

# KIC 009659036

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009659036-01	OBS	No	398.946833	513.584068	1858.4	4.457	12.7	7.4	0.54	3885	2.52	0.08
009659036-02	OBS	No	436.994412	176.798184	1725.5	4.794	12.2	6.5	0.54	3885	2.42	0.07
009659036-03	OBS	No	308.748433	190.526525	1556.6	7.188	9.1	7.4	0.54	3885	2.10	0.11
009659036-04	OBS	No	370.467254	313.935006	1828.7	3.500	12.8	-1.0	0.54	3885	2.28	0.09

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009659036-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009659036-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009659036-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009659036-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_NOFITS

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

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

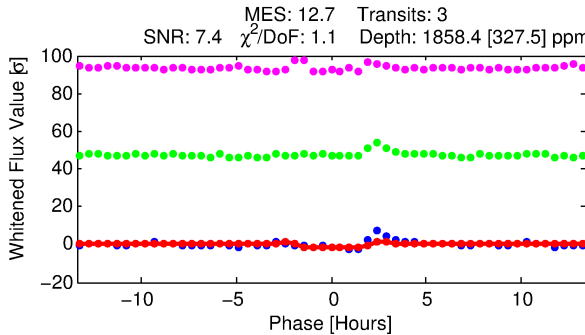
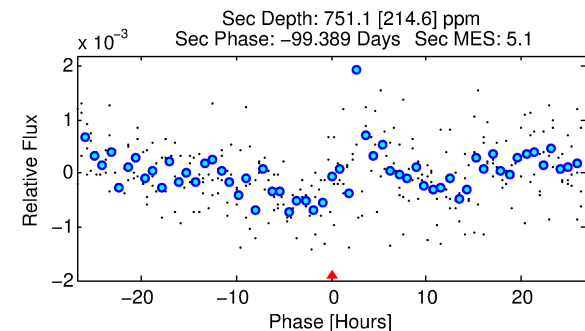
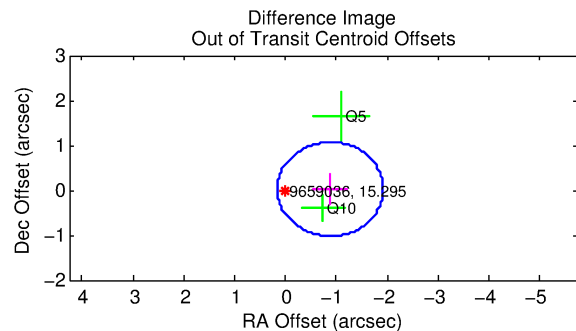
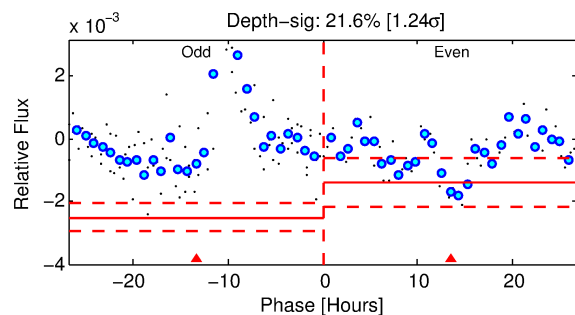
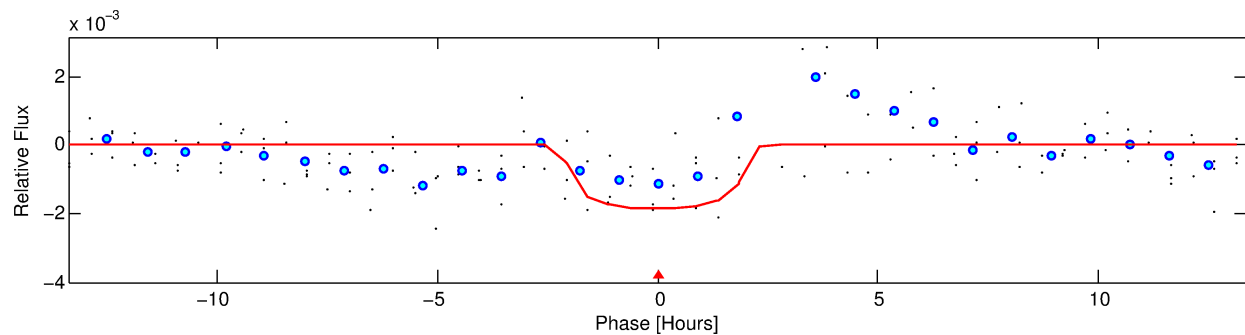
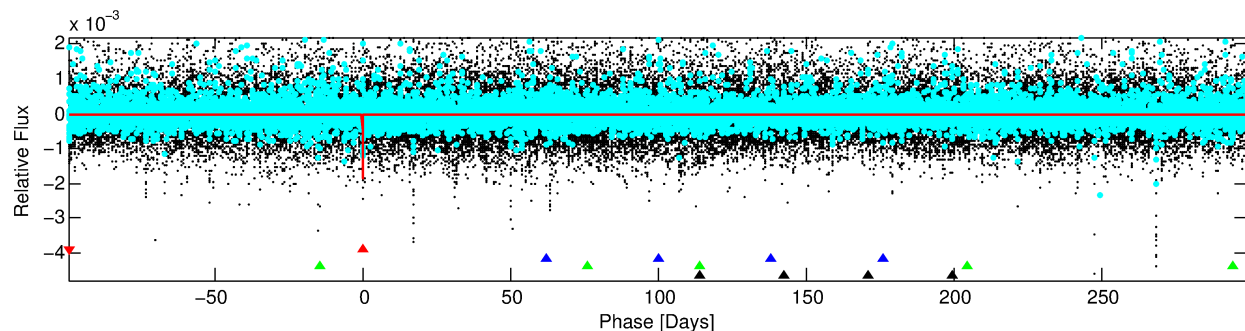
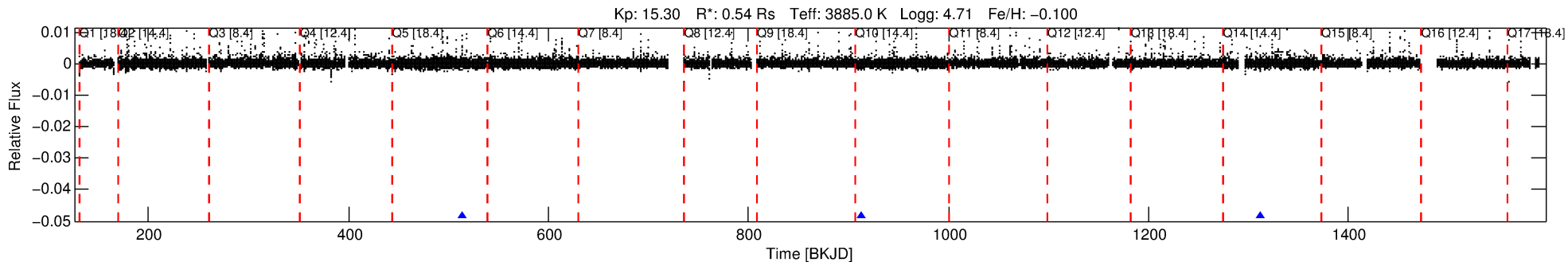
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009659036-01

No Significant Match Found

# DV One-Page Summary

KIC: 9659036 Candidate: 1 of 4 Period: 398.947 d



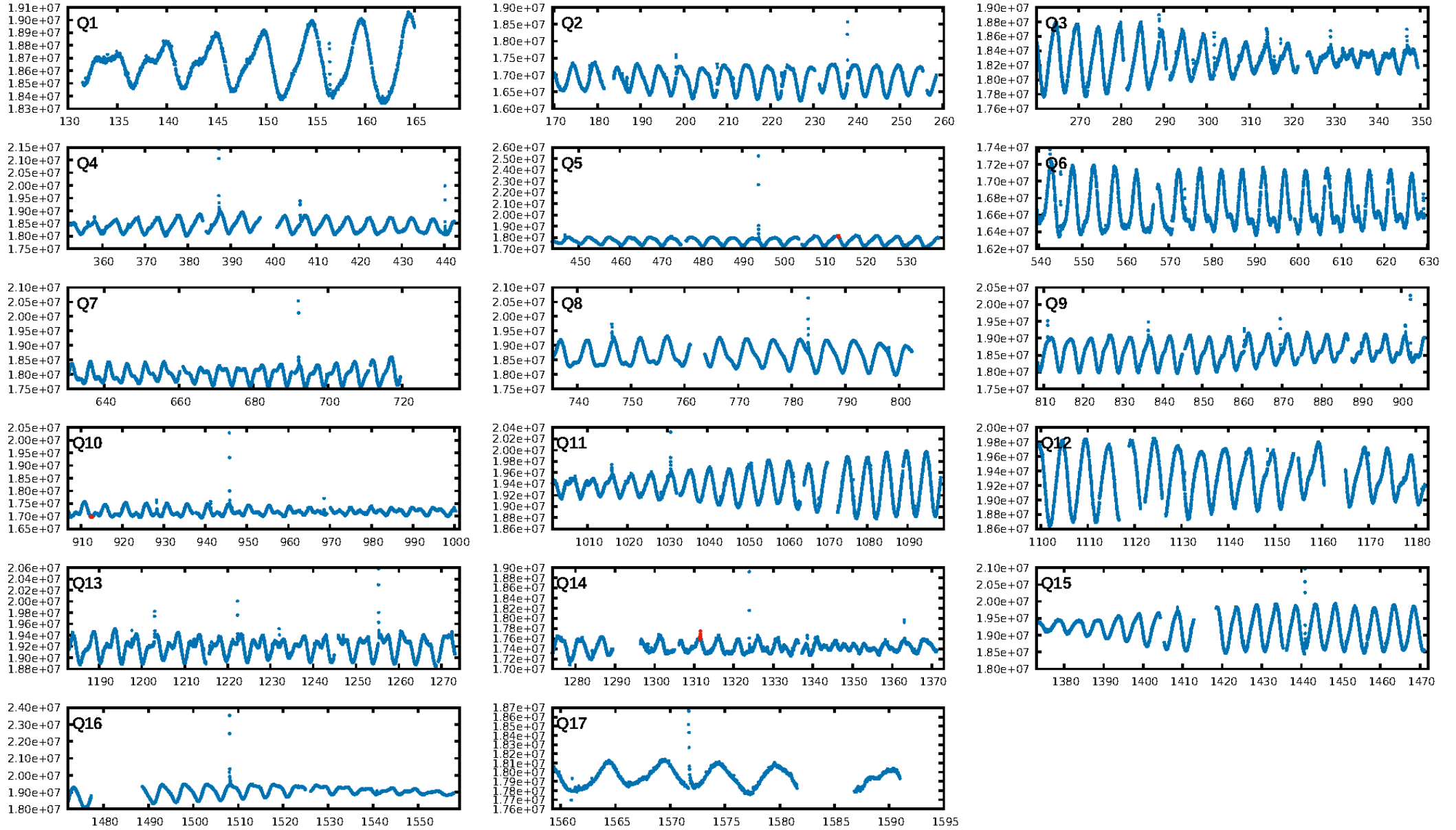
## DV Fit Results:

Period = 398.94683 [0.00718] d  
Epoch = 513.5841 [0.0097] BKJD  
Rp/R\* = 0.0428 [0.0240]  
a/R\* = 501.72 [1162.01]  
b = 0.74 [1.41]  
Seff = 0.08 [0.01]  
Teq = 135 [5] K  
Rp = 2.52 [1.43] Re  
a = 0.8668 [0.0510] AU  
Ag = 48889.58 [56692.82] [0.86 $\sigma$ ]  
Teffp = 3110 [904] K [3.29 $\sigma$ ]

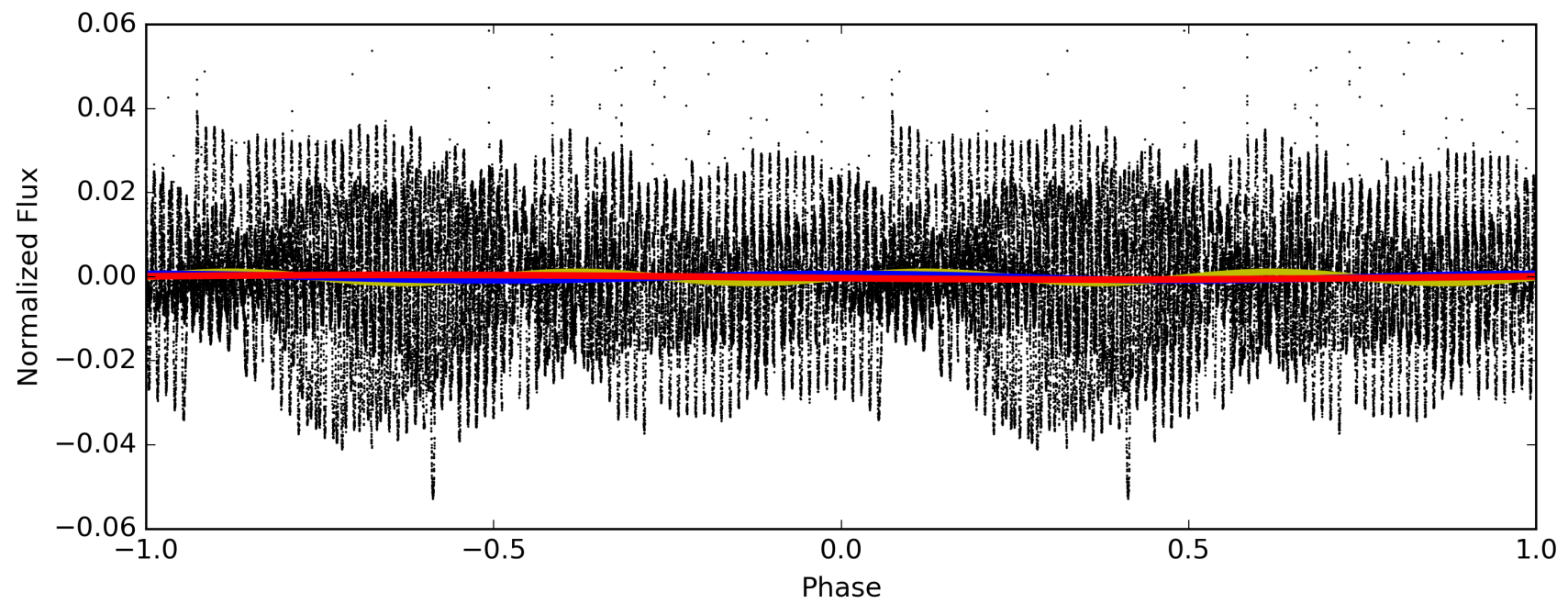
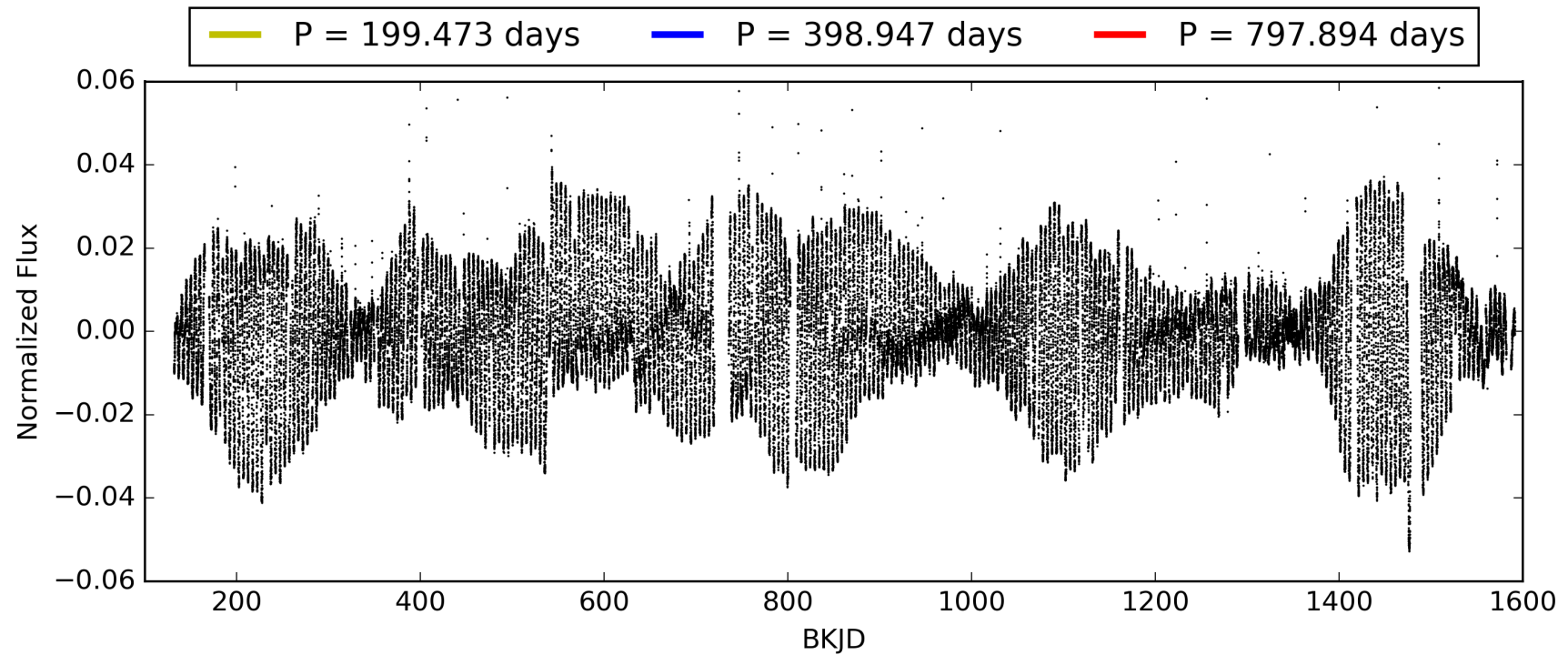
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [120.61 $\sigma$ ]  
LongPeriod-sig: 100.0% [139.50 $\sigma$ ]  
ModelChiSquare2-sig: 18.1%  
ModelChiSquareGof-sig: 92.0%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: 1.952  
Centroid-sig: 49.6%  
Centroid-so: 0.434 arcsec [0.56 $\sigma$ ]  
OotOffset-rm: 0.879 arcsec [2.52 $\sigma$ ]  
KicOffset-rm: 0.580 arcsec [1.67 $\sigma$ ]  
OotOffset-st: 1/0/0/1 [2]  
KicOffset-st: 1/0/0/1 [2]  
DiffImageQuality-fgm: 0.50 [1/2]  
DiffImageOverlap-fno: 1.00 [3/3]

# TCE 009659036-01, PDC Light Curves

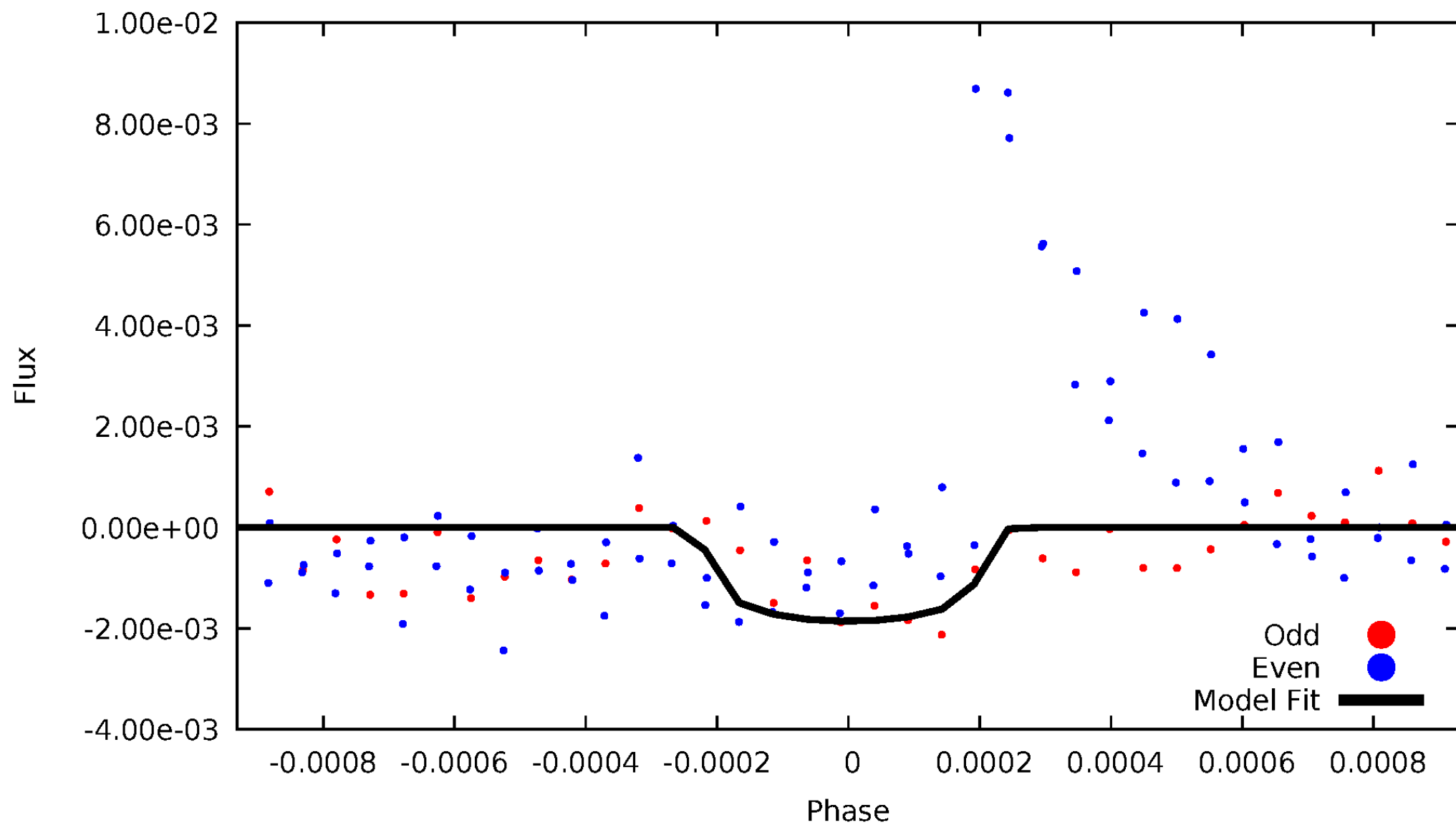


TCE 009659036-01



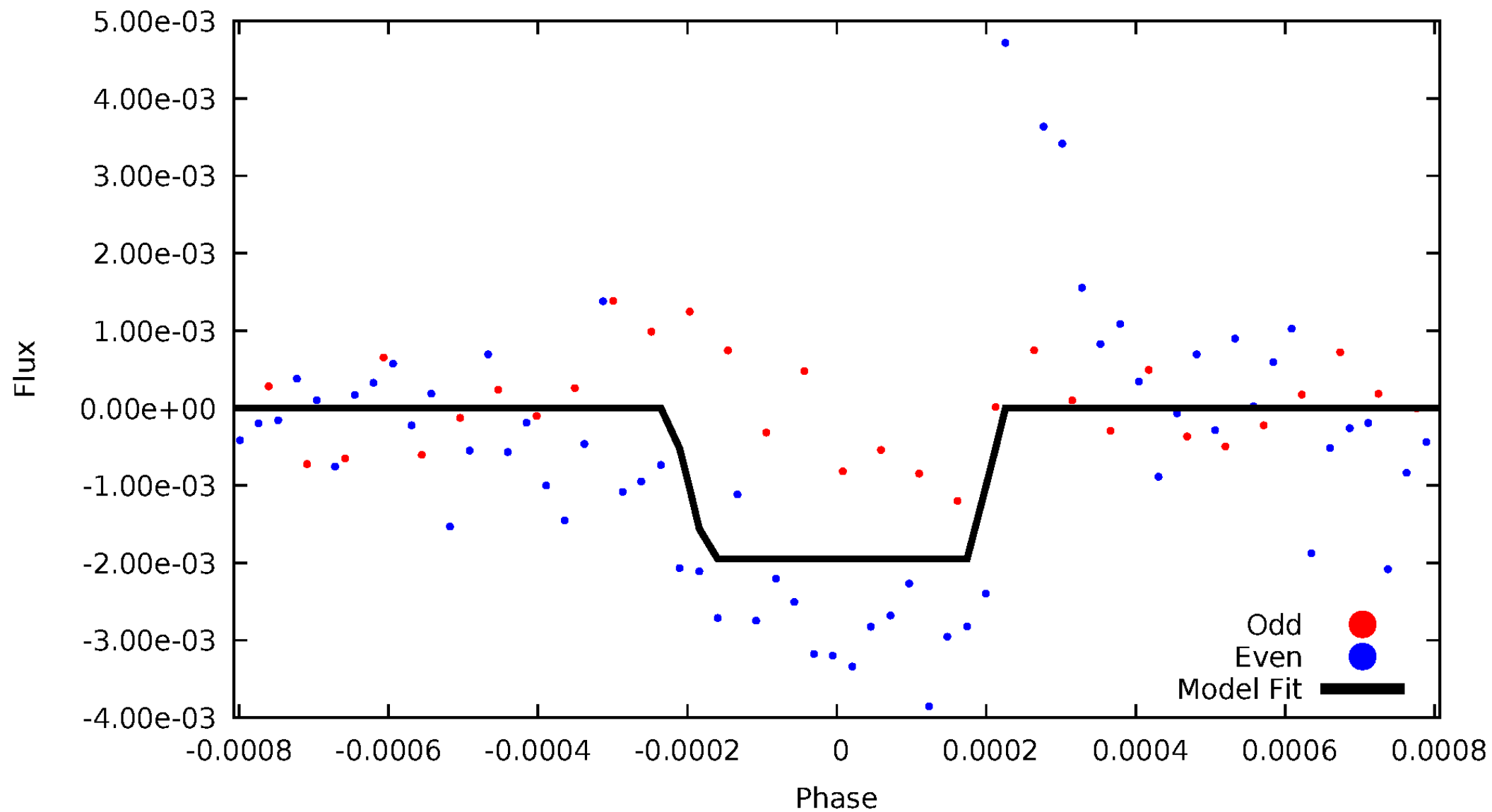
# DV Odd/Even

TCE 009659036-01



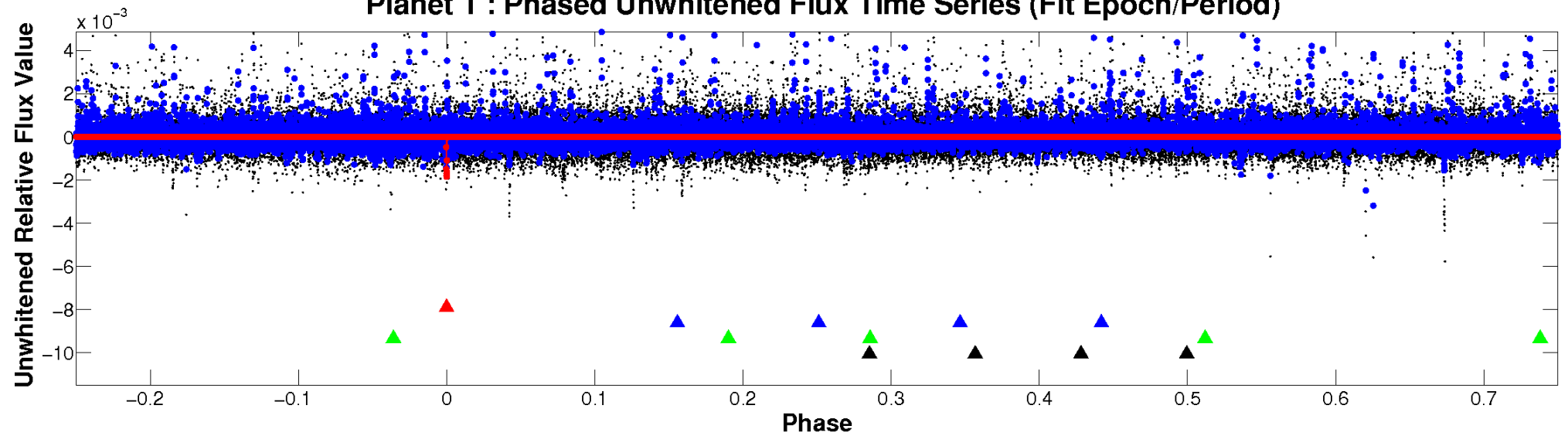
# ALT Odd/Even

TCE 009659036-01

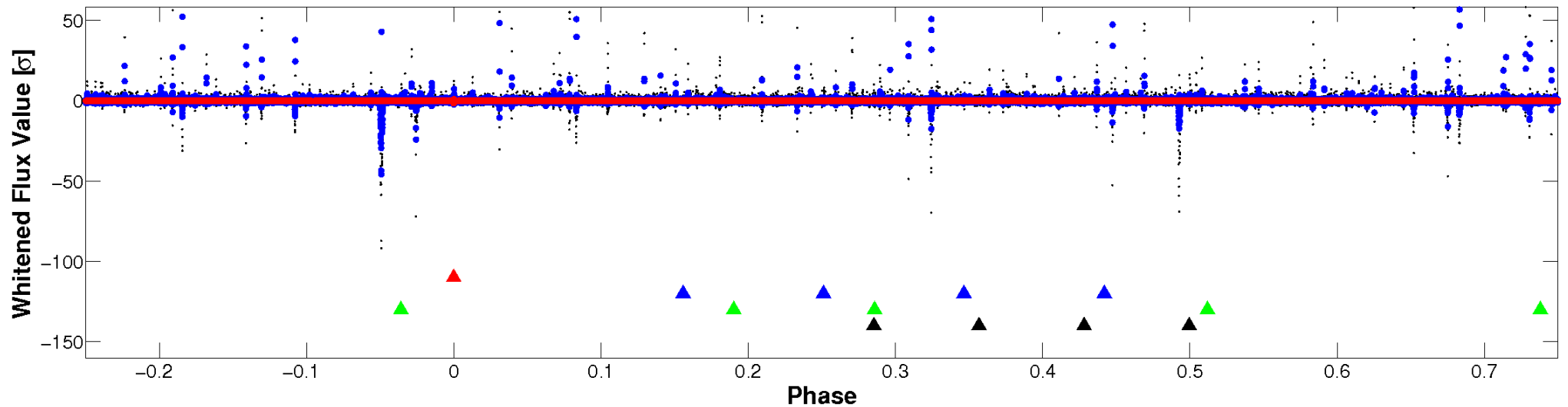


# Non-Whitened Vs. Whitened Light Curve

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

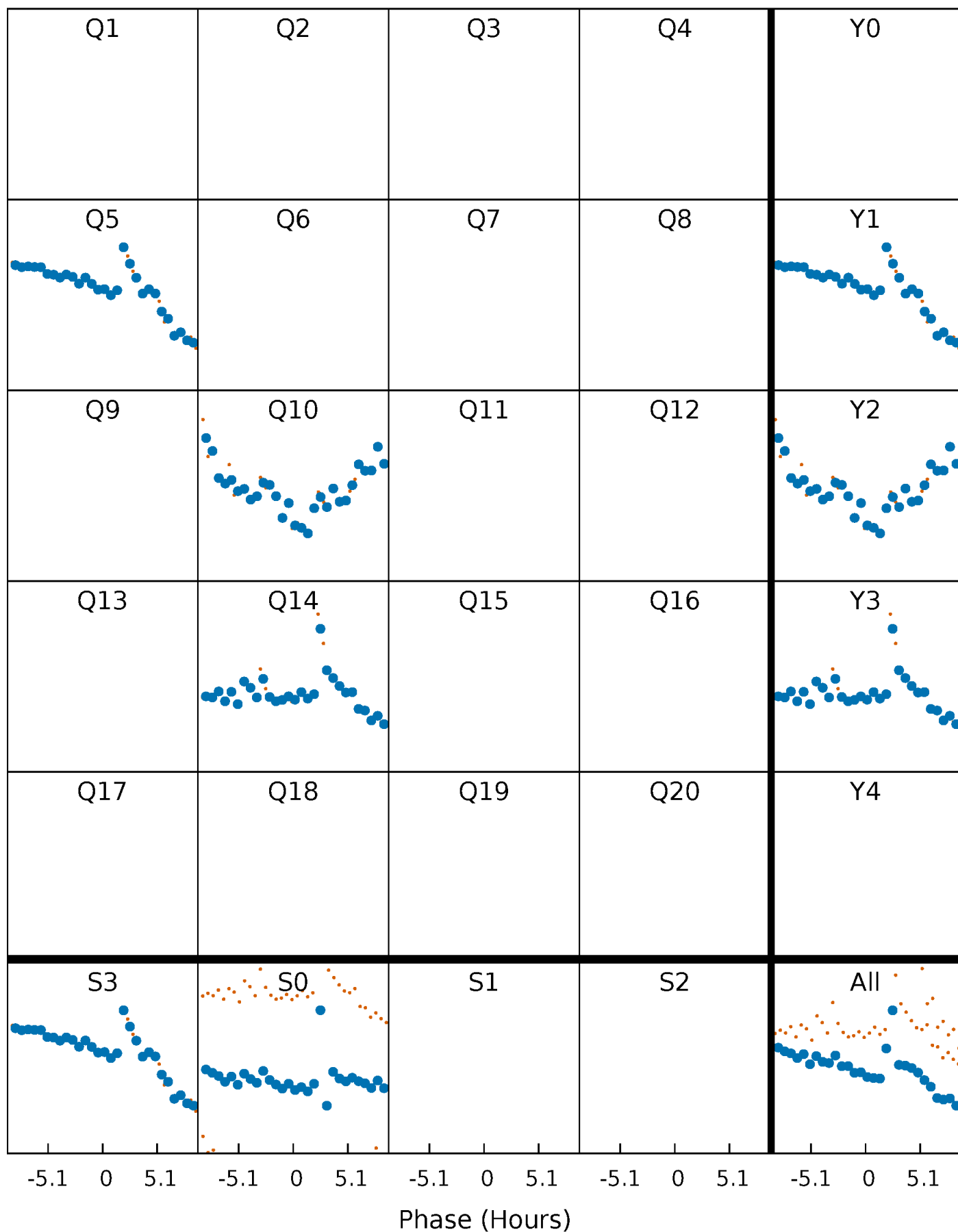


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

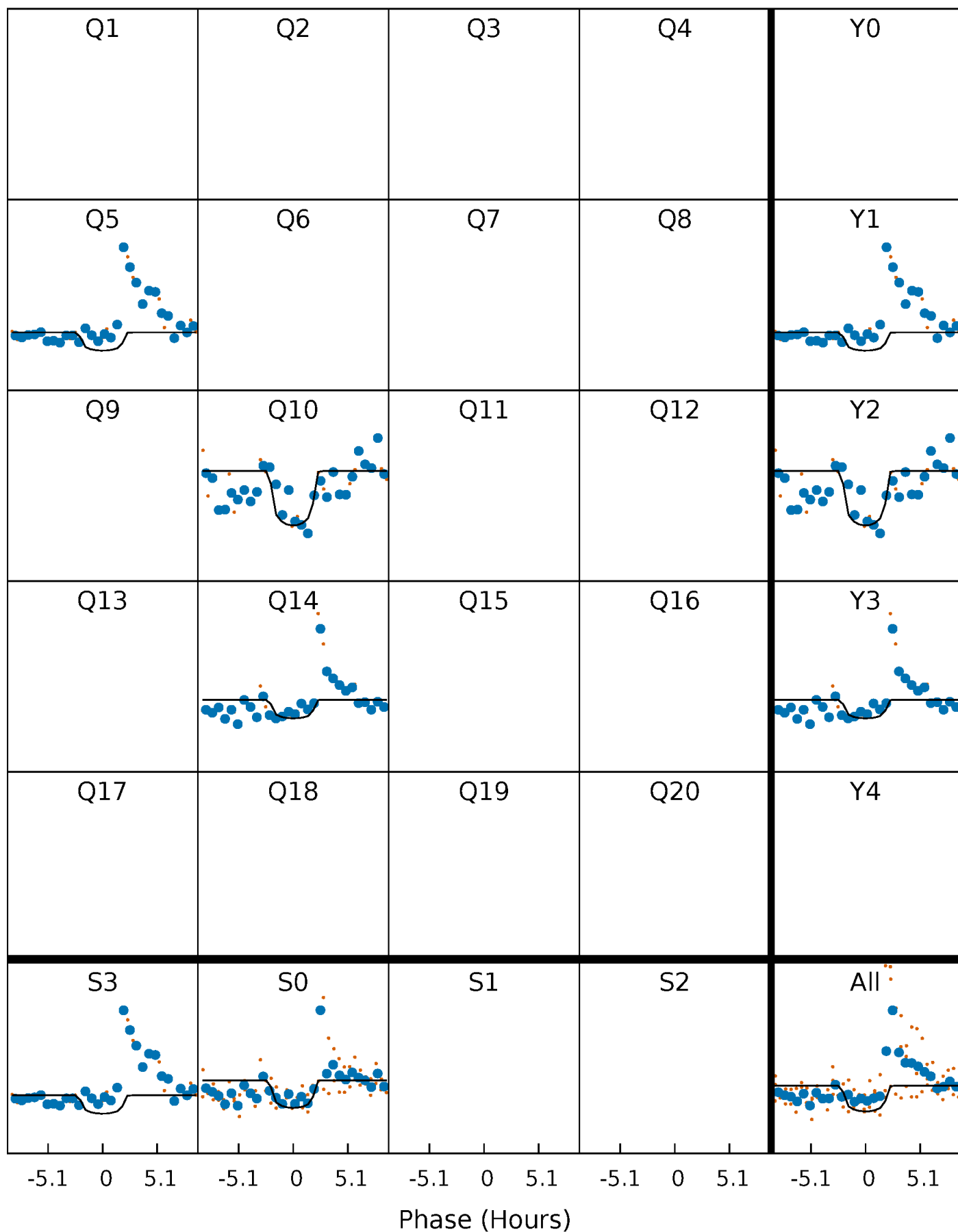
TCE 009659036-01     $P=398.946833$  Days     $T_0=513.584068$  (BKJD)





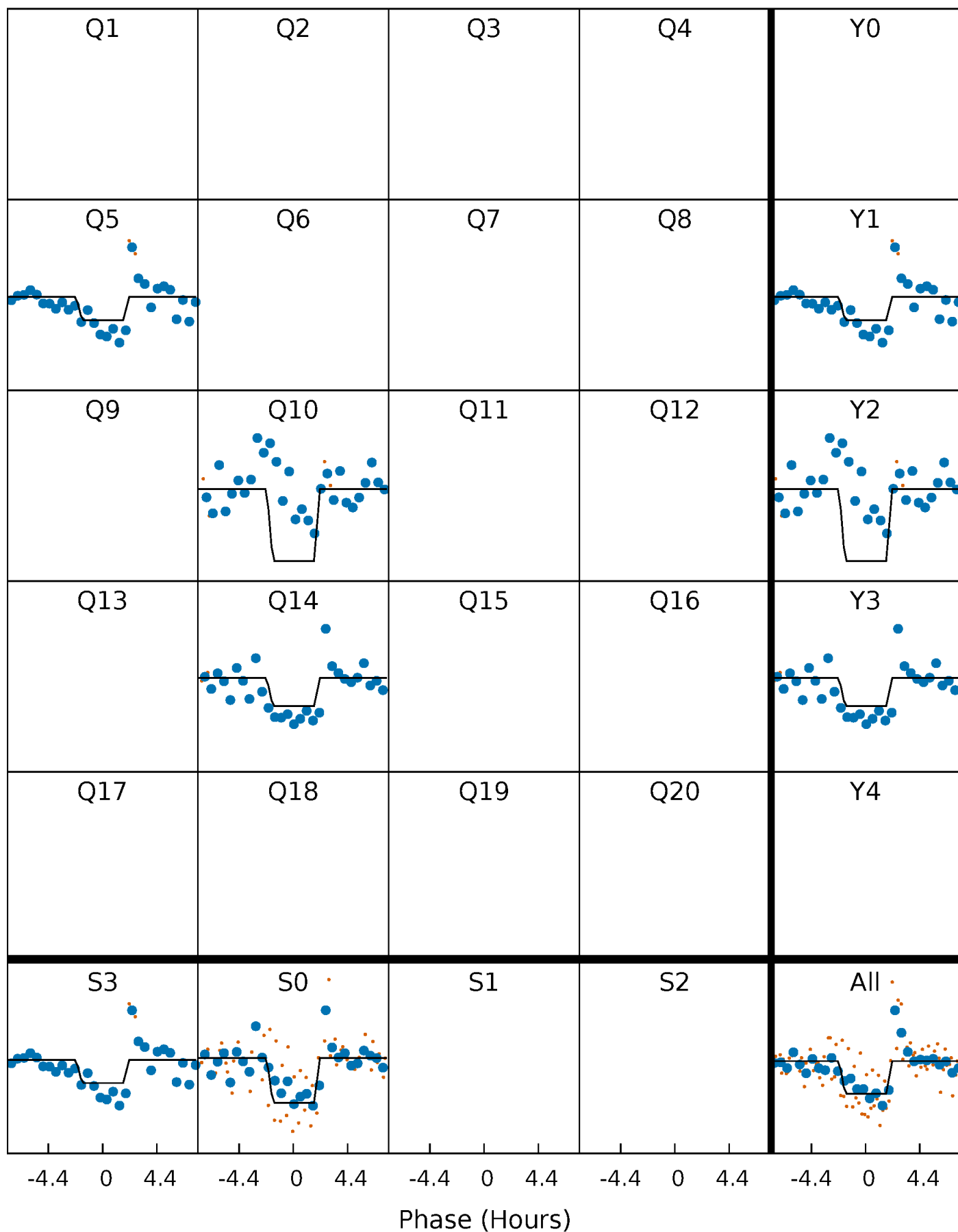
# DV Quarter-Phased Transit Curves

TCE 009659036-01 P=398.946833 Days  $T_0=513.584068$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

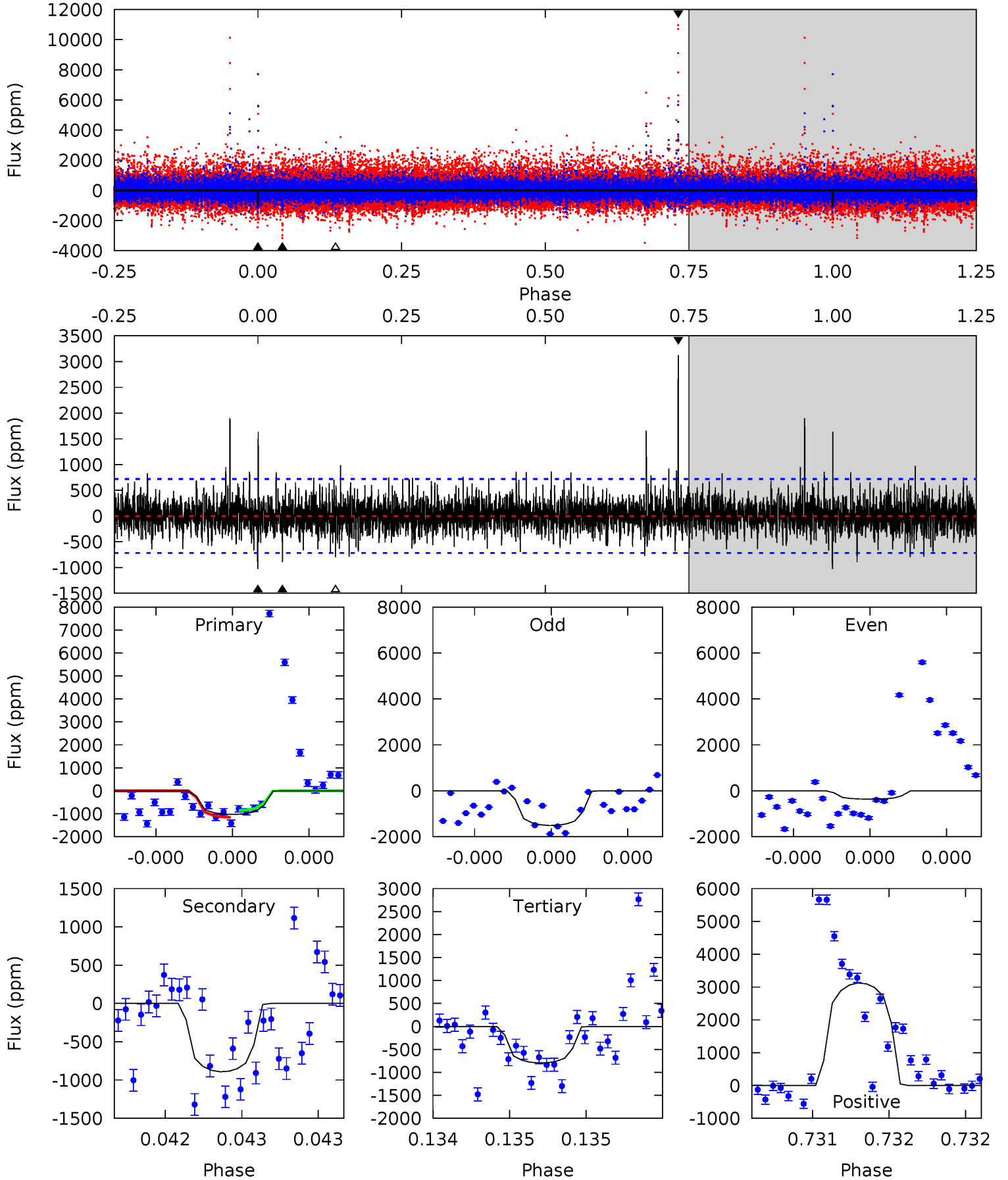
TCE 009659036-01 P=398.951637 Days  $T_0=513.571542$  (BKJD)



# DV Model-Shift Uniqueness Test

009659036-01, P = 398.946833 Days, E = 114.637235 Days

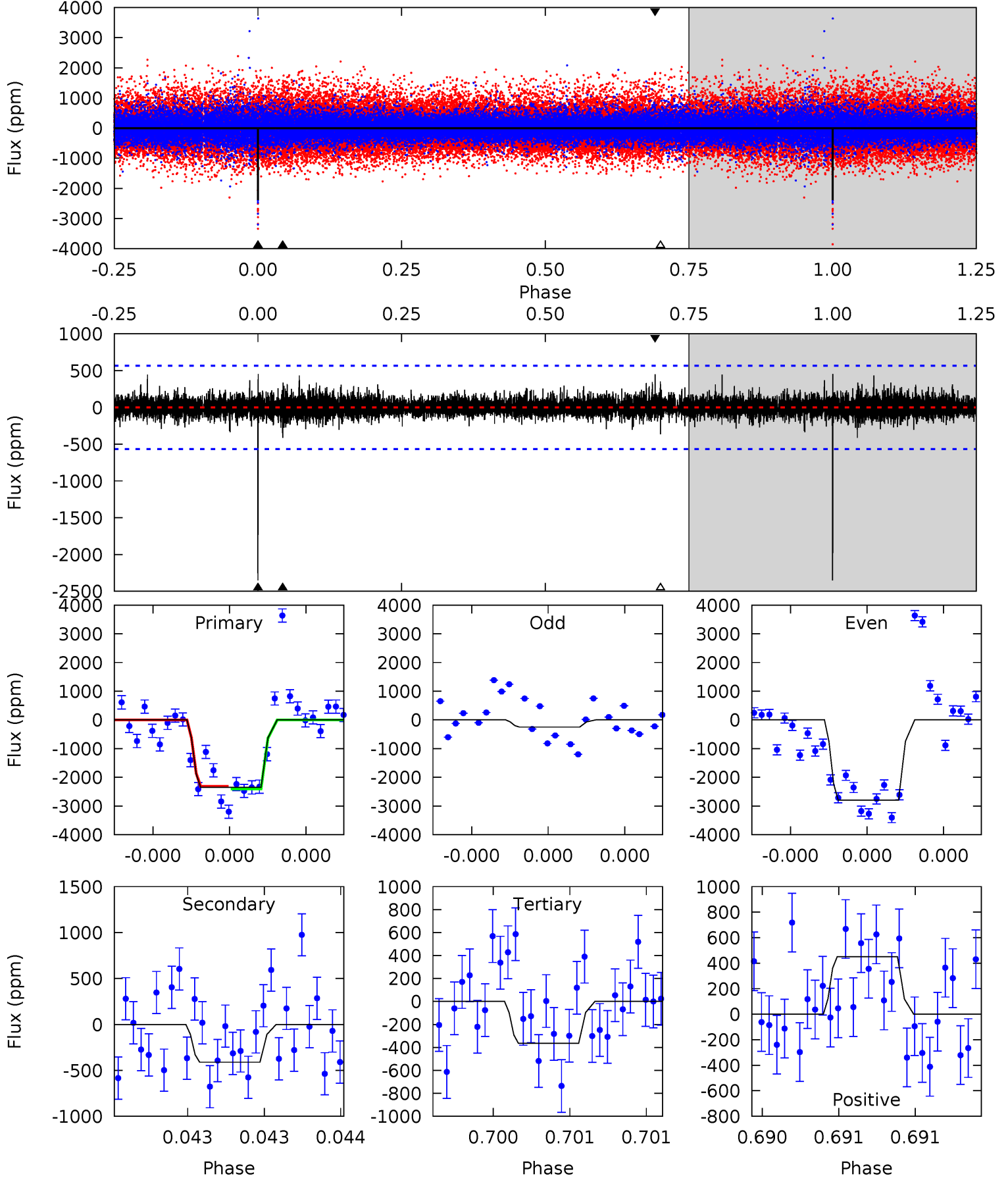
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
8.00	6.93	6.19	24.3	5.59	3.50	1.73	1.81	-16.3	0.75	-17.3	2.19	0.56	0.75	1.15



# Alt Model-Shift Uniqueness Test

009659036-01, P = 398.951637 Days, E = 114.619905 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
23.3	4.07	3.60	4.46	5.60	3.53	0.76	19.7	18.8	0.47	-0.39	12.9	0.71	0.16	0.40



### Stellar Parameters For KIC 009659036

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$3885^{+117}_{-105}$	$4.710^{+0.039}_{-0.025}$	$-0.100^{+0.100}_{-0.100}$	$0.540^{+0.030}_{-0.041}$	$0.545^{+0.037}_{-0.034}$	$4.882^{+0.884}_{-0.513}$
	+3%/-3%	+1%/-1%	+100%/-100%	+6%/-8%	+7%/-6%	+18%/-11%
Source	PHO2	PHO2	PHO2	DSEP		

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

### Secondary Eclipse Parameters for KIC 009659036-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-892 \pm 129$	$2.58^{+1.38}_{-1.35}$	$189^{+6}_{-5}$	$3417^{+1033}_{-414}$	$55402^{+189905}_{-32079}$
Alt.	$-411 \pm 101$	$2.65^{+1.38}_{-1.32}$	$189^{+6}_{-6}$	$2996^{+737}_{-316}$	$22940^{+74490}_{-13178}$

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

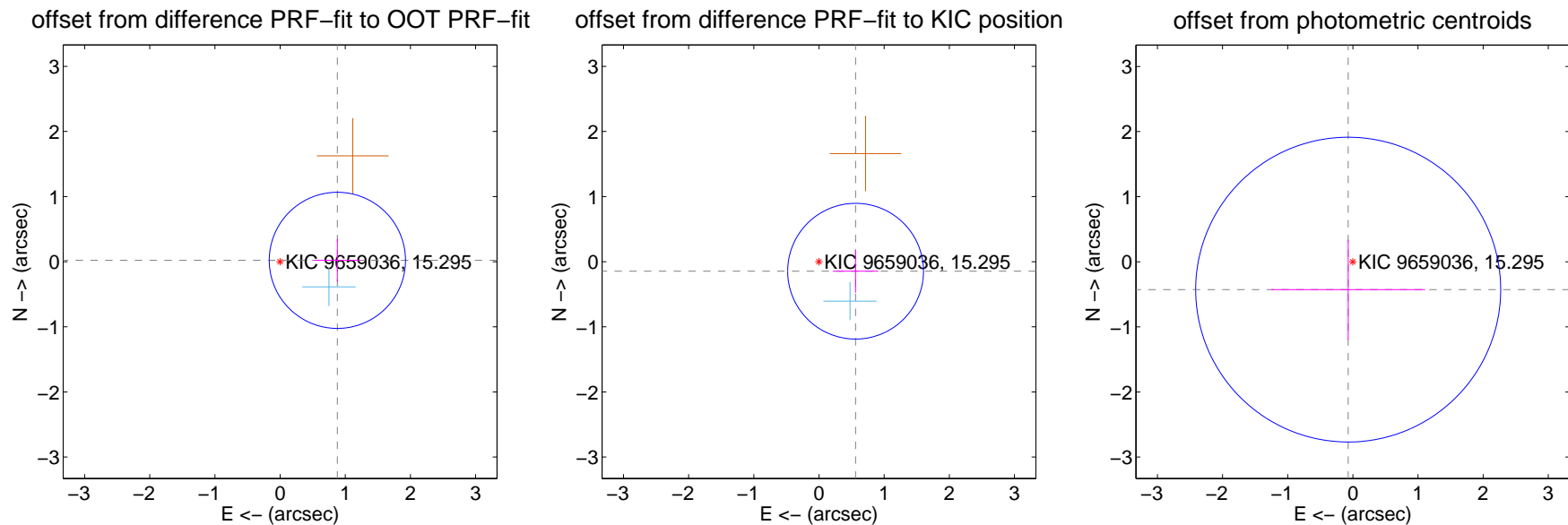
## DV Centroid Data

Supplemental centroid analysis for 009659036-01. Kepler magnitude: 15.29. Transit SNR 7.38

There are 1 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.35 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.879 \pm 0.348$	2.52	$-0.879 \pm 0.349$	$0.021 \pm 0.331$
PRF-fit source offset from KIC position	$0.580 \pm 0.347$	1.67	$-0.562 \pm 0.349$	$-0.146 \pm 0.331$
photometric centroid source offset	$0.43 \pm 0.78$	0.56	$0.07 \pm 1.18$	$-0.43 \pm 0.77$

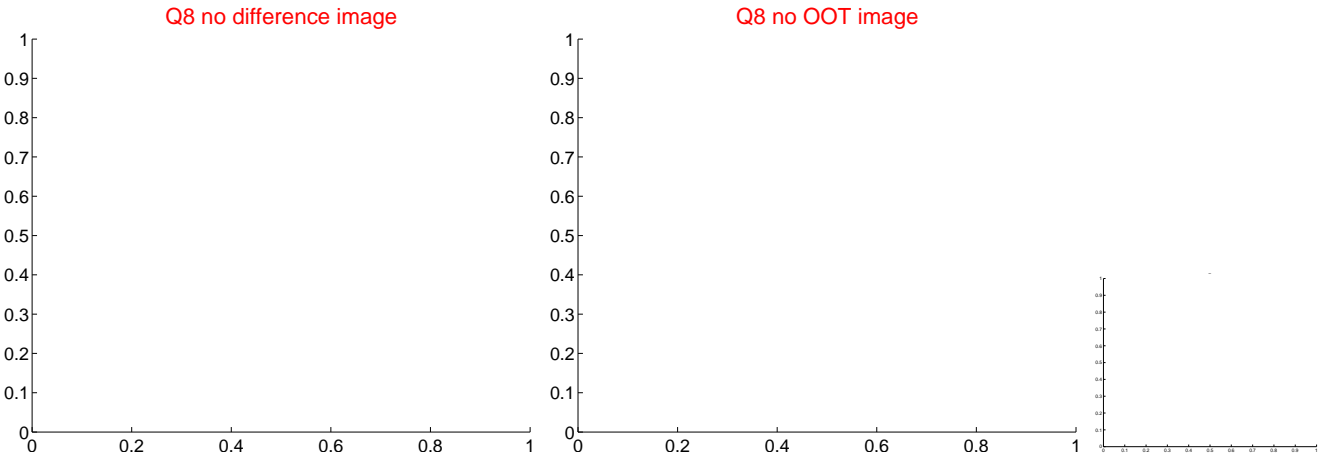
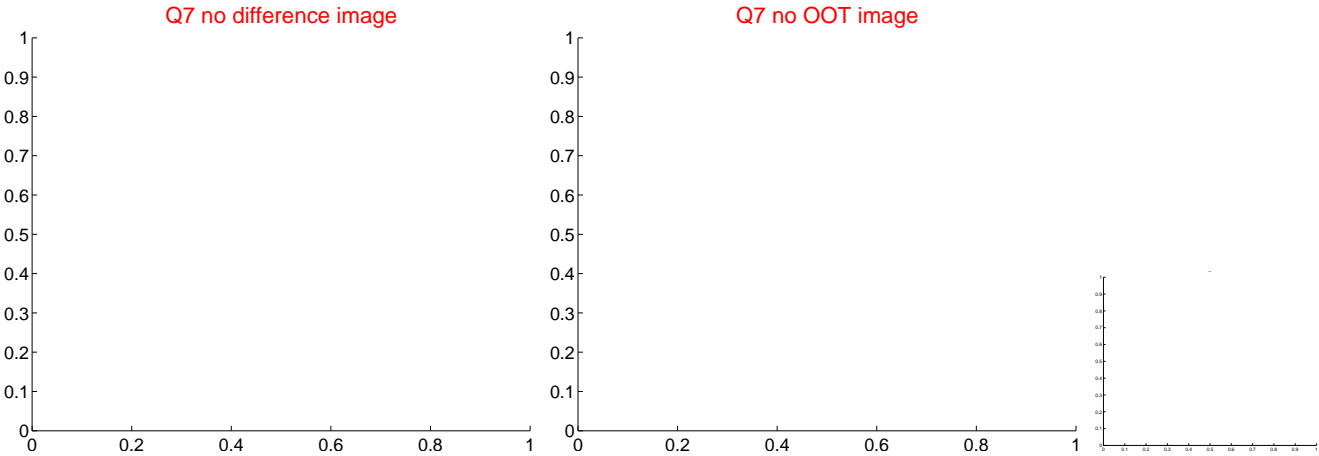
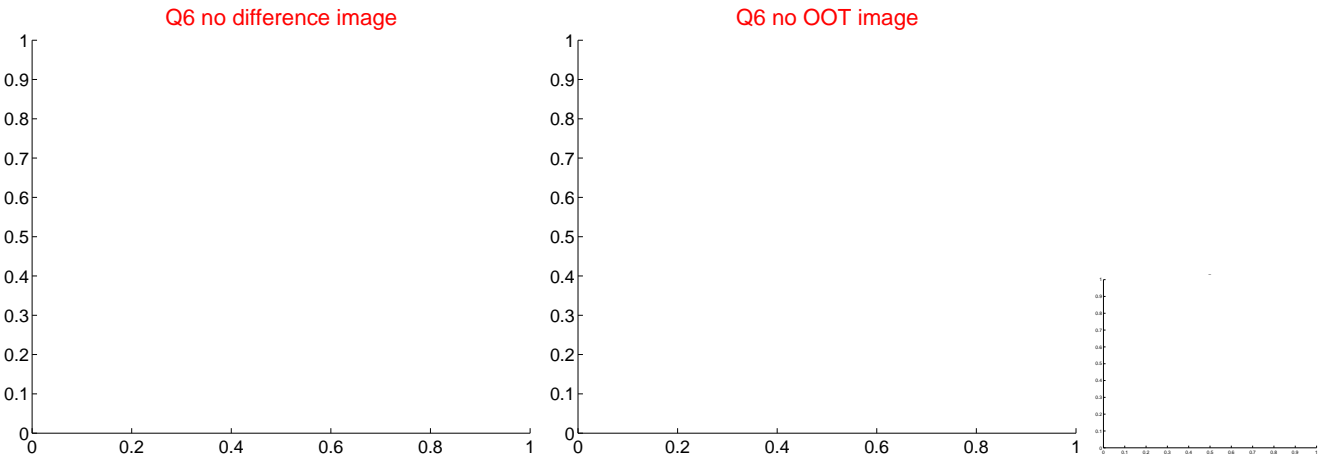
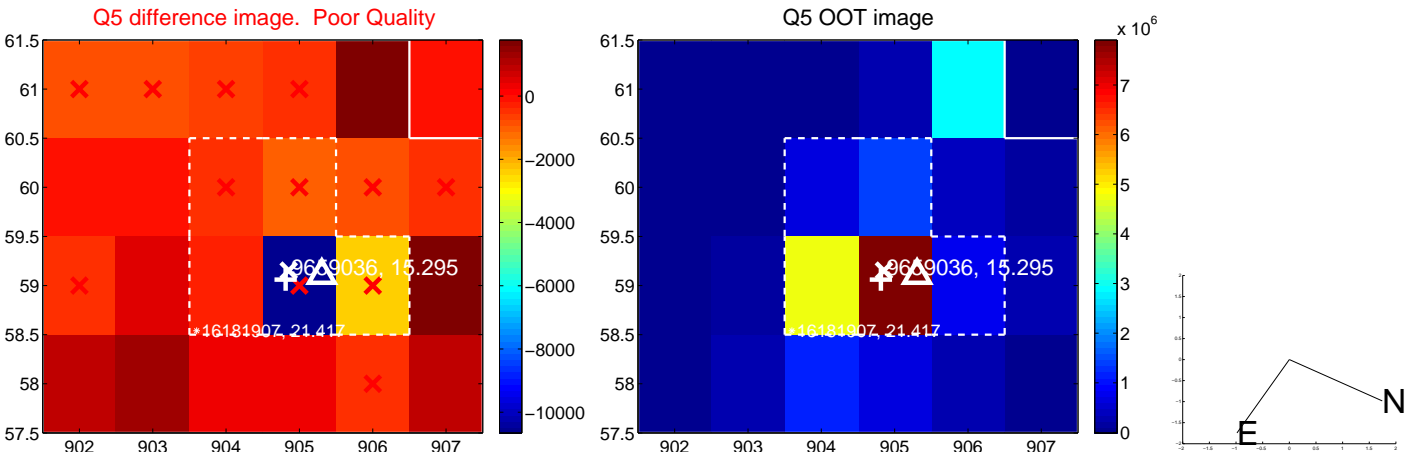


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

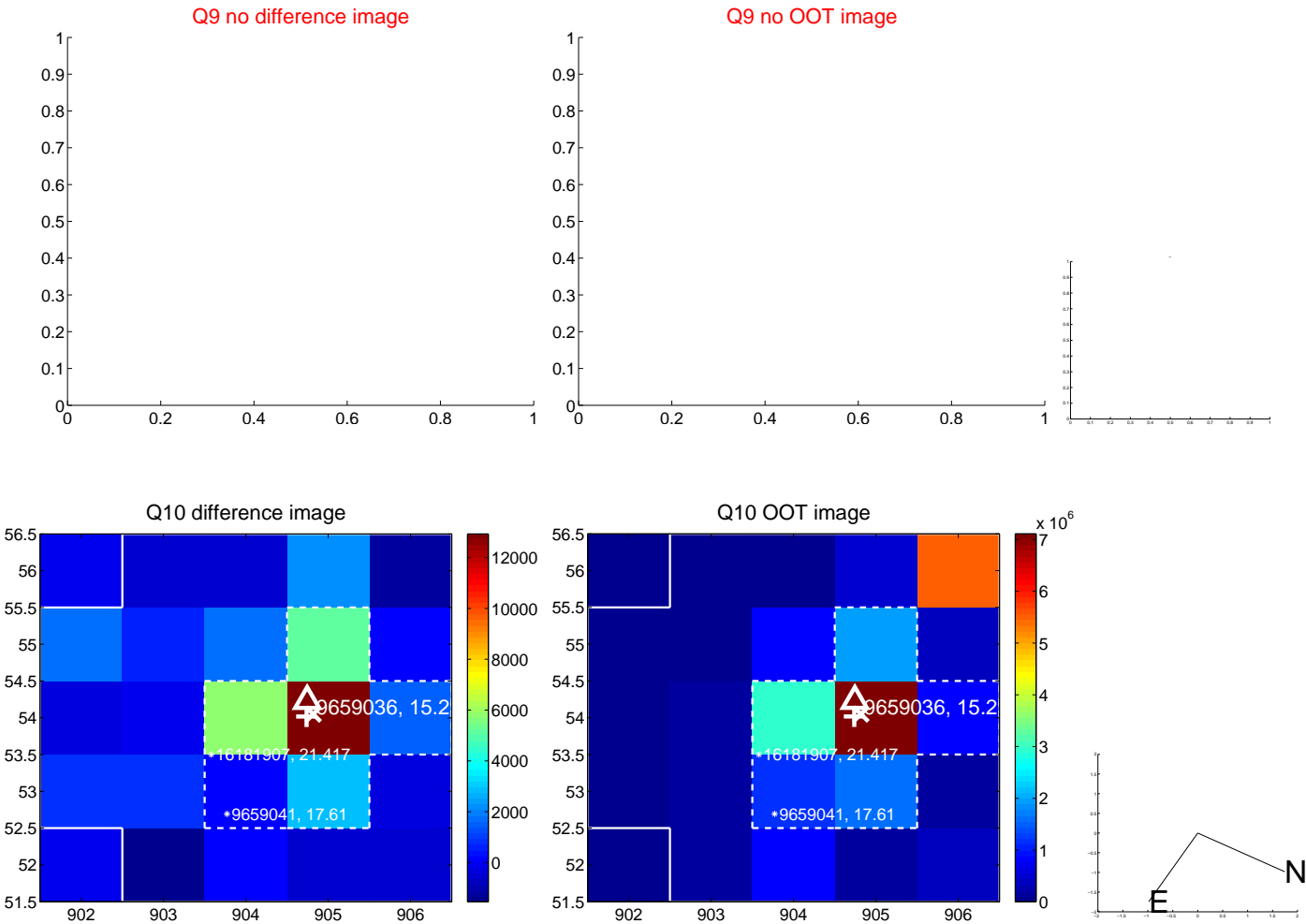


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

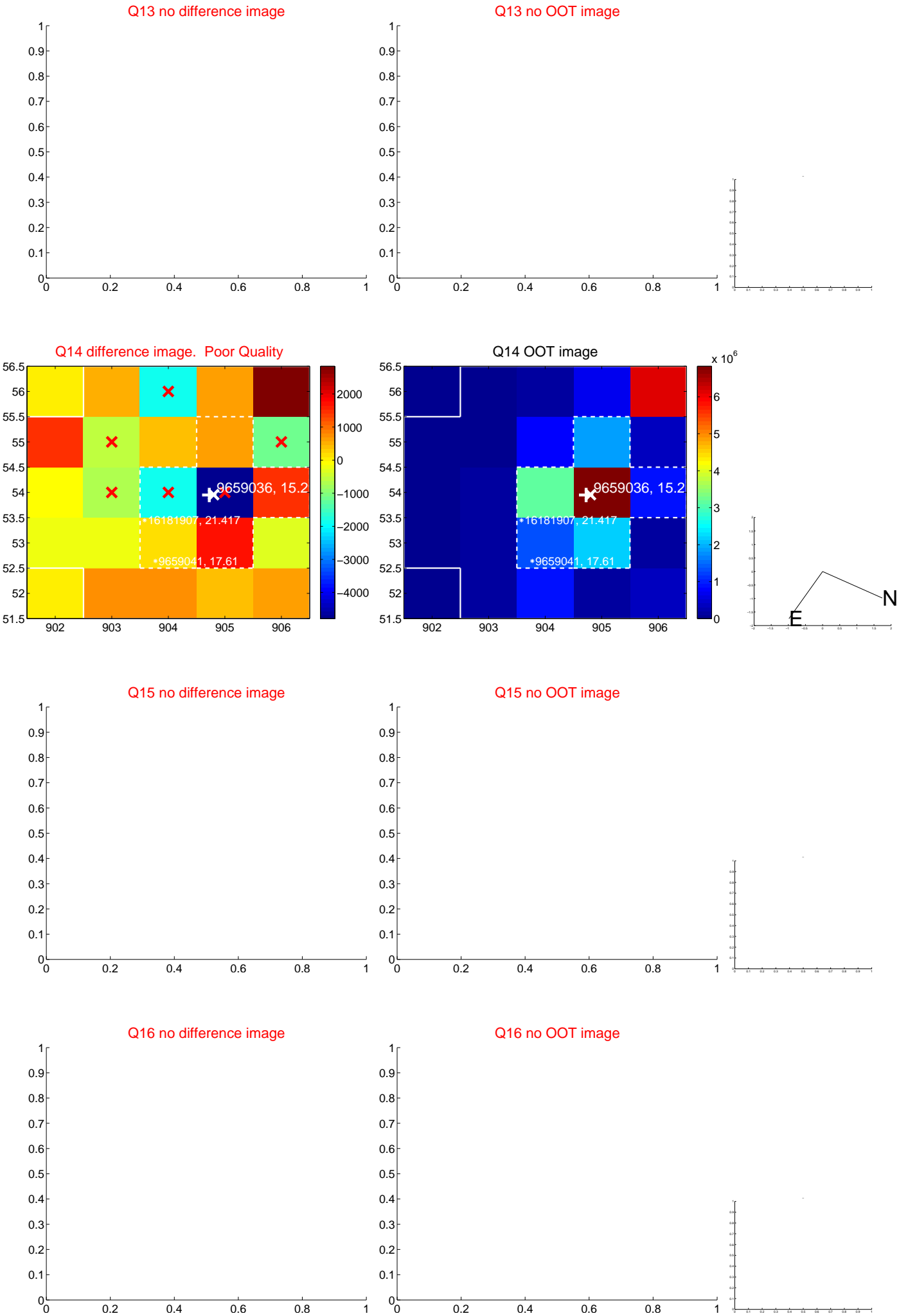




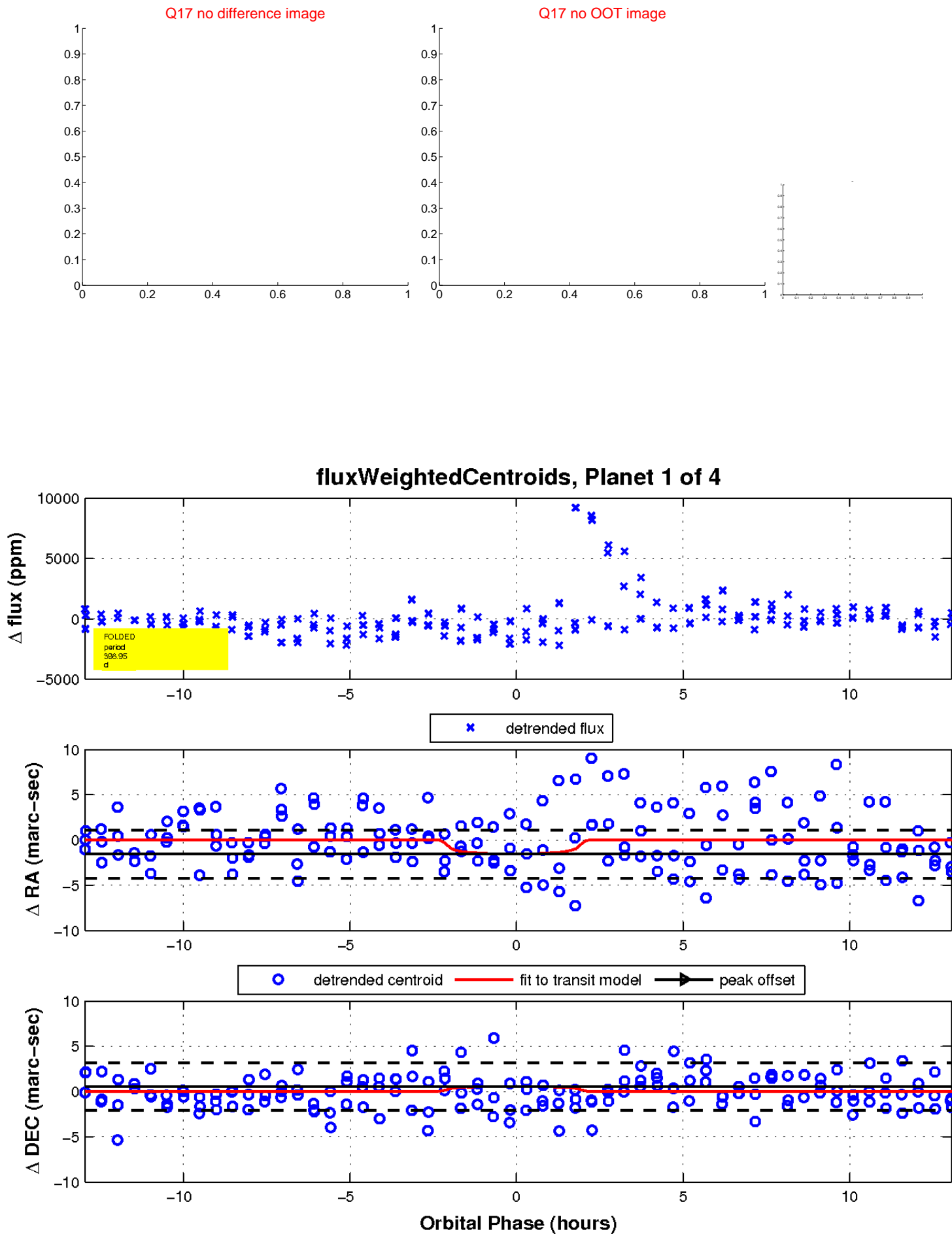
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

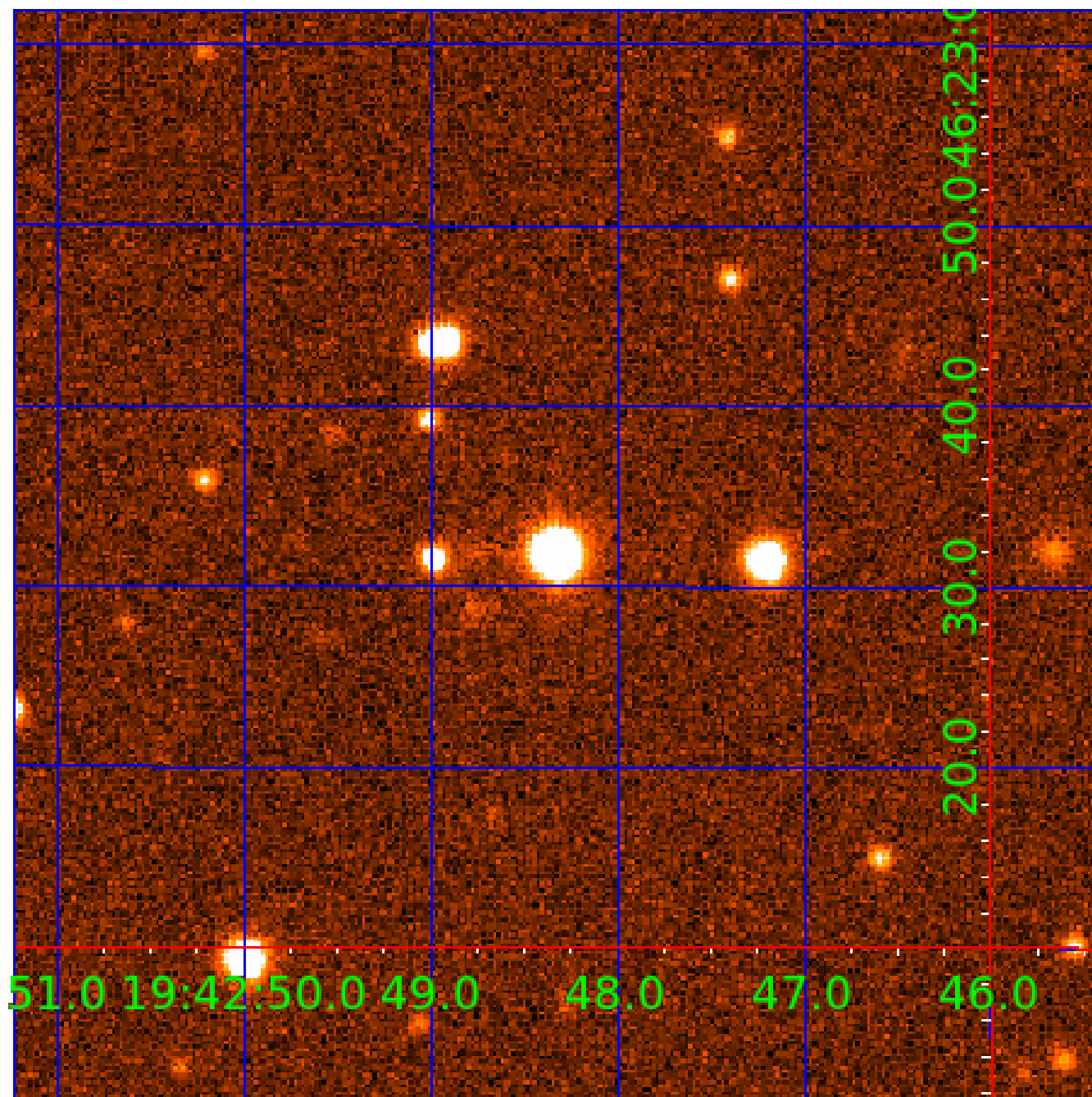


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 009659036

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009659036-01	OBS	No	398.946833	513.584068	1858.4	4.457	12.7	7.4	0.54	3885	2.52	0.08
009659036-02	OBS	No	436.994412	176.798184	1725.5	4.794	12.2	6.5	0.54	3885	2.42	0.07
009659036-03	OBS	No	308.748433	190.526525	1556.6	7.188	9.1	7.4	0.54	3885	2.10	0.11
009659036-04	OBS	No	370.467254	313.935006	1828.7	3.500	12.8	-1.0	0.54	3885	2.28	0.09

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009659036-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009659036-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009659036-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009659036-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_NOFITS

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

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

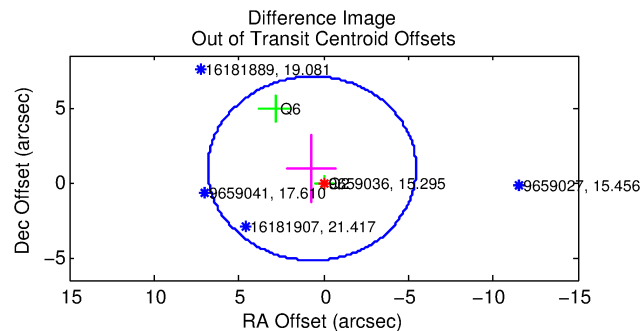
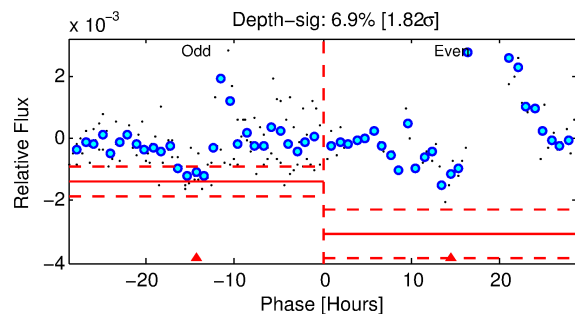
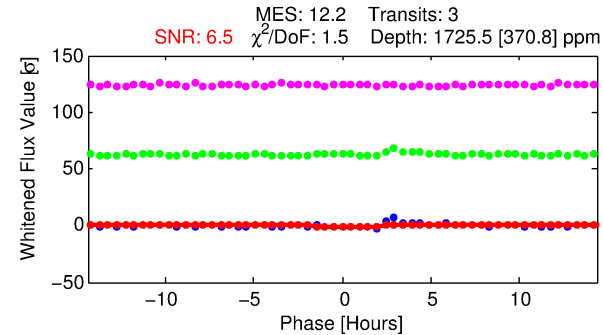
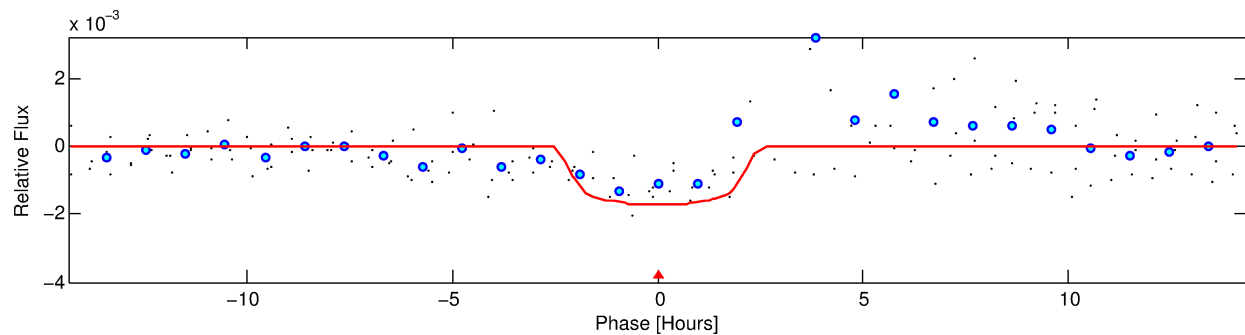
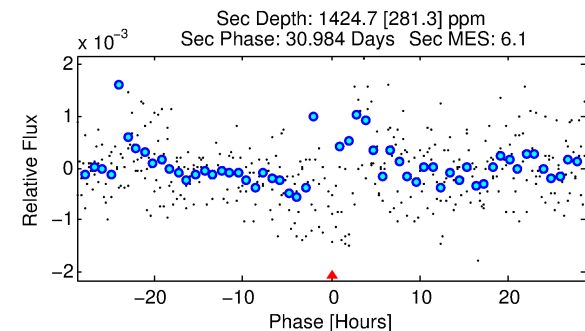
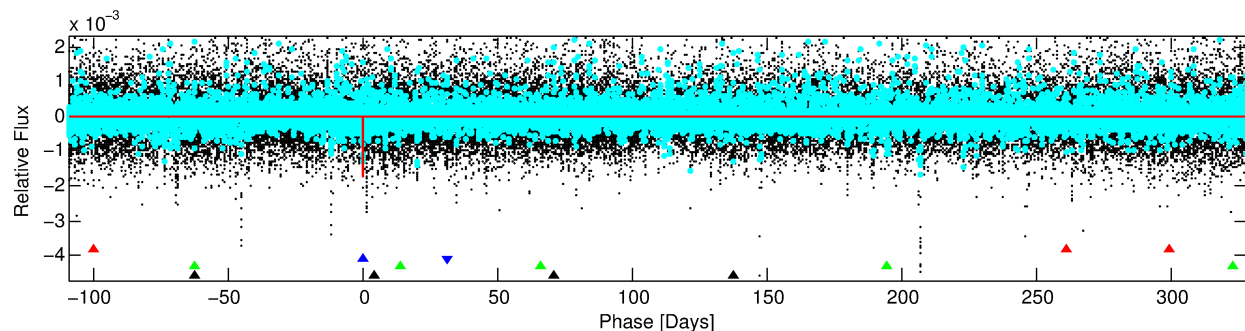
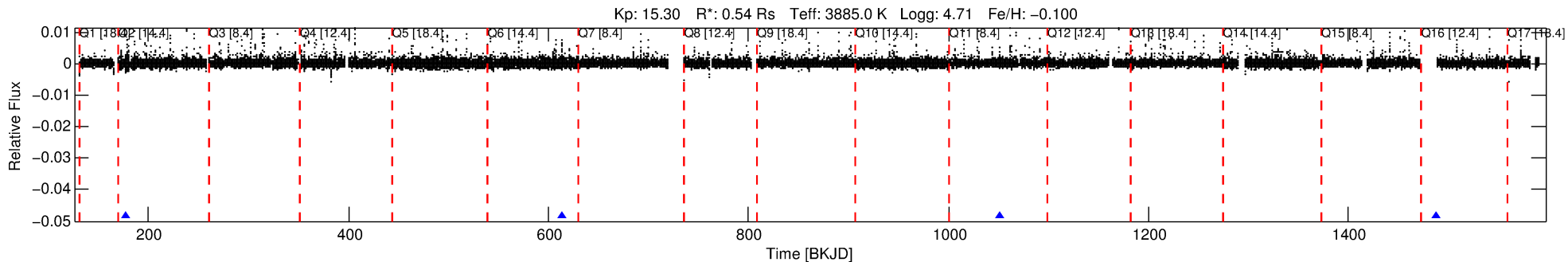
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009659036-02

No Significant Match Found

# DV One-Page Summary

KIC: 9659036 Candidate: 2 of 4 Period: 436.994 d



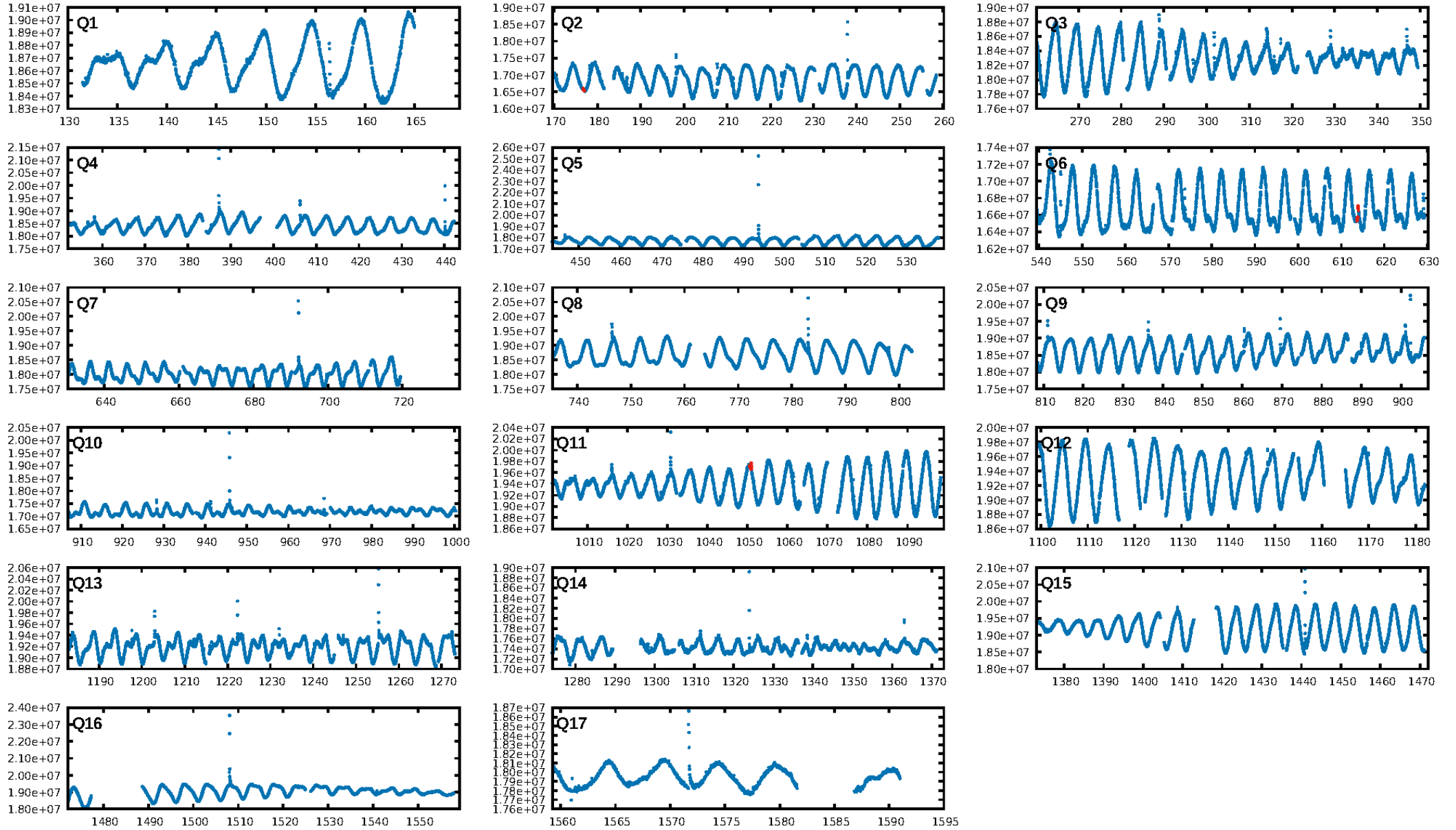
## DV Fit Results:

Period = 436.99441 [0.00713] d  
Epoch = 176.7982 [0.0124] BKJD  
Rp/R\* = 0.0410 [0.0259]  
a/R\* = 517.85 [1339.42]  
b = 0.73 [1.69]  
Seff = 0.07 [0.01]  
Teq = 131 [5] K  
Rp = 2.42 [1.54] Re  
a = 0.9210 [0.0542] AU  
Ag = 113860.07 [146030.17] [0.78σ]  
Teffp = 3727 [1198] K [3.00σ]

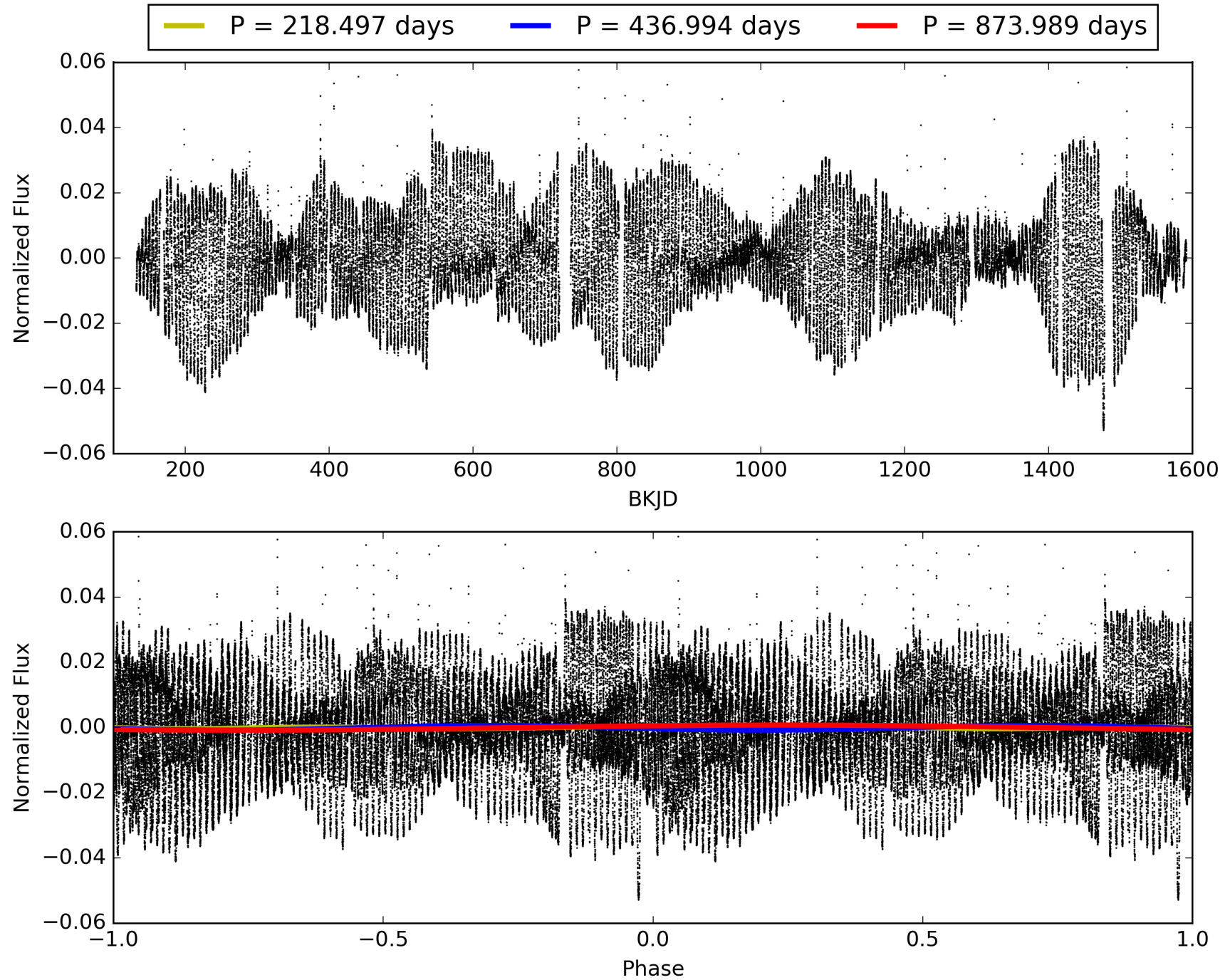
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [139.50σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 2.9%  
ModelChiSquareGof-sig: 81.5%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: -2.71  
Centroid-sig: 77.4%  
Centroid-so: 0.228 arcsec [0.27σ]  
OotOffset-rm: 1.161 arcsec [0.57σ]  
KicOffset-rm: 1.214 arcsec [0.68σ]  
OotOffset-st: 2/0/0/0 [2]  
KicOffset-st: 2/0/0/0 [2]  
DiffImageQuality-fgm: 0.50 [1/2]  
DiffImageOverlap-fno: 1.00 [3/3]

# TCE 009659036-02, PDC Light Curves



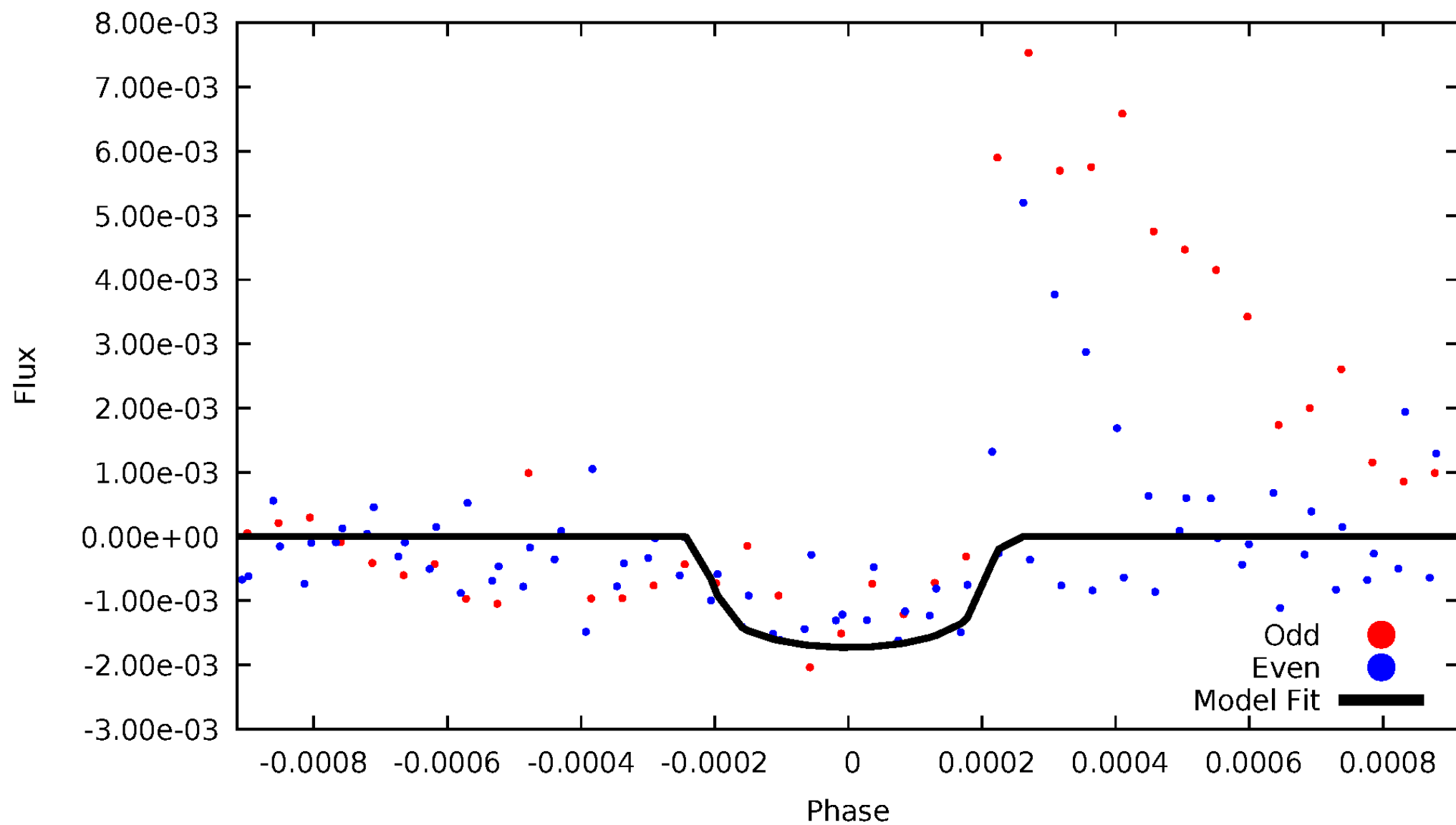
# TCE 009659036-02





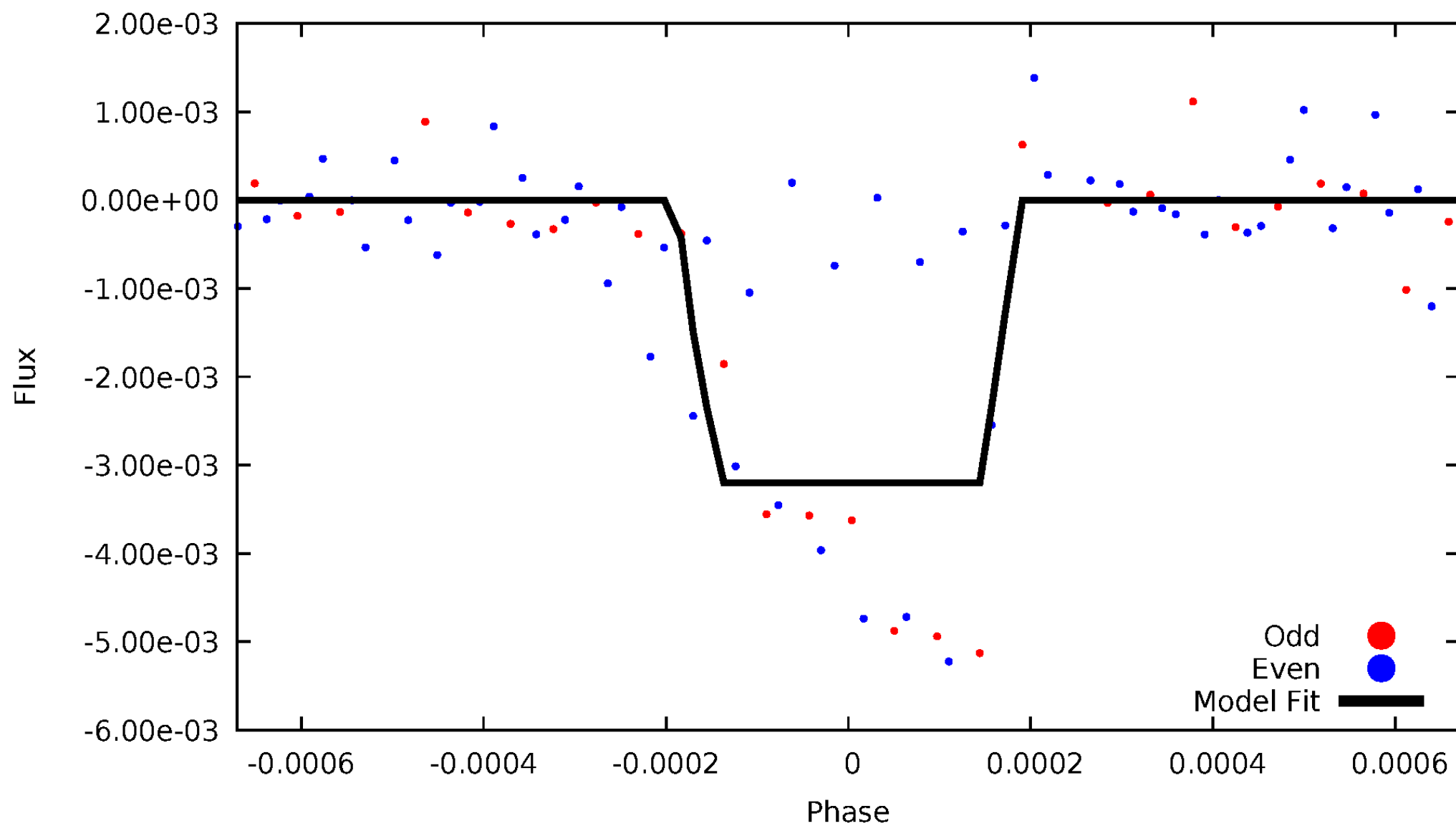
# DV Odd/Even

TCE 009659036-02



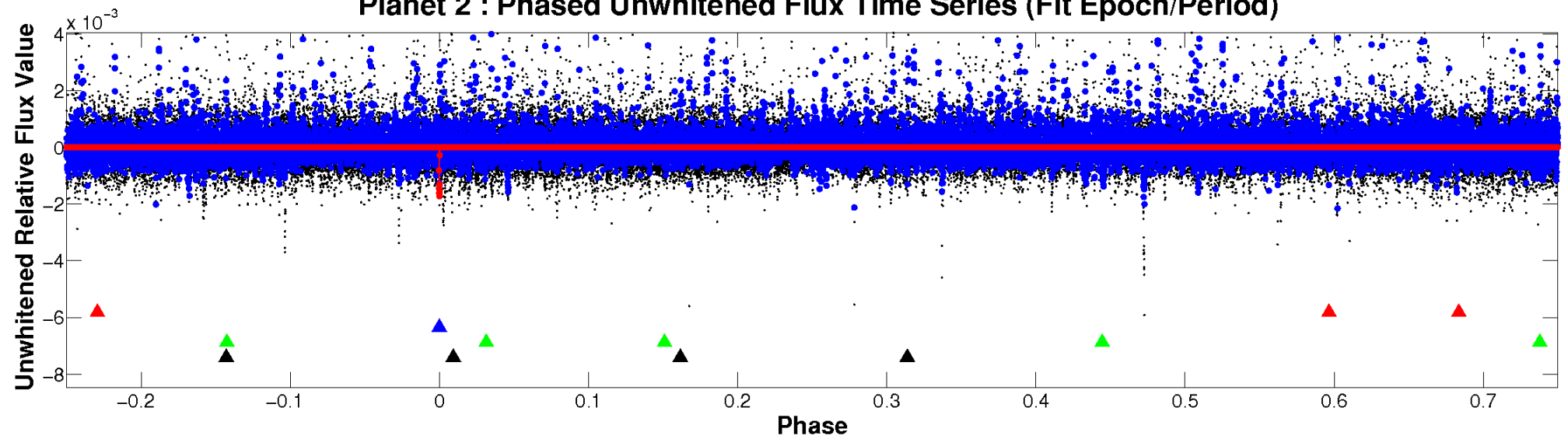
# ALT Odd/Even

TCE 009659036-02

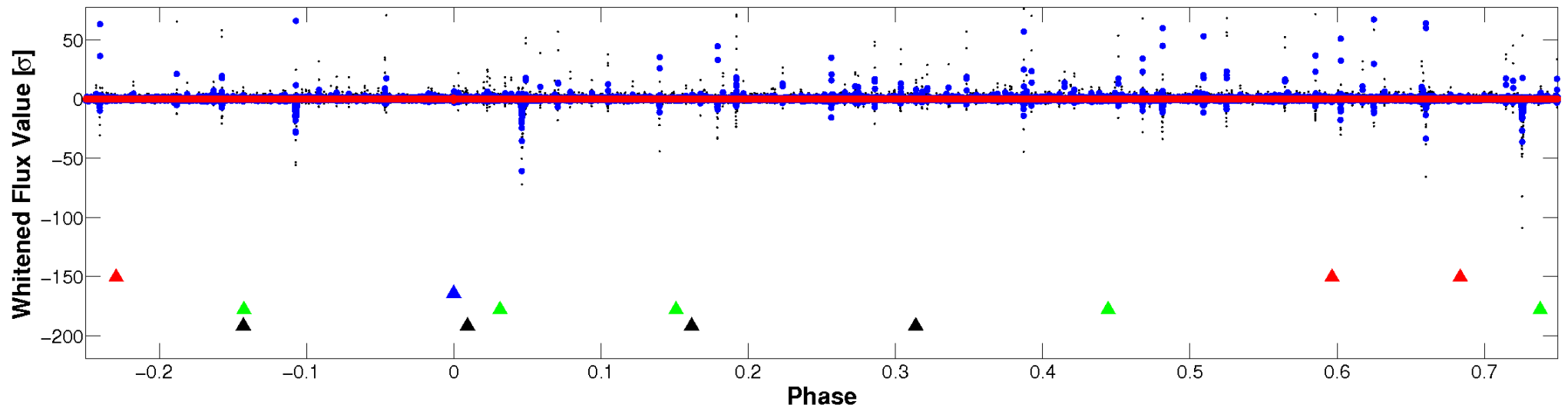


# Non-Whitened Vs. Whitened Light Curve

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



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



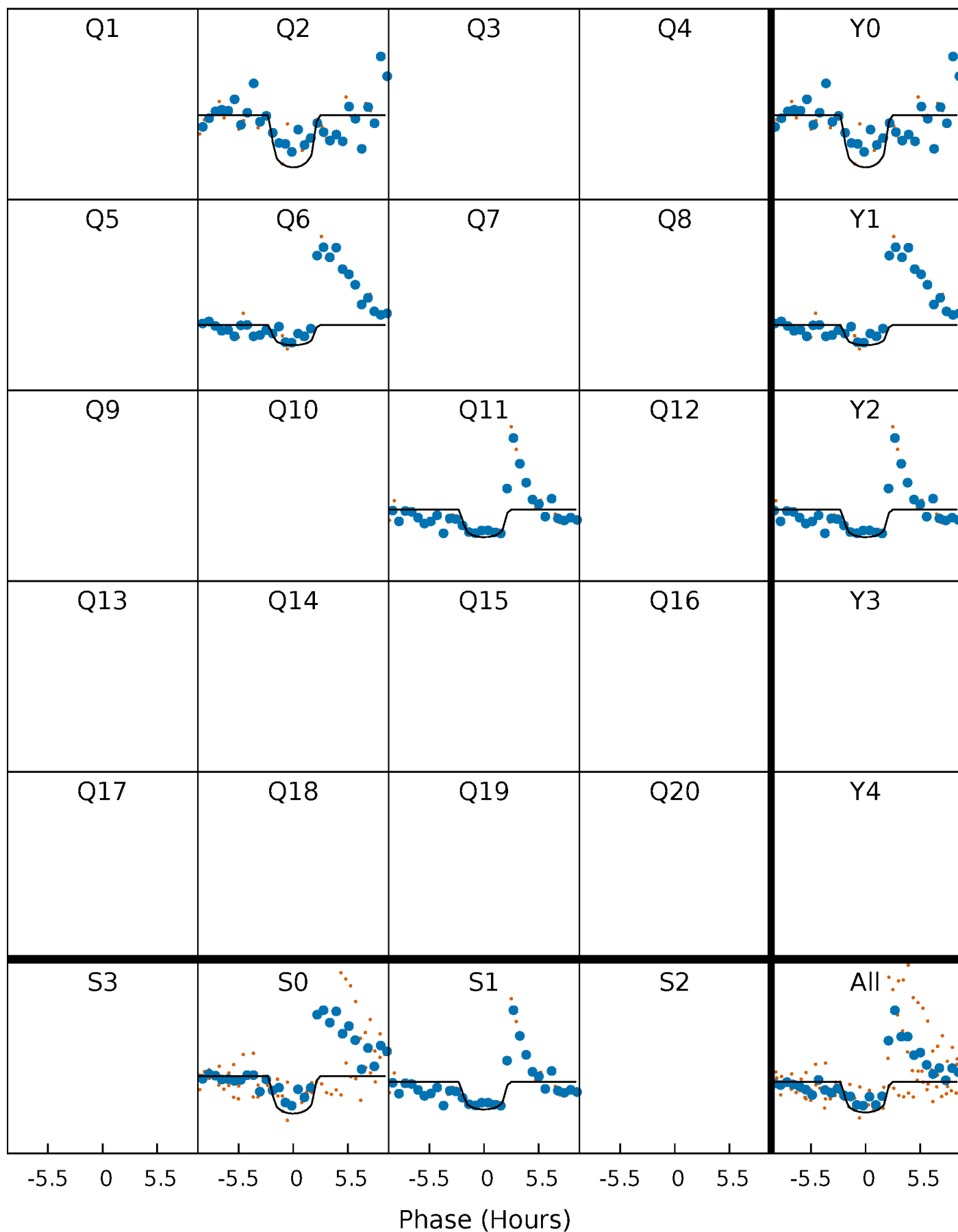
# PDC Quarter-Phased Transit Curves

TCE 009659036-02     $P=436.994412$  Days     $T_0=176.798184$  (BKJD)



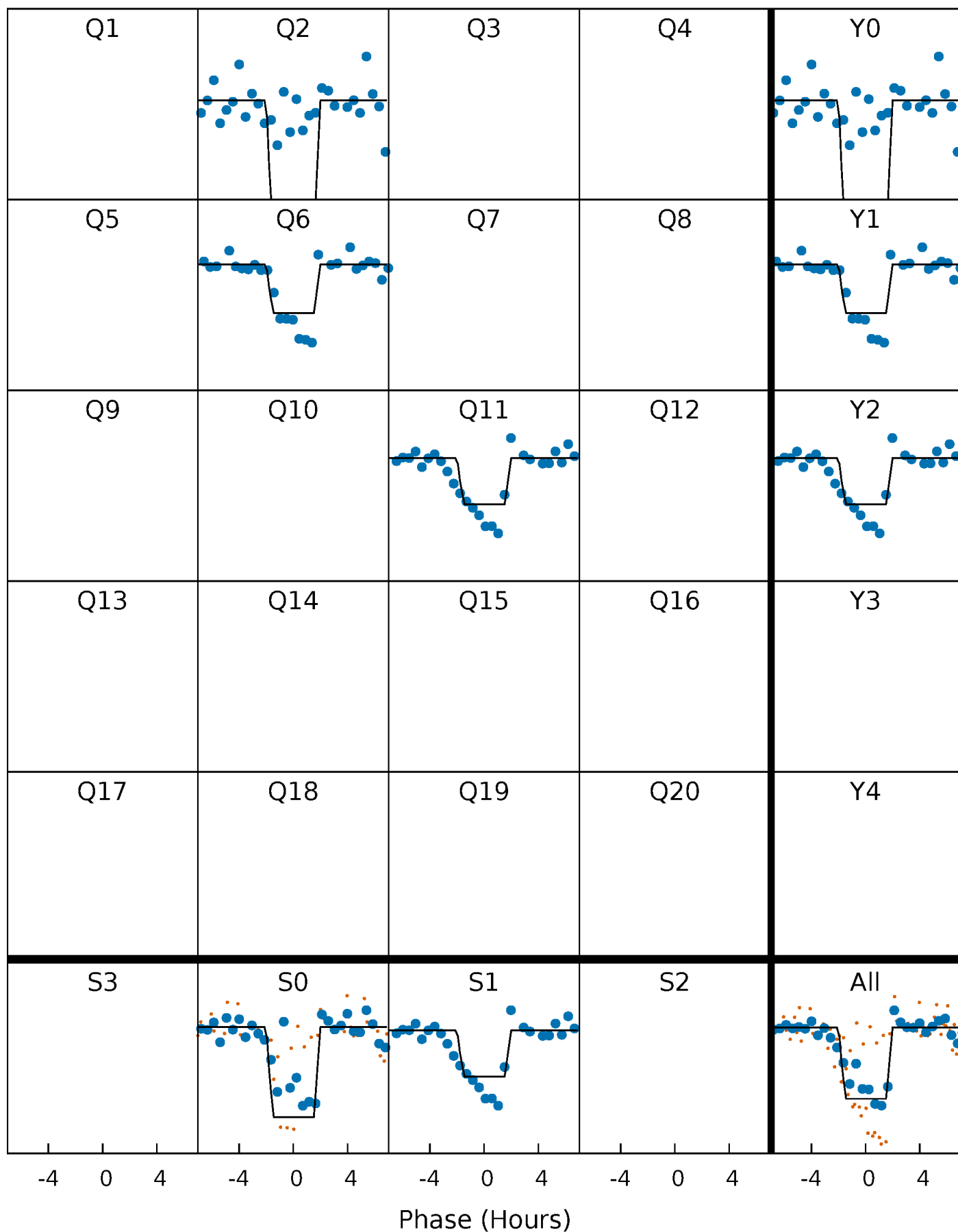
# DV Quarter-Phased Transit Curves

TCE 009659036-02 P=436.994412 Days  $T_0=176.798184$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

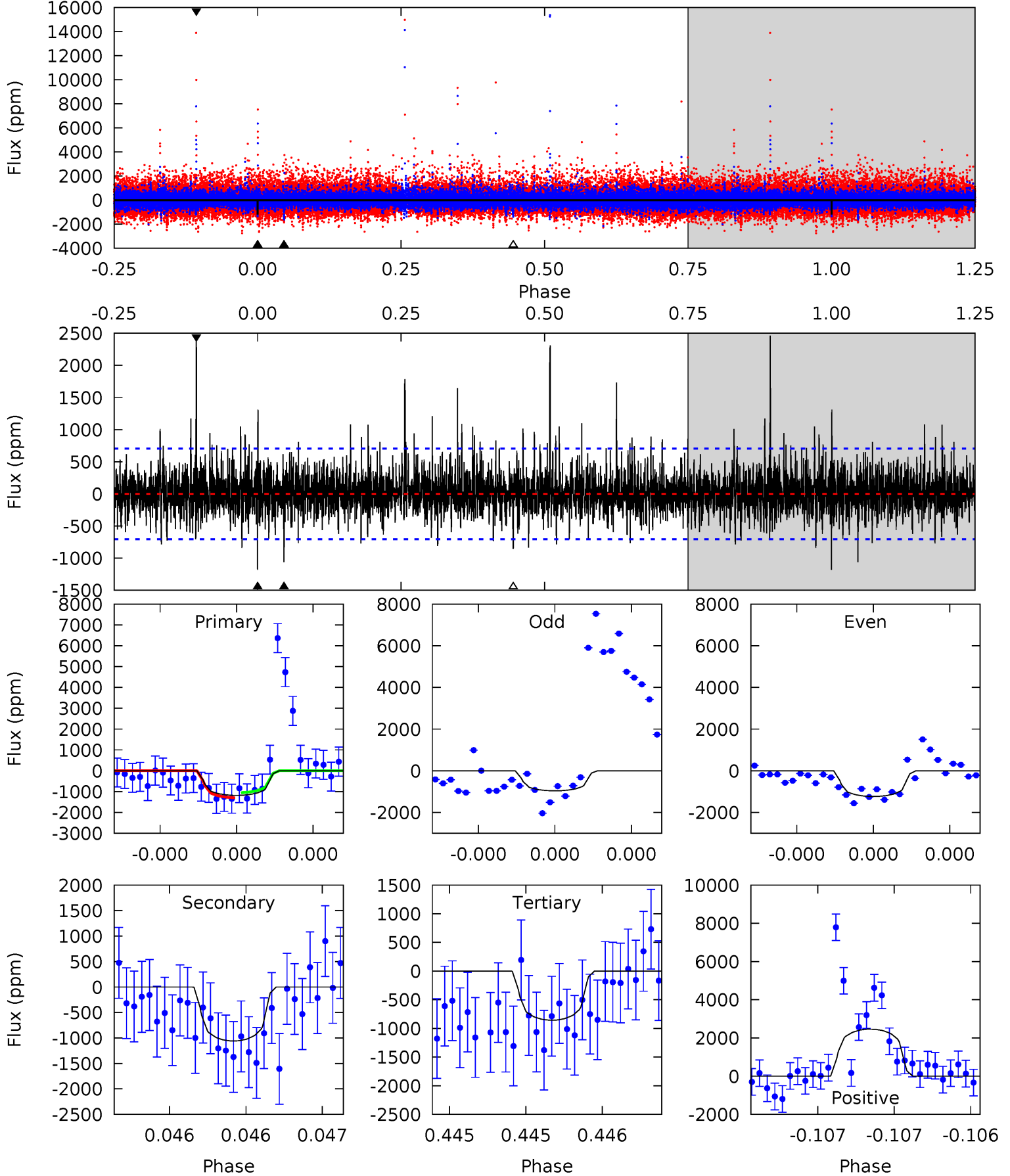
TCE 009659036-02 P=437.005737 Days  $T_0=176.800911$  (BKJD)



# DV Model-Shift Uniqueness Test

009659036-02, P = 436.994412 Days, E = 176.798184 Days

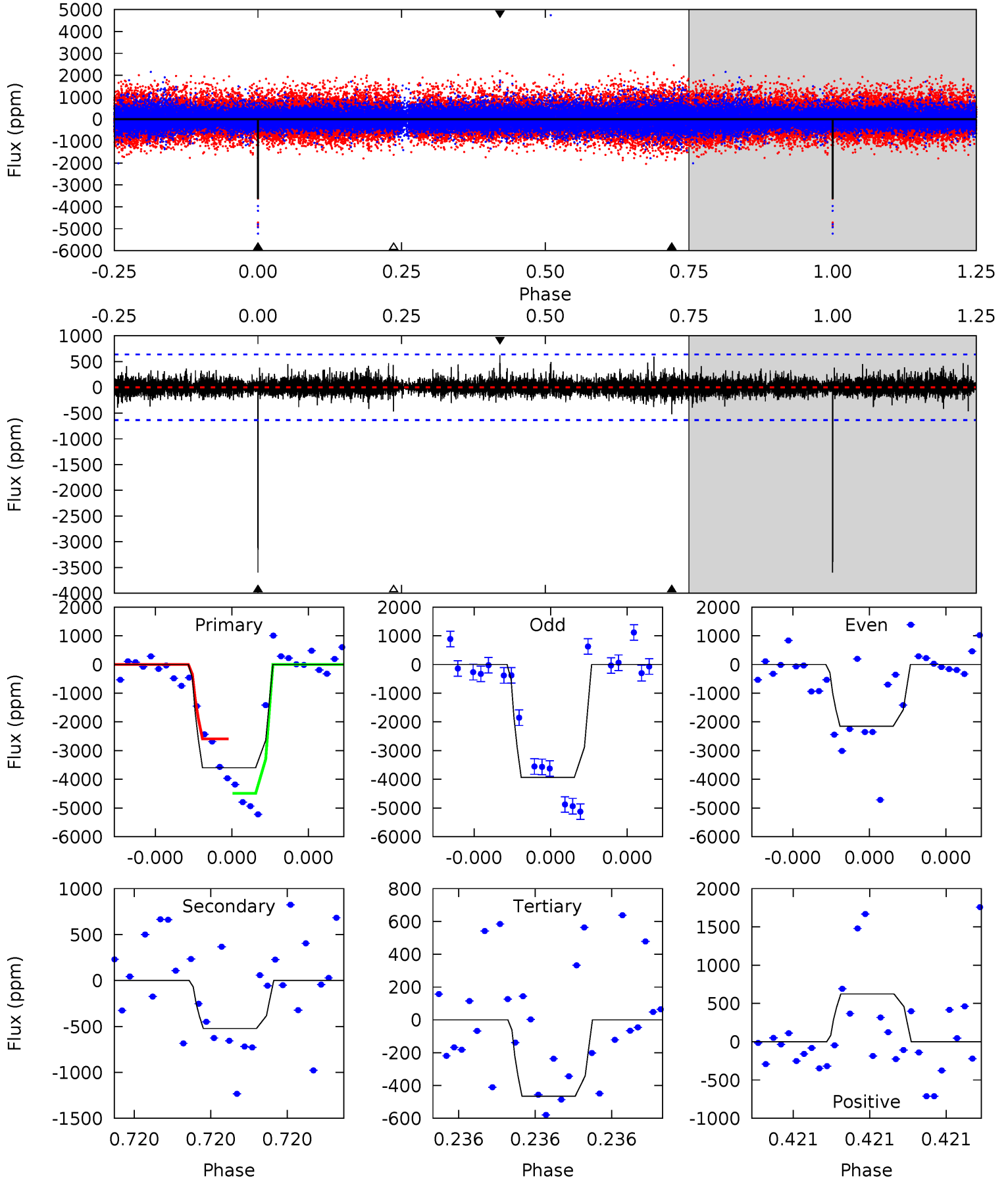
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
9.36	8.39	6.79	19.5	5.58	3.50	2.01	2.57	-10.2	1.61	-11.1	0.48	1.16	0.68	0.96



# Alt Model-Shift Uniqueness Test

009659036-02, P = 437.005737 Days, E = 176.800911 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
31.8	4.63	4.12	5.52	5.63	3.57	0.81	27.7	26.3	0.50	-0.89	7.64	0.72	0.15	8.65





### Stellar Parameters For KIC 009659036

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$3885^{+117}_{-105}$	$4.710^{+0.039}_{-0.025}$	$-0.100^{+0.100}_{-0.100}$	$0.540^{+0.030}_{-0.041}$	$0.545^{+0.037}_{-0.034}$	$4.882^{+0.884}_{-0.513}$
	+3%/-3%	+1%/-1%	+100%/-100%	+6%/-8%	+7%/-6%	+18%/-11%
Source	PHO2	PHO2	PHO2	DSEP		

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

### Secondary Eclipse Parameters for KIC 009659036-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-1060 \pm 126$	$2.62^{+1.45}_{-1.30}$	$183^{+6}_{-5}$	$3513^{+1039}_{-441}$	$69863^{+223339}_{-39224}$
Alt.	$-523 \pm 113$	$3.30^{+1.60}_{-1.51}$	$183^{+6}_{-6}$	$2926^{+624}_{-287}$	$21326^{+56688}_{-11554}$

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

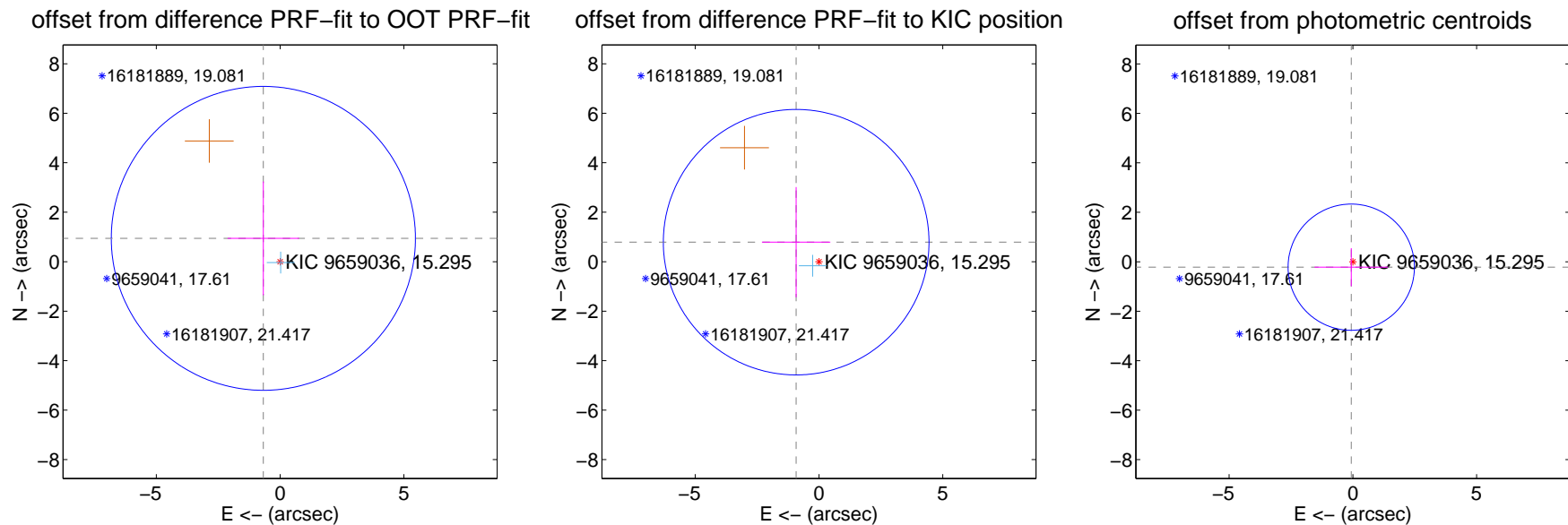
## DV Centroid Data

Supplemental centroid analysis for 009659036-02. Kepler magnitude: 15.29. Transit SNR 6.54

There are 1 quarters with good PRF difference image offsets

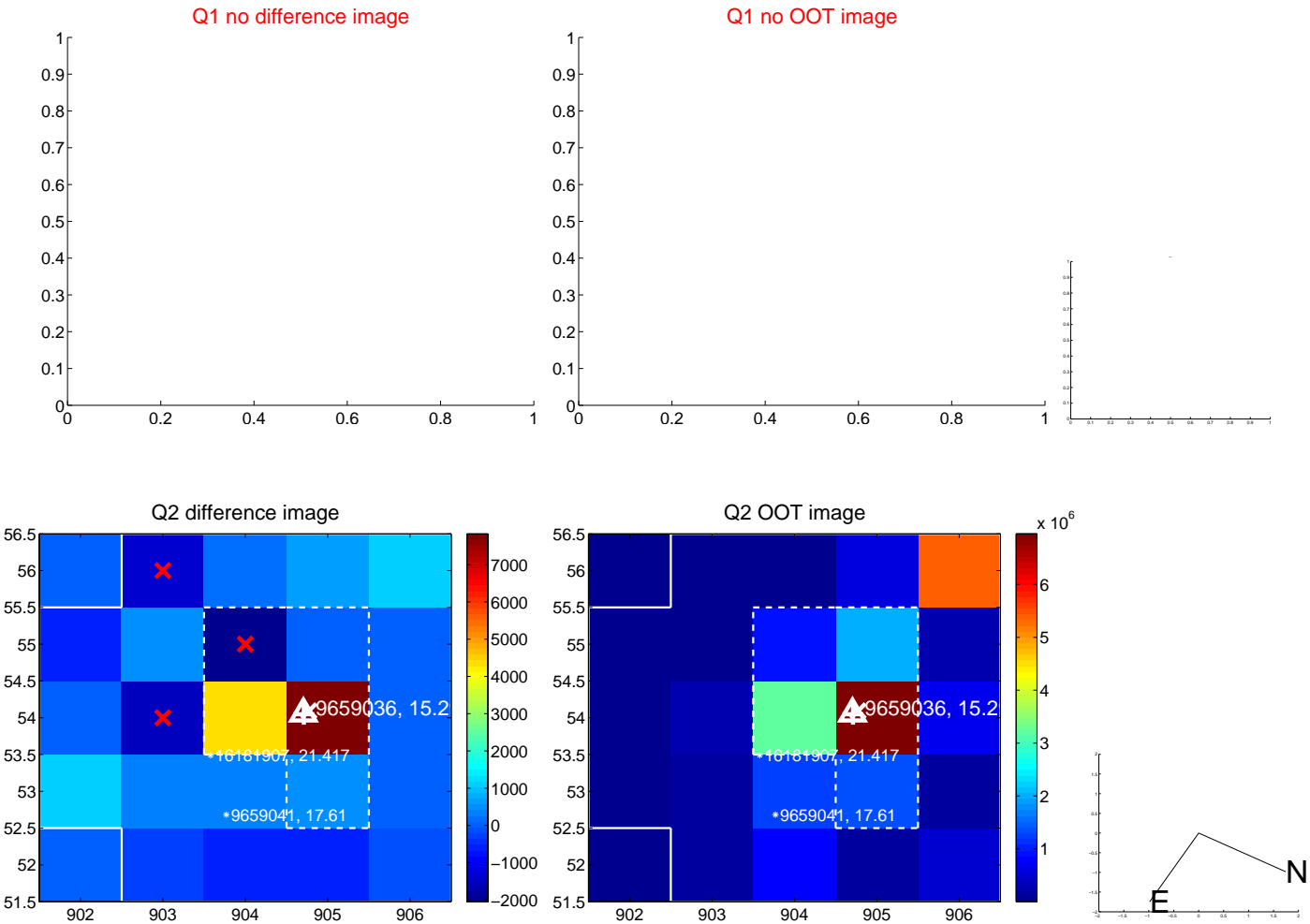
The direct PRF centroid is offset from the target star catalog position by about 0.31 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.161 \pm 2.048$	0.57	$0.677 \pm 1.446$	$0.944 \pm 2.297$
PRF-fit source offset from KIC position	$1.214 \pm 1.789$	0.68	$0.922 \pm 1.382$	$0.789 \pm 2.228$
photometric centroid source offset	$0.23 \pm 0.85$	0.27	$0.07 \pm 1.48$	$-0.22 \pm 0.77$

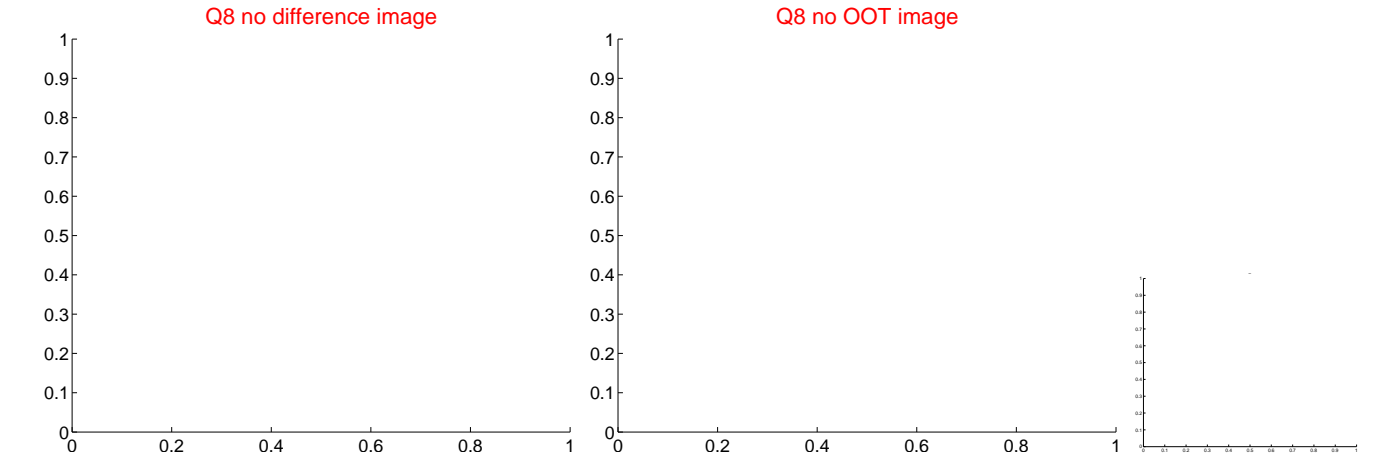
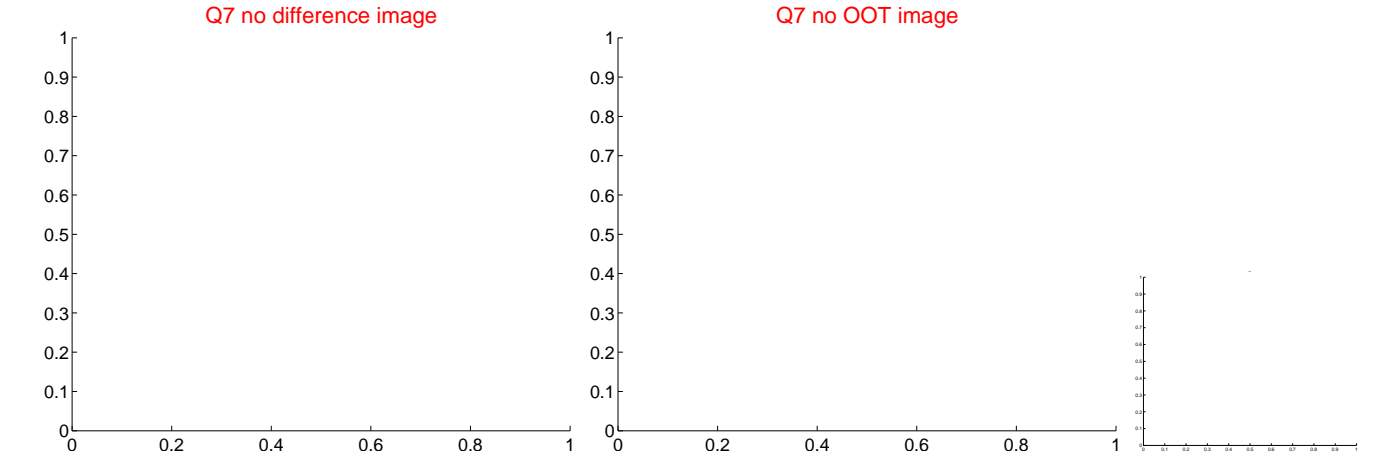
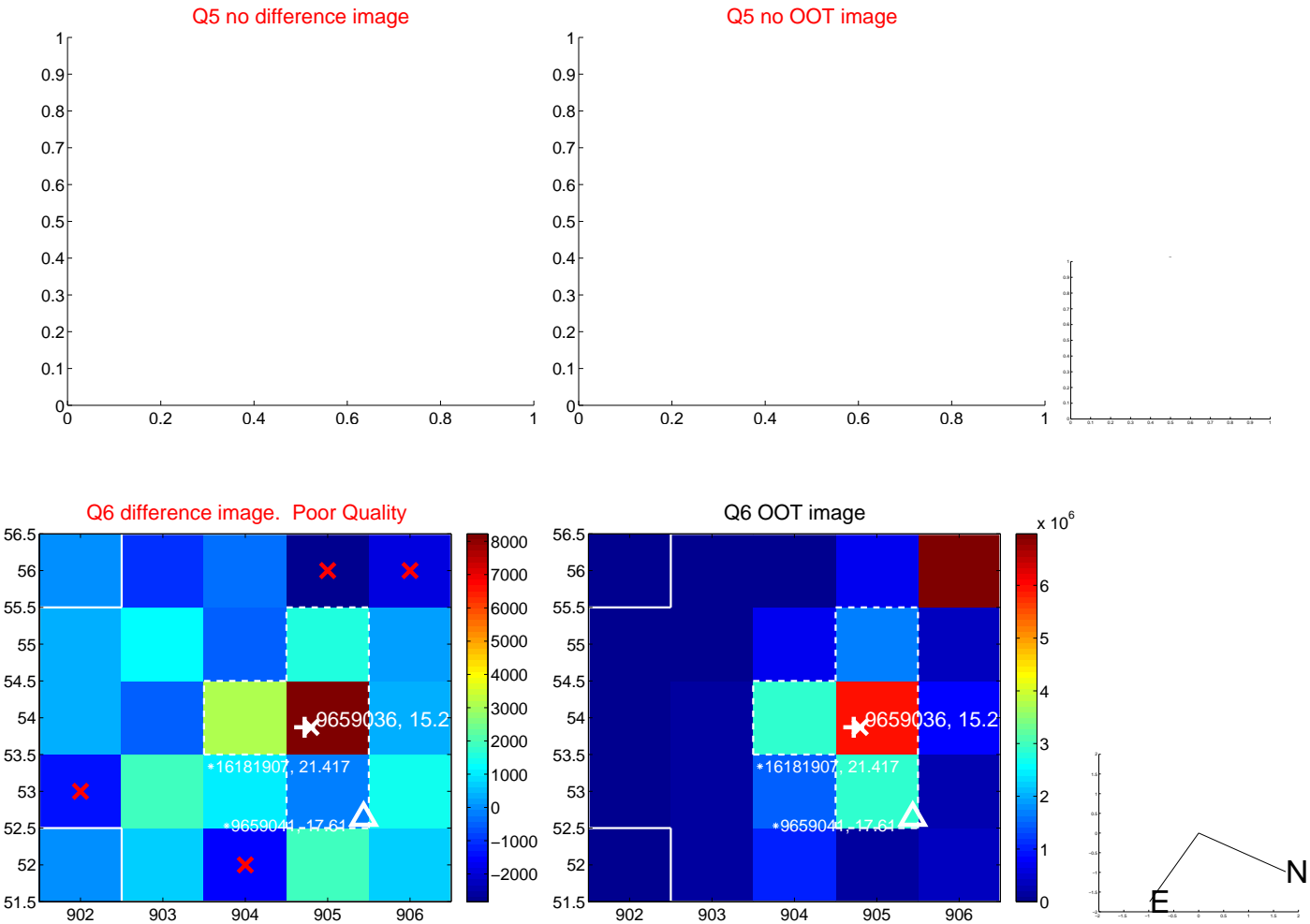


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

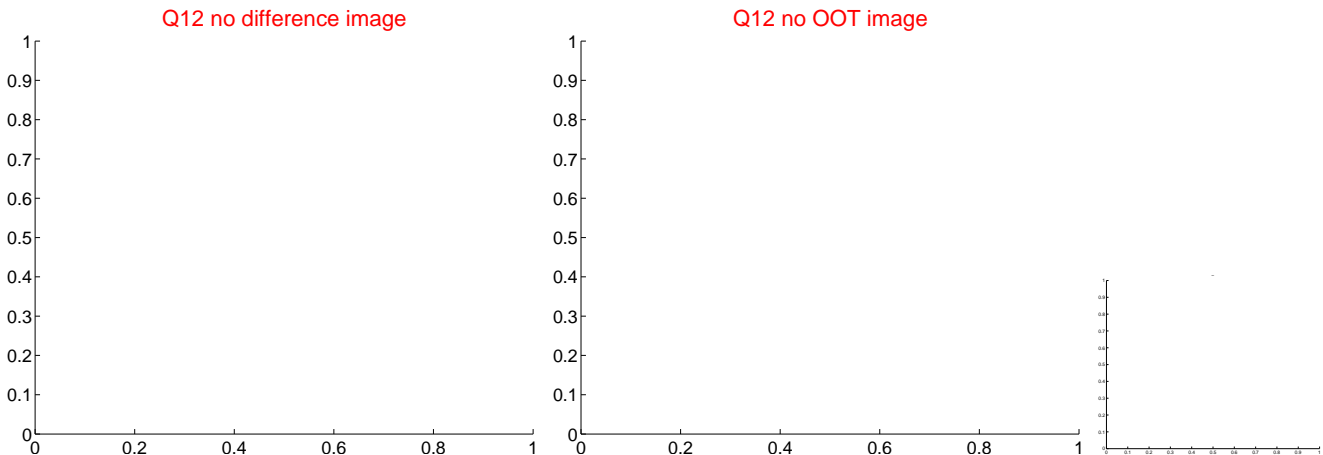
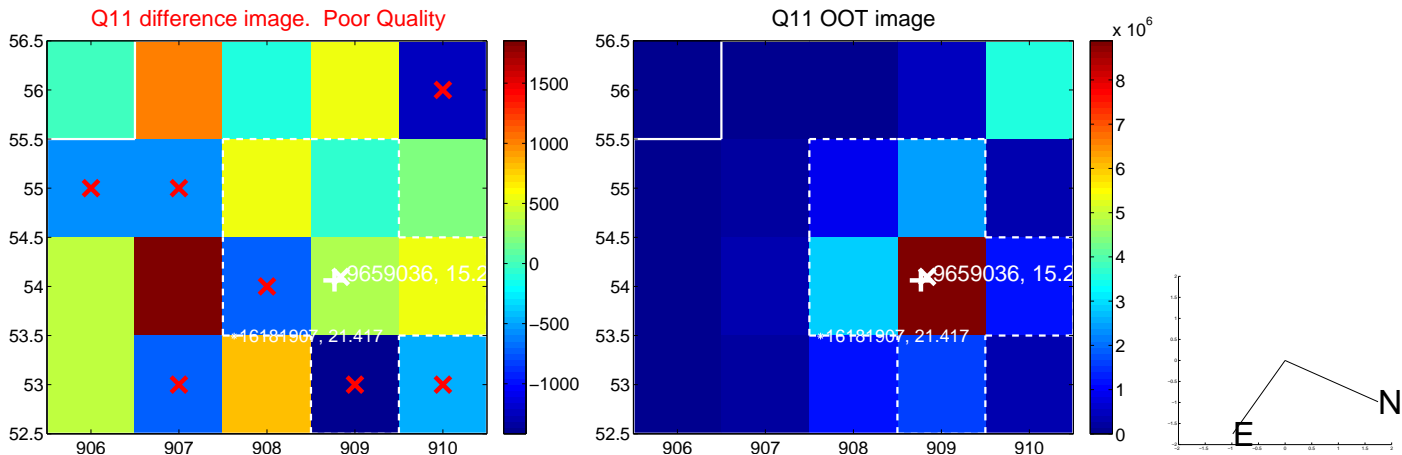
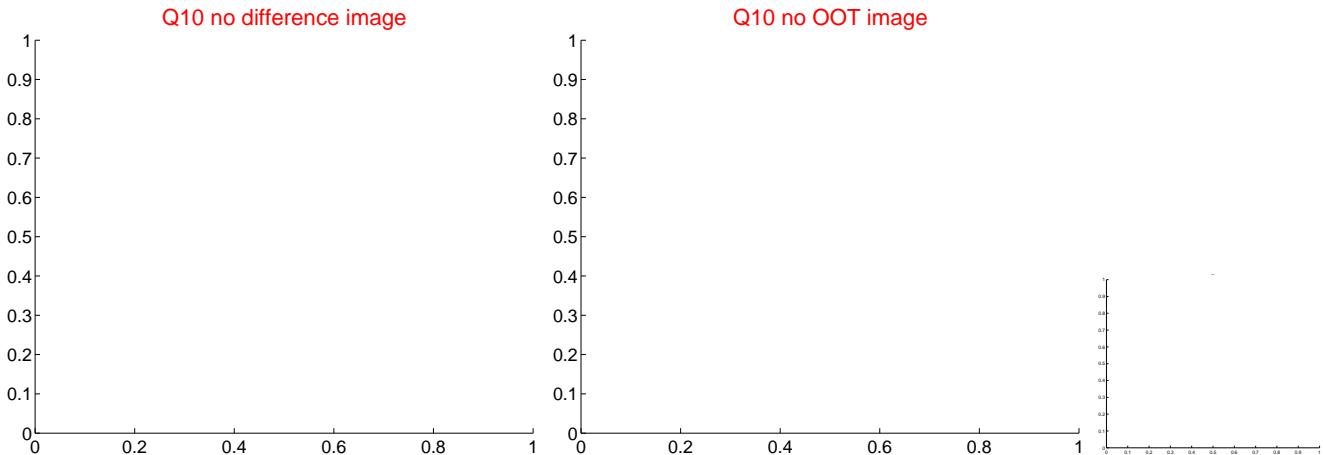
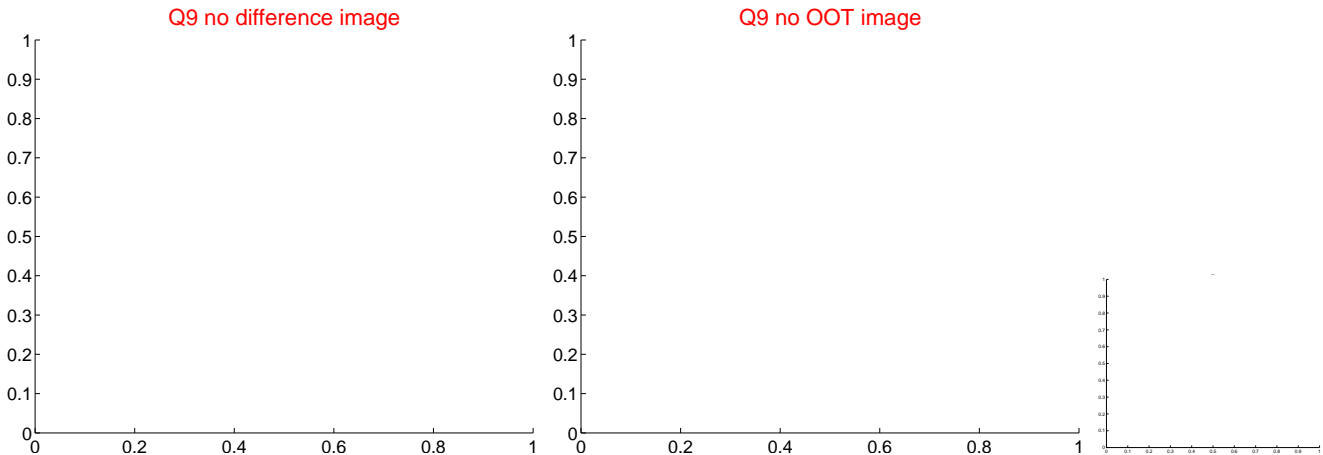
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



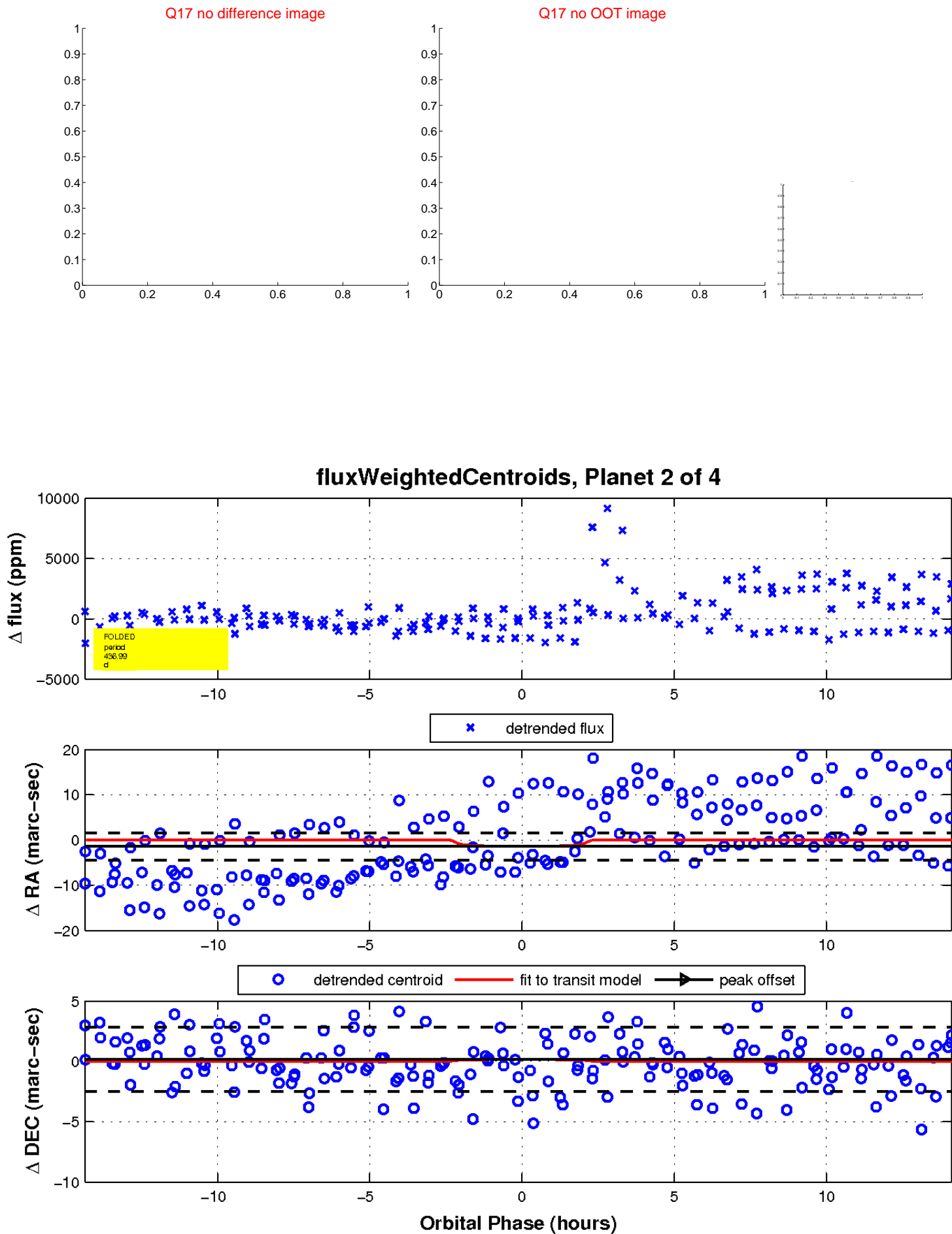
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value



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

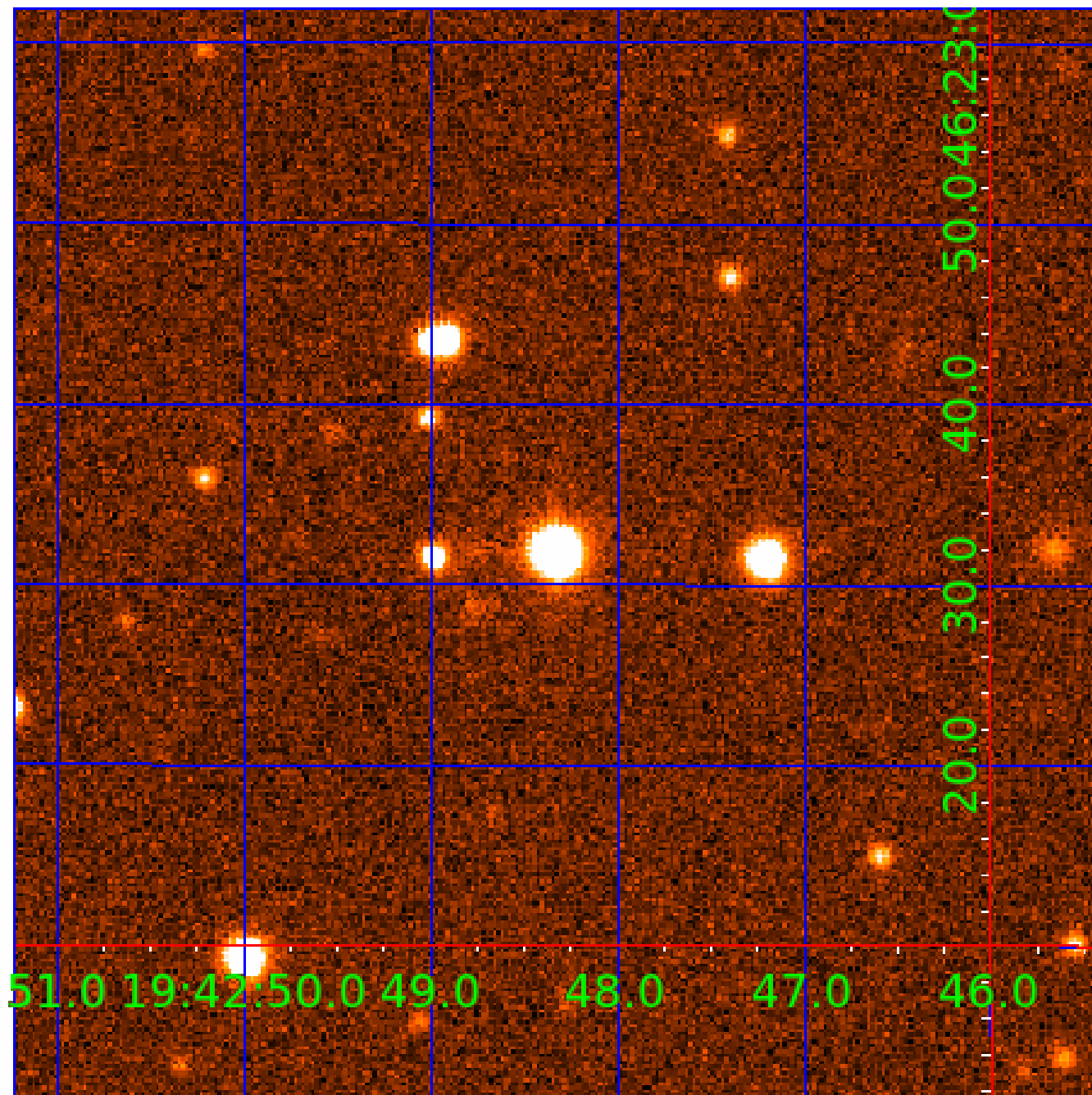


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 009659036

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009659036-01	OBS	No	398.946833	513.584068	1858.4	4.457	12.7	7.4	0.54	3885	2.52	0.08
009659036-02	OBS	No	436.994412	176.798184	1725.5	4.794	12.2	6.5	0.54	3885	2.42	0.07
009659036-03	OBS	No	308.748433	190.526525	1556.6	7.188	9.1	7.4	0.54	3885	2.10	0.11
009659036-04	OBS	No	370.467254	313.935006	1828.7	3.500	12.8	-1.0	0.54	3885	2.28	0.09

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009659036-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009659036-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009659036-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009659036-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_NOFITS

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

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

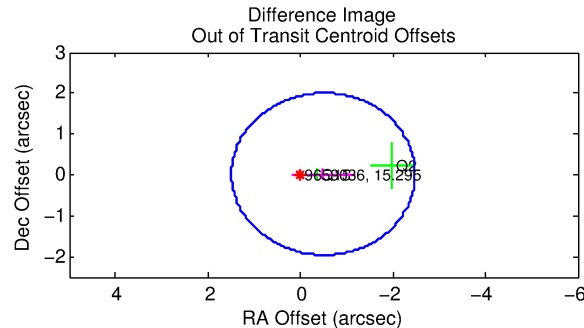
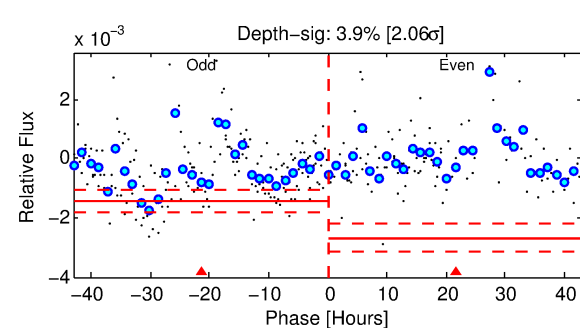
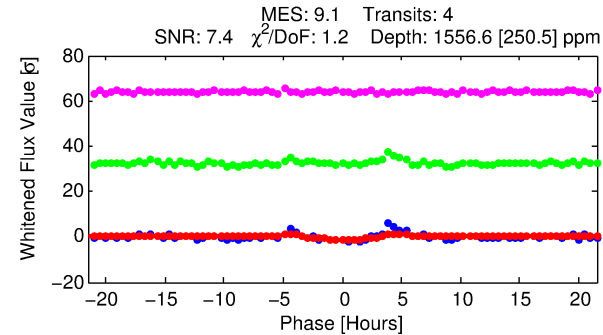
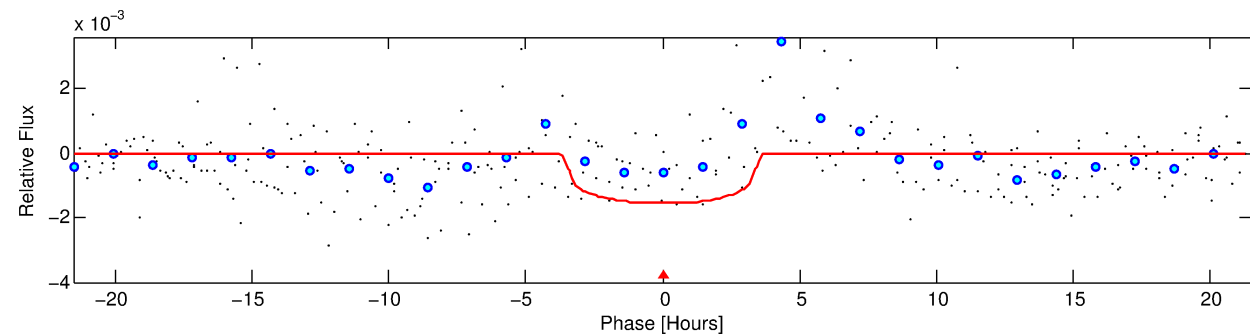
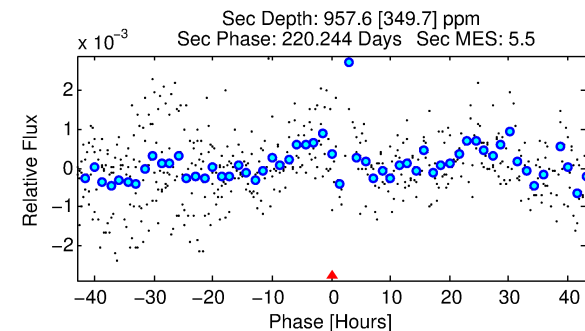
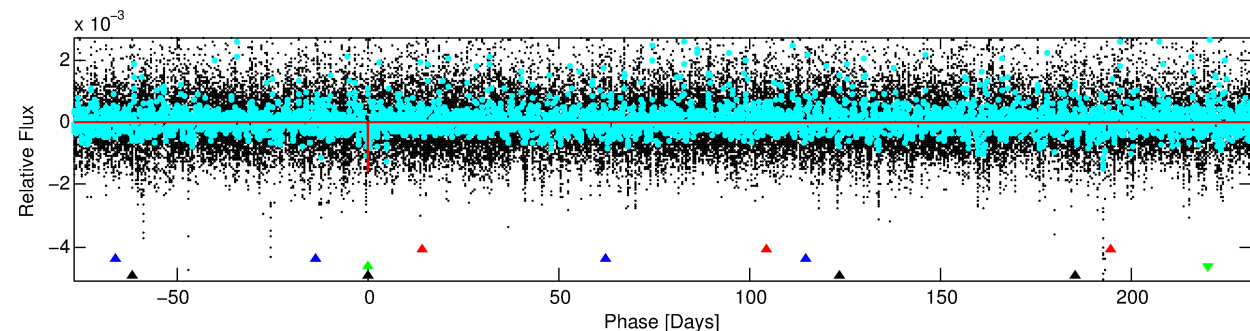
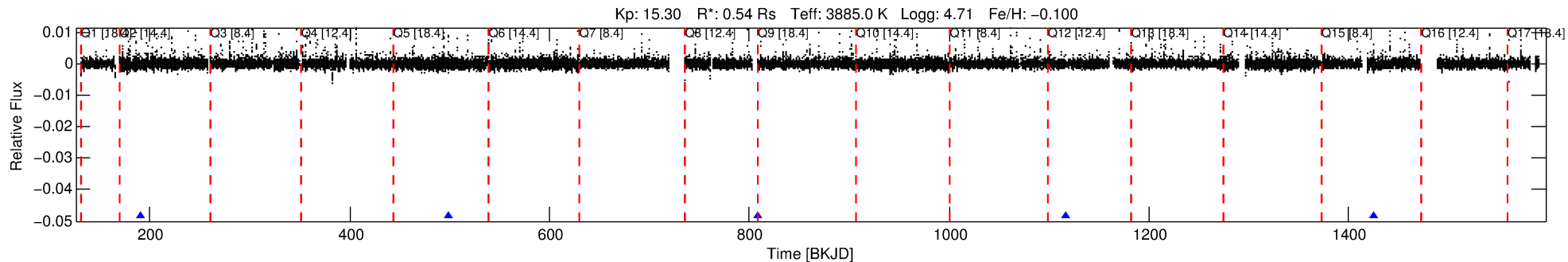
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009659036-03

No Significant Match Found

# DV One-Page Summary

KIC: 9659036 Candidate: 3 of 4 Period: 308.748 d



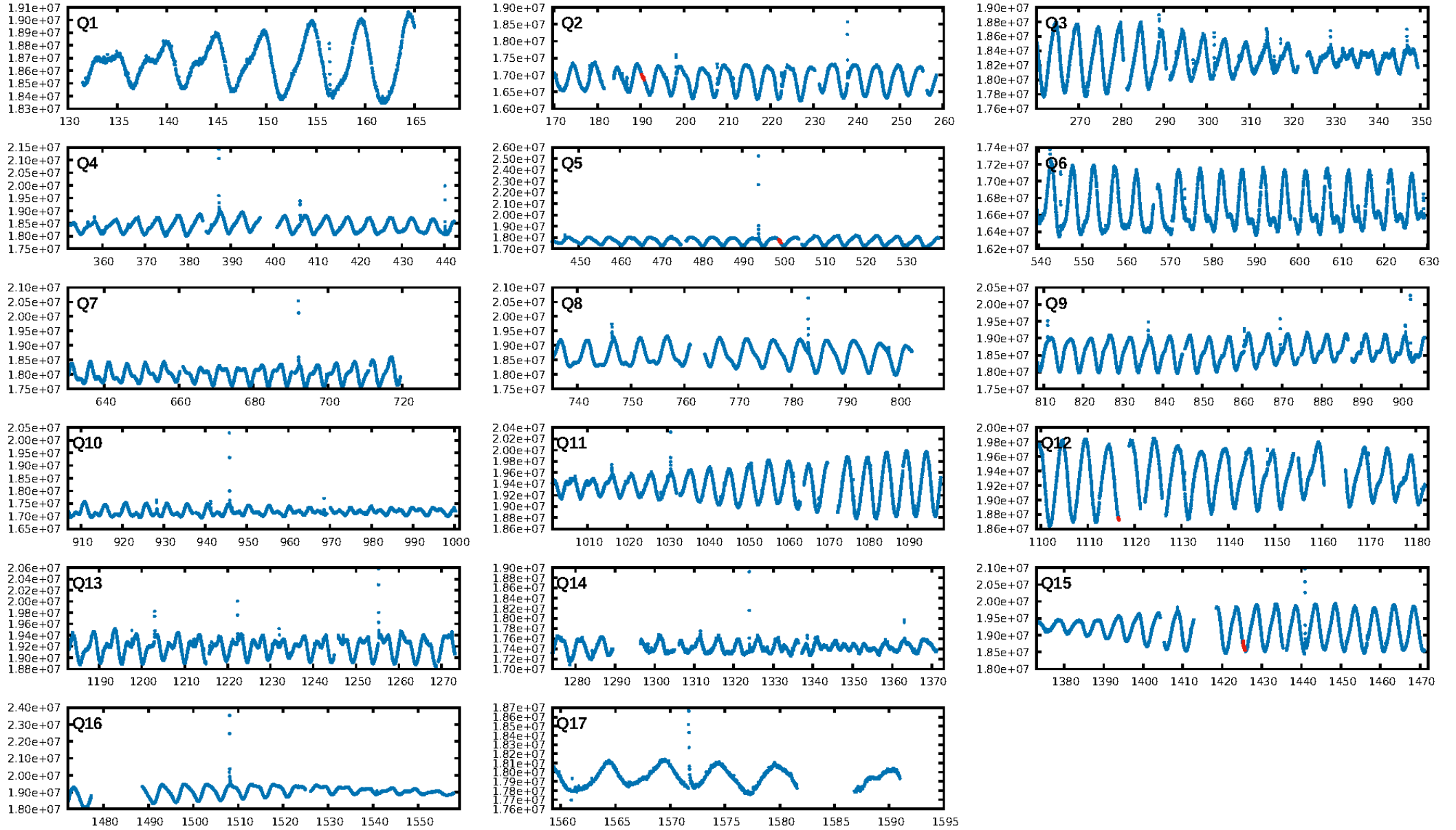
## DV Fit Results:

Period = 308.74843 [0.00407] d  
Epoch = 190.5265 [0.0090] BKJD  
Rp/R\* = 0.0356 [0.0387]  
a/R\* = 339.72 [1531.03]  
b = 0.02 [186.14]  
Seff = 0.11 [0.02]  
Teq = 147 [5] K  
Rp = 2.10 [2.28] Re  
a = 0.7306 [0.0430] AU  
Ag = 63805.11 [140524.33] [0.45σ]  
Teffp = 3621 [1995] K [1.74σ]

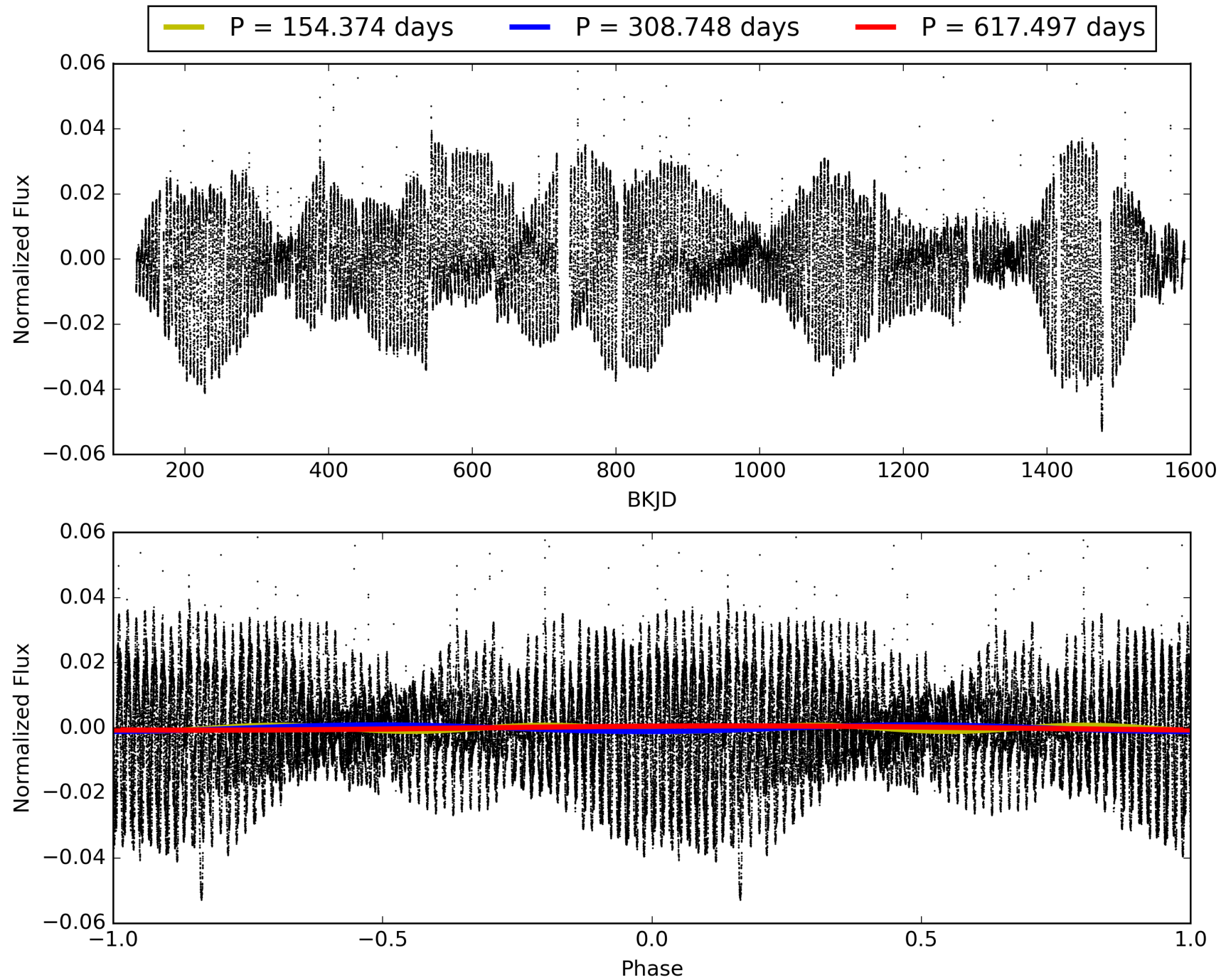
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [185.27σ]  
ModelChiSquare2-sig: 4.5%  
ModelChiSquareGof-sig: 98.6%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [4/4]  
**GhostDiagnostic-chr: -1.112**  
Centroid-sig: 0.6%  
Centroid-so: 1.333 arcsec [1.22σ]  
OotOffset-rm: 0.497 arcsec [0.75σ]  
KicOffset-rm: 0.255 arcsec [0.54σ]  
OotOffset-st: 1/1/0/0 [2]  
KicOffset-st: 1/1/0/0 [2]  
DiffImageQuality-fgm: 1.00 [2/2]  
DiffImageOverlap-fno: 0.67 [2/3]

# TCE 009659036-03, PDC Light Curves

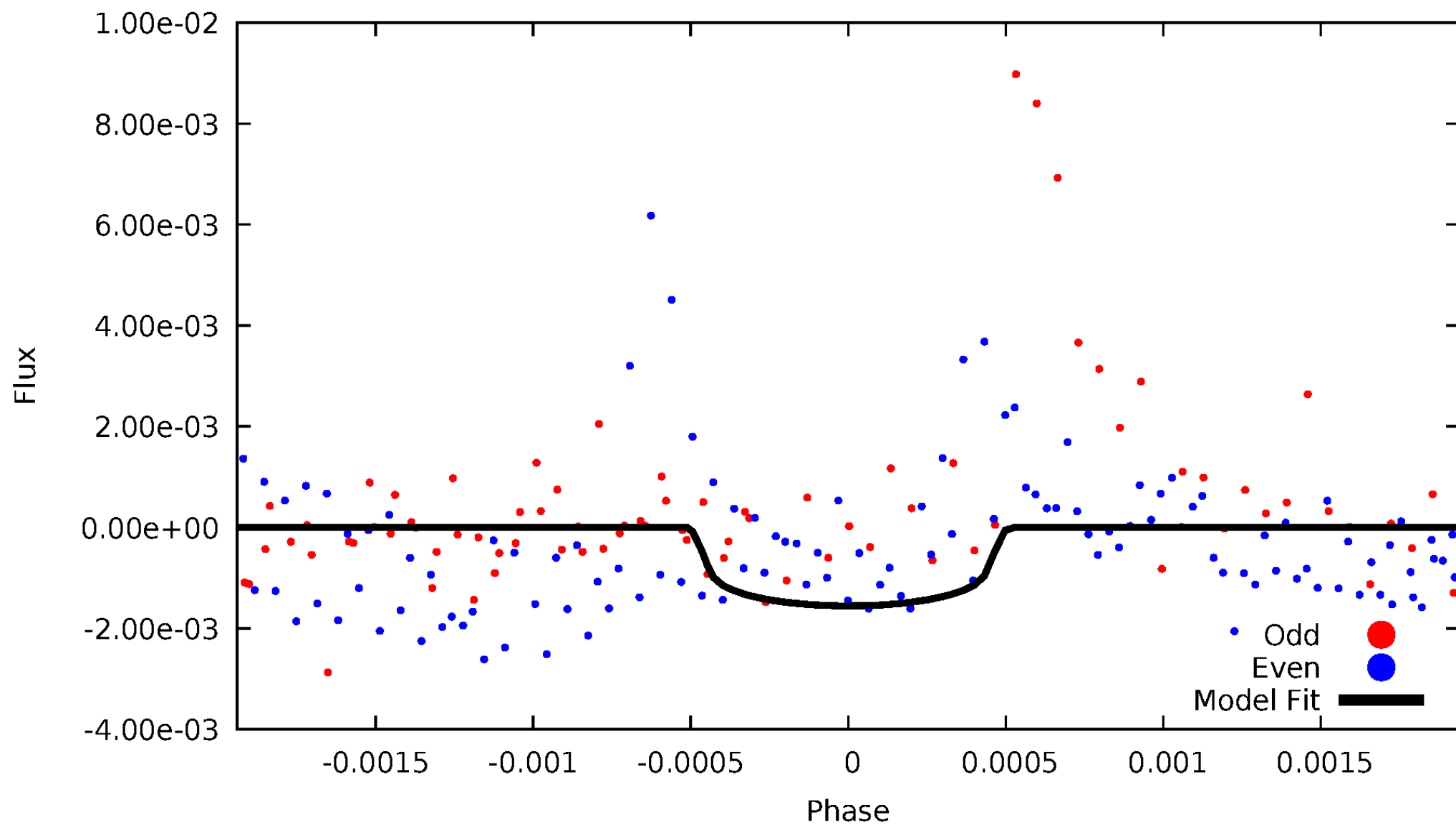


# TCE 009659036-03



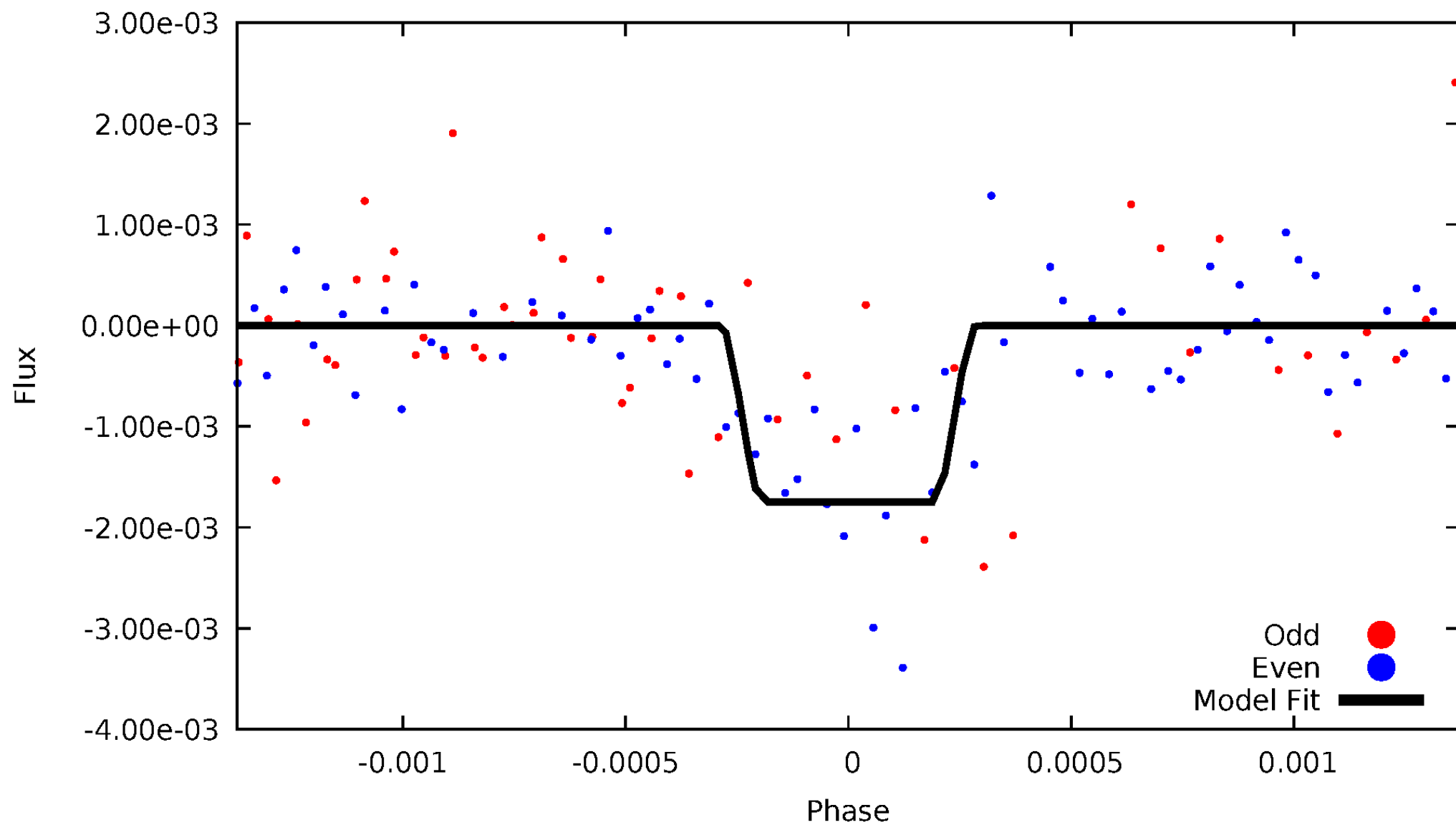
# DV Odd/Even

TCE 009659036-03



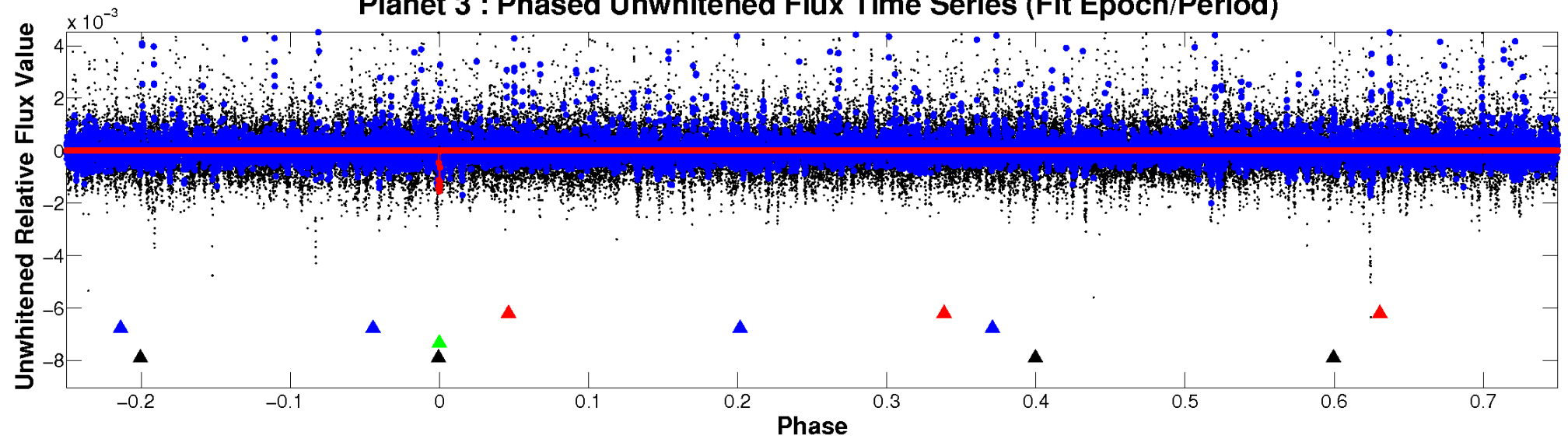
# ALT Odd/Even

TCE 009659036-03

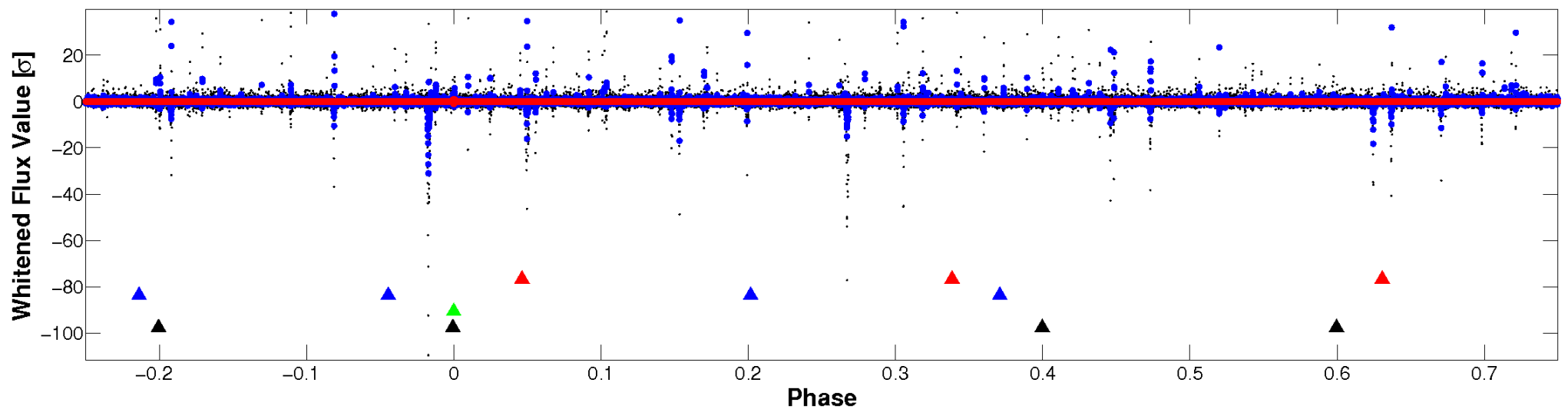


# Non-Whitened Vs. Whitened Light Curve

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

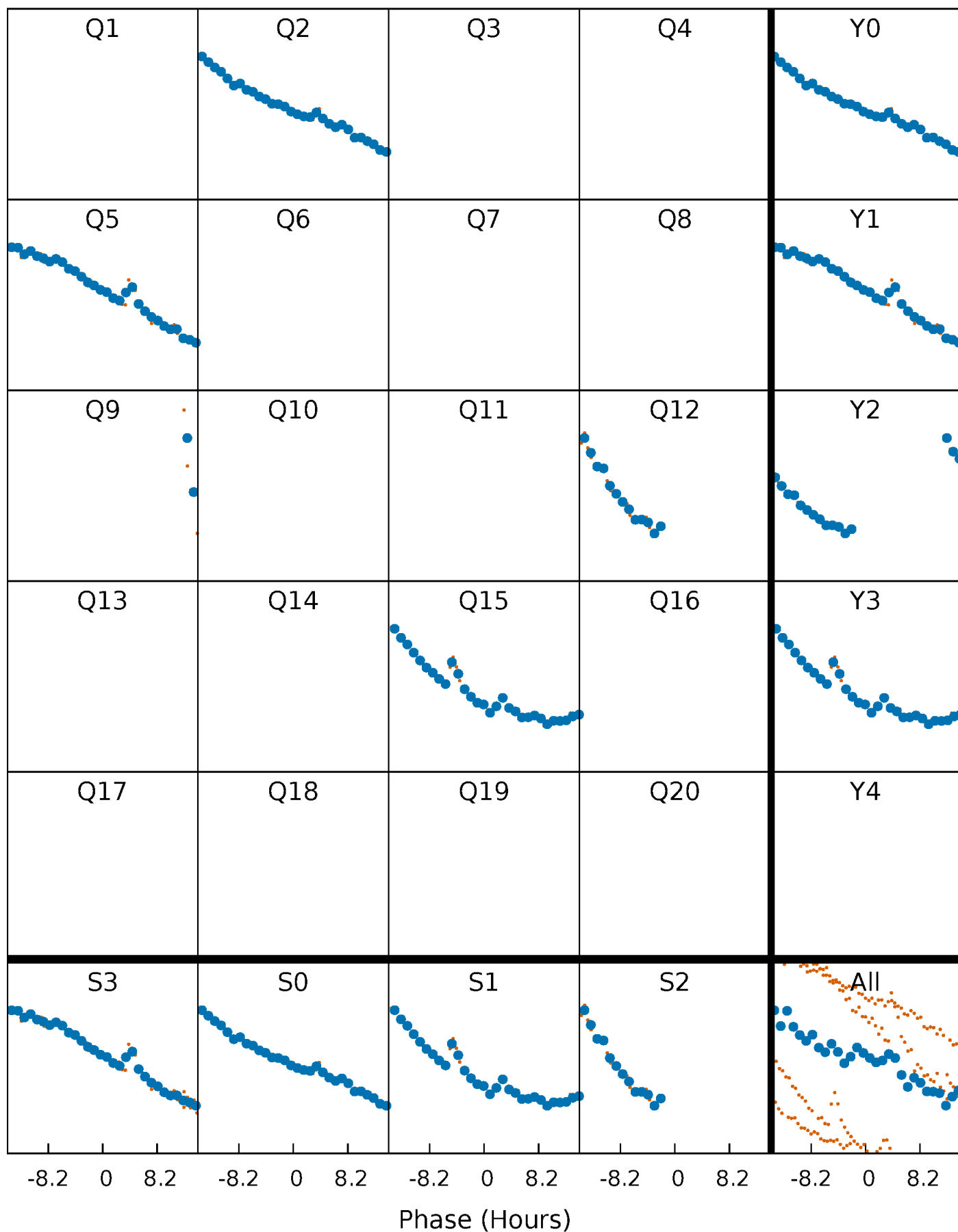


**Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

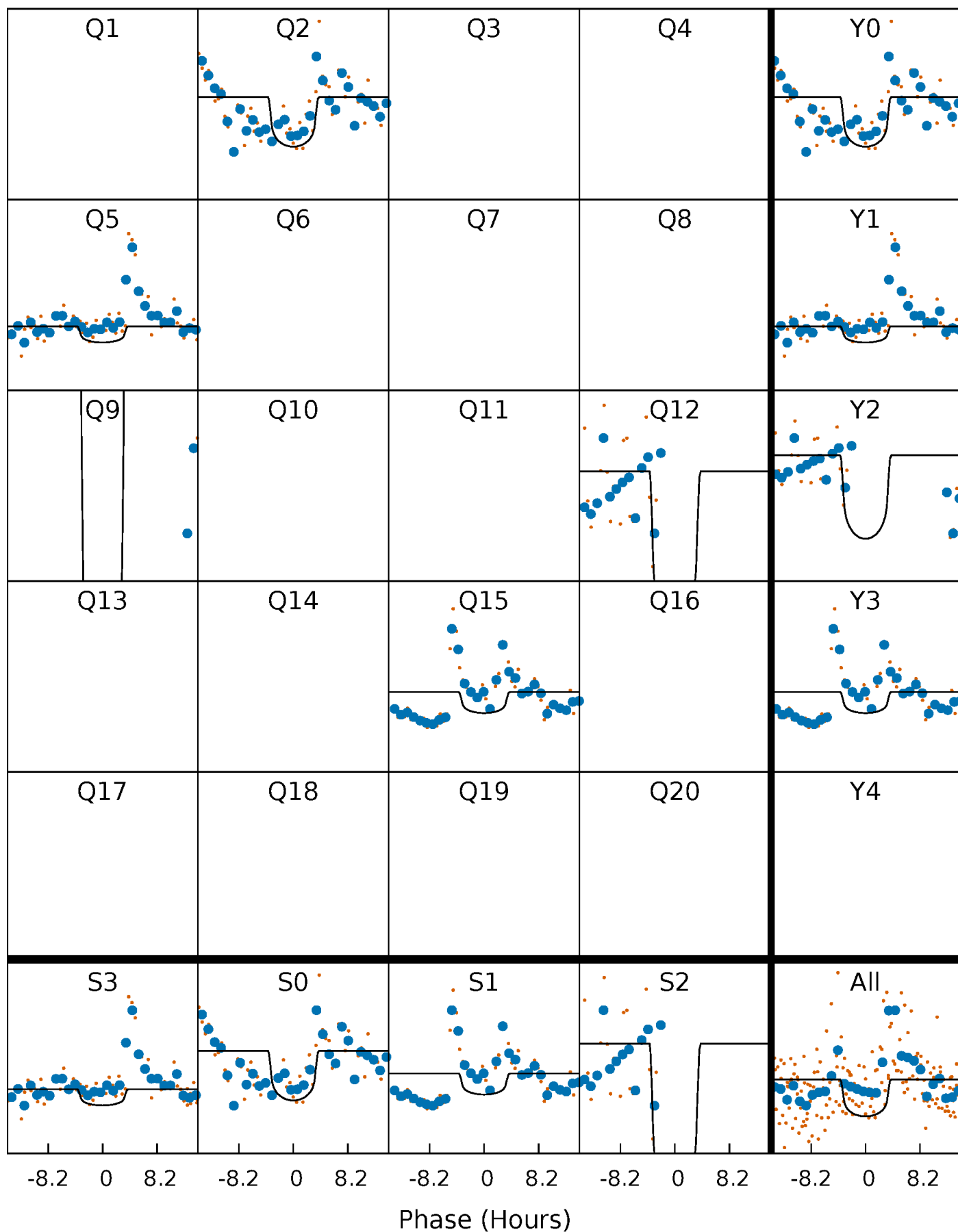
TCE 009659036-03 P=308.748433 Days  $T_0=190.526525$  (BKJD)





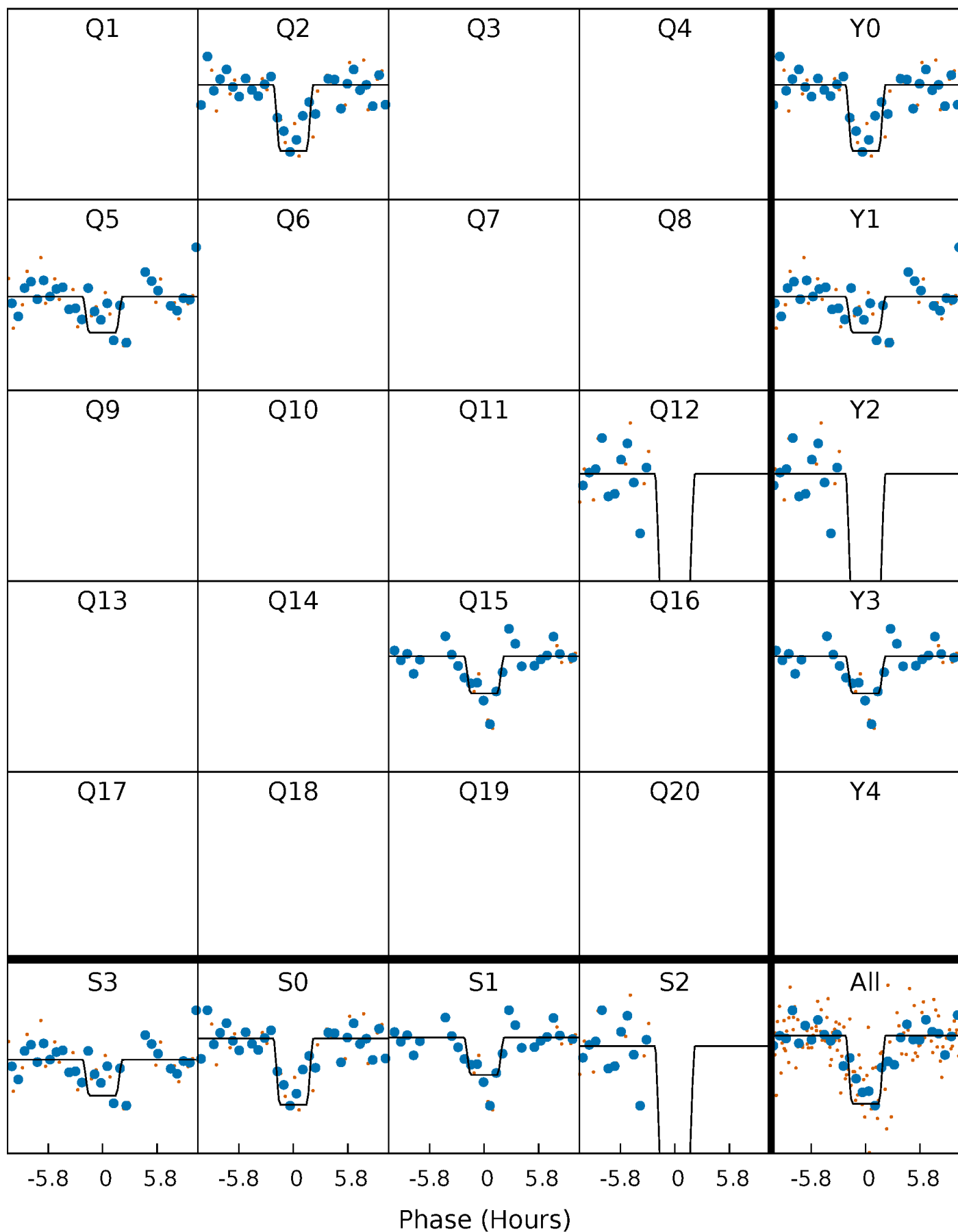
# DV Quarter-Phased Transit Curves

TCE 009659036-03 P=308.748433 Days  $T_0=190.526525$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

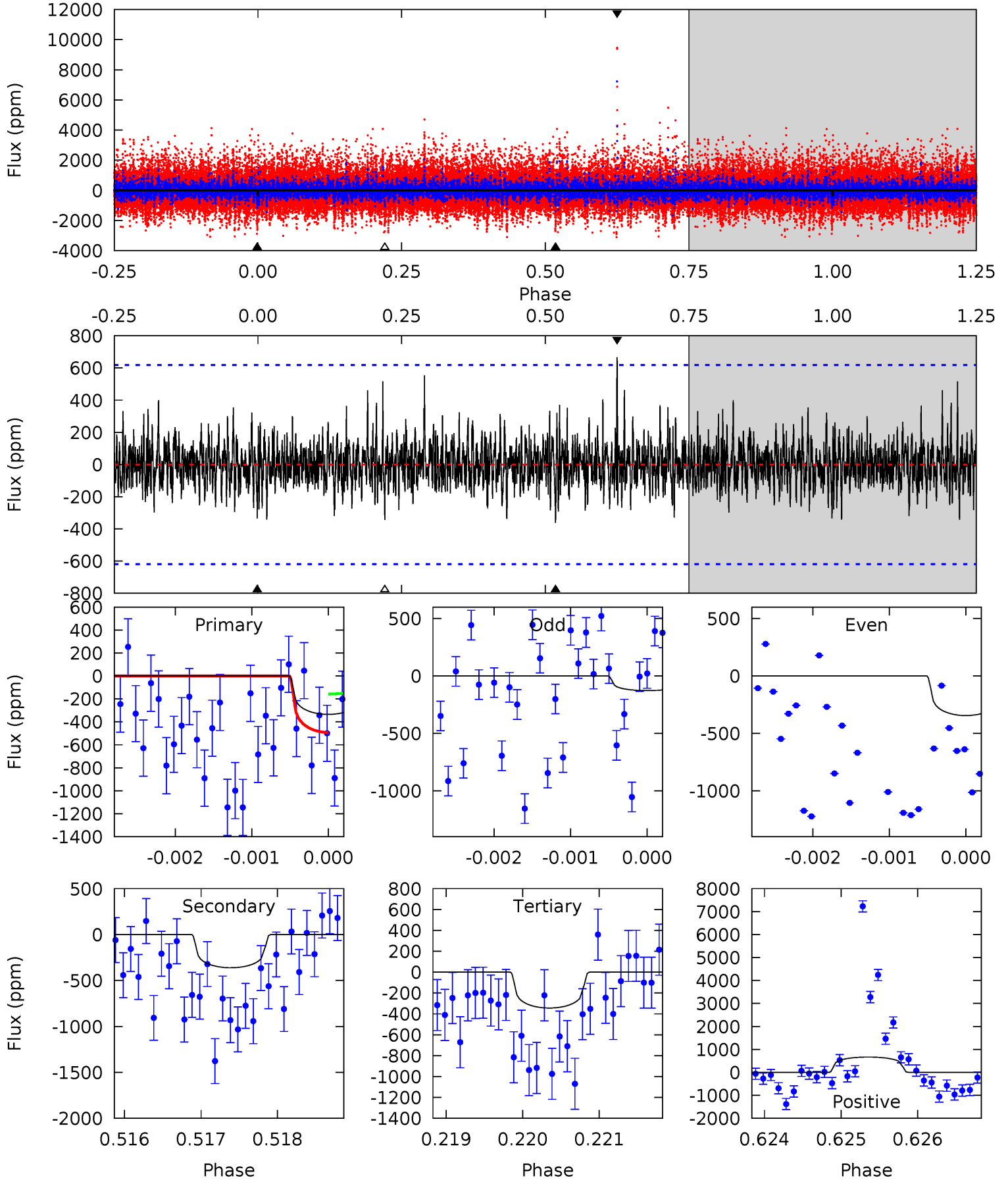
TCE 009659036-03     $P=308.743173$  Days     $T_0=190.561315$  (BKJD)



# DV Model-Shift Uniqueness Test

009659036-03, P = 308.748433 Days, E = 190.526525 Days

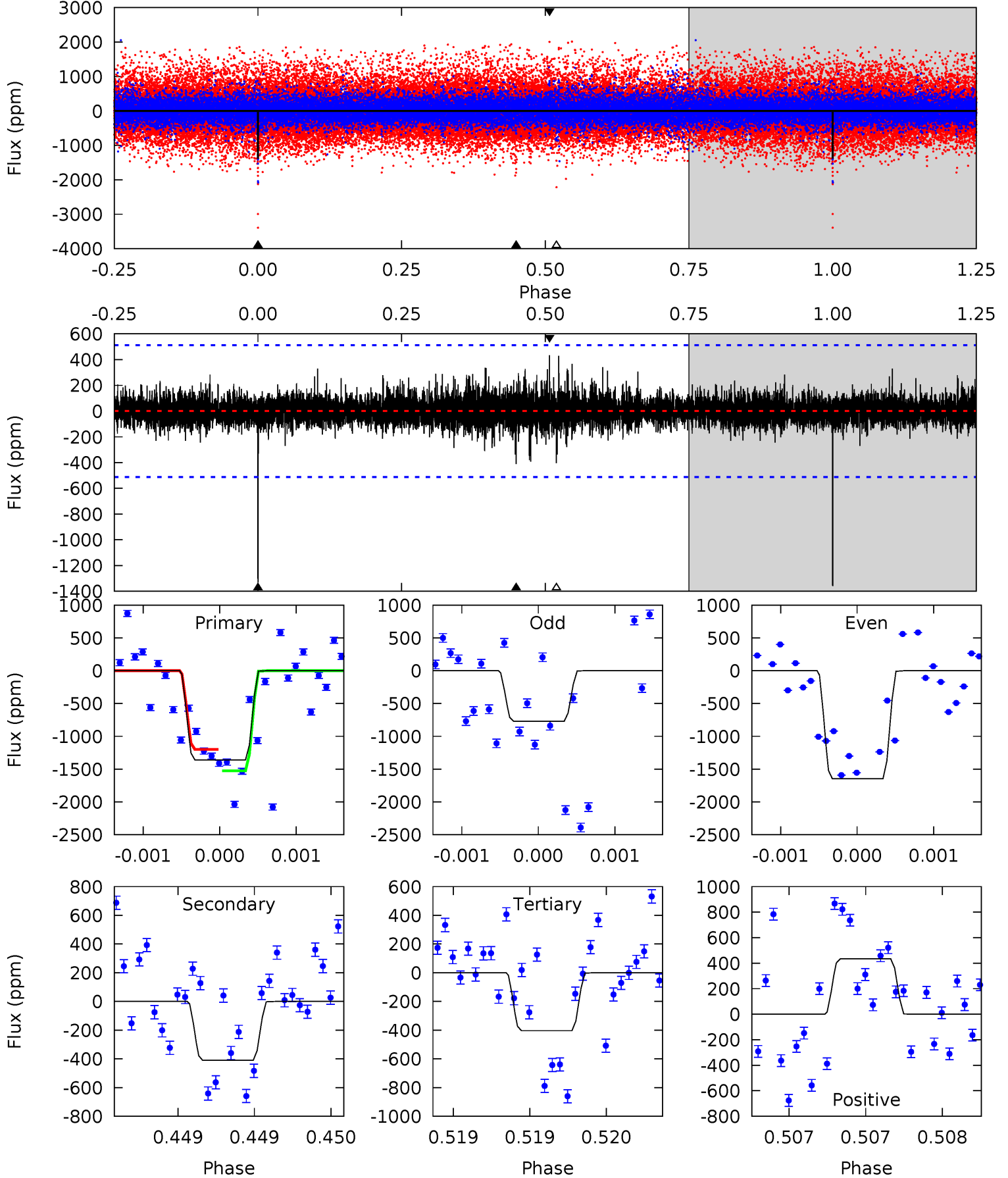
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
2.95	3.18	3.03	5.88	5.45	3.29	1.00	-0.08	-2.93	0.15	-2.69	0.80	1.32	0.65	1.48



# Alt Model-Shift Uniqueness Test

009659036-03, P = 308.743173 Days, E = 190.561315 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
14.7	4.44	4.37	4.70	5.55	3.45	0.82	10.4	10.0	0.07	-0.26	4.36	1.07	0.24	1.78



### Stellar Parameters For KIC 009659036

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$3885^{+117}_{-105}$	$4.710^{+0.039}_{-0.025}$	$-0.100^{+0.100}_{-0.100}$	$0.540^{+0.030}_{-0.041}$	$0.545^{+0.037}_{-0.034}$	$4.882^{+0.884}_{-0.513}$
	+3%/-3%	+1%/-1%	+100%/-100%	+6%/-8%	+7%/-6%	+18%/-11%
Source	PHO2	PHO2	PHO2	DSEP		

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

### Secondary Eclipse Parameters for KIC 009659036-03 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-361 \pm 113$	$2.68^{+2.10}_{-1.71}$	$205^{+6}_{-6}$	$2956^{+1130}_{-434}$	$14483^{+90899}_{-10257}$
Alt.	$-410 \pm 92$	$2.90^{+2.11}_{-1.78}$	$206^{+7}_{-7}$	$2955^{+1022}_{-424}$	$14424^{+82429}_{-10035}$

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

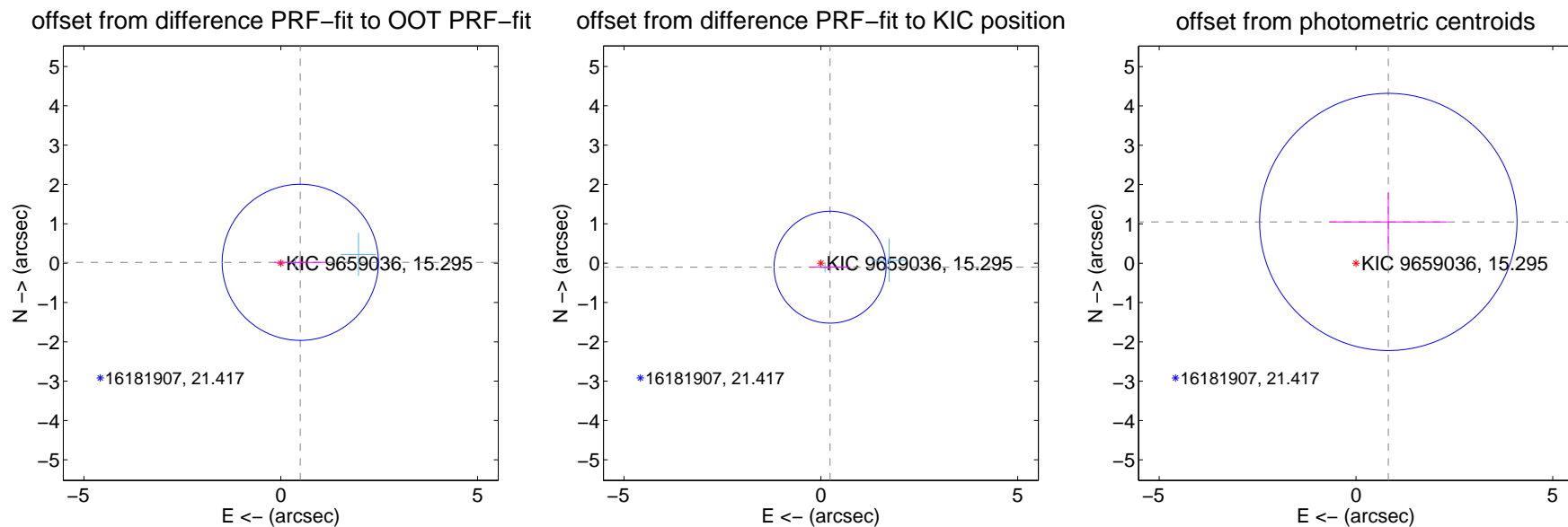
## DV Centroid Data

Supplemental centroid analysis for 009659036-03. Kepler magnitude: 15.29. Transit SNR 7.39

There are 2 quarters with good PRF difference image offsets

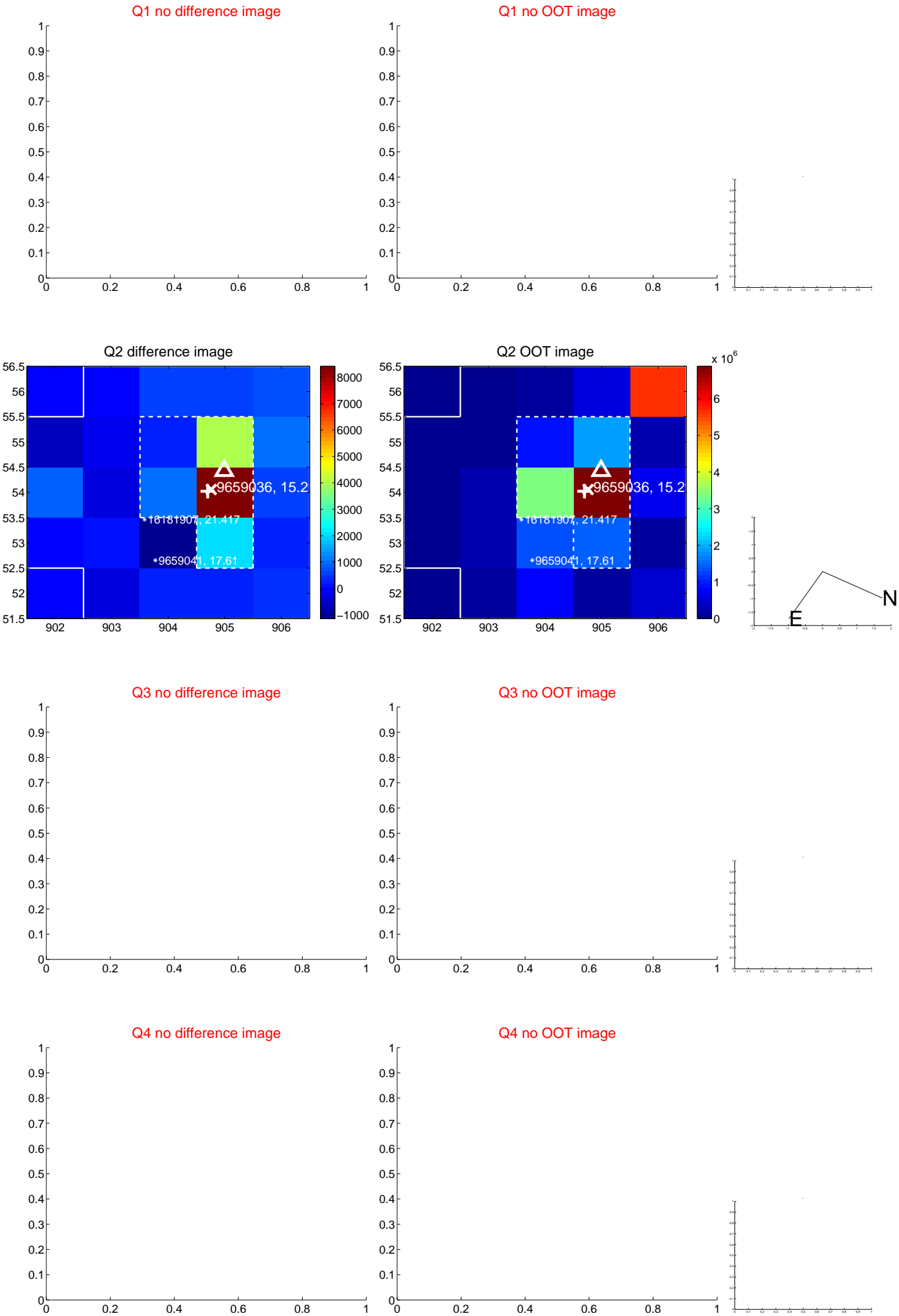
The direct PRF centroid is offset from the target star catalog position by about 0.29 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.497 \pm 0.661$	0.75	$-0.497 \pm 0.658$	$0.020 \pm 0.109$
PRF-fit source offset from KIC position	$0.255 \pm 0.474$	0.54	$-0.234 \pm 0.517$	$-0.103 \pm 0.081$
photometric centroid source offset	$1.33 \pm 1.09$	1.22	$-0.82 \pm 1.49$	$1.05 \pm 0.74$

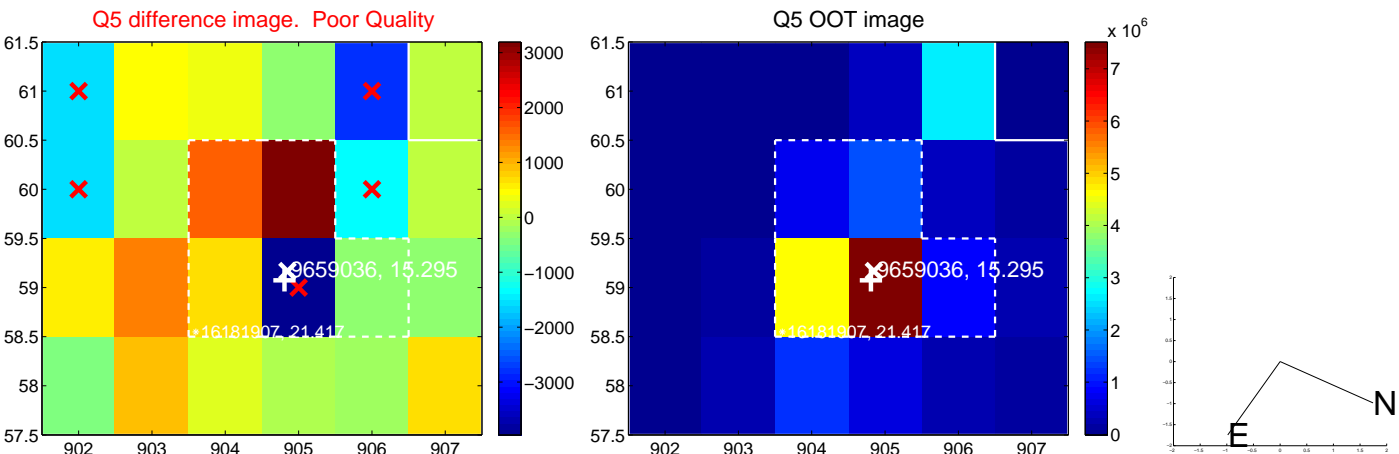


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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



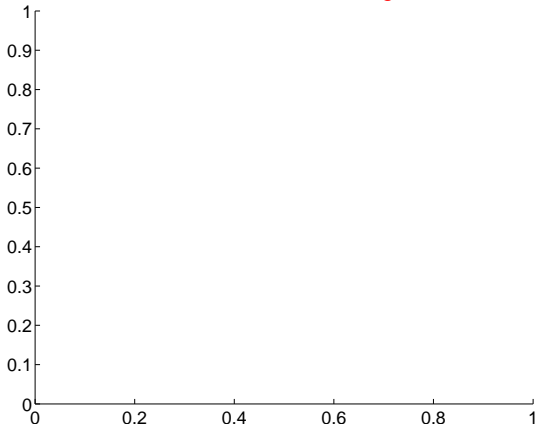


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

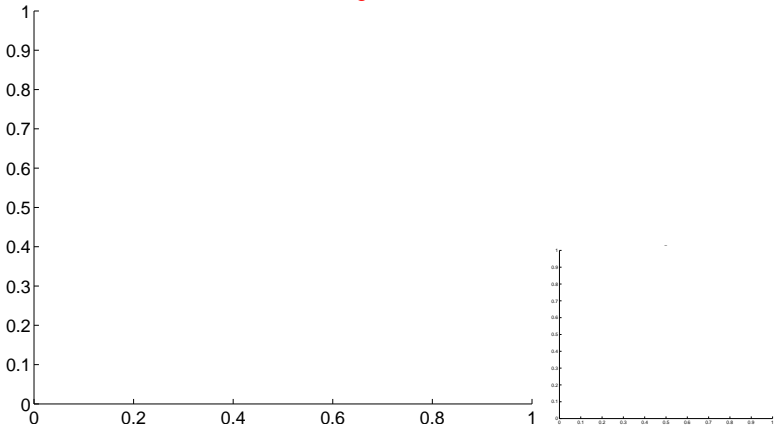


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

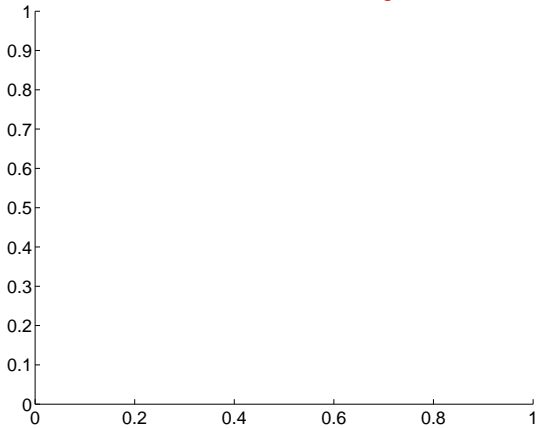
Q13 no difference image



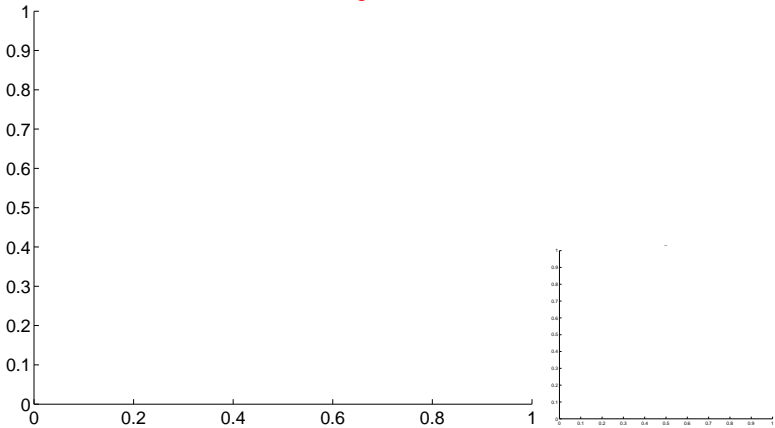
Q13 no OOT image



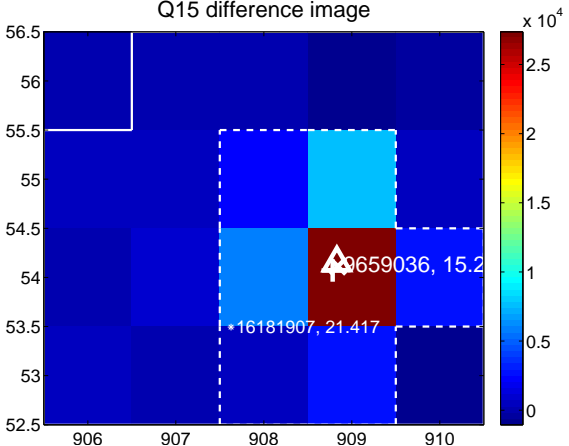
Q14 no difference image



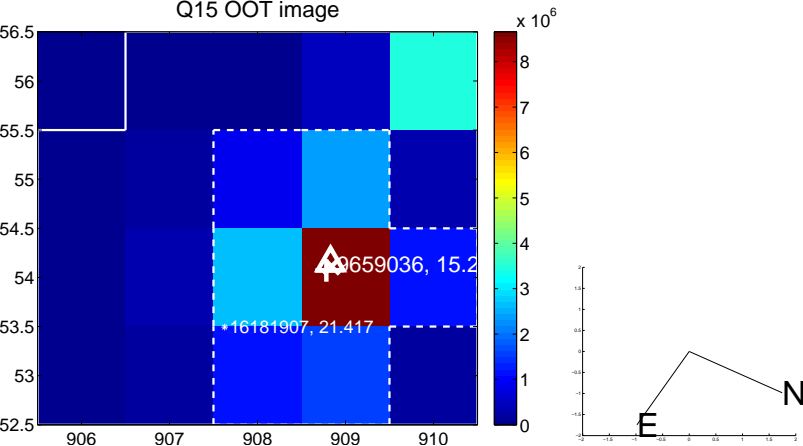
Q14 no OOT image



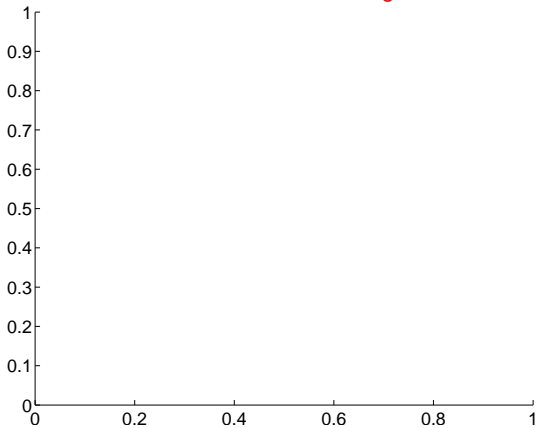
Q15 difference image



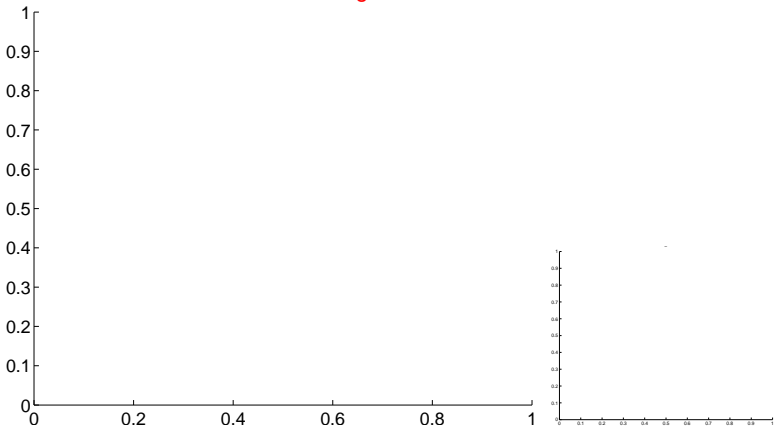
Q15 OOT image



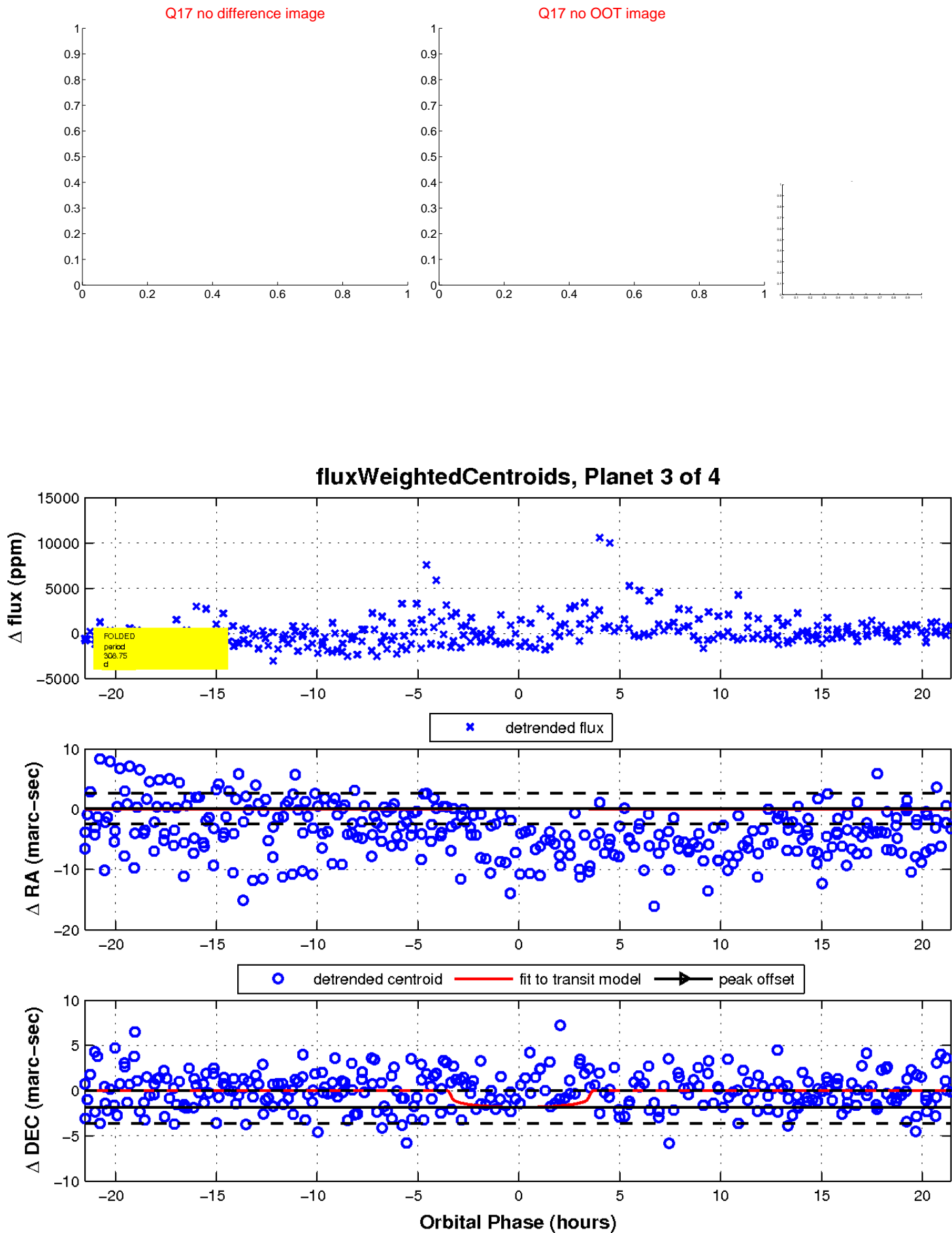
Q16 no difference image



Q16 no OOT image

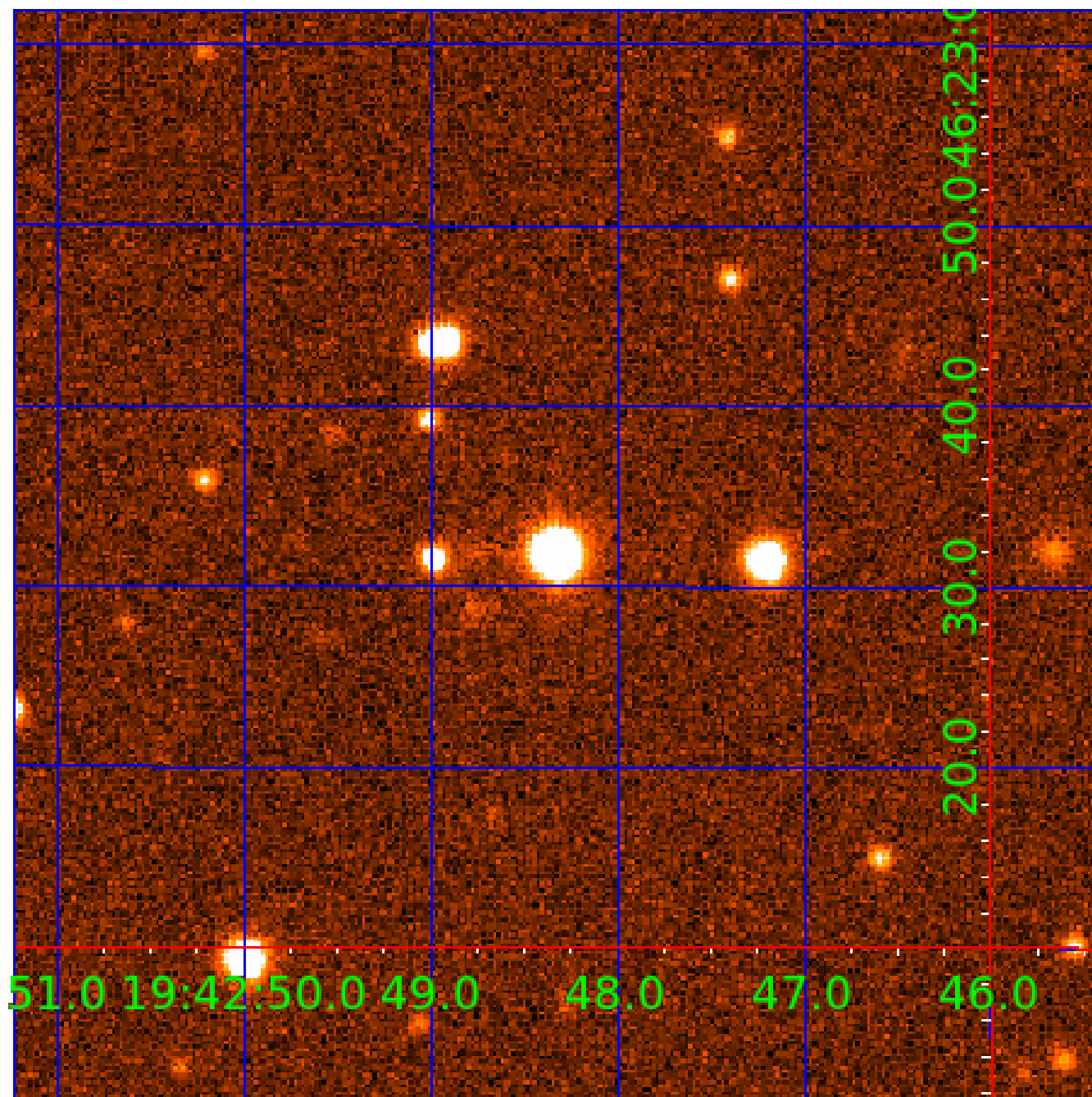


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 009659036

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009659036-01	OBS	No	398.946833	513.584068	1858.4	4.457	12.7	7.4	0.54	3885	2.52	0.08
009659036-02	OBS	No	436.994412	176.798184	1725.5	4.794	12.2	6.5	0.54	3885	2.42	0.07
009659036-03	OBS	No	308.748433	190.526525	1556.6	7.188	9.1	7.4	0.54	3885	2.10	0.11
009659036-04	OBS	No	370.467254	313.935006	1828.7	3.500	12.8	-1.0	0.54	3885	2.28	0.09

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009659036-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009659036-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009659036-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
009659036-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_NOFITS

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

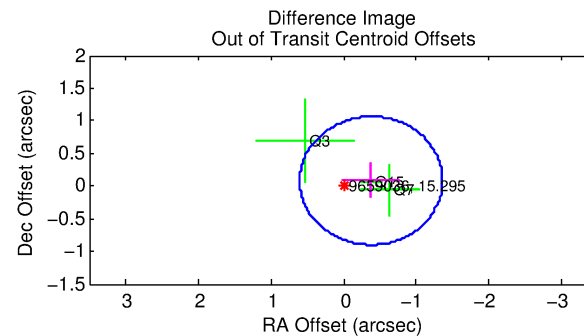
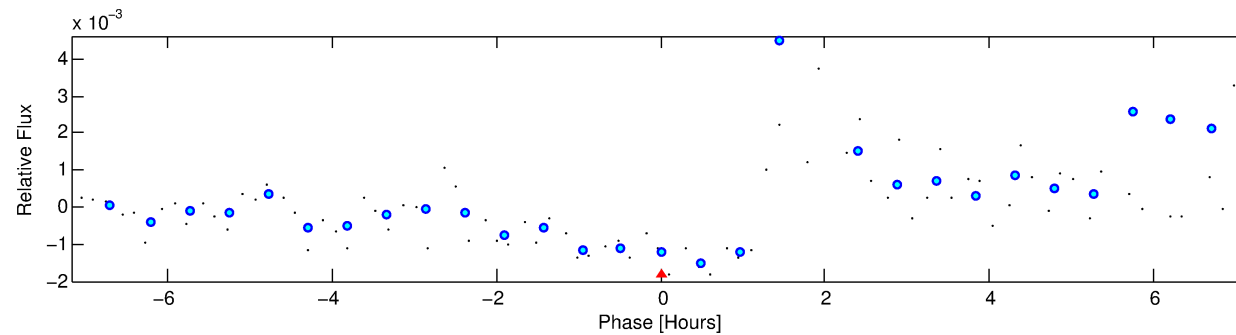
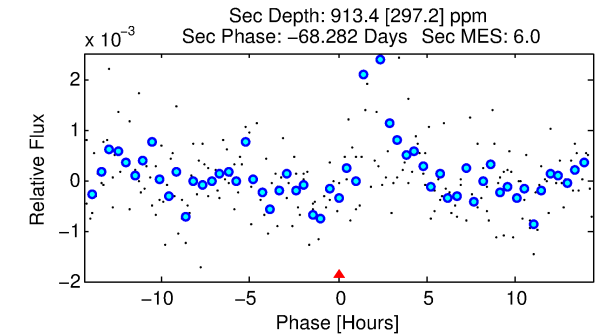
N = Not Transit-Like. S = Stellar Eclipse. C = Centroid Offset. E = Ephemeris Match.

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 009659036-04

No Significant Match Found

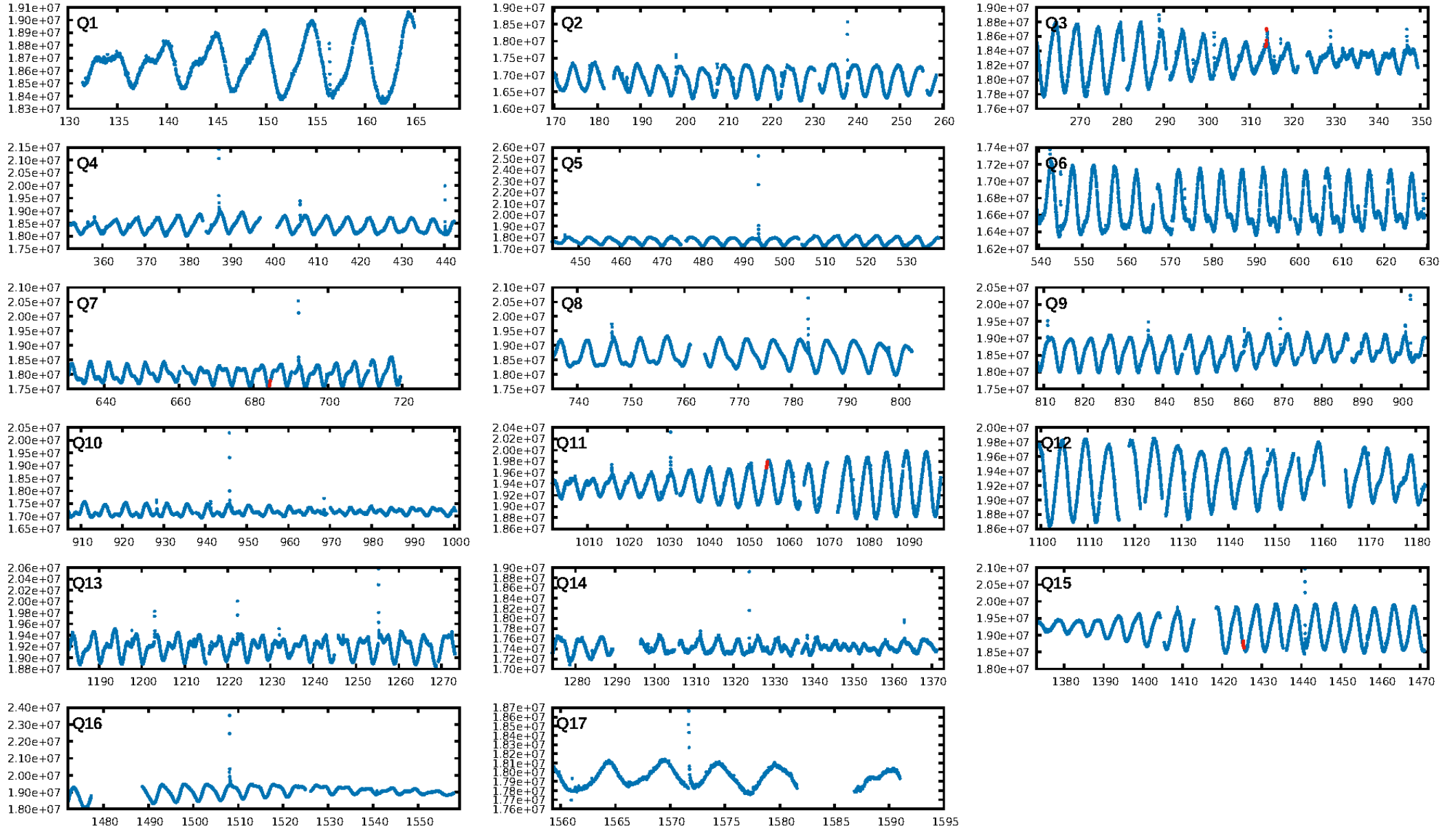
## KIC: 9659036    Candidate: 4 of 4    Period: 370.467 d



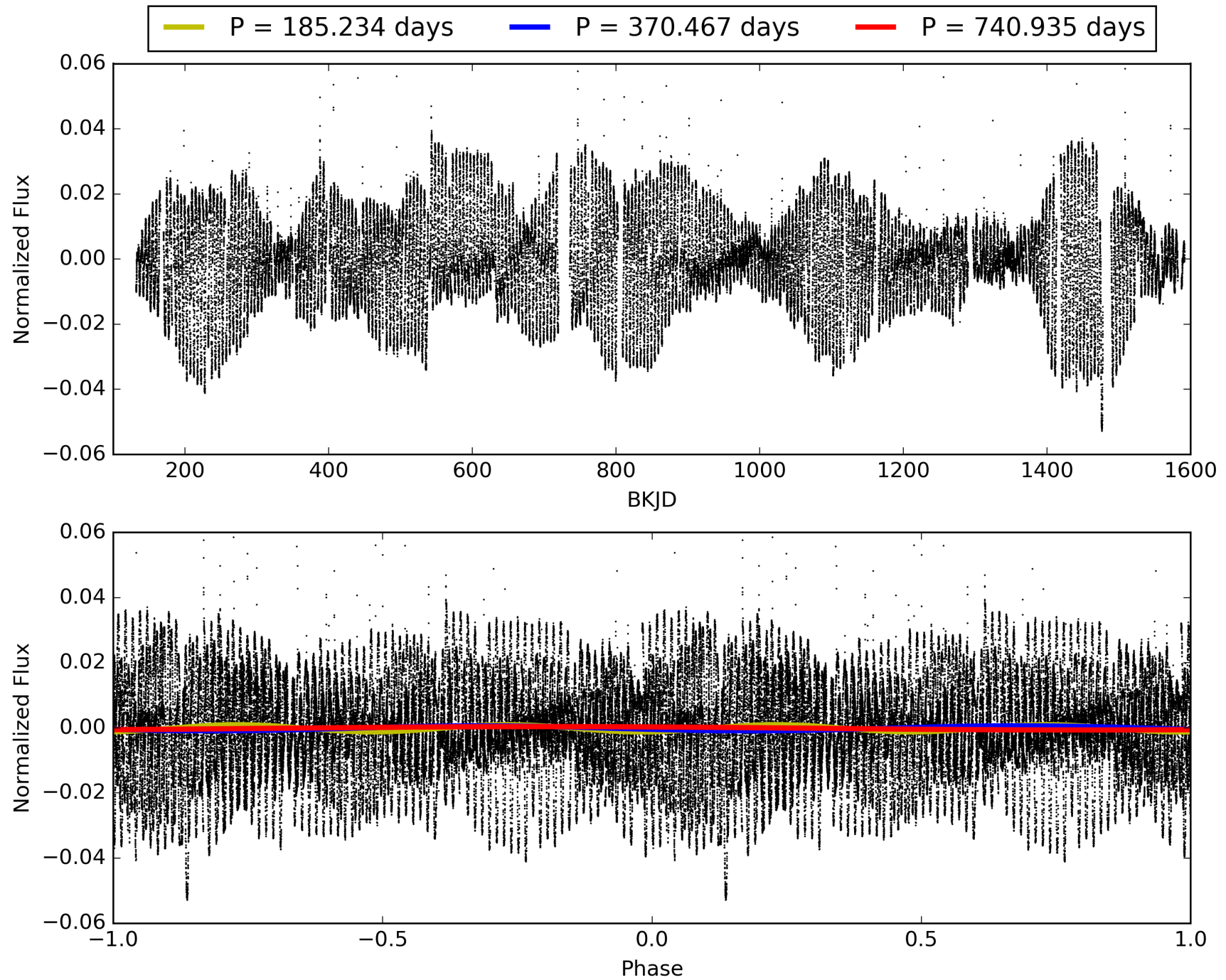
Centroid-sig: 71.3%  
Centroid-so: 1.485 arcsec [1.36σ]  
OotOffset-rm: 0.387 arcsec [1.18σ]  
KicOffset-rm: 0.124 arcsec [0.39σ]  
OotOffset-st: 0/3/0/0 [3]  
KicOffset-st: 0/3/0/0 [3]  
DiffImageQuality-fgm: 0.33 [1/3]  
DiffImageOverlap-fno: 0.75 [3/4]

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

# TCE 009659036-04, PDC Light Curves



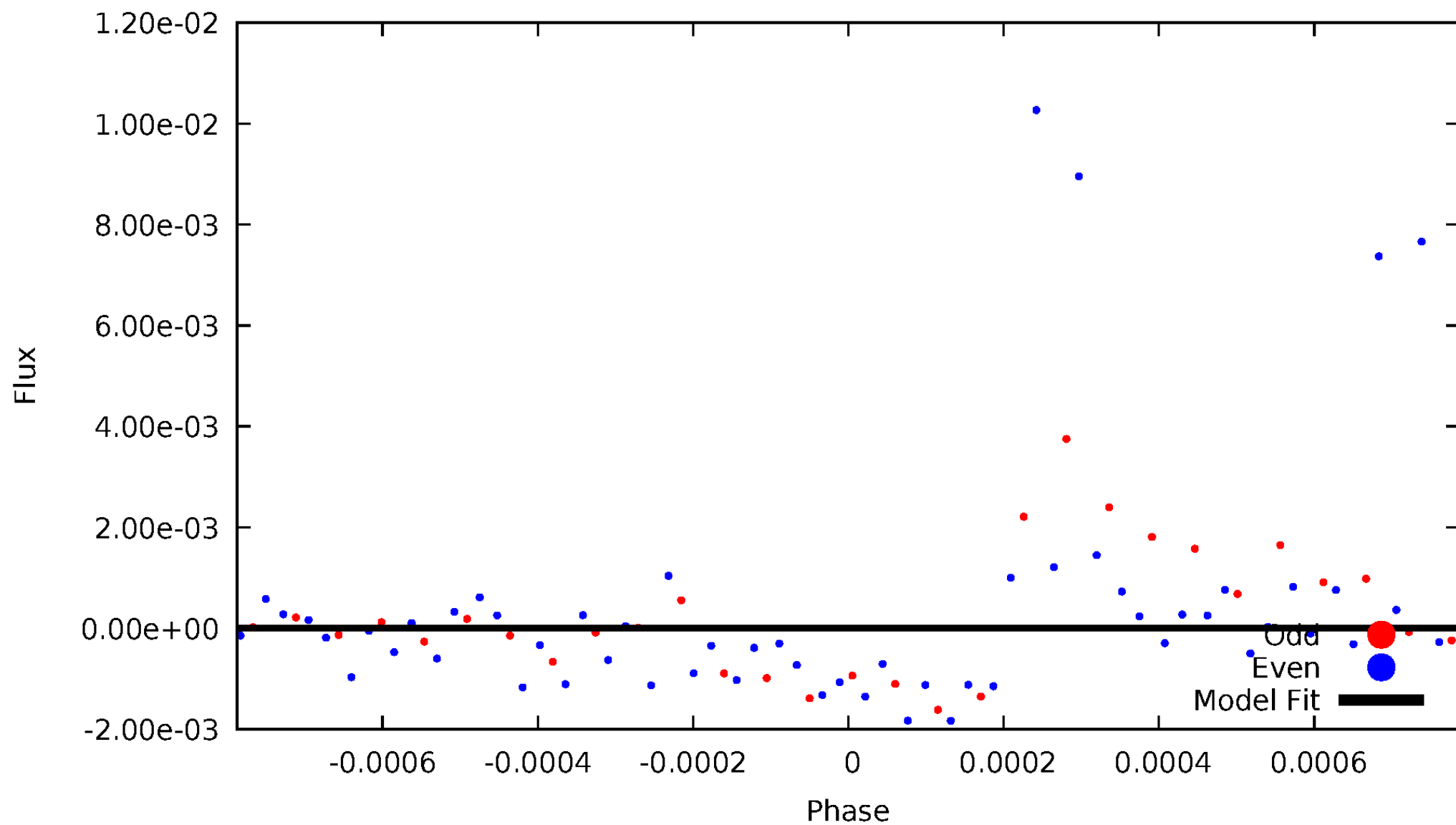
TCE 009659036-04





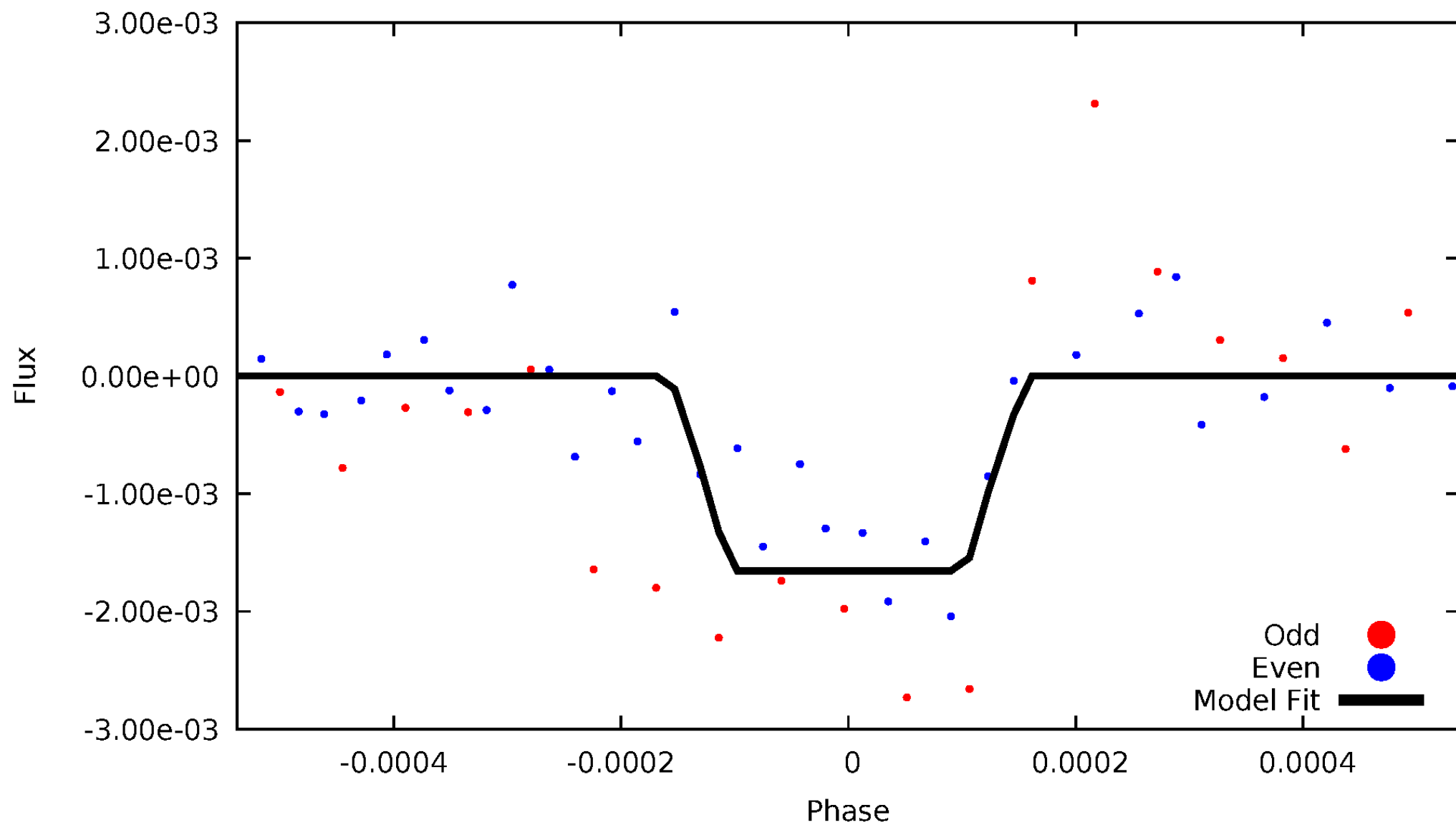
# DV Odd/Even

TCE 009659036-04



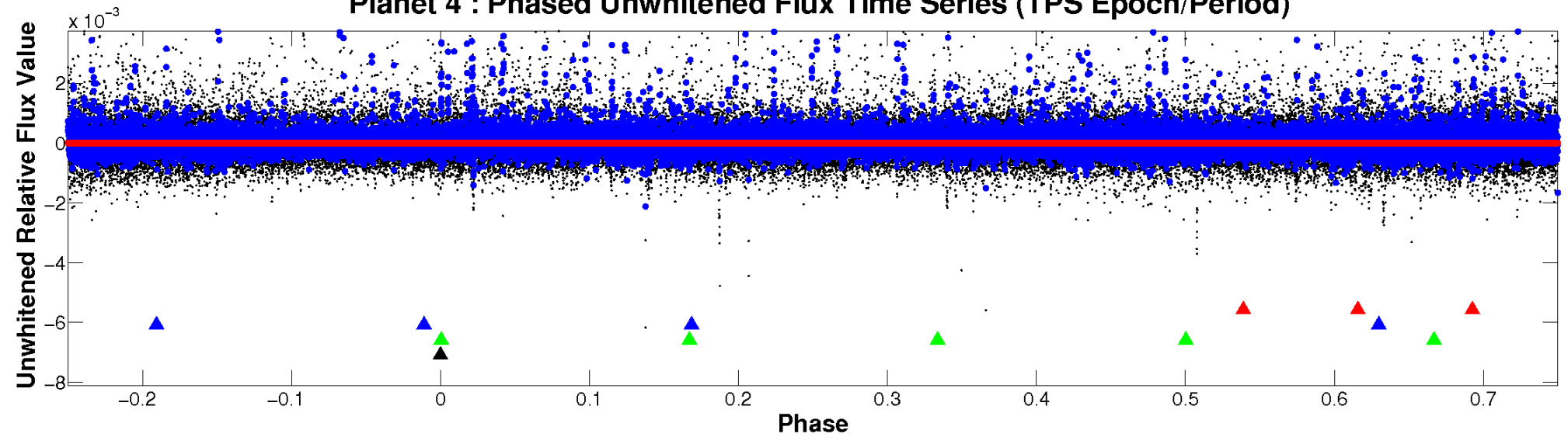
# ALT Odd/Even

TCE 009659036-04

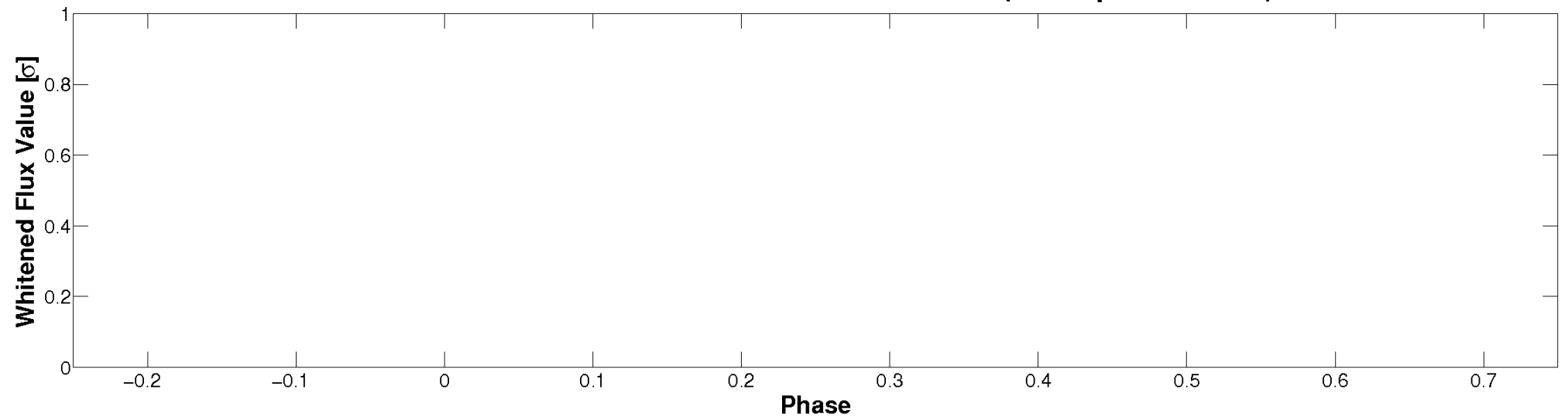


# Non-Whitened Vs. Whitened Light Curve

**Planet 4 : Phased Unwhitened Flux Time Series (TPS Epoch/Period)**

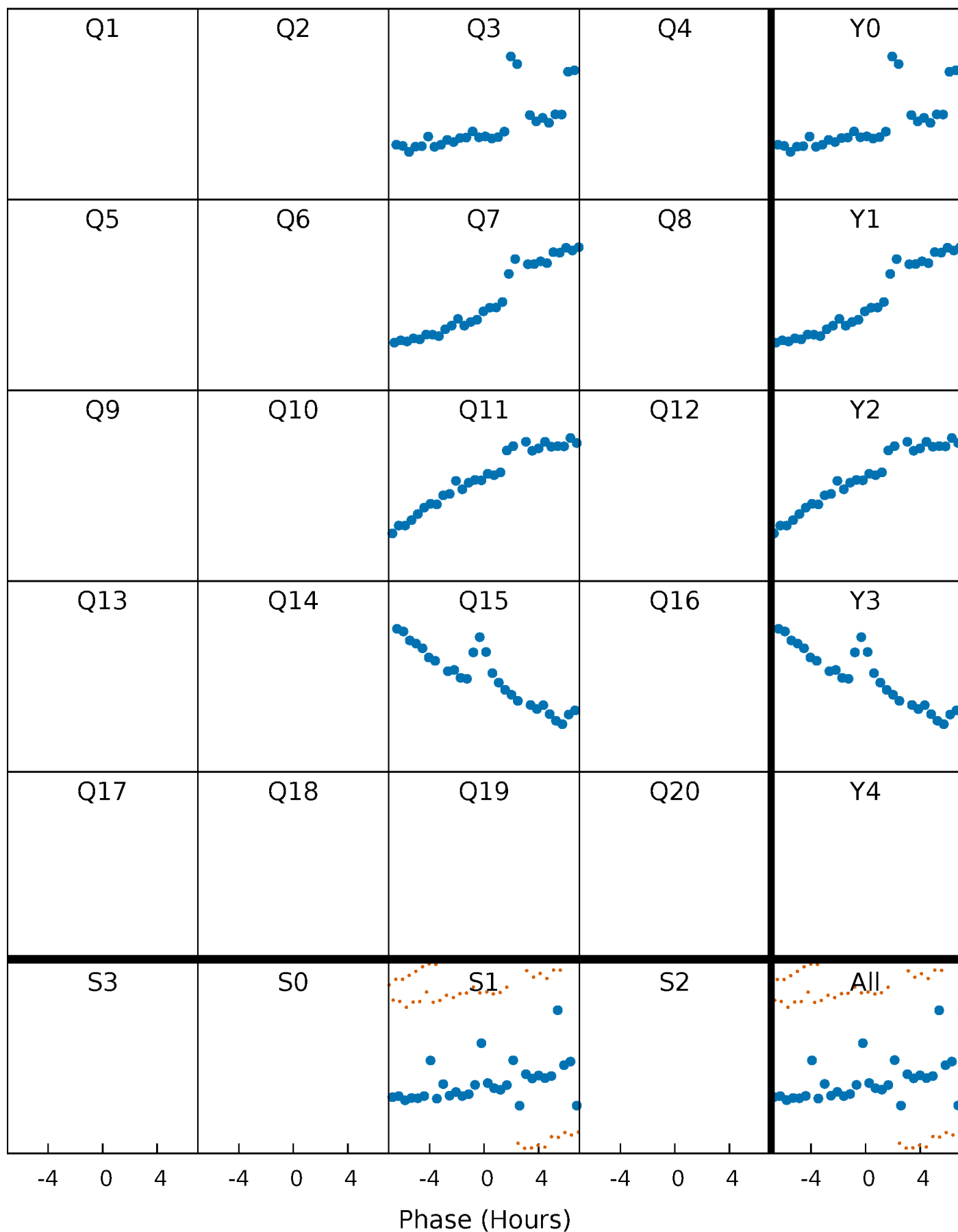


**Planet 4 : Phased Whitened Flux Time Series (TPS Epoch/Period)**



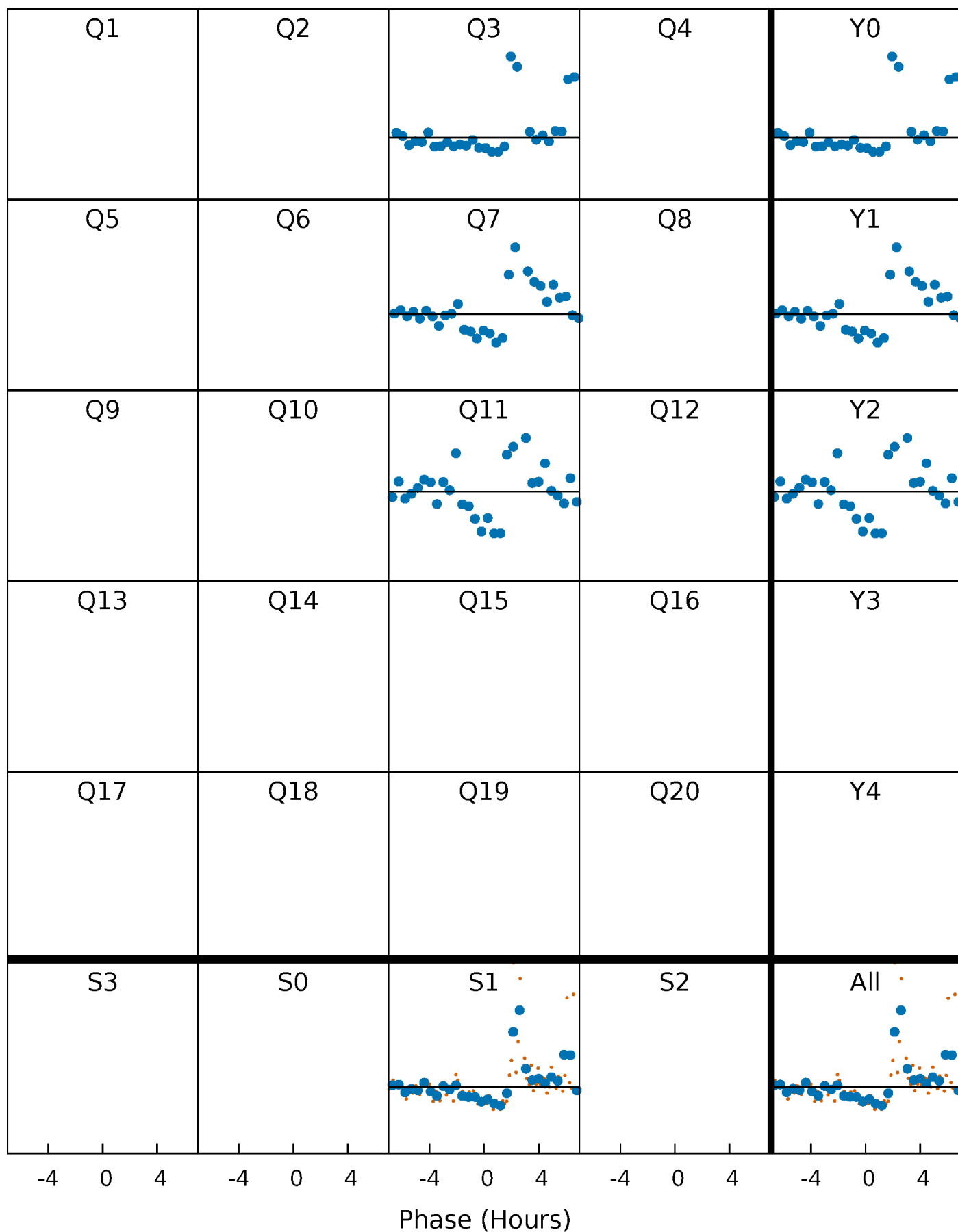
# PDC Quarter-Phased Transit Curves

TCE 009659036-04     $P=370.467254$  Days     $T_0=313.935006$  (BKJD)



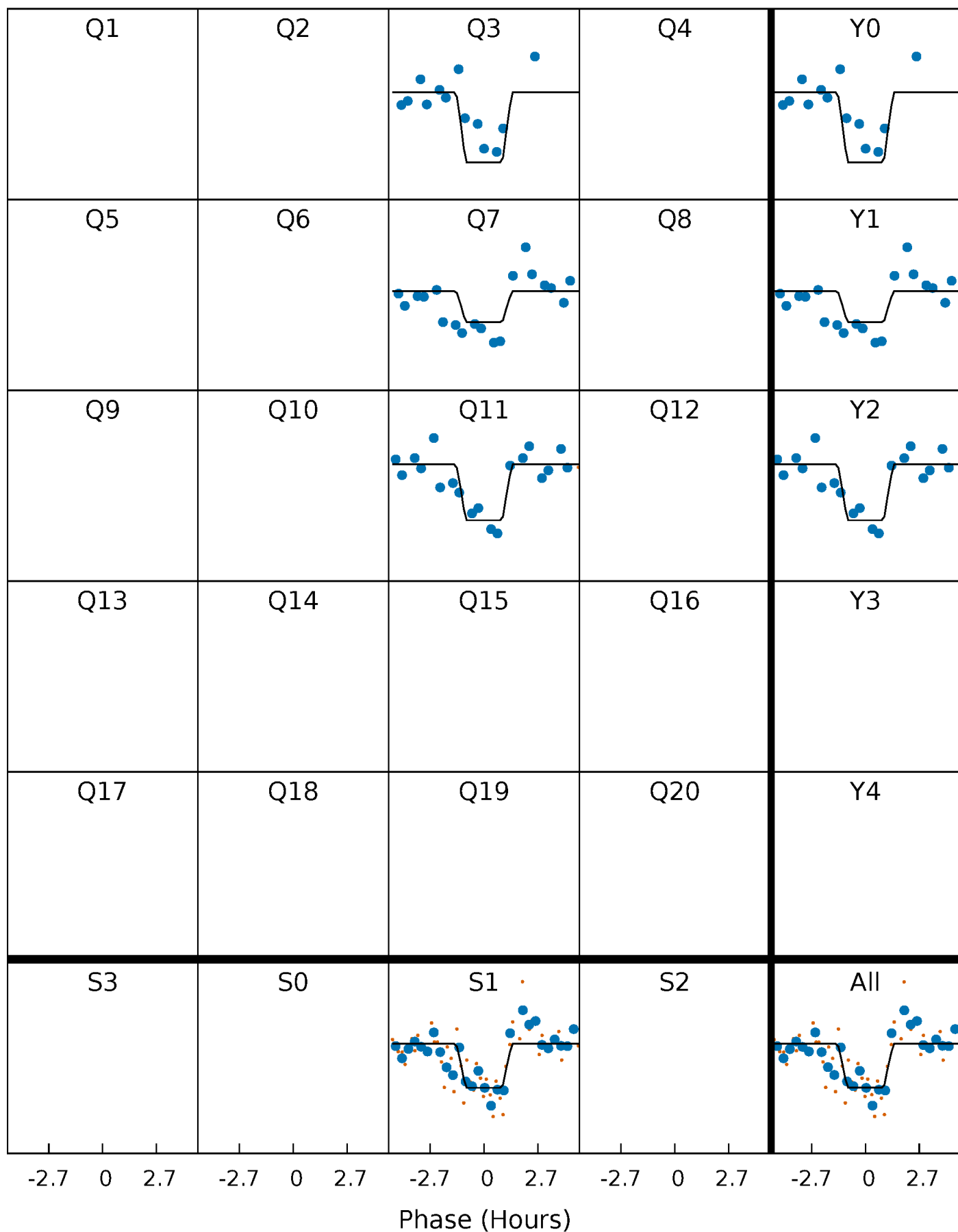
# DV Quarter-Phased Transit Curves

TCE 009659036-04     $P=370.467254$  Days     $T_0=313.935006$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

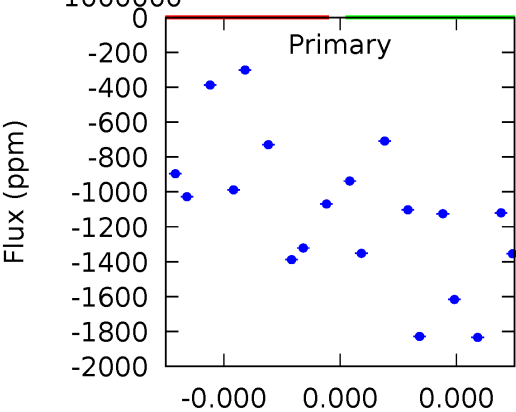
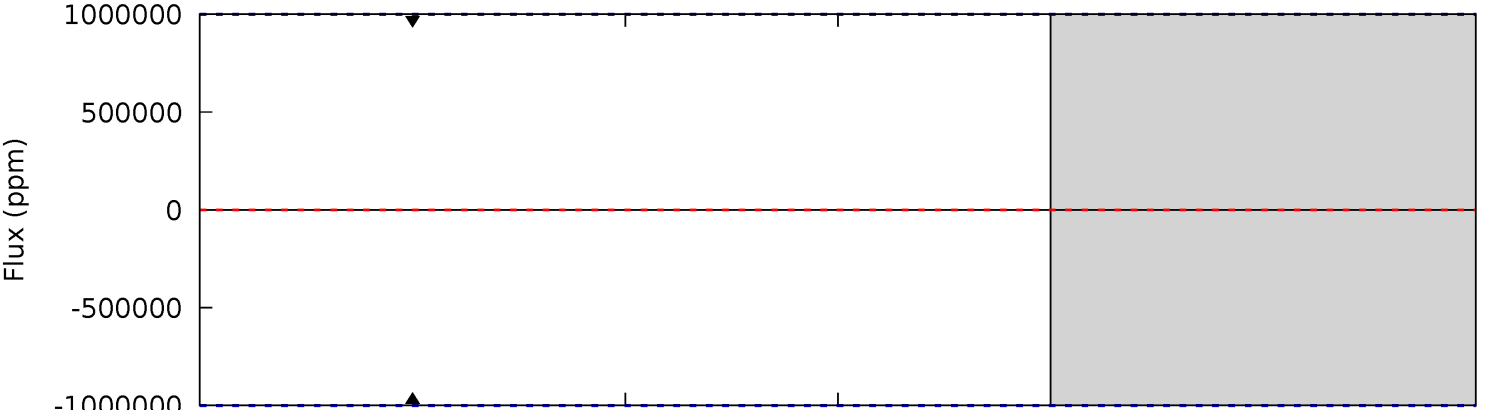
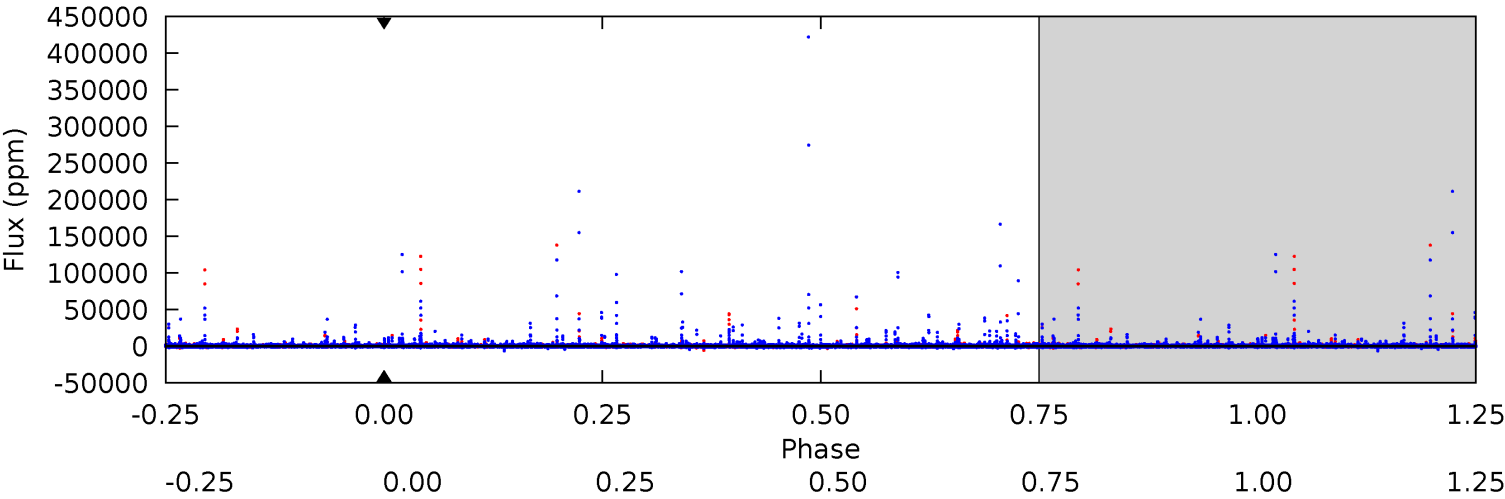
TCE 009659036-04 P=370.467254 Days  $T_0=313.958740$  (BKJD)



# DV Model-Shift Uniqueness Test

009659036-04, P = 370.467254 Days, E = 313.935006 Days

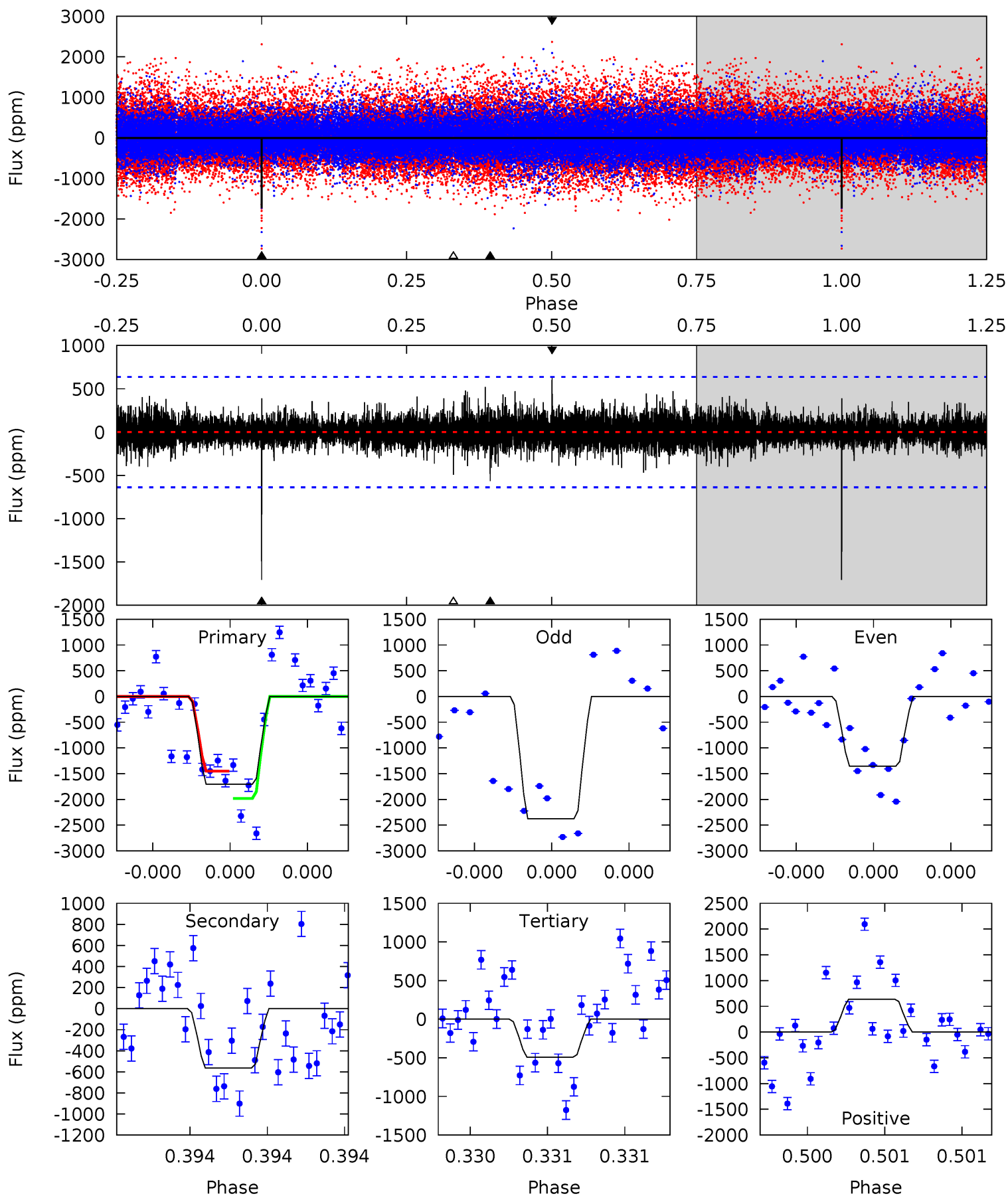
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
0	0	0	0	1.00	1.00	1.00	0	0	0	0	0	0	0	0



# Alt Model-Shift Uniqueness Test

009659036-04, P = 370.467254 Days, E = 313.958740 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
15.1	5.00	4.36	5.65	5.65	3.60	0.91	10.8	9.48	0.64	-0.65	4.15	1.02	0.27	2.37





### Stellar Parameters For KIC 009659036

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$3885^{+117}_{-105}$	$4.710^{+0.039}_{-0.025}$	$-0.100^{+0.100}_{-0.100}$	$0.540^{+0.030}_{-0.041}$	$0.545^{+0.037}_{-0.034}$	$4.882^{+0.884}_{-0.513}$
	+3%/-3%	+1%/-1%	+100%/-100%	+6%/-8%	+7%/-6%	+18%/-11%
Source	PHO2	PHO2	PHO2	DSEP		

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

### Secondary Eclipse Parameters for KIC 009659036-04 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$0 \pm 1000000$	$4.62^{+5.08}_{-3.08}$	$193^{+6}_{-5}$	$-2846^{+11240}_{-5228}$	$-15309.470^{+3026157.950}_{-2632893.970}$
Alt.	$-563 \pm 113$	$4.88^{+4.80}_{-3.11}$	$194^{+6}_{-7}$	$2680^{+905}_{-416}$	$8741^{+57609}_{-6498}$

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

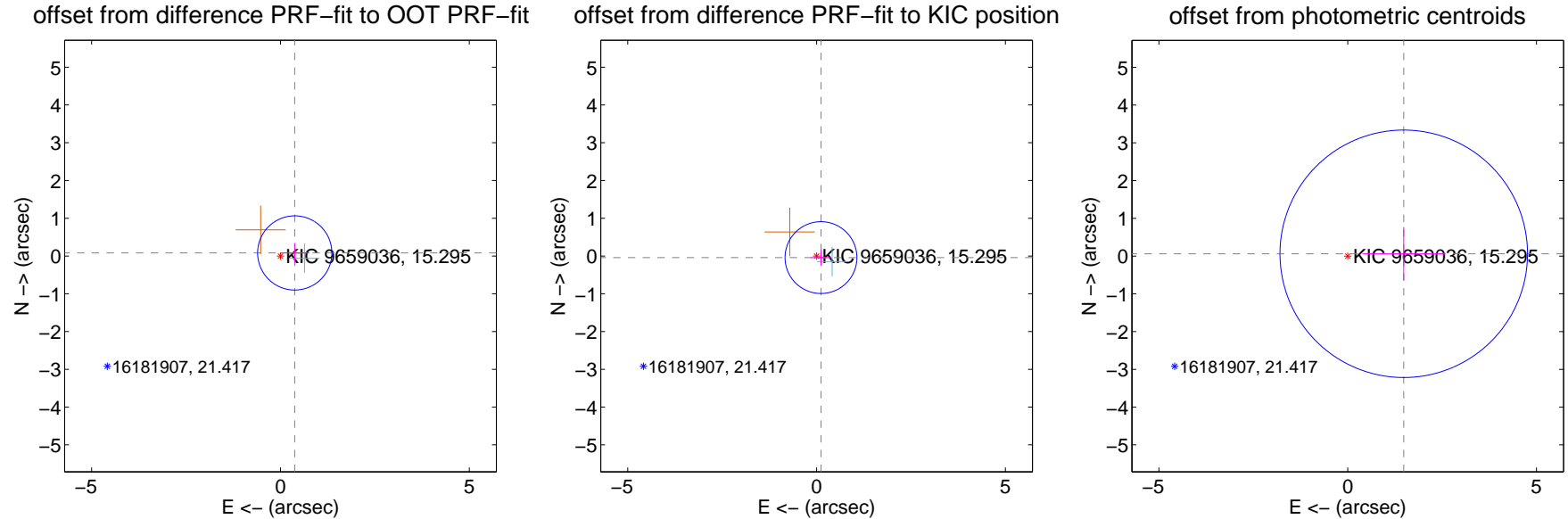
## DV Centroid Data

Supplemental centroid analysis for 009659036-04. Kepler magnitude: 15.29. 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 0.29 arcsec

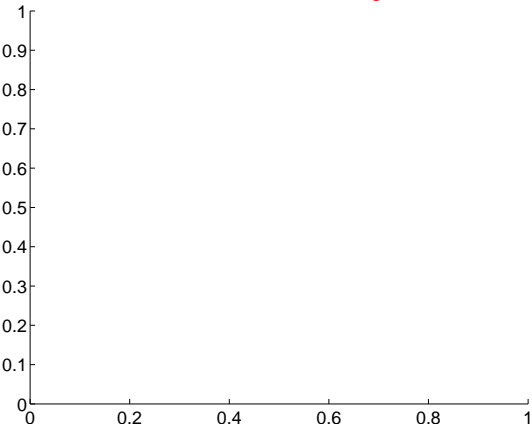
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.387 \pm 0.327$	1.18	$-0.378 \pm 0.388$	$0.082 \pm 0.262$
PRF-fit source offset from KIC position	$0.124 \pm 0.317$	0.39	$-0.116 \pm 0.269$	$-0.042 \pm 0.203$
photometric centroid source offset	$1.48 \pm 1.09$	1.36	$-1.48 \pm 1.09$	$0.06 \pm 0.71$



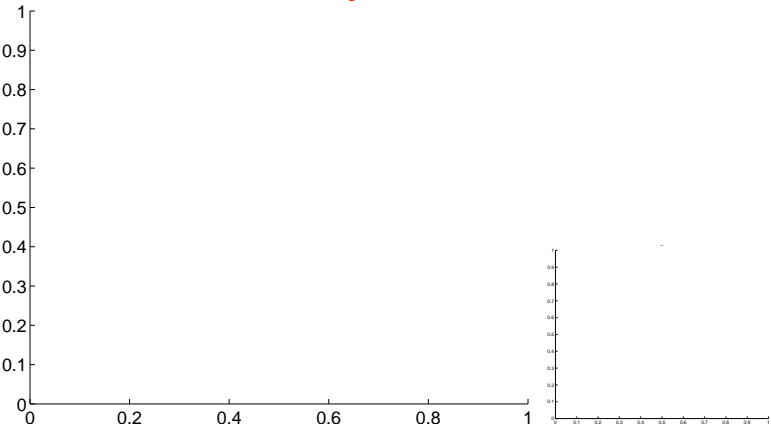
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

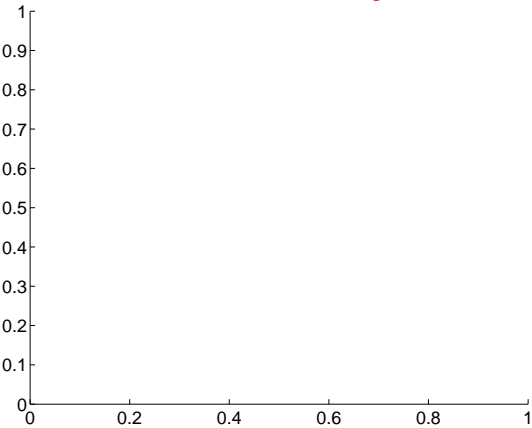
Q1 no difference image



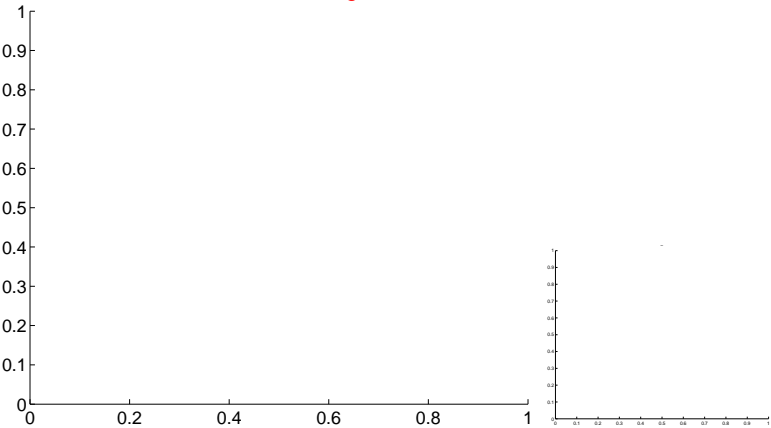
Q1 no OOT image



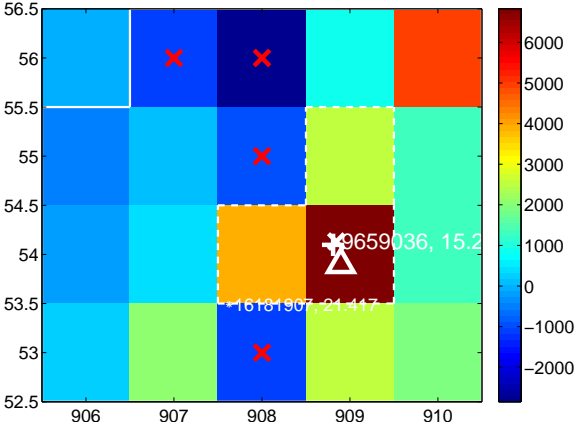
Q2 no difference image



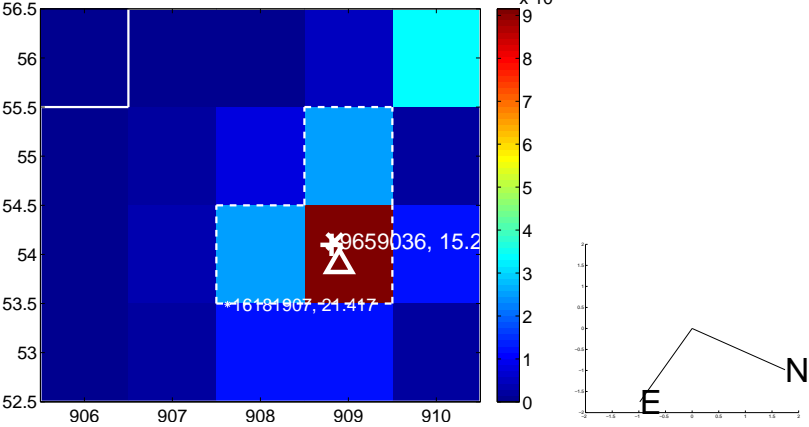
Q2 no OOT image



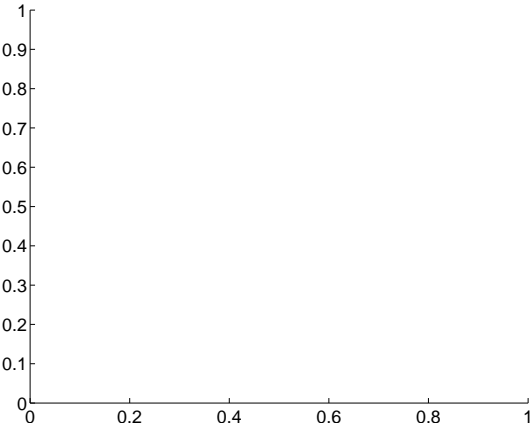
Q3 difference image. Poor Quality



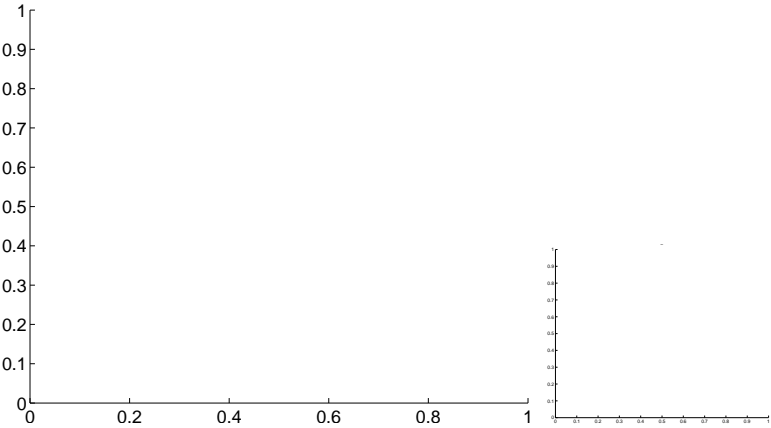
Q3 OOT image



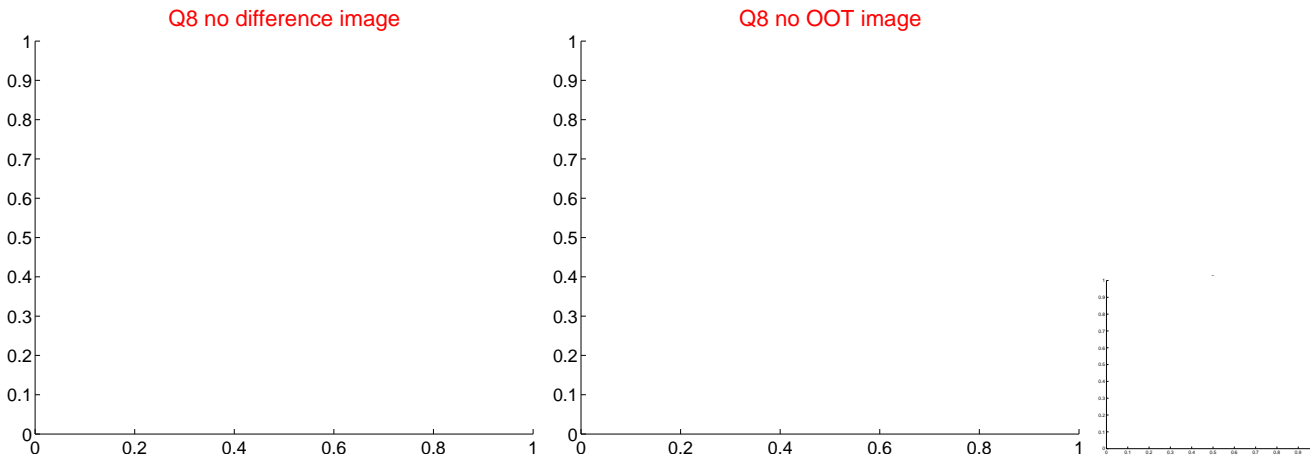
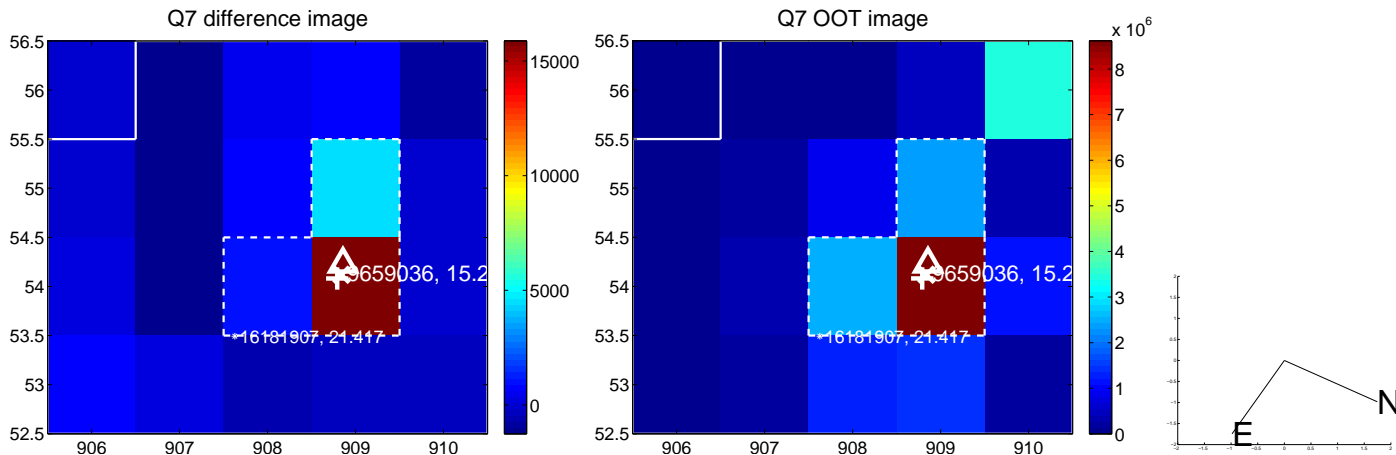
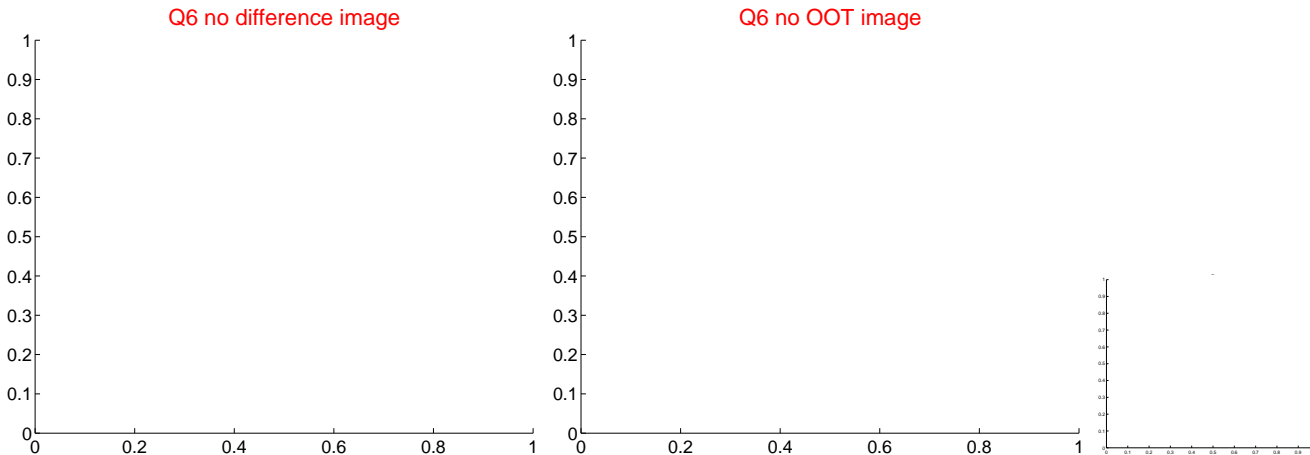
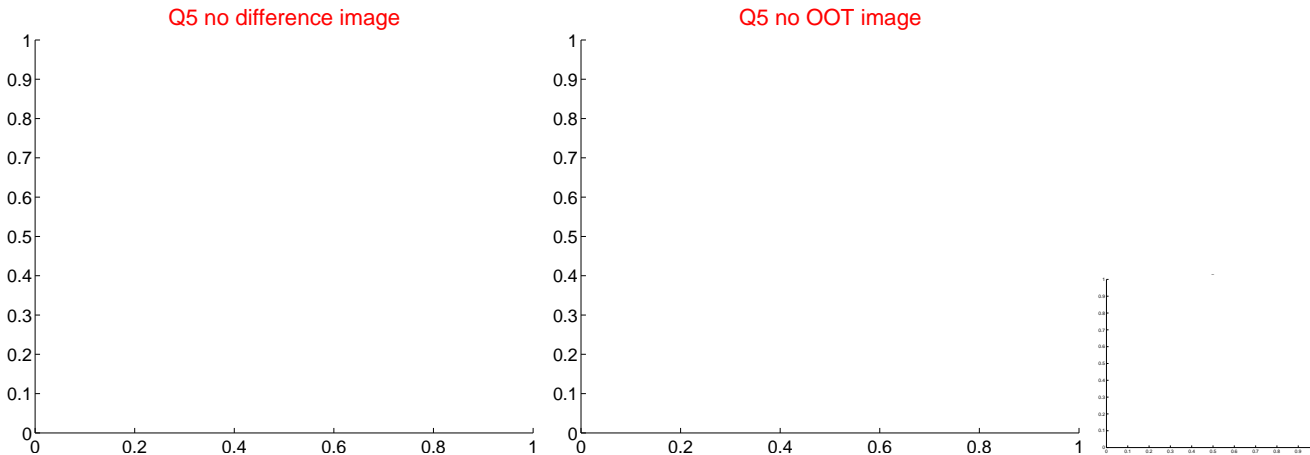
Q4 no difference image



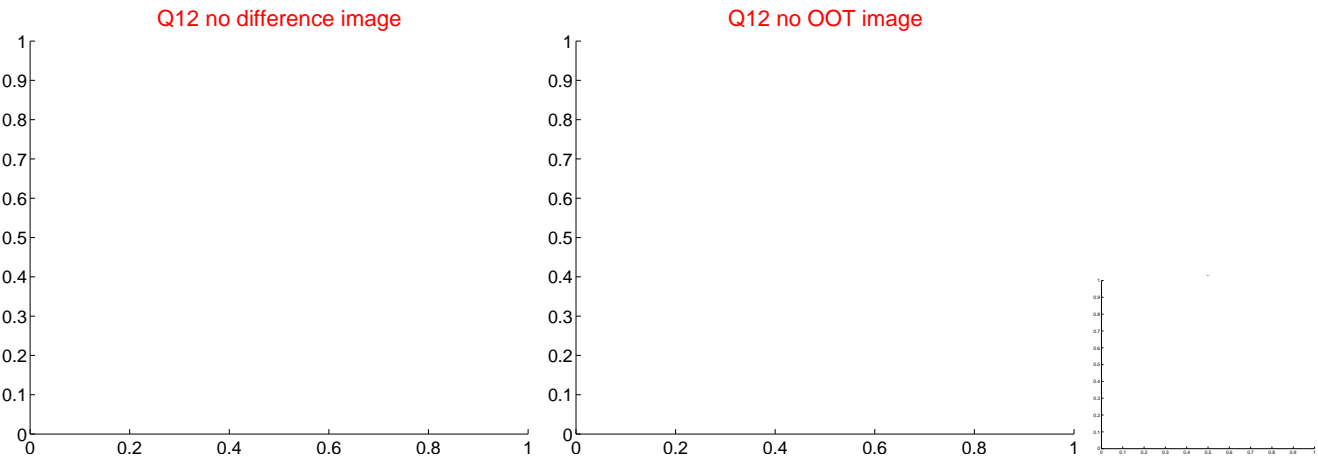
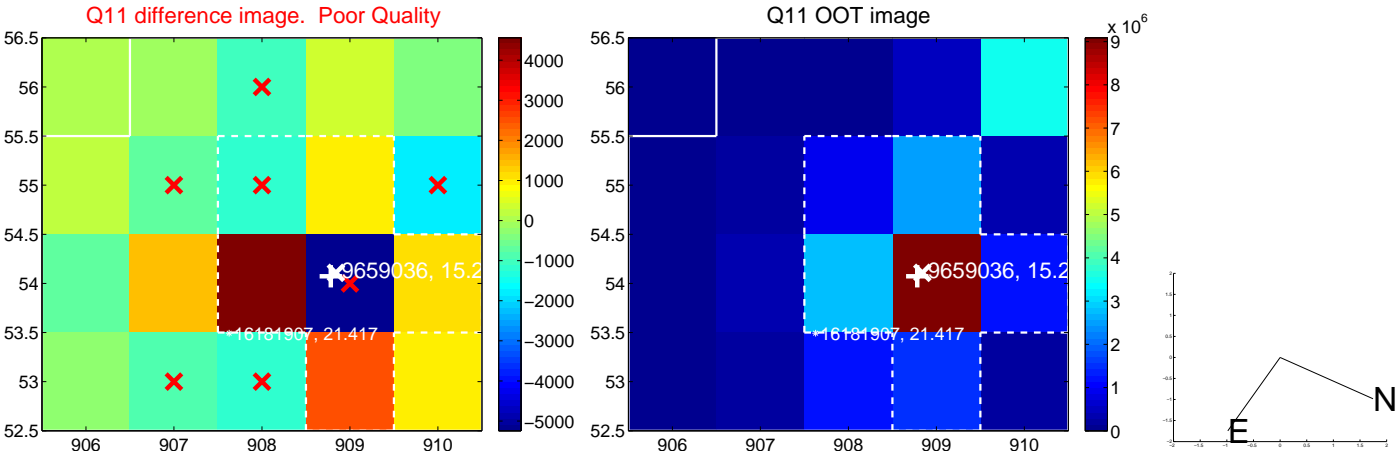
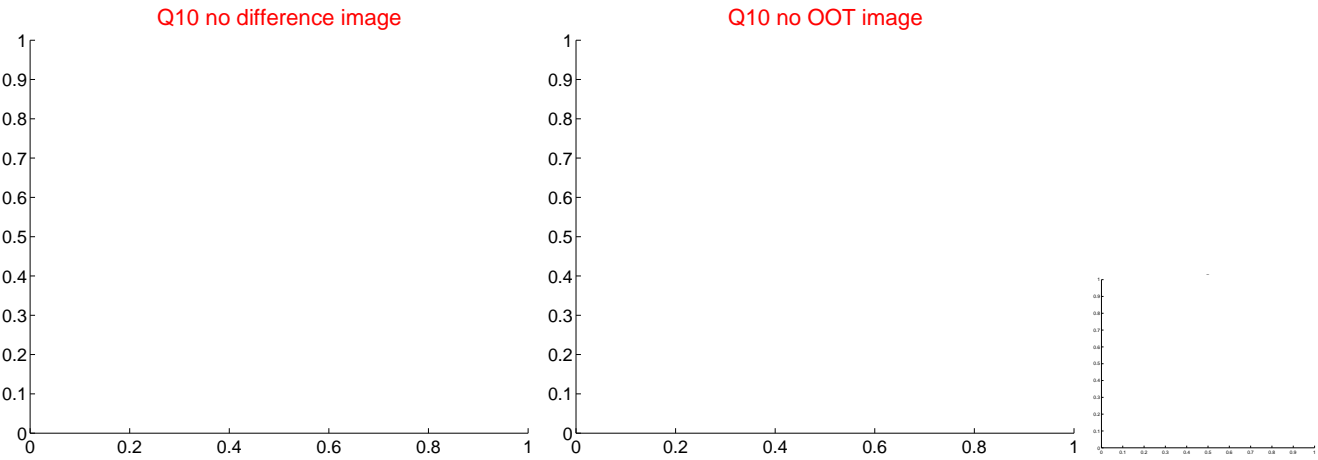
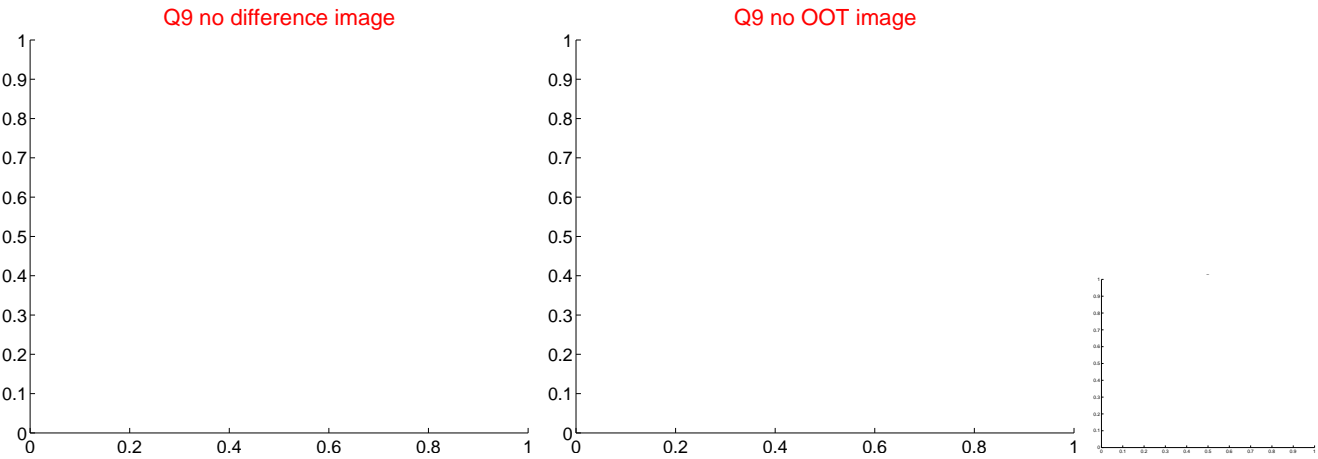
Q4 no OOT image



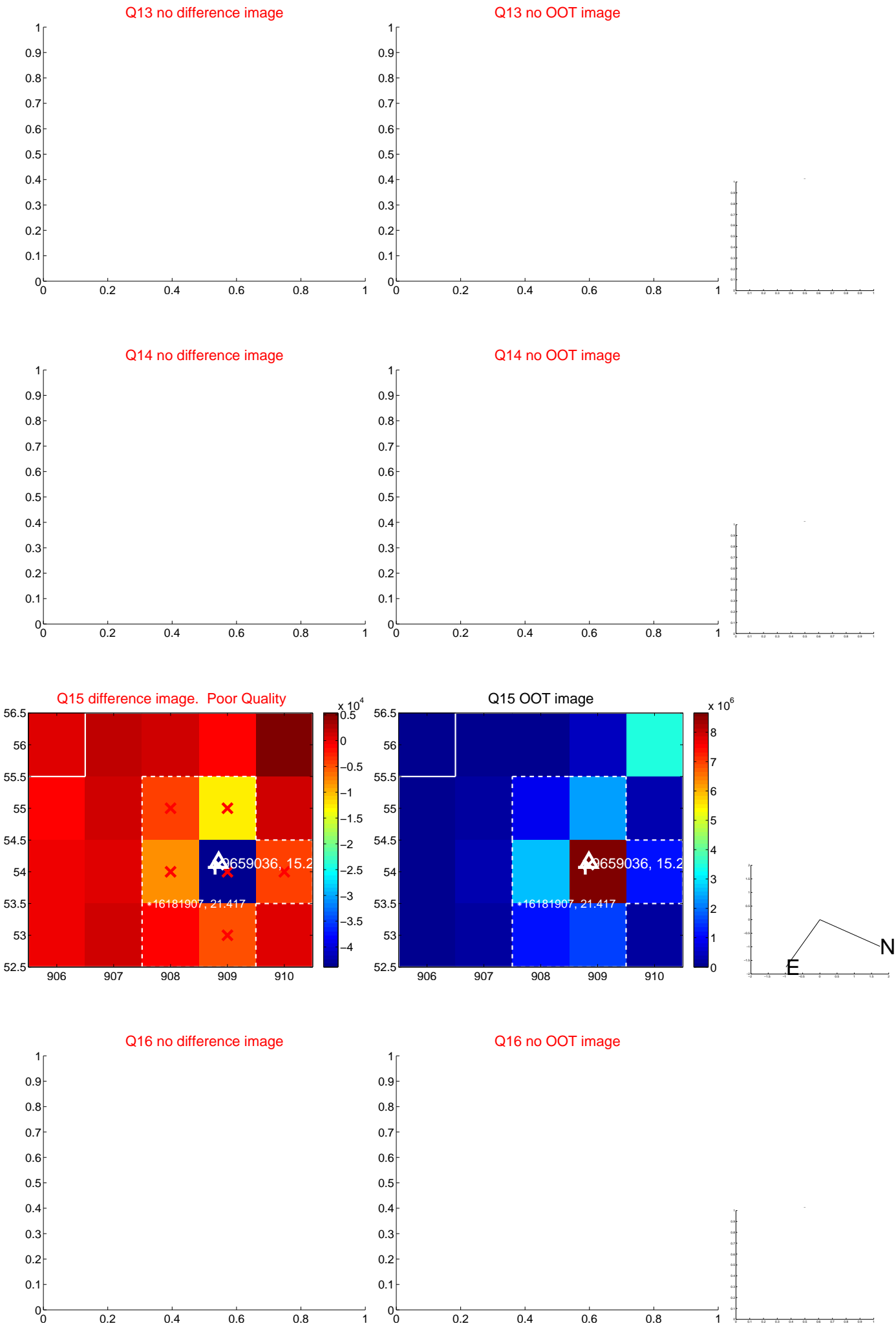
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value



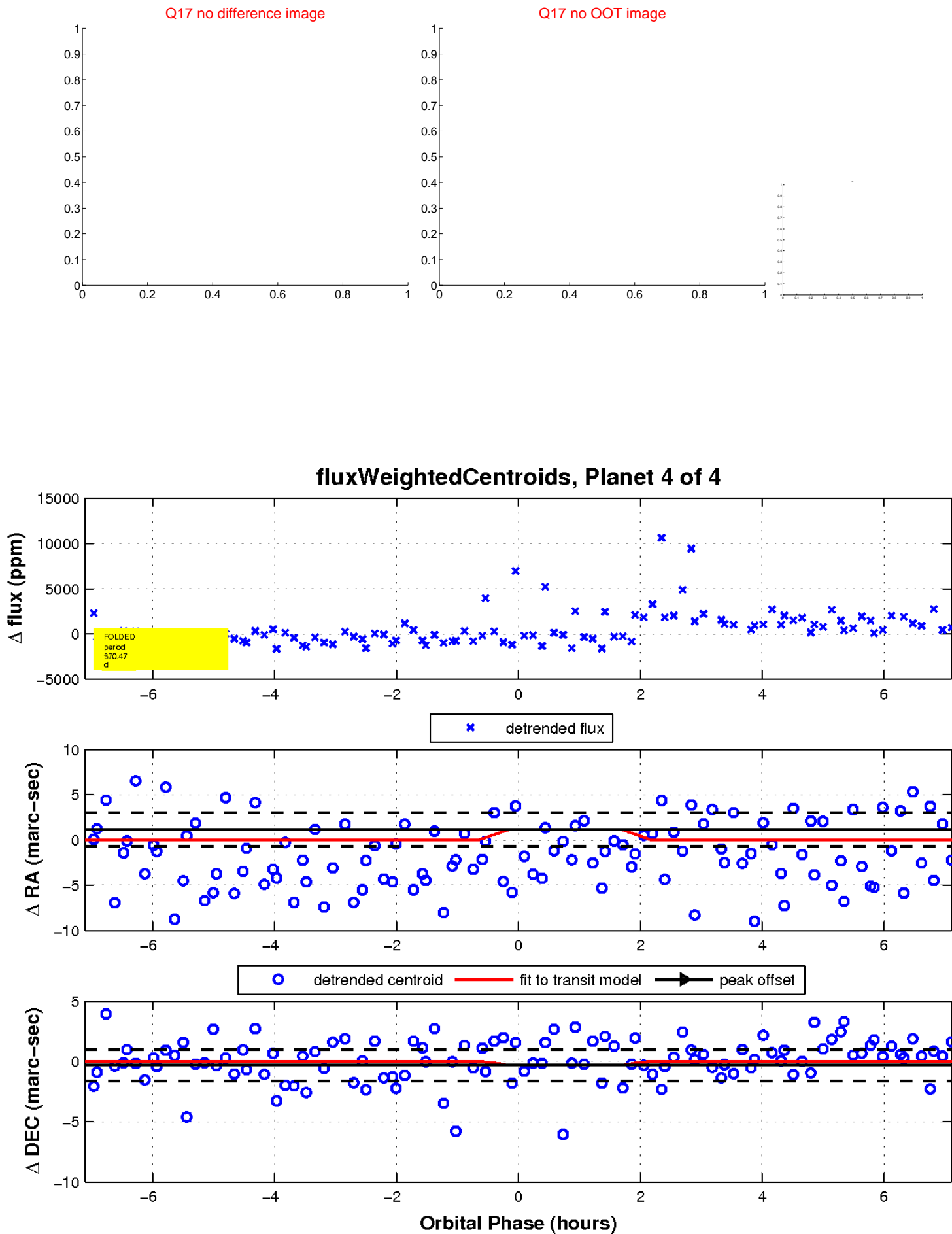
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



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



UKIRT Image

Declination

