

# KIC 009412445

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009412445-01	OBS	3970.01	5.093267	132.472409	194.8	11.733	25.2	28.0	0.56	3995	1.61	30.99

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009412445-01	OBS	FP	0.00	0	0	1	1	CENT_RESOLVED_OFFSET—EPHEM_MATCH

**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 009412445-01

TCE (1)	KIC	Parent (2)	Parent KIC	$P_1:P_2$	Dist ( $''$ )	$\Delta$ Row	$\Delta$ Col	$m_2$	$m_1$	$D_2/D_1$	Mechanism	Flag	$\sigma_P$	$\sigma_T$
009412445-01	9412445	7171.01	9412462	1:2	15.4	4	0	14.85	14.65	1772.40	Direct-PRF	0	0.44	2.29

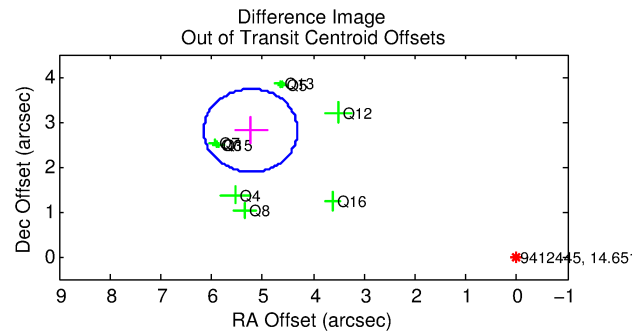
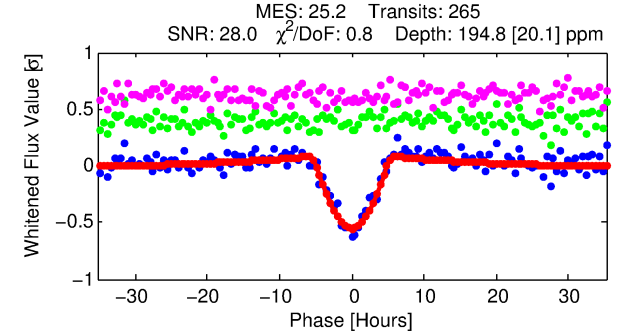
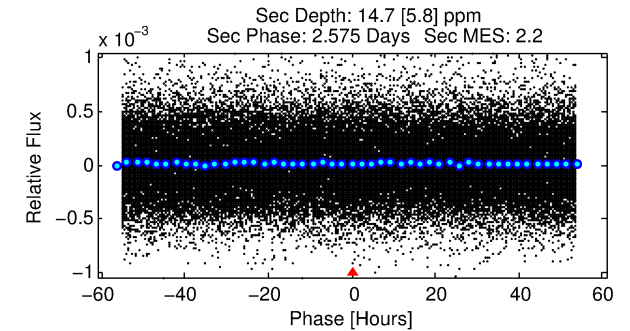
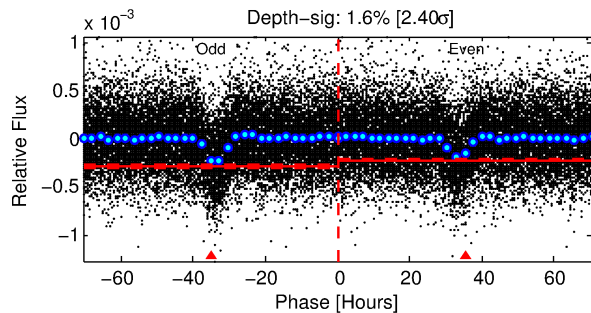
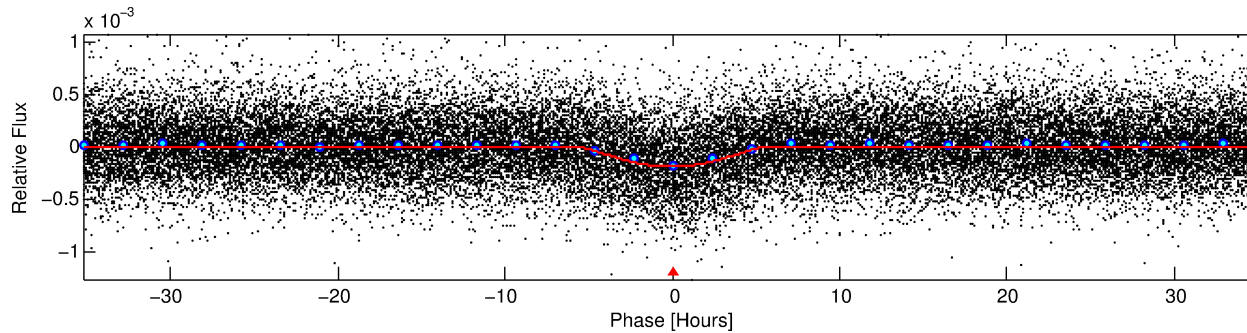
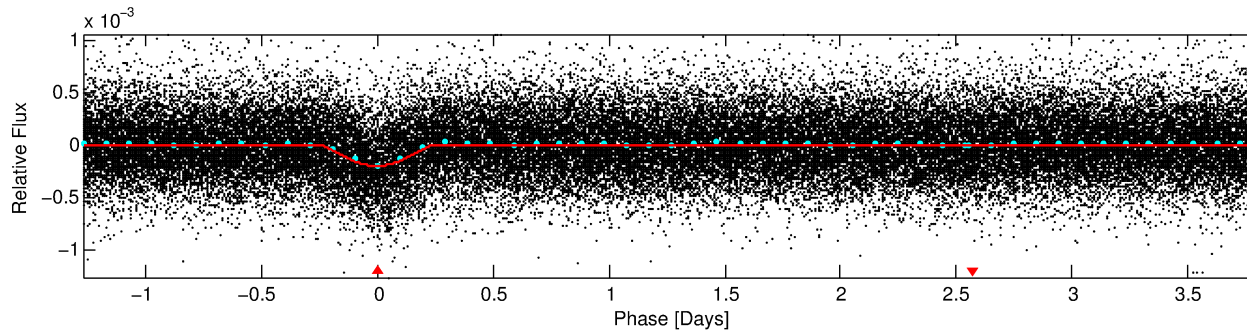
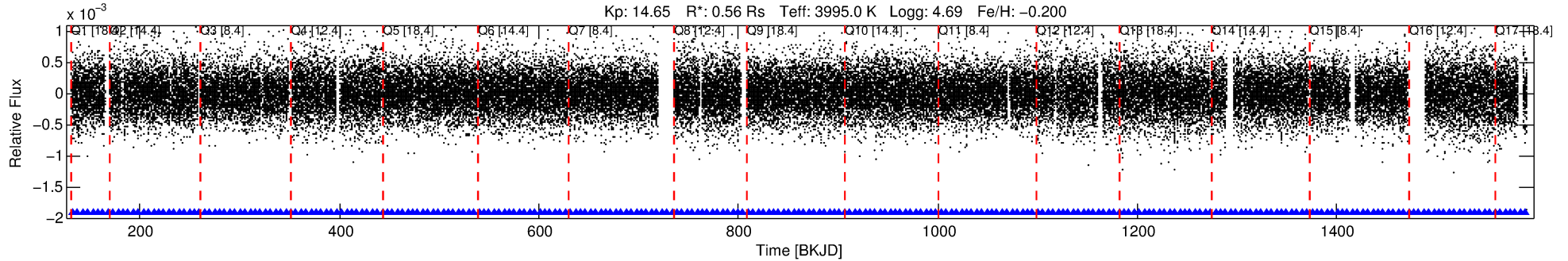
**Notes:**  $P_1:P_2$  is the period ratio. Dist is the distance in arcseconds.  $\Delta$ Row and  $\Delta$ Col are the number of pixels apart in row and column.  $m_2$  and  $m_1$  are the magnitudes of the parent and child.  $D_2/D_1$  is the parent's transit depth divided by the child's.  $\sigma_P$  and  $\sigma_T$  are the significance of the match in period and epoch. For a match to be considered significant  $\sigma_P < 5.0$  and  $\sigma_T < 5.0$ . Matches which have  $\sigma_P$  and  $\sigma_T$  very close to this cutoff should receive extra scrutiny, especially if the period ratio is very large.

# DV One-Page Summary

KIC: 9412445 Candidate: 1 of 1 Period: 5.093 d

KOI: K03970 Corr: No Ephemeris Match

Kp: 14.65 R\*: 0.56 Rs Teff: 3995.0 K Logg: 4.69 Fe/H: -0.200



## DV Fit Results:

Period = 5.09327 [0.00006] d  
Epoch = 132.4724 [0.0085] BKJD  
Rp/R\* = 0.0266 [0.0289]  
a/R\* = 1.27 [0.11]  
b = 1.00 [0.04]  
Seff = 30.99 [2.40]  
Teq = 602 [12] K  
Rp = 1.61 [1.75] Re  
a = 0.0476 [0.0017] AU  
Ag = 7.08 [15.59] [0.39σ]  
Teffp = 1517 [836] K [1.10σ]

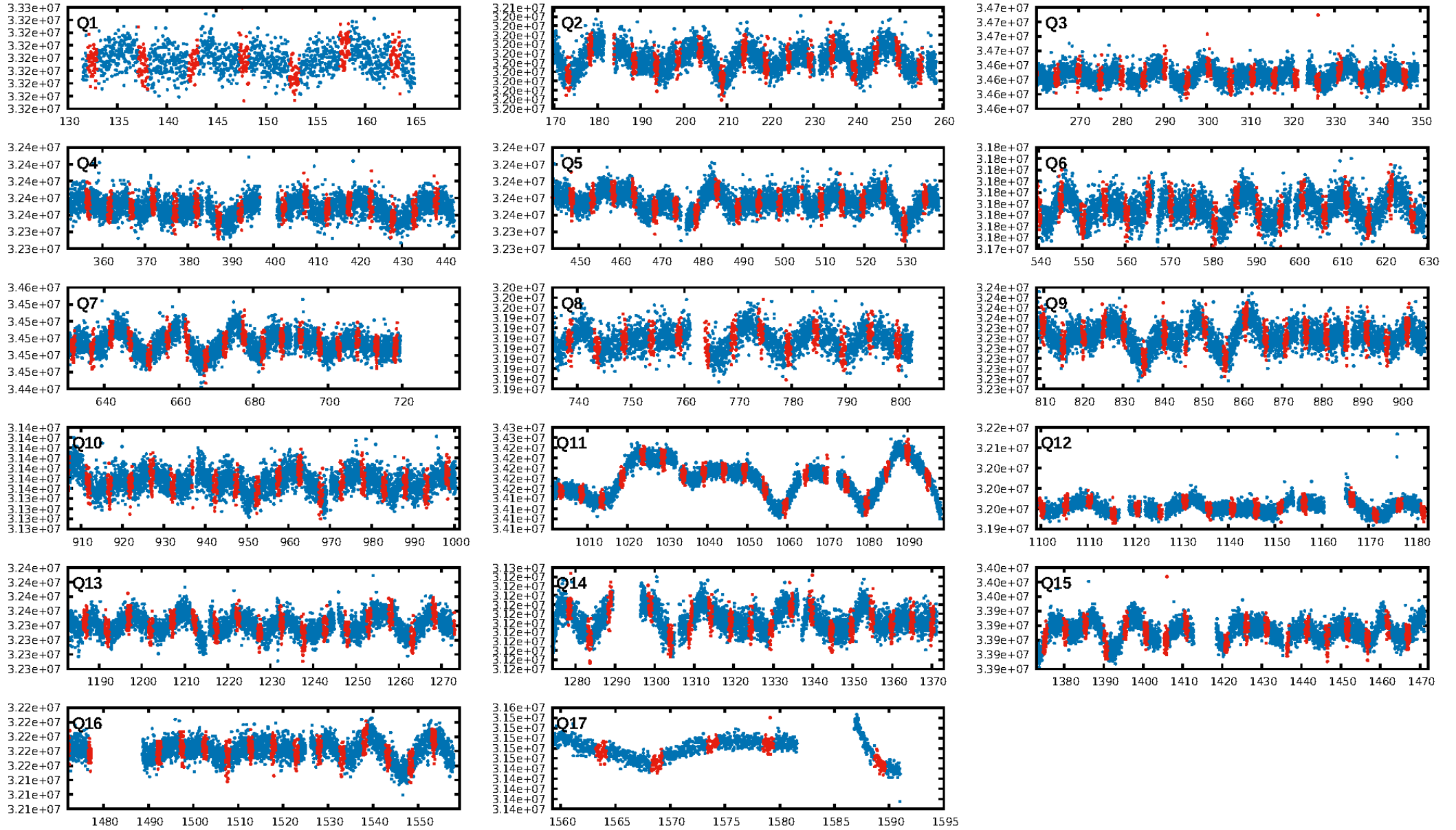
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 5.88e-125  
RollingBand-fgt: 1.00 [253/253]  
GhostDiagnostic-chr: -0.5841  
Centroid-sig: 0.0%  
Centroid-so: 13.399 arcsec [27.24σ]  
OotOffset-rm: 5.936 arcsec [19.31σ]  
KicOffset-rm: 6.214 arcsec [20.75σ]  
OotOffset-st: 0/3/4/2 [9]  
KicOffset-st: 0/3/4/2 [9]  
DiffImageQuality-fgm: 1.00 [9/9]  
DiffImageOverlap-fno: 1.00 [17/17]

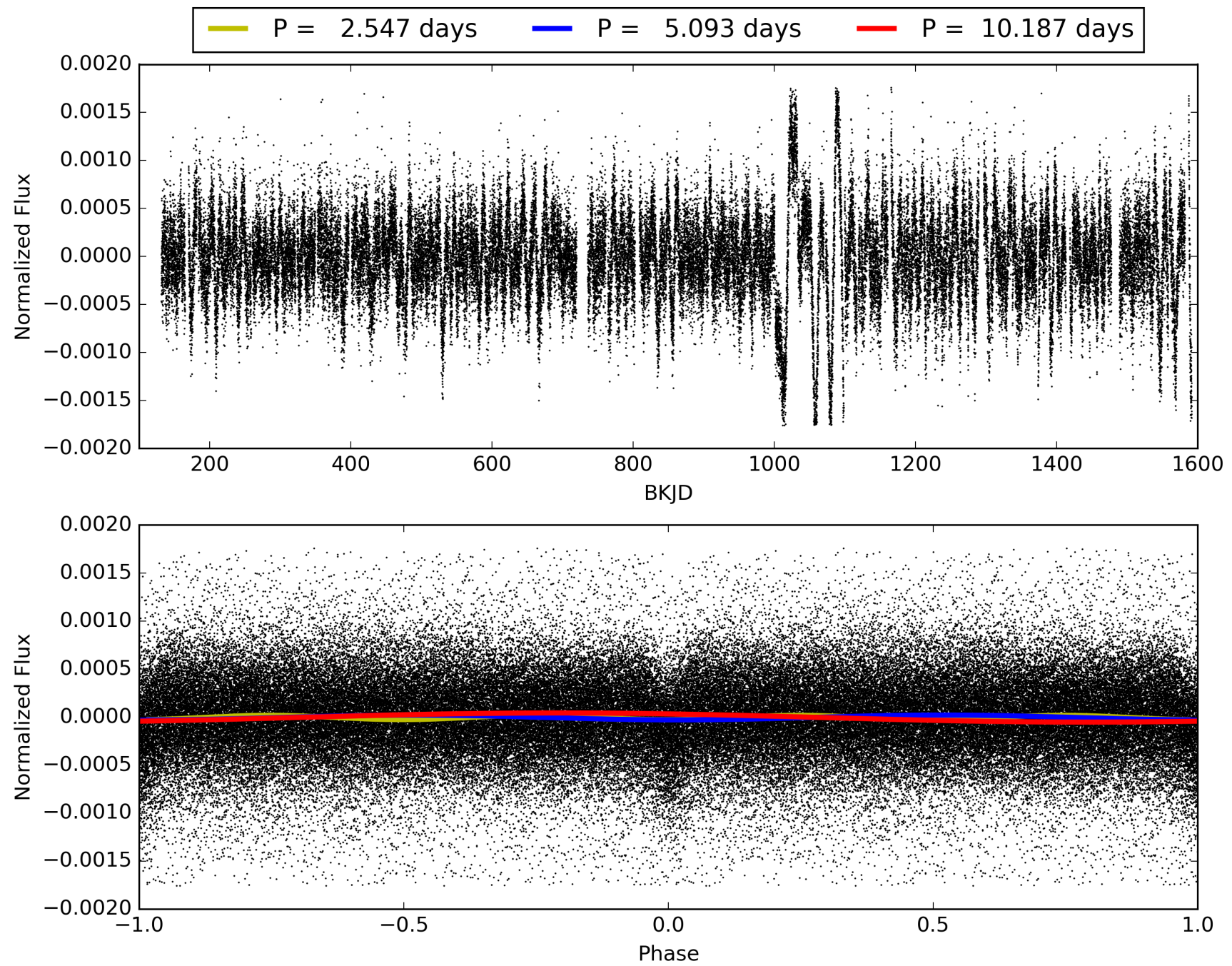
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 05:45:31 Z

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

# TCE 009412445-01, PDC Light Curves



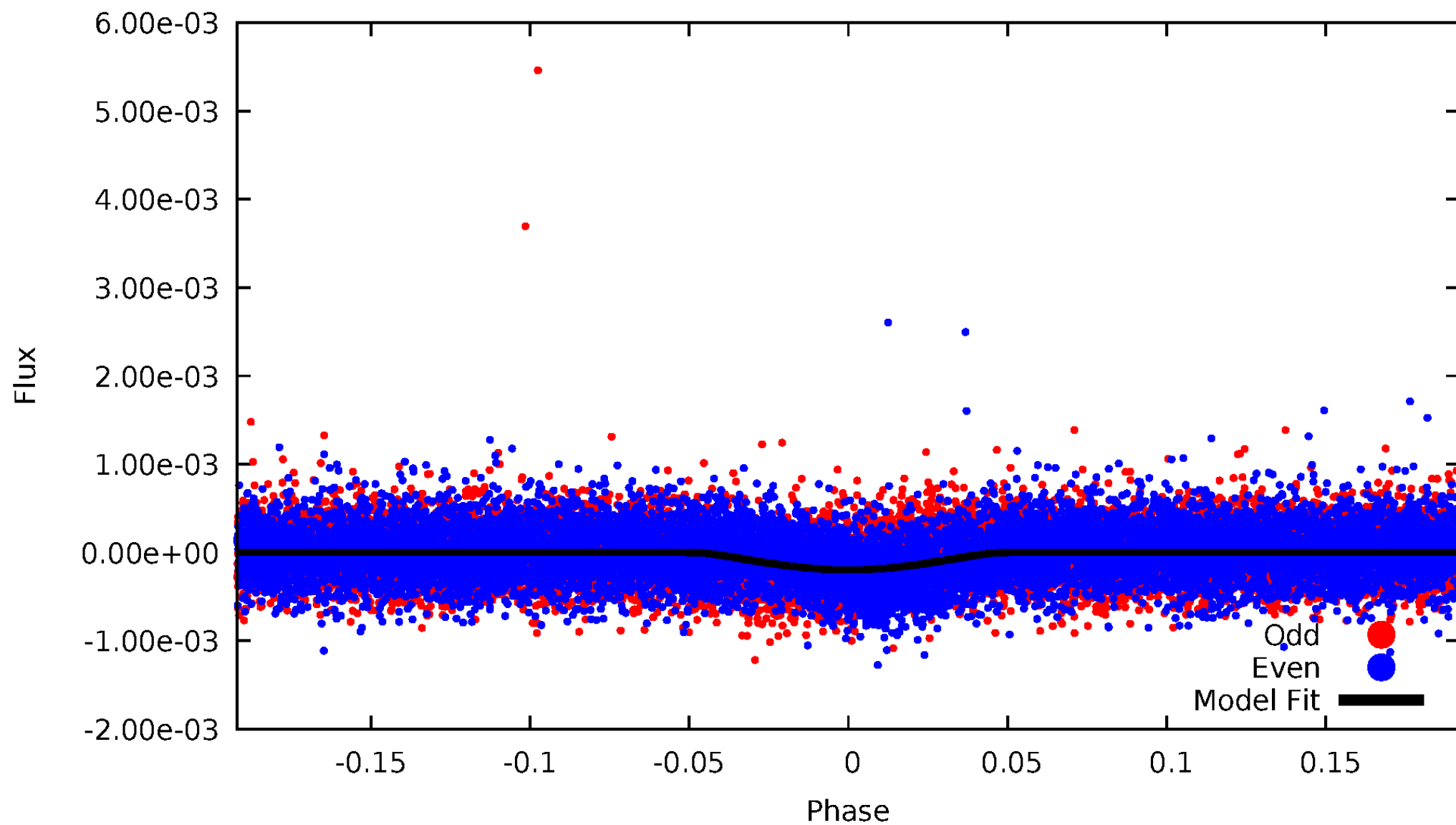
TCE 009412445-01





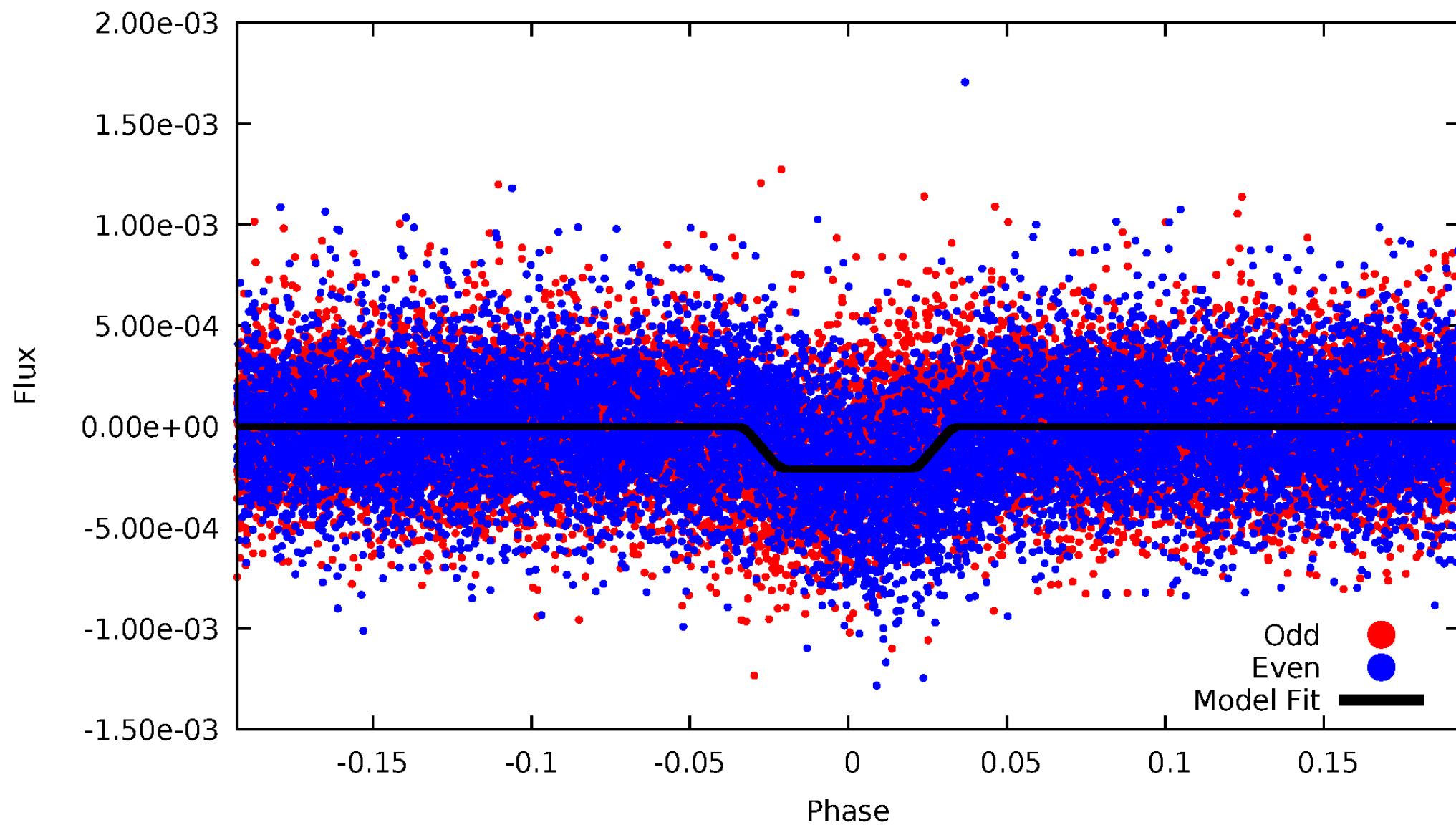
# DV Odd/Even

TCE 009412445-01

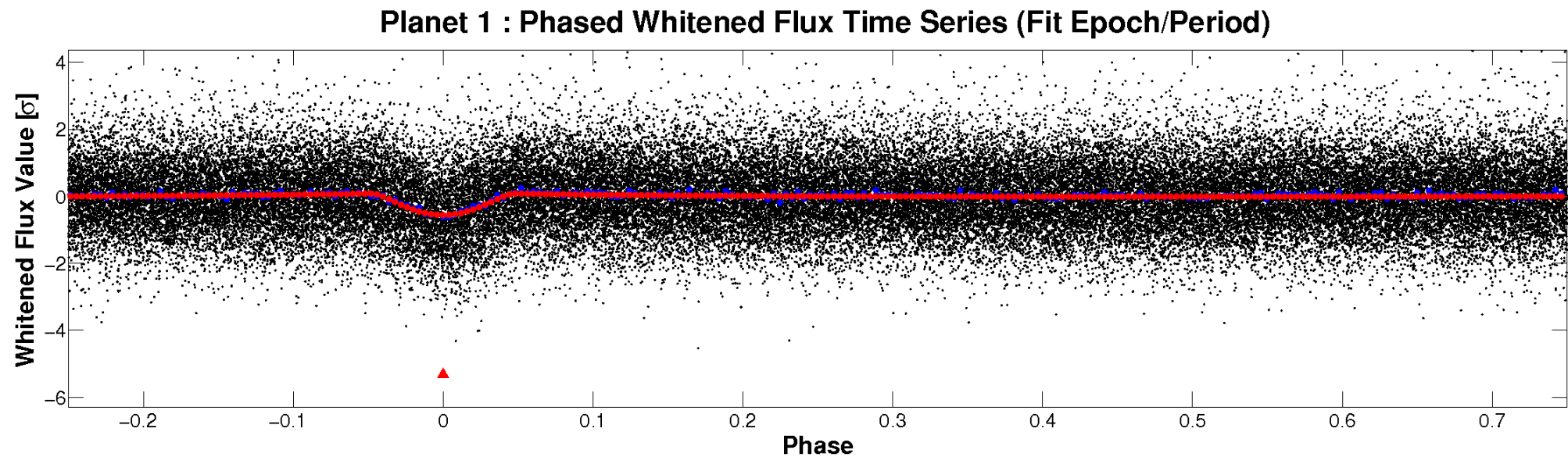
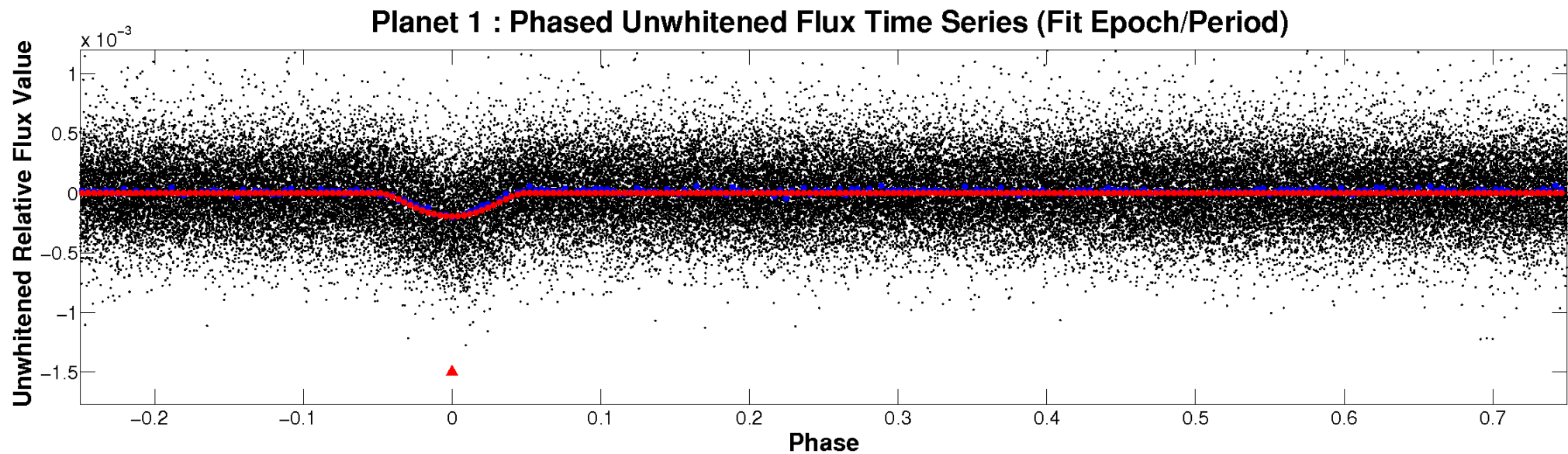


# ALT Odd/Even

TCE 009412445-01

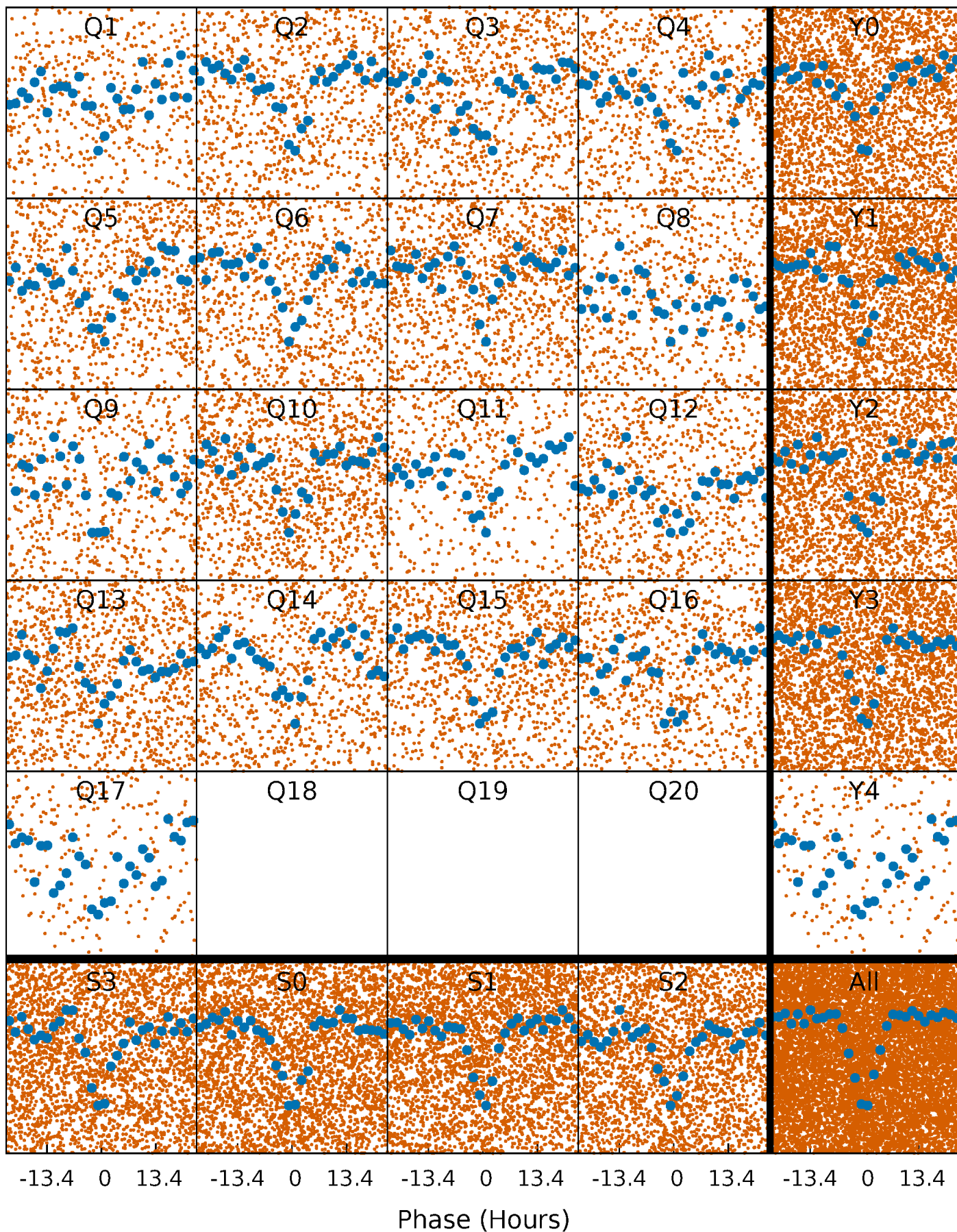


# Non-Whitened Vs. Whitened Light Curve



# PDC Quarter-Phased Transit Curves

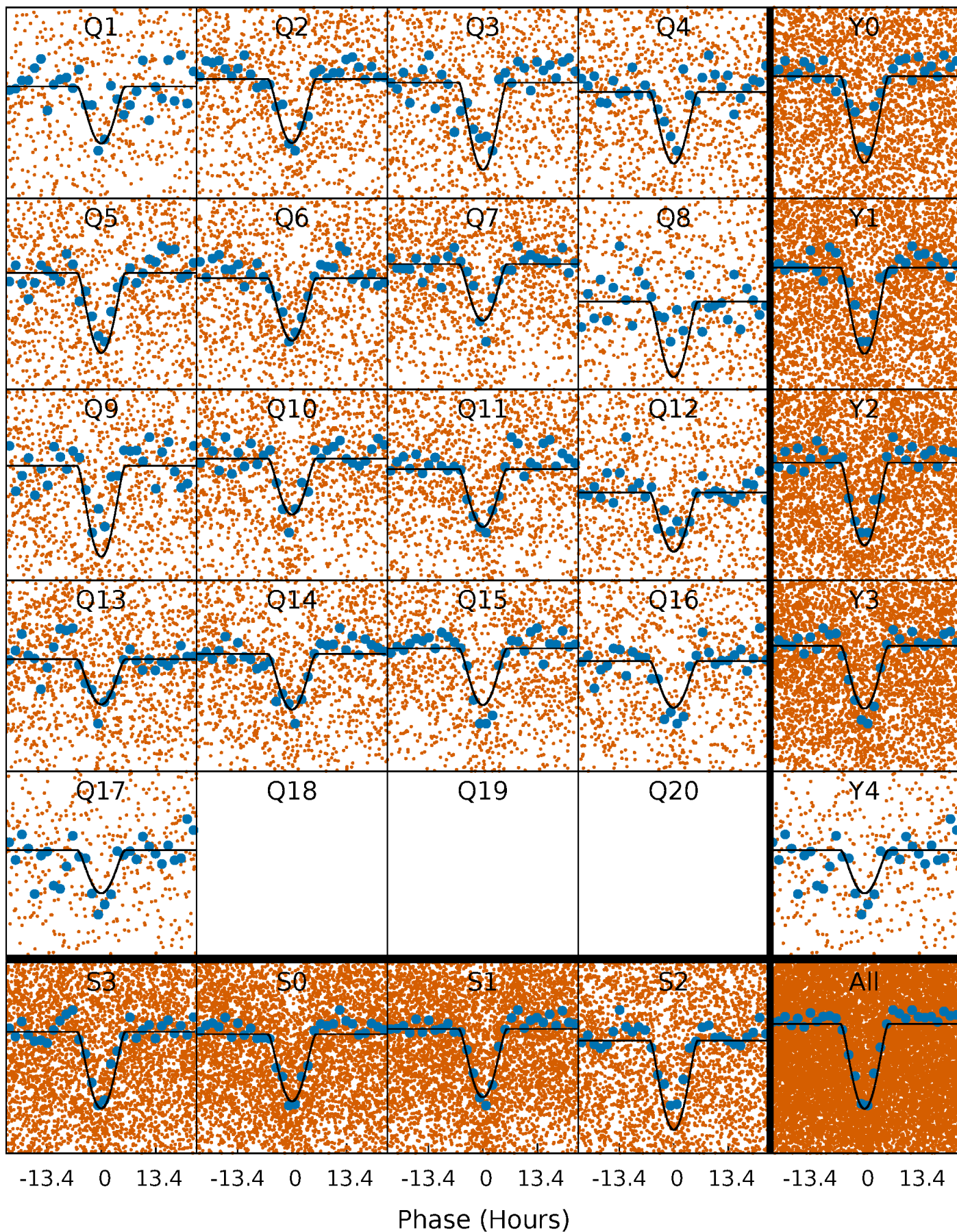
TCE 009412445-01   P= 5.093267 Days    $T_0=132.472409$  (BKJD)





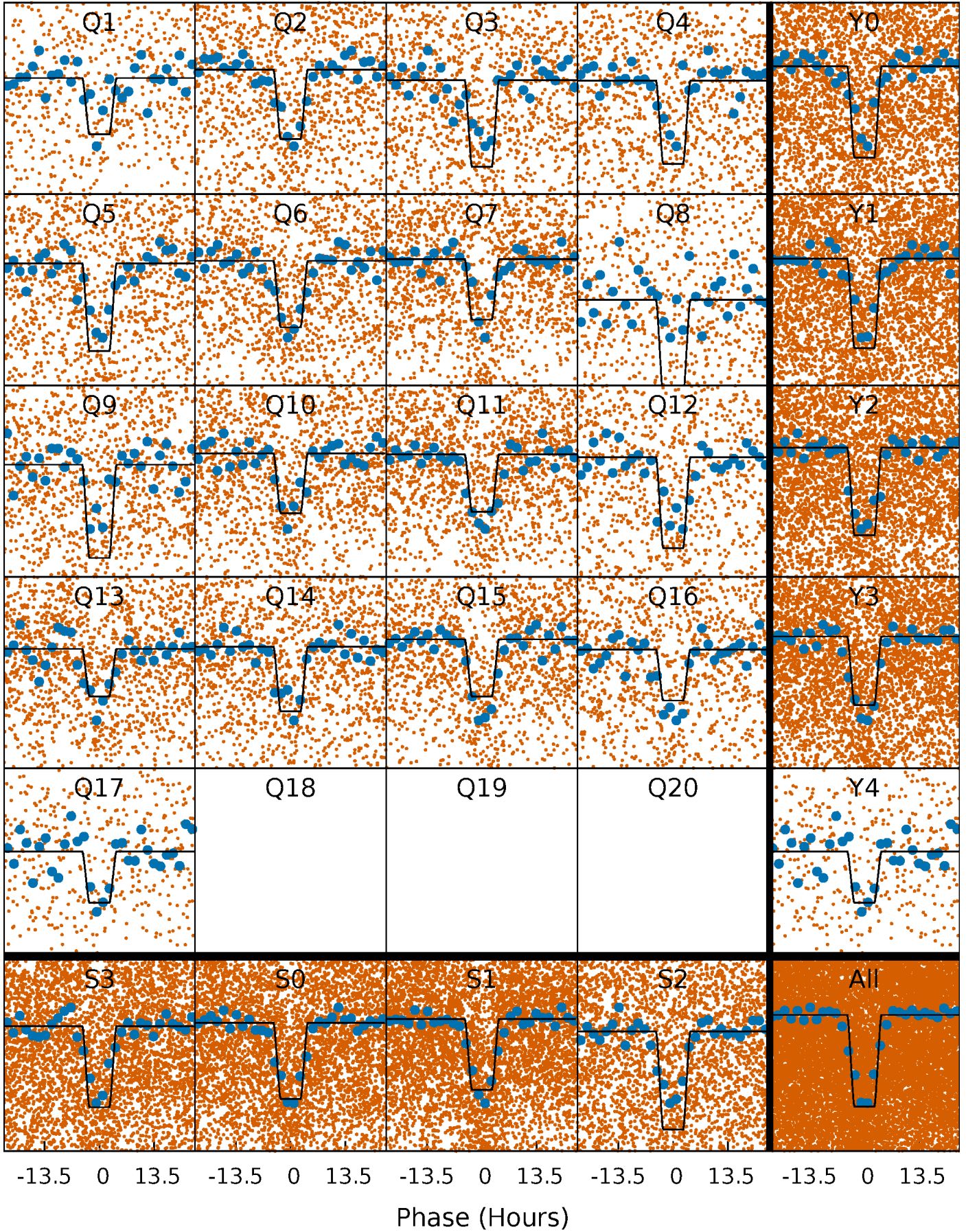
# DV Quarter-Phased Transit Curves

TCE 009412445-01   P= 5.093267 Days    $T_0=132.472409$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 009412445-01 P= 5.093262 Days  $T_0=132.475235$  (BKJD)

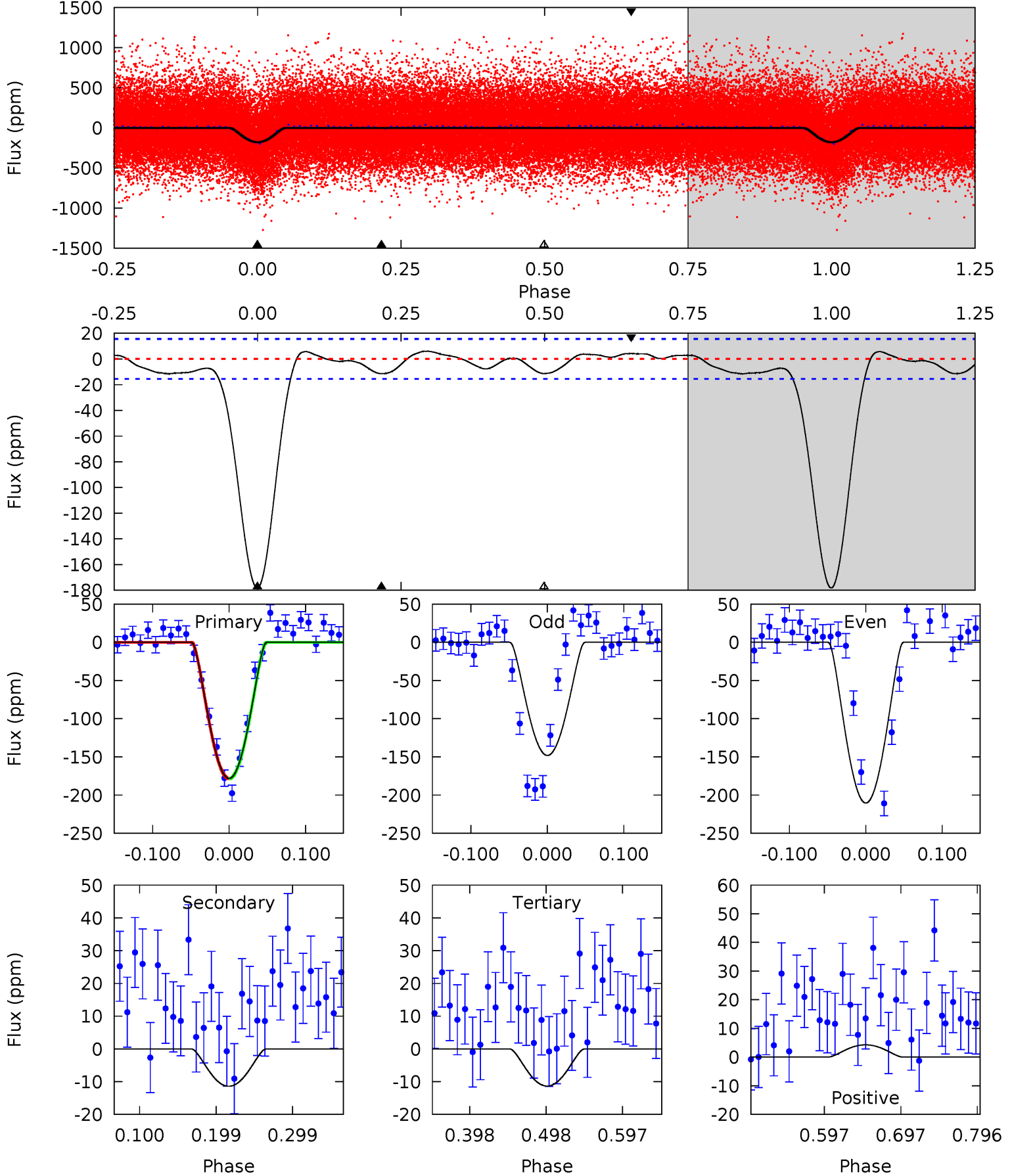




# DV Model-Shift Uniqueness Test

009412445-01, P = 5.093267 Days, E = 127.379142 Days

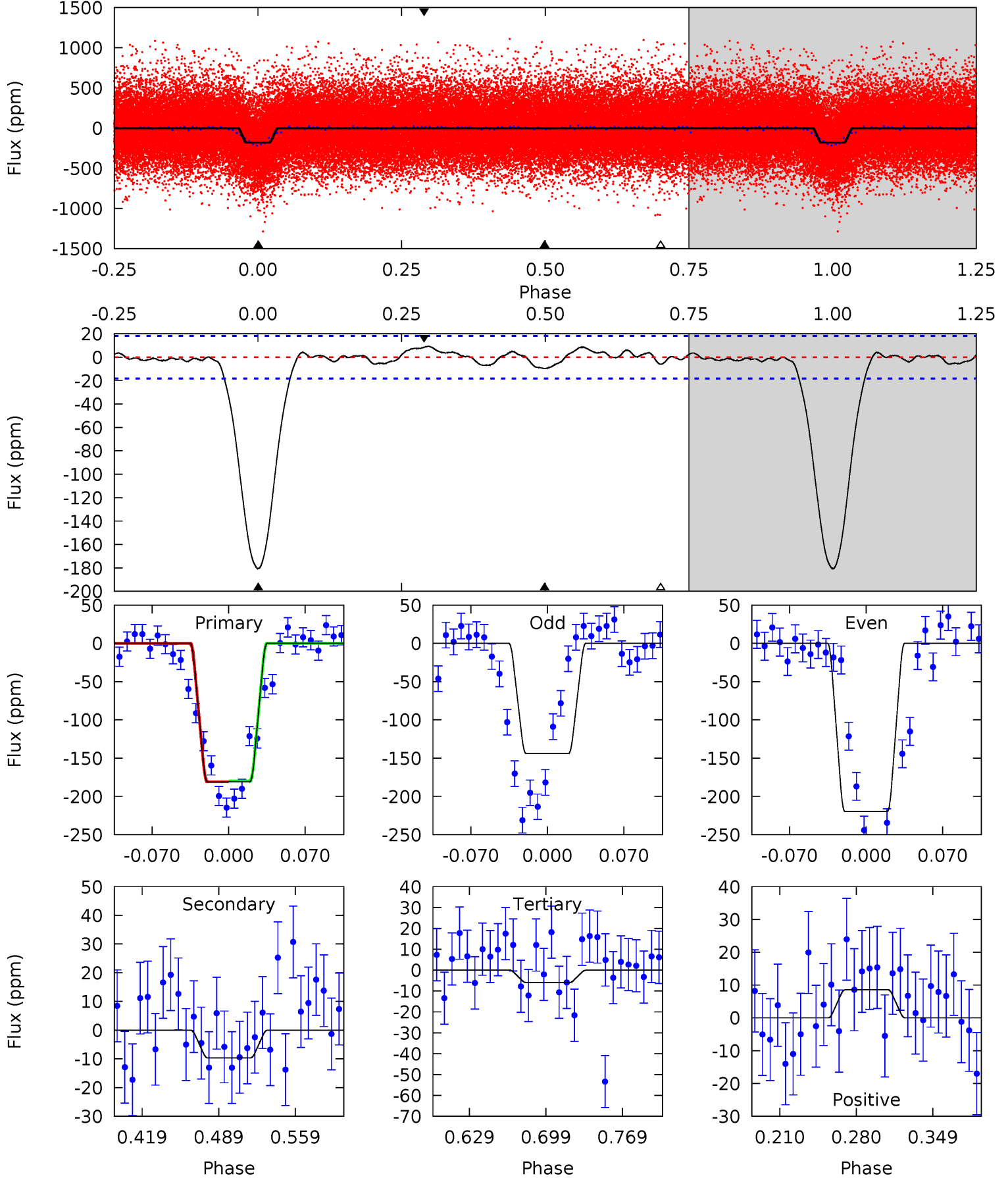
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
52.2	3.34	3.33	1.25	4.57	1.65	1.58	48.9	50.9	0.02	2.09	9.14	1.05	0.03	0.03



# Alt Model-Shift Uniqueness Test

009412445-01, P = 5.093262 Days, E = 127.381973 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
45.9	2.46	1.53	2.18	4.64	1.81	0.93	44.4	43.8	0.93	0.28	9.61	1.03	0.05	0.14





### Stellar Parameters For KIC 009412445

	$T_{\text{eff}}(K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$3995^{+53}_{-59}$	$4.694^{+0.026}_{-0.014}$	$-0.200^{+0.100}_{-0.100}$	$0.555^{+0.019}_{-0.025}$	$0.556^{+0.025}_{-0.021}$	$4.584^{+0.535}_{-0.286}$
	+1%/-1%	+1%/-0%	+50%/-50%	+3%/-5%	+4%/-4%	+12%/-6%
Source	PHO2	PHO2	PHO2	DSEP		

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

### Secondary Eclipse Parameters for KIC 009412445-01 / KOI 3970.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-11 \pm 3$	$2.10^{+1.54}_{-1.30}$	$839^{+12}_{-14}$	$2083^{+586}_{-285}$	$3.090^{+19.937}_{-2.162}$
Alt.	$-10 \pm 4$	$1.53^{+1.52}_{-1.05}$	$839^{+13}_{-15}$	$2212^{+753}_{-367}$	$5.057^{+46.160}_{-3.949}$

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

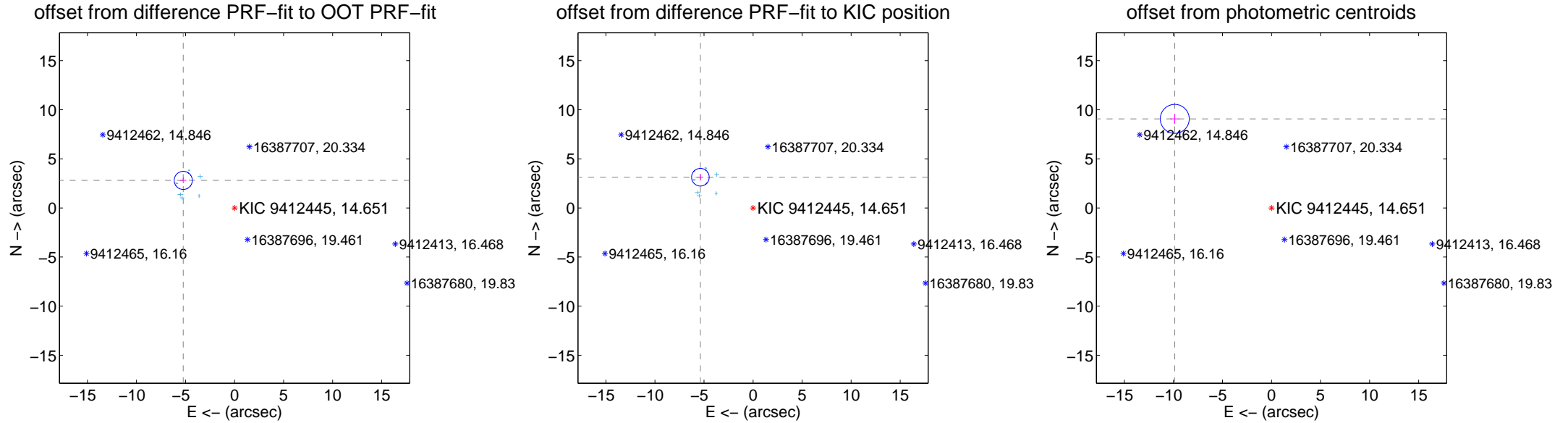
## DV Centroid Data

Supplemental centroid analysis for 009412445-01. Kepler magnitude: 14.65. Transit SNR 28.03

There are 9 quarters with good PRF difference image offsets

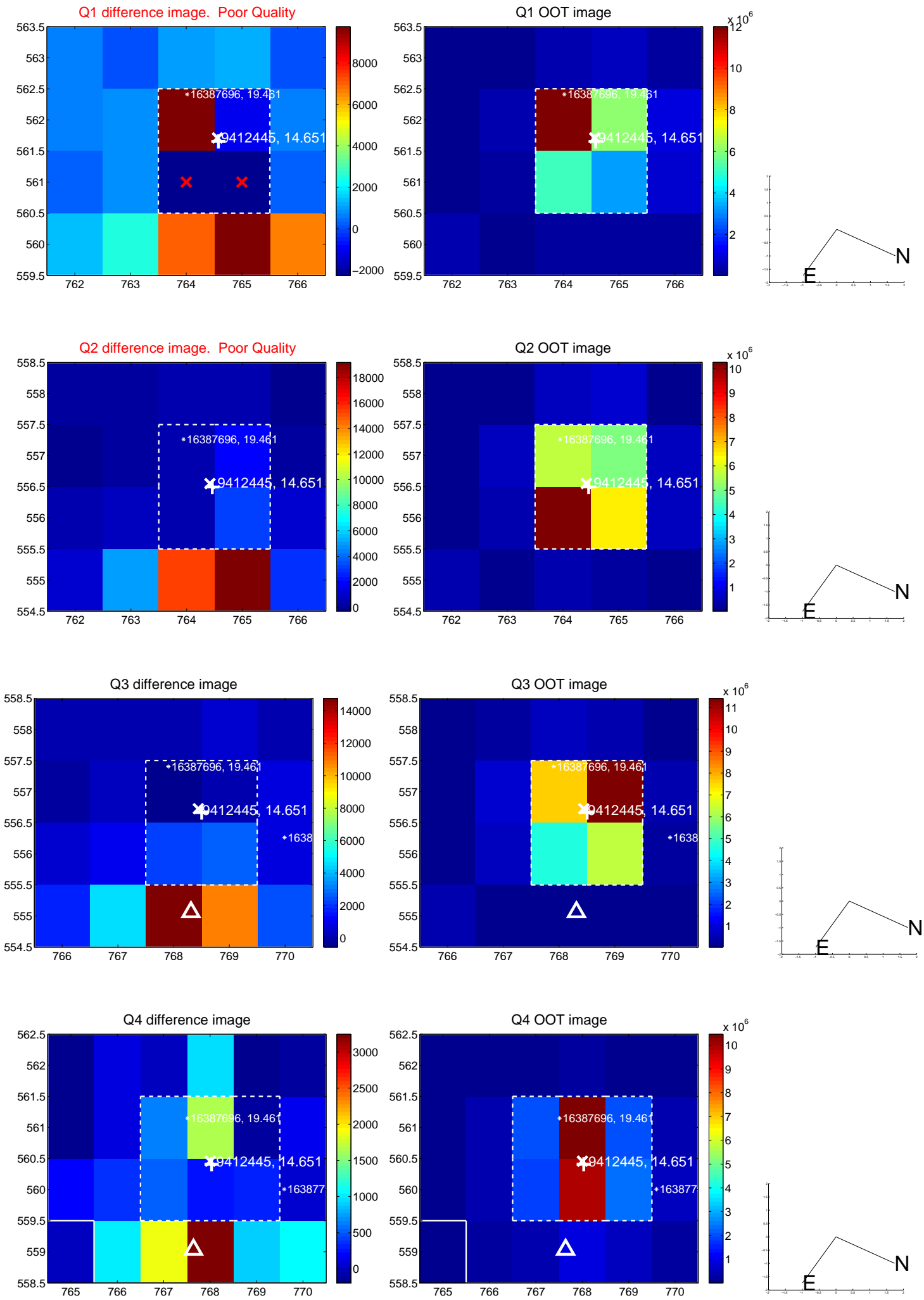
The direct PRF centroid is offset from the target star catalog position by about 0.29 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	<b><math>5.936 \pm 0.307</math></b>	<b>19.31</b>	$5.230 \pm 0.313$	$2.806 \pm 0.287$
PRF-fit source offset from KIC position	<b><math>6.214 \pm 0.299</math></b>	<b>20.75</b>	$5.368 \pm 0.301$	$3.129 \pm 0.336$
photometric centroid source offset	<b><math>13.40 \pm 0.49</math></b>	<b>27.24</b>	$9.86 \pm 0.47$	$9.07 \pm 0.51$

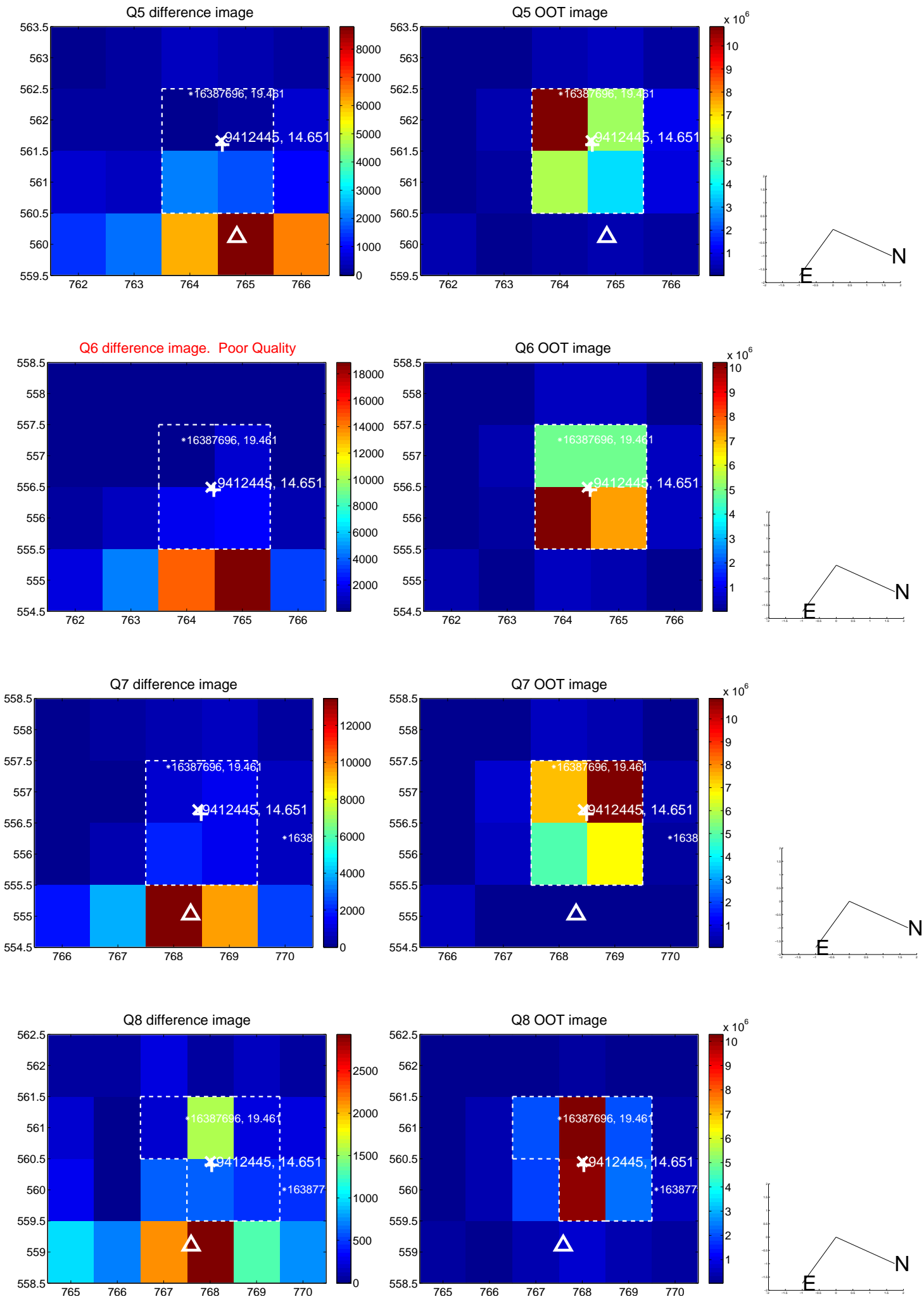


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

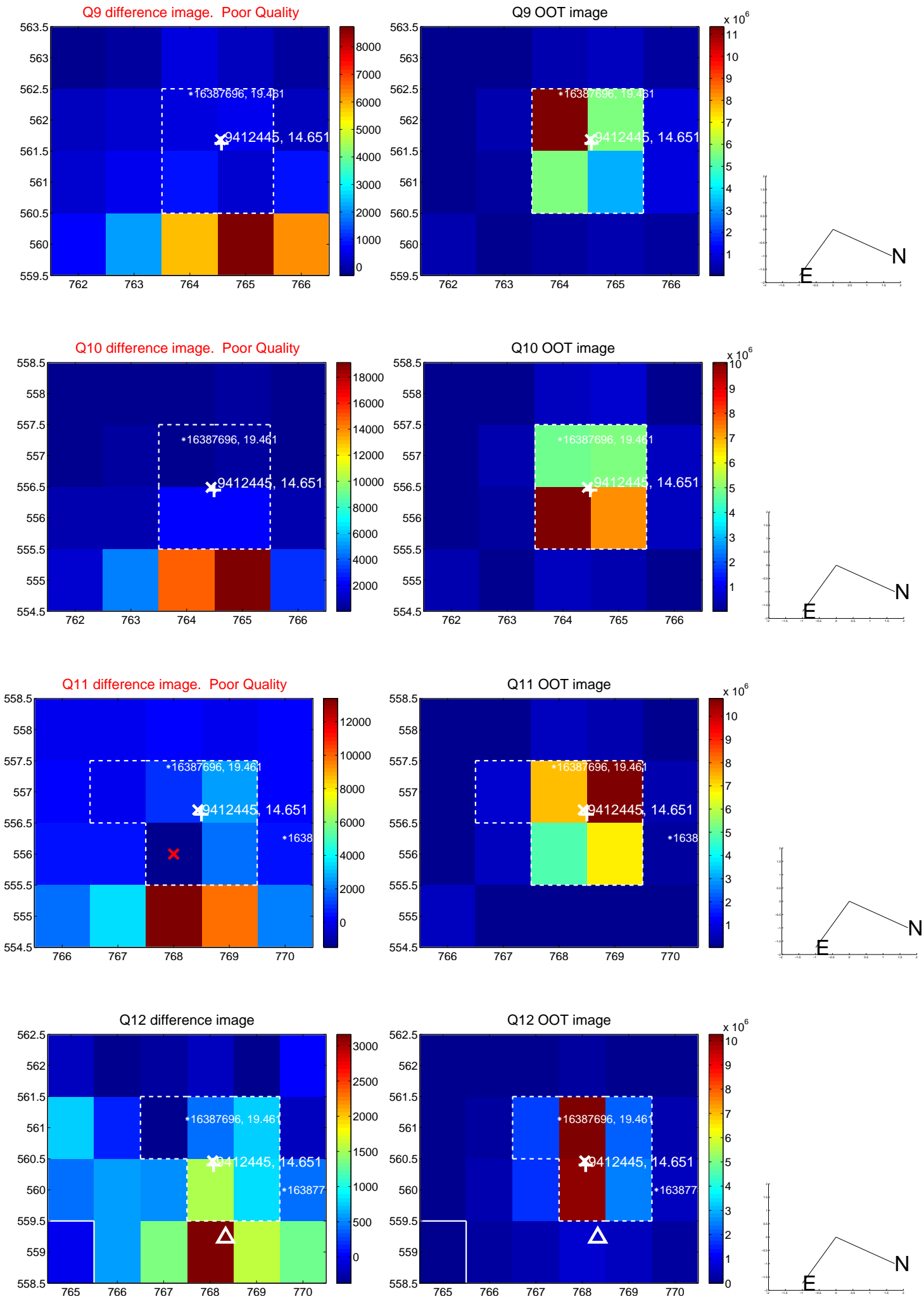


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

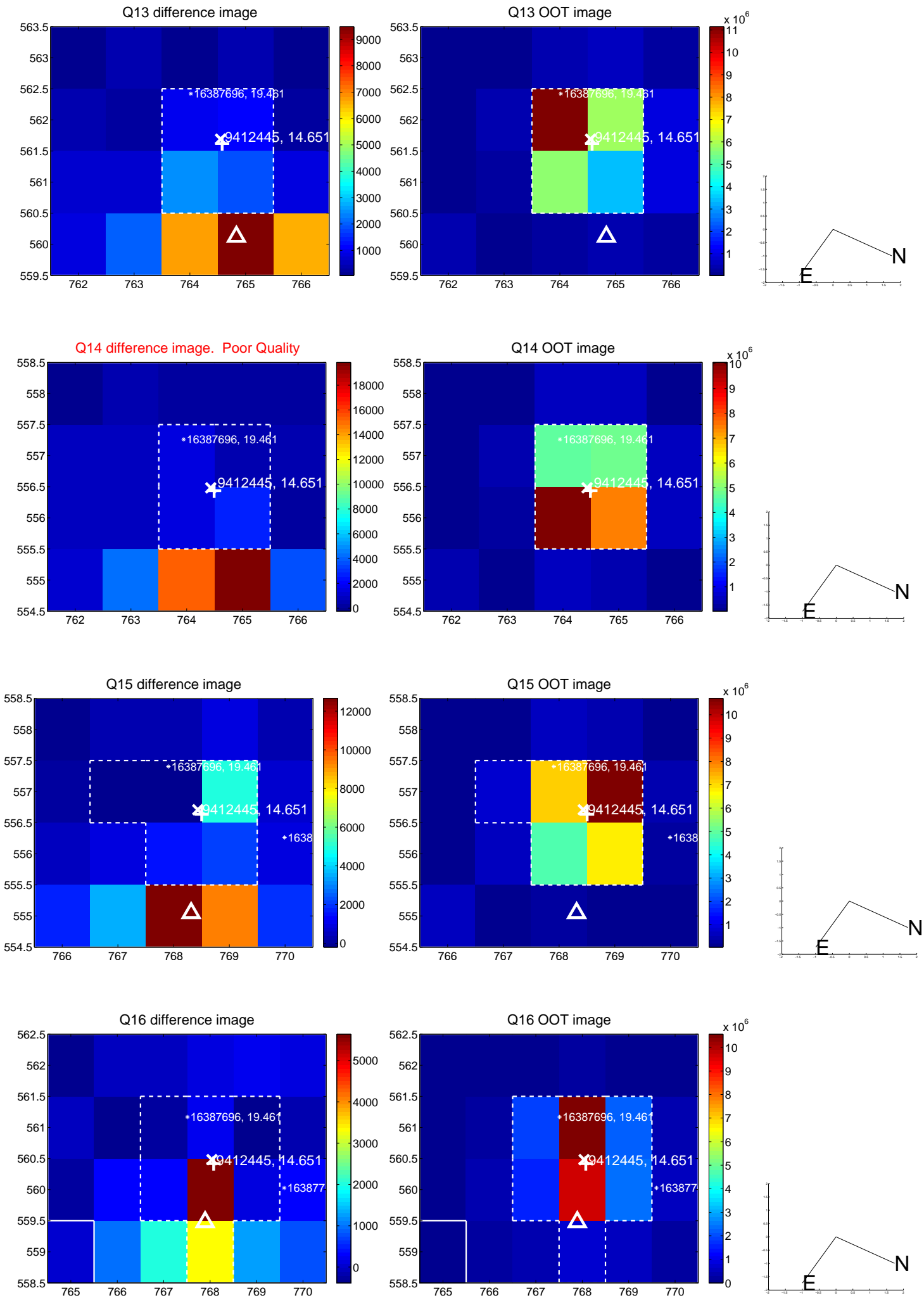




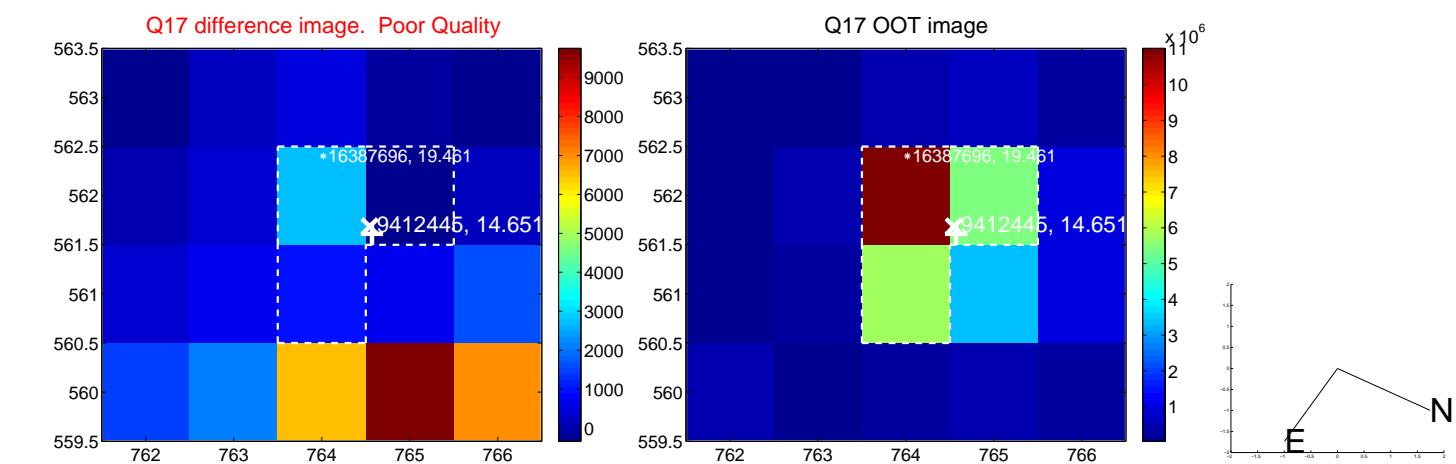
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



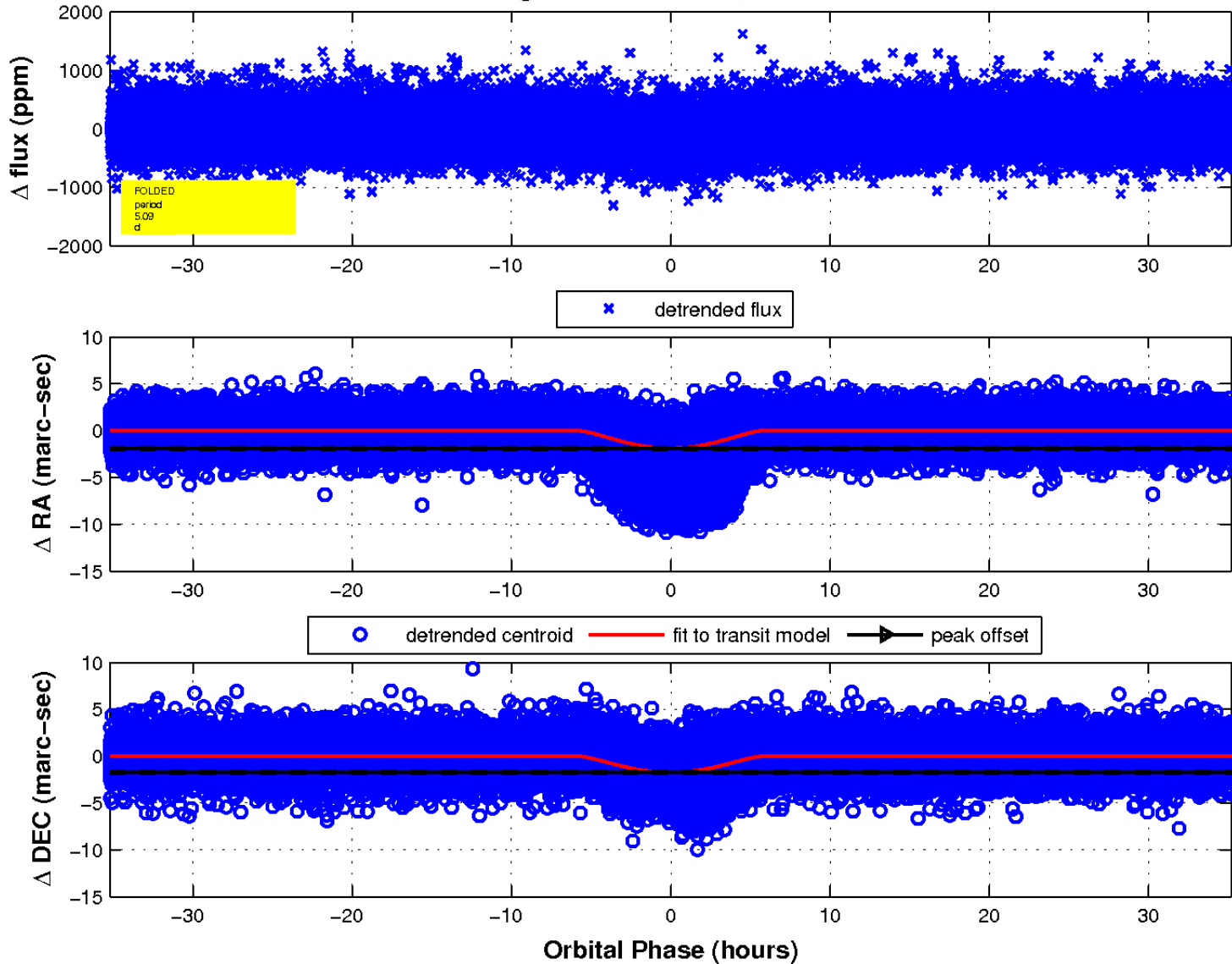
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



fluxWeightedCentroids, Planet 1 of 1



UKIRT Image

Declination

