

# KIC 009517991

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009517991-01	OBS	No	220.914692	351.602108	0.0	145.239	4316.5	0.0	0.84	5775	0.01	1.44
009517991-02	OBS	No	224.925817	291.315055	3114.2	15.000	76.7	-1.0	0.84	5775	4.65	1.41
009517991-03	OBS	No	225.368544	286.458679	2780.8	15.000	51.7	-1.0	0.84	5775	4.40	1.40
009517991-04	OBS	No	240.600290	273.530936	150.0	59.082	919.2	2.2	0.84	5775	1.10	1.29
009517991-05	OBS	No	640.770968	284.809551	156.8	2.970	8.7	2.1	0.84	5775	1.25	0.35
009517991-06	OBS	No	336.035734	285.788611	306.0	1.832	8.8	2.4	0.84	5775	1.55	0.82

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009517991-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009517991-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_NOFITS
009517991-03	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_MARSHALL_SKYE_ZUMA—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_NOFITS—HALO_GHOST
009517991-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL_ZUMA—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS
009517991-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_TRACKER—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009517991-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_MARSHALL_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—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.

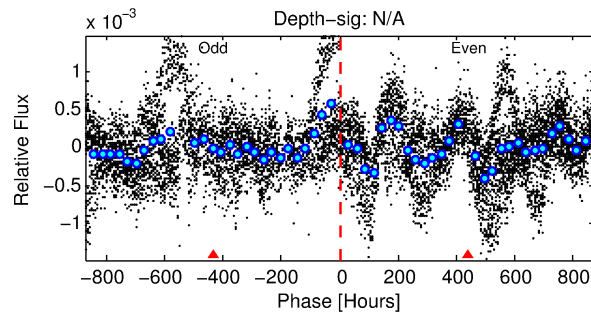
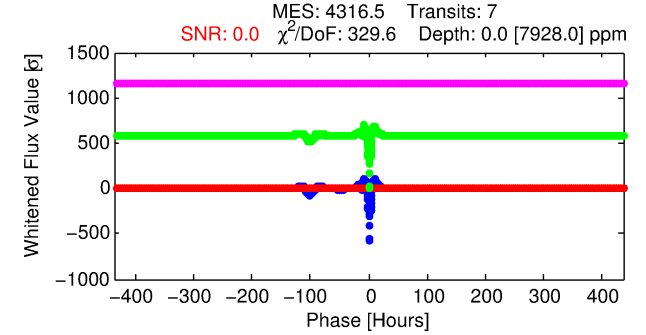
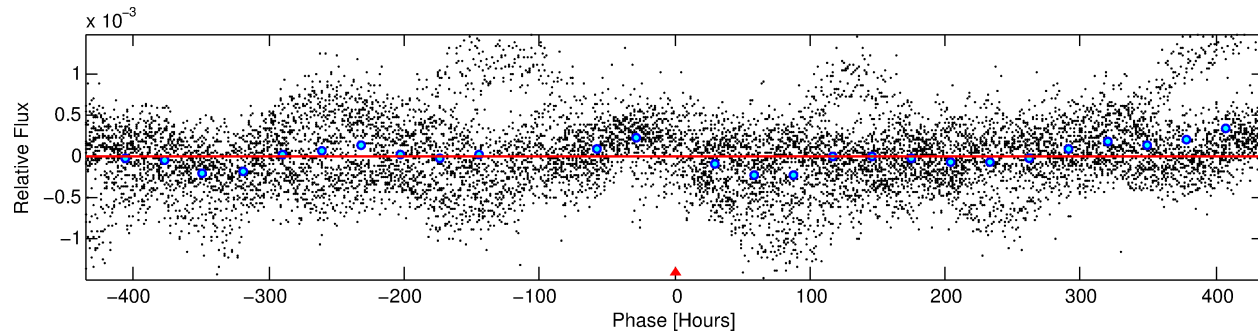
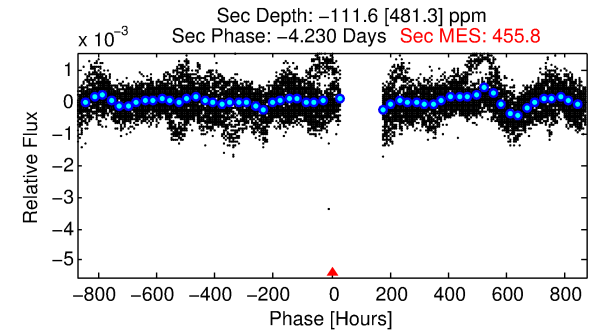
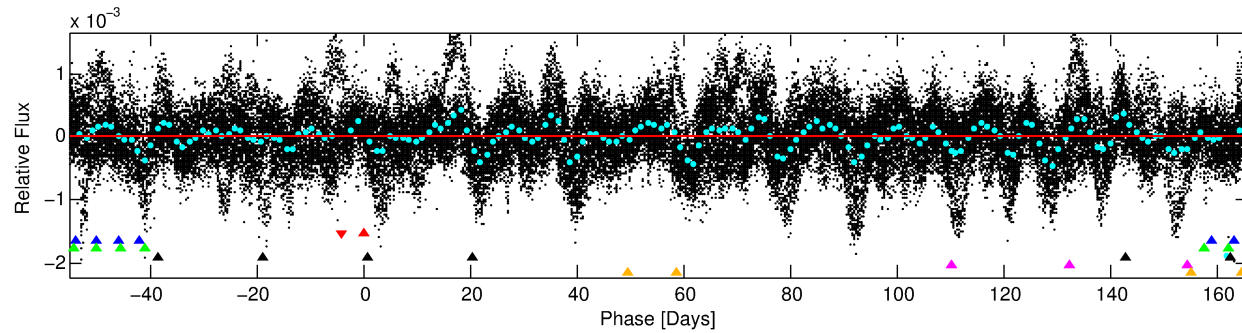
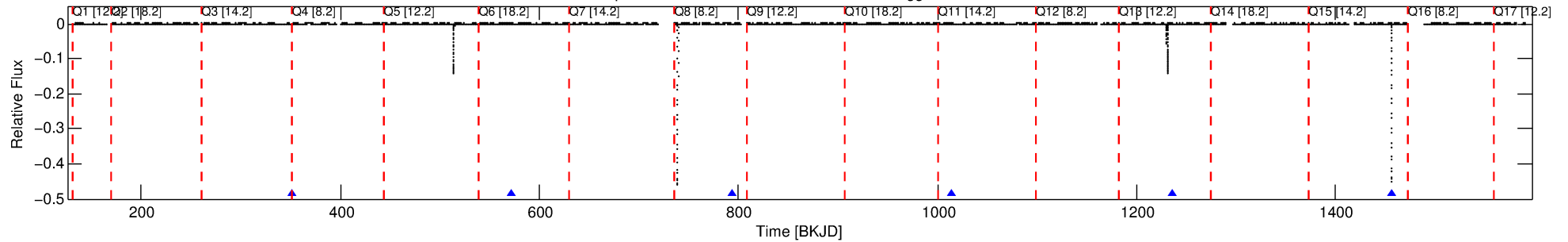
Ephemeris Match Information For 009517991-01

No Significant Match Found

# DV One-Page Summary

KIC: 9517991 Candidate: 1 of 6 Period: 220.915 d

Kp: 14.16 R\*: 0.84 Rs Teff: 5775.0 K Logg: 4.56 Fe/H: -0.220



## DV Fit Results:

Period = 220.91469 [1630146.80895] d  
 Epoch = 351.6021 [4099145.6453] BKJD  
 Rp/R\* = 0.0001 [686.4312]  
 a/R\* = 3.41 [141986985.82]  
 b = 0.96 [3818249.40]  
 Seff = 1.44 [14188.28]  
 Teq = 279 [687313] K  
 Rp = 0.01 [62920.44] Re  
 a = 0.6983 [3435.1360] AU  
 Ag = N/A  
 Teffp = N/A

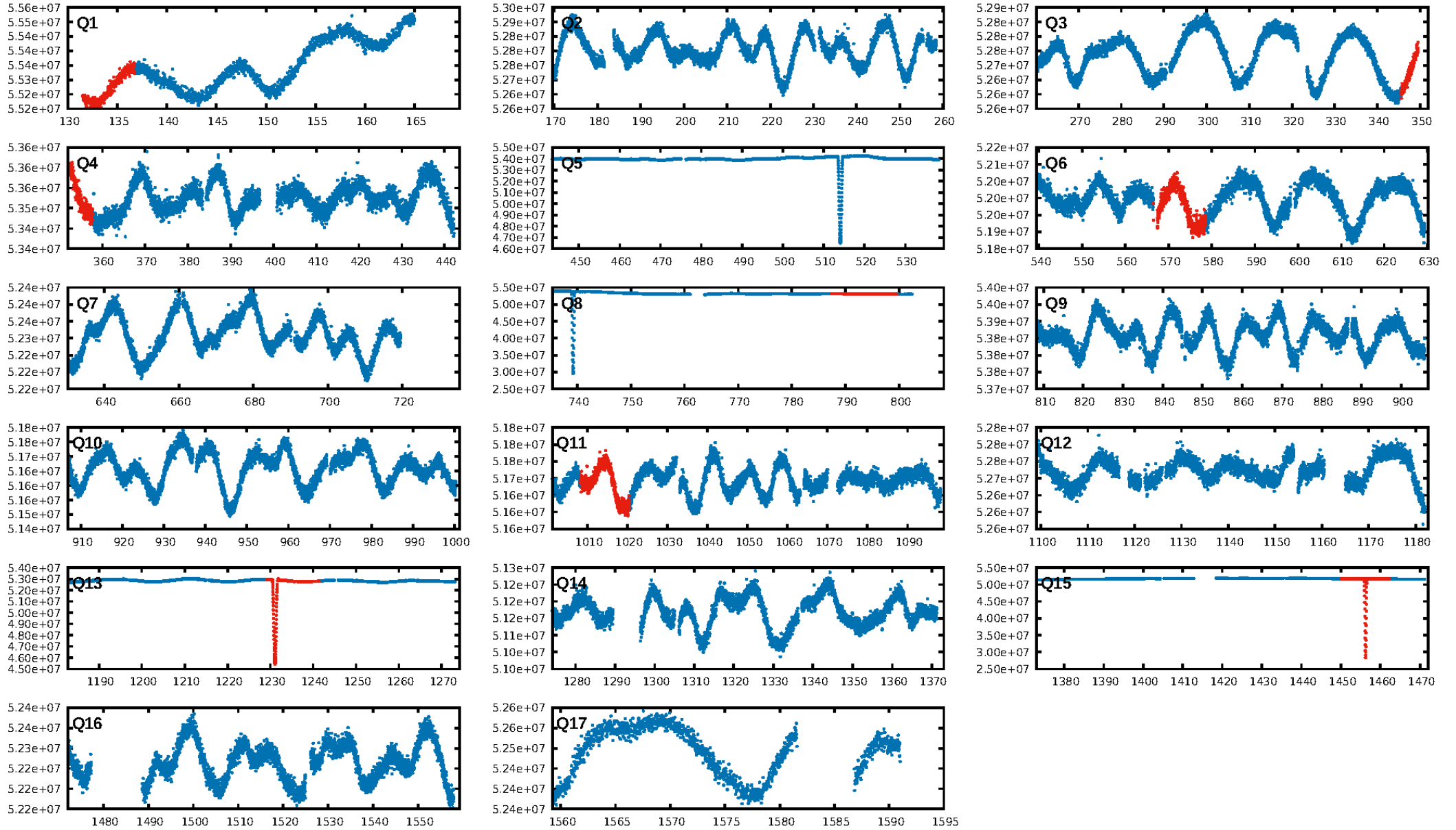
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
 LongPeriod-sig: 49.0% [0.66σ]  
 ModelChiSquare2-sig: 0.0%  
 ModelChiSquareGof-sig: 0.0%  
 Bootstrap-pfa: 0.00e+00  
 RollingBand-fgt: 1.00 [6/6]  
 GhostDiagnostic-chr: N/A  
 Centroid-sig: N/A  
 Centroid-so: N/A  
 OotOffset-rm: N/A  
 KicOffset-rm: N/A  
 OotOffset-st: 0/0/0/0 [0]  
 KicOffset-st: 0/0/0/0 [0]  
 DiffImageQuality-fgm: N/A  
 DiffImageOverlap-fno: N/A

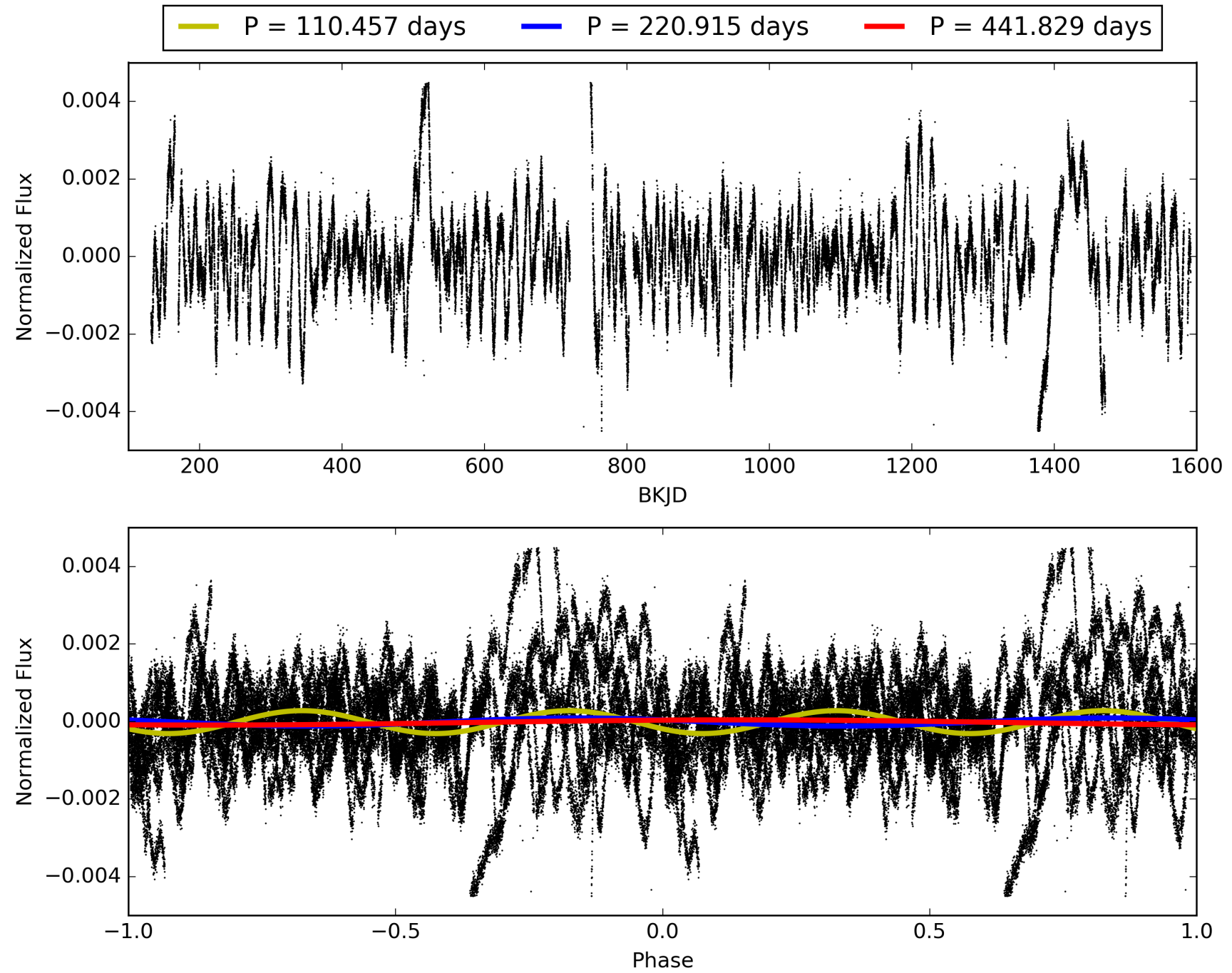
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 03:23:53 Z

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

# TCE 009517991-01, PDC Light Curves



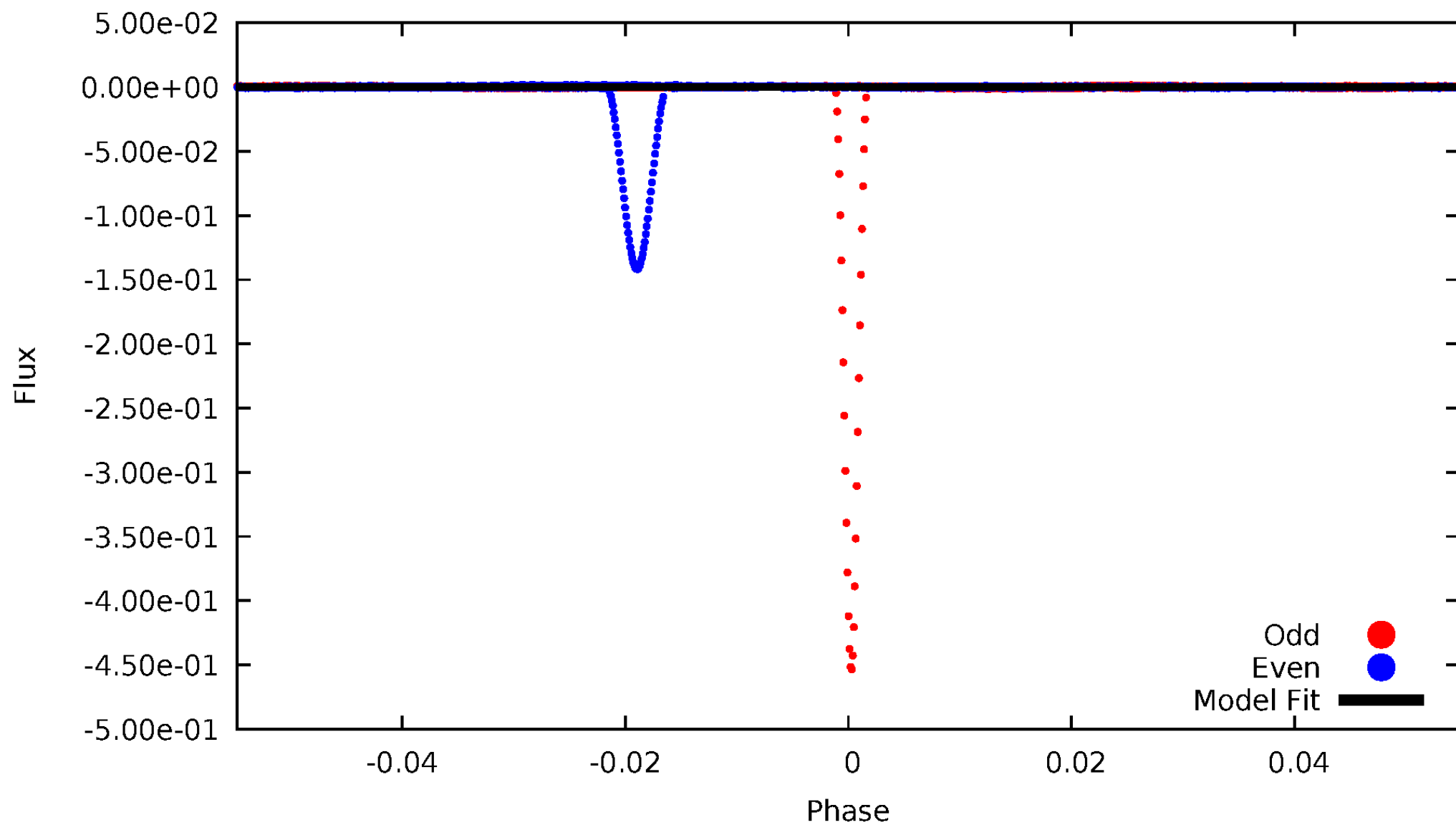
TCE 009517991-01





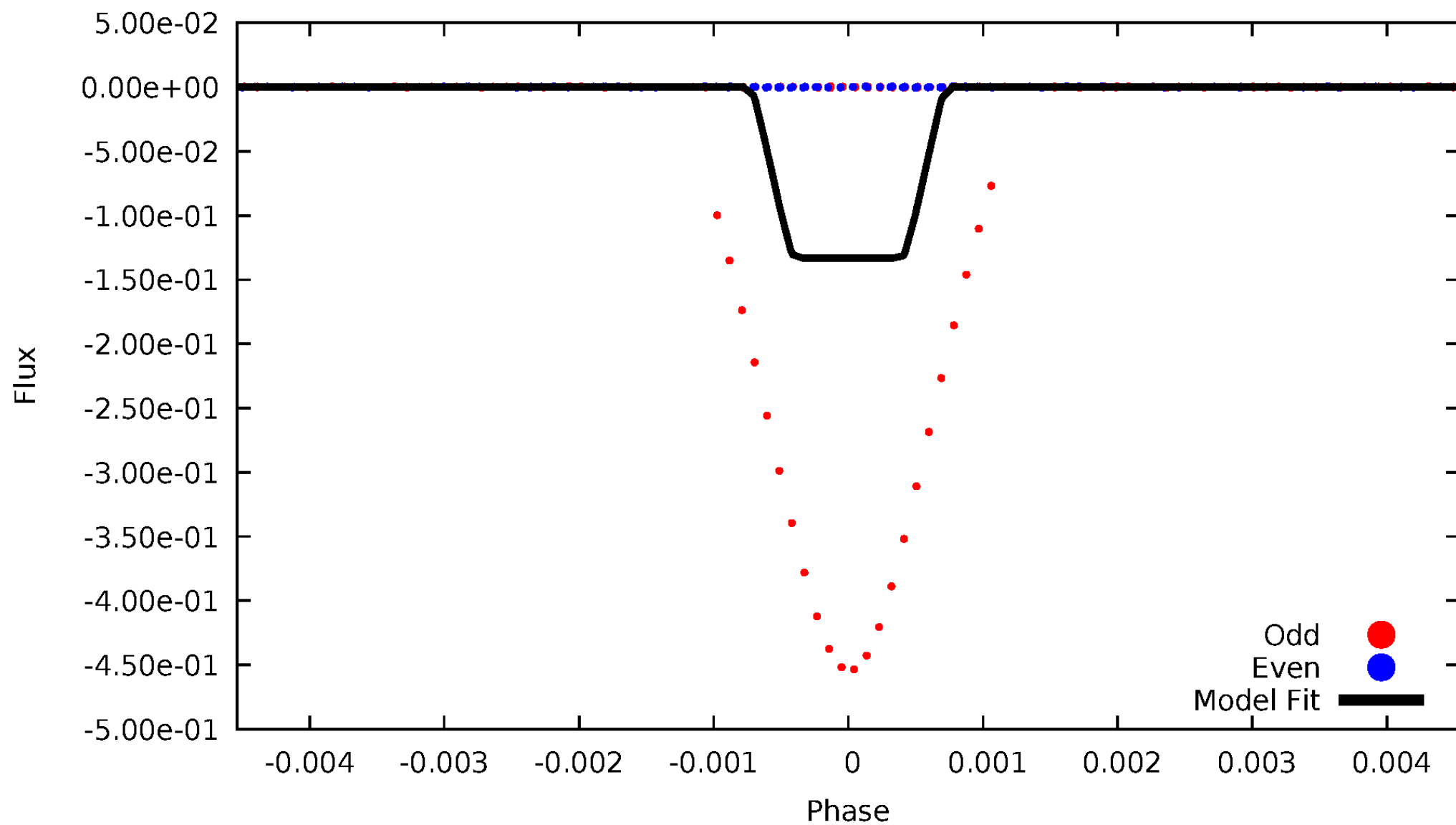
# DV Odd/Even

TCE 009517991-01



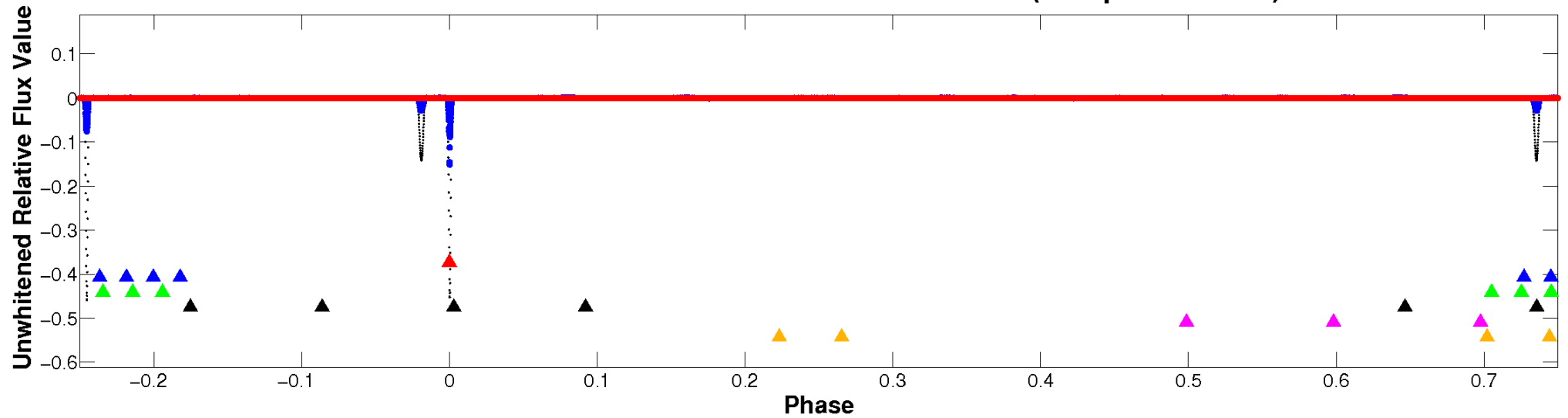
# ALT Odd/Even

TCE 009517991-01

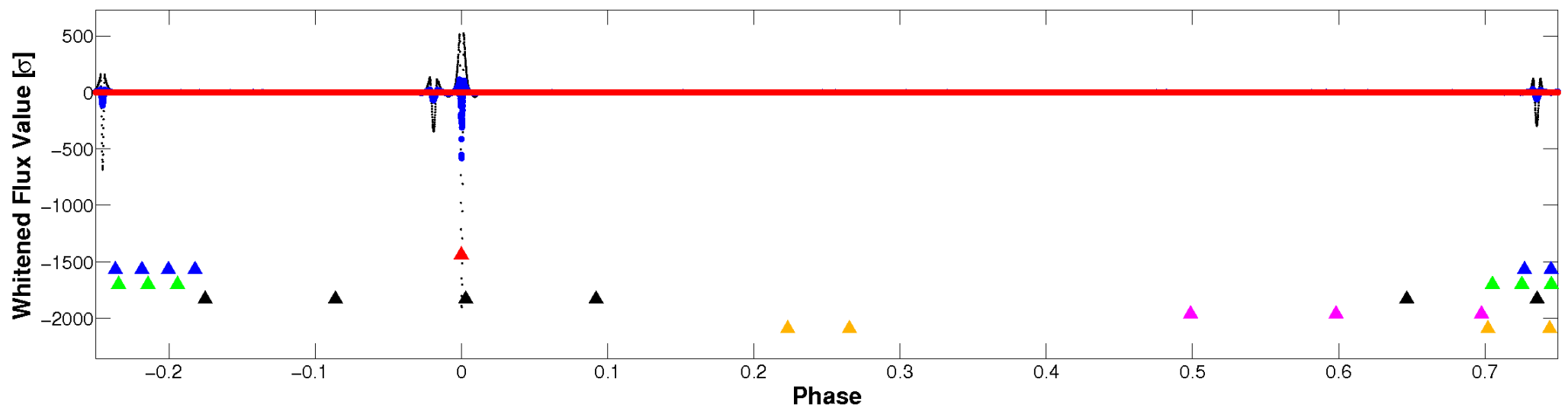


# Non-Whitened Vs. Whitened Light Curve

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

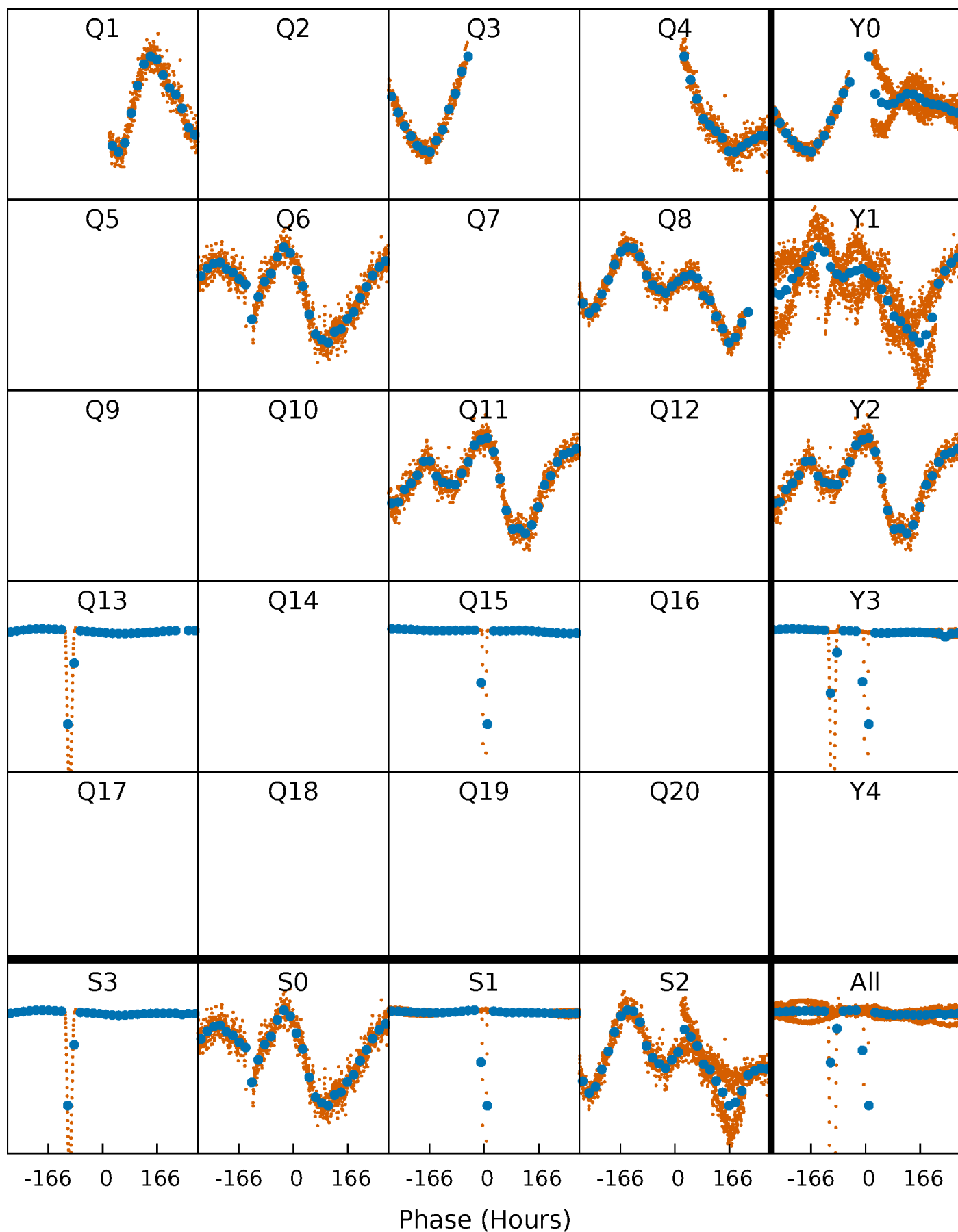


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



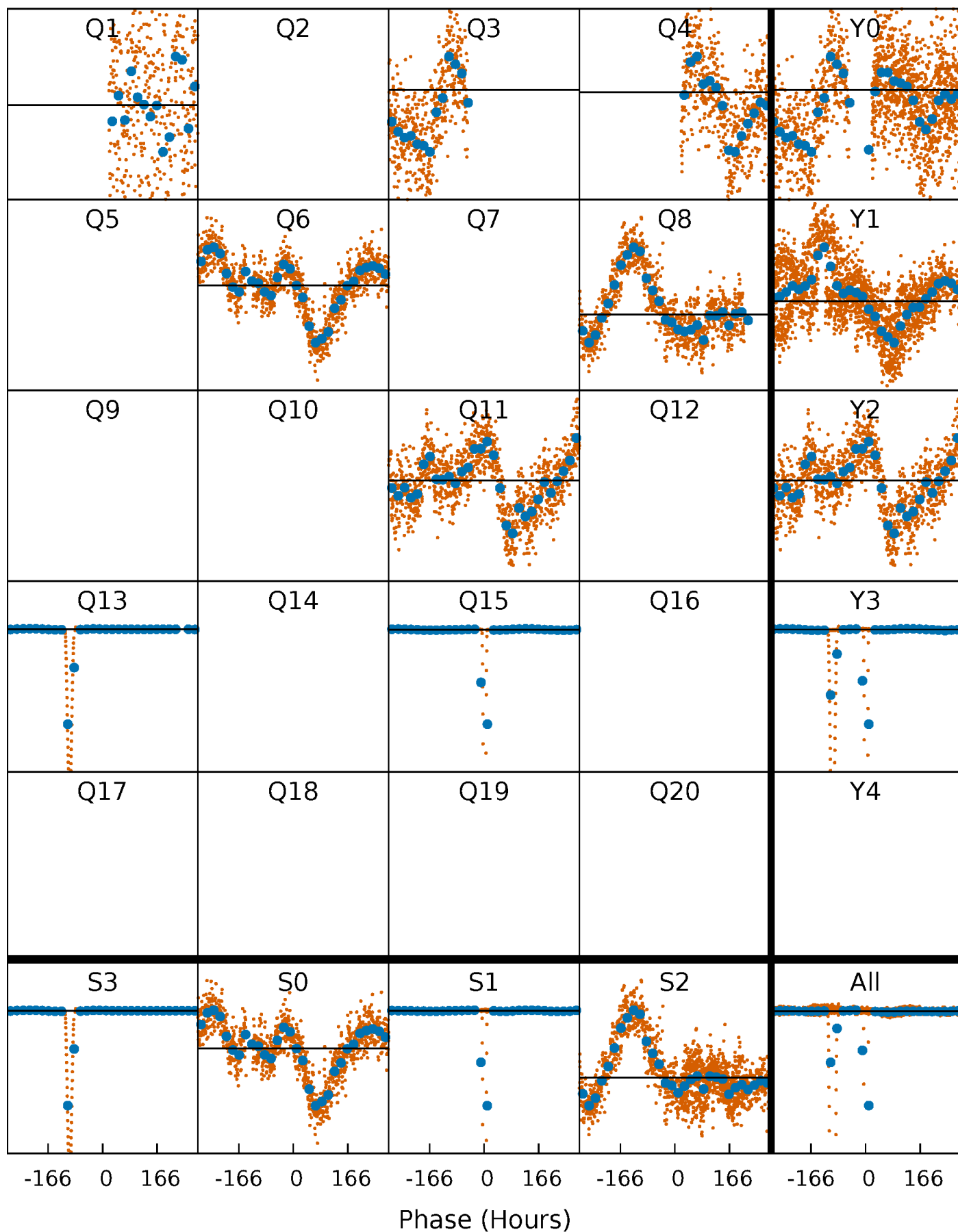
# PDC Quarter-Phased Transit Curves

TCE 009517991-01     $P=220.914692$  Days     $T_0=351.602108$  (BKJD)



# DV Quarter-Phased Transit Curves

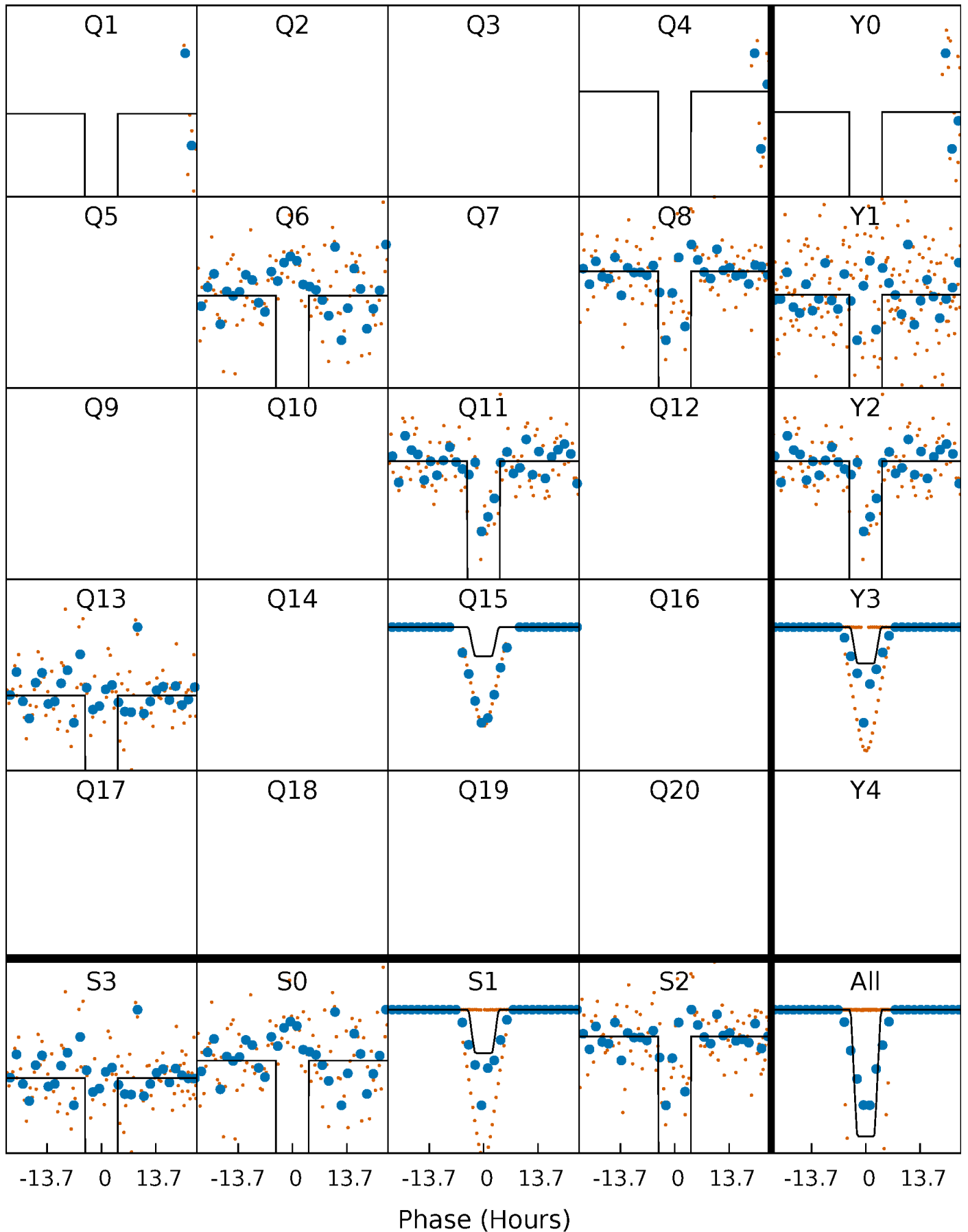
TCE 009517991-01 P=220.914692 Days  $T_0=351.602108$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

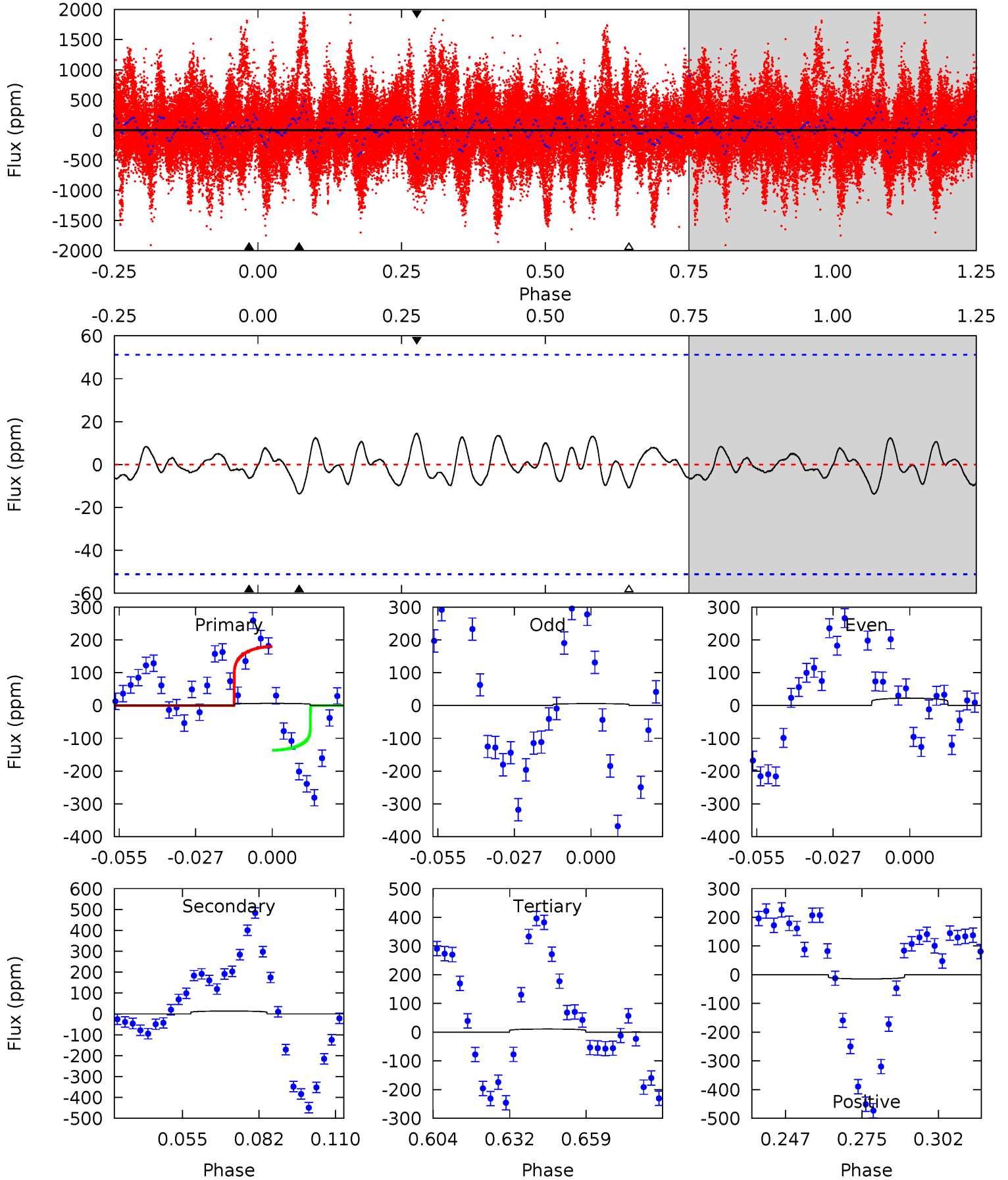
TCE 009517991-01 P=220.927651 Days  $T_0=351.593252$  (BKJD)



# DV Model-Shift Uniqueness Test

009517991-01, P = 220.914692 Days, E = 130.687416 Days

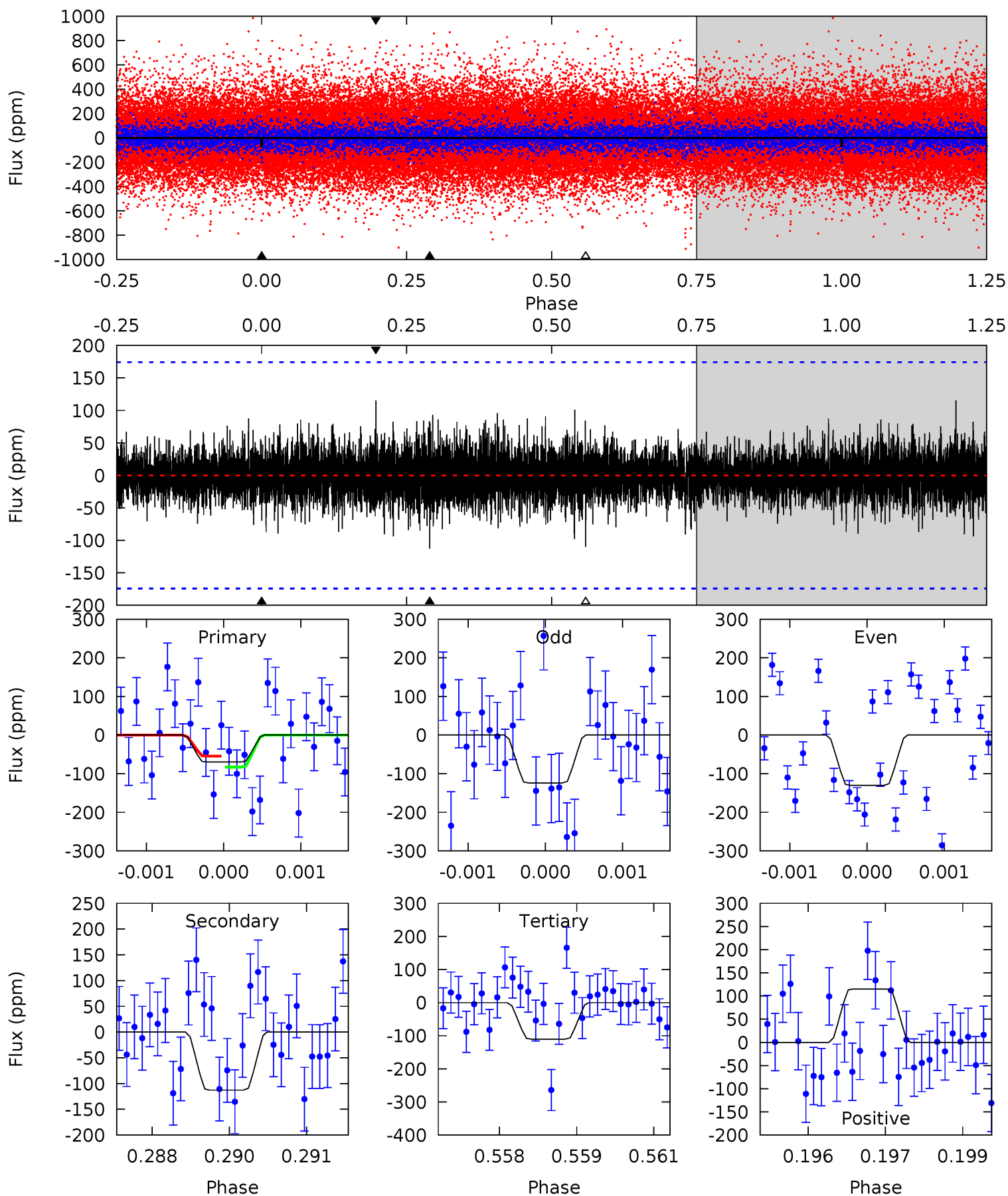
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
0.60	1.29	1.03	1.37	4.83	2.20	0.56	-0.43	-0.77	0.26	-0.08	0.78	200.8	0.52	2.03



# Alt Model-Shift Uniqueness Test

009517991-01, P = 220.927651 Days, E = 130.665601 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
2.15	3.48	3.40	3.56	5.38	3.18	0.80	-1.25	-1.41	0.08	-0.08	0.11	341.1	0.51	0.44



### Stellar Parameters For KIC 009517991

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5775^{+138}_{-155}$	$4.558^{+0.040}_{-0.160}$	$-0.220^{+0.300}_{-0.300}$	$0.840^{+0.199}_{-0.080}$	$0.934^{+0.090}_{-0.120}$	$2.219^{+0.380}_{-0.996}$
	+2%/-3%	+1%/-4%	+136%/-136%	+24%/-10%	+10%/-13%	+17%/-45%
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 009517991-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-14 \pm 11$	$46651.03^{+48051.03}_{-32492.75}$	$23^{+11}_{-5}$	$-697^{+1454}_{-71}$	$0.108^{+1.250}_{-0.103}$
Alt.	$-113 \pm 32$	$43654.10^{+47038.85}_{-32331.34}$	$24^{+13}_{-5}$	$751^{+122}_{-1475}$	$1.182^{+18.578}_{-1.024}$

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

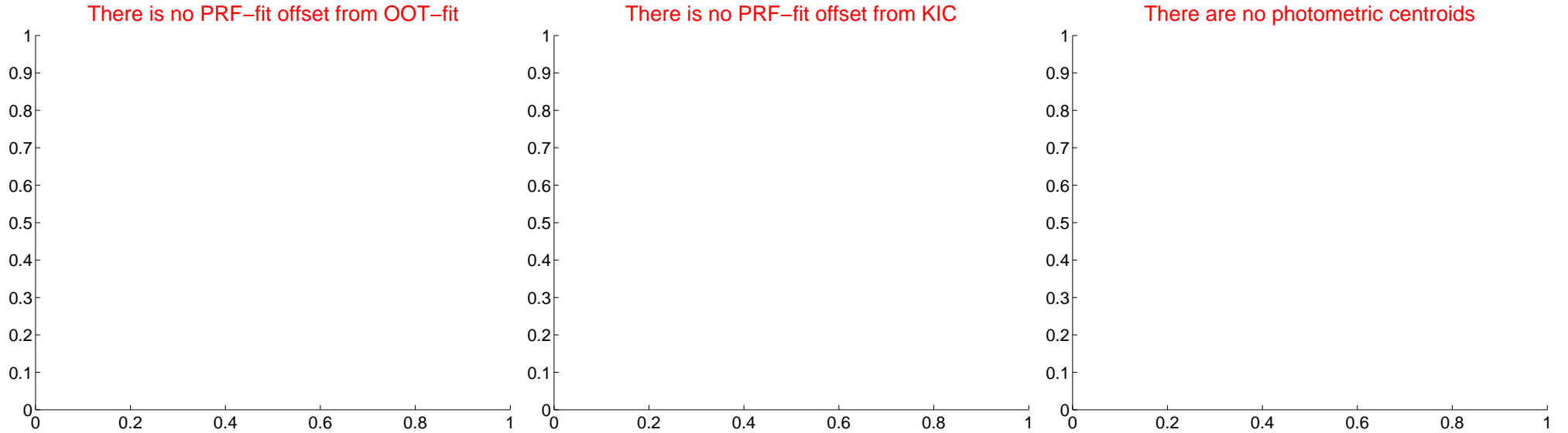
## DV Centroid Data

Supplemental centroid analysis for 009517991-01. Kepler magnitude: 14.16. Transit SNR 0.00

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	—	—	—	—



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.

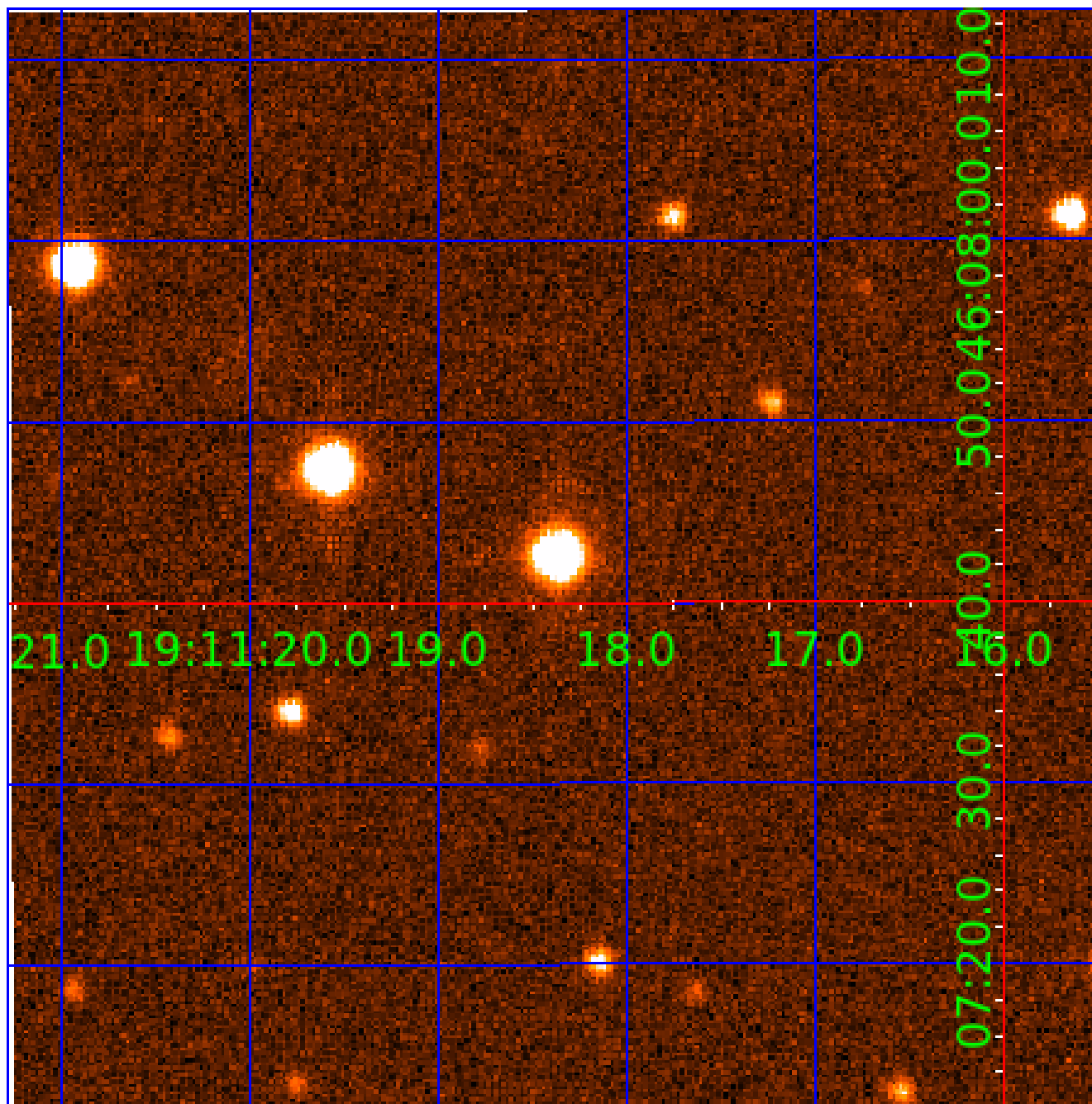


folded centroid time series figure for this object.



UKIRT Image

Declination



# KIC 009517991

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009517991-01	OBS	No	220.914692	351.602108	0.0	145.239	4316.5	0.0	0.84	5775	0.01	1.44
009517991-02	OBS	No	224.925817	291.315055	3114.2	15.000	76.7	-1.0	0.84	5775	4.65	1.41
009517991-03	OBS	No	225.368544	286.458679	2780.8	15.000	51.7	-1.0	0.84	5775	4.40	1.40
009517991-04	OBS	No	240.600290	273.530936	150.0	59.082	919.2	2.2	0.84	5775	1.10	1.29
009517991-05	OBS	No	640.770968	284.809551	156.8	2.970	8.7	2.1	0.84	5775	1.25	0.35
009517991-06	OBS	No	336.035734	285.788611	306.0	1.832	8.8	2.4	0.84	5775	1.55	0.82

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009517991-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009517991-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_NOFITS
009517991-03	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_MARSHALL_SKYE_ZUMA—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT— INCONSISTENT_TRANS—CENT_NOFITS—HALO_GHOST
009517991-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL_ZUMA—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT— MOD_POS_ALT—INCONSISTENT_TRANS
009517991-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_TRACKER—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT— MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009517991-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_MARSHALL_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV— MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—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.

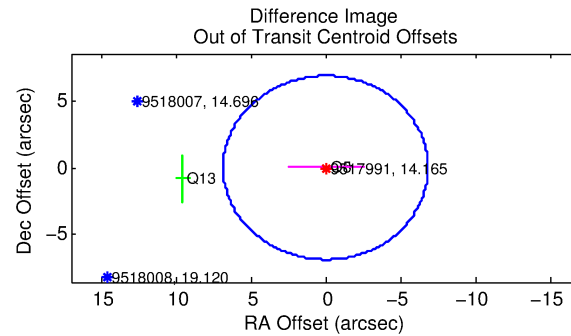
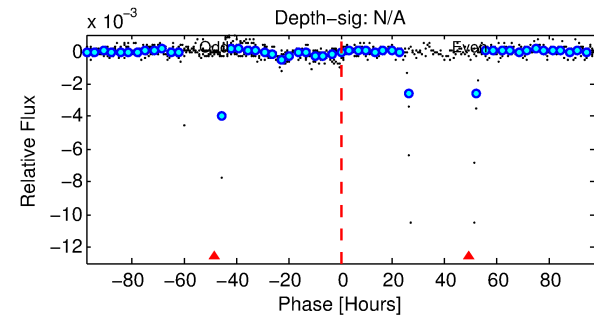
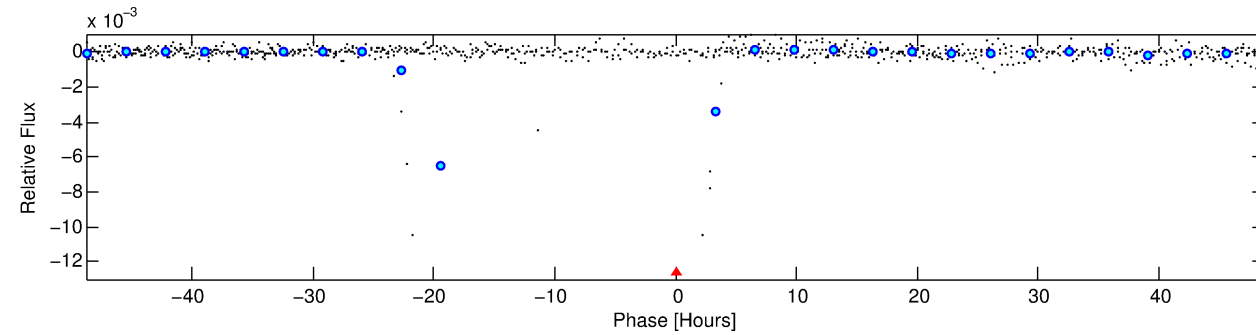
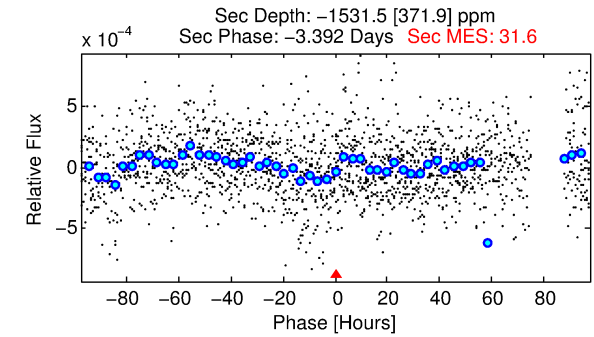
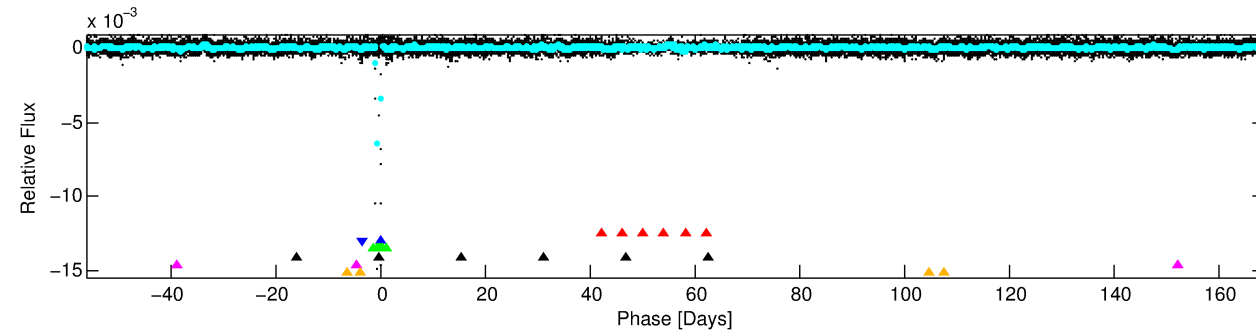
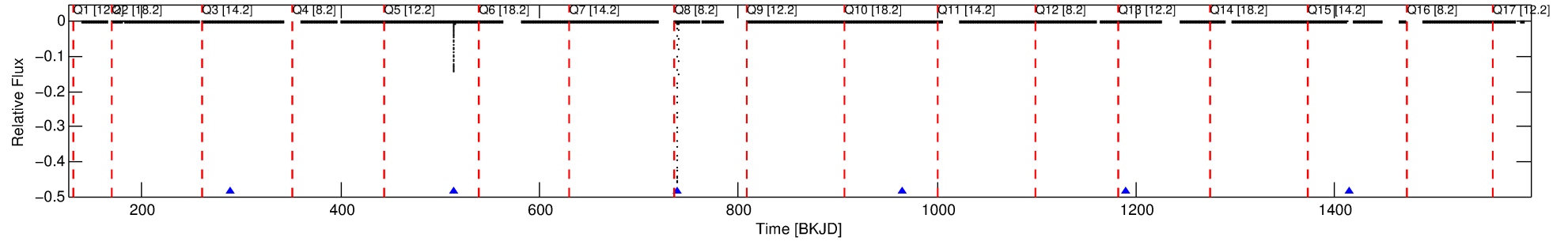
## Ephemeris Match Information For 009517991-02

No Significant Match Found

# DV One-Page Summary

KIC: 9517991 Candidate: 2 of 6 Period: 224.926 d

Kp: 14.16 R\*: 0.84 Rs Teff: 5775.0 K Logg: 4.56 Fe/H: -0.220



## TPS TCE Results:

Period = 224.92582 d  
Epoch = 291.3151 BKJD

DV fit results are unavailable

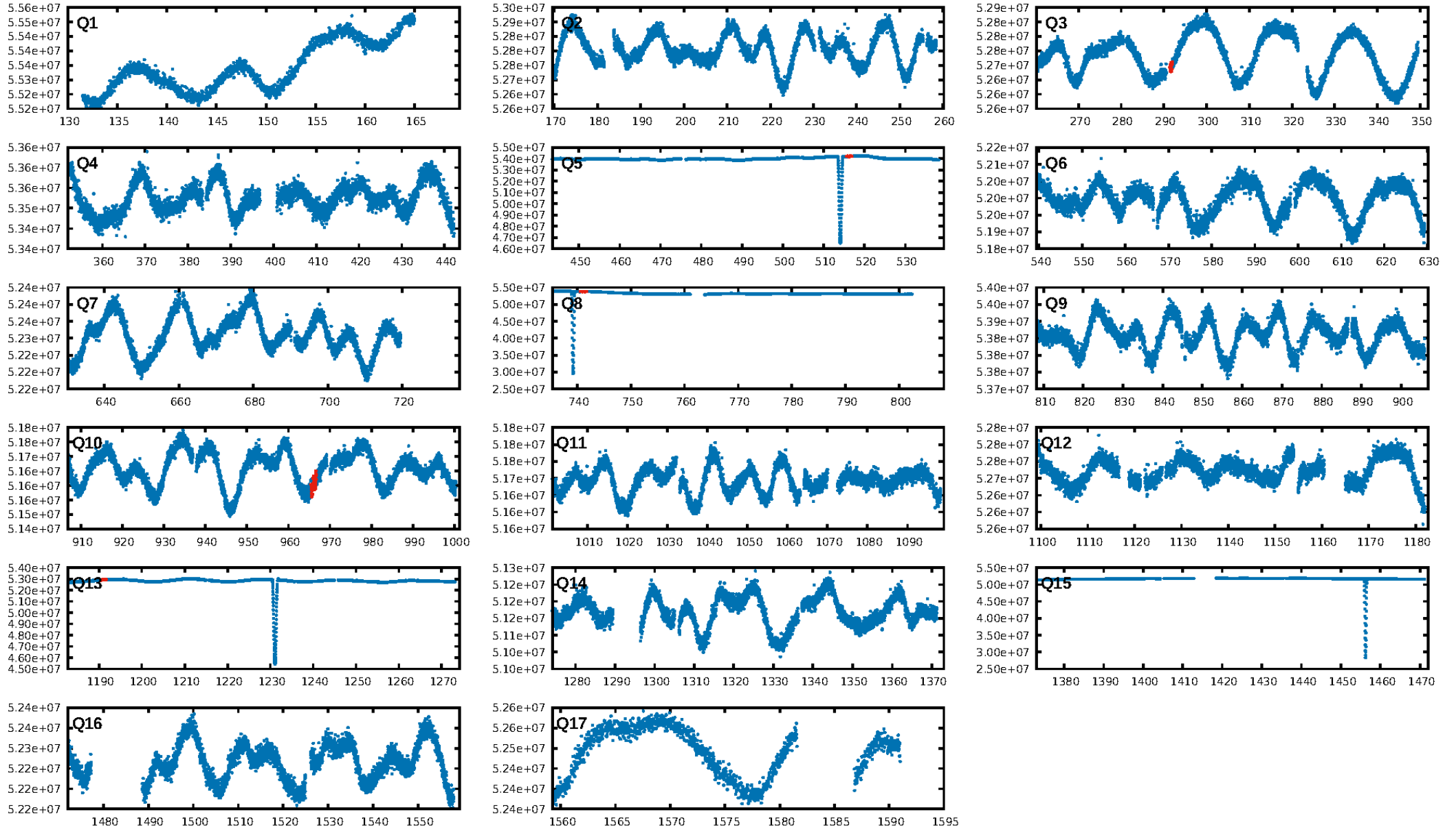
## DV Diagnostic Results:

ShortPeriod-sig: 49.0% [0.66 $\sigma$ ]  
LongPeriod-sig: 38.4% [0.50 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [5/5]  
GhostDiagnostic-chr: 0.2917  
Centroid-sig: 0.0%  
Centroid-so: 1.066 arcsec [34.83 $\sigma$ ]  
OotOffset-rm: 0.013 arcsec [0.01 $\sigma$ ]  
KicOffset-rm: 0.235 arcsec [0.36 $\sigma$ ]  
OotOffset-st: 0/0/1/2 [3]  
KicOffset-st: 0/0/1/2 [3]  
DiffImageQuality-fgm: 0.67 [2/3]  
DiffImageOverlap-fno: 0.00 [0/4]

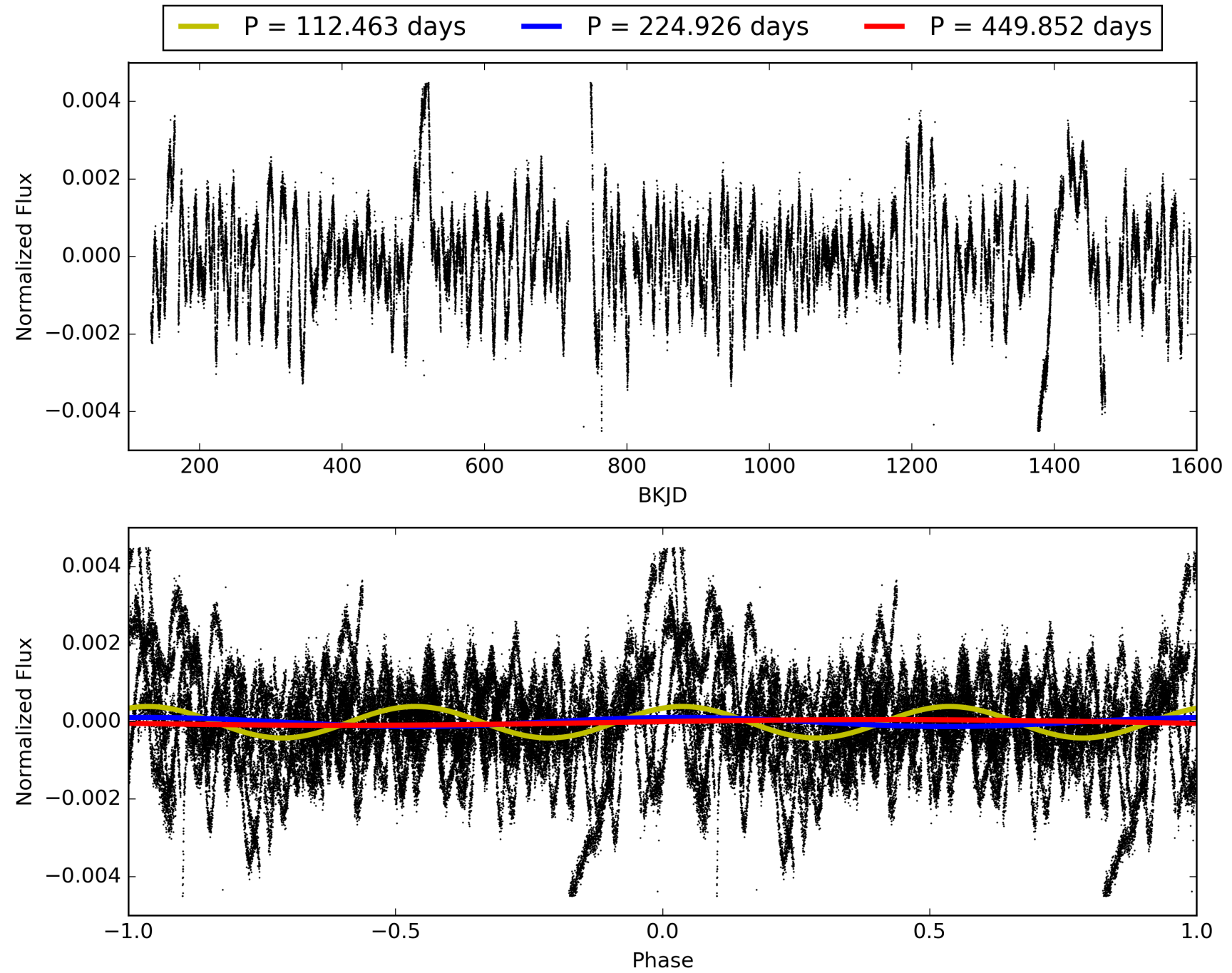
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 03:24:00 Z

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

# TCE 009517991-02, PDC Light Curves



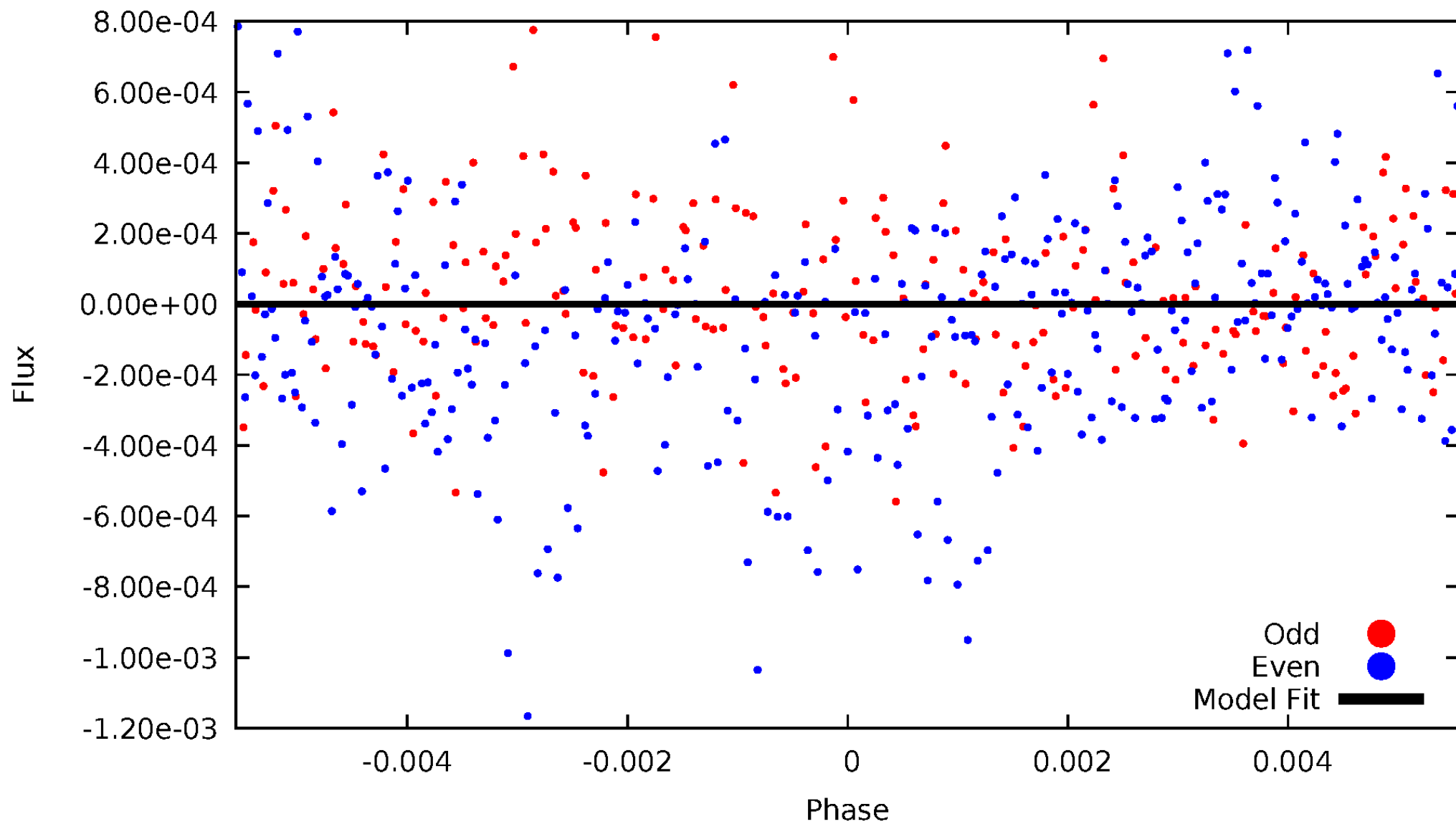
TCE 009517991-02





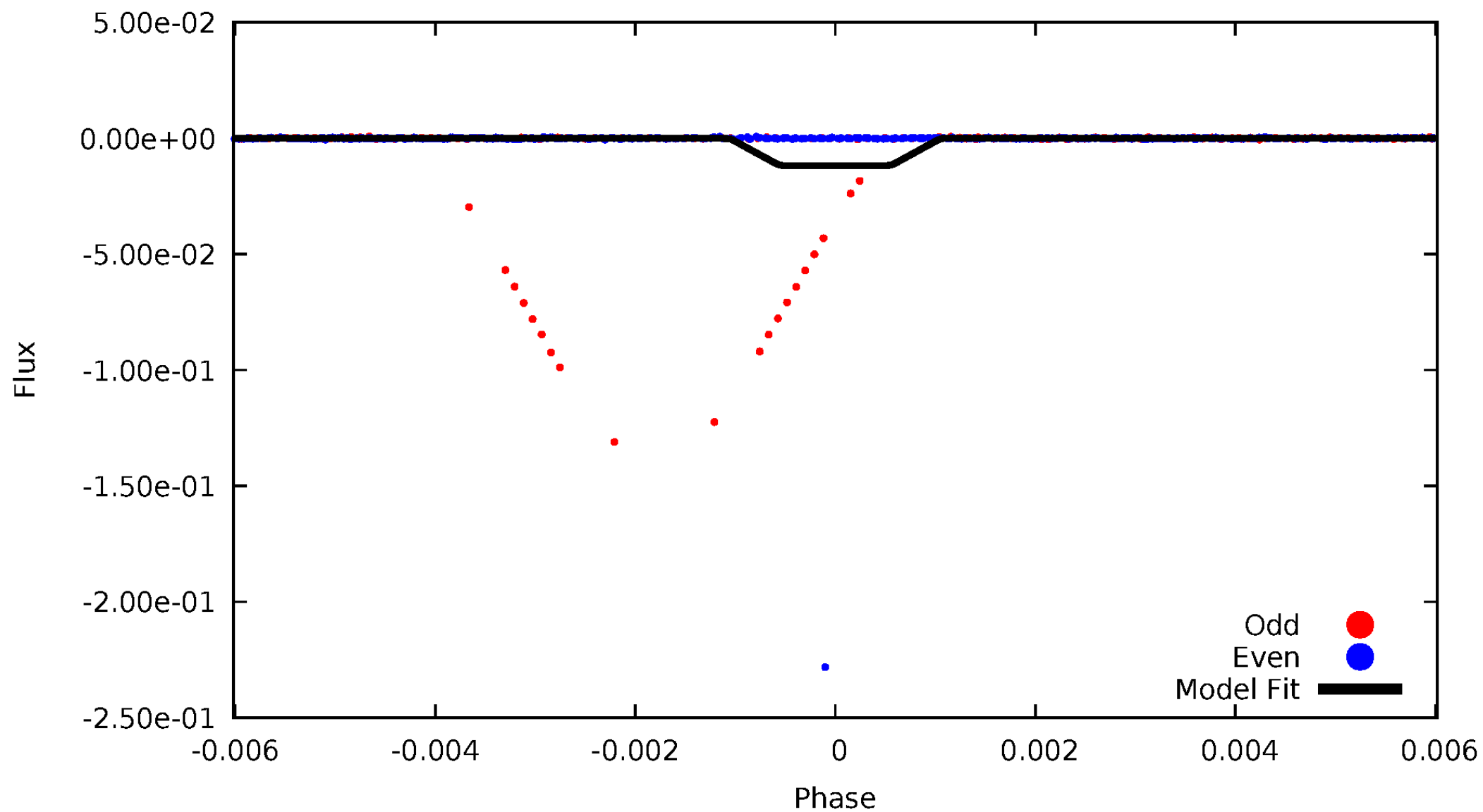
# DV Odd/Even

TCE 009517991-02



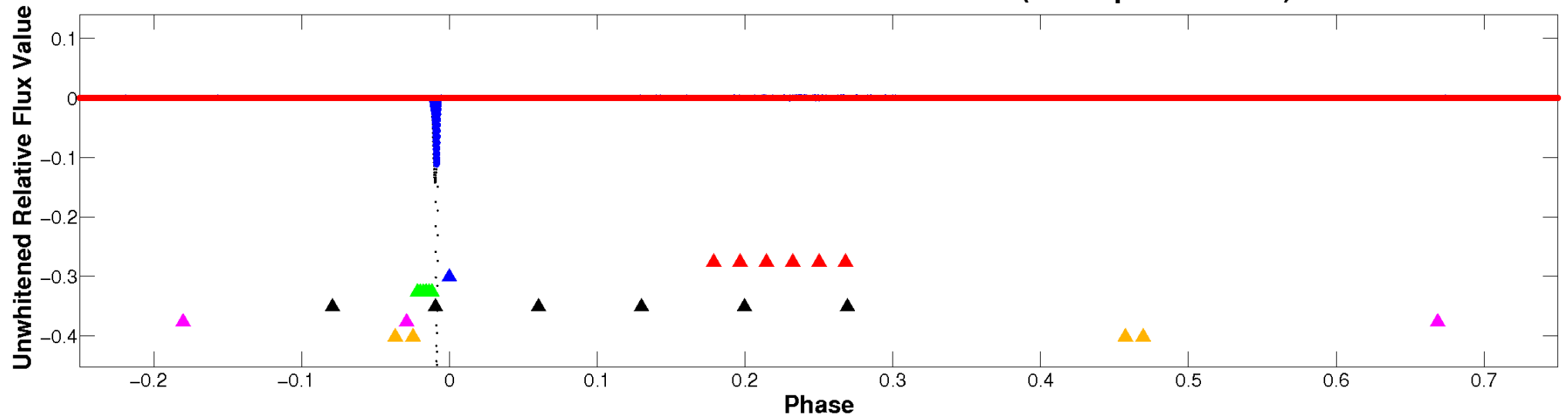
# ALT Odd/Even

TCE 009517991-02



# Non-Whitened Vs. Whitened Light Curve

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

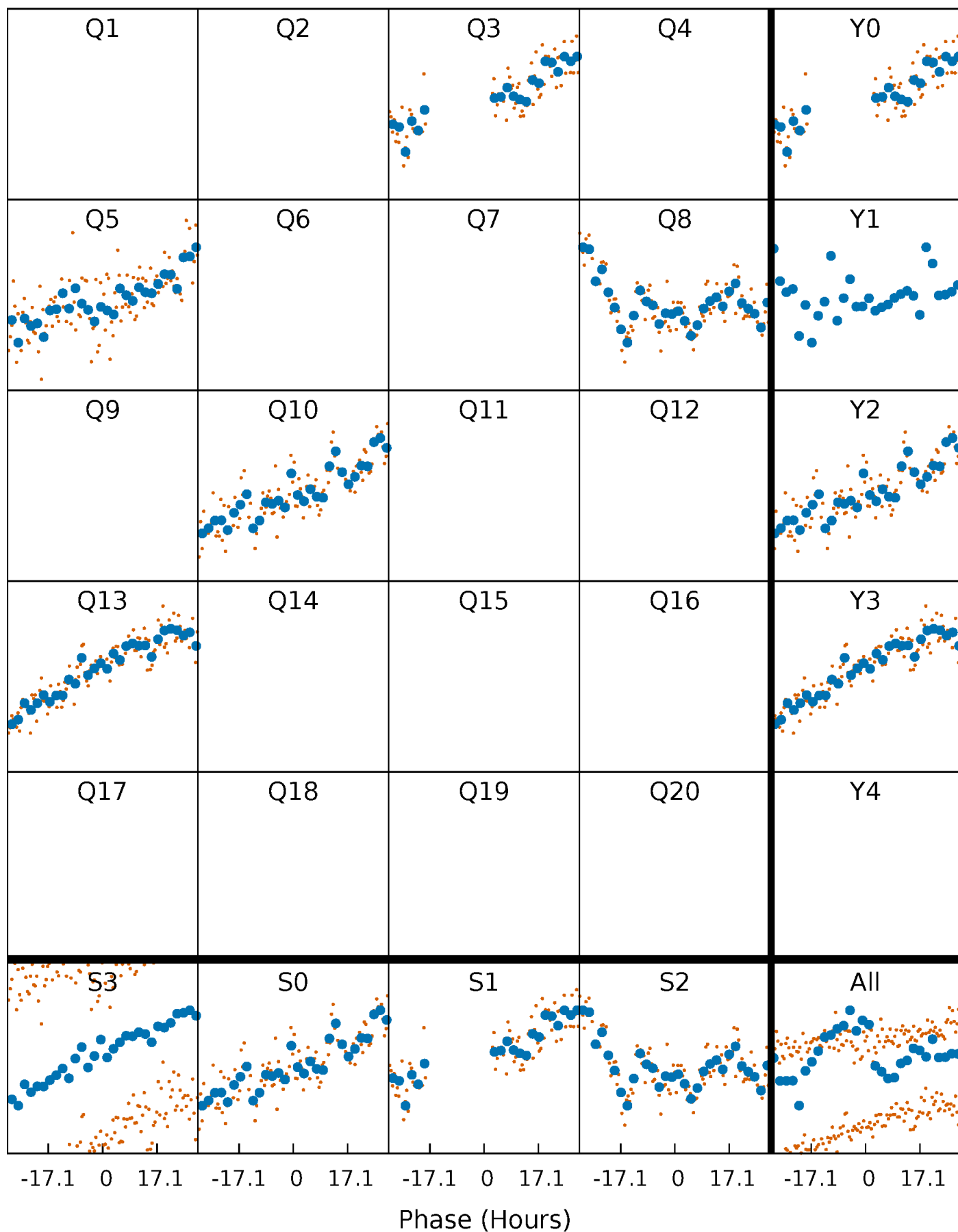


**Planet 2 : Phased Whitened Flux Time Series (TPS Epoch/Period)**



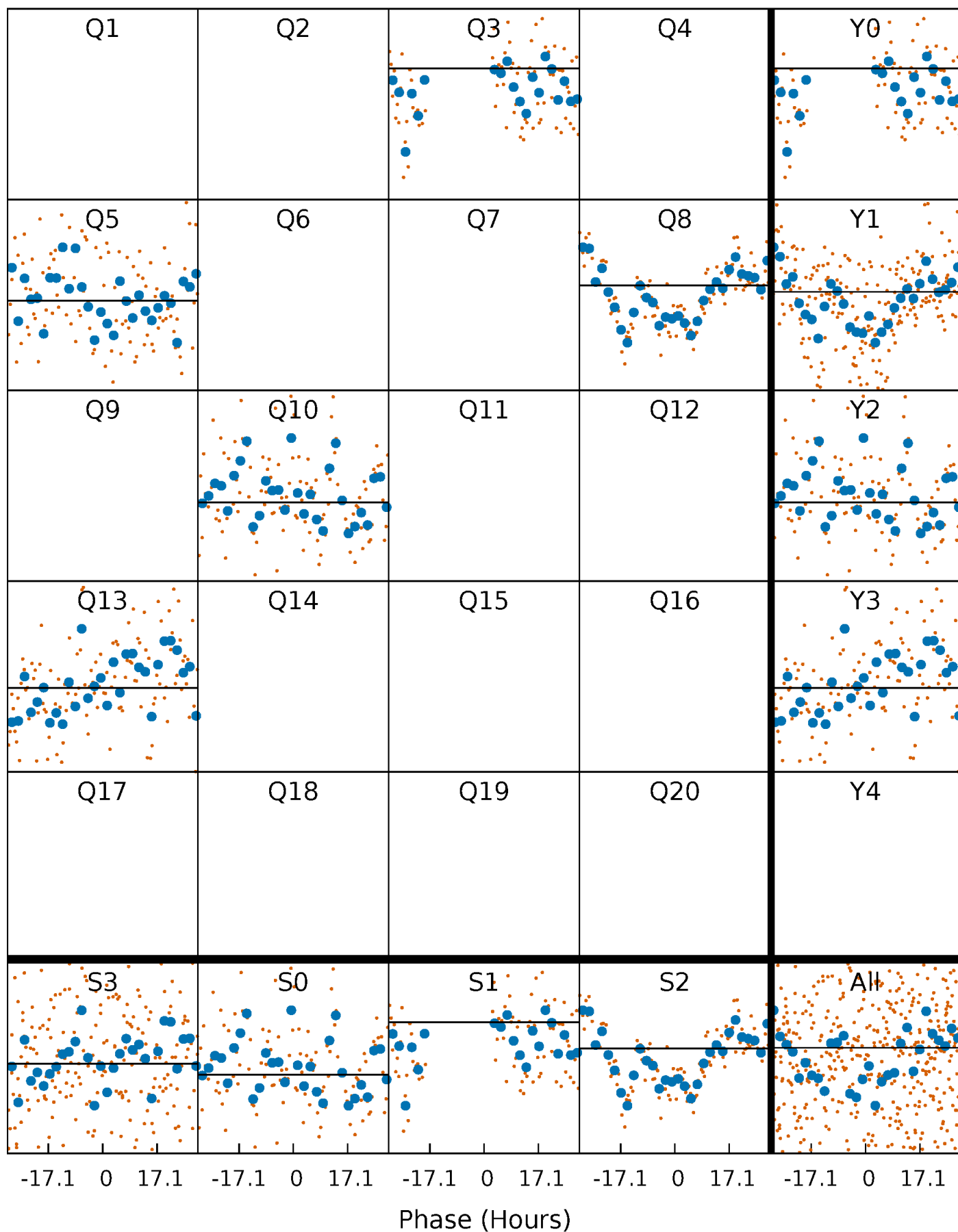
# PDC Quarter-Phased Transit Curves

TCE 009517991-02     $P=224.925817$  Days     $T_0=291.315055$  (BKJD)



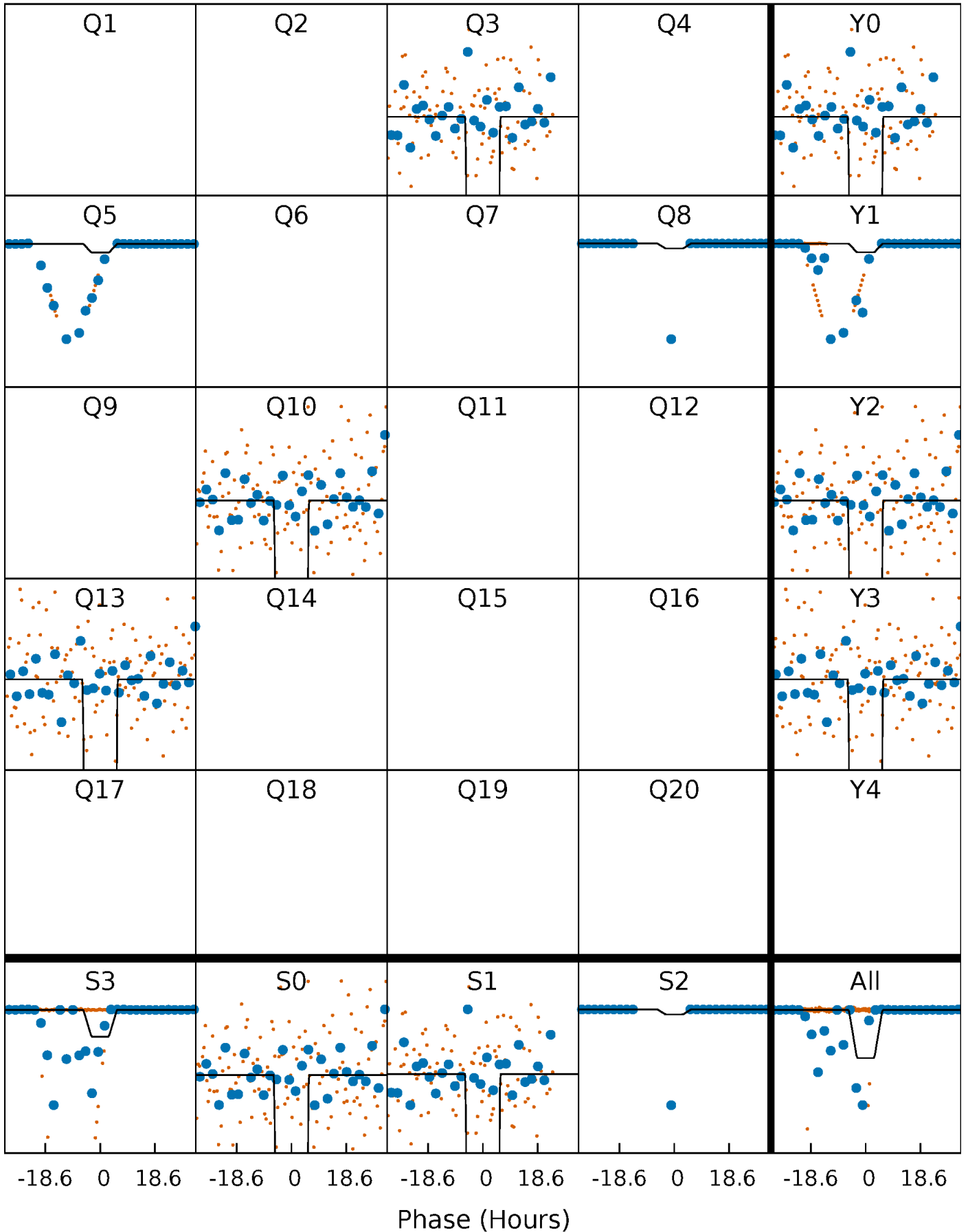
# DV Quarter-Phased Transit Curves

TCE 009517991-02   P=224.925817 Days    $T_0=291.315055$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

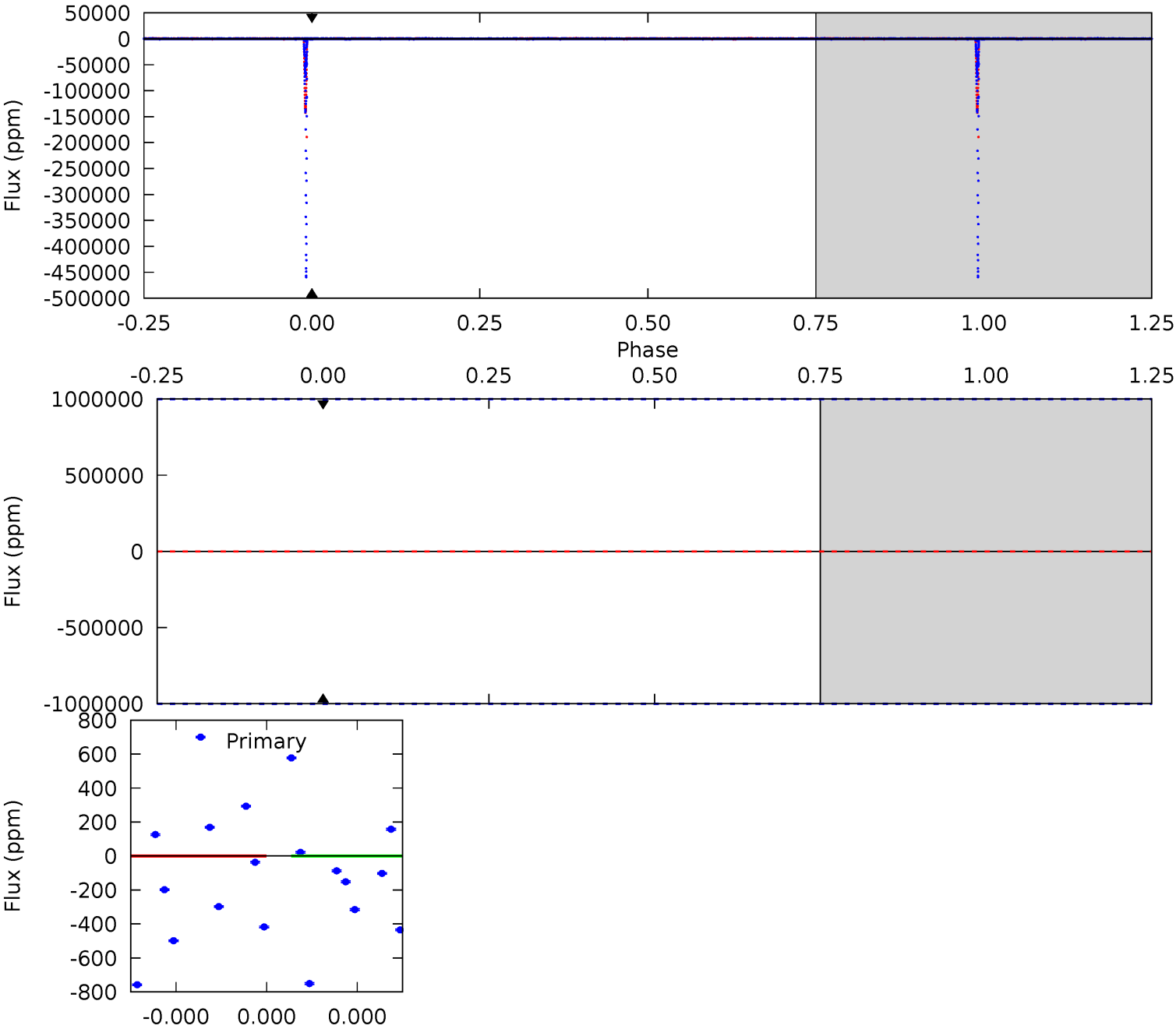
TCE 009517991-02     $P=224.925817$  Days     $T_0=289.559823$  (BKJD)



# DV Model-Shift Uniqueness Test

009517991-02, P = 224.925817 Days, E = 66.389238 Days

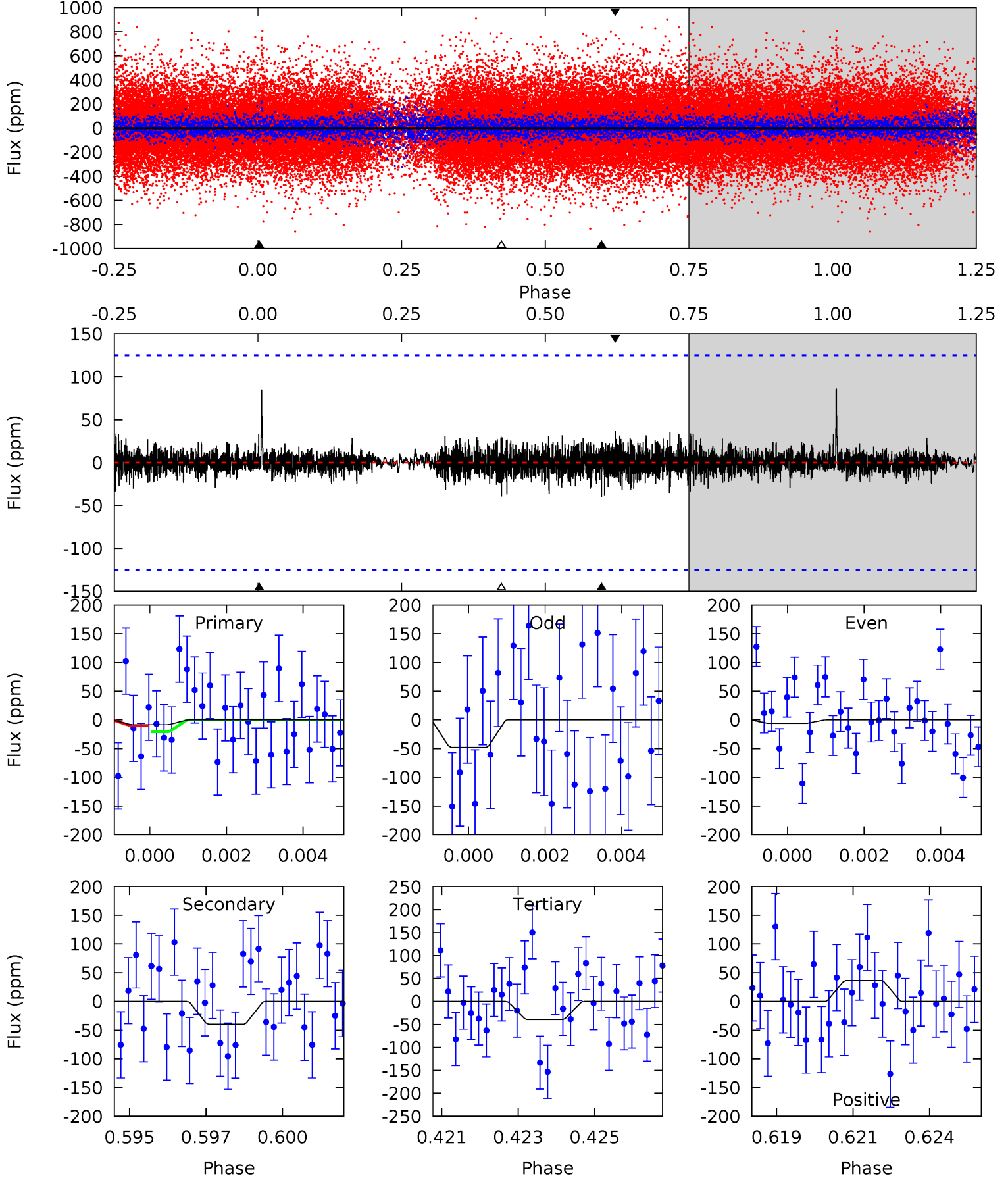
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
0	0	0	0	1.00	1.00	1.00	0	0	0	0	0	0	0	0



# Alt Model-Shift Uniqueness Test

009517991-02,  $P = 224.925817$  Days,  $E = 64.634006$  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
0.35	1.69	1.68	1.56	5.31	3.06	0.43	-1.33	-1.20	0.01	0.13	0.81	23479	0.68	0.22





### Stellar Parameters For KIC 009517991

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5775^{+138}_{-155}$	$4.558^{+0.040}_{-0.160}$	$-0.220^{+0.300}_{-0.300}$	$0.840^{+0.199}_{-0.080}$	$0.934^{+0.090}_{-0.120}$	$2.219^{+0.380}_{-0.996}$
	+2%/-3%	+1%/-4%	+136%/-136%	+24%/-10%	+10%/-13%	+17%/-45%
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 009517991-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$0 \pm 1000000$	$8.64^{+7.37}_{-5.61}$	$395^{+22}_{-16}$	$3036^{+13907}_{-18890}$	$843^{+676317}_{-563651}$
Alt.	$-40 \pm 24$	$11.85^{+9.80}_{-7.11}$	$396^{+21}_{-16}$	$2171^{+615}_{-296}$	$60^{+393}_{-46}$

$T_{max}$  = 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

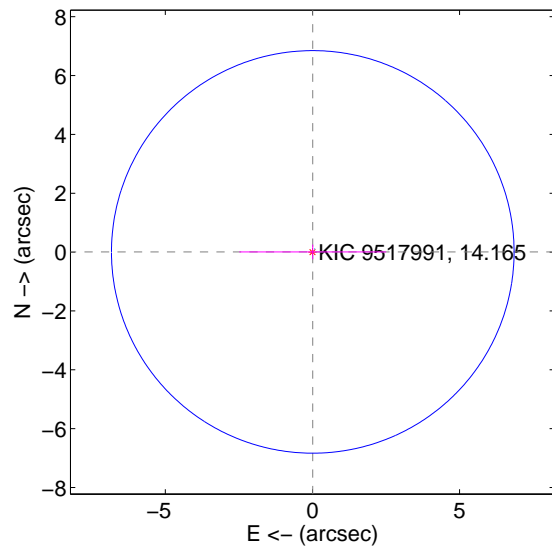
Supplemental centroid analysis for 009517991-02. Kepler magnitude: 14.16. Transit SNR -1.00

There are 2 quarters with good PRF difference image offsets

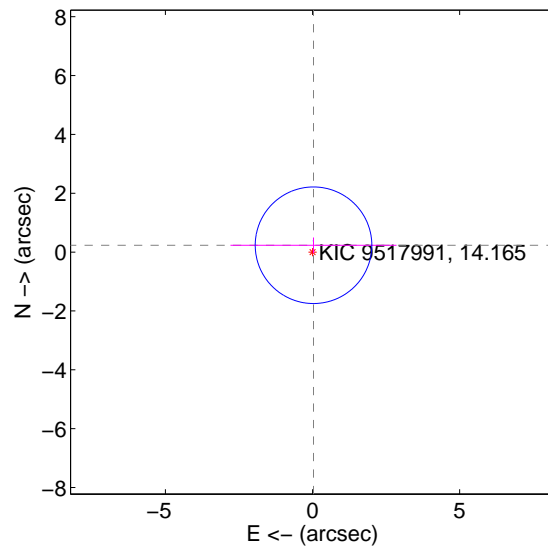
The direct PRF centroid is offset from the target star catalog position by about 0.31 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.013 \pm 2.280$	0.01	$-0.011 \pm 2.495$	$0.007 \pm 0.250$
PRF-fit source offset from KIC position	$0.235 \pm 0.660$	0.36	$-0.034 \pm 2.821$	$0.233 \pm 0.264$
photometric centroid source offset	$1.07 \pm 0.03$	34.83	$-0.04 \pm 0.03$	$-1.07 \pm 0.03$

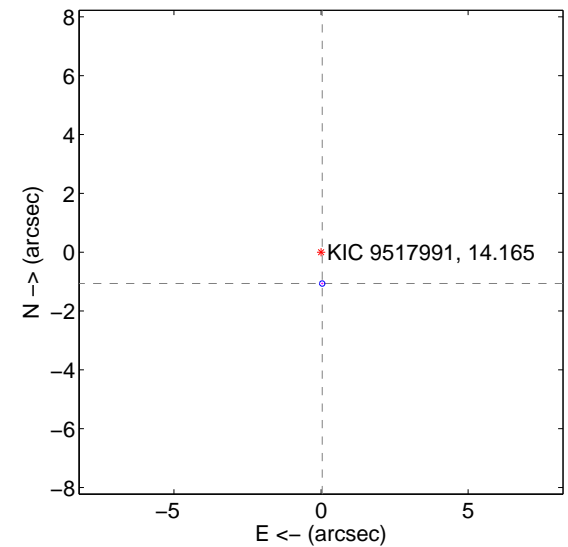
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position



offset from photometric centroids

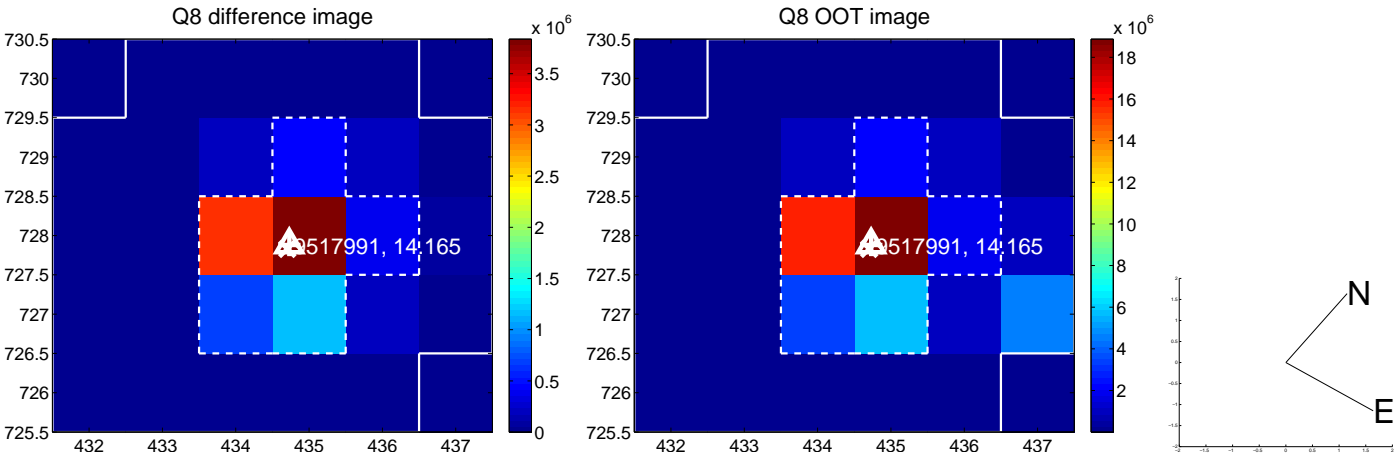
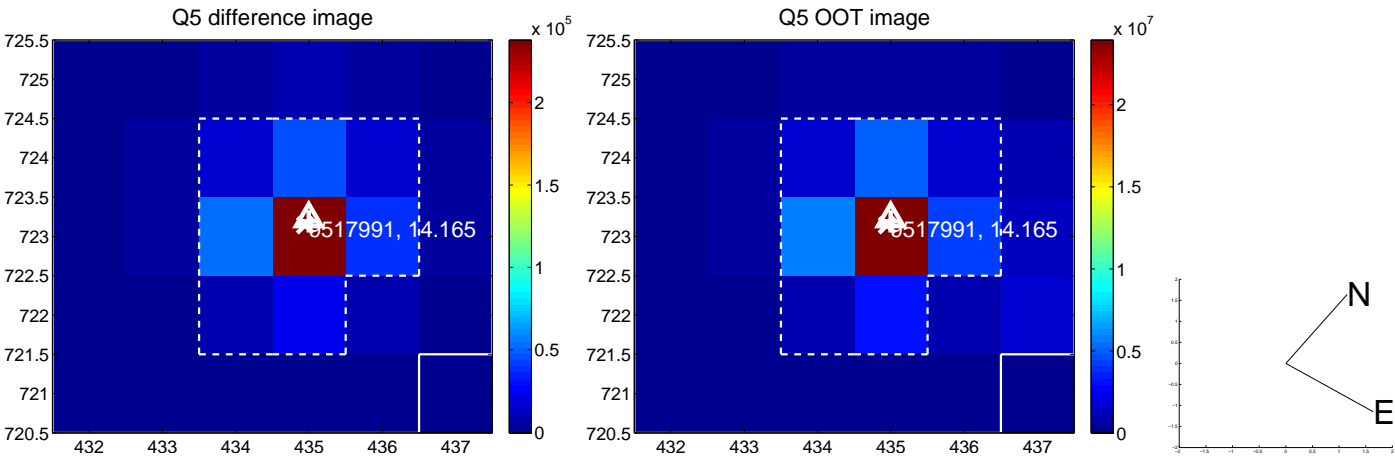


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

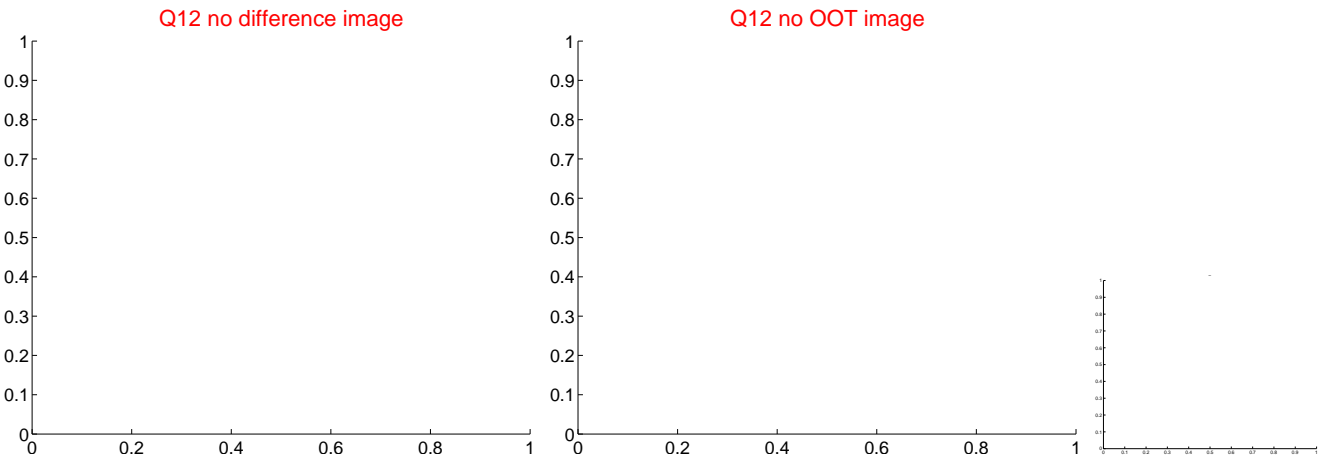
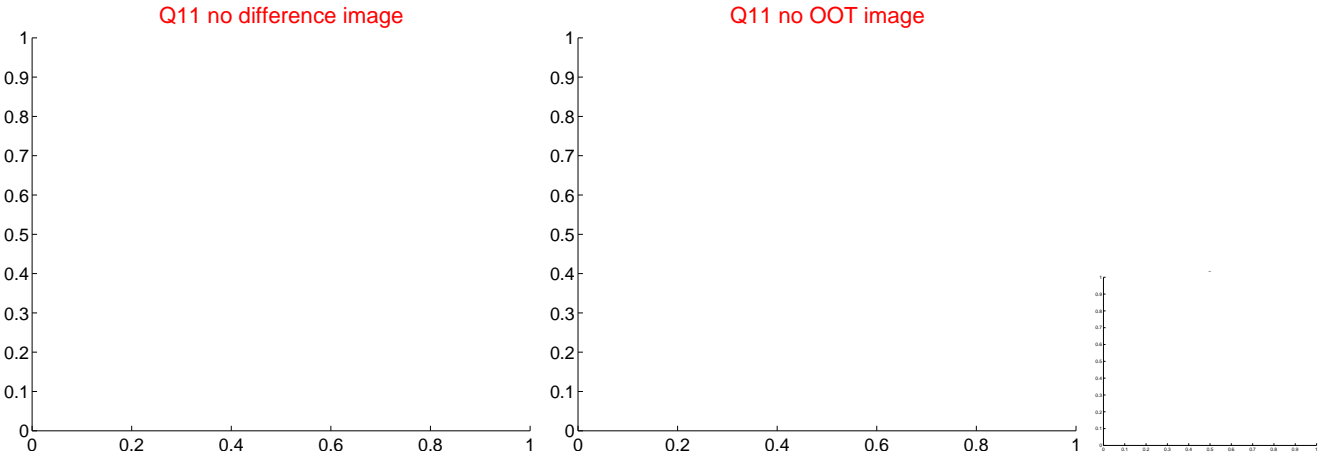
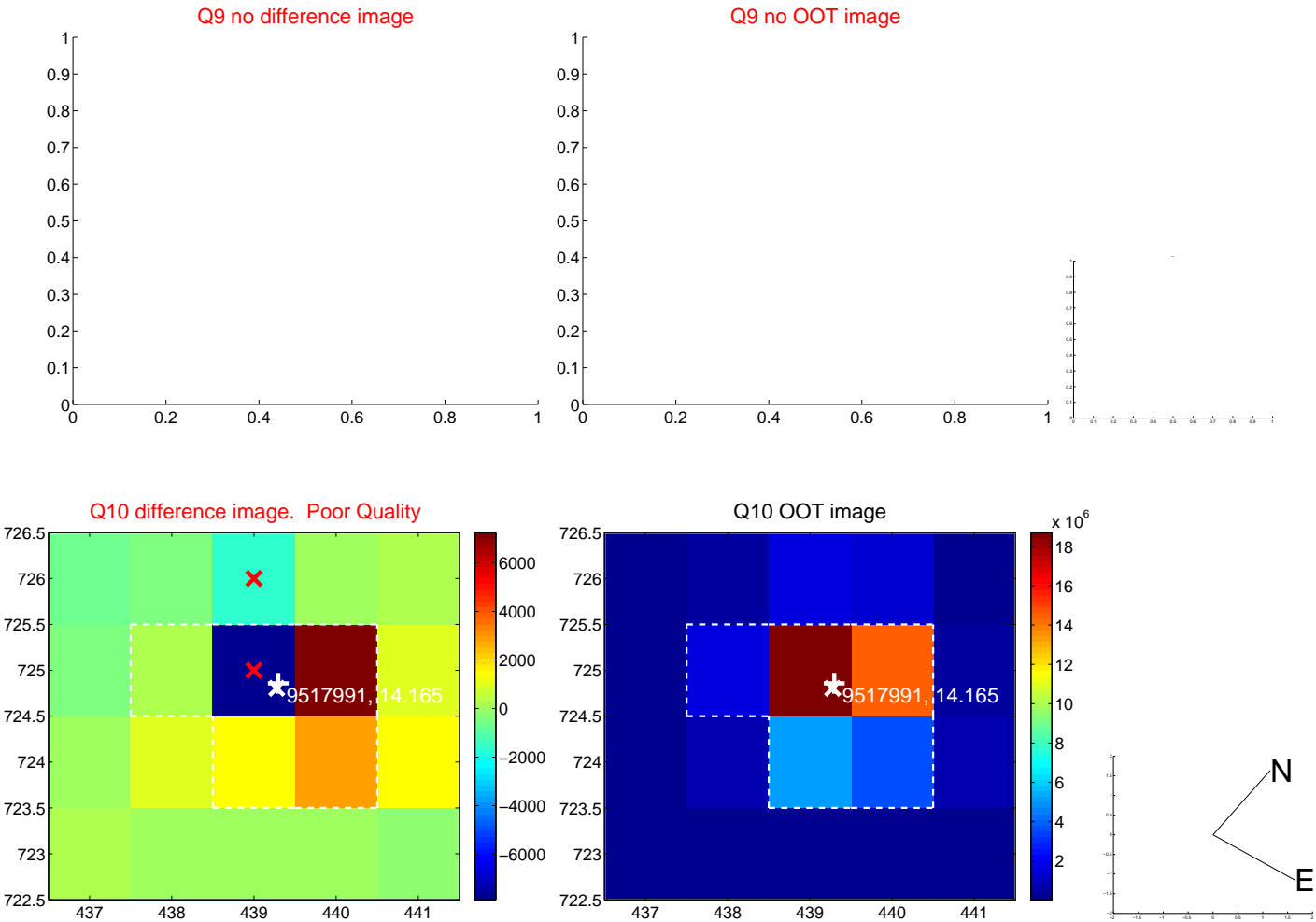
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



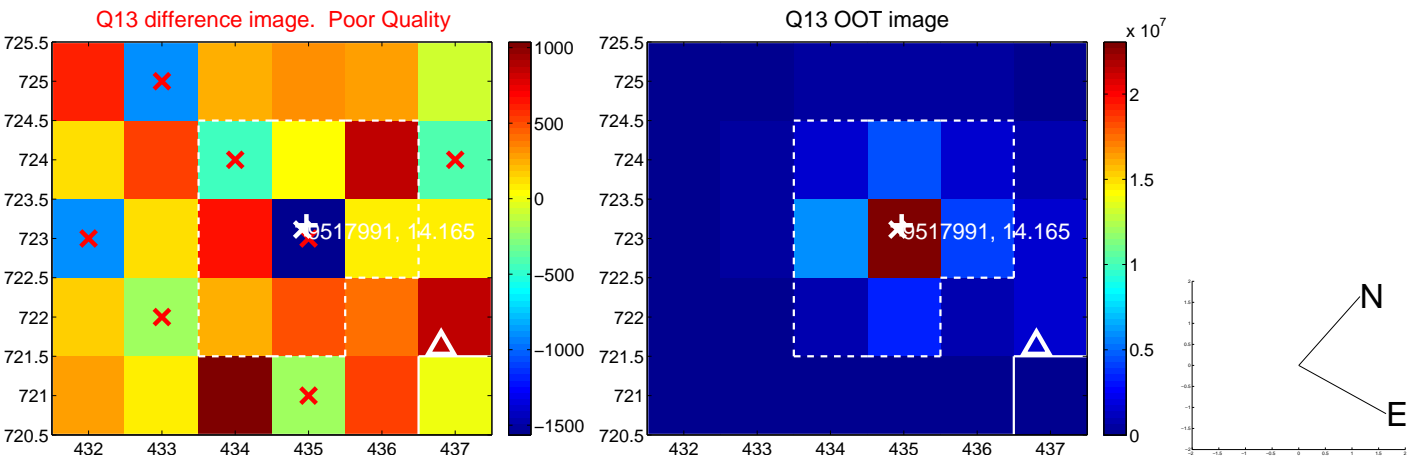
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



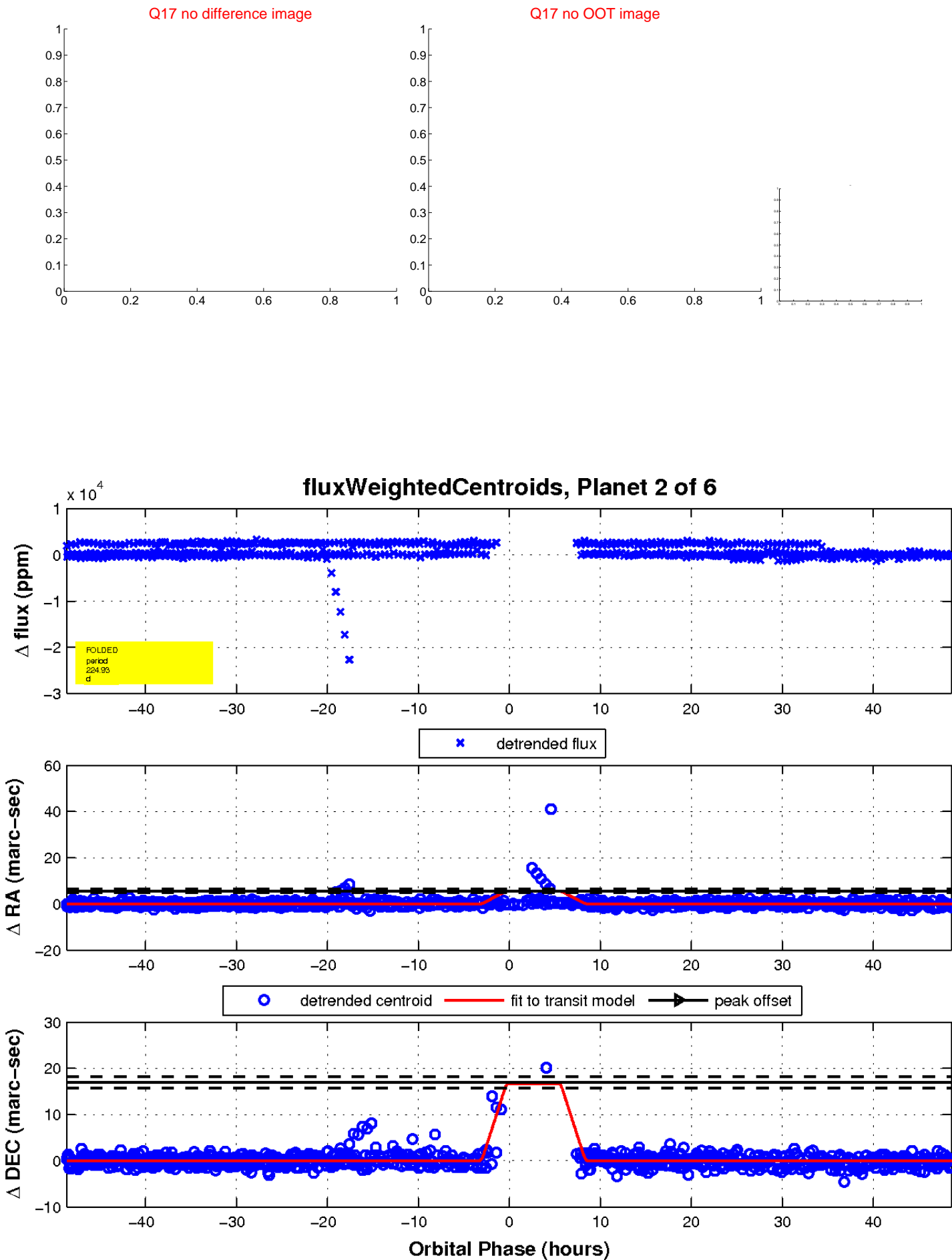
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

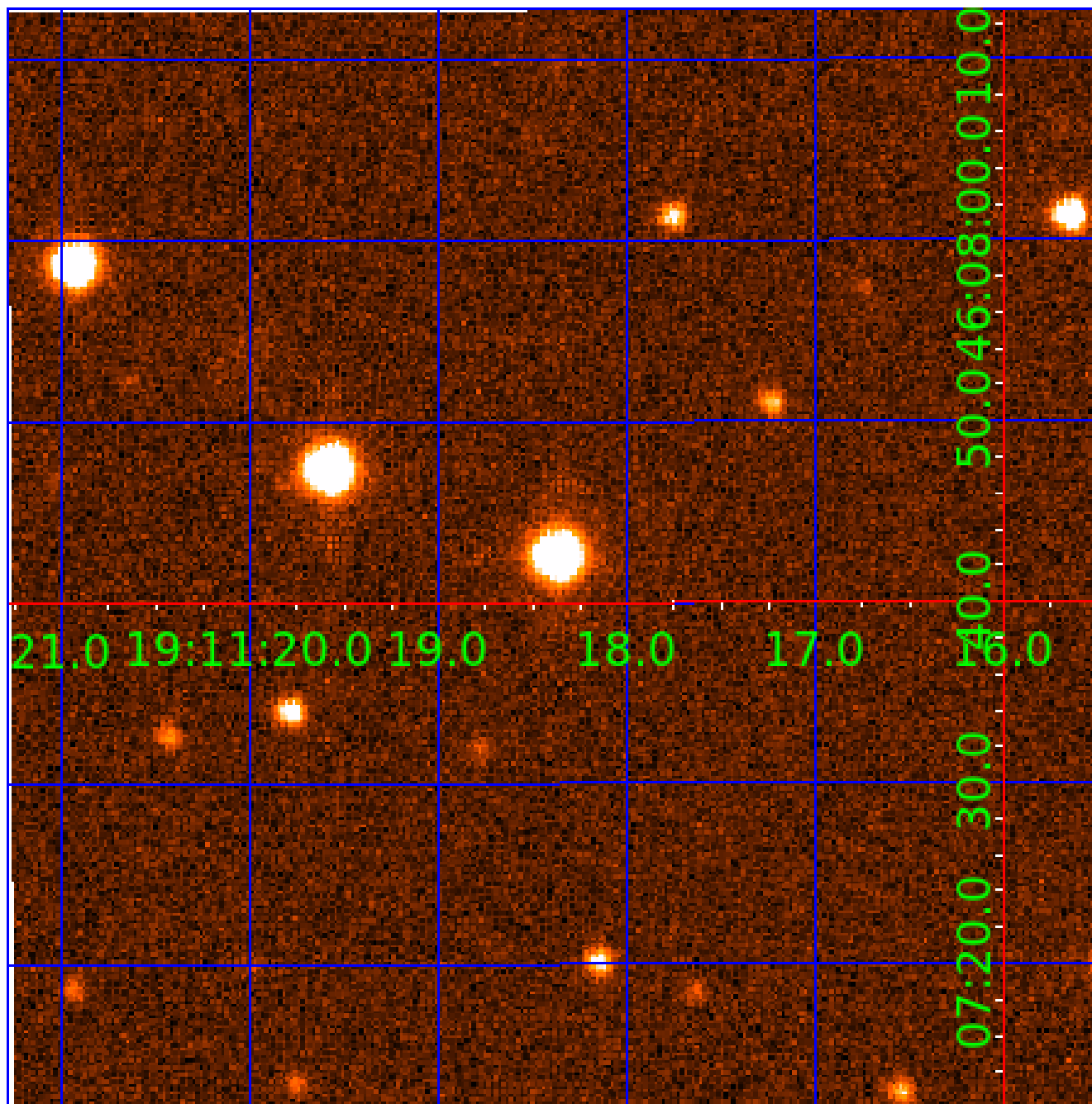


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 009517991

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009517991-01	OBS	No	220.914692	351.602108	0.0	145.239	4316.5	0.0	0.84	5775	0.01	1.44
009517991-02	OBS	No	224.925817	291.315055	3114.2	15.000	76.7	-1.0	0.84	5775	4.65	1.41
009517991-03	OBS	No	225.368544	286.458679	2780.8	15.000	51.7	-1.0	0.84	5775	4.40	1.40
009517991-04	OBS	No	240.600290	273.530936	150.0	59.082	919.2	2.2	0.84	5775	1.10	1.29
009517991-05	OBS	No	640.770968	284.809551	156.8	2.970	8.7	2.1	0.84	5775	1.25	0.35
009517991-06	OBS	No	336.035734	285.788611	306.0	1.832	8.8	2.4	0.84	5775	1.55	0.82

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009517991-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009517991-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_NOFITS
009517991-03	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_MARSHALL_SKYE_ZUMA—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT— INCONSISTENT_TRANS—CENT_NOFITS—HALO_GHOST
009517991-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL_ZUMA—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT— MOD_POS_ALT—INCONSISTENT_TRANS
009517991-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_TRACKER—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT— MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009517991-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_MARSHALL_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV— MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—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.

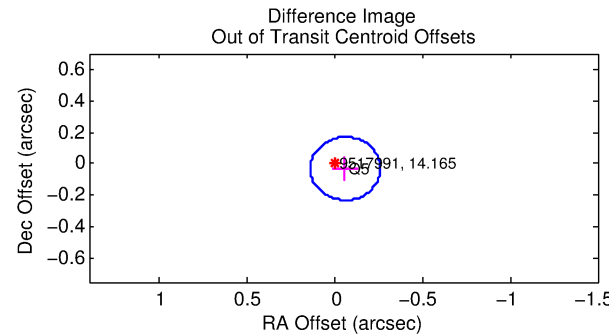
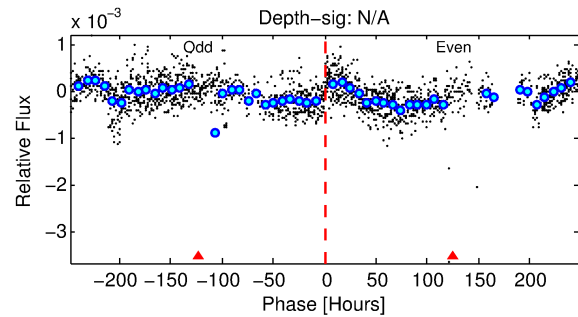
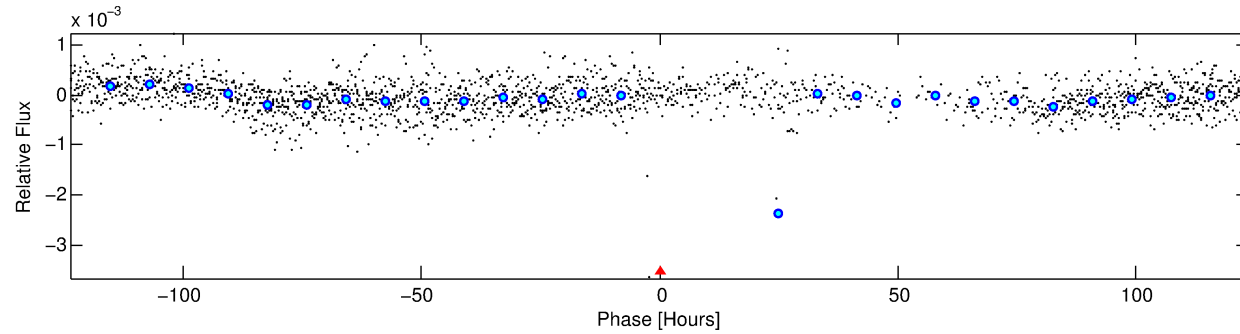
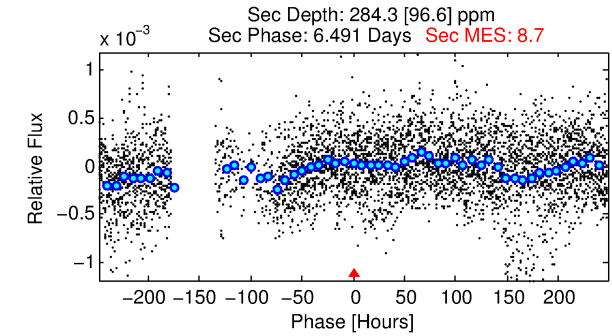
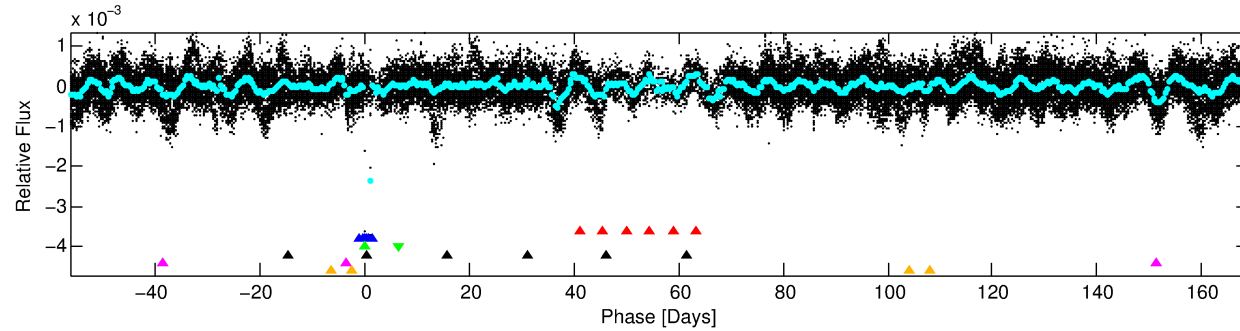
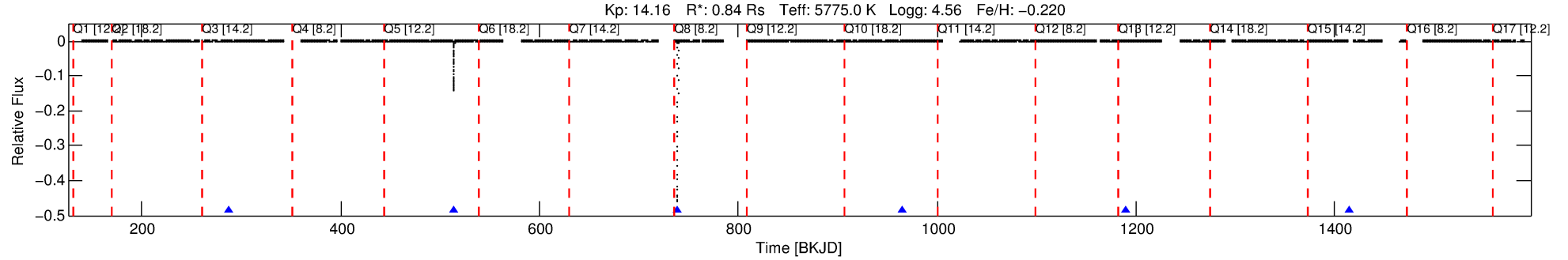
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009517991-03

No Significant Match Found

# DV One-Page Summary

KIC: 9517991 Candidate: 3 of 6 Period: 225.369 d



## TPS TCE Results:

Period = 225.36854 d  
Epoch = 286.4587 BKJD

**DV fit results are unavailable**

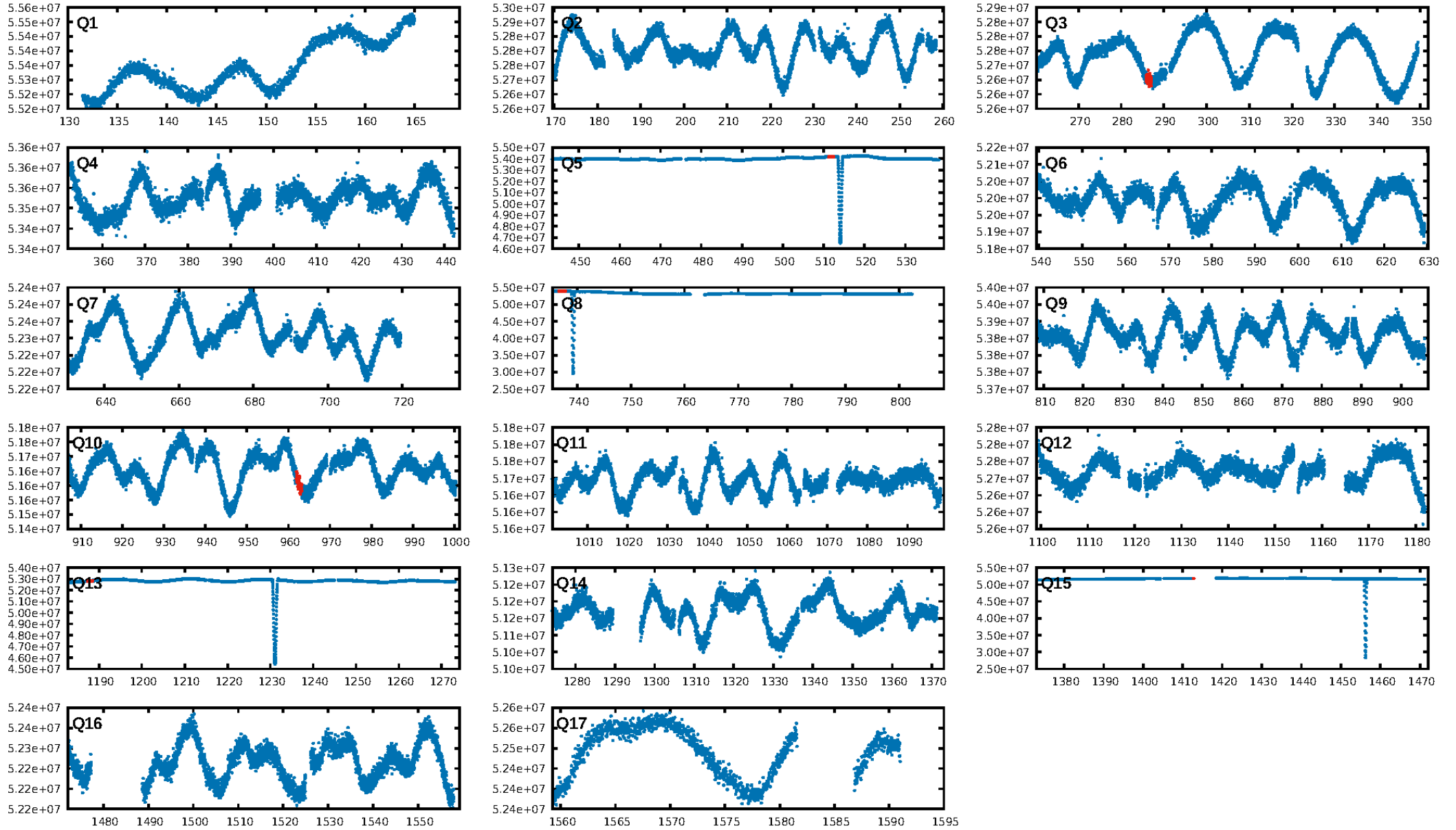
## DV Diagnostic Results:

ShortPeriod-sig: 38.4% [0.50 $\sigma$ ]  
LongPeriod-sig: 100.0% [6.00 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [5/5]  
**GhostDiagnostic-chr: 0.1032**  
Centroid-sig: 3.1%  
**Centroid-so: 0.463 arcsec [6.02 $\sigma$ ]**  
OotOffset-rm: 0.066 arcsec [0.99 $\sigma$ ]  
**KicOffset-rm: 0.241 arcsec [3.61 $\sigma$ ]**  
OotOffset-st: 0/0/0/1 [1]  
KicOffset-st: 0/0/0/1 [1]  
DiffImageQuality-fgm: 1.00 [1/1]  
DiffImageOverlap-fno: 0.00 [0/1]

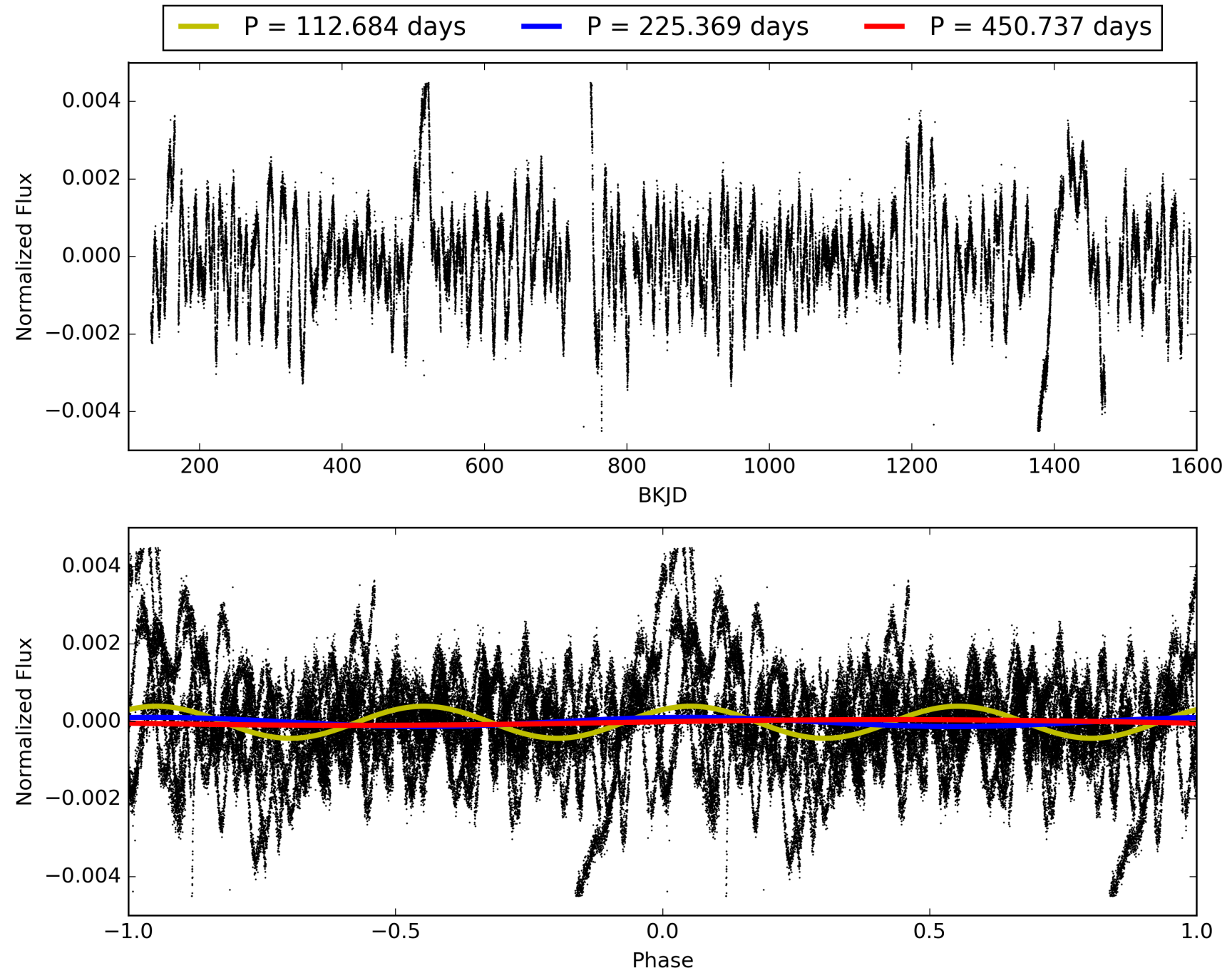
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 03:24:06 Z

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

# TCE 009517991-03, PDC Light Curves

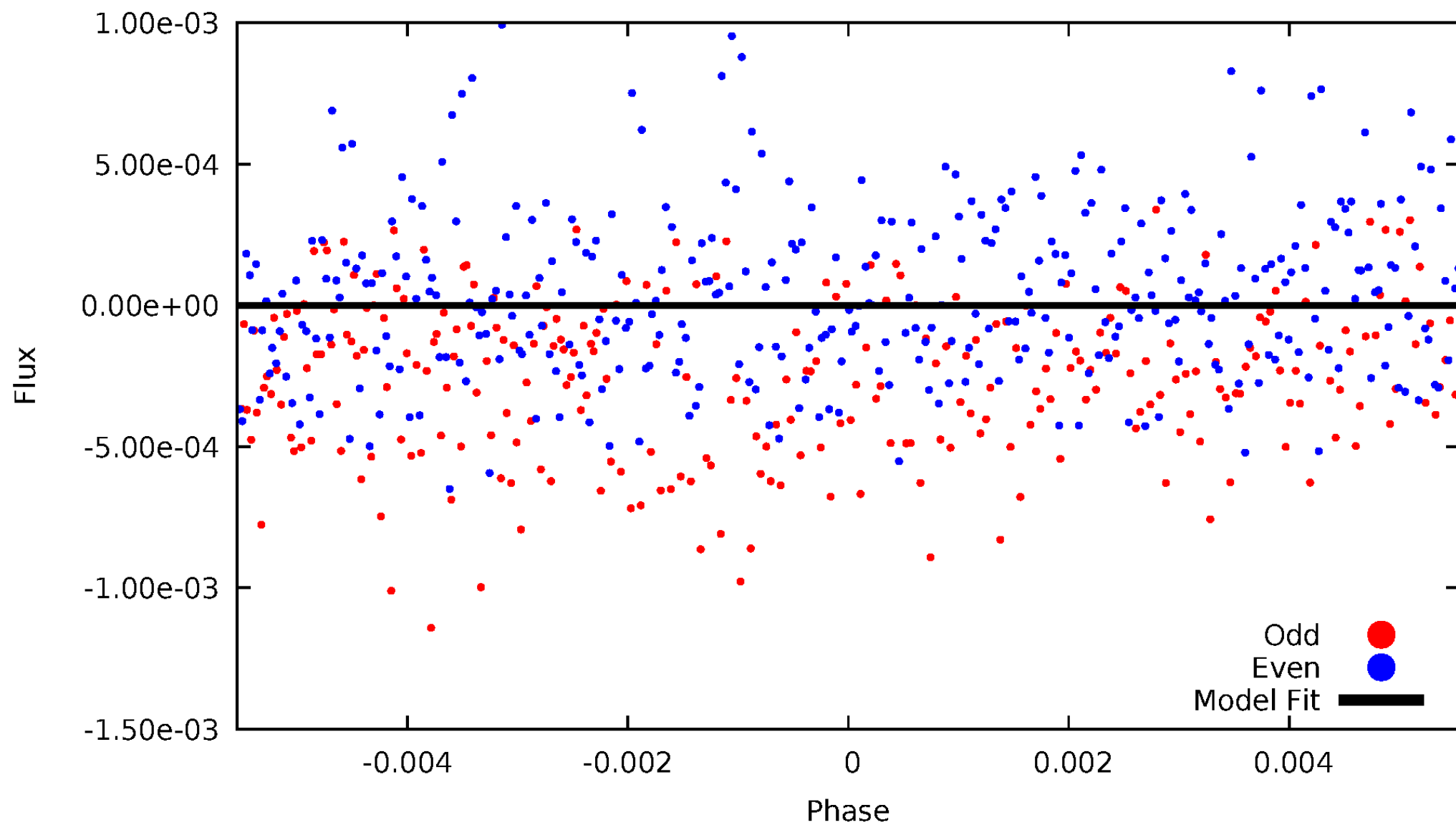


TCE 009517991-03



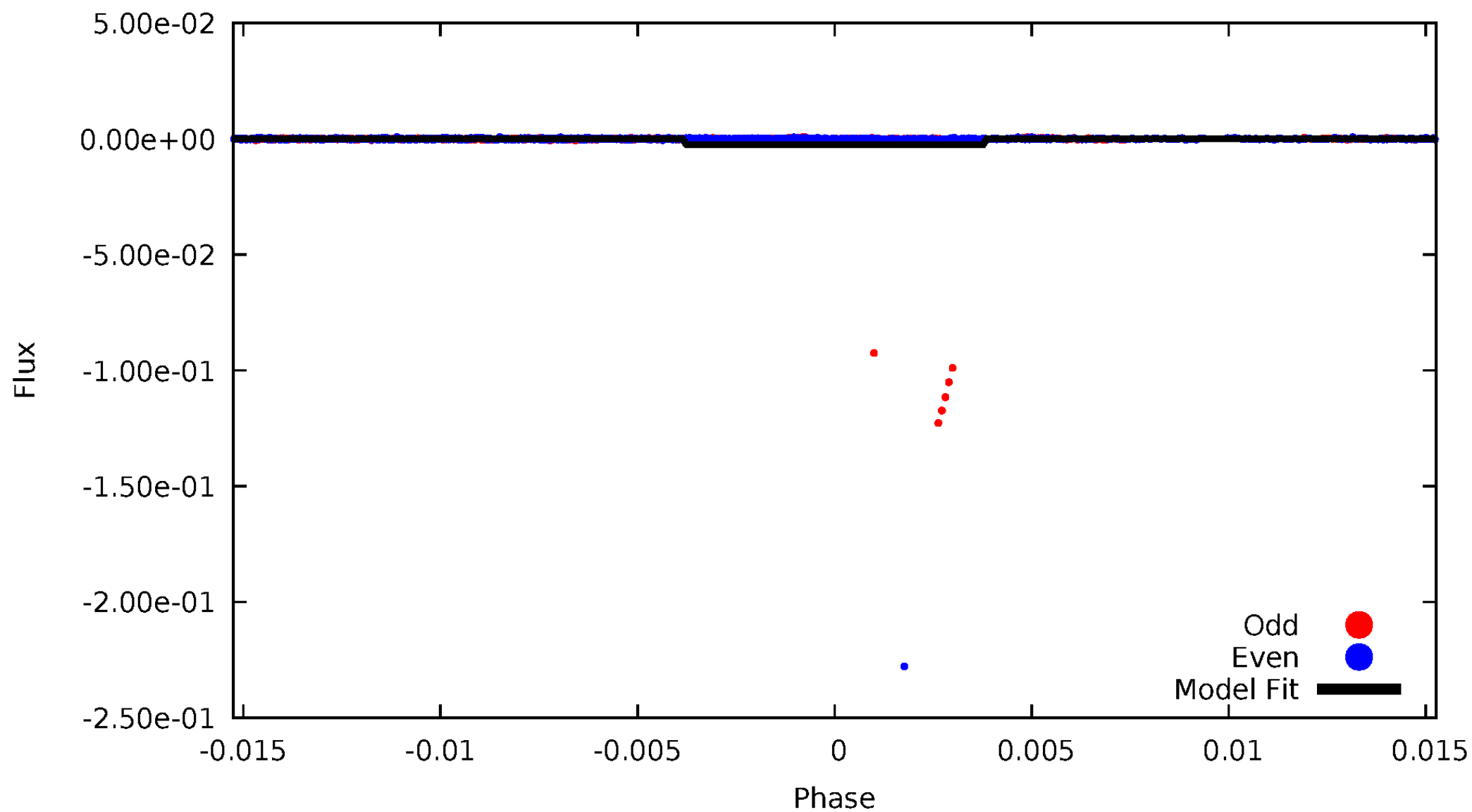
# DV Odd/Even

TCE 009517991-03



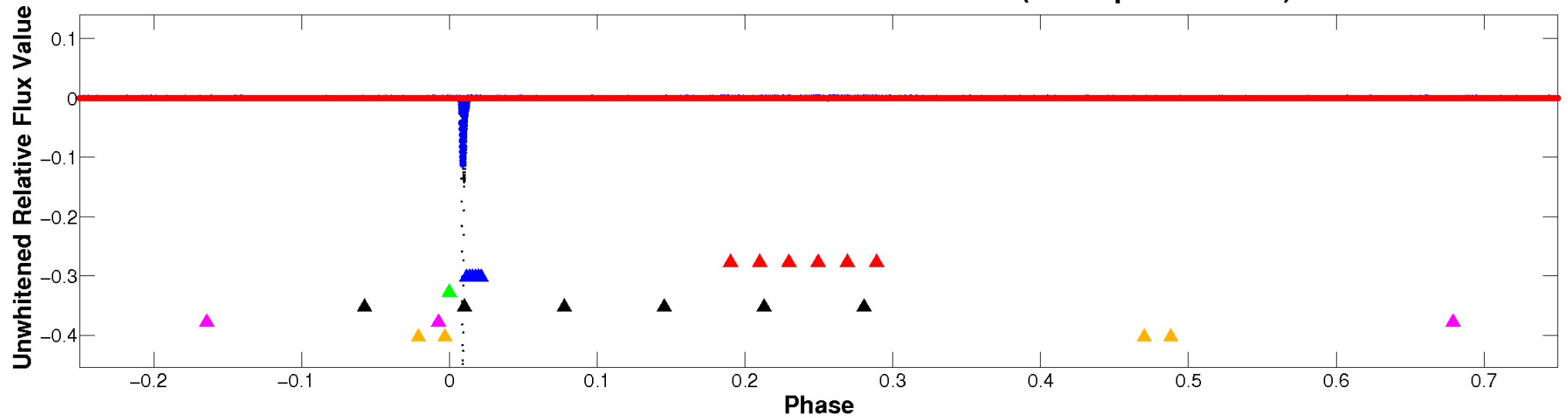
# ALT Odd/Even

TCE 009517991-03



# Non-Whitened Vs. Whitened Light Curve

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

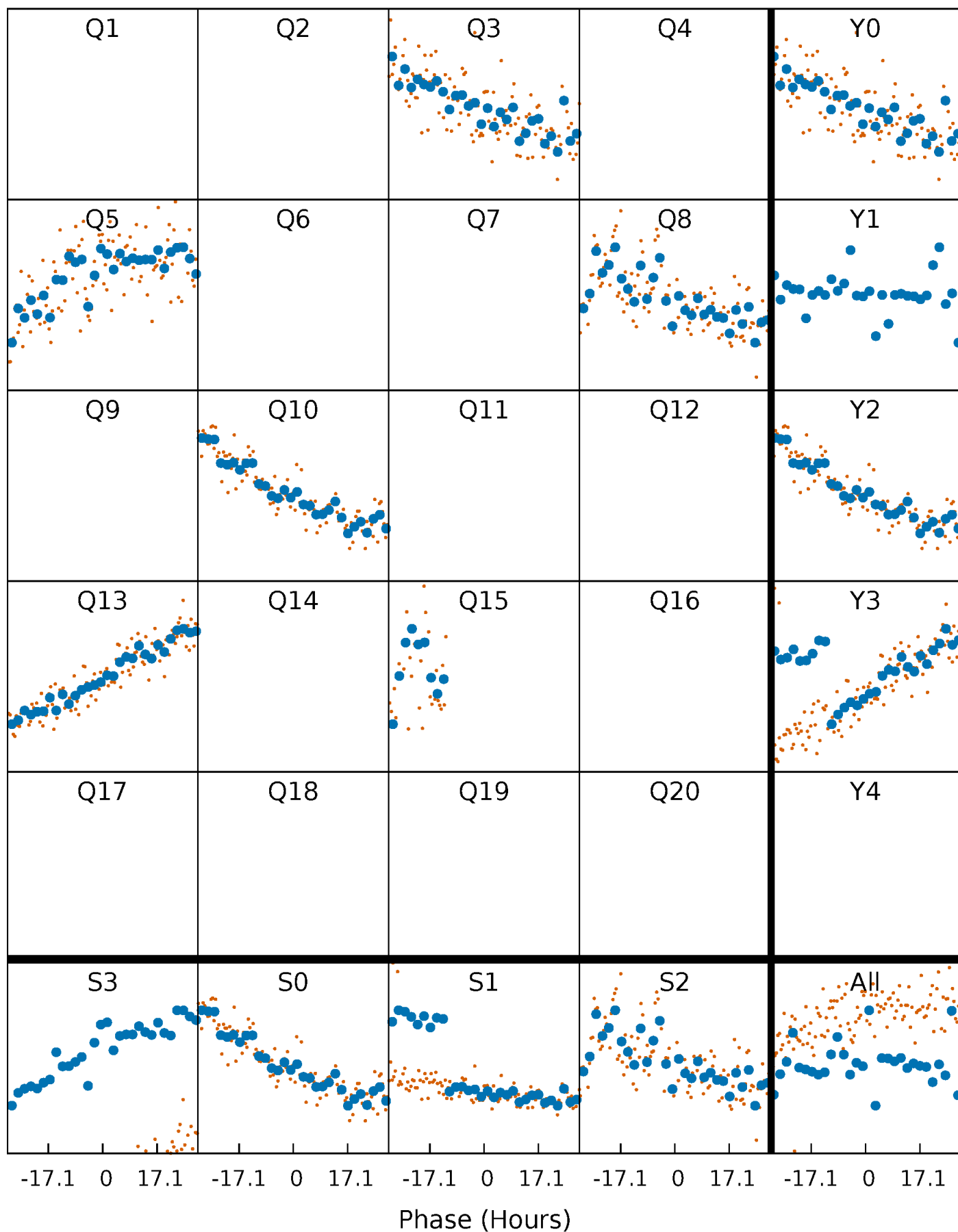


**Planet 3 : Phased Whitened Flux Time Series (TPS Epoch/Period)**



# PDC Quarter-Phased Transit Curves

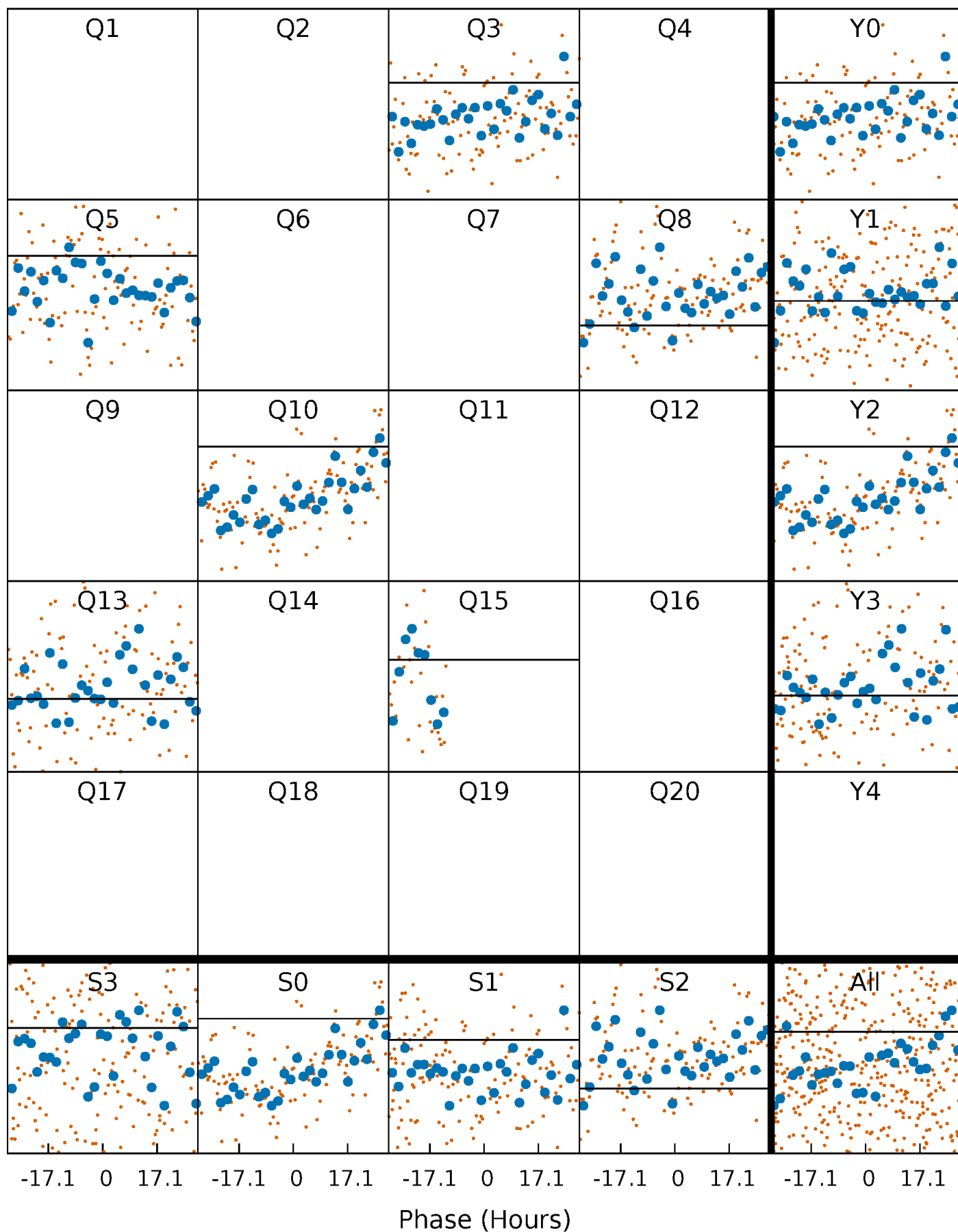
TCE 009517991-03     $P=225.368544$  Days     $T_0=286.458679$  (BKJD)





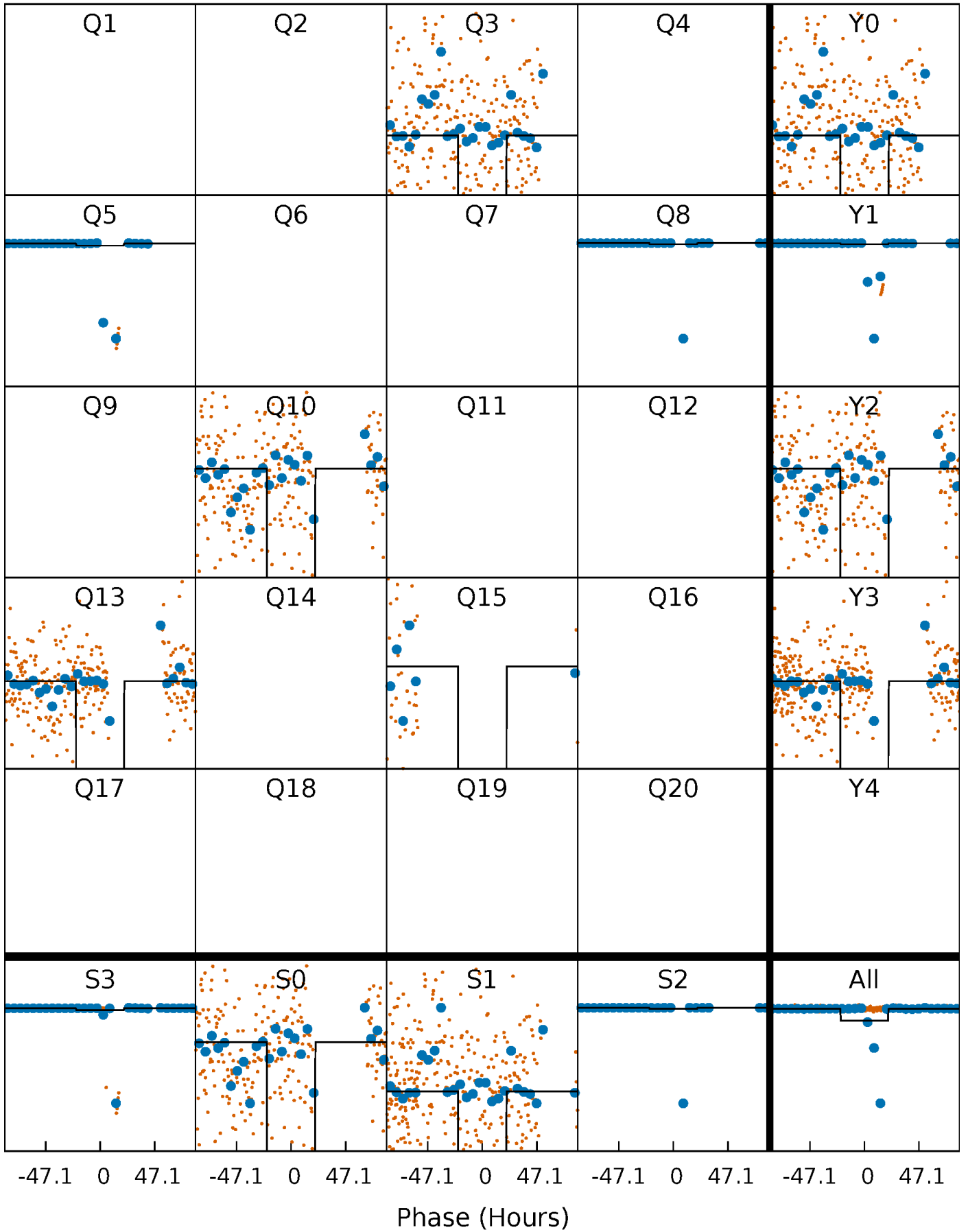
# DV Quarter-Phased Transit Curves

TCE 009517991-03 P=225.368544 Days  $T_0=286.458679$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

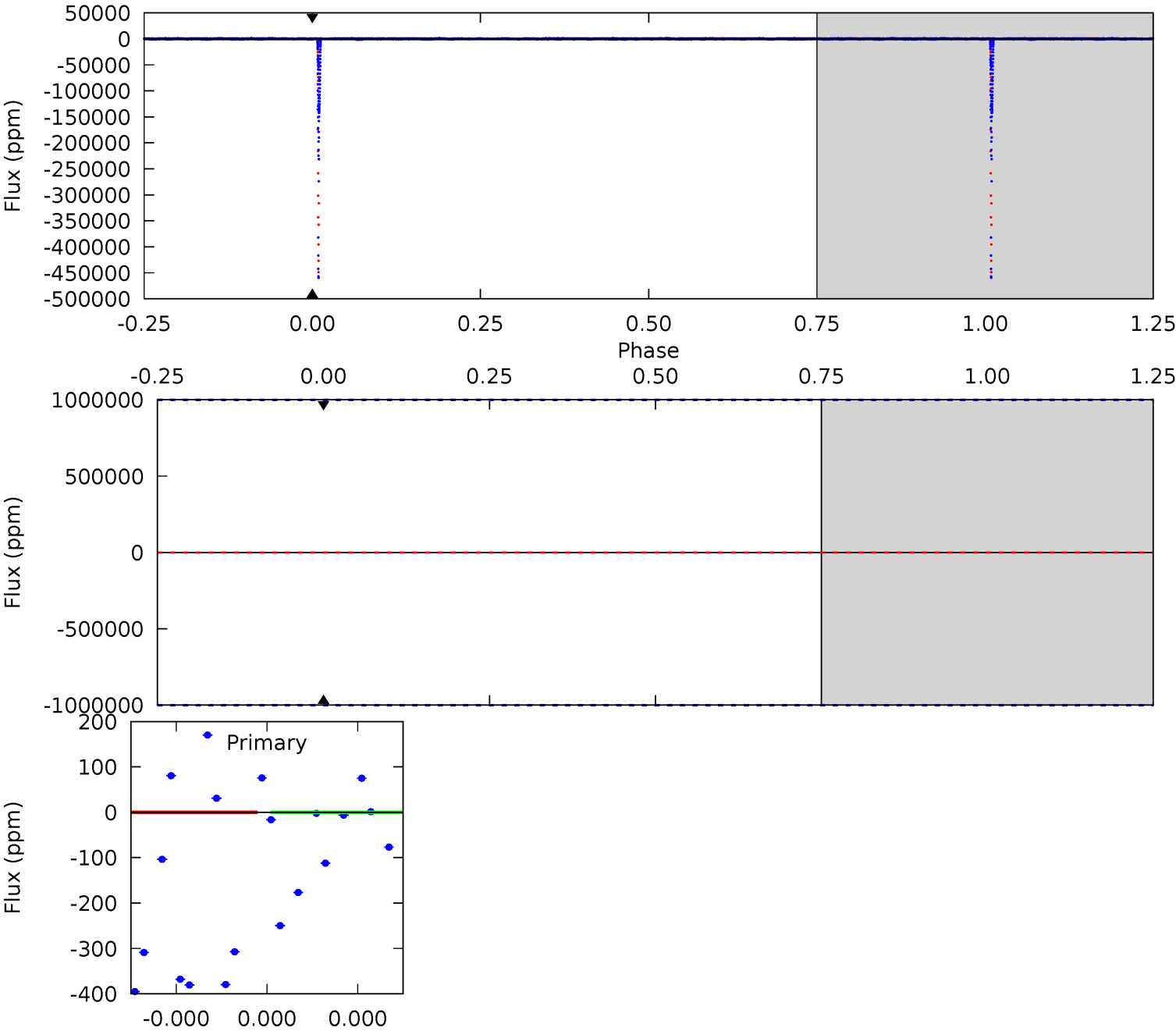
TCE 009517991-03 P=225.368544 Days  $T_0=288.253138$  (BKJD)



# DV Model-Shift Uniqueness Test

009517991-03, P = 225.368544 Days, E = 61.090135 Days

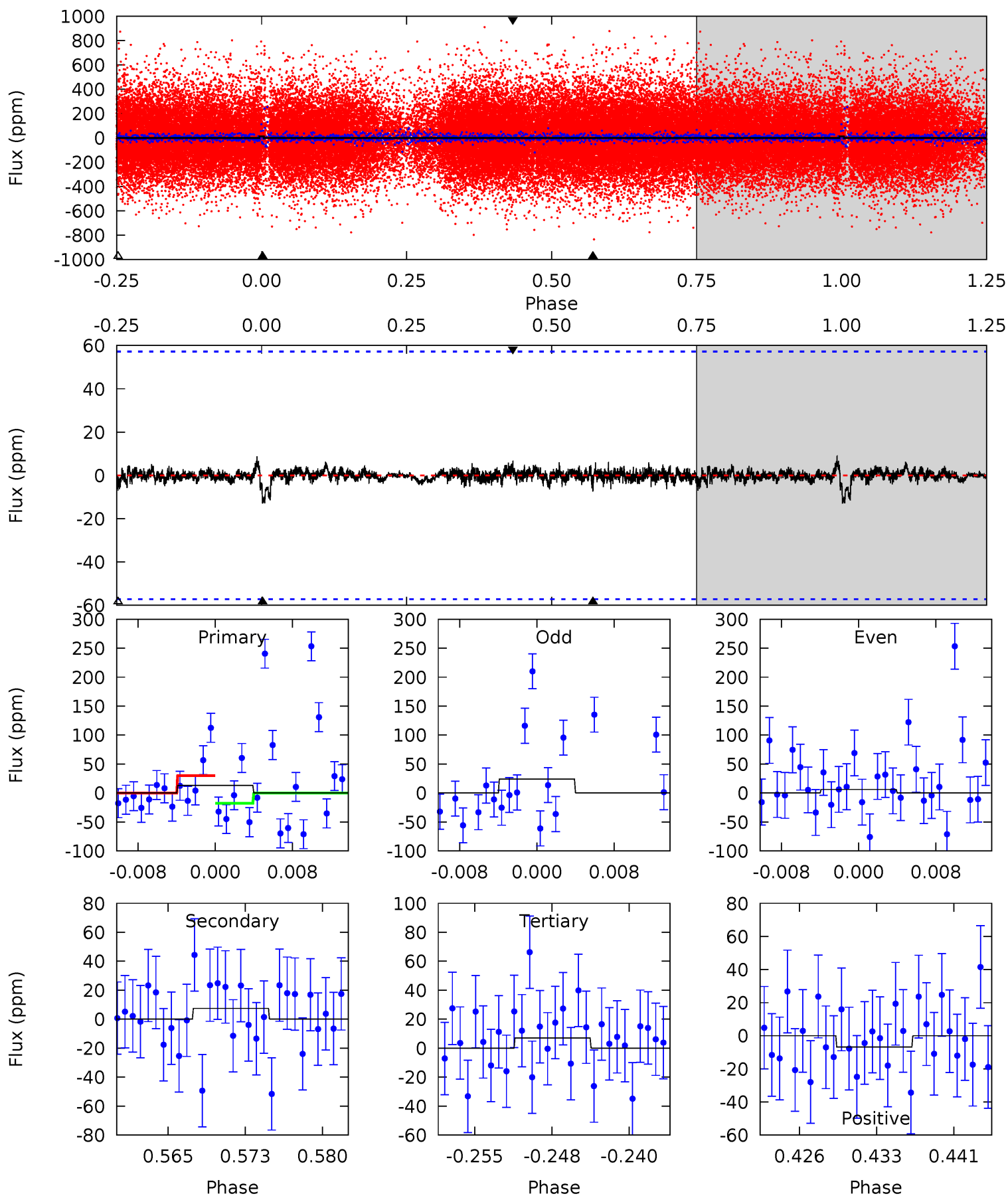
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
0	0	0	0	1.00	1.00	1.00	0	0	0	0	0	0	0	0



# Alt Model-Shift Uniqueness Test

009517991-03, P = 225.368544 Days, E = 62.884594 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
1.15	0.66	0.62	0.60	5.08	2.66	0.16	0.53	0.56	0.04	0.06	0.78	210.7	0.40	0.53



### Stellar Parameters For KIC 009517991

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5775^{+138}_{-155}$	$4.558^{+0.040}_{-0.160}$	$-0.220^{+0.300}_{-0.300}$	$0.840^{+0.199}_{-0.080}$	$0.934^{+0.090}_{-0.120}$	$2.219^{+0.380}_{-0.996}$
	+2%/-3%	+1%/-4%	+136%/-136%	+24%/-10%	+10%/-13%	+17%/-45%
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 009517991-03 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$0 \pm 1000000$	$7.98^{+8.45}_{-5.15}$	$395^{+22}_{-15}$	$-3486^{+22206}_{-14312}$	$-2061.357^{+816546.410}_{-705216.946}$
Alt.	$-7 \pm 11$	$8.63^{+8.02}_{-5.65}$	$395^{+19}_{-16}$	$1899^{+572}_{-3738}$	$16^{+158}_{-27}$

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

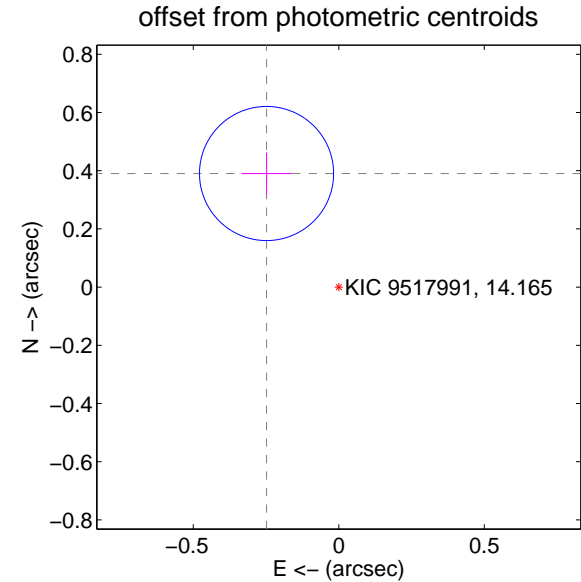
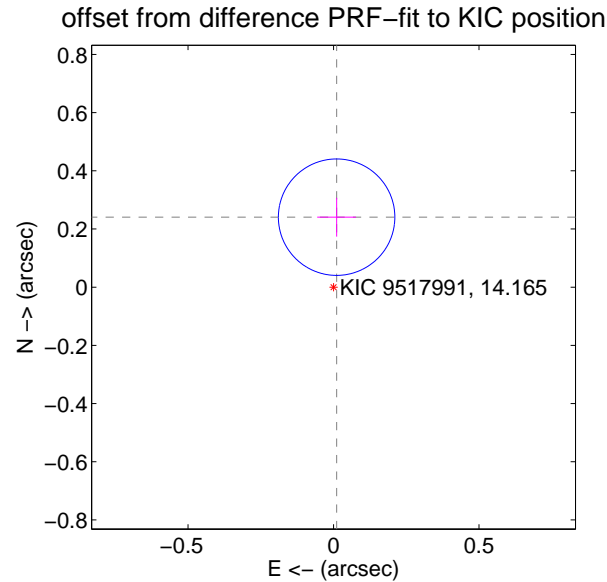
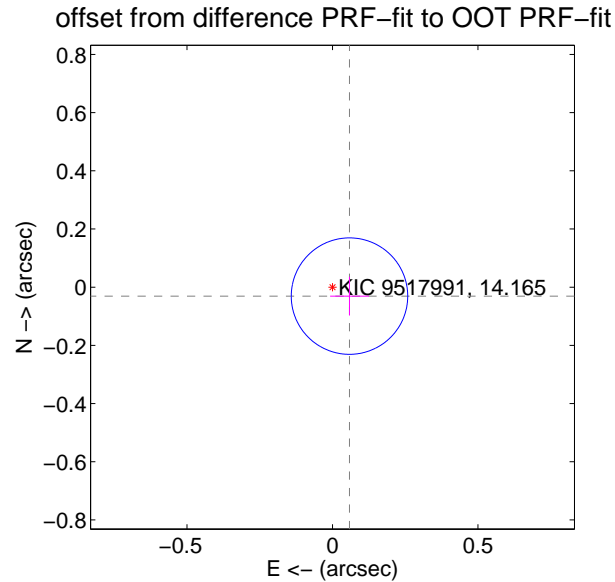
## DV Centroid Data

Supplemental centroid analysis for 009517991-03. Kepler magnitude: 14.16. Transit SNR -1.00

There are 1 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.28 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.066 \pm 0.067$	0.99	$-0.059 \pm 0.067$	$-0.031 \pm 0.067$
PRF-fit source offset from KIC position	$0.241 \pm 0.067$	3.61	$-0.011 \pm 0.067$	$0.241 \pm 0.067$
photometric centroid source offset	$0.46 \pm 0.08$	6.02	$0.25 \pm 0.09$	$0.39 \pm 0.07$

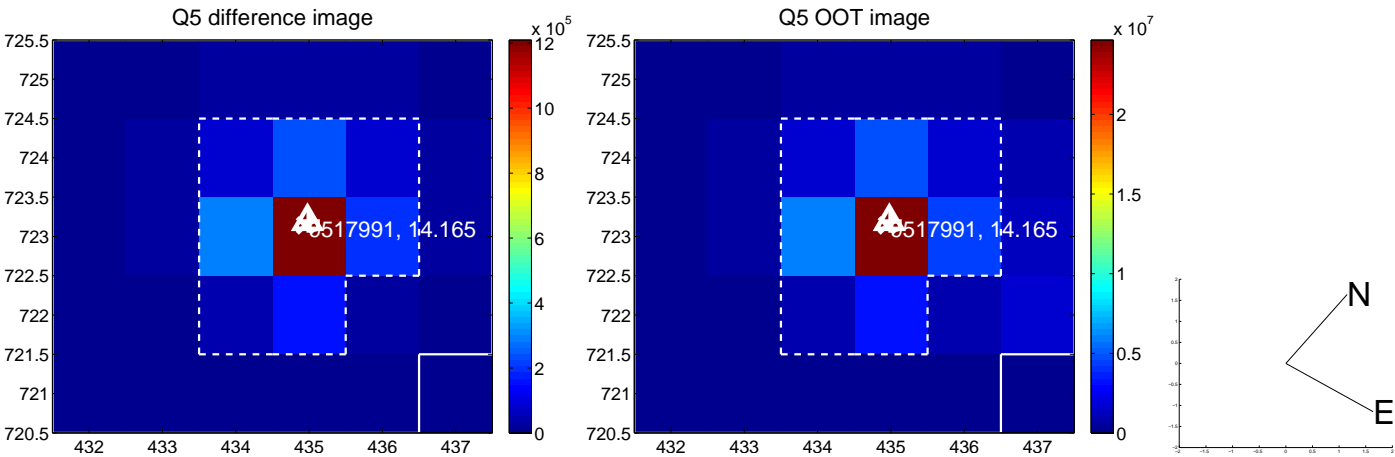


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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





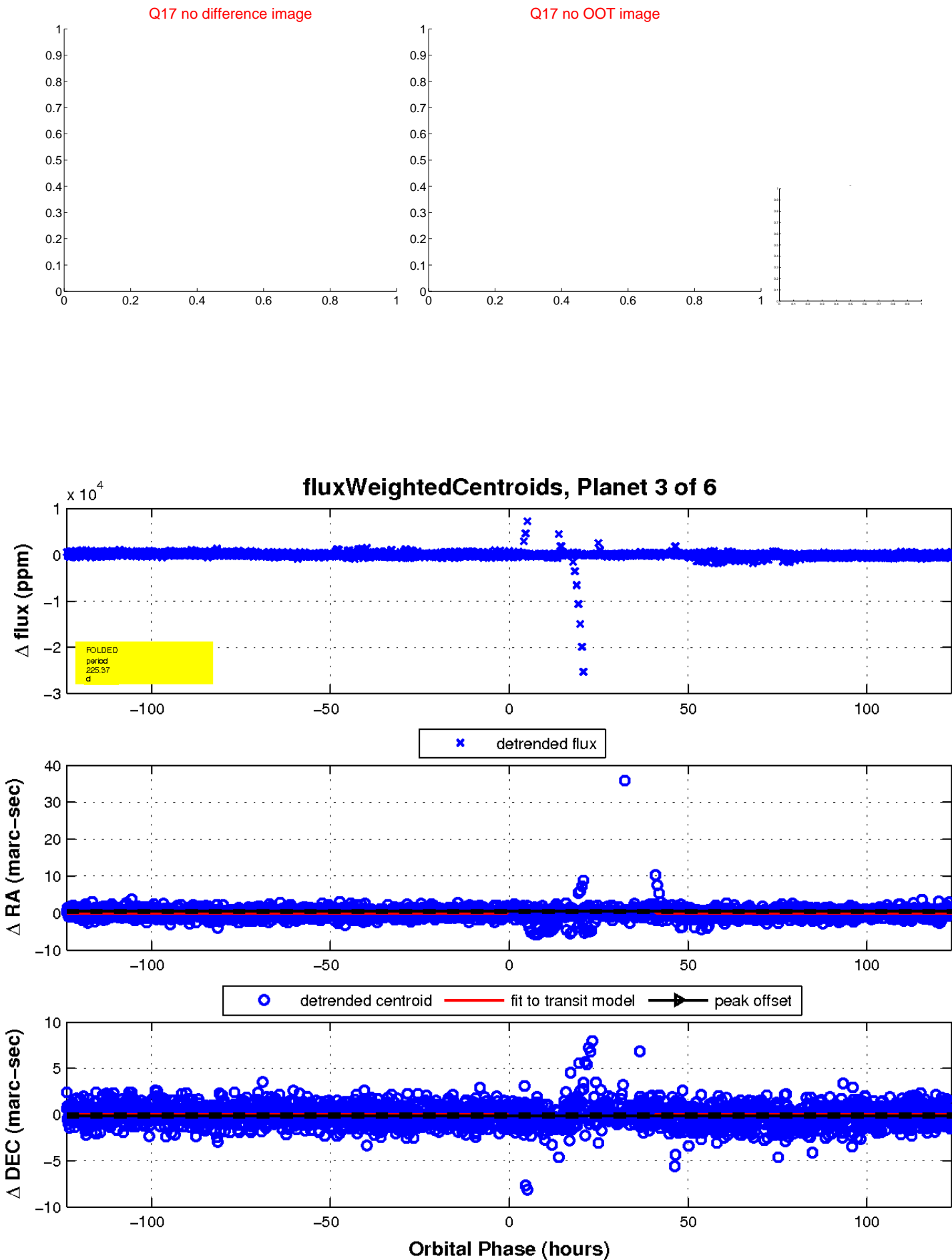
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

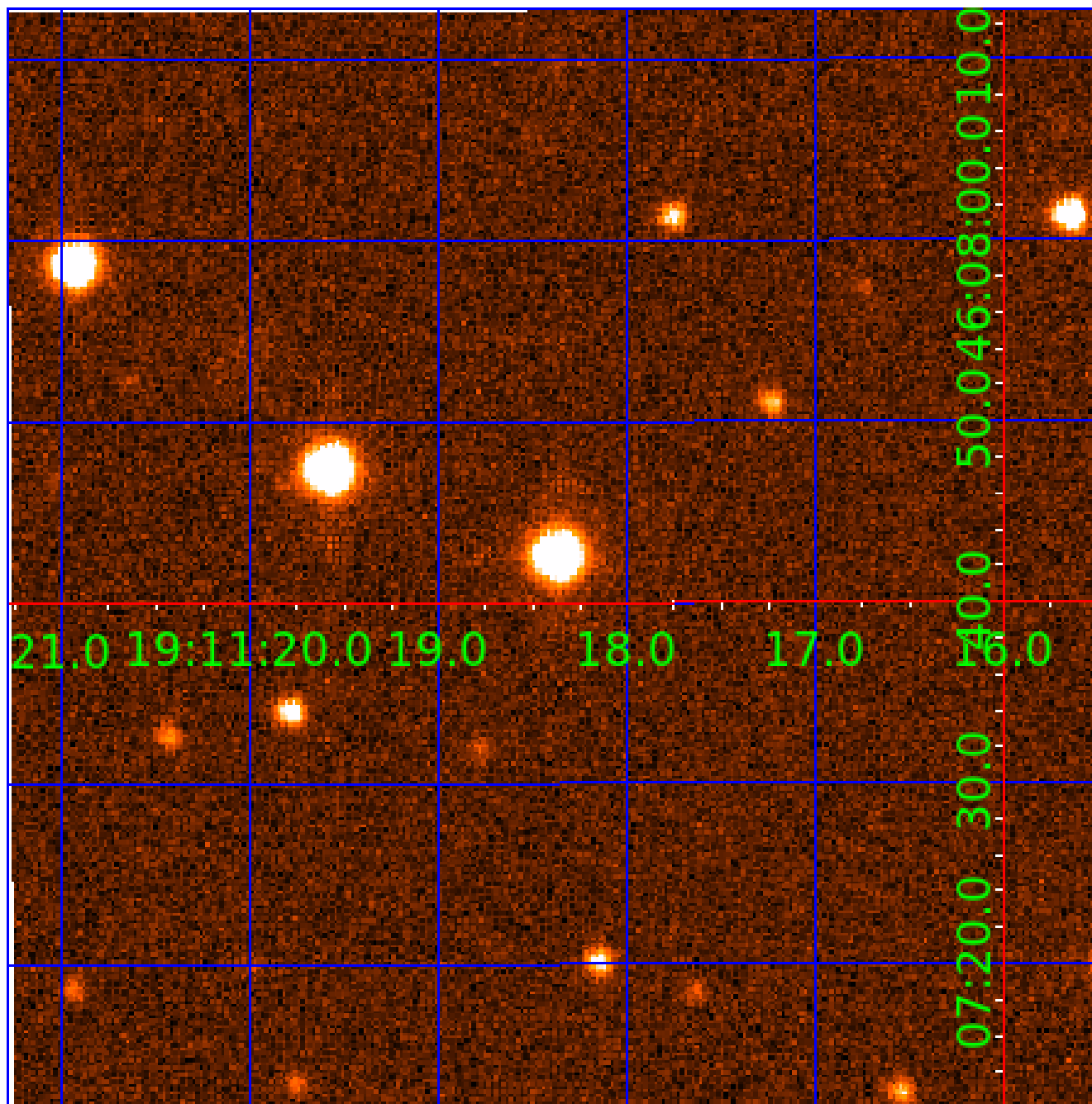


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 009517991

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009517991-01	OBS	No	220.914692	351.602108	0.0	145.239	4316.5	0.0	0.84	5775	0.01	1.44
009517991-02	OBS	No	224.925817	291.315055	3114.2	15.000	76.7	-1.0	0.84	5775	4.65	1.41
009517991-03	OBS	No	225.368544	286.458679	2780.8	15.000	51.7	-1.0	0.84	5775	4.40	1.40
009517991-04	OBS	No	240.600290	273.530936	150.0	59.082	919.2	2.2	0.84	5775	1.10	1.29
009517991-05	OBS	No	640.770968	284.809551	156.8	2.970	8.7	2.1	0.84	5775	1.25	0.35
009517991-06	OBS	No	336.035734	285.788611	306.0	1.832	8.8	2.4	0.84	5775	1.55	0.82

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009517991-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009517991-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_NOFITS
009517991-03	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_MARSHALL_SKYE_ZUMA—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_NOFITS—HALO_GHOST
009517991-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL_ZUMA—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS
009517991-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_TRACKER—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009517991-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_MARSHALL_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—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.

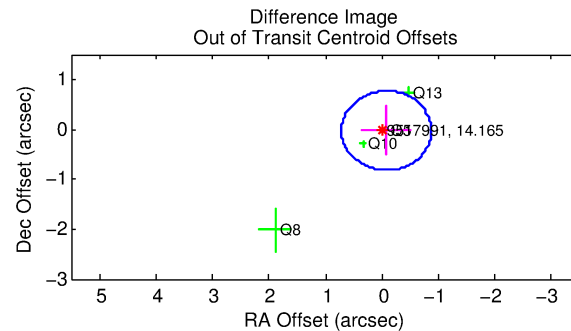
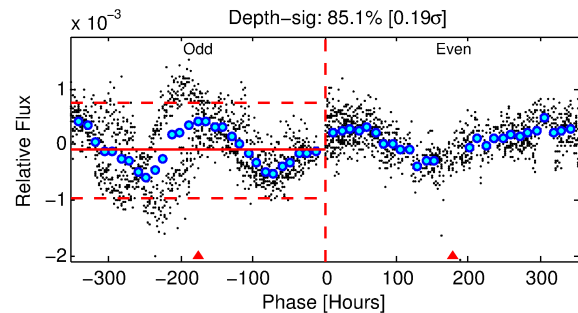
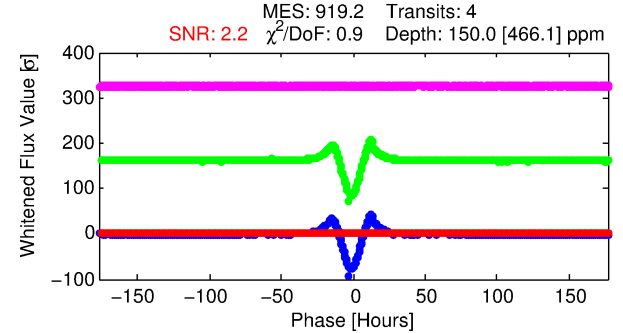
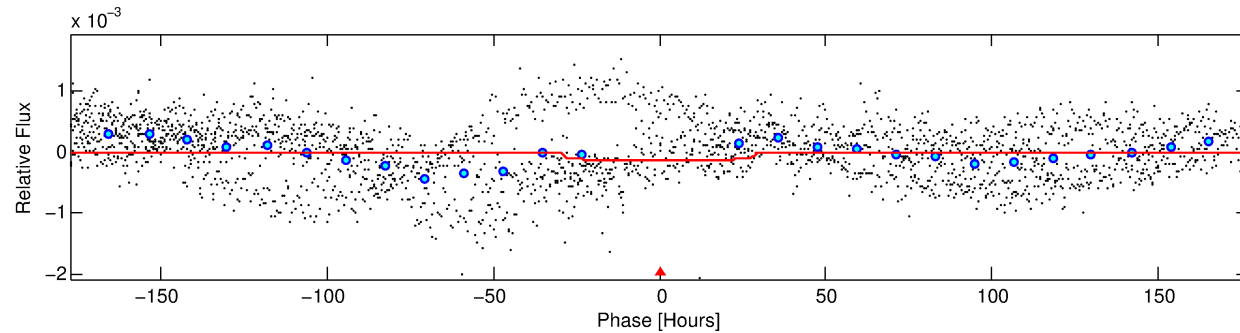
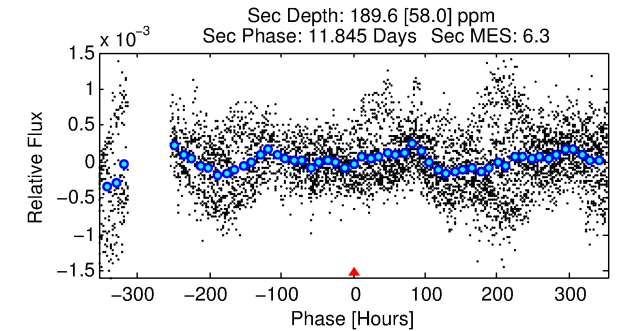
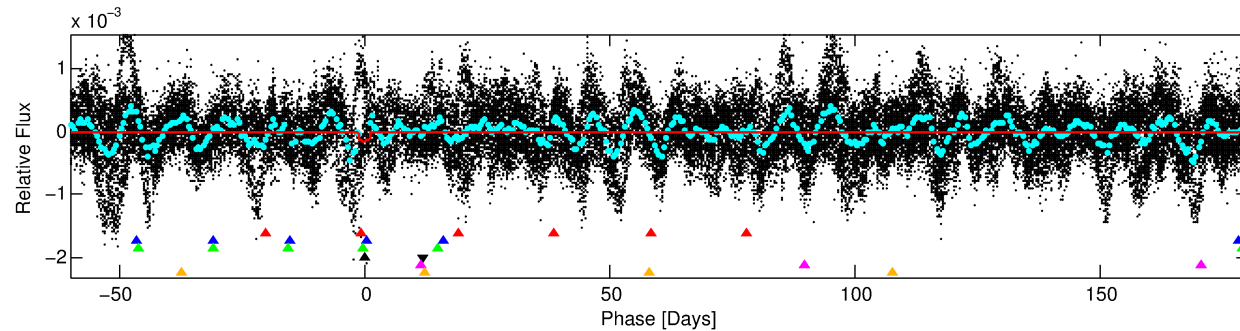
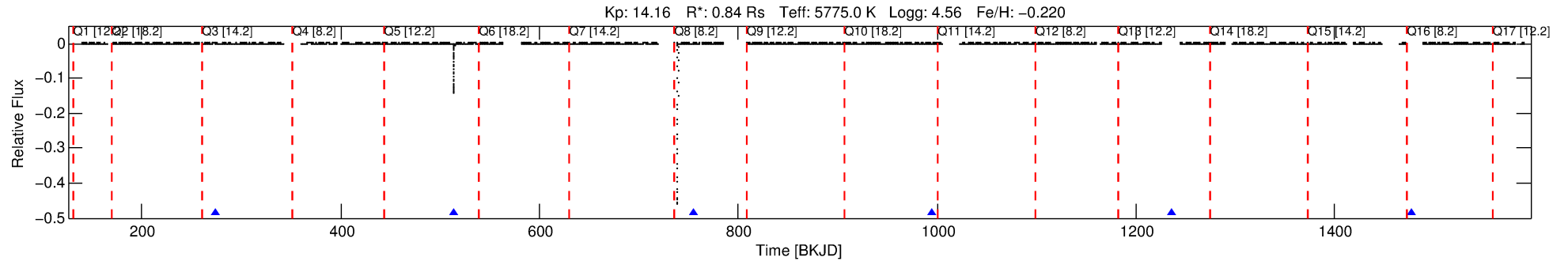
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009517991-04

No Significant Match Found

# DV One-Page Summary

KIC: 9517991 Candidate: 4 of 6 Period: 240.600 d



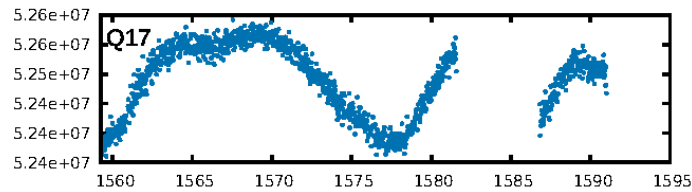
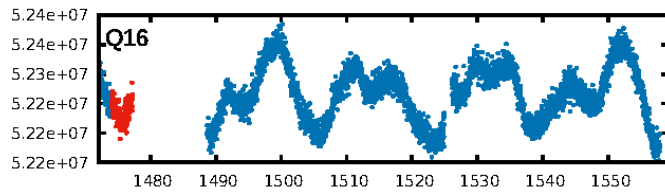
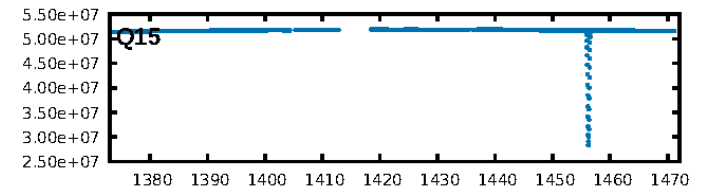
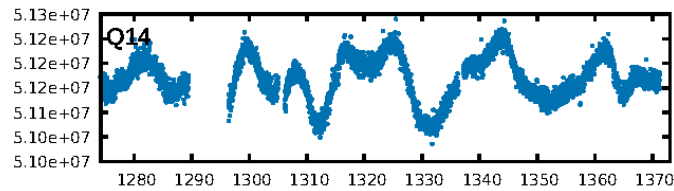
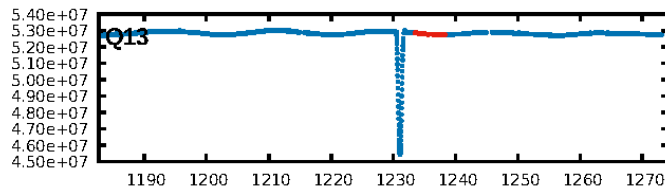
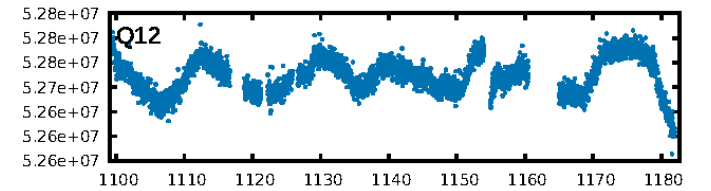
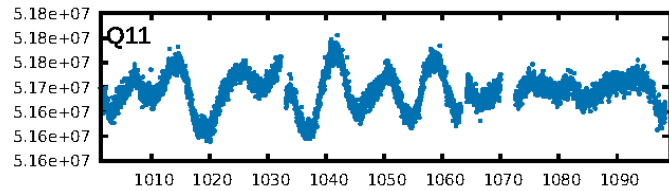
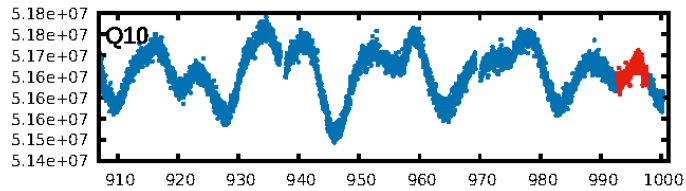
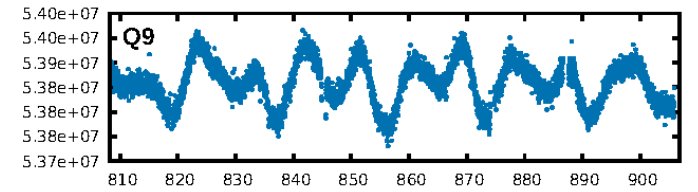
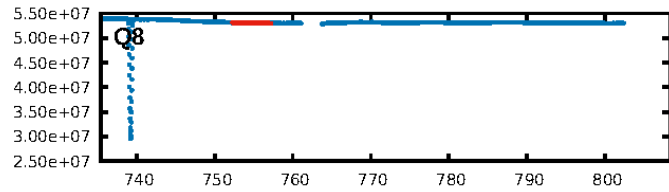
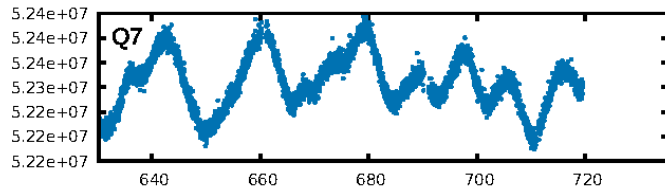
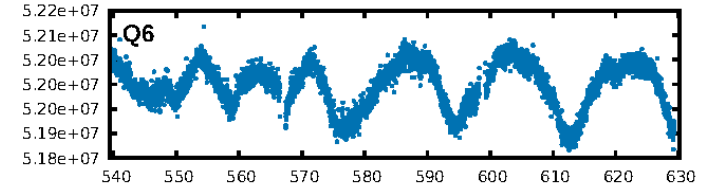
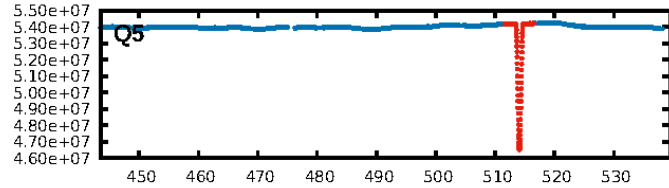
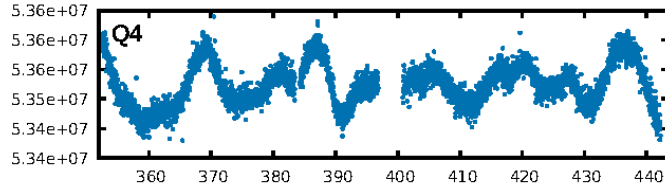
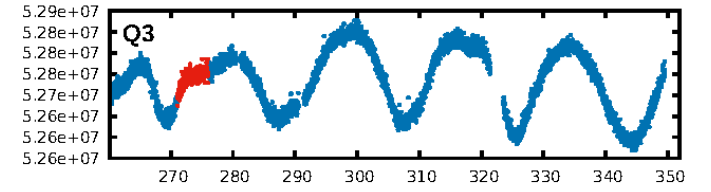
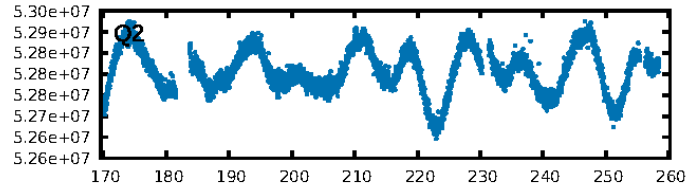
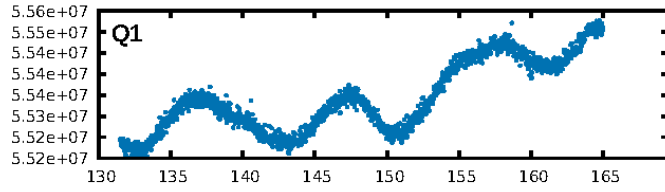
## DV Fit Results:

Period = 240.60029 [0.24009] d  
Epoch = 273.5309 [0.4139] BKJD  
Rp/R\* = 0.0120 [0.0261]  
a/R\* = 22.76 [145.98]  
b = 0.70 [4.71]  
Seff = 1.29 [0.40]  
Teq = 272 [21] K  
Rp = 1.10 [2.41] Re  
a = 0.7392 [0.1479] AU  
Ag = 47261.74 [206947.09] [0.23σ]  
Teffp = 6191 [6765] K [0.88σ]

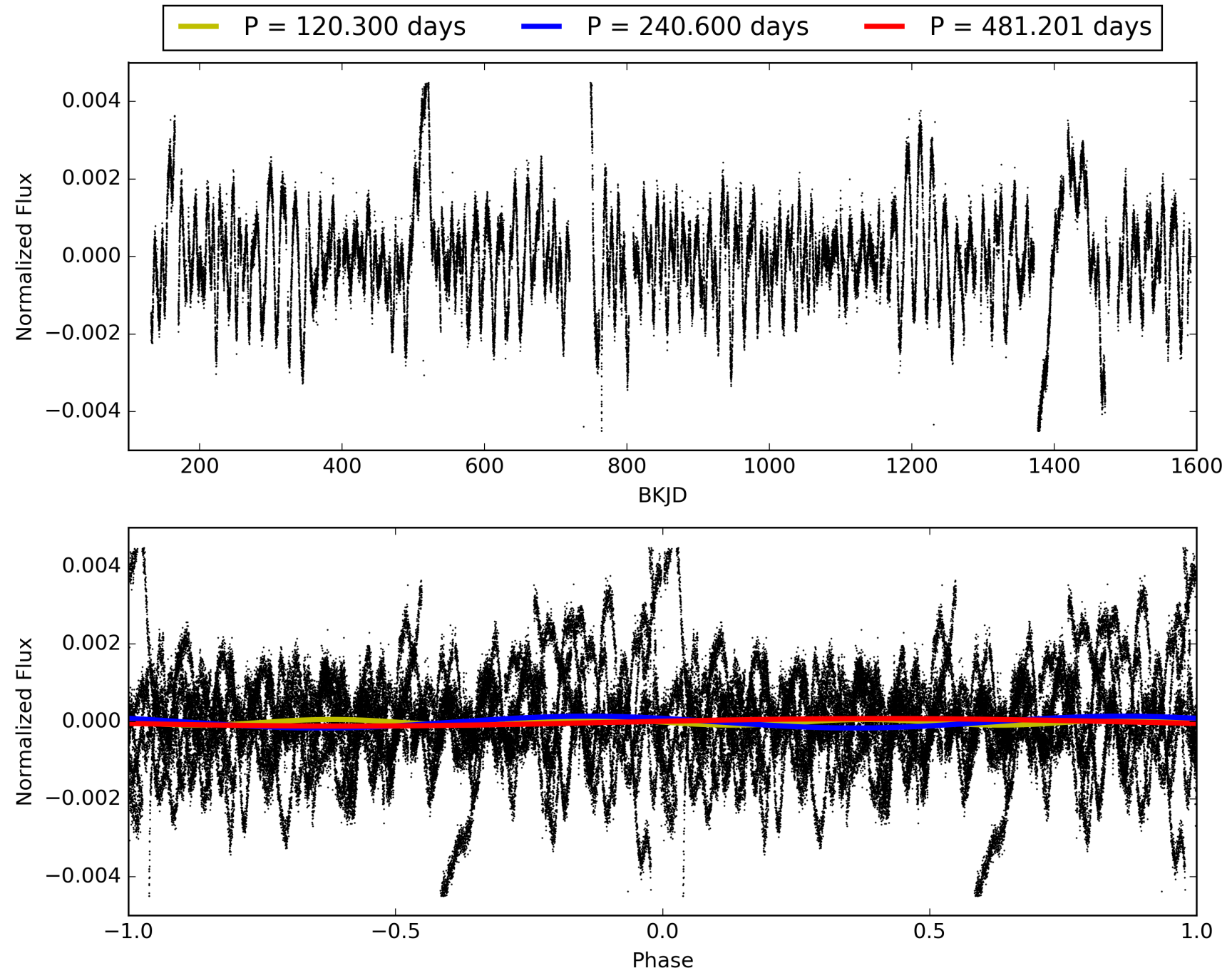
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [6.00σ]  
LongPeriod-sig: 100.0% [38.75σ]  
ModelChiSquare2-sig: 53.6%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: 2.76  
Centroid-sig: 56.9%  
Centroid-so: 0.673 arcsec [0.51σ]  
OotOffset-rm: 0.080 arcsec [0.30σ]  
KicOffset-rm: 0.249 arcsec [0.59σ]  
OotOffset-st: 1/0/1/2 [4]  
KicOffset-st: 1/0/1/2 [4]  
DiffImageQuality-fgm: 0.75 [3/4]  
DiffImageOverlap-fno: 0.50 [2/4]

# TCE 009517991-04, PDC Light Curves



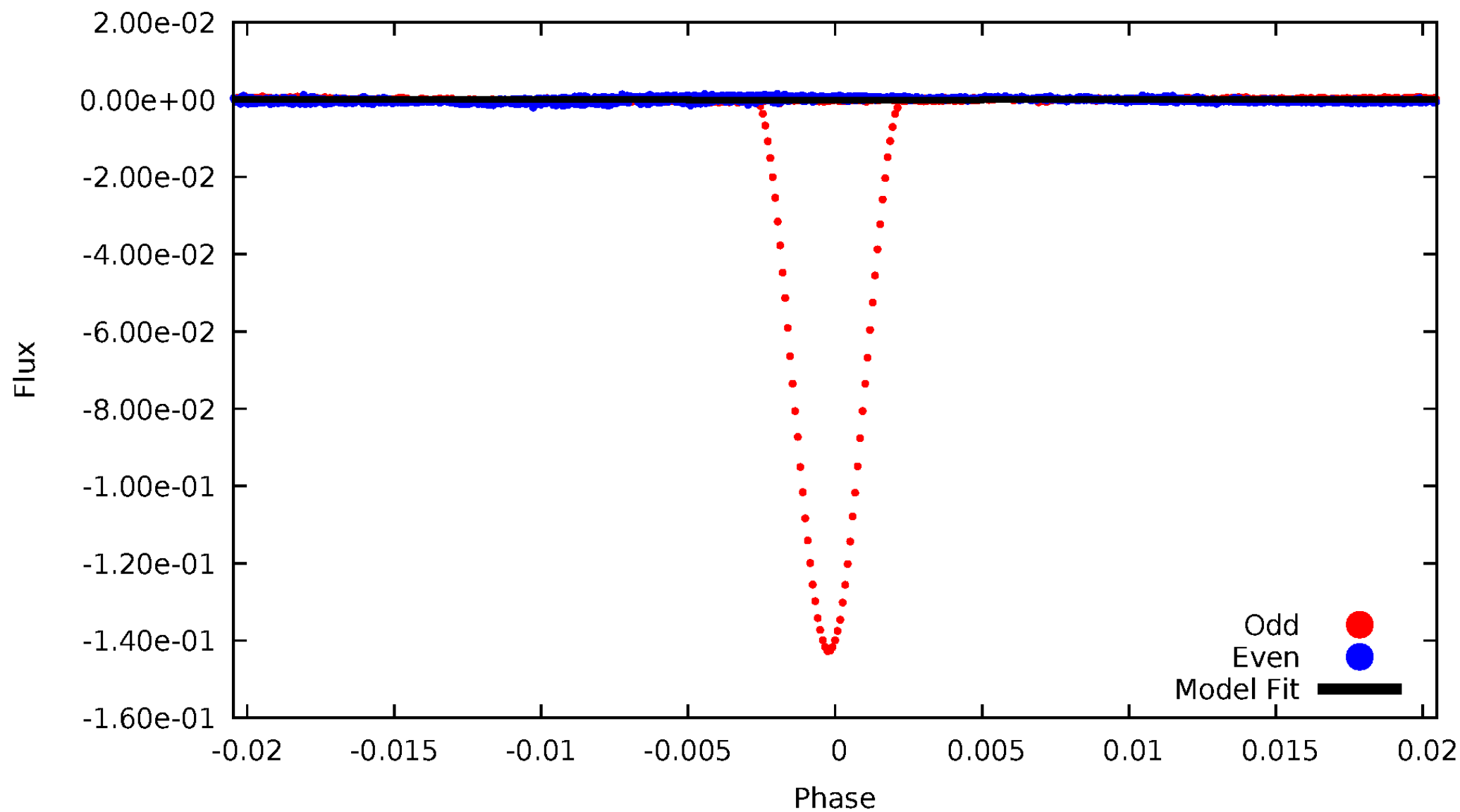
TCE 009517991-04





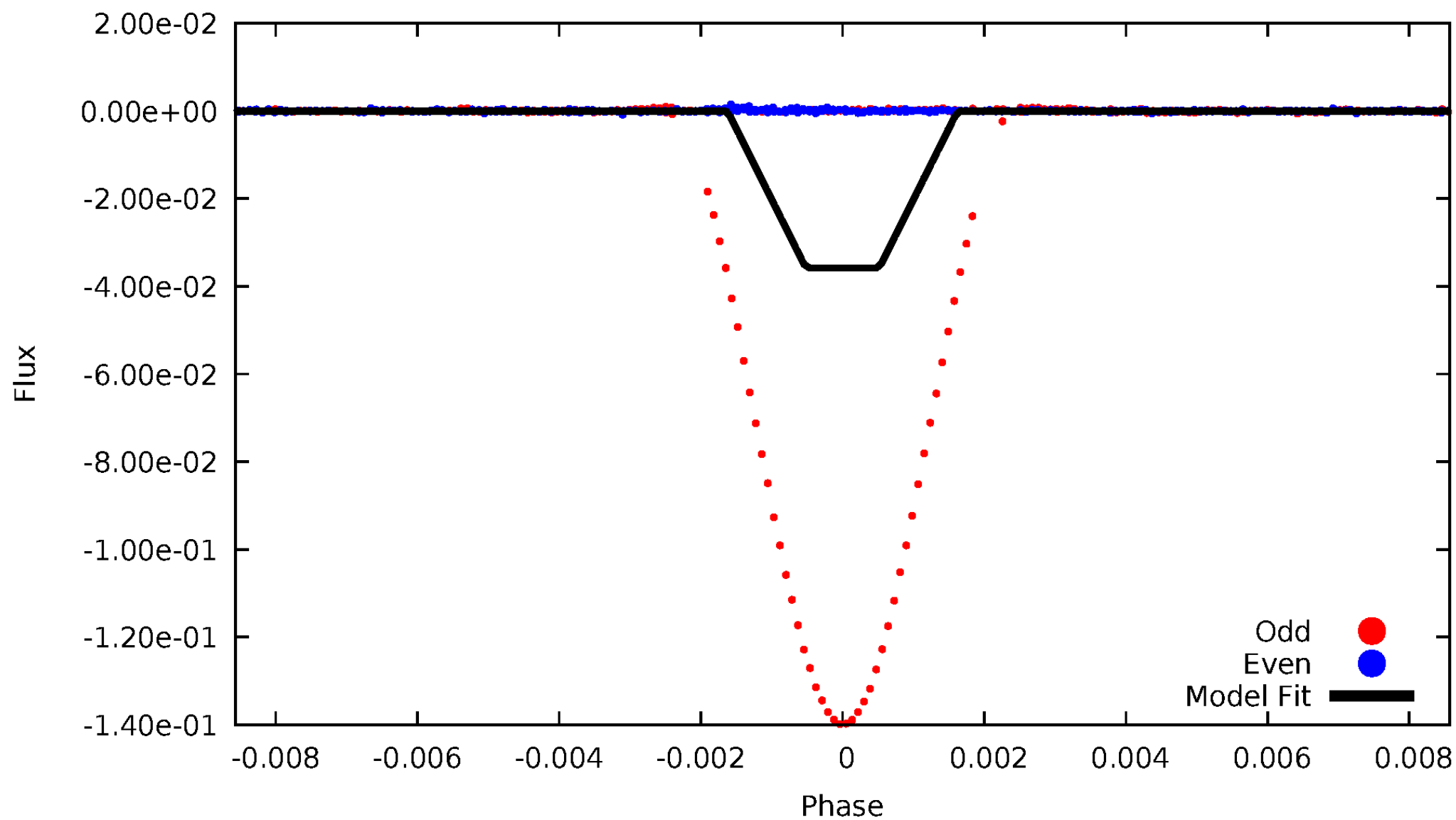
# DV Odd/Even

TCE 009517991-04



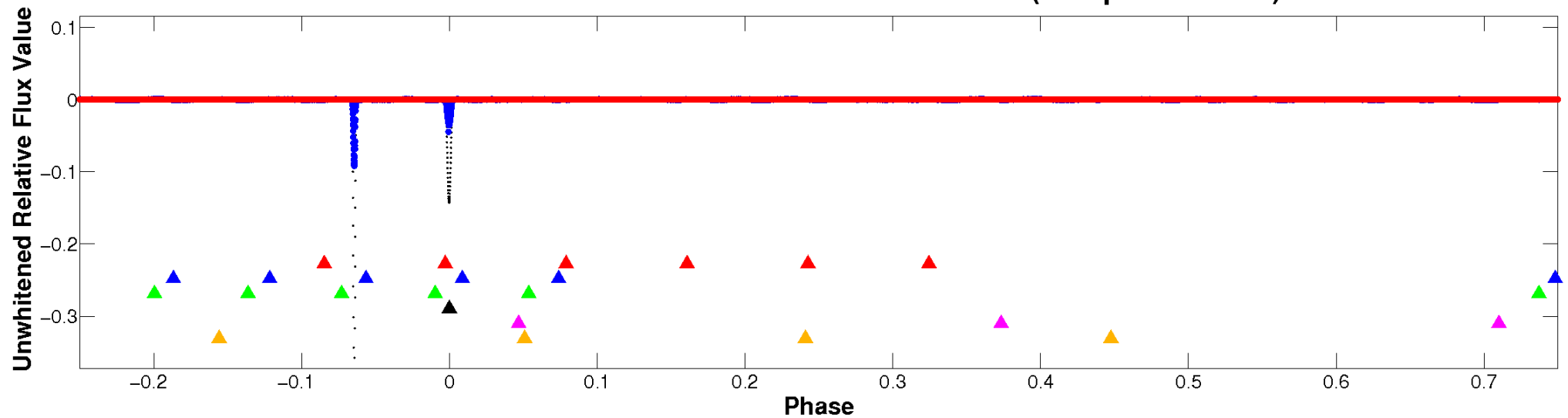
# ALT Odd/Even

TCE 009517991-04

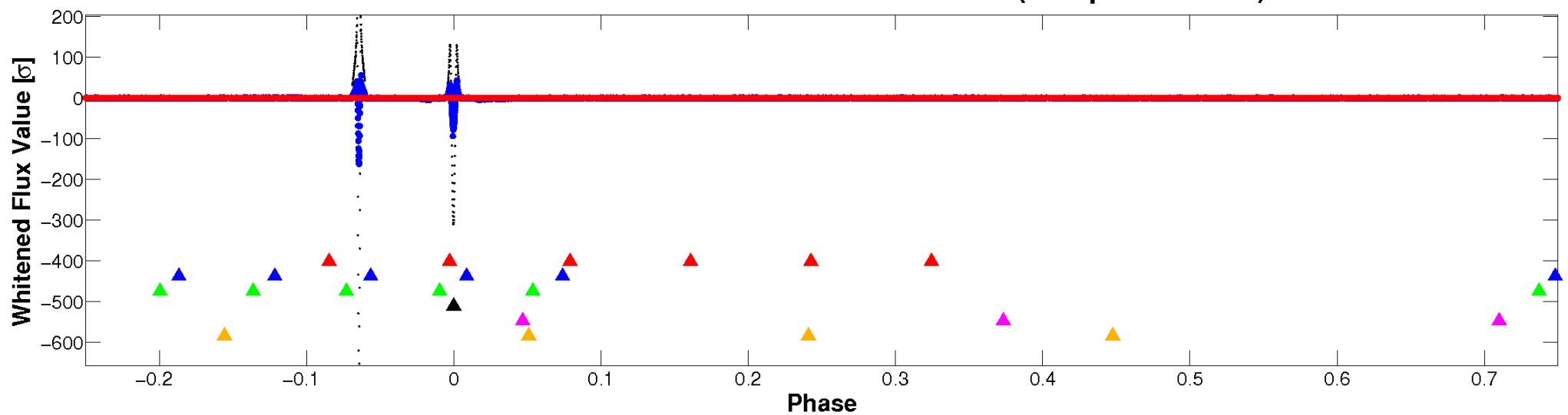


# Non-Whitened Vs. Whitened Light Curve

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

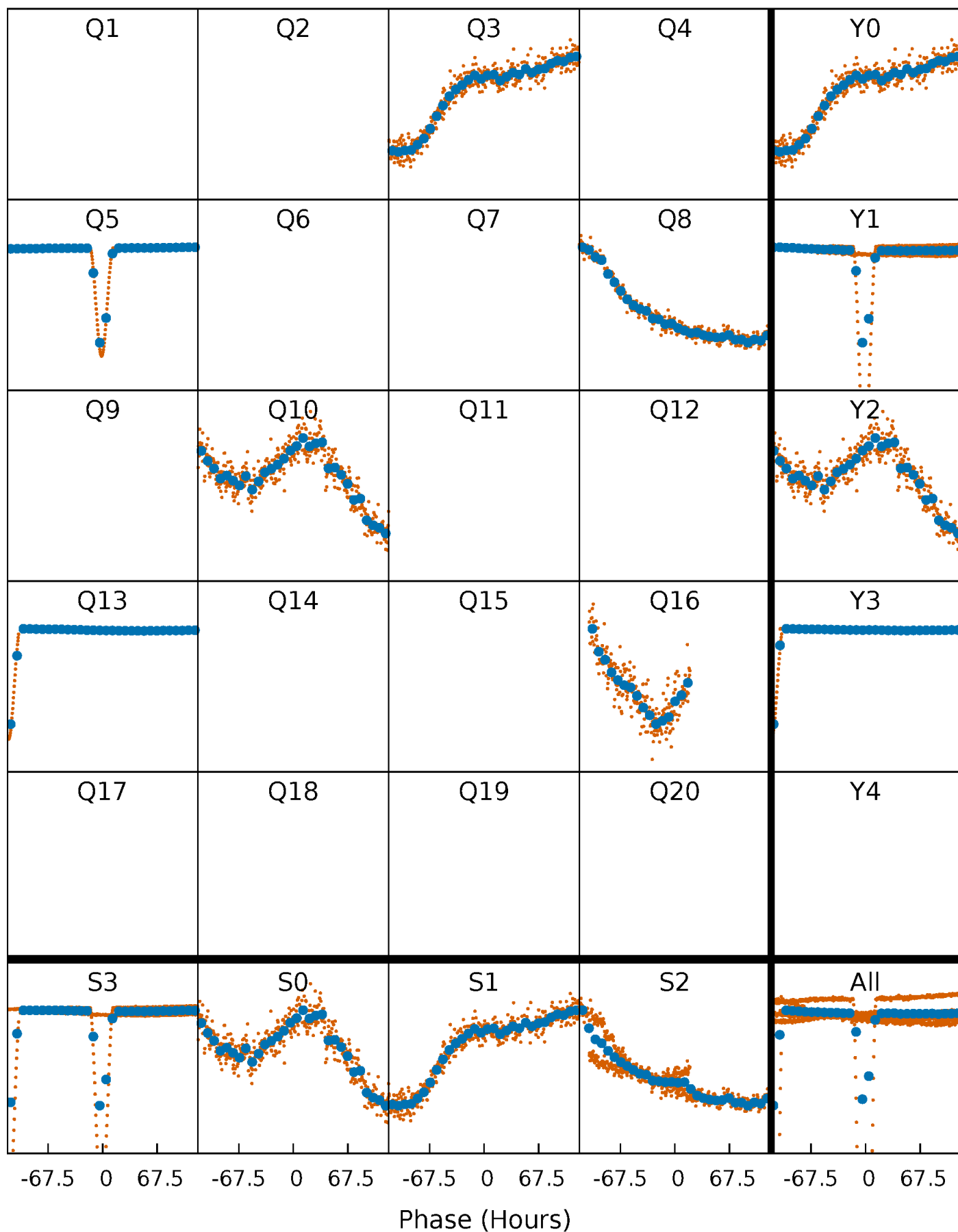


## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

TCE 009517991-04     $P=240.600290$  Days     $T_0=273.530936$  (BKJD)



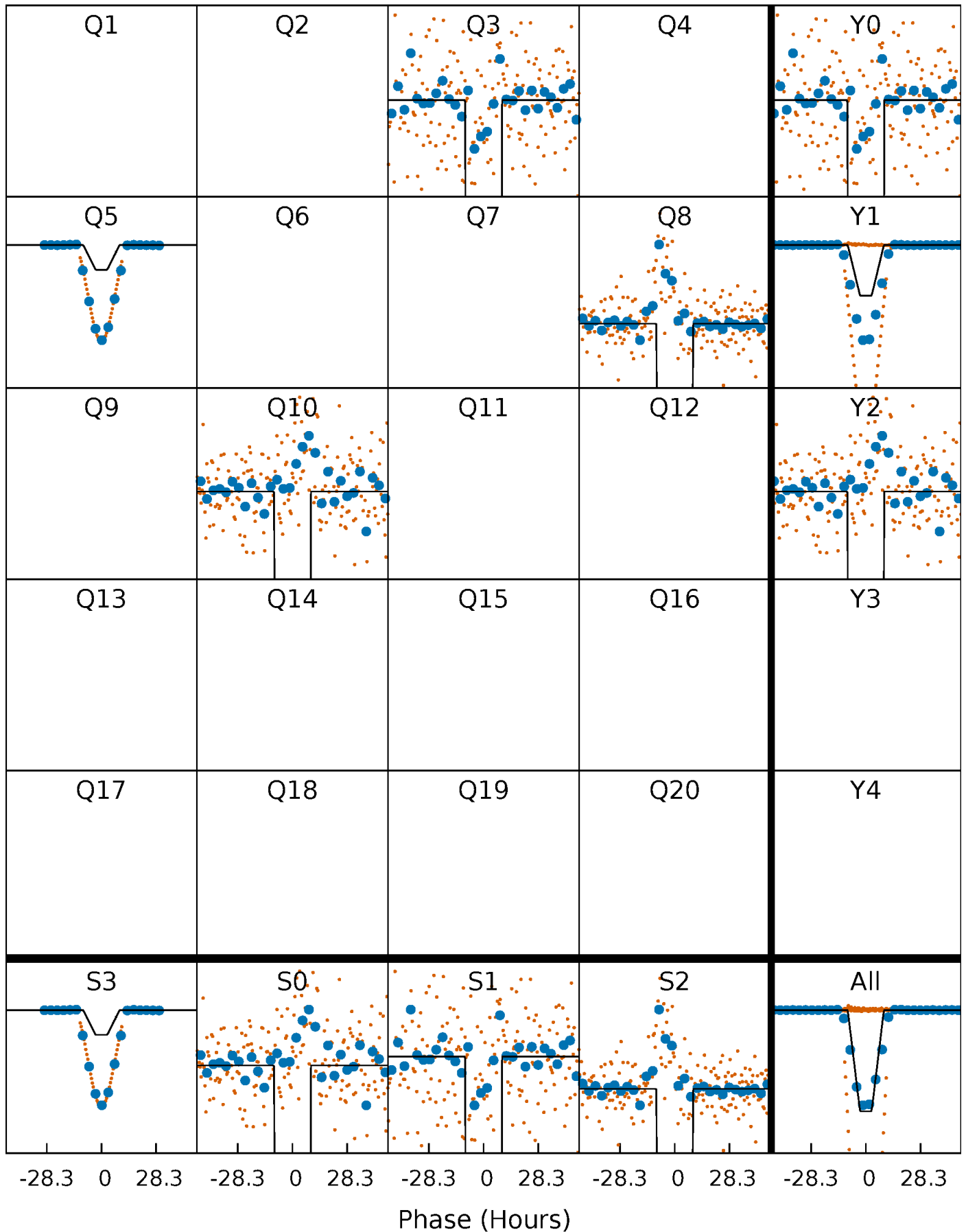
# DV Quarter-Phased Transit Curves

TCE 009517991-04     $P=240.600290$  Days     $T_0=273.530936$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

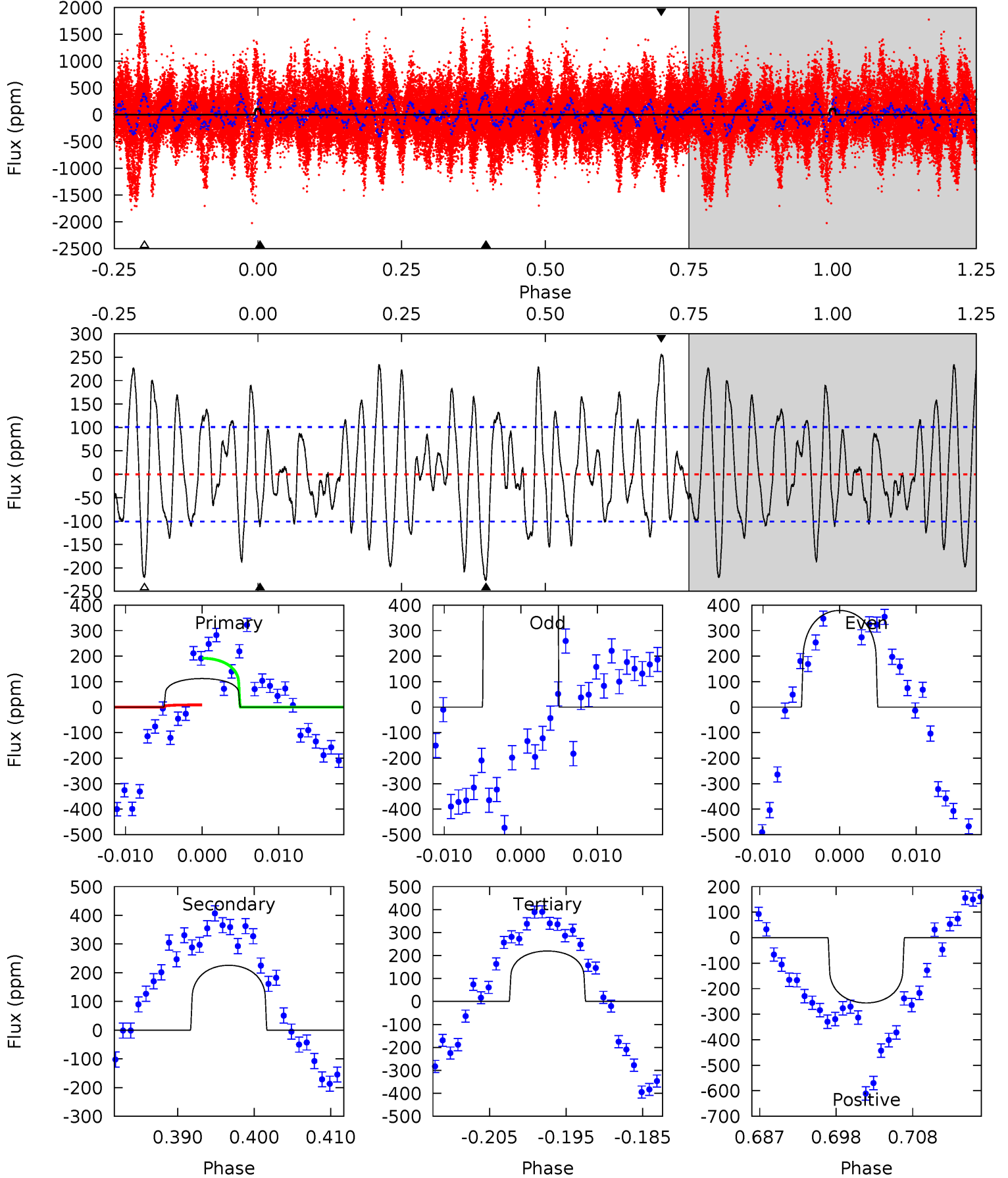
TCE 009517991-04 P=240.686903 Days  $T_0=273.392285$  (BKJD)



# DV Model-Shift Uniqueness Test

009517991-04, P = 240.600290 Days, E = 32.930646 Days

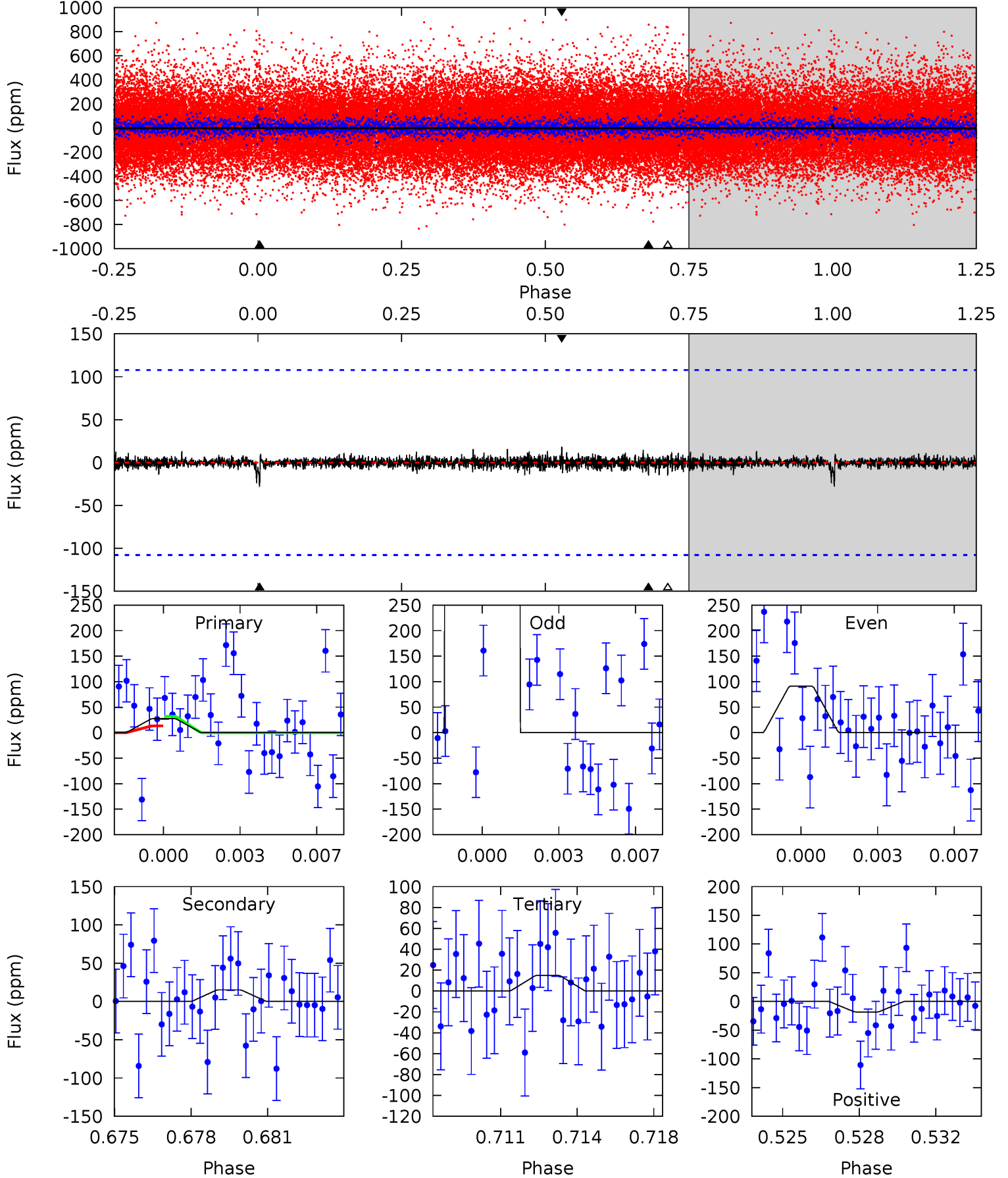
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
5.58	11.2	10.9	12.7	5.02	2.57	4.82	-5.35	-7.15	0.31	-1.49	48.5	67.6	0.53	4.59



# Alt Model-Shift Uniqueness Test

009517991-04, P = 240.686903 Days, E = 32.705382 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
1.34	0.73	0.73	0.89	5.23	2.94	0.19	0.61	0.45	0.01	-0.16	794.1	-1902	0.40	0.45





### Stellar Parameters For KIC 009517991

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5775^{+138}_{-155}$	$4.558^{+0.040}_{-0.160}$	$-0.220^{+0.300}_{-0.300}$	$0.840^{+0.199}_{-0.080}$	$0.934^{+0.090}_{-0.120}$	$2.219^{+0.380}_{-0.996}$
	+2%/-3%	+1%/-4%	+136%/-136%	+24%/-10%	+10%/-13%	+17%/-45%
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 009517991-04 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-226 \pm 20$	$2.14^{+2.19}_{-1.48}$	$386^{+21}_{-15}$	$4826^{+3985}_{-1107}$	$14549^{+129509}_{-11046}$
Alt.	$-15 \pm 21$	$17.86^{+3.10}_{-2.83}$	$387^{+22}_{-16}$	$1867^{+176}_{-3474}$	$15^{+22}_{-17}$

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

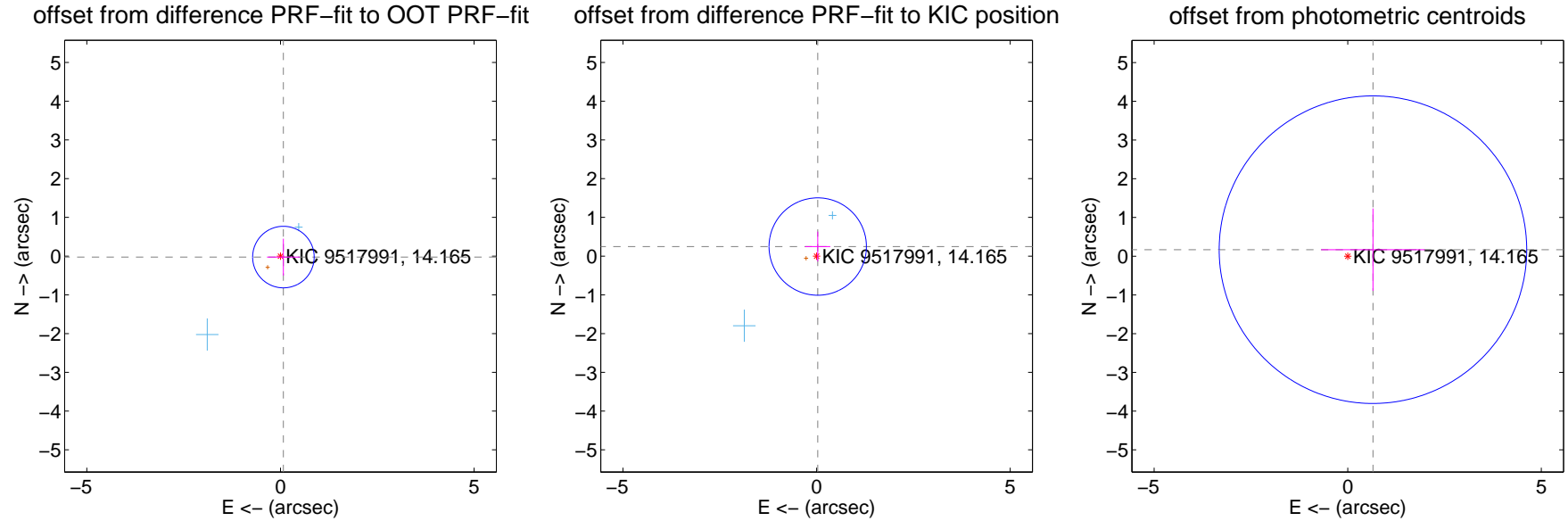
## DV Centroid Data

Supplemental centroid analysis for 009517991-04. Kepler magnitude: 14.16. Transit SNR 2.20

There are 3 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.31 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.080 \pm 0.265$	0.30	$-0.076 \pm 0.423$	$-0.024 \pm 0.475$
PRF-fit source offset from KIC position	$0.249 \pm 0.419$	0.59	$-0.030 \pm 0.325$	$0.248 \pm 0.385$
photometric centroid source offset	$0.67 \pm 1.32$	0.51	$-0.65 \pm 1.34$	$0.17 \pm 1.06$

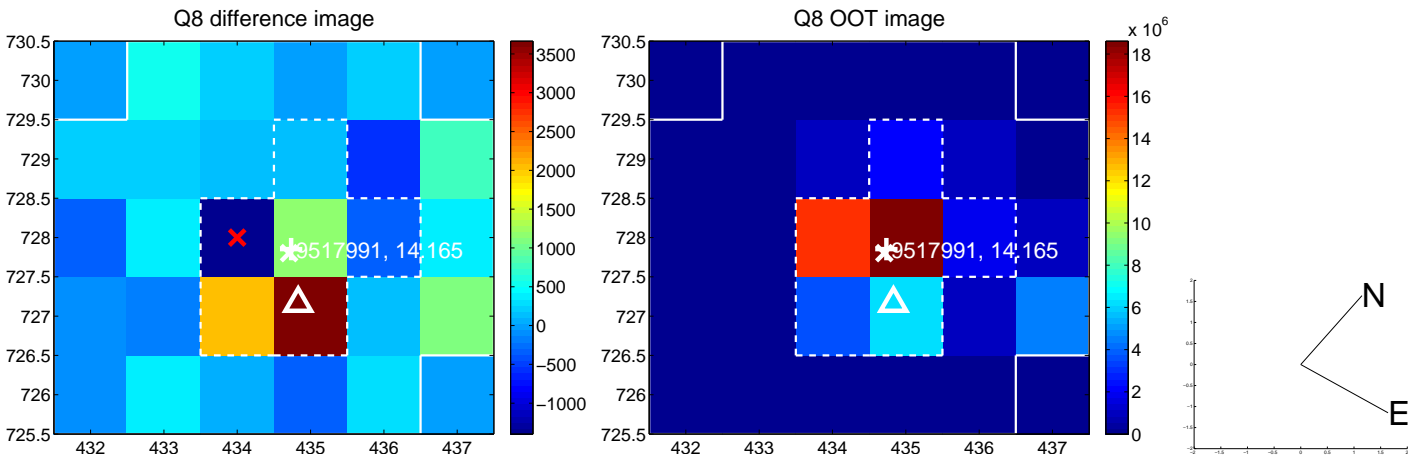
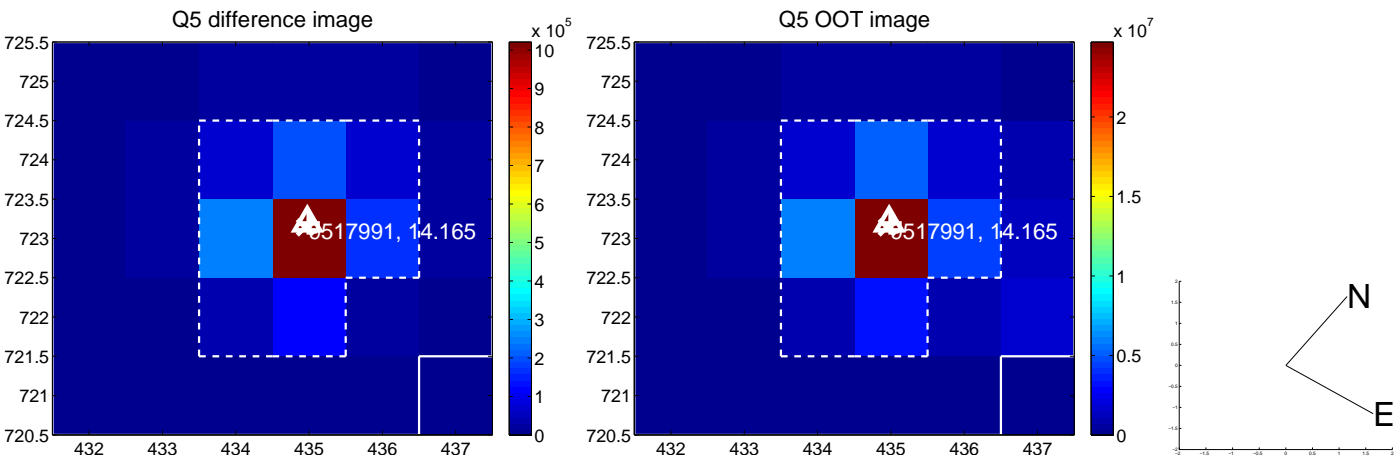


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

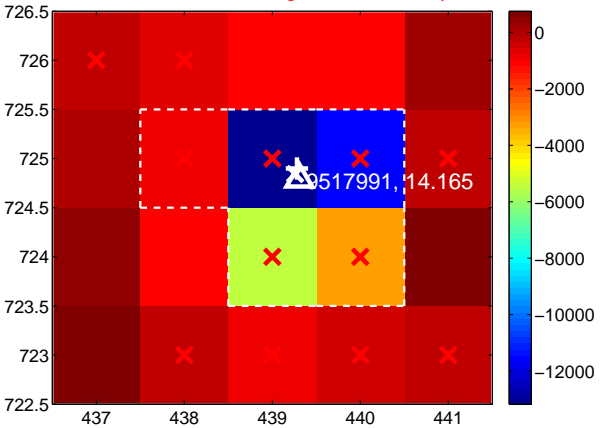
Q9 no difference image



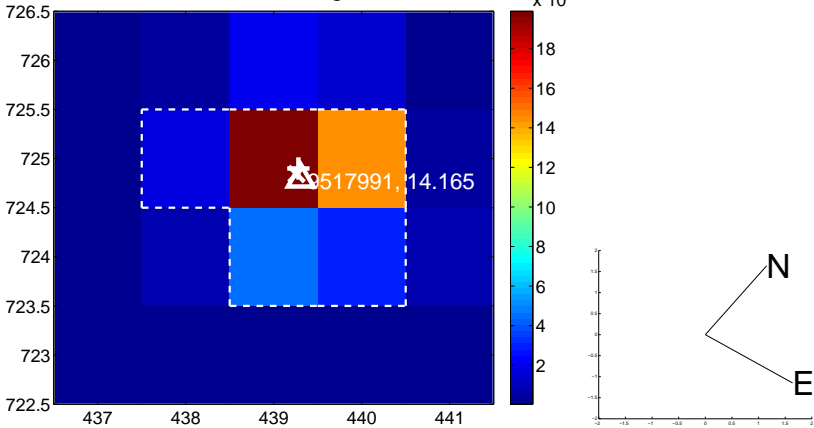
Q9 no OOT image



Q10 difference image. Poor Quality



Q10 OOT image



Q11 no difference image



Q11 no OOT image



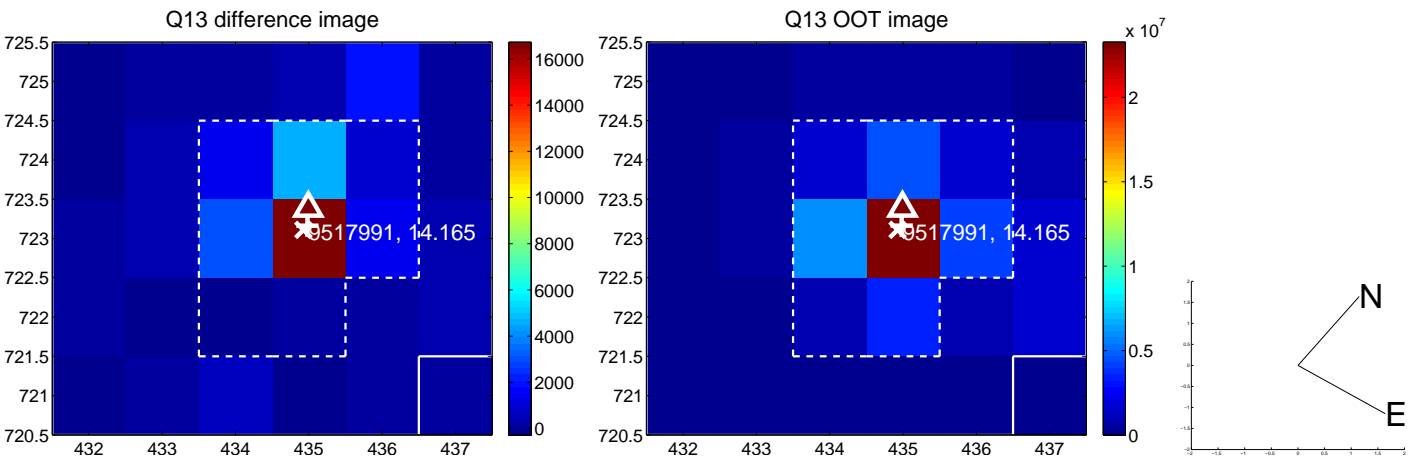
Q12 no difference image



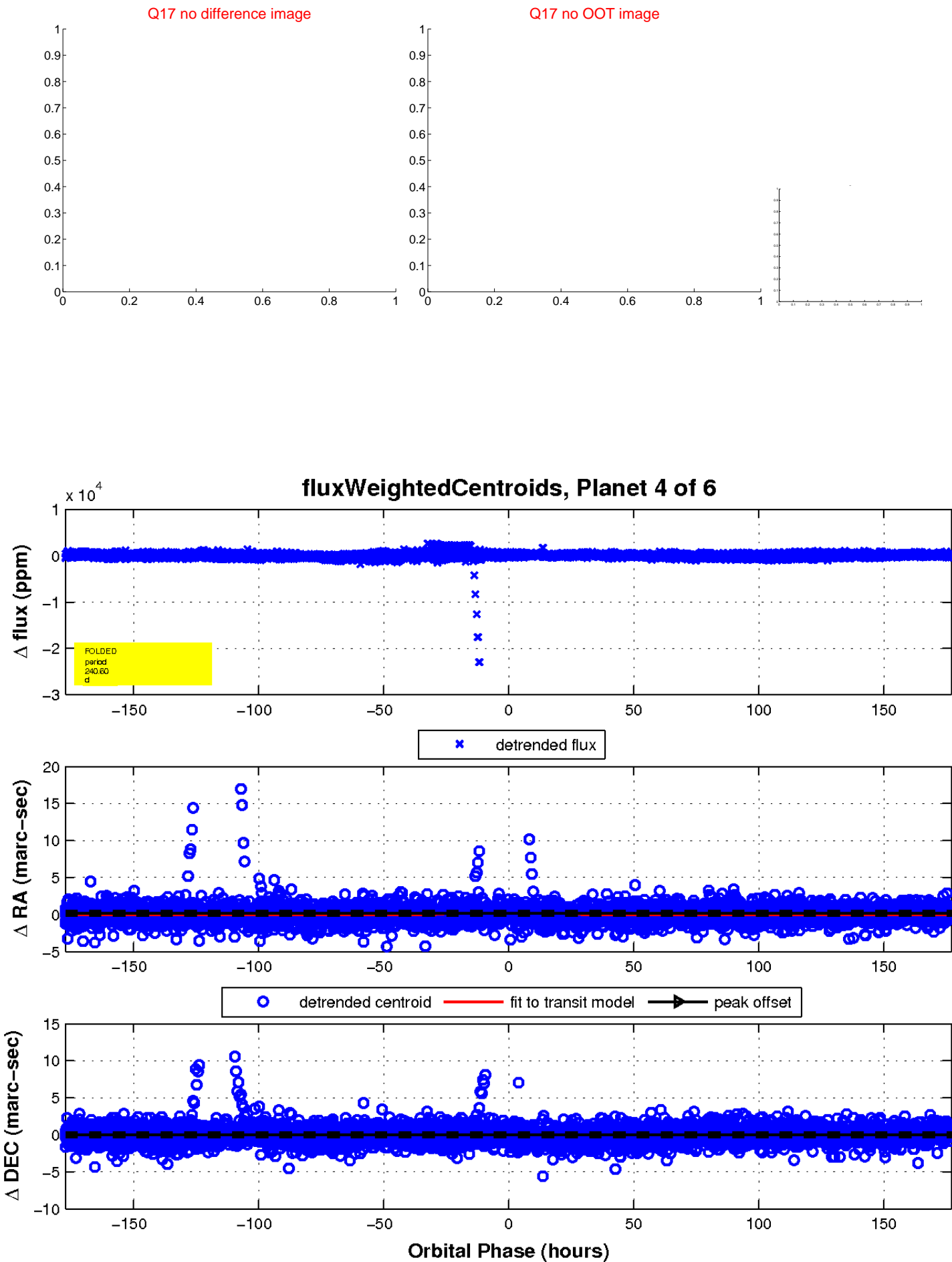
Q12 no OOT image



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

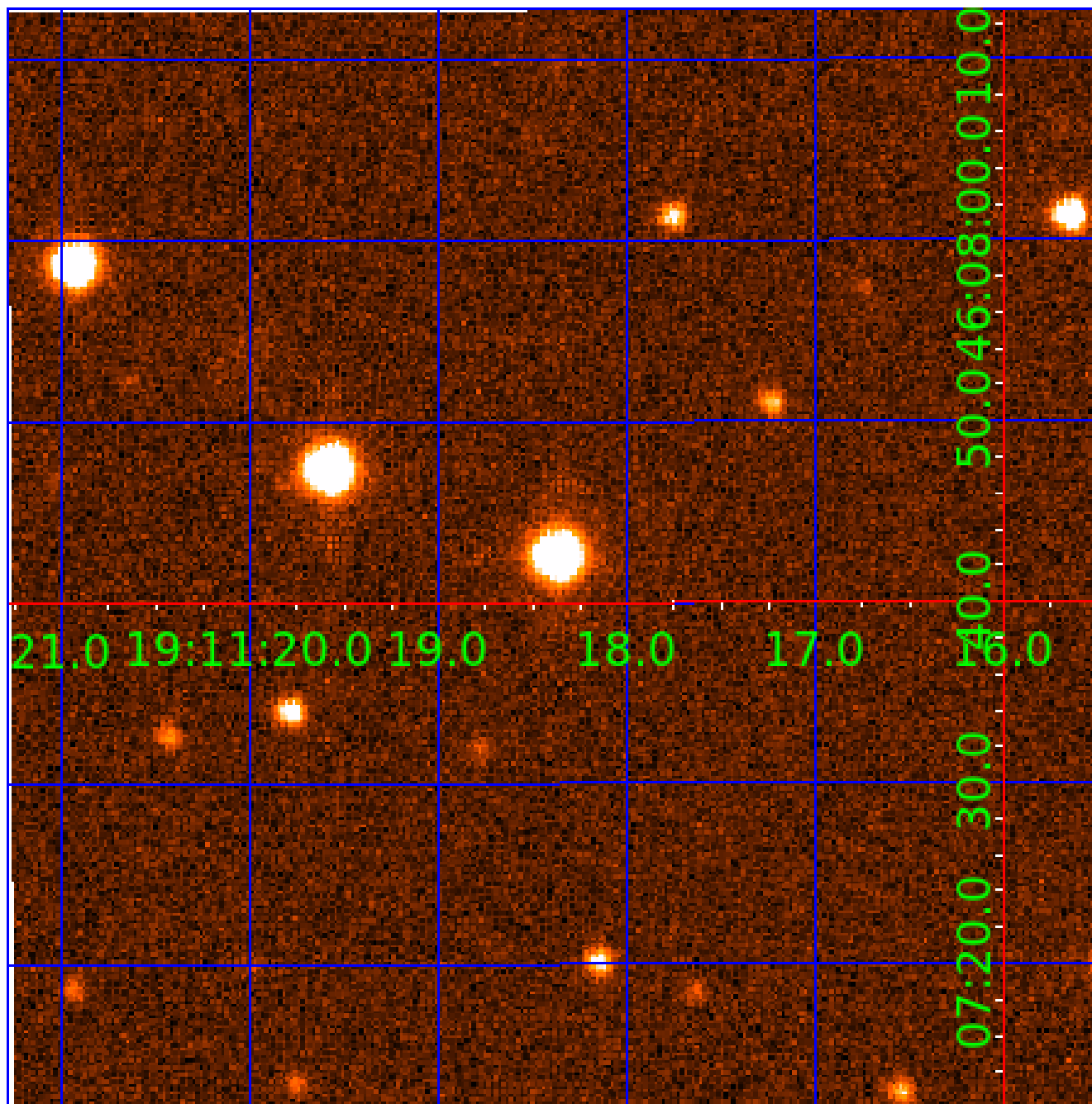


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 009517991

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009517991-01	OBS	No	220.914692	351.602108	0.0	145.239	4316.5	0.0	0.84	5775	0.01	1.44
009517991-02	OBS	No	224.925817	291.315055	3114.2	15.000	76.7	-1.0	0.84	5775	4.65	1.41
009517991-03	OBS	No	225.368544	286.458679	2780.8	15.000	51.7	-1.0	0.84	5775	4.40	1.40
009517991-04	OBS	No	240.600290	273.530936	150.0	59.082	919.2	2.2	0.84	5775	1.10	1.29
009517991-05	OBS	No	640.770968	284.809551	156.8	2.970	8.7	2.1	0.84	5775	1.25	0.35
009517991-06	OBS	No	336.035734	285.788611	306.0	1.832	8.8	2.4	0.84	5775	1.55	0.82

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009517991-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009517991-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_NOFITS
009517991-03	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_MARSHALL_SKYE_ZUMA—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_NOFITS—HALO_GHOST
009517991-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL_ZUMA—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS
009517991-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_TRACKER—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009517991-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_MARSHALL_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—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.

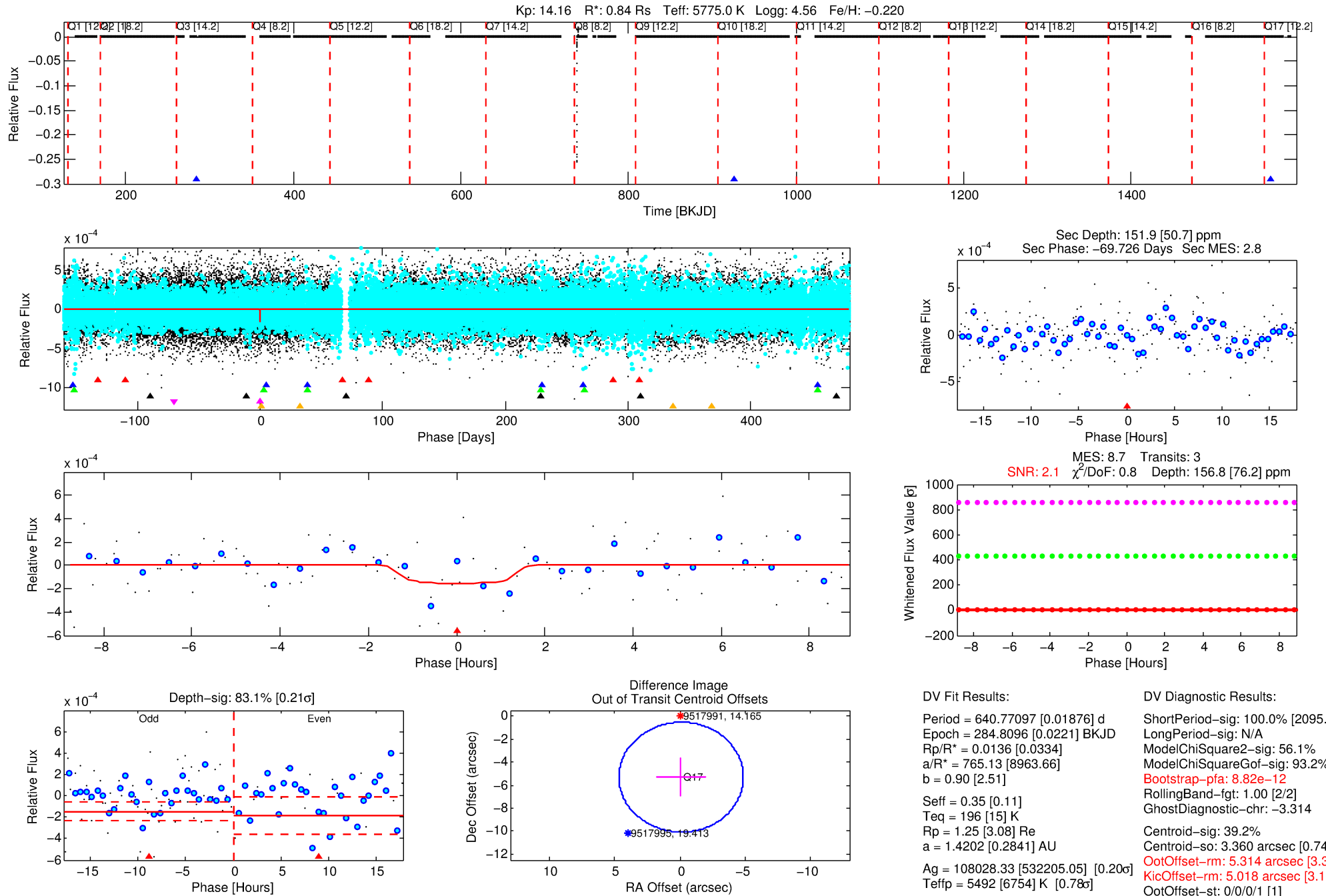
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009517991-05

No Significant Match Found

# DV One-Page Summary

KIC: 9517991 Candidate: 5 of 6 Period: 640.771 d



## DV Fit Results:

Period = 640.77097 [0.01876] d  
Epoch = 284.8096 [0.0221] BKJD  
Rp/R\* = 0.0136 [0.0334]  
a/R\* = 765.13 [8963.66]  
b = 0.90 [2.51]  
Seff = 0.35 [0.11]  
Teff = 196 [15] K  
Rp = 1.25 [3.08] Re  
a = 1.4202 [0.2841] AU  
Ag = 108028.33 [532205.05] [0.20 $\sigma$ ]  
Teffp = 5492 [6754] K [0.78 $\sigma$ ]

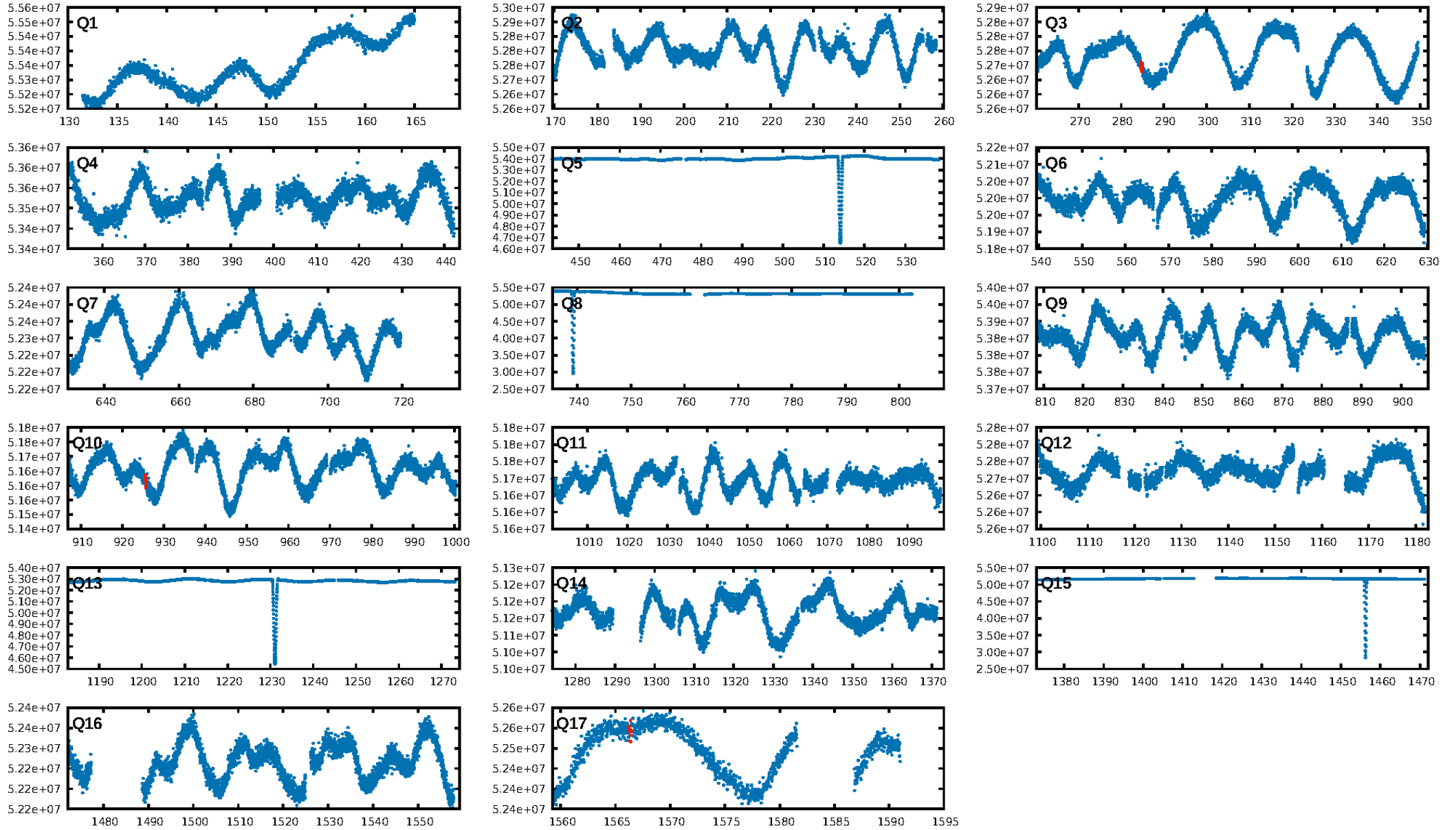
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [2095.73 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 56.1%  
ModelChiSquareGoF-sig: 93.2%  
**Bootstrap-pfa: 8.82e-12**  
RollingBand-fgt: 1.00 [2/2]  
GhostDiagnostic-chr: -3.314  
Centroid-sig: 39.2%  
Centroid-so: 3.360 arcsec [0.74 $\sigma$ ]  
**OotOffset-rm: 5.314 arcsec [3.34 $\sigma$ ]**  
**KicOffset-rm: 5.018 arcsec [3.16 $\sigma$ ]**  
OotOffset-st: 0/0/0/1 [1]  
KicOffset-st: 0/0/0/1 [1]  
DiffImageQuality-fgm: 0.00 [0/1]  
DiffImageOverlap-fno: 1.00 [3/3]

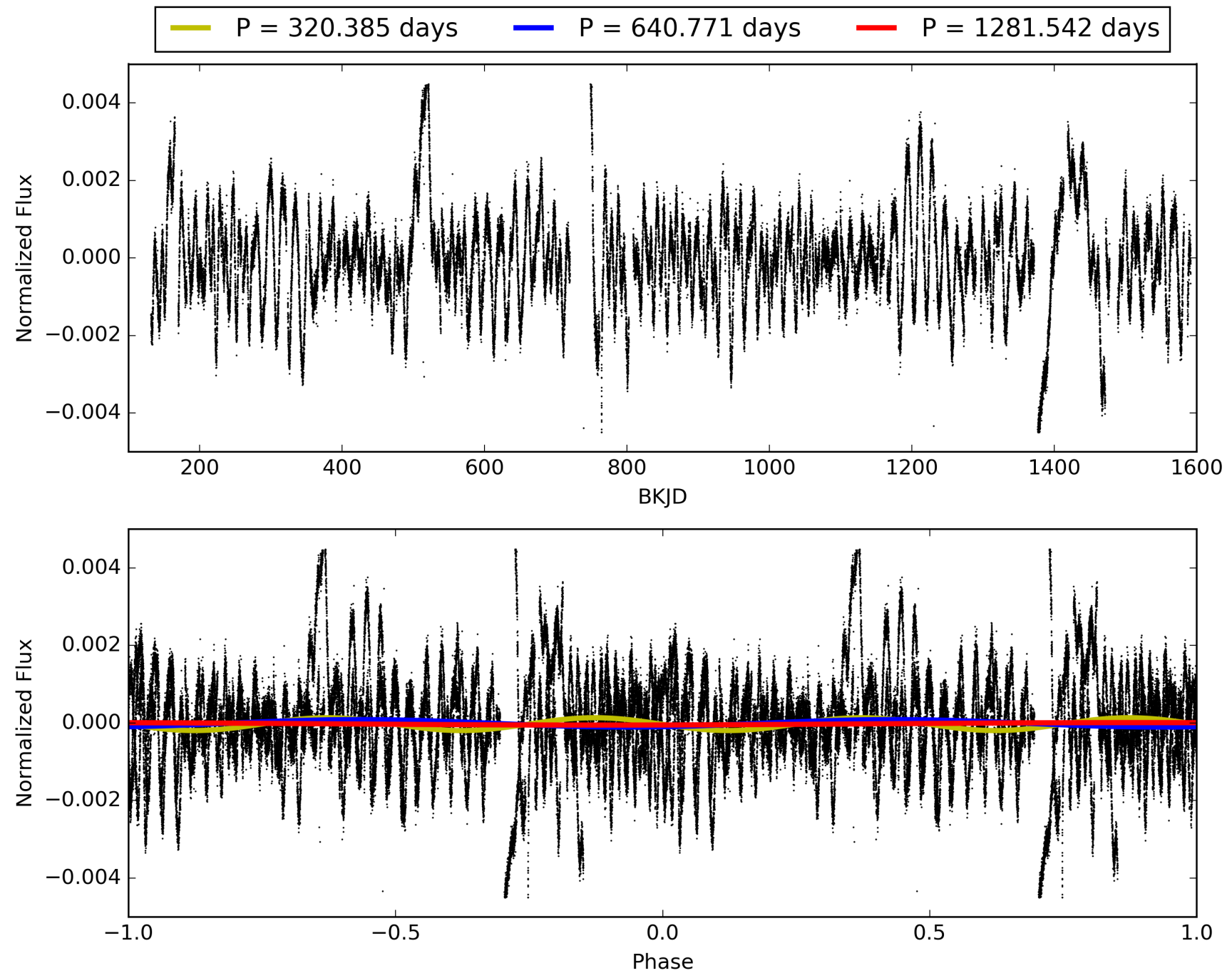
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 03:24:36 Z

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

# TCE 009517991-05, PDC Light Curves

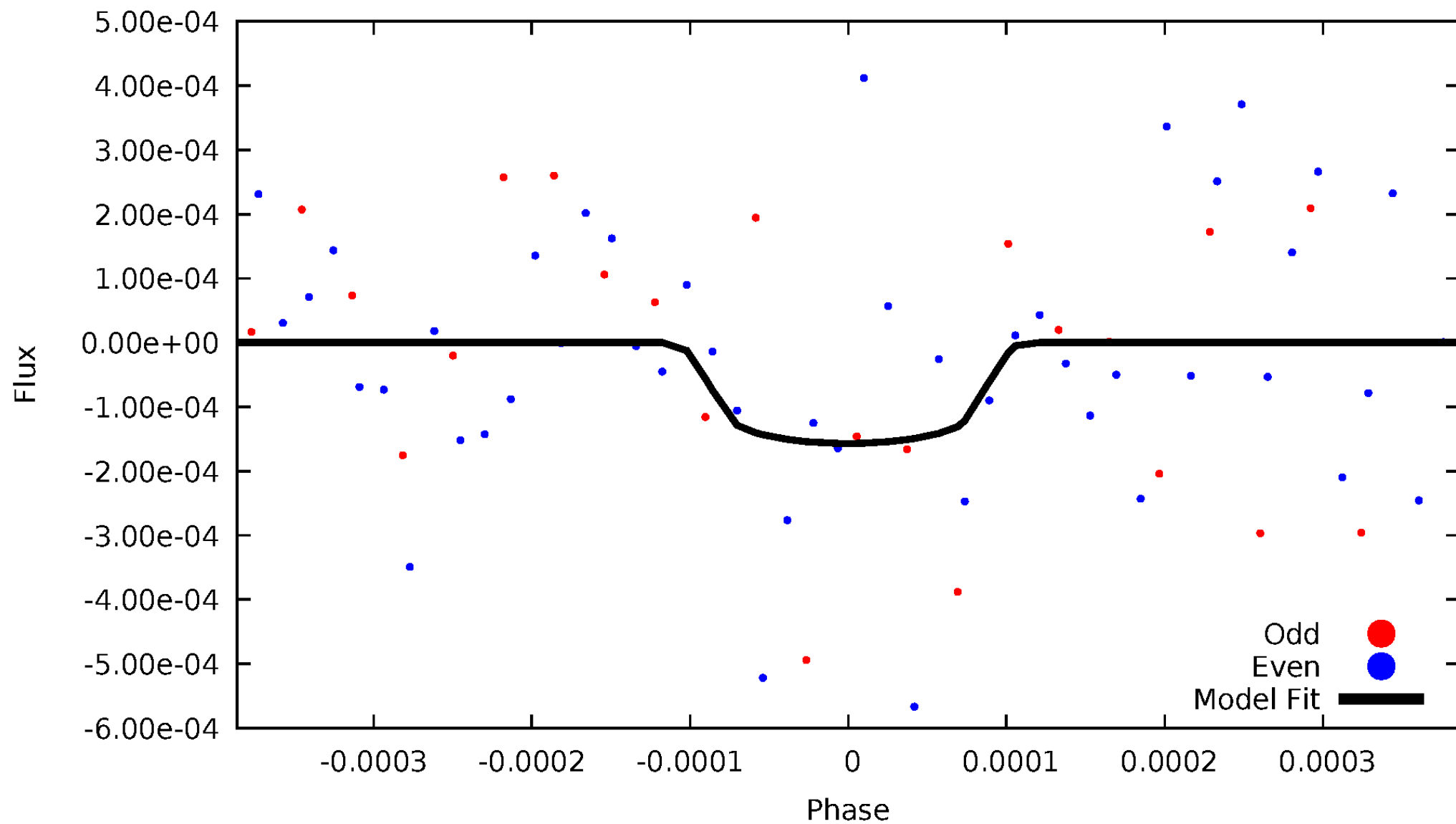


TCE 009517991-05



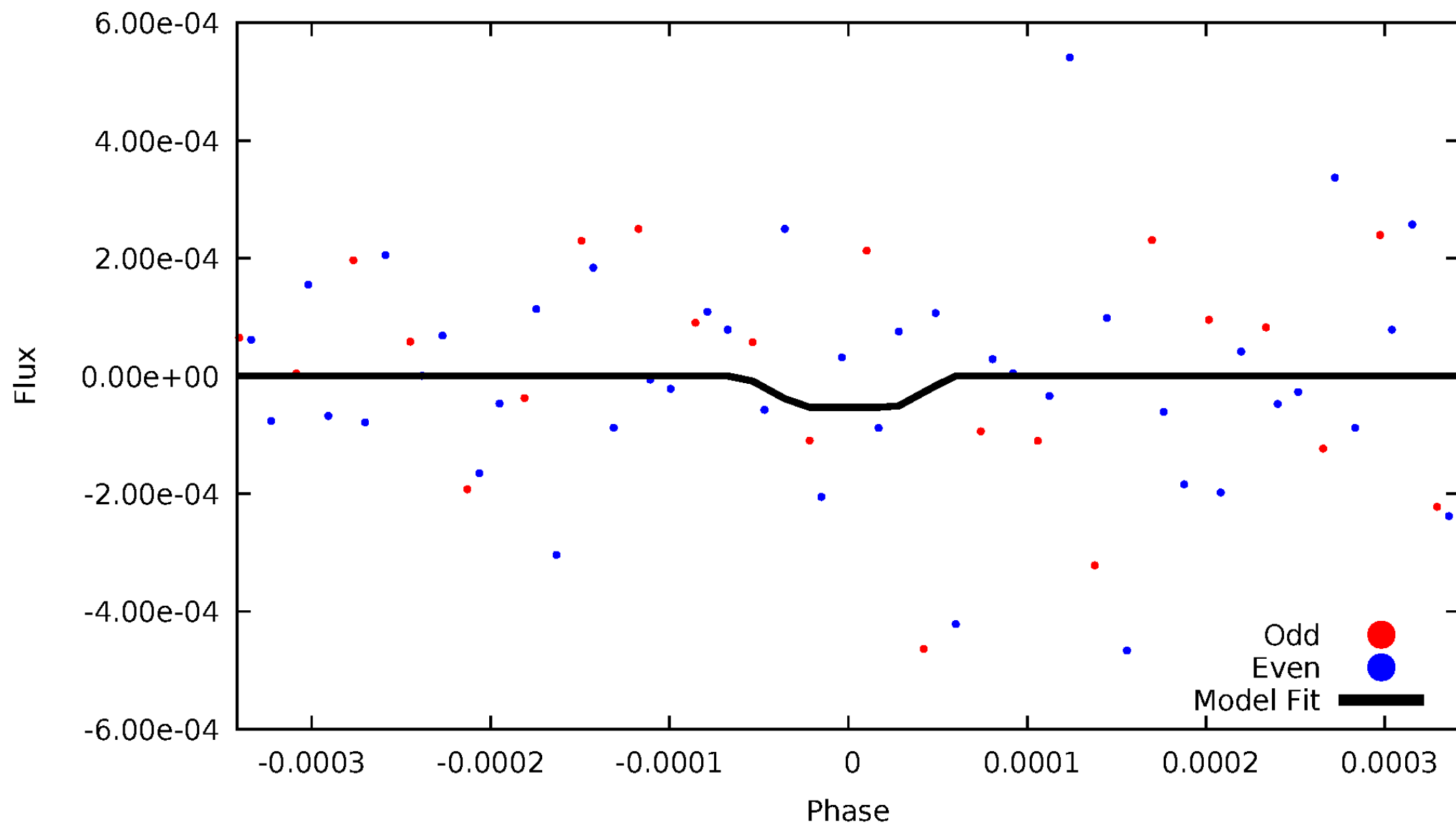
# DV Odd/Even

TCE 009517991-05



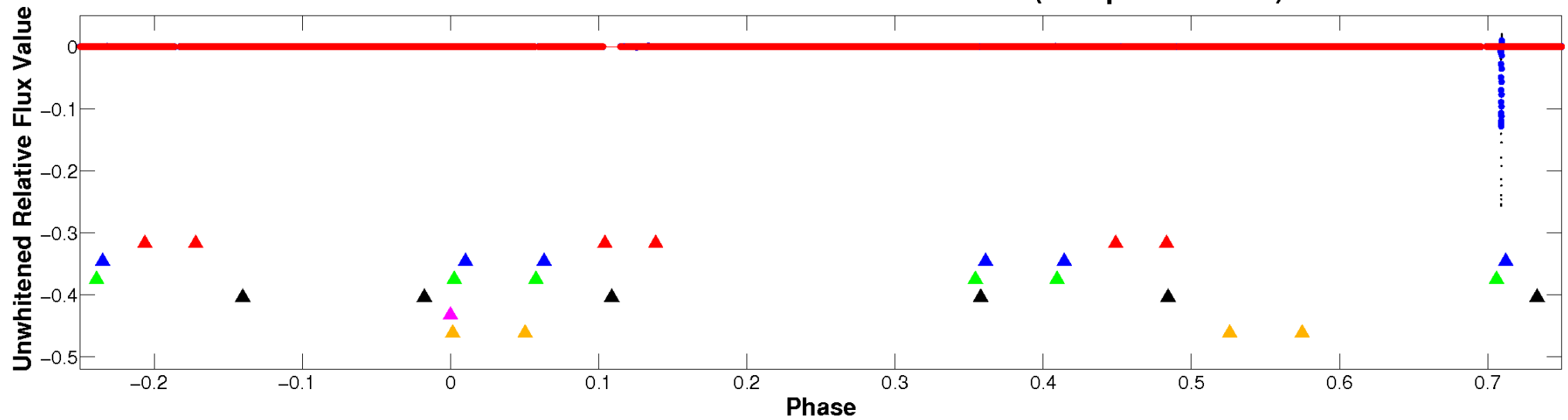
# ALT Odd/Even

TCE 009517991-05

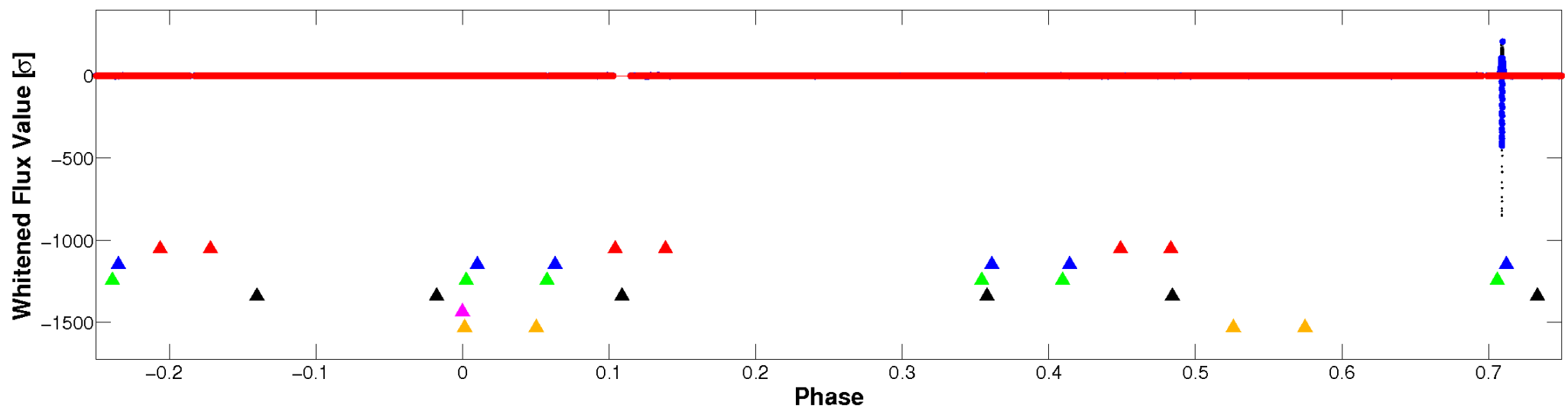


# Non-Whitened Vs. Whitened Light Curve

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

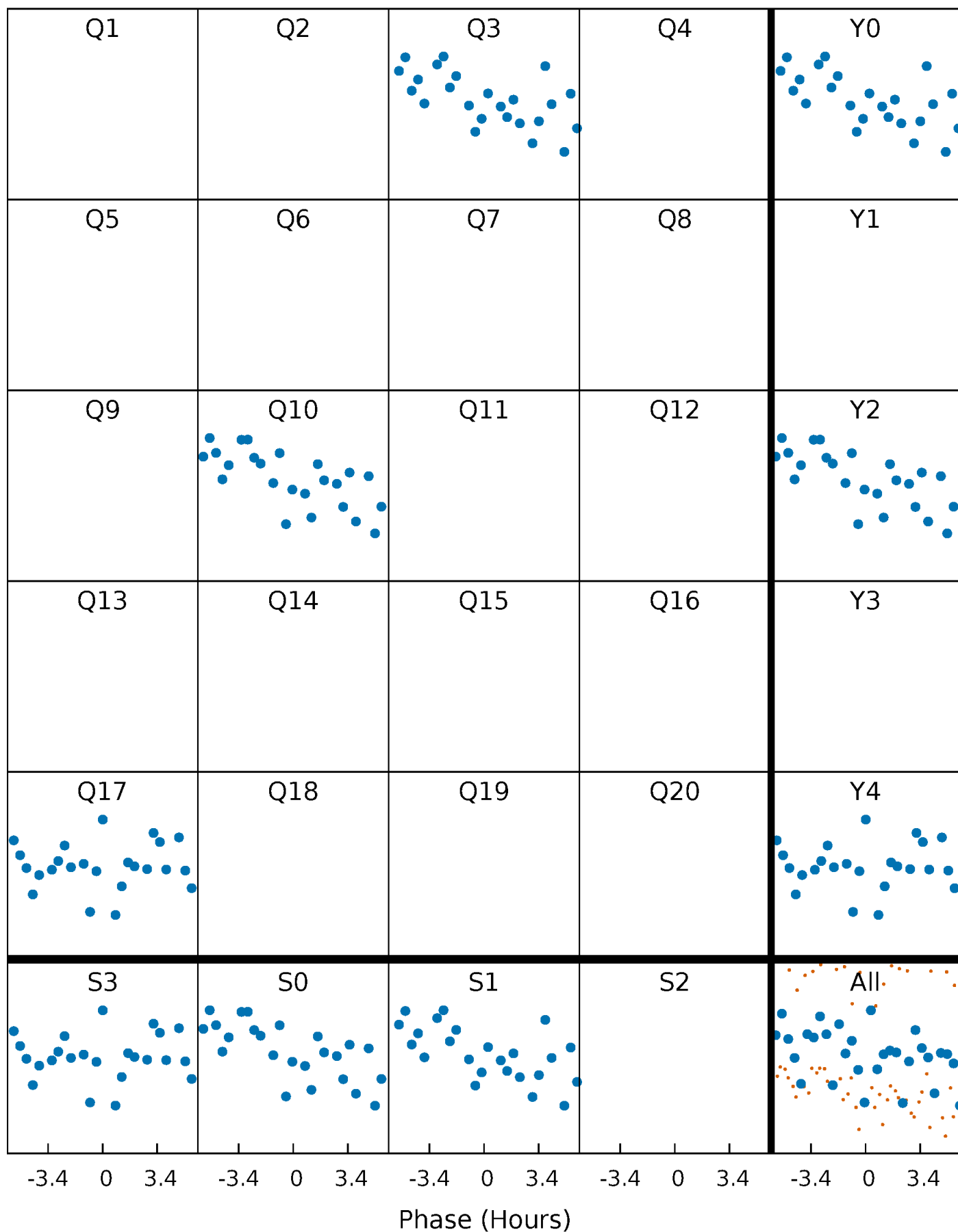


## Planet 5 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

TCE 009517991-05     $P=640.770968$  Days     $T_0=284.809551$  (BKJD)





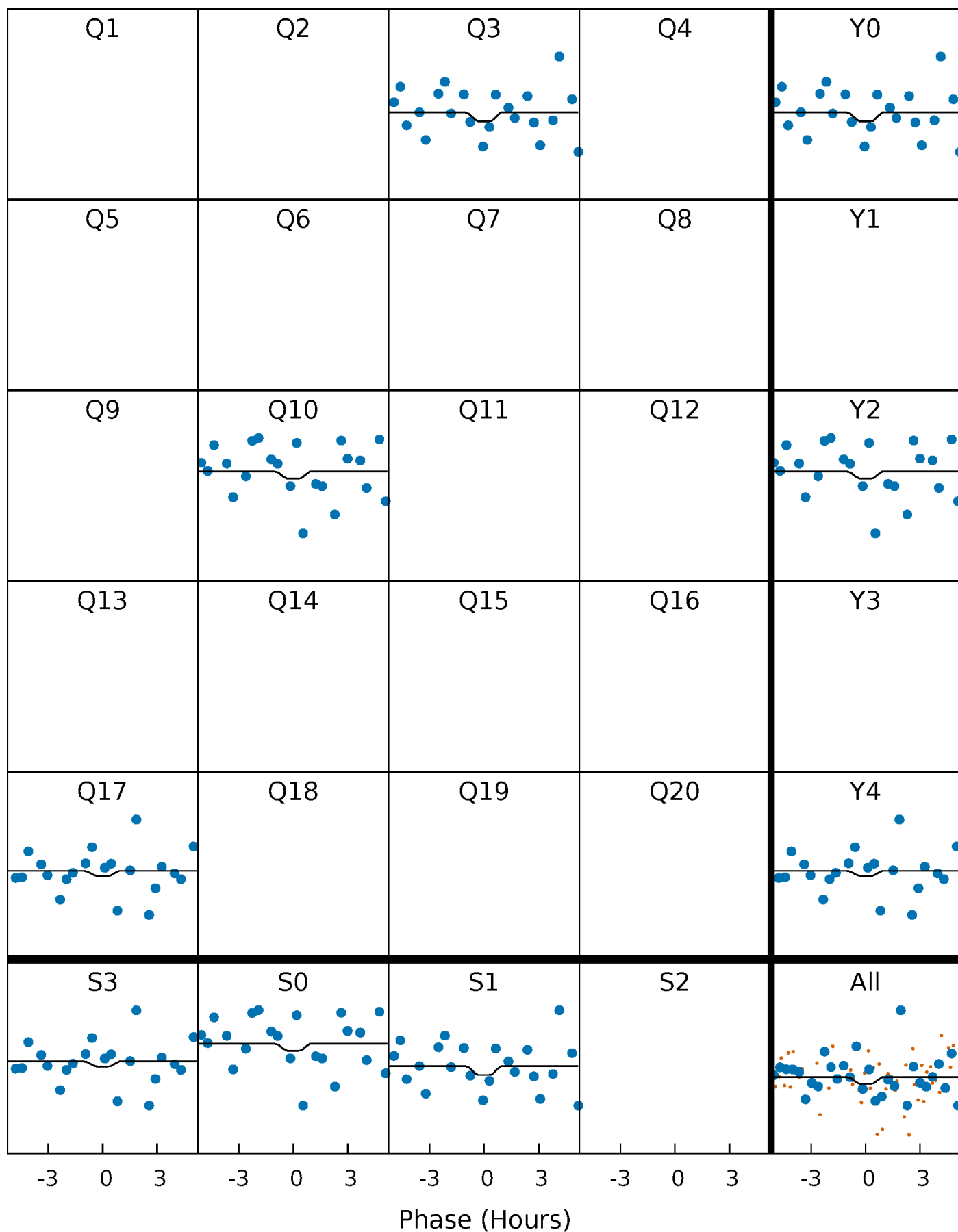
# DV Quarter-Phased Transit Curves

TCE 009517991-05     $P=640.770968$  Days     $T_0=284.809551$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

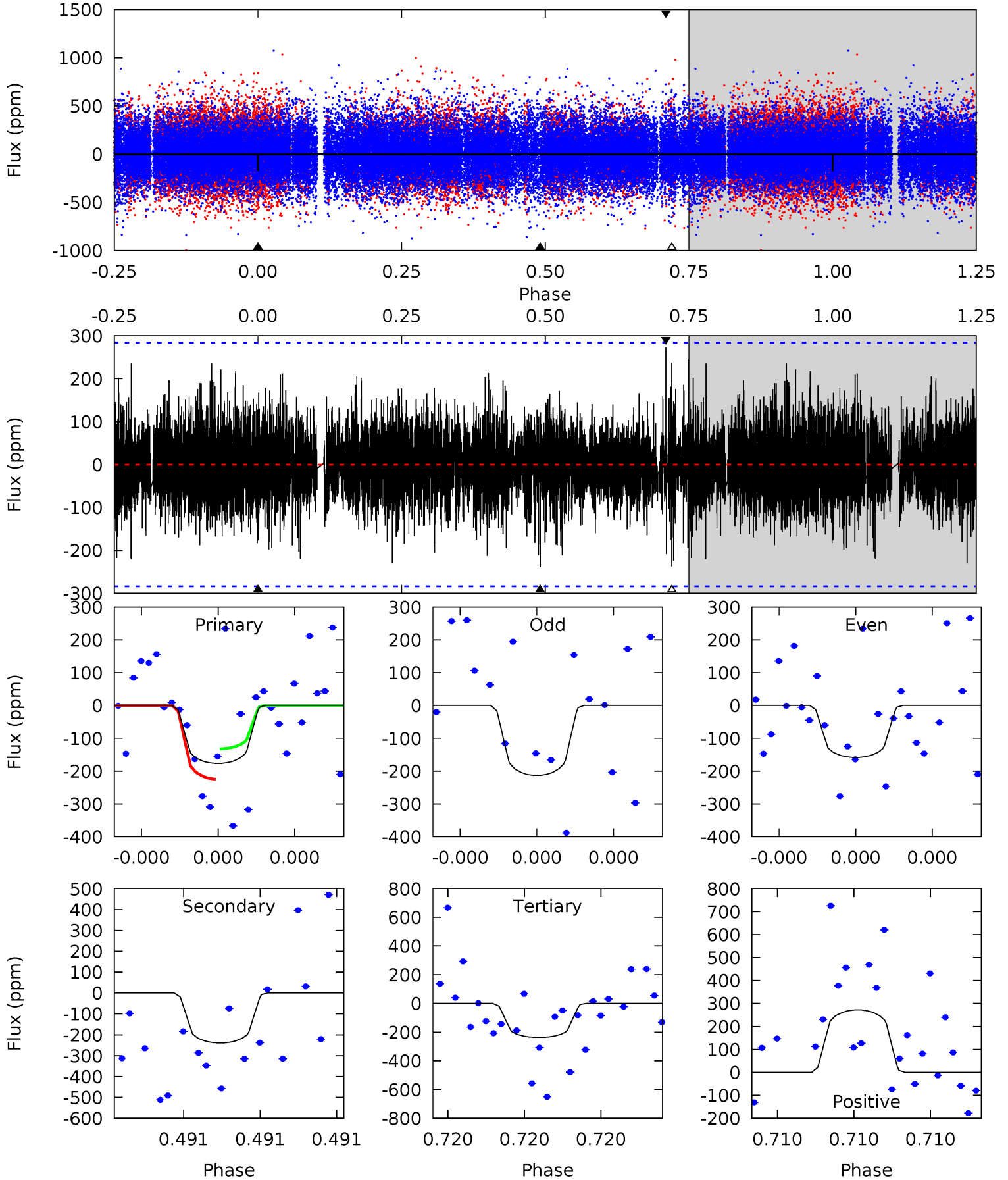
TCE 009517991-05     $P=640.741952$  Days     $T_0=284.794514$  (BKJD)



# DV Model-Shift Uniqueness Test

009517991-05, P = 640.770968 Days, E = 284.809551 Days

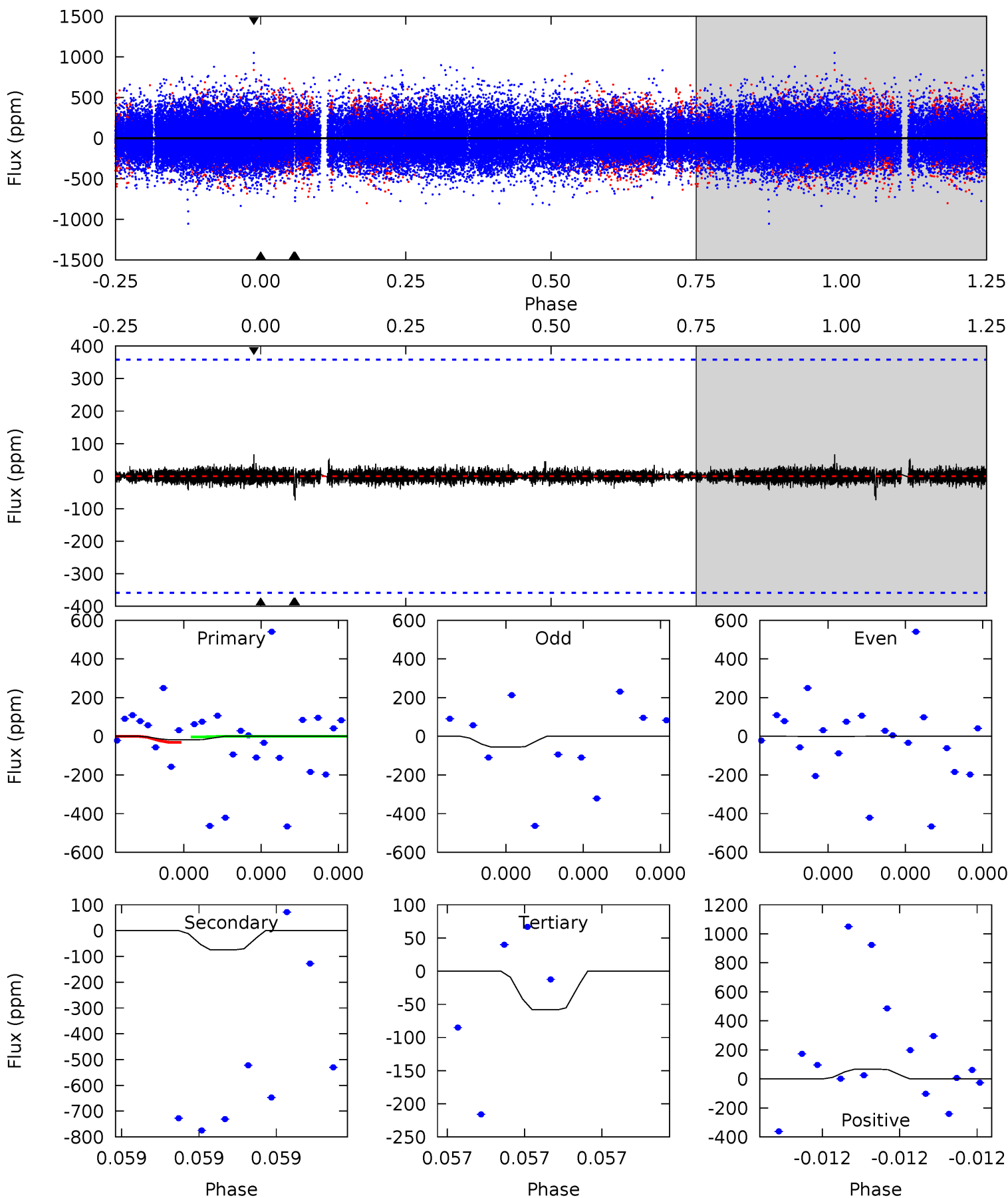
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
3.57	4.83	4.79	5.50	5.73	3.72	1.19	-1.21	-1.92	0.05	-0.66	0.18	0.87	0.53	0.93



# Alt Model-Shift Uniqueness Test

009517991-05, P = 640.741952 Days, E = 284.794514 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
0.29	1.20	0.94	1.09	5.83	3.86	0.16	-0.65	-0.79	0.26	0.12	0.36	0.39	0.47	0.23



### Stellar Parameters For KIC 009517991

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5775^{+138}_{-155}$	$4.558^{+0.040}_{-0.160}$	$-0.220^{+0.300}_{-0.300}$	$0.840^{+0.199}_{-0.080}$	$0.934^{+0.090}_{-0.120}$	$2.219^{+0.380}_{-0.996}$
	+2%/-3%	+1%/-4%	+136%/-136%	+24%/-10%	+10%/-13%	+17%/-45%
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 009517991-05 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	-239±49	$2.75^{+2.55}_{-1.89}$	$279^{+14}_{-10}$	$4431^{+3181}_{-929}$	$34487^{+292506}_{-25430}$
Alt.	-74±62	$2.37^{+2.47}_{-1.64}$	$279^{+15}_{-11}$	$3567^{+2398}_{-978}$	$10168^{+122556}_{-9222}$

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

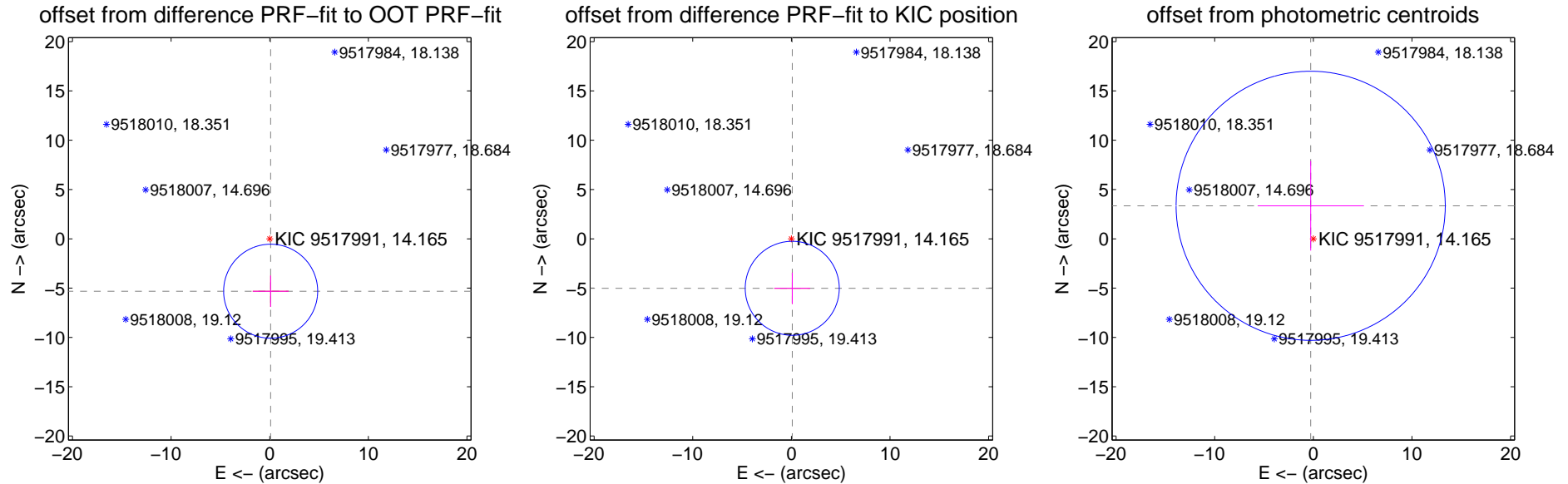
## DV Centroid Data

Supplemental centroid analysis for 009517991-05. Kepler magnitude: 14.16. Transit SNR 2.12

There are 0 quarters with good PRF difference image offsets

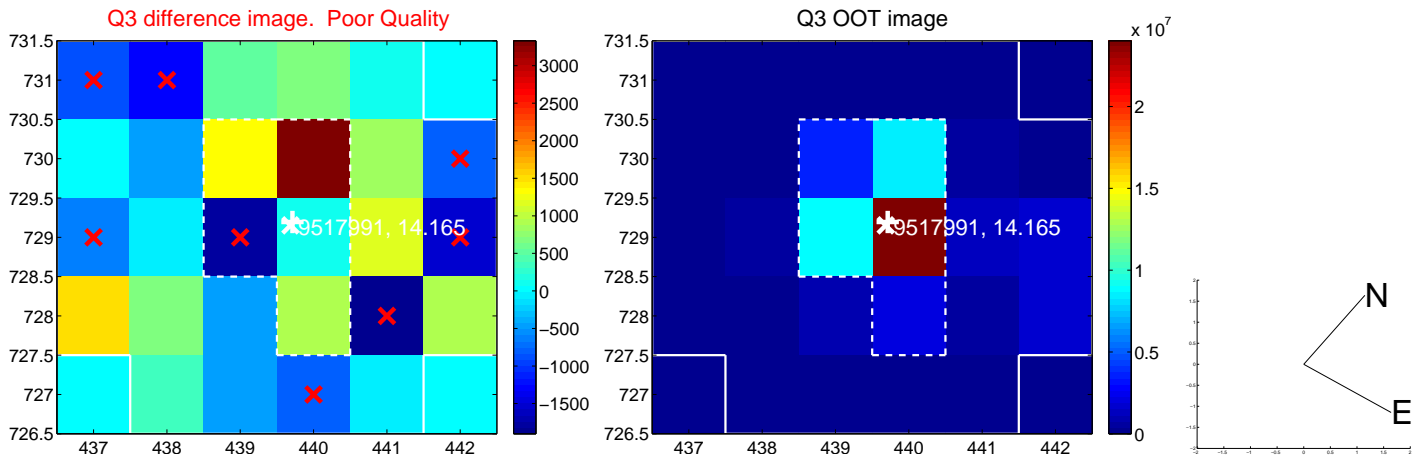
The direct PRF centroid is offset from the target star catalog position by about 0.30 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$5.314 \pm 1.589$	3.34	$-0.093 \pm 1.821$	$-5.313 \pm 1.589$
PRF-fit source offset from KIC position	$5.018 \pm 1.589$	3.16	$-0.088 \pm 1.821$	$-5.017 \pm 1.589$
photometric centroid source offset	$3.36 \pm 4.55$	0.74	$0.27 \pm 5.38$	$3.35 \pm 4.54$



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

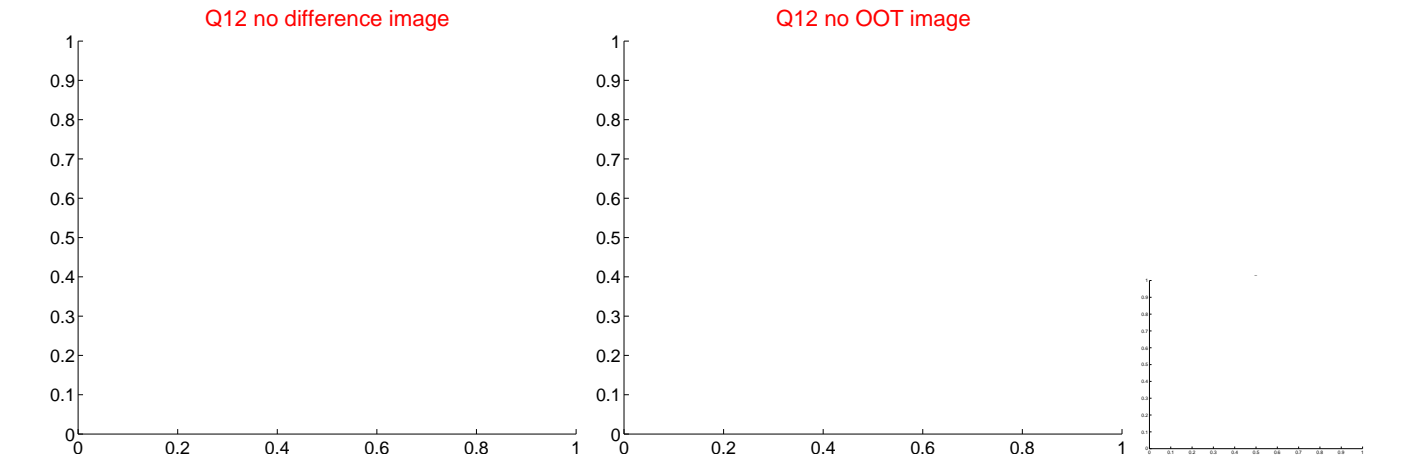
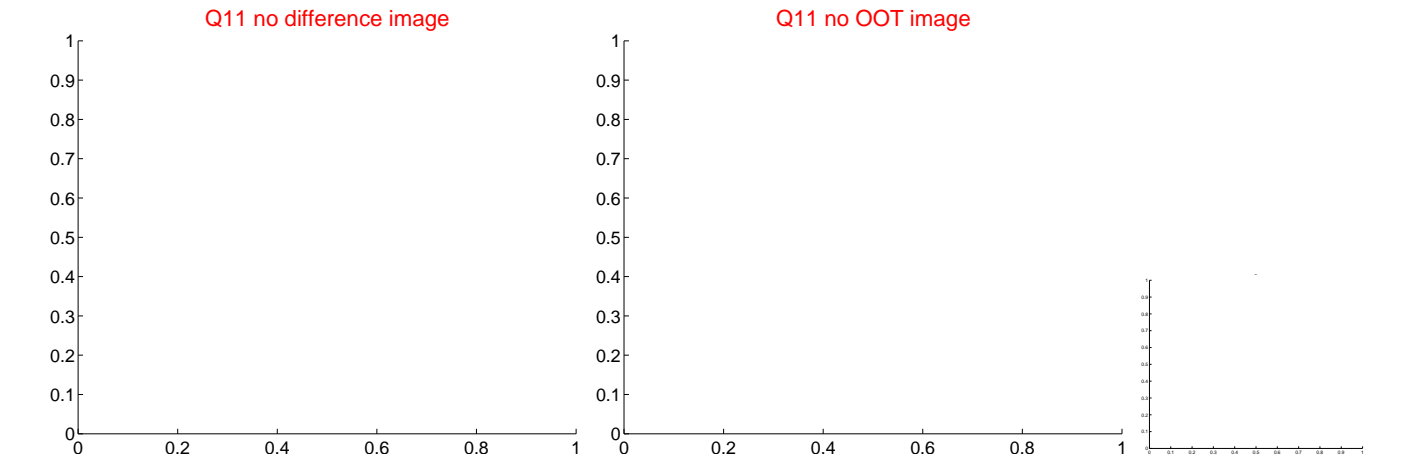
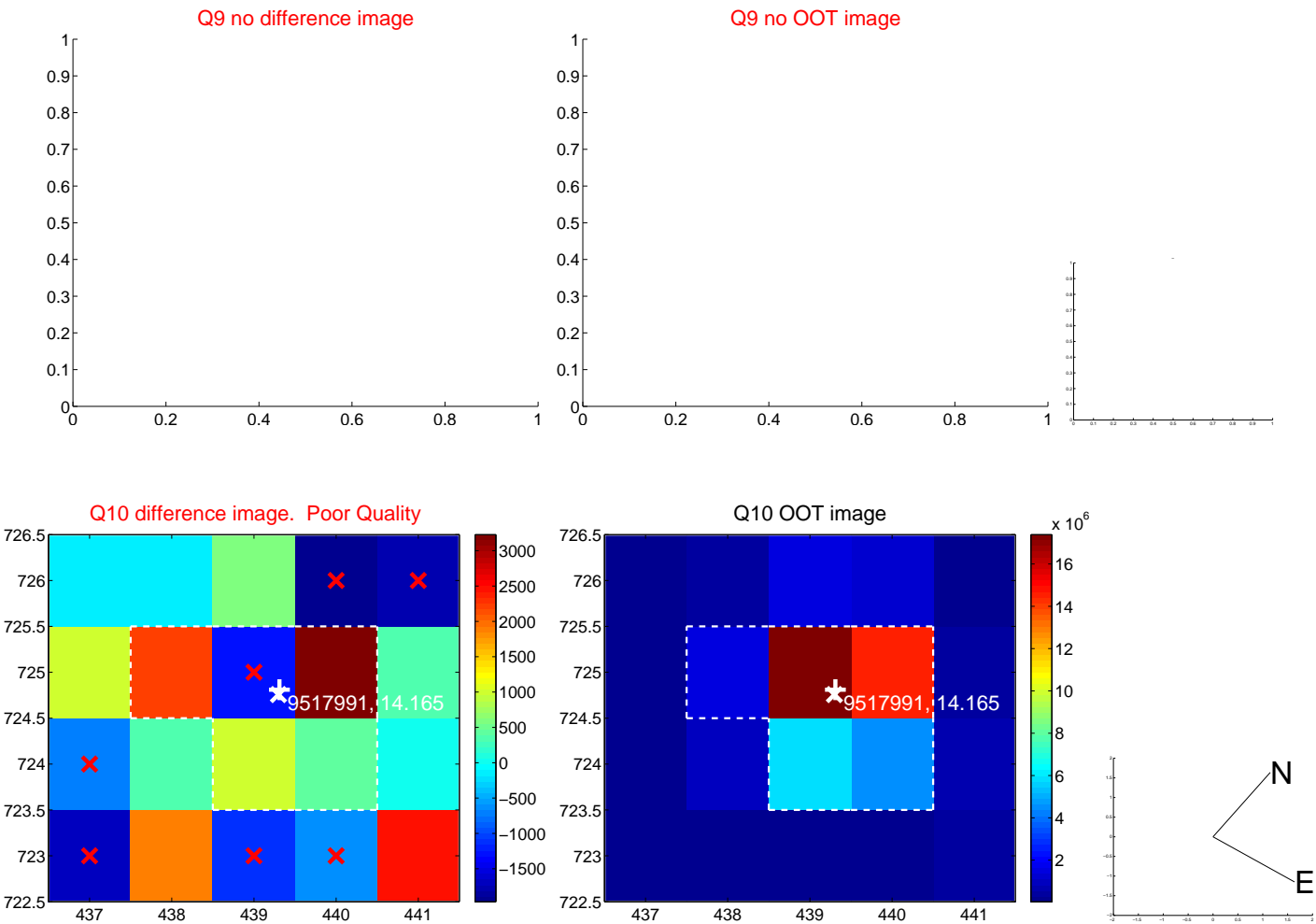


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





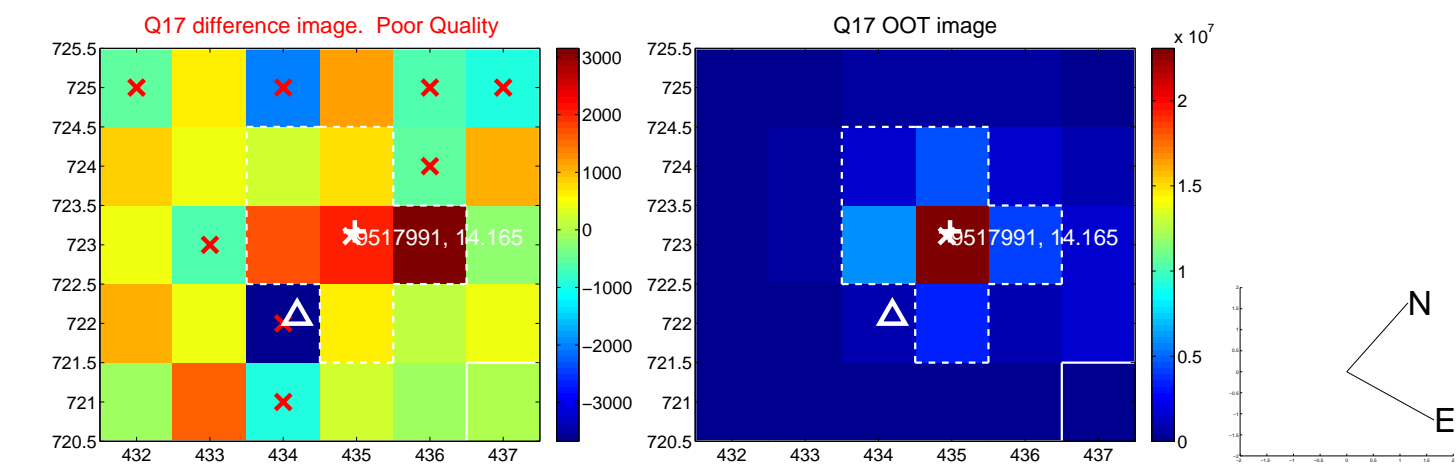
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.



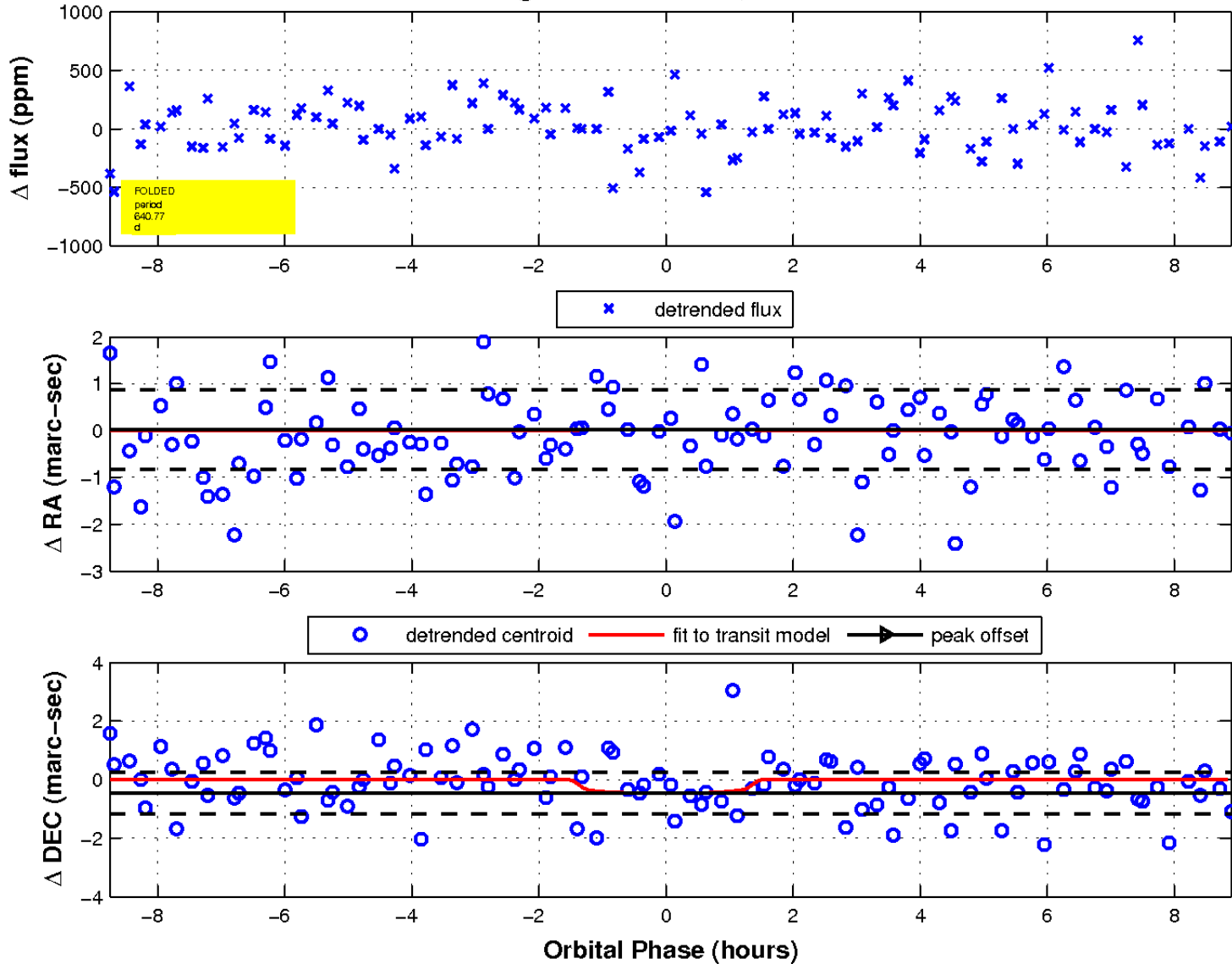
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

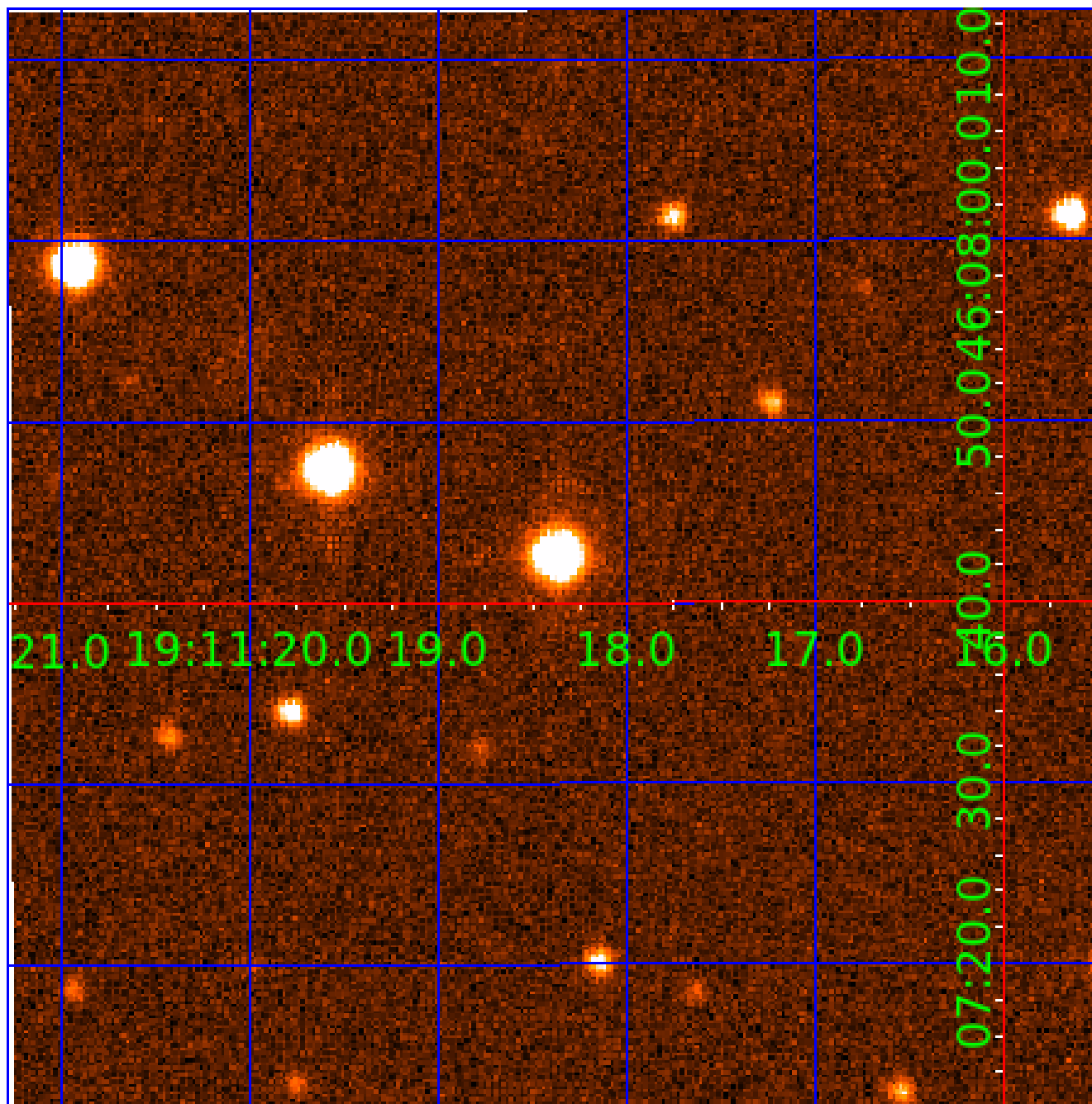


fluxWeightedCentroids, Planet 5 of 6



UKIRT Image

Declination



# KIC 009517991

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009517991-01	OBS	No	220.914692	351.602108	0.0	145.239	4316.5	0.0	0.84	5775	0.01	1.44
009517991-02	OBS	No	224.925817	291.315055	3114.2	15.000	76.7	-1.0	0.84	5775	4.65	1.41
009517991-03	OBS	No	225.368544	286.458679	2780.8	15.000	51.7	-1.0	0.84	5775	4.40	1.40
009517991-04	OBS	No	240.600290	273.530936	150.0	59.082	919.2	2.2	0.84	5775	1.10	1.29
009517991-05	OBS	No	640.770968	284.809551	156.8	2.970	8.7	2.1	0.84	5775	1.25	0.35
009517991-06	OBS	No	336.035734	285.788611	306.0	1.832	8.8	2.4	0.84	5775	1.55	0.82

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009517991-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009517991-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_NOFITS
009517991-03	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_MARSHALL_SKYE_ZUMA—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_NOFITS—HALO_GHOST
009517991-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL_ZUMA—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS
009517991-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_TRACKER—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009517991-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_MARSHALL_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—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.

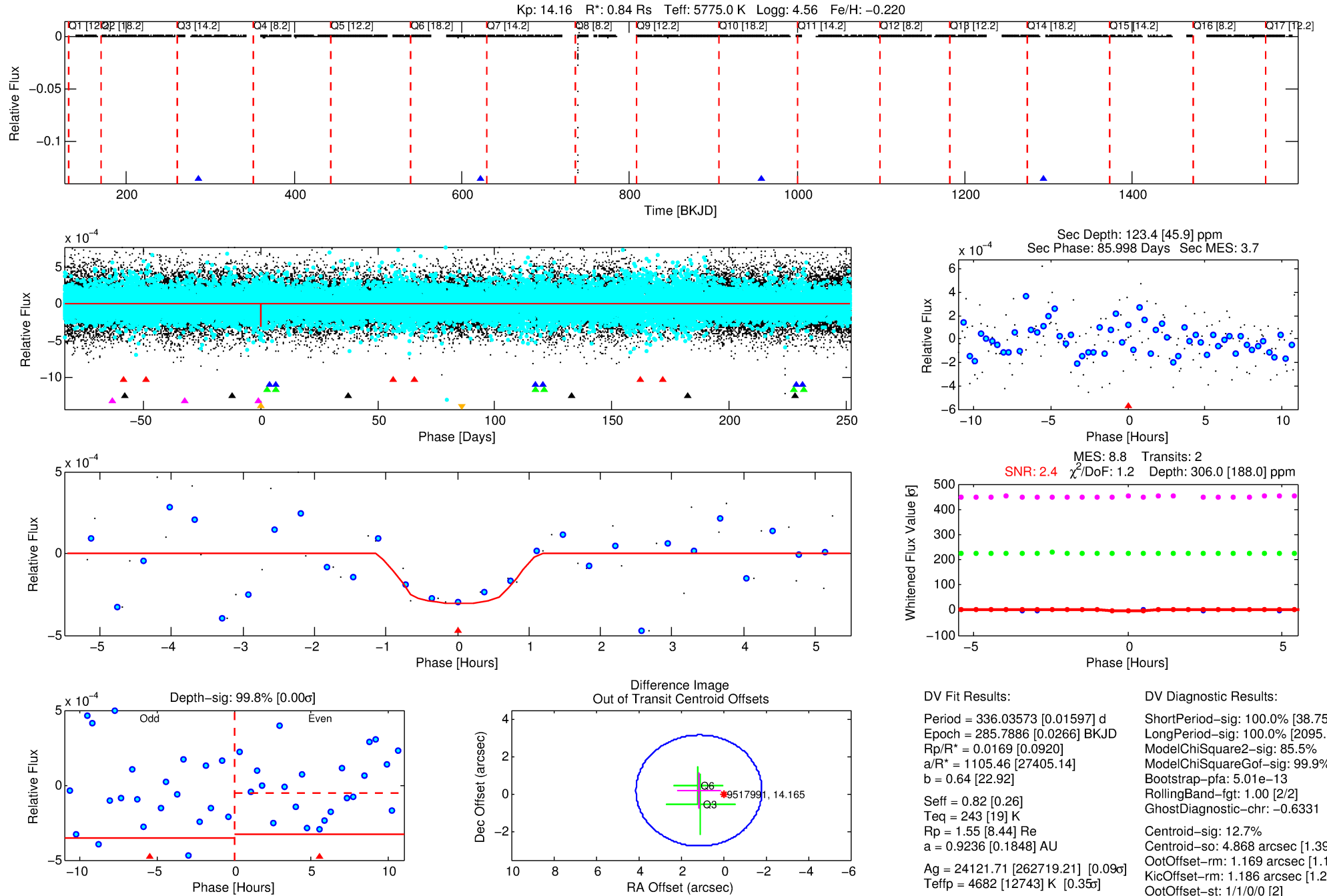
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009517991-06

No Significant Match Found

# DV One-Page Summary

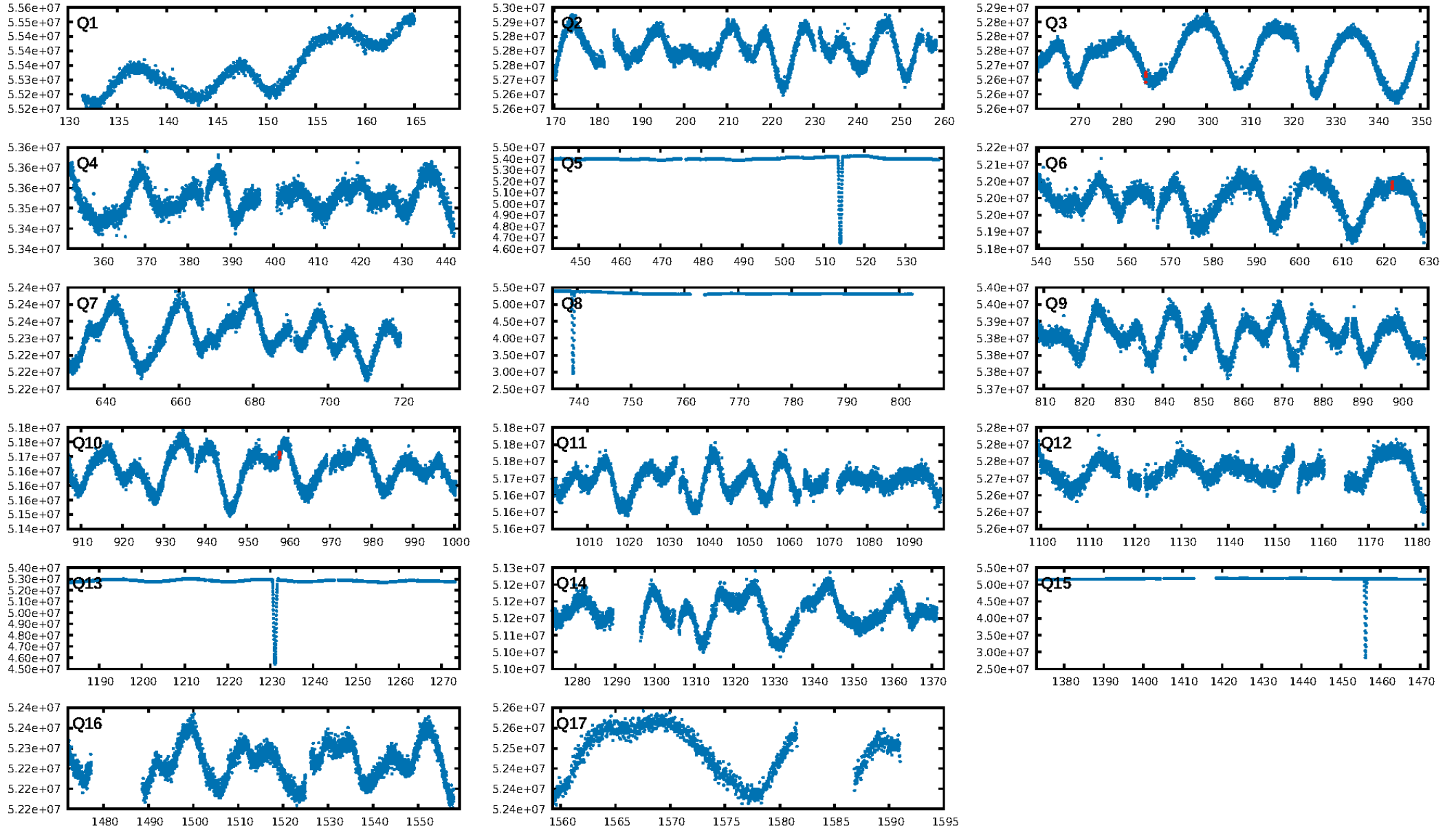
KIC: 9517991 Candidate: 6 of 6 Period: 336.036 d



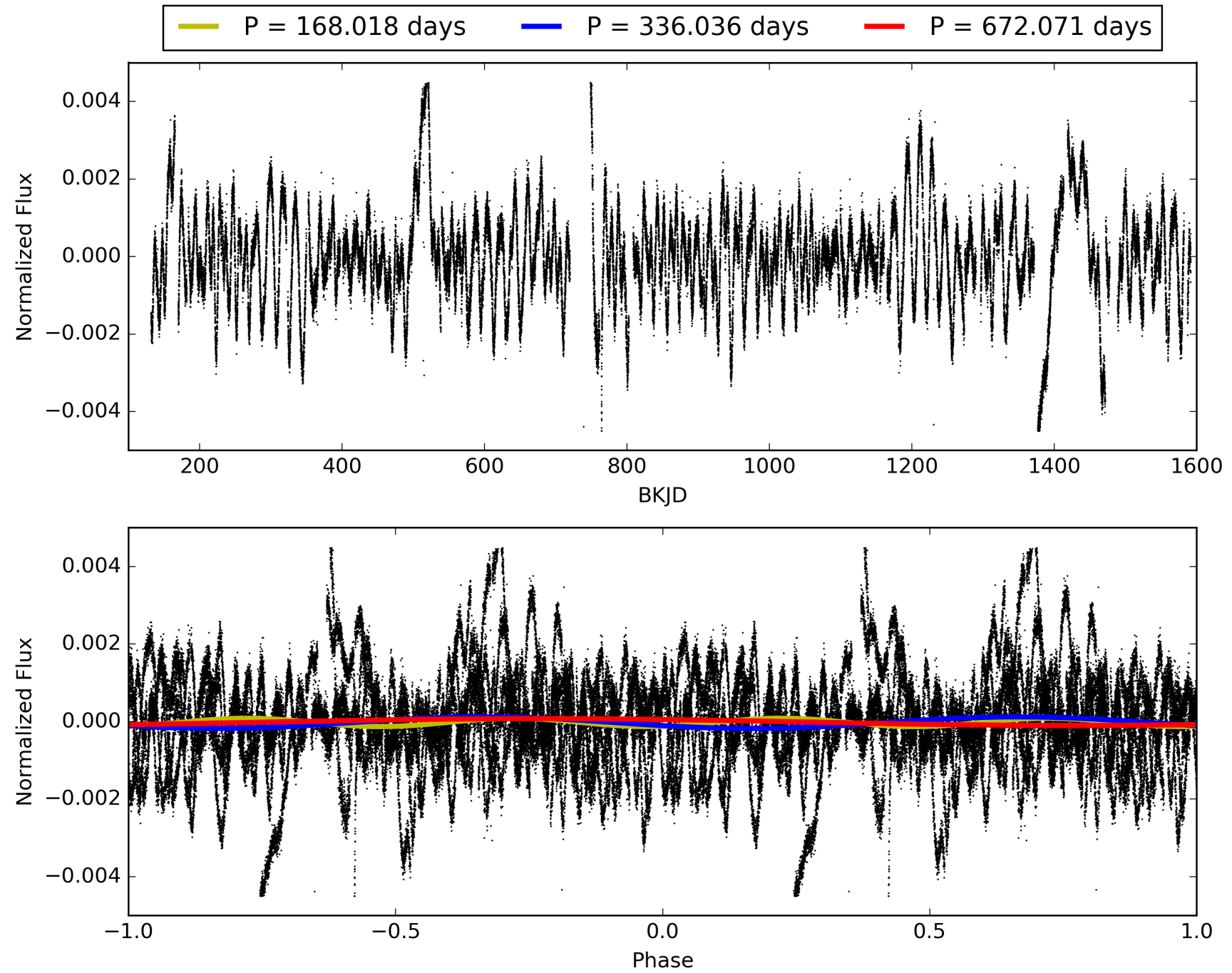
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 03:24:58 Z

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

# TCE 009517991-06, PDC Light Curves



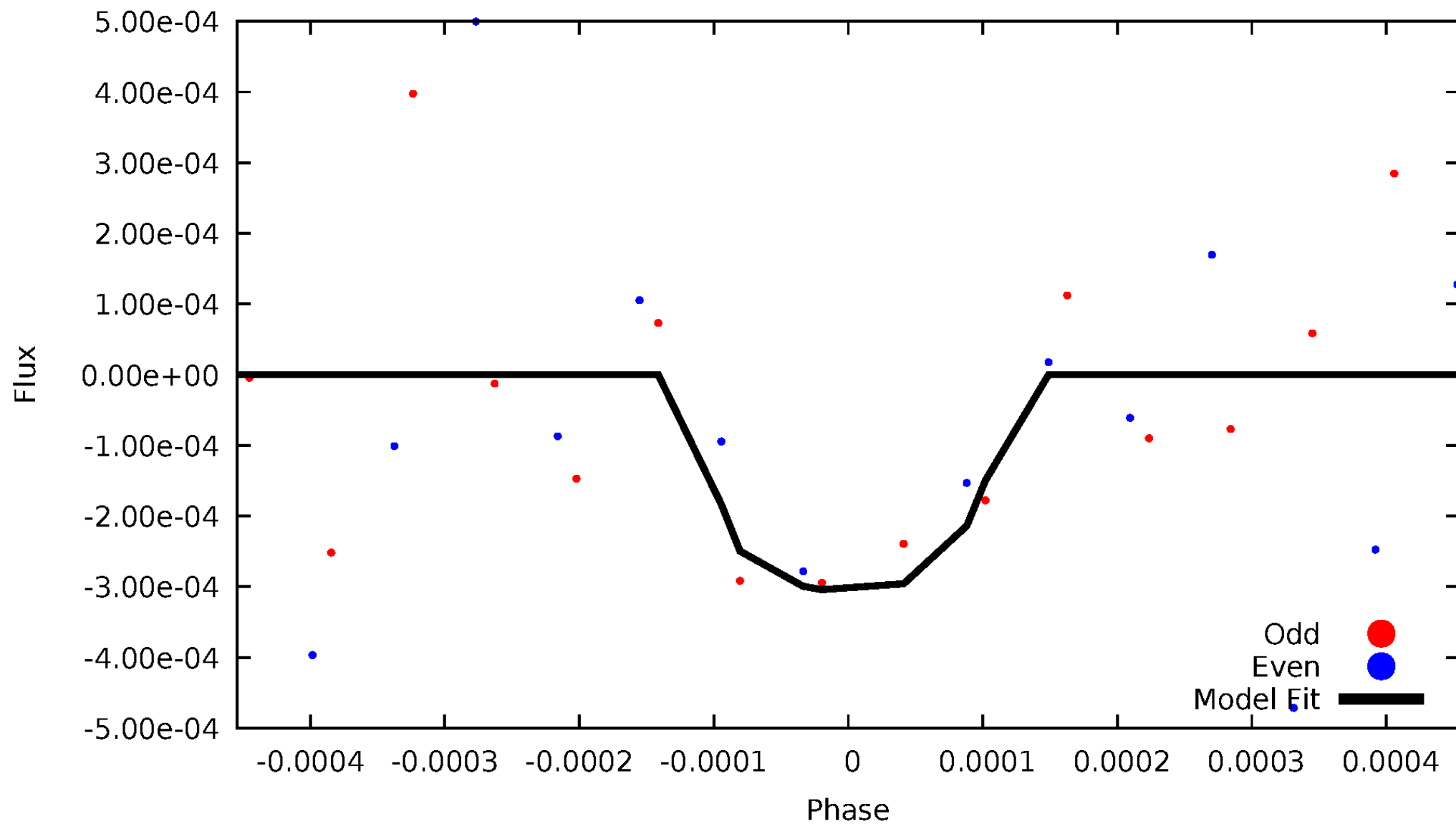
TCE 009517991-06





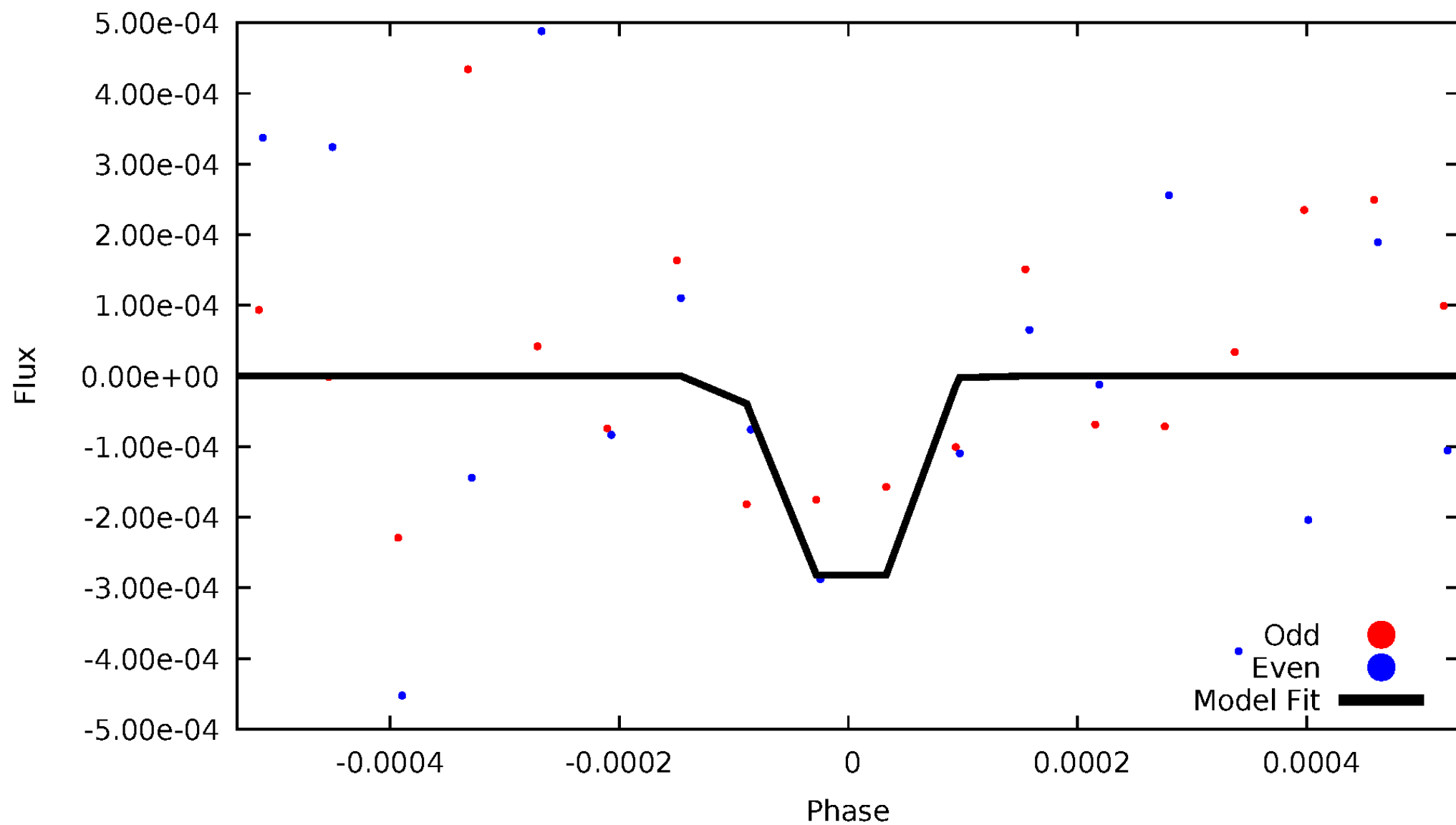
# DV Odd/Even

TCE 009517991-06



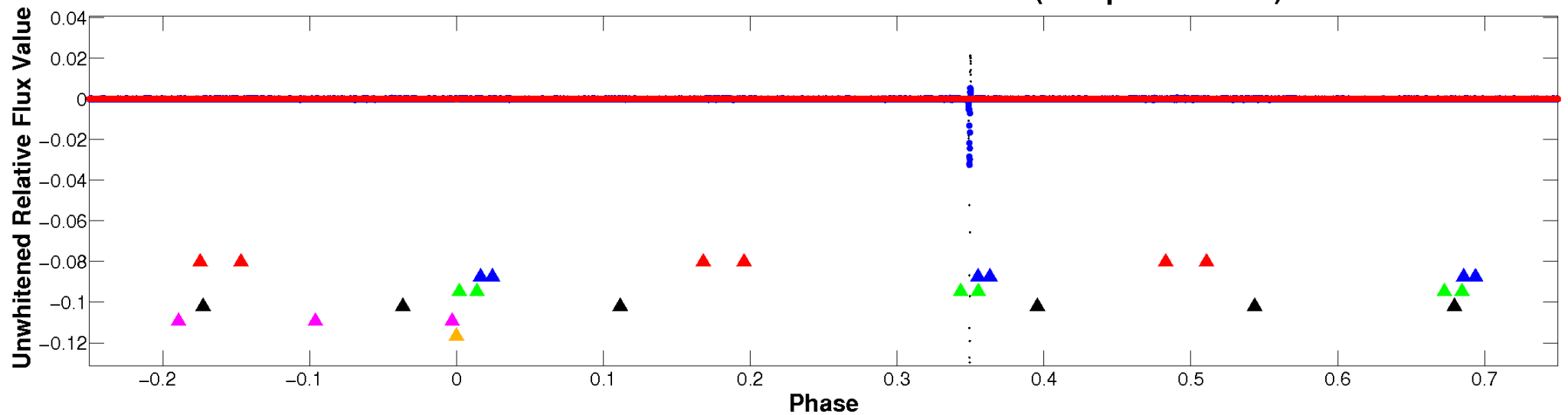
# ALT Odd/Even

TCE 009517991-06

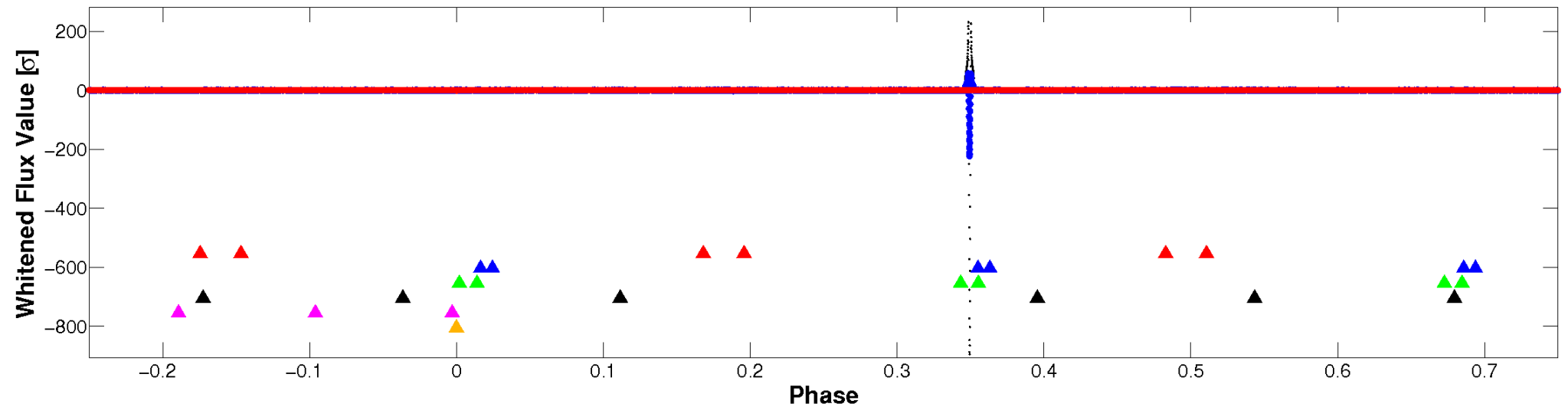


# Non-Whitened Vs. Whitened Light Curve

## Planet 6 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

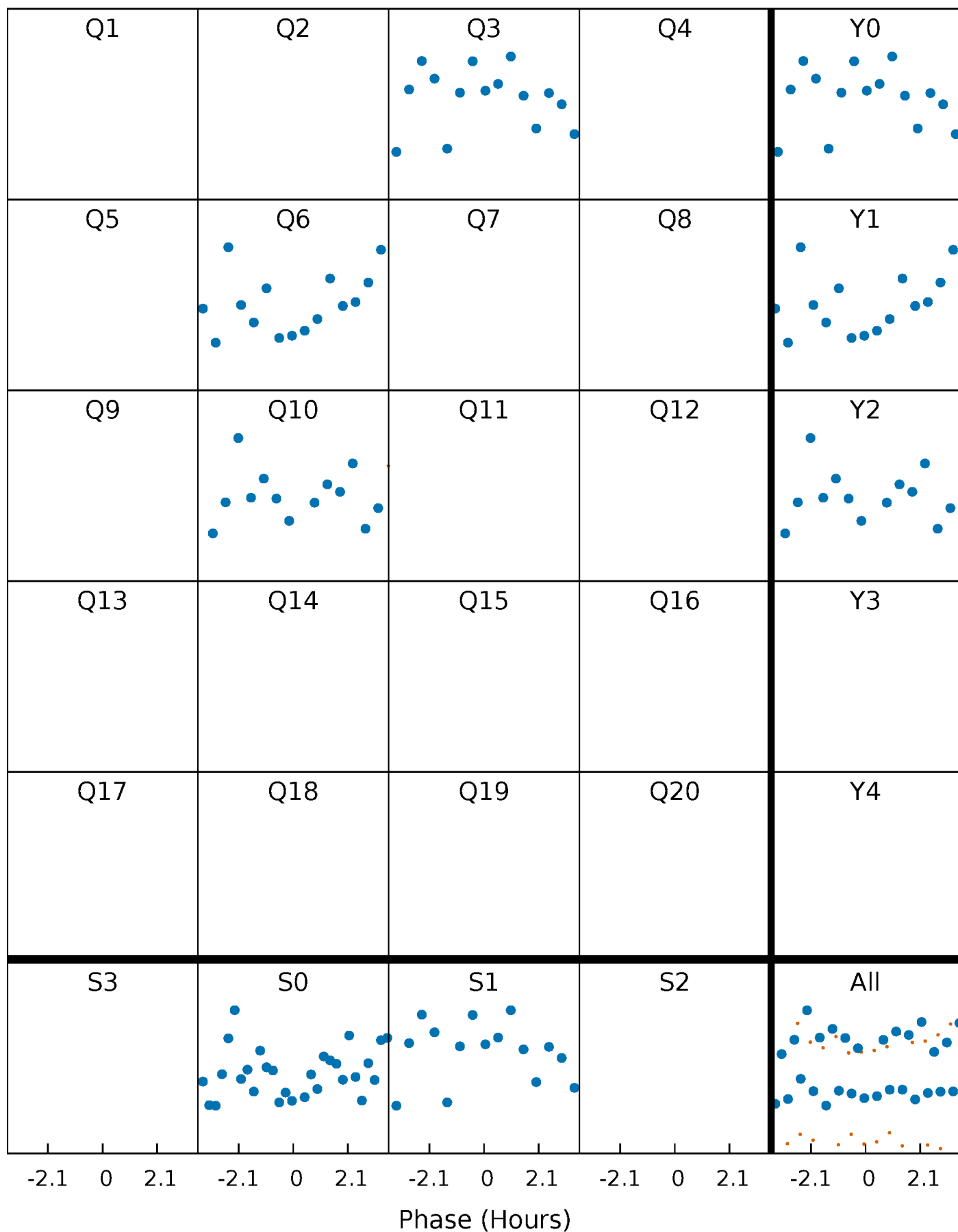


## Planet 6 : Phased Whitened Flux Time Series (Fit Epoch/Period)



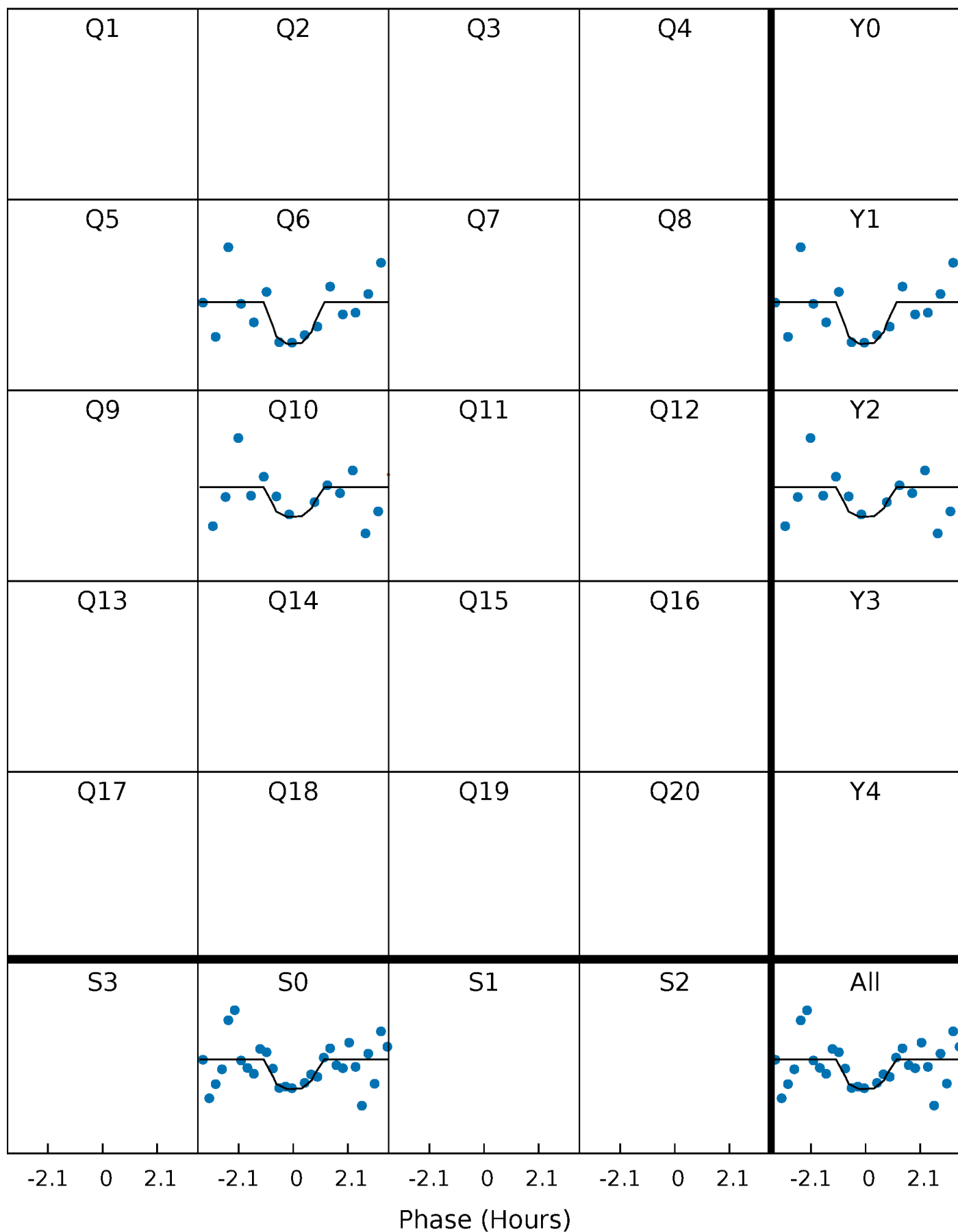
# PDC Quarter-Phased Transit Curves

TCE 009517991-06 P=336.035734 Days  $T_0=285.788611$  (BKJD)



# DV Quarter-Phased Transit Curves

TCE 009517991-06 P=336.035734 Days  $T_0=285.788611$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

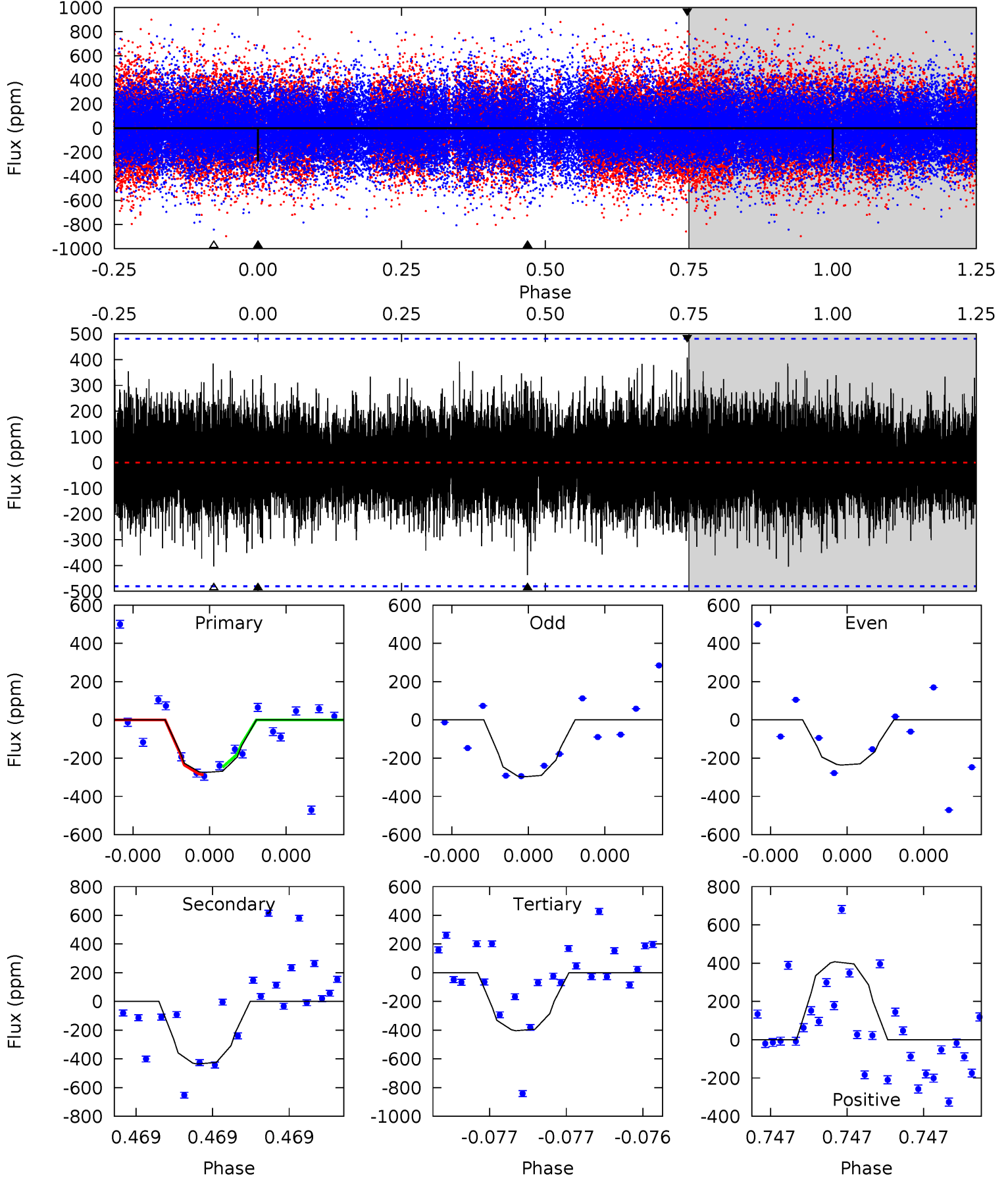
TCE 009517991-06 P=336.029894 Days  $T_0=285.797193$  (BKJD)



# DV Model-Shift Uniqueness Test

009517991-06, P = 336.035734 Days, E = 285.788611 Days

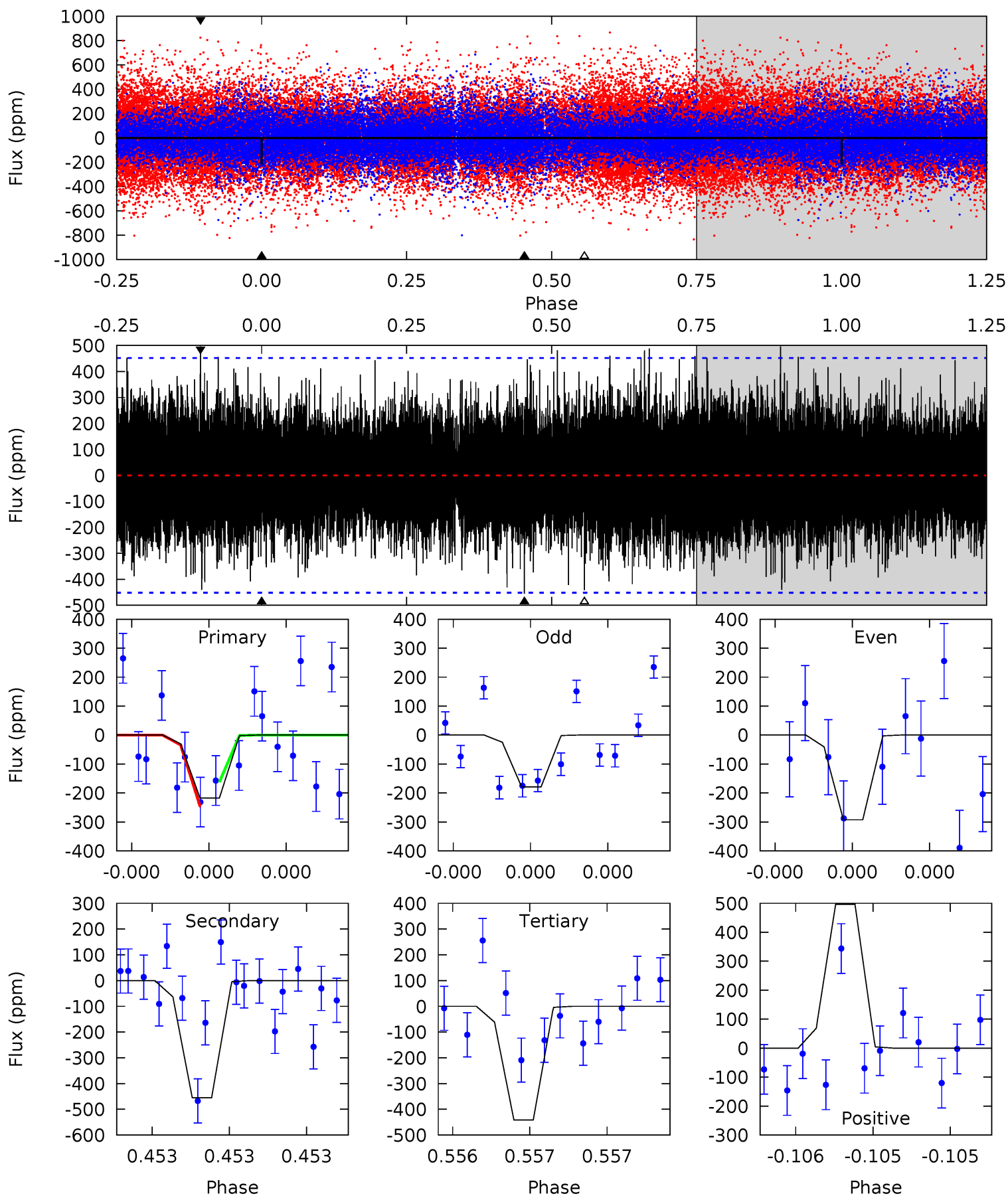
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
3.26	5.17	4.78	4.82	5.70	3.67	1.15	-1.52	-1.56	0.39	0.34	0.31	1.00	0.48	0.24



# Alt Model-Shift Uniqueness Test

009517991-06, P = 336.029894 Days, E = 285.797193 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
2.74	5.74	5.57	6.26	5.70	3.67	1.39	-2.82	-3.52	0.17	-0.52	0.72	1.00	0.52	0.52





### Stellar Parameters For KIC 009517991

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5775^{+138}_{-155}$	$4.558^{+0.040}_{-0.160}$	$-0.220^{+0.300}_{-0.300}$	$0.840^{+0.199}_{-0.080}$	$0.934^{+0.090}_{-0.120}$	$2.219^{+0.380}_{-0.996}$
	+2%/-3%	+1%/-4%	+136%/-136%	+24%/-10%	+10%/-13%	+17%/-45%
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 009517991-06 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-436 \pm 84$	$6.40^{+6.96}_{-4.65}$	$346^{+19}_{-14}$	$3627^{+2346}_{-728}$	$4804^{+57271}_{-3722}$
Alt.	$-455 \pm 79$	$6.87^{+6.75}_{-4.88}$	$346^{+16}_{-14}$	$3592^{+2107}_{-660}$	$4466^{+41369}_{-3356}$

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

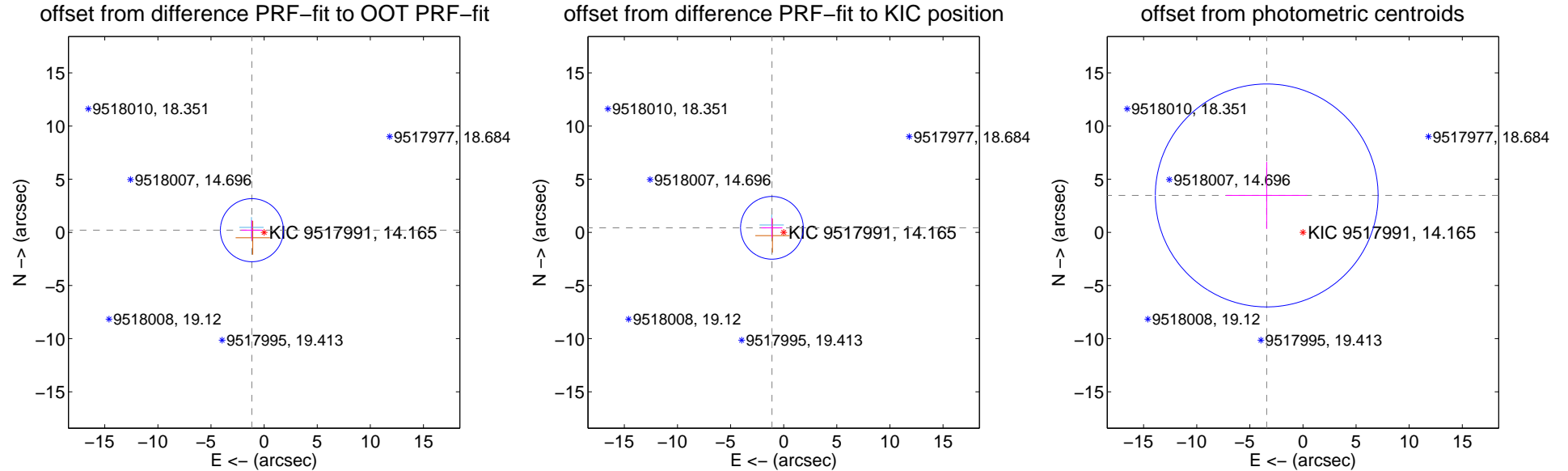
## DV Centroid Data

Supplemental centroid analysis for 009517991-06. Kepler magnitude: 14.16. Transit SNR 2.37

There are 1 quarters with good PRF difference image offsets

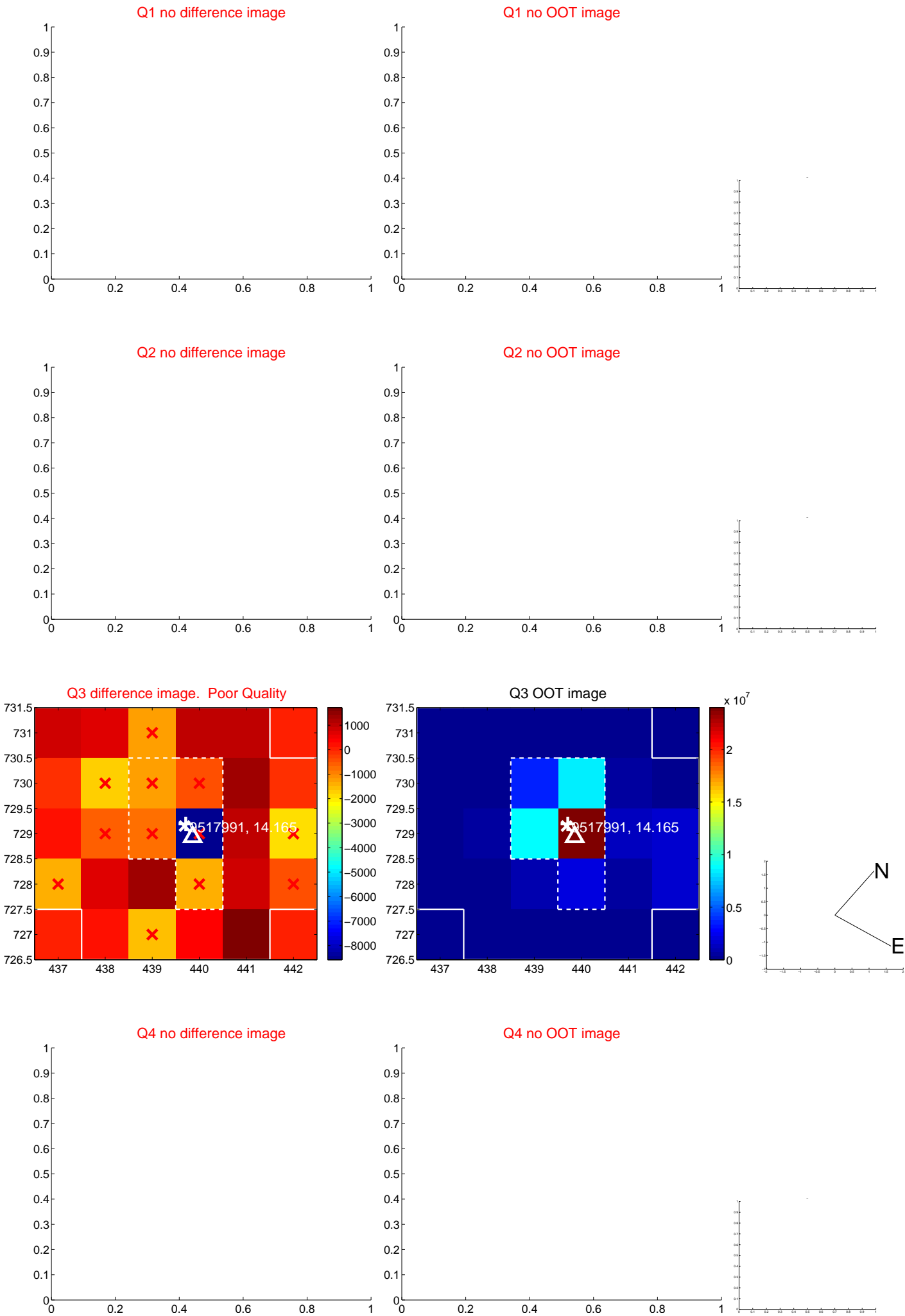
The direct PRF centroid is offset from the target star catalog position by about 0.24 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.169 \pm 0.989$	1.18	$1.151 \pm 0.990$	$0.202 \pm 0.937$
PRF-fit source offset from KIC position	$1.186 \pm 0.984$	1.21	$1.107 \pm 0.990$	$0.426 \pm 0.937$
photometric centroid source offset	$4.87 \pm 3.50$	1.39	$3.41 \pm 3.82$	$3.47 \pm 3.15$



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.

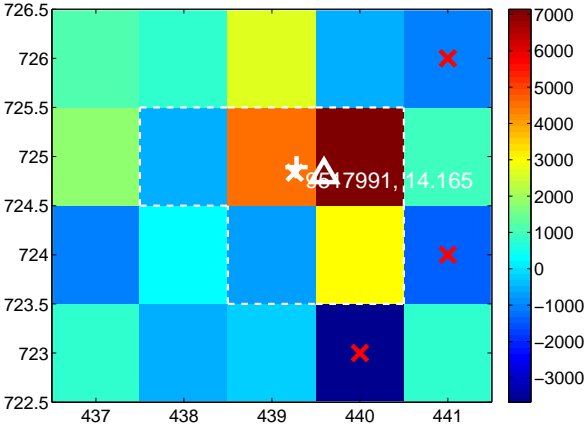
Q5 no difference image



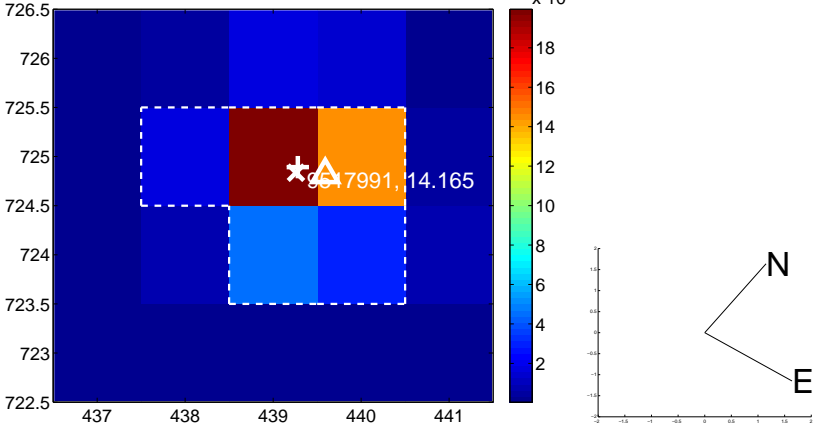
Q5 no OOT image



Q6 difference image



Q6 OOT image



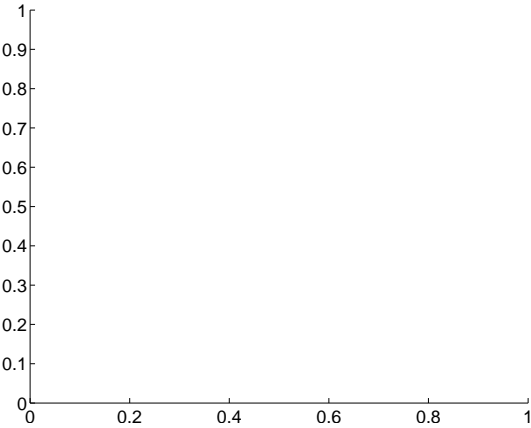
Q7 no difference image



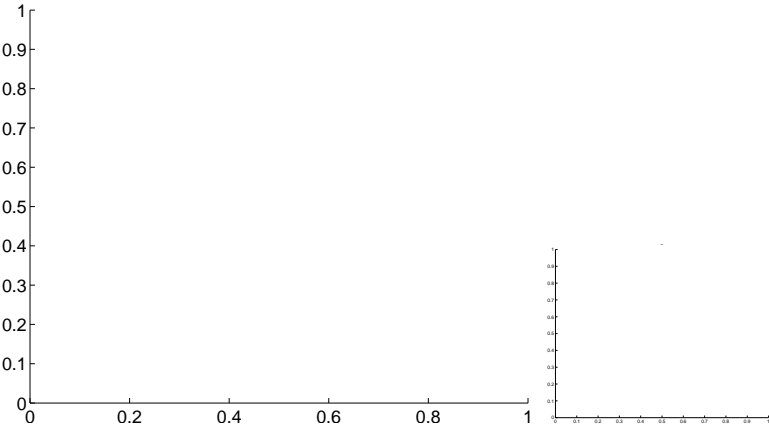
Q7 no OOT image



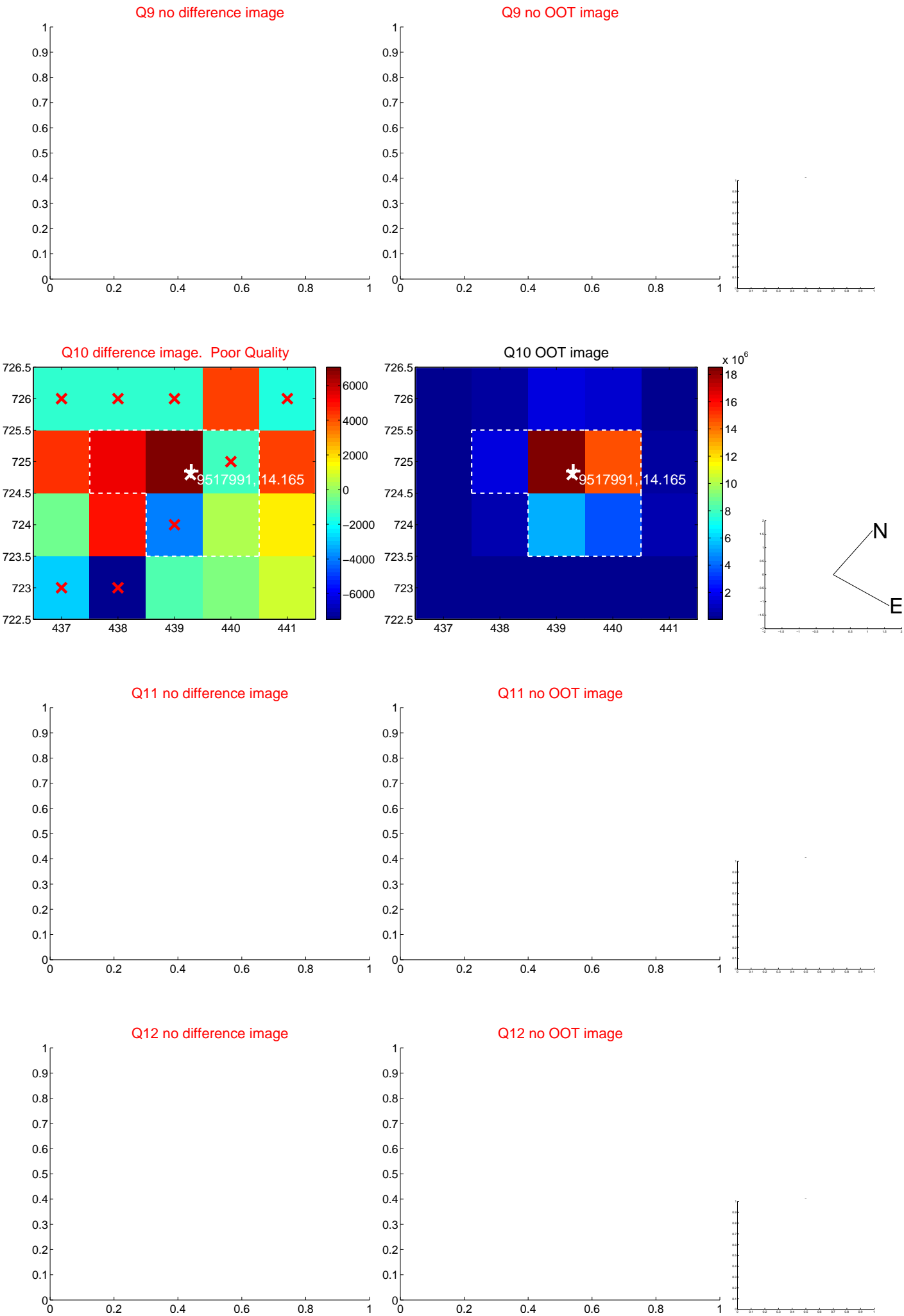
Q8 no difference image



Q8 no OOT image



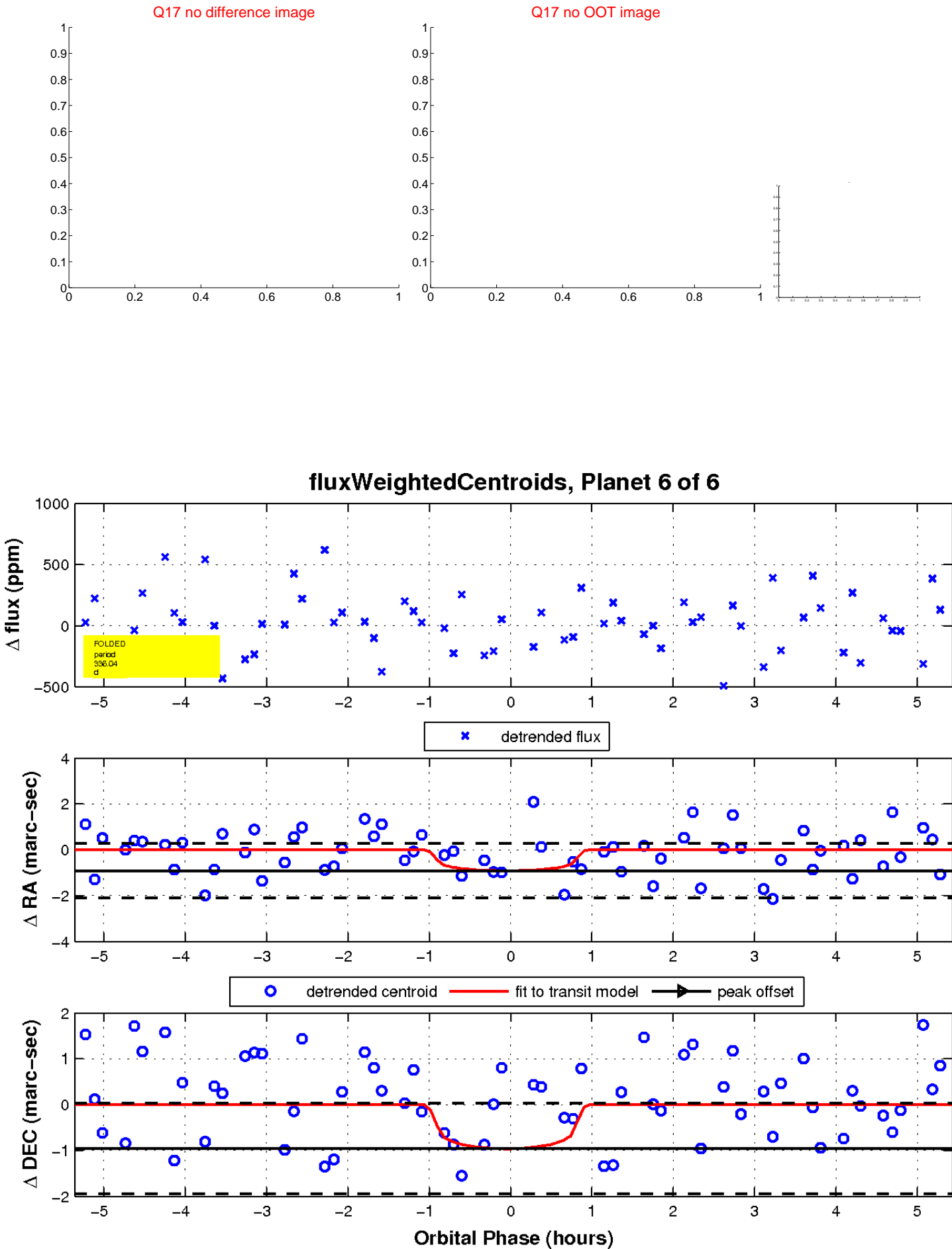
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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.



UKIRT Image

Declination

