

# KIC 009898800

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009898800-01	OBS	No	631.924471	197.116385	360.9	3.689	10.6	7.4	1.53	5739	3.11	1.12
009898800-02	OBS	No	358.586705	458.655008	143.4	3.289	12.1	3.1	1.53	5739	2.15	2.38

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009898800-01	OBS	FP	0.00	1	0	0	0	MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_SATURATED
009898800-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_SATURATED

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

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

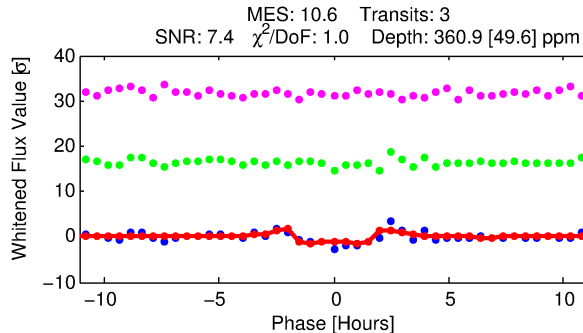
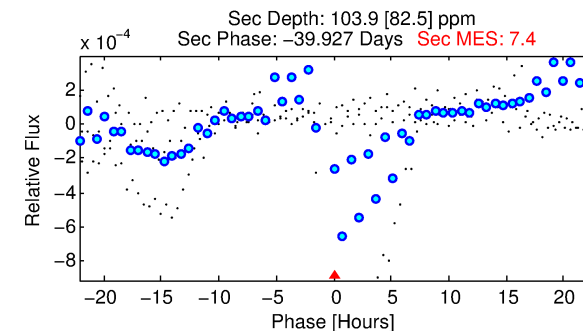
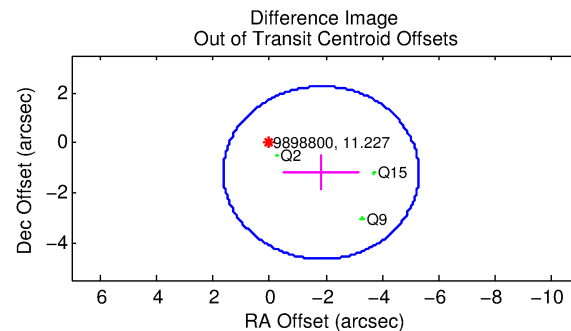
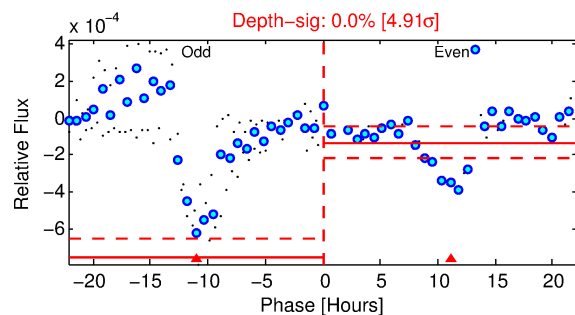
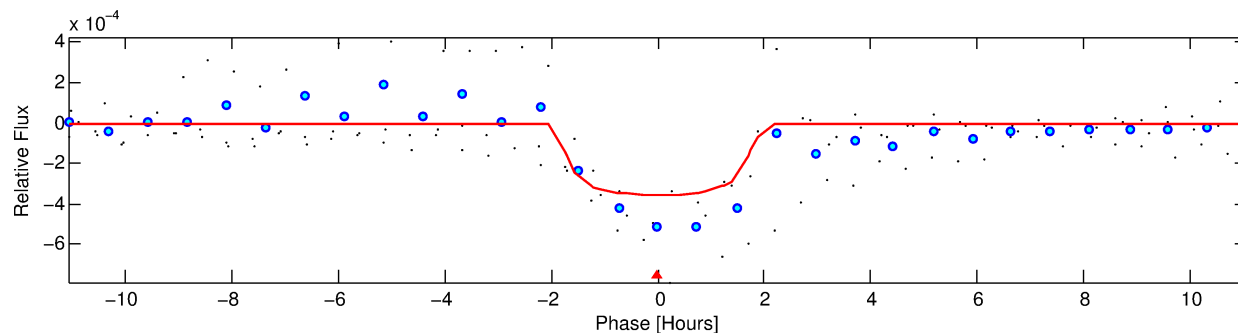
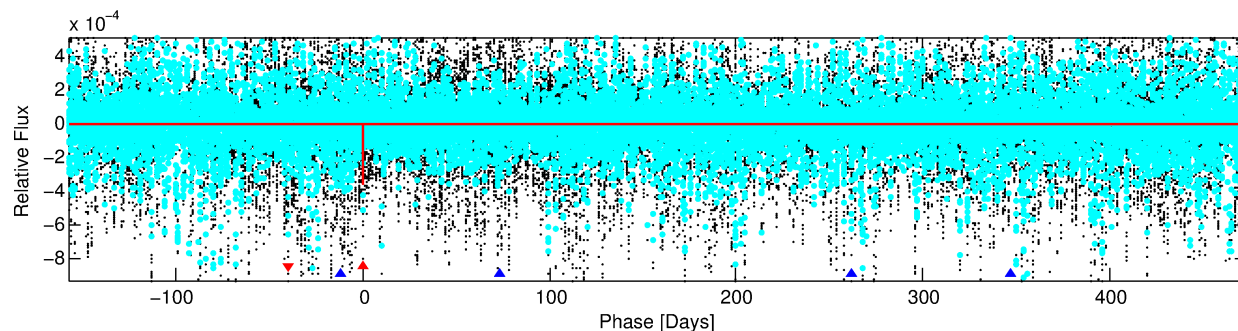
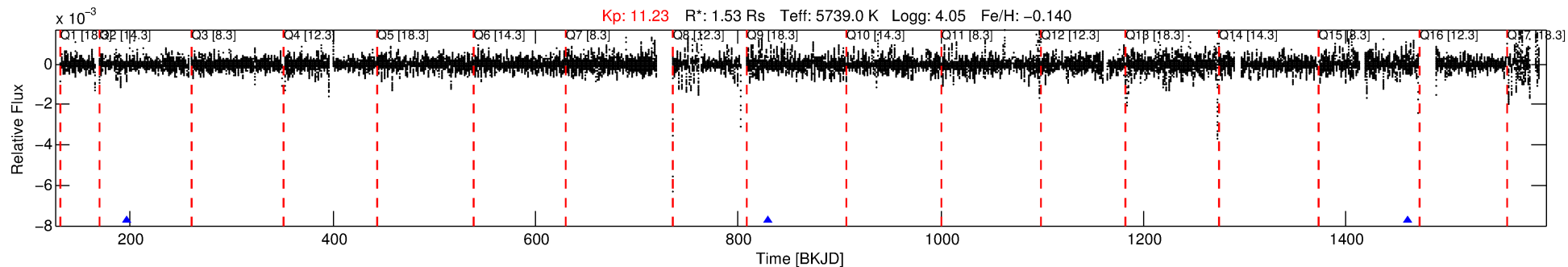
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009898800-01

No Significant Match Found

# DV One-Page Summary

KIC: 9898800 Candidate: 1 of 2 Period: 631.924 d



## DV Fit Results:

Period = 631.92447 [0.00287] d  
Epoch = 197.1164 [0.0039] BKJD  
Rp/R\* = 0.0187 [0.0136]  
a/R\* = 955.93 [3107.55]  
b = 0.71 [2.30]  
Seff = 1.12 [0.77]  
Teq = 262 [45] K  
Rp = 3.11 [2.56] Re  
a = 1.4248 [0.5797] AU  
Ag = 11969.72 [21484.31] [0.56 $\sigma$ ]  
Teff = 4242 [1764] K [2.26 $\sigma$ ]

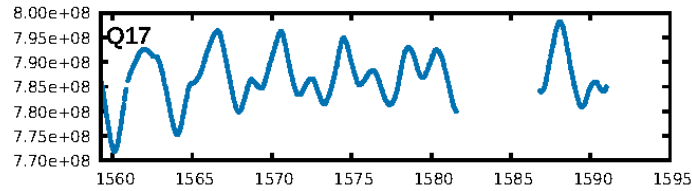
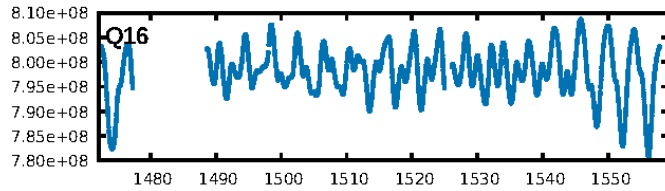
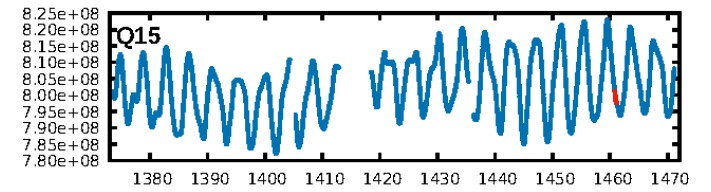
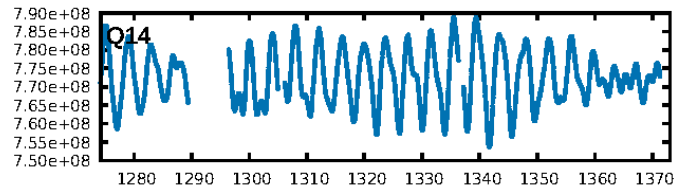
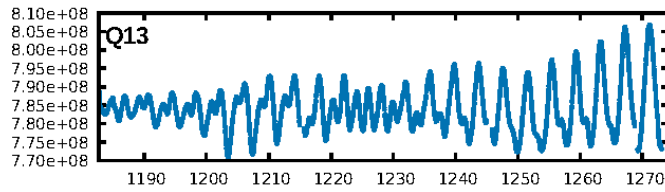
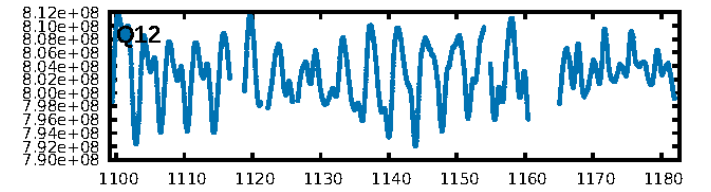
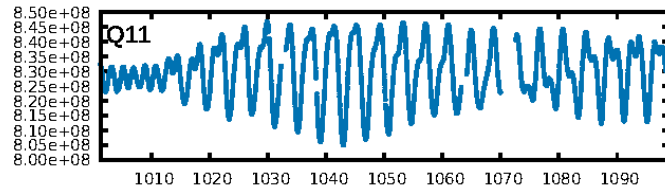
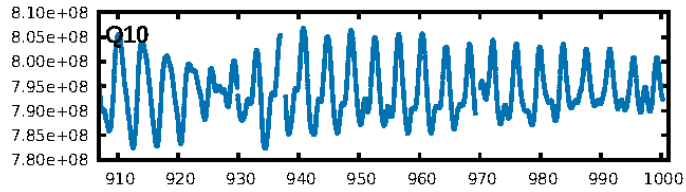
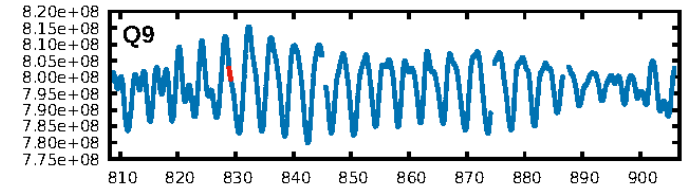
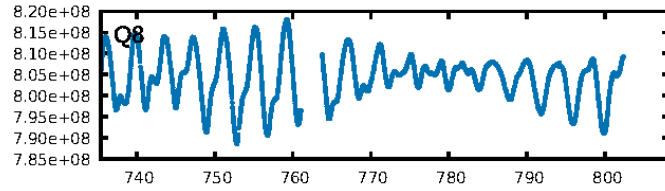
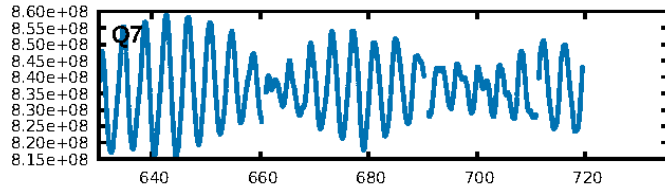
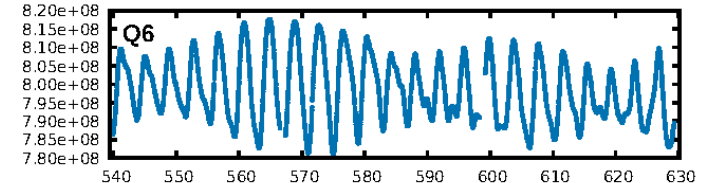
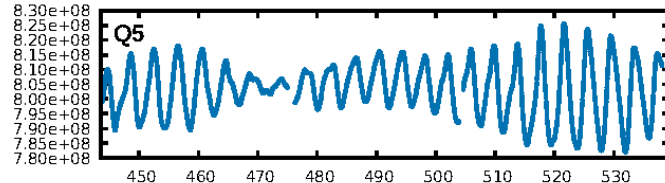
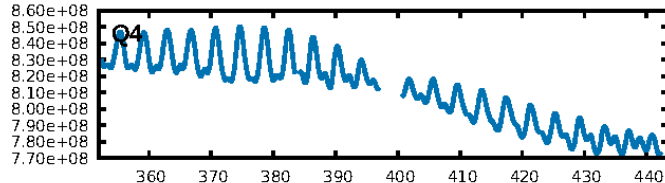
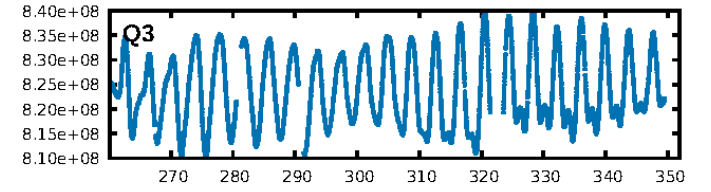
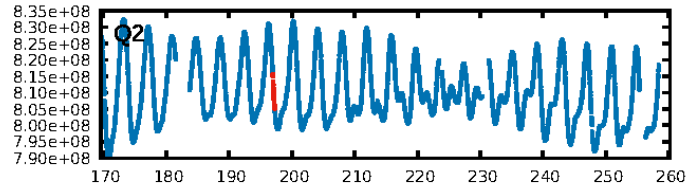
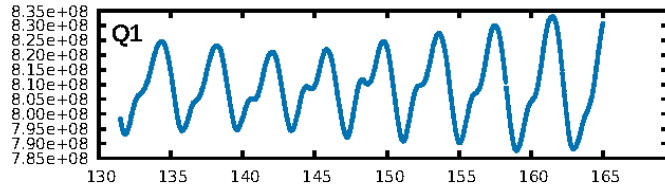
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [1327.48 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 4.3%  
ModelChiSquareGof-sig: 72.5%  
Bootstrap-pfa: 6.52e-06  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: 1.16  
Centroid-sig: 51.9%  
Centroid-so: 1.048 arcsec [0.72 $\sigma$ ]  
OotOffset-rm: 2.194 arcsec [1.90 $\sigma$ ]  
KicOffset-rm: 2.024 arcsec [1.86 $\sigma$ ]  
OotOffset-st: 1/1/0/1 [3]  
KicOffset-st: 1/1/0/1 [3]  
DiffImageQuality-fgm: 1.00 [3/3]  
DiffImageOverlap-fno: 1.00 [3/3]

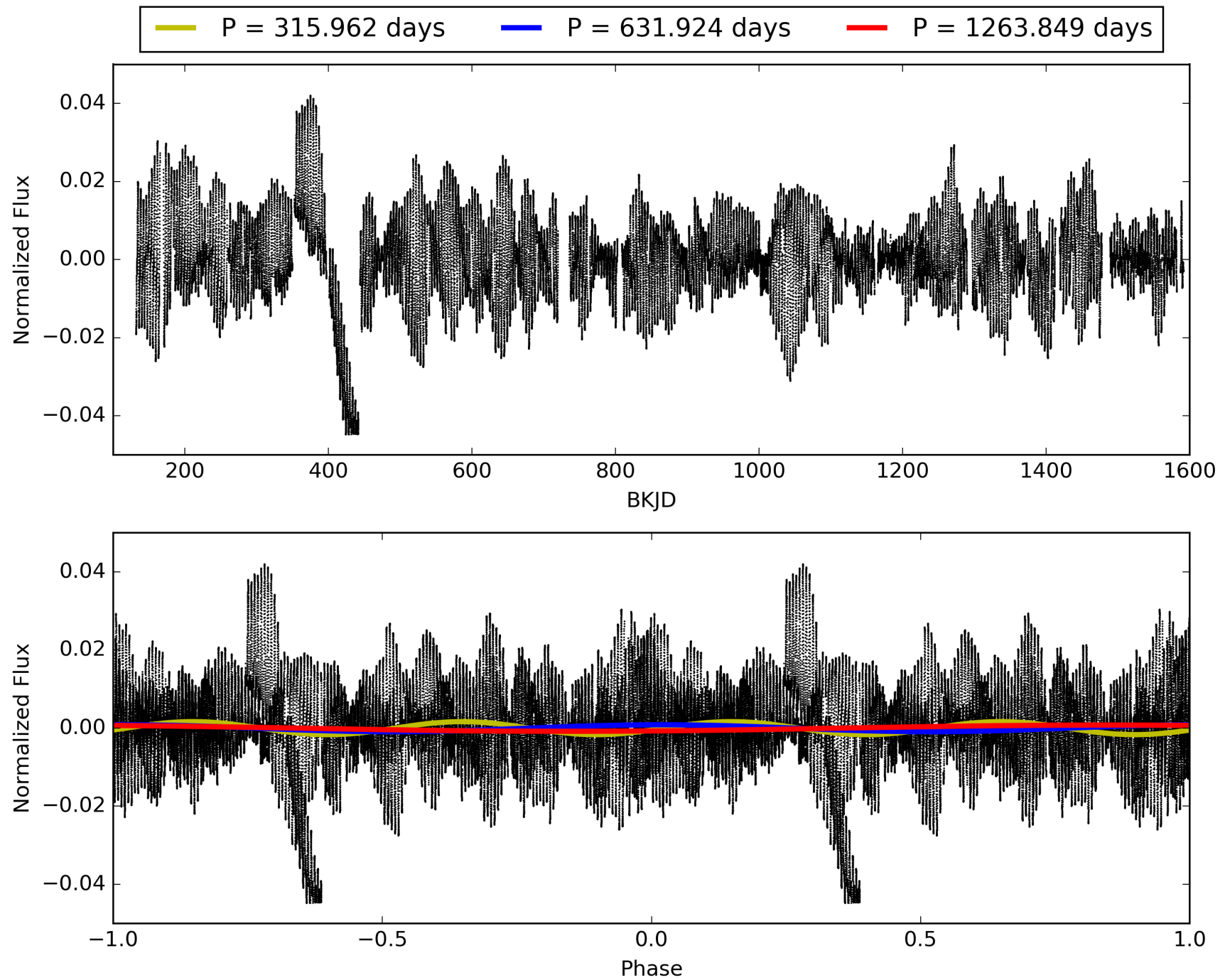
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This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 009898800-01, PDC Light Curves

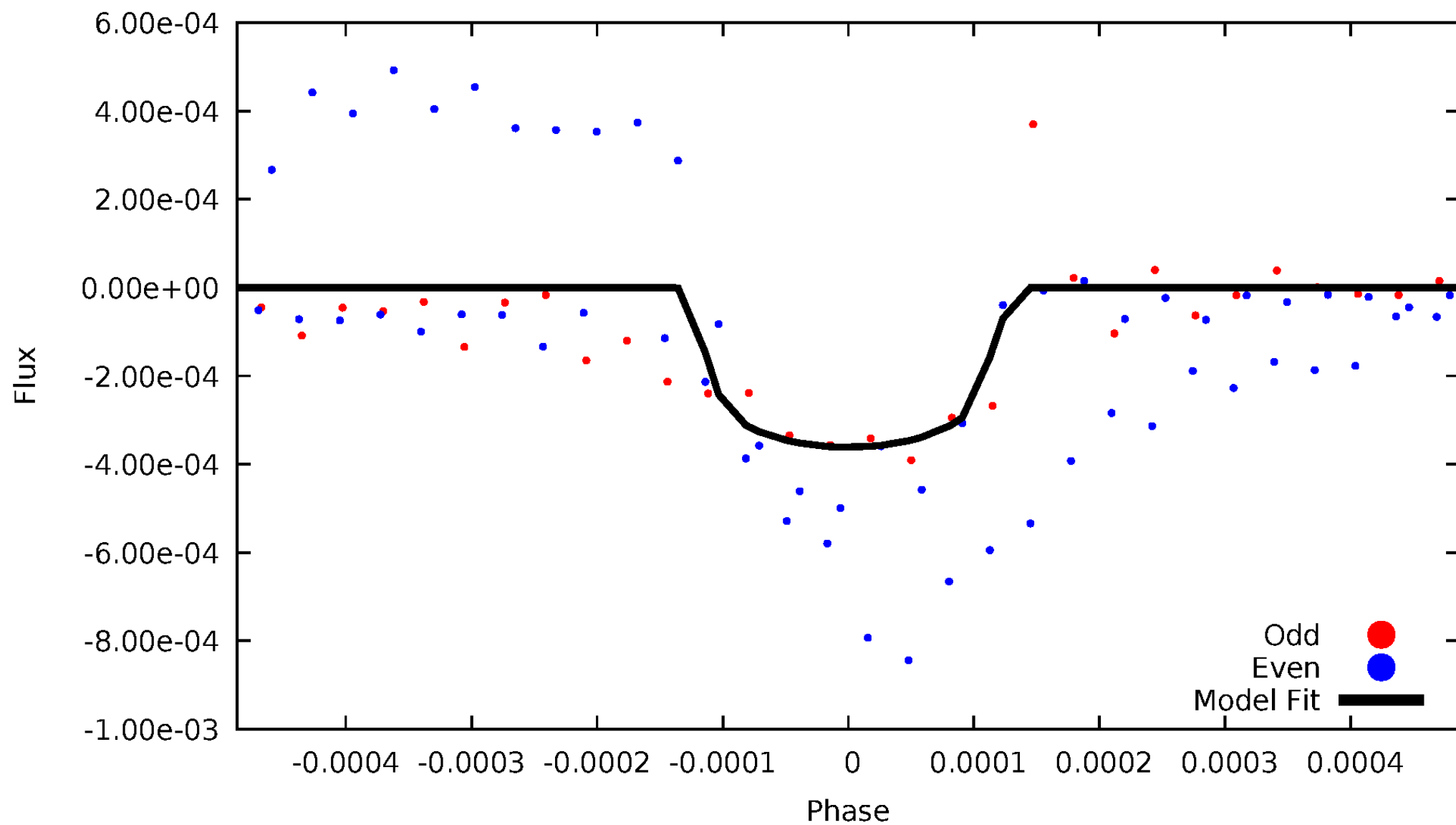


TCE 009898800-01



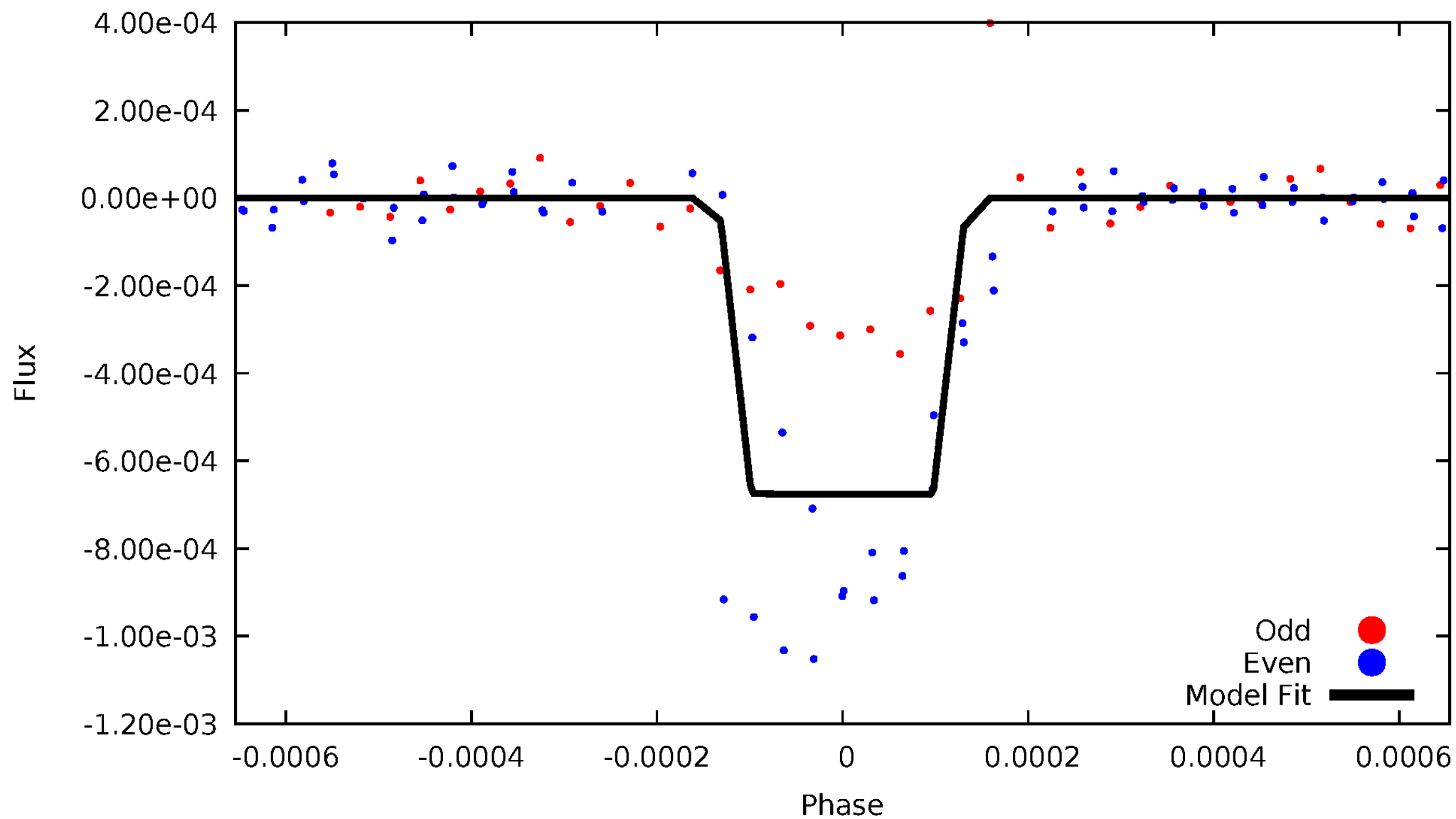
# DV Odd/Even

TCE 009898800-01



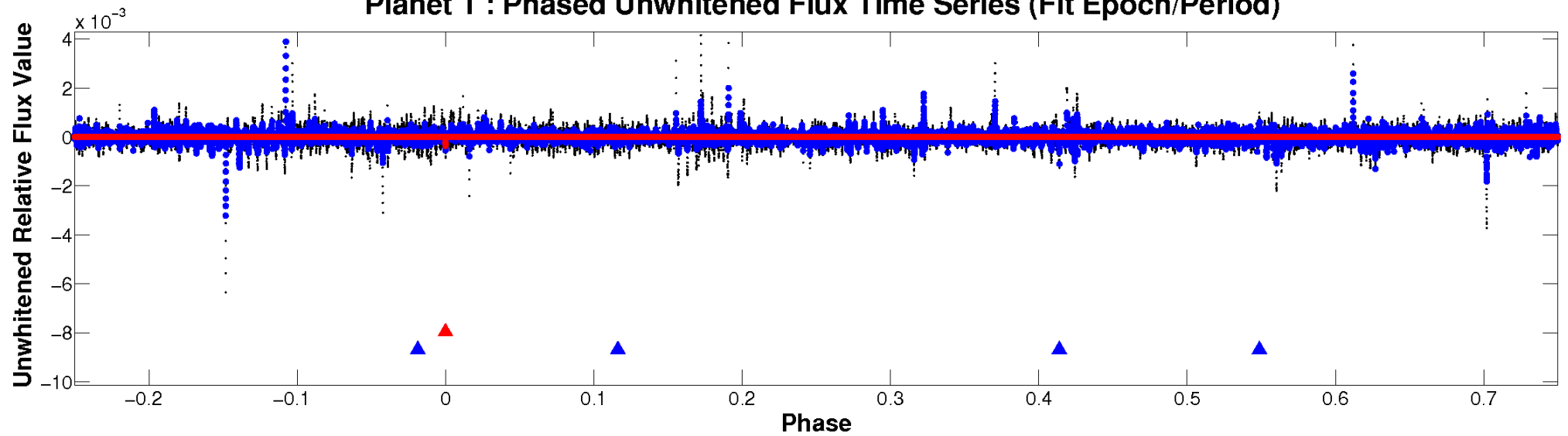
# ALT Odd/Even

TCE 009898800-01

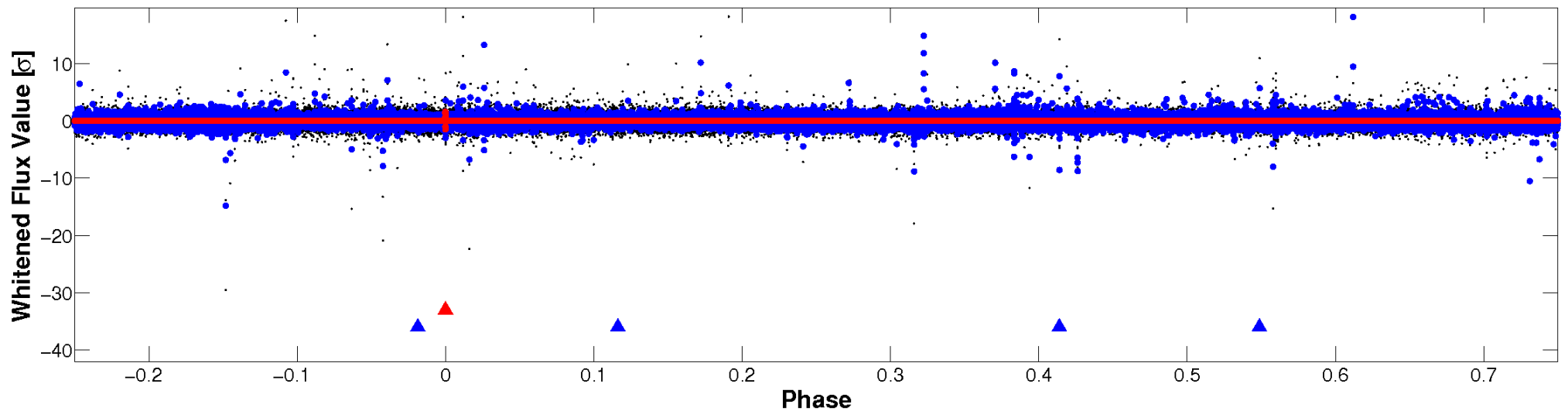


# Non-Whitened Vs. Whitened Light Curve

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

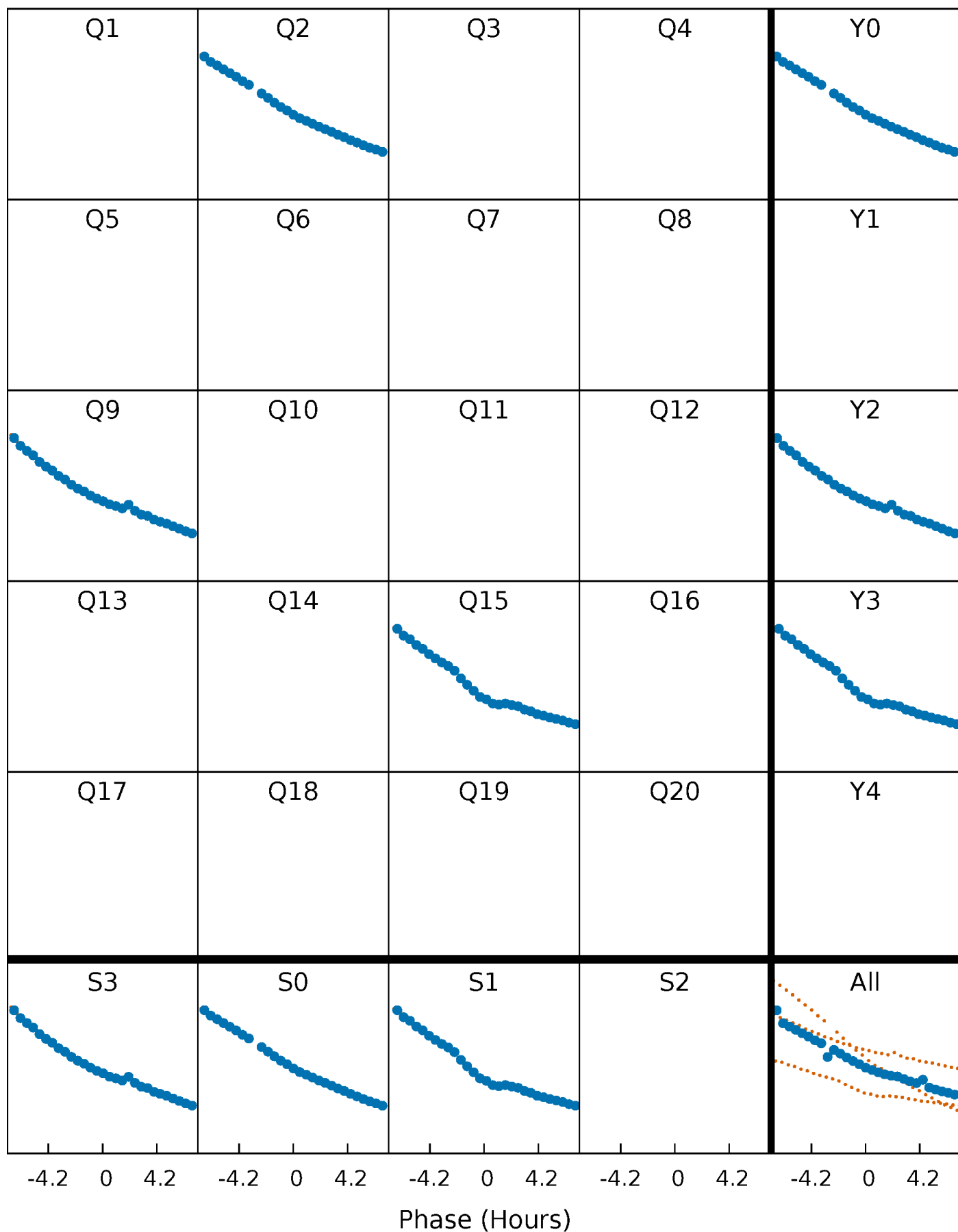


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

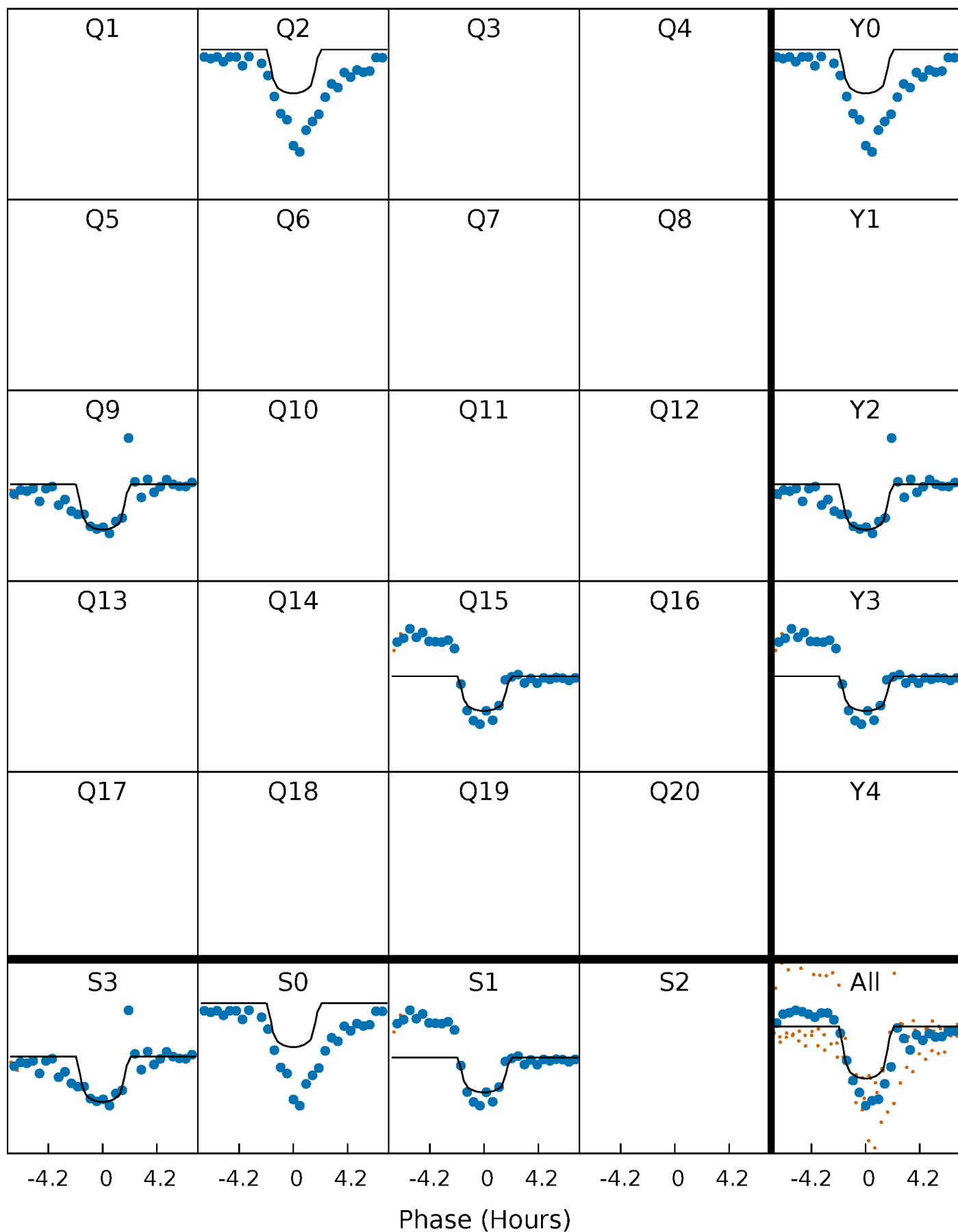
TCE 009898800-01 P=631.924471 Days  $T_0=197.116385$  (BKJD)





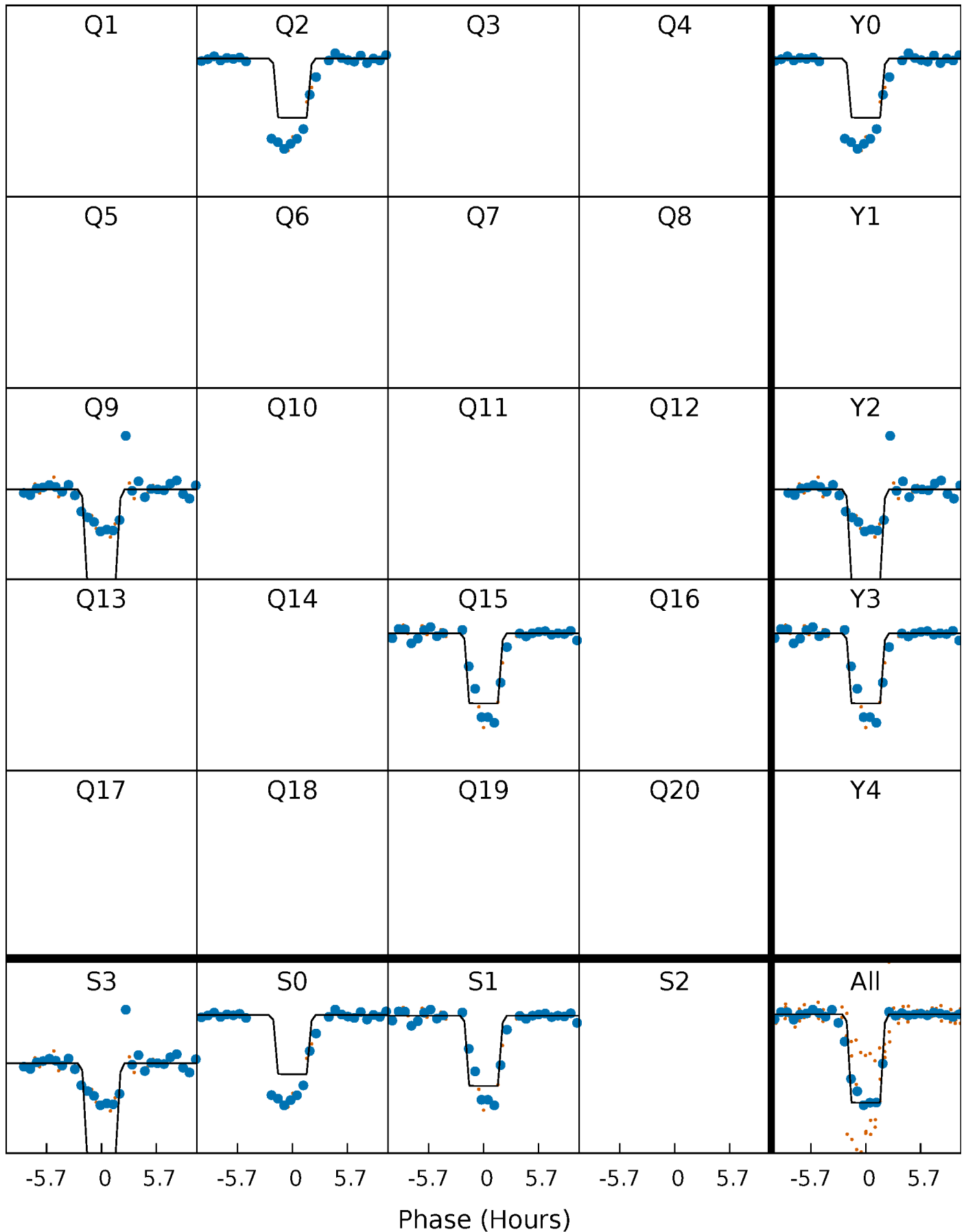
# DV Quarter-Phased Transit Curves

TCE 009898800-01 P=631.924471 Days  $T_0=197.116385$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

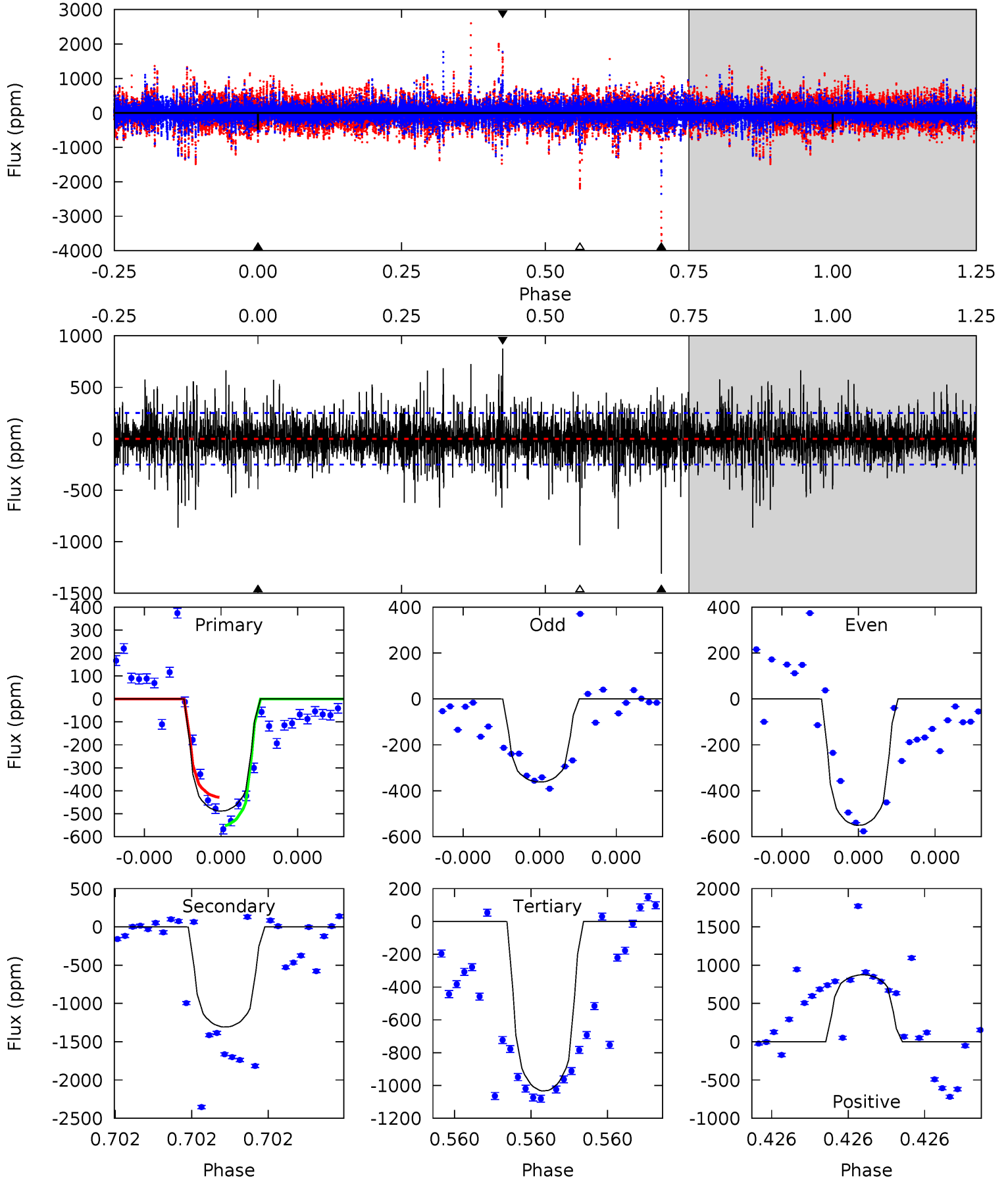
TCE 009898800-01 P=631.928277 Days  $T_0=197.104925$  (BKJD)



# DV Model-Shift Uniqueness Test

009898800-01, P = 631.924471 Days, E = 197.116385 Days

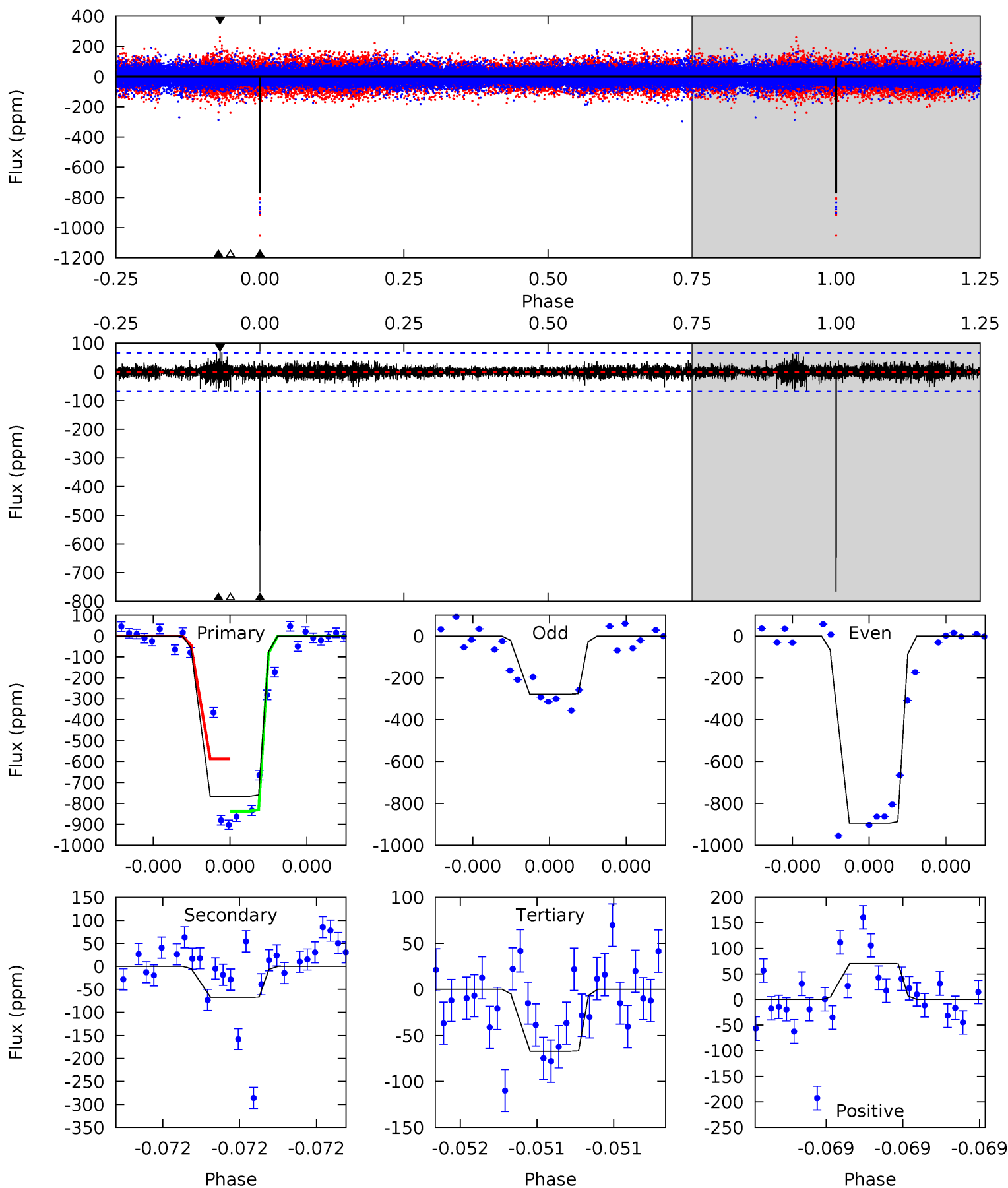
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
11.0	29.5	23.3	19.7	5.67	3.63	3.21	-12.3	-8.71	6.19	9.79	1.75	1.19	0.40	1.40



# Alt Model-Shift Uniqueness Test

009898800-01, P = 631.928277 Days, E = 197.104925 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
64.8	5.70	5.70	5.97	5.69	3.65	0.80	59.1	58.9	0.01	-0.26	30.4	0.91	0.08	9.55



### Stellar Parameters For KIC 009898800

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$\rho_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5739^{+156}_{-138}$	$4.054^{+0.413}_{-0.138}$	$-0.140^{+0.300}_{-0.250}$	$1.529^{+0.390}_{-0.585}$	$0.967^{+0.125}_{-0.114}$	$0.381^{+1.217}_{-0.162}$
	+3%/-2%	+10%/-3%	+214%/-179%	+26%/-38%	+13%/-12%	+319%/-42%
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 009898800-01 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-1308 \pm 44$	$3.10^{+2.01}_{-1.83}$	$359^{+28}_{-42}$	$7876^{+7181}_{-1812}$	$158646^{+748027}_{-102174}$
Alt.	$-67 \pm 12$	$4.09^{+2.67}_{-2.11}$	$358^{+29}_{-40}$	$3581^{+1019}_{-423}$	$4350^{+14795}_{-2720}$

$T_{\text{max}}$  = 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

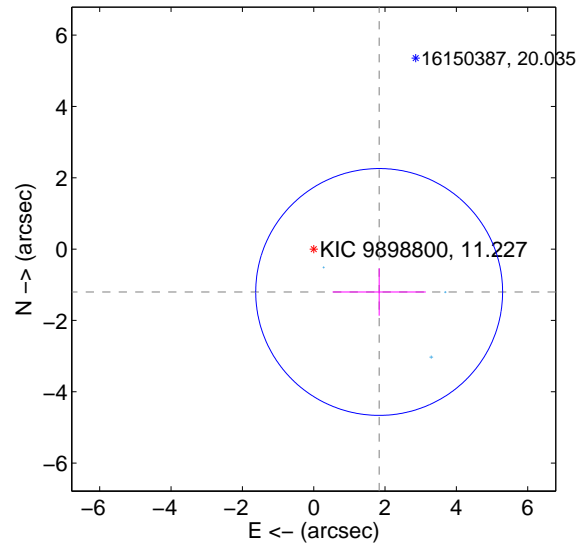
Supplemental centroid analysis for 009898800-01. **Kepler magnitude: 11.23.** Transit SNR 7.42

**There are 3 quarters with good PRF difference image offsets**

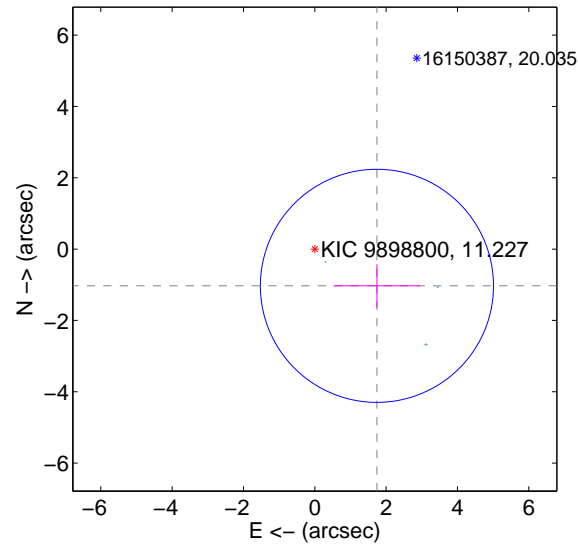
The direct PRF centroid is offset from the target star catalog position by about 0.28 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$2.194 \pm 1.153$	1.90	$-1.835 \pm 1.308$	$-1.202 \pm 0.665$
PRF-fit source offset from KIC position	$2.024 \pm 1.089$	1.86	$-1.742 \pm 1.213$	$-1.030 \pm 0.609$
photometric centroid source offset	$1.05 \pm 1.45$	0.72	$-0.91 \pm 1.56$	$0.52 \pm 1.00$

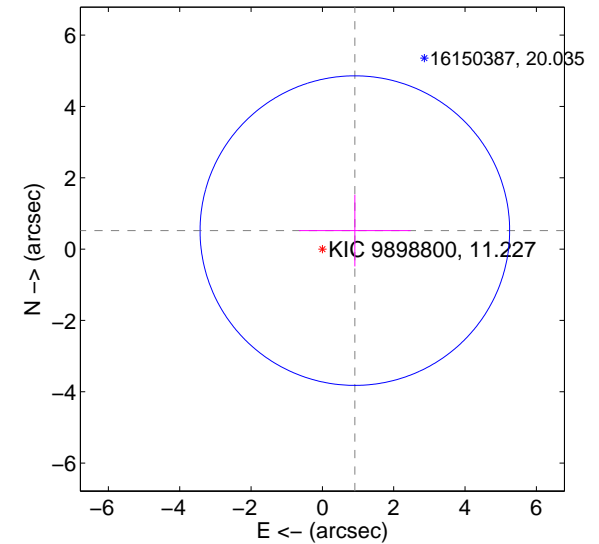
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

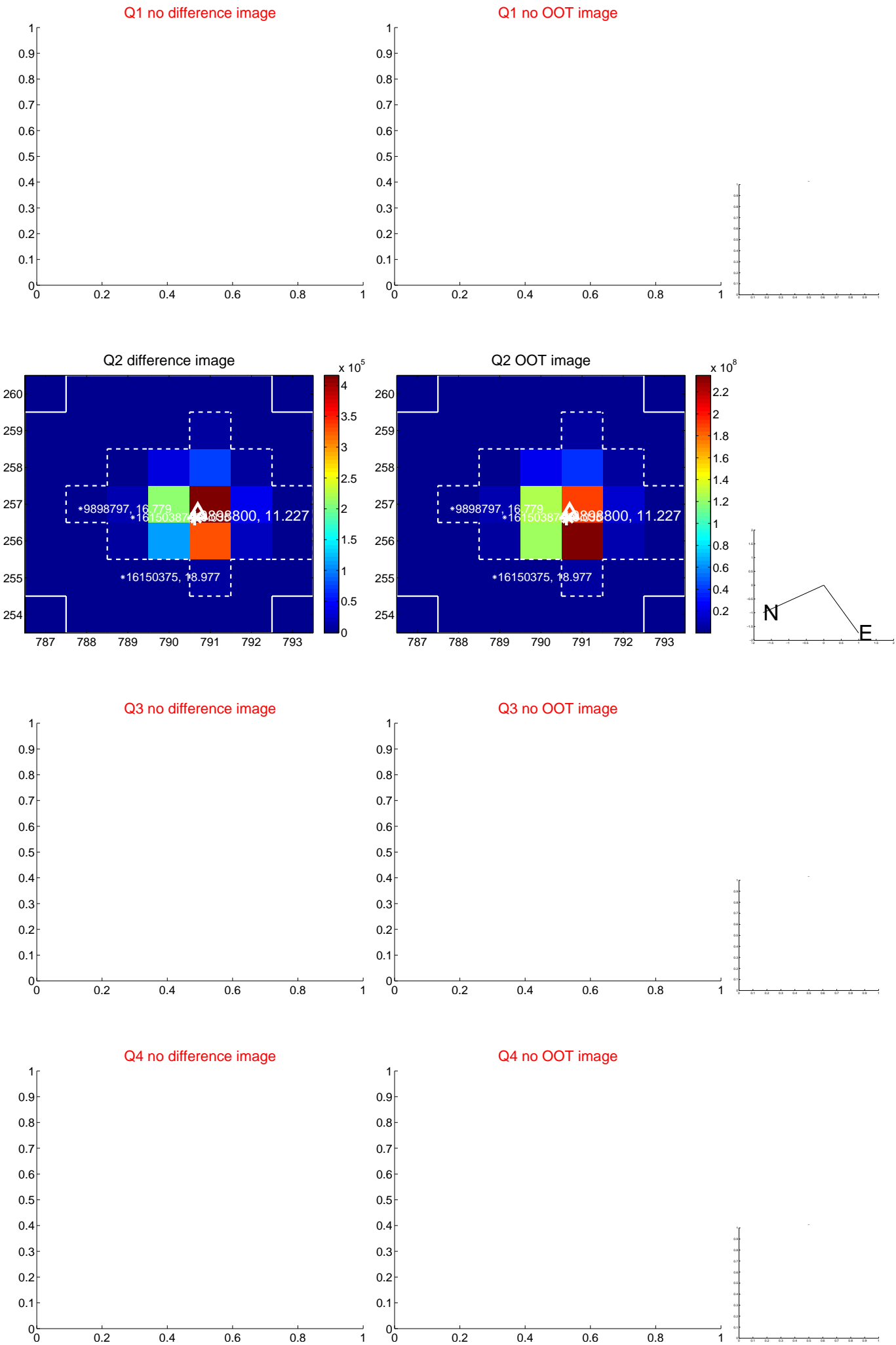


offset from photometric centroids



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.

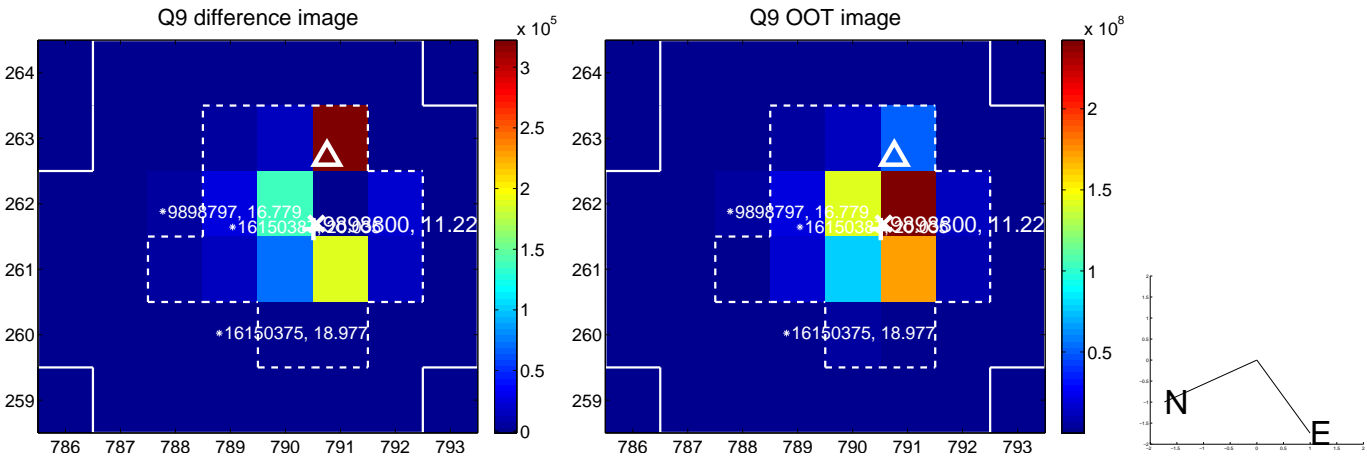


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





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



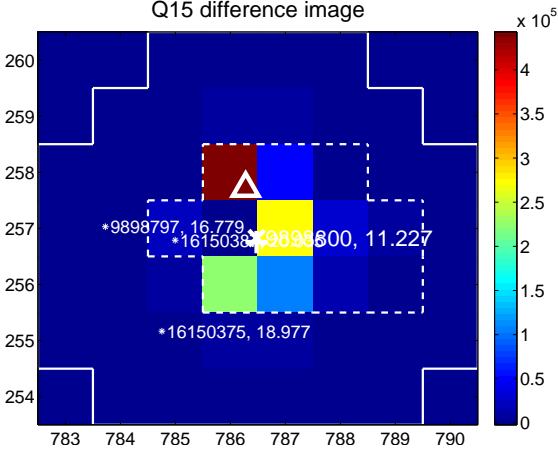
Q14 no difference image



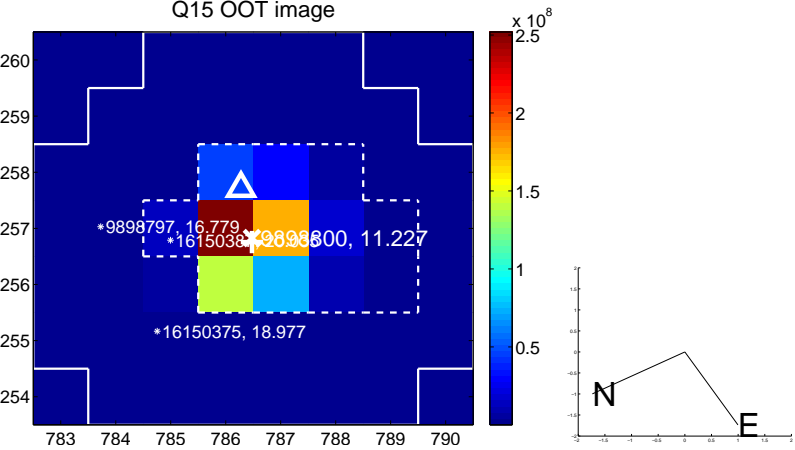
Q14 no OOT image



Q15 difference image



Q15 OOT image



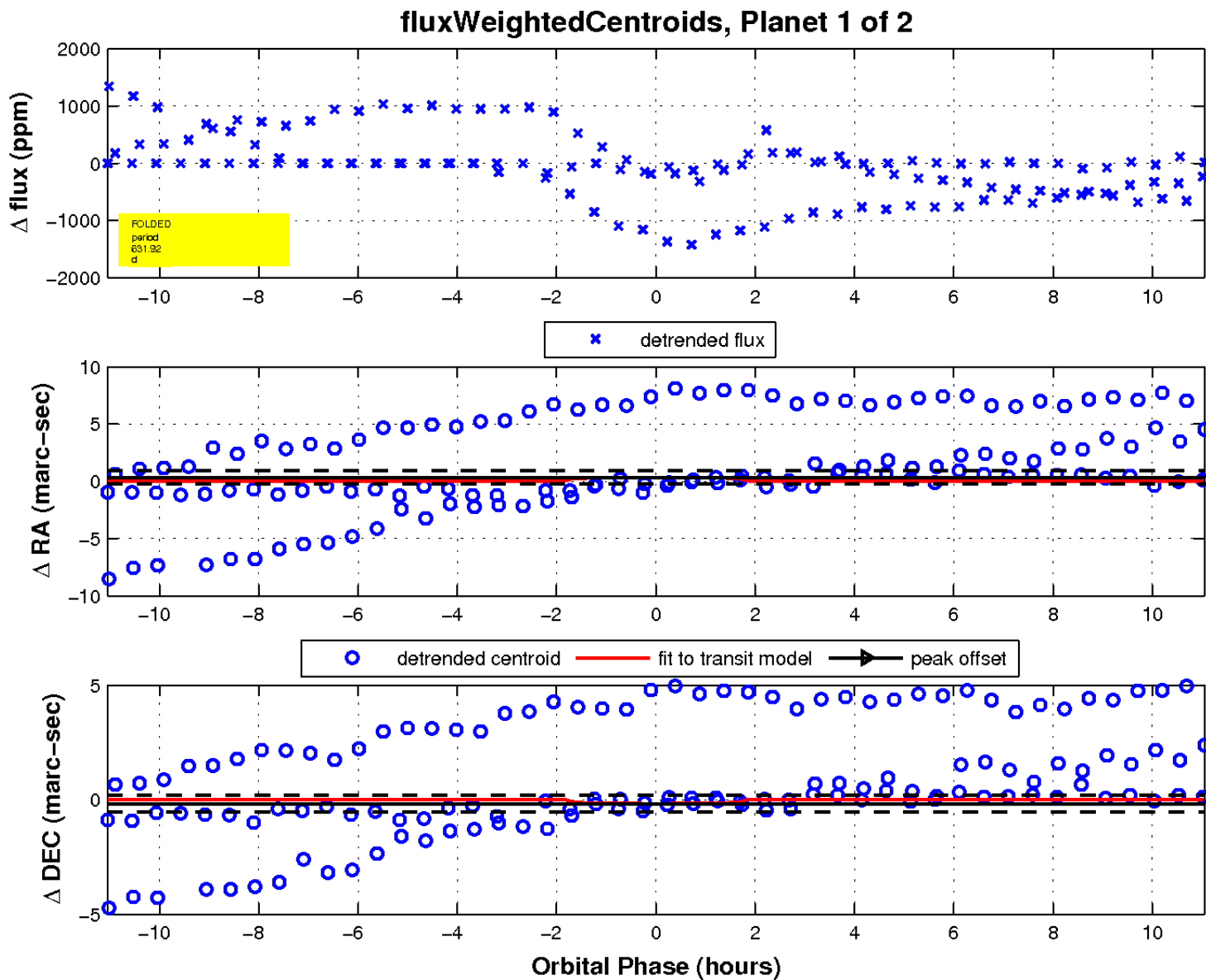
Q16 no difference image



Q16 no OOT image

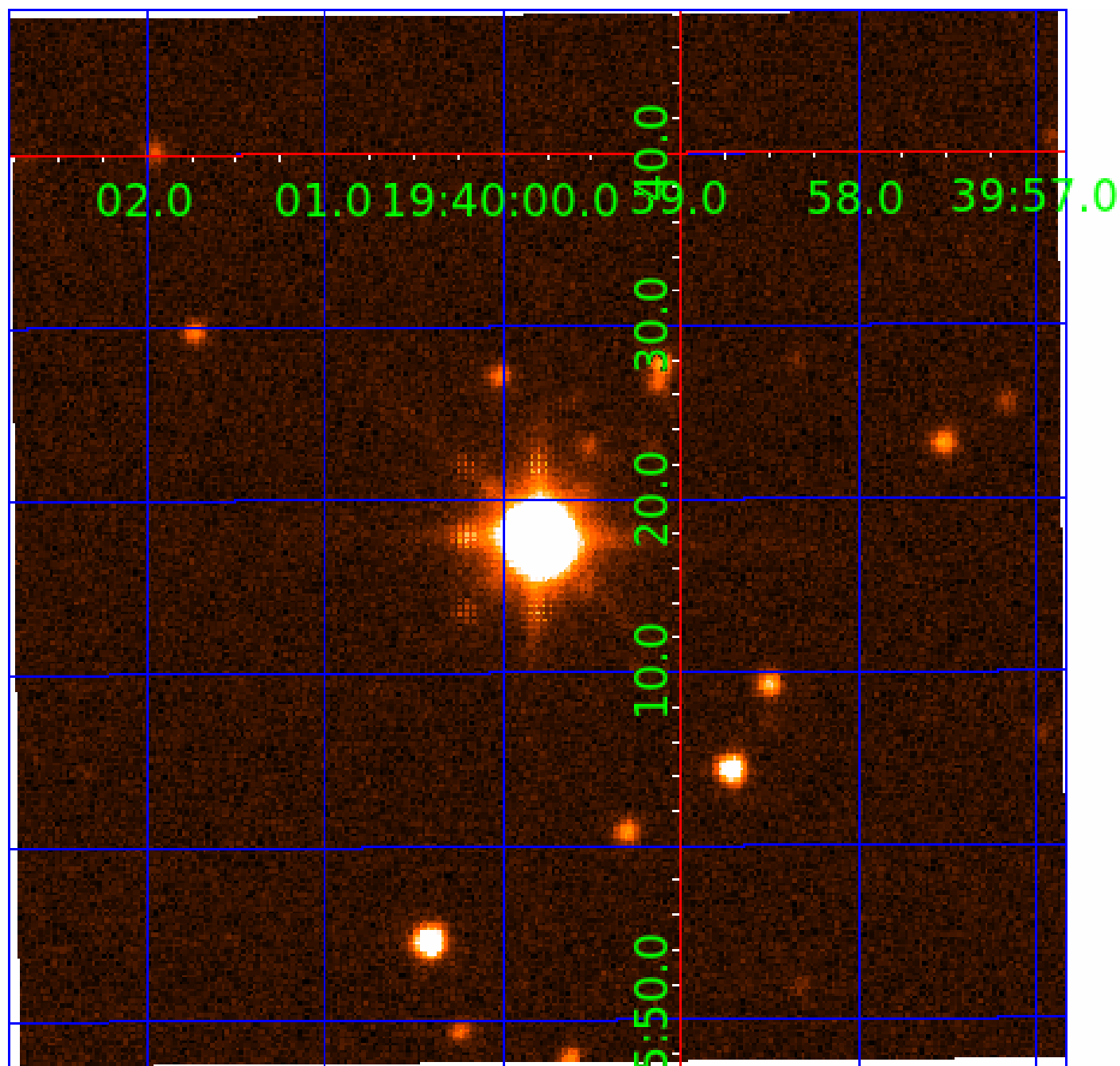


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 009898800

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009898800-01	OBS	No	631.924471	197.116385	360.9	3.689	10.6	7.4	1.53	5739	3.11	1.12
009898800-02	OBS	No	358.586705	458.655008	143.4	3.289	12.1	3.1	1.53	5739	2.15	2.38

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009898800-01	OBS	FP	0.00	1	0	0	0	MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_SATURATED
009898800-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_SATURATED

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

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

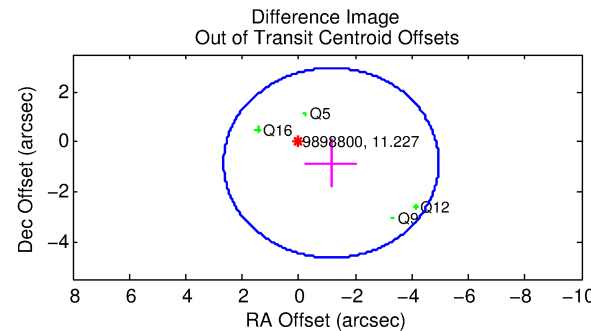
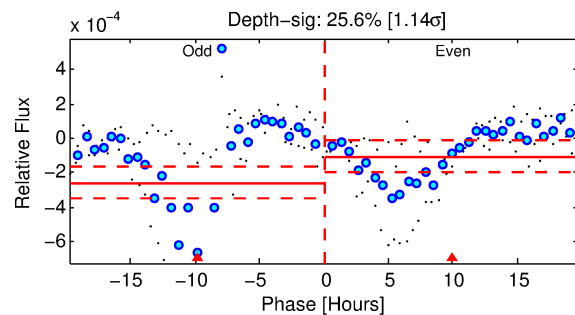
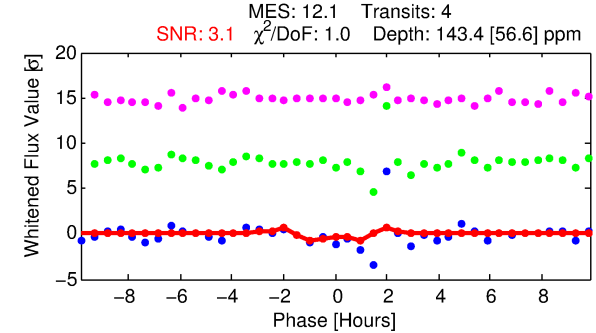
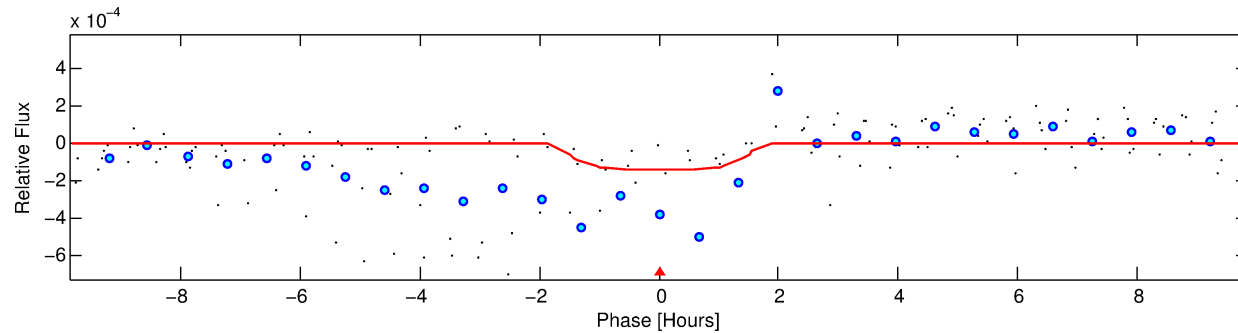
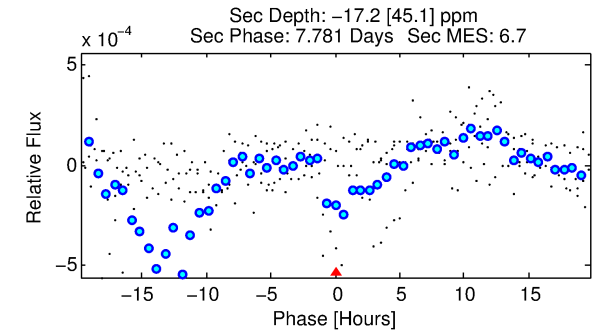
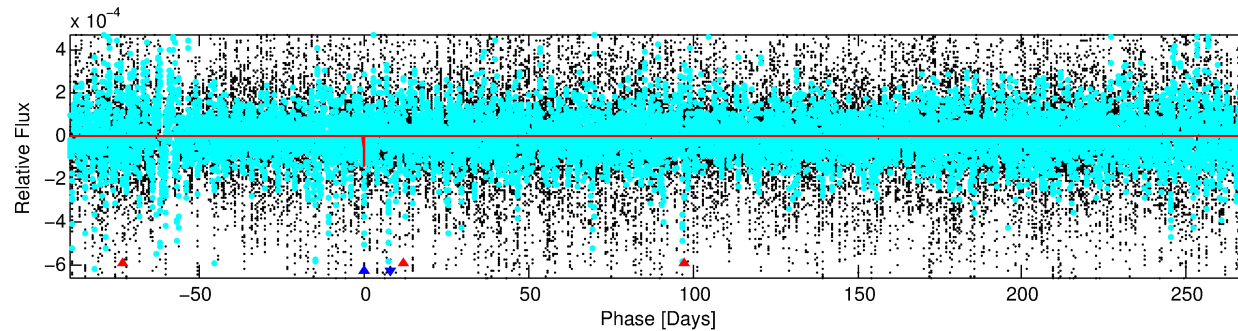
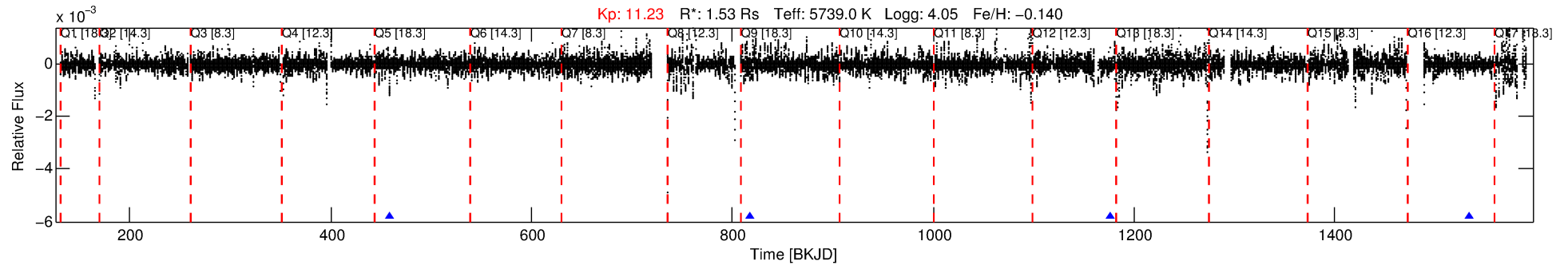
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009898800-02

No Significant Match Found

# DV One-Page Summary

KIC: 9898800 Candidate: 2 of 2 Period: 358.587 d



## DV Fit Results:

Period = 358.58670 [0.00640] d  
Epoch = 458.6550 [0.0108] BKJD  
Rp/R\* = 0.0129 [0.0270]  
a/R\* = 401.73 [4181.37]  
b = 0.89 [2.46]  
Seff = 2.38 [1.65]  
Teq = 317 [55] K  
Rp = 2.15 [4.58] Re  
a = 0.9766 [0.3973] AU  
Ag = N/A  
Teffp = N/A

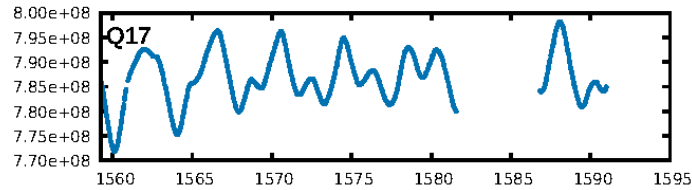
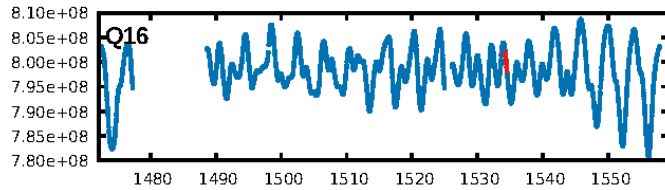
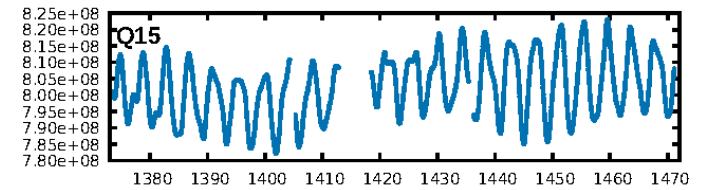
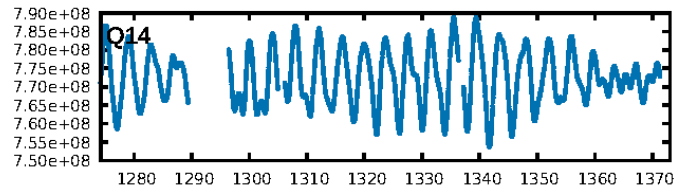
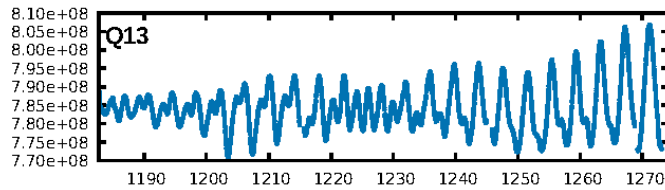
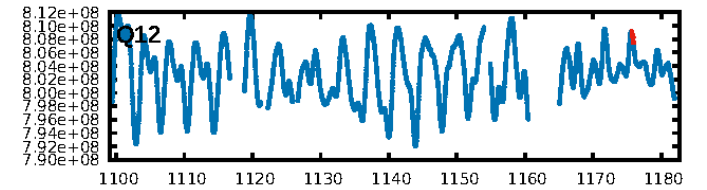
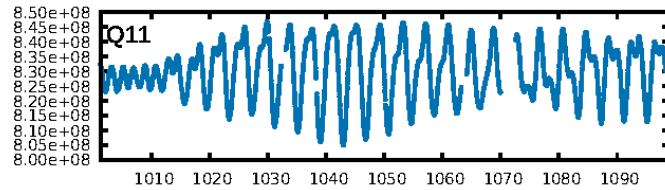
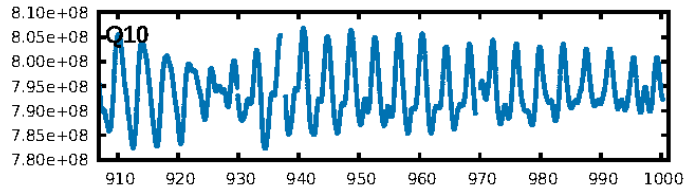
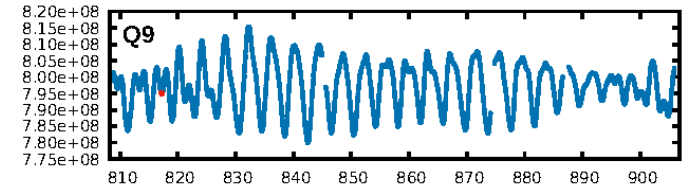
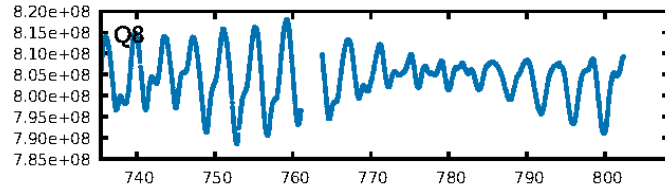
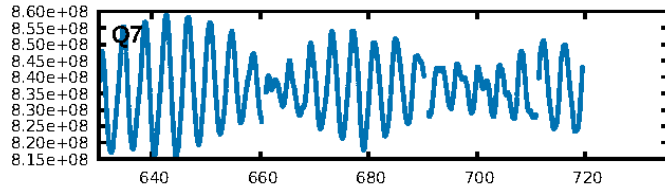
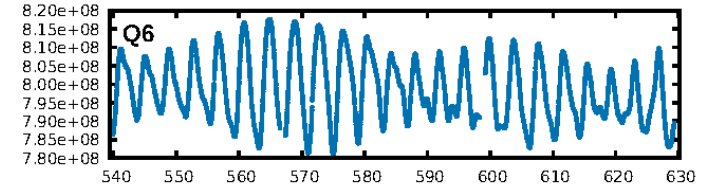
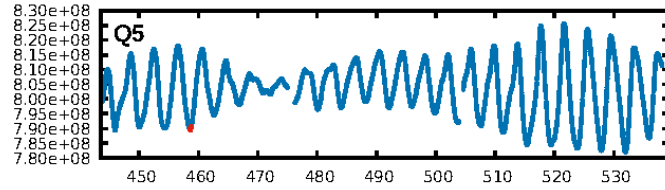
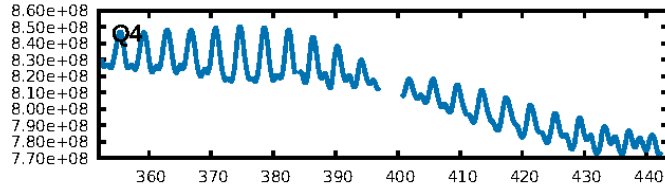
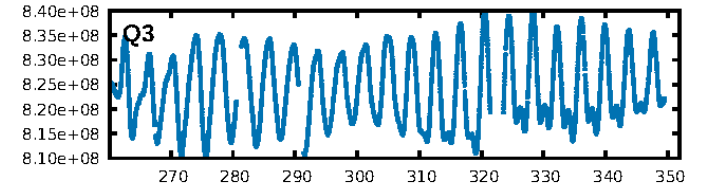
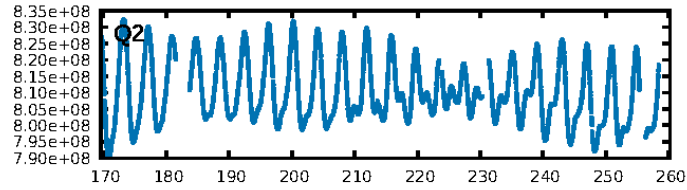
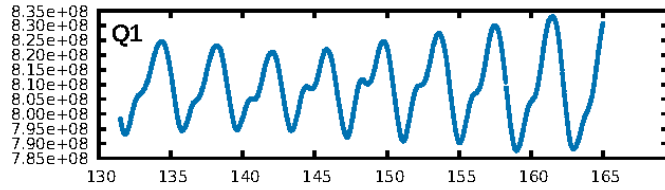
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [1327.48σ]  
ModelChiSquare2-sig: 47.5%  
ModelChiSquareGof-sig: 91.0%  
**Bootstrap-pfa: 1.77e-08**  
RollingBand-fgt: 1.00 [4/4]  
**GhostDiagnostic-chr: -0.2722**  
Centroid-sig: 69.7%  
Centroid-so: 2.024 arcsec [0.42σ]  
OotOffset-rm: 1.427 arcsec [1.13σ]  
KicOffset-rm: 1.116 arcsec [0.68σ]  
OotOffset-st: 0/0/2/2 [4]  
KicOffset-st: 0/0/2/2 [4]  
DiffImageQuality-fgm: 0.50 [2/4]  
DiffImageOverlap-fno: 1.00 [4/4]

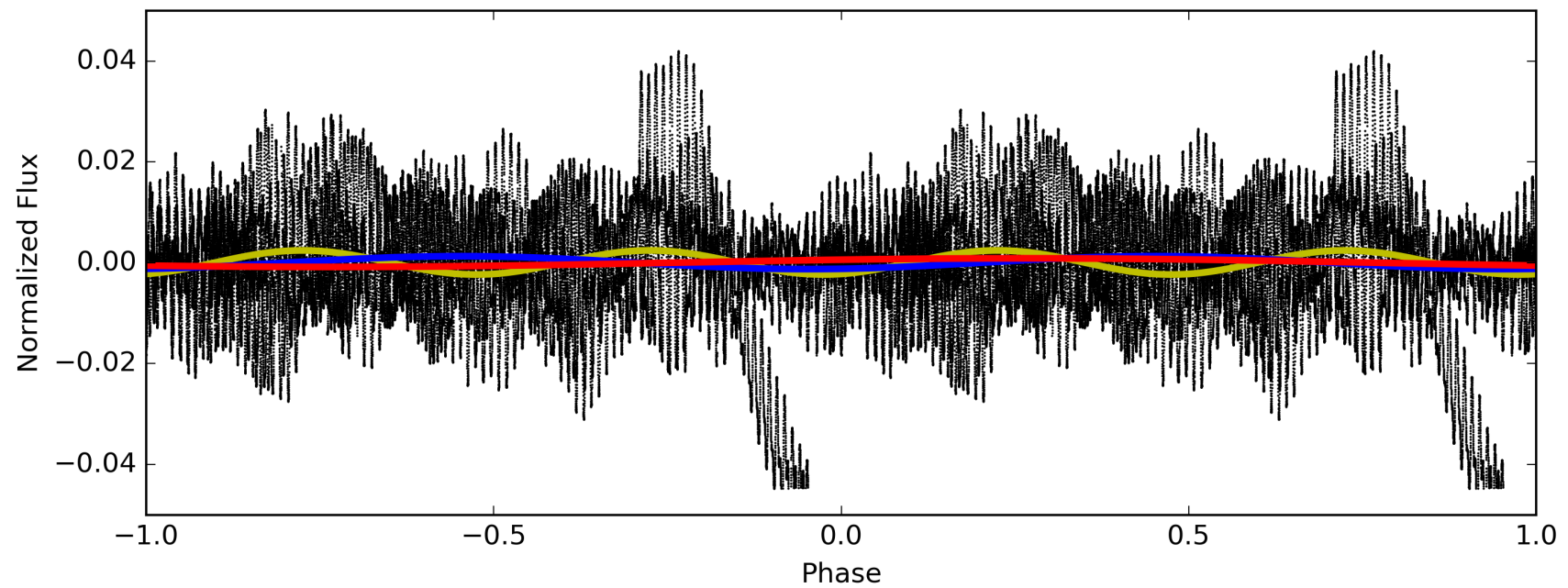
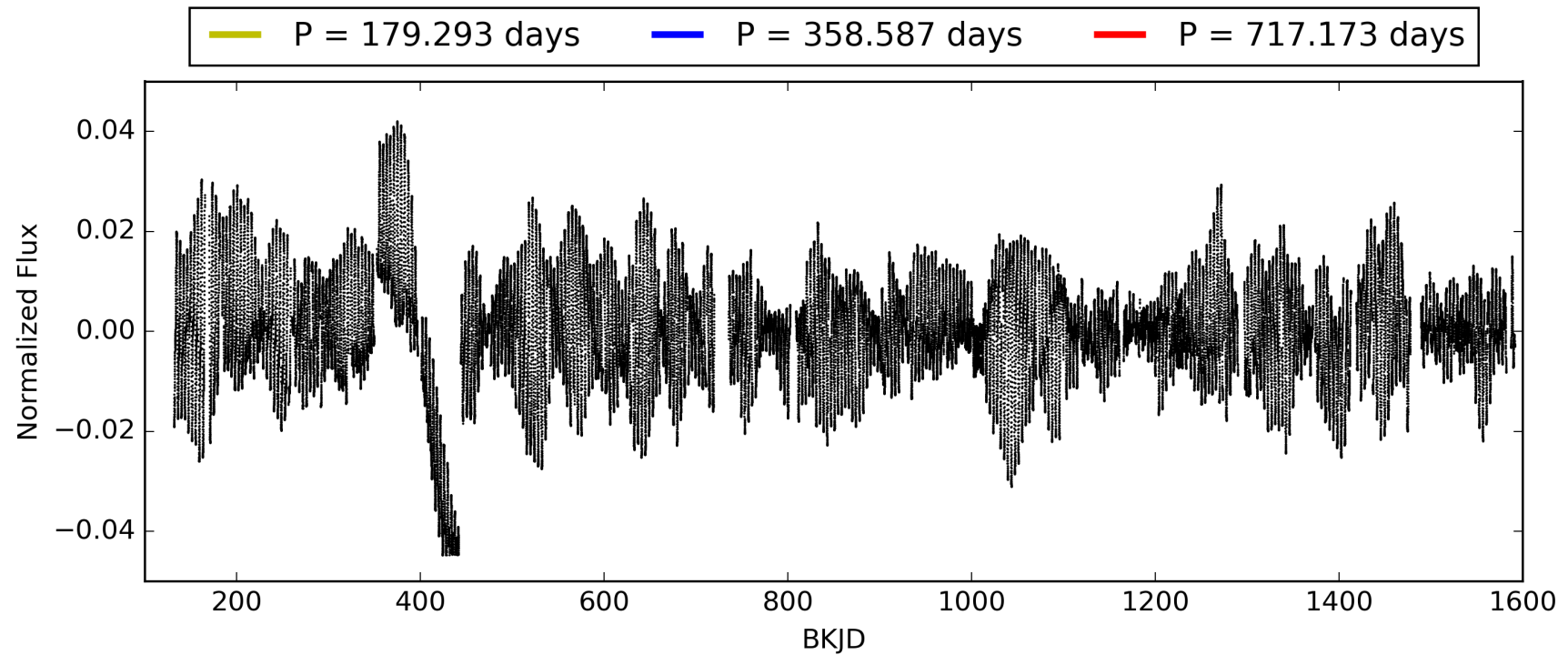
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 06:04:29 Z

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

# TCE 009898800-02, PDC Light Curves



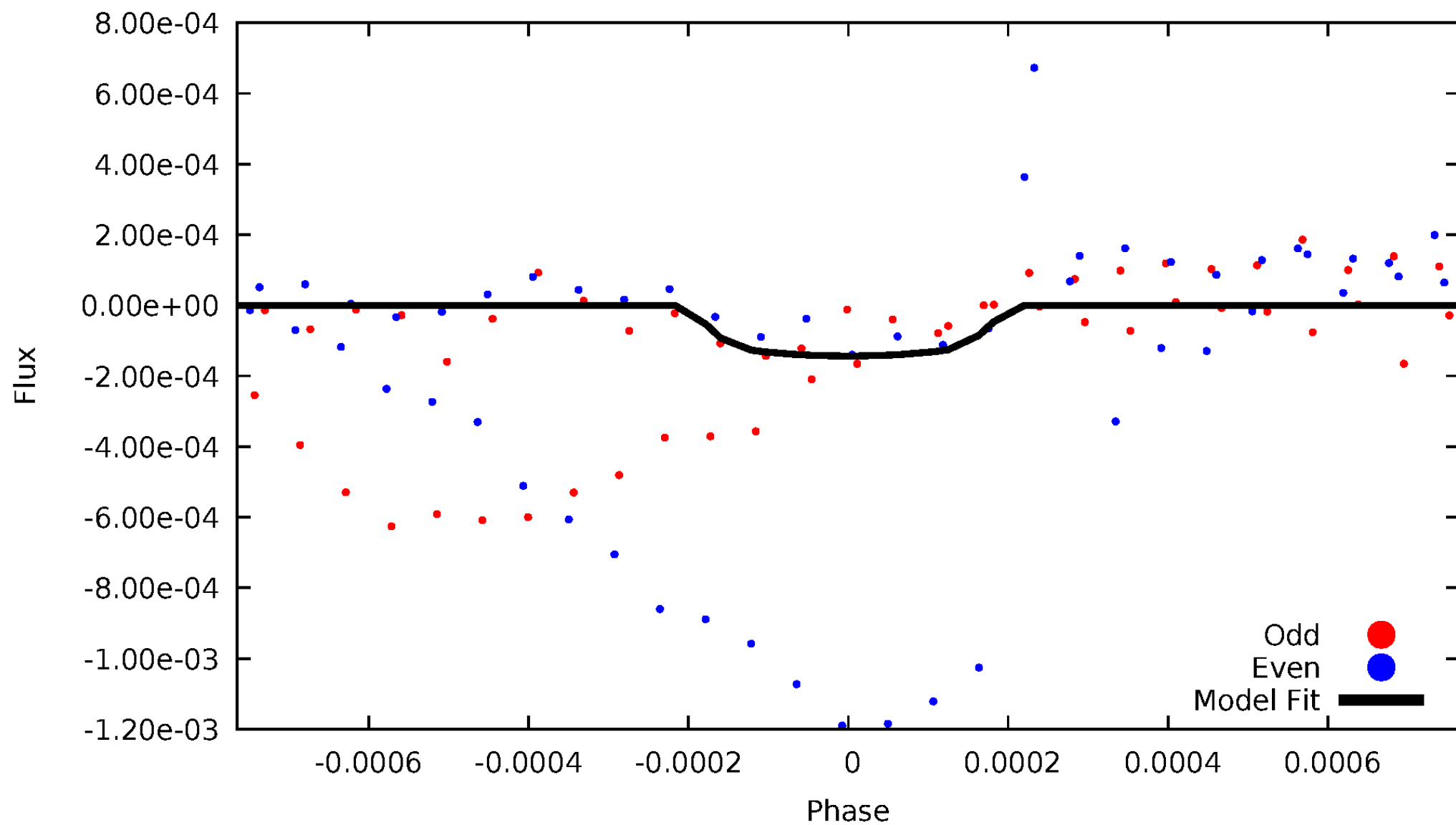
TCE 009898800-02





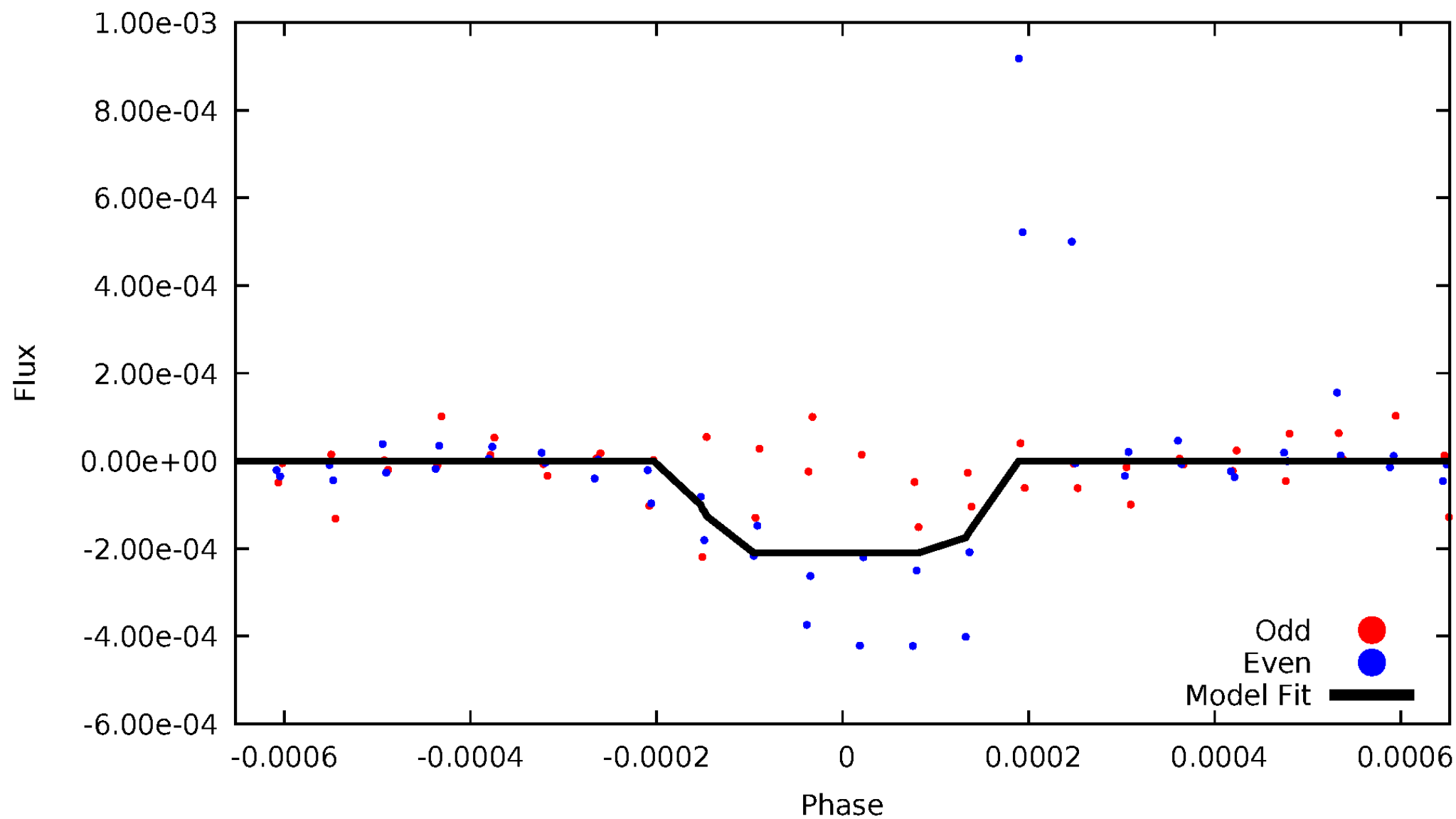
# DV Odd/Even

TCE 009898800-02



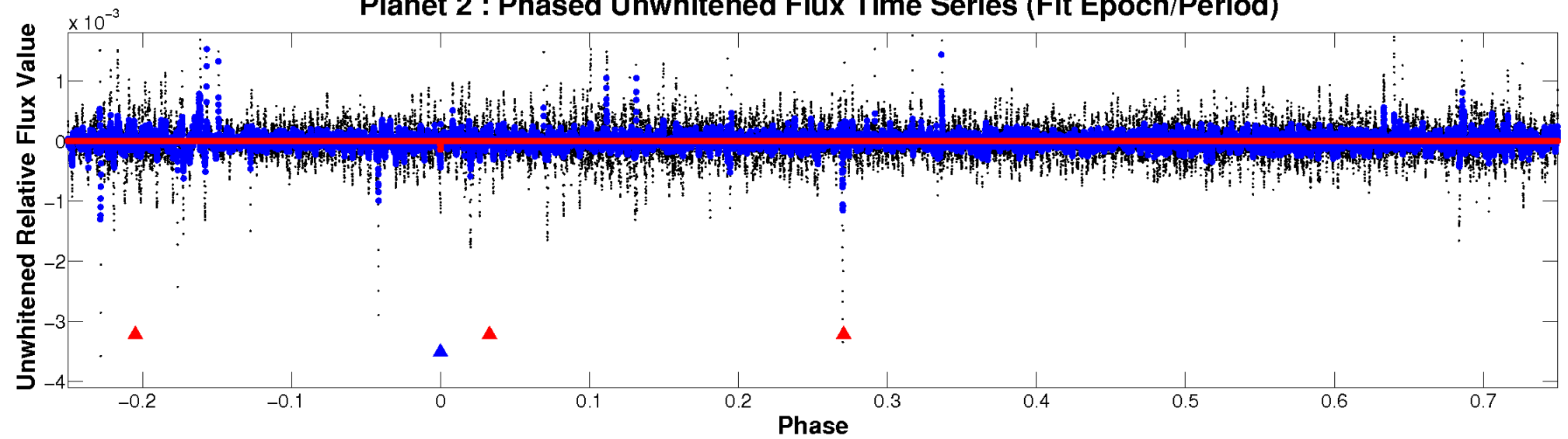
# ALT Odd/Even

TCE 009898800-02

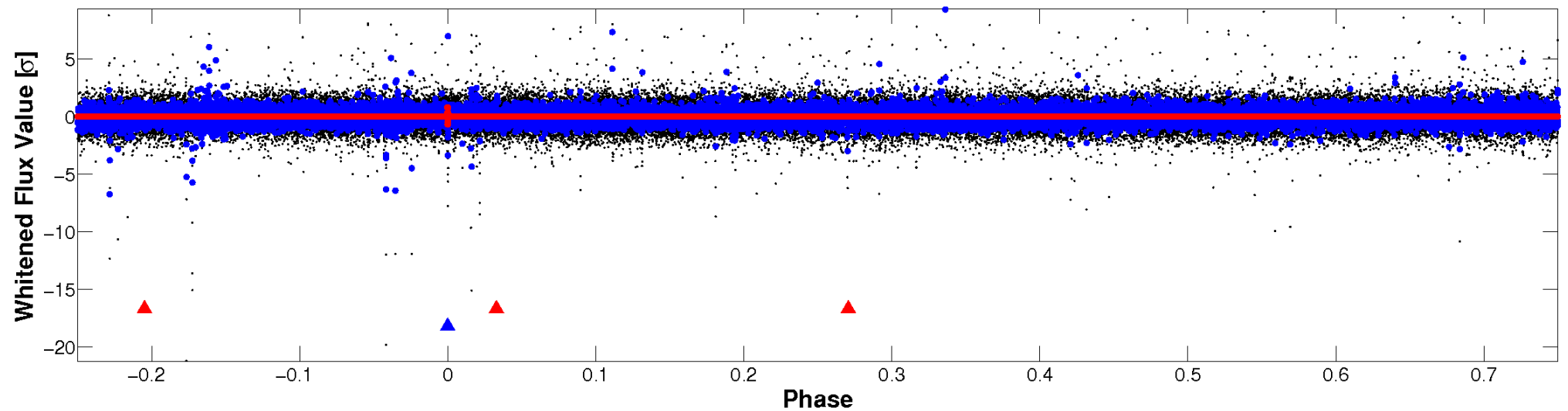


# Non-Whitened Vs. Whitened Light Curve

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

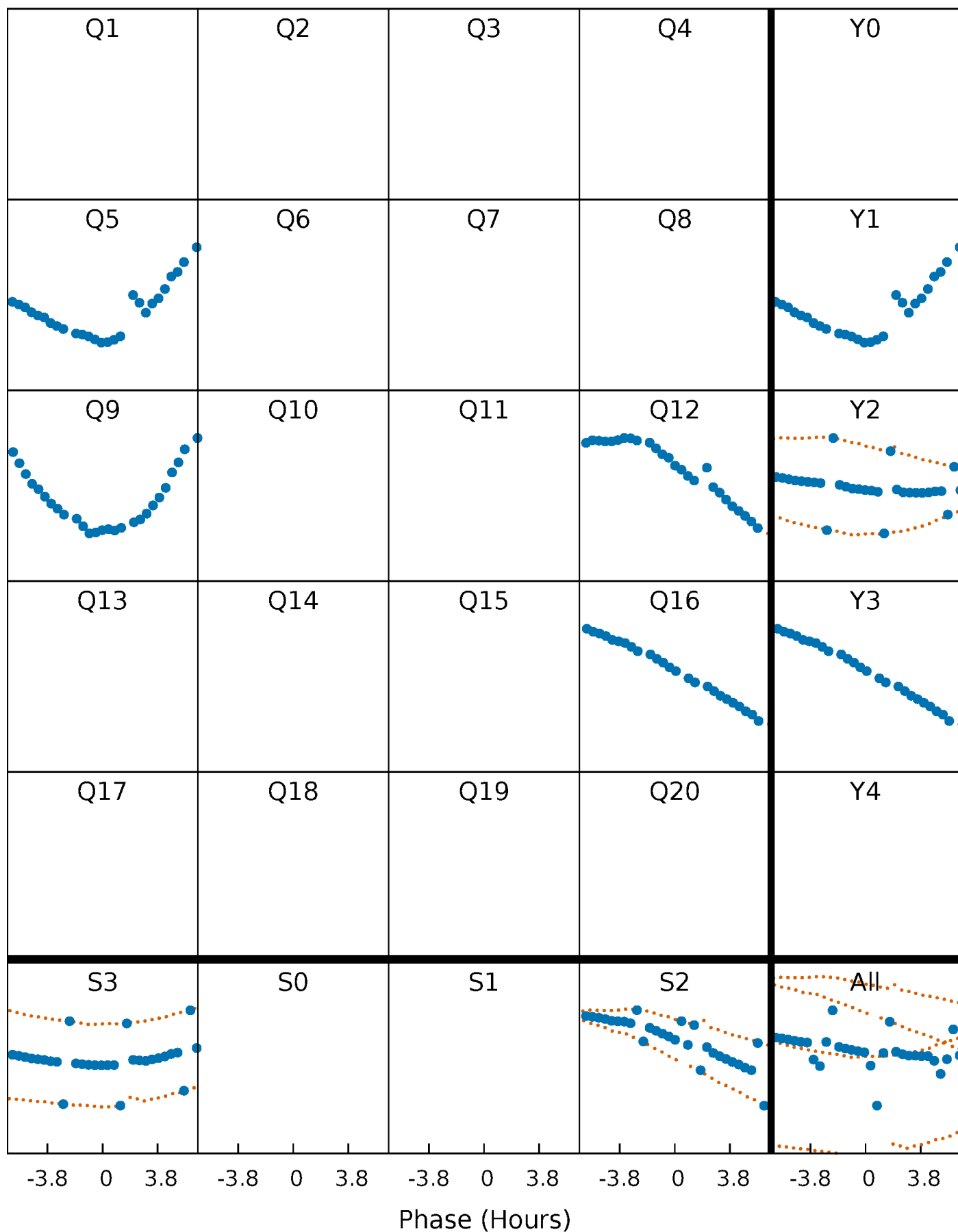


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



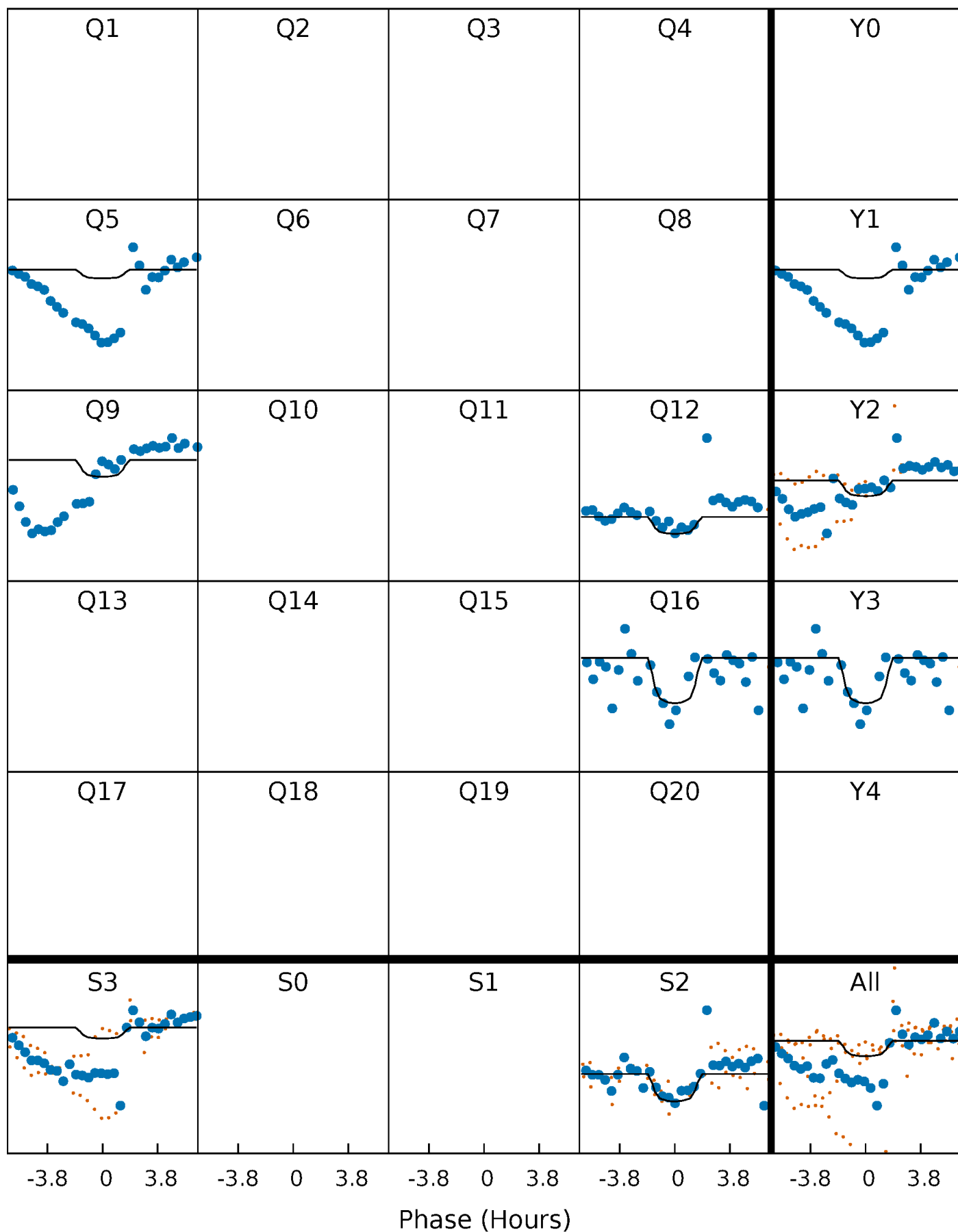
# PDC Quarter-Phased Transit Curves

TCE 009898800-02 P=358.586705 Days  $T_0=458.655008$  (BKJD)



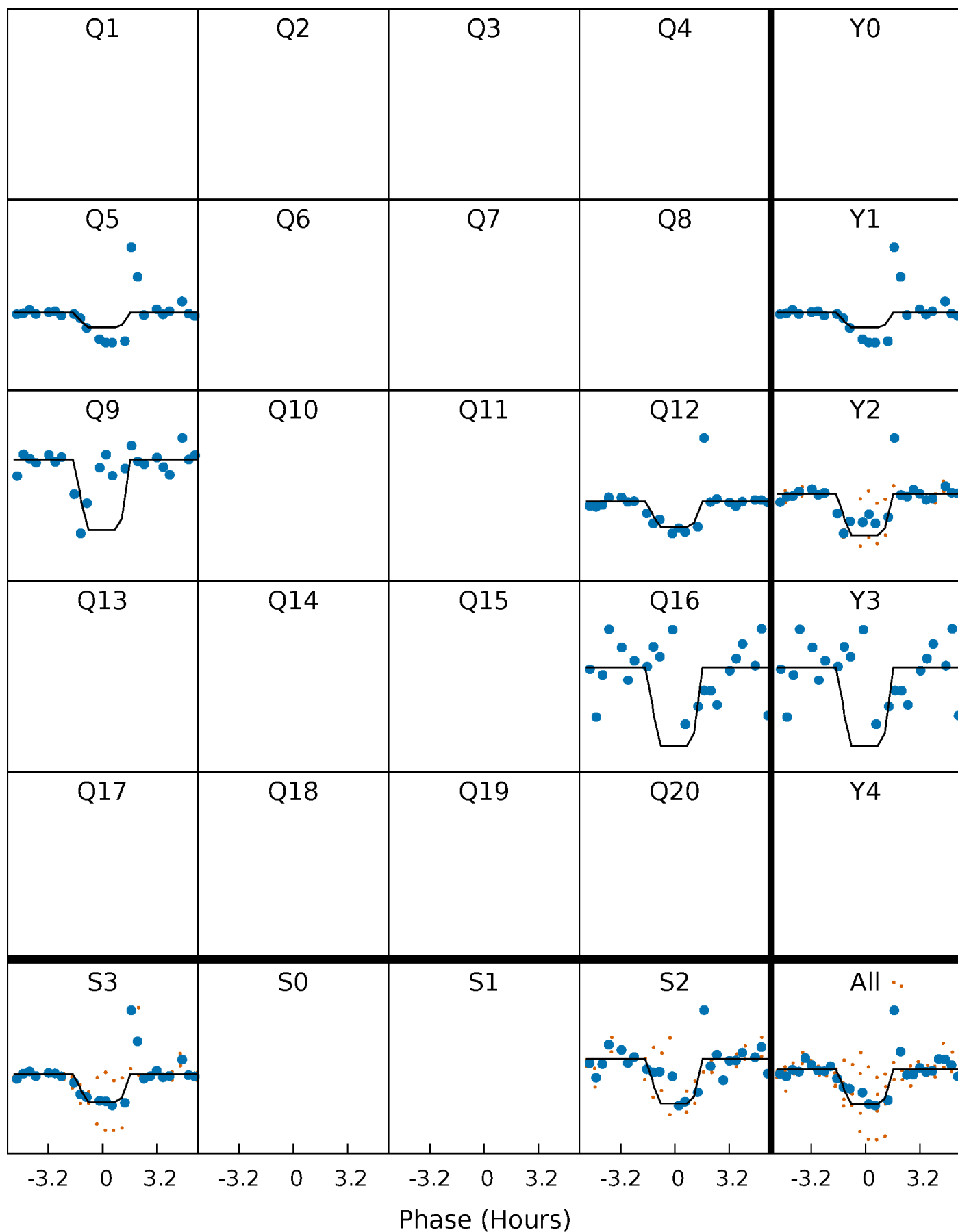
# DV Quarter-Phased Transit Curves

TCE 009898800-02     $P=358.586705$  Days     $T_0=458.655008$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

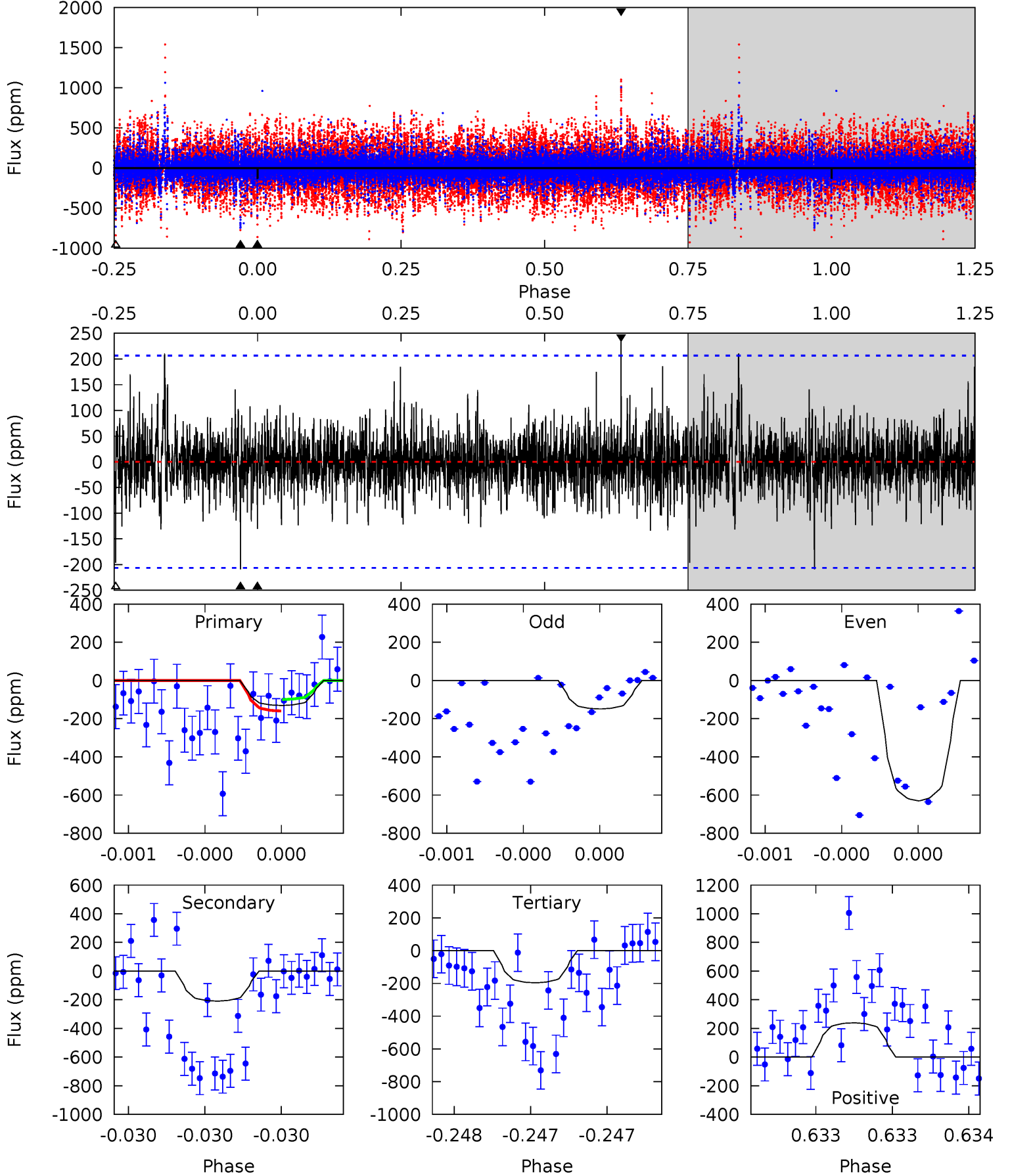
TCE 009898800-02     $P=358.588185$  Days     $T_0=458.666041$  (BKJD)



# DV Model-Shift Uniqueness Test

009898800-02, P = 358.586705 Days, E = 100.068303 Days

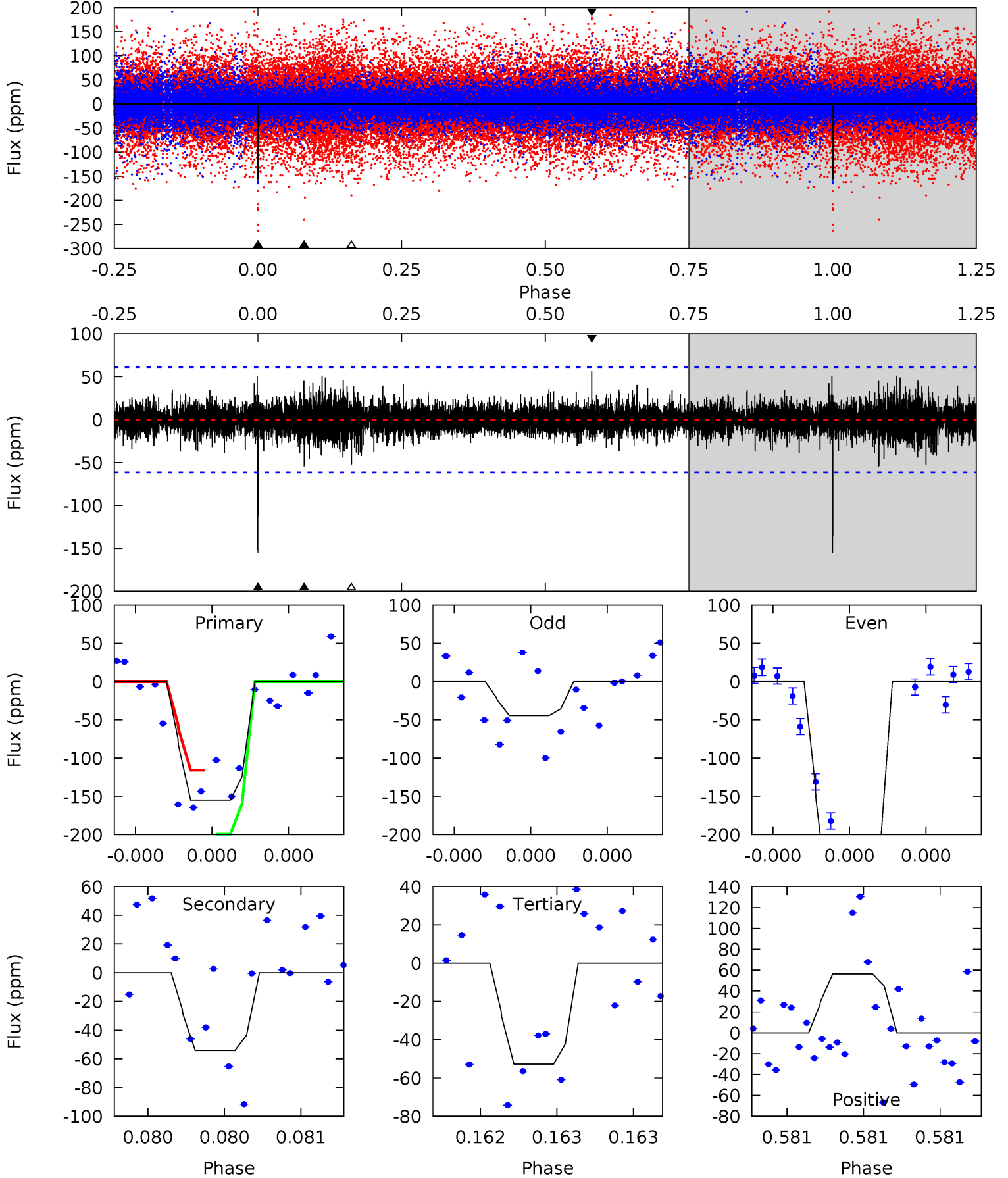
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
3.55	5.68	5.33	6.49	5.61	3.54	1.02	-1.78	-2.94	0.35	-0.81	6.05	2.74	0.53	0.83



# Alt Model-Shift Uniqueness Test

009898800-02, P = 358.588185 Days, E = 100.077856 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
14.2	4.98	4.84	5.17	5.64	3.58	0.88	9.39	9.05	0.14	-0.19	13.1	1.14	0.27	3.86





### Stellar Parameters For KIC 009898800

	$T_{\text{eff}}(K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5739^{+156}_{-138}$	$4.054^{+0.413}_{-0.138}$	$-0.140^{+0.300}_{-0.250}$	$1.529^{+0.390}_{-0.585}$	$0.967^{+0.125}_{-0.114}$	$0.381^{+1.217}_{-0.162}$
	+3%/-2%	+10%/-3%	+214%/-179%	+26%/-38%	+13%/-12%	+319%/-42%
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 009898800-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-209 \pm 37$	$3.46^{+3.66}_{-2.46}$	$435^{+33}_{-50}$	$4740^{+4303}_{-1085}$	$9277^{+104961}_{-7184}$
Alt.	$-54 \pm 11$	$3.66^{+3.69}_{-2.44}$	$432^{+33}_{-45}$	$3631^{+1874}_{-662}$	$2147^{+16576}_{-1636}$

$T_{\text{max}}$  = 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

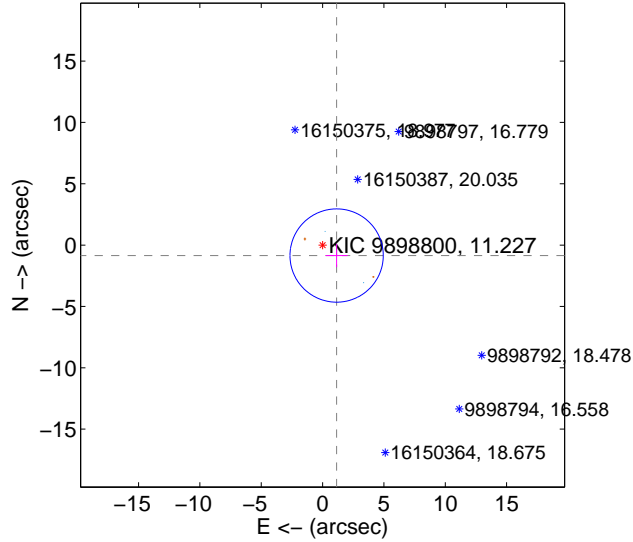
Supplemental centroid analysis for 009898800-02. **Kepler magnitude: 11.23.** Transit SNR 3.12

**There are 2 quarters with good PRF difference image offsets**

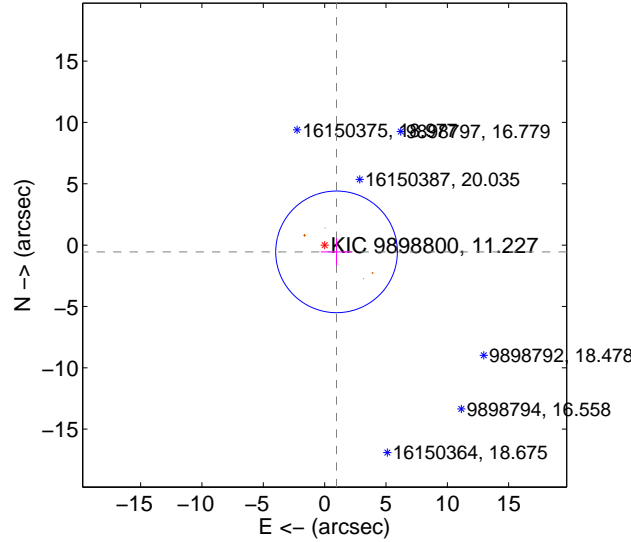
The direct PRF centroid is offset from the target star catalog position by about 0.36 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.427 \pm 1.267$	1.13	$-1.145 \pm 0.897$	$-0.851 \pm 0.950$
PRF-fit source offset from KIC position	$1.116 \pm 1.653$	0.68	$-0.971 \pm 1.287$	$-0.551 \pm 1.108$
photometric centroid source offset	$2.02 \pm 4.81$	0.42	$1.19 \pm 6.17$	$-1.64 \pm 3.90$

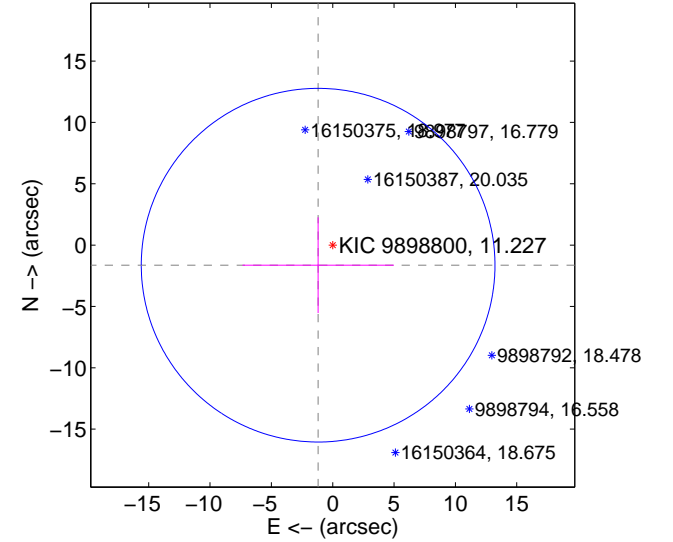
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position



offset from photometric centroids

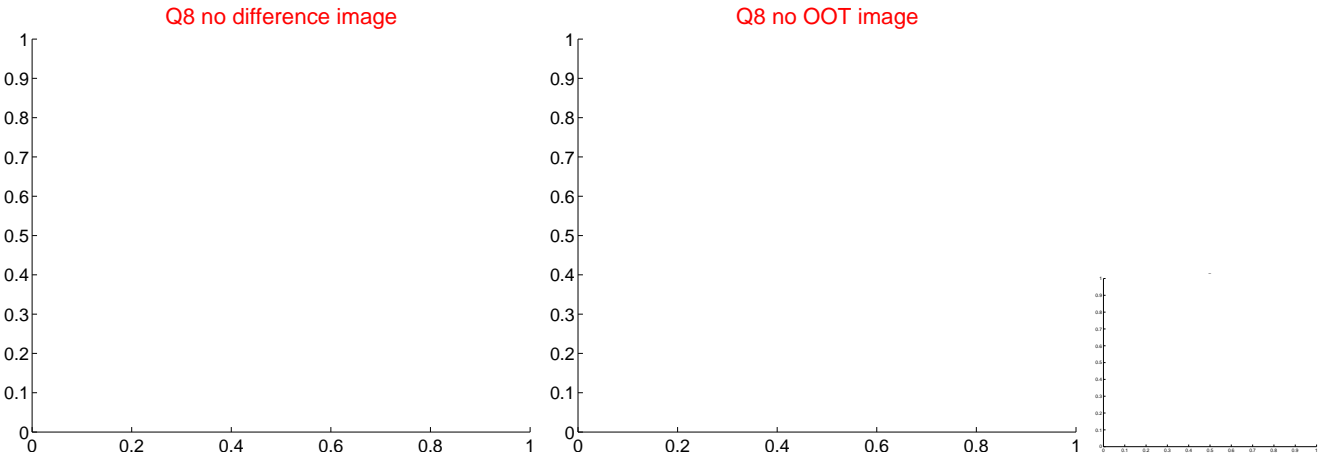
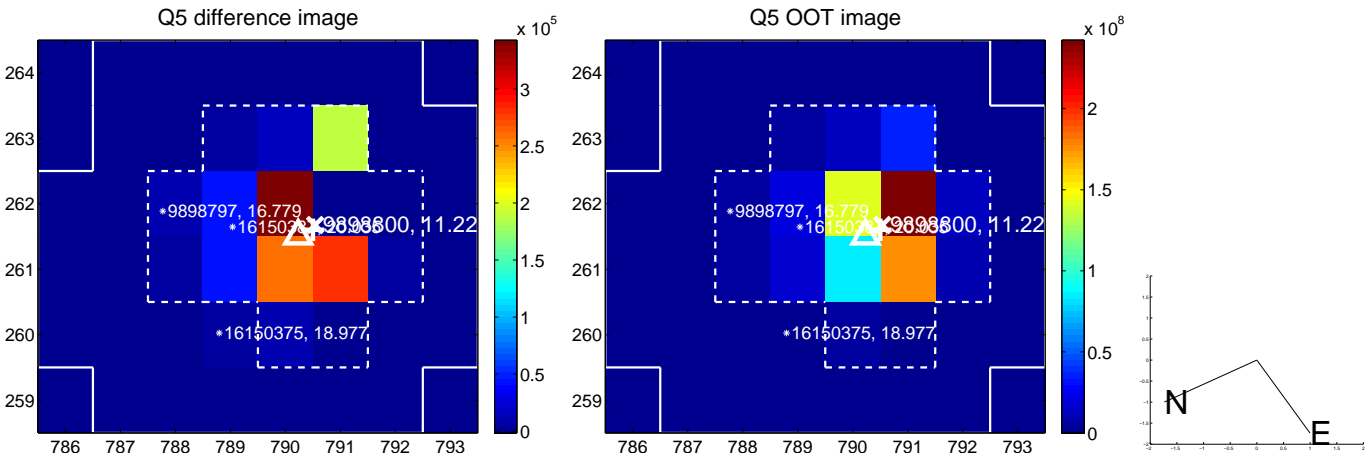


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

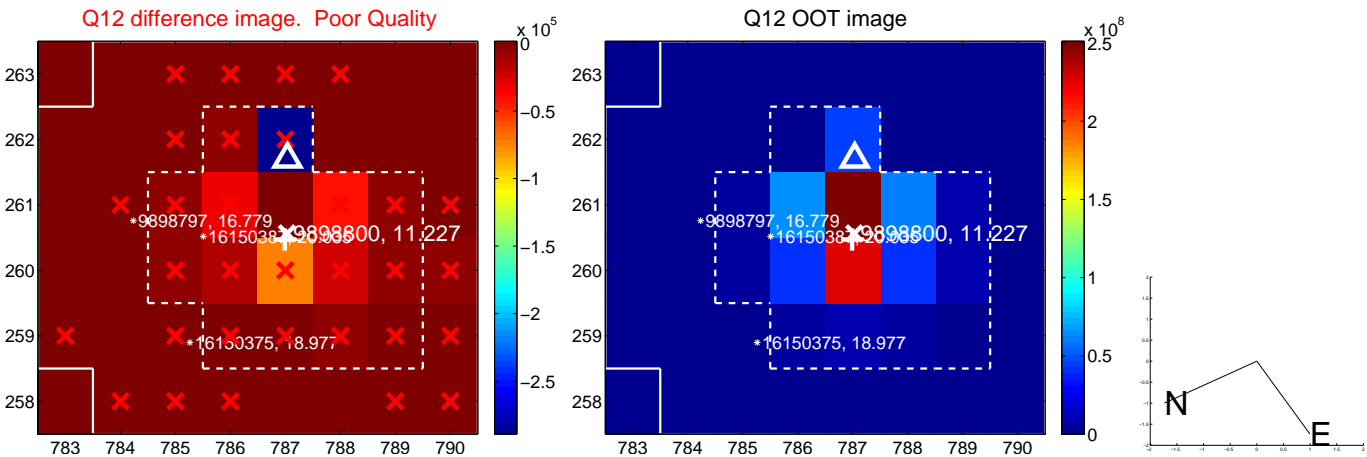
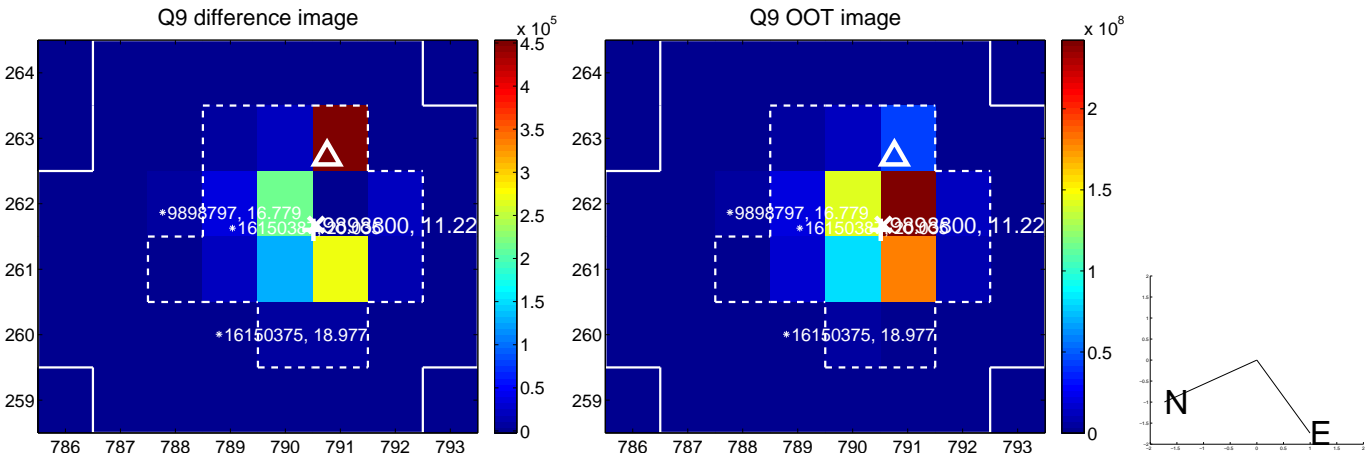
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



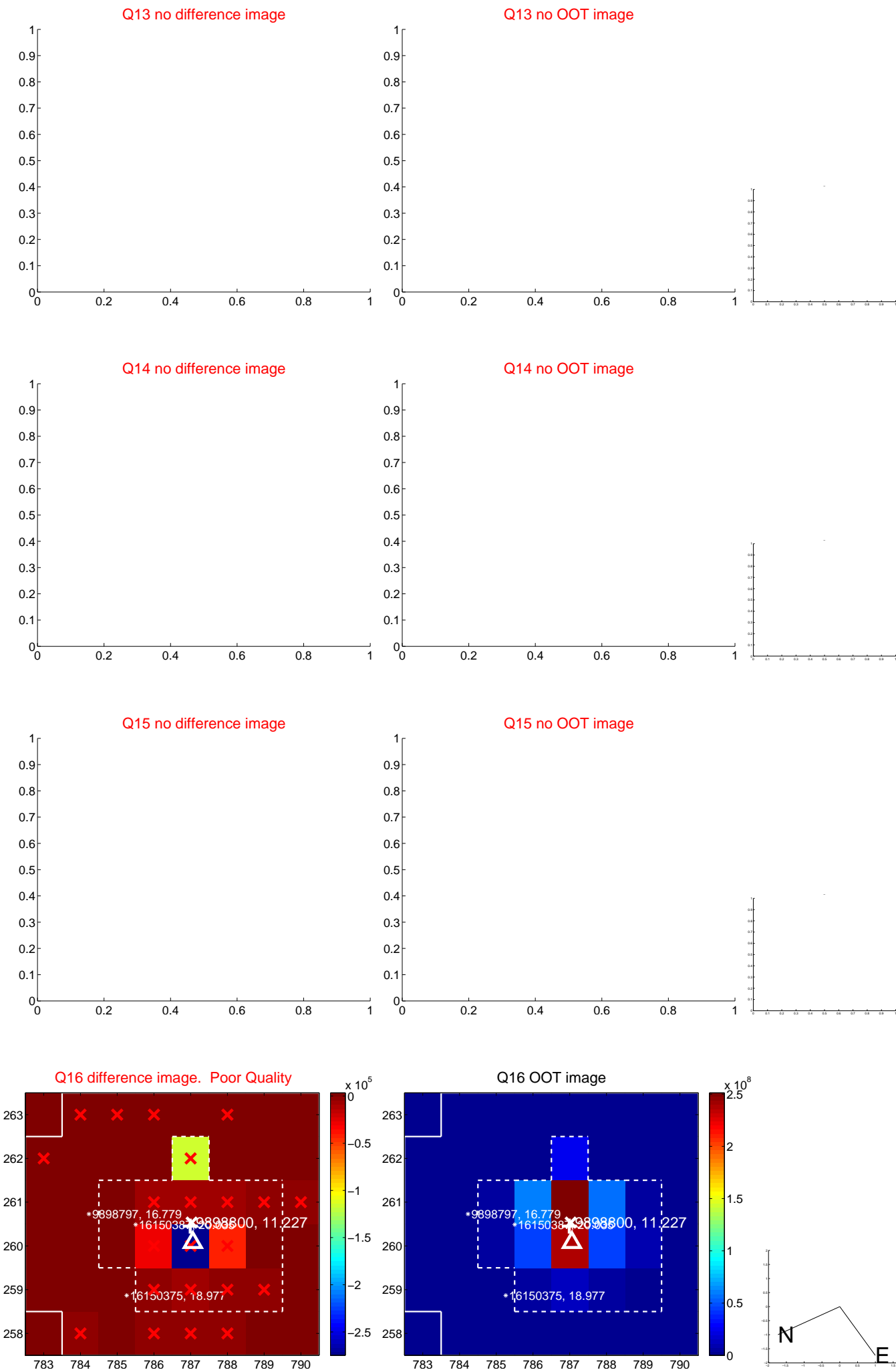
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



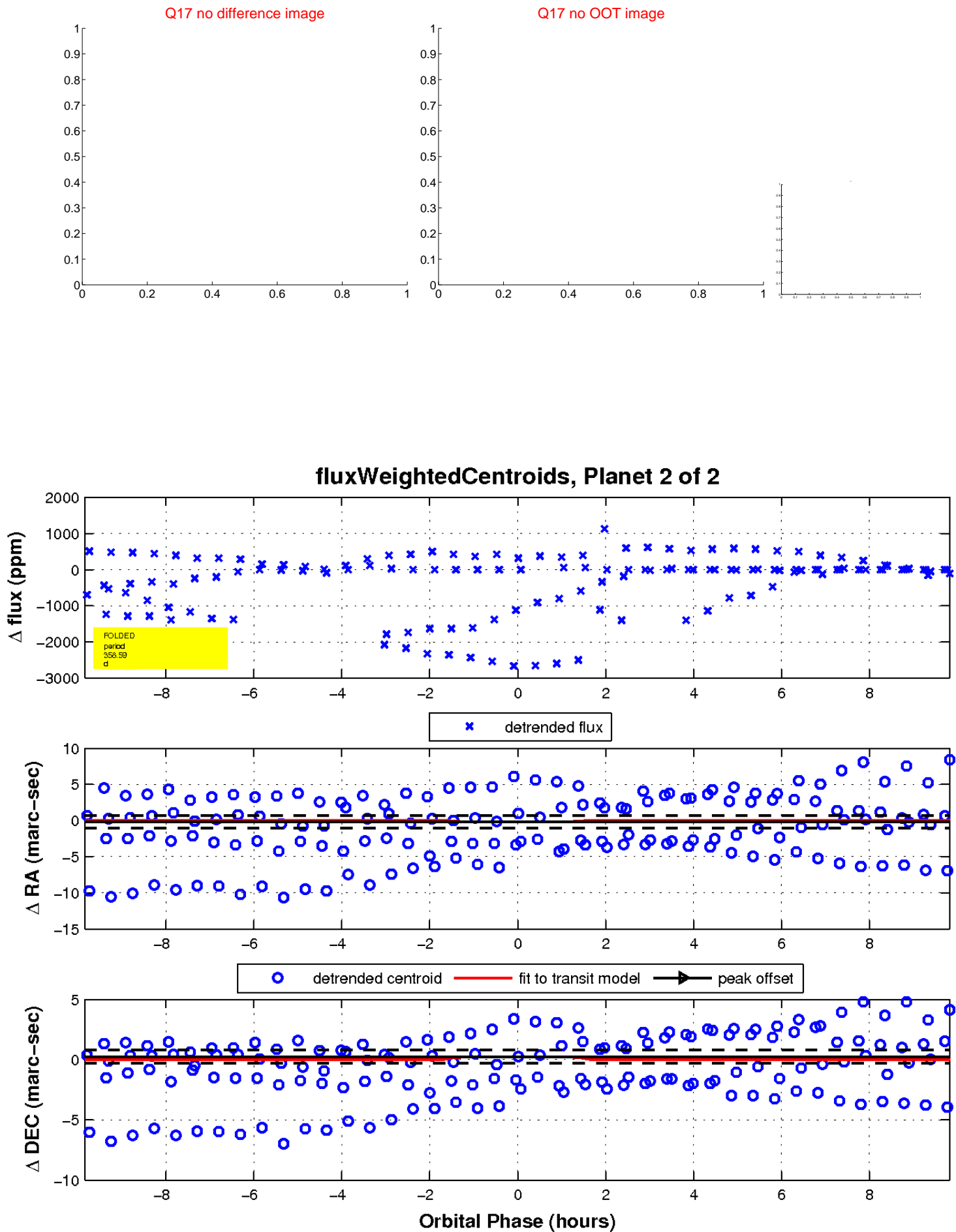
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



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



UKIRT Image

Declination

