

# KIC 009011903

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009011903-01	OBS	No	386.546561	401.465037	1030.5	16.778	7.4	9.5	0.78	4955	2.83	0.35
009011903-02	OBS	No	370.010352	173.520268	1508.2	23.443	9.5	8.4	0.78	4955	3.78	0.37

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009011903-01	OBS	FP	0.00	1	0	1	0	LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—CENT_FEW_DIFFS—HALO_GHOST
009011903-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_SKYE—LPP_DV—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.

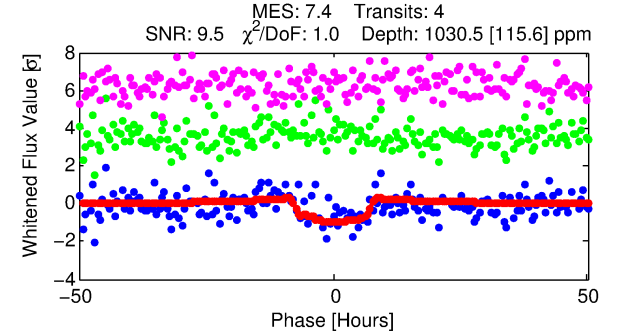
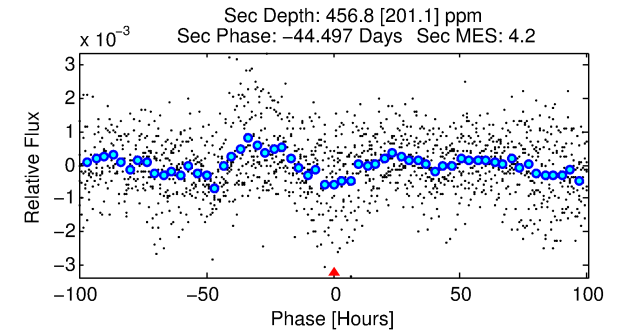
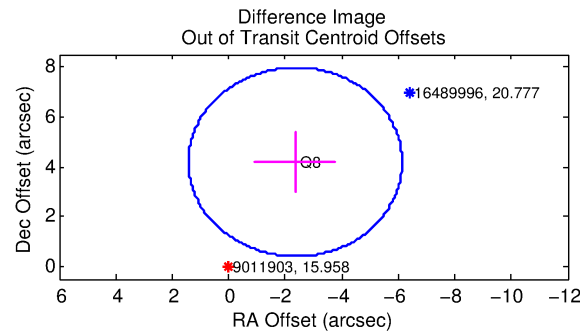
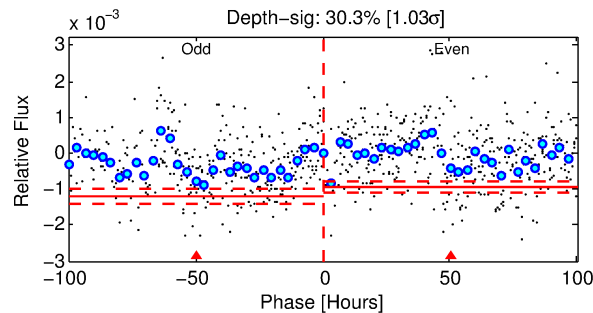
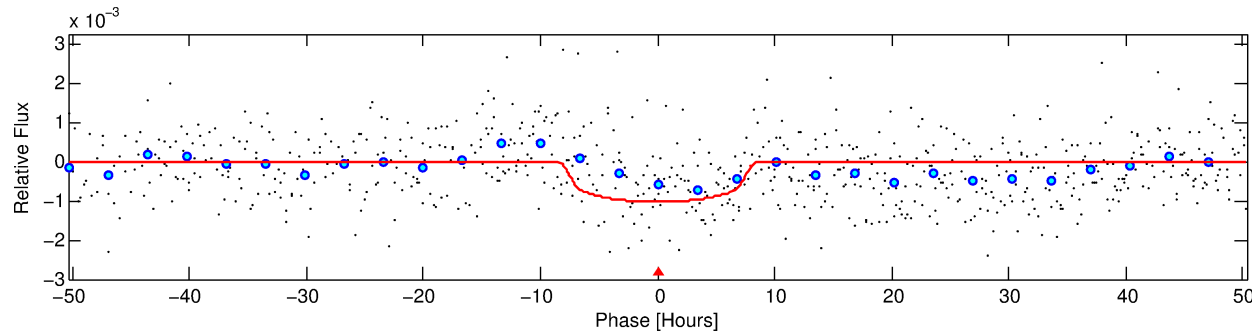
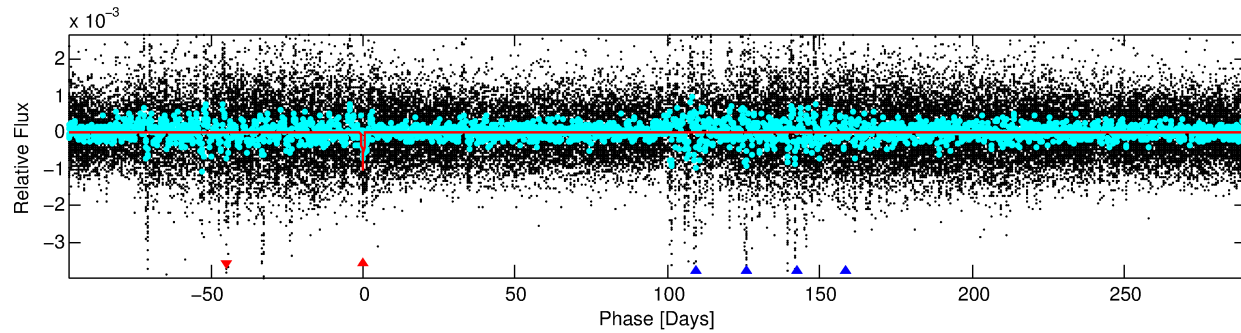
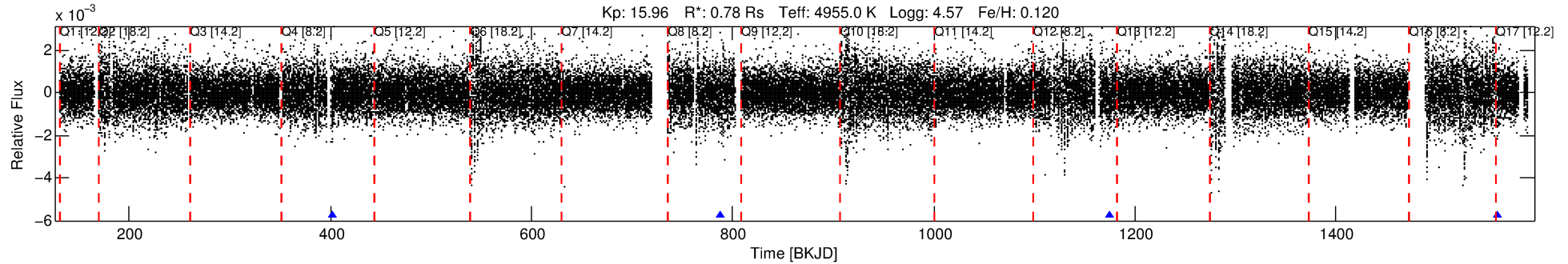
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009011903-01

No Significant Match Found

# DV One-Page Summary

KIC: 9011903 Candidate: 1 of 2 Period: 386.547 d



## DV Fit Results:

Period = 386.54656 [0.01221] d  
Epoch = 401.4650 [0.0248] BKJD  
Rp/R\* = 0.0334 [0.0061]  
a/R\* = 110.64 [67.05]  
b = 0.82 [0.25]  
Seff = 0.35 [0.05]  
Teq = 196 [8] K  
Rp = 2.83 [0.57] Re  
a = 0.9678 [0.0672] AU  
Ag = 29312.99 [17008.32] [1.72σ]  
Teffp = 3962 [578] K [6.51σ]

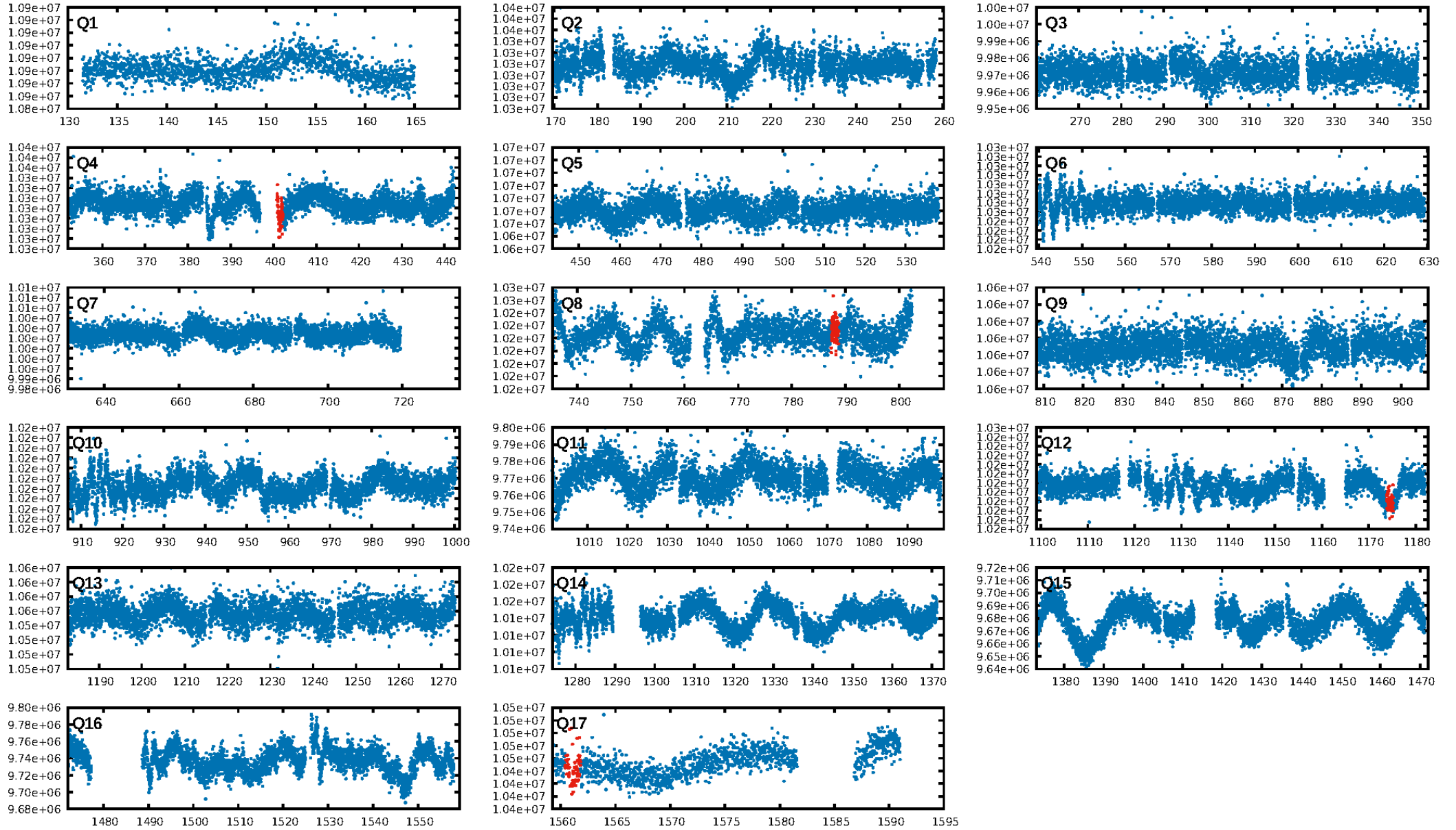
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [13.77σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 3.4%  
ModelChiSquareGof-sig: 100.0%  
**Bootstrap-pfa: 4.76e-09**  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: -0.0198  
Centroid-sig: 16.5%  
Centroid-so: 2.646 arcsec [1.53σ]  
**OotOffset-rm: 4.802 arcsec [3.81σ]**  
**KicOffset-rm: 4.865 arcsec [3.86σ]**  
OotOffset-st: 0/0/1/0 [1]  
KicOffset-st: 0/0/1/0 [1]  
DiffImageQuality-fgm: 0.00 [0/1]  
DiffImageOverlap-fno: 1.00 [2/2]

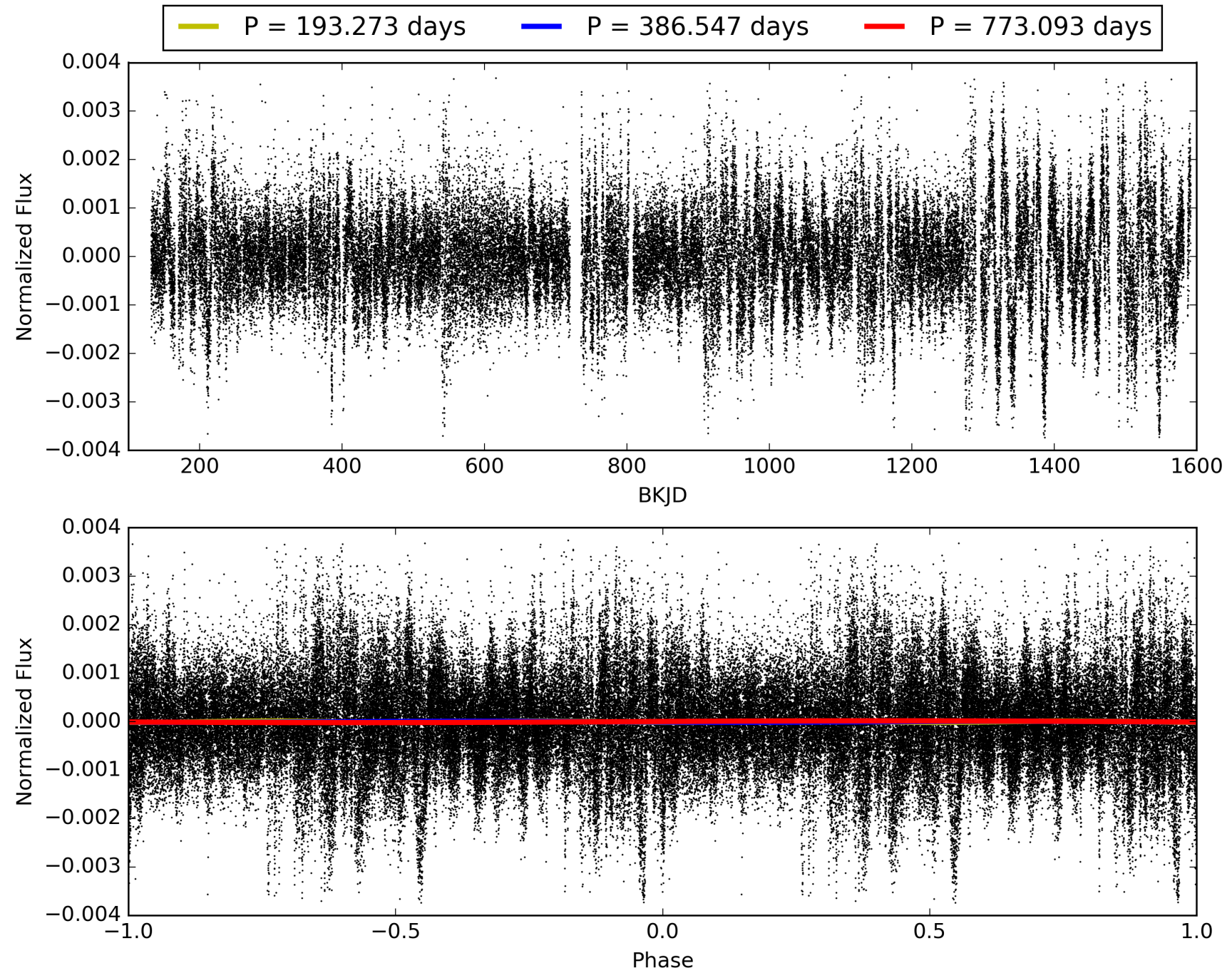
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 00:00:39 Z

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

# TCE 009011903-01, PDC Light Curves

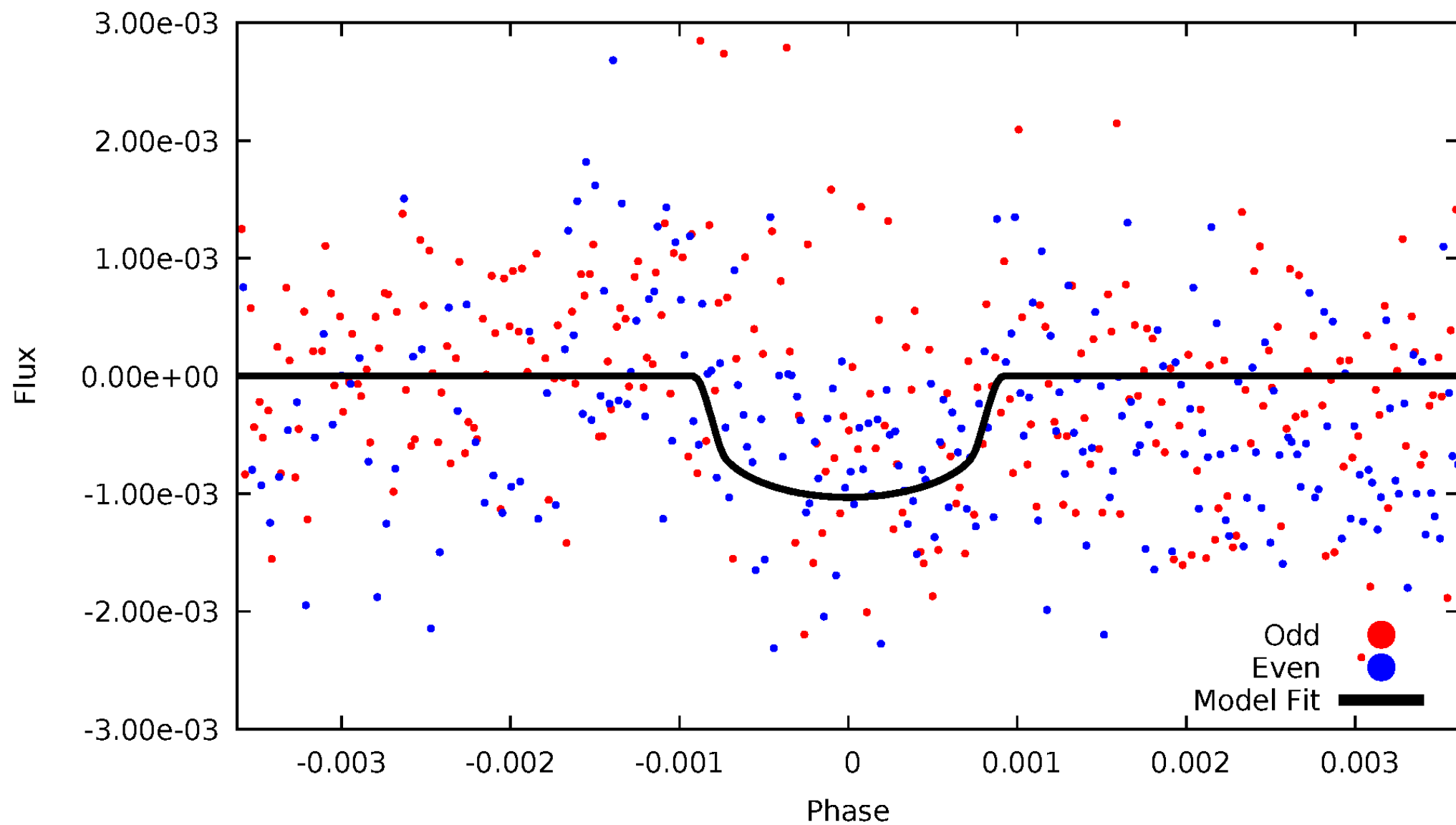


TCE 009011903-01



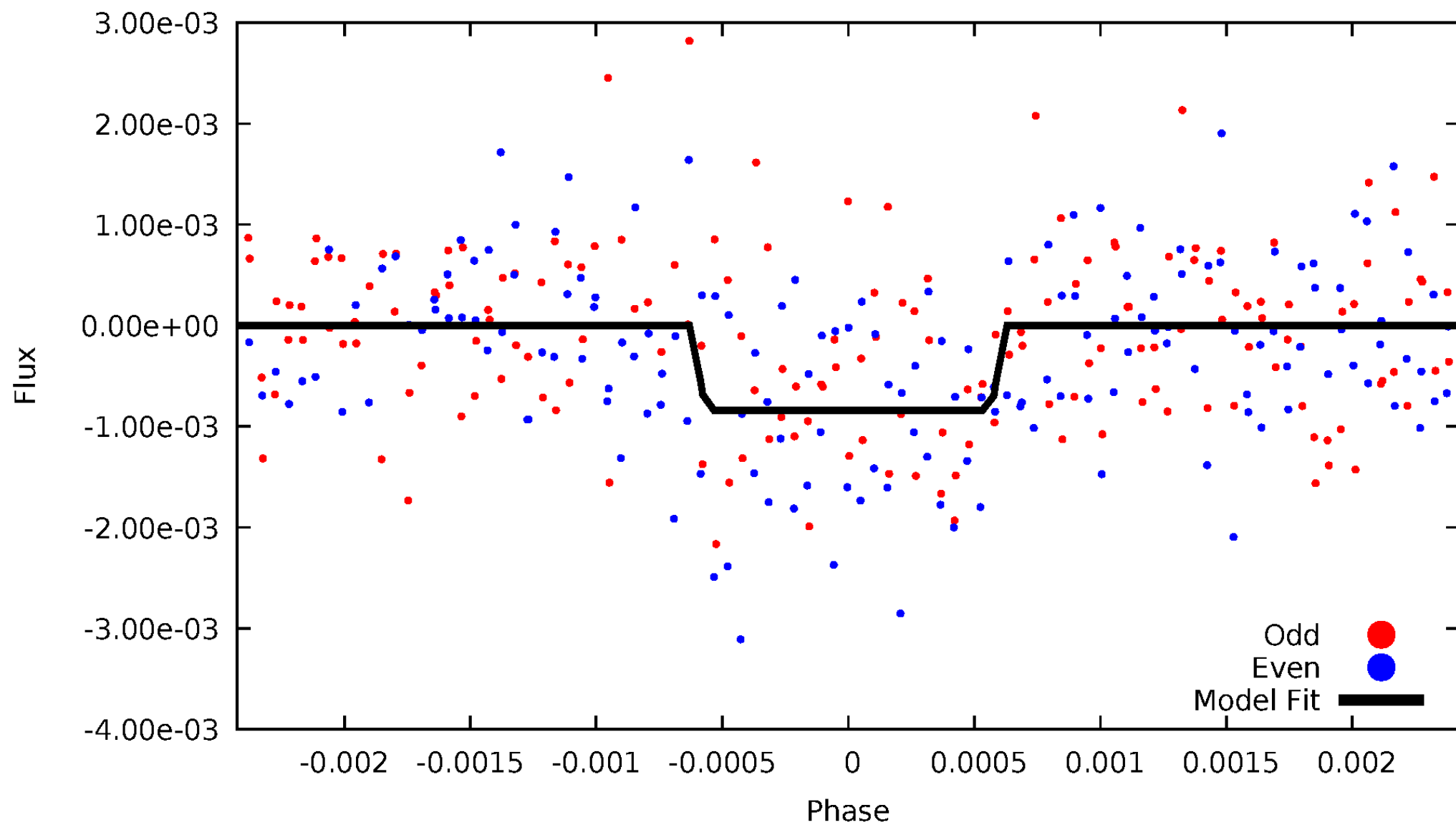
# DV Odd/Even

TCE 009011903-01



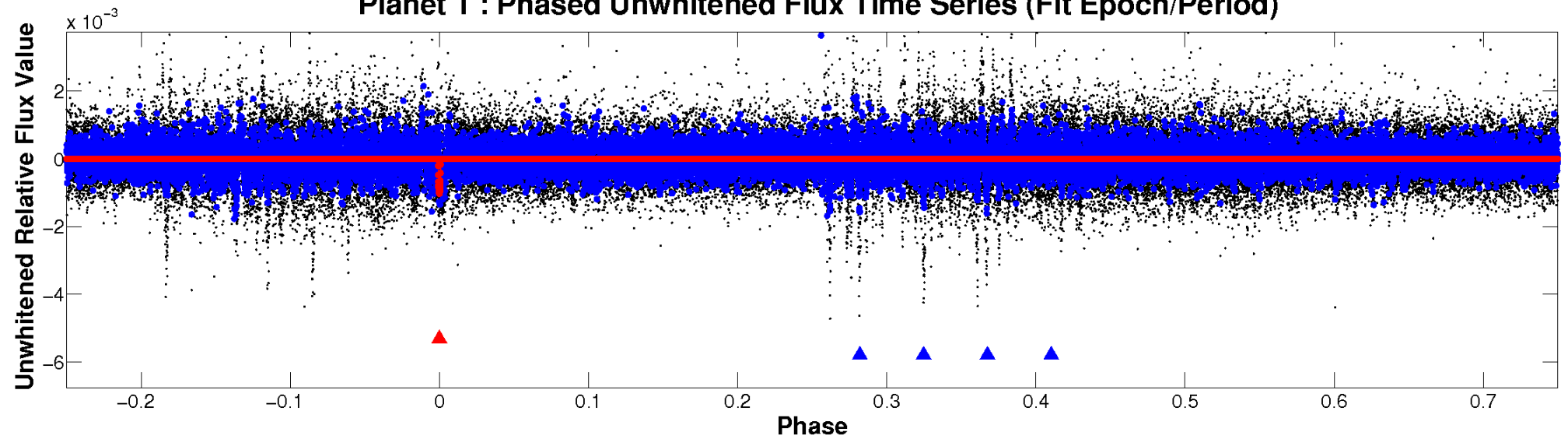
# ALT Odd/Even

TCE 009011903-01

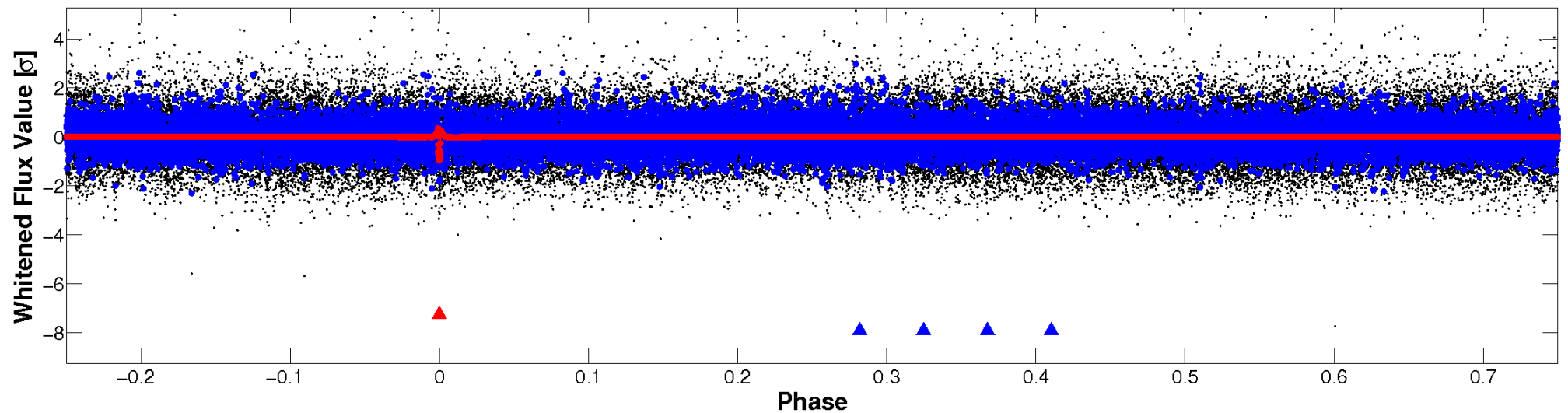


# Non-Whitened Vs. Whitened Light Curve

**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 009011903-01 P=386.546561 Days  $T_0=401.465037$  (BKJD)



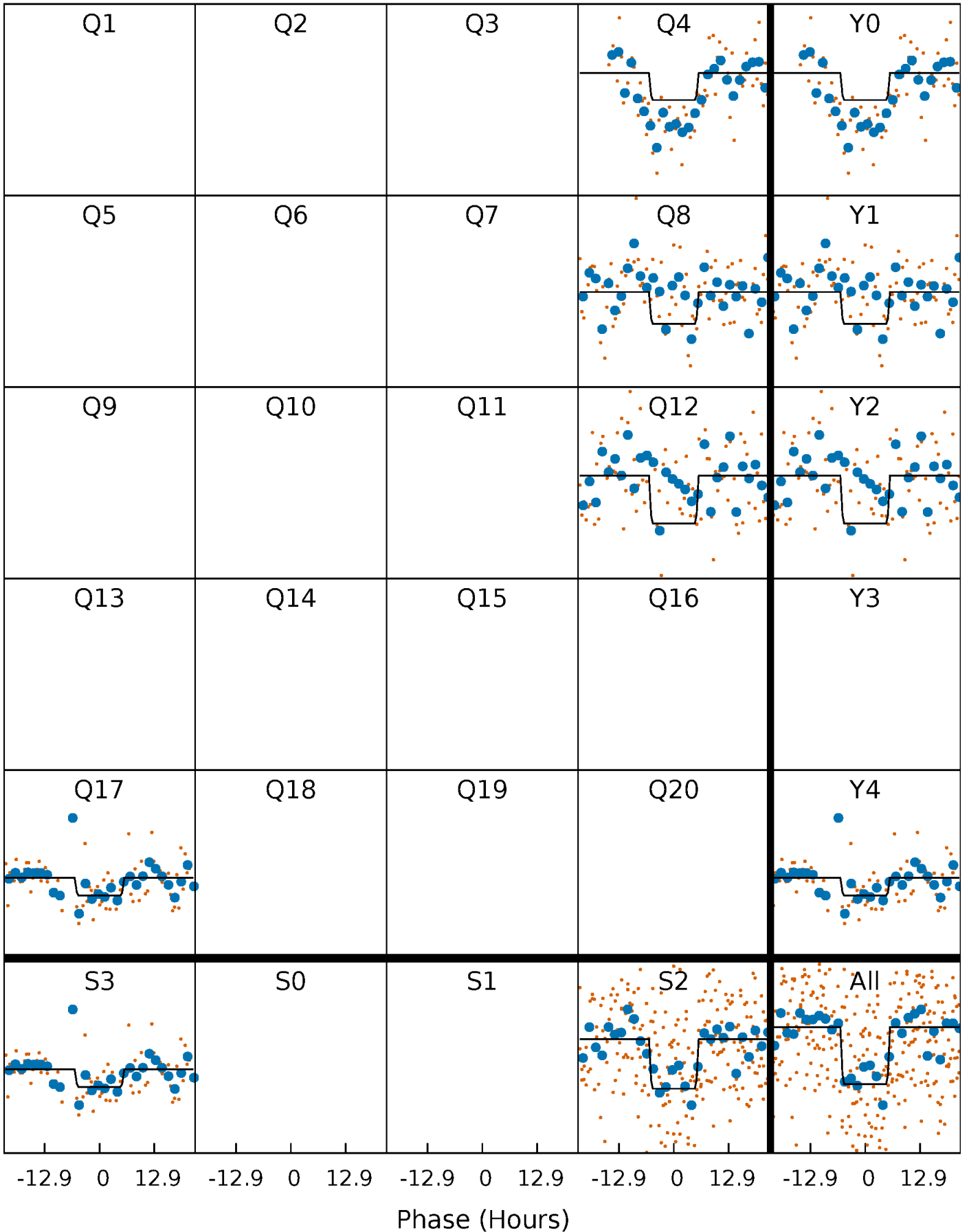
# DV Quarter-Phased Transit Curves

TCE 009011903-01     $P=386.546561$  Days     $T_0=401.465037$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

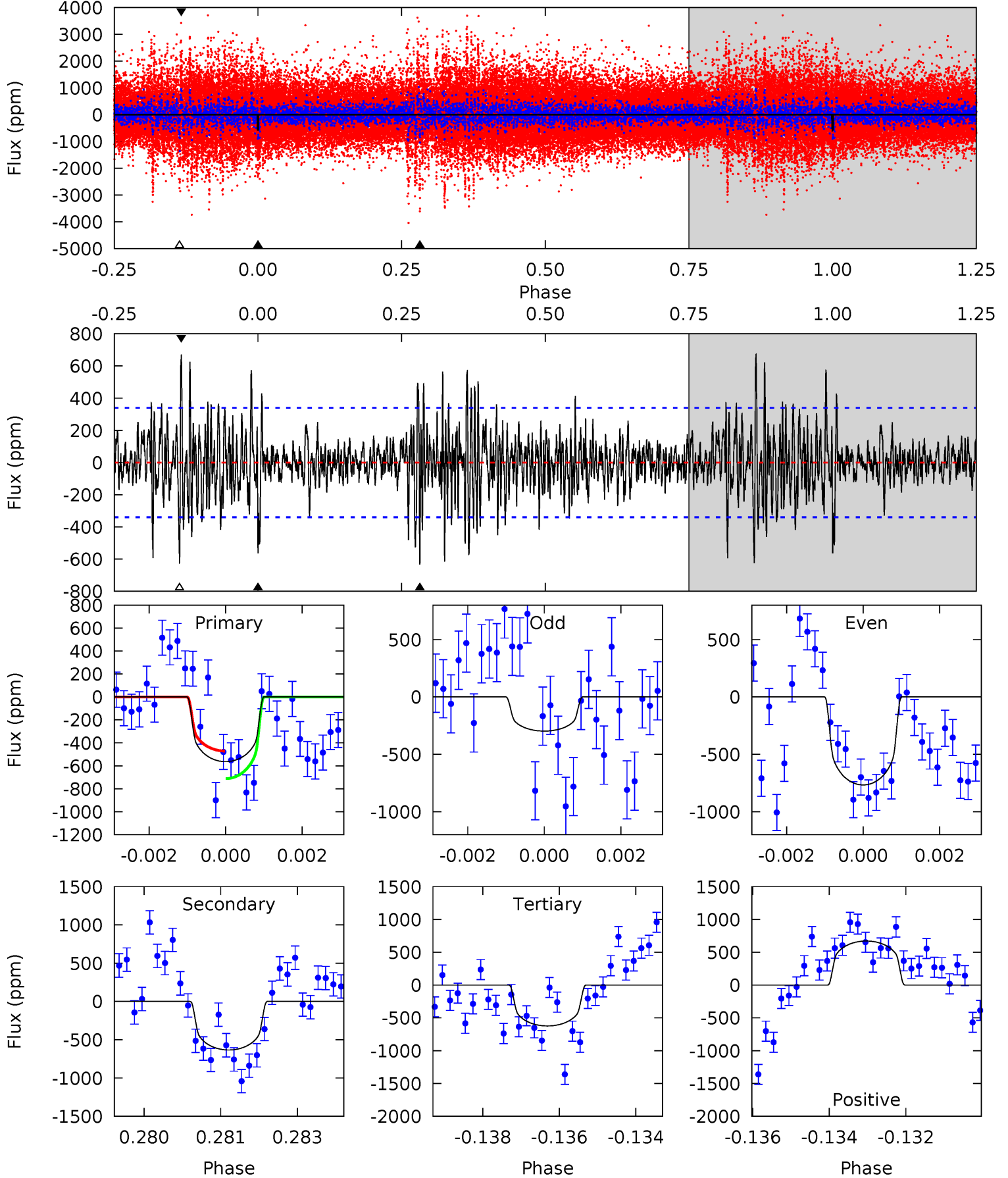
TCE 009011903-01 P=386.582522 Days  $T_0=401.459422$  (BKJD)



# DV Model-Shift Uniqueness Test

009011903-01,  $P = 386.546561$  Days,  $E = 14.918476$  Days

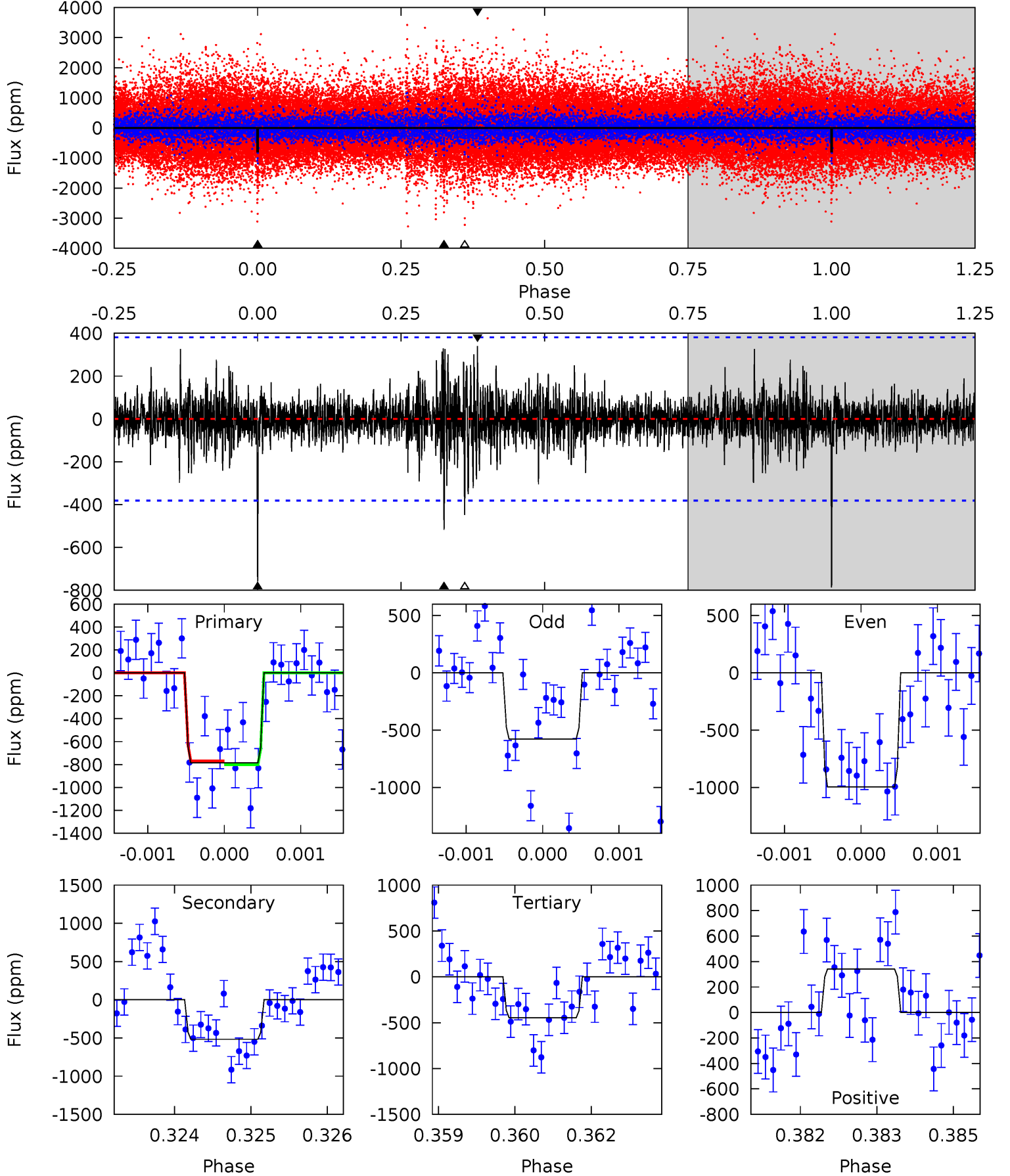
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
8.87	9.97	9.81	10.6	5.34	3.11	2.46	-0.94	-1.69	0.16	-0.58	3.68	0.87	0.51	1.88



# Alt Model-Shift Uniqueness Test

009011903-01,  $P = 386.582522$  Days,  $E = 14.876900$  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
11.2	7.35	6.36	4.84	5.42	3.24	1.08	4.81	6.33	0.99	2.51	2.97	1.36	0.30	0.25



### Stellar Parameters For KIC 009011903

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$4955^{+148}_{-148}$	$4.565^{+0.045}_{-0.054}$	$0.120^{+0.250}_{-0.300}$	$0.777^{+0.065}_{-0.065}$	$0.808^{+0.055}_{-0.067}$	$2.427^{+0.521}_{-0.428}$
	+3%/-3%	+1%/-1%	+208%/-250%	+8%/-8%	+7%/-8%	+21%/-18%
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 009011903-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-634 \pm 64$	$2.86^{+0.52}_{-0.51}$	$275^{+9}_{-10}$	$4413^{+375}_{-296}$	$39775^{+19609}_{-11902}$
Alt.	$-517 \pm 70$	$2.44^{+0.56}_{-0.50}$	$274^{+10}_{-9}$	$4495^{+476}_{-375}$	$43678^{+27631}_{-14962}$

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

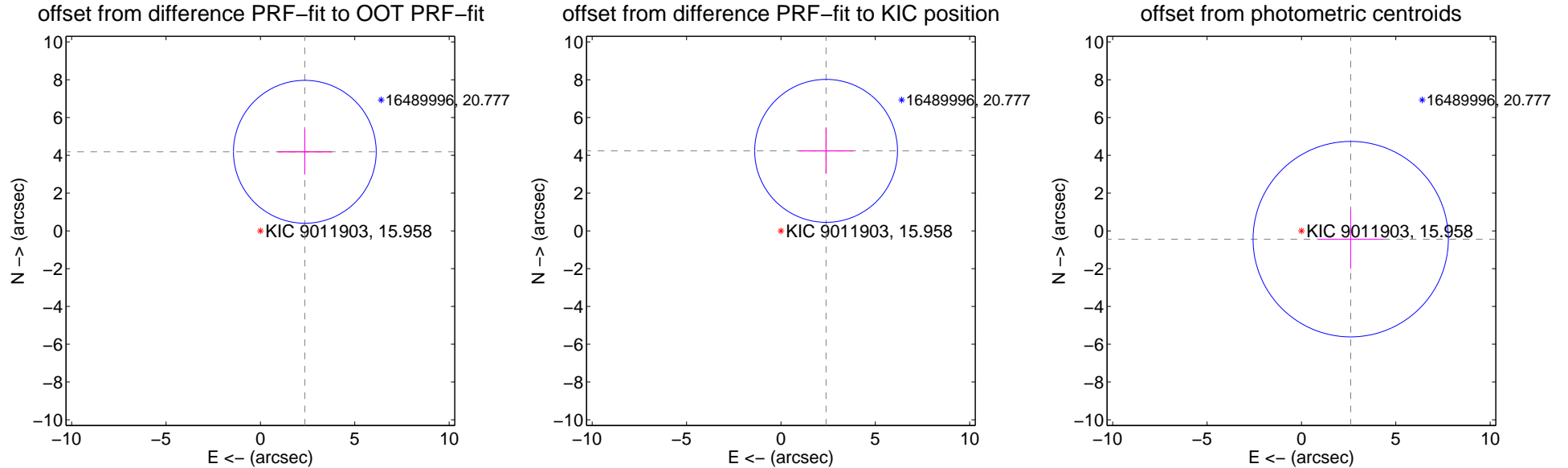
## DV Centroid Data

Supplemental centroid analysis for 009011903-01. Kepler magnitude: 15.96. Transit SNR 9.47

There are 0 quarters with good PRF difference image offsets

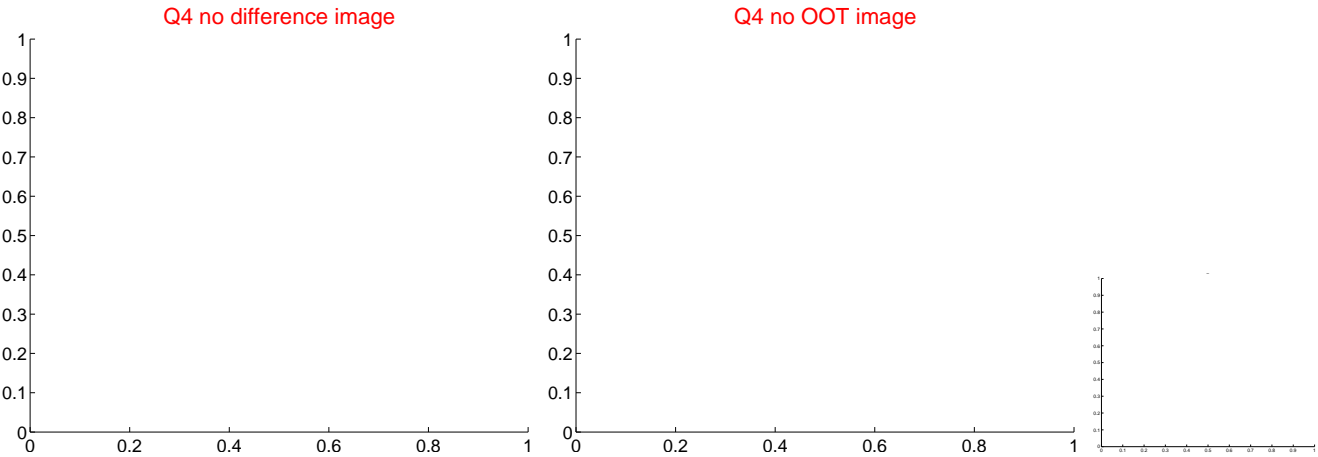
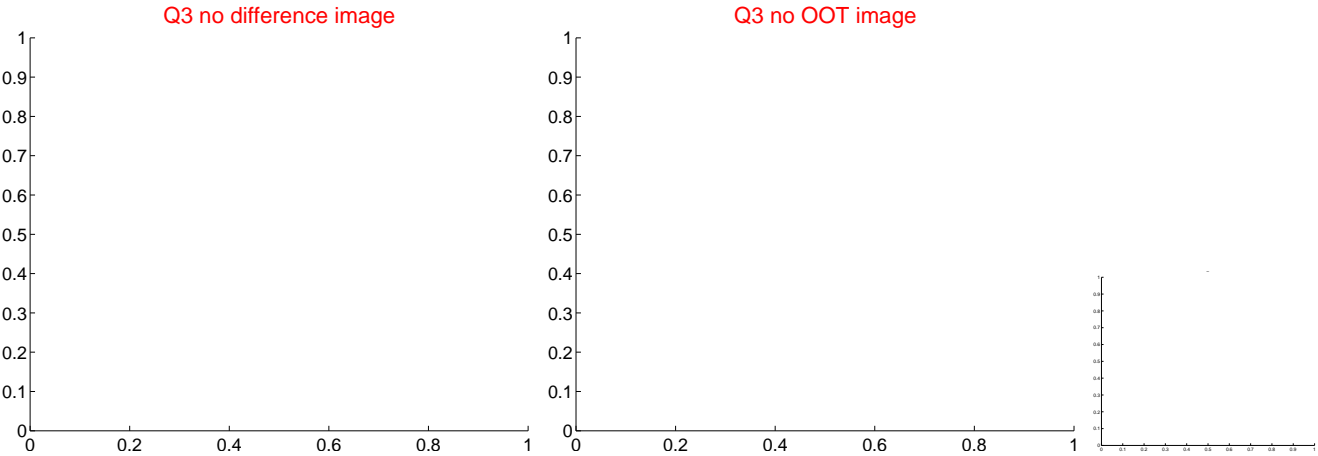
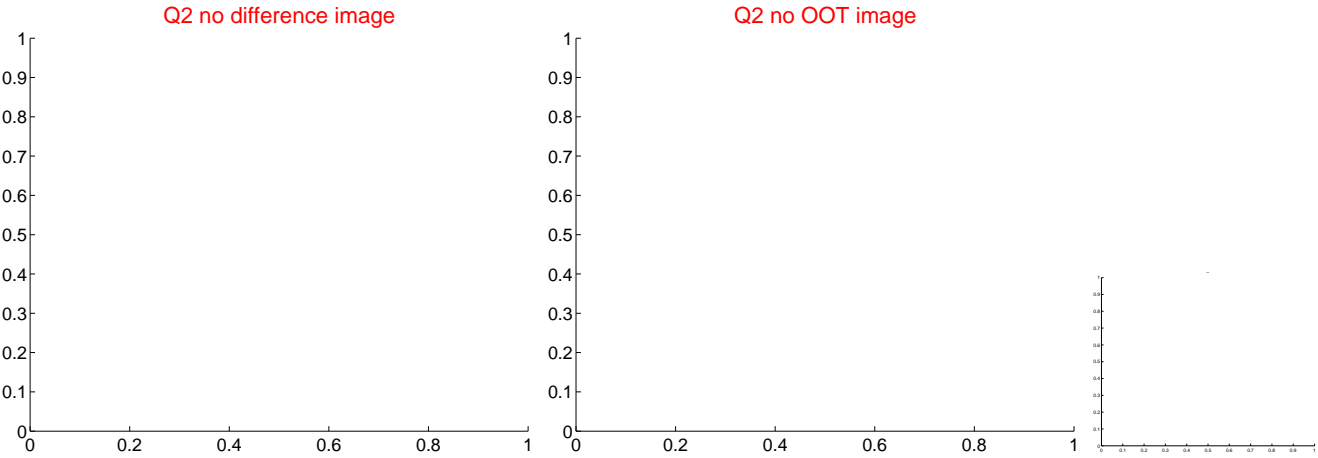
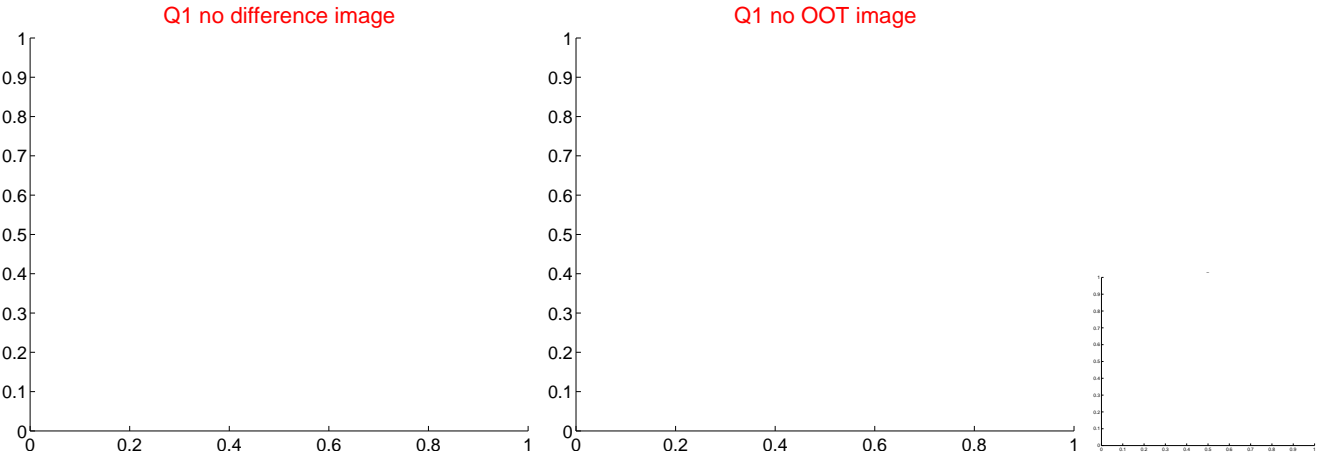
The direct PRF centroid is offset from the target star catalog position by about 0.06 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$4.802 \pm 1.261$	3.81	$-2.354 \pm 1.434$	$4.186 \pm 1.201$
PRF-fit source offset from KIC position	$4.865 \pm 1.261$	3.86	$-2.394 \pm 1.434$	$4.236 \pm 1.201$
photometric centroid source offset	$2.65 \pm 1.72$	1.53	$-2.61 \pm 1.73$	$-0.44 \pm 1.56$

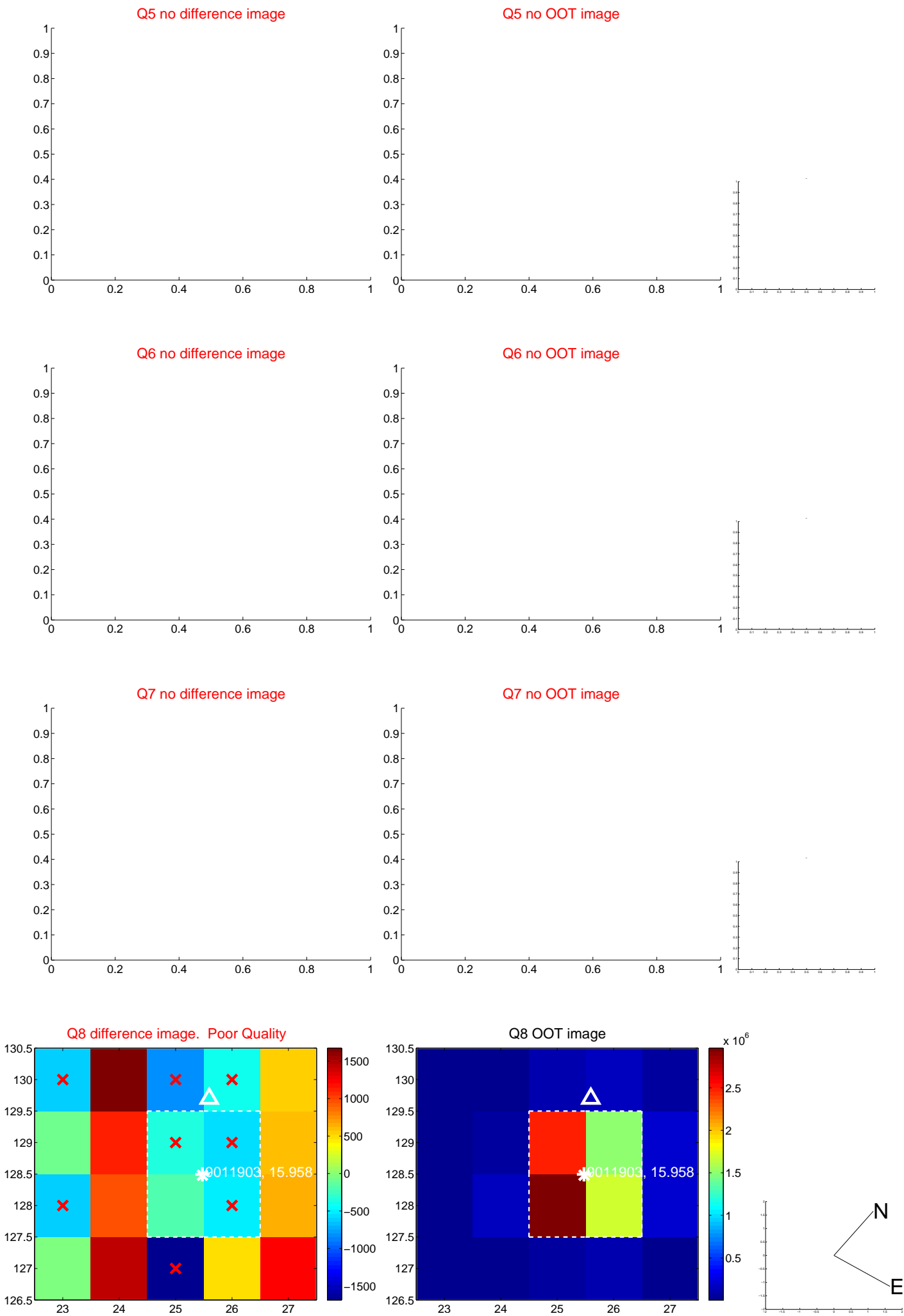


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

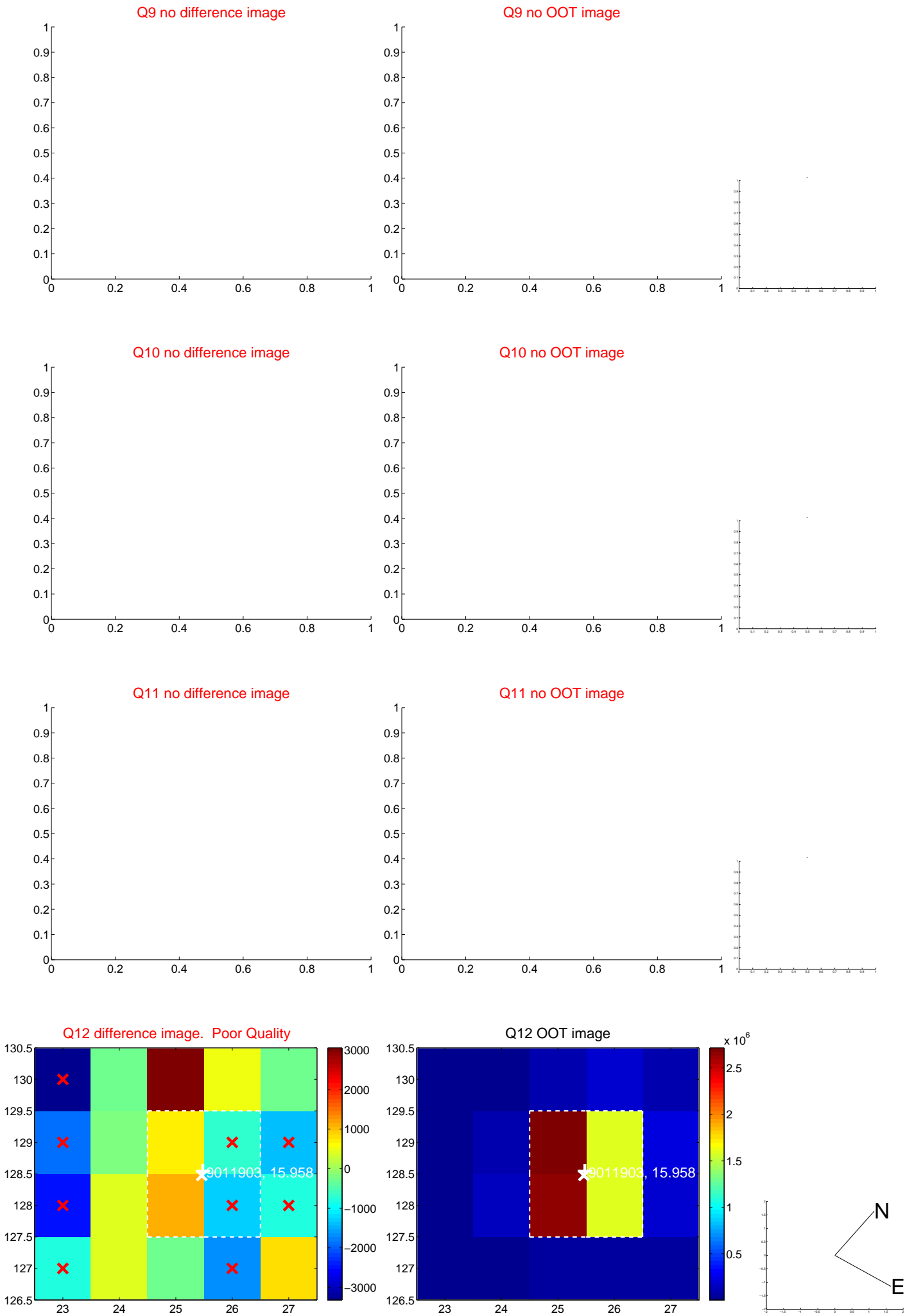
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



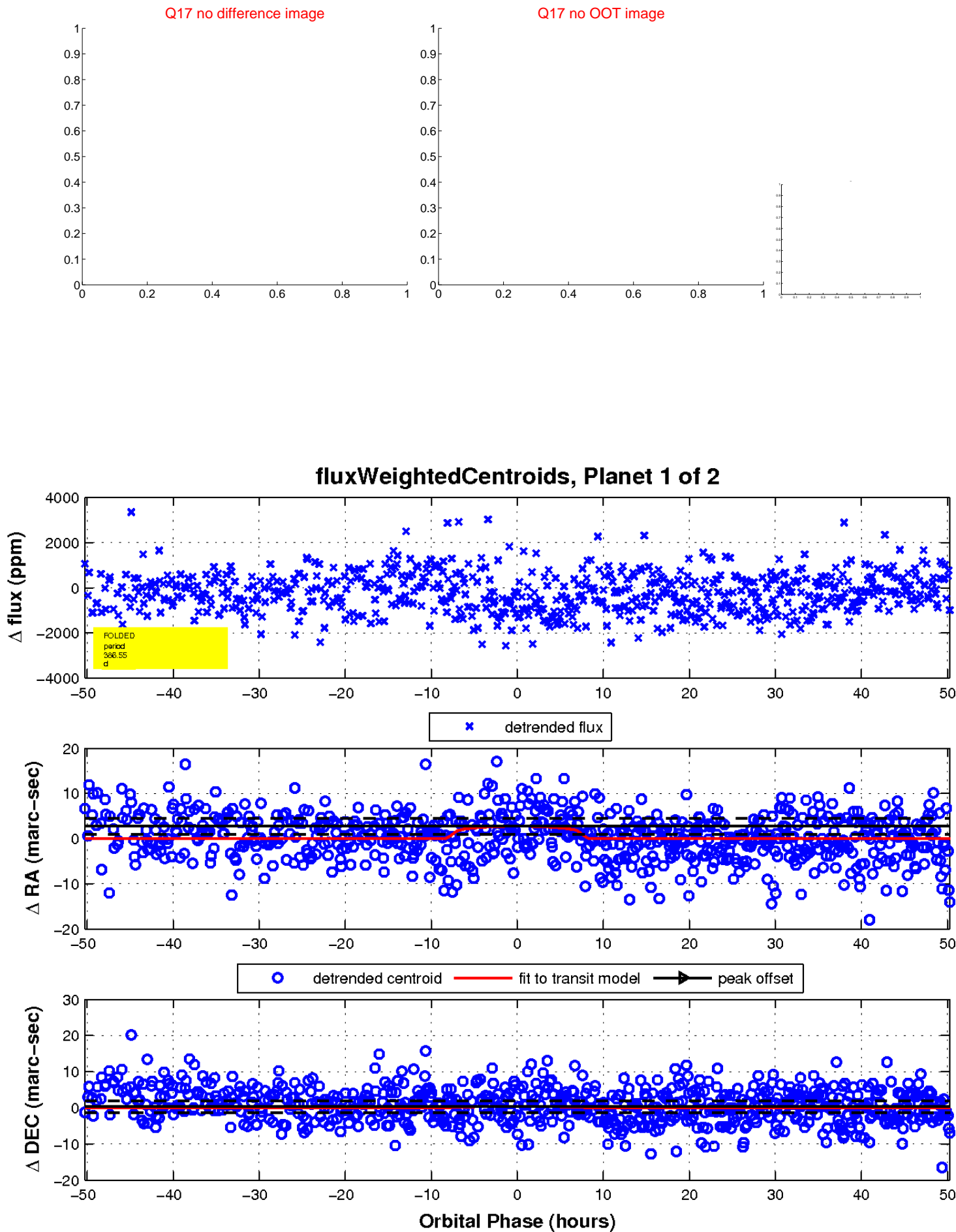
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.



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

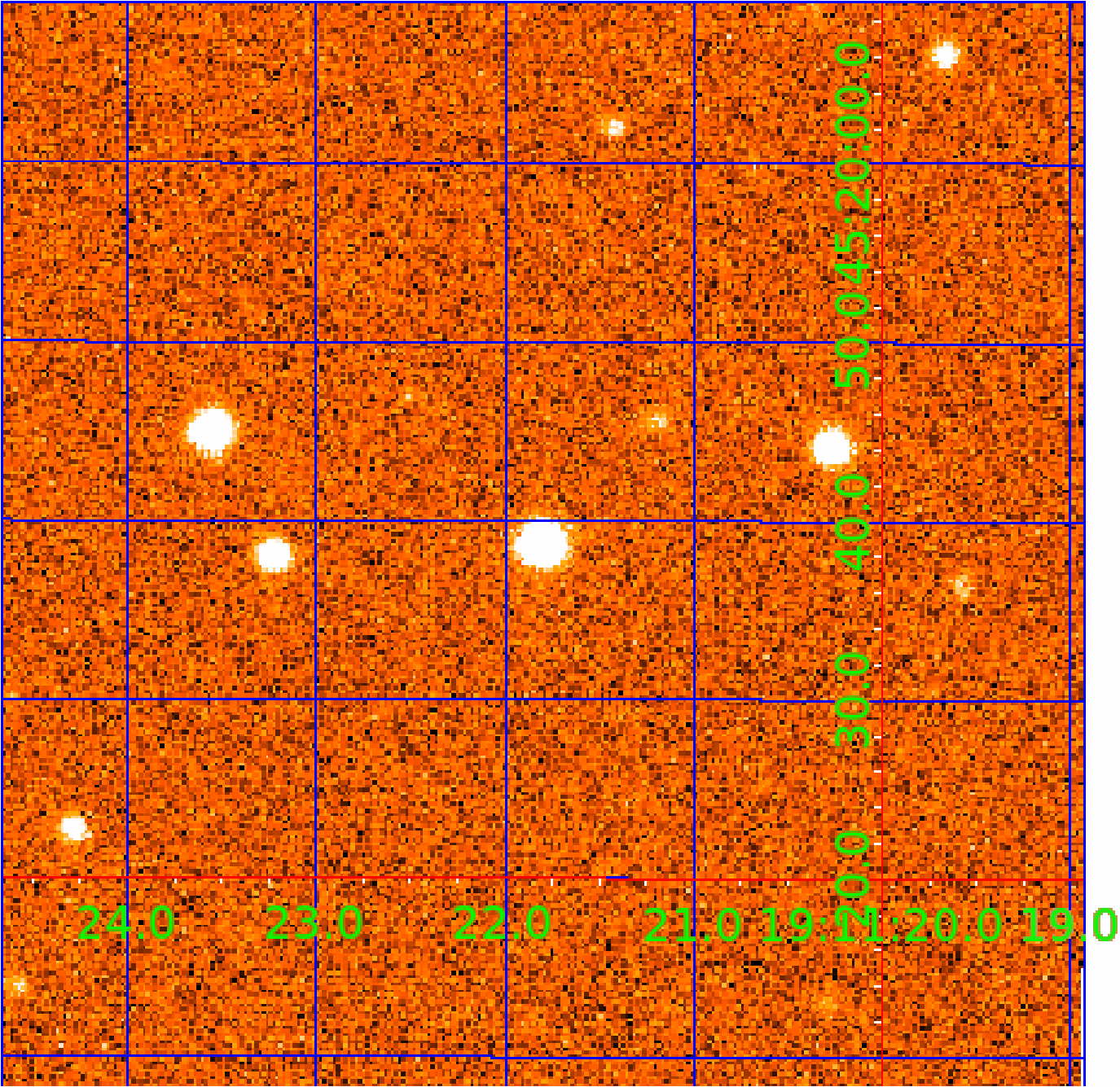


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 009011903

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009011903-01	OBS	No	386.546561	401.465037	1030.5	16.778	7.4	9.5	0.78	4955	2.83	0.35
009011903-02	OBS	No	370.010352	173.520268	1508.2	23.443	9.5	8.4	0.78	4955	3.78	0.37

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009011903-01	OBS	FP	0.00	1	0	1	0	LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—CENT_FEW_DIFFS—HALO_GHOST
009011903-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_SKYE—LPP_DV—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.

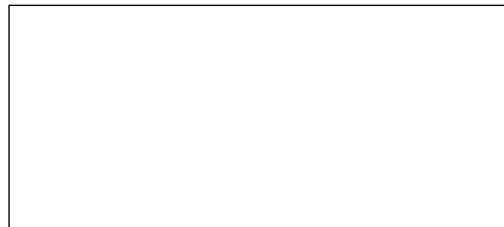
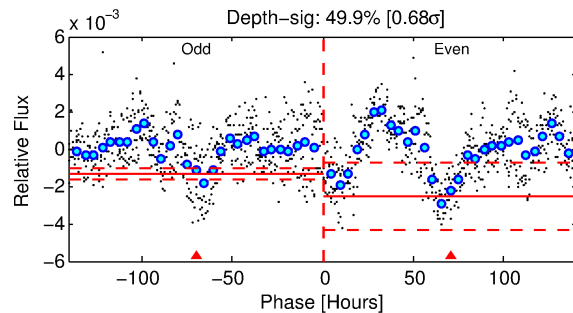
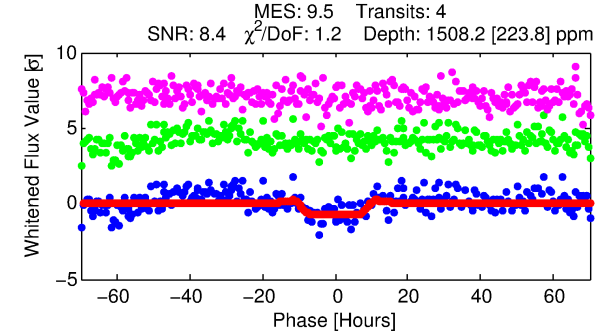
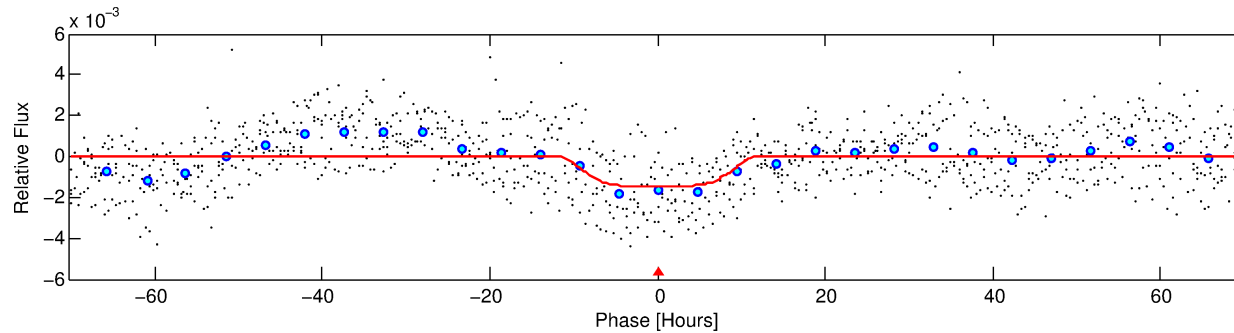
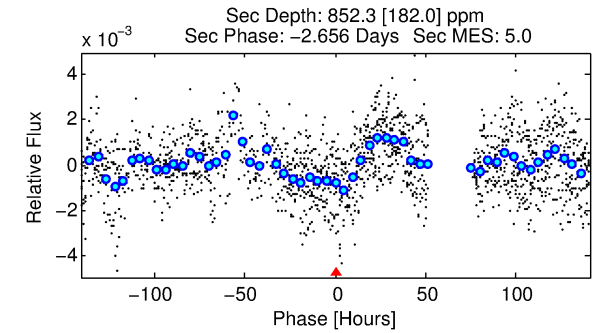
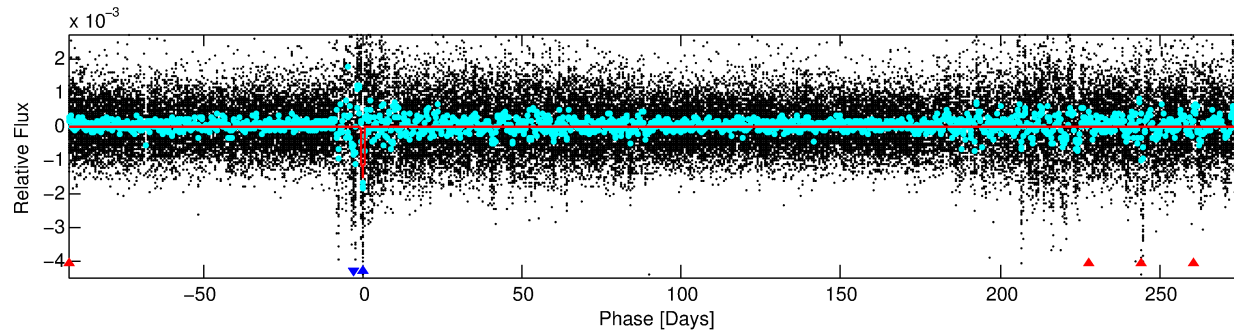
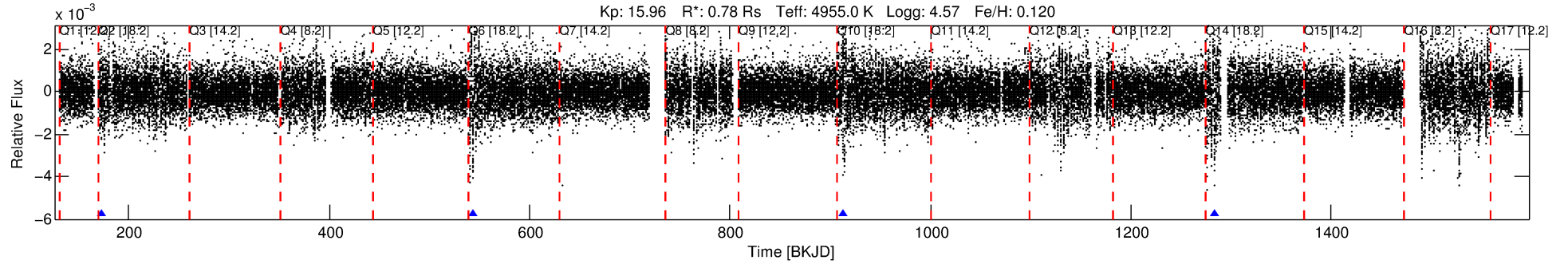
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009011903-02

No Significant Match Found

# DV One-Page Summary

KIC: 9011903 Candidate: 2 of 2 Period: 370.010 d



## DV Fit Results:

Period = 370.01035 [0.02554] d  
Epoch = 173.5203 [0.0439] BKJD  
Rp/R\* = 0.0445 [0.0048]  
a/R\* = 60.21 [14.20]  
b = 0.92 [0.04]  
Seff = 0.37 [0.06]  
Teq = 199 [8] K  
Rp = 3.78 [0.51] Re  
a = 0.9400 [0.0653] AU  
Ag = 29052.49 [9258.69] [3.14σ]  
Teffp = 4012 [326] K [11.68σ]

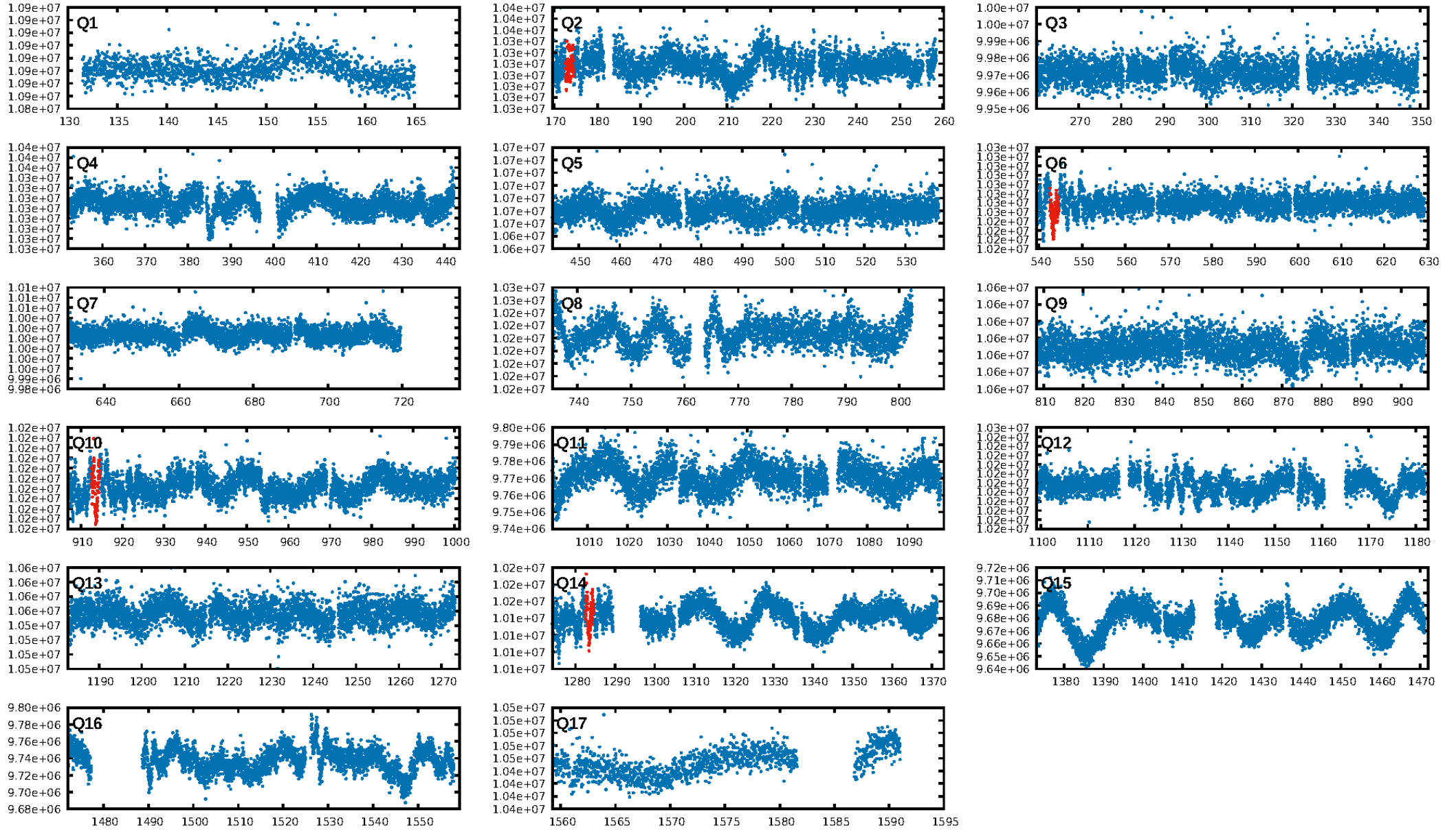
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [13.77σ]  
**ModelChiSquare2-sig: 0.1%**  
ModelChiSquareGoF-sig: 86.9%  
**Bootstrap-pfa: 4.15e-10**  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: -1.596  
Centroid-sig: 34.9%  
Centroid-so: 2.220 arcsec [0.90σ]  
OotOffset-rm: N/A  
KicOffset-rm: N/A  
OotOffset-st: 0/0/0 [0]  
KicOffset-st: 0/0/0 [0]  
DiffImageQuality-fgm: N/A  
DiffImageOverlap-fno: 1.00 [3/3]

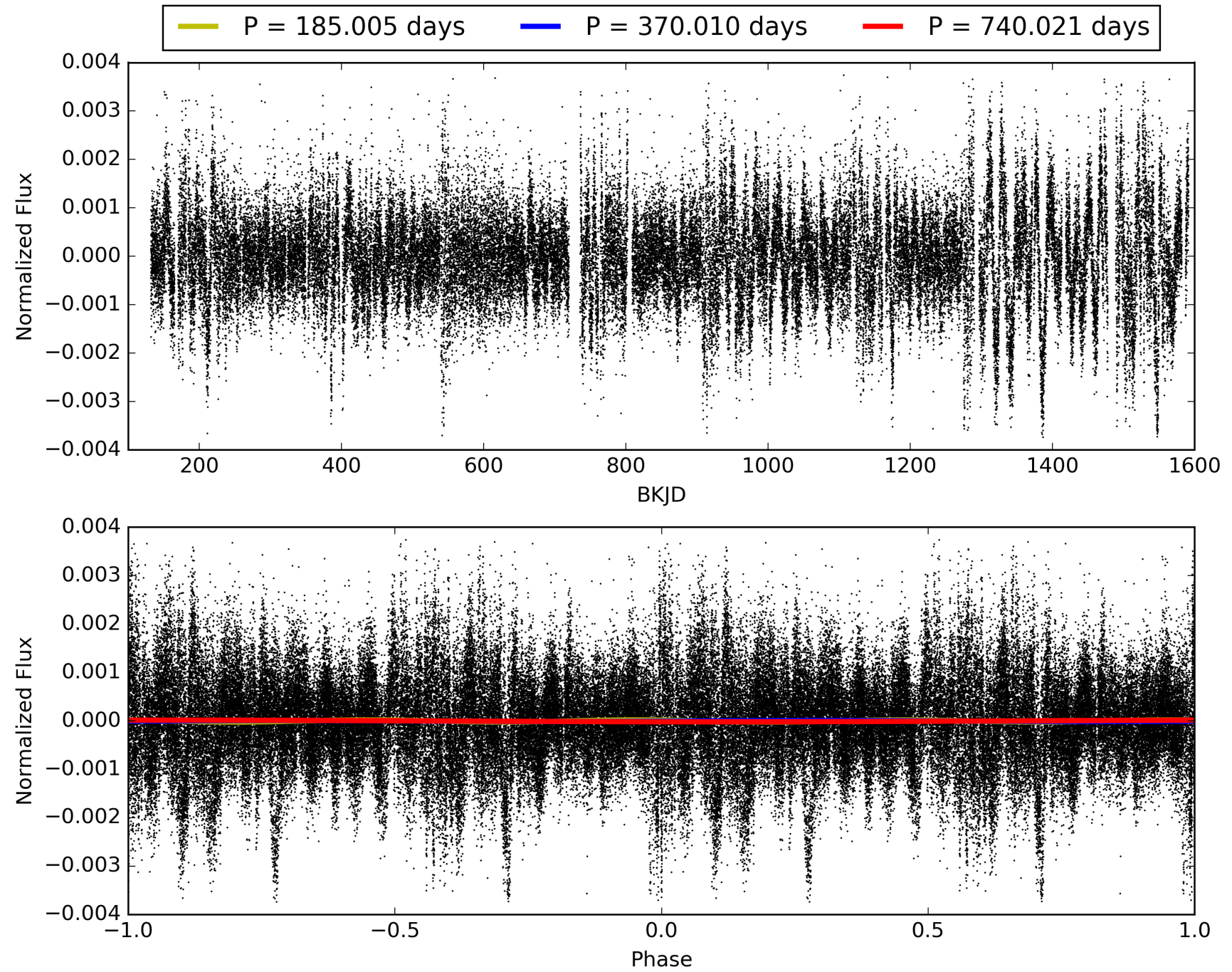
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 00:00:47 Z

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

# TCE 009011903-02, PDC Light Curves

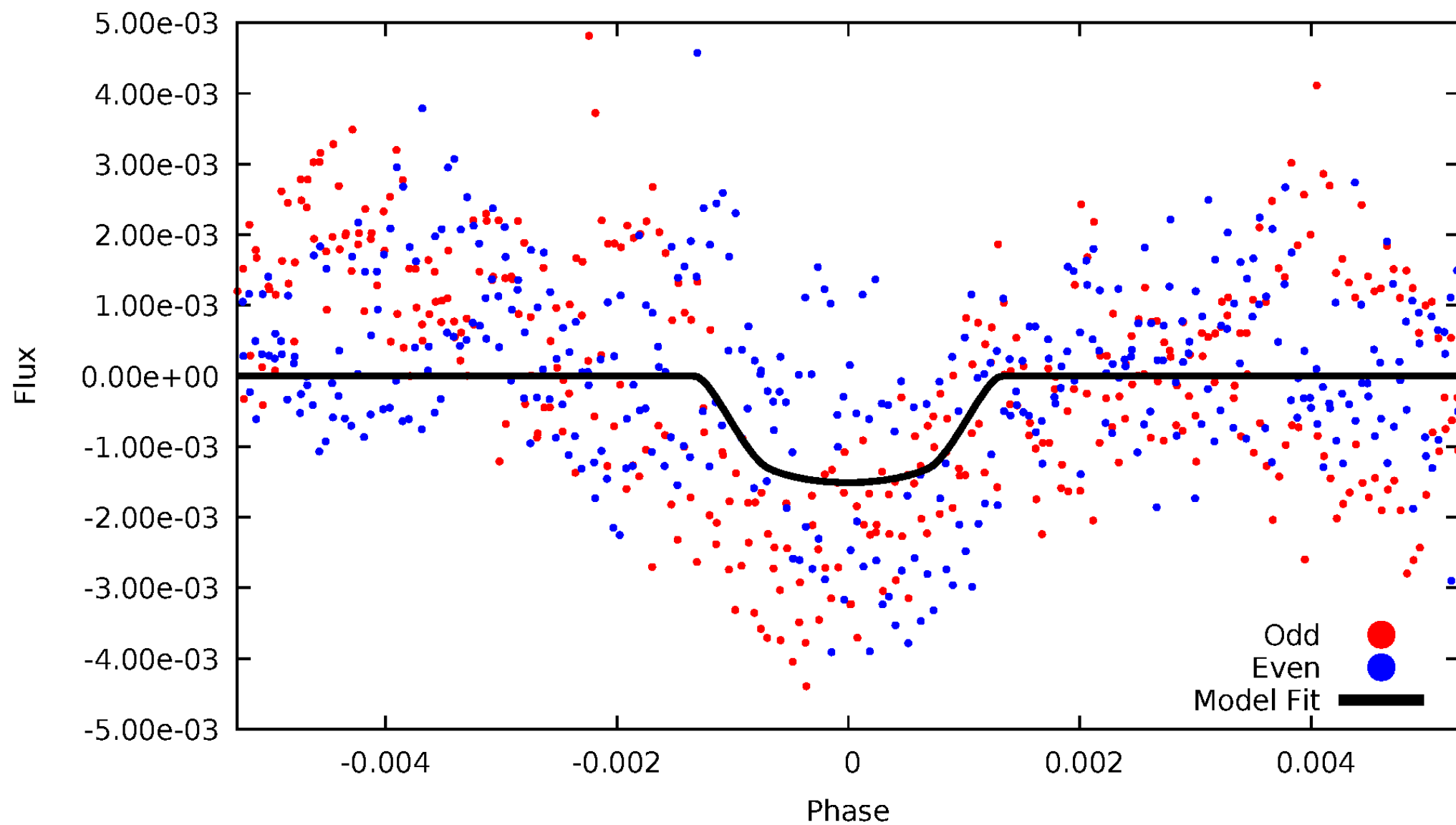


# TCE 009011903-02



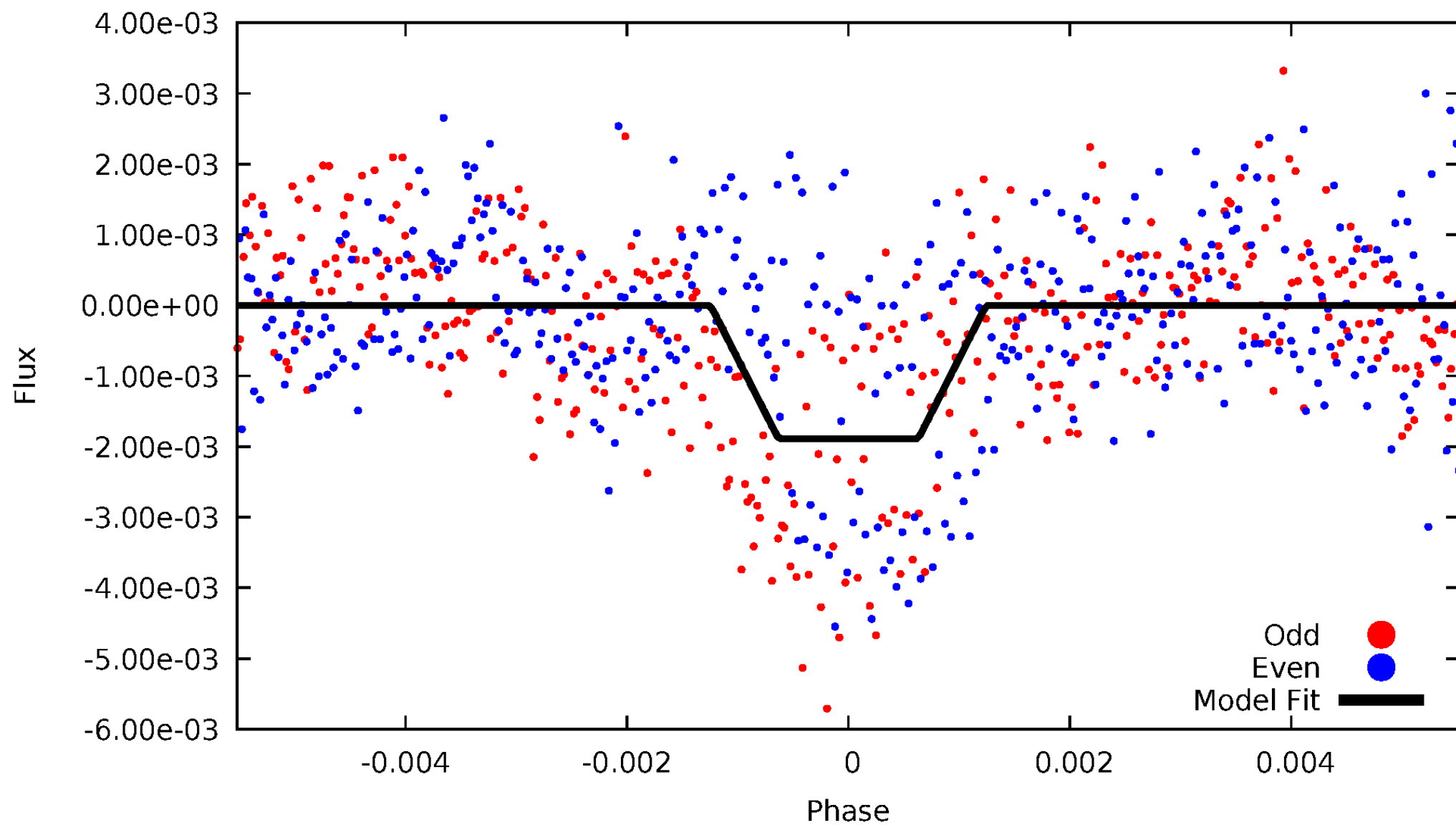
# DV Odd/Even

TCE 009011903-02



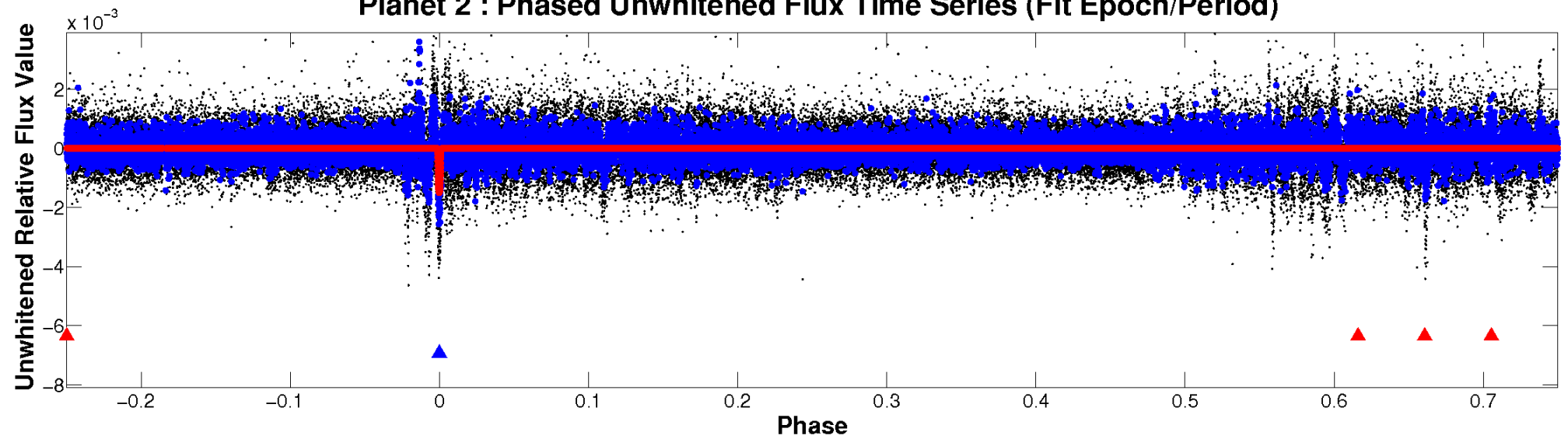
# ALT Odd/Even

TCE 009011903-02

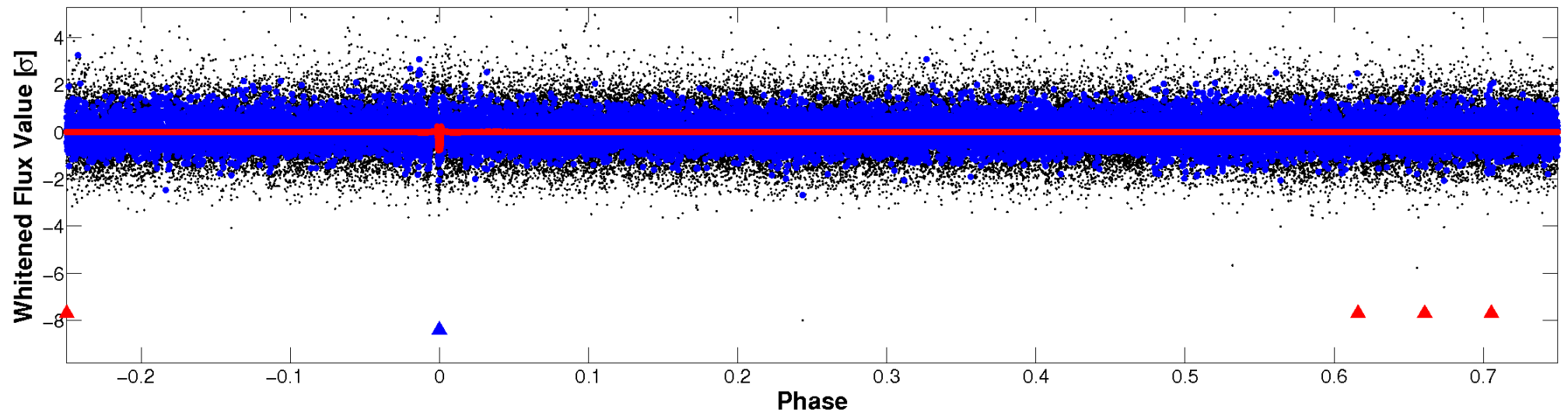


# Non-Whitened Vs. Whitened Light Curve

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

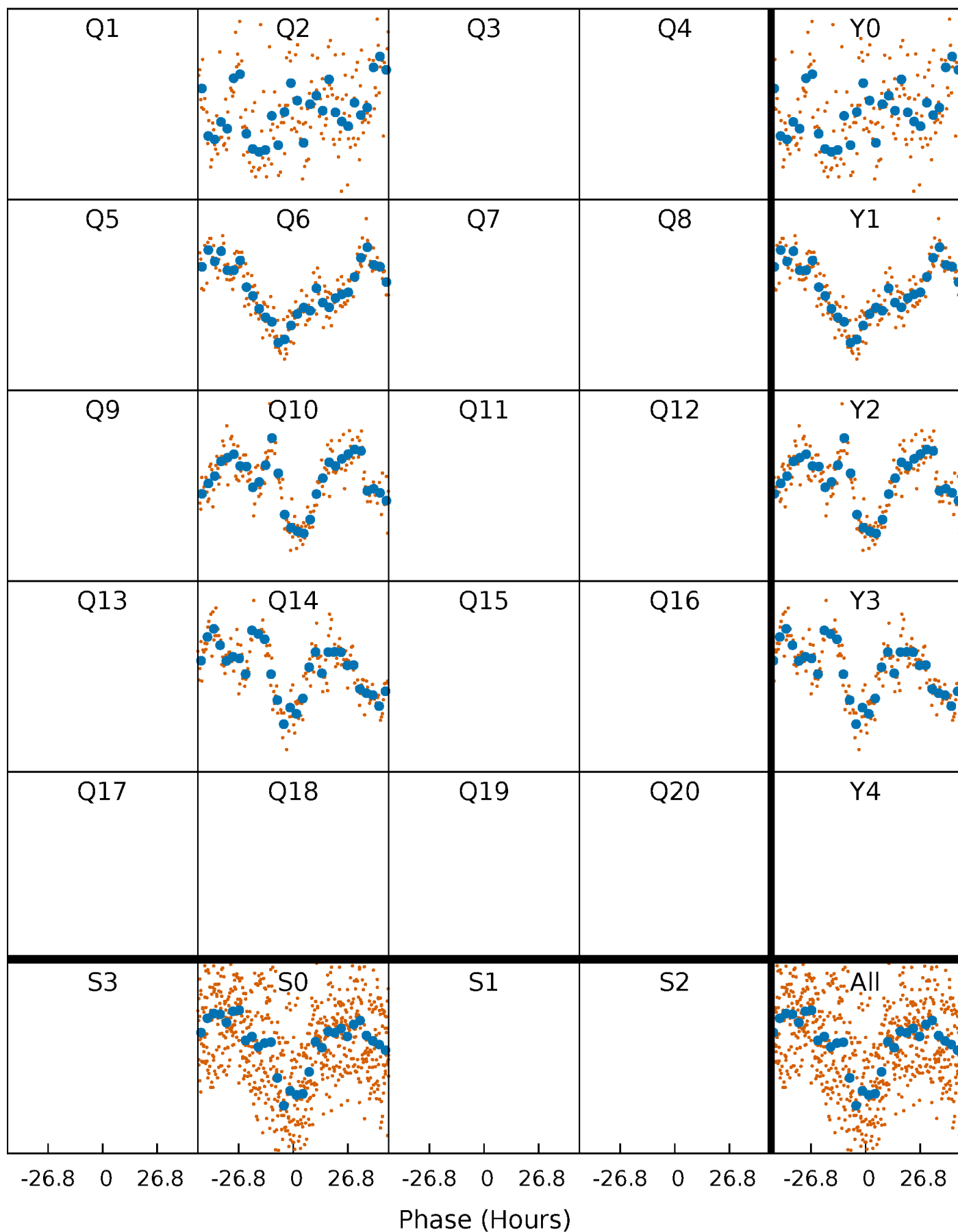


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



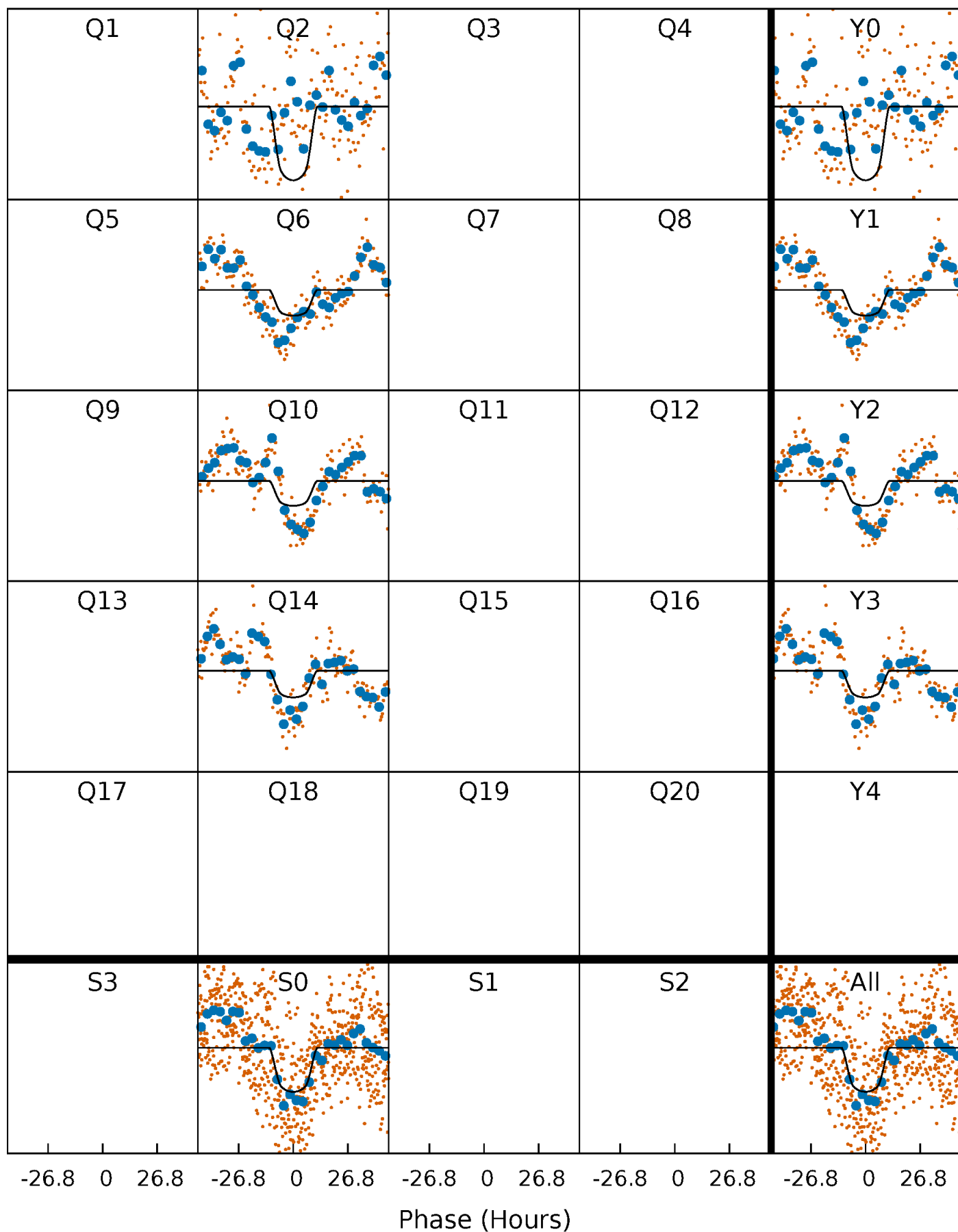
# PDC Quarter-Phased Transit Curves

TCE 009011903-02 P=370.010352 Days  $T_0=173.520268$  (BKJD)



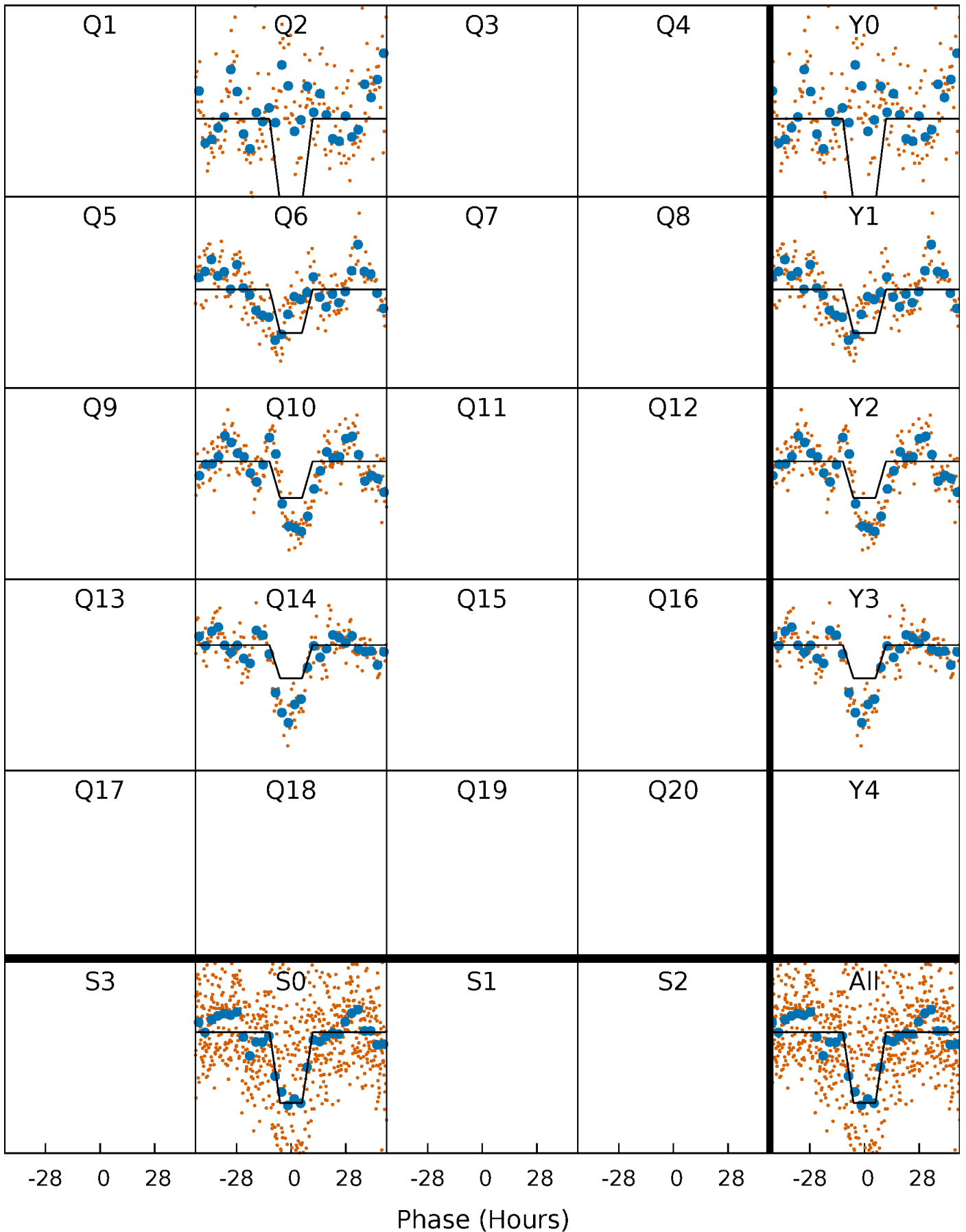
# DV Quarter-Phased Transit Curves

TCE 009011903-02 P=370.010352 Days  $T_0=173.520268$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

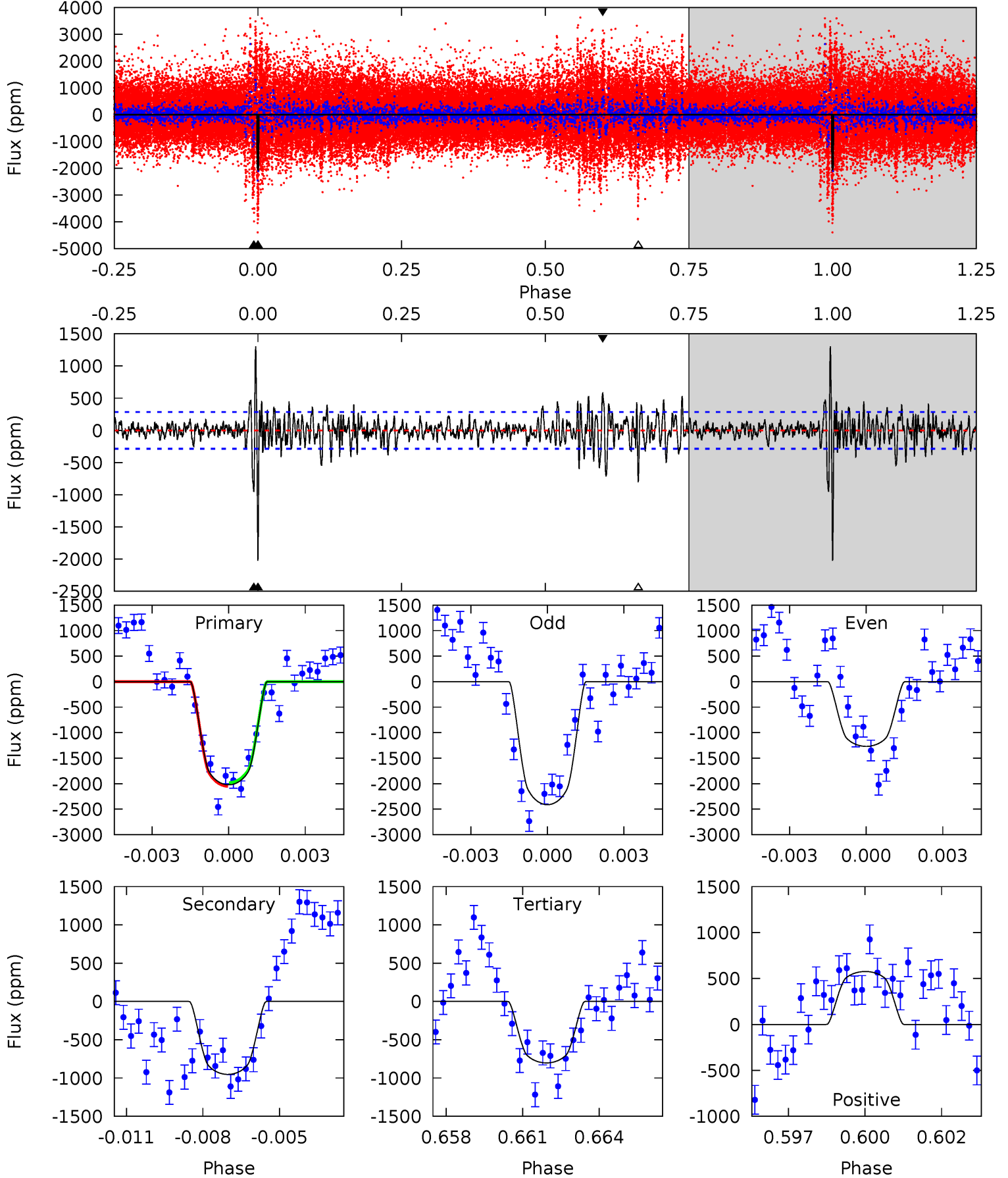
TCE 009011903-02     $P=369.956415$  Days     $T_0=173.618667$  (BKJD)



# DV Model-Shift Uniqueness Test

009011903-02, P = 370.010352 Days, E = 173.520268 Days

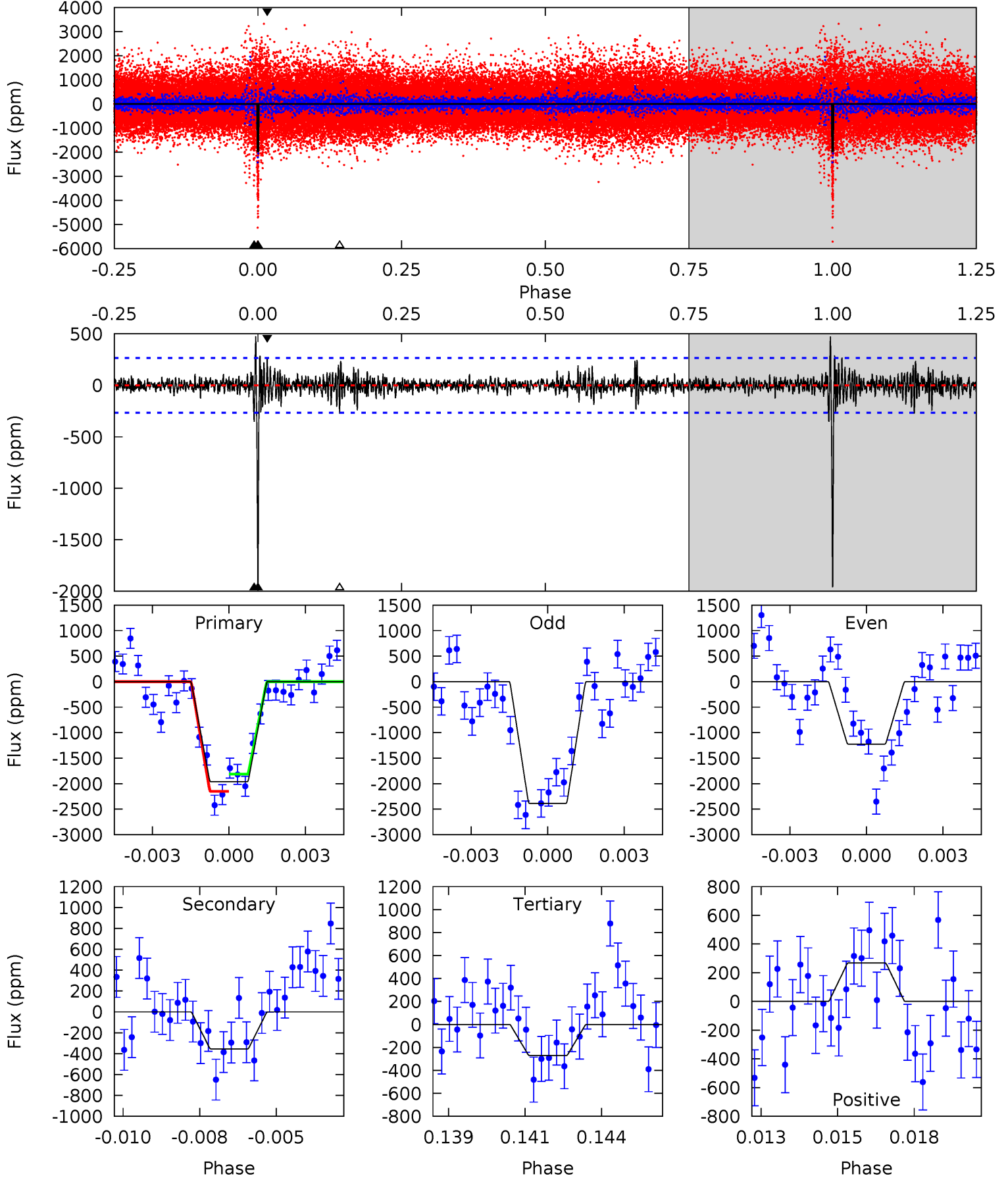
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
37.3	17.6	14.8	10.6	5.28	3.01	3.07	22.5	26.7	2.77	6.94	10.8	0.78	0.39	0.66



# Alt Model-Shift Uniqueness Test

009011903-02, P = 369.956415 Days, E = 173.618667 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
39.0	7.04	5.40	5.34	5.28	3.02	1.11	33.6	33.7	1.64	1.70	11.8	0.90	0.19	3.30



### Stellar Parameters For KIC 009011903

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$4955^{+148}_{-148}$	$4.565^{+0.045}_{-0.054}$	$0.120^{+0.250}_{-0.300}$	$0.777^{+0.065}_{-0.065}$	$0.808^{+0.055}_{-0.067}$	$2.427^{+0.521}_{-0.428}$
	+3%/-3%	+1%/-1%	+208%/-250%	+8%/-8%	+7%/-8%	+21%/-18%
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 009011903-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-953 \pm 54$	$3.79^{+0.43}_{-0.44}$	$278^{+10}_{-10}$	$4284^{+232}_{-193}$	$31997^{+9141}_{-6268}$
Alt.	$-354 \pm 50$	$3.70^{+0.45}_{-0.45}$	$278^{+11}_{-9}$	$3629^{+203}_{-159}$	$12520^{+4059}_{-2829}$

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

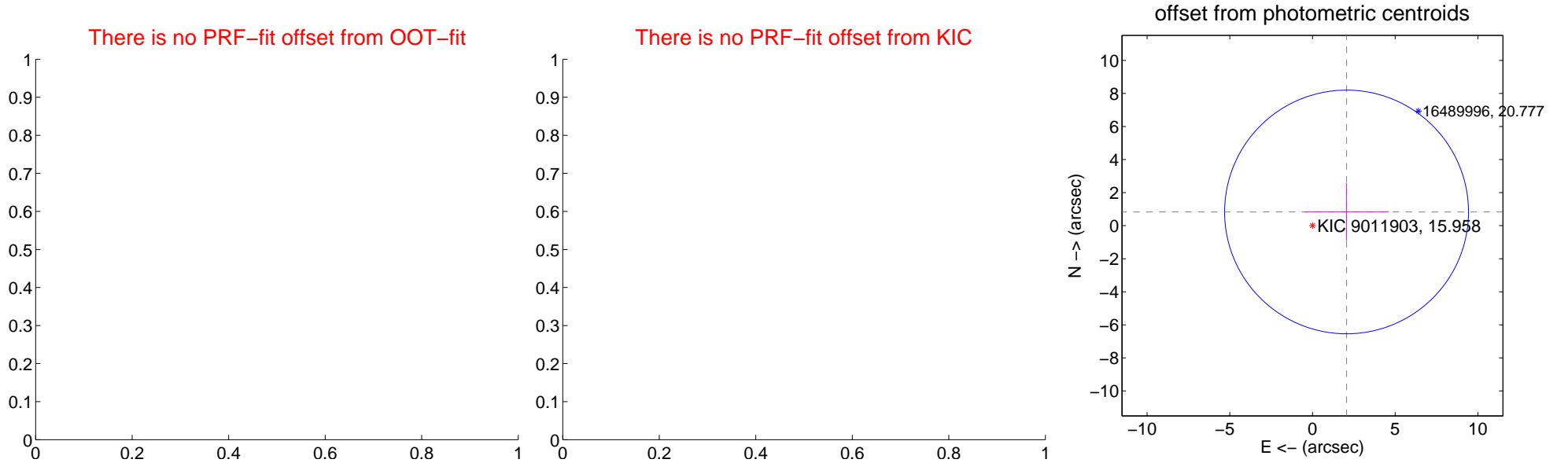
## DV Centroid Data

Supplemental centroid analysis for 009011903-02. Kepler magnitude: 15.96. Transit SNR 8.44

There are 0 quarters with good PRF difference image offsets

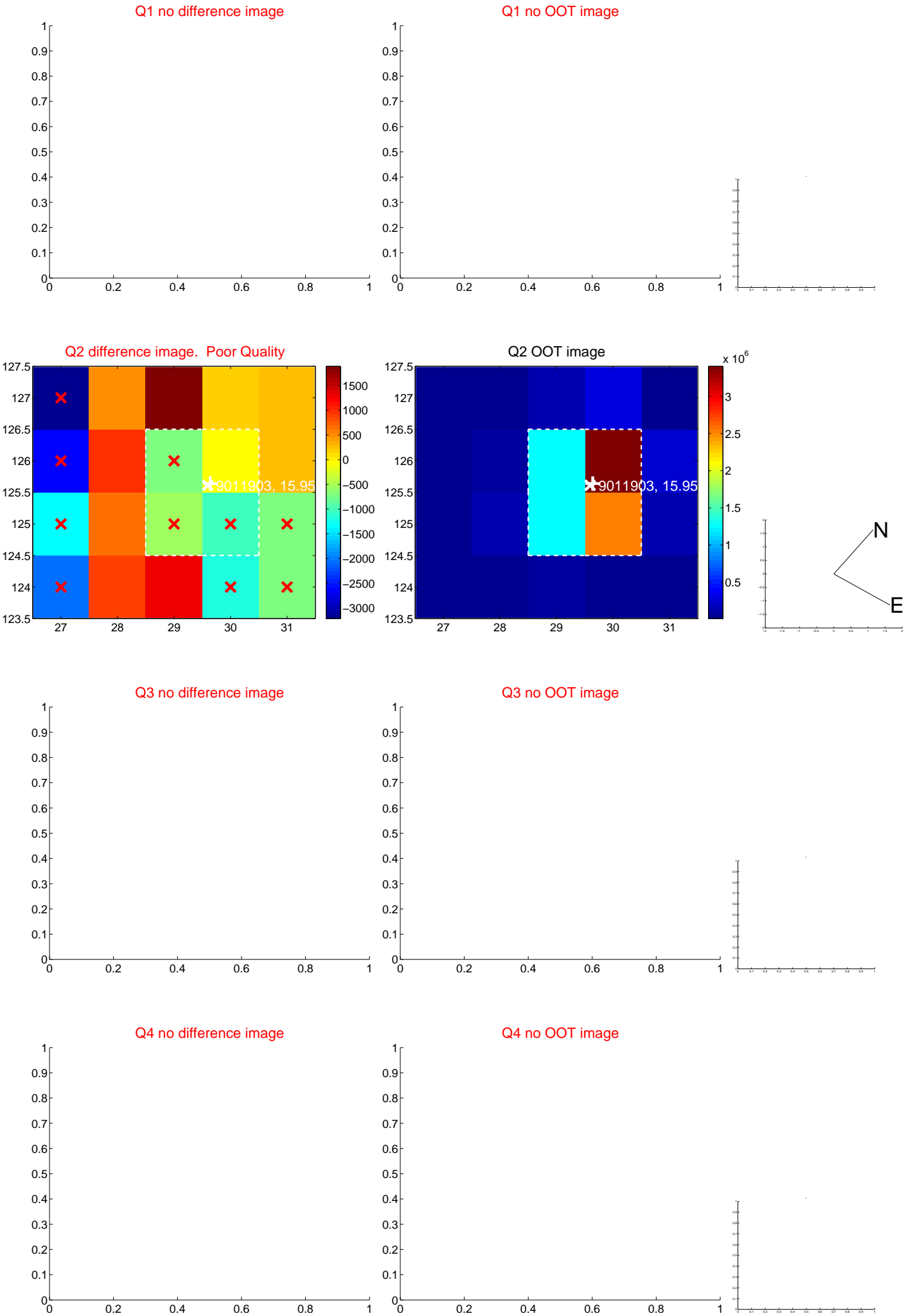
The direct PRF centroid is offset from the target star catalog position by about NaN arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	—	—	—	—
PRF-fit source offset from KIC position	—	—	—	—
photometric centroid source offset	$2.22 \pm 2.46$	0.90	$-2.06 \pm 2.55$	$0.83 \pm 1.74$

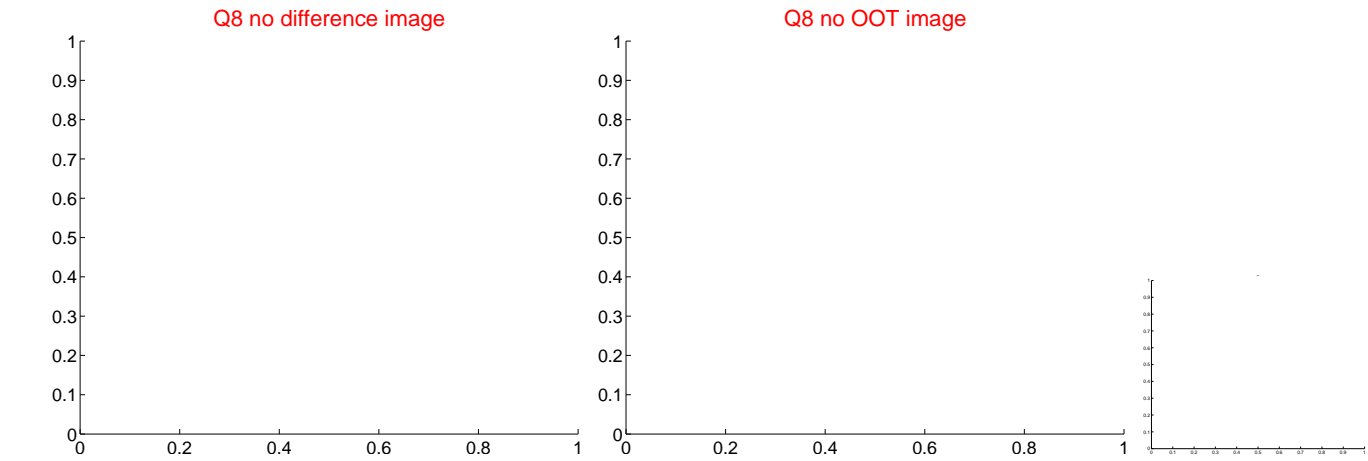
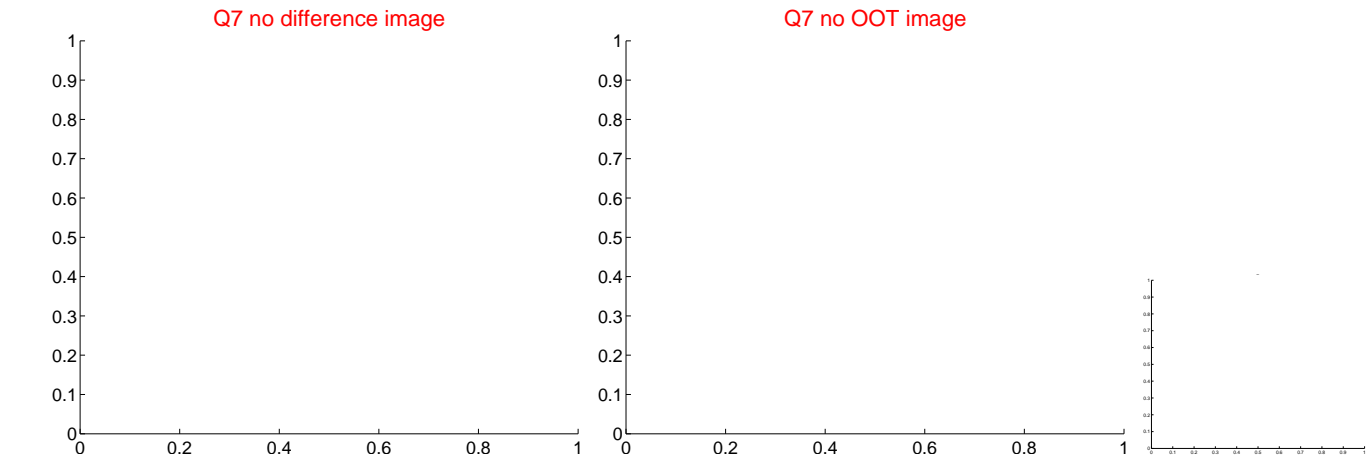
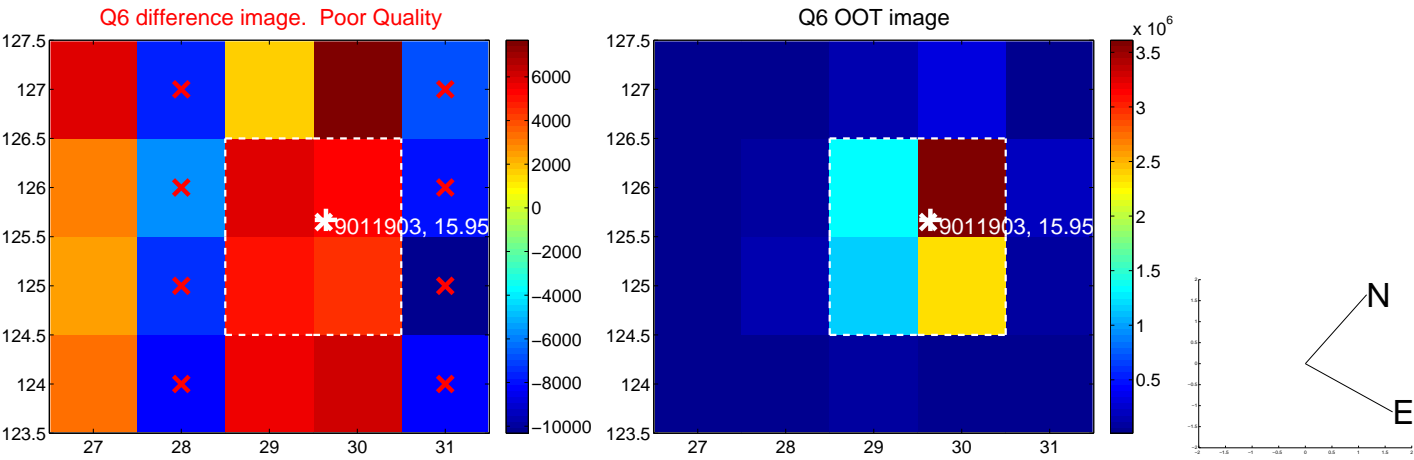
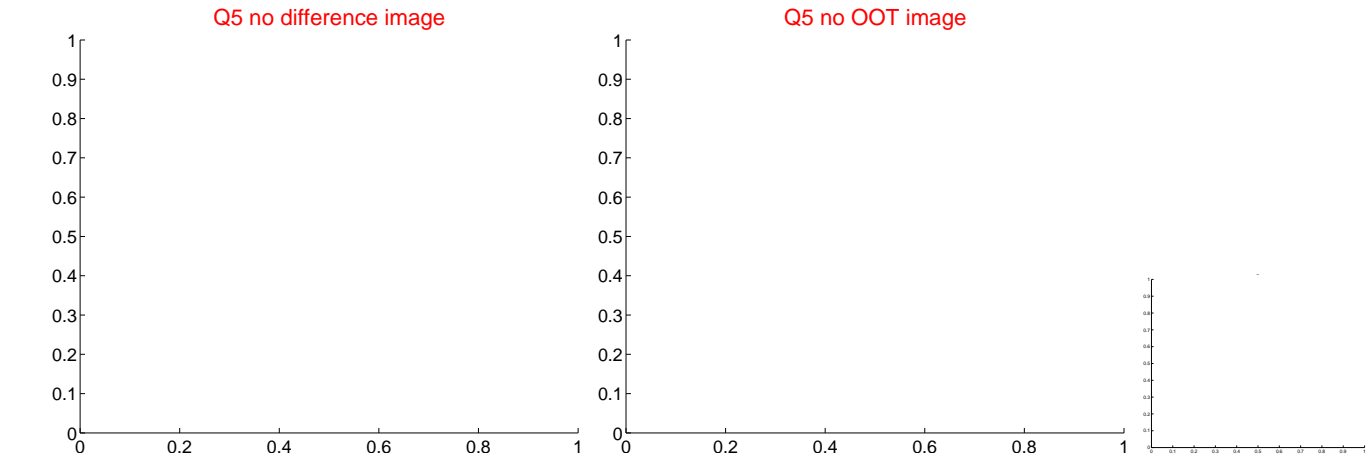


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

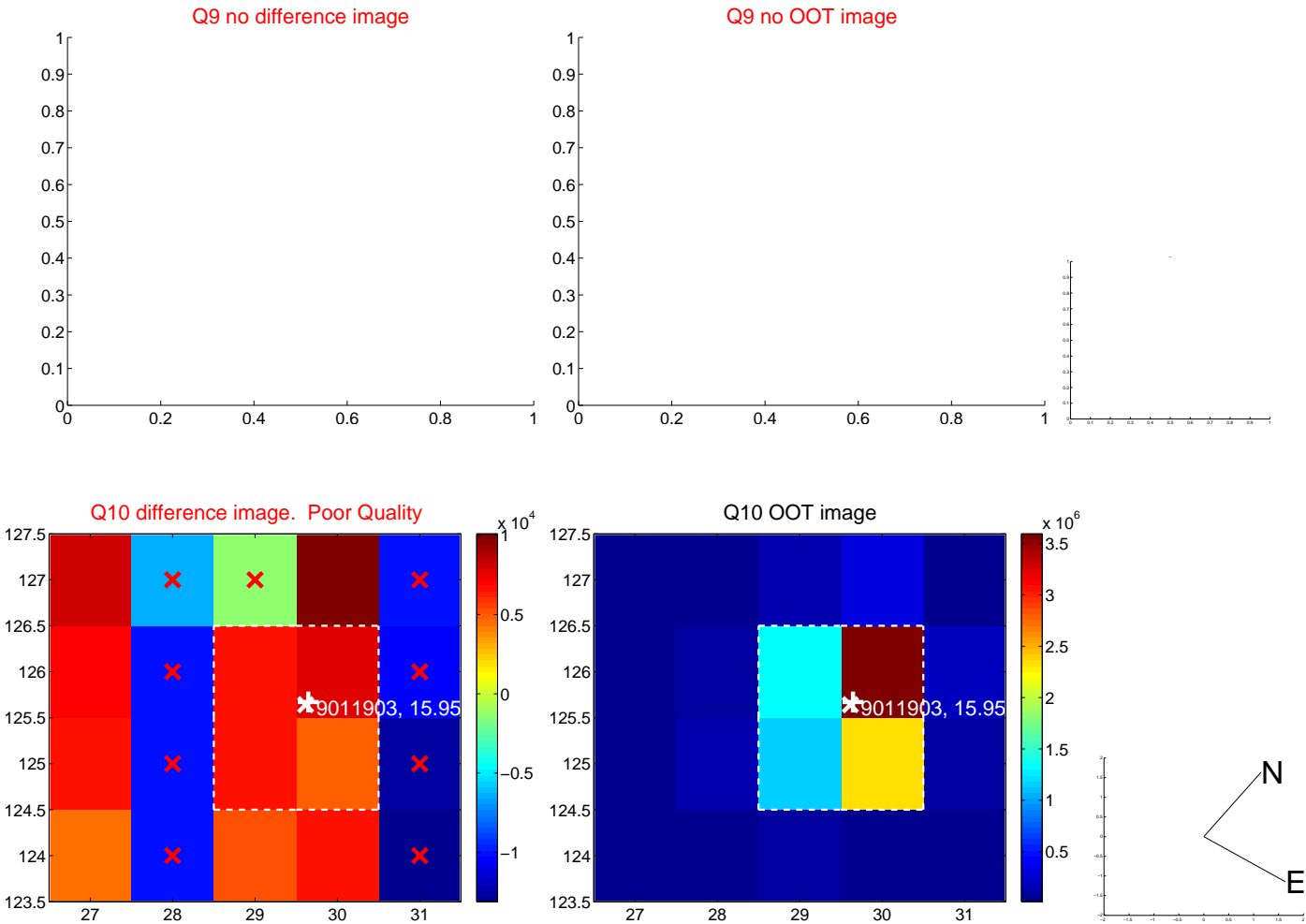
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



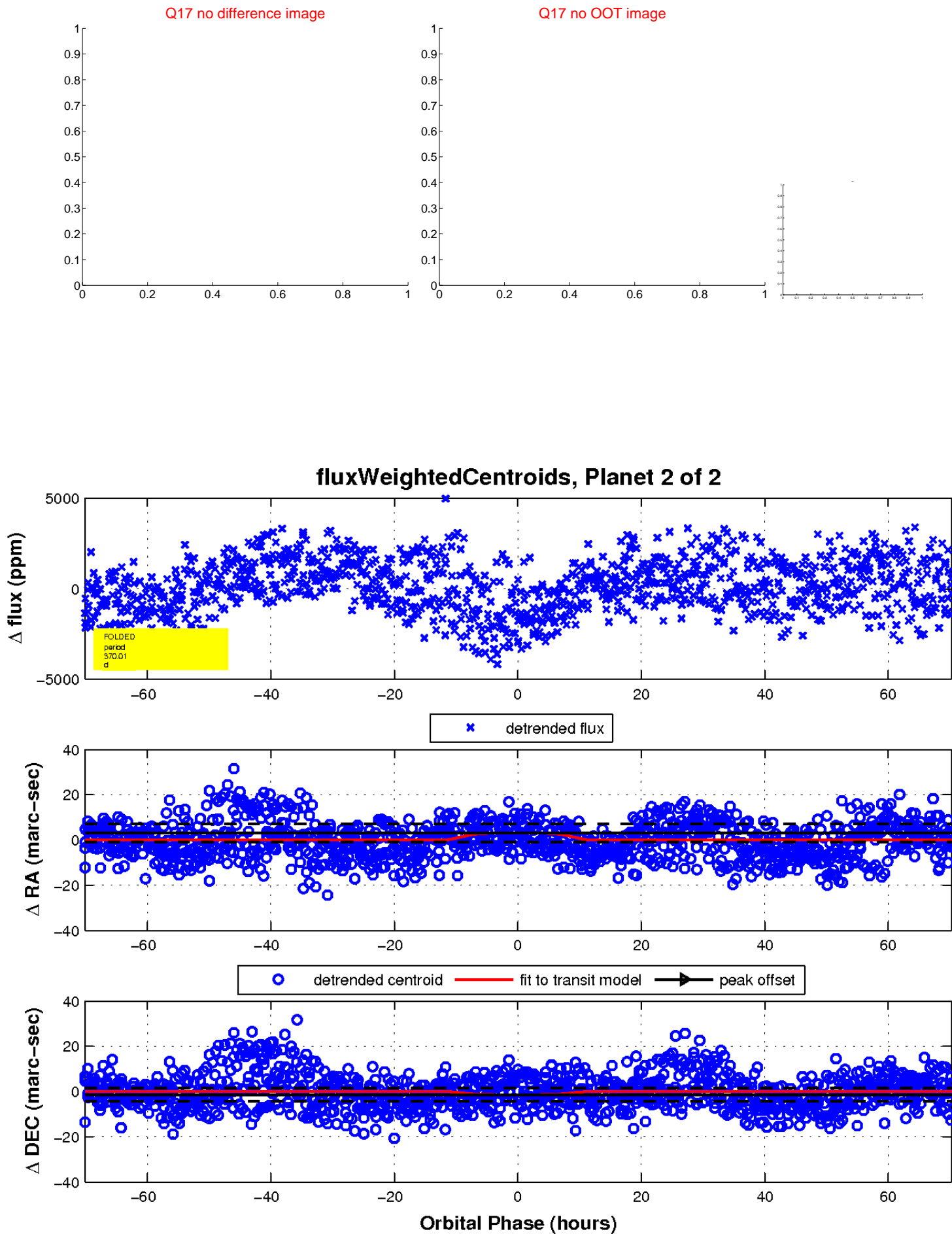
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



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



UKIRT Image

Declination

