

# KIC 009306900

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009306900-01	OBS	No	2.486580	133.978601	32.9	6.895	8.2	7.8	4.00	5945	2.71	10424.90
009306900-02	OBS	No	566.686043	364.044312	370.1	4.149	7.4	8.0	4.00	5945	9.05	7.49

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009306900-01	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT
009306900-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—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.

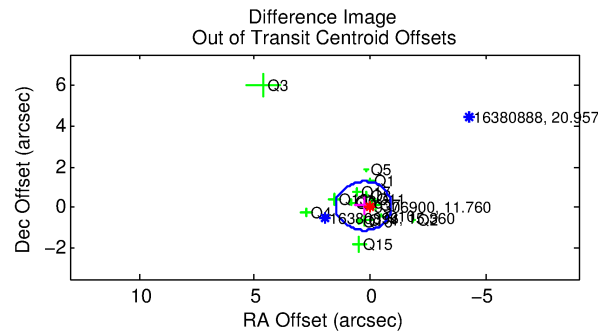
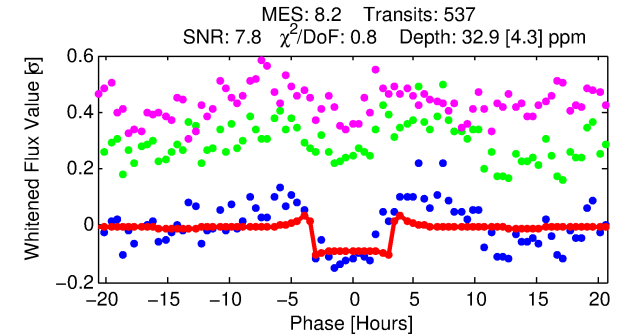
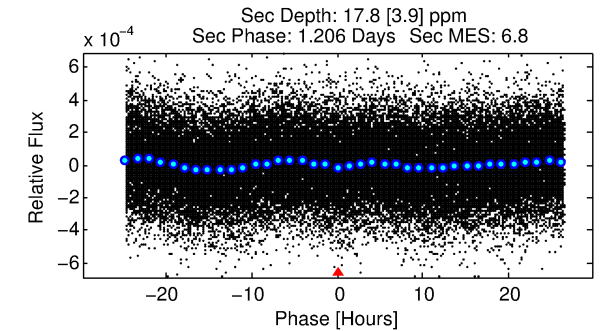
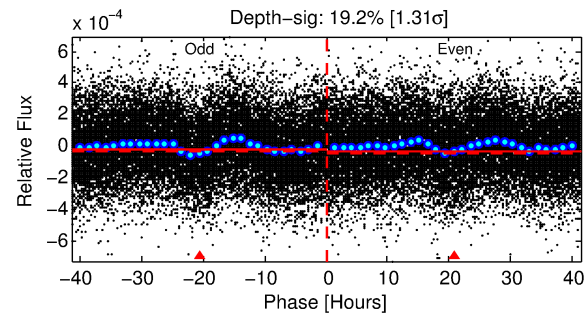
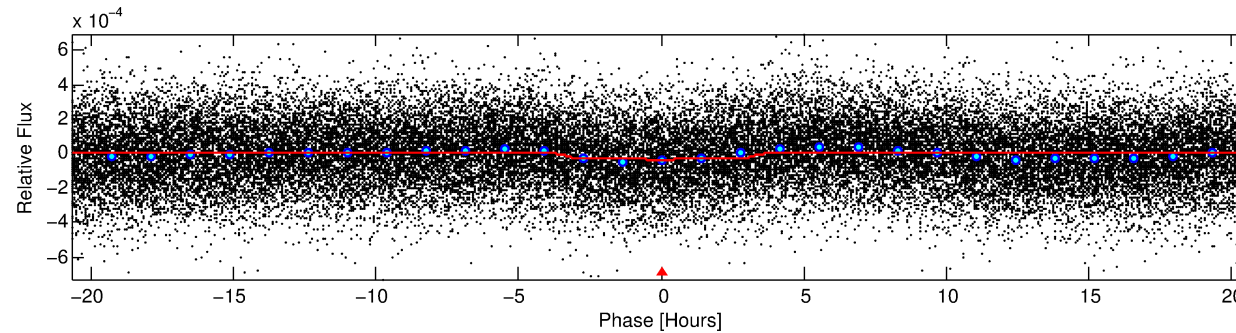
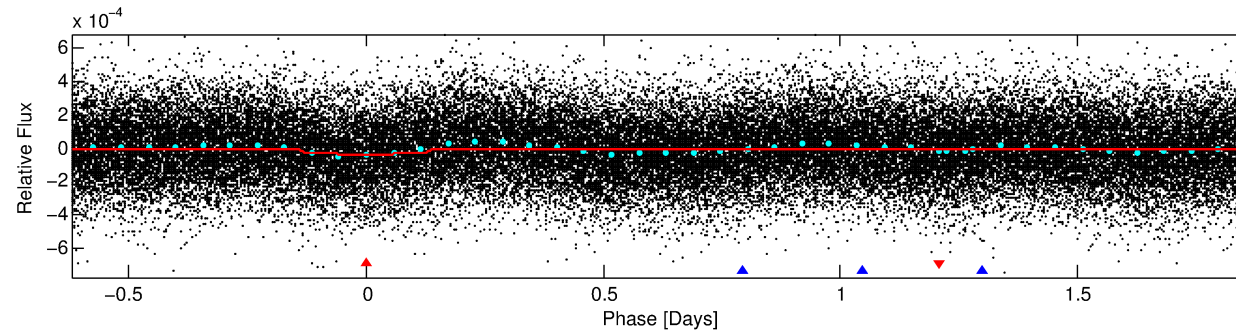
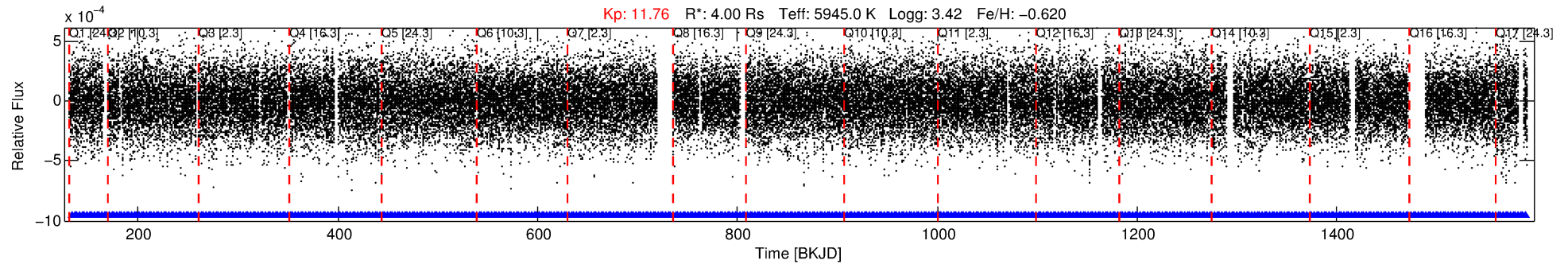
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009306900-01

No Significant Match Found

# DV One-Page Summary

KIC: 9306900 Candidate: 1 of 2 Period: 2.487 d



## DV Fit Results:

Period = 2.48658 [0.00002] d  
Epoch = 133.9786 [0.0045] BKJD  
Rp/R\* = 0.0062 [0.0013]  
a/R\* = 1.52 [0.91]  
b = 0.91 [0.20]  
Seff = 10424.90 [6361.23]  
Teq = 2577 [393] K  
Rp = 2.71 [1.27] Re  
a = 0.0414 [0.0160] AU  
Ag = 2.29 [1.73] [0.75 $\sigma$ ]  
Teffp = 4900 [585] K [3.30 $\sigma$ ]

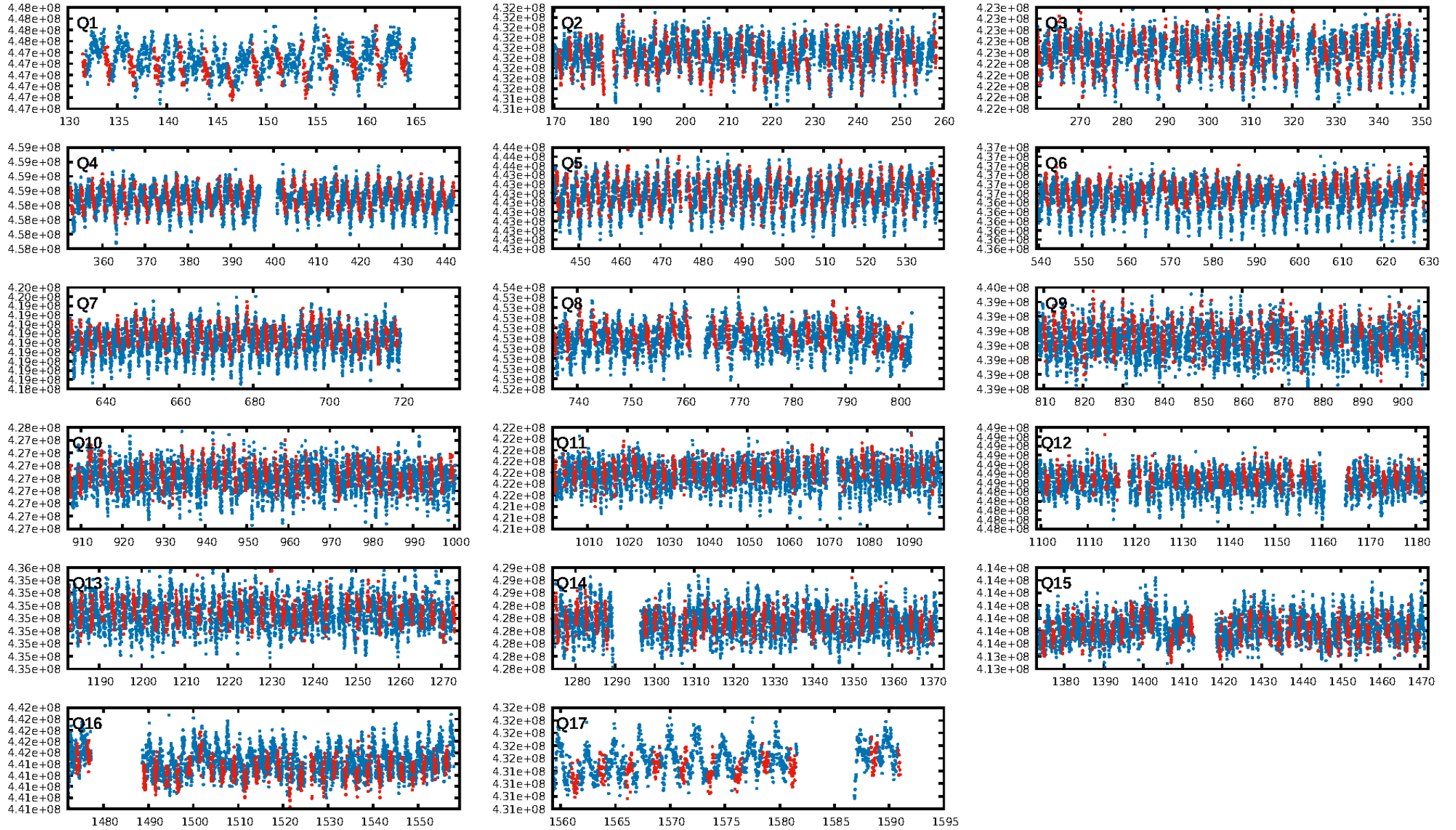
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [1682.72 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
**Bootstrap-pfa: 7.48e-11**  
RollingBand-fgt: 1.00 [512/512]  
GhostDiagnostic-chr: 1.35  
Centroid-sig: 26.1%  
Centroid-so: 0.508 arcsec [0.96 $\sigma$ ]  
OotOffset-rm: 0.304 arcsec [0.76 $\sigma$ ]  
OotOffset-st: 4/4/3/5 [16]  
KicOffset-rm: 0.273 arcsec [0.57 $\sigma$ ]  
KicOffset-st: 4/4/3/5 [16]  
DiffImageQuality-fgm: 0.69 [11/16]  
DiffImageOverlap-fno: 1.00 [17/17]

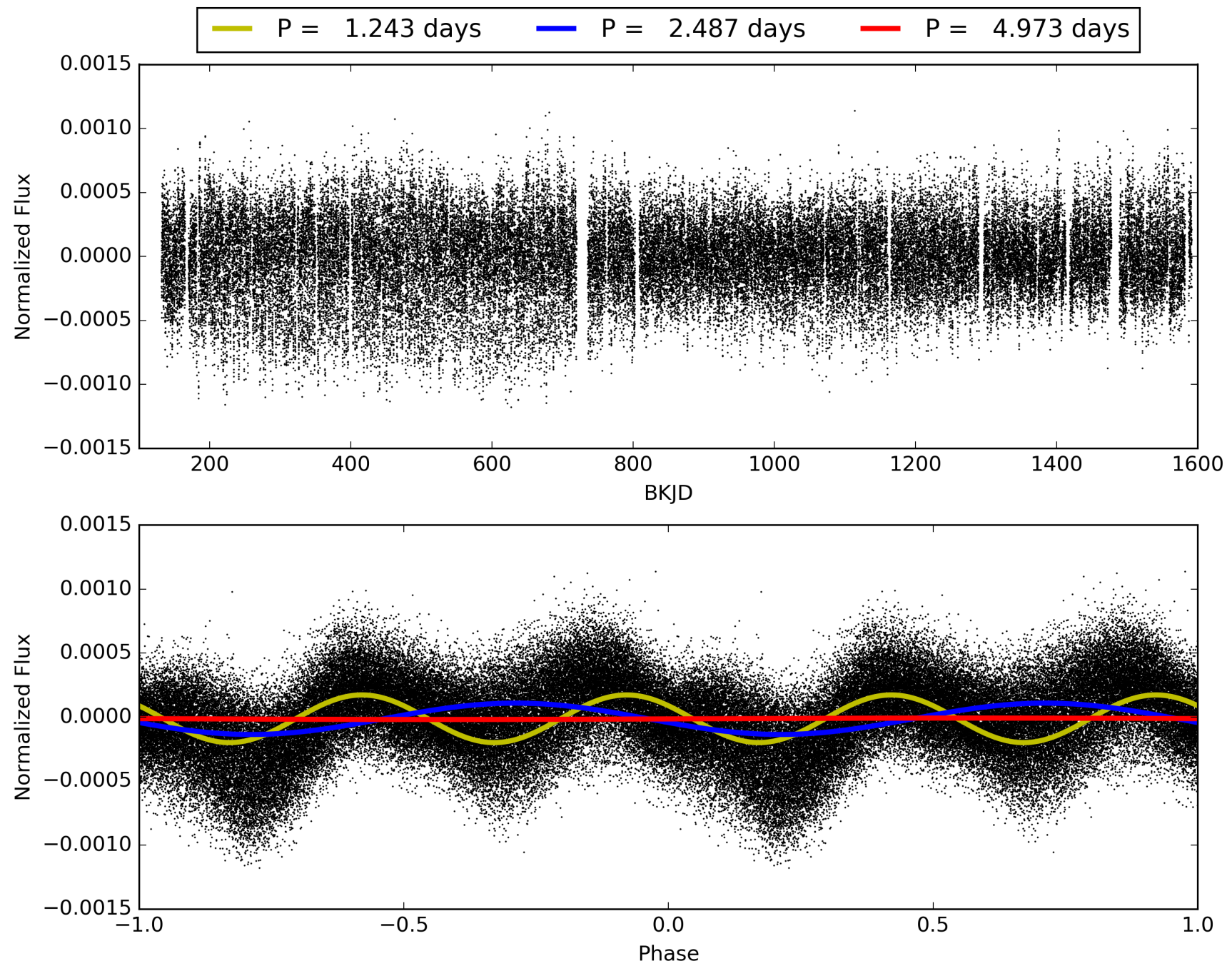
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 10:30:10 Z

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

# TCE 009306900-01, PDC Light Curves

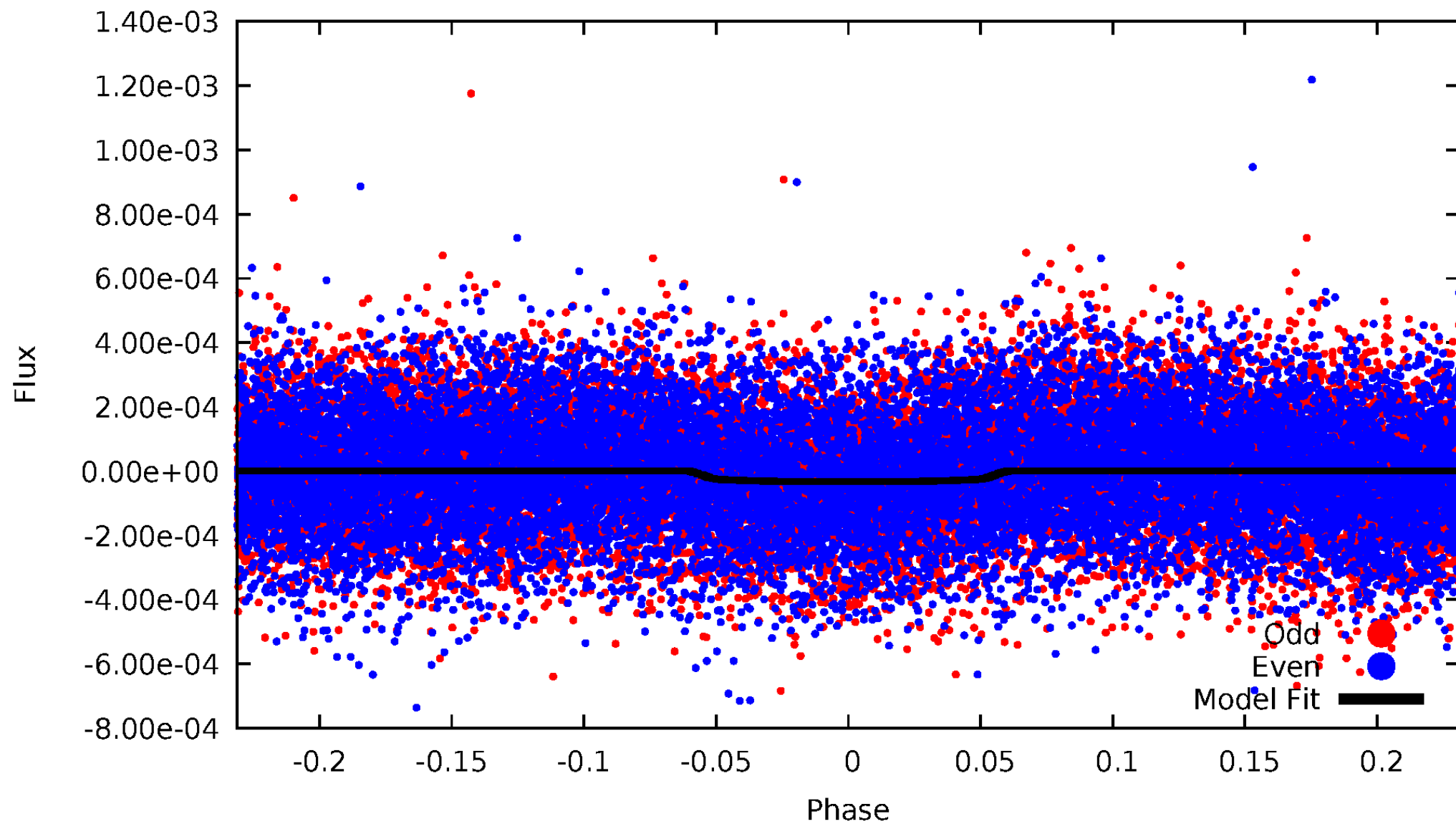


TCE 009306900-01



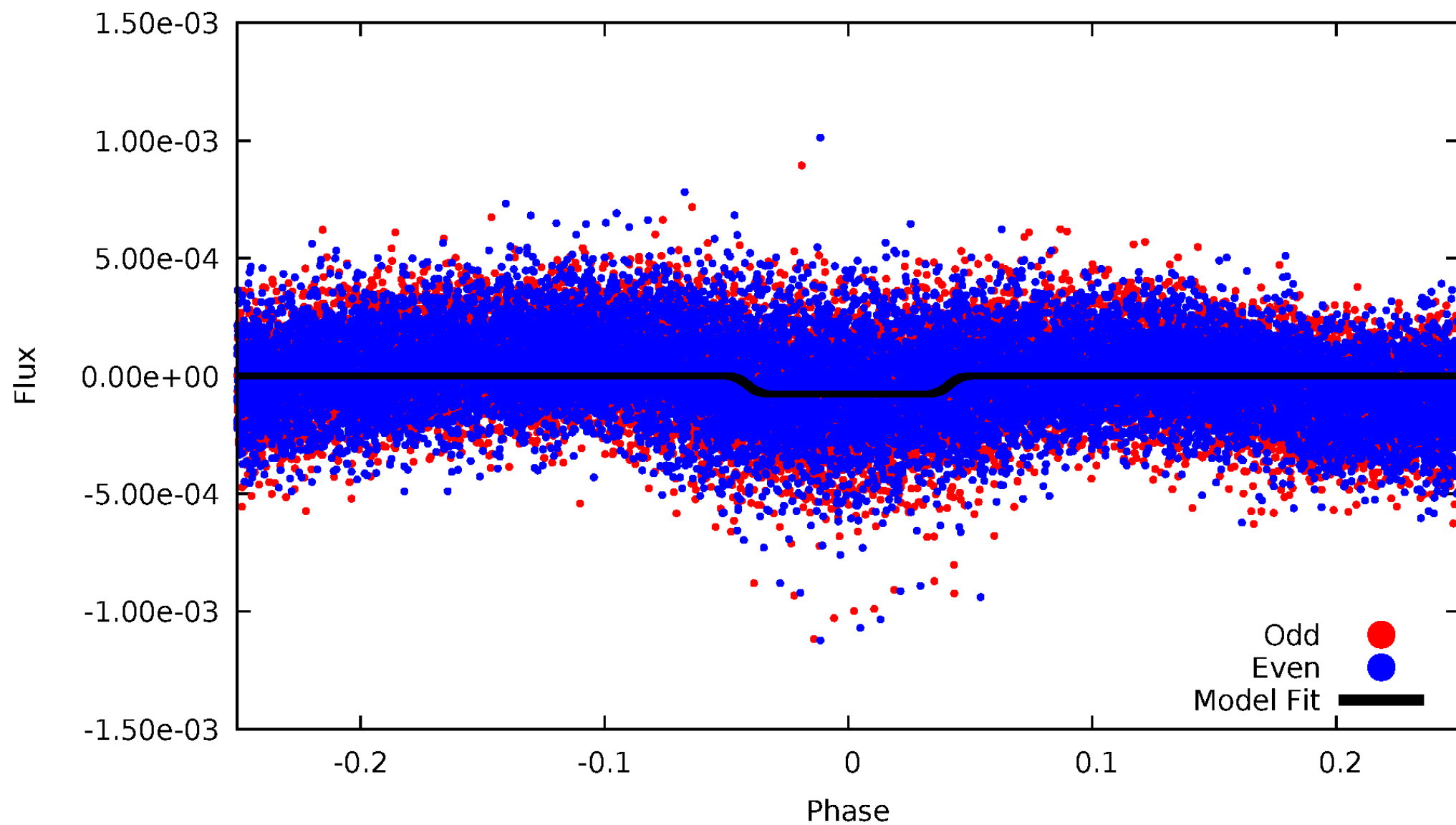
# DV Odd/Even

TCE 009306900-01

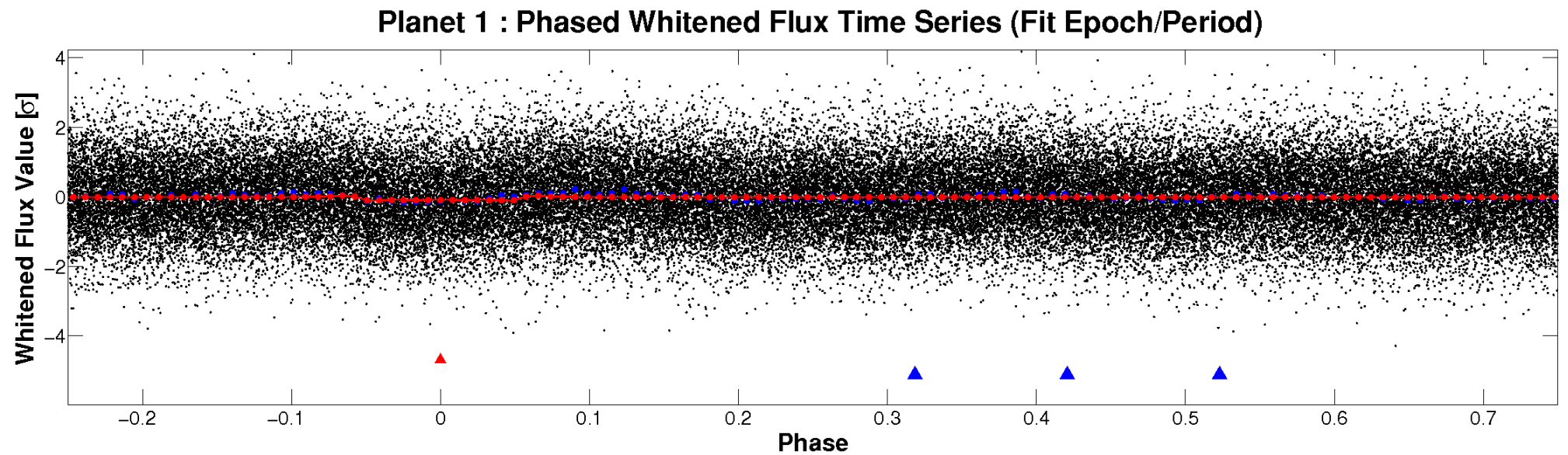
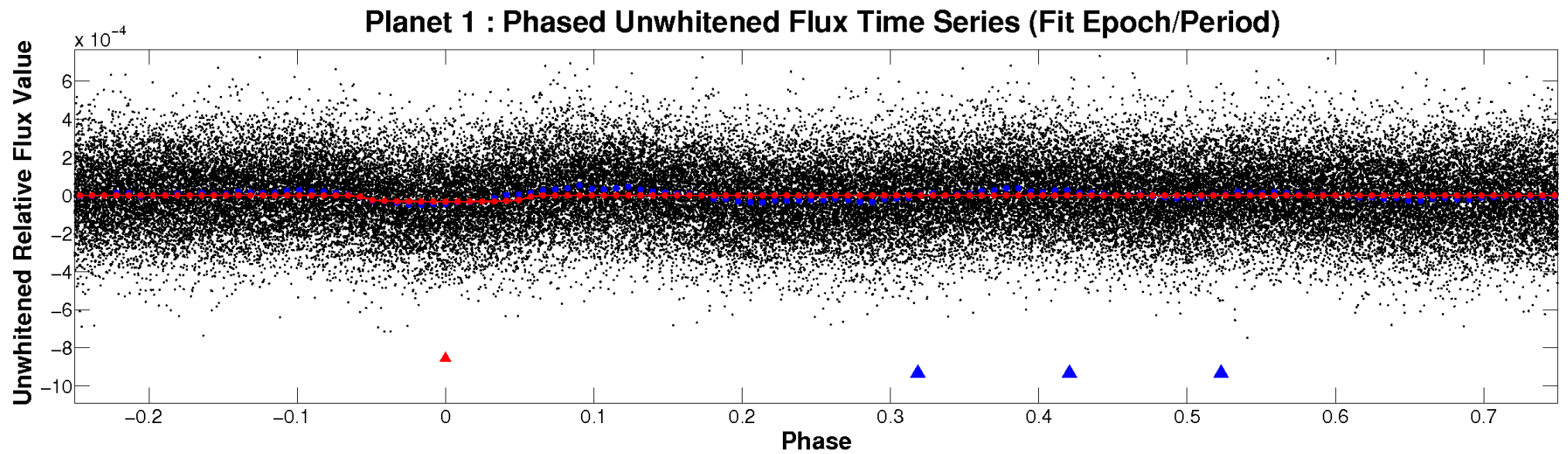


# ALT Odd/Even

TCE 009306900-01

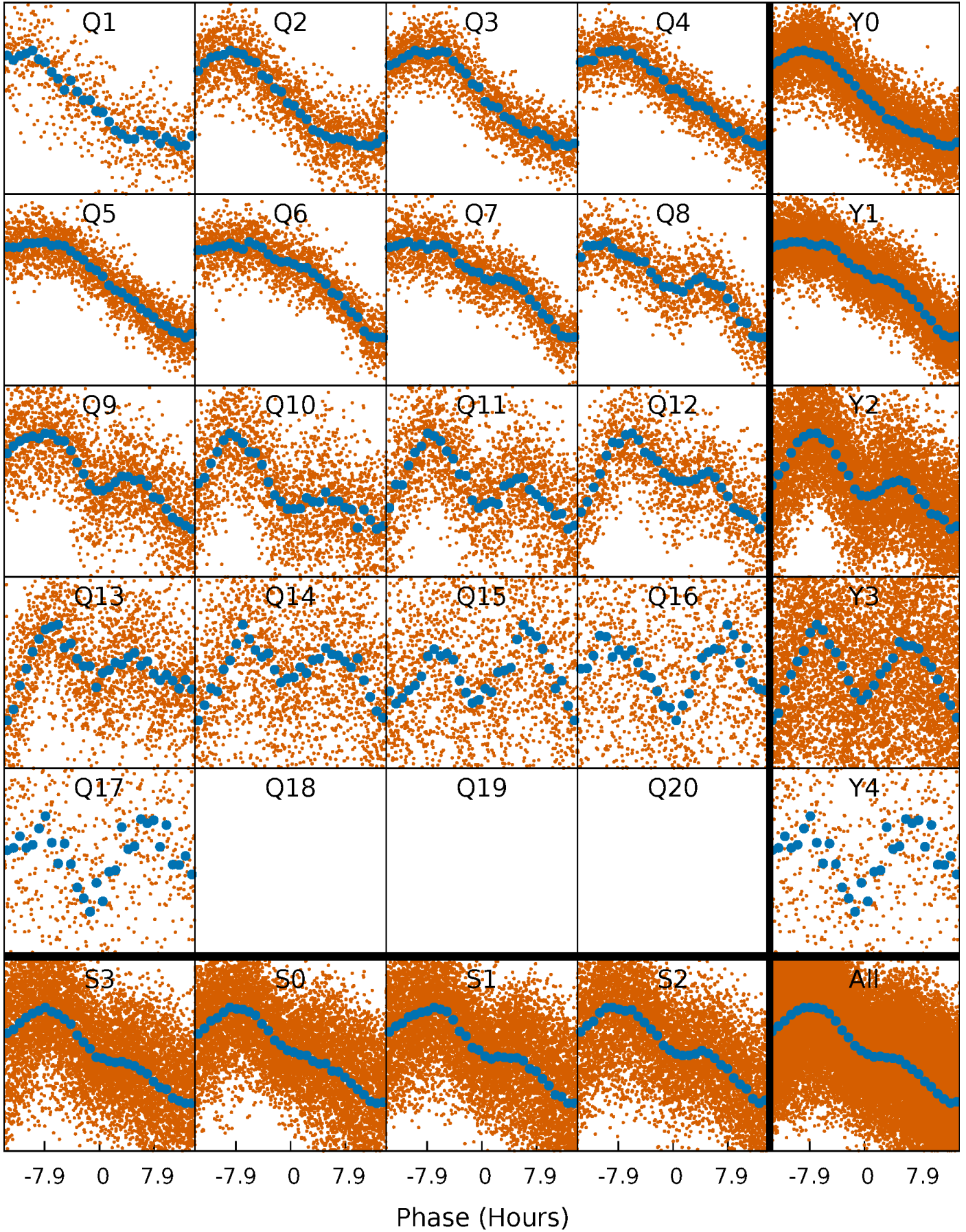


# Non-Whitened Vs. Whitened Light Curve



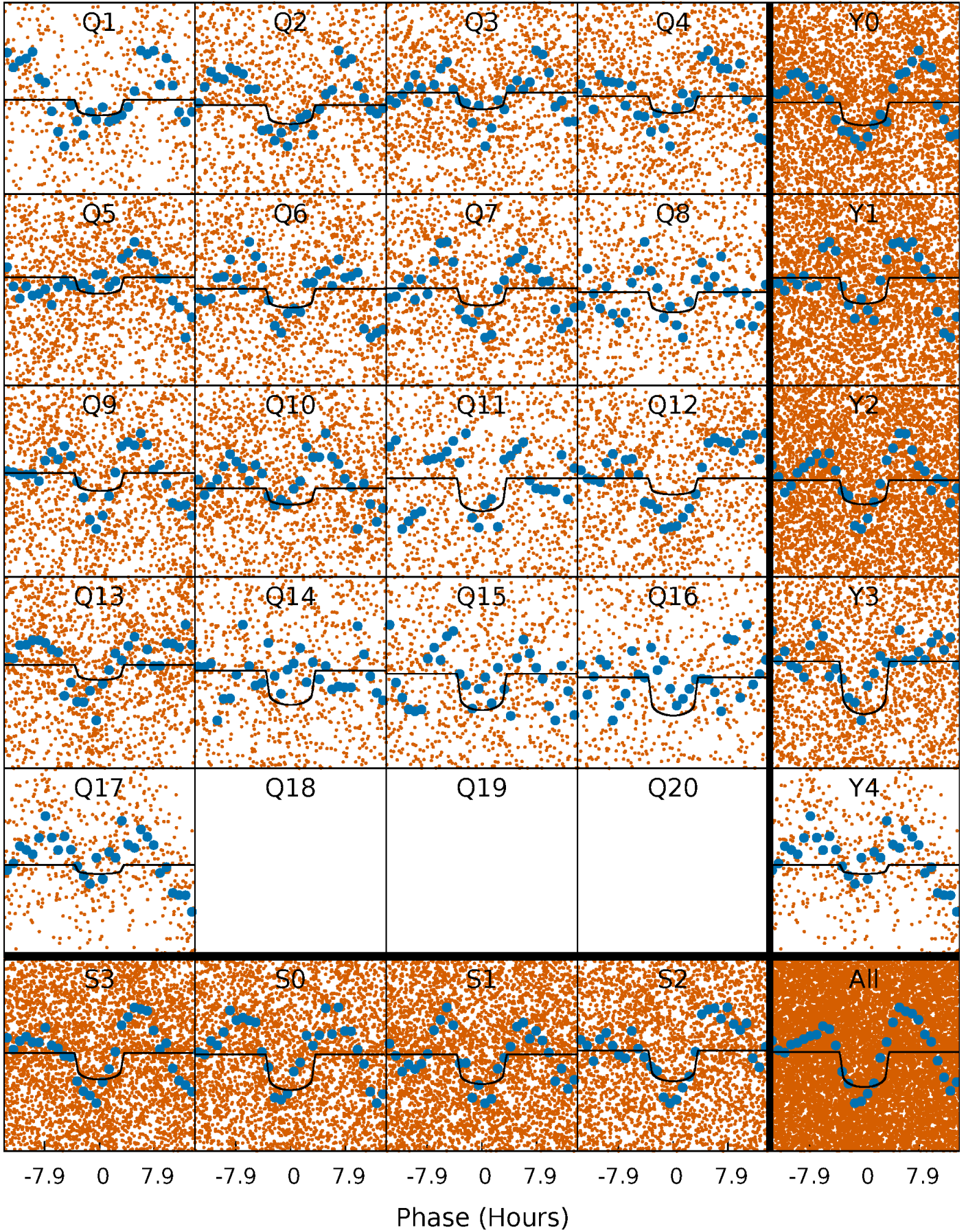
# PDC Quarter-Phased Transit Curves

TCE 009306900-01   P= 2.486580 Days    $T_0=133.978601$  (BKJD)



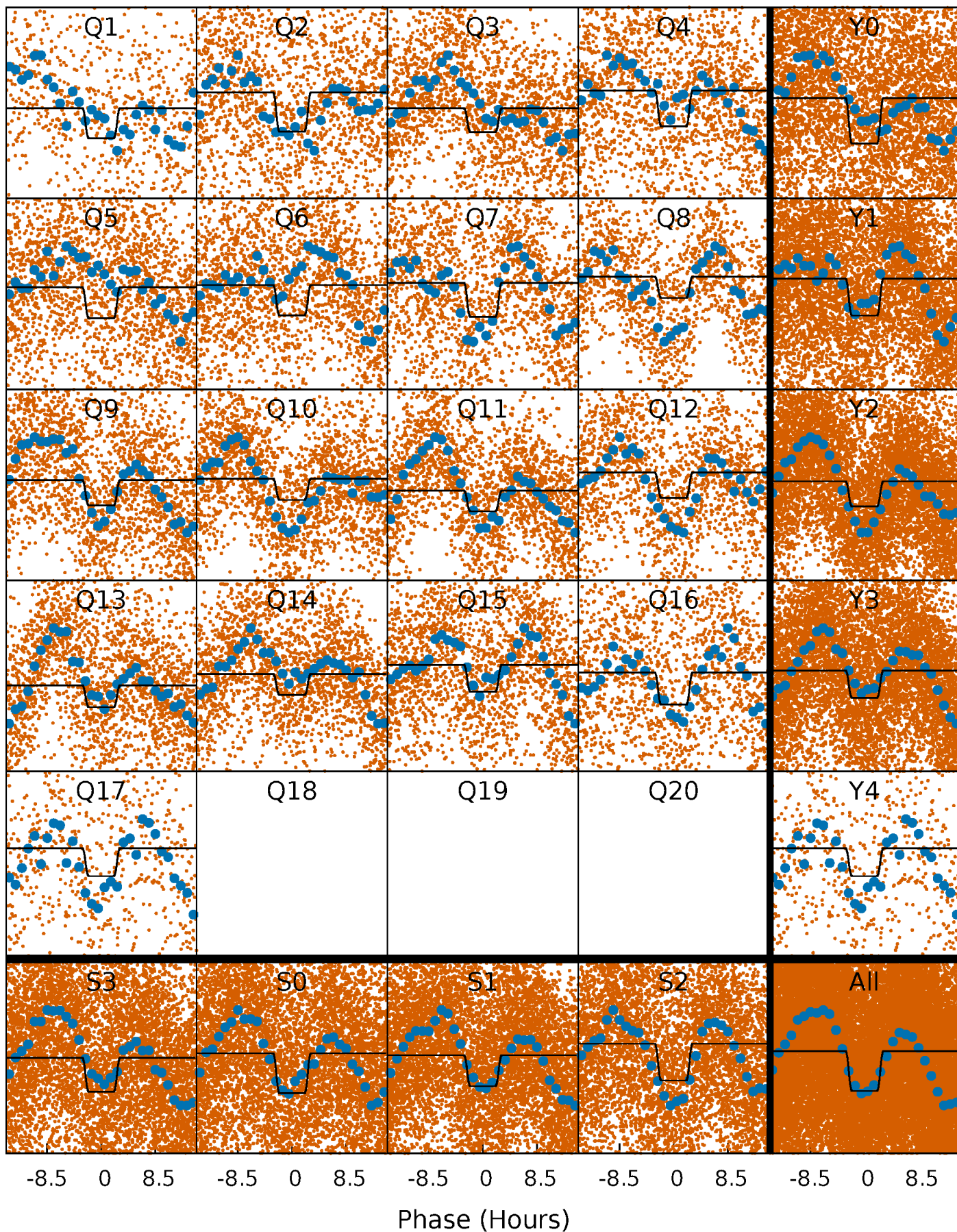
# DV Quarter-Phased Transit Curves

TCE 009306900-01 P= 2.486580 Days  $T_0=133.978601$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

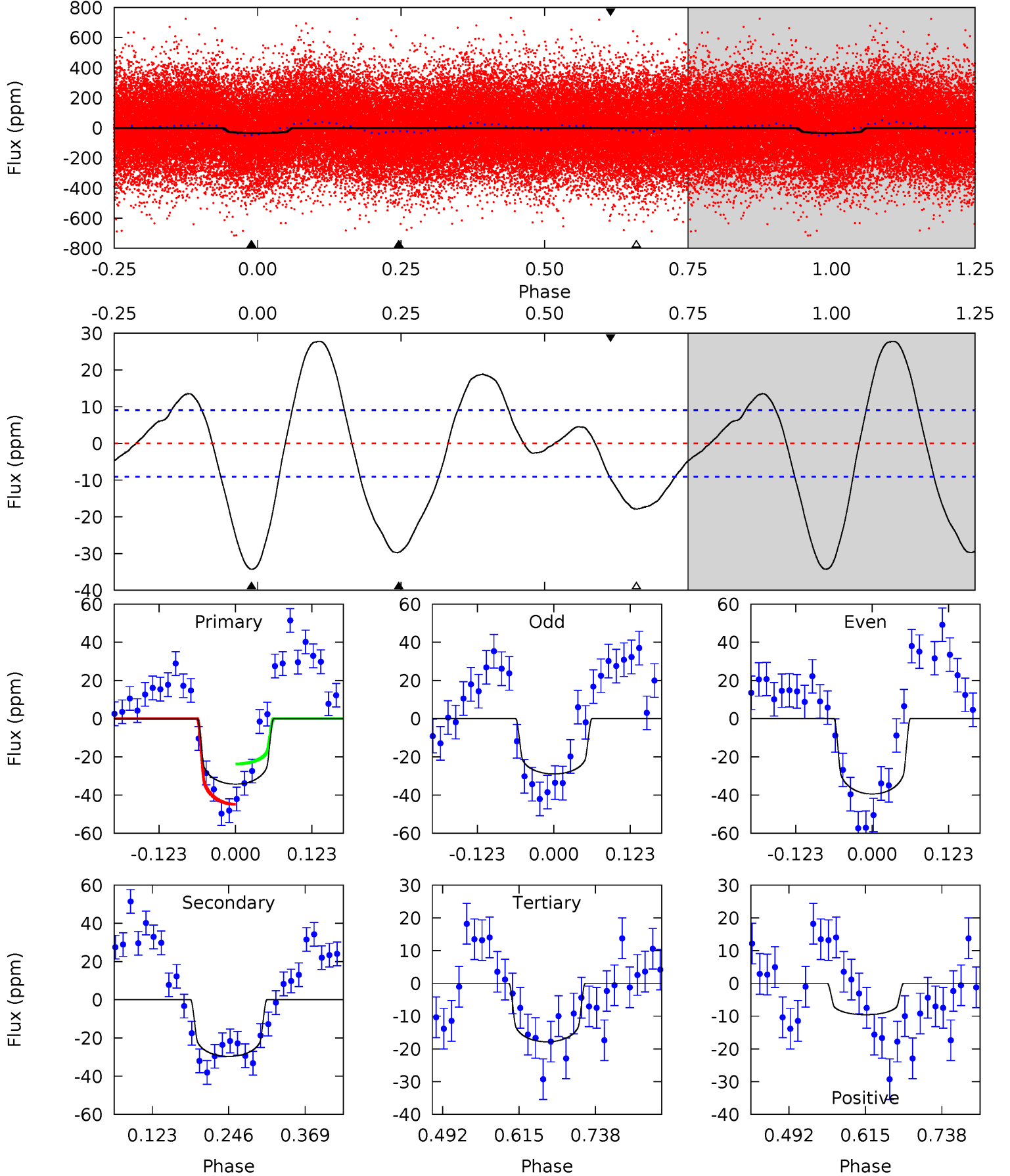
TCE 009306900-01 P= 2.486508 Days  $T_0=133.993661$  (BKJD)



# DV Model-Shift Uniqueness Test

009306900-01, P = 2.486580 Days, E = 131.492021 Days

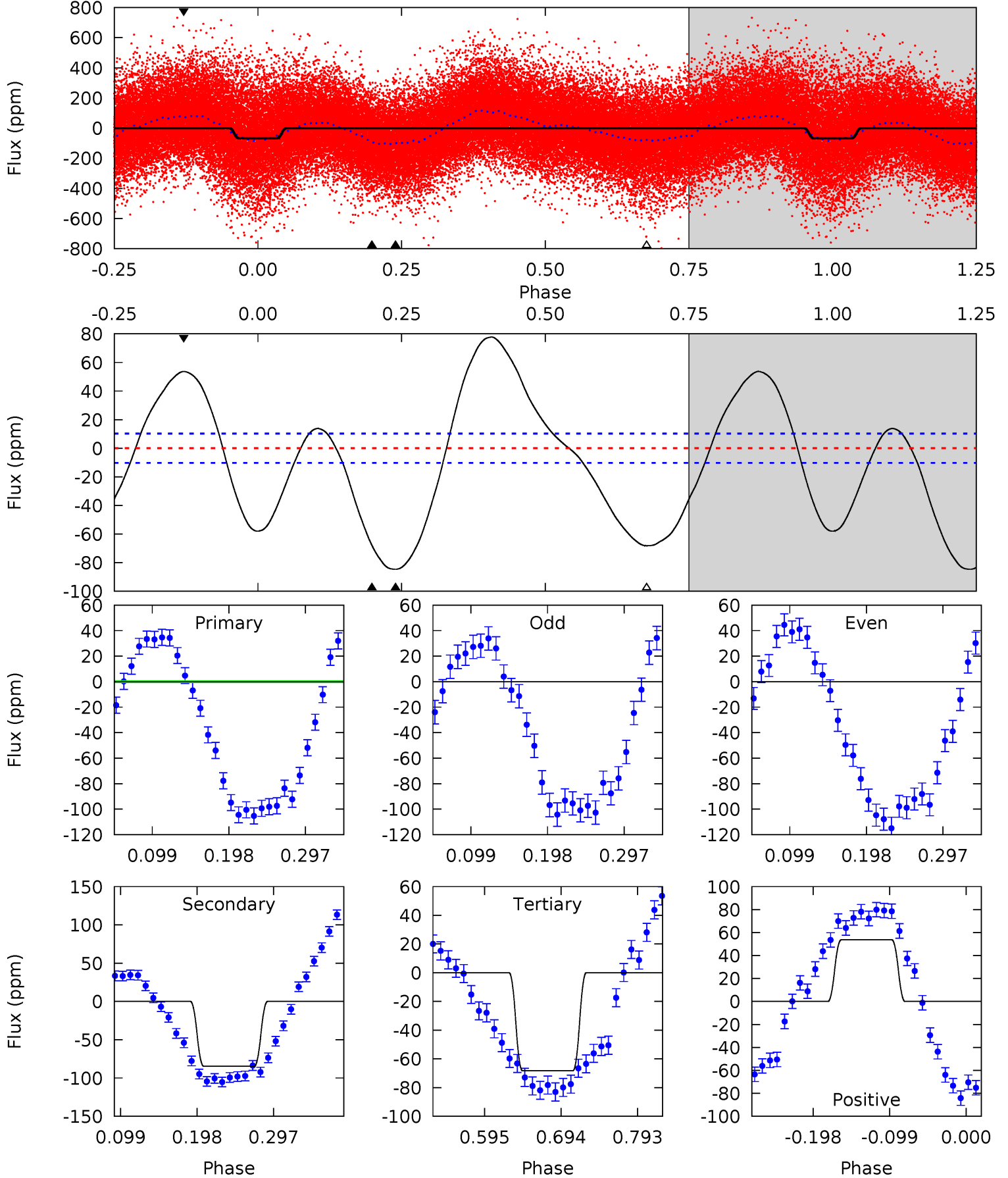
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
17.1	14.8	8.91	-4.78	4.52	1.54	5.42	8.20	21.9	5.89	19.6	2.62	1.02	0.45	5.24



# Alt Model-Shift Uniqueness Test

009306900-01, P = 2.486508 Days, E = 131.507153 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
30.2	37.7	30.4	23.9	4.57	1.65	19.7	-0.16	6.30	7.32	13.8	4.02	1.09	0.48	0.46



### Stellar Parameters For KIC 009306900

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5945^{+142}_{-178}$	$3.420^{+0.344}_{-0.086}$	$-0.620^{+0.300}_{-0.350}$	$4.000^{+0.563}_{-1.688}$	$1.533^{+0.163}_{-0.490}$	$0.034^{+0.095}_{-0.009}$
	+2%/-3%	+10%/-3%	+48%/-56%	+14%/-42%	+11%/-32%	+281%/-28%
Source	PHO1	FLK73	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 009306900-01 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-30 \pm 2$	$2.47^{+0.71}_{-0.71}$	$3511^{+217}_{-336}$	$5528^{+677}_{-528}$	$4.594^{+3.671}_{-1.818}$
Alt.	$-85 \pm 2$	$3.52^{+0.89}_{-0.84}$	$3524^{+192}_{-361}$	$6011^{+556}_{-432}$	$6.388^{+4.152}_{-2.163}$

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

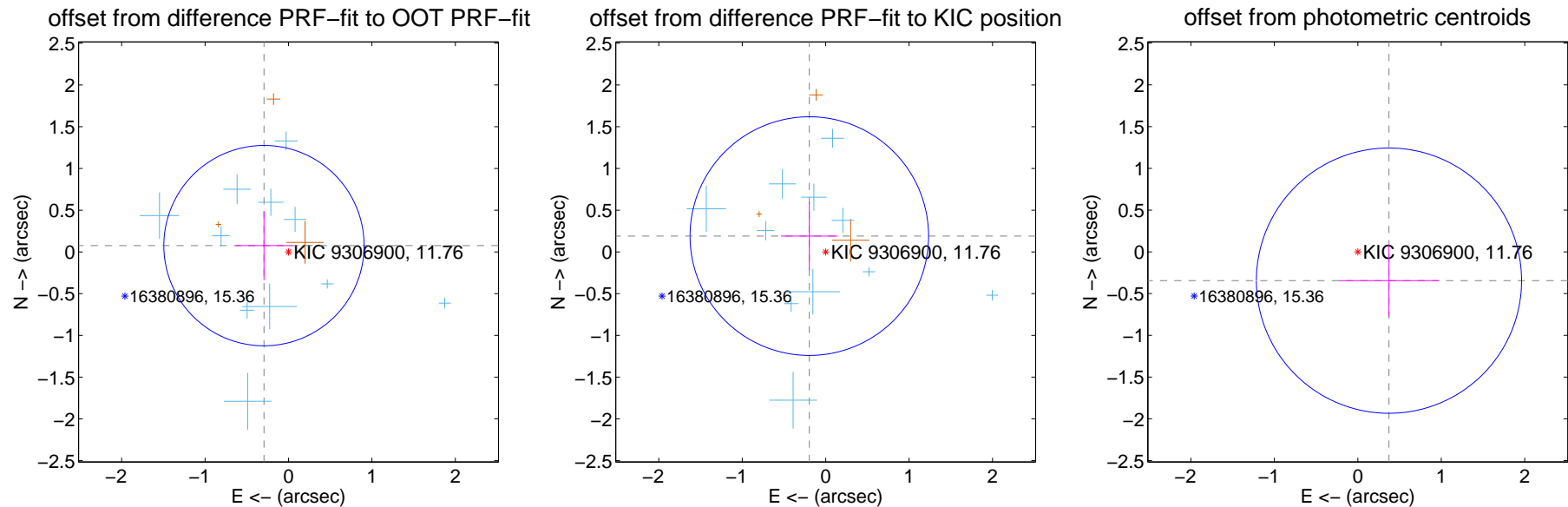
## DV Centroid Data

Supplemental centroid analysis for 009306900-01. **Kepler magnitude: 11.76.** Transit SNR 7.83

There are 11 quarters with good PRF difference image offsets

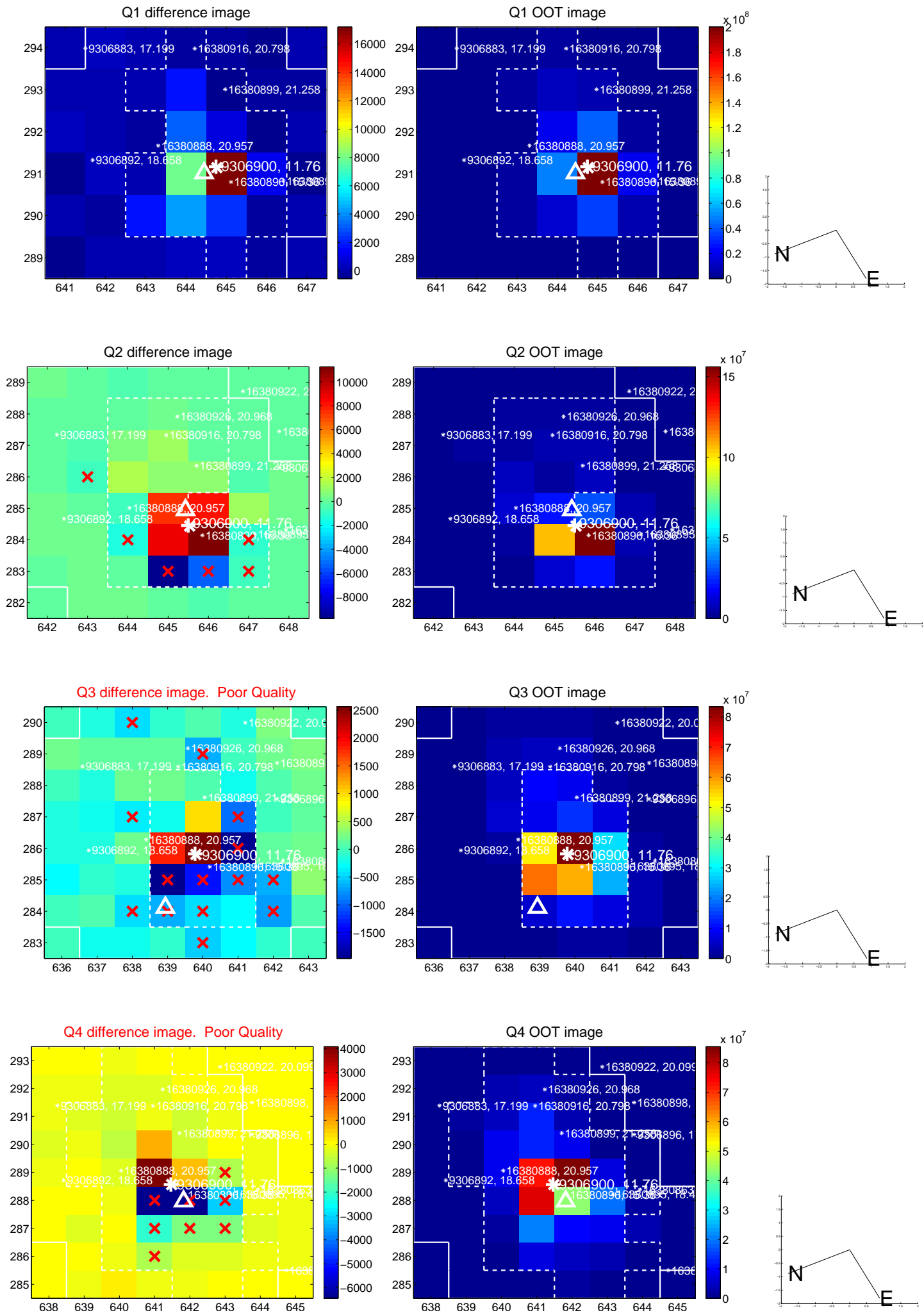
The direct PRF centroid is offset from the target star catalog position by about 0.12 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.304 \pm 0.400$	0.76	$0.294 \pm 0.340$	$0.075 \pm 0.413$
PRF-fit source offset from KIC position	$0.273 \pm 0.476$	0.57	$0.196 \pm 0.340$	$0.189 \pm 0.408$
photometric centroid source offset	$0.51 \pm 0.53$	0.96	$-0.37 \pm 0.60$	$-0.34 \pm 0.43$

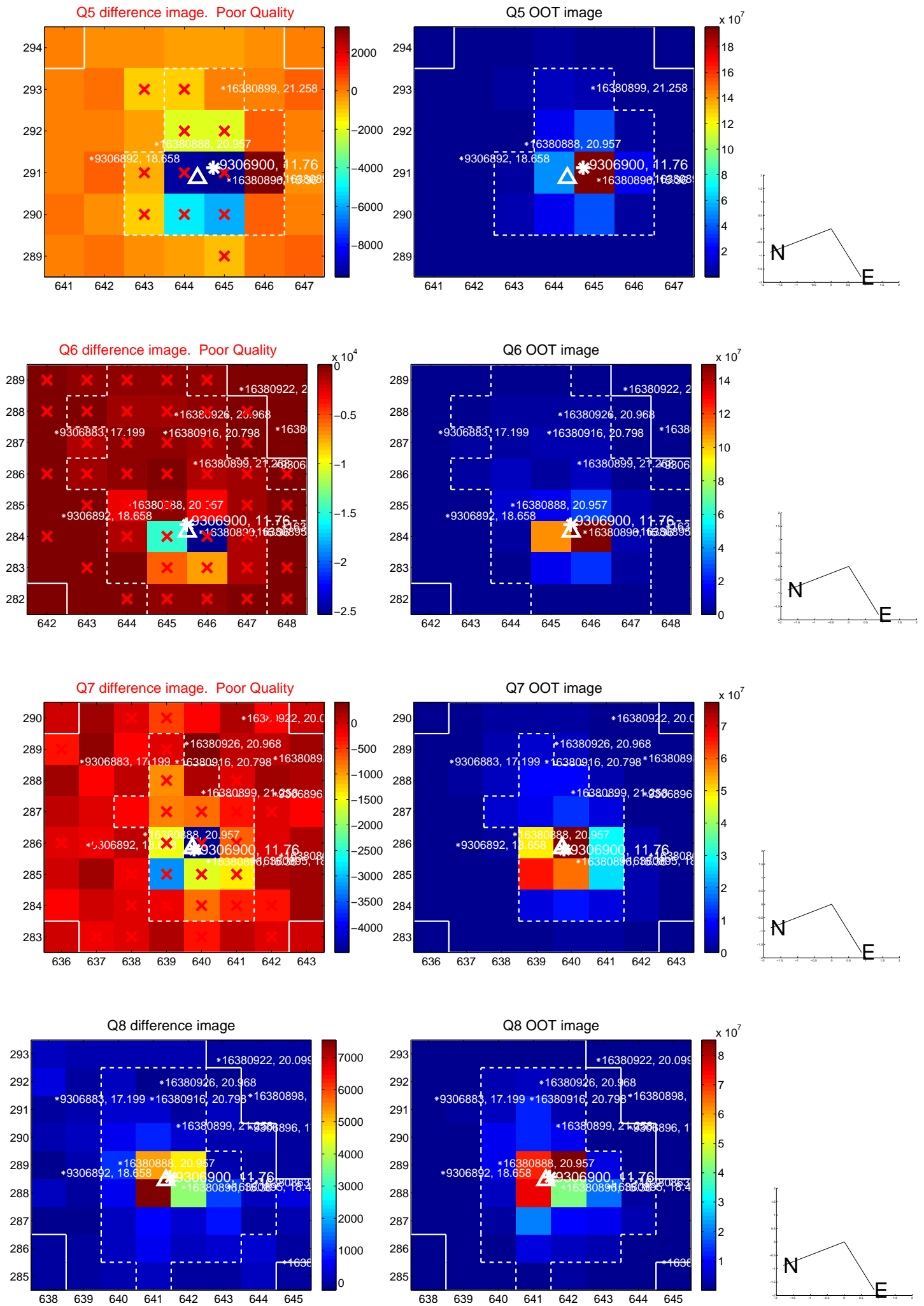


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

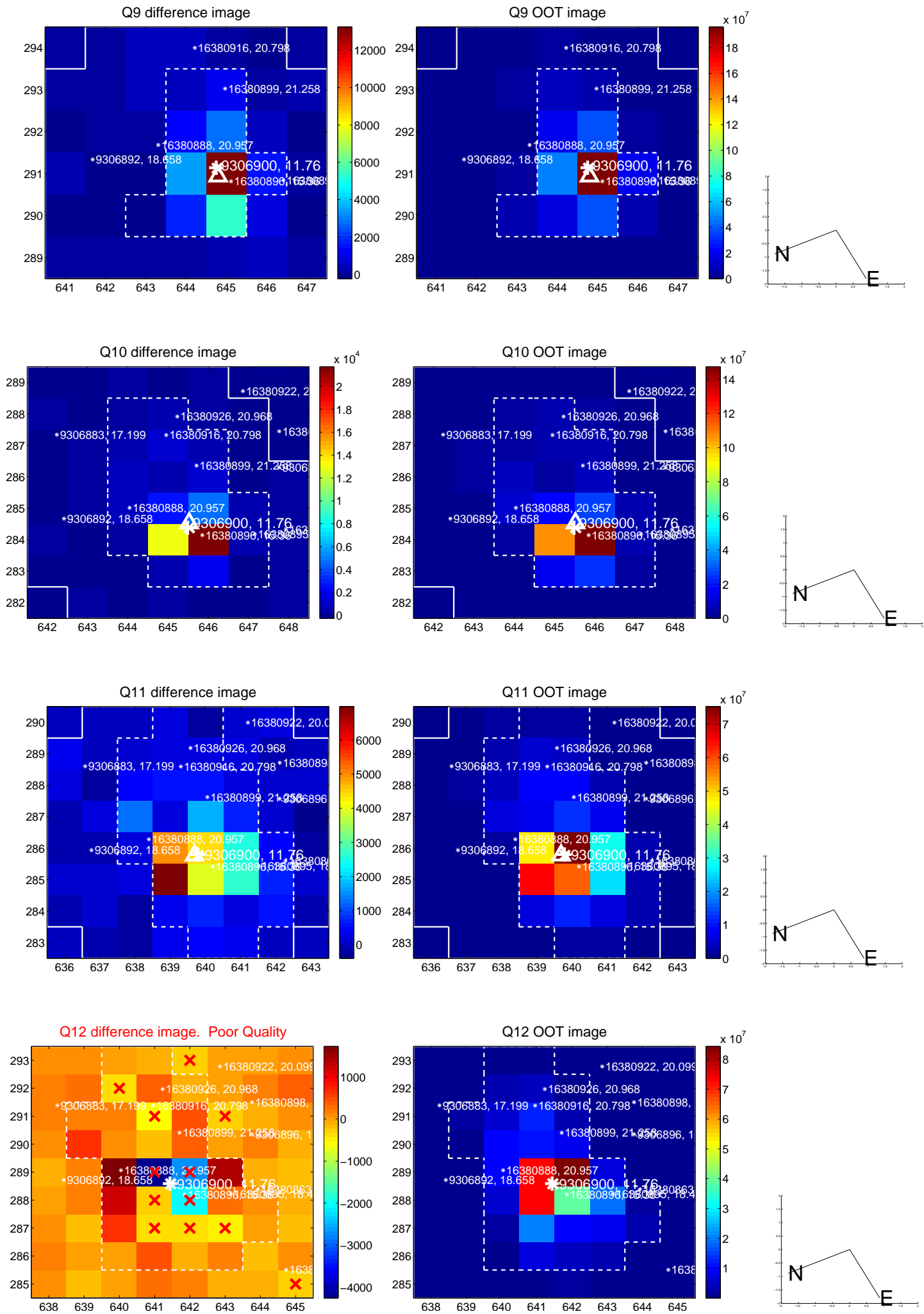
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



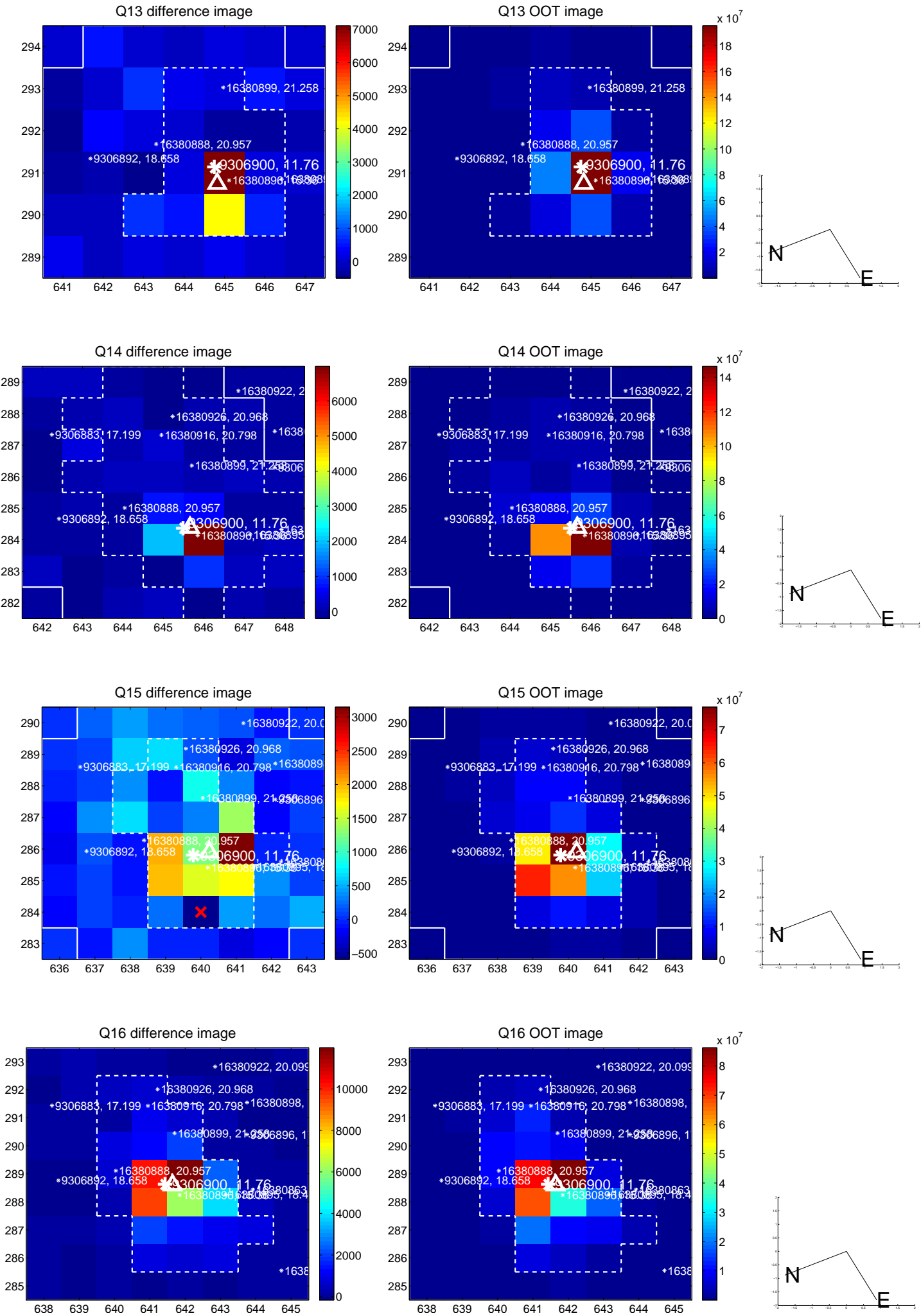
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



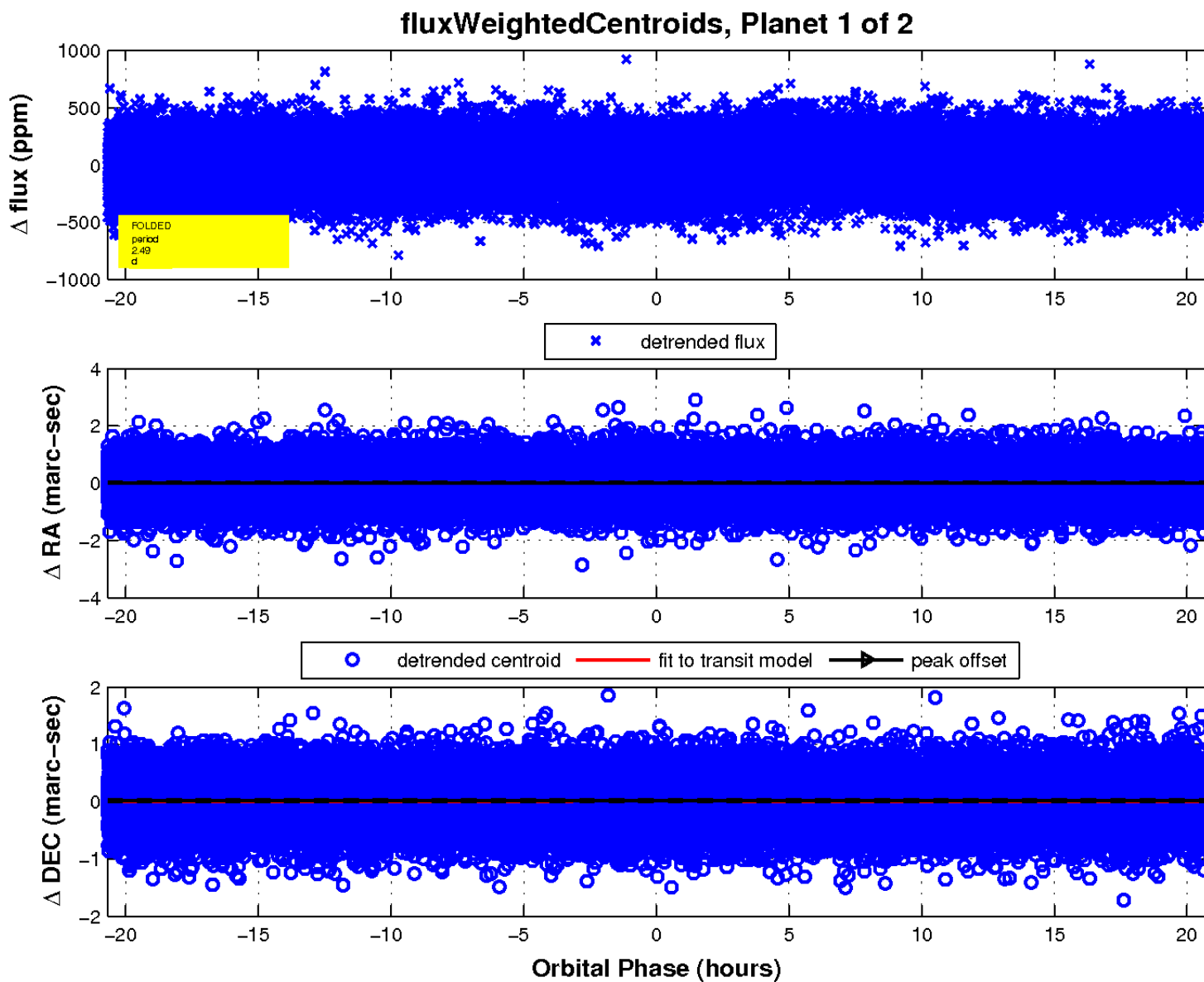
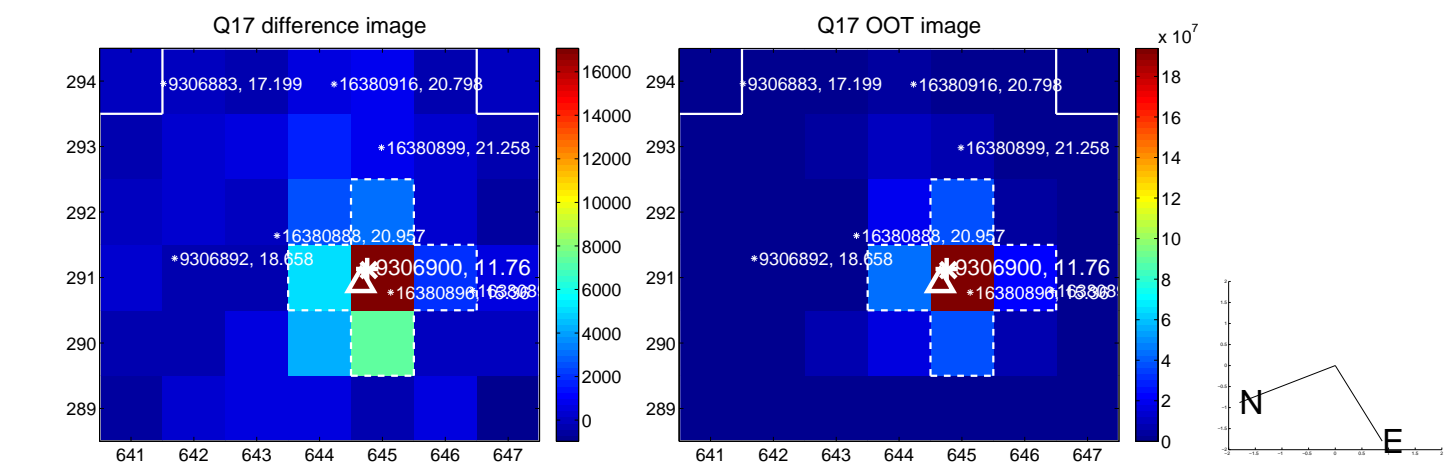
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



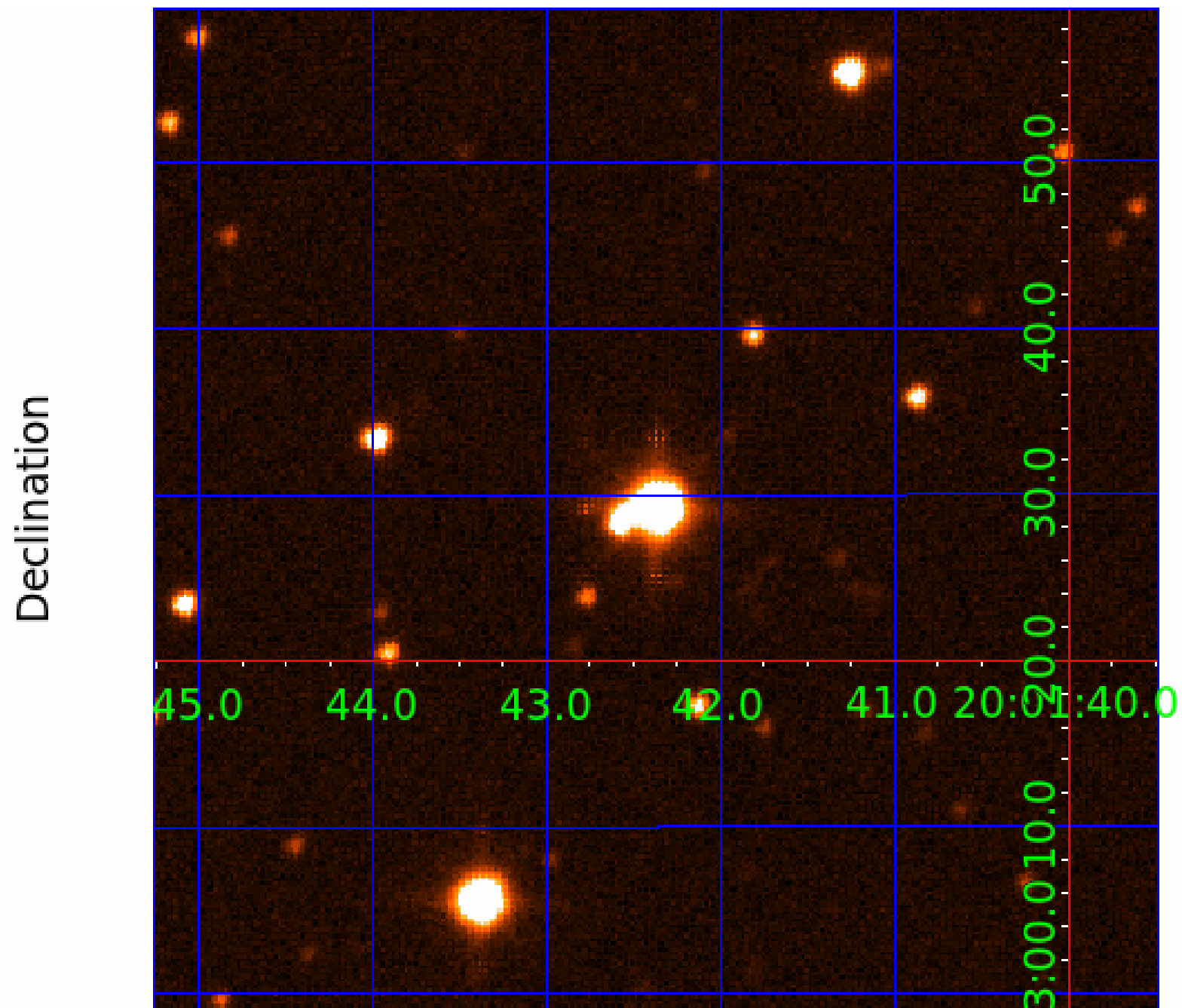
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



UKIRT Image



# KIC 009306900

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009306900-01	OBS	No	2.486580	133.978601	32.9	6.895	8.2	7.8	4.00	5945	2.71	10424.90
009306900-02	OBS	No	566.686043	364.044312	370.1	4.149	7.4	8.0	4.00	5945	9.05	7.49

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009306900-01	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT
009306900-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—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.

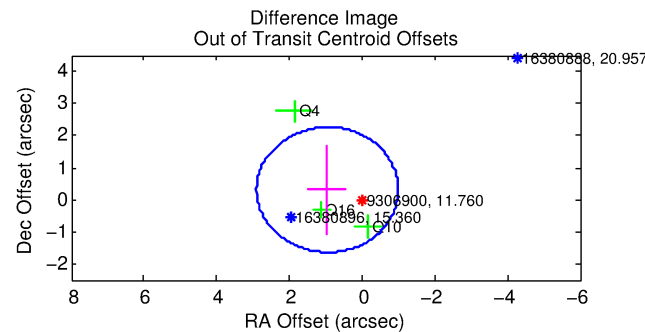
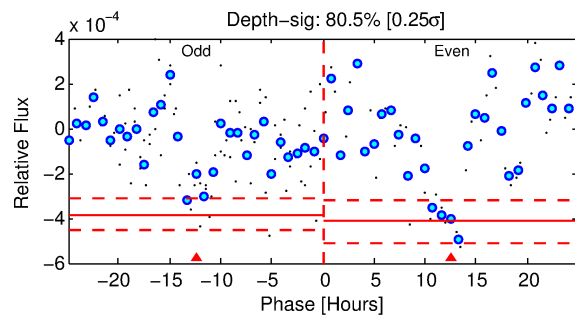
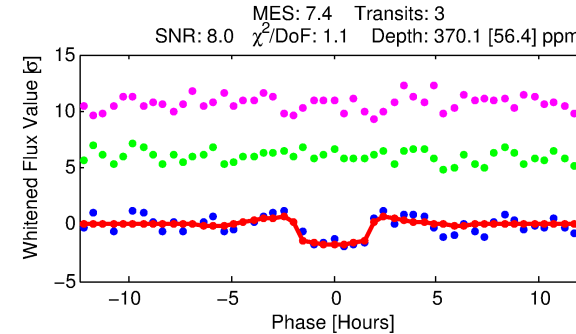
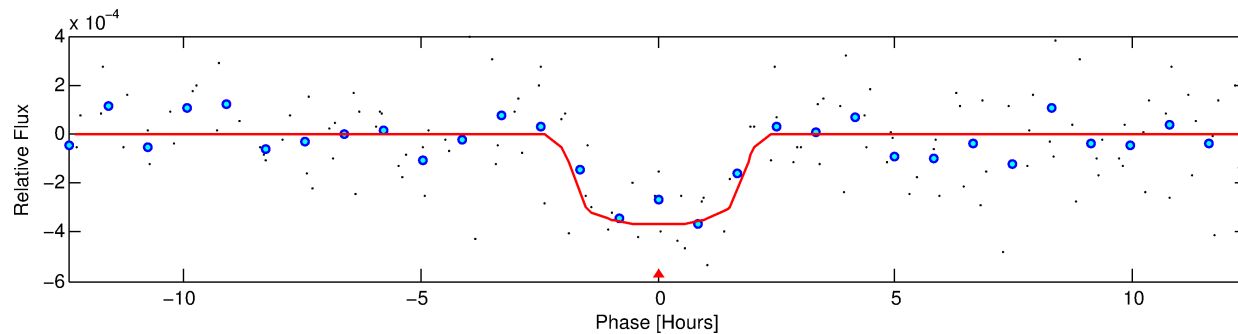
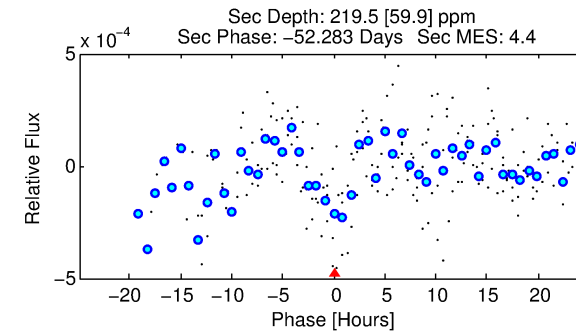
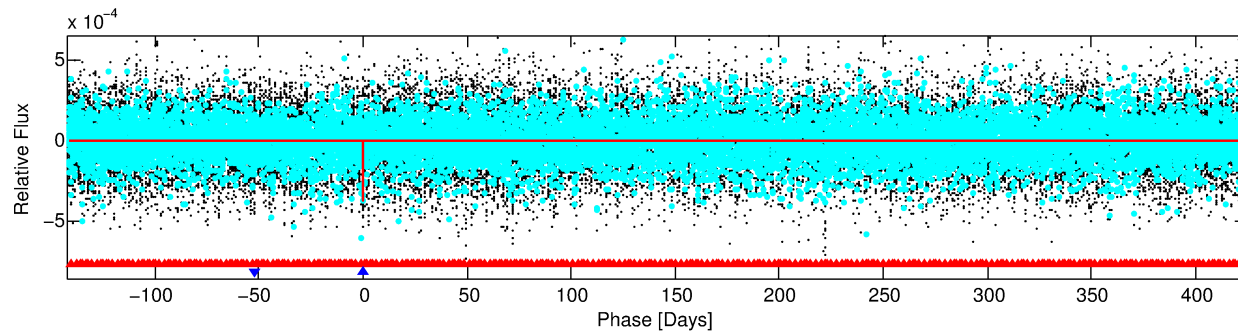
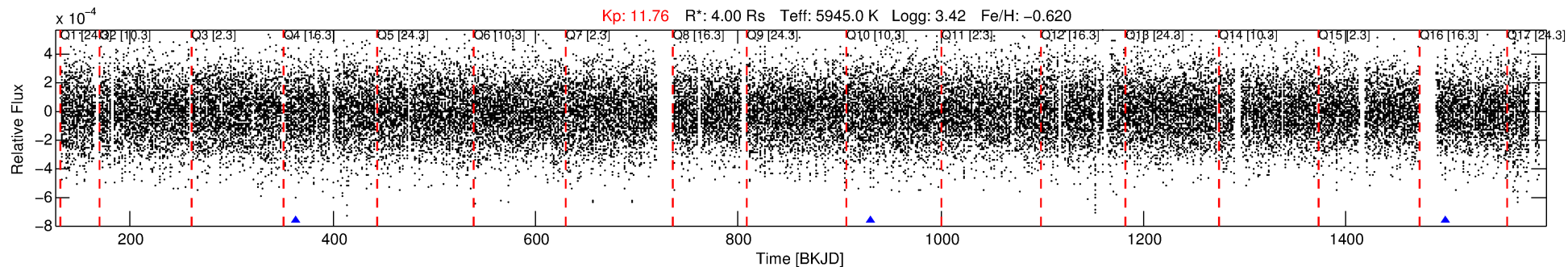
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009306900-02

No Significant Match Found

# DV One-Page Summary

KIC: 9306900 Candidate: 2 of 2 Period: 566.686 d



## DV Fit Results:

Period = 566.68604 [0.00641] d  
Epoch = 364.0443 [0.0084] BKJD  
Rp/R\* = 0.0207 [0.0069]  
a/R\* = 498.90 [828.33]  
b = 0.90 [0.35]  
Seff = 7.49 [4.57]  
Teq = 422 [64] K  
Rp = 9.05 [4.88] Re  
a = 1.5463 [0.5966] AU  
Ag = 3524.59 [3308.69] [1.06σ]  
Teff = 5025 [921] K [4.99σ]

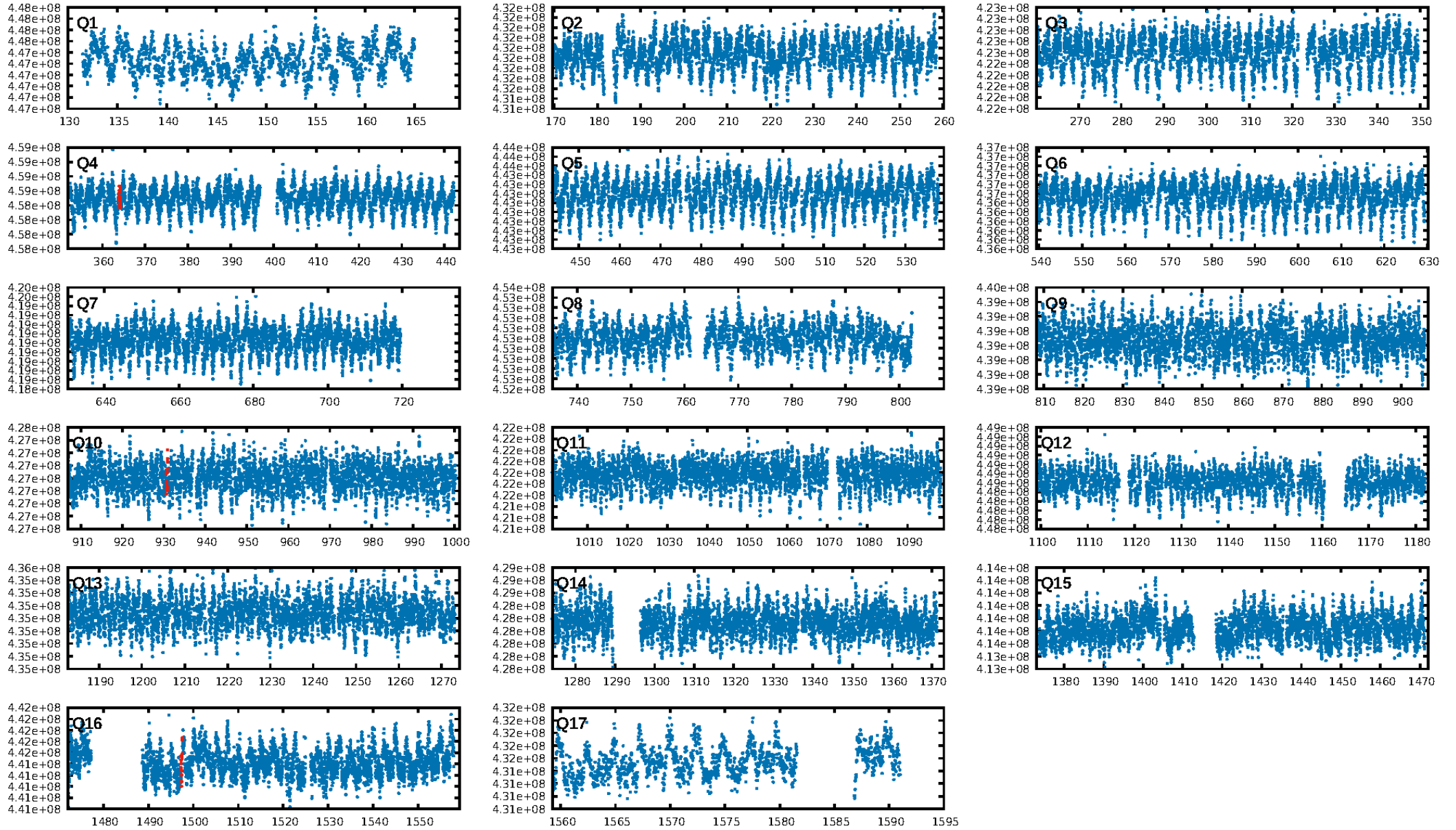
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [1682.72σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 98.3%  
ModelChiSquareGof-sig: 99.1%  
**Bootstrap-pfa: 6.00e-10**  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: 2.935  
Centroid-sig: 93.8%  
Centroid-so: 0.086 arcsec [0.08σ]  
OotOffset-rm: 1.007 arcsec [1.55σ]  
KicOffset-rm: 0.945 arcsec [1.32σ]  
OotOffset-st: 1/0/2/0 [3]  
KicOffset-st: 1/0/2/0 [3]  
DiffImageQuality-fgm: 0.67 [2/3]  
DiffImageOverlap-fno: 1.00 [3/3]

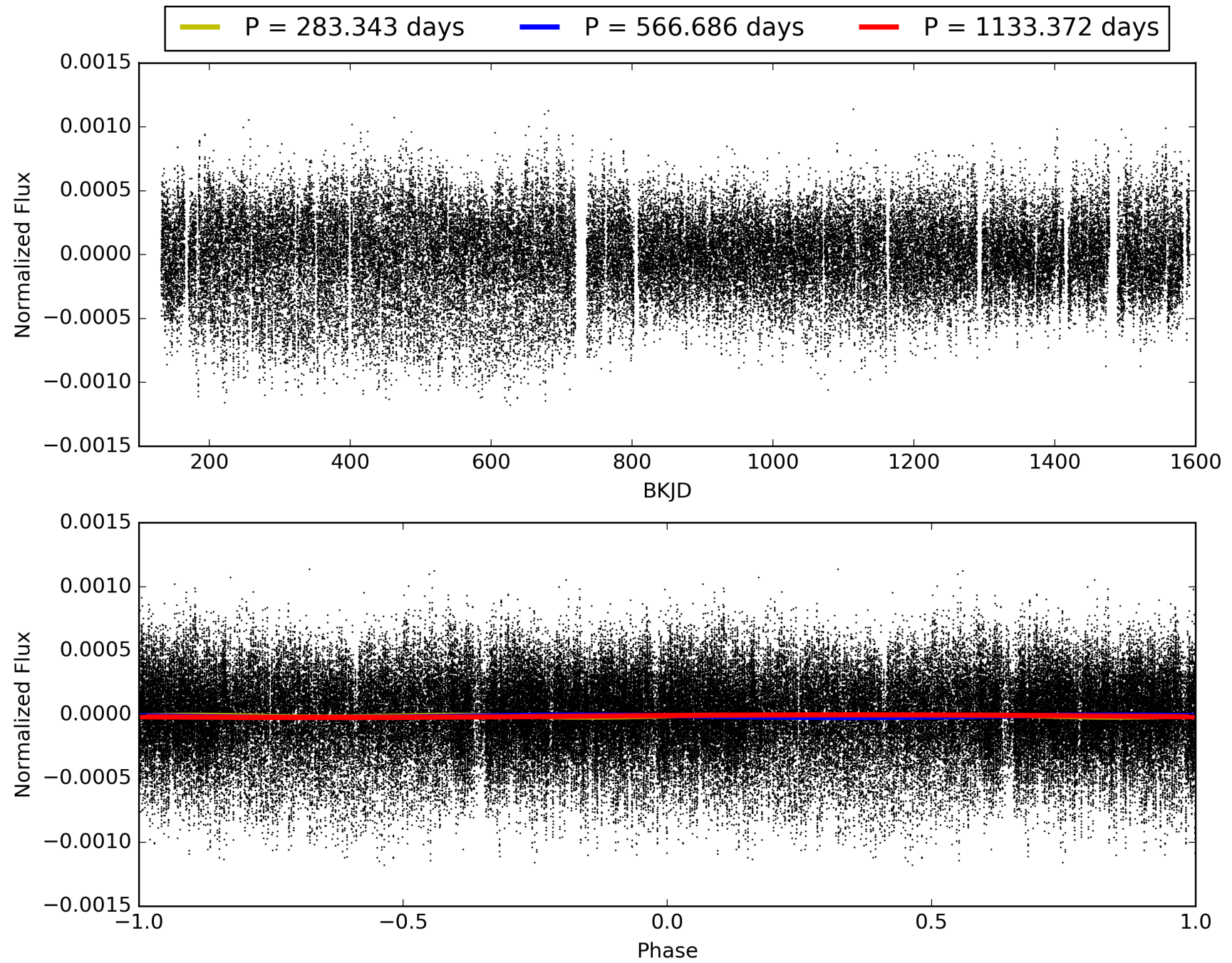
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 10:30:29 Z

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

# TCE 009306900-02, PDC Light Curves

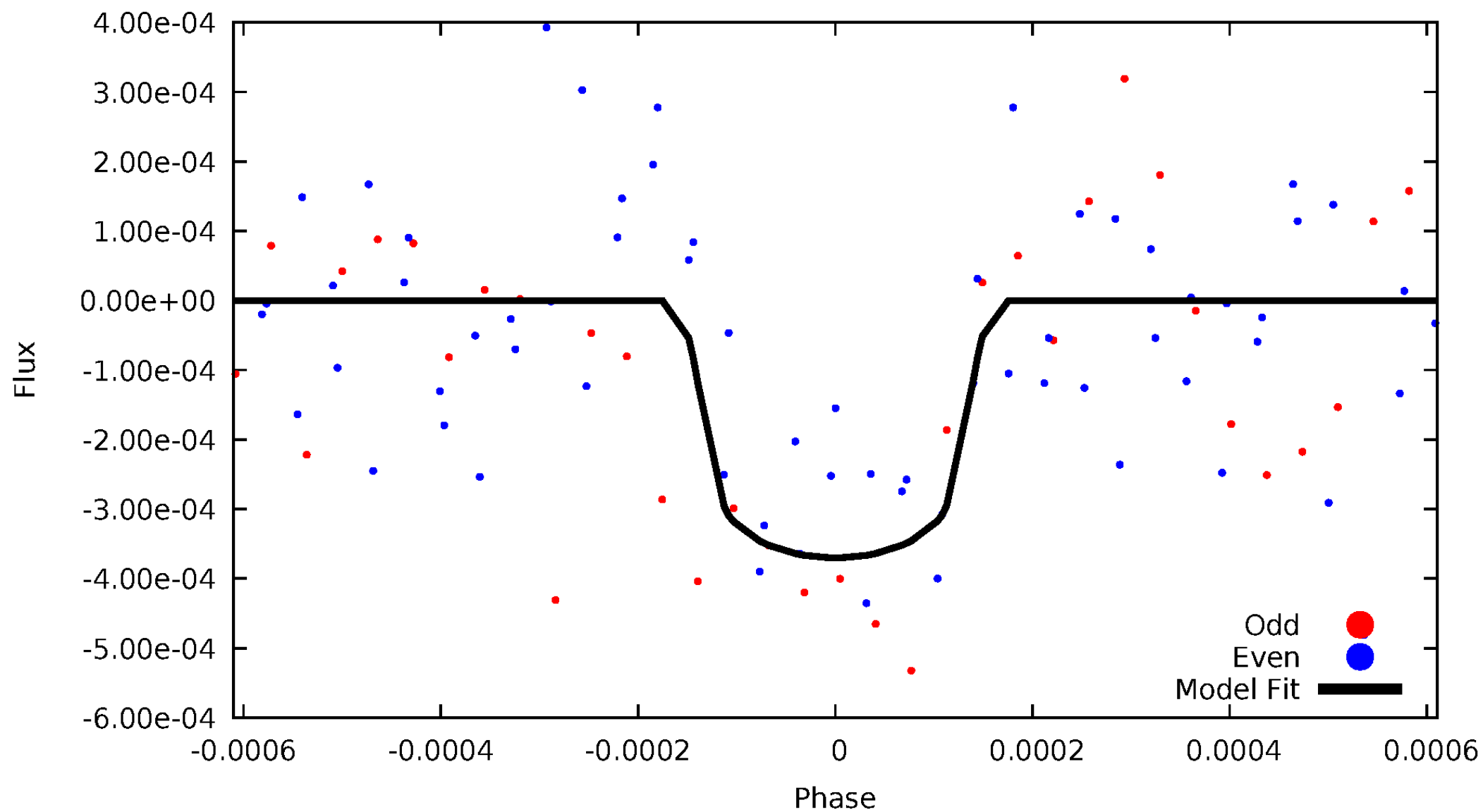


TCE 009306900-02



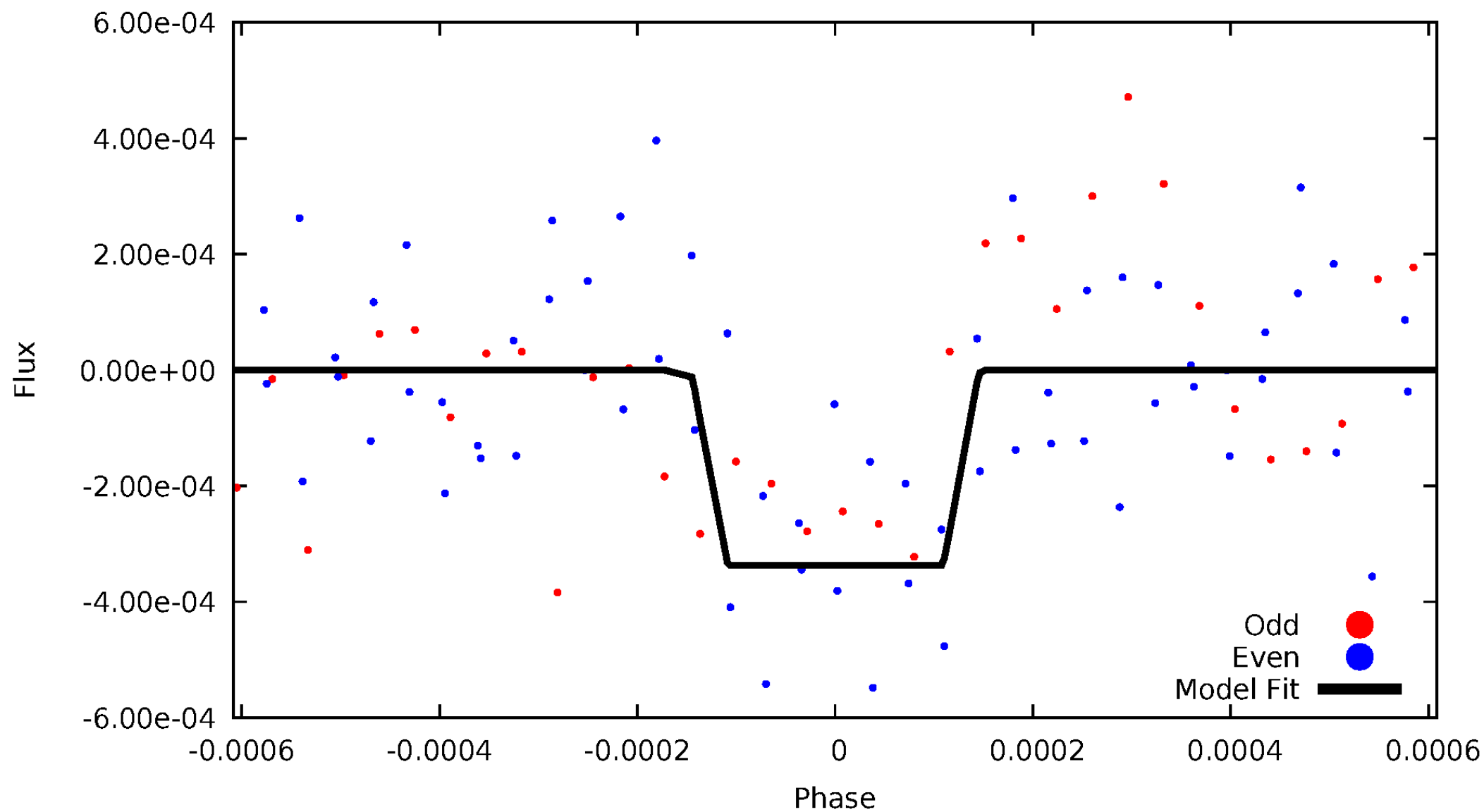
# DV Odd/Even

TCE 009306900-02



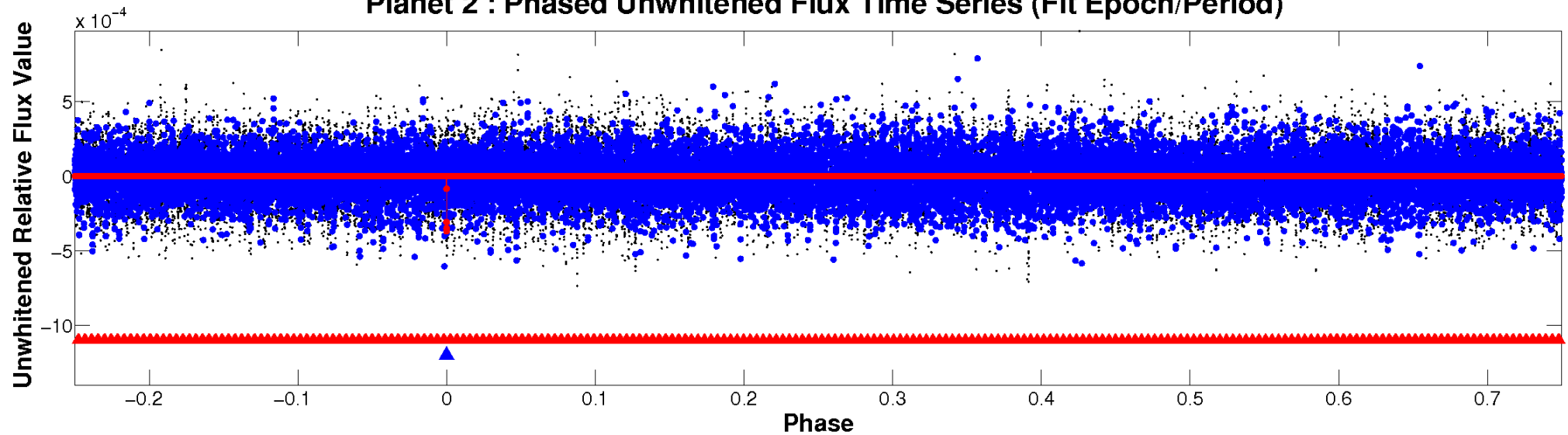
# ALT Odd/Even

TCE 009306900-02

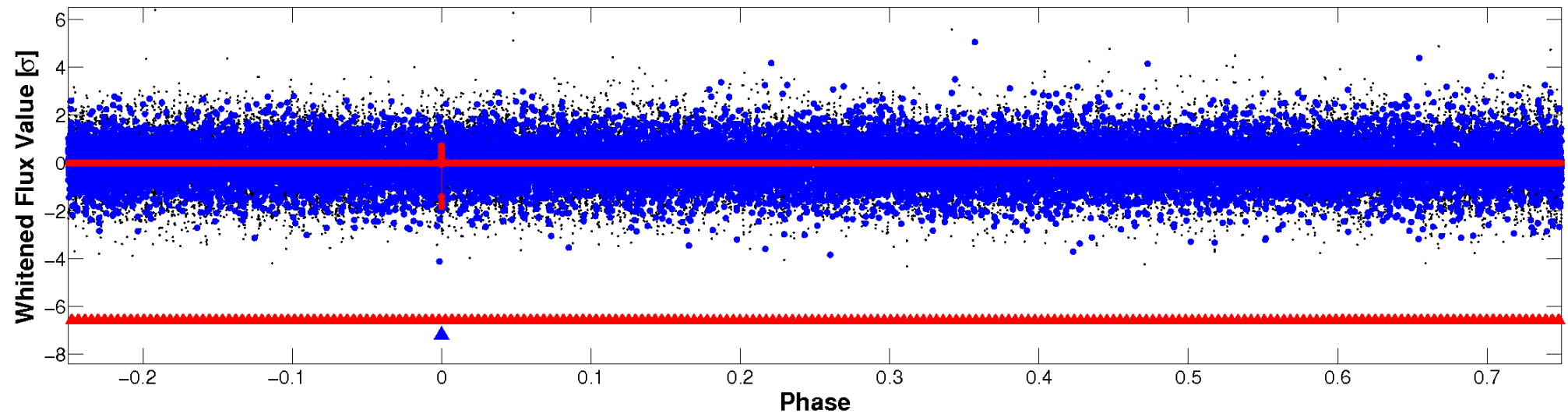


# Non-Whitened Vs. Whitened Light Curve

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

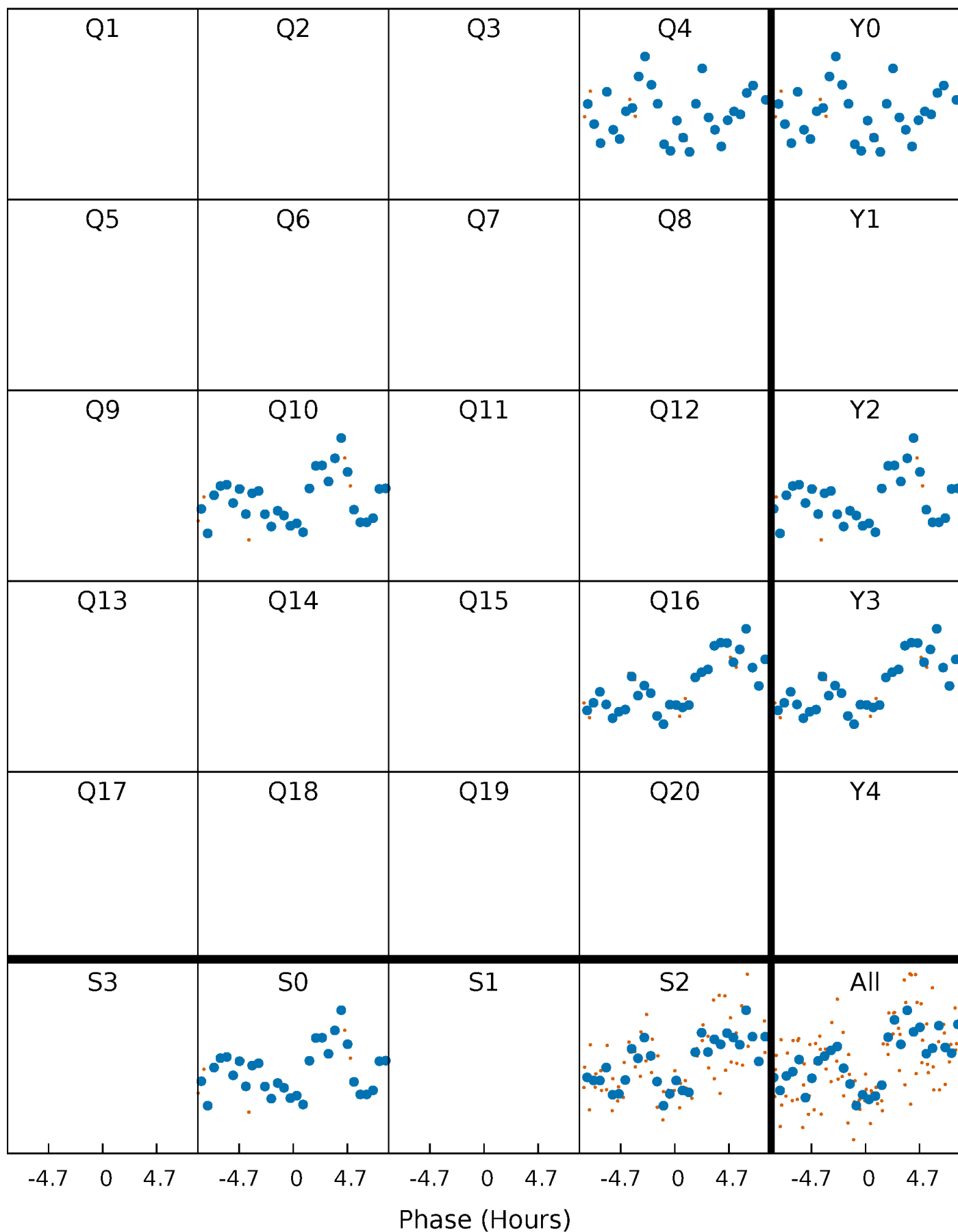


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



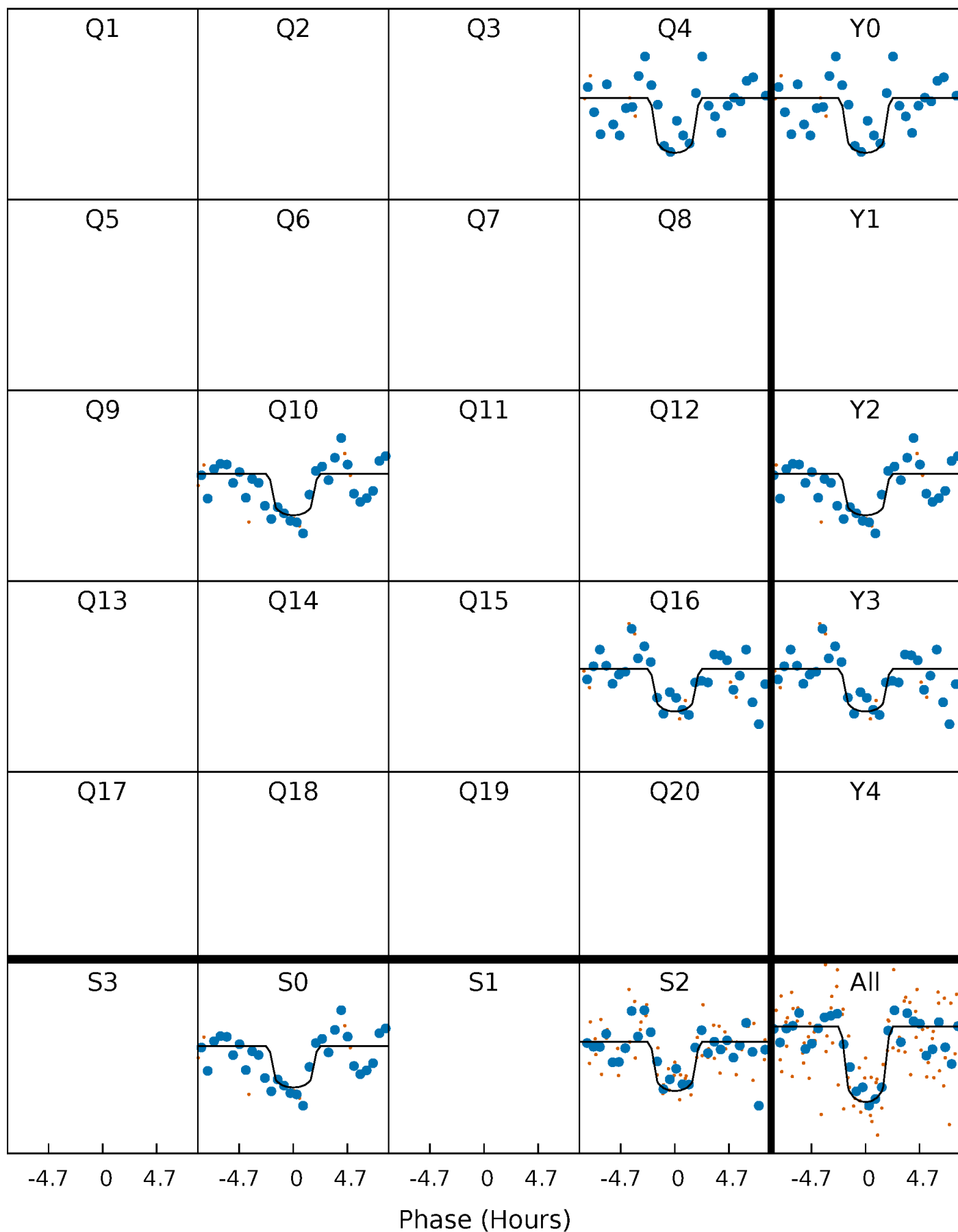
# PDC Quarter-Phased Transit Curves

TCE 009306900-02 P=566.686043 Days  $T_0=364.044312$  (BKJD)



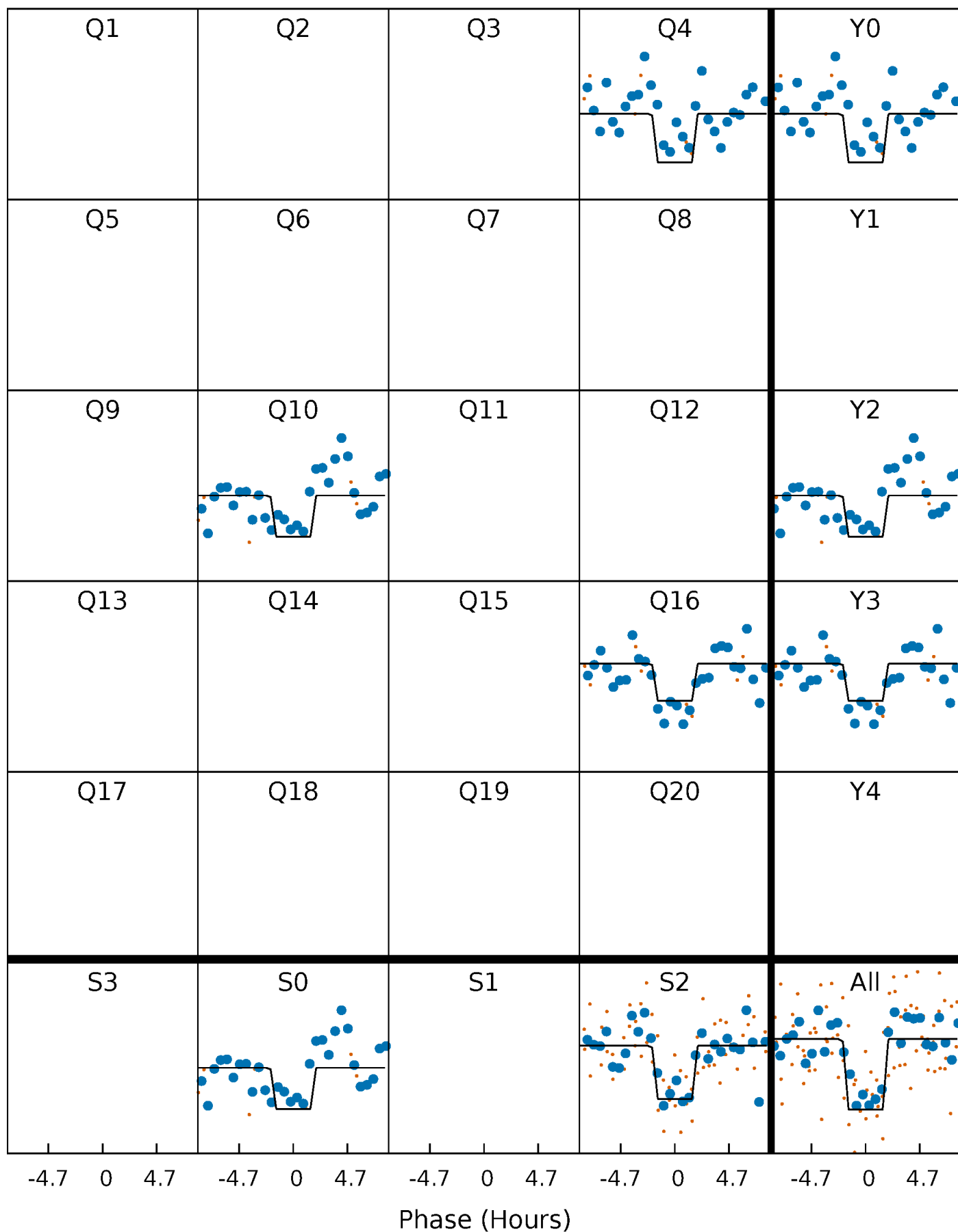
# DV Quarter-Phased Transit Curves

TCE 009306900-02     $P=566.686043$  Days     $T_0=364.044312$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

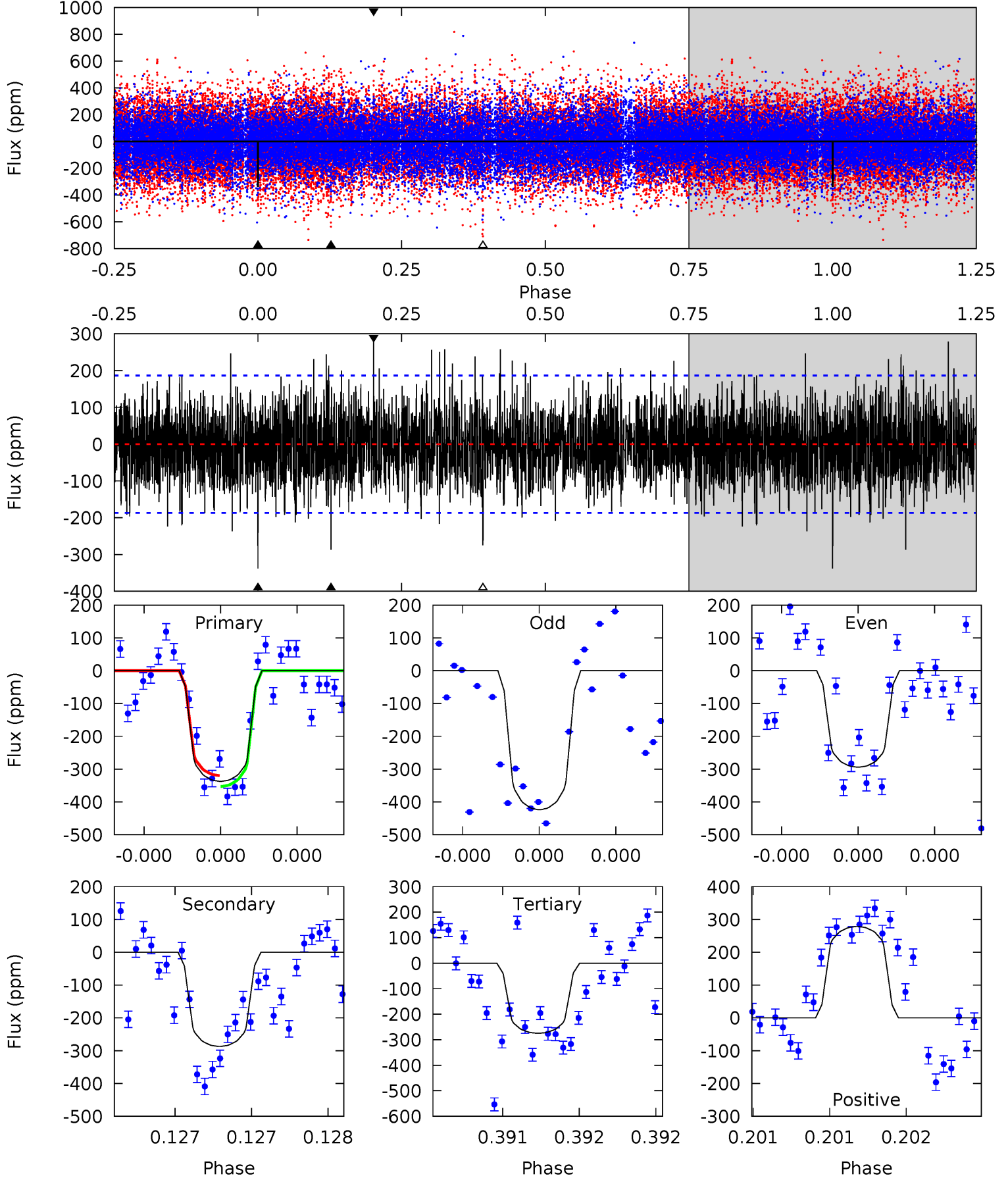
TCE 009306900-02 P=566.683920 Days  $T_0=364.044748$  (BKJD)



# DV Model-Shift Uniqueness Test

009306900-02, P = 566.686043 Days, E = 364.044312 Days

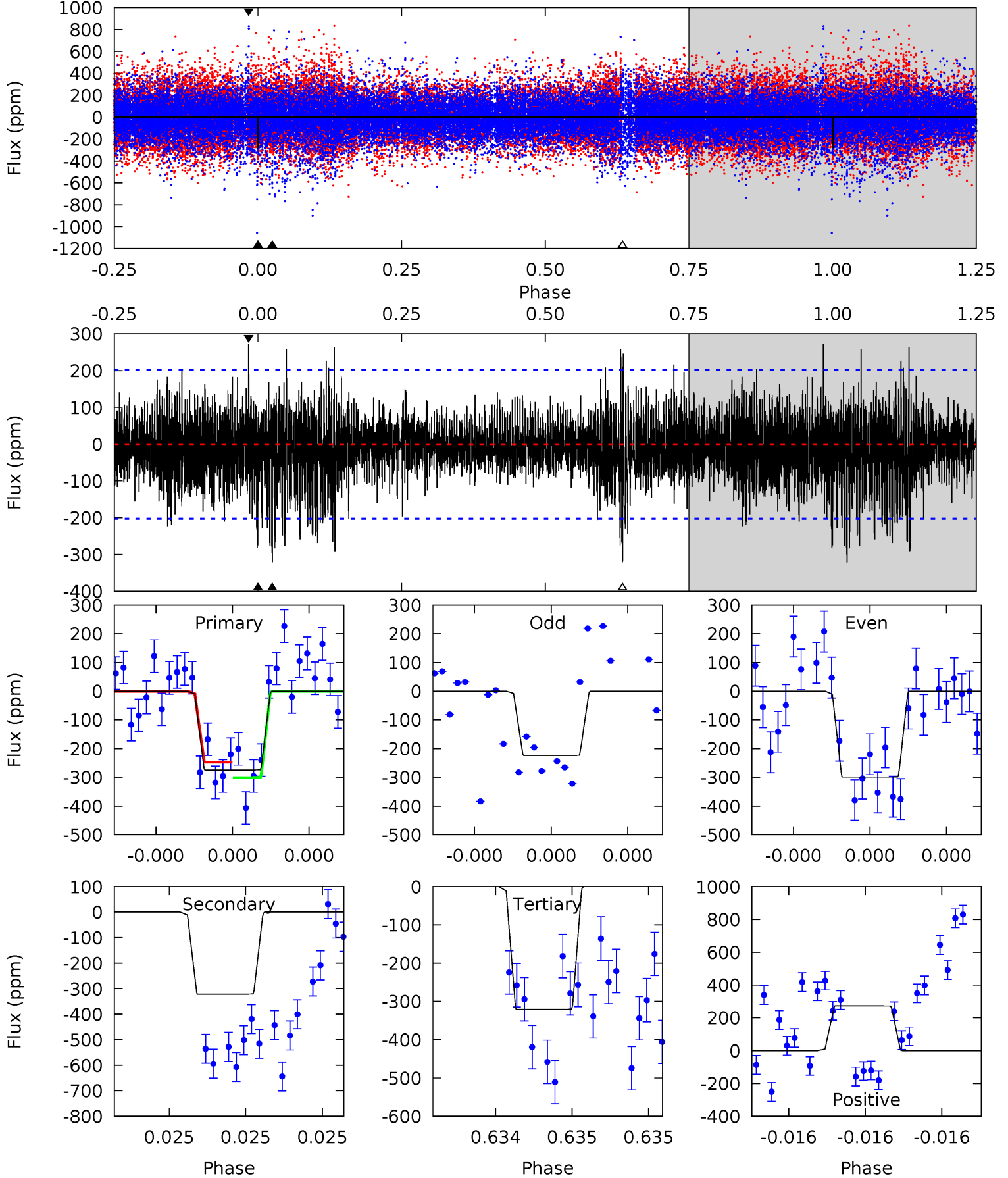
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
10.2	8.68	8.31	8.42	5.65	3.59	2.05	1.89	1.78	0.38	0.26	1.87	1.01	0.45	0.50



# Alt Model-Shift Uniqueness Test

009306900-02, P = 566.683920 Days, E = 364.044748 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
7.68	8.98	8.97	7.62	5.67	3.62	1.76	-1.29	0.05	0.02	1.36	1.00	1.22	0.46	0.75



### Stellar Parameters For KIC 009306900

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5945^{+142}_{-178}$	$3.420^{+0.344}_{-0.086}$	$-0.620^{+0.300}_{-0.350}$	$4.000^{+0.563}_{-1.688}$	$1.533^{+0.163}_{-0.490}$	$0.034^{+0.095}_{-0.009}$
	+2%/-3%	+10%/-3%	+48%/-56%	+14%/-42%	+11%/-32%	+281%/-28%
Source	PHO1	FLK73	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 009306900-02 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-287 \pm 33$	$7.97^{+3.46}_{-3.14}$	$575^{+37}_{-57}$	$5494^{+1242}_{-717}$	$5846^{+9054}_{-2973}$
Alt.	$-321 \pm 36$	$7.22^{+3.24}_{-2.87}$	$571^{+37}_{-54}$	$5889^{+1656}_{-837}$	$7782^{+13591}_{-3937}$

$T_{max}$  = 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

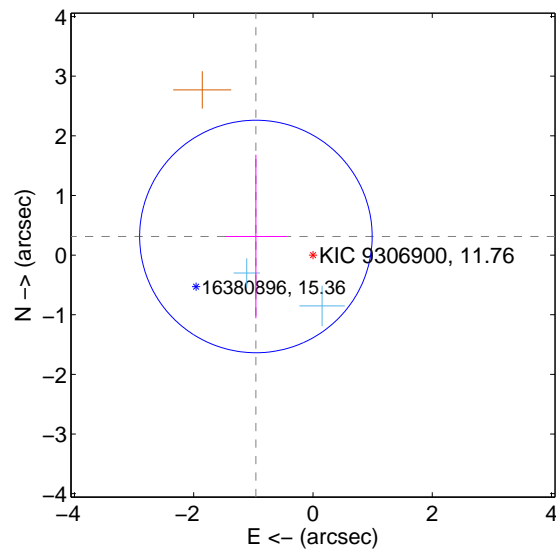
Supplemental centroid analysis for 009306900-02. **Kepler magnitude: 11.76.** Transit SNR 8.00

**There are 2 quarters with good PRF difference image offsets**

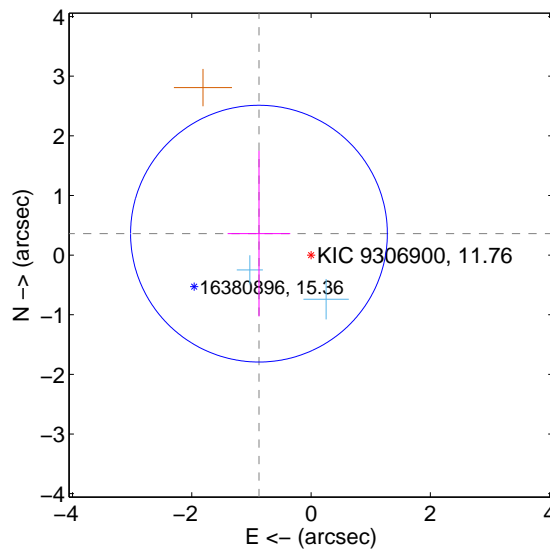
The direct PRF centroid is offset from the target star catalog position by about 0.10 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.007 \pm 0.650$	1.55	$0.957 \pm 0.517$	$0.312 \pm 1.371$
PRF-fit source offset from KIC position	$0.945 \pm 0.718$	1.32	$0.874 \pm 0.525$	$0.360 \pm 1.389$
photometric centroid source offset	$0.09 \pm 1.10$	0.08	$0.09 \pm 1.10$	$0.01 \pm 0.60$

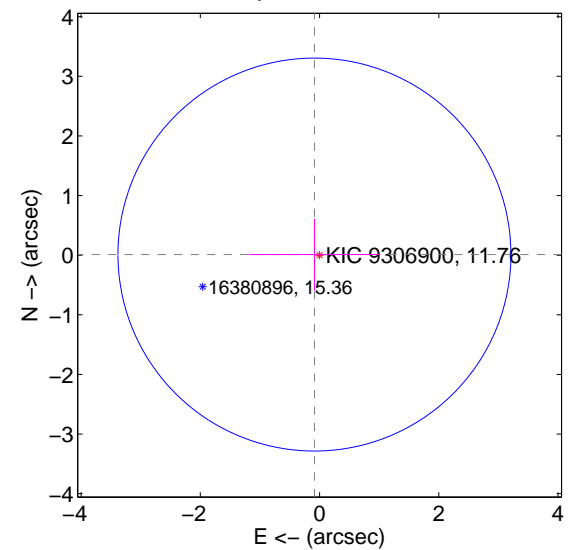
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

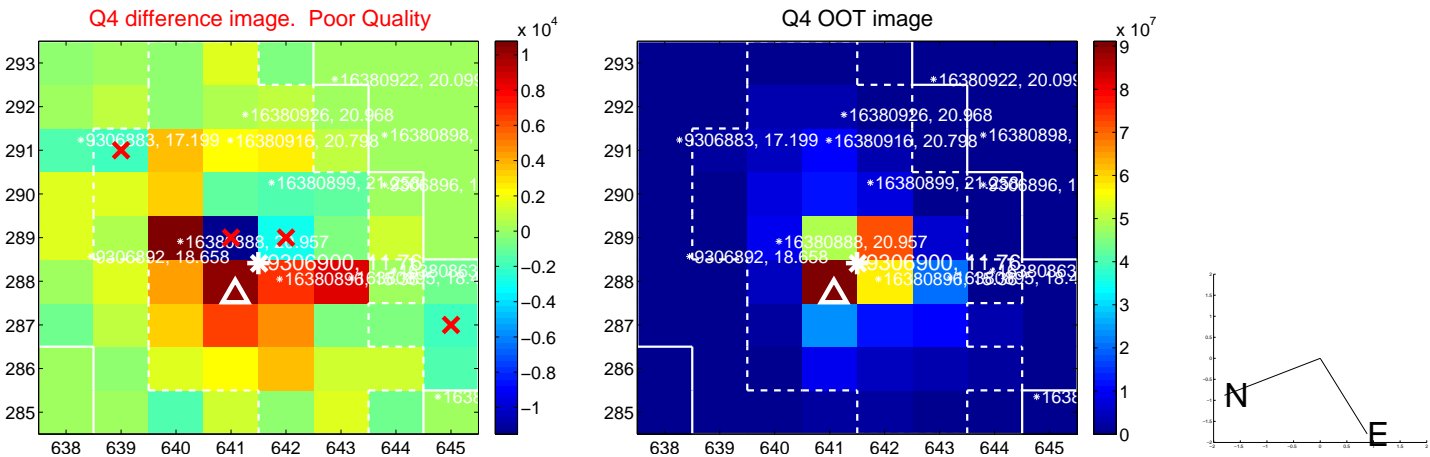
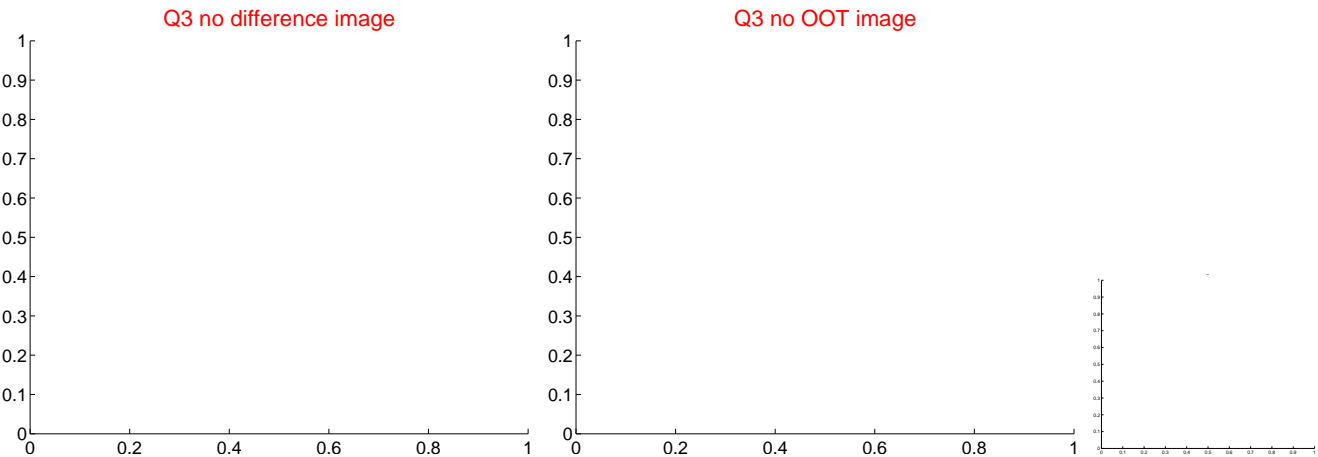
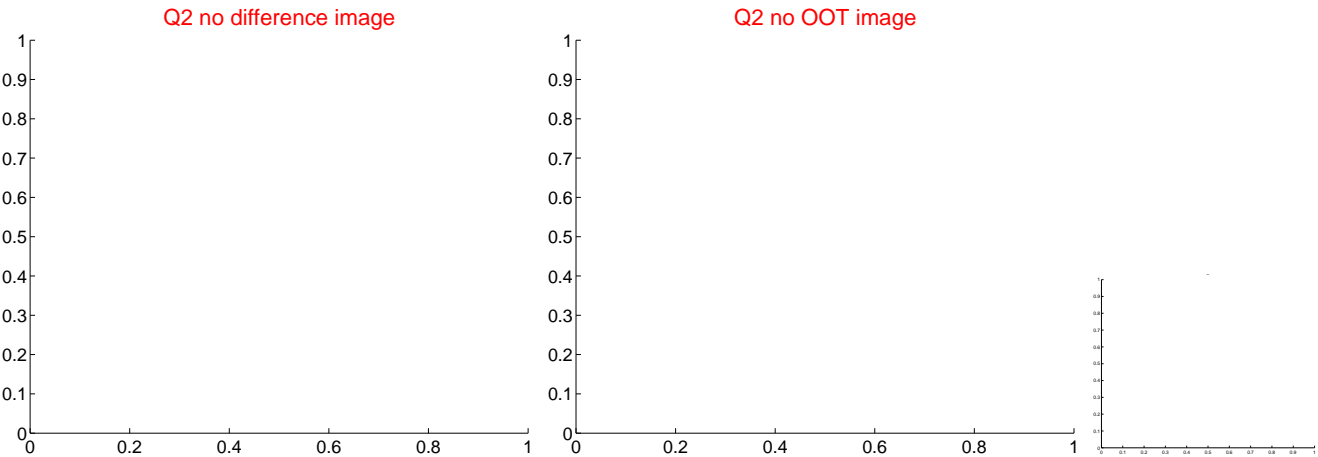
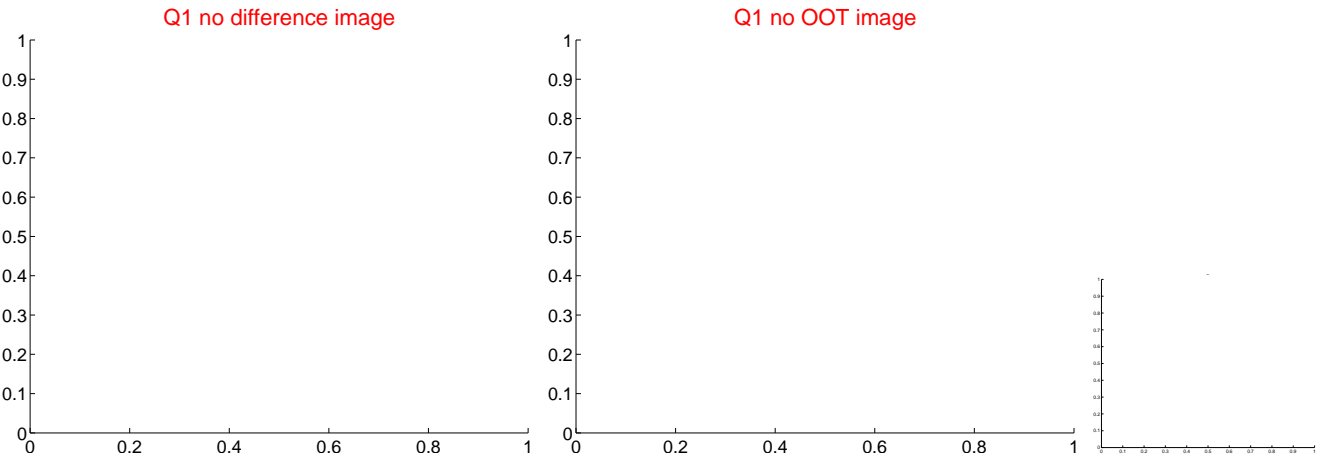


offset from photometric centroids

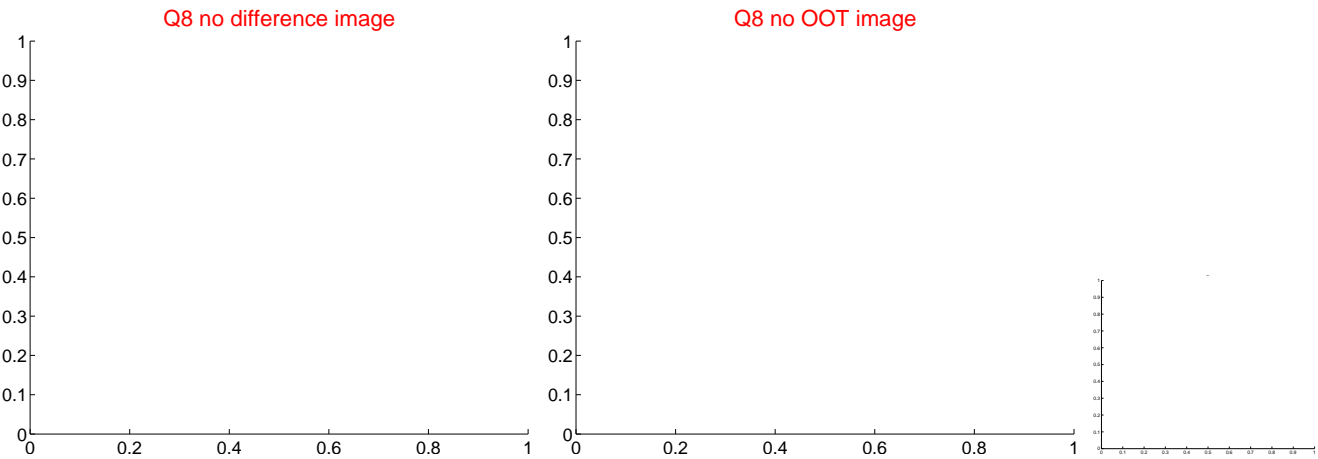
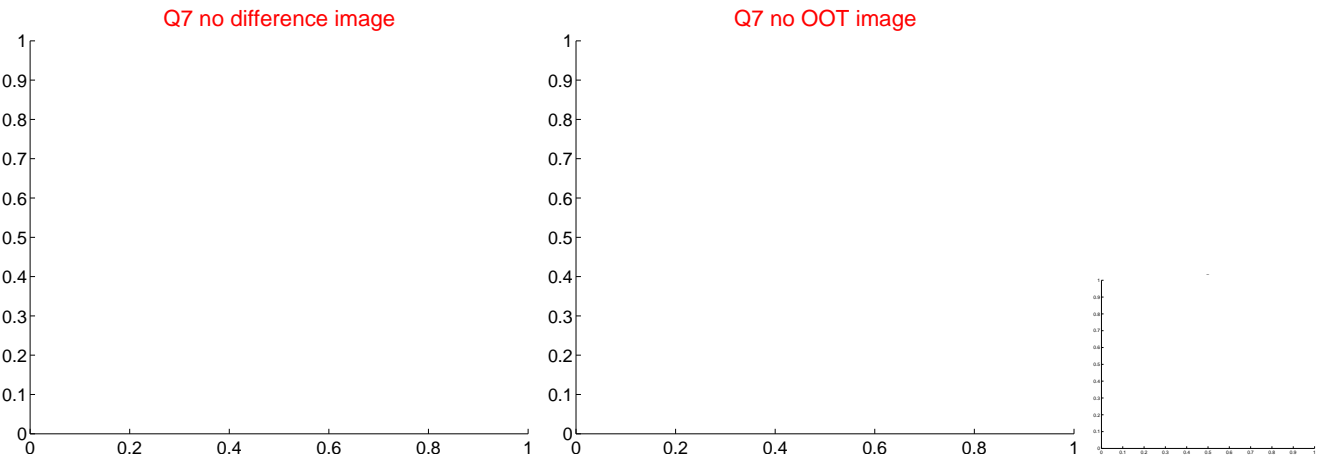
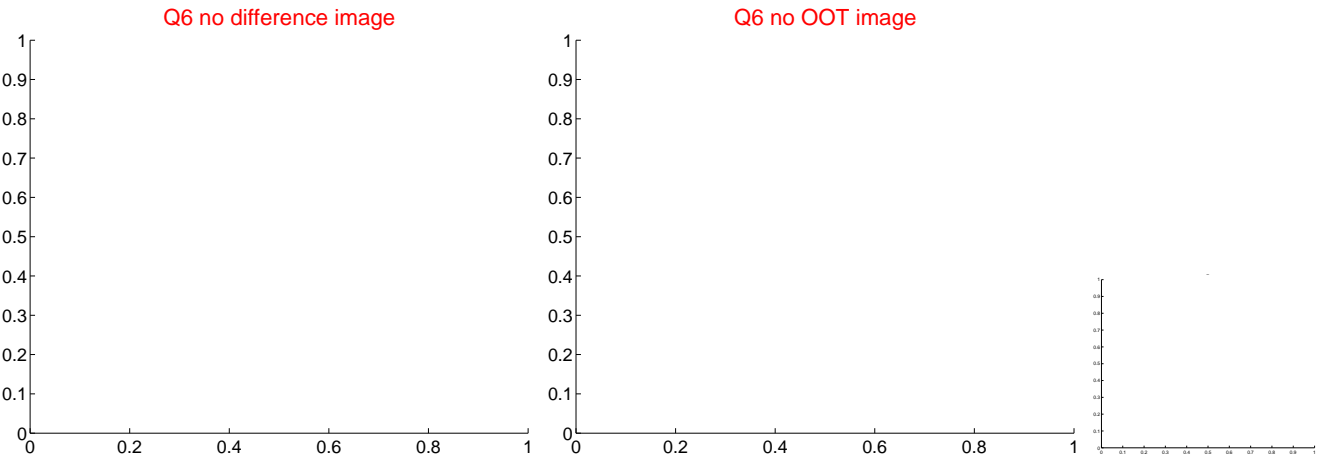
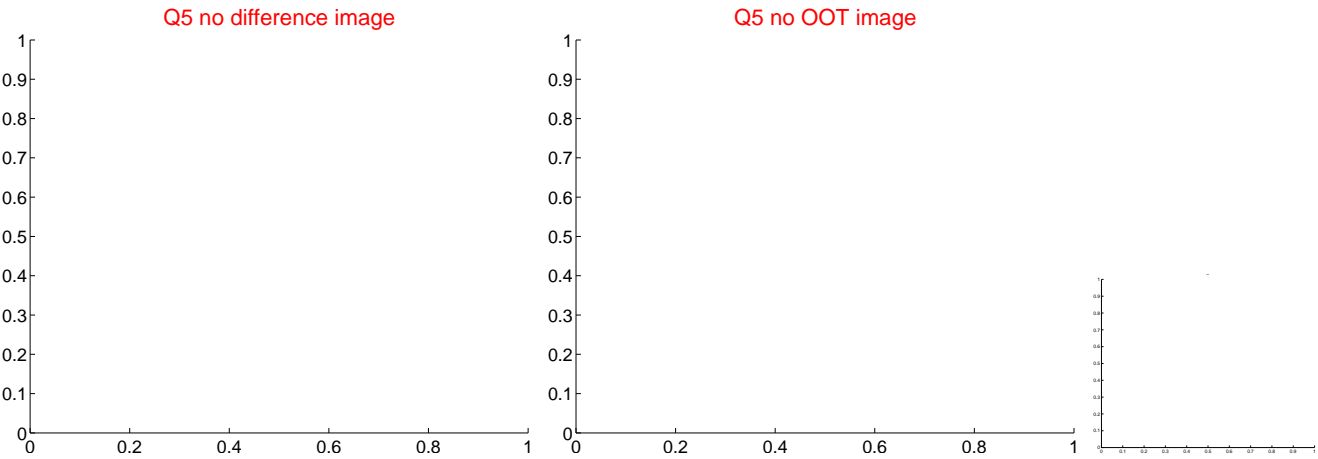


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

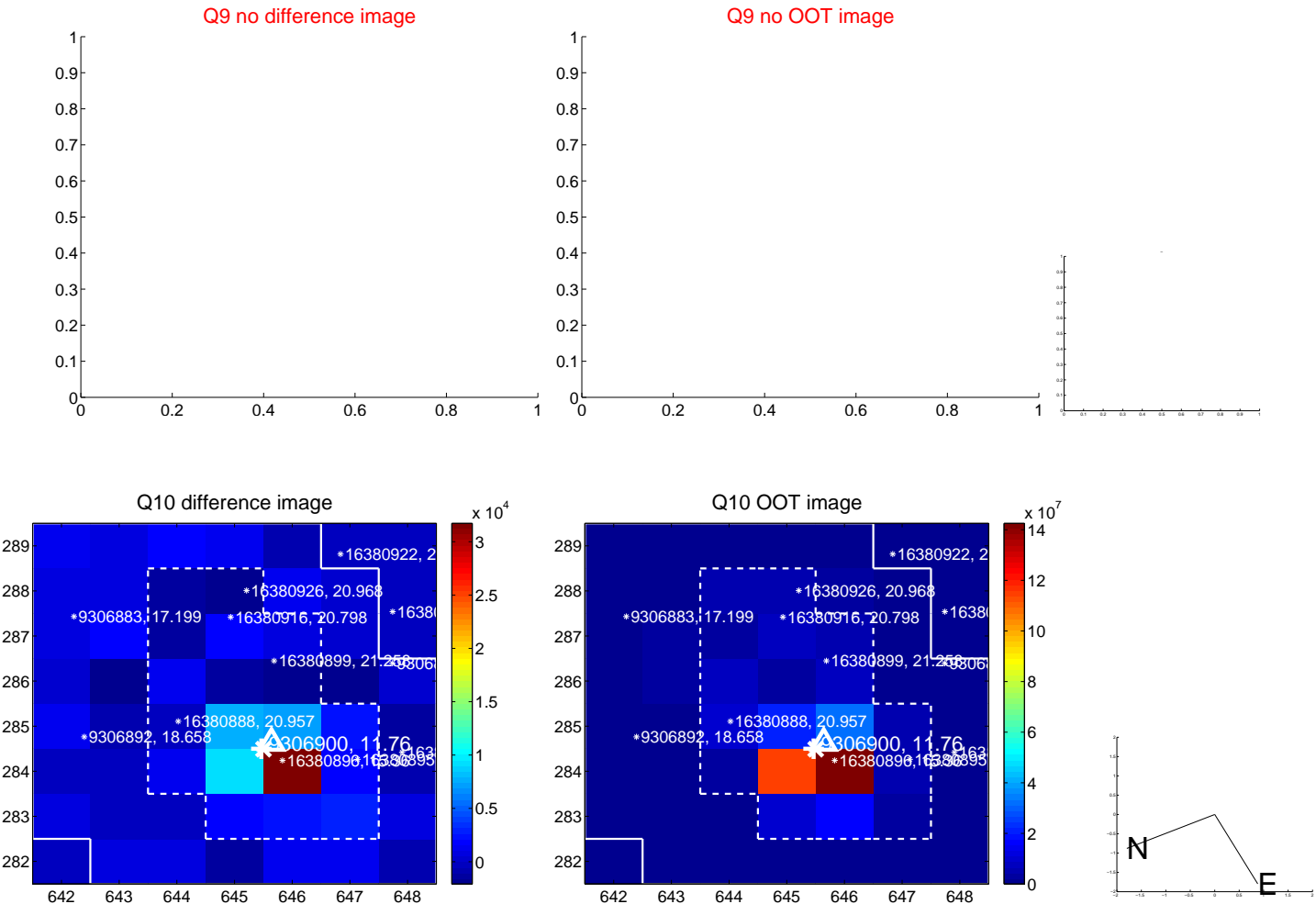
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



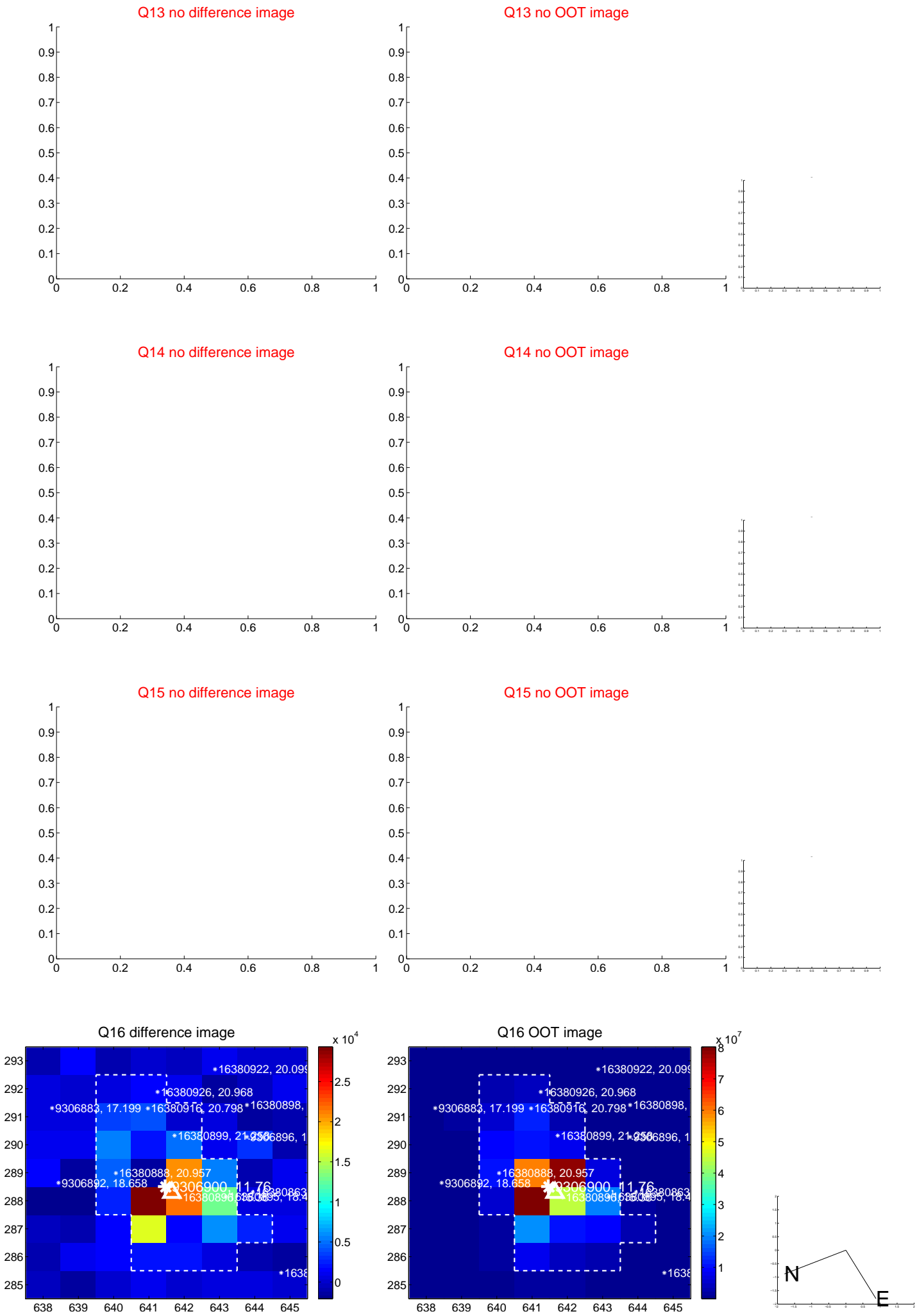
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



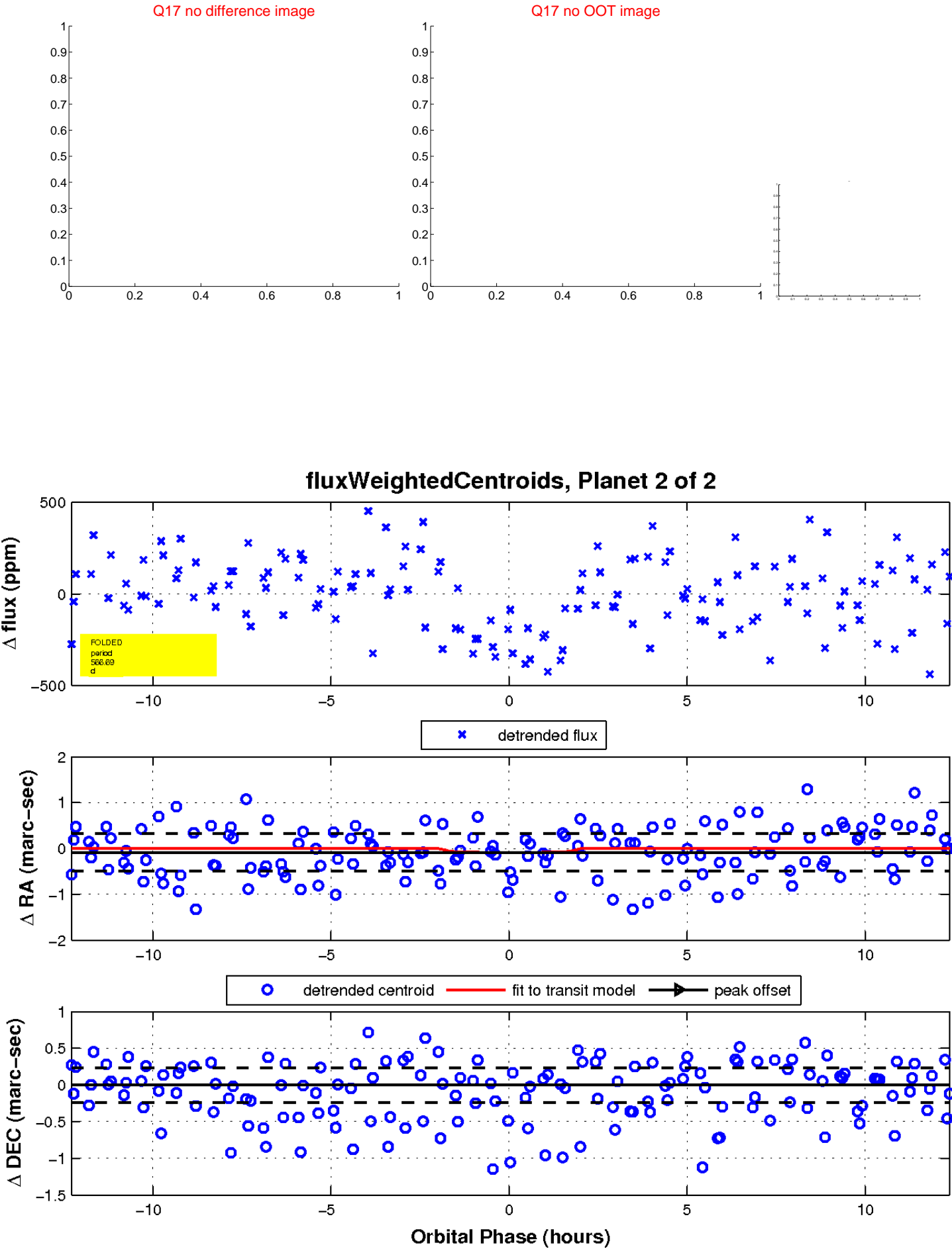
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

