

# KIC 010858691

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010858691-01	OBS	1306.01	1.796313	131.539720	182.8	2.086	17.9	18.8	0.83	5576	1.32	826.76
010858691-02	OBS	1306.02	3.468089	132.536691	223.8	2.709	14.9	16.7	0.83	5576	1.57	343.90
010858691-03	OBS	1306.03	5.914304	133.486728	257.4	3.010	12.0	15.1	0.83	5576	1.59	168.79
010858691-04	OBS	1306.04	29.221258	139.336833	366.8	3.957	9.0	10.5	0.83	5576	1.81	20.06

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010858691-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
010858691-02	OBS	PC	0.99	0	0	0	0	NO_COMMENT
010858691-03	OBS	PC	0.95	0	0	0	0	NO_COMMENT
010858691-04	OBS	PC	0.91	0	0	0	0	NO_COMMENT

**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.

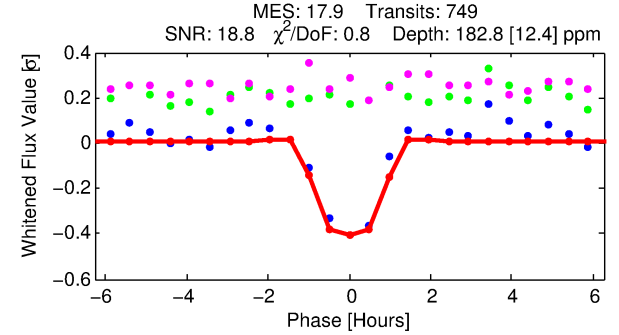
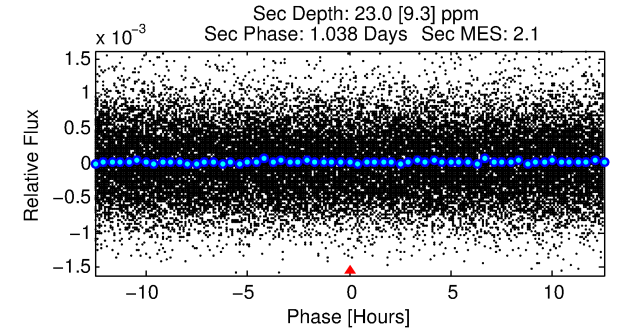
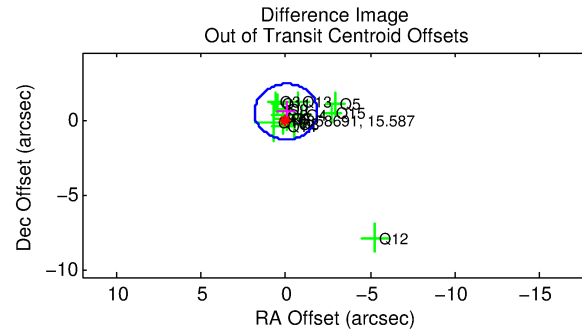
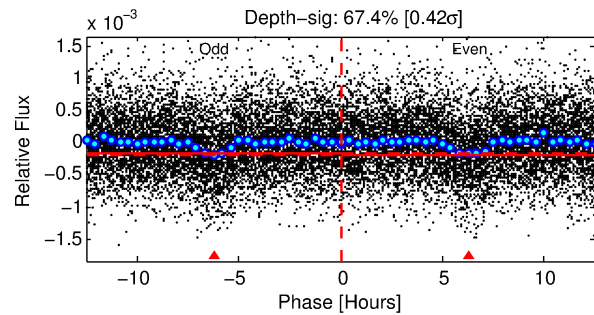
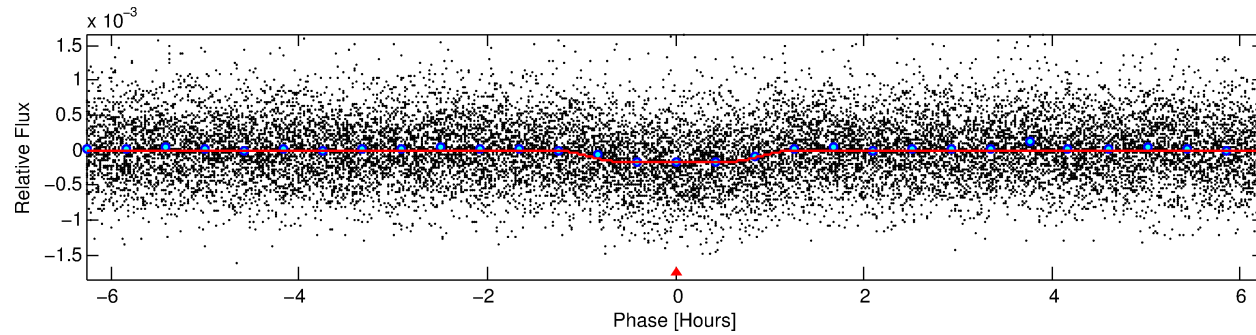
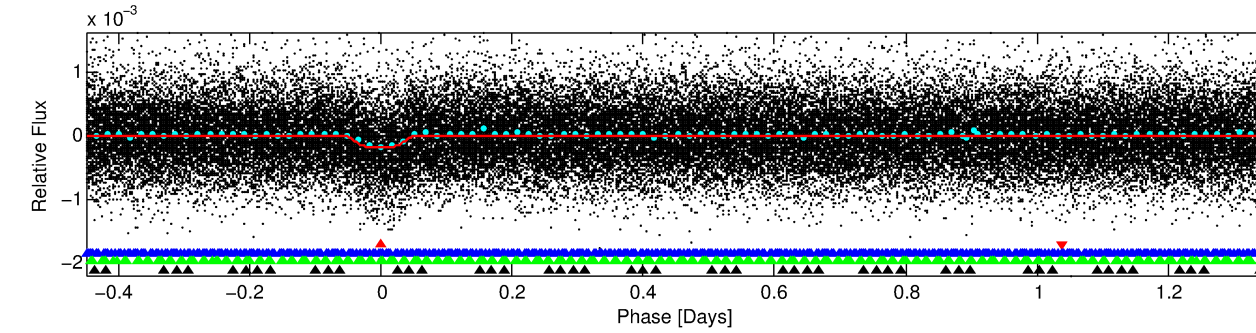
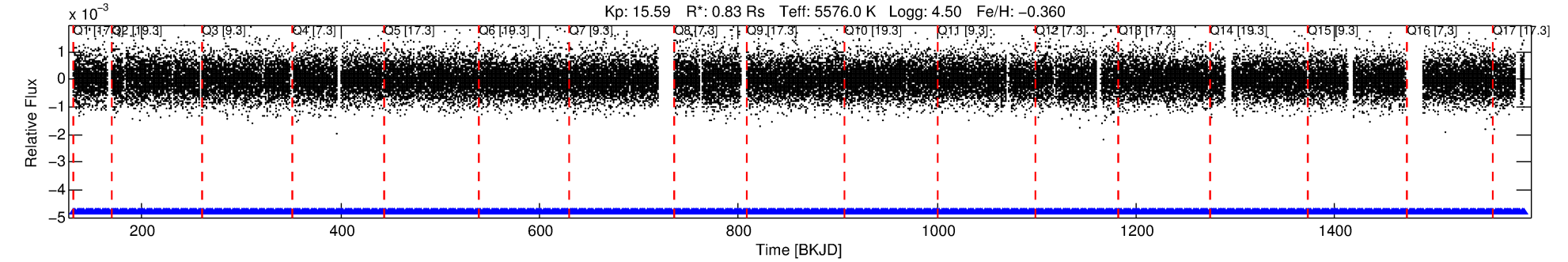
Ephemeris Match Information For 010858691-01

No Significant Match Found

# DV One-Page Summary

KIC: 10858691 Candidate: 1 of 4 Period: 1.796 d  
KOI: K01306.01 Name: Kepler-286b Corr: 0.962

Kp: 15.59 R\*: 0.83 Rs Teff: 5576.0 K Logg: 4.50 Fe/H: -0.360



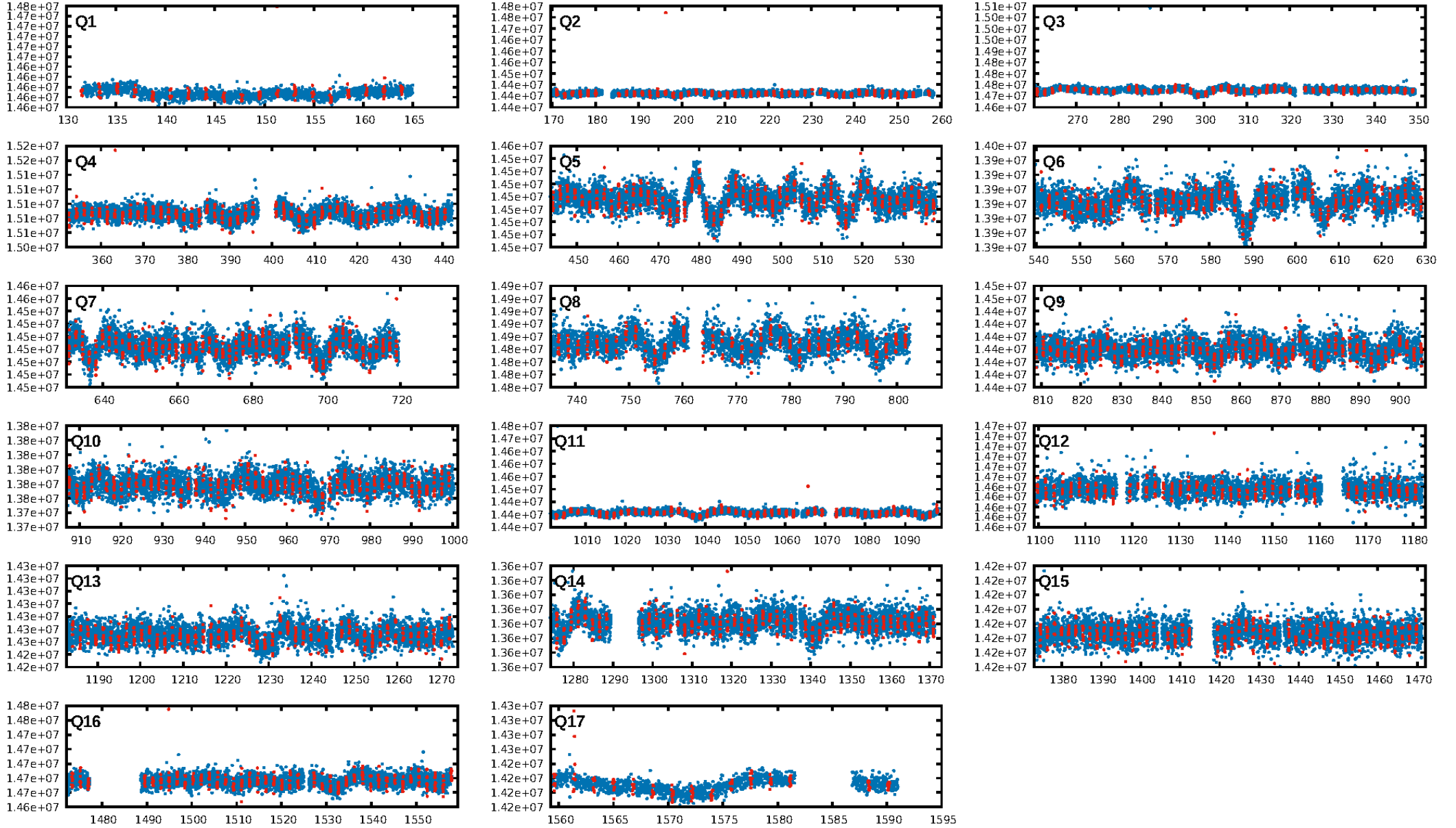
## DV Fit Results:

Period = 1.79631 [0.00001] d  
Epoch = 131.5397 [0.0017] BKJD  
Rp/R\* = 0.0146 [0.0061]  
a/R\* = 3.38 [6.06]  
b = 0.89 [0.49]  
Seff = 826.76 [129.09]  
Teff = 1367 [53] K  
Rp = 1.32 [0.57] Re  
a = 0.0268 [0.0024] AU  
Ag = 5.25 [4.94] [0.86σ]  
Teffp = 3200 [748] K [2.44σ]

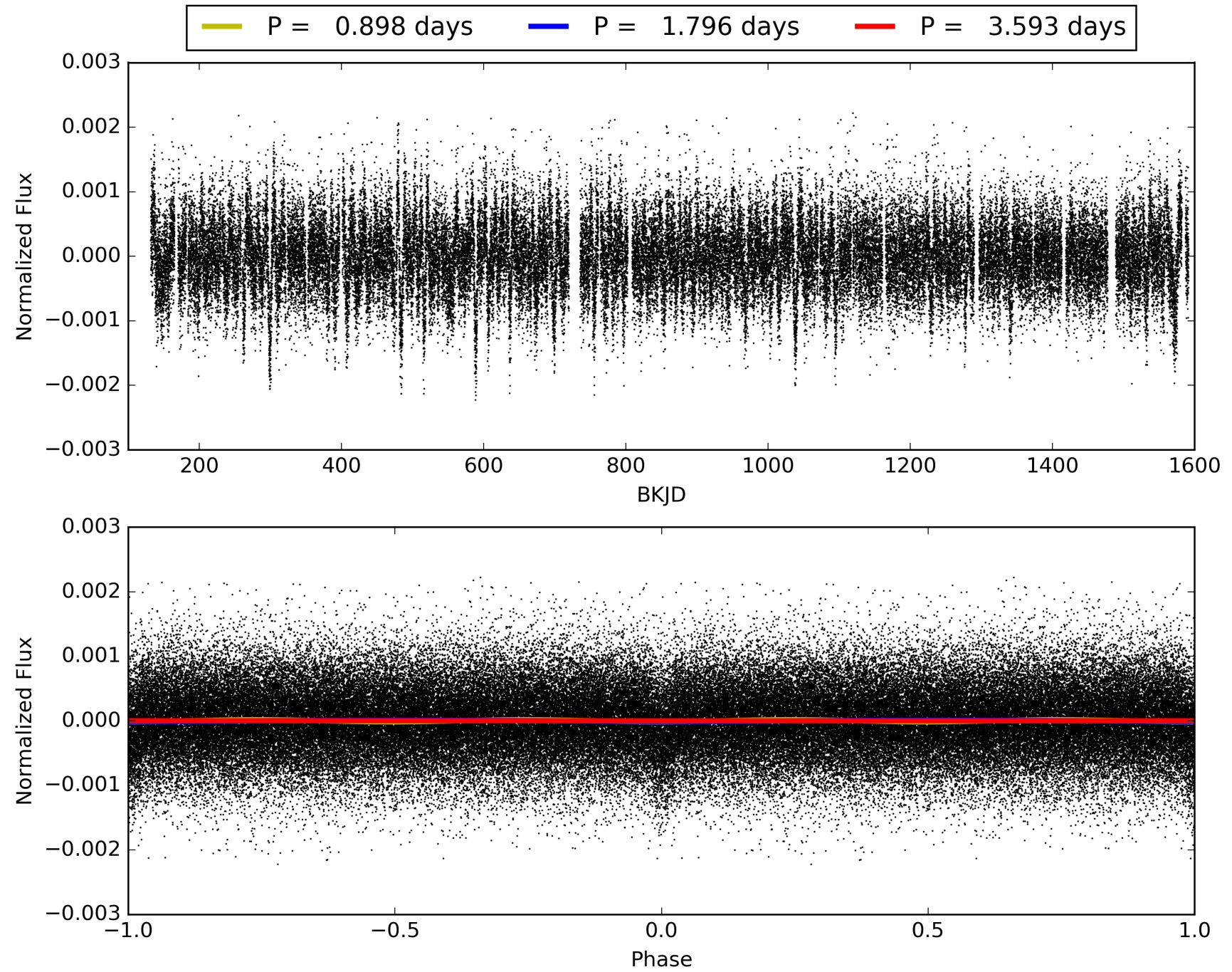
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [11.74σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 9.73e-72  
RollingBand-fgt: 1.00 [715/715]  
GhostDiagnostic-chr: 20.99  
Centroid-sig: 24.2%  
Centroid-so: 0.710 arcsec [0.87σ]  
OotOffset-rm: 0.545 arcsec [0.88σ]  
KicOffset-rm: 0.450 arcsec [0.63σ]  
OotOffset-st: 2/4/4/3 [13]  
KicOffset-st: 2/4/4/3 [13]  
DiffImageQuality-fgm: 0.92 [12/13]  
DiffImageOverlap-fno: 1.00 [17/17]

# TCE 010858691-01, PDC Light Curves



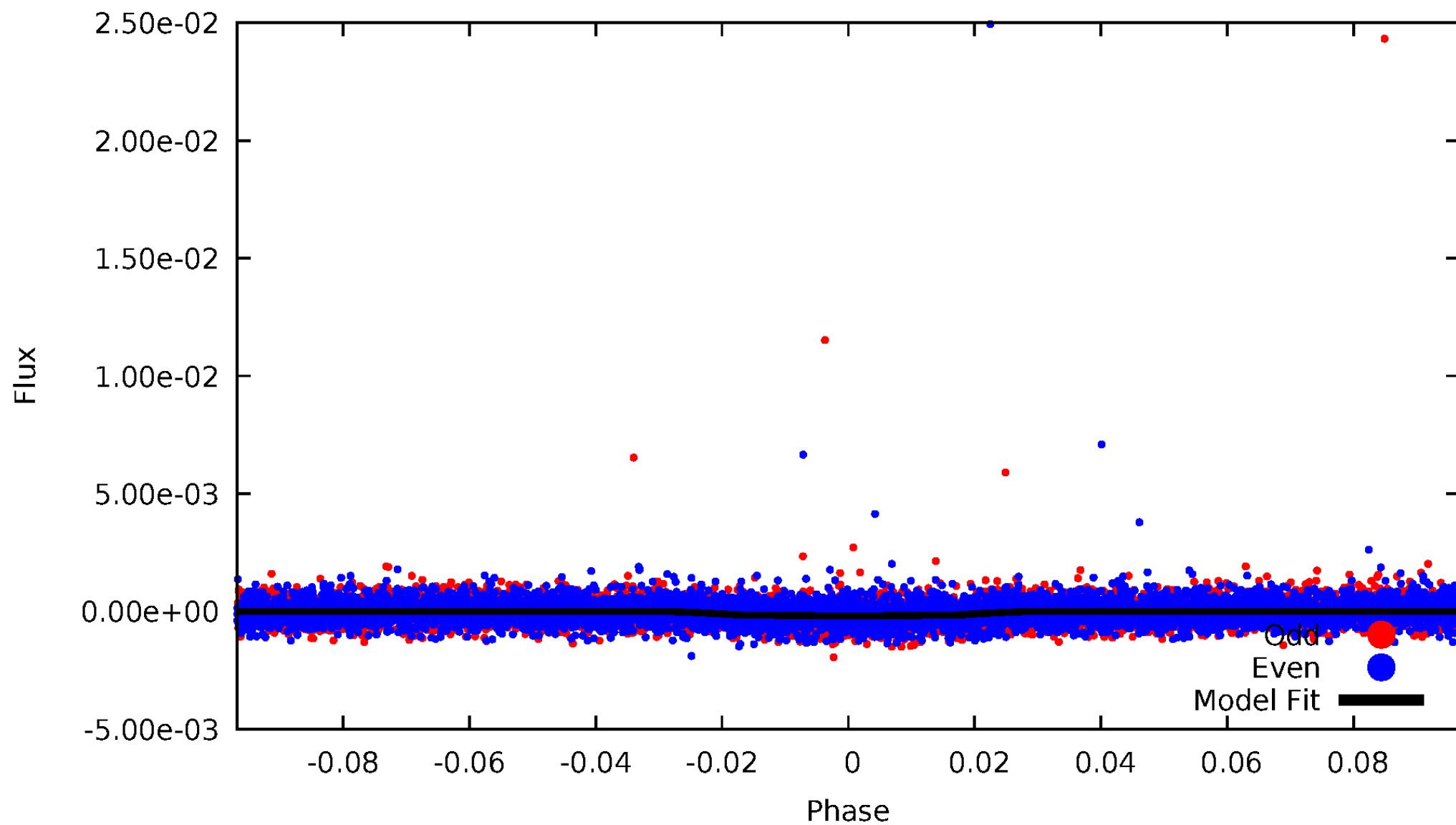
# TCE 010858691-01





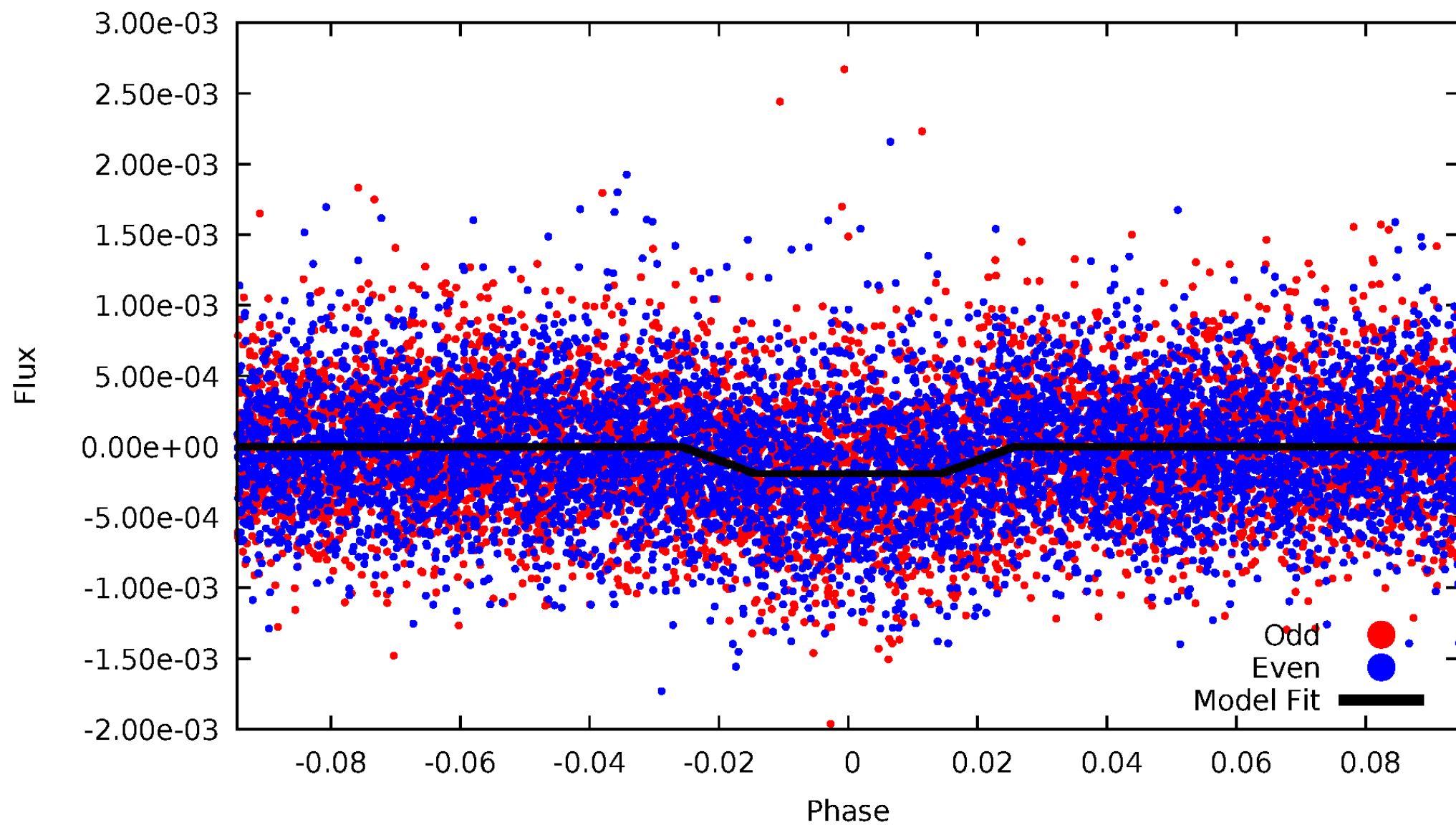
# DV Odd/Even

TCE 010858691-01

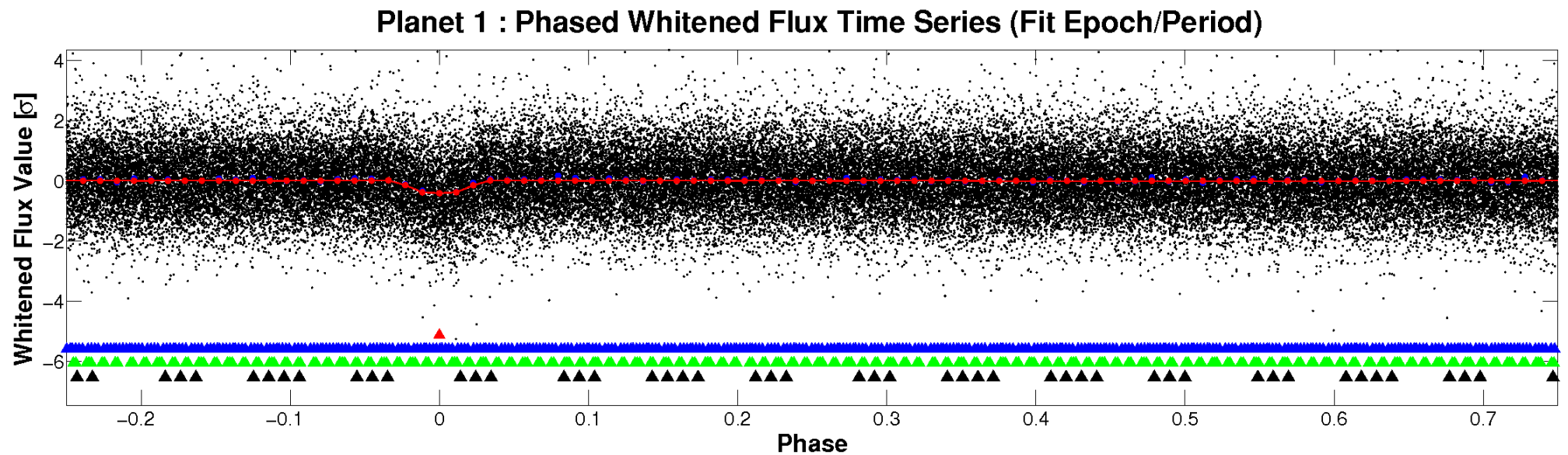
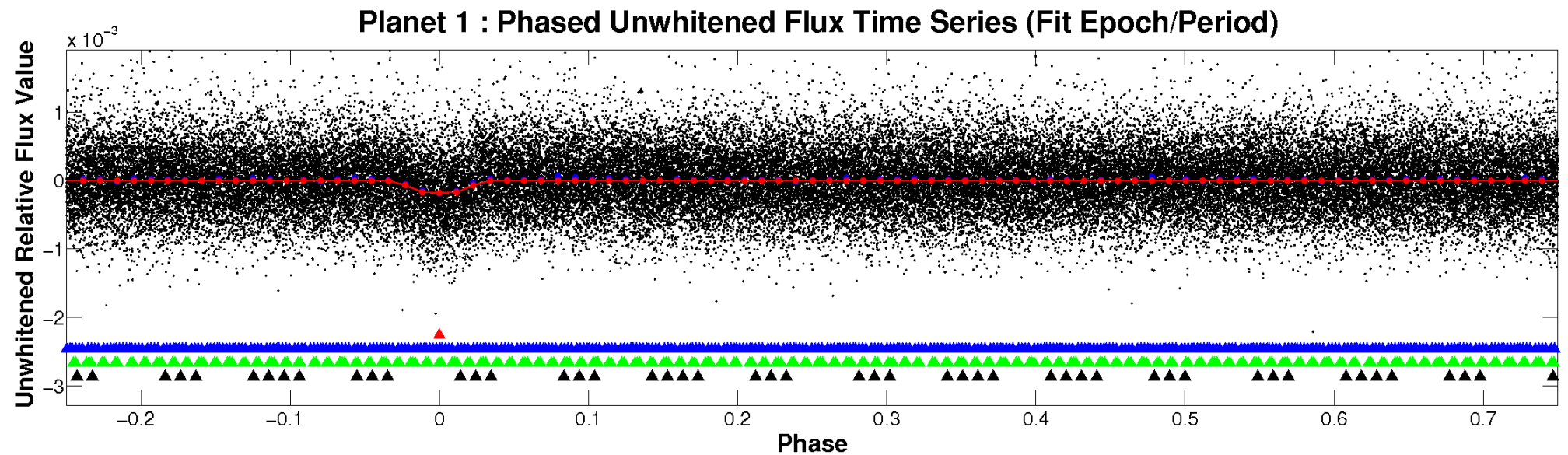


# ALT Odd/Even

TCE 010858691-01

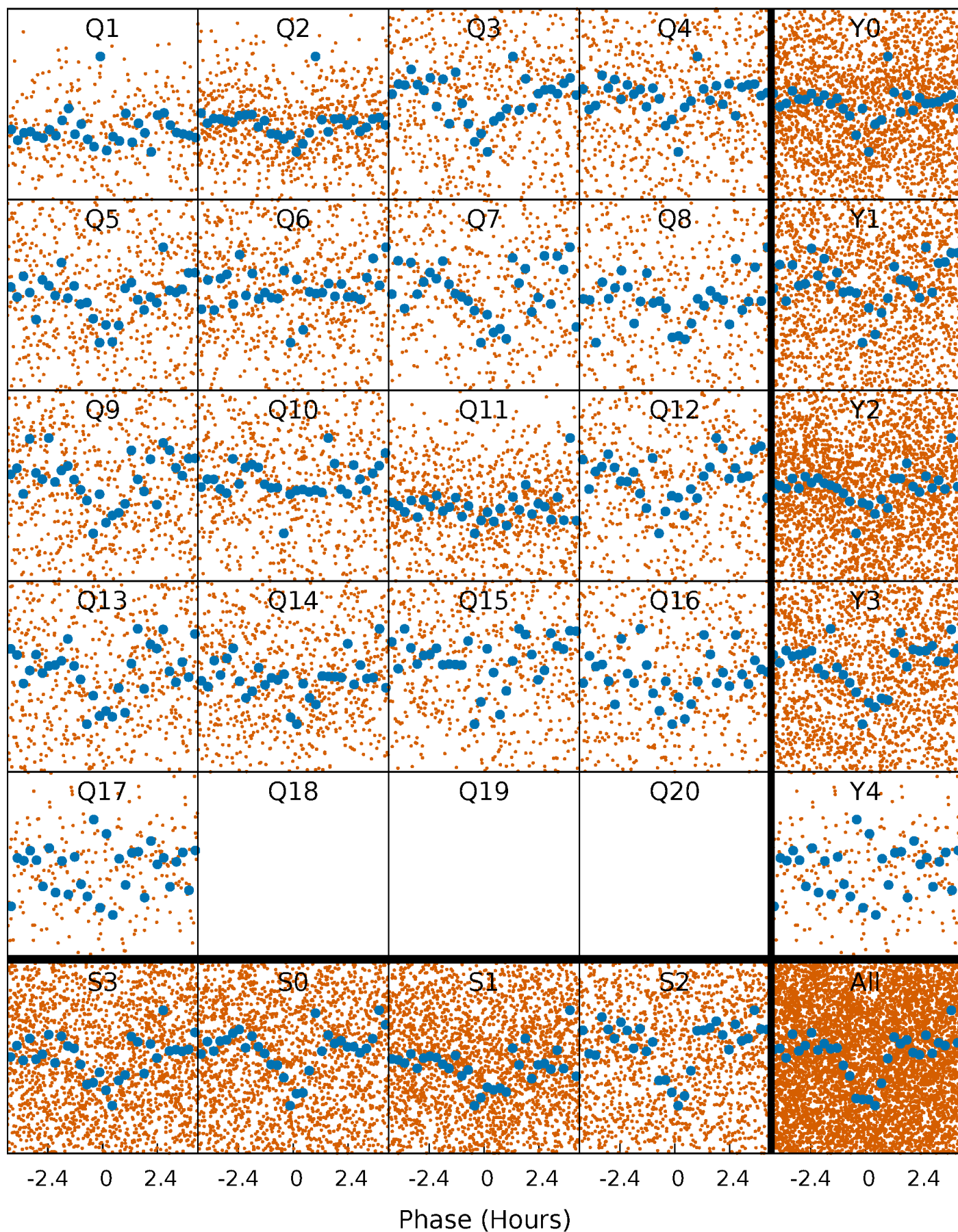


# Non-Whitened Vs. Whitened Light Curve



# PDC Quarter-Phased Transit Curves

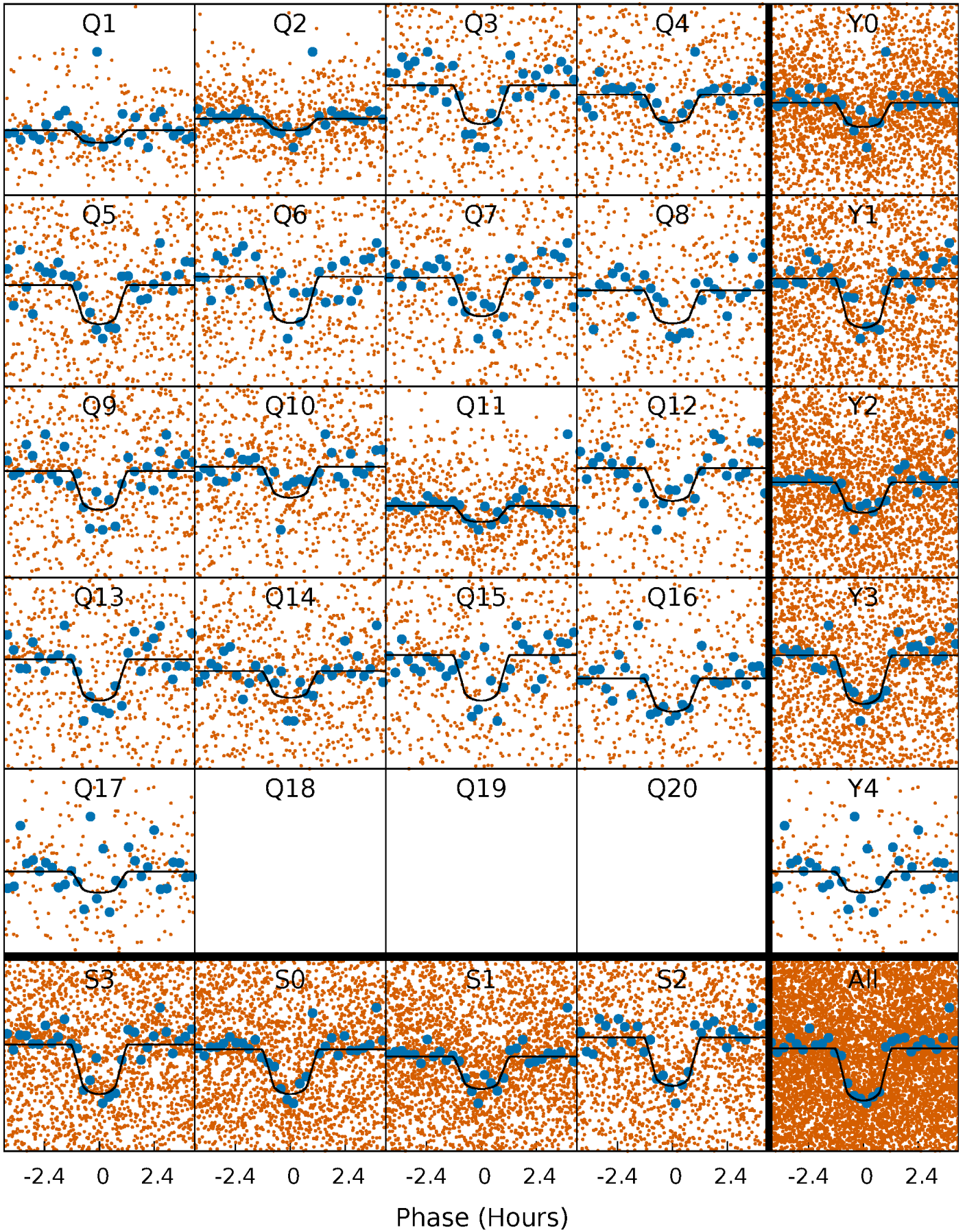
TCE 010858691-01 P= 1.796313 Days  $T_0=131.539720$  (BKJD)





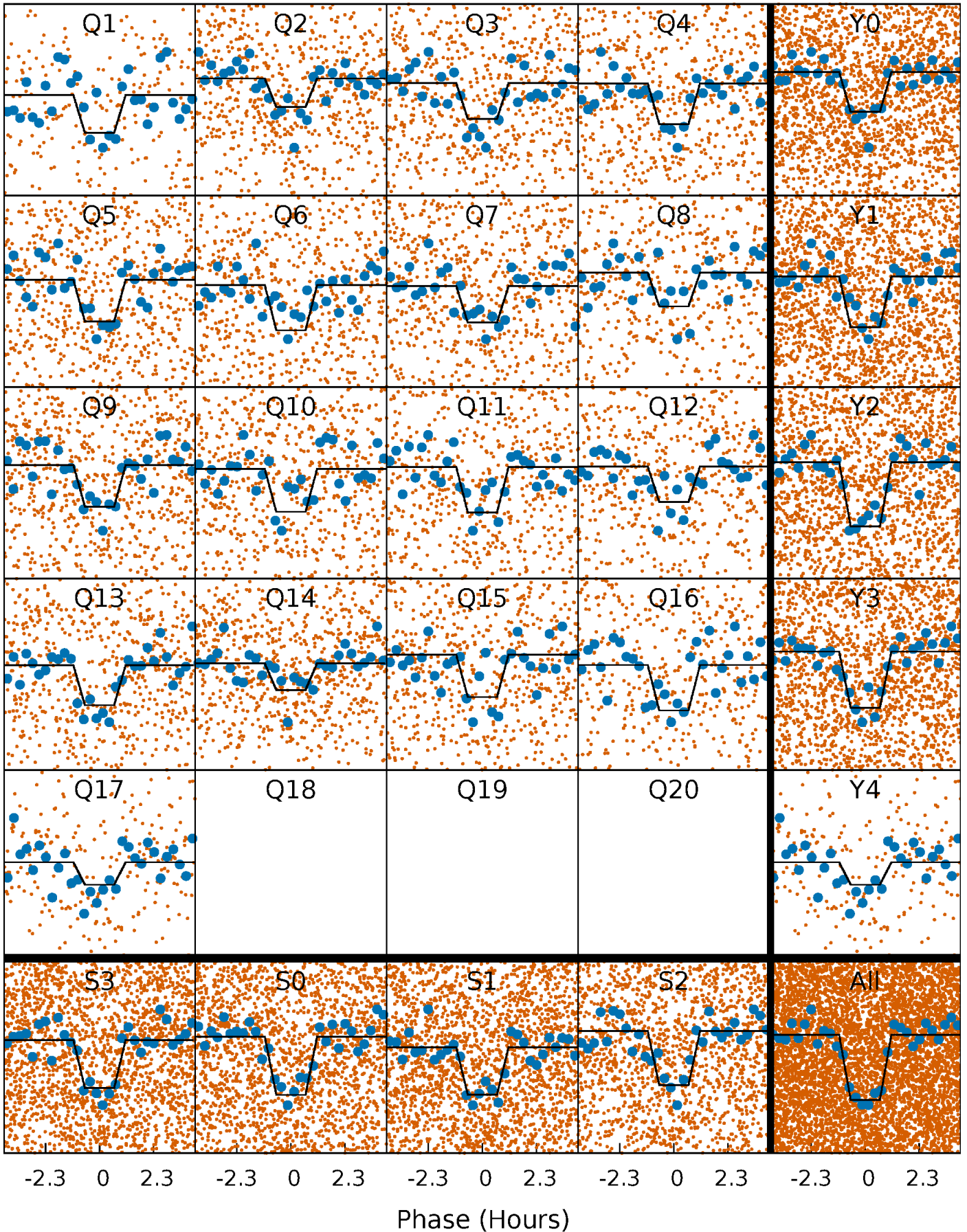
# DV Quarter-Phased Transit Curves

TCE 010858691-01 P= 1.796313 Days  $T_0=131.539720$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

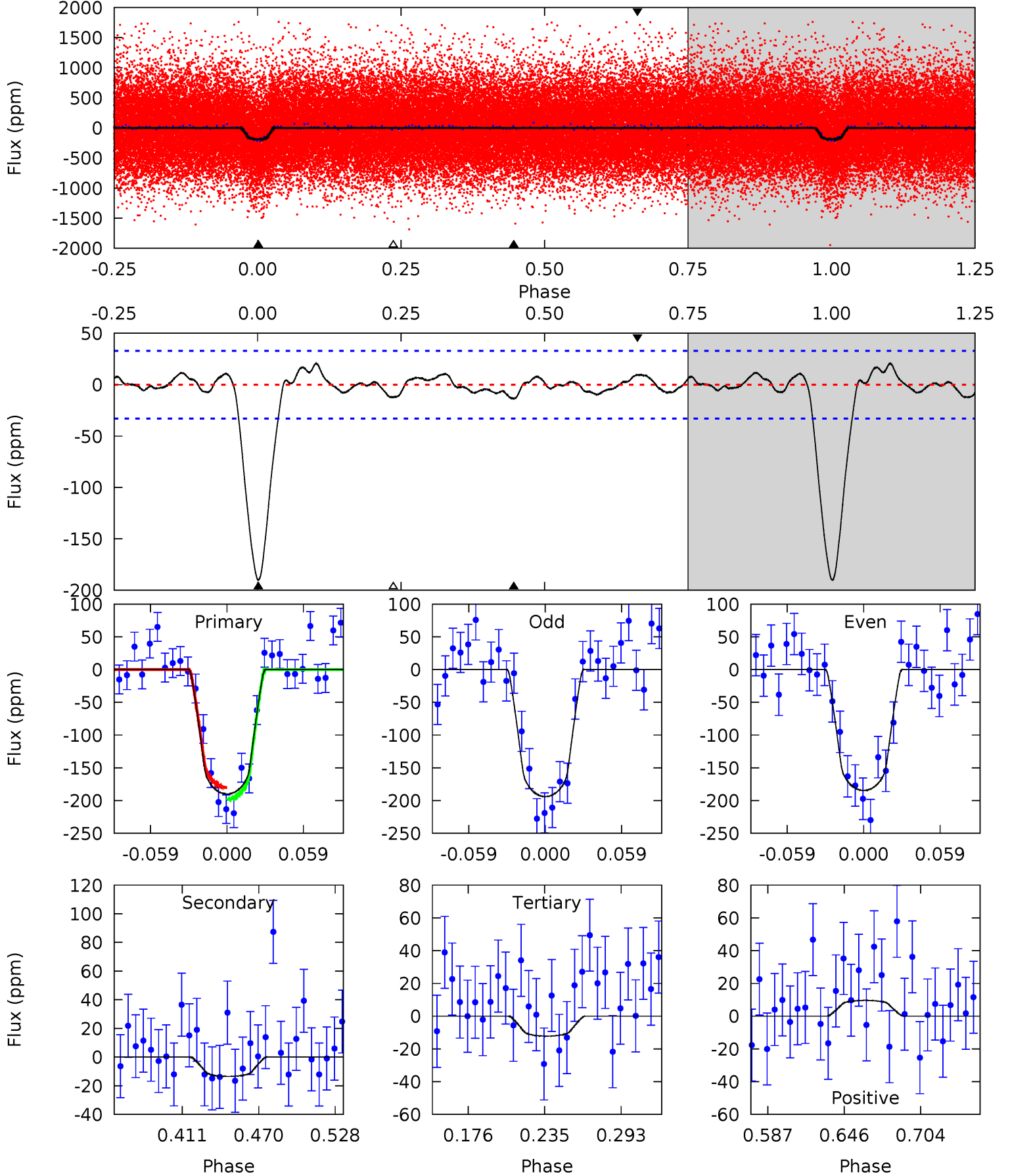
TCE 010858691-01 P= 1.796324 Days  $T_0=131.538782$  (BKJD)



# DV Model-Shift Uniqueness Test

010858691-01, P = 1.796313 Days, E = 129.743407 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	1.91	1.73	1.37	4.68	1.89	0.94	25.2	25.6	0.18	0.55	0.67	0.92	0.10	1.29

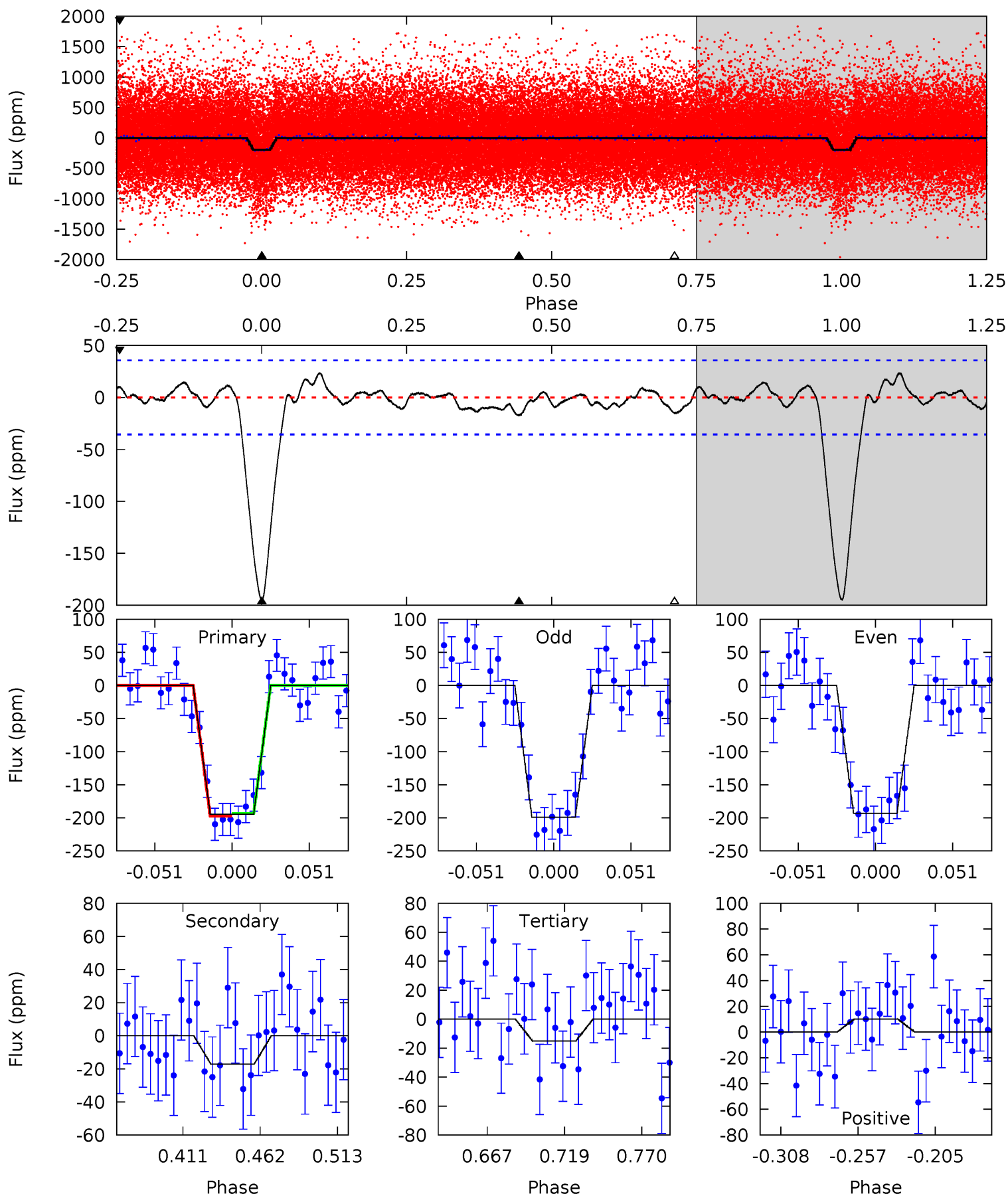




# Alt Model-Shift Uniqueness Test

010858691-01, P = 1.796324 Days, E = 129.742458 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
25.7	2.26	1.98	1.33	4.70	1.95	0.99	23.7	24.3	0.27	0.92	0.37	0.95	0.11	0.25





### Stellar Parameters For KIC 010858691

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5576^{+111}_{-111}$	$4.503^{+0.075}_{-0.075}$	$-0.360^{+0.150}_{-0.150}$	$0.829^{+0.086}_{-0.065}$	$0.800^{+0.060}_{-0.040}$	$1.974^{+0.510}_{-0.484}$
	+2%/-2%	+2%/-2%	+42%/-42%	+10%/-8%	+8%/-5%	+26%/-25%
Source	SPE58	SPE58	SPE58	DSEP		

KIC = Kepler Input Catalog; PHO = Photometry; SPE = Spectroscopy; AST = Asteroseismology  
 TRA = Transits; DESP = Dartmouth Models; MULT = Multiple Models

### Secondary Eclipse Parameters for KIC 010858691-01 / KOI 1306.01

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-14 \pm 7$	$1.34^{+0.55}_{-0.55}$	$1908^{+68}_{-60}$	$3230^{+713}_{-523}$	$2.815^{+6.012}_{-1.843}$
Alt.	$-17 \pm 8$	$1.27^{+0.54}_{-0.54}$	$1913^{+61}_{-64}$	$3454^{+774}_{-540}$	$4.195^{+8.550}_{-2.670}$

$T_{\text{max}}$  = 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

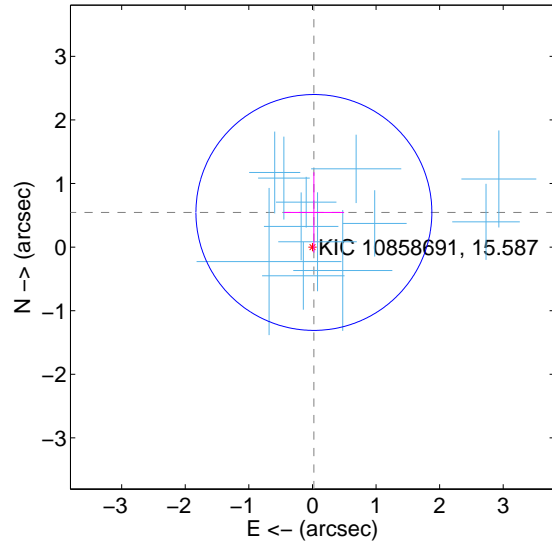
Supplemental centroid analysis for 010858691-01. Kepler magnitude: 15.59. Transit SNR 18.76

There are 12 quarters with good PRF difference image offsets

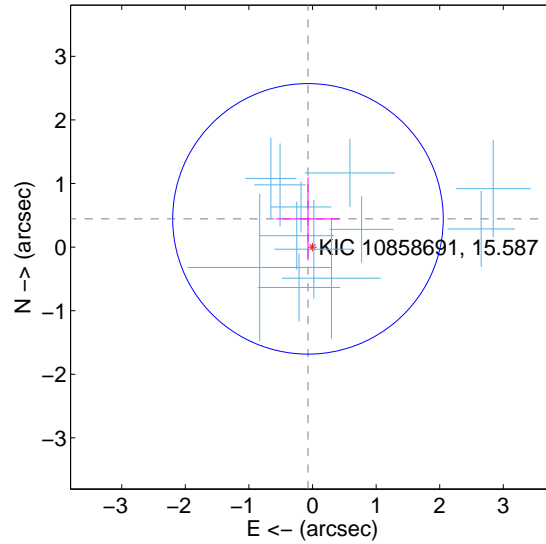
The direct PRF centroid is offset from the target star catalog position by about 0.17 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.545 \pm 0.618$	0.88	$-0.023 \pm 0.475$	$0.545 \pm 0.632$
PRF-fit source offset from KIC position	$0.450 \pm 0.709$	0.63	$0.072 \pm 0.501$	$0.444 \pm 0.654$
photometric centroid source offset	$0.71 \pm 0.82$	0.87	$-0.40 \pm 0.85$	$0.59 \pm 0.80$

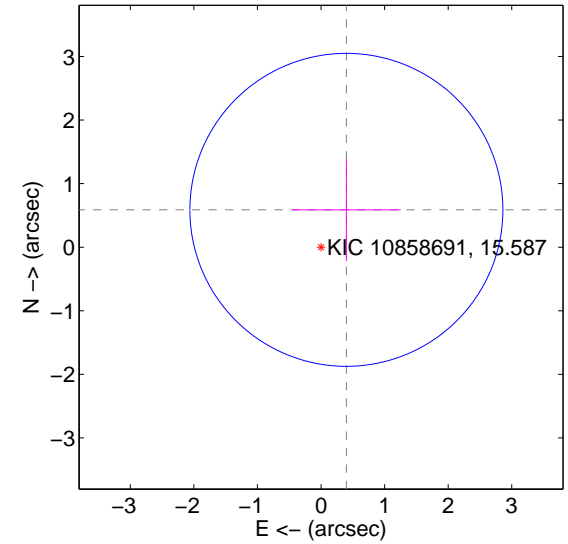
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

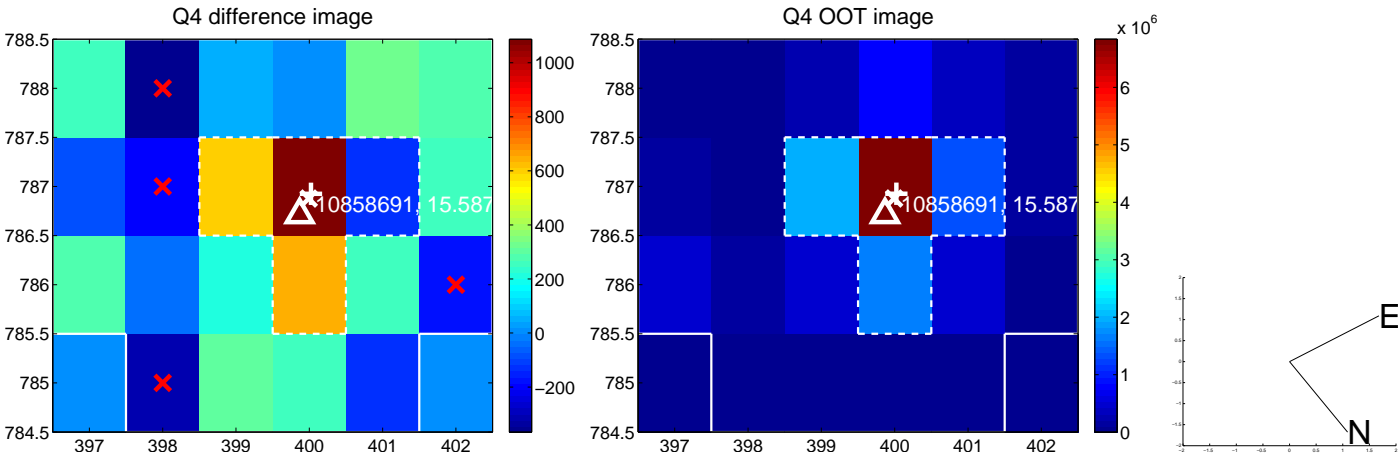
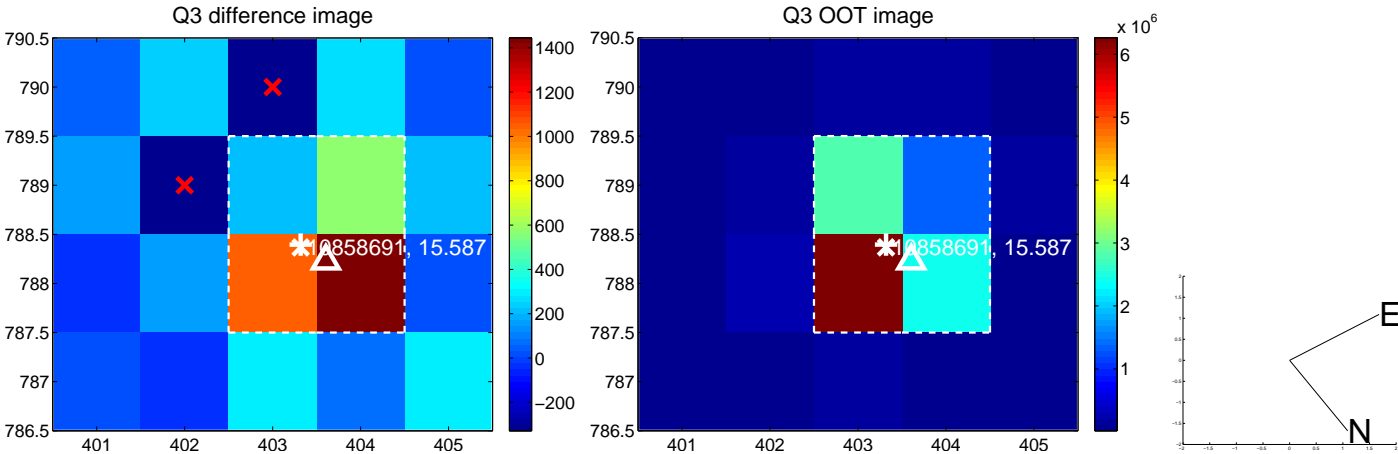
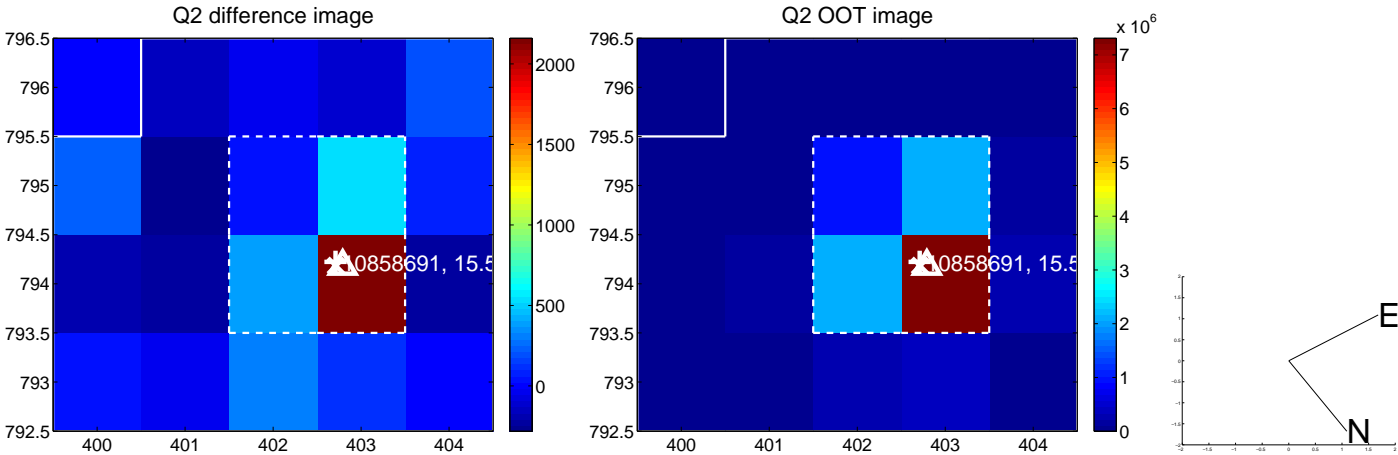
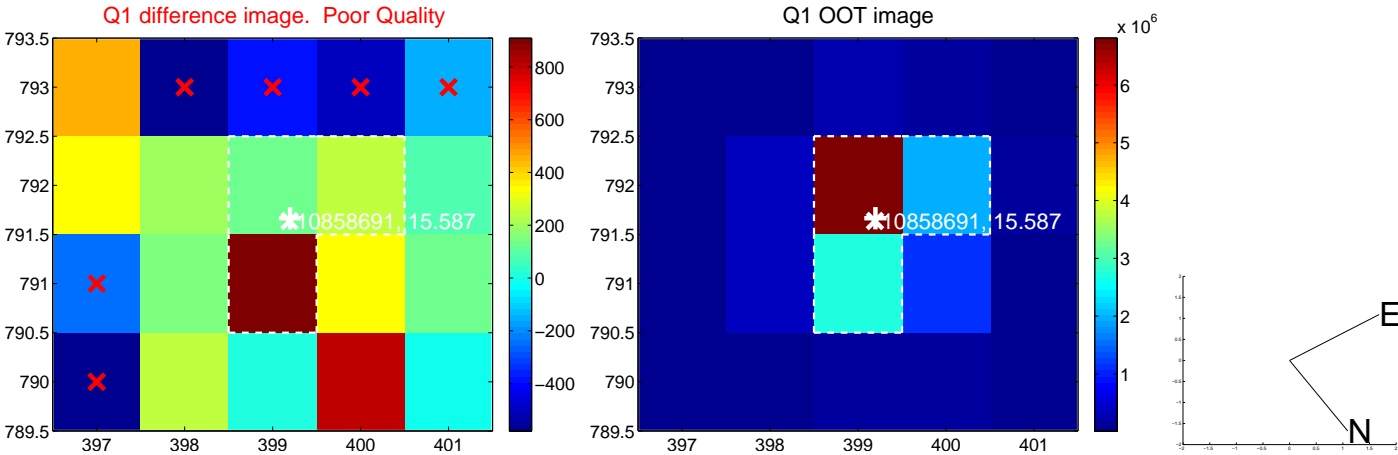


offset from photometric centroids

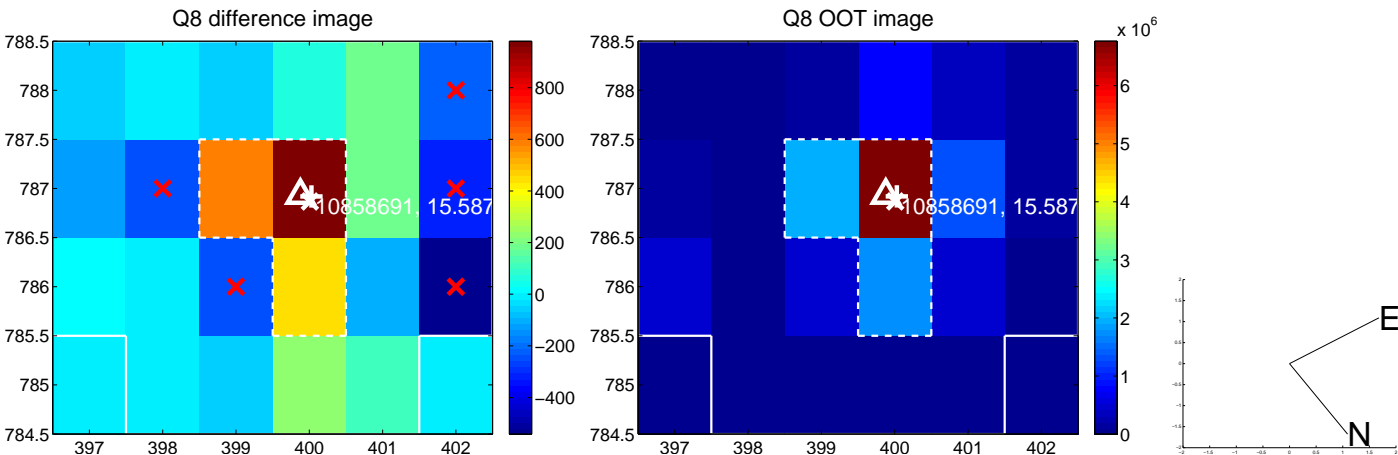
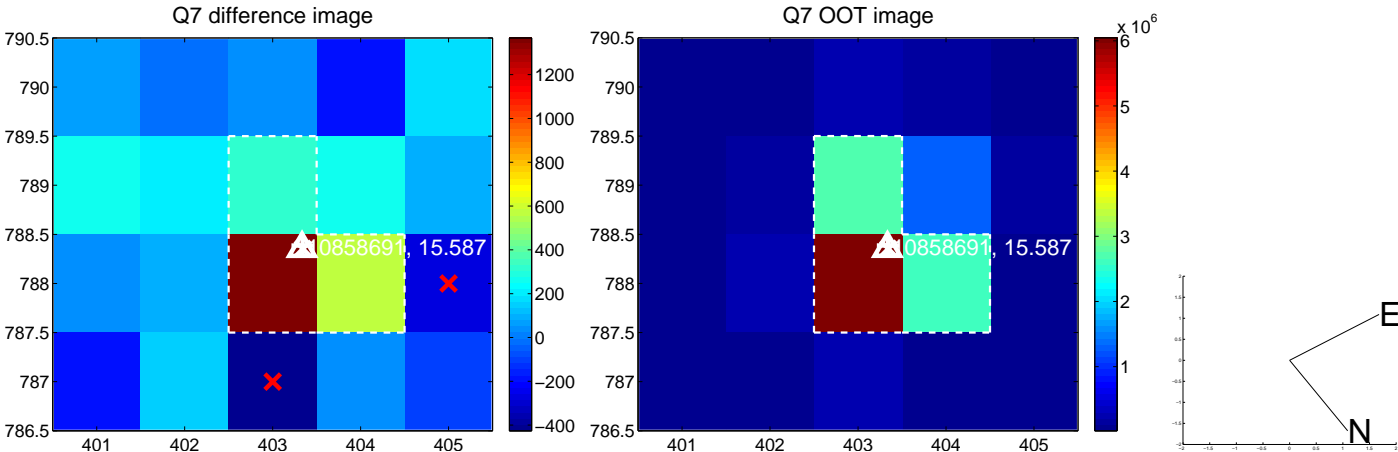
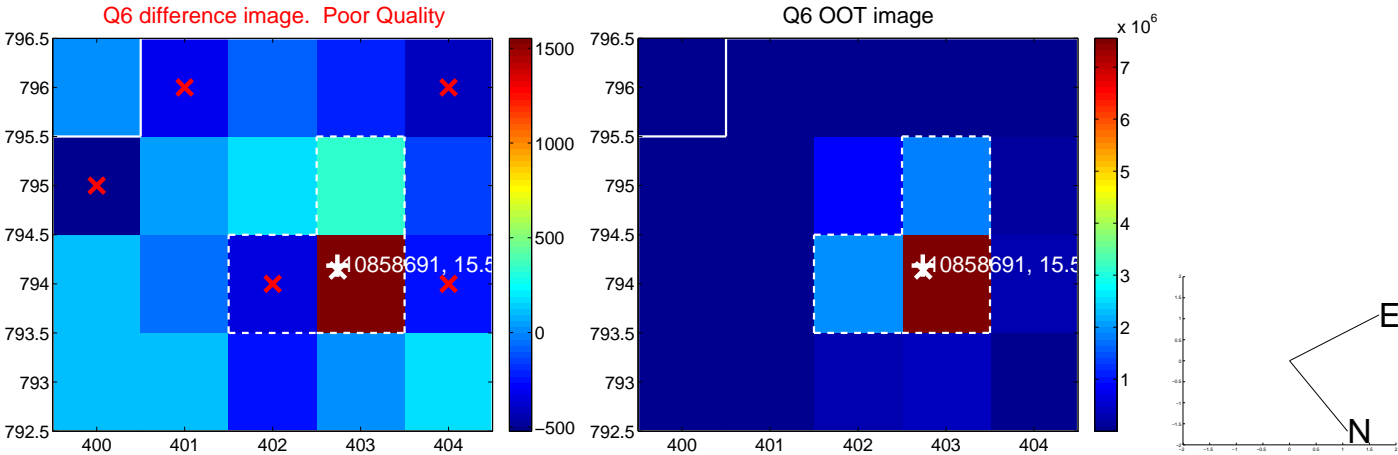
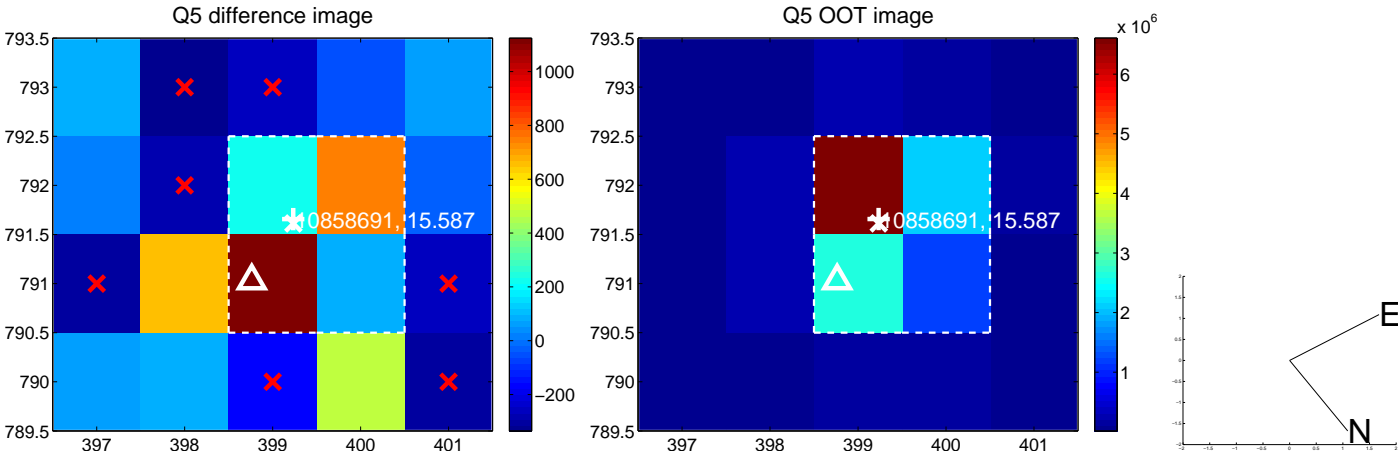


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

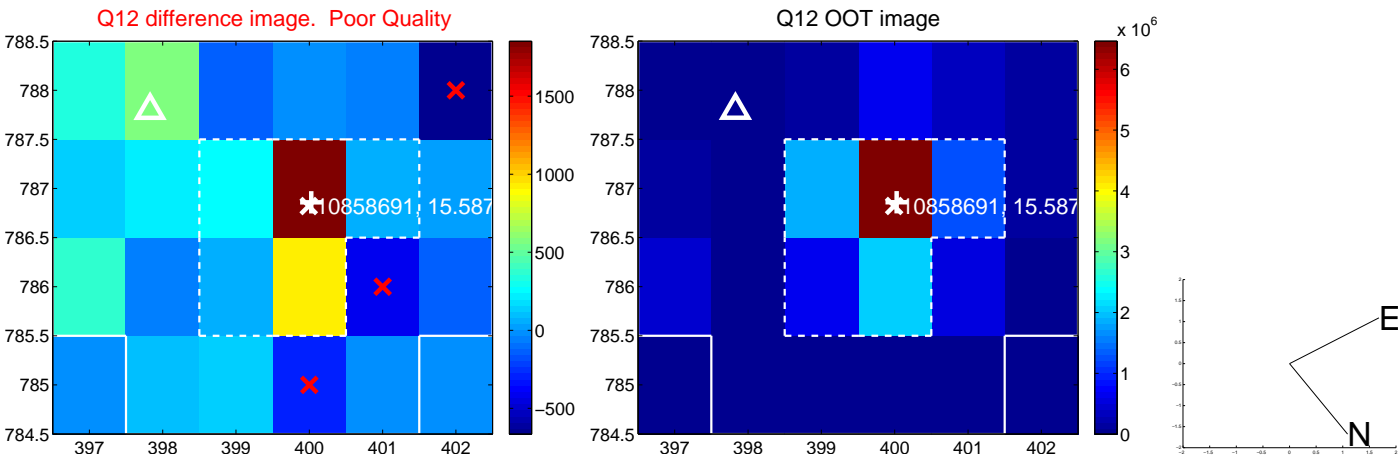
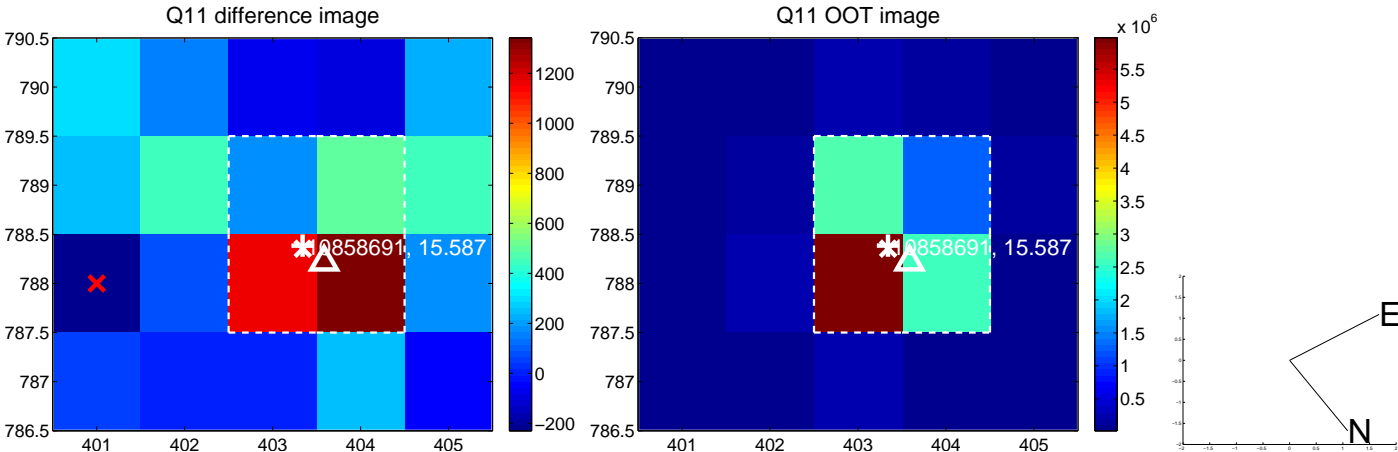
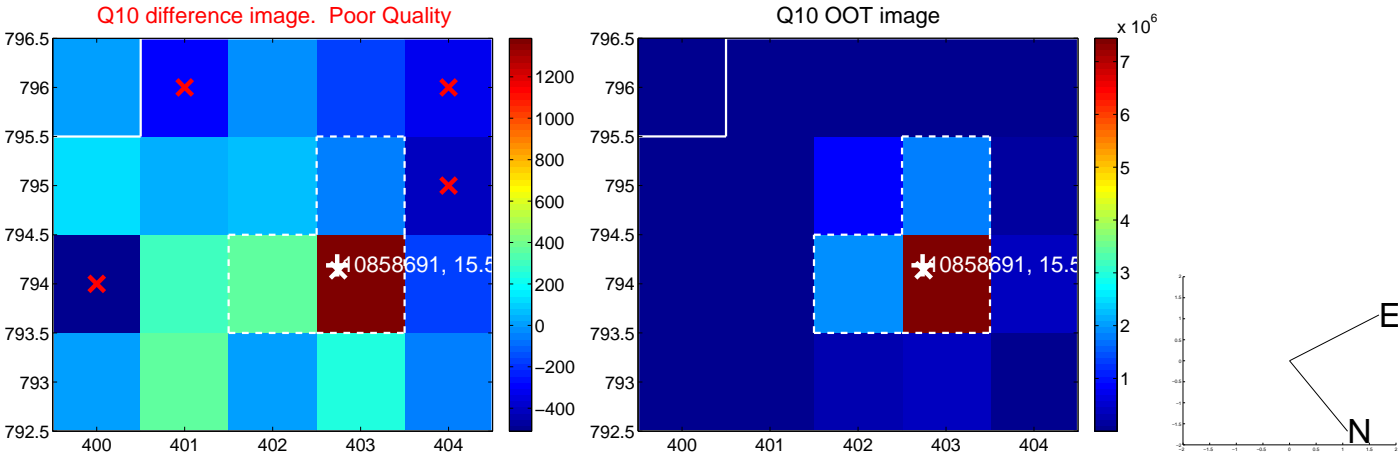
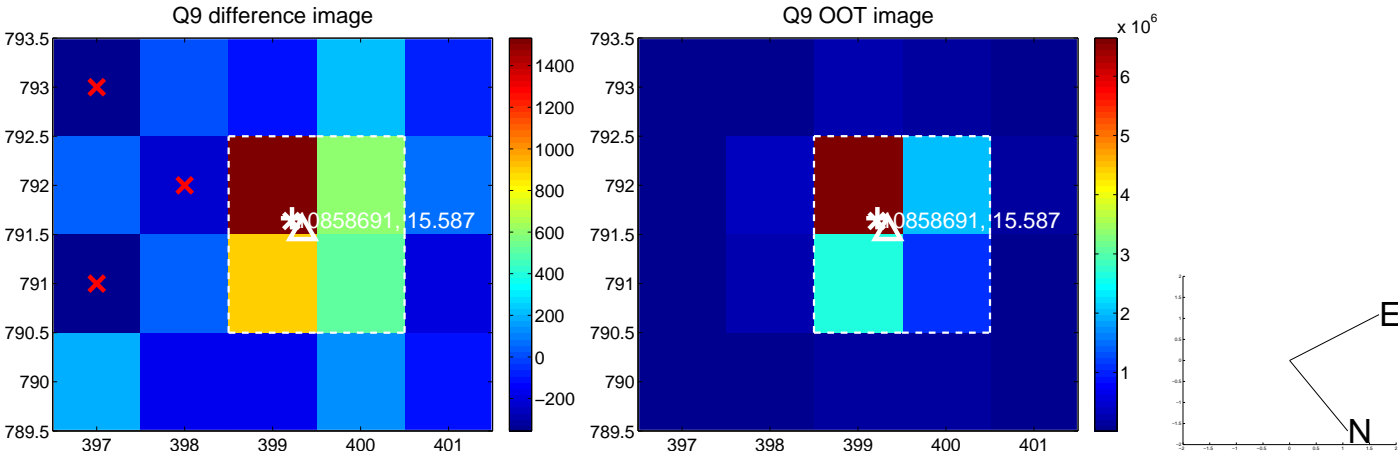


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

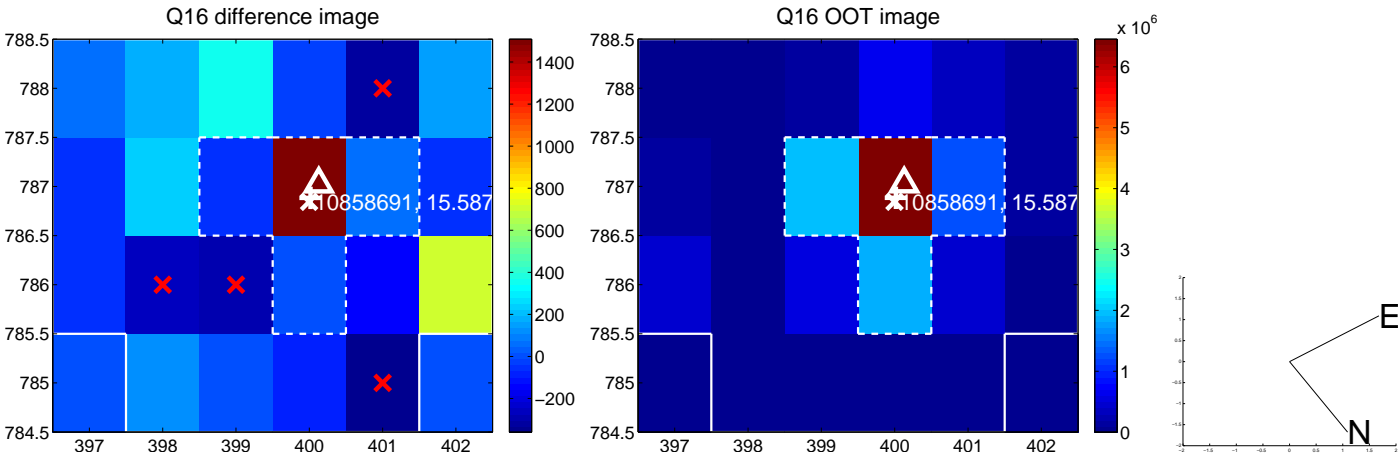
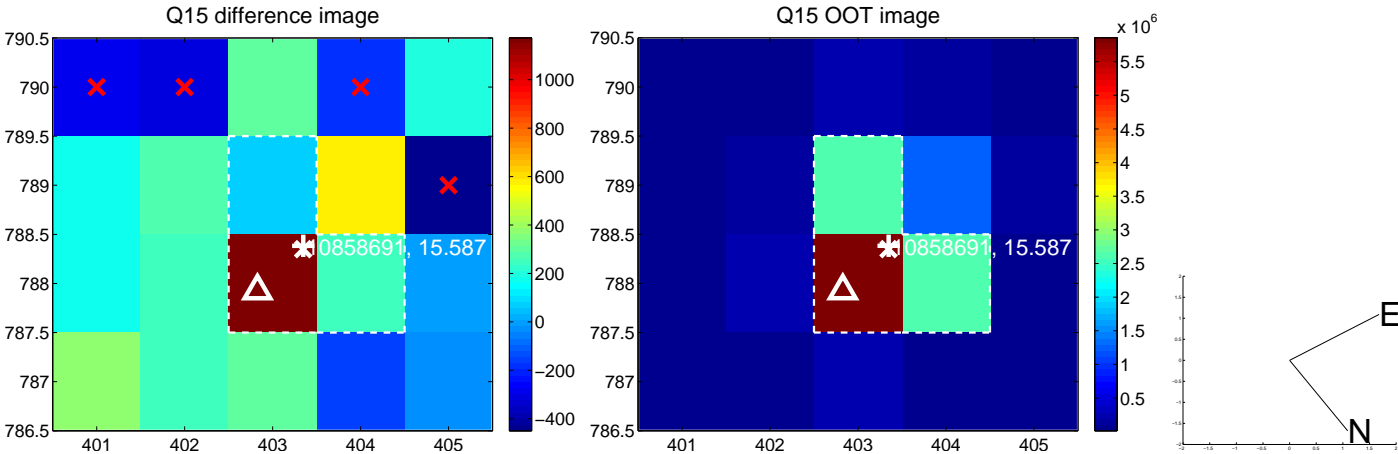
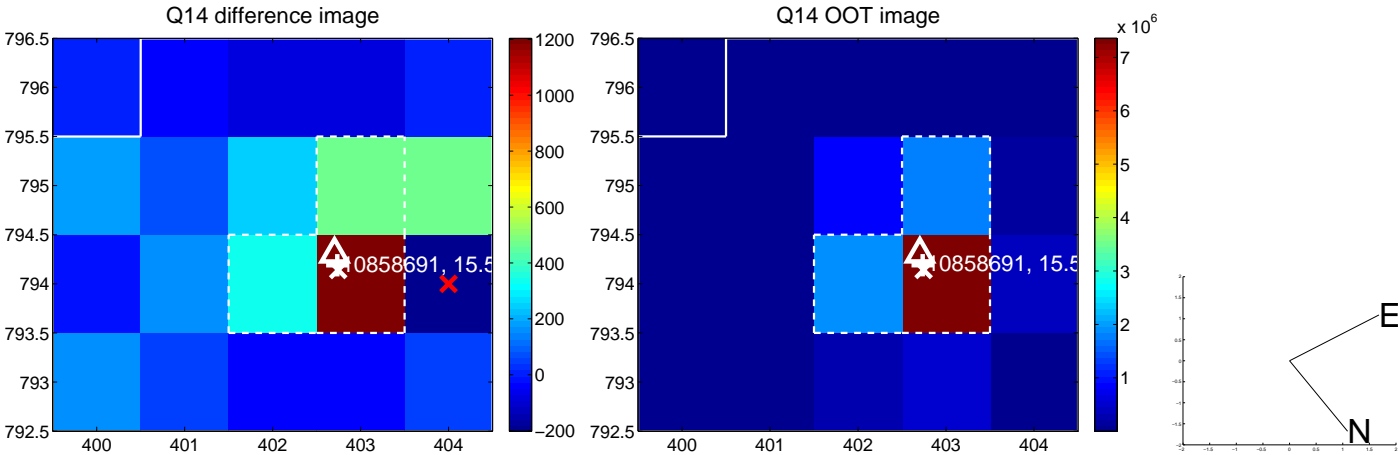
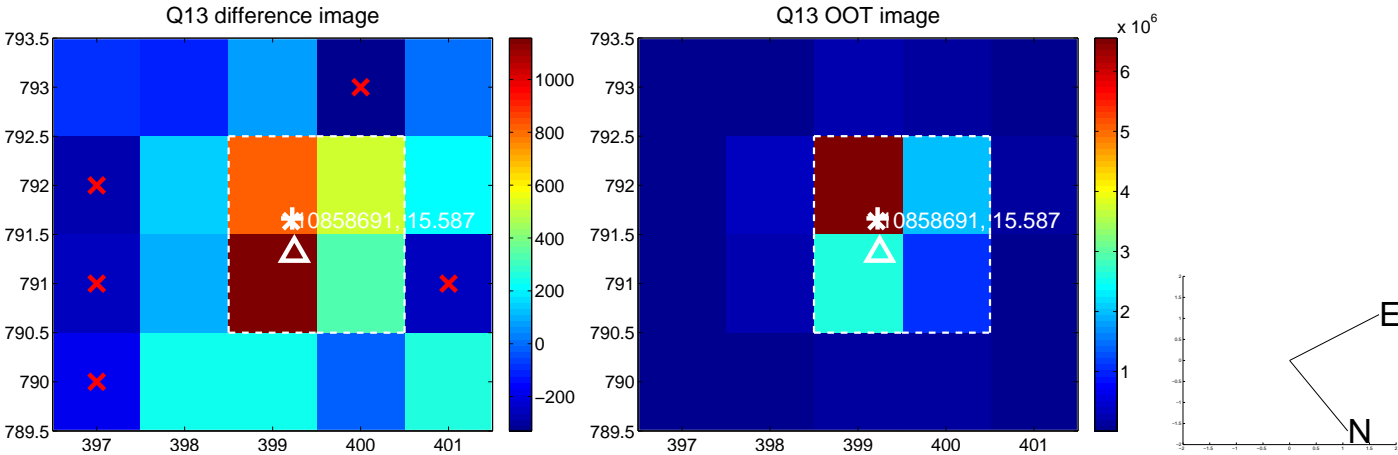




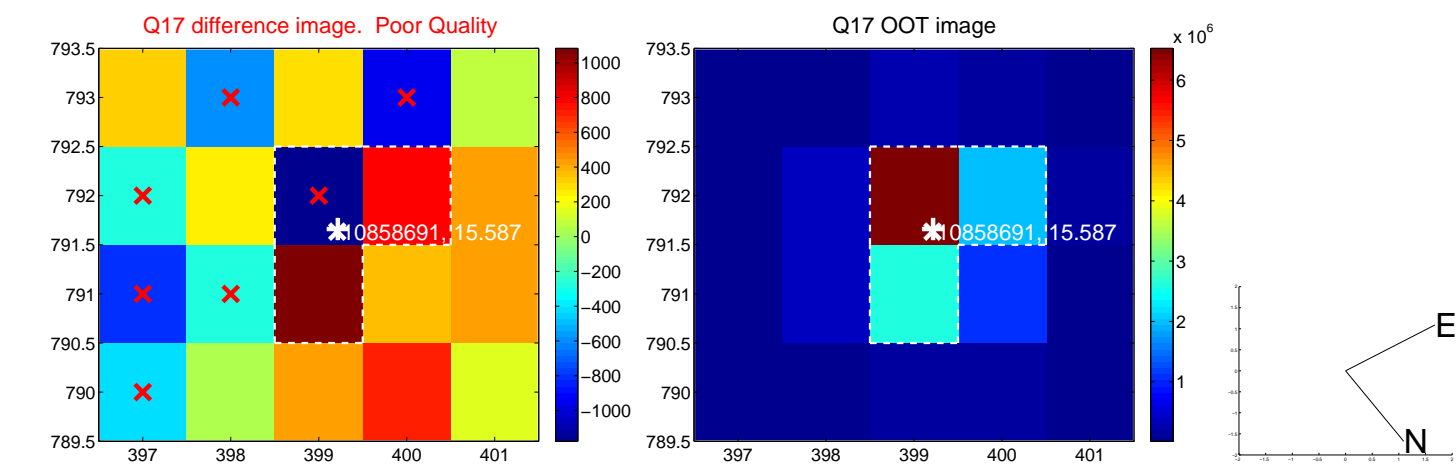
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



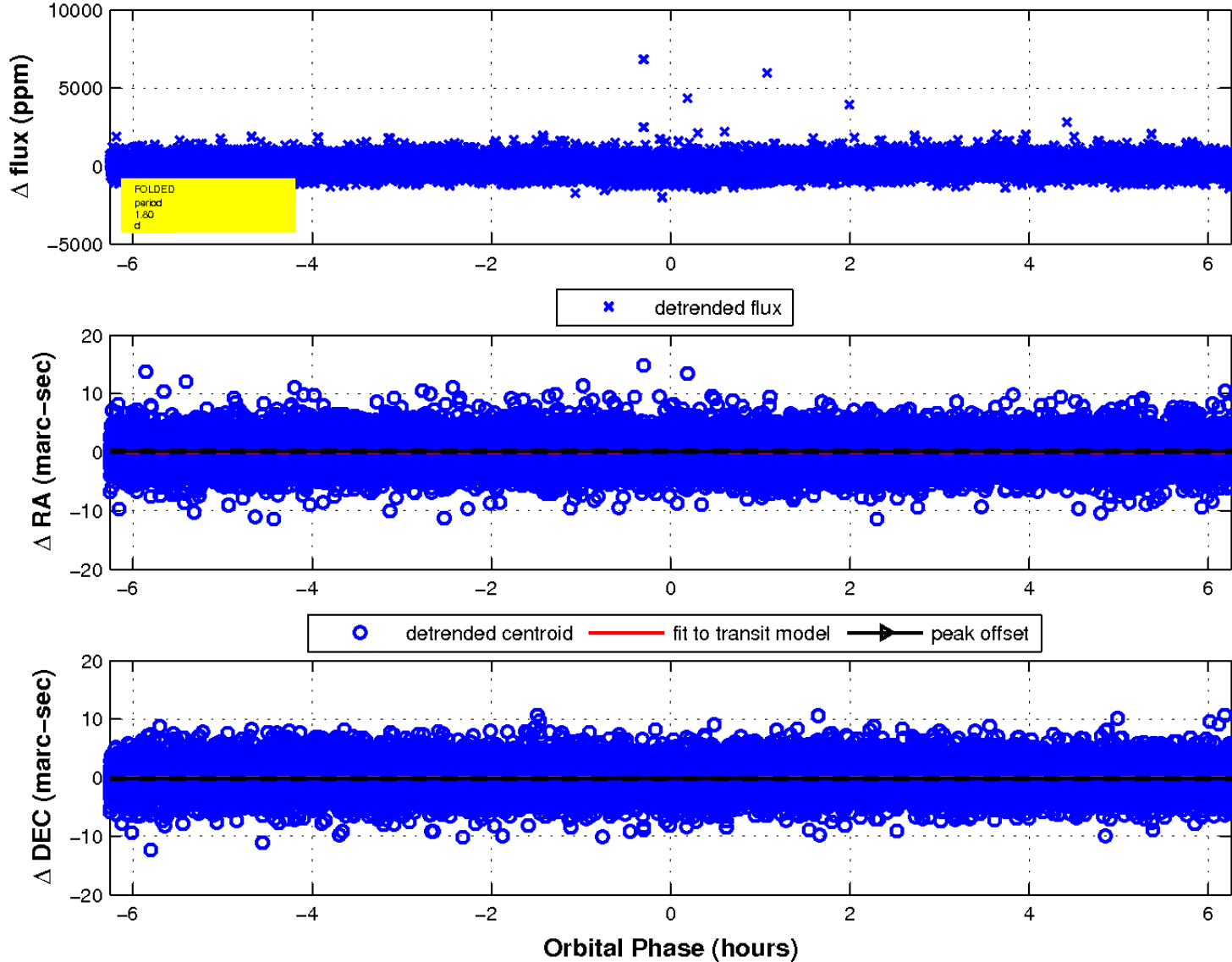
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

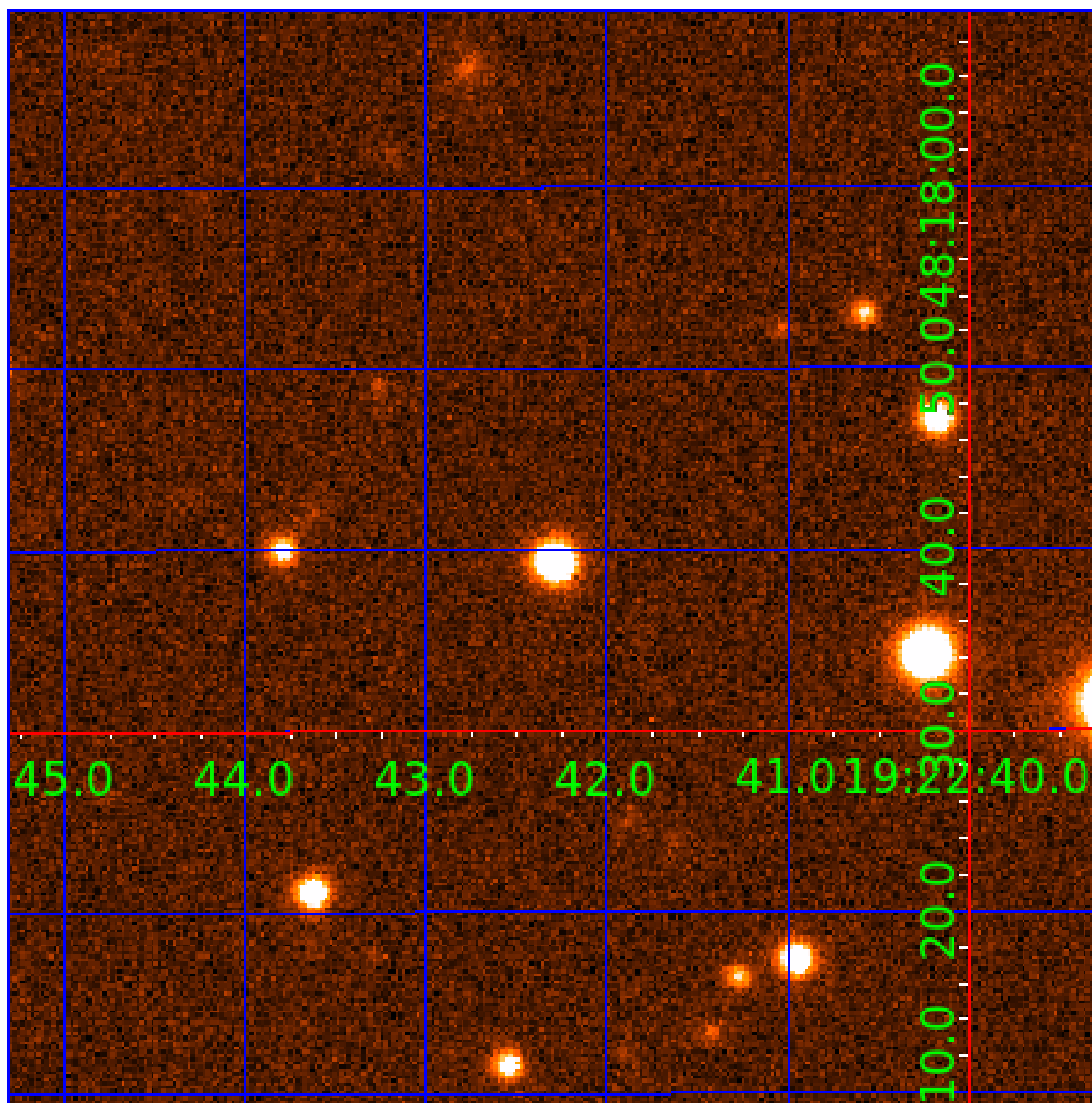


fluxWeightedCentroids, Planet 1 of 4



UKIRT Image

Declination



# KIC 010858691

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
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010858691-04	OBS	1306.04	29.221258	139.336833	366.8	3.957	9.0	10.5	0.83	5576	1.81	20.06

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010858691-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
010858691-02	OBS	PC	0.99	0	0	0	0	NO_COMMENT
010858691-03	OBS	PC	0.95	0	0	0	0	NO_COMMENT
010858691-04	OBS	PC	0.91	0	0	0	0	NO_COMMENT

**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.

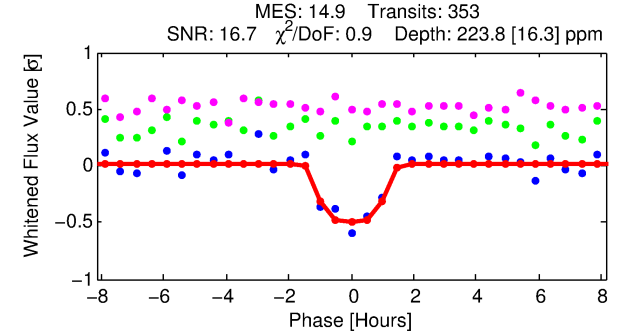
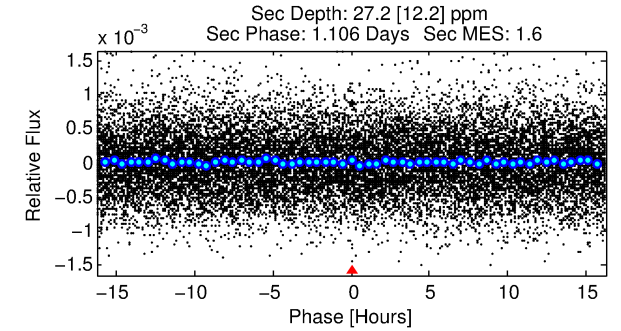
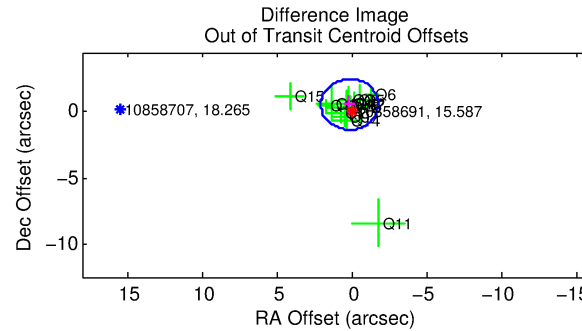
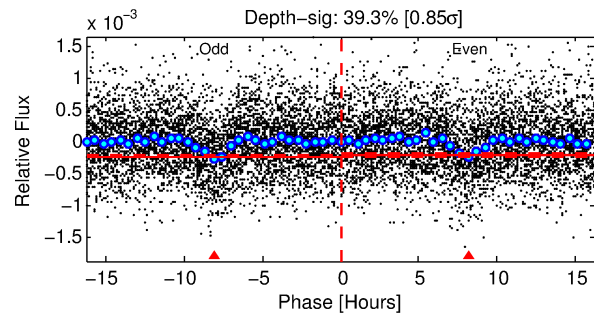
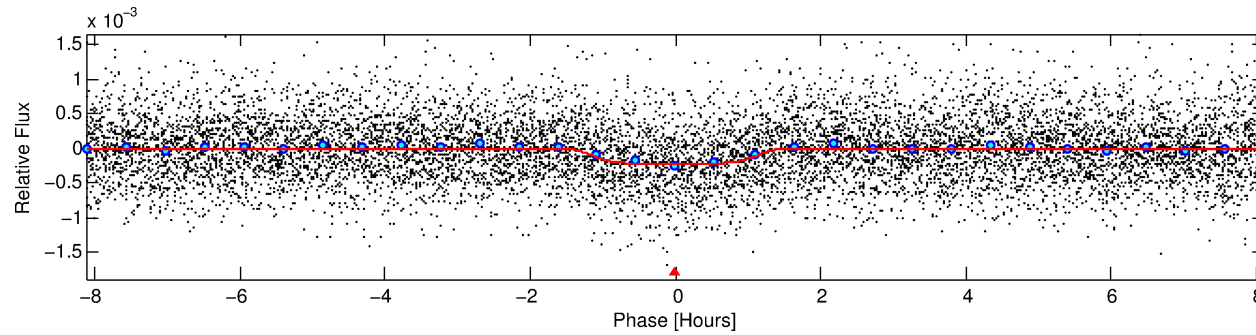
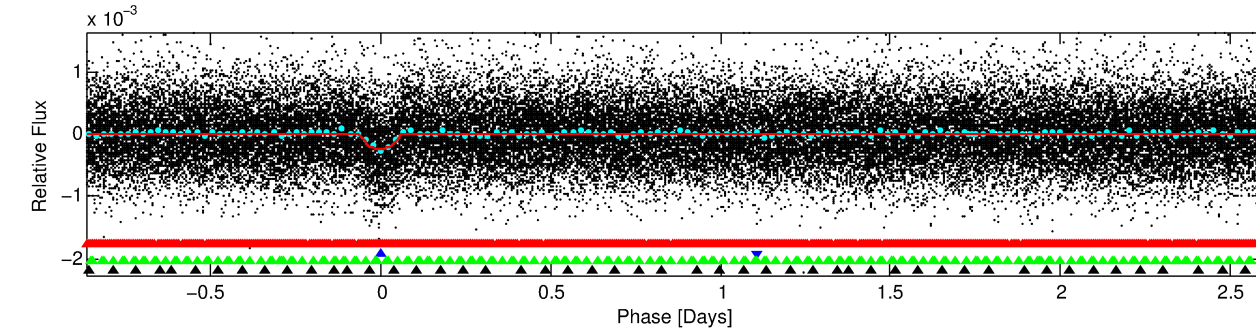
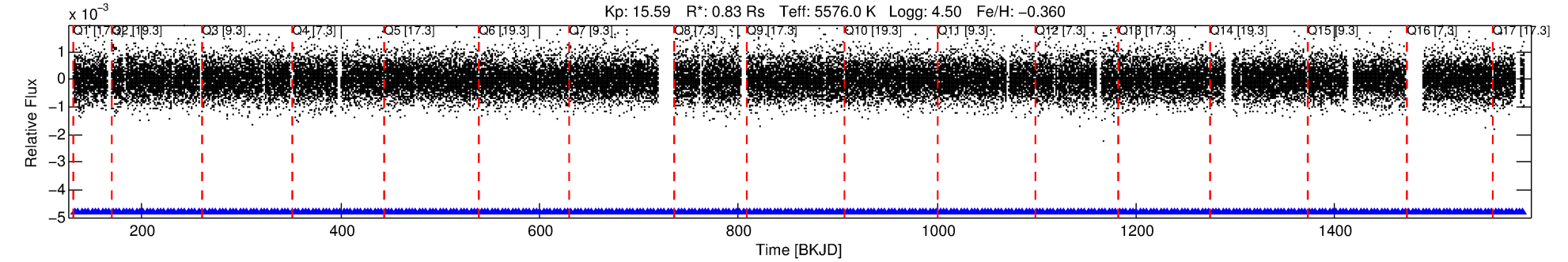
## Ephemeris Match Information For 010858691-02

No Significant Match Found

# DV One-Page Summary

KIC: 10858691 Candidate: 2 of 4 Period: 3.468 d  
KOI: K01306.02 Name: Kepler-286c Corr: 0.935

Kp: 15.59 R\*: 0.83 Rs Teff: 5576.0 K Logg: 4.50 Fe/H: -0.360



## DV Fit Results:

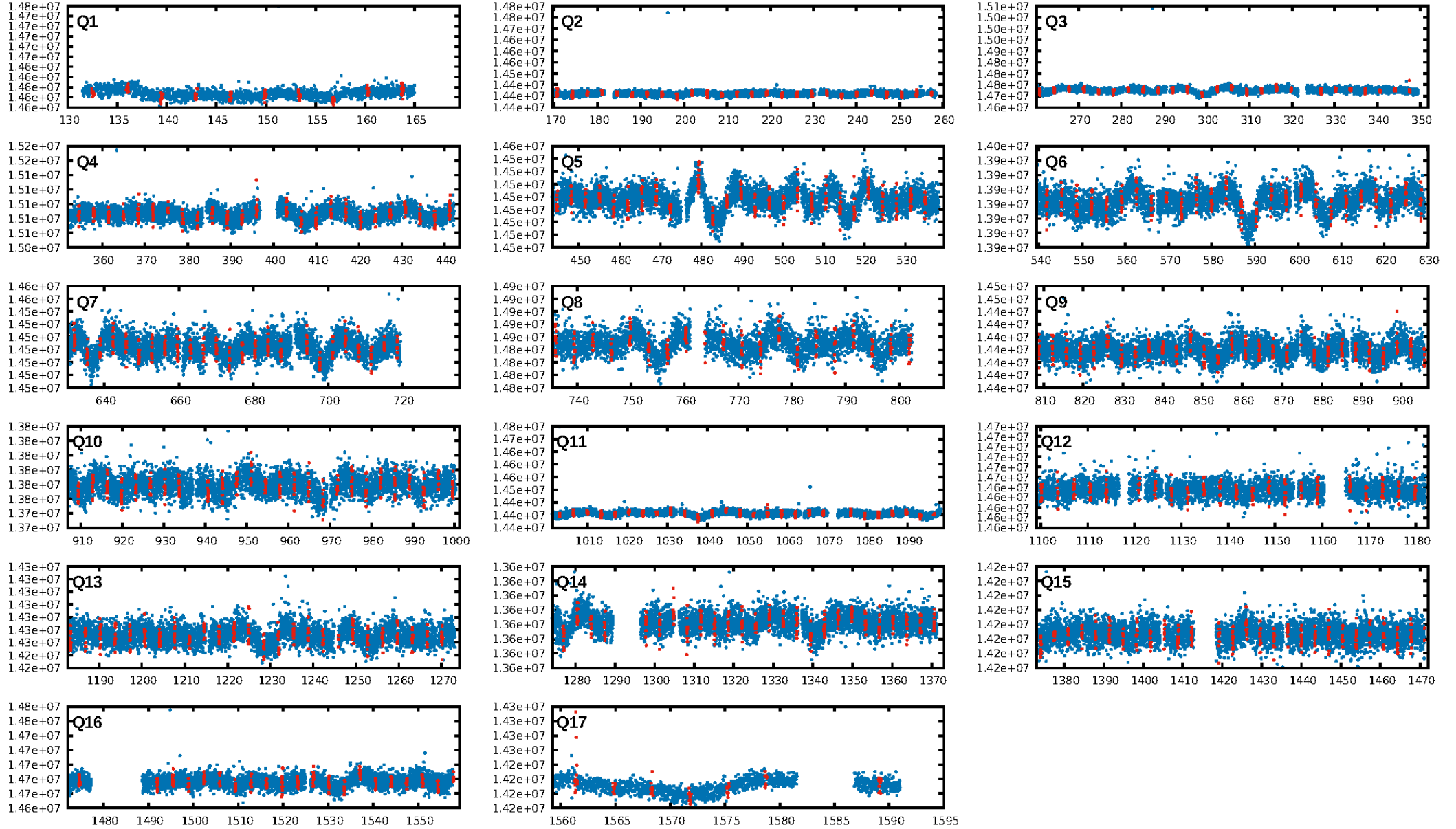
Period = 3.46809 [0.00001] d  
Epoch = 132.5367 [0.0027] BKJD  
Rp/R\* = 0.0173 [0.0025]  
a/R\* = 3.78 [2.41]  
b = 0.95 [0.08]  
Seff = 343.90 [53.70]  
Teff = 1098 [43] K  
Rp = 1.57 [0.28] Re  
a = 0.0416 [0.0037] AU  
Ag = 10.54 [5.80] [1.64σ]  
Teffp = 3059 [413] K [4.73σ]

## DV Diagnostic Results:

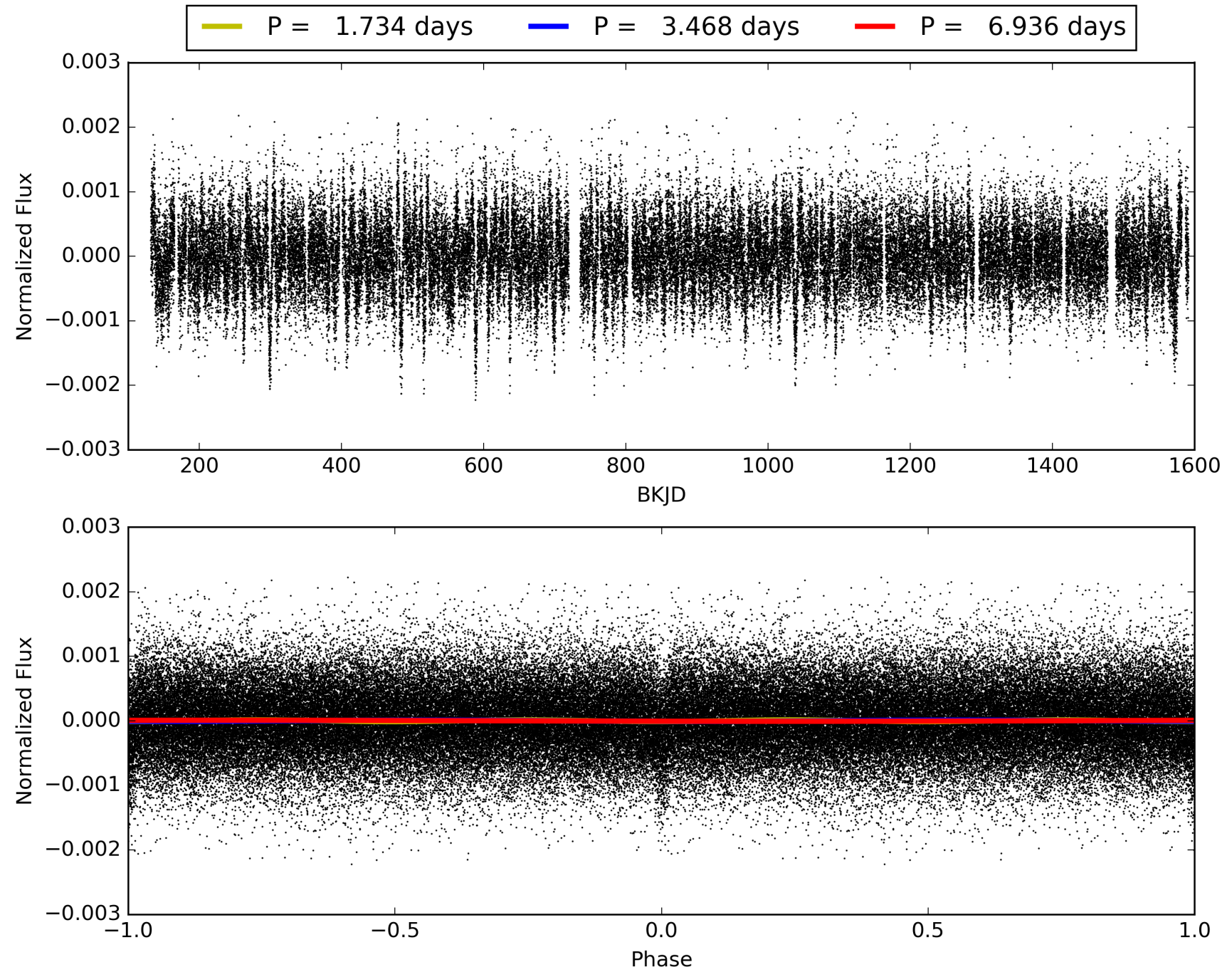
ShortPeriod-sig: 100.0% [11.74σ]  
LongPeriod-sig: 100.0% [14.50σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 1.31e-51  
RollingBand-fgt: 1.00 [338/338]  
GhostDiagnostic-chr: 15.39  
Centroid-sig: 3.7%  
Centroid-so: 1.054 arcsec [1.27σ]  
OotOffset-rm: 0.578 arcsec [0.91σ]  
KicOffset-rm: 0.513 arcsec [0.86σ]  
OotOffset-st: 4/4/3/4 [15]  
KicOffset-st: 4/4/3/4 [15]  
DiffImageQuality-fgm: 0.67 [10/15]  
DiffImageOverlap-fno: 1.00 [17/17]



# TCE 010858691-02, PDC Light Curves

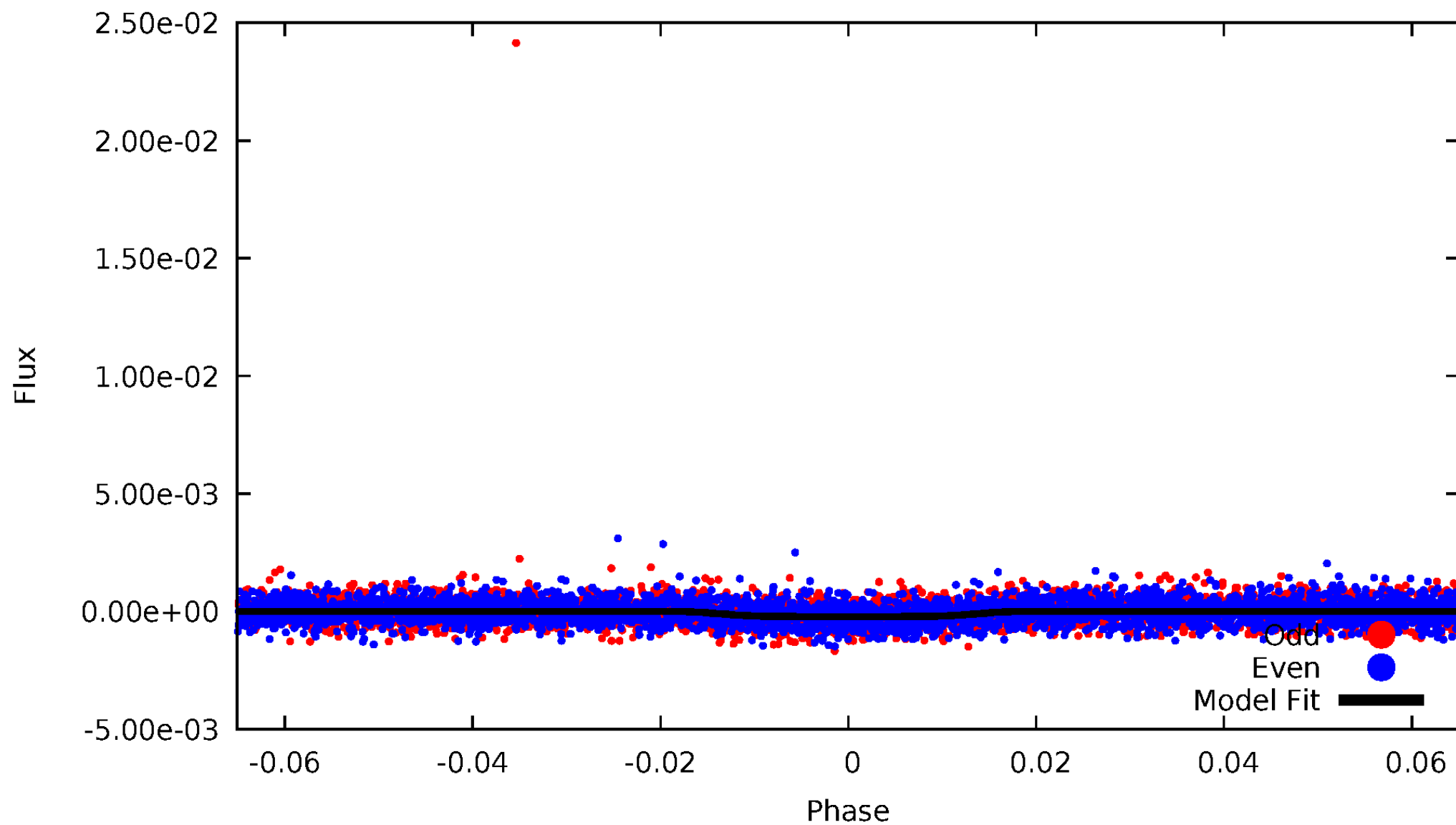


# TCE 010858691-02



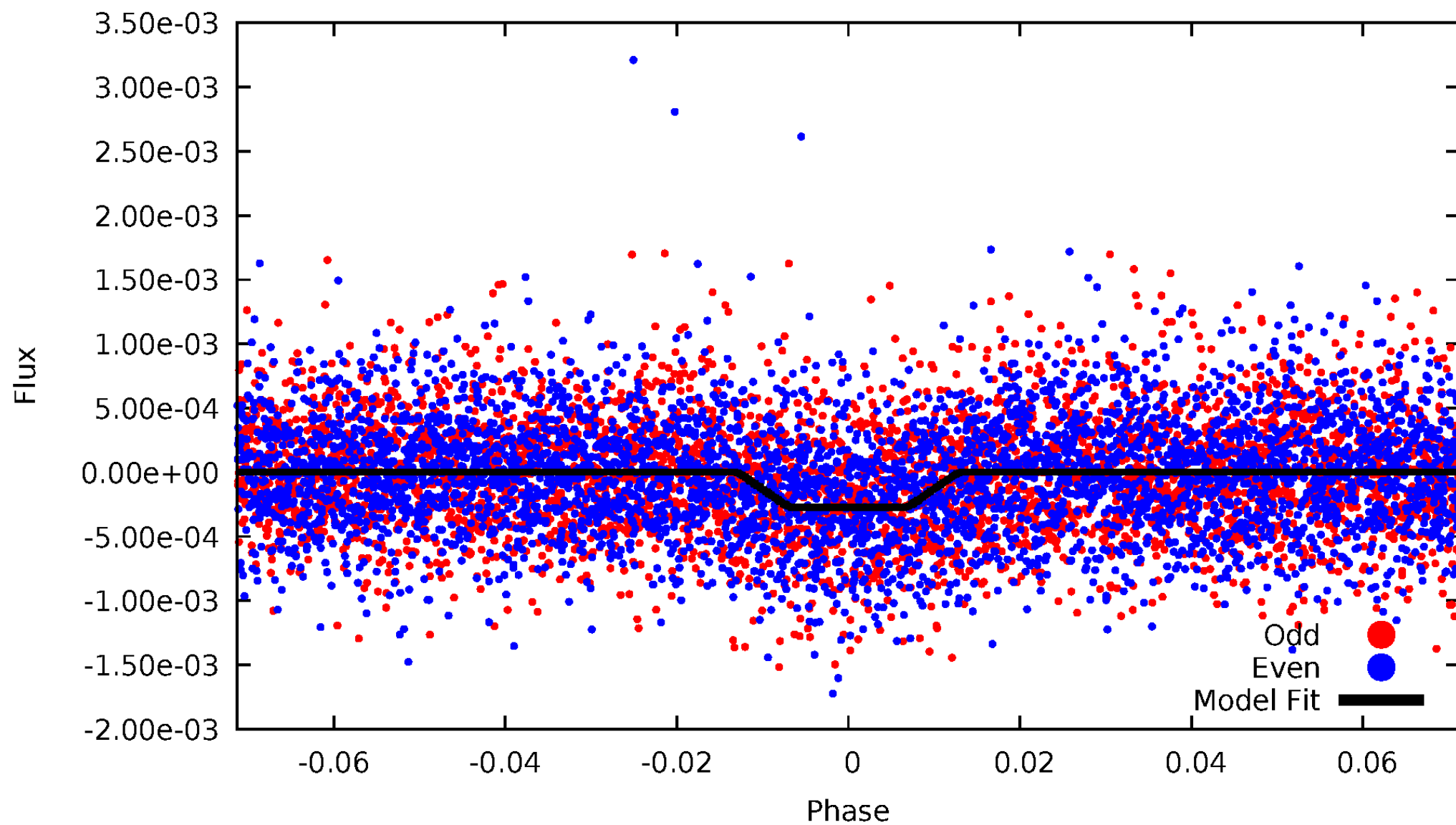
# DV Odd/Even

TCE 010858691-02



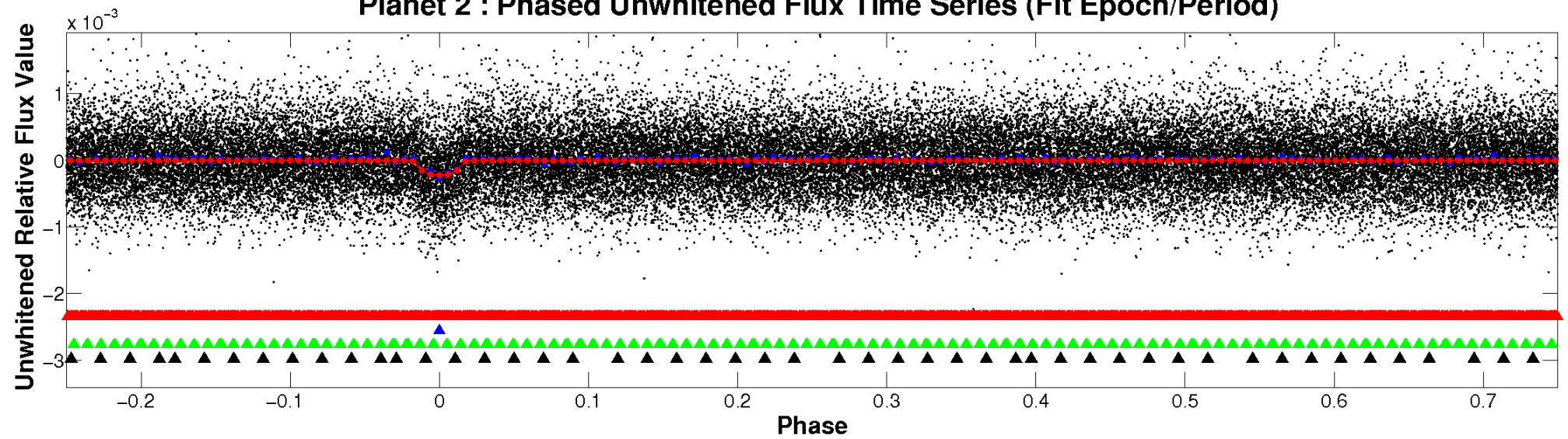
# ALT Odd/Even

TCE 010858691-02

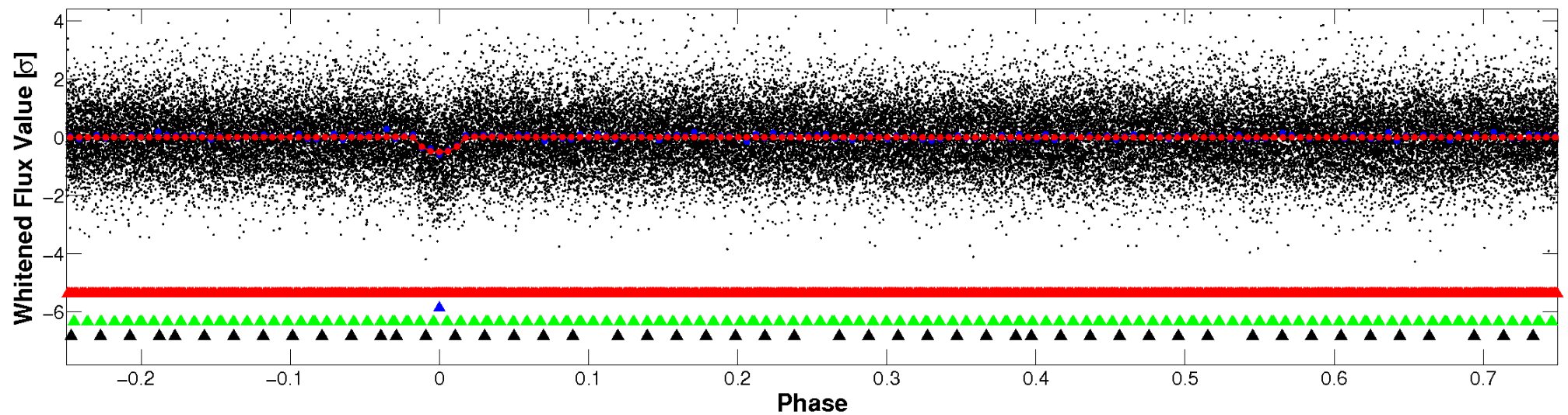


# Non-Whitened Vs. Whitened Light Curve

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



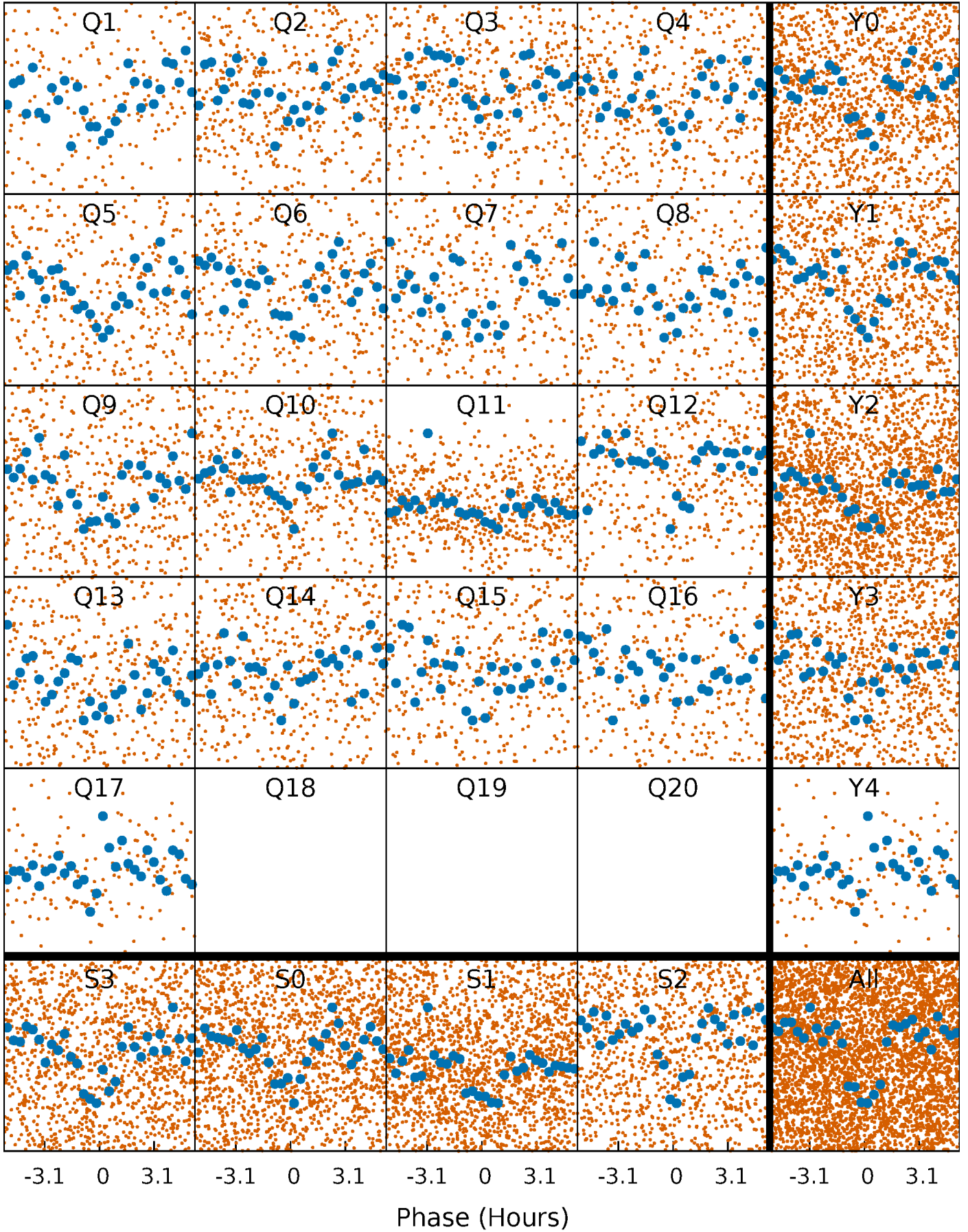
## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)





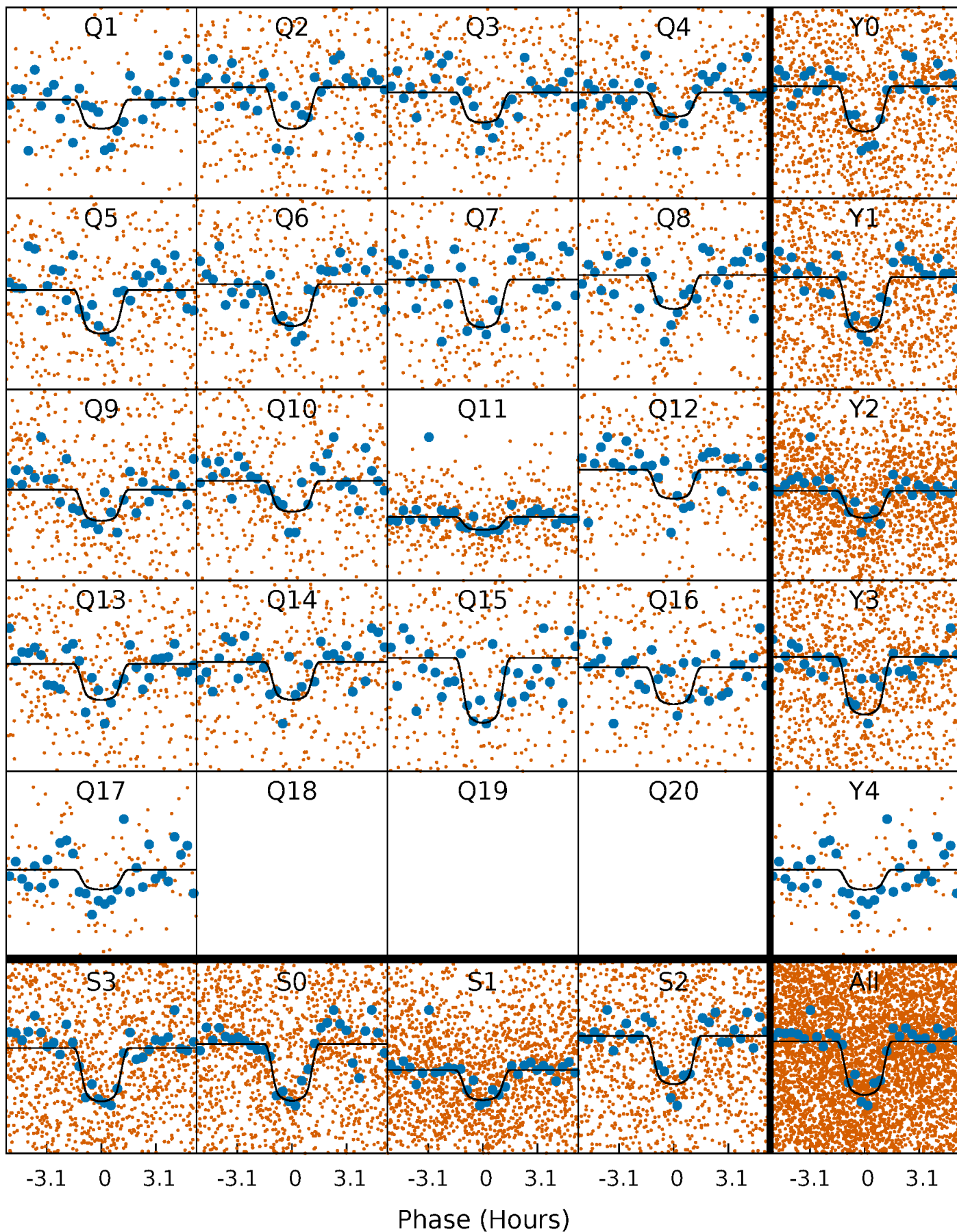
# PDC Quarter-Phased Transit Curves

TCE 010858691-02   P= 3.468089 Days    $T_0=132.536691$  (BKJD)



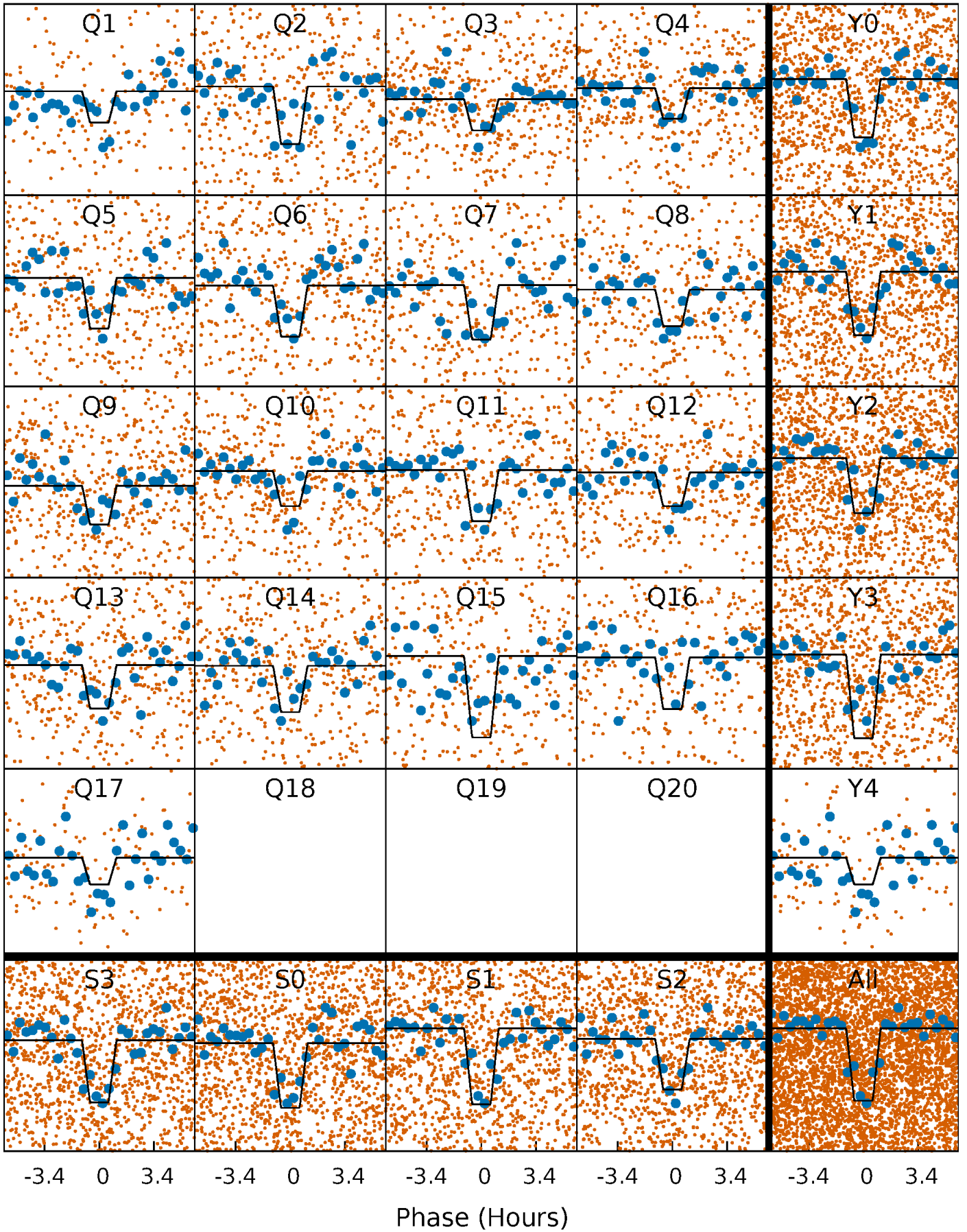
# DV Quarter-Phased Transit Curves

TCE 010858691-02     $P = 3.468089$  Days     $T_0 = 132.536691$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 010858691-02     $P = 3.468076$  Days     $T_0 = 132.539330$  (BKJD)

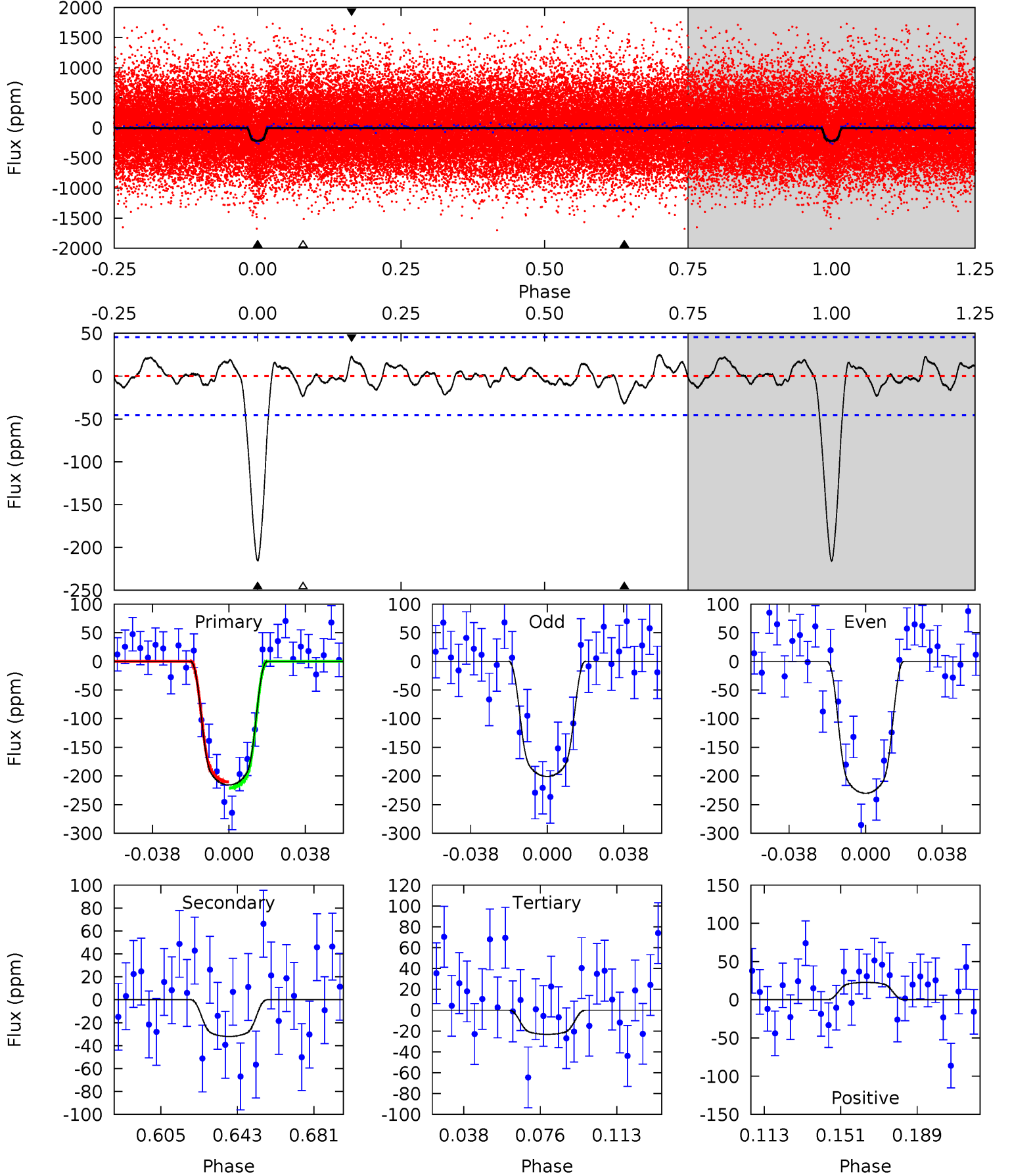




# DV Model-Shift Uniqueness Test

010858691-02, P = 3.468089 Days, E = 129.068602 Days

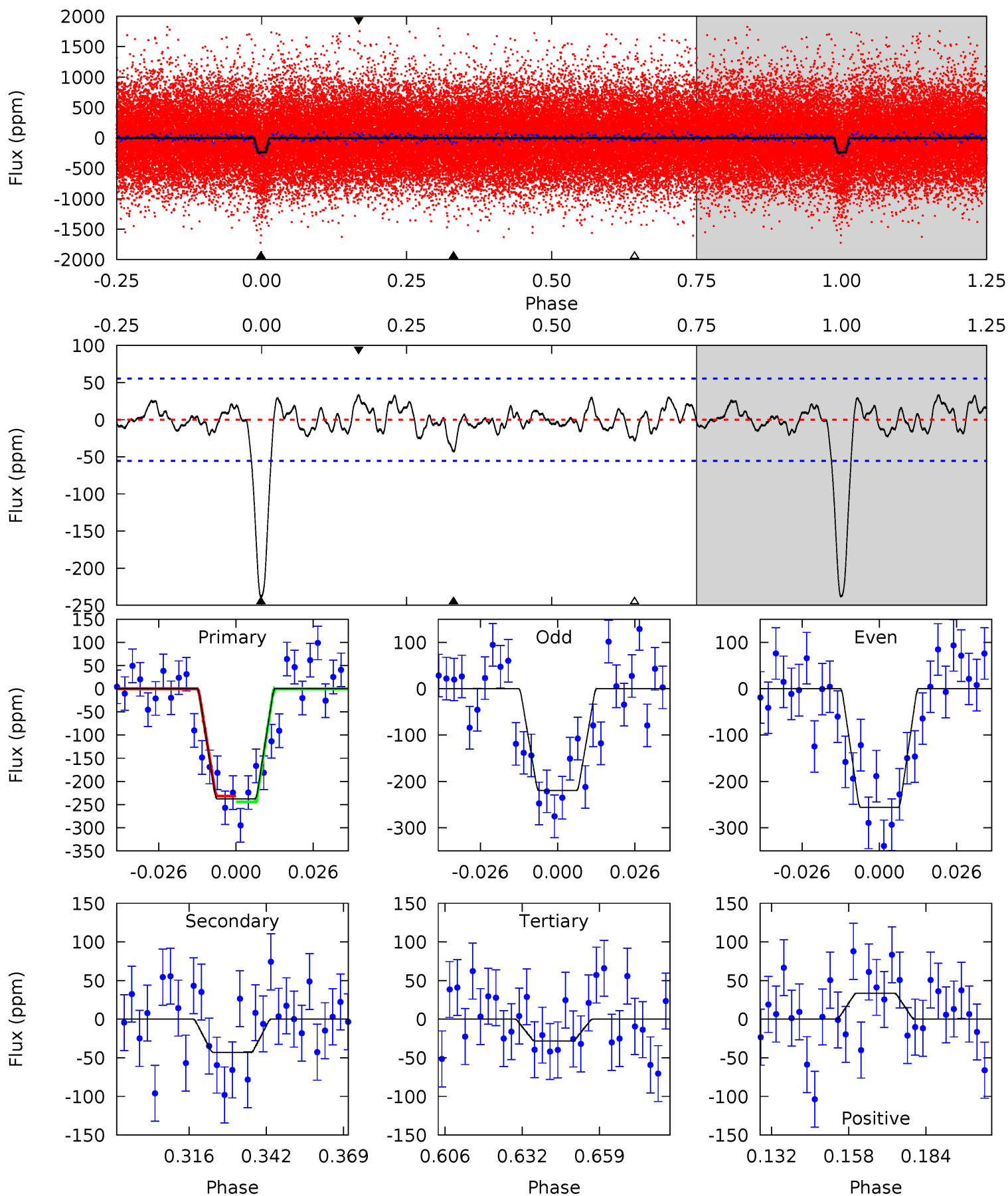
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
22.6	3.36	2.44	2.38	4.76	2.08	1.03	20.2	20.3	0.93	0.98	1.54	0.96	0.10	0.57



# Alt Model-Shift Uniqueness Test

010858691-02, P = 3.468076 Days, E = 129.071254 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
20.8	3.75	2.46	2.92	4.84	2.22	1.13	18.3	17.8	1.29	0.82	1.60	0.95	0.12	0.53





### Stellar Parameters For KIC 010858691

	$T_{\text{eff}}(K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5576^{+111}_{-111}$	$4.503^{+0.075}_{-0.075}$	$-0.360^{+0.150}_{-0.150}$	$0.829^{+0.086}_{-0.065}$	$0.800^{+0.060}_{-0.040}$	$1.974^{+0.510}_{-0.484}$
	+2%/-2%	+2%/-2%	+42%/-42%	+10%/-8%	+8%/-5%	+26%/-25%
Source	SPE58	SPE58	SPE58	DSEP		

KIC = Kepler Input Catalog; PHO = Photometry; SPE = Spectroscopy; AST = Asteroseismology  
 TRA = Transits; DESP = Dartmouth Models; MULT = Multiple Models

### Secondary Eclipse Parameters for KIC 010858691-02 / KOI 1306.02

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-32 \pm 10$	$1.56^{+0.25}_{-0.25}$	$1534^{+50}_{-50}$	$3593^{+277}_{-243}$	$12^{+7}_{-4}$
Alt.	$-43 \pm 11$	$1.49^{+0.26}_{-0.23}$	$1531^{+53}_{-46}$	$3838^{+288}_{-280}$	$18^{+9}_{-7}$

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

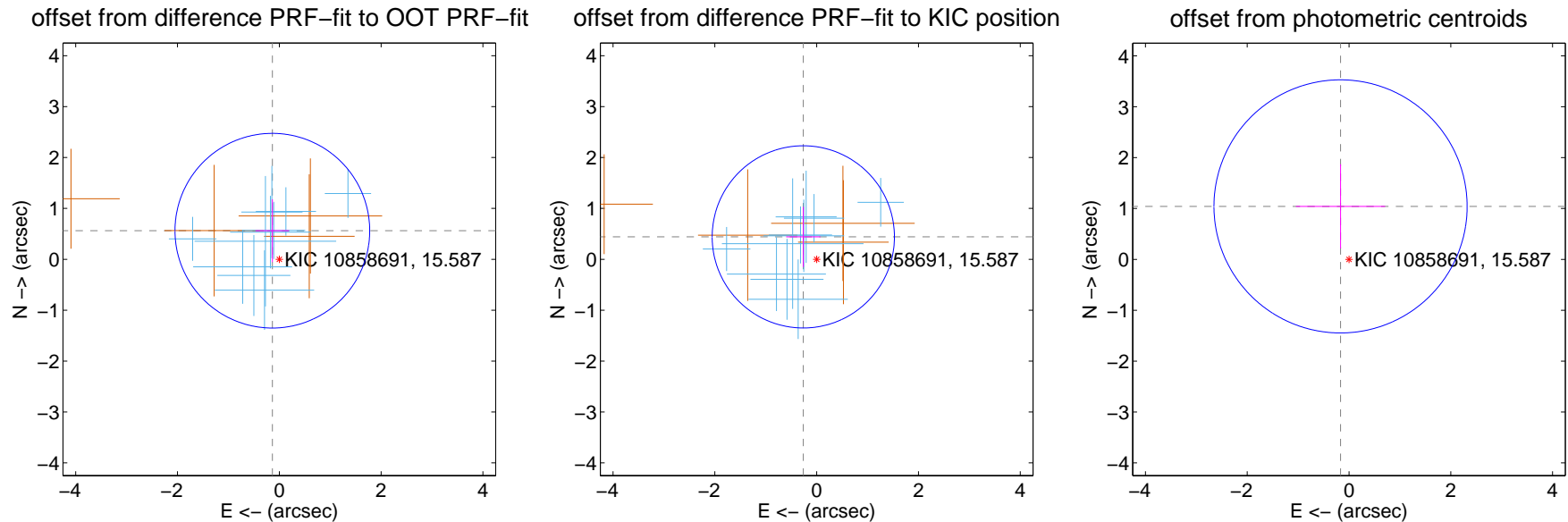
## DV Centroid Data

Supplemental centroid analysis for 010858691-02. Kepler magnitude: 15.59. Transit SNR 16.67

There are 10 quarters with good PRF difference image offsets

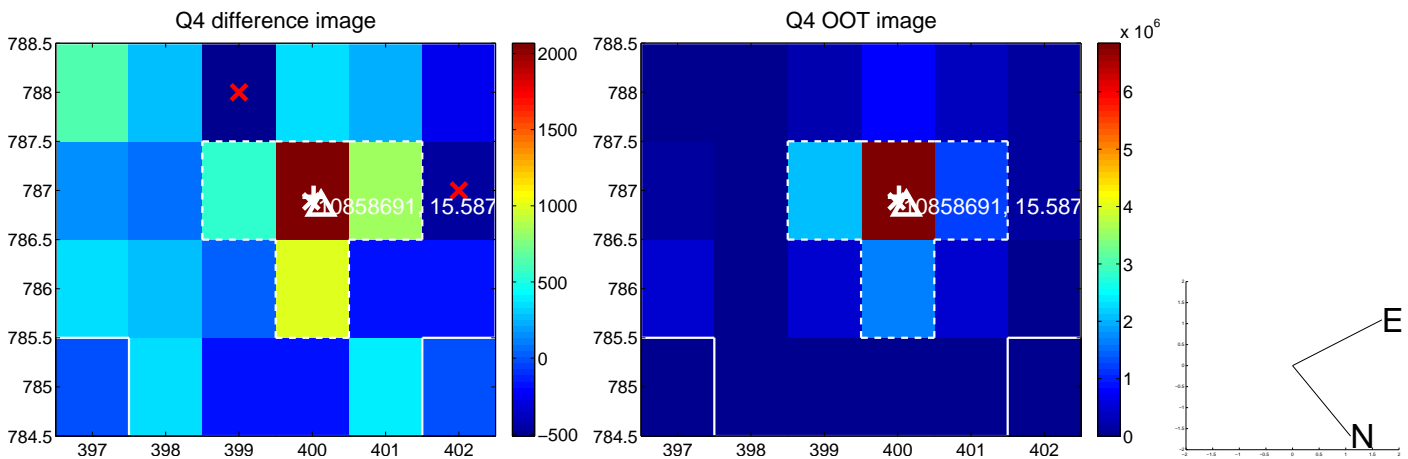
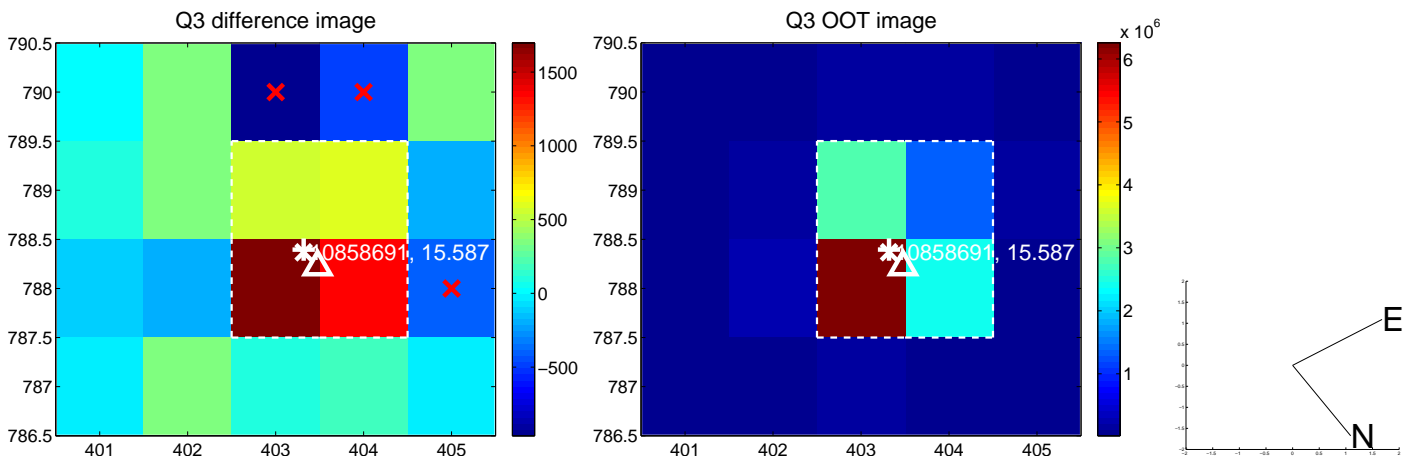
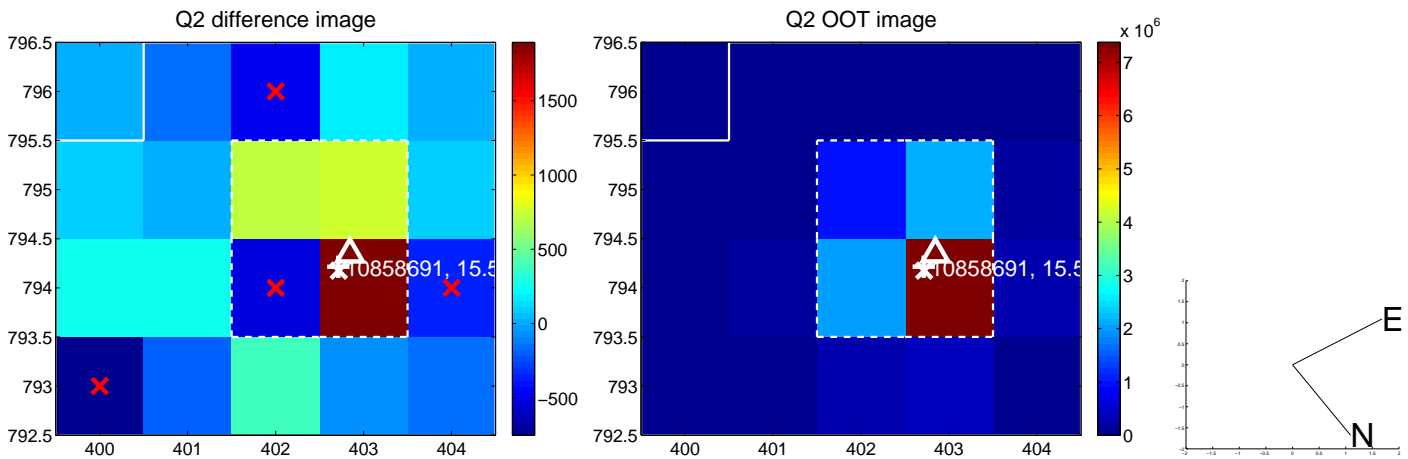
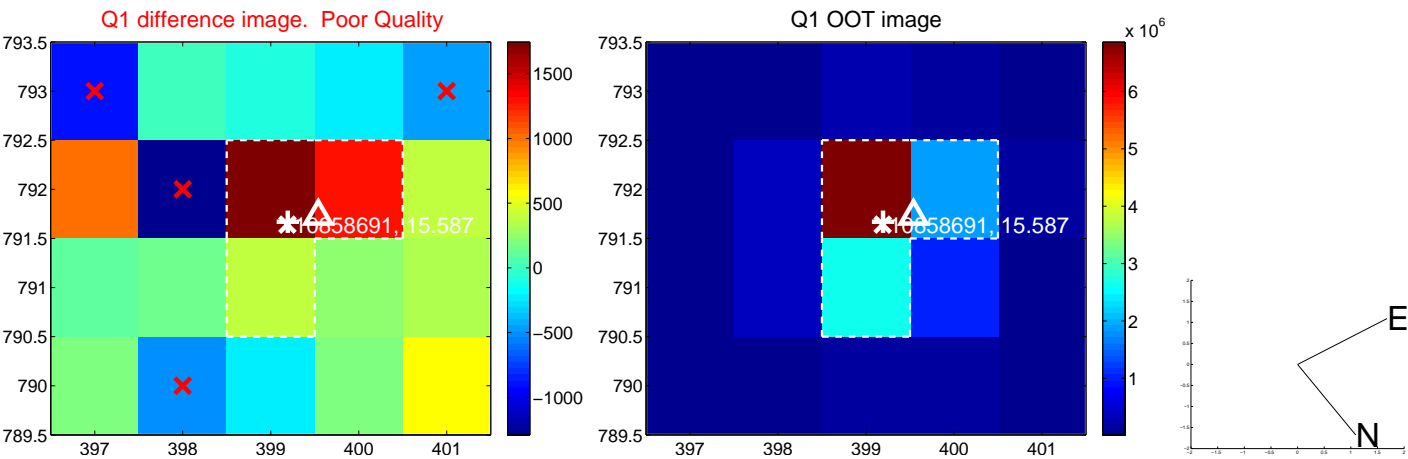
The direct PRF centroid is offset from the target star catalog position by about 0.11 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.578 \pm 0.637$	0.91	$0.137 \pm 0.329$	$0.562 \pm 0.618$
PRF-fit source offset from KIC position	$0.513 \pm 0.597$	0.86	$0.262 \pm 0.337$	$0.441 \pm 0.590$
photometric centroid source offset	$1.05 \pm 0.83$	1.27	$0.17 \pm 0.88$	$1.04 \pm 0.83$

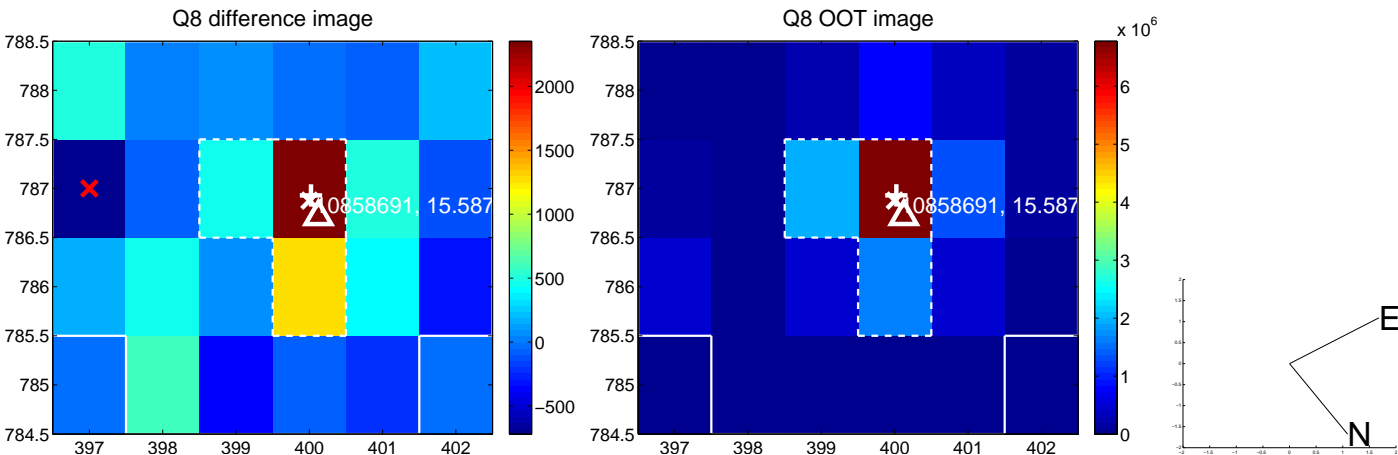
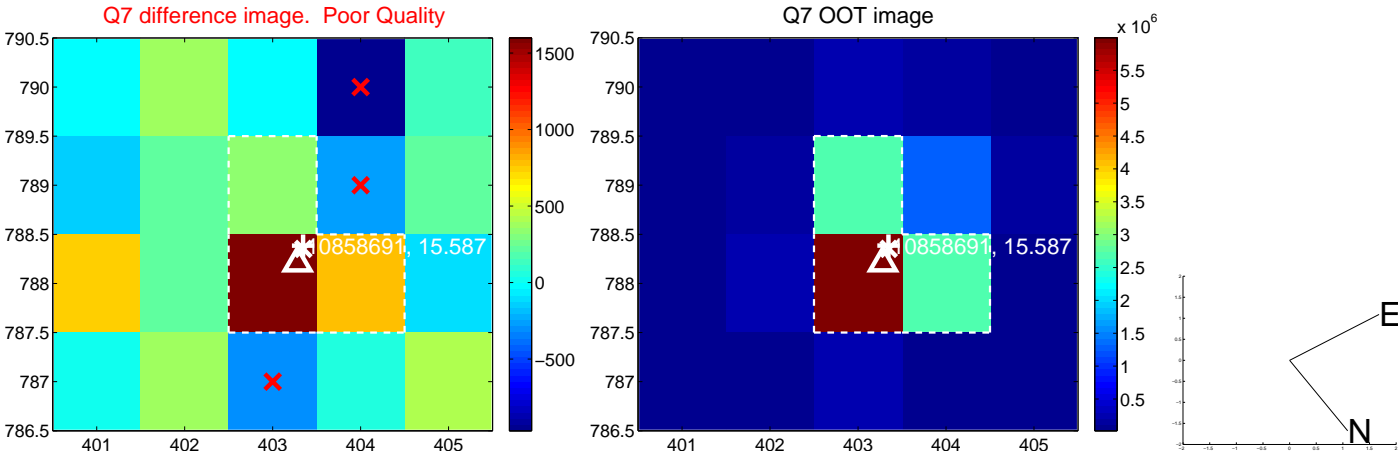
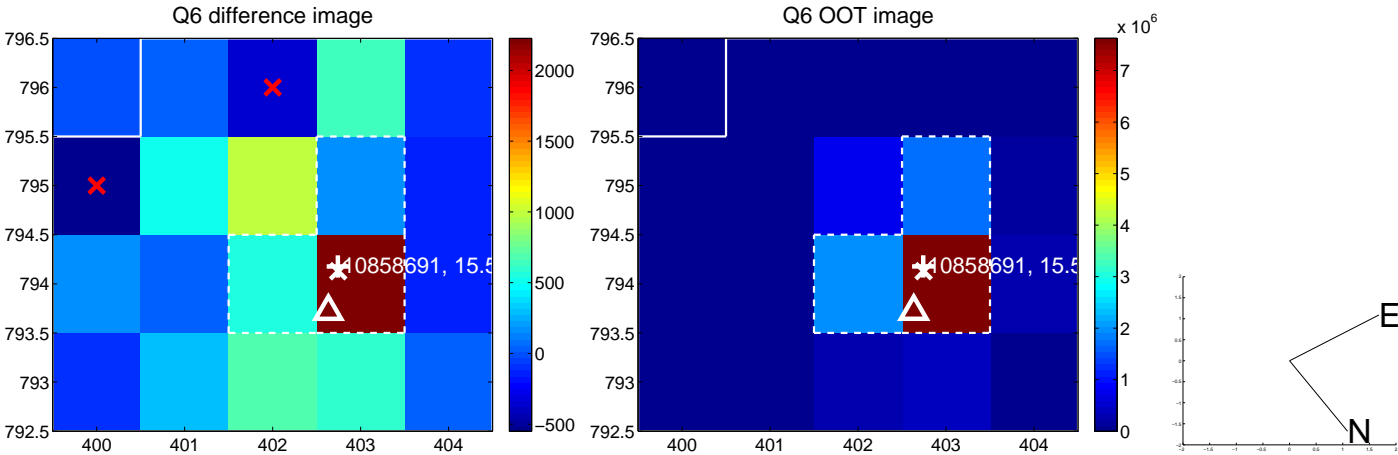
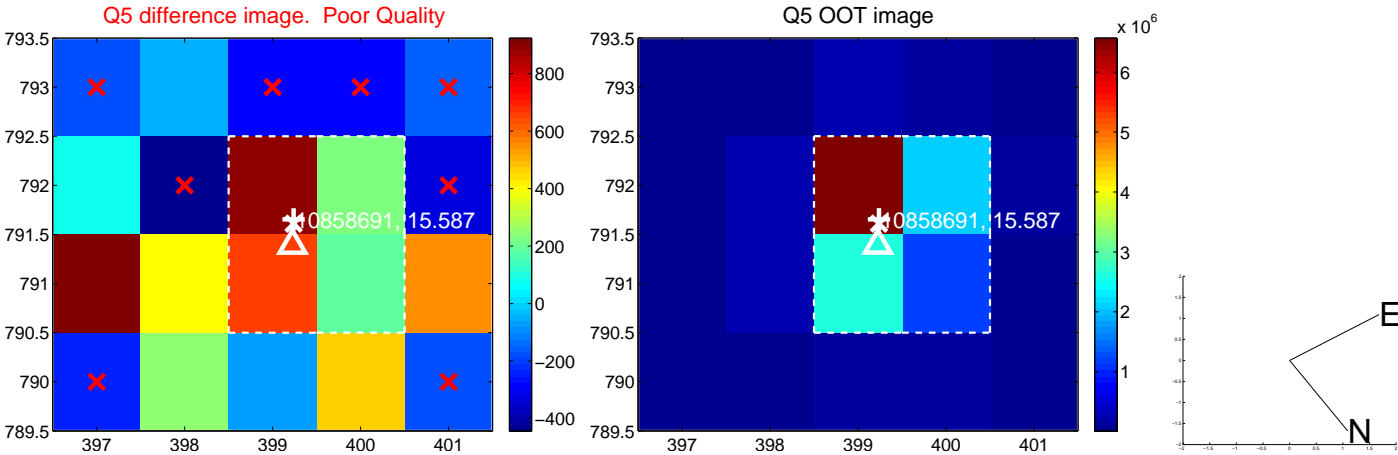


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

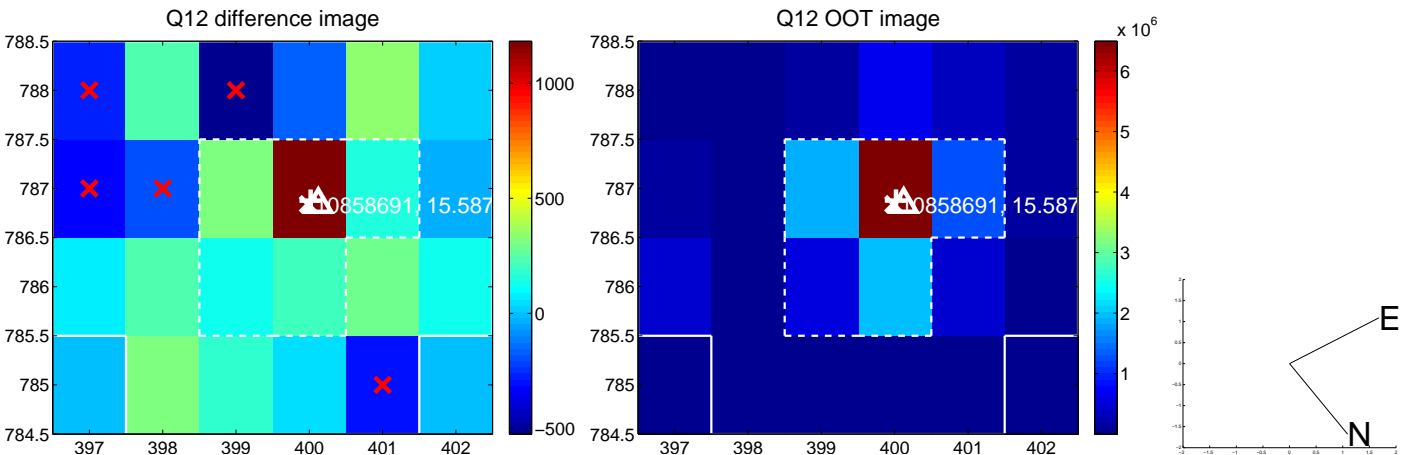
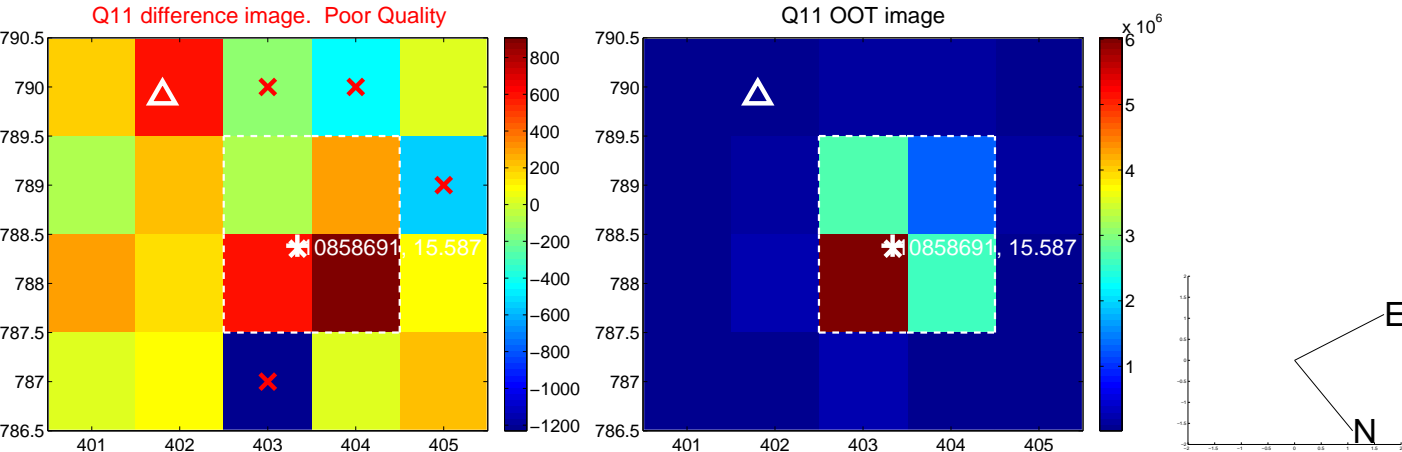
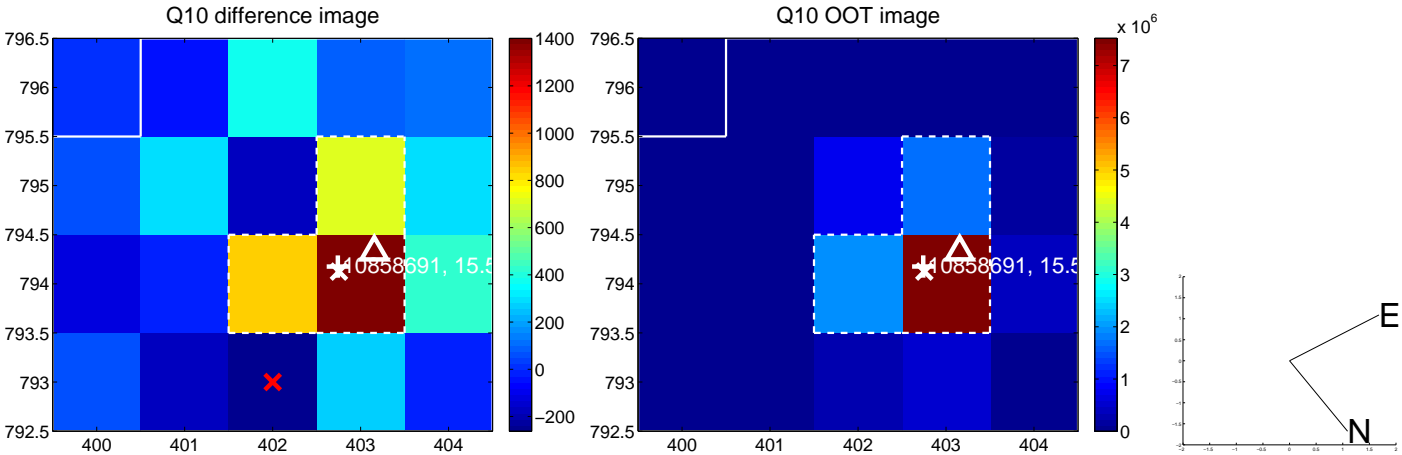
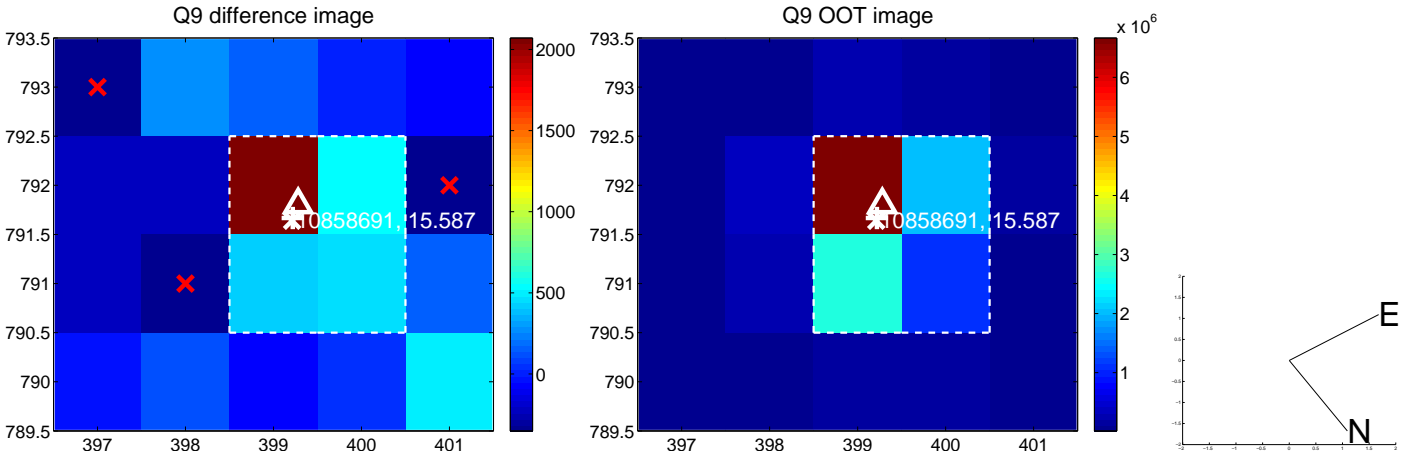
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

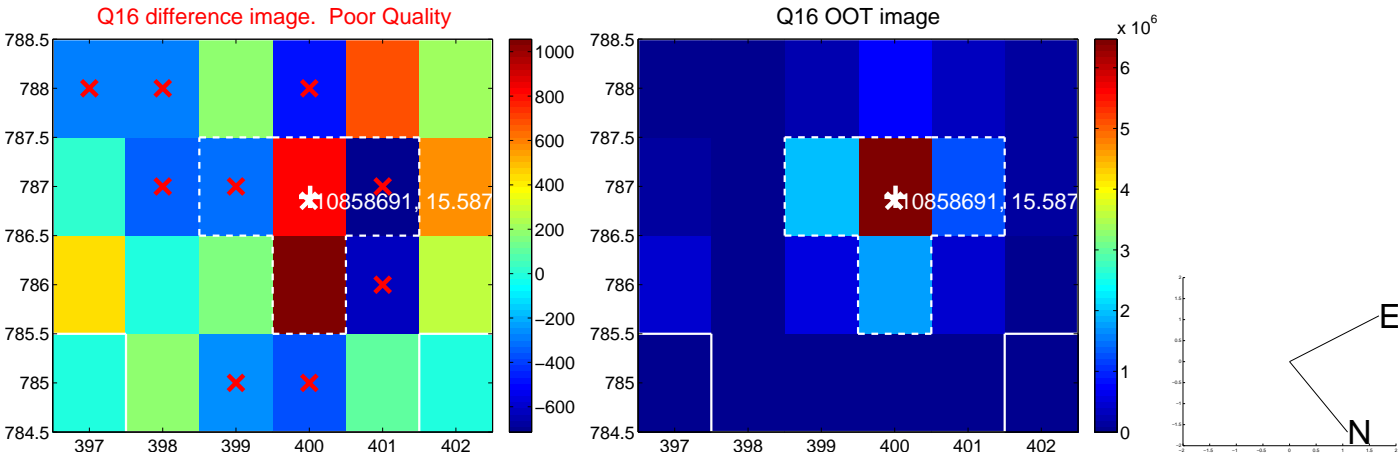
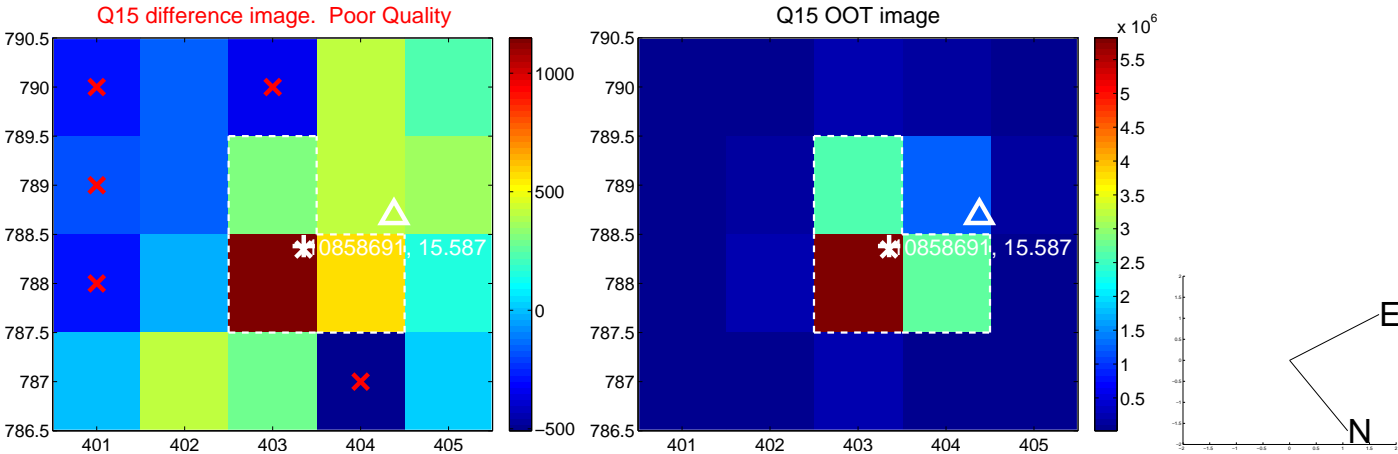
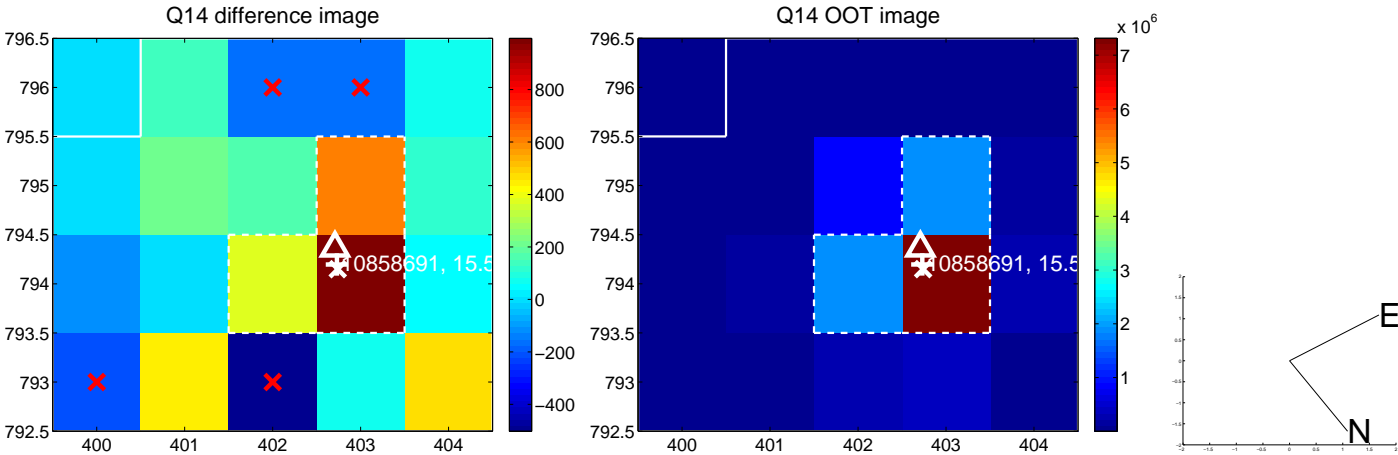
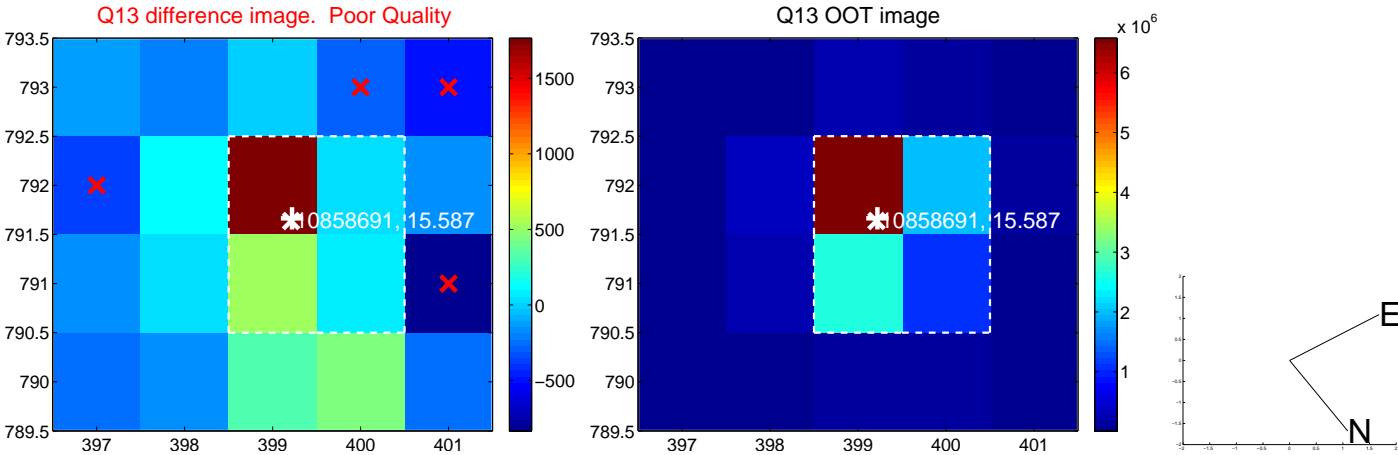


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

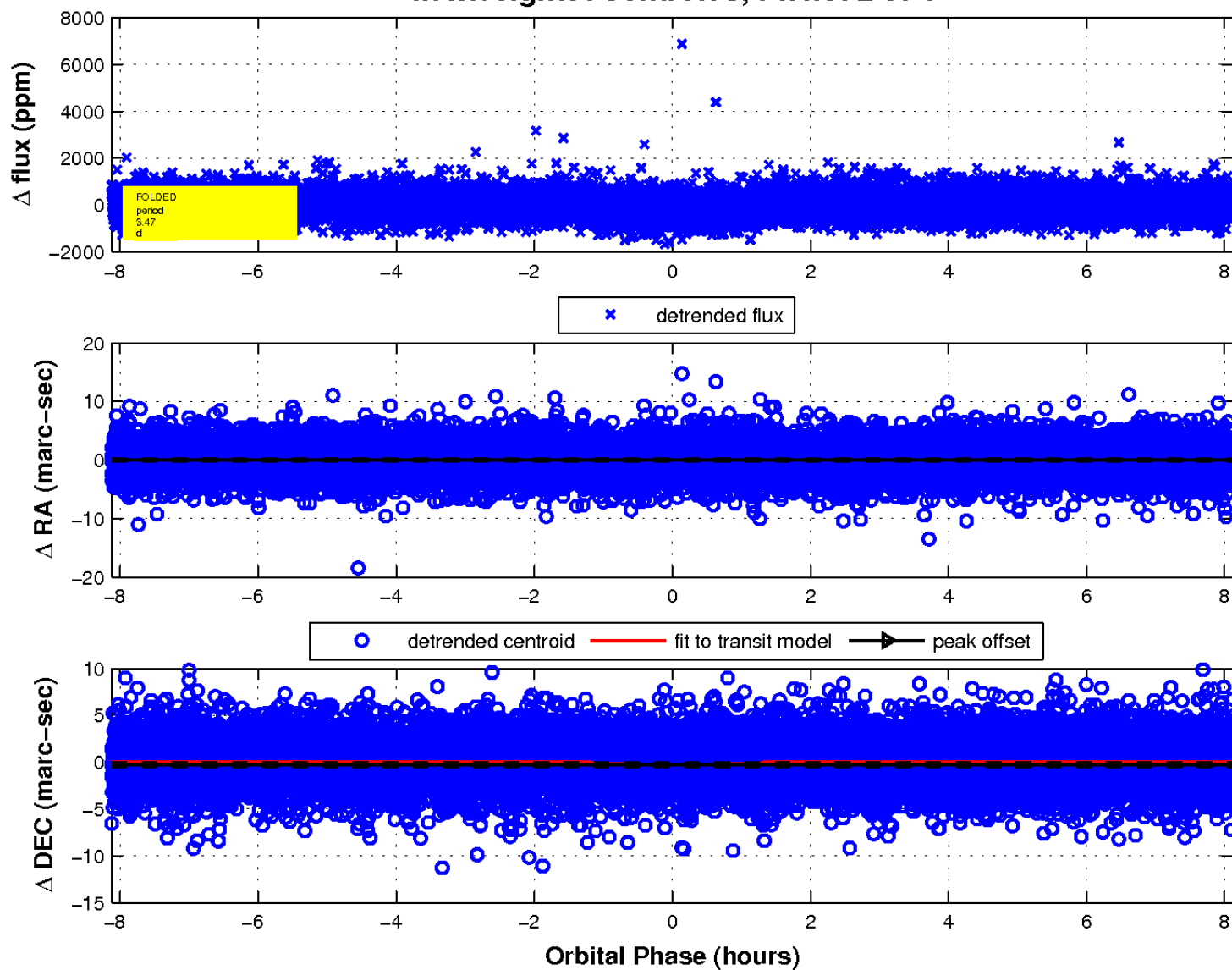
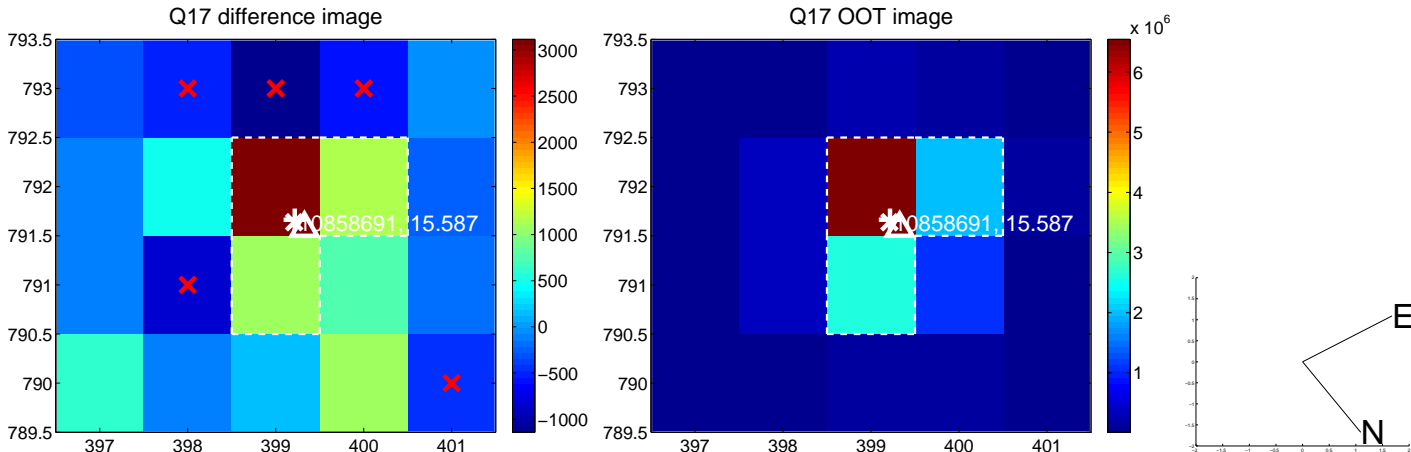




white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

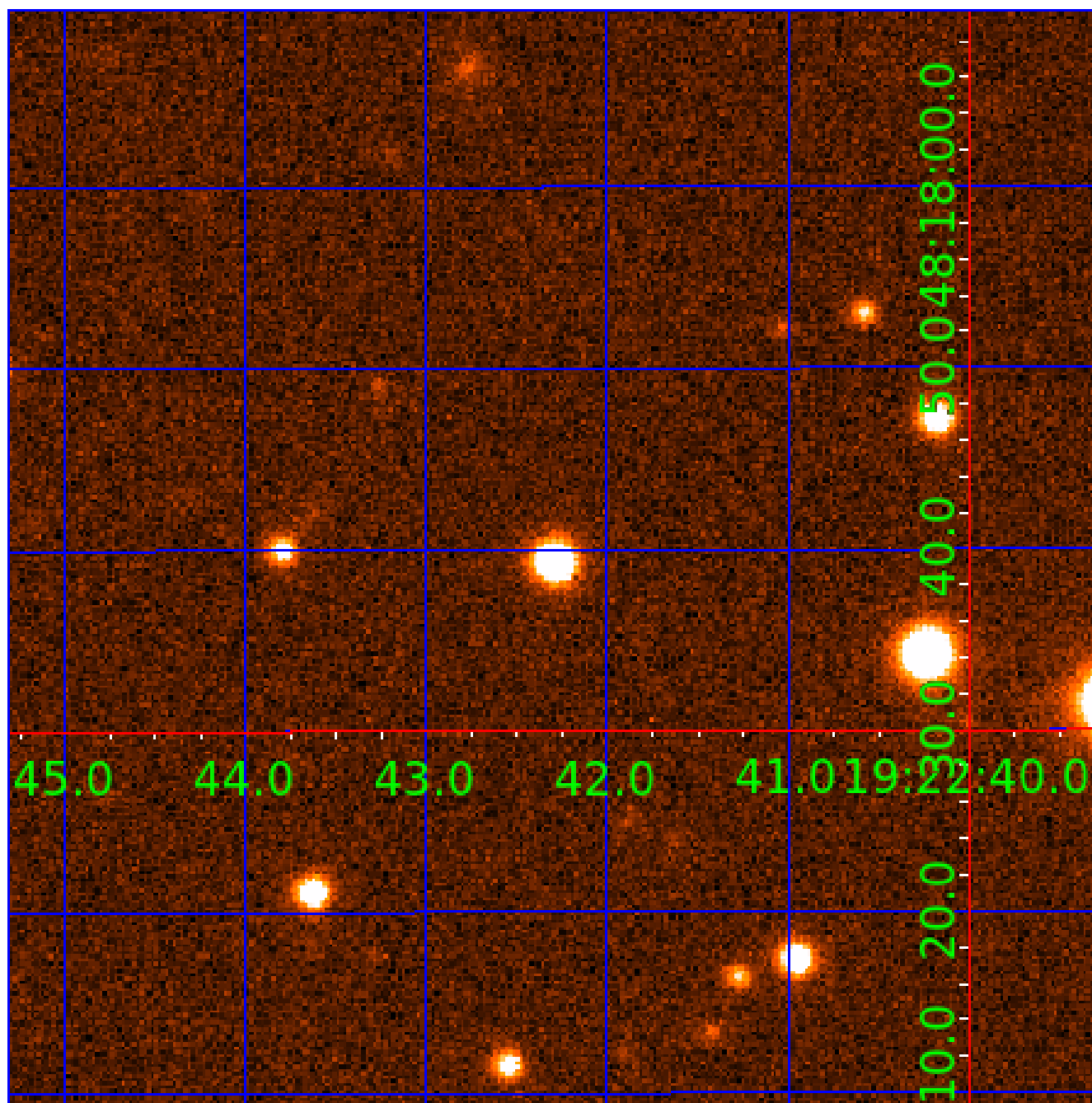


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 010858691

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010858691-01	OBS	1306.01	1.796313	131.539720	182.8	2.086	17.9	18.8	0.83	5576	1.32	826.76
010858691-02	OBS	1306.02	3.468089	132.536691	223.8	2.709	14.9	16.7	0.83	5576	1.57	343.90
010858691-03	OBS	1306.03	5.914304	133.486728	257.4	3.010	12.0	15.1	0.83	5576	1.59	168.79
010858691-04	OBS	1306.04	29.221258	139.336833	366.8	3.957	9.0	10.5	0.83	5576	1.81	20.06

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010858691-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
010858691-02	OBS	PC	0.99	0	0	0	0	NO_COMMENT
010858691-03	OBS	PC	0.95	0	0	0	0	NO_COMMENT
010858691-04	OBS	PC	0.91	0	0	0	0	NO_COMMENT

**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.

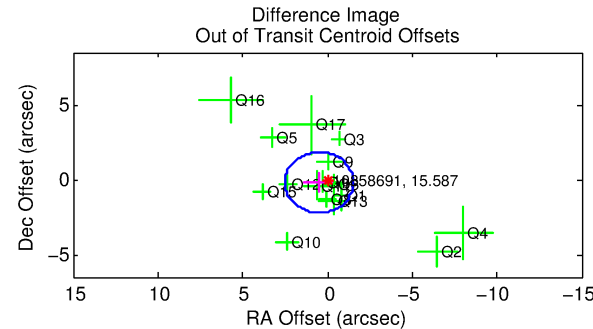
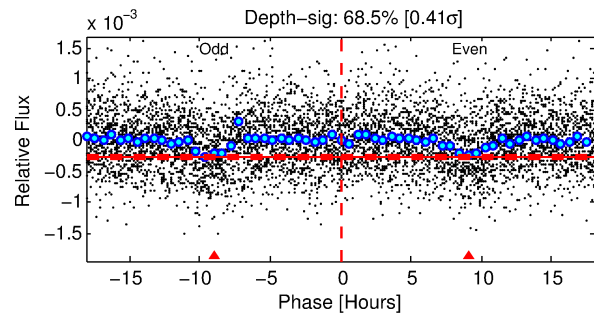
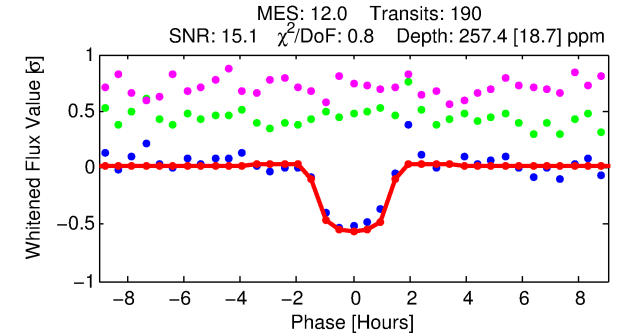
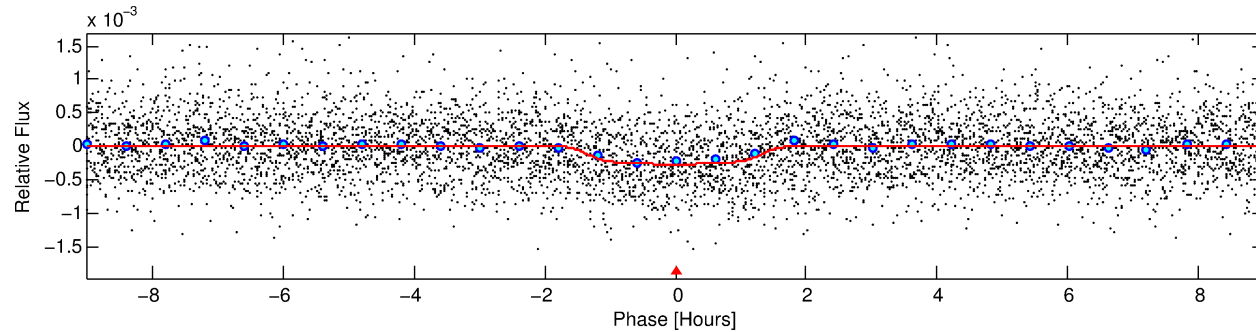
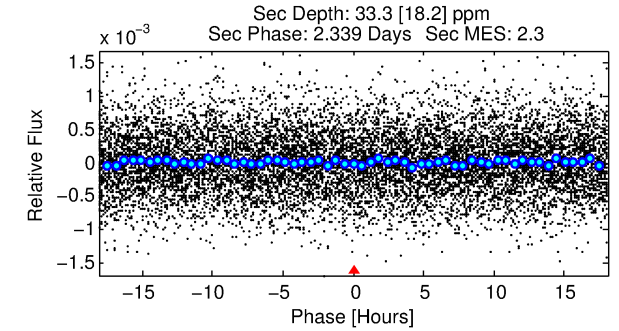
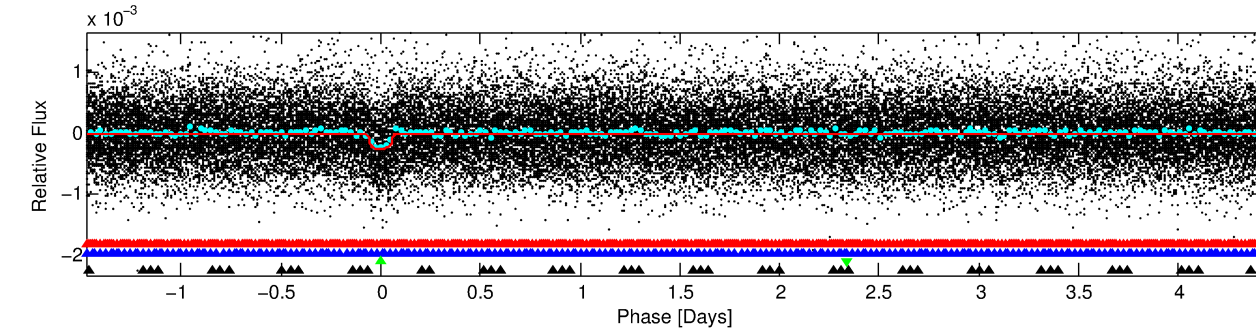
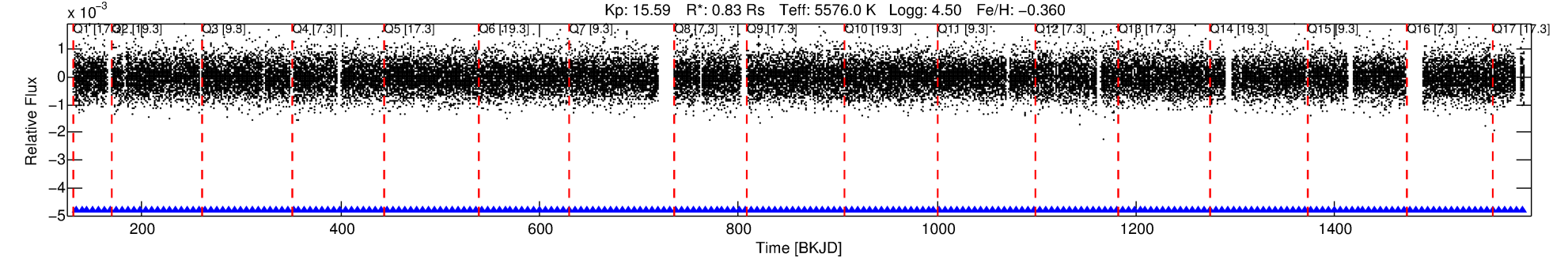
Ephemeris Match Information For 010858691-03

No Significant Match Found

# DV One-Page Summary

KIC: 10858691 Candidate: 3 of 4 Period: 5.914 d  
KOI: K01306.03 Name: Kepler-286d Corr: 0.943

Kp: 15.59 R\*: 0.83 Rs Teff: 5576.0 K Logg: 4.50 Fe/H: -0.360



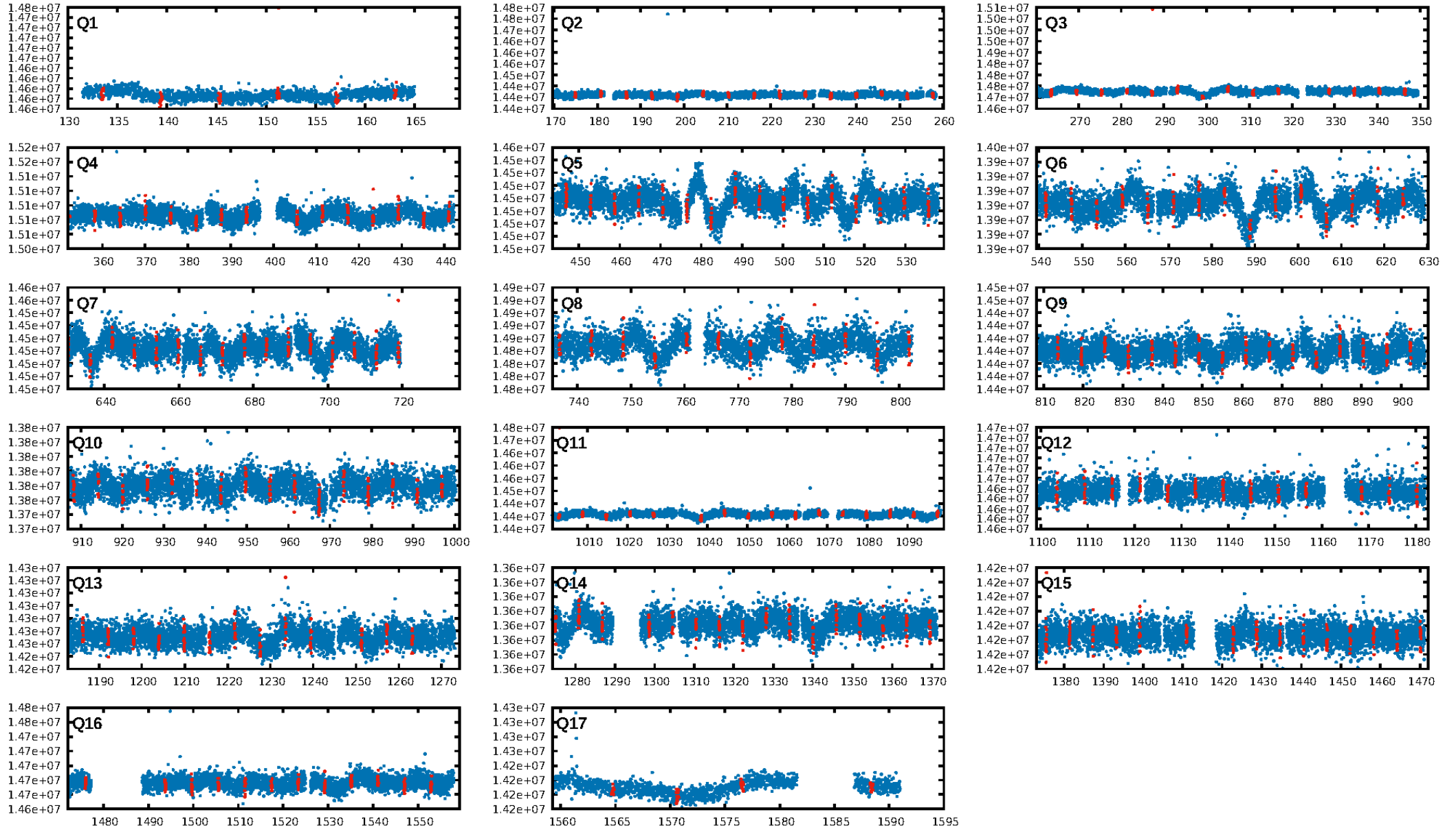
## DV Fit Results:

Period = 5.91430 [0.00003] d  
Epoch = 133.4867 [0.0039] BKJD  
Rp/R\* = 0.0176 [0.0055]  
a/R\* = 7.03 [10.24]  
b = 0.91 [0.30]  
Seff = 168.79 [26.35]  
Teq = 919 [36] K  
Rp = 1.59 [0.53] Re  
a = 0.0594 [0.0053] AU  
Ag = 25.50 [21.57] [1.14σ]  
Teffp = 3193 [670] K [3.39σ]

## DV Diagnostic Results:

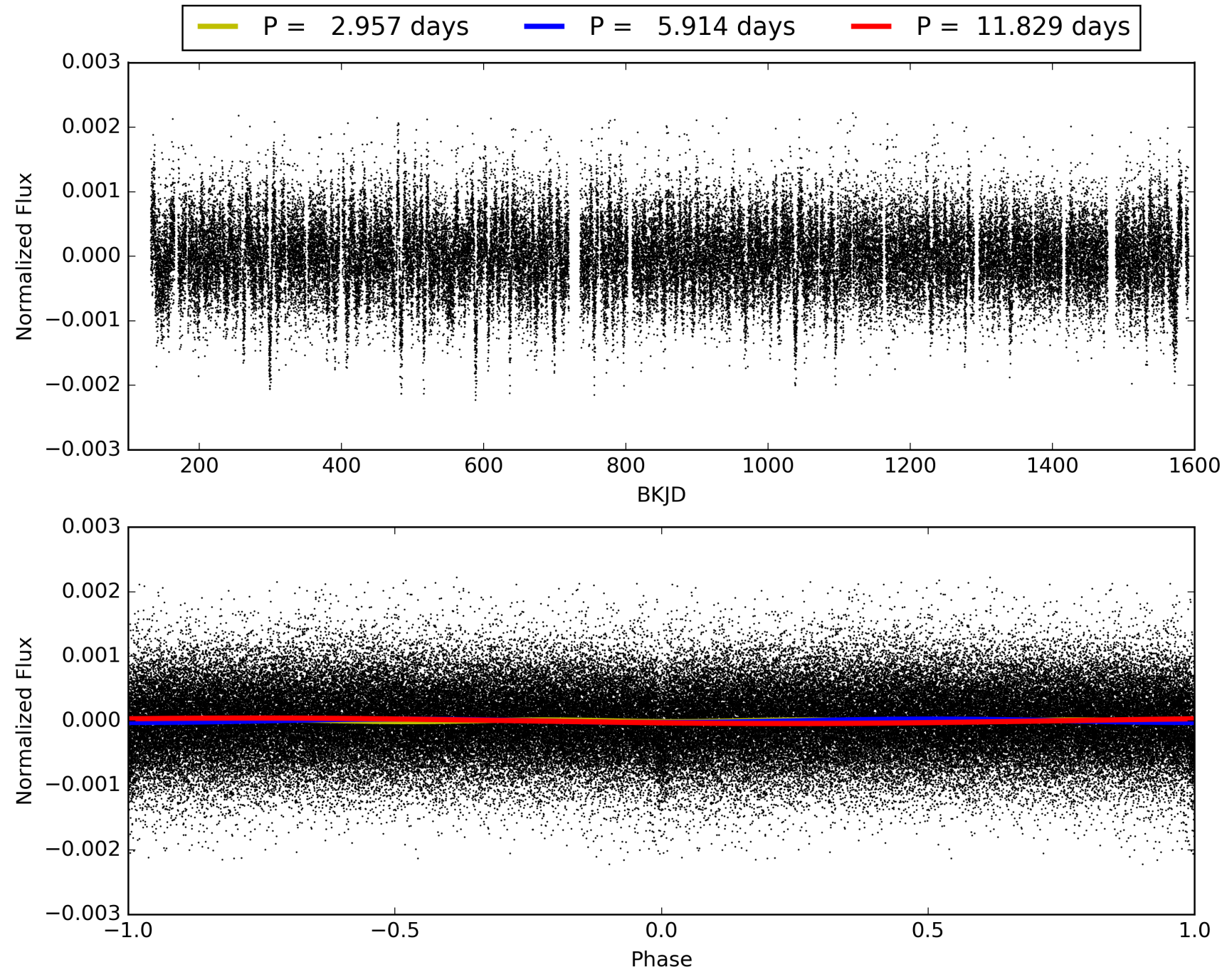
ShortPeriod-sig: 100.0% [14.50σ]  
LongPeriod-sig: 100.0% [112.53σ]  
ModelChiSquare2-sig: 98.9%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 1.16e-33  
RollingBand-fgt: 1.00 [184/184]  
GhostDiagnostic-chr: 72.65  
Centroid-sig: 13.5%  
Centroid-so: 0.924 arcsec [1.05σ]  
OotOffset-rm: 0.538 arcsec [0.80σ]  
KicOffset-rm: 0.678 arcsec [1.05σ]  
OotOffset-st: 4/3/4/5 [16]  
KicOffset-st: 4/3/4/5 [16]  
DiffImageQuality-fgm: 0.44 [7/16]  
DiffImageOverlap-fno: 1.00 [17/17]

# TCE 010858691-03, PDC Light Curves



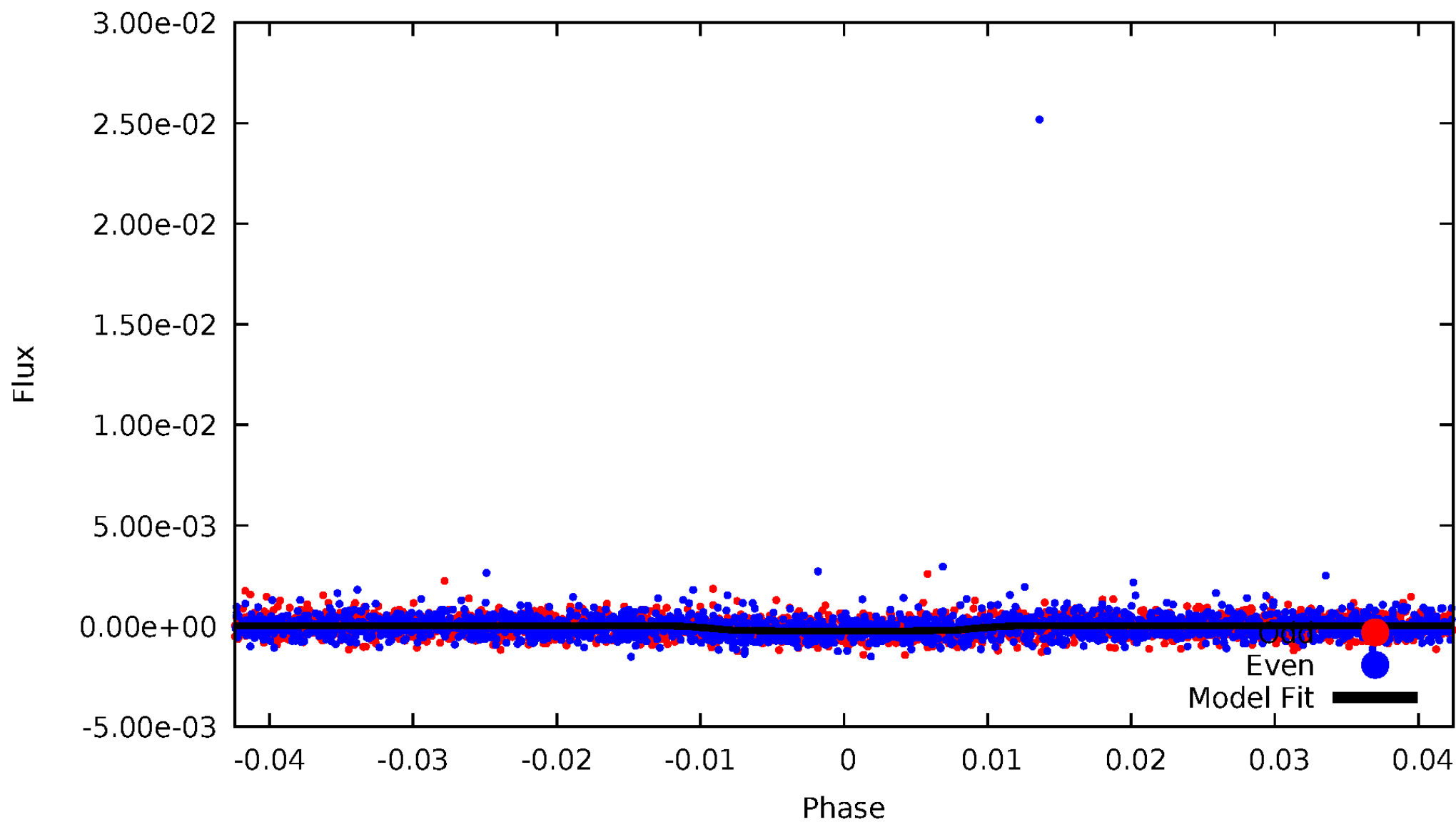


# TCE 010858691-03



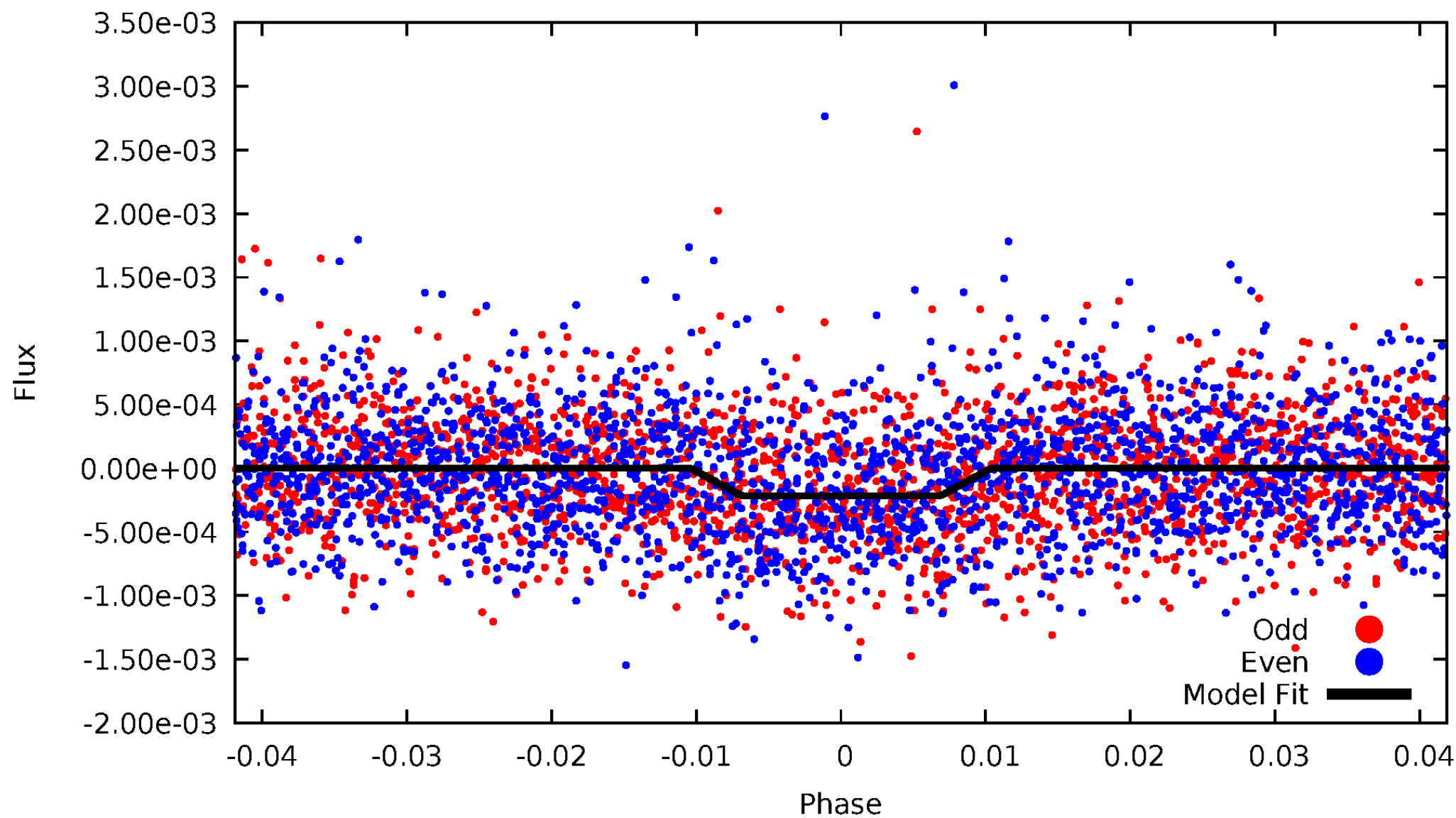
# DV Odd/Even

TCE 010858691-03



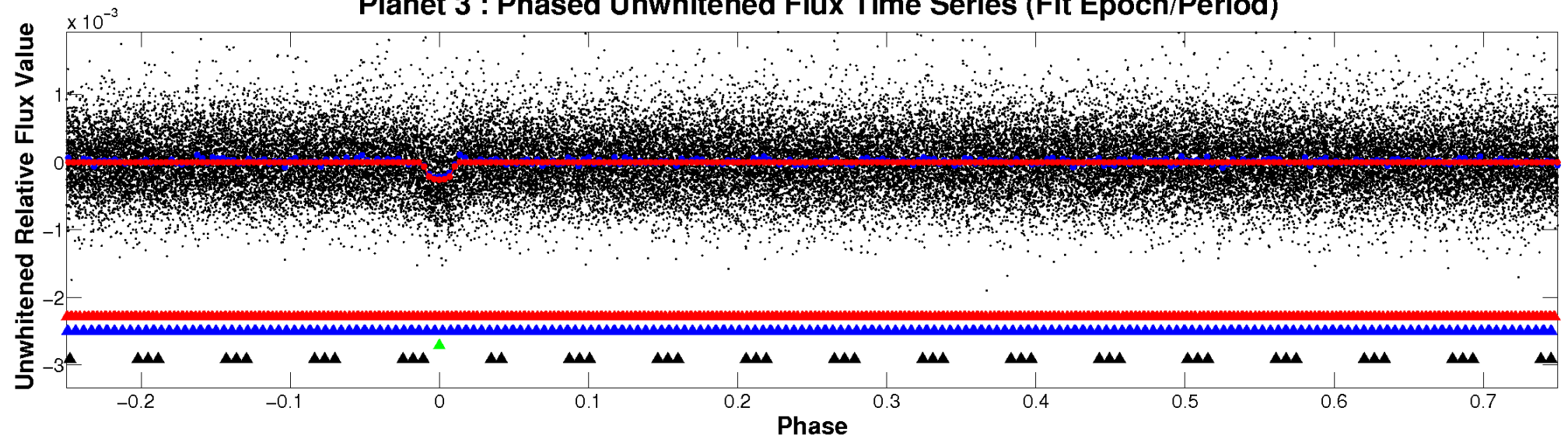
# ALT Odd/Even

TCE 010858691-03

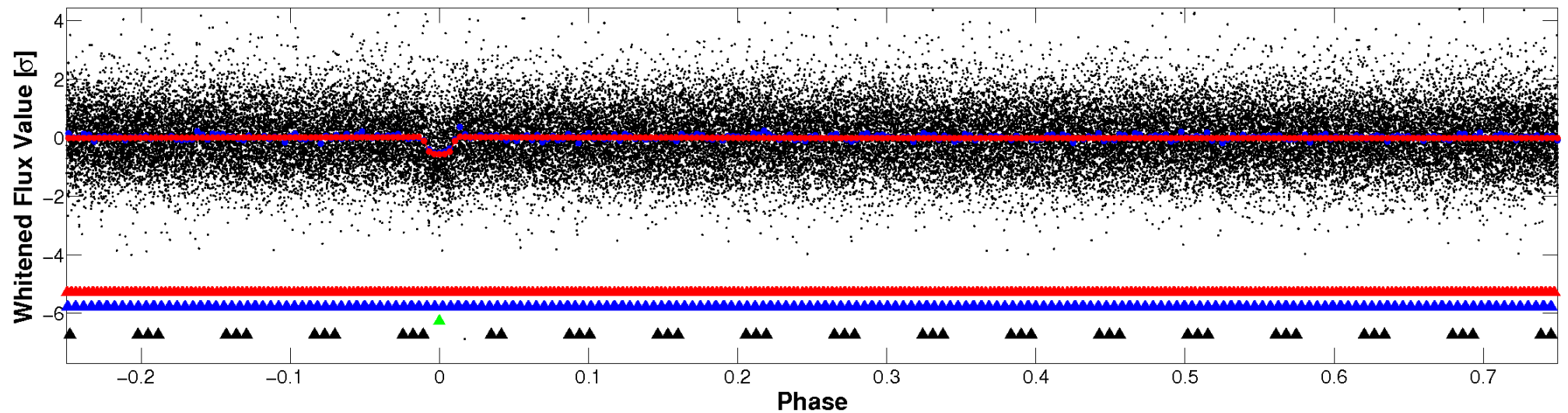


# Non-Whitened Vs. Whitened Light Curve

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

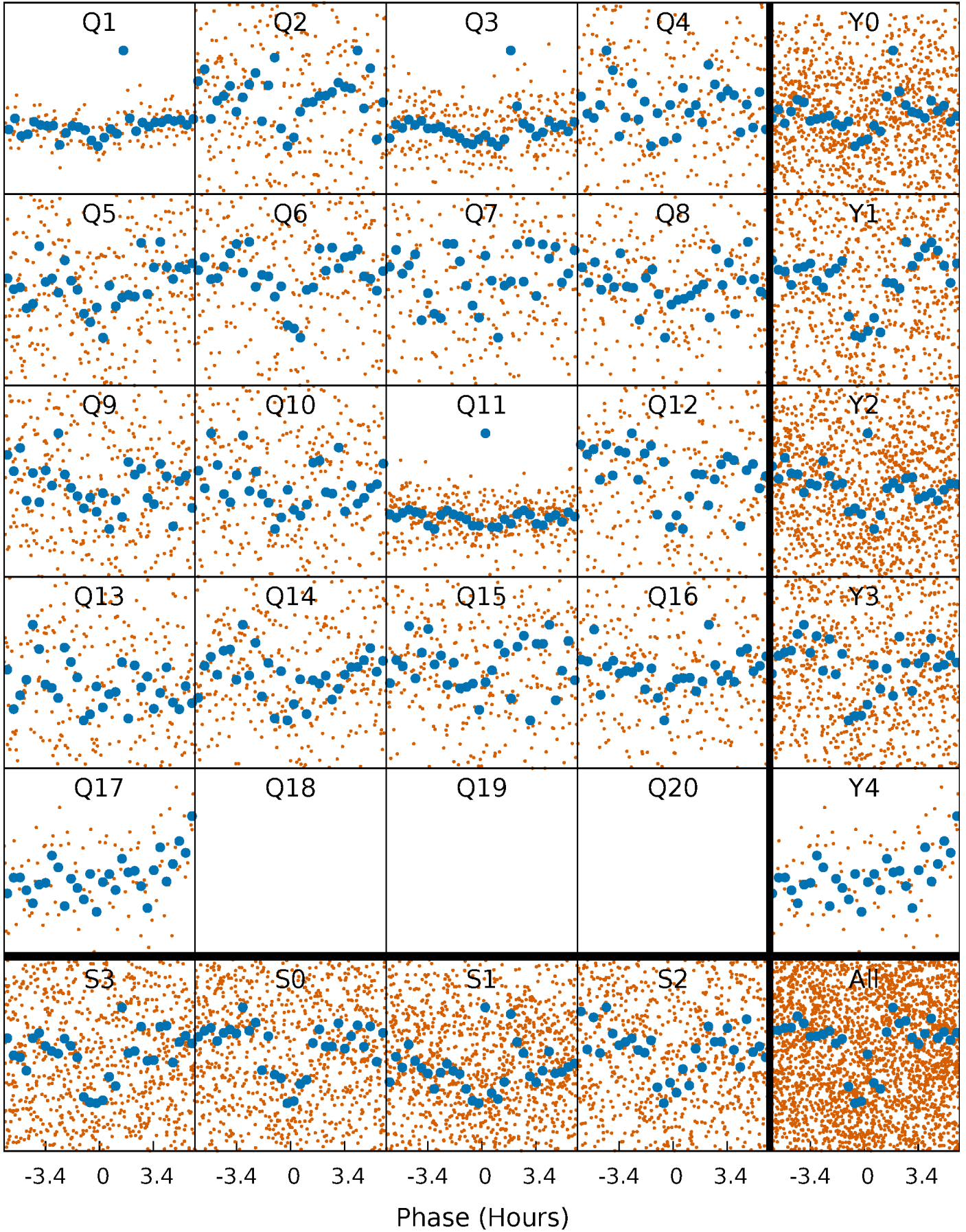


Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

TCE 010858691-03   P= 5.914304 Days    $T_0=133.486728$  (BKJD)





# DV Quarter-Phased Transit Curves

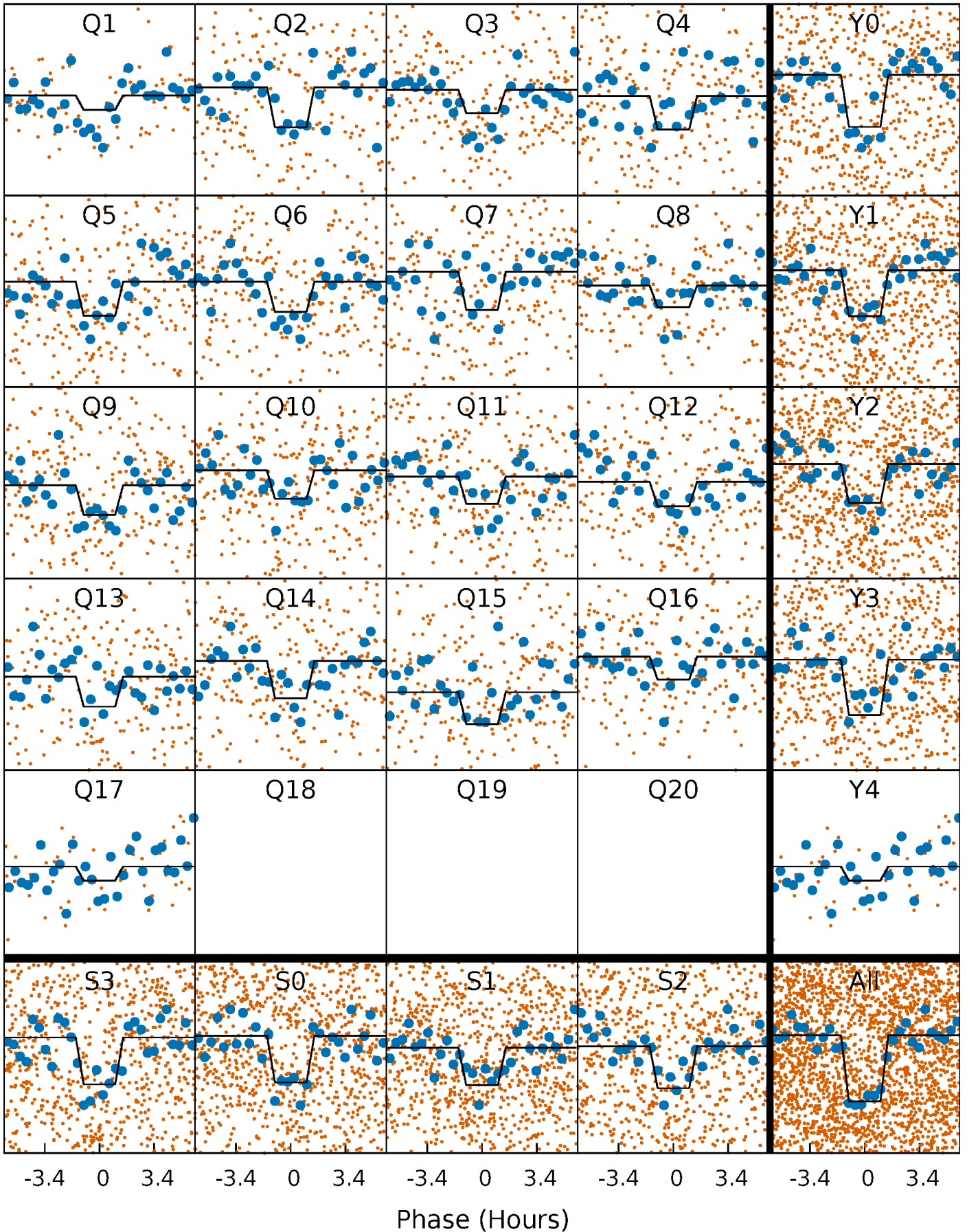
TCE 010858691-03 P= 5.914304 Days  $T_0=133.486728$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

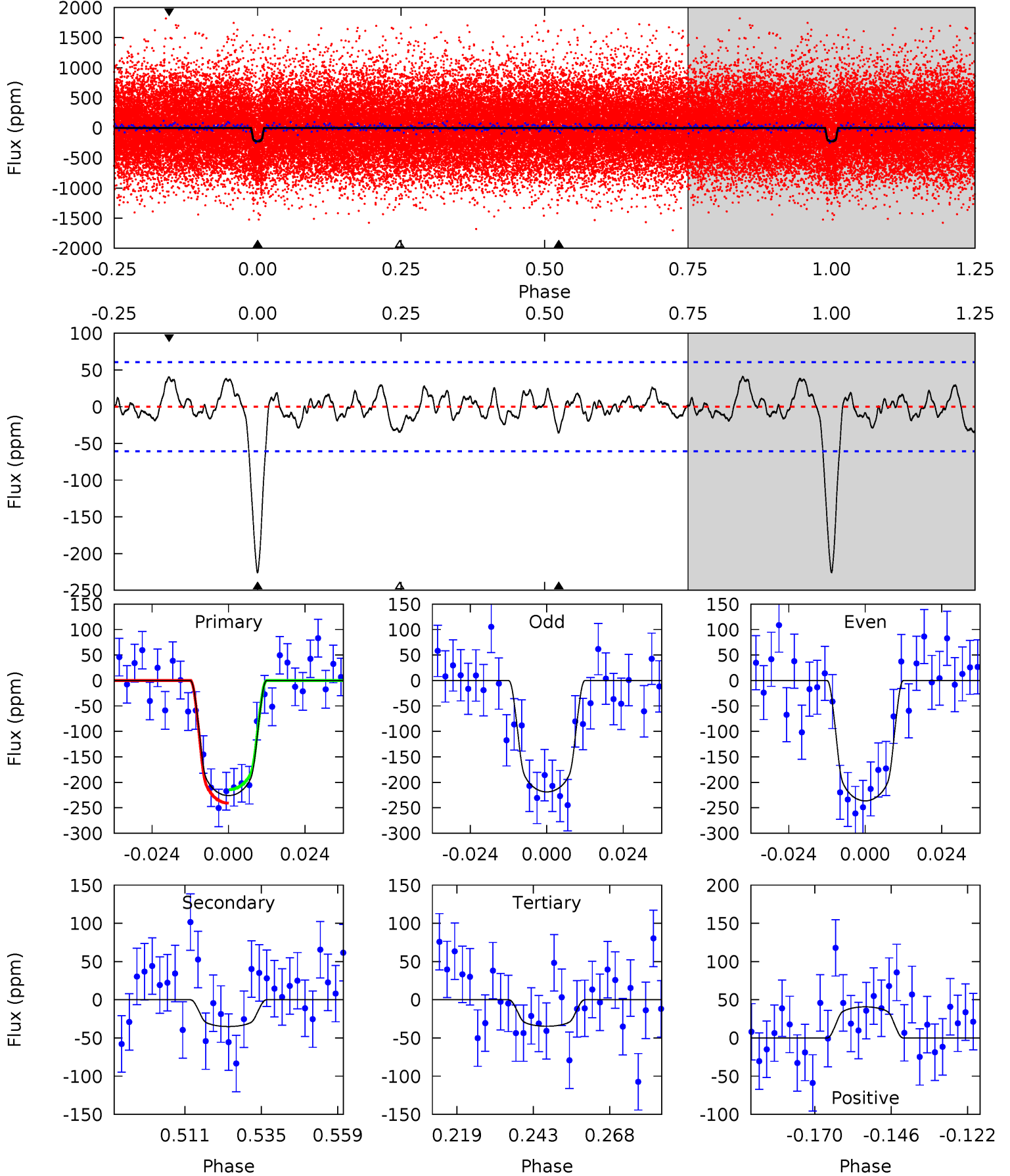
TCE 010858691-03     $P = 5.914248$  Days     $T_0 = 133.492935$  (BKJD)



# DV Model-Shift Uniqueness Test

010858691-03, P = 5.914304 Days, E = 127.572424 Days

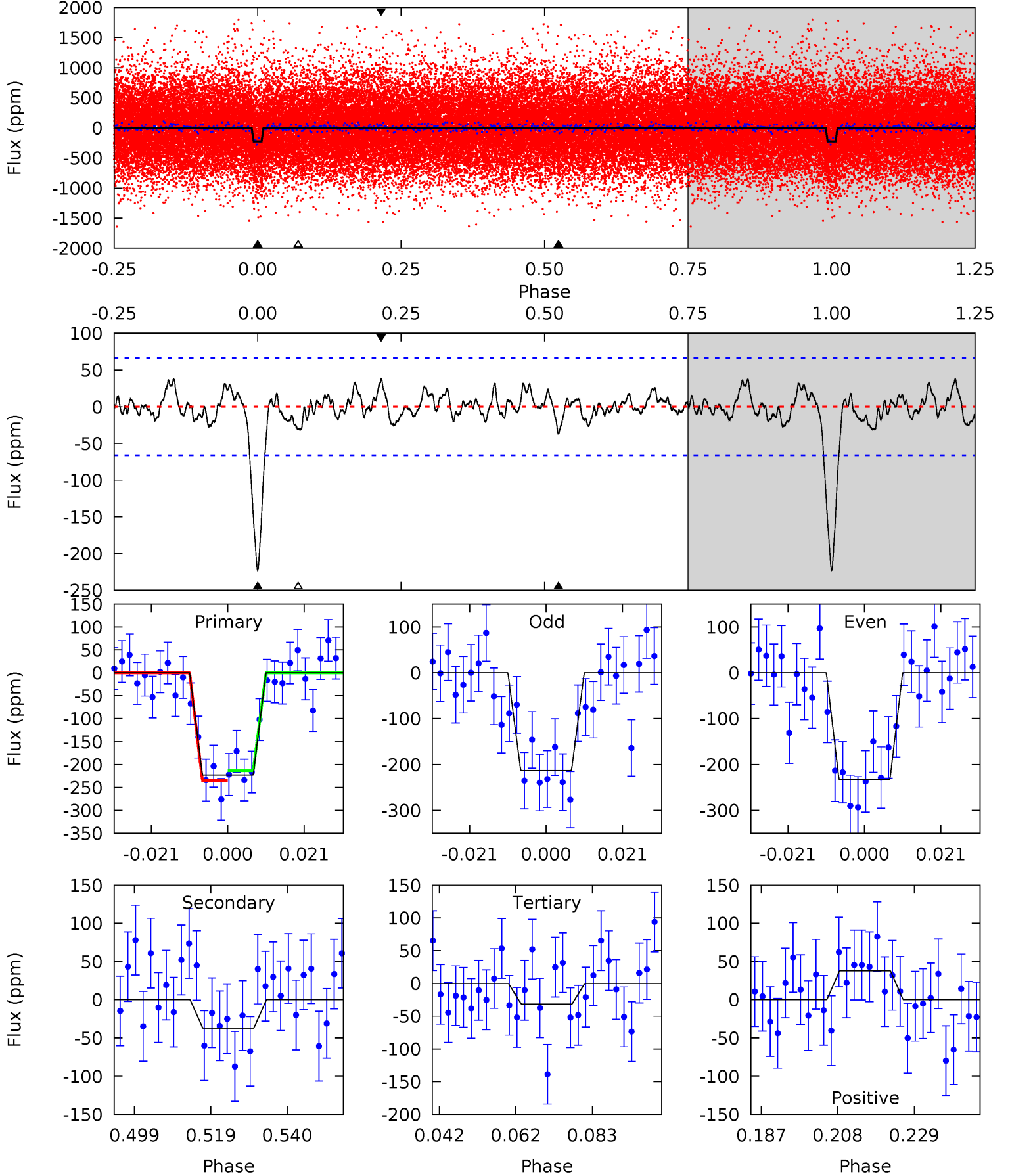
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
18.0	2.80	2.77	3.25	4.85	2.25	1.15	15.3	14.8	0.03	-0.45	0.70	1.00	0.15	1.05



# Alt Model-Shift Uniqueness Test

010858691-03, P = 5.914248 Days, E = 127.578687 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
16.5	2.76	2.33	2.81	4.88	2.31	1.01	14.1	13.7	0.43	-0.05	0.76	0.97	0.15	0.77



### Stellar Parameters For KIC 010858691

	$T_{\text{eff}}(K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5576^{+111}_{-111}$	$4.503^{+0.075}_{-0.075}$	$-0.360^{+0.150}_{-0.150}$	$0.829^{+0.086}_{-0.065}$	$0.800^{+0.060}_{-0.040}$	$1.974^{+0.510}_{-0.484}$
	+2%/-2%	+2%/-2%	+42%/-42%	+10%/-8%	+8%/-5%	+26%/-25%
Source	SPE58	SPE58	SPE58	DSEP		

KIC = Kepler Input Catalog; PHO = Photometry; SPE = Spectroscopy; AST = Asteroseismology  
 TRA = Transits; DESP = Dartmouth Models; MULT = Multiple Models

### Secondary Eclipse Parameters for KIC 010858691-03 / KOI 1306.03

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-35 \pm 13$	$1.63^{+0.46}_{-0.54}$	$1287^{+44}_{-47}$	$3620^{+555}_{-369}$	$26^{+31}_{-13}$
Alt.	$-37 \pm 14$	$1.33^{+0.51}_{-0.54}$	$1286^{+42}_{-43}$	$3913^{+822}_{-482}$	$41^{+76}_{-22}$

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

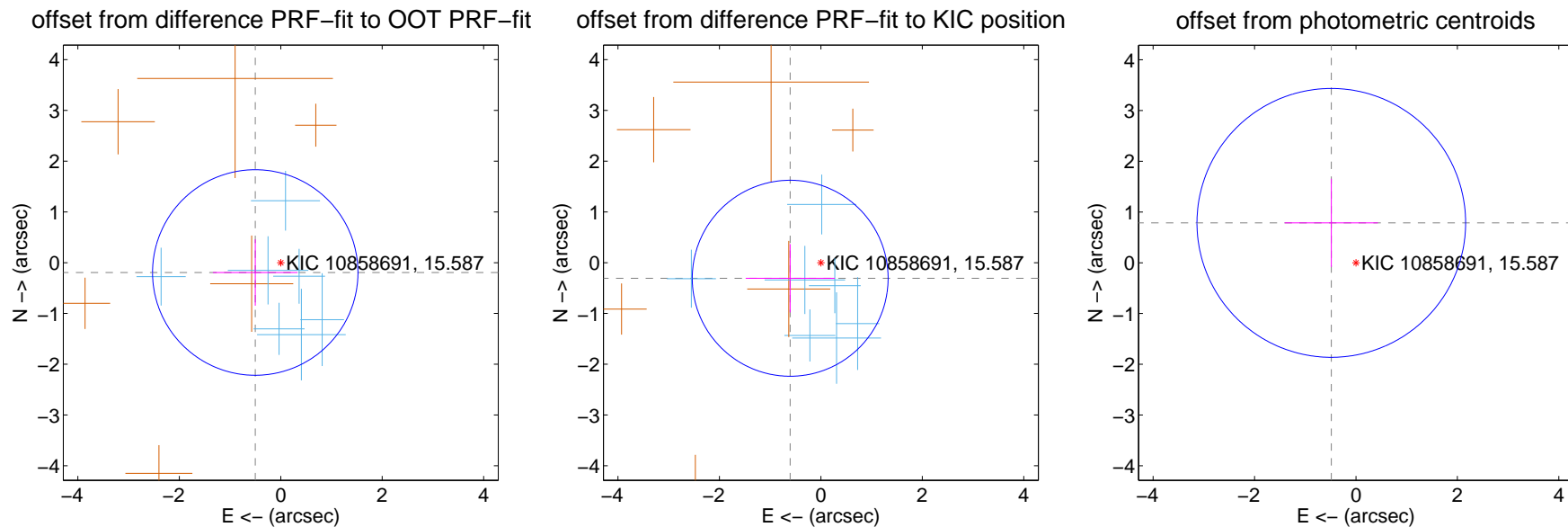
## DV Centroid Data

Supplemental centroid analysis for 010858691-03. Kepler magnitude: 15.59. Transit SNR 15.08

There are 7 quarters with good PRF difference image offsets

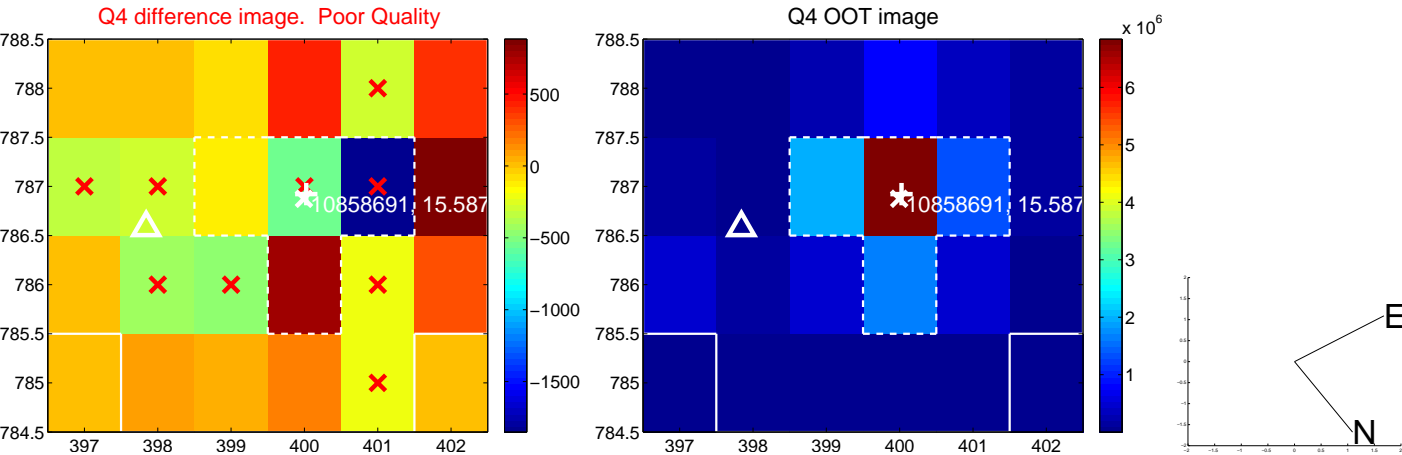
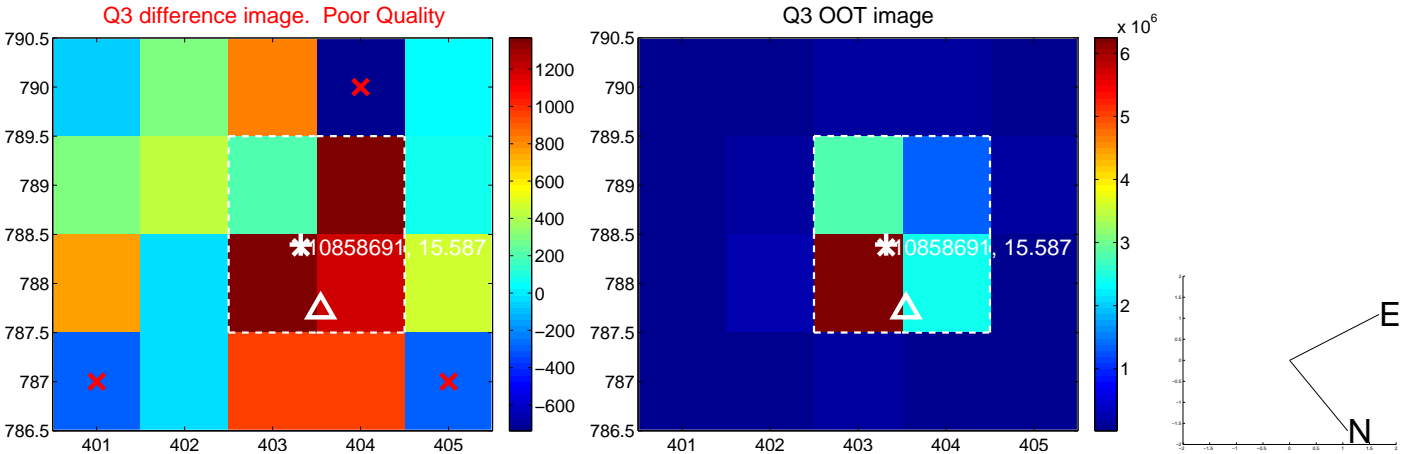
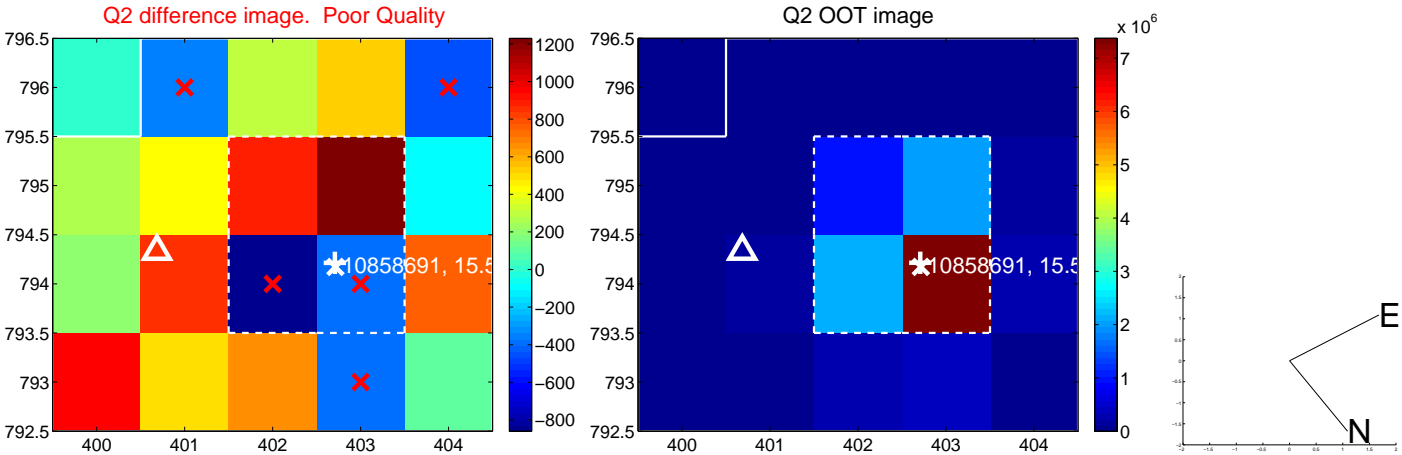
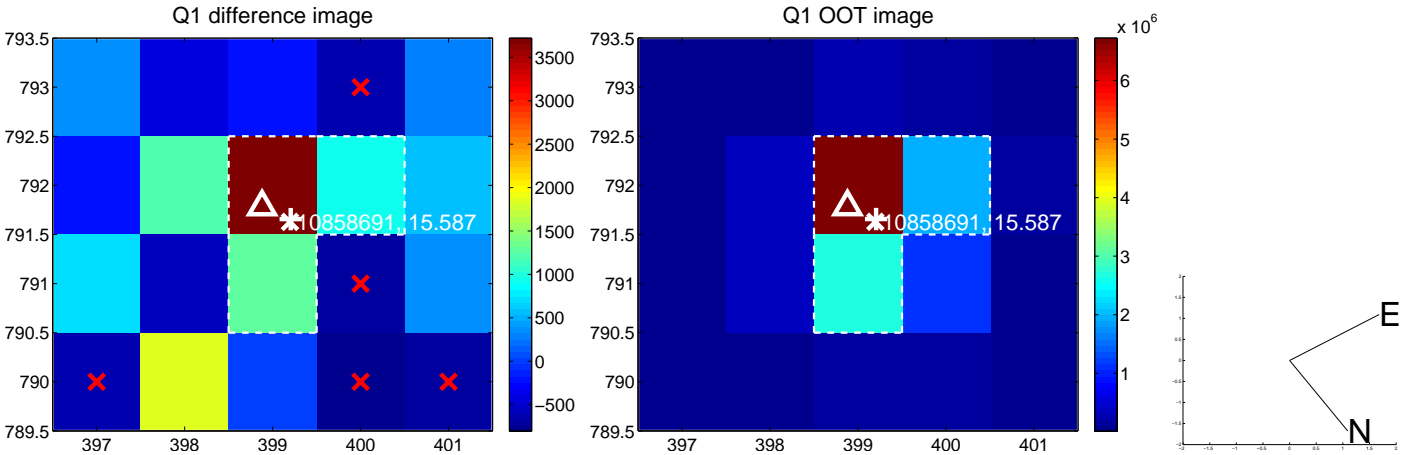
The direct PRF centroid is offset from the target star catalog position by about 0.11 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.538 \pm 0.675$	0.80	$0.503 \pm 0.833$	$-0.193 \pm 0.653$
PRF-fit source offset from KIC position	$0.678 \pm 0.644$	1.05	$0.605 \pm 0.877$	$-0.307 \pm 0.673$
photometric centroid source offset	$0.92 \pm 0.88$	1.05	$0.49 \pm 0.92$	$0.79 \pm 0.87$



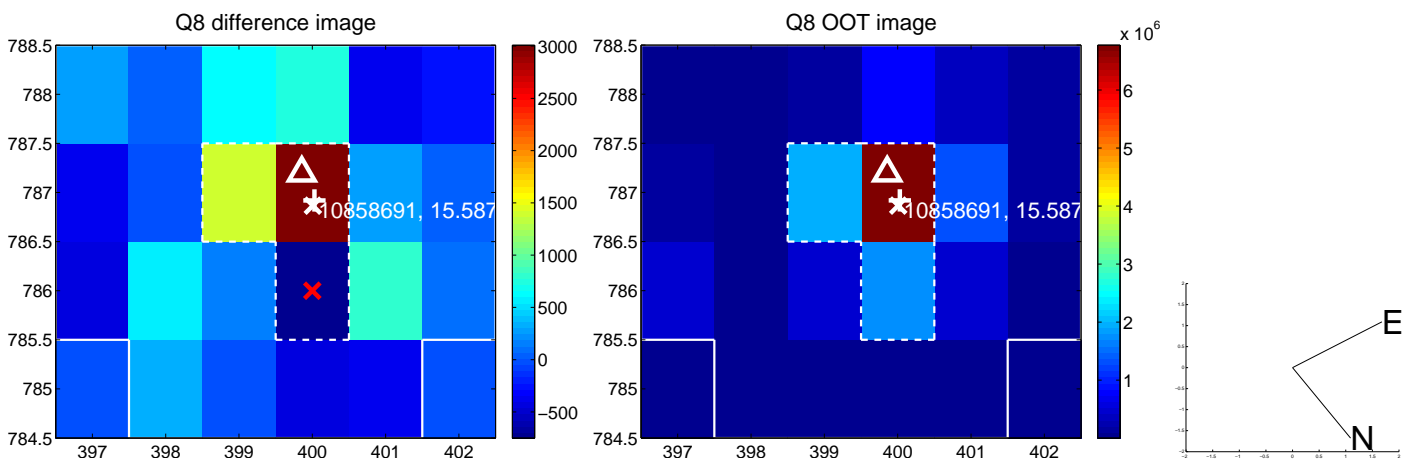
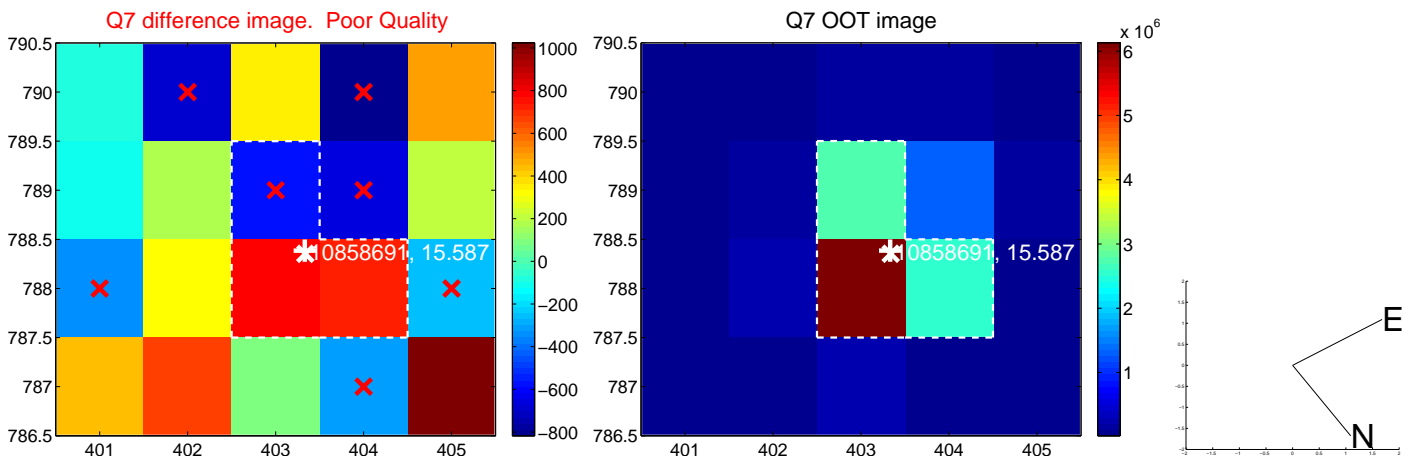
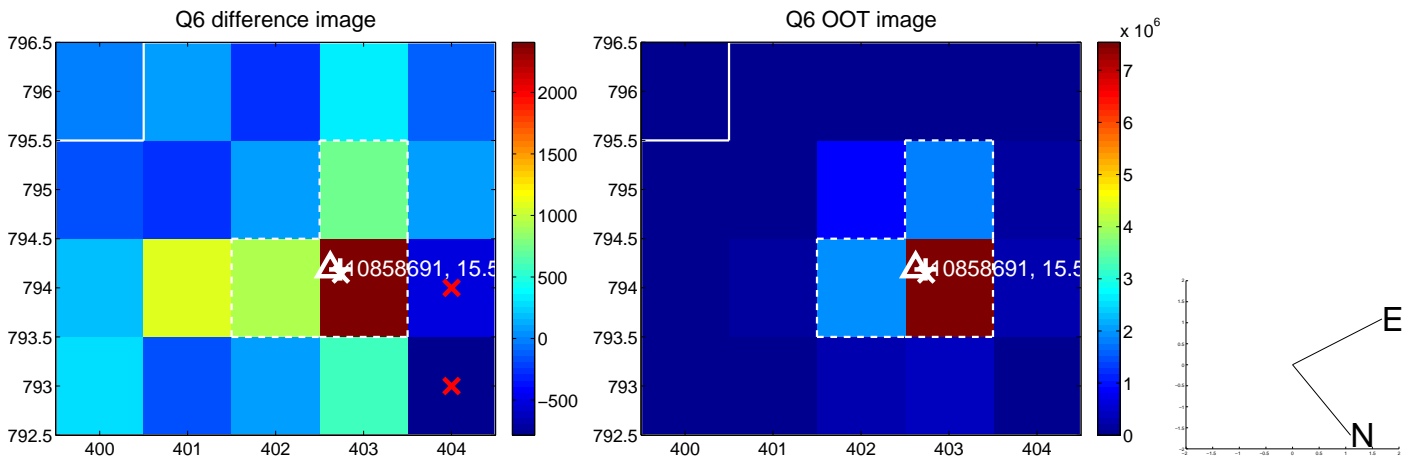
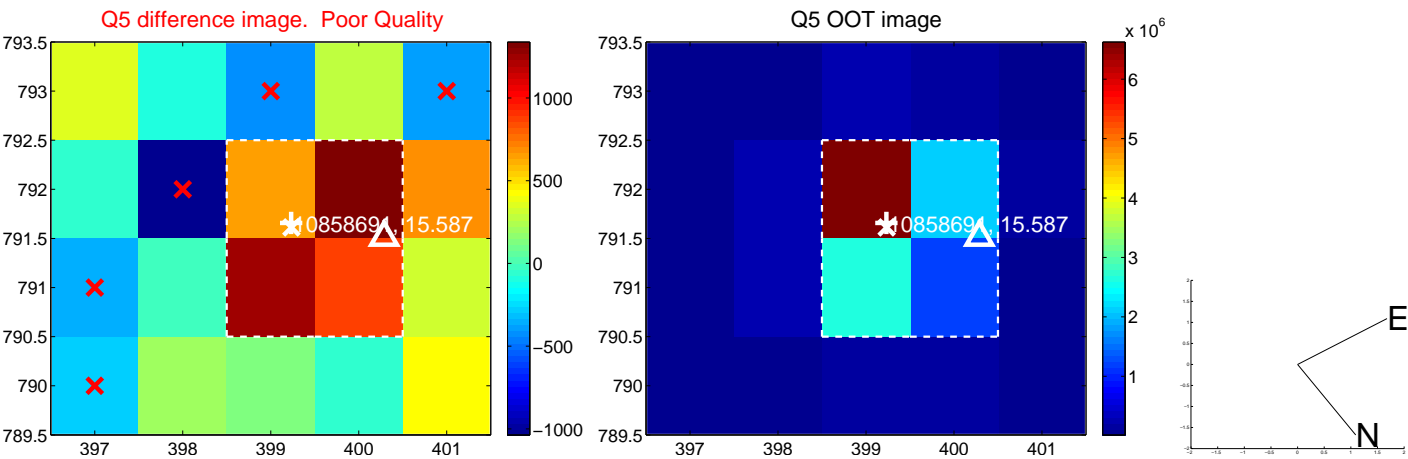
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

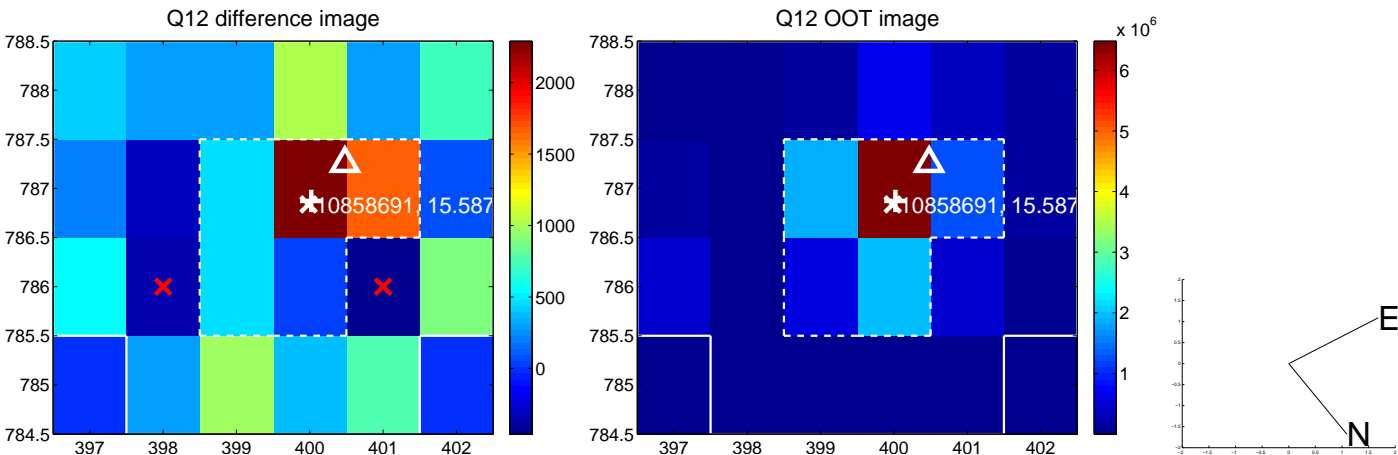
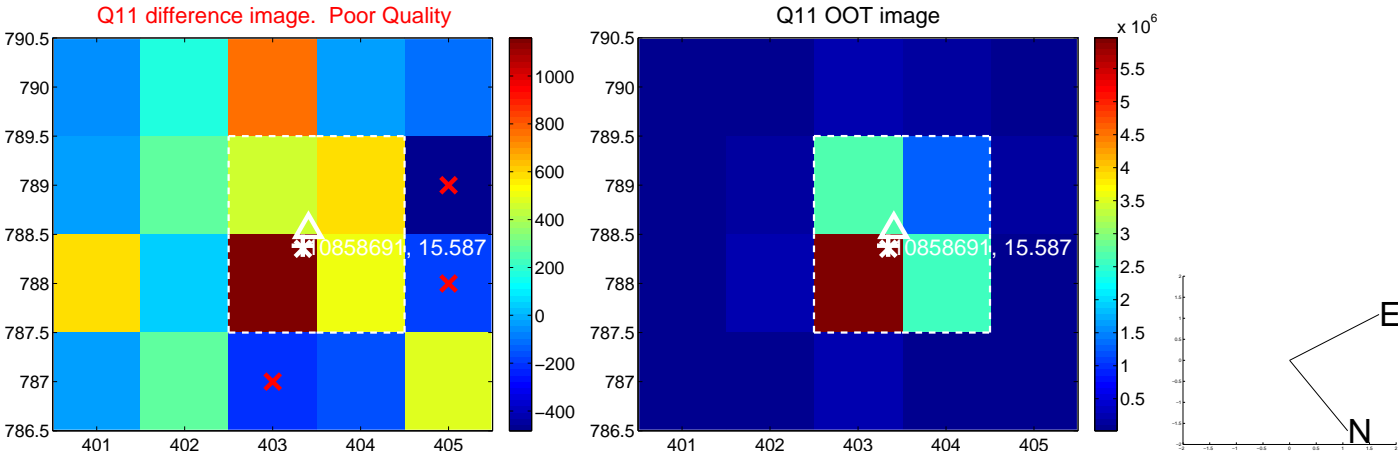
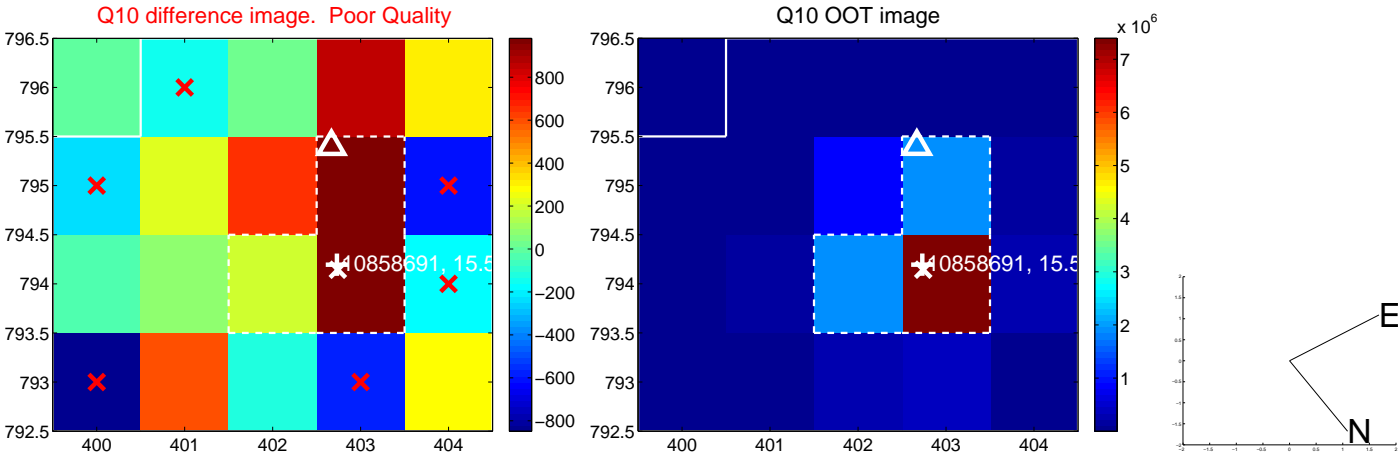
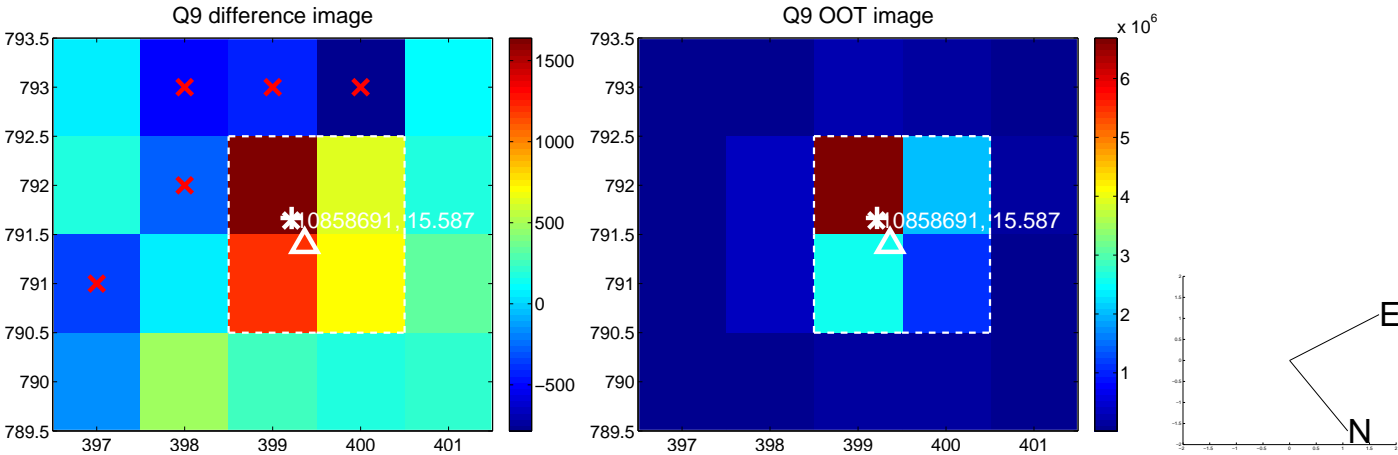




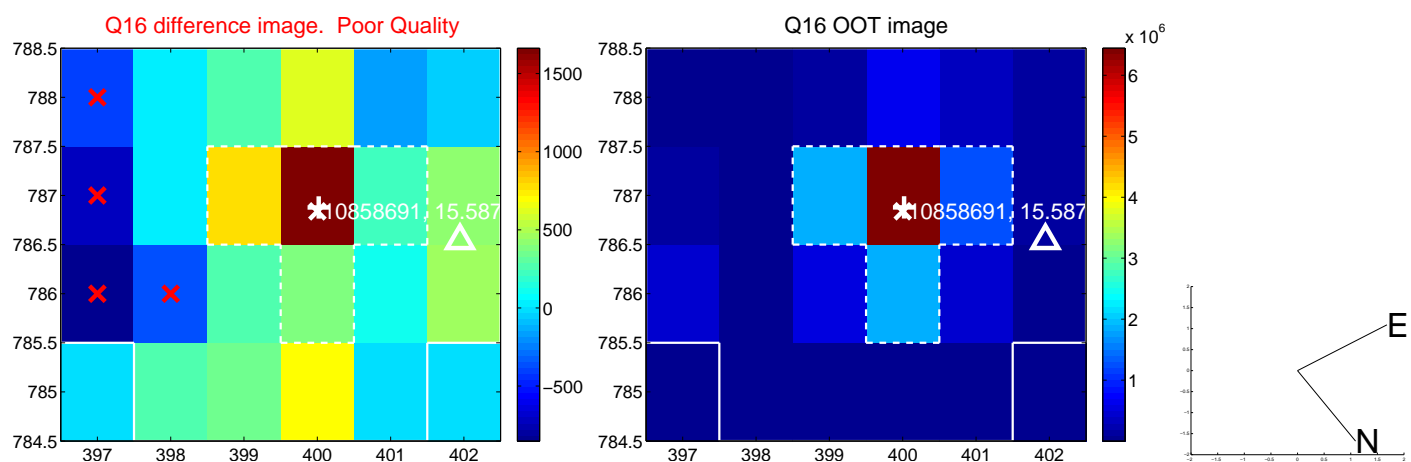
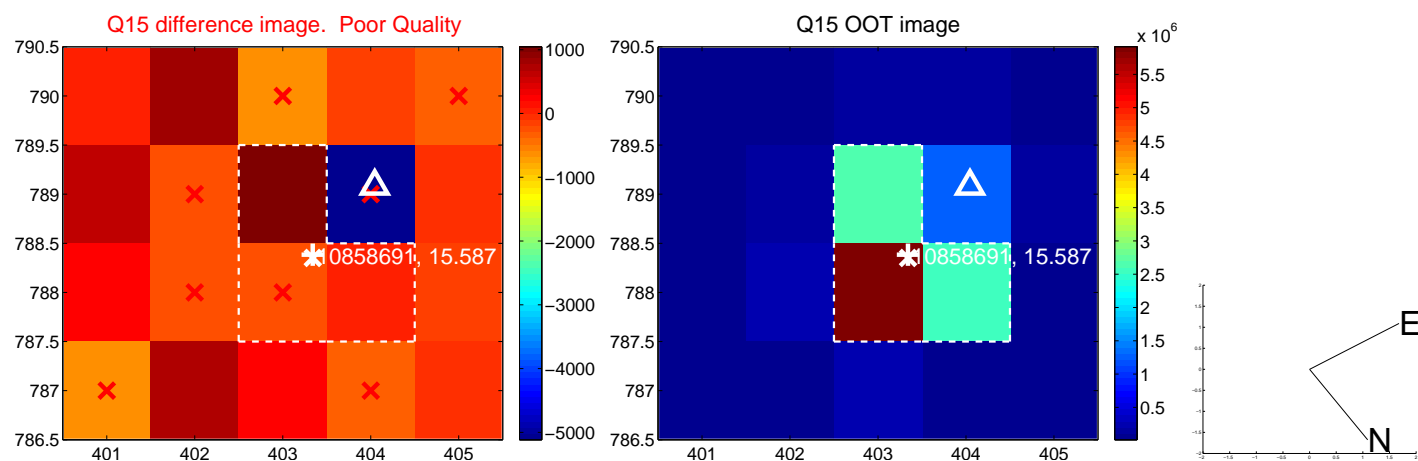
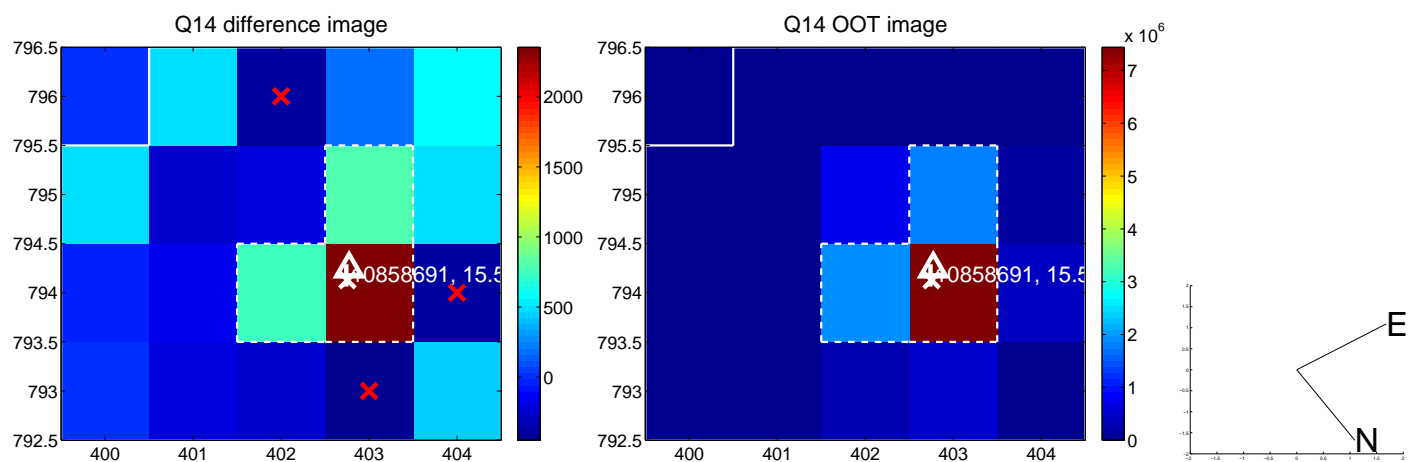
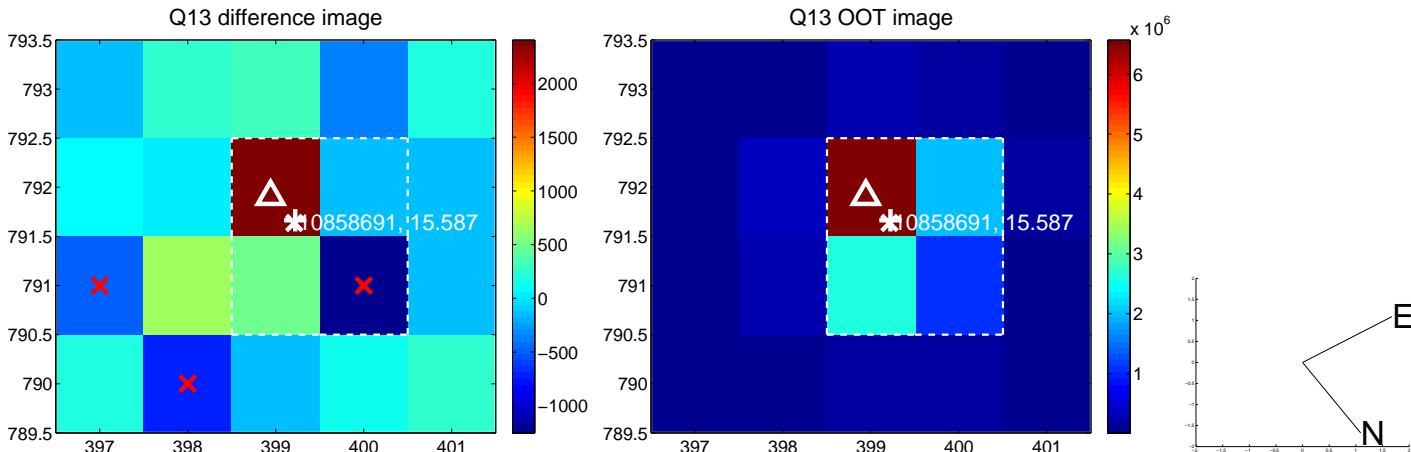
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



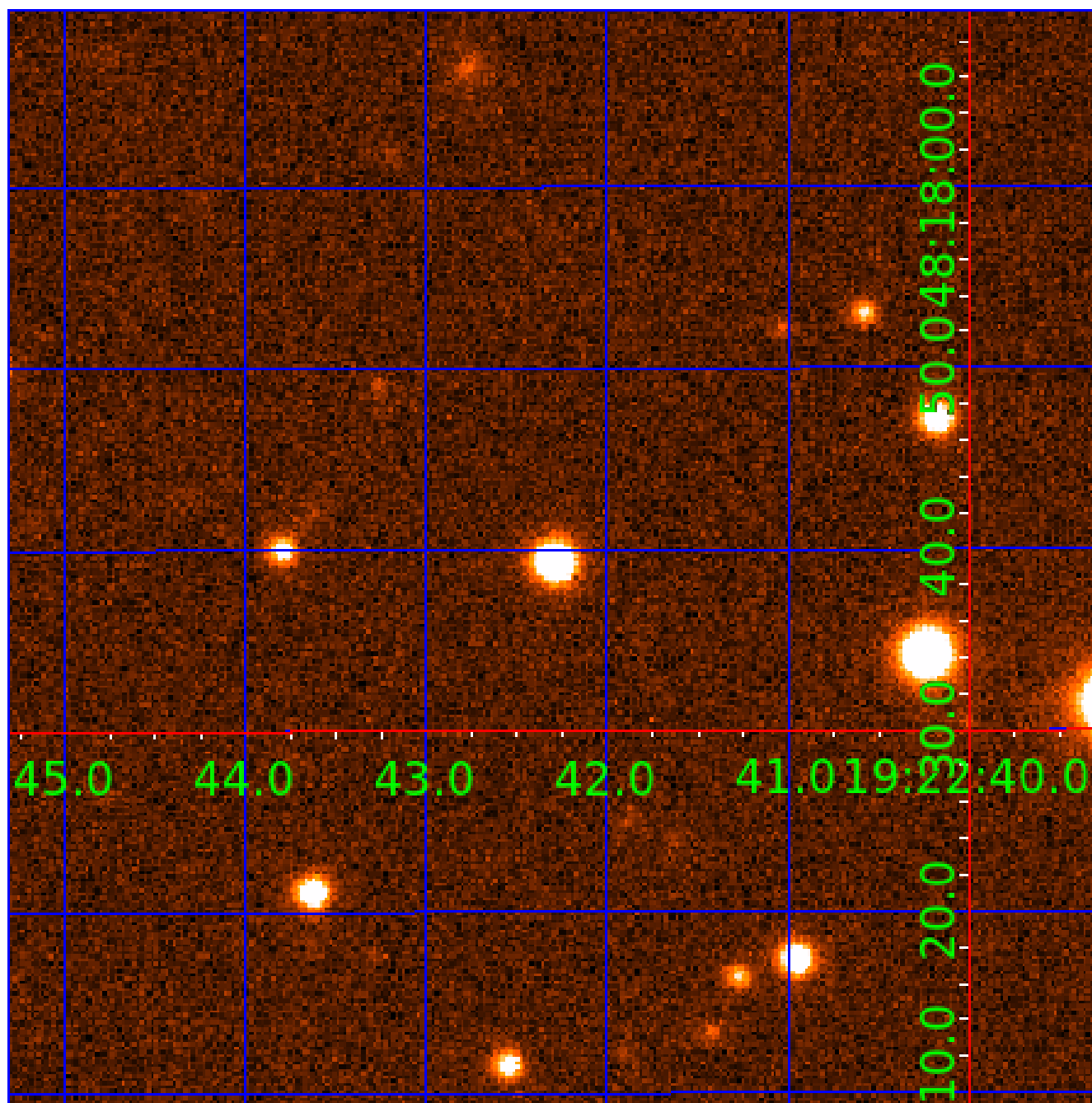
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





UKIRT Image

Declination





# KIC 010858691

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010858691-01	OBS	1306.01	1.796313	131.539720	182.8	2.086	17.9	18.8	0.83	5576	1.32	826.76
010858691-02	OBS	1306.02	3.468089	132.536691	223.8	2.709	14.9	16.7	0.83	5576	1.57	343.90
010858691-03	OBS	1306.03	5.914304	133.486728	257.4	3.010	12.0	15.1	0.83	5576	1.59	168.79
010858691-04	OBS	1306.04	29.221258	139.336833	366.8	3.957	9.0	10.5	0.83	5576	1.81	20.06

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010858691-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
010858691-02	OBS	PC	0.99	0	0	0	0	NO_COMMENT
010858691-03	OBS	PC	0.95	0	0	0	0	NO_COMMENT
010858691-04	OBS	PC	0.91	0	0	0	0	NO_COMMENT

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

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

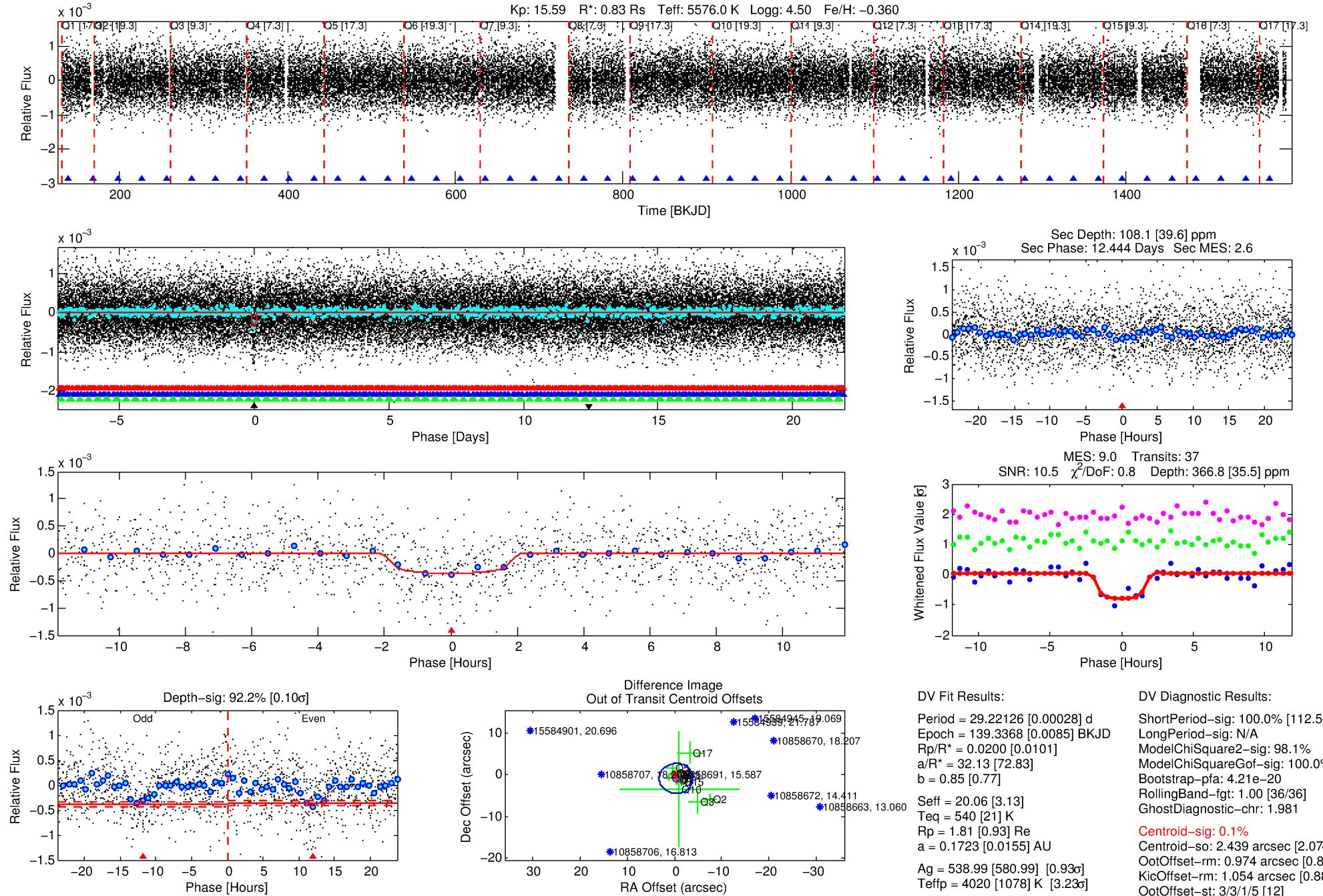
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 010858691-04

No Significant Match Found

# DV One-Page Summary

KIC: 10858691 Candidate: 4 of 4 Period: 29.221 d  
KOI: K01306.04 Name: Kepler-286e Corr: 0.972



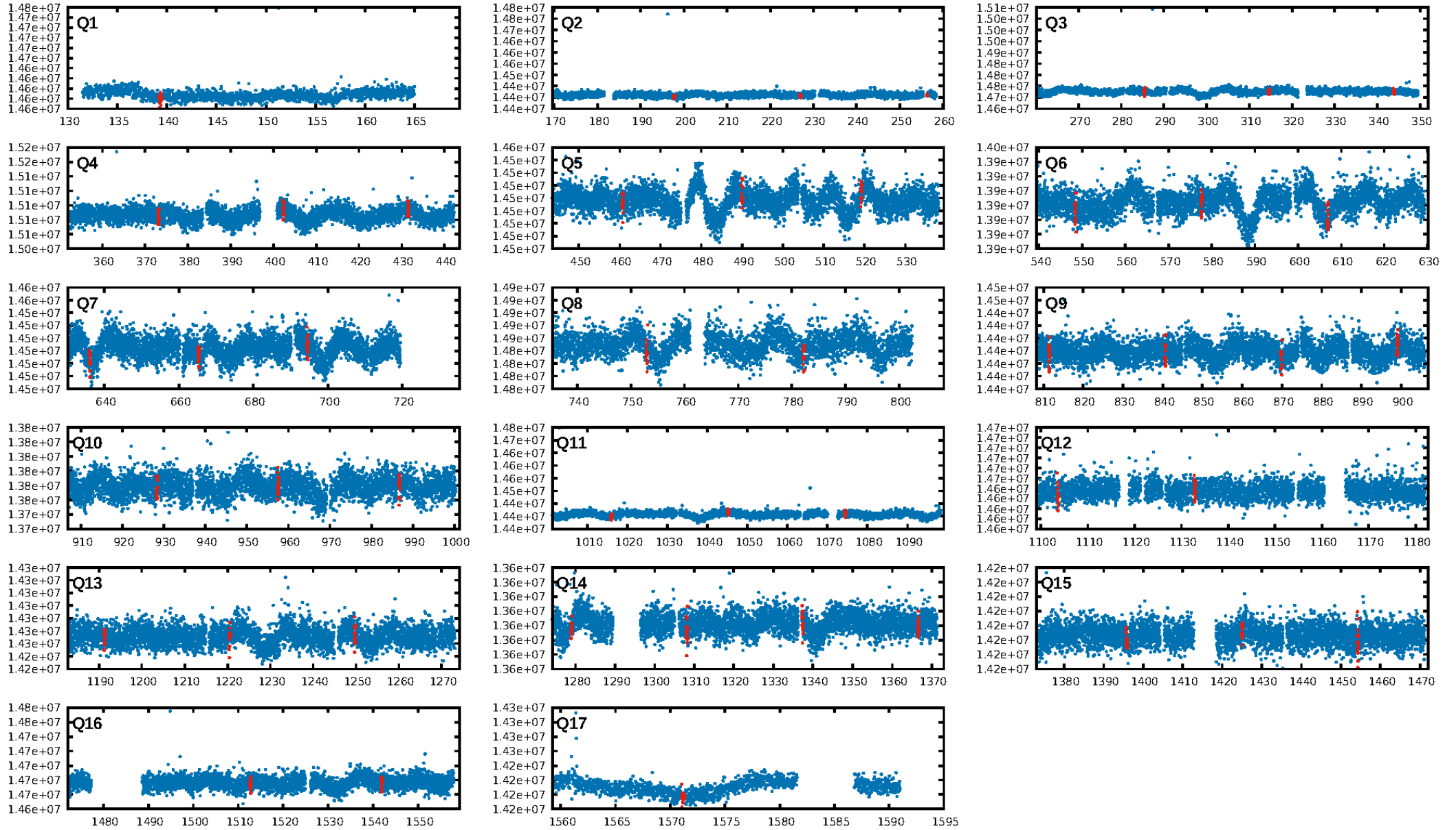
## DV Fit Results:

Period = 29.22126 [0.00028] d  
Epoch = 139.3368 [0.0085] BKJD  
Rp/R\* = 0.0200 [0.0101]  
a/R\* = 32.13 [72.83]  
b = 0.85 [0.77]  
Seff = 20.06 [3.13]  
Teff = 540 [21] K  
Rp = 1.81 [0.93] Re  
a = 0.1723 [0.0155] AU  
Ag = 538.99 [580.99] [0.93 $\sigma$ ]  
Teffp = 4020 [1078] K [3.23 $\sigma$ ]

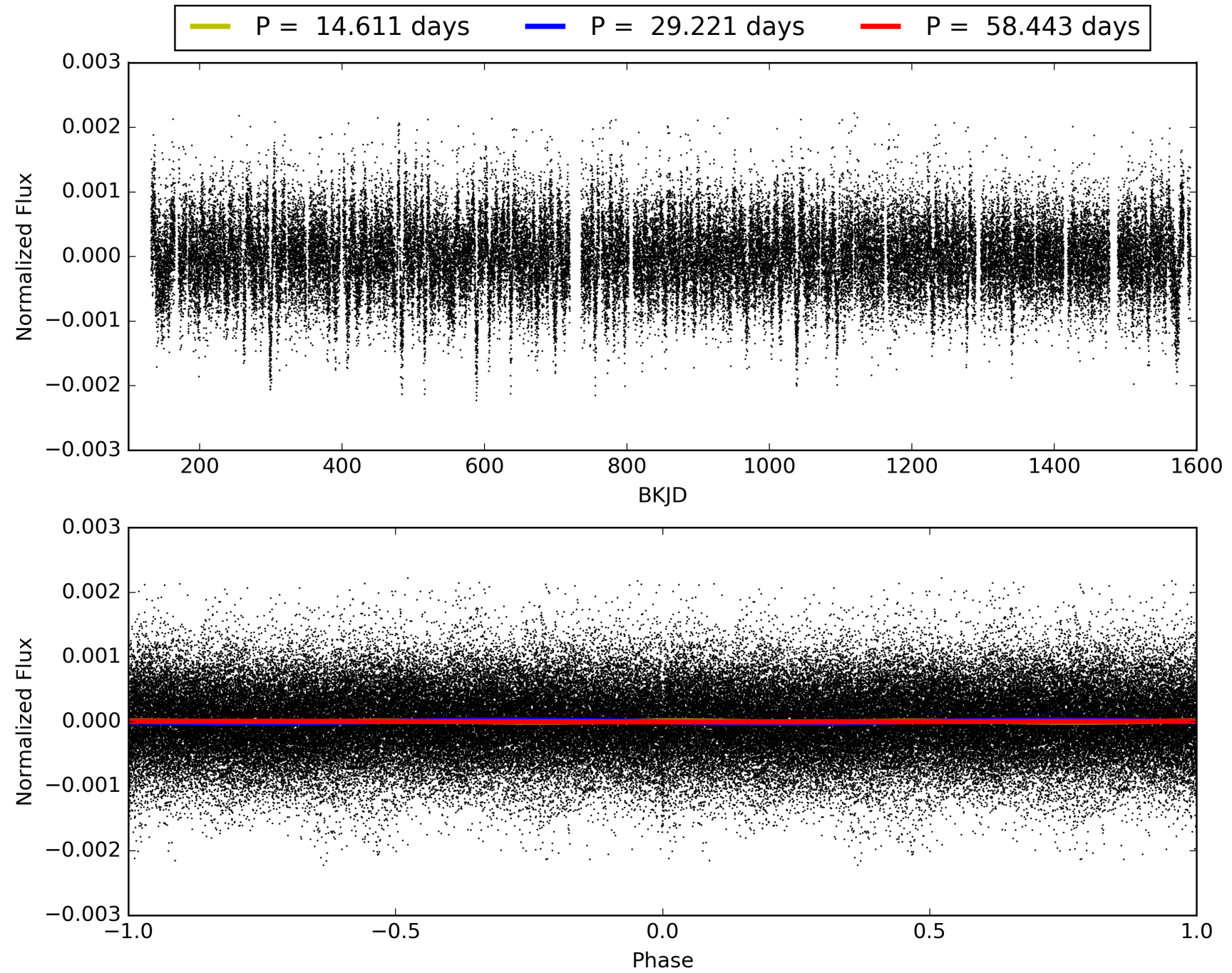
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [112.53 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 98.1%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 4.21e-20  
RollingBand-fgt: 1.00 [36/36]  
GhostDiagnostic-chr: 1.981  
Centroid-sig: 0.1%  
Centroid-so: 2.439 arcsec [2.07 $\sigma$ ]  
OotOffset-rm: 0.974 arcsec [0.81 $\sigma$ ]  
KicOffset-rm: 1.054 arcsec [0.88 $\sigma$ ]  
OotOffset-st: 3/3/1/5 [12]  
KicOffset-st: 3/3/1/5 [12]  
DiffImageQuality-fgm: 0.42 [5/12]  
DiffImageOverlap-fno: 0.53 [9/17]

# TCE 010858691-04, PDC Light Curves

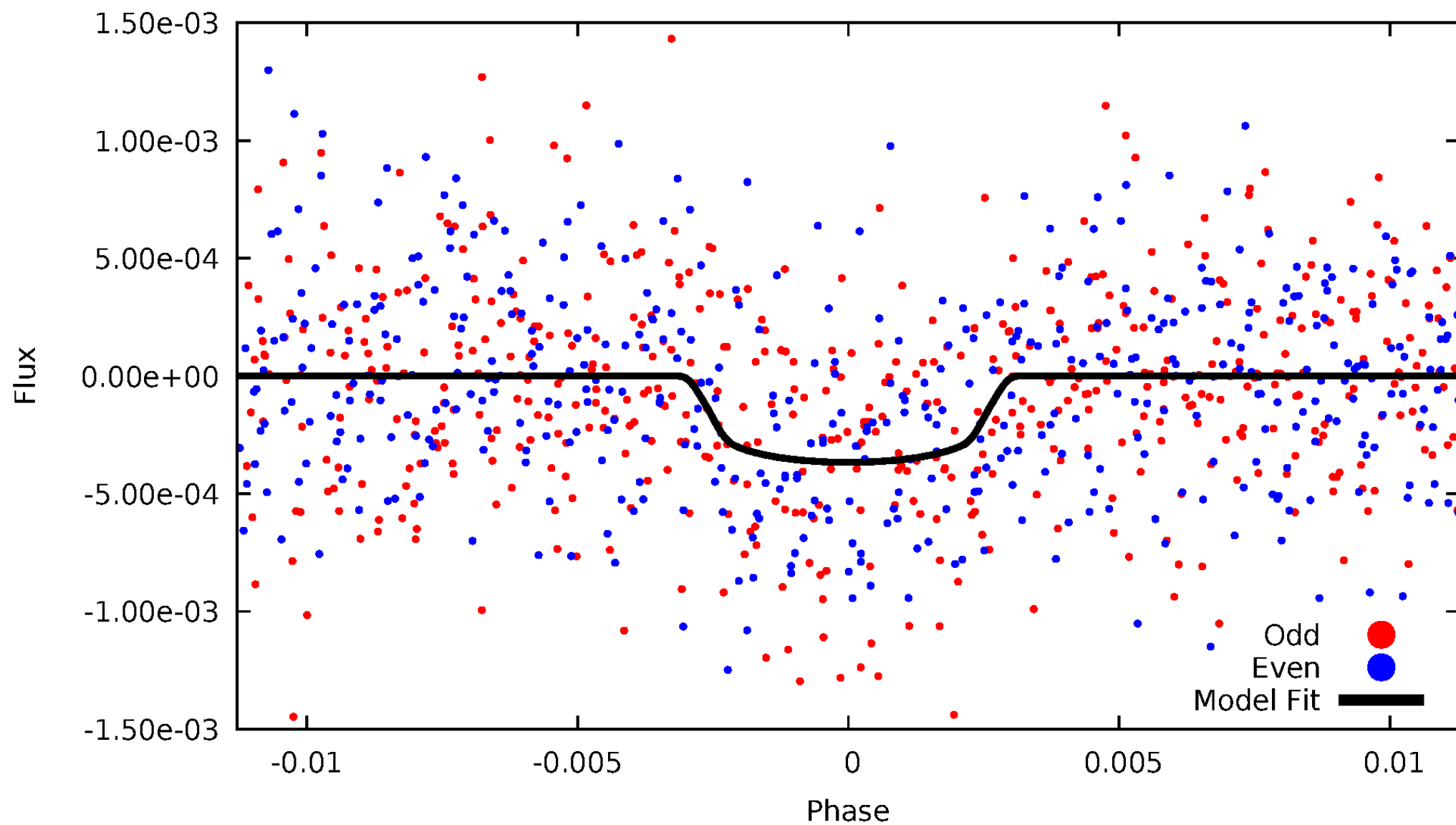


TCE 010858691-04



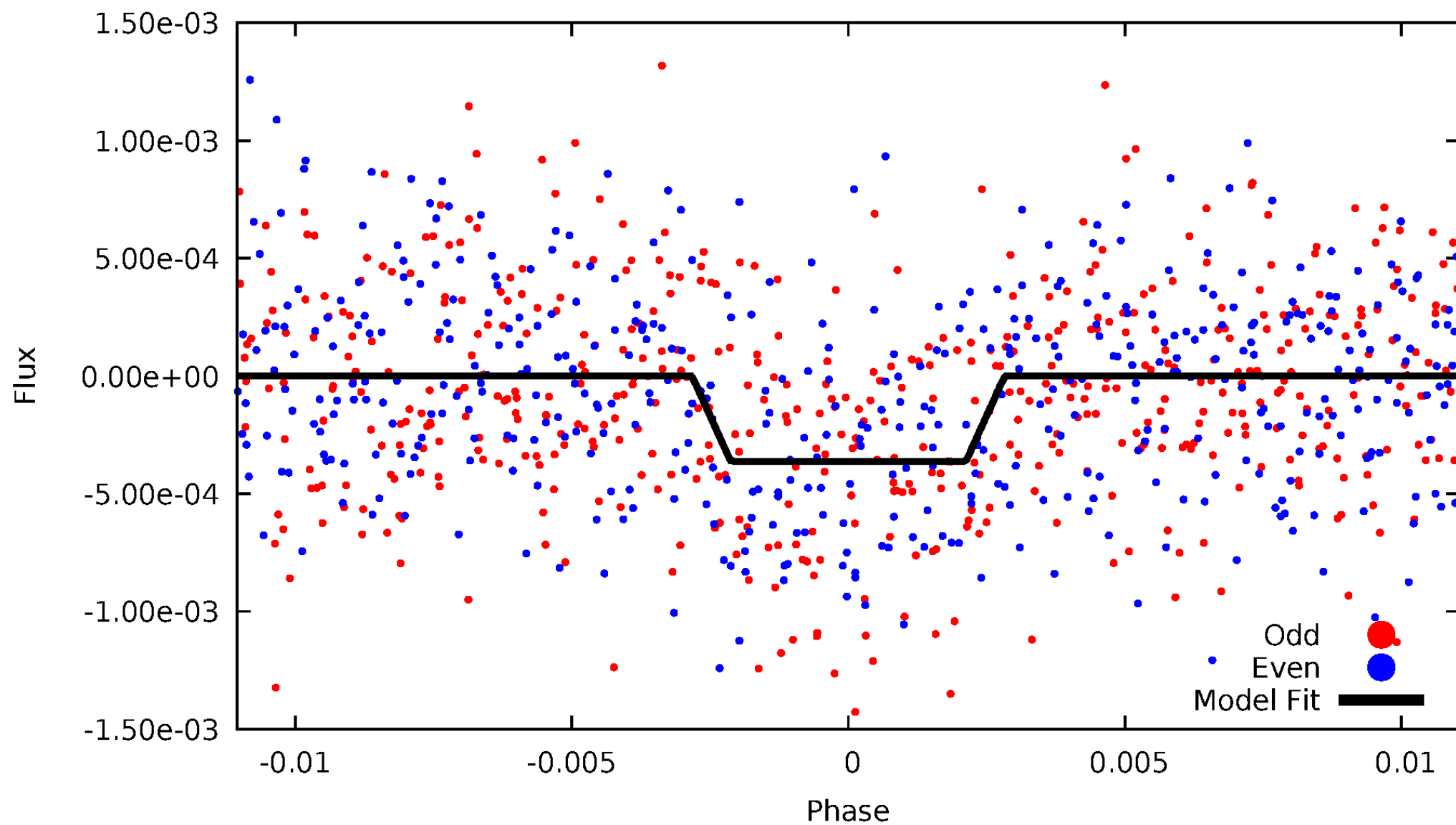
# DV Odd/Even

TCE 010858691-04



# ALT Odd/Even

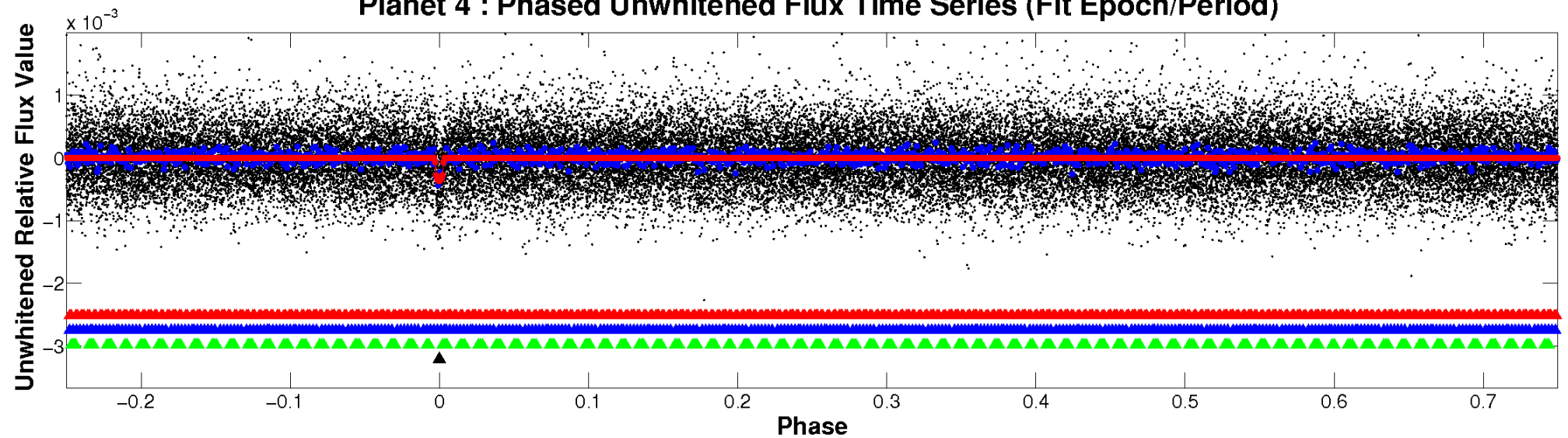
TCE 010858691-04



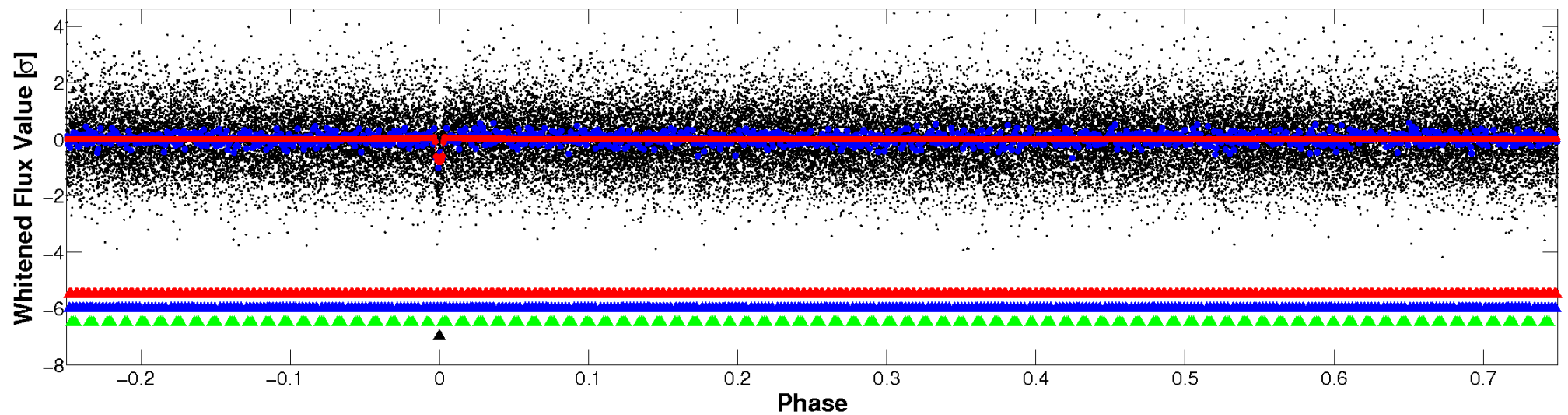


# Non-Whitened Vs. Whitened Light Curve

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

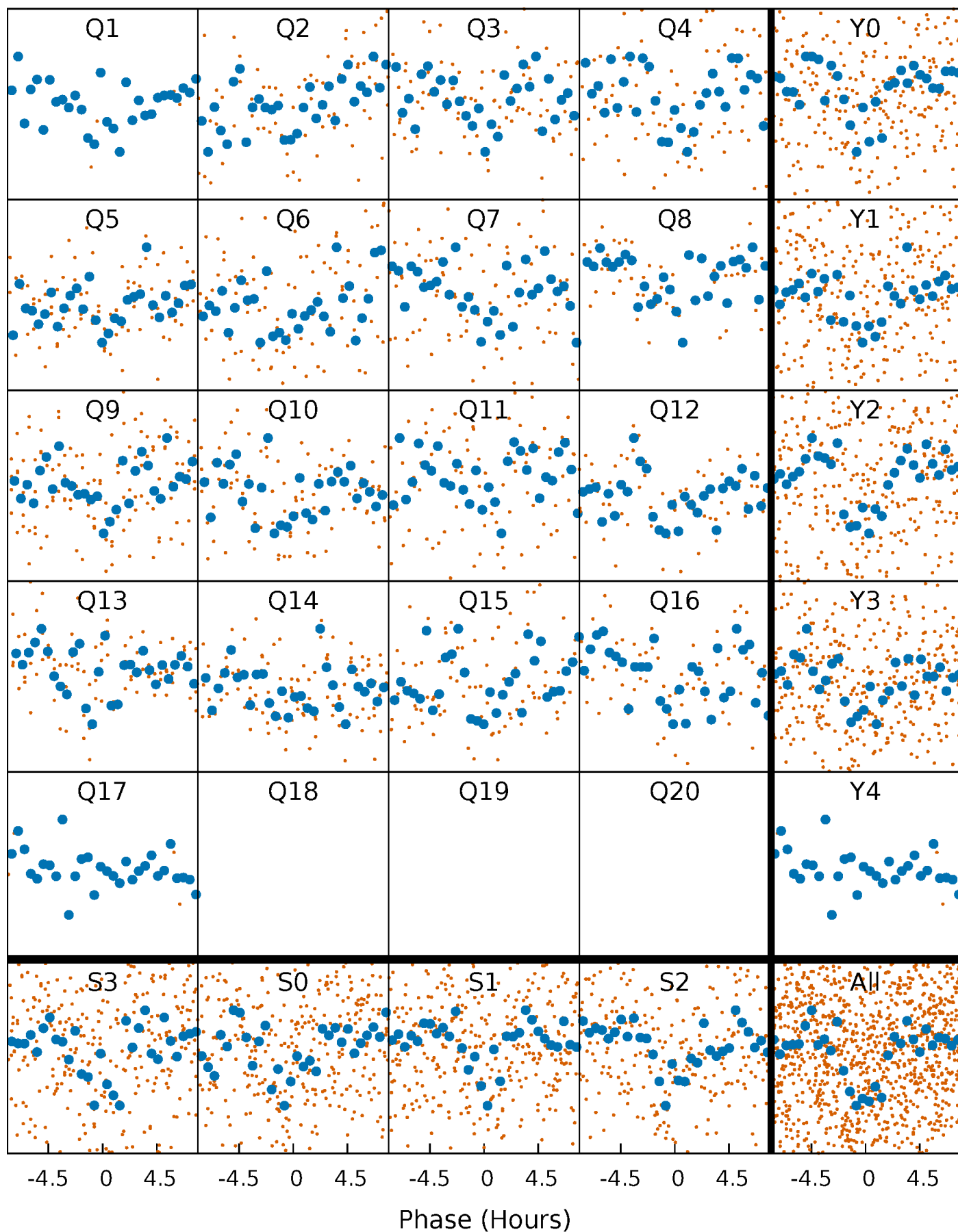


## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



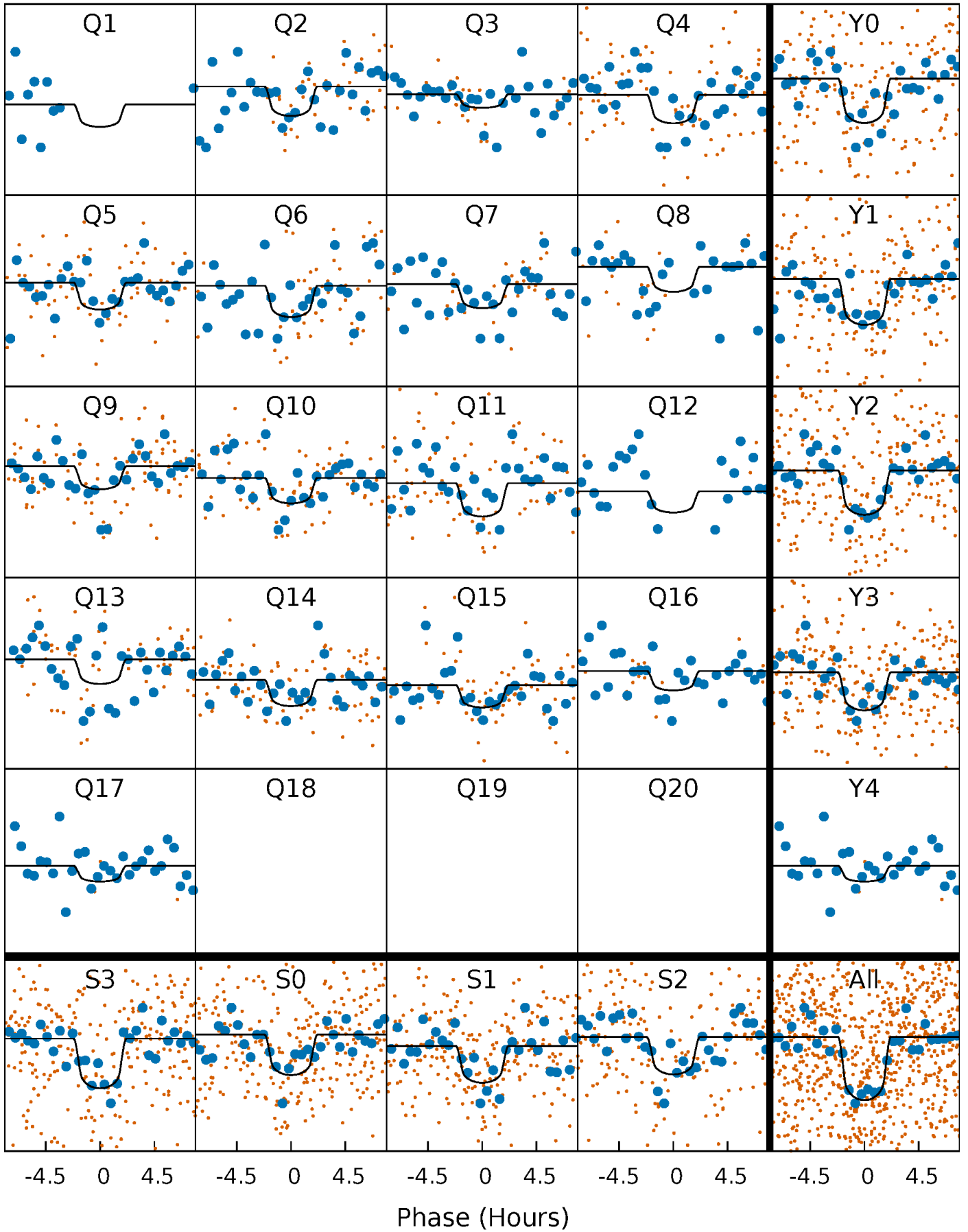
# PDC Quarter-Phased Transit Curves

TCE 010858691-04   P= 29.221258 Days    $T_0=139.336833$  (BKJD)



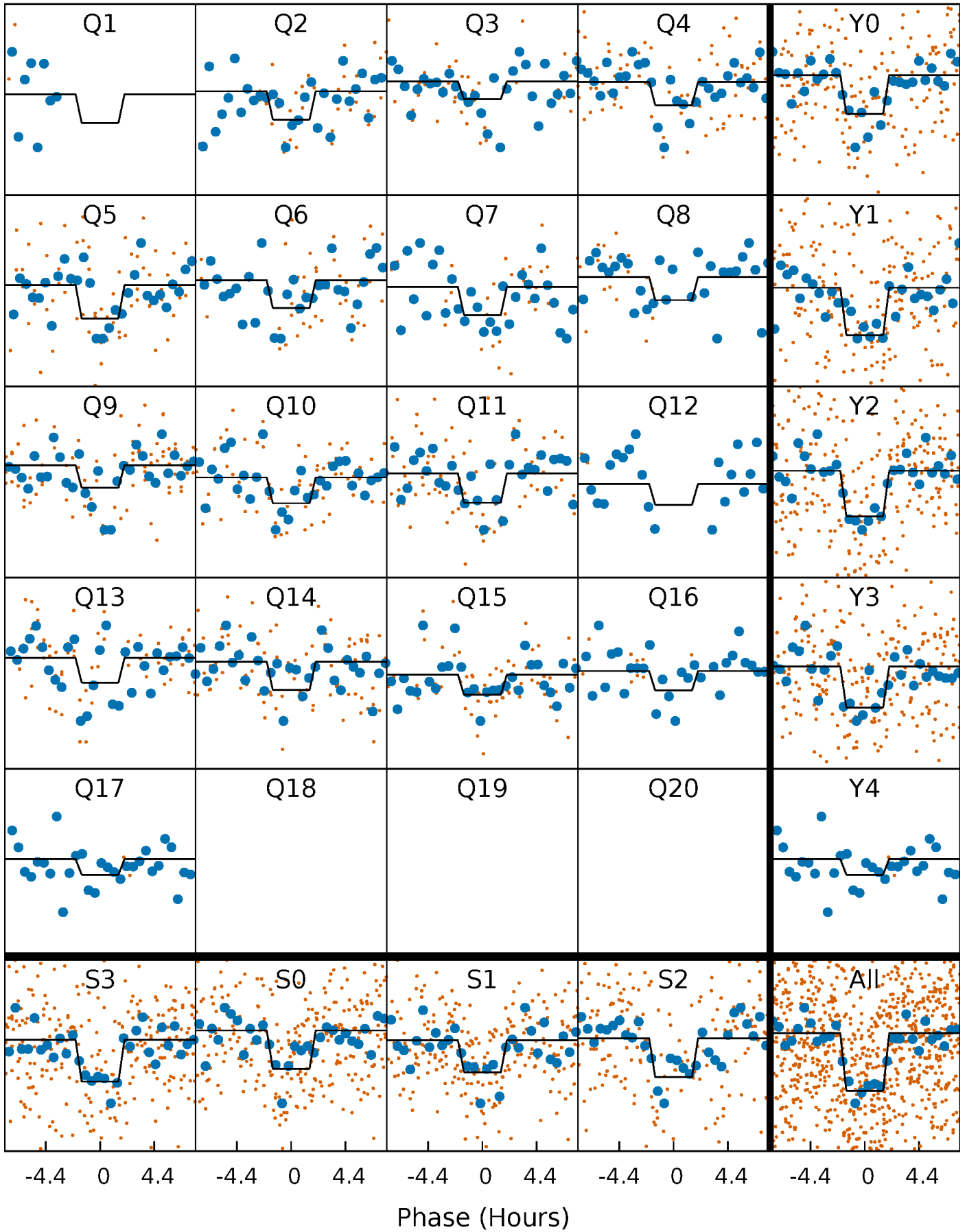
# DV Quarter-Phased Transit Curves

TCE 010858691-04 P= 29.221258 Days  $T_0=139.336833$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

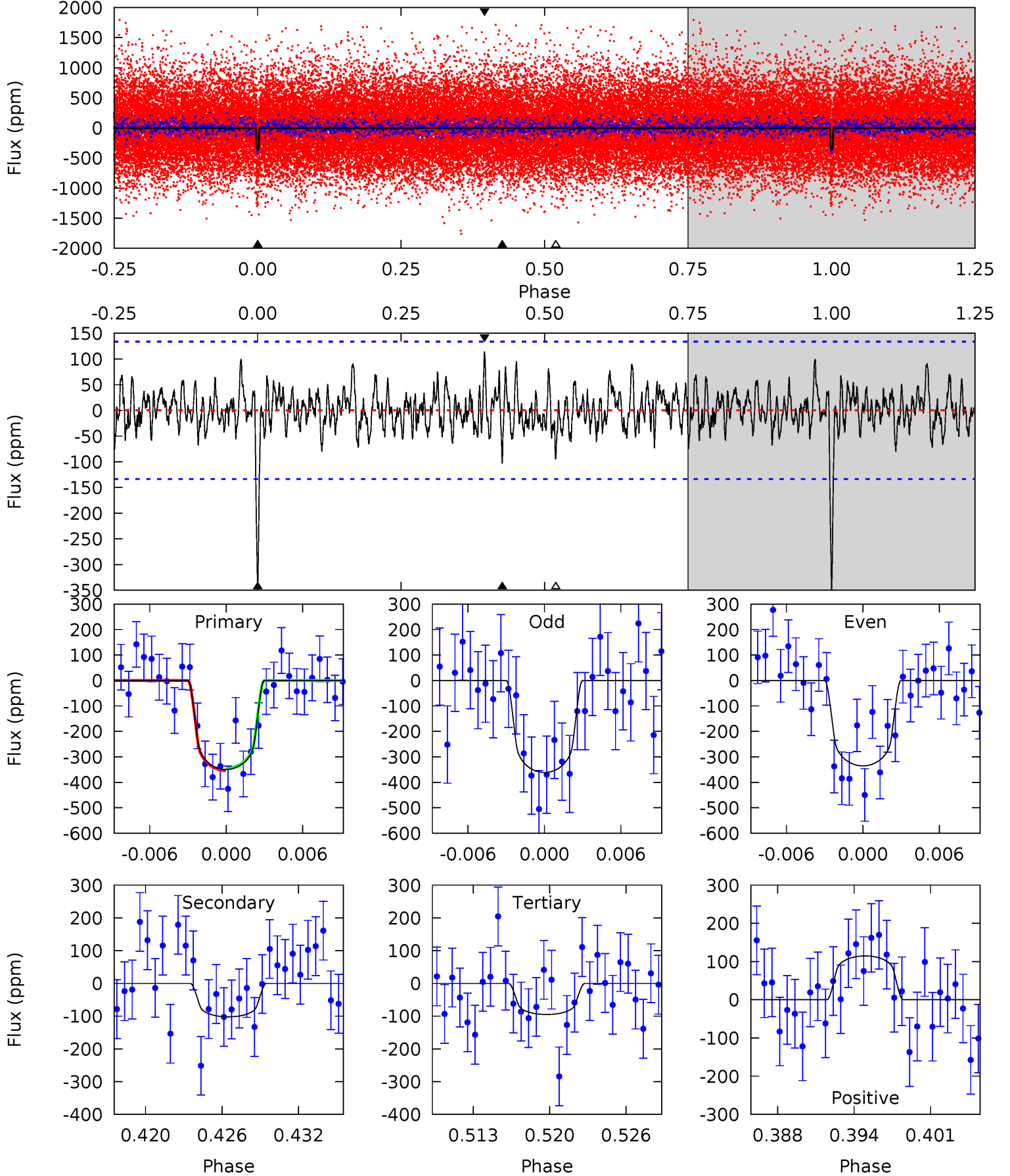
TCE 010858691-04     $P = 29.221255$  Days     $T_0 = 139.339979$  (BKJD)



# DV Model-Shift Uniqueness Test

010858691-04, P = 29.221258 Days, E = 110.115575 Days

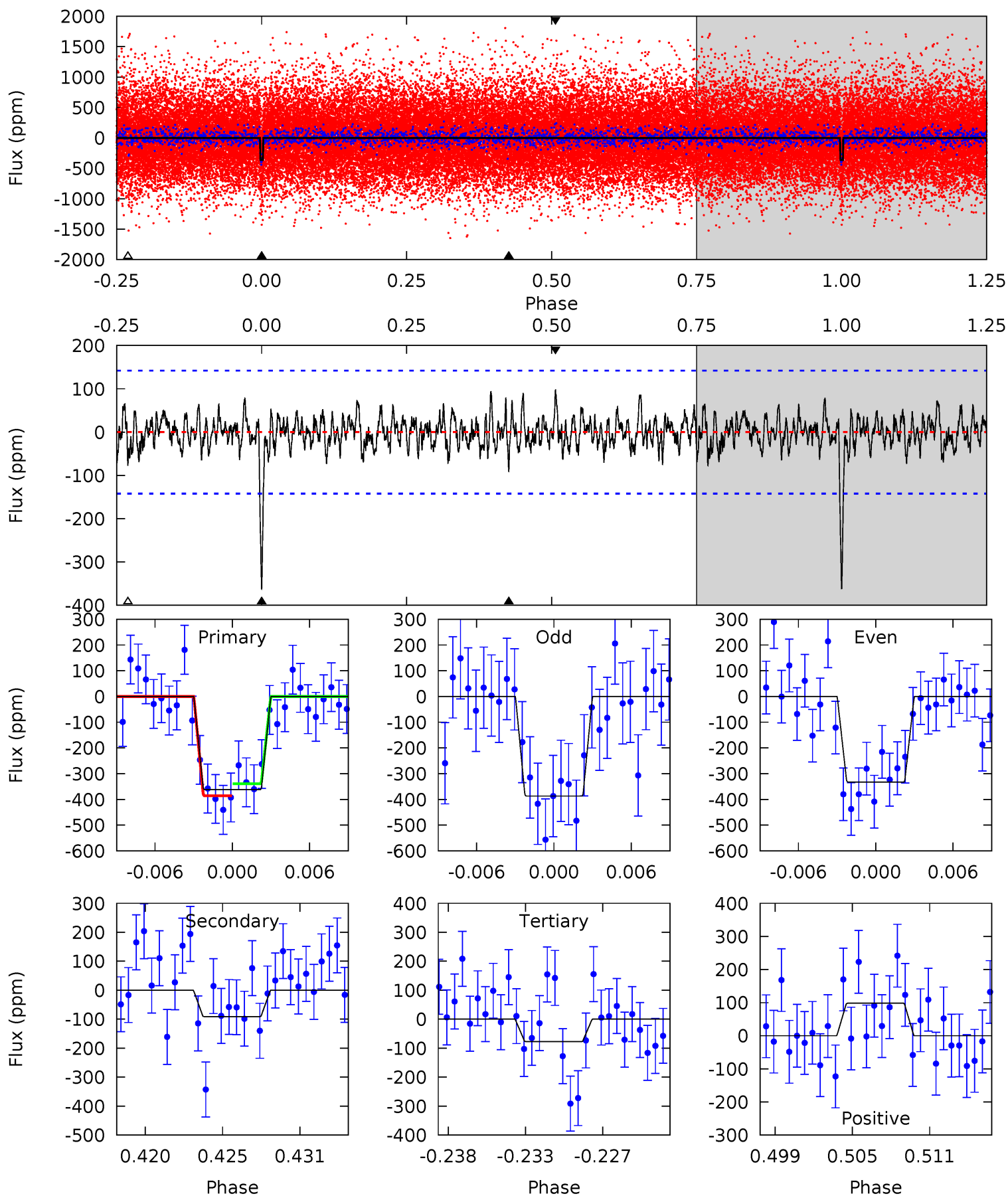
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
13.4	3.91	3.64	4.39	5.12	2.73	1.22	9.73	8.98	0.28	-0.48	0.50	1.06	0.25	0.17



# Alt Model-Shift Uniqueness Test

010858691-04, P = 29.221255 Days, E = 110.118724 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
13.1	3.29	2.80	3.55	5.13	2.77	1.06	10.3	9.55	0.50	-0.25	0.98	1.06	0.21	0.85





### Stellar Parameters For KIC 010858691

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5576^{+111}_{-111}$	$4.503^{+0.075}_{-0.075}$	$-0.360^{+0.150}_{-0.150}$	$0.829^{+0.086}_{-0.065}$	$0.800^{+0.060}_{-0.040}$	$1.974^{+0.510}_{-0.484}$
	+2%/-2%	+2%/-2%	+42%/-42%	+10%/-8%	+8%/-5%	+26%/-25%
Source	SPE58	SPE58	SPE58	DSEP		

KIC = Kepler Input Catalog; PHO = Photometry; SPE = Spectroscopy; AST = Asteroseismology  
 TRA = Transits; DESP = Dartmouth Models; MULT = Multiple Models

### Secondary Eclipse Parameters for KIC 010858691-04 / KOI 1306.04

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-102 \pm 26$	$1.86^{+0.90}_{-0.89}$	$756^{+25}_{-25}$	$4161^{+1295}_{-579}$	$476^{+1352}_{-278}$
Alt.	$-91 \pm 28$	$1.78^{+0.92}_{-0.89}$	$753^{+26}_{-23}$	$4163^{+1313}_{-631}$	$486^{+1484}_{-299}$

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

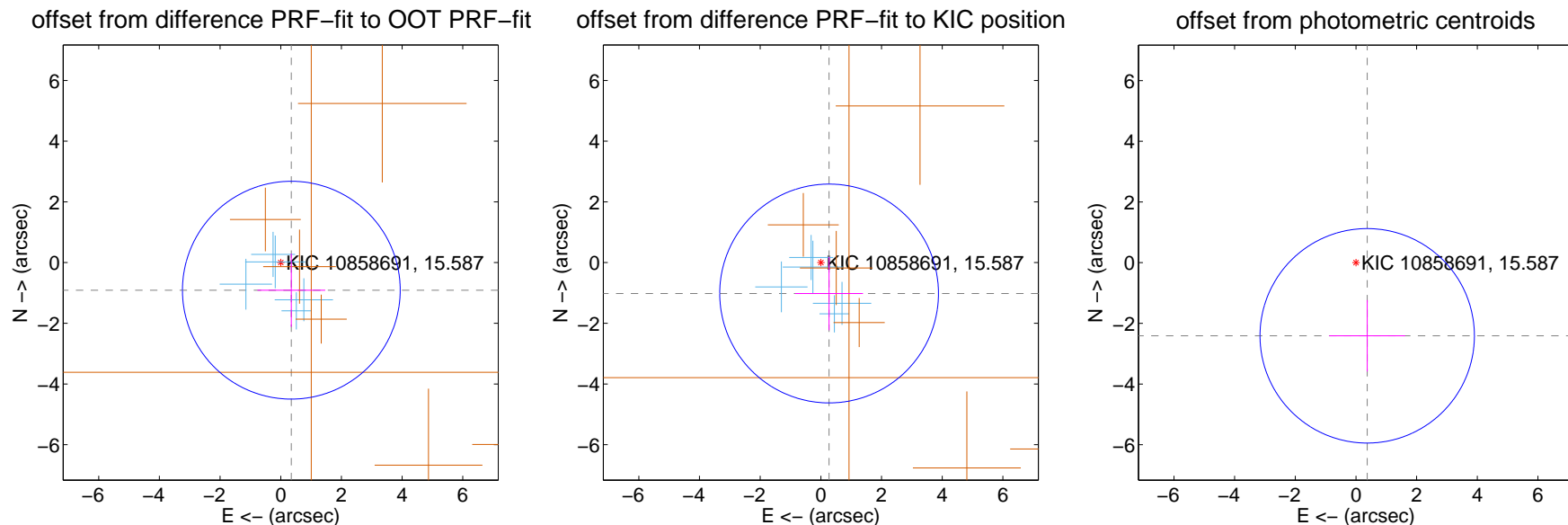
## DV Centroid Data

Supplemental centroid analysis for 010858691-04. Kepler magnitude: 15.59. Transit SNR 10.49

There are 5 quarters with good PRF difference image offsets

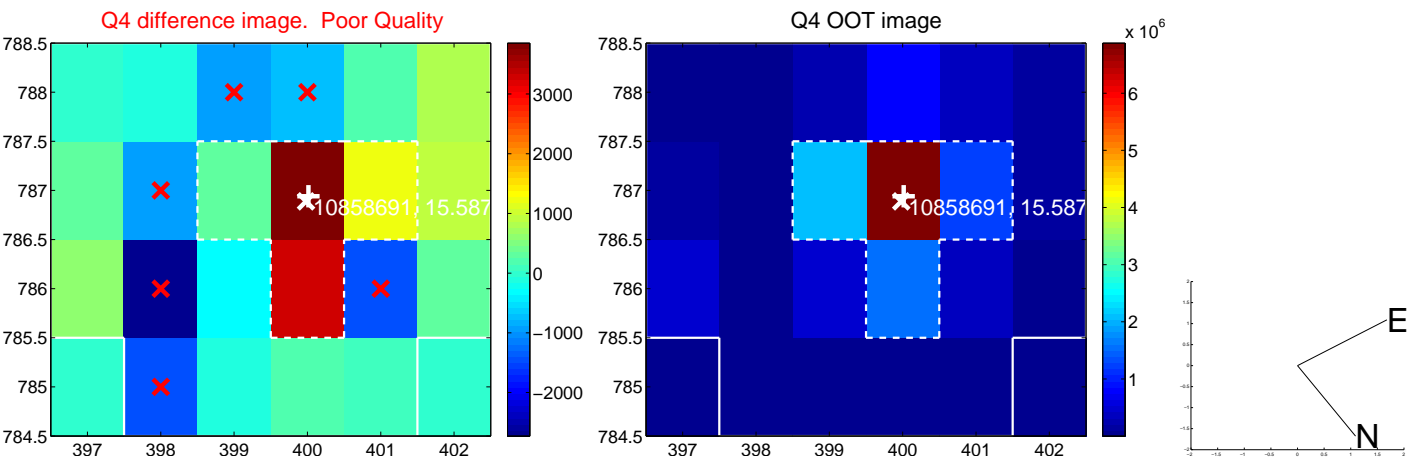
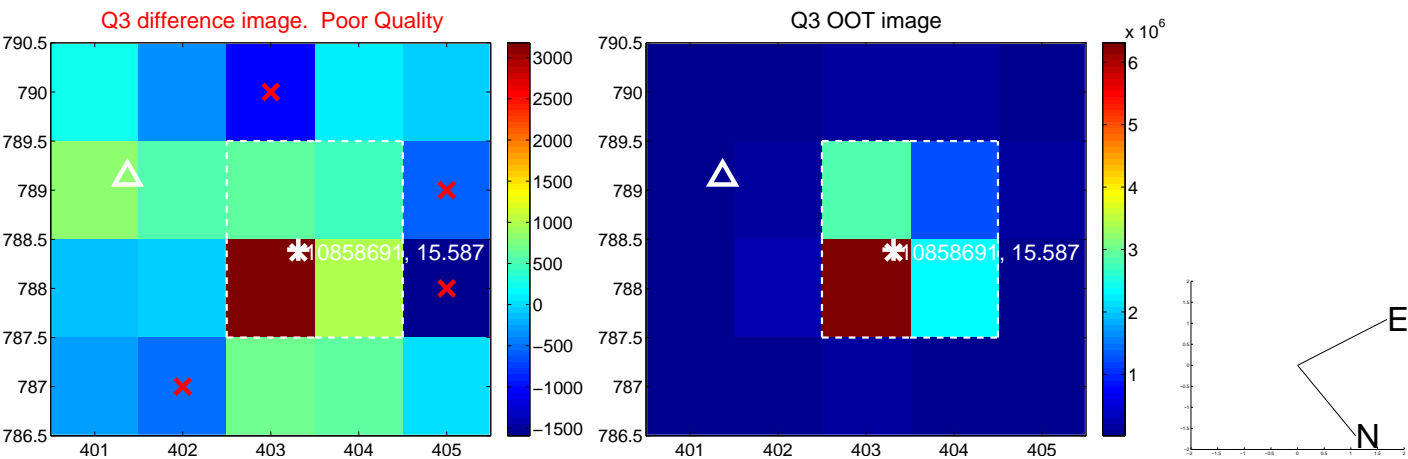
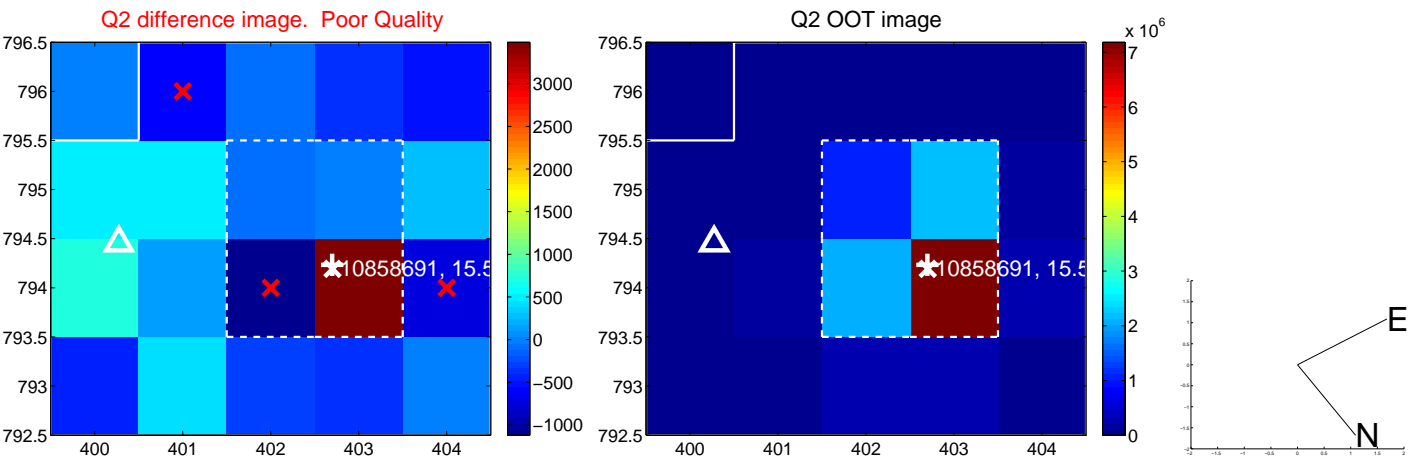
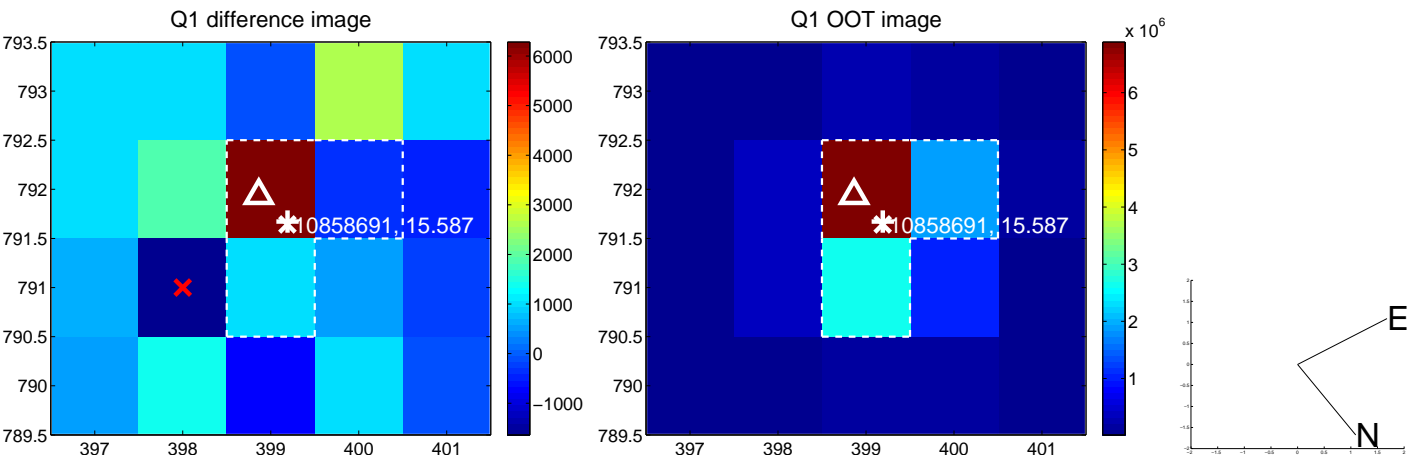
The direct PRF centroid is offset from the target star catalog position by about 0.11 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.974 \pm 1.196$	0.81	$-0.349 \pm 1.118$	$-0.909 \pm 1.207$
PRF-fit source offset from KIC position	$1.054 \pm 1.202$	0.88	$-0.271 \pm 1.118$	$-1.018 \pm 1.207$
photometric centroid source offset	$2.44 \pm 1.18$	2.07	$-0.37 \pm 1.25$	$-2.41 \pm 1.18$

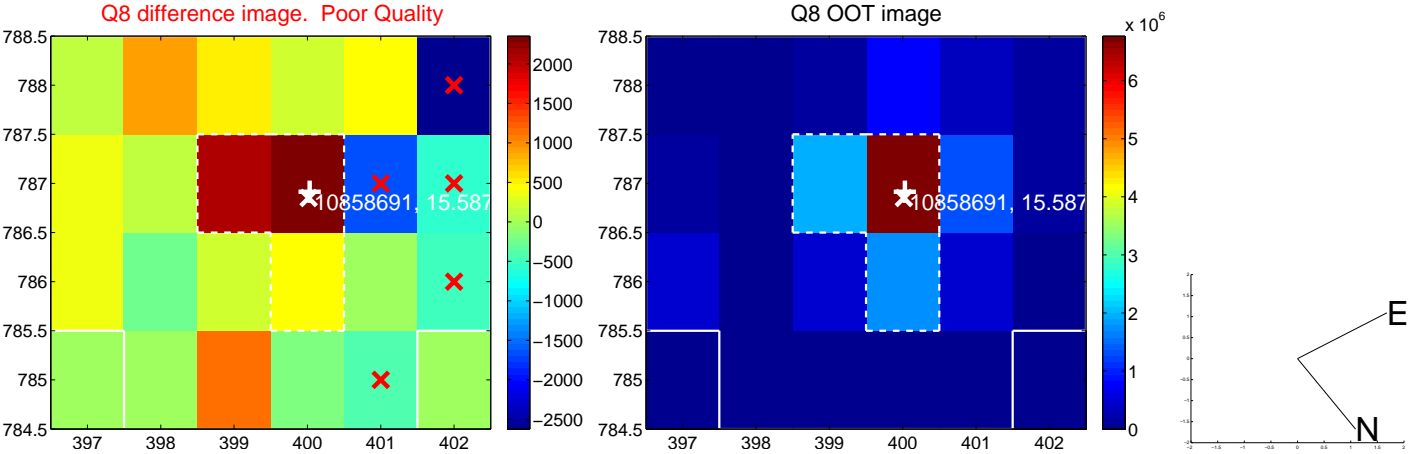
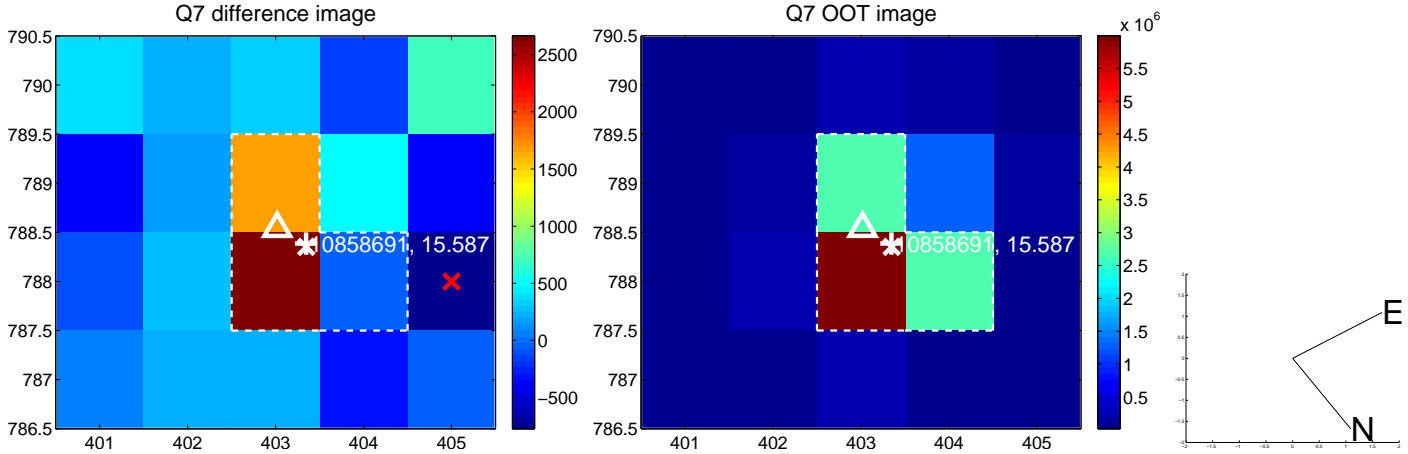
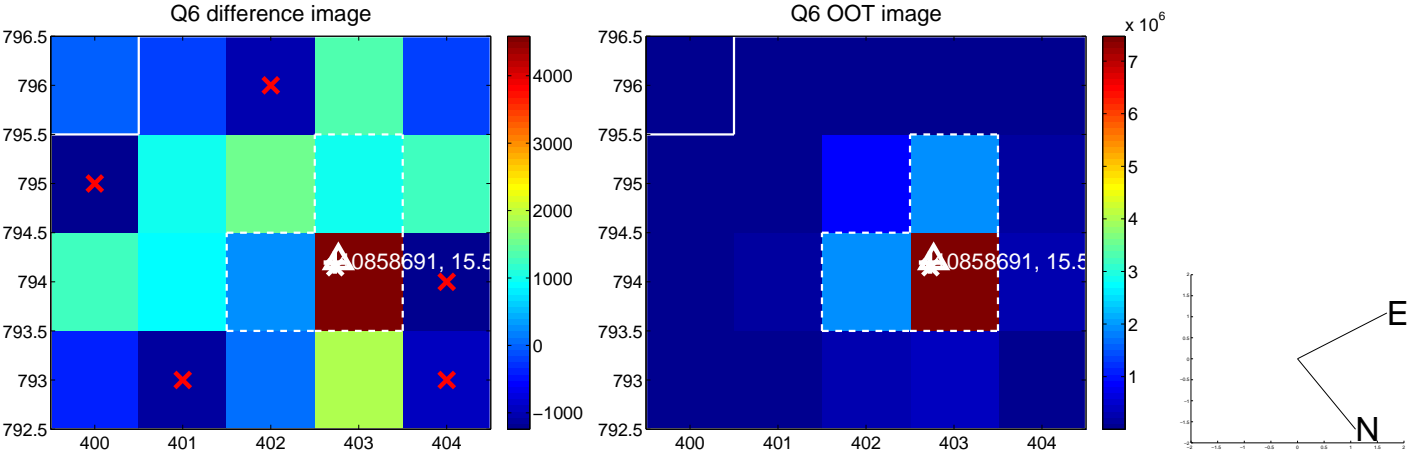
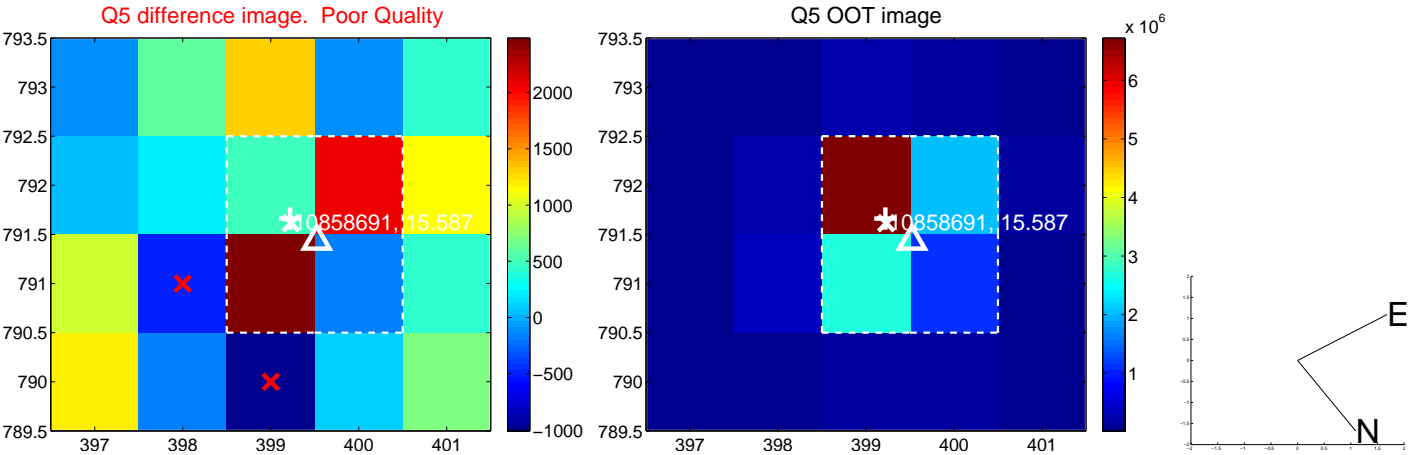


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

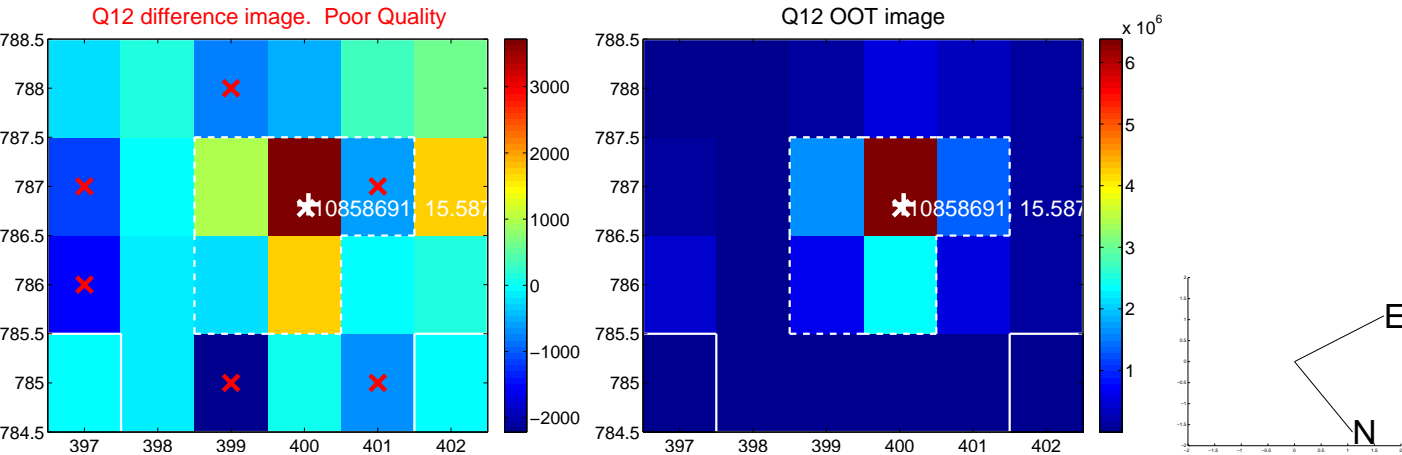
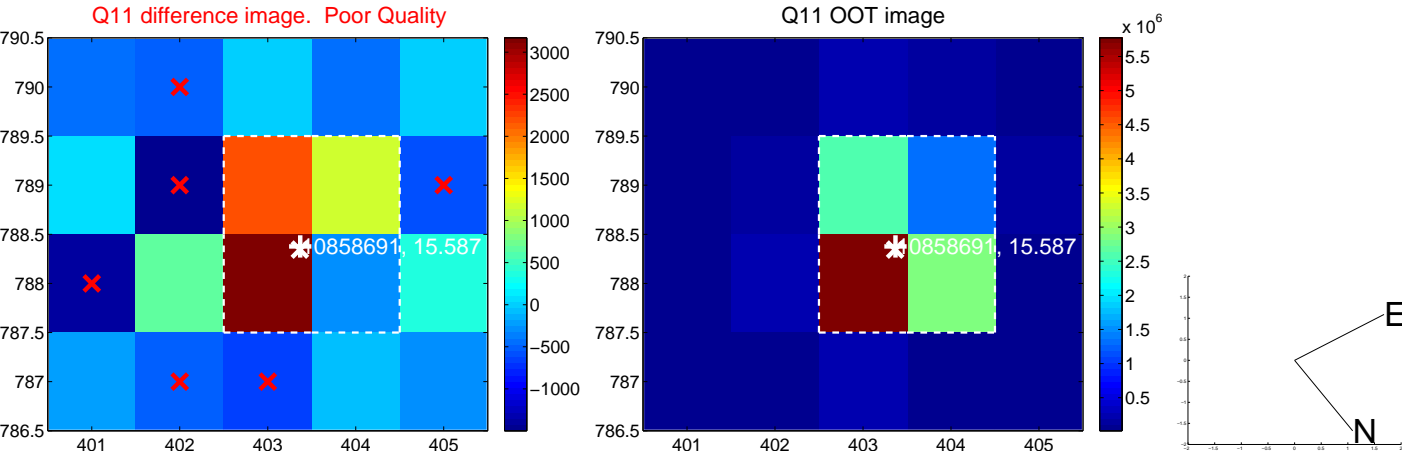
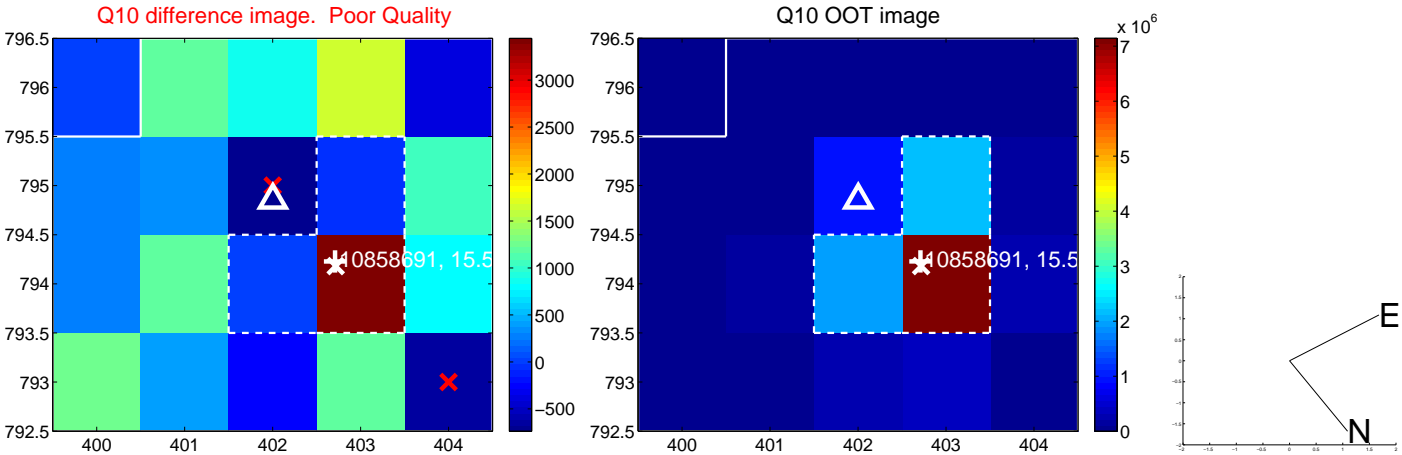
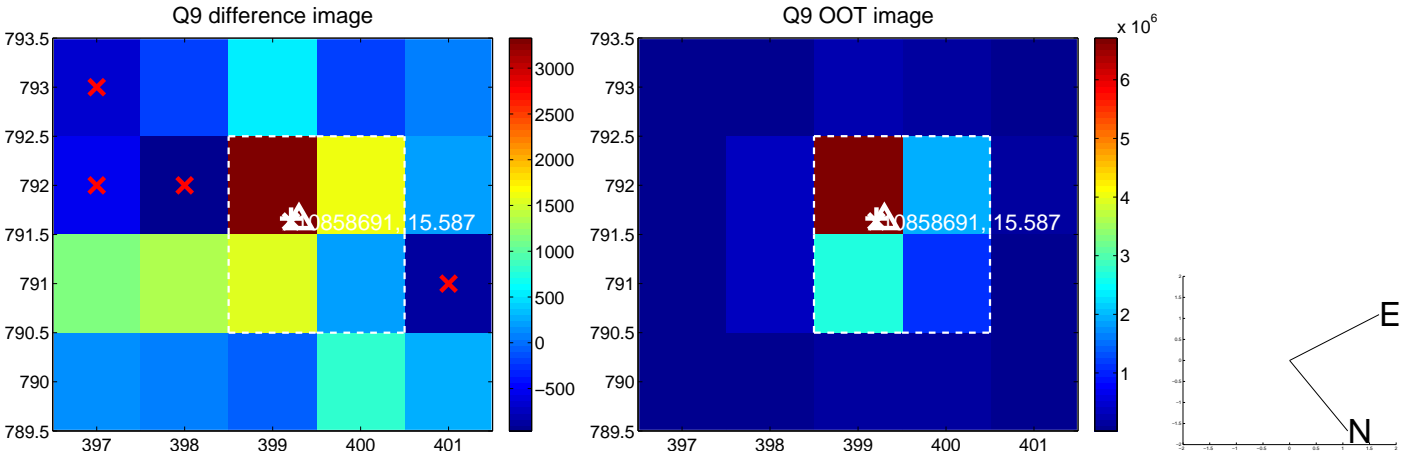
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



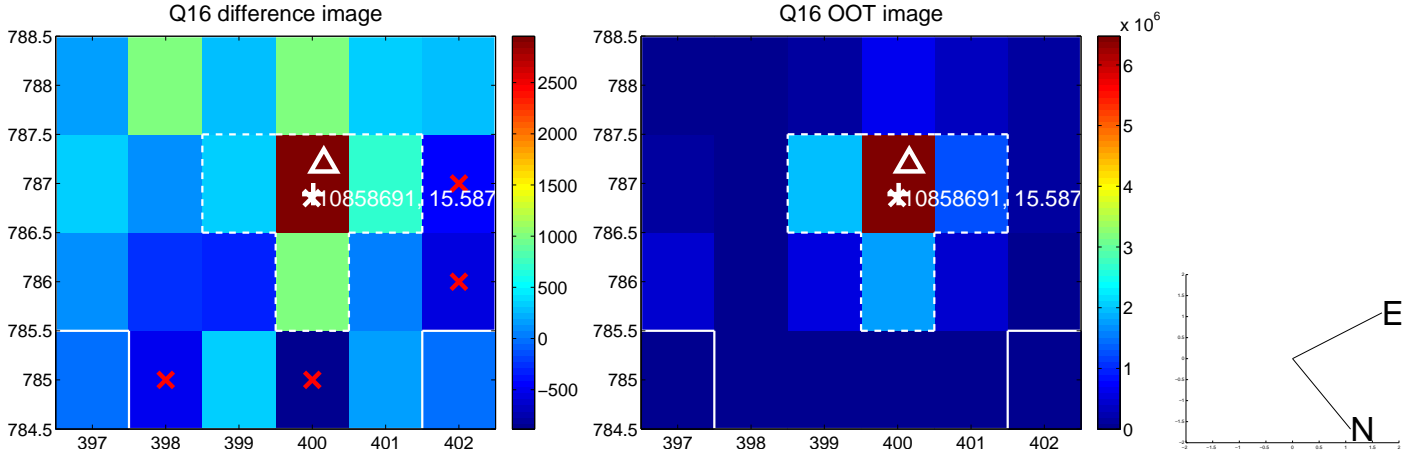
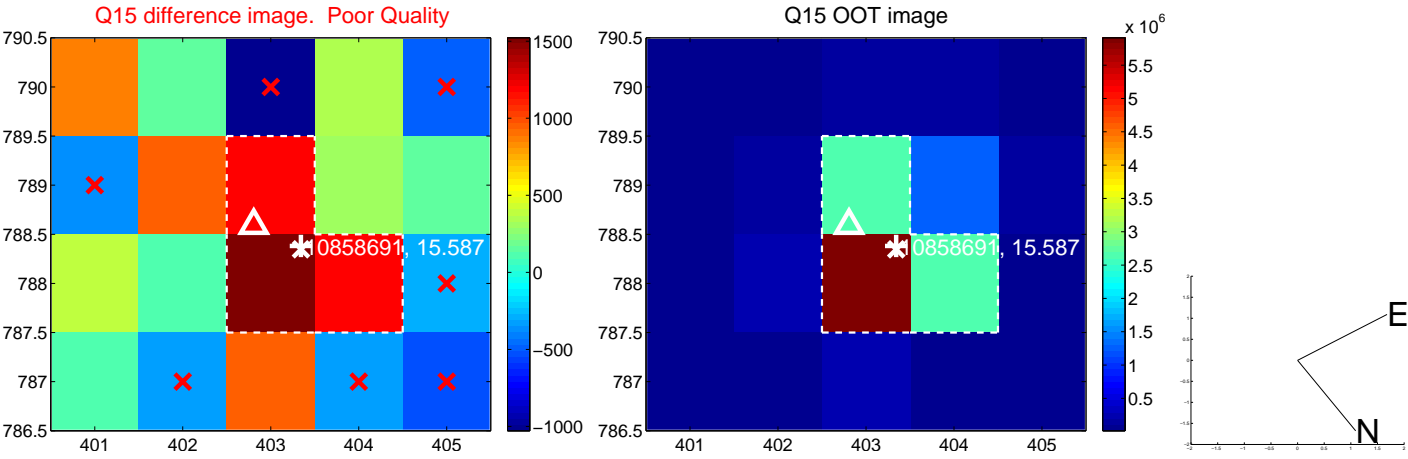
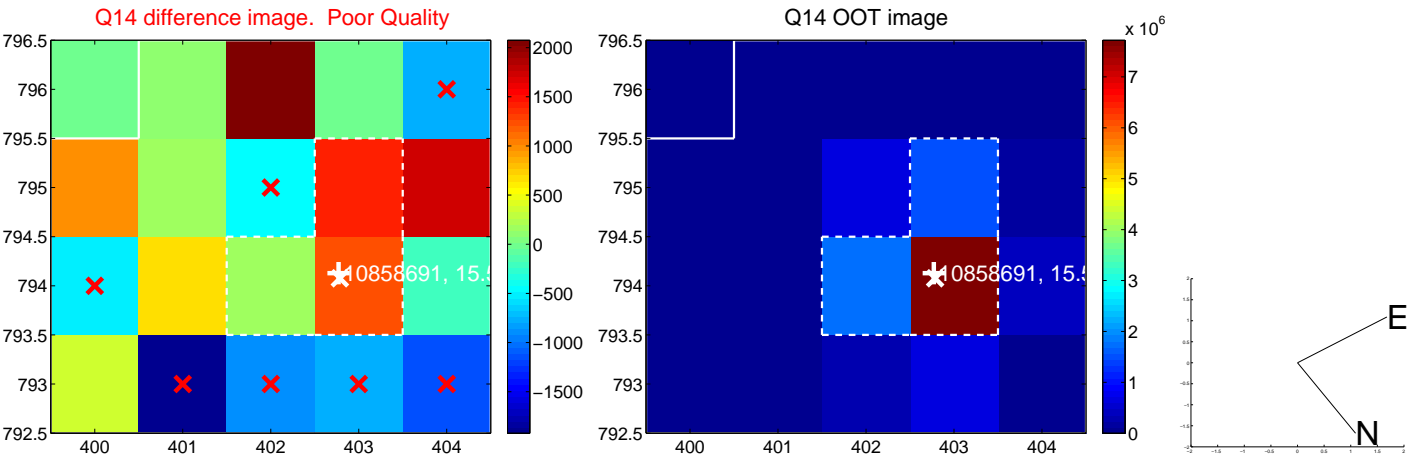
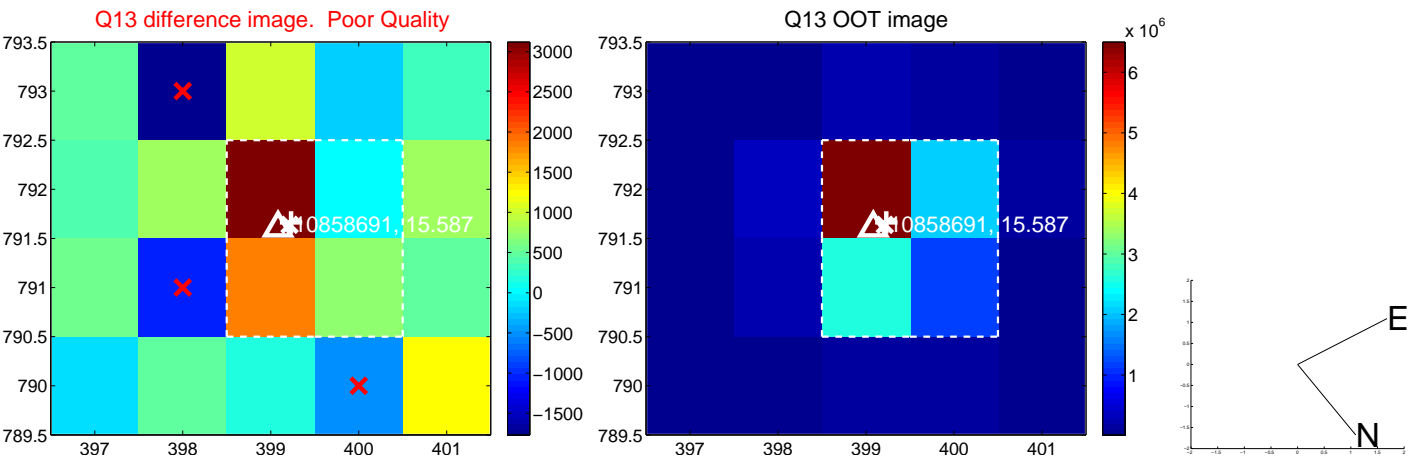
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

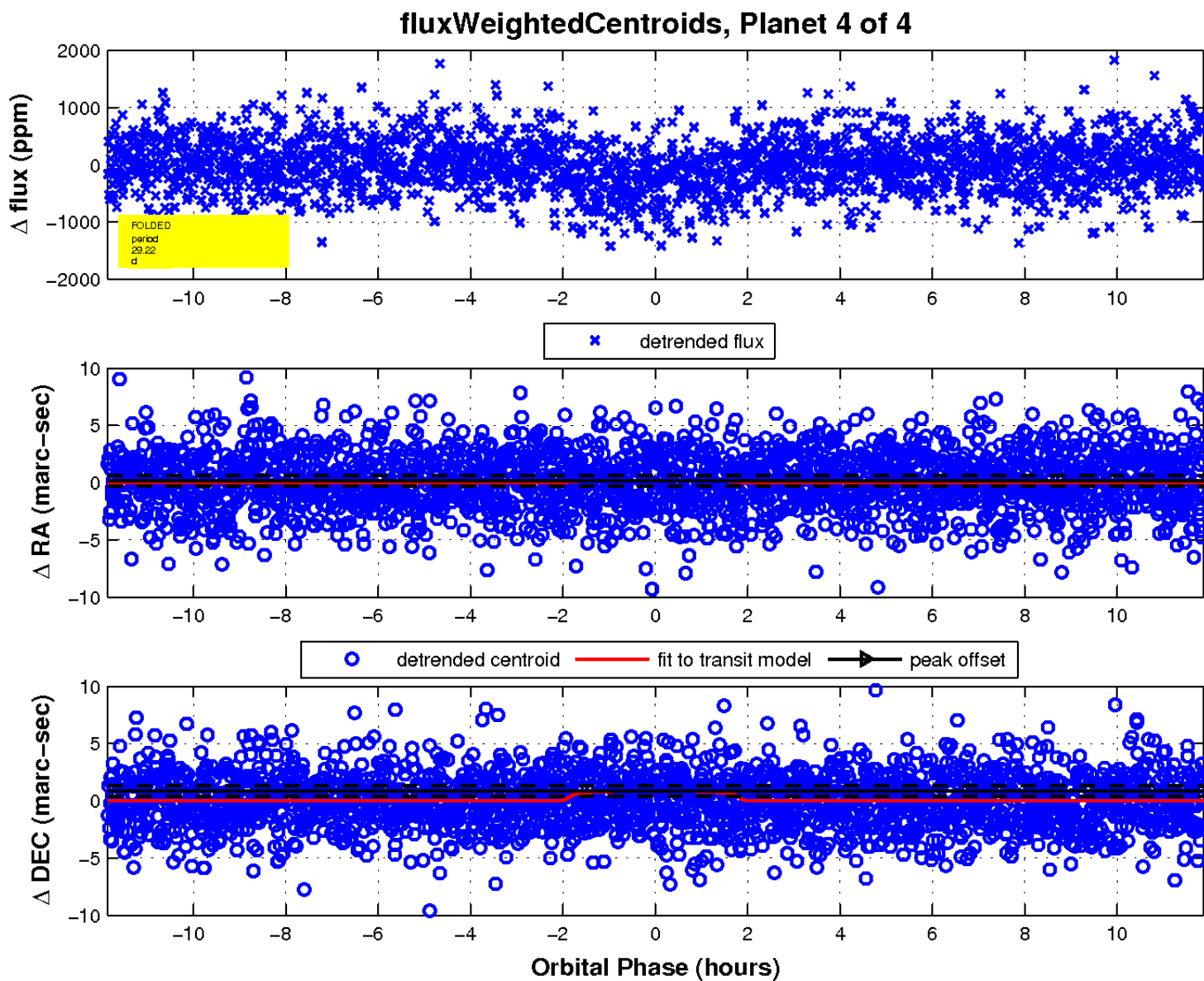
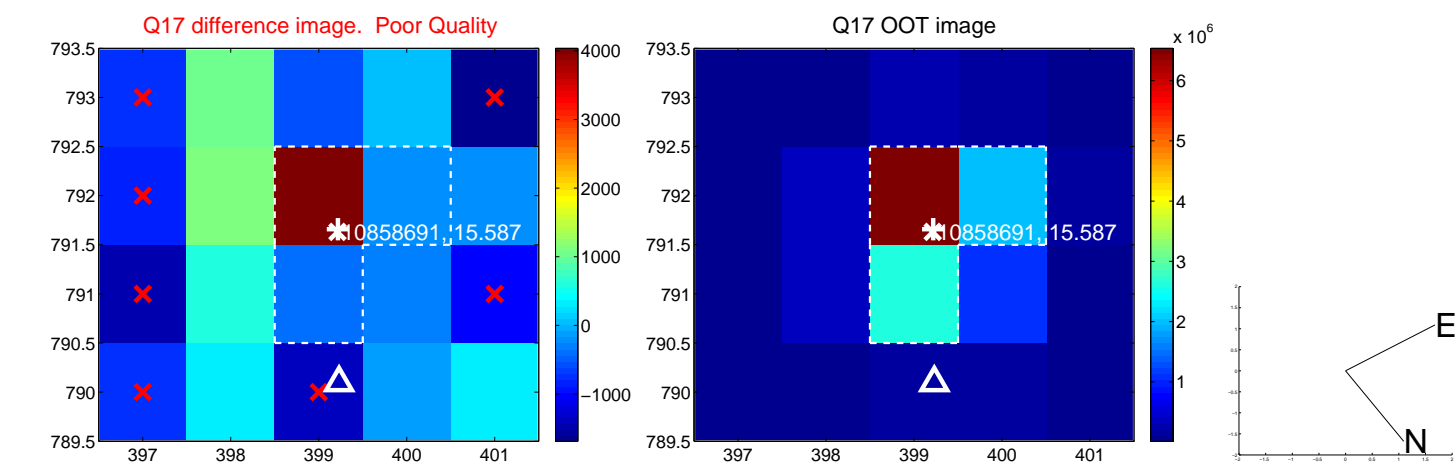


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





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



UKIRT Image

Declination

