

# KIC 007970617

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
007970617-01	OBS	No	368.283236	234.725981	768.1	25.489	7.3	8.1	0.95	5695	3.48	0.96
007970617-02	OBS	No	479.547439	569.720720	949.7	27.006	11.6	11.6	0.95	5695	3.87	0.67

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
007970617-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—CENT_FEW_DIFFS
007970617-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_SKYE—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_FEW_DIFFS

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

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

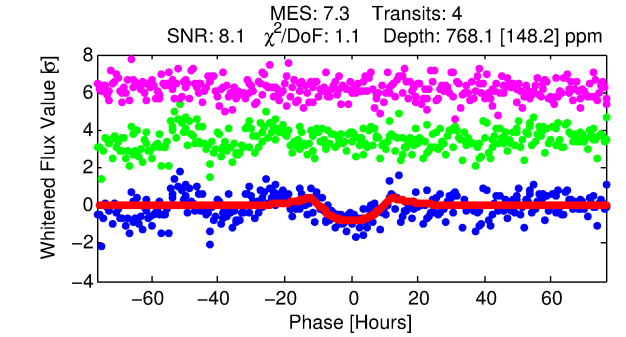
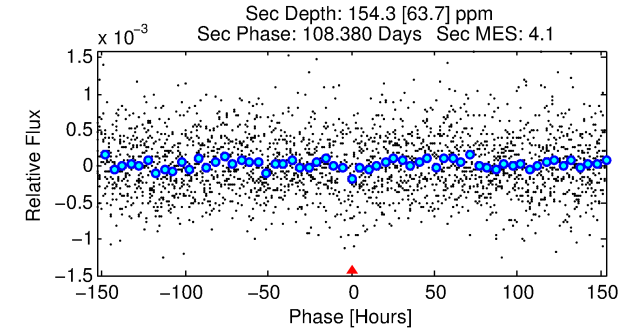
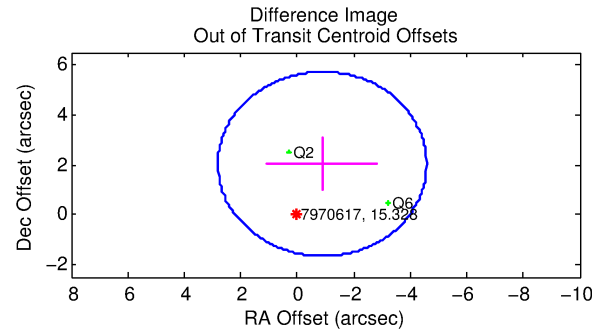
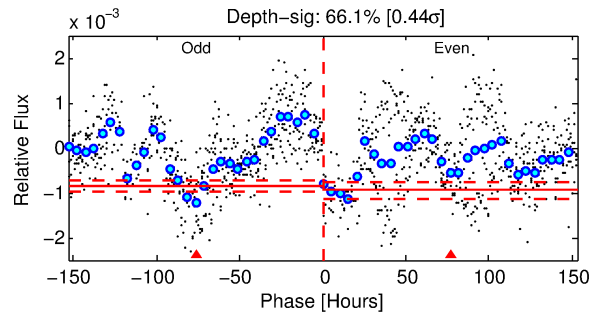
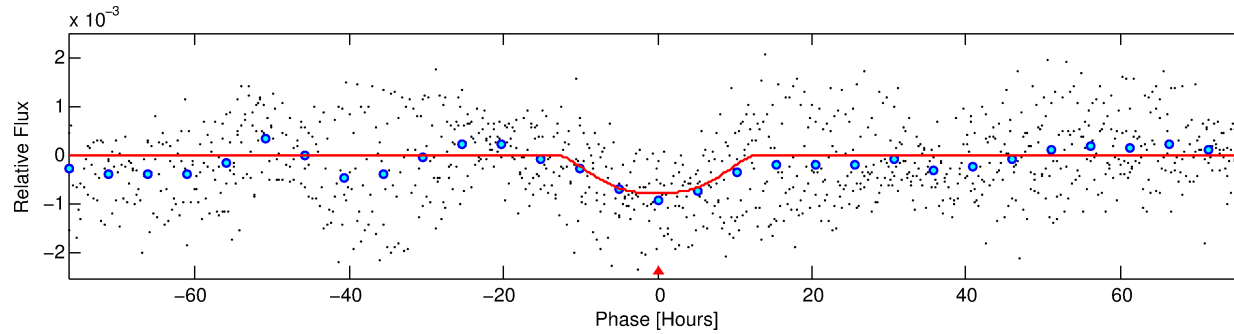
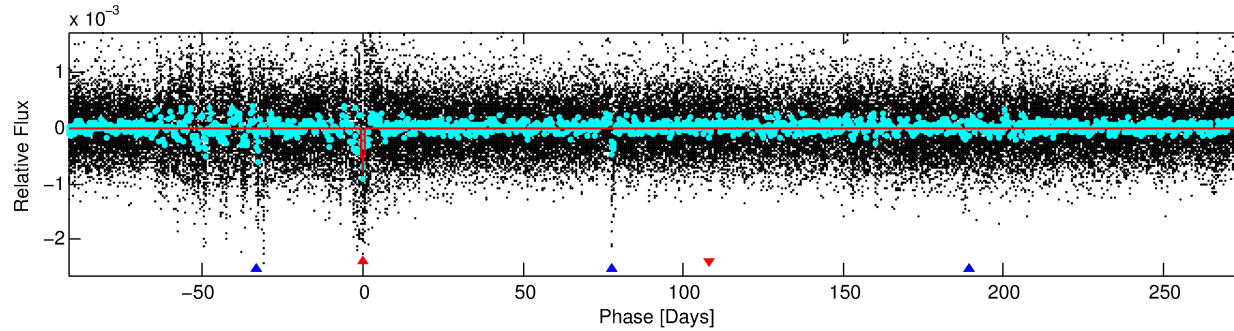
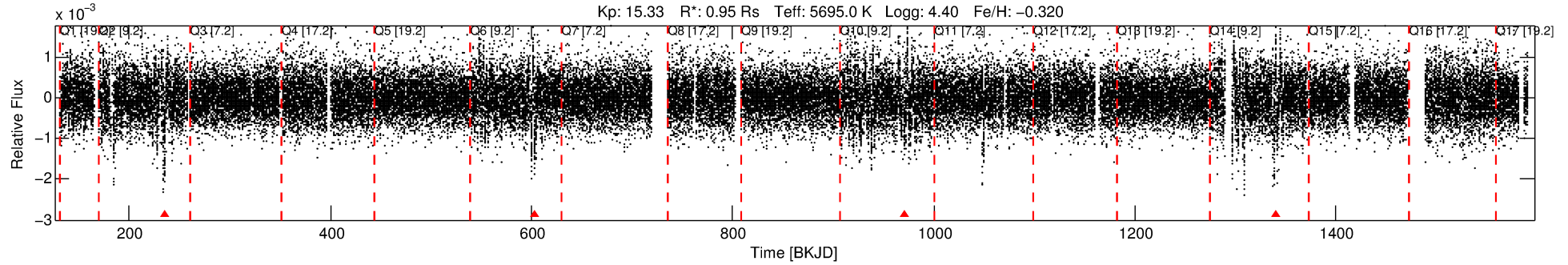
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 007970617-01

No Significant Match Found

# DV One-Page Summary

KIC: 7970617 Candidate: 1 of 2 Period: 368.283 d



## DV Fit Results:

Period = 368.28324 [0.02737] d  
Epoch = 234.7260 [0.0497] BKJD  
Rp/R\* = 0.0335 [0.0043]  
a/R\* = 40.60 [6.50]  
b = 0.97 [0.02]  
Seff = 0.96 [0.34]  
Teq = 252 [23] K  
Rp = 3.48 [1.03] Re  
a = 0.9432 [0.2152] AU  
Ag = 6252.68 [3706.25] [1.69 $\sigma$ ]  
Teffp = 3468 [435] K [7.38 $\sigma$ ]

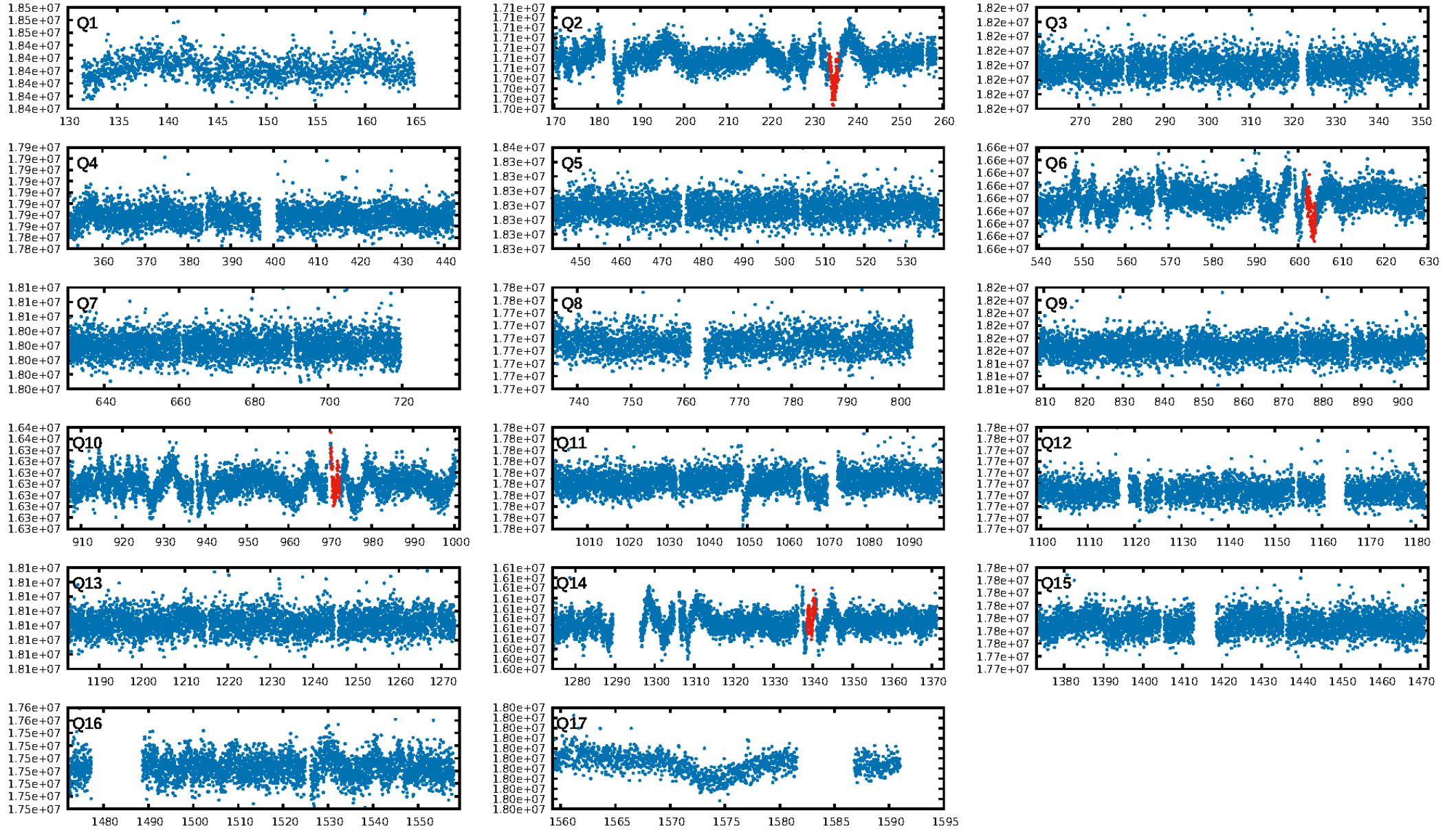
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [71.91 $\sigma$ ]  
ModelChiSquare2-sig: 29.8%  
ModelChiSquareGof-sig: 99.9%  
Bootstrap-pfa: 1.37e-09  
RollingBand-fgt: 0.00 [0/4]  
GhostDiagnostic-chr: -5.151  
Centroid-sig: 7.1%  
Centroid-so: 2.297 arcsec [1.38 $\sigma$ ]  
OotOffset-rm: 2.211 arcsec [1.80 $\sigma$ ]  
KicOffset-rm: 2.079 arcsec [1.60 $\sigma$ ]  
OotOffset-st: 2/0/0/0 [2]  
KicOffset-st: 2/0/0/0 [2]  
DiffImageQuality-fgm: 0.00 [0/2]  
DiffImageOverlap-fno: 1.00 [2/2]

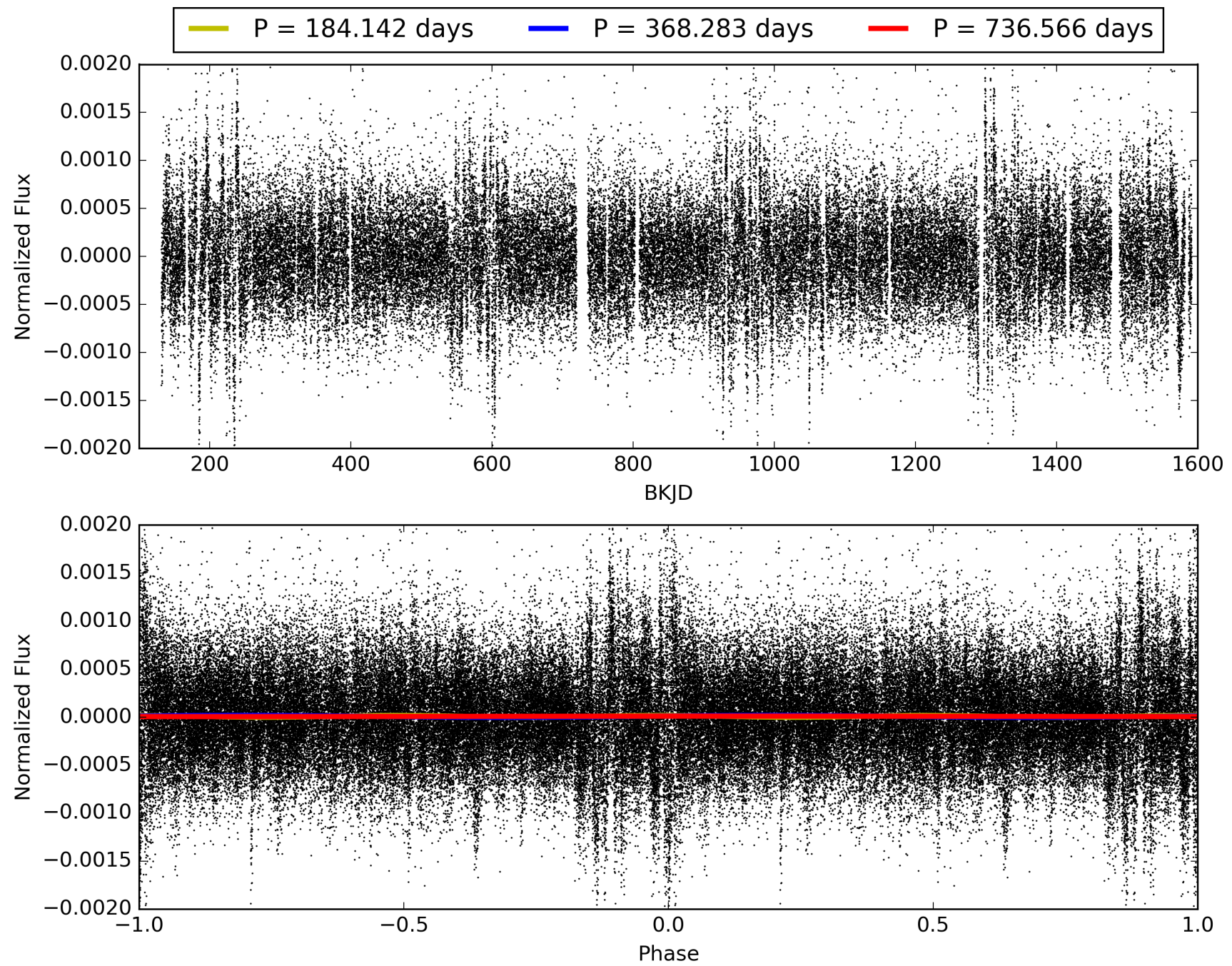
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 05:38:56 Z

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

# TCE 007970617-01, PDC Light Curves

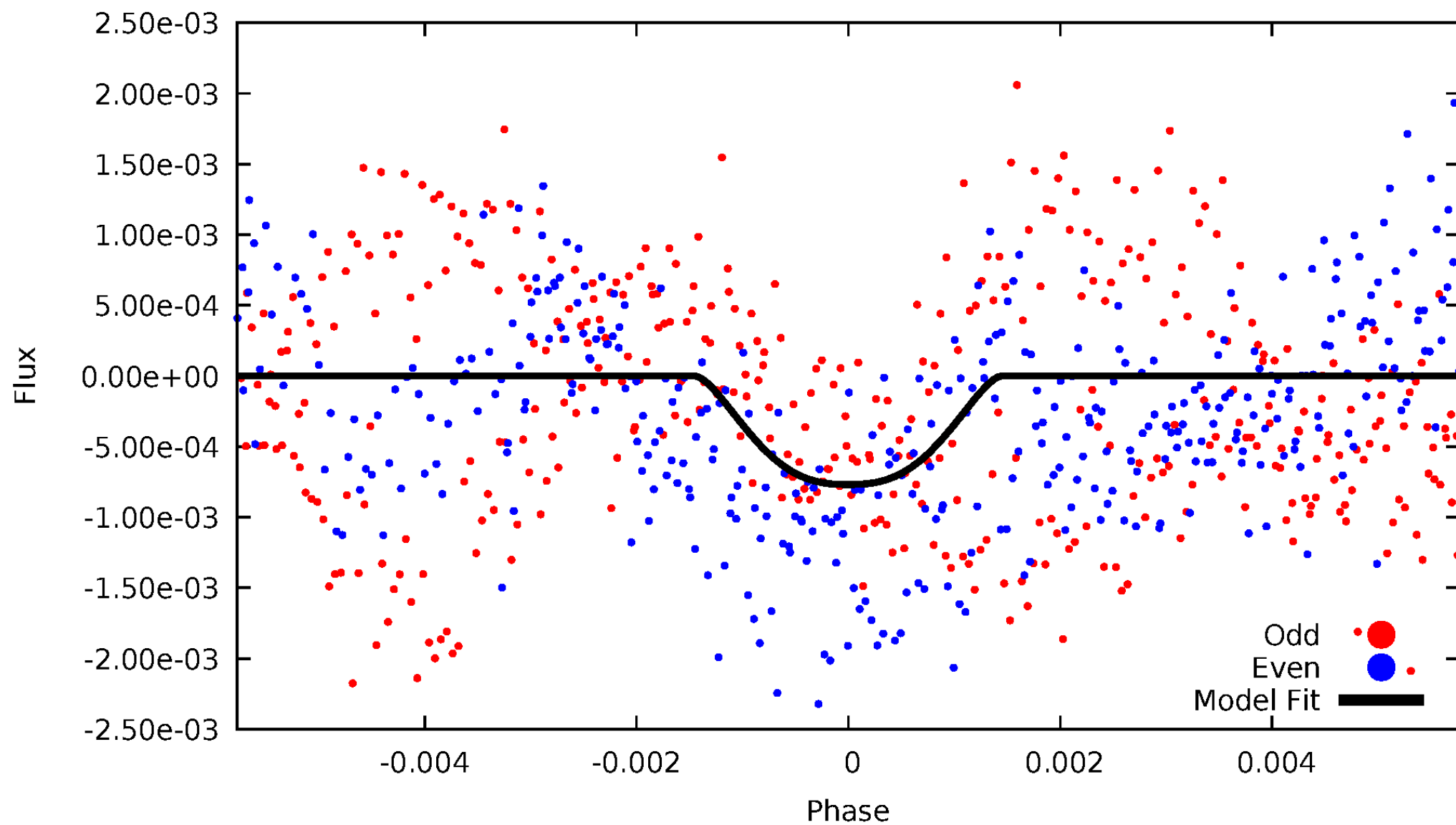


TCE 007970617-01



# DV Odd/Even

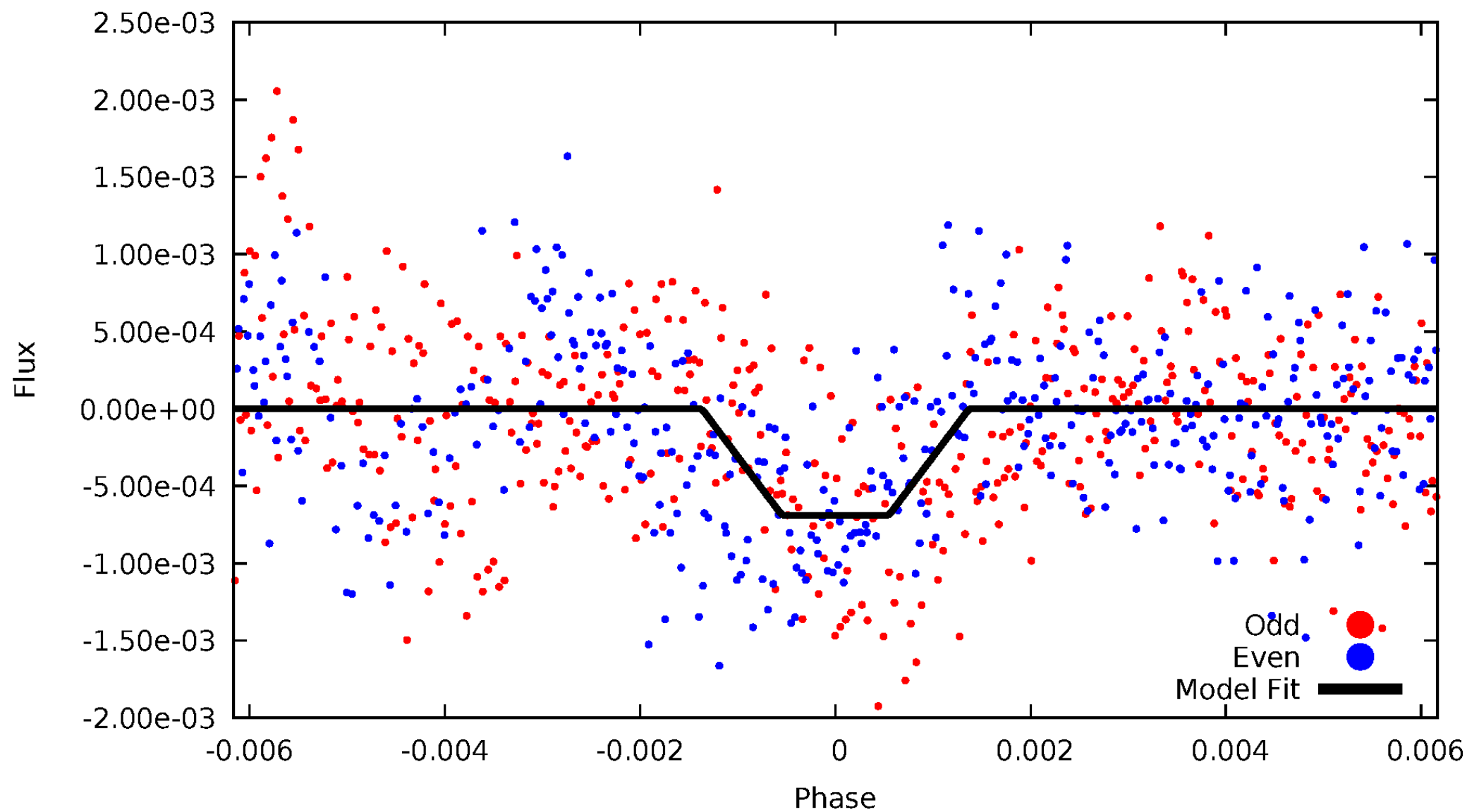
TCE 007970617-01





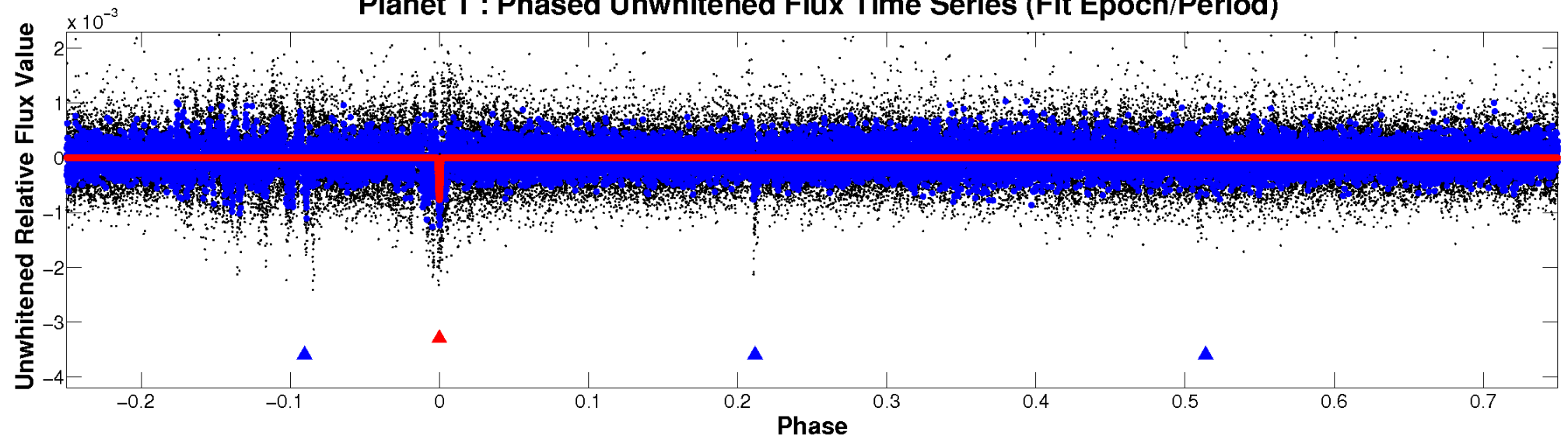
# ALT Odd/Even

TCE 007970617-01

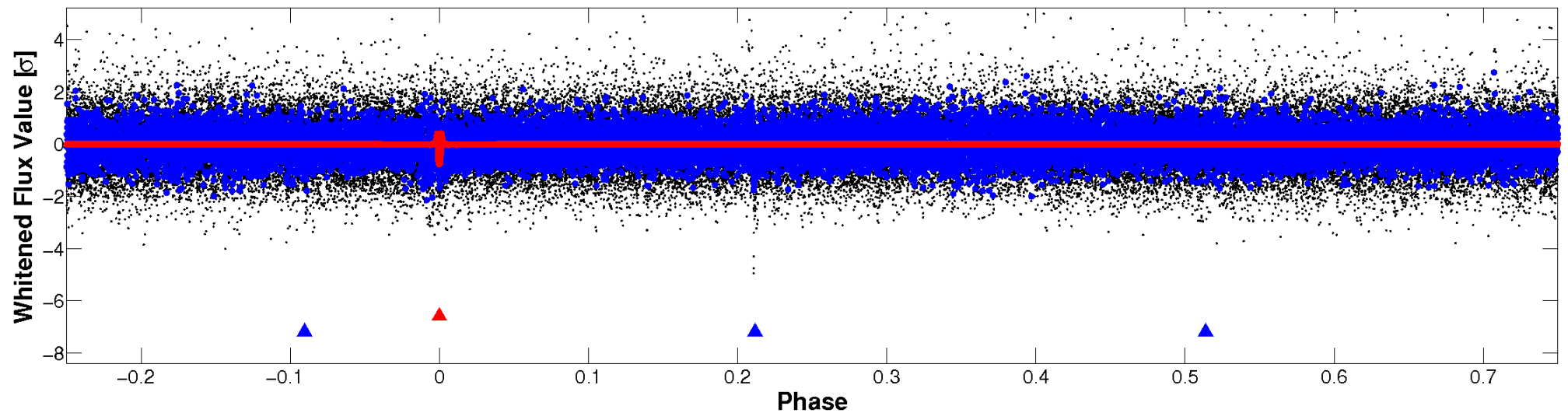


# Non-Whitened Vs. Whitened Light Curve

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

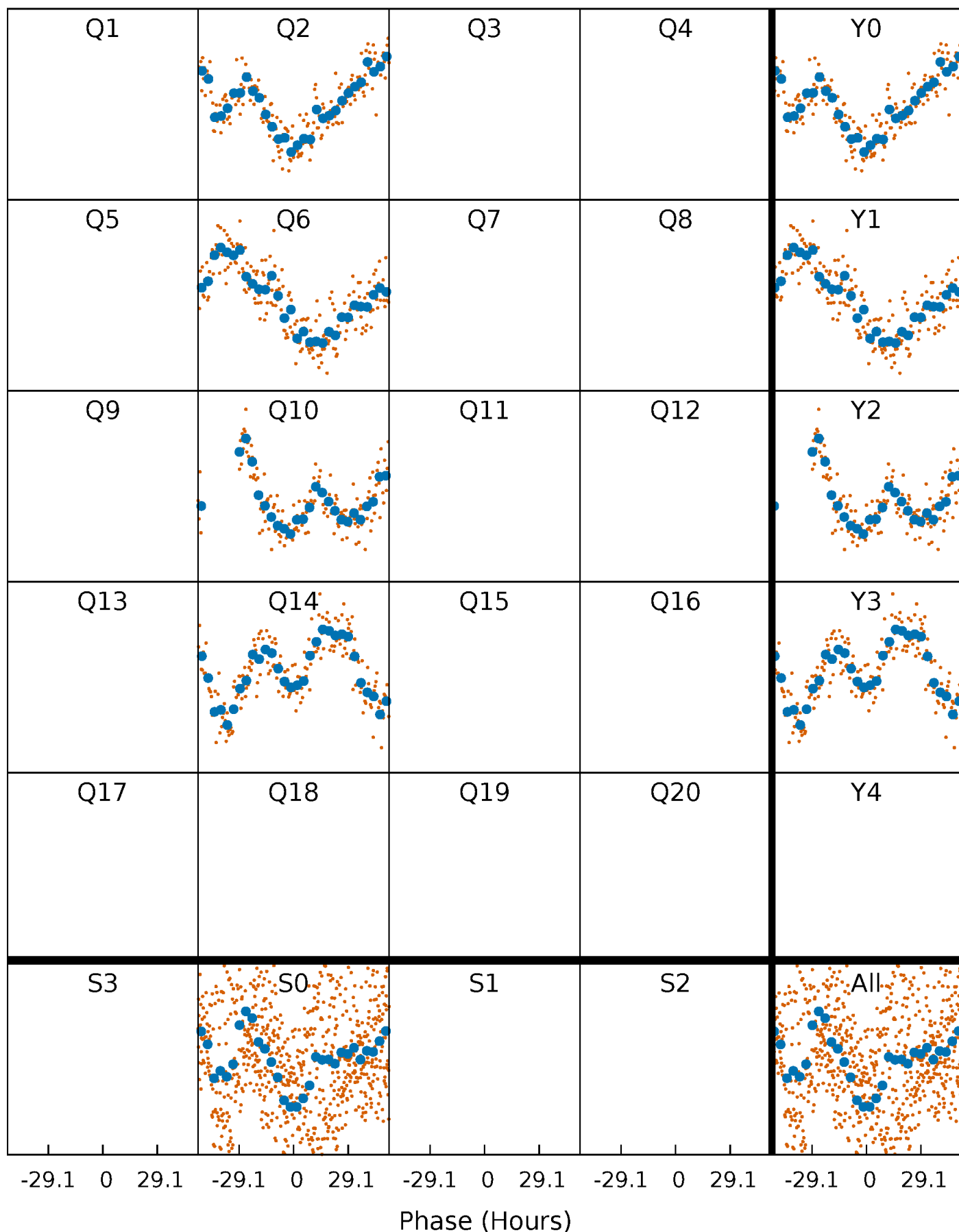


**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

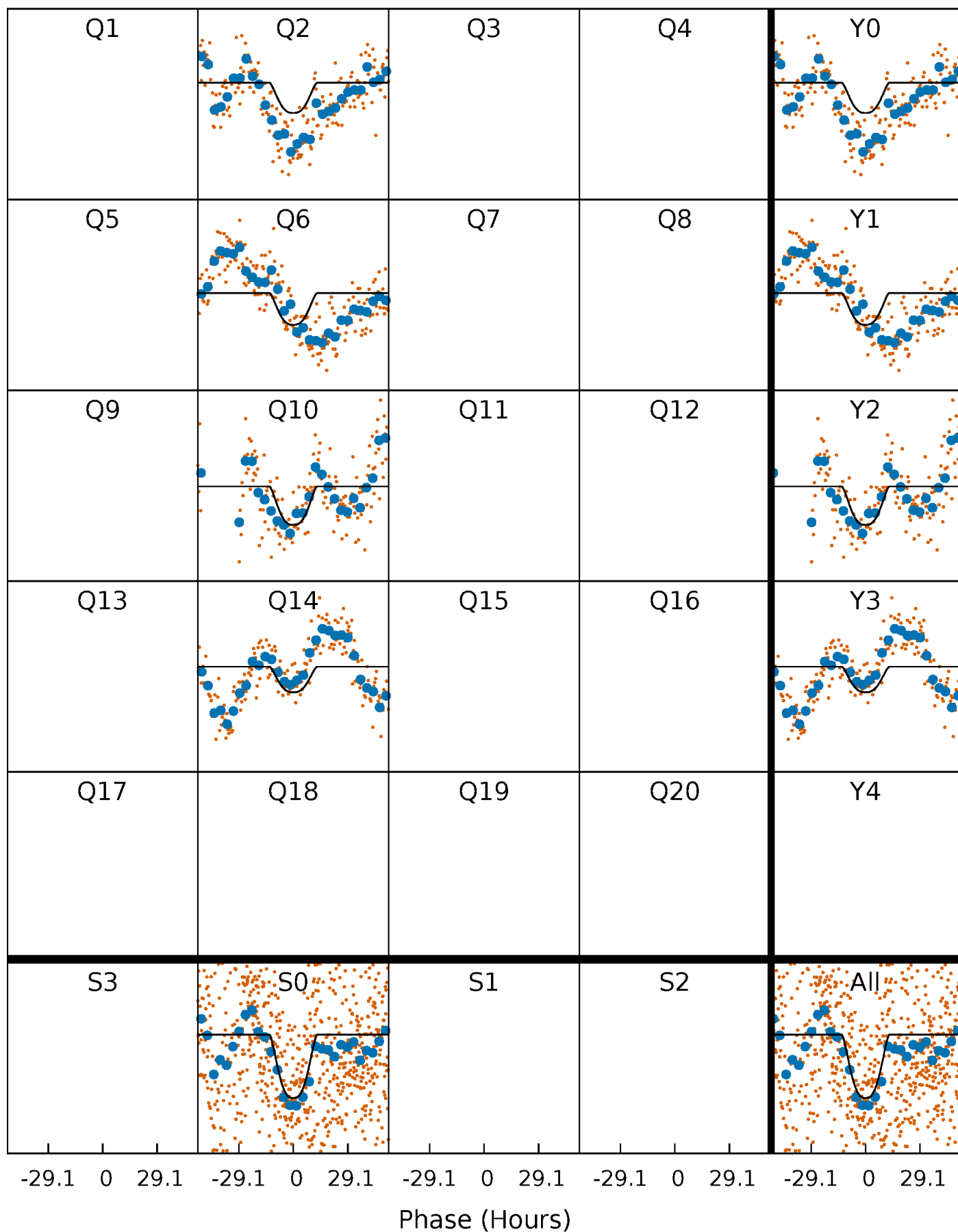
TCE 007970617-01 P=368.283236 Days  $T_0=234.725981$  (BKJD)





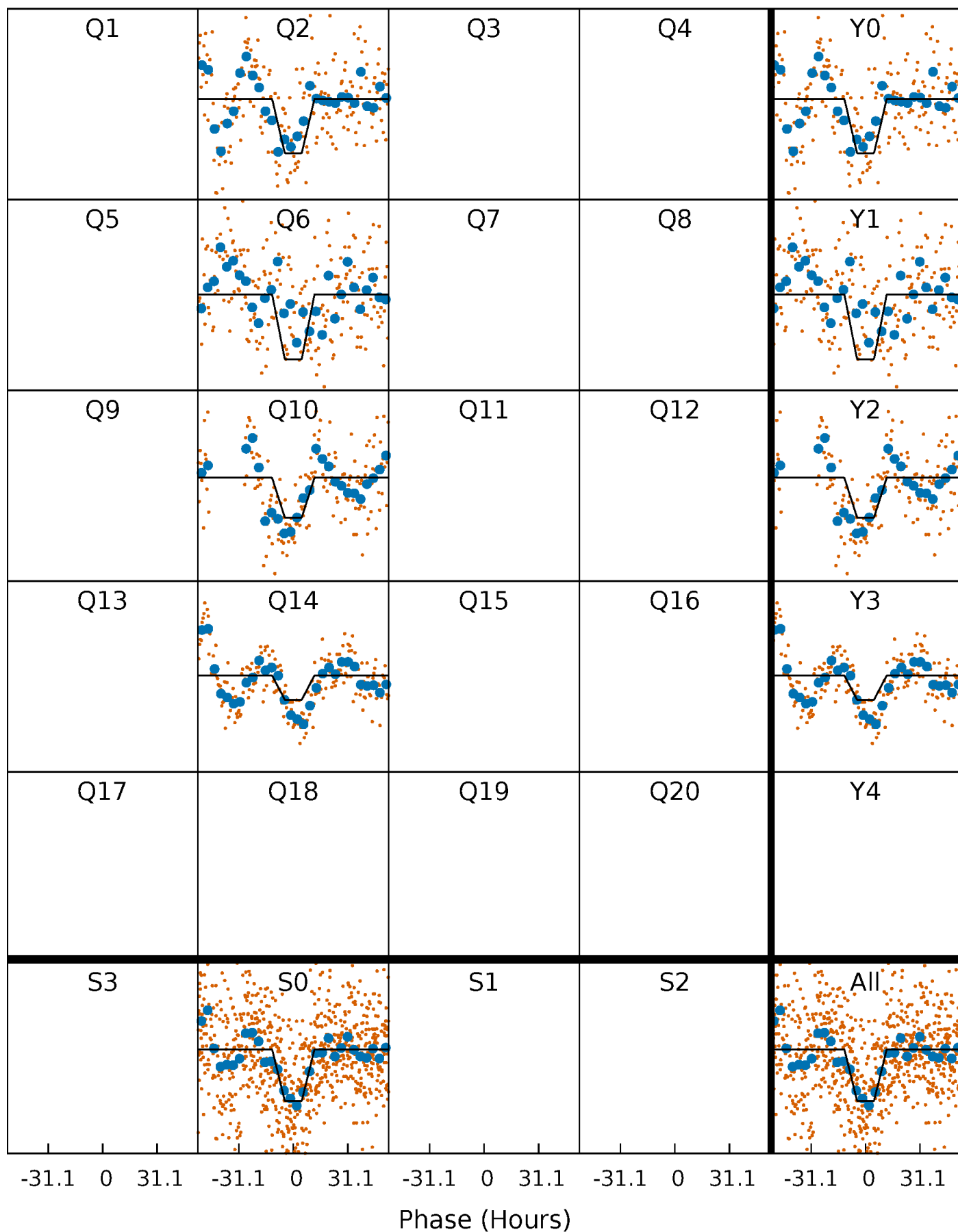
# DV Quarter-Phased Transit Curves

TCE 007970617-01 P=368.283236 Days  $T_0=234.725981$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

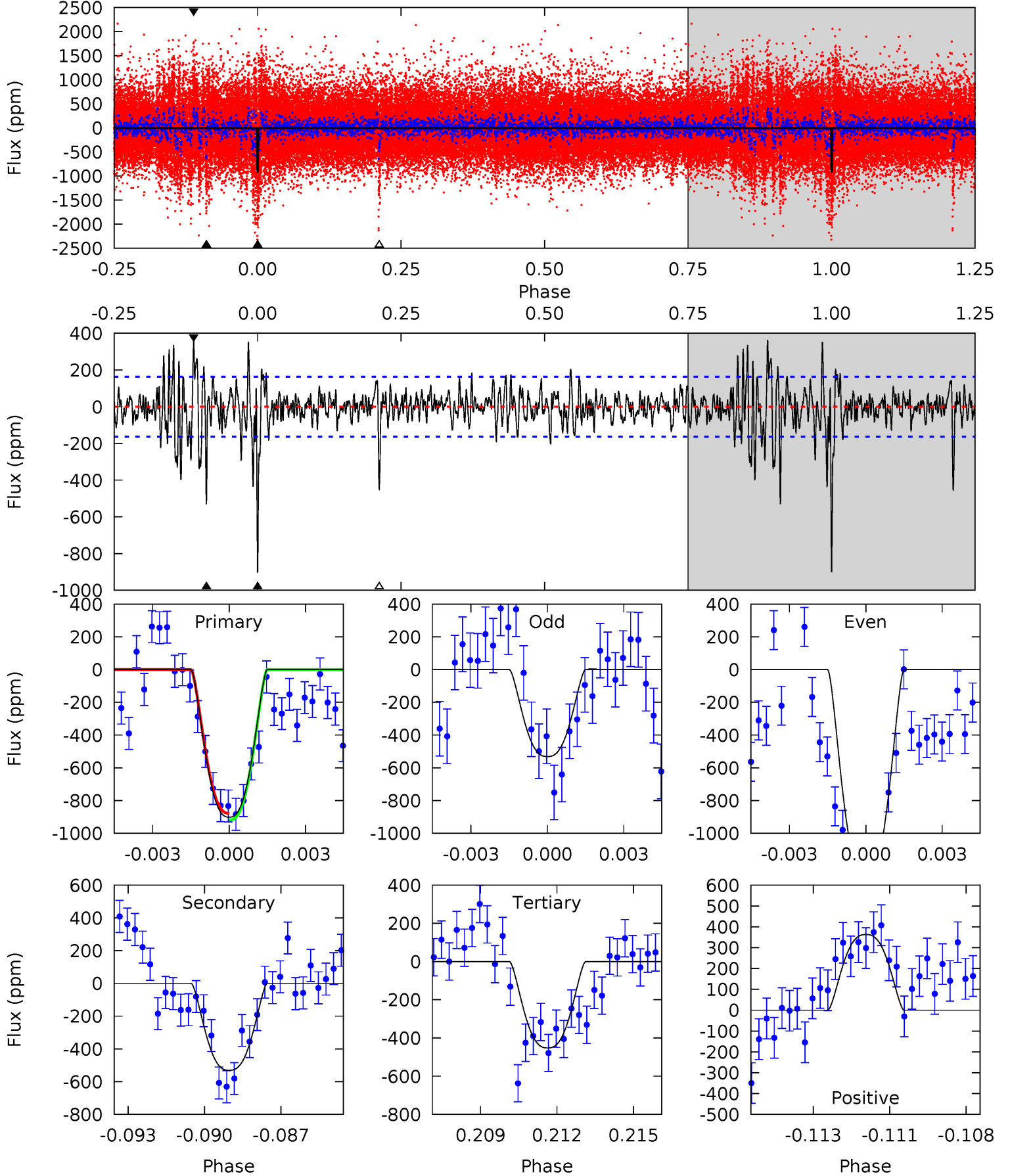
TCE 007970617-01 P=368.226374 Days  $T_0=234.789733$  (BKJD)



# DV Model-Shift Uniqueness Test

007970617-01, P = 368.283236 Days, E = 234.725981 Days

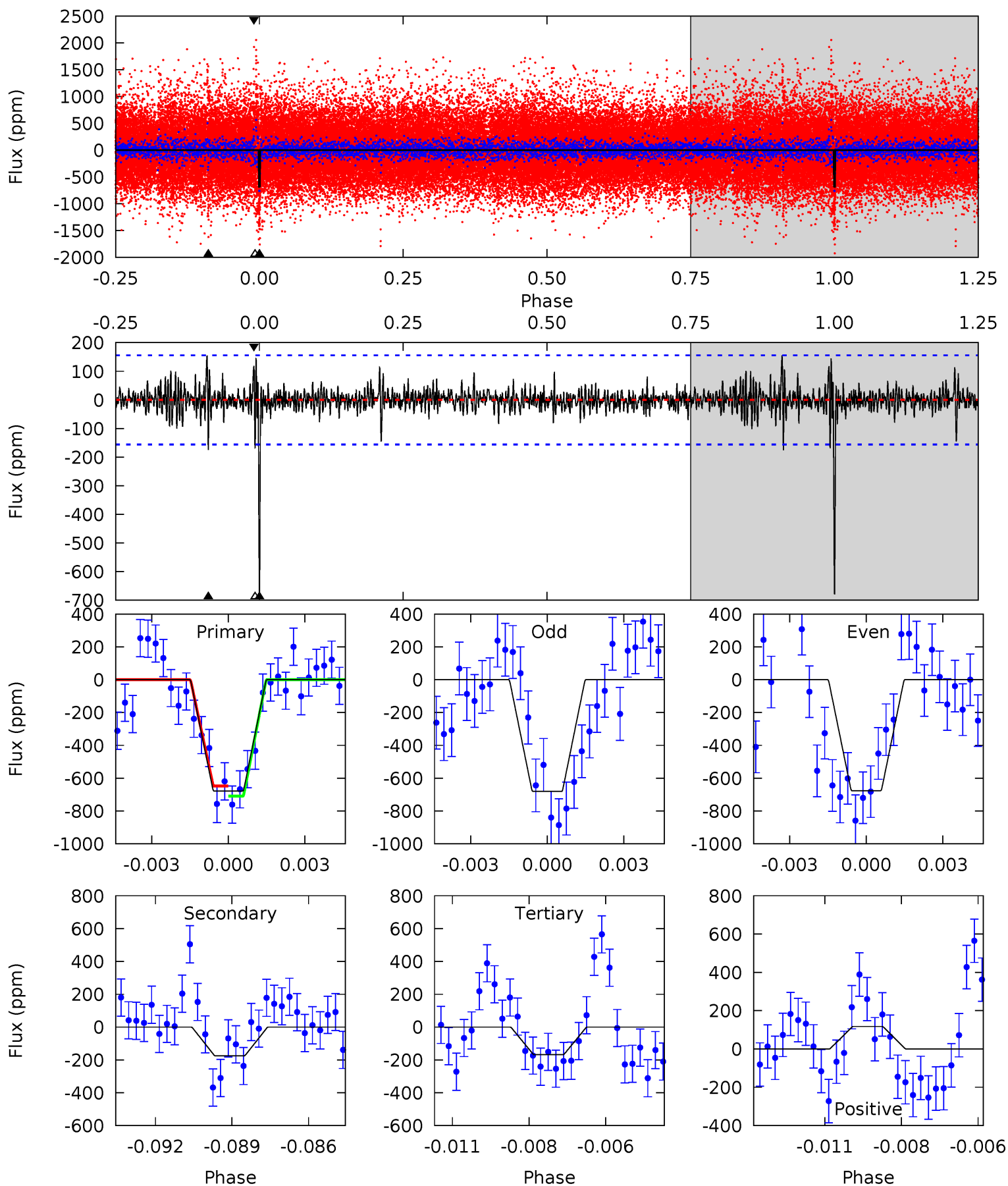
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
29.1	17.1	14.6	11.7	5.26	2.98	2.84	14.5	17.4	2.54	5.42	11.8	1.22	0.29	0.66



# Alt Model-Shift Uniqueness Test

007970617-01, P = 368.226374 Days, E = 234.789733 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
22.9	5.92	5.69	3.97	5.27	2.99	0.97	17.2	19.0	0.23	1.95	0.07	1.01	0.18	1.04



### Stellar Parameters For KIC 007970617

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5695^{+172}_{-172}$	$4.398^{+0.153}_{-0.187}$	$-0.320^{+0.300}_{-0.300}$	$0.951^{+0.253}_{-0.148}$	$0.824^{+0.118}_{-0.069}$	$1.350^{+0.947}_{-0.640}$
	+3%/-3%	+3%/-4%	+94%/-94%	+27%/-16%	+14%/-8%	+70%/-47%
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 007970617-01 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-531 \pm 31$	$3.53^{+0.67}_{-0.56}$	$354^{+26}_{-21}$	$4827^{+303}_{-259}$	$21037^{+9137}_{-6181}$
Alt.	$-175 \pm 30$	$2.77^{+0.69}_{-0.53}$	$354^{+27}_{-22}$	$4283^{+327}_{-308}$	$11195^{+6430}_{-4259}$

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

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

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

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

## DV Centroid Data

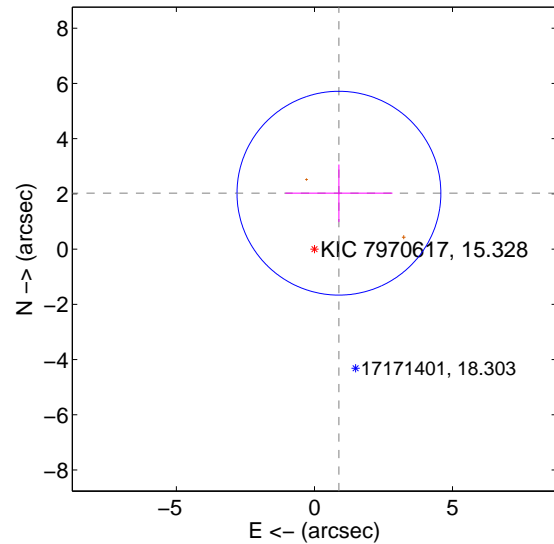
Supplemental centroid analysis for 007970617-01. Kepler magnitude: 15.33. Transit SNR 8.14

There are 0 quarters with good PRF difference image offsets

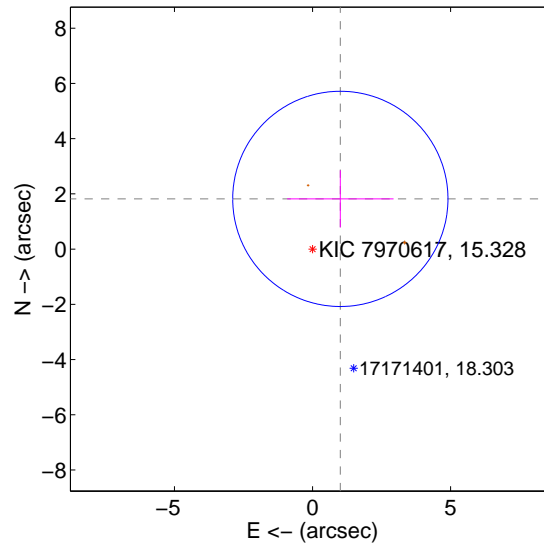
The direct PRF centroid is offset from the target star catalog position by about 0.22 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$2.211 \pm 1.231$	1.80	$-0.887 \pm 1.941$	$2.025 \pm 1.040$
PRF-fit source offset from KIC position	$2.079 \pm 1.300$	1.60	$-1.008 \pm 1.929$	$1.819 \pm 1.032$
photometric centroid source offset	$2.30 \pm 1.67$	1.38	$-0.47 \pm 1.71$	$2.25 \pm 1.67$

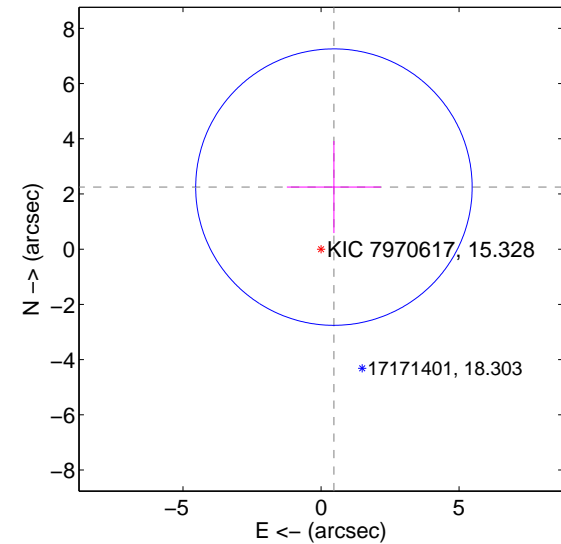
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position



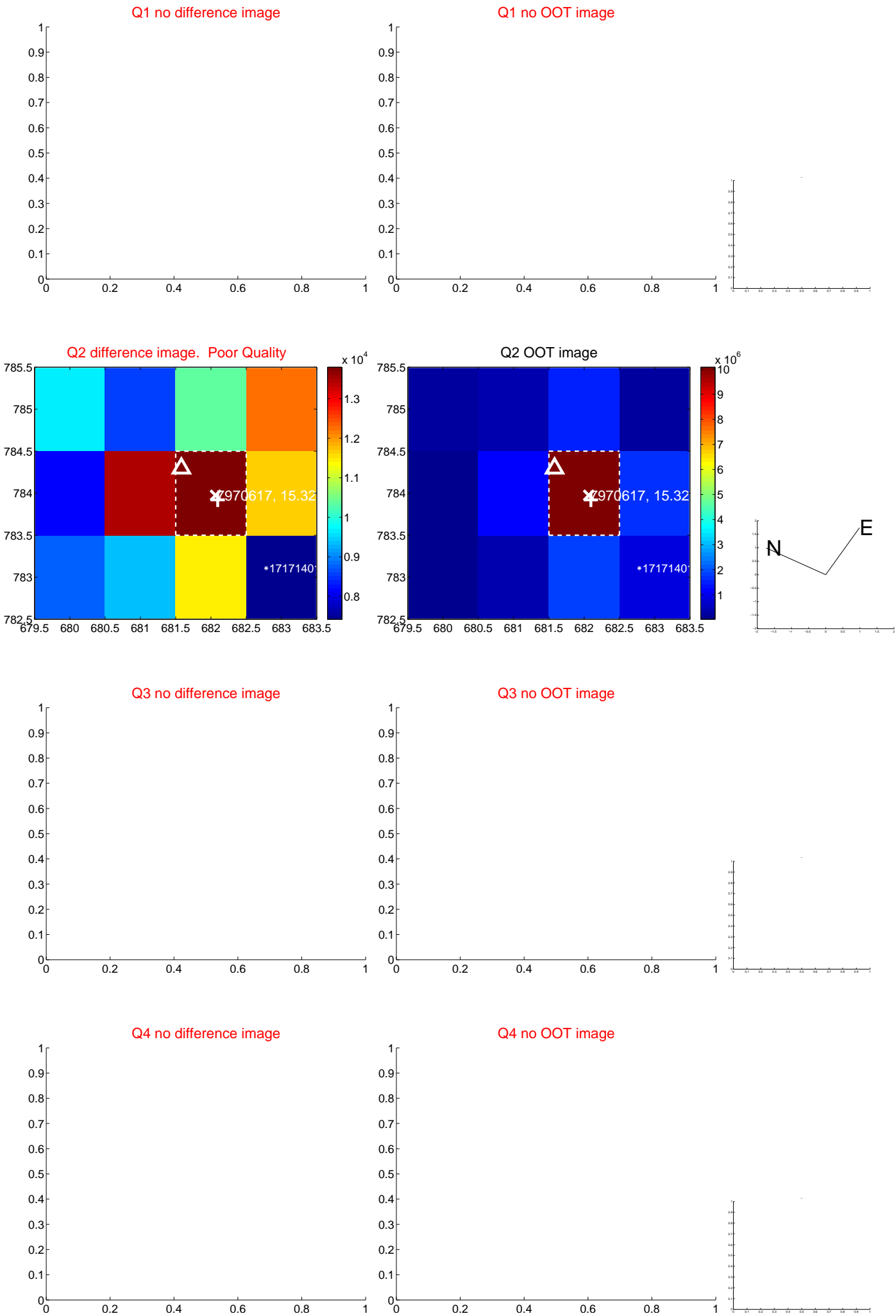
offset from photometric centroids



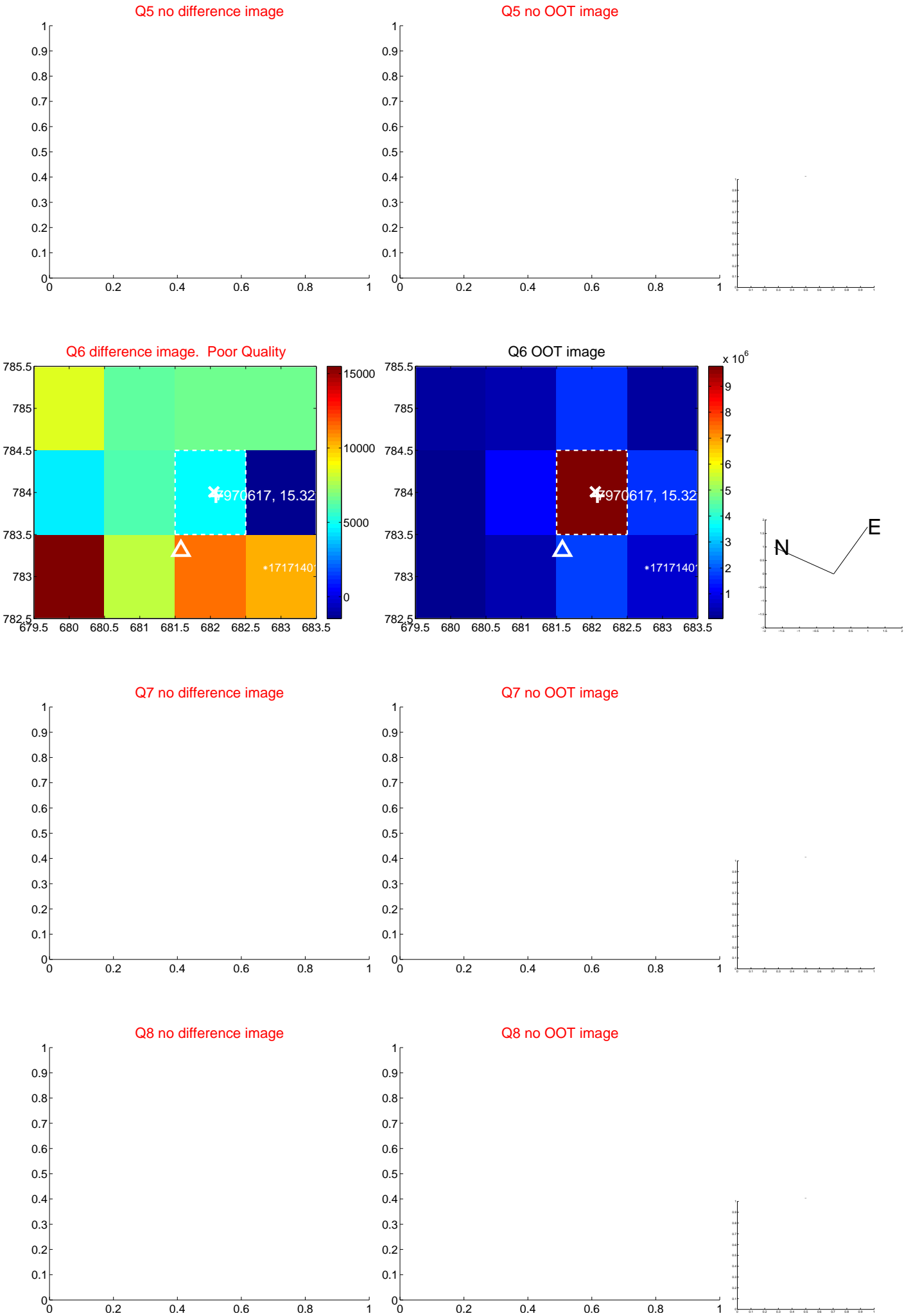
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three- $\sigma$ . 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 ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.



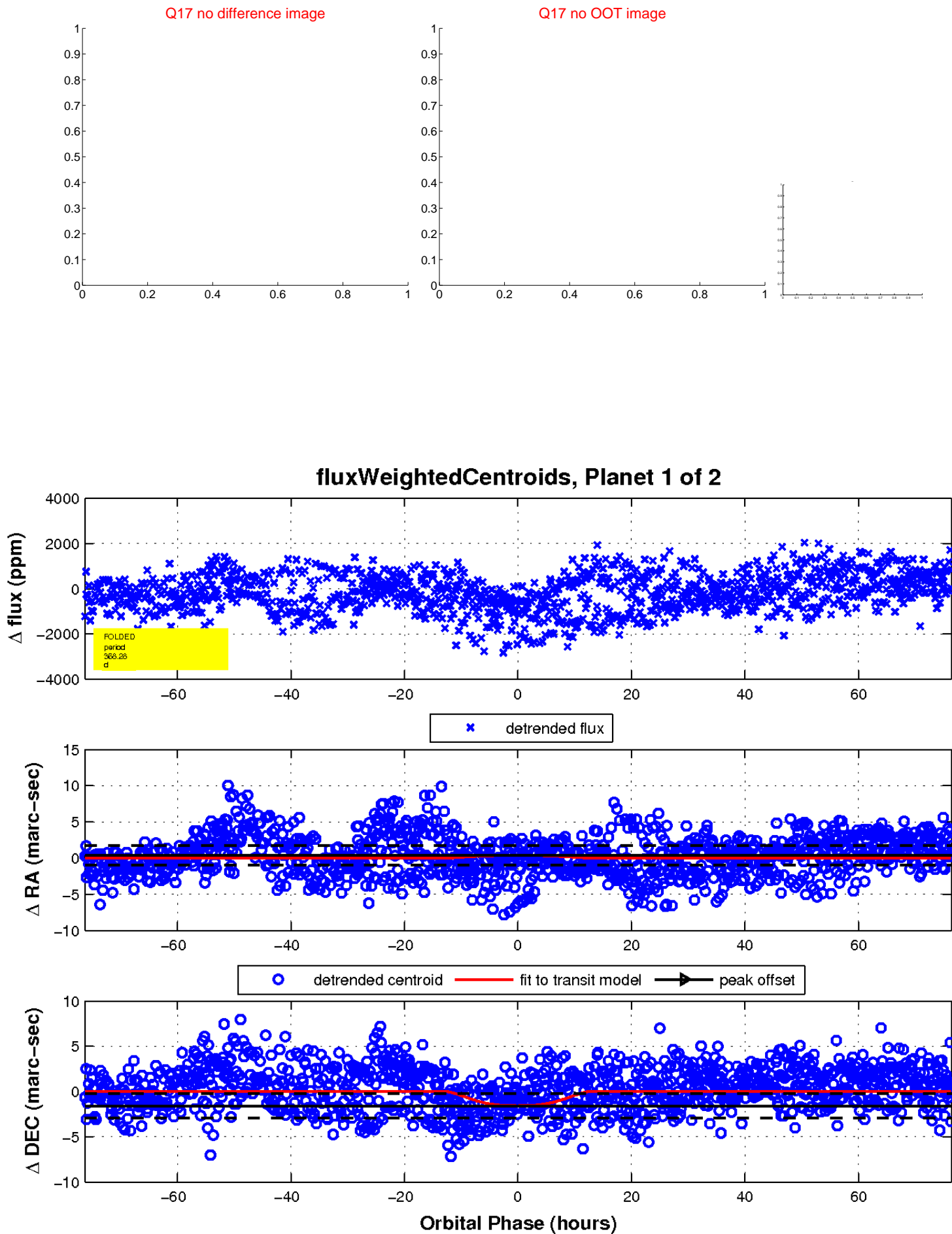
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

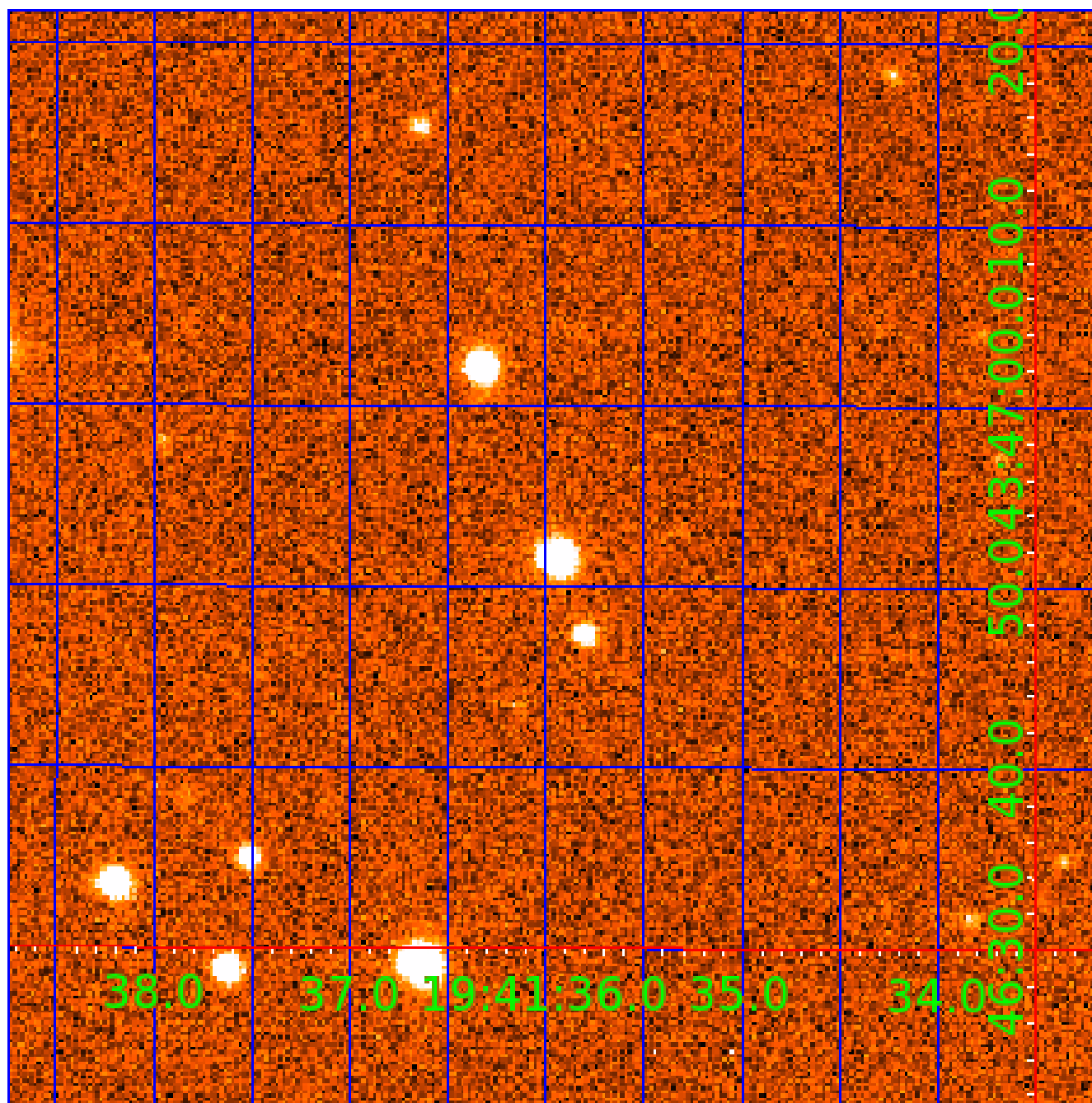


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 007970617

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
007970617-01	OBS	No	368.283236	234.725981	768.1	25.489	7.3	8.1	0.95	5695	3.48	0.96
007970617-02	OBS	No	479.547439	569.720720	949.7	27.006	11.6	11.6	0.95	5695	3.87	0.67

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
007970617-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—CENT_FEW_DIFFS
007970617-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_SKYE—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_FEW_DIFFS

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

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

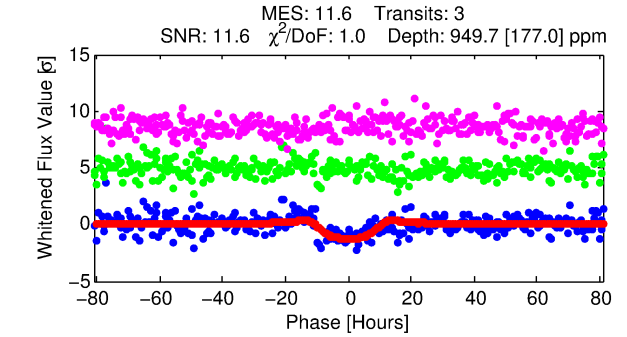
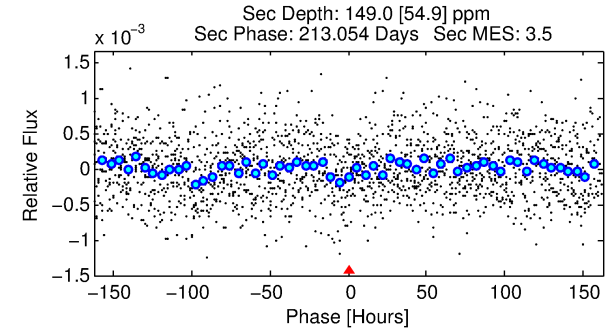
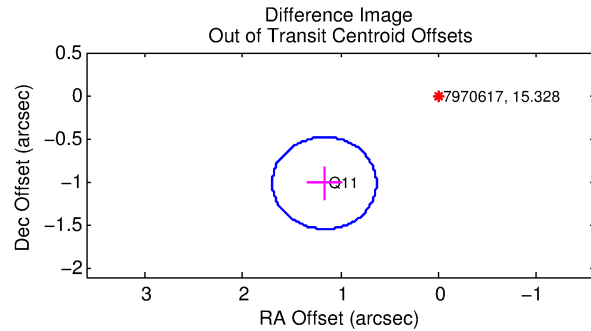
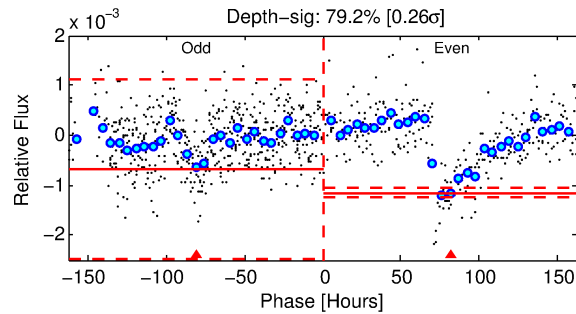
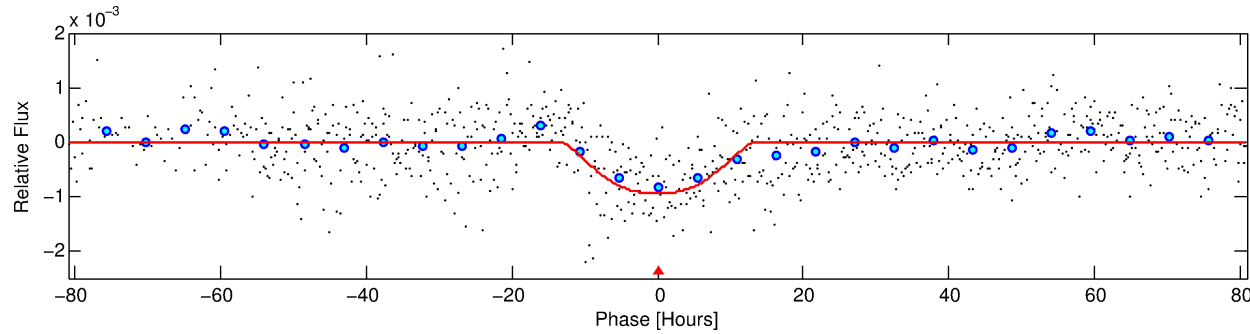
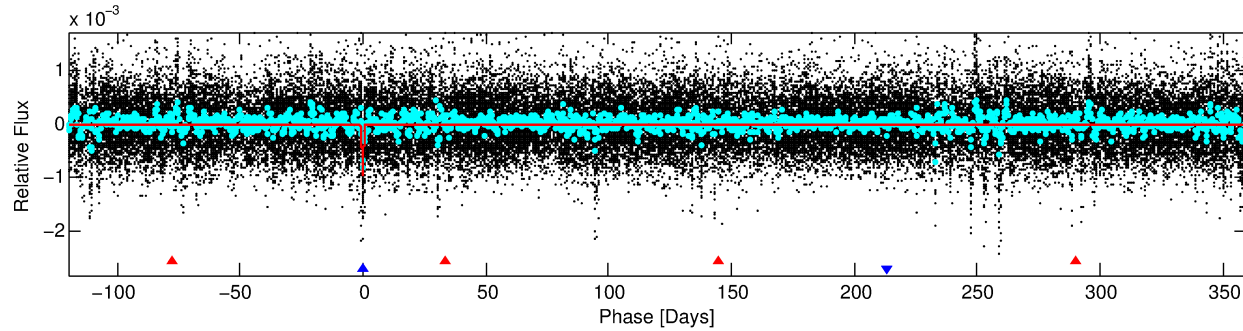
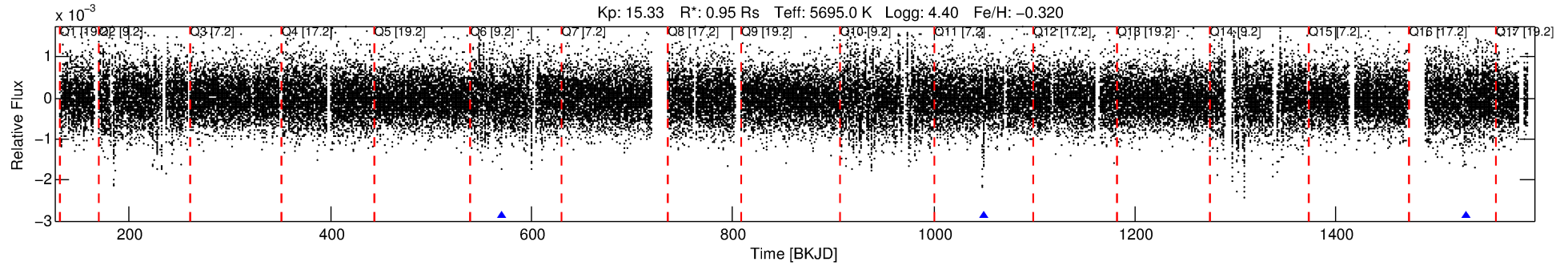
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 007970617-02

No Significant Match Found

# DV One-Page Summary

KIC: 7970617 Candidate: 2 of 2 Period: 479.547 d



## DV Fit Results:

Period = 479.54744 [0.03270] d  
Epoch = 569.7207 [0.0383] BKJD  
Rp/R\* = 0.0373 [0.0062]  
a/R\* = 51.81 [8.58]  
b = 0.96 [0.02]  
Seff = 0.67 [0.24]  
Teq = 231 [21] K  
Rp = 3.87 [1.21] Re  
a = 1.1247 [0.2566] AU  
Ag = 6934.54 [4155.84] [1.67 $\sigma$ ]  
Teffp = 3260 [415] K [7.28 $\sigma$ ]

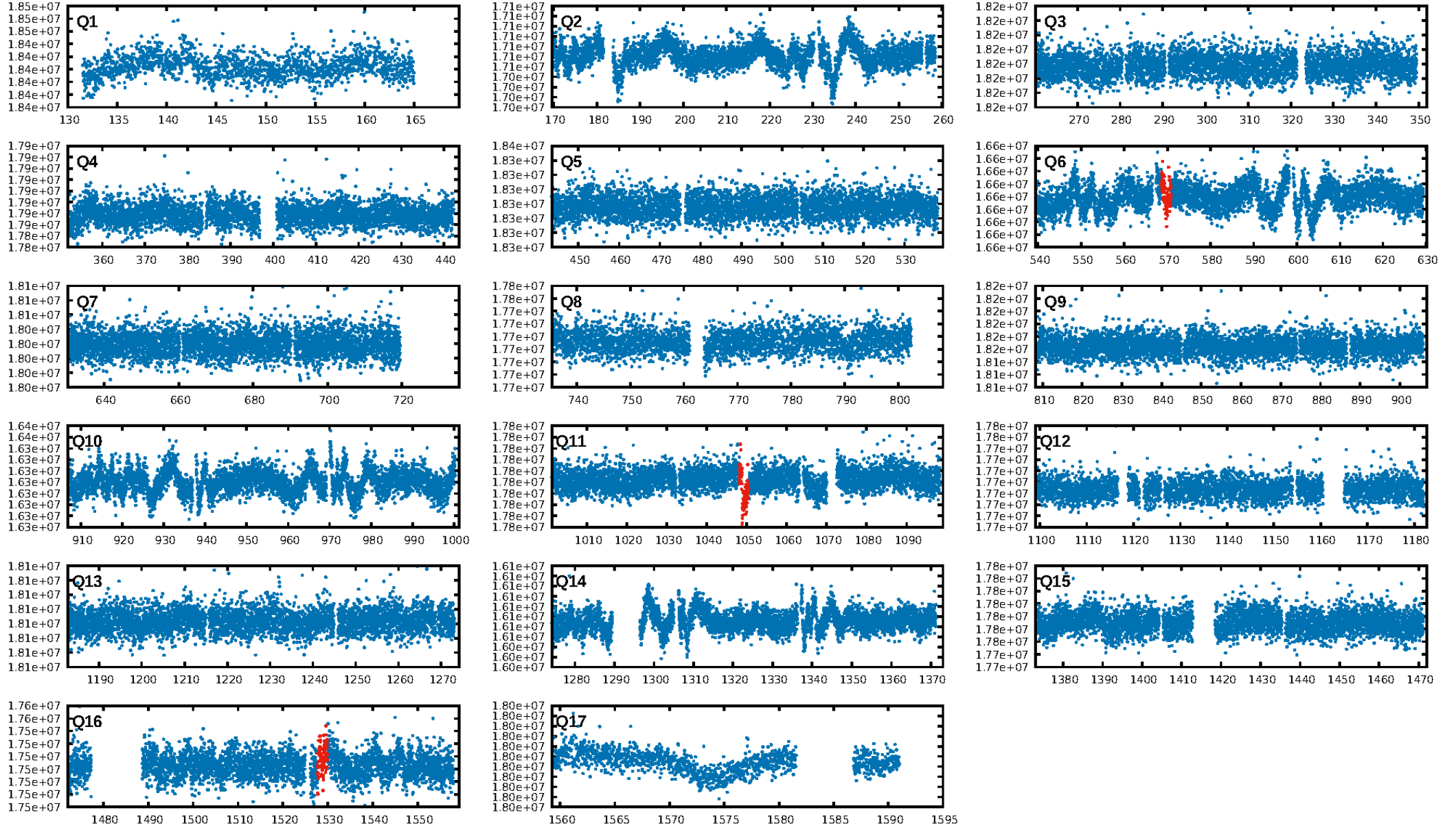
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [71.91 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 0.5%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 1.88e-16  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: 4.791  
Centroid-sig: 91.5%  
Centroid-so: 0.404 arcsec [0.40 $\sigma$ ]  
OotOffset-rm: 1.545 arcsec [8.71 $\sigma$ ]  
KicOffset-rm: 1.538 arcsec [8.62 $\sigma$ ]  
OotOffset-st: 0/1/0/0 [1]  
KicOffset-st: 0/1/0/0 [1]  
DiffImageQuality-fgm: 1.00 [1/1]  
DiffImageOverlap-fno: 1.00 [1/1]

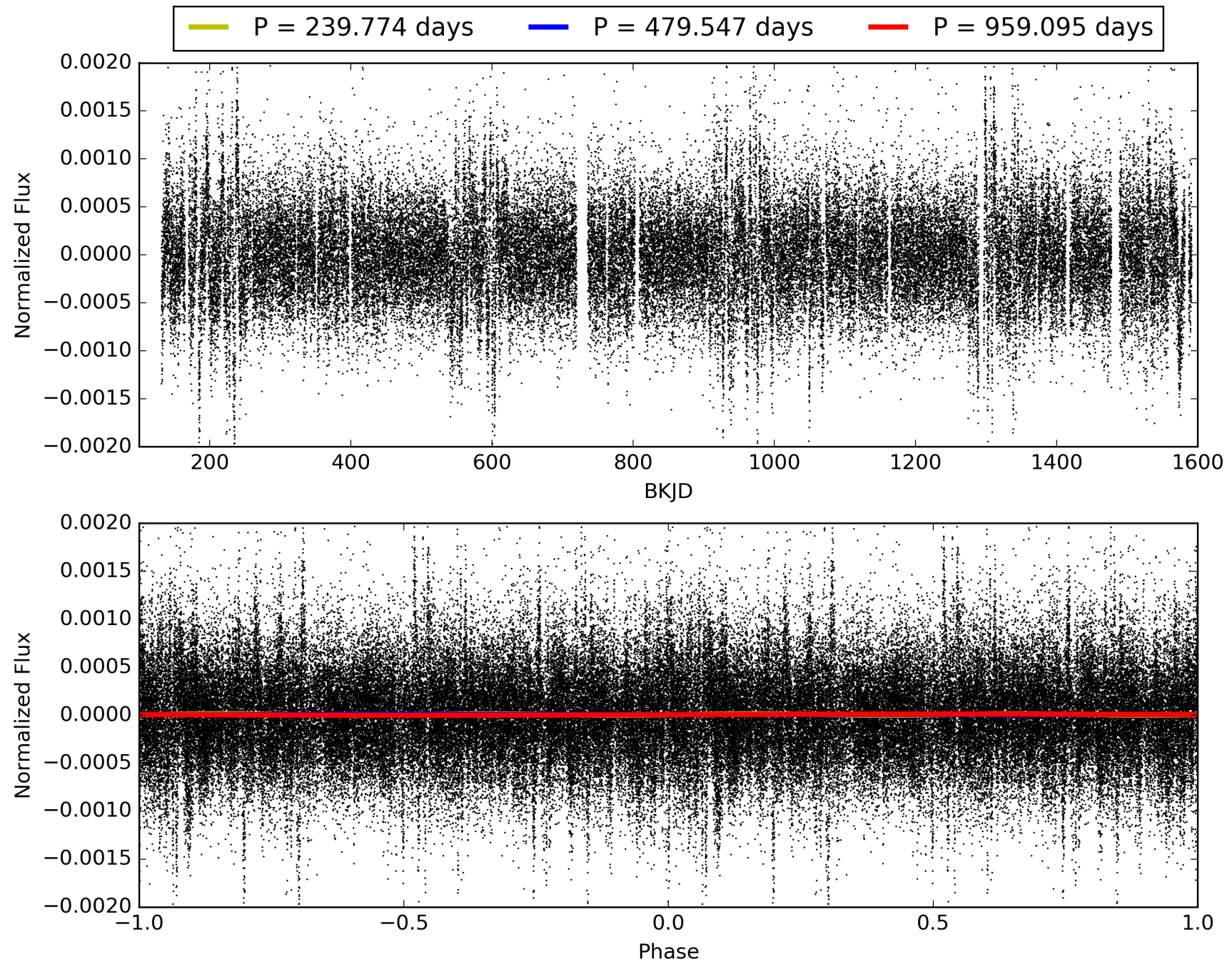
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 05:39:05 Z

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

# TCE 007970617-02, PDC Light Curves

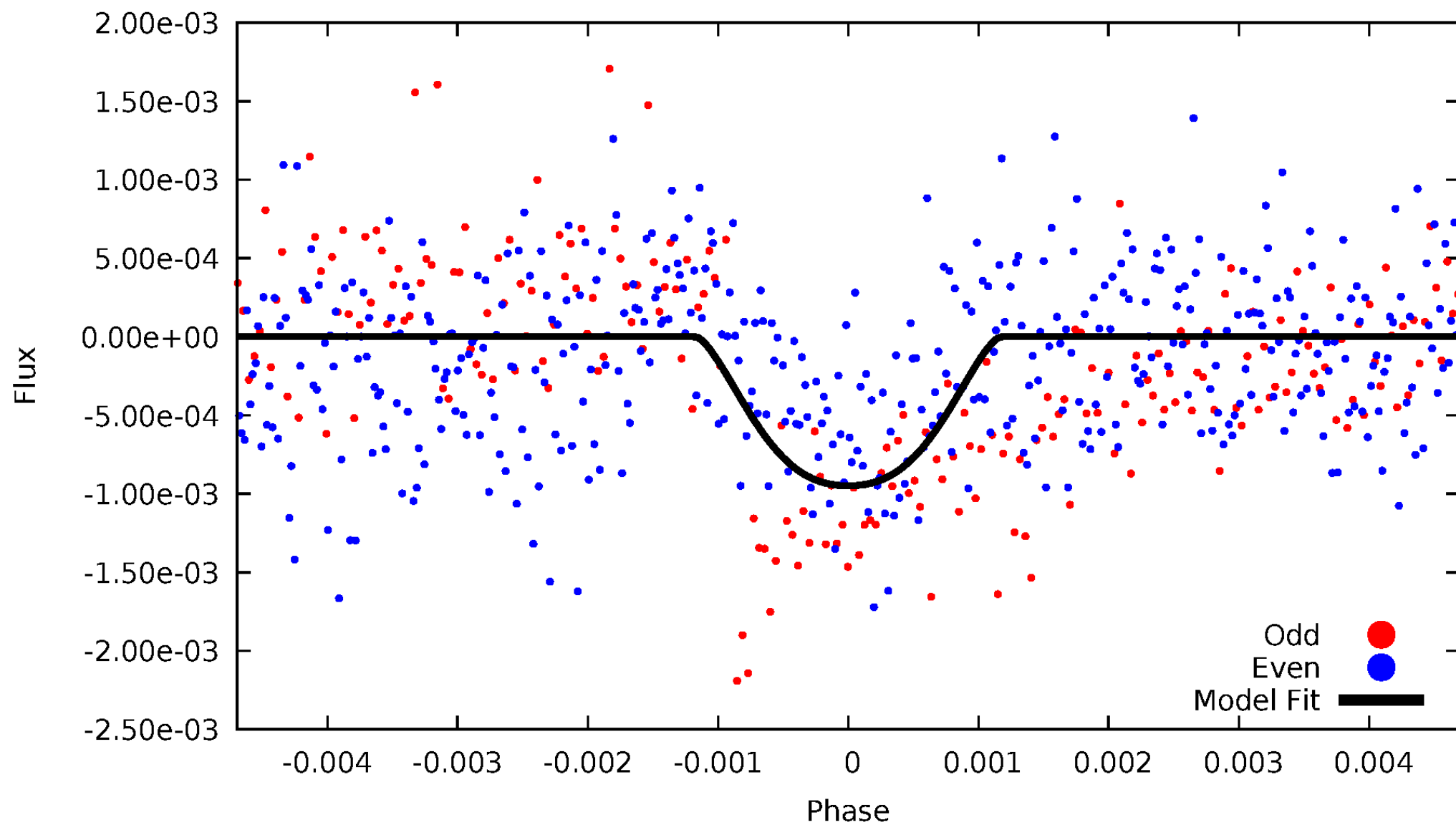


# TCE 007970617-02



# DV Odd/Even

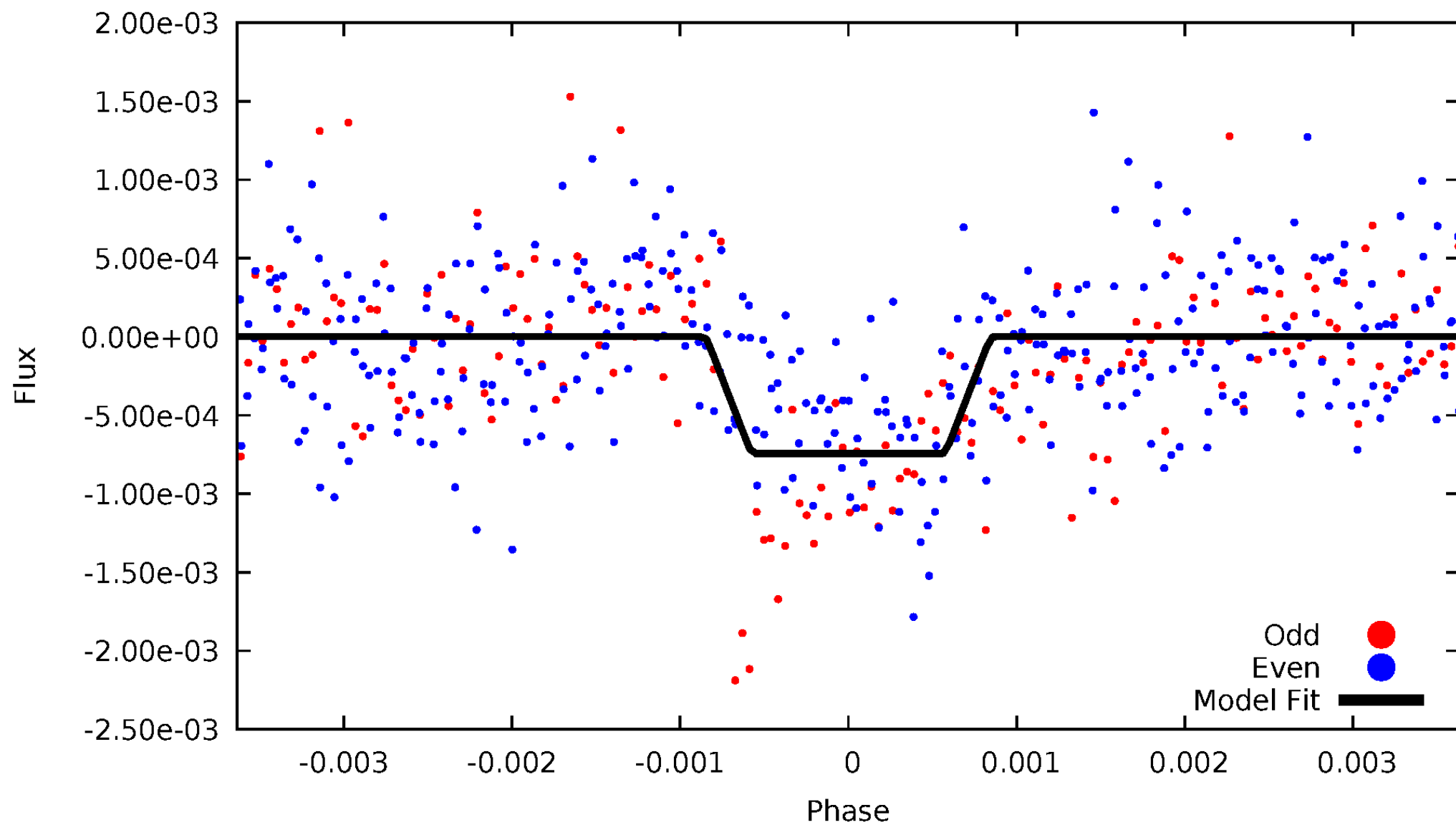
TCE 007970617-02





# ALT Odd/Even

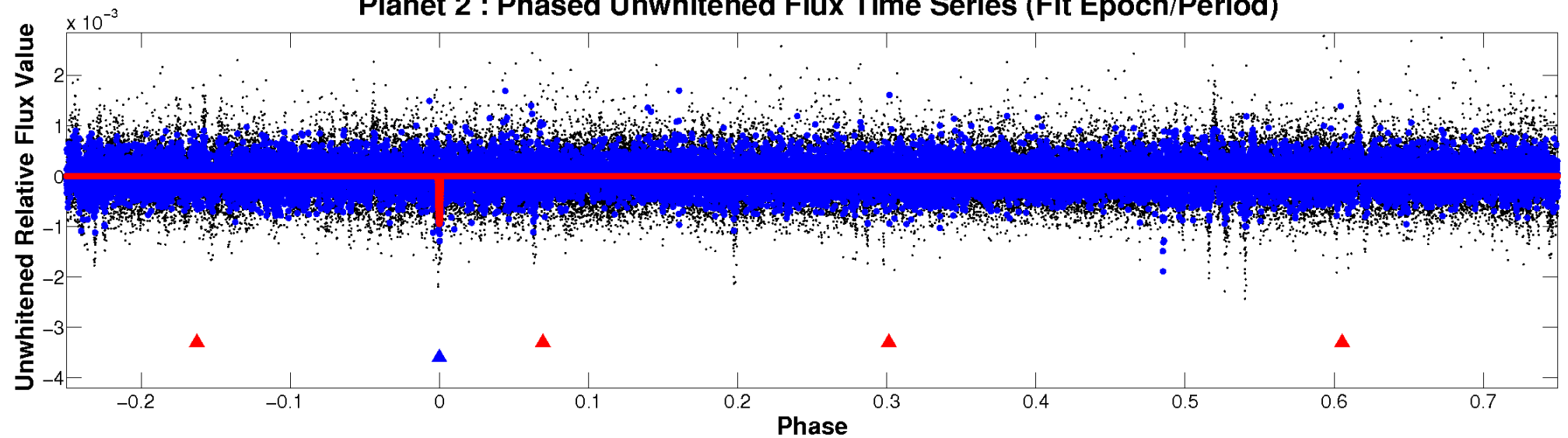
TCE 007970617-02



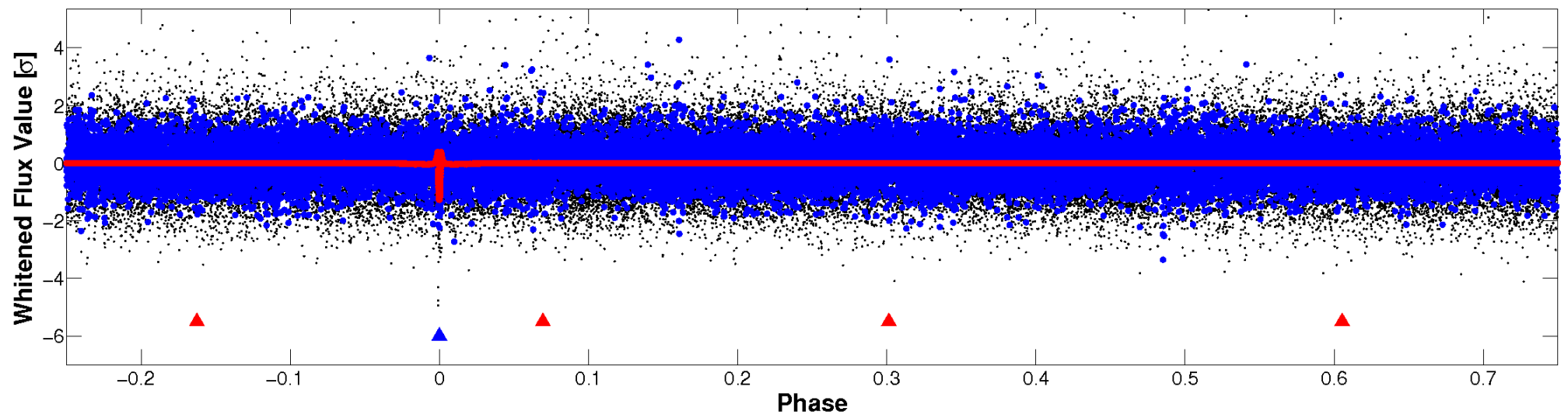


# Non-Whitened Vs. Whitened Light Curve

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

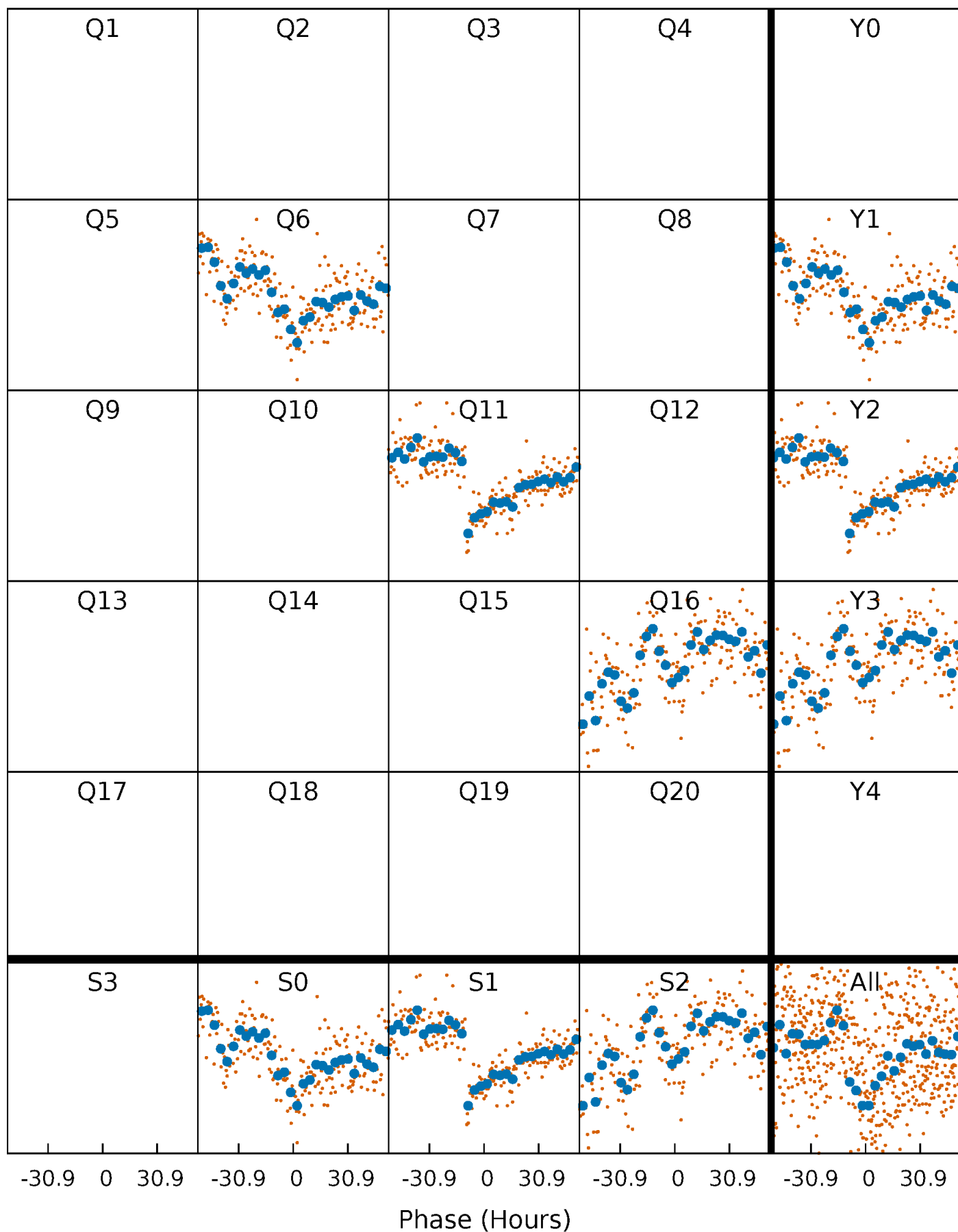


**Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



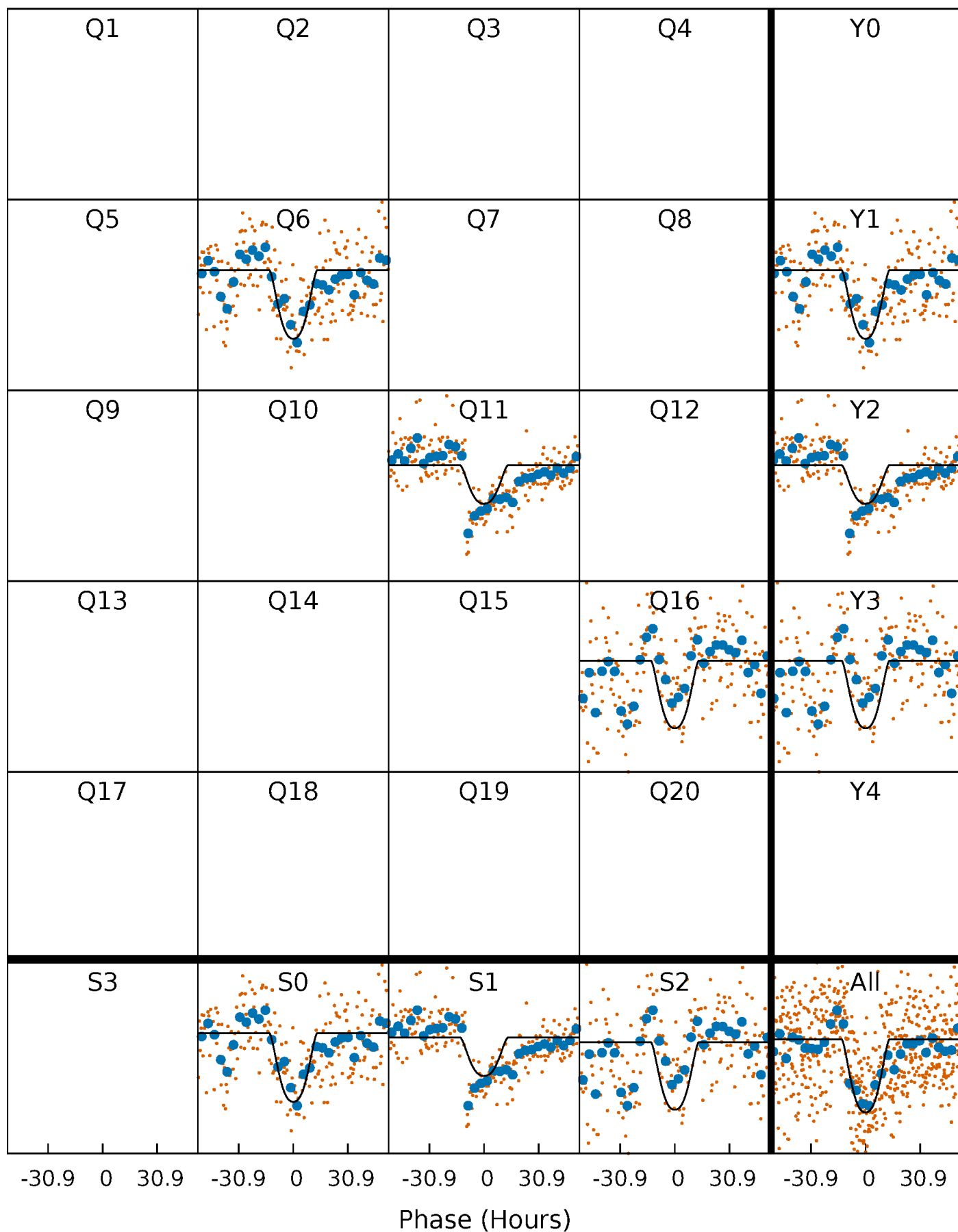
# PDC Quarter-Phased Transit Curves

TCE 007970617-02 P=479.547439 Days  $T_0=569.720720$  (BKJD)



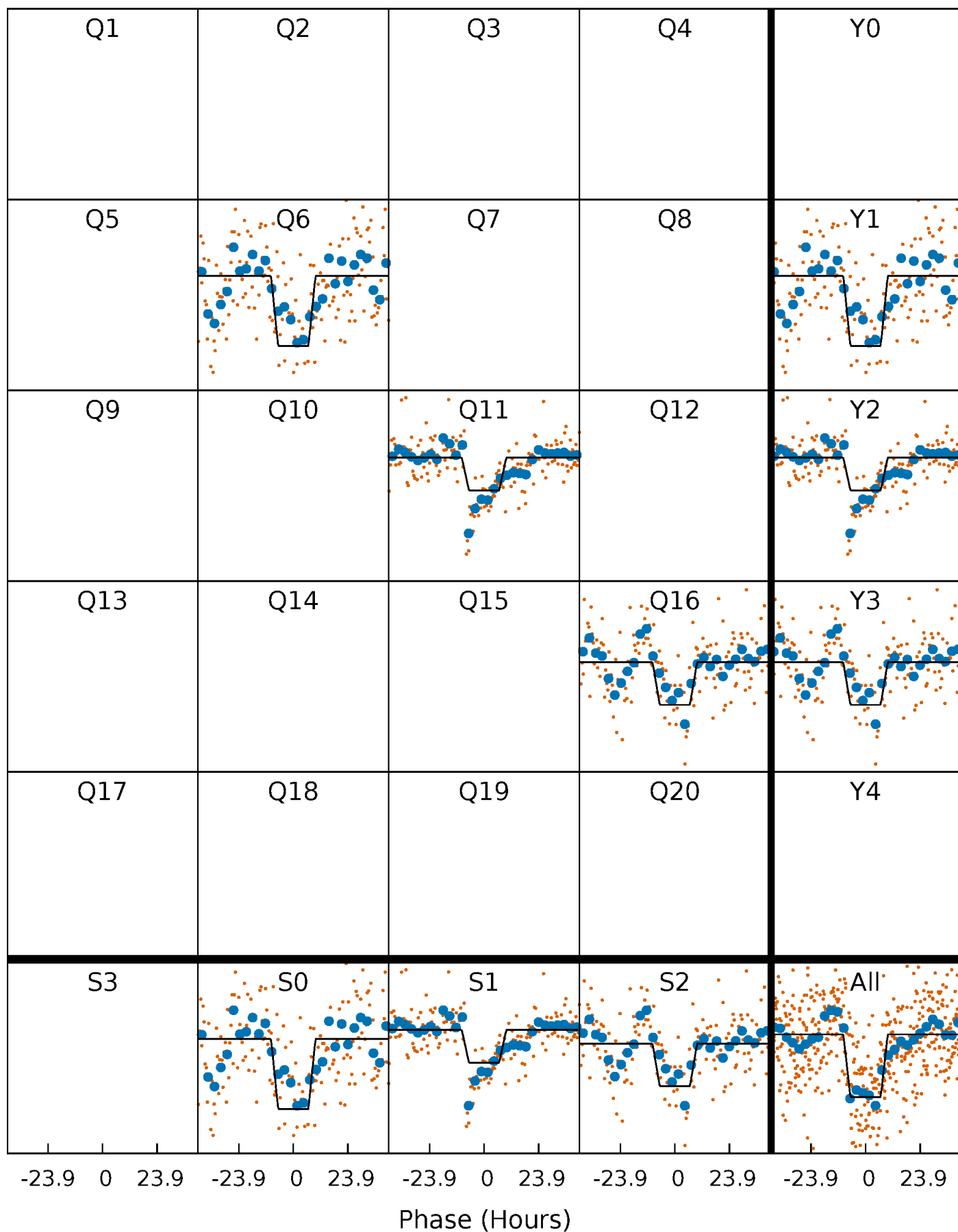
# DV Quarter-Phased Transit Curves

TCE 007970617-02 P=479.547439 Days  $T_0=569.720720$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

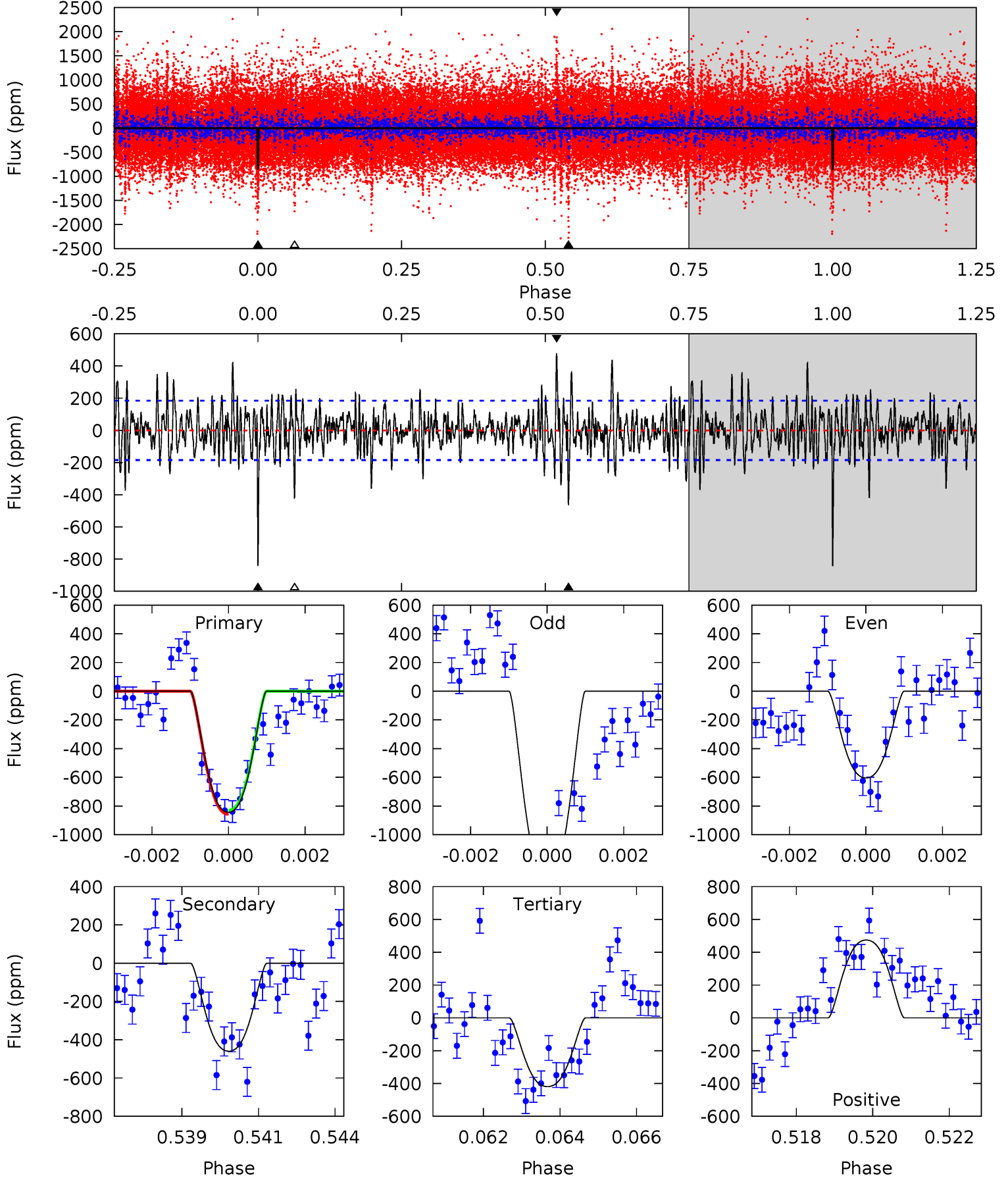
TCE 007970617-02 P=479.596087 Days  $T_0=569.584874$  (BKJD)



# DV Model-Shift Uniqueness Test

007970617-02, P = 479.547439 Days, E = 90.173281 Days

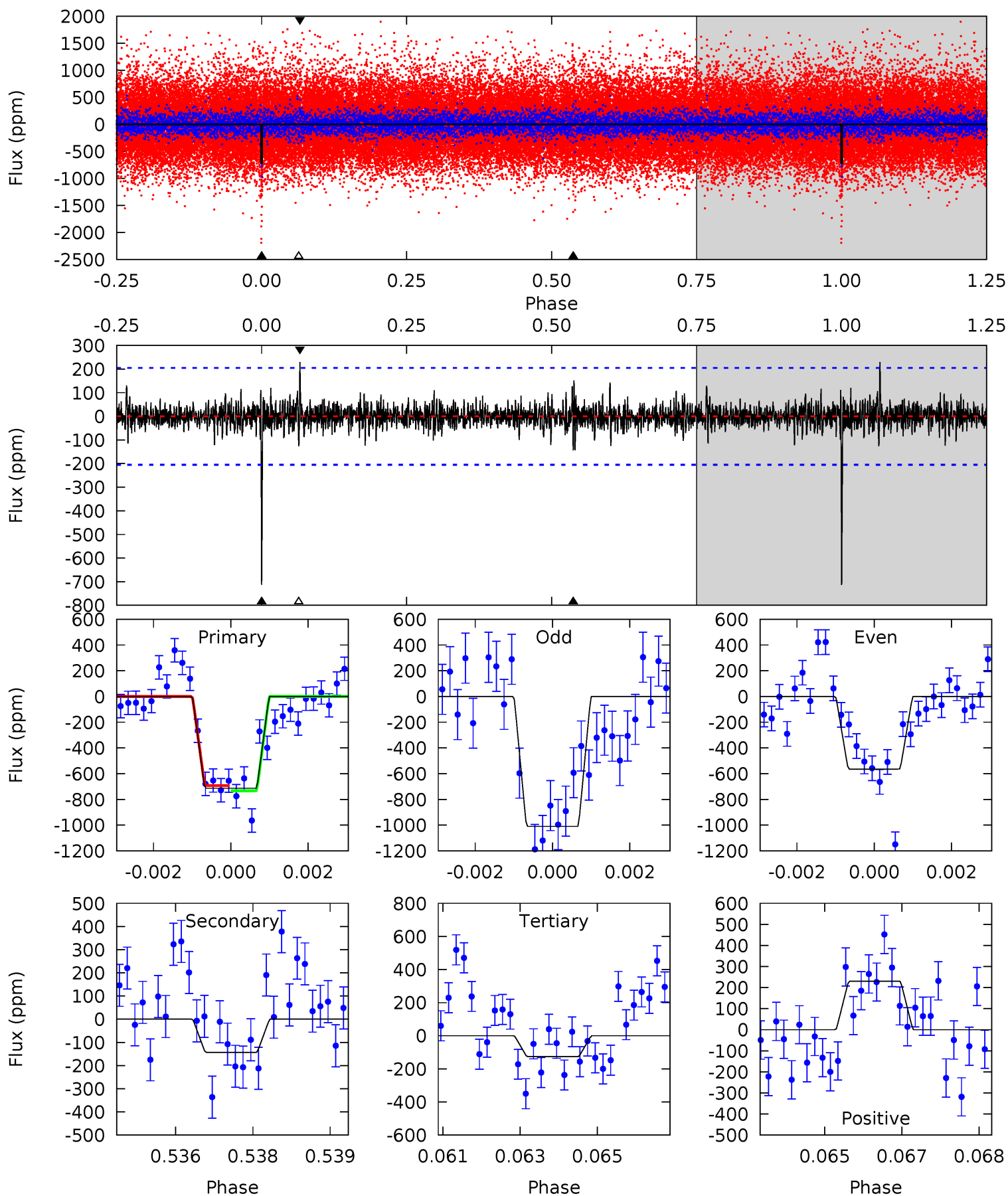
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
24.2	13.2	12.0	13.6	5.30	3.04	3.14	12.2	10.6	1.18	-0.41	9.65	1.07	0.36	0.41



# Alt Model-Shift Uniqueness Test

007970617-02, P = 479.596087 Days, E = 89.988787 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
18.7	3.73	3.31	6.01	5.36	3.14	0.90	15.3	12.6	0.43	-2.27	5.52	1.20	0.24	0.52





### Stellar Parameters For KIC 007970617

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5695^{+172}_{-172}$	$4.398^{+0.153}_{-0.187}$	$-0.320^{+0.300}_{-0.300}$	$0.951^{+0.253}_{-0.148}$	$0.824^{+0.118}_{-0.069}$	$1.350^{+0.947}_{-0.640}$
	+3%/-3%	+3%/-4%	+94%/-94%	+27%/-16%	+14%/-8%	+70%/-47%
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 007970617-02 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-460 \pm 35$	$3.94^{+0.87}_{-0.84}$	$323^{+24}_{-19}$	$4510^{+385}_{-300}$	$21074^{+12959}_{-7127}$
Alt.	$-143 \pm 38$	$2.79^{+0.84}_{-0.73}$	$323^{+24}_{-20}$	$4071^{+513}_{-355}$	$12299^{+11932}_{-5368}$

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

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

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

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

## DV Centroid Data

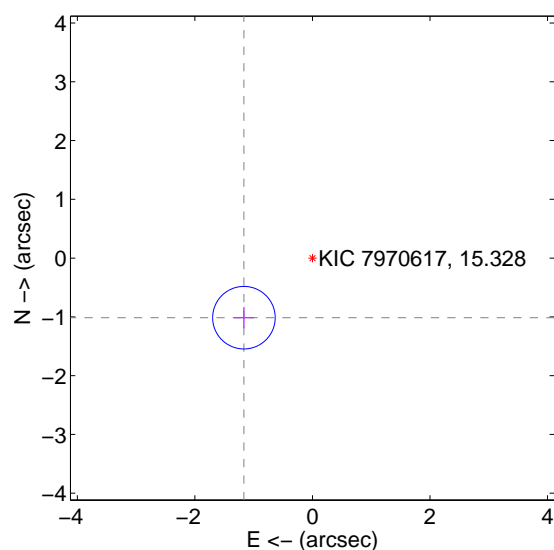
Supplemental centroid analysis for 007970617-02. Kepler magnitude: 15.33. Transit SNR 11.56

There are 1 quarters with good PRF difference image offsets

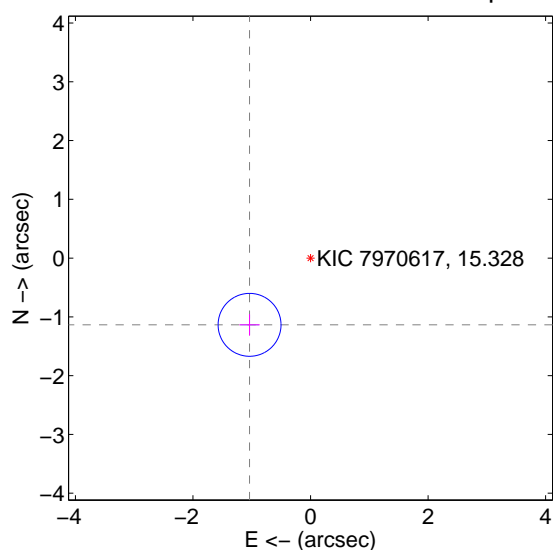
The direct PRF centroid is offset from the target star catalog position by about 0.18 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.545 \pm 0.177$	8.71	$1.166 \pm 0.173$	$-1.014 \pm 0.182$
PRF-fit source offset from KIC position	$1.538 \pm 0.178$	8.62	$1.037 \pm 0.173$	$-1.136 \pm 0.182$
photometric centroid source offset	$0.40 \pm 1.01$	0.40	$0.06 \pm 0.93$	$0.40 \pm 1.01$

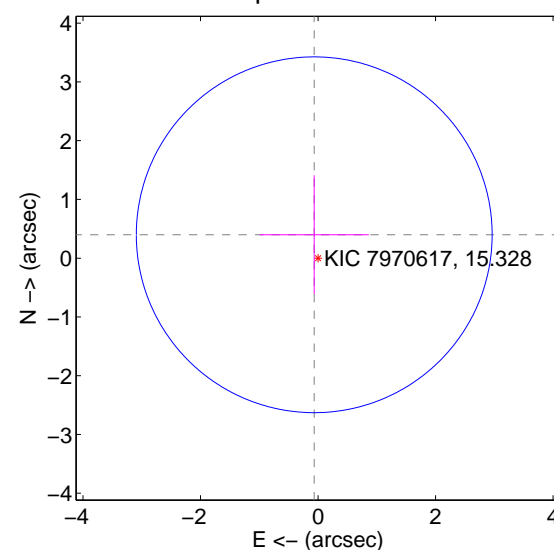
offset from difference PRF-fit to OOT PRF-fit



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.

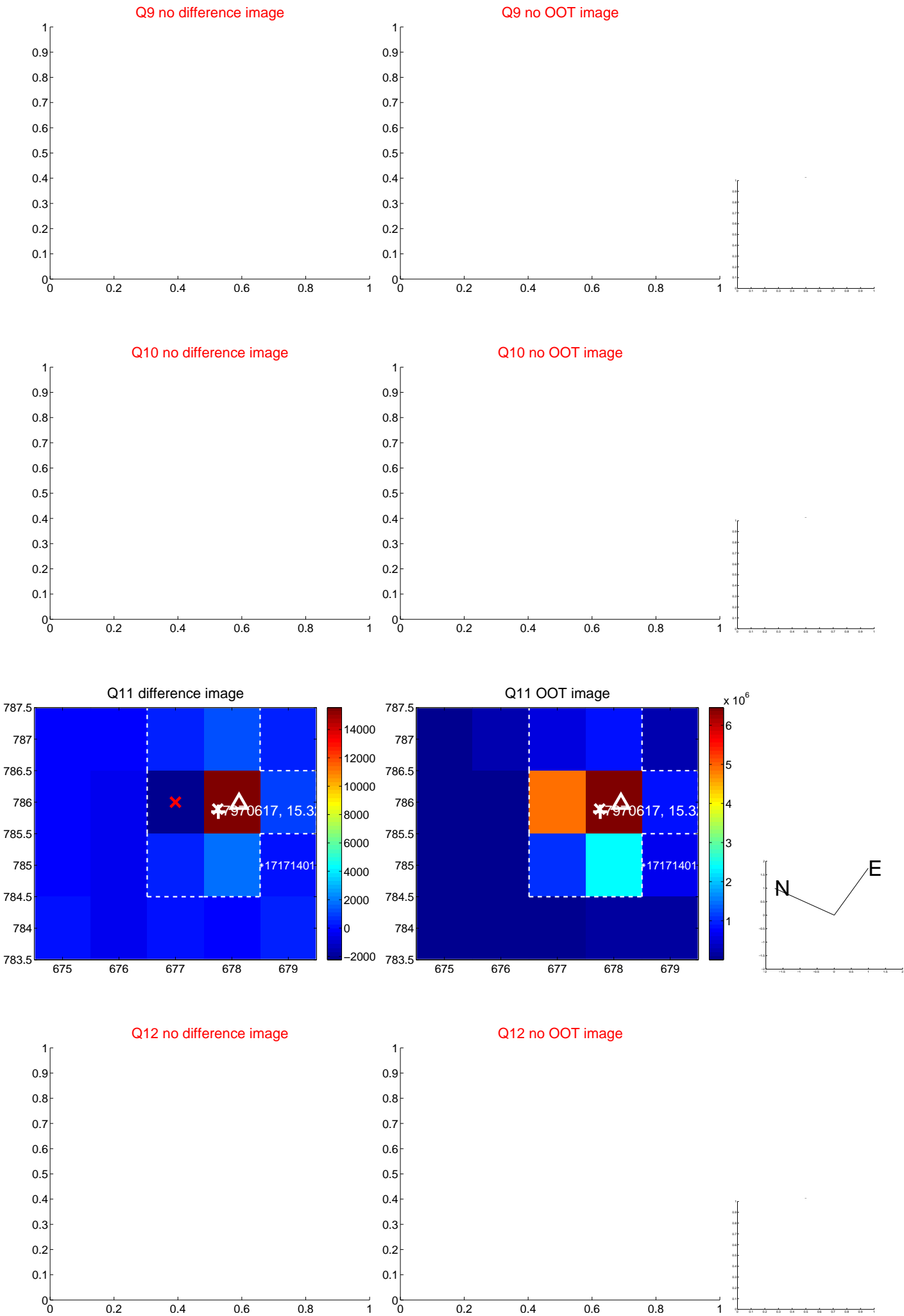
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



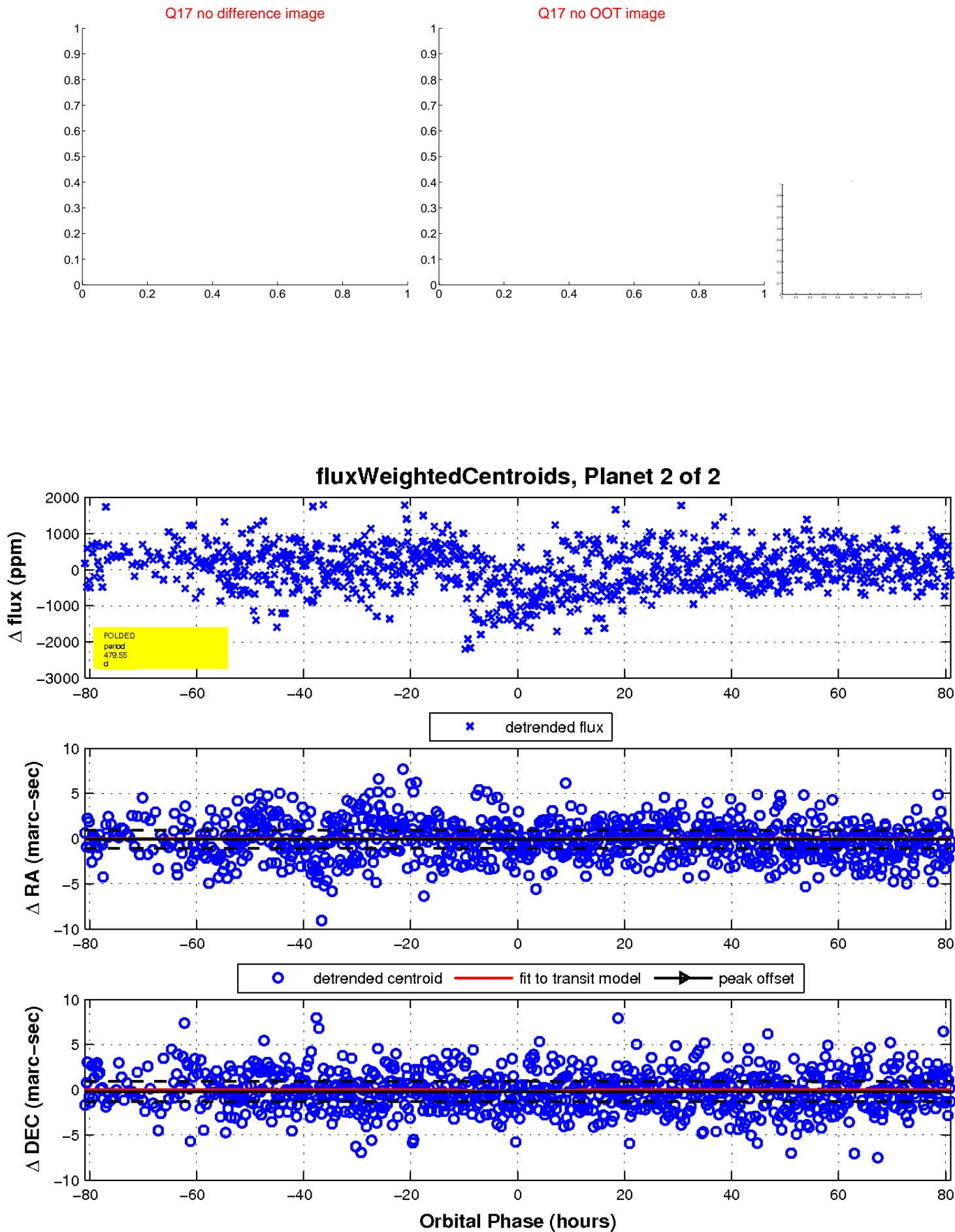
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.



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.



# UKIRT Image

Declination

