

# KIC 010004660

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010004660-01	OBS	No	0.518294	131.584224	111.9	1.540	10.0	10.8	4.01	9416	4.89	0.00
010004660-02	OBS	No	0.633253	131.992779	60.6	6.622	8.9	5.9	4.01	9416	3.22	280294.73

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010004660-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
010004660-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE_ZUMA—LPP_DV—LPP_ALT

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

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

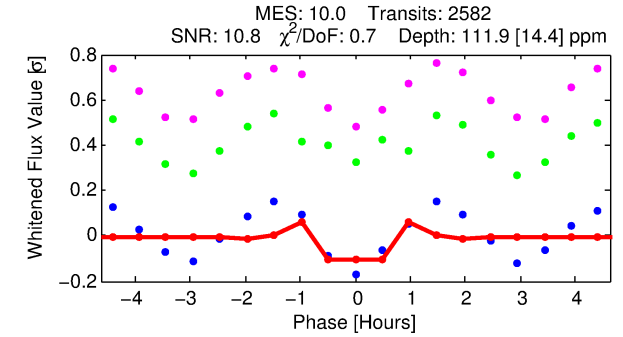
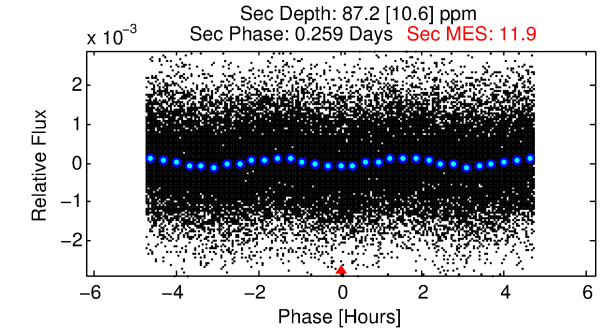
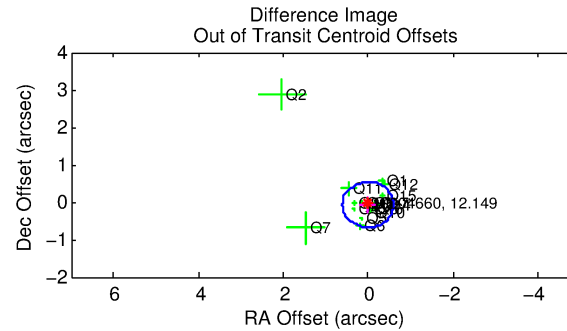
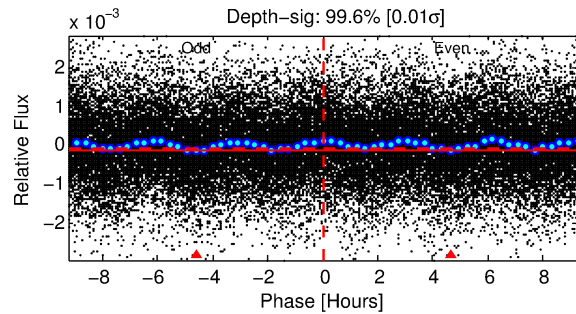
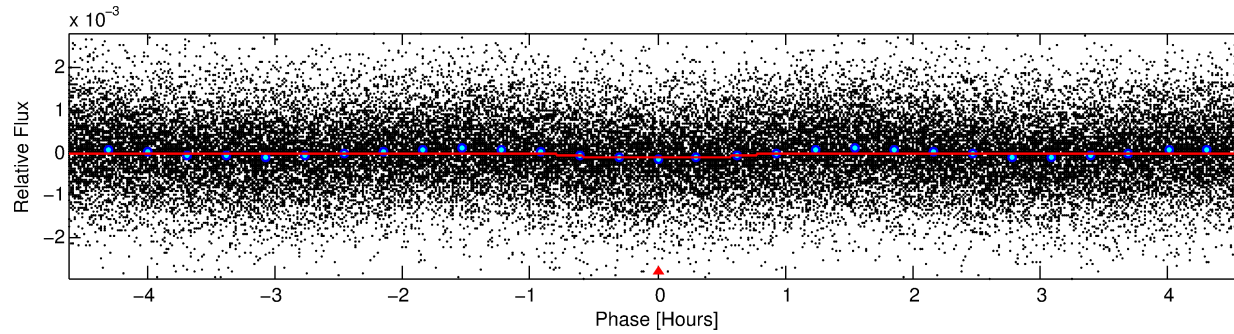
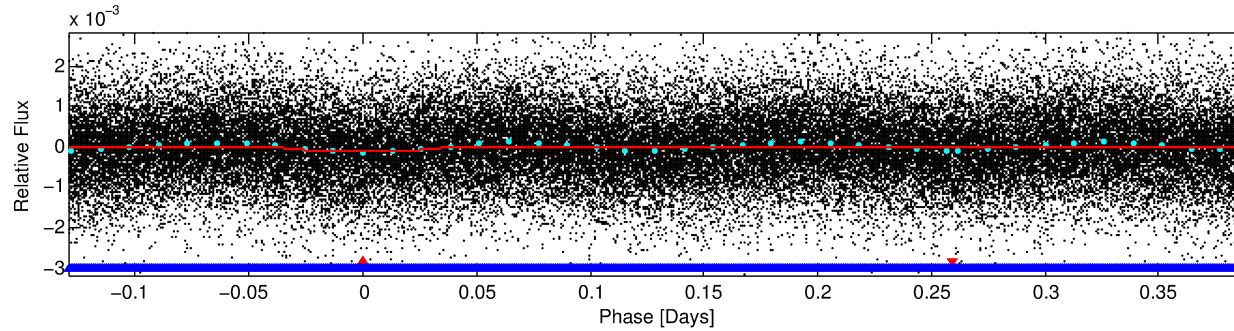
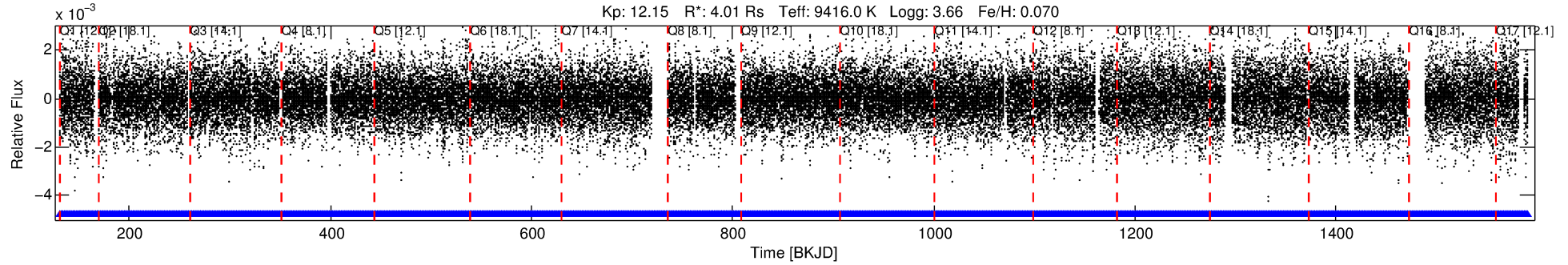
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 010004660-01

No Significant Match Found

# DV One-Page Summary

KIC: 10004660 Candidate: 1 of 2 Period: 0.518 d



## DV Fit Results:

Period = 0.51829 [0.00001] d  
Epoch = 131.5842 [0.0010] BKJD  
Rp/R\* = 0.0112 [0.0018]  
a/R\* = 1.51 [0.92]  
b = 0.90 [0.23]  
Seff = N/A  
Teq = N/A  
Rp = 4.89 [2.64] Re  
a = N/A  
Ag = N/A  
Teffp = N/A

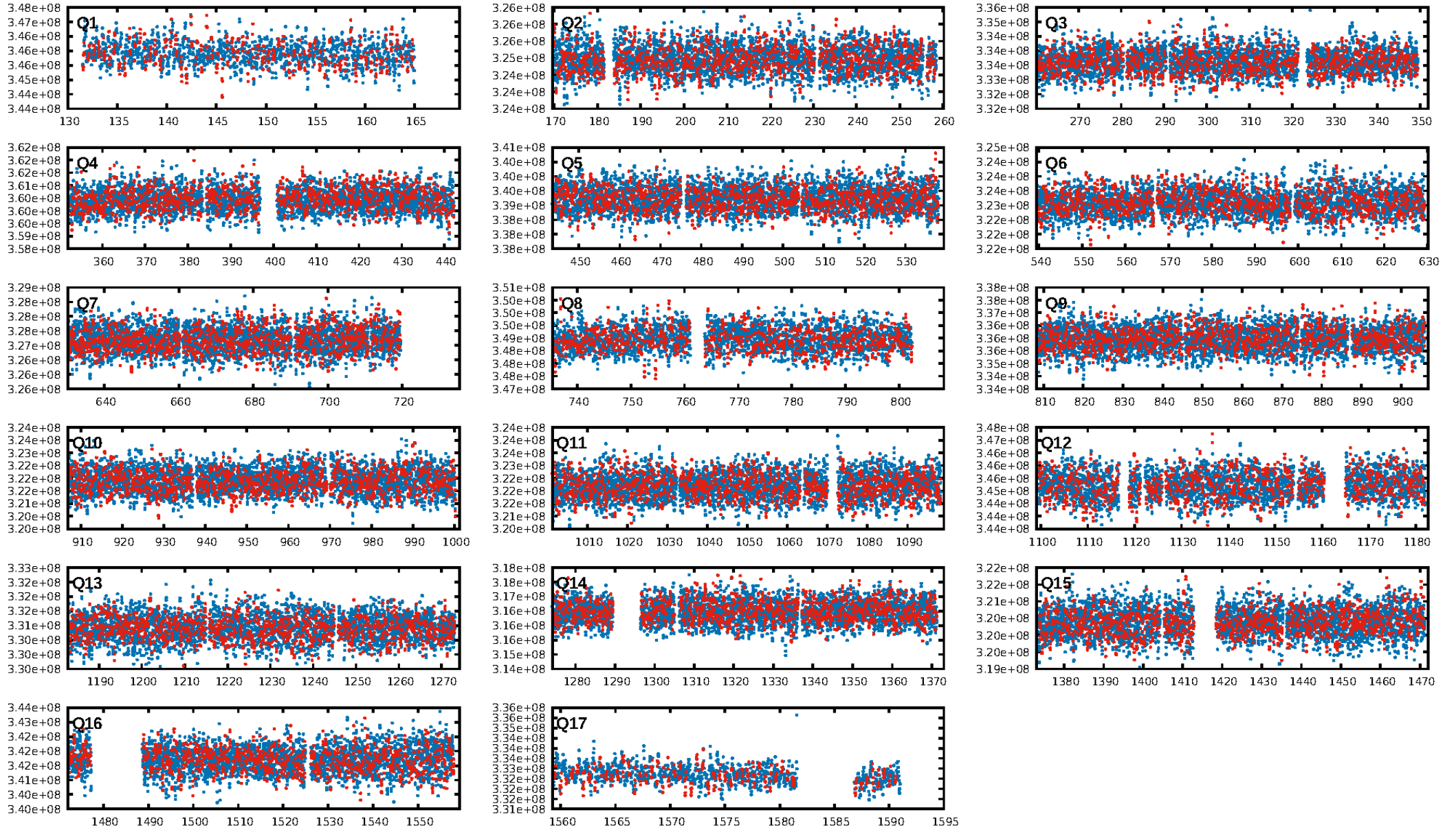
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 31.5% [0.41 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [2466/2466]  
GhostDiagnostic-chr: 1.869  
Centroid-sig: 0.0%  
Centroid-so: 0.353 arcsec [3.99 $\sigma$ ]  
OotOffset-rm: 0.070 arcsec [0.35 $\sigma$ ]  
KicOffset-rm: 0.092 arcsec [0.47 $\sigma$ ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 0.71 [12/17]  
DiffImageOverlap-fno: 0.00 [0/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 16:37:07 Z

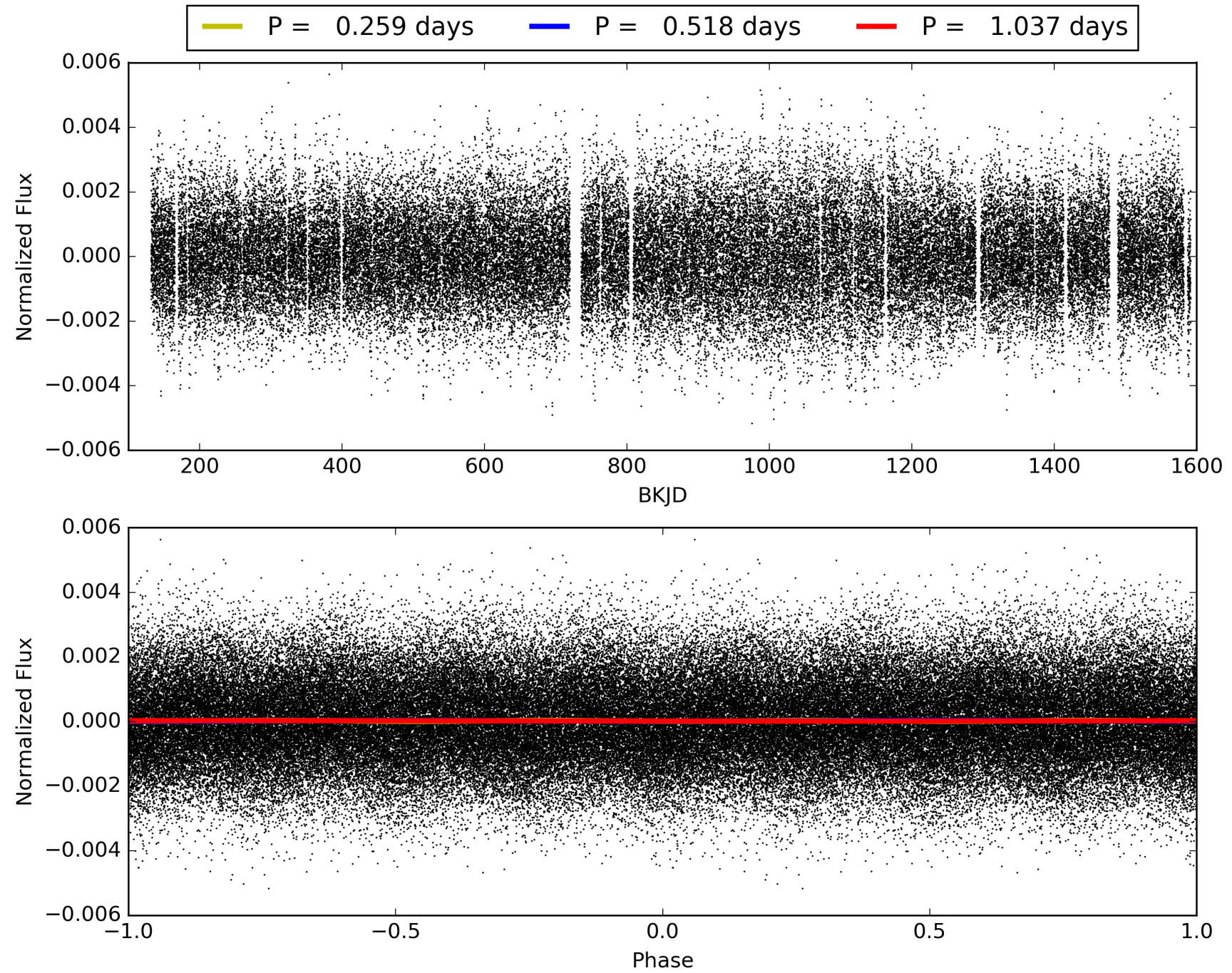
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 010004660-01, PDC Light Curves



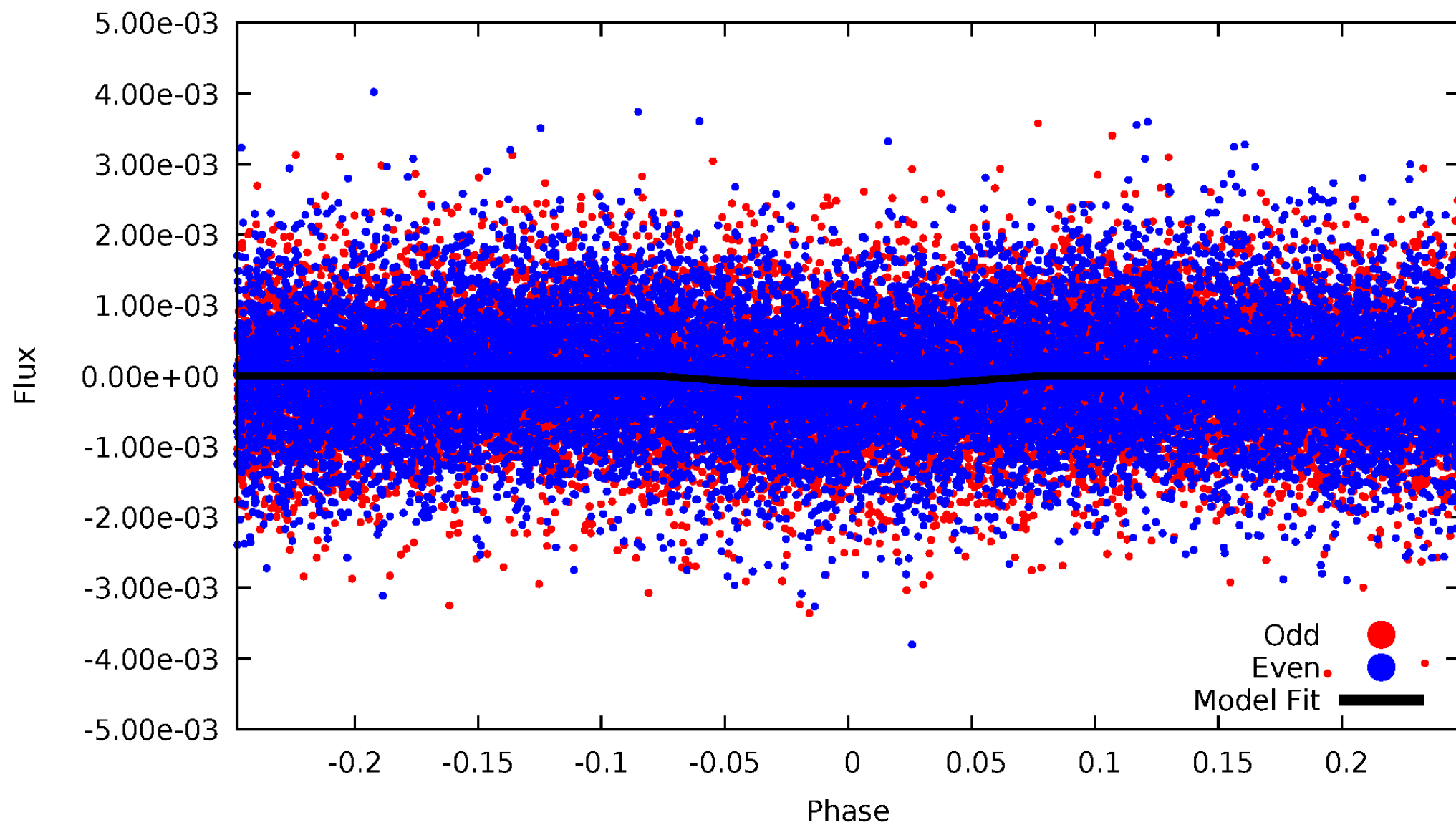


TCE 010004660-01



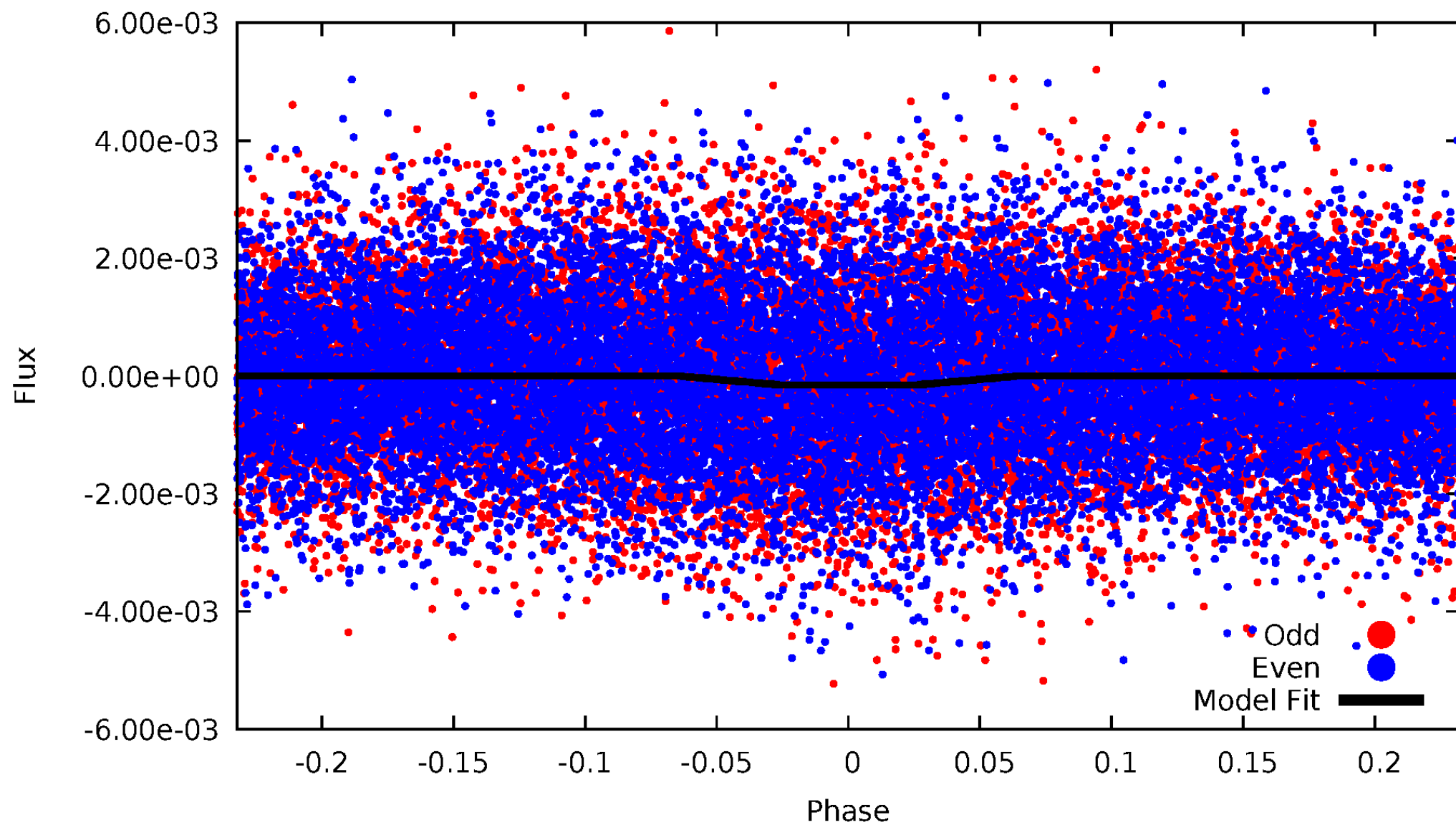
# DV Odd/Even

TCE 010004660-01



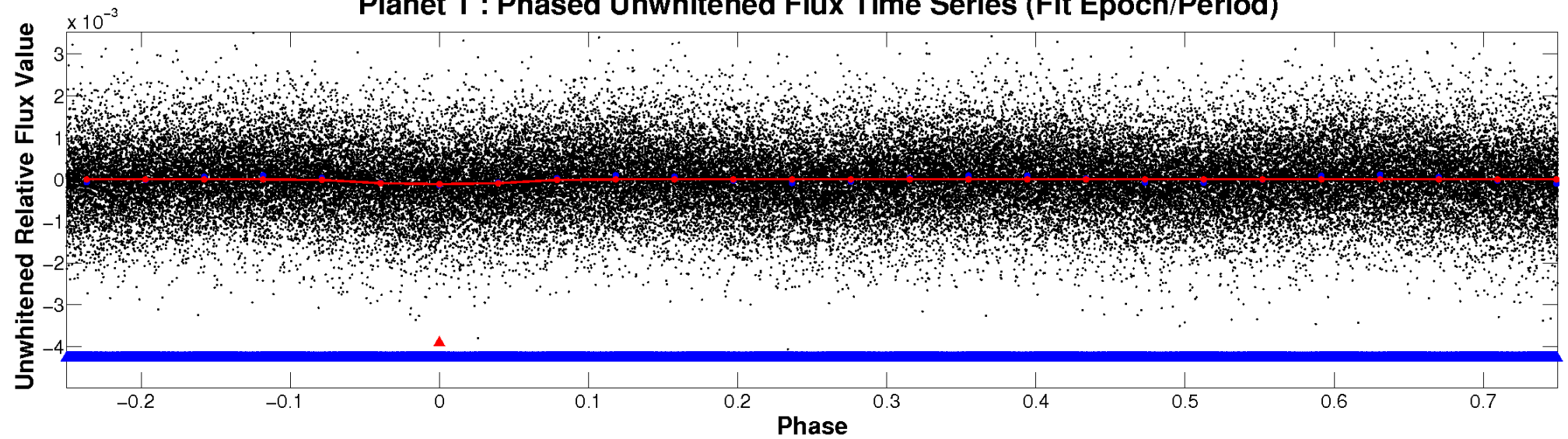
# ALT Odd/Even

TCE 010004660-01

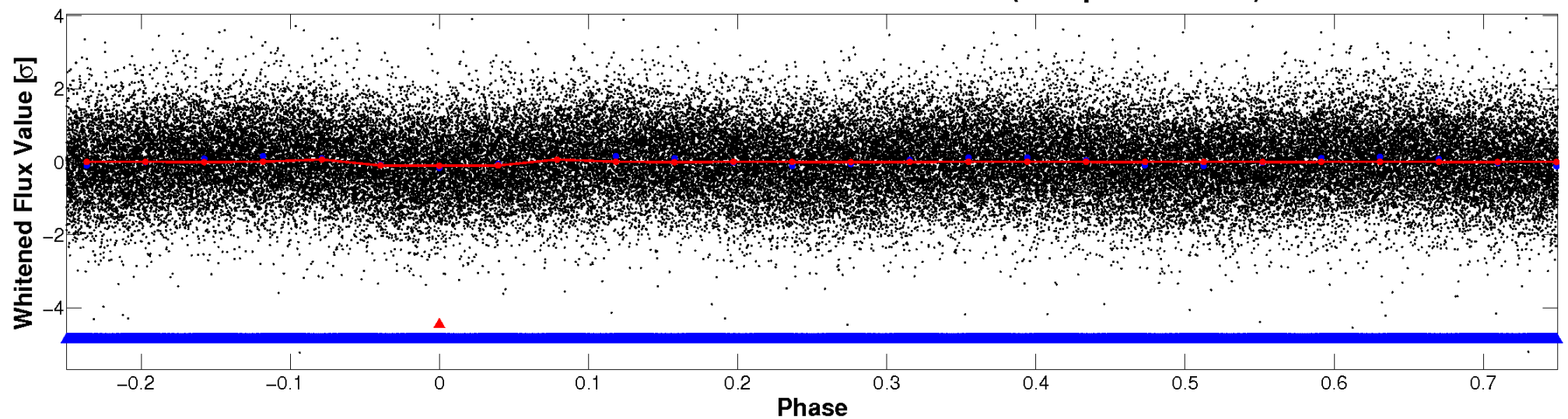


# Non-Whitened Vs. Whitened Light Curve

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



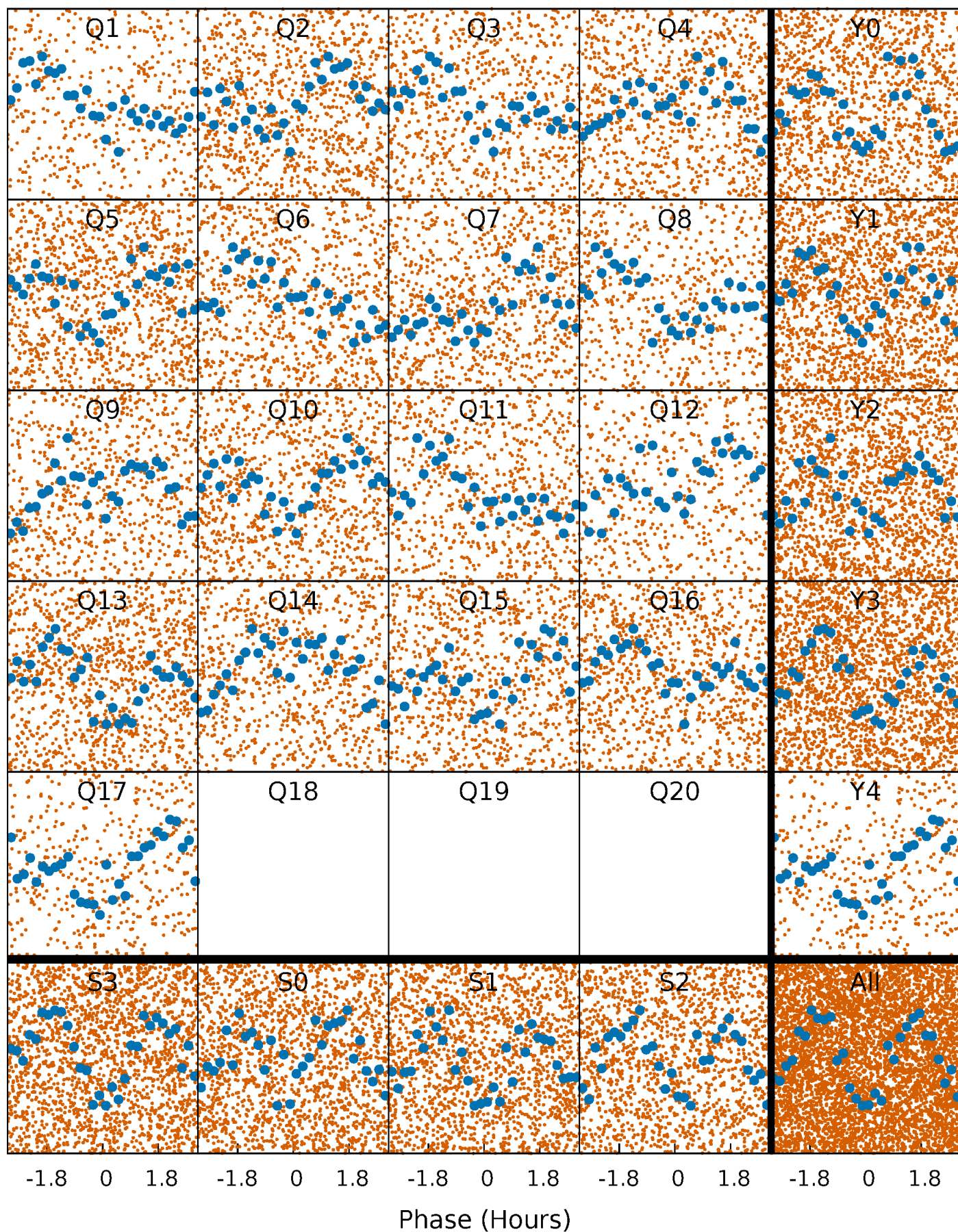
## Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)





# PDC Quarter-Phased Transit Curves

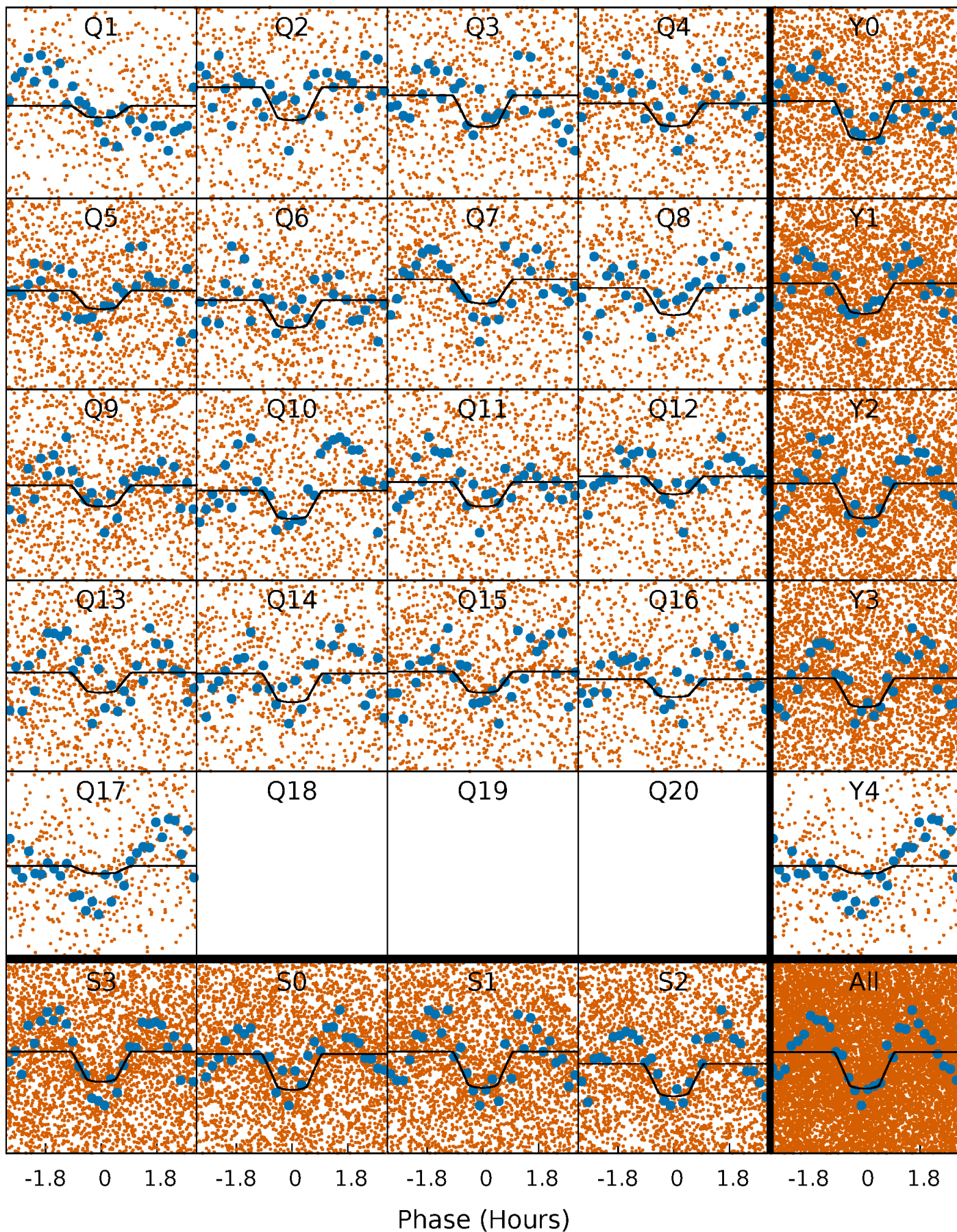
TCE 010004660-01 P= 0.518294 Days  $T_0=131.584224$  (BKJD)





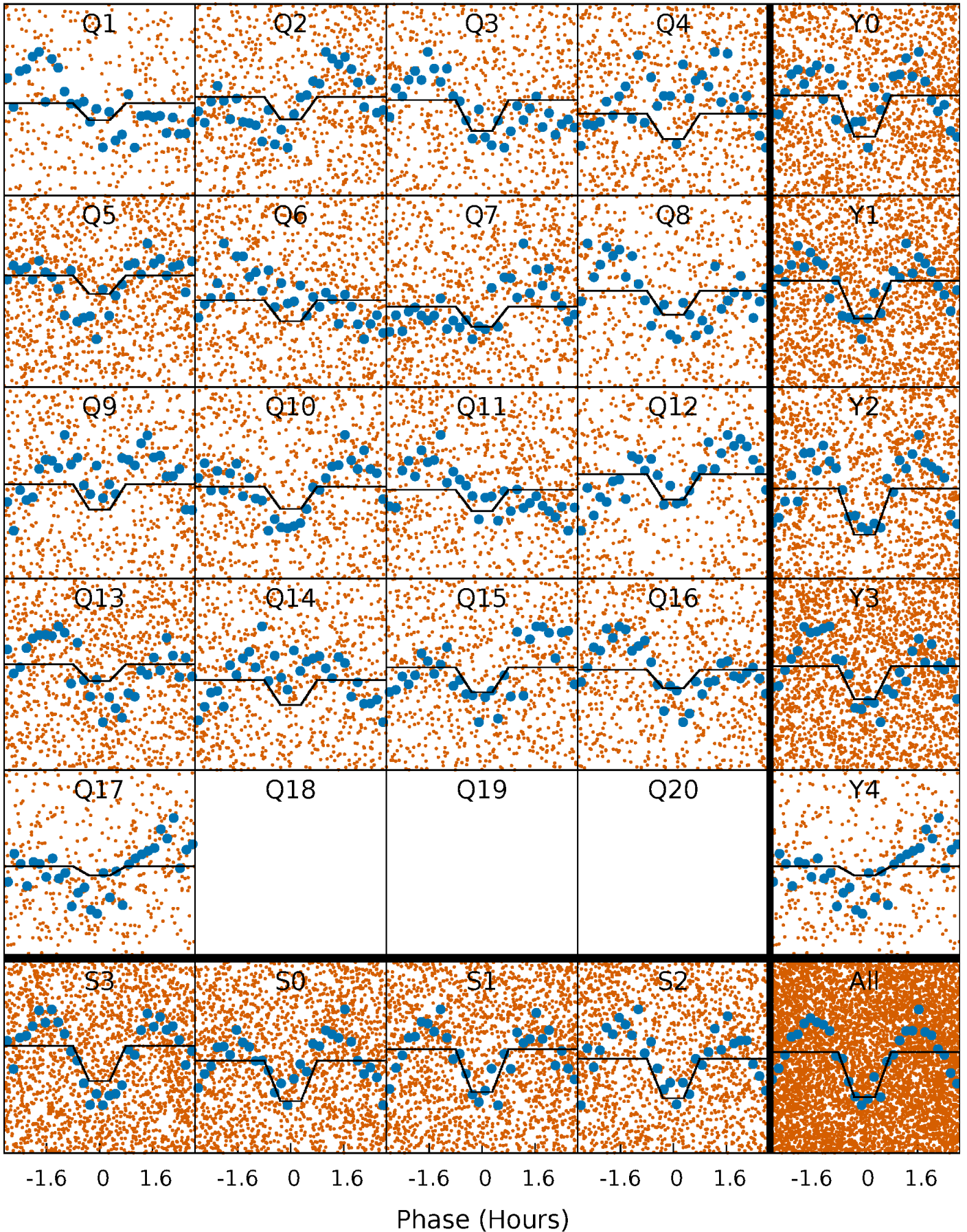
# DV Quarter-Phased Transit Curves

TCE 010004660-01 P= 0.518294 Days  $T_0=131.584224$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 010004660-01 P= 0.518296 Days  $T_0=131.581680$  (BKJD)

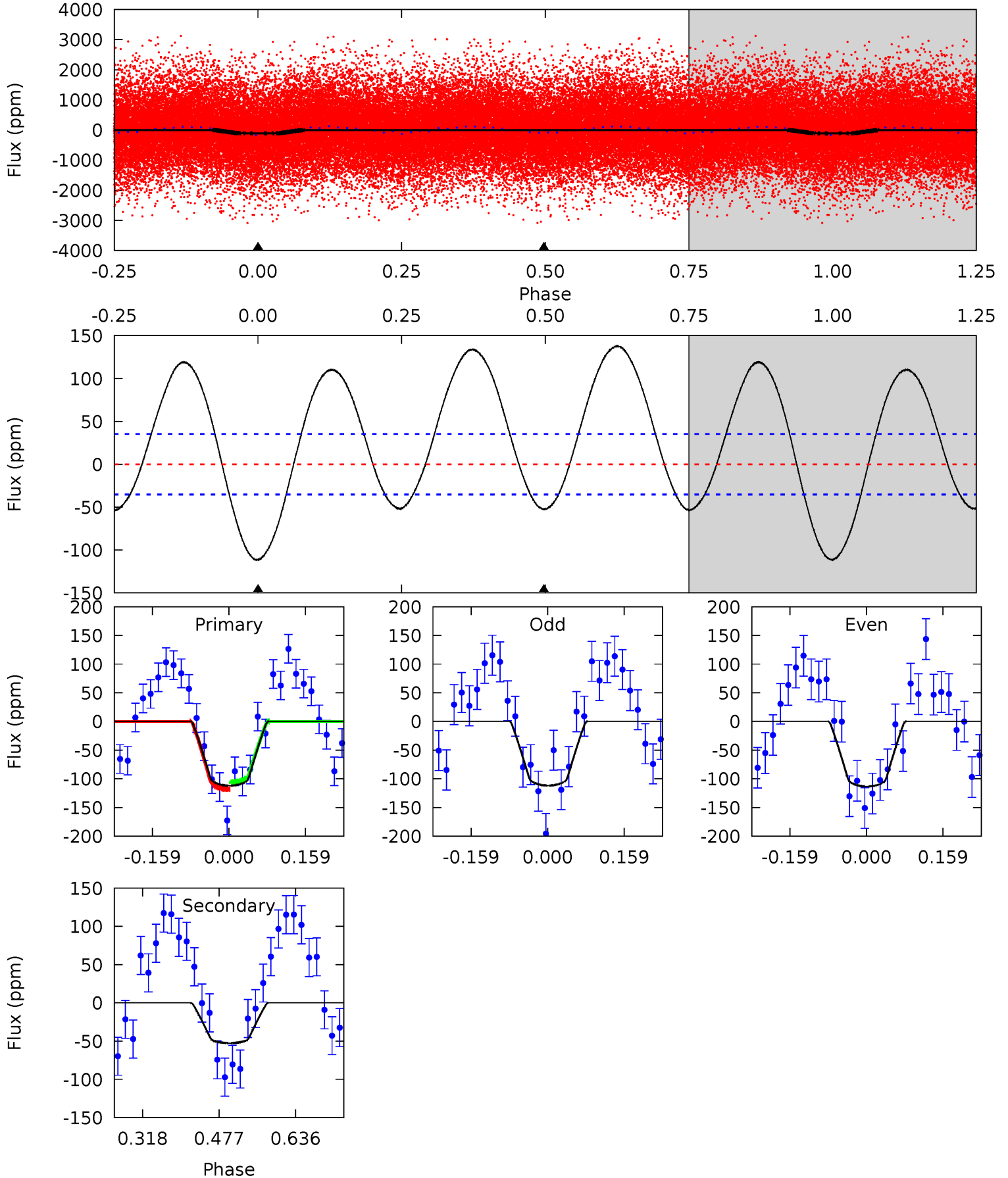




# DV Model-Shift Uniqueness Test

010004660-01, P = 0.518294 Days, E = 131.065930 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
14.1	6.64	0	0	4.47	1.41	6.12	14.1	14.1	6.64	6.64	0.10	1.18	0.55	0.69

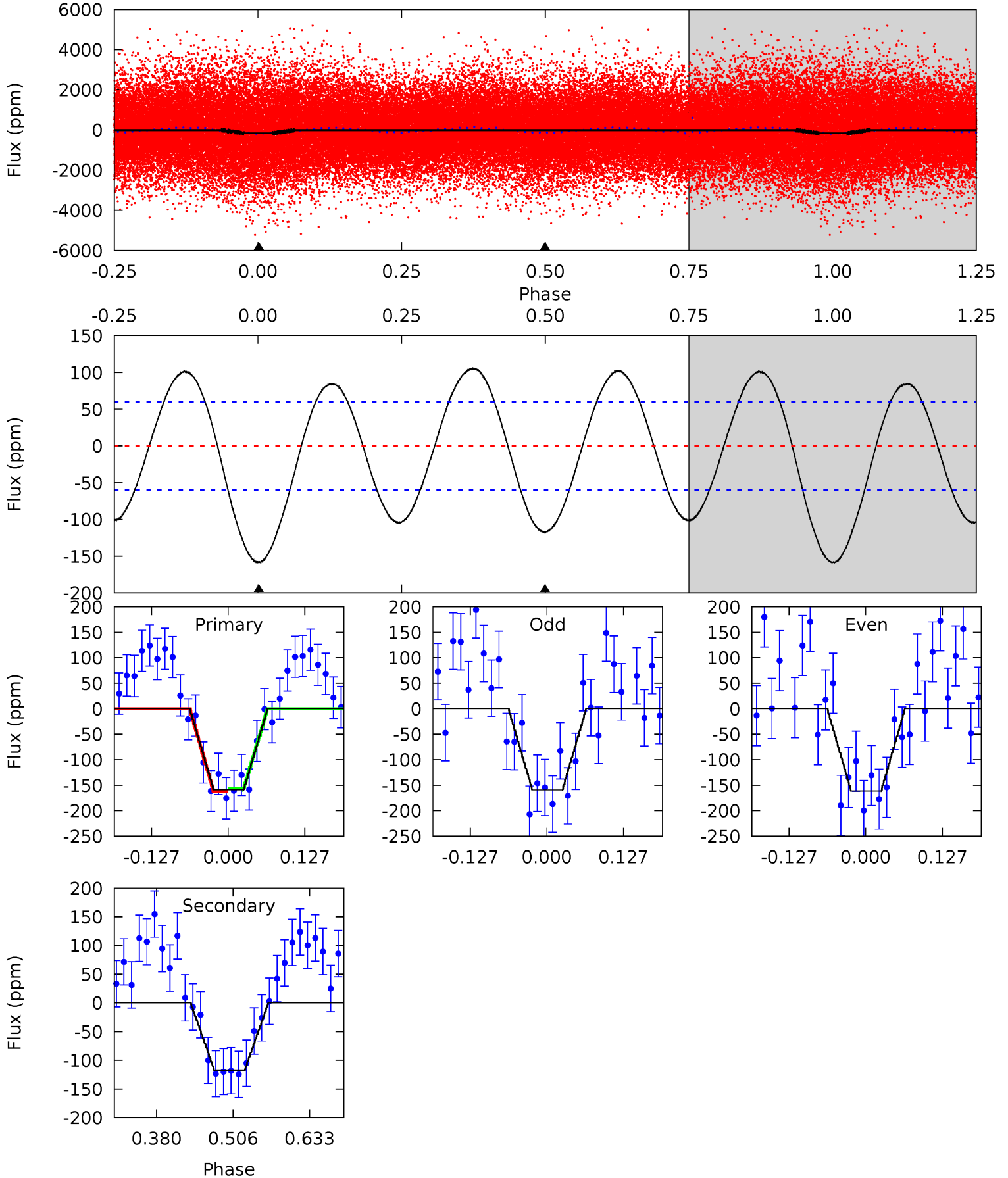




# Alt Model-Shift Uniqueness Test

010004660-01, P = 0.518296 Days, E = 131.063384 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
12.0	8.93	0	0	4.52	1.53	5.40	12.0	12.0	8.93	8.93	0.08	0.77	0.40	0.21



### Stellar Parameters For KIC 010004660

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$9416^{+301}_{-451}$	$3.663^{+0.472}_{-0.118}$	$0.070^{+0.200}_{-0.700}$	$4.009^{+0.886}_{-2.068}$	$2.699^{+0.325}_{-0.975}$	$0.059^{+0.299}_{-0.021}$
	+3%/-5%	+13%/-3%	+286%/-1000%	+22%/-52%	+12%/-36%	+507%/-35%
Source	KIC0	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 010004660-01 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-53 \pm 8$	$4.46^{+1.23}_{-1.35}$	$8454^{+727}_{-1139}$	$5459^{+1292}_{-9453}$	$0.453^{+0.410}_{-0.181}$
Alt.	$-118 \pm 13$	$4.98^{+1.42}_{-1.51}$	$8436^{+758}_{-1148}$	$7376^{+1227}_{-1317}$	$0.803^{+0.694}_{-0.311}$

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

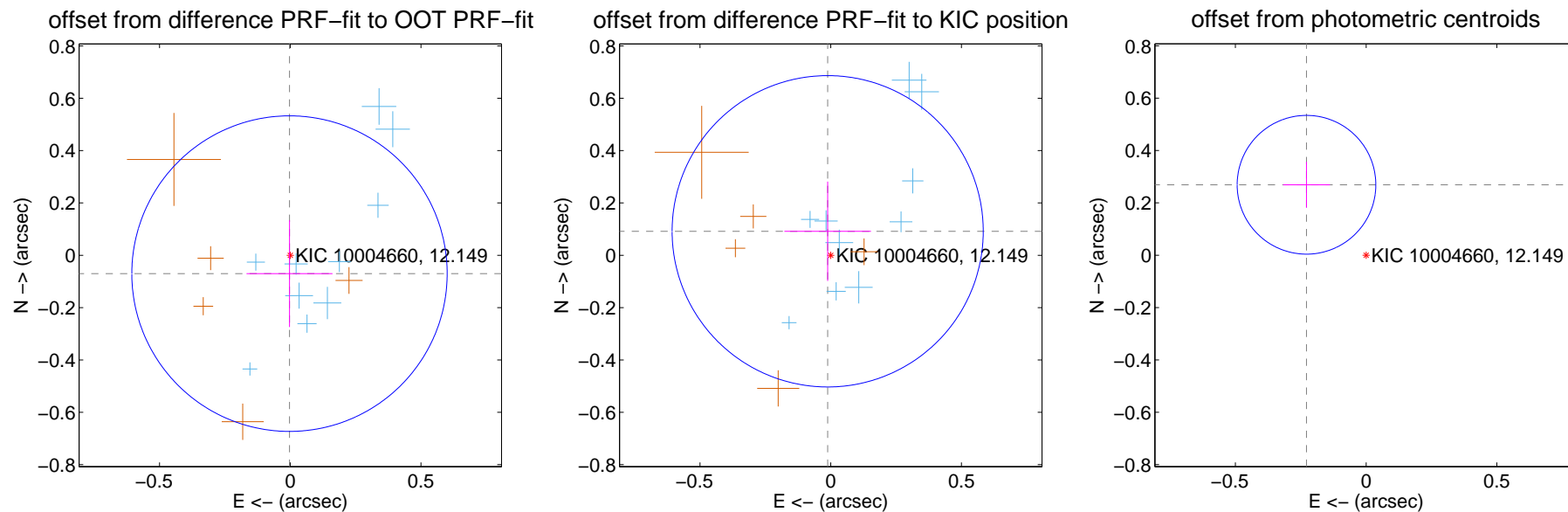
## DV Centroid Data

Supplemental centroid analysis for 010004660-01. Kepler magnitude: 12.15. Transit SNR 10.78

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

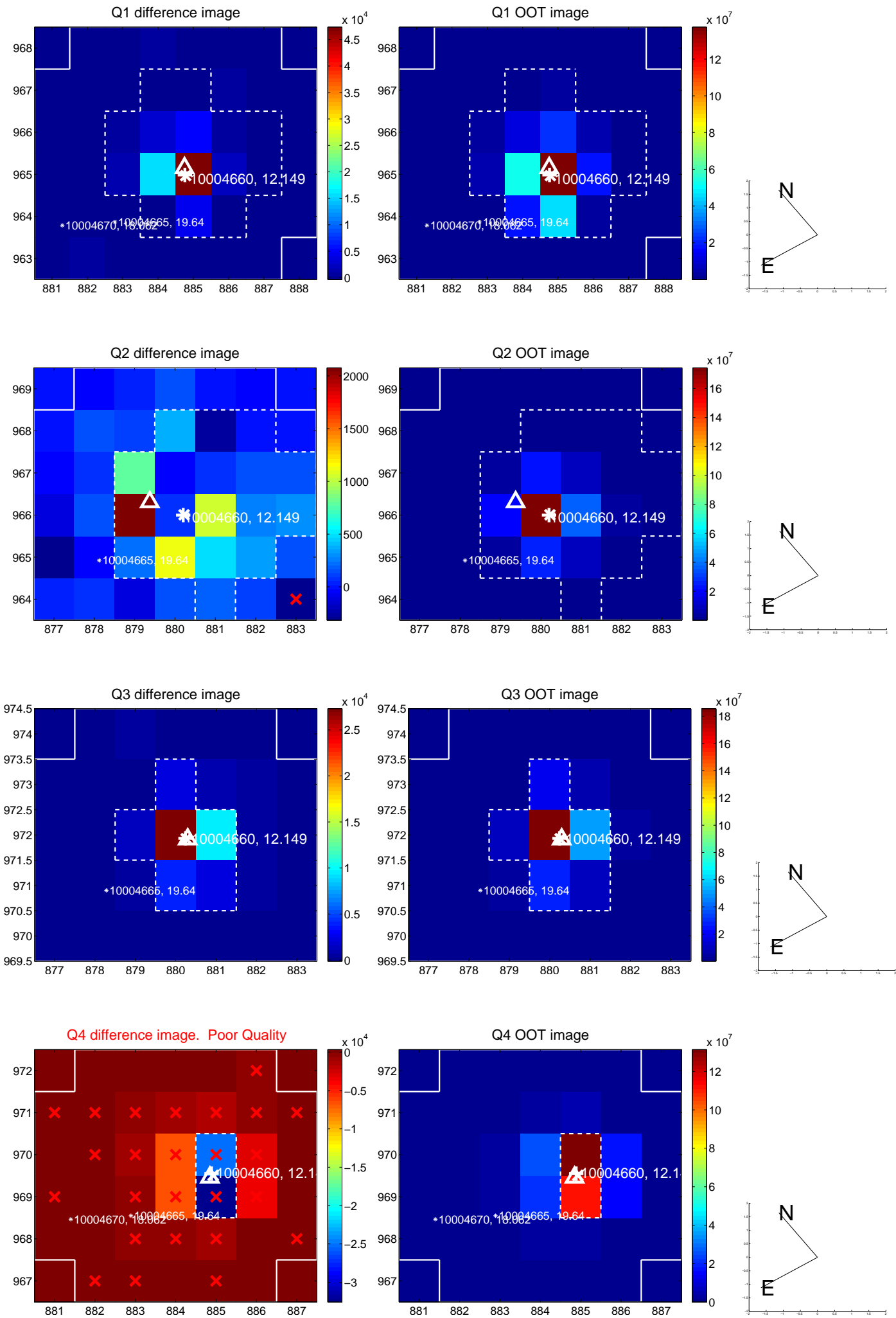
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.070 \pm 0.201$	0.35	$0.003 \pm 0.165$	$-0.070 \pm 0.204$
PRF-fit source offset from KIC position	$0.092 \pm 0.198$	0.47	$0.012 \pm 0.166$	$0.092 \pm 0.190$
photometric centroid source offset	$0.35 \pm 0.09$	3.99	$0.23 \pm 0.09$	$0.27 \pm 0.09$



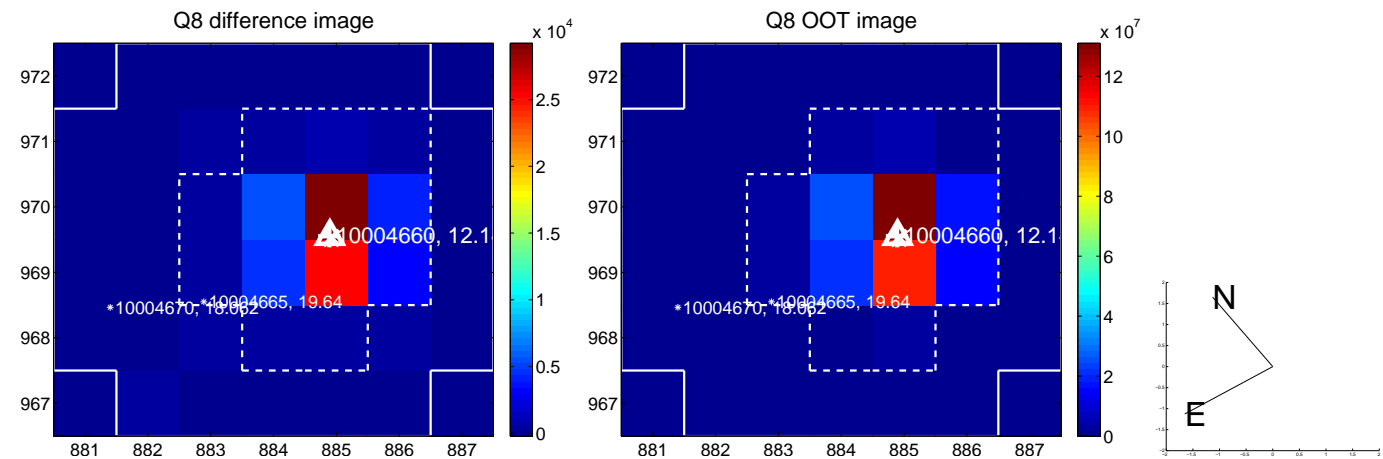
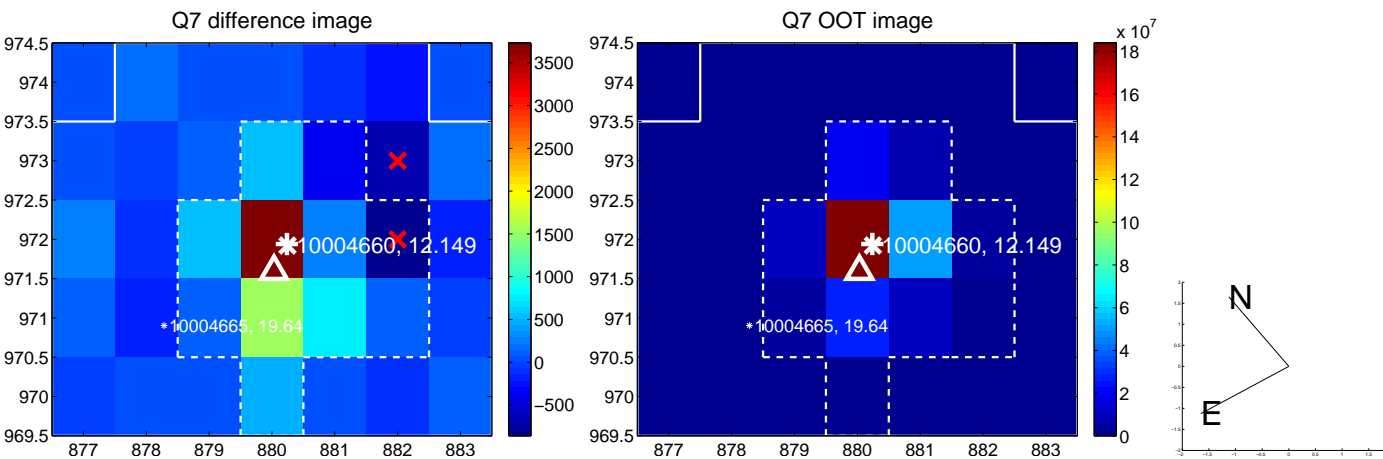
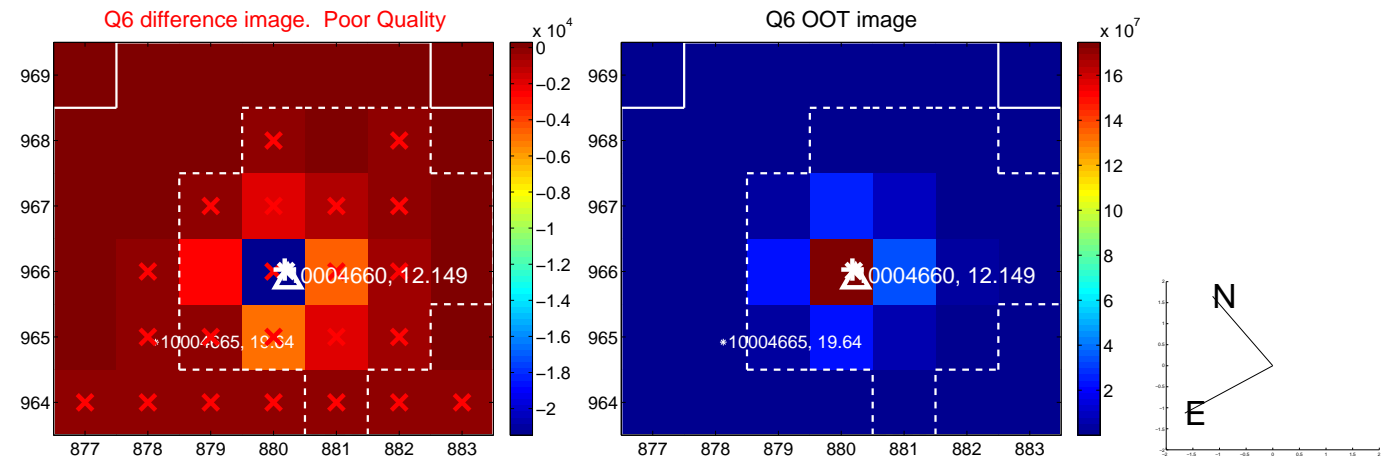
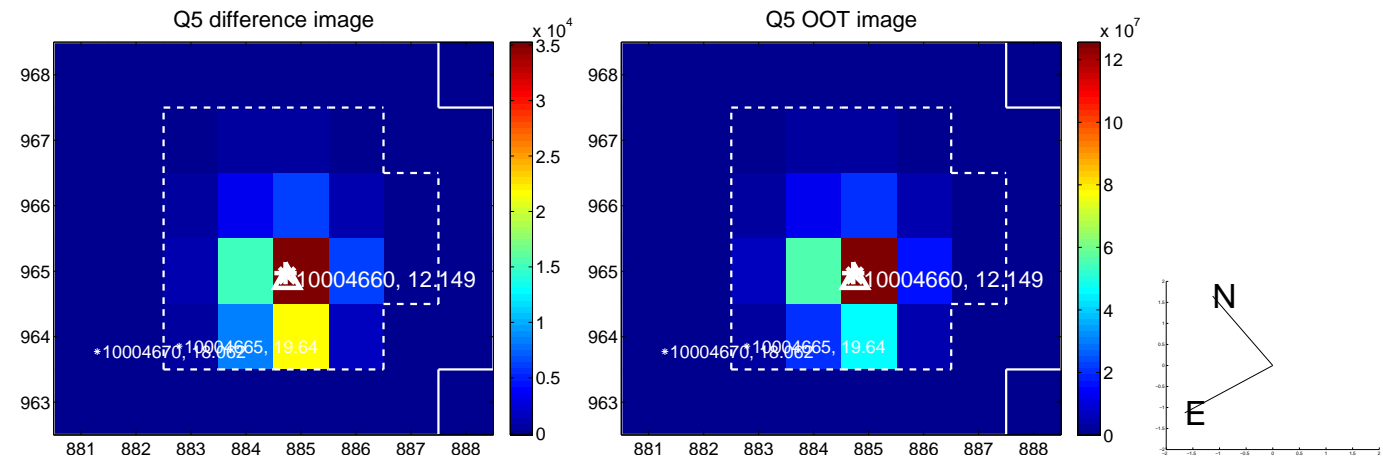
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets**; **Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



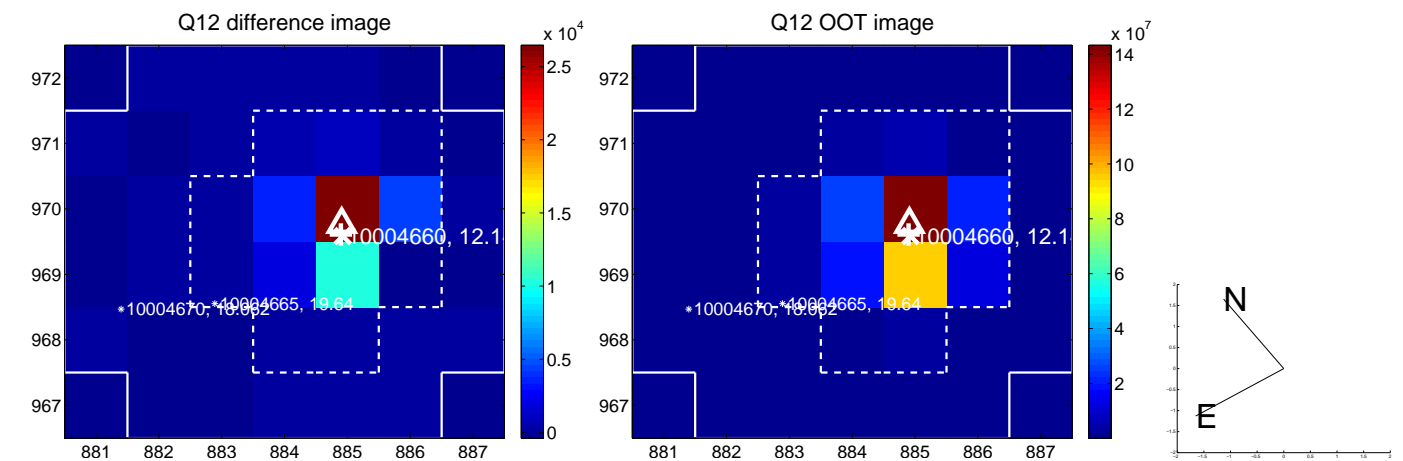
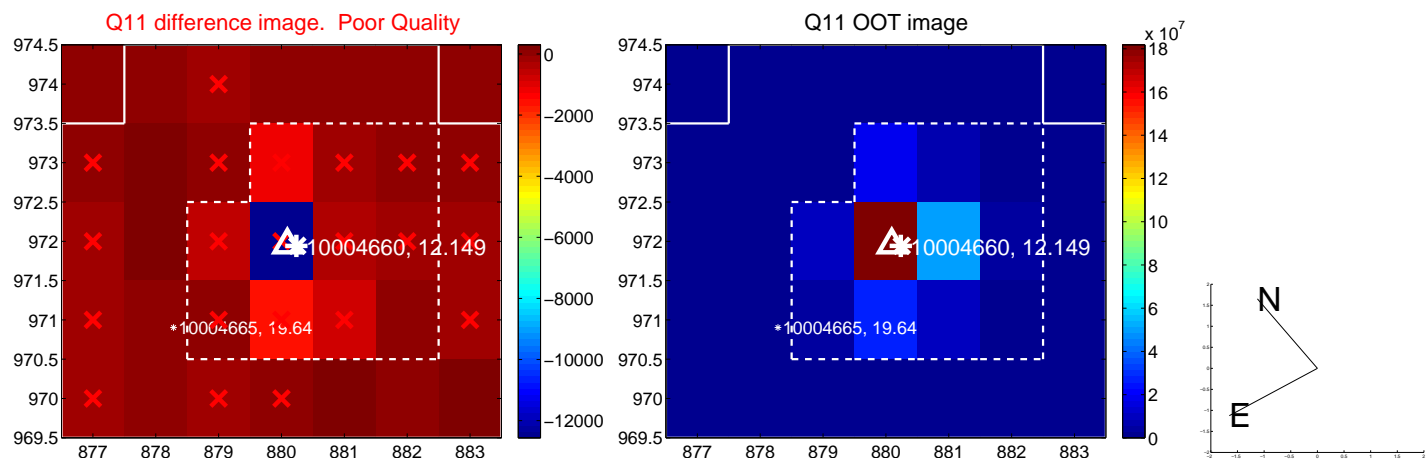
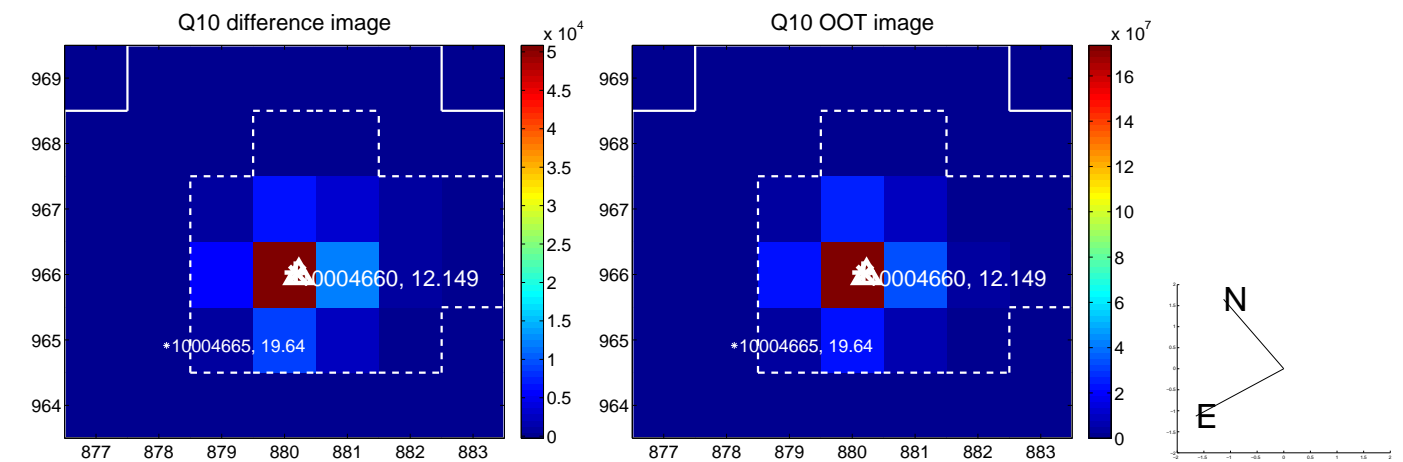
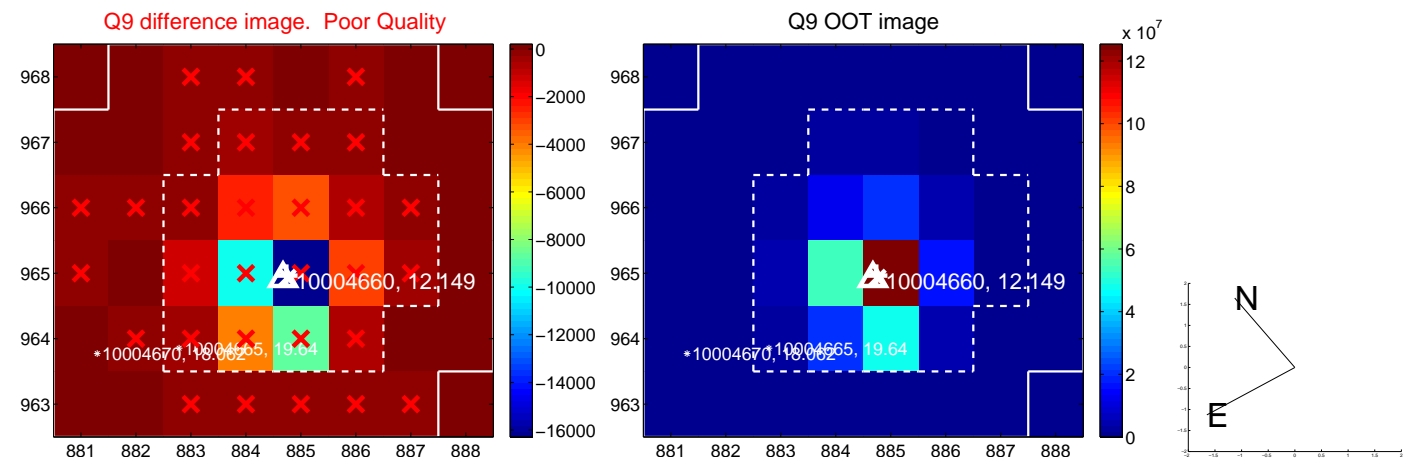
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

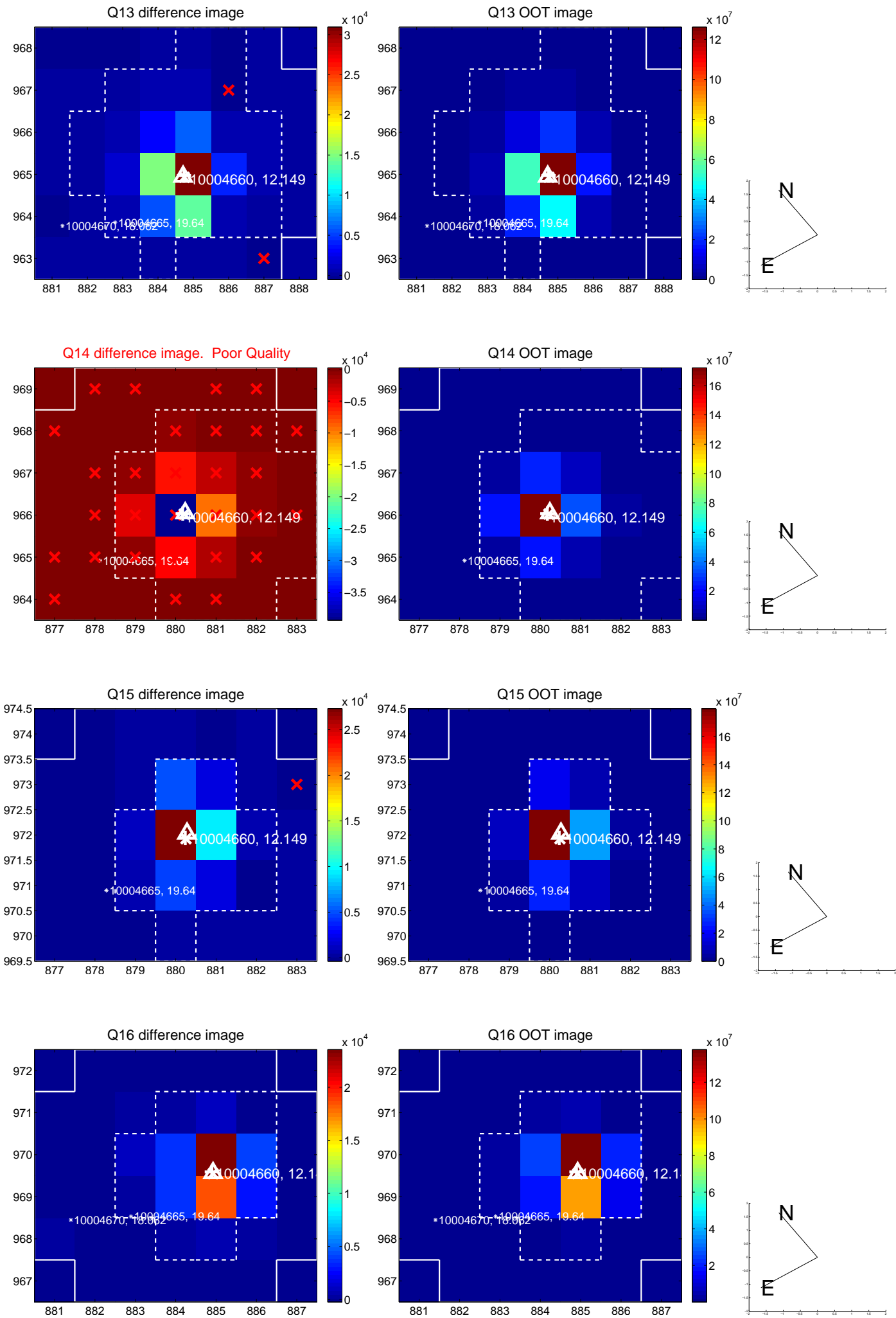


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

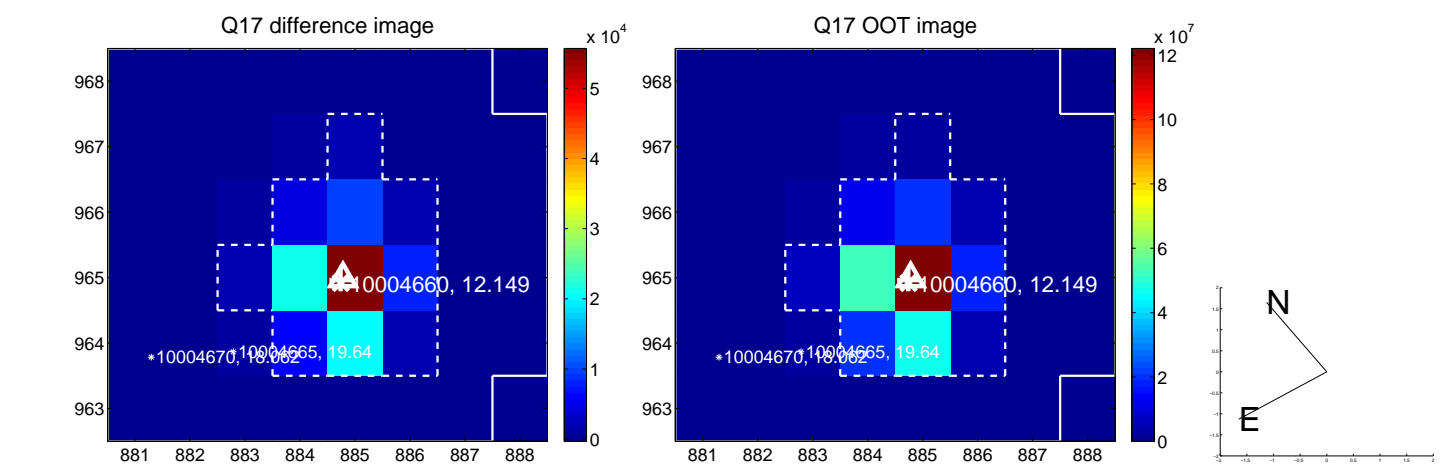




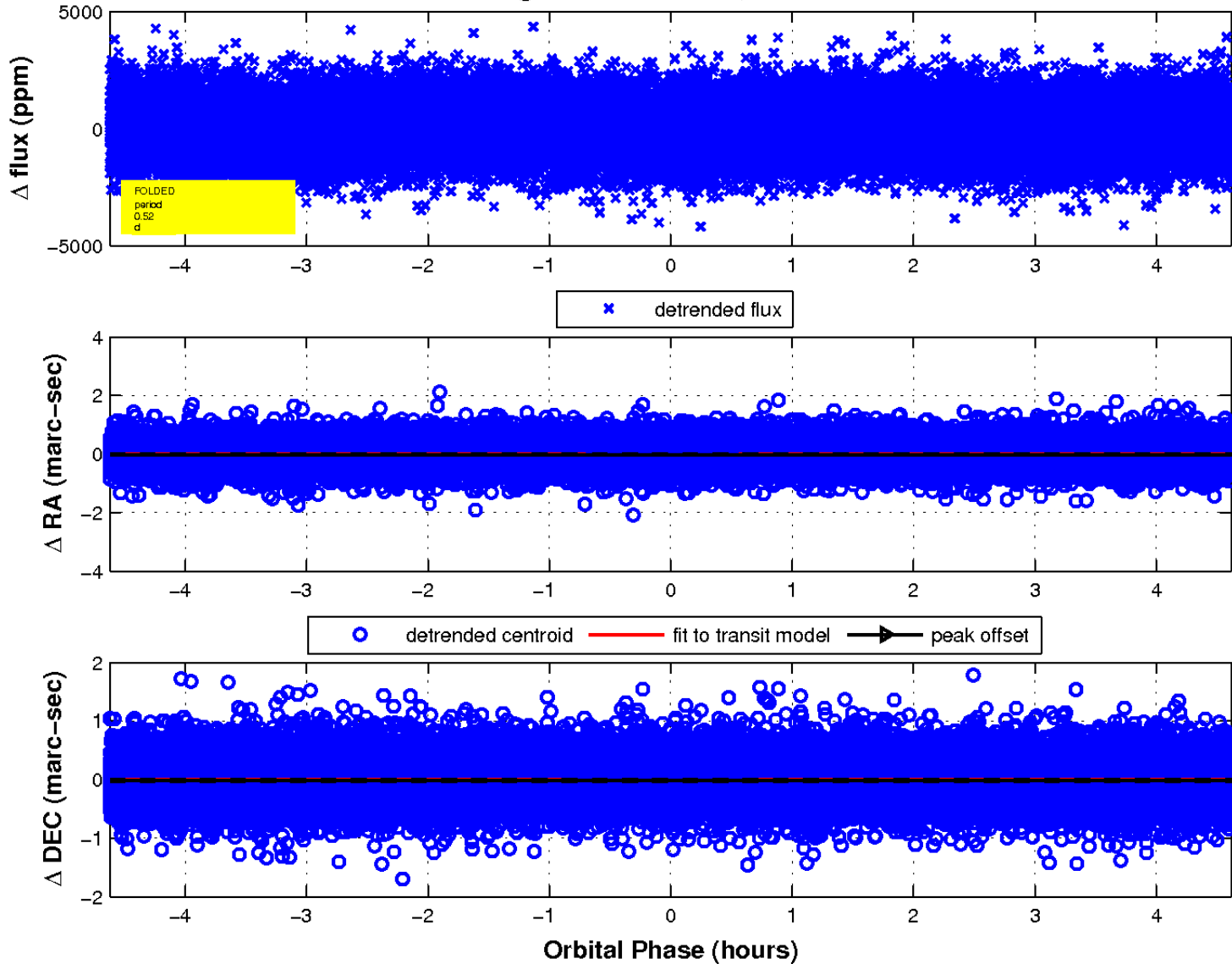
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

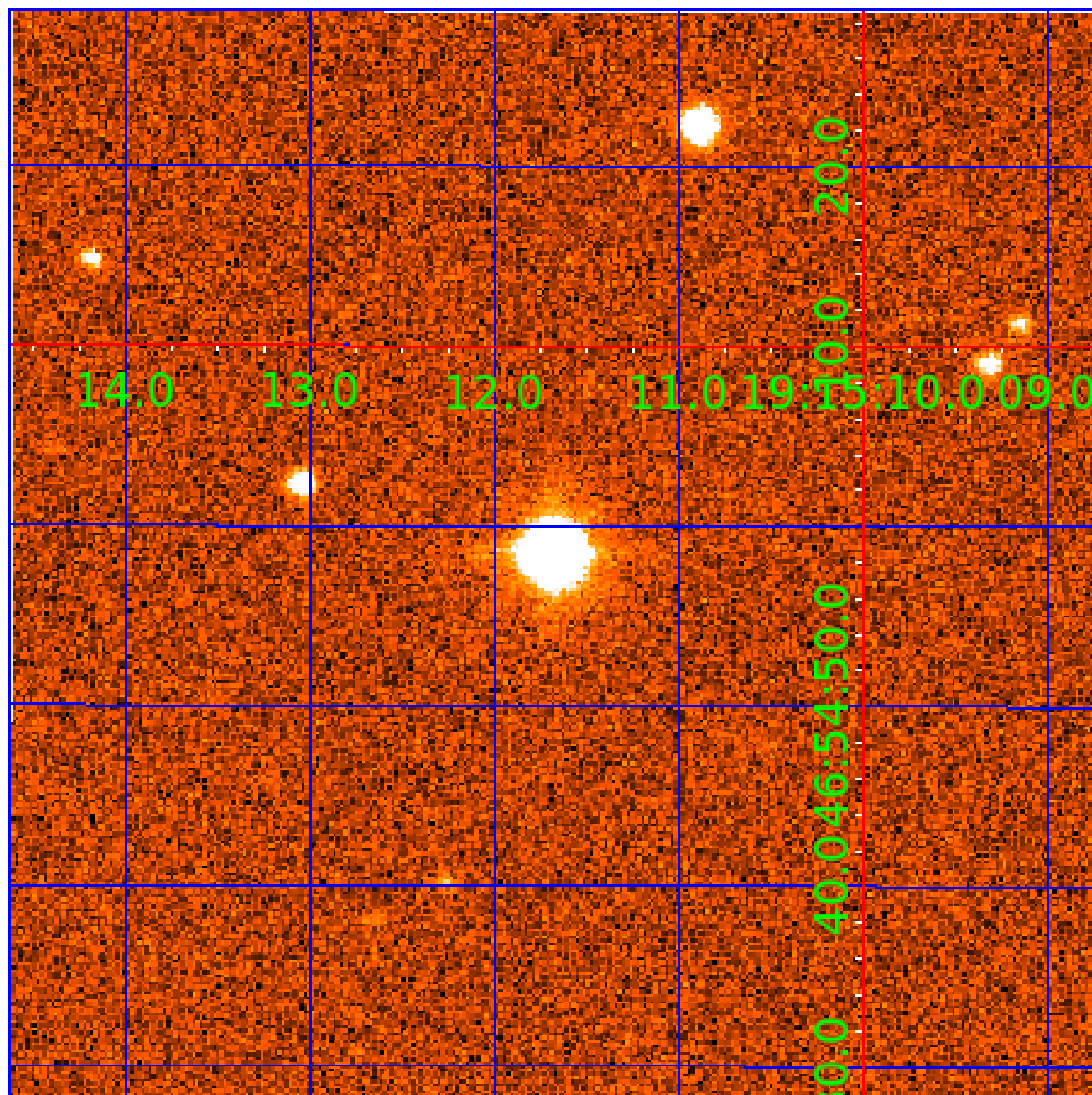


fluxWeightedCentroids, Planet 1 of 2



UKIRT Image

Declination



# KIC 010004660

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010004660-01	OBS	No	0.518294	131.584224	111.9	1.540	10.0	10.8	4.01	9416	4.89	0.00
010004660-02	OBS	No	0.633253	131.992779	60.6	6.622	8.9	5.9	4.01	9416	3.22	280294.73

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010004660-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
010004660-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE_ZUMA—LPP_DV—LPP_ALT

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

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

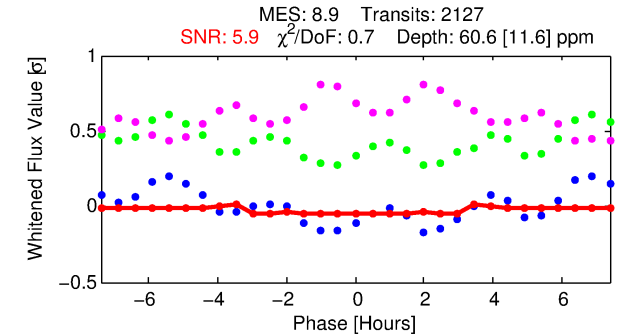
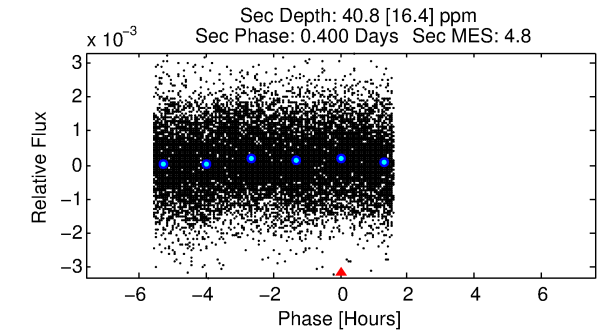
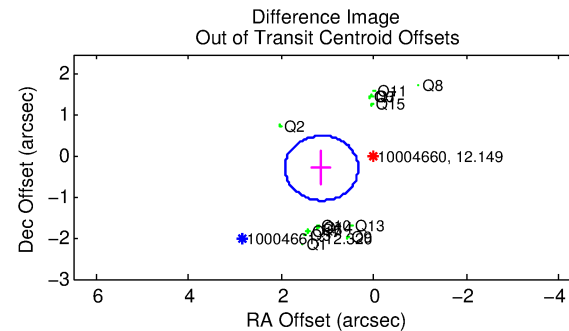
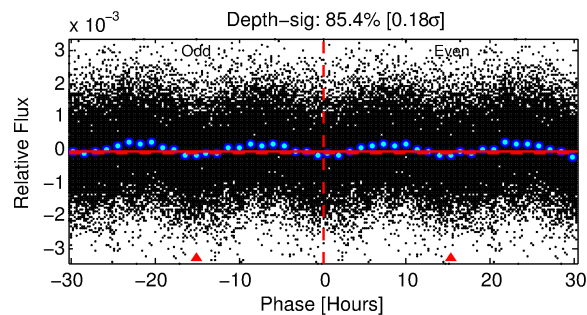
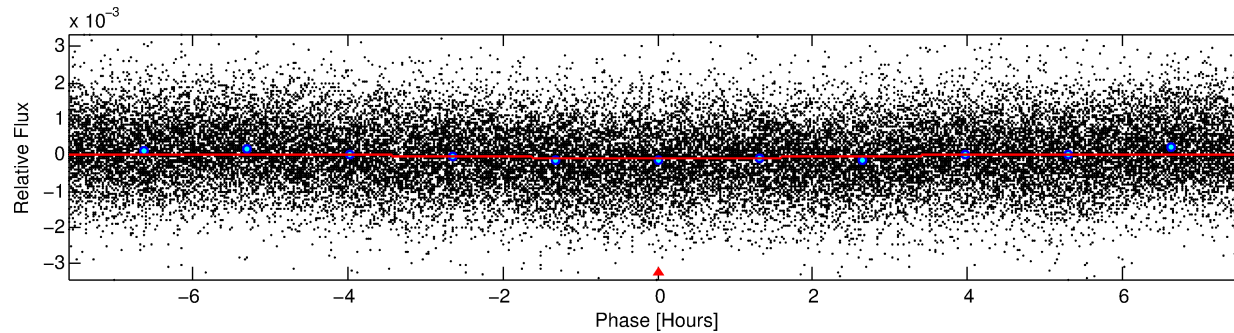
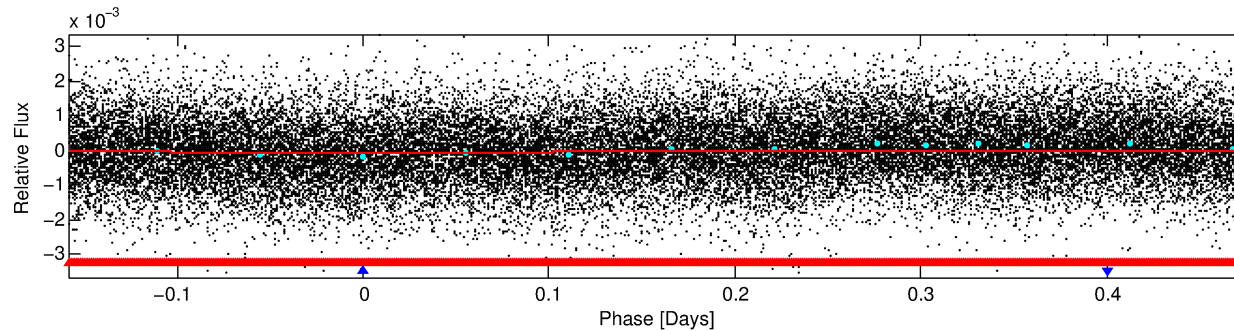
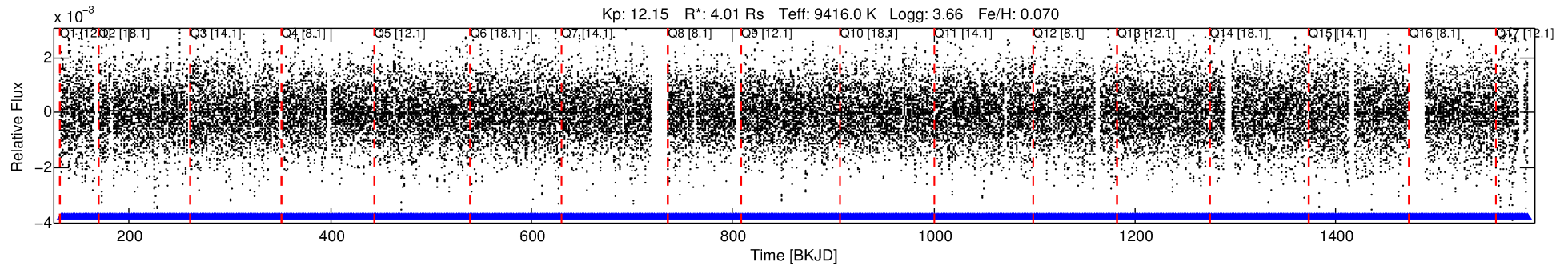
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 010004660-02

No Significant Match Found

# DV One-Page Summary

KIC: 10004660 Candidate: 2 of 2 Period: 0.633 d



## DV Fit Results:

Period = 0.63325 [0.00002] d  
Epoch = 131.9928 [0.0048] BKJD  
Rp/R\* = 0.0074 [0.0052]  
a/R\* = 1.03 [0.24]  
b = 0.37 [11.51]  
Seff = 280294.73 [231126.19]  
Teff = 5867 [1209] K  
Rp = 3.22 [2.81] Re  
a = 0.0201 [0.0100] AU  
Ag = 0.87 [1.45] [-0.09 $\sigma$ ]  
Teffp = 8767 [3232] K [0.84 $\sigma$ ]

## DV Diagnostic Results:

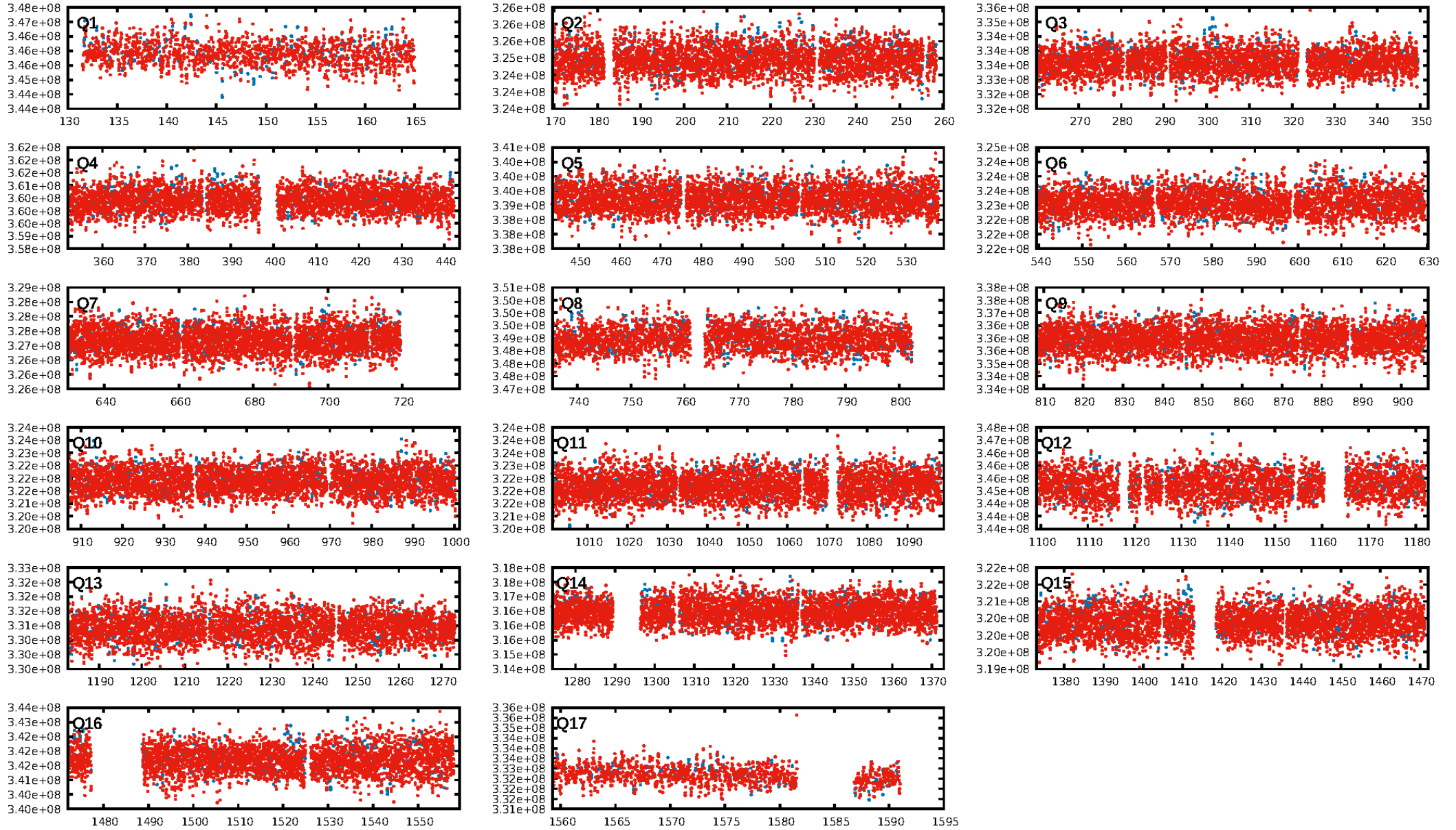
ShortPeriod-sig: 31.5% [0.41 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [2031/2031]  
GhostDiagnostic-chr: 2.249  
Centroid-sig: 4.4%  
Centroid-so: 0.072 arcsec [0.77 $\sigma$ ]  
OotOffset-rm: 1.166 arcsec [4.42 $\sigma$ ]  
KicOffset-rm: 1.161 arcsec [4.48 $\sigma$ ]  
OotOffset-st: 4/4/1/5 [14]  
KicOffset-st: 4/4/1/5 [14]  
DiffImageQuality-fgm: 0.71 [10/14]  
DiffImageOverlap-fno: 0.00 [0/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 16:37:23 Z

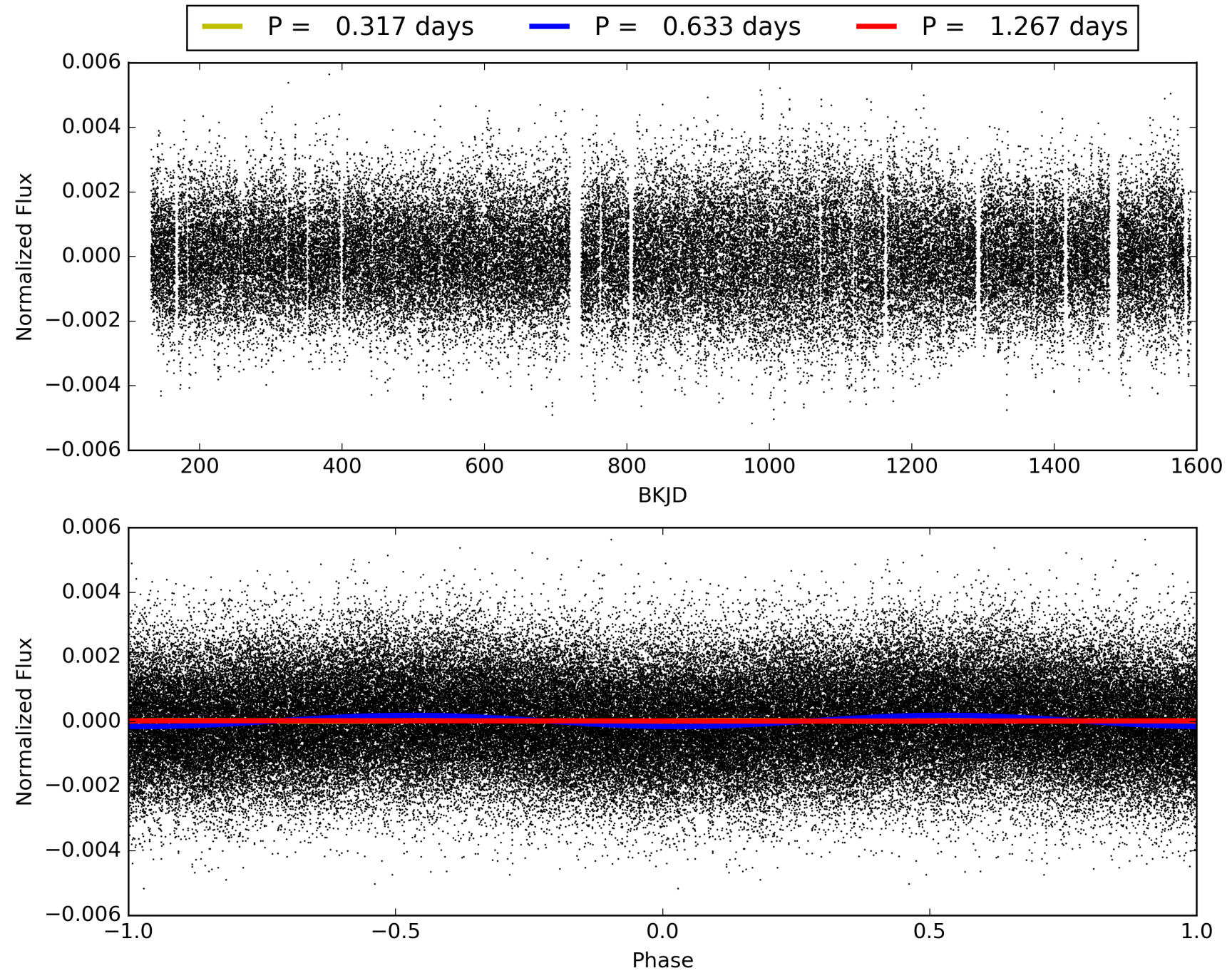
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center



# TCE 010004660-02, PDC Light Curves

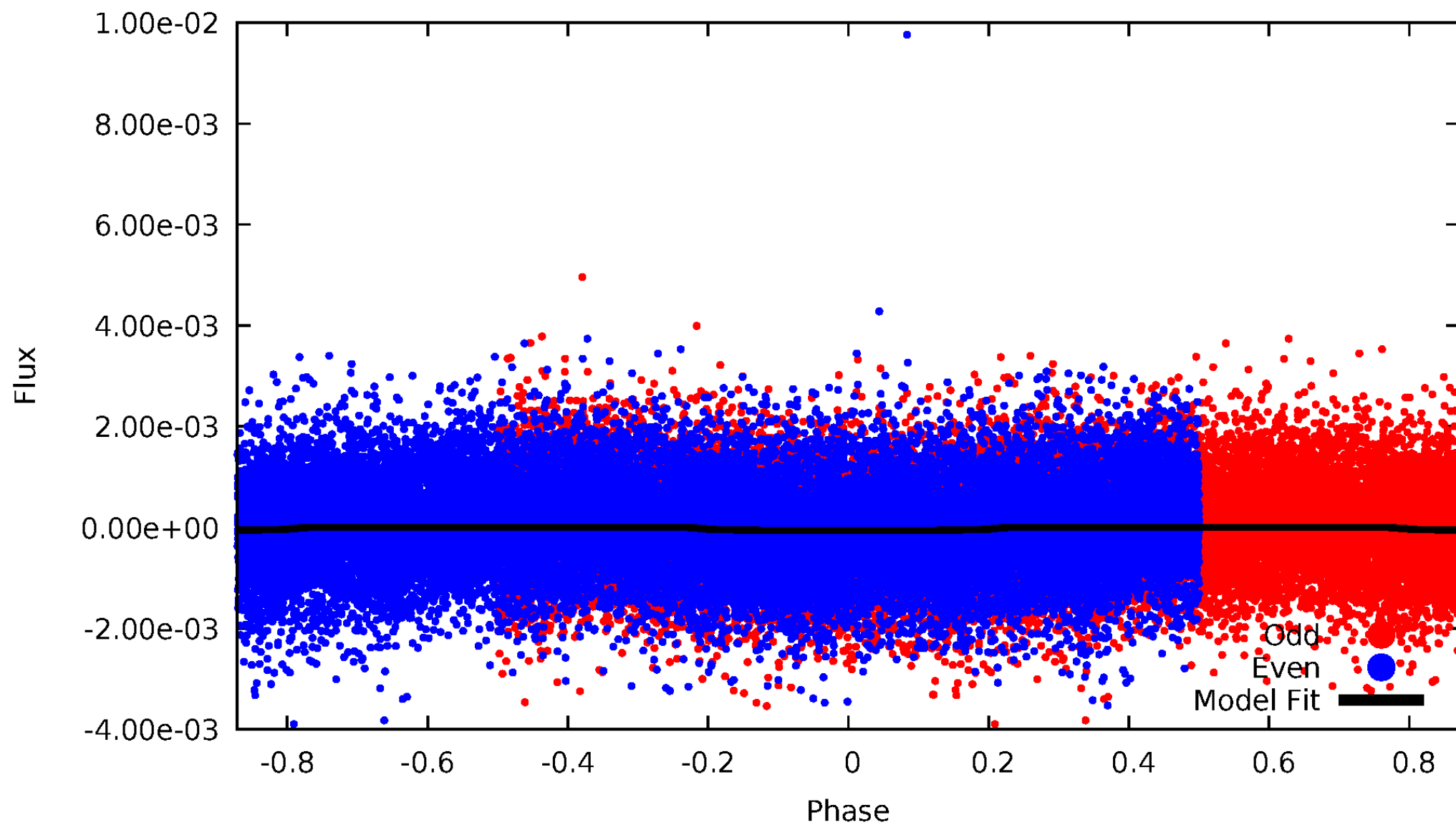


TCE 010004660-02



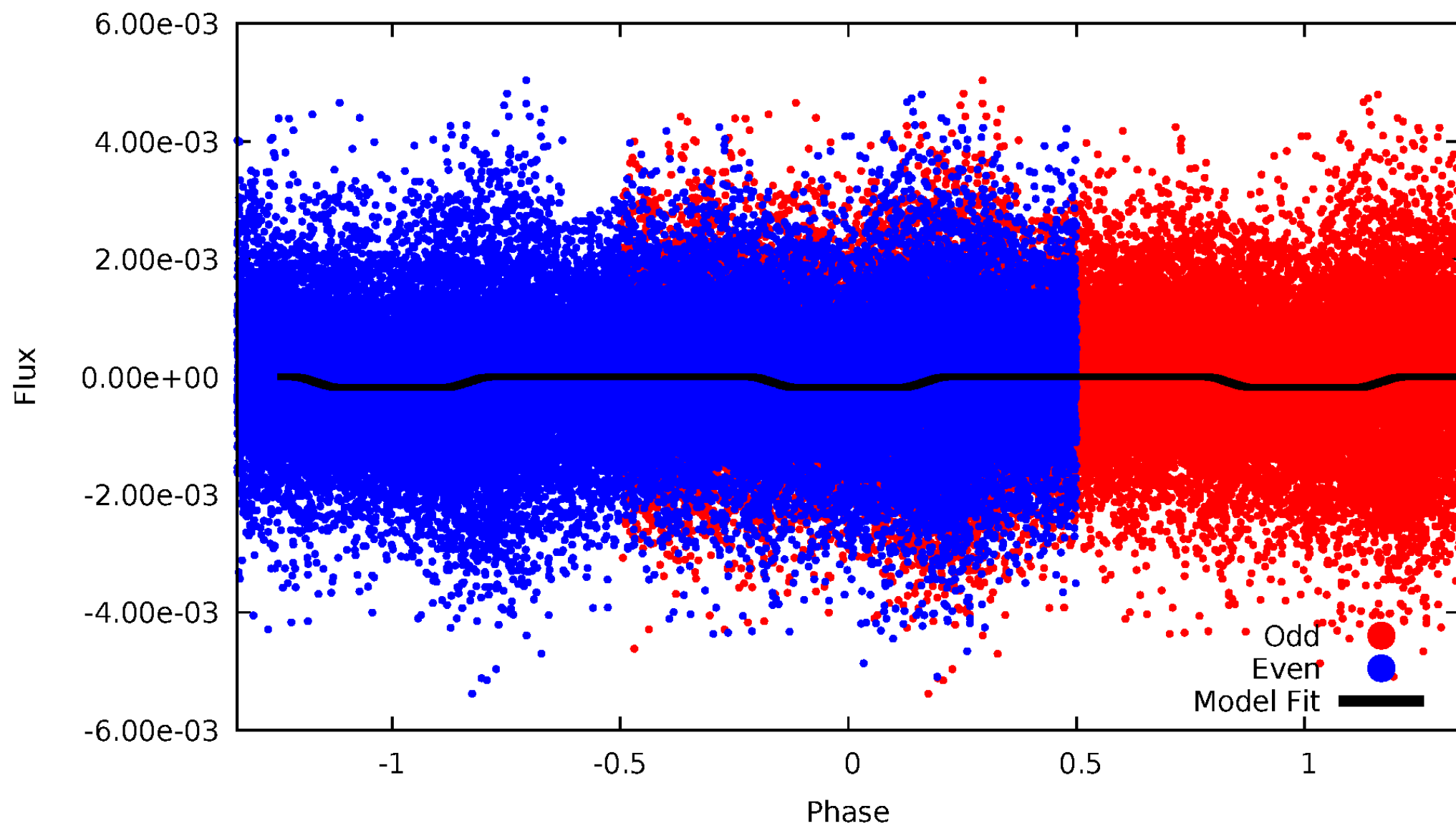
# DV Odd/Even

TCE 010004660-02



# ALT Odd/Even

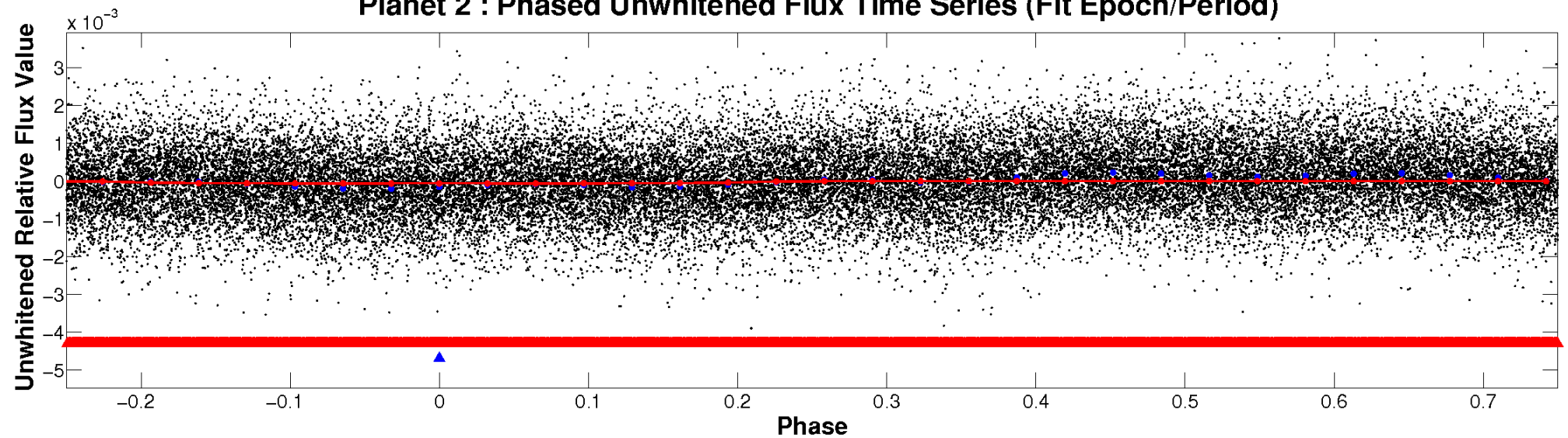
TCE 010004660-02



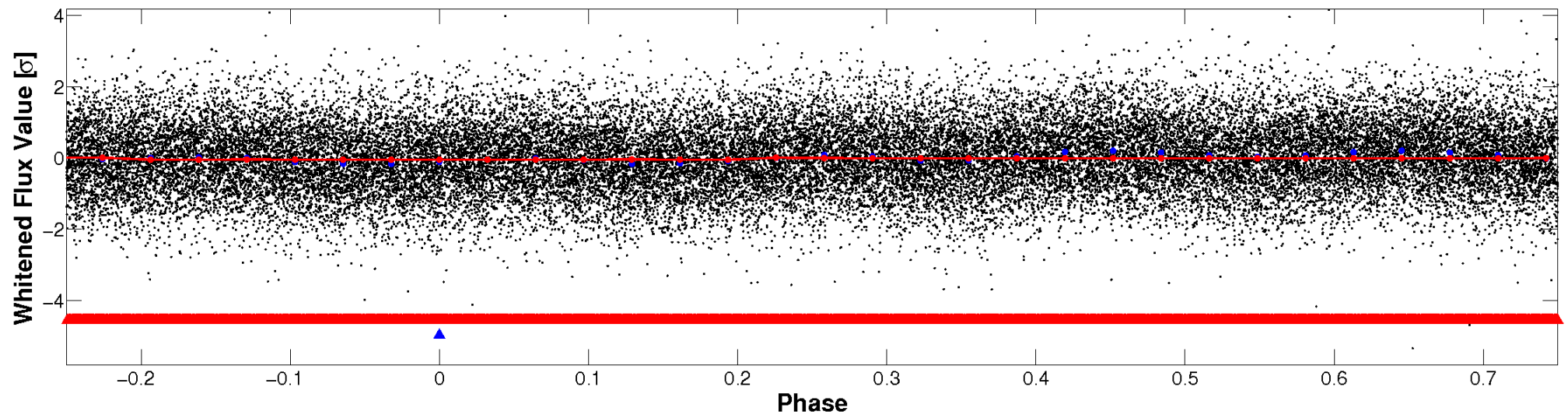


# Non-Whitened Vs. Whitened Light Curve

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



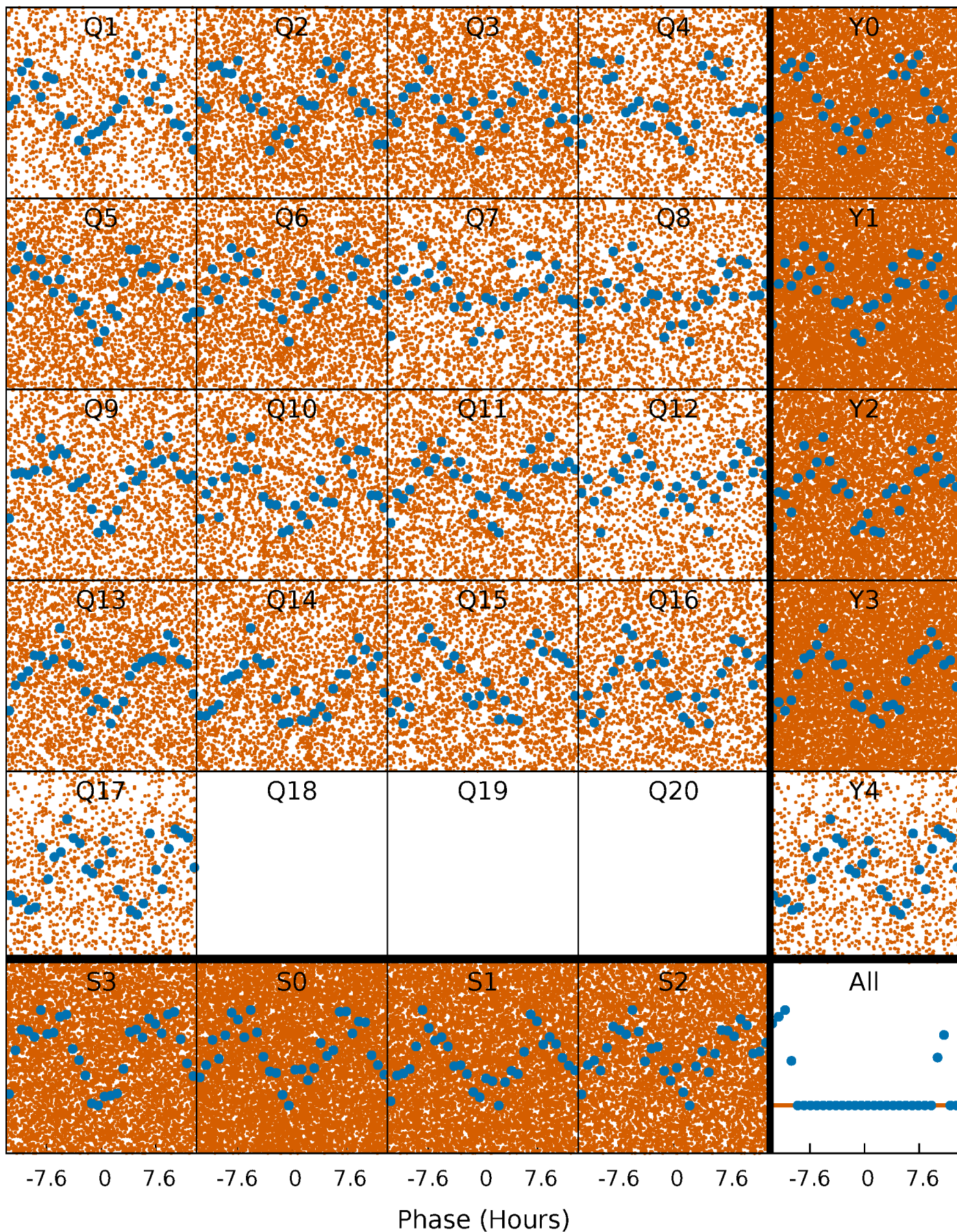
## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)





# PDC Quarter-Phased Transit Curves

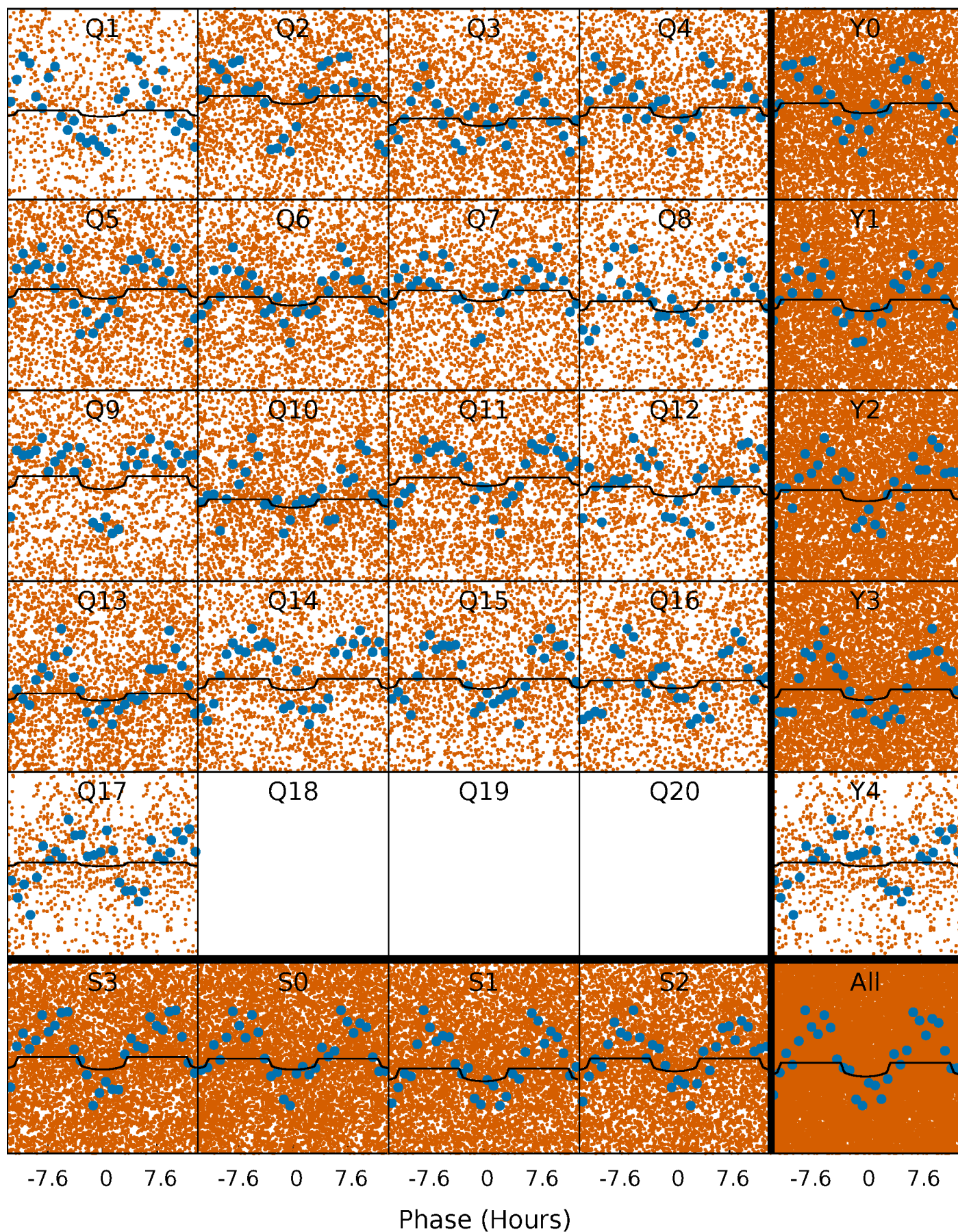
TCE 010004660-02 P= 0.633253 Days  $T_0=131.992779$  (BKJD)





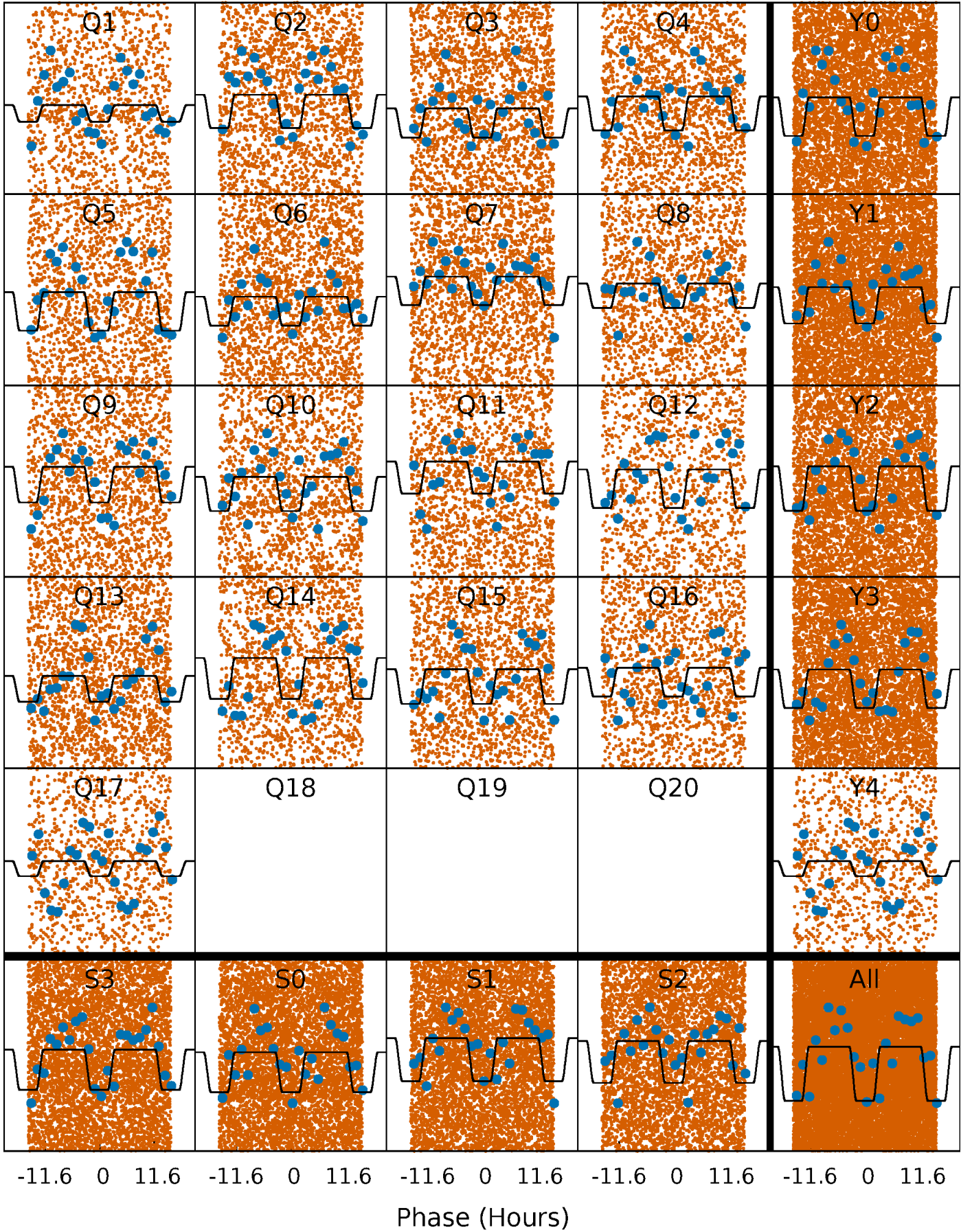
# DV Quarter-Phased Transit Curves

TCE 010004660-02 P= 0.633253 Days  $T_0=131.992779$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 010004660-02   P= 0.633230 Days    $T_0=131.980251$  (BKJD)

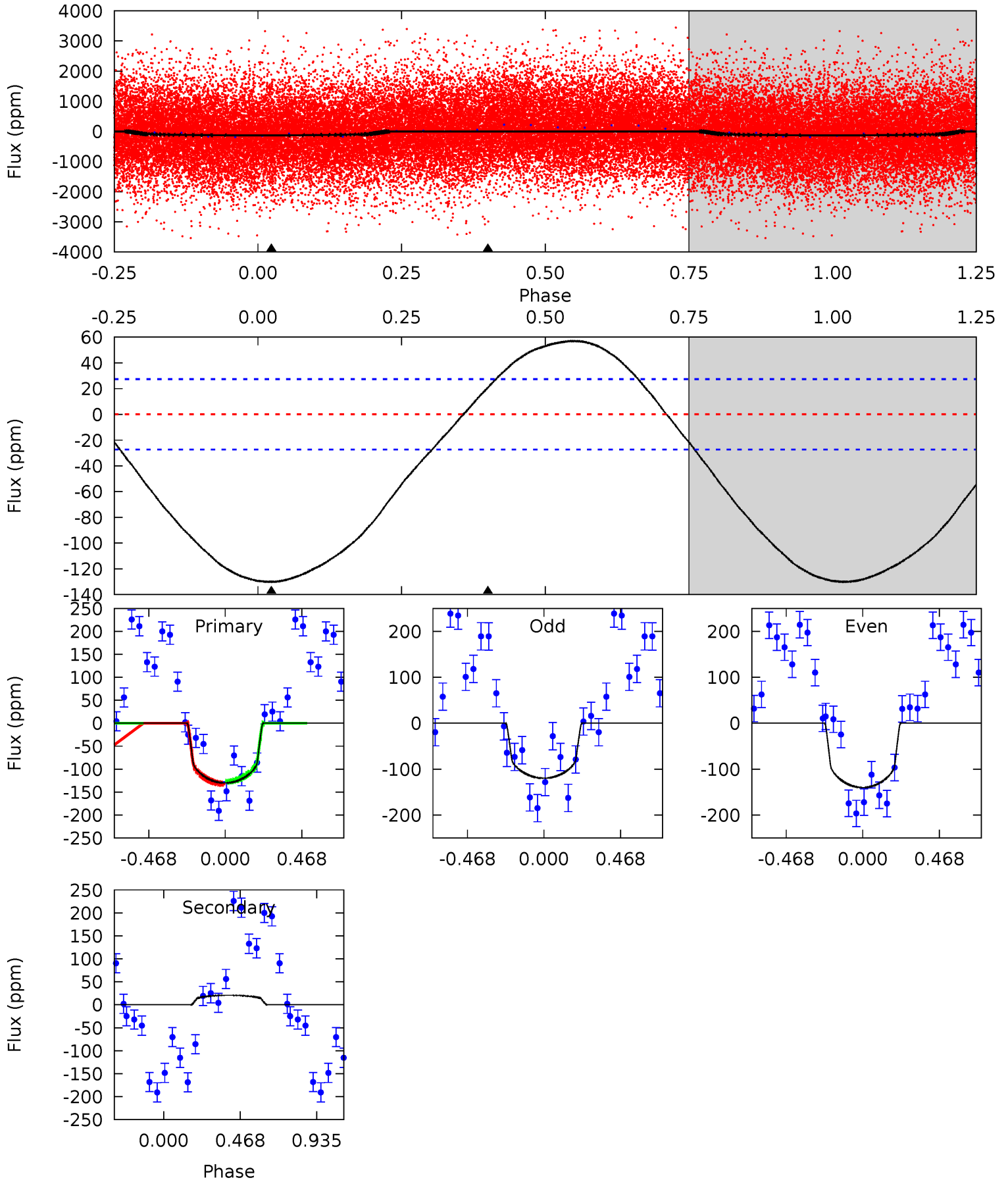




# DV Model-Shift Uniqueness Test

010004660-02, P = 0.633253 Days, E = 131.359526 Days

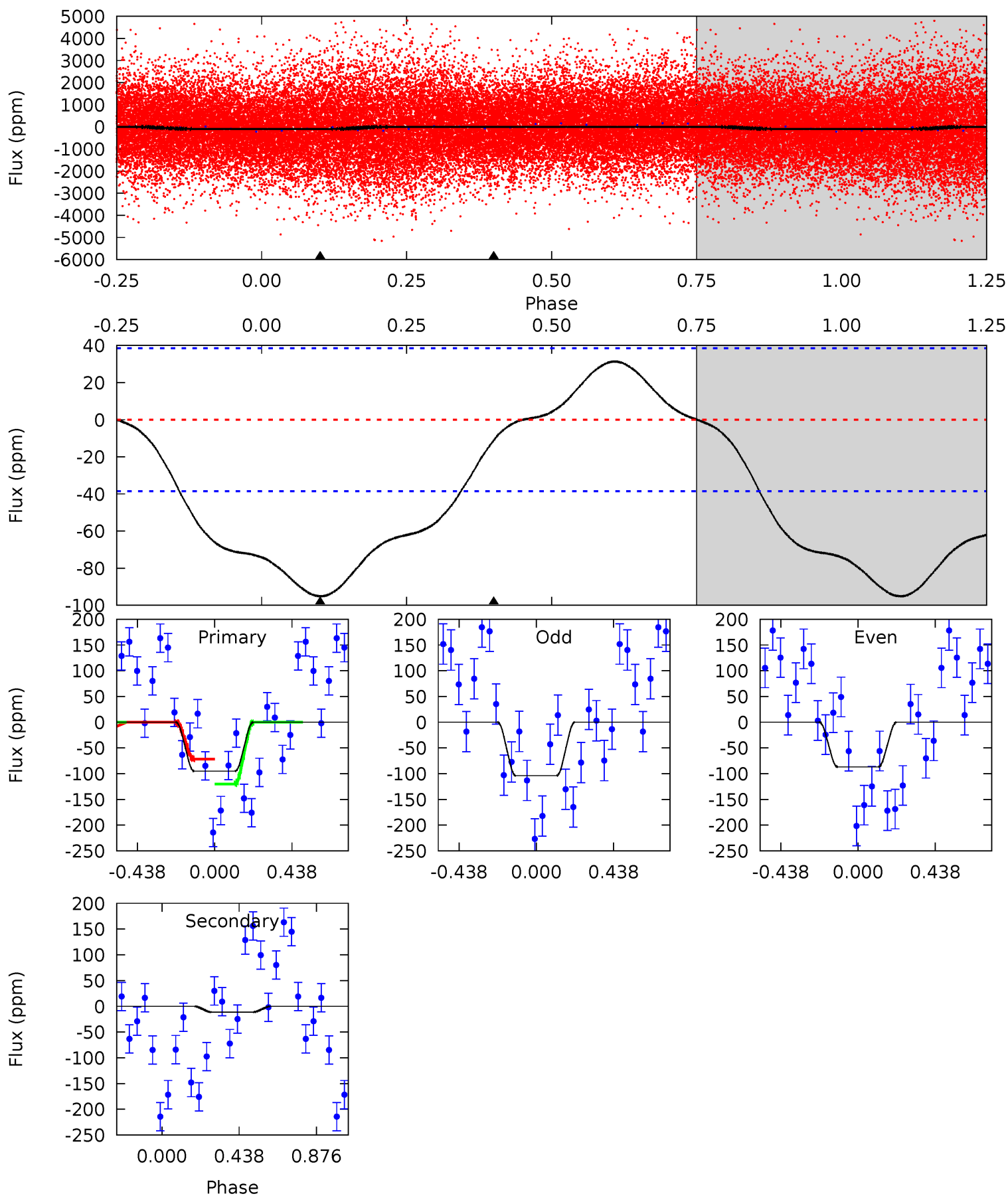
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
20.1	-3.21	0	0	4.23	0.73	2.62	20.1	20.1	-3.21	-3.21	1.56	1.06	0.30	0.37



# Alt Model-Shift Uniqueness Test

010004660-02, P = 0.633230 Days, E = 131.347021 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
10.5	1.23	0	0	4.24	0.78	0.49	10.5	10.5	1.23	1.23	0.93	1.76	0.25	2.54





### Stellar Parameters For KIC 010004660

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$9416^{+301}_{-451}$	$3.663^{+0.472}_{-0.118}$	$0.070^{+0.200}_{-0.700}$	$4.009^{+0.886}_{-2.068}$	$2.699^{+0.325}_{-0.975}$	$0.059^{+0.299}_{-0.021}$
	+3%/-5%	+13%/-3%	+286%/-1000%	+22%/-52%	+12%/-36%	+507%/-35%
Source	KIC0	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 010004660-02 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$21 \pm 6$	$3.09^{+2.24}_{-1.84}$	$7931^{+639}_{-984}$	$-7709^{+1028}_{-4326}$	$-0.464^{+0.314}_{-2.136}$
Alt.	$-11 \pm 9$	$4.96^{+2.75}_{-2.13}$	$7887^{+696}_{-1017}$	$-5479^{+3254}_{-815}$	$0.085^{+0.214}_{-0.072}$

$T_{max}$  = 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

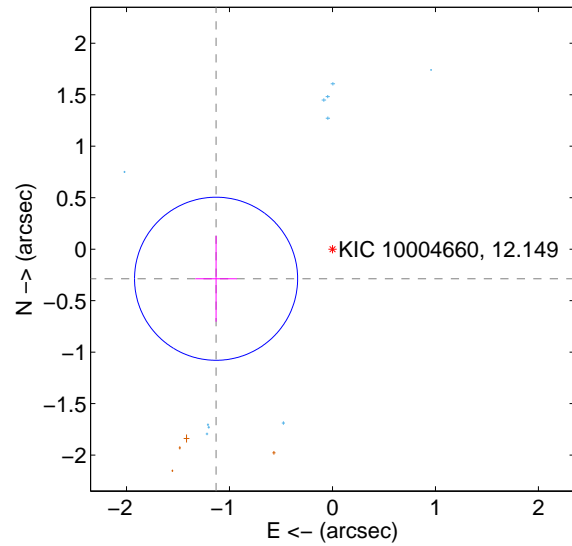
Supplemental centroid analysis for 010004660-02. Kepler magnitude: 12.15. Transit SNR 5.87

There are 10 quarters with good PRF difference image offsets

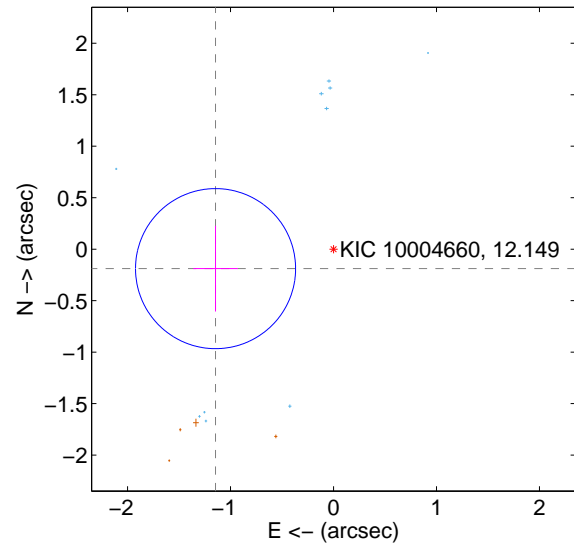
The direct PRF centroid is offset from the target star catalog position by about 0.17 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.166 \pm 0.264$	4.42	$1.131 \pm 0.201$	$-0.287 \pm 0.417$
PRF-fit source offset from KIC position	$1.161 \pm 0.259$	4.48	$1.146 \pm 0.217$	$-0.189 \pm 0.416$
photometric centroid source offset	$0.07 \pm 0.09$	0.77	$0.07 \pm 0.09$	$0.00 \pm 0.09$

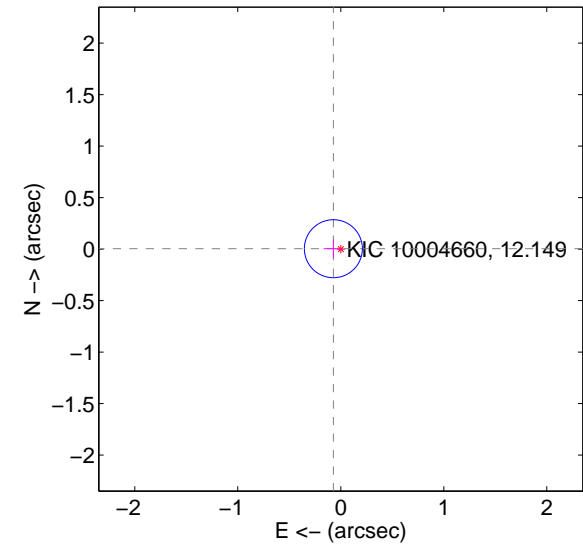
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

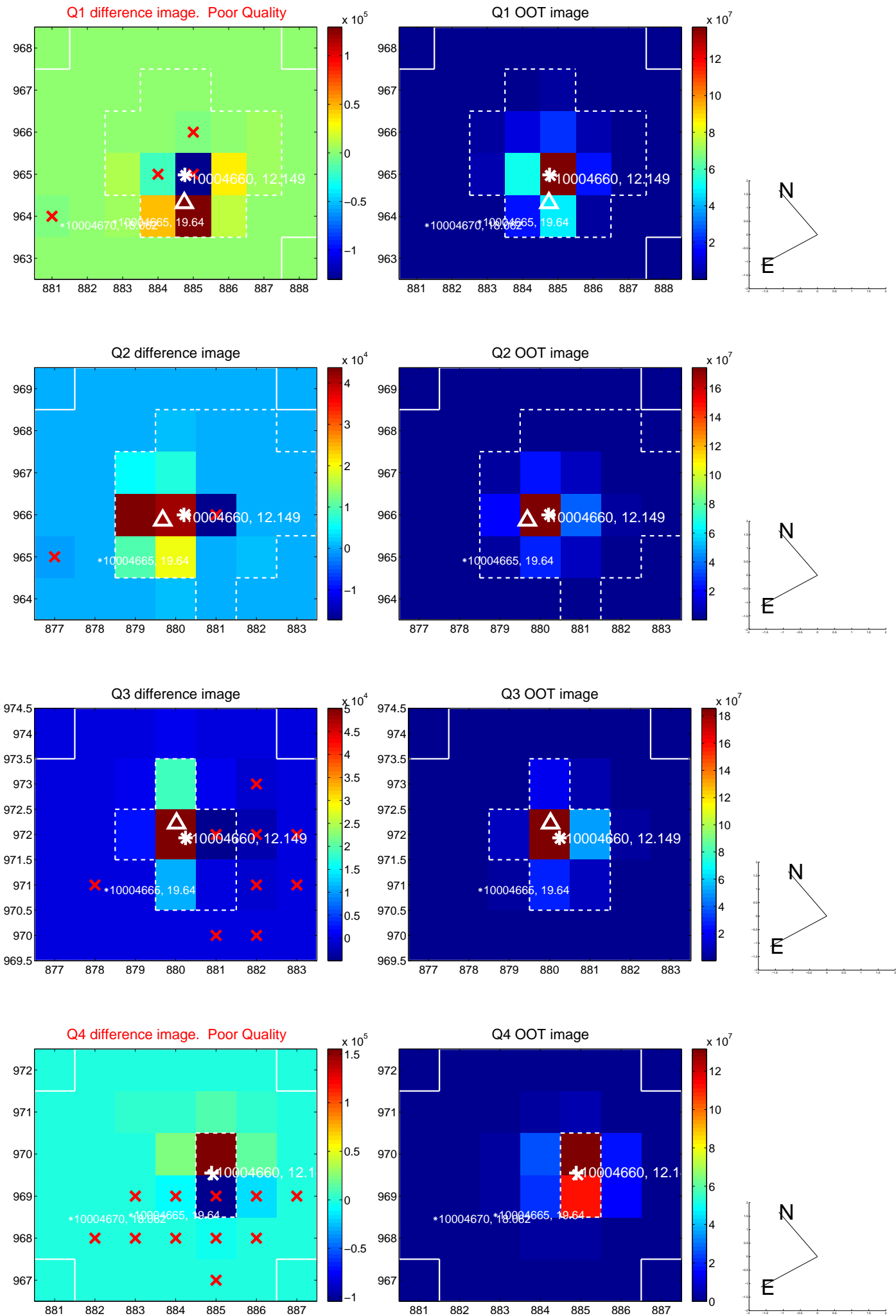


offset from photometric centroids

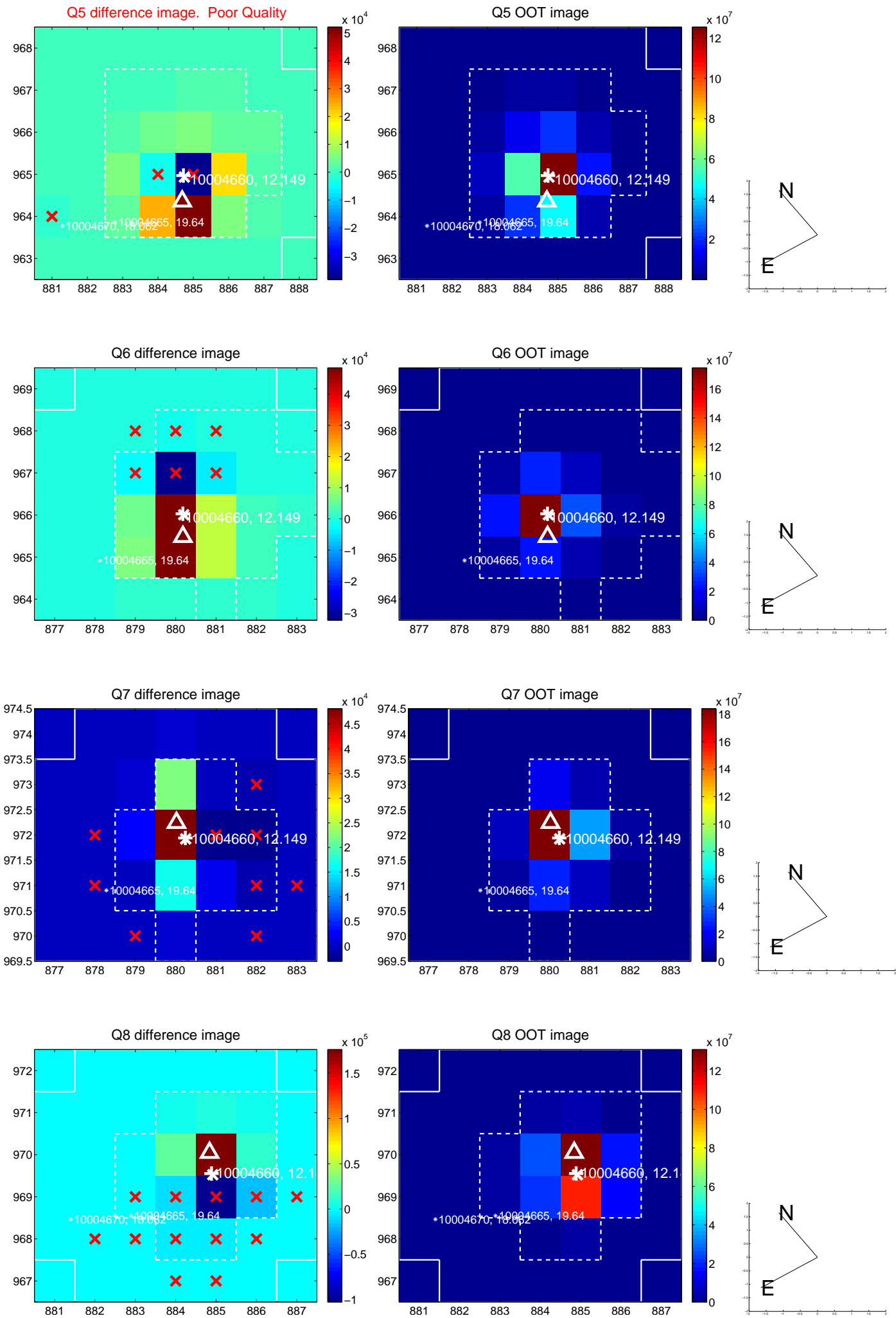


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

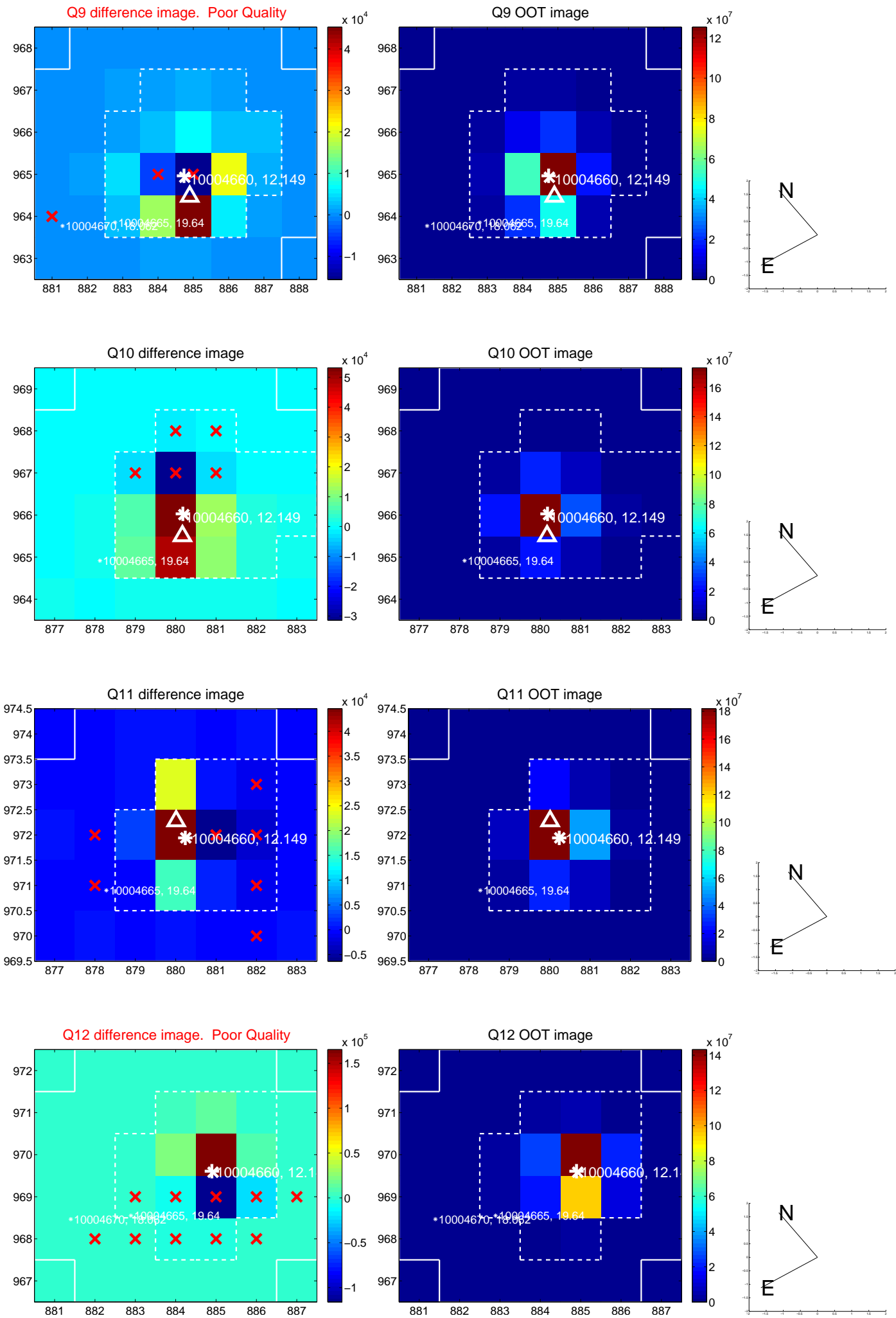


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

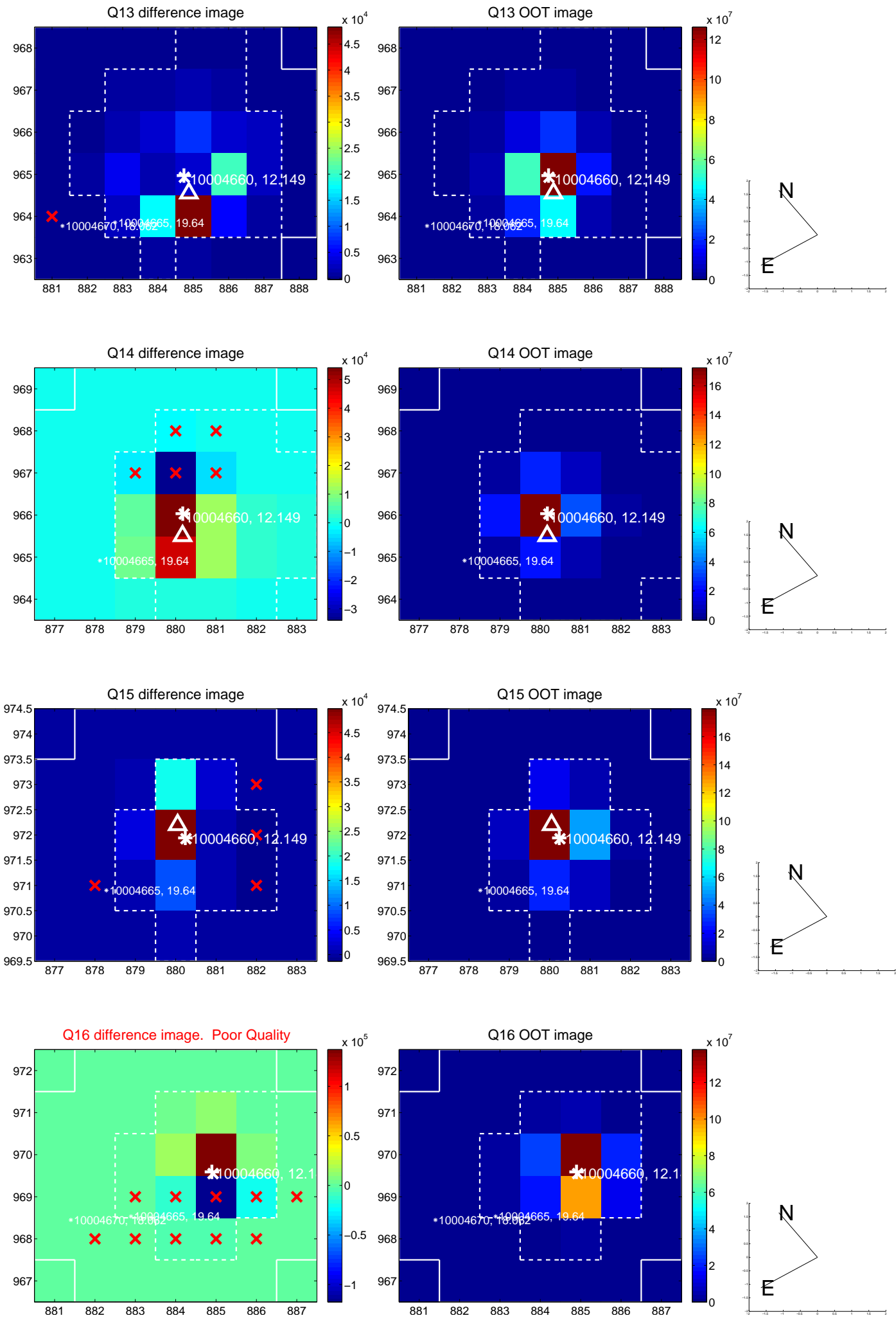




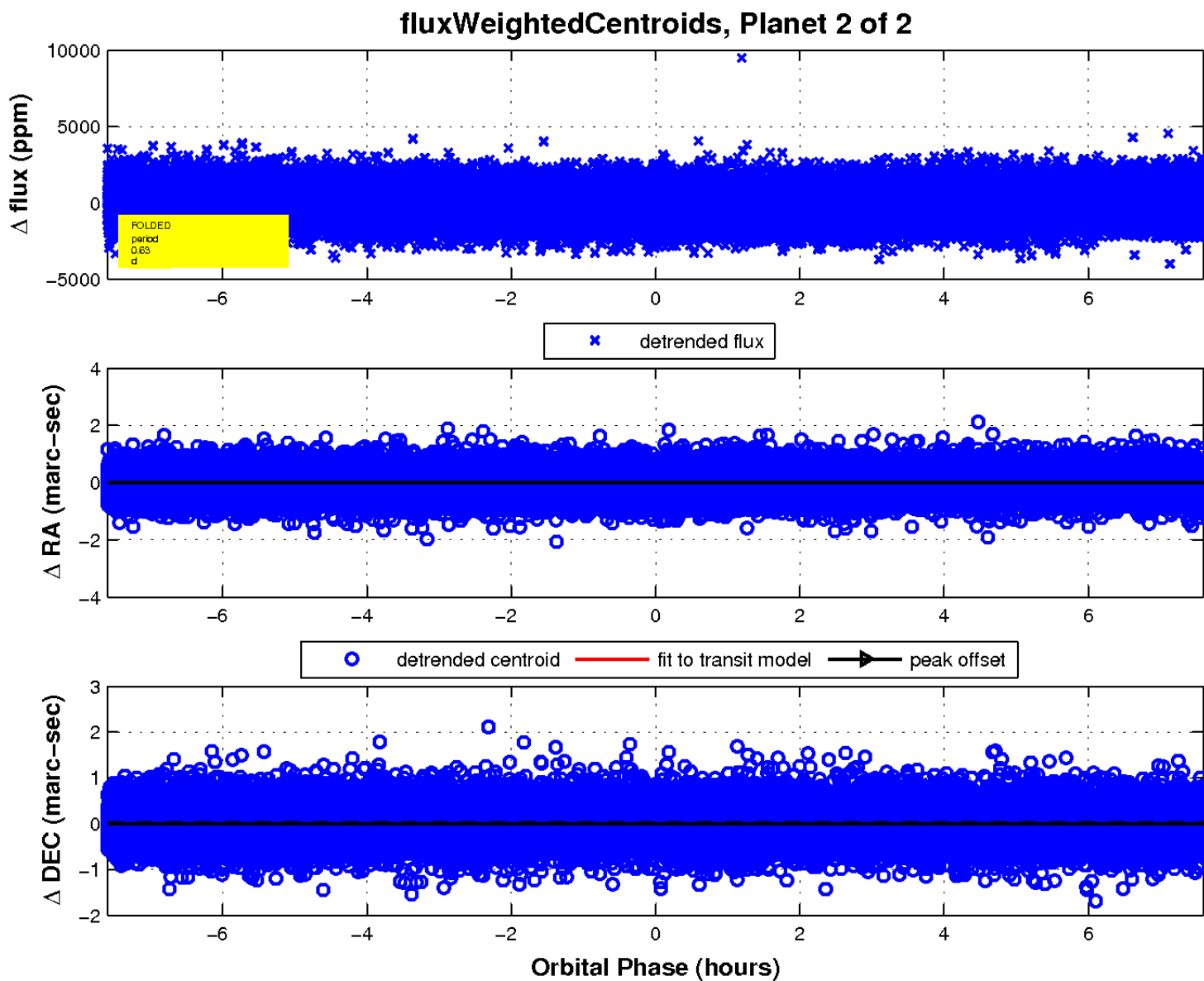
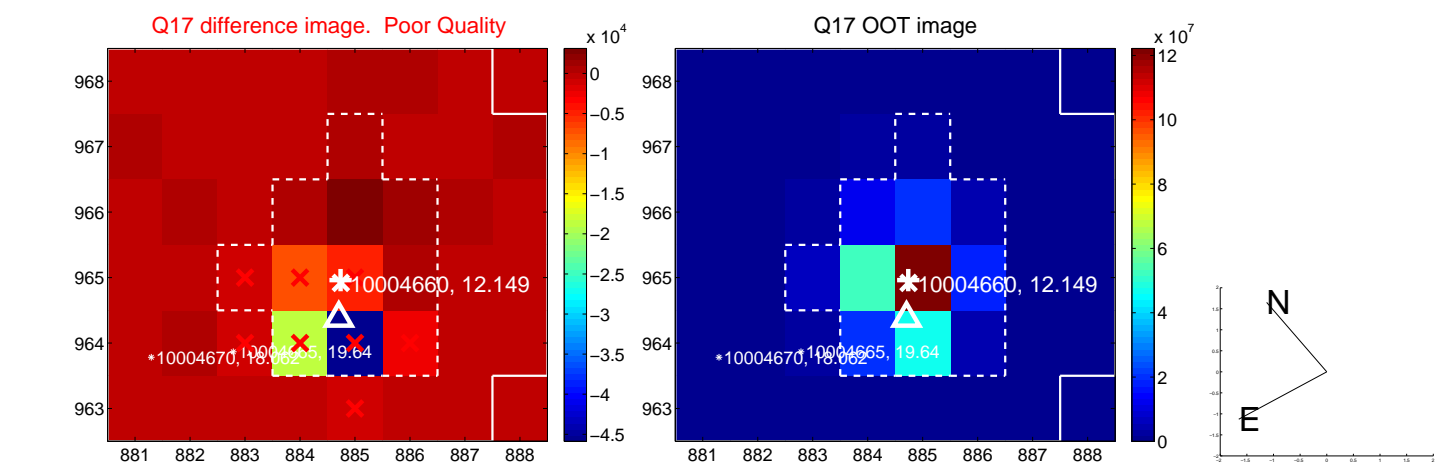
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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.



UKIRT Image

Declination

