

# KIC 012400729

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
012400729-01	OBS	No	4.658710	132.470799	6288.9	1.796	157.9	47.0	0.65	5065	9.72	112.12
012400729-02	OBS	No	0.931893	131.527991	1331.8	1.831	440.5	31.6	0.65	5065	2.94	958.40

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
012400729-01	OBS	FP	0.00	1	0	0	0	LPP_DV
012400729-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT

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

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

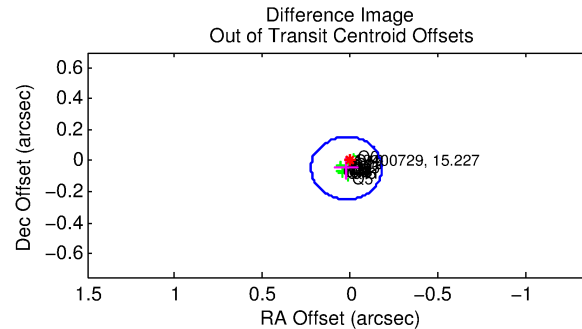
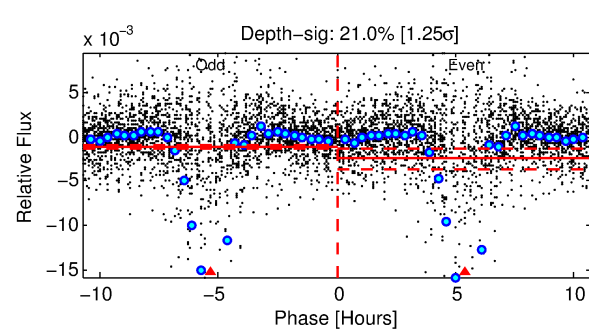
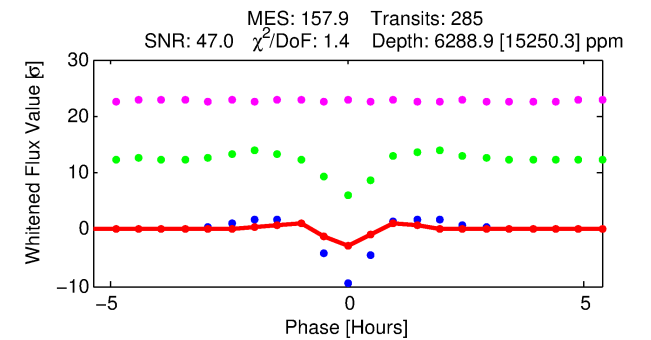
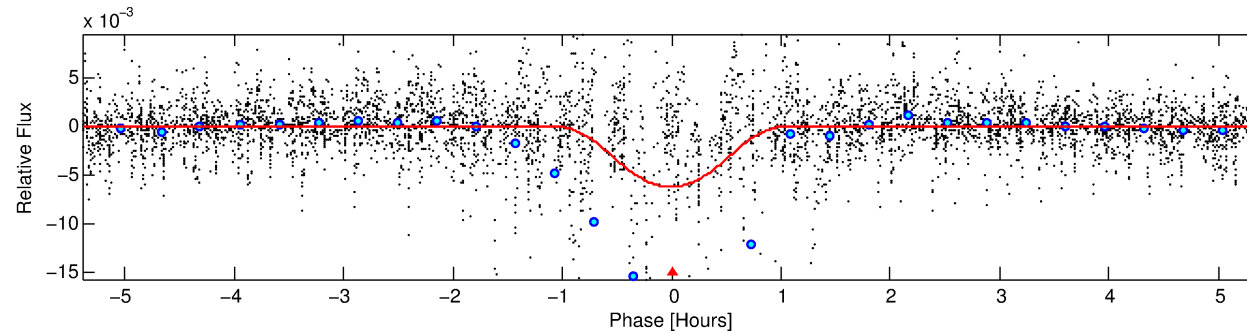
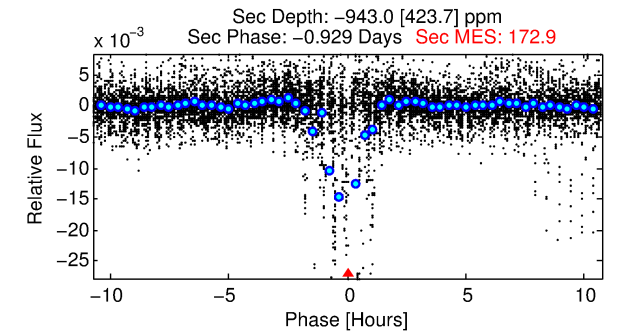
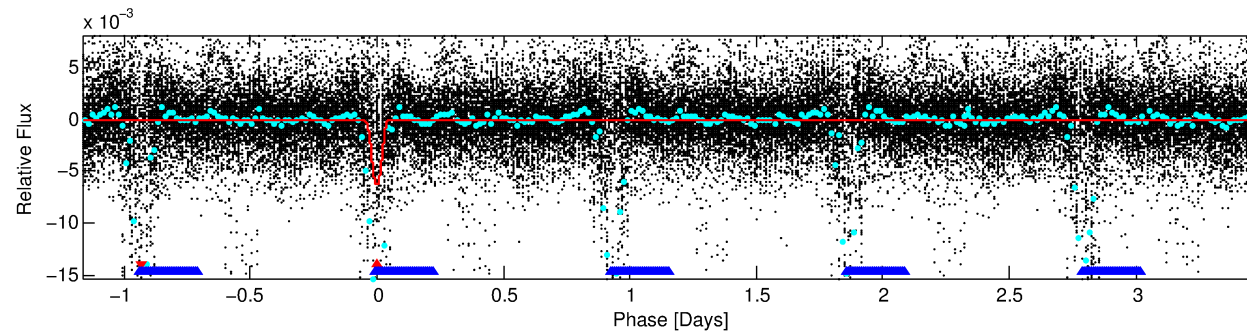
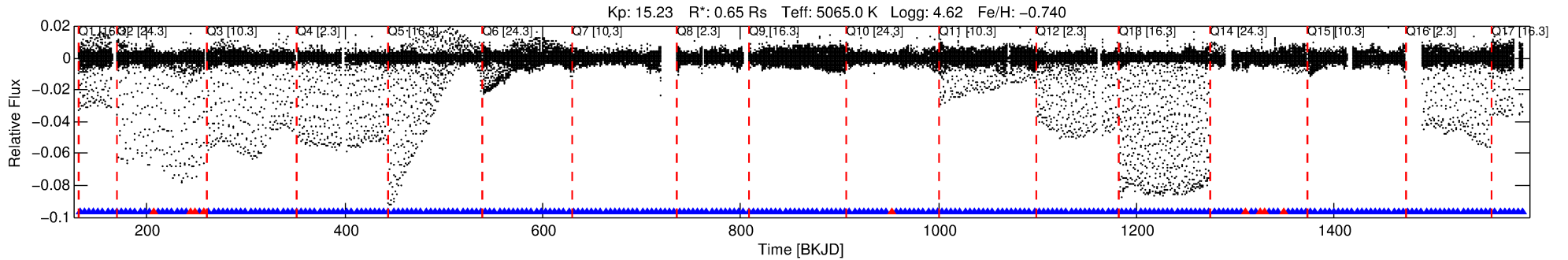
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 012400729-01

No Significant Match Found

# DV One-Page Summary

KIC: 12400729 Candidate: 1 of 2 Period: 4.659 d



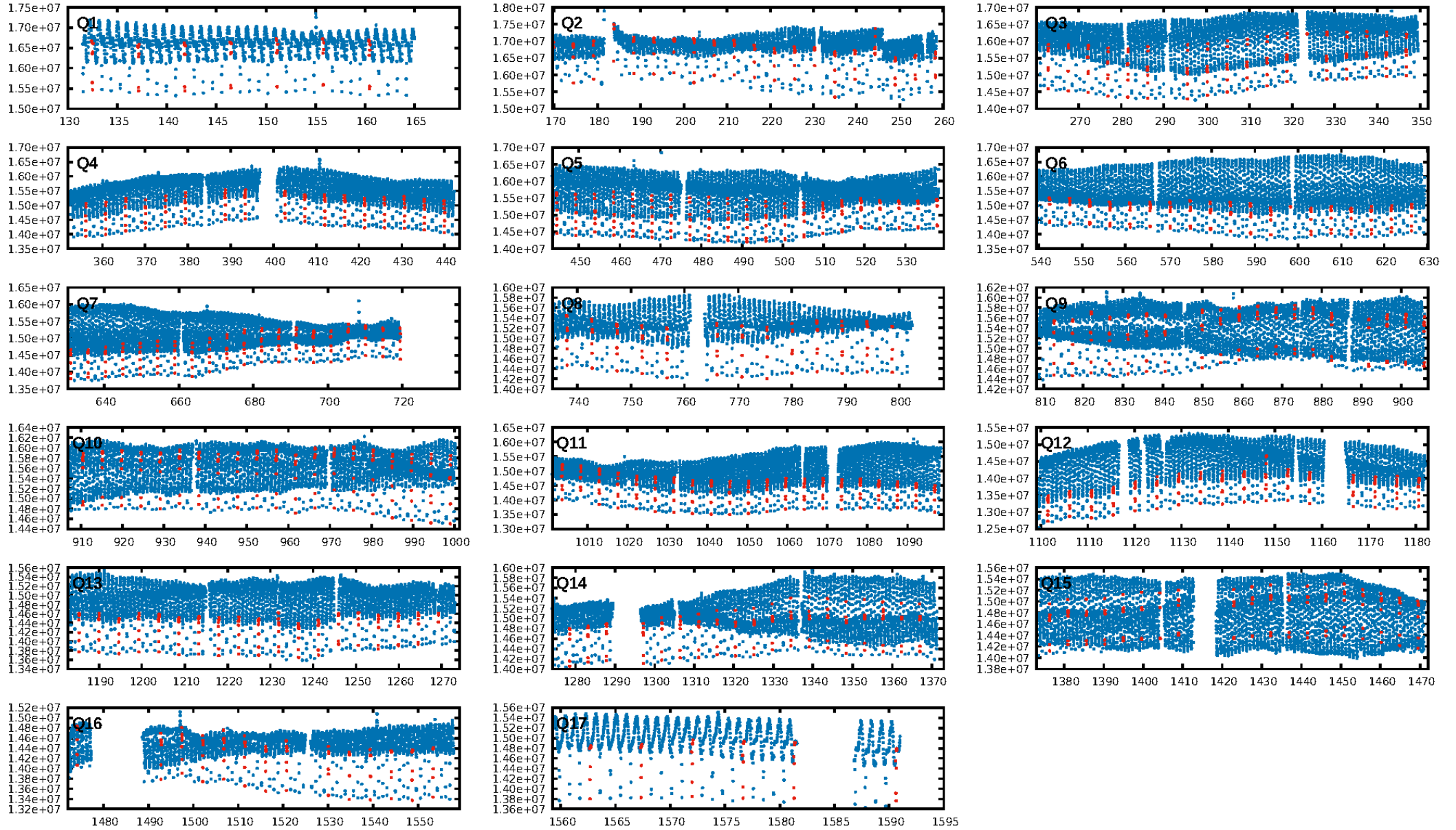
## DV Fit Results:

Period = 4.65871 [0.00000] d  
Epoch = 132.4708 [0.0005] BKJD  
Rp/R\* = 0.1379 [0.1707]  
a/R\* = 10.81 [2.17]  
b = 1.00 [0.03]  
Seff = 112.12 [19.29]  
Teff = 830 [36] K  
Rp = 9.72 [12.07] Re  
a = 0.0468 [0.0037] AU  
Ag = N/A  
Teffp = N/A

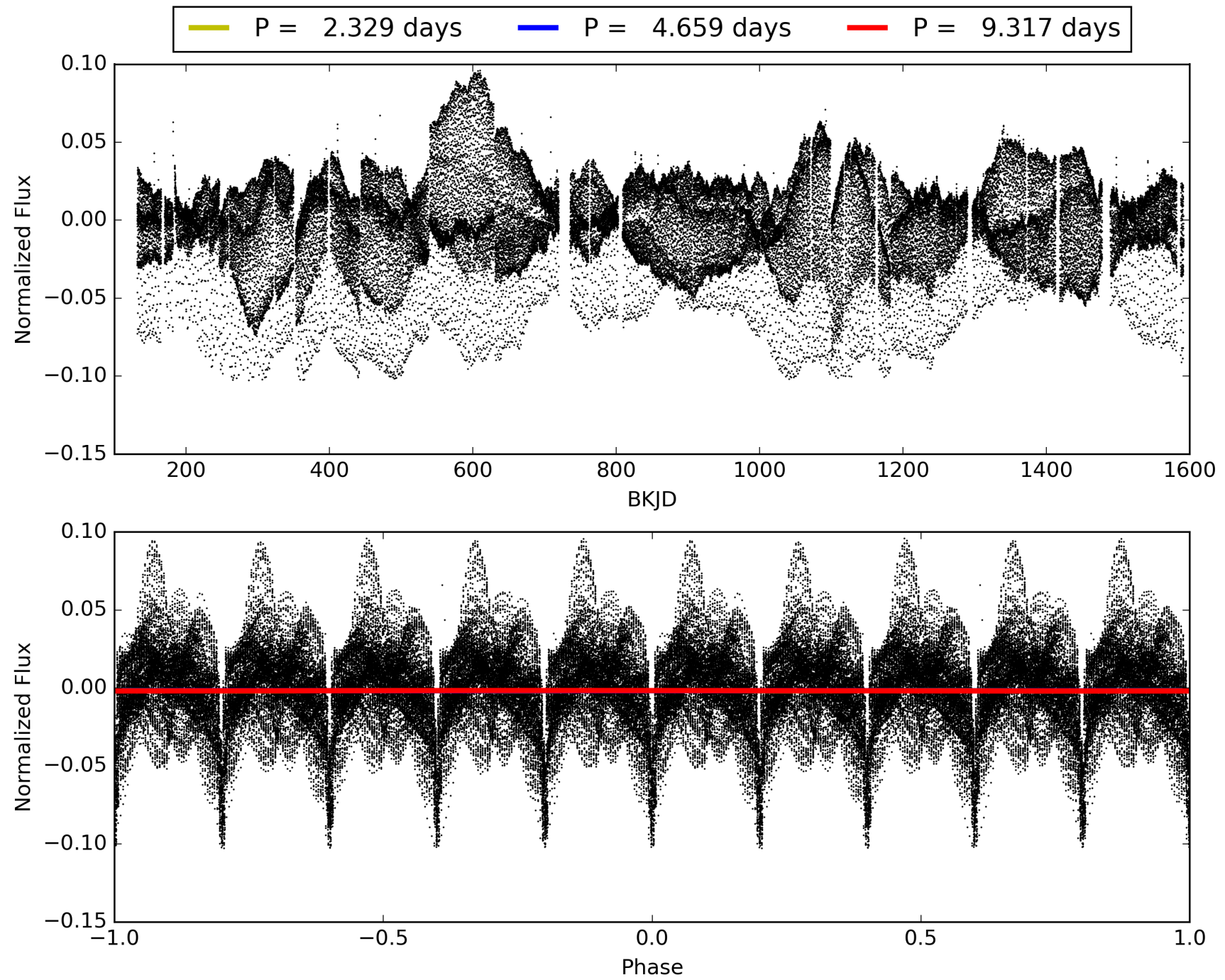
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [34.88σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 0.97 [263/272]  
GhostDiagnostic-chr: 0.6609  
Centroid-sig: 0.0%  
Centroid-so: 0.905 arcsec [13.47σ]  
OotOffset-rm: 0.052 arcsec [0.78σ]  
KicOffset-rm: 0.127 arcsec [1.86σ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 1.00 [17/17]  
DiffImageOverlap-fno: 0.00 [0/17]

# TCE 012400729-01, PDC Light Curves

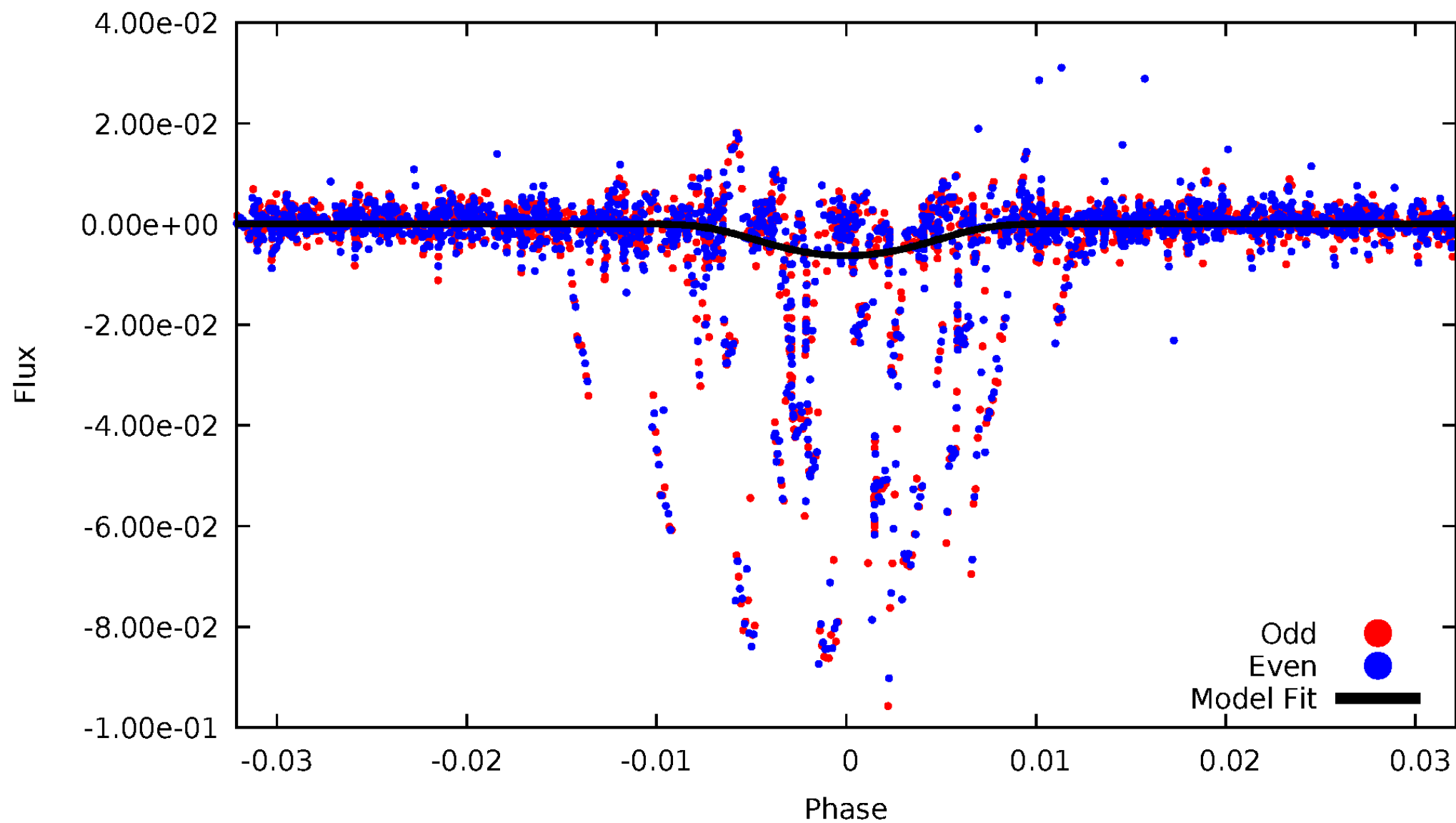


TCE 012400729-01



DV Odd/Even

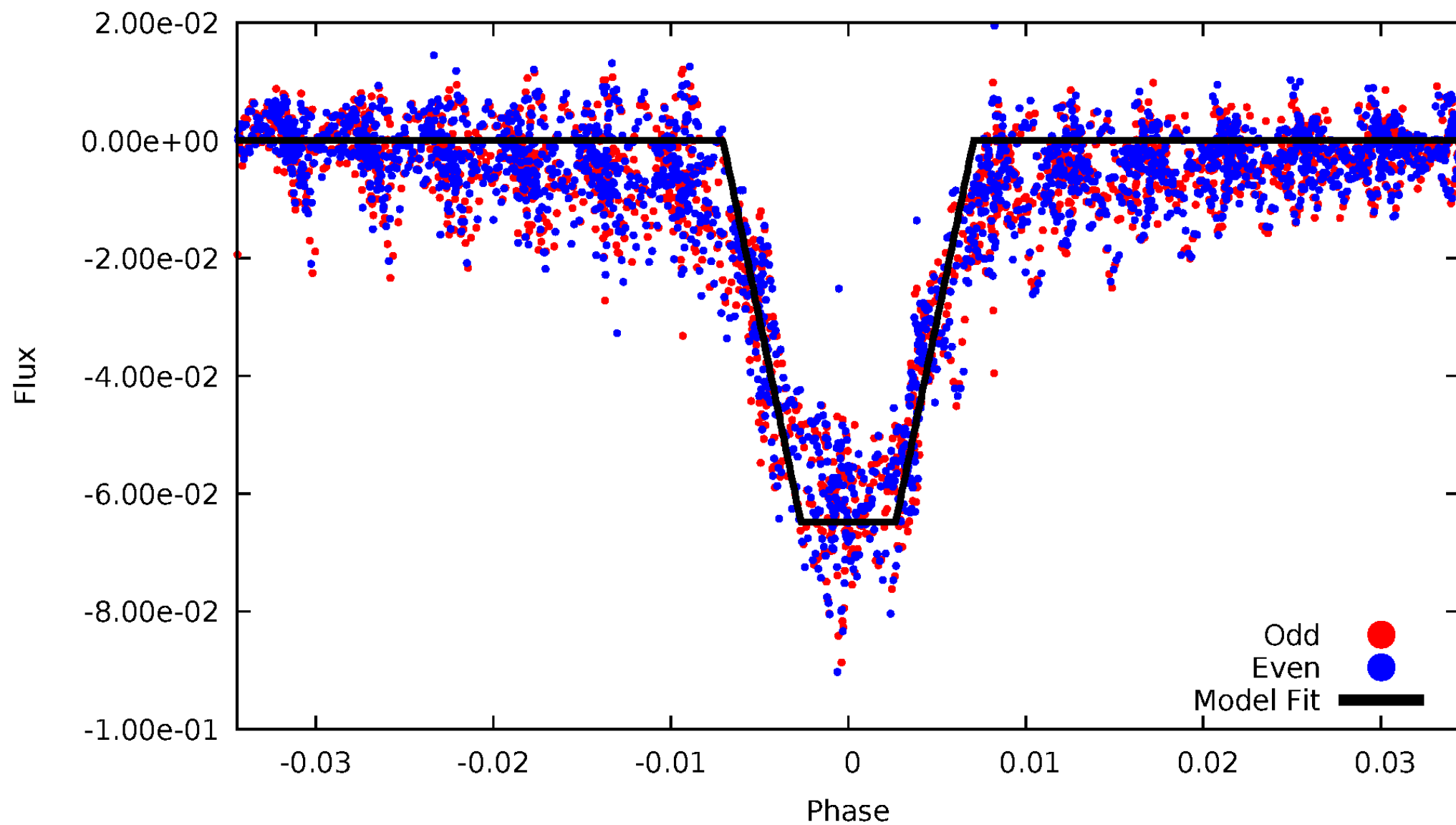
TCE 012400729-01





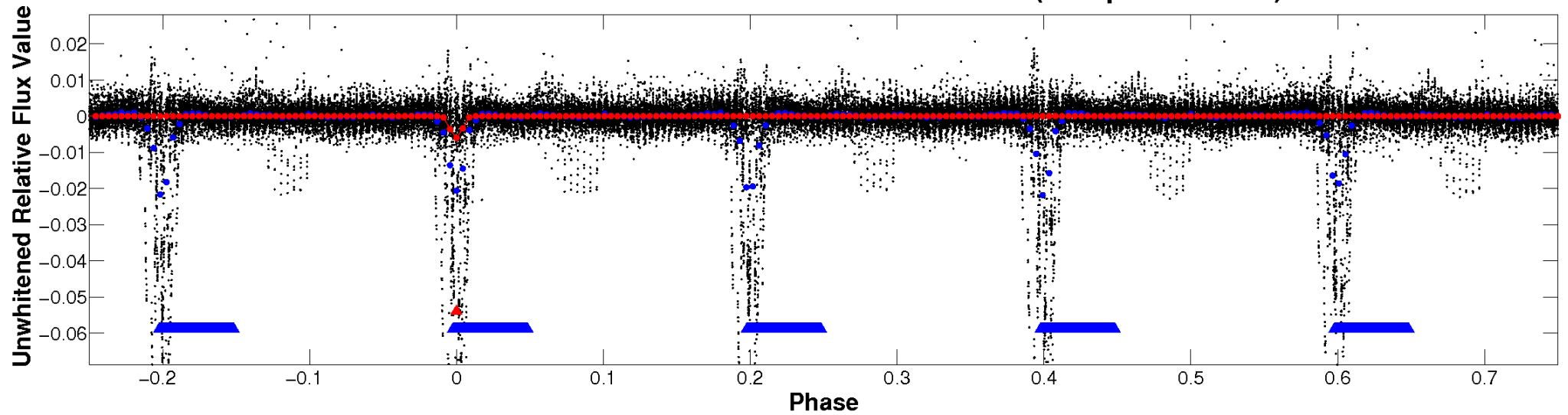
# ALT Odd/Even

TCE 012400729-01

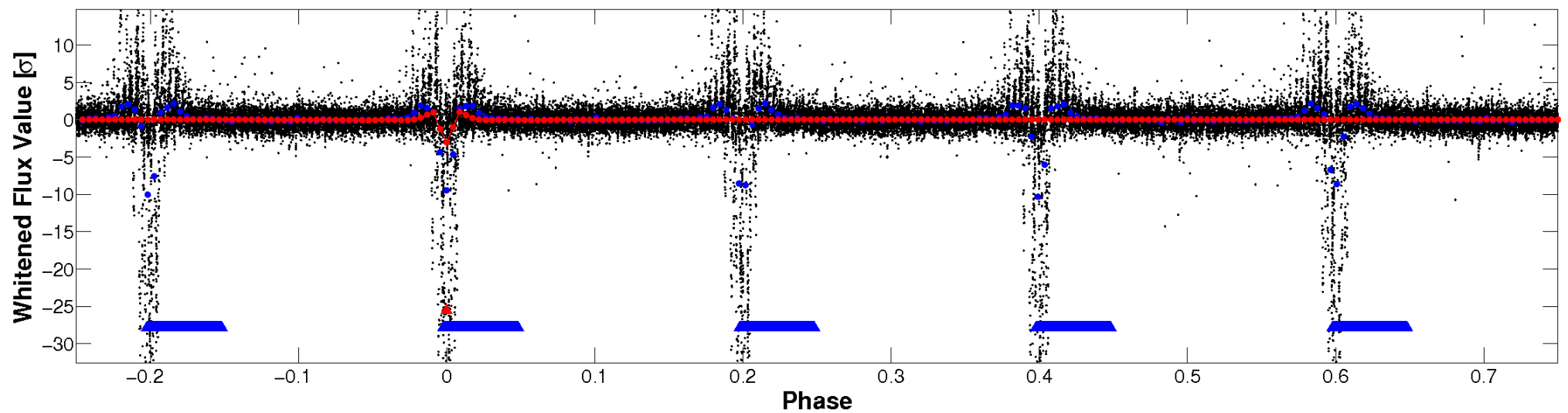


# Non-Whitened Vs. Whitened Light Curve

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

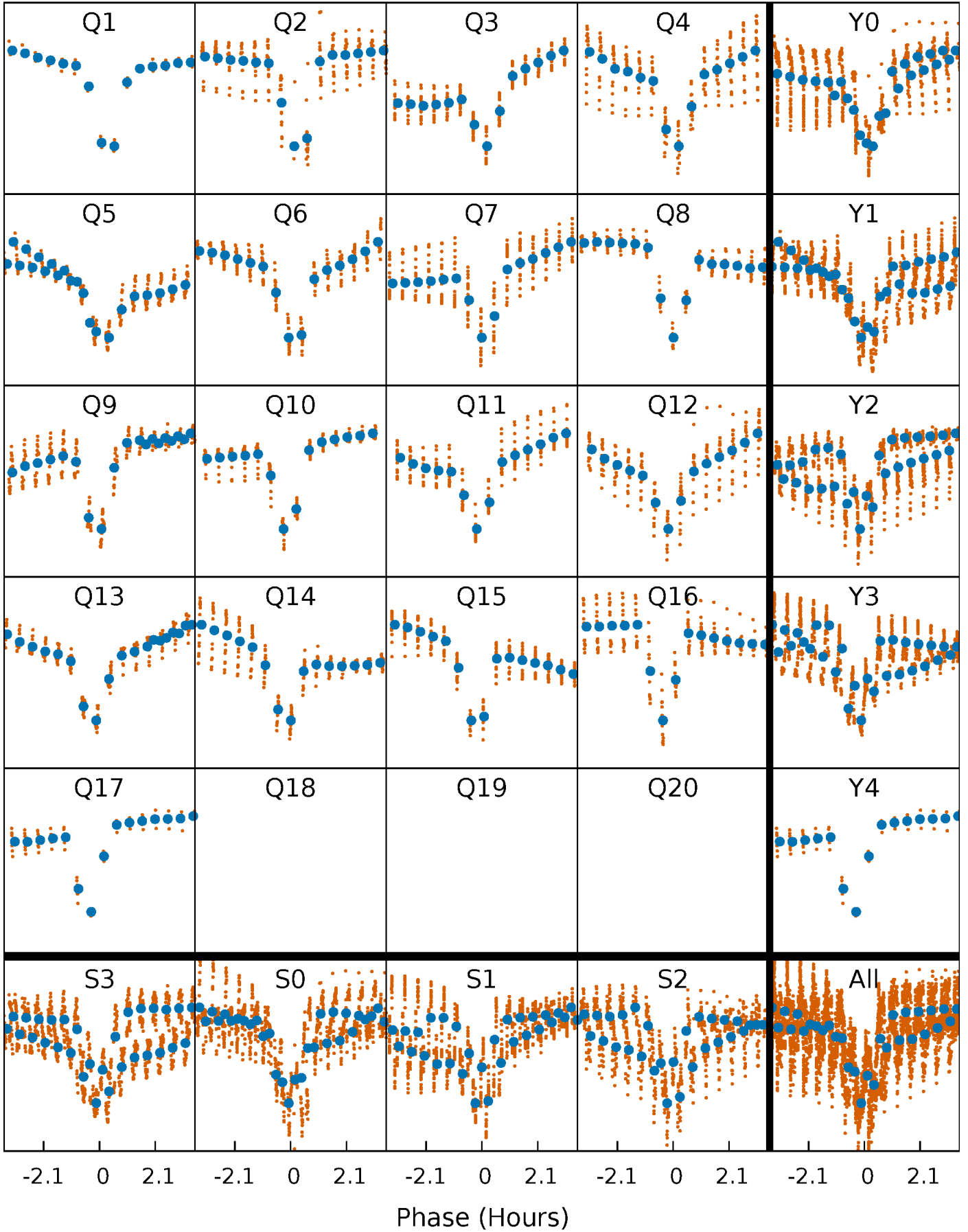


**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

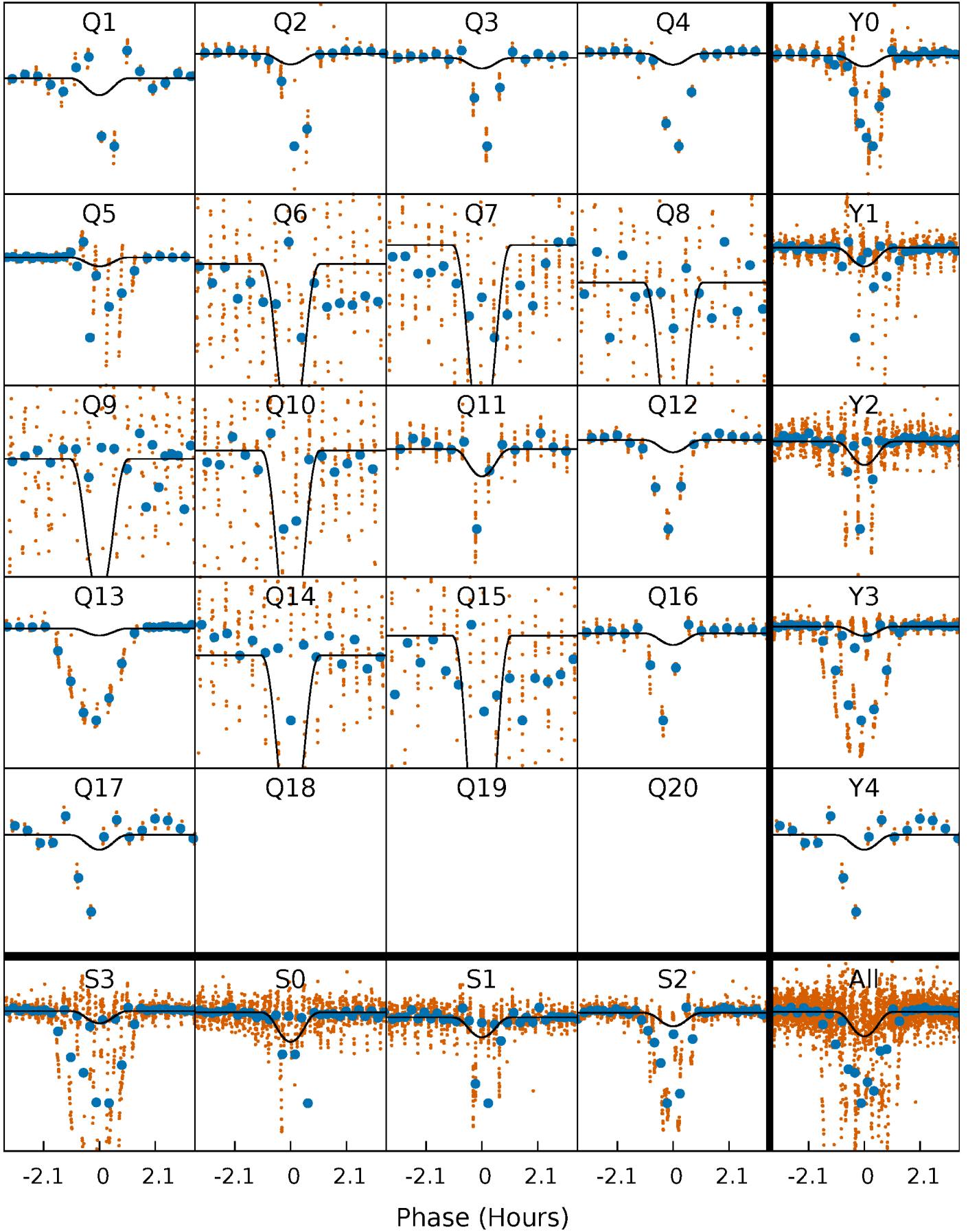
TCE 012400729-01   P= 4.658710 Days    $T_0=132.470799$  (BKJD)





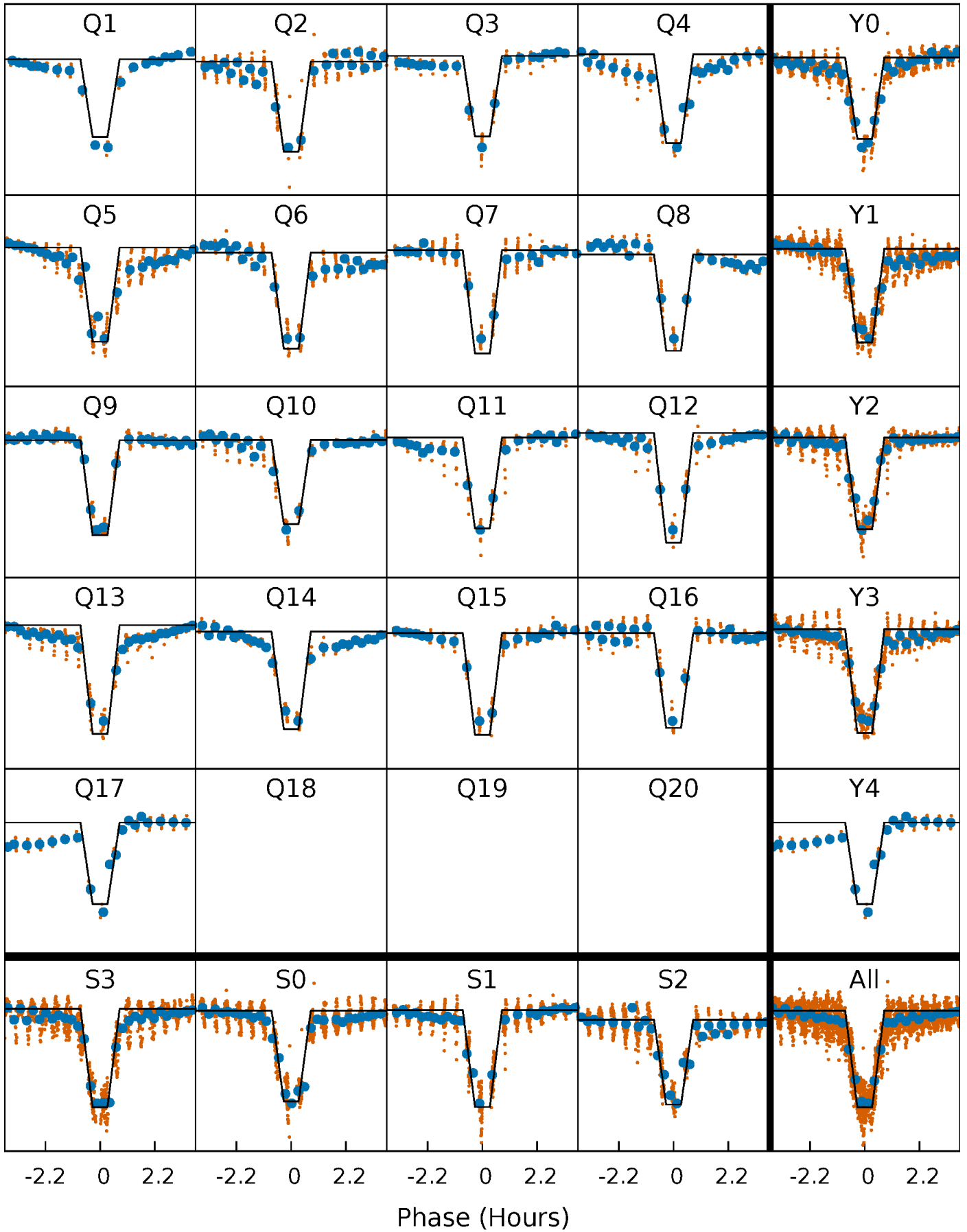
# DV Quarter-Phased Transit Curves

TCE 012400729-01 P= 4.658710 Days  $T_0=132.470799$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

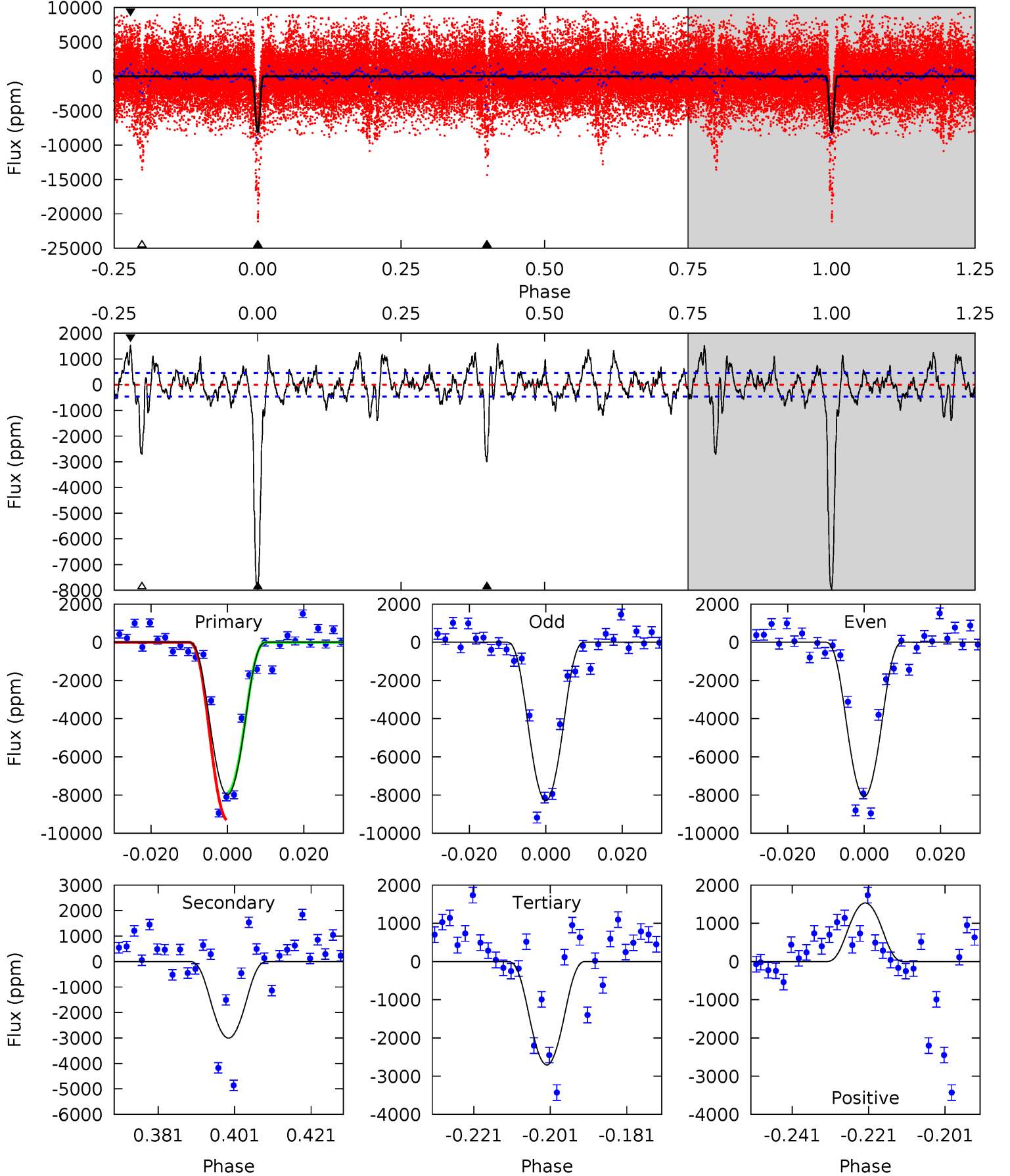
TCE 012400729-01   P= 4.658622 Days    $T_0=132.481931$  (BKJD)



# DV Model-Shift Uniqueness Test

012400729-01, P = 4.658710 Days, E = 127.812089 Days

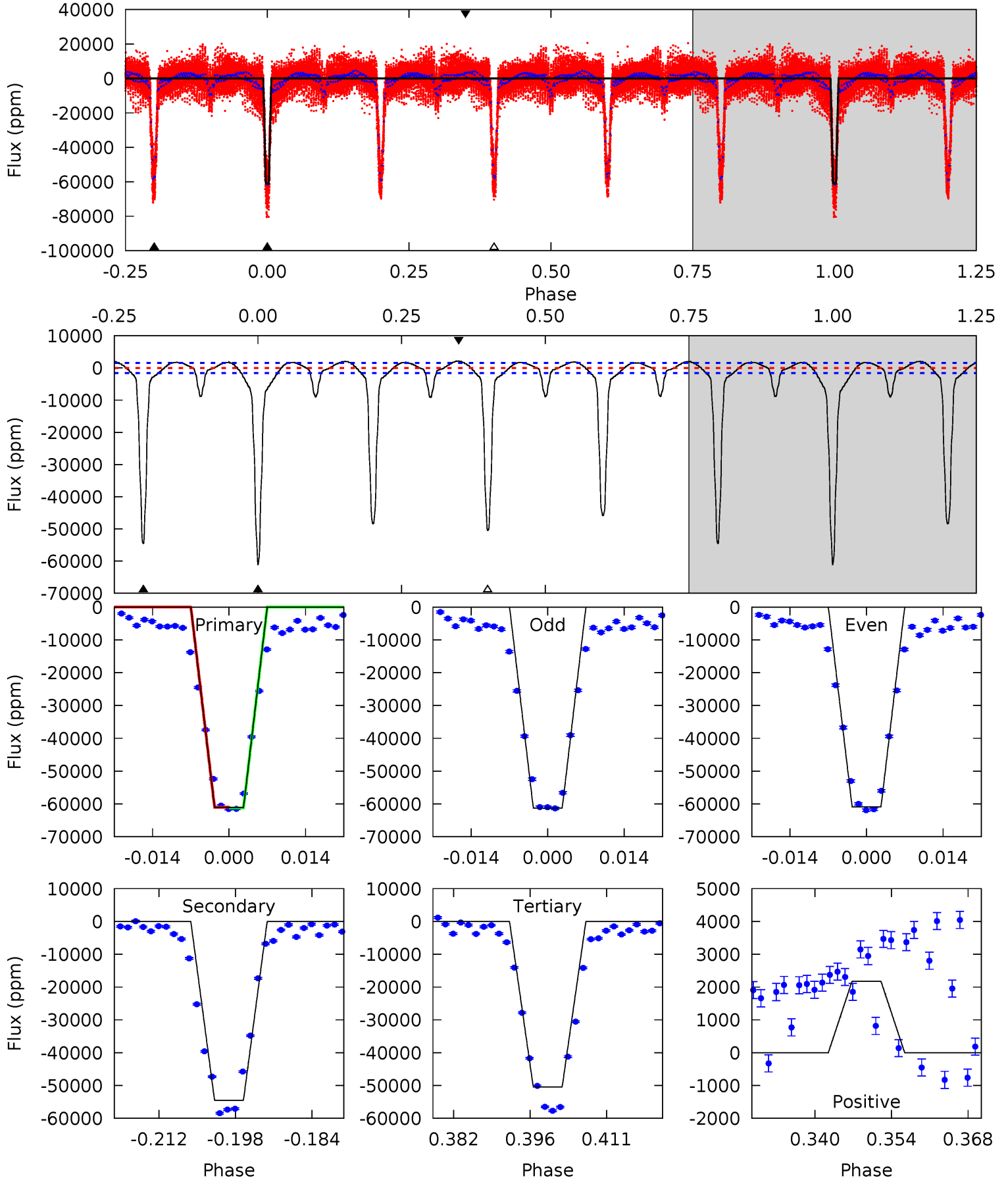
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
84.4	31.8	28.6	16.2	4.89	2.33	5.35	55.8	68.2	3.17	15.6	1.13	2.20	0.17	0



# Alt Model-Shift Uniqueness Test

012400729-01, P = 4.658622 Days, E = 127.823309 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
193.2	172.3	159.5	6.88	4.96	2.45	25.0	33.7	186.3	12.8	165.4	0.65	1.02	0.03	0.41



### Stellar Parameters For KIC 012400729

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5065^{+153}_{-153}$	$4.618^{+0.070}_{-0.040}$	$-0.740^{+0.300}_{-0.300}$	$0.646^{+0.057}_{-0.057}$	$0.631^{+0.068}_{-0.031}$	$3.299^{+0.893}_{-0.527}$
	+3%/-3%	+2%/-1%	+41%/-41%	+9%/-9%	+11%/-5%	+27%/-16%
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 012400729-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-3005 \pm 95$	$12.94^{+10.88}_{-8.33}$	$1152^{+42}_{-42}$	$3277^{+1451}_{-530}$	$22^{+153}_{-16}$
Alt.	$-54511 \pm 316$	$18.28^{+12.25}_{-9.76}$	$1152^{+43}_{-44}$	$4868^{+2230}_{-800}$	$210^{+784}_{-132}$

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

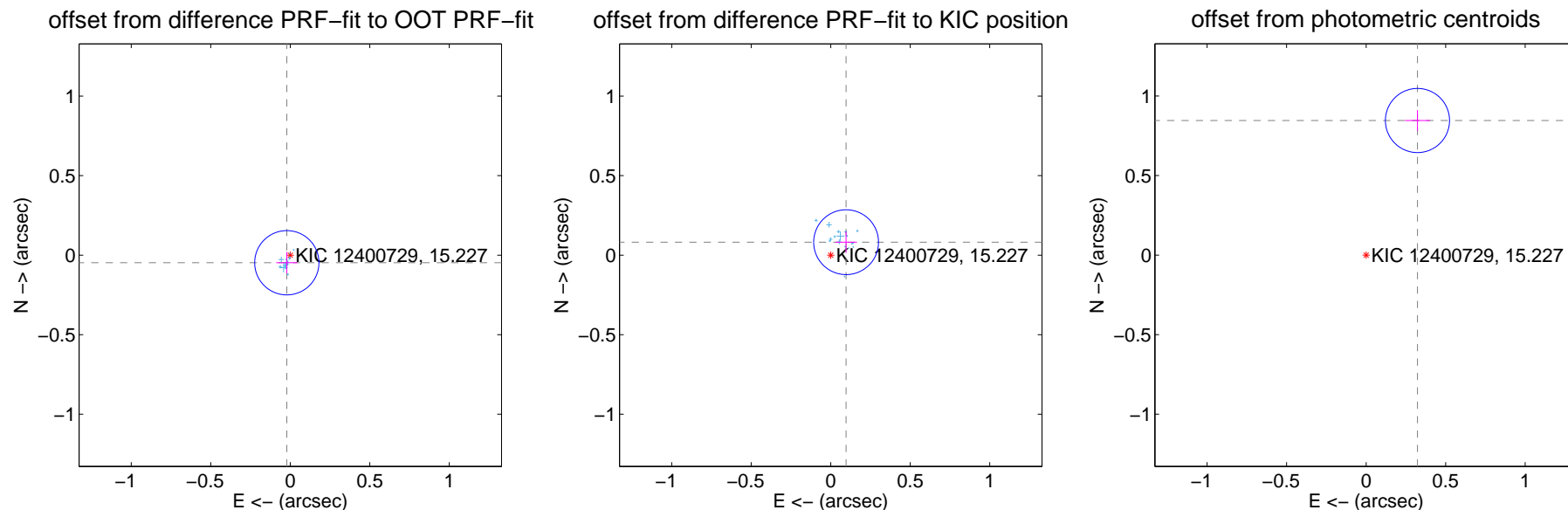
## DV Centroid Data

Supplemental centroid analysis for 012400729-01. Kepler magnitude: 15.23. Transit SNR 46.99

There are 17 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.22 arcsec

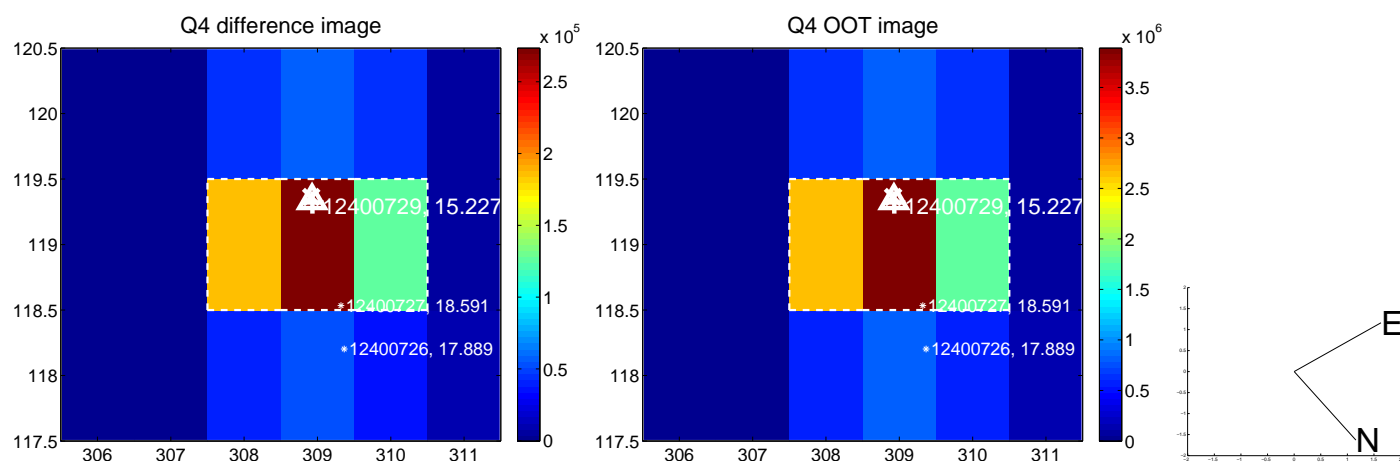
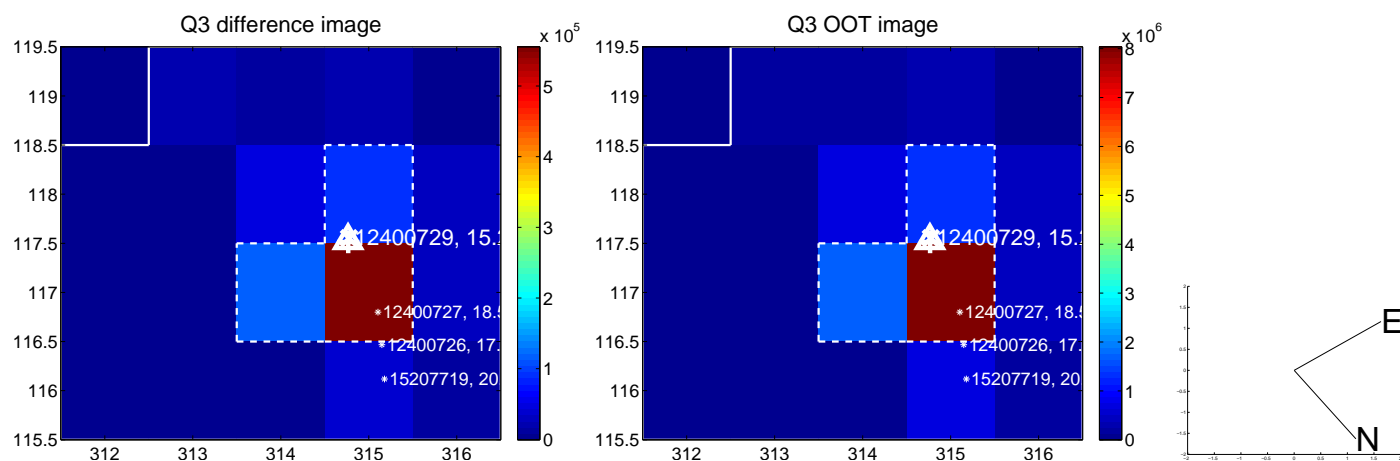
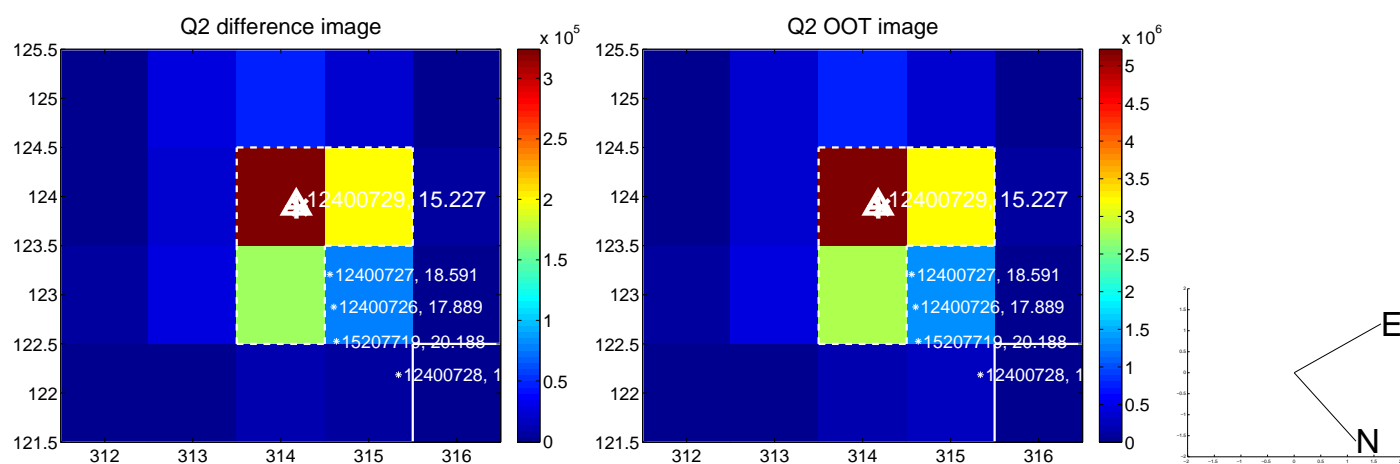
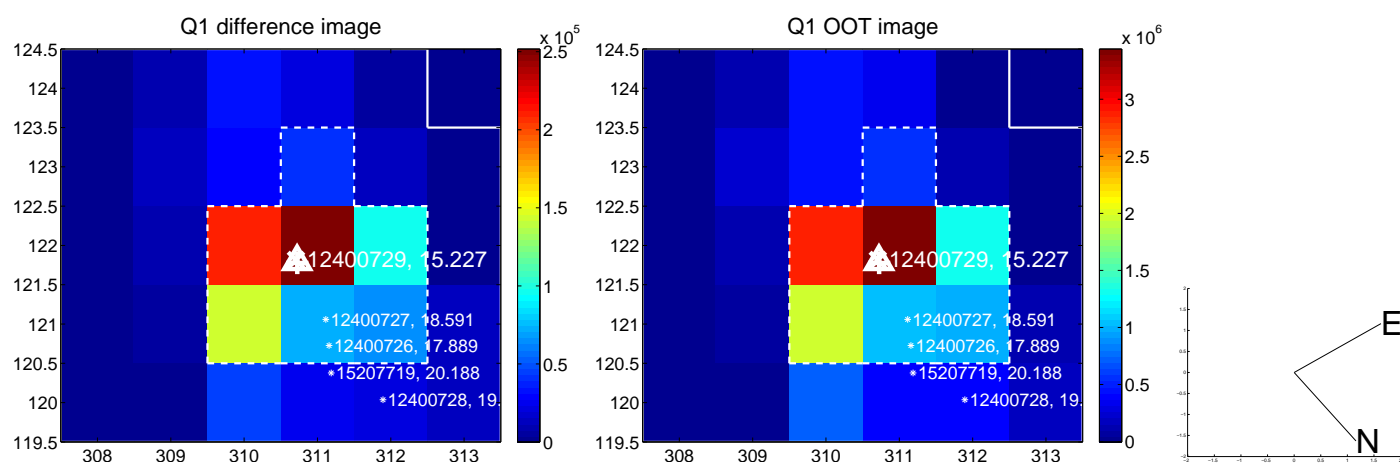
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.052 \pm 0.067$	0.78	$0.022 \pm 0.067$	$-0.048 \pm 0.067$
PRF-fit source offset from KIC position	$0.127 \pm 0.068$	1.86	$-0.097 \pm 0.068$	$0.082 \pm 0.068$
photometric centroid source offset	$0.91 \pm 0.07$	13.47	$-0.32 \pm 0.08$	$0.85 \pm 0.07$



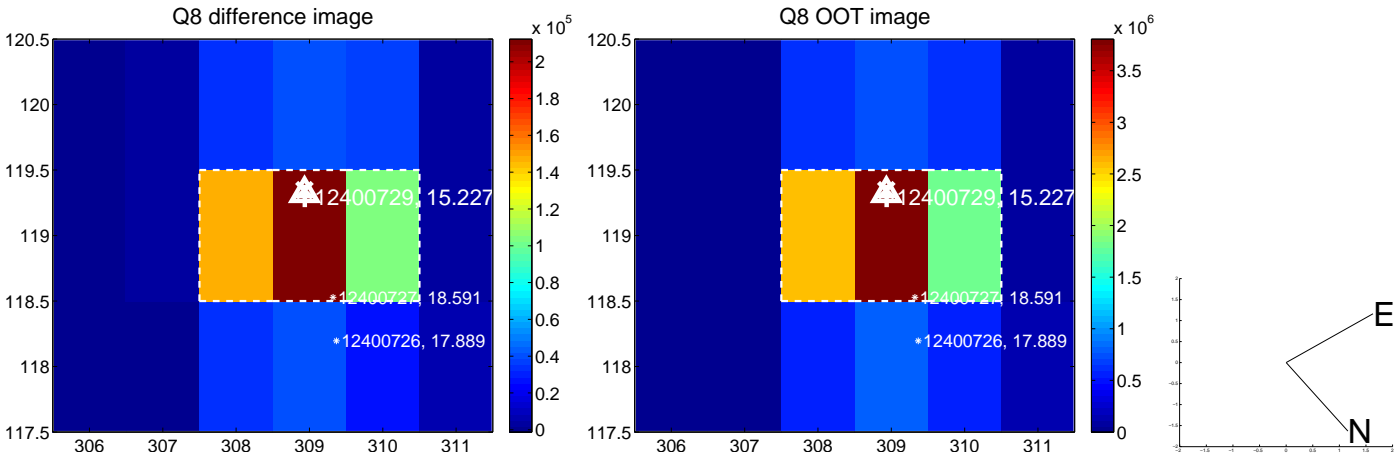
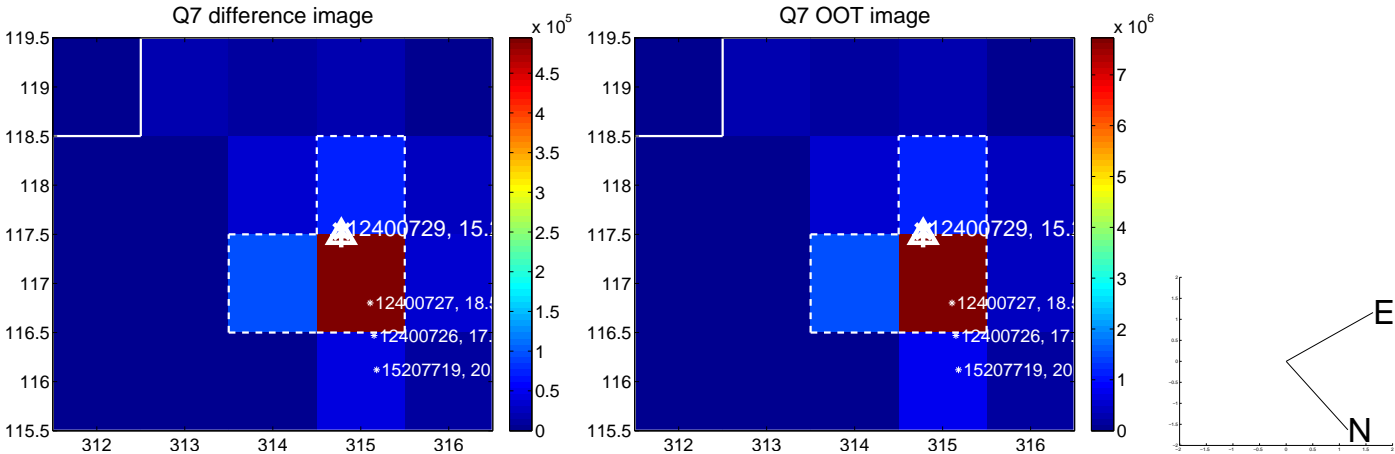
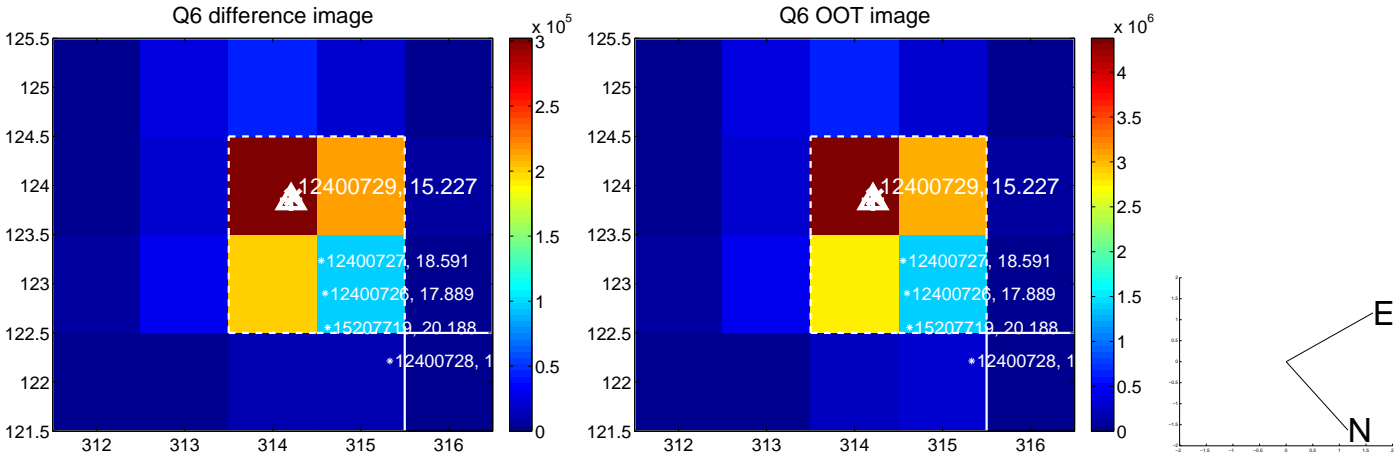
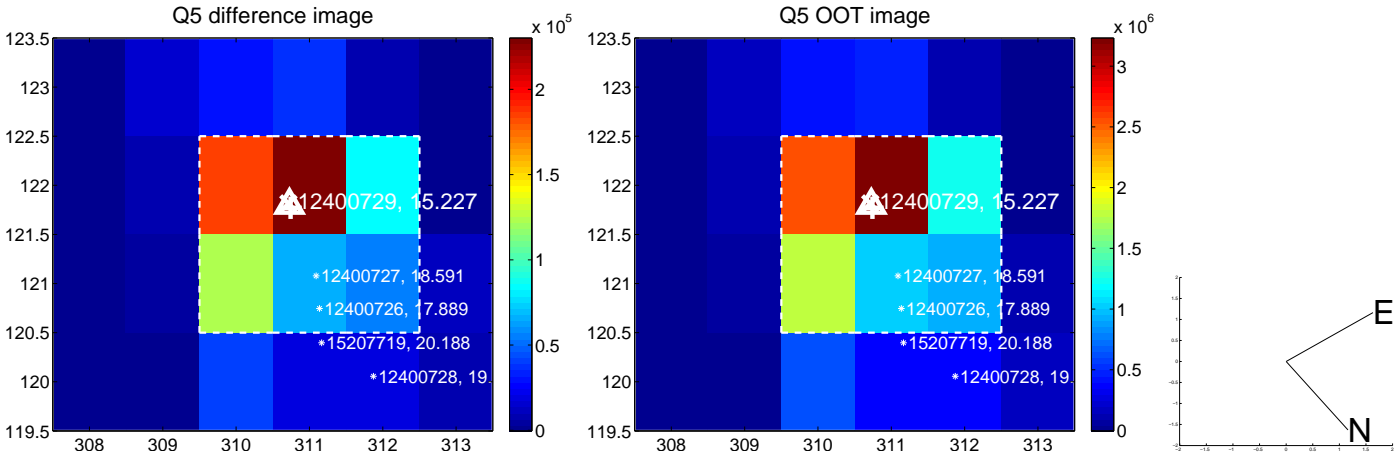
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets**; **Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



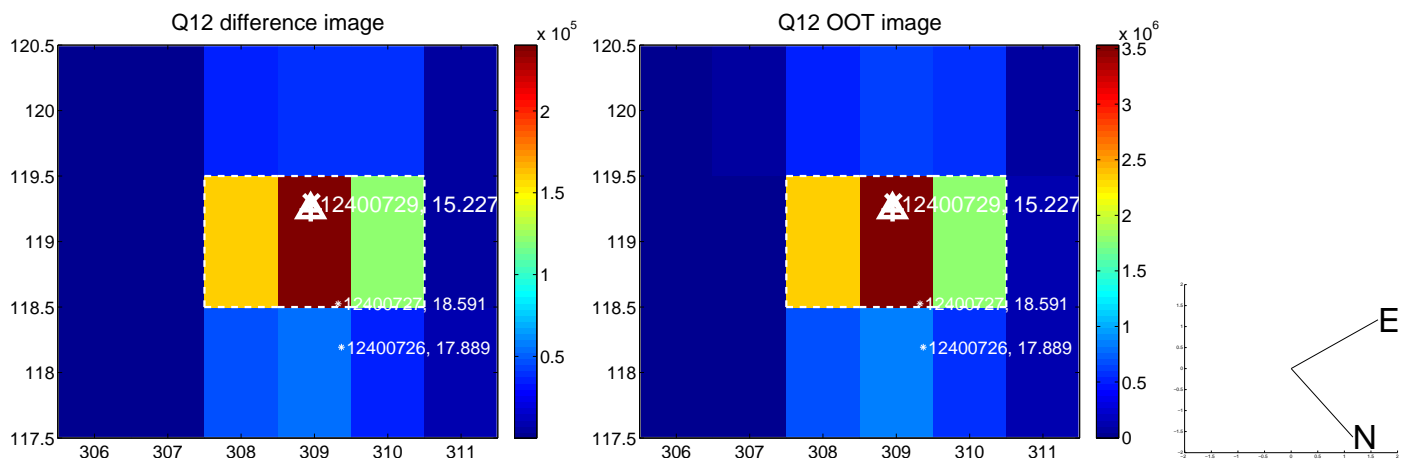
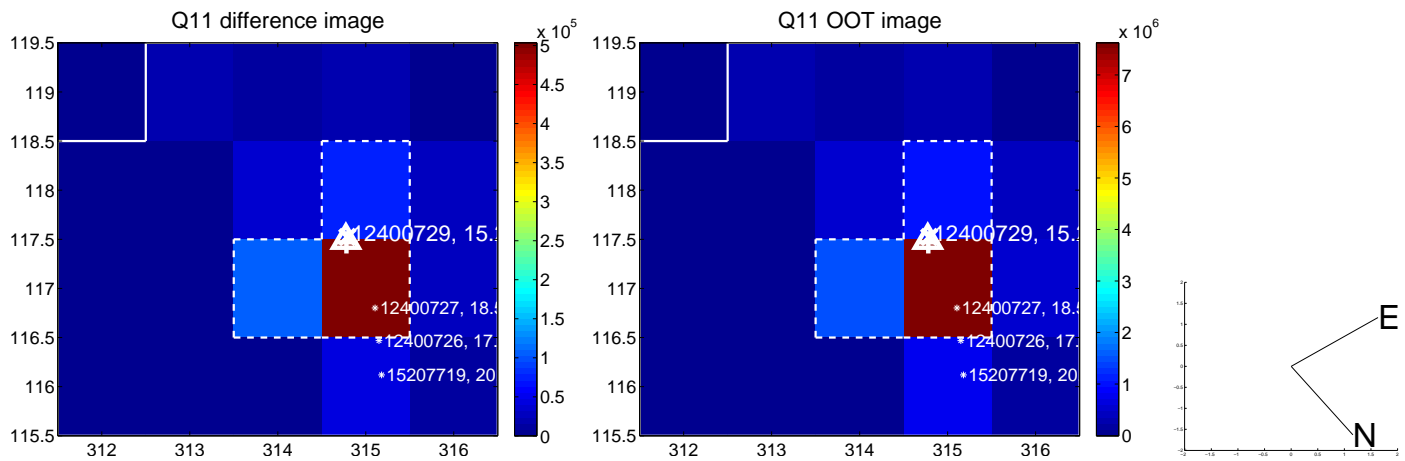
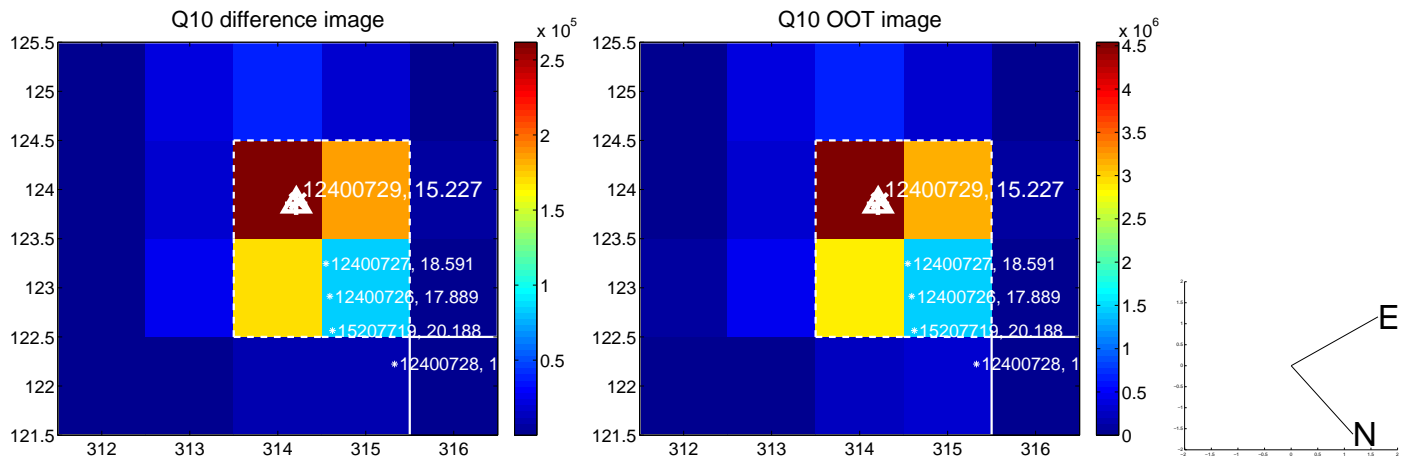
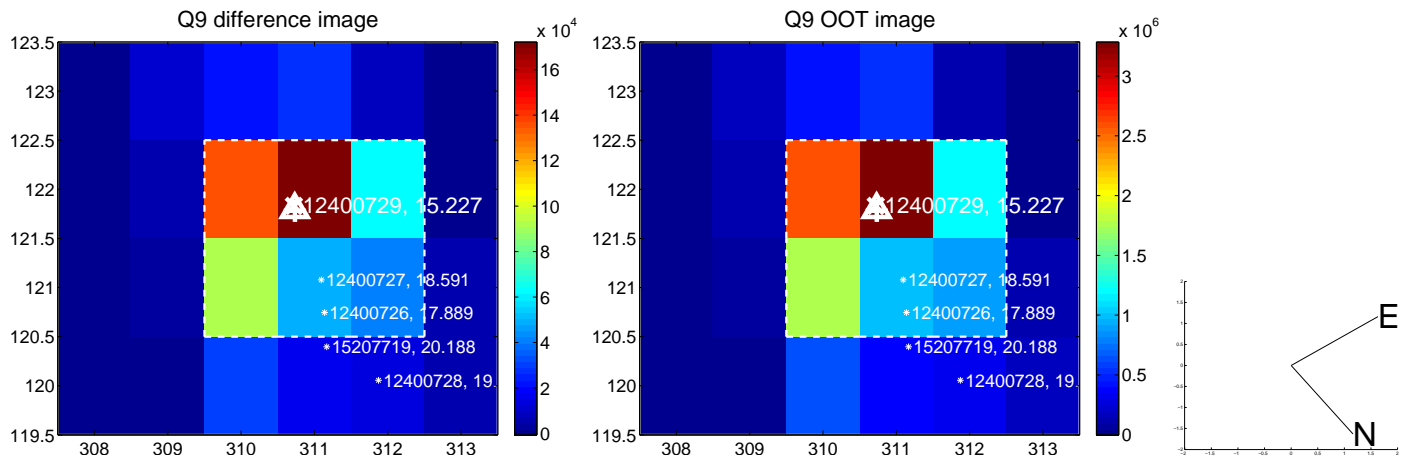
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



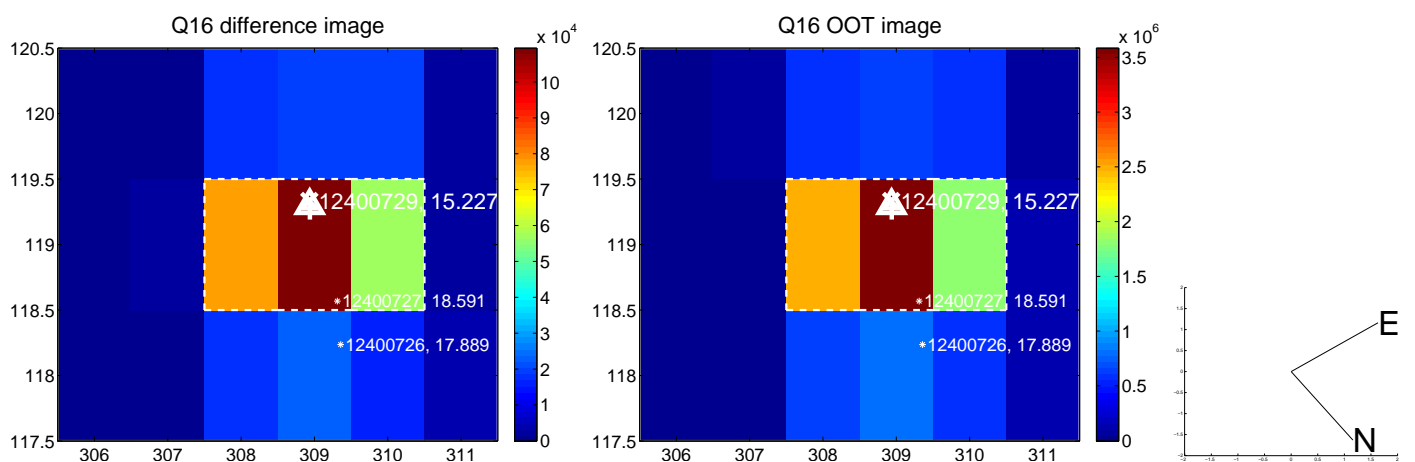
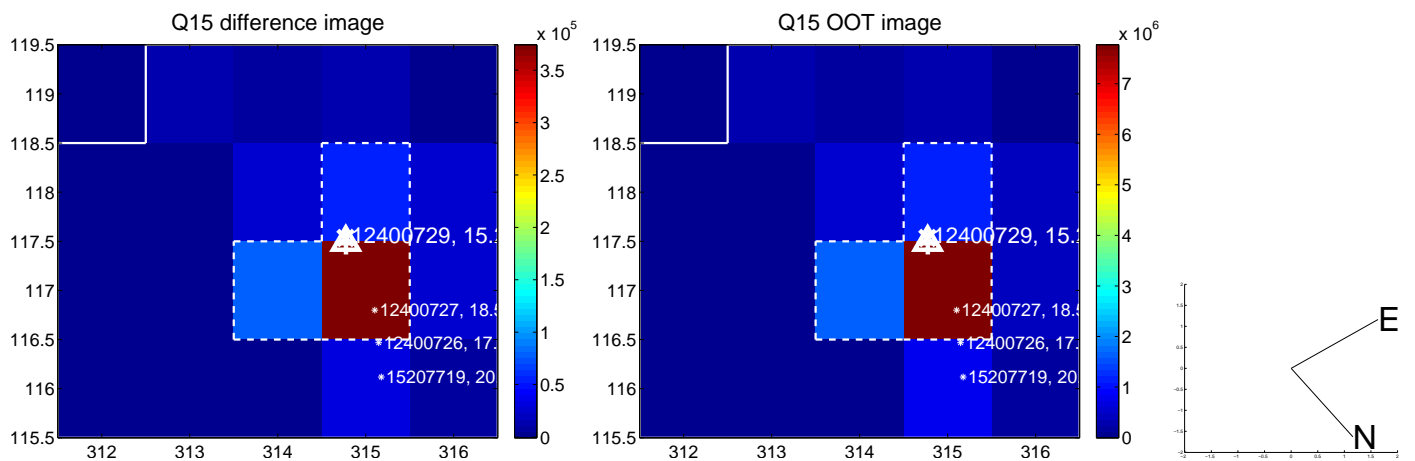
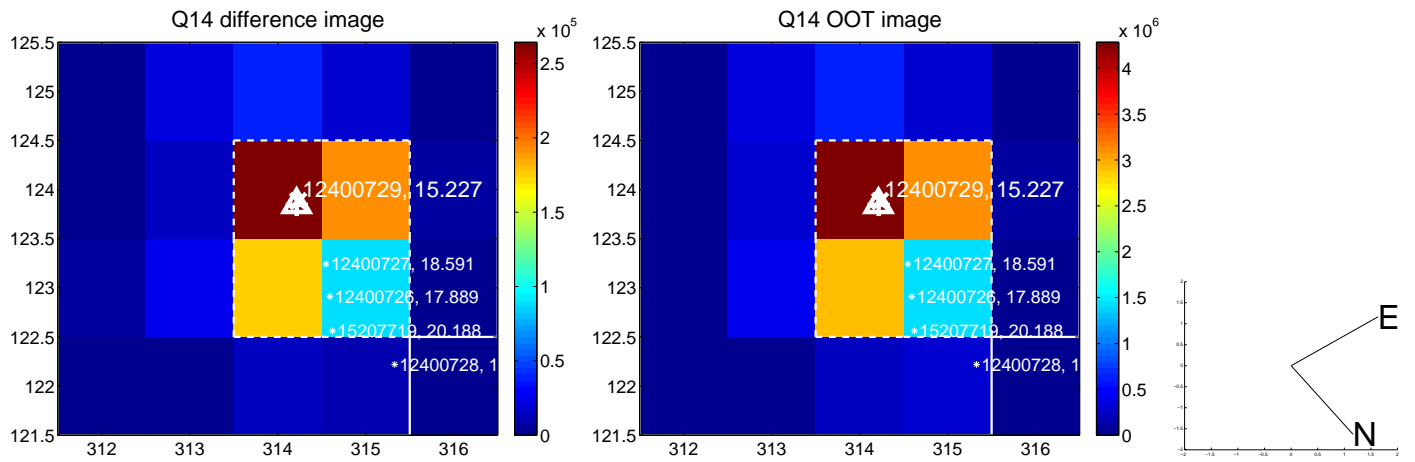
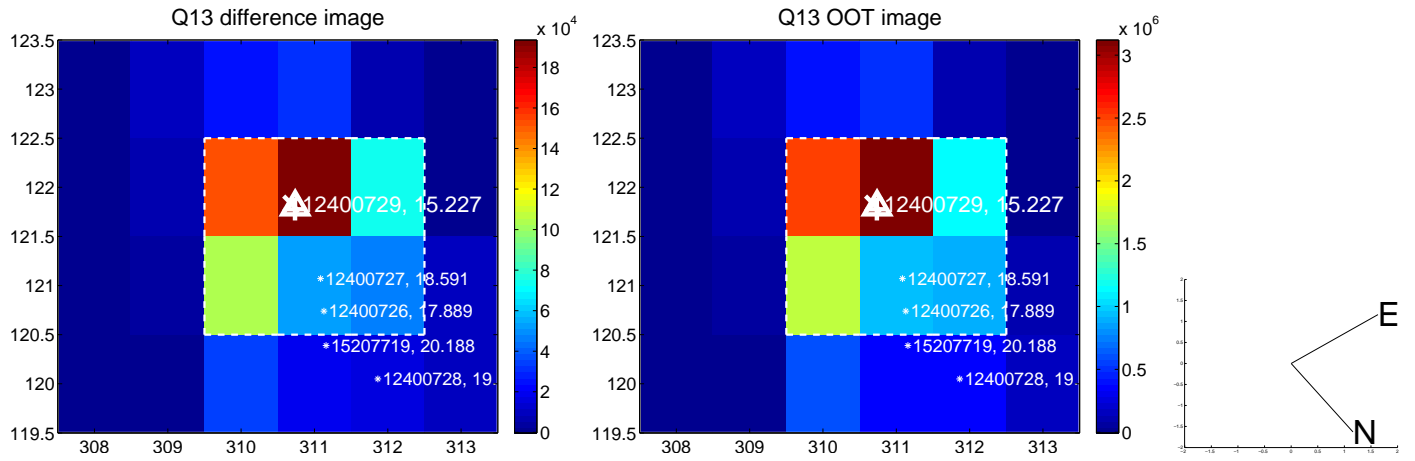
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



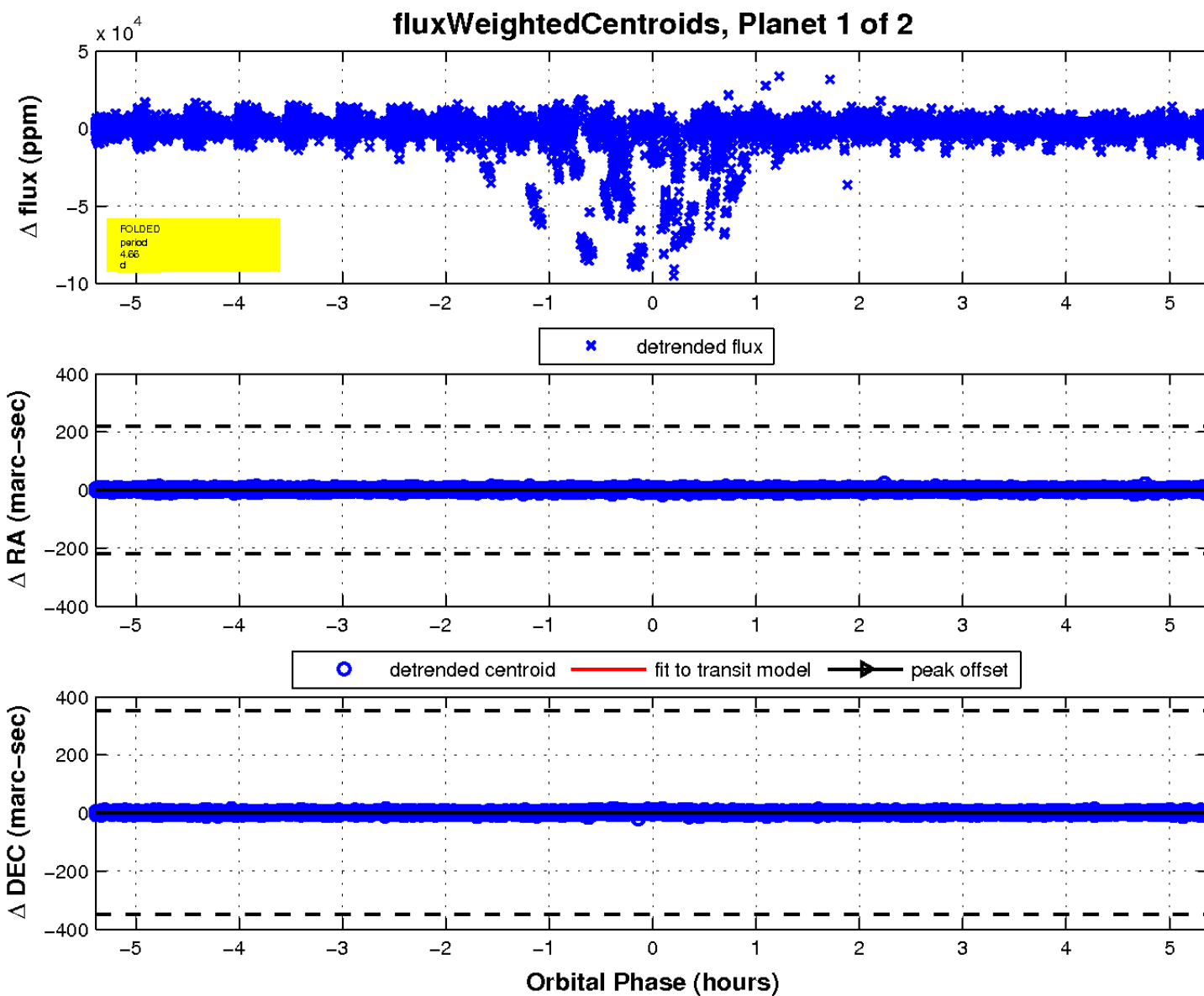
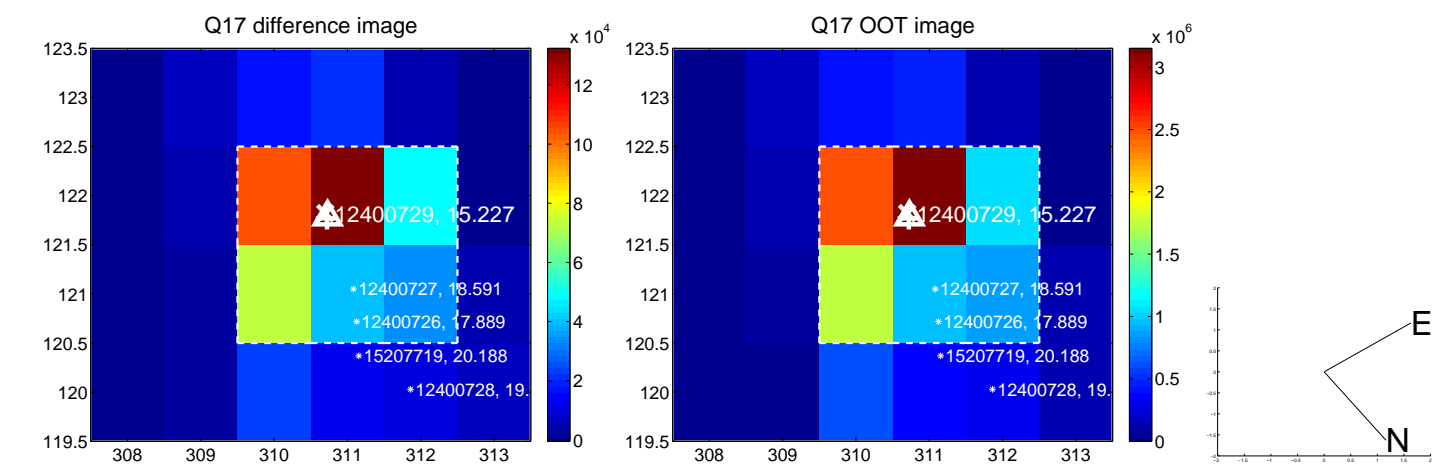
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

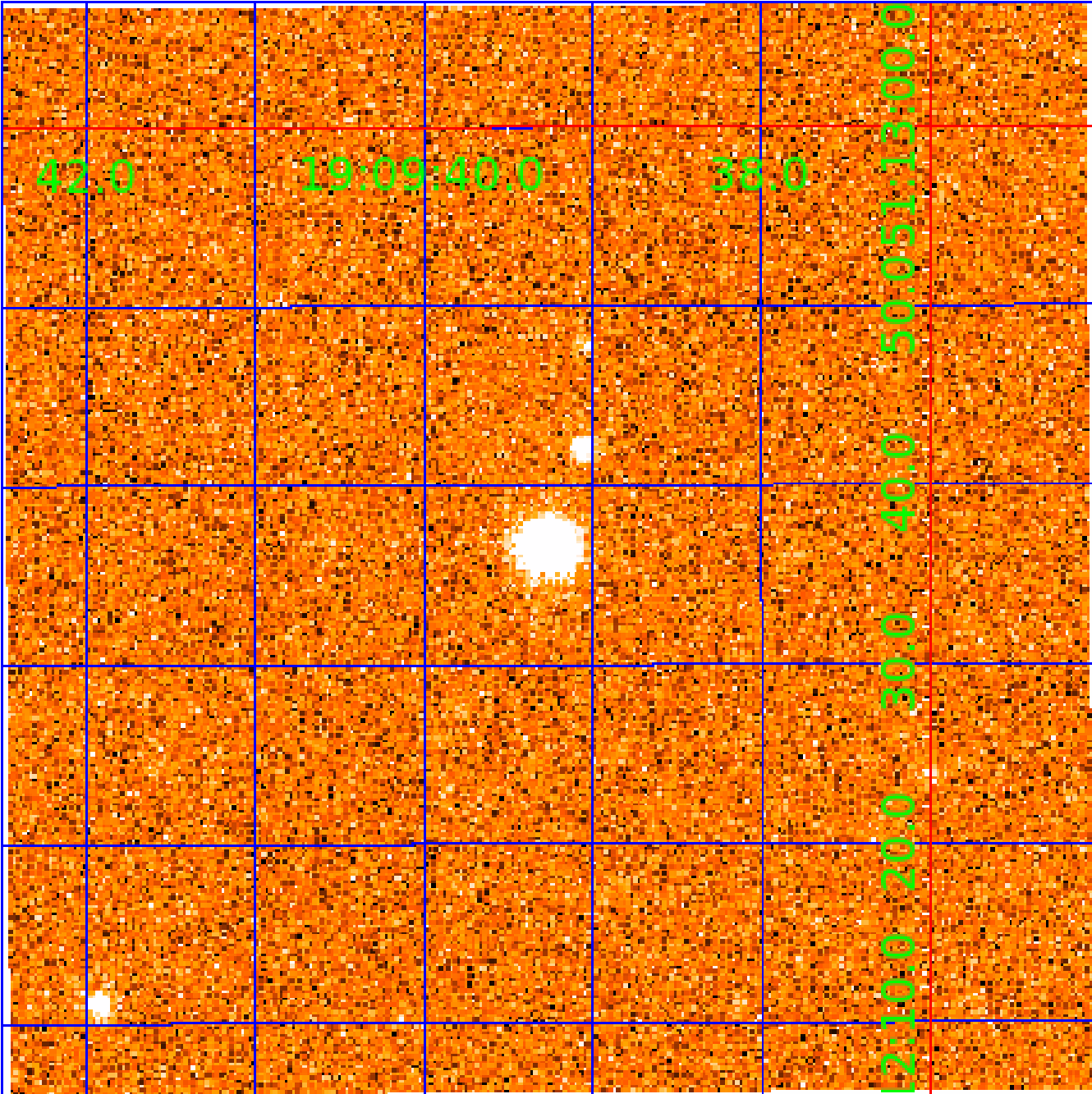


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 012400729

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
012400729-01	OBS	No	4.658710	132.470799	6288.9	1.796	157.9	47.0	0.65	5065	9.72	112.12
012400729-02	OBS	No	0.931893	131.527991	1331.8	1.831	440.5	31.6	0.65	5065	2.94	958.40

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
012400729-01	OBS	FP	0.00	1	0	0	0	LPP_DV
012400729-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT

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

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

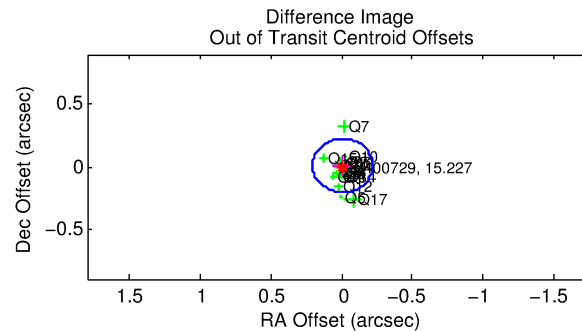
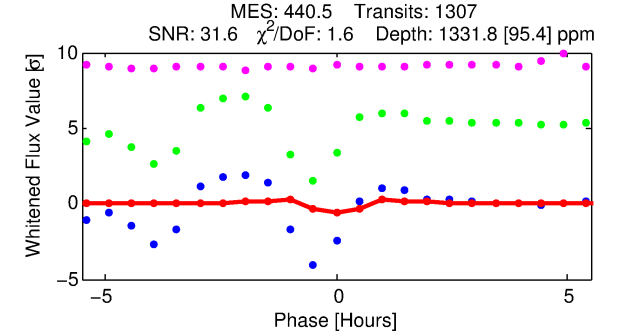
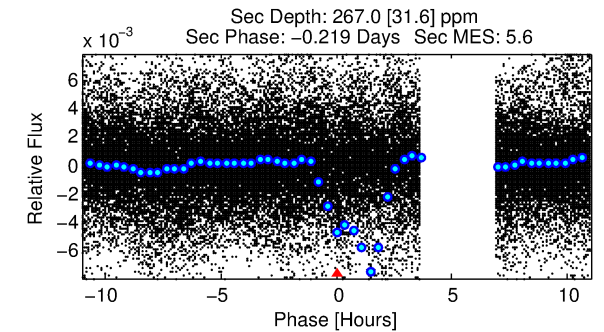
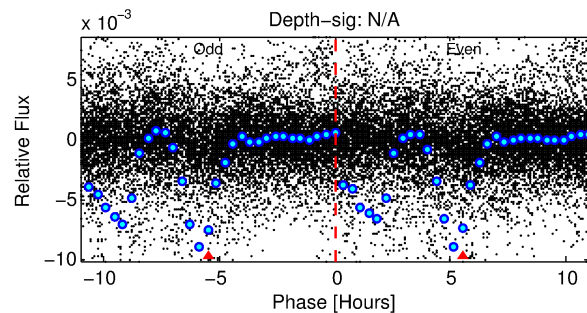
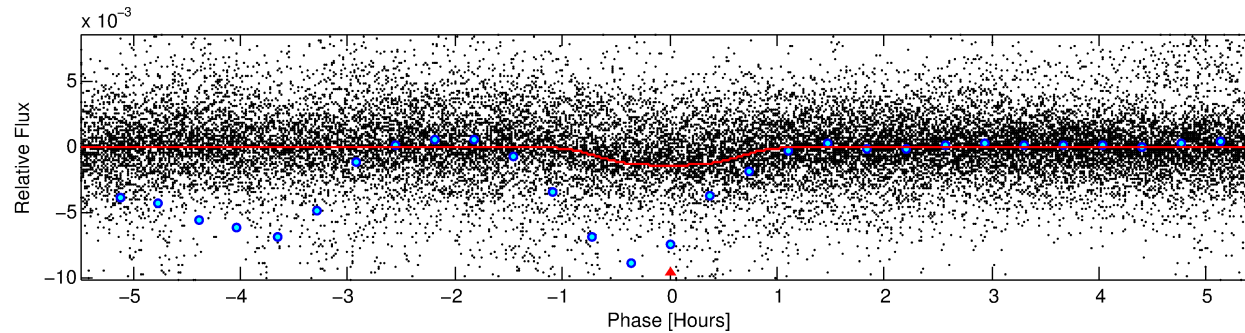
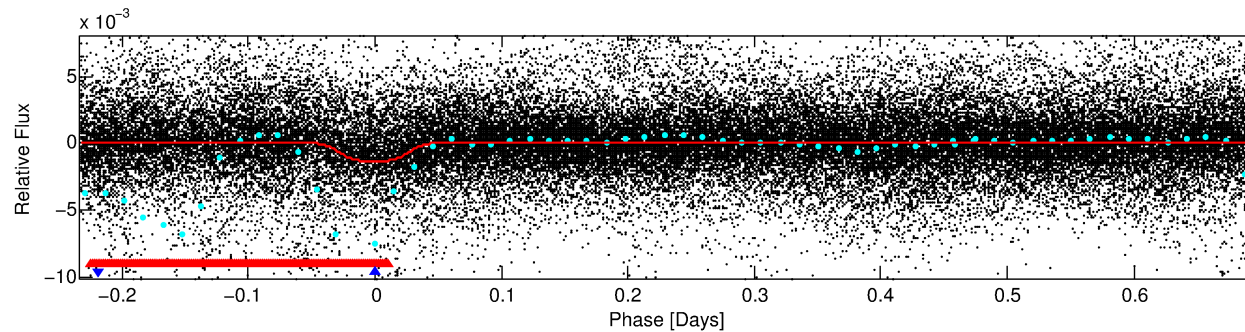
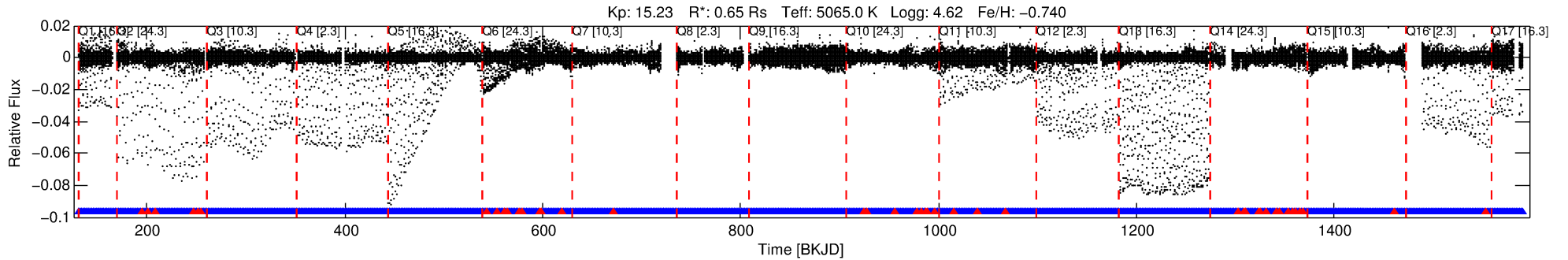
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 012400729-02

No Significant Match Found

# DV One-Page Summary

KIC: 12400729 Candidate: 2 of 2 Period: 0.932 d



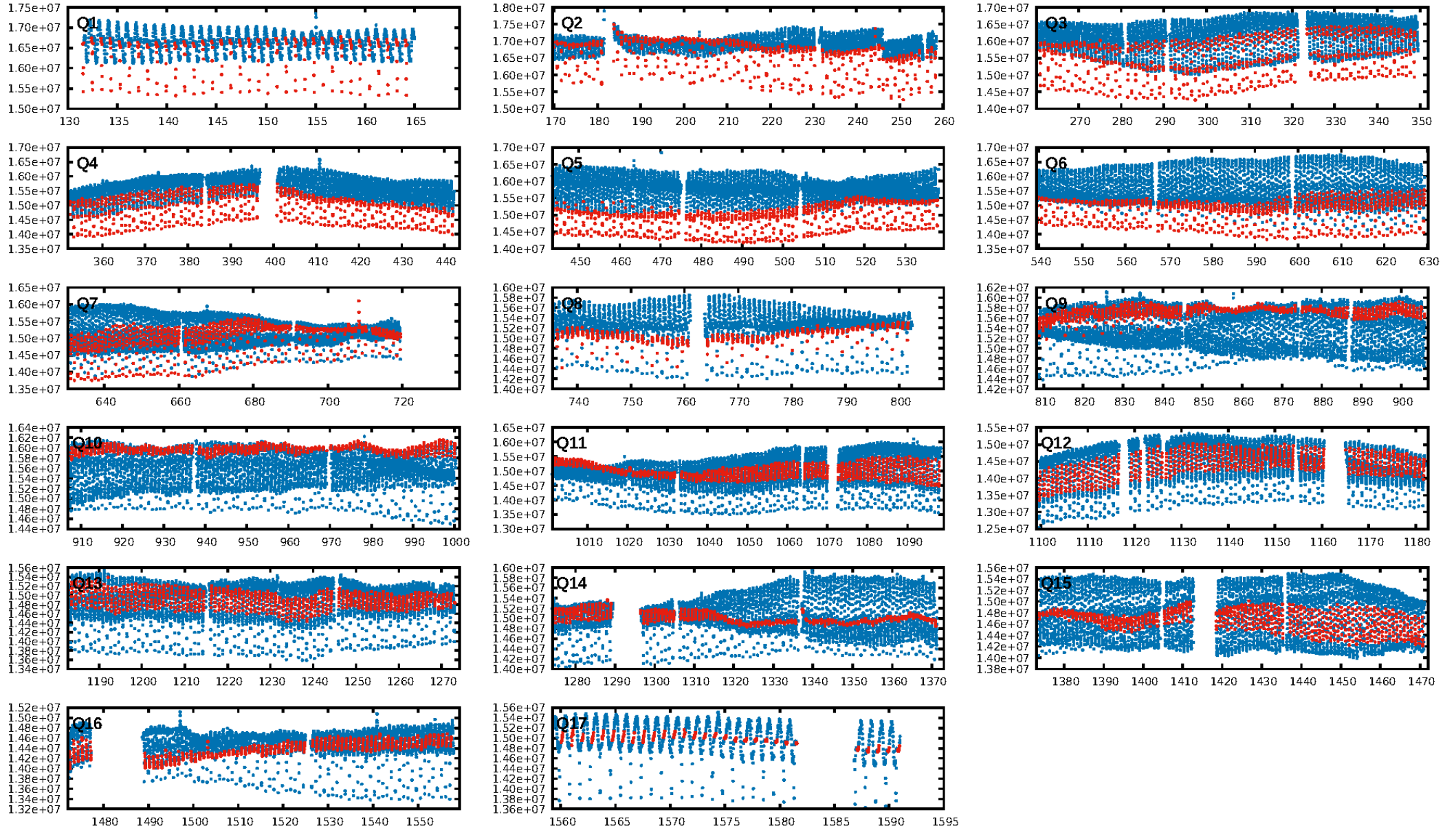
## DV Fit Results:

Period = 0.93189 [0.00000] d  
Epoch = 131.5280 [0.0007] BKJD  
Rp/R\* = 0.0418 [0.0028]  
a/R\* = 2.10 [0.32]  
b = 0.93 [0.03]  
Seff = 958.40 [164.91]  
Teq = 1419 [61] K  
Rp = 2.94 [0.33] Re  
a = 0.0160 [0.0013] AU  
Ag = 4.35 [0.95] [3.54σ]  
Teffp = 3168 [171] K [9.62σ]

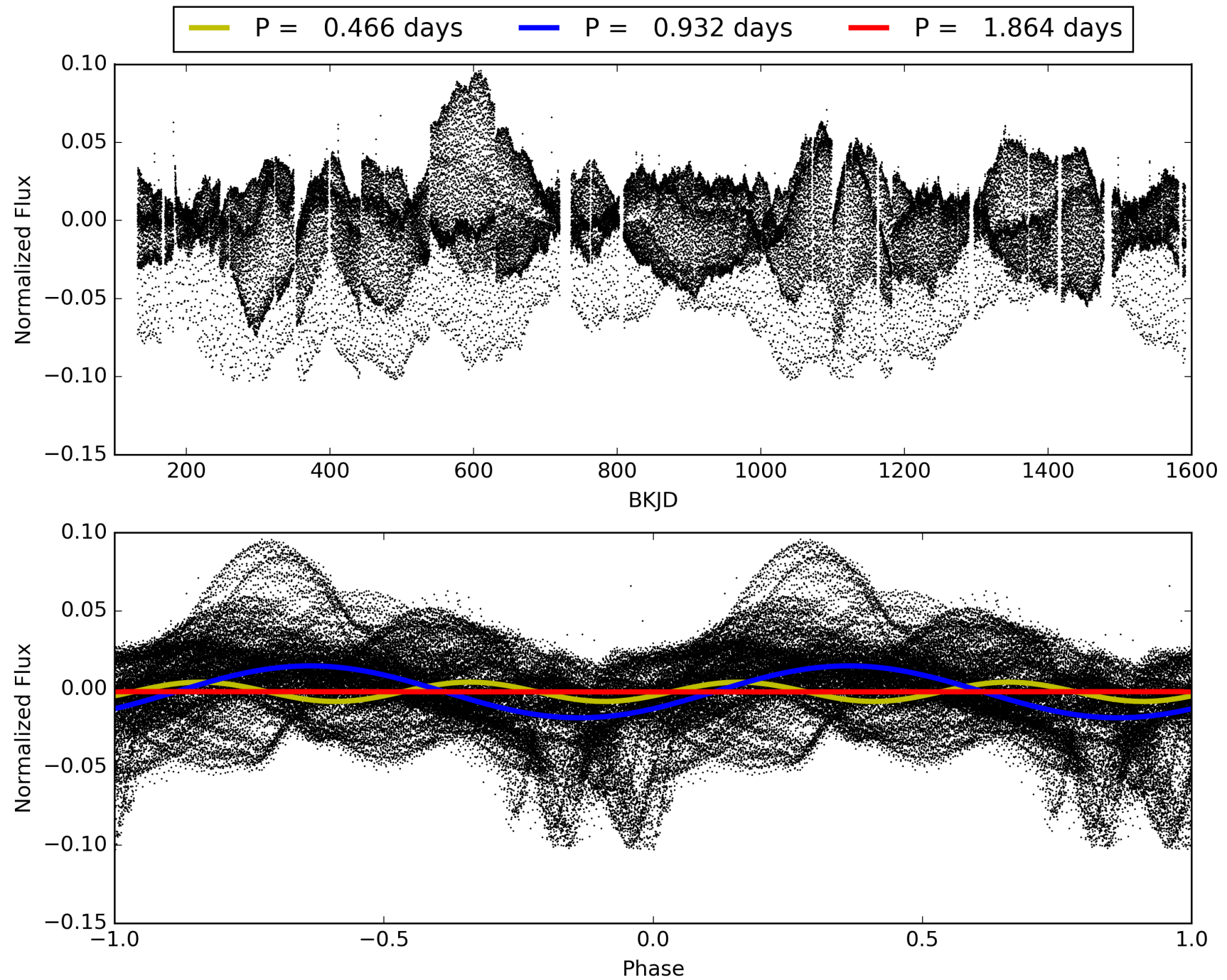
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [34.88σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 0.97 [1206/1249]  
GhostDiagnostic-chr: 2.093  
Centroid-sig: 0.2%  
Centroid-so: 1.402 arcsec [11.23σ]  
OotOffset-rm: 0.011 arcsec [0.15σ]  
KicOffset-rm: 0.111 arcsec [1.59σ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 0.59 [10/17]  
DiffImageOverlap-fno: 1.00 [17/17]

# TCE 012400729-02, PDC Light Curves



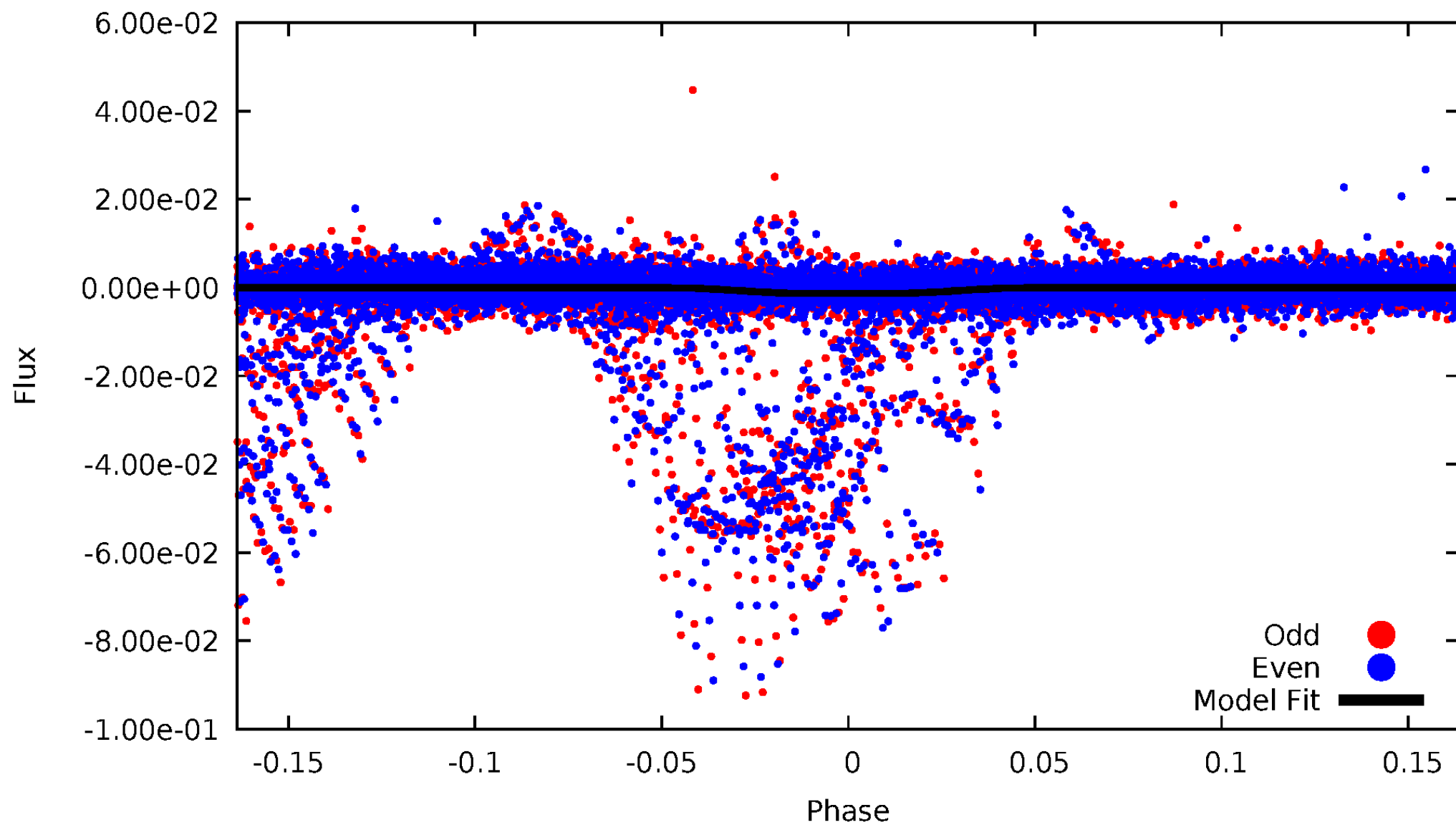
TCE 012400729-02





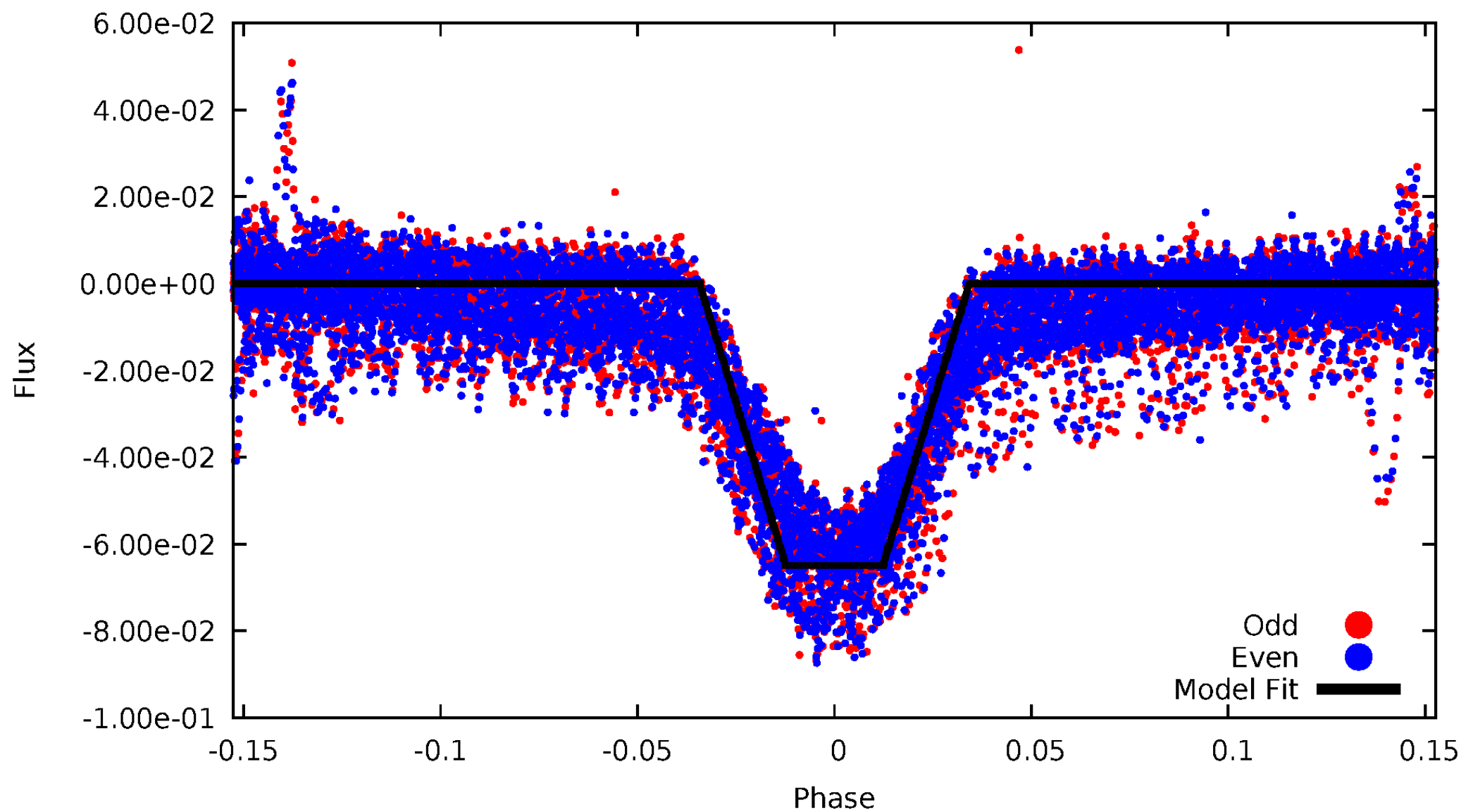
# DV Odd/Even

TCE 012400729-02



# ALT Odd/Even

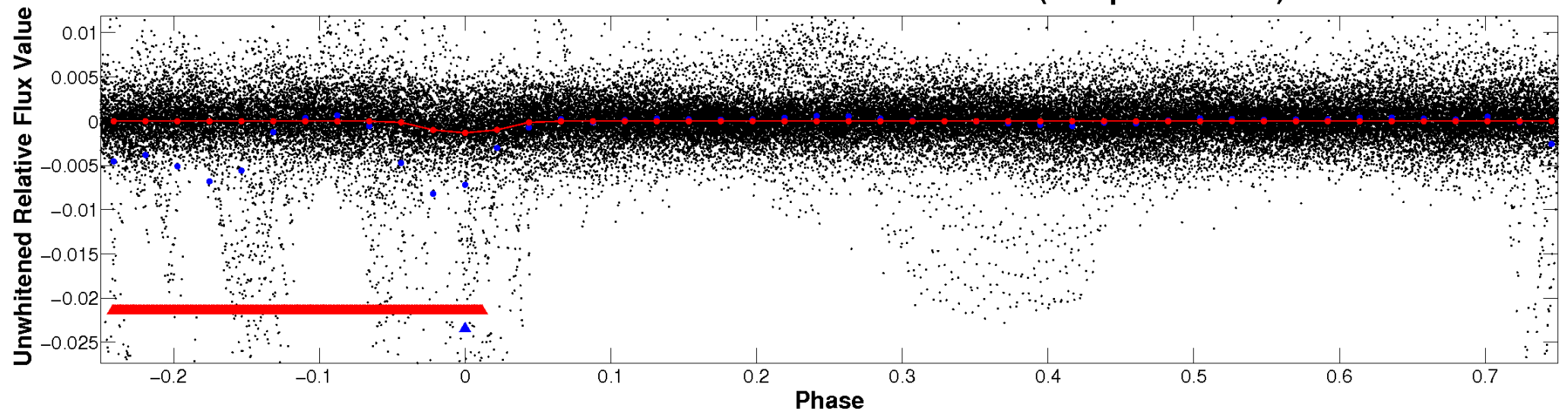
TCE 012400729-02



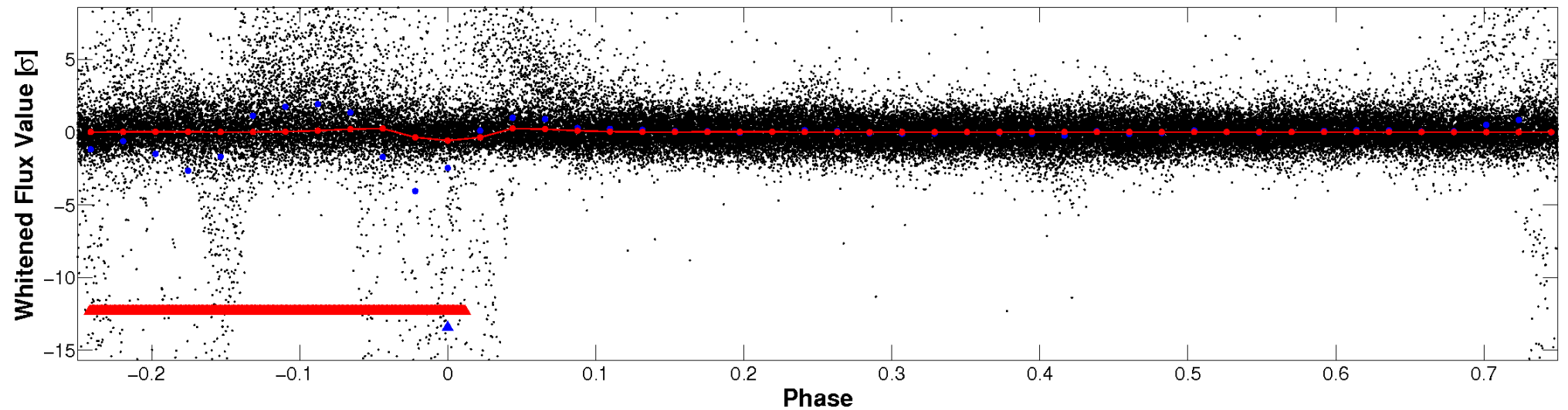


# Non-Whitened Vs. Whitened Light Curve

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

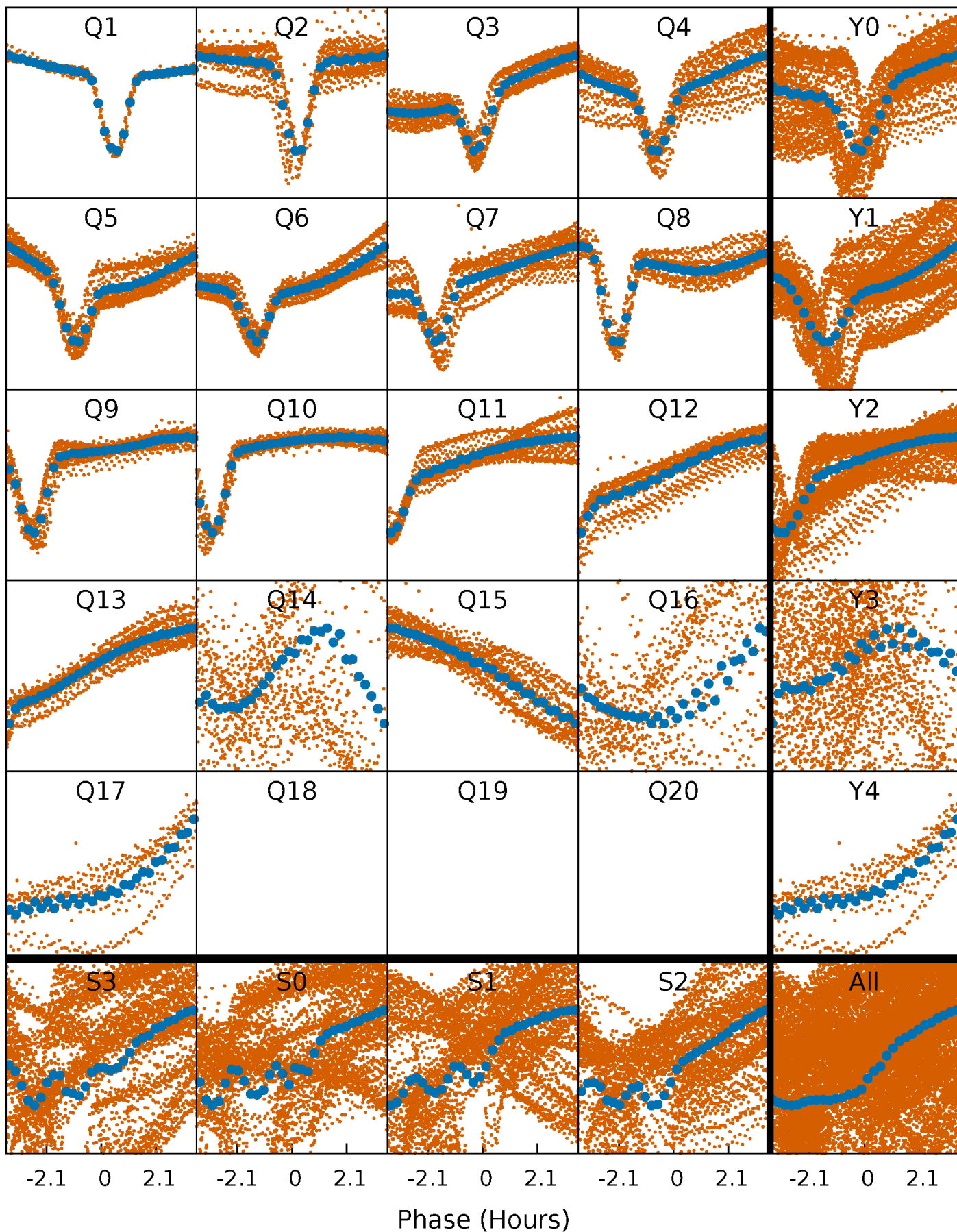


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



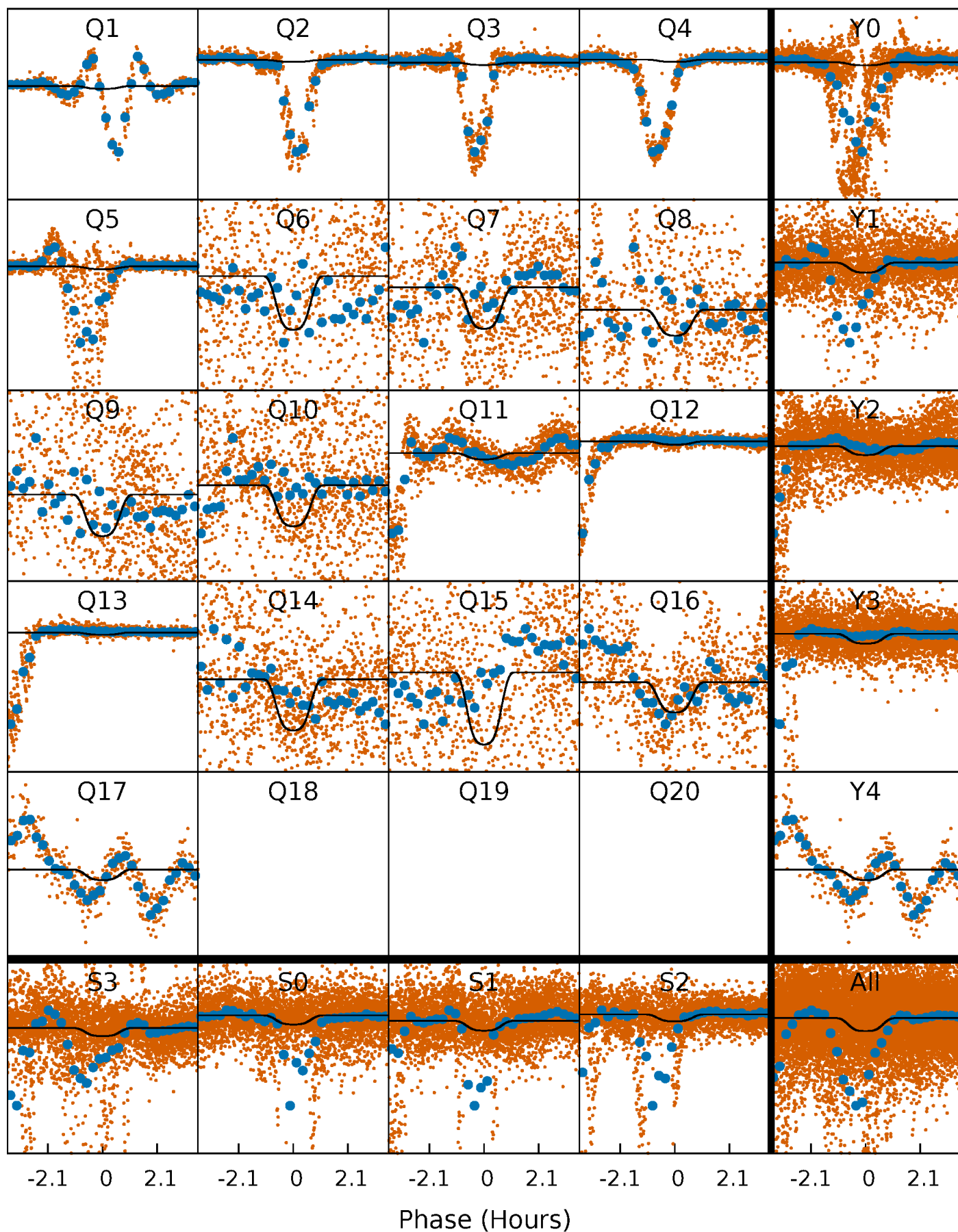
# PDC Quarter-Phased Transit Curves

TCE 012400729-02   P= 0.931893 Days    $T_0=131.527991$  (BKJD)



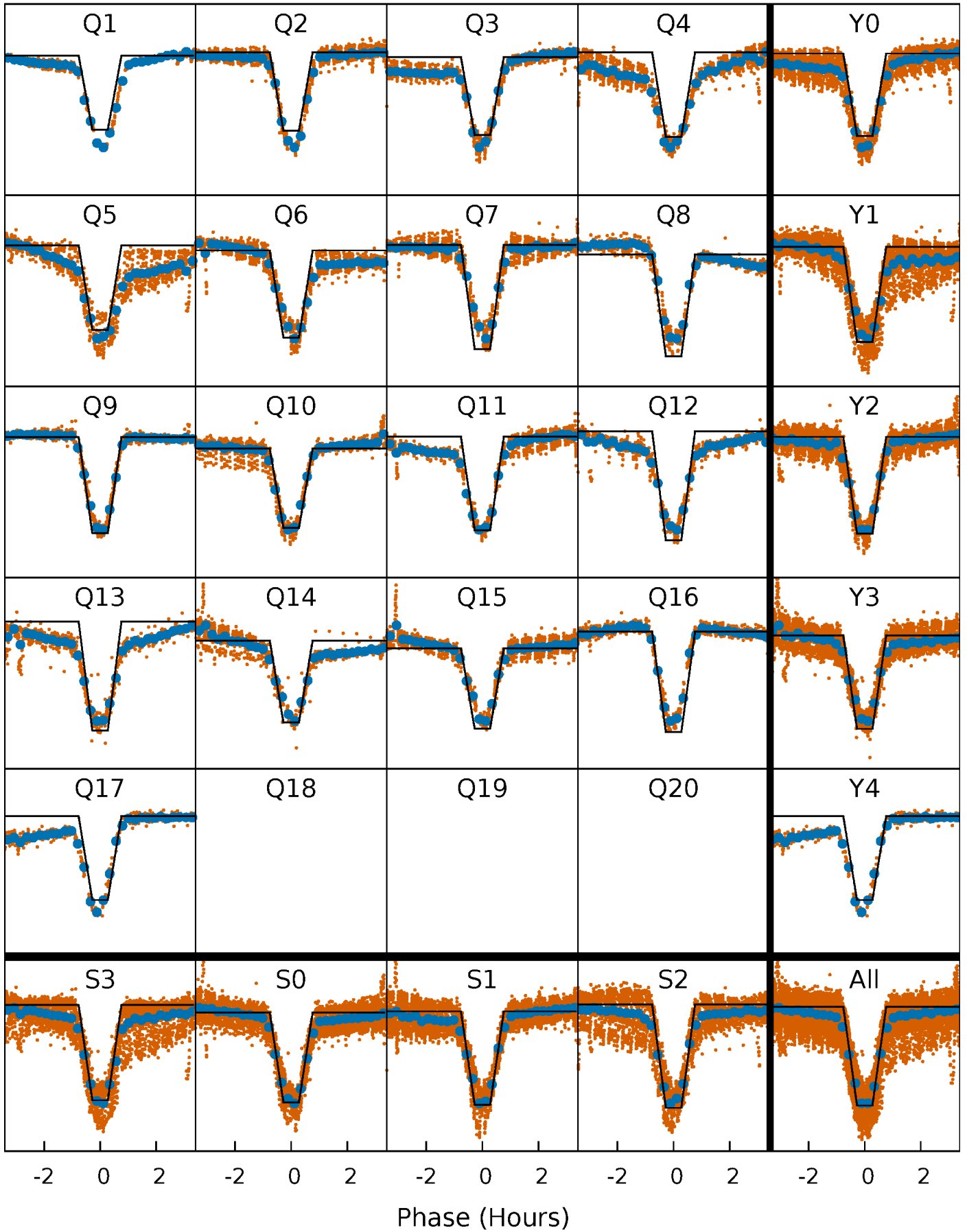
# DV Quarter-Phased Transit Curves

TCE 012400729-02   P= 0.931893 Days    $T_0=131.527991$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

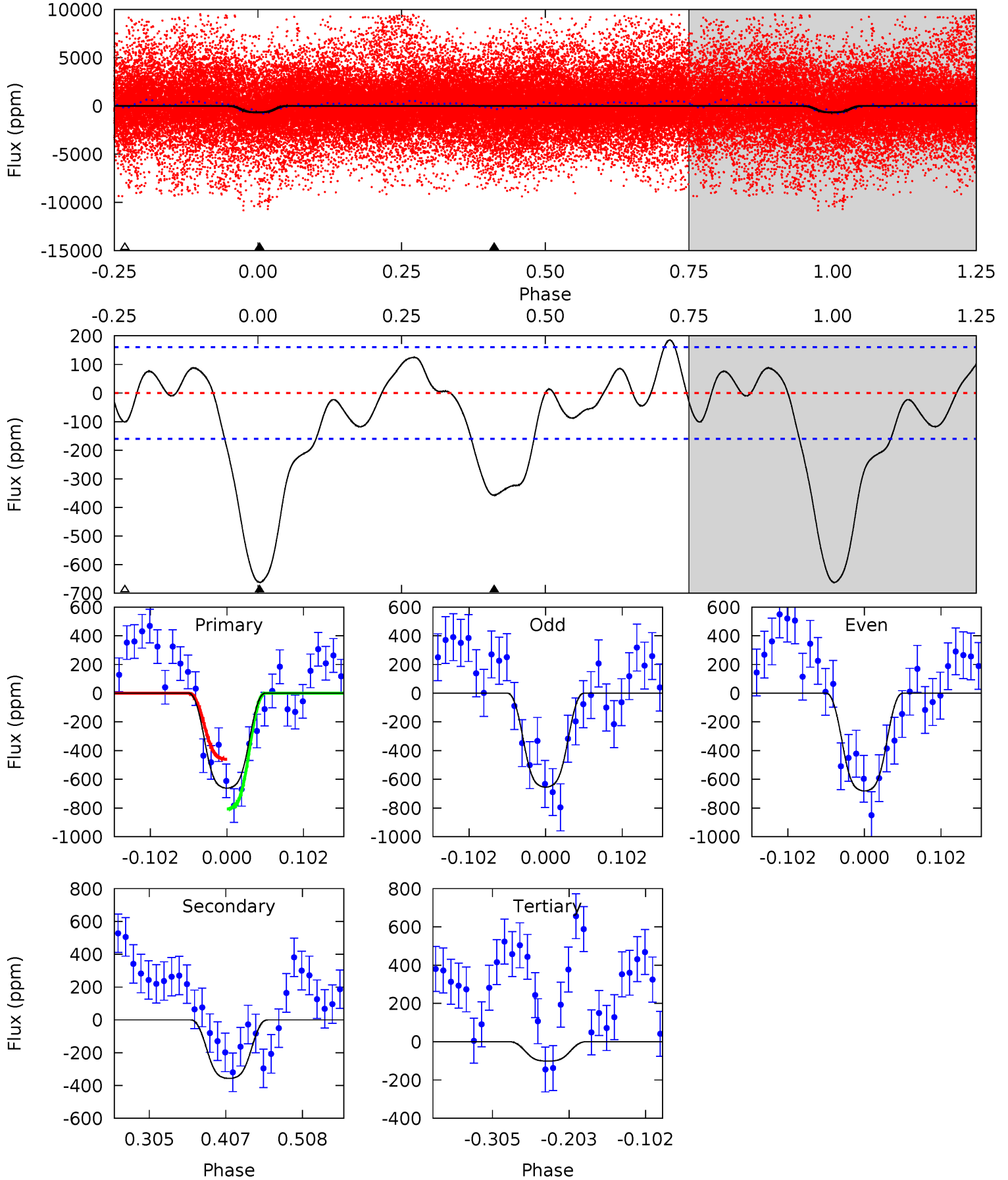
TCE 012400729-02     $P = 0.931726$  Days     $T_0 = 131.548667$  (BKJD)



# DV Model-Shift Uniqueness Test

012400729-02, P = 0.931893 Days, E = 130.596098 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
18.9	10.2	2.89	0	4.56	1.64	2.18	16.0	18.9	7.30	10.2	0.38	5.79	0.22	4.90

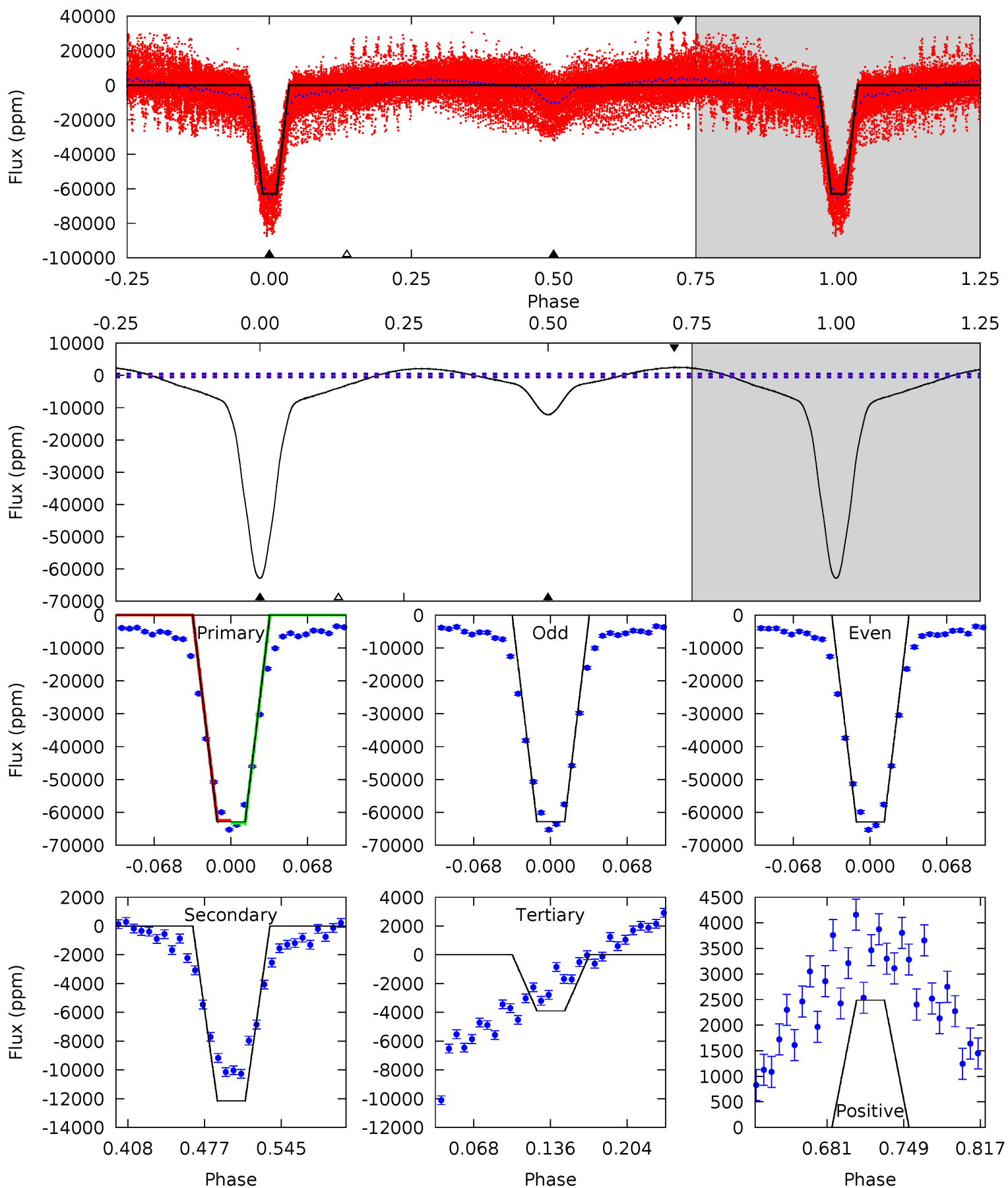




# Alt Model-Shift Uniqueness Test

012400729-02, P = 0.931726 Days, E = 130.616941 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
511.9	99.0	31.7	20.3	4.64	1.82	21.9	480.1	491.6	67.2	78.7	0.41	1.03	0.04	3.66





### Stellar Parameters For KIC 012400729

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5065^{+153}_{-153}$	$4.618^{+0.070}_{-0.040}$	$-0.740^{+0.300}_{-0.300}$	$0.646^{+0.057}_{-0.057}$	$0.631^{+0.068}_{-0.031}$	$3.299^{+0.893}_{-0.527}$
	+3%/-3%	+2%/-1%	+41%/-41%	+9%/-9%	+11%/-5%	+27%/-16%
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 012400729-02 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-357 \pm 35$	$2.94^{+0.27}_{-0.25}$	$1973^{+74}_{-78}$	$3718^{+149}_{-142}$	$5.887^{+1.354}_{-0.966}$
Alt.	$-12156 \pm 123$	$17.86^{+0.96}_{-0.85}$	$1970^{+72}_{-73}$	$3670^{+89}_{-89}$	$5.481^{+0.560}_{-0.401}$

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

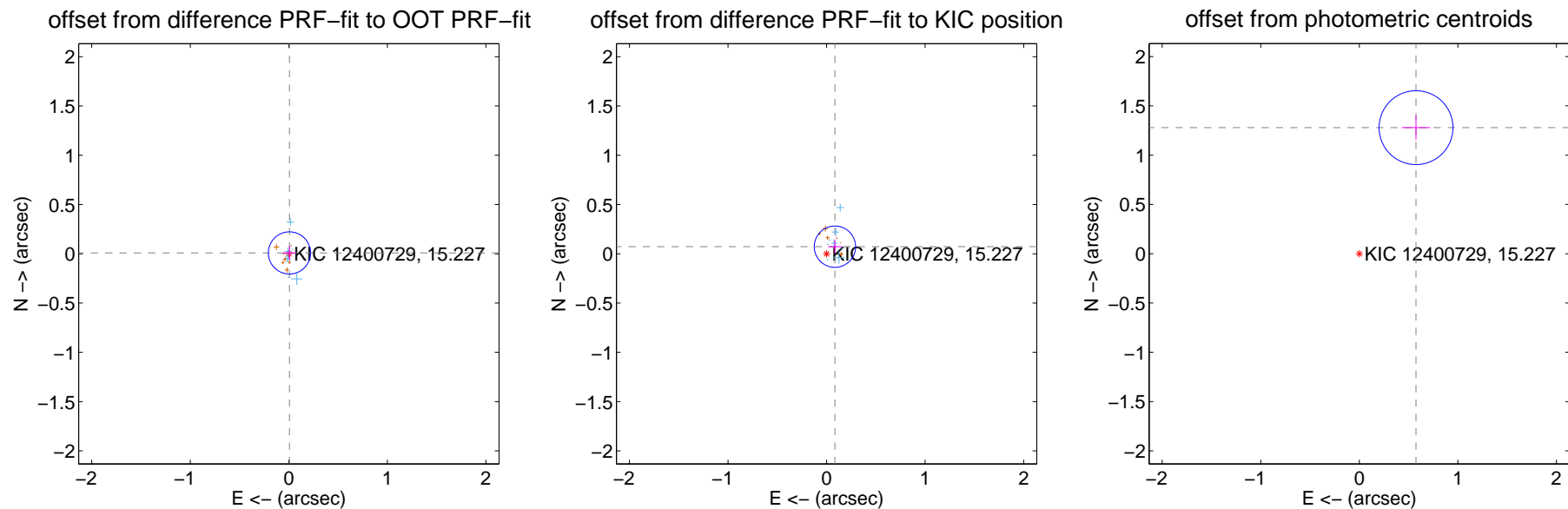
## DV Centroid Data

Supplemental centroid analysis for 012400729-02. Kepler magnitude: 15.23. Transit SNR 31.56

There are 10 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.22 arcsec

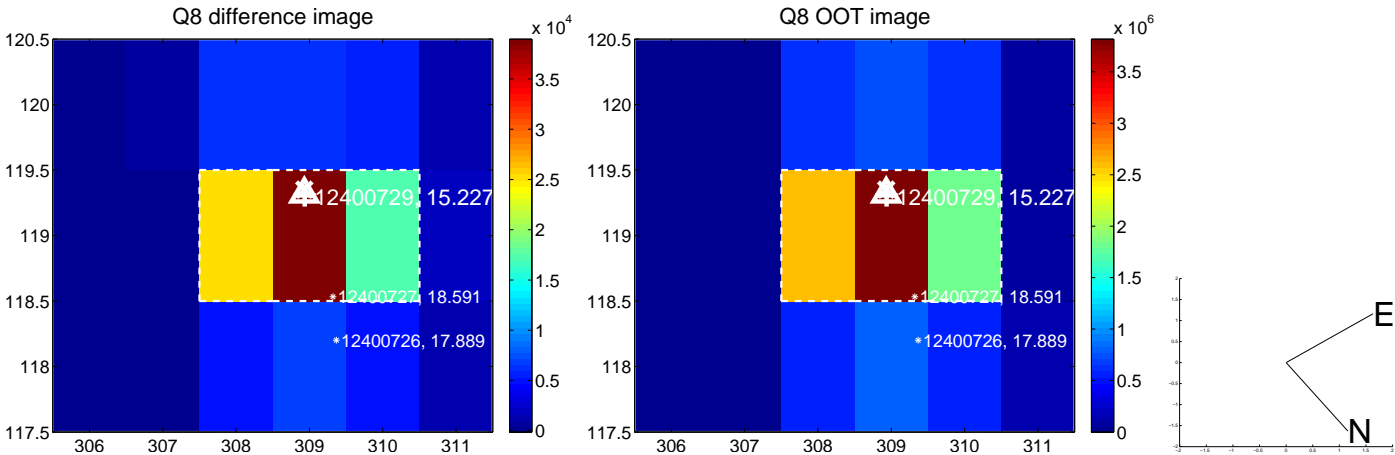
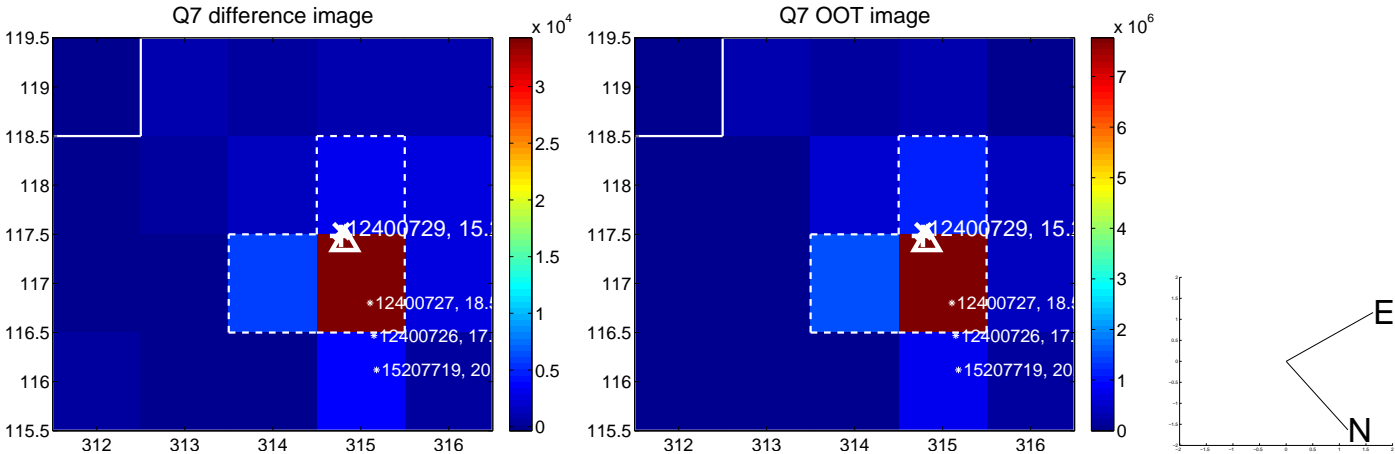
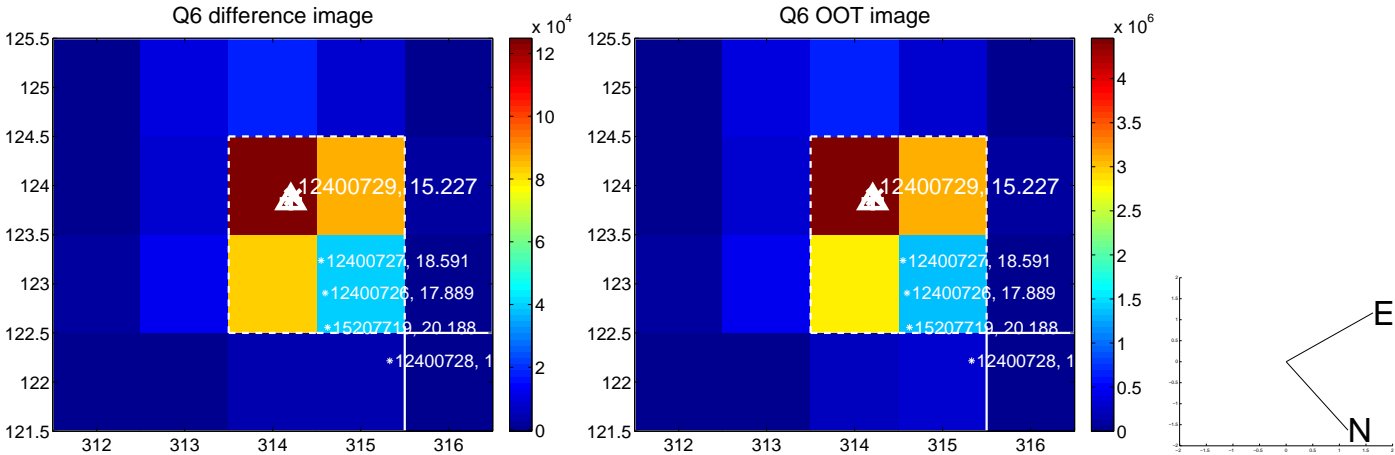
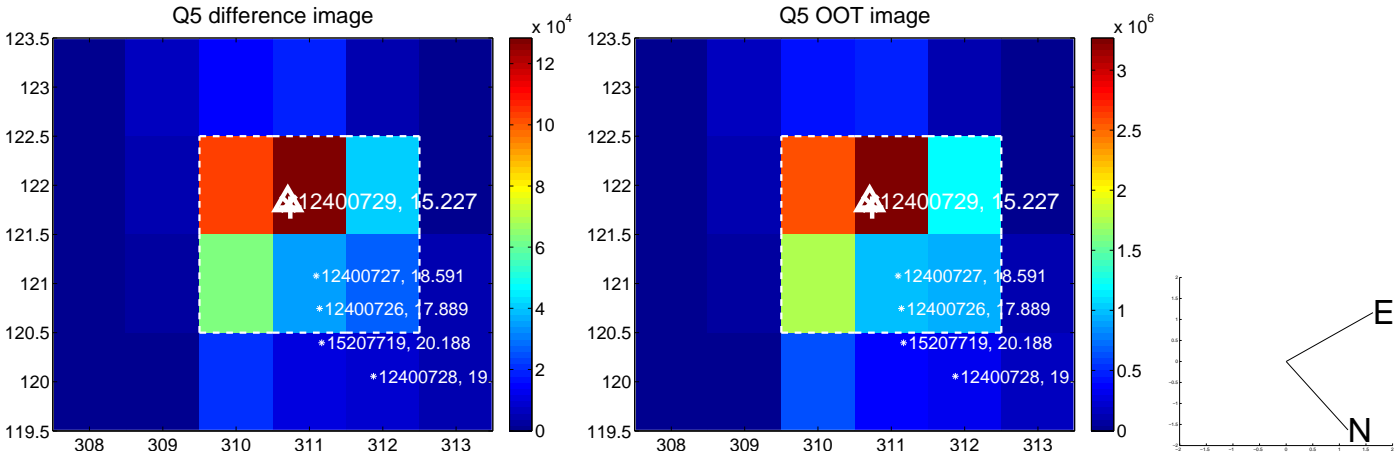
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.011 \pm 0.071$	0.15	$-0.006 \pm 0.068$	$0.009 \pm 0.074$
PRF-fit source offset from KIC position	$0.111 \pm 0.070$	1.59	$-0.085 \pm 0.069$	$0.072 \pm 0.074$
photometric centroid source offset	$1.40 \pm 0.12$	11.23	$-0.58 \pm 0.14$	$1.28 \pm 0.12$



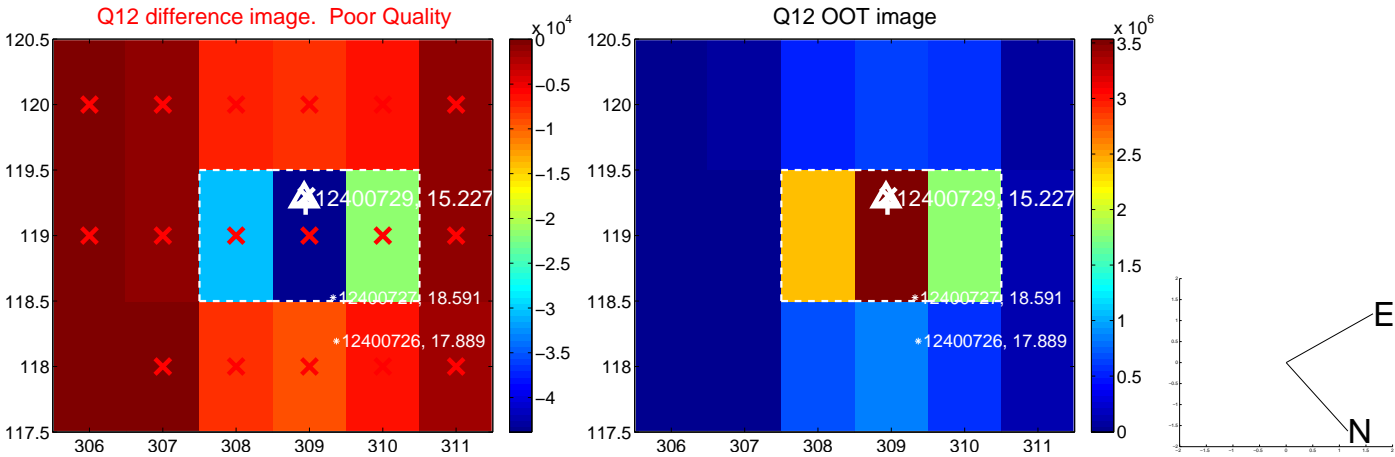
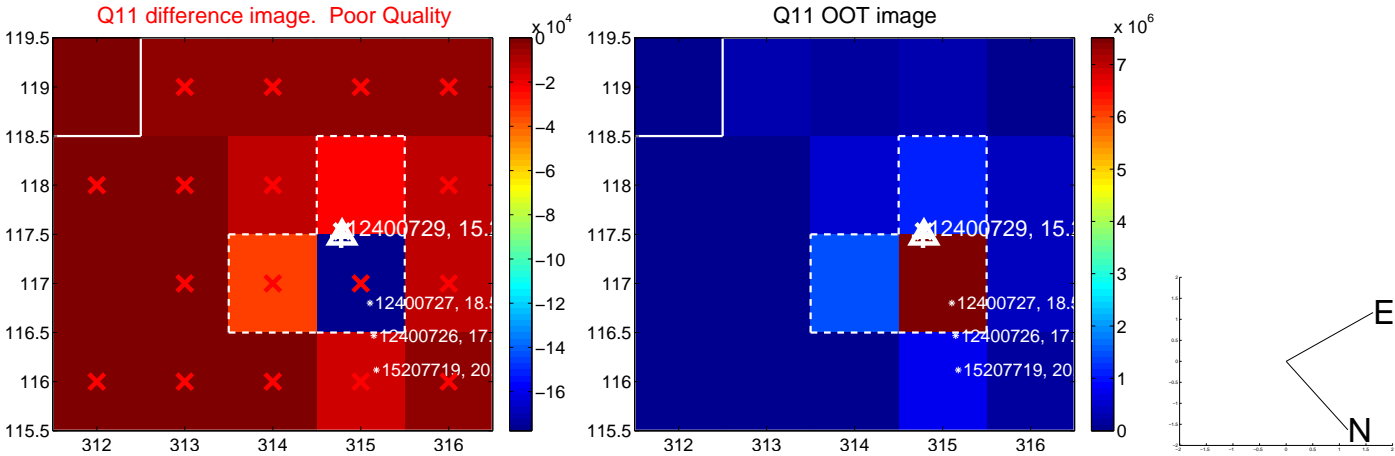
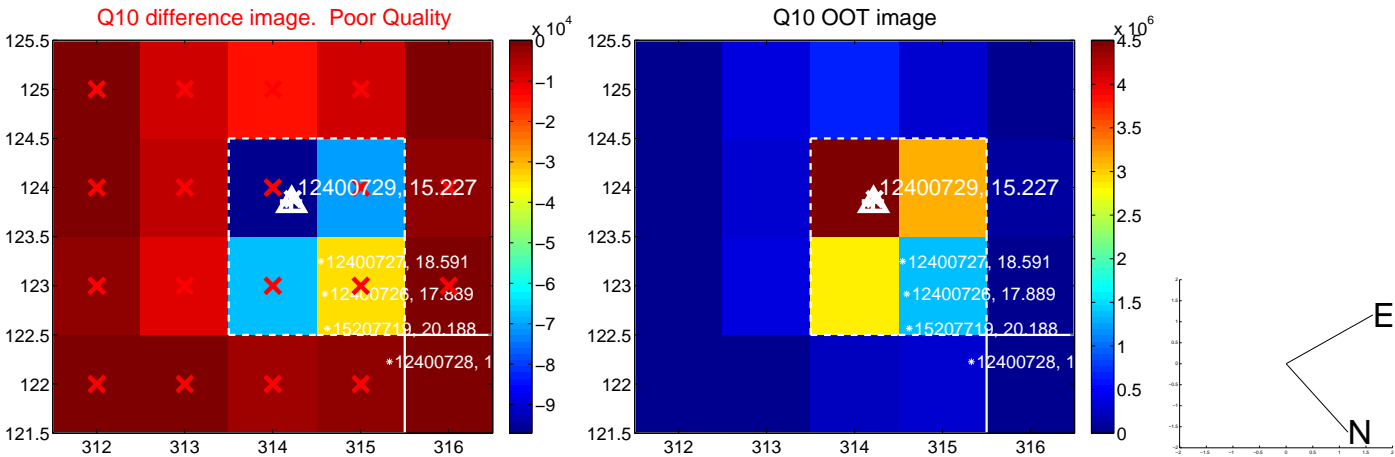
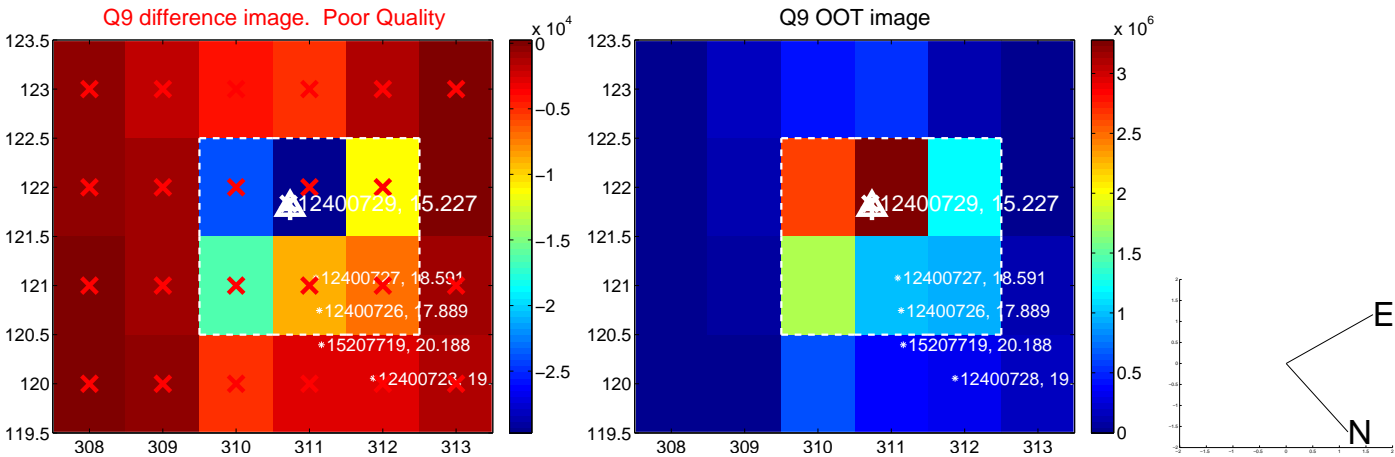
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



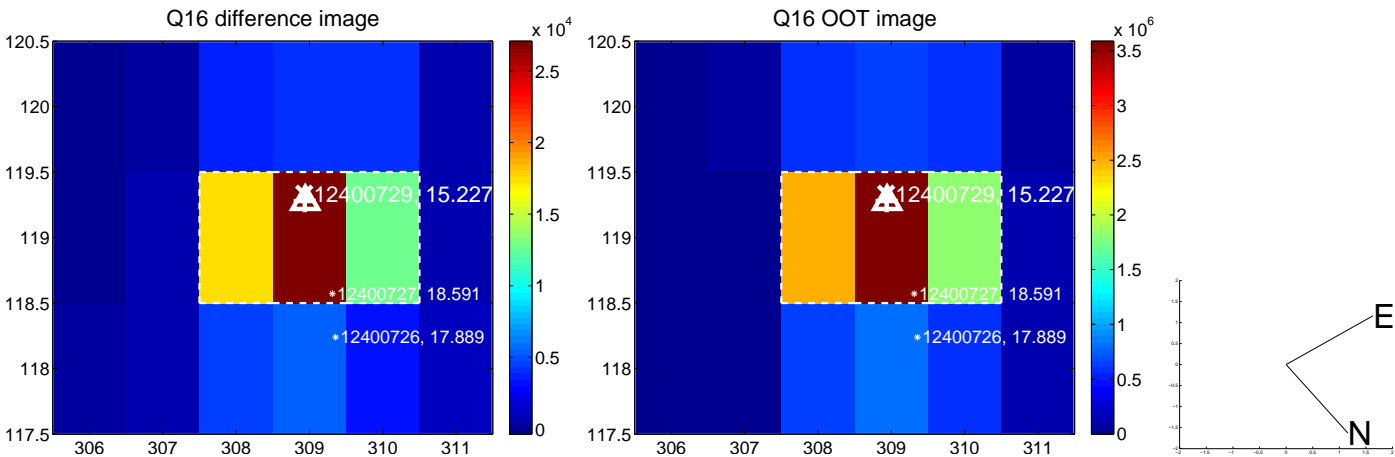
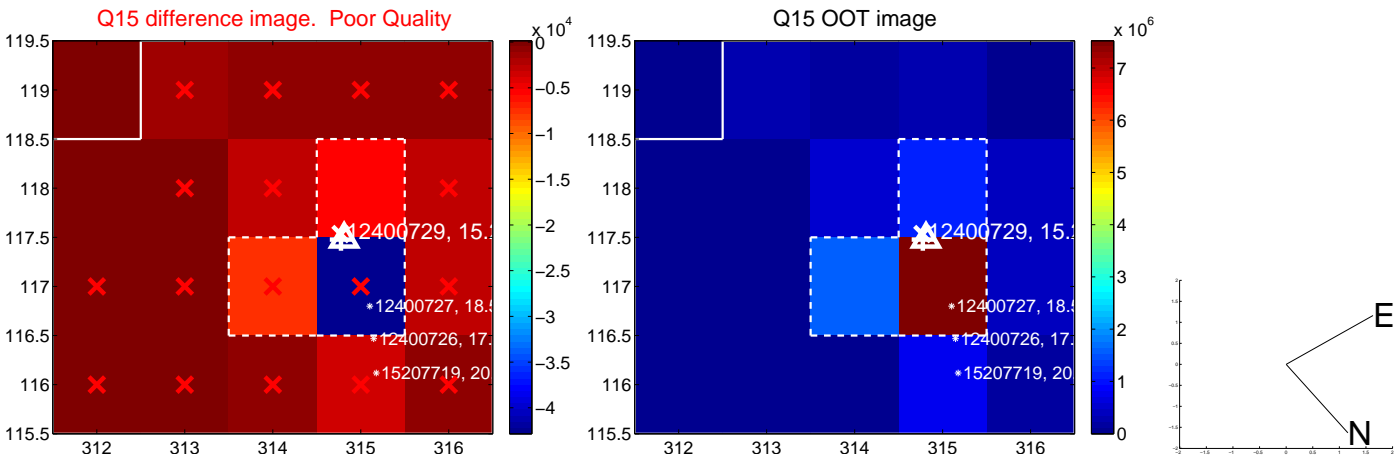
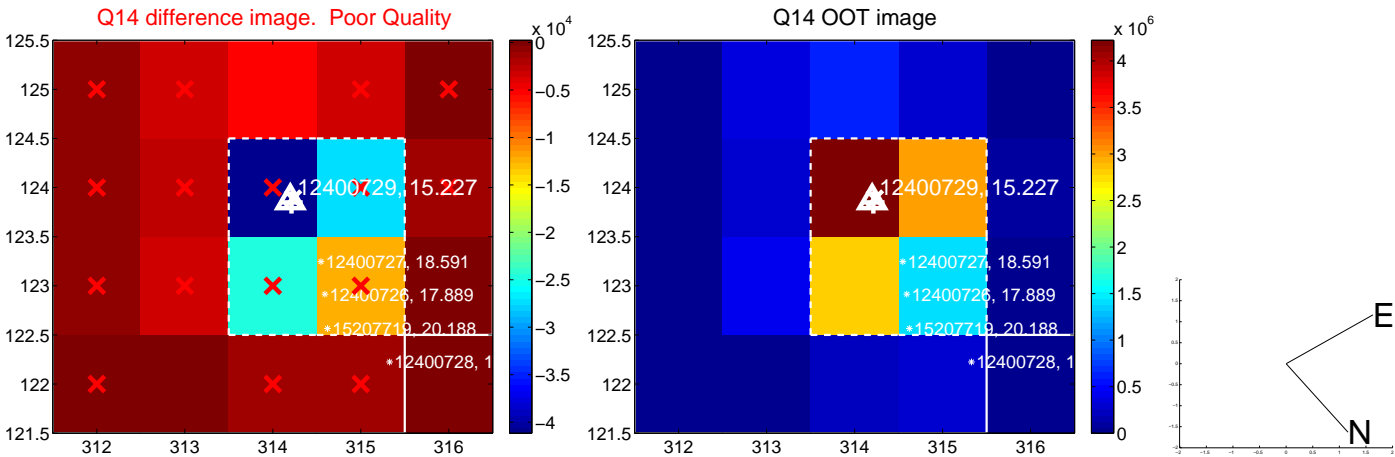
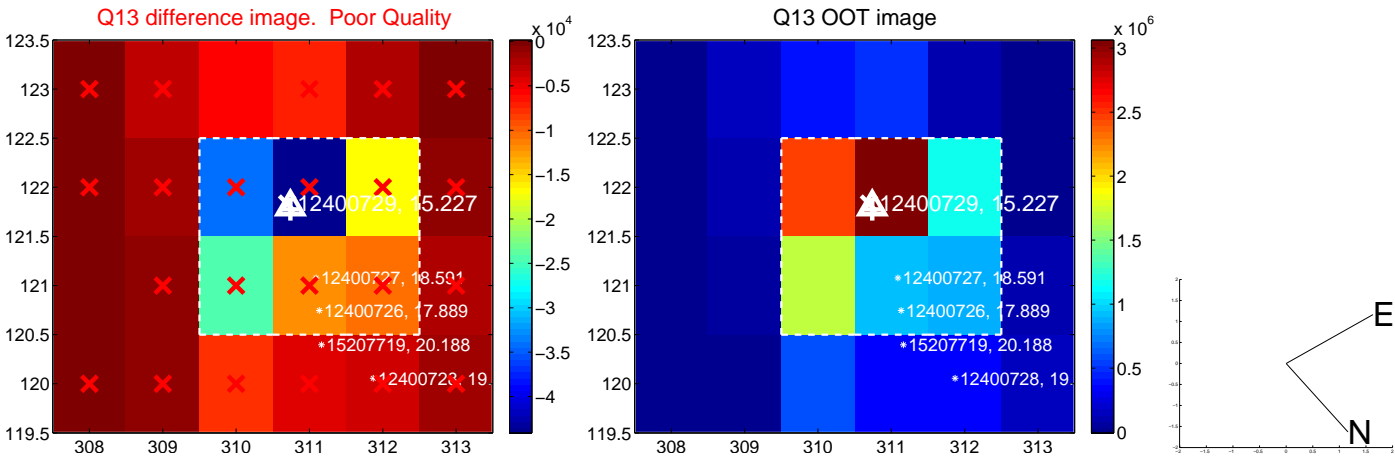
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



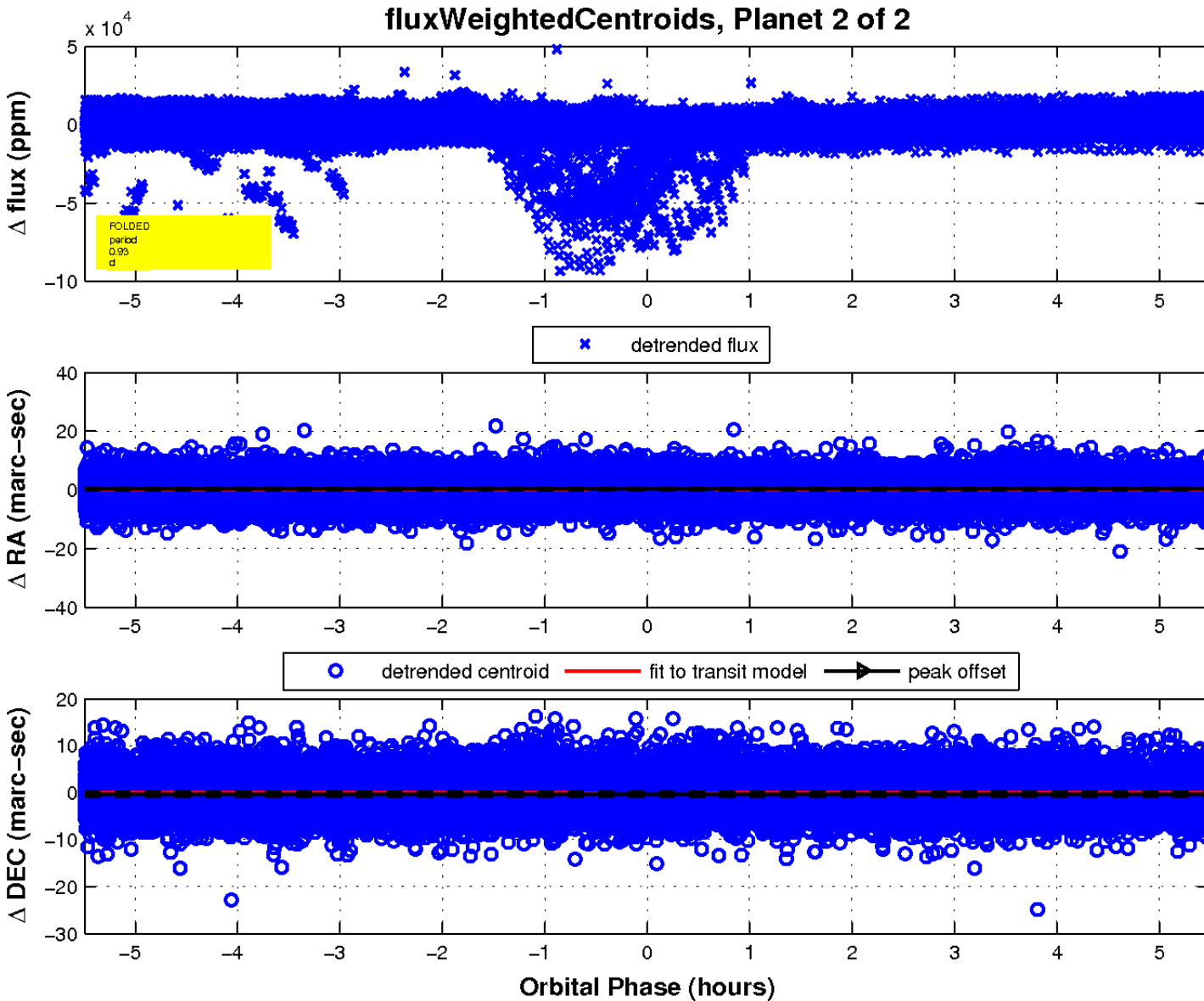
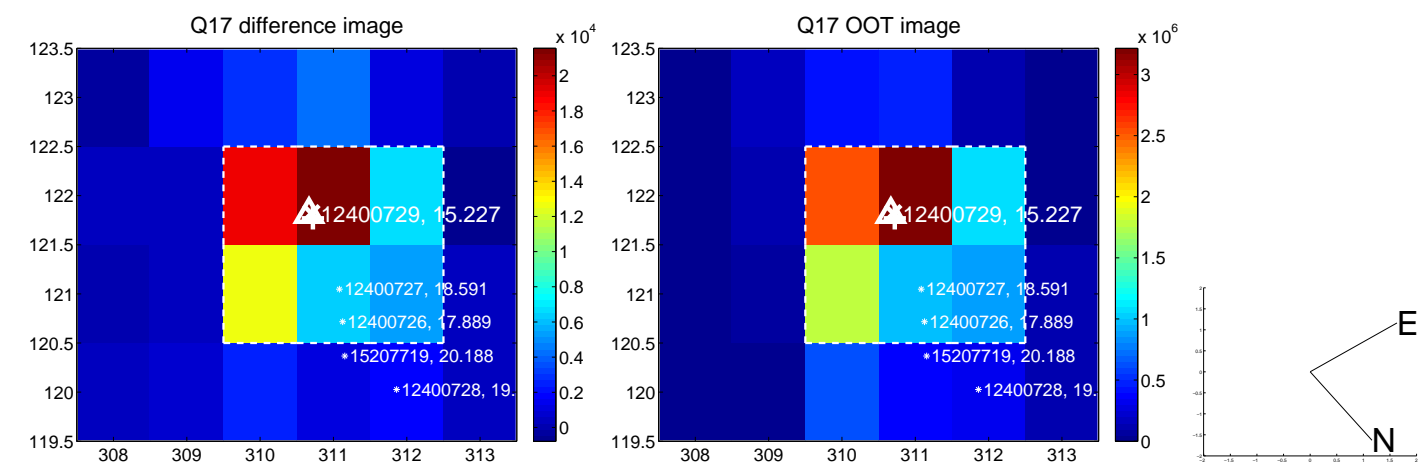
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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.



UKIRT Image

Declination

