

# KIC 009653110

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009653110-01	OBS	No	292.588605	277.400199	652.2	7.016	20.3	5.8	0.75	5396	1.98	0.73
009653110-02	OBS	No	369.069568	266.609746	920.6	1.557	16.9	9.0	0.75	5396	2.31	0.53
009653110-03	OBS	No	266.685084	326.565628	1495.7	6.032	17.8	11.9	0.75	5396	3.70	0.82
009653110-04	OBS	No	496.497894	389.828814	1524.4	6.663	15.5	8.5	0.75	5396	3.53	0.36

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009653110-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_ZUMA—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV
009653110-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_POS_DV
009653110-03	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
009653110-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—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.

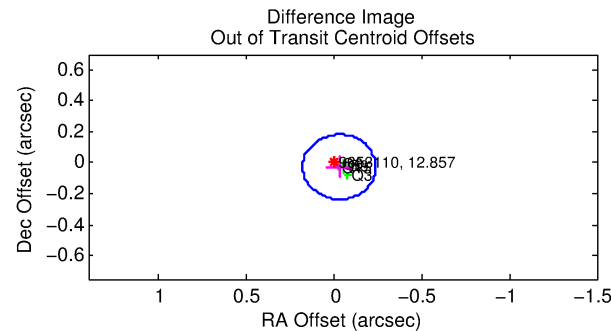
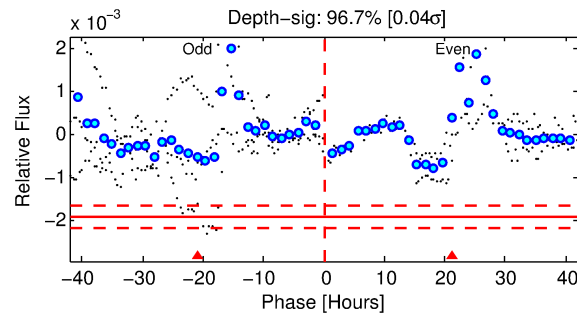
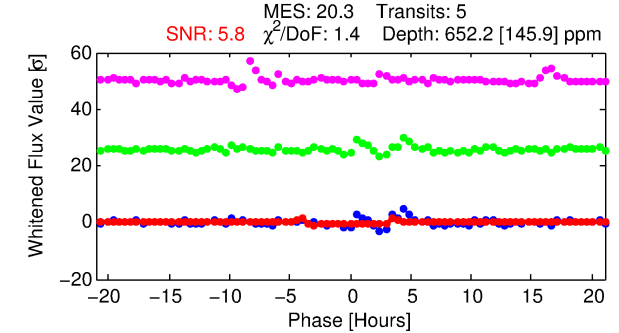
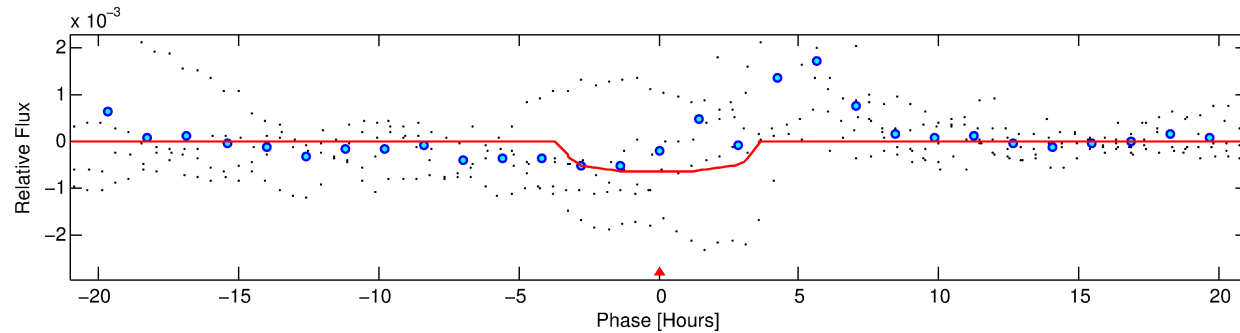
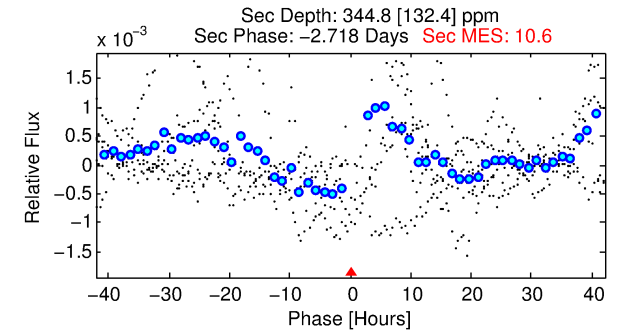
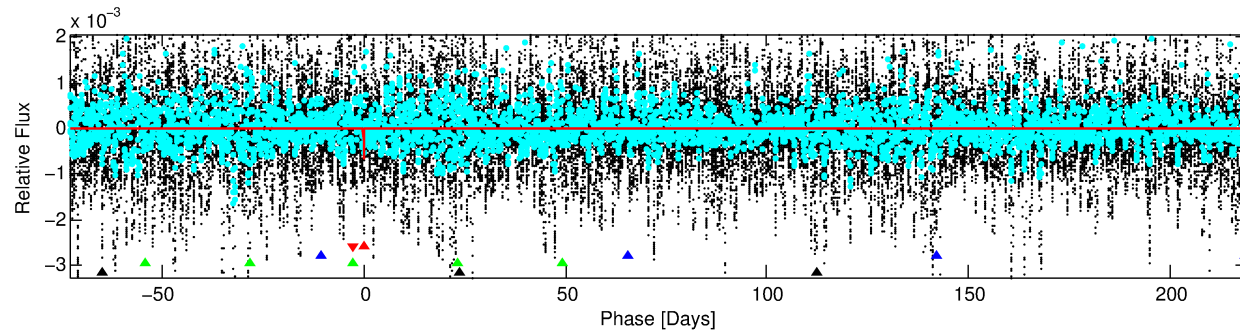
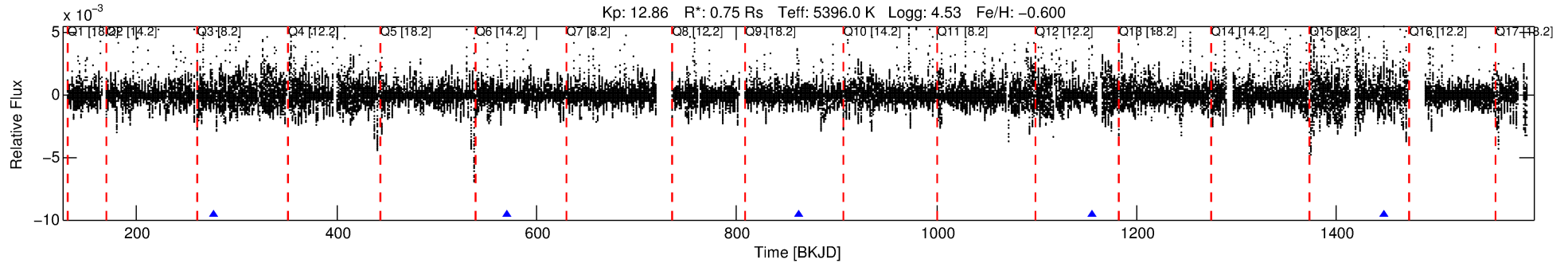
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009653110-01

No Significant Match Found

# DV One-Page Summary

KIC: 9653110 Candidate: 1 of 4 Period: 292.589 d



## DV Fit Results:

Period = 292.58860 [0.00315] d  
Epoch = 277.4002 [0.0075] BKJD  
Rp/R\* = 0.0243 [0.0104]  
a/R\* = 267.39 [442.22]  
b = 0.59 [1.86]  
Seff = 0.73 [0.15]  
Teq = 235 [12] K  
Rp = 1.98 [0.89] Re  
a = 0.7652 [0.0881] AU  
Ag = 28324.89 [27159.03] [1.04 $\sigma$ ]  
Teffp = 4721 [1121] K [4.00 $\sigma$ ]

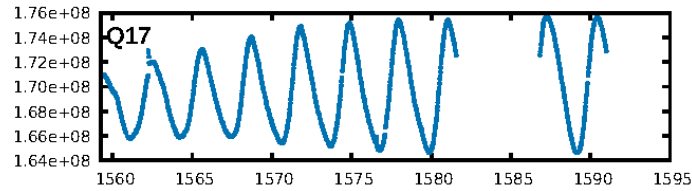
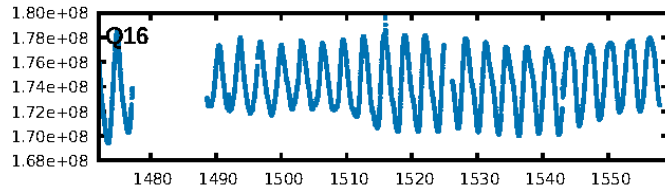
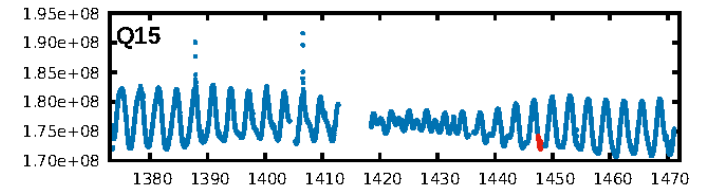
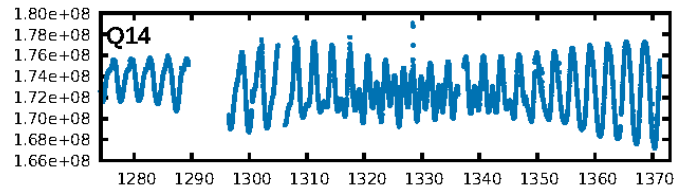
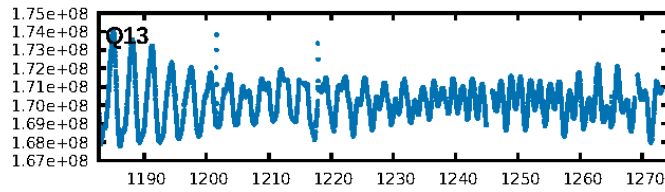
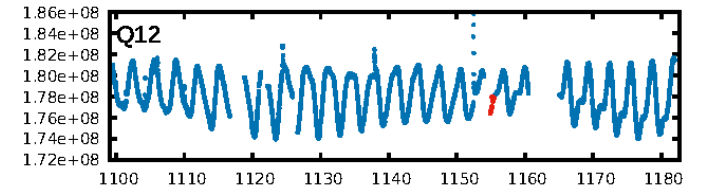
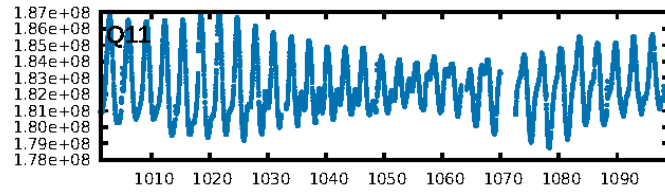
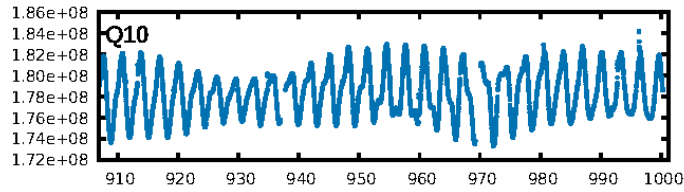
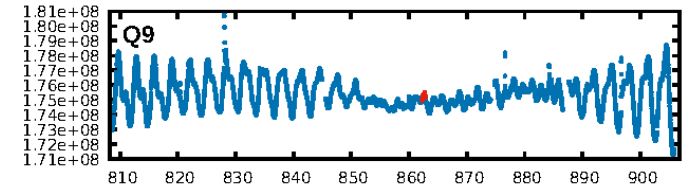
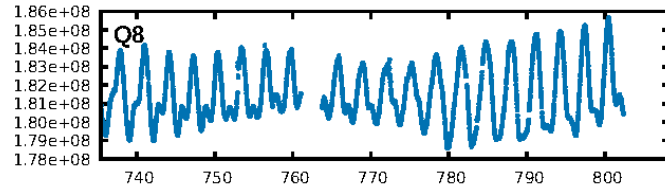
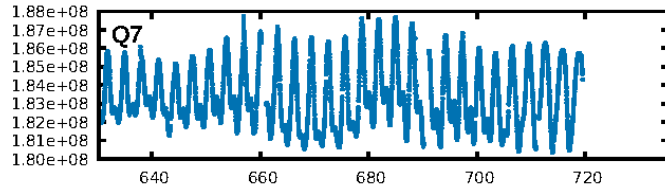
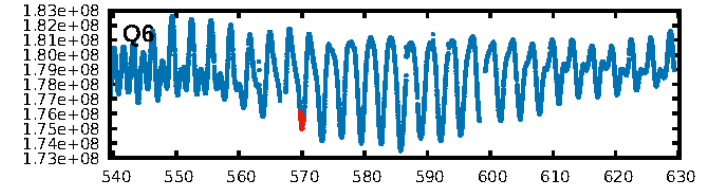
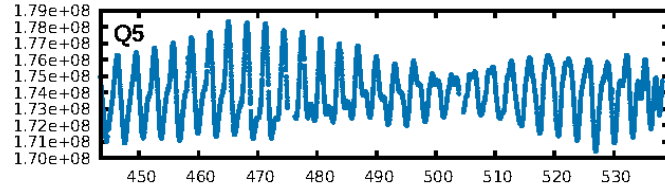
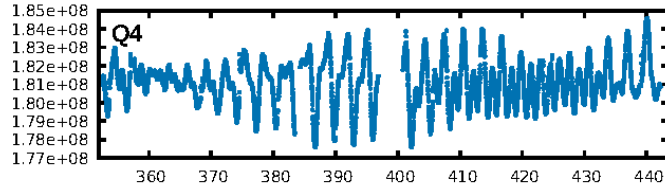
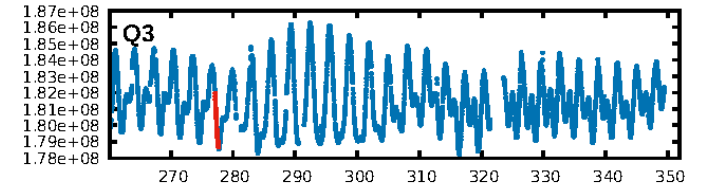
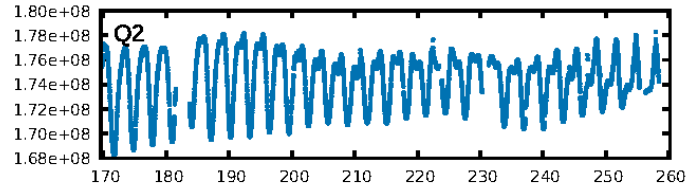
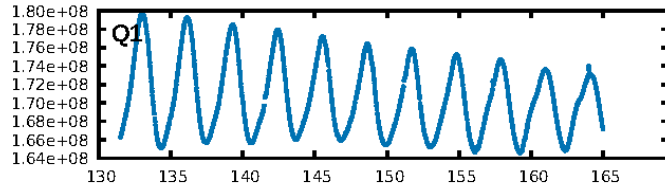
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [67.19 $\sigma$ ]  
LongPeriod-sig: 100.0% [255.41 $\sigma$ ]  
ModelChiSquare2-sig: 0.8%  
ModelChiSquareGof-sig: 68.7%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [5/5]  
GhostDiagnostic-chr: 0.5046  
Centroid-sig: 0.6%  
Centroid-so: 0.694 arcsec [1.81 $\sigma$ ]  
OotOffset-rm: 0.040 arcsec [0.58 $\sigma$ ]  
KicOffset-rm: 0.068 arcsec [0.93 $\sigma$ ]  
OotOffset-st: 1/2/0/1 [4]  
KicOffset-st: 1/2/0/1 [4]  
DiffImageQuality-fgm: 0.75 [3/4]  
DiffImageOverlap-fno: 1.00 [4/4]

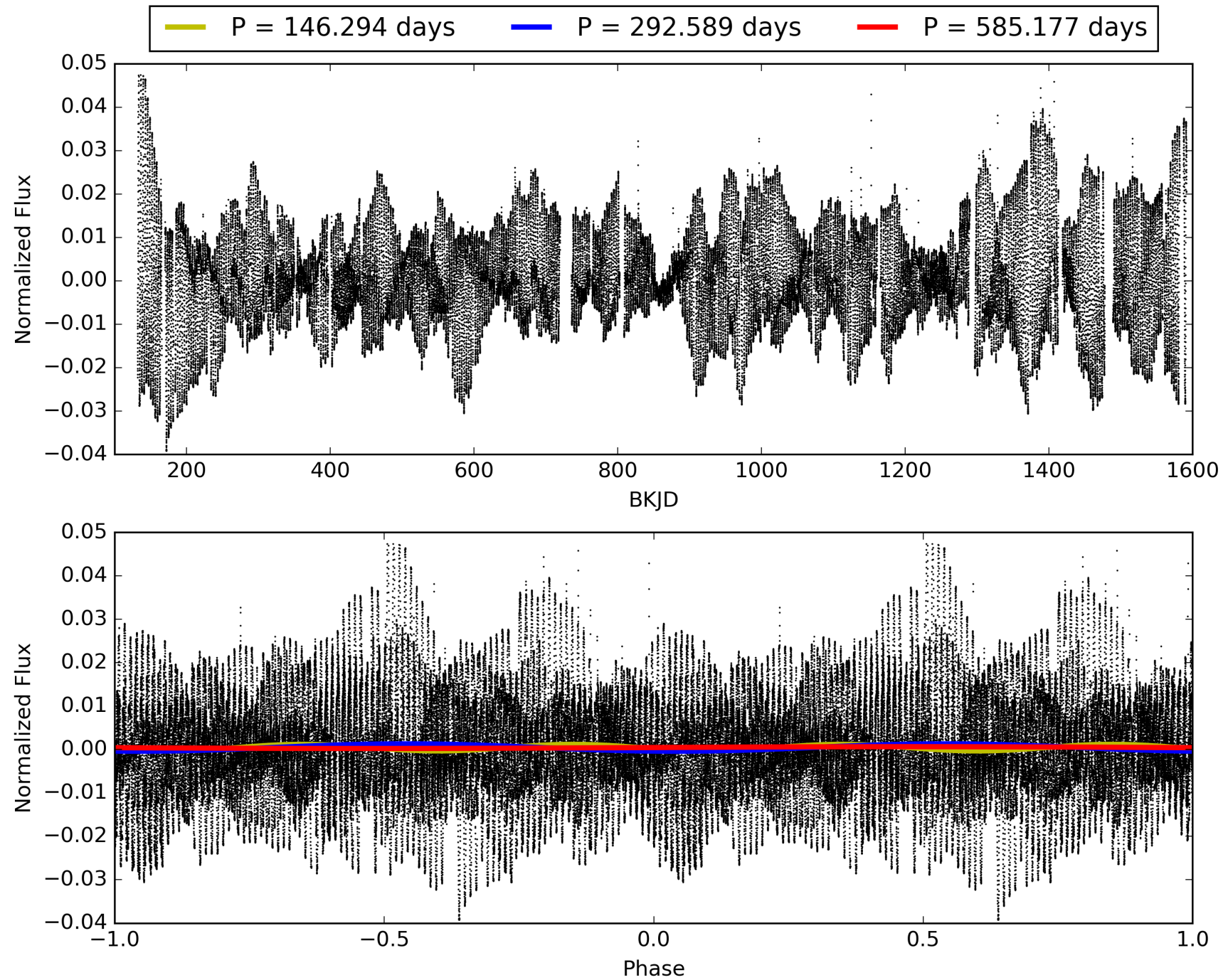
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 22:05:06 Z

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

# TCE 009653110-01, PDC Light Curves



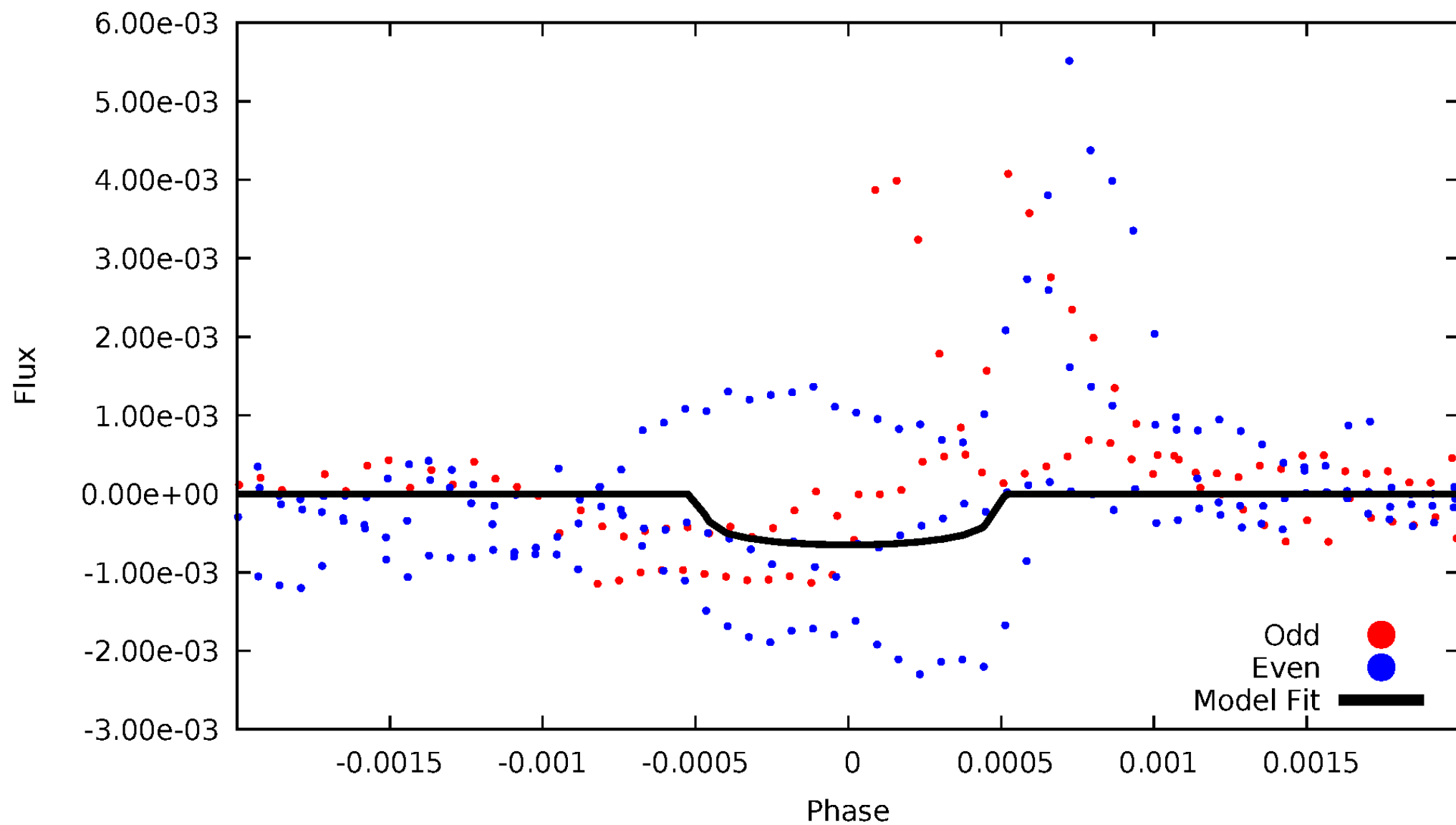
TCE 009653110-01





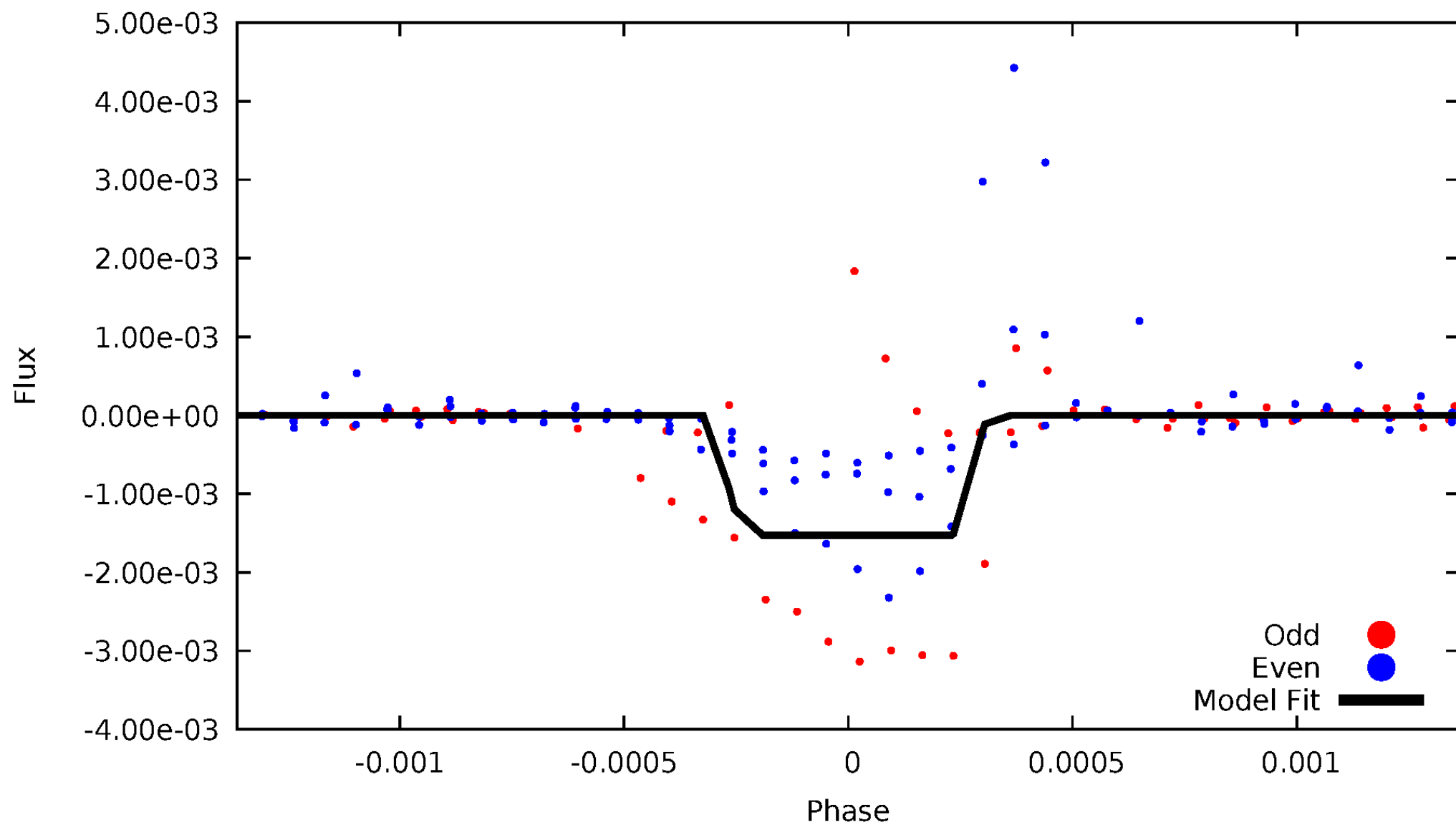
# DV Odd/Even

TCE 009653110-01



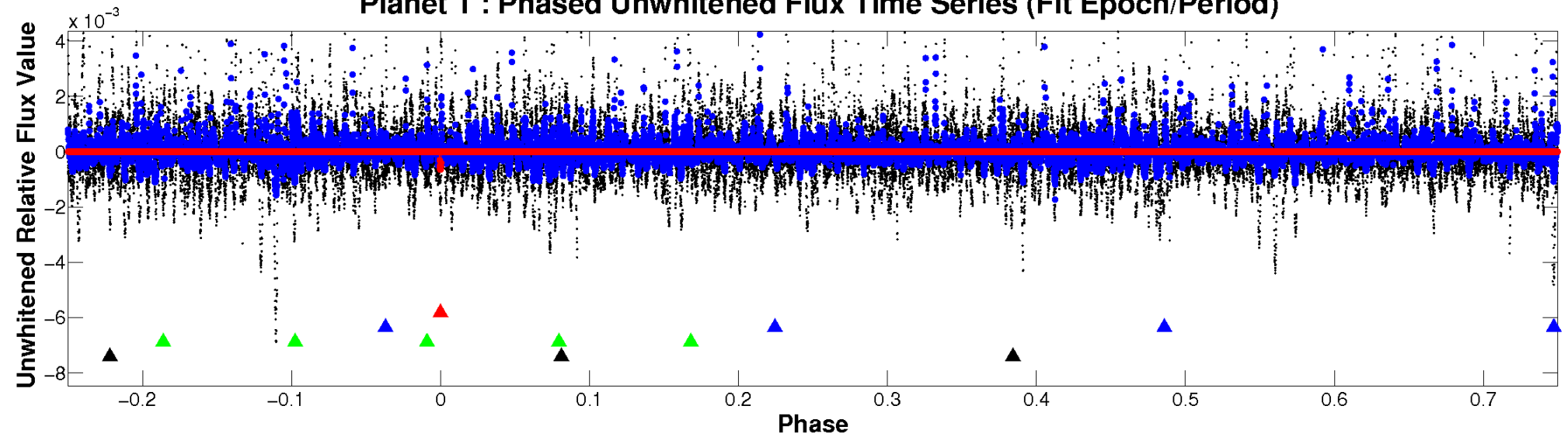
# ALT Odd/Even

TCE 009653110-01

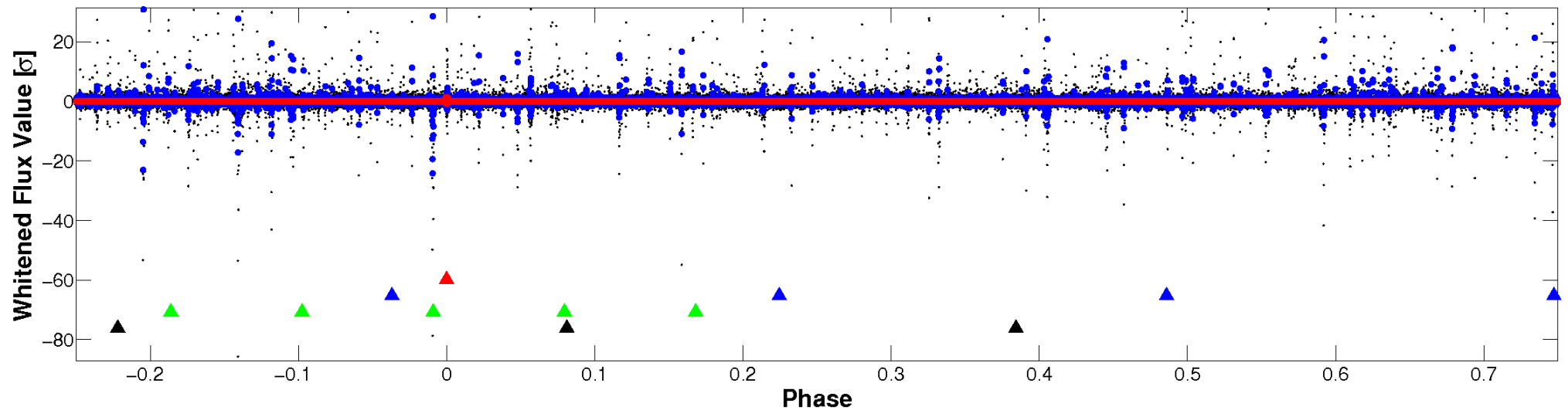


# Non-Whitened Vs. Whitened Light Curve

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

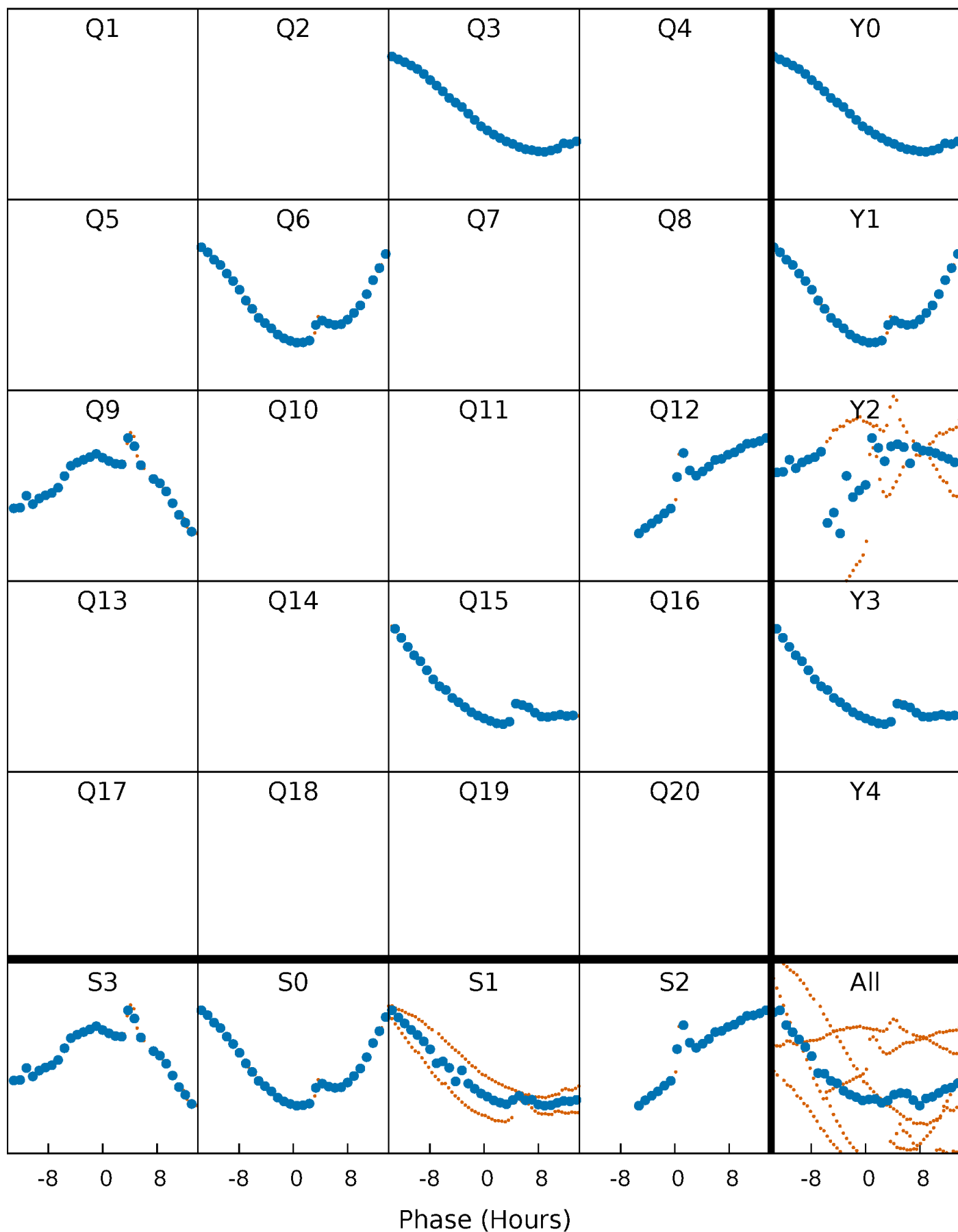


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

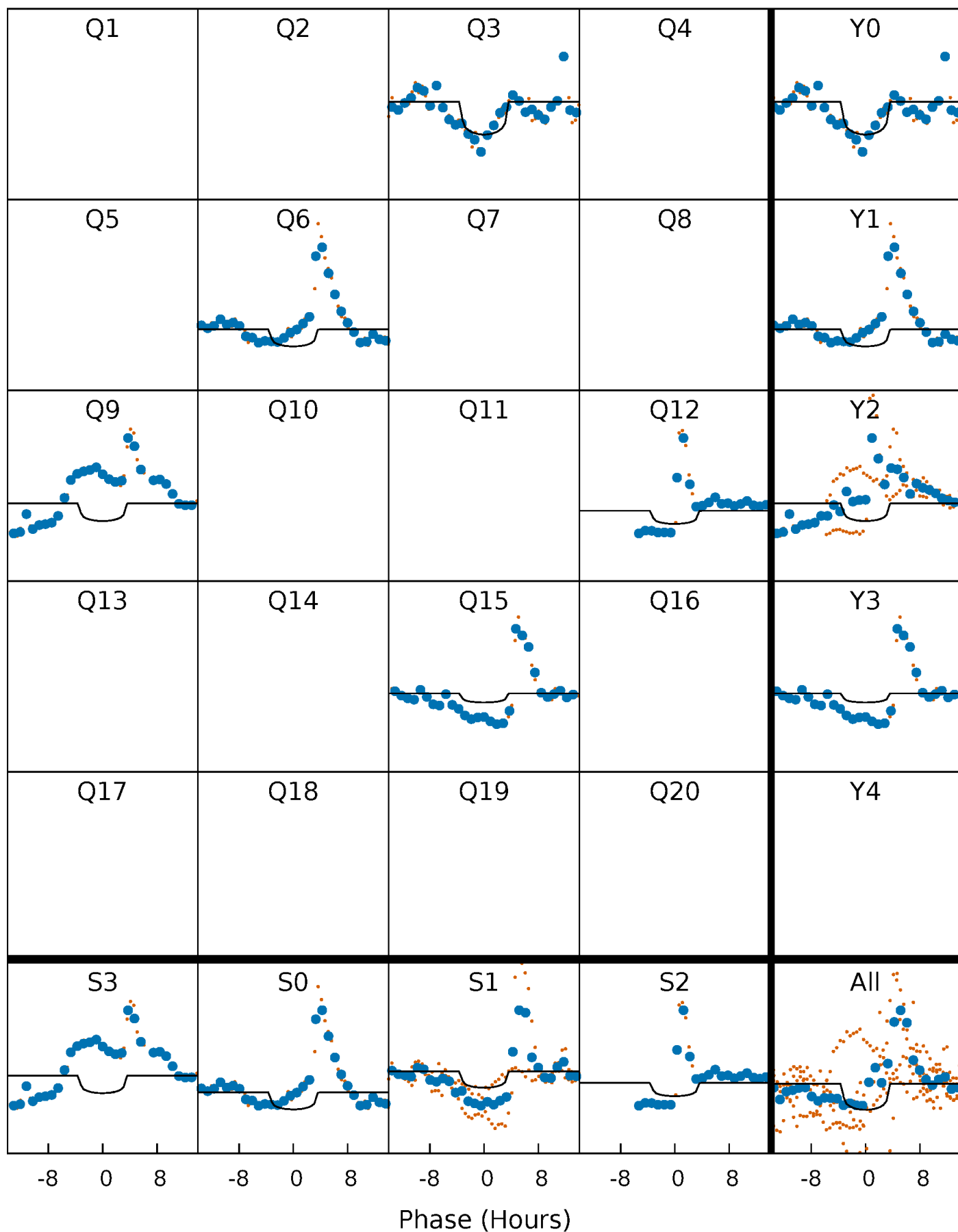
TCE 009653110-01 P=292.588604 Days  $T_0=277.400199$  (BKJD)





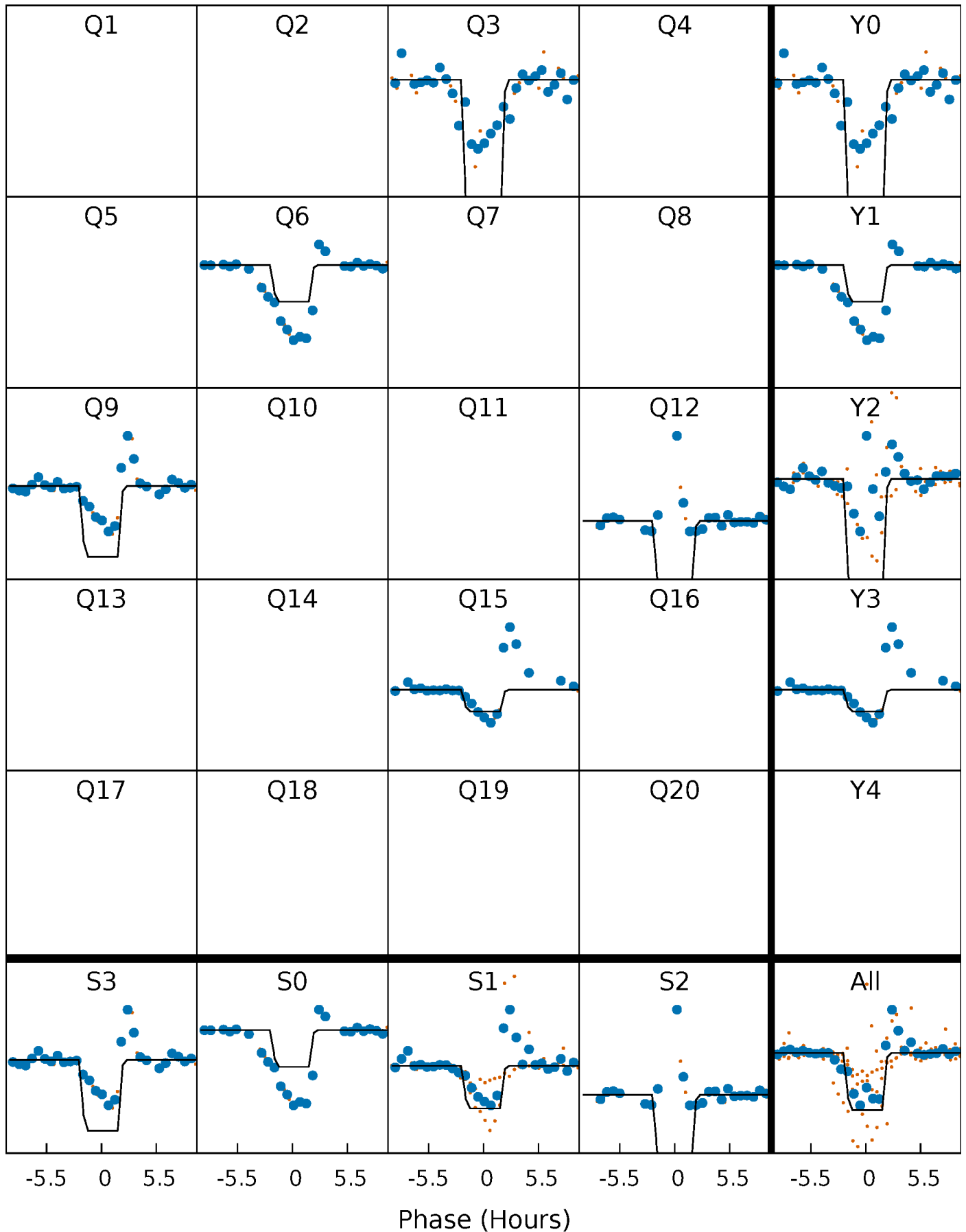
# DV Quarter-Phased Transit Curves

TCE 009653110-01 P=292.588604 Days  $T_0=277.400199$  (BKJD)



### Alt. Detrend Quarter-Phased Transit Curves

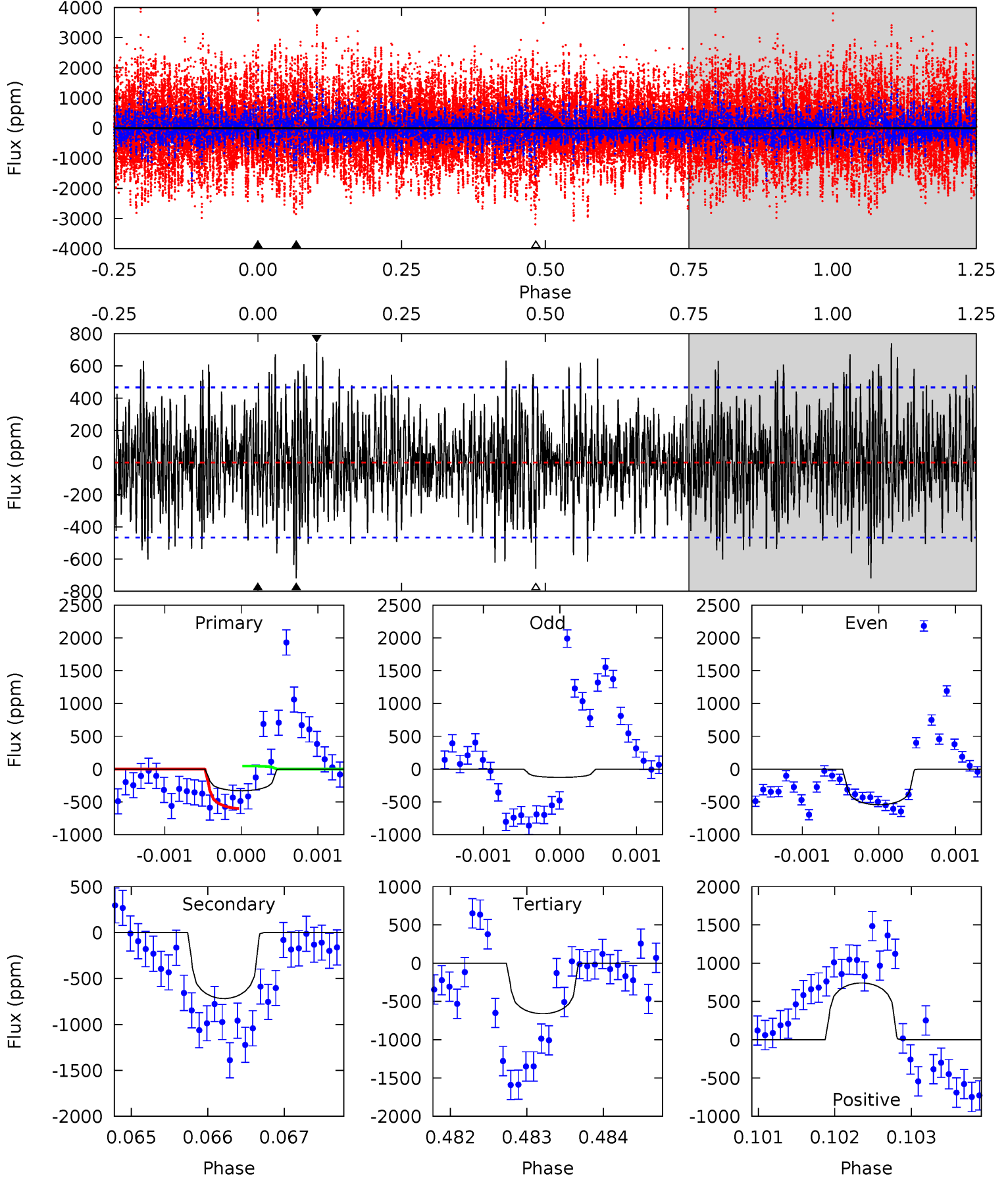
TCE 009653110-01 P=292.608579 Days  $T_0=277.423514$  (BKJD)



# DV Model-Shift Uniqueness Test

009653110-01, P = 292.588604 Days, E = 277.400199 Days

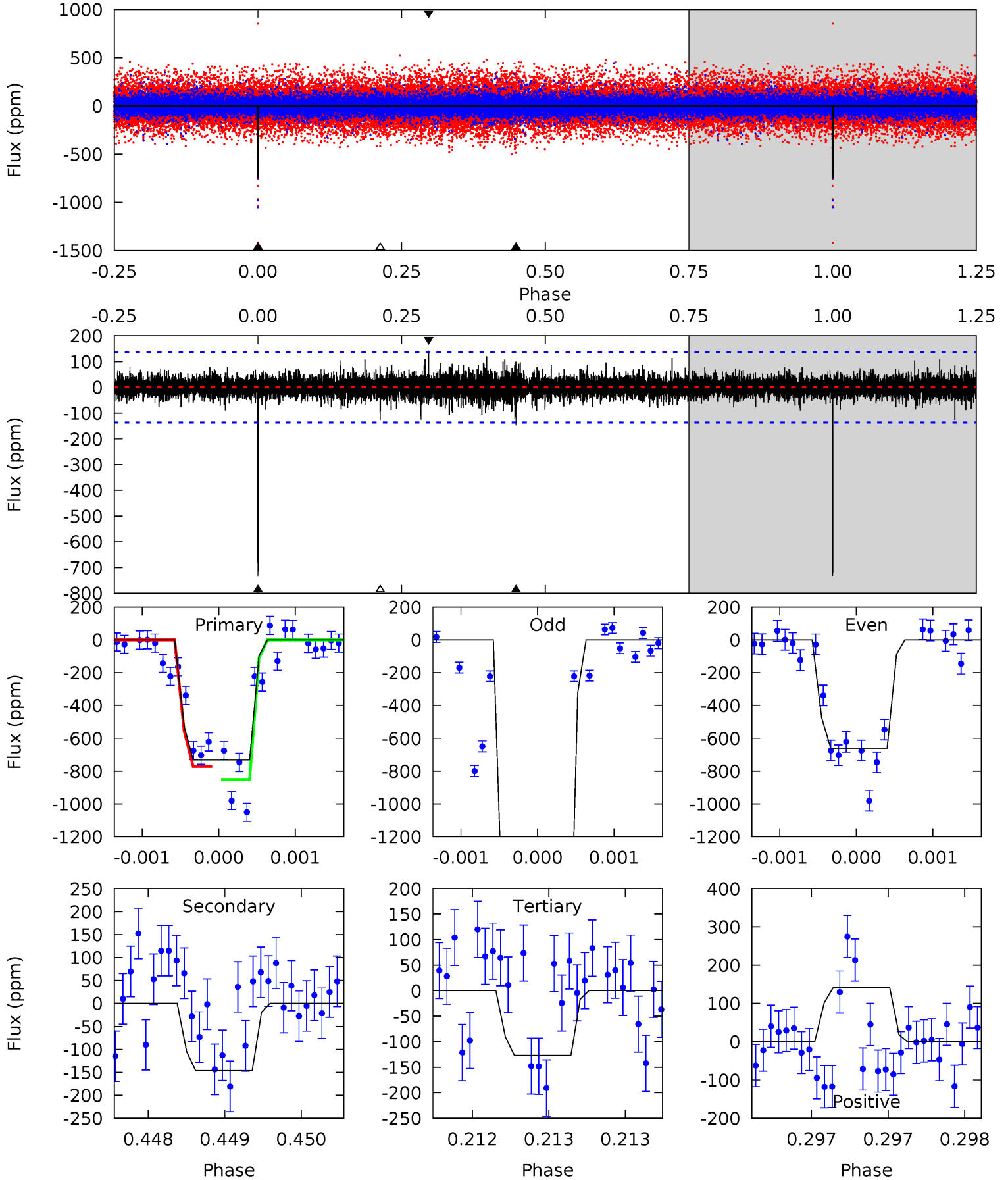
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
3.84	8.36	7.68	8.63	5.43	3.26	2.40	-3.84	-4.79	0.68	-0.27	2.25	-11.4	0.51	3.23



# Alt Model-Shift Uniqueness Test

009653110-01, P = 292.608579 Days, E = 277.423514 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
29.7	5.94	5.14	5.75	5.55	3.45	0.96	24.6	24.0	0.80	0.19	37.3	1.42	0.16	0





### Stellar Parameters For KIC 009653110

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5396^{+160}_{-144}$	$4.534^{+0.099}_{-0.081}$	$-0.600^{+0.350}_{-0.300}$	$0.748^{+0.097}_{-0.088}$	$0.696^{+0.097}_{-0.039}$	$2.347^{+1.043}_{-0.610}$
	+3%/-3%	+2%/-2%	+58%/-50%	+13%/-12%	+14%/-6%	+44%/-26%
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 009653110-01 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-718 \pm 86$	$1.97^{+0.88}_{-0.76}$	$329^{+14}_{-13}$	$5617^{+1754}_{-770}$	$60012^{+104745}_{-31394}$
Alt.	$-146 \pm 25$	$3.12^{+0.86}_{-0.83}$	$328^{+15}_{-14}$	$3498^{+370}_{-261}$	$4771^{+4115}_{-1828}$

$T_{max}$  = 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

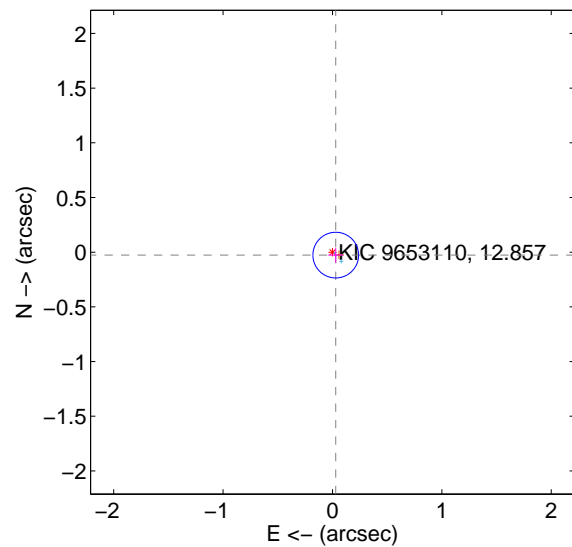
Supplemental centroid analysis for 009653110-01. Kepler magnitude: 12.86. Transit SNR 5.75

There are 3 quarters with good PRF difference image offsets

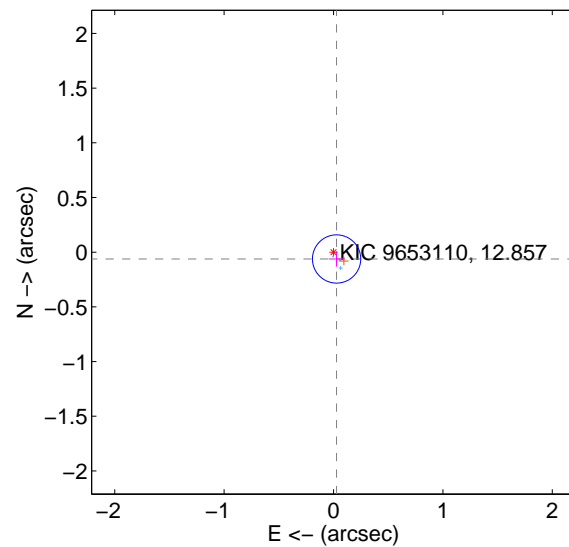
The direct PRF centroid is offset from the target star catalog position by about 0.03 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.040 \pm 0.070$	0.58	$-0.030 \pm 0.068$	$-0.027 \pm 0.069$
PRF-fit source offset from KIC position	$0.068 \pm 0.074$	0.93	$-0.028 \pm 0.071$	$-0.062 \pm 0.071$
photometric centroid source offset	$0.69 \pm 0.38$	1.81	$-0.22 \pm 0.44$	$-0.66 \pm 0.38$

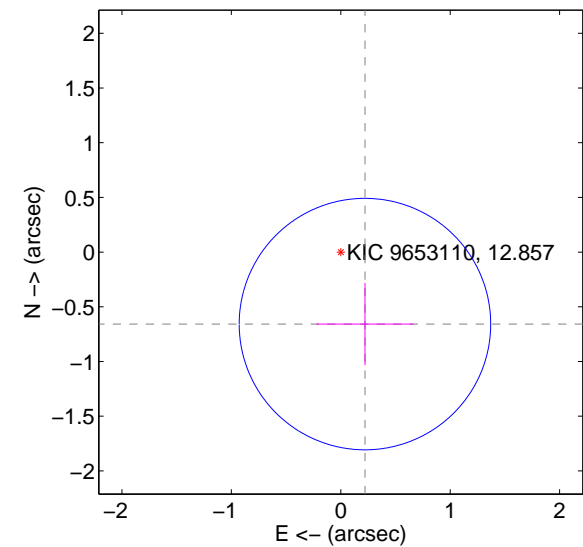
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position



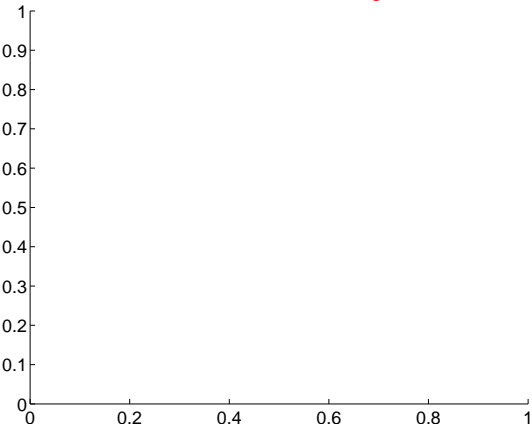
offset from photometric centroids



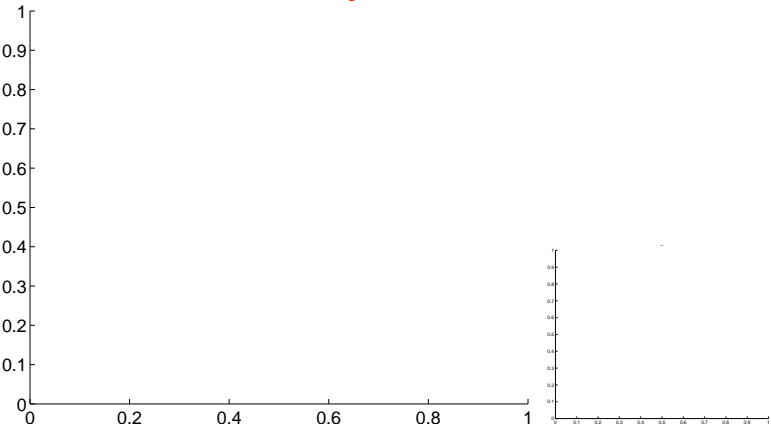
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

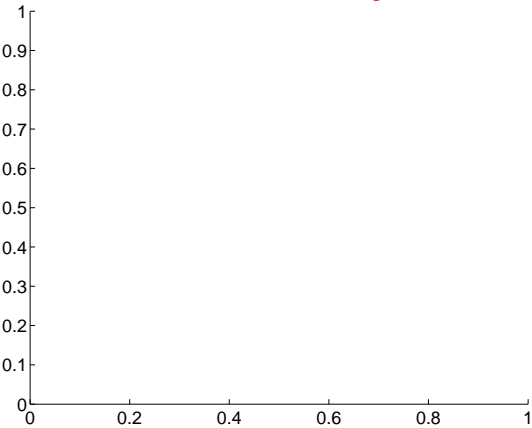
Q1 no difference image



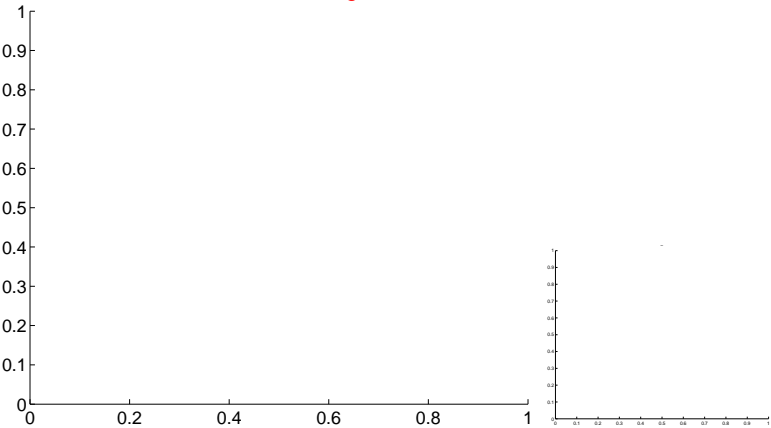
Q1 no OOT image



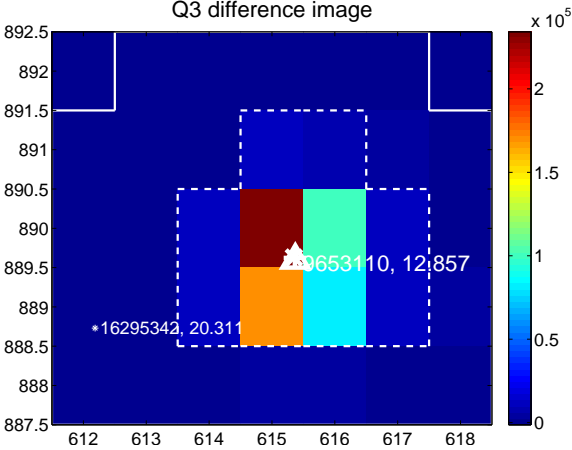
Q2 no difference image



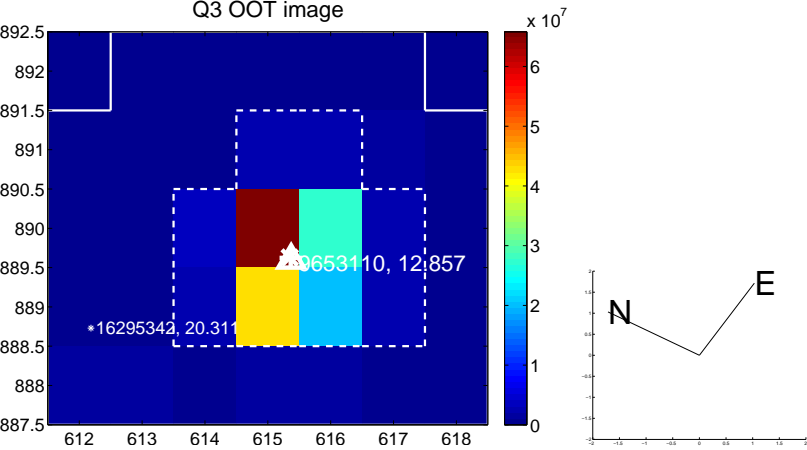
Q2 no OOT image



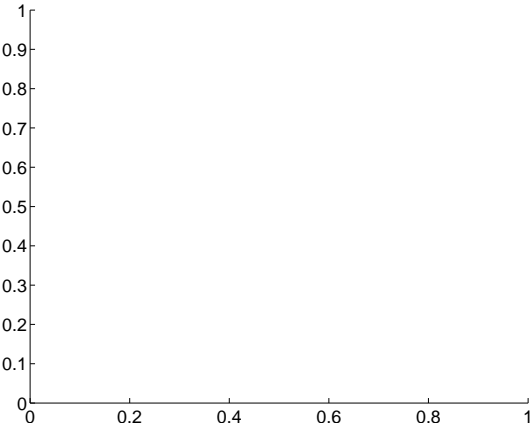
Q3 difference image



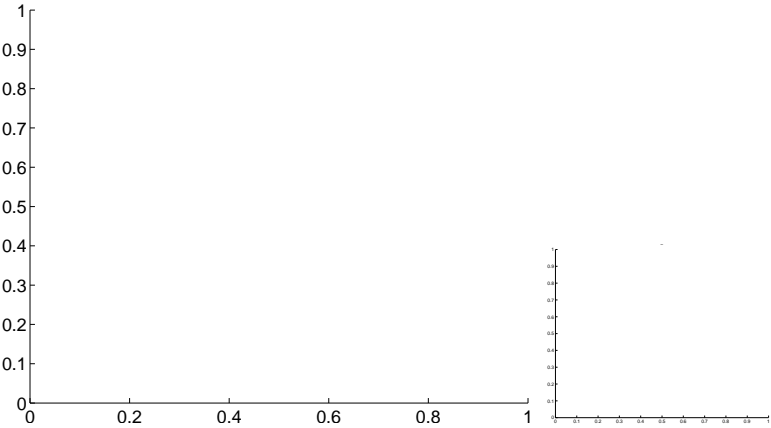
Q3 OOT image



Q4 no difference image

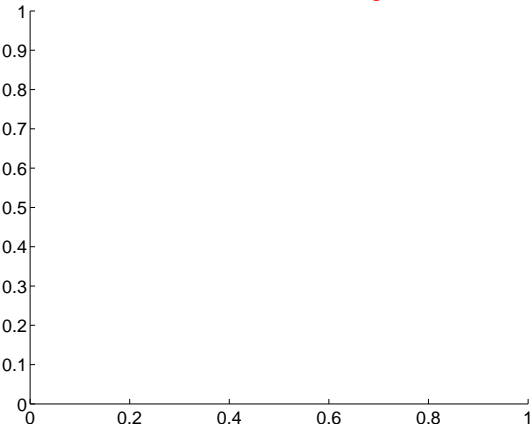


Q4 no OOT image

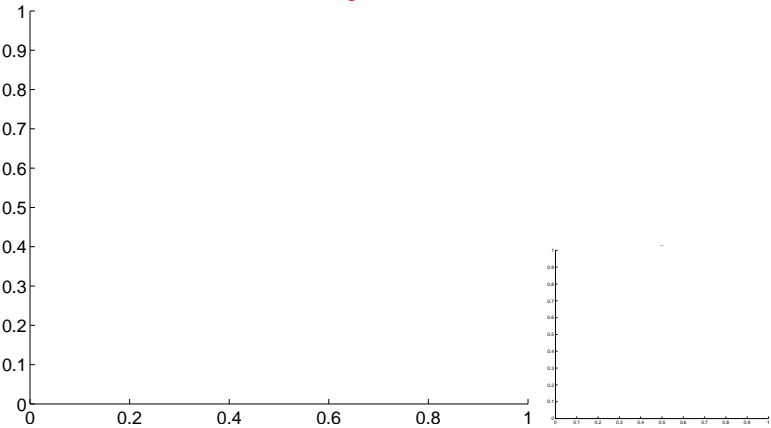


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

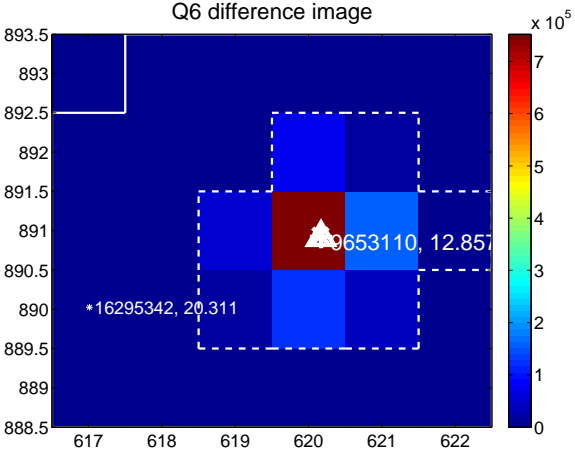
Q5 no difference image



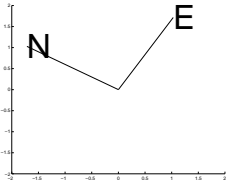
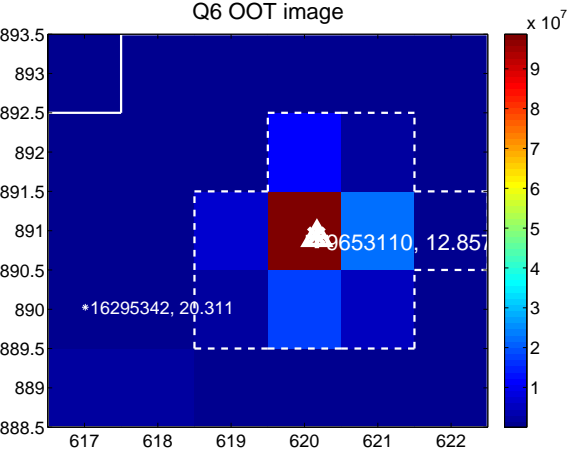
Q5 no OOT image



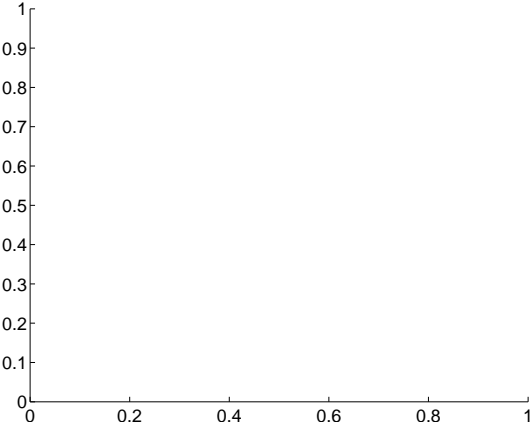
Q6 difference image



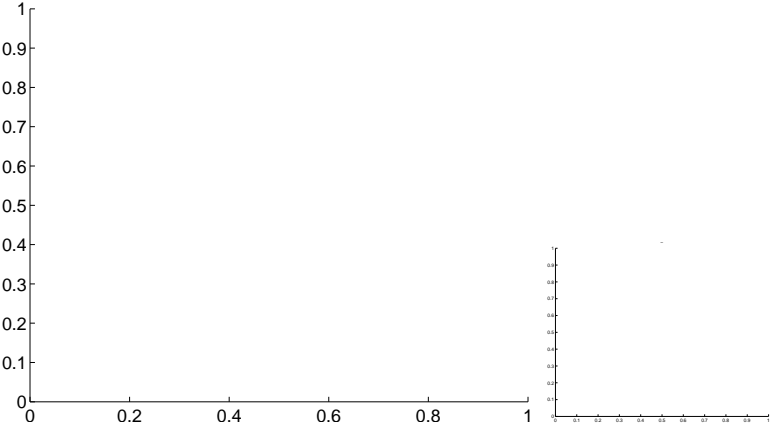
Q6 OOT image



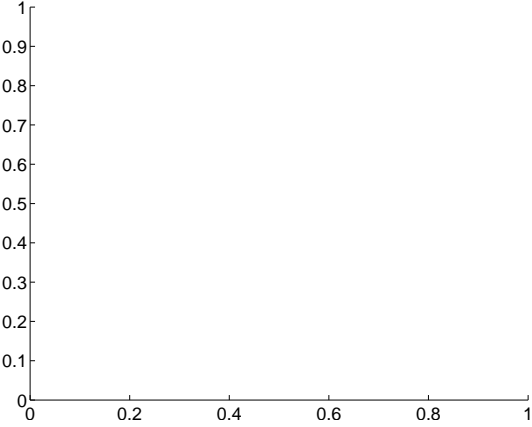
Q7 no difference image



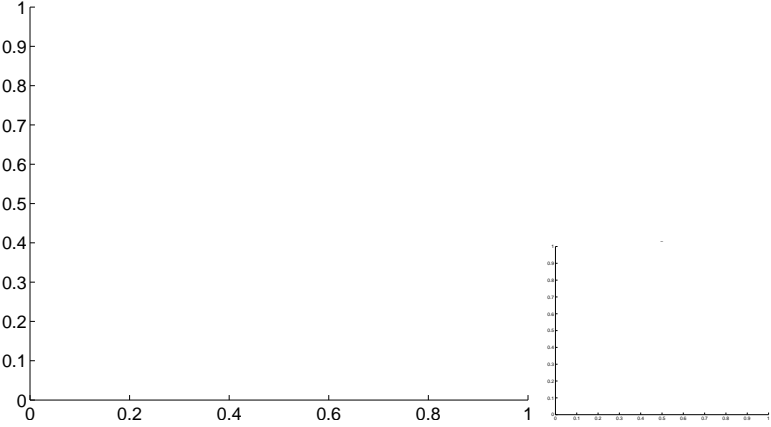
Q7 no OOT image



Q8 no difference image

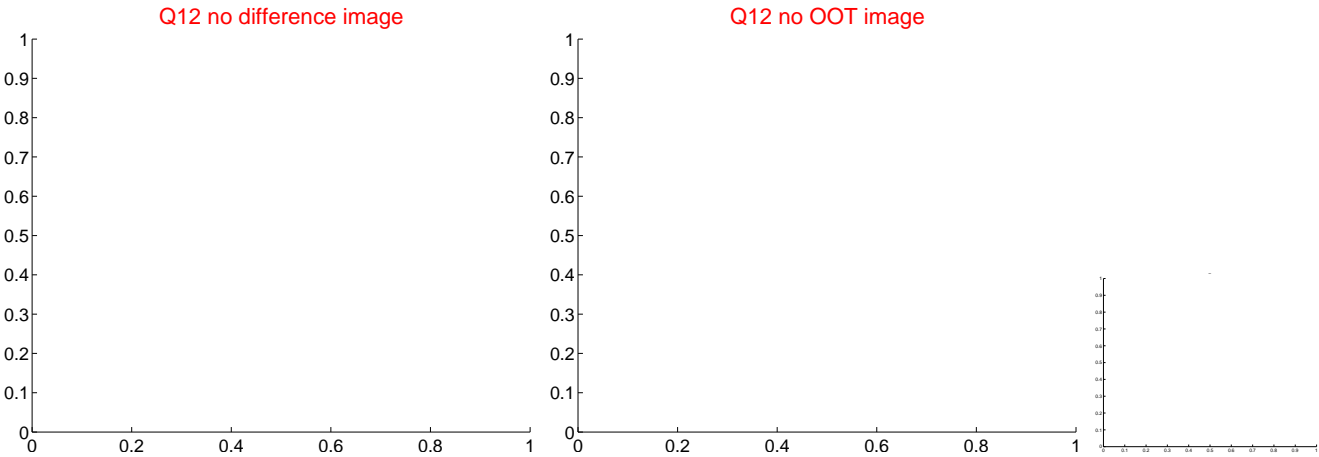
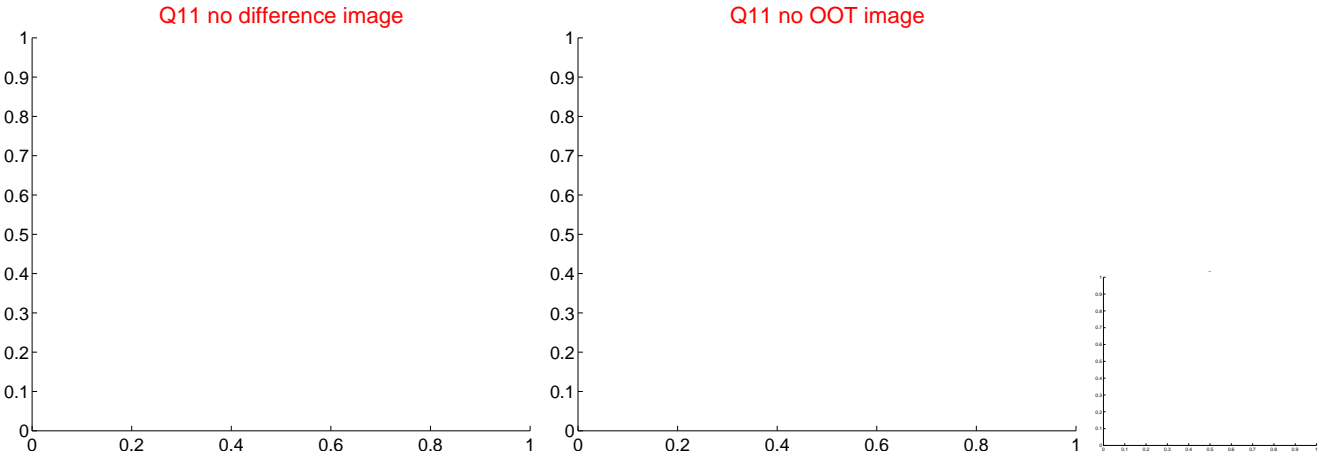
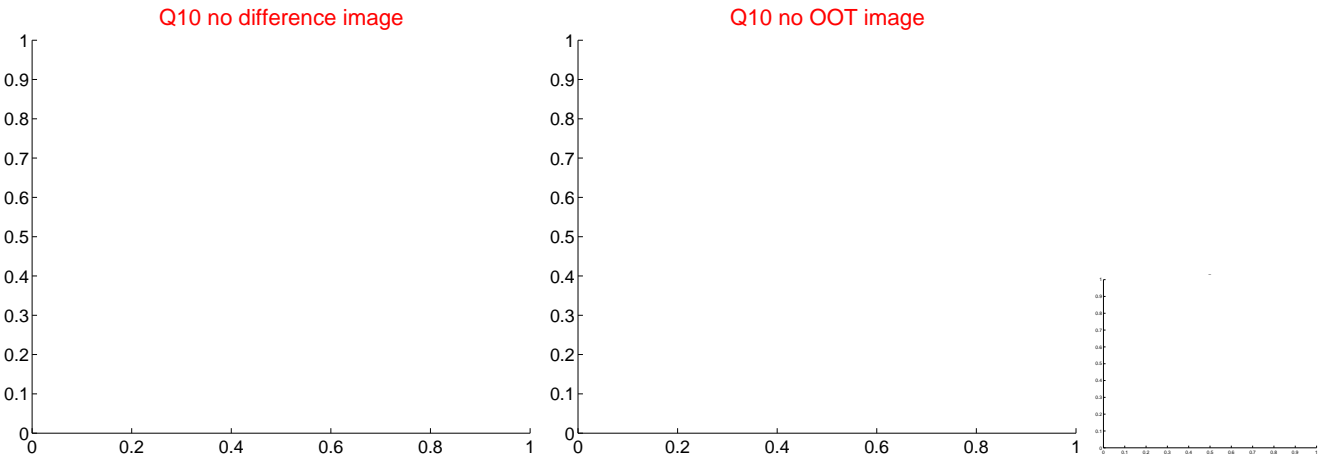
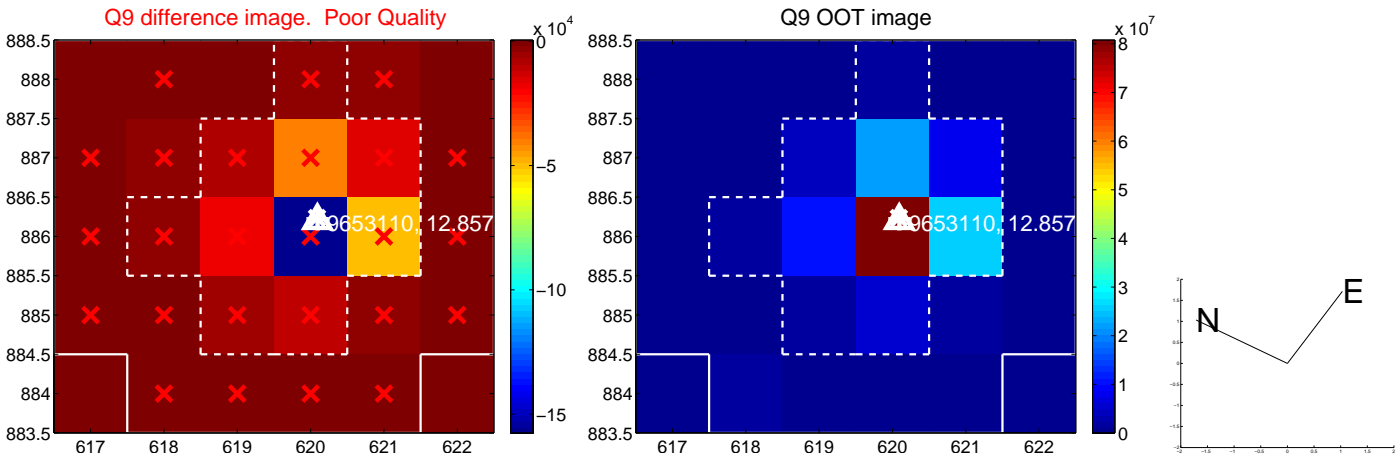


Q8 no OOT image



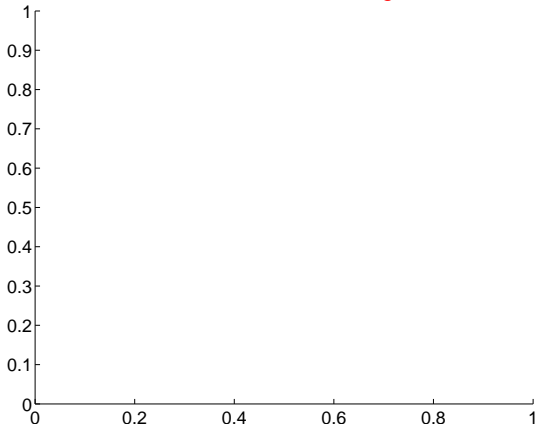


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

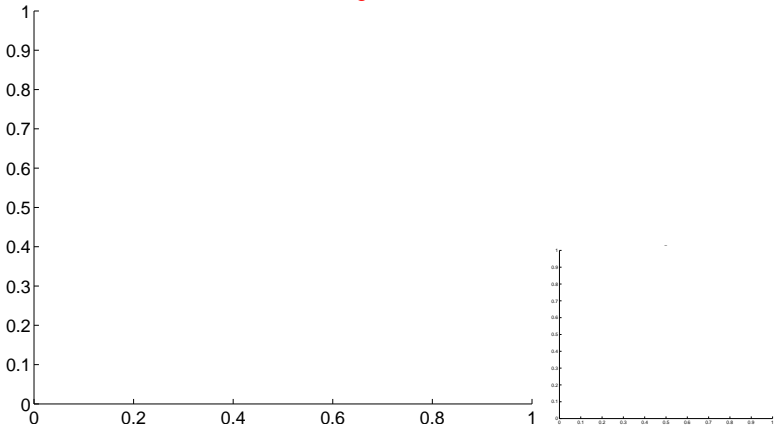


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

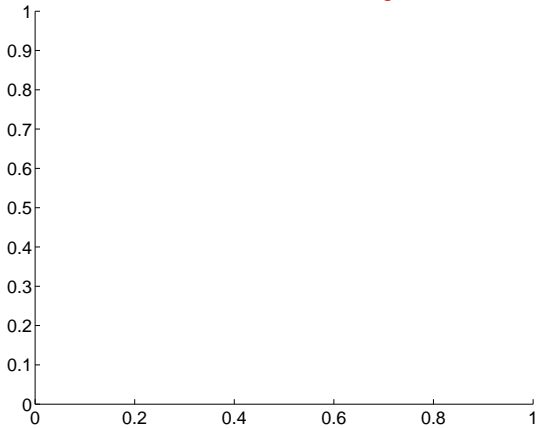
Q13 no difference image



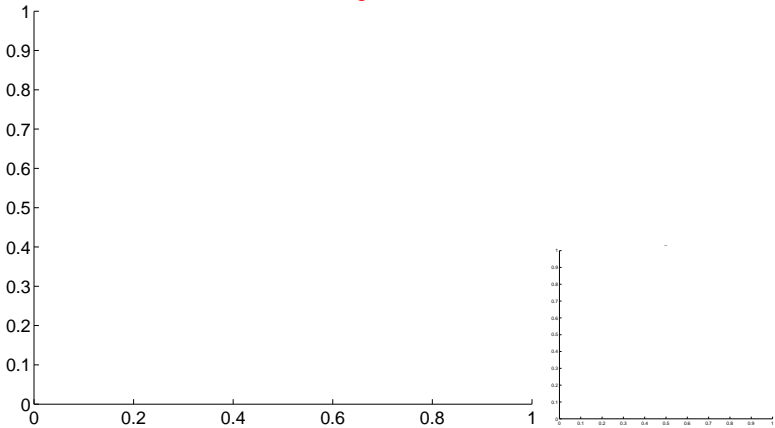
Q13 no OOT image



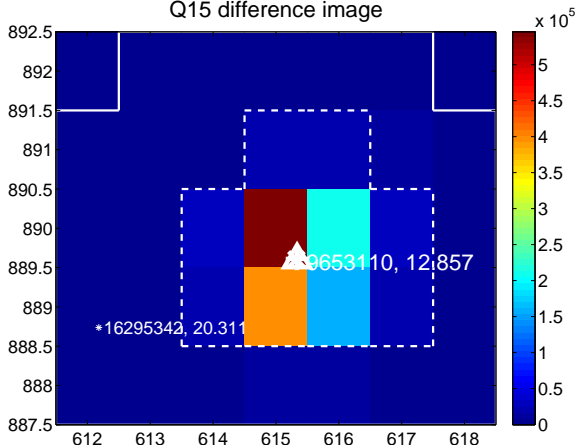
Q14 no difference image



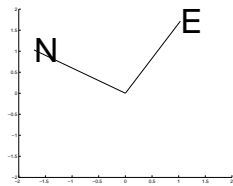
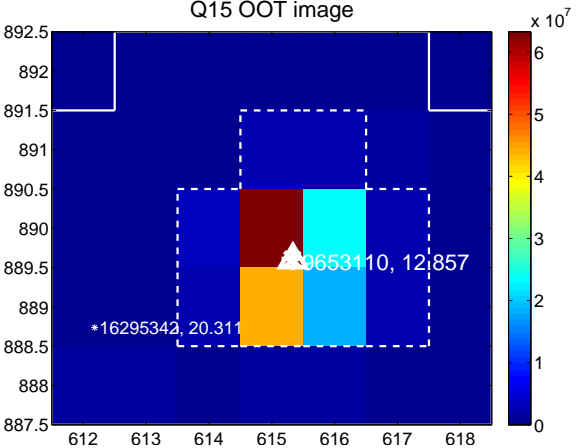
Q14 no OOT image



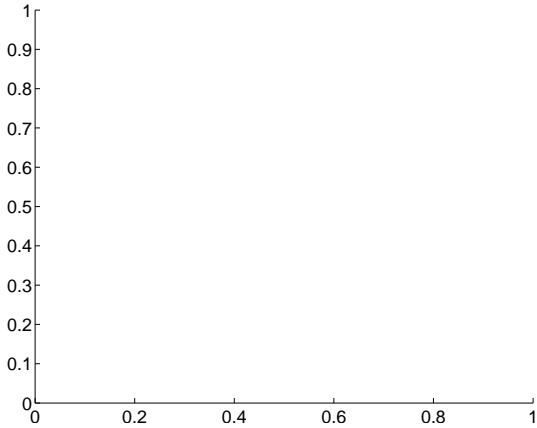
Q15 difference image



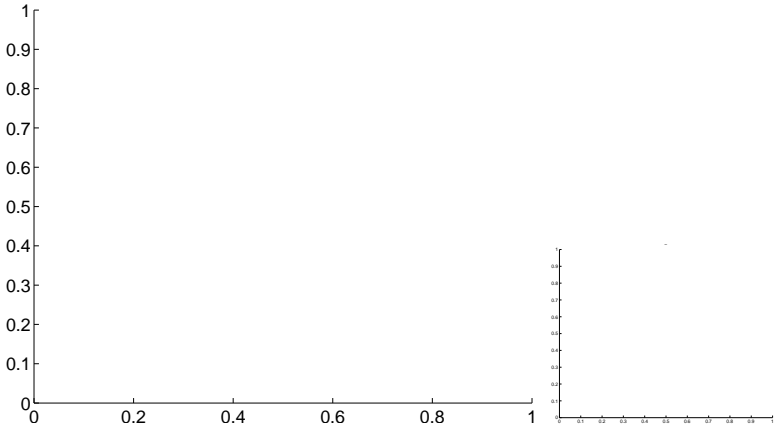
Q15 OOT image



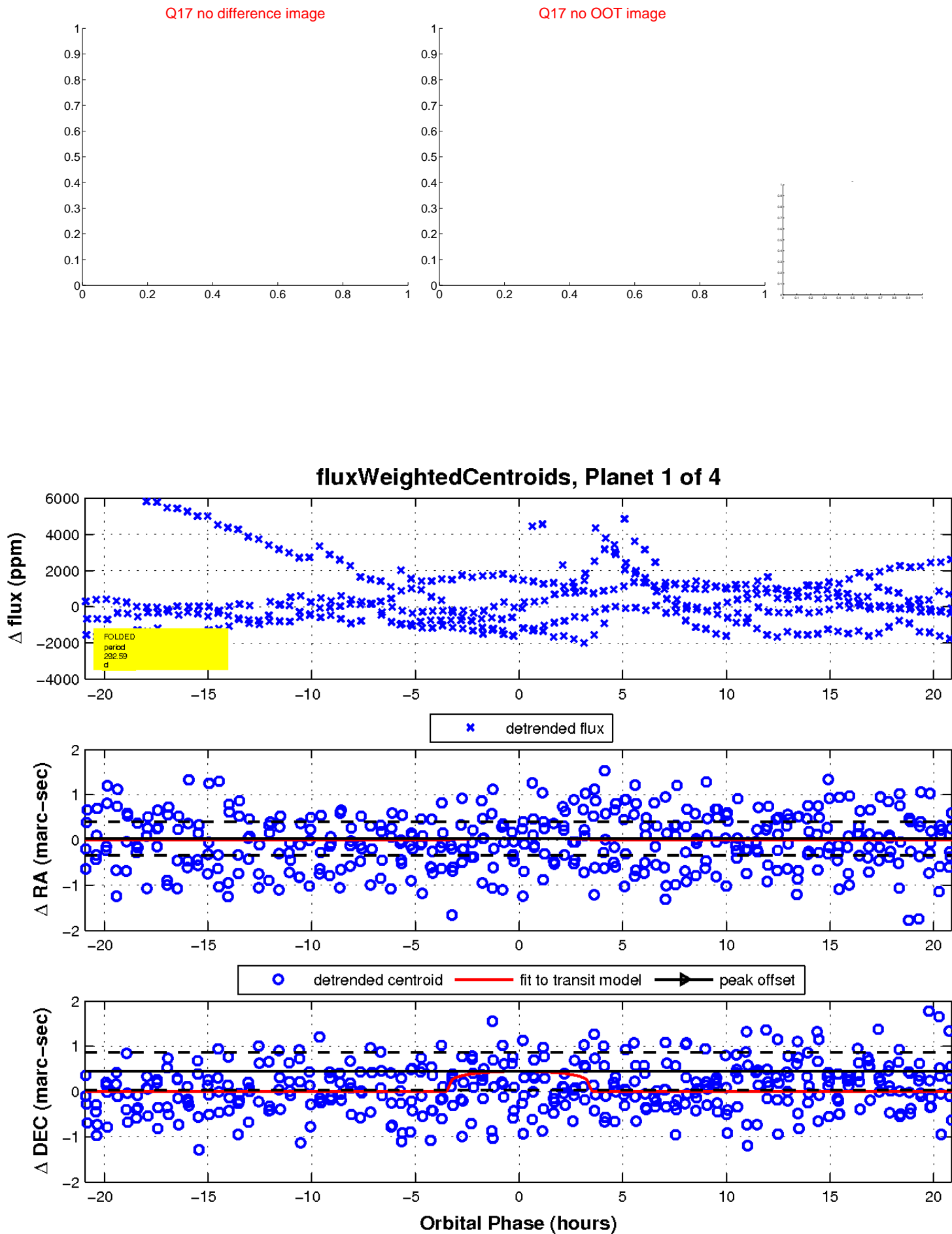
Q16 no difference image



Q16 no OOT image

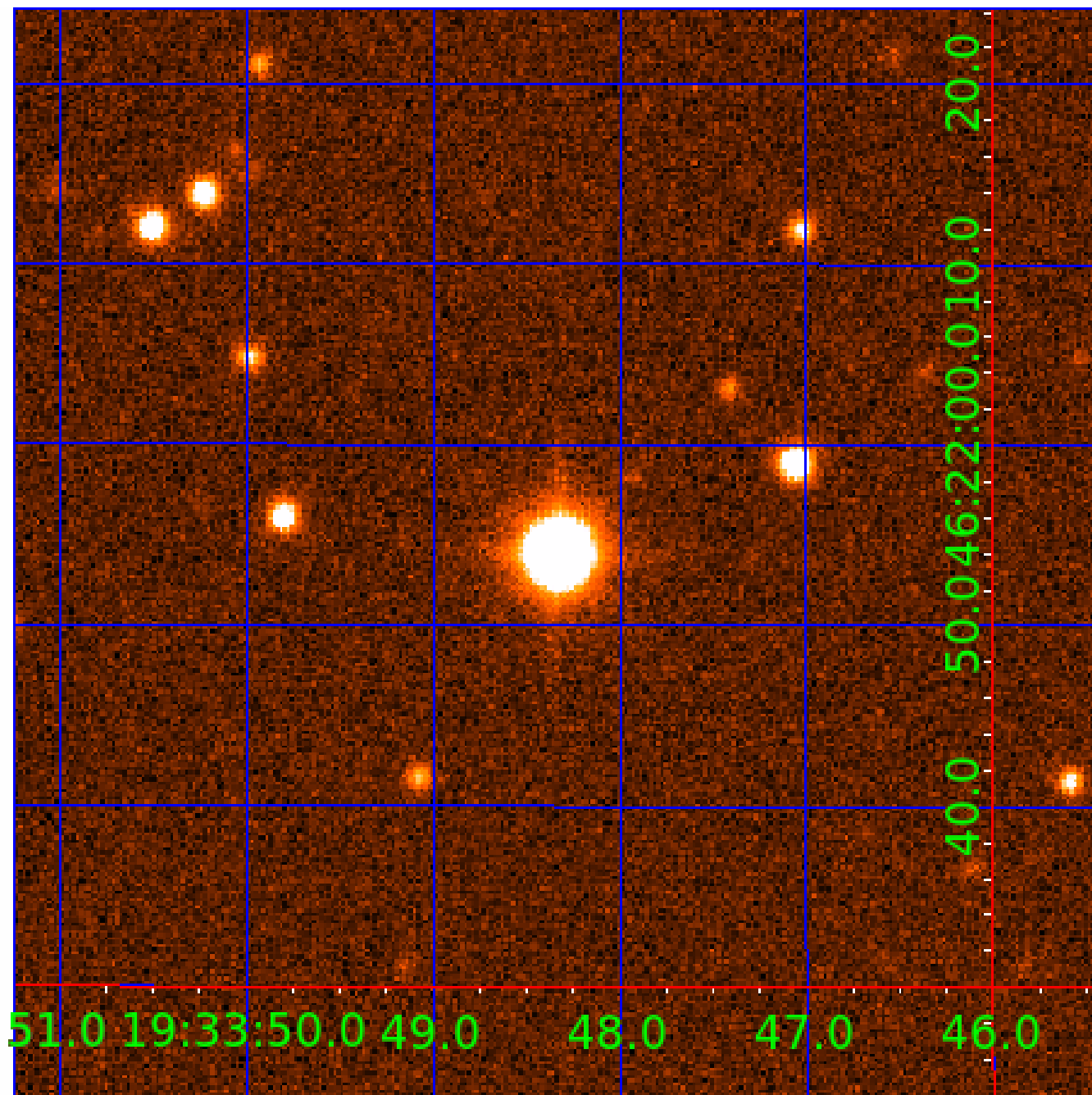


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 009653110

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009653110-01	OBS	No	292.588605	277.400199	652.2	7.016	20.3	5.8	0.75	5396	1.98	0.73
009653110-02	OBS	No	369.069568	266.609746	920.6	1.557	16.9	9.0	0.75	5396	2.31	0.53
009653110-03	OBS	No	266.685084	326.565628	1495.7	6.032	17.8	11.9	0.75	5396	3.70	0.82
009653110-04	OBS	No	496.497894	389.828814	1524.4	6.663	15.5	8.5	0.75	5396	3.53	0.36

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009653110-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_ZUMA—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV
009653110-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_POS_DV
009653110-03	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
009653110-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—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.

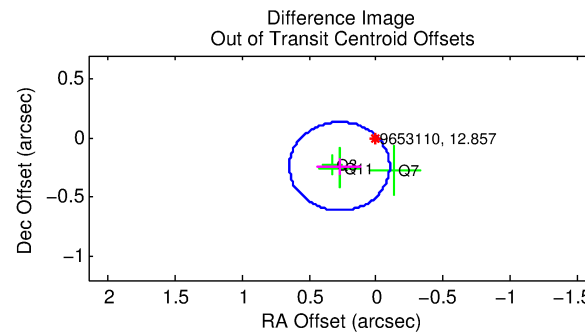
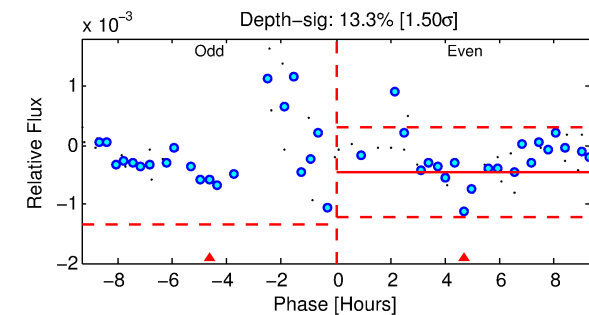
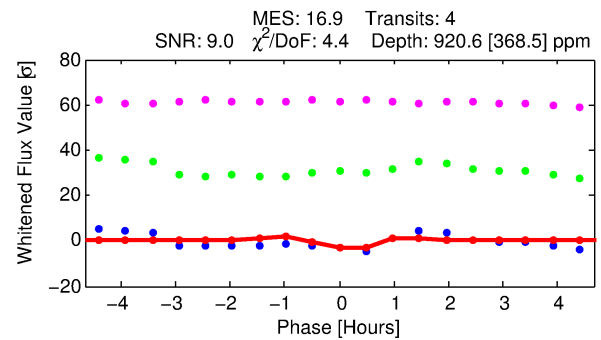
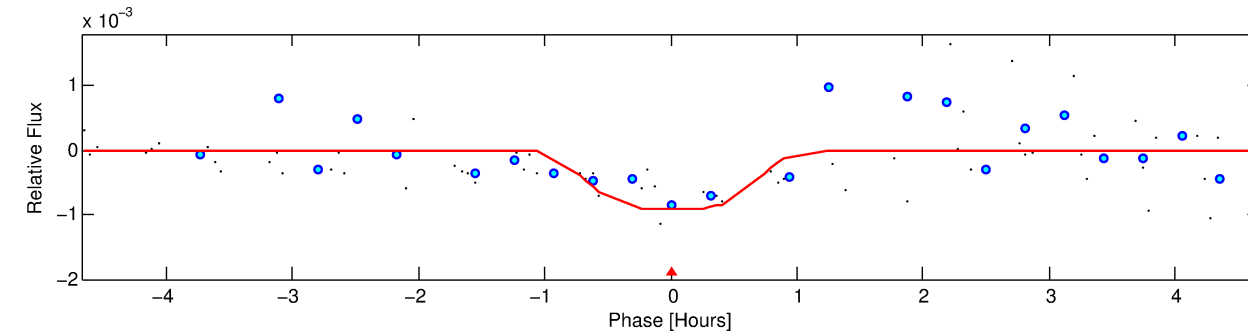
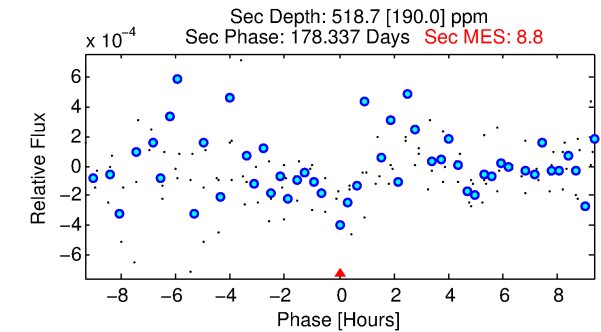
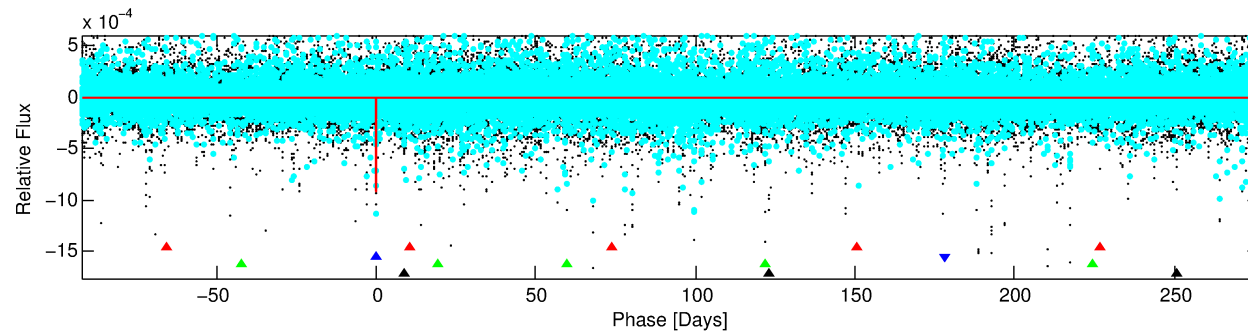
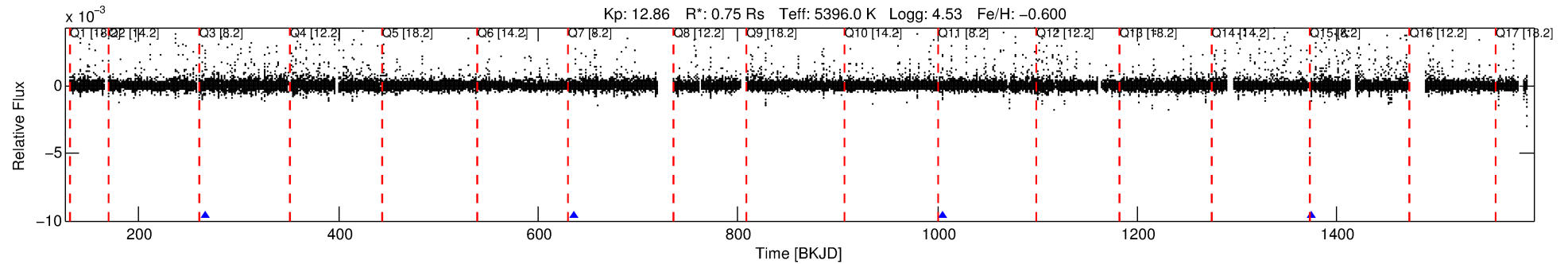
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009653110-02

No Significant Match Found

# DV One-Page Summary

KIC: 9653110 Candidate: 2 of 4 Period: 369.070 d



## DV Fit Results:

Period = 369.06957 [0.00666] d  
Epoch = 266.6097 [0.0106] BKJD  
Rp/R\* = 0.0284 [0.1575]  
a/R\* = 1666.00 [39054.33]  
b = 0.46 [41.01]  
Seff = 0.53 [0.11]  
Teq = 218 [12] K  
Rp = 2.32 [12.86] Re  
a = 0.8934 [0.1028] AU  
Ag = 42482.43 [472040.77] [0.09 $\sigma$ ]  
Teffp = 4835 [13430] K [0.34 $\sigma$ ]

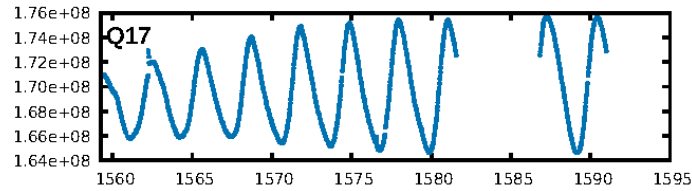
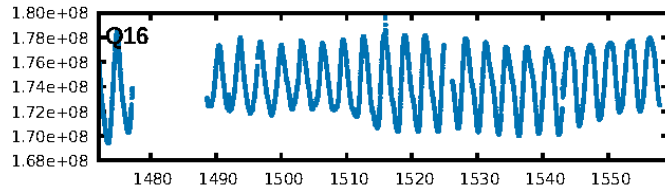
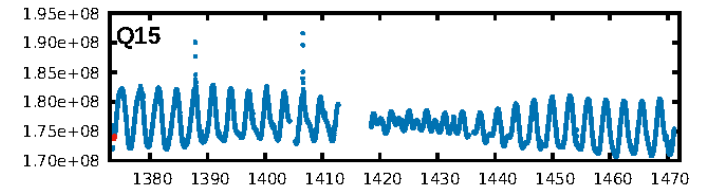
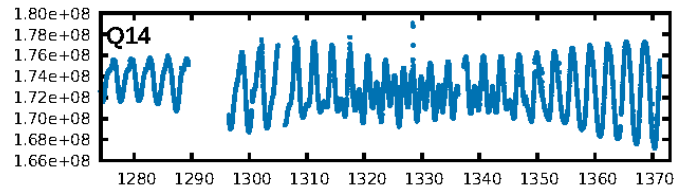
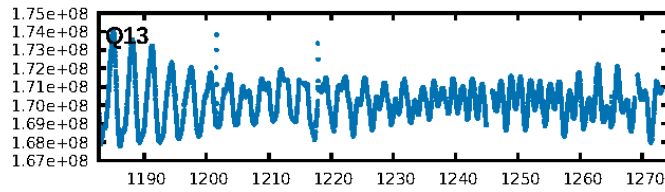
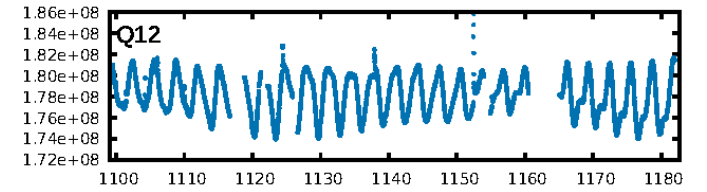
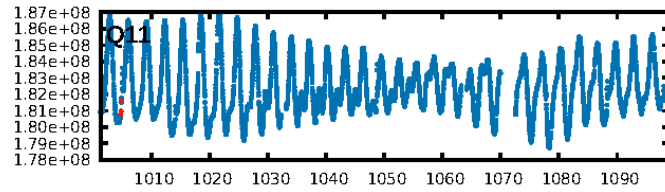
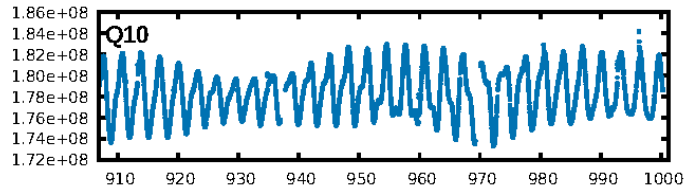
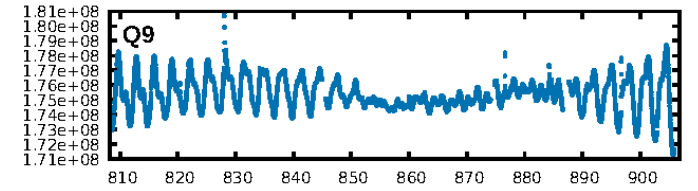
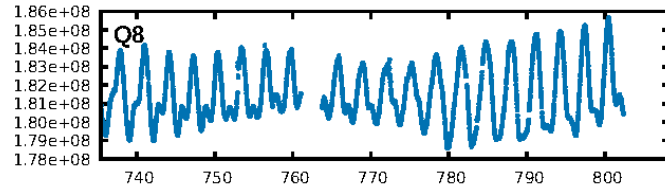
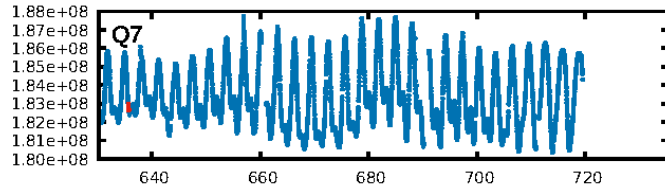
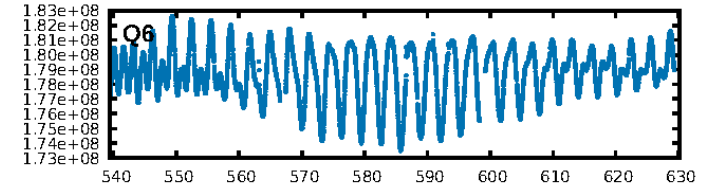
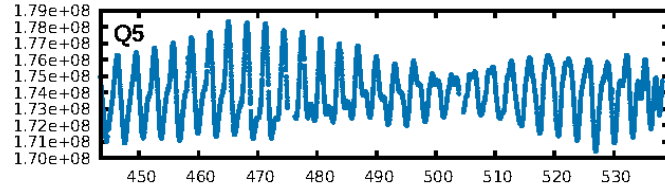
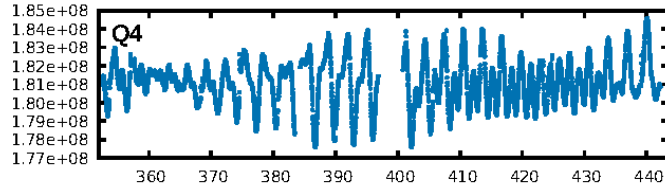
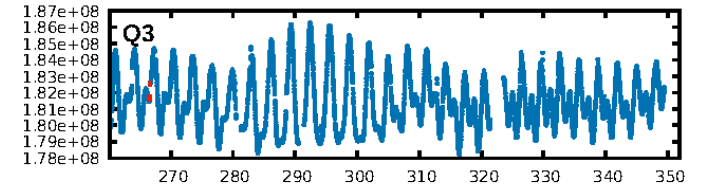
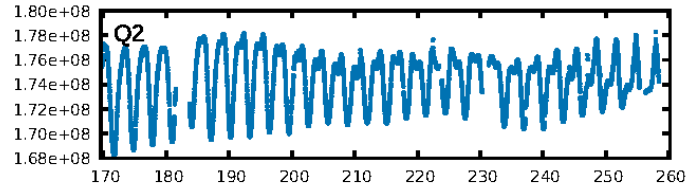
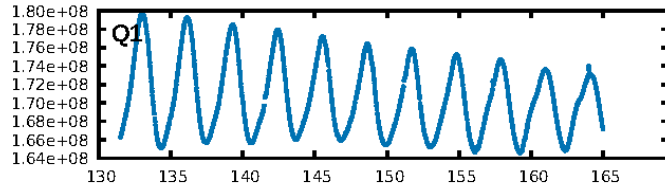
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [255.41 $\sigma$ ]  
LongPeriod-sig: 100.0% [446.94 $\sigma$ ]  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 0.1%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: -0.9228  
Centroid-sig: 83.0%  
Centroid-so: 0.064 arcsec [0.12 $\sigma$ ]  
OotOffset-rm: 0.363 arcsec [2.91 $\sigma$ ]  
OotOffset-st: 0/3/0/0 [3]  
KicOffset-rm: 0.433 arcsec [3.79 $\sigma$ ]  
KicOffset-st: 0/3/0/0 [3]  
DiffImageQuality-fgm: 1.00 [3/3]  
DiffImageOverlap-fno: 1.00 [3/3]

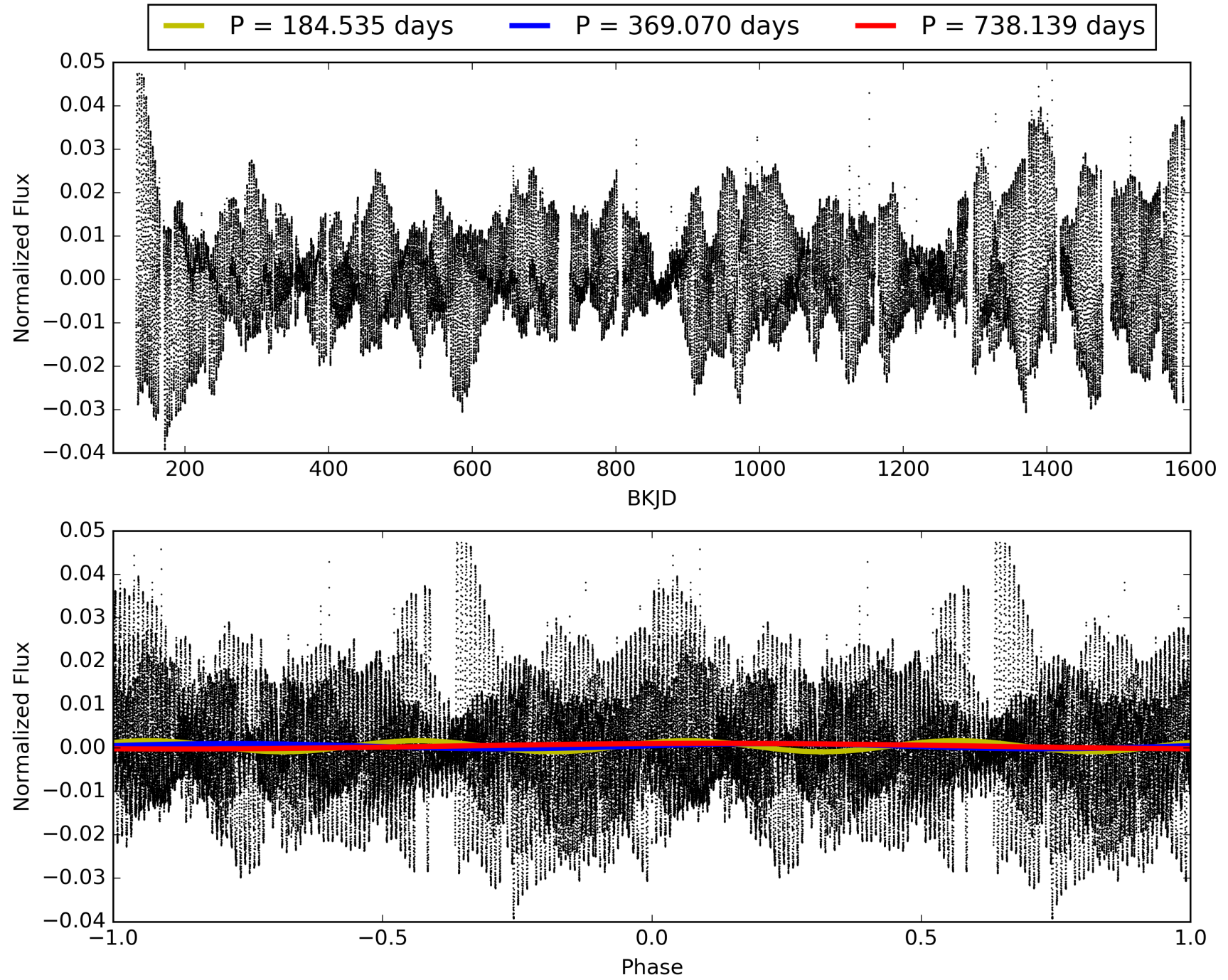
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 22:05:35 Z

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

# TCE 009653110-02, PDC Light Curves

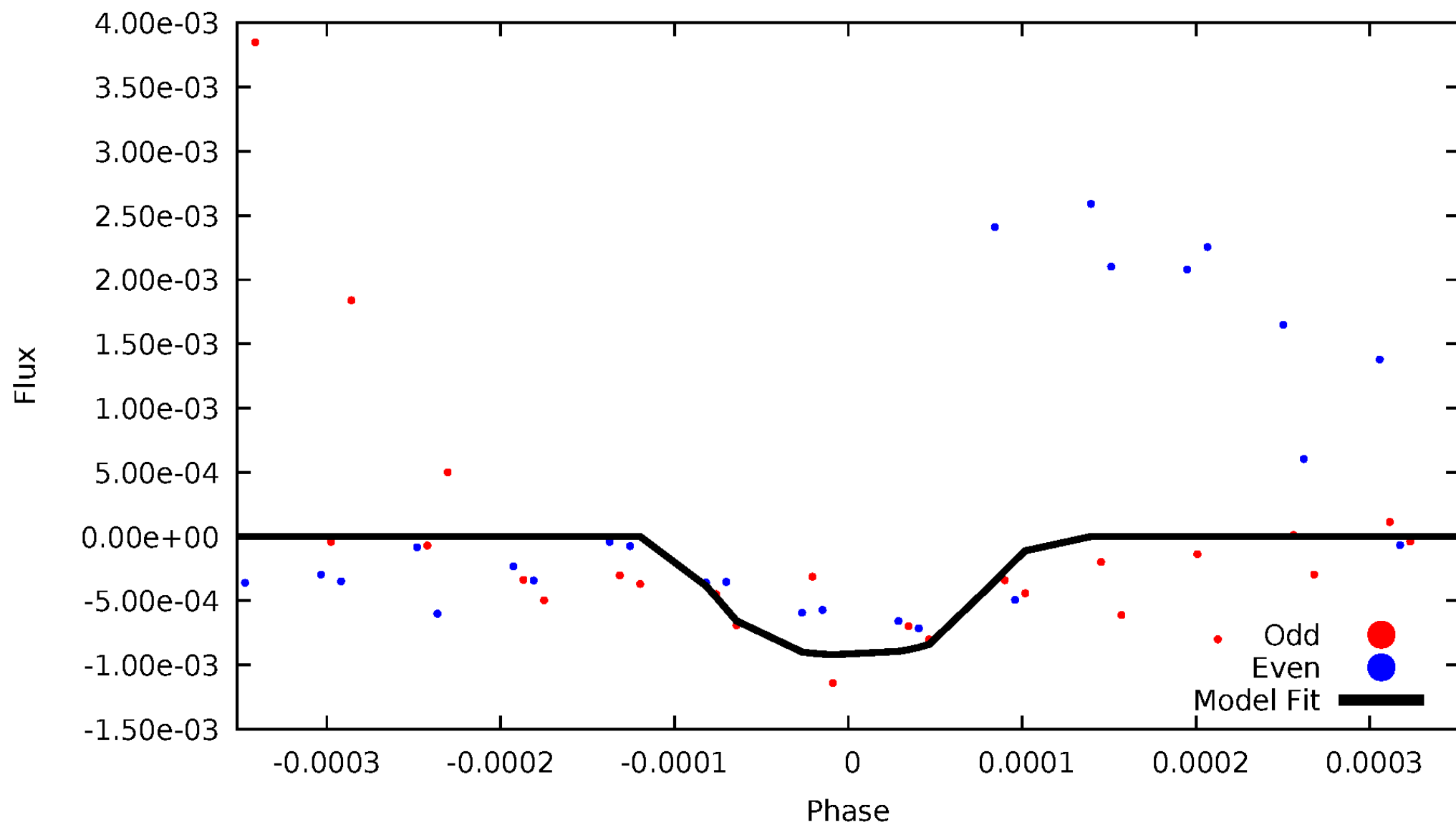


# TCE 009653110-02



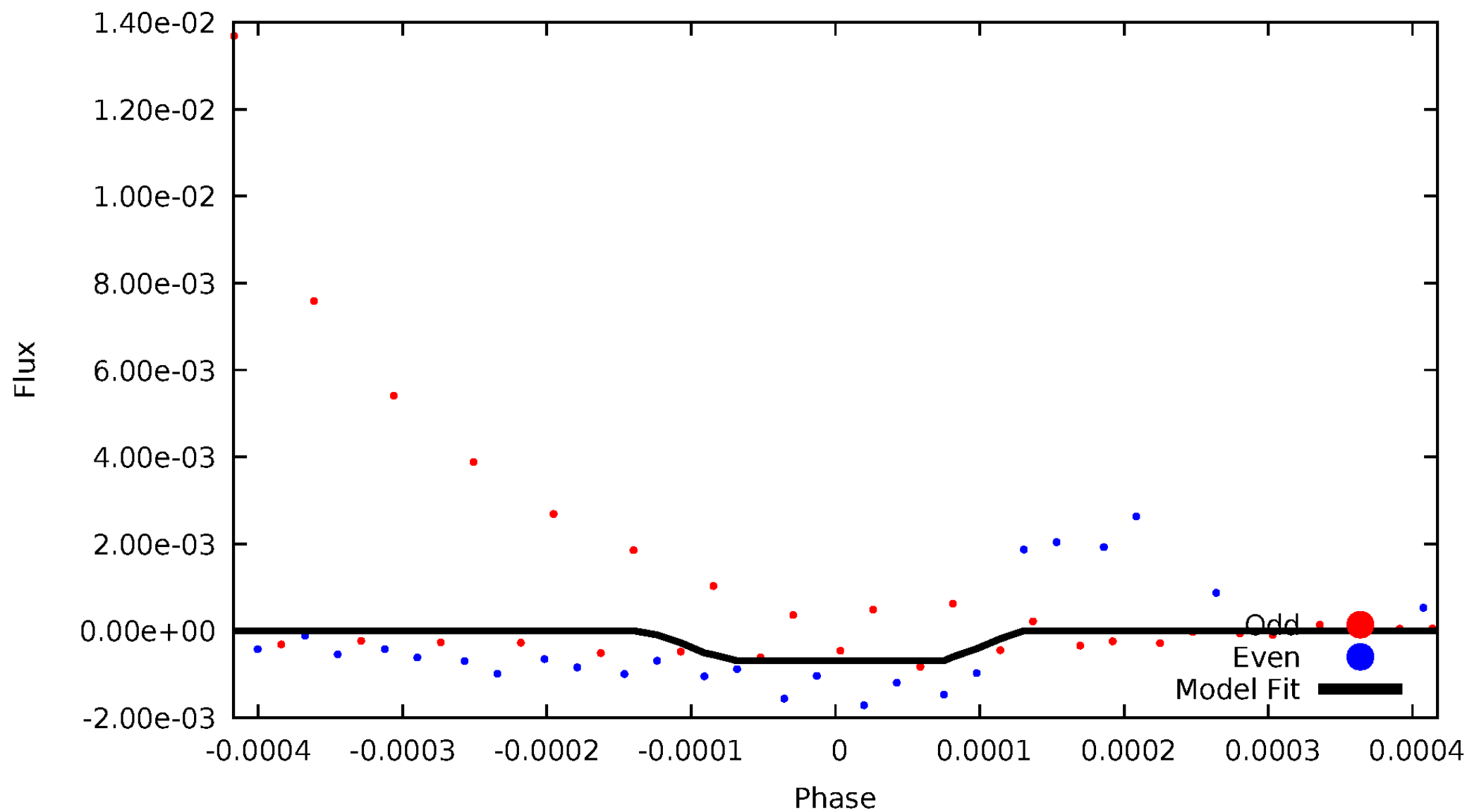
# DV Odd/Even

TCE 009653110-02



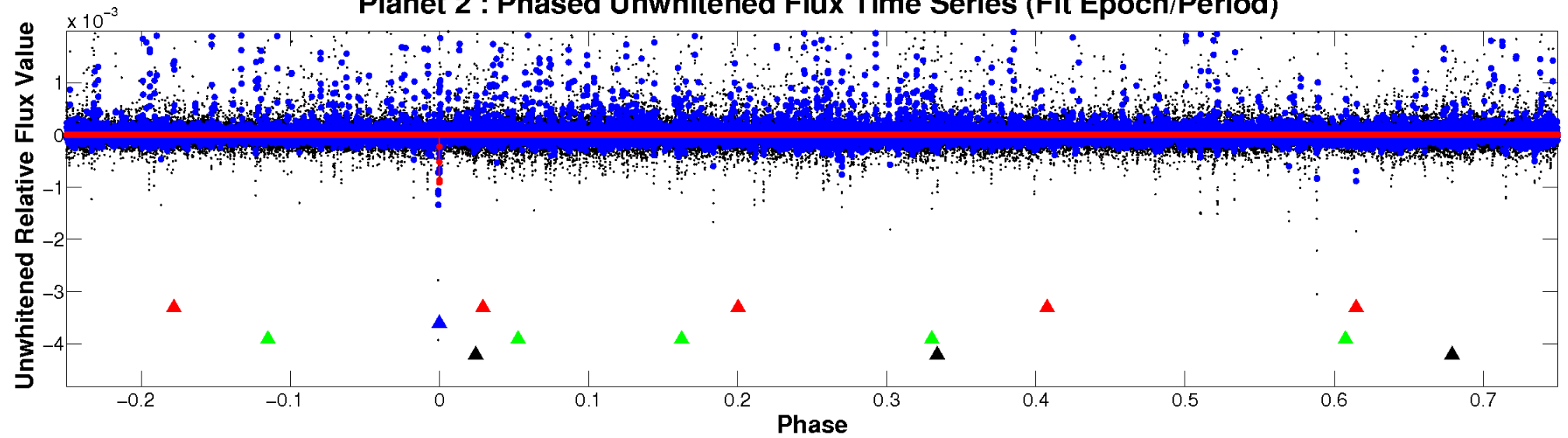
# ALT Odd/Even

TCE 009653110-02

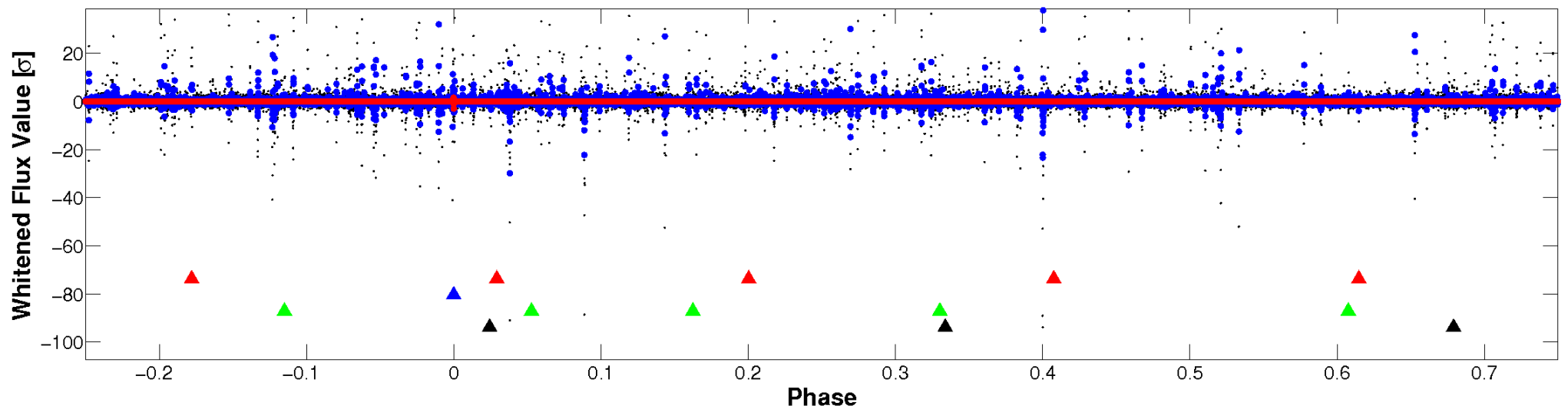


# Non-Whitened Vs. Whitened Light Curve

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



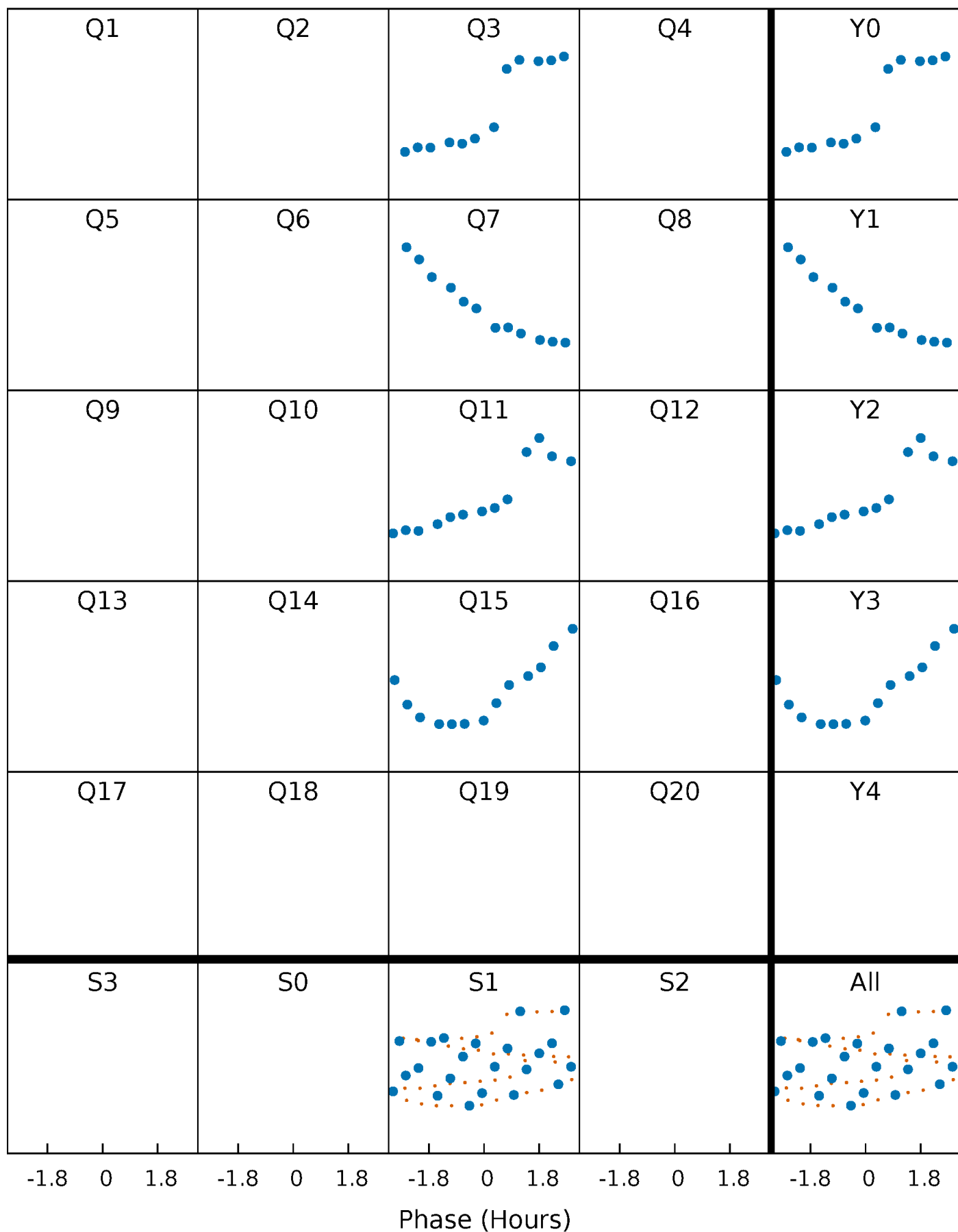
## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)





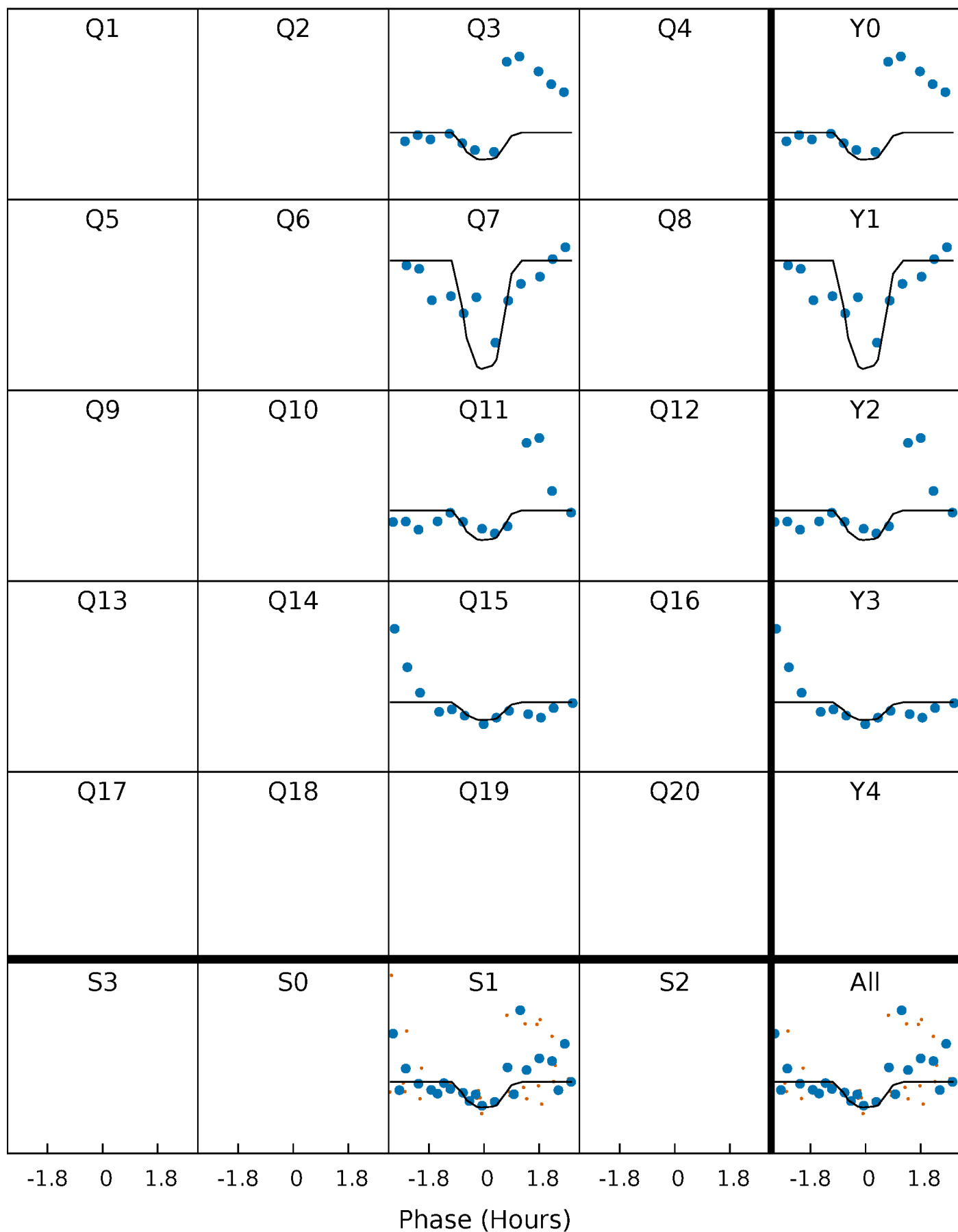
# PDC Quarter-Phased Transit Curves

TCE 009653110-02 P=369.069568 Days  $T_0=266.609746$  (BKJD)



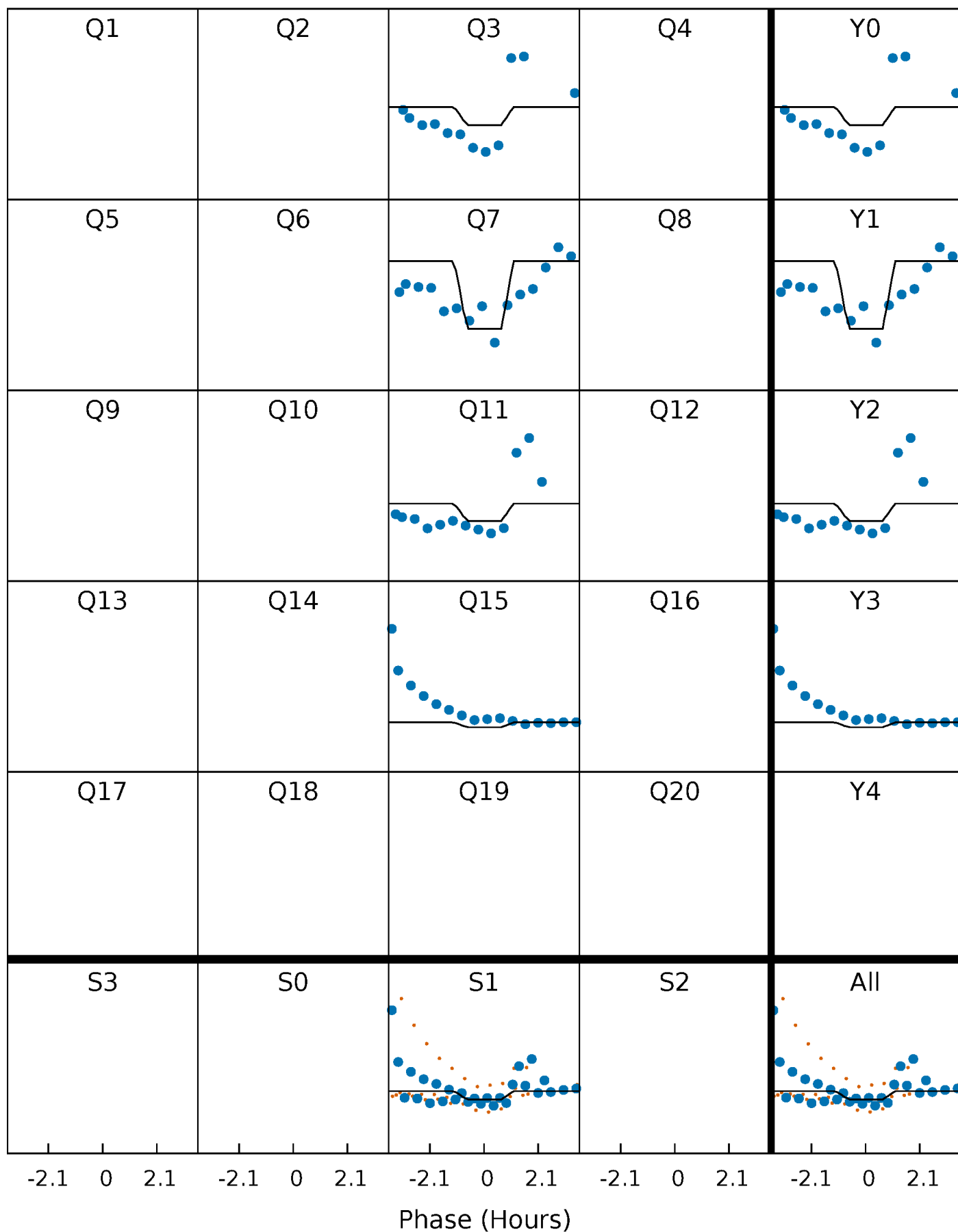
# DV Quarter-Phased Transit Curves

TCE 009653110-02 P=369.069568 Days  $T_0=266.609746$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

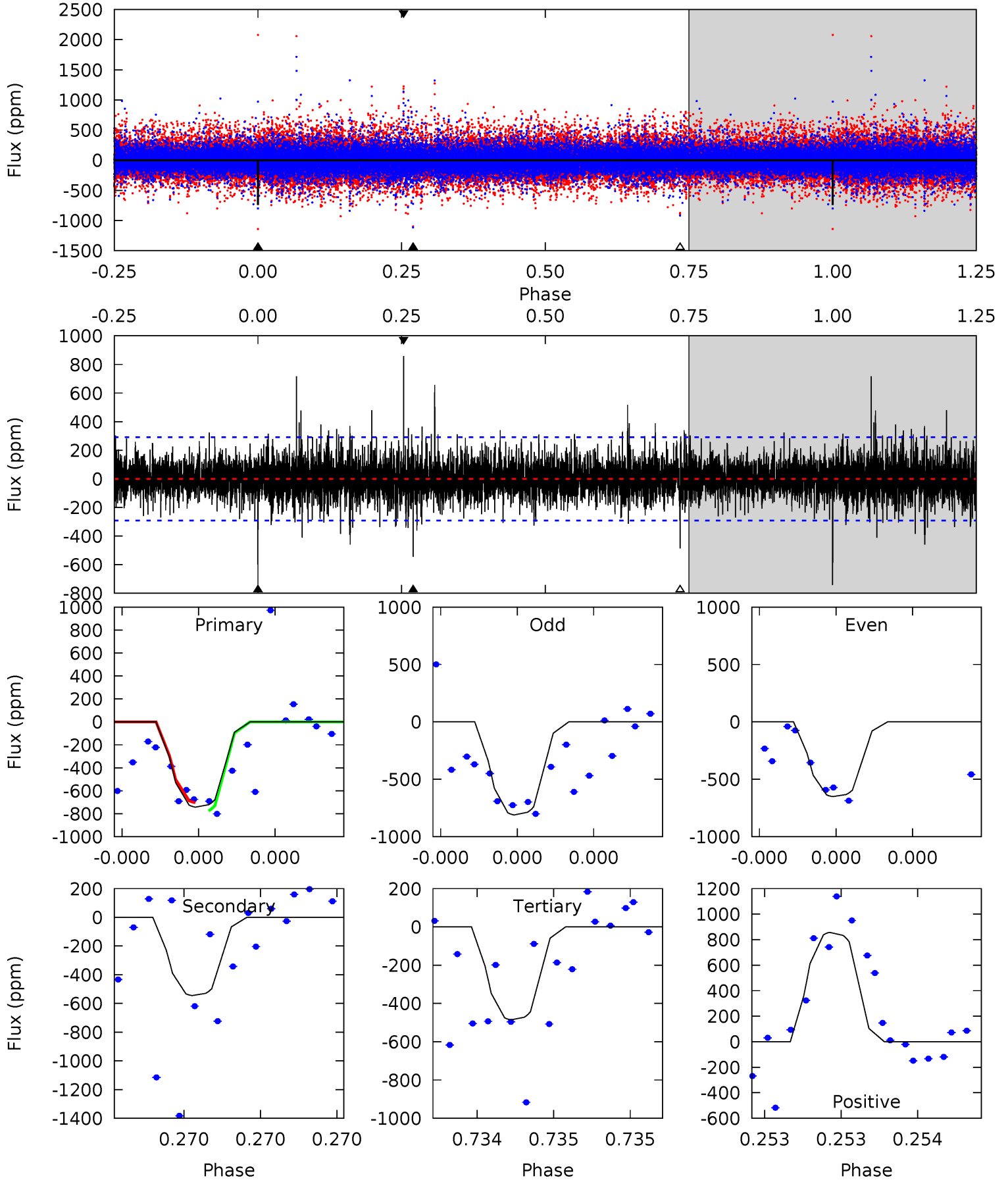
TCE 009653110-02 P=369.077772 Days  $T_0=266.592607$  (BKJD)



# DV Model-Shift Uniqueness Test

009653110-02, P = 369.069568 Days, E = 266.609746 Days

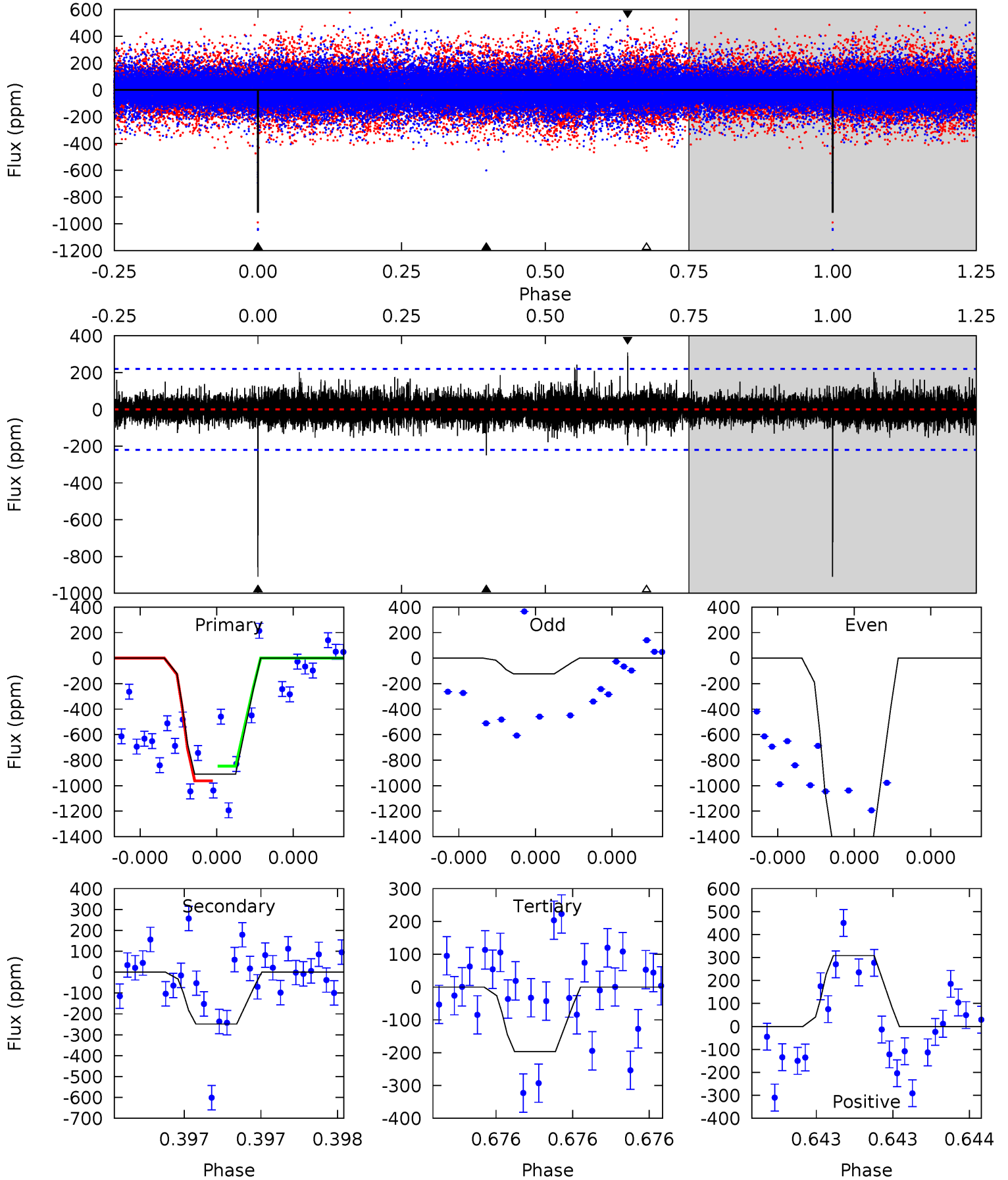
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
14.6	10.7	9.54	16.8	5.72	3.70	1.74	5.04	-2.25	1.16	-6.12	1.17	0.99	0.54	0.71



# Alt Model-Shift Uniqueness Test

009653110-02, P = 369.077772 Days, E = 266.592607 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
23.6	6.45	5.10	8.00	5.70	3.68	1.05	18.5	15.6	1.35	-1.55	19.9	0.75	0.25	1.50



### Stellar Parameters For KIC 009653110

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5396^{+160}_{-144}$	$4.534^{+0.099}_{-0.081}$	$-0.600^{+0.350}_{-0.300}$	$0.748^{+0.097}_{-0.088}$	$0.696^{+0.097}_{-0.039}$	$2.347^{+1.043}_{-0.610}$
	+3%/-3%	+2%/-2%	+58%/-50%	+13%/-12%	+14%/-6%	+44%/-26%
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 009653110-02 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-545 \pm 51$	$9.71^{+10.45}_{-6.57}$	$305^{+14}_{-13}$	$3051^{+1362}_{-533}$	$2664^{+22123}_{-2067}$
Alt.	$-249 \pm 39$	$9.50^{+9.83}_{-6.45}$	$303^{+13}_{-12}$	$2727^{+1115}_{-422}$	$1218^{+10479}_{-922}$

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

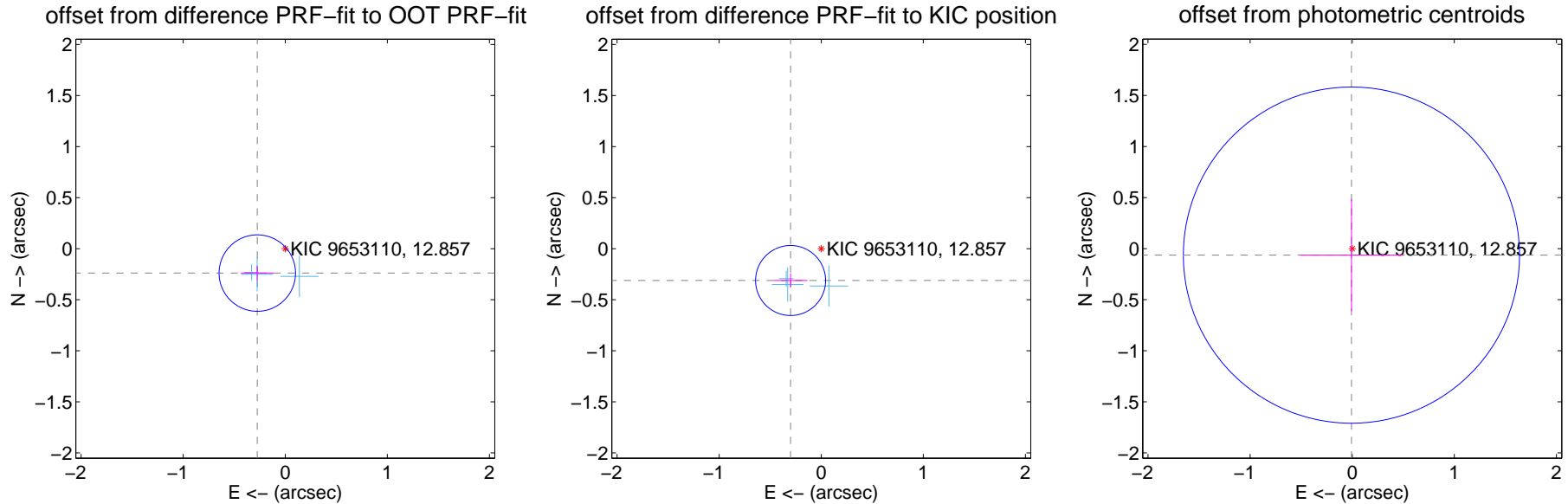
## DV Centroid Data

Supplemental centroid analysis for 009653110-02. Kepler magnitude: 12.86. Transit SNR 8.99

There are 3 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.11 arcsec

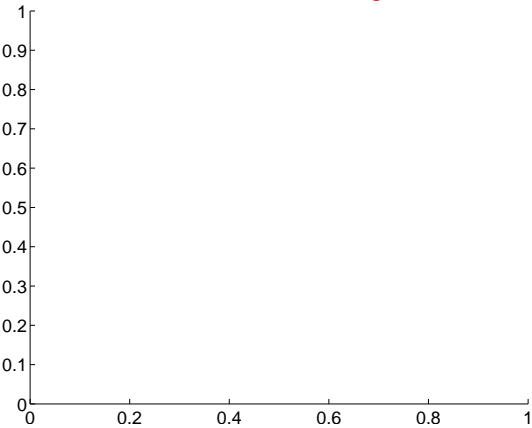
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.363 \pm 0.125$	2.91	$0.274 \pm 0.161$	$-0.239 \pm 0.067$
PRF-fit source offset from KIC position	$0.433 \pm 0.114$	3.79	$0.300 \pm 0.164$	$-0.312 \pm 0.069$
photometric centroid source offset	$0.06 \pm 0.55$	0.12	$0.01 \pm 0.50$	$-0.06 \pm 0.55$



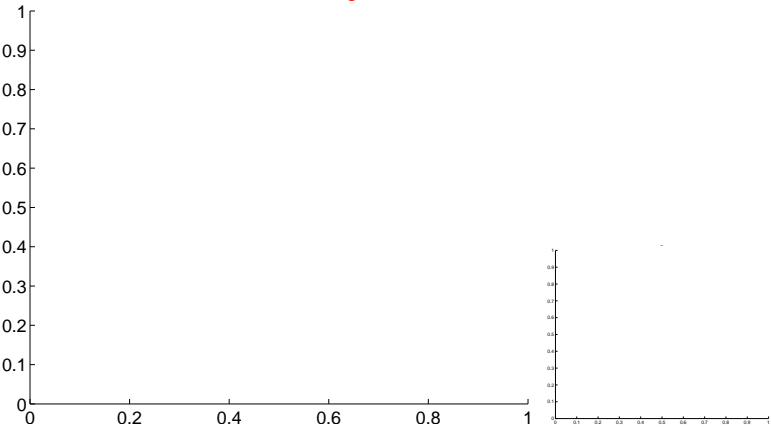
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

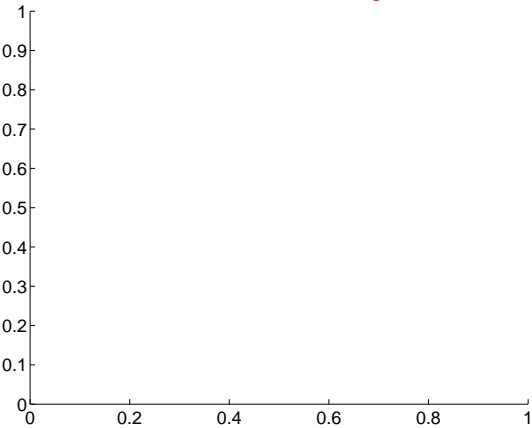
Q1 no difference image



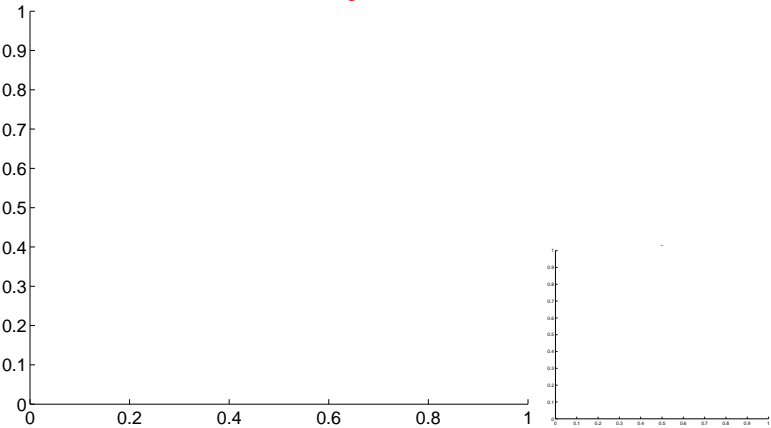
Q1 no OOT image



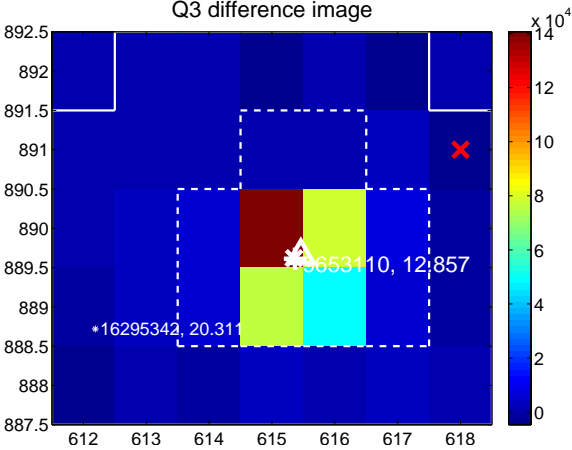
Q2 no difference image



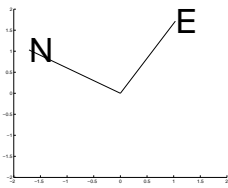
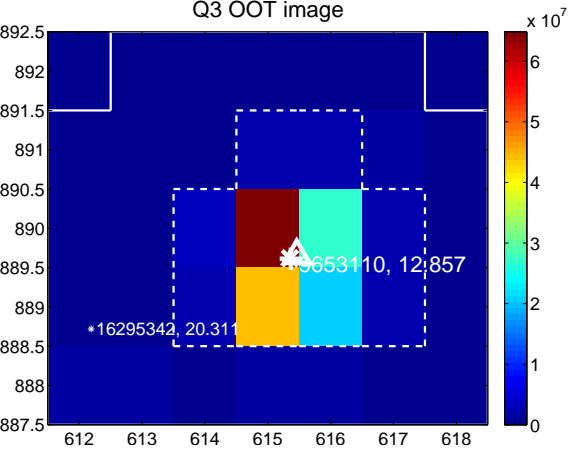
Q2 no OOT image



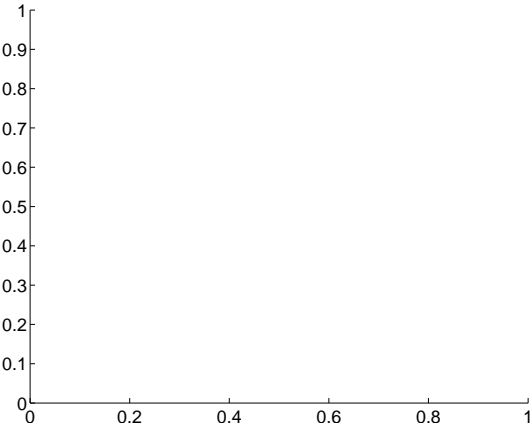
Q3 difference image



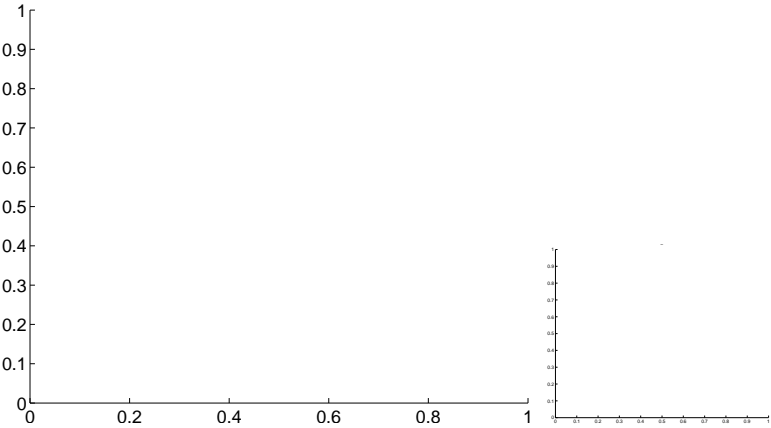
Q3 OOT image



Q4 no difference image



Q4 no OOT image





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

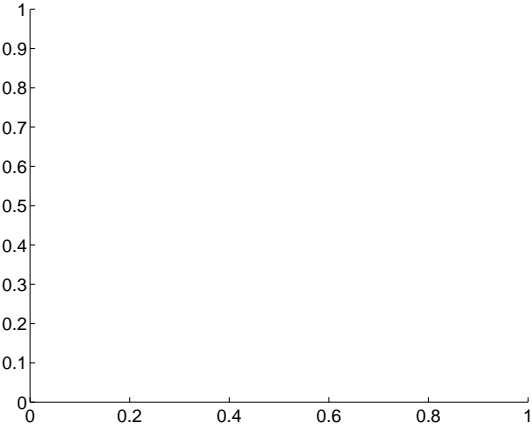
Q5 no difference image



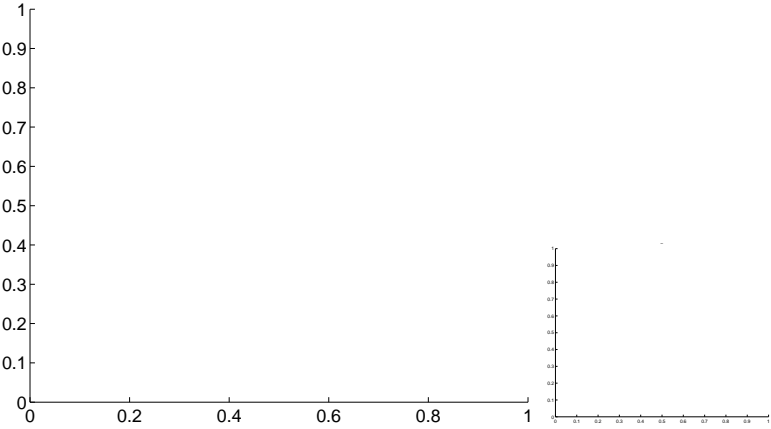
Q5 no OOT image



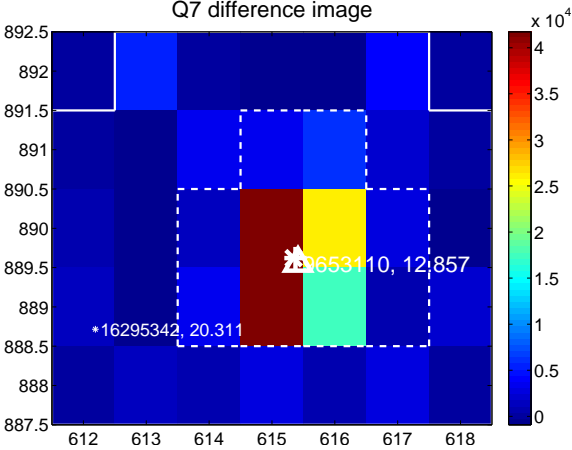
Q6 no difference image



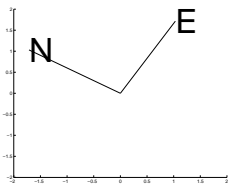
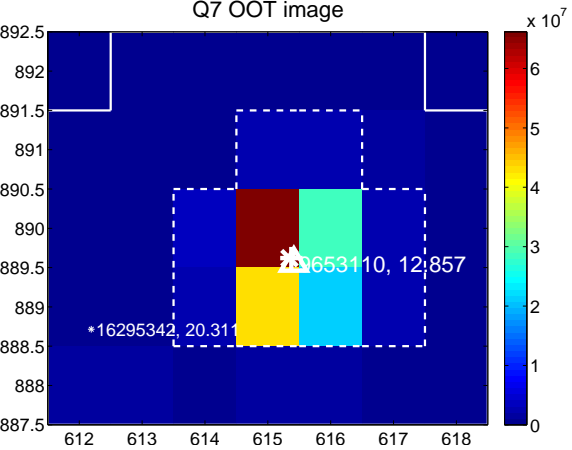
Q6 no OOT image



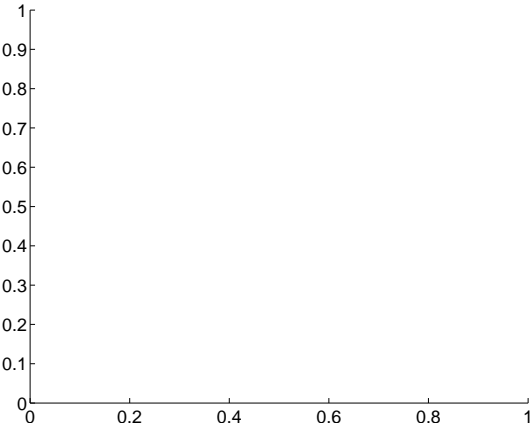
Q7 difference image



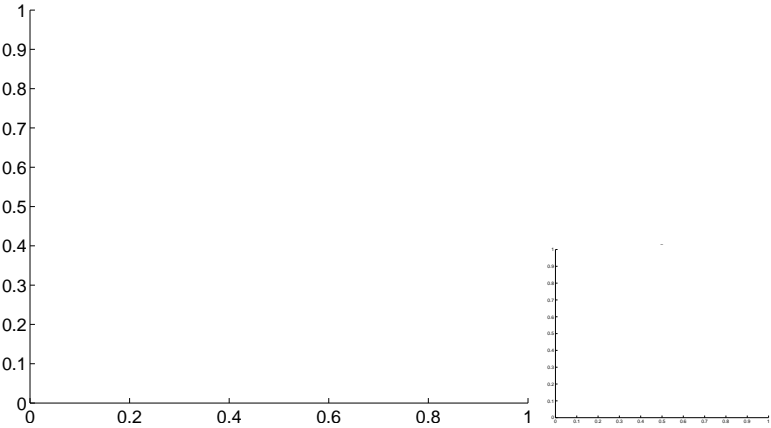
Q7 OOT image



Q8 no difference image

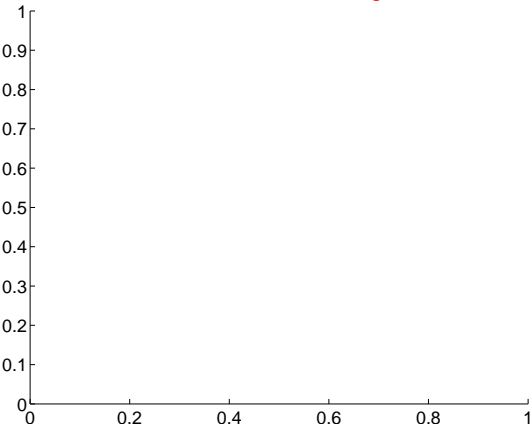


Q8 no OOT image

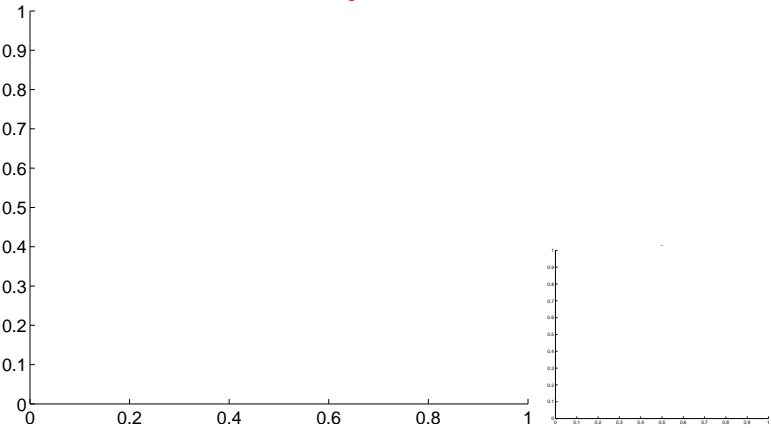


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

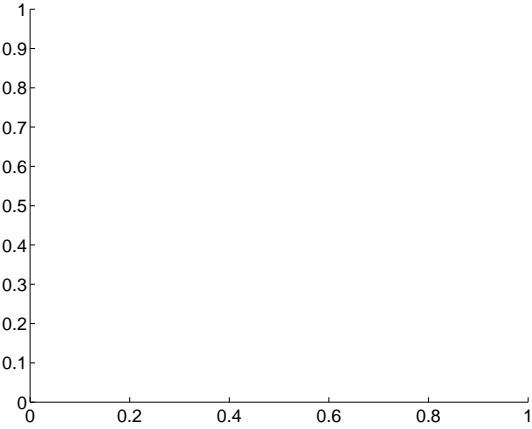
Q9 no difference image



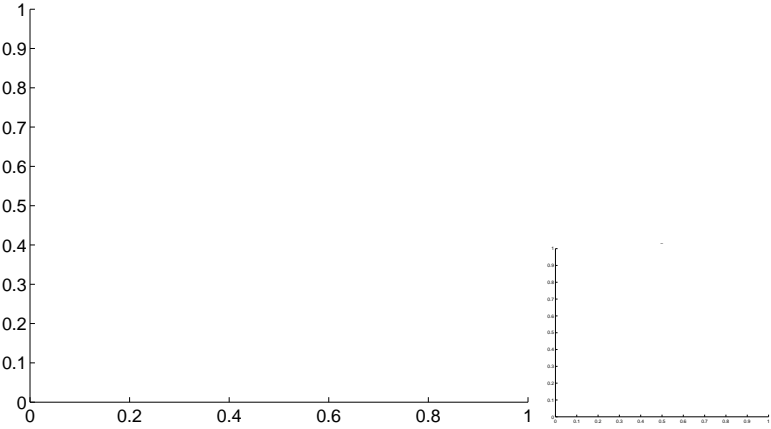
Q9 no OOT image



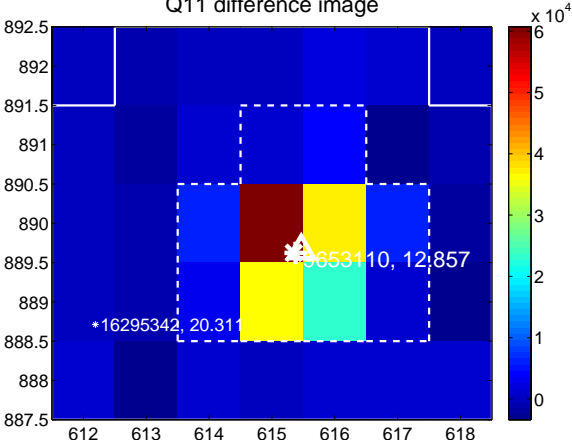
Q10 no difference image



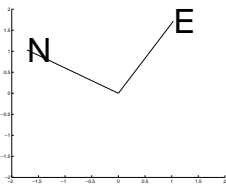
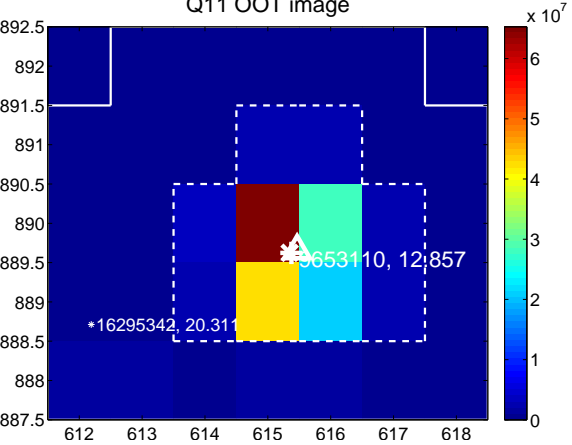
Q10 no OOT image



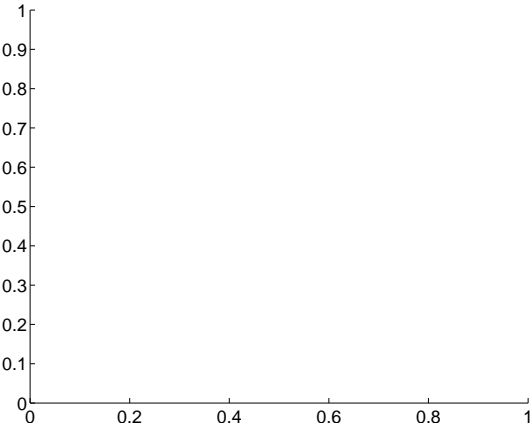
Q11 difference image



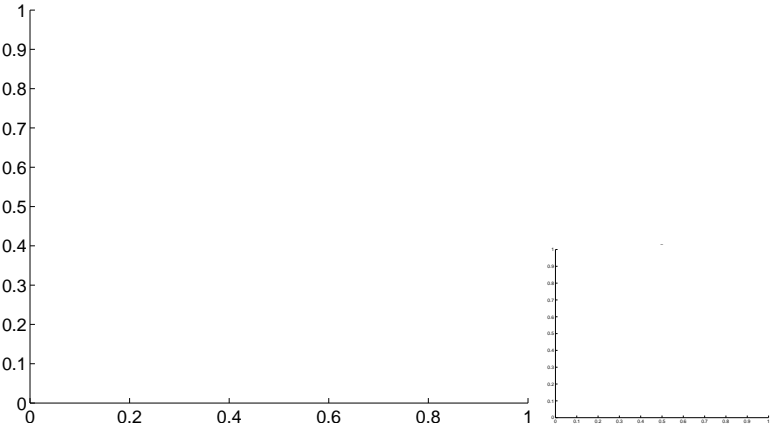
Q11 OOT image



Q12 no difference image



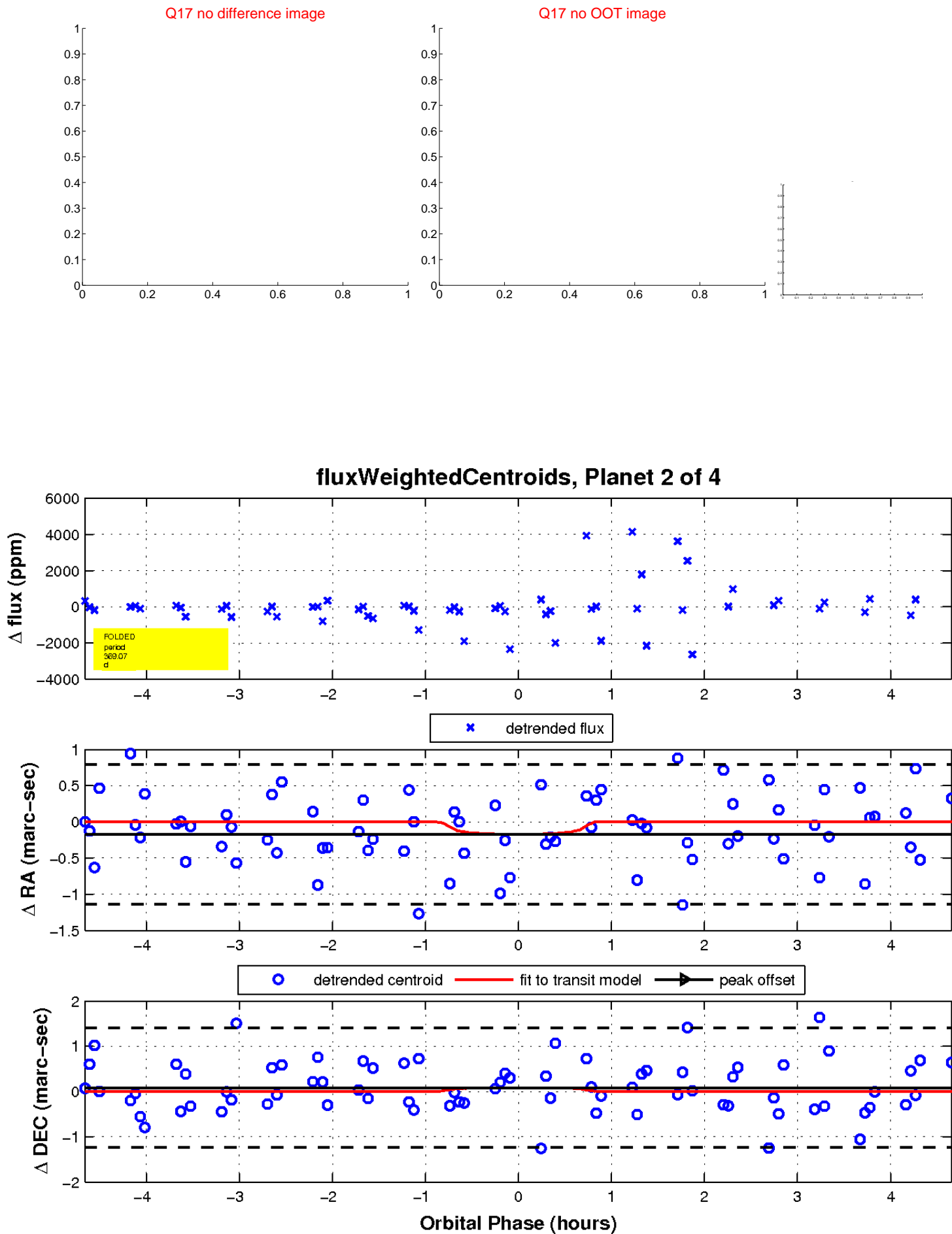
Q12 no OOT image



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

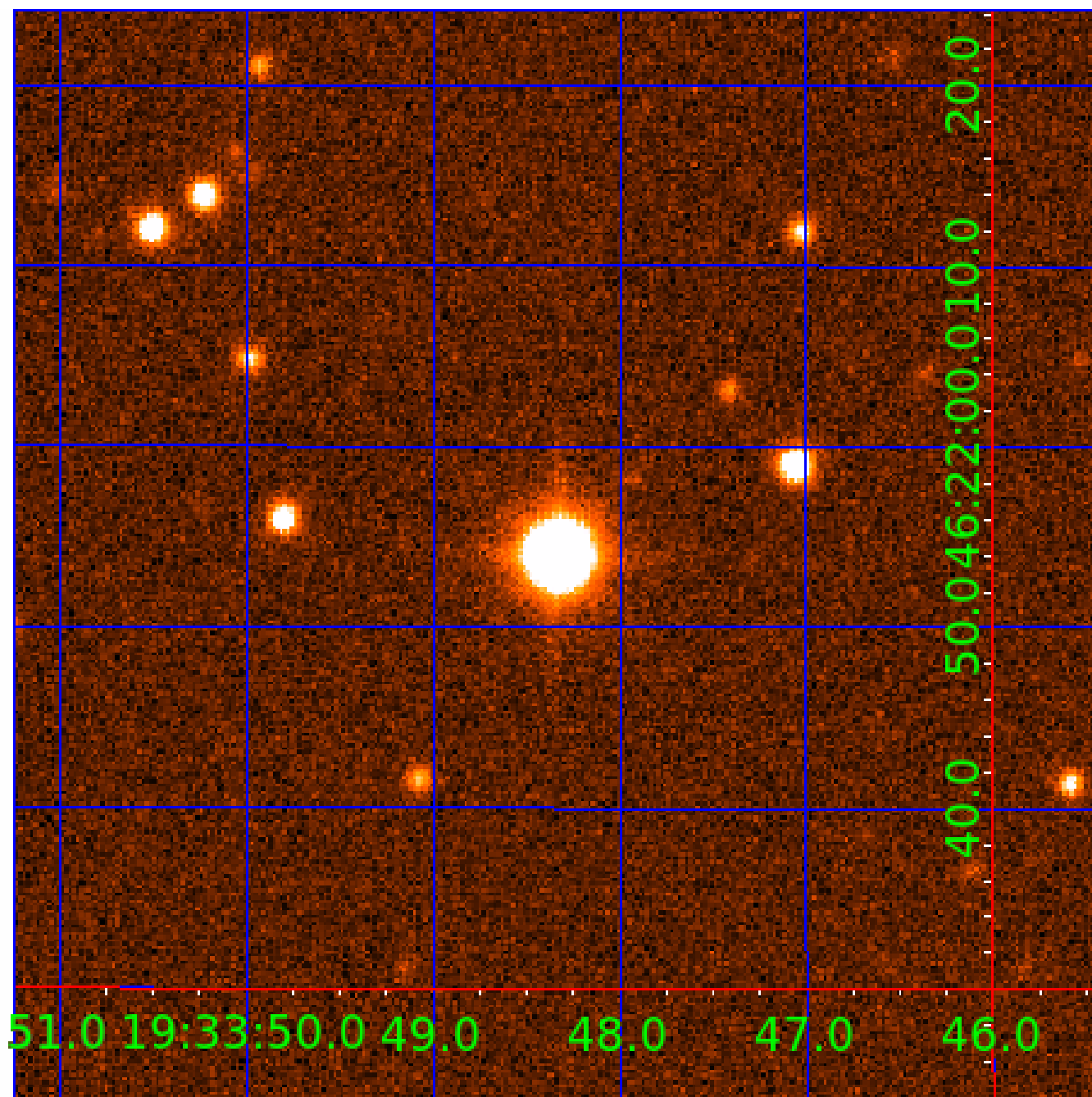


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 009653110

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009653110-01	OBS	No	292.588605	277.400199	652.2	7.016	20.3	5.8	0.75	5396	1.98	0.73
009653110-02	OBS	No	369.069568	266.609746	920.6	1.557	16.9	9.0	0.75	5396	2.31	0.53
009653110-03	OBS	No	266.685084	326.565628	1495.7	6.032	17.8	11.9	0.75	5396	3.70	0.82
009653110-04	OBS	No	496.497894	389.828814	1524.4	6.663	15.5	8.5	0.75	5396	3.53	0.36

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009653110-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_ZUMA—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV
009653110-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_POS_DV
009653110-03	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
009653110-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—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.

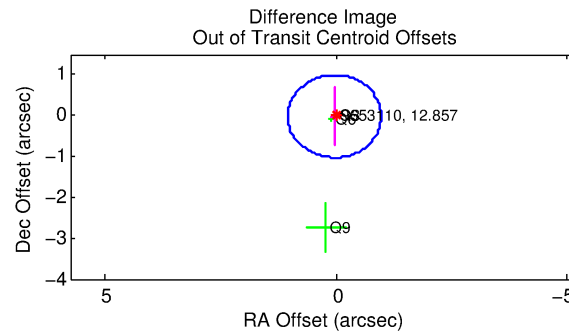
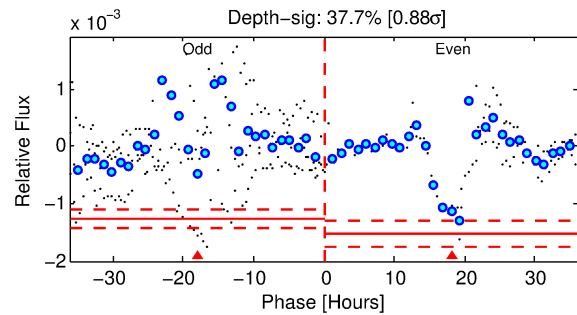
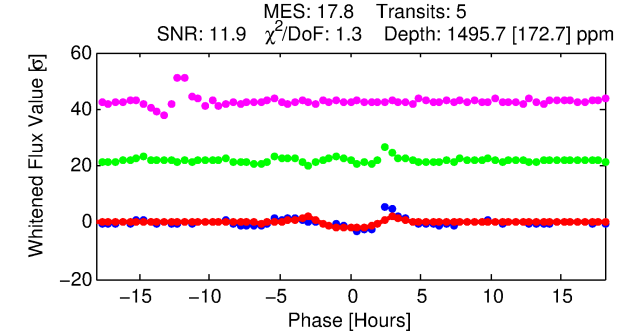
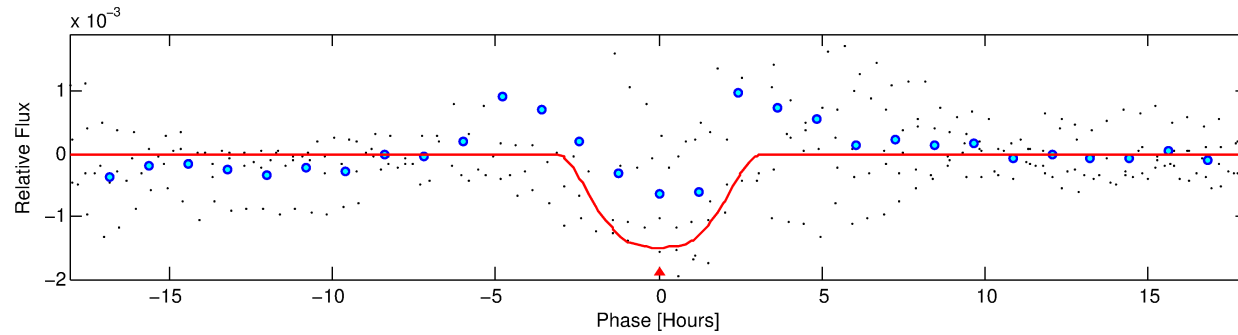
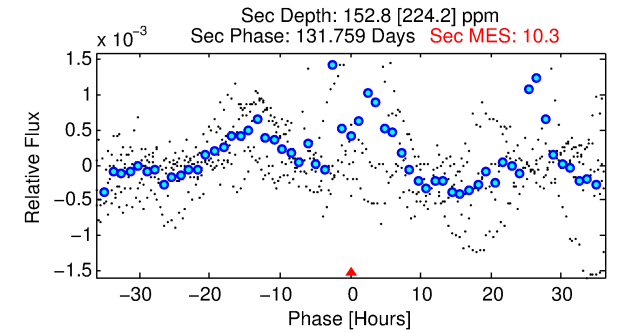
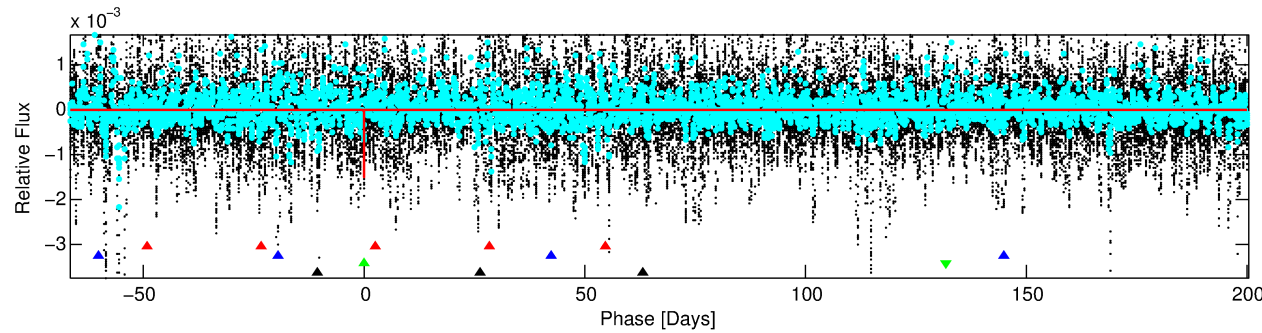
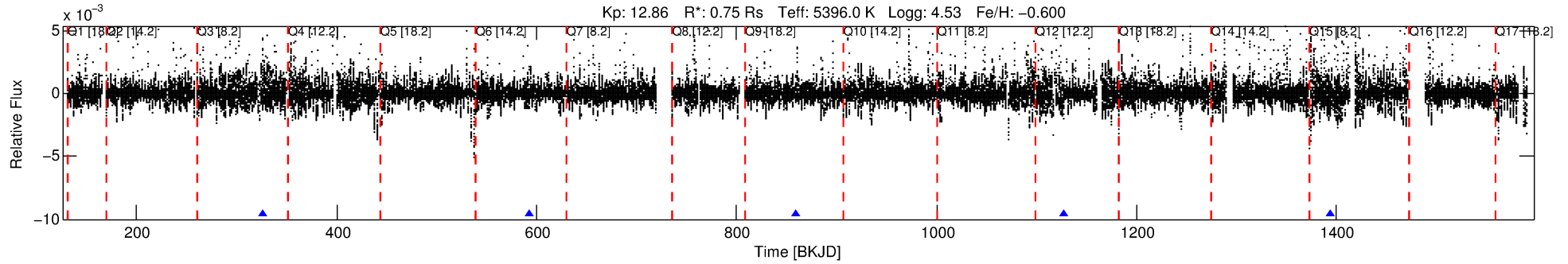
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009653110-03

No Significant Match Found

# DV One-Page Summary

KIC: 9653110 Candidate: 3 of 4 Period: 266.685 d



## DV Fit Results:

Period = 266.68508 [0.00346] d  
Epoch = 326.5656 [0.0076] BKJD  
Rp/R\* = 0.0454 [0.0031]  
a/R\* = 148.61 [12.96]  
b = 0.95 [0.01]  
Seff = 0.82 [0.17]  
Teq = 243 [13] K  
Rp = 3.70 [0.54] Re  
a = 0.7194 [0.0828] AU  
Ag = 3175.66 [4711.46] [0.67 $\sigma$ ]  
Teffp = 2817 [1041] K [2.47 $\sigma$ ]

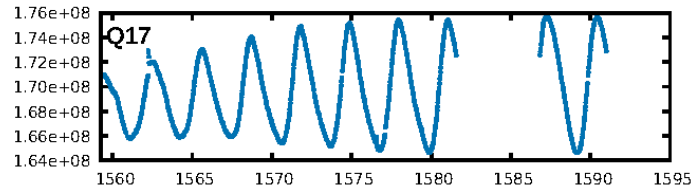
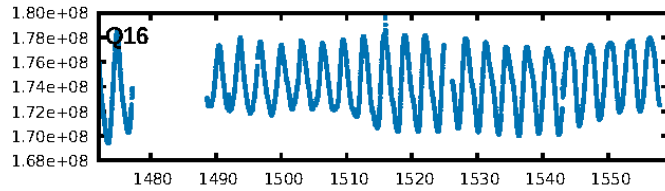
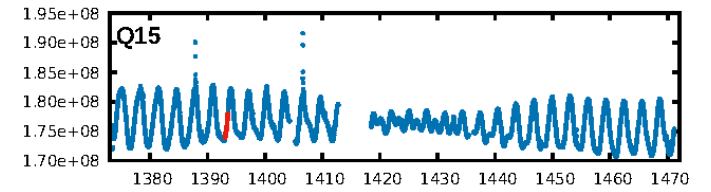
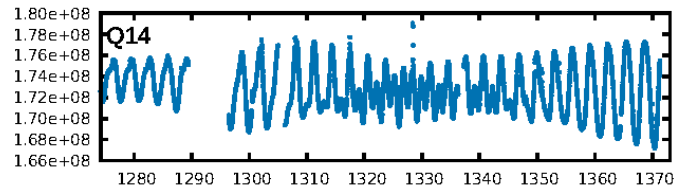
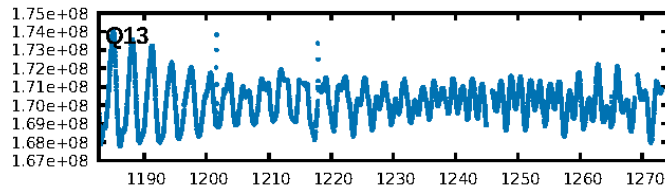
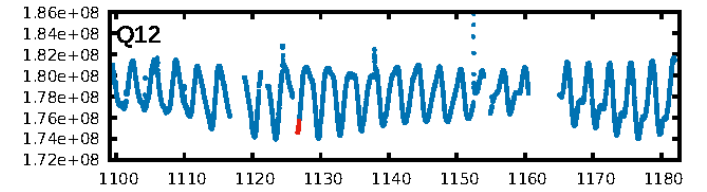
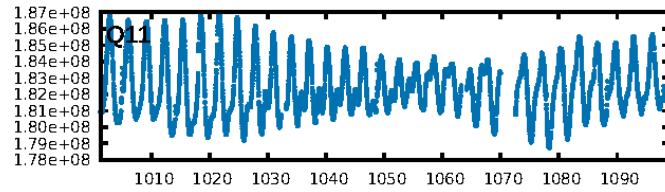
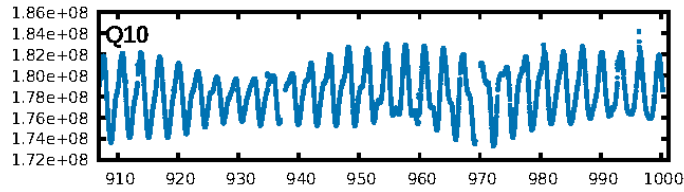
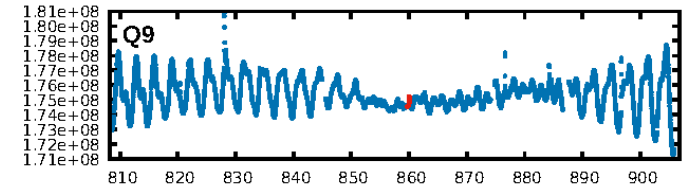
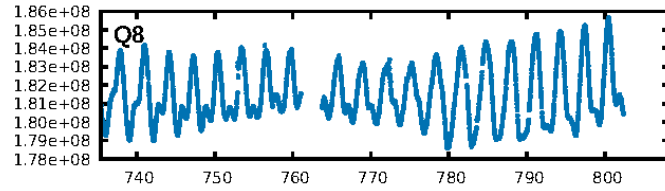
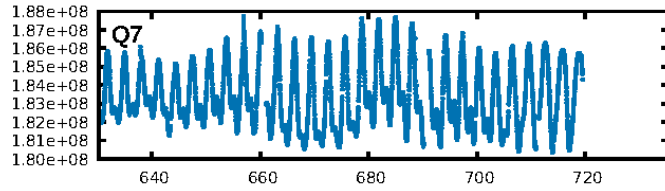
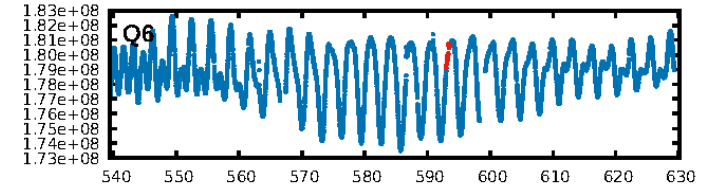
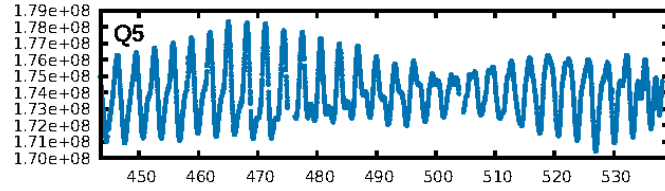
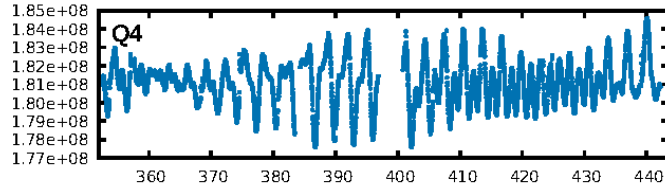
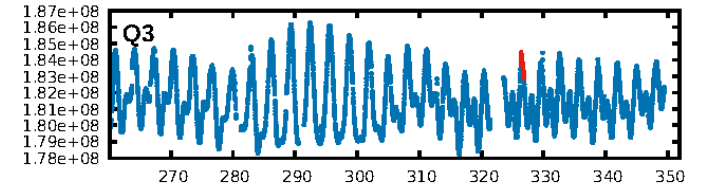
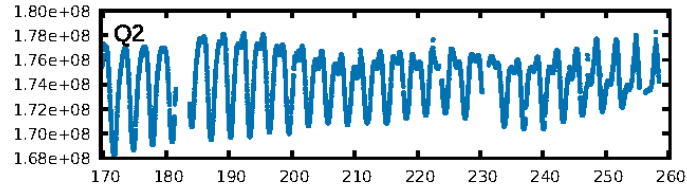
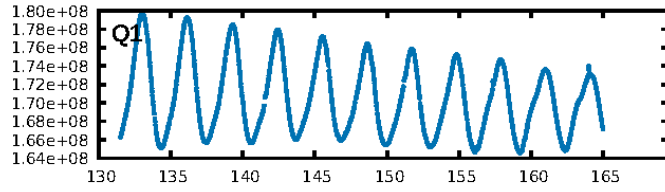
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [67.19 $\sigma$ ]  
ModelChiSquare2-sig: 47.8%  
ModelChiSquareGof-sig: 71.8%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [5/5]  
GhostDiagnostic-chr: 1.685  
Centroid-sig: 6.0%  
Centroid-so: 0.229 arcsec [1.08 $\sigma$ ]  
OotOffset-rm: 0.042 arcsec [0.13 $\sigma$ ]  
KicOffset-rm: 0.050 arcsec [0.08 $\sigma$ ]  
OotOffset-st: 1/1/0/1 [3]  
KicOffset-st: 1/1/0/1 [3]  
DiffImageQuality-fgm: 0.00 [0/3]  
DiffImageOverlap-fno: 1.00 [3/3]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 22:05:45 Z

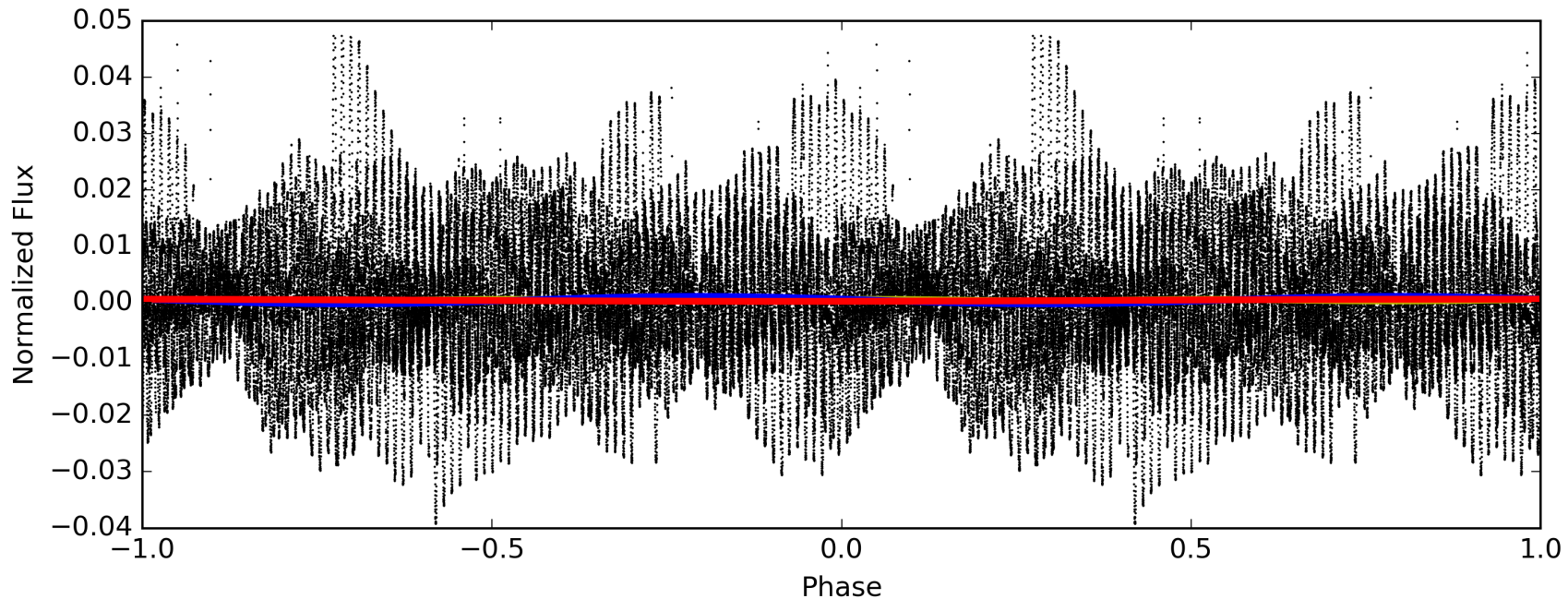
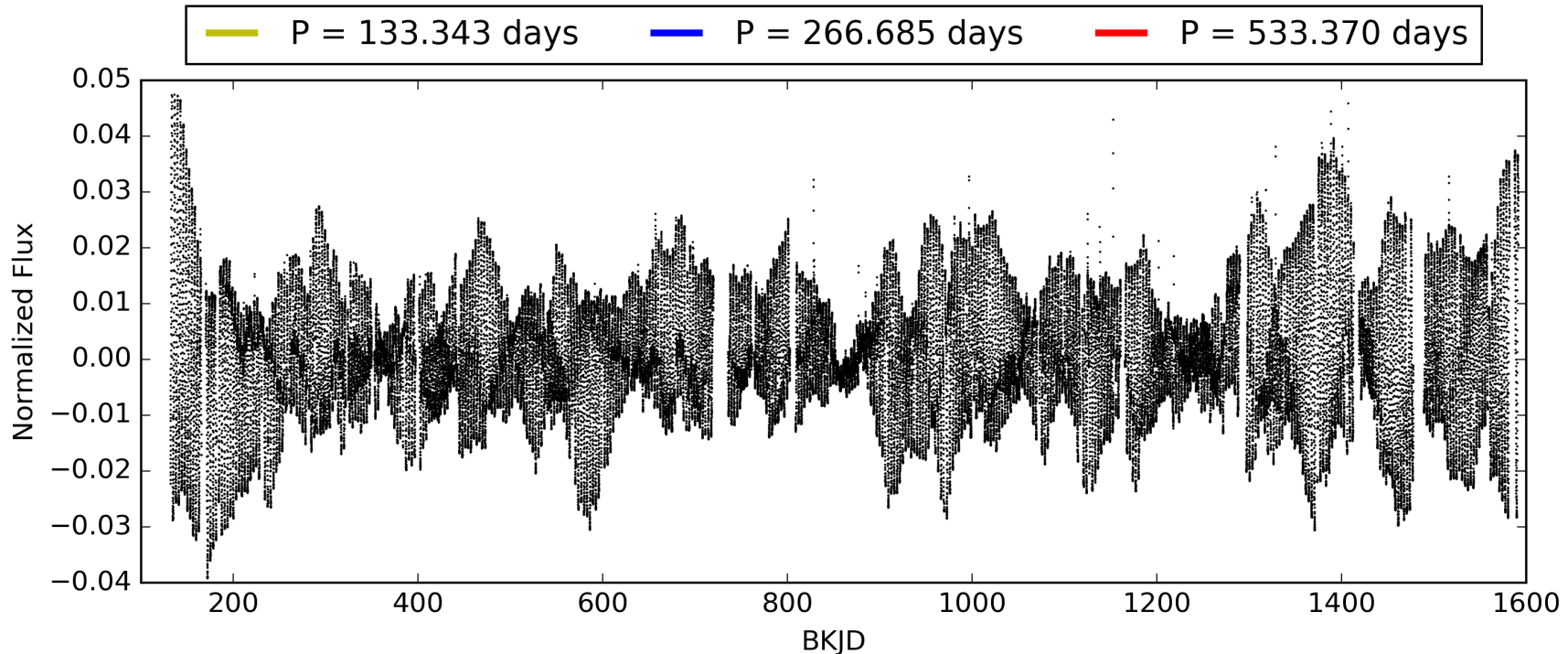
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 009653110-03, PDC Light Curves



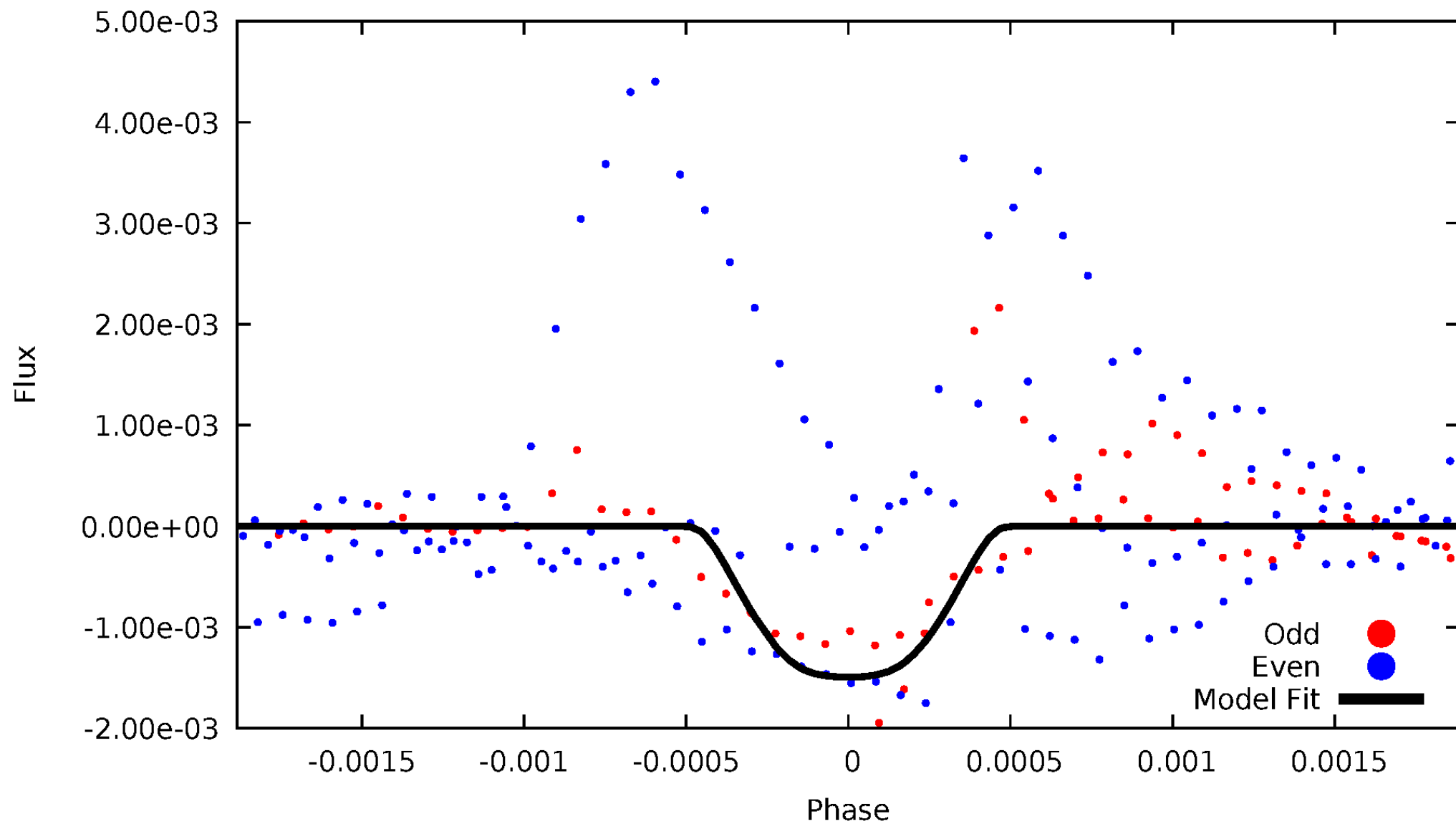


TCE 009653110-03



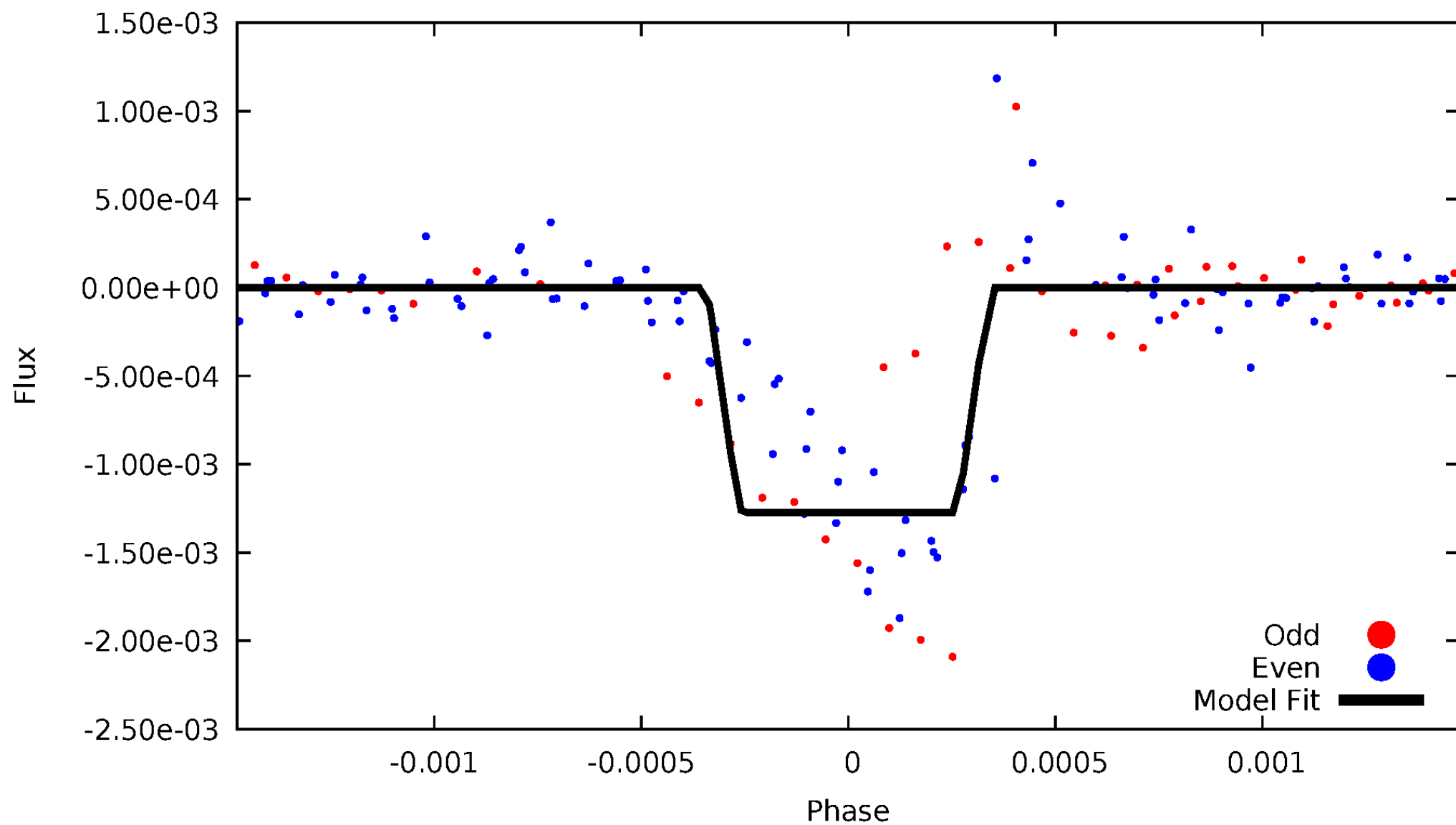
# DV Odd/Even

TCE 009653110-03



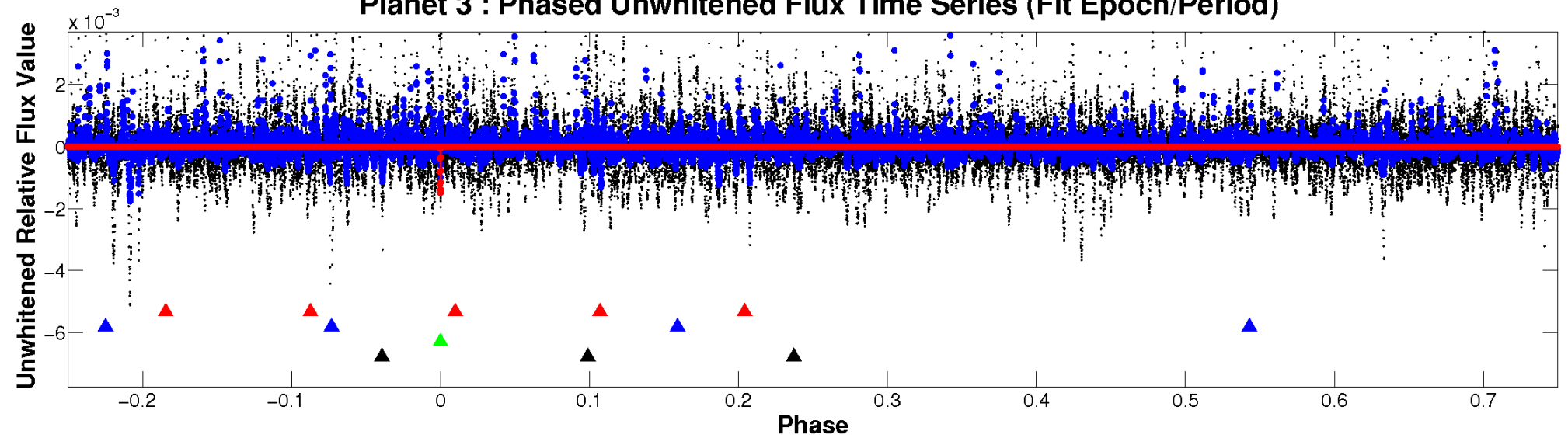
# ALT Odd/Even

TCE 009653110-03

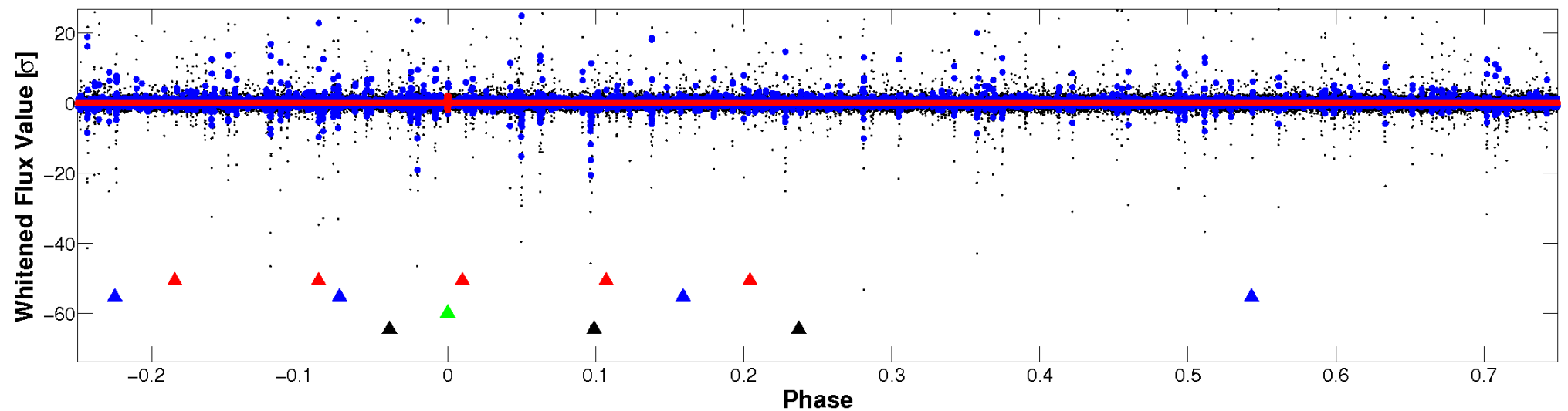


# Non-Whitened Vs. Whitened Light Curve

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

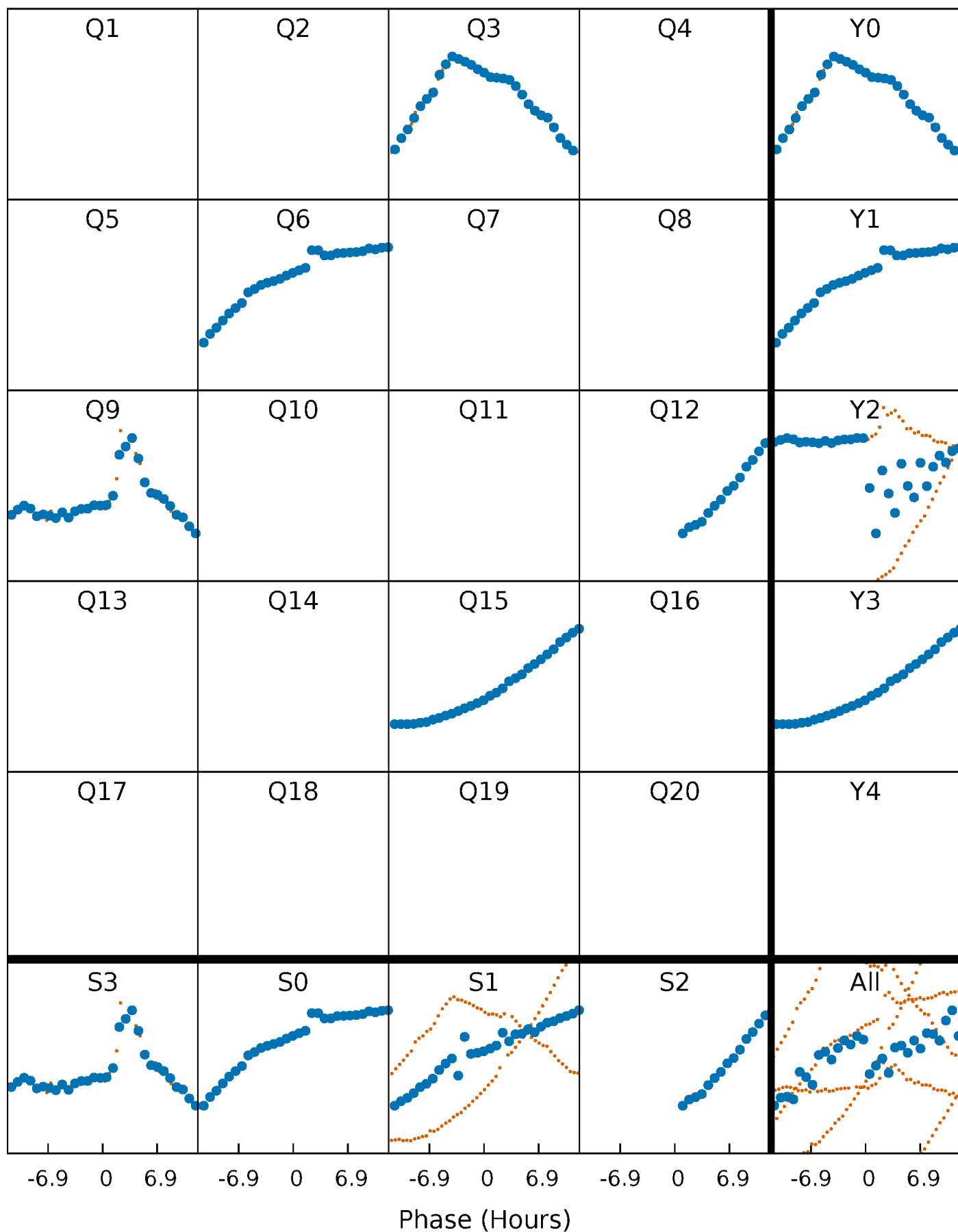


**Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



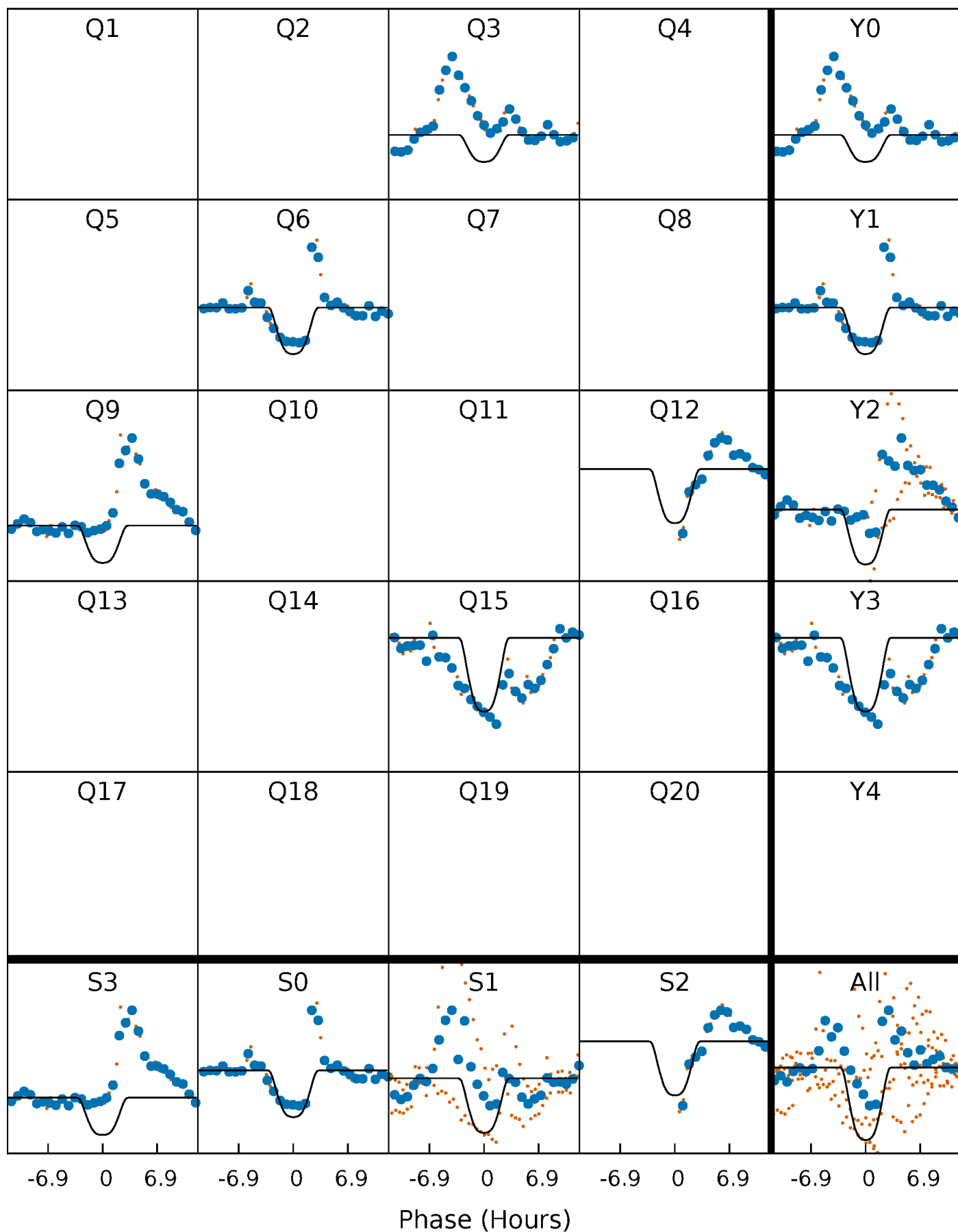
# PDC Quarter-Phased Transit Curves

TCE 009653110-03 P=266.685084 Days  $T_0=326.565628$  (BKJD)



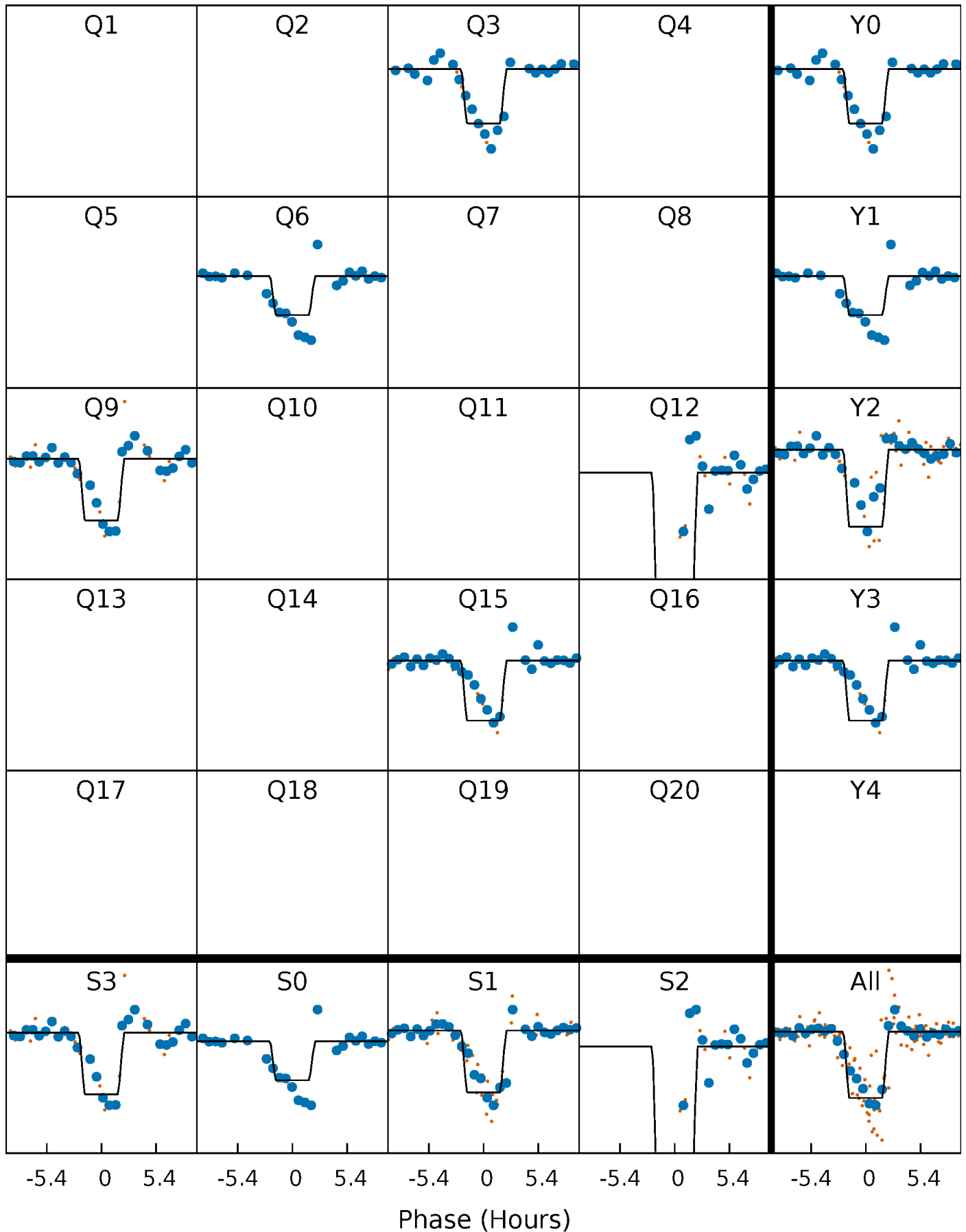
# DV Quarter-Phased Transit Curves

TCE 009653110-03 P=266.685084 Days  $T_0=326.565628$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

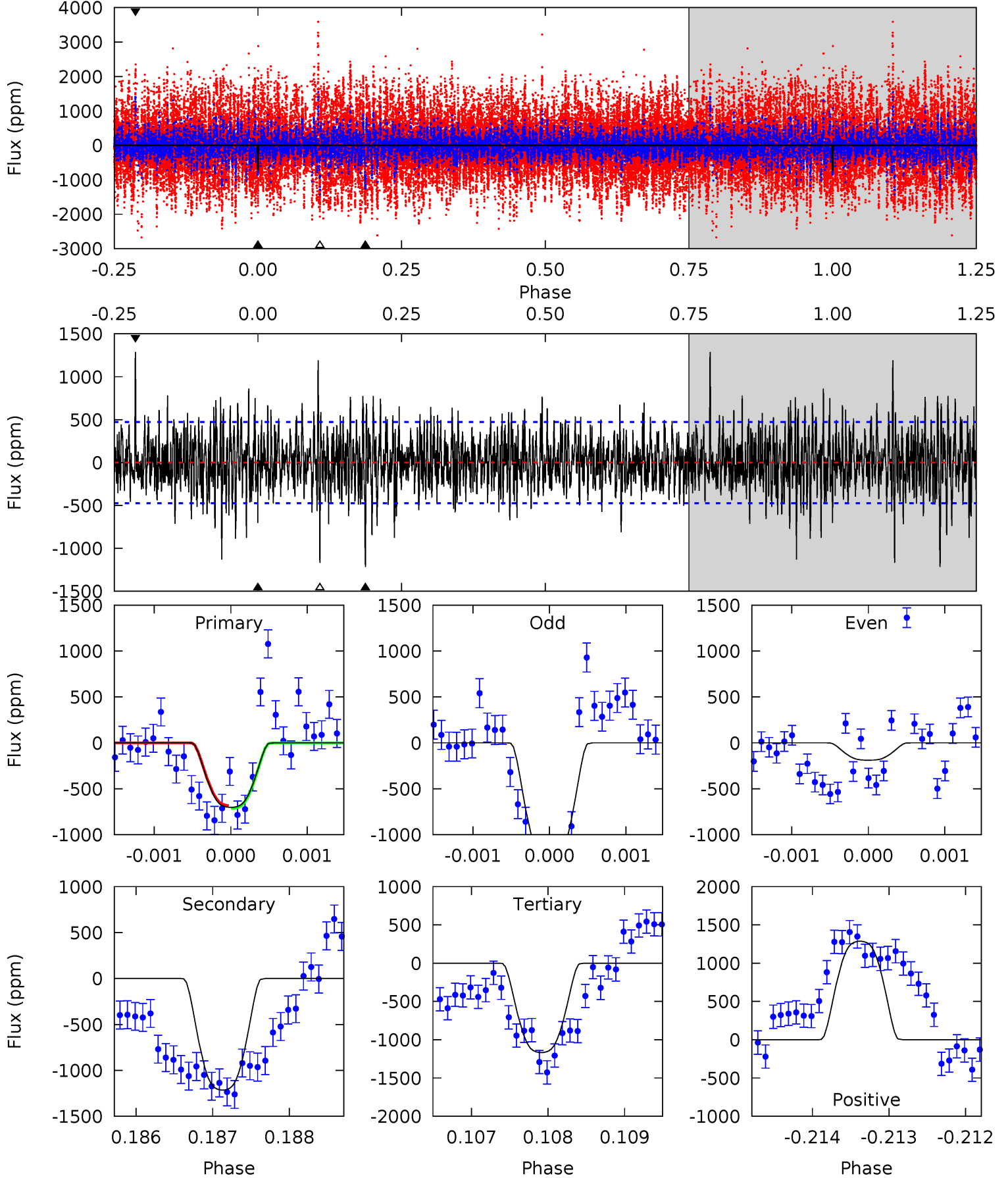
TCE 009653110-03 P=266.688640 Days  $T_0=326.557680$  (BKJD)



# DV Model-Shift Uniqueness Test

009653110-03, P = 266.685084 Days, E = 59.880544 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
8.10	14.0	13.5	14.8	5.46	3.30	2.95	-5.36	-6.74	0.55	-0.83	5.77	0.55	0.51	0.17

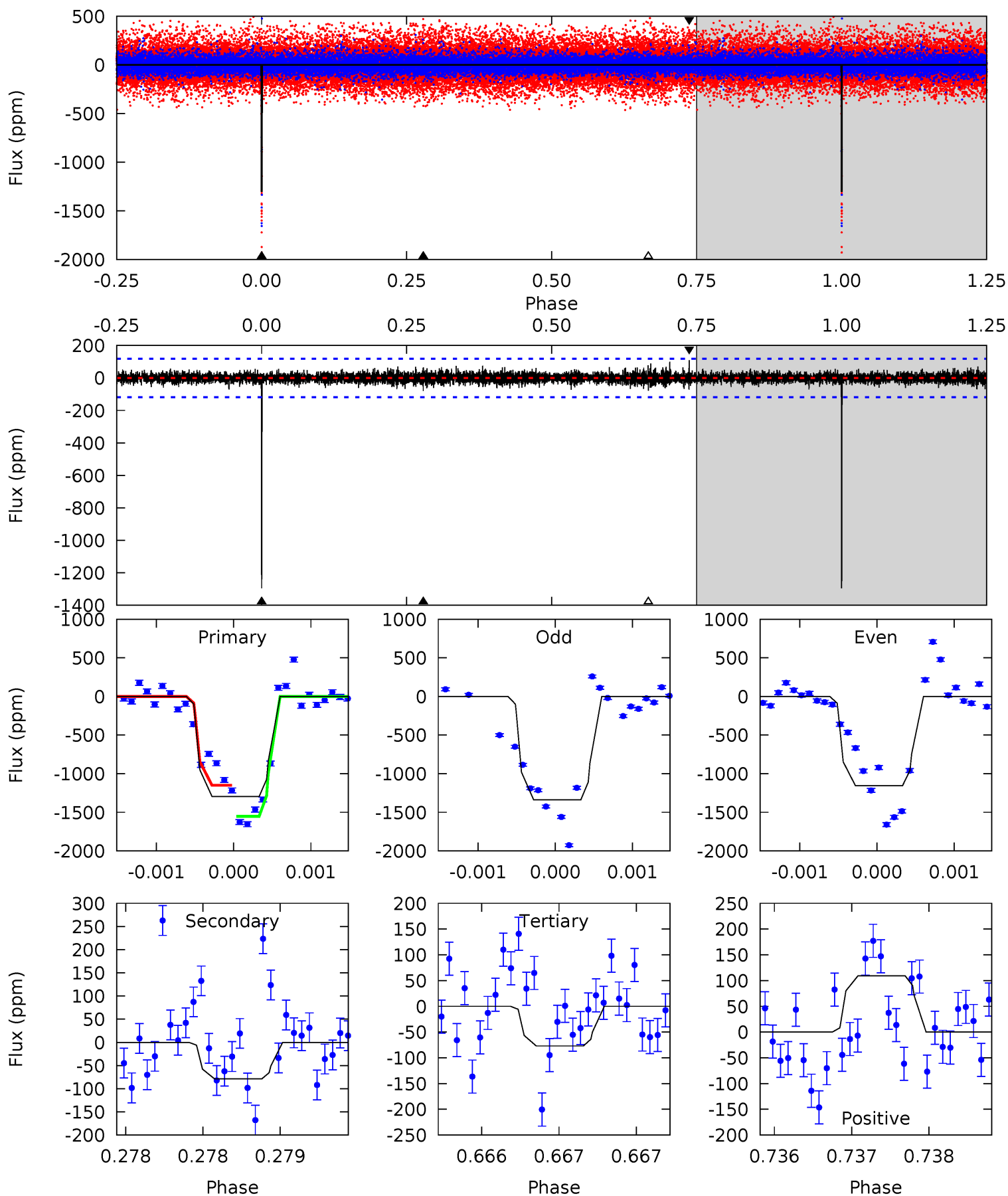




# Alt Model-Shift Uniqueness Test

009653110-03, P = 266.688640 Days, E = 59.869040 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
60.5	3.69	3.60	5.11	5.53	3.41	0.86	56.9	55.4	0.09	-1.42	4.07	0.87	0.08	9.04



### Stellar Parameters For KIC 009653110

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5396^{+160}_{-144}$	$4.534^{+0.099}_{-0.081}$	$-0.600^{+0.350}_{-0.300}$	$0.748^{+0.097}_{-0.088}$	$0.696^{+0.097}_{-0.039}$	$2.347^{+1.043}_{-0.610}$
	+3%/-3%	+2%/-2%	+58%/-50%	+13%/-12%	+14%/-6%	+44%/-26%
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 009653110-03 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-1215 \pm 87$	$3.72^{+0.39}_{-0.38}$	$339^{+15}_{-14}$	$4815^{+208}_{-179}$	$25460^{+6450}_{-4714}$
Alt.	$-79 \pm 21$	$2.92^{+0.36}_{-0.32}$	$339^{+15}_{-14}$	$3253^{+163}_{-180}$	$2677^{+1012}_{-859}$

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

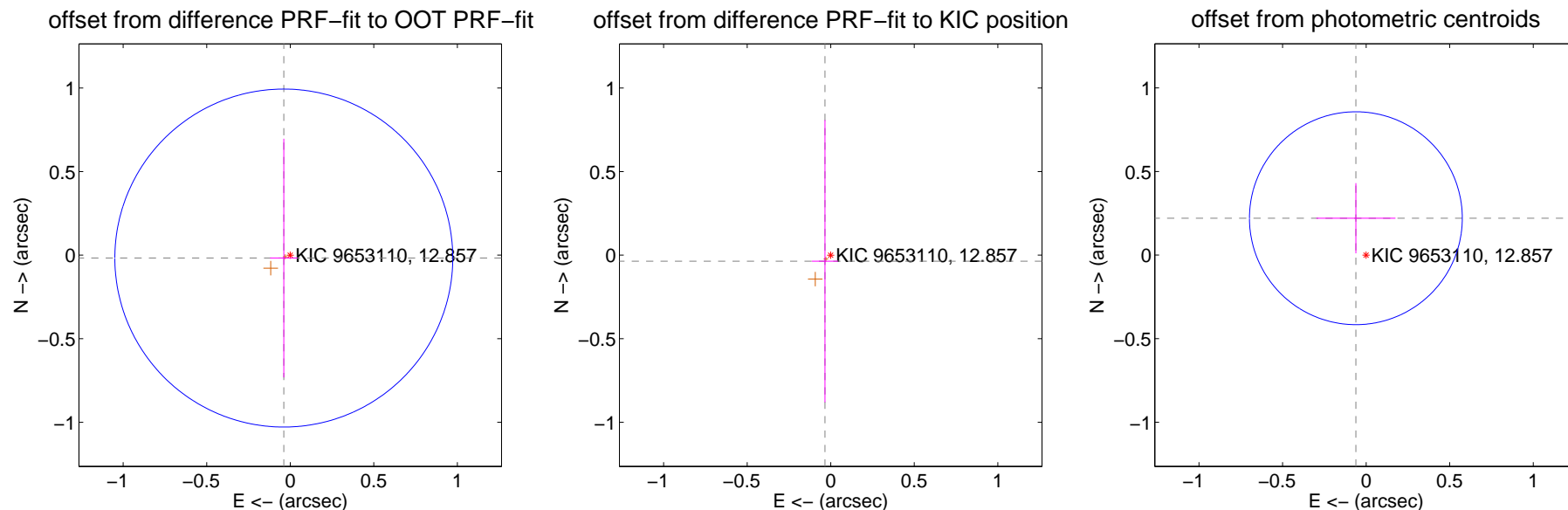
## DV Centroid Data

Supplemental centroid analysis for 009653110-03. Kepler magnitude: 12.86. Transit SNR 11.92

There are 0 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.07 arcsec

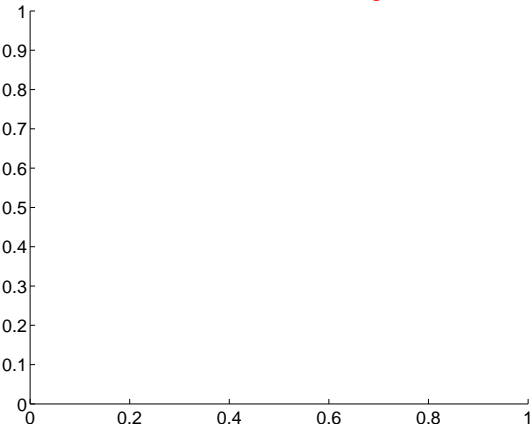
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.042 \pm 0.337$	0.13	$0.039 \pm 0.082$	$-0.017 \pm 0.714$
PRF-fit source offset from KIC position	$0.050 \pm 0.637$	0.08	$0.035 \pm 0.078$	$-0.036 \pm 0.844$
photometric centroid source offset	$0.23 \pm 0.21$	1.08	$0.06 \pm 0.24$	$0.22 \pm 0.21$



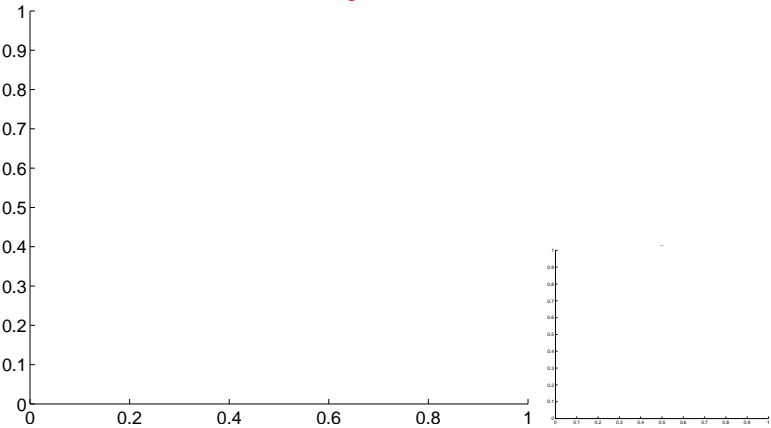
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

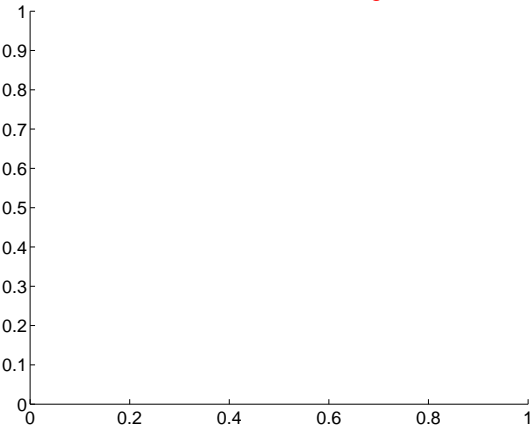
Q1 no difference image



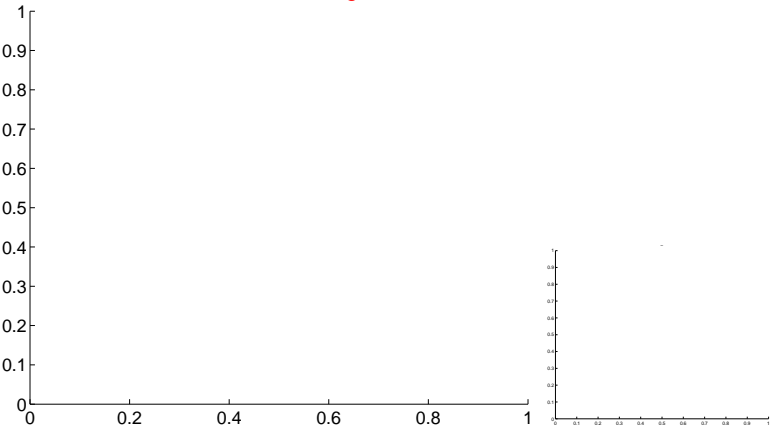
Q1 no OOT image



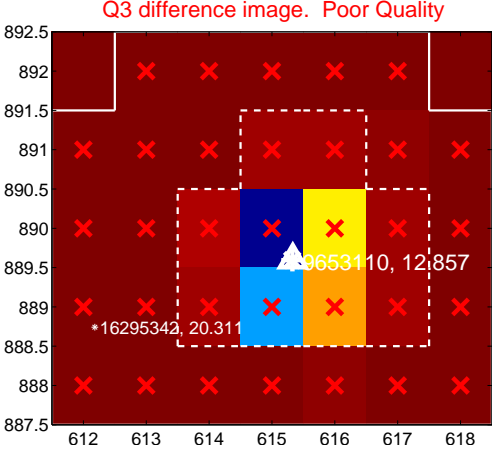
Q2 no difference image



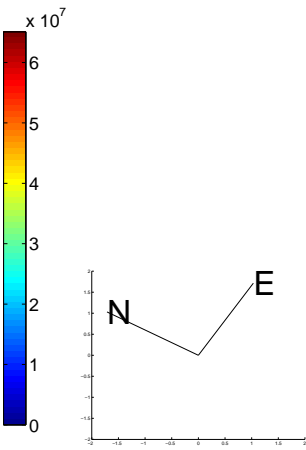
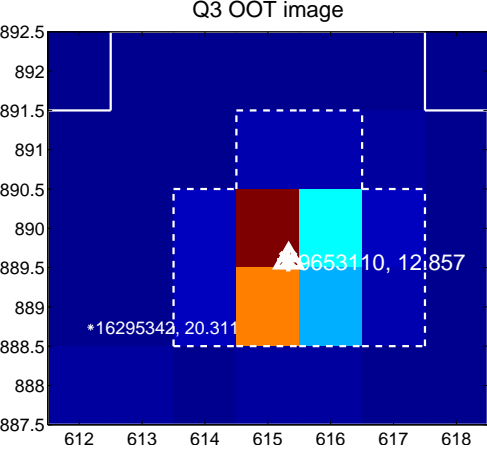
Q2 no OOT image



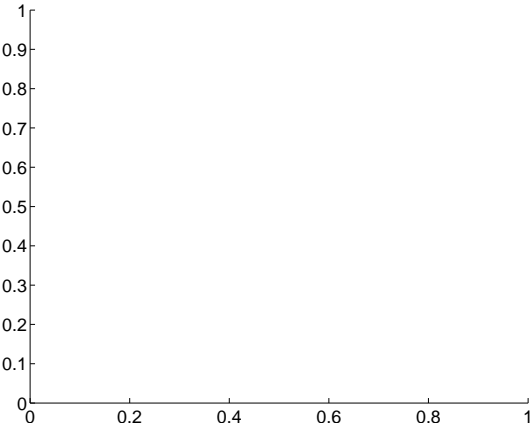
Q3 difference image. Poor Quality



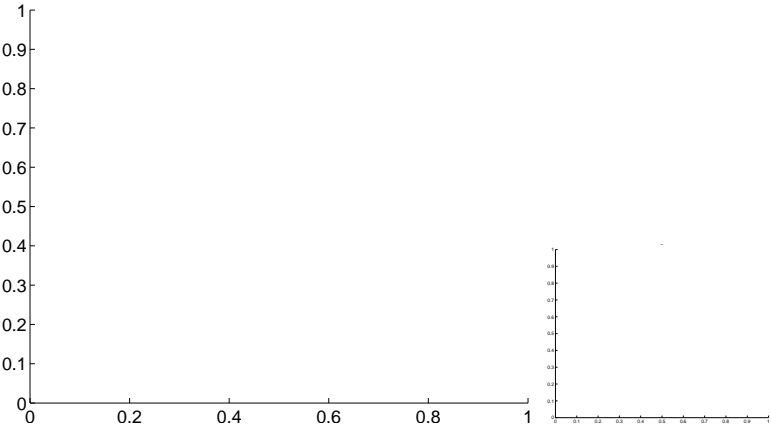
Q3 OOT image



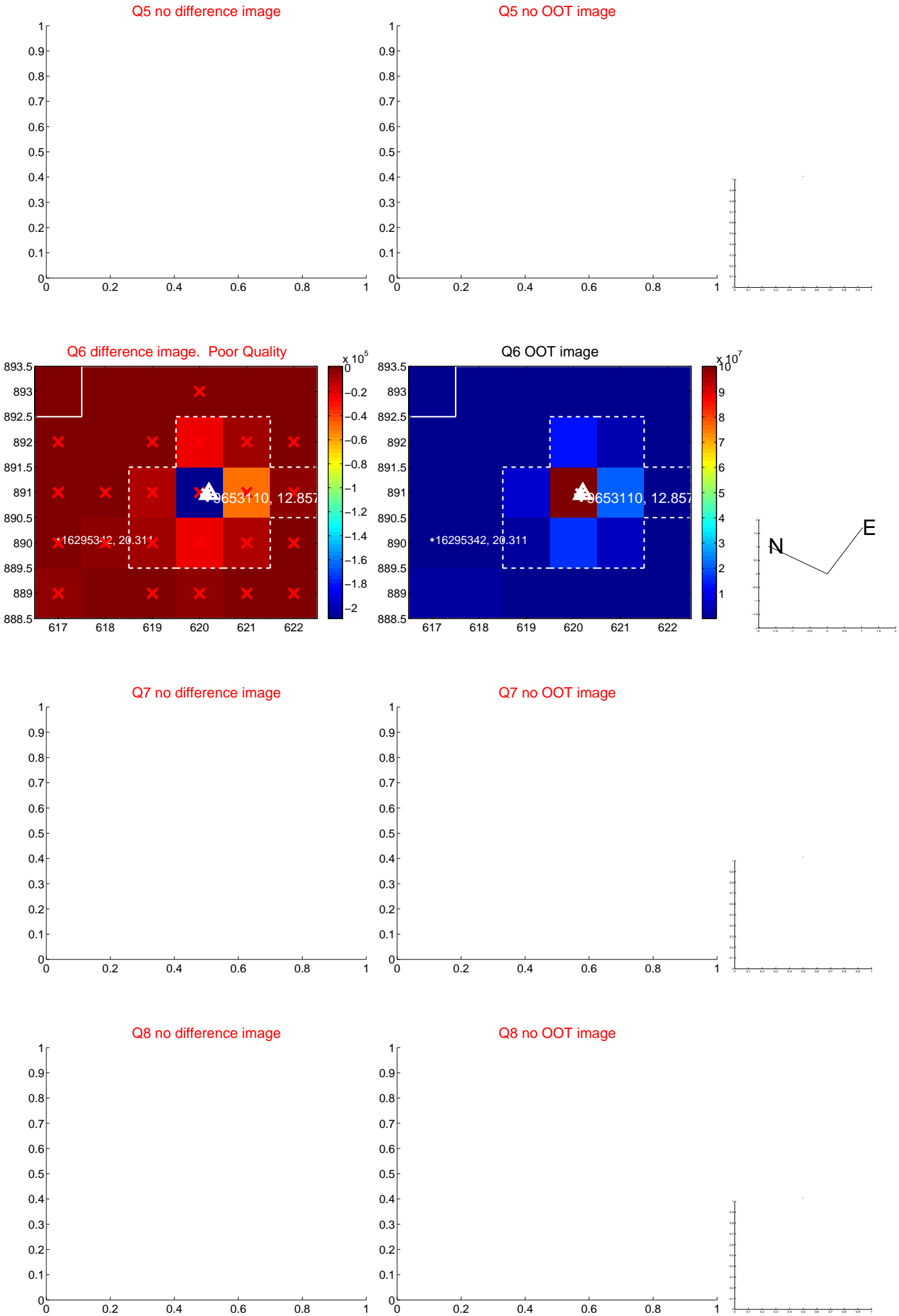
Q4 no difference image



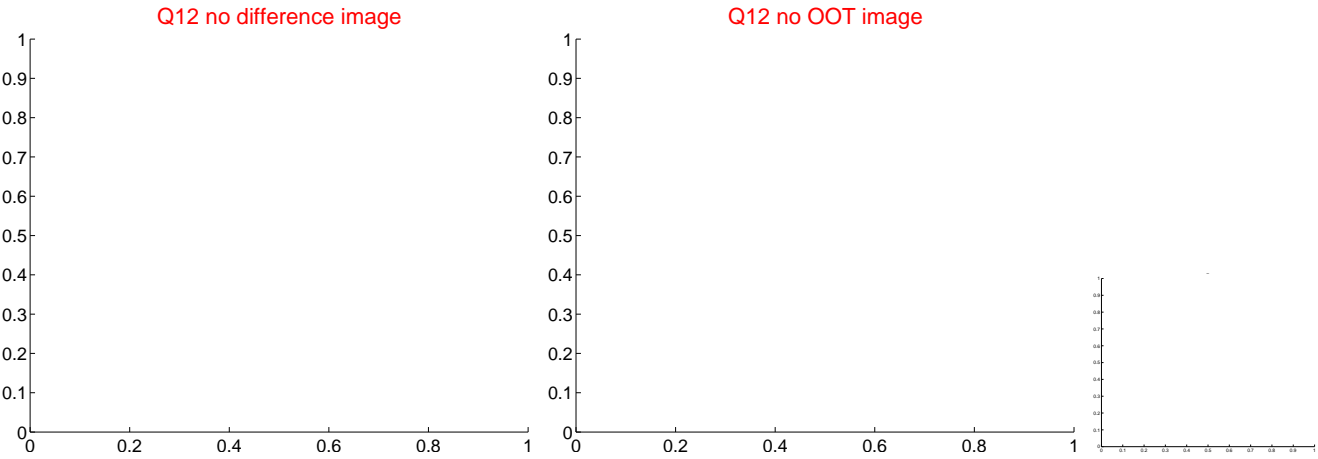
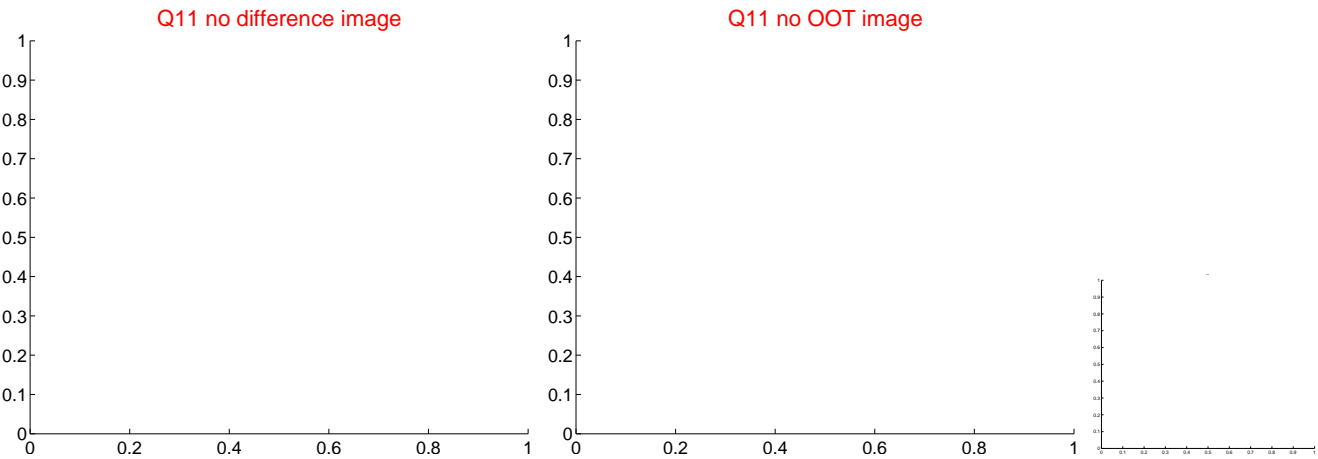
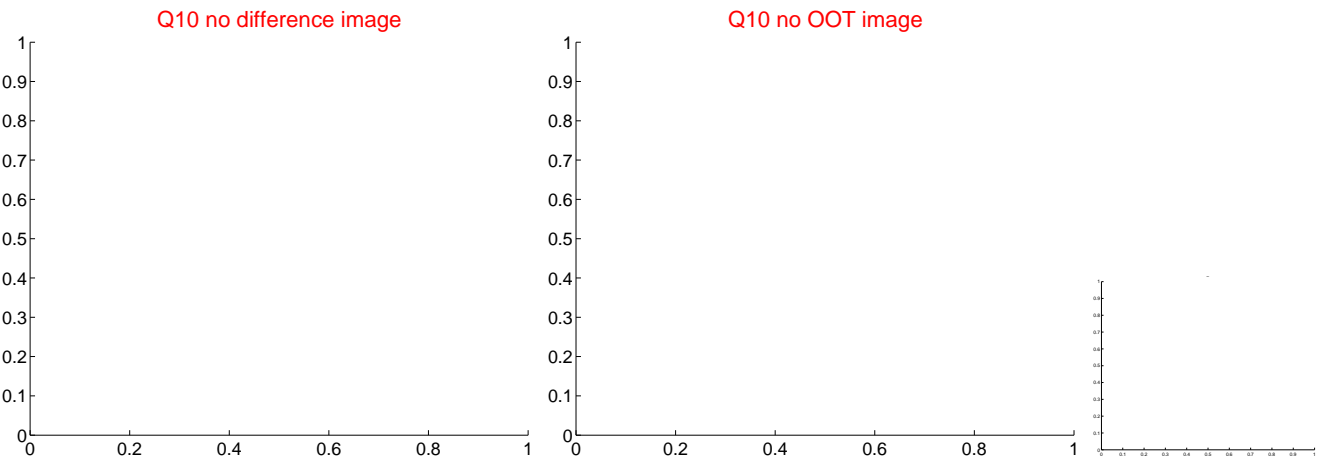
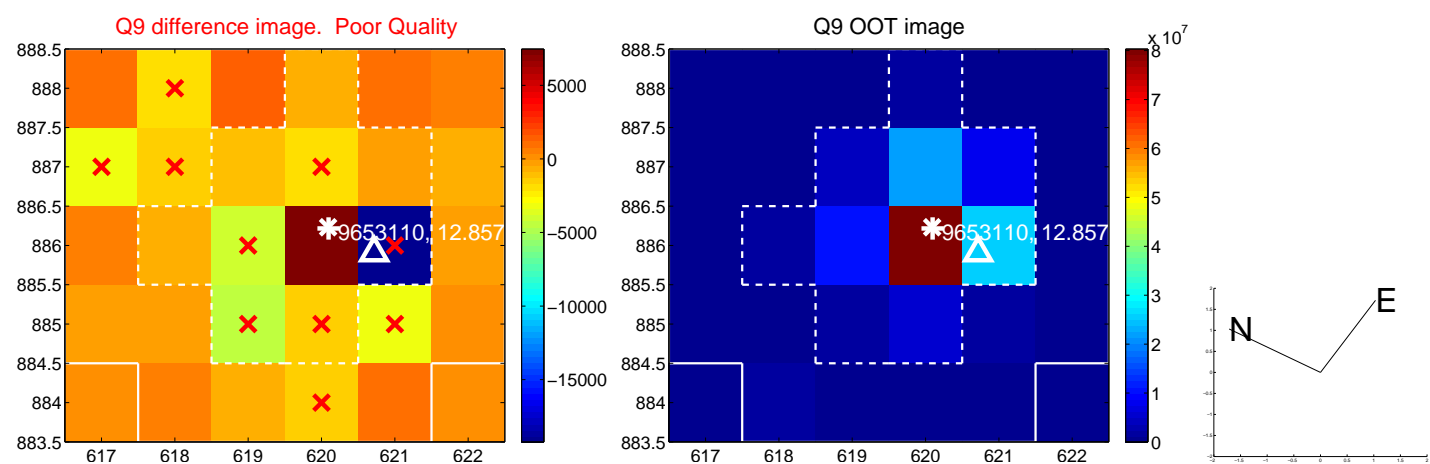
Q4 no OOT image



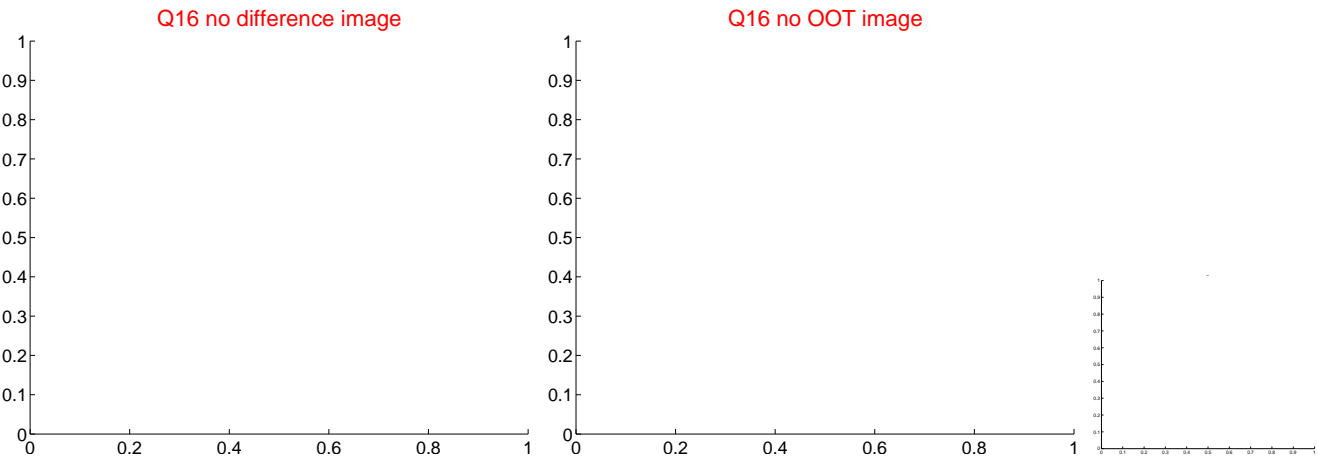
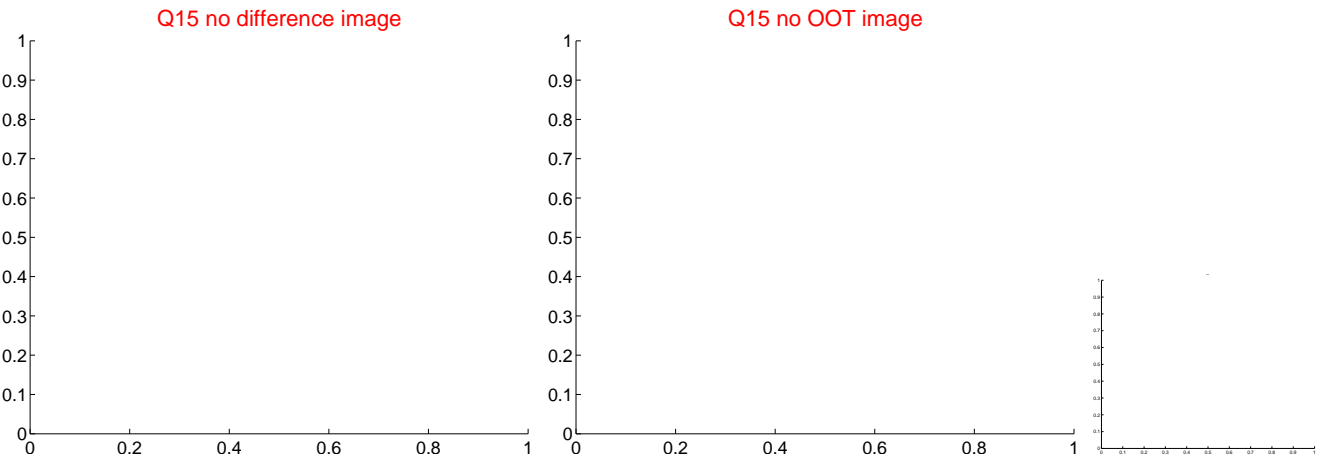
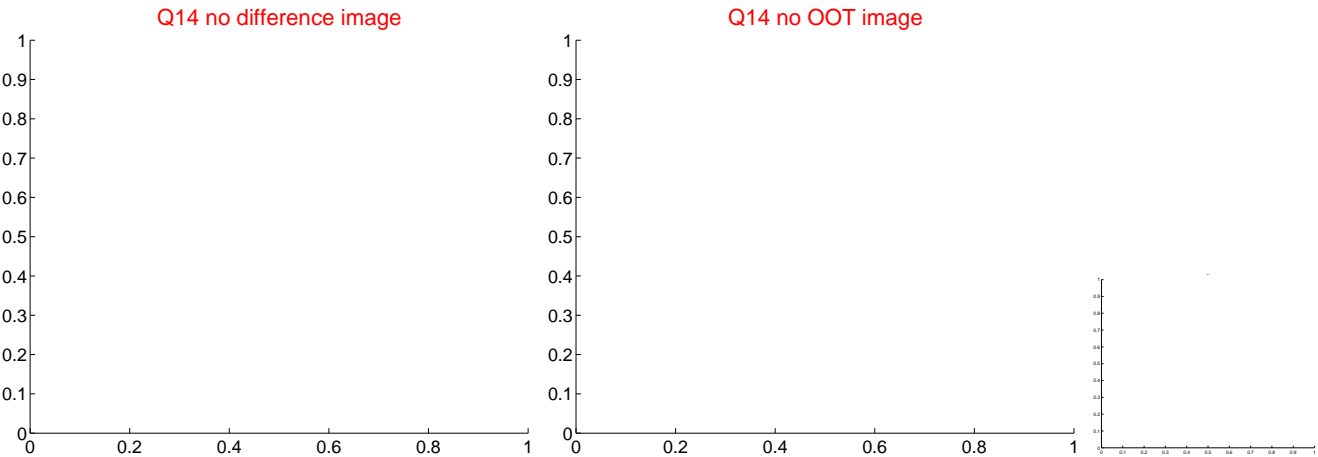
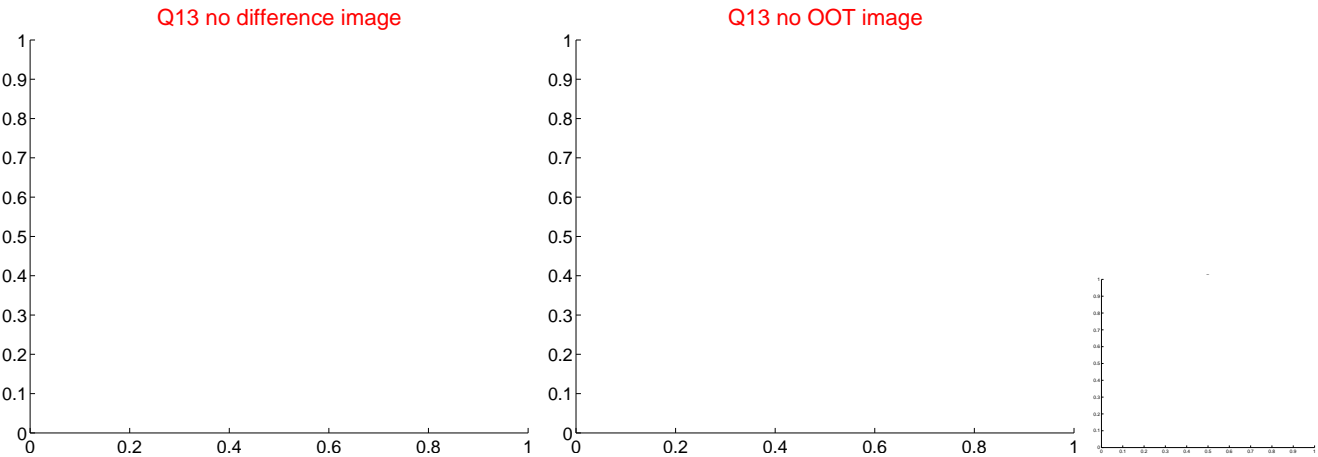
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



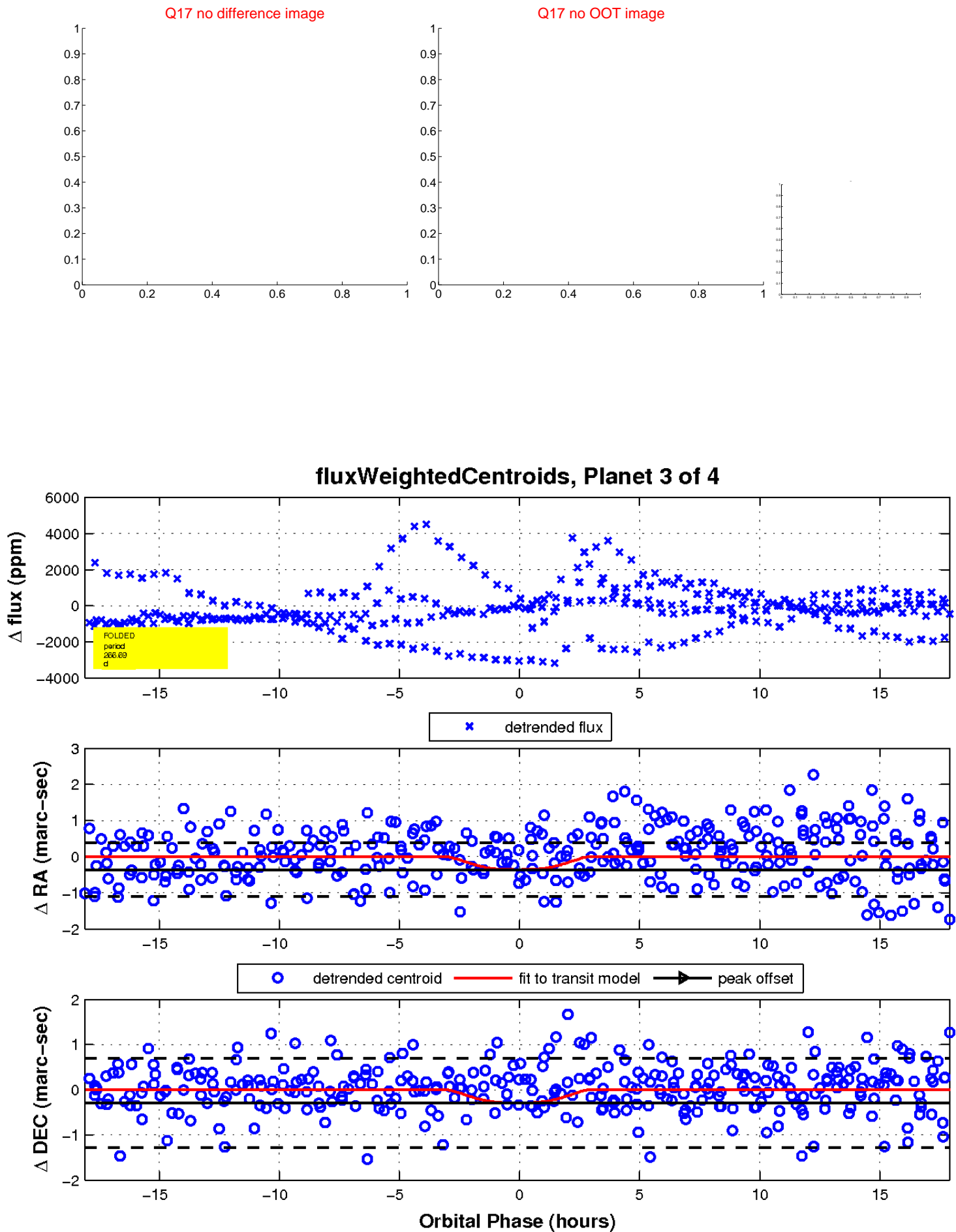
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ×: large negative pixel value.



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



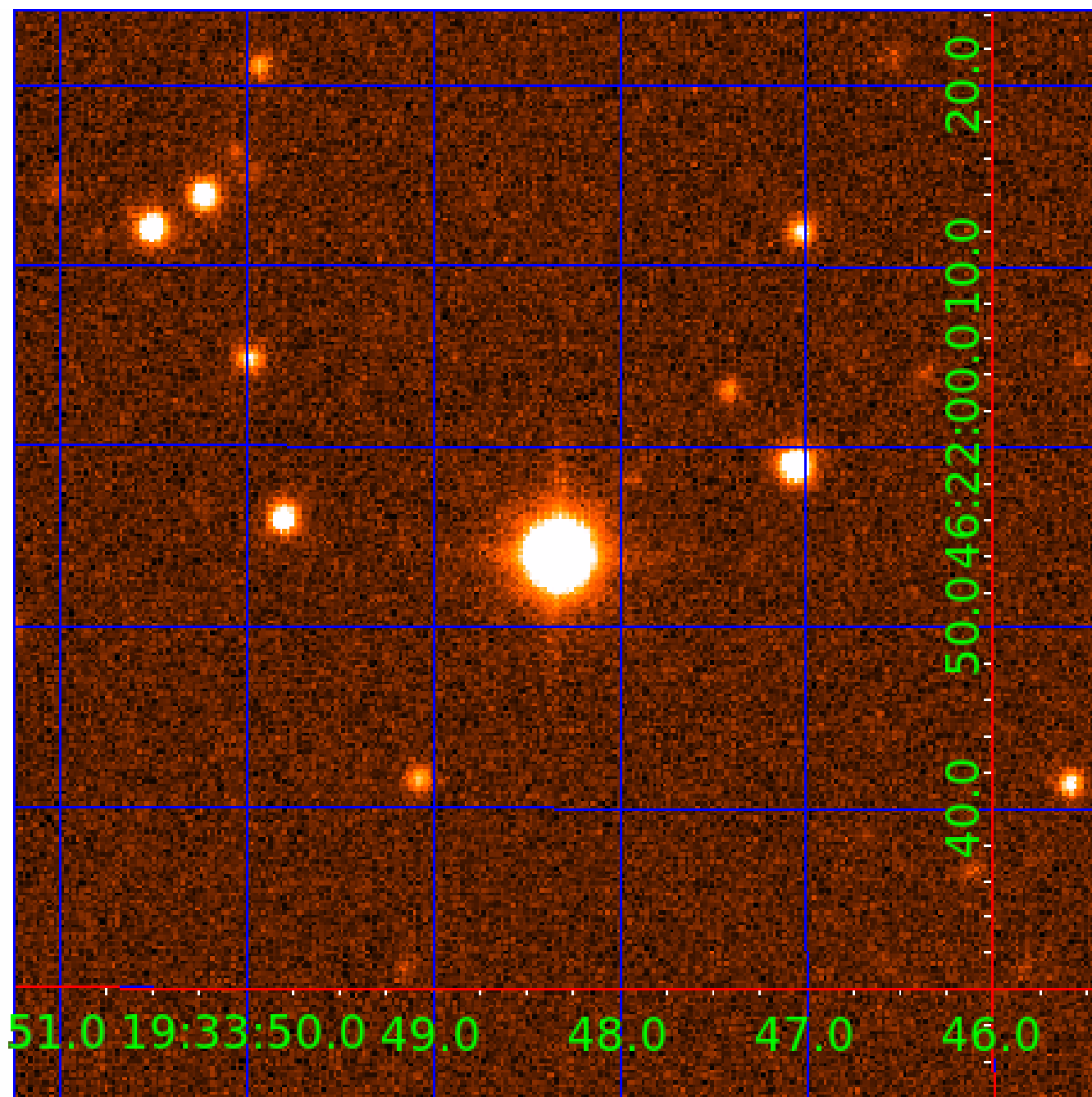
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





UKIRT Image

Declination



# KIC 009653110

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009653110-01	OBS	No	292.588605	277.400199	652.2	7.016	20.3	5.8	0.75	5396	1.98	0.73
009653110-02	OBS	No	369.069568	266.609746	920.6	1.557	16.9	9.0	0.75	5396	2.31	0.53
009653110-03	OBS	No	266.685084	326.565628	1495.7	6.032	17.8	11.9	0.75	5396	3.70	0.82
009653110-04	OBS	No	496.497894	389.828814	1524.4	6.663	15.5	8.5	0.75	5396	3.53	0.36

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009653110-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_ZUMA—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV
009653110-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_POS_DV
009653110-03	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
009653110-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—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.

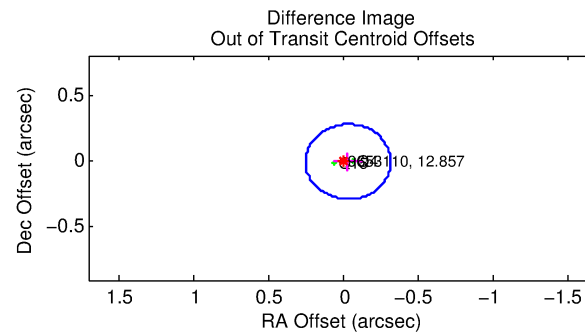
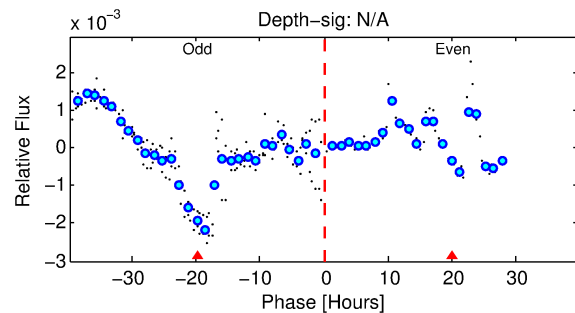
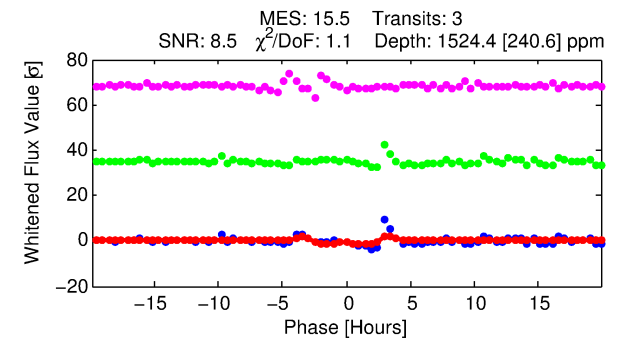
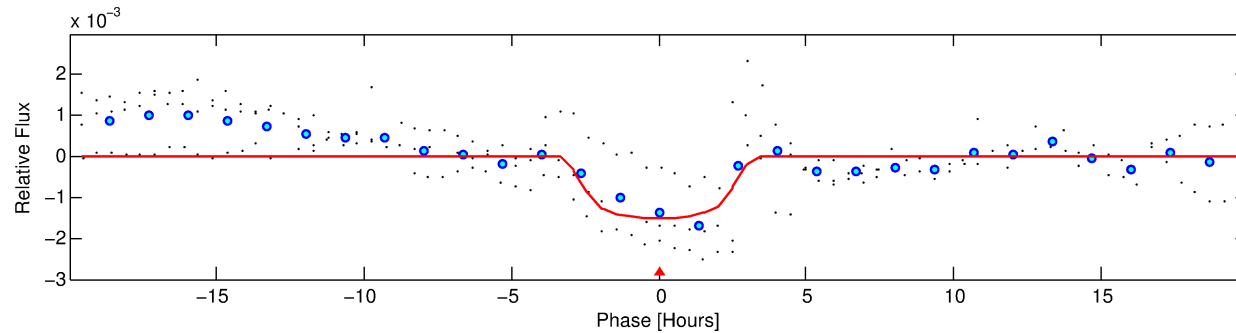
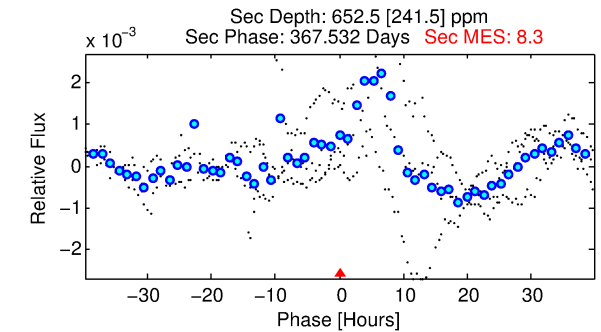
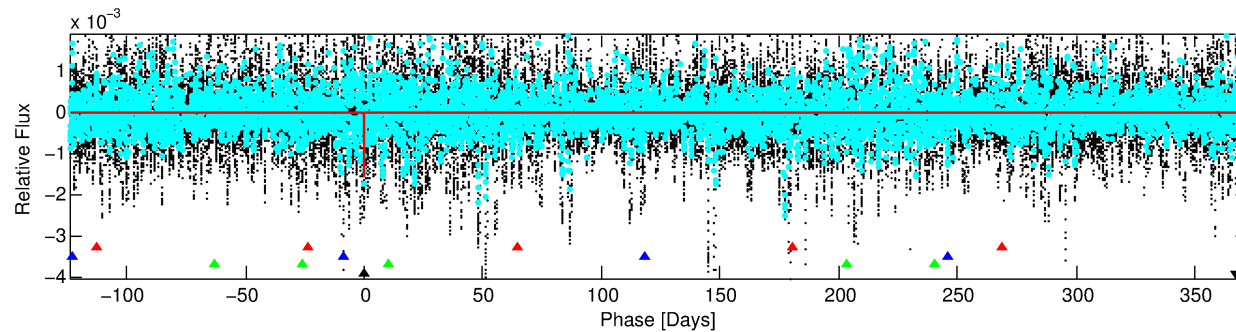
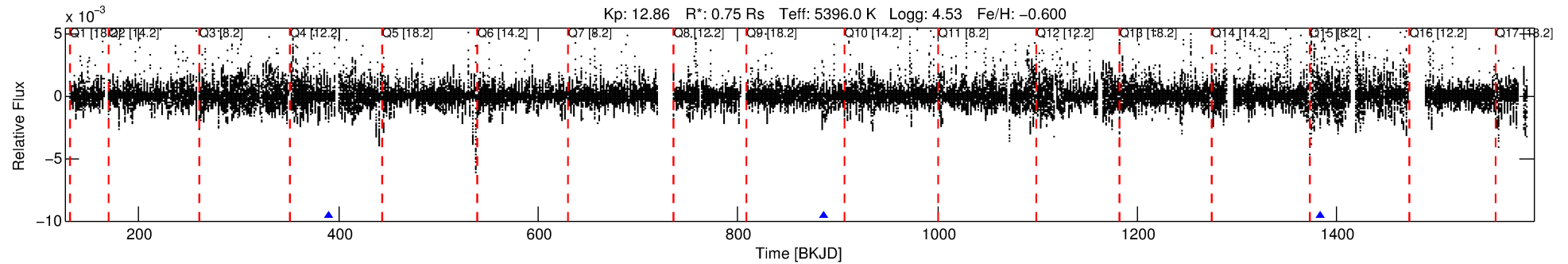
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009653110-04

No Significant Match Found

# DV One-Page Summary

KIC: 9653110 Candidate: 4 of 4 Period: 496.498 d



## DV Fit Results:

Period = 496.49789 [0.00520] d  
Epoch = 389.8288 [0.0062] BKJD  
Rp/R\* = 0.0432 [0.0039]  
a/R\* = 289.19 [37.09]  
b = 0.91 [0.03]  
Seff = 0.36 [0.08]  
Teq = 197 [10] K  
Rp = 3.53 [0.56] Re  
a = 1.0887 [0.1253] AU  
Ag = 34207.77 [15327.32] [2.23σ]  
T<sub>effp</sub> = 4149 [445] K [8.87σ]

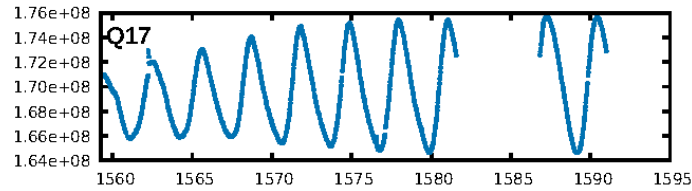
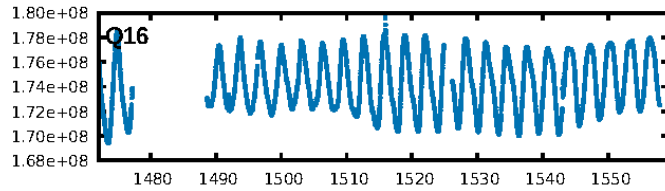
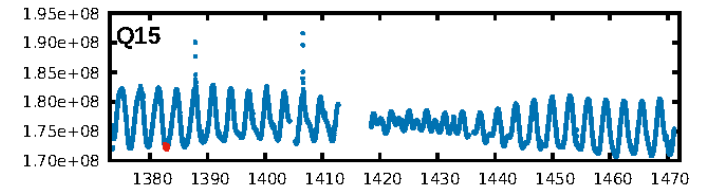
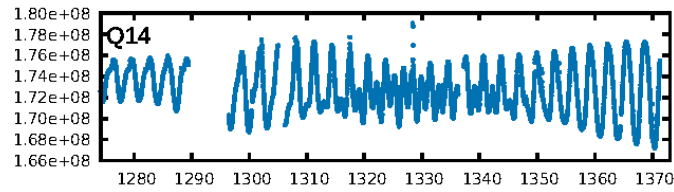
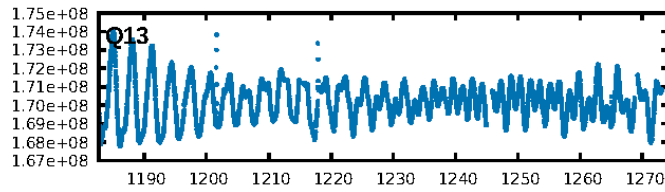
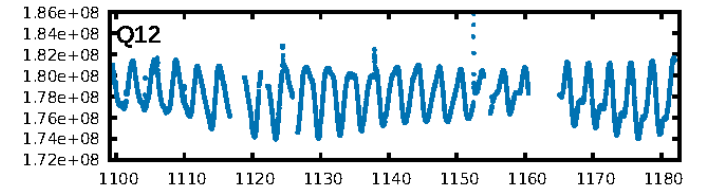
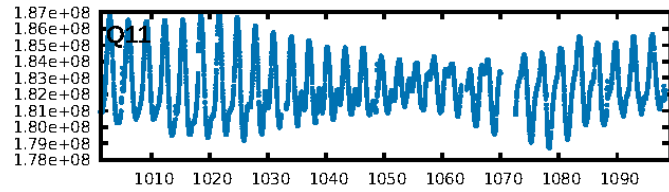
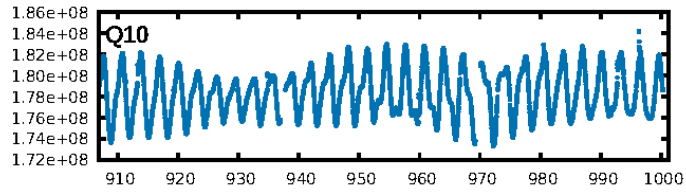
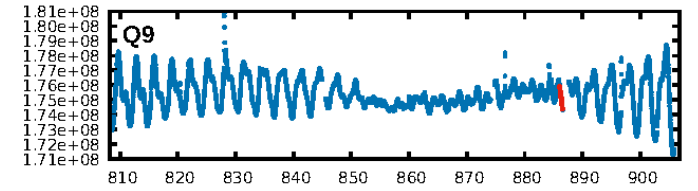
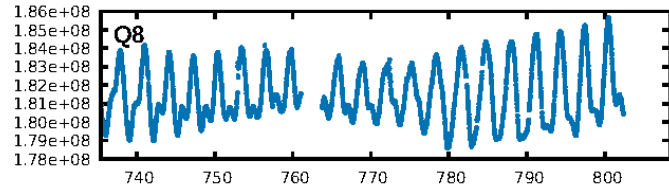
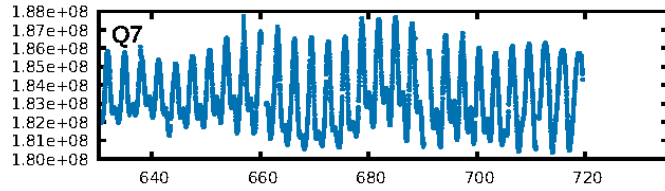
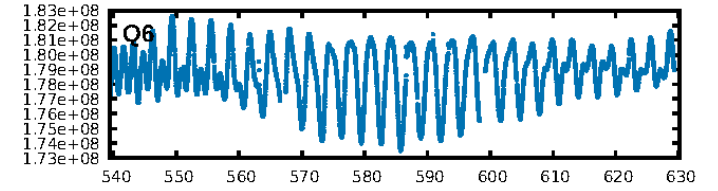
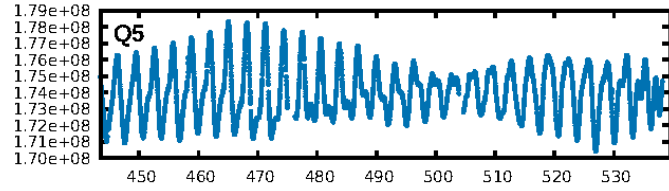
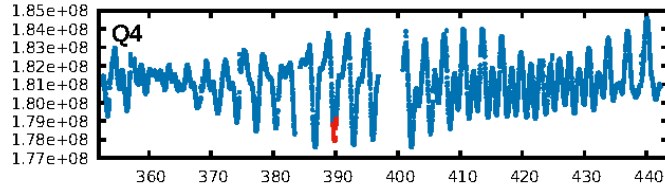
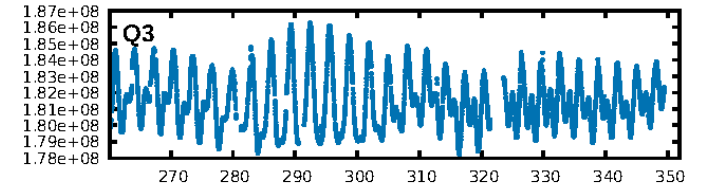
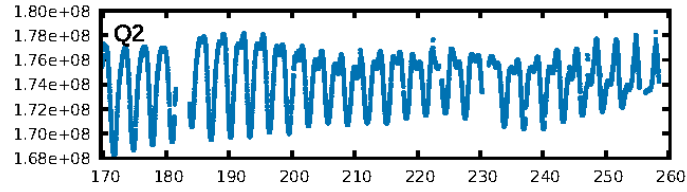
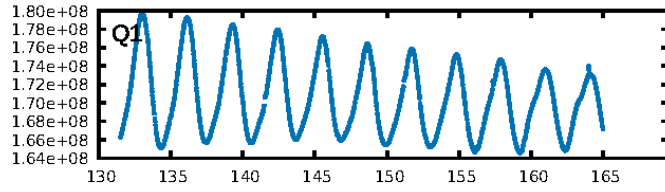
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [446.94σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 50.3%  
ModelChiSquareGof-sig: 97.9%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: 2.205  
Centroid-sig: 26.9%  
Centroid-so: 0.150 arcsec [0.57σ]  
OotOffset-rm: 0.036 arcsec [0.38σ]  
OotOffset-st: 0/1/1/0 [2]  
KicOffset-rm: 0.094 arcsec [1.33σ]  
KicOffset-st: 0/1/1/0 [2]  
DiffImageQuality-fgm: 1.00 [2/2]  
DiffImageOverlap-fno: 1.00 [2/2]

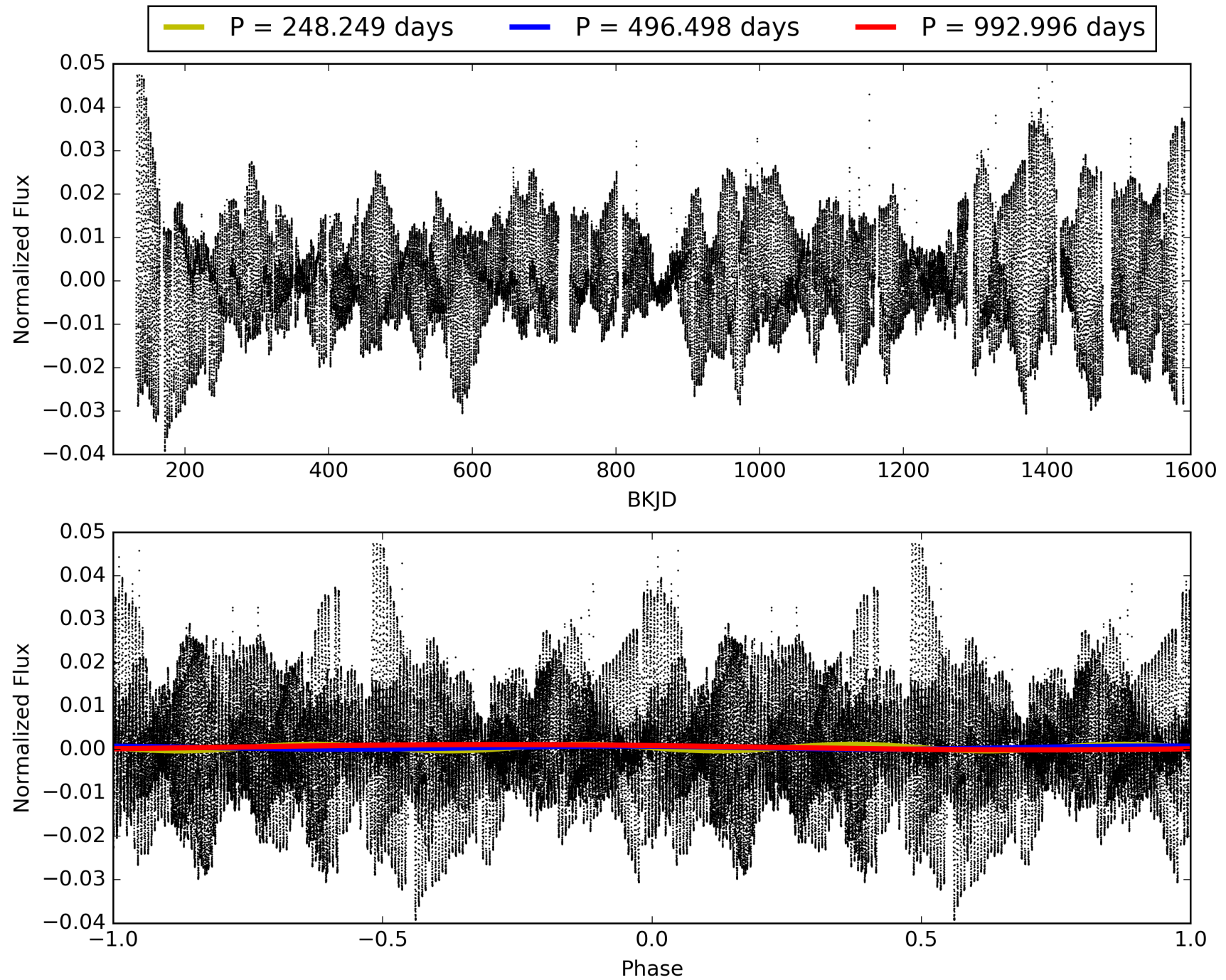
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 22:05:58 Z

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

# TCE 009653110-04, PDC Light Curves

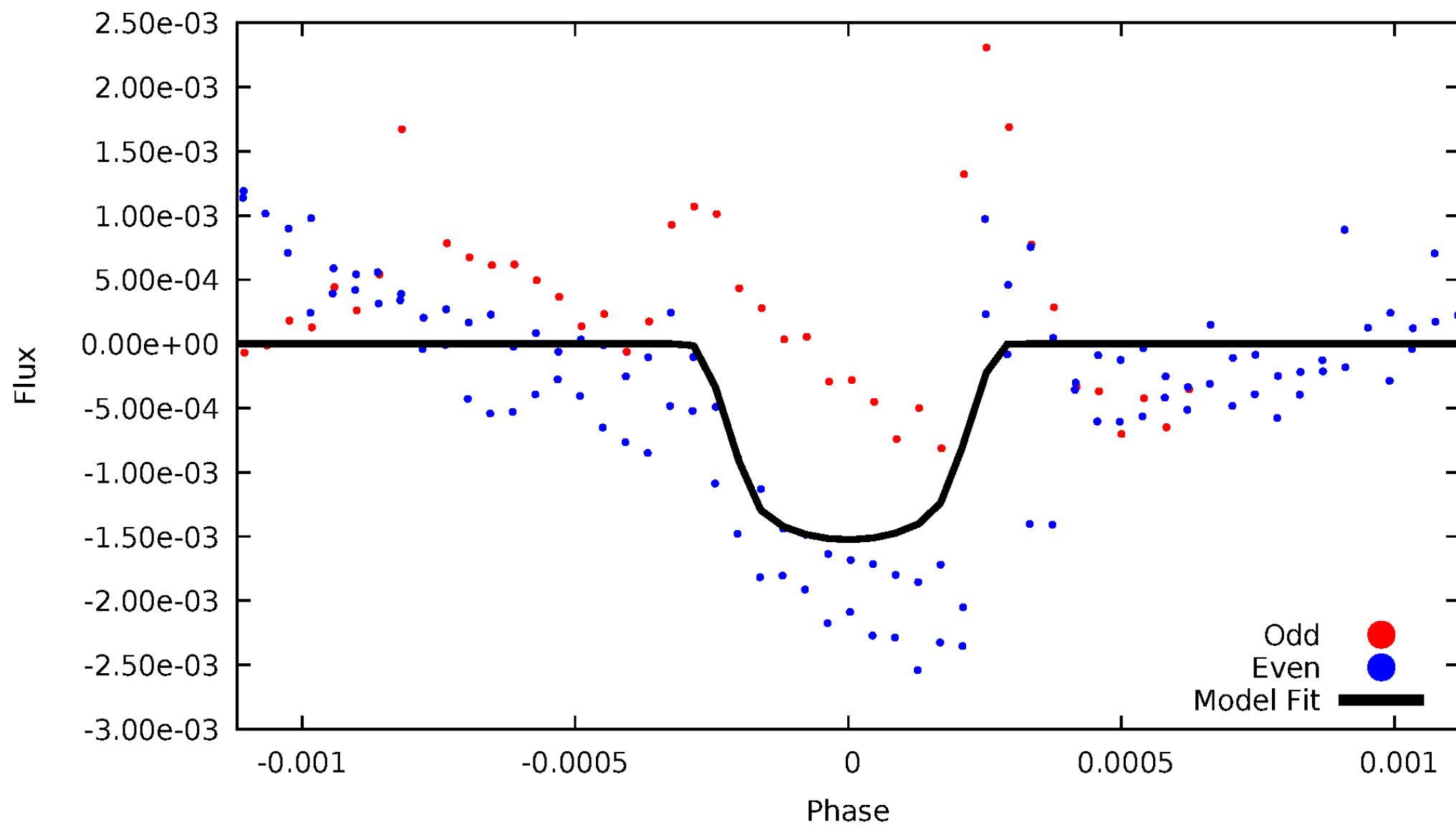


# TCE 009653110-04



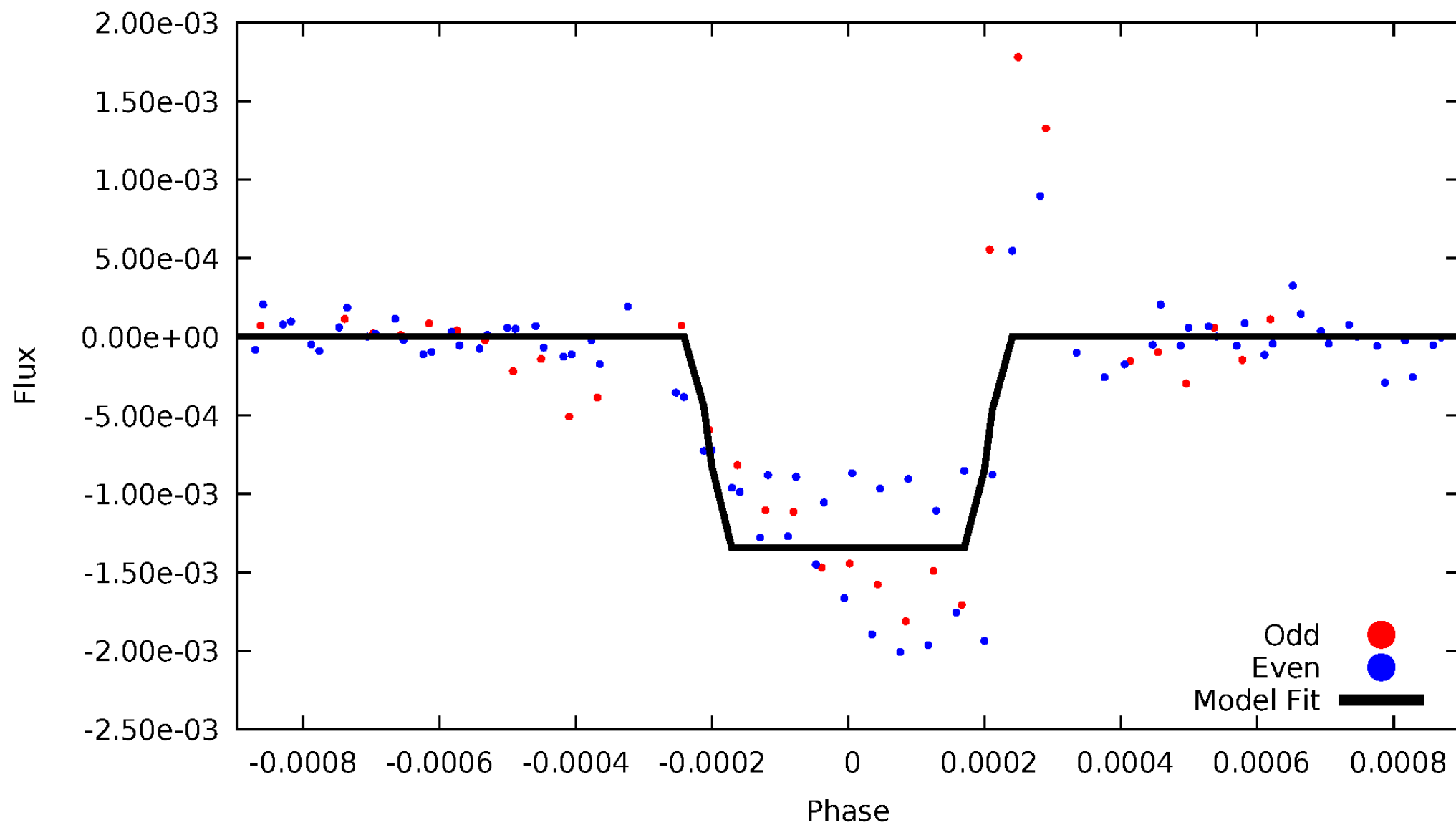
# DV Odd/Even

TCE 009653110-04



# ALT Odd/Even

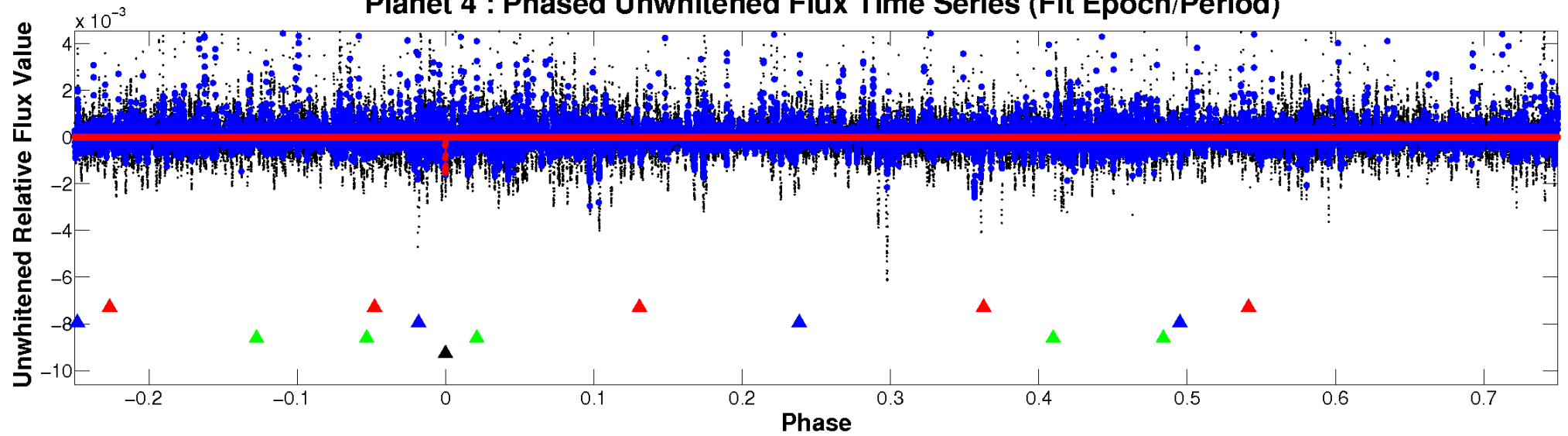
TCE 009653110-04



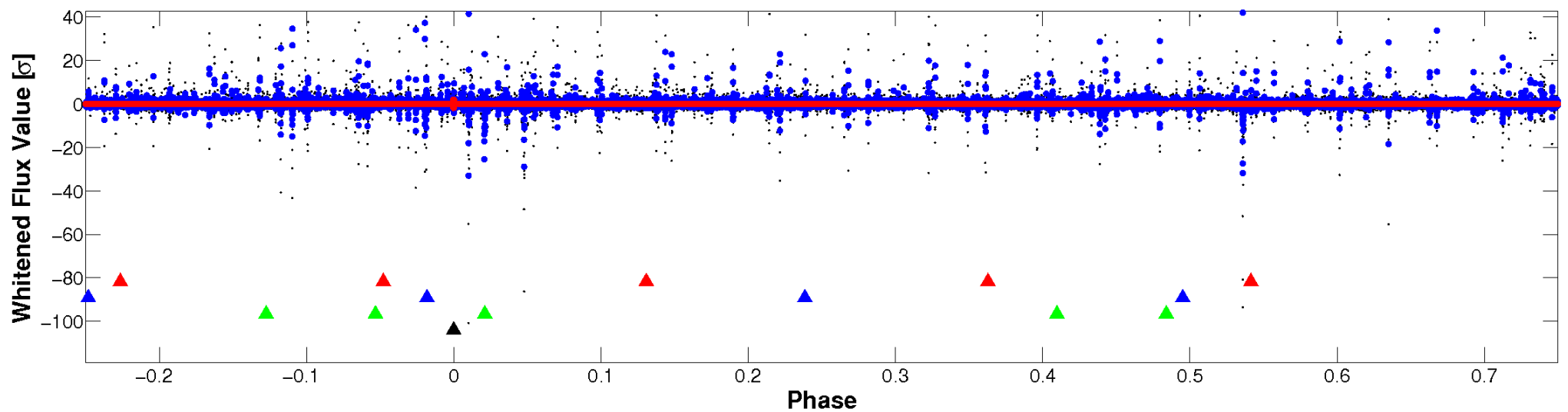


# Non-Whitened Vs. Whitened Light Curve

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



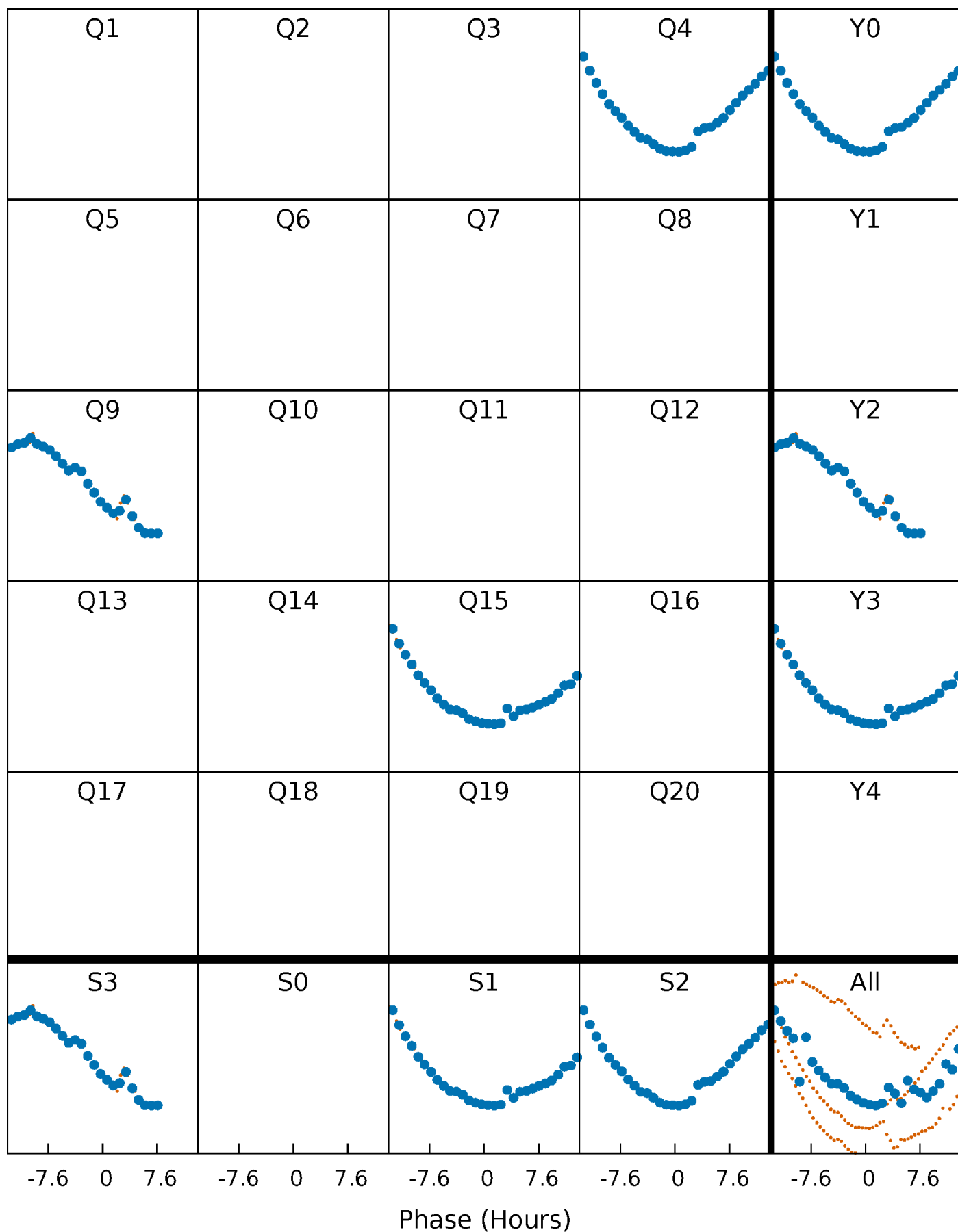
## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)





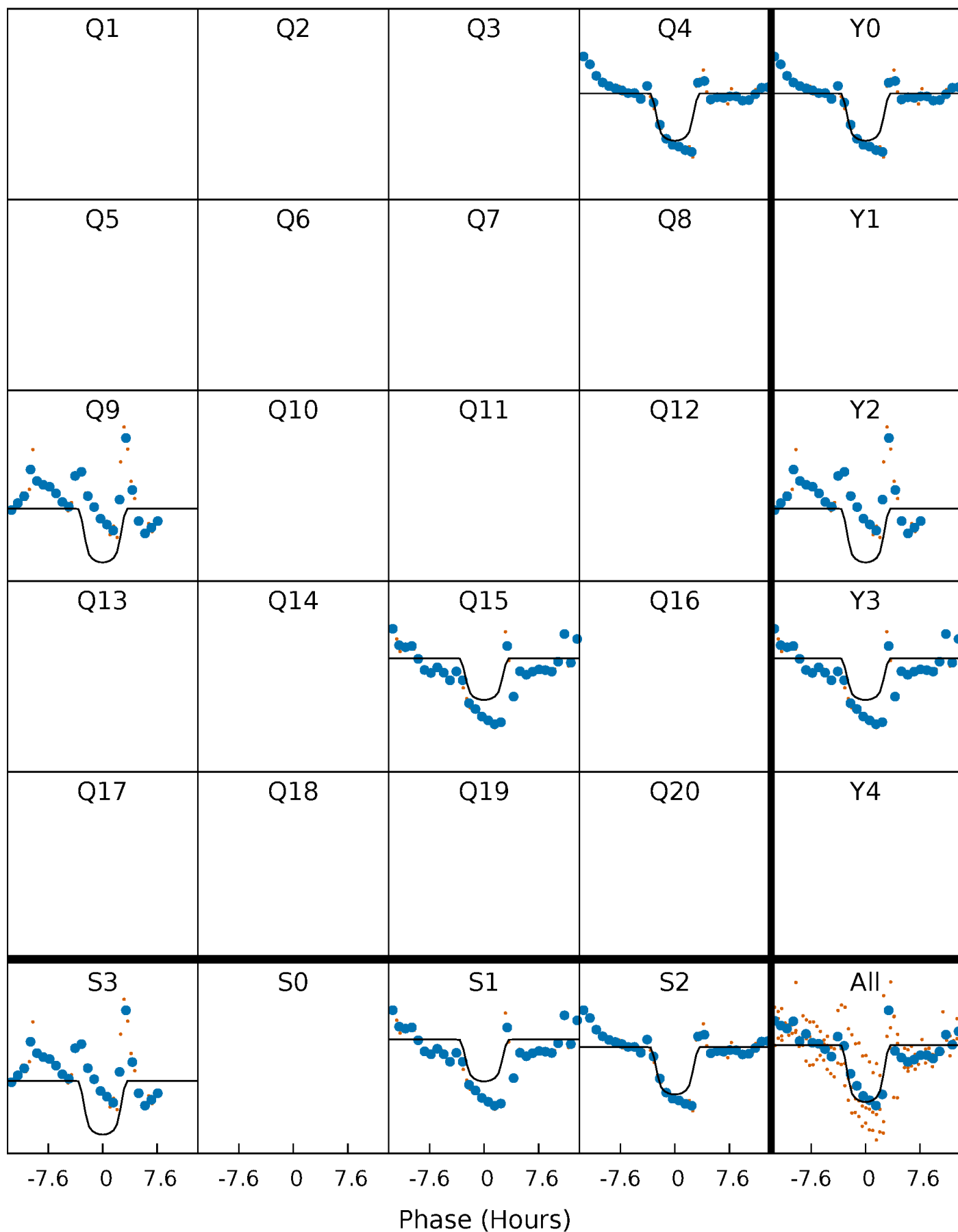
# PDC Quarter-Phased Transit Curves

TCE 009653110-04 P=496.497894 Days  $T_0=389.828814$  (BKJD)



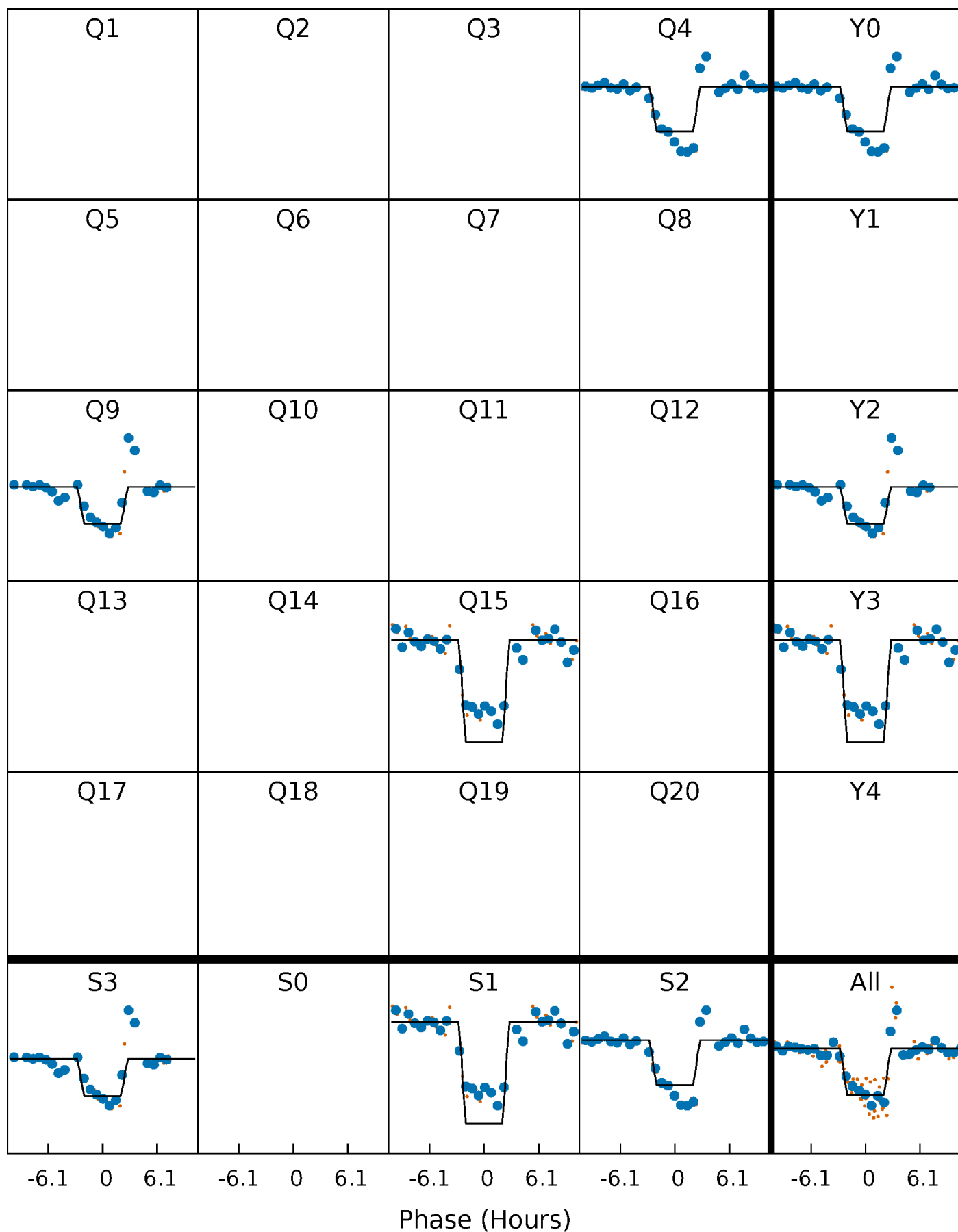
# DV Quarter-Phased Transit Curves

TCE 009653110-04 P=496.497894 Days  $T_0=389.828814$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

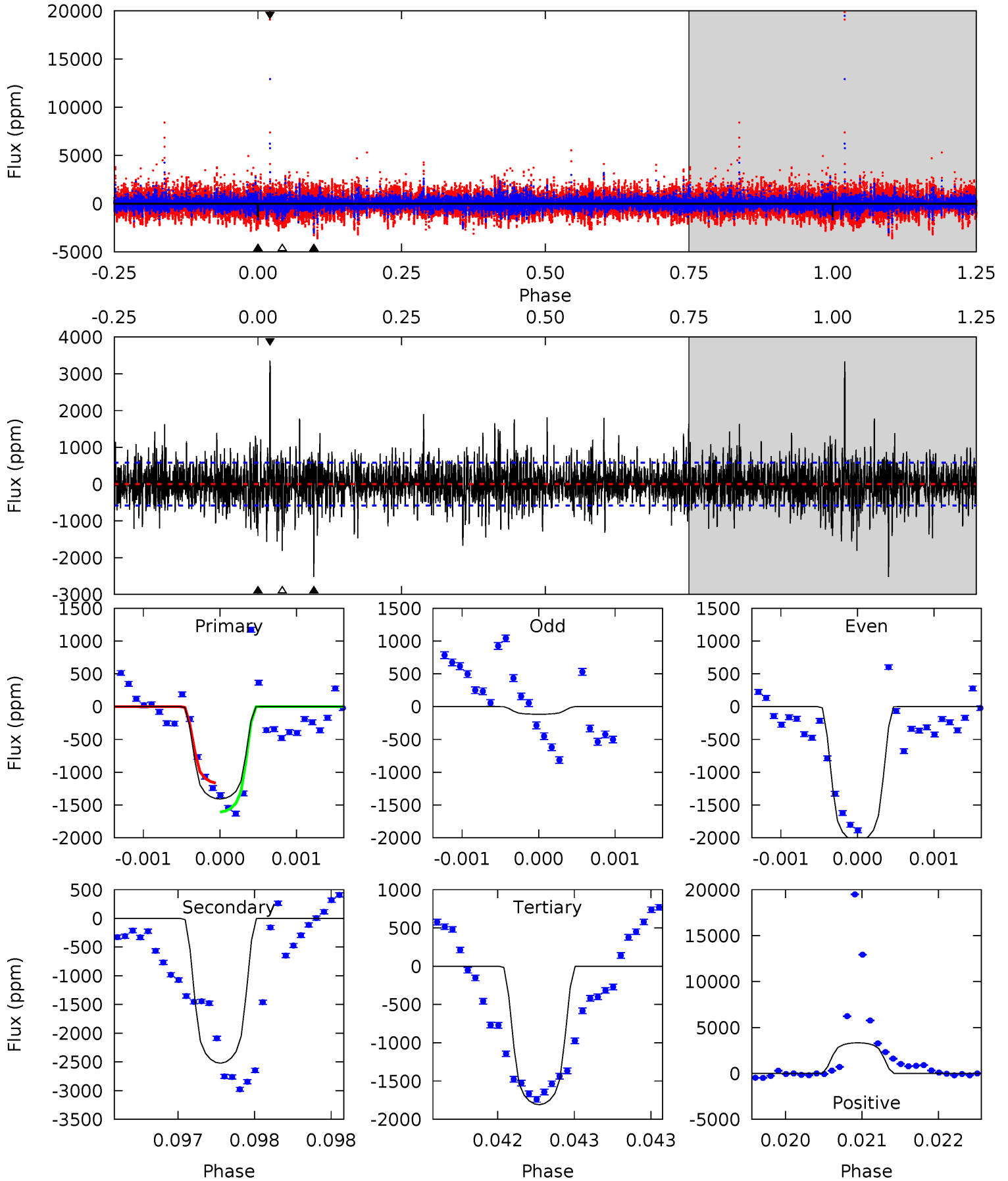
TCE 009653110-04 P=496.494641 Days  $T_0=389.834099$  (BKJD)



# DV Model-Shift Uniqueness Test

009653110-04, P = 496.497894 Days, E = 389.828814 Days

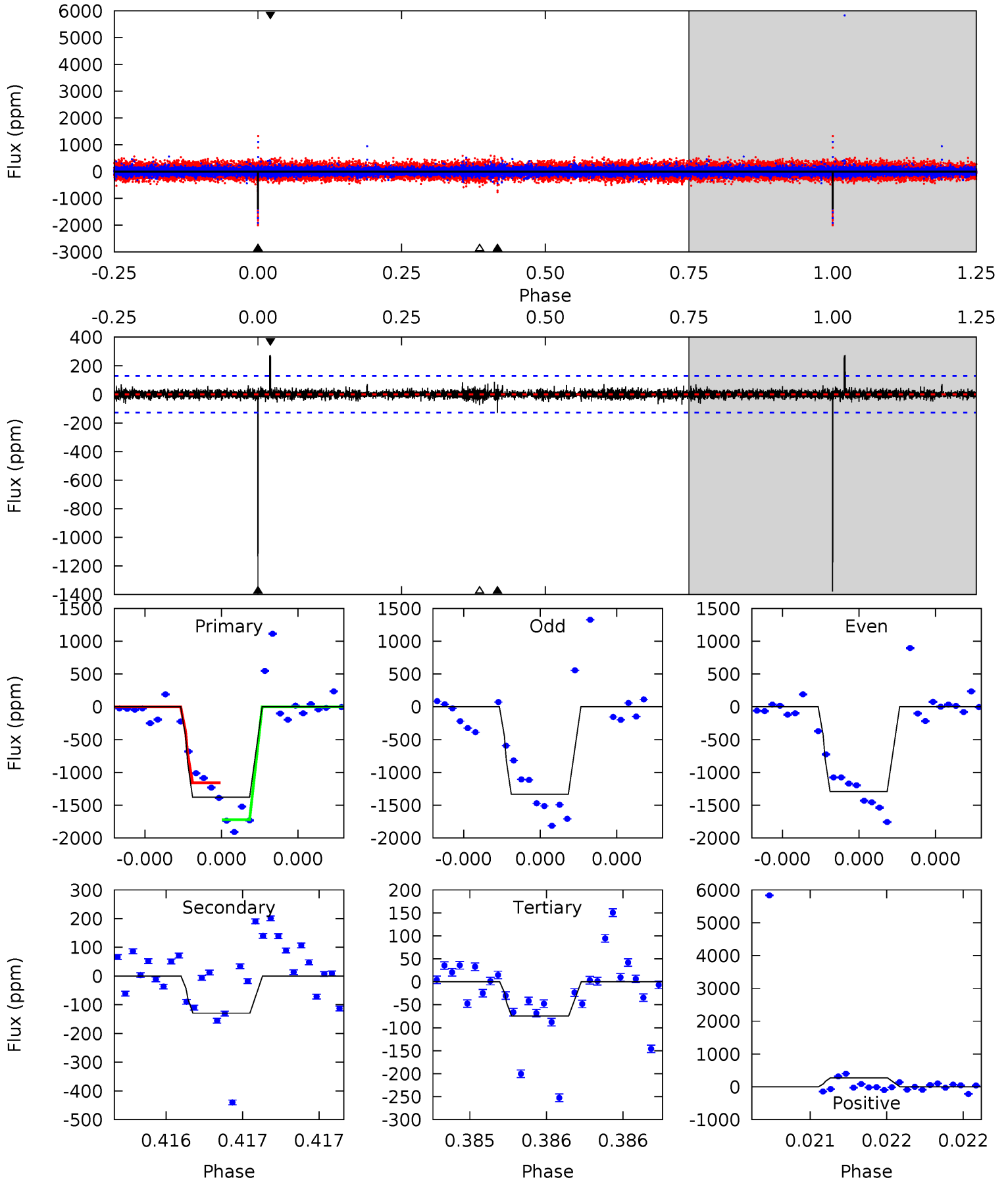
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
13.4	23.9	17.2	31.7	5.54	3.42	4.08	-3.80	-18.3	6.77	-7.73	7.35	0.80	0.57	2.10



# Alt Model-Shift Uniqueness Test

009653110-04, P = 496.494641 Days, E = 389.834099 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
60.3	5.65	3.26	12.0	5.59	3.51	0.65	57.0	48.3	2.38	-6.31	0.79	0.99	0.17	11.3



### Stellar Parameters For KIC 009653110

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5396^{+160}_{-144}$	$4.534^{+0.099}_{-0.081}$	$-0.600^{+0.350}_{-0.300}$	$0.748^{+0.097}_{-0.088}$	$0.696^{+0.097}_{-0.039}$	$2.347^{+1.043}_{-0.610}$
	+3%/-3%	+2%/-2%	+58%/-50%	+13%/-12%	+14%/-6%	+44%/-26%
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 009653110-04 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-2522 \pm 105$	$3.53^{+0.45}_{-0.37}$	$275^{+12}_{-11}$	$5801^{+297}_{-298}$	$133607^{+32276}_{-27734}$
Alt.	$-129 \pm 23$	$2.99^{+0.39}_{-0.37}$	$276^{+12}_{-13}$	$3476^{+168}_{-161}$	$9430^{+3286}_{-2510}$

$T_{max}$  = 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

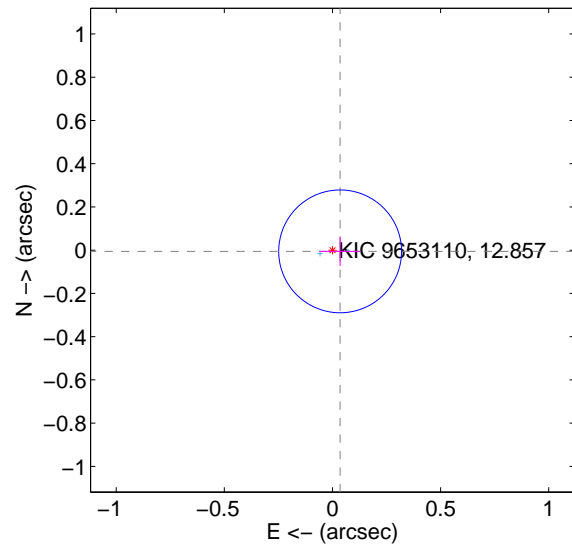
Supplemental centroid analysis for 009653110-04. Kepler magnitude: 12.86. Transit SNR 8.46

There are 2 quarters with good PRF difference image offsets

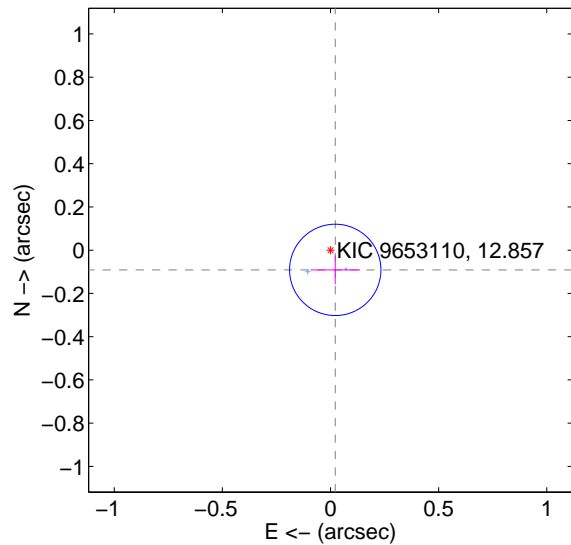
The direct PRF centroid is offset from the target star catalog position by about 0.10 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.036 \pm 0.095$	0.38	$-0.035 \pm 0.095$	$-0.006 \pm 0.067$
PRF-fit source offset from KIC position	$0.094 \pm 0.070$	1.33	$-0.022 \pm 0.114$	$-0.091 \pm 0.067$
photometric centroid source offset	$0.15 \pm 0.26$	0.57	$0.03 \pm 0.26$	$-0.15 \pm 0.26$

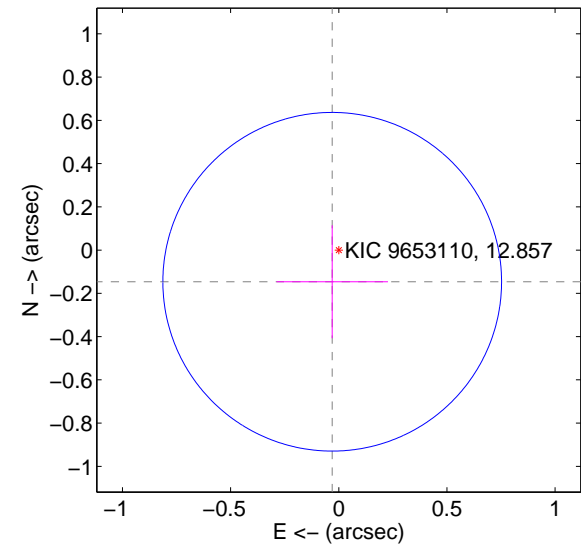
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

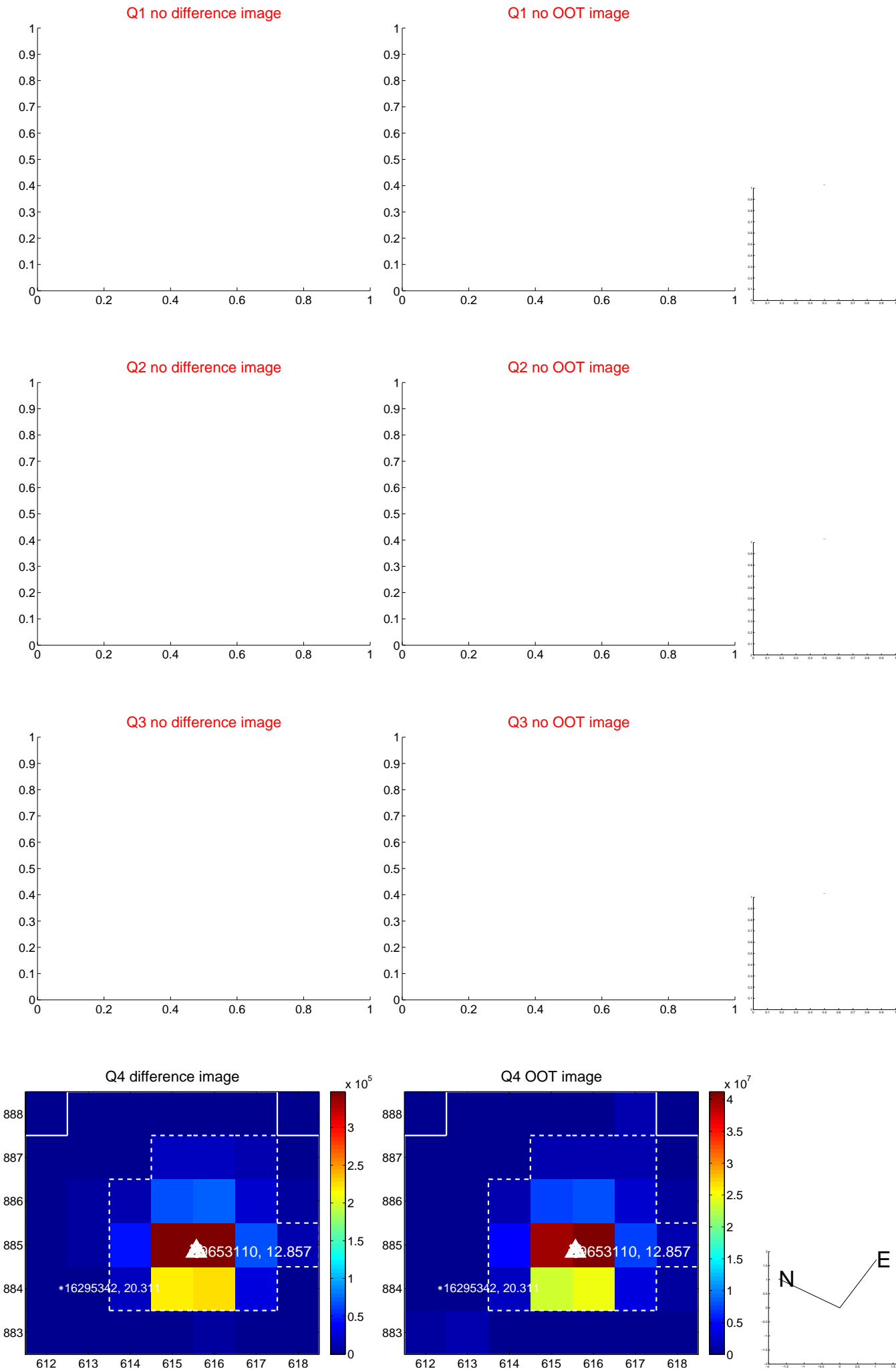


offset from photometric centroids



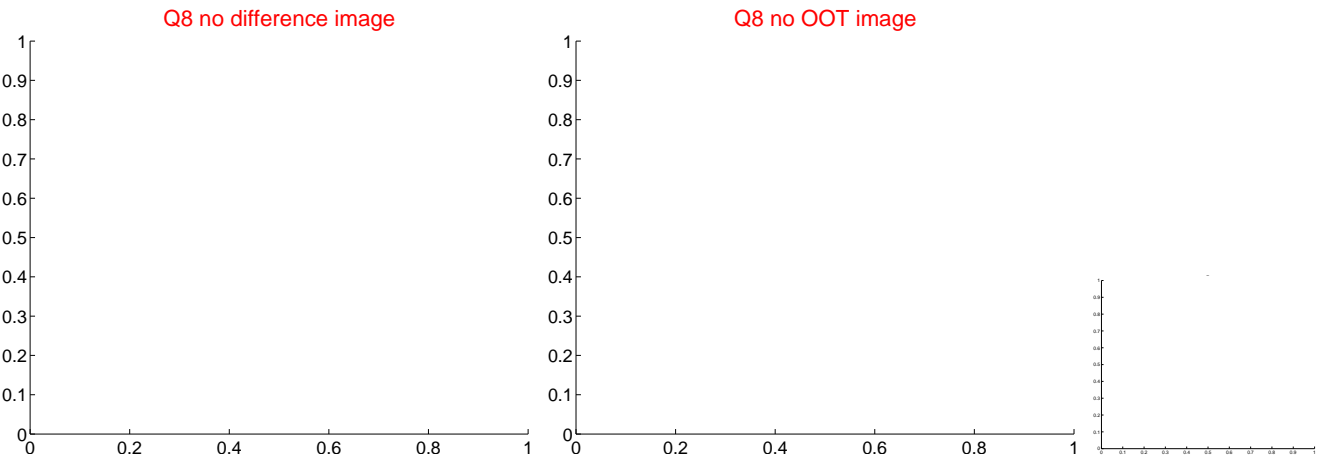
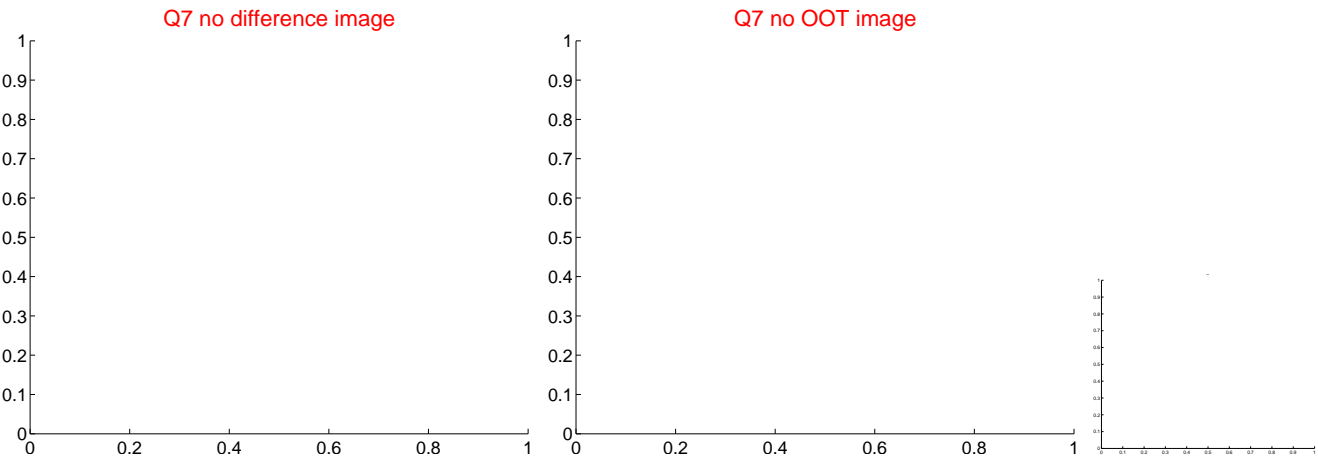
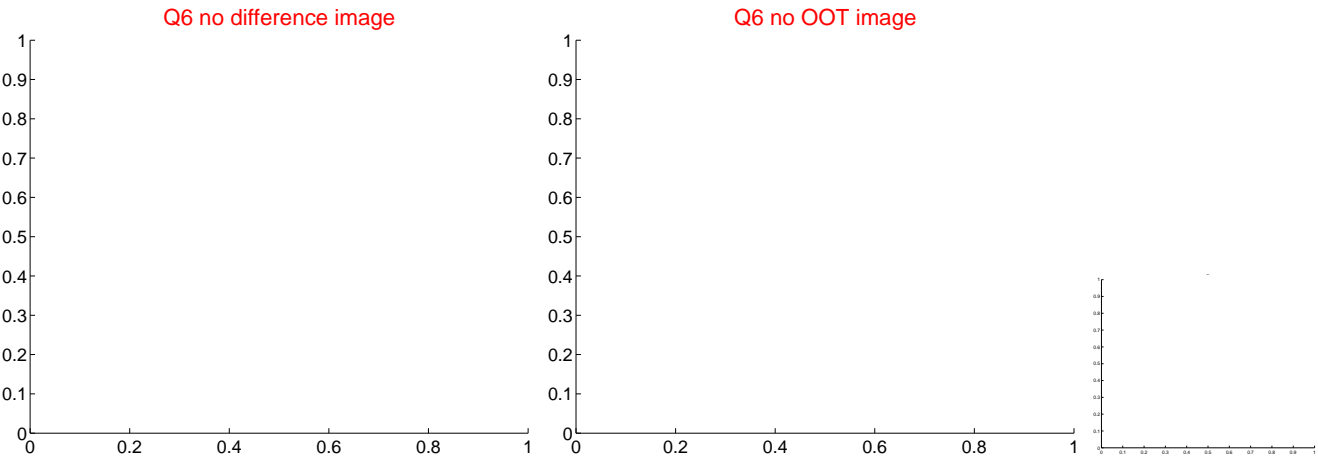
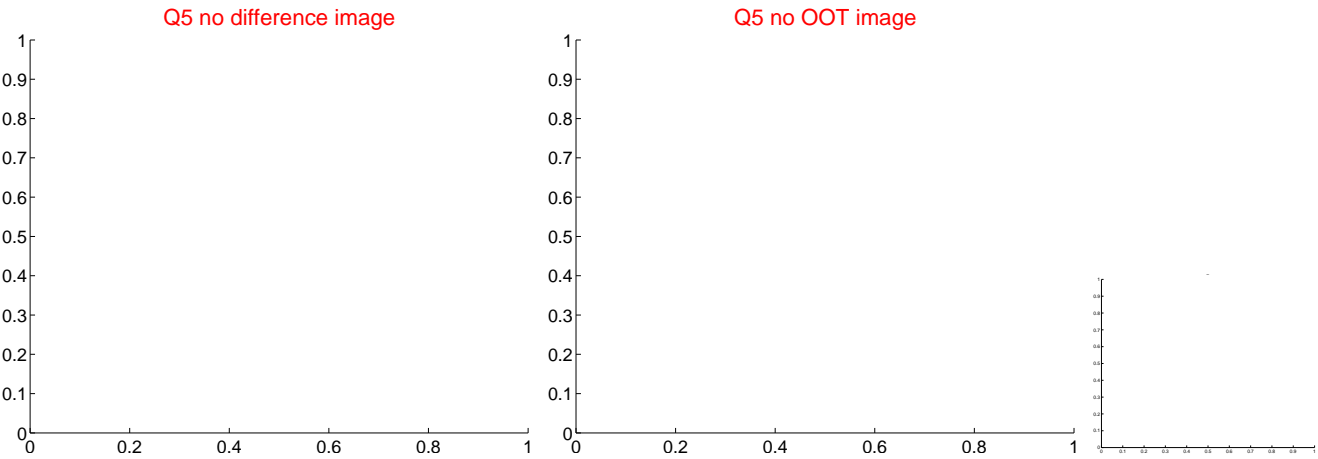
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

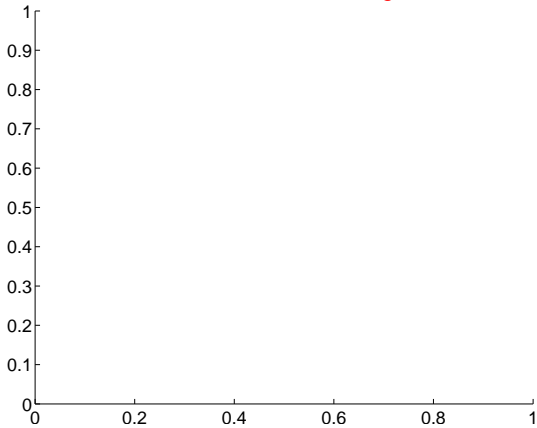


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

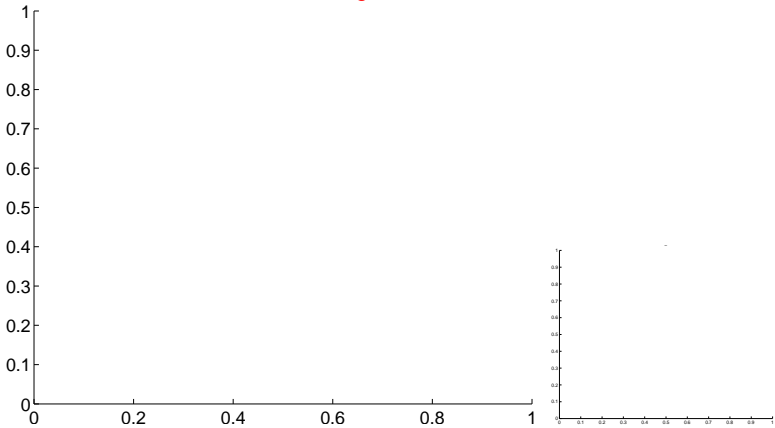


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

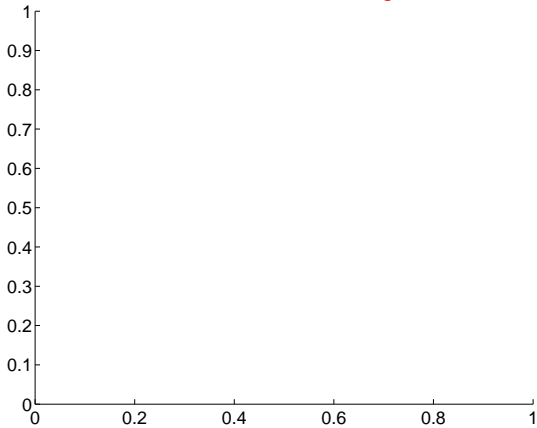
Q13 no difference image



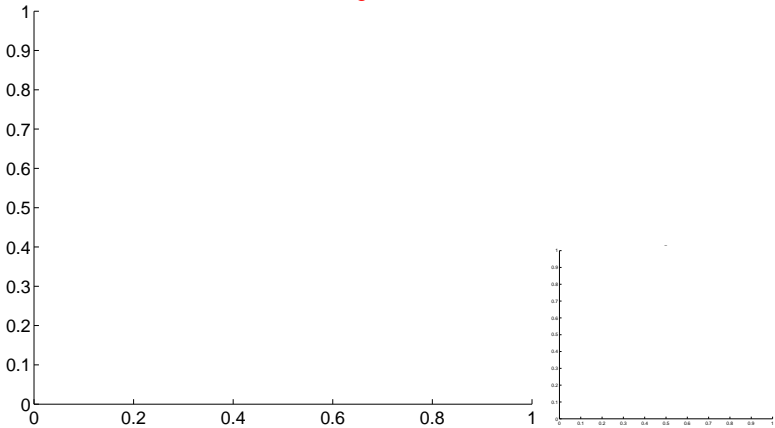
Q13 no OOT image



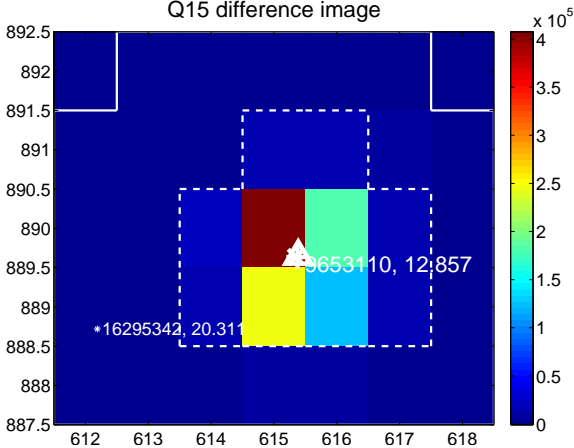
Q14 no difference image



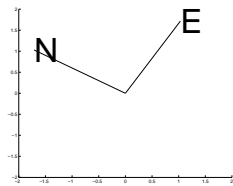
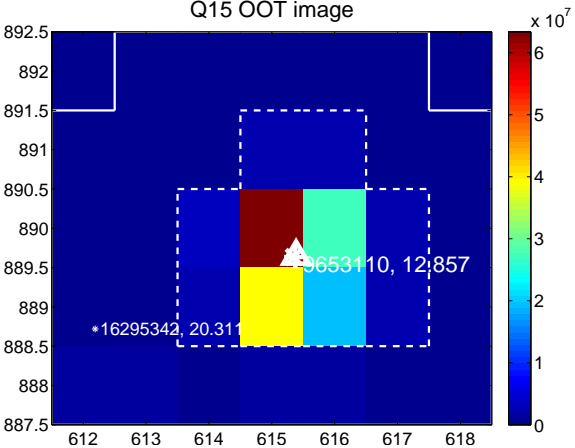
Q14 no OOT image



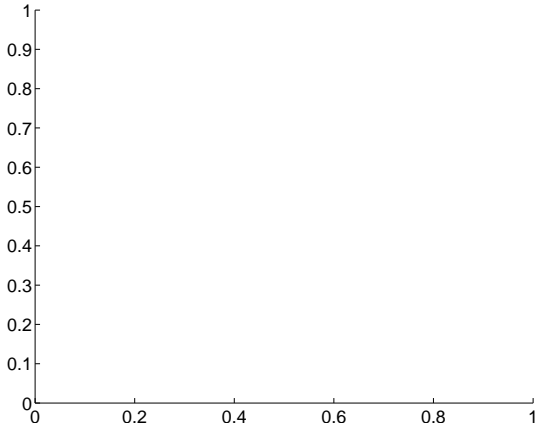
Q15 difference image



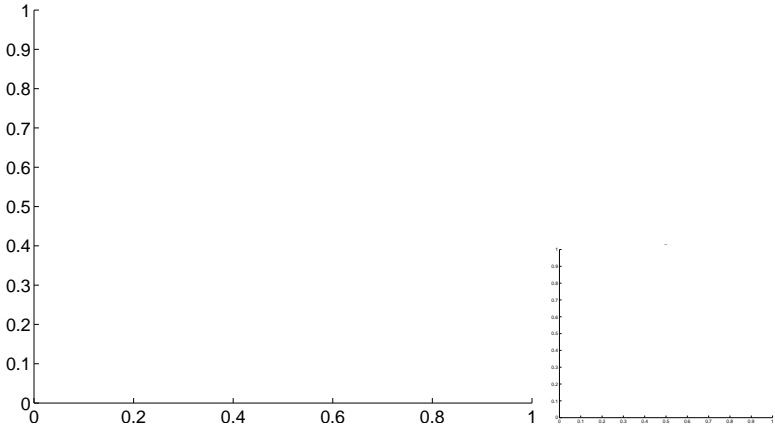
Q15 OOT image



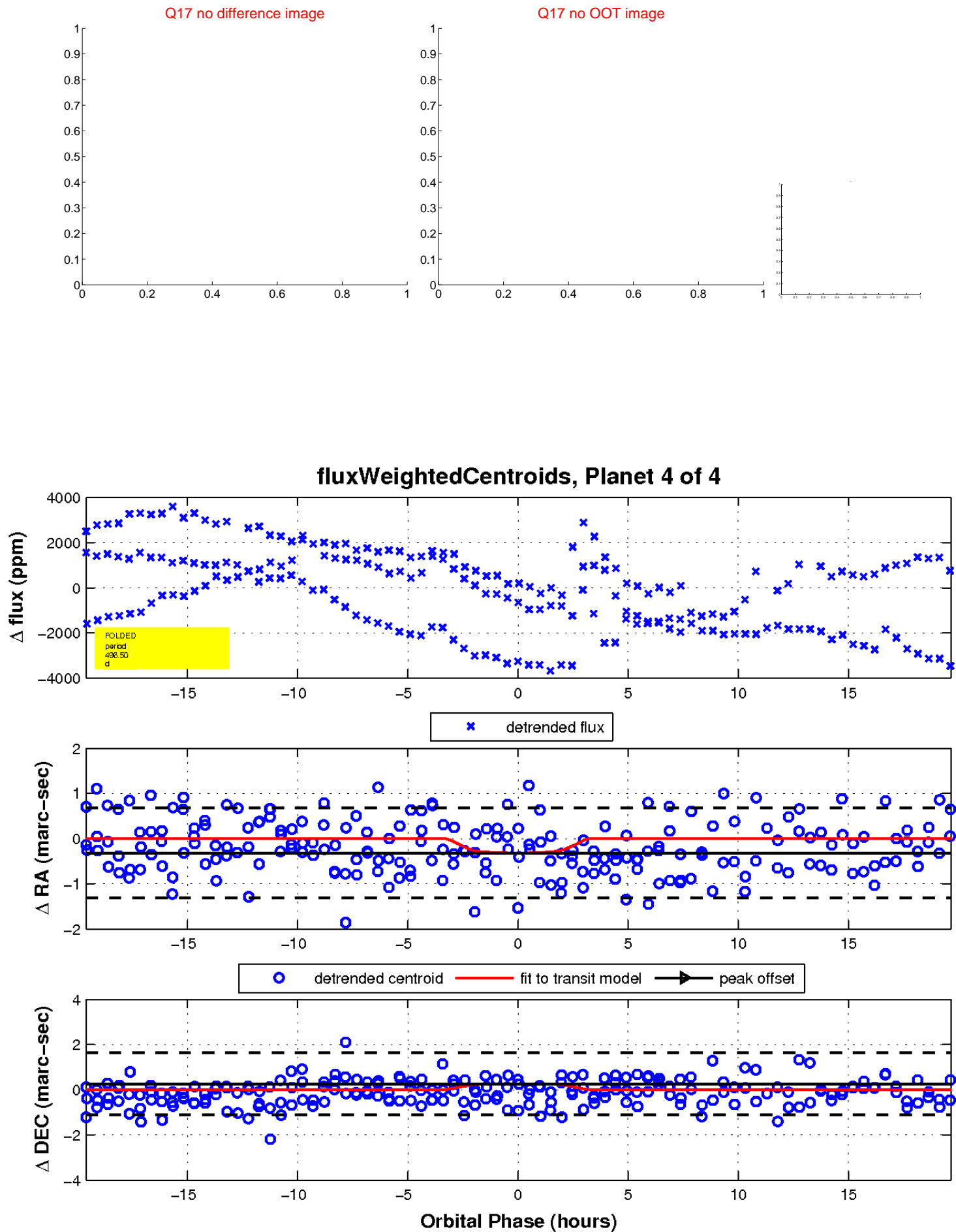
Q16 no difference image



Q16 no OOT image



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



UKIRT Image

Declination

