

# KIC 012117689

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
012117689-01	OBS	No	0.503779	131.885740	21.3	2.638	8.6	6.7	1.85	7171	0.99	40472.87
012117689-02	OBS	No	157.296501	155.325473	1442.6	2.306	15.9	9.4	1.85	7171	13.08	19.11

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
012117689-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_SATURATED
012117689-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—CENT_SATURATED

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

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

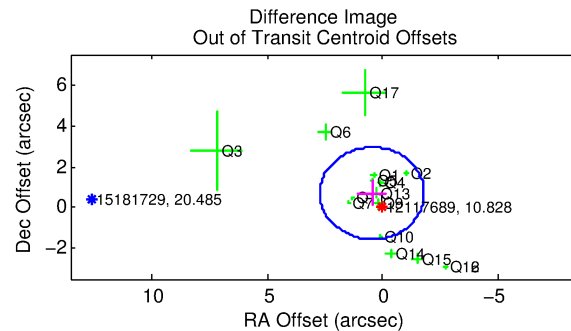
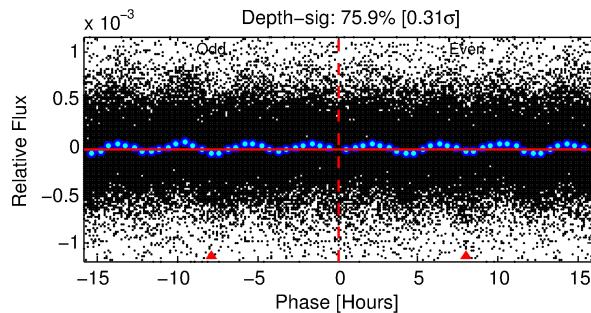
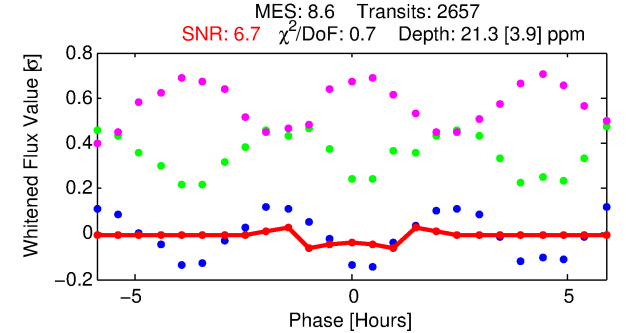
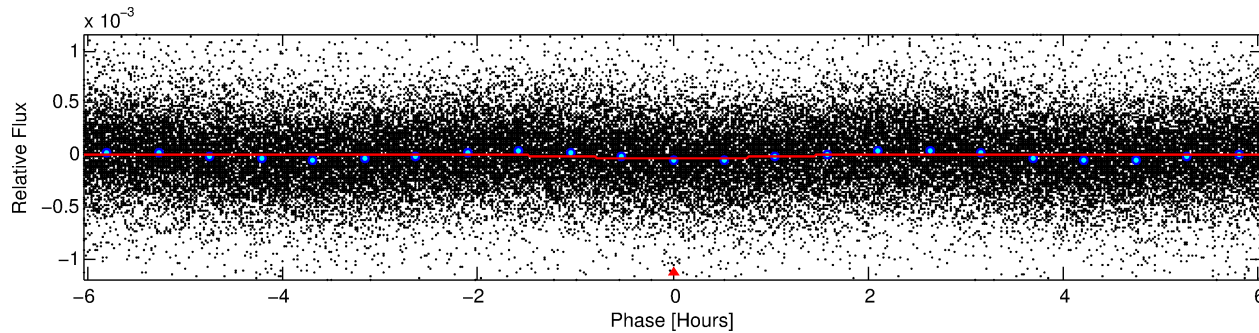
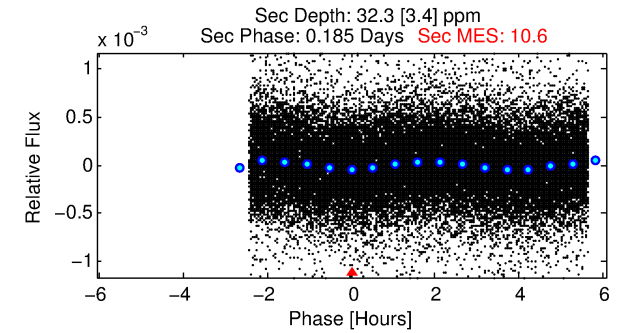
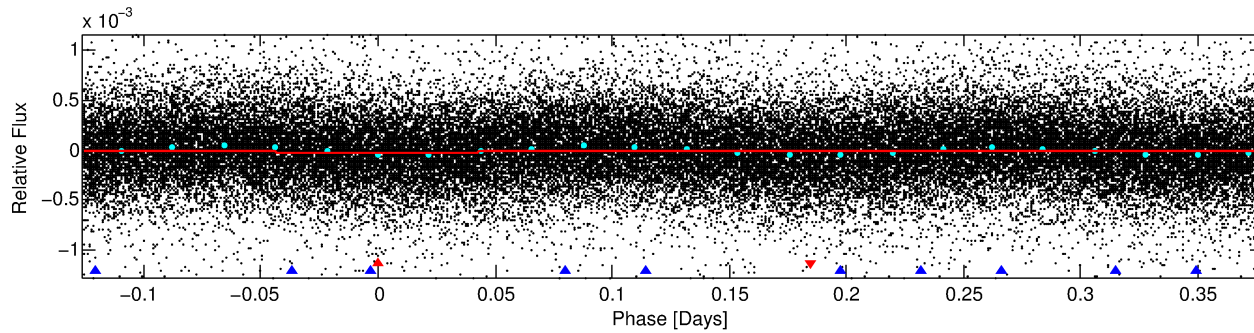
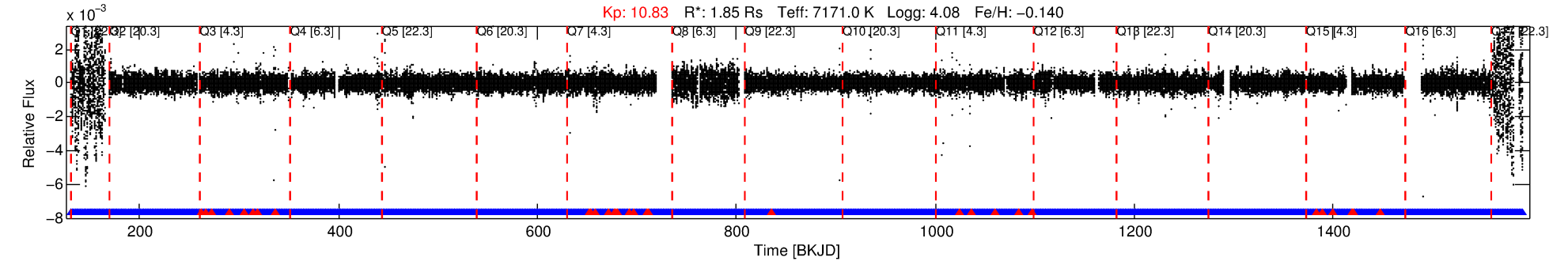
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 012117689-01

No Significant Match Found

# DV One-Page Summary

KIC: 12117689 Candidate: 1 of 2 Period: 0.504 d



## DV Fit Results:

Period = 0.50378 [0.00001] d  
Epoch = 131.8857 [0.0020] BKJD  
 $R_p/R^* = 0.0049$  [0.0013]  
 $a/R^* = 1.14$  [0.44]  
 $b = 0.90$  [0.35]  
 $S_{\text{eff}} = 40472.87$  [14712.65]  
 $T_{\text{eq}} = 3617$  [329] K  
 $R_p = 0.99$  [0.40]  $R_e$   
 $a = 0.0142$  [0.0034] AU  
 $A_g = 3.63$  [2.33] [1.13σ]  
 **$T_{\text{eff}} = 7716$  [1090] K [3.60σ]**

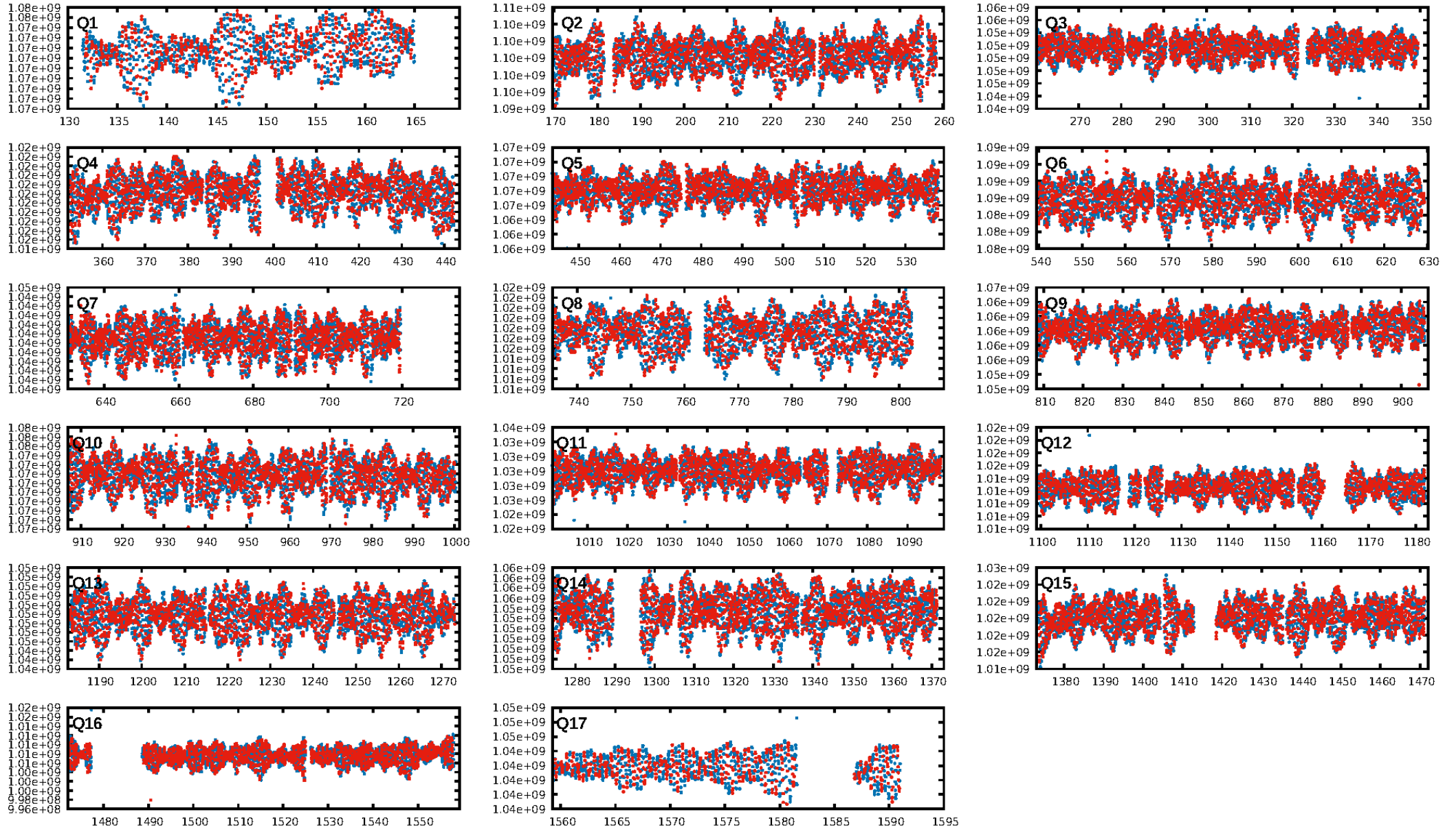
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [1073.87σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
**Bootstrap-pfa: 7.86e-12**  
RollingBand-fgt: 0.99 [2505/2538]  
GhostDiagnostic-chr: N/A  
Centroid-sig: 3.9%  
Centroid-so: 1.110 arcsec [1.78σ]  
OotOffset-rm: 0.840 arcsec [1.12σ]  
OotOffset-st: 4/4/3/5 [16]  
KicOffset-rm: 0.894 arcsec [1.35σ]  
KicOffset-st: 4/4/3/5 [16]  
DiffImageQuality-fgm: 0.50 [8/16]  
DiffImageOverlap-fno: 1.00 [17/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 18:50:07 Z

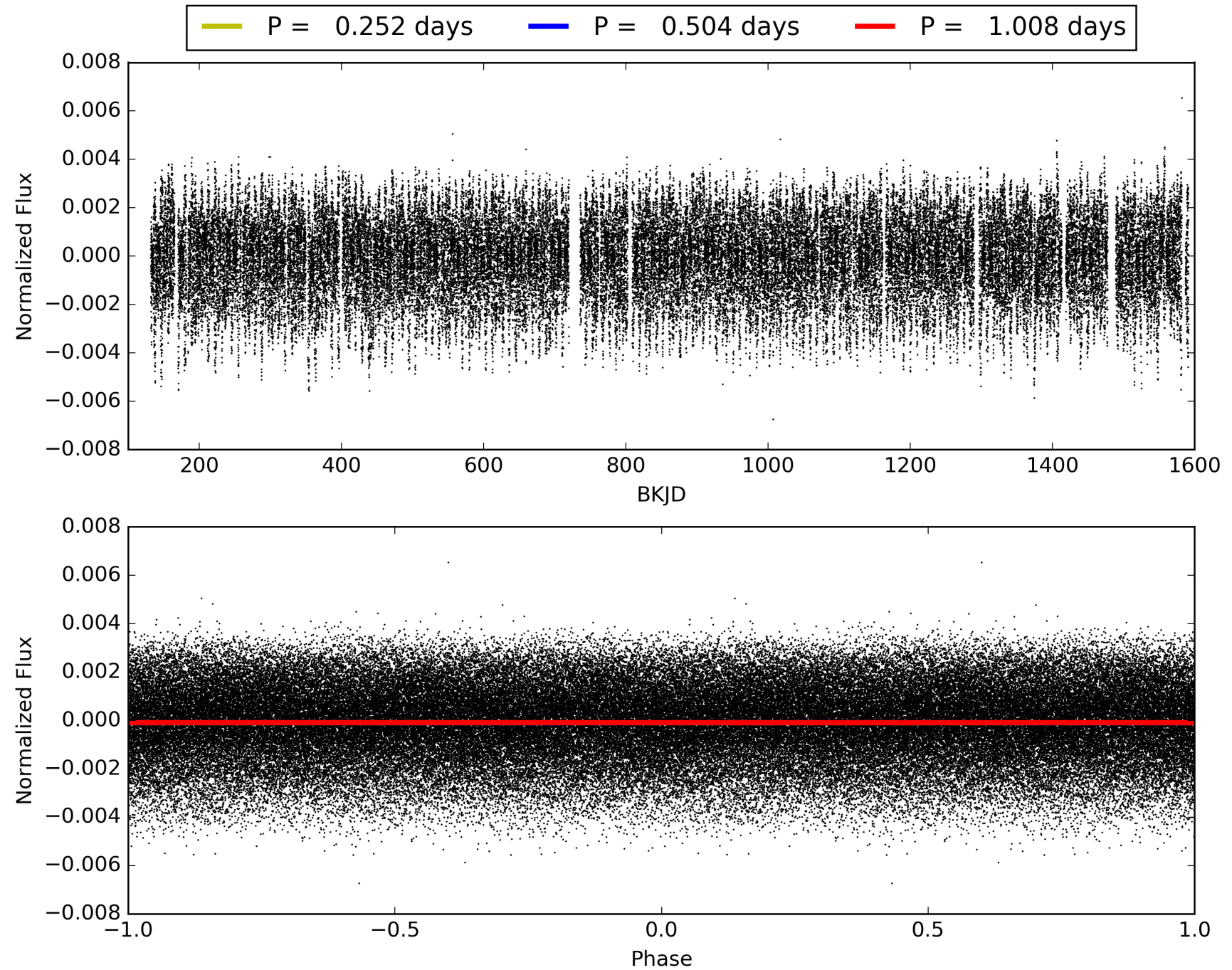
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 012117689-01, PDC Light Curves



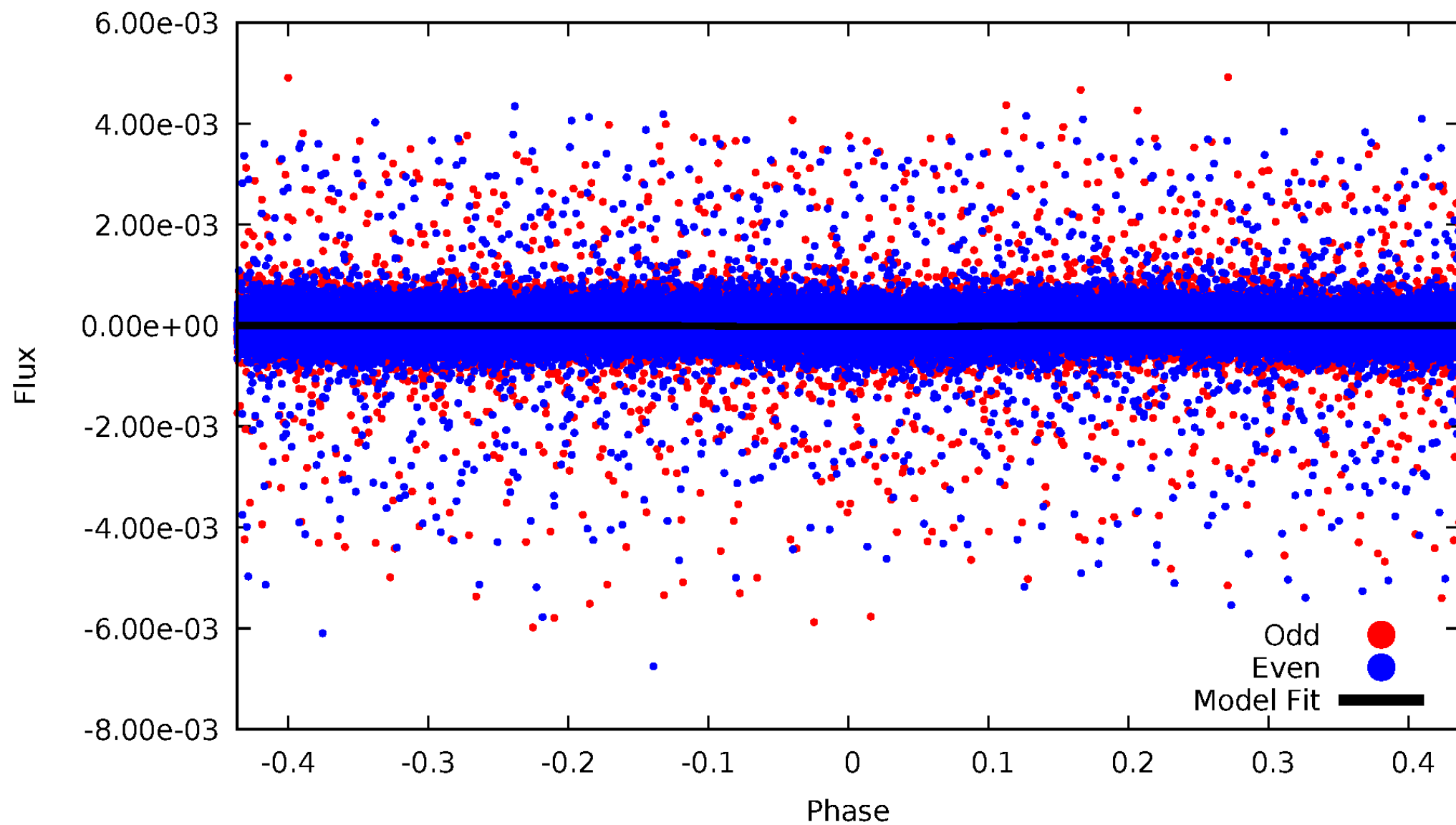


# TCE 012117689-01



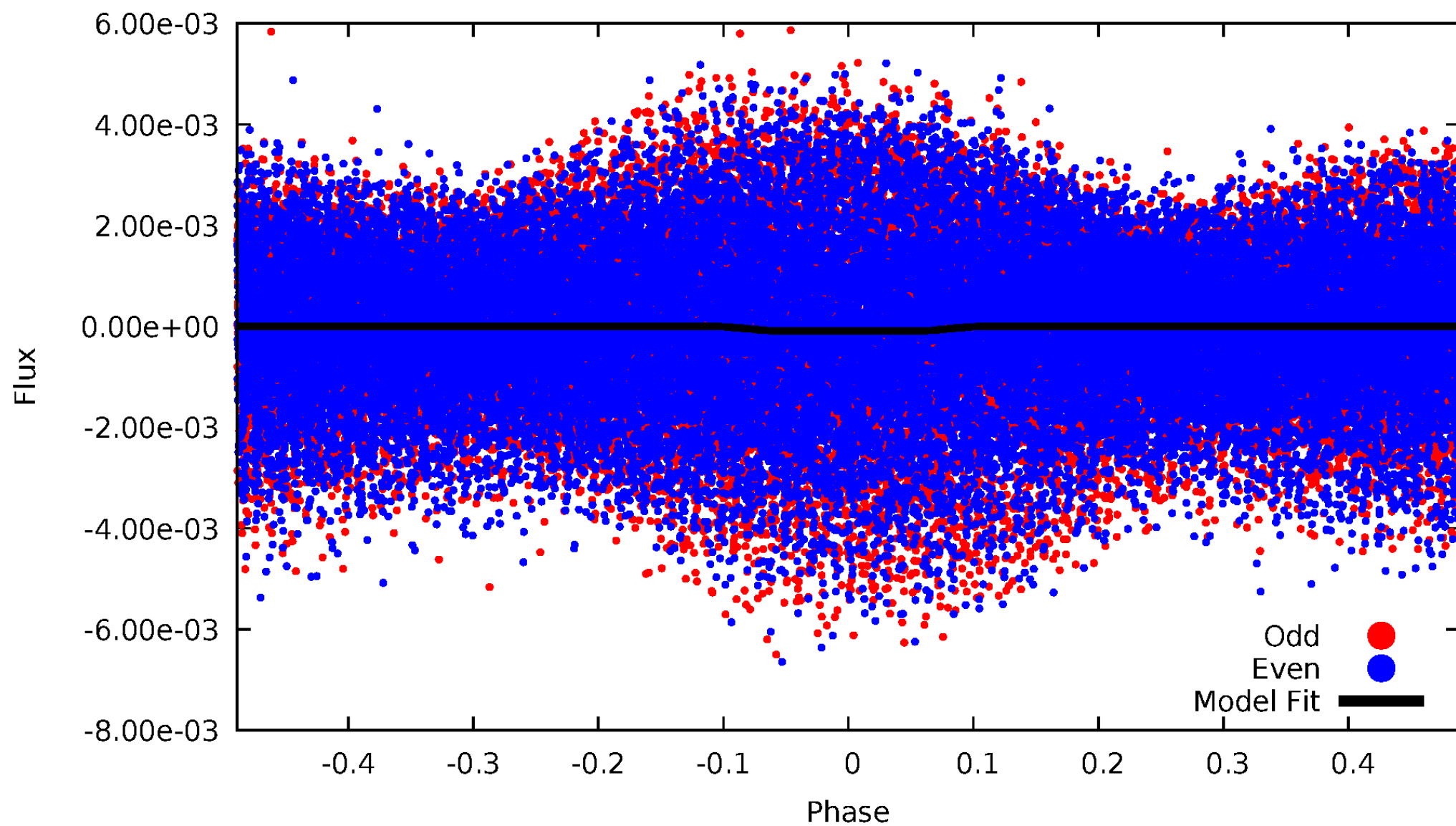
# DV Odd/Even

TCE 012117689-01



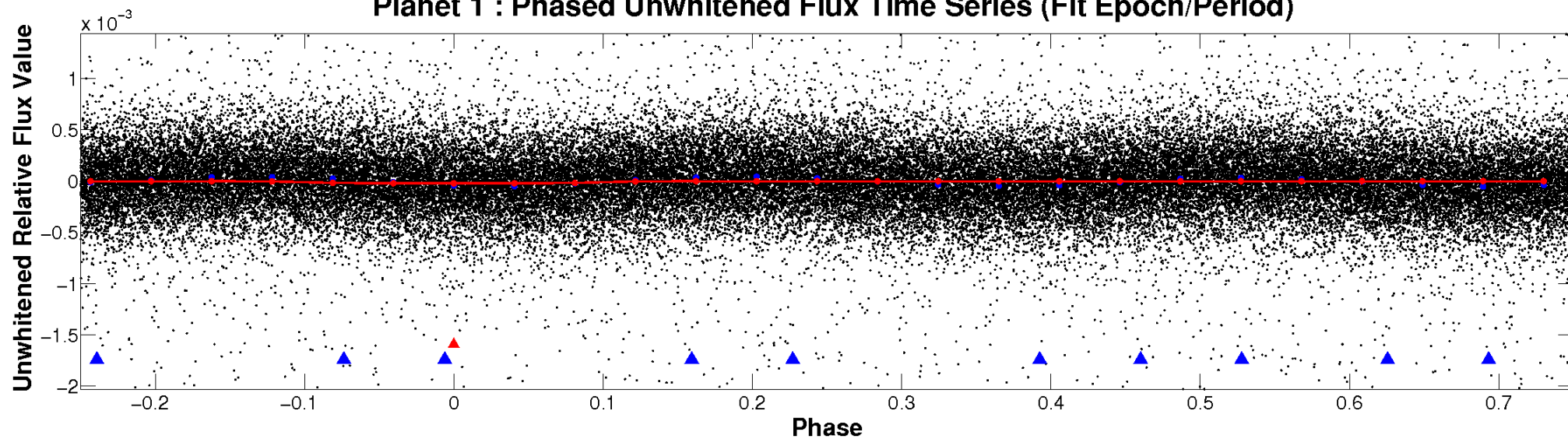
# ALT Odd/Even

TCE 012117689-01

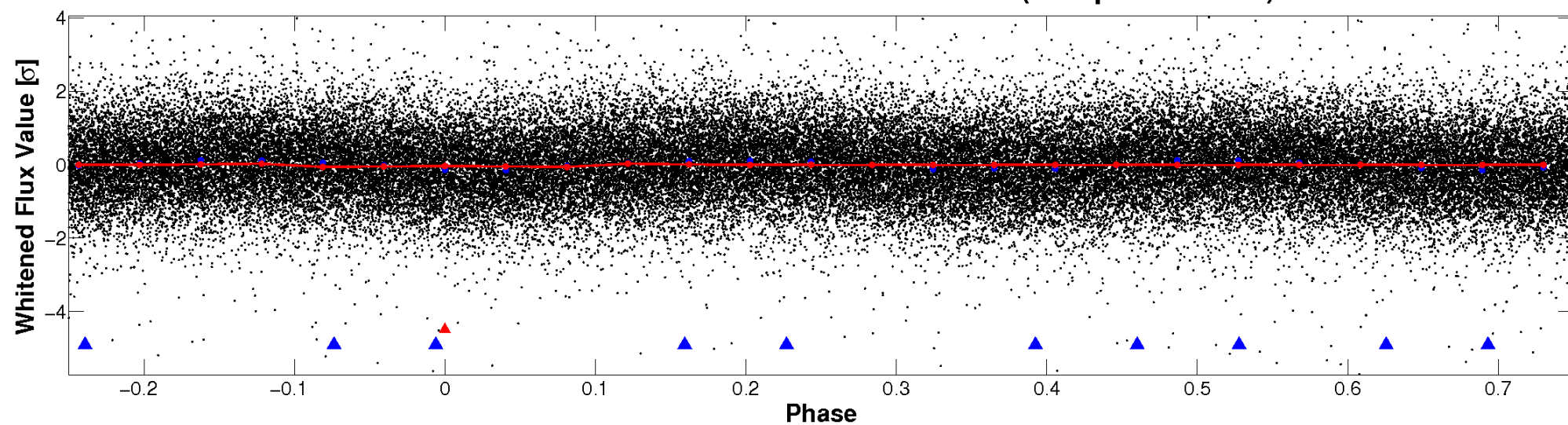


# Non-Whitened Vs. Whitened Light Curve

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



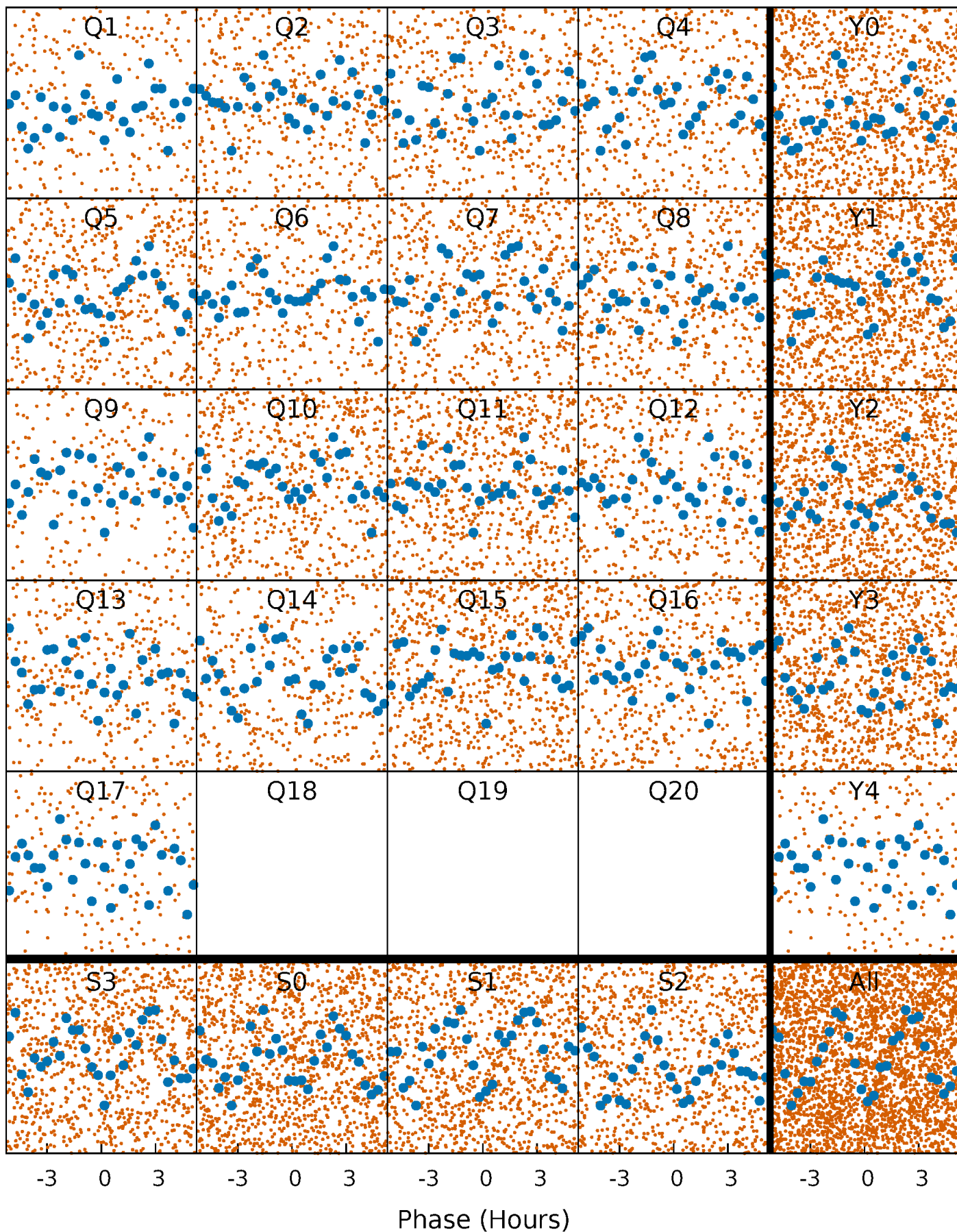
**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**





# PDC Quarter-Phased Transit Curves

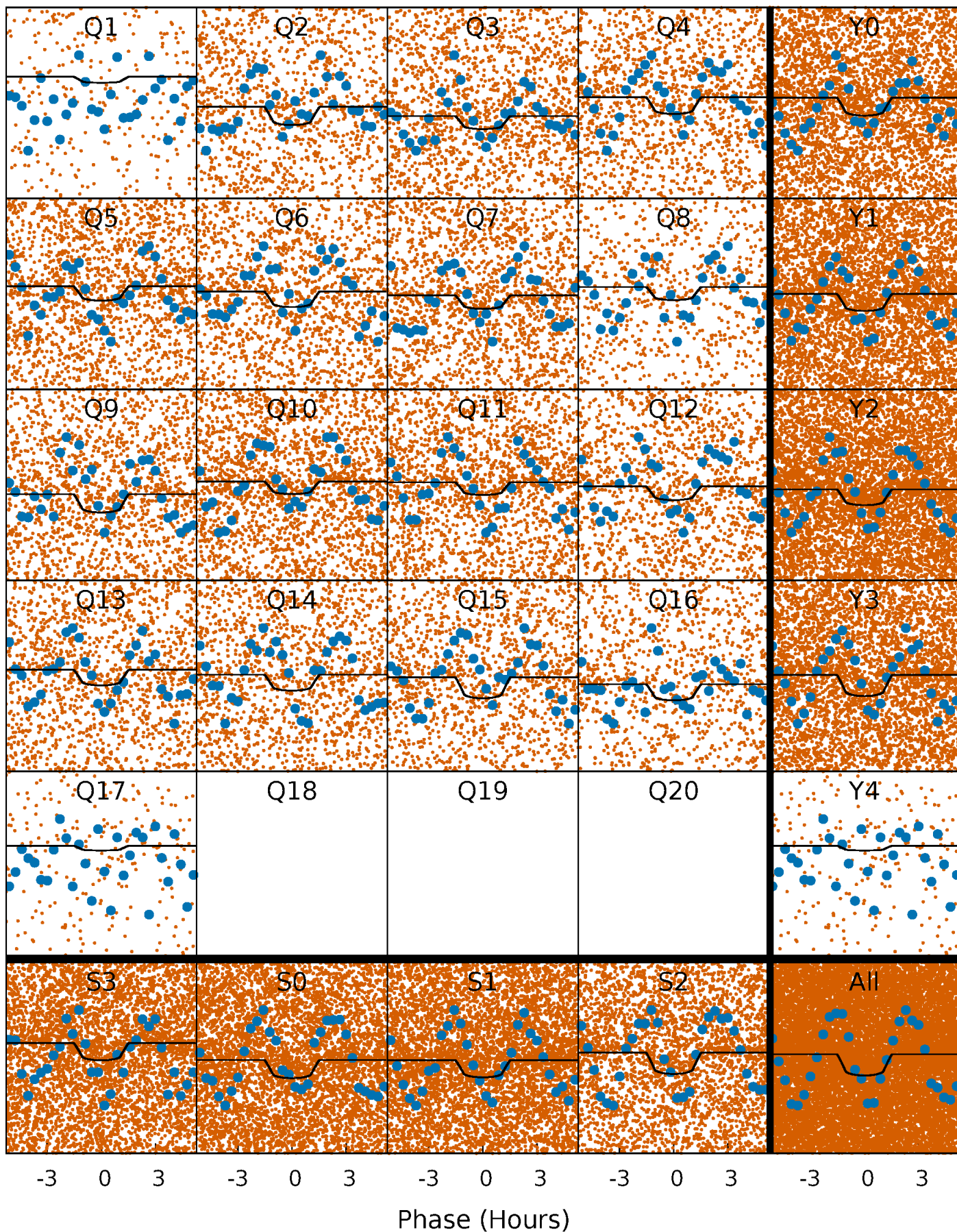
TCE 012117689-01 P= 0.503779 Days  $T_0=131.885740$  (BKJD)





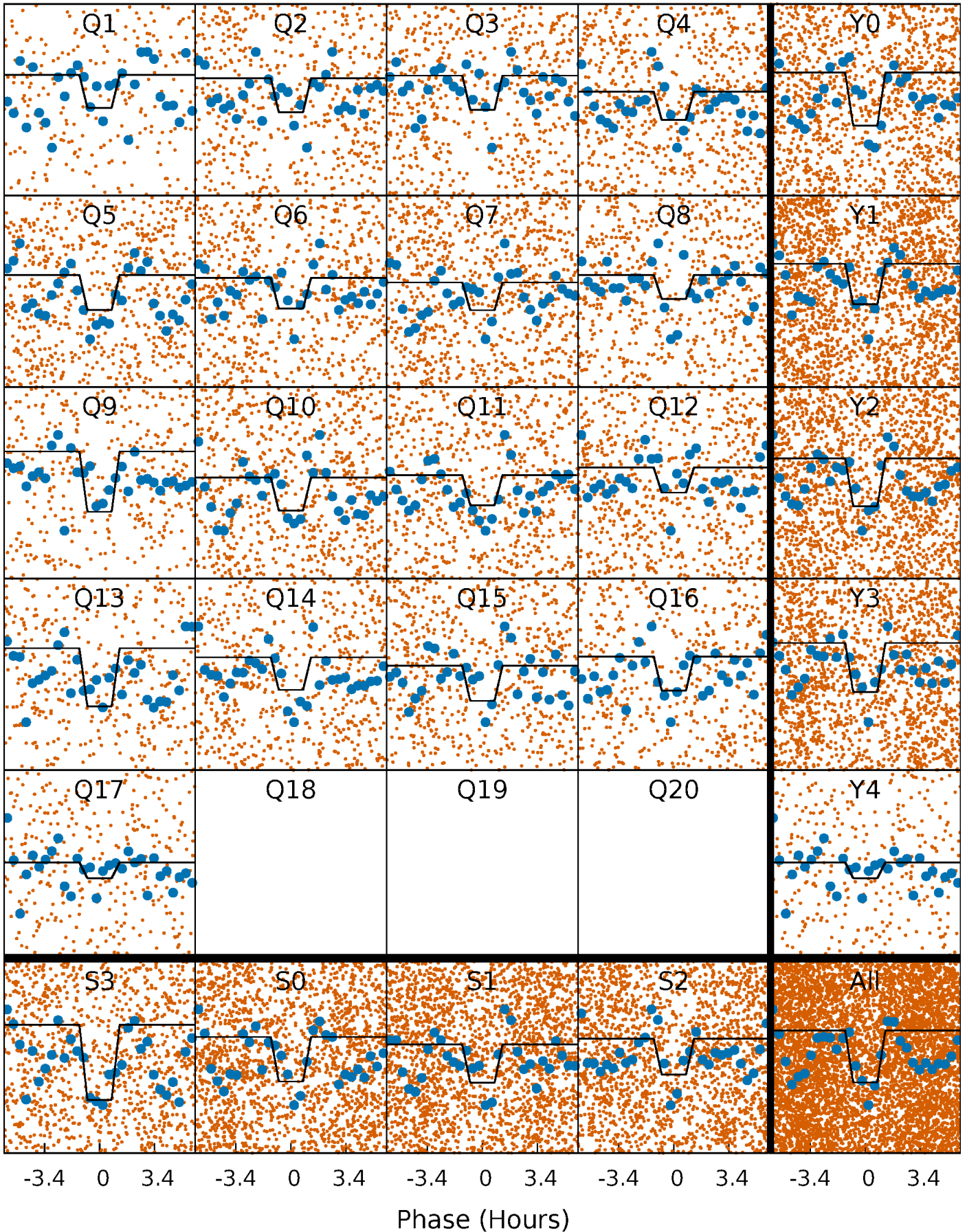
# DV Quarter-Phased Transit Curves

TCE 012117689-01 P= 0.503779 Days  $T_0=131.885740$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 012117689-01 P= 0.503791 Days  $T_0=131.883750$  (BKJD)

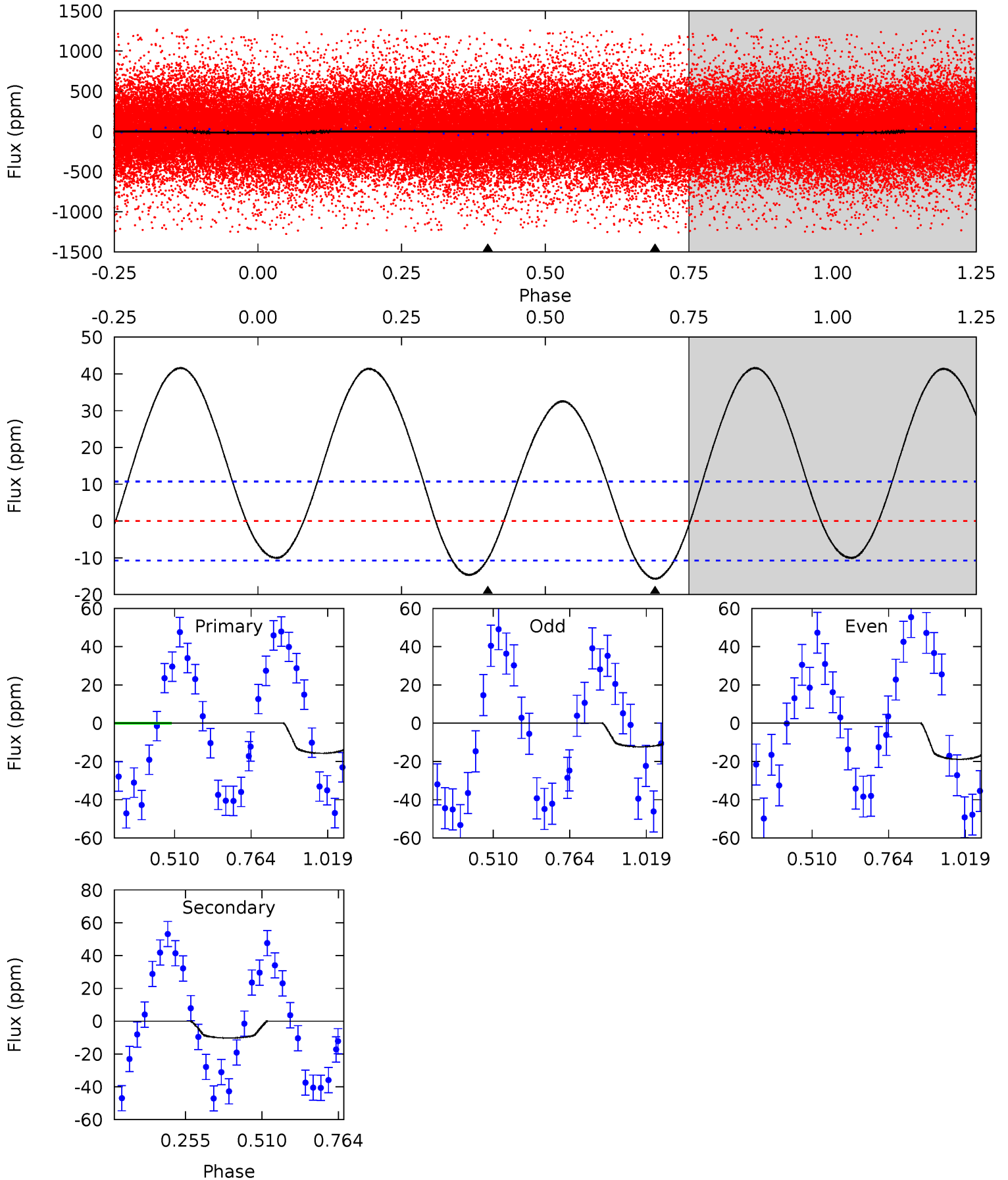




# DV Model-Shift Uniqueness Test

012117689-01, P = 0.503779 Days, E = 131.381961 Days

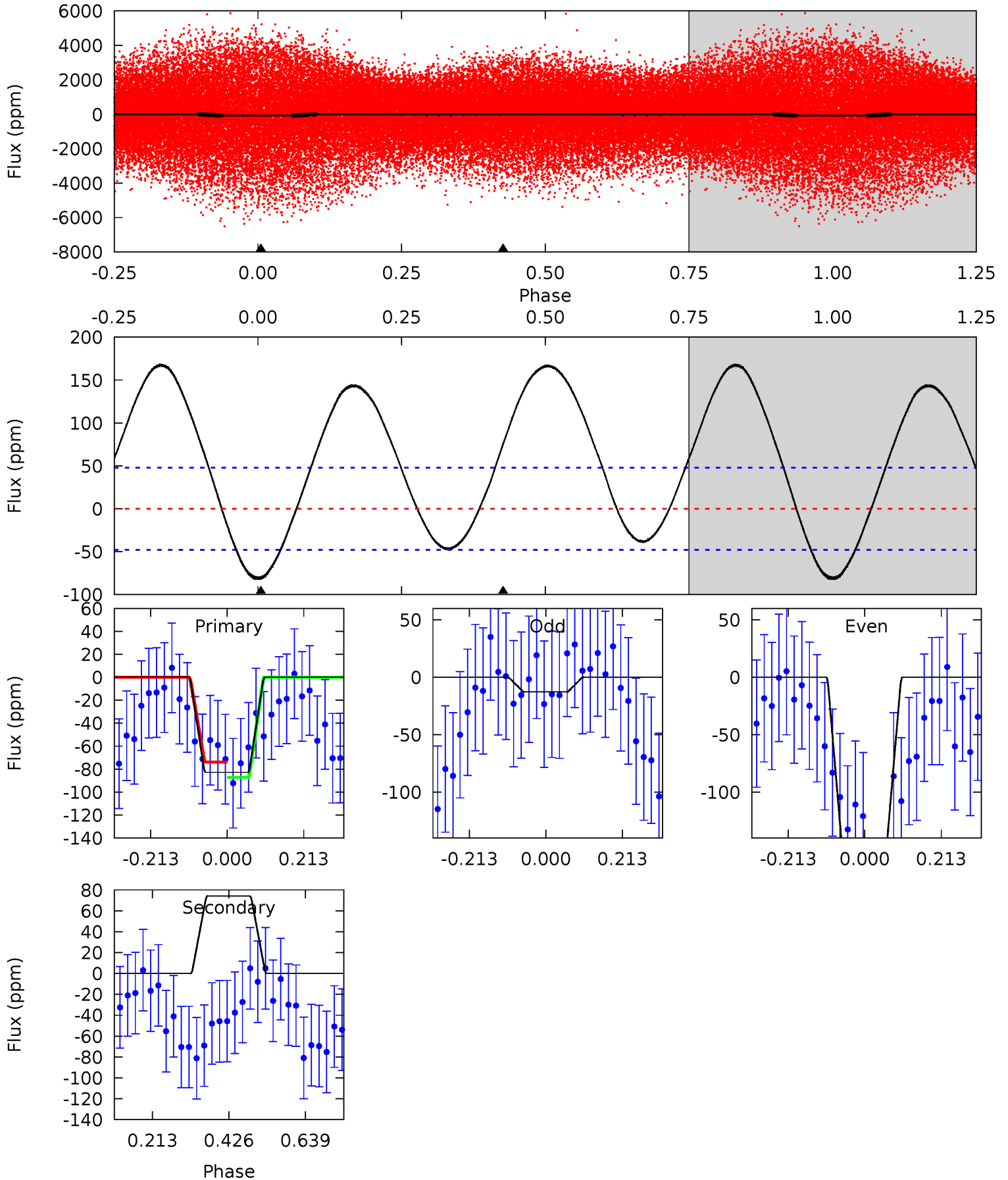
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
6.38	4.17	0	0	4.36	1.14	4.70	6.38	6.38	4.17	4.17	1.32	1.14	0.73	6.35



# Alt Model-Shift Uniqueness Test

012117689-01, P = 0.503791 Days, E = 131.379959 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
7.62	-6.82	0	0	4.40	1.24	5.07	7.62	7.62	-6.82	-6.82	5.32	2.95	0.67	0.46





### Stellar Parameters For KIC 012117689

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7171^{+200}_{-250}$	$4.077^{+0.175}_{-0.175}$	$-0.140^{+0.250}_{-0.350}$	$1.851^{+0.559}_{-0.457}$	$1.488^{+0.209}_{-0.232}$	$0.331^{+0.327}_{-0.166}$
	+3%/-3%	+4%/-4%	+179%/-250%	+30%/-25%	+14%/-16%	+99%/-50%
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 012117689-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-10 \pm 2$	$0.97^{+0.35}_{-0.29}$	$5092^{+364}_{-392}$	$5371^{+1250}_{-1023}$	$1.135^{+1.324}_{-0.547}$
Alt.	$74 \pm 11$	$1.89^{+0.41}_{-0.35}$	$5061^{+405}_{-371}$	$-7067^{+568}_{-756}$	$-2.253^{+0.765}_{-1.235}$

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

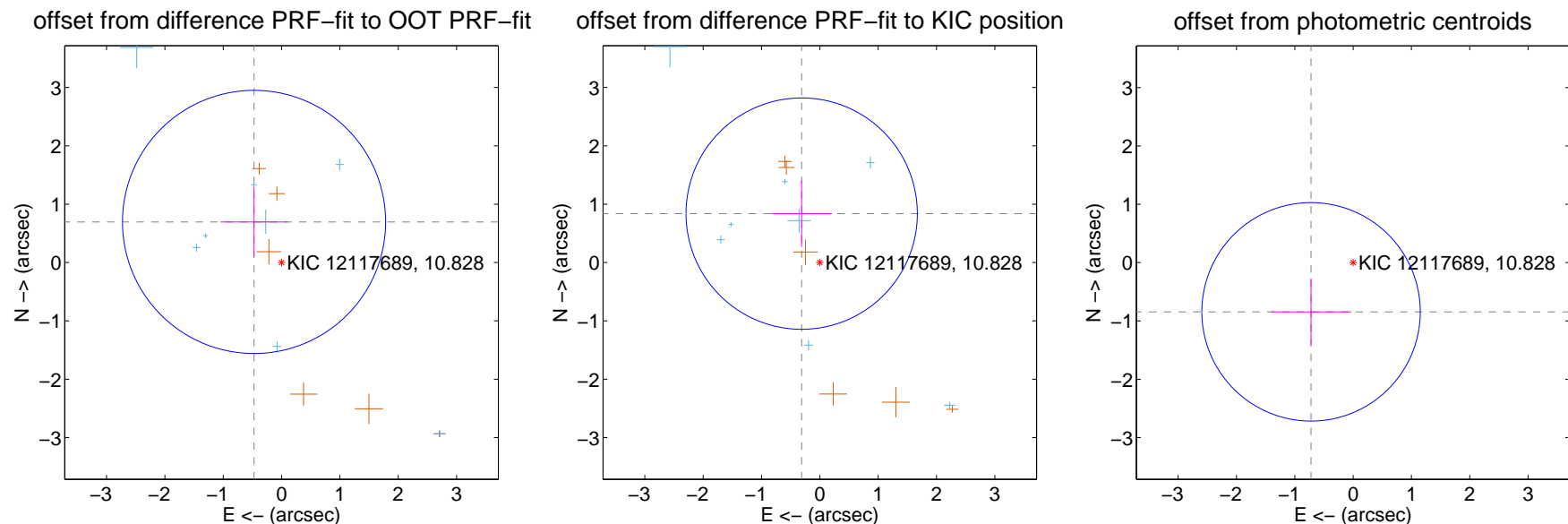
## DV Centroid Data

Supplemental centroid analysis for 012117689-01. **Kepler magnitude: 10.83.** Transit SNR 6.71

There are 8 quarters with good PRF difference image offsets

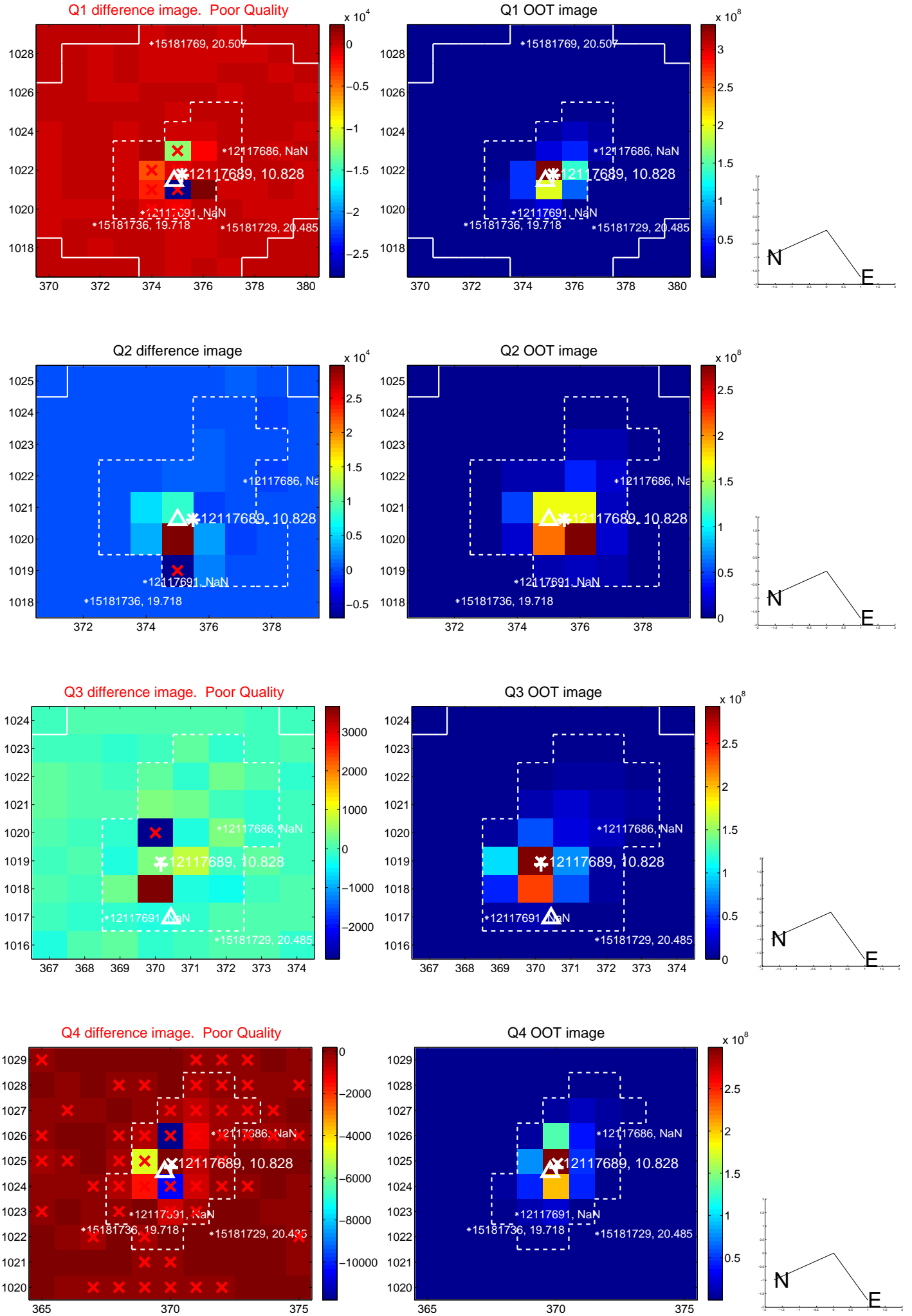
The direct PRF centroid is offset from the target star catalog position by about 0.13 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.840 \pm 0.751$	1.12	$0.472 \pm 0.575$	$0.696 \pm 0.602$
PRF-fit source offset from KIC position	$0.894 \pm 0.661$	1.35	$0.311 \pm 0.520$	$0.838 \pm 0.572$
photometric centroid source offset	$1.11 \pm 0.62$	1.78	$0.72 \pm 0.69$	$-0.84 \pm 0.57$

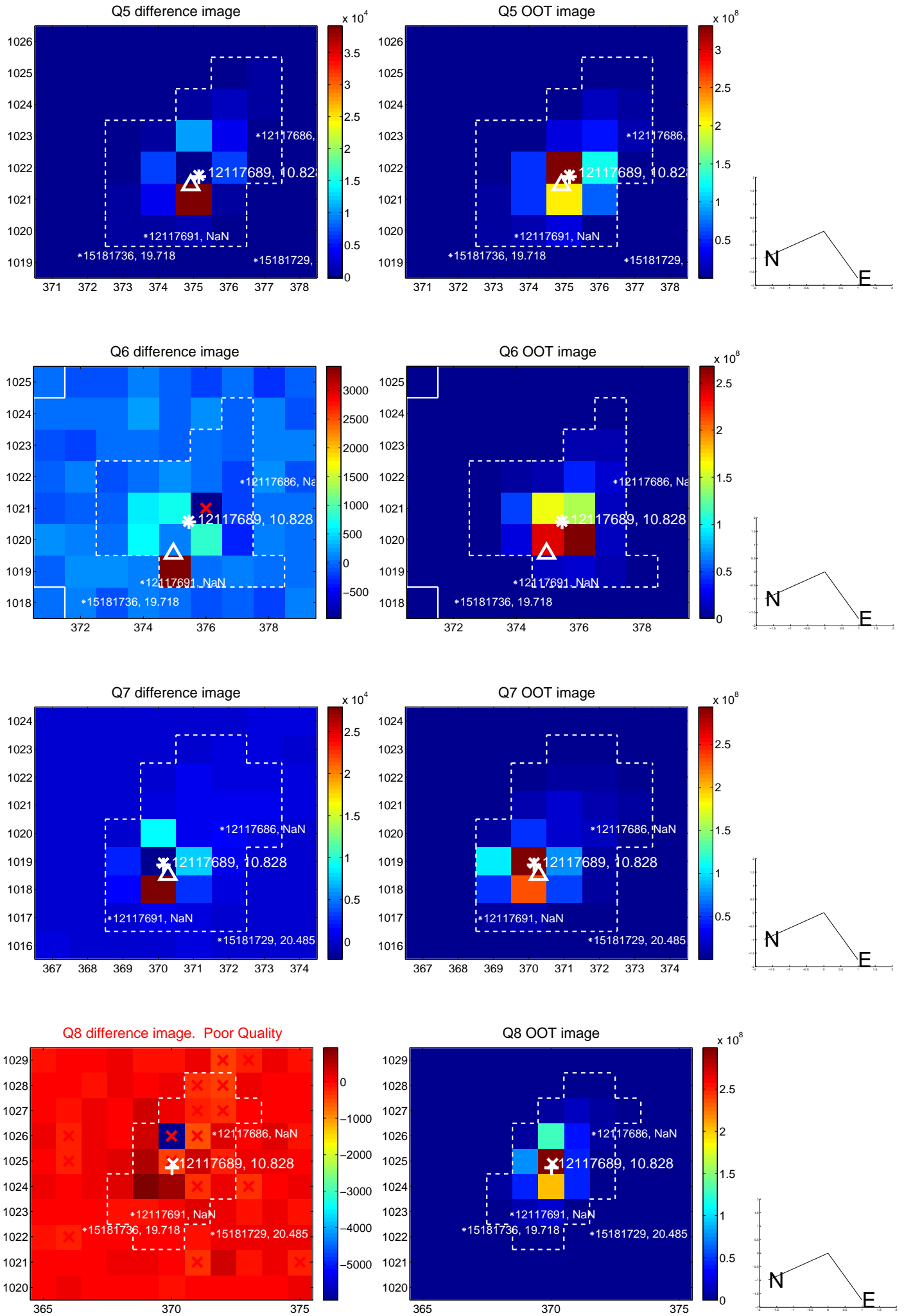


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

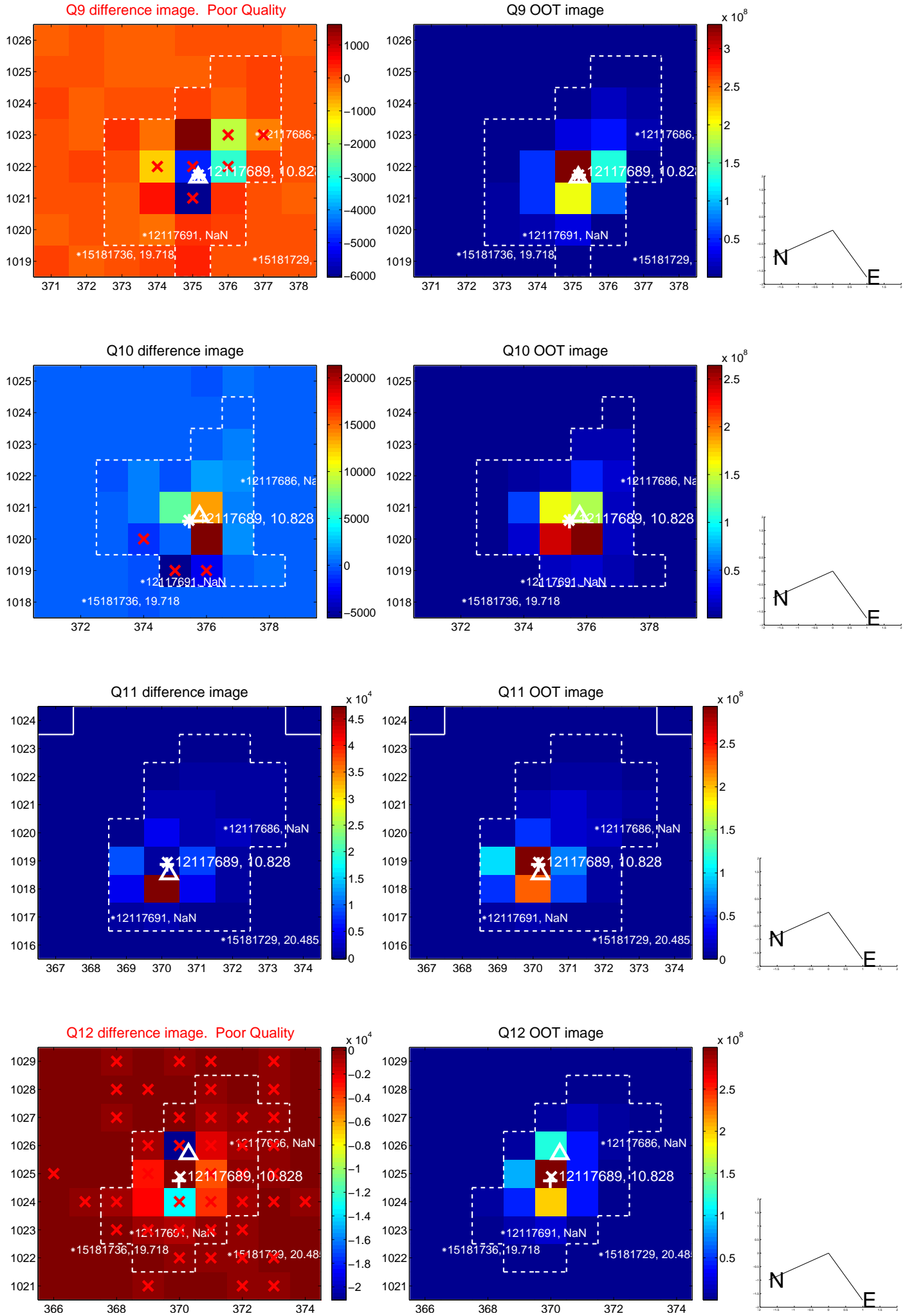


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

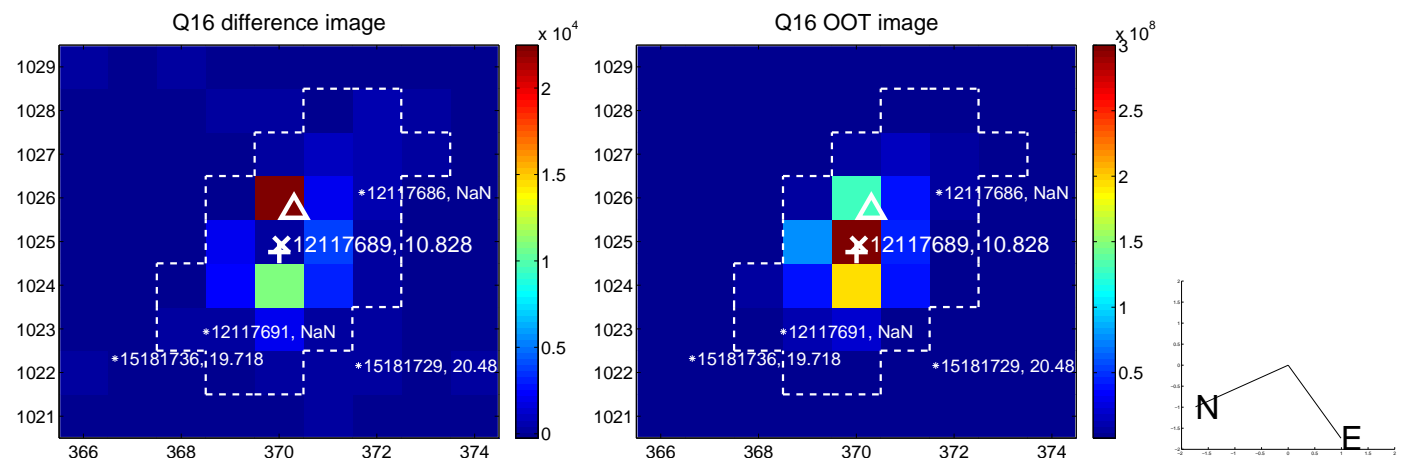
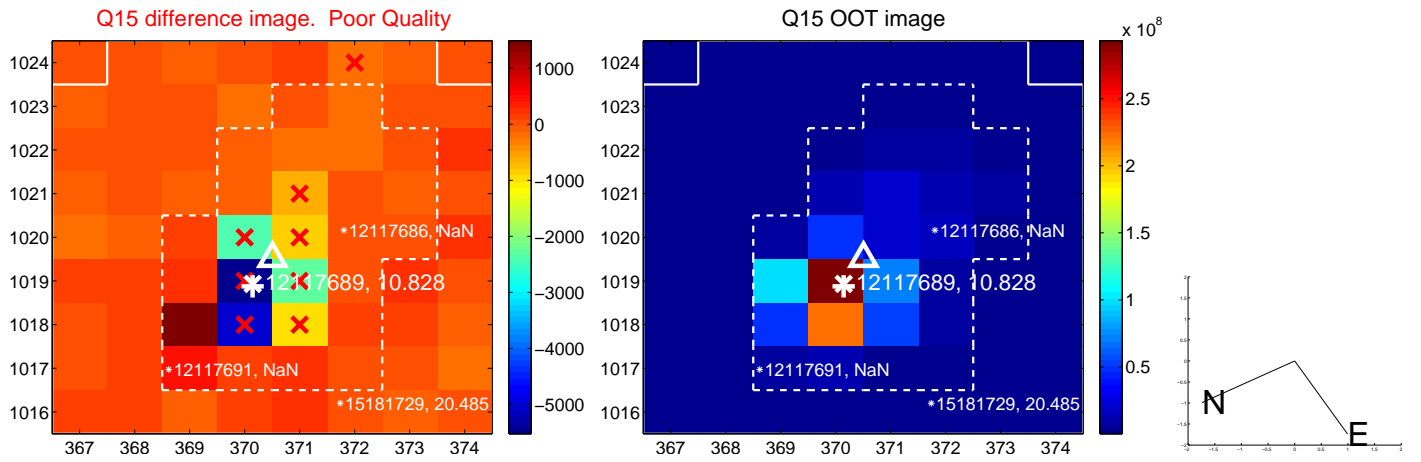
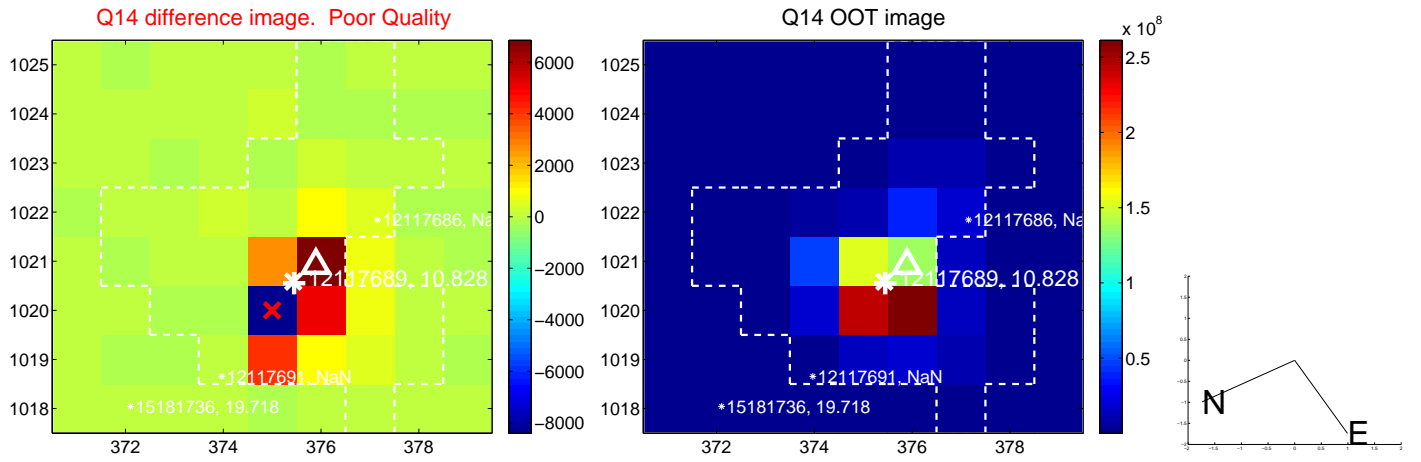
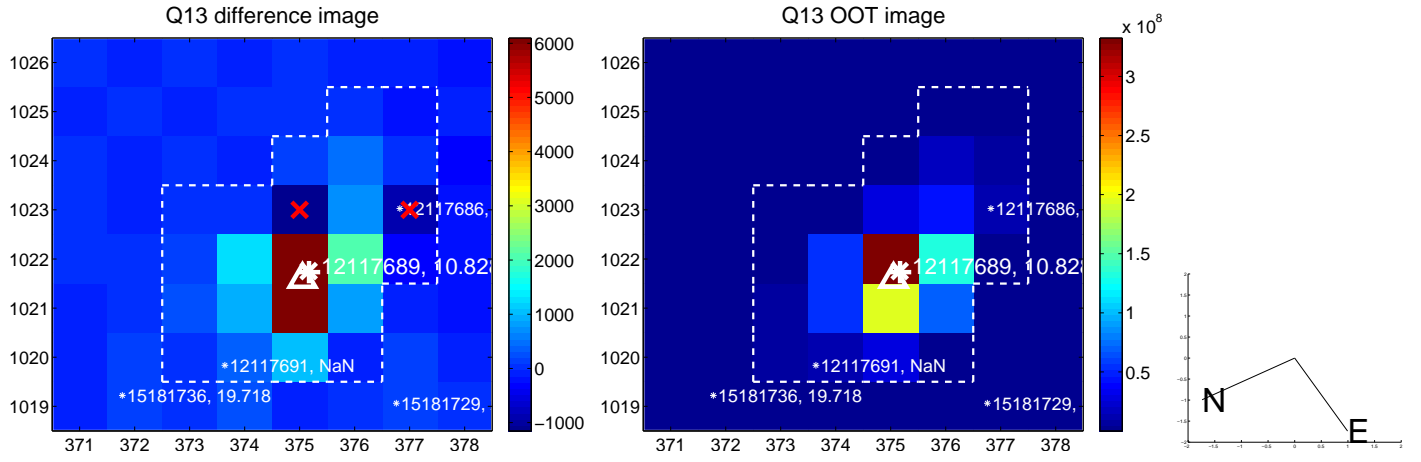




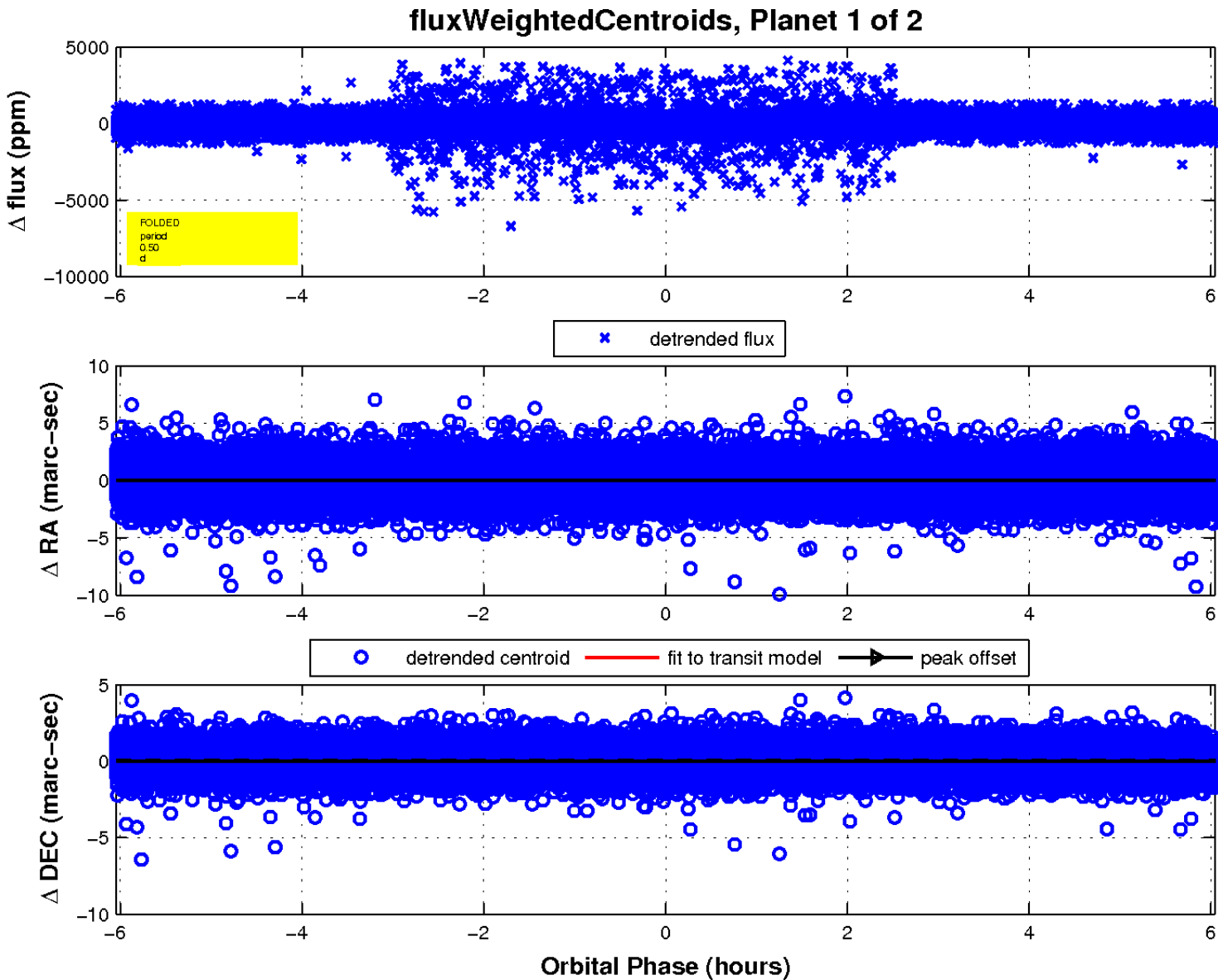
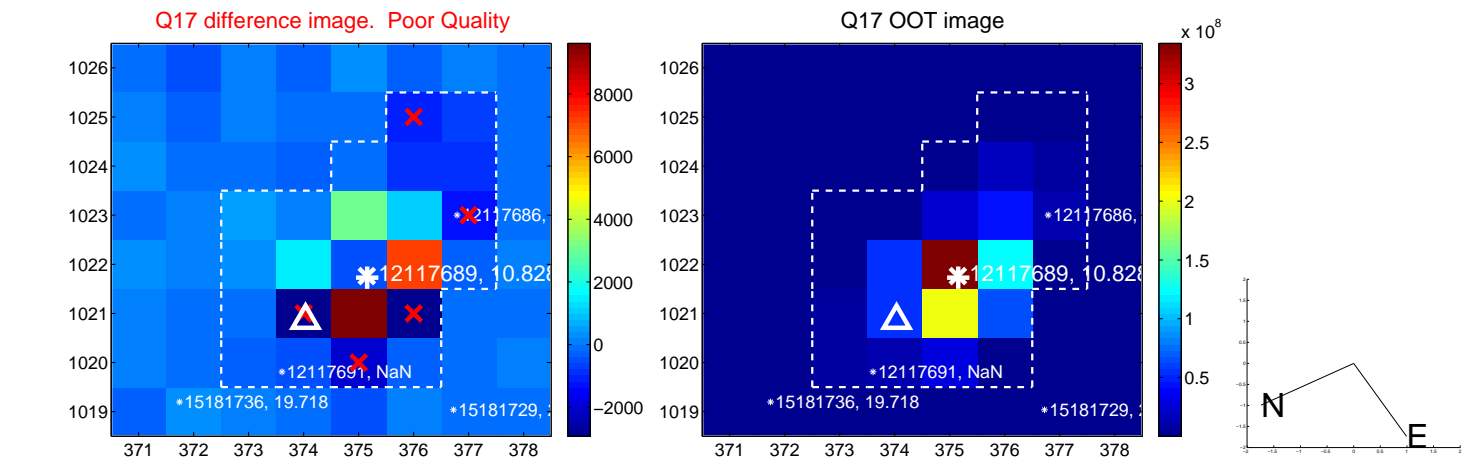
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



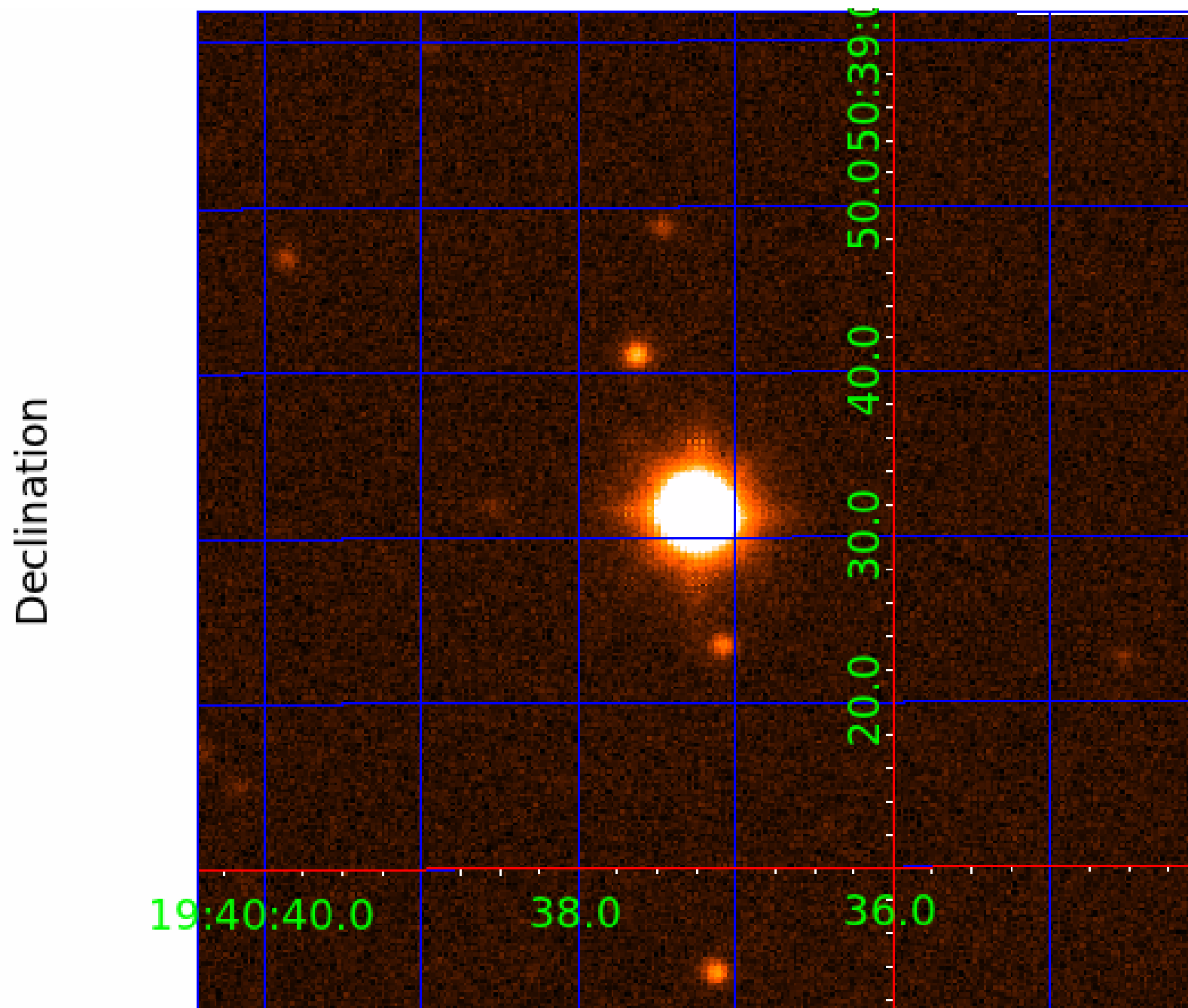
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



UKIRT Image





# KIC 012117689

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
012117689-01	OBS	No	0.503779	131.885740	21.3	2.638	8.6	6.7	1.85	7171	0.99	40472.87
012117689-02	OBS	No	157.296501	155.325473	1442.6	2.306	15.9	9.4	1.85	7171	13.08	19.11

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
012117689-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_SATURATED
012117689-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—CENT_SATURATED

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

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

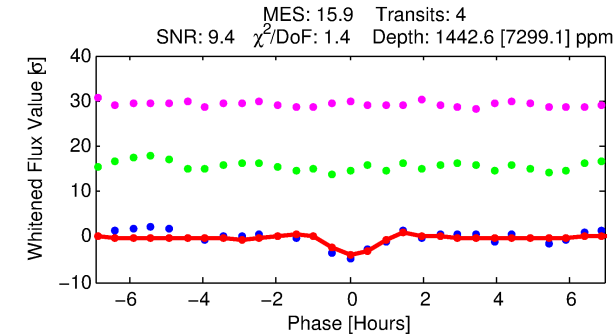
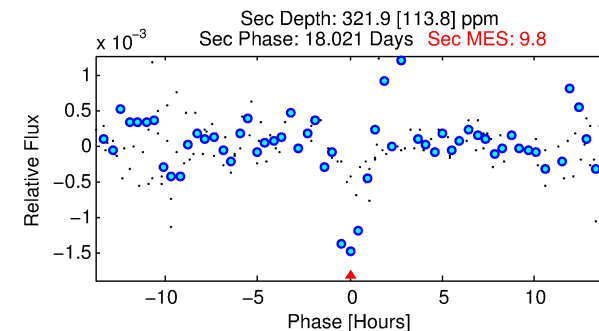
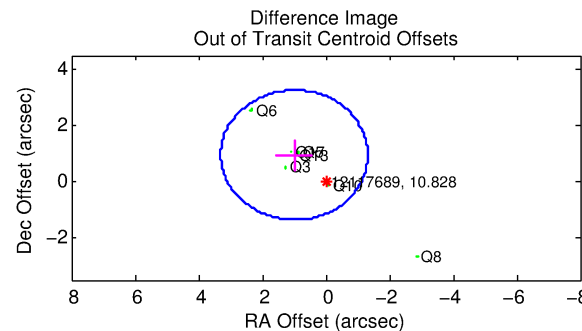
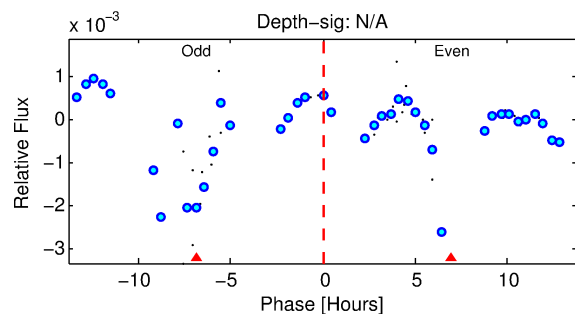
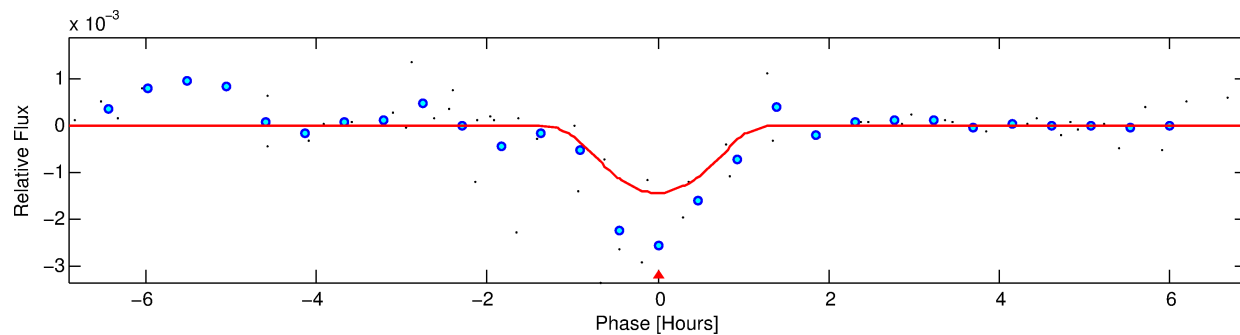
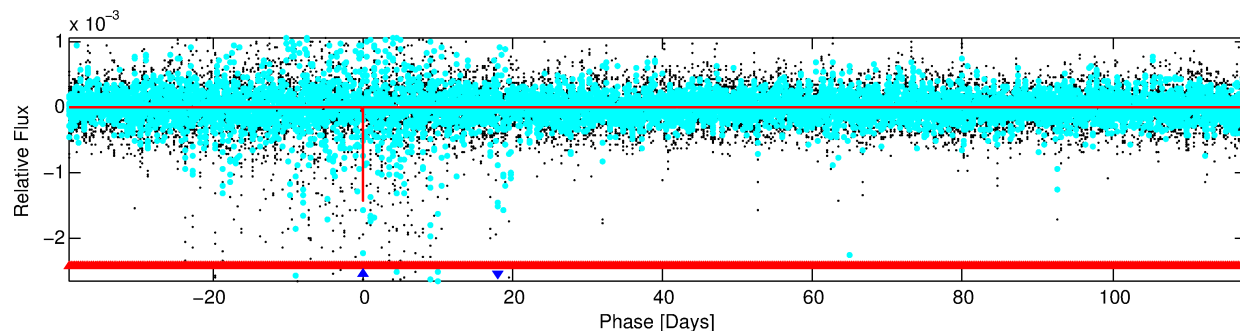
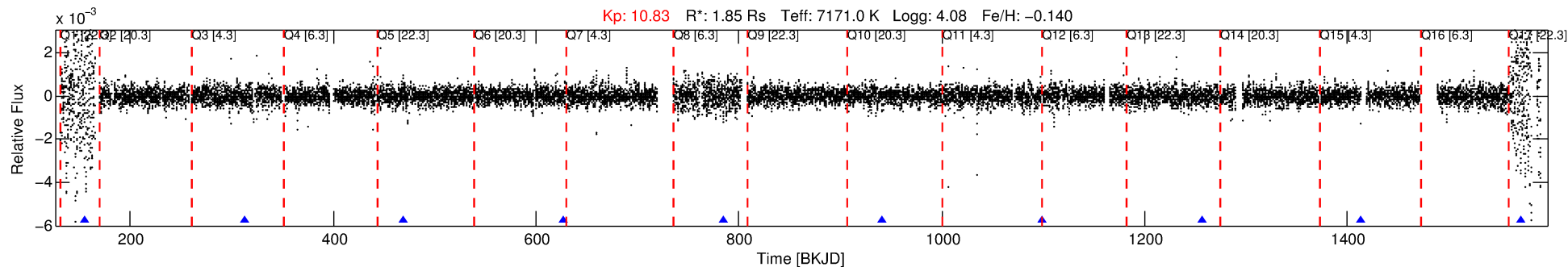
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 012117689-02

No Significant Match Found

# DV One-Page Summary

KIC: 12117689 Candidate: 2 of 2 Period: 157.297 d



## DV Fit Results:

Period = 157.29650 [0.00095] d  
Epoch = 155.3255 [0.0050] BKJD  
Rp/R\* = 0.0647 [0.4014]  
a/R\* = 190.49 [278.42]  
b = 1.00 [0.36]  
Seff = 19.11 [6.95]  
Teq = 533 [48] K  
Rp = 13.08 [81.17] Re  
a = 0.6518 [0.1578] AU  
Ag = 439.97 [5459.98] [0.08σ]  
Teff = 3775 [11708] K [0.28σ]

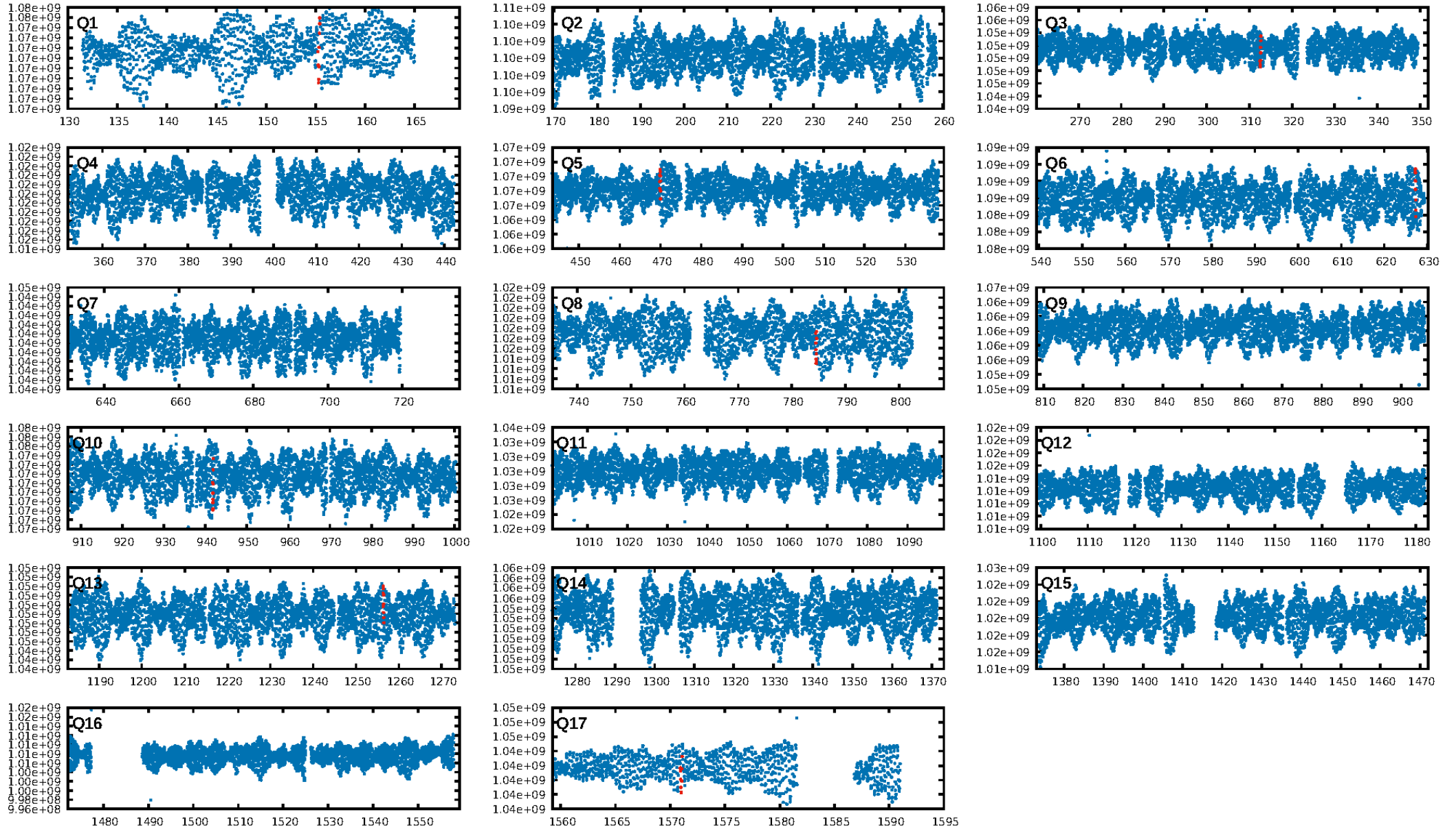
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [1073.87σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 25.7%  
ModelChiSquareGof-sig: 96.7%  
Bootstrap-pfa: 6.36e-16  
RollingBand-fgt: 1.00 [2/2]  
GhostDiagnostic-chr: N/A  
Centroid-sig: 1.2%  
Centroid-so: 0.209 arcsec [1.14σ]  
OotOffset-rm: 1.374 arcsec [1.78σ]  
KicOffset-rm: 1.509 arcsec [2.44σ]  
OotOffset-st: 2/1/1/4 [8]  
KicOffset-st: 2/1/1/4 [8]  
DiffImageQuality-fgm: 0.62 [5/8]  
DiffImageOverlap-fno: 0.00 [0/8]

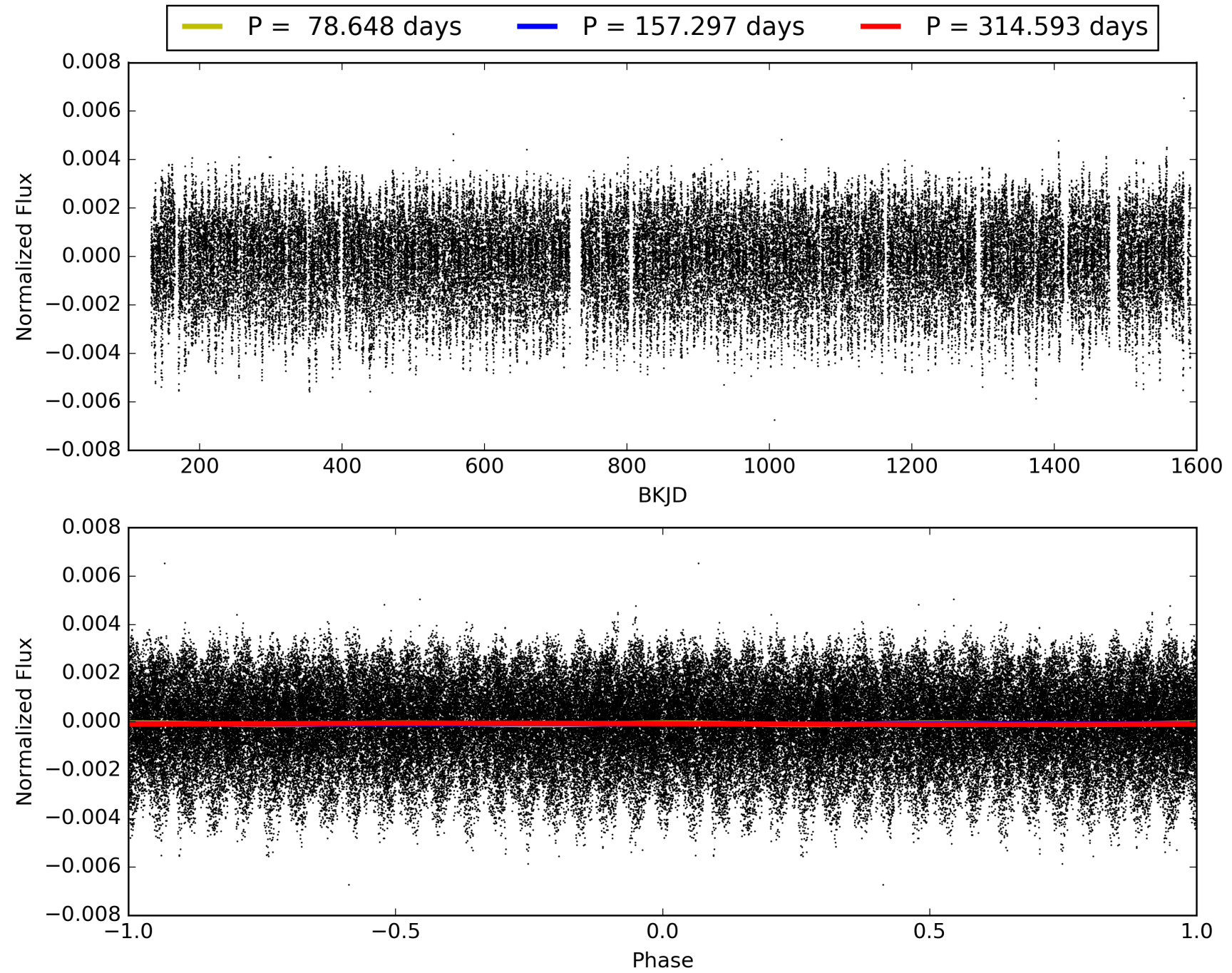
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 18:50:19 Z

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

# TCE 012117689-02, PDC Light Curves



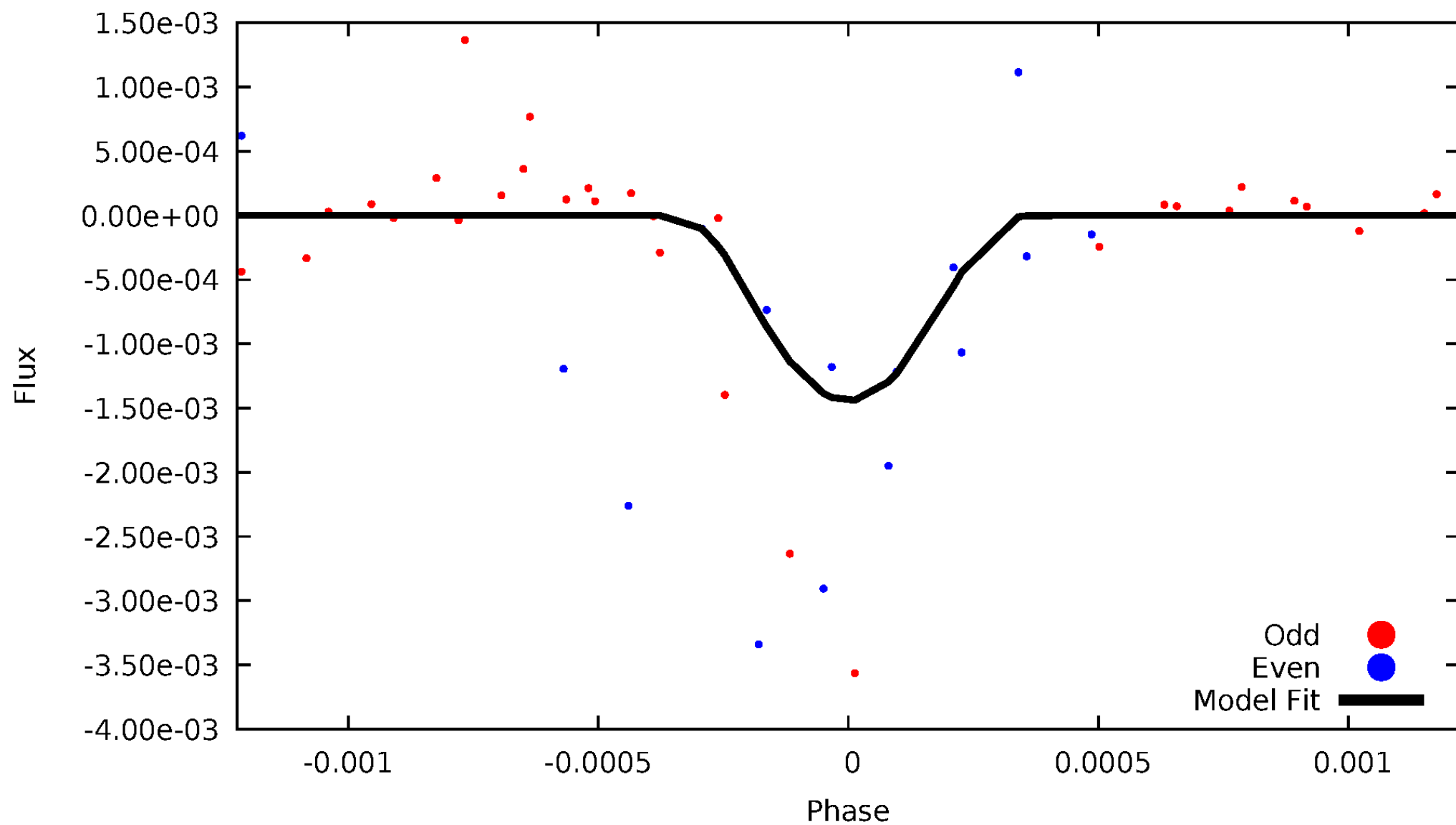
# TCE 012117689-02





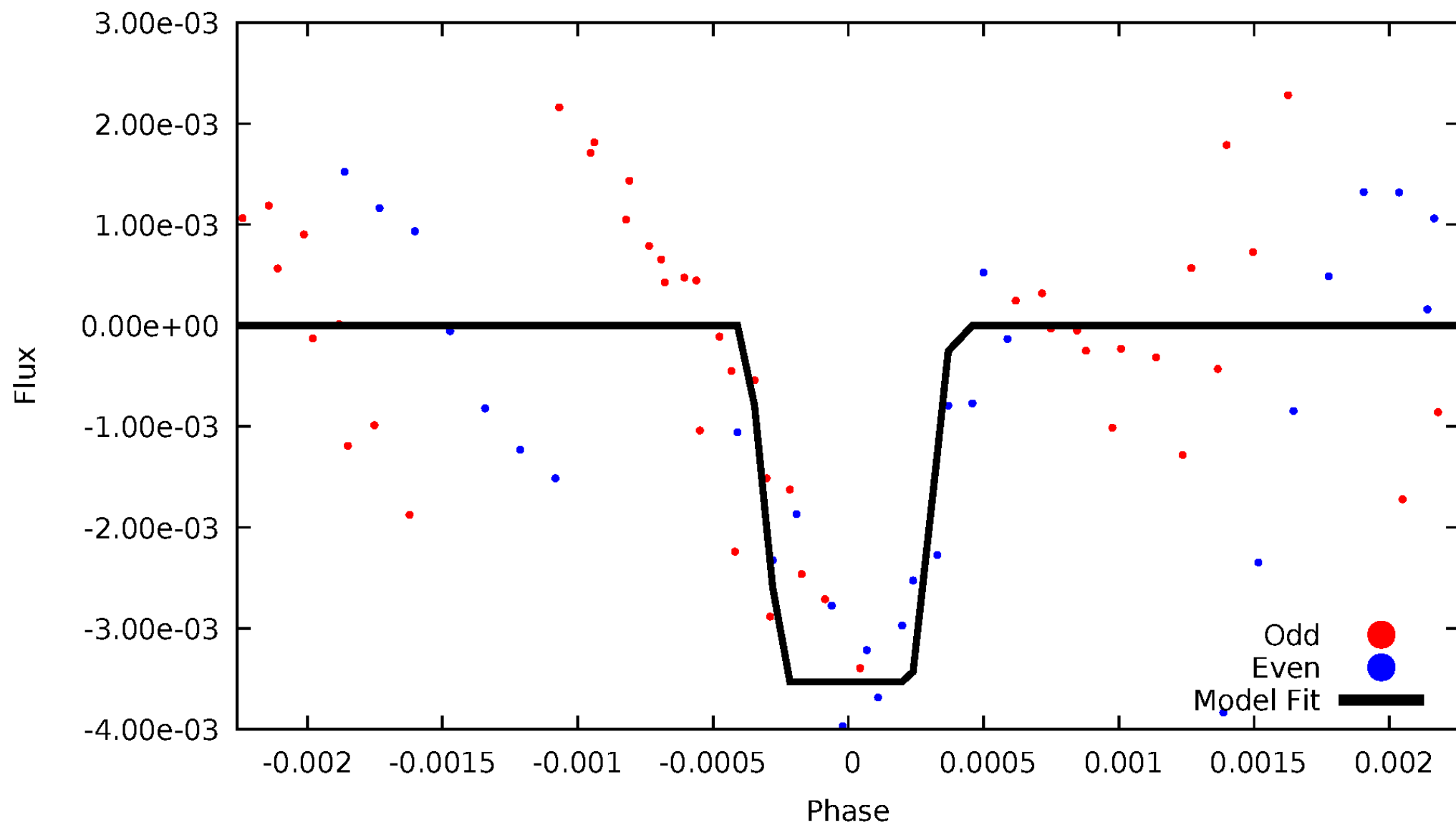
# DV Odd/Even

TCE 012117689-02



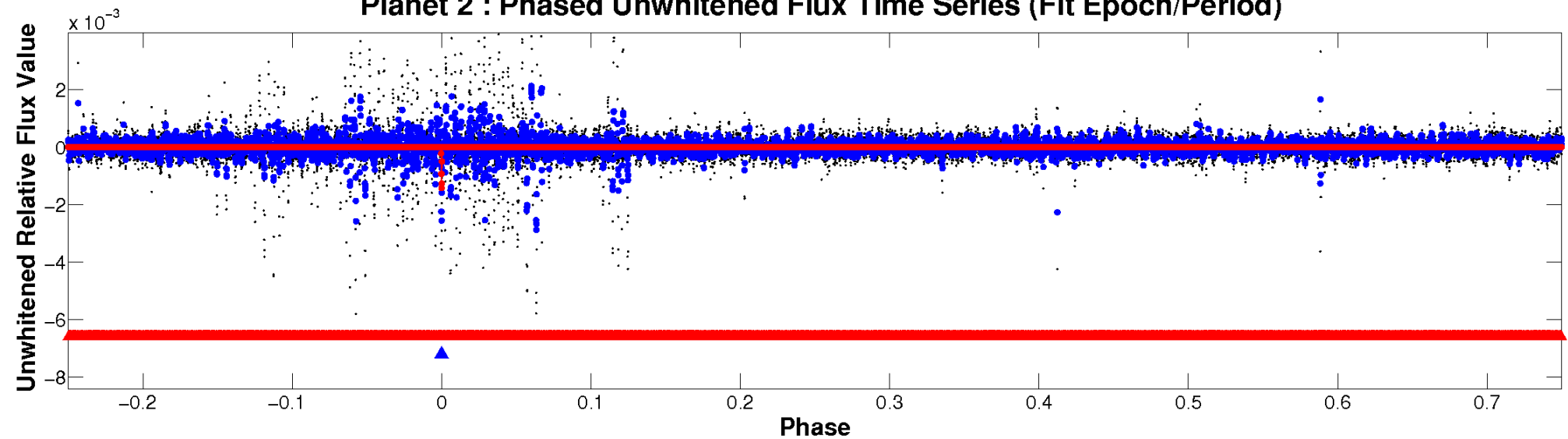
# ALT Odd/Even

TCE 012117689-02

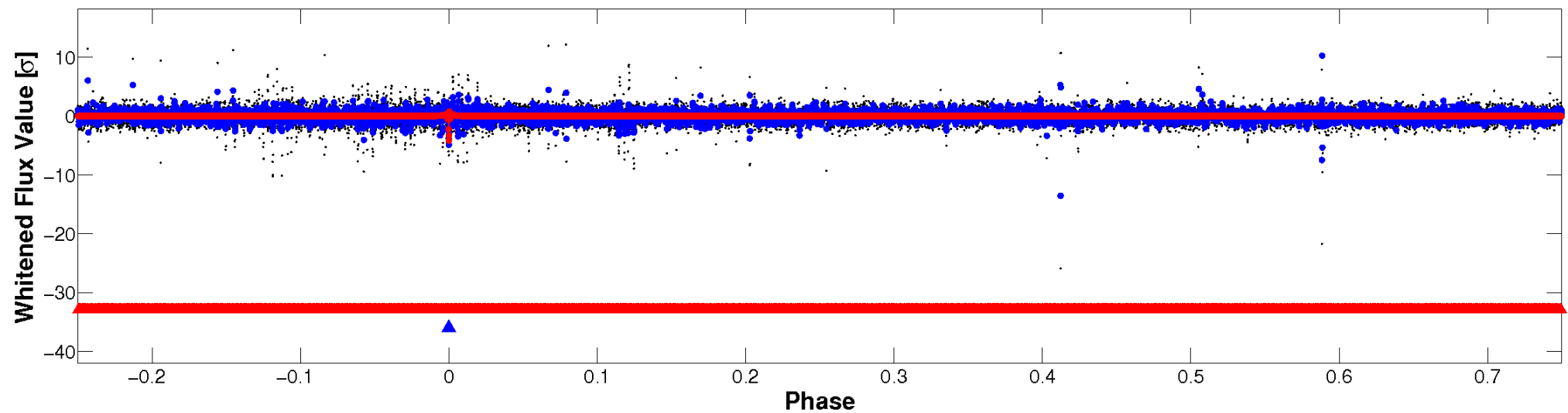


# Non-Whitened Vs. Whitened Light Curve

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

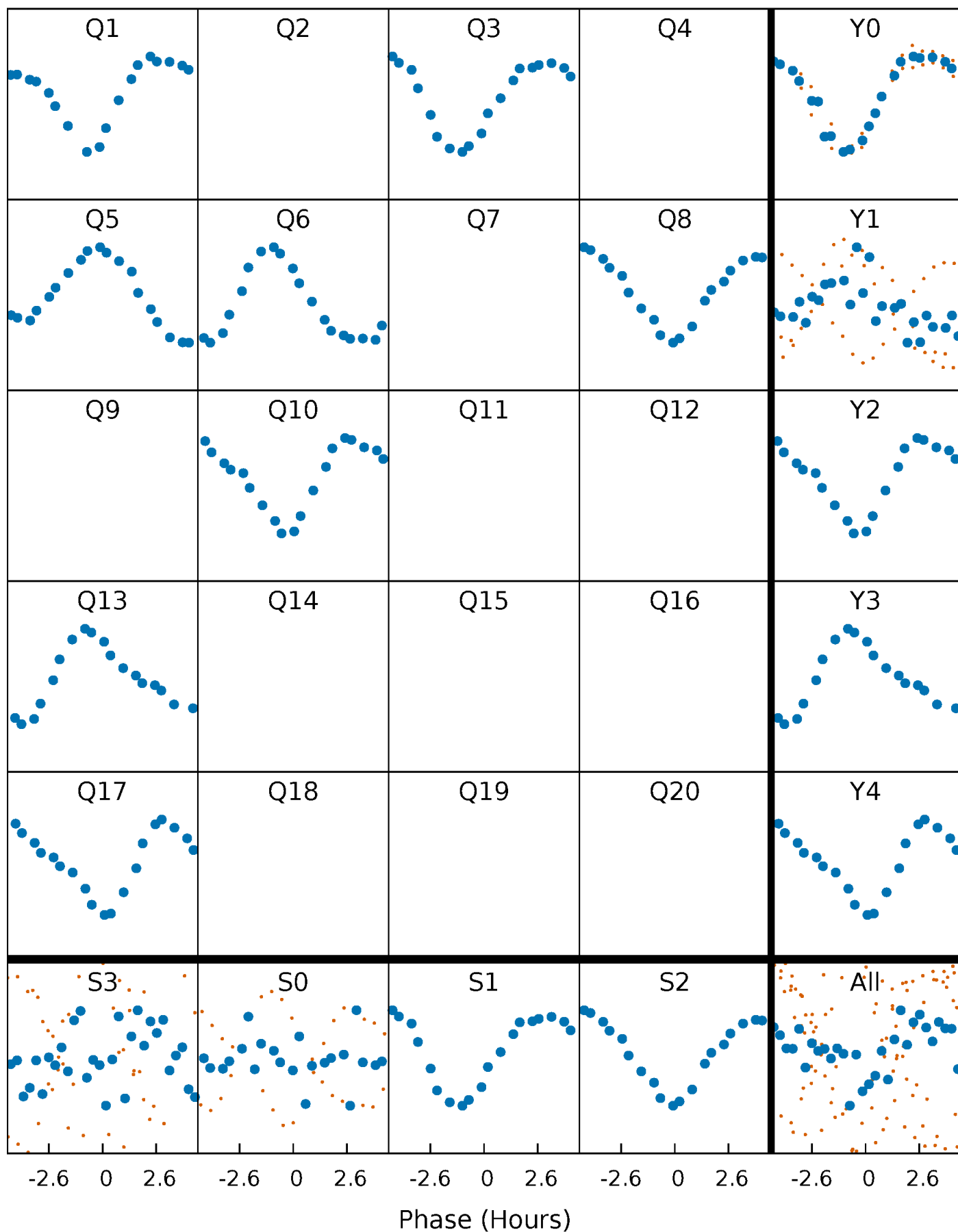


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



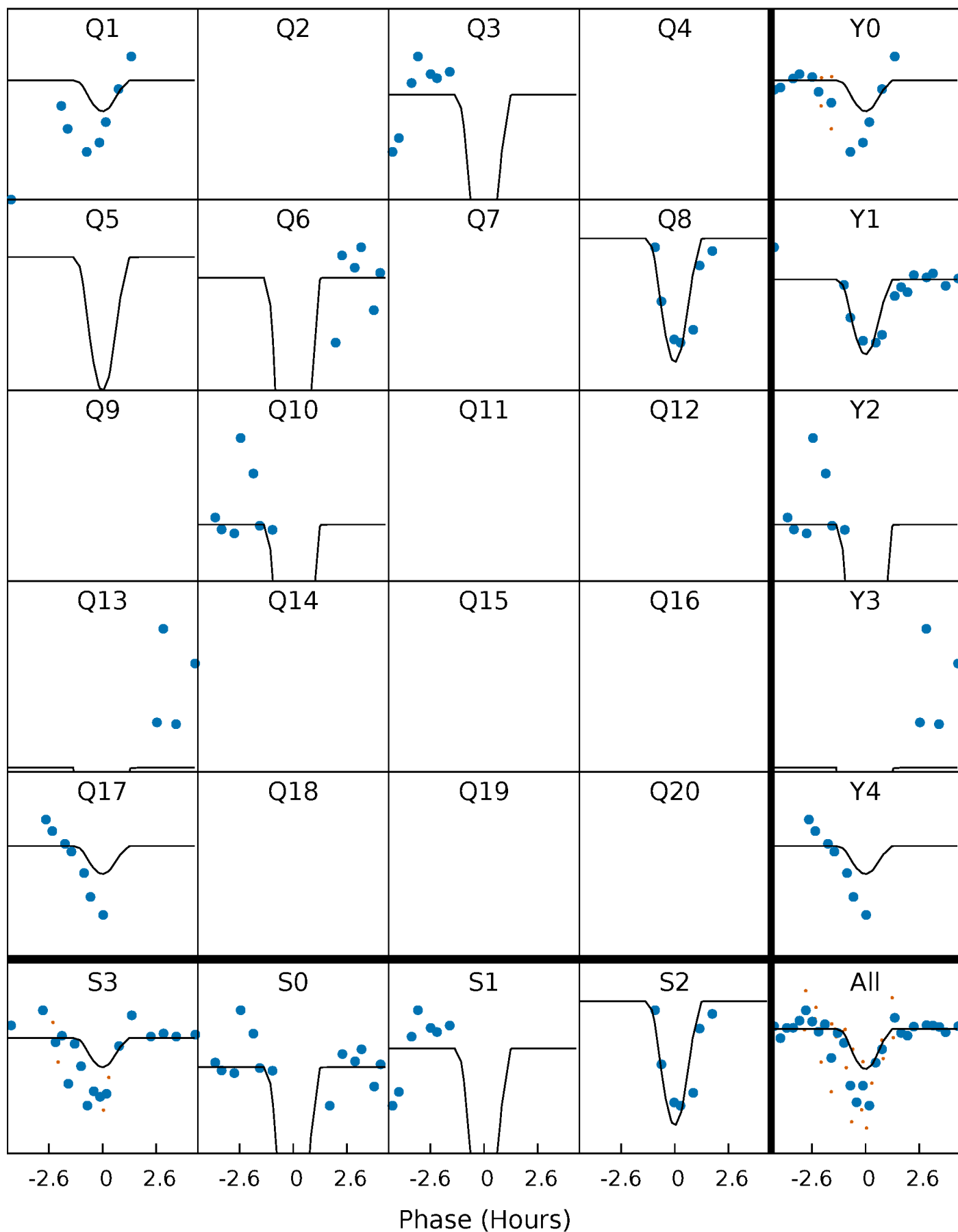
# PDC Quarter-Phased Transit Curves

TCE 012117689-02 P=157.296501 Days  $T_0=155.325473$  (BKJD)



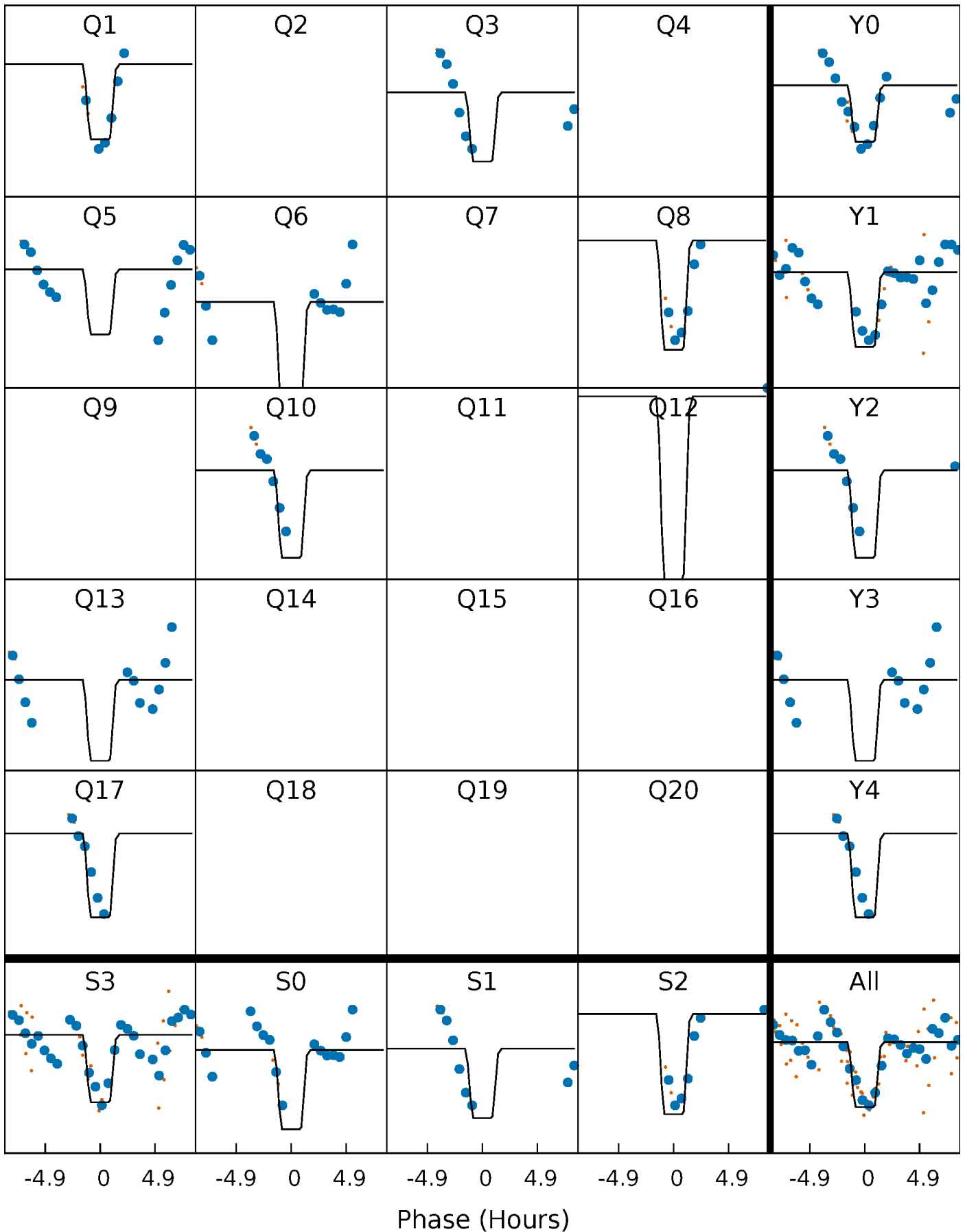
# DV Quarter-Phased Transit Curves

TCE 012117689-02 P=157.296501 Days  $T_0=155.325473$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 012117689-02 P=157.298752 Days  $T_0=155.300415$  (BKJD)

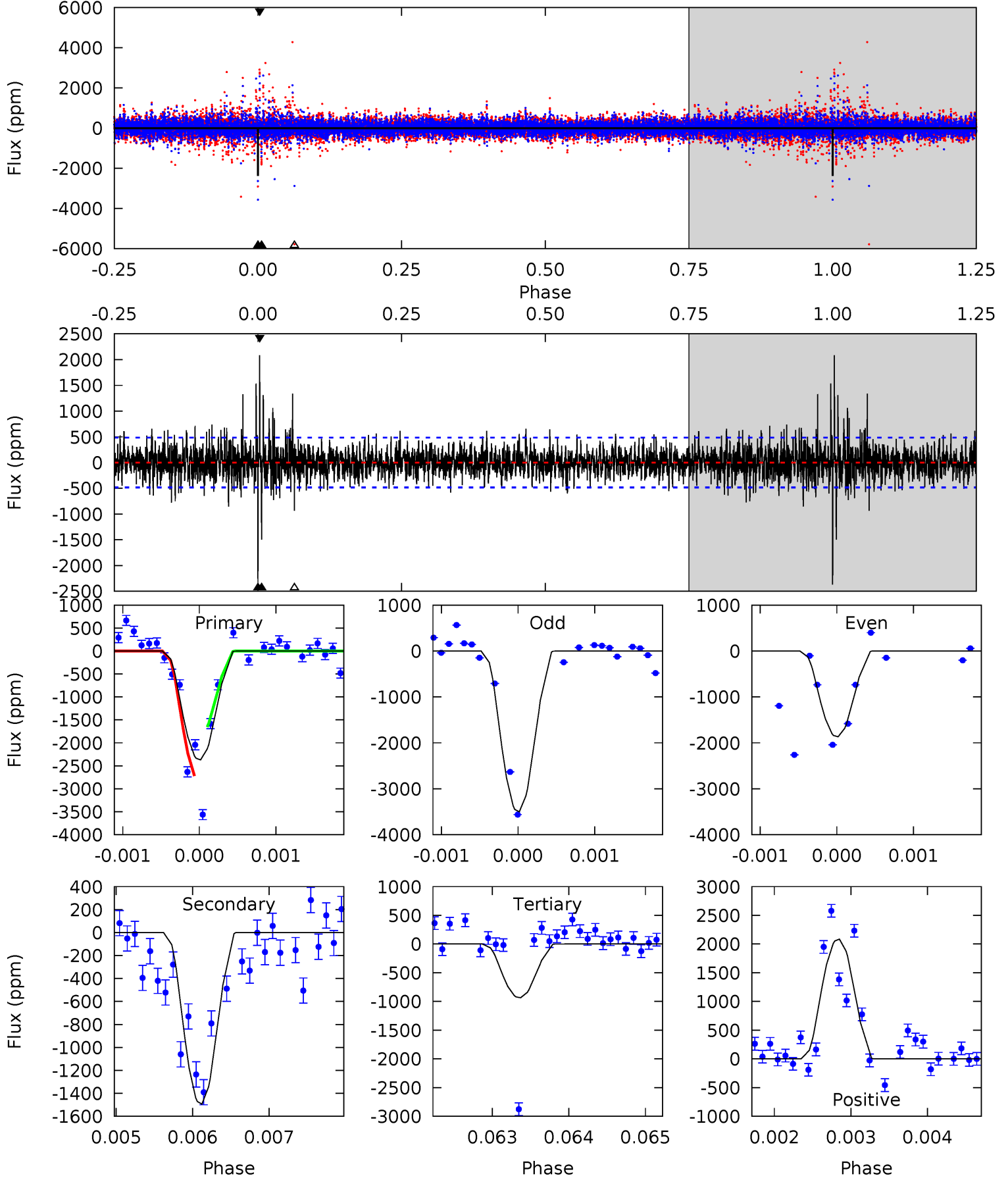




# DV Model-Shift Uniqueness Test

012117689-02, P = 157.296501 Days, E = 155.325473 Days

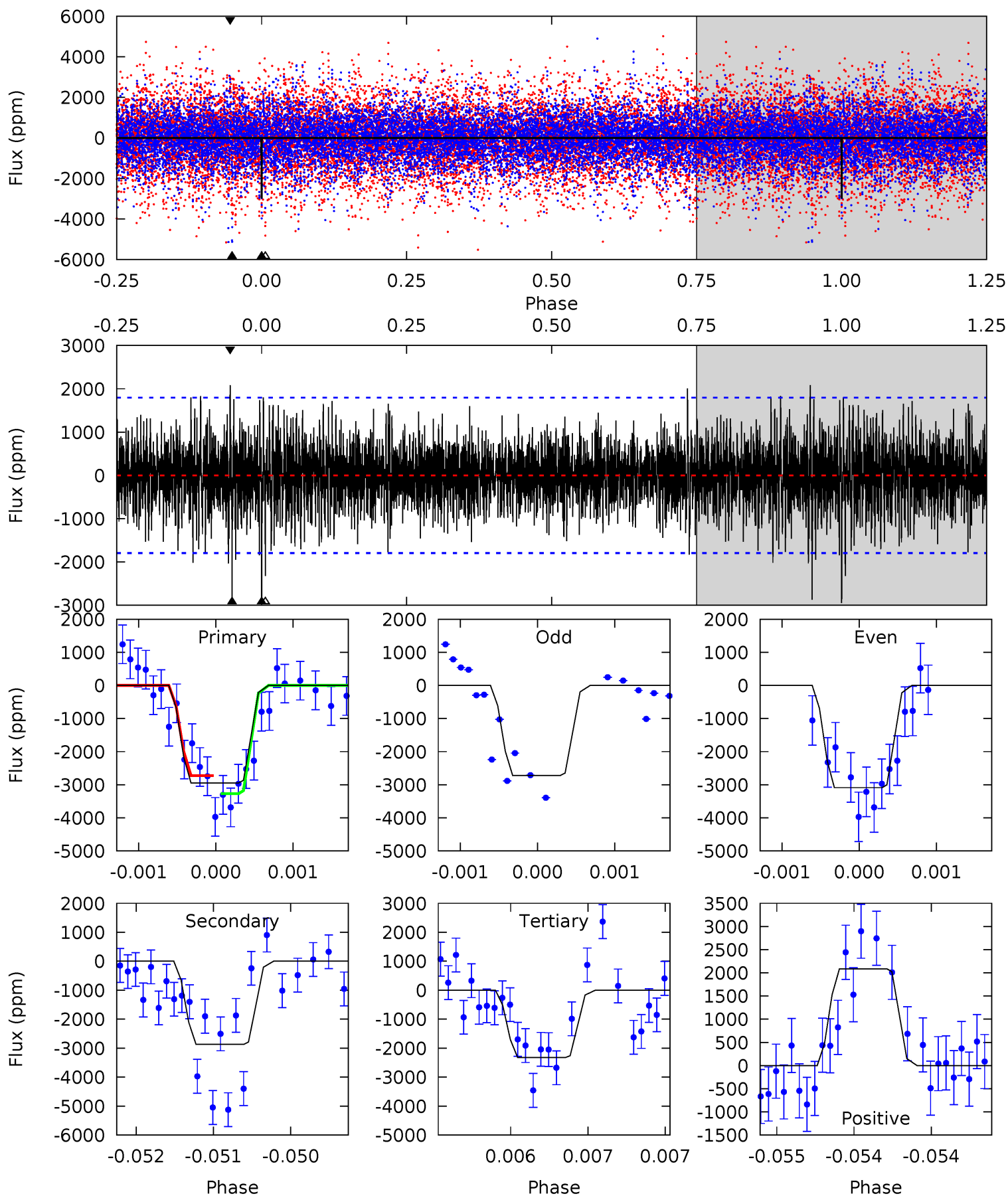
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
26.9	17.0	10.6	23.7	5.50	3.36	2.36	16.3	3.23	6.34	-6.72	7.37	0.88	0.47	0



# Alt Model-Shift Uniqueness Test

012117689-02, P = 157.298752 Days, E = 155.300415 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
9.06	8.82	7.15	6.41	5.52	3.40	1.75	1.91	2.65	1.67	2.42	0.54	1.05	0.41	0.83



### Stellar Parameters For KIC 012117689

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7171^{+200}_{-250}$	$4.077^{+0.175}_{-0.175}$	$-0.140^{+0.250}_{-0.350}$	$1.851^{+0.559}_{-0.457}$	$1.488^{+0.209}_{-0.232}$	$0.331^{+0.327}_{-0.166}$
	+3%/-3%	+4%/-4%	+179%/-250%	+30%/-25%	+14%/-16%	+99%/-50%
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 012117689-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-1494 \pm 88$	$59.48^{+60.28}_{-40.81}$	$742^{+62}_{-48}$	$3178^{+1524}_{-574}$	$96^{+879}_{-72}$
Alt.	$-2869 \pm 325$	$61.30^{+61.64}_{-41.72}$	$745^{+54}_{-49}$	$3510^{+1844}_{-673}$	$176^{+1560}_{-131}$

$T_{max}$  = 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

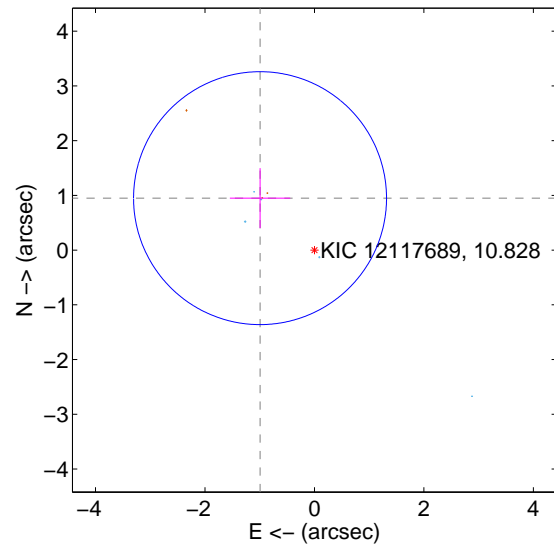
Supplemental centroid analysis for 012117689-02. **Kepler magnitude: 10.83.** Transit SNR 9.41

There are 5 quarters with good PRF difference image offsets

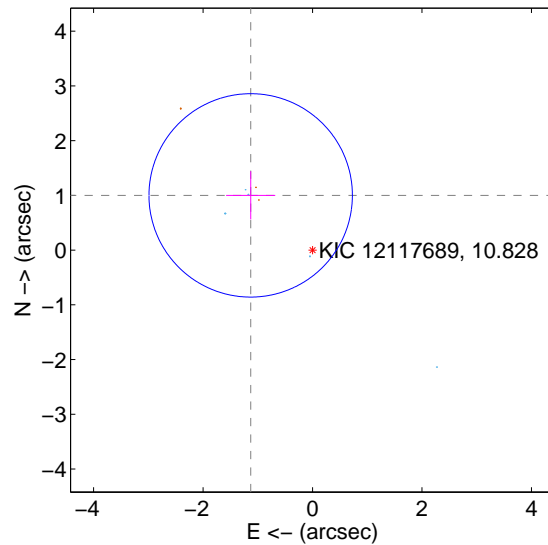
The direct PRF centroid is offset from the target star catalog position by about 0.13 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.374 \pm 0.770$	1.78	$0.994 \pm 0.552$	$0.949 \pm 0.548$
PRF-fit source offset from KIC position	$1.509 \pm 0.619$	2.44	$1.130 \pm 0.449$	$1.000 \pm 0.440$
photometric centroid source offset	$0.21 \pm 0.18$	1.14	$0.03 \pm 0.25$	$0.21 \pm 0.18$

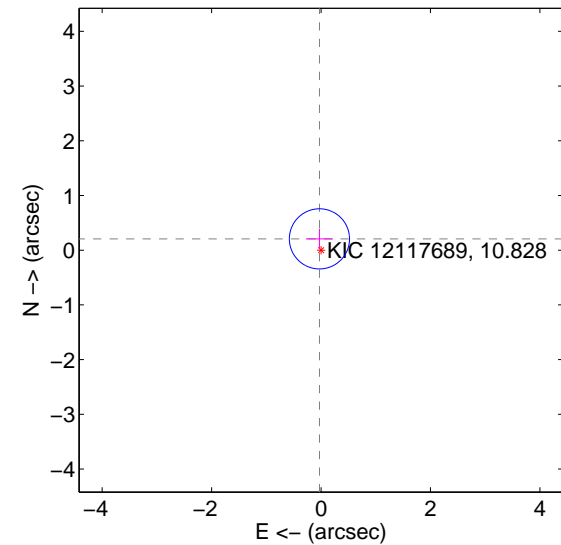
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

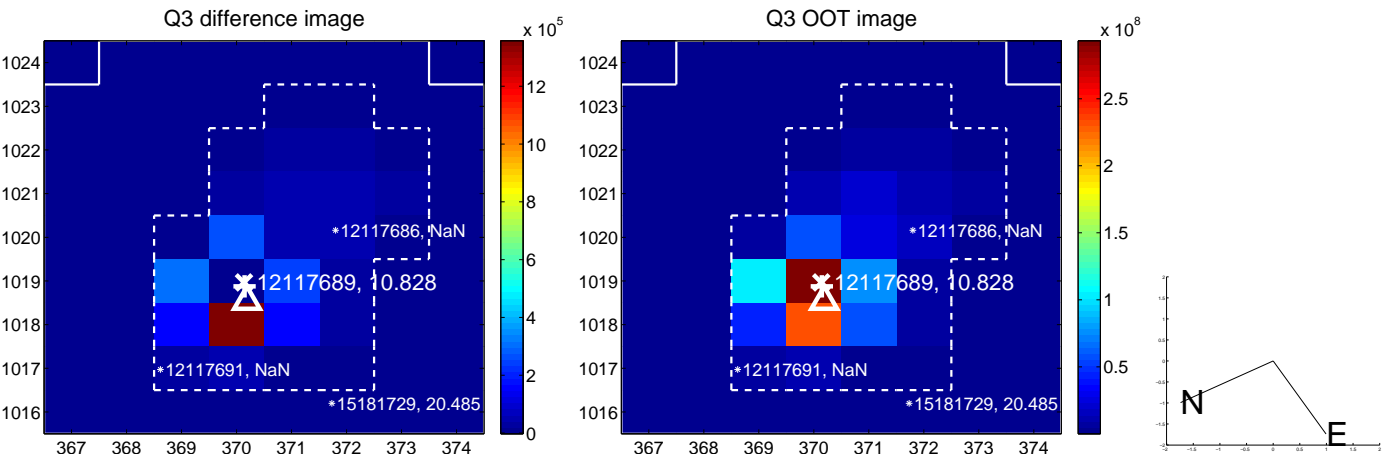
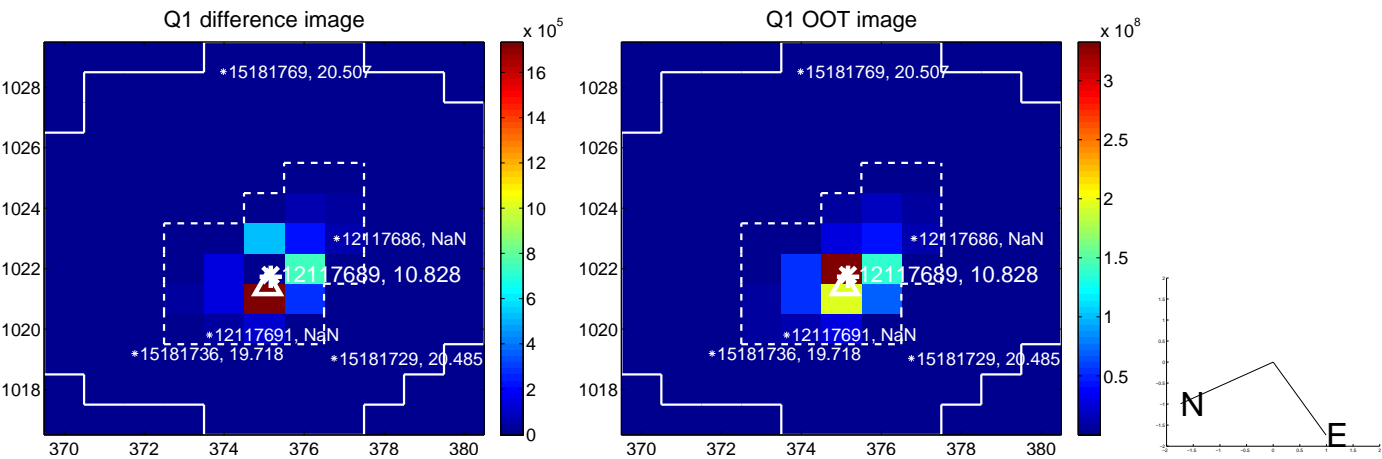


offset from photometric centroids



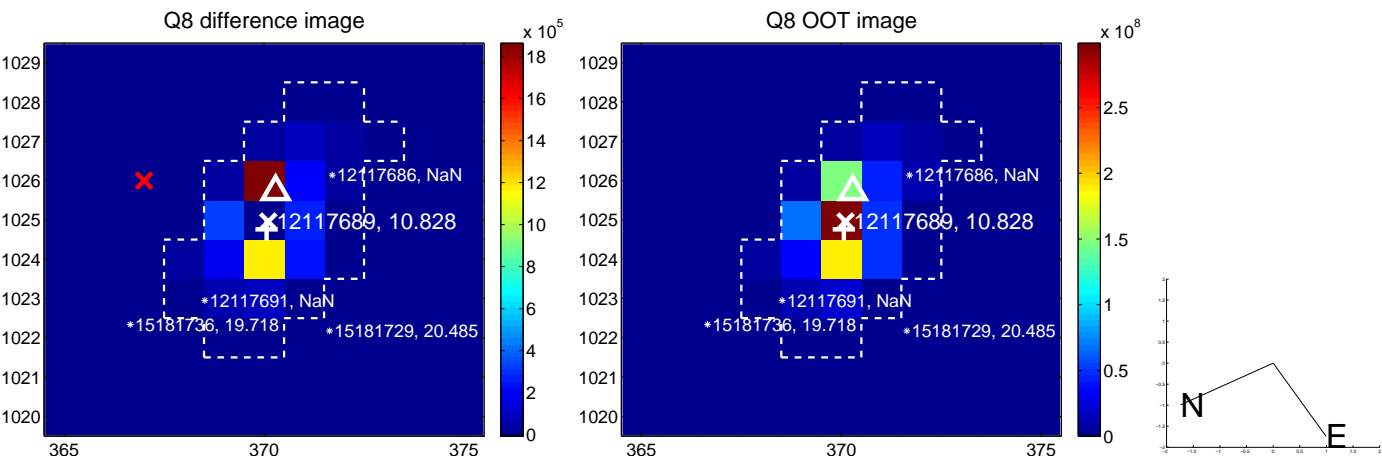
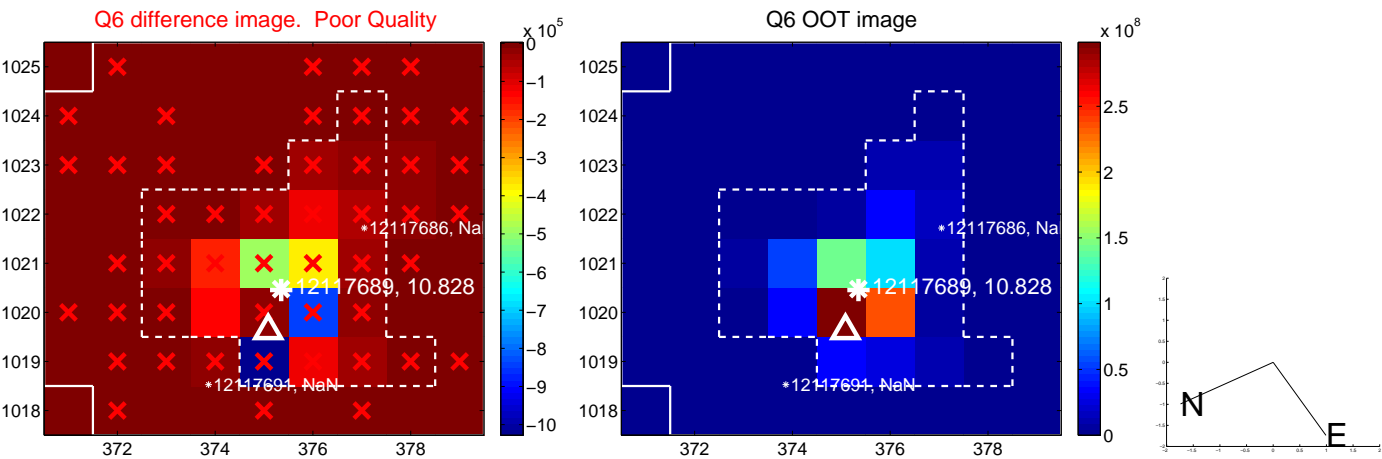
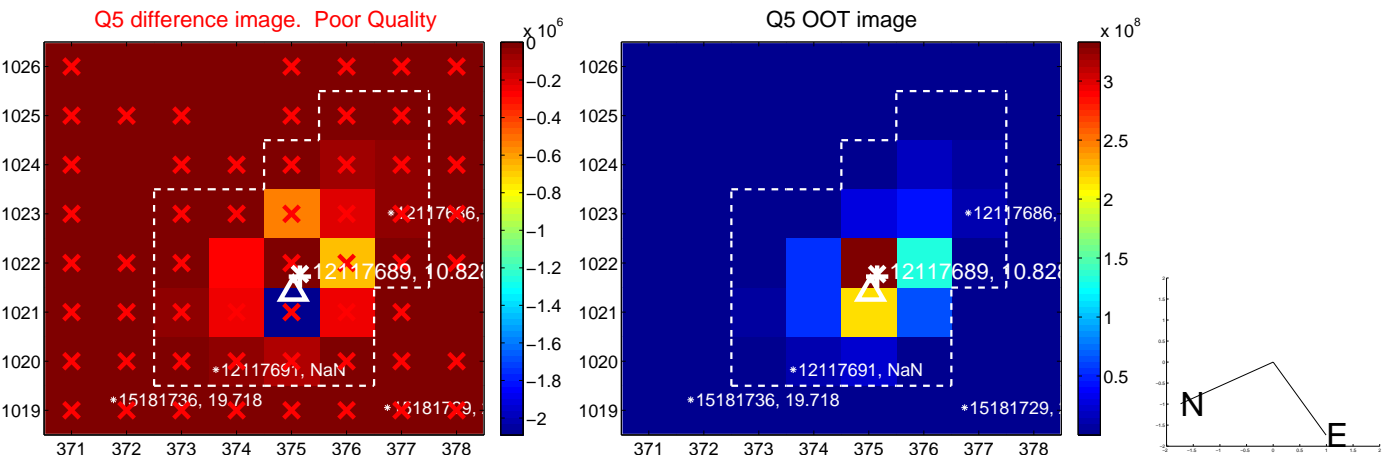
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

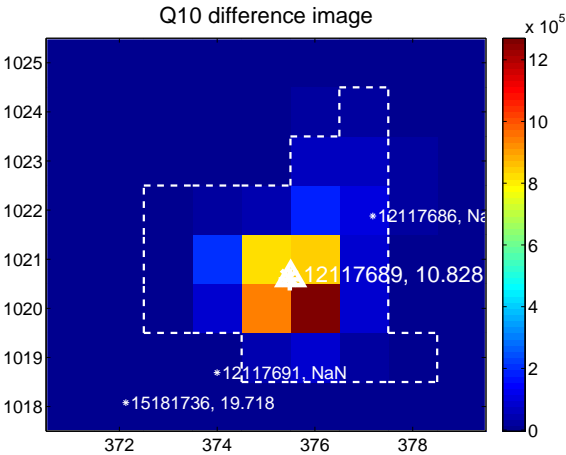
Q9 no difference image



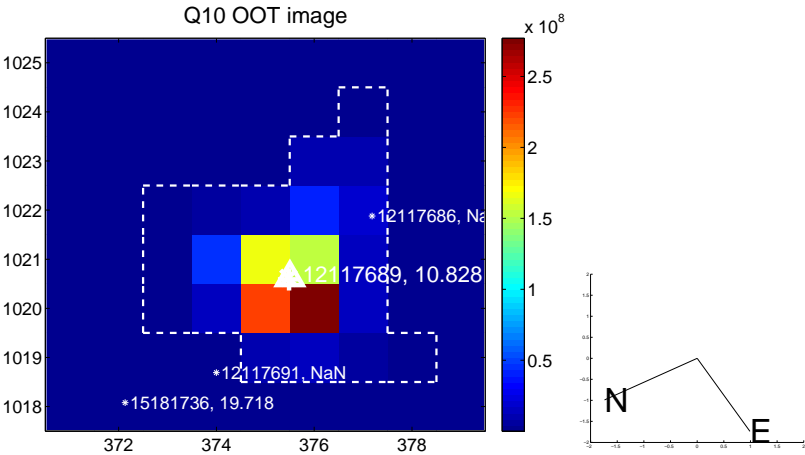
Q9 no OOT image



Q10 difference image



Q10 OOT image



Q11 no difference image



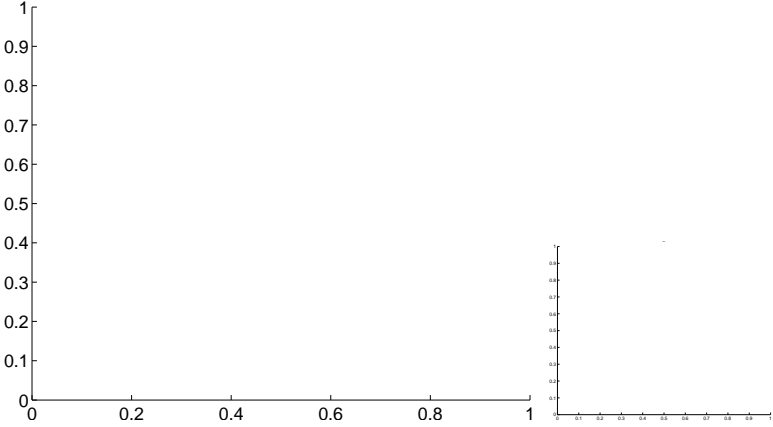
Q11 no OOT image



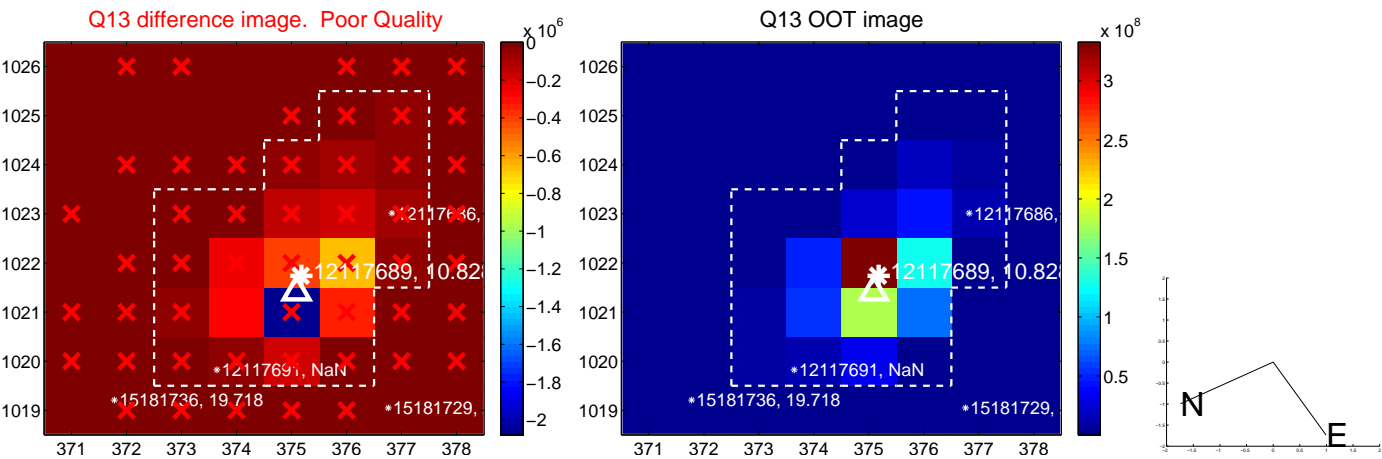
Q12 no difference image



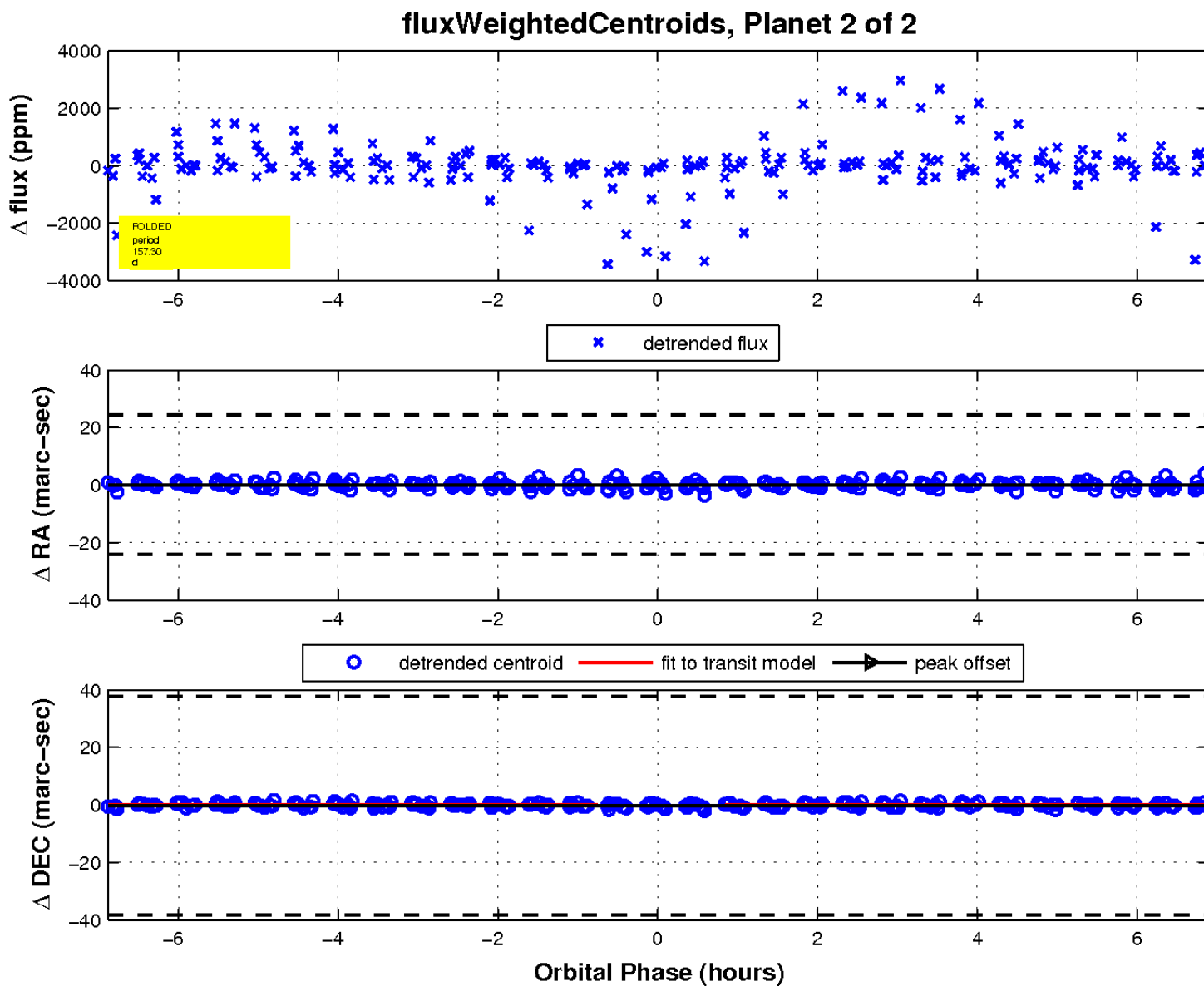
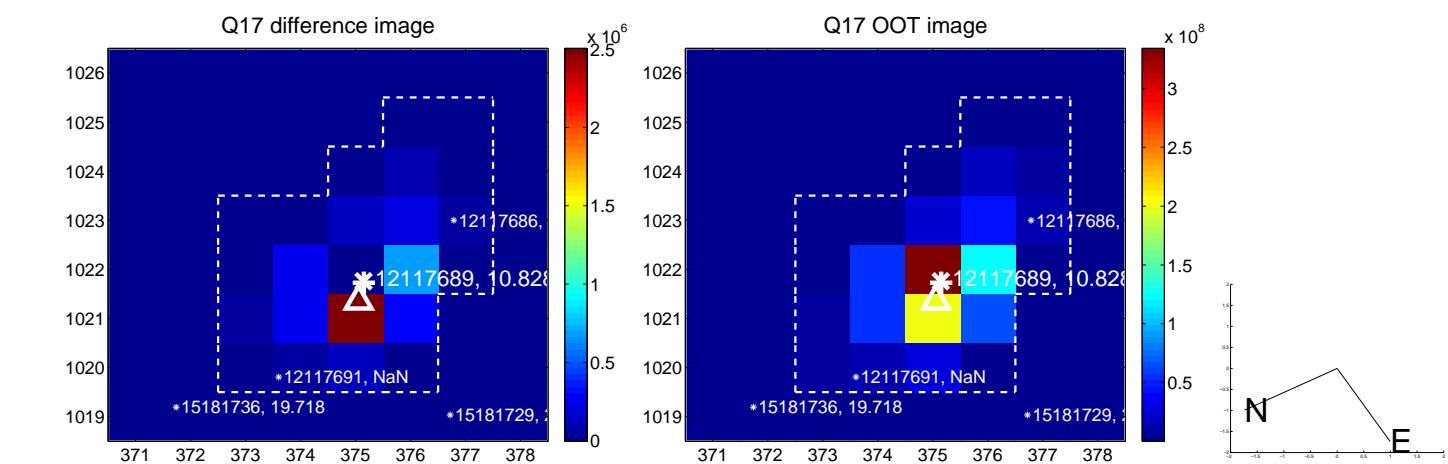
Q12 no OOT image



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



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



UKIRT Image

