

# KIC 011958998

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
011958998-01	OBS	No	293.803322	323.477466	1837.4	2.431	11.6	7.8	1.20	5688	5.44	1.86
011958998-02	OBS	No	474.473354	301.773725	1563.7	3.827	9.9	5.7	1.20	5688	4.71	0.98

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
011958998-01	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_CHASES_MARSHALL—ALL_TRANS_CHASES—CENT_FEW_DIFFS—HALO_GHOST
011958998-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS

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

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

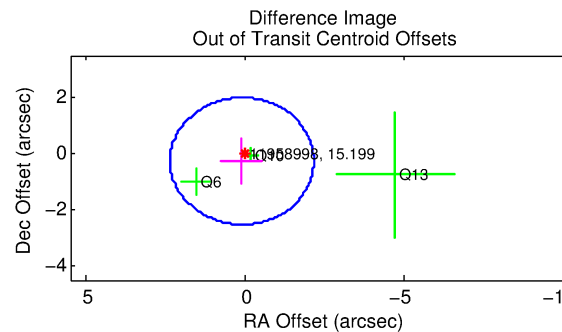
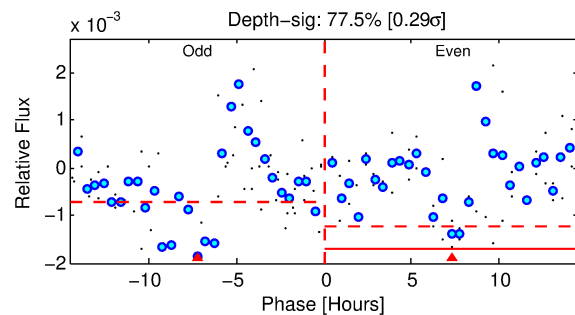
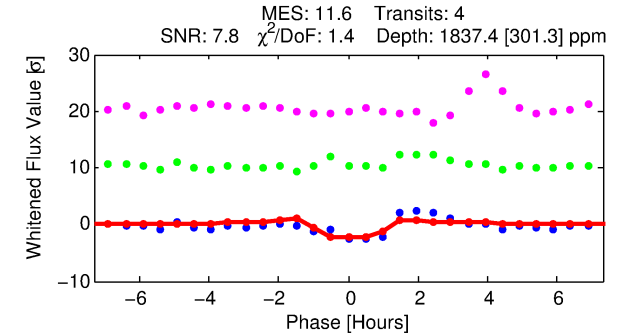
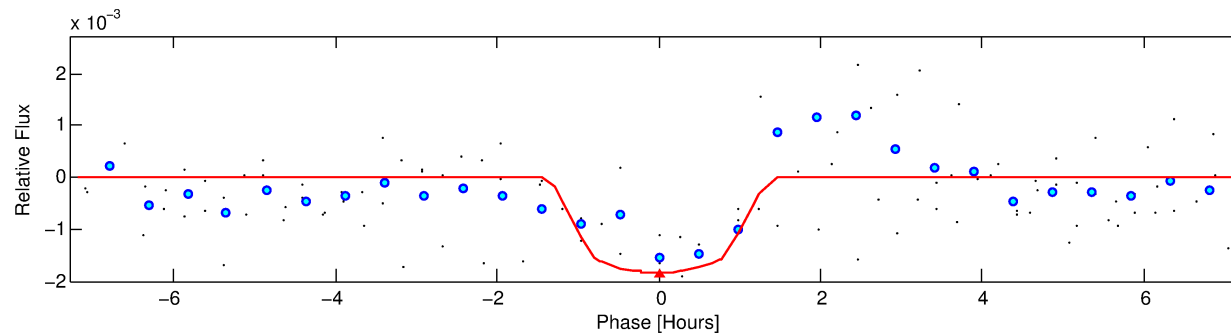
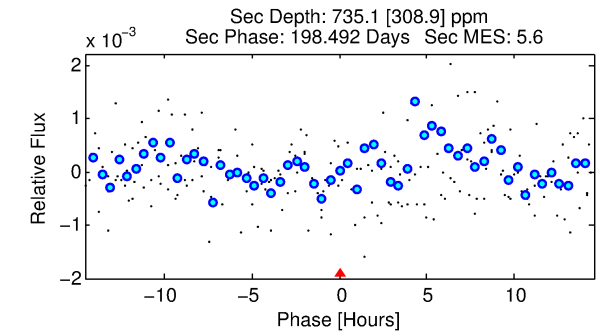
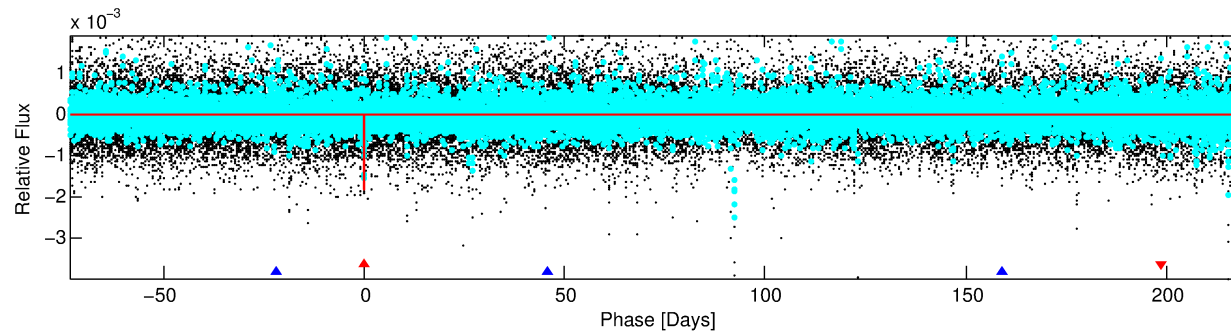
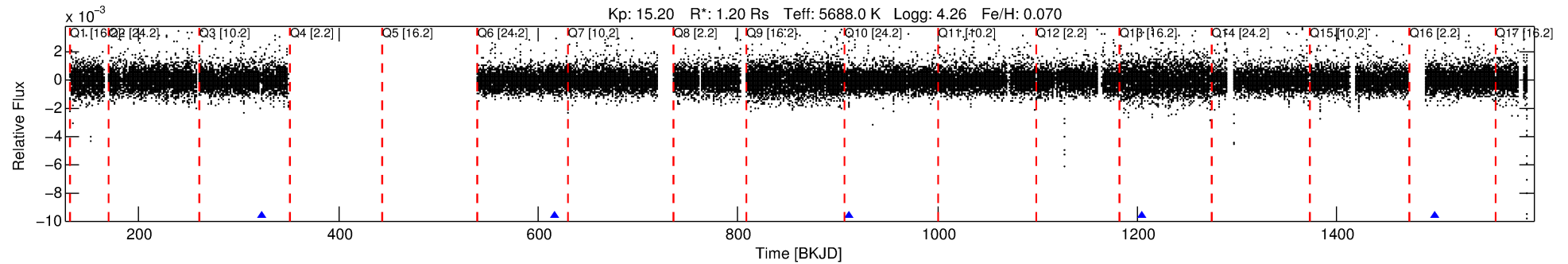
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 011958998-01

No Significant Match Found

# DV One-Page Summary

KIC: 11958998 Candidate: 1 of 2 Period: 293.803 d



## DV Fit Results:

Period = 293.80332 [0.00365] d  
Epoch = 323.4775 [0.0081] BKJD  
Rp/R\* = 0.0414 [0.1982]  
a/R\* = 750.94 [15138.82]  
b = 0.65 [18.15]  
Seff = 1.86 [0.73]  
Teq = 298 [29] K  
Rp = 5.44 [26.08] Re  
a = 0.8541 [0.2098] AU  
Ag = 9972.05 [95644.72] [0.10 $\sigma$ ]  
Teffp = 4603 [11030] K [0.39 $\sigma$ ]

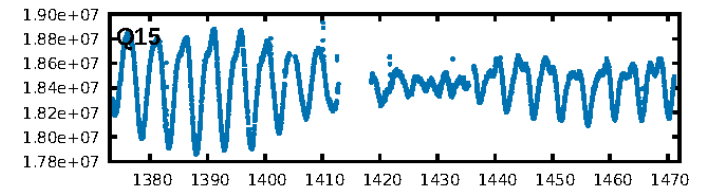
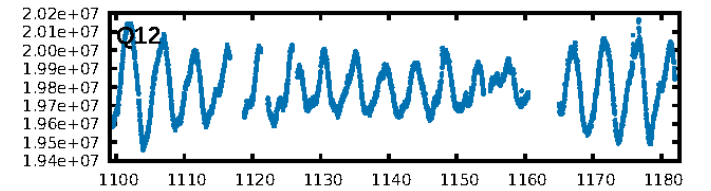
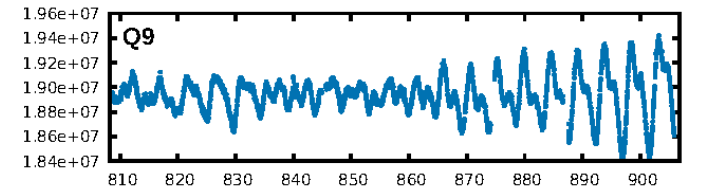
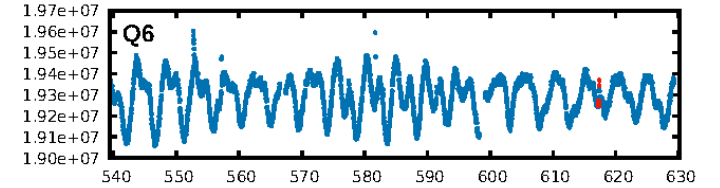
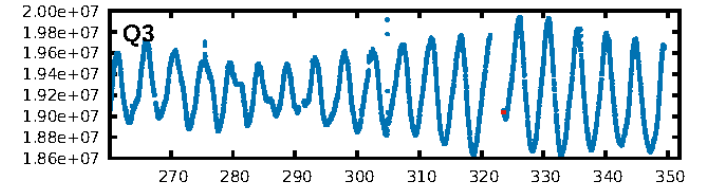
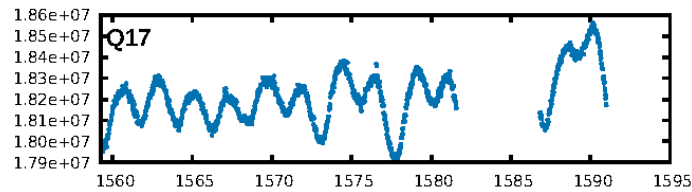
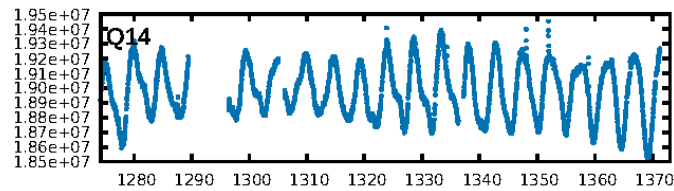
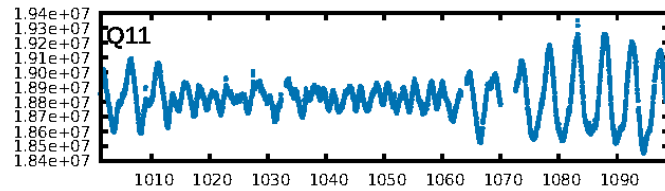
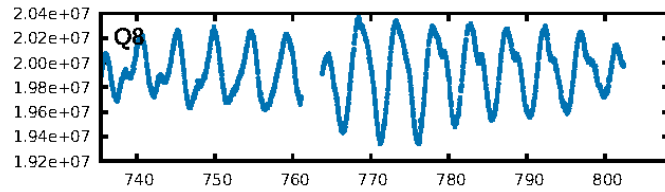
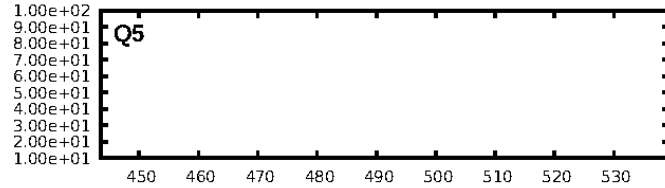
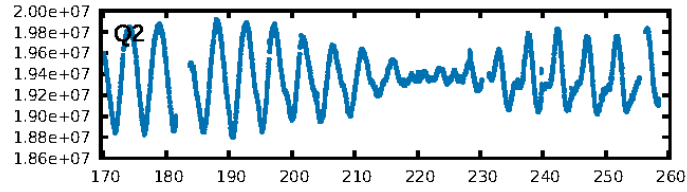
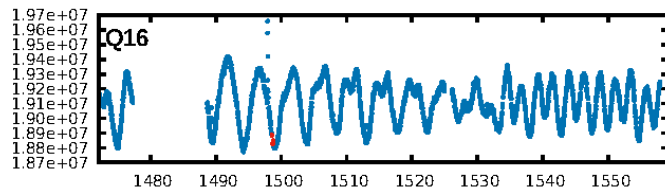
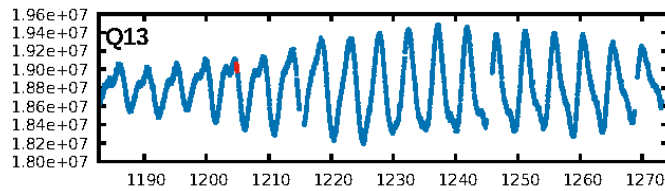
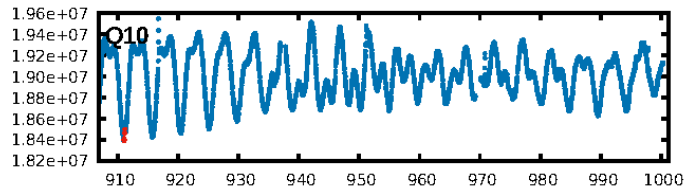
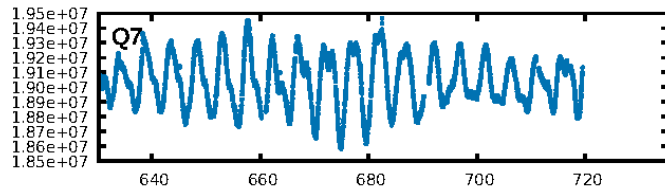
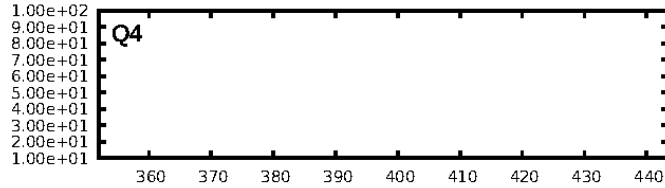
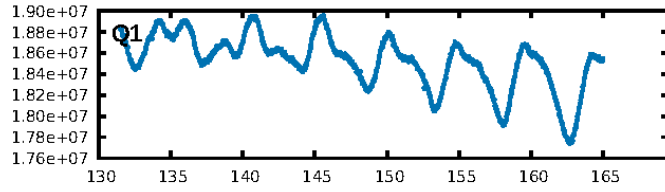
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [956.36 $\sigma$ ]  
ModelChiSquare2-sig: 26.6%  
ModelChiSquareGof-sig: 87.8%  
**Bootstrap-pfa: 4.98e-12**  
RollingBand-fgt: 1.00 [4/4]  
**GhostDiagnostic-chr: 0.06993**  
Centroid-sig: 30.0%  
Centroid-so: 0.985 arcsec [0.86 $\sigma$ ]  
OotOffset-rm: 0.285 arcsec [0.38 $\sigma$ ]  
OotOffset-st: 2/0/0/1 [3]  
KicOffset-rm: 0.297 arcsec [0.39 $\sigma$ ]  
KicOffset-st: 2/0/0/1 [3]  
DiffImageQuality-fgm: 0.67 [2/3]  
DiffImageOverlap-fno: 1.00 [3/3]

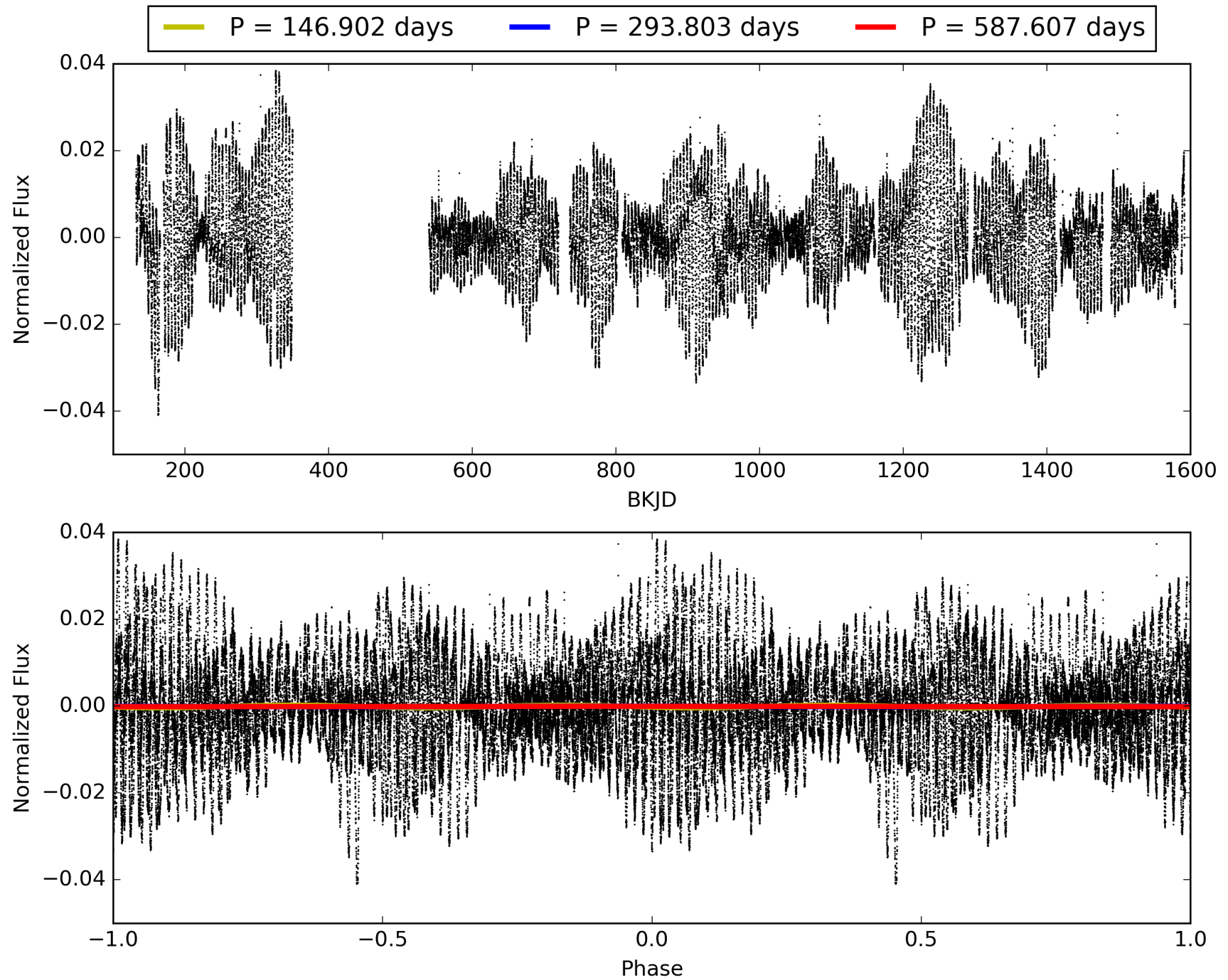
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 06:39:14 Z

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

# TCE 011958998-01, PDC Light Curves

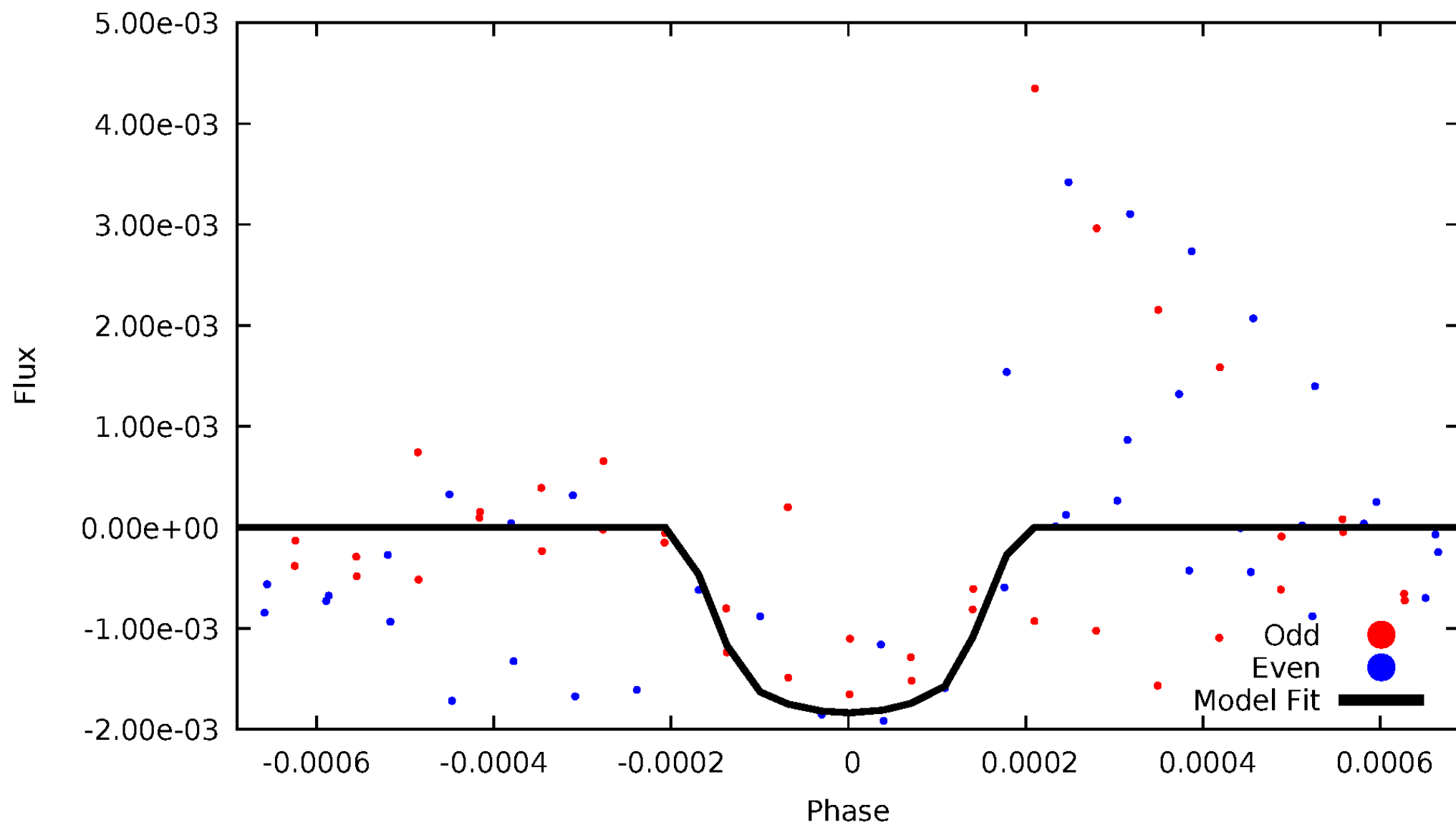


# TCE 011958998-01



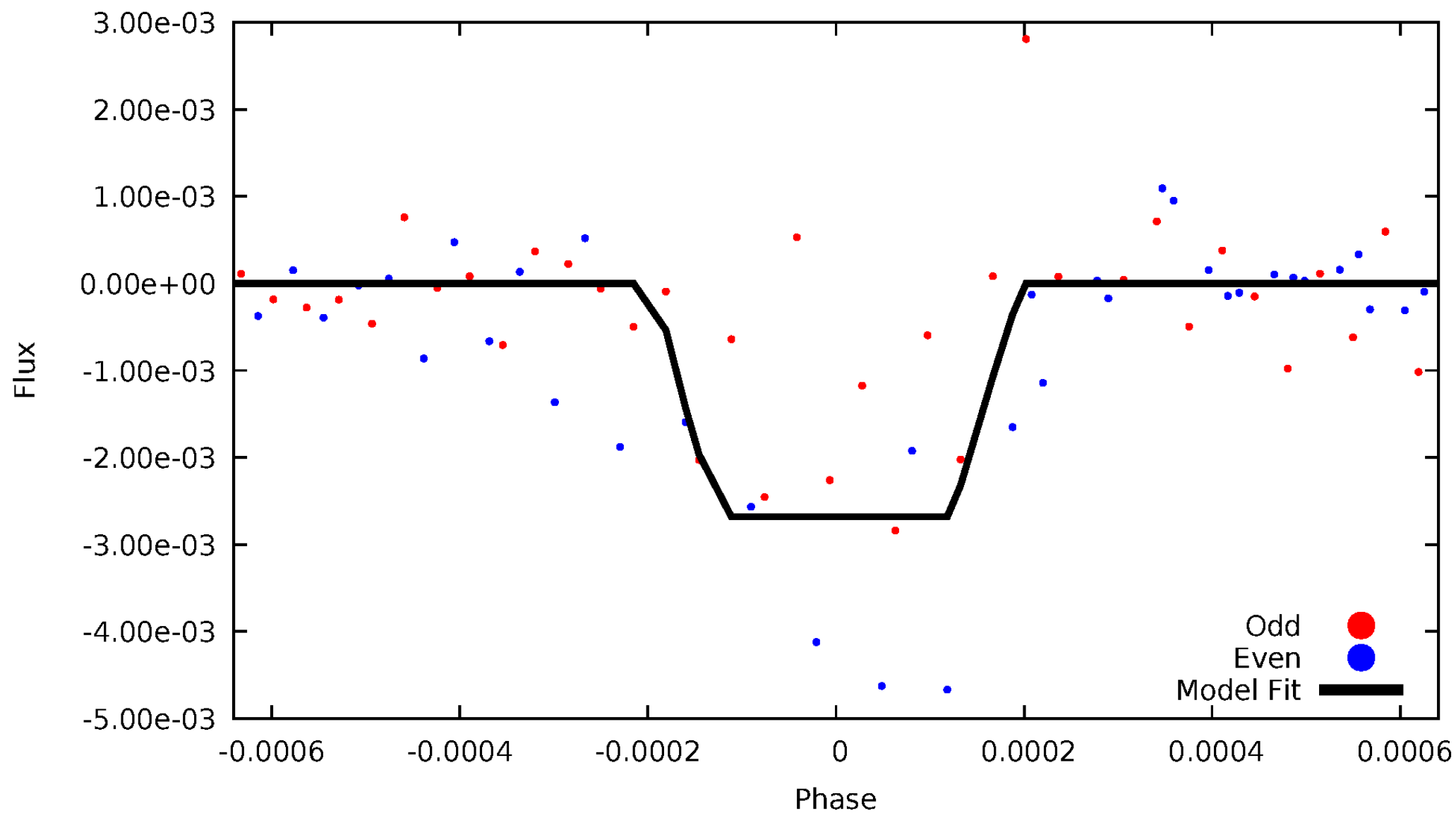
# DV Odd/Even

TCE 011958998-01



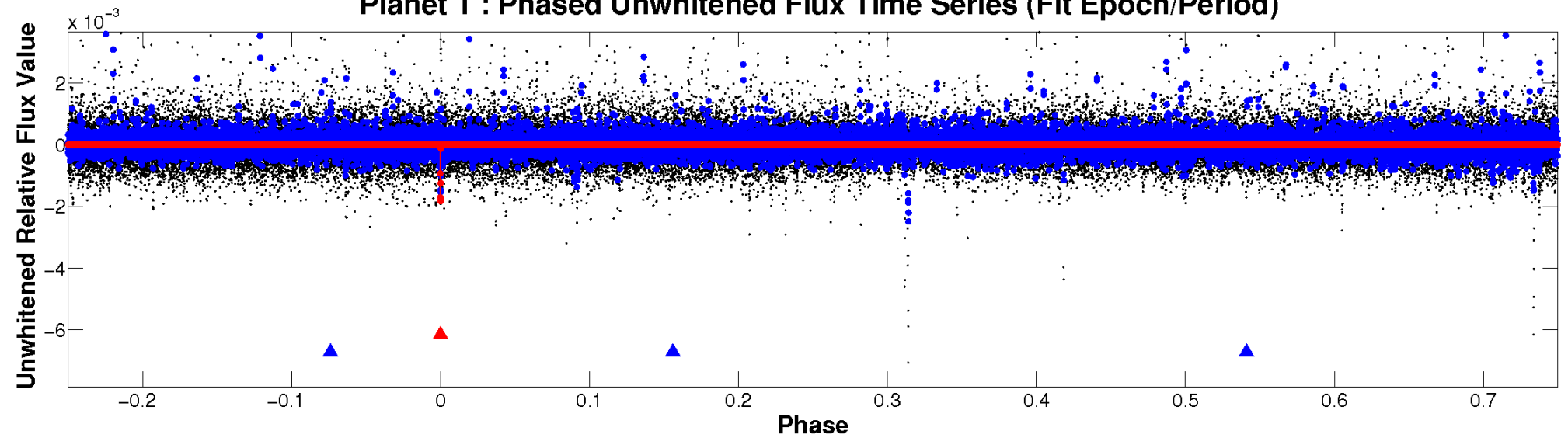
# ALT Odd/Even

TCE 011958998-01

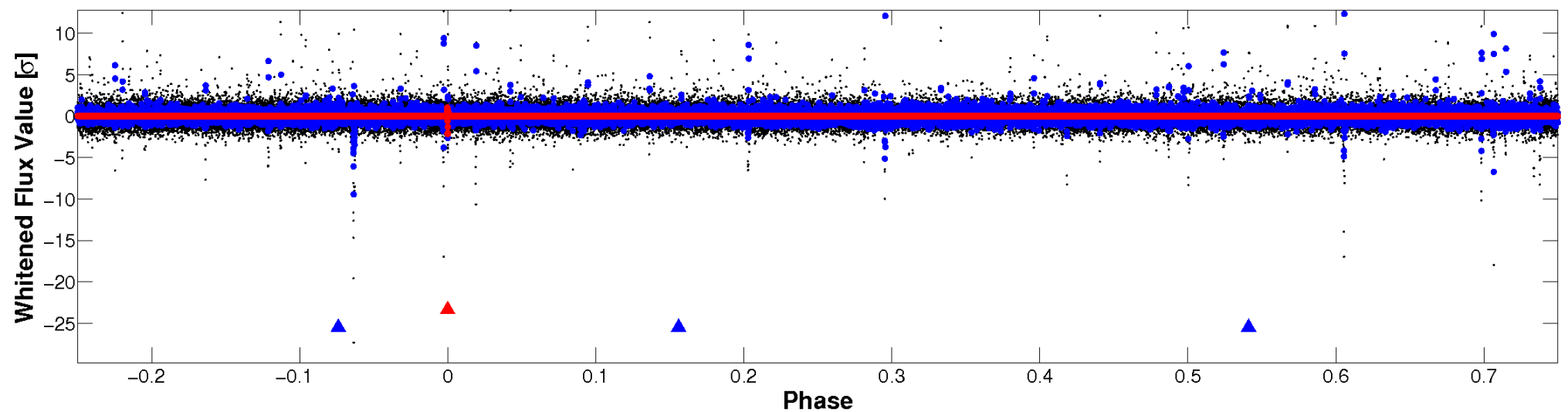


# Non-Whitened Vs. Whitened Light Curve

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

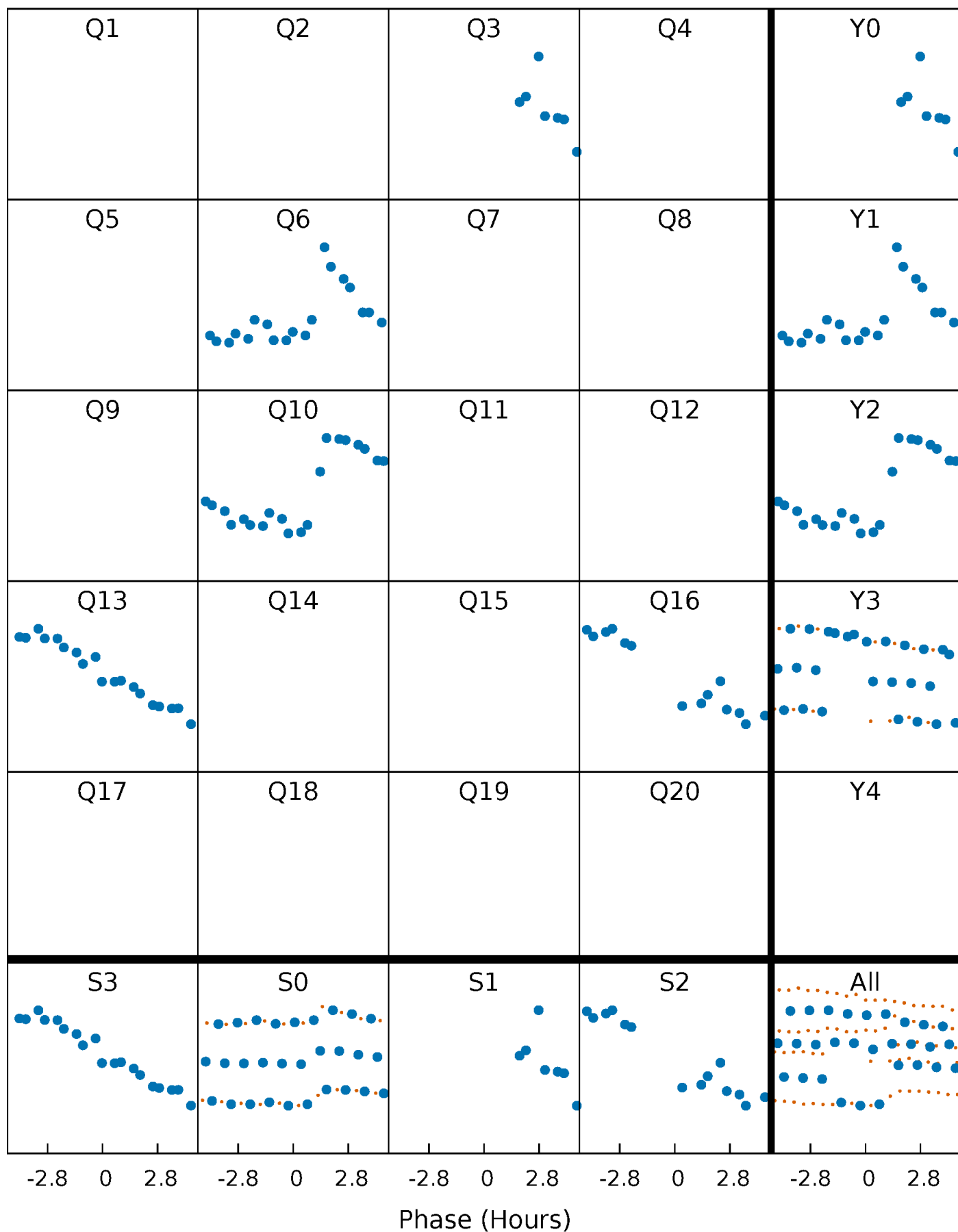


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

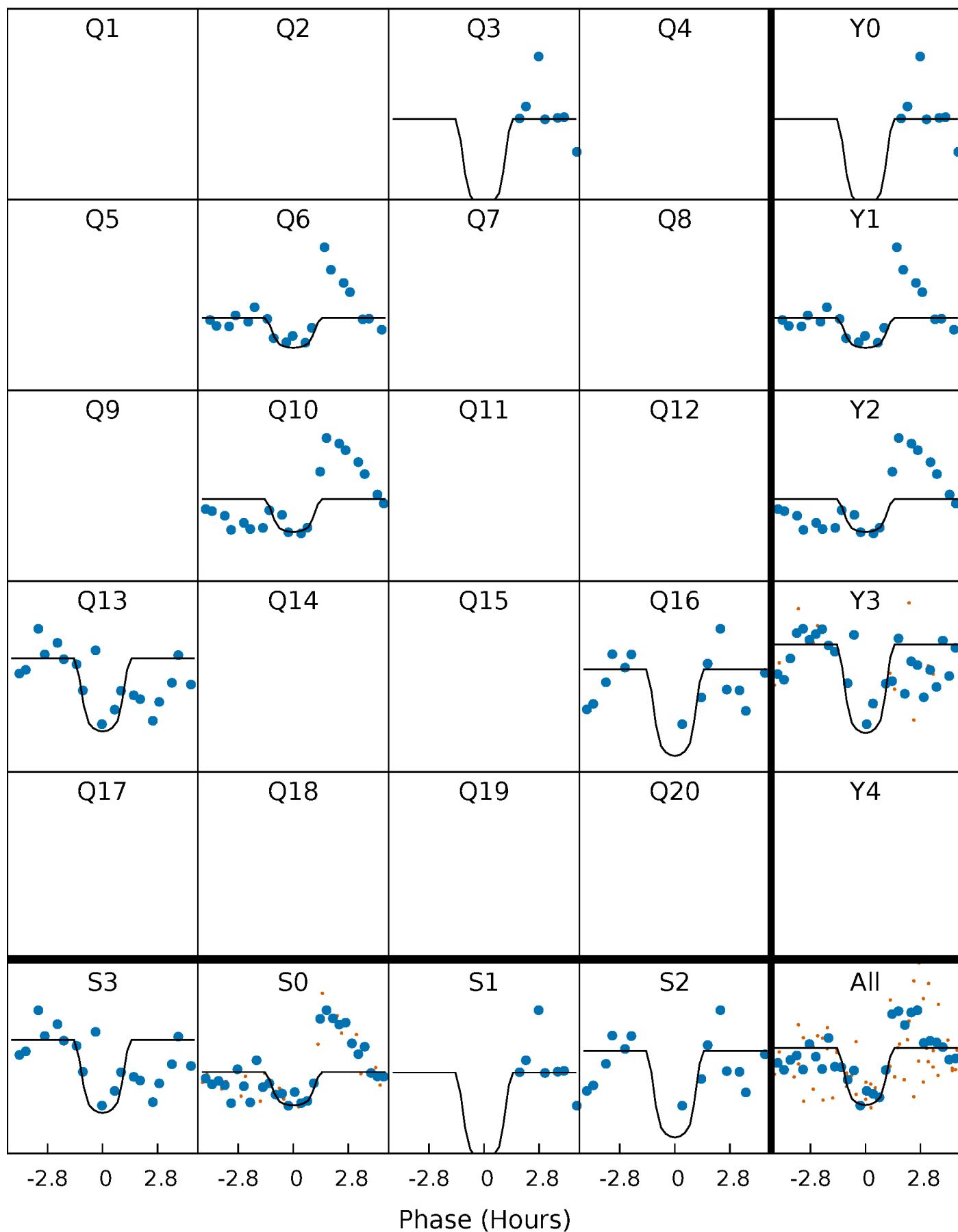
TCE 011958998-01   P=293.803322 Days    $T_0=323.477466$  (BKJD)





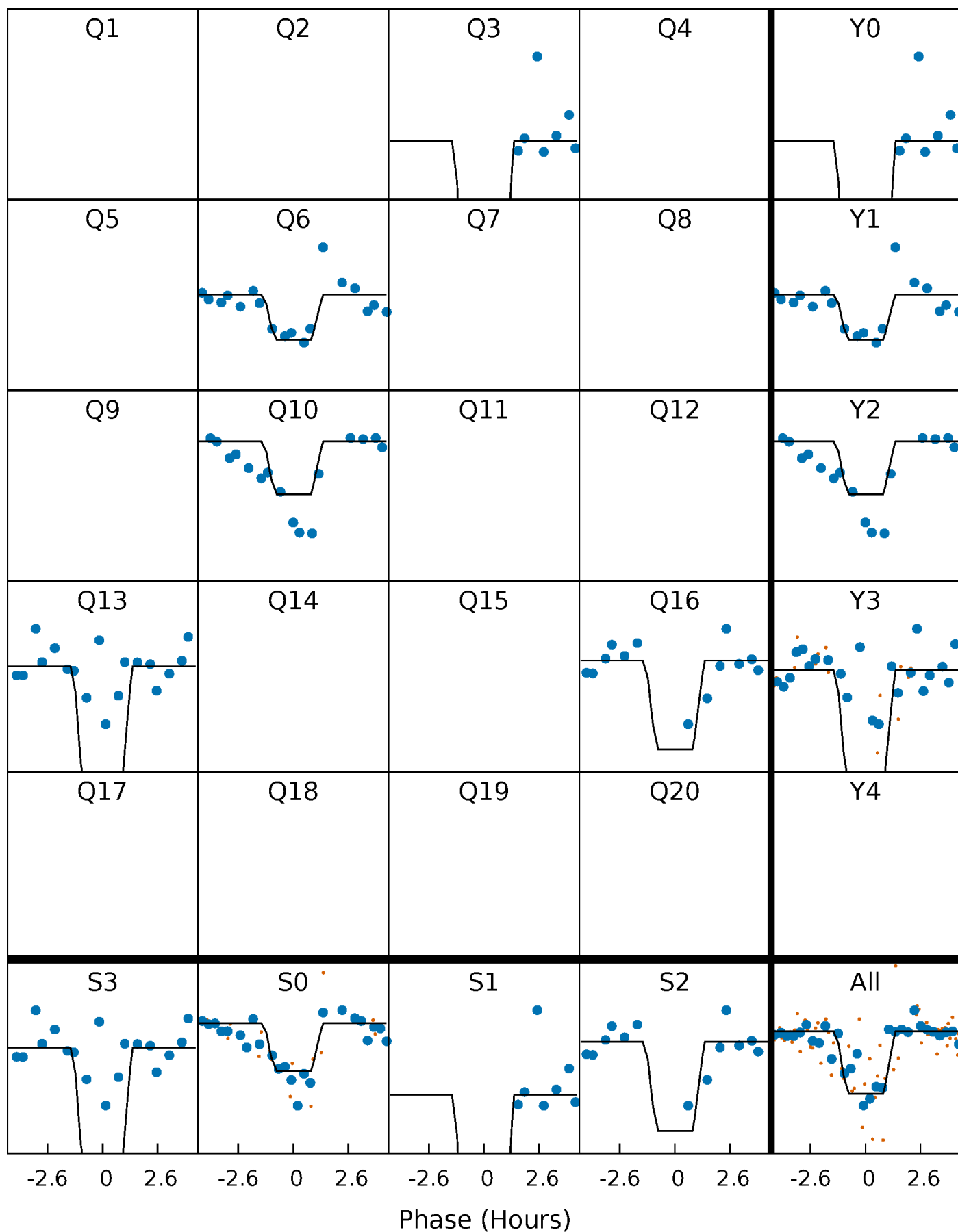
# DV Quarter-Phased Transit Curves

TCE 011958998-01 P=293.803322 Days  $T_0=323.477466$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

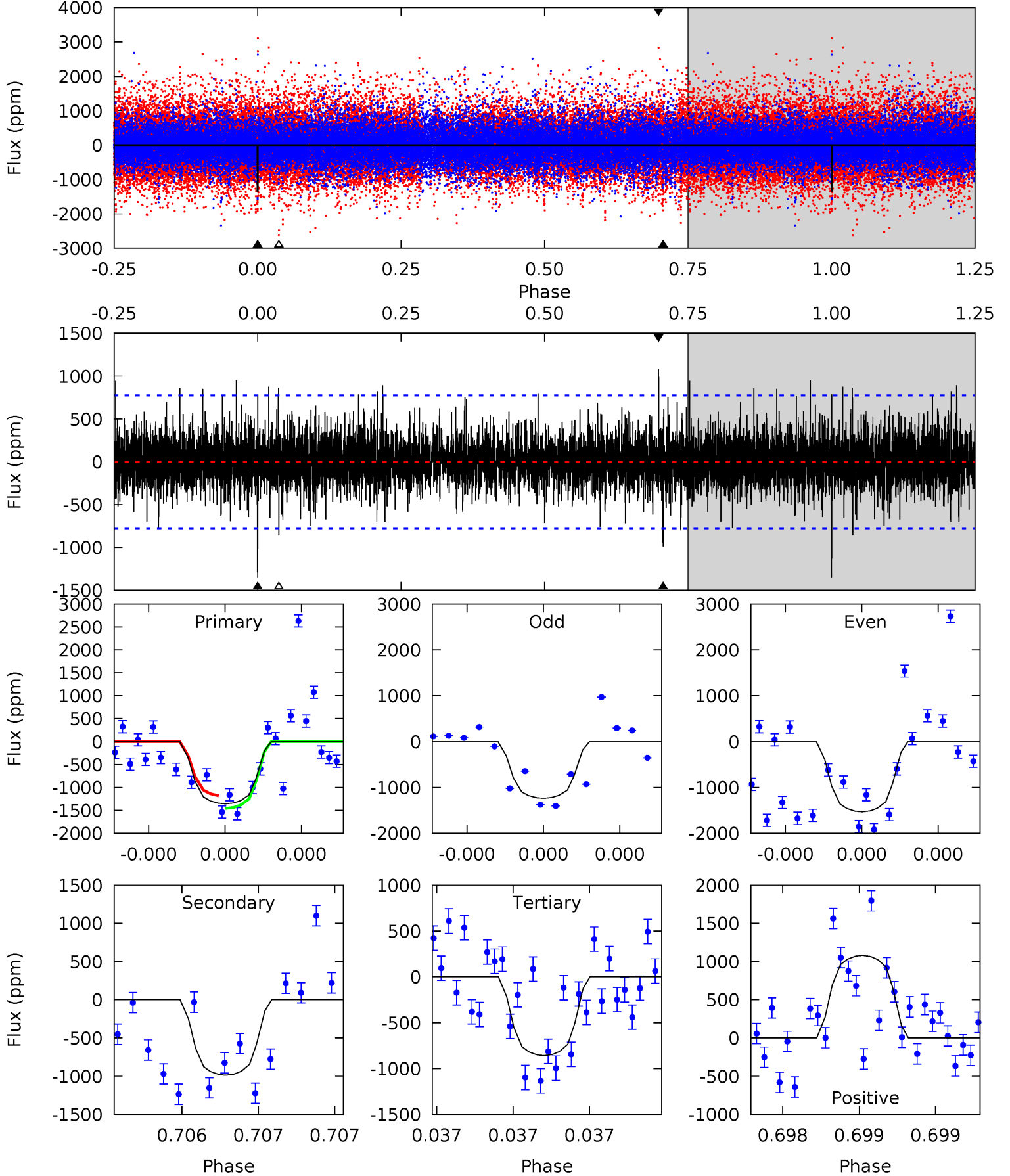
TCE 011958998-01 P=293.798170 Days  $T_0=323.485116$  (BKJD)



# DV Model-Shift Uniqueness Test

011958998-01, P = 293.803322 Days, E = 29.674144 Days

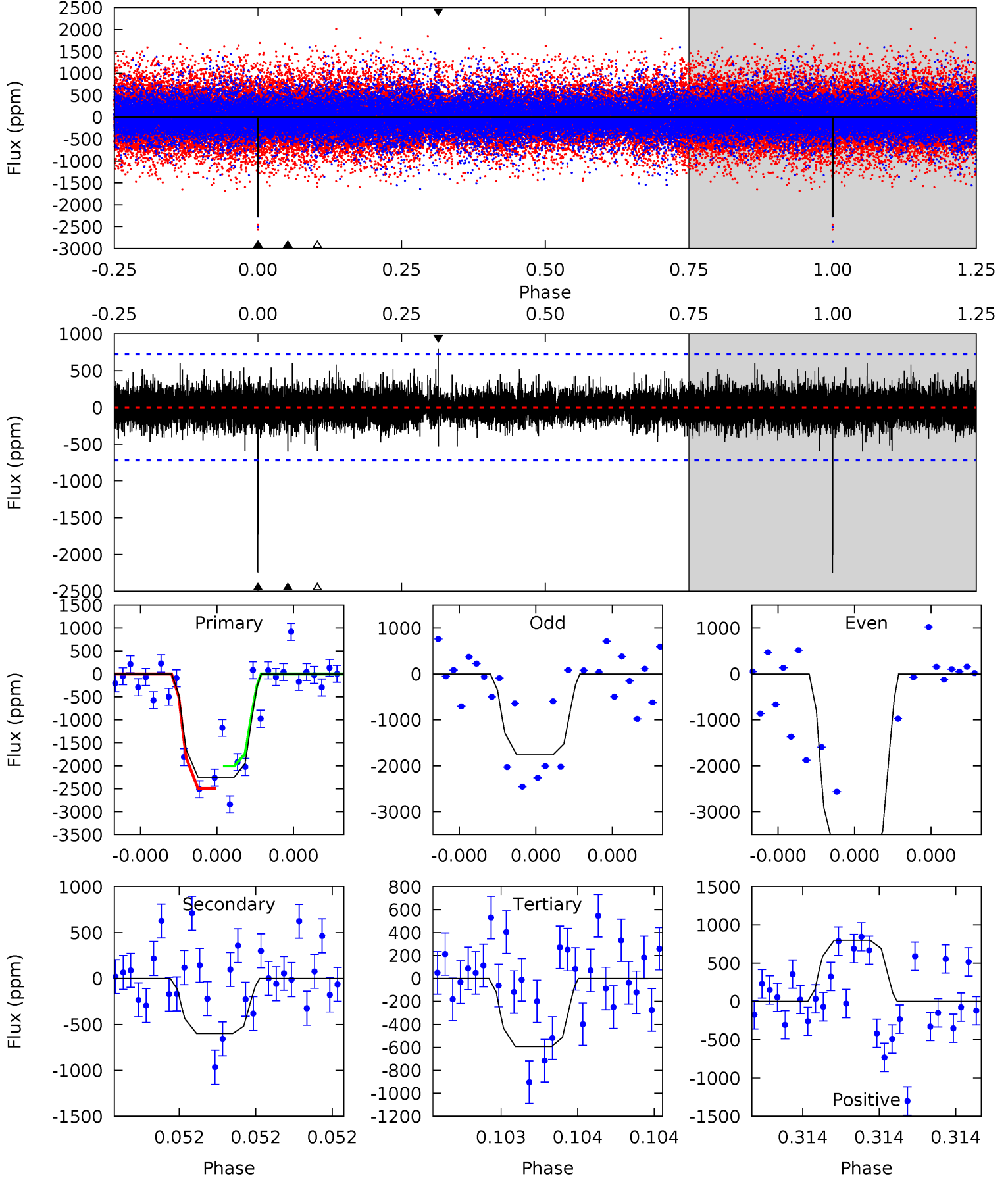
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
9.86	7.17	6.24	7.86	5.64	3.58	1.46	3.62	2.00	0.93	-0.68	0.99	1.00	0.44	0.98



# Alt Model-Shift Uniqueness Test

011958998-01, P = 293.798170 Days, E = 29.686946 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
17.6	4.68	4.64	6.24	5.63	3.57	1.01	12.9	11.3	0.04	-1.56	9.85	0.92	0.26	1.89



### Stellar Parameters For KIC 011958998

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5688^{+154}_{-154}$	$4.260^{+0.214}_{-0.175}$	$0.070^{+0.250}_{-0.300}$	$1.204^{+0.330}_{-0.300}$	$0.962^{+0.122}_{-0.089}$	$0.775^{+0.912}_{-0.400}$
	+3%/-3%	+5%/-4%	+357%/-429%	+27%/-25%	+13%/-9%	+118%/-52%
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 011958998-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-987 \pm 138$	$21.61^{+21.73}_{-15.68}$	$417^{+31}_{-28}$	$3082^{+1754}_{-481}$	$836^{+10465}_{-629}$
Alt.	$-598 \pm 128$	$20.48^{+21.60}_{-14.03}$	$417^{+29}_{-33}$	$2947^{+1372}_{-477}$	$584^{+5384}_{-452}$

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

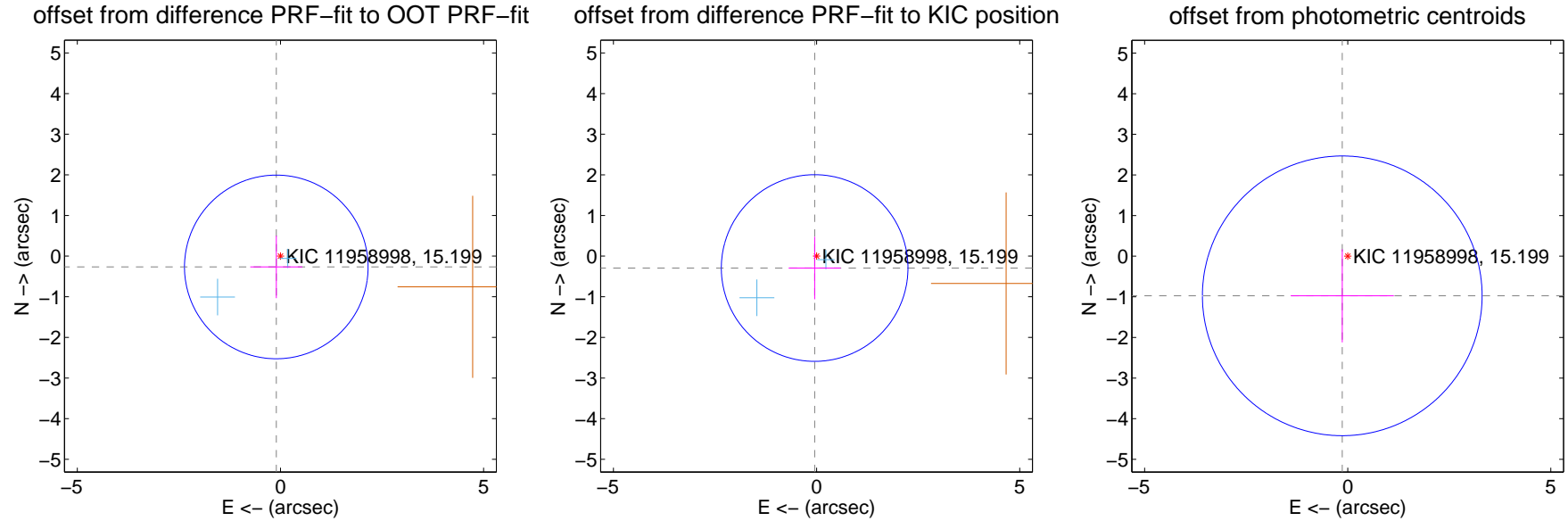
## DV Centroid Data

Supplemental centroid analysis for 011958998-01. Kepler magnitude: 15.20. Transit SNR 7.79

There are 2 quarters with good PRF difference image offsets

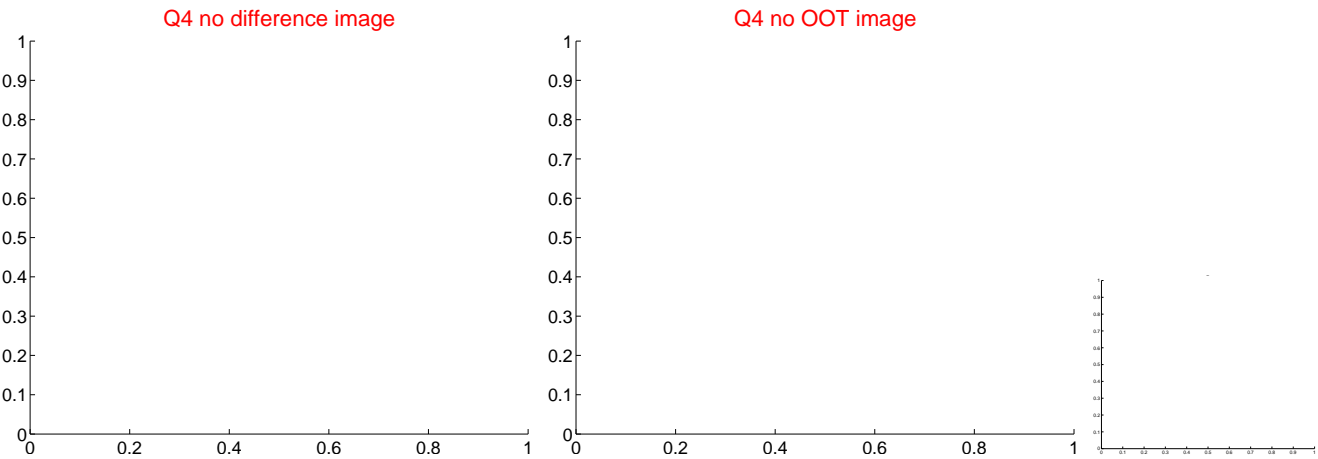
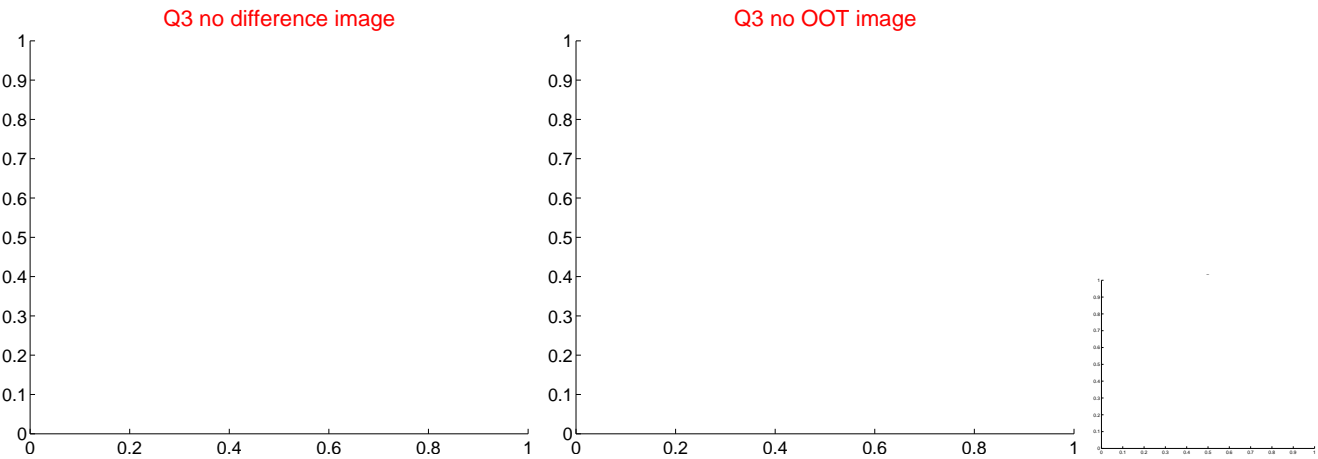
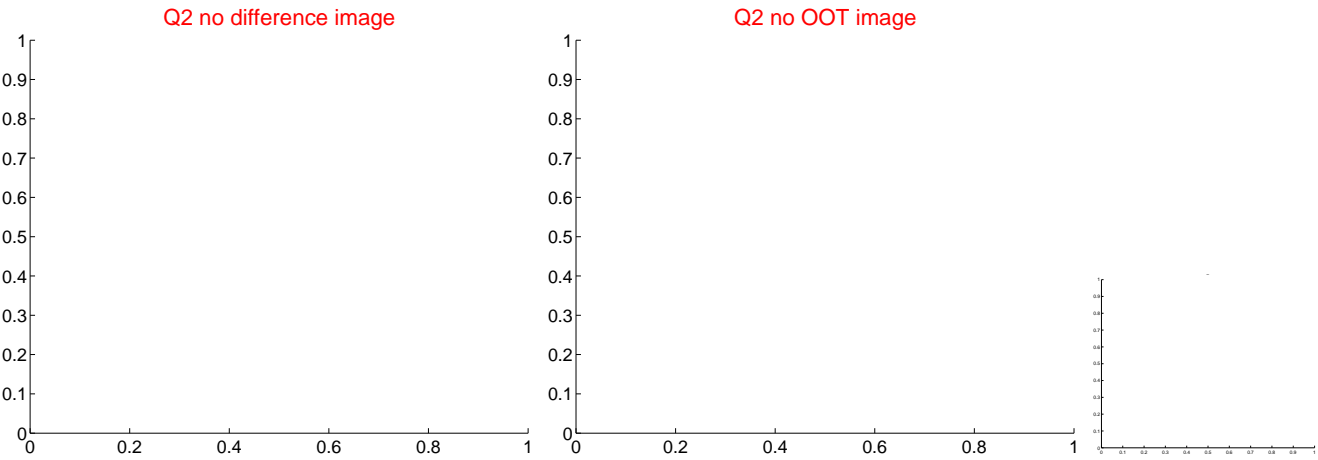
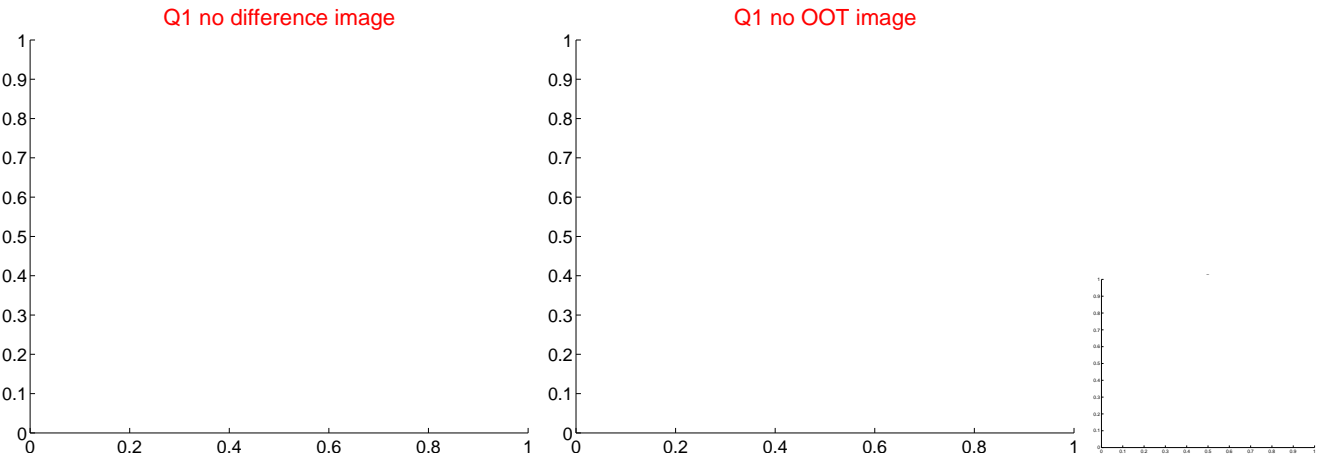
The direct PRF centroid is offset from the target star catalog position by about 0.11 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.285 \pm 0.753$	0.38	$0.102 \pm 0.640$	$-0.266 \pm 0.769$
PRF-fit source offset from KIC position	$0.297 \pm 0.766$	0.39	$0.048 \pm 0.640$	$-0.293 \pm 0.769$
photometric centroid source offset	$0.98 \pm 1.15$	0.86	$0.13 \pm 1.27$	$-0.98 \pm 1.15$

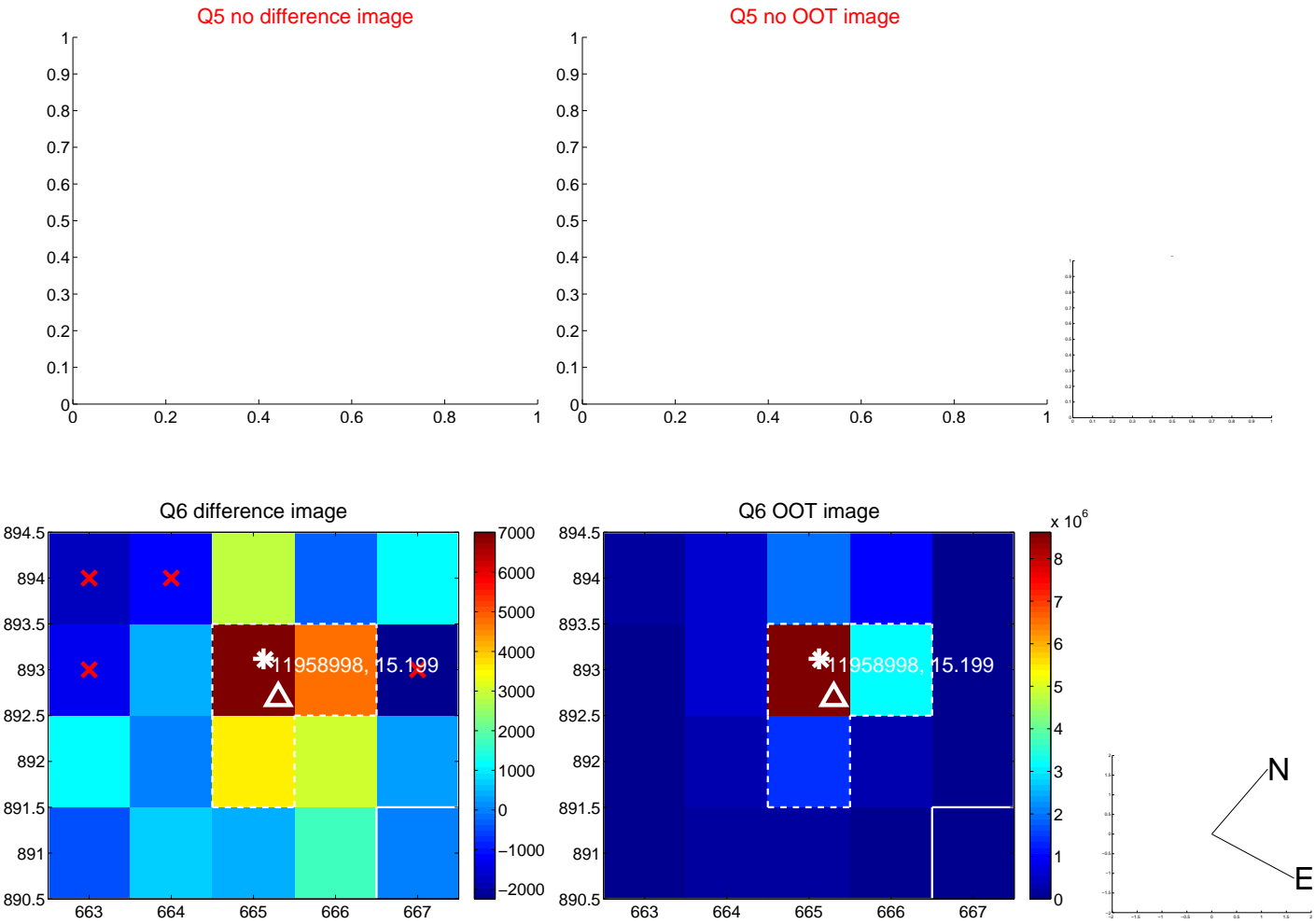


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

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

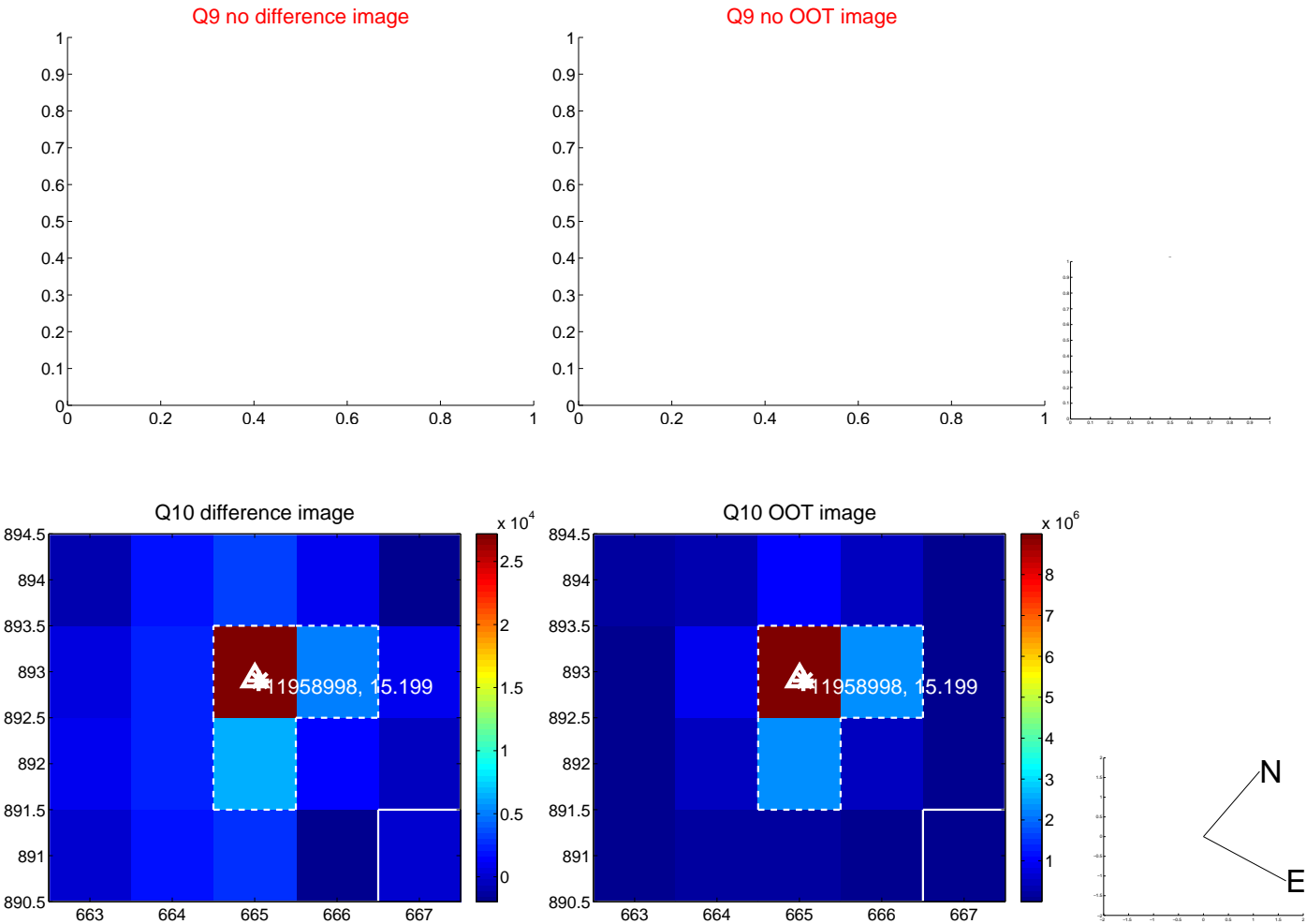


white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.

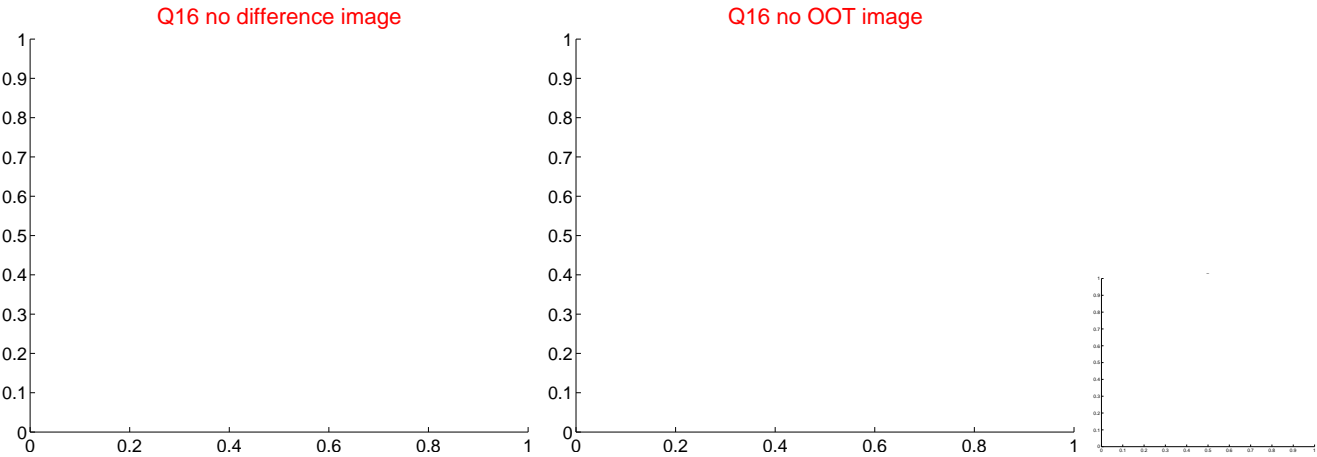
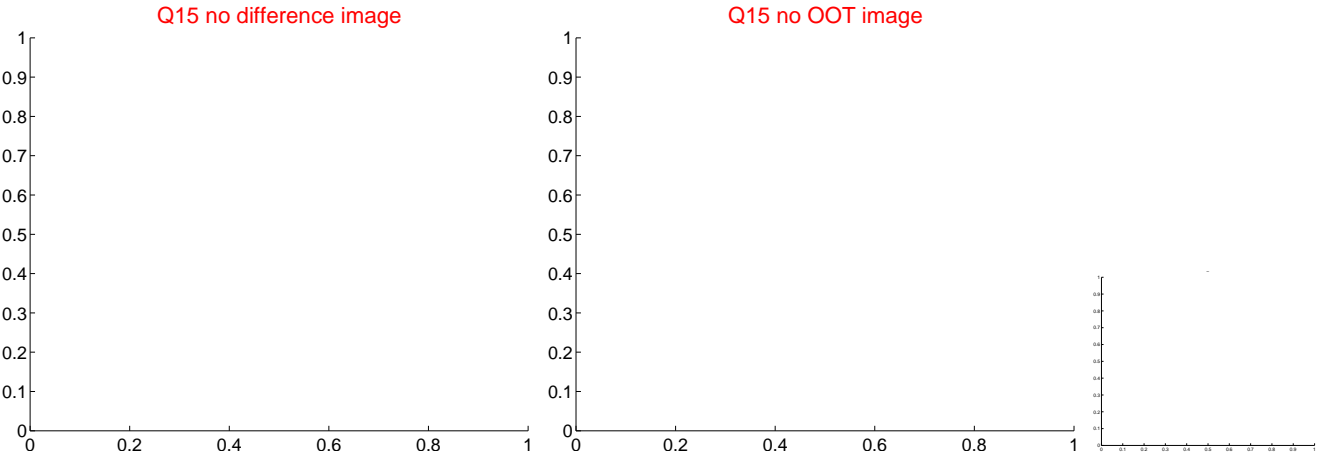
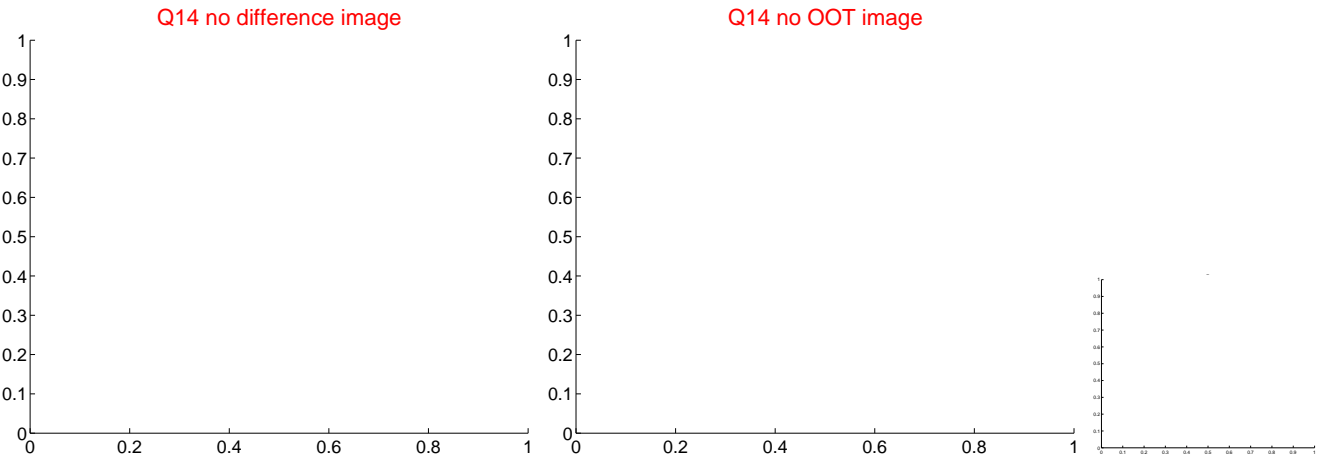
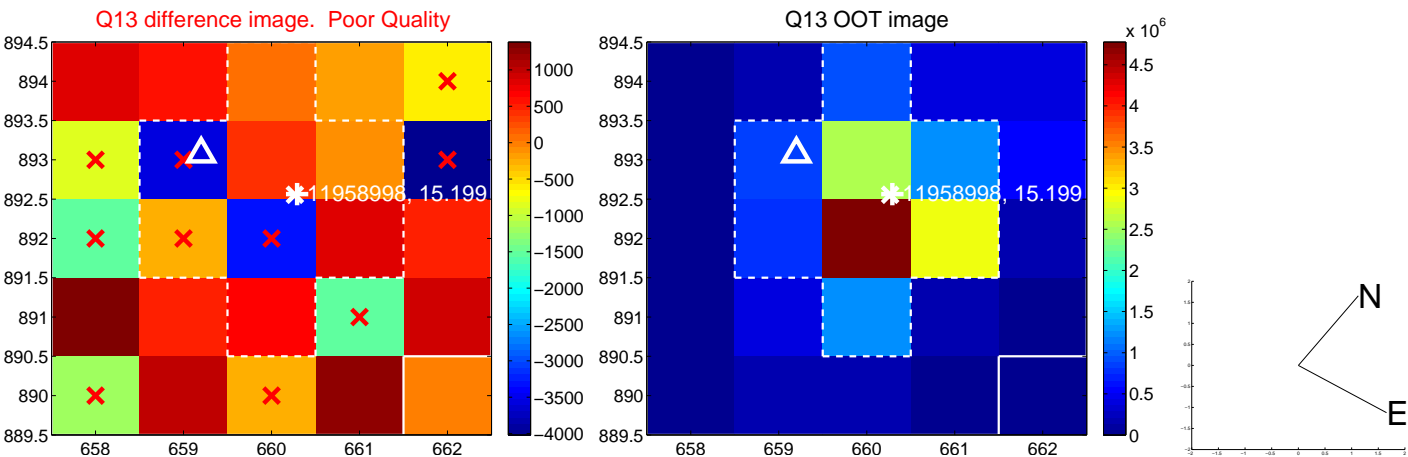




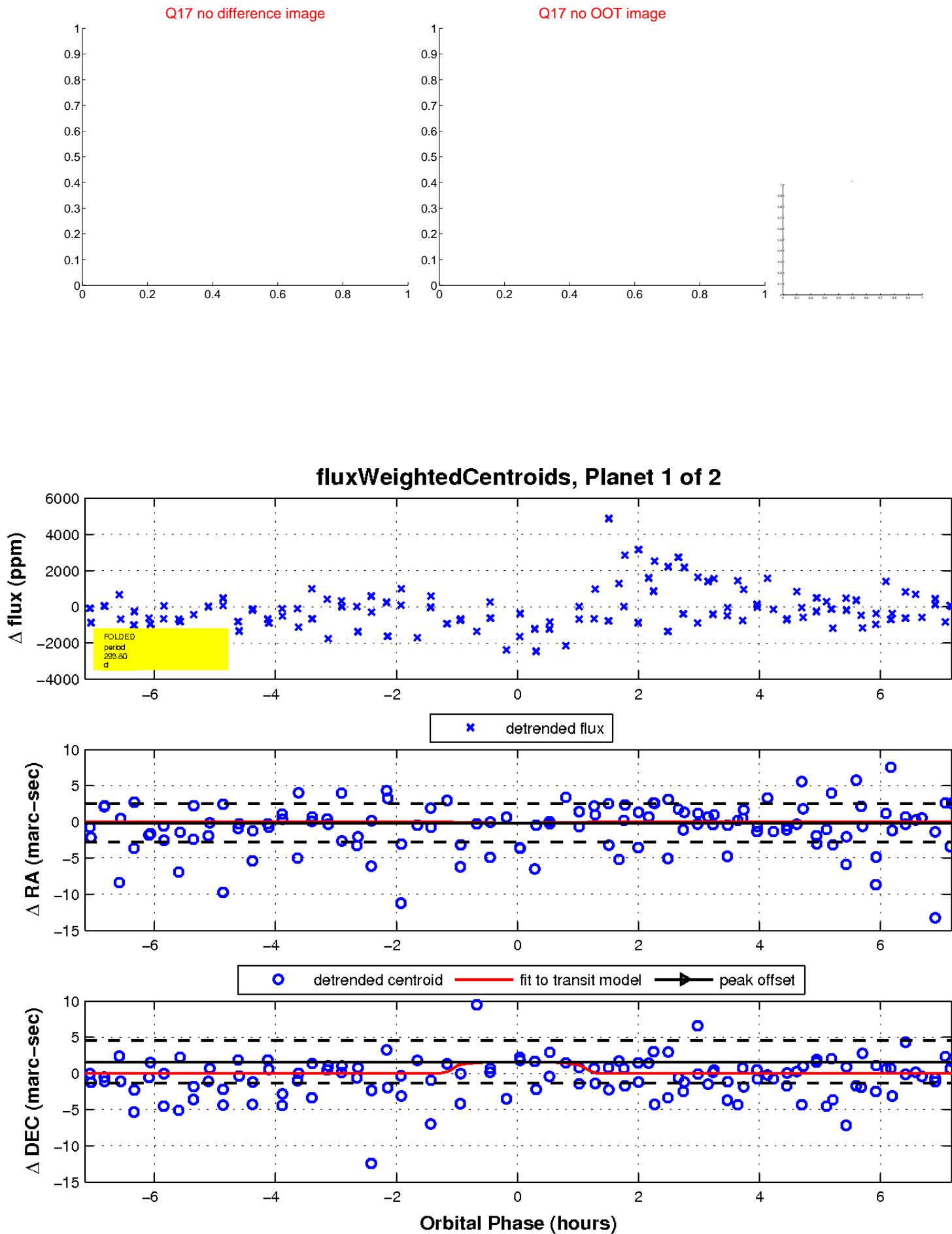
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white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

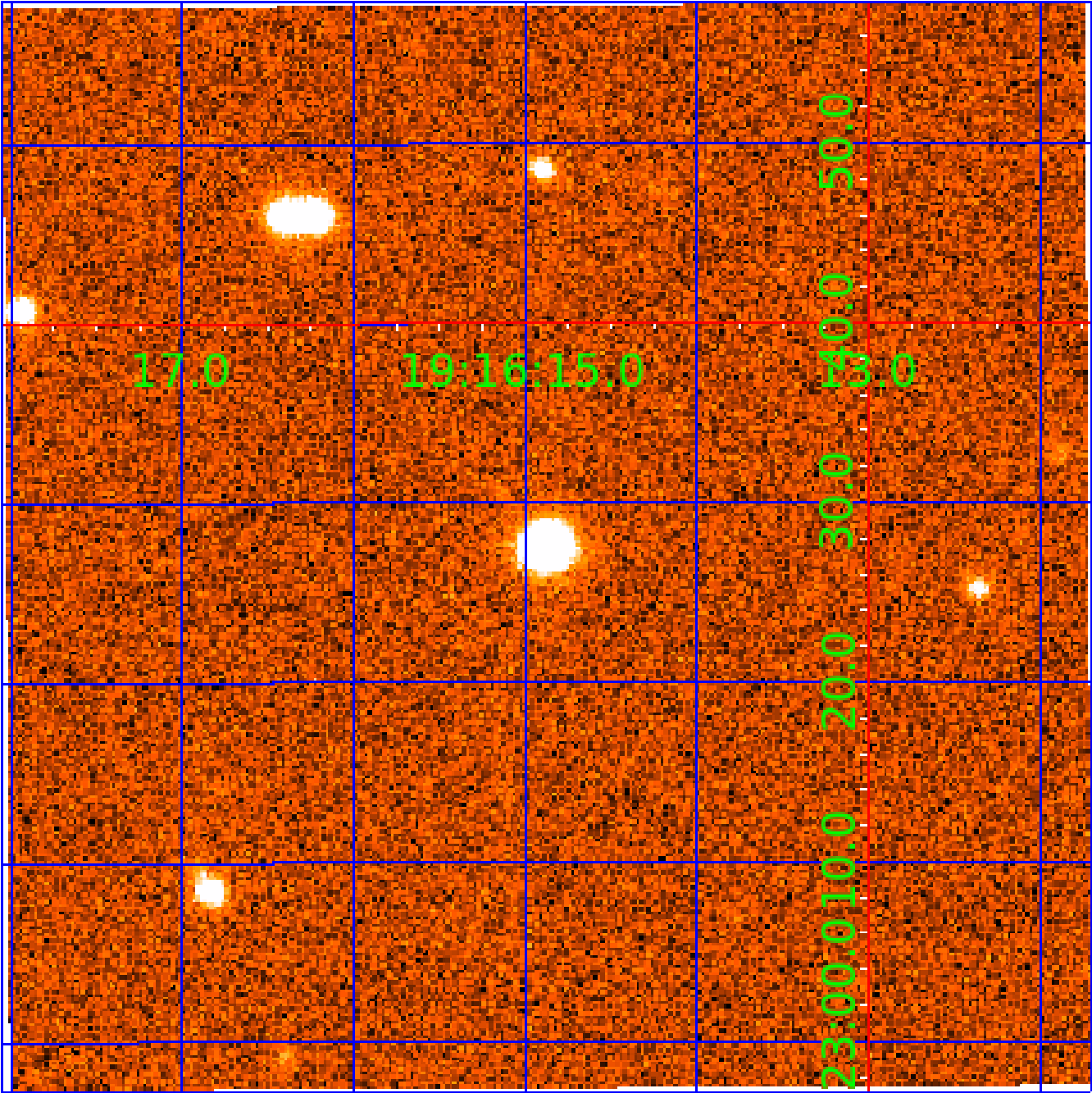


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 011958998

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
011958998-01	OBS	No	293.803322	323.477466	1837.4	2.431	11.6	7.8	1.20	5688	5.44	1.86
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## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
011958998-01	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_CHASES_MARSHALL—ALL_TRANS_CHASES—CENT_FEW_DIFFS—HALO_GHOST
011958998-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS

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

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

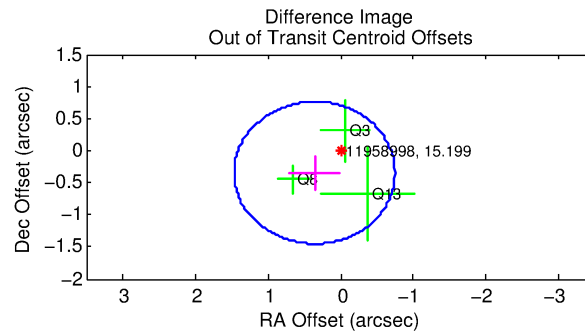
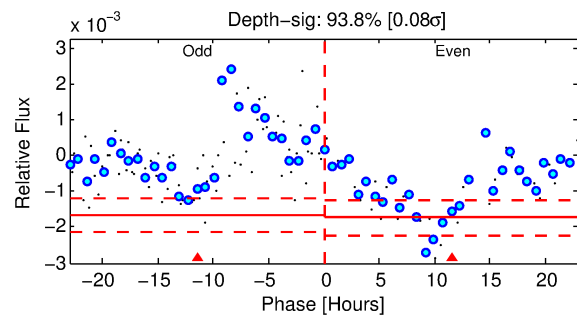
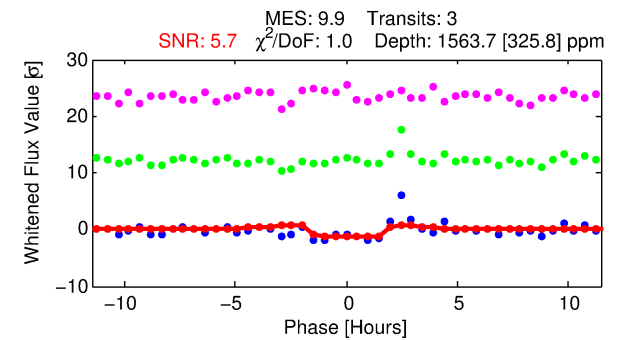
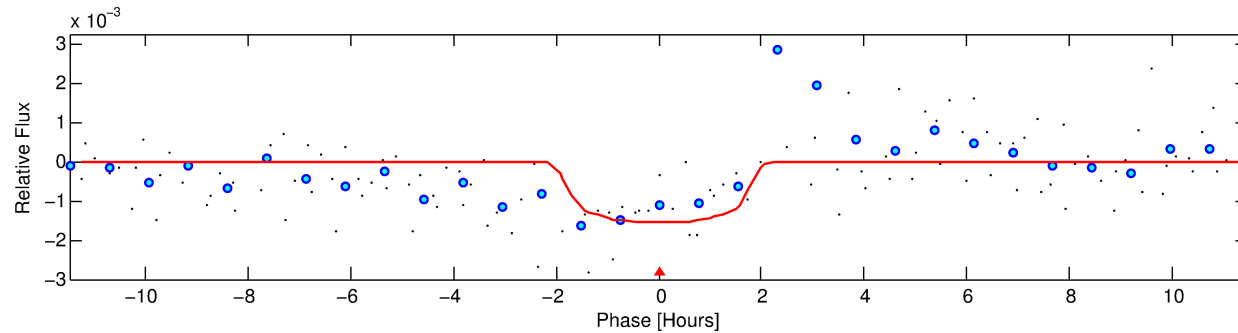
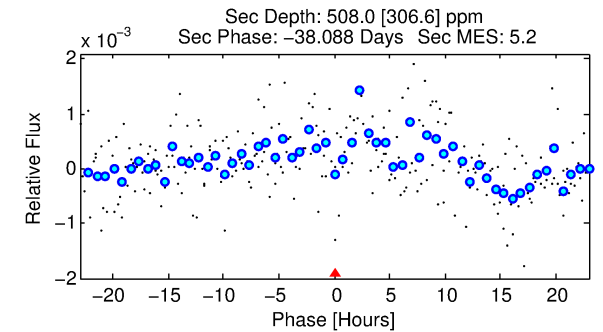
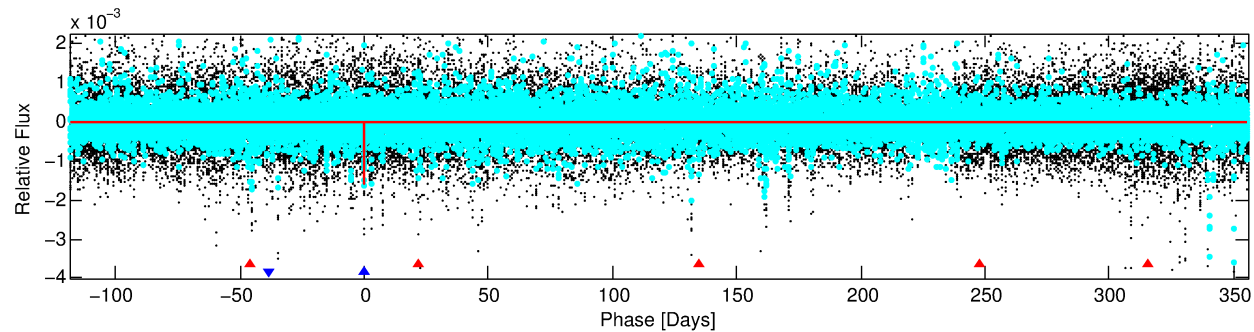
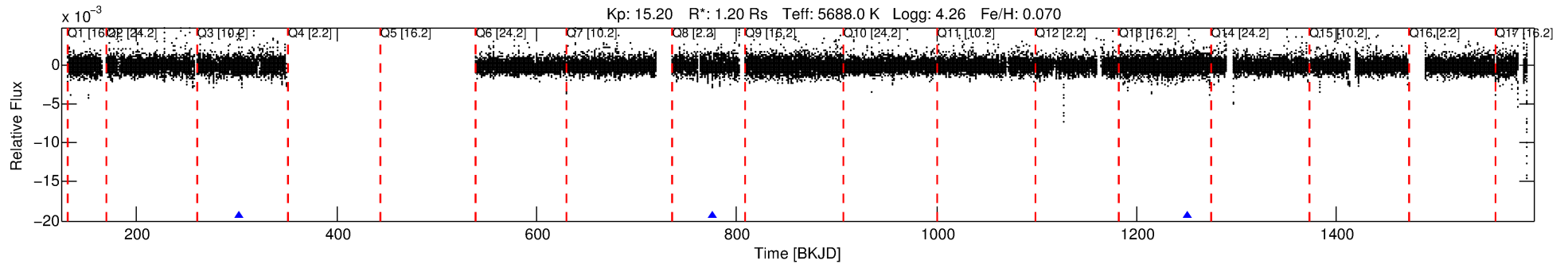
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 011958998-02

No Significant Match Found

# DV One-Page Summary

KIC: 11958998 Candidate: 2 of 2 Period: 474.473 d



## DV Fit Results:

Period = 474.47335 [0.00614] d  
Epoch = 301.7737 [0.0073] BKJD  
Rp/R\* = 0.0359 [0.0791]  
a/R\* = 966.82 [8873.98]  
b = 0.18 [51.08]  
Seff = 0.98 [0.38]  
Teq = 254 [25] K  
Rp = 4.71 [10.47] Re  
a = 1.1756 [0.2888] AU  
Ag = 17373.48 [77554.29] [0.22 $\sigma$ ]  
Teffp = 4508 [5014] K [0.85 $\sigma$ ]

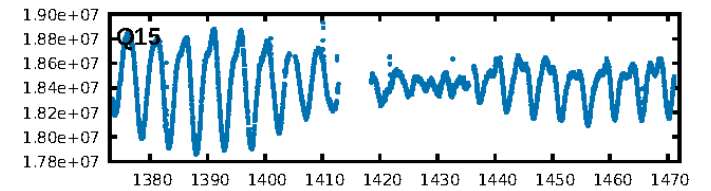
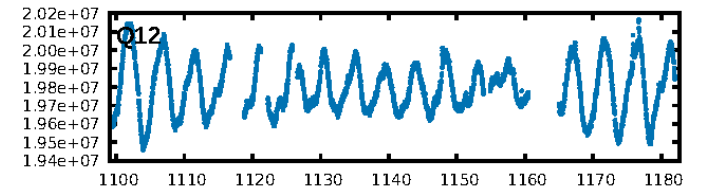
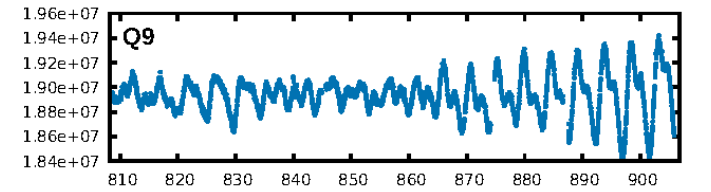
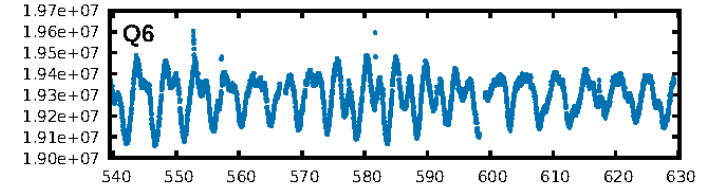
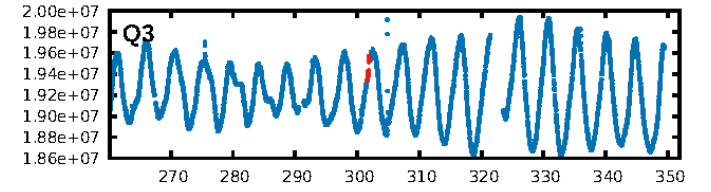
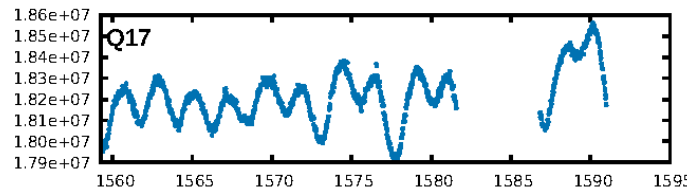
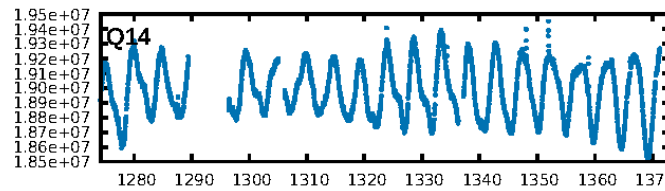
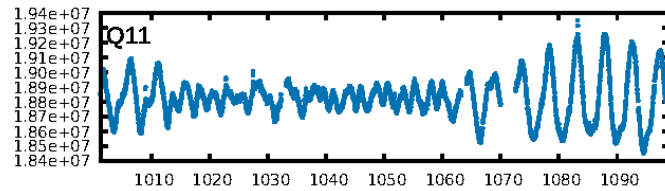
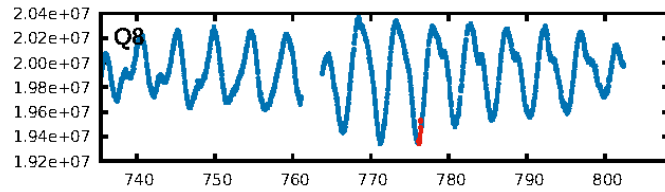
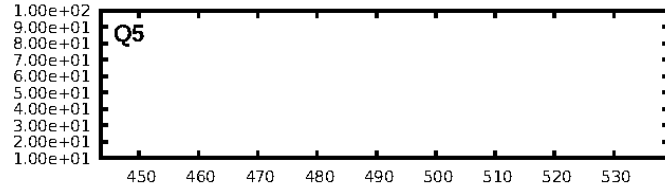
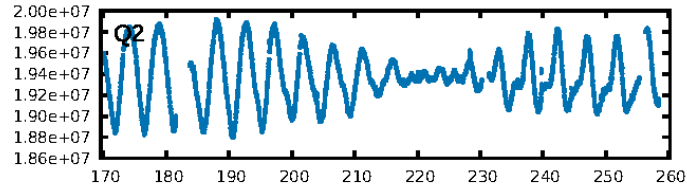
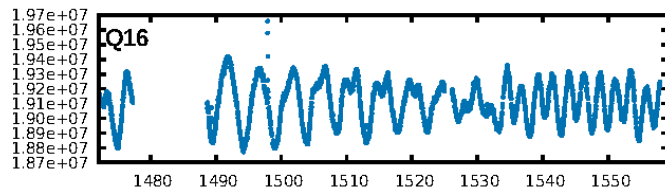
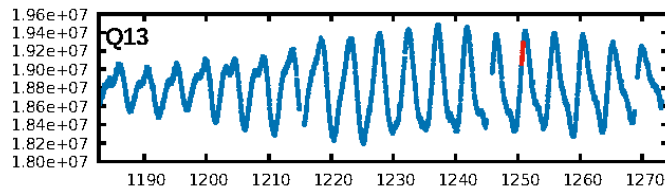
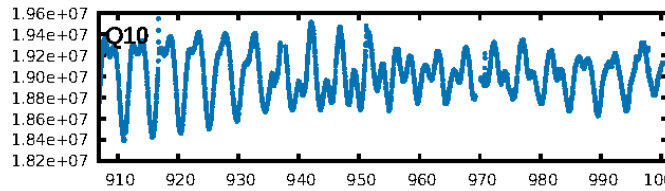
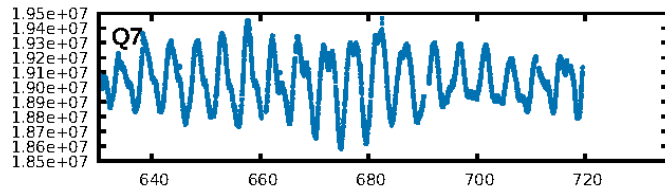
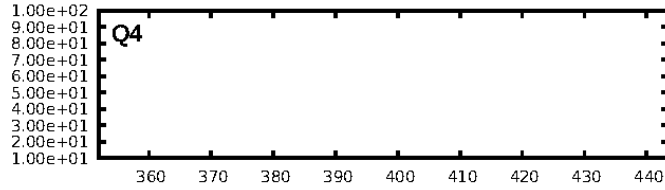
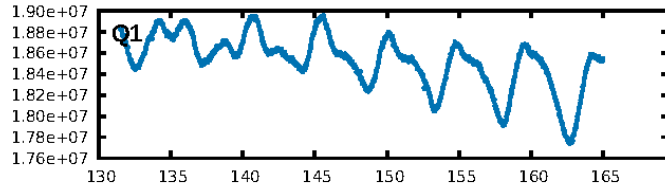
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [956.36 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 26.5%  
ModelChiSquareGof-sig: 96.2%  
**Bootstrap-pfa: 8.62e-09**  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: 1.644  
Centroid-sig: 4.2%  
Centroid-so: 2.244 arcsec [1.57 $\sigma$ ]  
OotOffset-rm: 0.498 arcsec [1.35 $\sigma$ ]  
OotOffset-st: 0/1/1/1 [3]  
KicOffset-rm: 0.379 arcsec [1.34 $\sigma$ ]  
KicOffset-st: 0/1/1/1 [3]  
DiffImageQuality-fgm: 0.67 [2/3]  
DiffImageOverlap-fno: 1.00 [3/3]

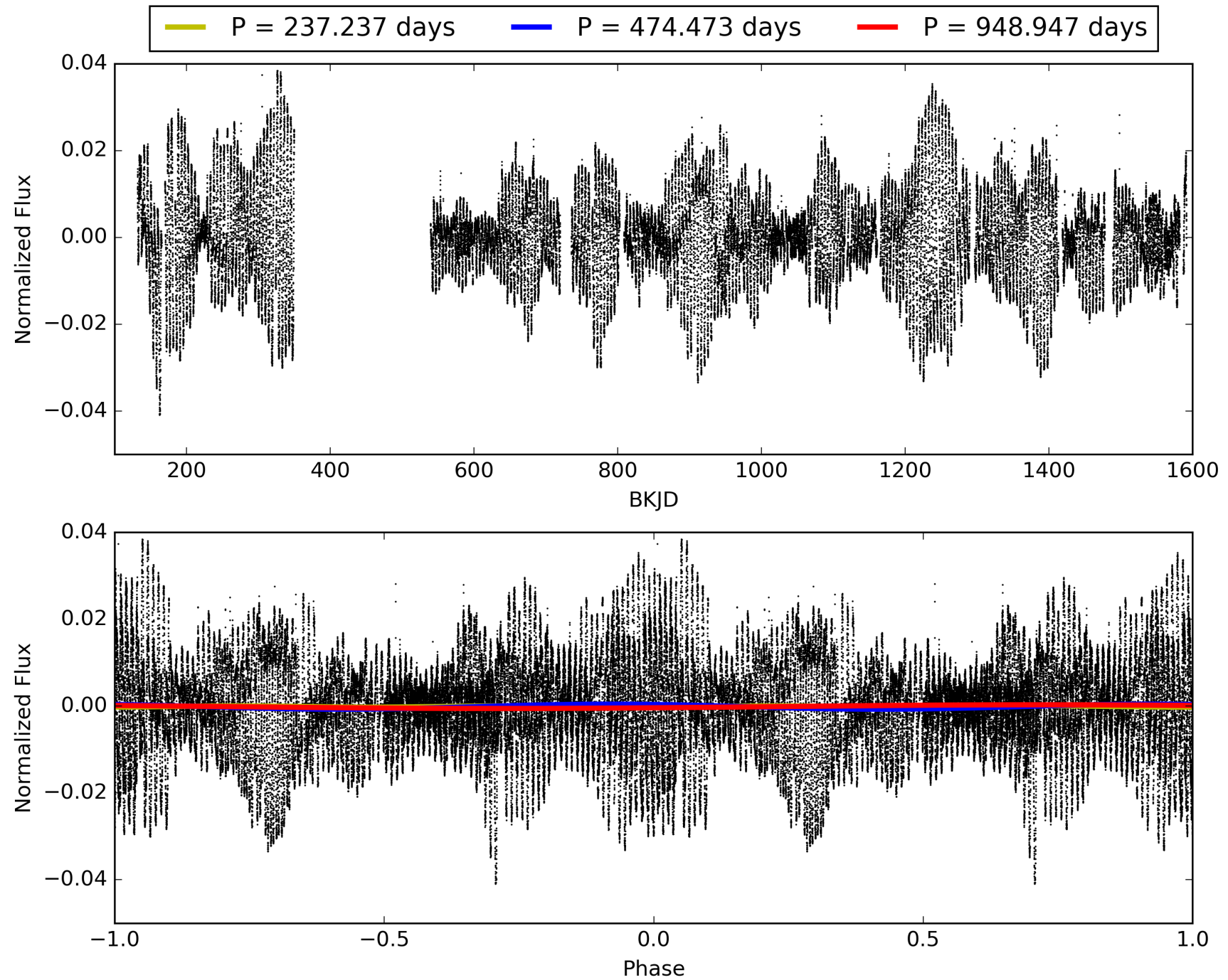
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 06:39:30 Z

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

# TCE 011958998-02, PDC Light Curves



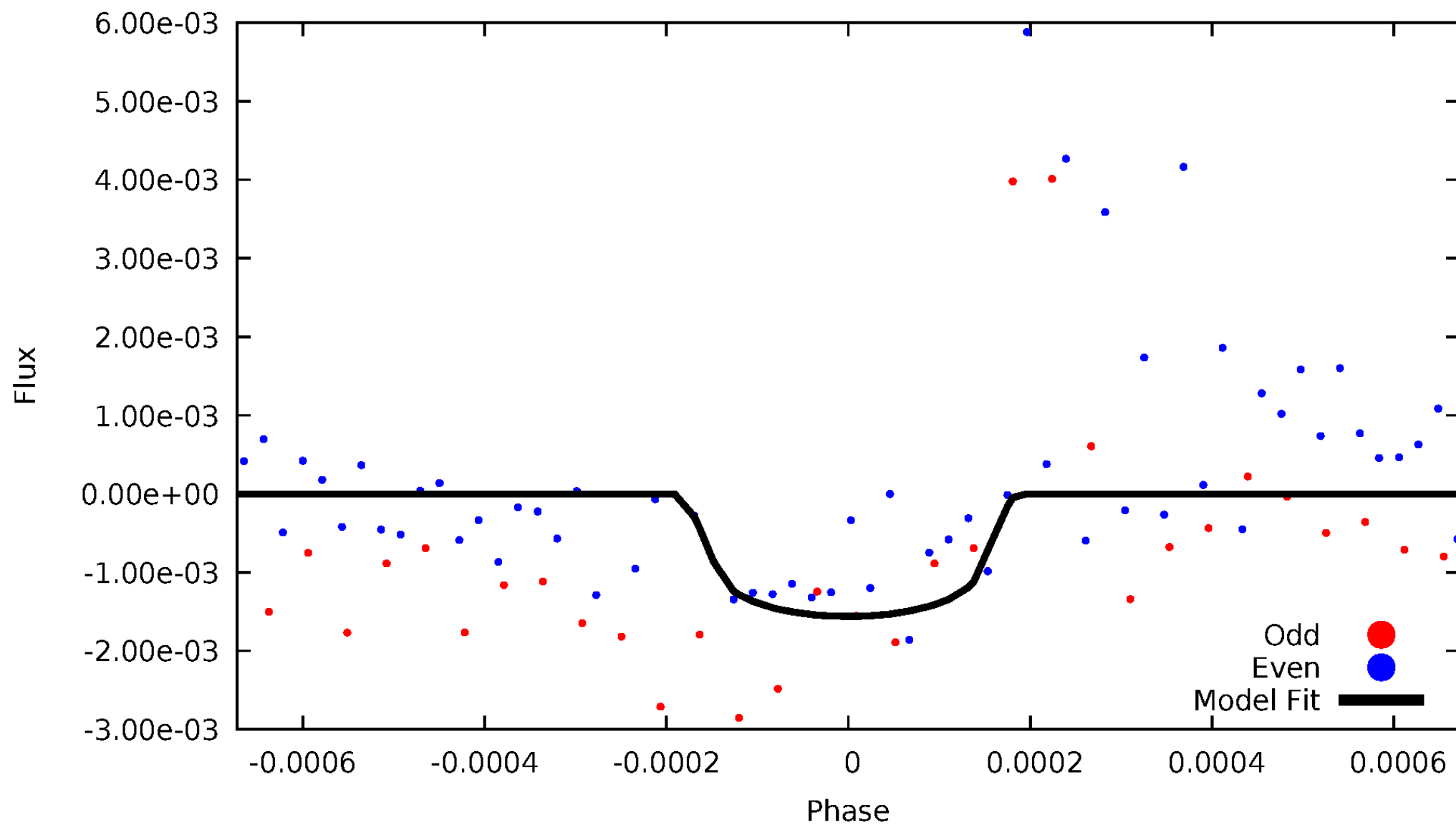
# TCE 011958998-02





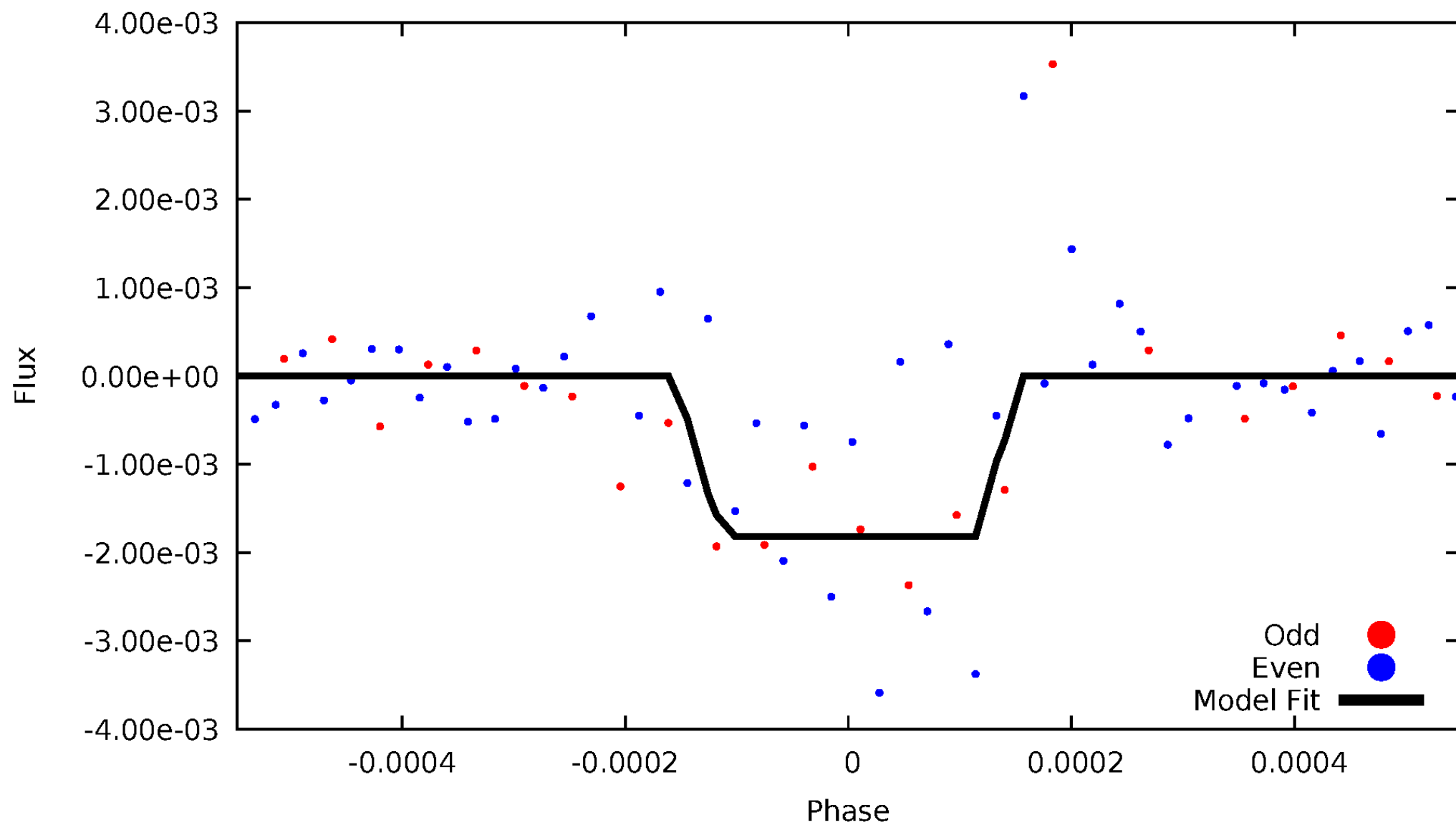
# DV Odd/Even

TCE 011958998-02



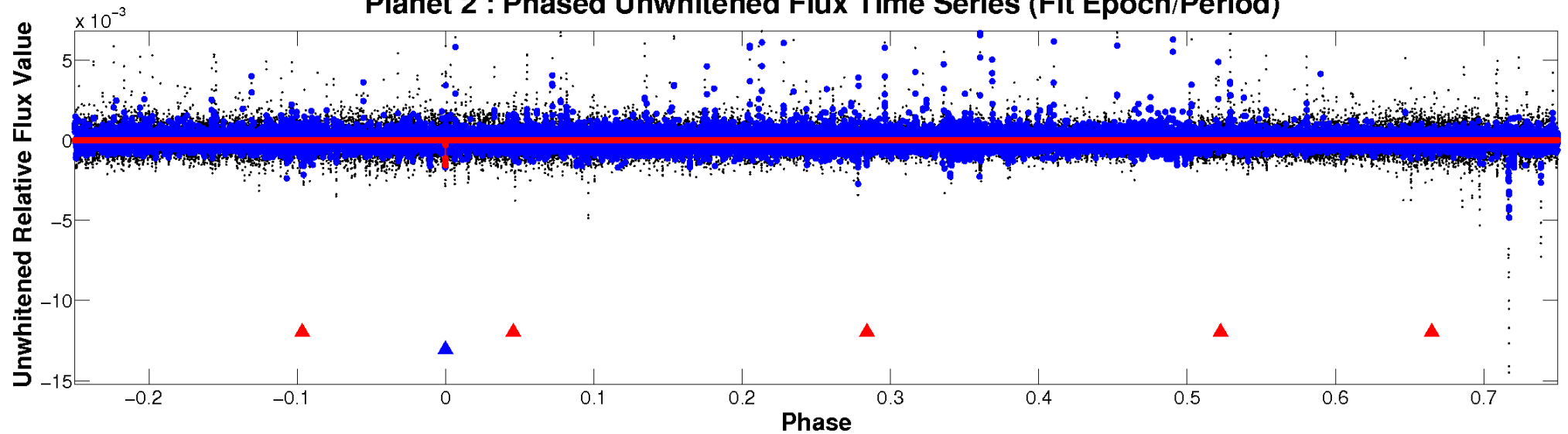
# ALT Odd/Even

TCE 011958998-02

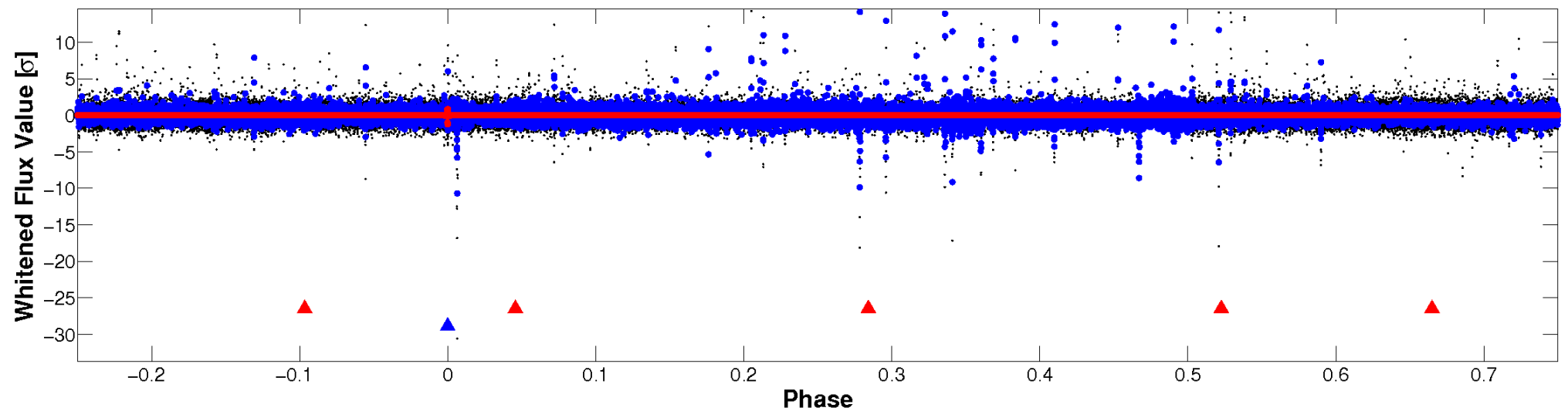


# Non-Whitened Vs. Whitened Light Curve

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

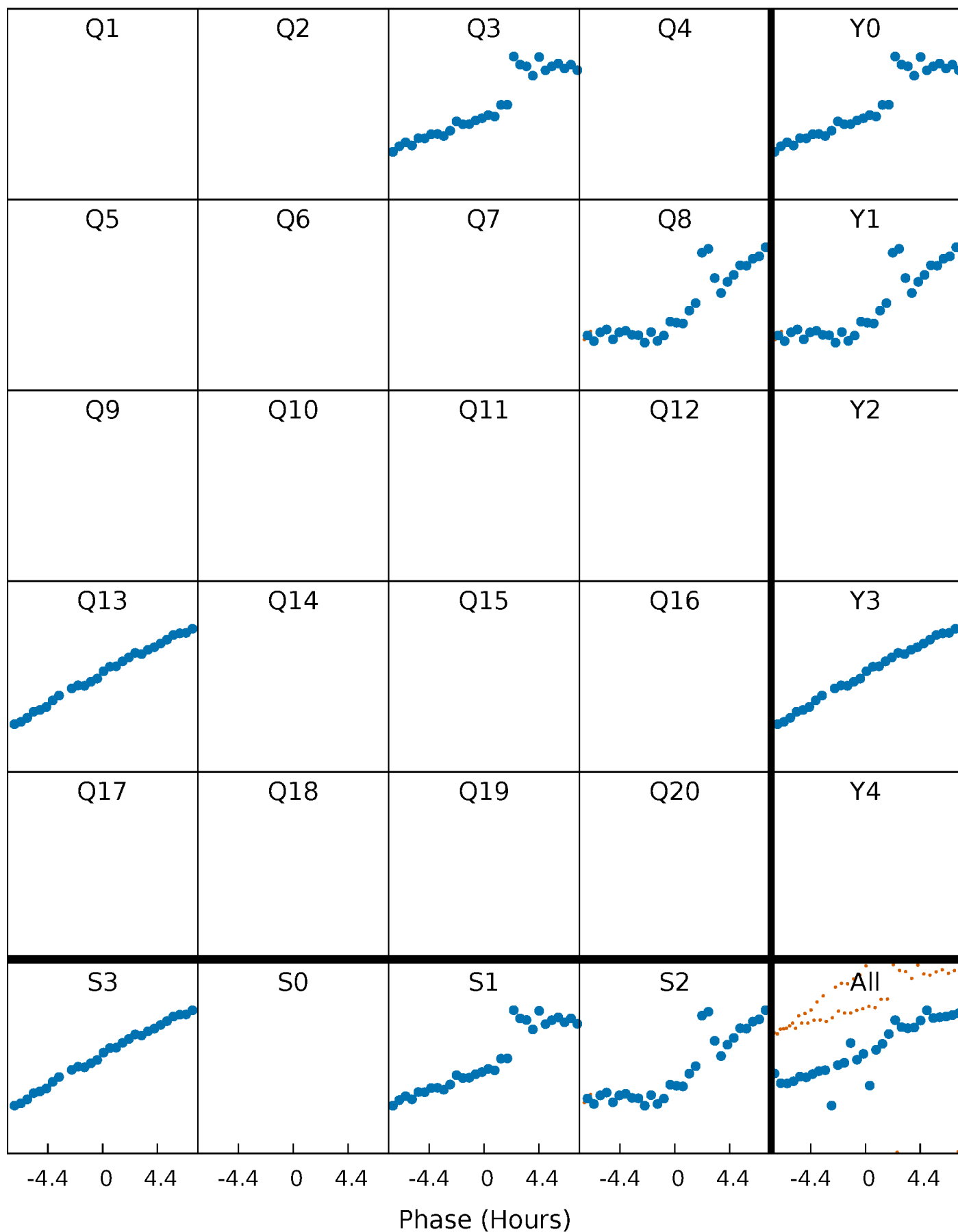


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



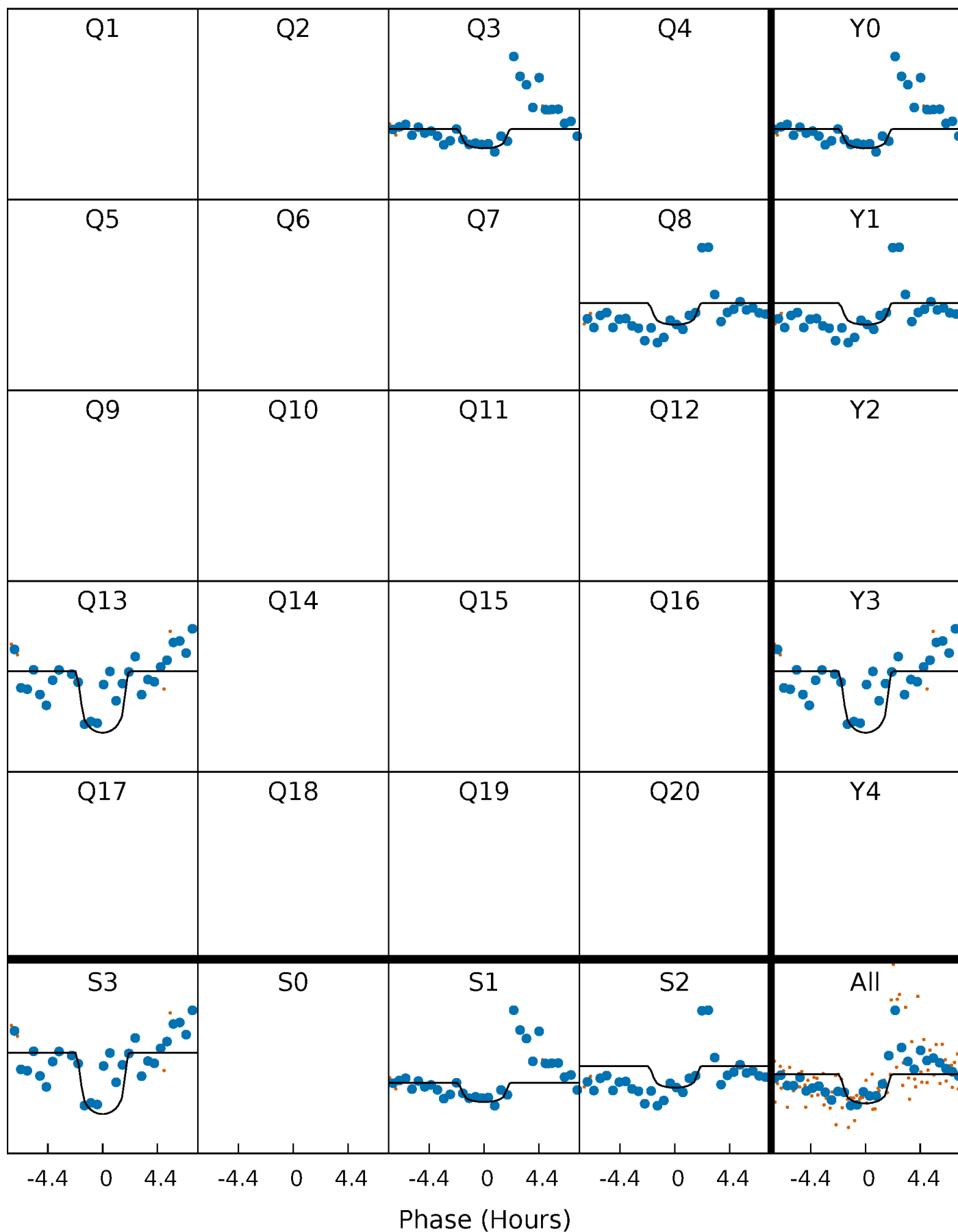
# PDC Quarter-Phased Transit Curves

TCE 011958998-02     $P=474.473354$  Days     $T_0=301.773725$  (BKJD)



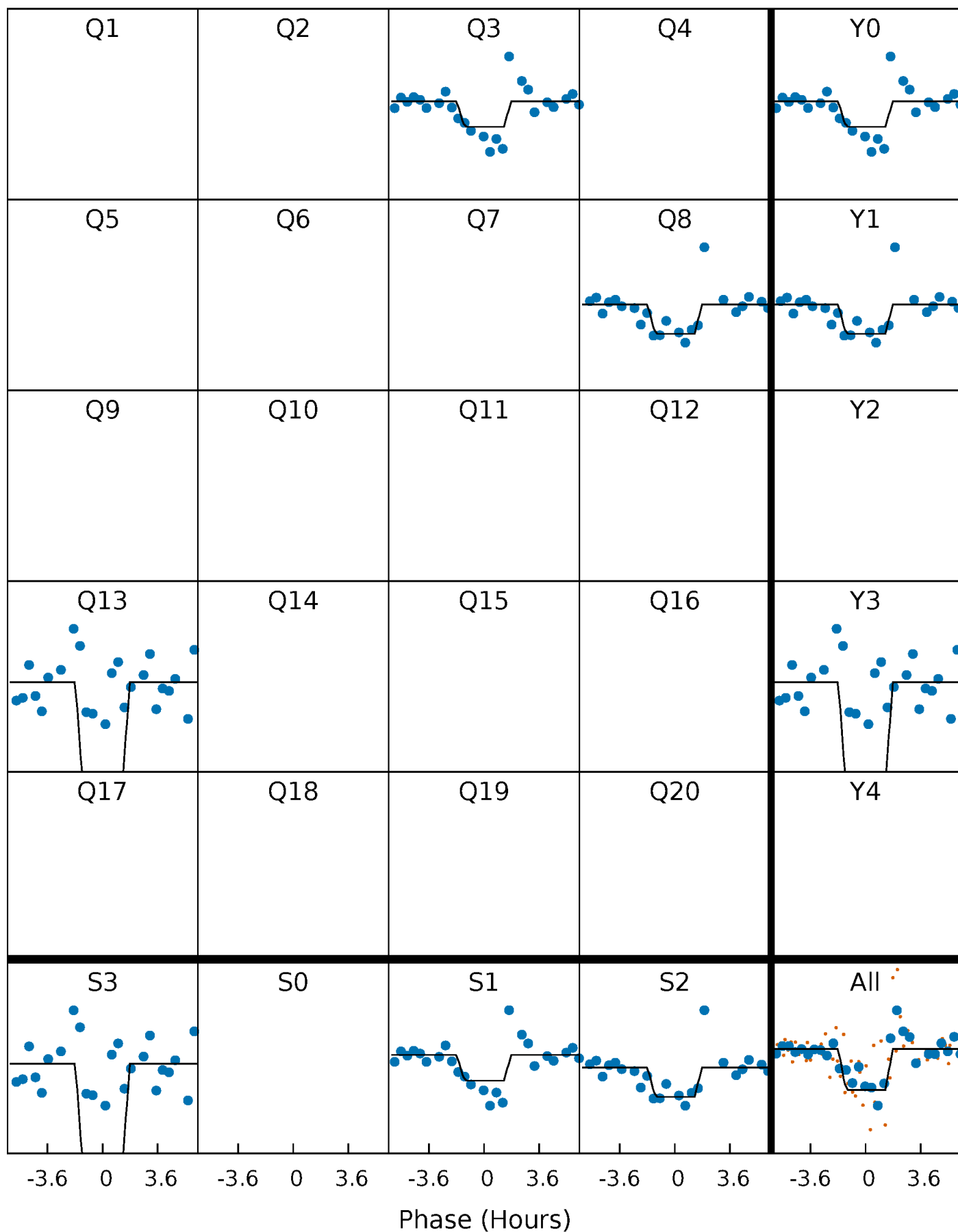
# DV Quarter-Phased Transit Curves

TCE 011958998-02     $P=474.473354$  Days     $T_0=301.773725$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

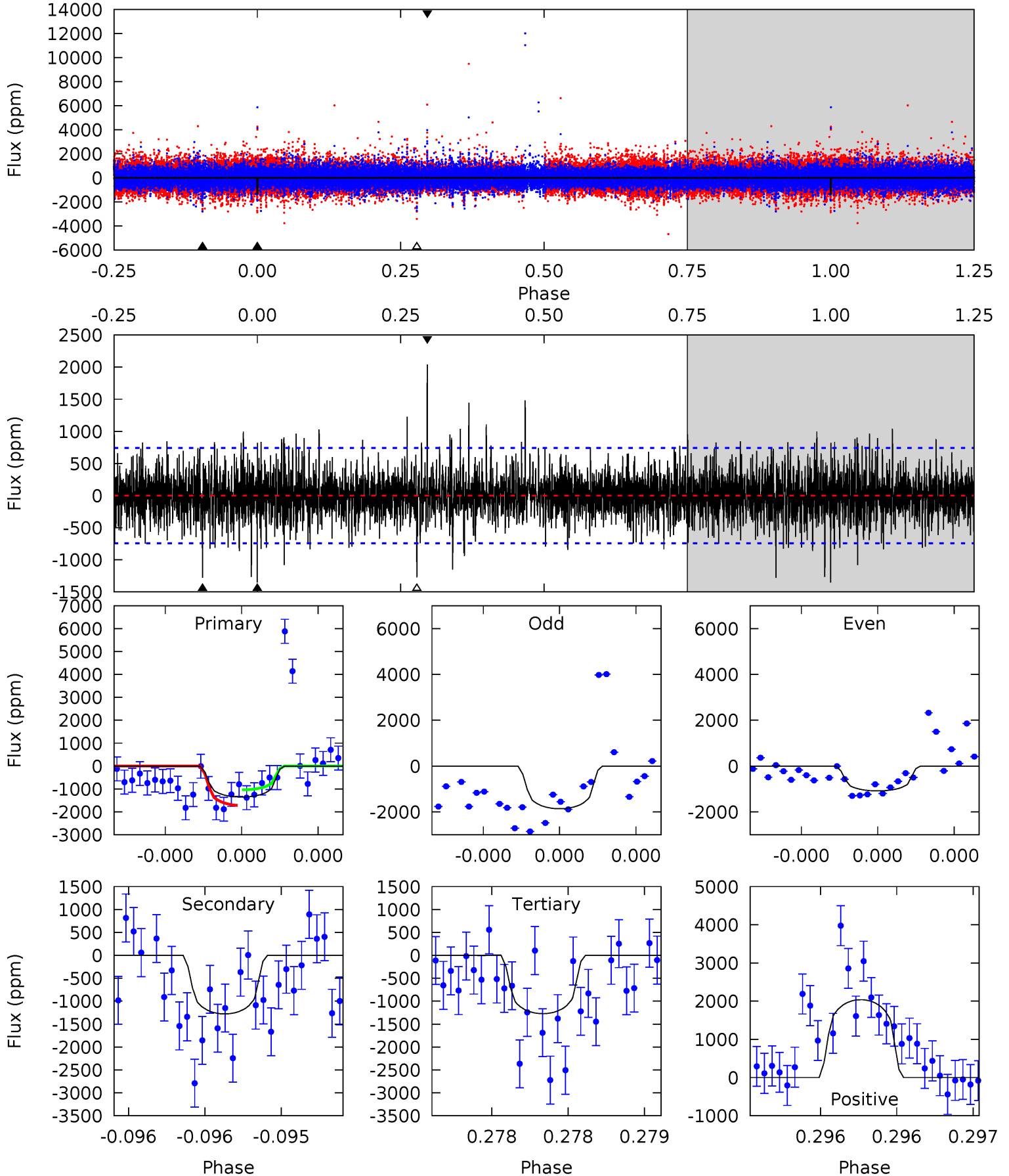
TCE 011958998-02     $P=474.453641$  Days     $T_0=301.792375$  (BKJD)



# DV Model-Shift Uniqueness Test

011958998-02, P = 474.473354 Days, E = 301.773725 Days

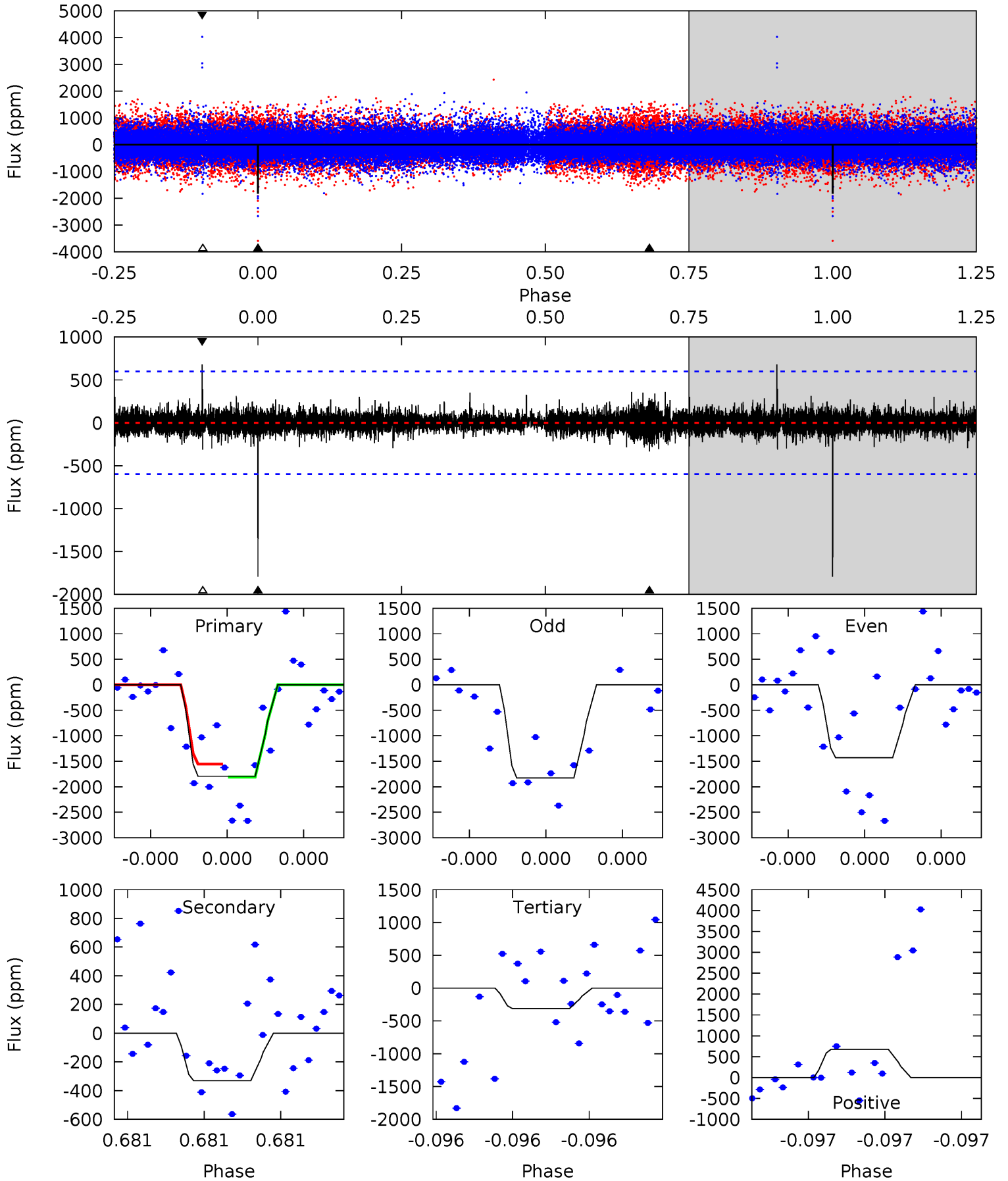
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
10.3	9.72	9.67	15.5	5.63	3.57	1.98	0.61	-5.22	0.05	-5.78	2.50	1.00	0.60	2.58



# Alt Model-Shift Uniqueness Test

011958998-02, P = 474.453641 Days, E = 301.792375 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
17.0	3.14	2.95	6.45	5.68	3.65	0.65	14.1	10.6	0.19	-3.31	1.88	0.85	0.27	1.16





### Stellar Parameters For KIC 011958998

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5688^{+154}_{-154}$	$4.260^{+0.214}_{-0.175}$	$0.070^{+0.250}_{-0.300}$	$1.204^{+0.330}_{-0.300}$	$0.962^{+0.122}_{-0.089}$	$0.775^{+0.912}_{-0.400}$
	+3%/-3%	+5%/-4%	+357%/-429%	+27%/-25%	+13%/-9%	+118%/-52%
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 011958998-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-1279 \pm 132$	$9.13^{+9.31}_{-6.17}$	$356^{+25}_{-23}$	$4290^{+3023}_{-913}$	$11683^{+105129}_{-8808}$
Alt.	$-331 \pm 105$	$9.28^{+9.24}_{-6.31}$	$354^{+25}_{-27}$	$3332^{+1807}_{-582}$	$2779^{+23744}_{-2109}$

$T_{max}$  = 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

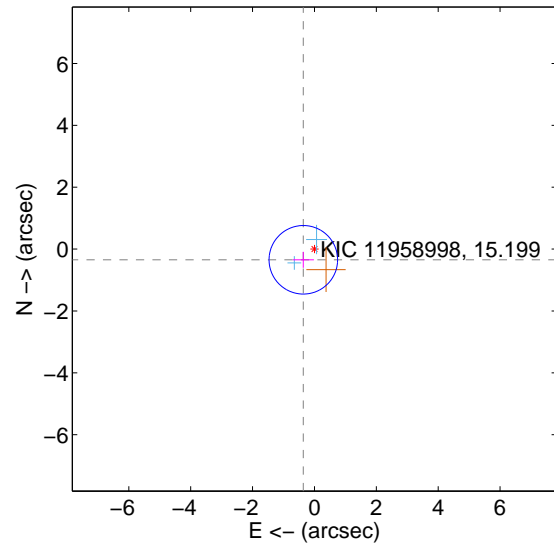
Supplemental centroid analysis for 011958998-02. Kepler magnitude: 15.20. Transit SNR 5.72

There are 2 quarters with good PRF difference image offsets

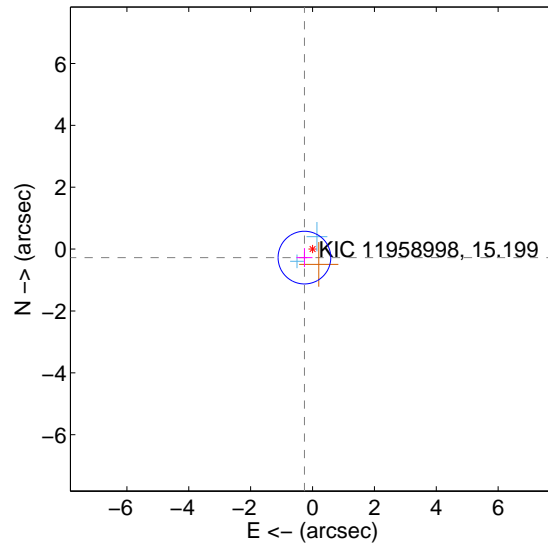
The direct PRF centroid is offset from the target star catalog position by about 0.24 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.498 \pm 0.369$	1.35	$0.359 \pm 0.343$	$-0.346 \pm 0.260$
PRF-fit source offset from KIC position	$0.379 \pm 0.284$	1.34	$0.261 \pm 0.259$	$-0.275 \pm 0.304$
photometric centroid source offset	$2.24 \pm 1.43$	1.57	$1.95 \pm 1.46$	$1.11 \pm 1.30$

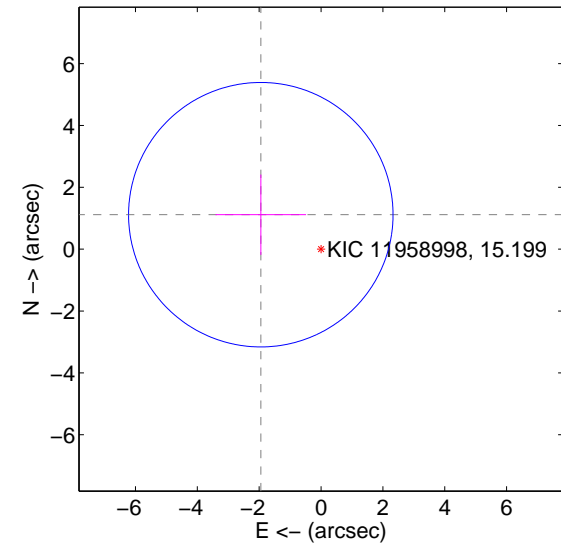
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

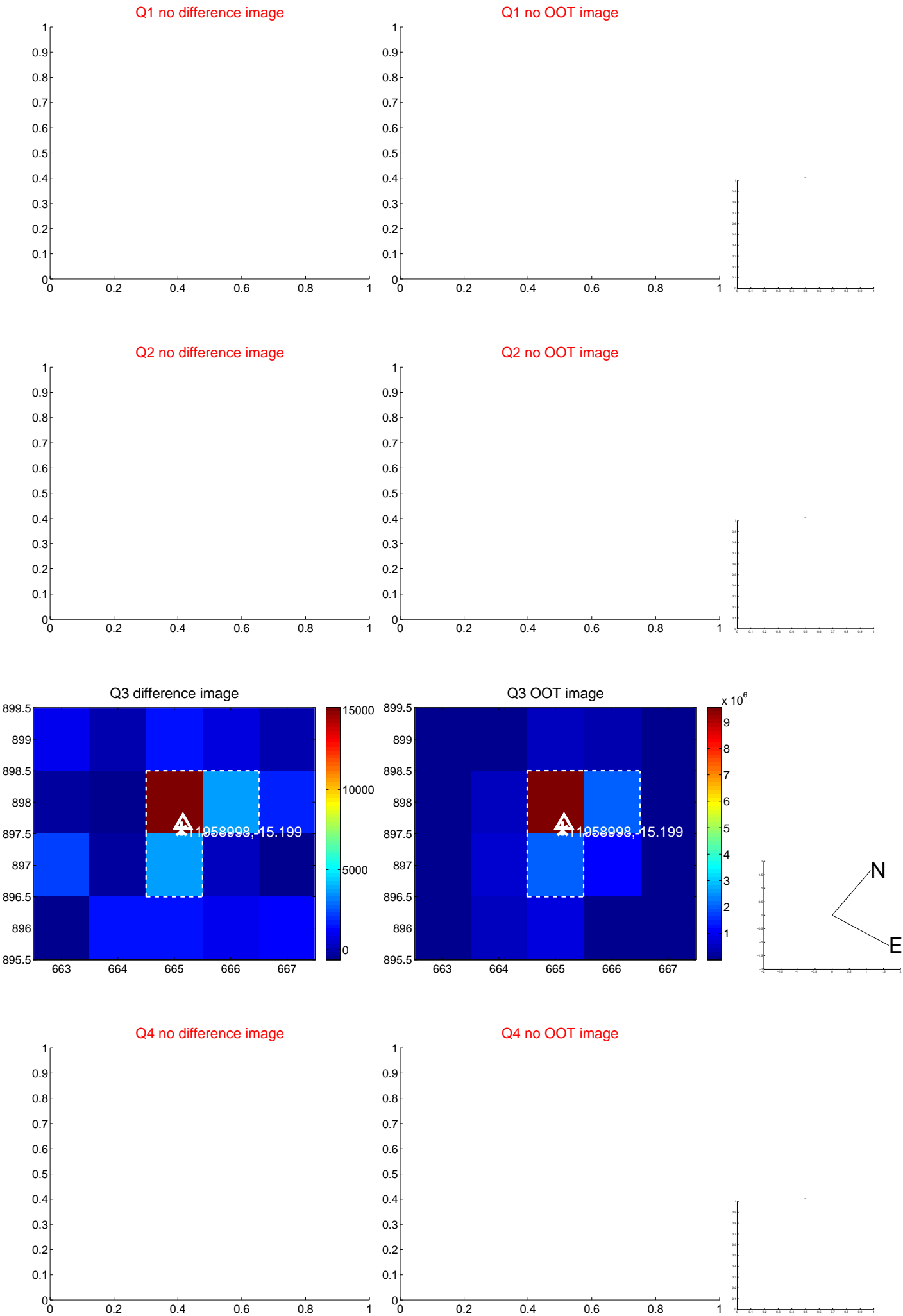


offset from photometric centroids

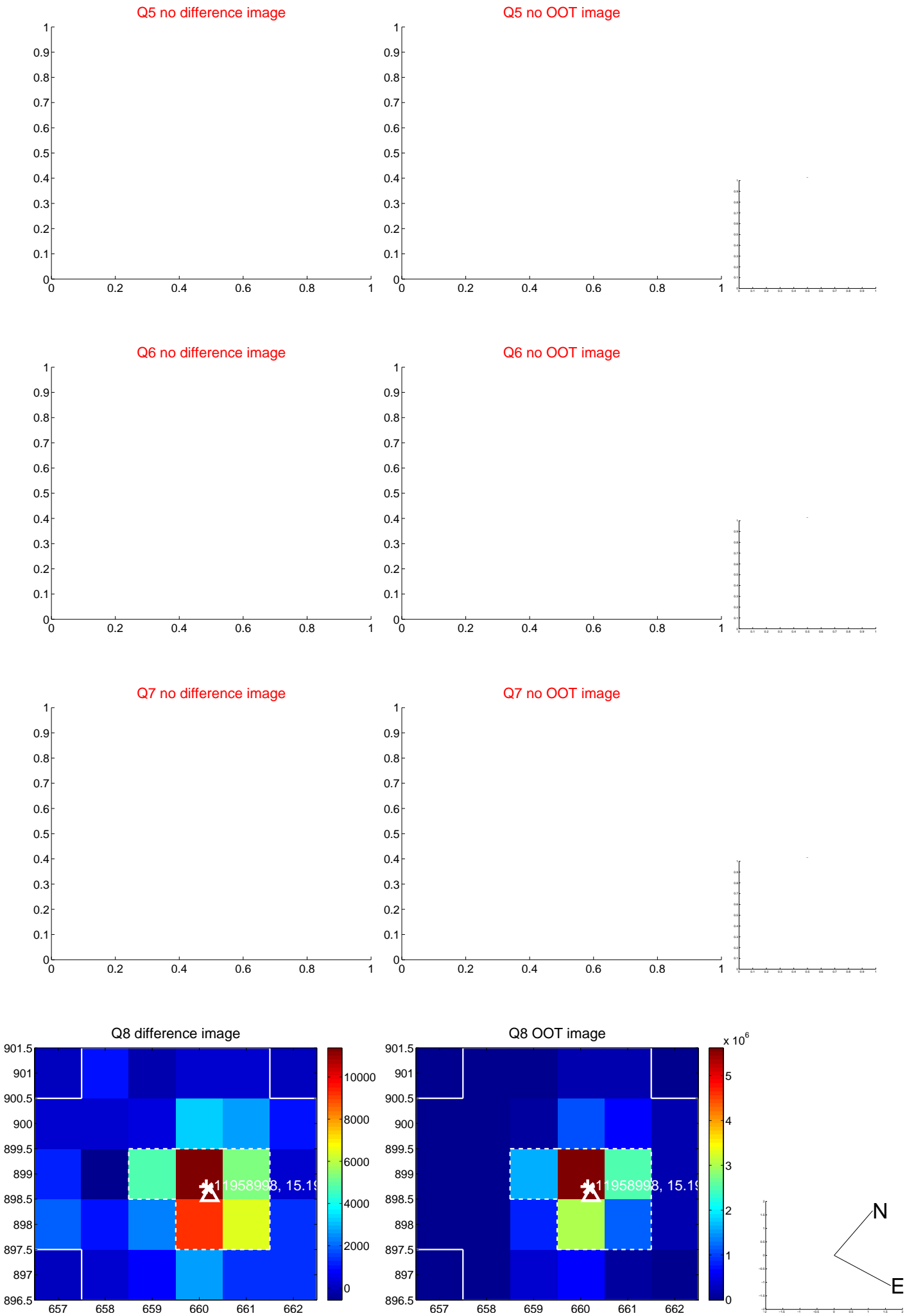


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

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



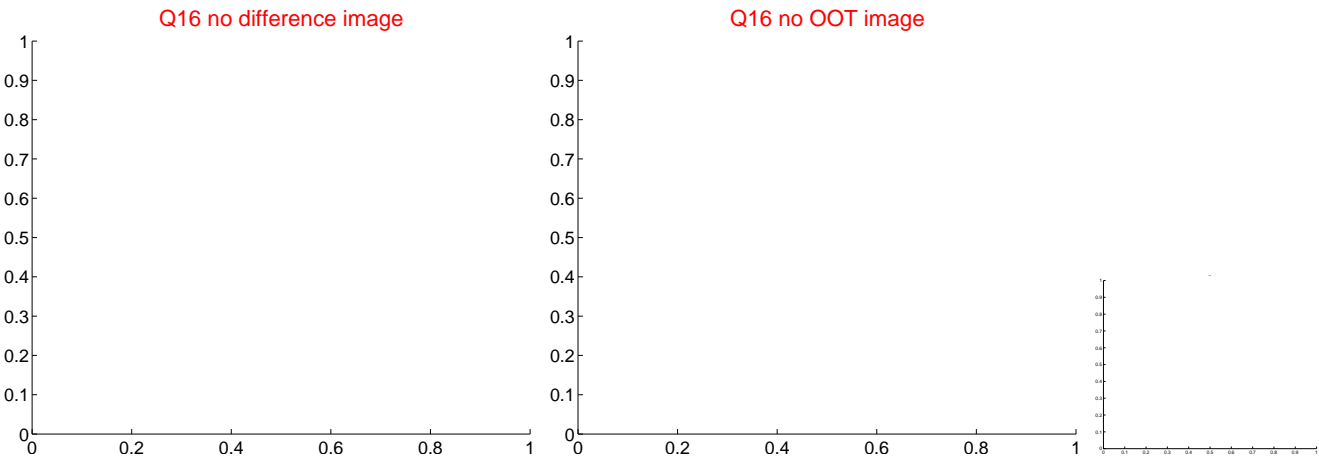
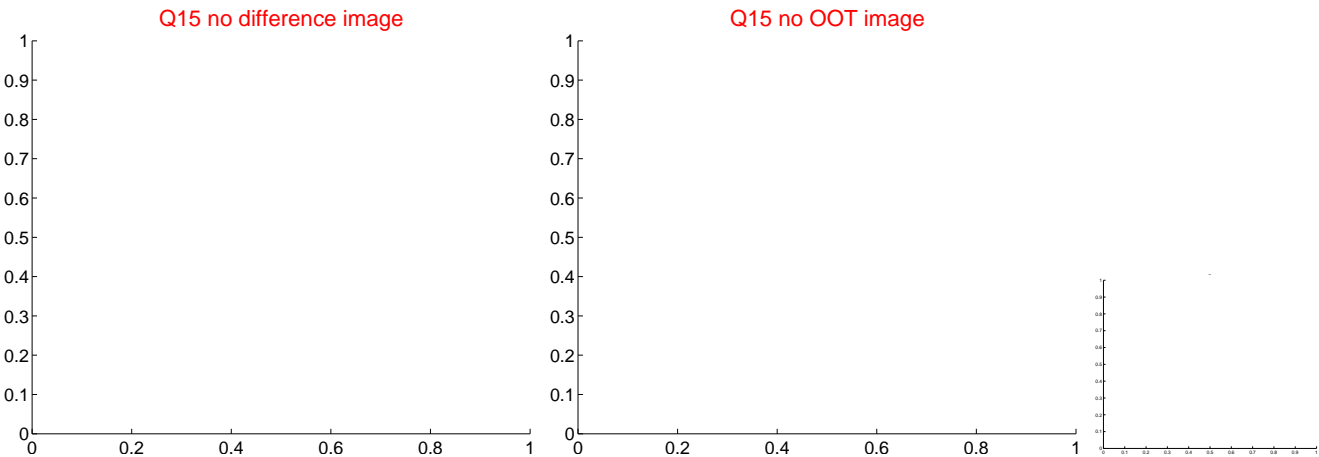
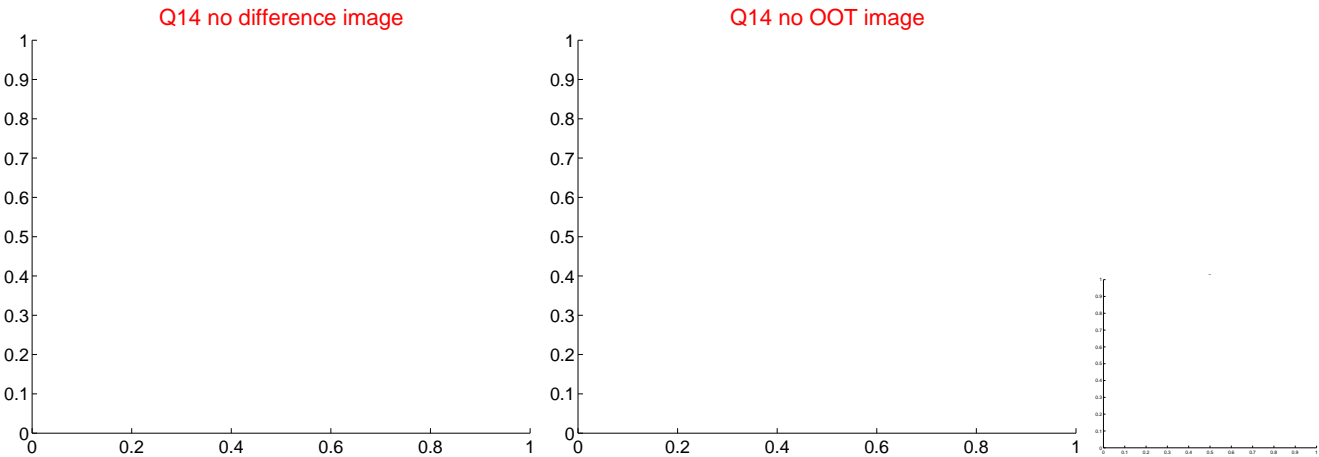
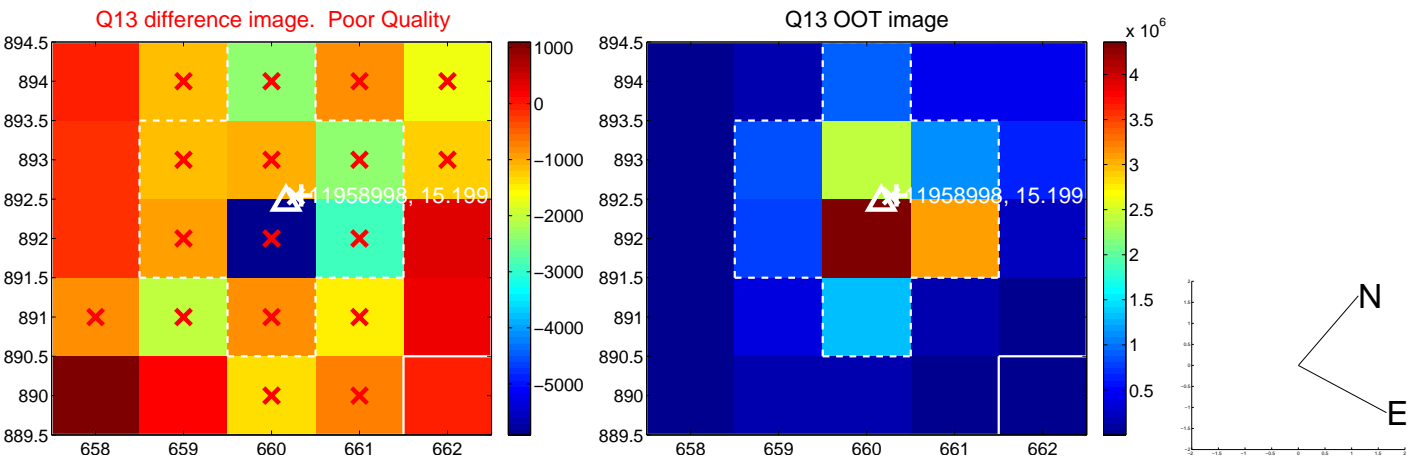
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.



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



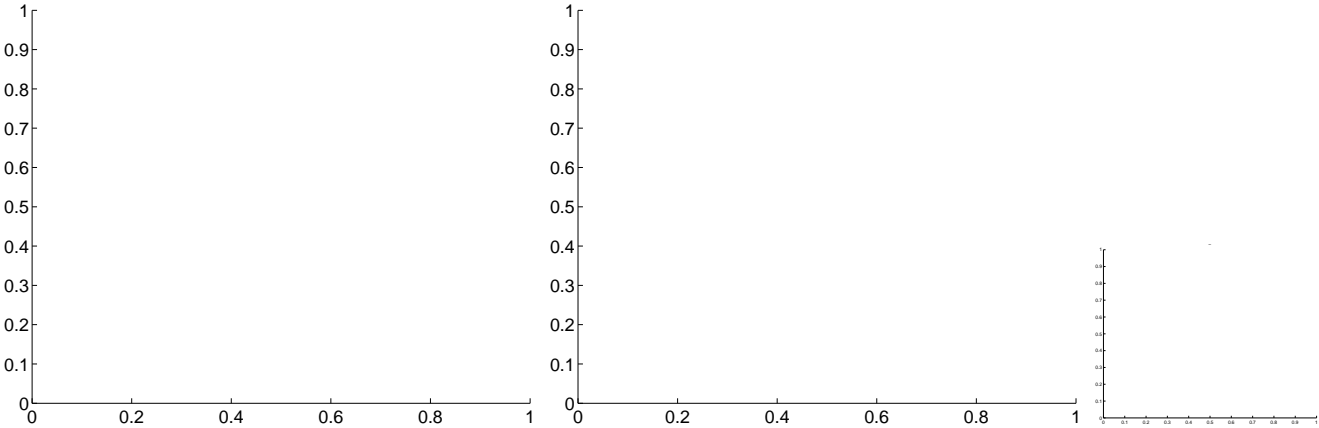
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



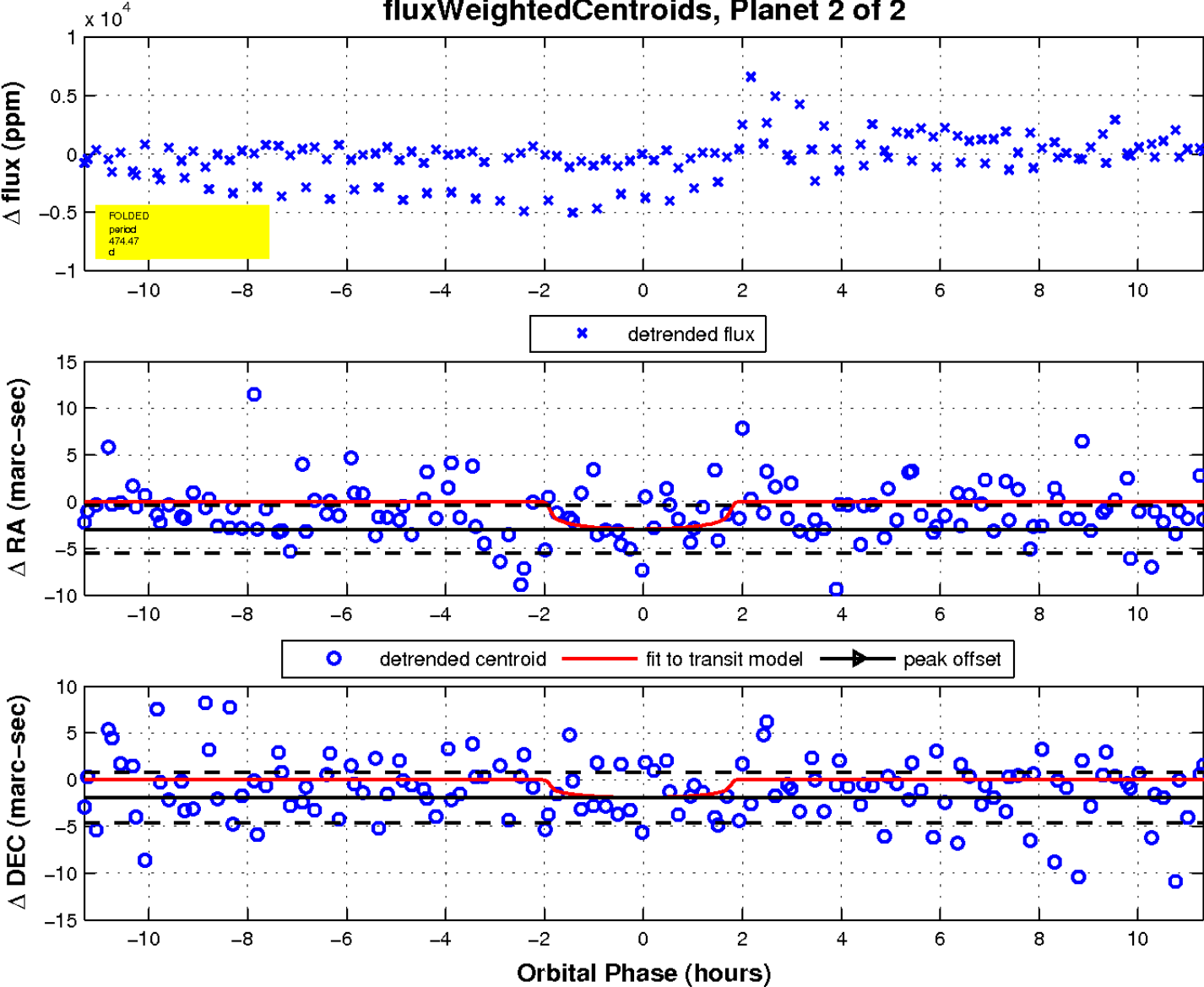
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

Q17 no difference image

Q17 no OOT image



fluxWeightedCentroids, Planet 2 of 2



UKIRT Image

Declination

