

# KIC 012208631

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
012208631-01	OBS	2449.01	53.357539	138.391667	775.9	6.831	16.3	17.5	1.04	5481	3.44	11.96
012208631-02	OBS	2449.02	0.912344	131.602850	98.5	1.071	7.7	9.1	1.04	5481	1.02	2714.53

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
012208631-01	OBS	PC	1.00	0	0	0	0	CENT_KIC_POS
012208631-02	OBS	PC	1.00	0	0	0	0	CENT_KIC_POS

**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.

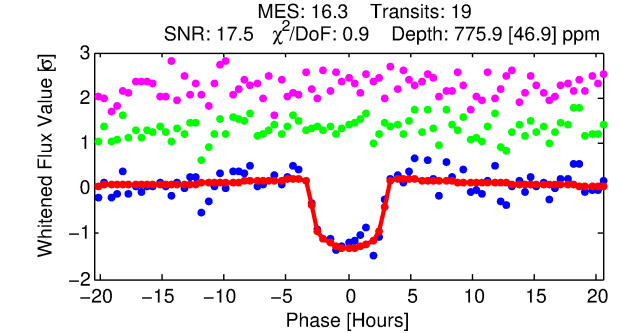
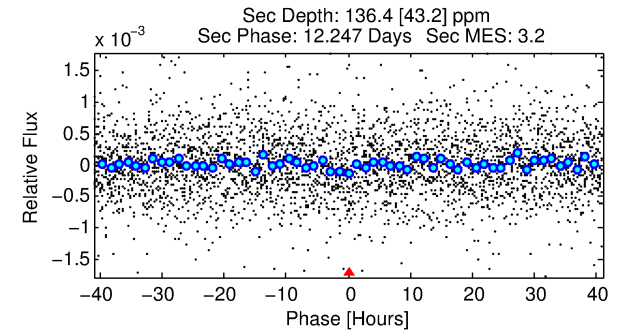
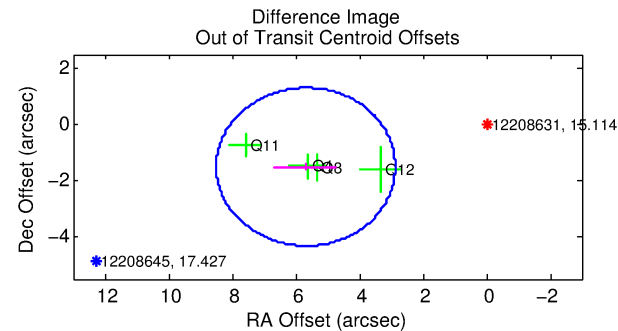
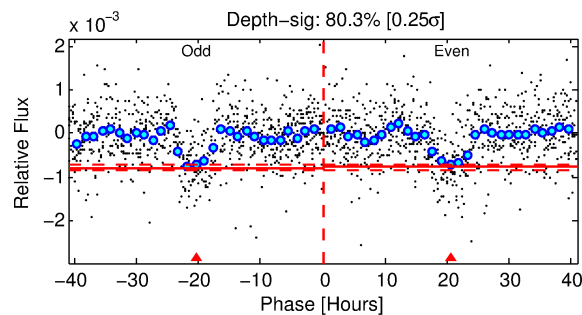
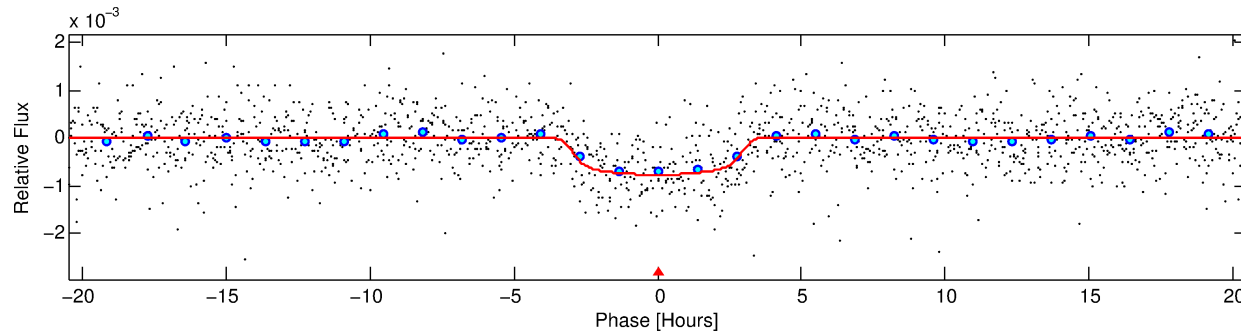
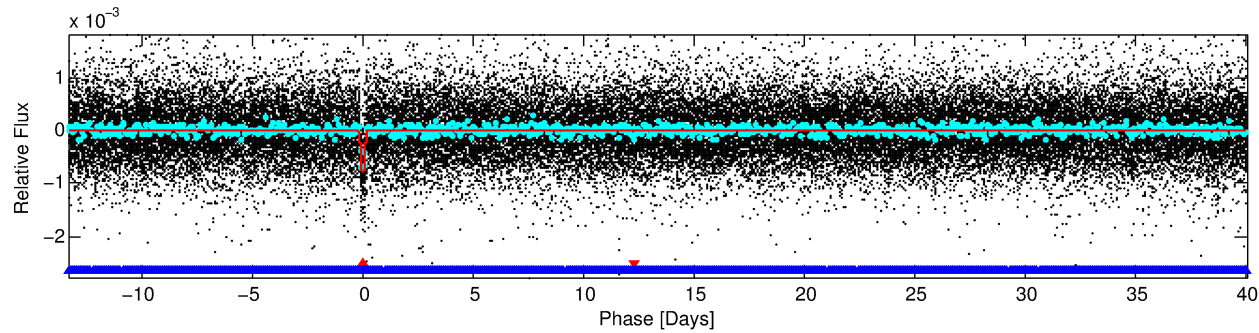
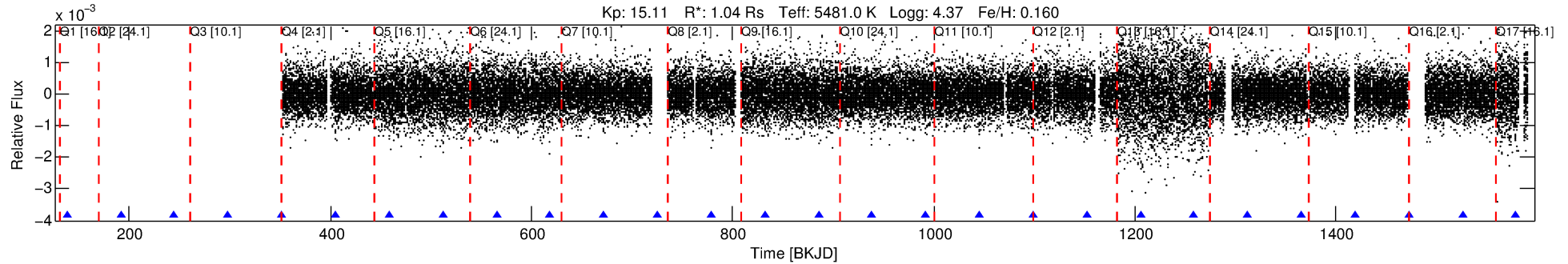
## Ephemeris Match Information For 012208631-01

No Significant Match Found

# DV One-Page Summary

KIC: 12208631 Candidate: 1 of 2 Period: 53.358 d

KOI: K02449.01 Corr: 0.951



## DV Fit Results:

Period = 53.35754 [0.00063] d  
Epoch = 138.3917 [0.0102] BKJD  
Rp/R\* = 0.0304 [0.0026]  
a/R\* = 30.84 [10.01]  
b = 0.89 [0.08]  
Seff = 11.96 [2.56]  
Teq = 474 [25] K  
Rp = 3.44 [0.54] Re  
a = 0.2694 [0.0346] AU  
Ag = 460.58 [191.12] [2.40 $\sigma$ ]  
Teffp = 3396 [310] K [9.39 $\sigma$ ]

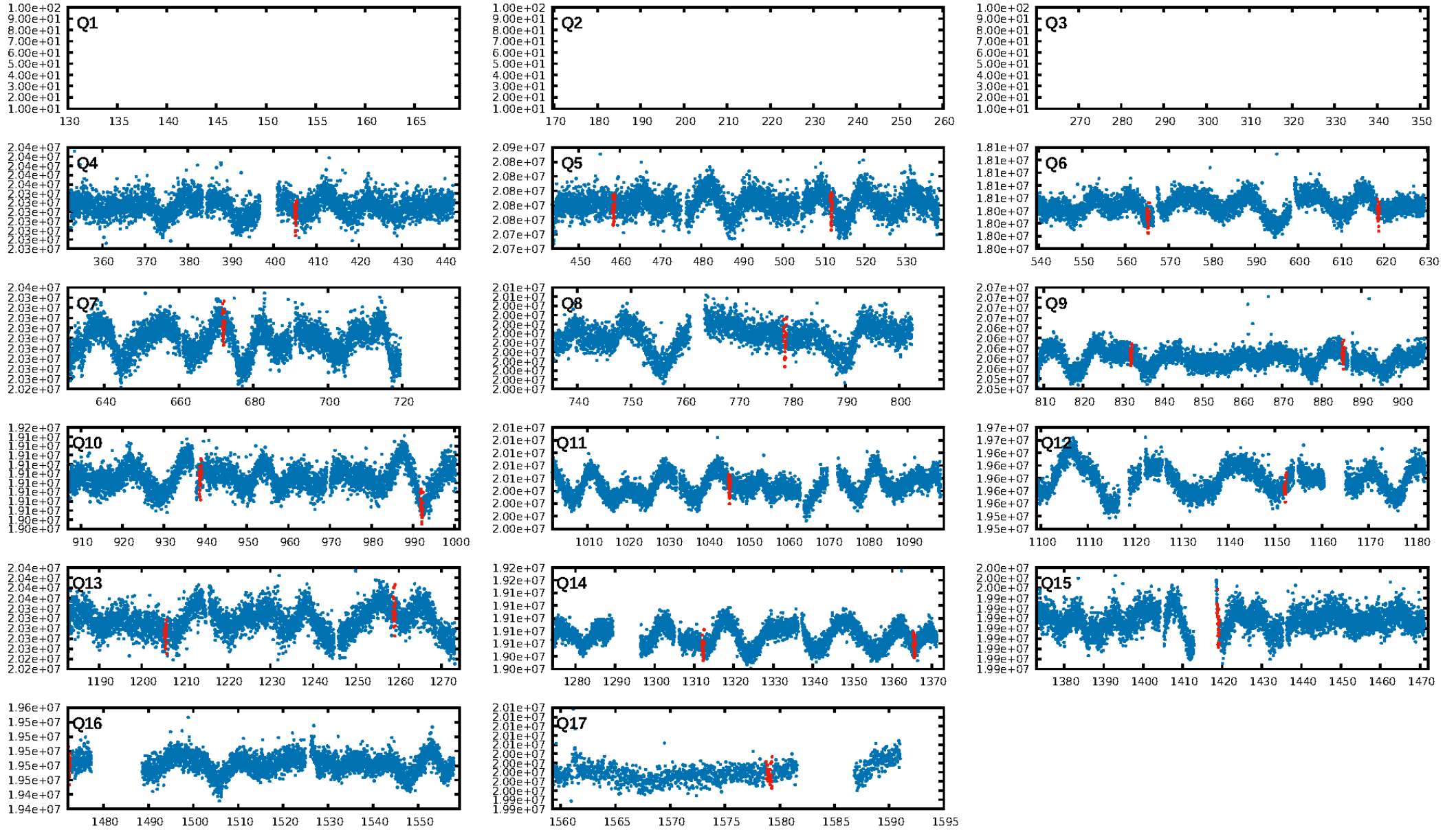
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [182.02 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 93.1%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 3.20e-58  
RollingBand-fgt: 1.00 [18/18]  
GhostDiagnostic-chr: 4.043  
Centroid-sig: 0.0%  
Centroid-so: 2.197 arcsec [5.81 $\sigma$ ]  
OotOffset-rm: 5.880 arcsec [6.27 $\sigma$ ]  
KicOffset-rm: 0.294 arcsec [1.22 $\sigma$ ]  
OotOffset-st: 0/1/3/0 [4]  
KicOffset-st: 1/1/3/3 [8]  
DiffImageQuality-fgm: 0.62 [5/8]  
DiffImageOverlap-fno: 0.00 [0/12]

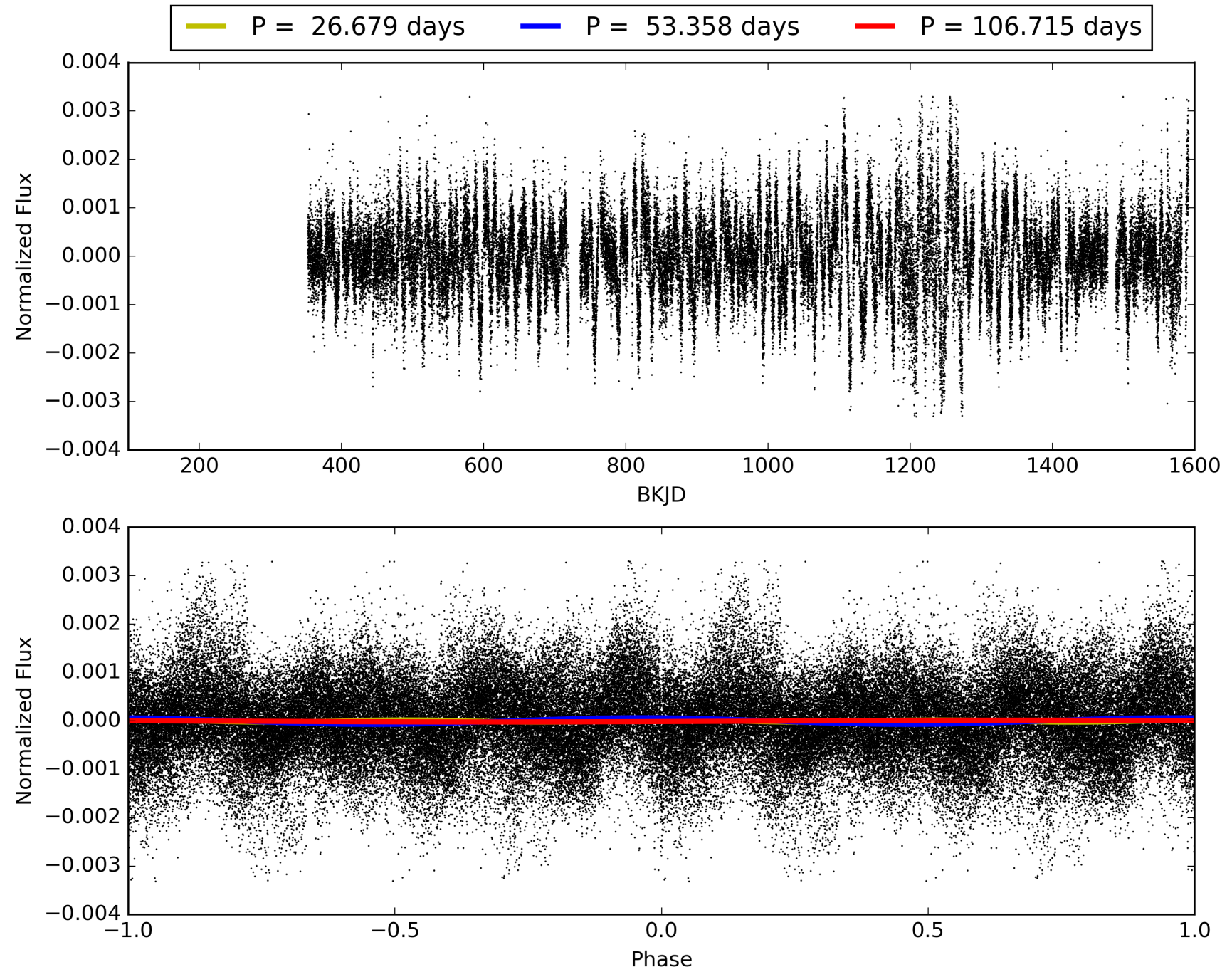
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 05:29:04 Z

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

# TCE 012208631-01, PDC Light Curves

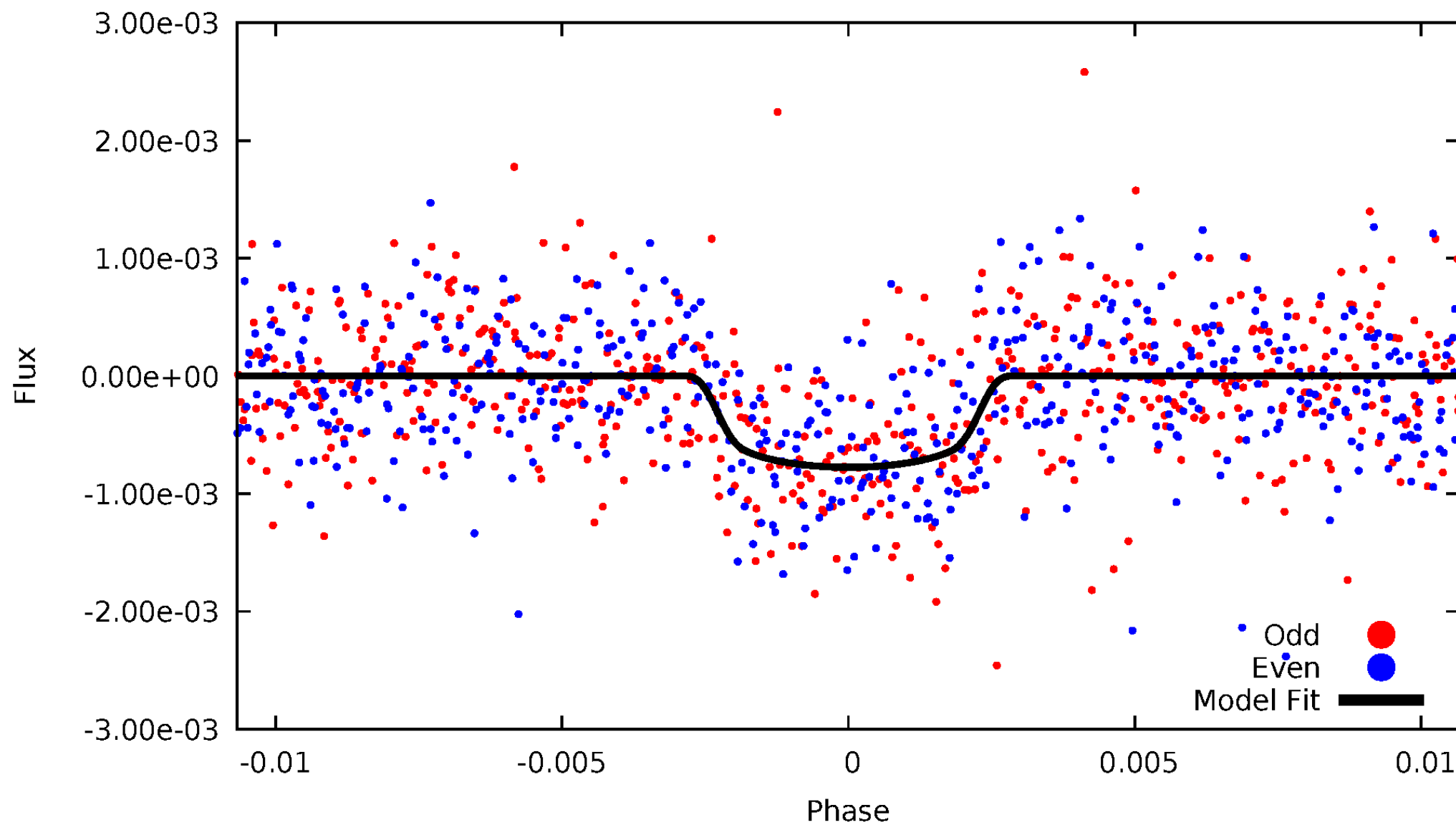


# TCE 012208631-01



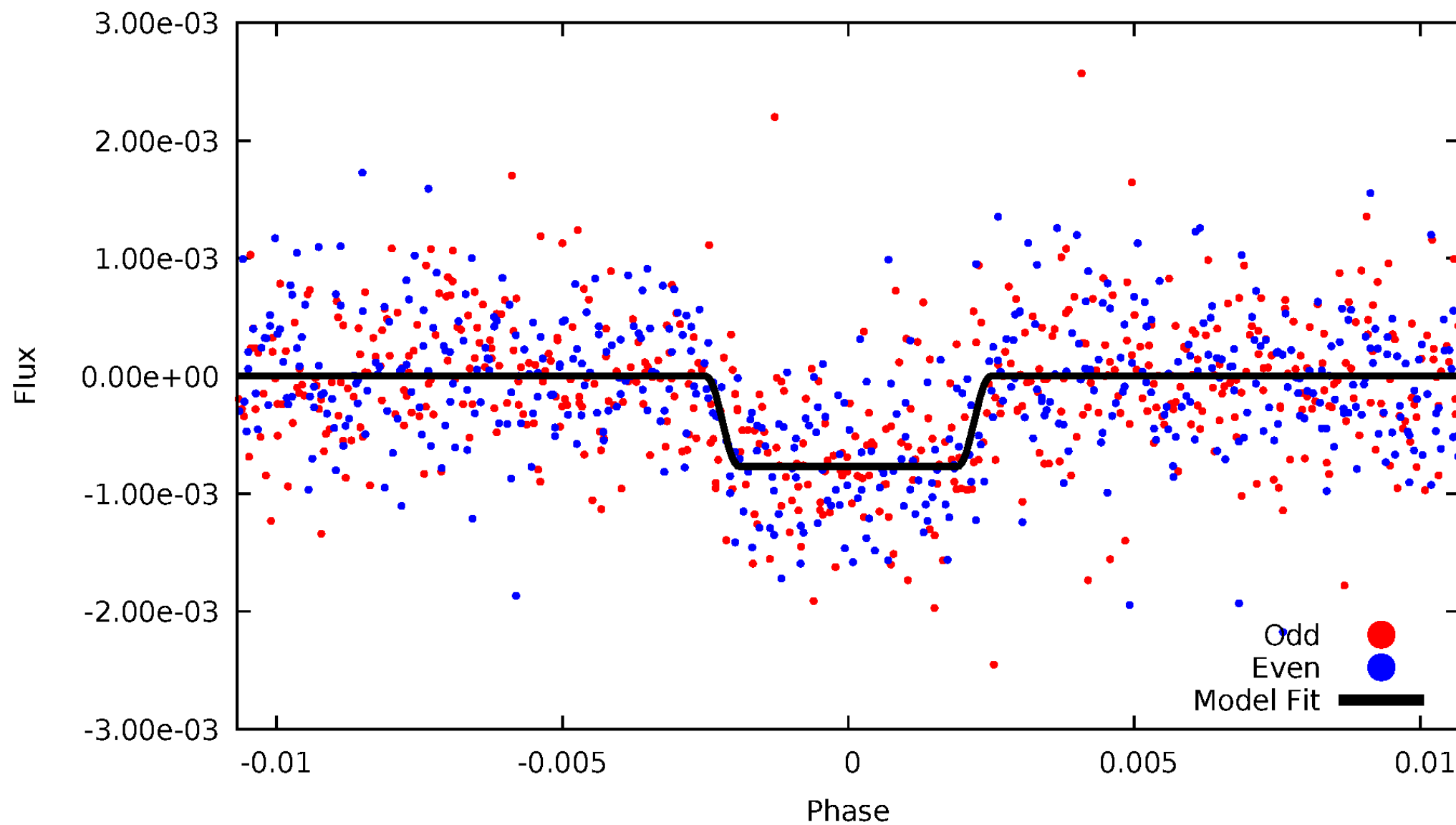
# DV Odd/Even

TCE 012208631-01



# ALT Odd/Even

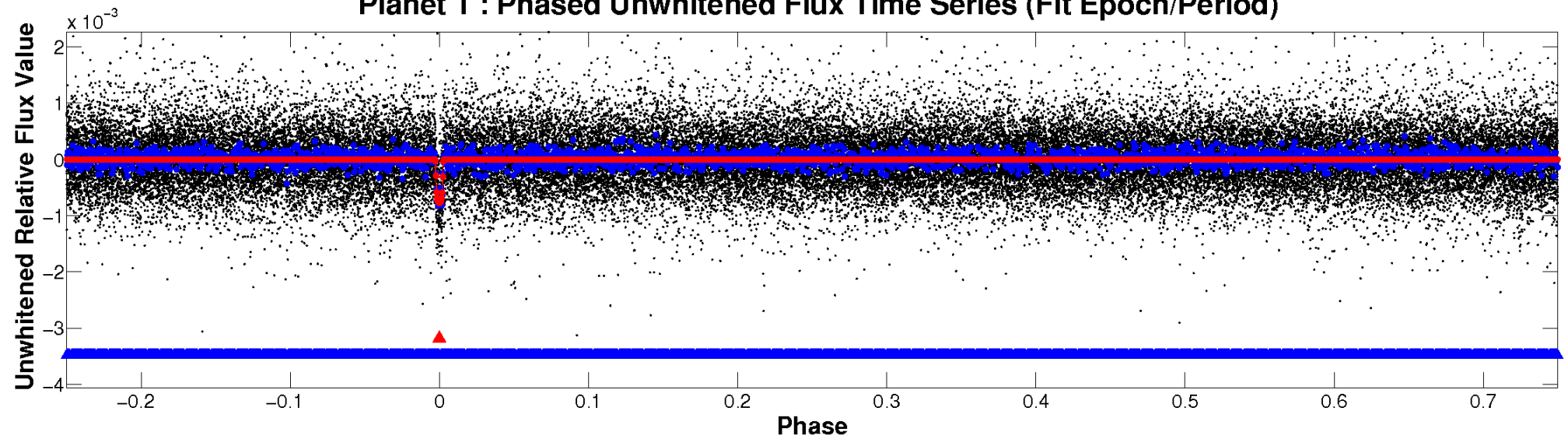
TCE 012208631-01



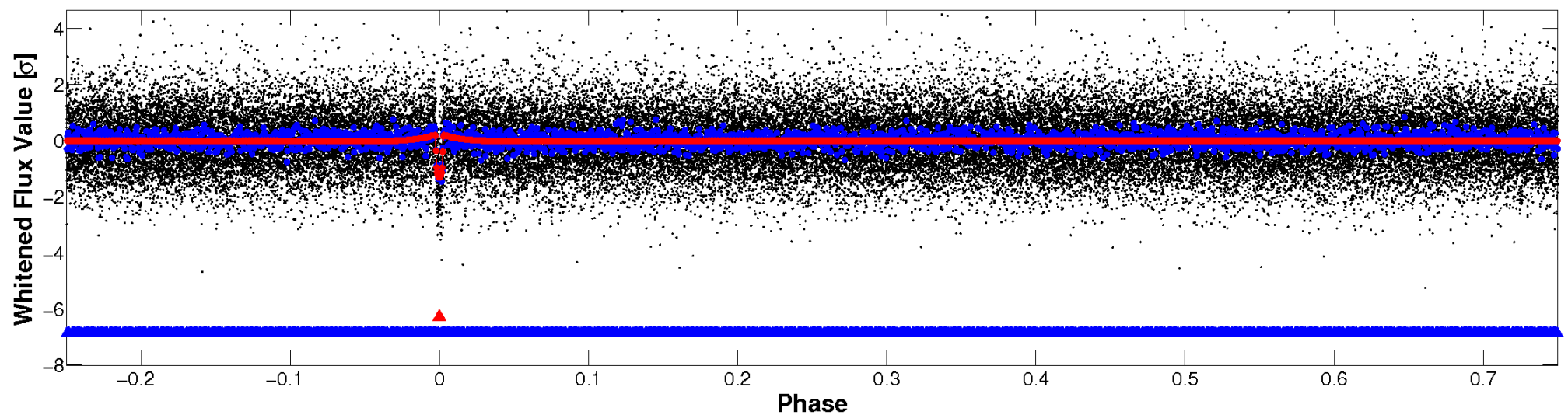


# Non-Whitened Vs. Whitened Light Curve

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

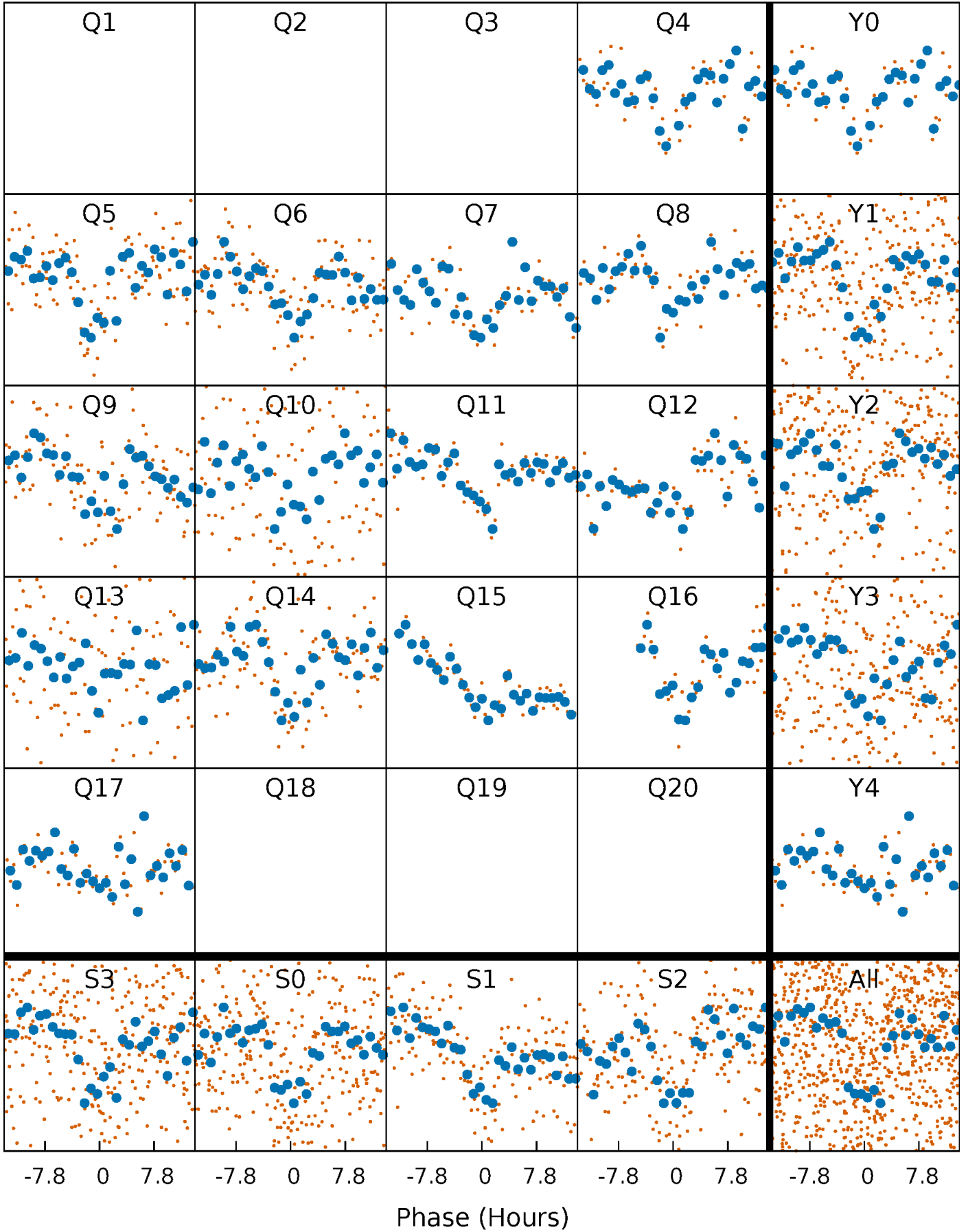


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

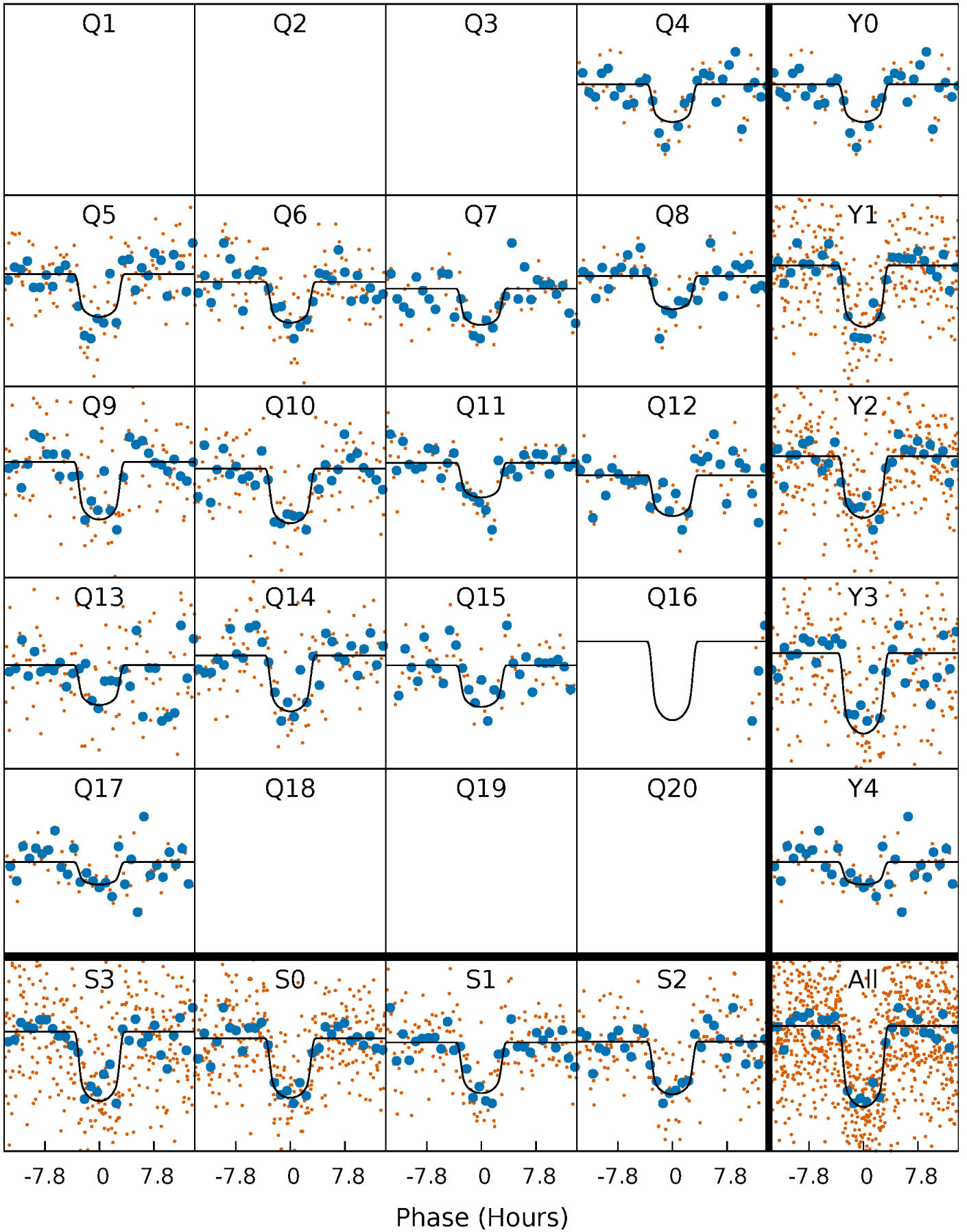
TCE 012208631-01 P= 53.357539 Days  $T_0=138.391667$  (BKJD)





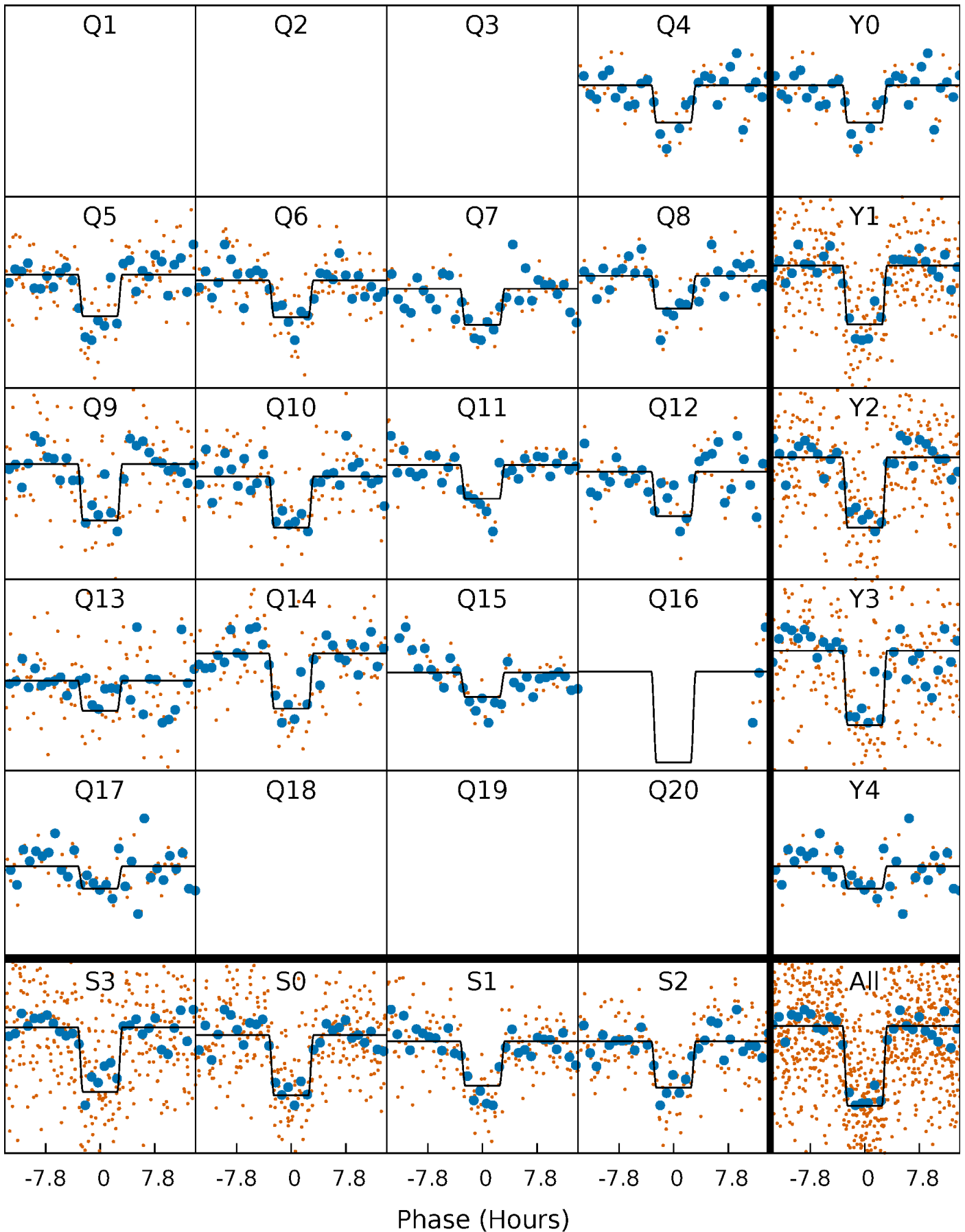
# DV Quarter-Phased Transit Curves

TCE 012208631-01 P= 53.357539 Days  $T_0=138.391667$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

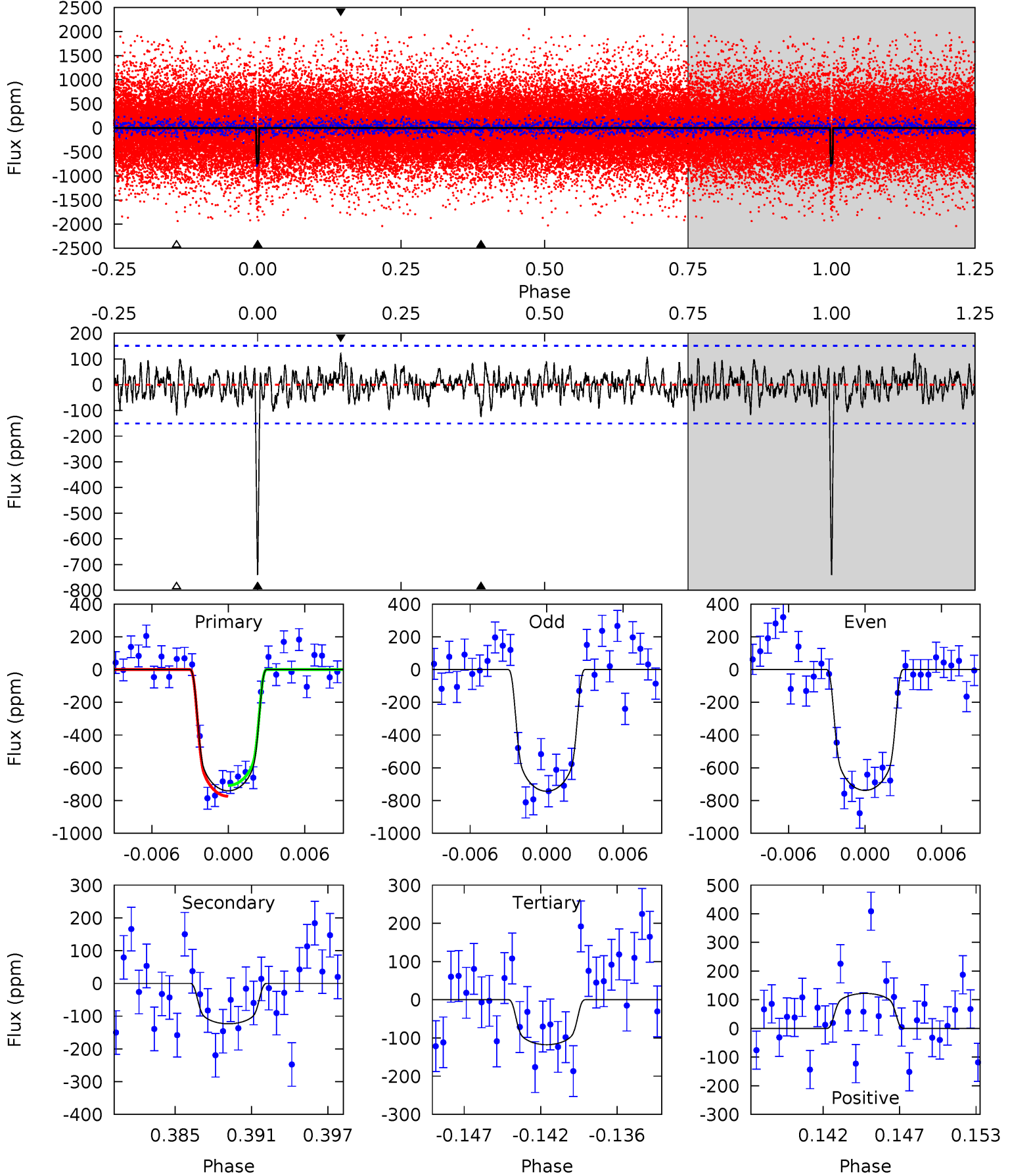
TCE 012208631-01 P= 53.357641 Days  $T_0=138.392088$  (BKJD)



# DV Model-Shift Uniqueness Test

012208631-01, P = 53.357539 Days, E = 138.391667 Days

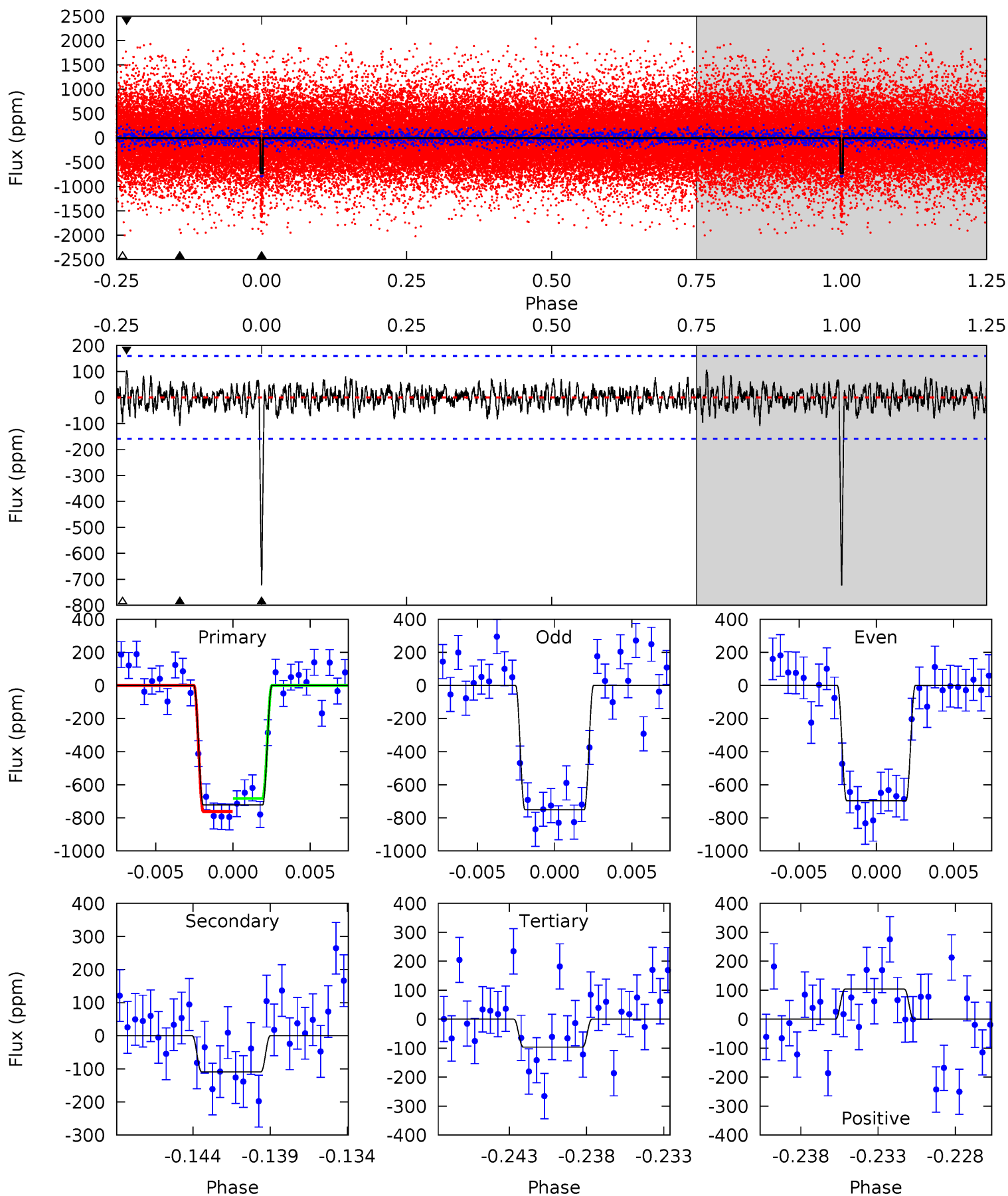
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
25.2	4.19	4.00	4.15	5.13	2.77	1.29	21.2	21.0	0.19	0.04	0.09	0.93	0.14	1.13



# Alt Model-Shift Uniqueness Test

012208631-01,  $P = 53.357641$  Days,  $E = 138.392088$  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
23.4	3.53	3.12	3.37	5.16	2.81	0.98	20.3	20.0	0.41	0.17	0.88	1.03	0.13	1.28



### Stellar Parameters For KIC 012208631

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5481^{+82}_{-74}$	$4.369^{+0.121}_{-0.099}$	$0.160^{+0.150}_{-0.150}$	$1.036^{+0.138}_{-0.124}$	$0.915^{+0.061}_{-0.042}$	$1.159^{+0.599}_{-0.334}$
	+1%/-1%	+3%/-2%	+94%/-94%	+13%/-12%	+7%/-5%	+52%/-29%
Source	SPE90	SPE90	SPE90	DSEP		

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

### Secondary Eclipse Parameters for KIC 012208631-01 / KOI 2449.01

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-123 \pm 29$	$3.44^{+0.41}_{-0.42}$	$662^{+25}_{-27}$	$3700^{+183}_{-186}$	$414^{+160}_{-120}$
Alt.	$-109 \pm 31$	$3.12^{+0.39}_{-0.36}$	$660^{+27}_{-27}$	$3739^{+188}_{-204}$	$436^{+176}_{-132}$

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

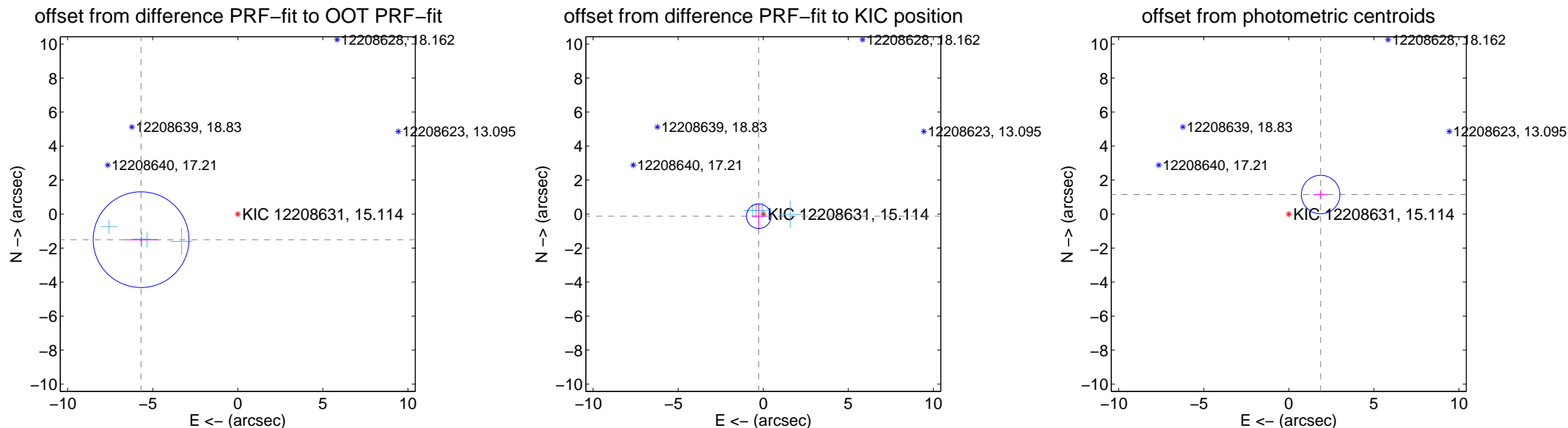
## DV Centroid Data

Supplemental centroid analysis for 012208631-01. Kepler magnitude: 15.11. Transit SNR 17.46

There are 5 quarters with good PRF difference image offsets

The OOT PRF centroid is offset from the target star catalog position by about 5.14 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

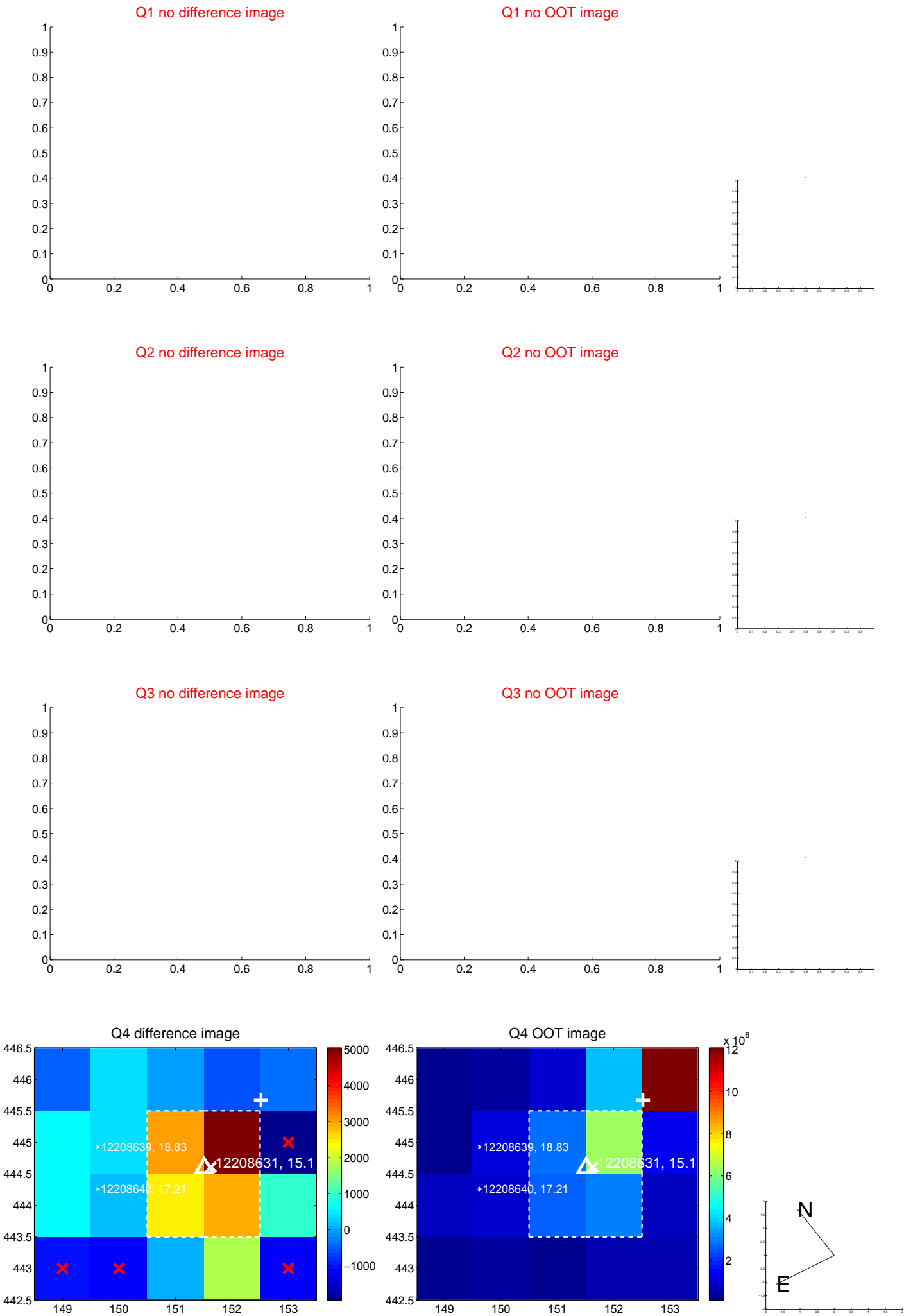
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$5.880 \pm 0.938$	<b>6.27</b>	$5.684 \pm 0.970$	$-1.506 \pm 0.118$
PRF-fit source offset from KIC position	$0.294 \pm 0.241$	1.22	$0.266 \pm 0.409$	$-0.125 \pm 0.767$
photometric centroid source offset	$2.20 \pm 0.38$	<b>5.81</b>	$-1.87 \pm 0.41$	$1.15 \pm 0.28$



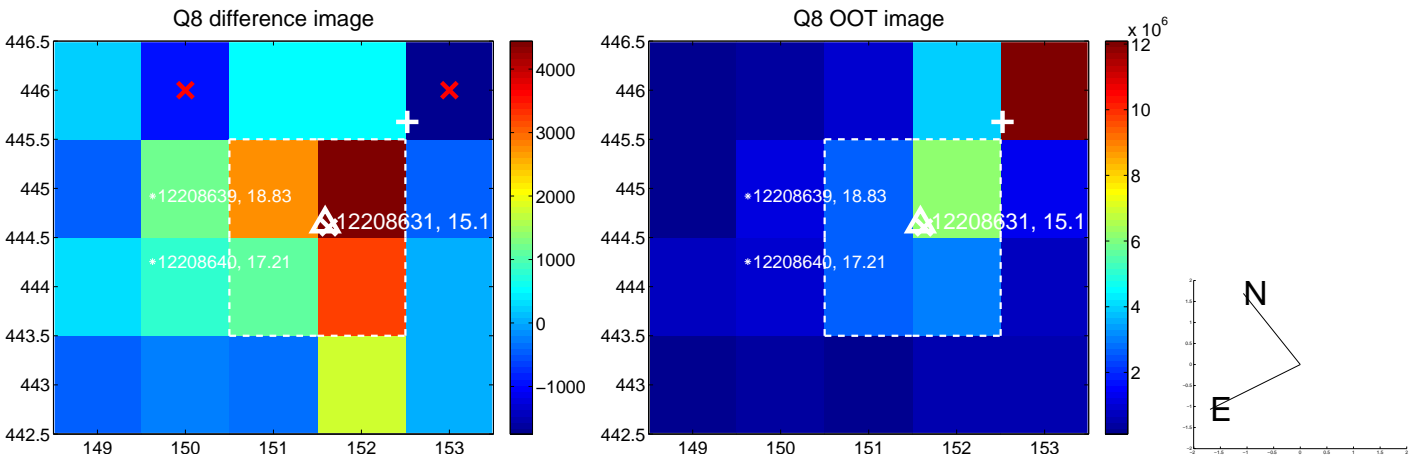
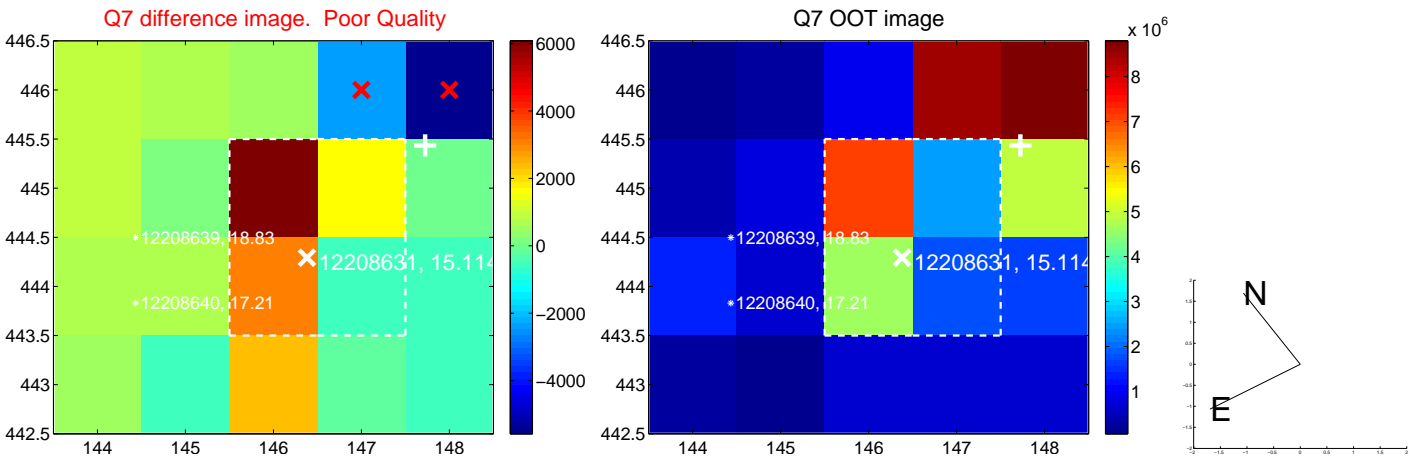
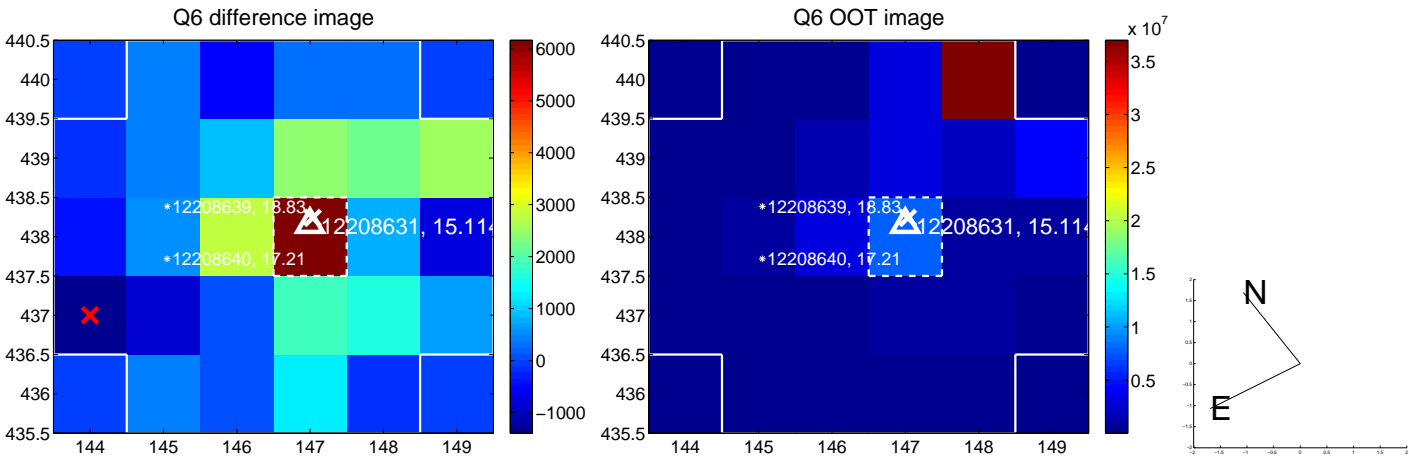
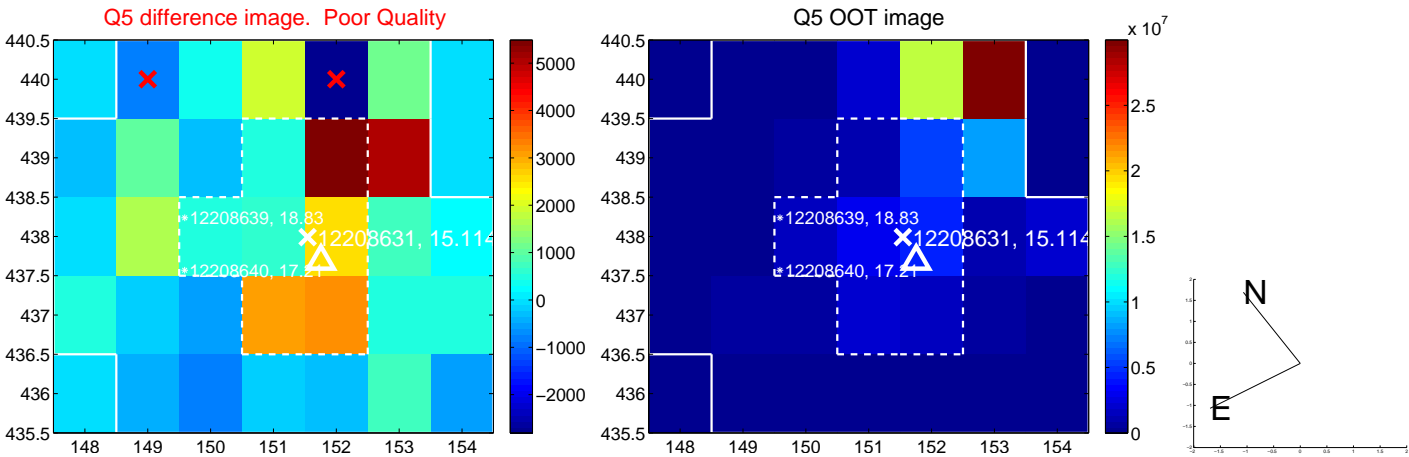
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



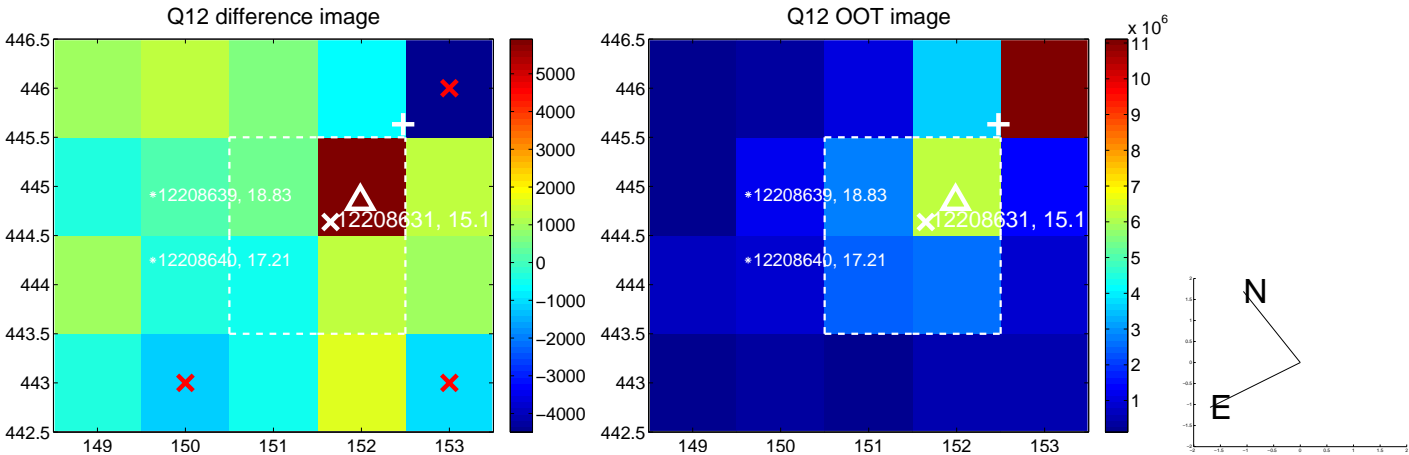
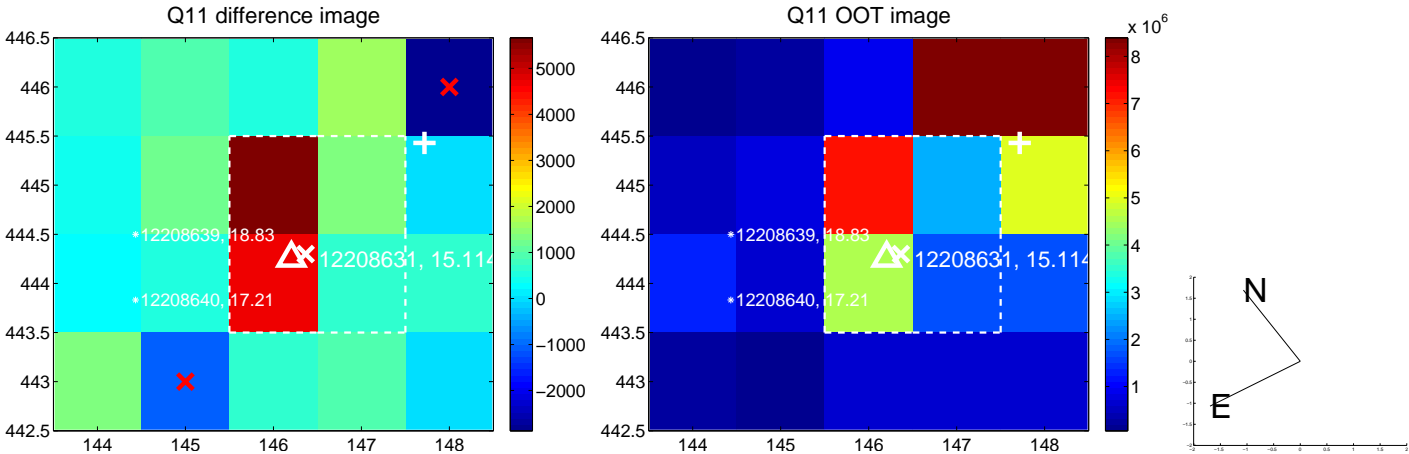
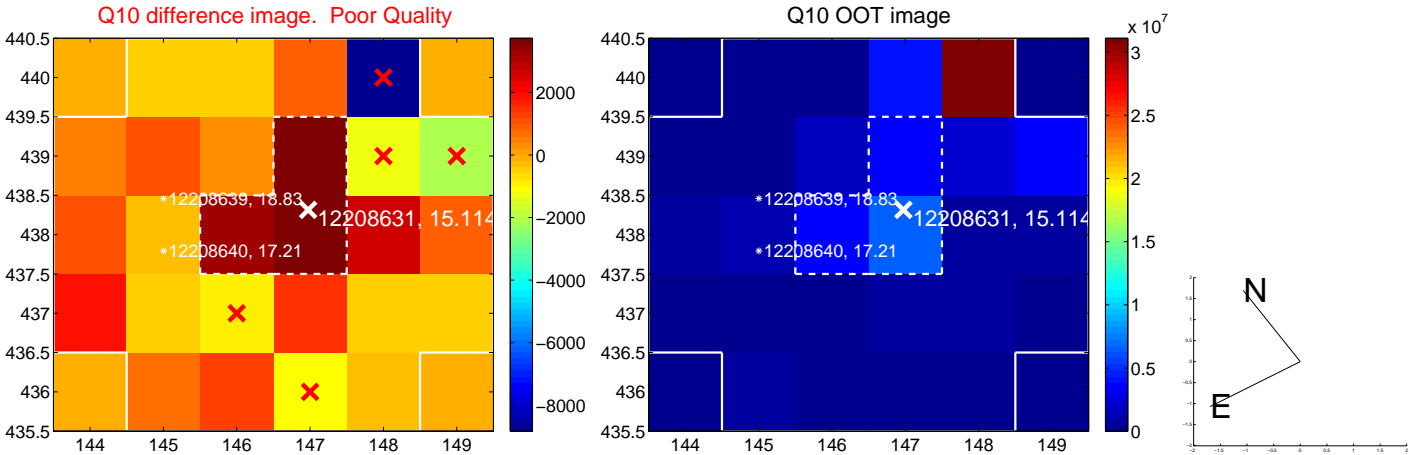
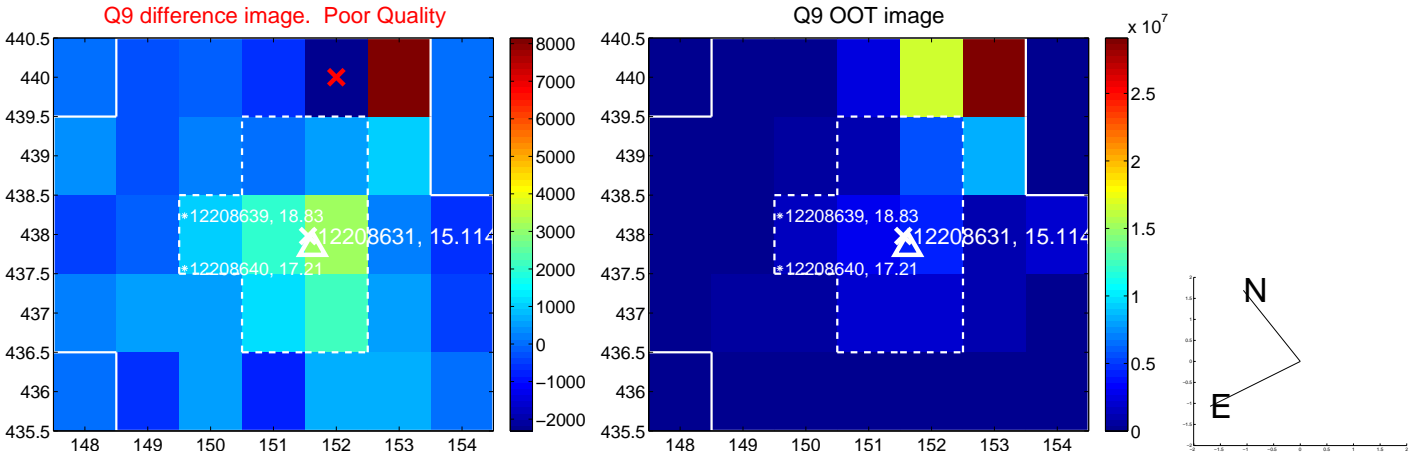
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



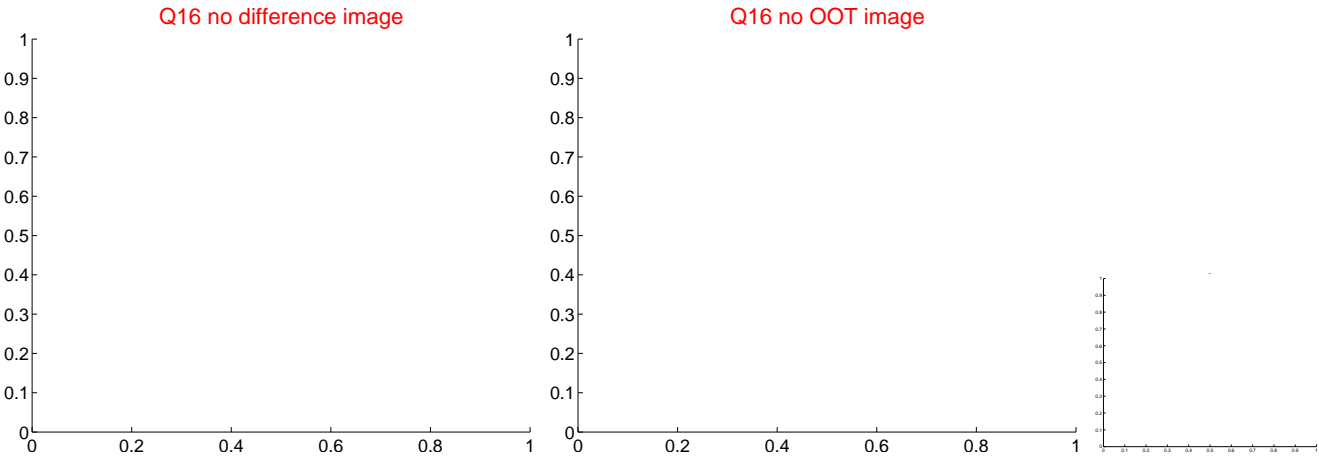
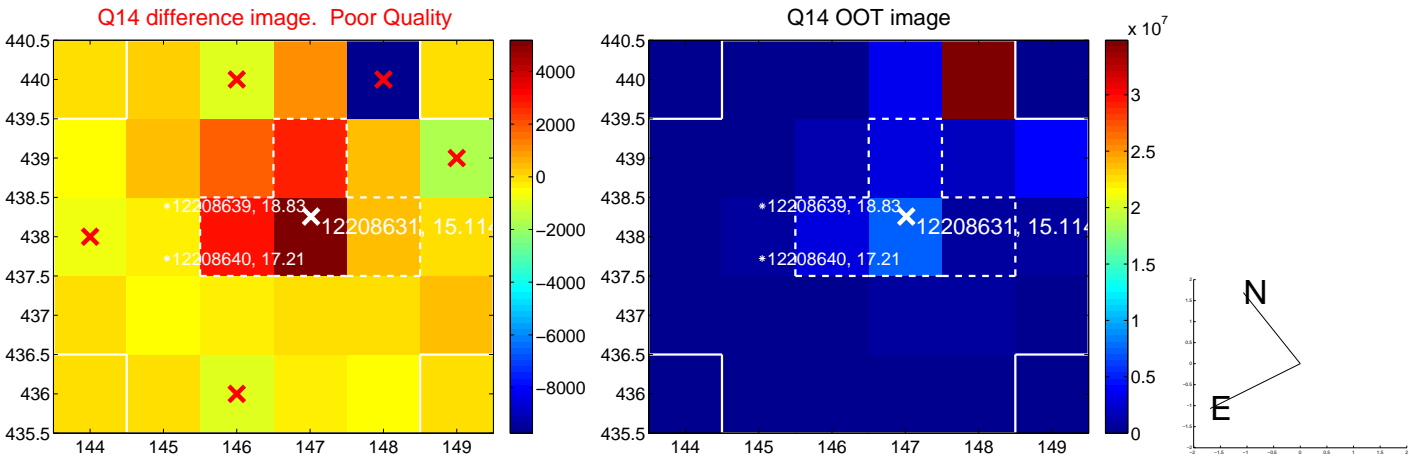
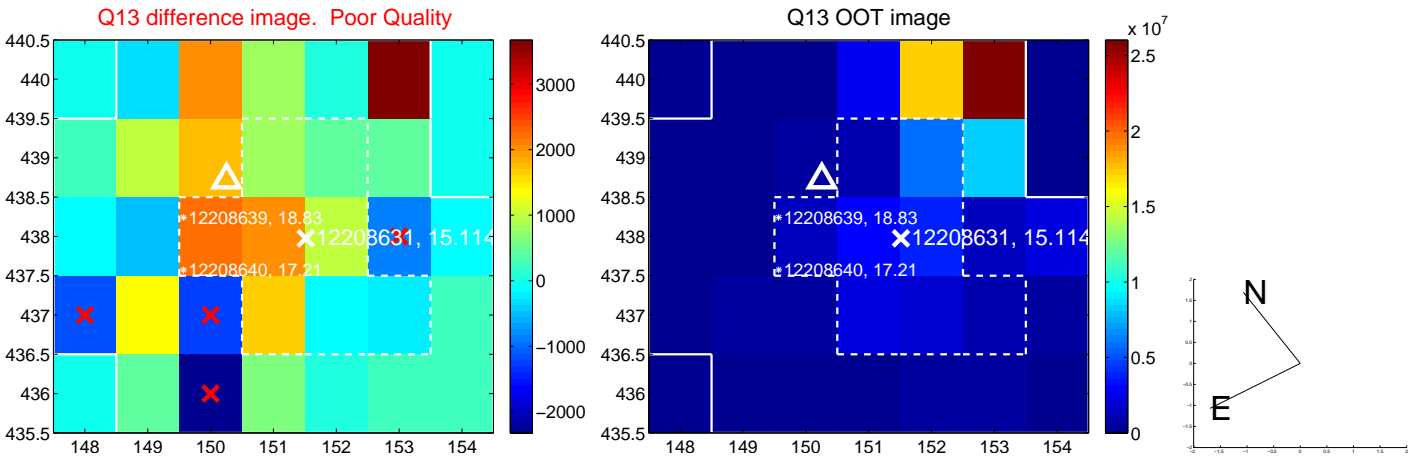
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



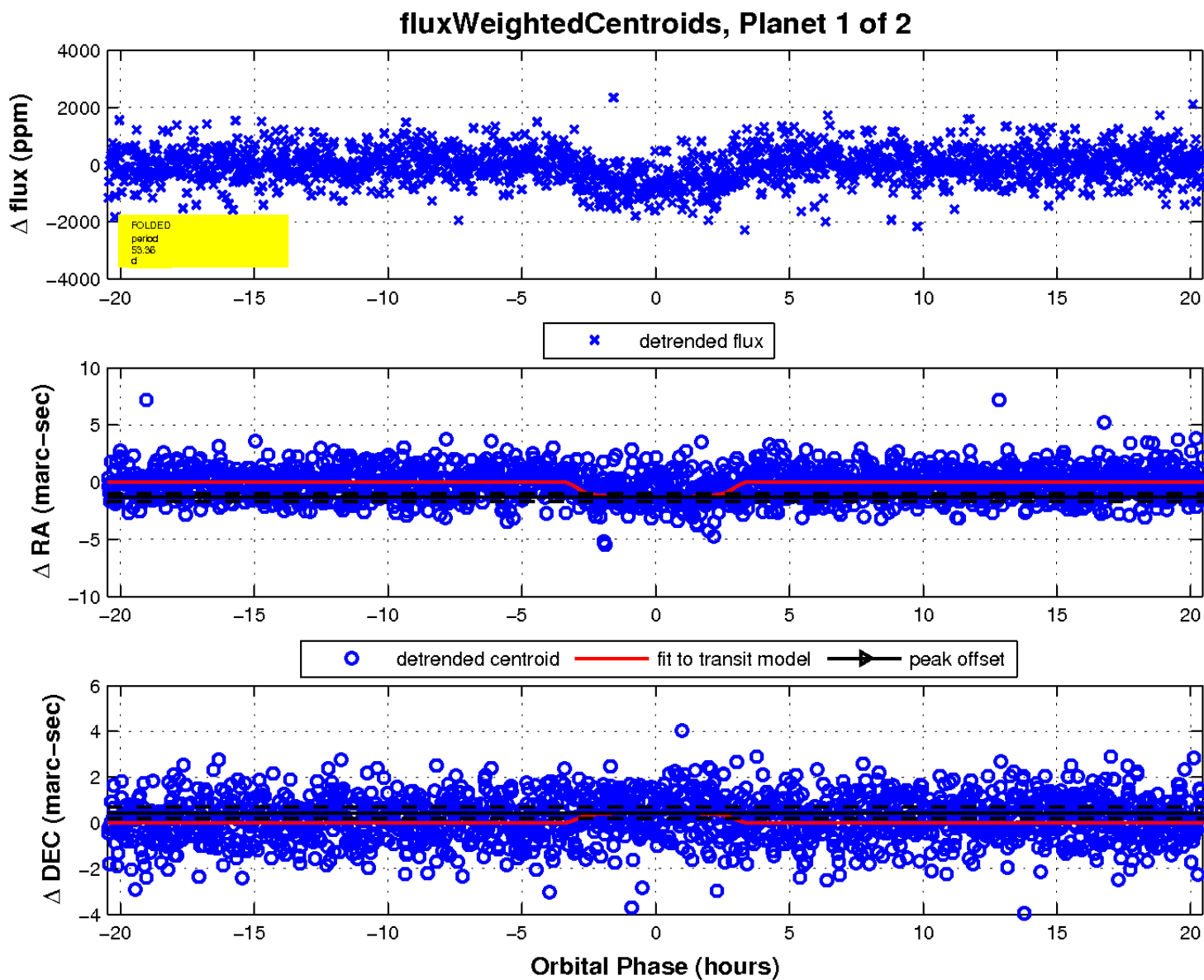
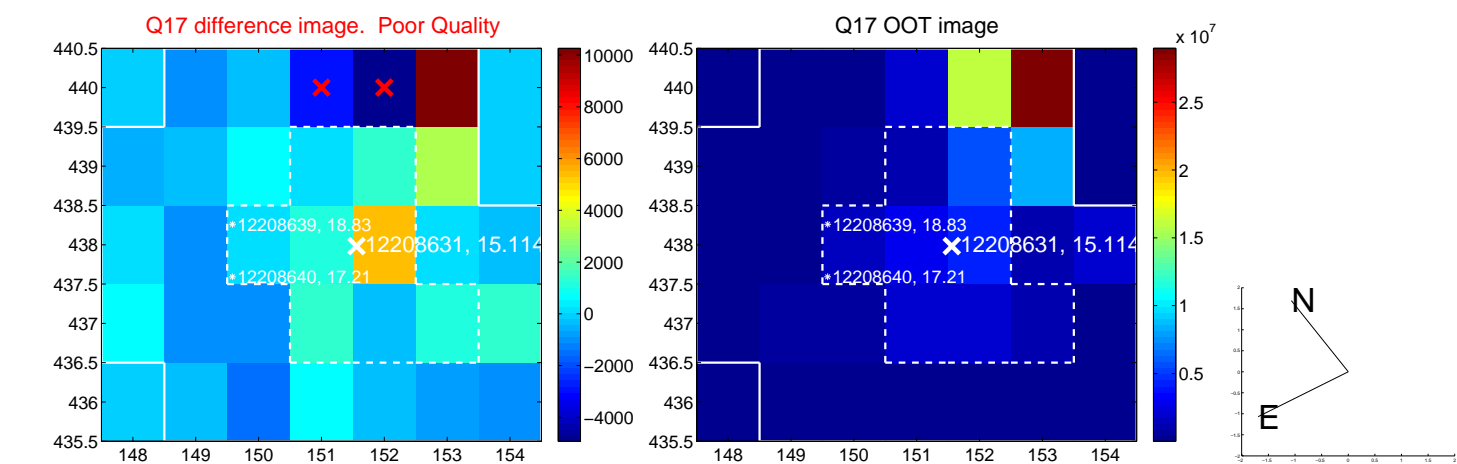
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

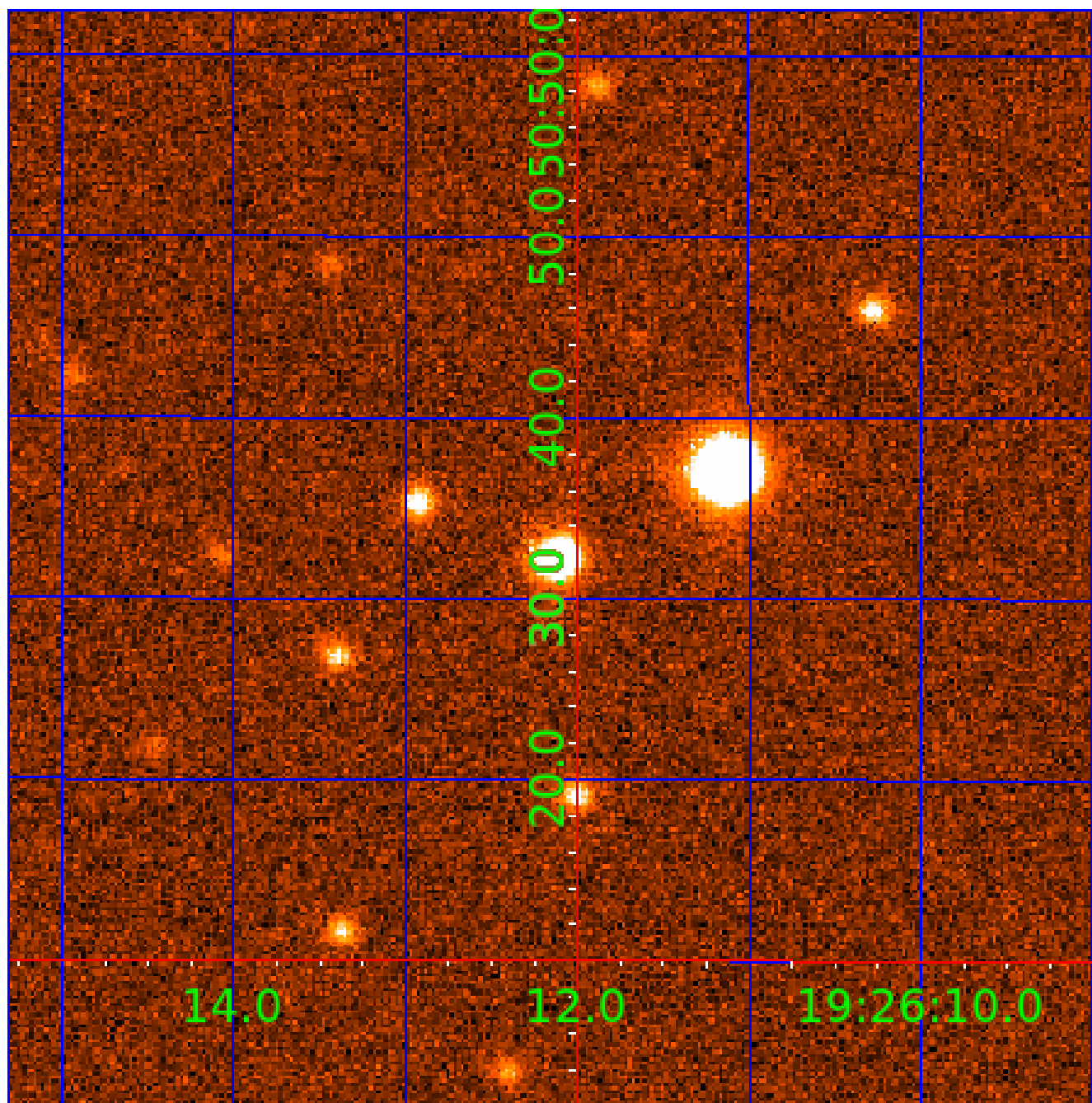


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 012208631

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
012208631-01	OBS	2449.01	53.357539	138.391667	775.9	6.831	16.3	17.5	1.04	5481	3.44	11.96
012208631-02	OBS	2449.02	0.912344	131.602850	98.5	1.071	7.7	9.1	1.04	5481	1.02	2714.53

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
012208631-01	OBS	PC	1.00	0	0	0	0	CENT_KIC_POS
012208631-02	OBS	PC	1.00	0	0	0	0	CENT_KIC_POS

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

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

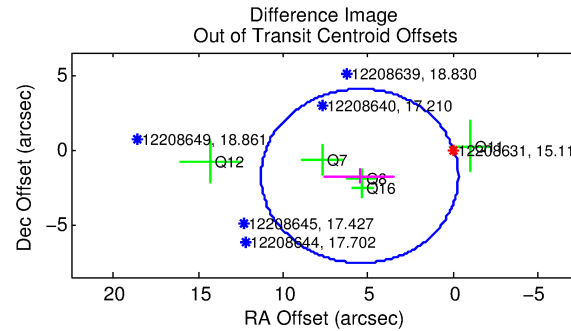
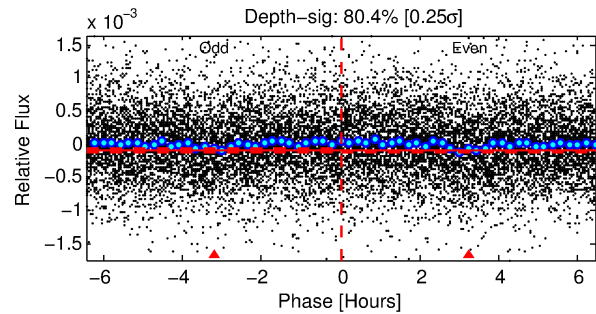
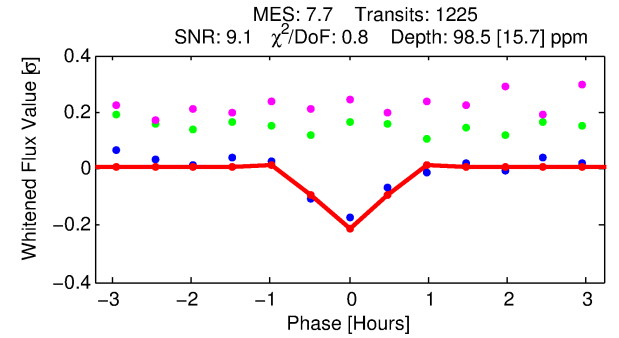
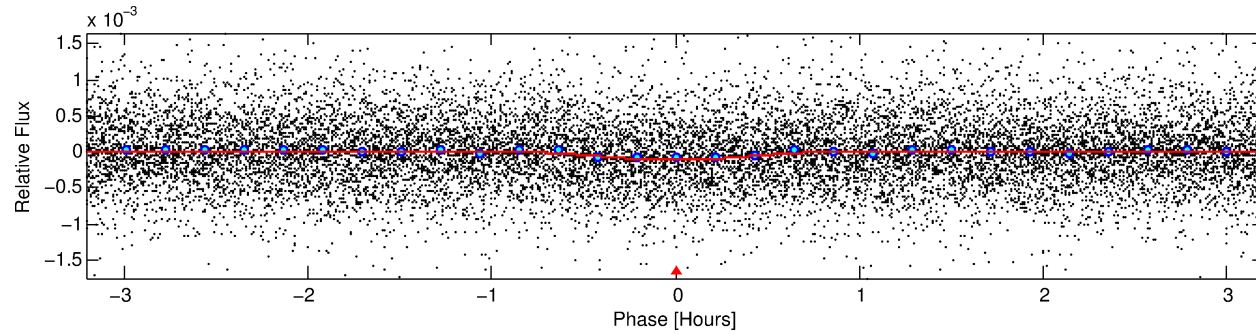
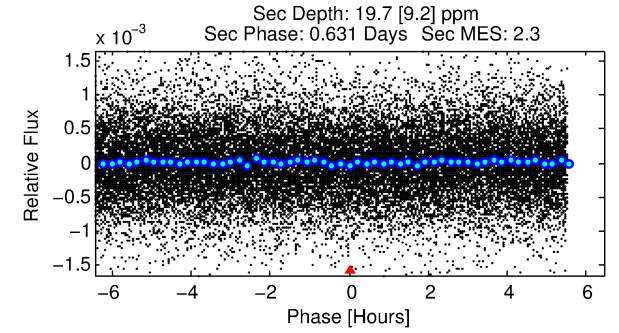
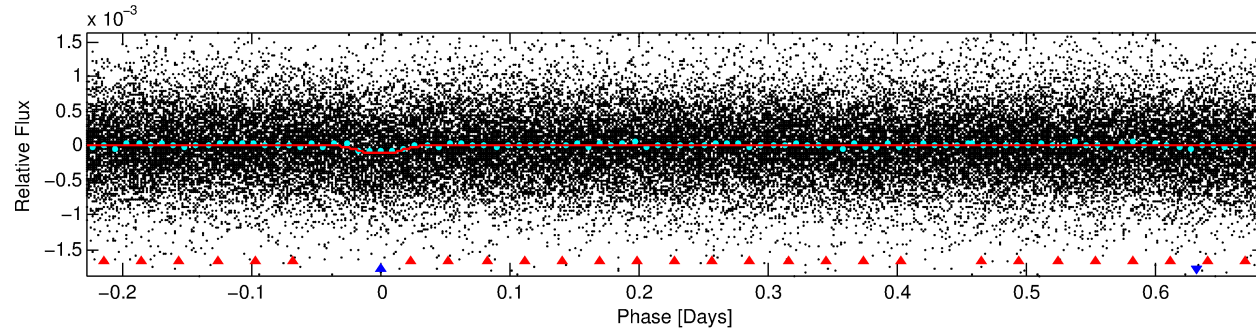
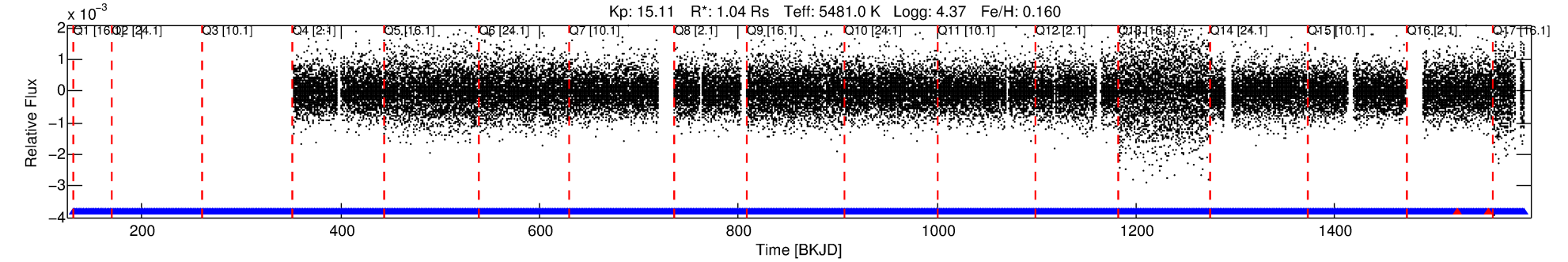
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 012208631-02

No Significant Match Found

# DV One-Page Summary

KIC: 12208631 Candidate: 2 of 2 Period: 0.912 d  
KOI: K02449.02 Corr: 0.932



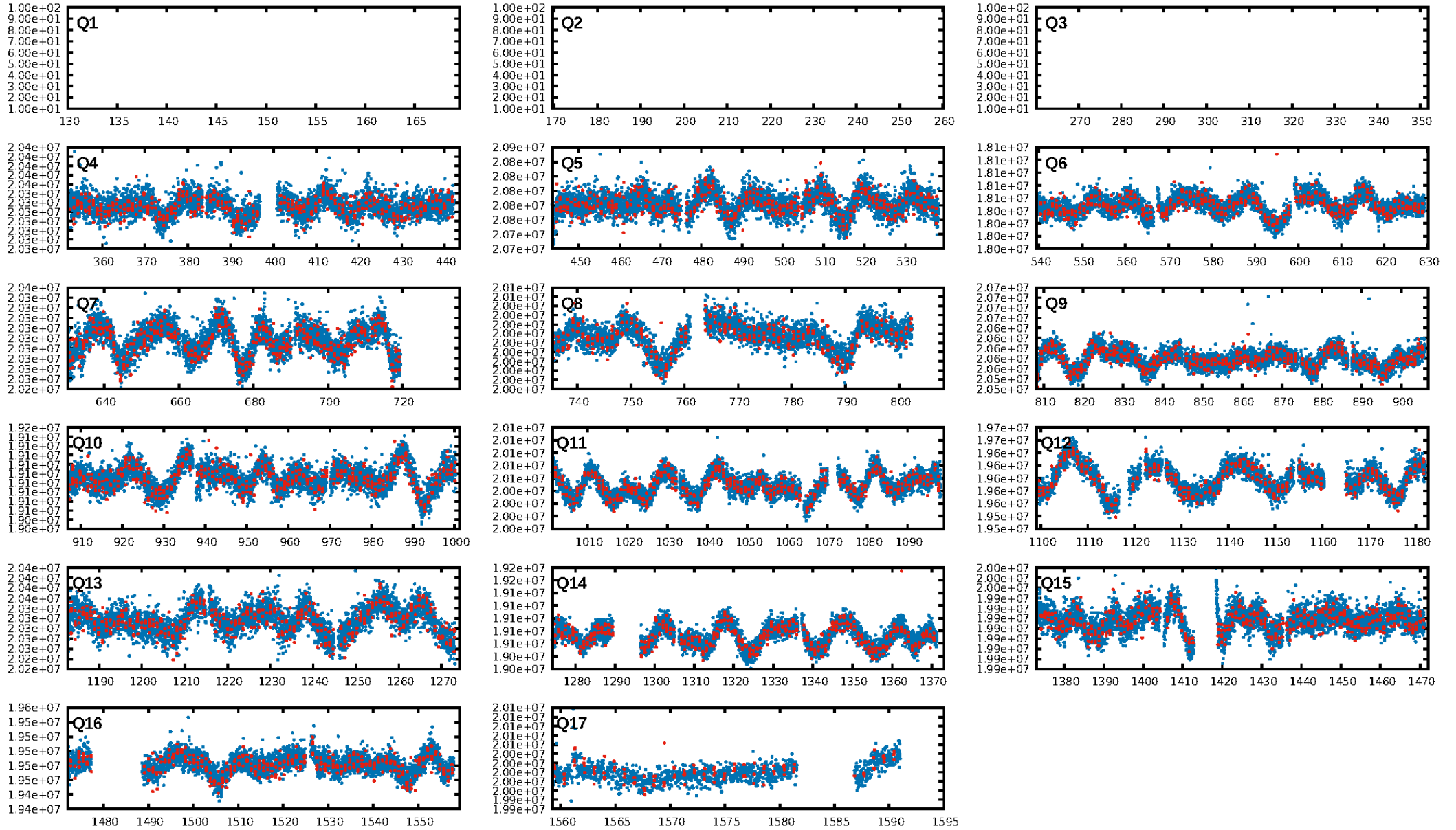
## DV Fit Results:

Period = 0.91234 [0.00001] d  
Epoch = 131.6028 [0.0020] BKJD  
Rp/R\* = 0.0091 [0.0155]  
a/R\* = 6.39 [41.89]  
b = 0.25 [25.45]  
Seff = 2714.53 [582.00]  
Teff = 1841 [99] K  
Rp = 1.02 [1.76] Re  
a = 0.0179 [0.0023] AU  
Ag = 3.30 [11.41] [0.20σ]  
Teffp = 3836 [3308] K [0.60σ]

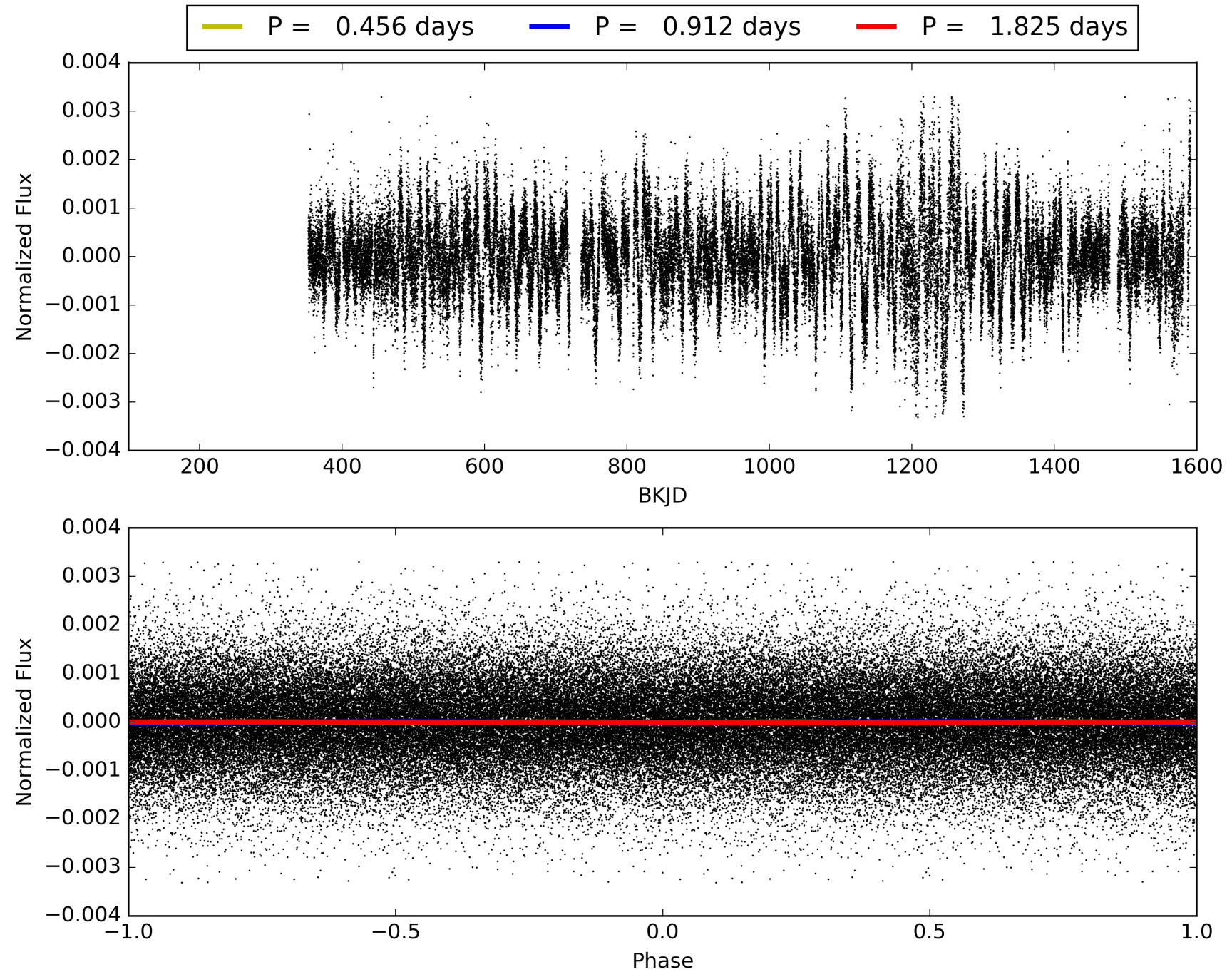
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [182.02σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 1.12e-14  
RollingBand-fgt: 1.00 [1194/1196]  
GhostDiagnostic-chr: 2.727  
Centroid-sig: 2.5%  
Centroid-so: 2.472 arcsec [2.97σ]  
OotOffset-rm: 5.747 arcsec [2.97σ]  
KicOffset-rm: 0.464 arcsec [0.34σ]  
OotOffset-st: 0/2/3/0 [5]  
KicOffset-st: 2/2/3/3 [10]  
DiffImageQuality-fgm: 0.30 [3/10]  
DiffImageOverlap-fno: 1.00 [14/14]

# TCE 012208631-02, PDC Light Curves



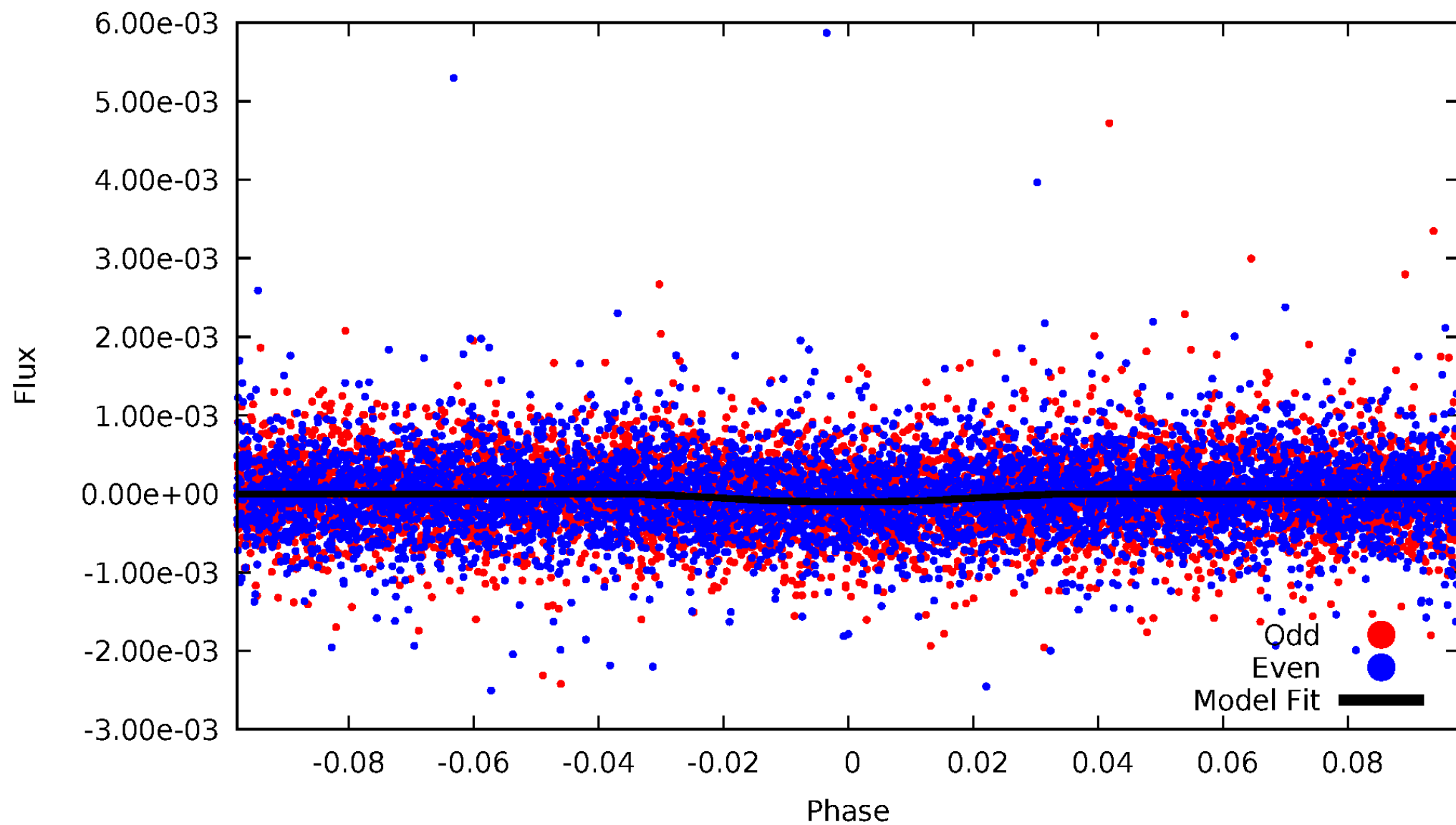
# TCE 012208631-02





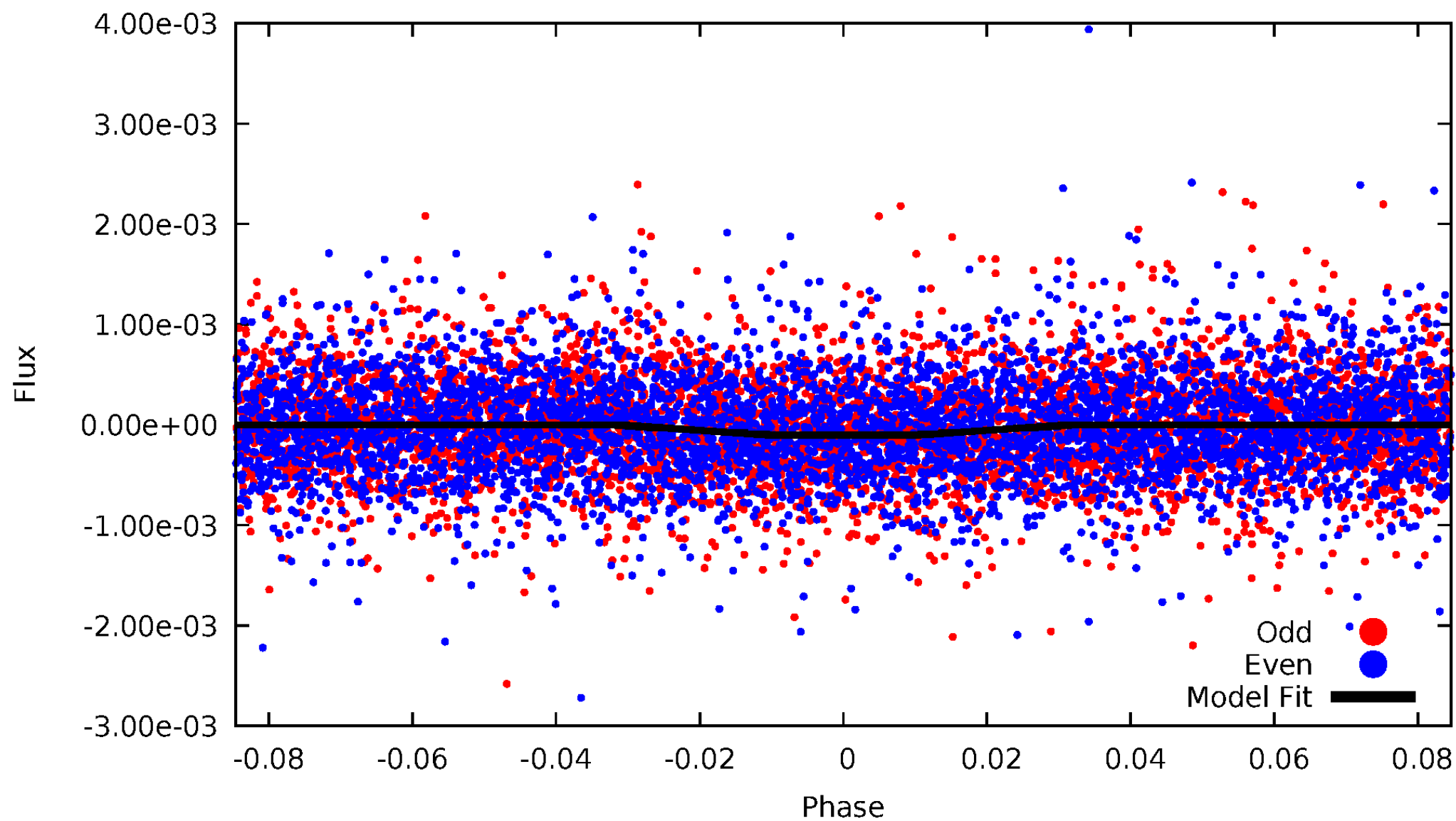
# DV Odd/Even

TCE 012208631-02



# ALT Odd/Even

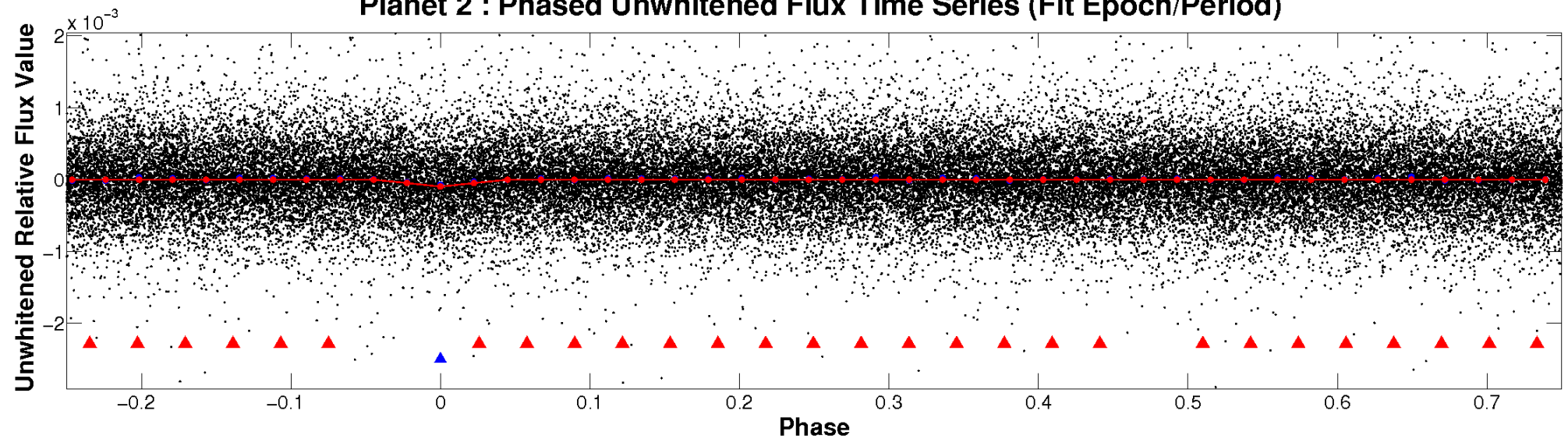
TCE 012208631-02



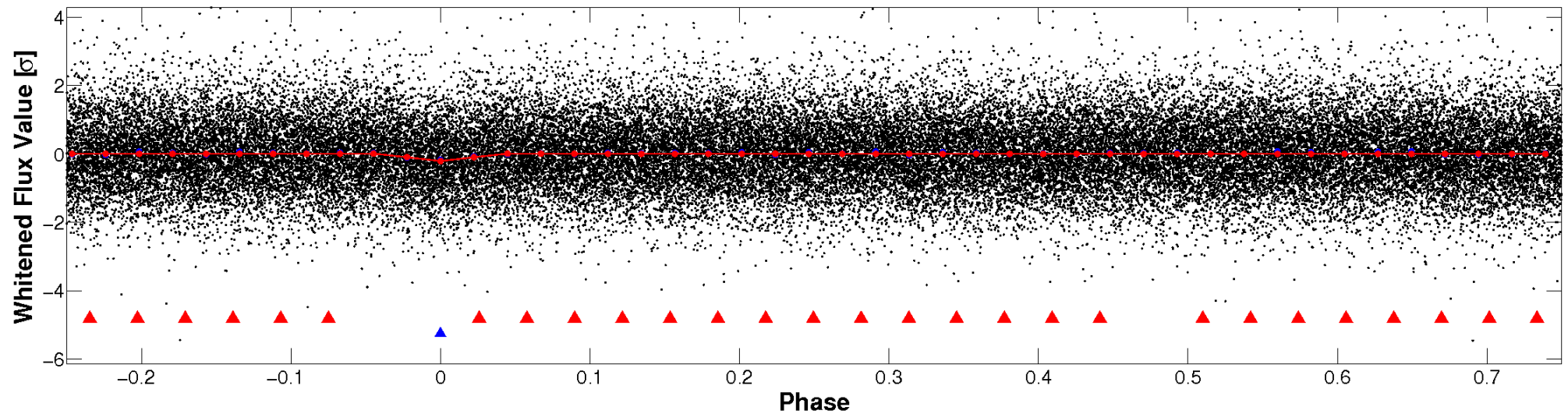


# Non-Whitened Vs. Whitened Light Curve

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

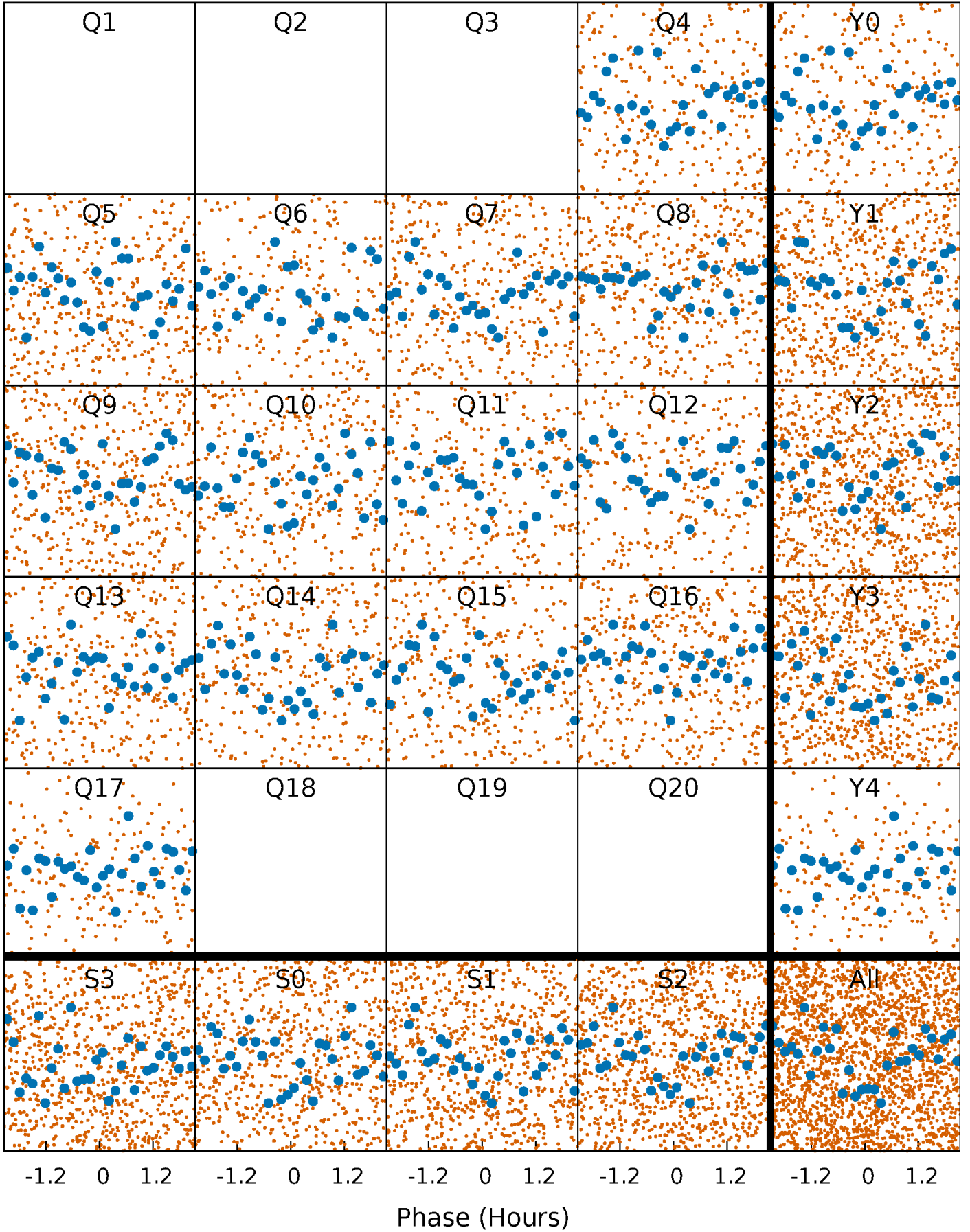


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



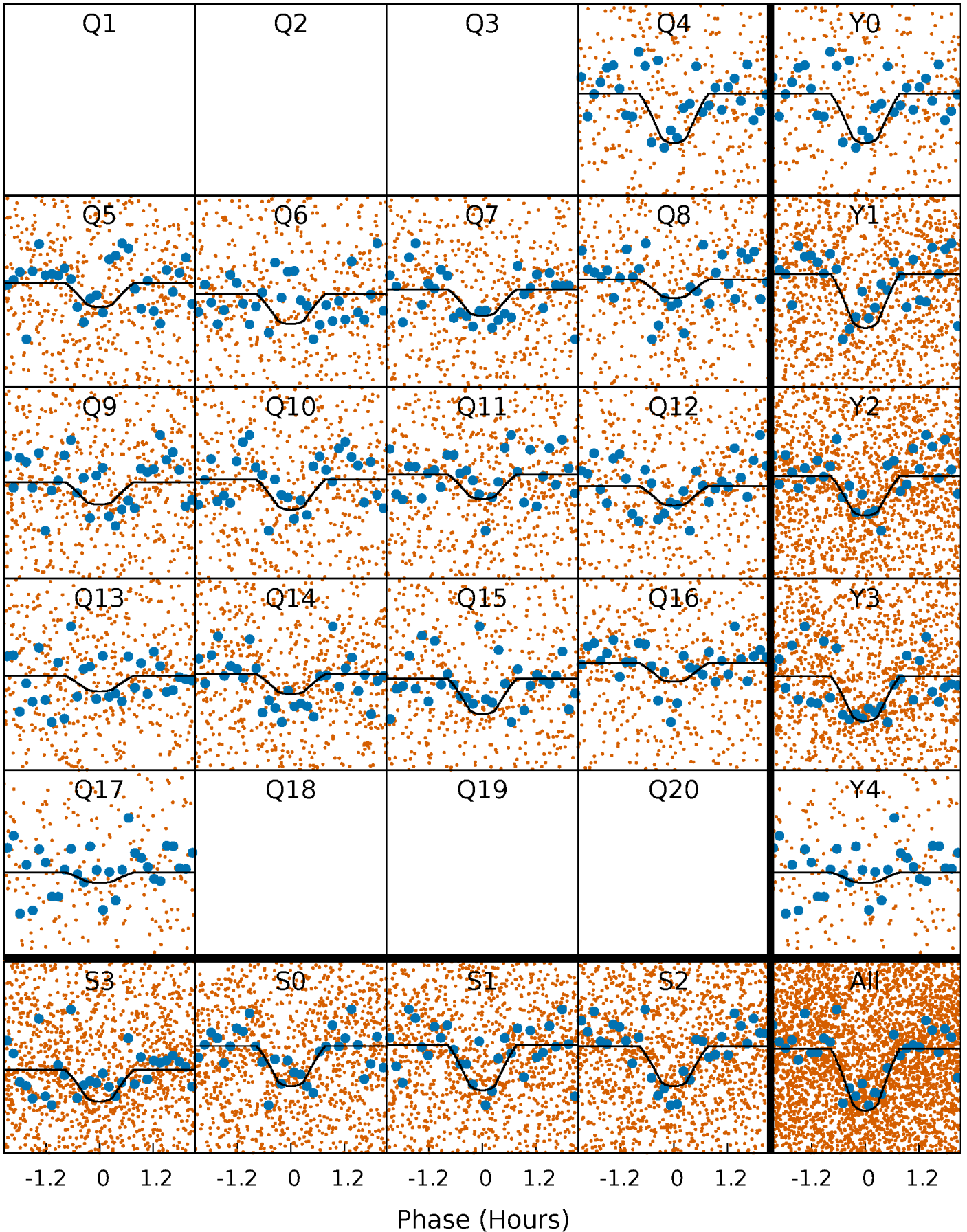
# PDC Quarter-Phased Transit Curves

TCE 012208631-02   P= 0.912344 Days    $T_0=131.602850$  (BKJD)



# DV Quarter-Phased Transit Curves

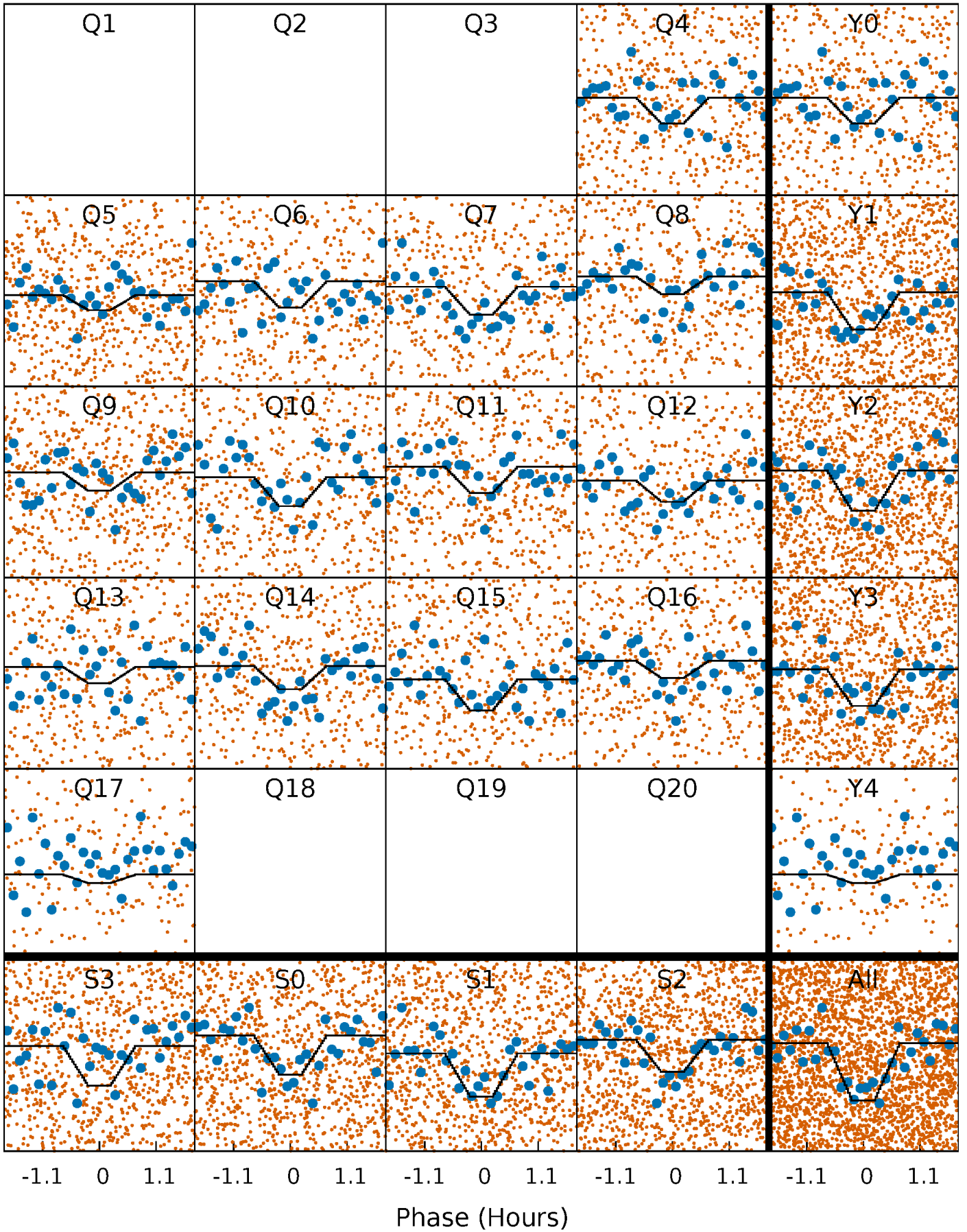
TCE 012208631-02   P= 0.912344 Days    $T_0=131.602850$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

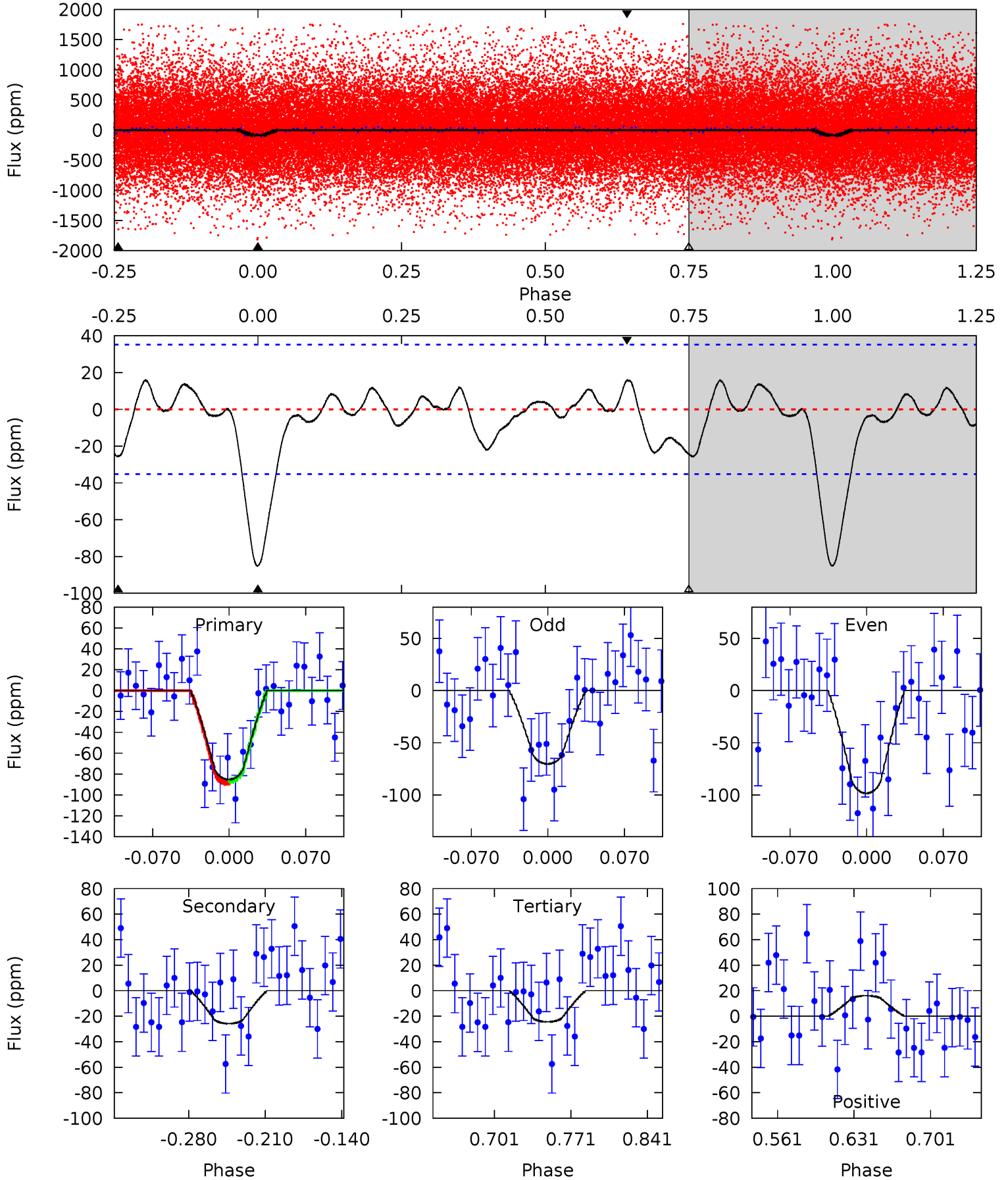
TCE 012208631-02    P= 0.912339 Days     $T_0=131.607039$  (BKJD)



# DV Model-Shift Uniqueness Test

012208631-02, P = 0.912344 Days, E = 131.602850 Days

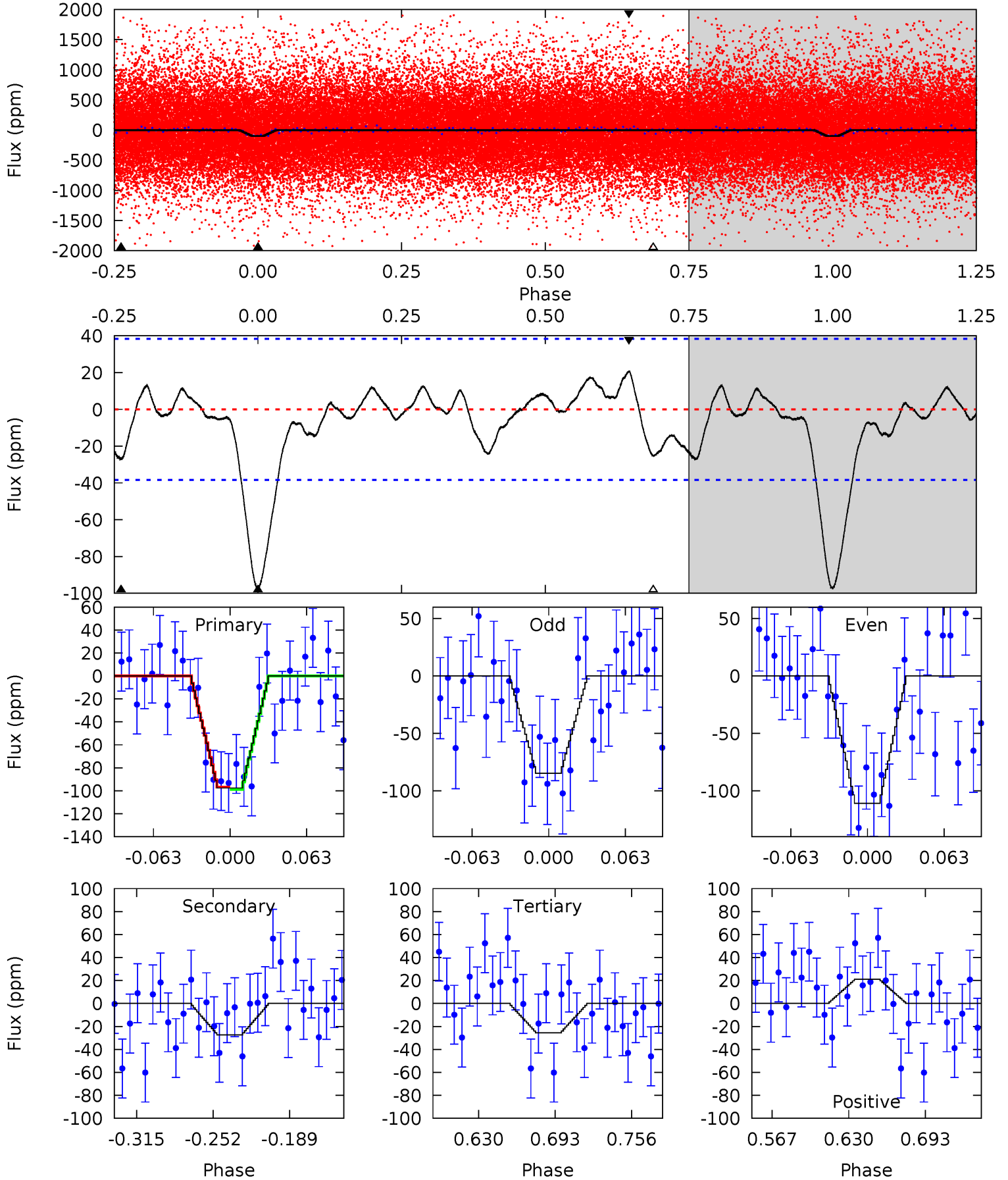
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
11.2	3.41	3.23	2.12	4.64	1.81	1.23	8.02	9.13	0.18	1.29	1.86	0.95	0.16	0.15



# Alt Model-Shift Uniqueness Test

012208631-02, P = 0.912339 Days, E = 131.607039 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
11.8	3.33	3.11	2.55	4.66	1.86	1.25	8.74	9.29	0.22	0.78	1.60	0.93	0.18	0.13





### Stellar Parameters For KIC 012208631

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5481^{+82}_{-74}$	$4.369^{+0.121}_{-0.099}$	$0.160^{+0.150}_{-0.150}$	$1.036^{+0.138}_{-0.124}$	$0.915^{+0.061}_{-0.042}$	$1.159^{+0.599}_{-0.334}$
	+1%/-1%	+3%/-2%	+94%/-94%	+13%/-12%	+7%/-5%	+52%/-29%
Source	SPE90	SPE90	SPE90	DSEP		

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

### Secondary Eclipse Parameters for KIC 012208631-02 / KOI 2449.02

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-26 \pm 8$	$1.59^{+1.40}_{-1.08}$	$2569^{+96}_{-94}$	$3571^{+2160}_{-946}$	$1.711^{+16.580}_{-1.242}$
Alt.	$-27 \pm 8$	$1.78^{+1.32}_{-1.15}$	$2564^{+101}_{-98}$	$3449^{+1874}_{-823}$	$1.525^{+10.557}_{-1.059}$

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

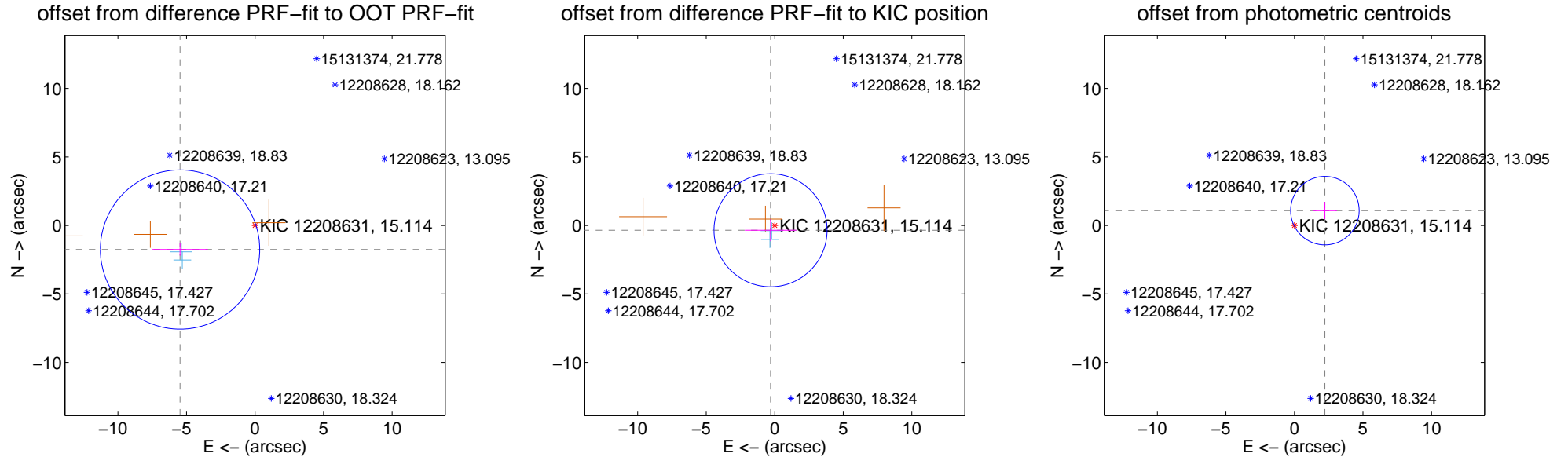
## DV Centroid Data

Supplemental centroid analysis for 012208631-02. Kepler magnitude: 15.11. Transit SNR 9.05

There are 3 quarters with good PRF difference image offsets

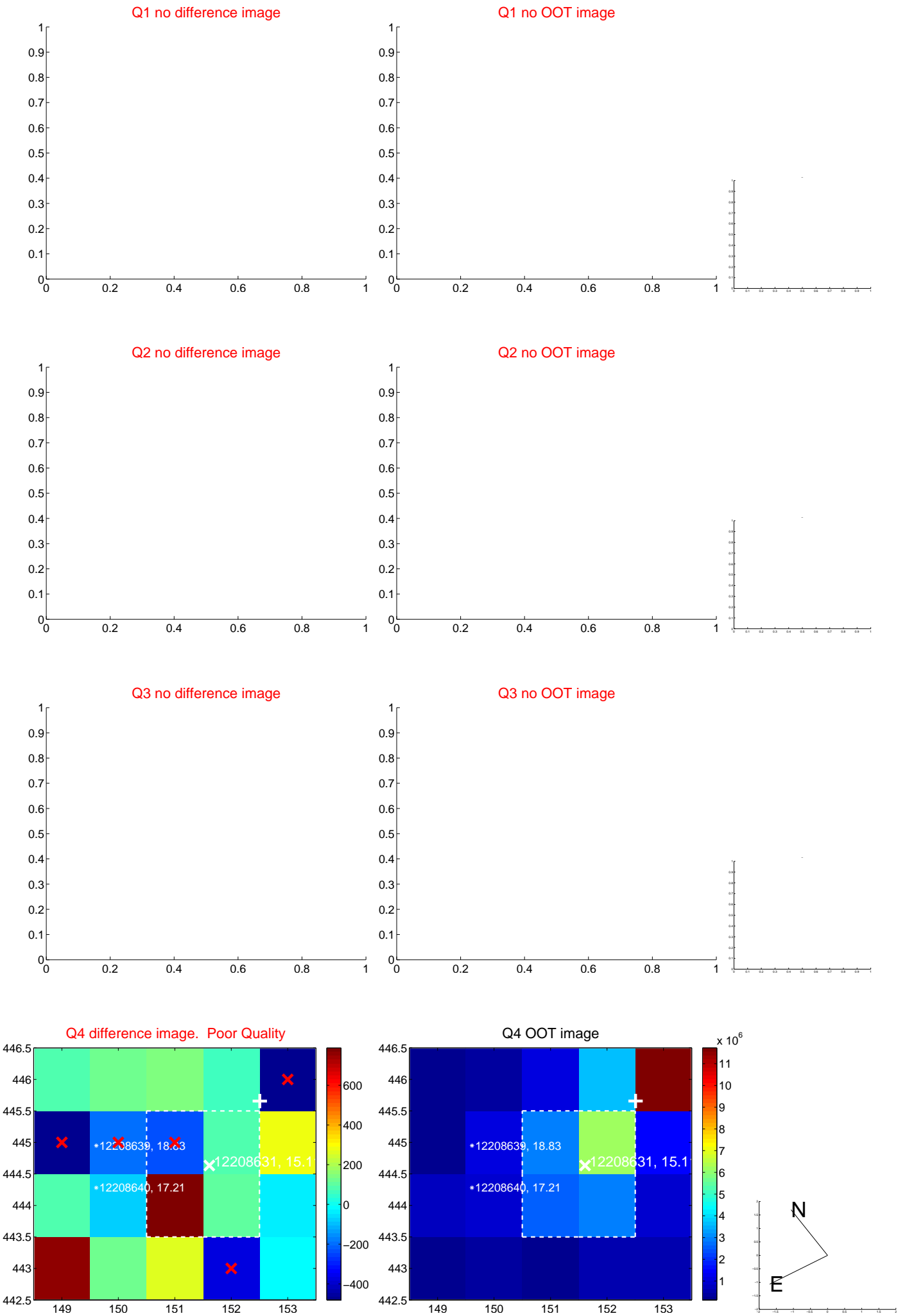
The OOT PRF centroid is offset from the target star catalog position by about 5.18 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$5.747 \pm 1.937$	2.97	$5.472 \pm 2.029$	$-1.757 \pm 0.448$
PRF-fit source offset from KIC position	$0.464 \pm 1.375$	0.34	$0.306 \pm 1.875$	$-0.349 \pm 0.797$
photometric centroid source offset	$2.47 \pm 0.83$	2.97	$-2.22 \pm 0.88$	$1.08 \pm 0.63$

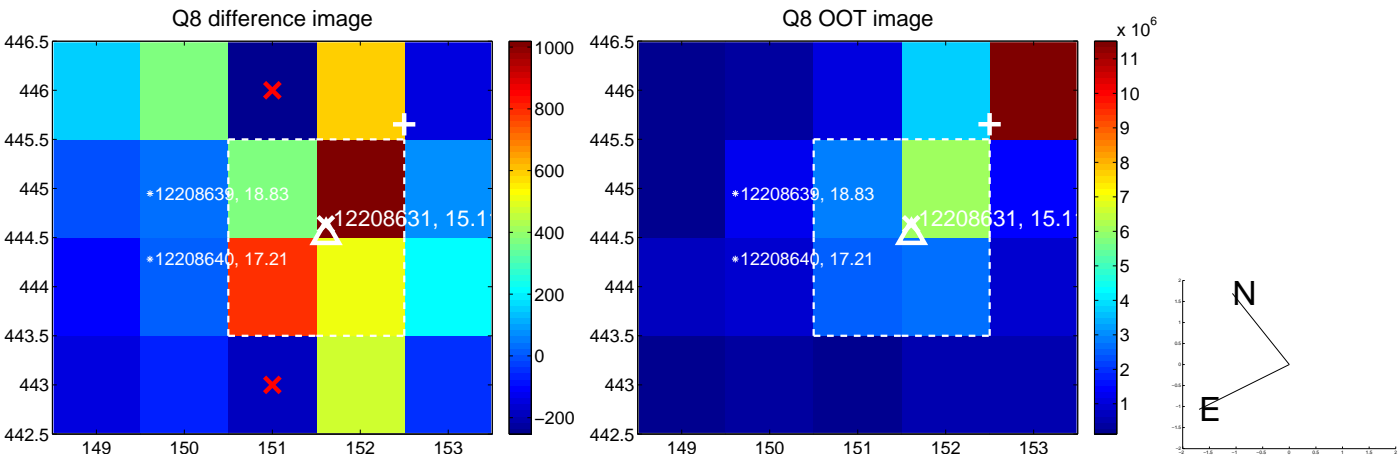
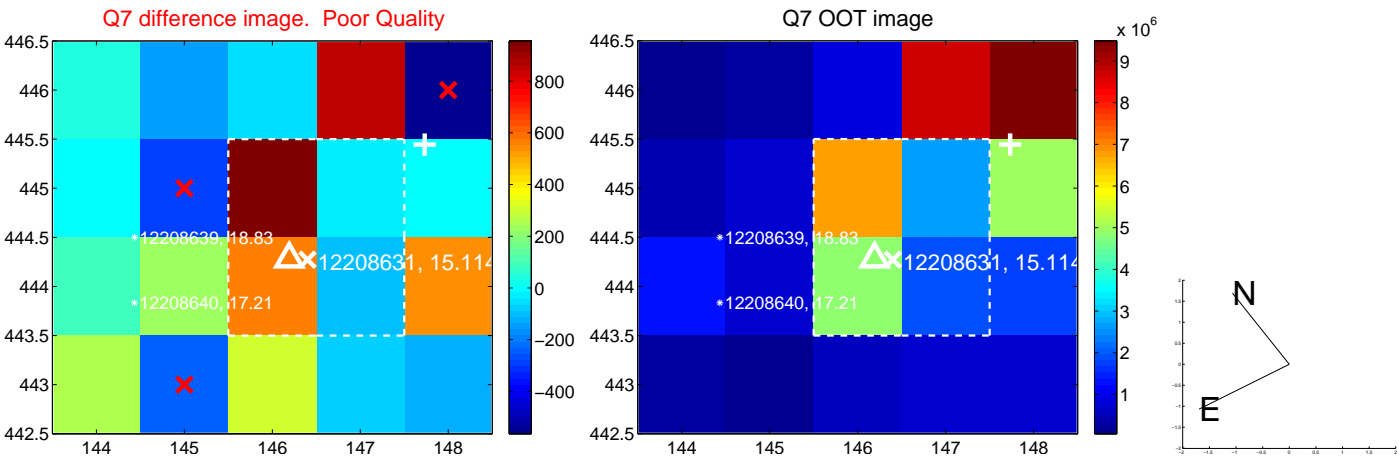
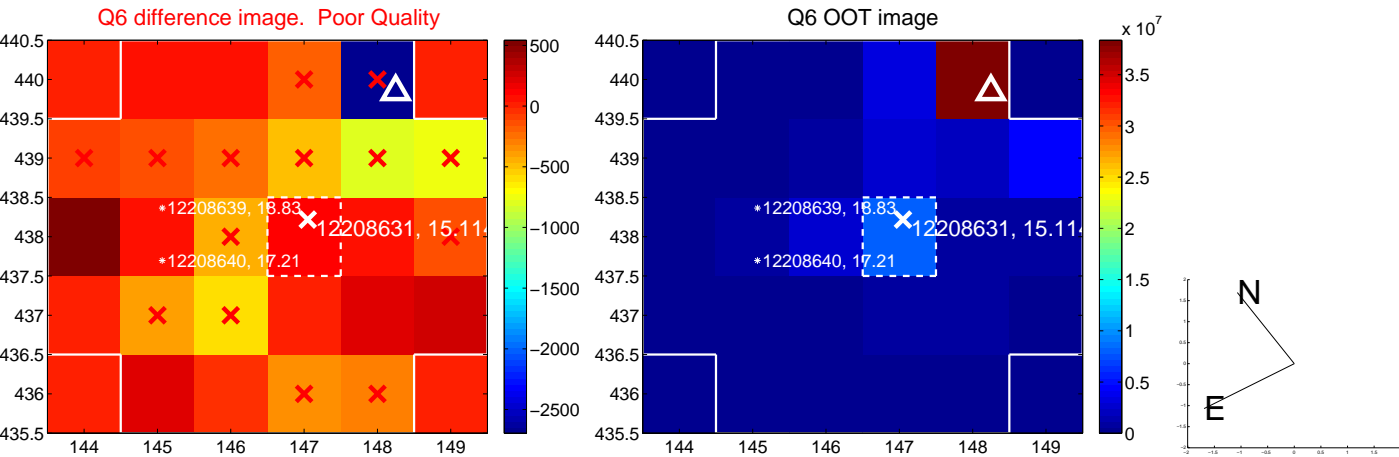
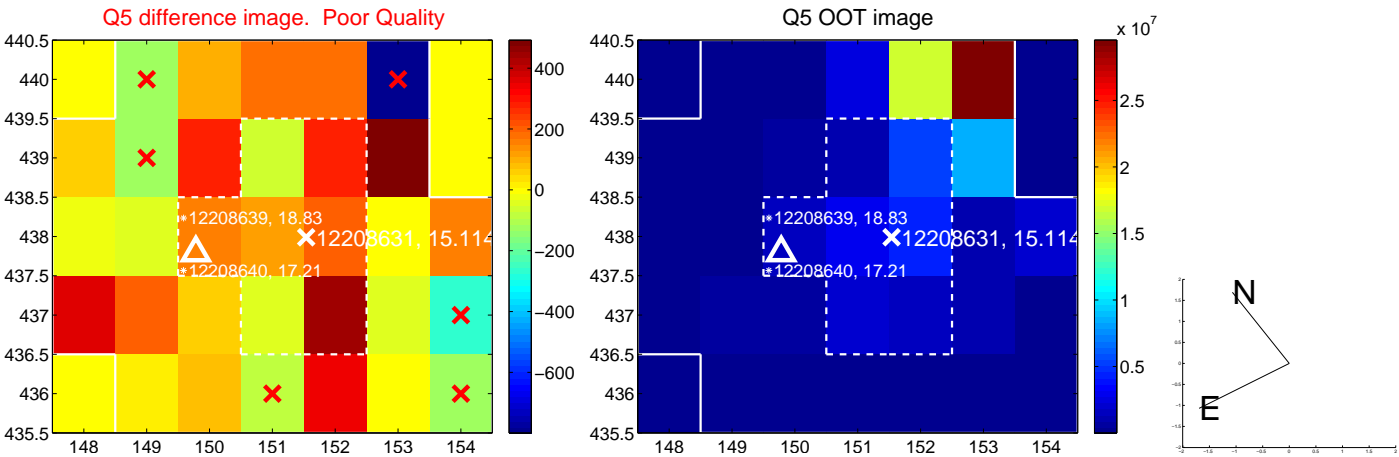


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

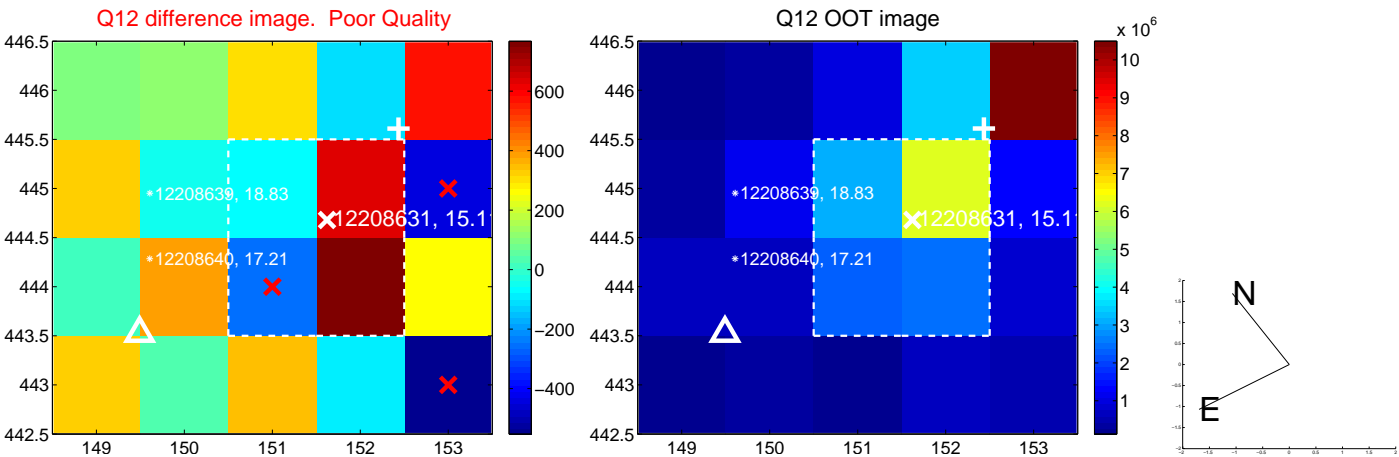
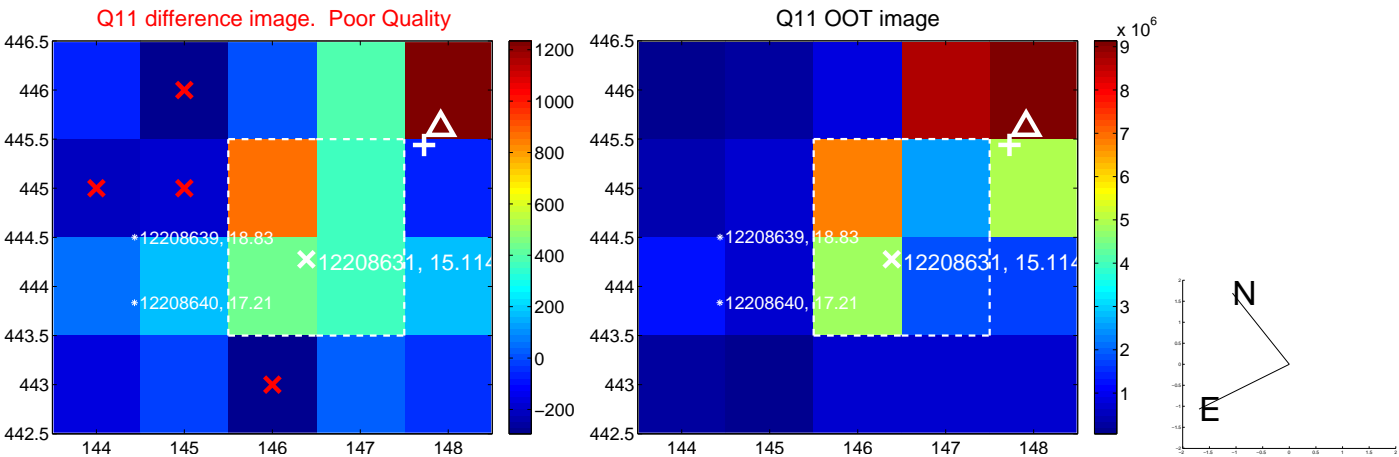
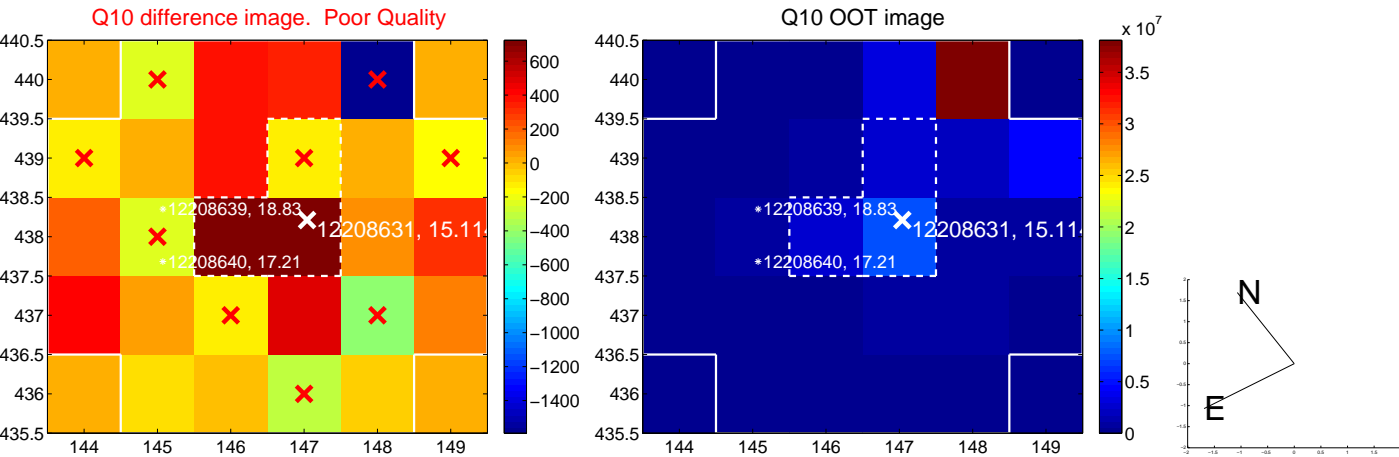
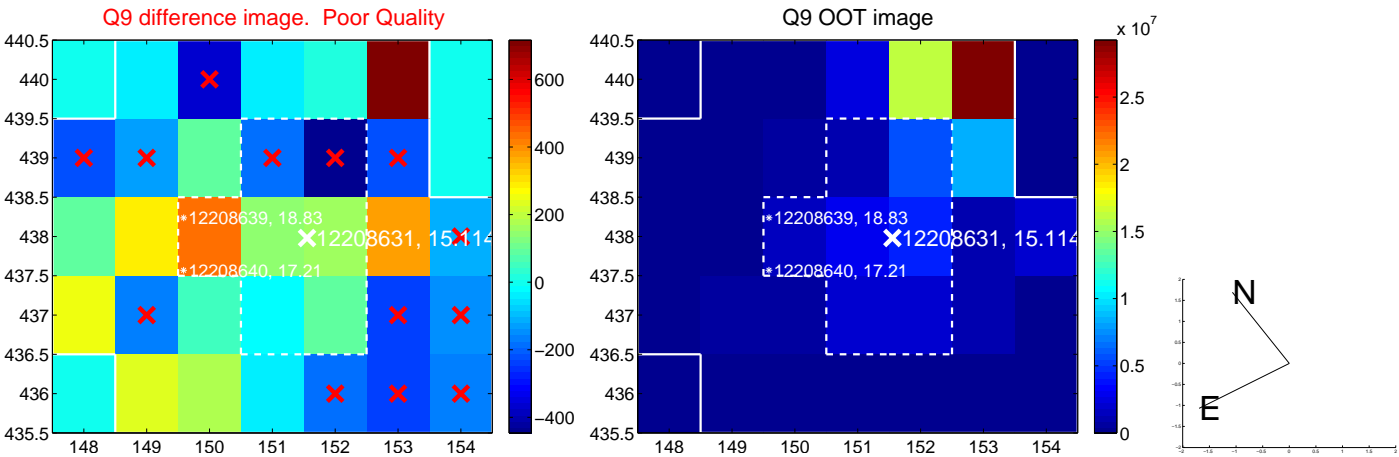
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



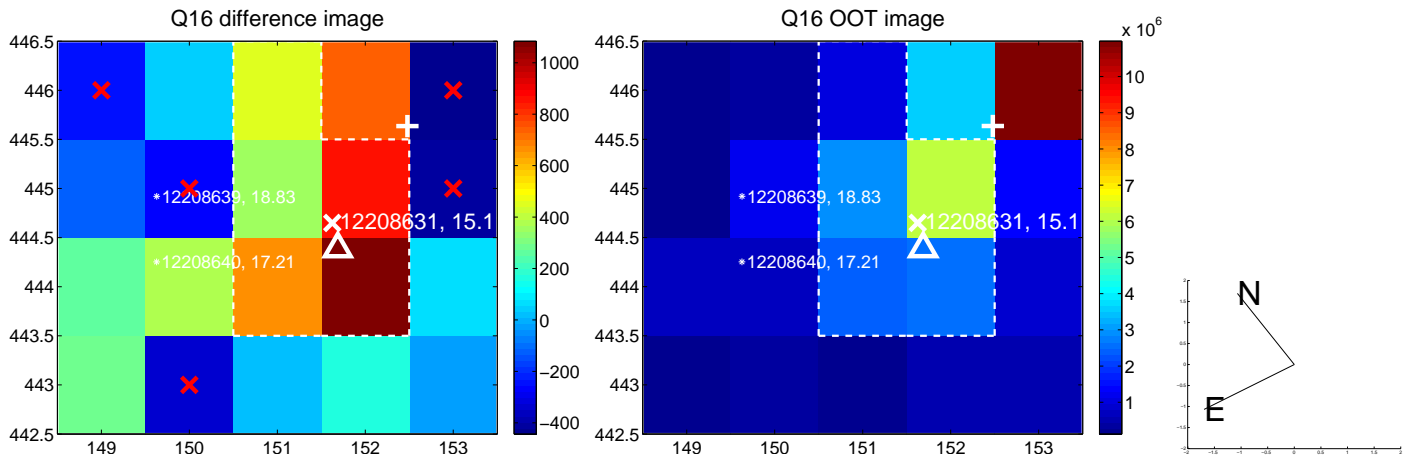
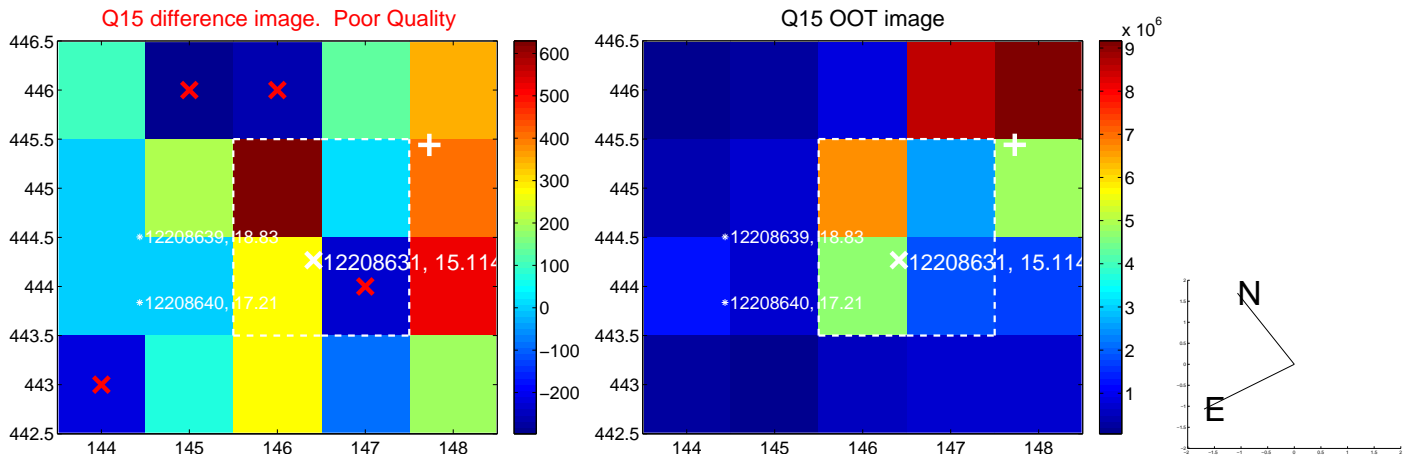
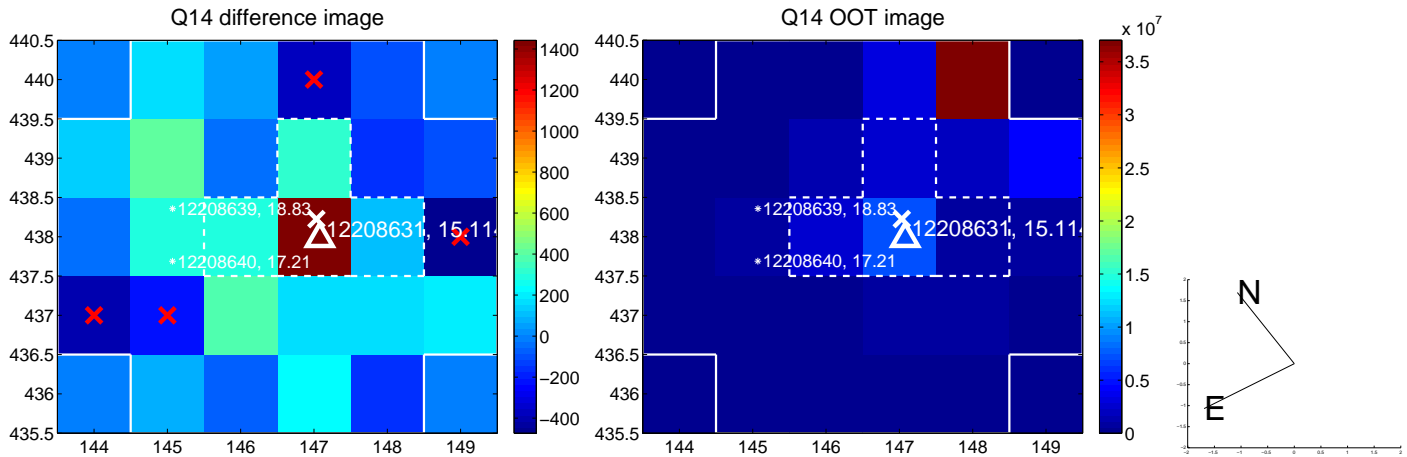
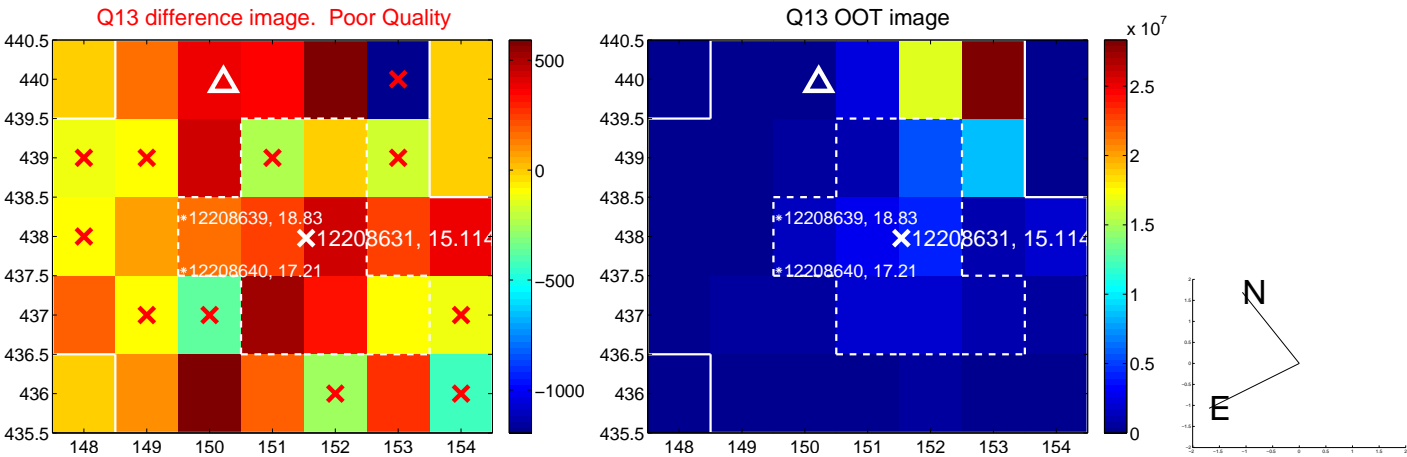
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



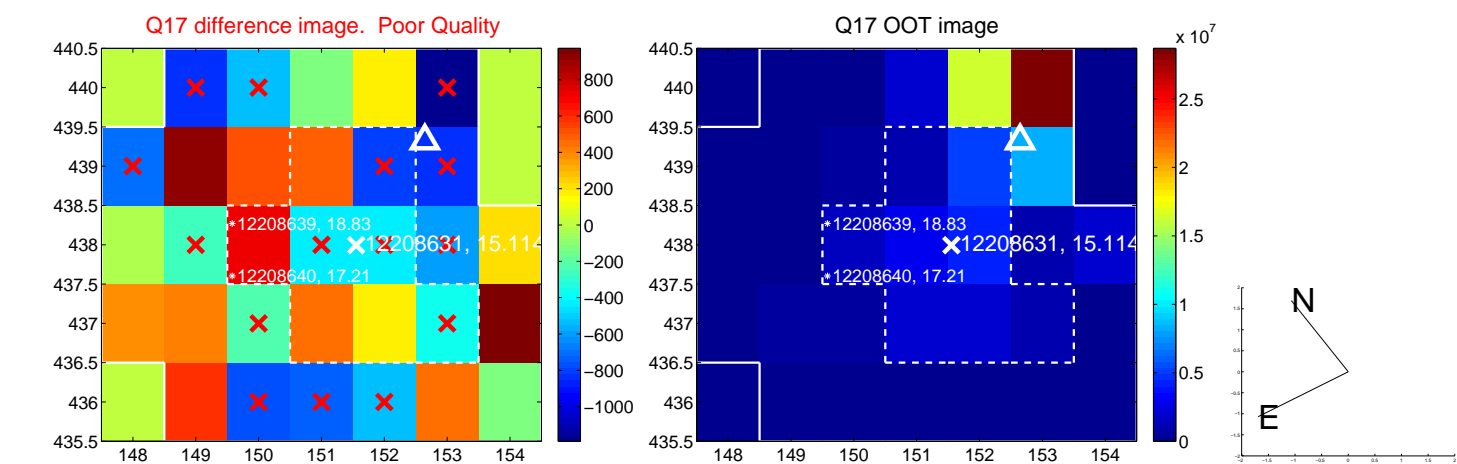
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



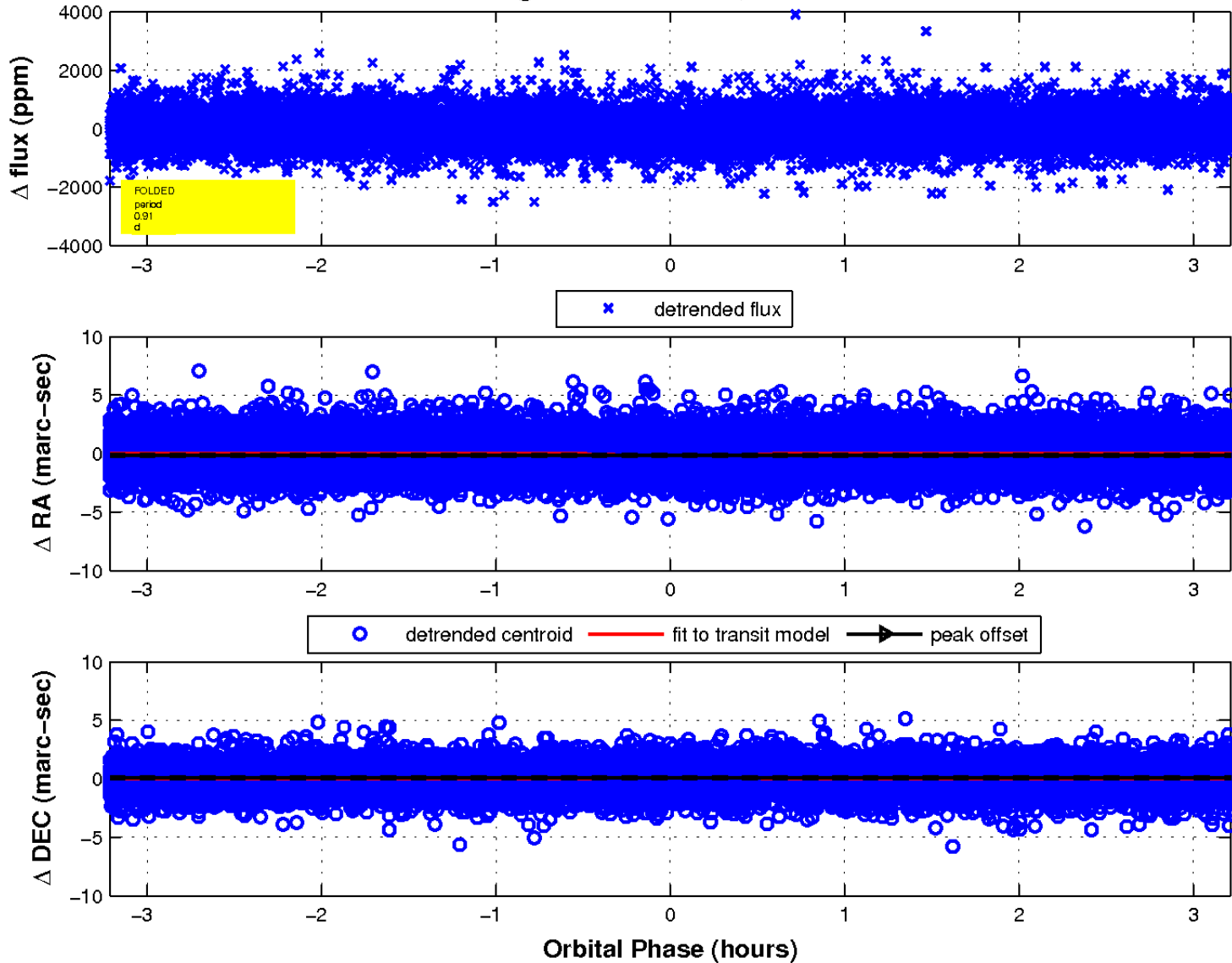
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



fluxWeightedCentroids, Planet 2 of 2





UKIRT Image

Declination

