

# KIC 004138951

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004138951-01	OBS	2866.01	1.291229	131.992081	60.9	1.927	13.1	14.5	1.09	6384	0.98	3004.79
004138951-02	OBS	No	182.495276	295.809946	173.3	14.277	7.9	5.7	1.09	6384	1.57	4.08

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004138951-01	OBS	PC	0.99	0	0	0	0	NO_COMMENT
004138951-02	OBS	FP	0.00	1	0	0	0	LPP_DV—MOD_NONUNIQ_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS

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

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

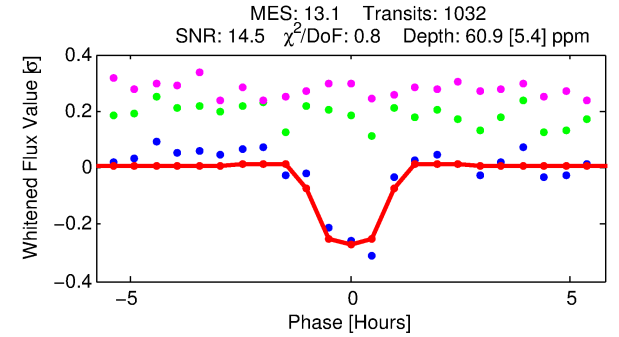
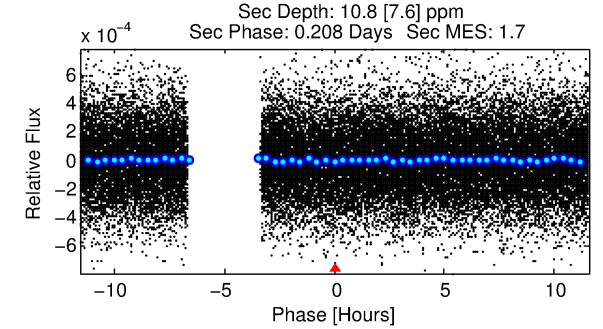
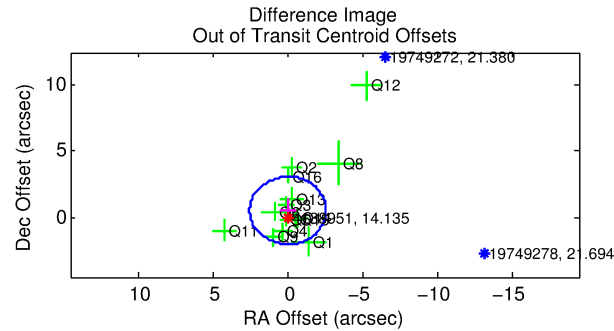
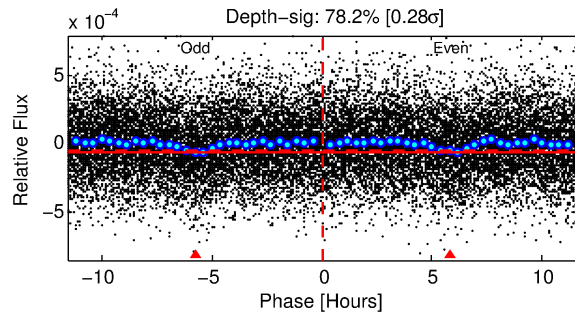
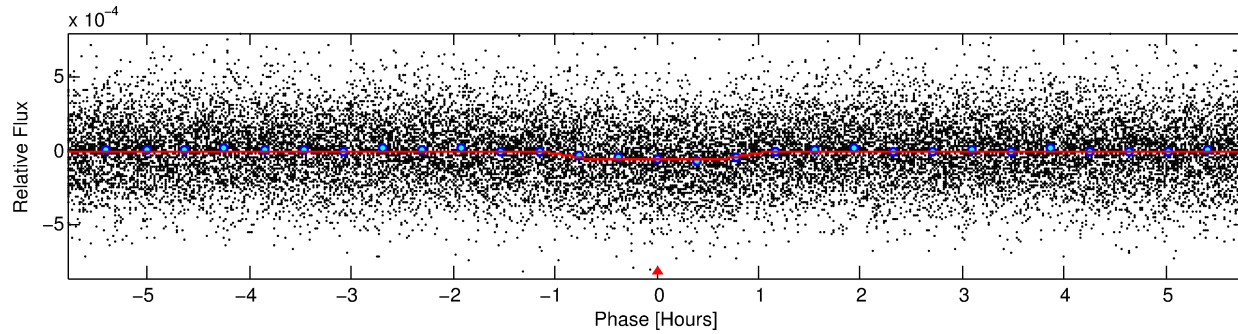
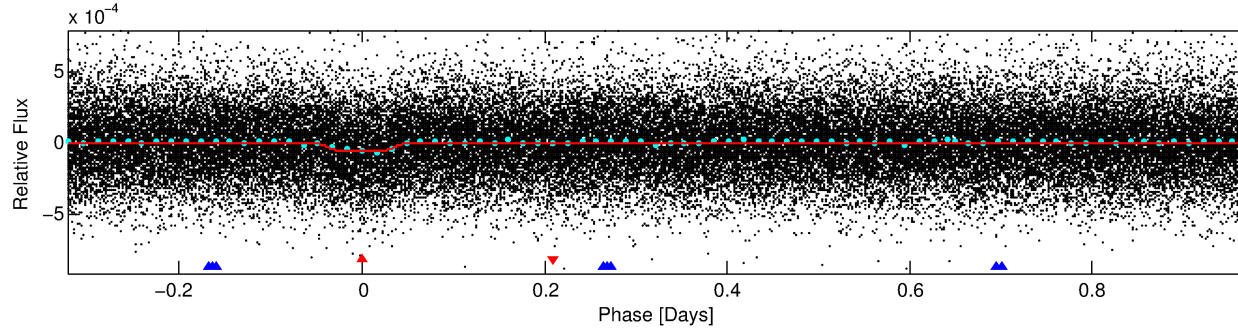
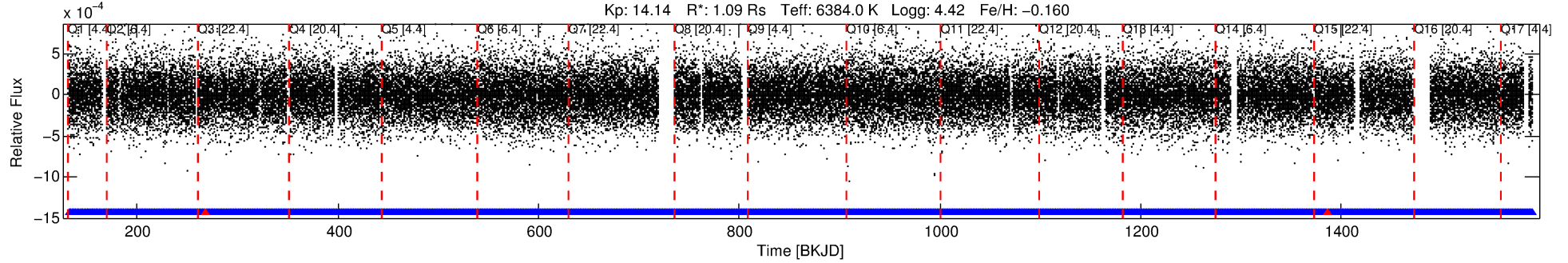
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 004138951-01

No Significant Match Found

# DV One-Page Summary

KIC: 4138951 Candidate: 1 of 2 Period: 1.291 d  
KOI: K02866.01 Corr: 0.982



## DV Fit Results:

Period = 1.29123 [0.00001] d  
Epoch = 131.9921 [0.0019] BKJD  
Rp/R\* = 0.0083 [0.0030]  
a/R\* = 2.61 [4.54]  
b = 0.89 [0.49]  
Seff = 3004.79 [1147.67]  
Teq = 1888 [180] K  
Rp = 0.98 [0.46] Re  
a = 0.0242 [0.0060] AU  
Ag = 3.57 [3.85] [0.67 $\sigma$ ]  
Teffp = 4014 [1024] K [2.04 $\sigma$ ]

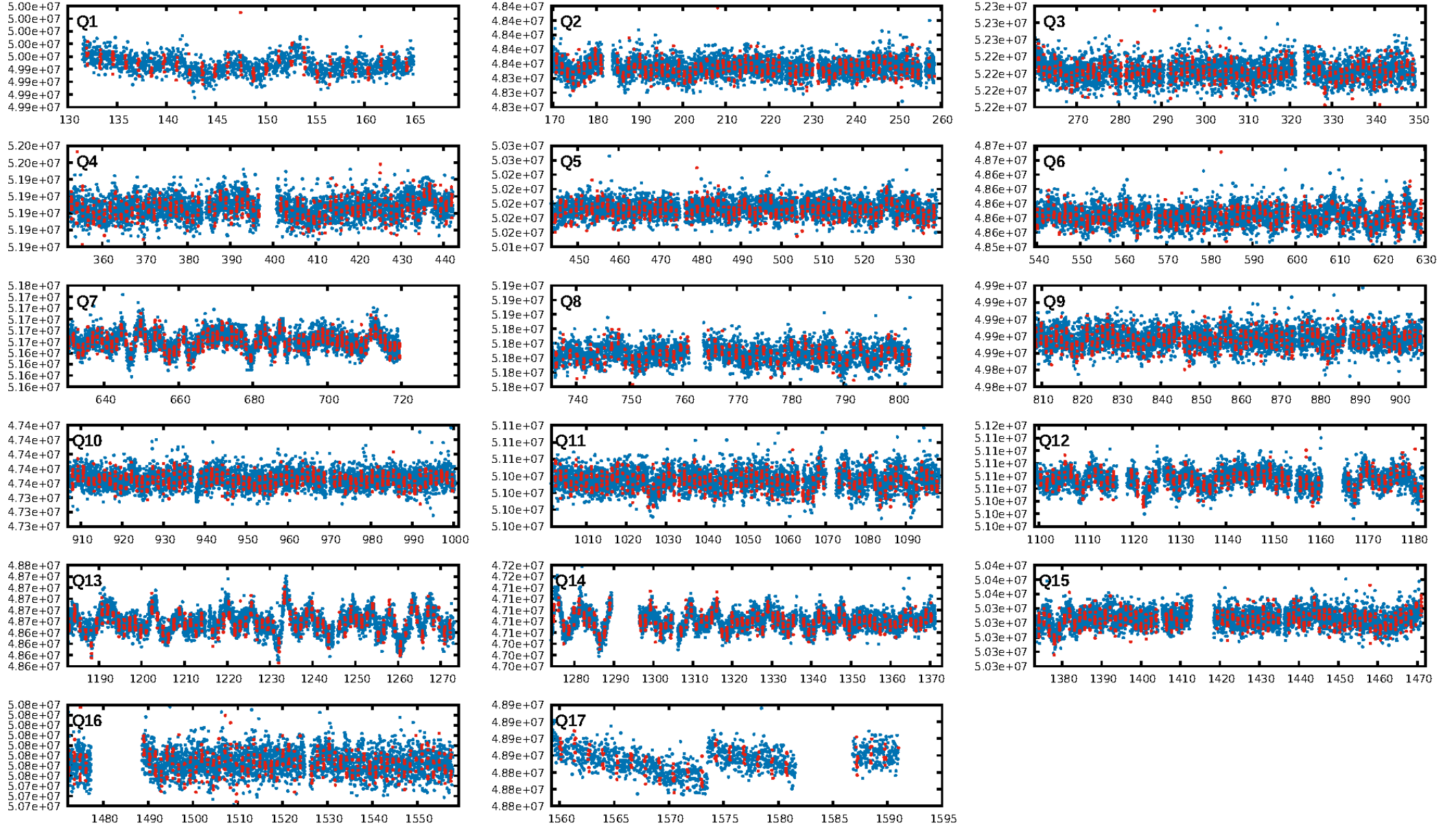
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [301.87 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 1.93e-38  
RollingBand-fgt: 1.00 [984/986]  
GhostDiagnostic-chr: 1.531  
Centroid-sig: 65.6%  
Centroid-so: 0.657 arcsec [0.69 $\sigma$ ]  
OotOffset-rm: 0.531 arcsec [0.62 $\sigma$ ]  
KicOffset-rm: 0.481 arcsec [0.56 $\sigma$ ]  
OotOffset-st: 3/3/4/4 [14]  
KicOffset-st: 3/3/4/4 [14]  
DiffImageQuality-fgm: 0.64 [9/14]  
DiffImageOverlap-fno: 1.00 [17/17]

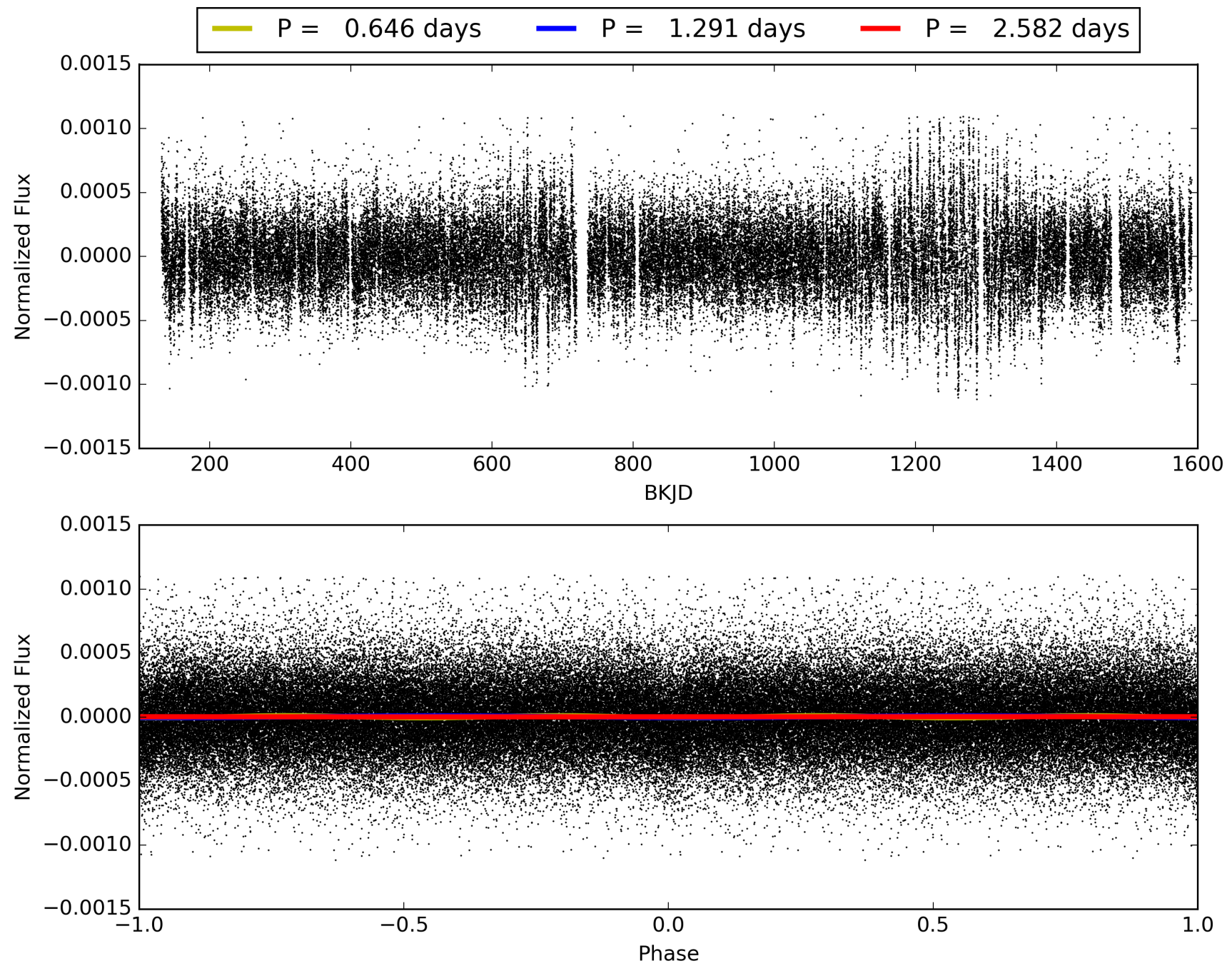
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 03:49:50 Z

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

# TCE 004138951-01, PDC Light Curves



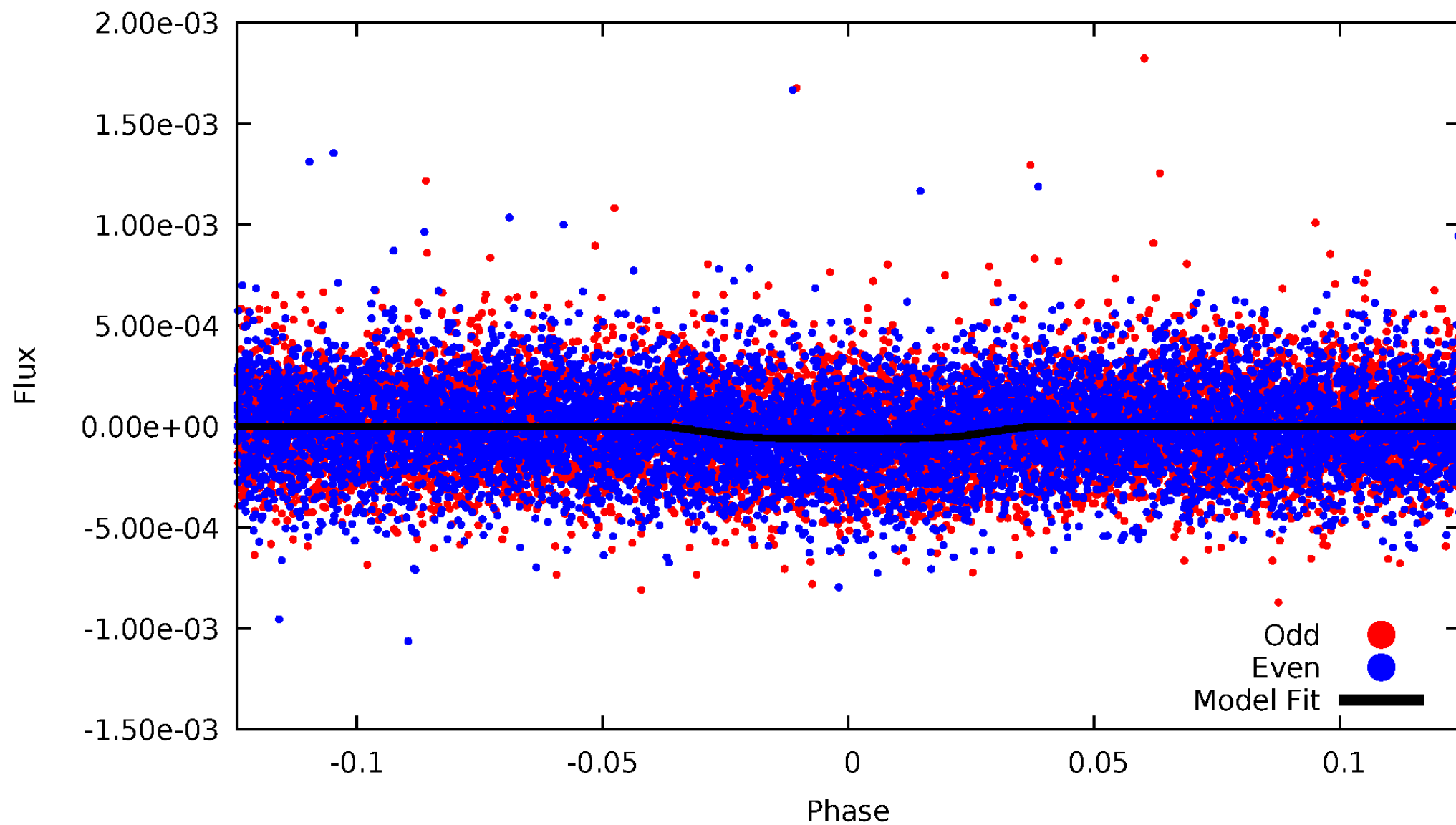
TCE 004138951-01





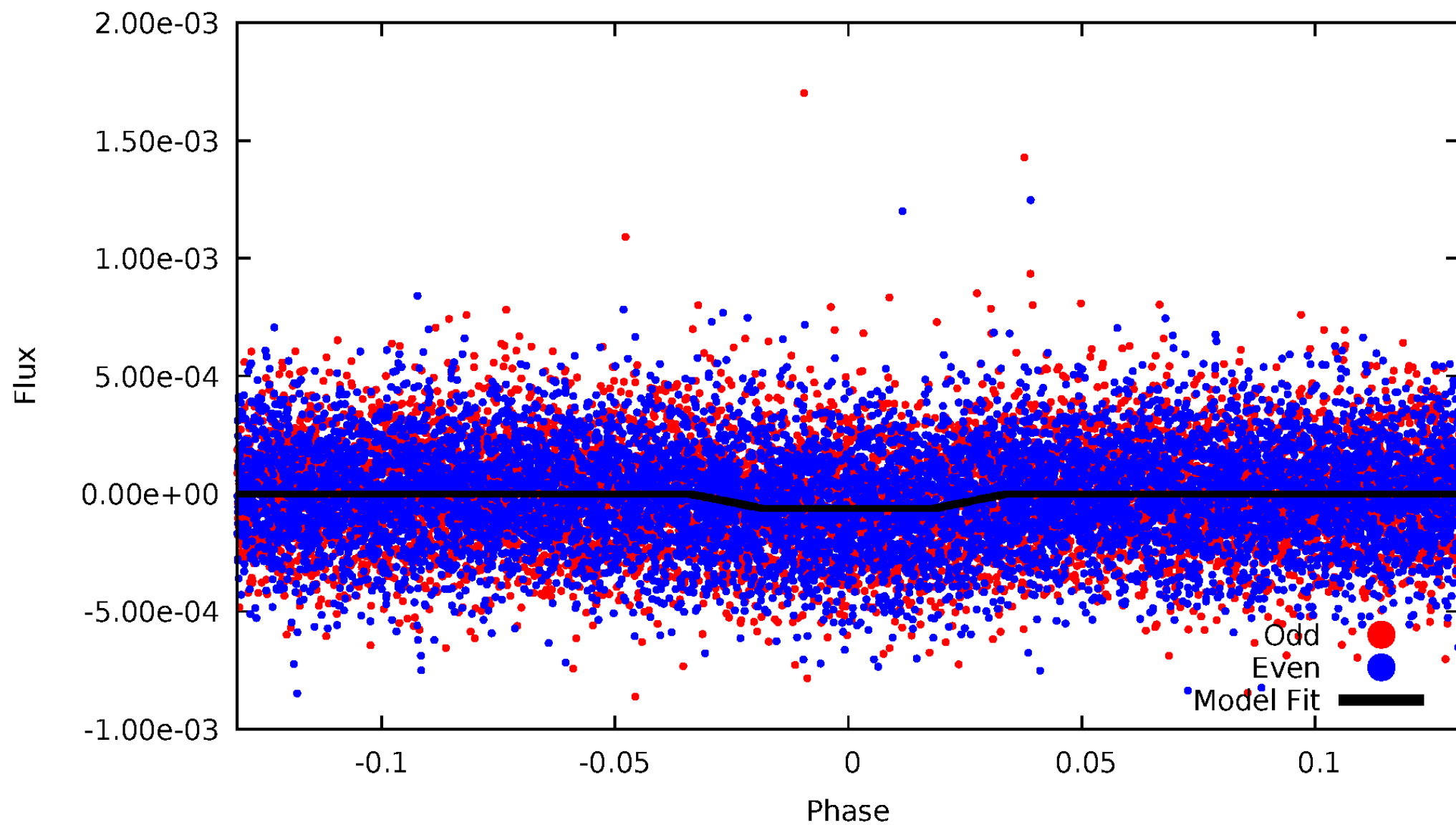
# DV Odd/Even

TCE 004138951-01

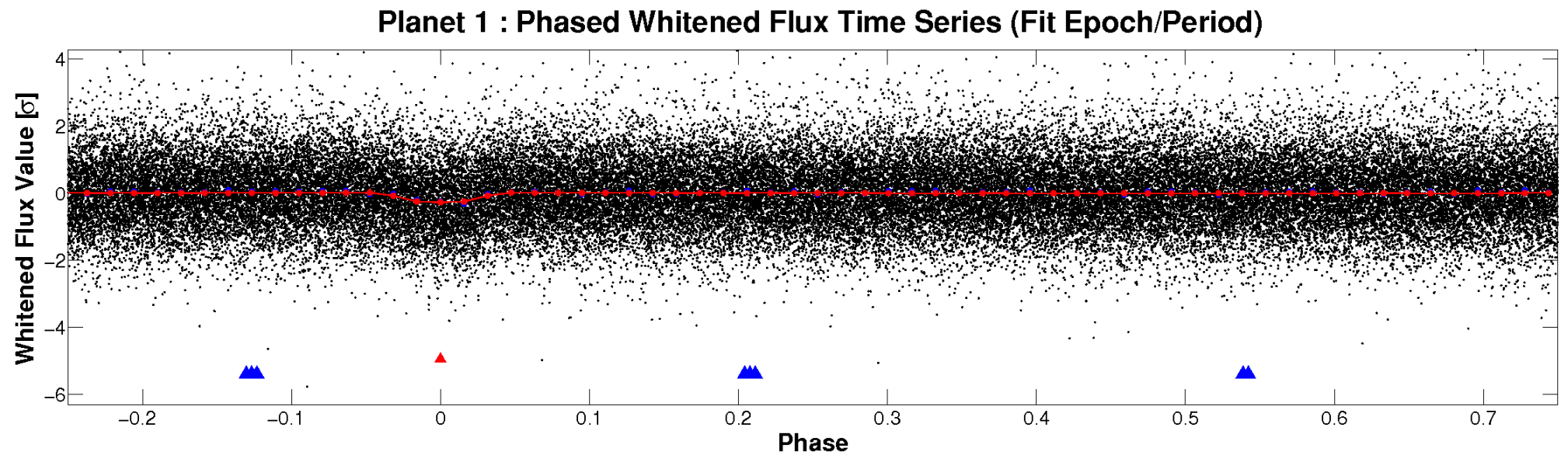
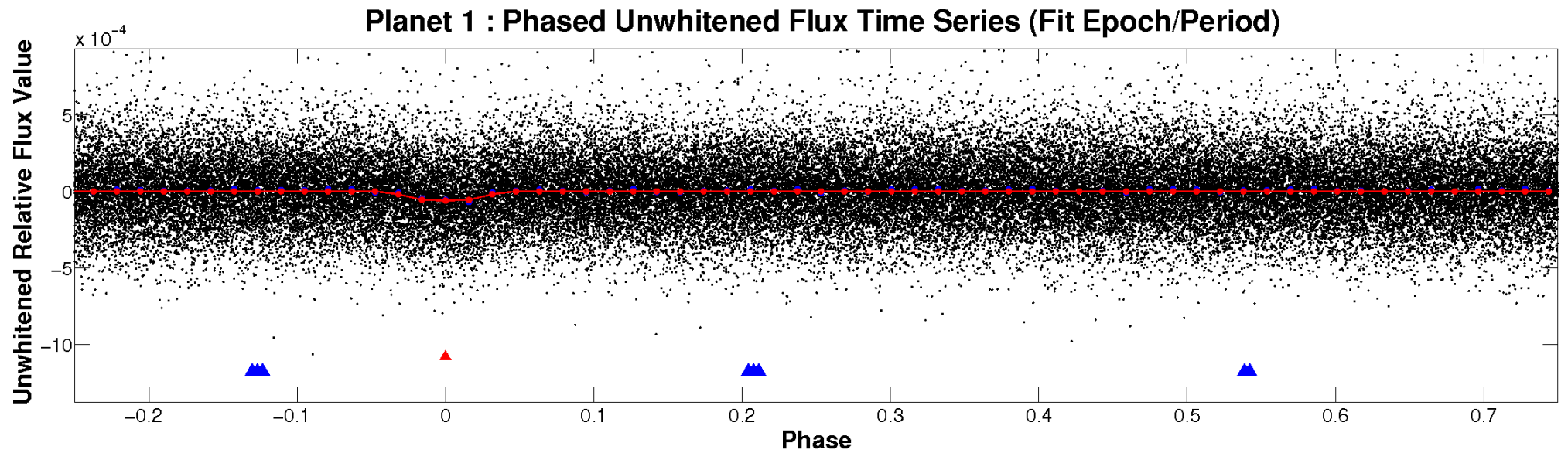


# ALT Odd/Even

TCE 004138951-01

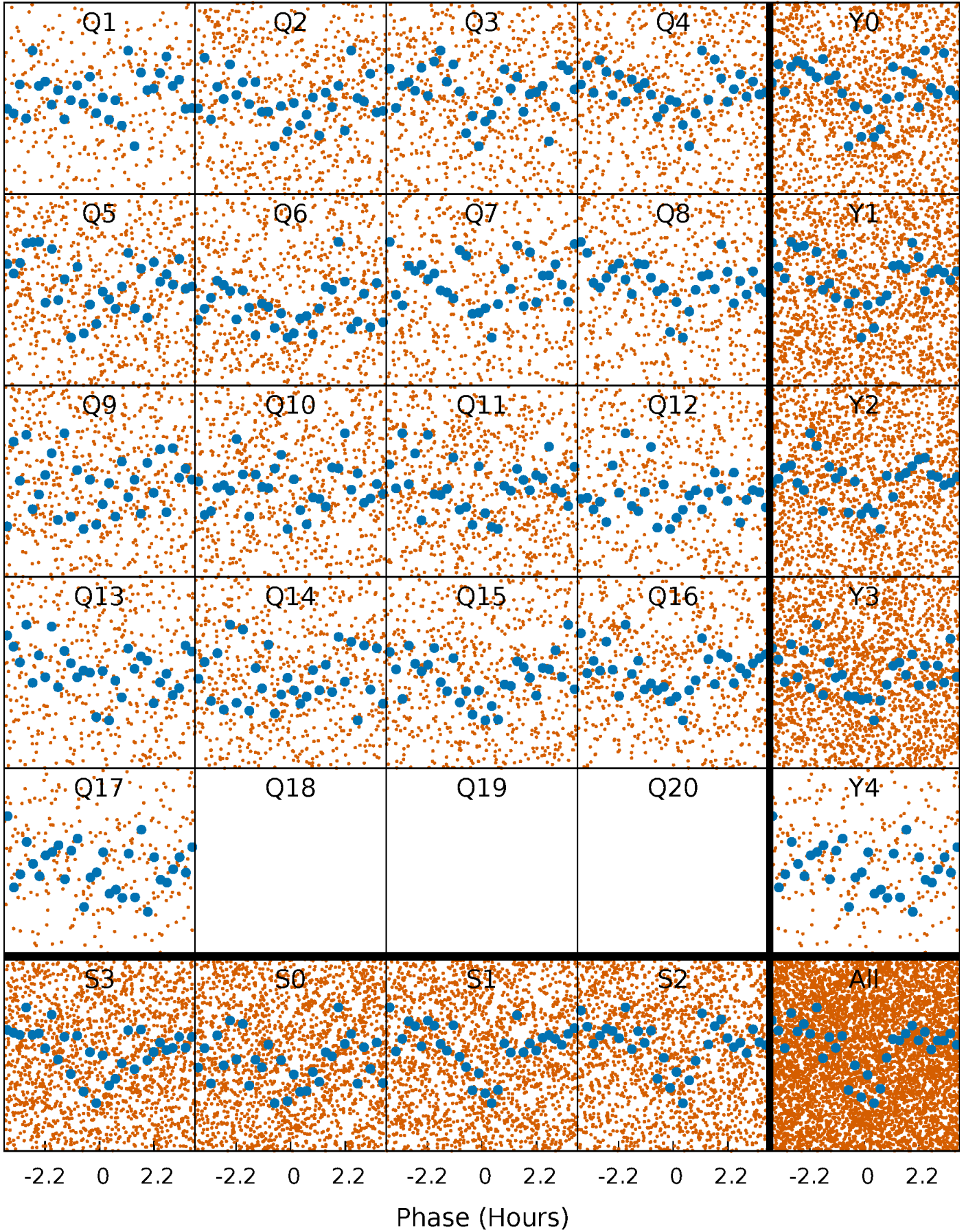


# Non-Whitened Vs. Whitened Light Curve



# PDC Quarter-Phased Transit Curves

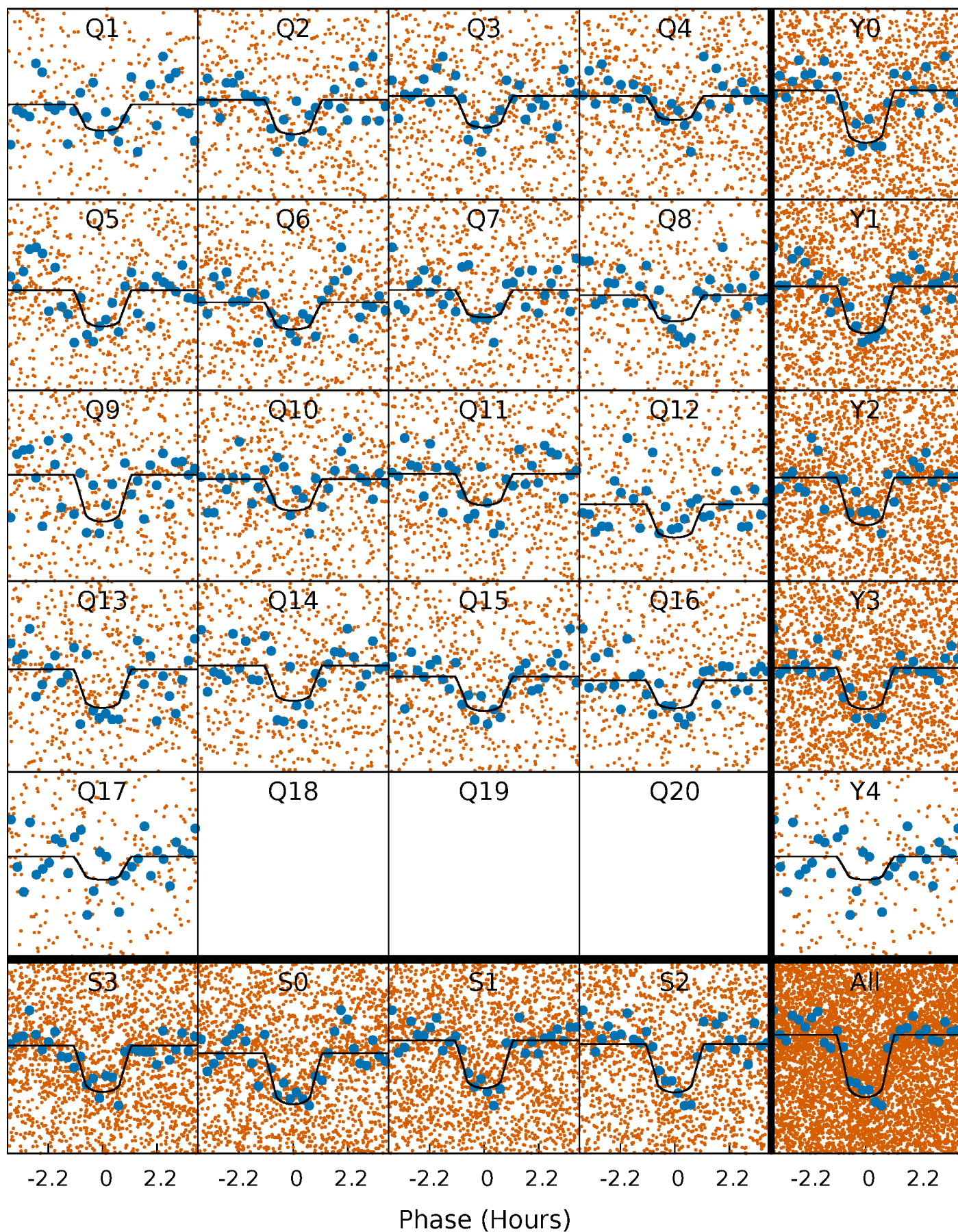
TCE 004138951-01 P= 1.291229 Days  $T_0=131.992081$  (BKJD)





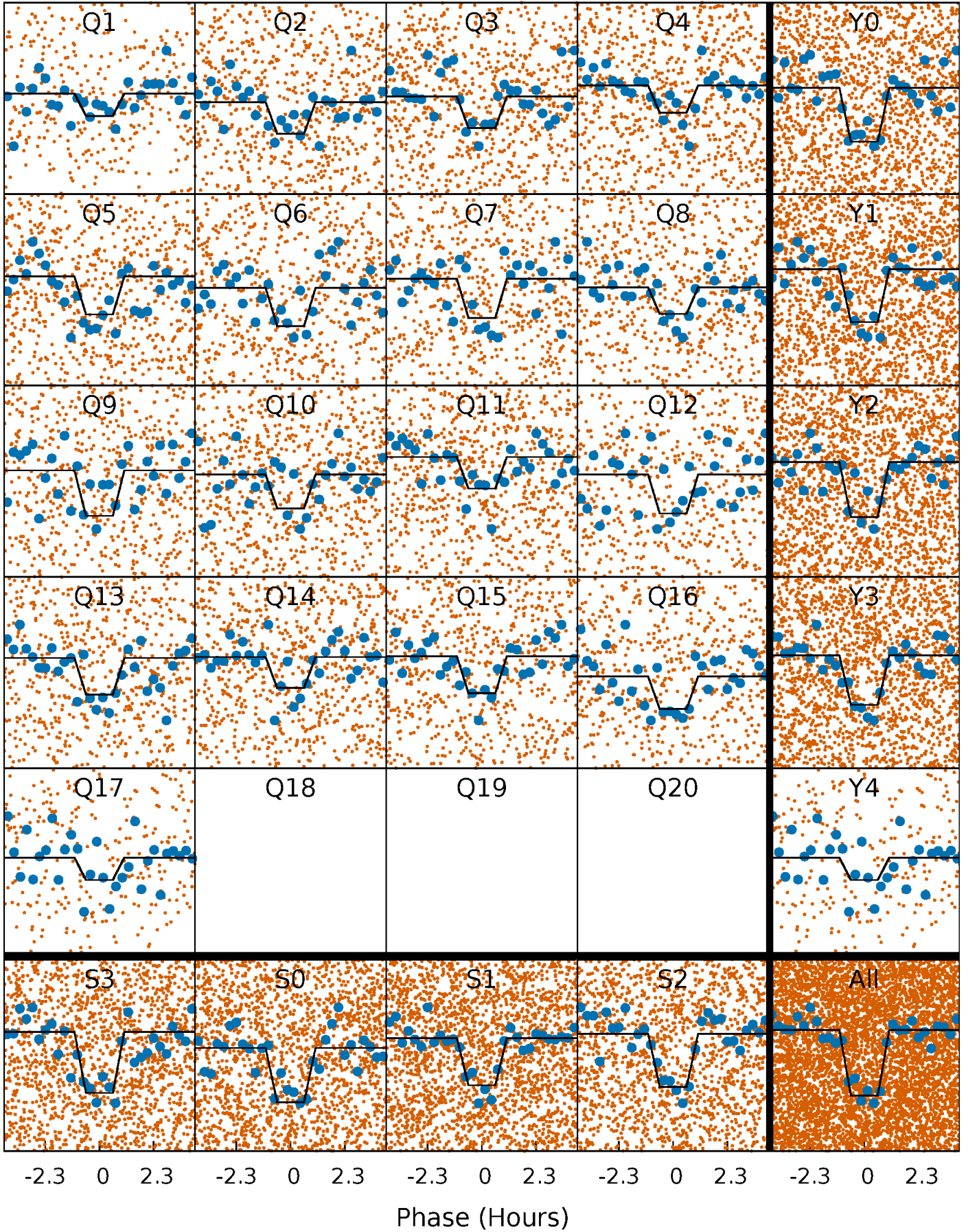
# DV Quarter-Phased Transit Curves

TCE 004138951-01 P= 1.291229 Days  $T_0=131.992081$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

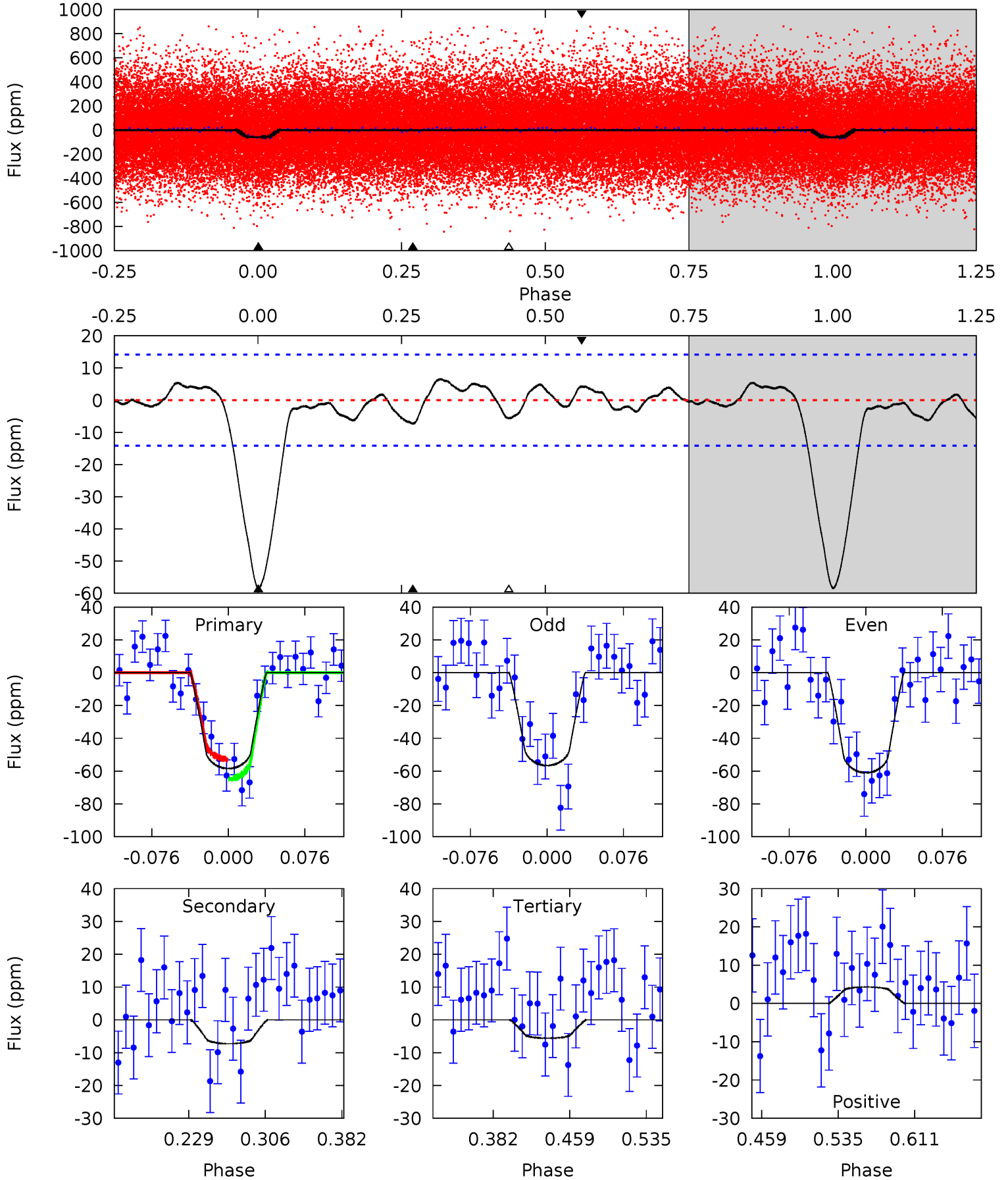
TCE 004138951-01 P= 1.291236 Days  $T_0=131.990350$  (BKJD)



# DV Model-Shift Uniqueness Test

004138951-01, P = 1.291229 Days, E = 130.700852 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
19.1	2.37	1.83	1.40	4.62	1.77	1.00	17.3	17.7	0.54	0.97	0.73	0.99	0.10	1.96

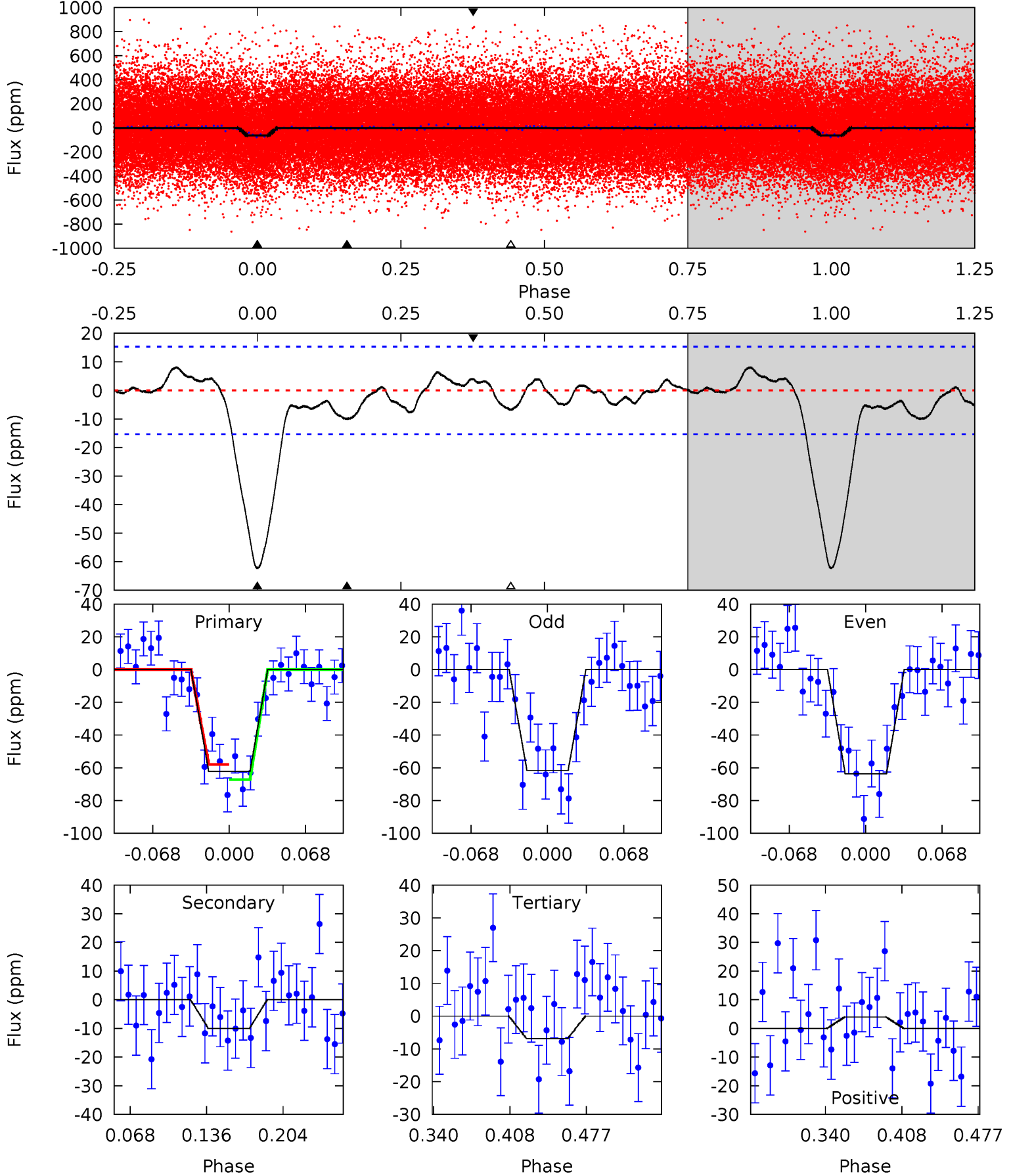




# Alt Model-Shift Uniqueness Test

004138951-01, P = 1.291236 Days, E = 130.699114 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	3.03	2.06	1.21	4.64	1.82	1.10	16.8	17.7	0.96	1.82	0.32	0.97	0.11	1.41





### Stellar Parameters For KIC 004138951

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6384^{+153}_{-192}$	$4.419^{+0.062}_{-0.200}$	$-0.160^{+0.250}_{-0.300}$	$1.086^{+0.314}_{-0.134}$	$1.129^{+0.150}_{-0.150}$	$1.240^{+0.341}_{-0.644}$
	+2%/-3%	+1%/-5%	+156%/-188%	+29%/-12%	+13%/-13%	+28%/-52%
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 004138951-01 / KOI 2866.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-7\pm3$	$1.04^{+0.45}_{-0.43}$	$2699^{+175}_{-137}$	$3814^{+950}_{-605}$	$2.073^{+4.184}_{-1.209}$
Alt.	$-10\pm3$	$1.00^{+0.41}_{-0.40}$	$2685^{+175}_{-127}$	$4153^{+1045}_{-619}$	$3.178^{+5.636}_{-1.733}$

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

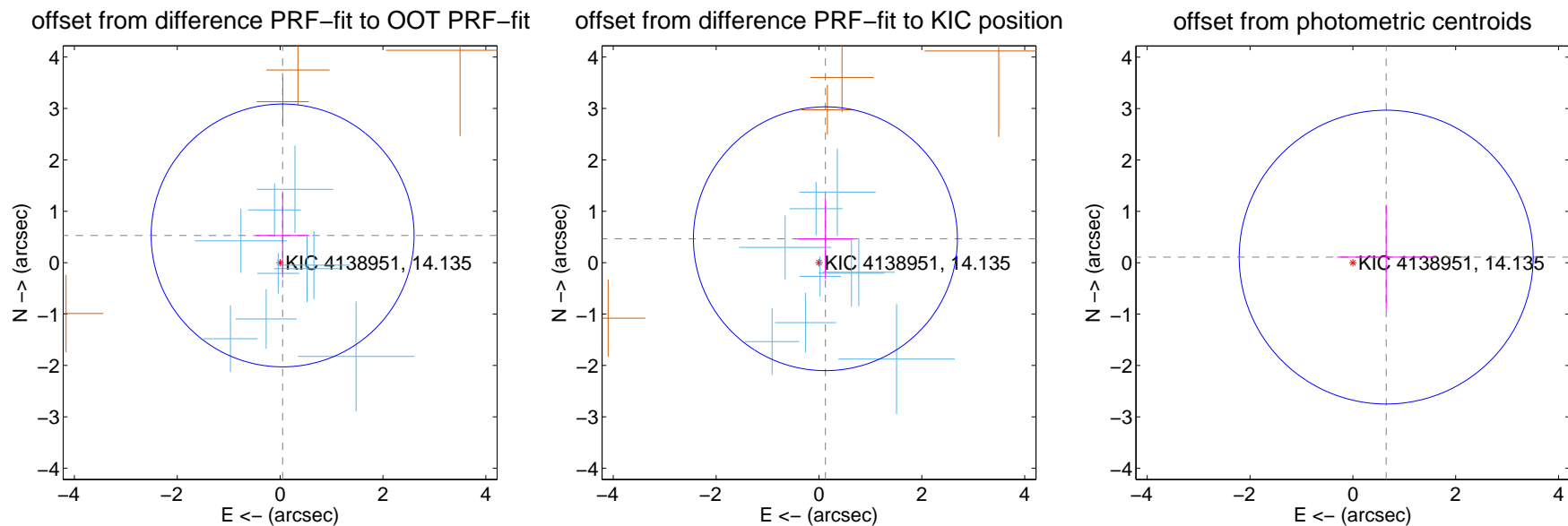
## DV Centroid Data

Supplemental centroid analysis for 004138951-01. Kepler magnitude: 14.13. Transit SNR 14.50

There are 9 quarters with good PRF difference image offsets

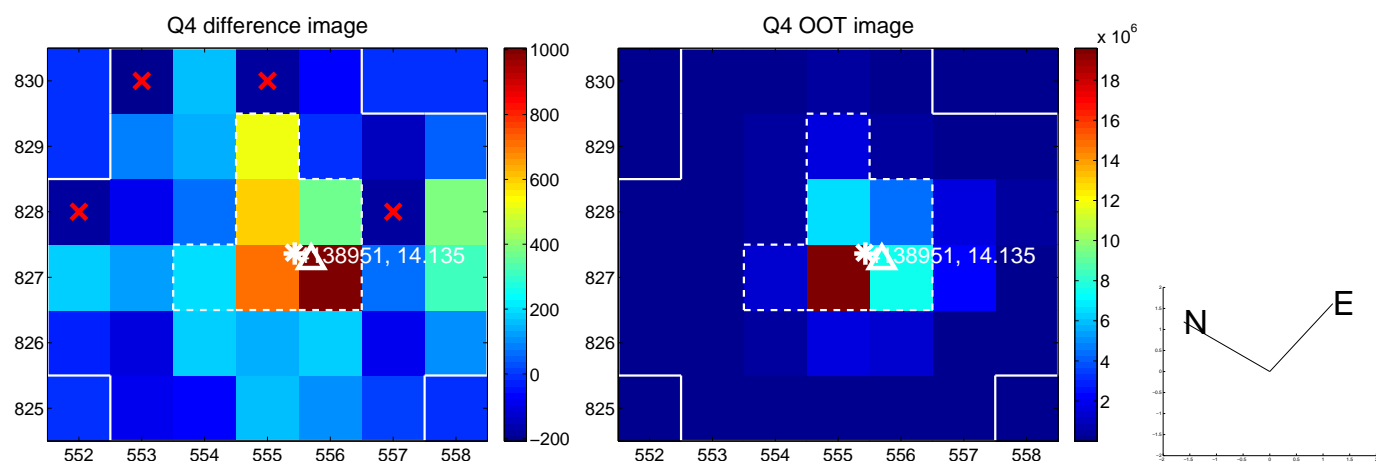
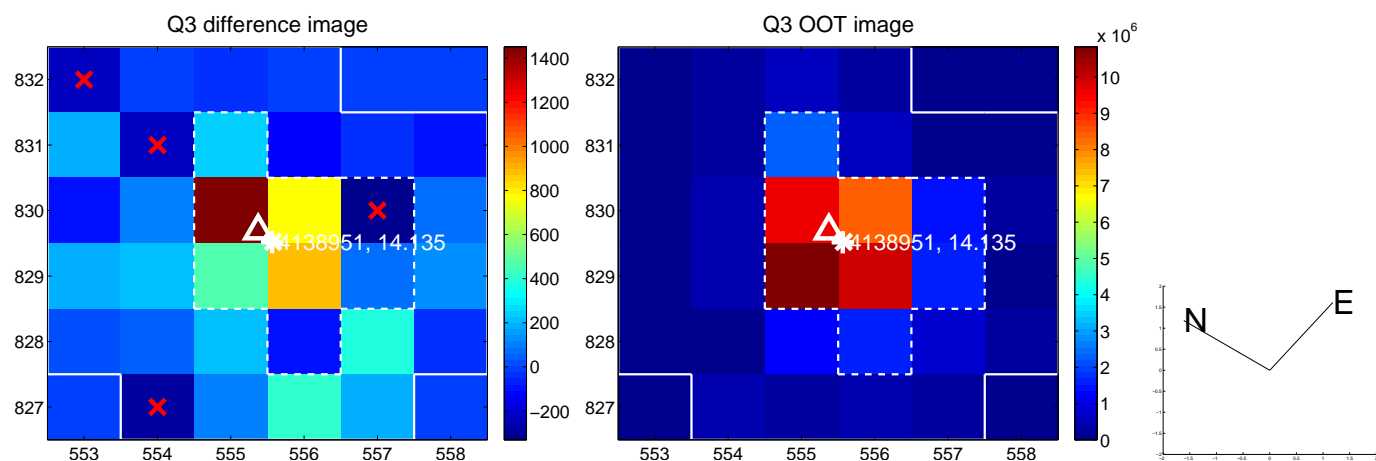
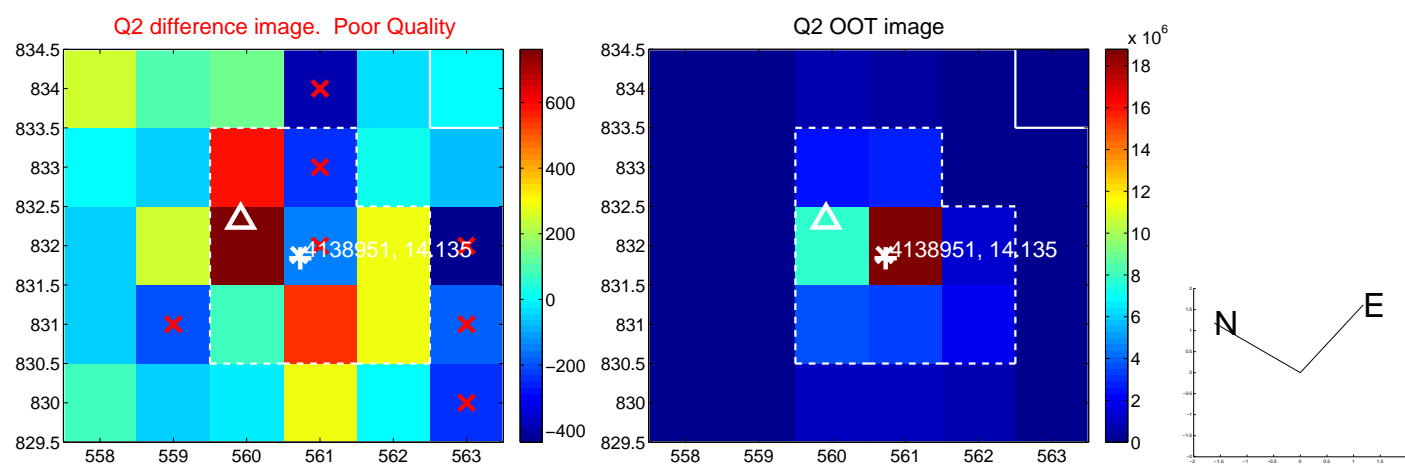
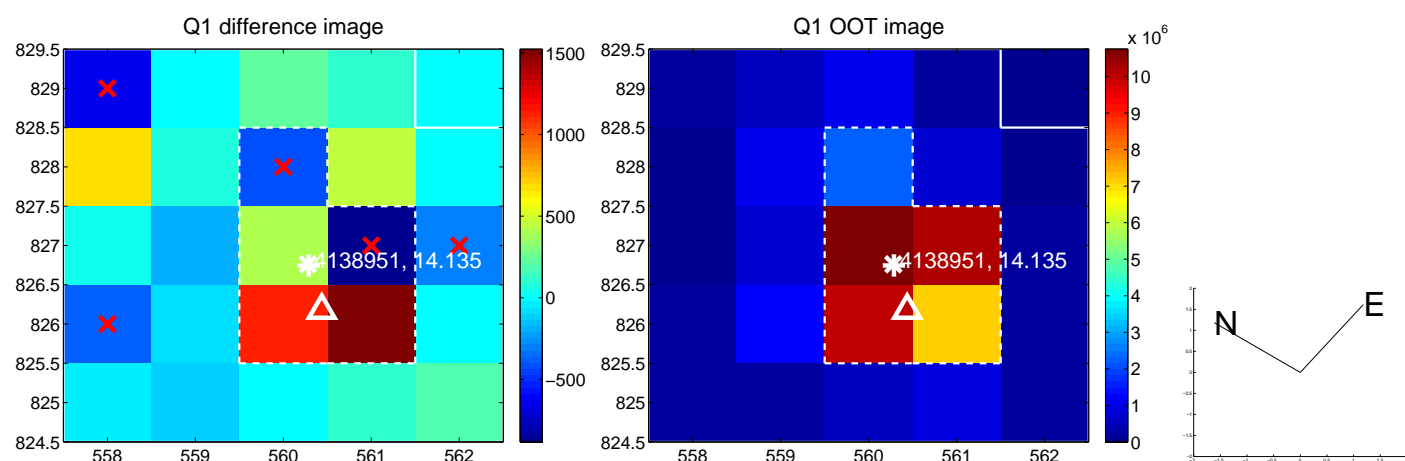
The direct PRF centroid is offset from the target star catalog position by about 0.19 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.531 \pm 0.852$	0.62	$-0.049 \pm 0.519$	$0.529 \pm 0.820$
PRF-fit source offset from KIC position	$0.481 \pm 0.855$	0.56	$-0.125 \pm 0.540$	$0.465 \pm 0.778$
photometric centroid source offset	$0.66 \pm 0.95$	0.69	$-0.65 \pm 0.95$	$0.11 \pm 1.02$

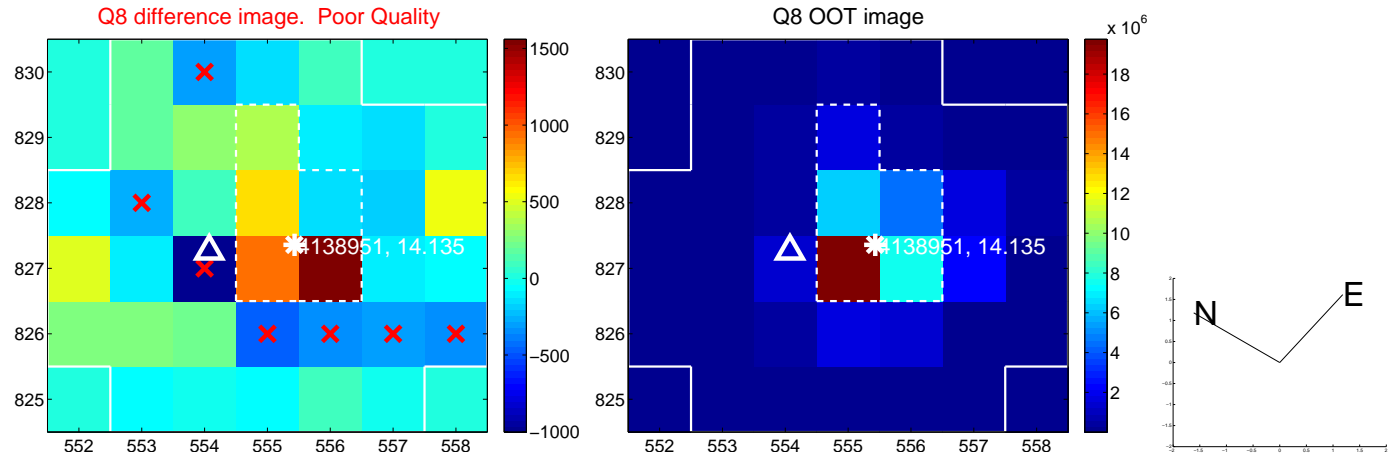
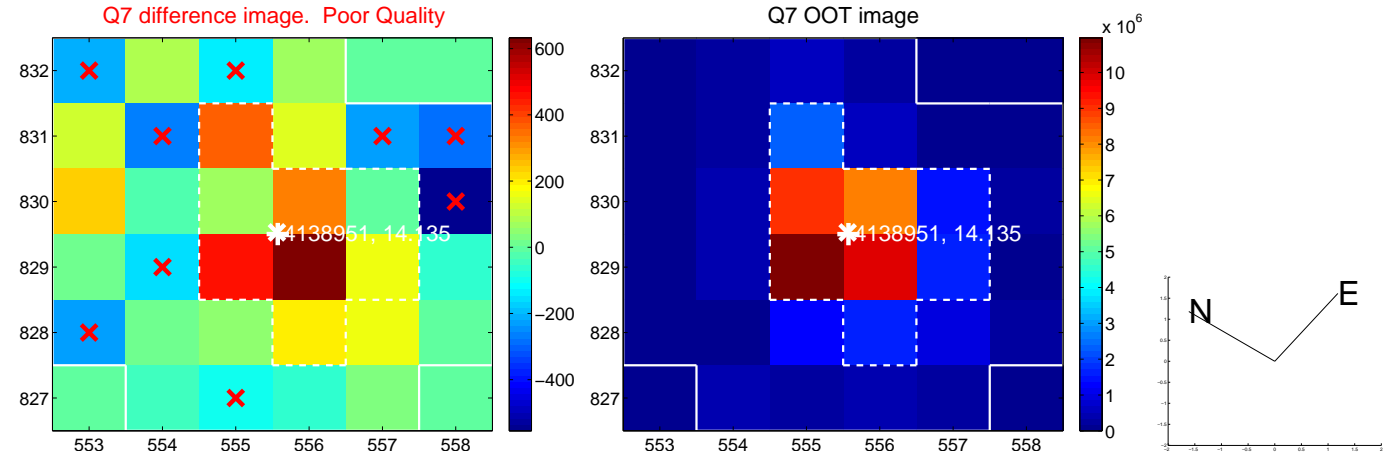
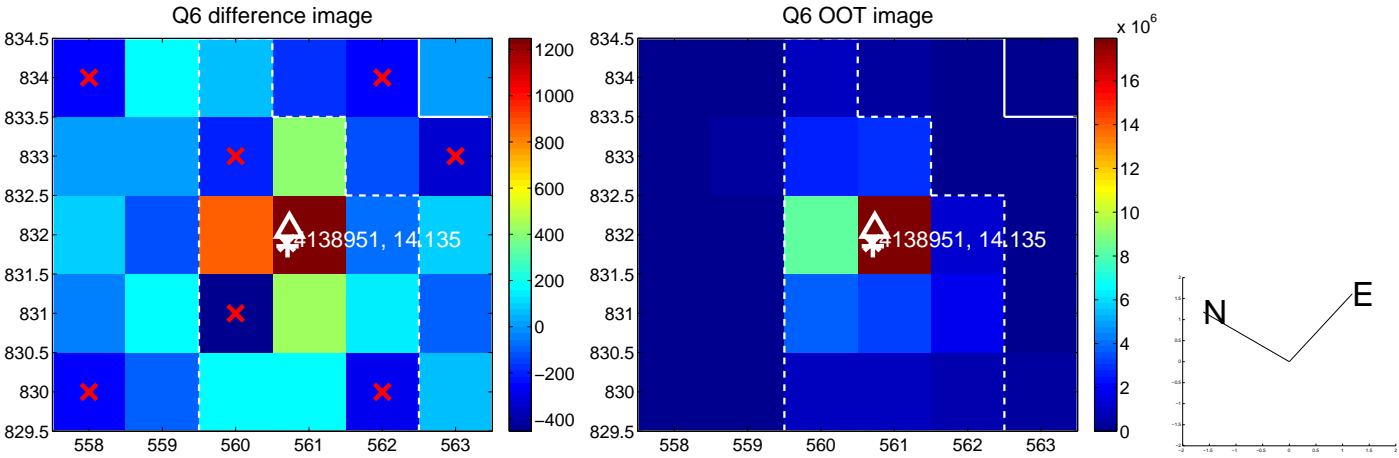
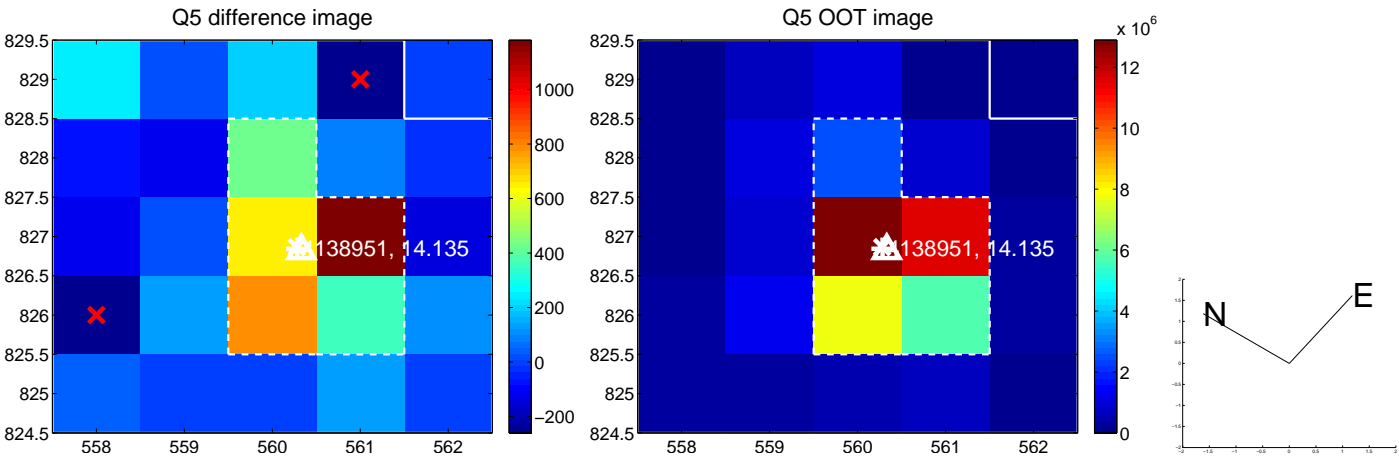


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

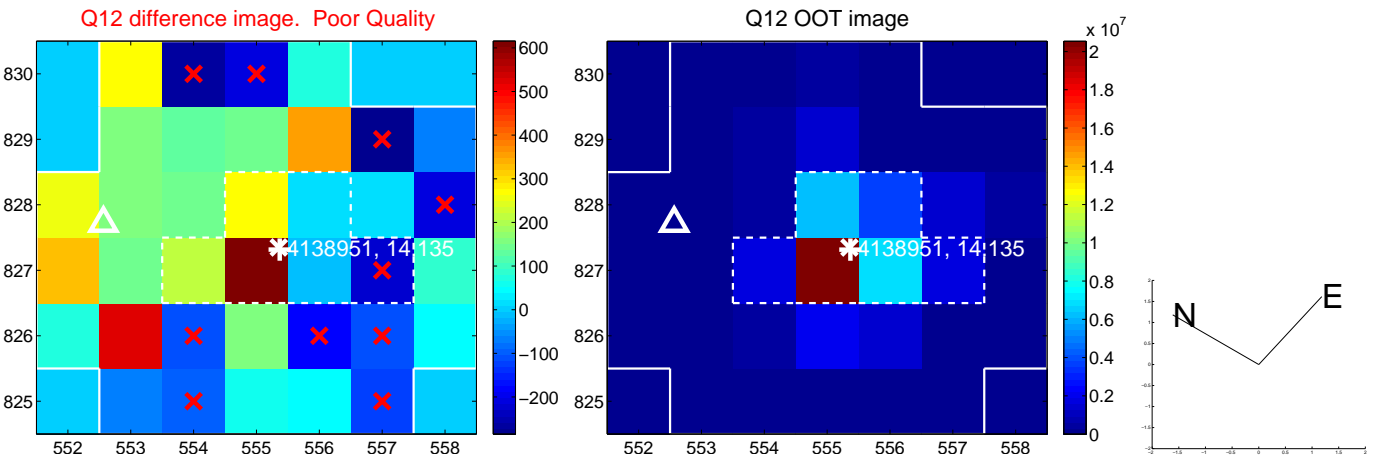
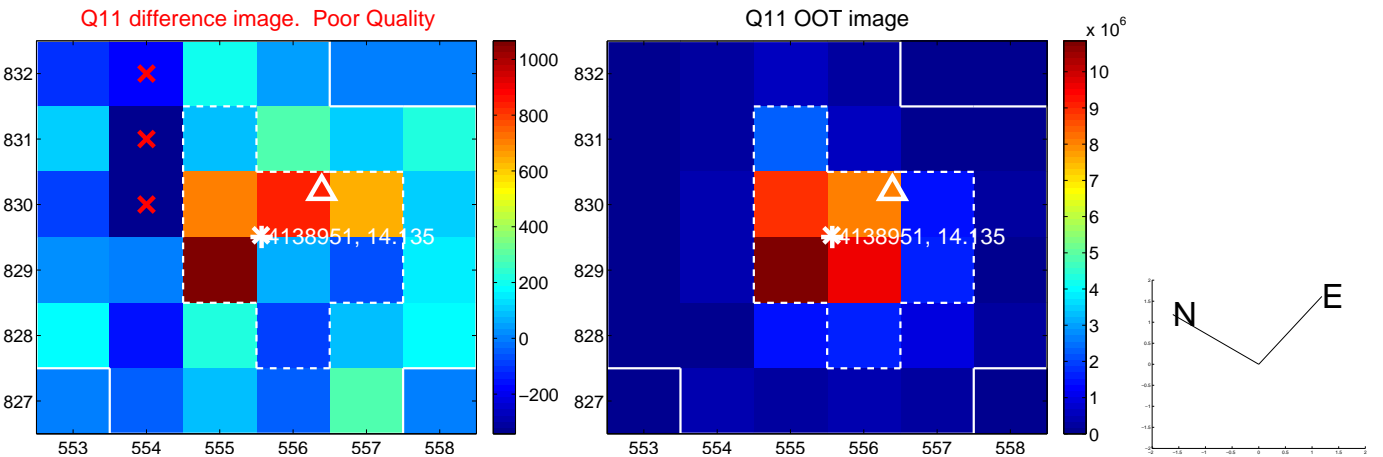
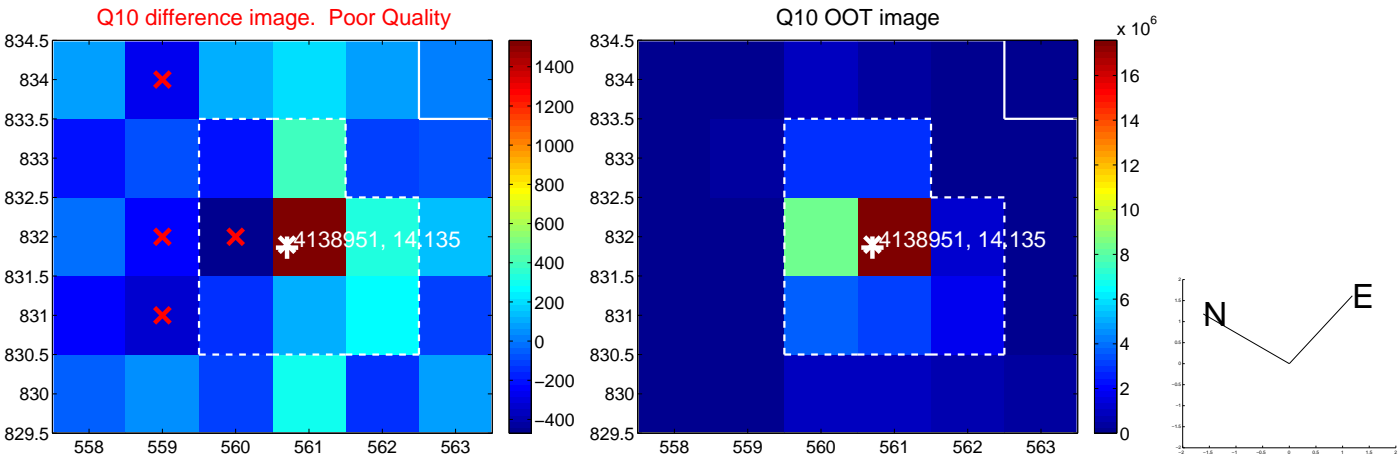
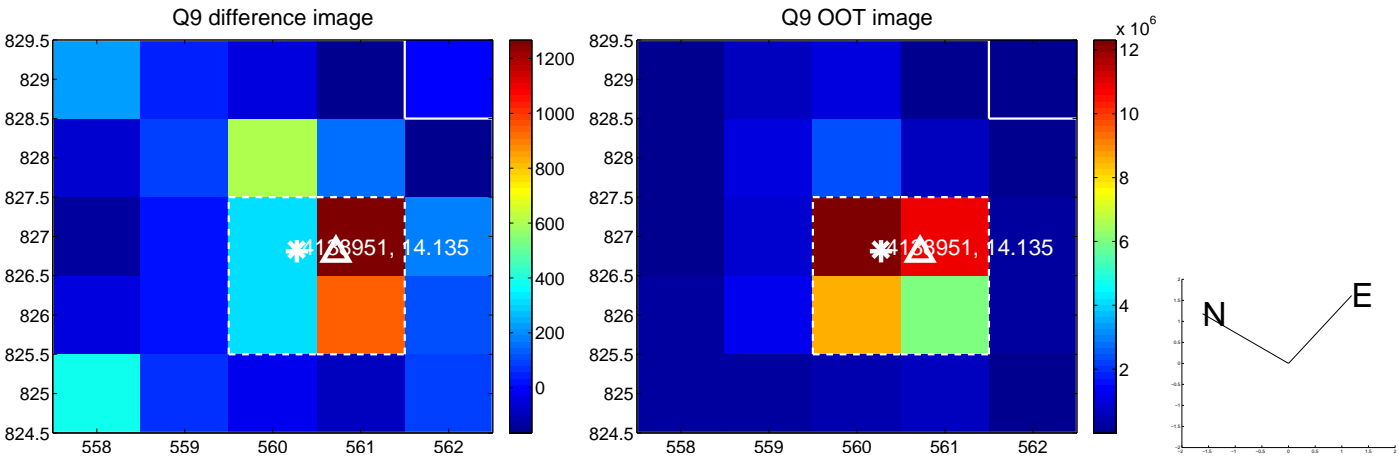


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

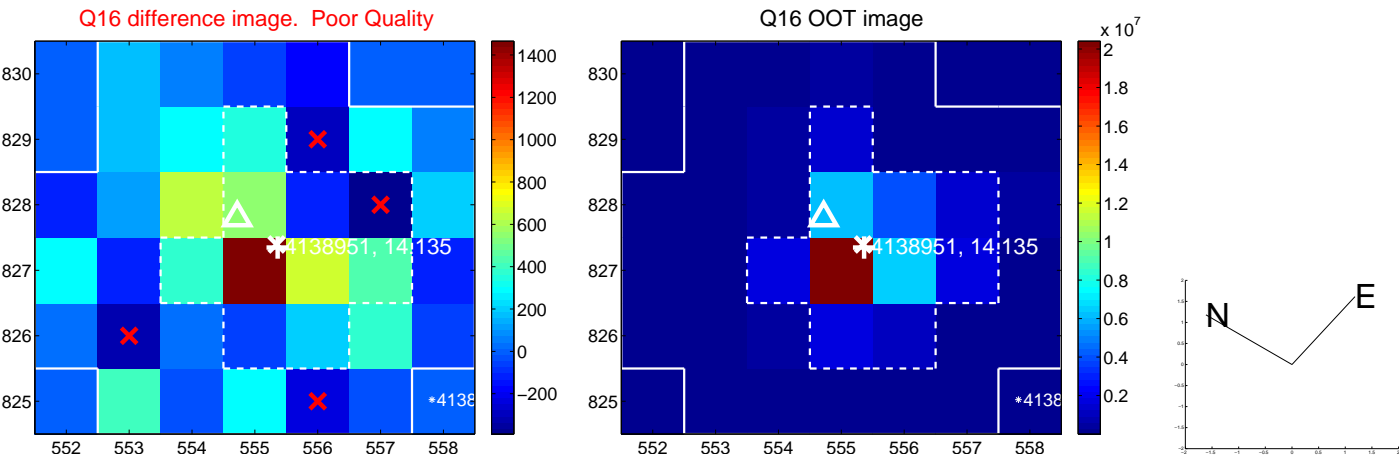
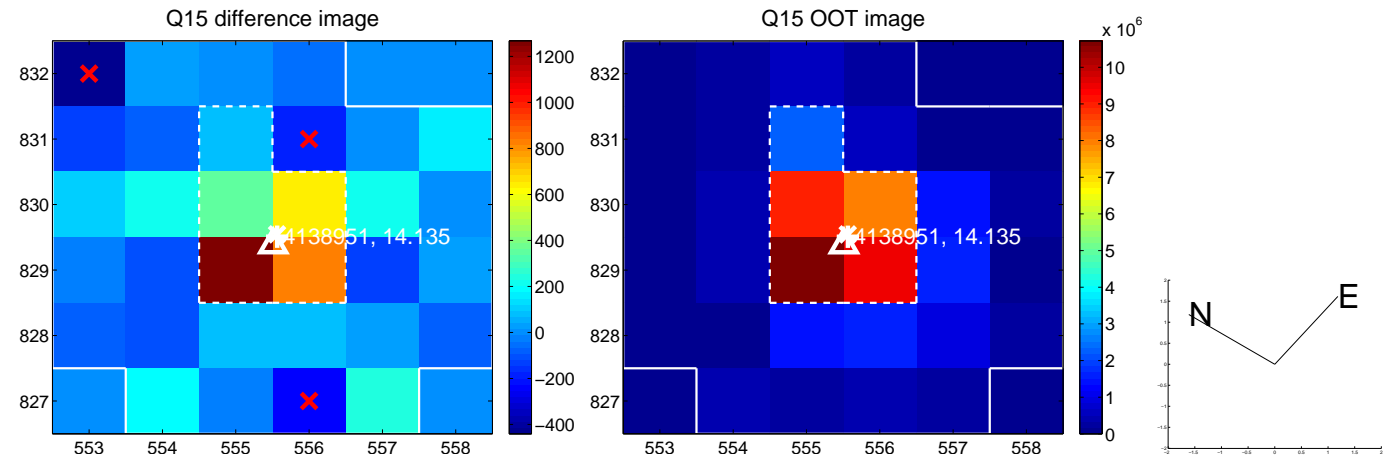
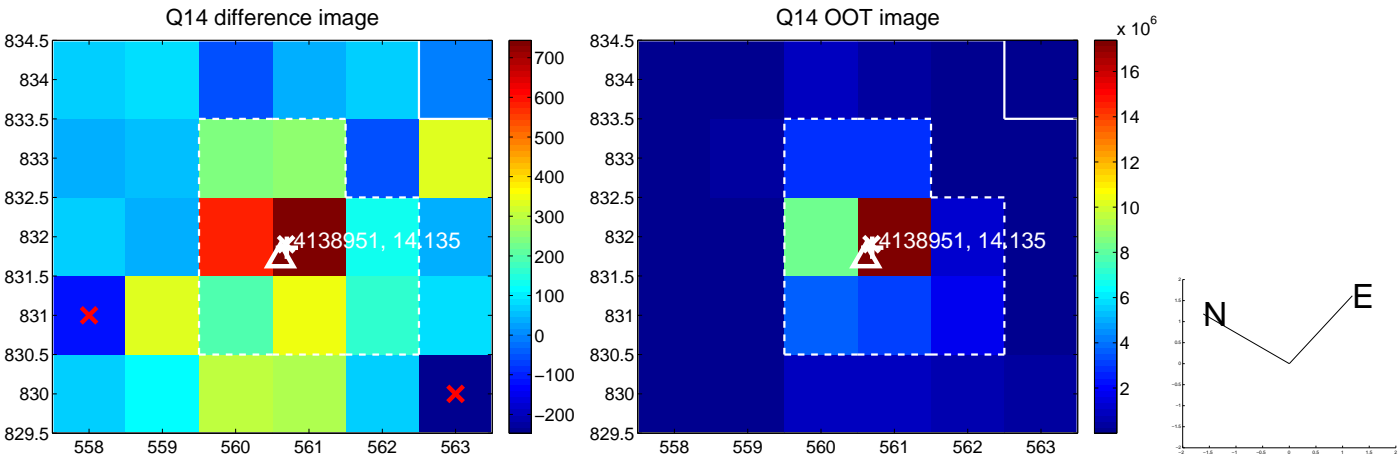
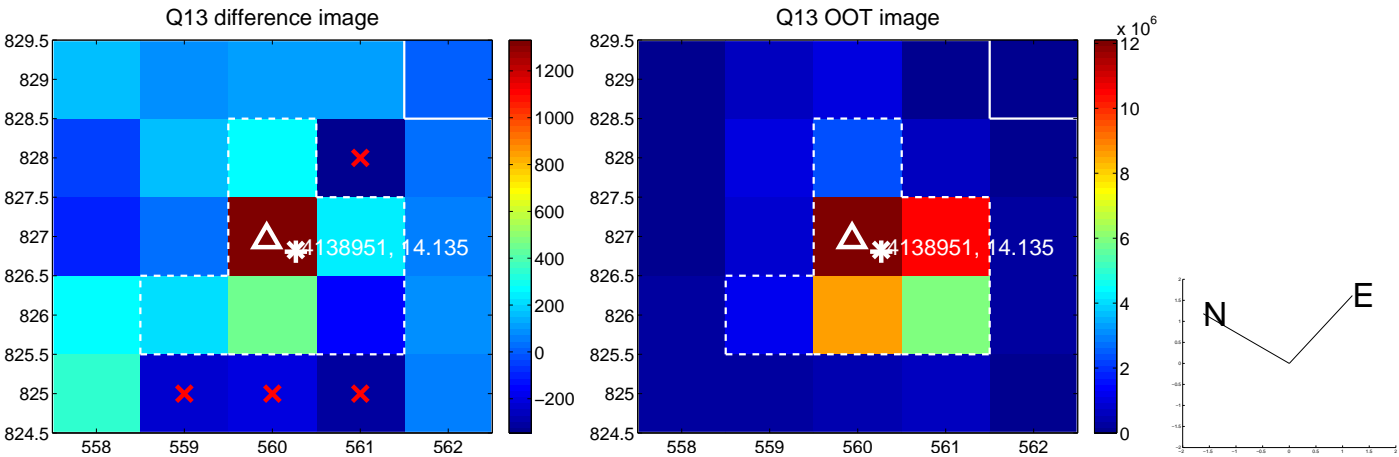




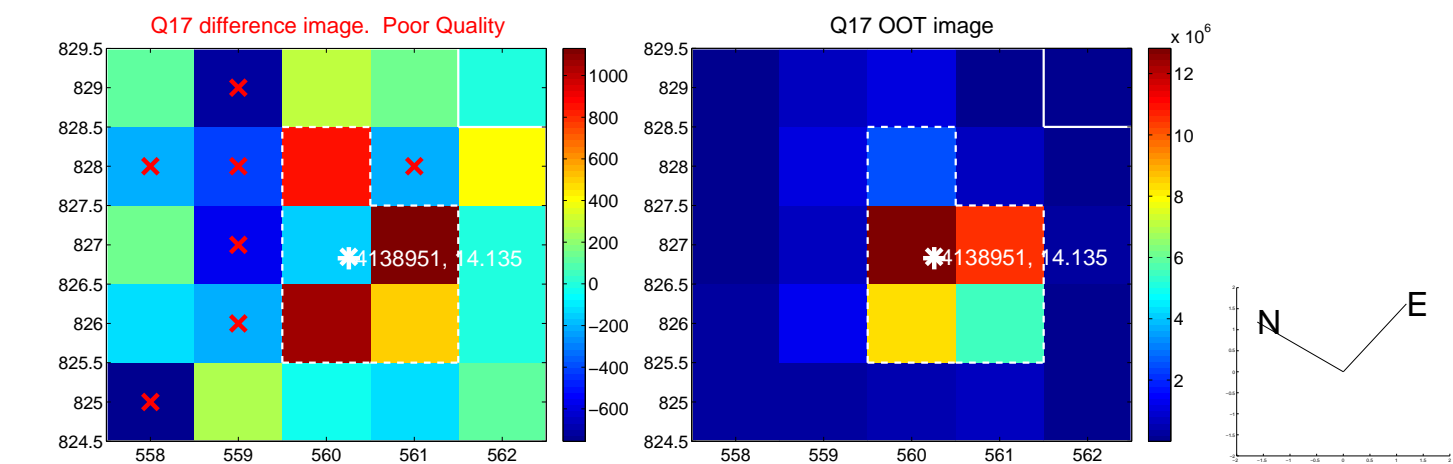
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



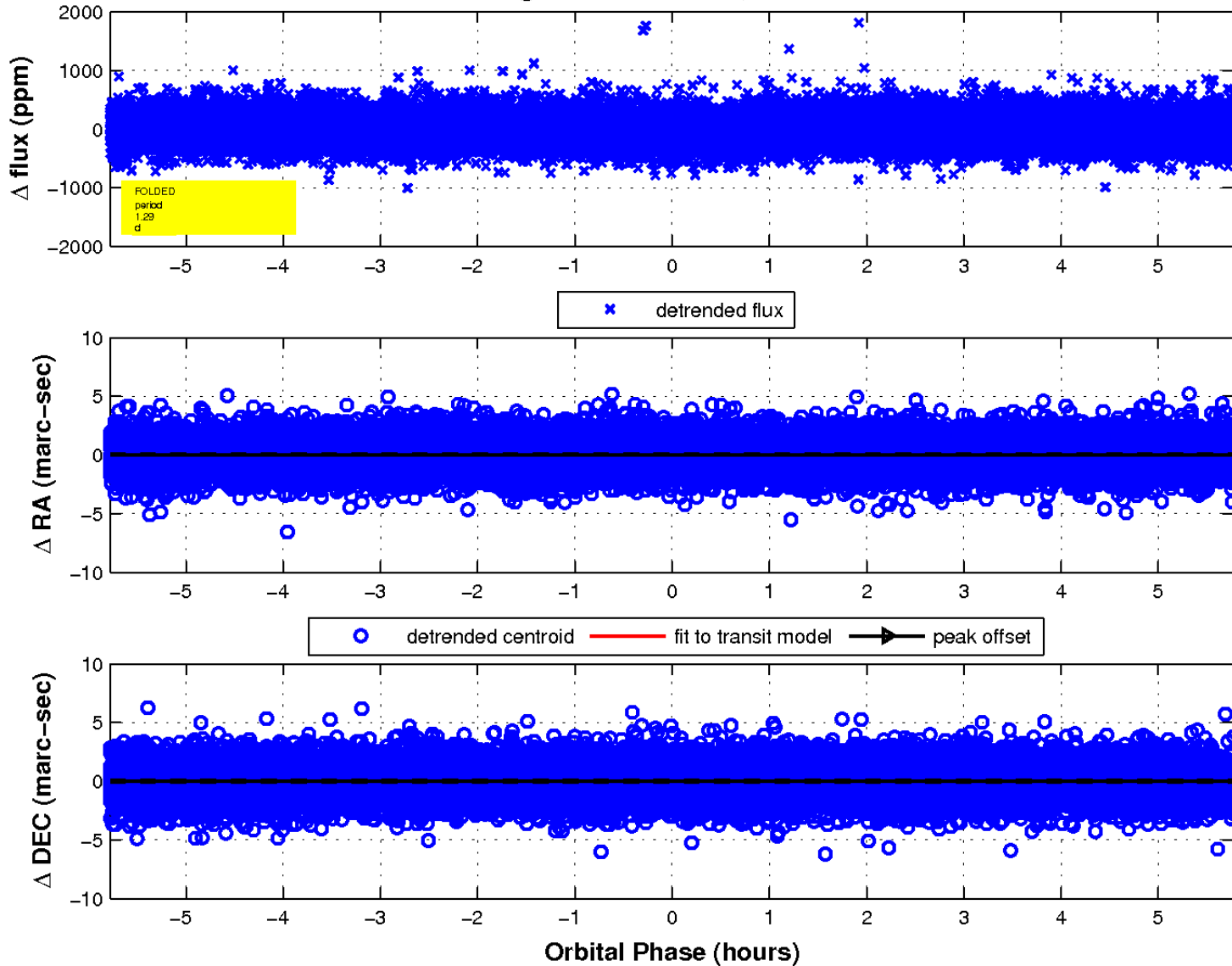
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

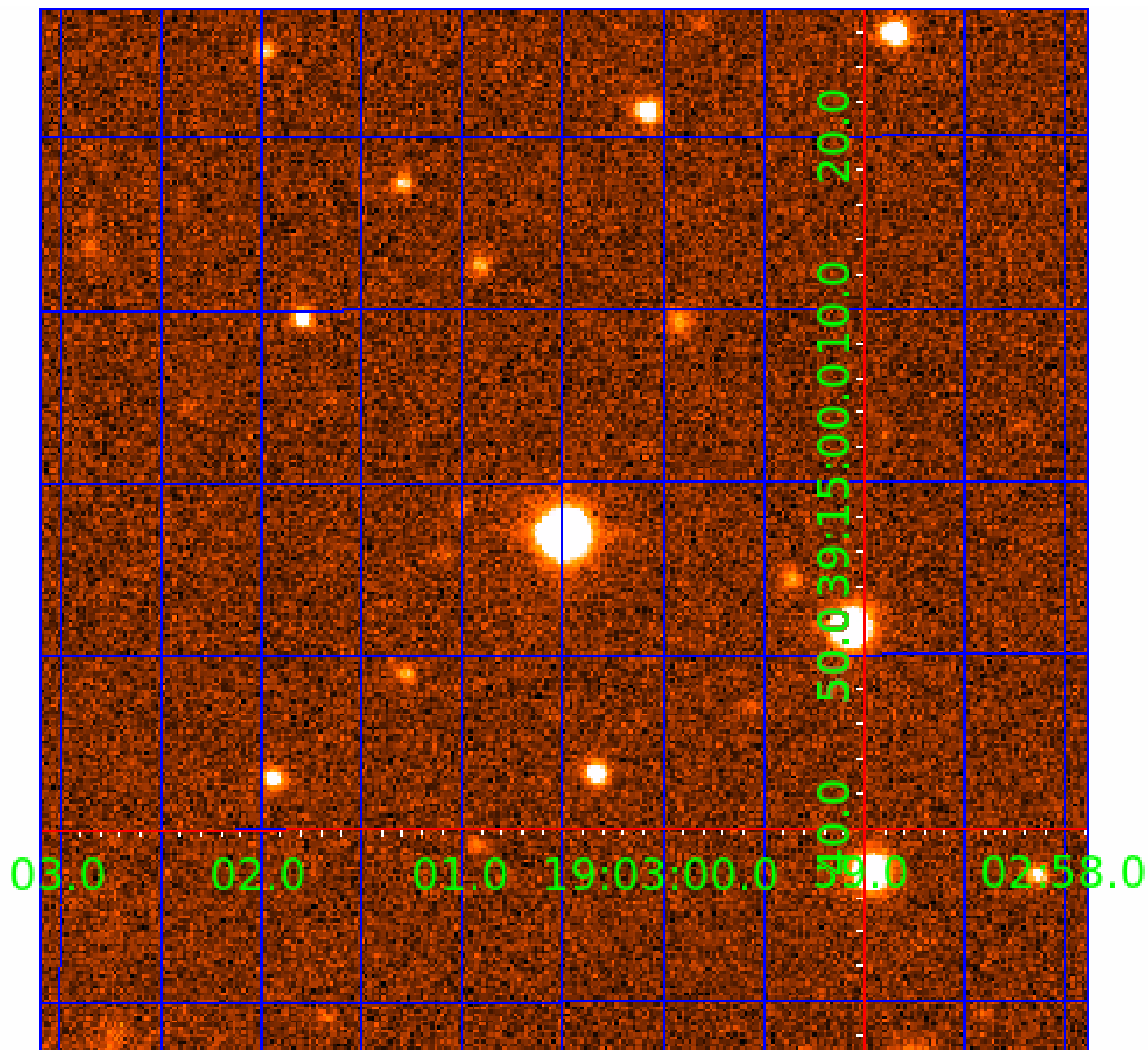


fluxWeightedCentroids, Planet 1 of 2



UKIRT Image

Declination





# KIC 004138951

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004138951-01	OBS	2866.01	1.291229	131.992081	60.9	1.927	13.1	14.5	1.09	6384	0.98	3004.79
004138951-02	OBS	No	182.495276	295.809946	173.3	14.277	7.9	5.7	1.09	6384	1.57	4.08

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004138951-01	OBS	PC	0.99	0	0	0	0	NO_COMMENT
004138951-02	OBS	FP	0.00	1	0	0	0	LPP_DV—MOD_NONUNIQ_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS

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

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

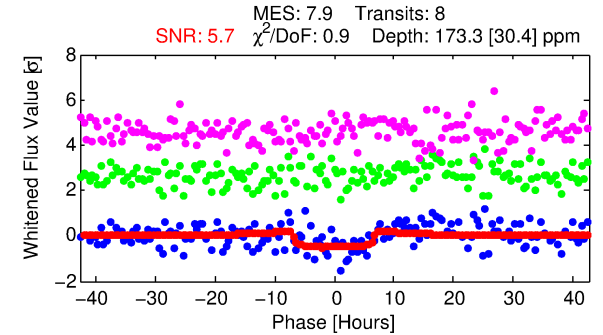
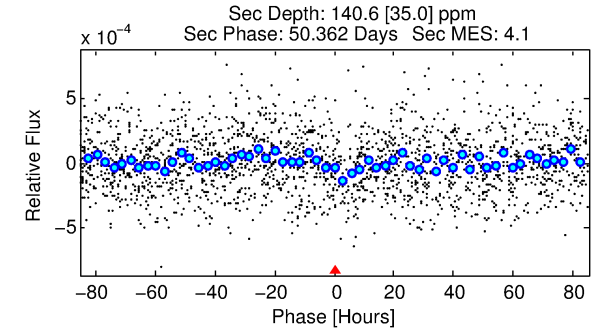
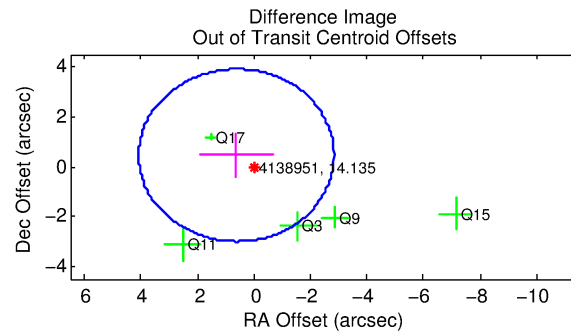
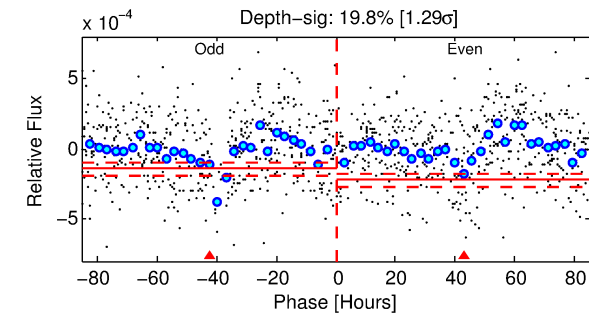
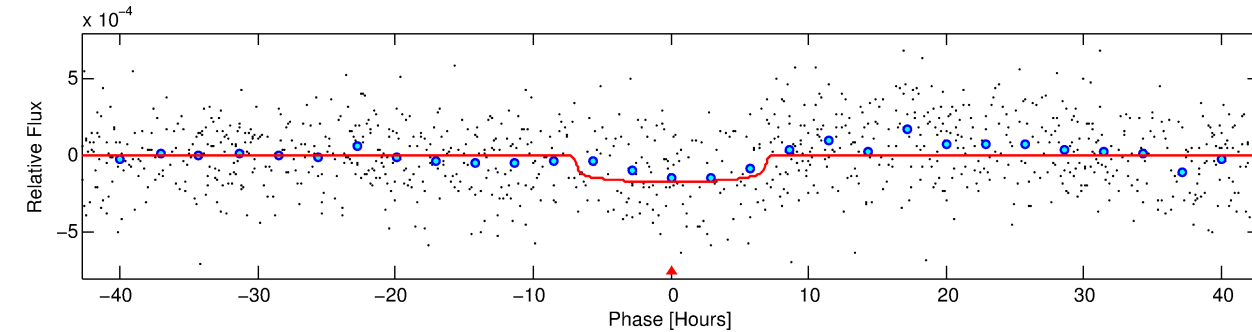
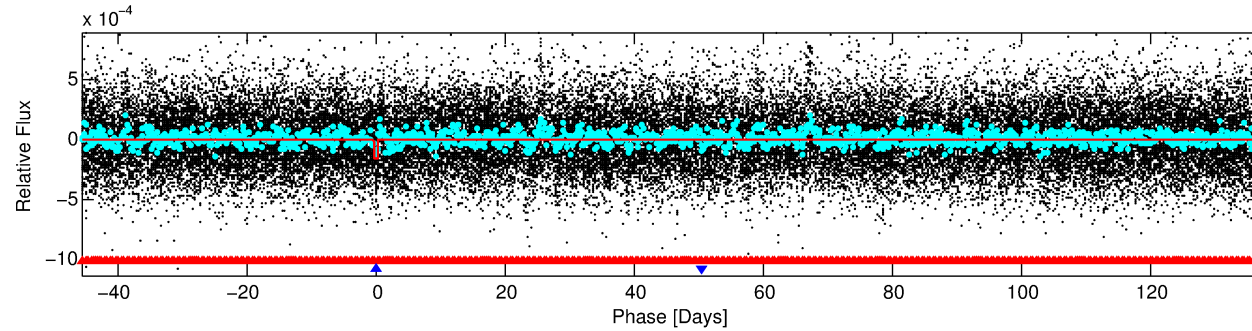
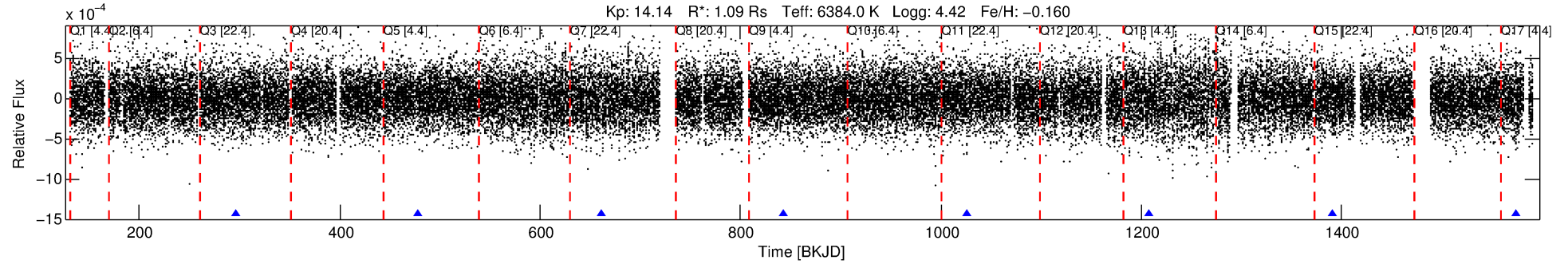
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 004138951-02

No Significant Match Found

# DV One-Page Summary

KIC: 4138951 Candidate: 2 of 2 Period: 182.495 d  
KOI: K02866 Corr: No Ephemeris Match



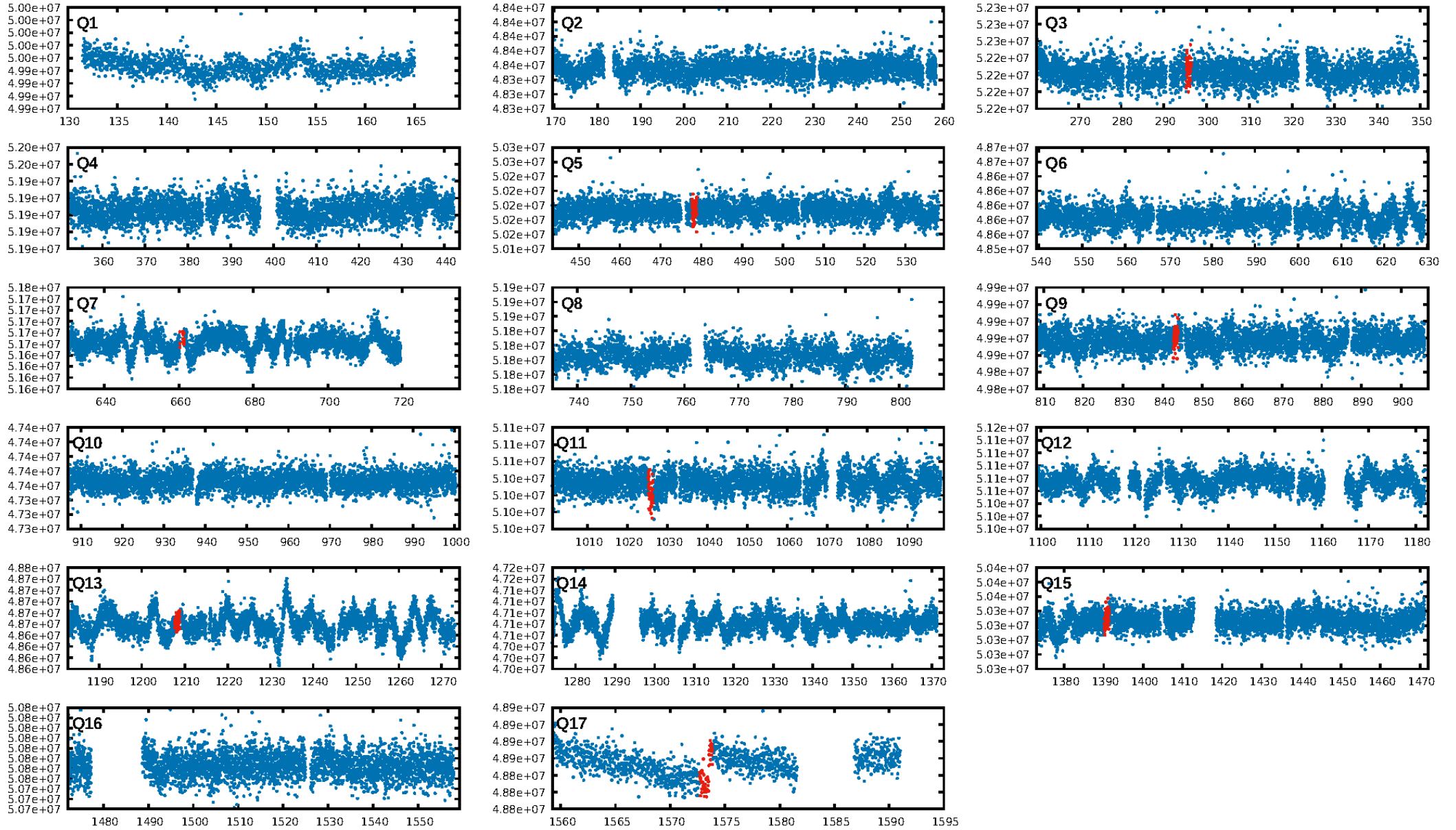
## DV Fit Results:

Period = 182.49528 [0.00741] d  
Epoch = 295.8099 [0.0311] BKJD  
Rp/R\* = 0.0132 [0.0053]  
a/R\* = 63.14 [131.28]  
b = 0.78 [1.05]  
Seff = 4.08 [1.56]  
Teq = 362 [35] K  
Rp = 1.57 [0.78] Re  
a = 0.6558 [0.1616] AU  
Ag = 13536.65 [12395.33] [1.09 $\sigma$ ]  
Teffp = 6044 [1284] K [4.42 $\sigma$ ]

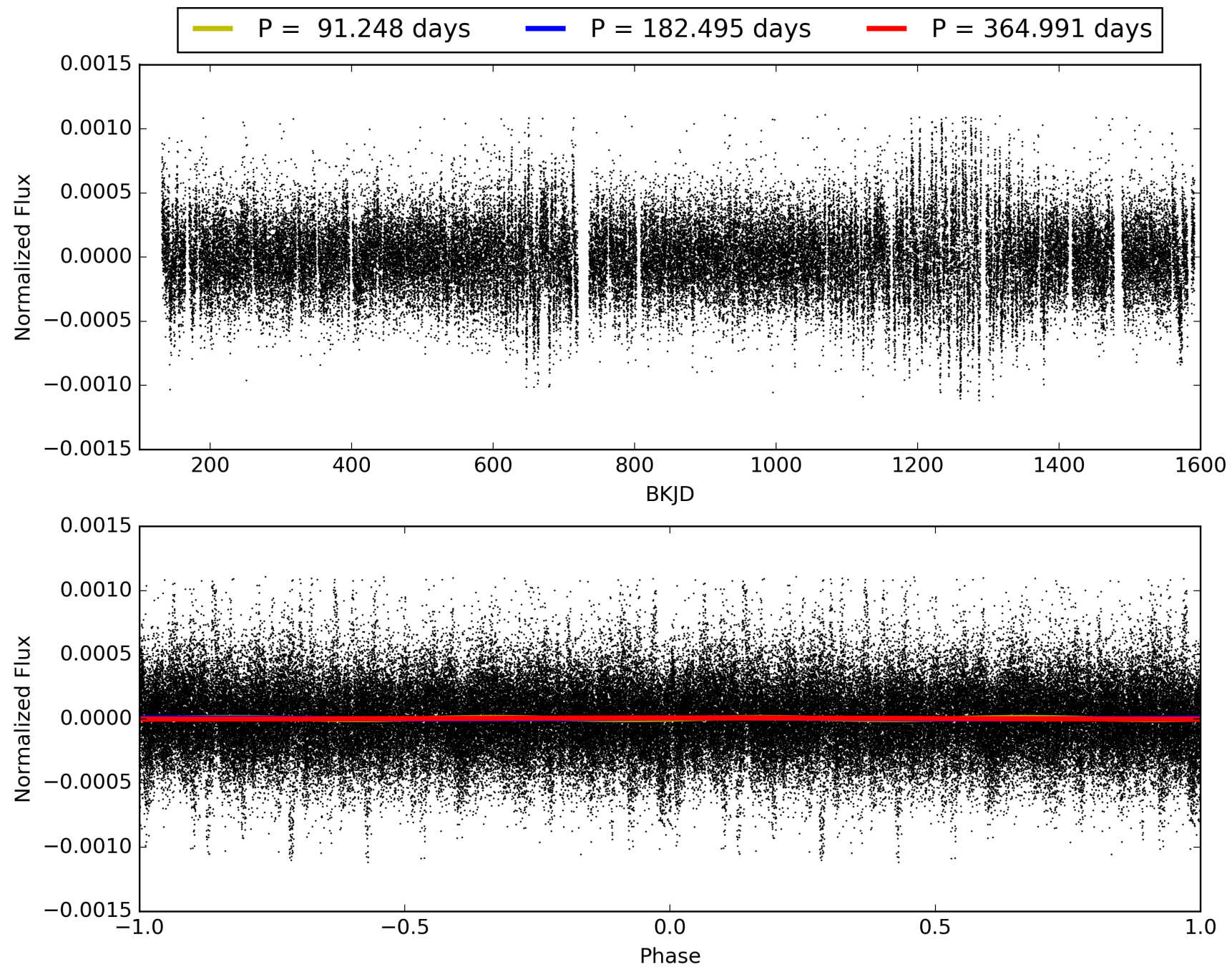
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [301.87 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 1.45e-15  
RollingBand-fgt: 1.00 [7/7]  
GhostDiagnostic-chr: -1.308  
Centroid-sig: 19.8%  
Centroid-so: 1.675 arcsec [1.14 $\sigma$ ]  
OotOffset-rm: 0.770 arcsec [0.67 $\sigma$ ]  
OotOffset-st: 0/3/0/2 [5]  
KicOffset-rm: 0.701 arcsec [0.51 $\sigma$ ]  
KicOffset-st: 0/3/0/2 [5]  
DiffImageQuality-fgm: 0.20 [1/5]  
DiffImageOverlap-fno: 0.00 [0/7]

# TCE 004138951-02, PDC Light Curves

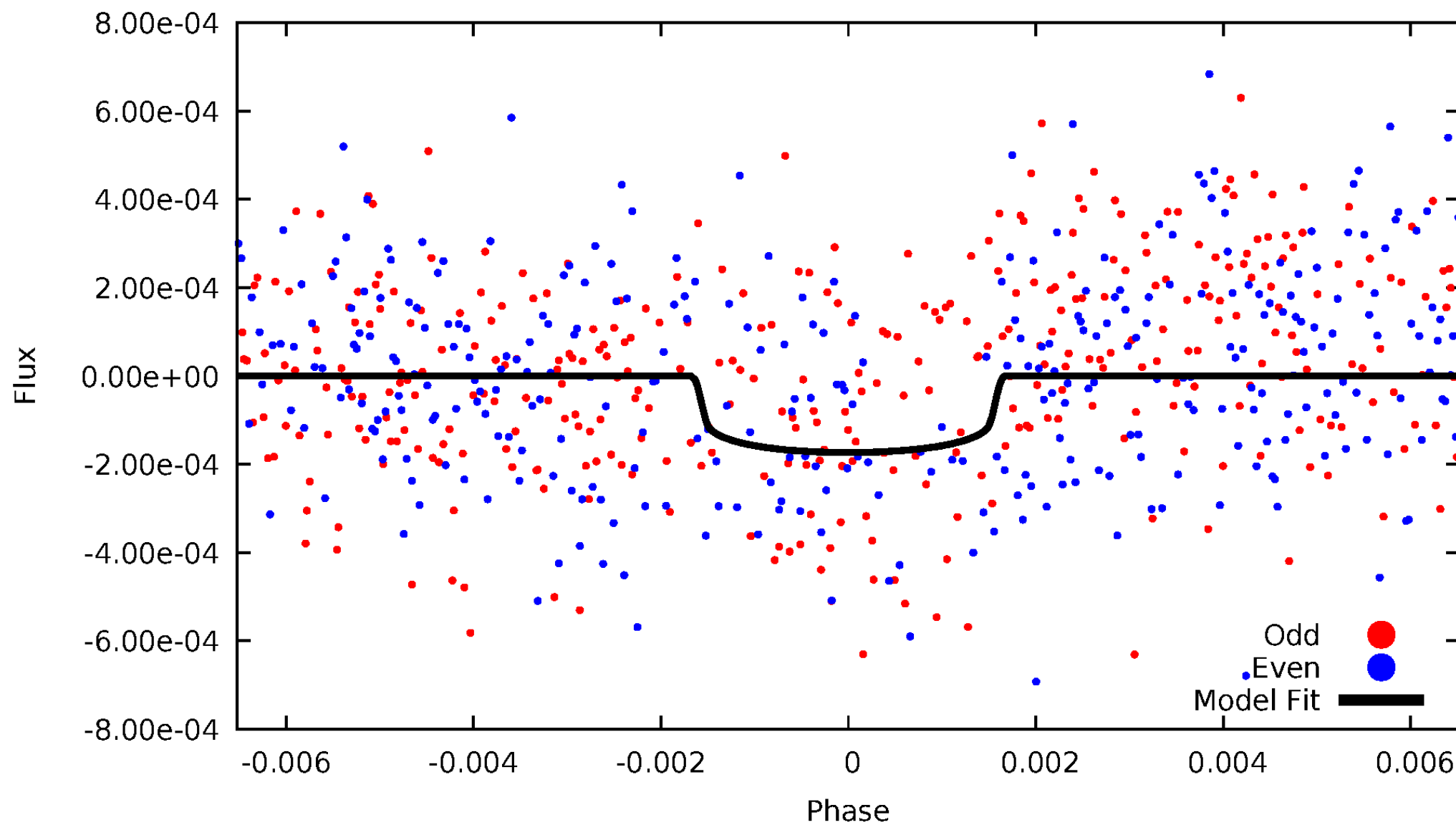


# TCE 004138951-02



# DV Odd/Even

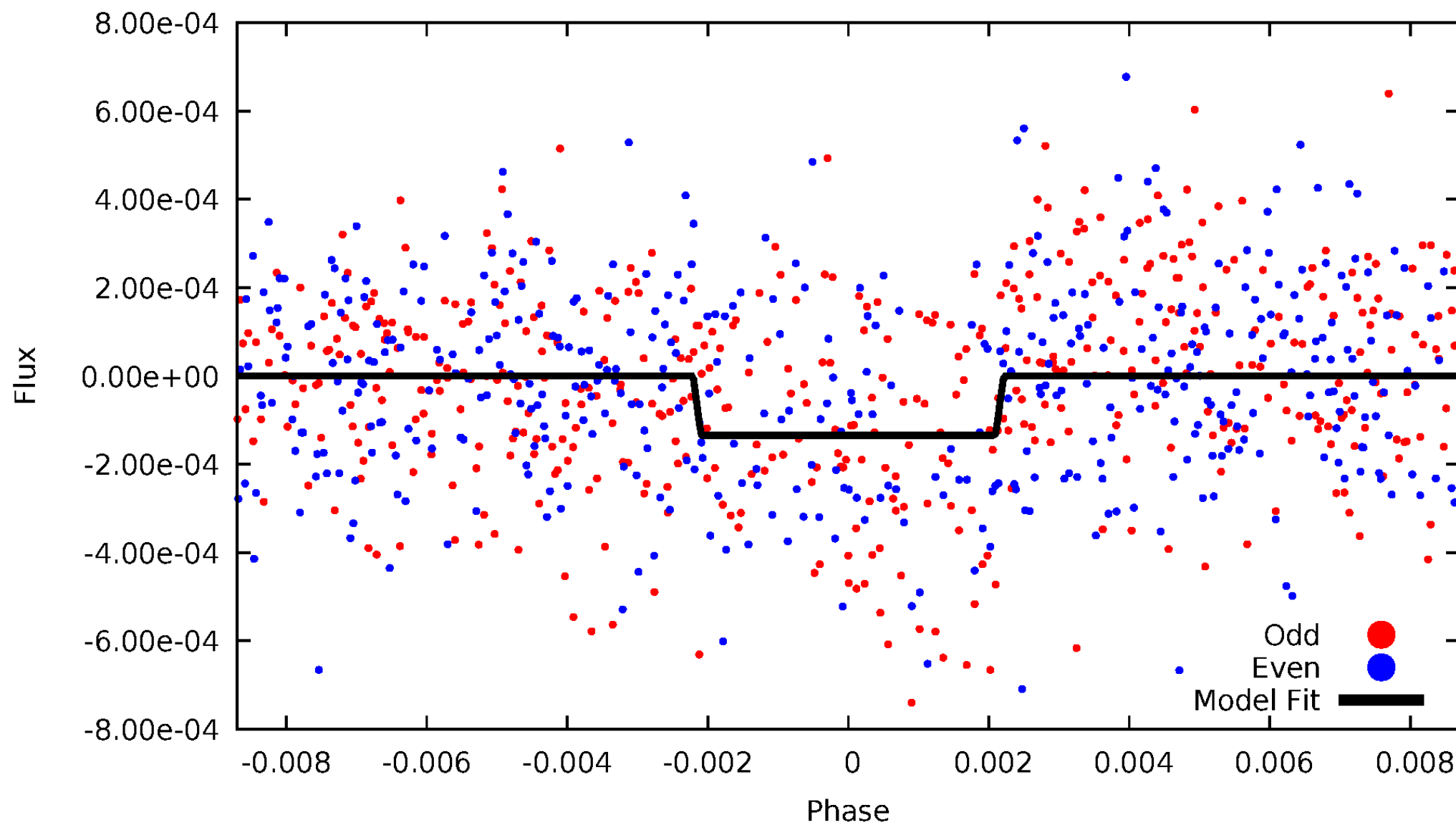
TCE 004138951-02





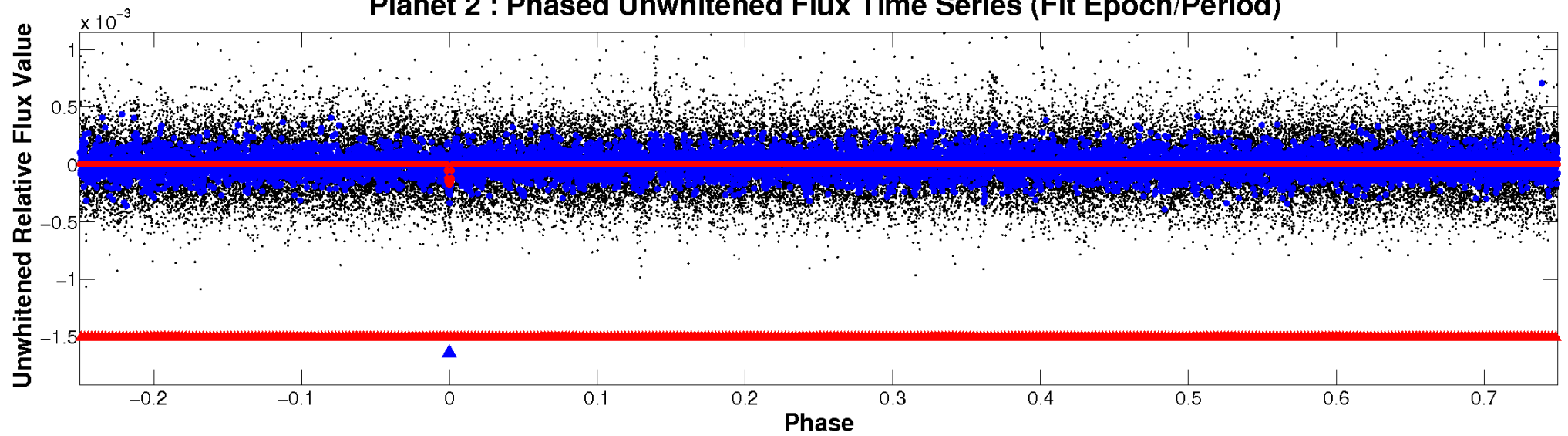
# ALT Odd/Even

TCE 004138951-02

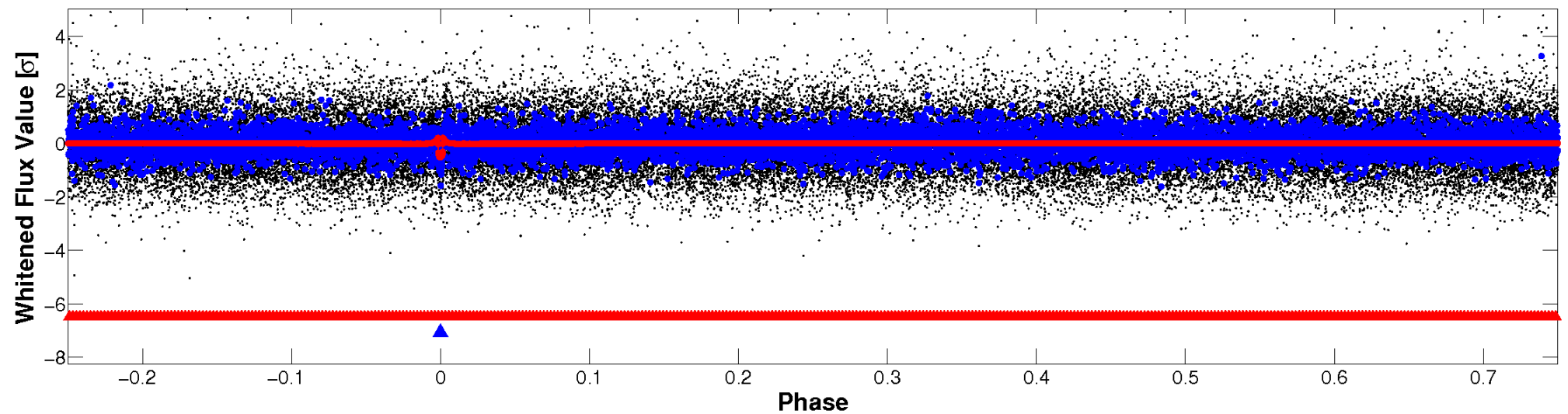


# Non-Whitened Vs. Whitened Light Curve

## 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 004138951-02   P=182.495276 Days    $T_0=295.809946$  (BKJD)



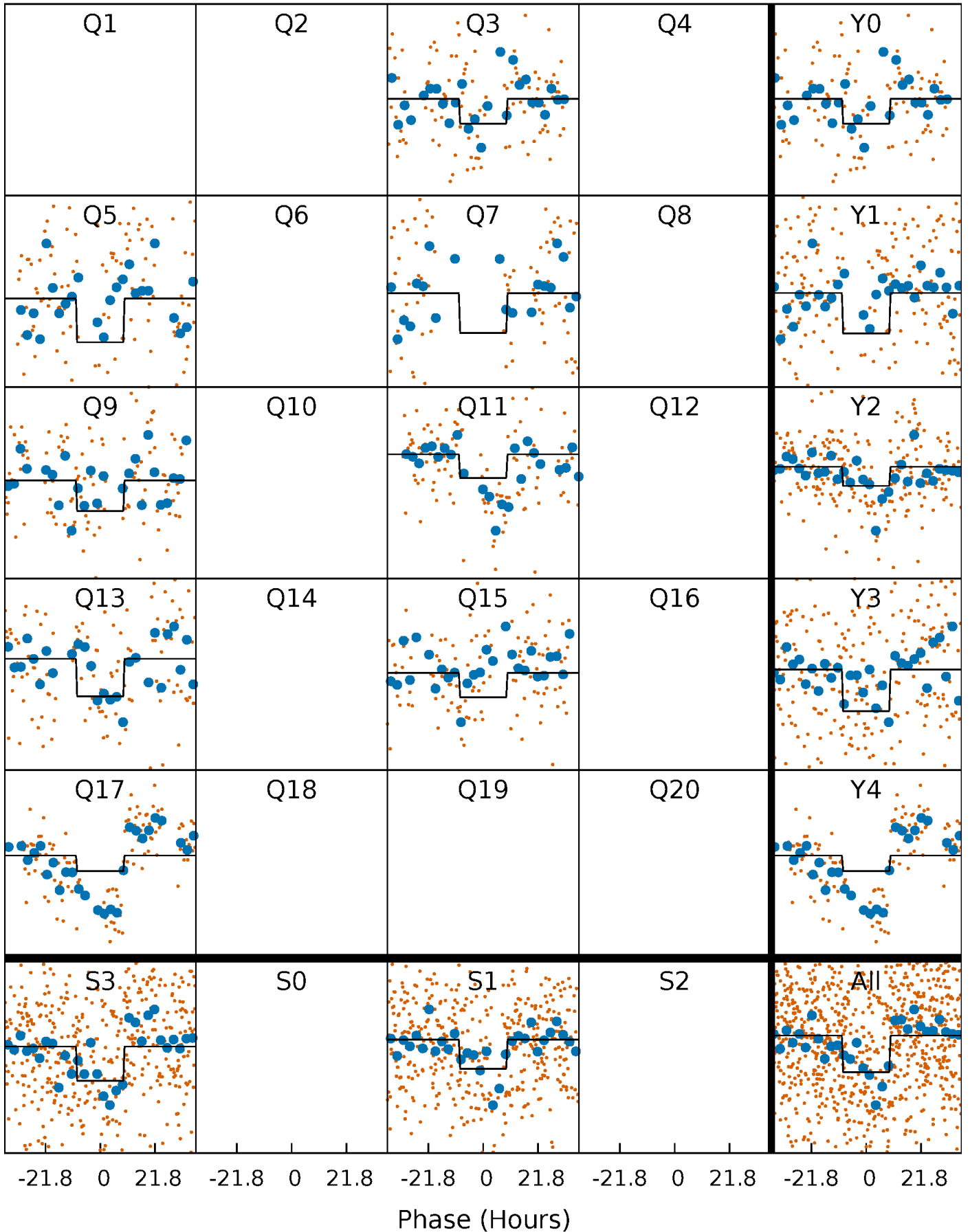
# DV Quarter-Phased Transit Curves

TCE 004138951-02     $P=182.495276$  Days     $T_0=295.809946$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 004138951-02     $P=182.478502$  Days     $T_0=295.791507$  (BKJD)

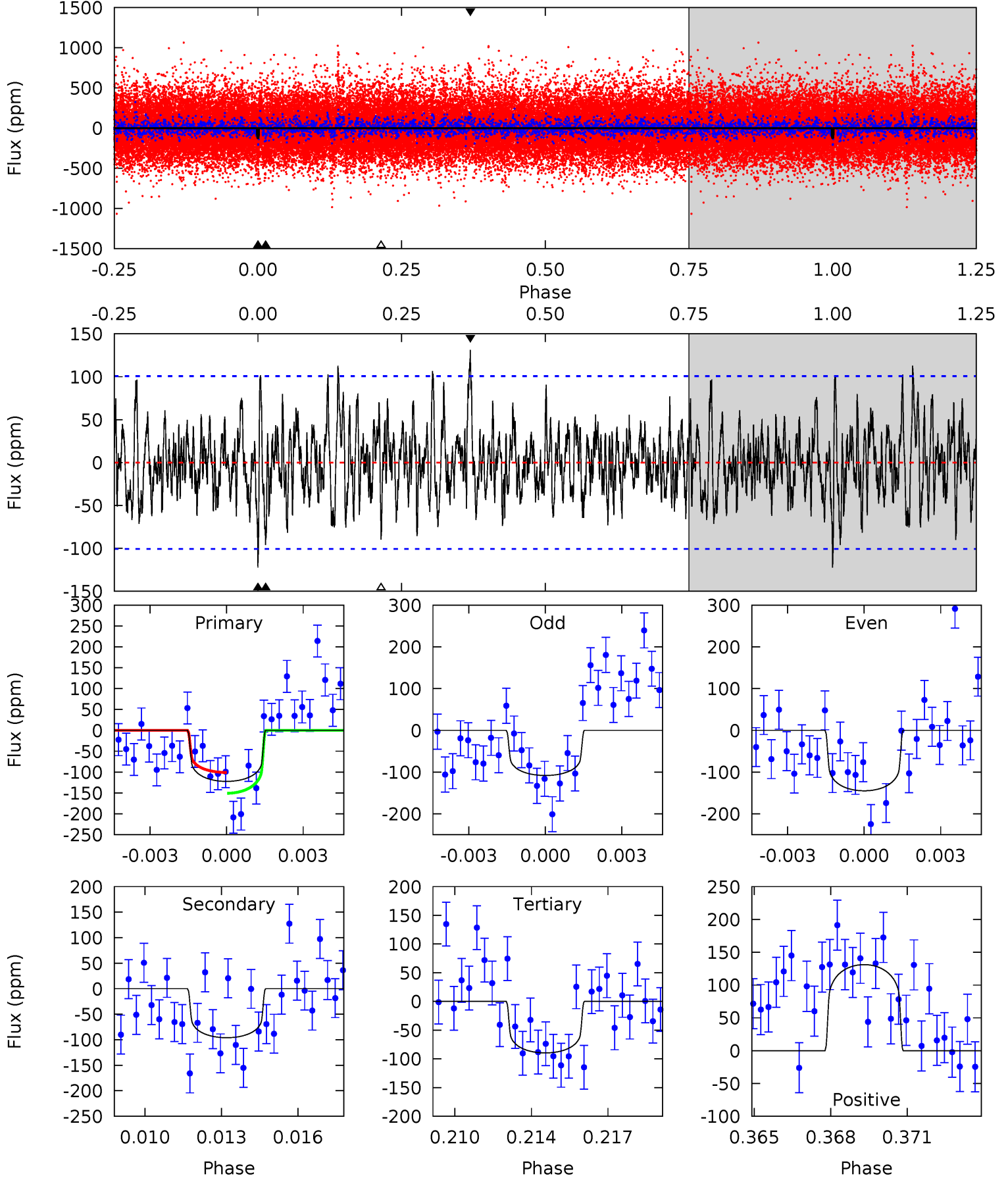




# DV Model-Shift Uniqueness Test

004138951-02,  $P = 182.495276$  Days,  $E = 113.314670$  Days

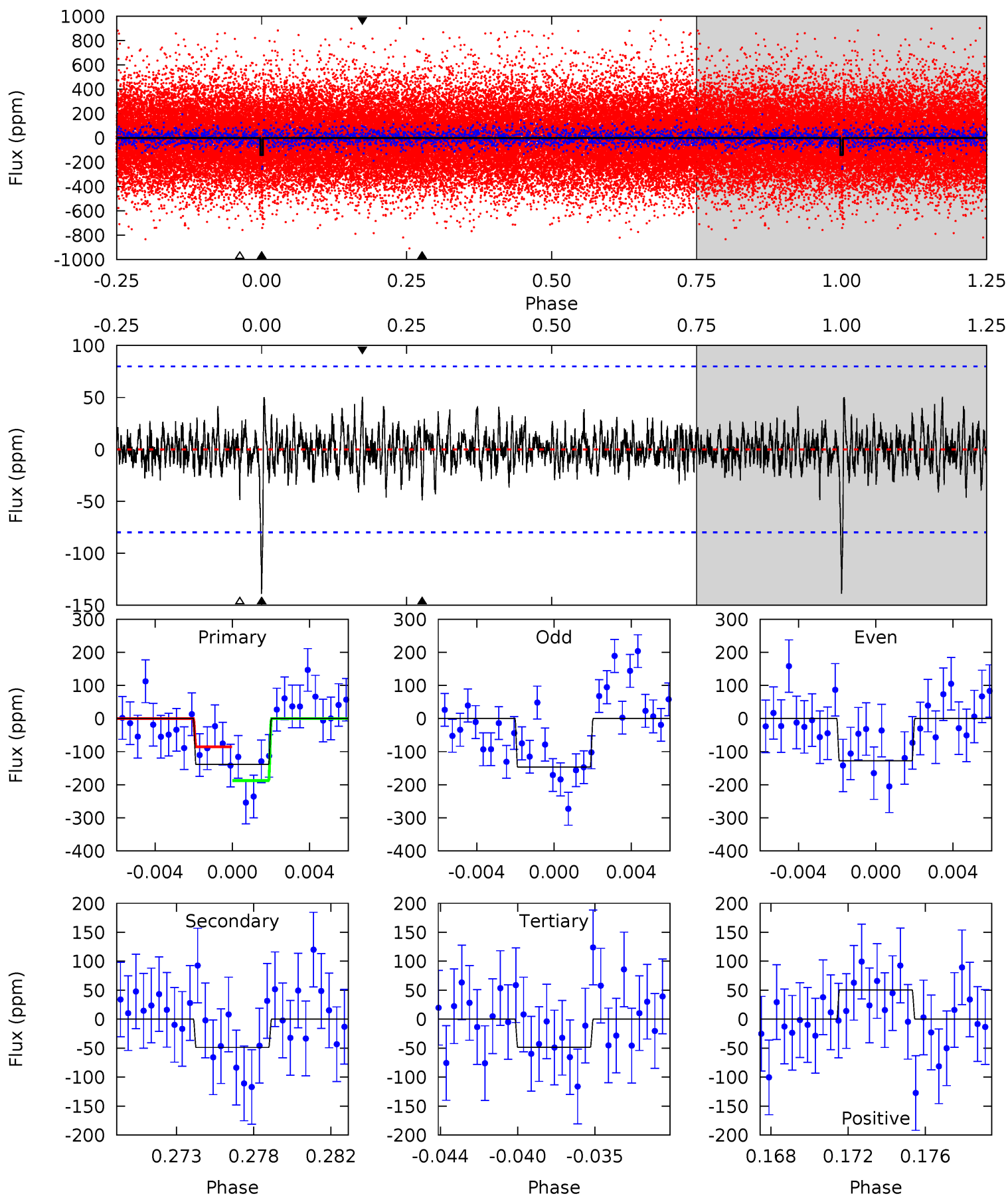
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
6.36	5.00	4.66	6.82	5.24	2.94	1.74	1.70	-0.46	0.33	-1.83	0.93	3.35	0.52	1.29



# Alt Model-Shift Uniqueness Test

004138951-02,  $P = 182.478502$  Days,  $E = 113.313005$  Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
9.00	3.16	3.15	3.27	5.18	2.85	0.87	5.85	5.72	0.01	-0.11	0.60	1.86	0.27	3.31



### Stellar Parameters For KIC 004138951

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6384^{+153}_{-192}$	$4.419^{+0.062}_{-0.200}$	$-0.160^{+0.250}_{-0.300}$	$1.086^{+0.314}_{-0.134}$	$1.129^{+0.150}_{-0.150}$	$1.240^{+0.341}_{-0.644}$
	+2%/-3%	+1%/-5%	+156%/-188%	+29%/-12%	+13%/-13%	+28%/-52%
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 004138951-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-96 \pm 19$	$1.67^{+0.74}_{-0.64}$	$515^{+37}_{-23}$	$5452^{+1615}_{-756}$	$8198^{+13851}_{-4424}$
Alt.	$-49 \pm 15$	$1.43^{+0.67}_{-0.63}$	$517^{+34}_{-25}$	$5005^{+1576}_{-795}$	$5226^{+12403}_{-3032}$

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

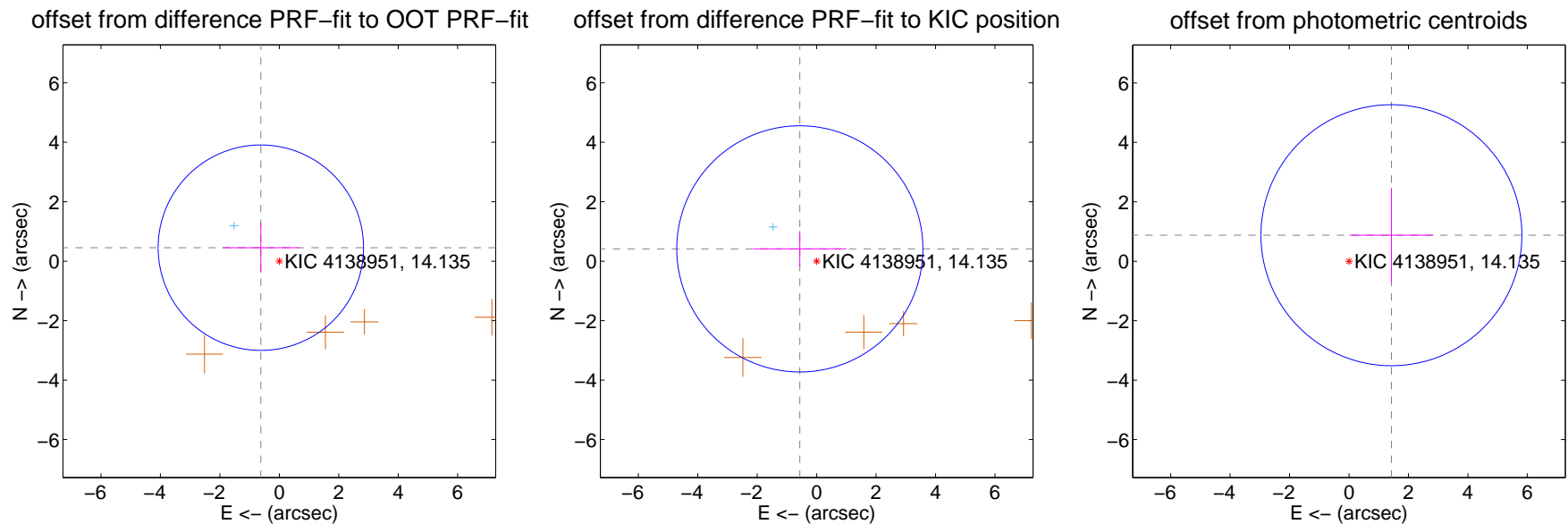
## DV Centroid Data

Supplemental centroid analysis for 004138951-02. Kepler magnitude: 14.13. Transit SNR 5.74

There are 1 quarters with good PRF difference image offsets

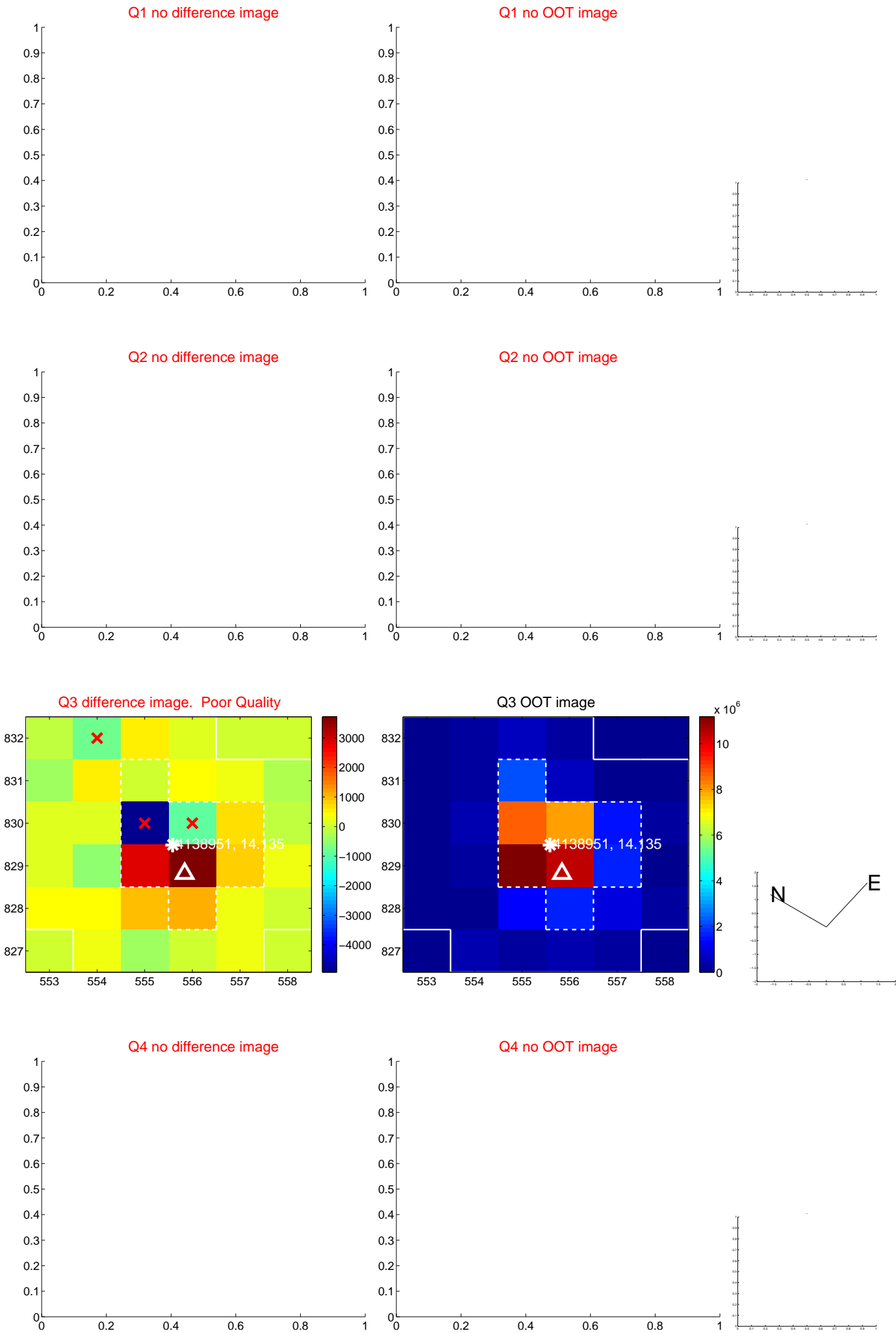
The direct PRF centroid is offset from the target star catalog position by about 0.07 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.770 \pm 1.152$	0.67	$0.622 \pm 1.288$	$0.454 \pm 0.839$
PRF-fit source offset from KIC position	$0.701 \pm 1.380$	0.51	$0.566 \pm 1.565$	$0.414 \pm 0.596$
photometric centroid source offset	$1.68 \pm 1.46$	1.14	$-1.43 \pm 1.41$	$0.88 \pm 1.60$



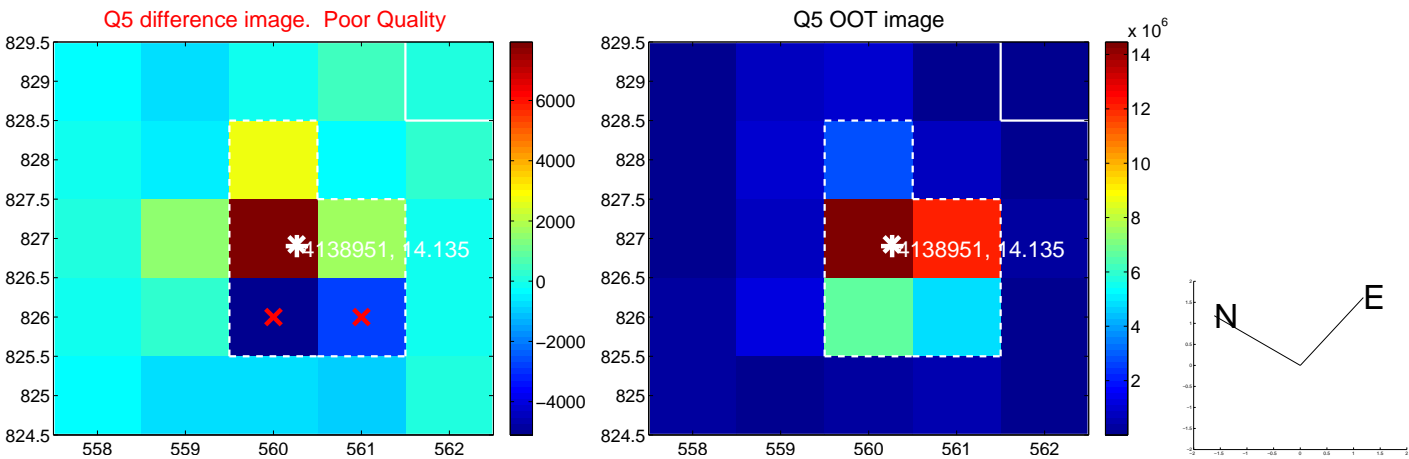
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

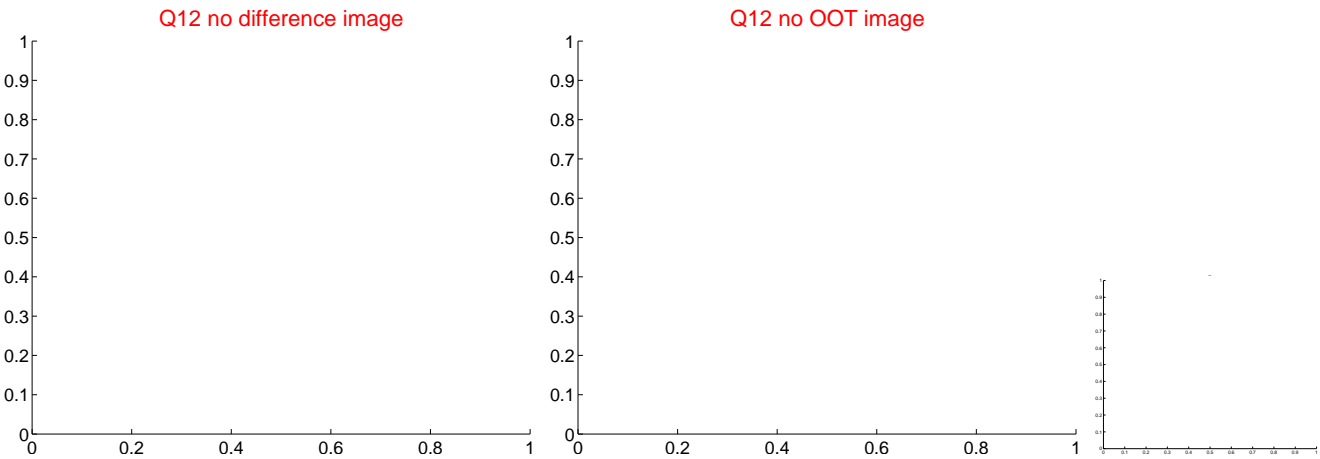
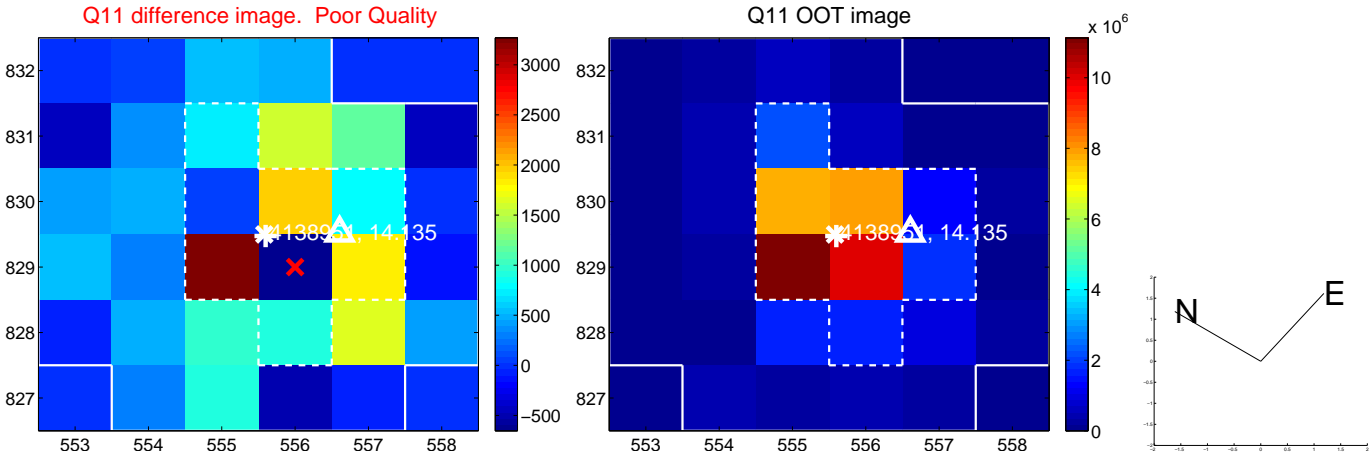
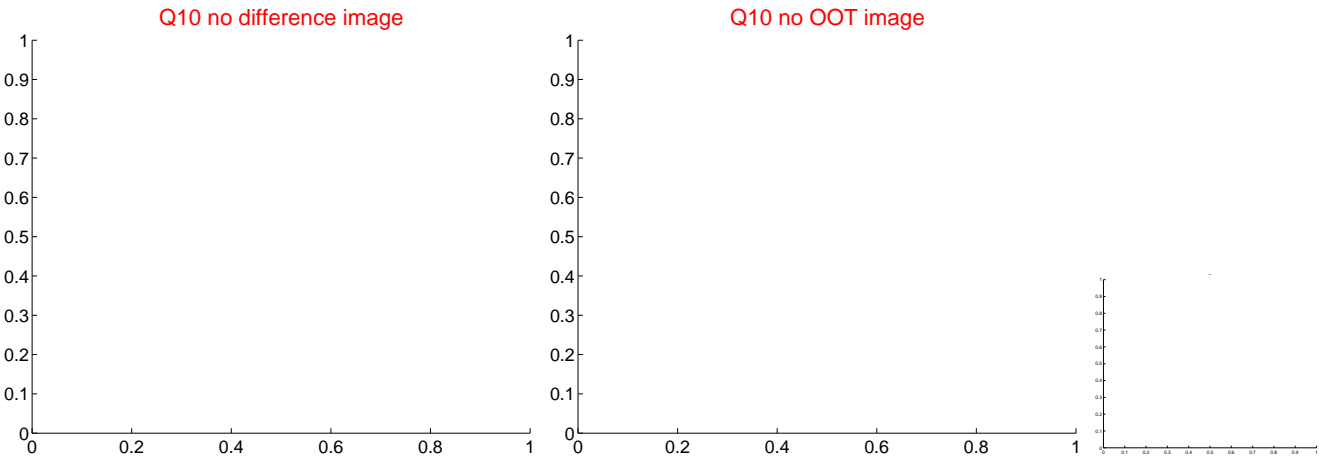
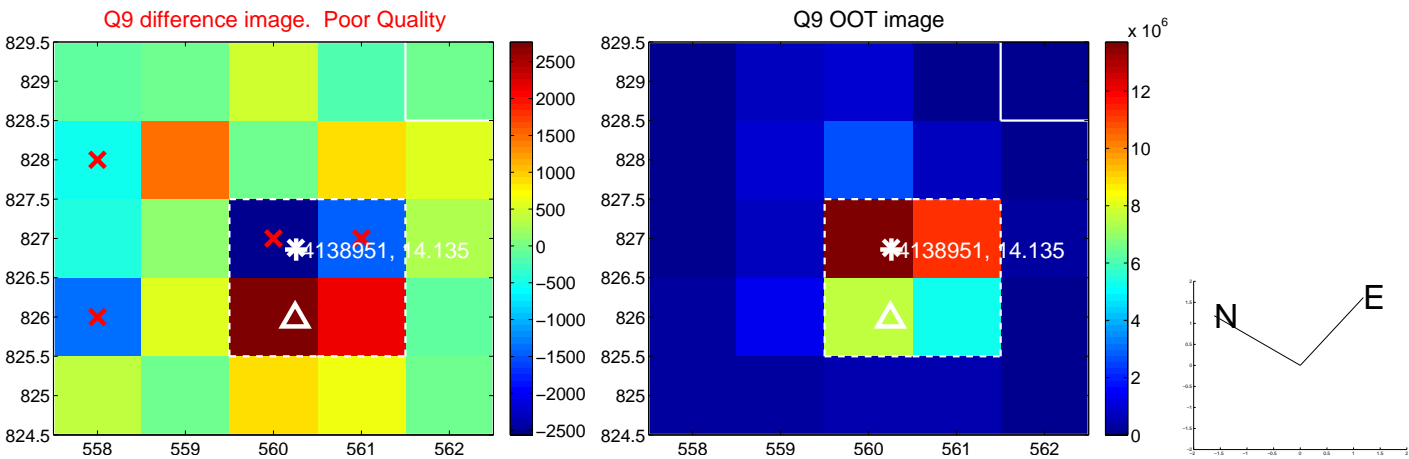




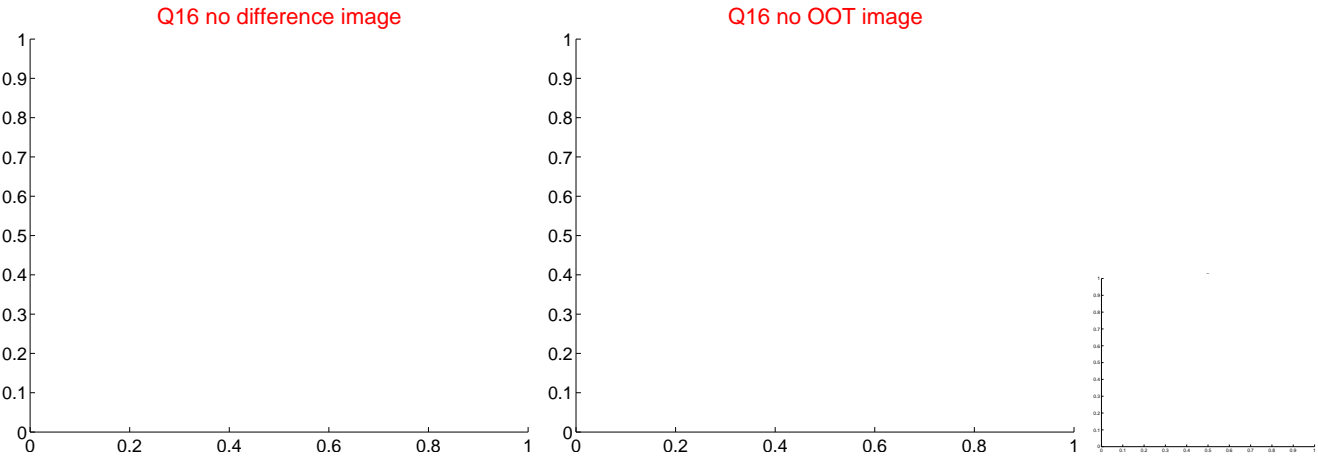
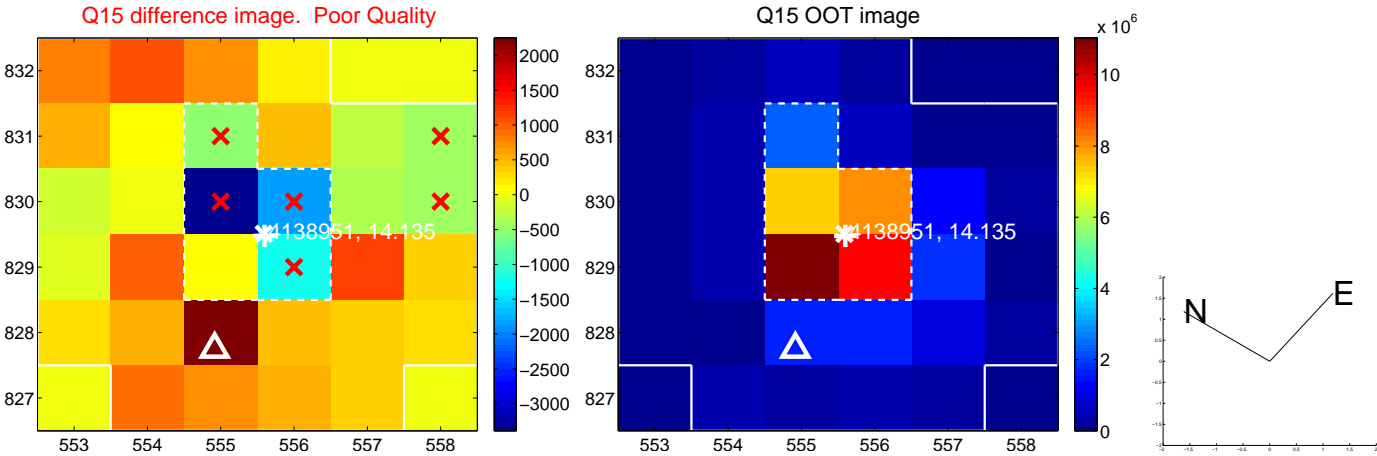
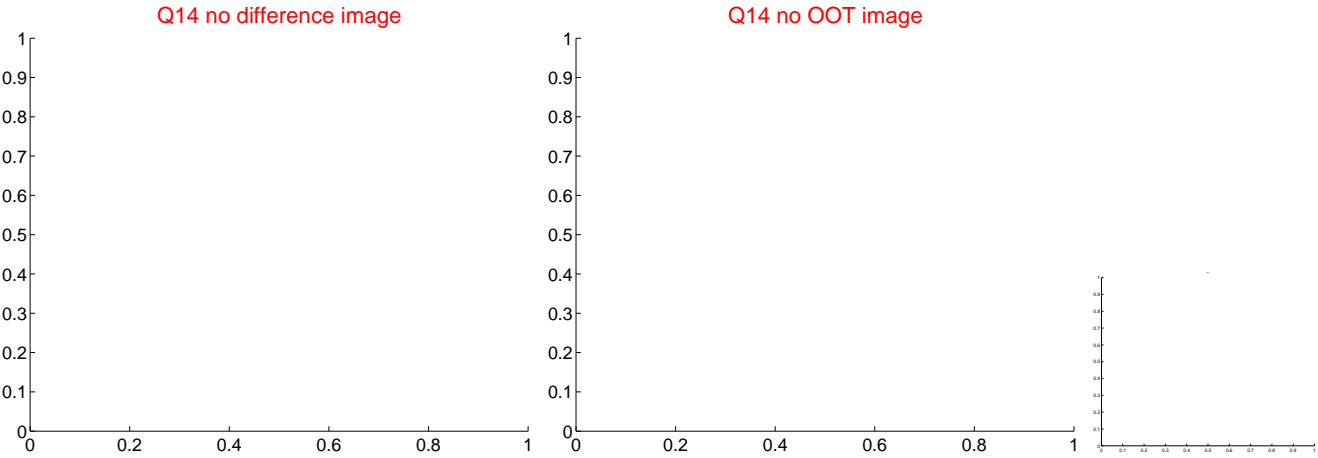
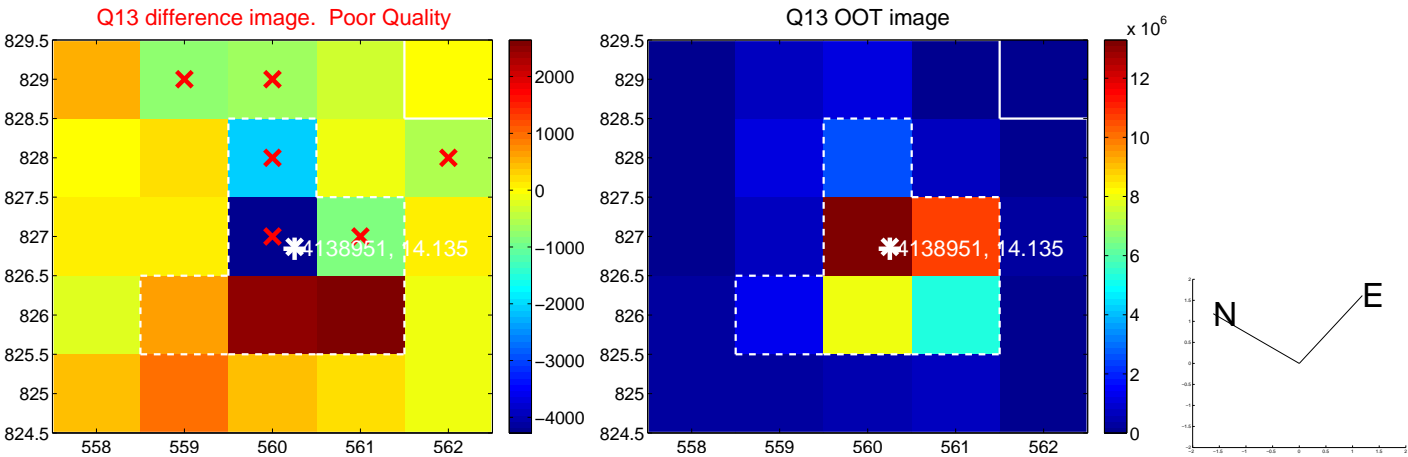
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.



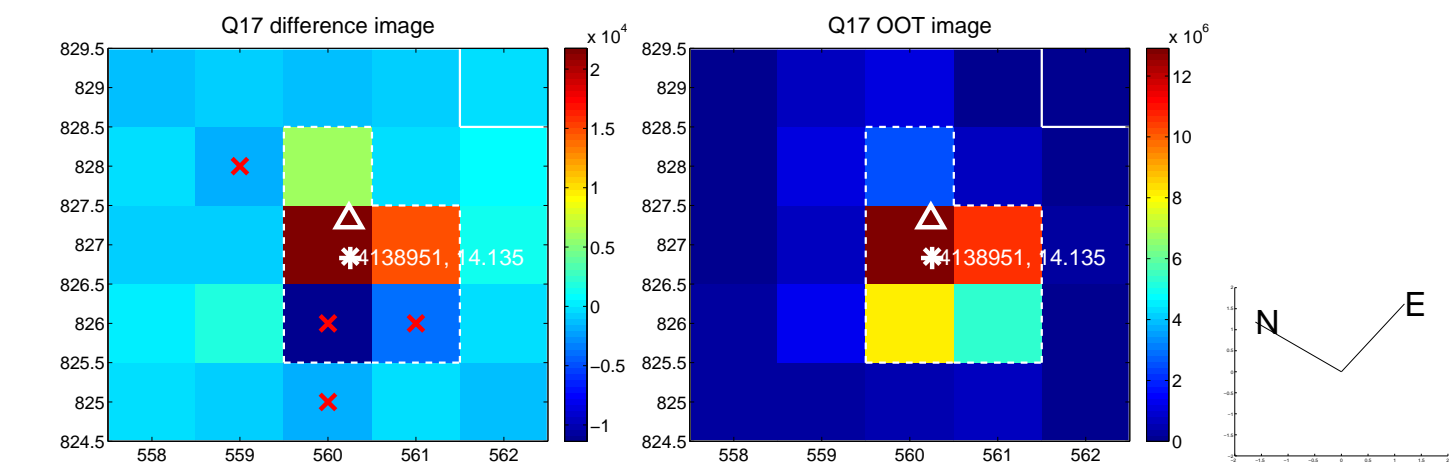
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ×: large negative pixel value.



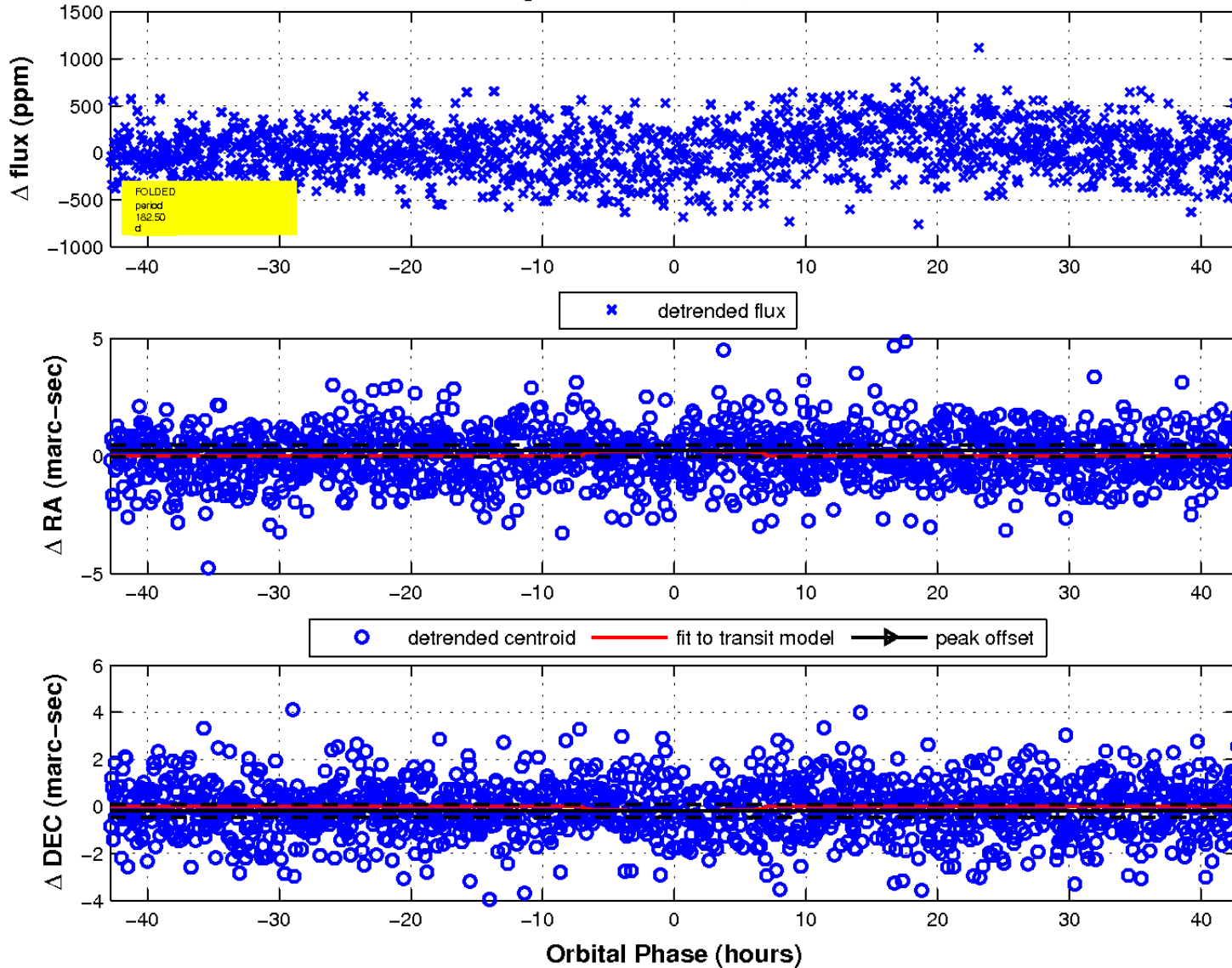
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.



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



fluxWeightedCentroids, Planet 2 of 2



UKIRT Image

Declination

