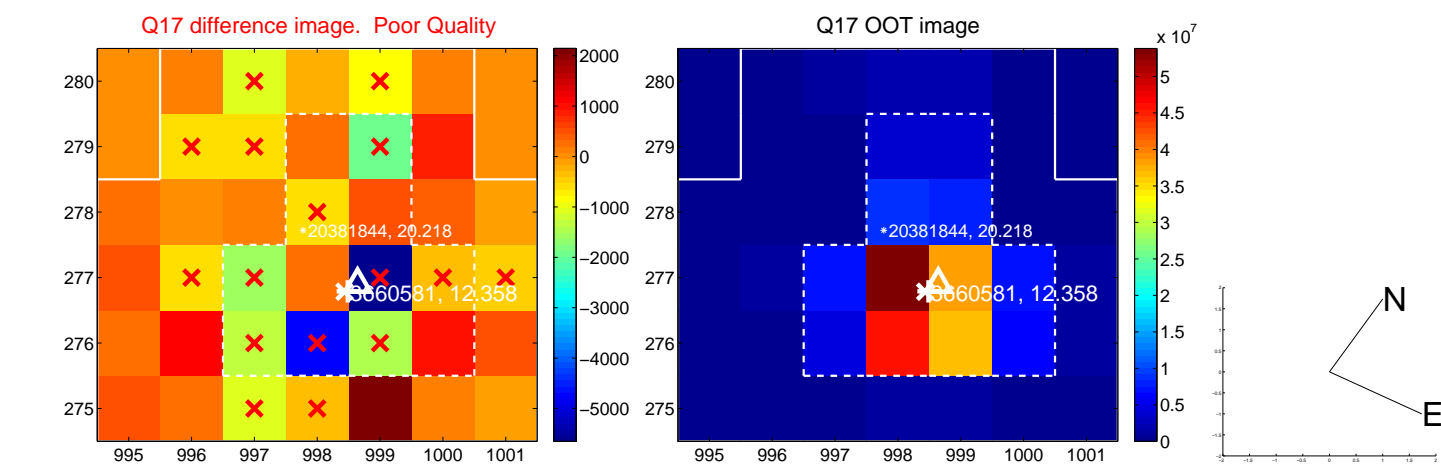
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ×: large negative pixel value.



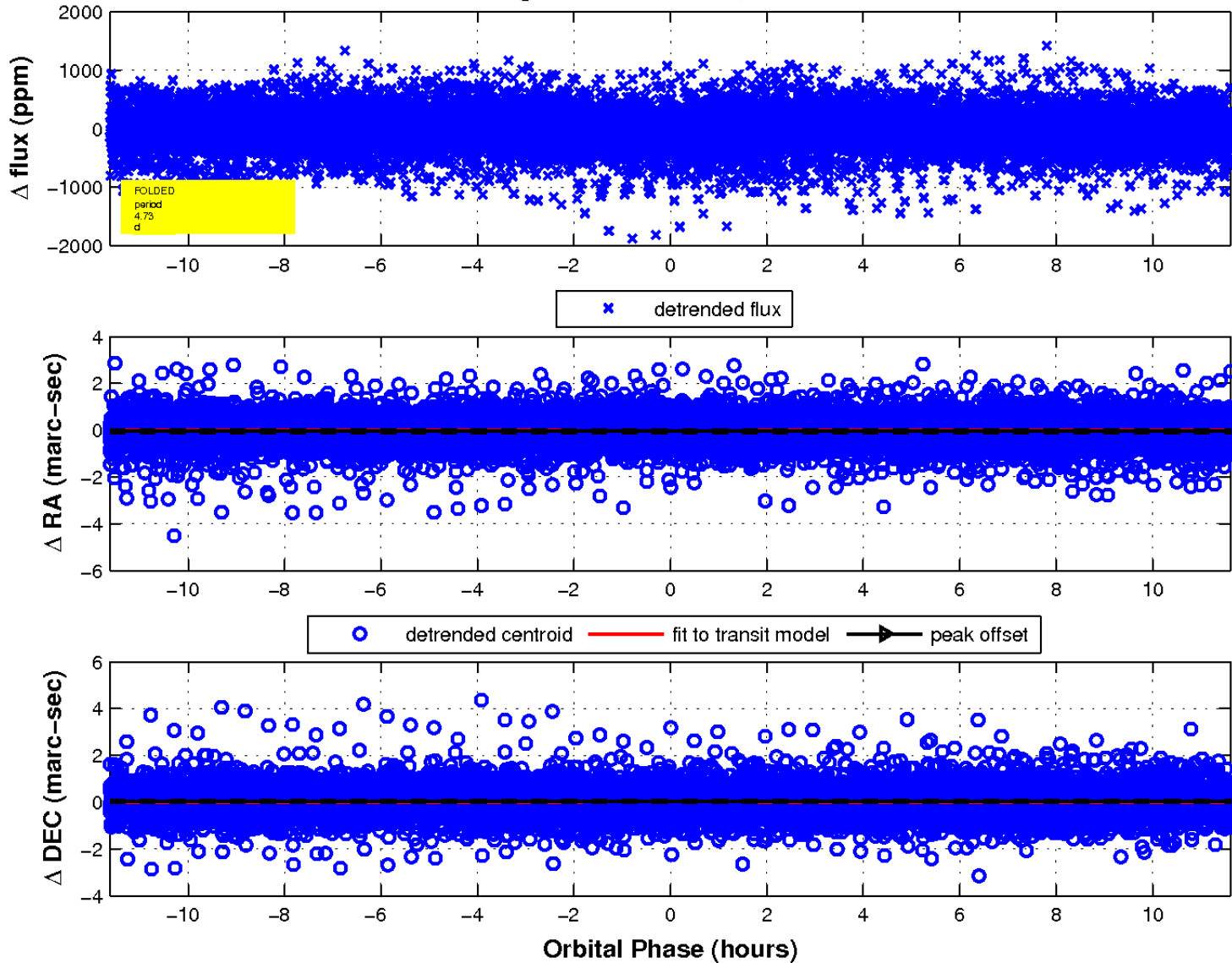
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value



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



fluxWeightedCentroids, Planet 2 of 2



UKIRT Image

Declination

