

# KIC 010973060

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010973060-01	OBS	No	631.506996	266.037509	297.2	15.792	8.0	7.4	0.97	5885	1.78	0.49
010973060-02	OBS	No	649.695730	249.222050	293.0	14.369	9.0	6.5	0.97	5885	1.81	0.47

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010973060-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—INCONSISTENT_TRANS—CENT_FEW_DIFFS
010973060-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—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.

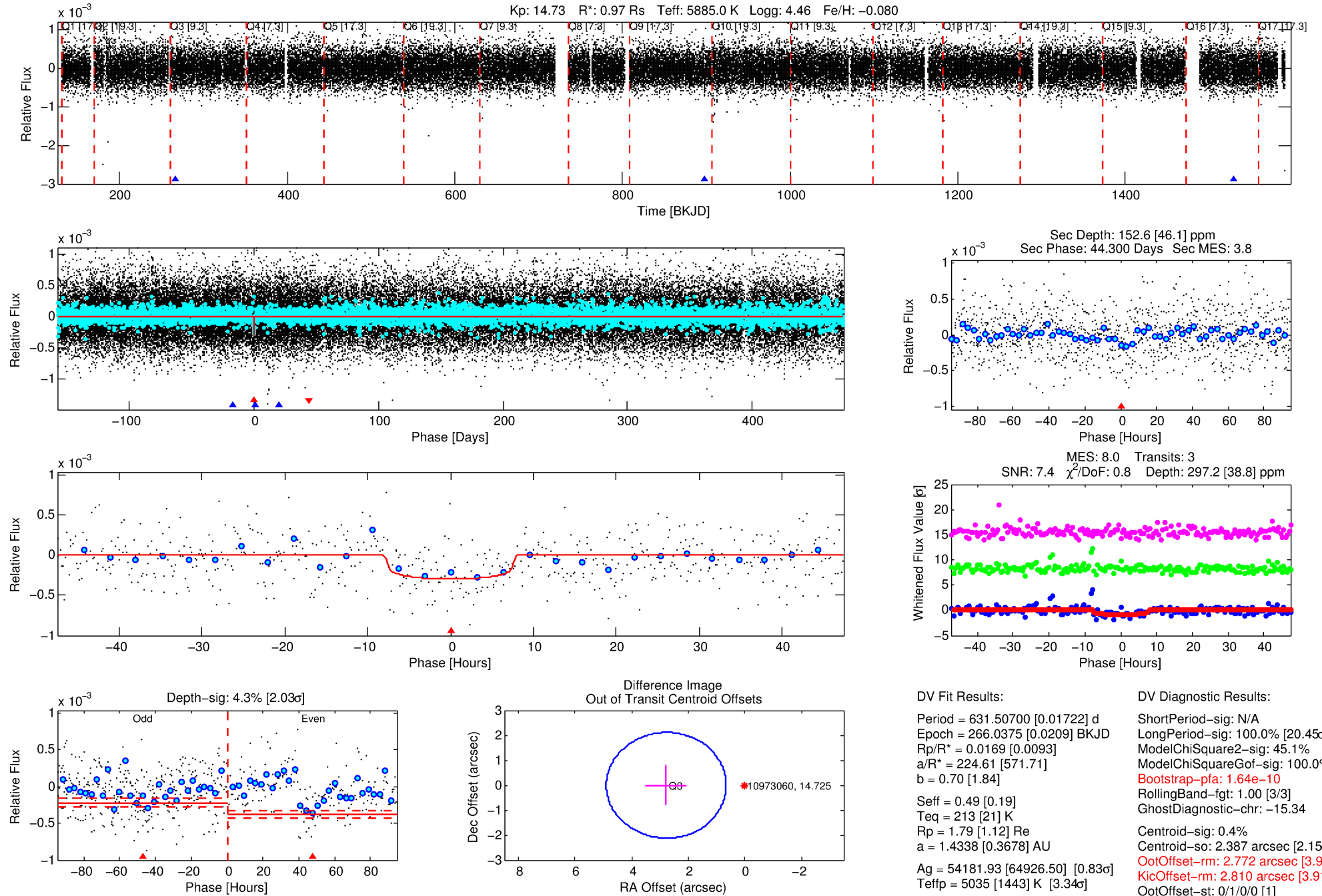
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 010973060-01

No Significant Match Found

# DV One-Page Summary

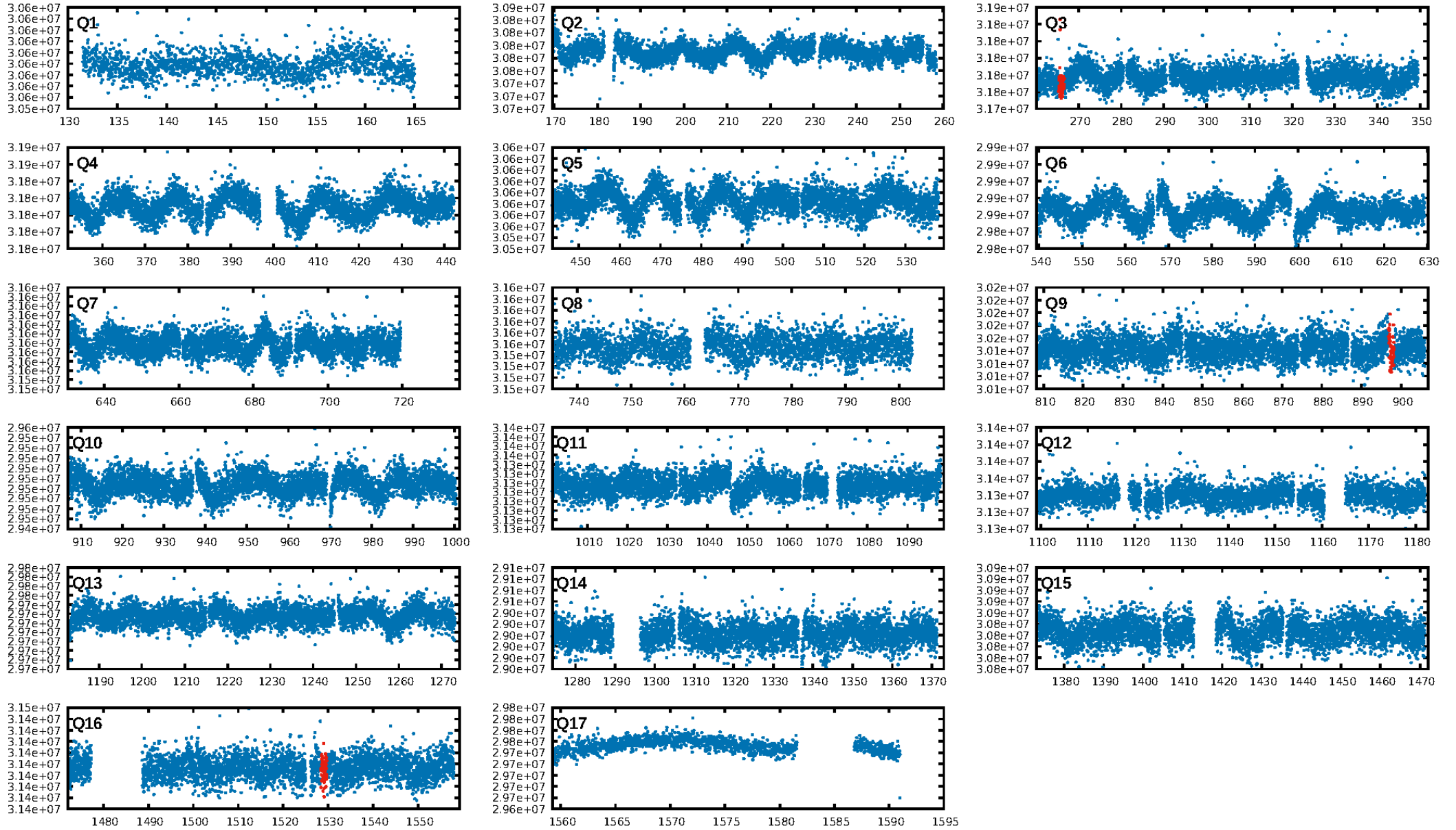
KIC: 10973060 Candidate: 1 of 2 Period: 631.507 d



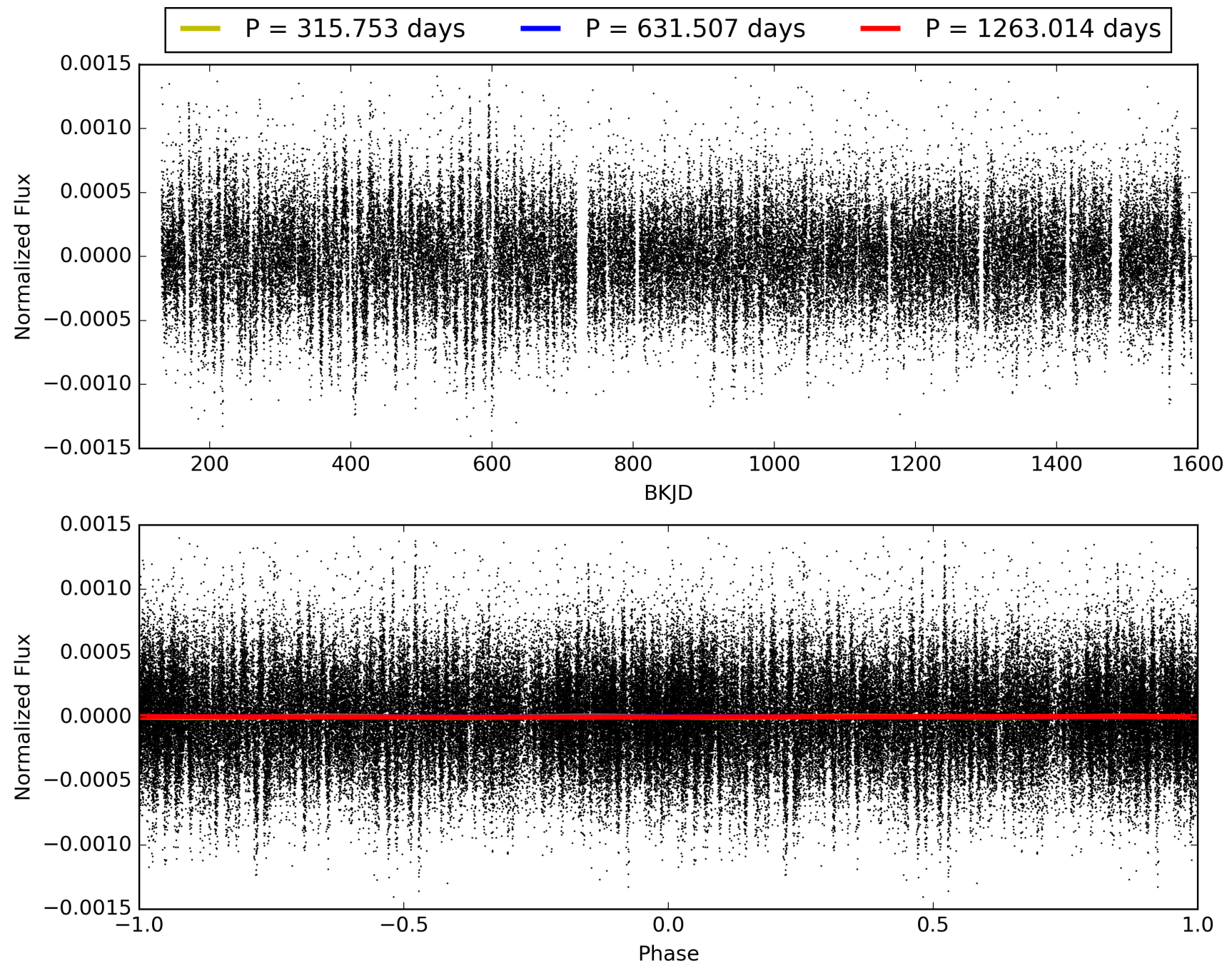
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 28-Jan-2016 23:39:53 Z

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

# TCE 010973060-01, PDC Light Curves

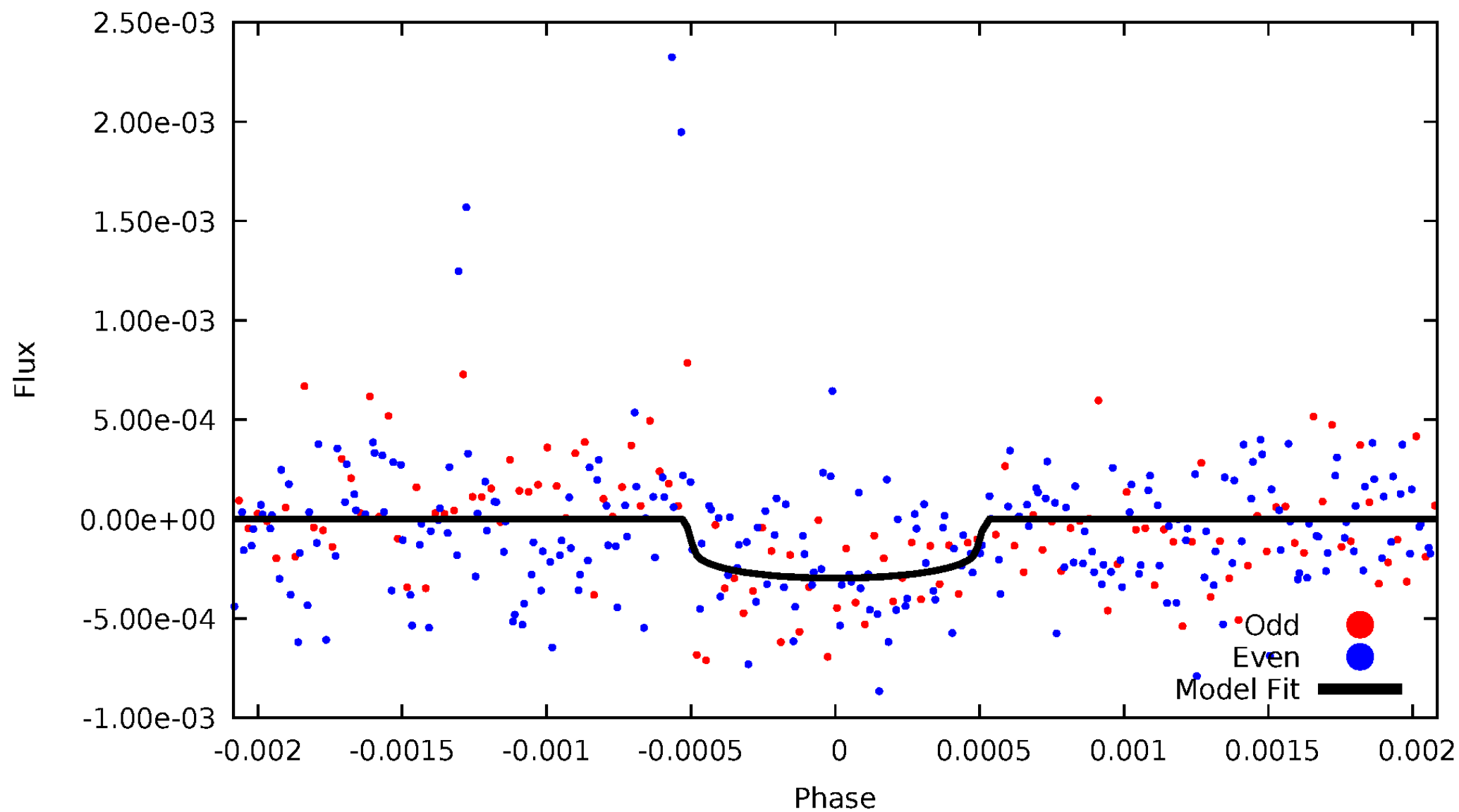


# TCE 010973060-01



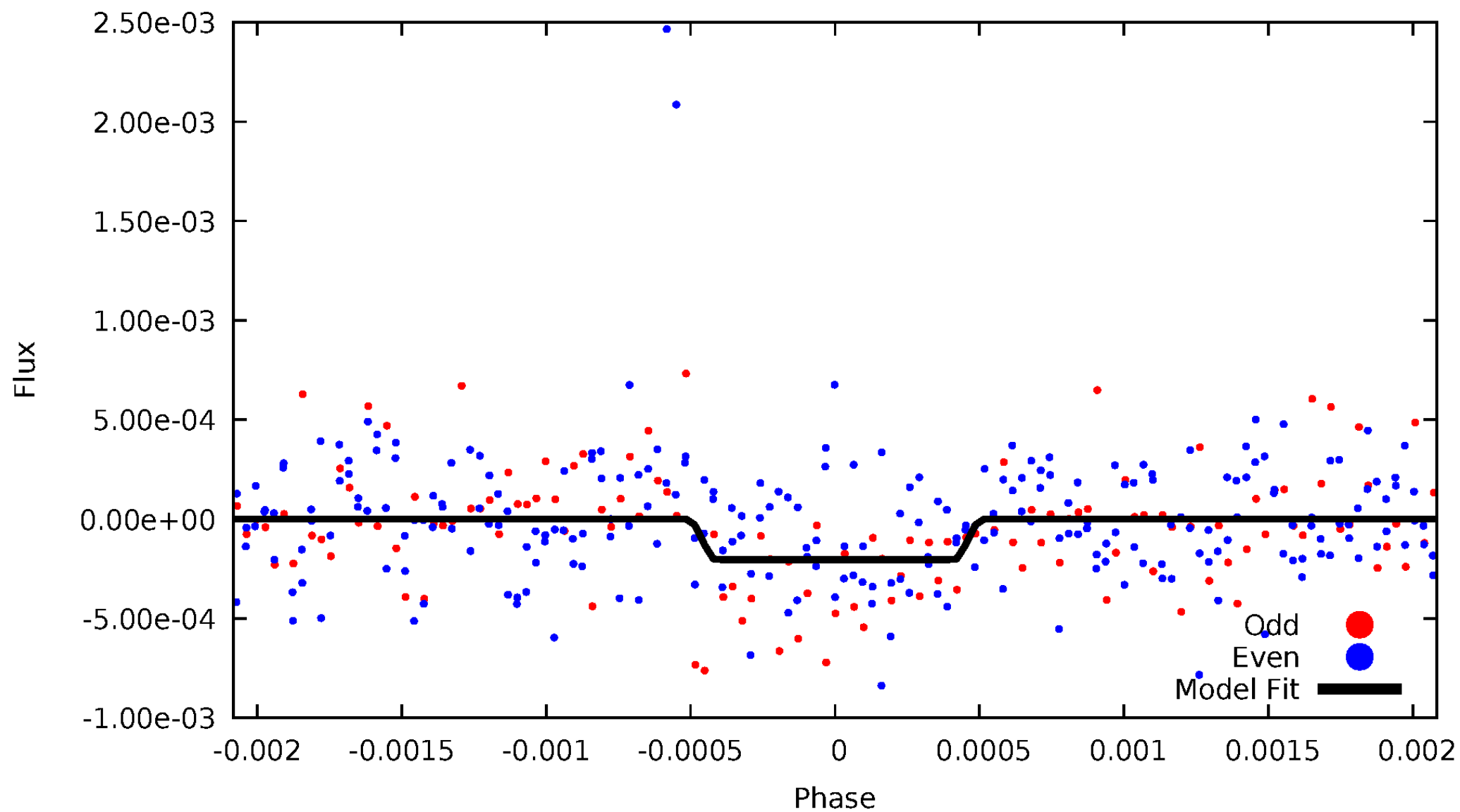
# DV Odd/Even

TCE 010973060-01



# ALT Odd/Even

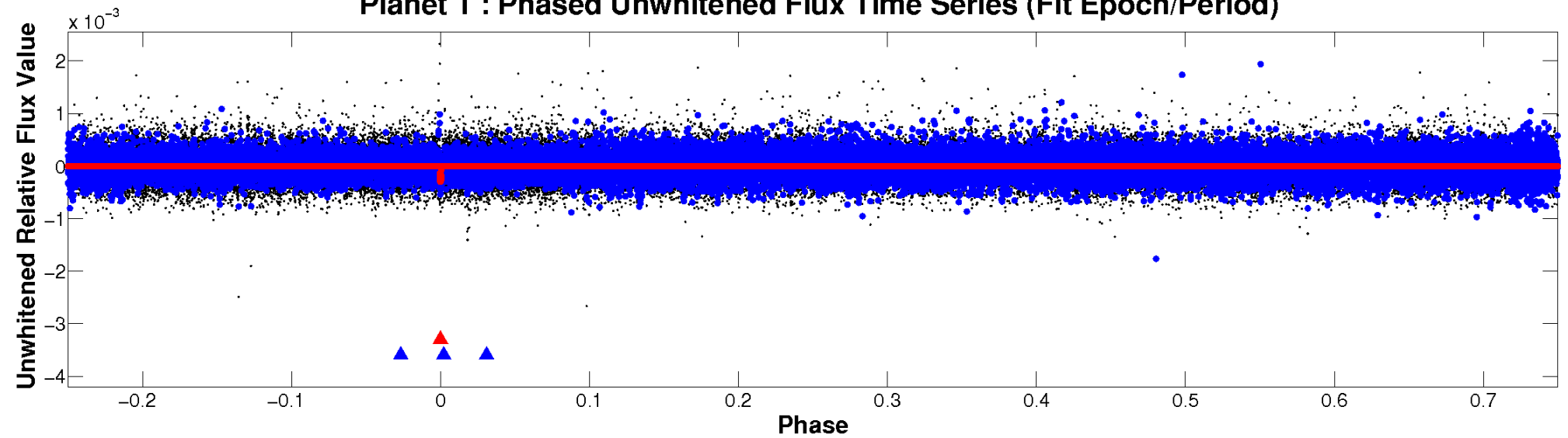
TCE 010973060-01



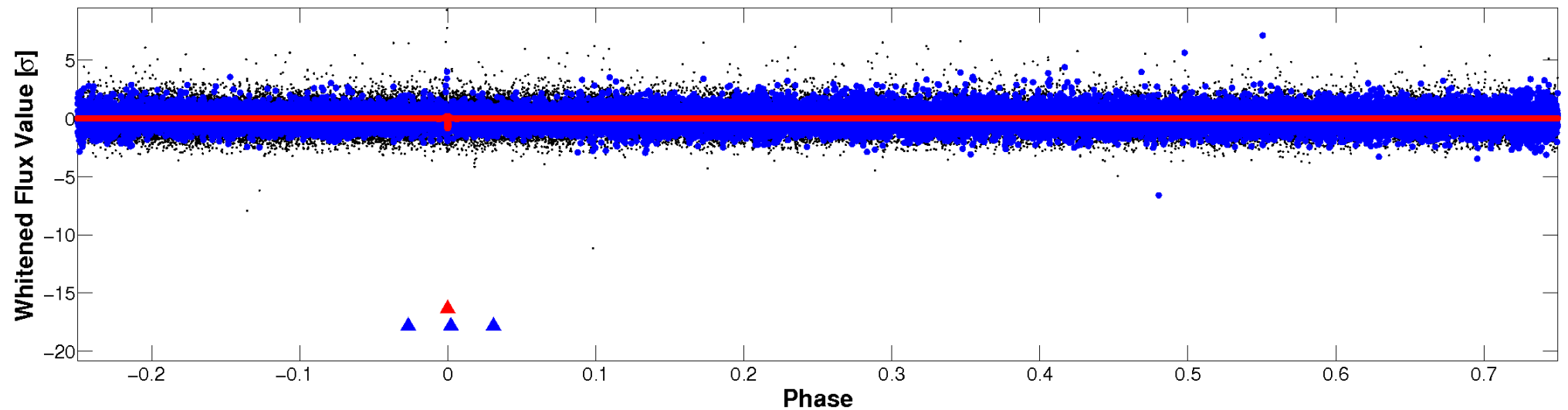


# Non-Whitened Vs. Whitened Light Curve

**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

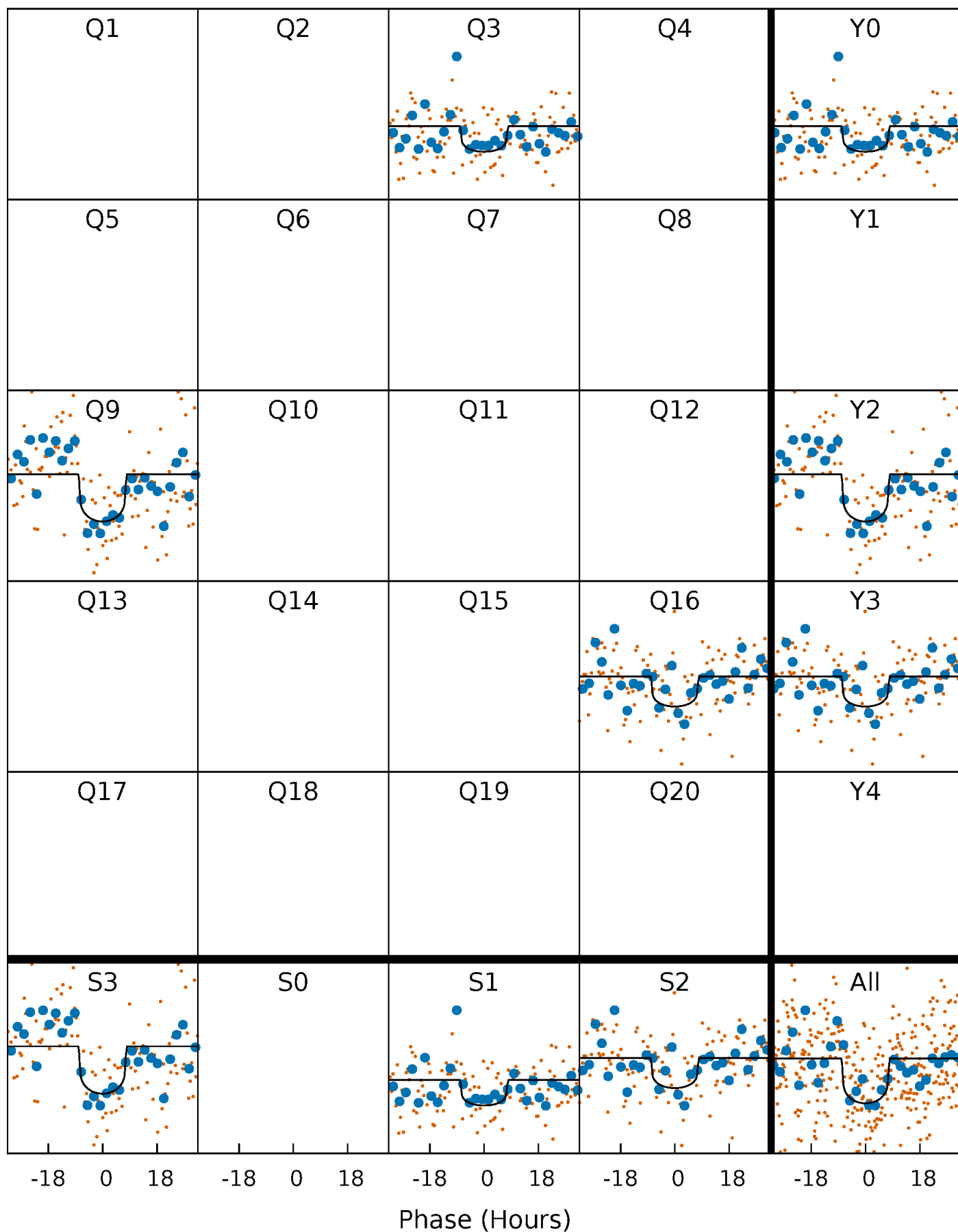
TCE 010973060-01 P=631.506996 Days  $T_0=266.037509$  (BKJD)





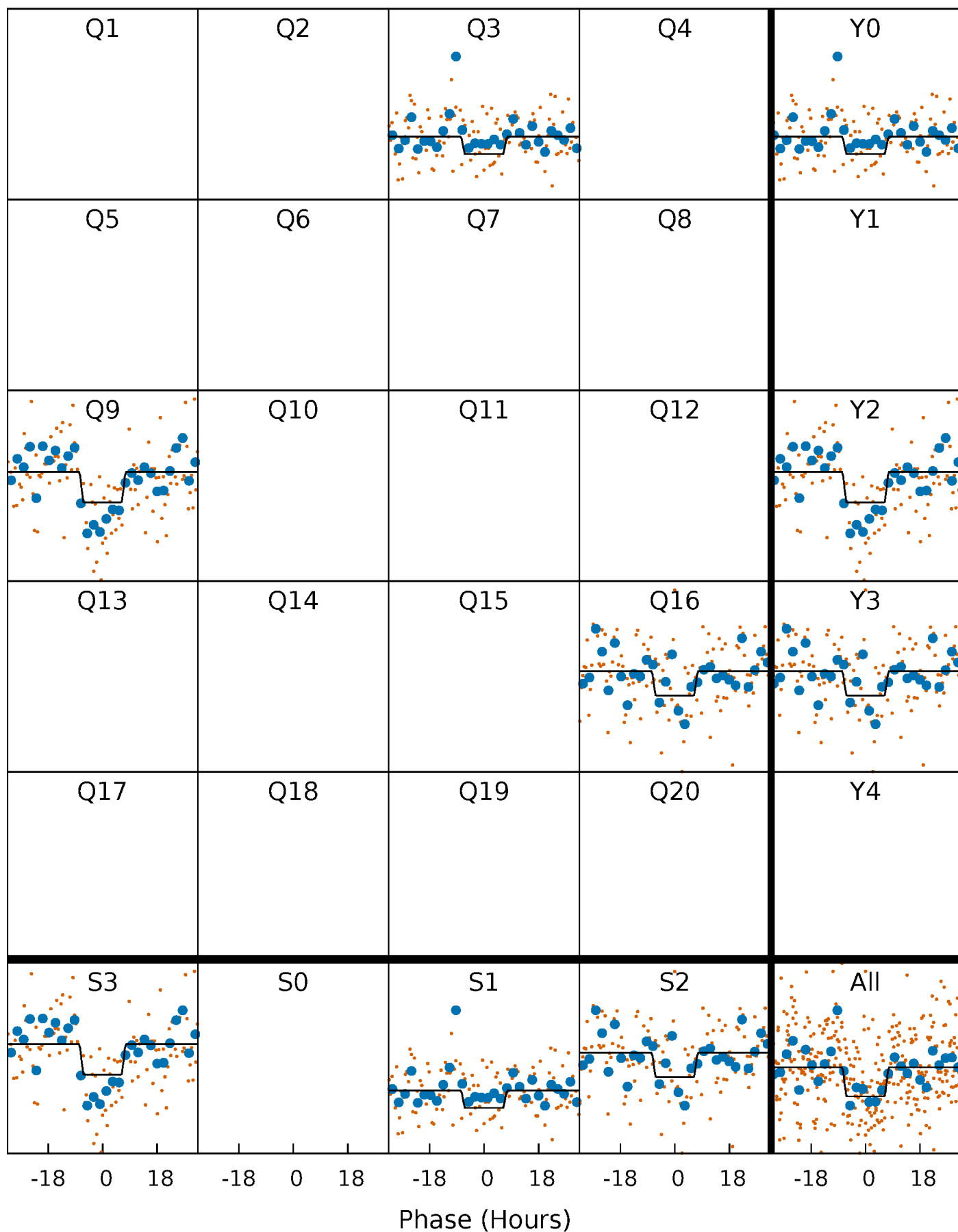
# DV Quarter-Phased Transit Curves

TCE 010973060-01     $P=631.506996$  Days     $T_0=266.037509$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

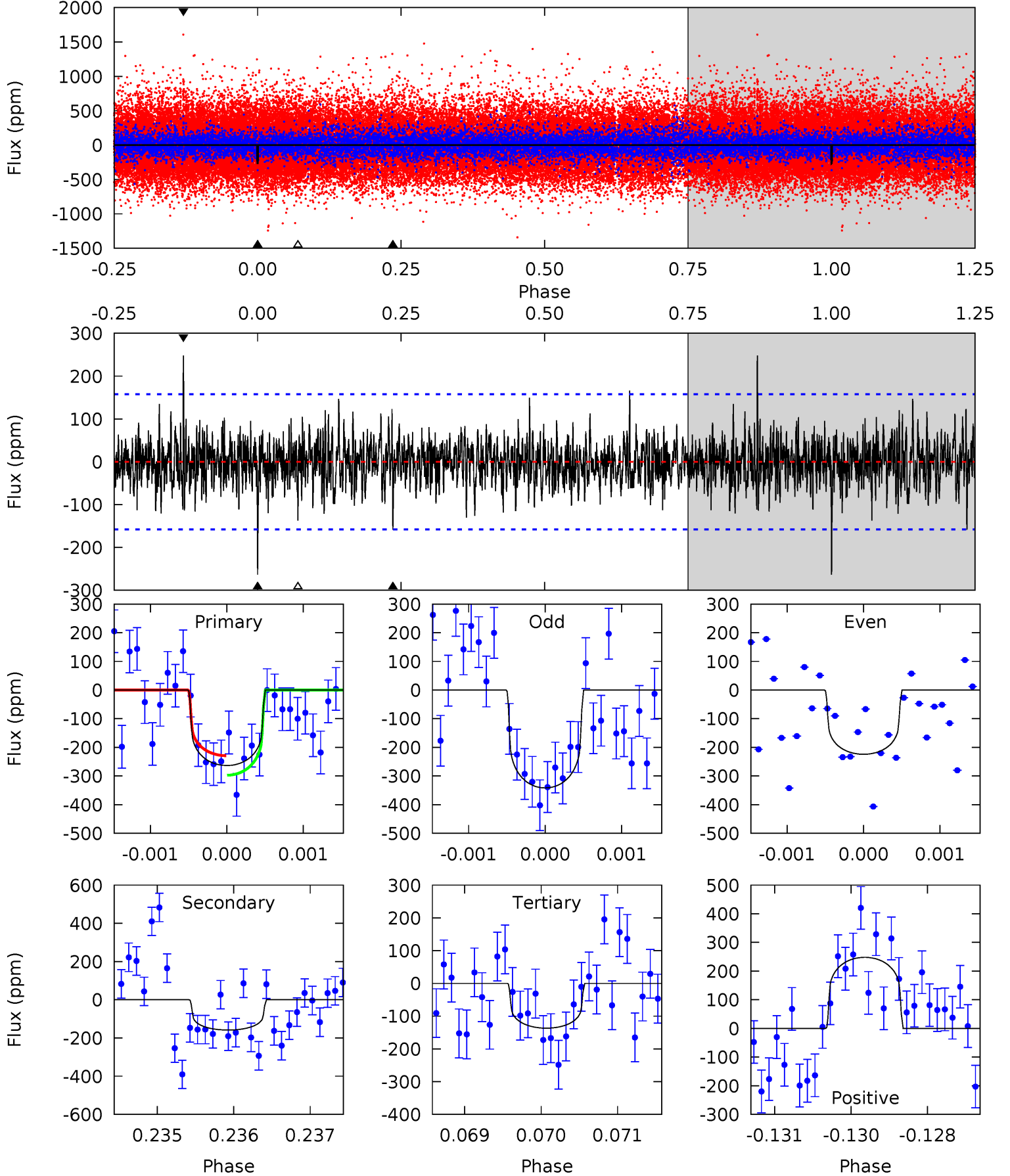
TCE 010973060-01 P=631.499172 Days  $T_0=266.047929$  (BKJD)



# DV Model-Shift Uniqueness Test

010973060-01, P = 631.506996 Days, E = 266.037509 Days

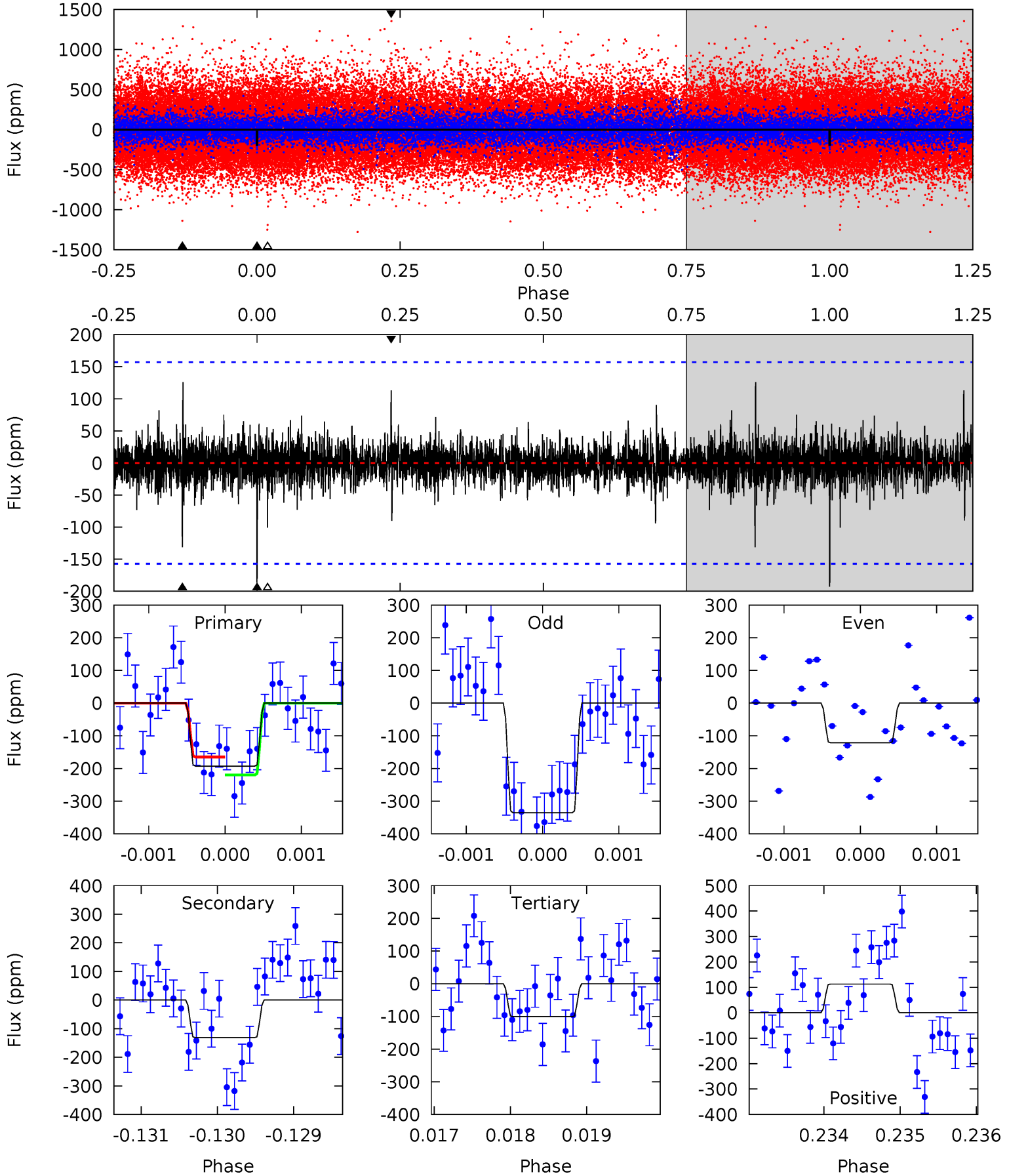
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
9.09	5.47	4.72	8.56	5.44	3.27	1.43	4.37	0.53	0.75	-3.09	1.92	1.16	0.48	1.18



# Alt Model-Shift Uniqueness Test

010973060-01, P = 631.499172 Days, E = 266.047929 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
6.69	4.55	3.49	3.92	5.45	3.29	0.71	3.19	2.77	1.06	0.63	3.52	1.13	0.39	0.96



### Stellar Parameters For KIC 010973060

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5885^{+158}_{-193}$	$4.459^{+0.067}_{-0.202}$	$-0.080^{+0.300}_{-0.300}$	$0.969^{+0.297}_{-0.099}$	$0.987^{+0.128}_{-0.117}$	$1.528^{+0.518}_{-0.748}$
	+3%/-3%	+2%/-5%	+375%/-375%	+31%/-10%	+13%/-12%	+34%/-49%
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 010973060-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-158 \pm 29$	$1.94^{+1.03}_{-0.98}$	$302^{+21}_{-14}$	$5047^{+1994}_{-779}$	$47586^{+134307}_{-27941}$
Alt.	$-131 \pm 29$	$1.61^{+1.02}_{-0.86}$	$302^{+22}_{-15}$	$5209^{+2753}_{-932}$	$55707^{+219200}_{-35586}$

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

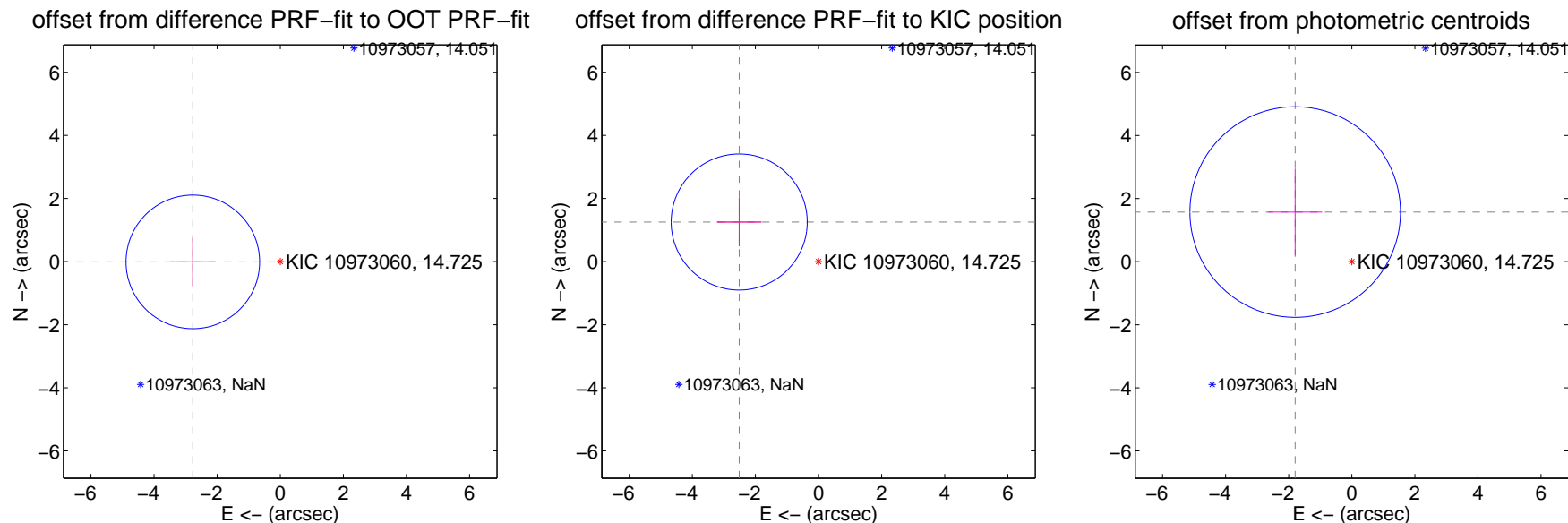
## DV Centroid Data

Supplemental centroid analysis for 010973060-01. Kepler magnitude: 14.72. Transit SNR 7.40

There are 0 quarters with good PRF difference image offsets

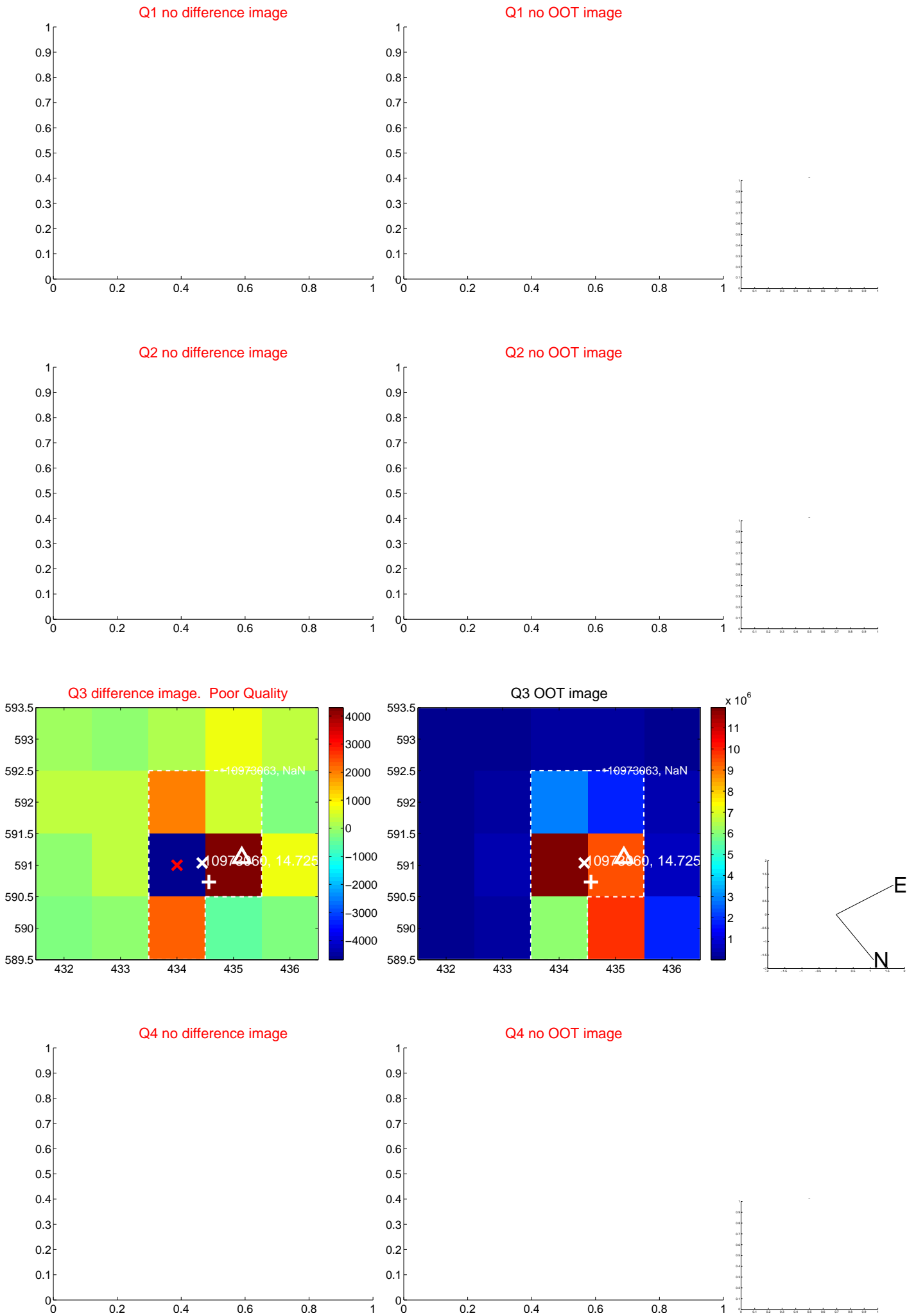
The direct PRF centroid is offset from the target star catalog position by about 1.29 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$2.772 \pm 0.706$	3.93	$2.772 \pm 0.706$	$-0.009 \pm 0.769$
PRF-fit source offset from KIC position	$2.810 \pm 0.719$	3.91	$2.515 \pm 0.706$	$1.254 \pm 0.769$
photometric centroid source offset	$2.39 \pm 1.11$	2.15	$1.80 \pm 0.86$	$1.57 \pm 1.38$



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.

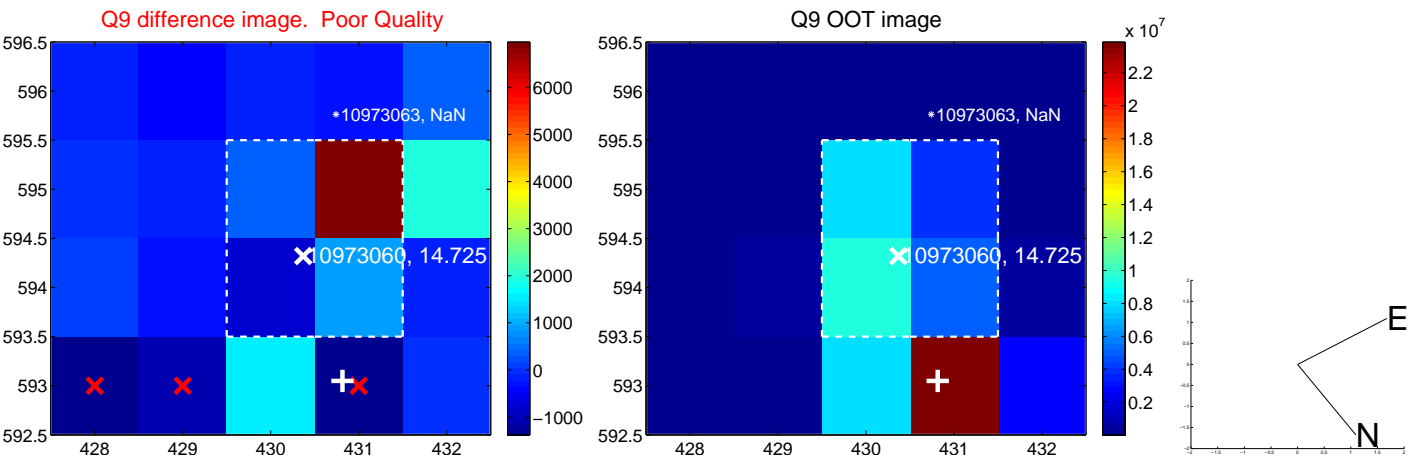




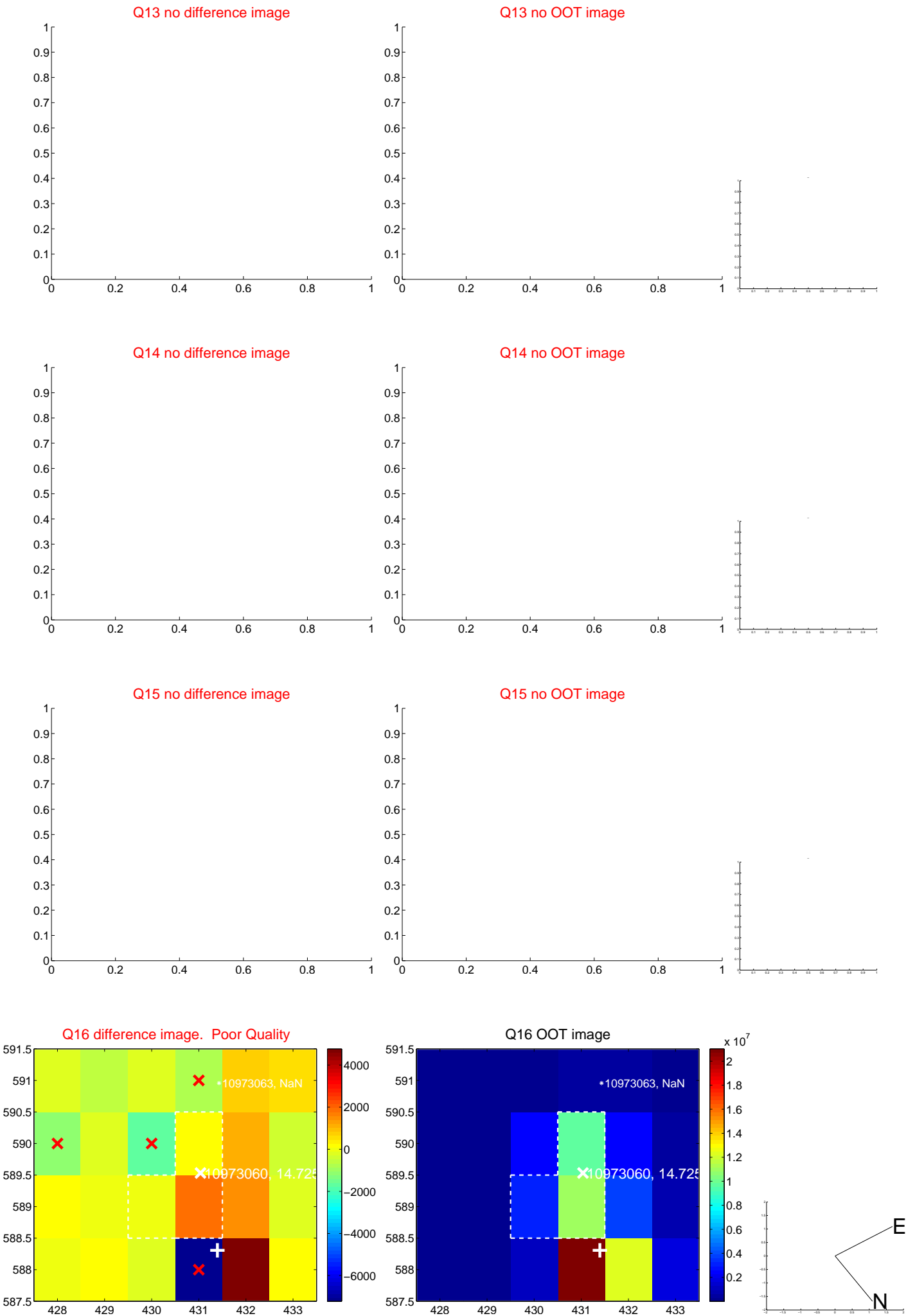
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



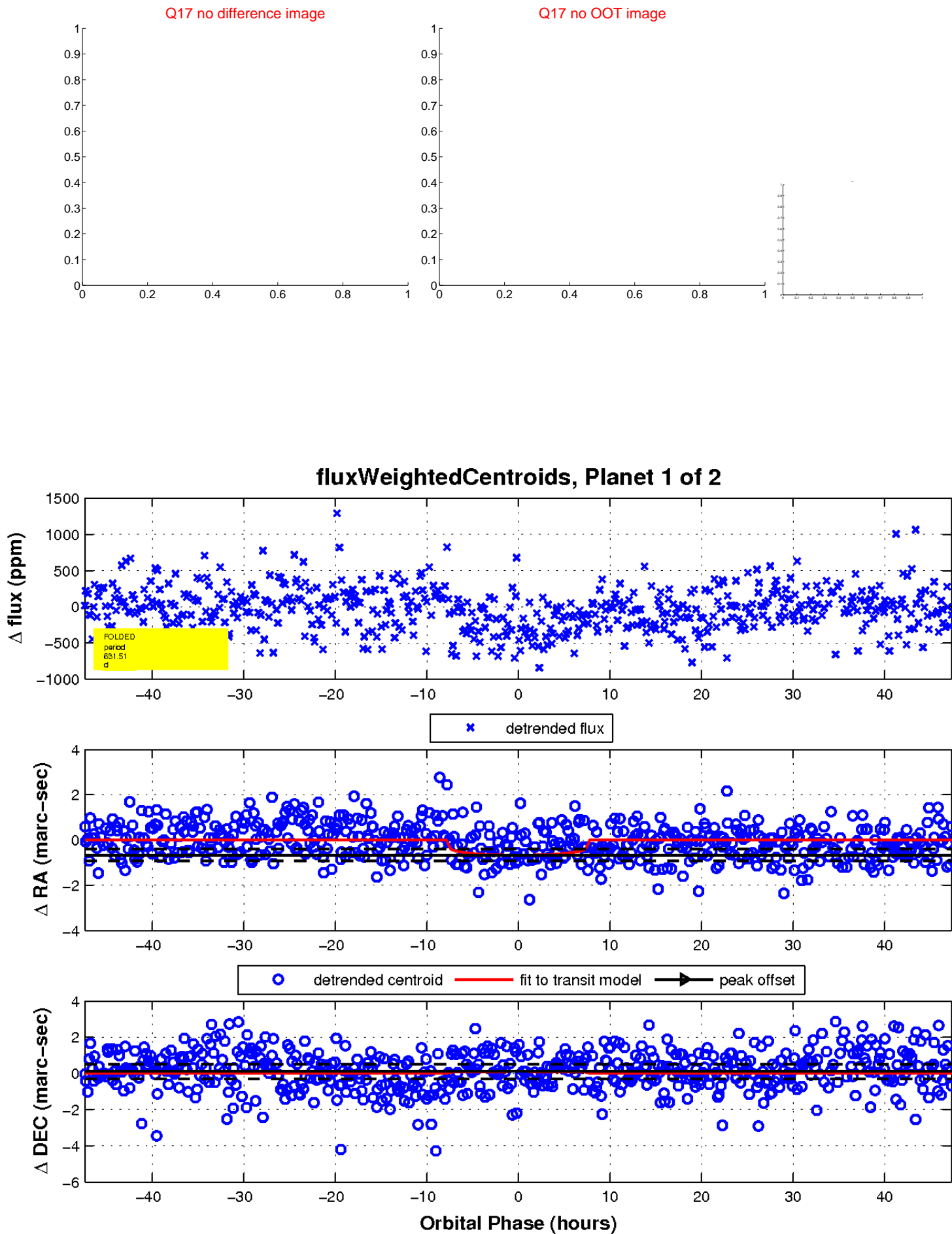
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.



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

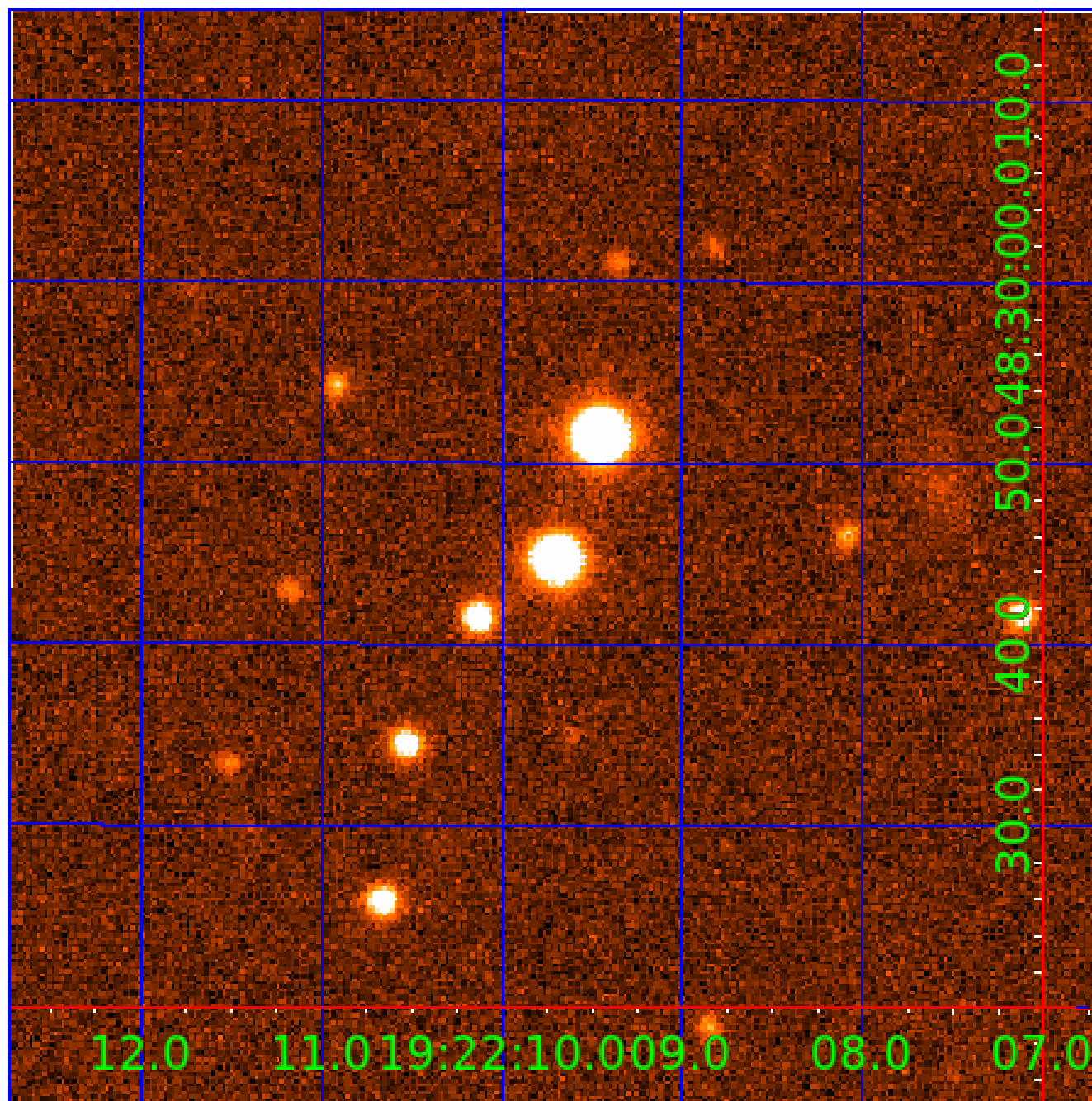


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 010973060

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010973060-01	OBS	No	631.506996	266.037509	297.2	15.792	8.0	7.4	0.97	5885	1.78	0.49
010973060-02	OBS	No	649.695730	249.222050	293.0	14.369	9.0	6.5	0.97	5885	1.81	0.47

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010973060-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—INCONSISTENT_TRANS—CENT_FEW_DIFFS
010973060-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—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.

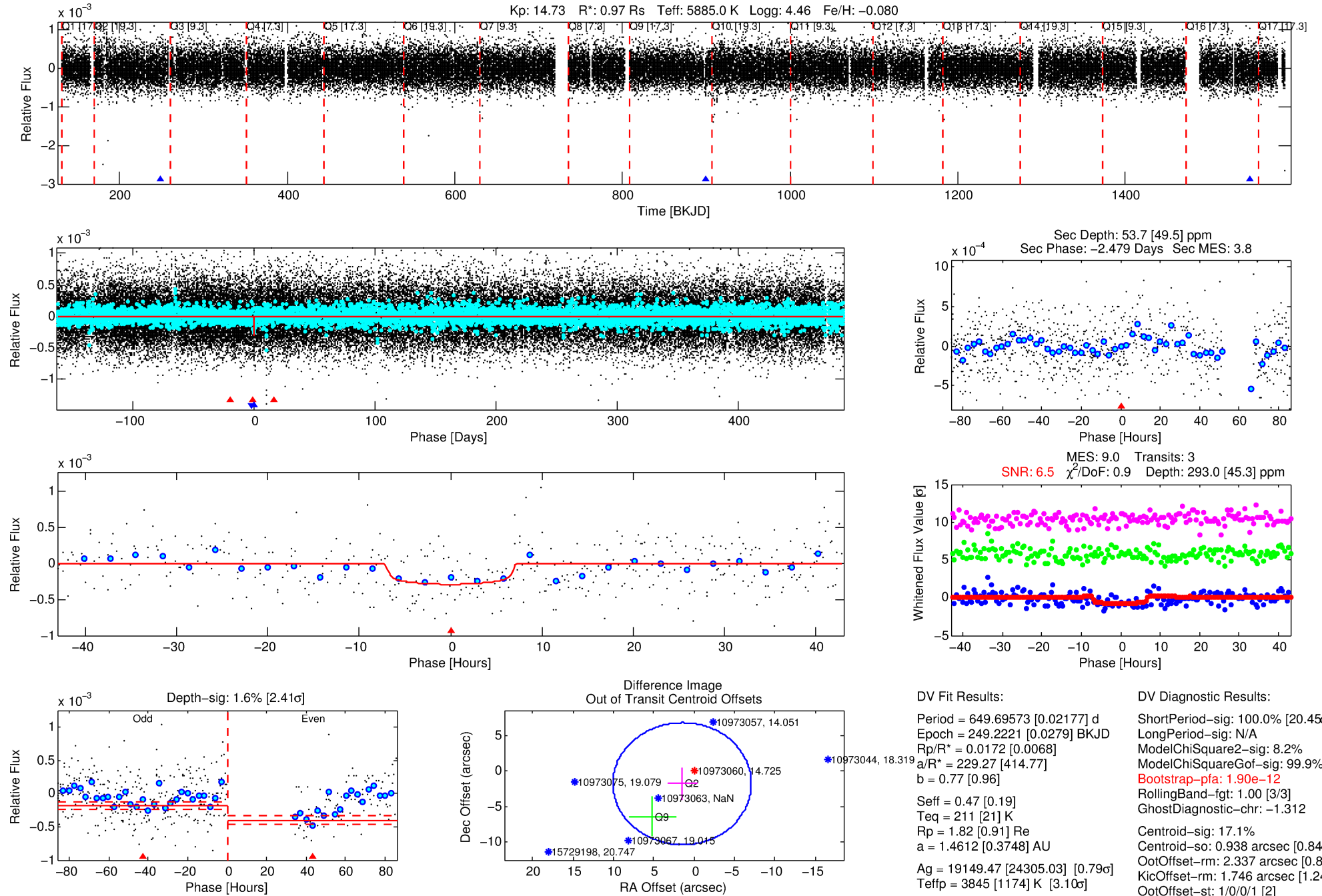
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 010973060-02

No Significant Match Found

# DV One-Page Summary

KIC: 10973060 Candidate: 2 of 2 Period: 649.696 d

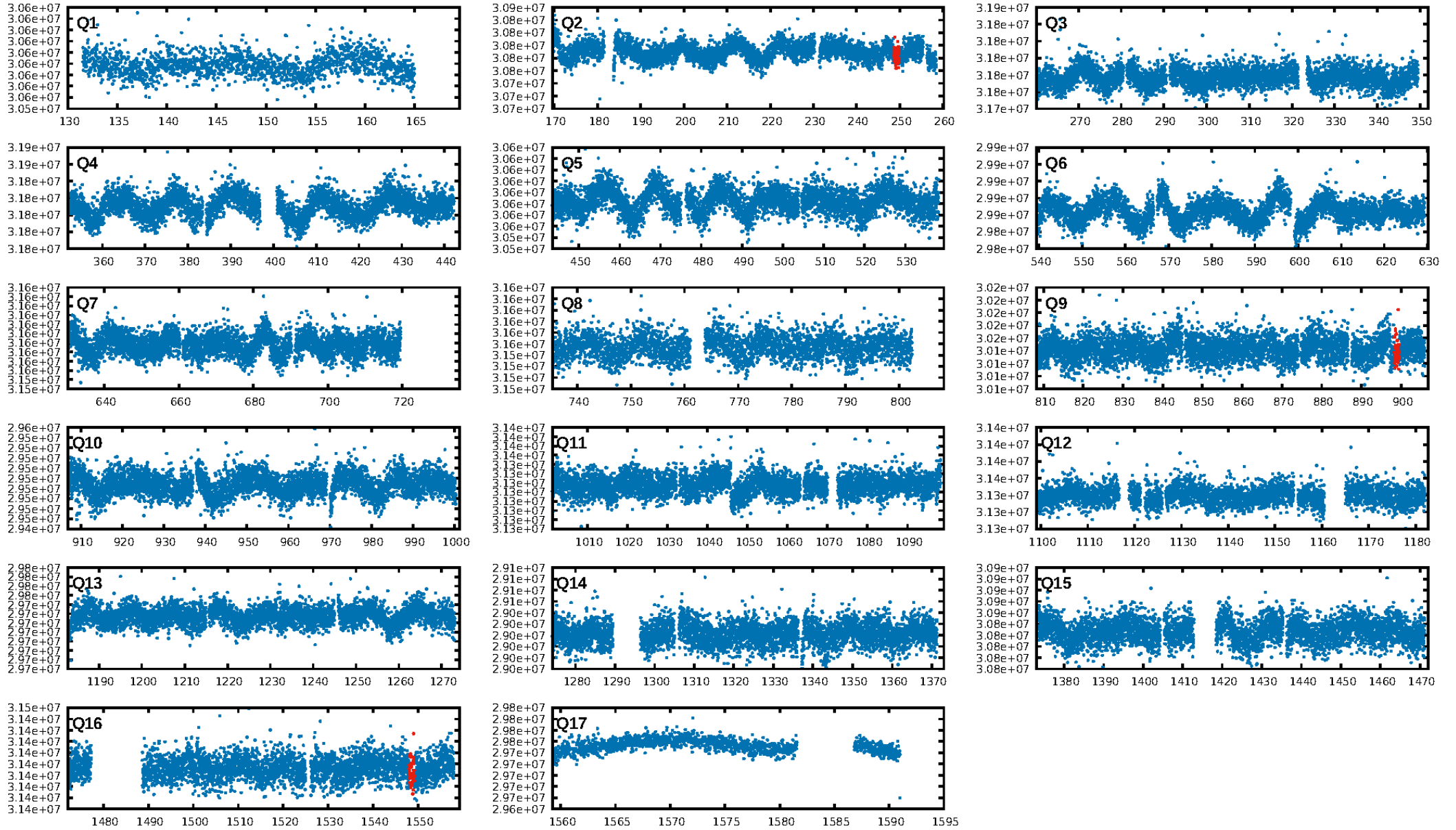


Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 28-Jan-2016 23:40:04 Z

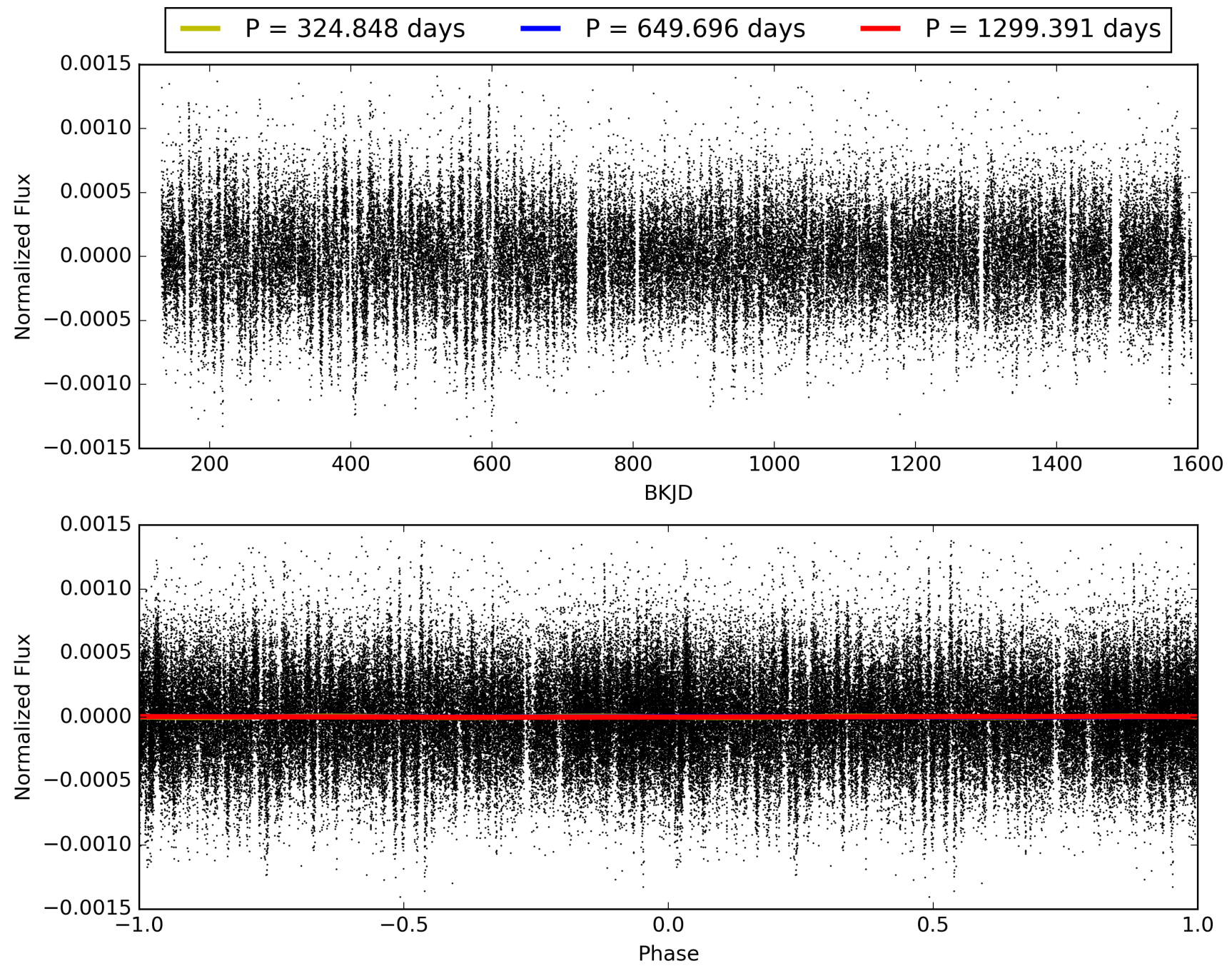
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center



# TCE 010973060-02, PDC Light Curves

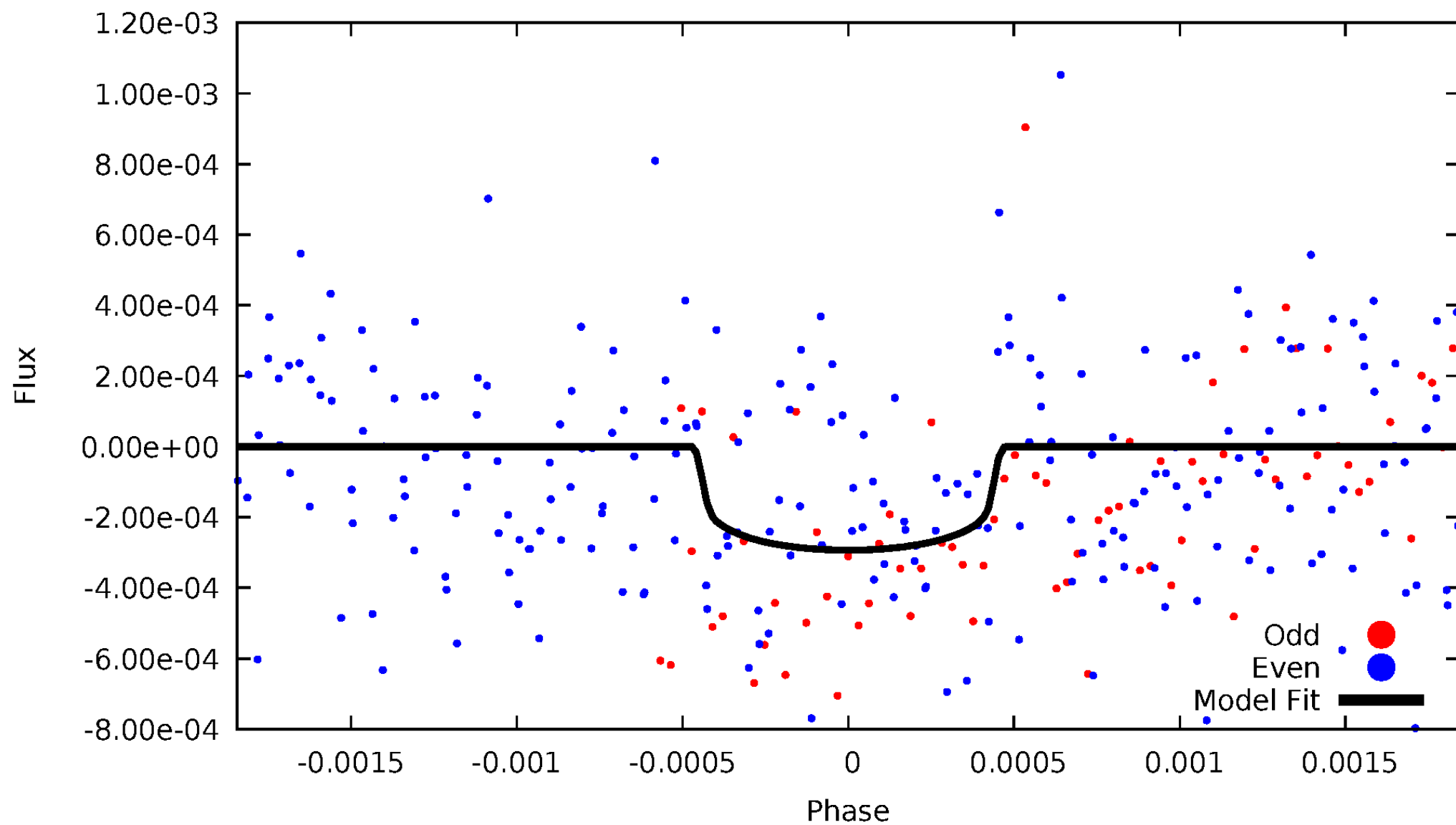


TCE 010973060-02



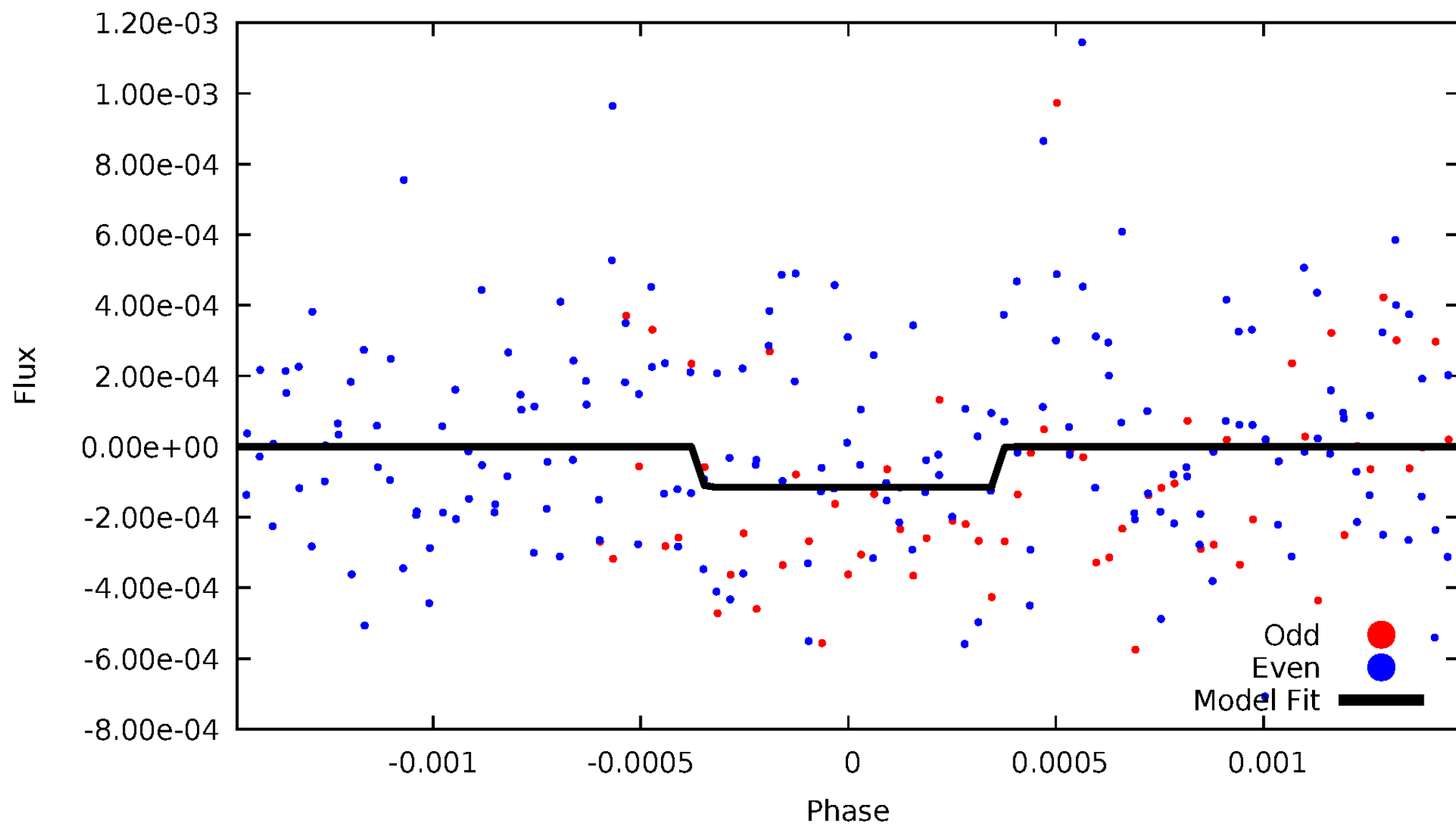
# DV Odd/Even

TCE 010973060-02



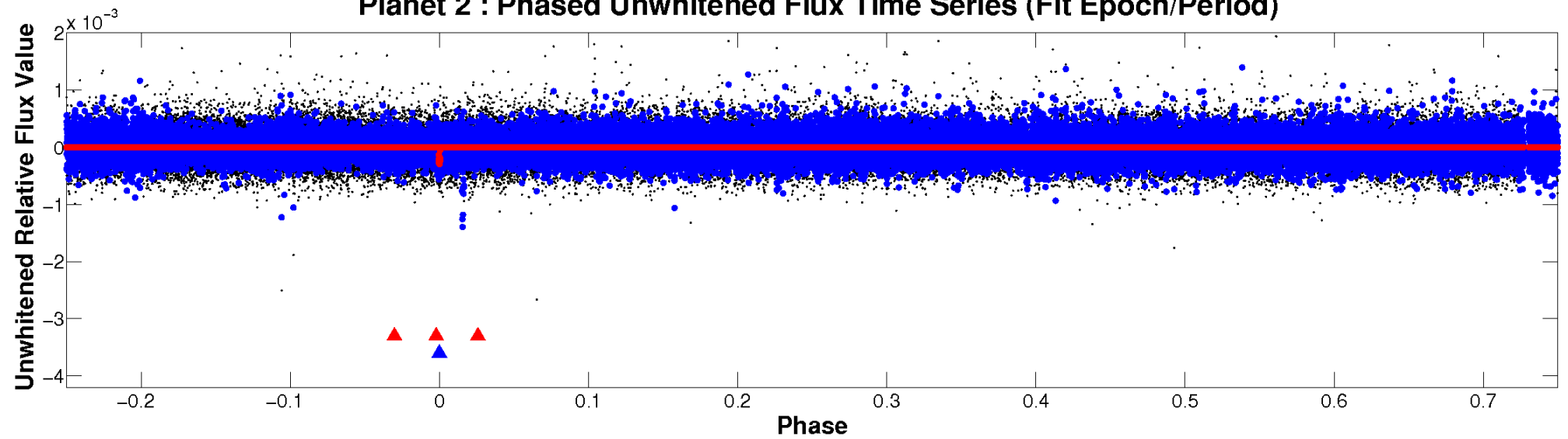
# ALT Odd/Even

TCE 010973060-02

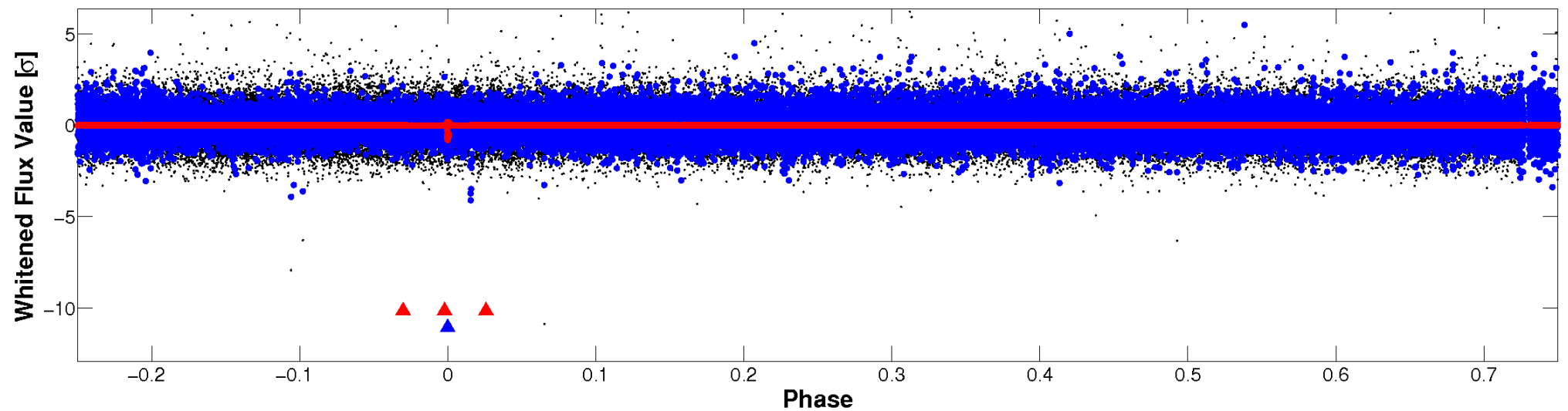


# Non-Whitened Vs. Whitened Light Curve

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



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



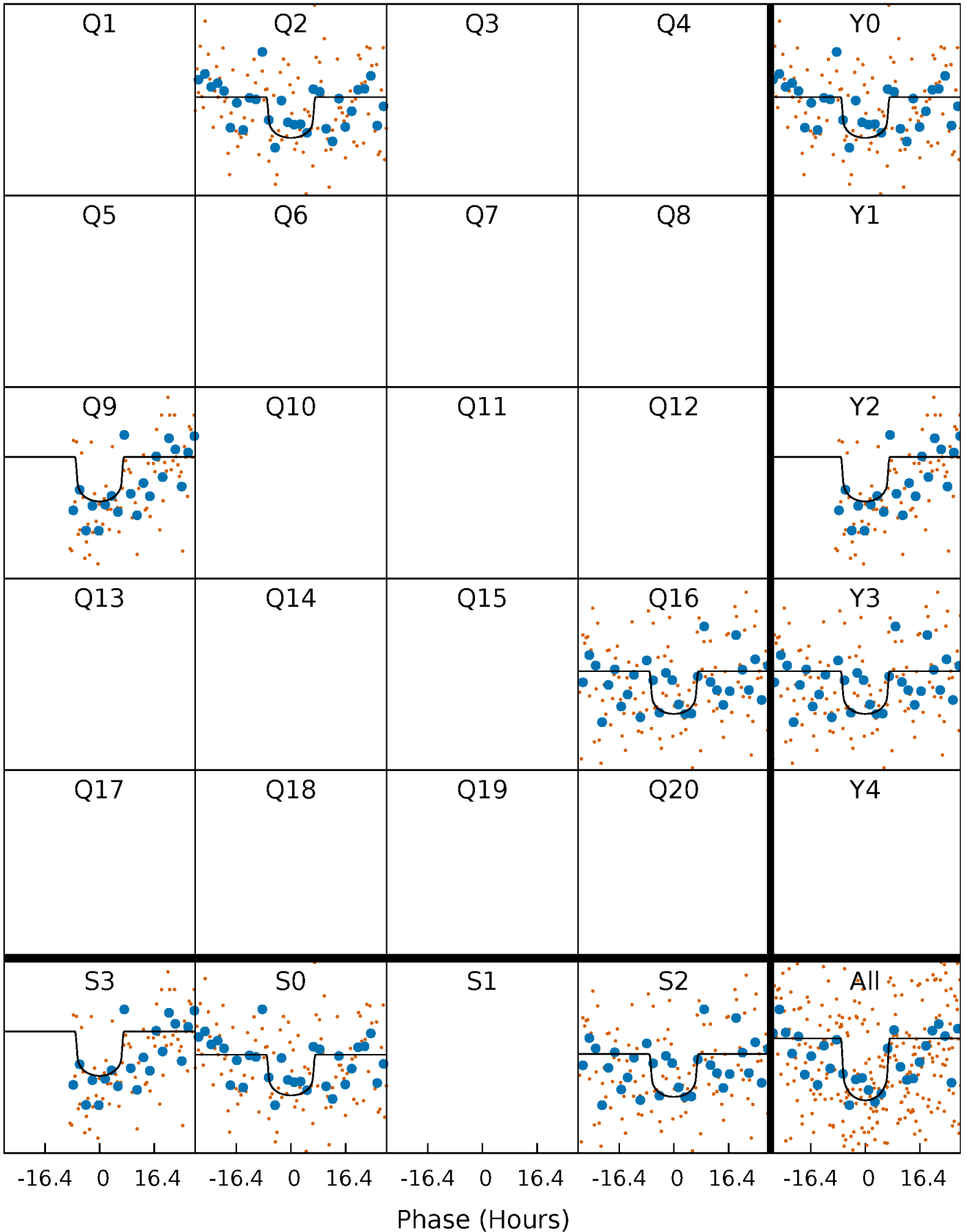
# PDC Quarter-Phased Transit Curves

TCE 010973060-02     $P=649.695730$  Days     $T_0=249.222050$  (BKJD)



# DV Quarter-Phased Transit Curves

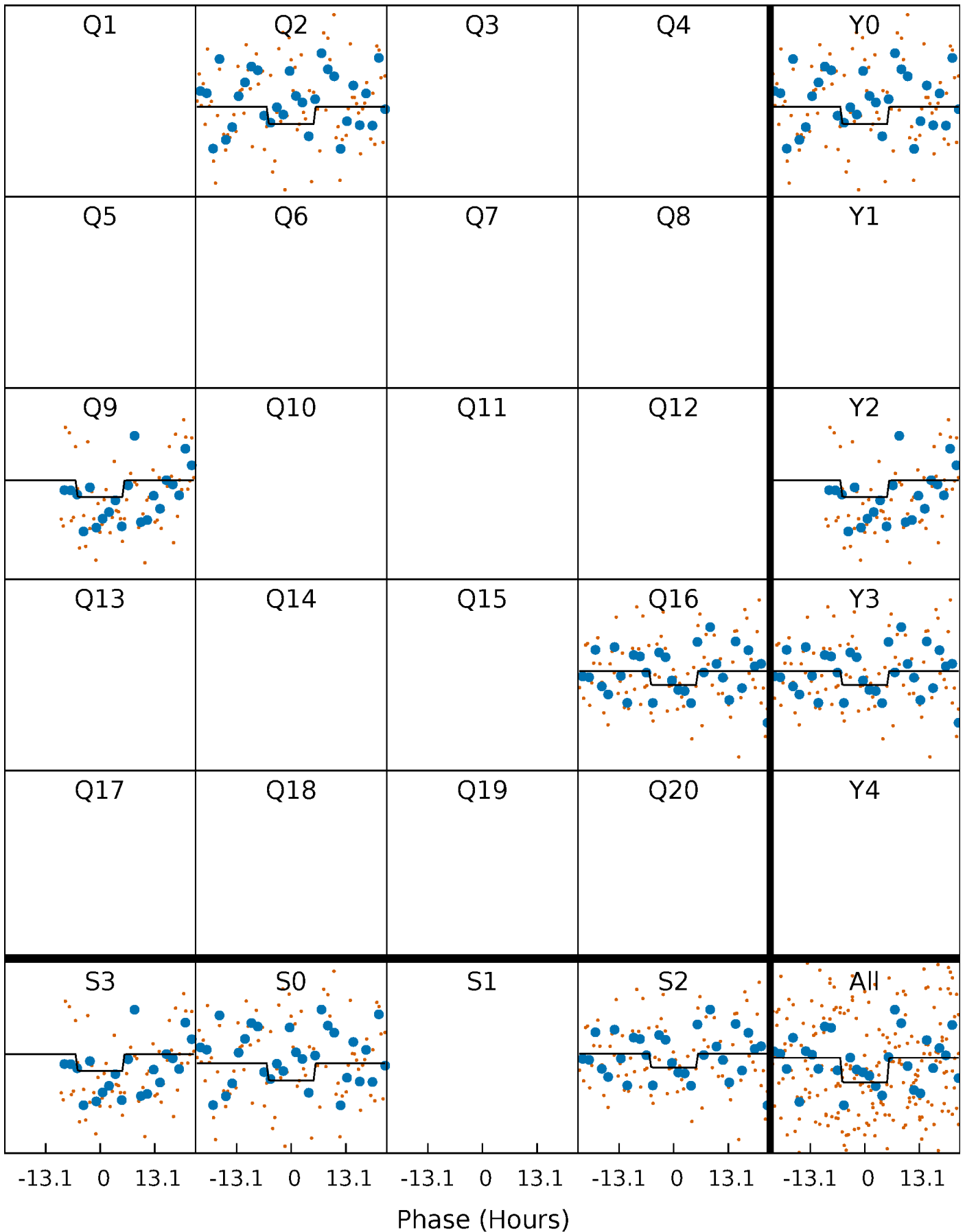
TCE 010973060-02     $P=649.695730$  Days     $T_0=249.222050$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

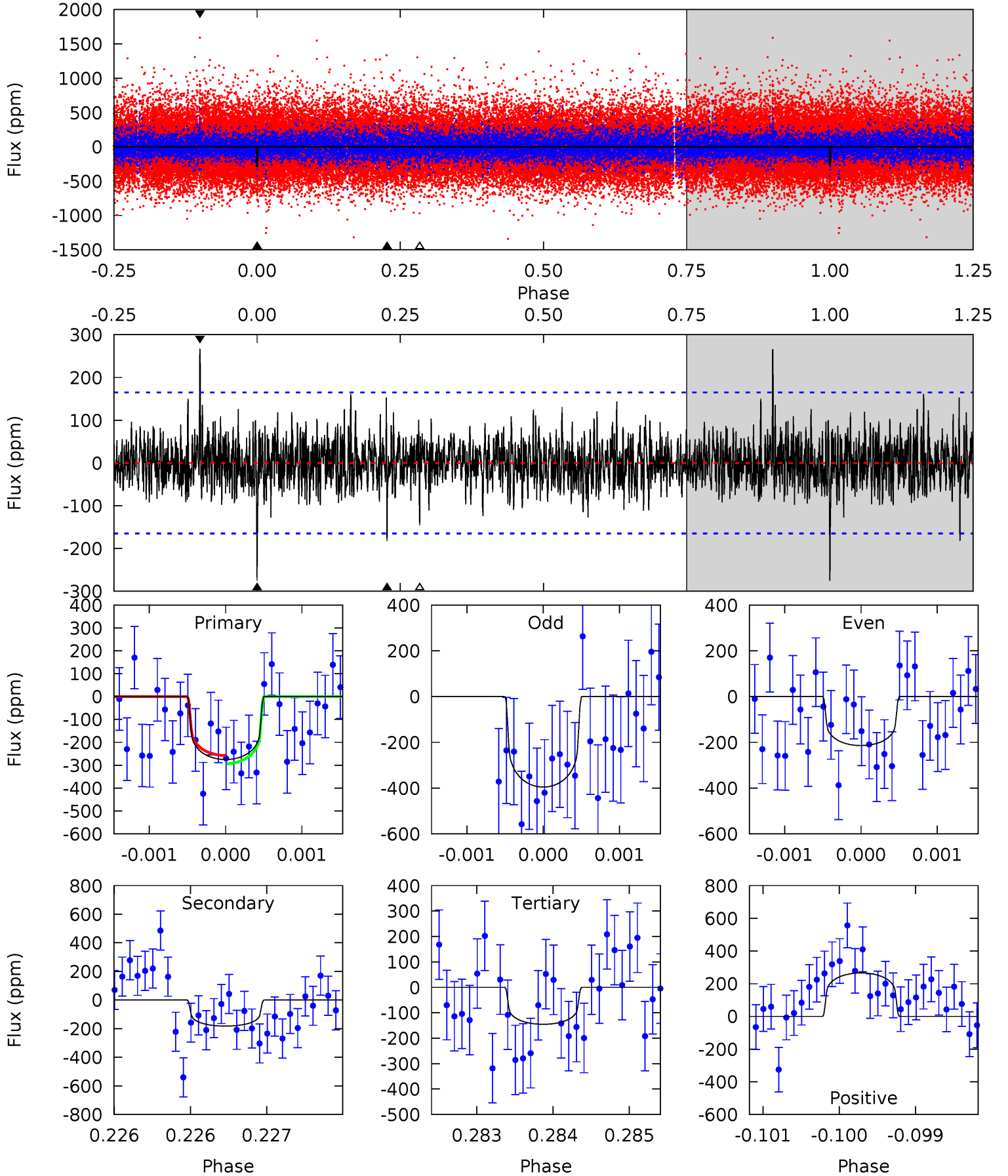
TCE 010973060-02 P=649.725907 Days  $T_0=249.212044$  (BKJD)



# DV Model-Shift Uniqueness Test

010973060-02, P = 649.695730 Days, E = 249.222050 Days

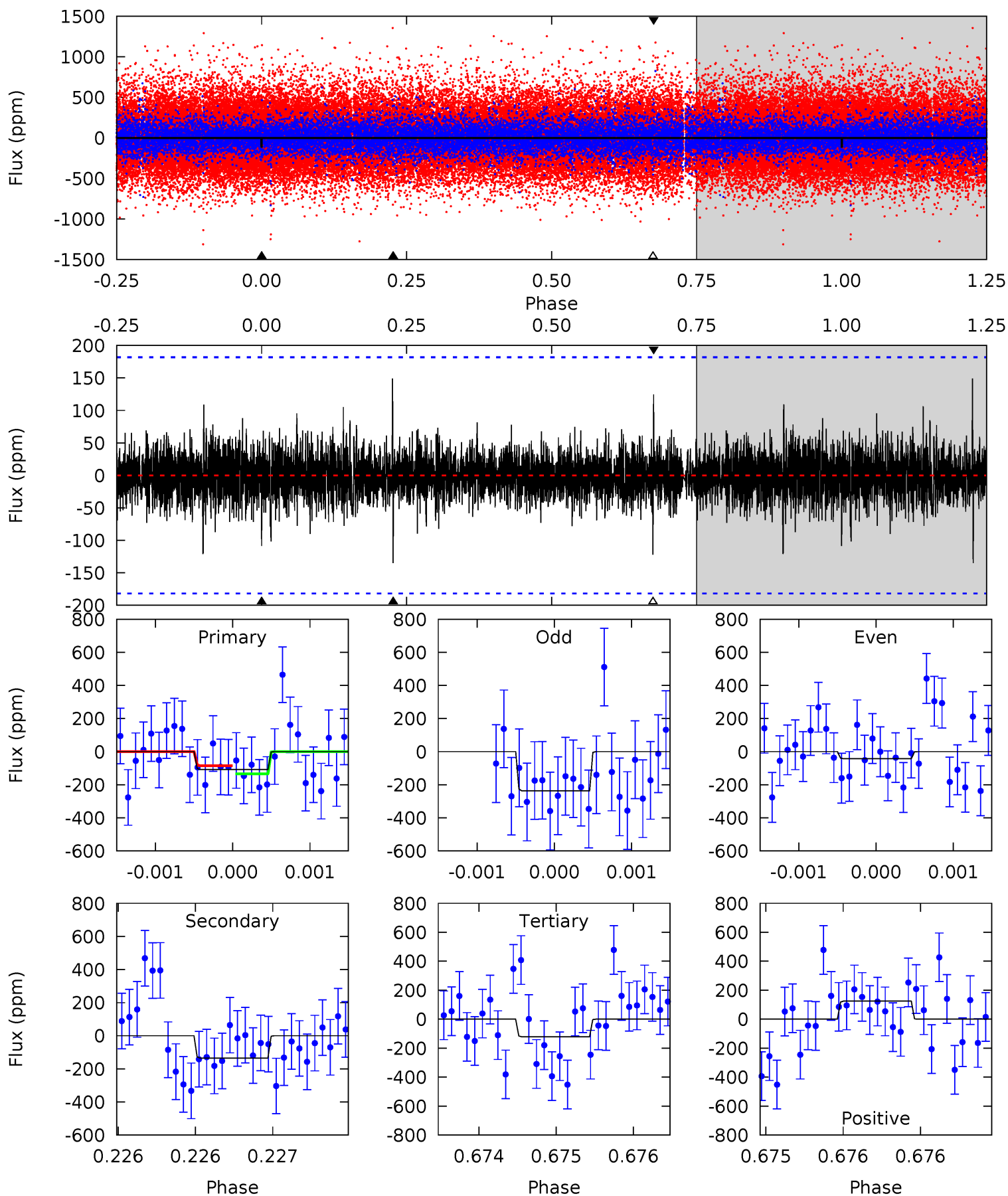
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
9.11	6.03	4.81	8.80	5.46	3.31	1.41	4.30	0.32	1.22	-2.77	2.86	1.18	0.49	0.60



# Alt Model-Shift Uniqueness Test

010973060-02, P = 649.725907 Days, E = 249.212044 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
3.28	4.08	3.69	3.77	5.50	3.37	0.75	-0.41	-0.49	0.39	0.31	2.78	1.21	0.52	0.73



### Stellar Parameters For KIC 010973060

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5885^{+158}_{-193}$	$4.459^{+0.067}_{-0.202}$	$-0.080^{+0.300}_{-0.300}$	$0.969^{+0.297}_{-0.099}$	$0.987^{+0.128}_{-0.117}$	$1.528^{+0.518}_{-0.748}$
	+3%/-3%	+2%/-5%	+375%/-375%	+31%/-10%	+13%/-12%	+34%/-49%
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 010973060-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-182 \pm 30$	$1.84^{+0.77}_{-0.70}$	$299^{+20}_{-14}$	$5304^{+1436}_{-718}$	$61265^{+105930}_{-31100}$
Alt.	$-135 \pm 33$	$1.27^{+0.77}_{-0.75}$	$300^{+23}_{-13}$	$5842^{+3758}_{-1128}$	$96124^{+428087}_{-60432}$

$T_{max}$  = 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

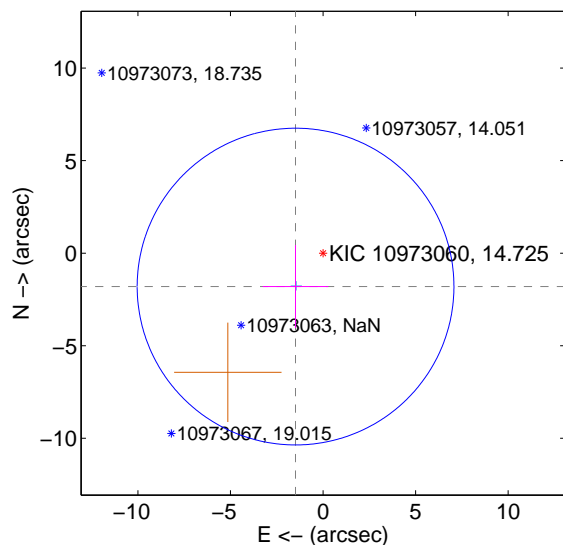
Supplemental centroid analysis for 010973060-02. Kepler magnitude: 14.72. Transit SNR 6.54

There are 1 quarters with good PRF difference image offsets

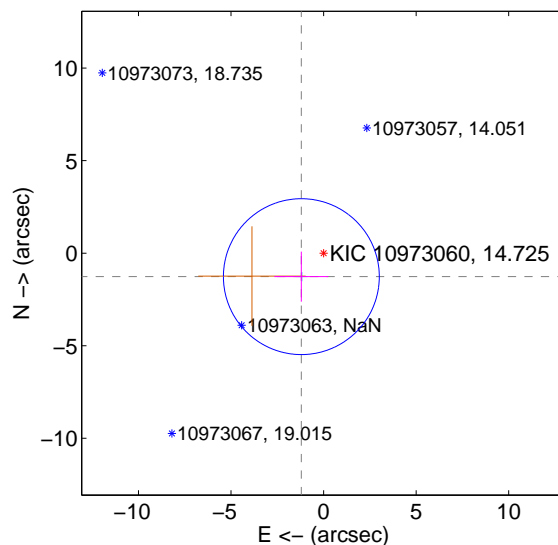
The OOT PRF centroid is offset from the target star catalog position by about 5.35 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$2.337 \pm 2.853$	0.82	$1.485 \pm 1.771$	$-1.805 \pm 2.238$
PRF-fit source offset from KIC position	$1.746 \pm 1.404$	1.24	$1.201 \pm 1.460$	$-1.268 \pm 1.351$
photometric centroid source offset	$0.94 \pm 1.12$	0.84	$-0.83 \pm 0.98$	$0.44 \pm 1.51$

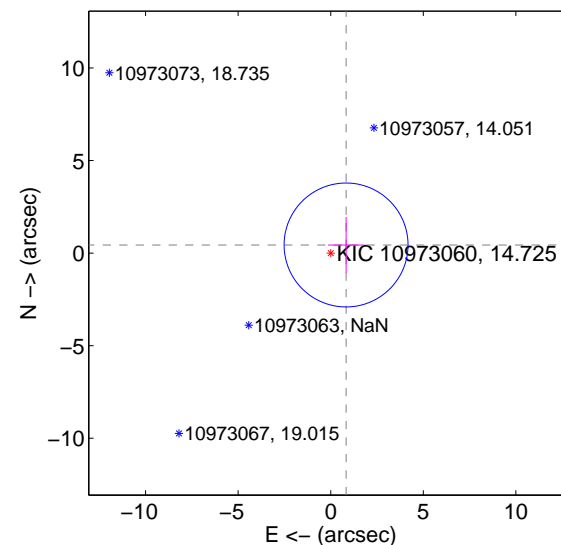
offset from difference PRF-fit to OOT PRF-fit



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.

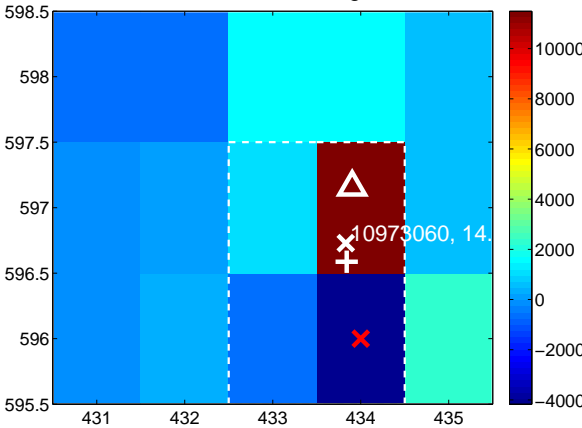
Q1 no difference image



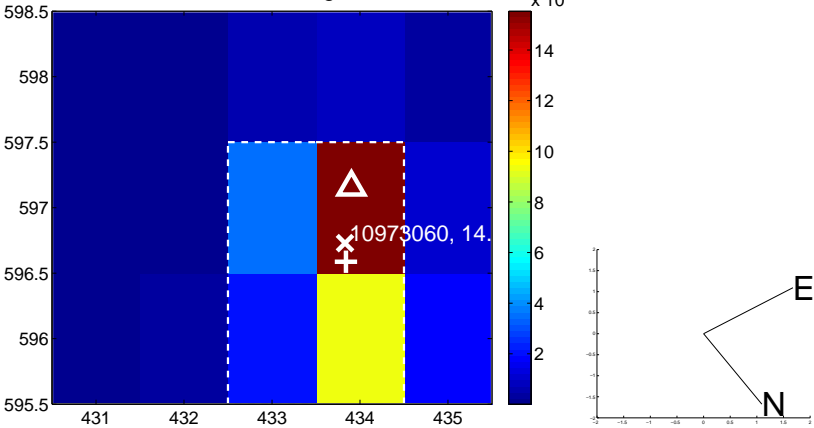
Q1 no OOT image



Q2 difference image



Q2 OOT image



Q3 no difference image



Q3 no OOT image



Q4 no difference image



Q4 no OOT image

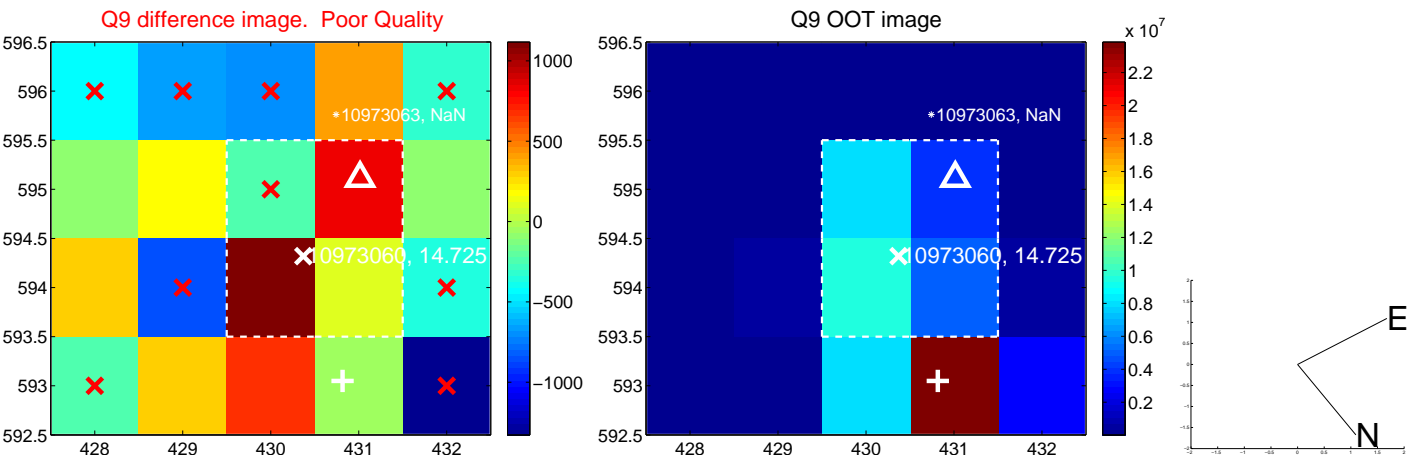


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





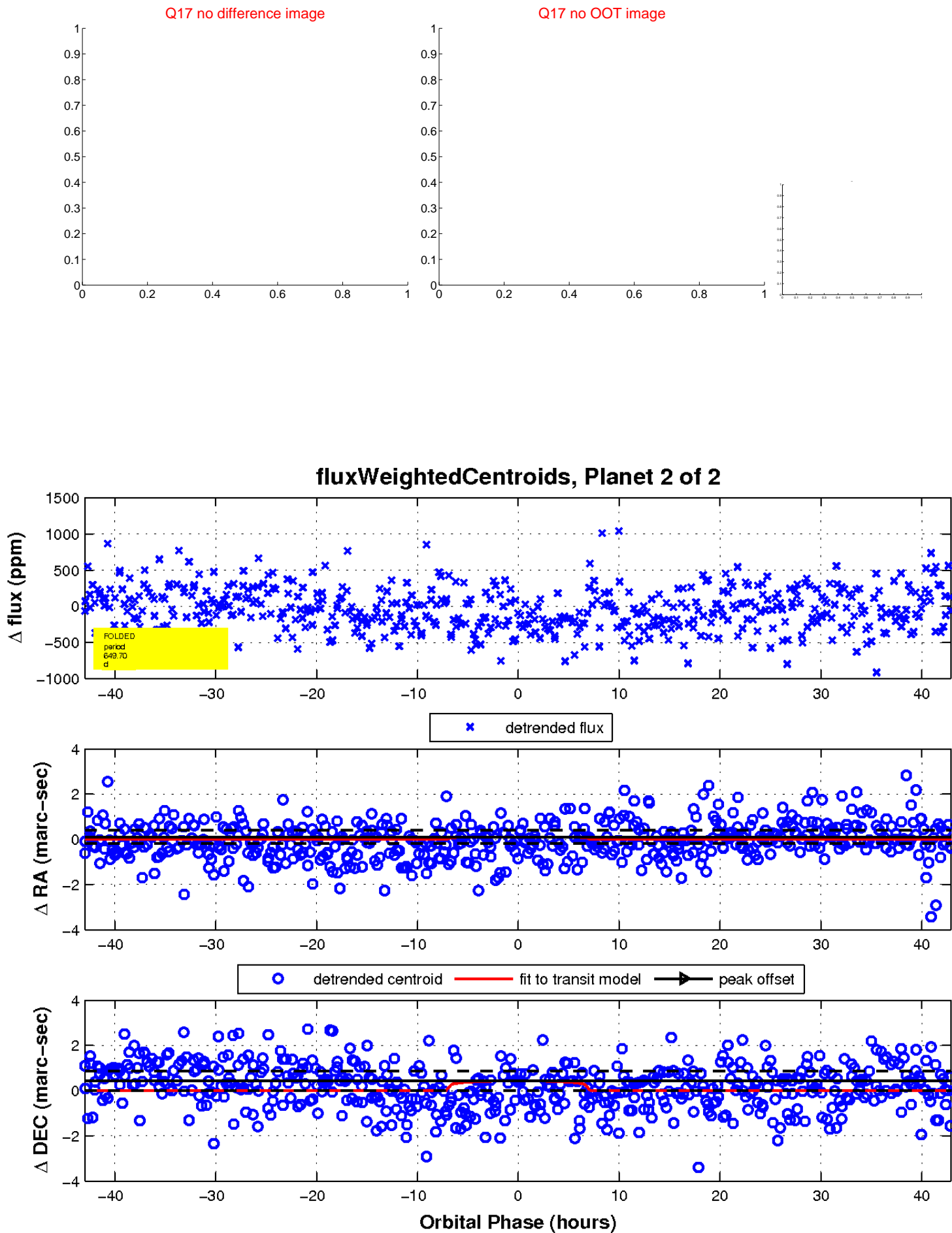
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



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



UKIRT Image

Declination

