

# KIC 009655858

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009655858-01	OBS	3733.01	31.432958	138.109011	164799.7	5.466	231.6	149.0	1.00	5780	61.41	26.31
009655858-02	OBS	No	31.432910	148.486247	83635.7	6.110	107.8	94.0	1.00	5780	39.94	26.31

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009655858-01	OBS	FP	0.00	0	1	0	0	MOD_SEC_DV—MOD_SEC_ALT—DEEP_V_SHAPED—HAS_SEC_TCE—CENT_KIC_POS
009655858-02	OBS	FP	0.00	1	1	0	0	IS_SEC_TCE—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.

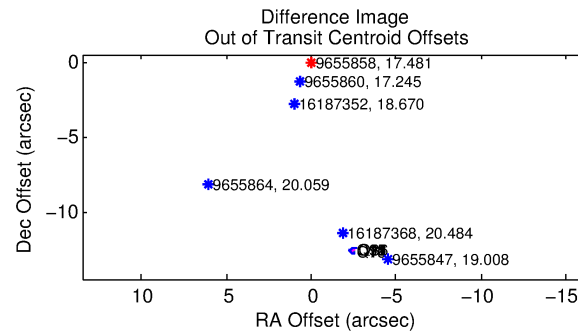
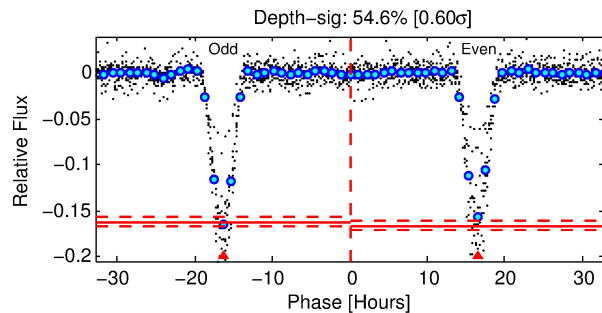
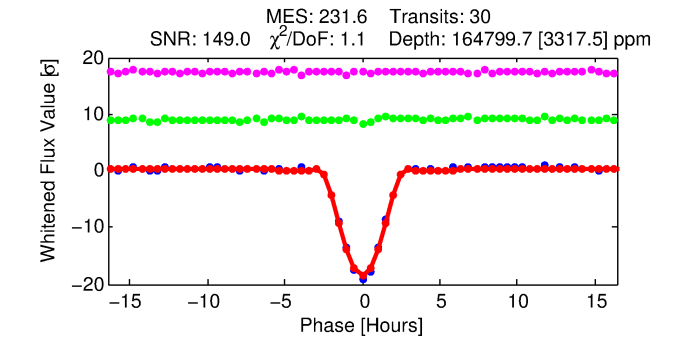
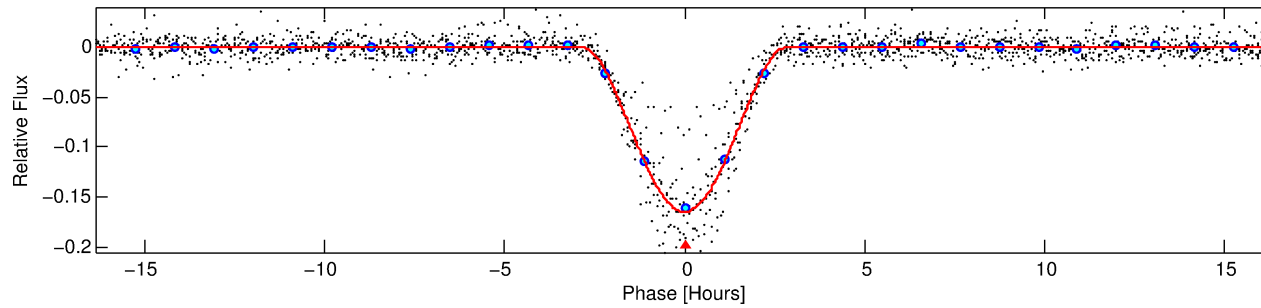
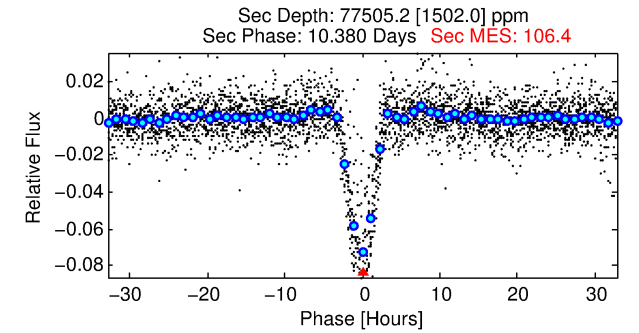
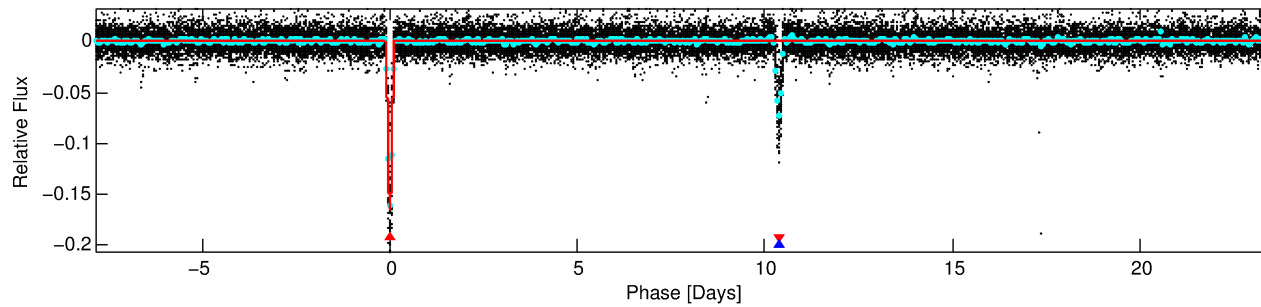
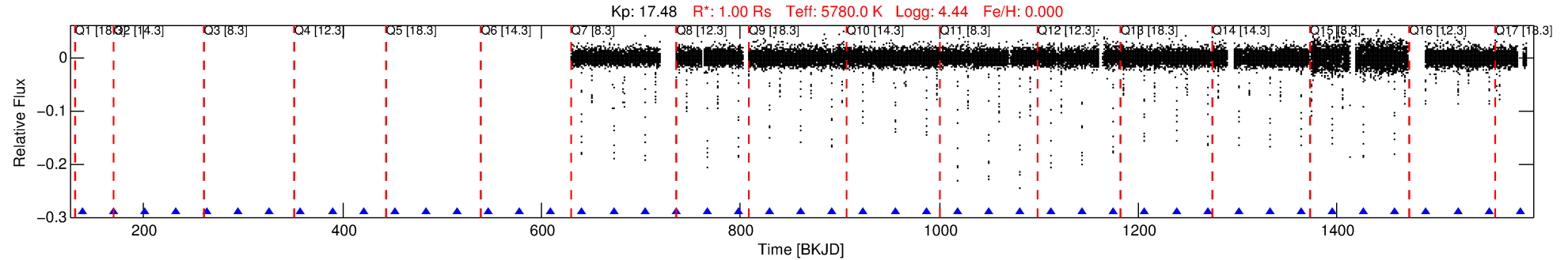
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009655858-01

No Significant Match Found

# DV One-Page Summary

KIC: 9655858 Candidate: 1 of 2 Period: 31.433 d  
KOI: K03733.01 Corr: 0.977



## DV Fit Results:

Period = 31.43296 [0.00004] d  
Epoch = 138.1090 [0.0013] BKJD  
Rp/R\* = 0.5628 [0.6447]  
a/R\* = 55.89 [7.97]  
b = 0.91 [0.89]  
Seff = 26.31 [0.00]  
Teq = 577 [0] K  
Rp = 61.41 [70.35] Re  
a = 0.1950 [0.0000] AU  
Ag = 429.74 [984.55] [0.44σ]  
Teffp = 4065 [2328] K [1.50σ]

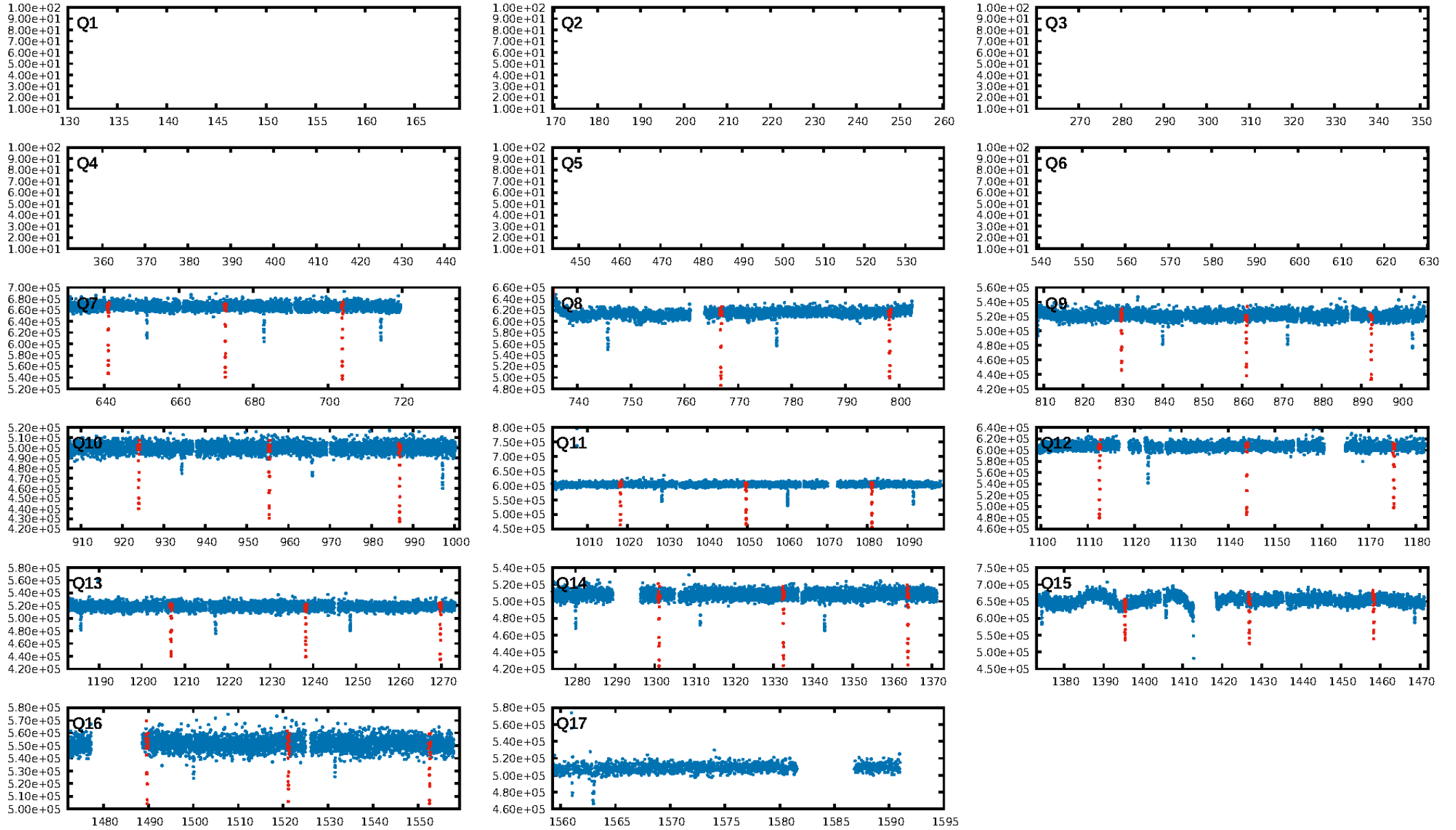
## DV Diagnostic Results:

ShortPeriod-sig: 0.0% [0.00σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [30/30]  
GhostDiagnostic-chr: 0.6191  
Centroid-sig: 0.0%  
Centroid-so: 1.147 arcsec [78.40σ]  
OotOffset-rm: 12.844 arcsec [190.67σ]  
KicOffset-rm: 2.952 arcsec [43.85σ]  
OotOffset-st: 2/3/3/2 [10]  
KicOffset-st: 2/3/3/2 [10]  
DiffImageQuality-fgm: 1.00 [10/10]  
DiffImageOverlap-fno: 1.00 [10/10]

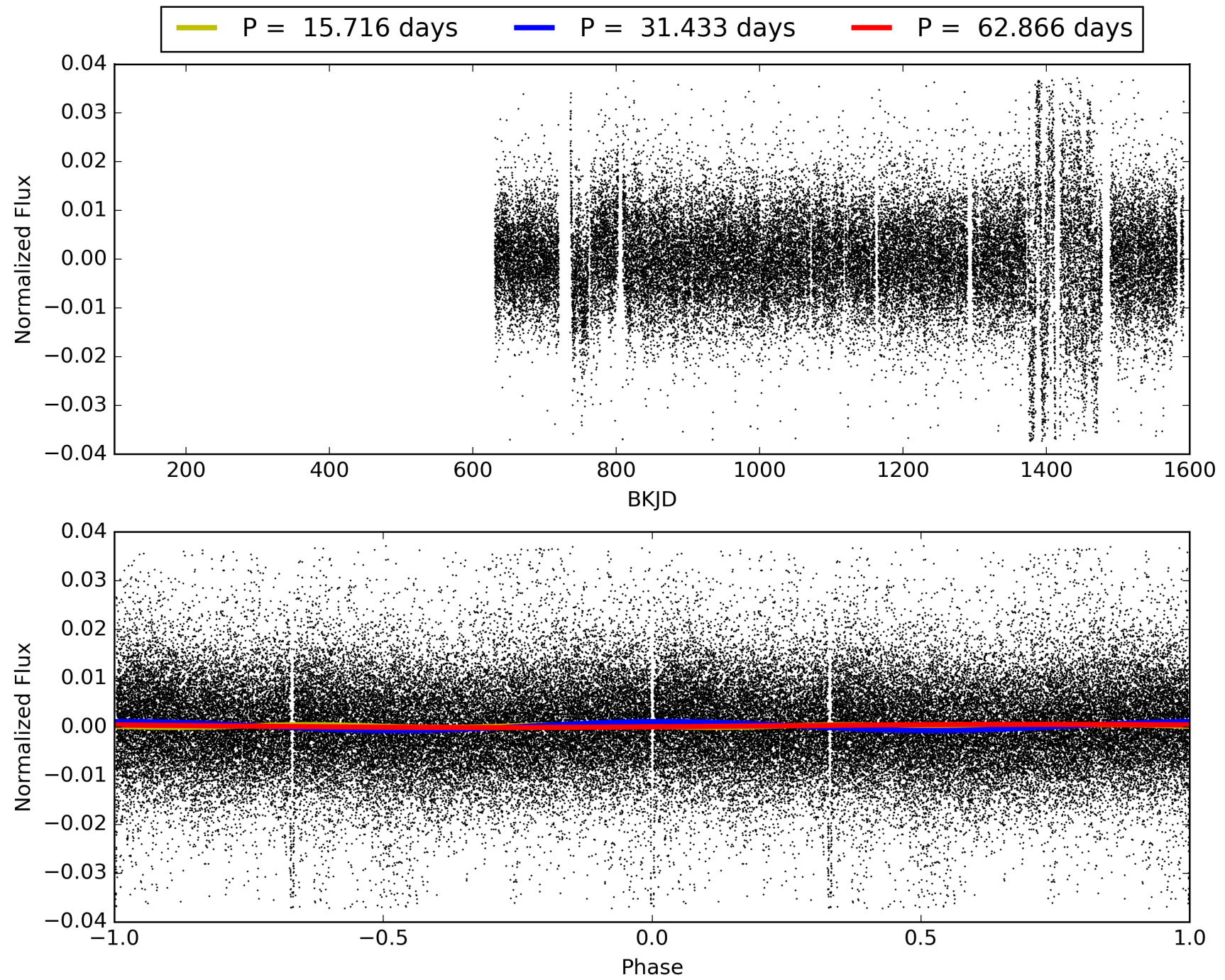
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 00:35:33 Z

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

# TCE 009655858-01, PDC Light Curves

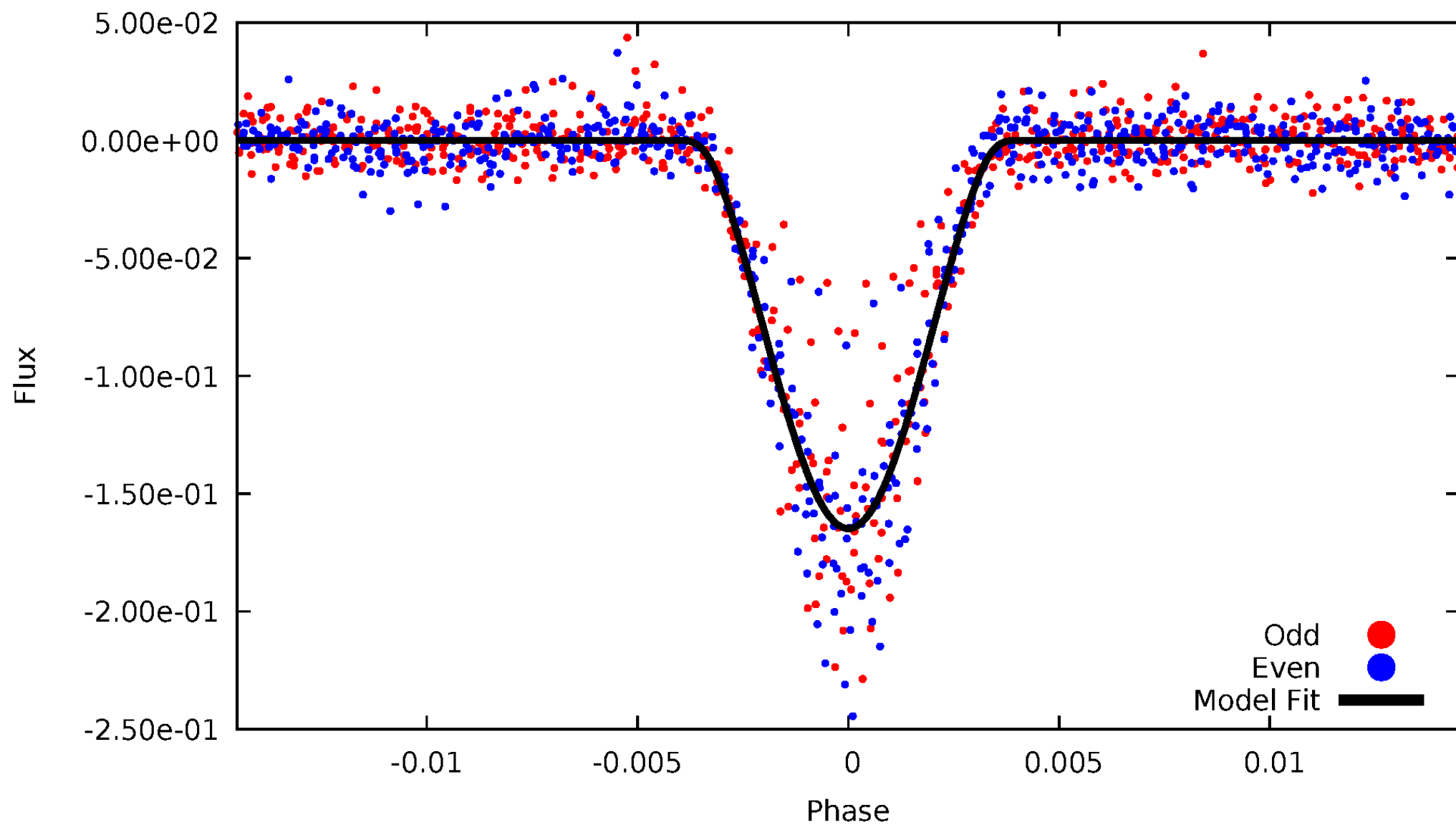


TCE 009655858-01



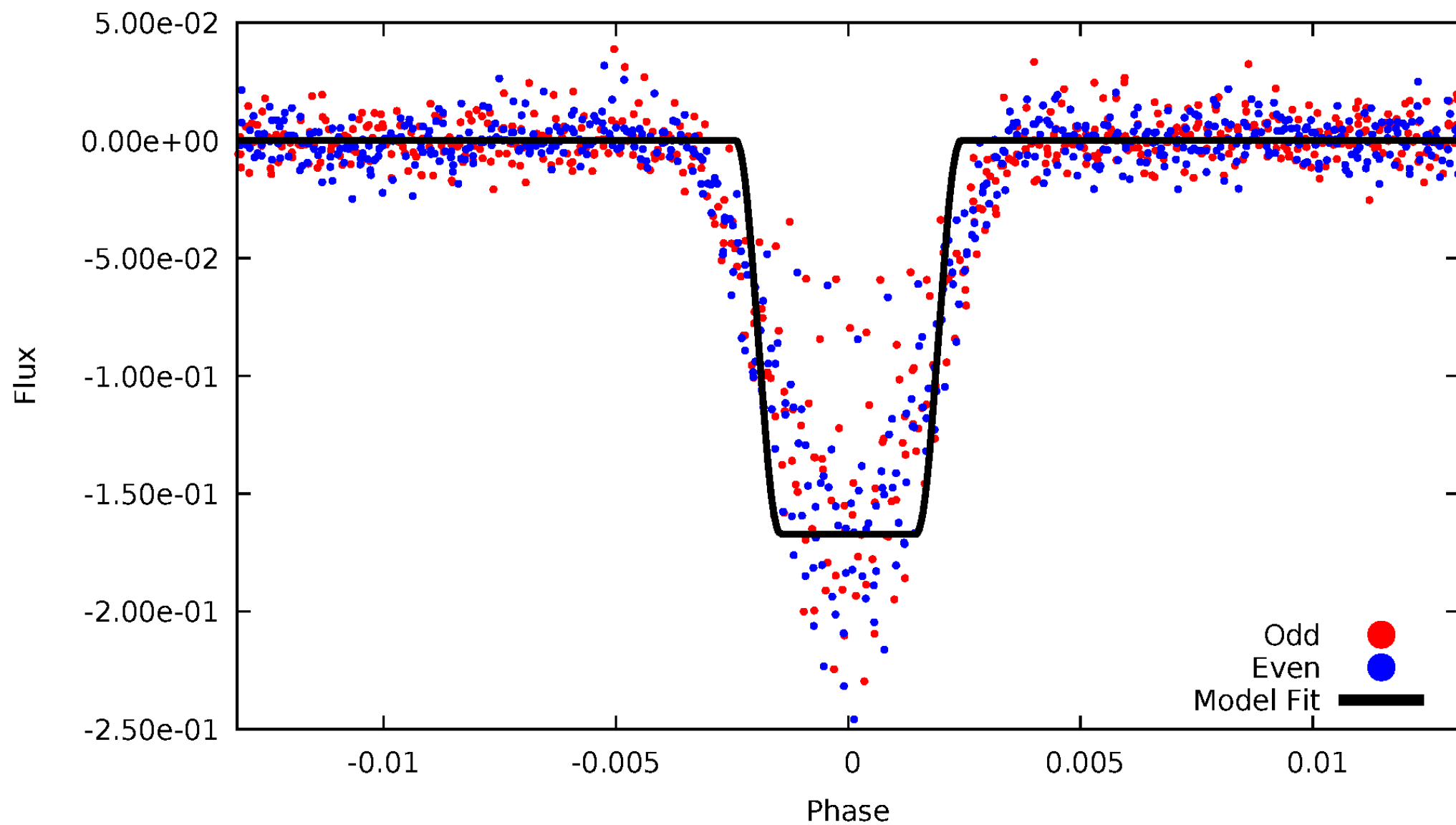
# DV Odd/Even

TCE 009655858-01



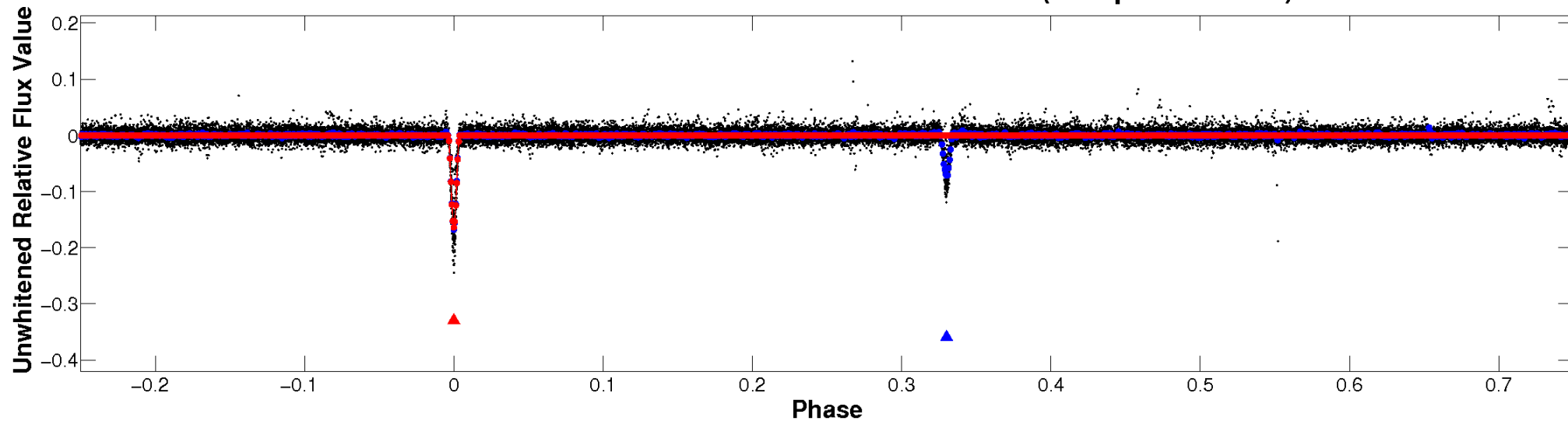
# ALT Odd/Even

TCE 009655858-01

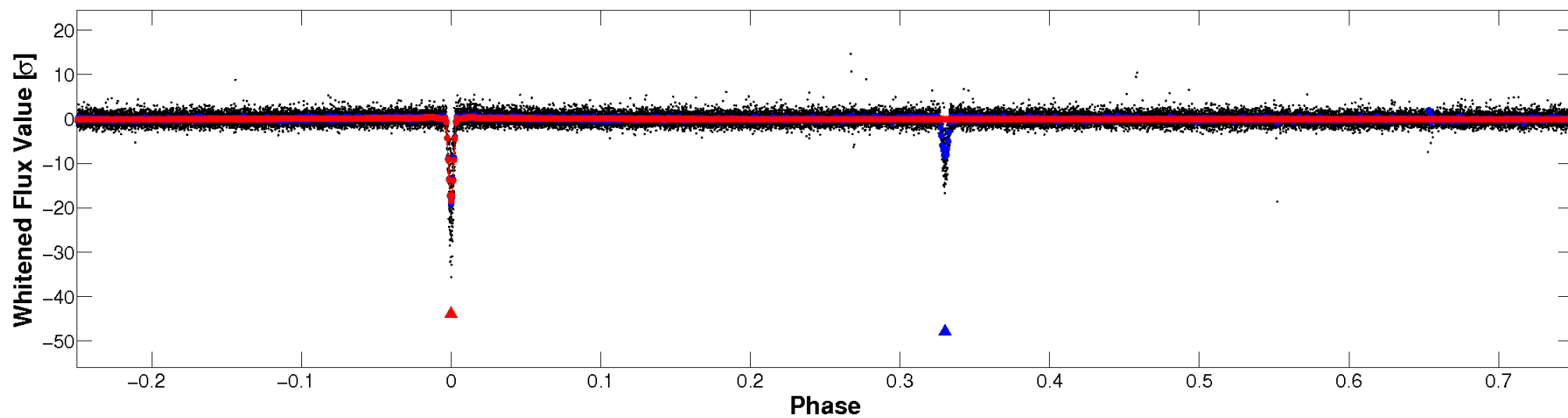


# Non-Whitened Vs. Whitened Light Curve

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

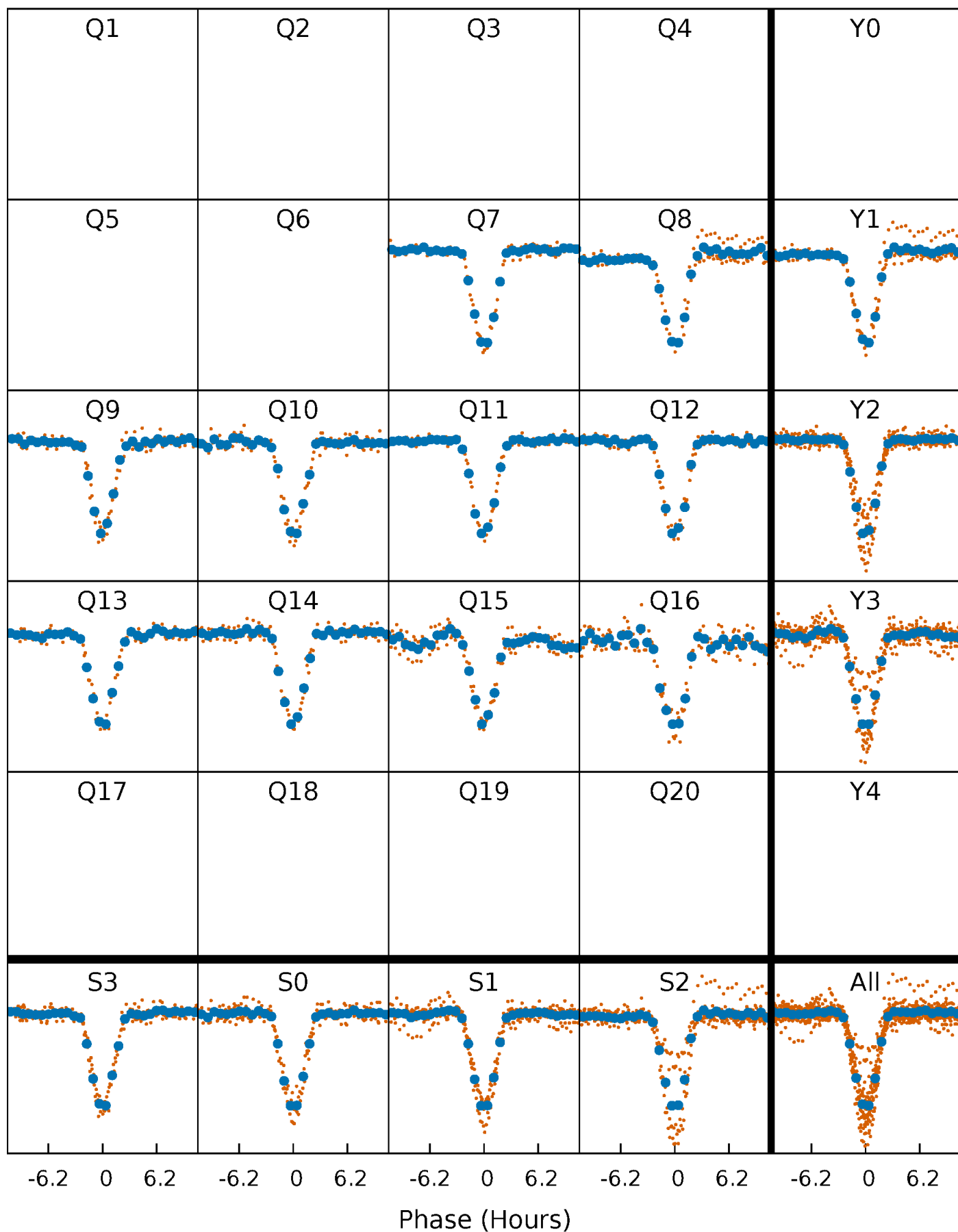


**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

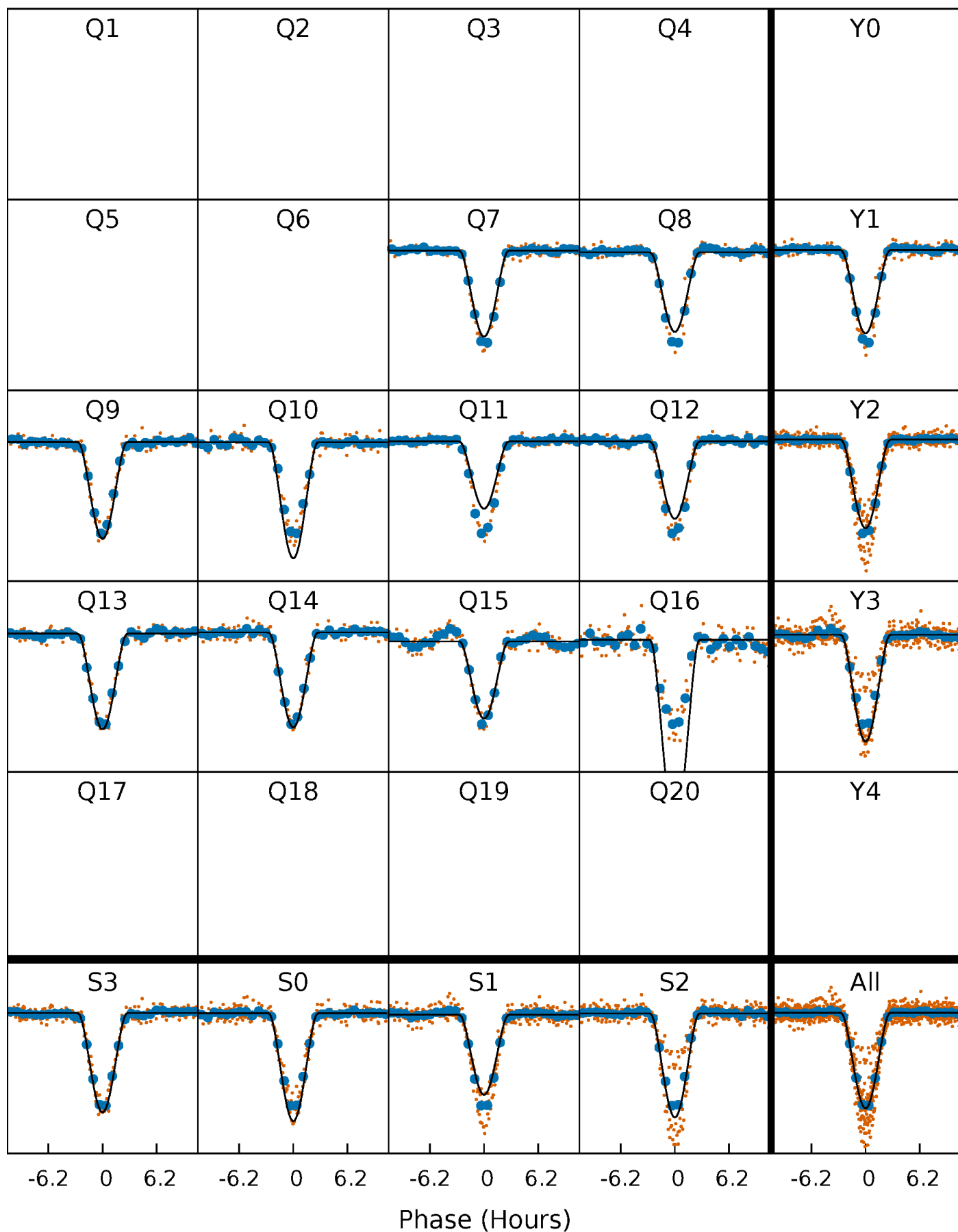
TCE 009655858-01 P= 31.432958 Days  $T_0=138.109011$  (BKJD)





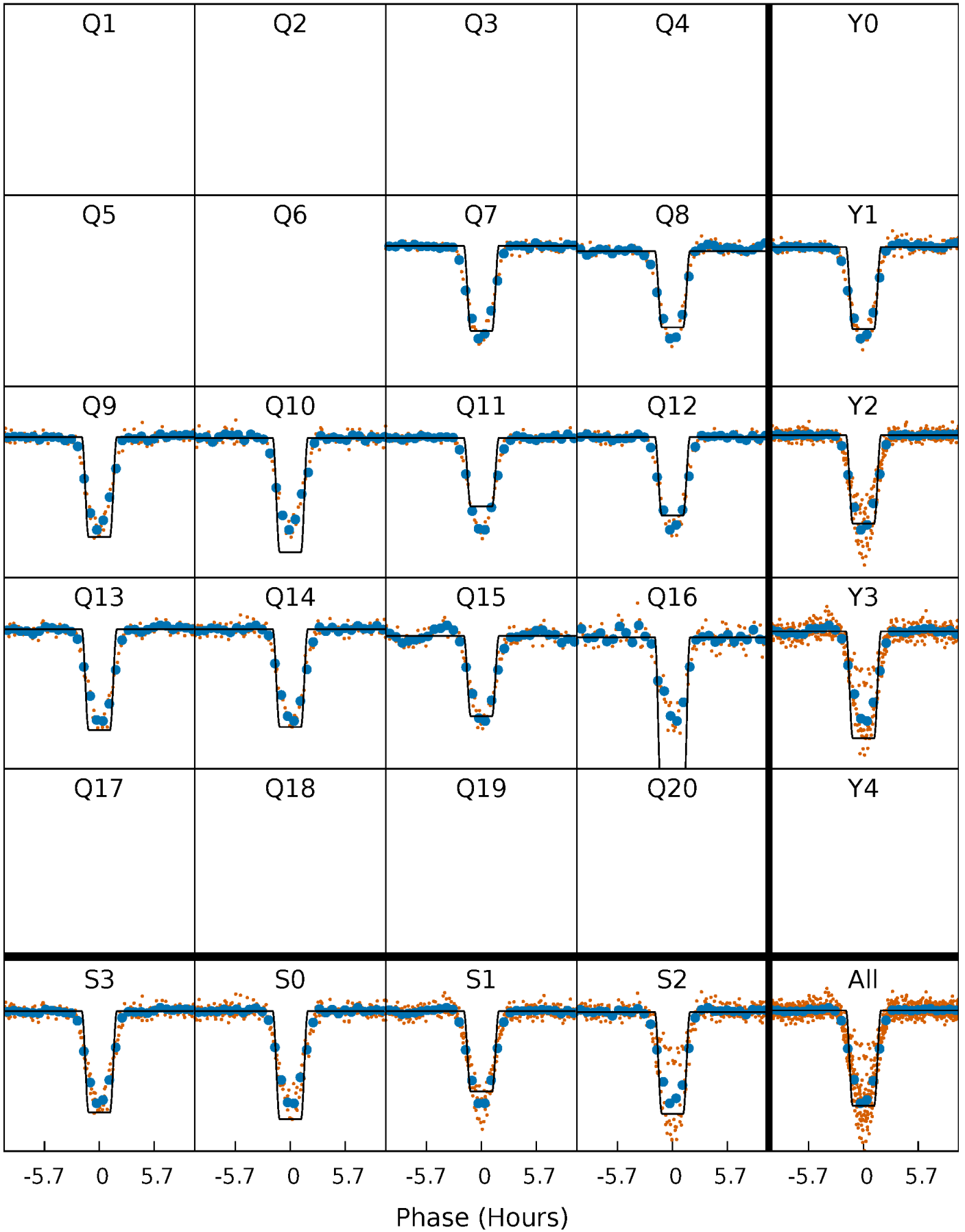
# DV Quarter-Phased Transit Curves

TCE 009655858-01 P= 31.432958 Days  $T_0=138.109011$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

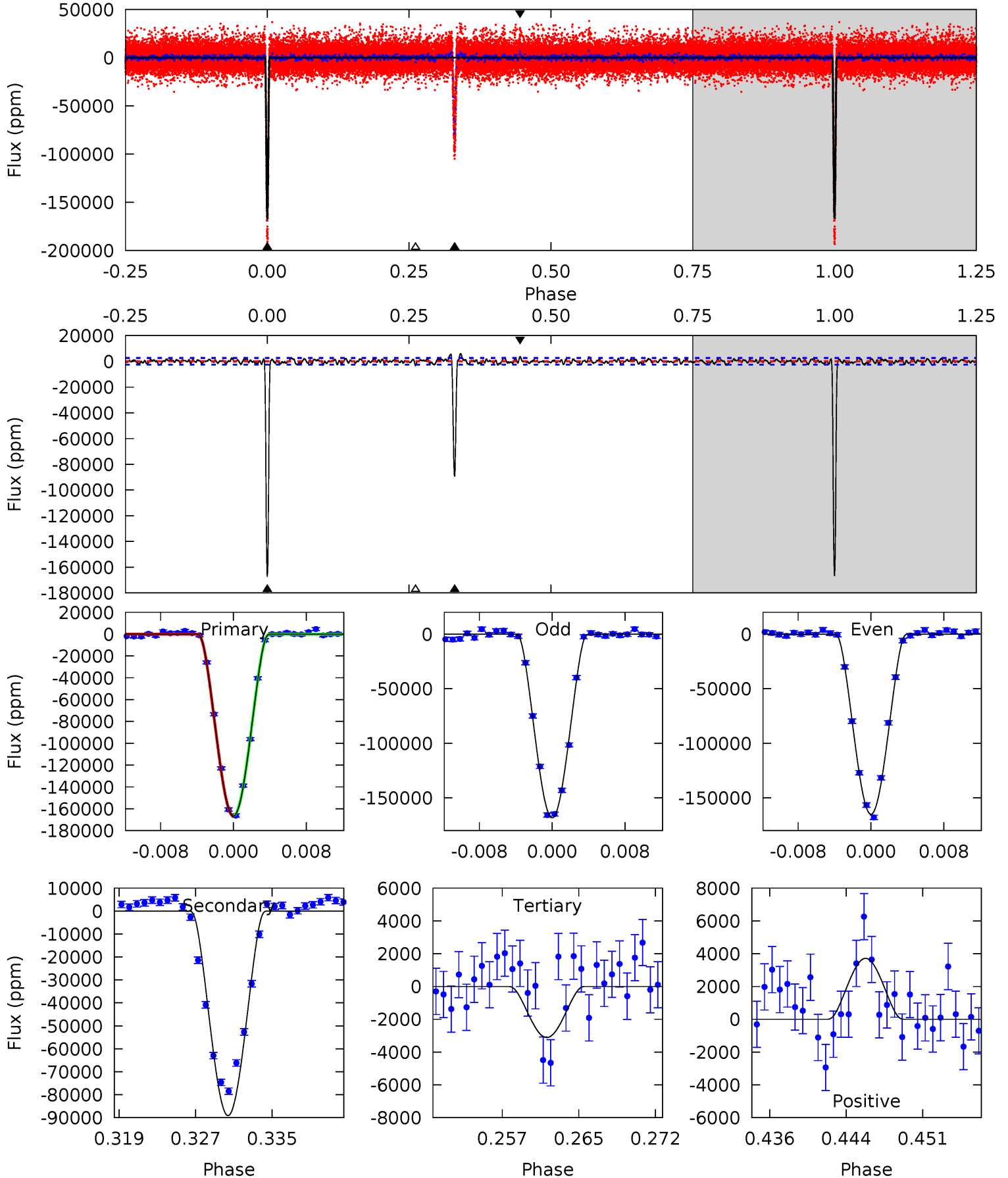
TCE 009655858-01 P= 31.432437 Days  $T_0=138.123947$  (BKJD)



# DV Model-Shift Uniqueness Test

009655858-01, P = 31.432958 Days, E = 138.109011 Days

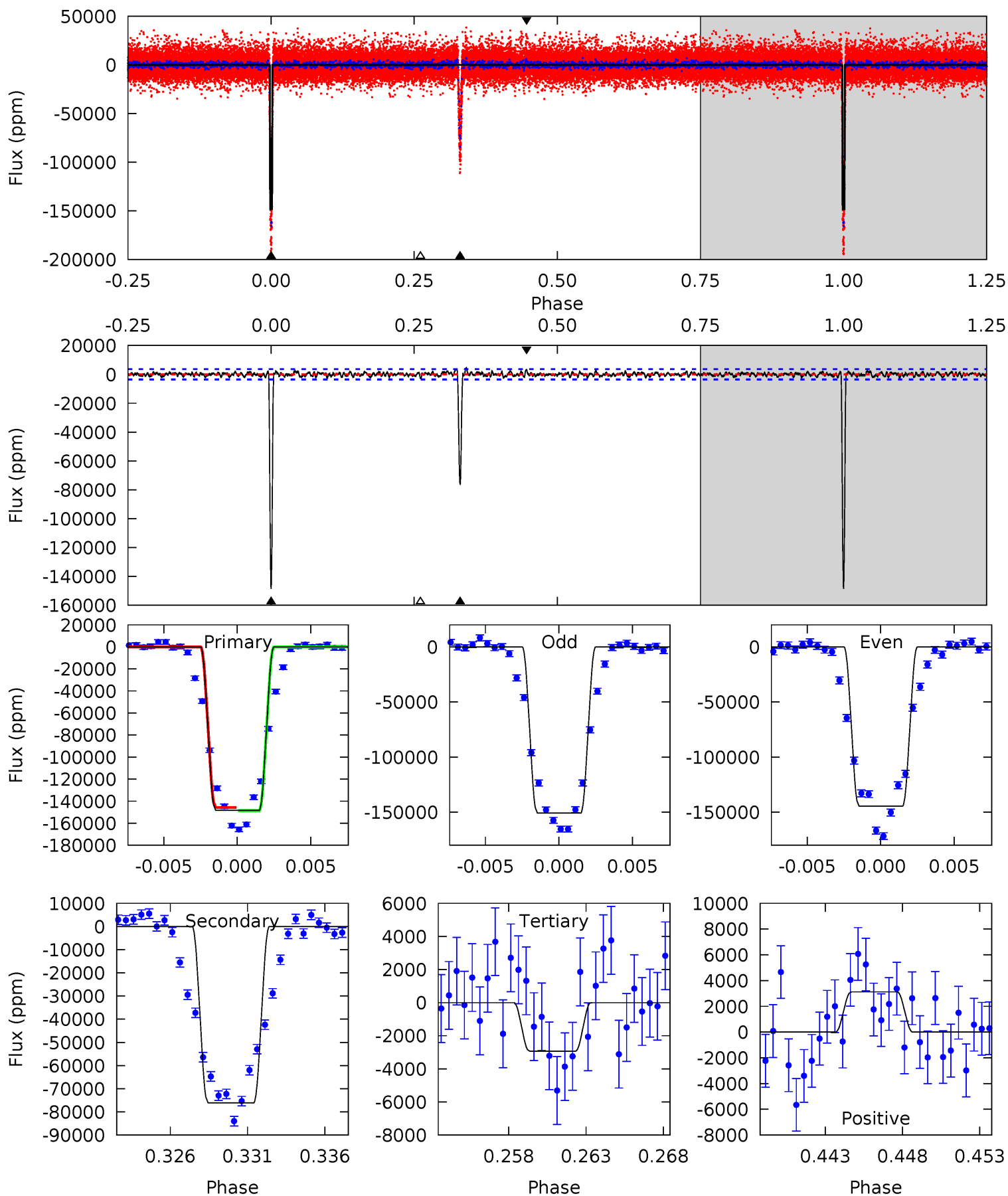
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
329.8	176.3	6.16	7.35	5.07	2.66	2.32	323.6	322.4	170.1	168.9	3.29	0.99	0.03	0.44



# Alt Model-Shift Uniqueness Test

009655858-01, P = 31.432437 Days, E = 138.123947 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
214.4	110.0	4.24	4.51	5.16	2.82	1.43	210.2	209.9	105.8	105.5	4.41	1.01	0.03	1.74



### Stellar Parameters For KIC 009655858

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5780^{+1}_{-1}$	$4.438^{+1.000}_{-1.000}$	$0.000^{+1.000}_{-1.000}$	$1.000^{+1.000}_{-1.000}$	$-1.000^{+1.000}_{-1.000}$	$-1.000^{+1.000}_{-1.000}$
	+0%/-0%	+23%/-23%	+inf%/-inf%	+100%/-100%	+100%/-100%	+100%/-100%
Source	Solar	Solar	Solar	Solar		

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

### Secondary Eclipse Parameters for KIC 009655858-01 / KOI 3733.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-89127 \pm 506$	$80.10^{+63.82}_{-54.97}$	$807^{+38}_{-35}$	$4080^{+2657}_{-748}$	$318^{+2921}_{-216}$
Alt.	$-76090 \pm 692$	$66.46^{+63.65}_{-44.74}$	$808^{+40}_{-40}$	$4219^{+2757}_{-863}$	$394^{+3292}_{-291}$

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

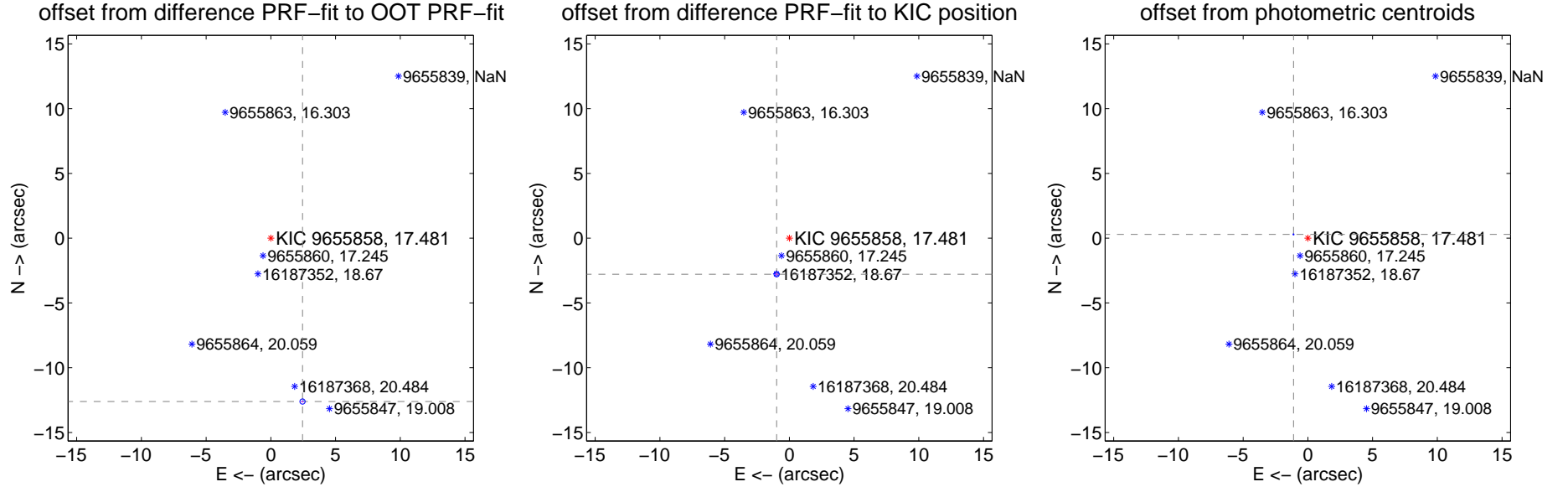
## DV Centroid Data

Supplemental centroid analysis for 009655858-01. Kepler magnitude: 17.48. Transit SNR 148.96

There are 10 quarters with good PRF difference image offsets

The OOT PRF centroid is offset from the target star catalog position by about 10.35 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	$12.844 \pm 0.067$	190.67	$-2.446 \pm 0.067$	$-12.608 \pm 0.067$
PRF-fit source offset from KIC position	$2.952 \pm 0.067$	43.85	$0.983 \pm 0.067$	$-2.783 \pm 0.067$
photometric centroid source offset	$1.15 \pm 0.01$	78.40	$1.11 \pm 0.01$	$0.29 \pm 0.01$



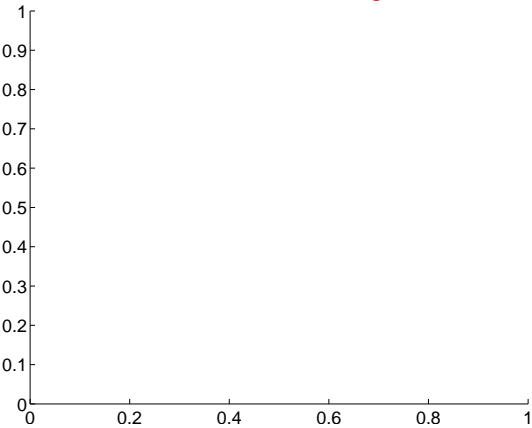
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

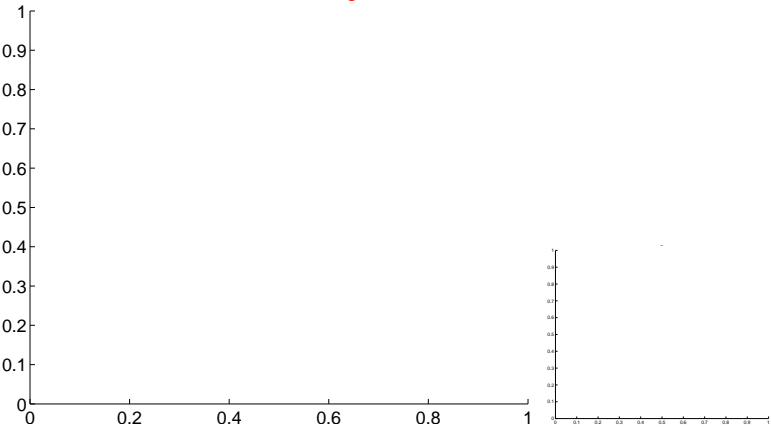


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

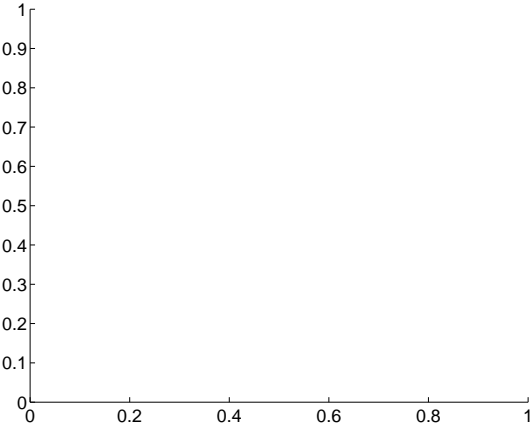
Q5 no difference image



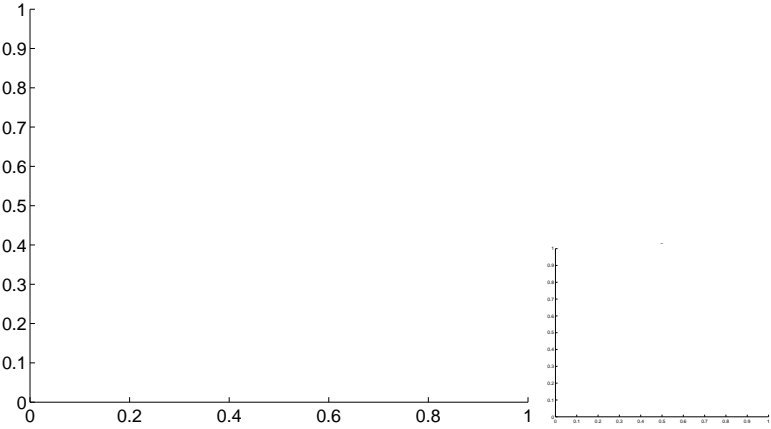
Q5 no OOT image



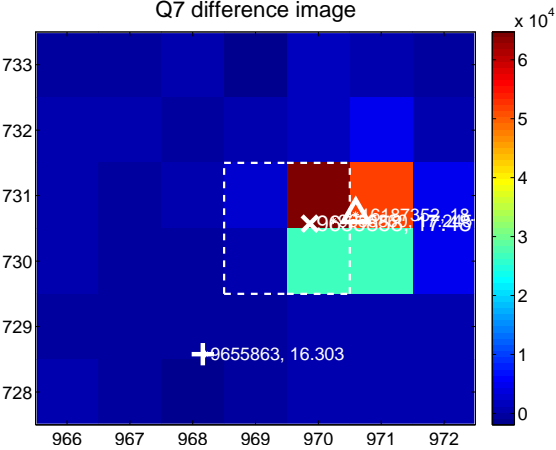
Q6 no difference image



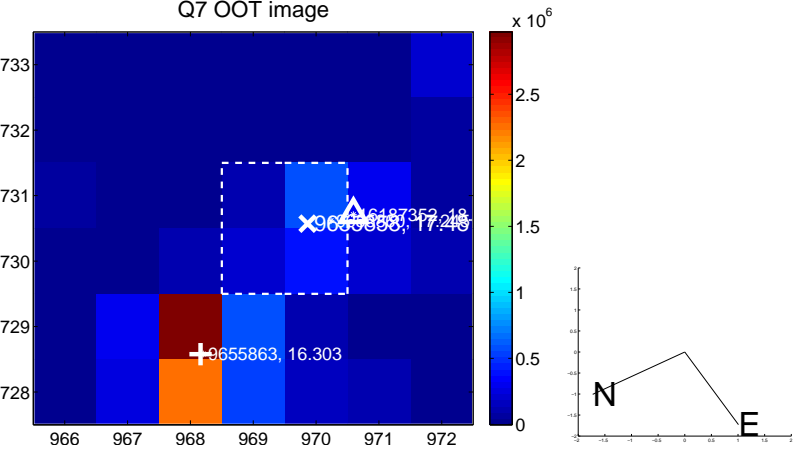
Q6 no OOT image



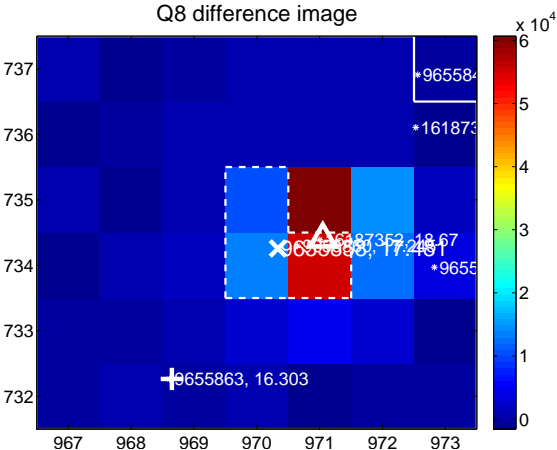
Q7 difference image



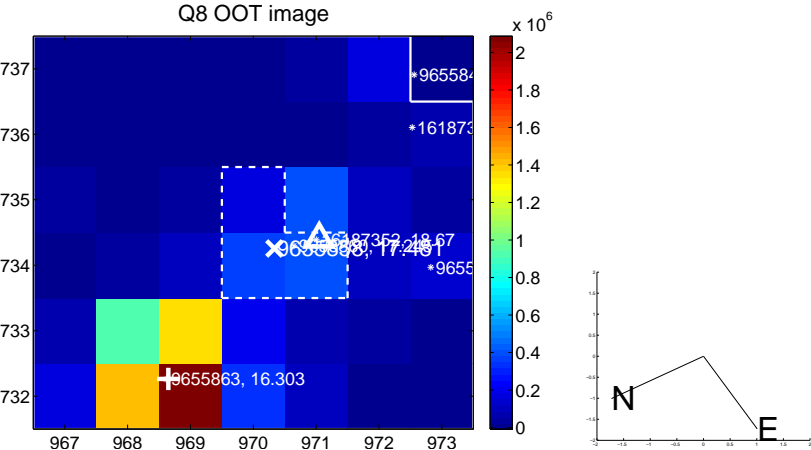
Q7 OOT image



Q8 difference image

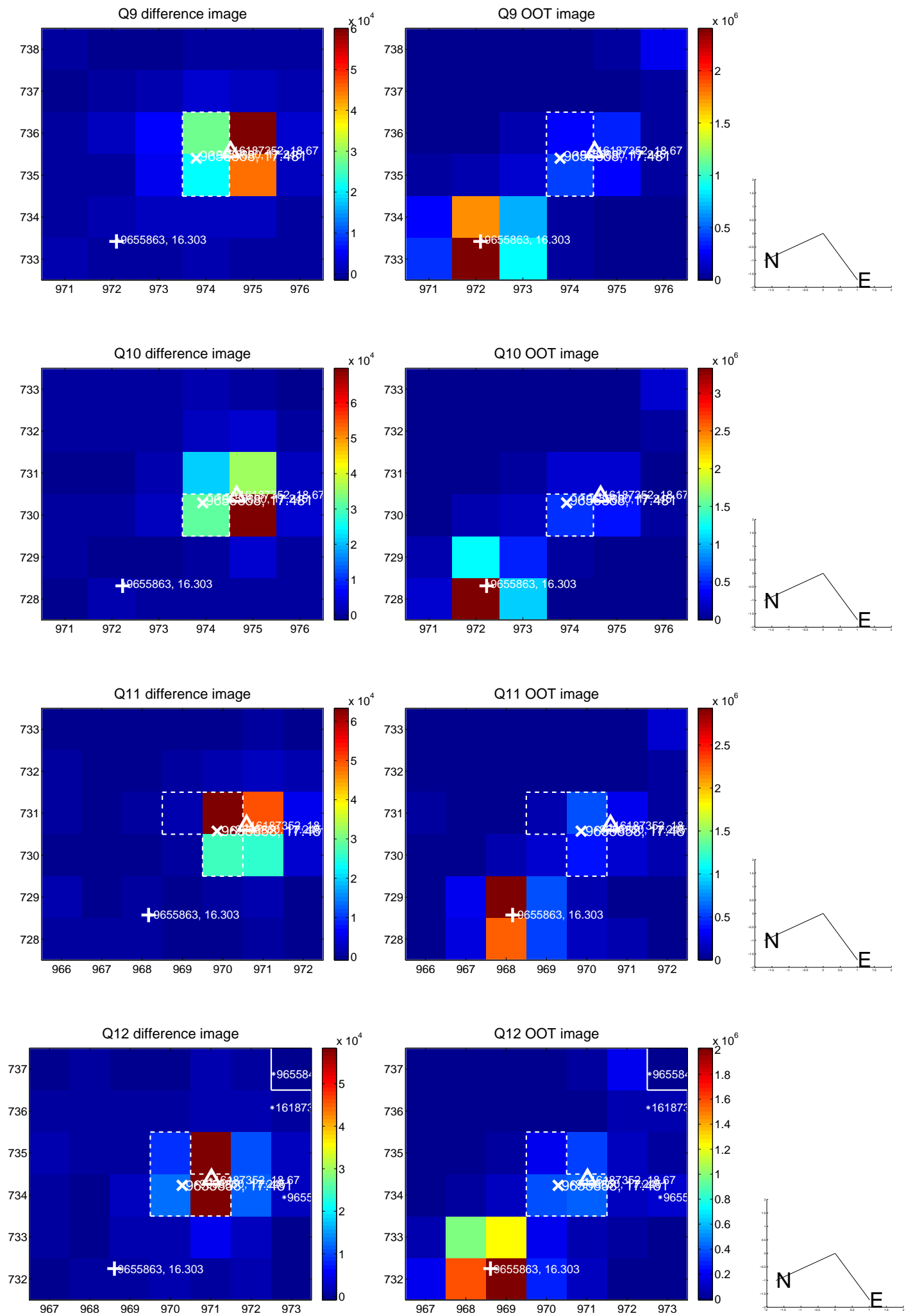


Q8 OOT image

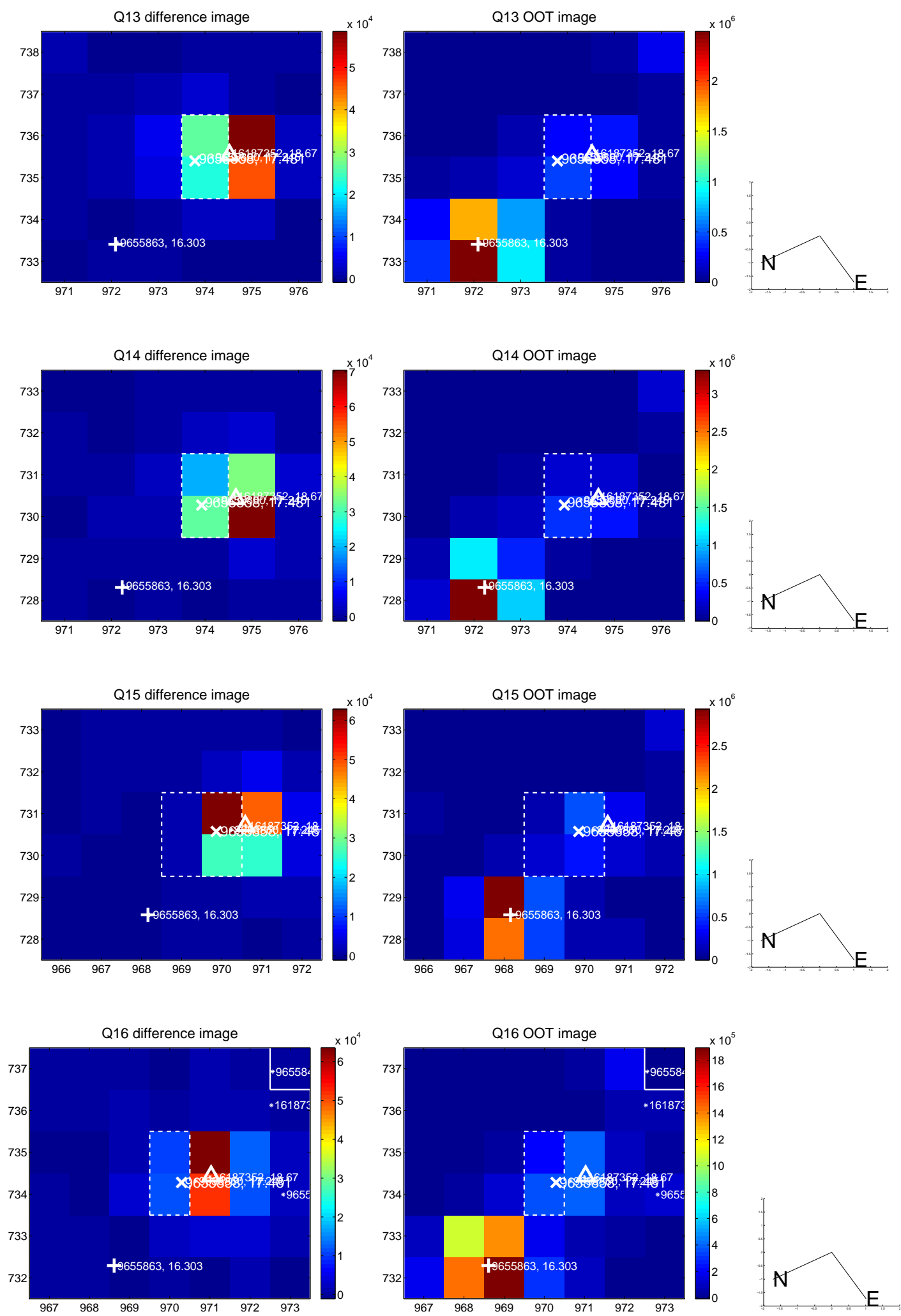




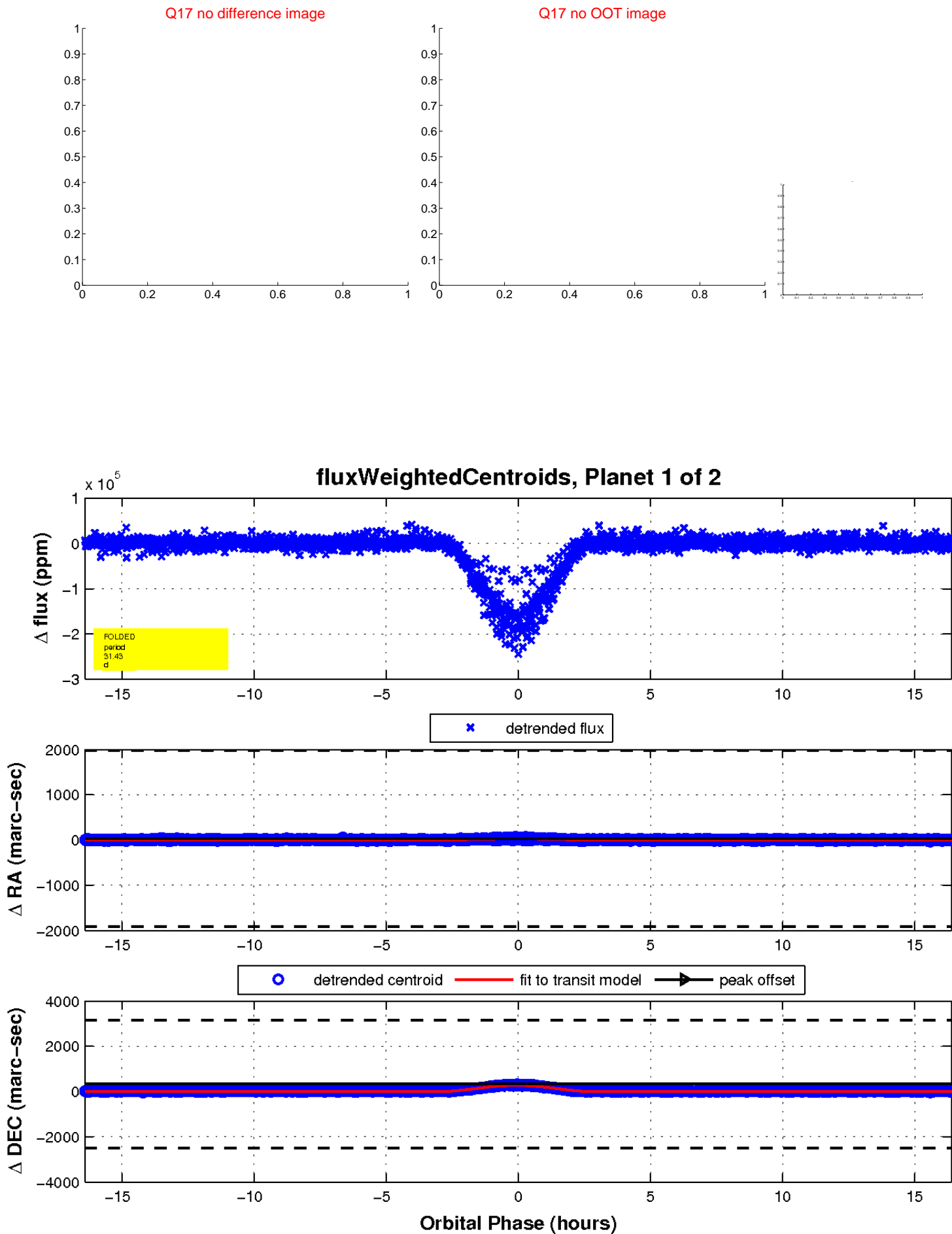
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

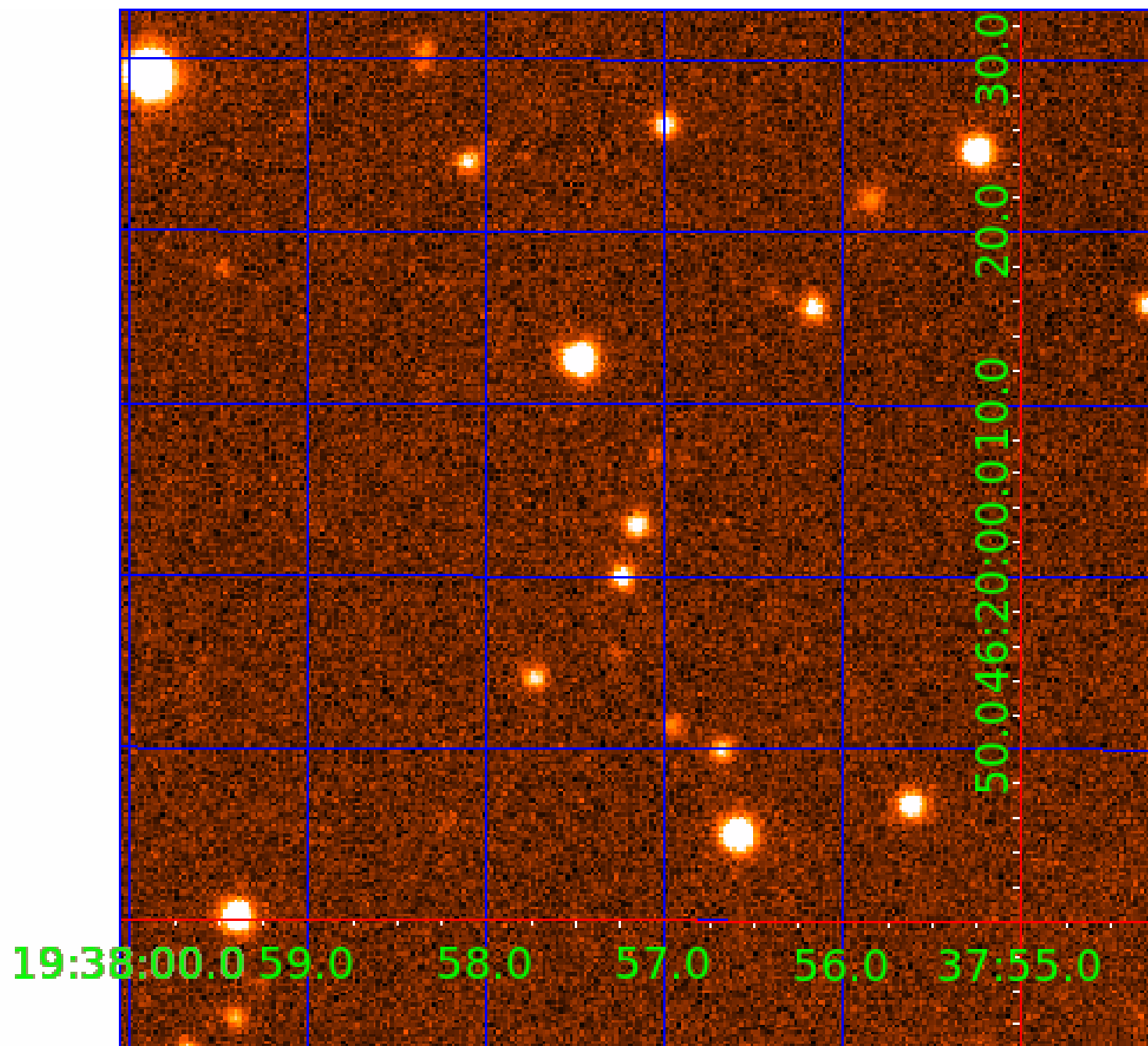


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 009655858

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009655858-01	OBS	3733.01	31.432958	138.109011	164799.7	5.466	231.6	149.0	1.00	5780	61.41	26.31
009655858-02	OBS	No	31.432910	148.486247	83635.7	6.110	107.8	94.0	1.00	5780	39.94	26.31

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009655858-01	OBS	FP	0.00	0	1	0	0	MOD_SEC_DV—MOD_SEC_ALT—DEEP_V_SHAPED—HAS_SEC_TCE—CENT_KIC_POS
009655858-02	OBS	FP	0.00	1	1	0	0	IS_SEC_TCE—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 009655858-02

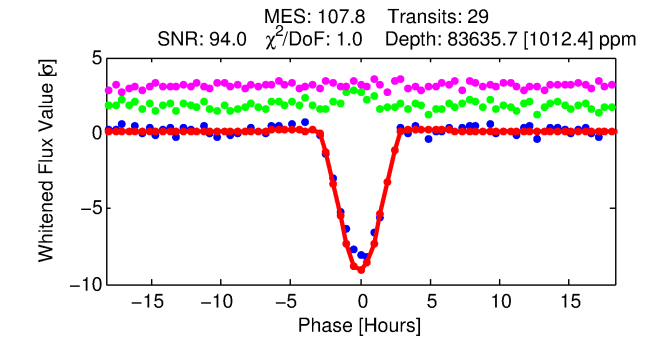
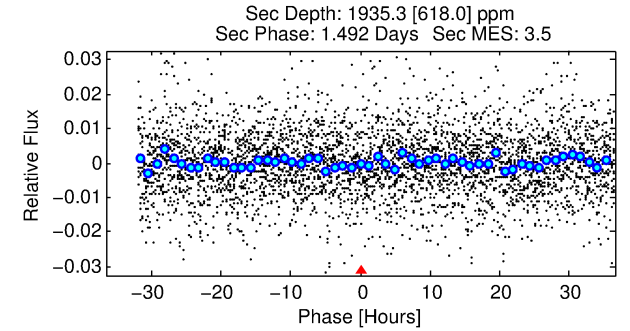
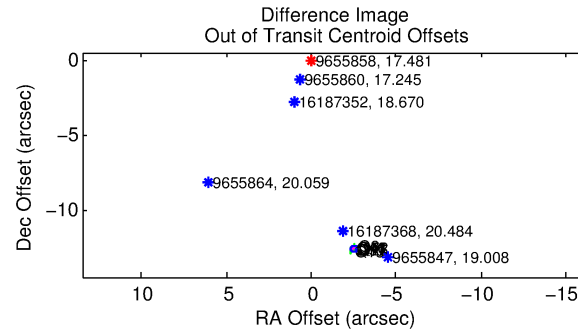
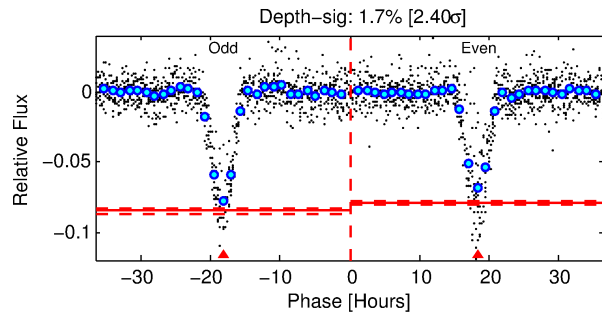
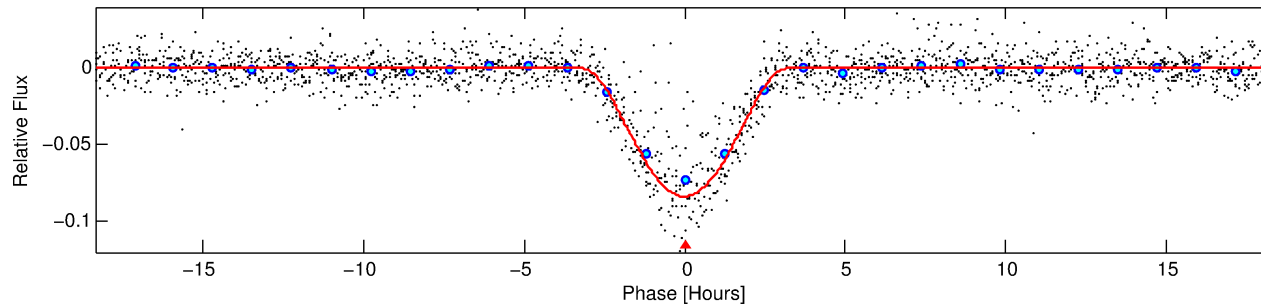
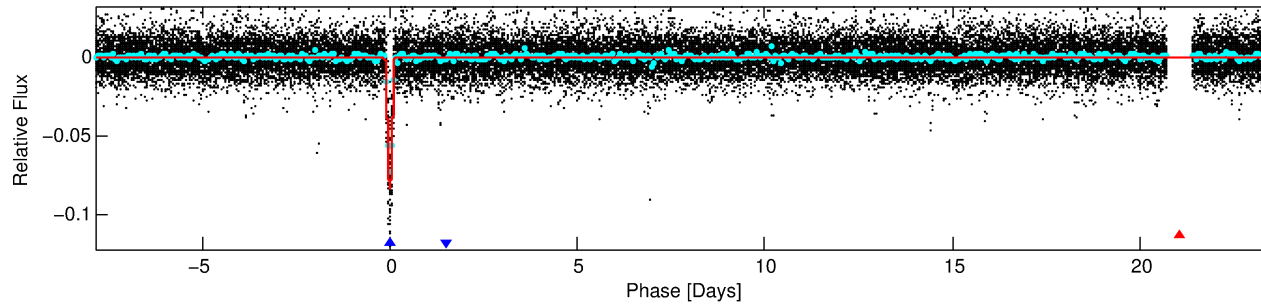
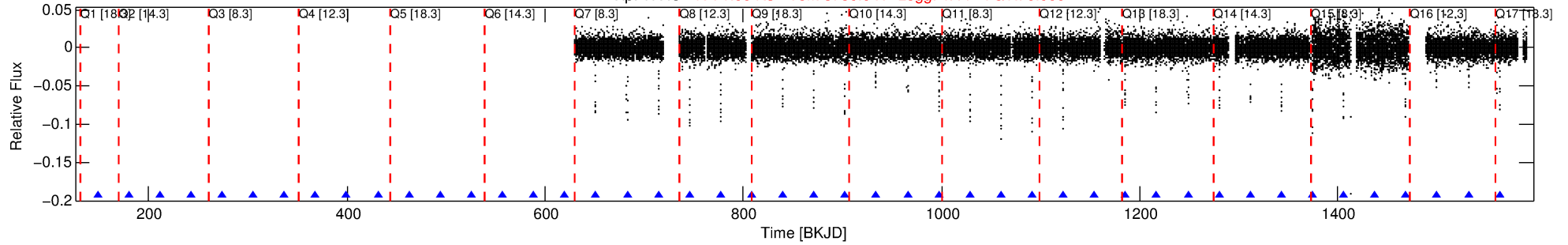
No Significant Match Found

# DV One-Page Summary

KIC: 9655858 Candidate: 2 of 2 Period: 31.433 d

KOI: K03733 Corr: No Ephemeris Match

Kp: 17.48 R\*: 1.00 Rs Teff: 5780.0 K Logg: 4.44 Fe/H: 0.000



## DV Fit Results:

Period = 31.43291 [0.00008] d  
Epoch = 148.4862 [0.0025] BKJD  
Rp/R\* = 0.3660 [0.1717]  
a/R\* = 41.21 [0.84]  
b = 0.88 [0.27]  
Seff = 26.31 [0.00]  
Teq = 577 [0] K  
Rp = 39.94 [18.73] Re  
a = 0.1950 [0.0000] AU  
Ag = 25.37 [25.14] [0.97σ]  
Teffp = 2004 [496] K [2.87σ]

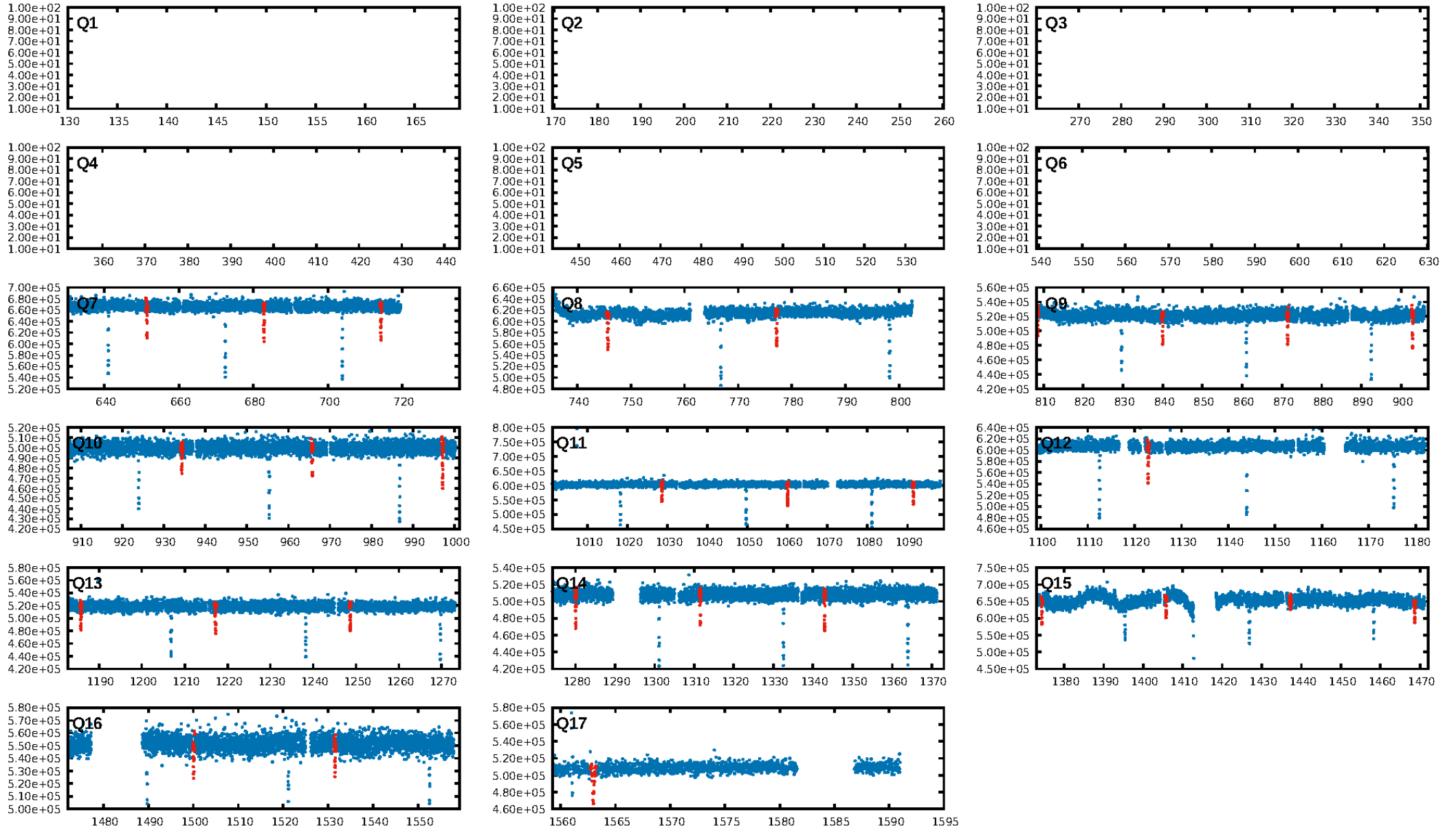
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.0% [0.00σ]  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [28/28]  
GhostDiagnostic-chr: 1.286  
Centroid-sig: 0.0%  
Centroid-so: 1.171 arcsec [44.44σ]  
OotOffset-rm: 12.850 arcsec [182.87σ]  
KicOffset-rm: 2.942 arcsec [40.90σ]  
OotOffset-st: 2/3/3/3 [11]  
KicOffset-st: 2/3/3/3 [11]  
DiffImageQuality-fgm: 1.00 [11/11]  
DiffImageOverlap-fno: 1.00 [11/11]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 00:35:38 Z

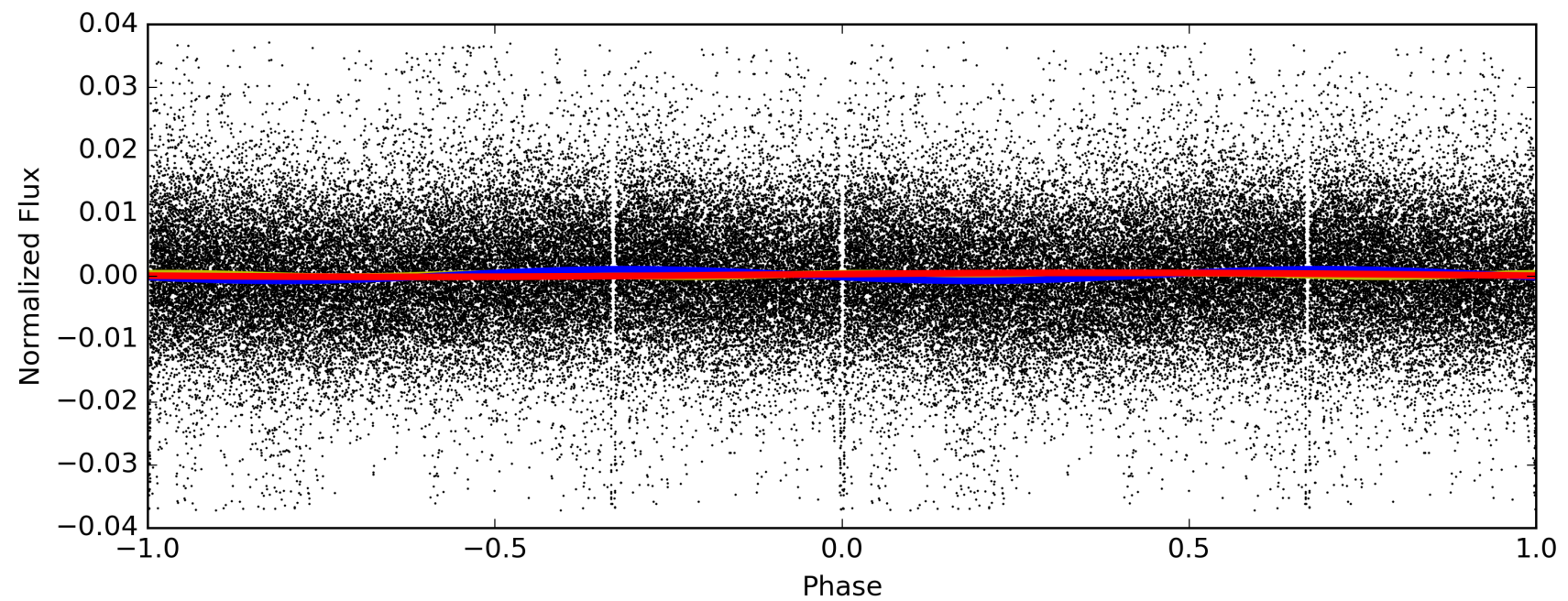
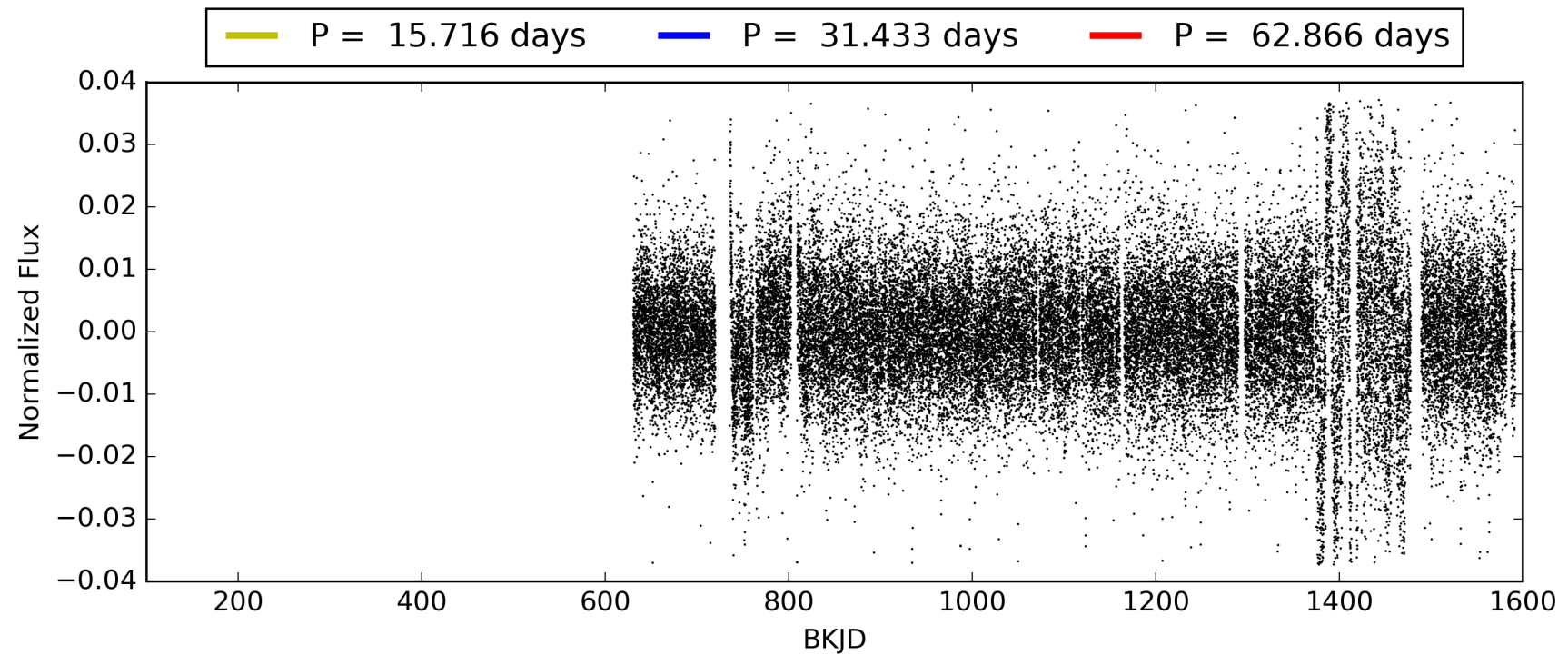
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 009655858-02, PDC Light Curves





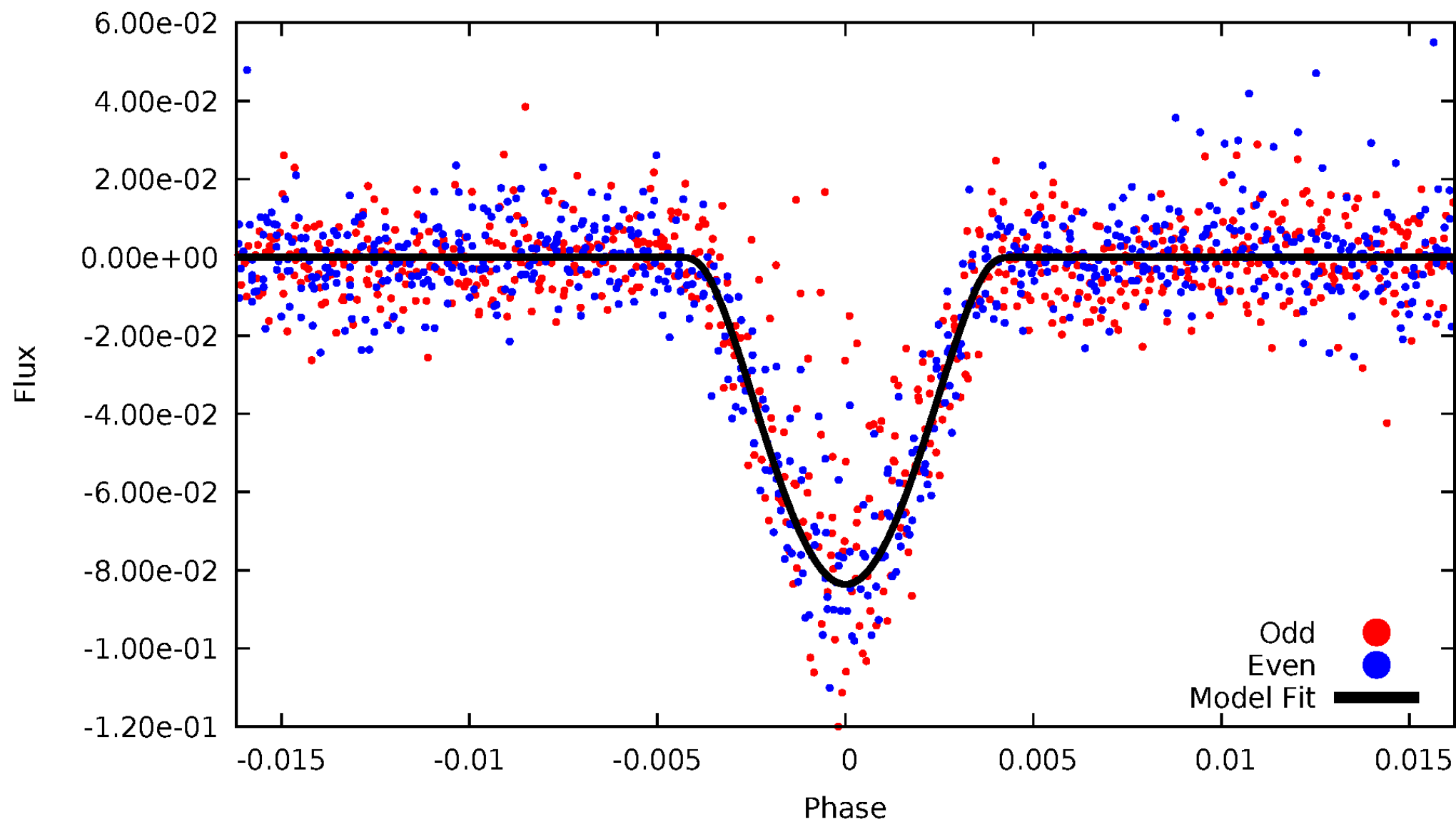
TCE 009655858-02





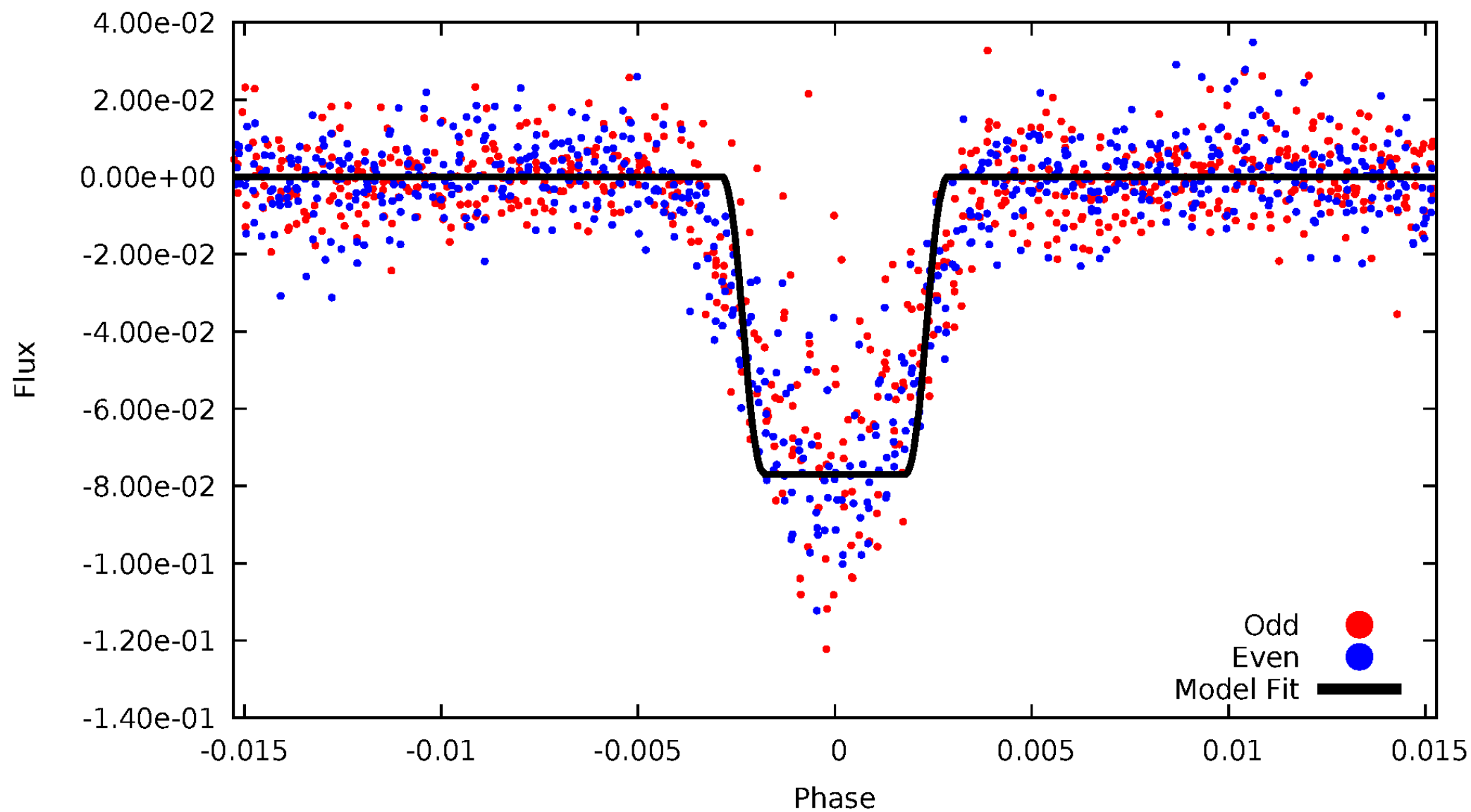
# DV Odd/Even

TCE 009655858-02



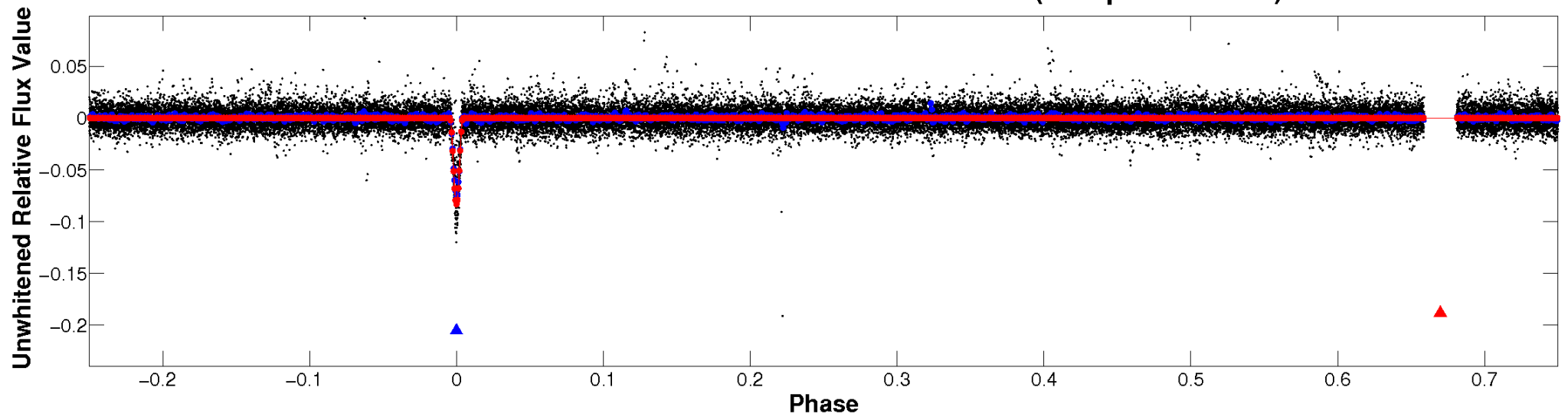
# ALT Odd/Even

TCE 009655858-02

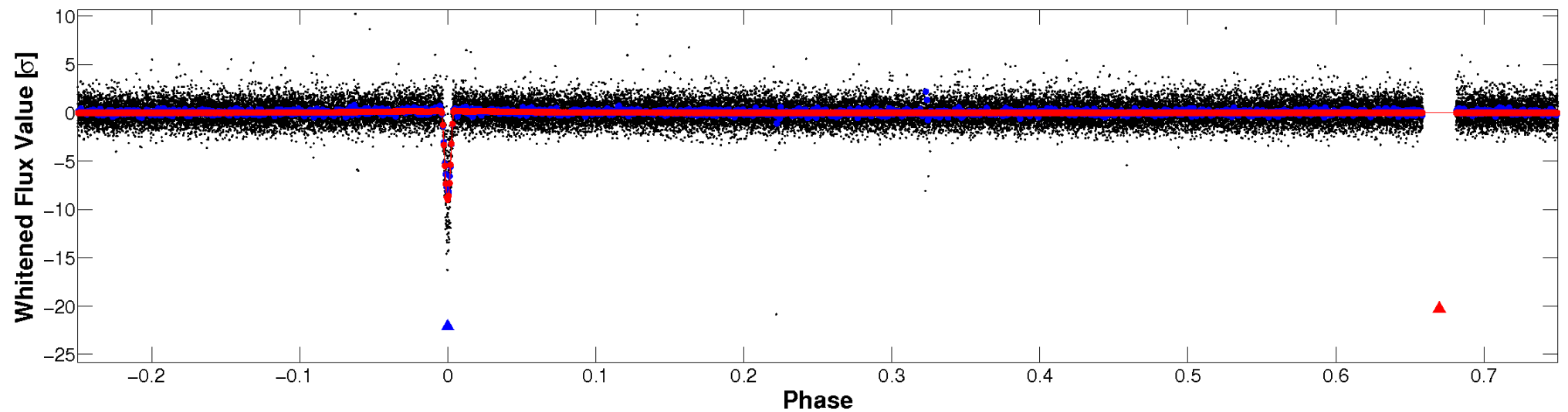


# Non-Whitened Vs. Whitened Light Curve

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

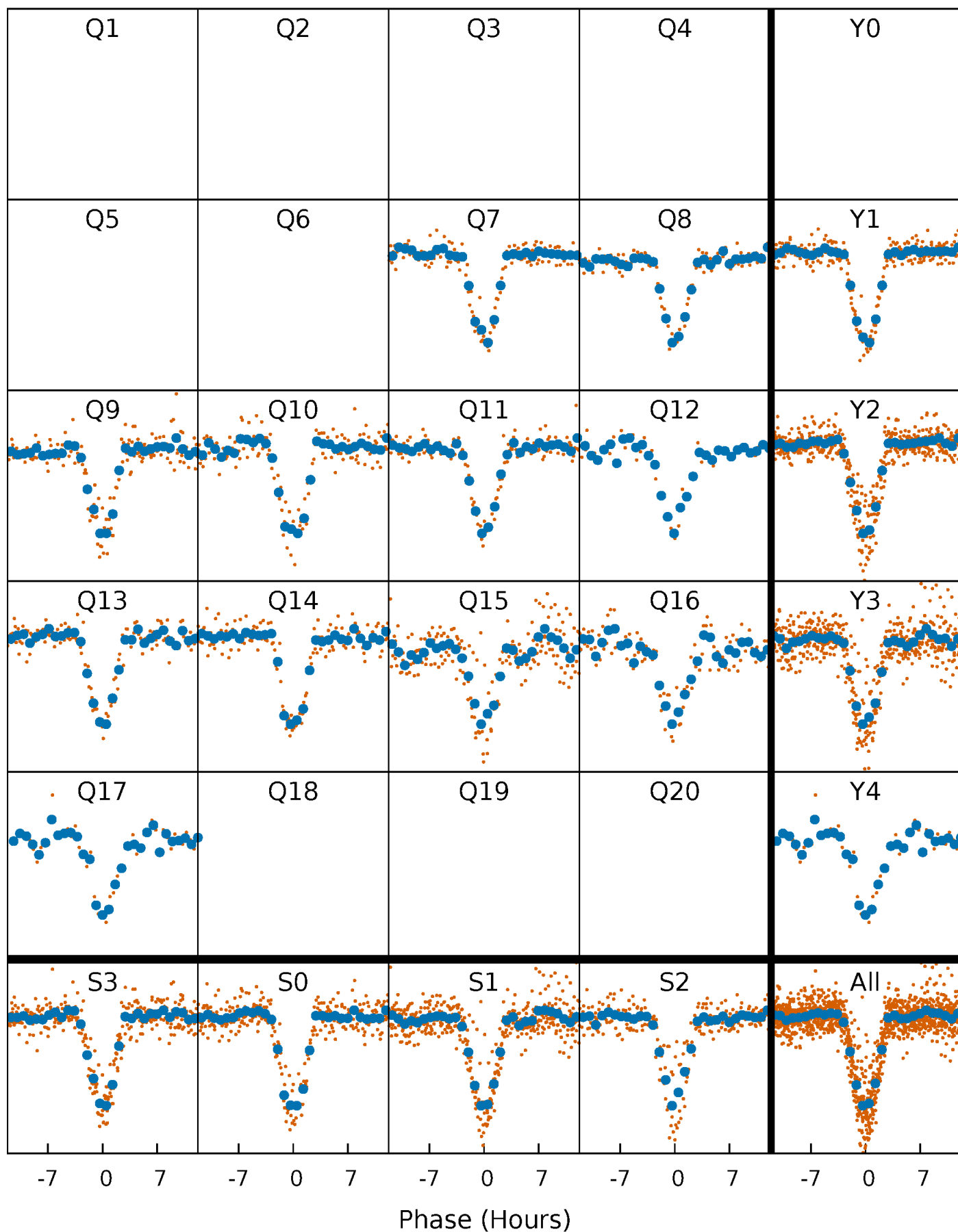


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



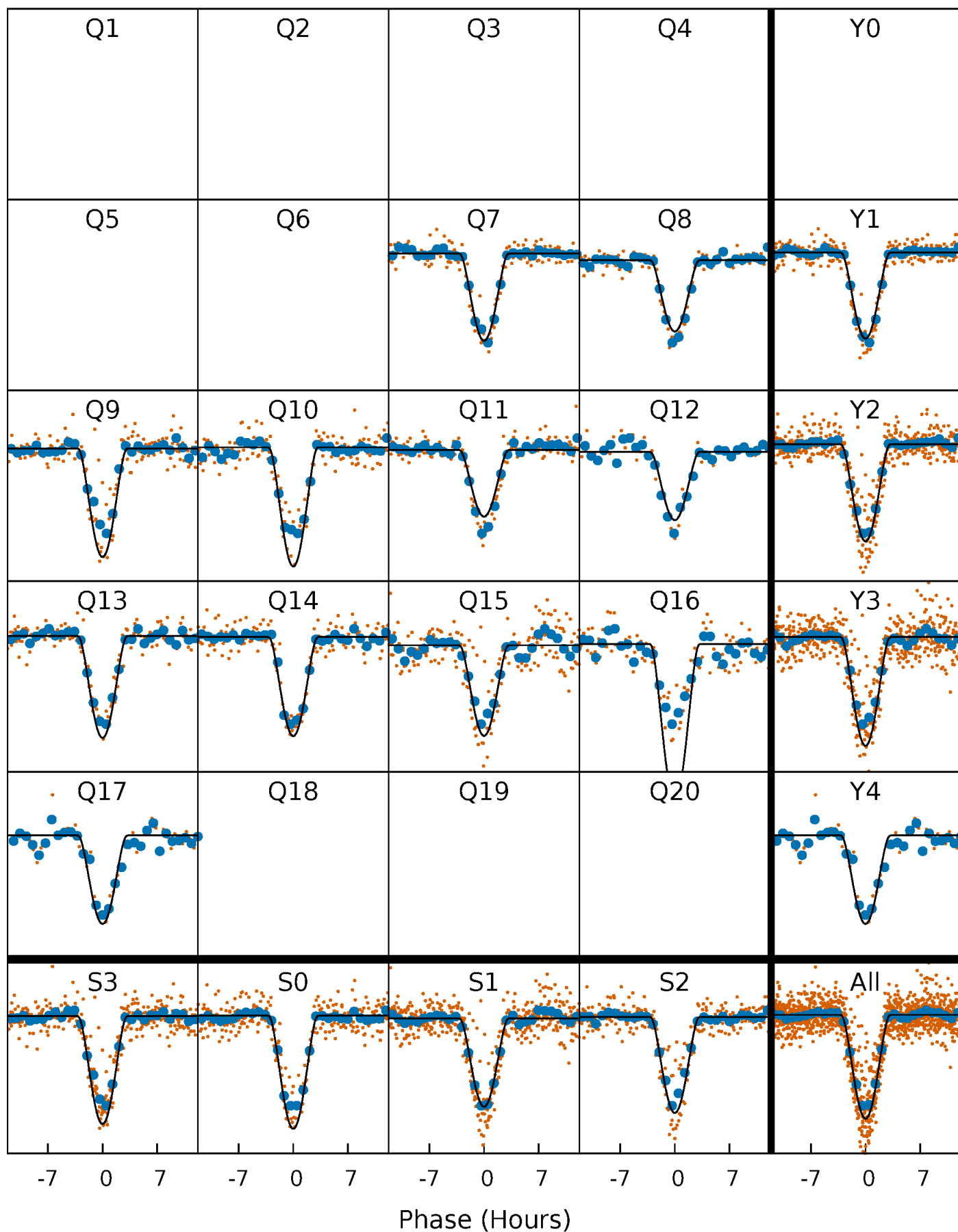
# PDC Quarter-Phased Transit Curves

TCE 009655858-02   P= 31.432910 Days    $T_0=148.486247$  (BKJD)



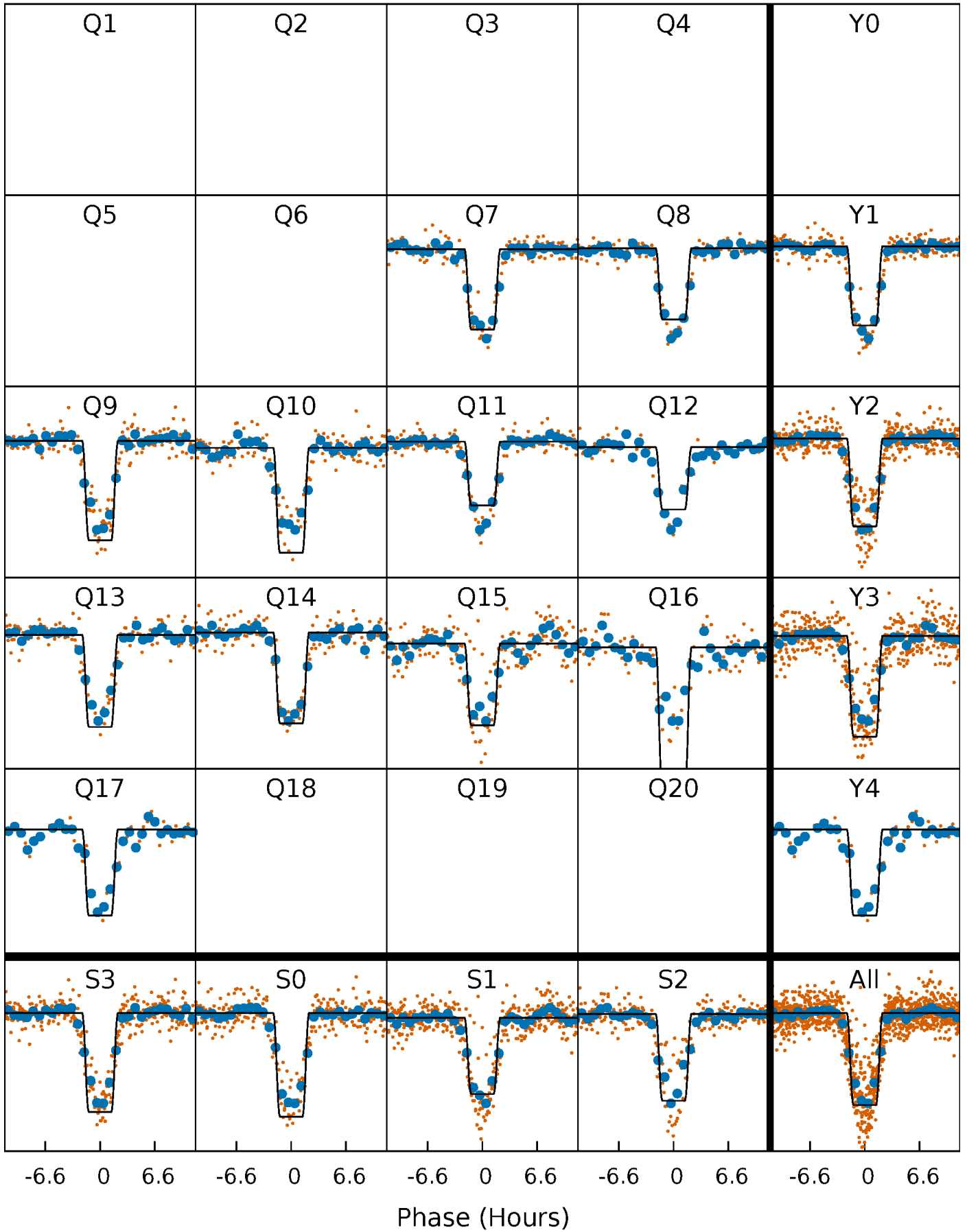
# DV Quarter-Phased Transit Curves

TCE 009655858-02 P= 31.432910 Days  $T_0=148.486247$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

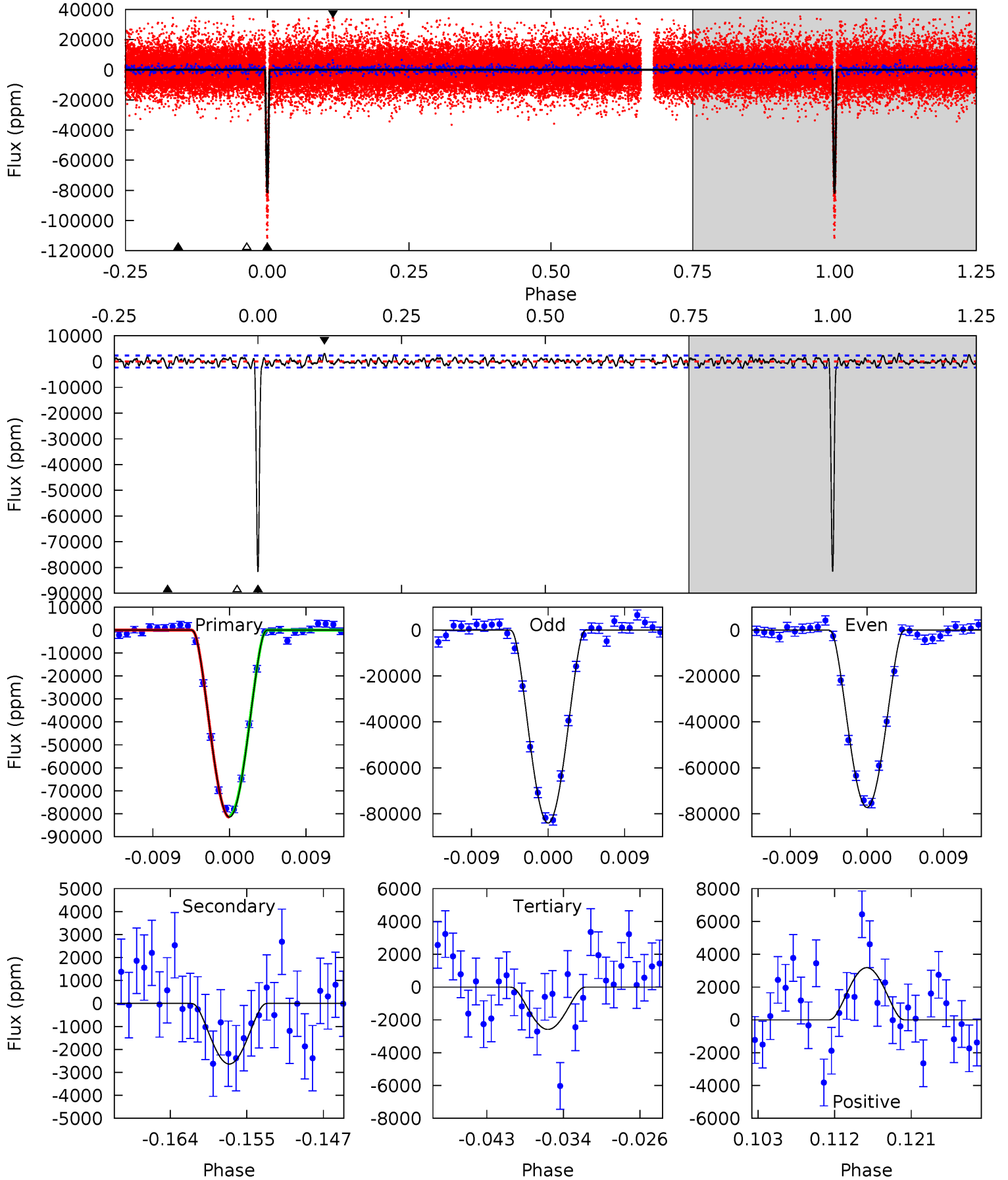
TCE 009655858-02 P= 31.433149 Days  $T_0=148.480352$  (BKJD)



# DV Model-Shift Uniqueness Test

009655858-02, P = 31.432910 Days, E = 148.486247 Days

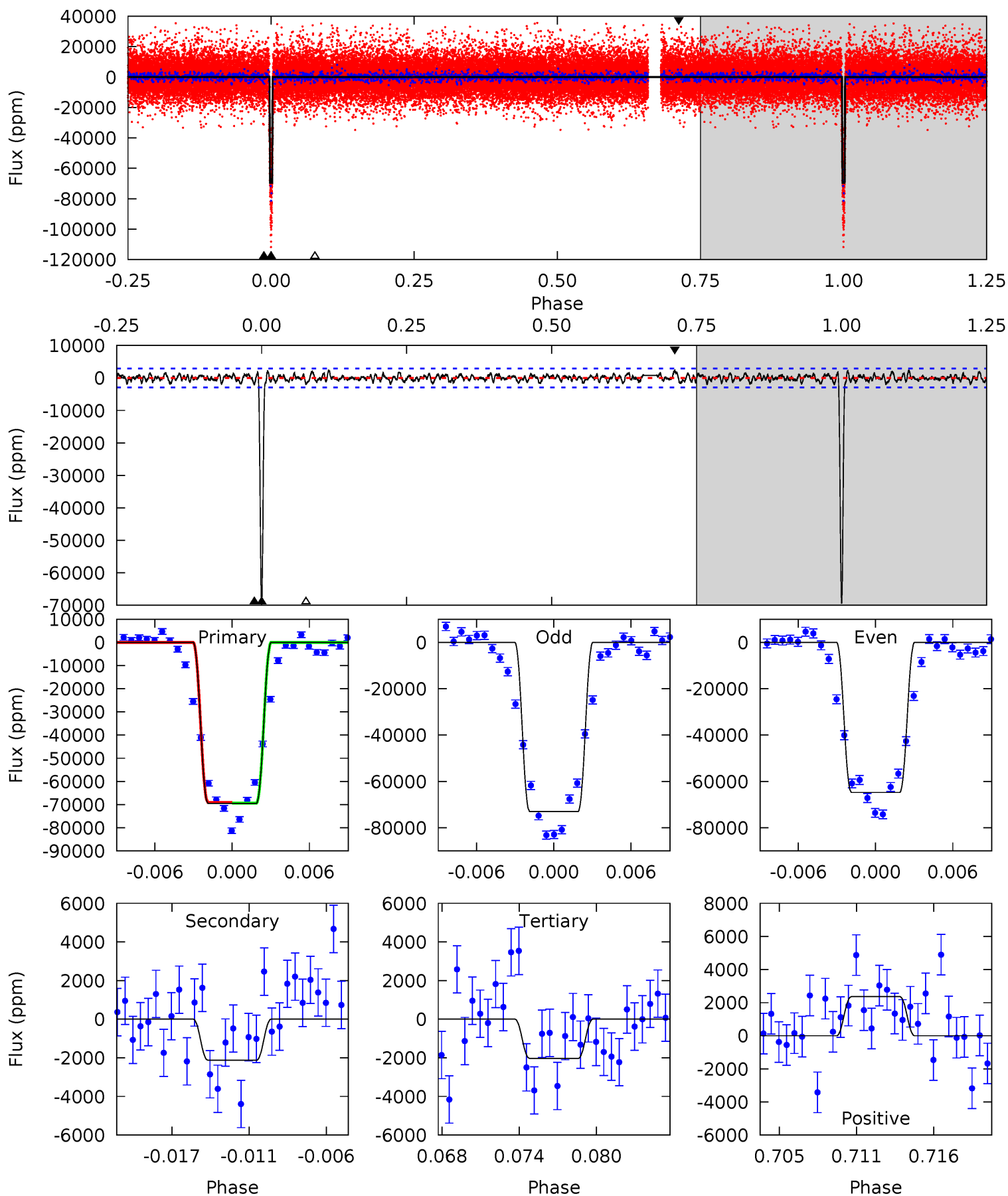
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
176.4	5.71	5.59	6.89	5.05	2.63	2.00	170.8	169.5	0.12	-1.18	7.34	0.98	0.04	0



# Alt Model-Shift Uniqueness Test

009655858-02, P = 31.433149 Days, E = 148.480352 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
122.7	3.76	3.59	4.17	5.13	2.77	1.34	119.1	118.5	0.17	-0.41	7.32	0.99	0.03	0.24





### Stellar Parameters For KIC 009655858

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5780^{+1}_{-1}$	$4.438^{+1.000}_{-1.000}$	$0.000^{+1.000}_{-1.000}$	$1.000^{+1.000}_{-1.000}$	$-1.000^{+1.000}_{-1.000}$	$-1.000^{+1.000}_{-1.000}$
	+0%/-0%	+23%/-23%	+inf%/-inf%	+100%/-100%	+100%/-100%	+100%/-100%
Source	Solar	Solar	Solar	Solar		

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

### Secondary Eclipse Parameters for KIC 009655858-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	-2639±462	$39.94^{+19.94}_{-17.95}$	$807^{+38}_{-41}$	$2867^{+584}_{-278}$	$35^{+87}_{-19}$
Alt.	-2129±566	$31.65^{+19.11}_{-16.41}$	$806^{+36}_{-36}$	$2956^{+752}_{-344}$	$42^{+141}_{-26}$

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

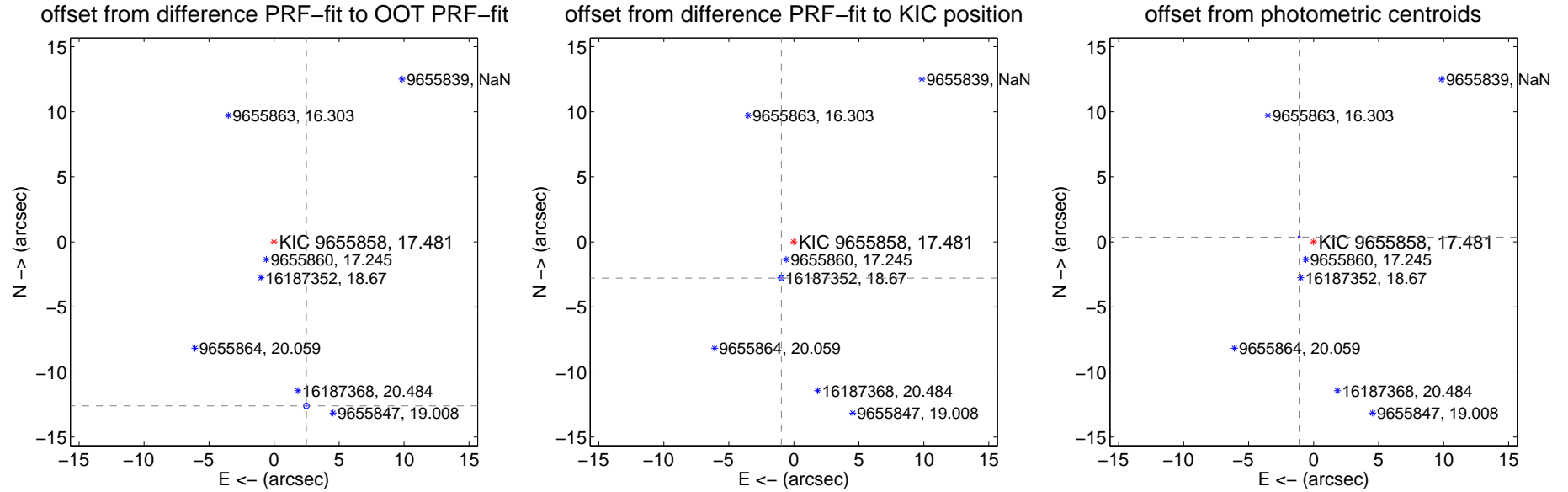
## DV Centroid Data

Supplemental centroid analysis for 009655858-02. Kepler magnitude: 17.48. Transit SNR 93.99

There are 11 quarters with good PRF difference image offsets

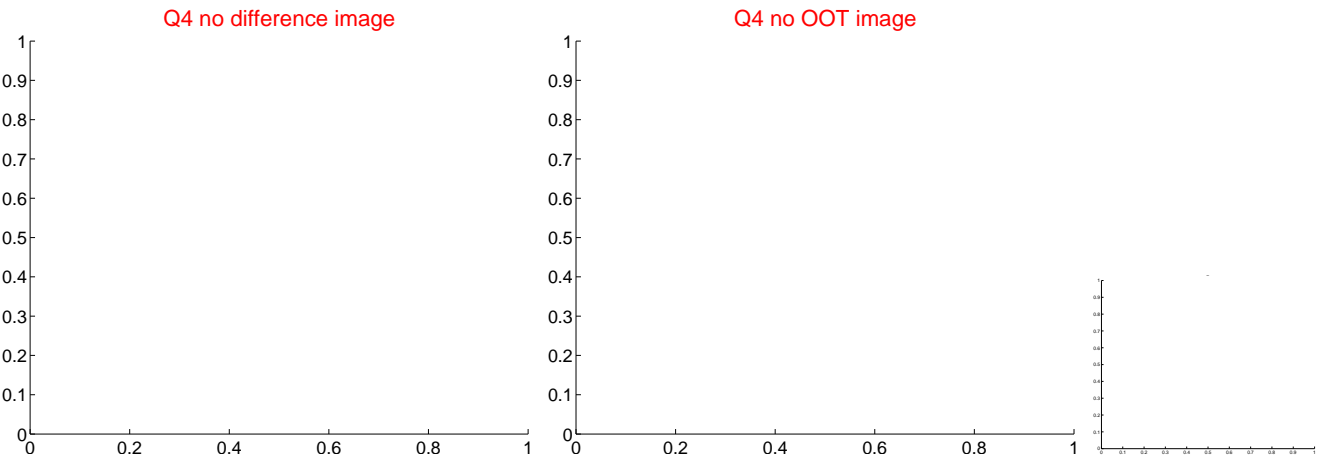
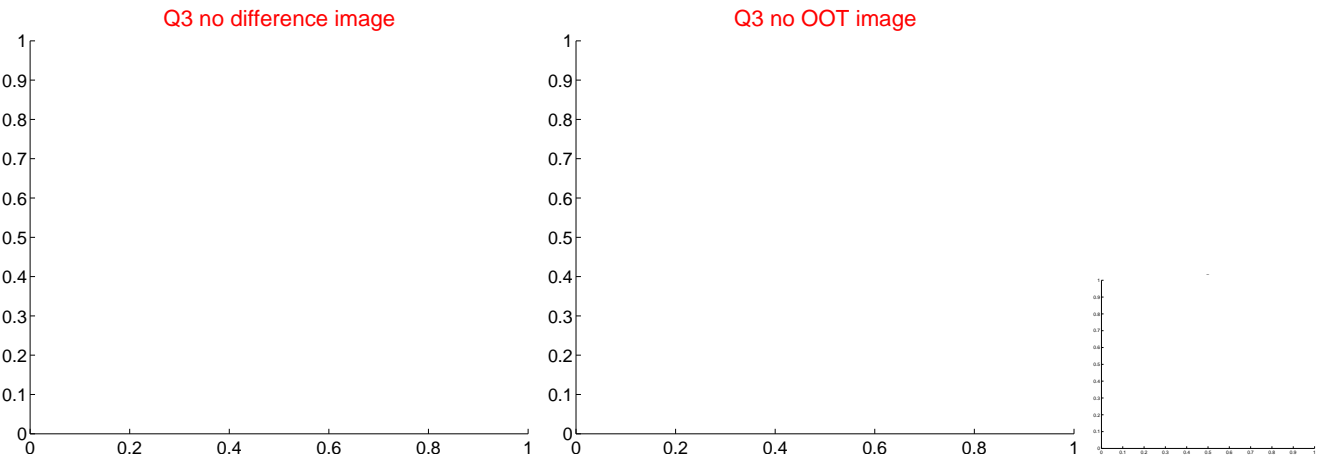
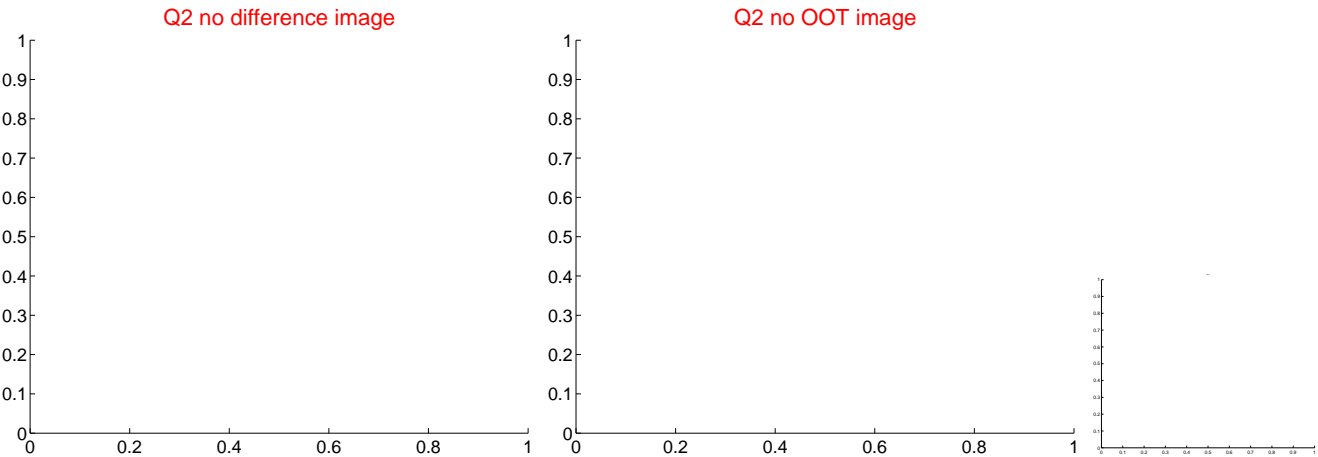
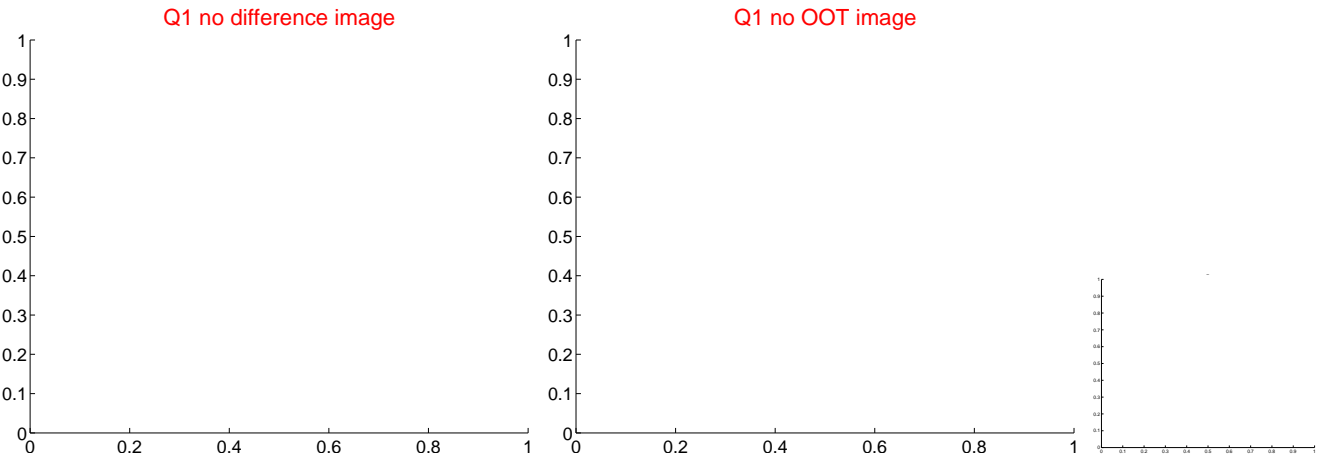
The OOT PRF centroid is offset from the target star catalog position by about 10.38 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$12.850 \pm 0.070$	182.87	$-2.486 \pm 0.069$	$-12.607 \pm 0.070$
PRF-fit source offset from KIC position	$2.942 \pm 0.072$	40.90	$0.959 \pm 0.069$	$-2.782 \pm 0.071$
photometric centroid source offset	$1.17 \pm 0.03$	44.44	$1.11 \pm 0.03$	$0.36 \pm 0.03$



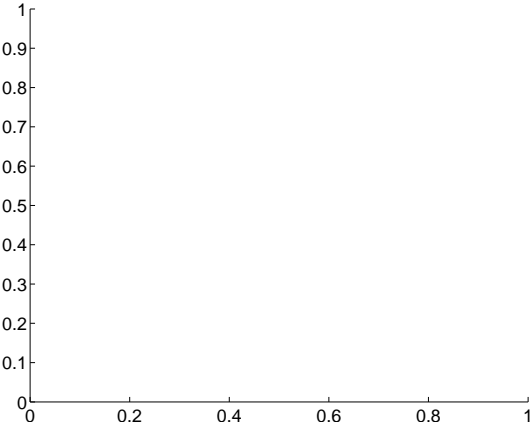
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

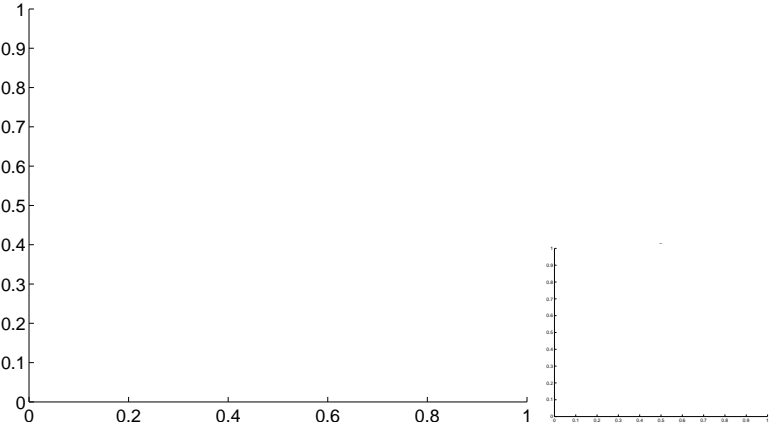


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

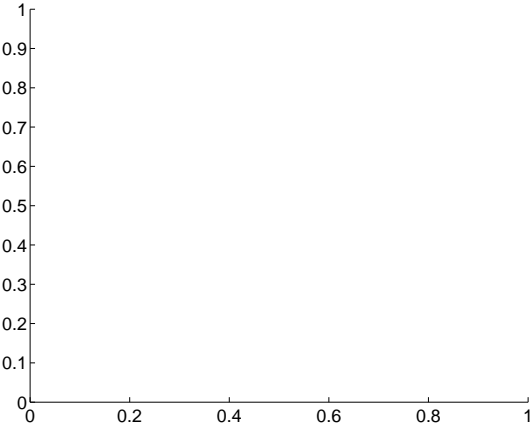
Q5 no difference image



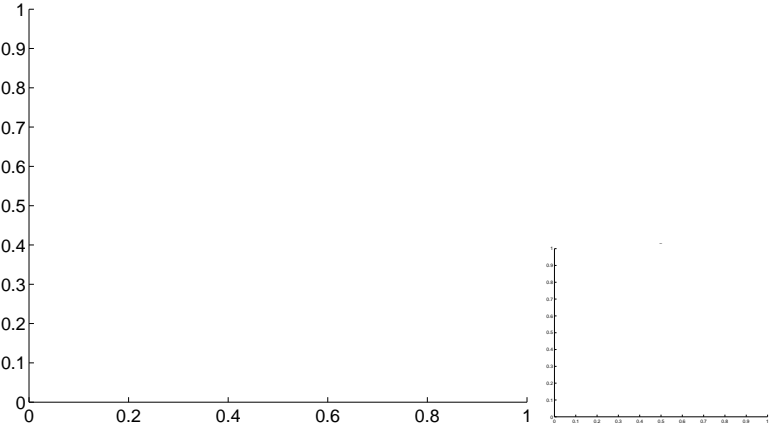
Q5 no OOT image



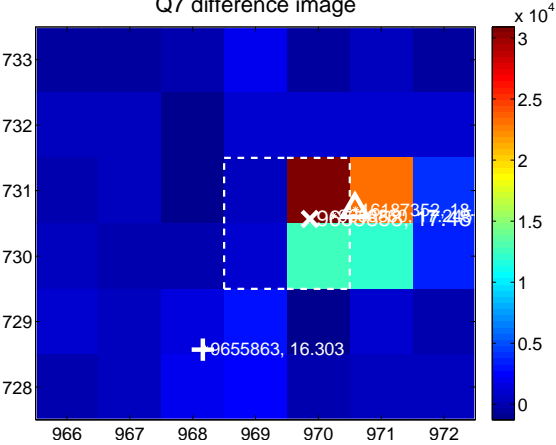
Q6 no difference image



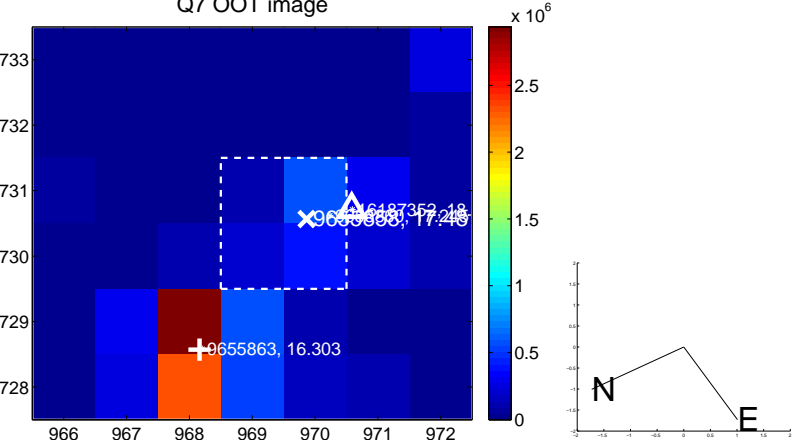
Q6 no OOT image



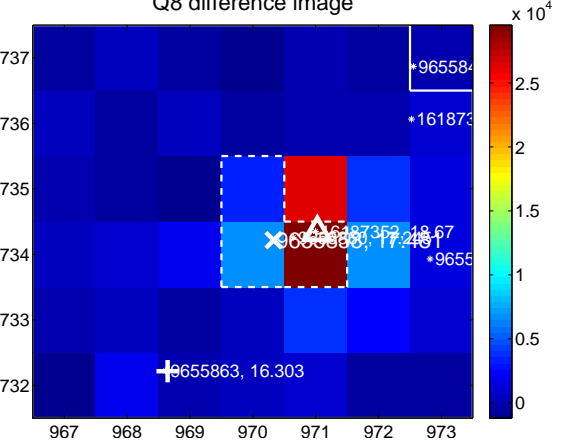
Q7 difference image



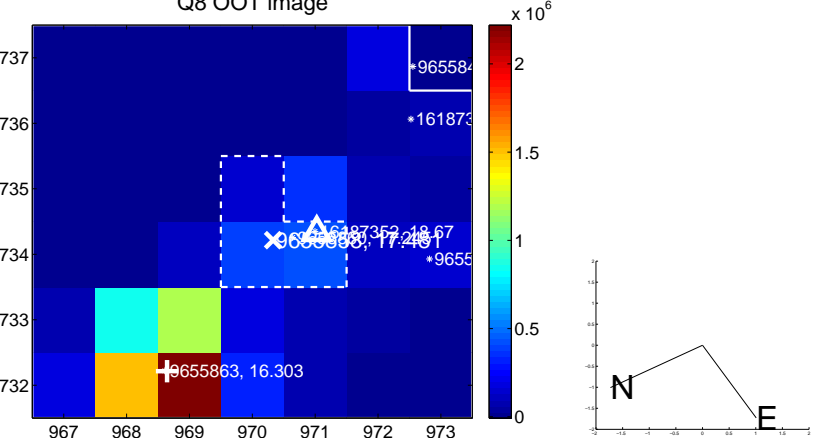
Q7 OOT image



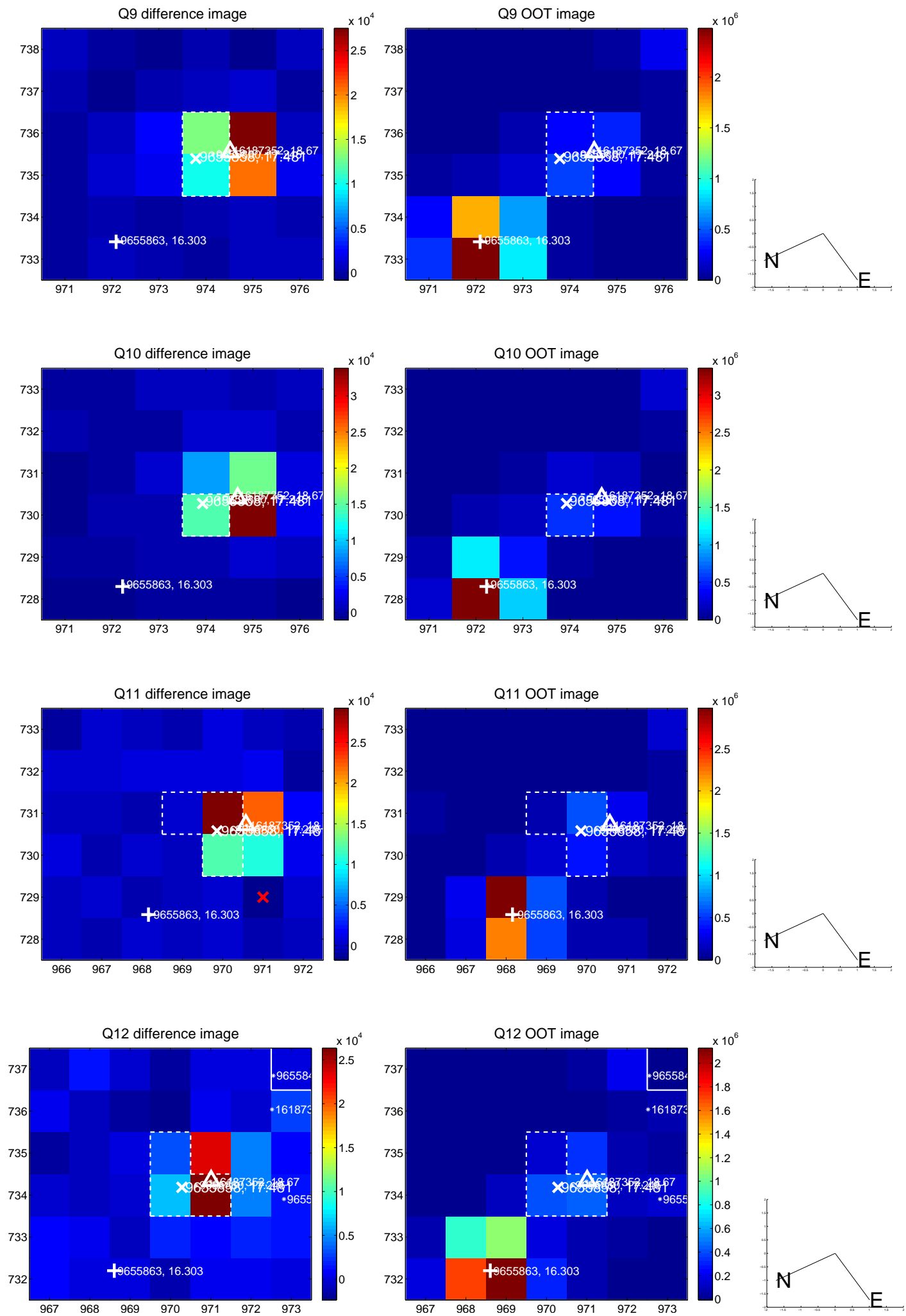
Q8 difference image



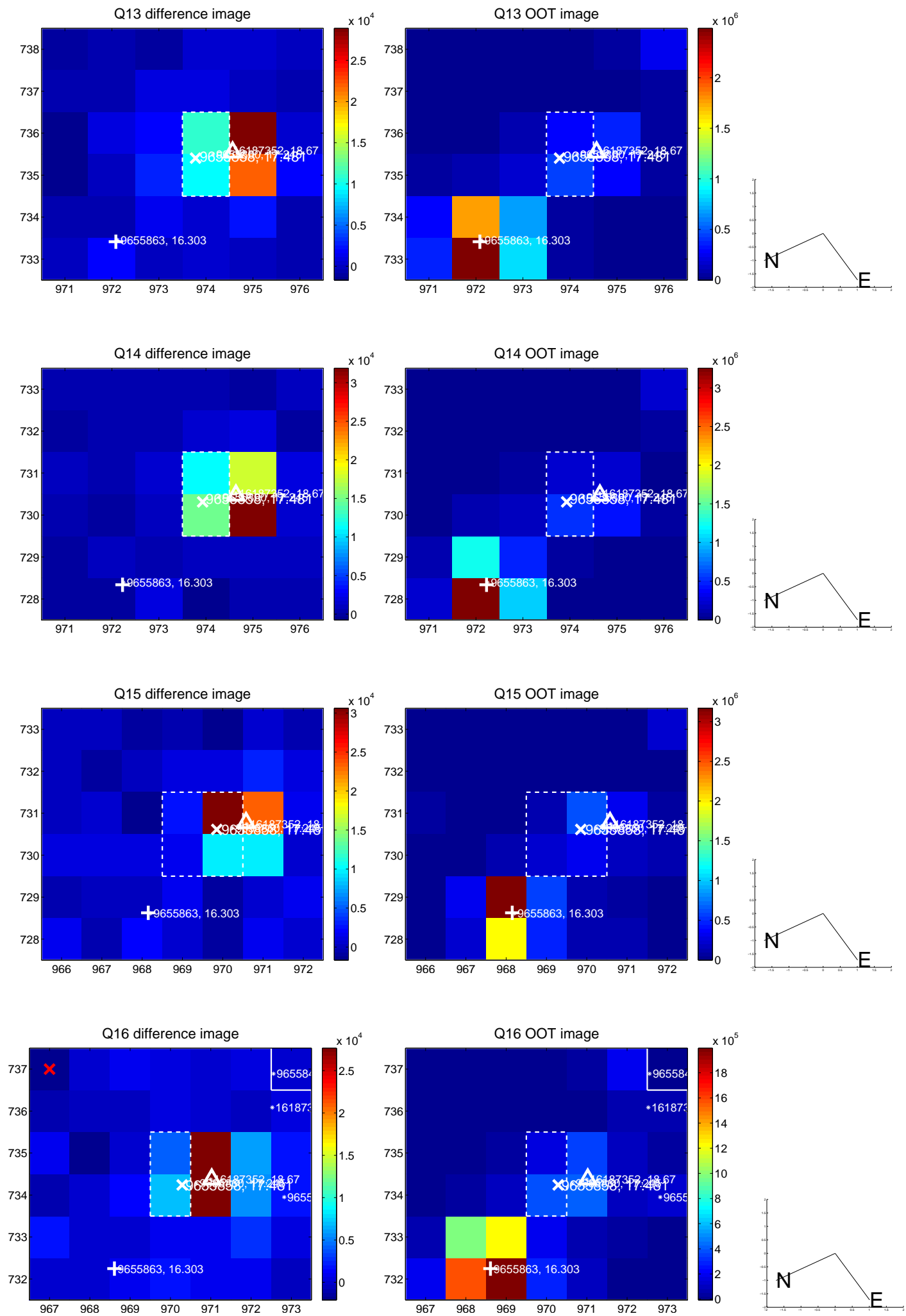
Q8 OOT image



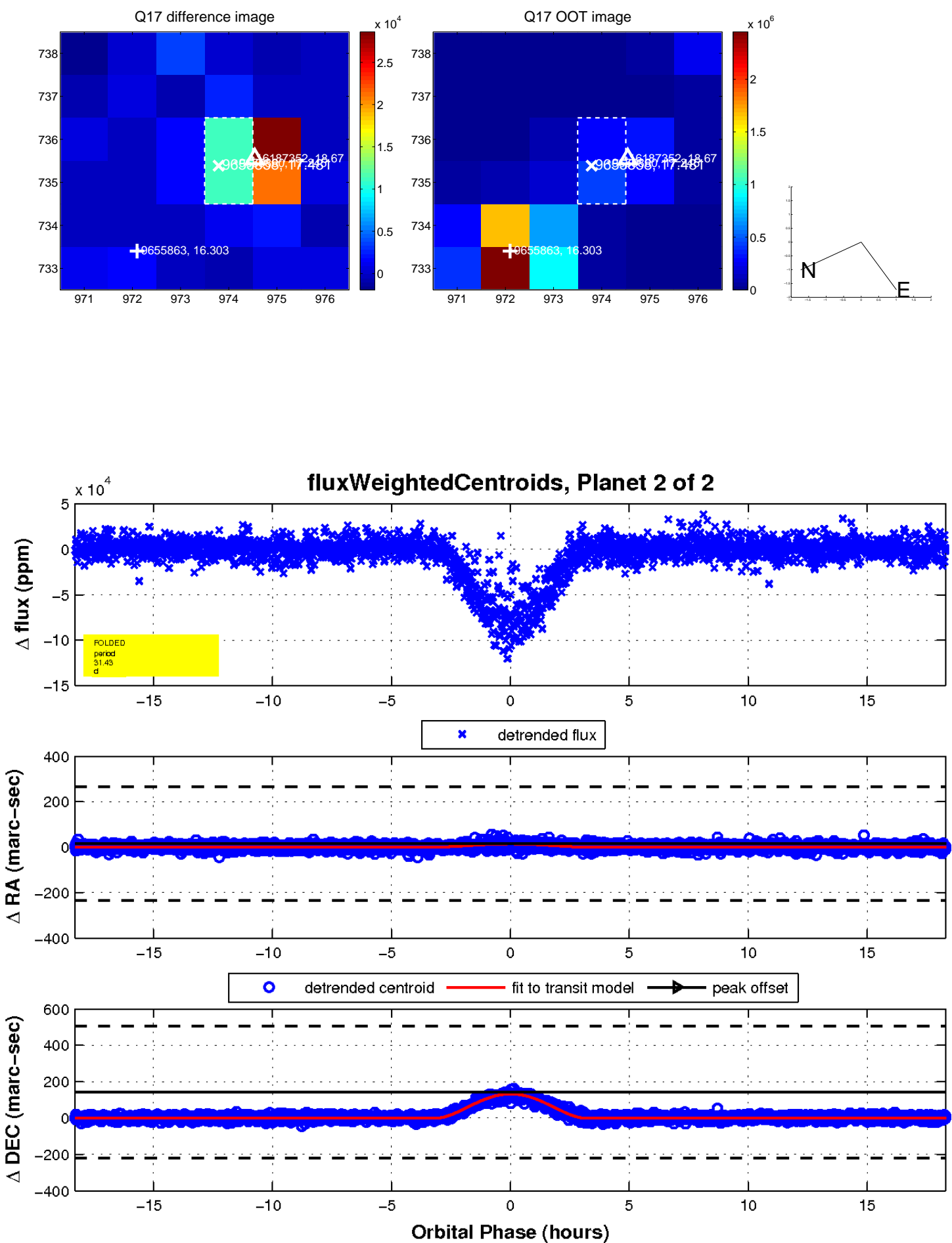
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



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



UKIRT Image

Declination

