

# KIC 009716385

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009716385-01	OBS	No	411.306873	185.967090	254.3	9.622	13.4	3.1	2.92	7452	5.04	12.73
009716385-02	OBS	No	372.960288	364.532748	377.8	3.325	10.0	9.3	2.92	7452	6.33	14.50
009716385-03	OBS	No	2.634047	132.164868	34.2	7.500	9.4	-1.0	2.92	7452	1.73	10703.08
009716385-04	OBS	No	5.268418	136.140060	93.1	28.941	7.7	9.7	2.92	7452	5.53	4247.17

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009716385-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_SKYE_ZUMA—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_SATURATED
009716385-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_SATURATED
009716385-03	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—CENT_SATURATED
009716385-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE_ZUMA—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD—CENT_SATURATED

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

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

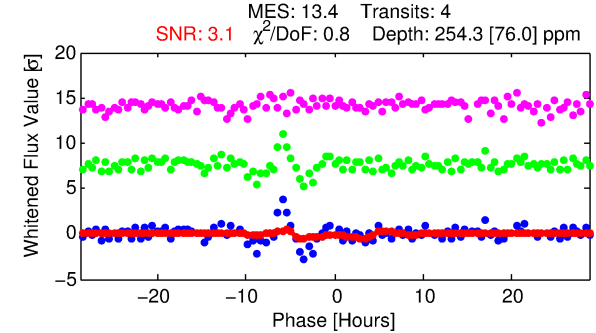
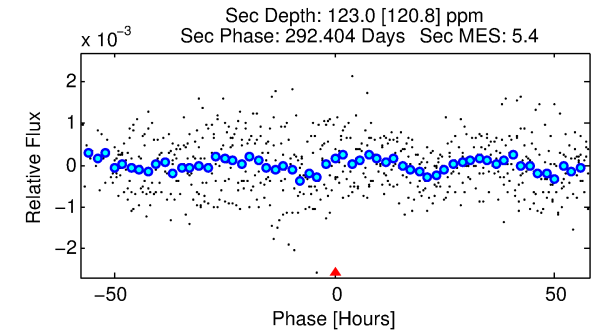
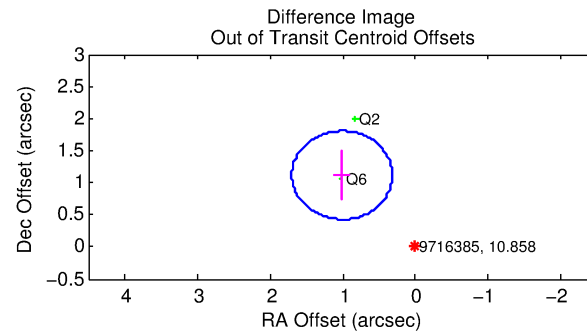
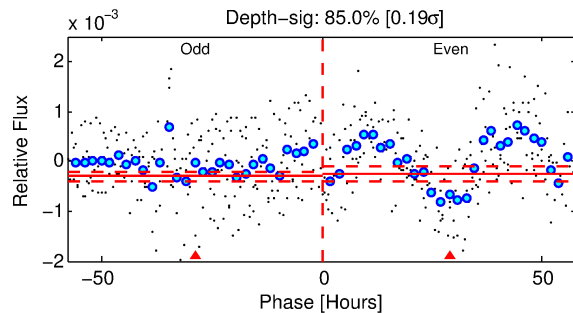
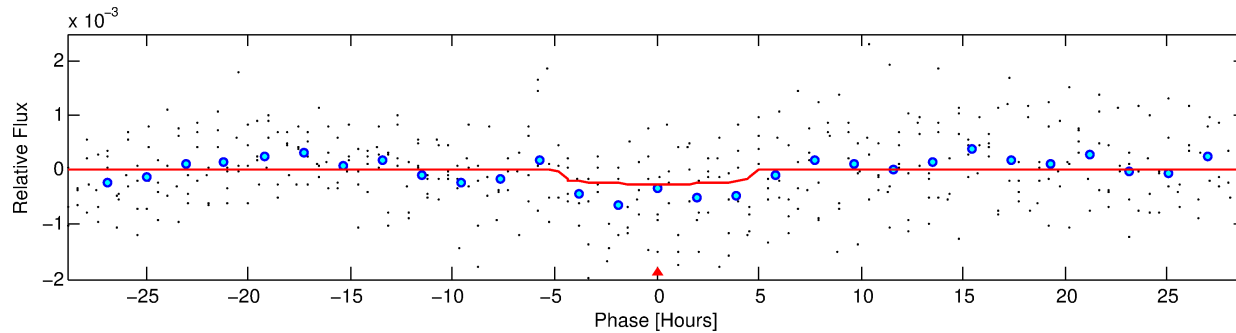
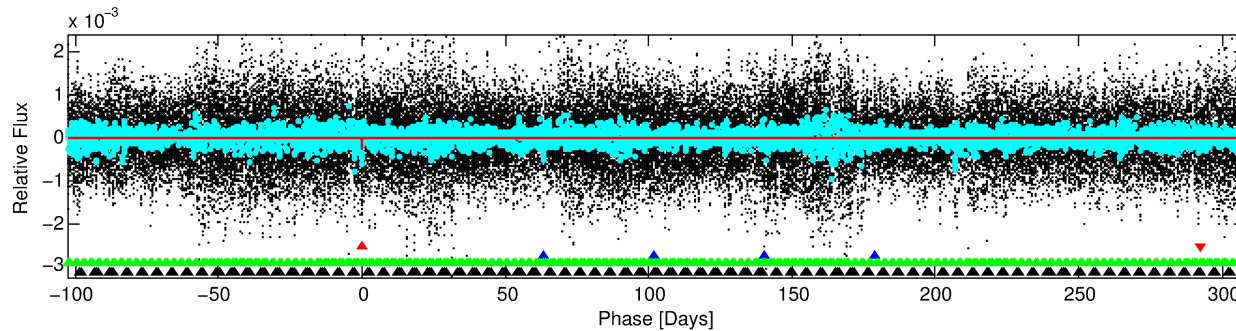
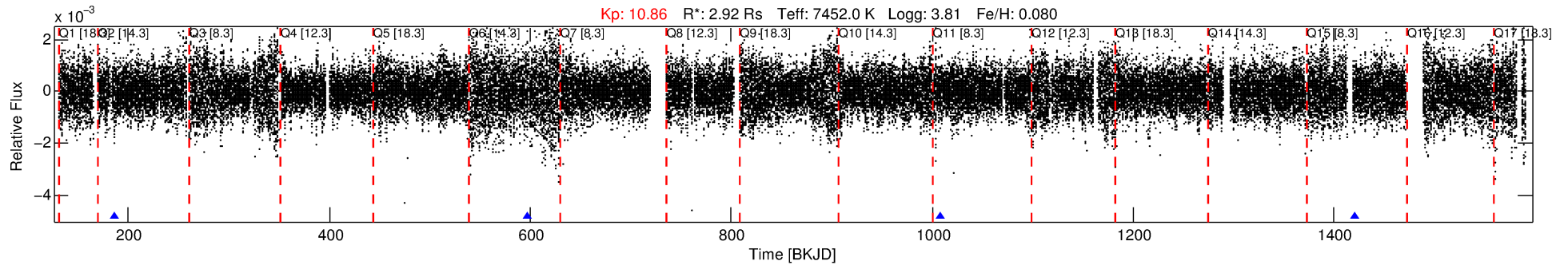
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009716385-01

No Significant Match Found

# DV One-Page Summary

KIC: 9716385 Candidate: 1 of 4 Period: 411.307 d



## DV Fit Results:

Period = 411.30687 [0.01218] d  
Epoch = 185.9671 [0.0215] BKJD  
Rp/R\* = 0.0158 [0.0147]  
a/R\* = 226.95 [1242.02]  
b = 0.74 [3.35]  
Seff = 12.73 [7.85]  
Teq = 482 [74] K  
Rp = 5.04 [5.14] Re  
a = 1.3609 [0.5204] AU  
Ag = 4930.41 [10763.06] [0.46 $\sigma$ ]  
Teffp = 6240 [3291] K [1.75 $\sigma$ ]

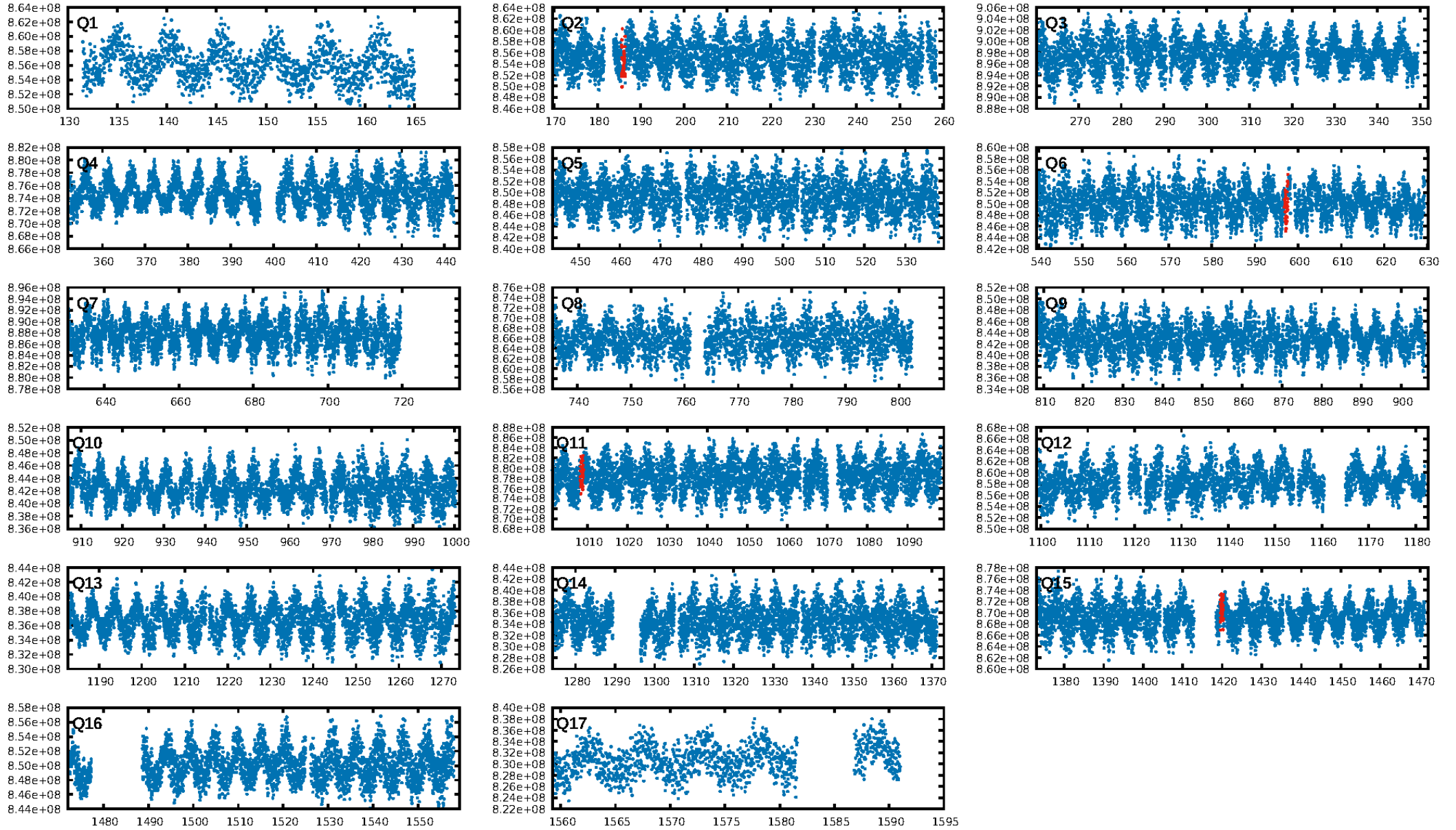
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [90.40 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 64.2%  
ModelChiSquareGof-sig: 99.9%  
Bootstrap-pfa: 1.93e-17  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: -1.549  
Centroid-sig: 3.4%  
Centroid-so: 1.025 arcsec [1.78 $\sigma$ ]  
OotOffset-rm: 1.506 arcsec [6.55 $\sigma$ ]  
KicOffset-rm: 1.993 arcsec [12.30 $\sigma$ ]  
OotOffset-st: 2/0/0/0 [2]  
KicOffset-st: 2/0/0/0 [2]  
DiffImageQuality-fgm: 0.00 [0/2]  
DiffImageOverlap-fno: 0.50 [1/2]

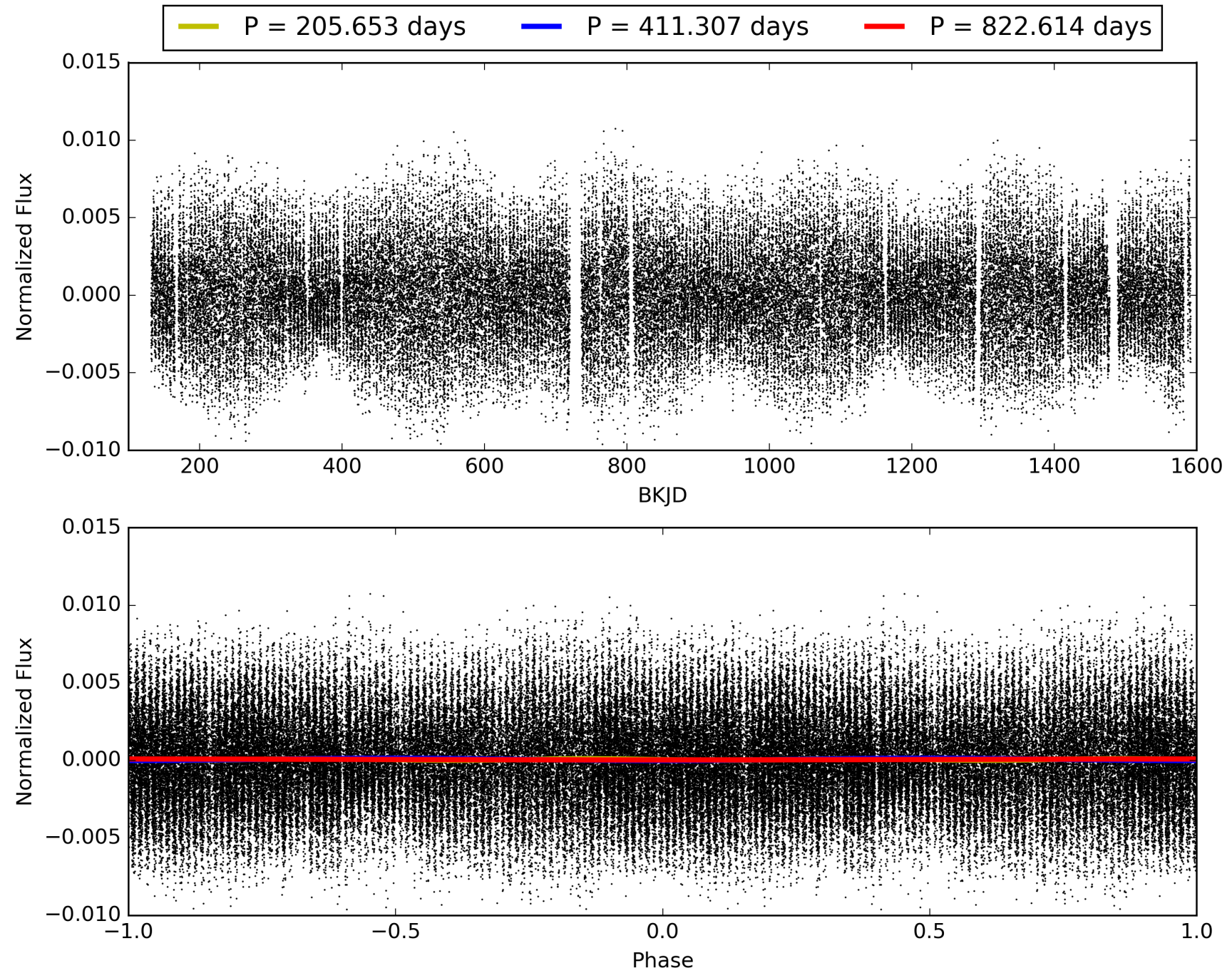
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 11:16:18 Z

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

# TCE 009716385-01, PDC Light Curves



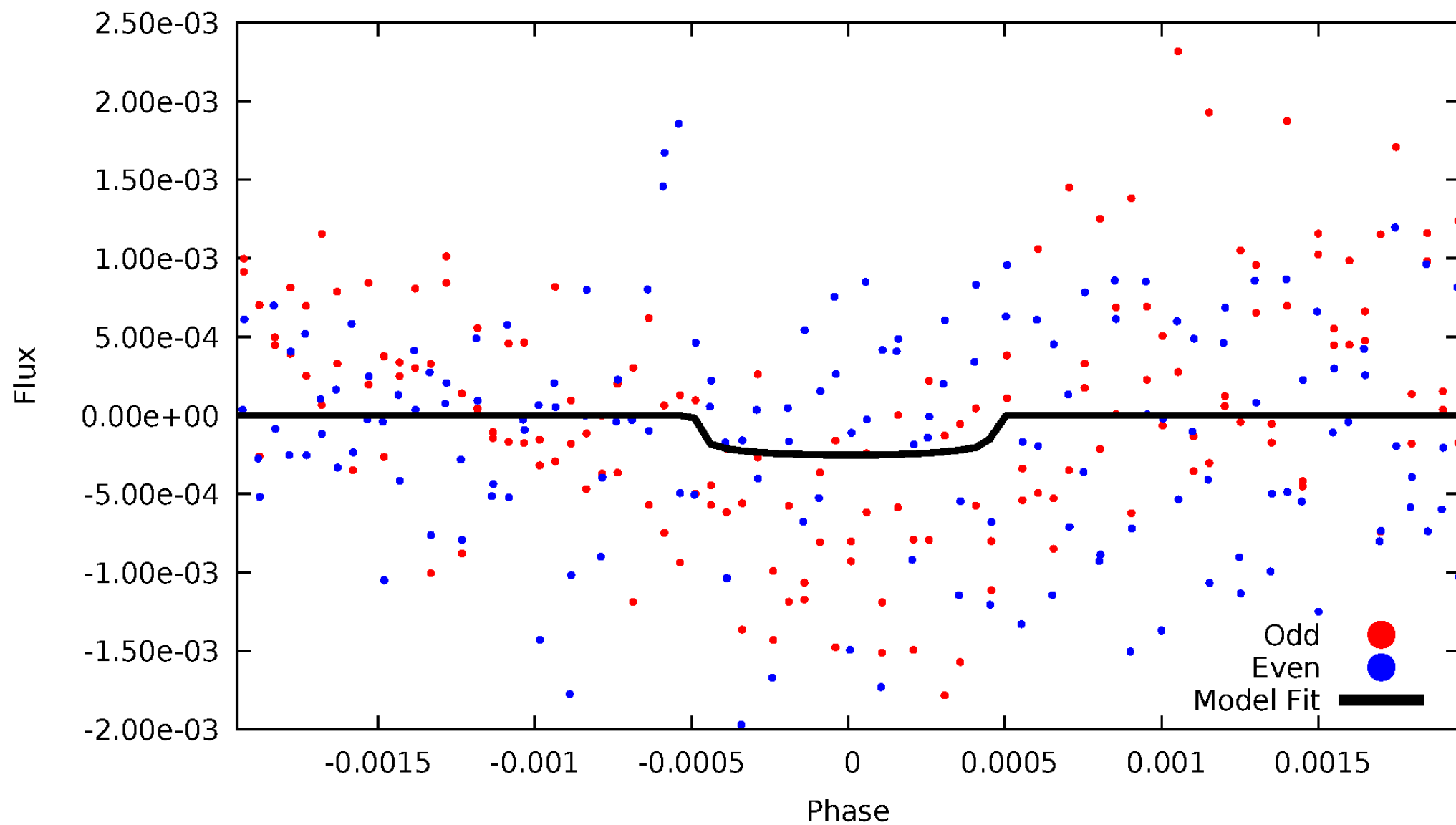
TCE 009716385-01





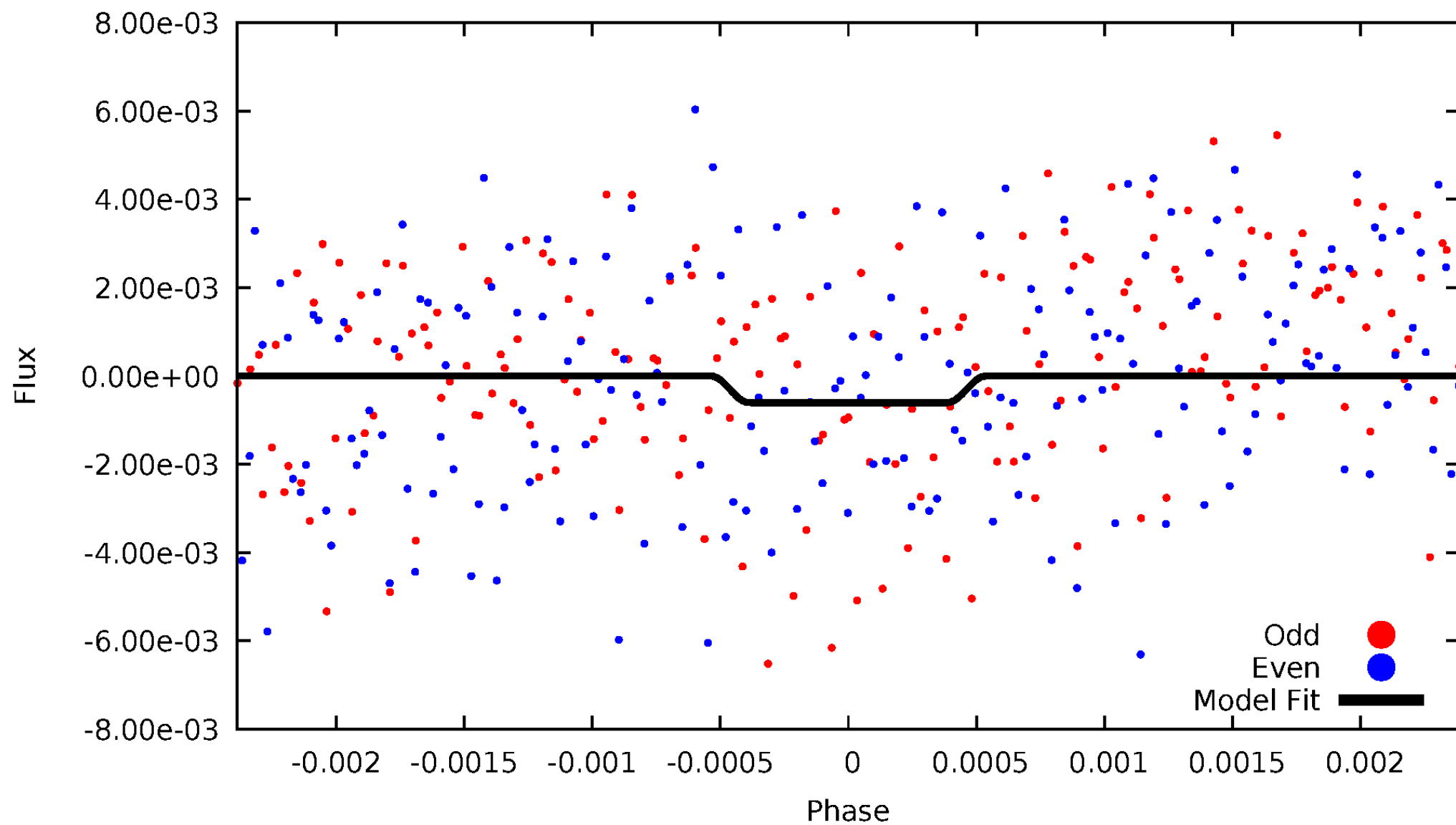
# DV Odd/Even

TCE 009716385-01



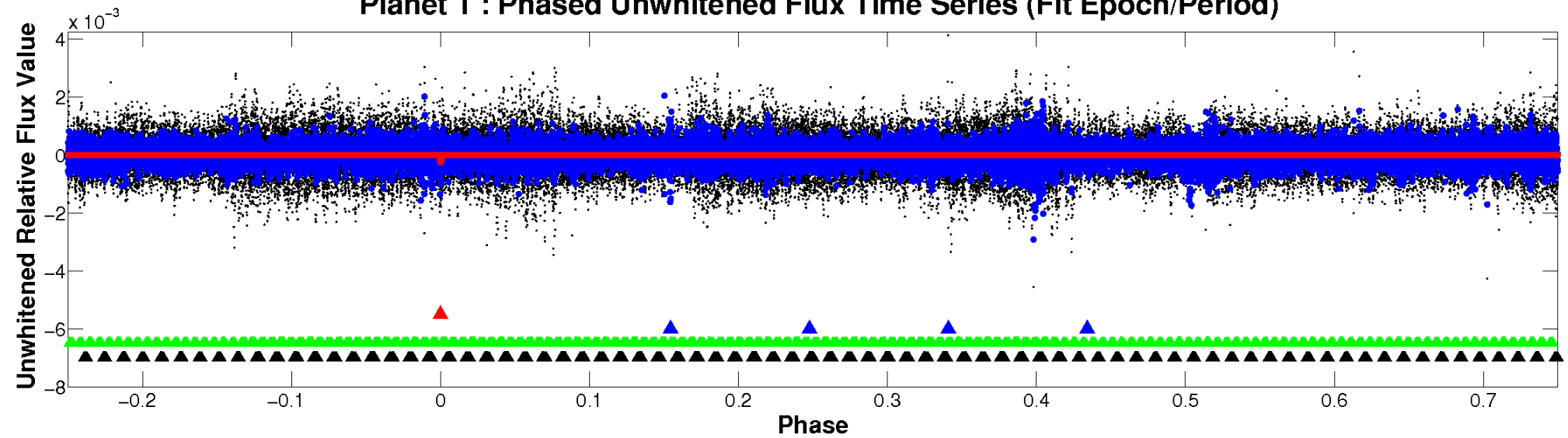
# ALT Odd/Even

TCE 009716385-01

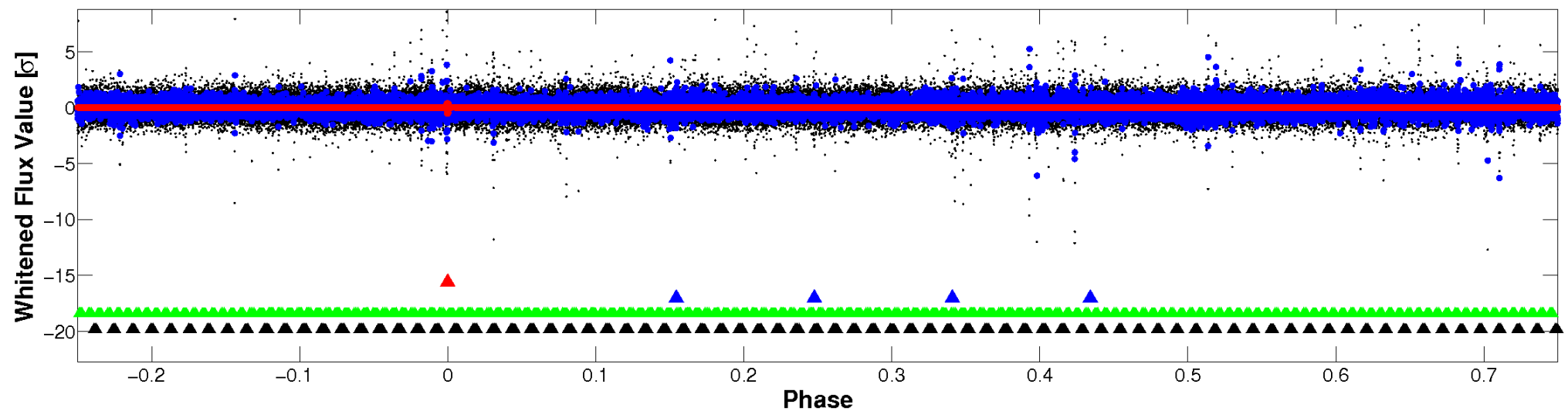


# Non-Whitened Vs. Whitened Light Curve

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

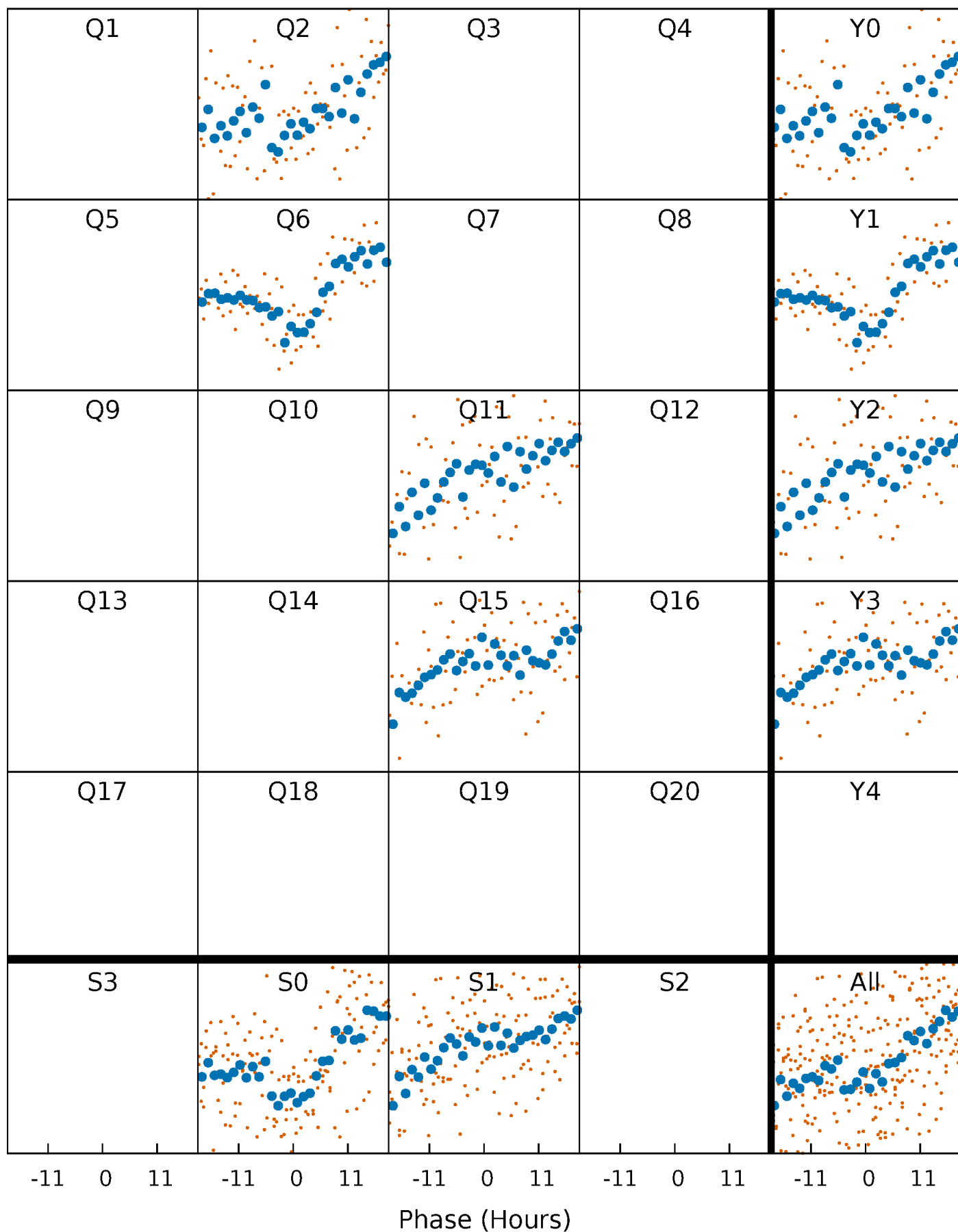


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

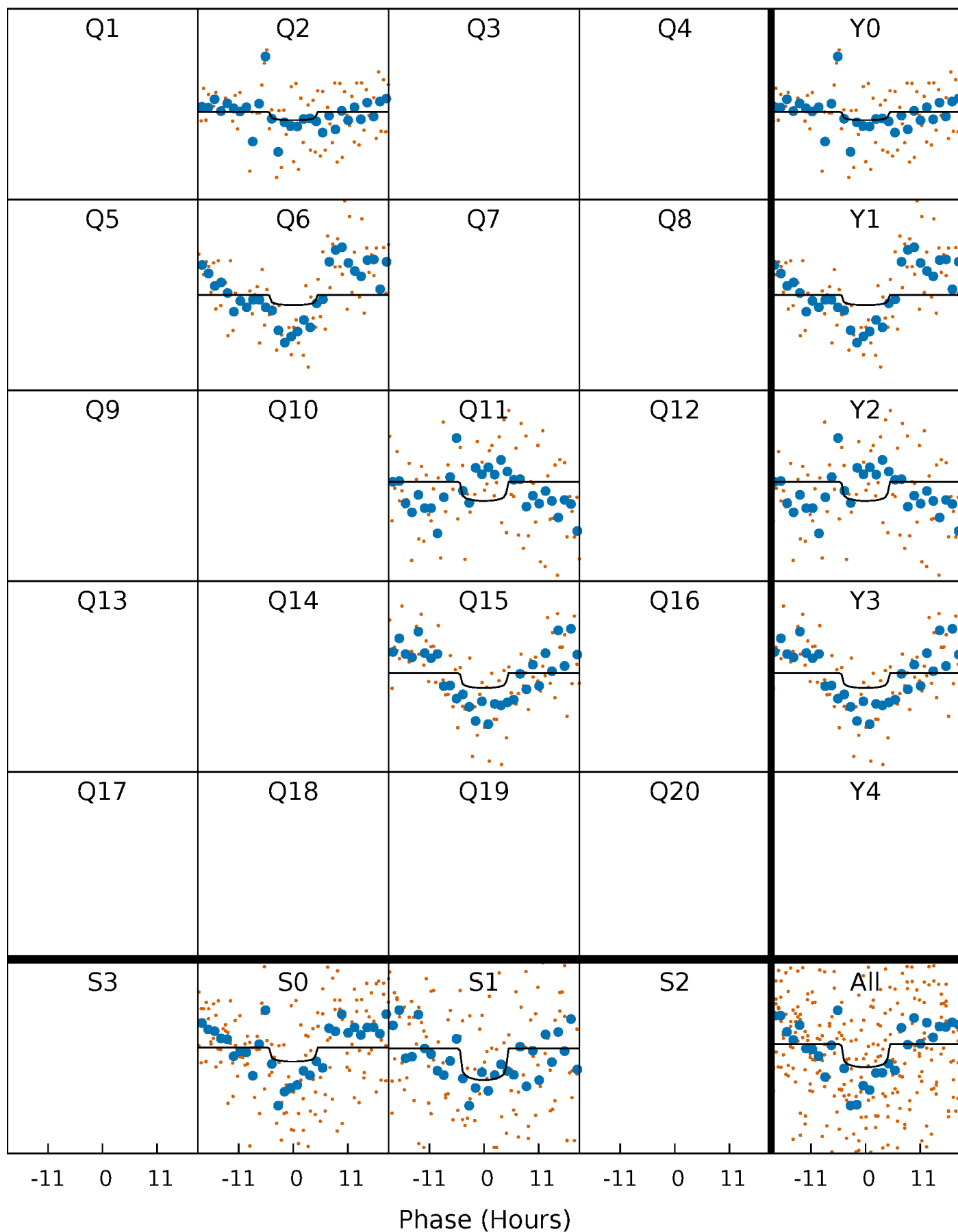
TCE 009716385-01 P=411.306873 Days  $T_0=185.967090$  (BKJD)





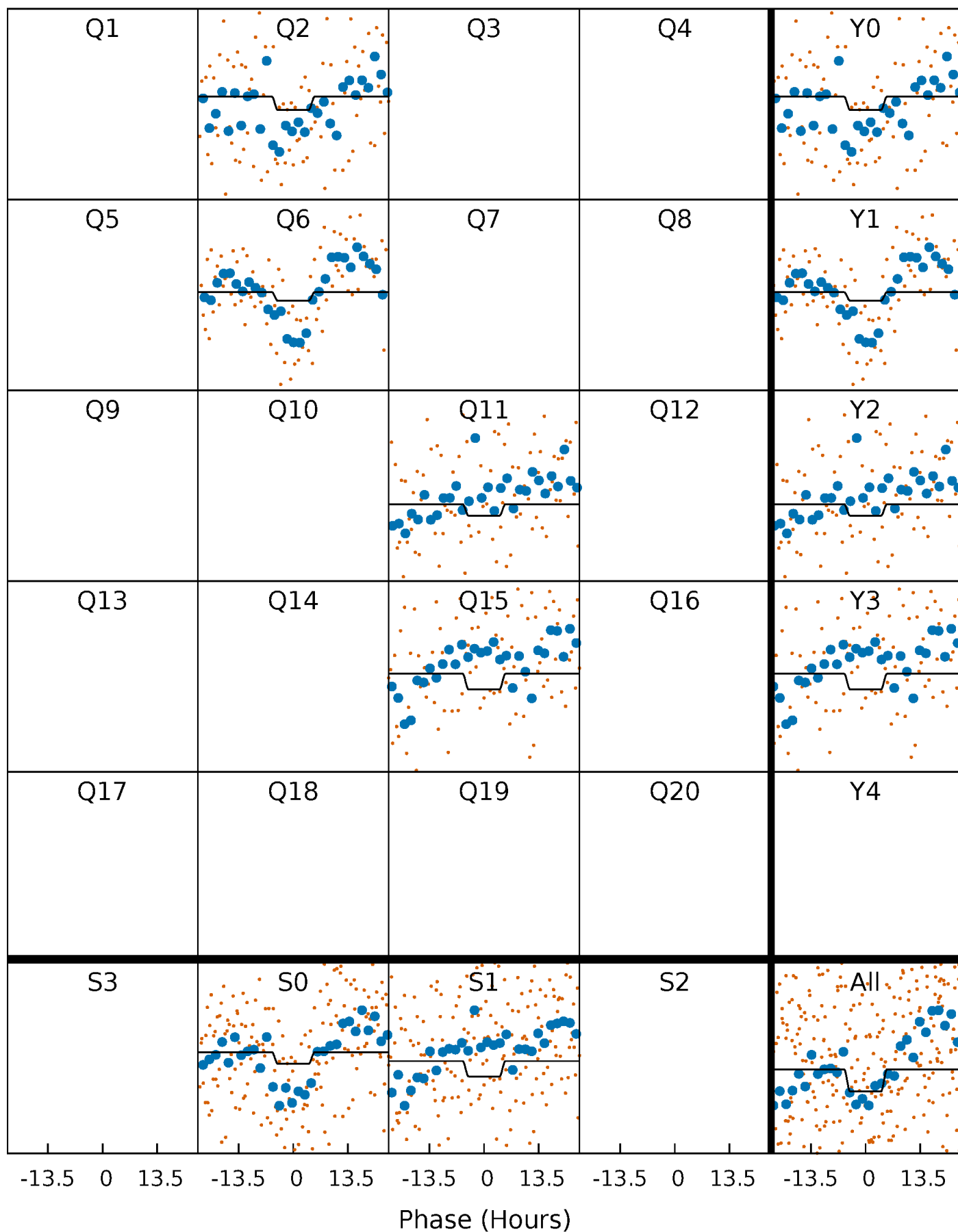
# DV Quarter-Phased Transit Curves

TCE 009716385-01 P=411.306873 Days  $T_0=185.967090$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

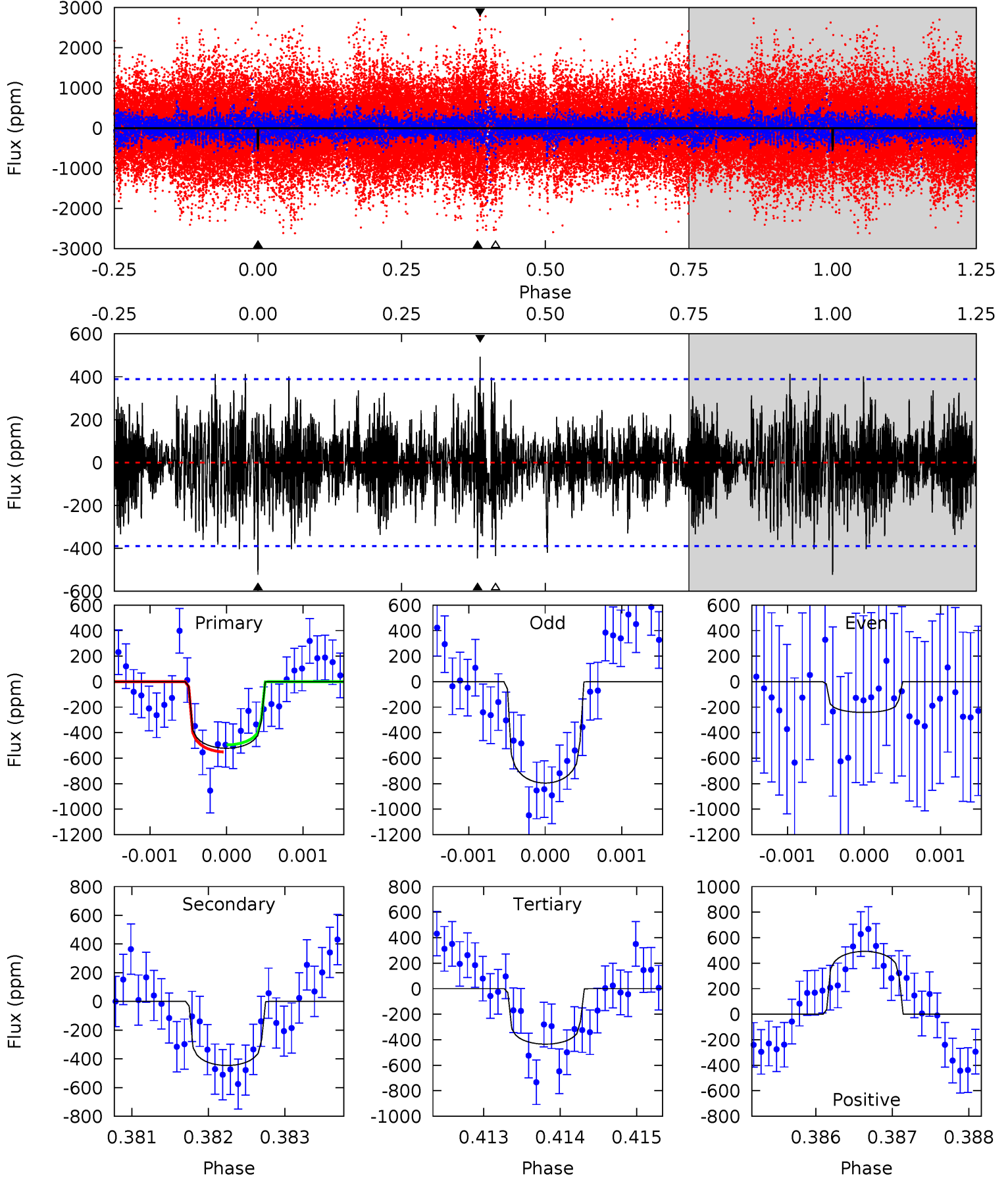
TCE 009716385-01 P=411.293507 Days  $T_0=185.990366$  (BKJD)



# DV Model-Shift Uniqueness Test

009716385-01, P = 411.306873 Days, E = 185.967090 Days

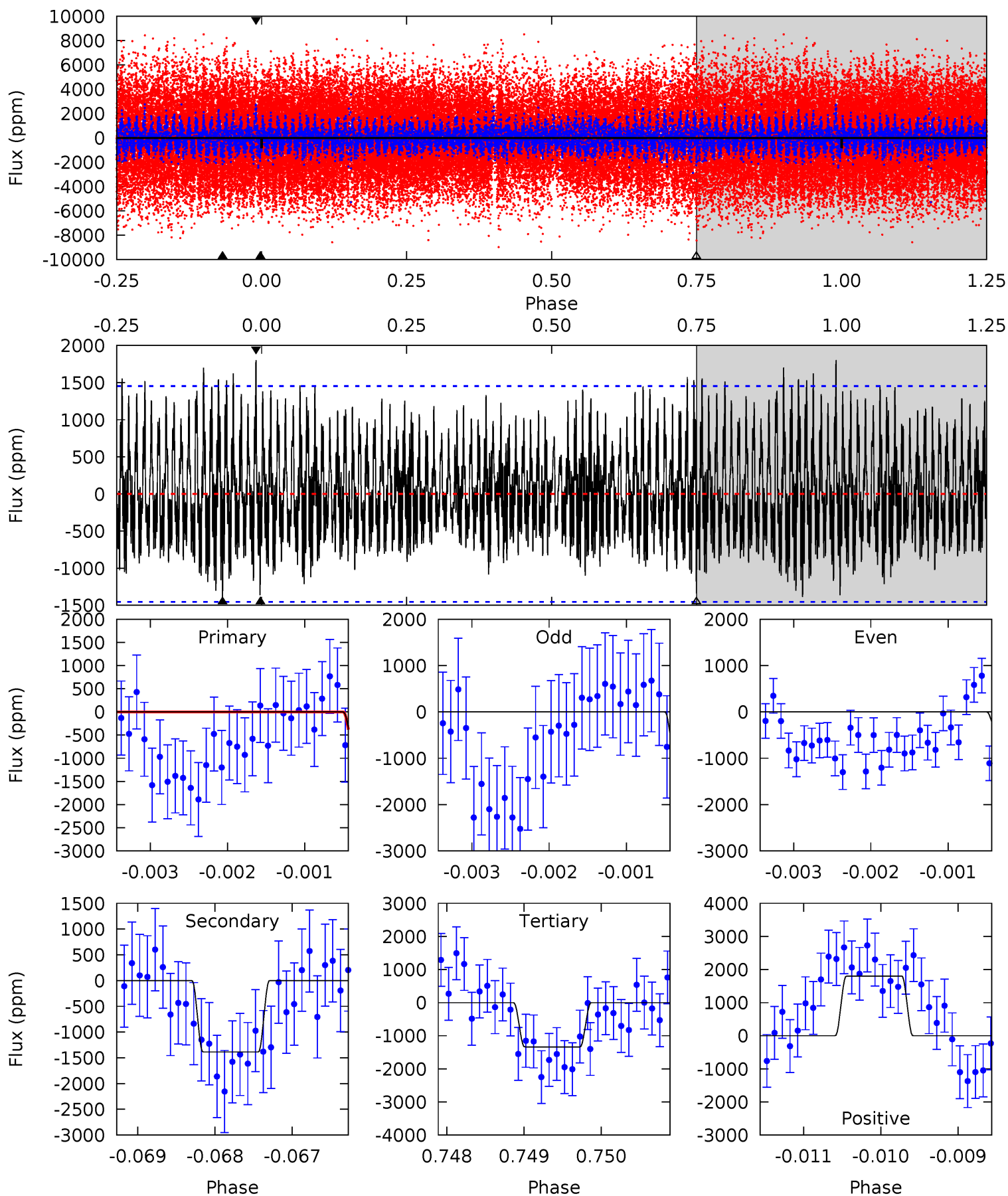
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
7.32	6.25	6.09	6.90	5.45	3.29	1.75	1.23	0.42	0.16	-0.65	3.95	0.87	0.49	0.39



# Alt Model-Shift Uniqueness Test

009716385-01, P = 411.293507 Days, E = 185.990366 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
2.87	5.19	5.00	6.74	5.44	3.27	2.11	-2.13	-3.87	0.19	-1.55	1.05	1.65	0.57	0.27





### Stellar Parameters For KIC 009716385

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$7452^{+206}_{-335}$	$3.805^{+0.338}_{-0.113}$	$0.080^{+0.200}_{-0.350}$	$2.921^{+0.493}_{-1.231}$	$1.985^{+0.089}_{-0.503}$	$0.112^{+0.293}_{-0.039}$
	+3%/-4%	+9%/-3%	+250%/-438%	+17%/-42%	+4%/-25%	+261%/-35%
Source	PHO54	PHO54	PHO54	DSEP		

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

### Secondary Eclipse Parameters for KIC 009716385-01 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-446 \pm 71$	$5.41^{+4.05}_{-3.33}$	$657^{+49}_{-65}$	$8035^{+9290}_{-2111}$	$14560^{+92008}_{-9615}$
Alt.	$-1387 \pm 267$	$7.04^{+4.77}_{-3.78}$	$660^{+46}_{-66}$	$9644^{+9922}_{-2542}$	$26208^{+108622}_{-16542}$

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

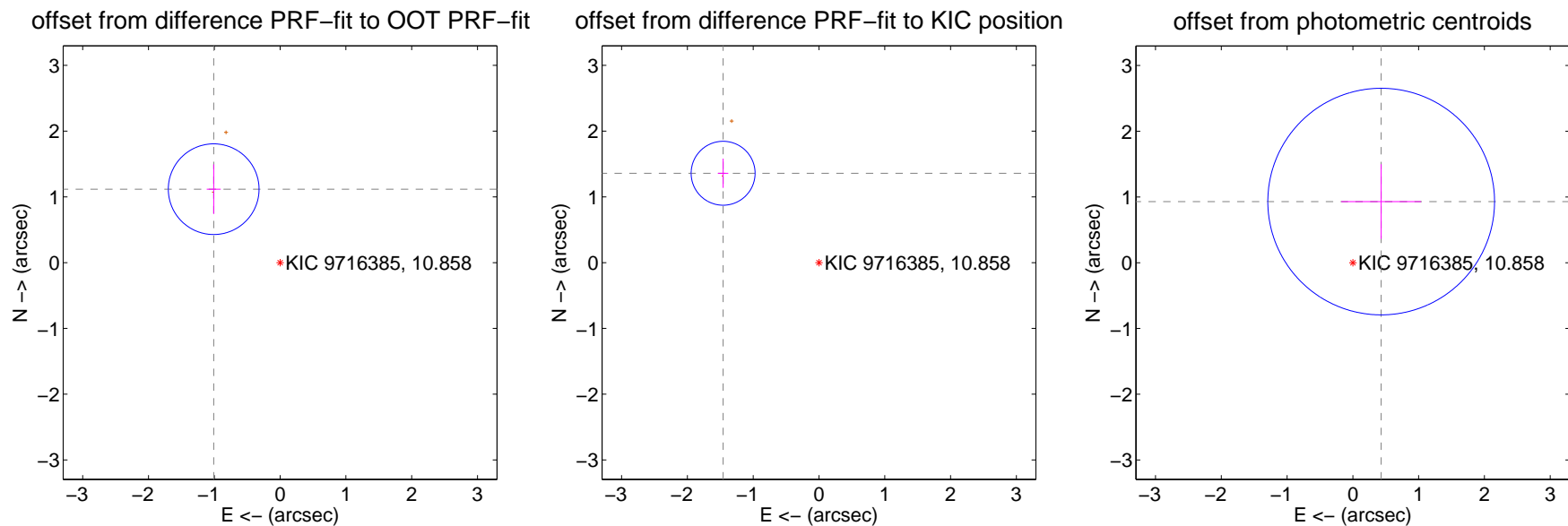
## DV Centroid Data

Supplemental centroid analysis for 009716385-01. **Kepler magnitude: 10.86.** Transit SNR 3.15

**There are 0 quarters with good PRF difference image offsets**

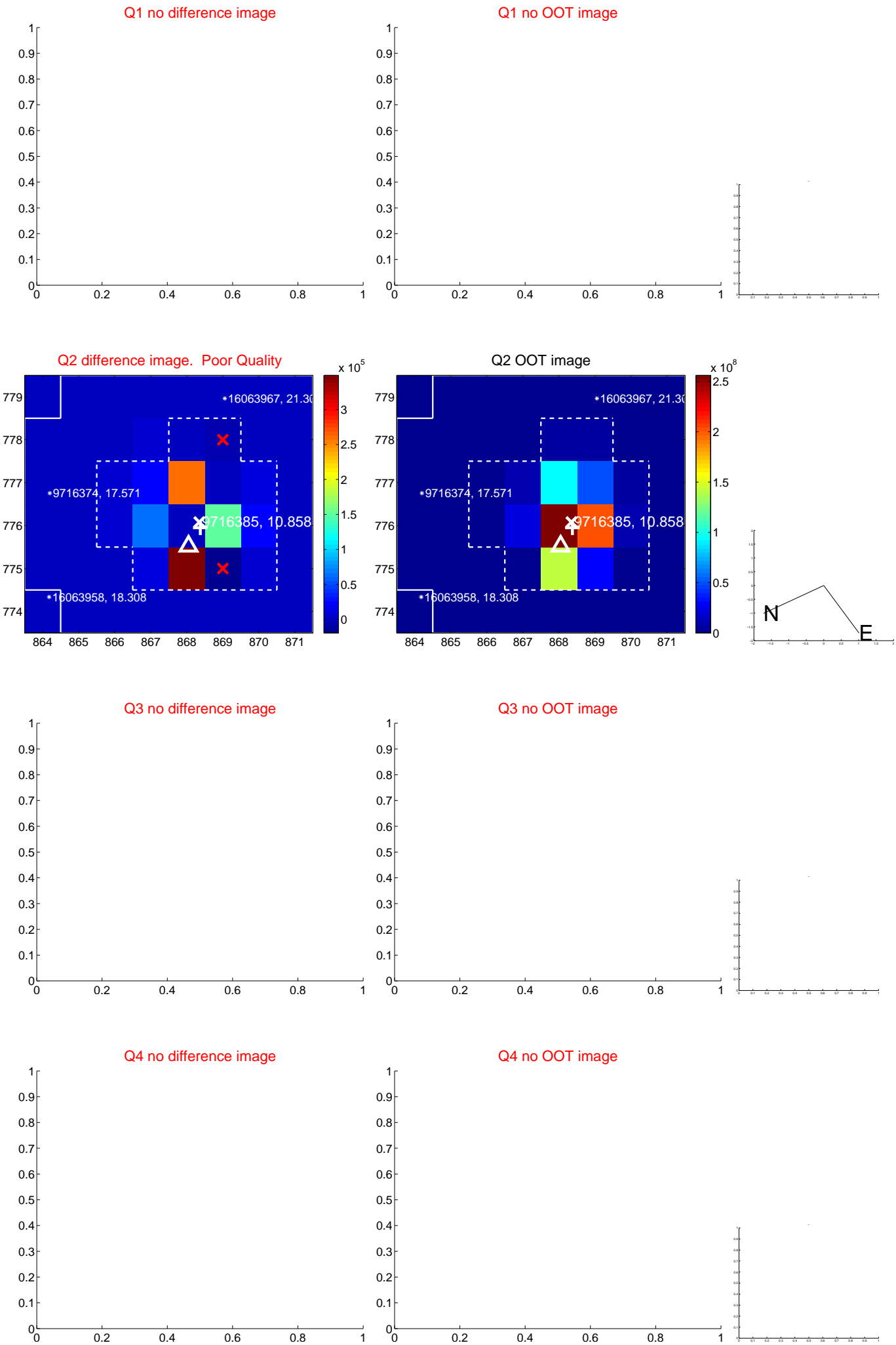
The direct PRF centroid is offset from the target star catalog position by about 0.51 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	<b>1.506 <math>\pm</math> 0.230</b>	<b>6.55</b>	1.010 $\pm$ 0.106	1.117 $\pm$ 0.377
PRF-fit source offset from KIC position	<b>1.993 <math>\pm</math> 0.162</b>	<b>12.30</b>	1.457 $\pm$ 0.079	1.359 $\pm$ 0.222
photometric centroid source offset	1.02 $\pm$ 0.57	1.78	-0.43 $\pm$ 0.61	0.93 $\pm$ 0.57



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.

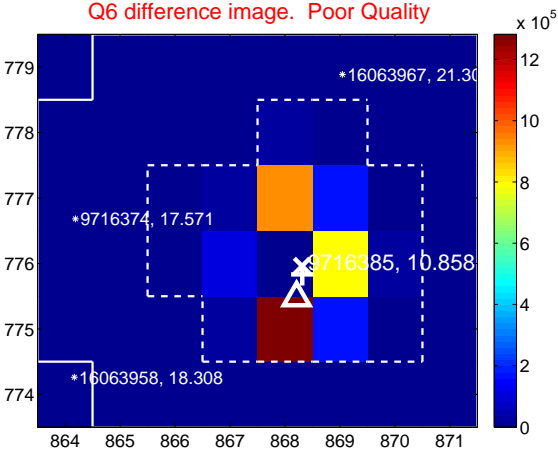
Q5 no difference image



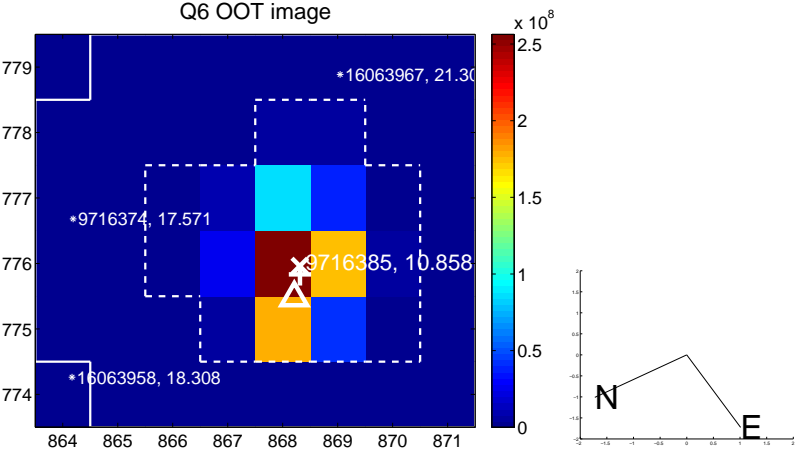
Q5 no OOT image



Q6 difference image. Poor Quality



Q6 OOT image



Q7 no difference image



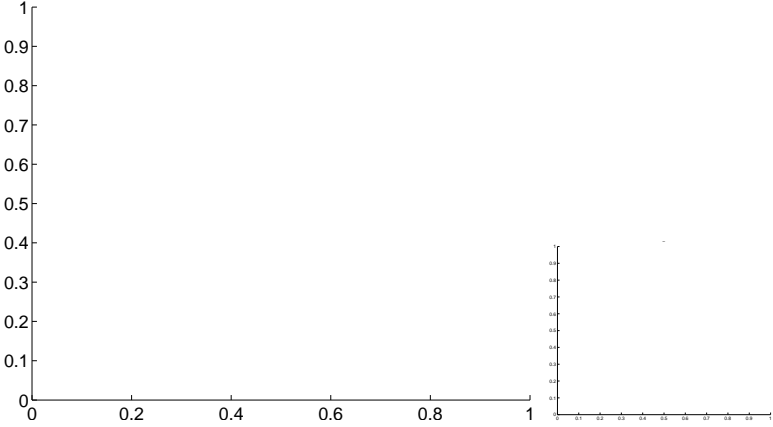
Q7 no OOT image



Q8 no difference image



Q8 no OOT image





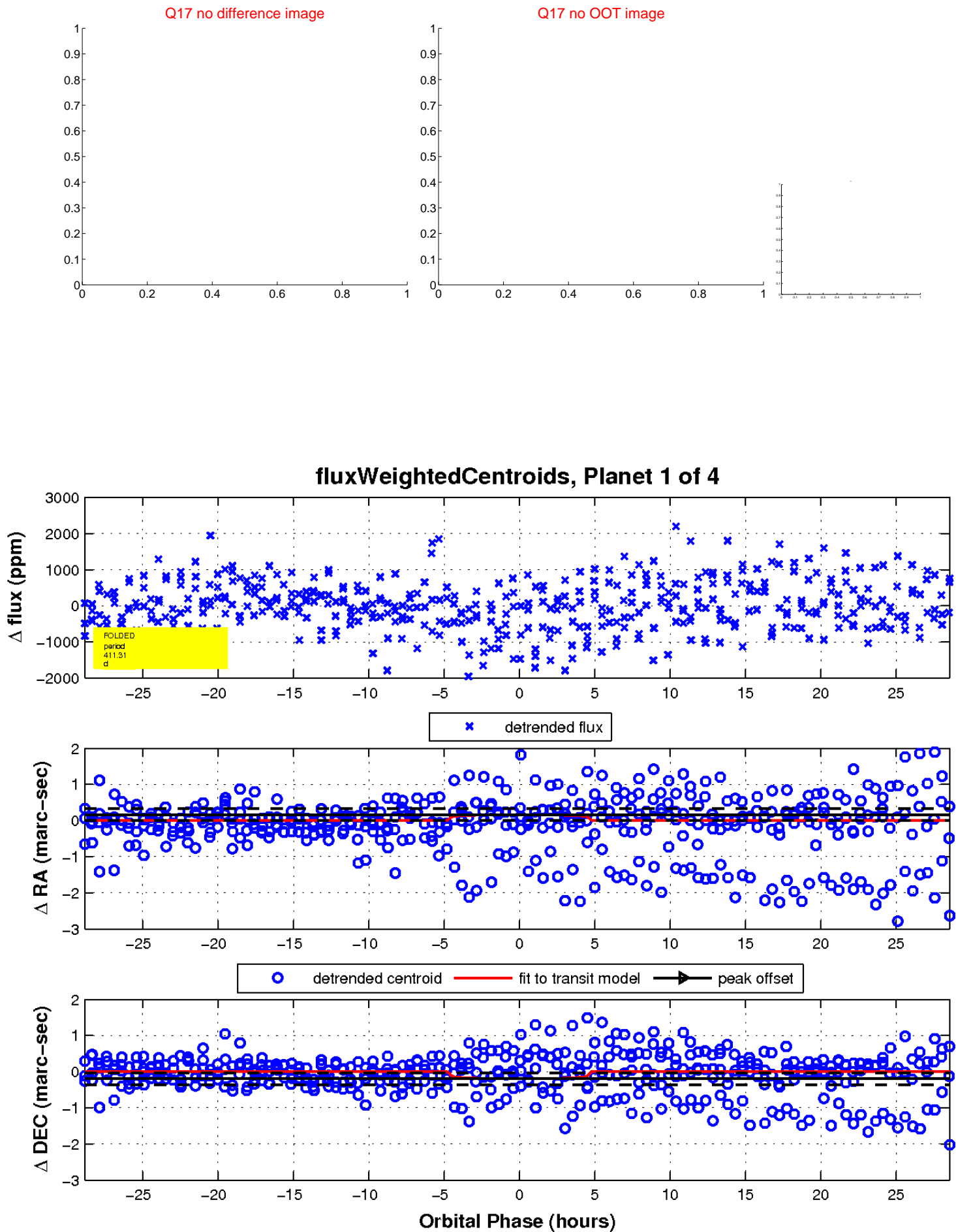
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

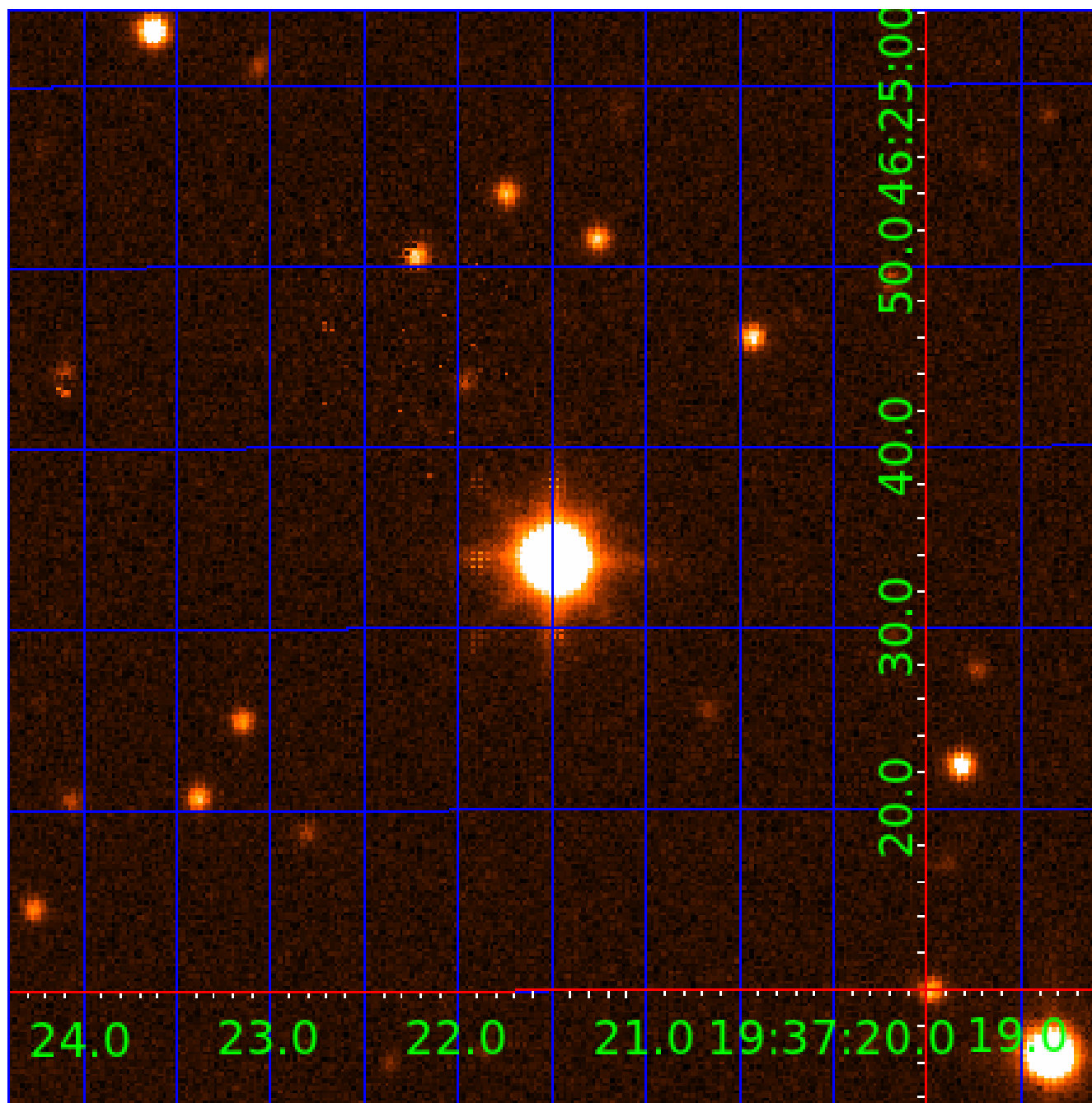


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 009716385

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009716385-01	OBS	No	411.306873	185.967090	254.3	9.622	13.4	3.1	2.92	7452	5.04	12.73
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## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
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009716385-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_SATURATED
009716385-03	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—CENT_SATURATED
009716385-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE_ZUMA—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD—CENT_SATURATED

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

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

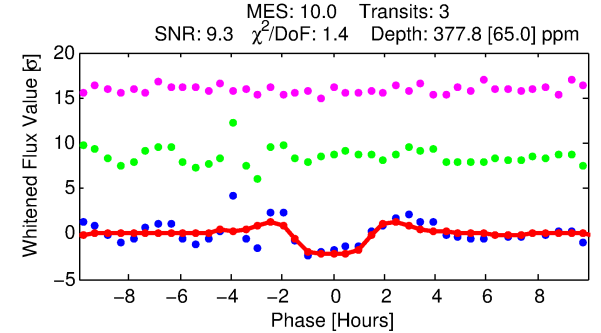
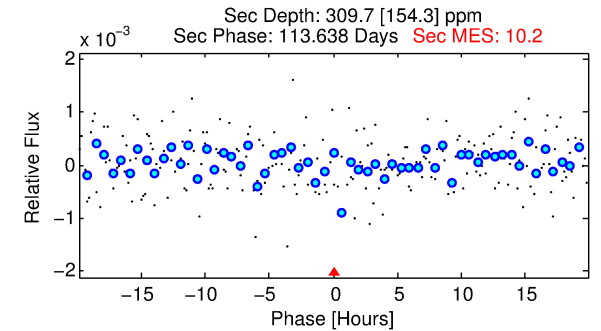
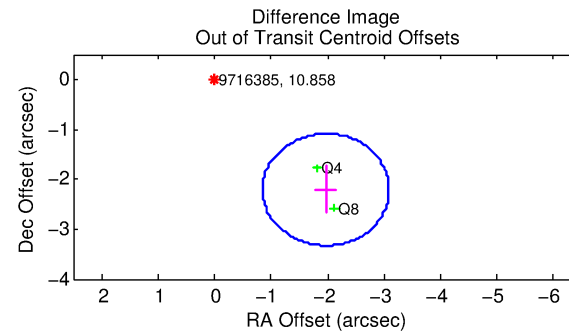
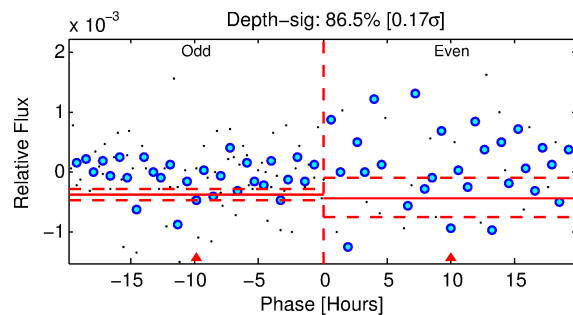
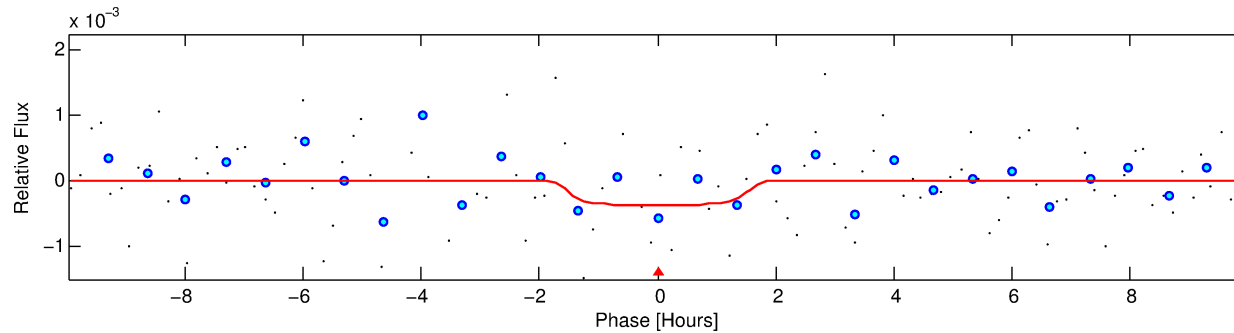
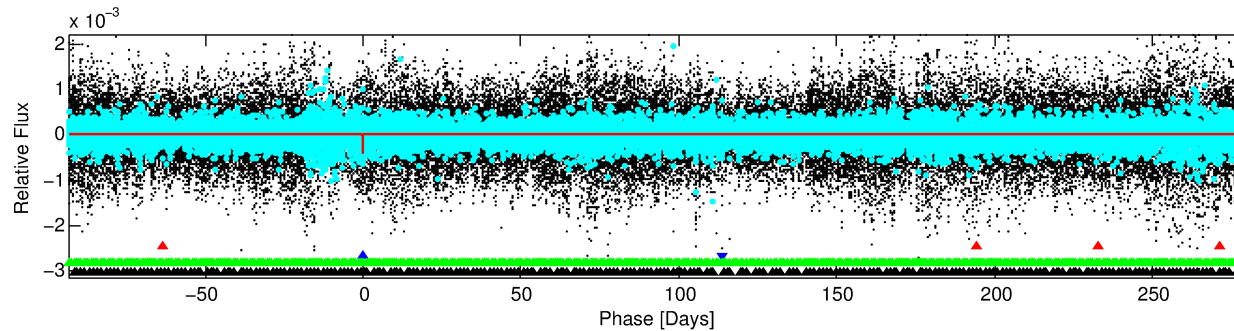
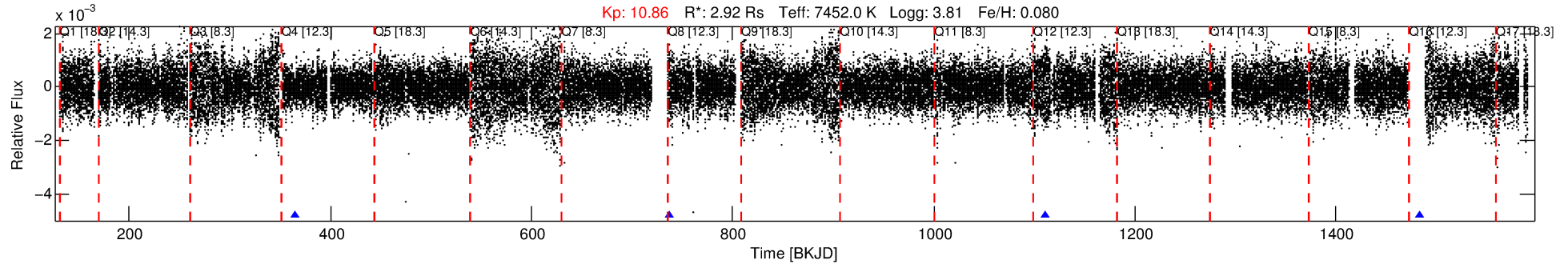
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009716385-02

No Significant Match Found

# DV One-Page Summary

KIC: 9716385 Candidate: 2 of 4 Period: 372.960 d



## DV Fit Results:

Period = 372.96029 [0.00616] d  
Epoch = 364.5327 [0.0083] BKJD  
Rp/R\* = 0.0199 [0.0360]  
a/R\* = 508.17 [5779.83]  
b = 0.83 [4.32]  
Seff = 14.50 [8.95]  
Teq = 498 [77] K  
Rp = 6.33 [11.77] Re  
a = 1.2750 [0.4876] AU  
Ag = 6906.52 [25558.58] [0.27 $\sigma$ ]  
Teffp = 7014 [6414] K [1.02 $\sigma$ ]

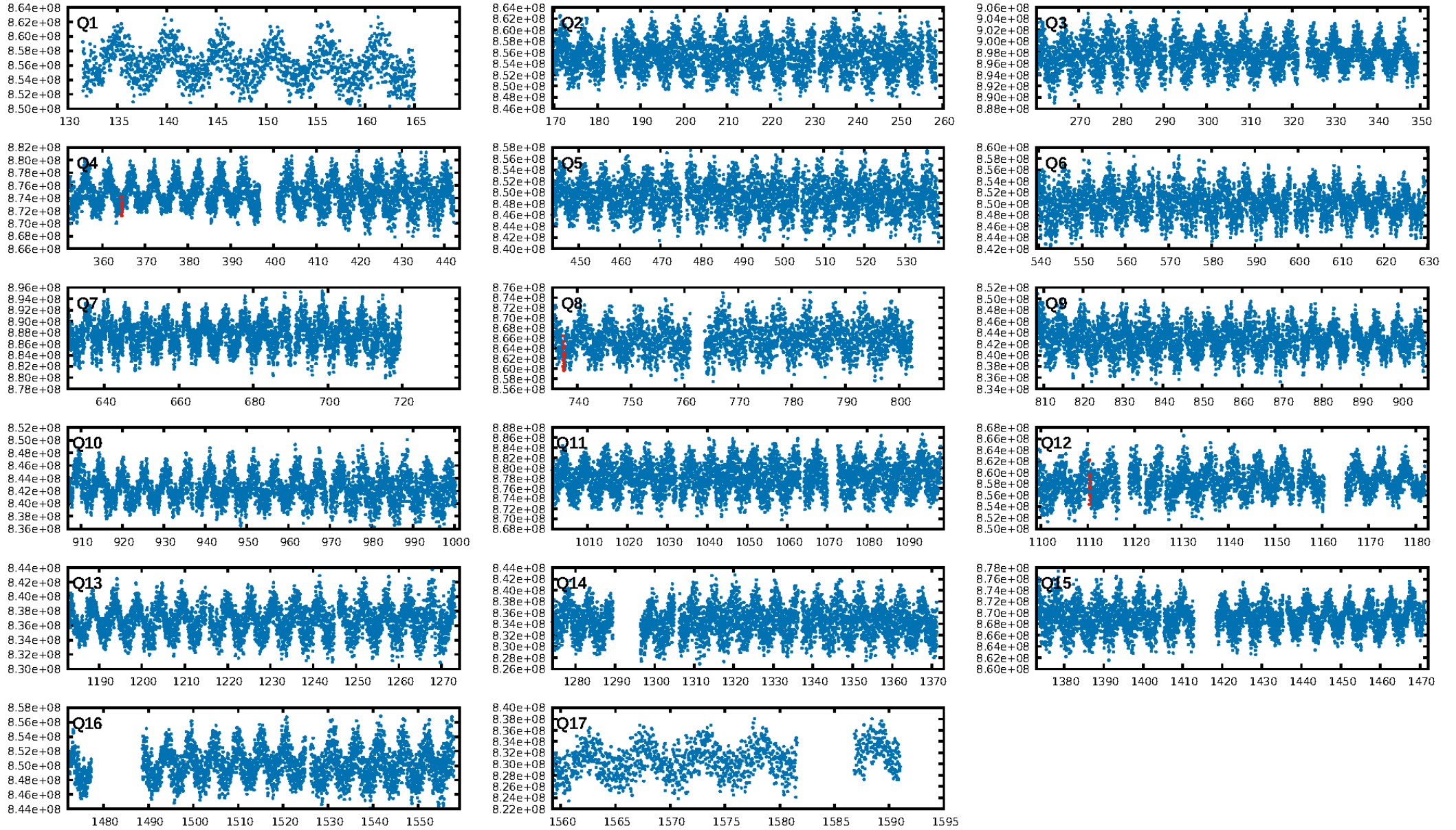
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [302.92 $\sigma$ ]  
LongPeriod-sig: 100.0% [90.40 $\sigma$ ]  
ModelChiSquare2-sig: 4.8%  
ModelChiSquareGof-sig: 92.9%  
Bootstrap-pfa: 1.18e-11  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: 0.935  
Centroid-sig: 34.3%  
Centroid-so: 0.669 arcsec [1.06 $\sigma$ ]  
OotOffset-rm: 2.961 arcsec [7.93 $\sigma$ ]  
KicOffset-rm: 2.509 arcsec [6.62 $\sigma$ ]  
OotOffset-st: 0/0/2/0 [2]  
KicOffset-st: 0/0/2/0 [2]  
DiffImageQuality-fgm: 0.00 [0/2]  
DiffImageOverlap-fno: 0.50 [1/2]

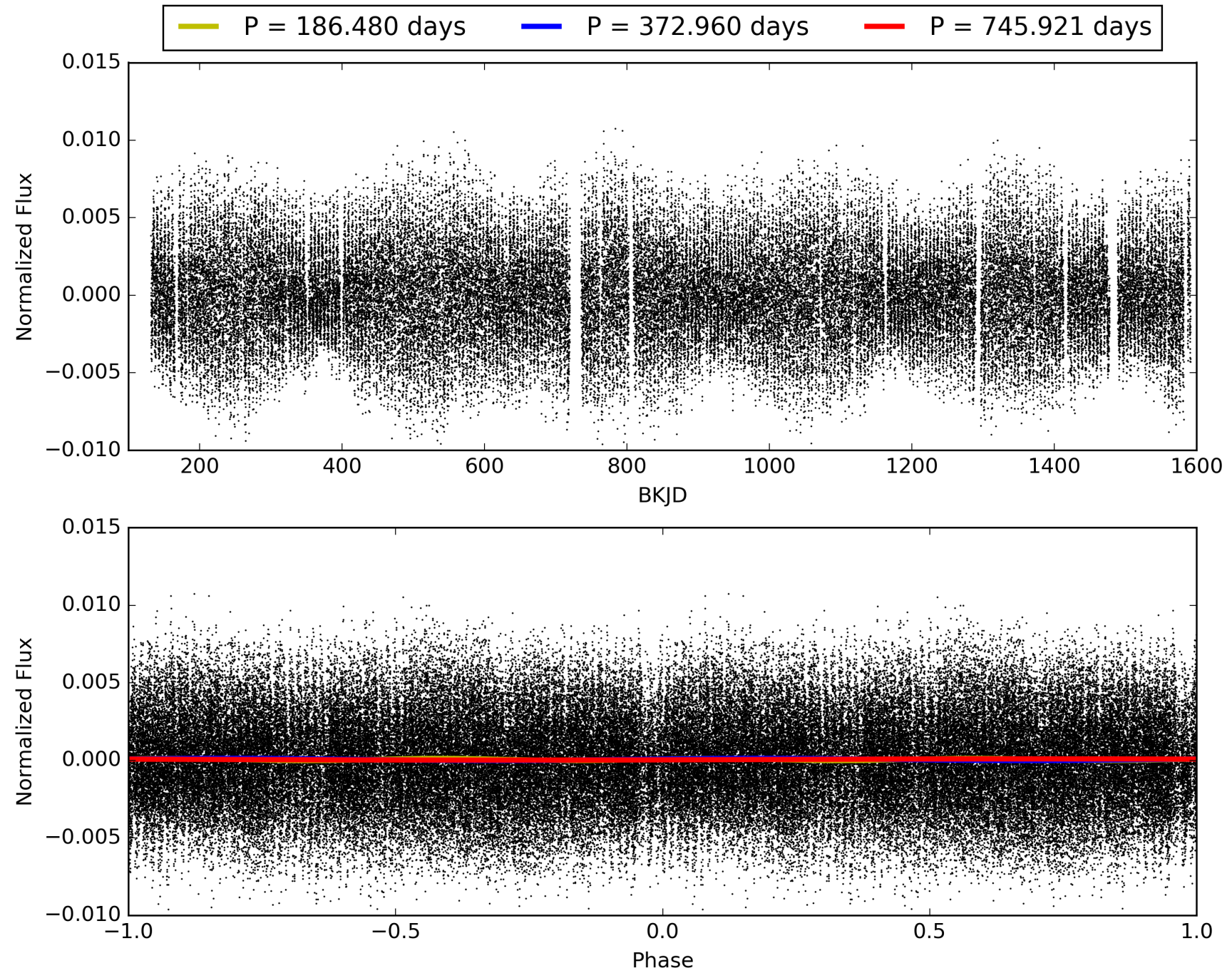
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 11:16:35 Z

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

# TCE 009716385-02, PDC Light Curves

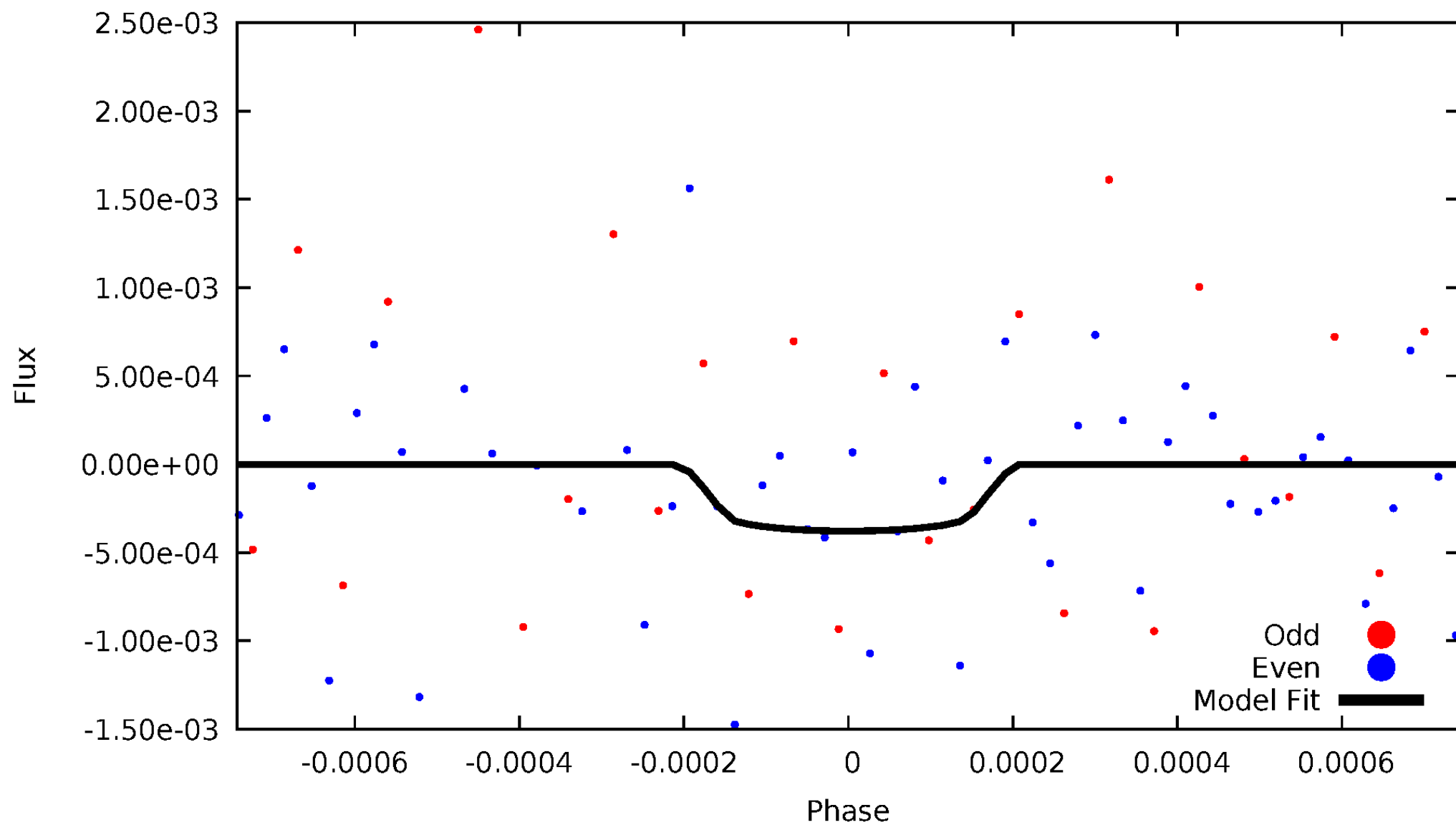


TCE 009716385-02



# DV Odd/Even

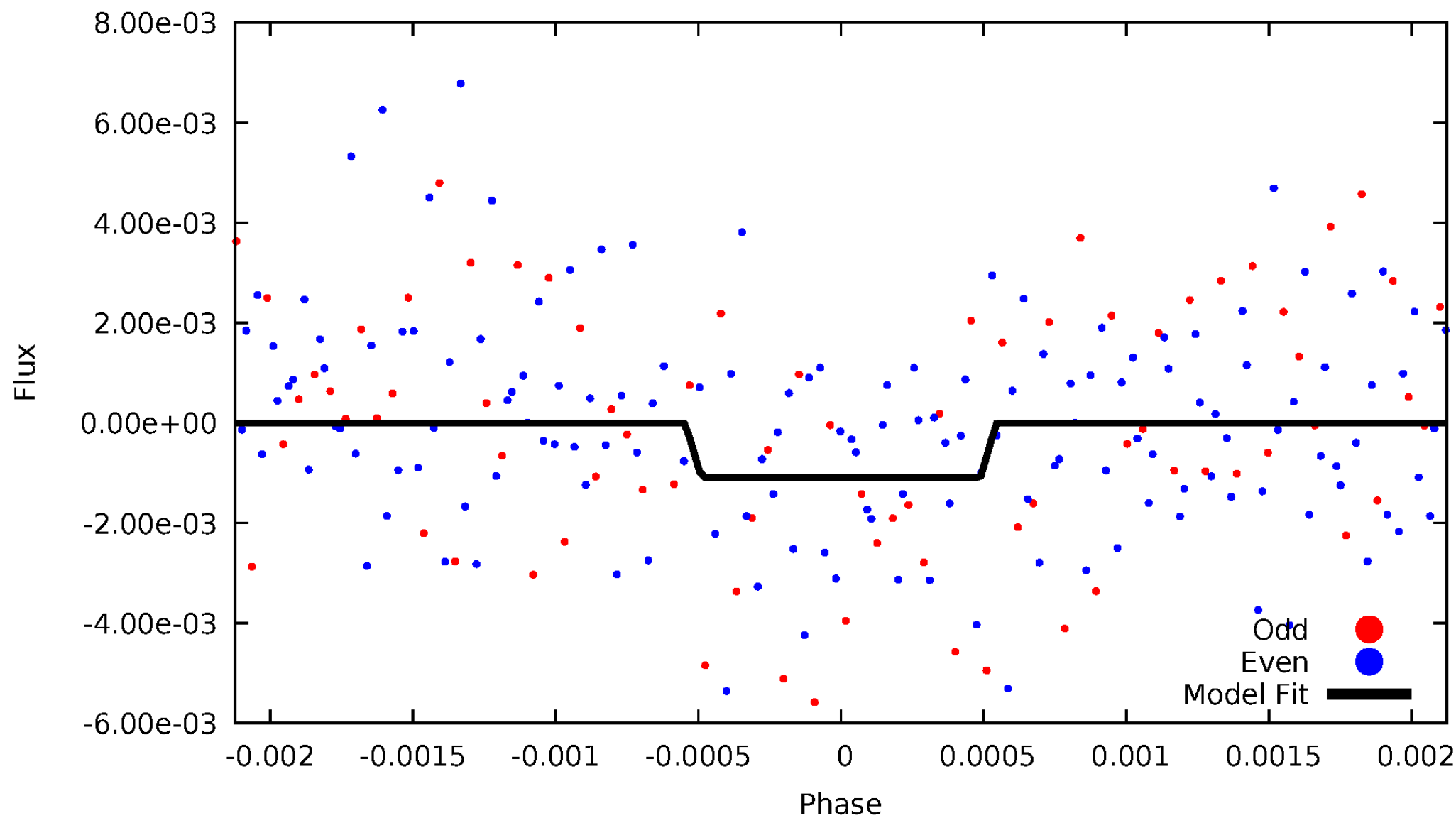
TCE 009716385-02





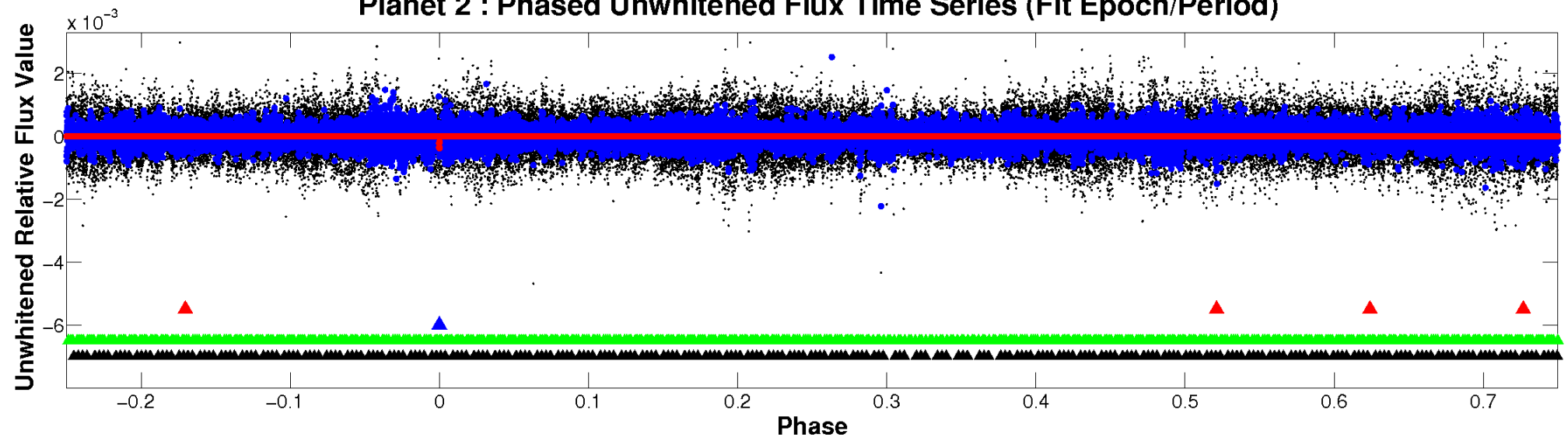
# ALT Odd/Even

TCE 009716385-02

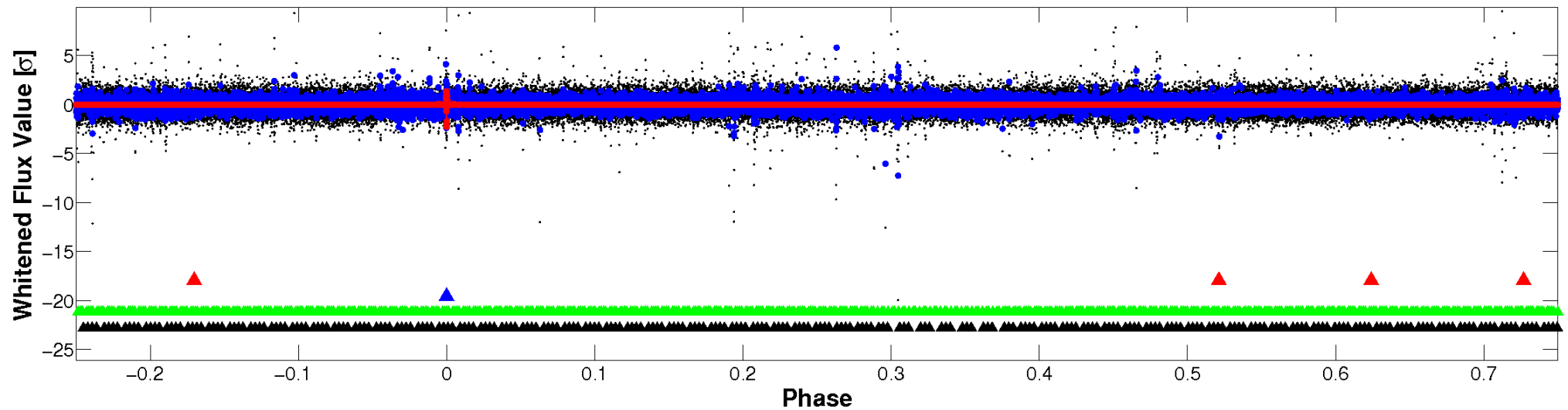


# Non-Whitened Vs. Whitened Light Curve

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

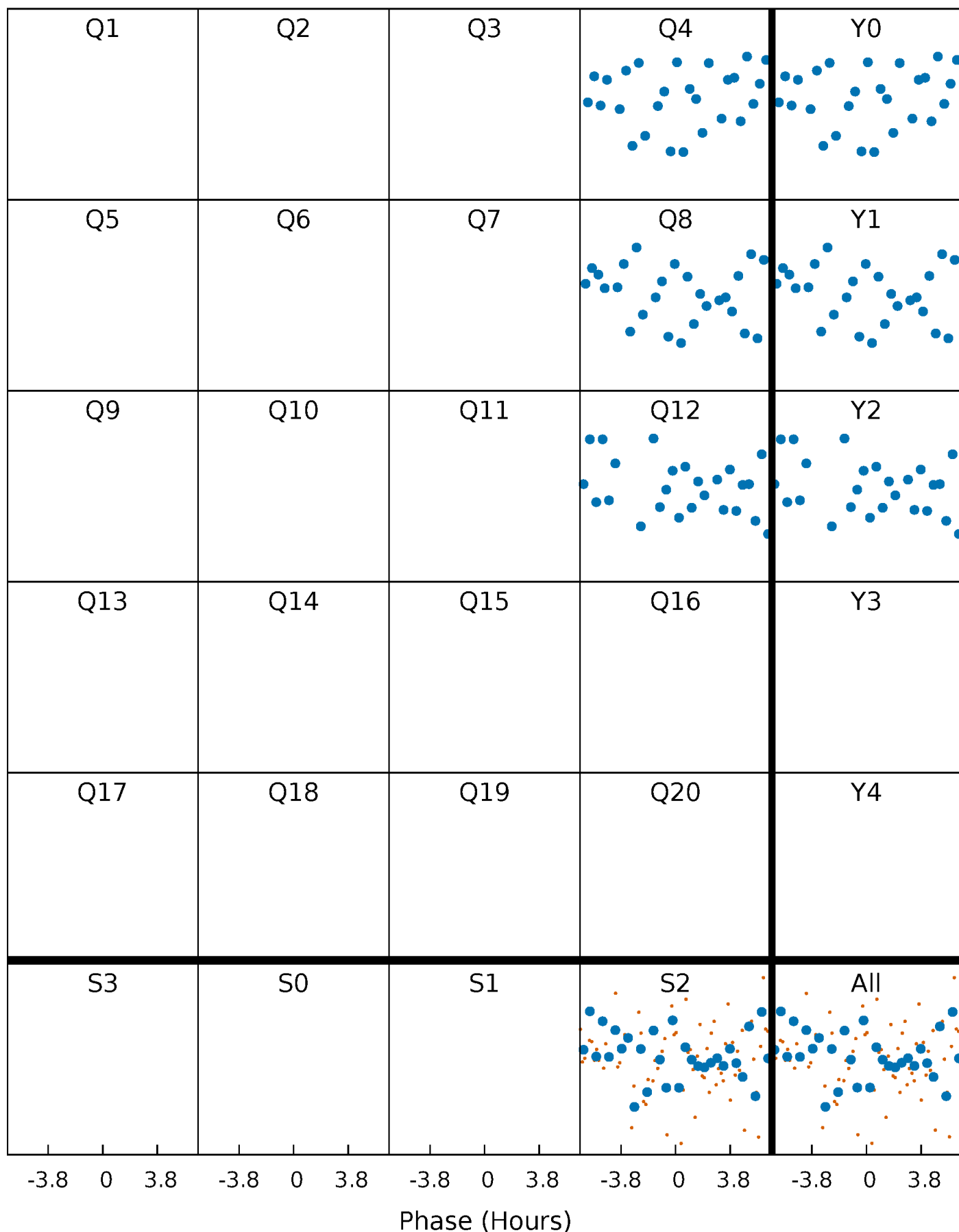


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

TCE 009716385-02 P=372.960288 Days  $T_0=364.532748$  (BKJD)





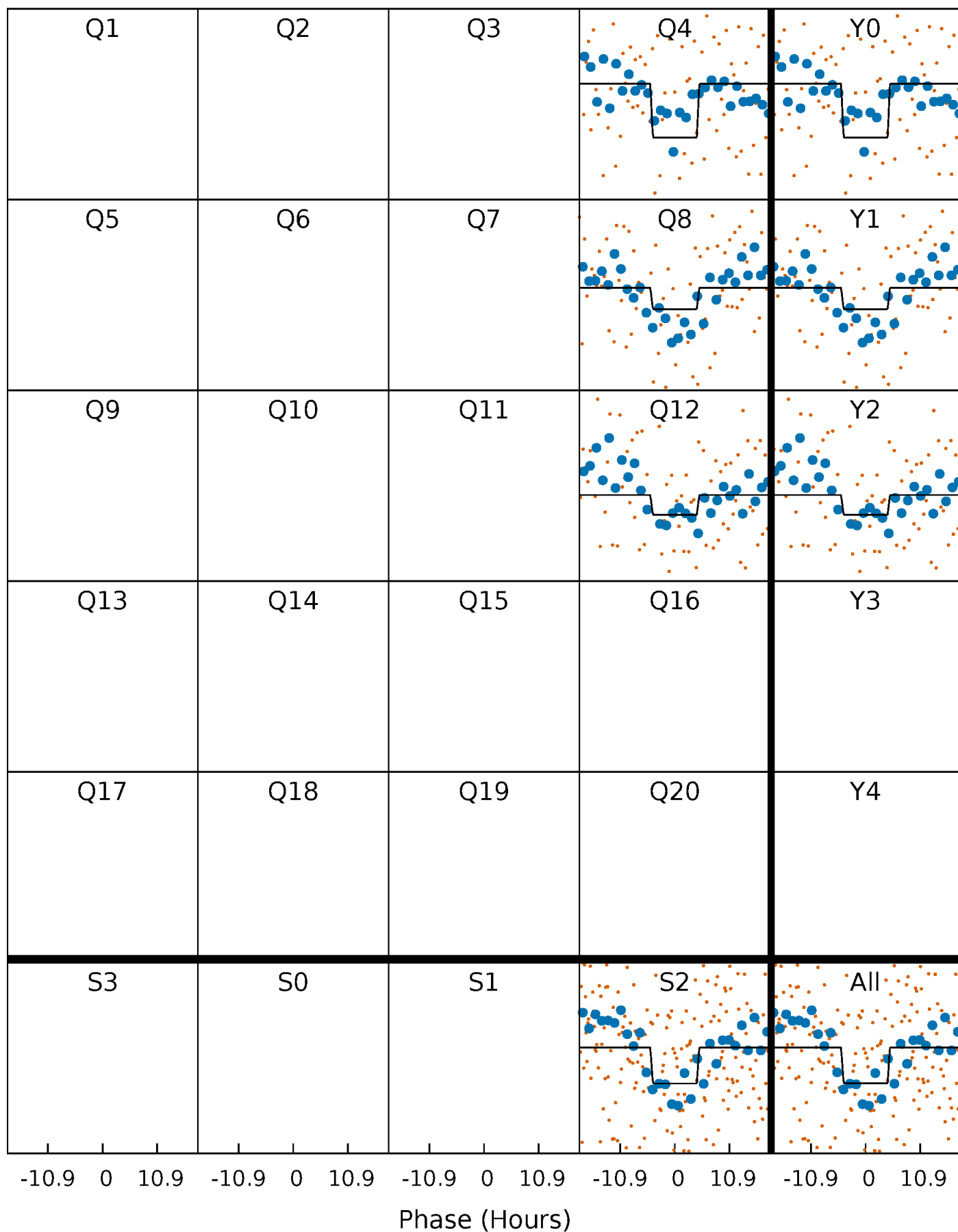
# DV Quarter-Phased Transit Curves

TCE 009716385-02 P=372.960288 Days  $T_0=364.532748$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

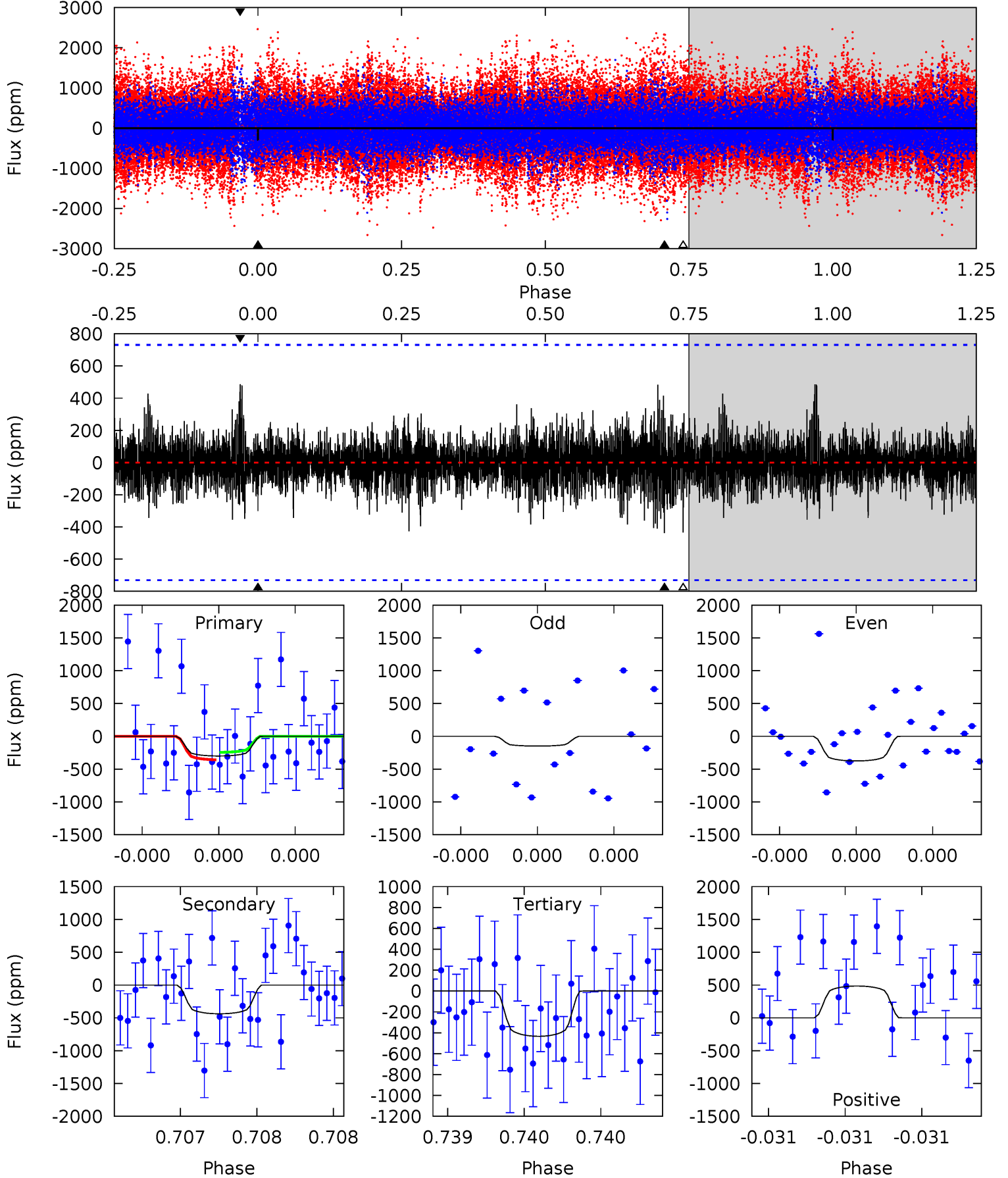
TCE 009716385-02 P=372.966959 Days  $T_0=364.576470$  (BKJD)



# DV Model-Shift Uniqueness Test

009716385-02, P = 372.960288 Days, E = 364.532748 Days

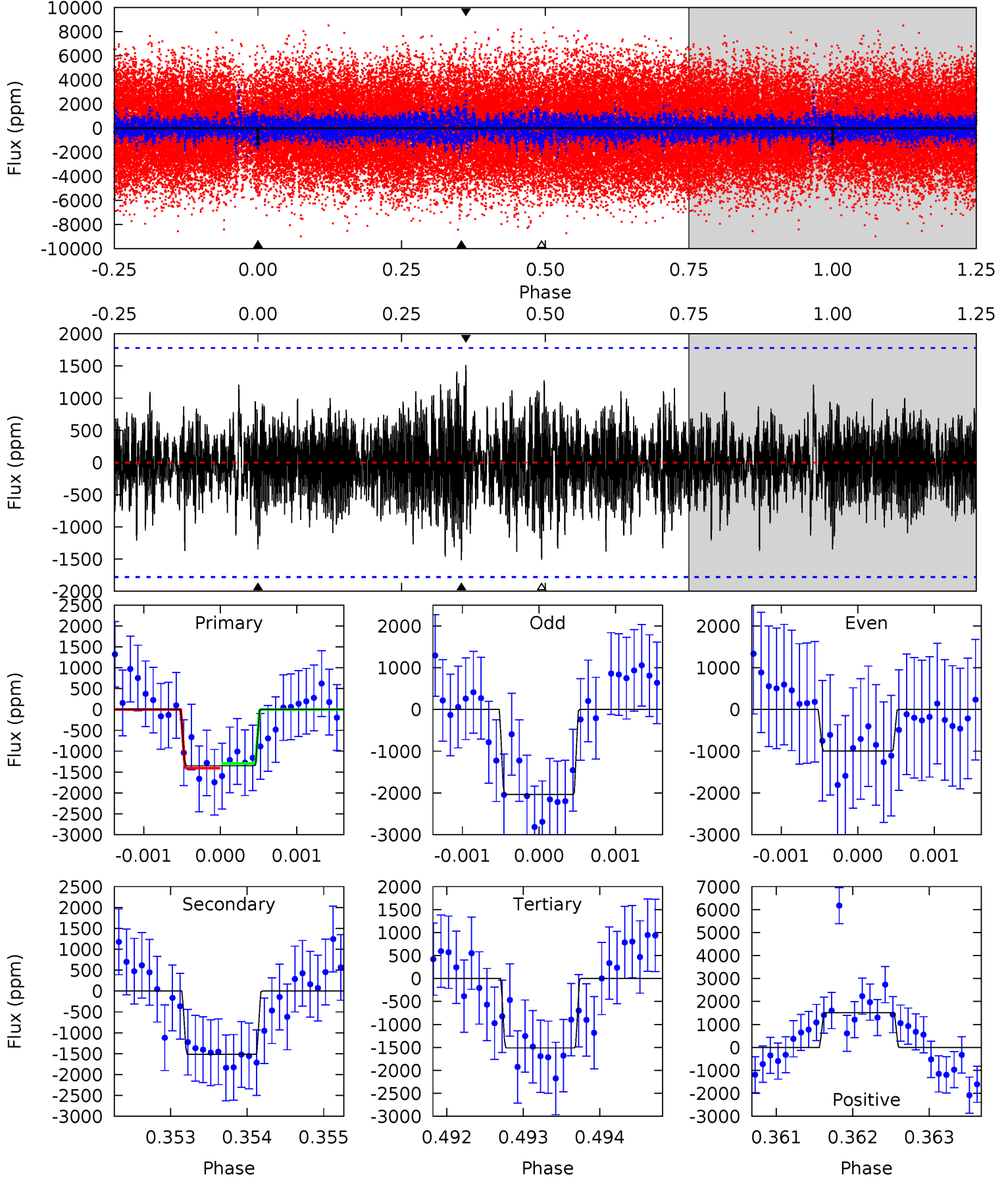
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
2.31	3.37	3.33	3.73	5.62	3.55	0.78	-1.03	-1.42	0.03	-0.37	0.79	1.57	0.53	0.43



# Alt Model-Shift Uniqueness Test

009716385-02, P = 372.966959 Days, E = 364.576470 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
4.13	4.63	4.62	4.64	5.44	3.27	1.36	-0.50	-0.51	0.01	-0.01	1.51	1.00	0.50	0.16



### Stellar Parameters For KIC 009716385

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7452^{+206}_{-335}$	$3.805^{+0.338}_{-0.113}$	$0.080^{+0.200}_{-0.350}$	$2.921^{+0.493}_{-1.231}$	$1.985^{+0.089}_{-0.503}$	$0.112^{+0.293}_{-0.039}$
	+3%/-4%	+9%/-3%	+250%/-438%	+17%/-42%	+4%/-25%	+261%/-35%
Source	PHO54	PHO54	PHO54	DSEP		

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

### Secondary Eclipse Parameters for KIC 009716385-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-438 \pm 130$	$9.60^{+9.32}_{-6.17}$	$681^{+47}_{-68}$	$5789^{+4708}_{-1421}$	$3944^{+24198}_{-2908}$
Alt.	$-1514 \pm 327$	$11.38^{+9.75}_{-7.23}$	$678^{+50}_{-64}$	$7368^{+7563}_{-1992}$	$10110^{+65685}_{-7304}$

$T_{max}$  = 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

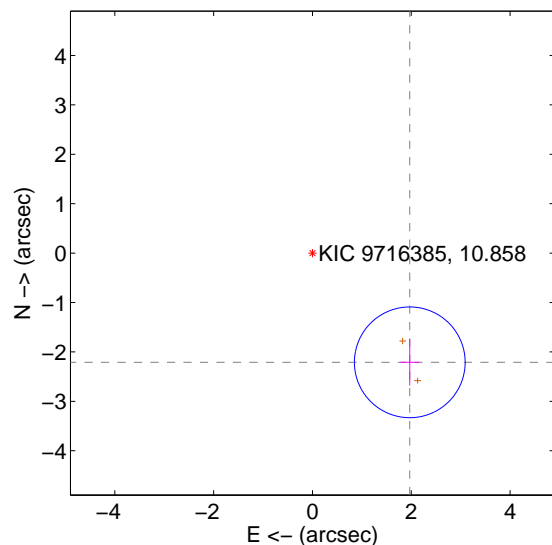
Supplemental centroid analysis for 009716385-02. **Kepler magnitude: 10.86.** Transit SNR 9.26

**There are 0 quarters with good PRF difference image offsets**

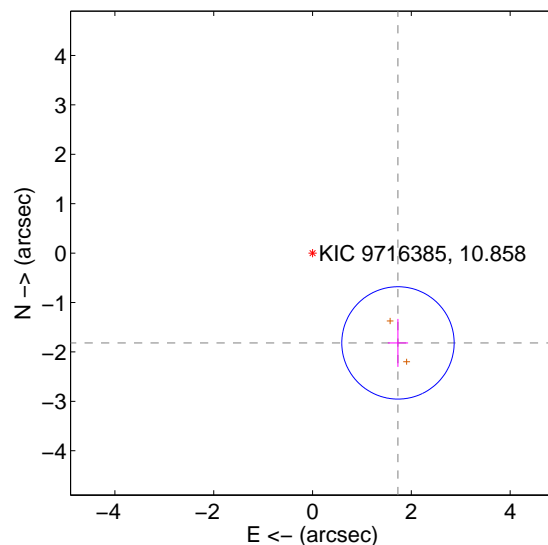
The direct PRF centroid is offset from the target star catalog position by about 0.44 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	<b><math>2.961 \pm 0.374</math></b>	<b>7.93</b>	$-1.970 \pm 0.189$	$-2.211 \pm 0.471$
PRF-fit source offset from KIC position	<b><math>2.509 \pm 0.379</math></b>	<b>6.62</b>	$-1.729 \pm 0.206$	$-1.818 \pm 0.485$
photometric centroid source offset	$0.67 \pm 0.63$	1.06	$-0.59 \pm 0.66$	$0.31 \pm 0.52$

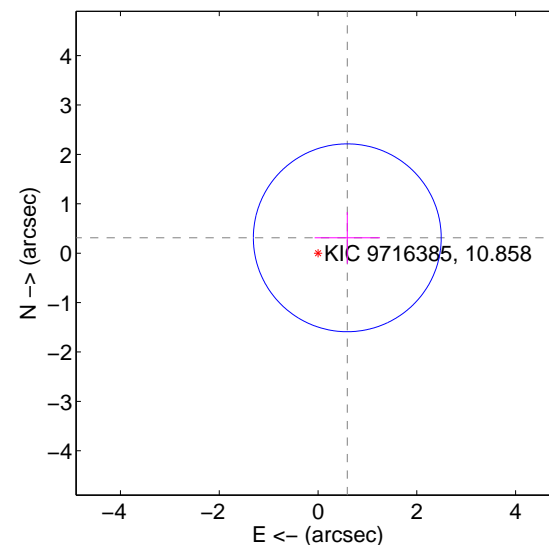
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

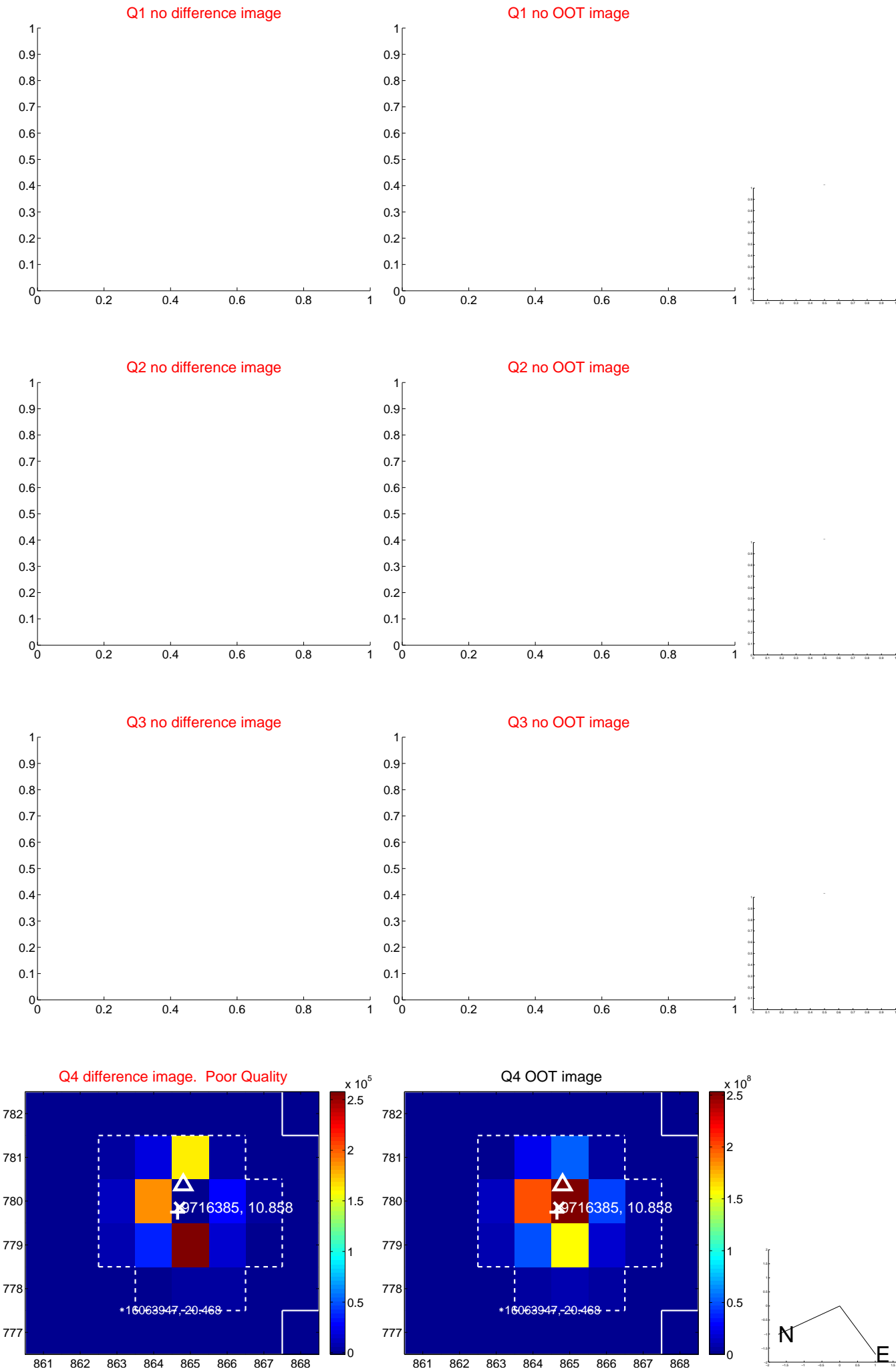


offset from photometric centroids

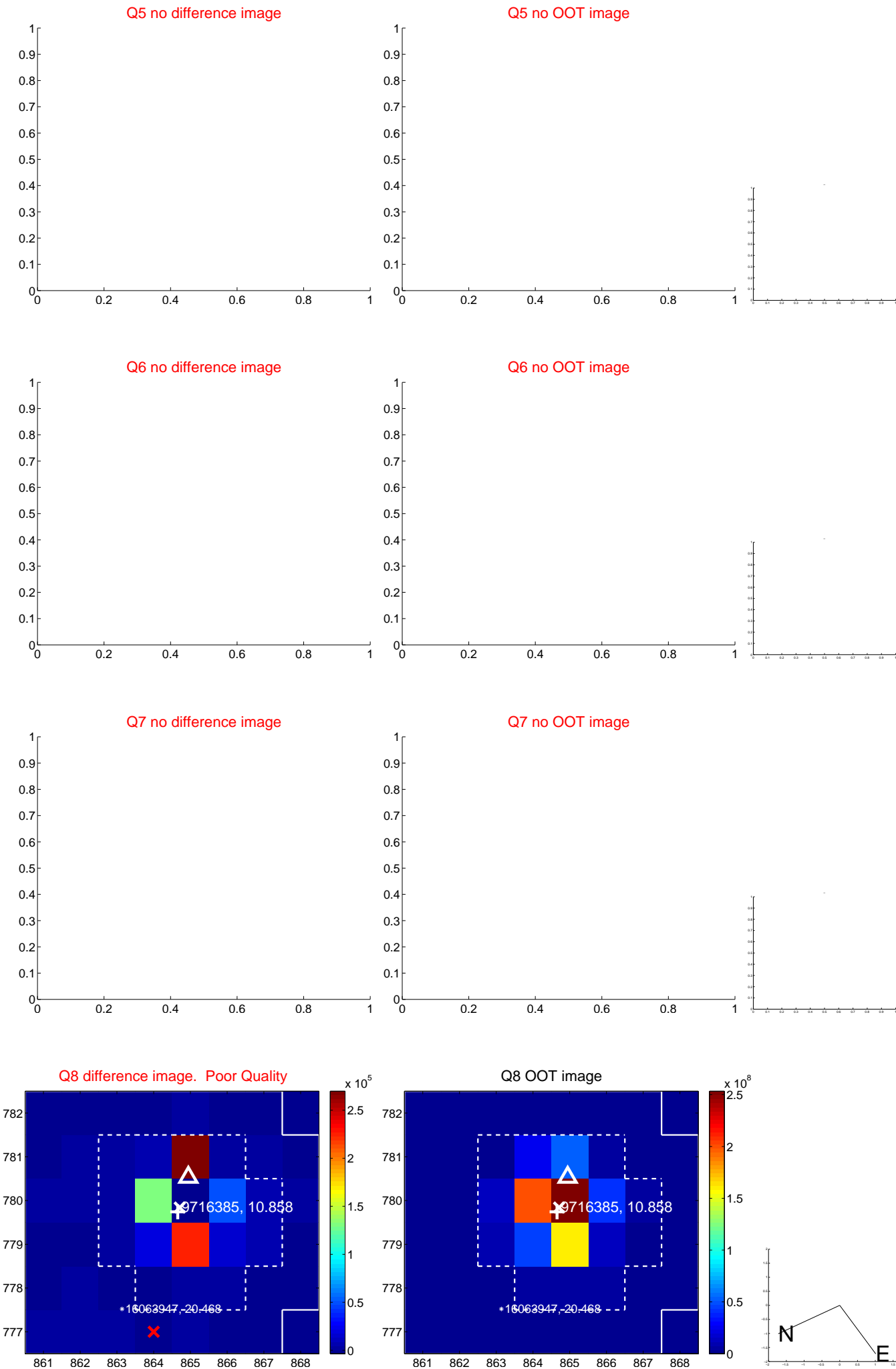


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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





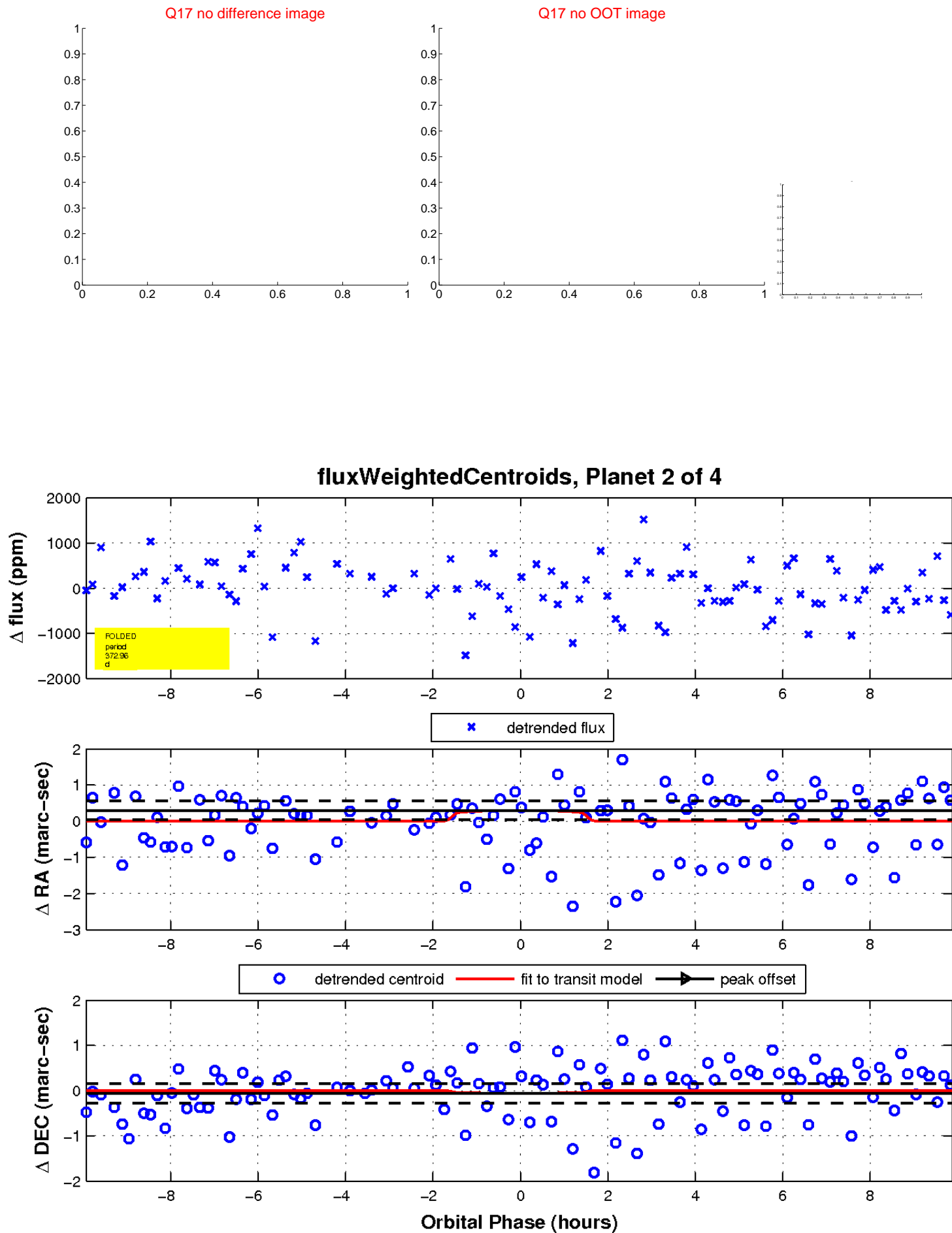
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

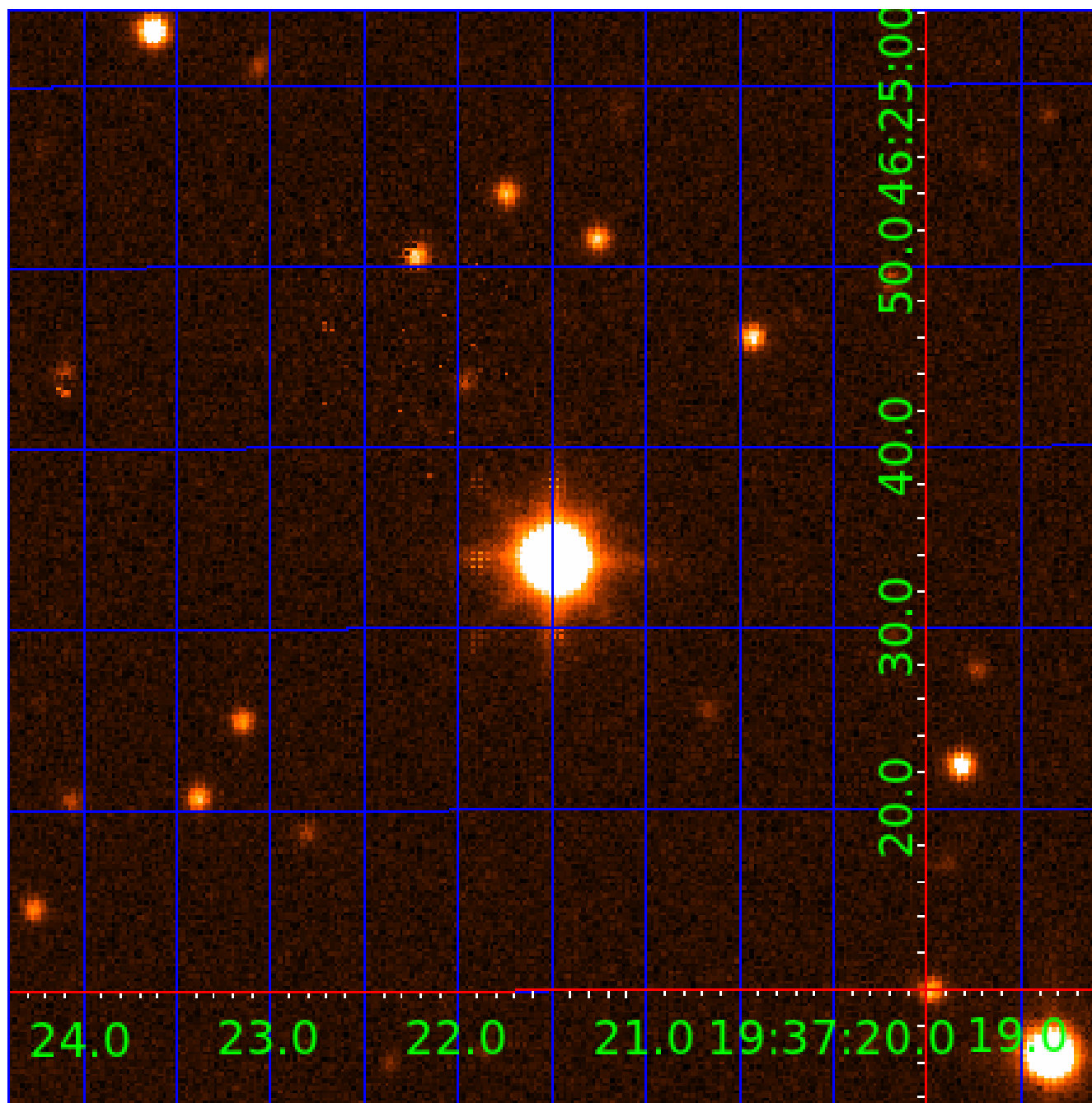


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 009716385

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009716385-01	OBS	No	411.306873	185.967090	254.3	9.622	13.4	3.1	2.92	7452	5.04	12.73
009716385-02	OBS	No	372.960288	364.532748	377.8	3.325	10.0	9.3	2.92	7452	6.33	14.50
009716385-03	OBS	No	2.634047	132.164868	34.2	7.500	9.4	-1.0	2.92	7452	1.73	10703.08
009716385-04	OBS	No	5.268418	136.140060	93.1	28.941	7.7	9.7	2.92	7452	5.53	4247.17

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009716385-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_SKYE_ZUMA—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_SATURATED
009716385-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_SATURATED
009716385-03	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—CENT_SATURATED
009716385-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE_ZUMA—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD—CENT_SATURATED

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

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

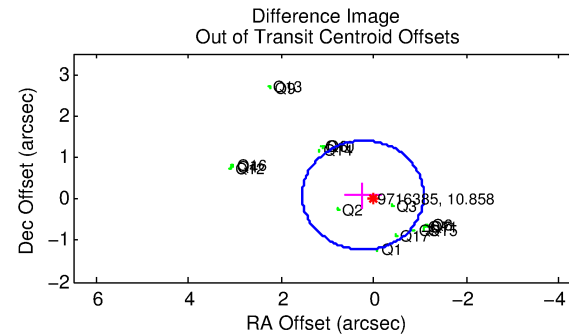
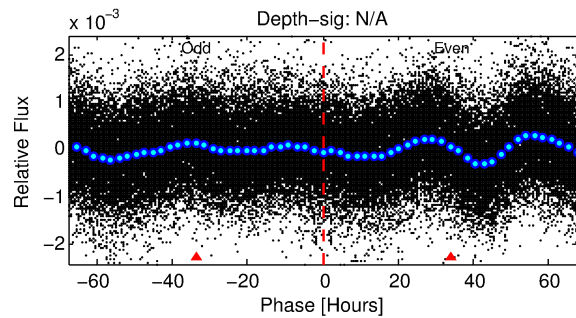
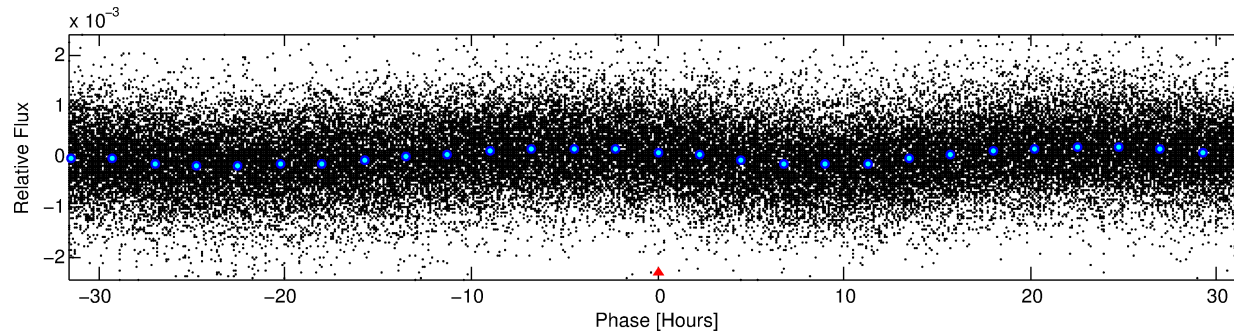
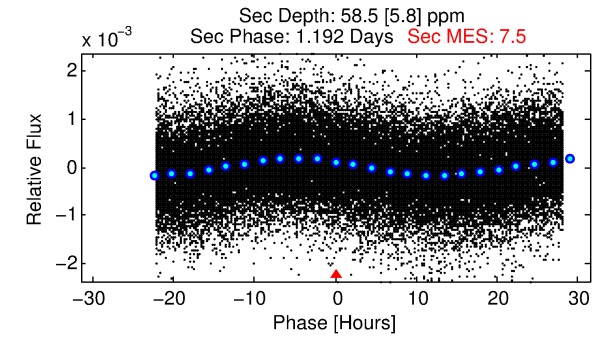
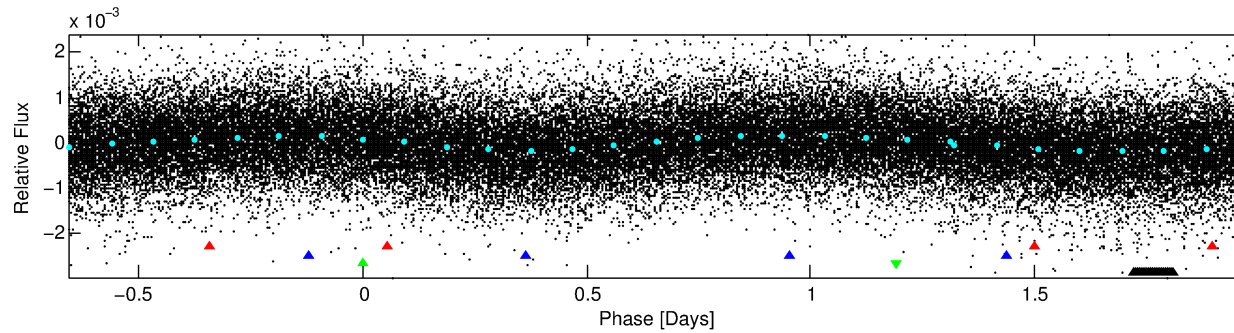
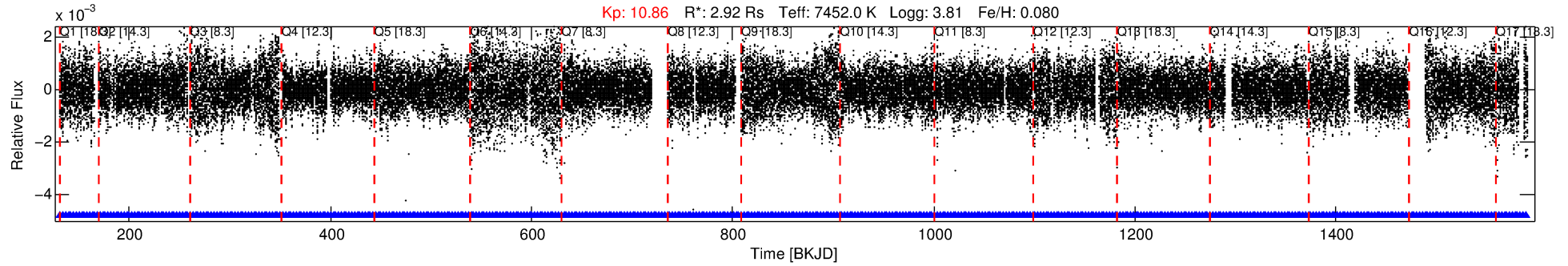
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009716385-03

No Significant Match Found

# DV One-Page Summary

KIC: 9716385 Candidate: 3 of 4 Period: 2.634 d



## TPS TCE Results:

Period = 2.63405 d  
Epoch = 132.1649 BKJD

DV fit results are unavailable

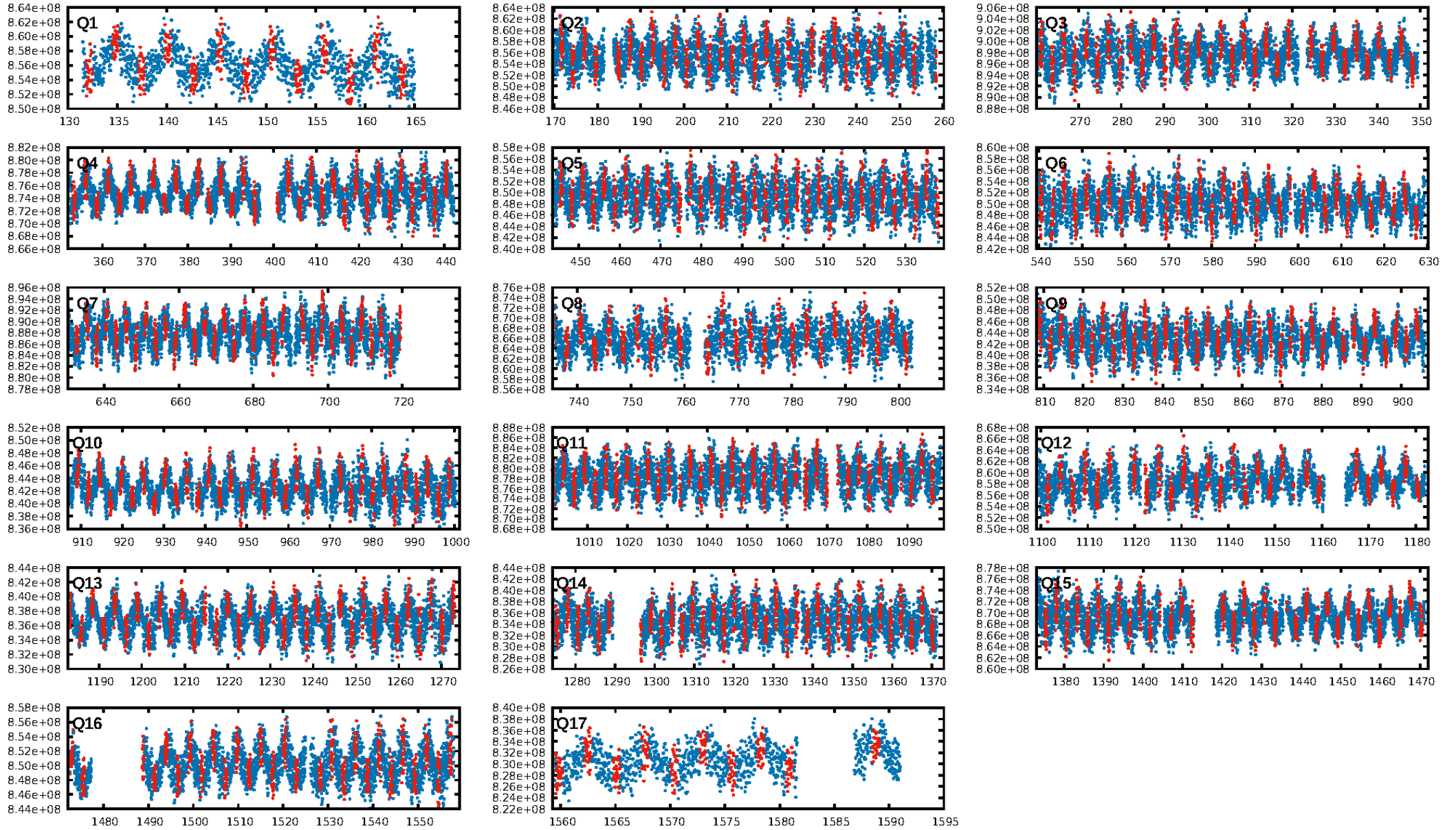
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 96.6% [2.11 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 1.58e-17  
RollingBand-fgt: 1.00 [491/491]  
GhostDiagnostic-chr: N/A  
Centroid-sig: N/A  
Centroid-so: N/A  
OotOffset-rm: 0.249 arcsec [0.57 $\sigma$ ]  
KicOffset-rm: 0.126 arcsec [0.28 $\sigma$ ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 0.00 [0/17]  
DiffImageOverlap-fno: 1.00 [17/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 11:16:45 Z

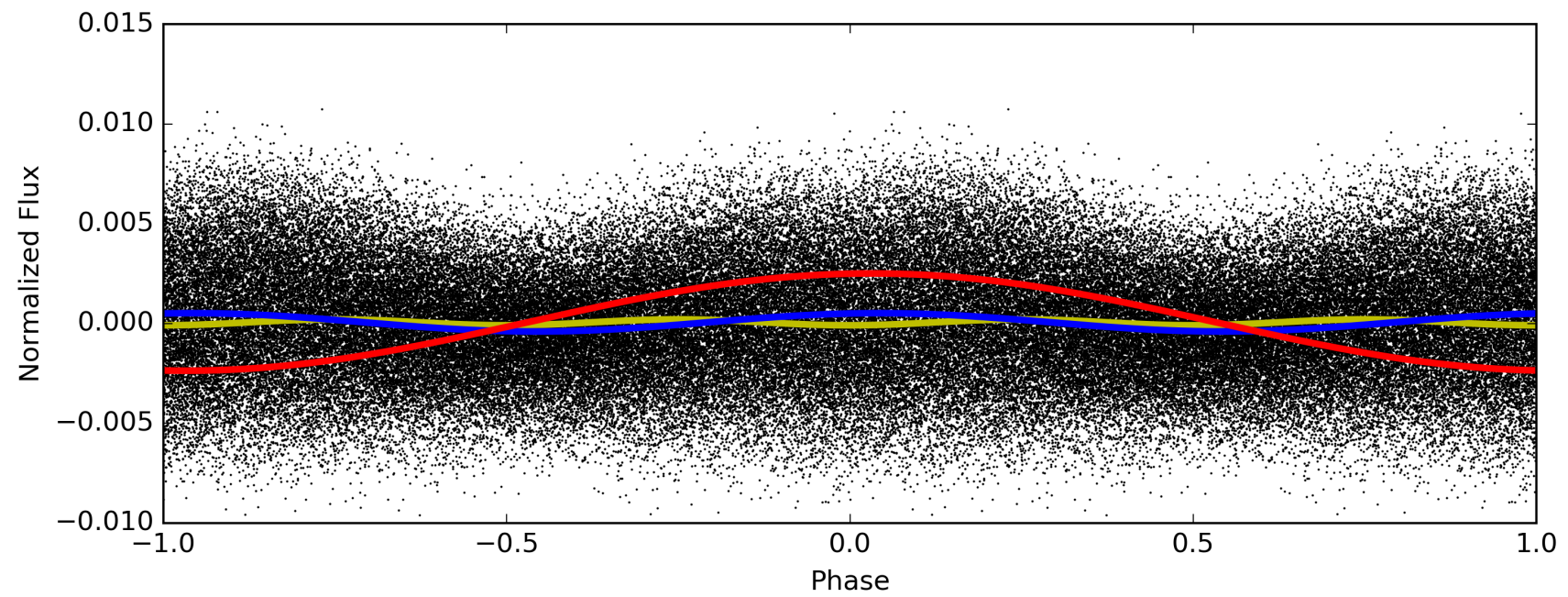
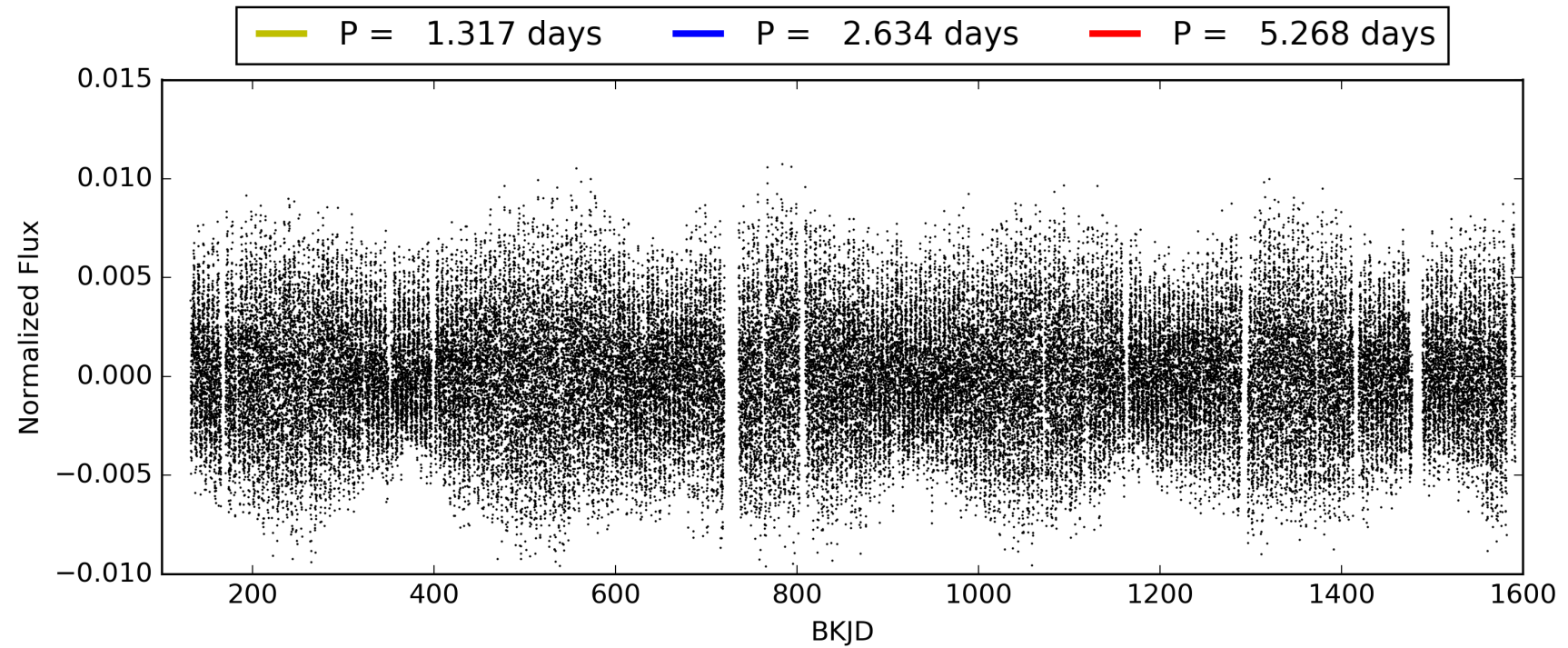
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 009716385-03, PDC Light Curves





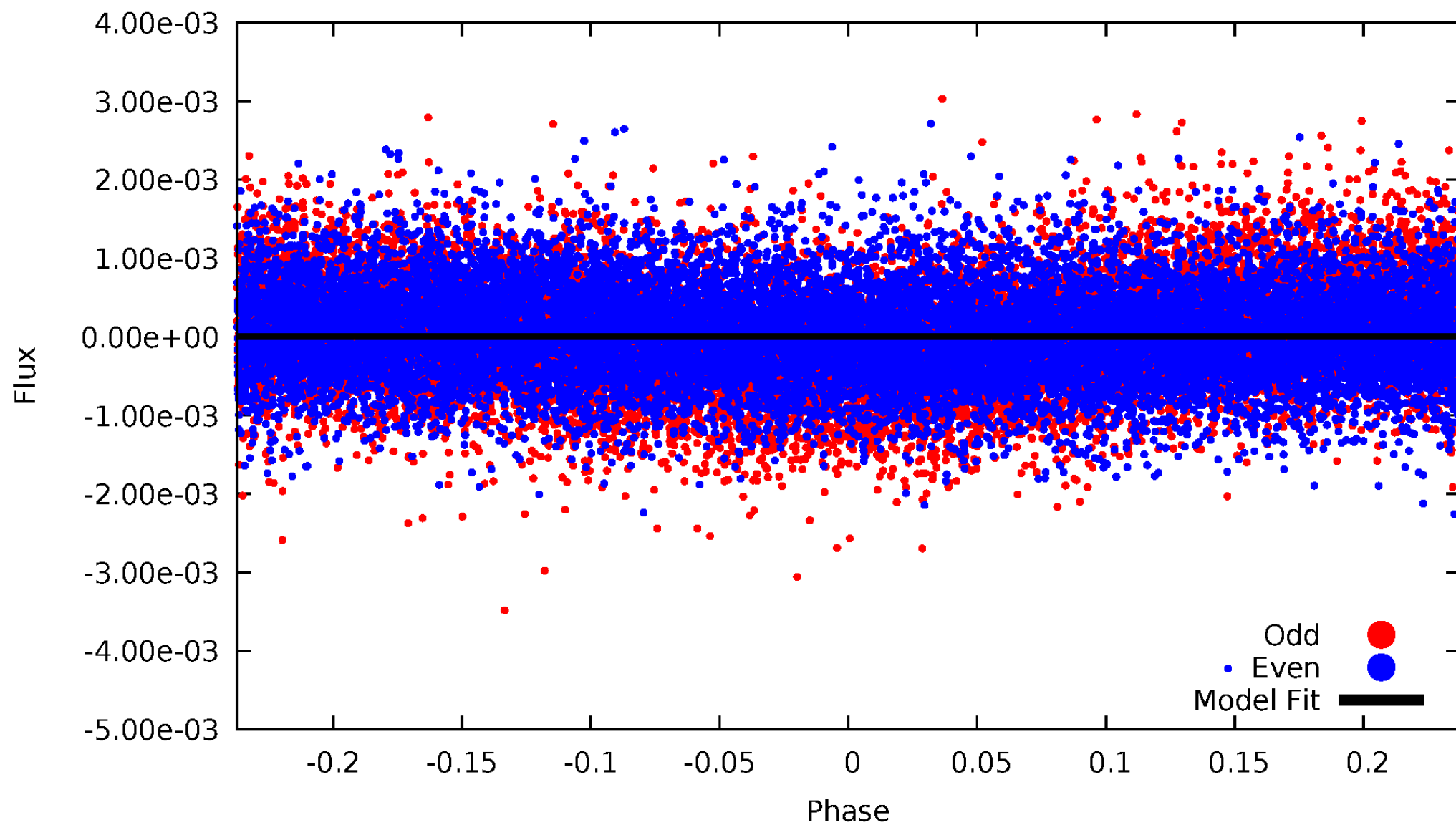
TCE 009716385-03





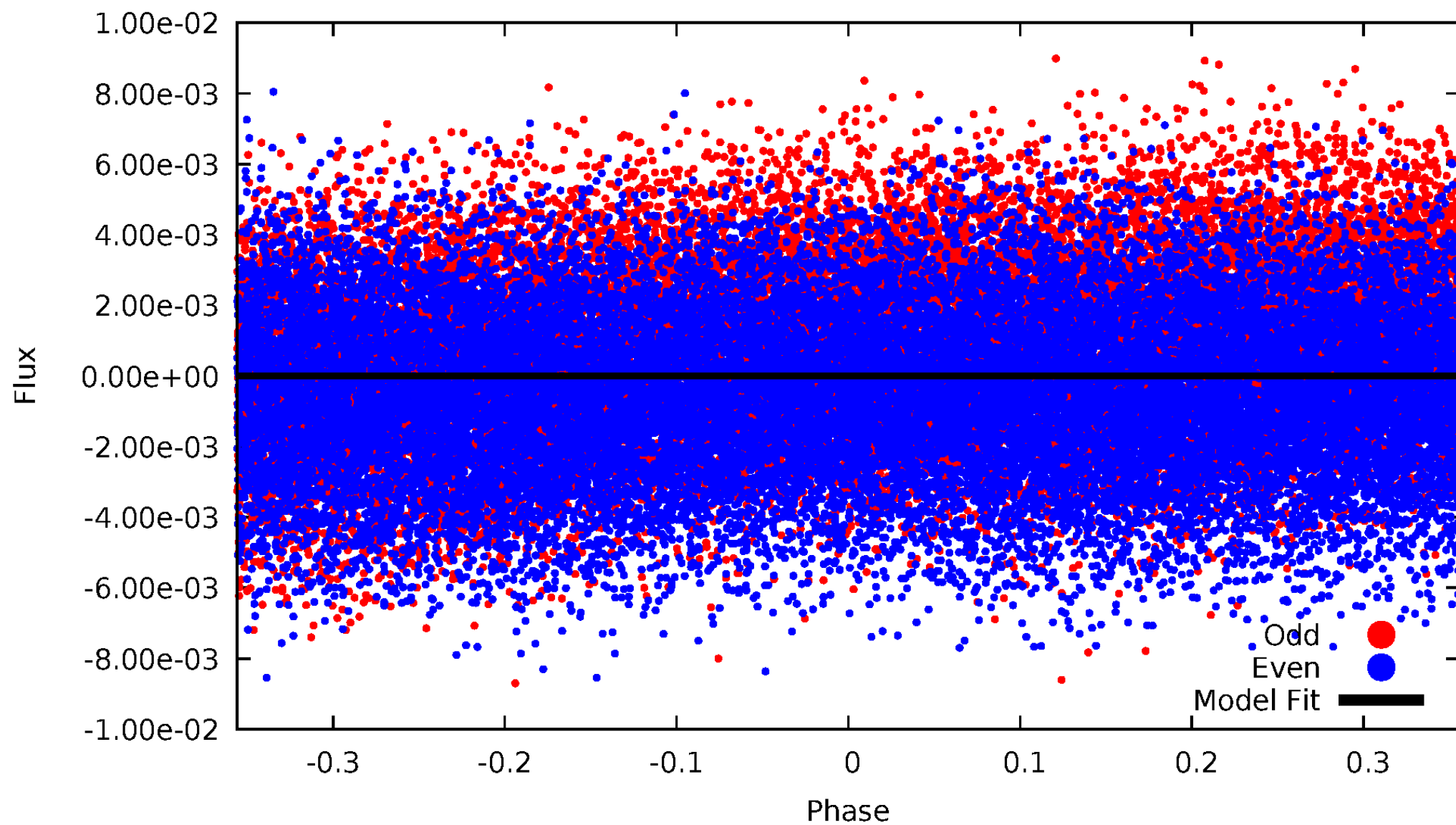
DV Odd/Even

TCE 009716385-03

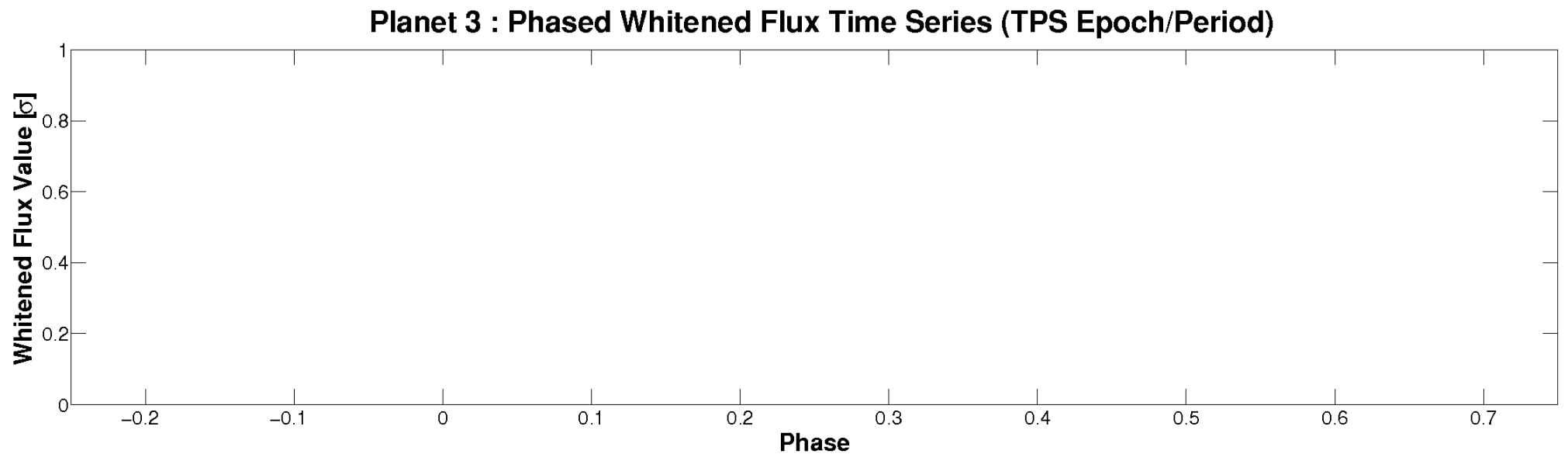
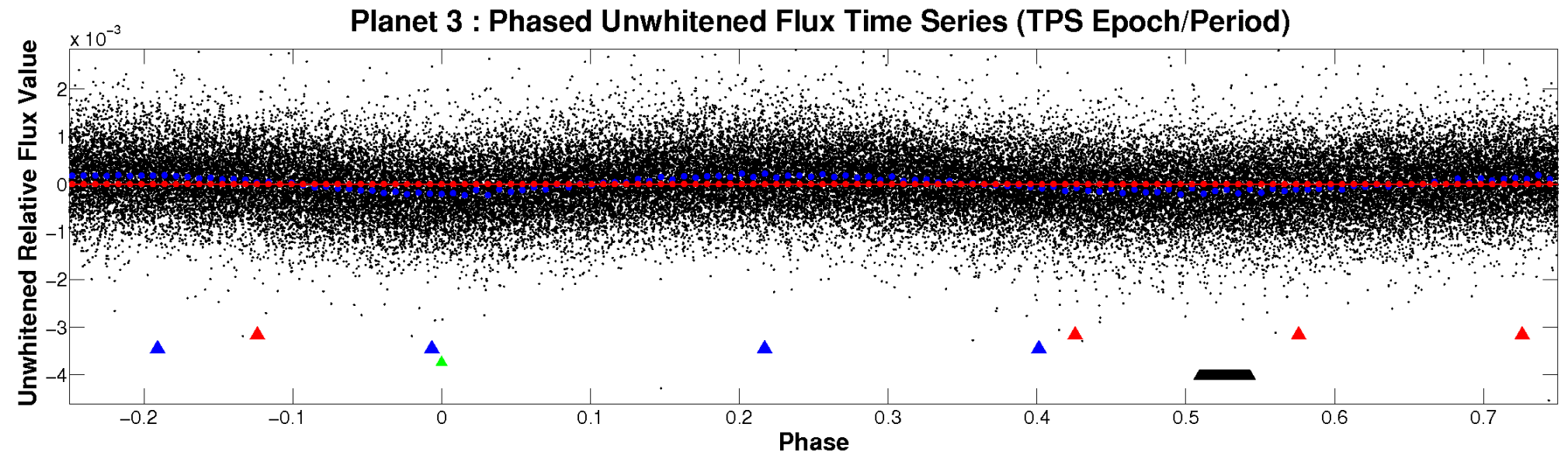


# ALT Odd/Even

TCE 009716385-03

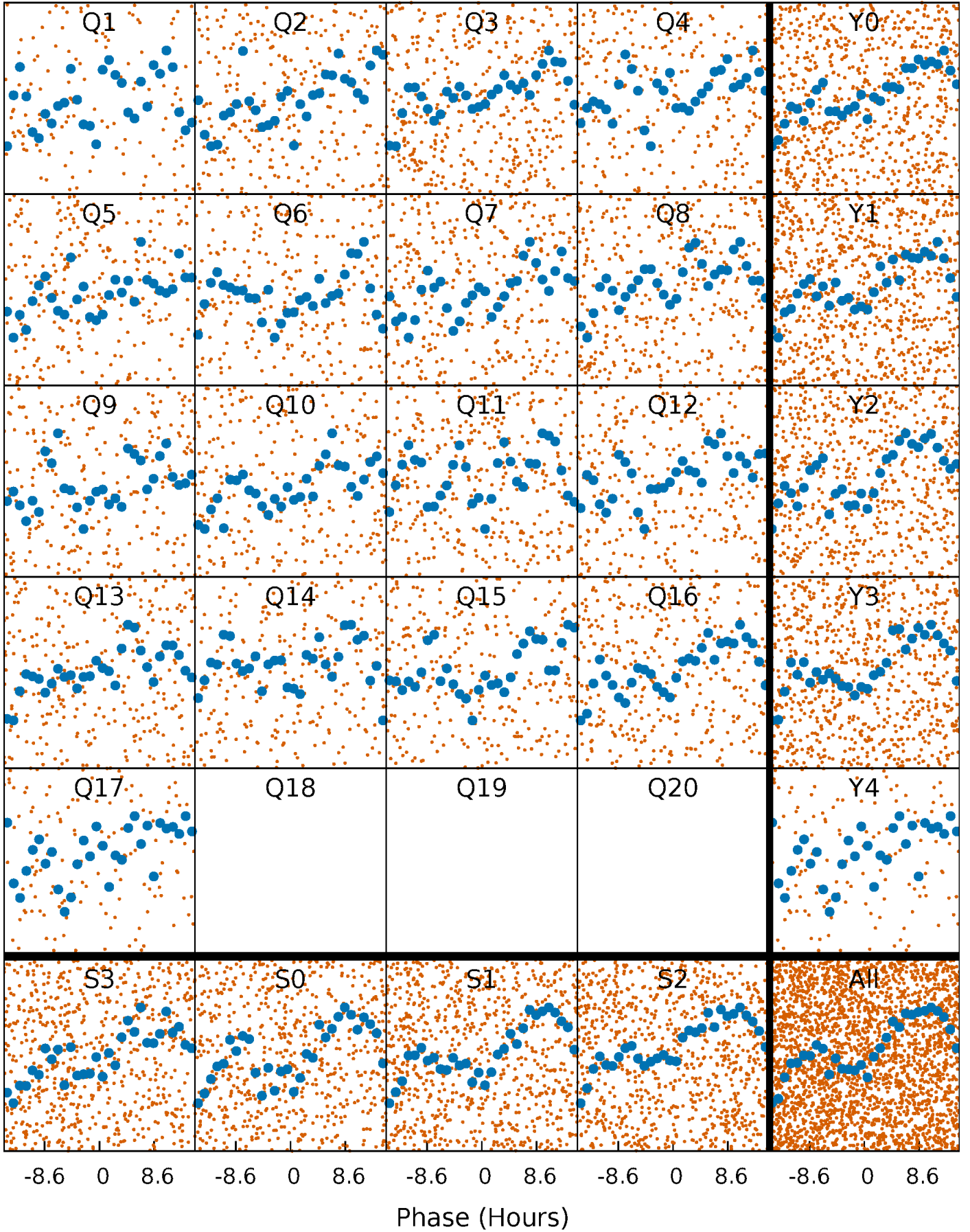


# Non-Whitened Vs. Whitened Light Curve



# PDC Quarter-Phased Transit Curves

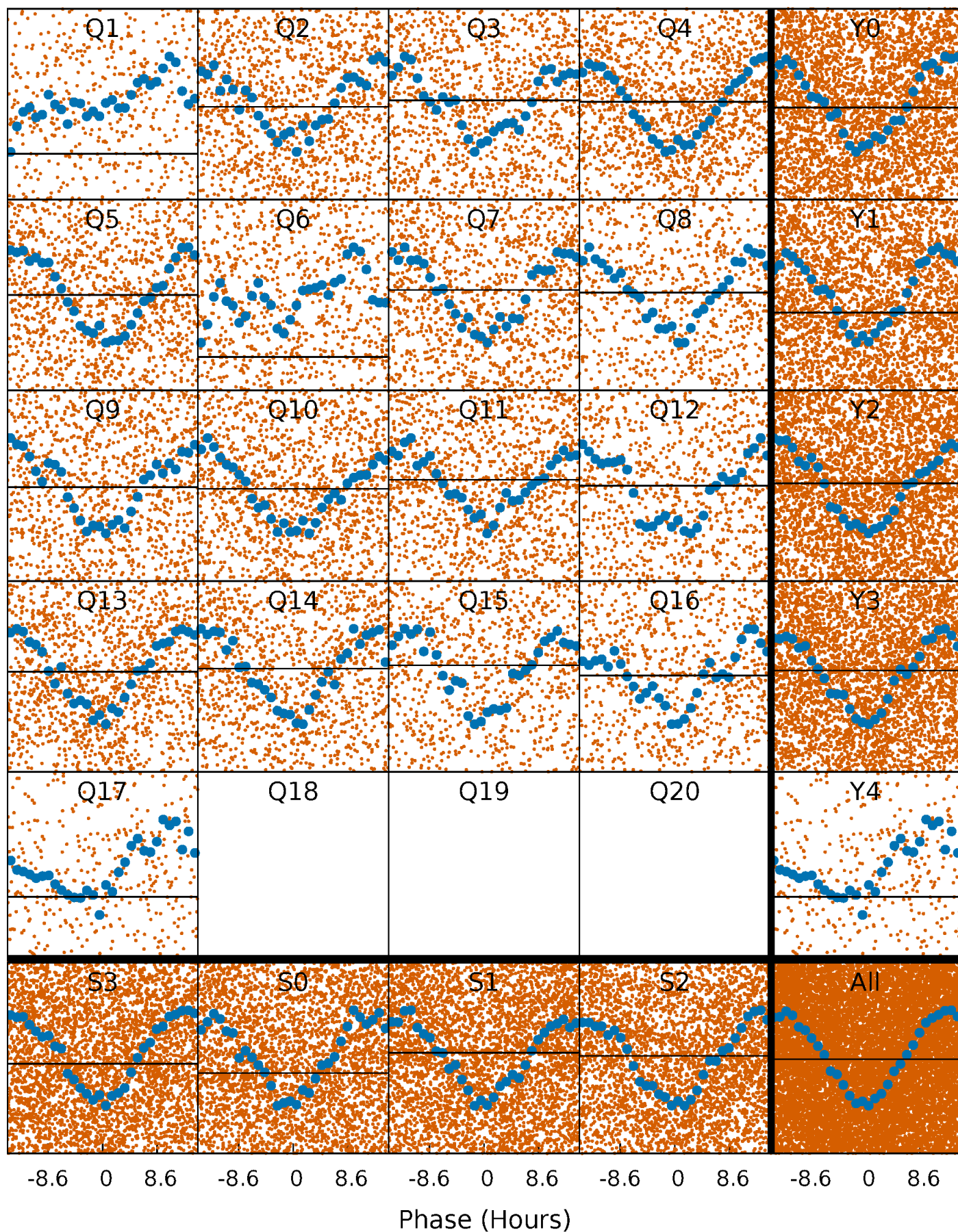
TCE 009716385-03   P= 2.634047 Days    $T_0=132.164868$  (BKJD)





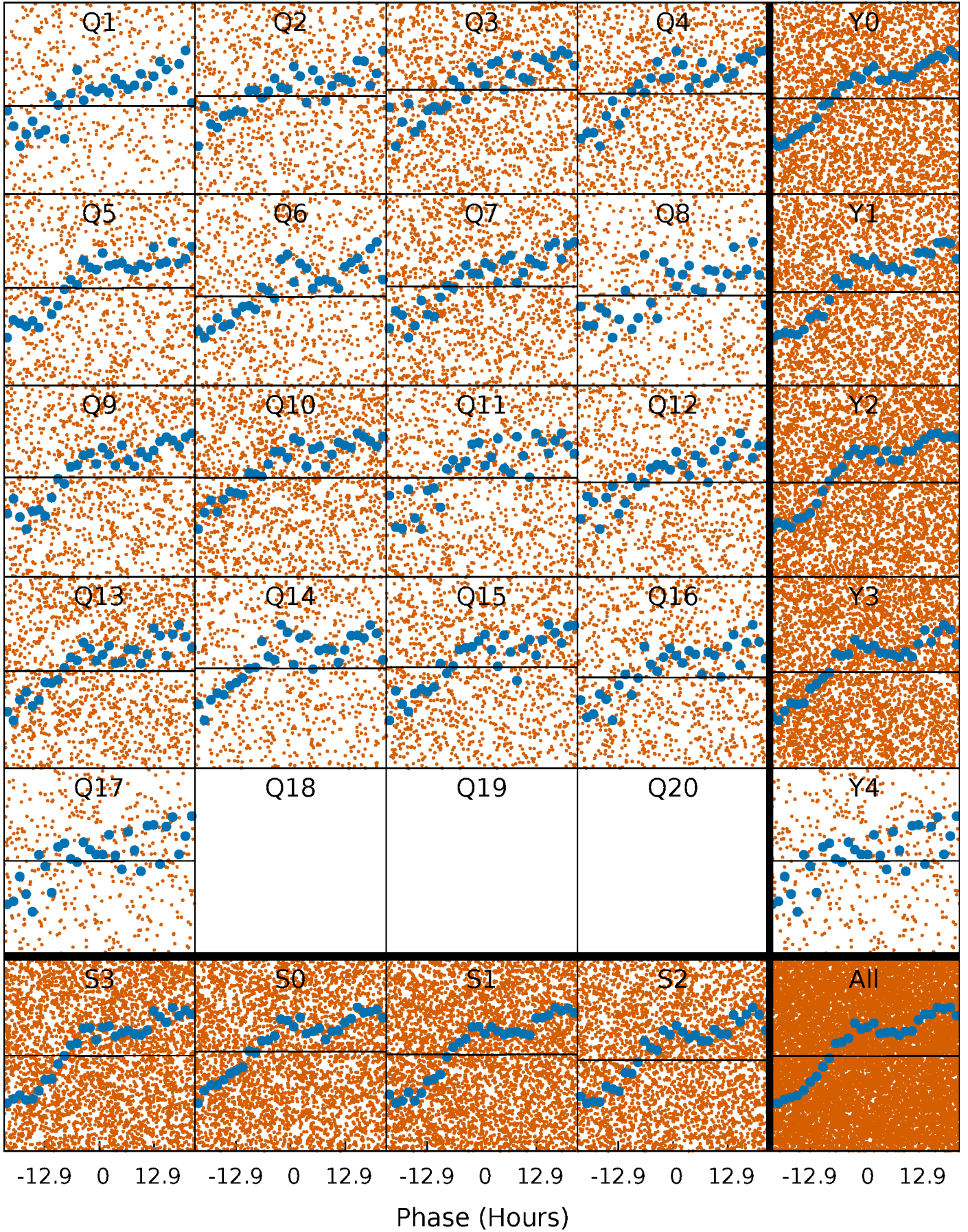
# DV Quarter-Phased Transit Curves

TCE 009716385-03   P= 2.634047 Days    $T_0=132.164868$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 009716385-03 P= 2.634047 Days  $T_0=131.785391$  (BKJD)

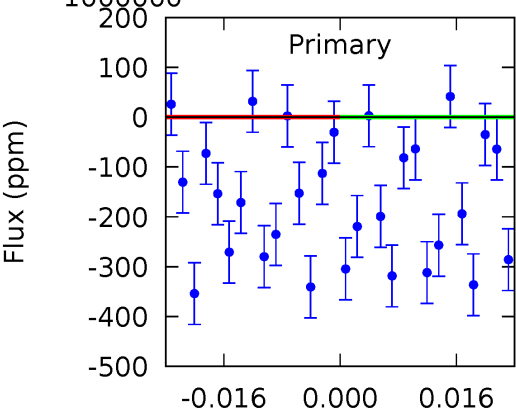
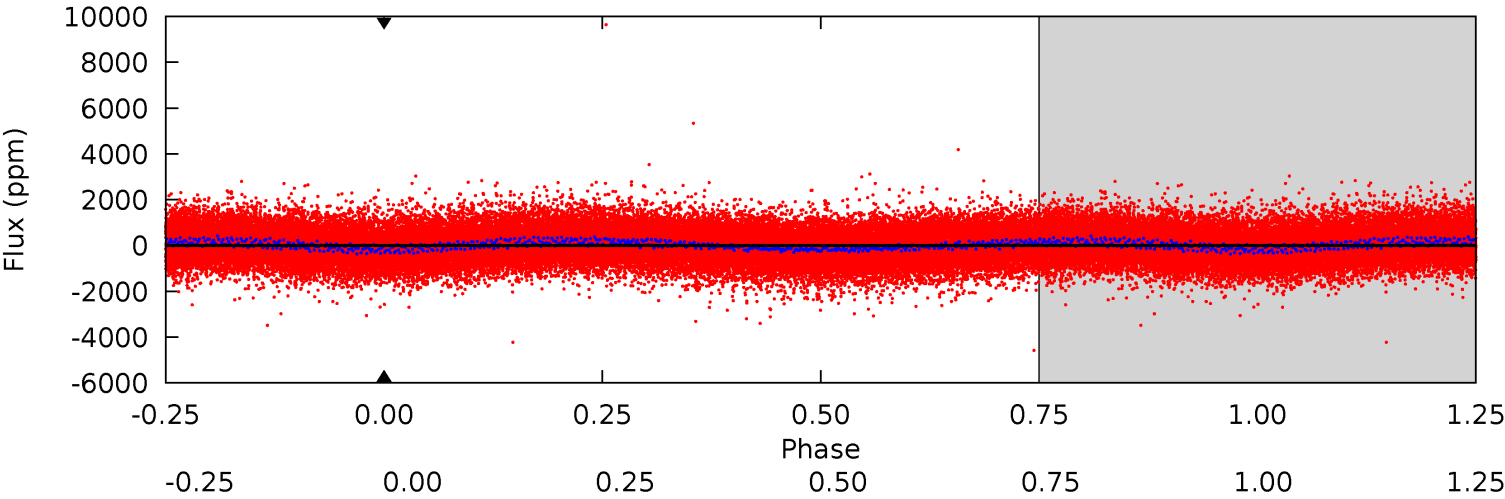




DV Model-Shift Uniqueness Test

009716385-03, P = 2.634047 Days, E = 129.530821 Days

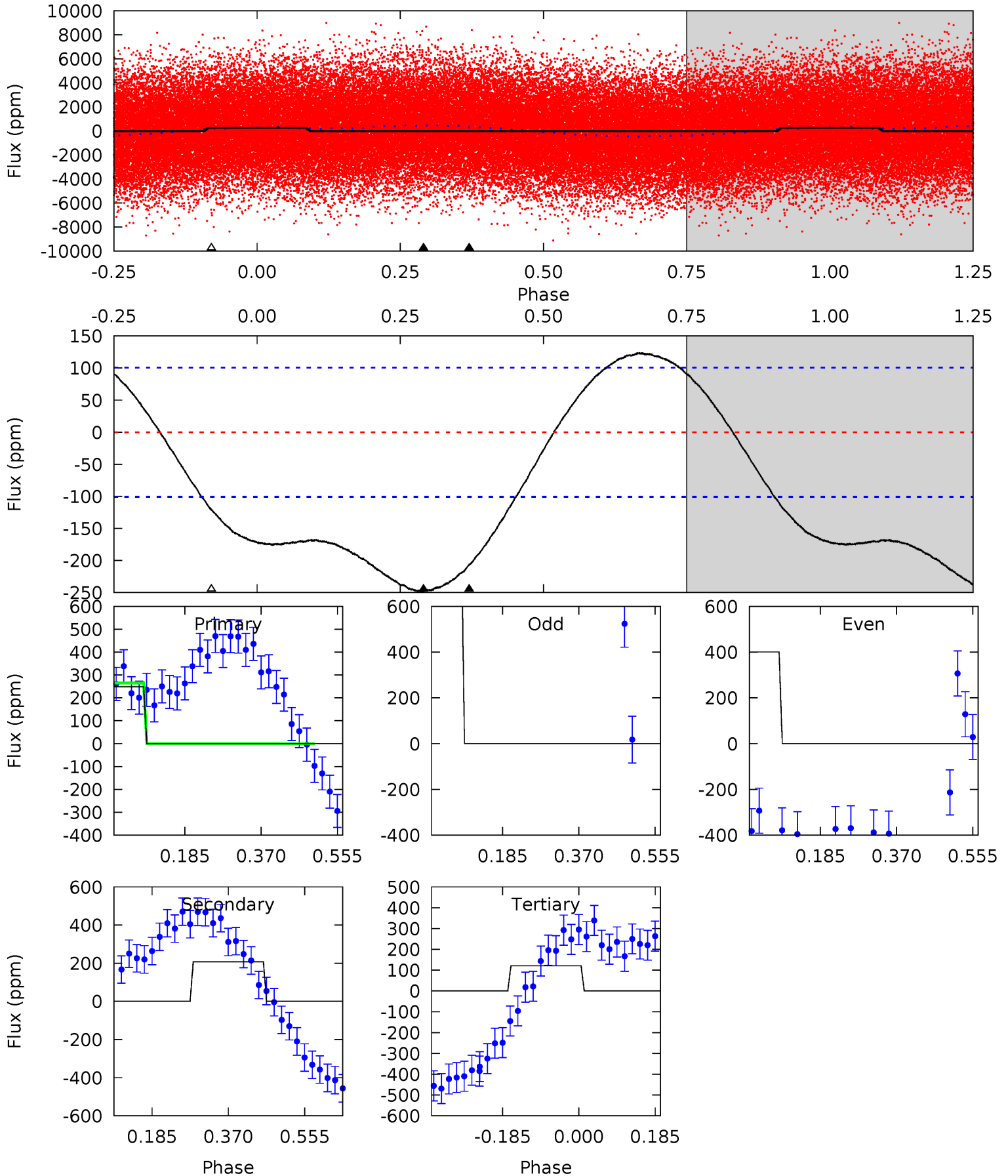
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
0	0	0	0	1.00	1.00	1.00	0	0	0	0	0	0	0	0



# Alt Model-Shift Uniqueness Test

009716385-03, P = 2.634047 Days, E = 129.151344 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
10.9	9.11	5.32	0	4.43	1.33	5.17	5.60	10.9	3.78	9.11	11.4	1.30	0.33	0.75





### Stellar Parameters For KIC 009716385

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7452^{+206}_{-335}$	$3.805^{+0.338}_{-0.113}$	$0.080^{+0.200}_{-0.350}$	$2.921^{+0.493}_{-1.231}$	$1.985^{+0.089}_{-0.503}$	$0.112^{+0.293}_{-0.039}$
	+3%/-4%	+9%/-3%	+250%/-438%	+17%/-42%	+4%/-25%	+261%/-35%
Source	PHO54	PHO54	PHO54	DSEP		

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

### Secondary Eclipse Parameters for KIC 009716385-03 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$0 \pm 1000000$	$20.05^{+23.29}_{-14.31}$	$3541^{+251}_{-388}$	$-4606^{+49919}_{-35440}$	$-1.604^{+590.357}_{-432.102}$
Alt.	$-207 \pm 23$	$19.58^{+23.12}_{-13.83}$	$3553^{+254}_{-362}$	$3434^{+2589}_{-6517}$	$0.652^{+6.465}_{-0.518}$

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

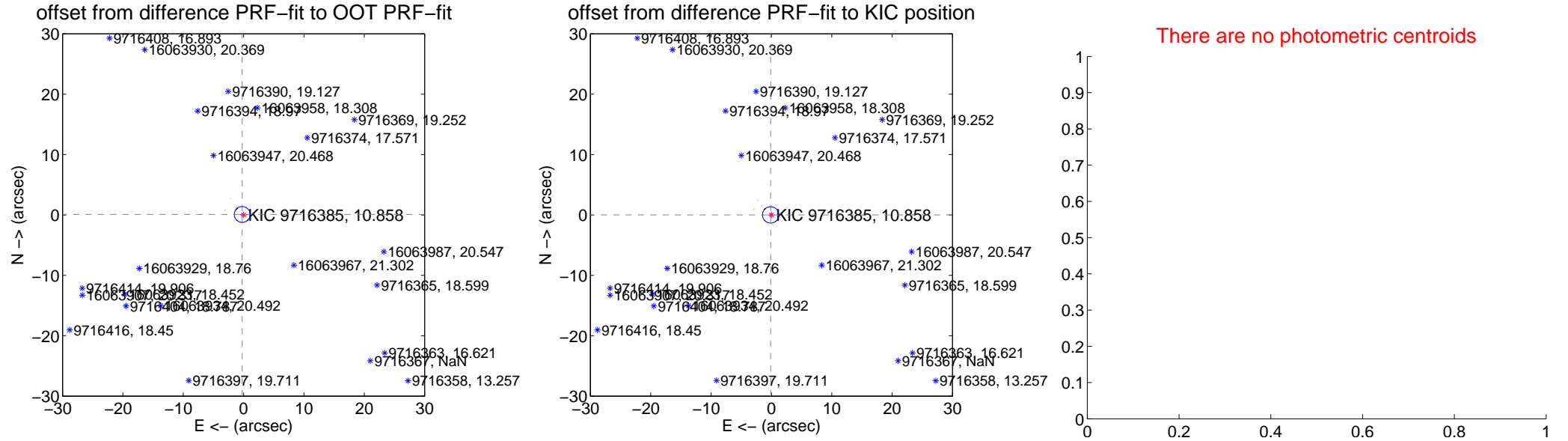
## DV Centroid Data

Supplemental centroid analysis for 009716385-03. **Kepler magnitude: 10.86.** Transit SNR -1.00

**There are 0 quarters with good PRF difference image offsets**

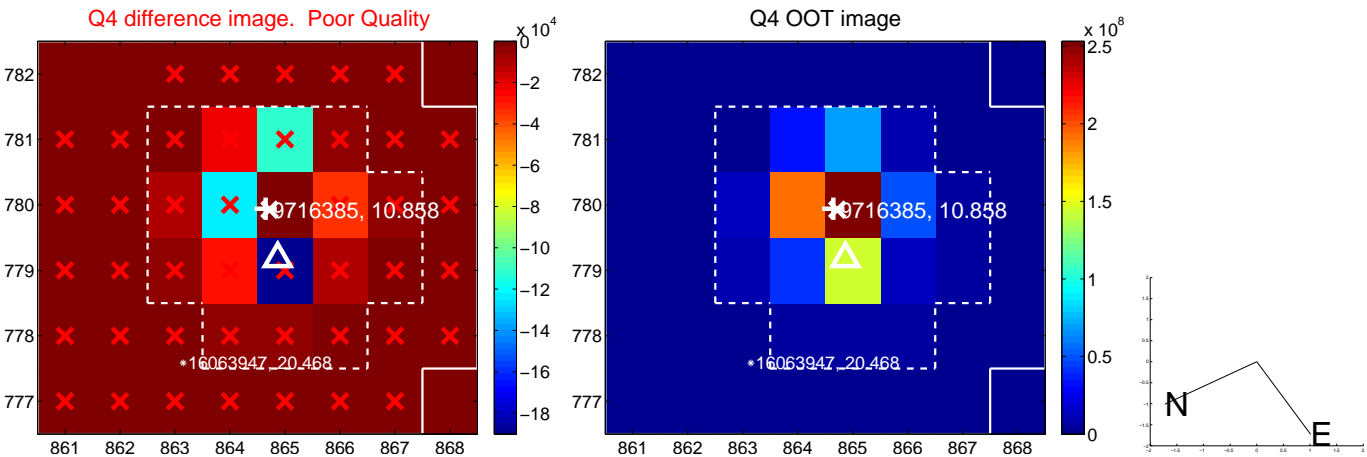
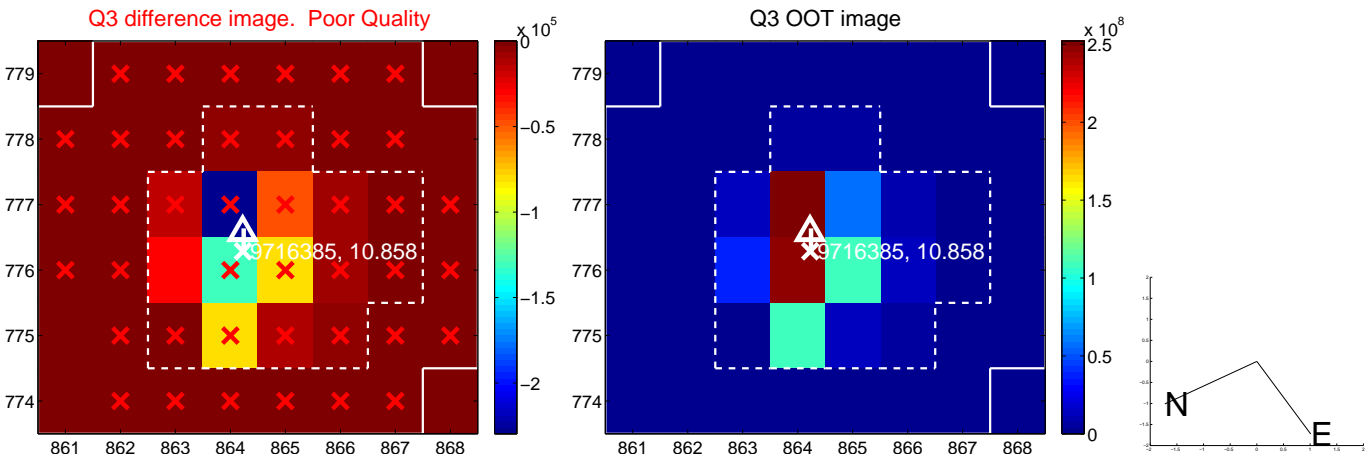
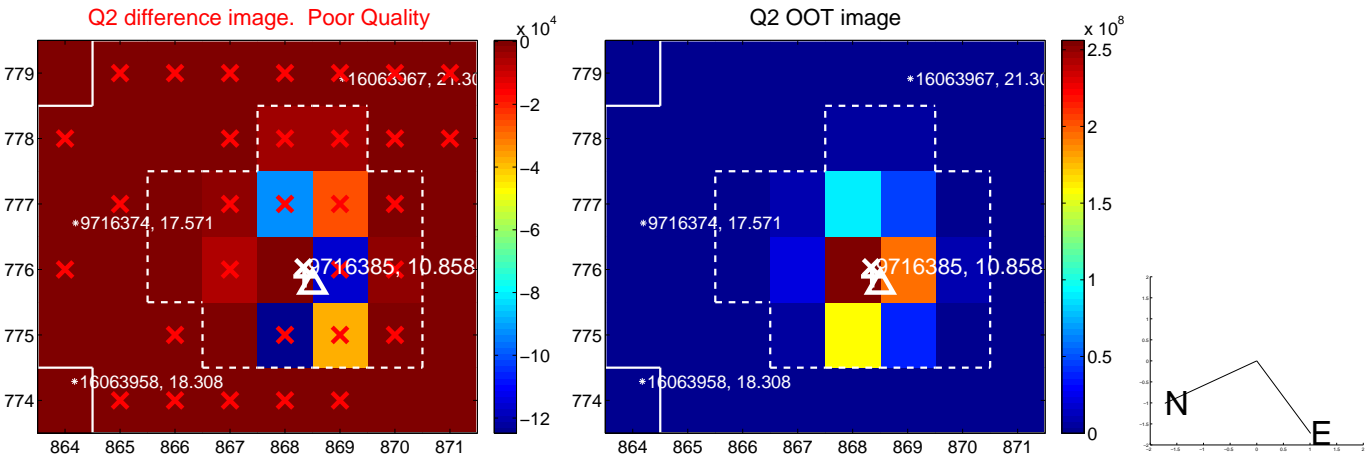
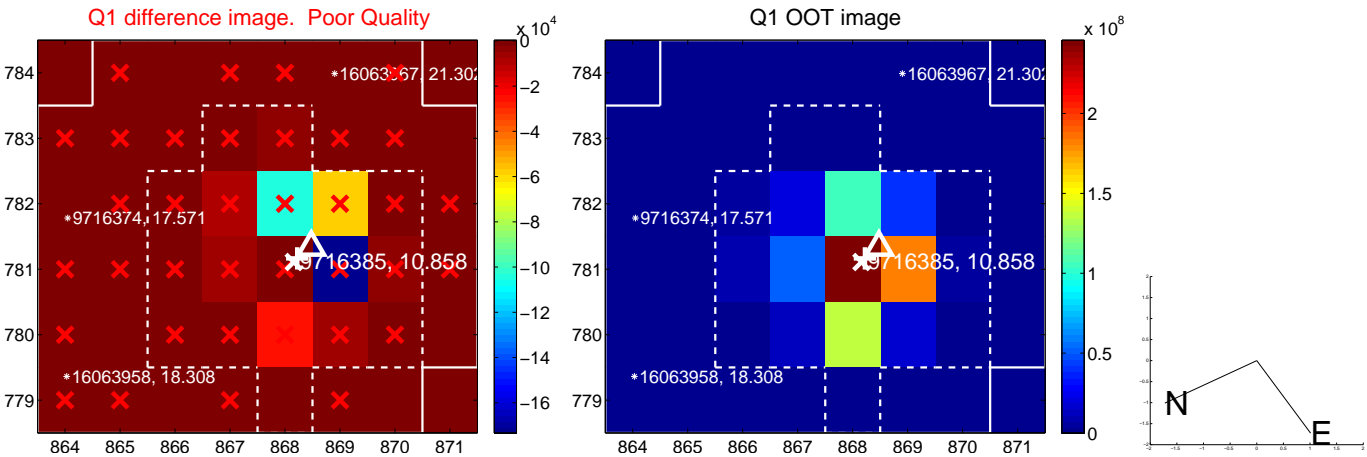
The direct PRF centroid is offset from the target star catalog position by about 0.25 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.249 \pm 0.438$	0.57	$0.234 \pm 0.382$	$0.087 \pm 0.290$
PRF-fit source offset from KIC position	$0.126 \pm 0.451$	0.28	$0.126 \pm 0.452$	$0.013 \pm 0.333$
photometric centroid source offset	—	—	—	—

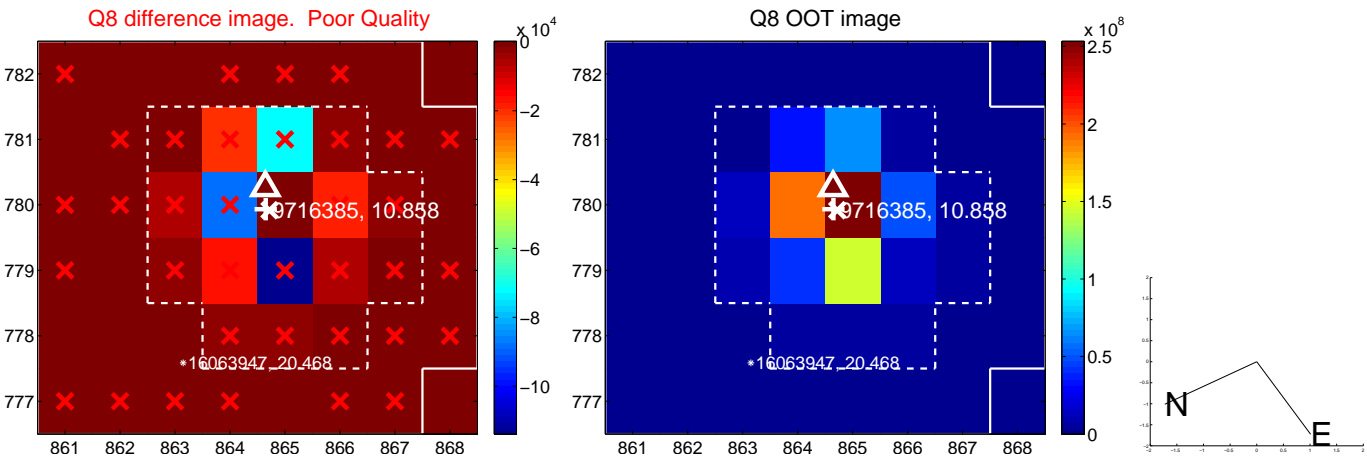
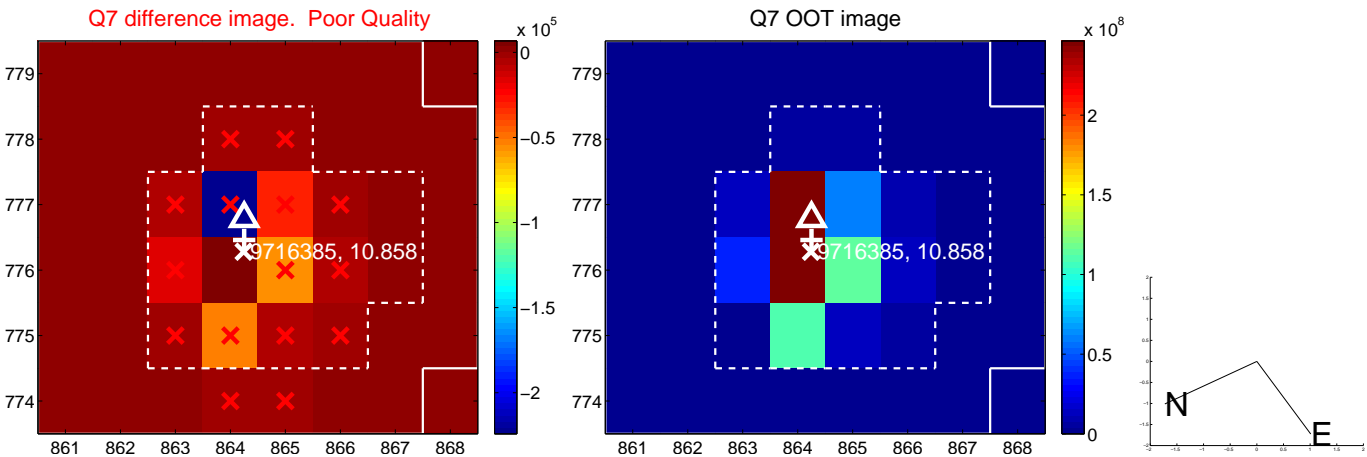
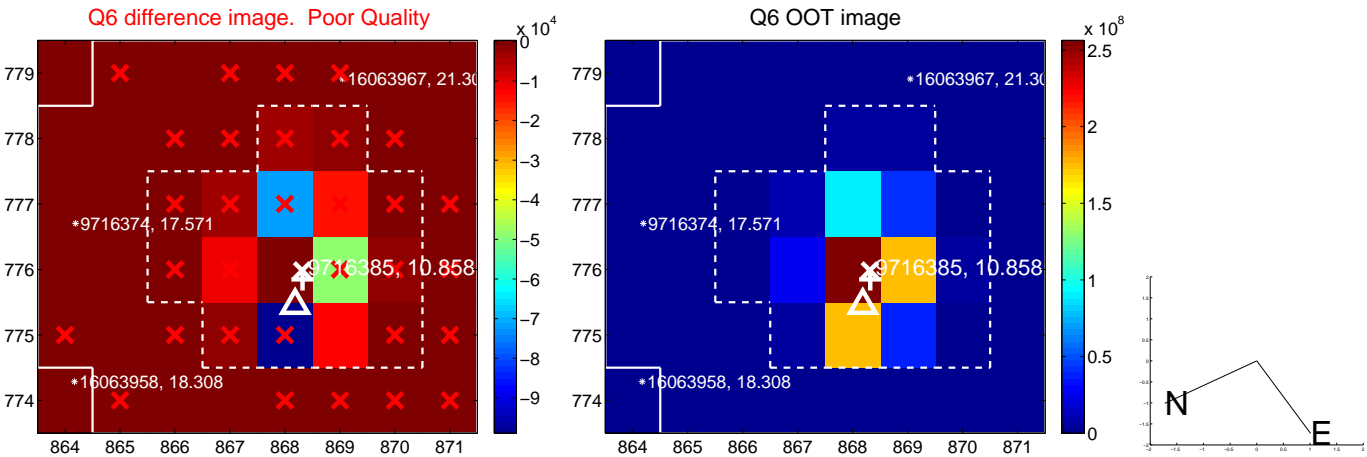
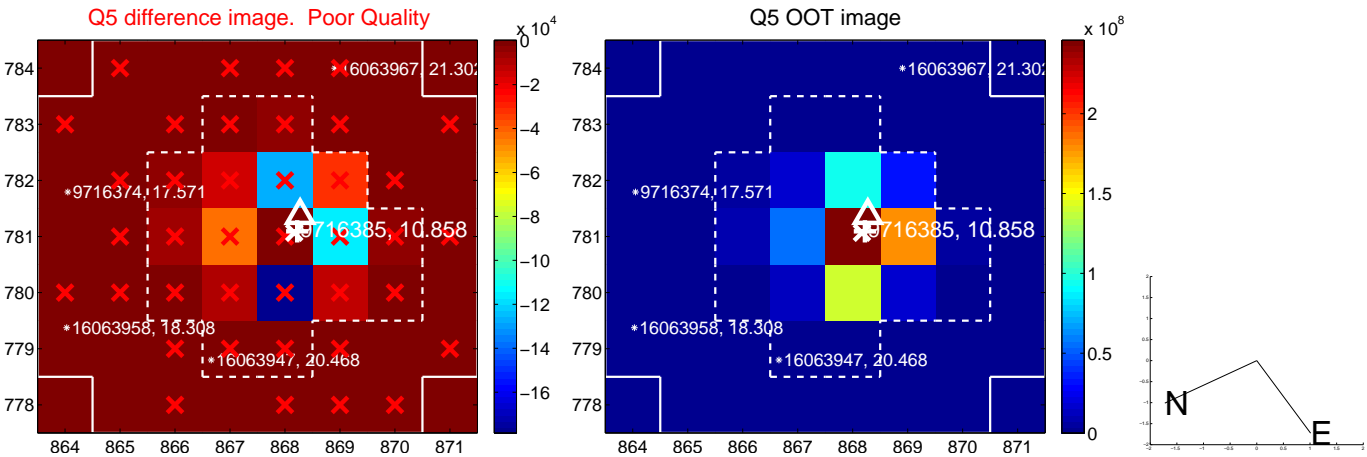


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

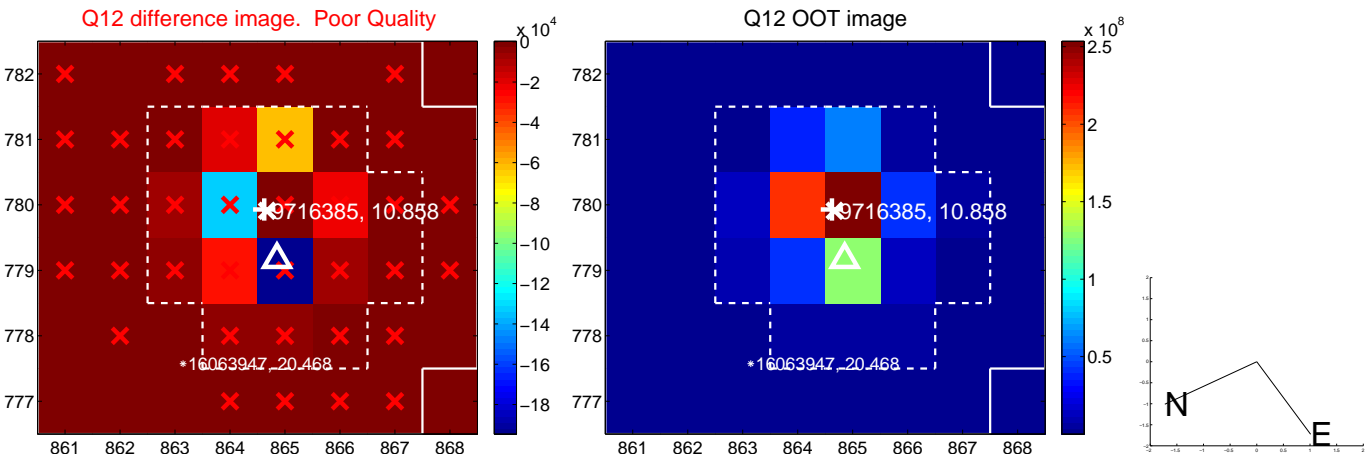
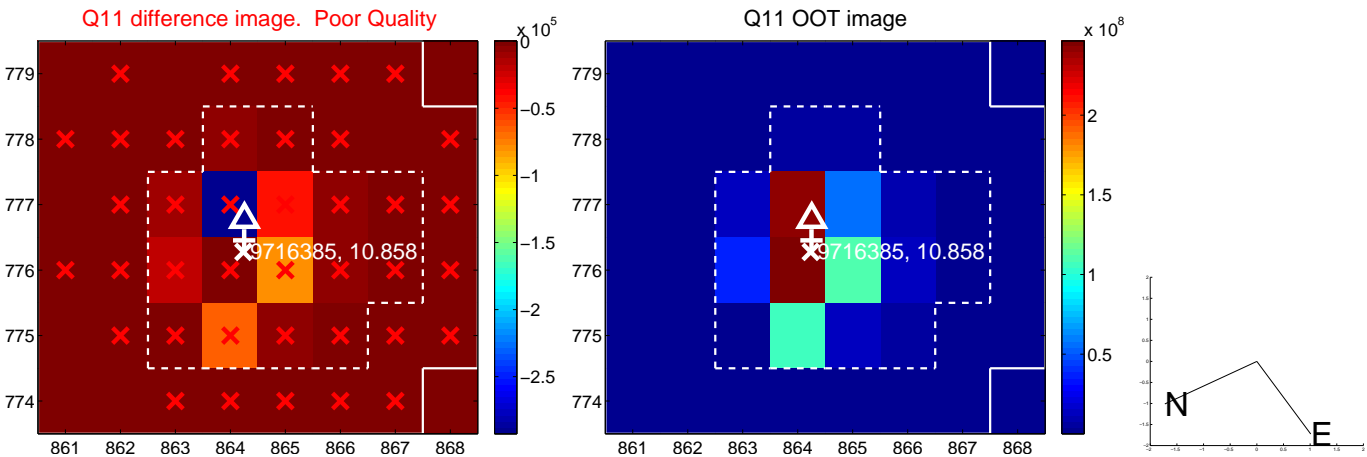
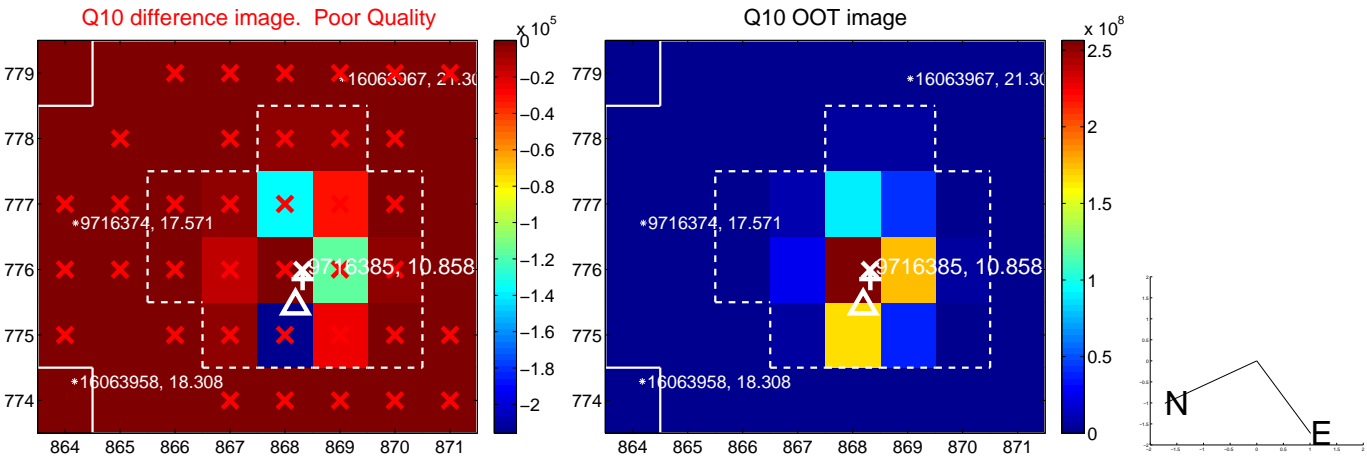
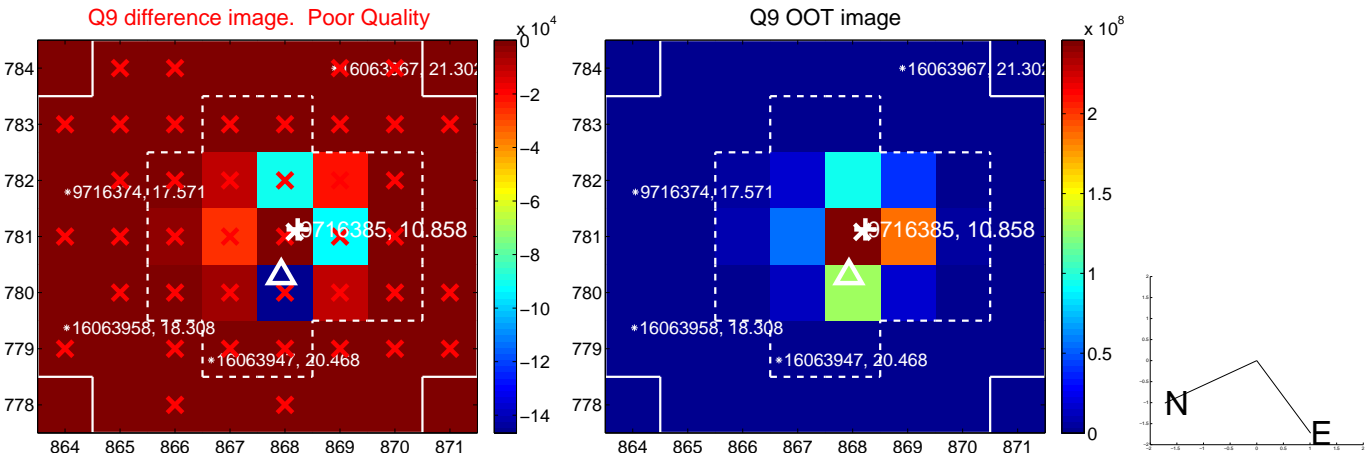
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



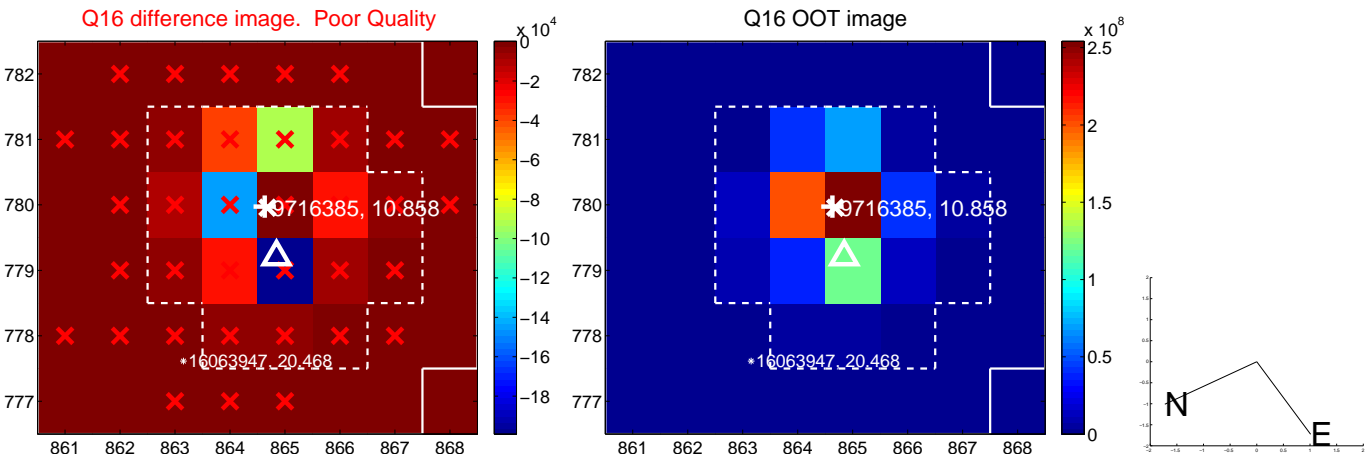
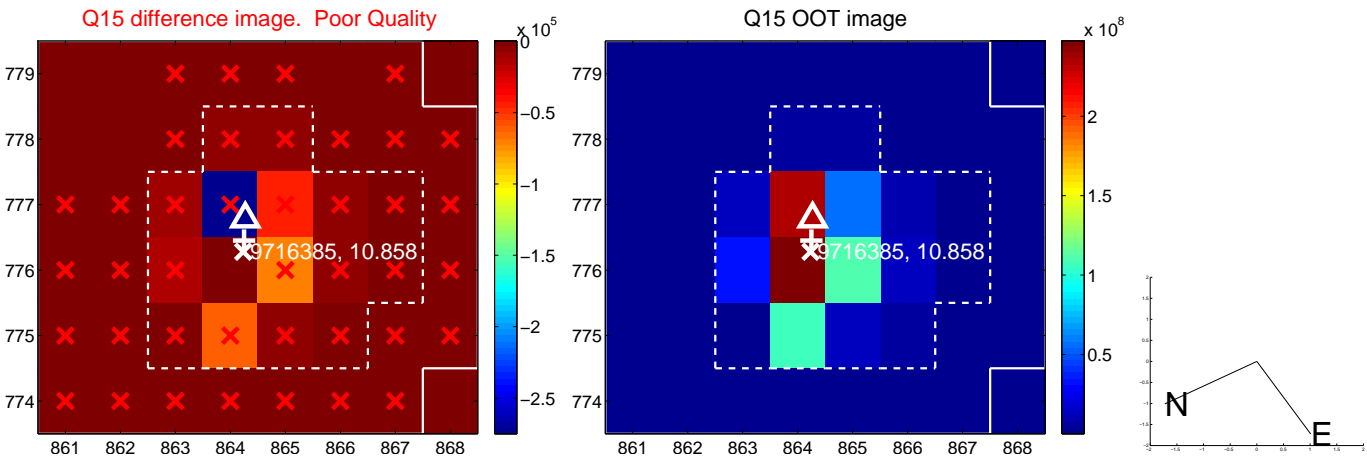
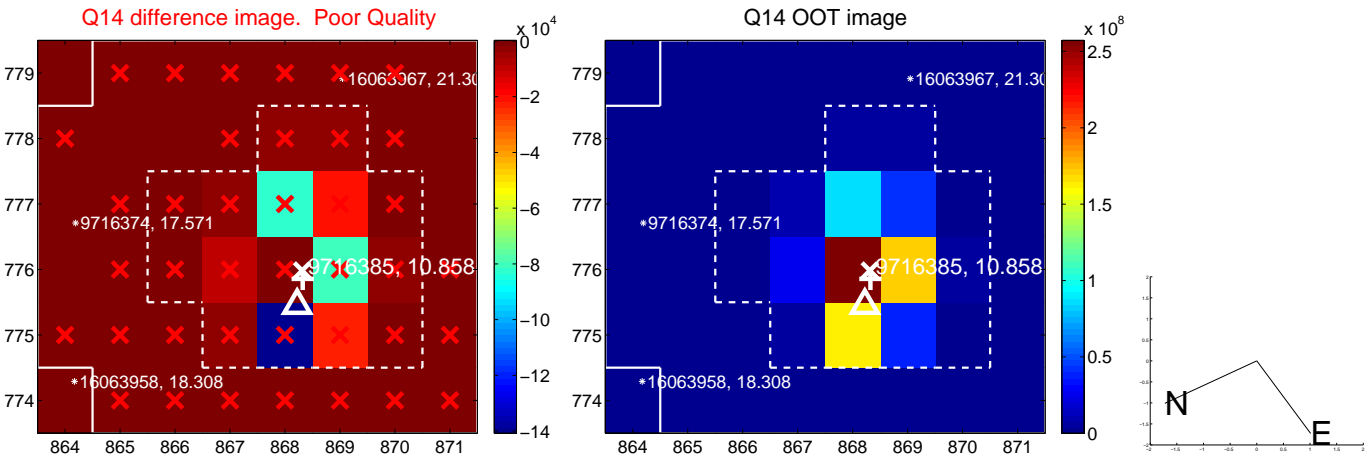
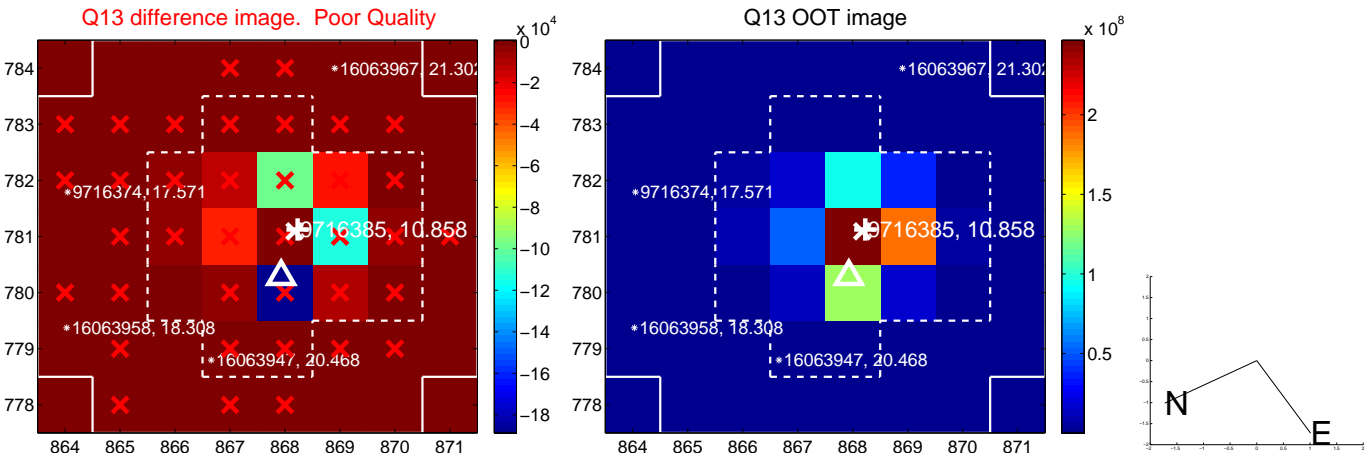
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



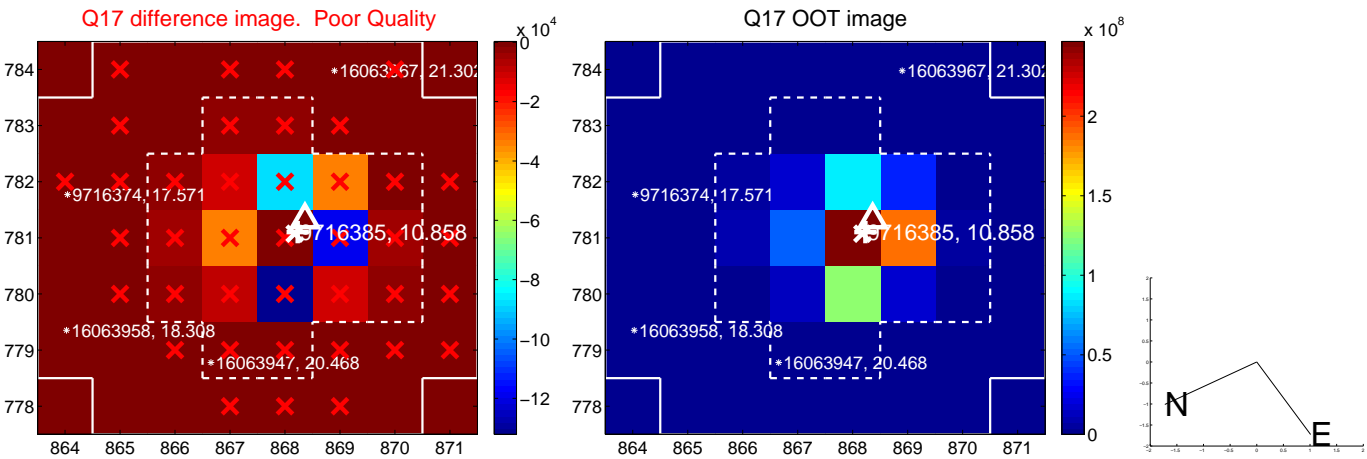
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



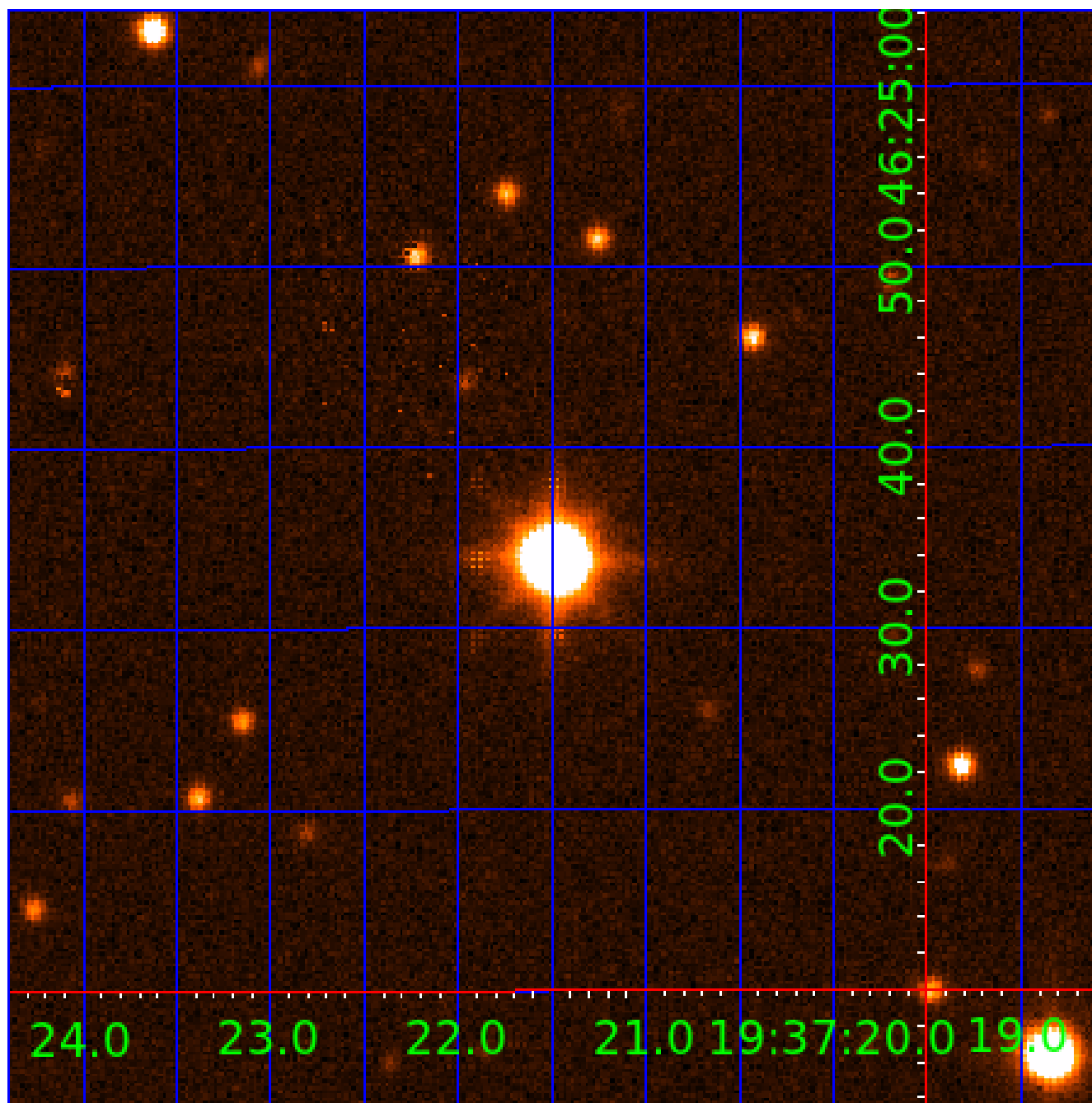
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



folded centroid time series figure for this object.

UKIRT Image

Declination





# KIC 009716385

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009716385-01	OBS	No	411.306873	185.967090	254.3	9.622	13.4	3.1	2.92	7452	5.04	12.73
009716385-02	OBS	No	372.960288	364.532748	377.8	3.325	10.0	9.3	2.92	7452	6.33	14.50
009716385-03	OBS	No	2.634047	132.164868	34.2	7.500	9.4	-1.0	2.92	7452	1.73	10703.08
009716385-04	OBS	No	5.268418	136.140060	93.1	28.941	7.7	9.7	2.92	7452	5.53	4247.17

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009716385-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_SKYE_ZUMA—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_SATURATED
009716385-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_SATURATED
009716385-03	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—CENT_SATURATED
009716385-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE_ZUMA—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD—CENT_SATURATED

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

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

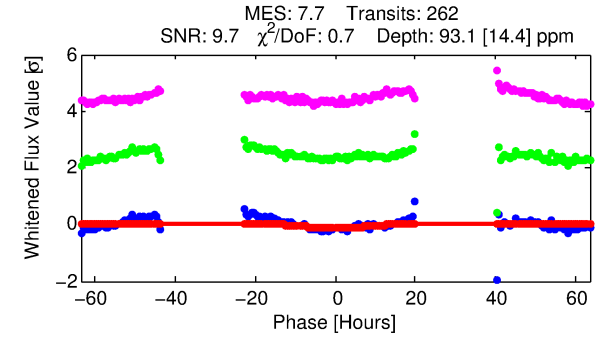
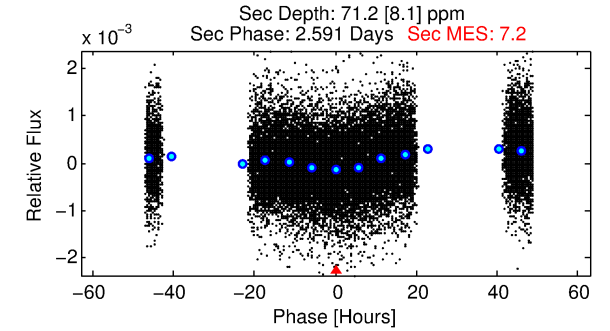
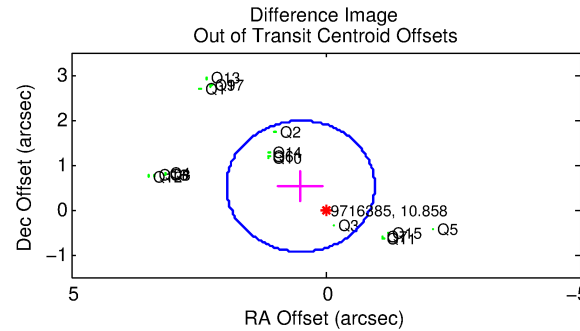
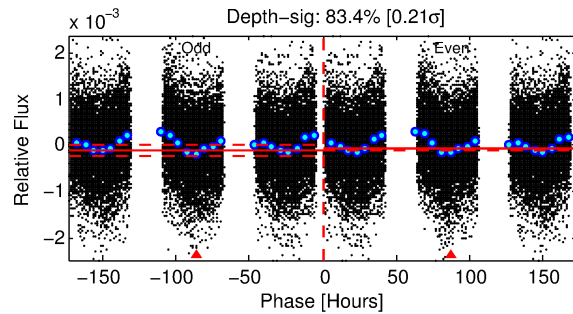
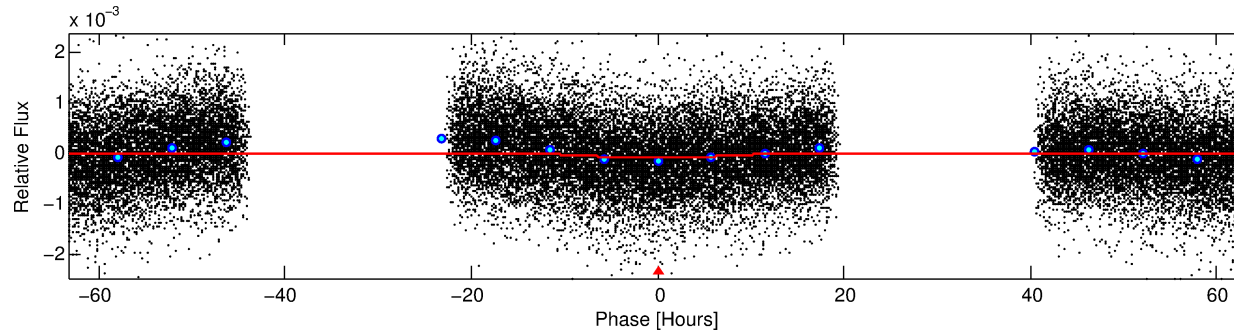
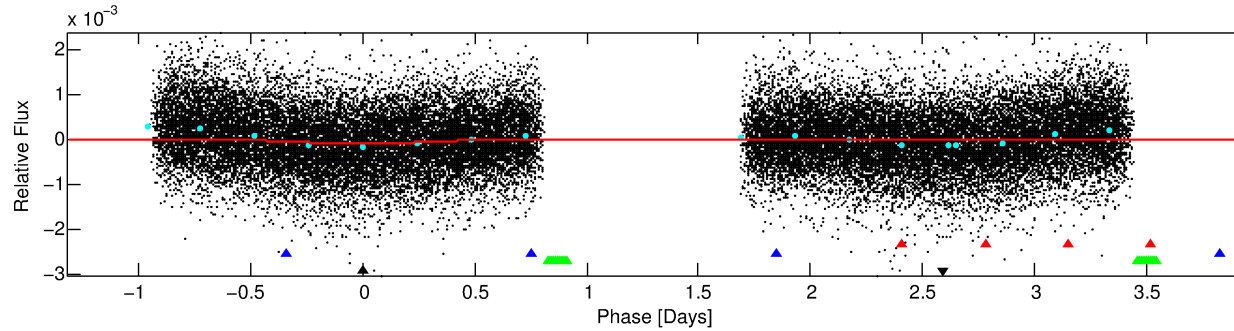
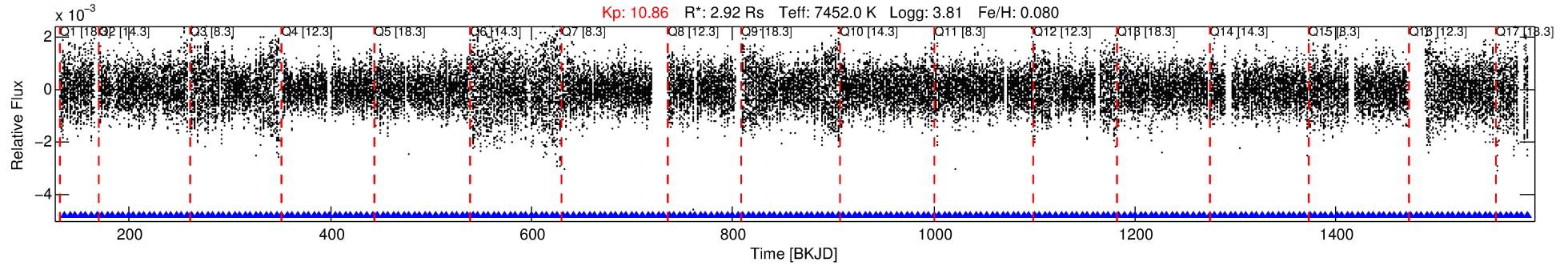
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009716385-04

No Significant Match Found

# DV One-Page Summary

KIC: 9716385 Candidate: 4 of 4 Period: 5.268 d



## DV Fit Results:

Period = 5.26842 [0.00043] d  
Epoch = 136.1401 [0.0636] BKJD  
 $R_p/R^* = 0.0173$  [0.0276]  
 $a/R^* = 1.04$  [0.01]  
 $b = 1.00$  [0.04]  
 $\text{Seff} = 4247.17$  [2619.76]  
 $T_{\text{eq}} = 2059$  [317] K  
 $R_p = 5.53$  [9.11]  $R_{\text{e}}$   
 $a = 0.0745$  [0.0285] AU  
 $\text{Ag} = 7.12$  [23.12] [0.26 $\sigma$ ]  
 $T_{\text{eff}} = 5200$  [4155] K [0.75 $\sigma$ ]

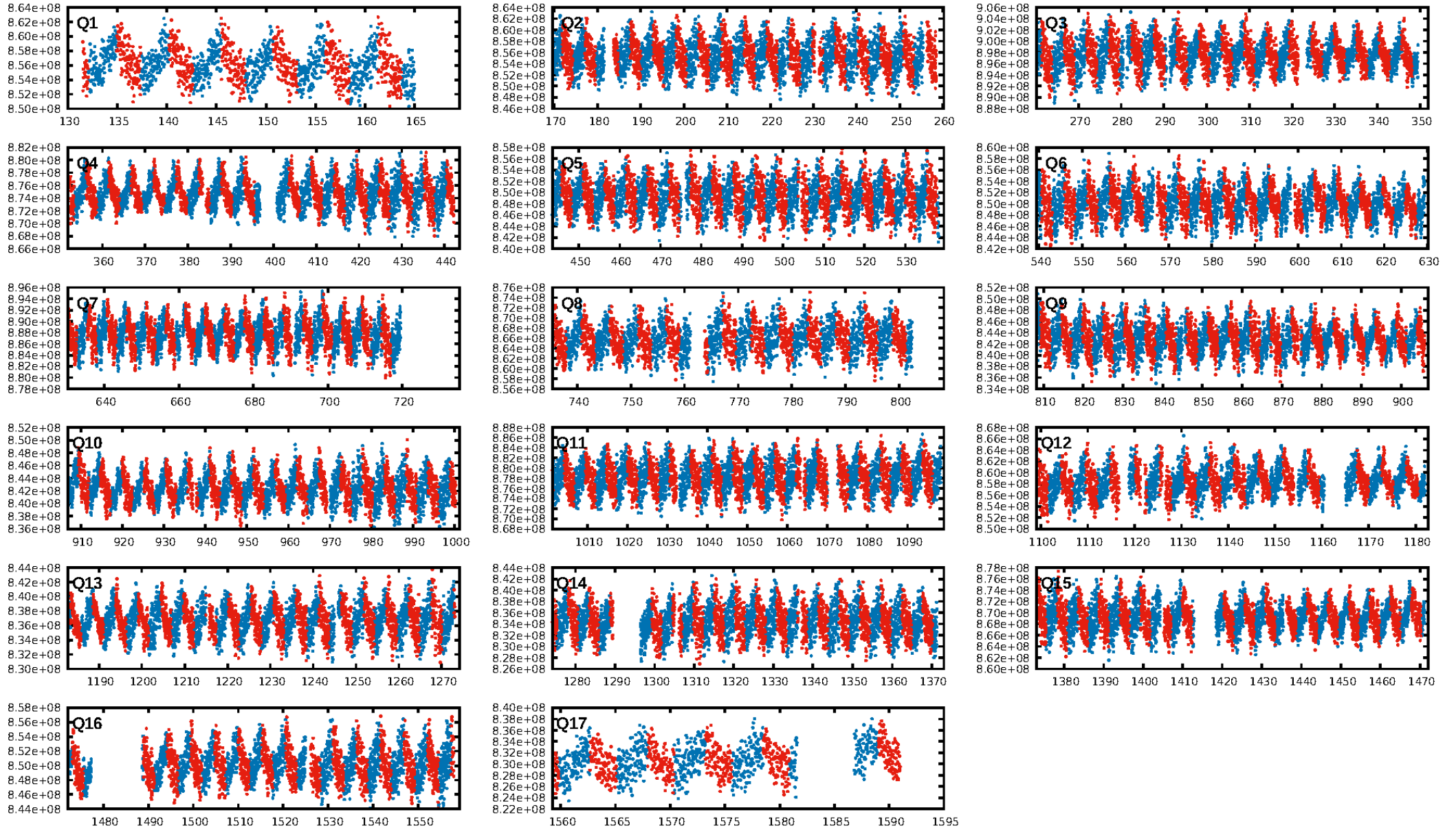
## DV Diagnostic Results:

ShortPeriod-sig: 96.6% [2.11 $\sigma$ ]  
LongPeriod-sig: 100.0% [302.92 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 3.22e-10  
RollingBand-fgt: 1.00 [251/251]  
GhostDiagnostic-chr: 0.9161  
Centroid-sig: 0.0%  
Centroid-so: 0.613 arcsec [2.02 $\sigma$ ]  
OotOffset-rm: 0.713 arcsec [1.47 $\sigma$ ]  
KicOffset-rm: 0.525 arcsec [1.03 $\sigma$ ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 0.88 [15/17]  
DiffImageOverlap-fno: 0.00 [0/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 11:16:59 Z

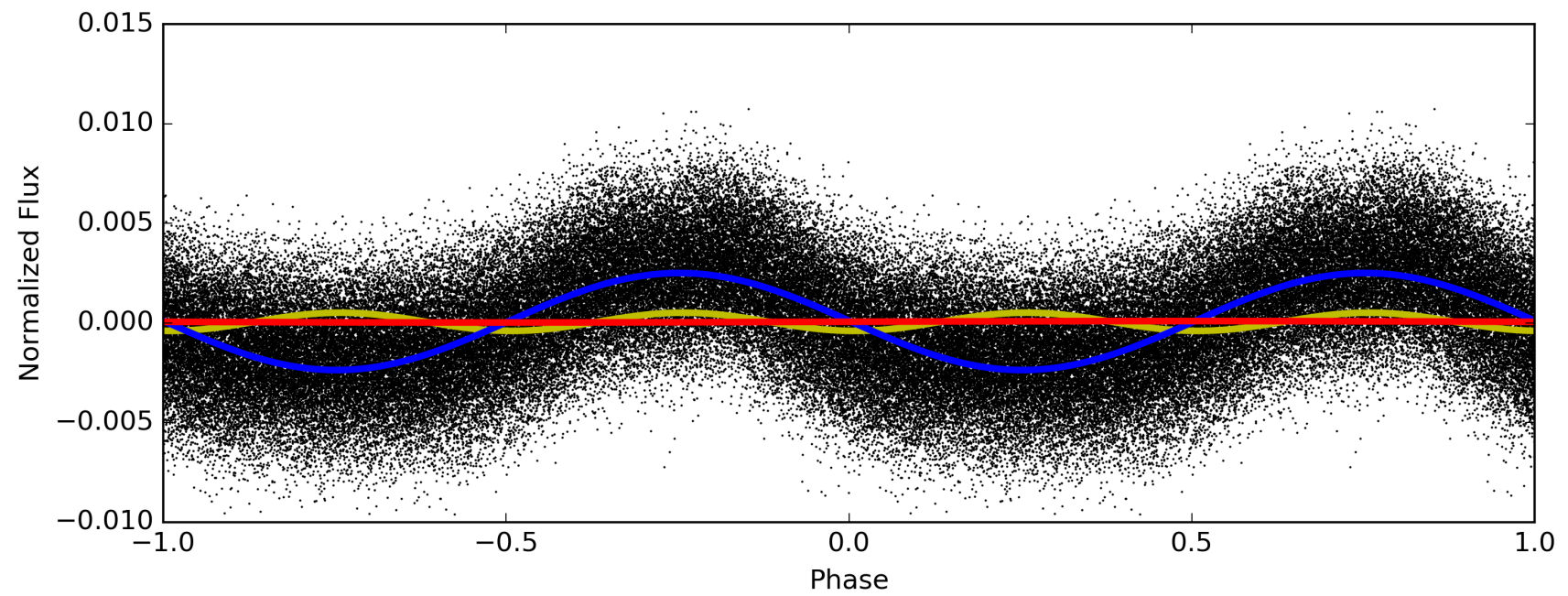
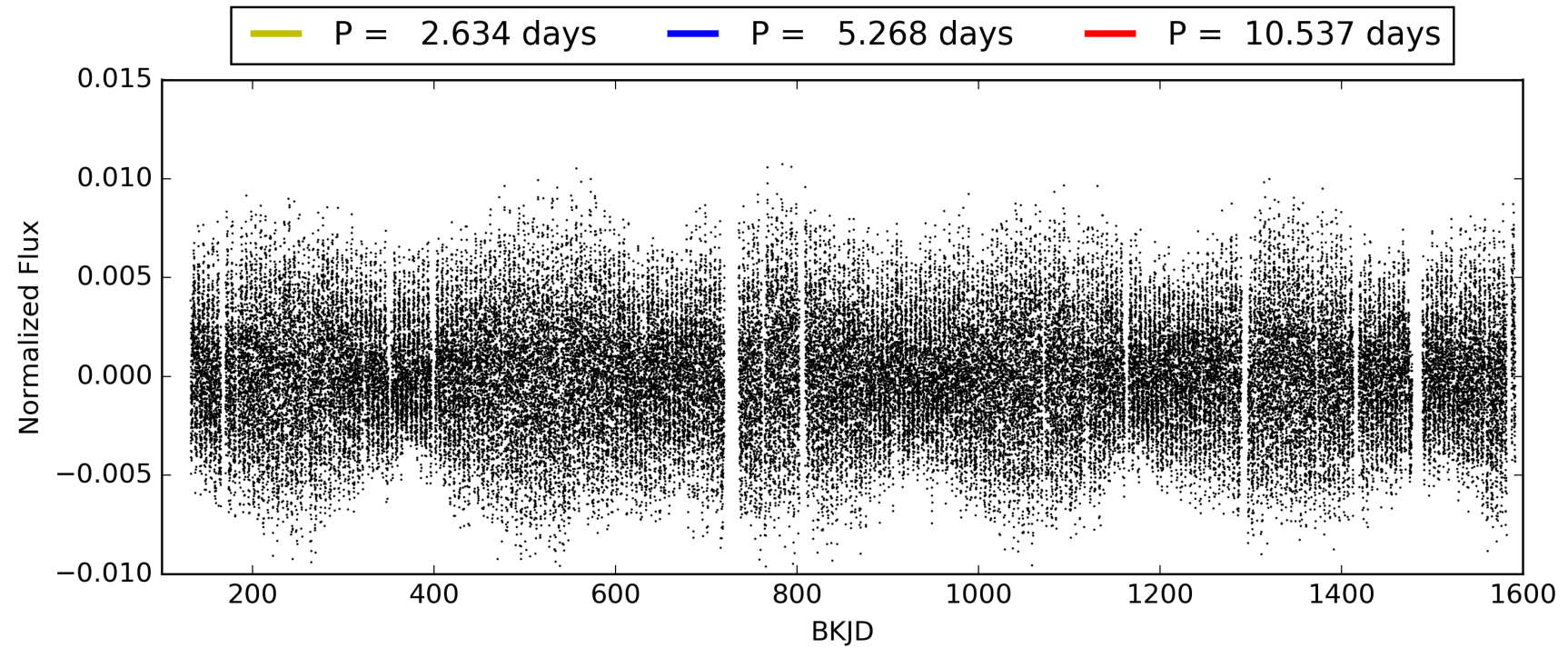
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 009716385-04, PDC Light Curves



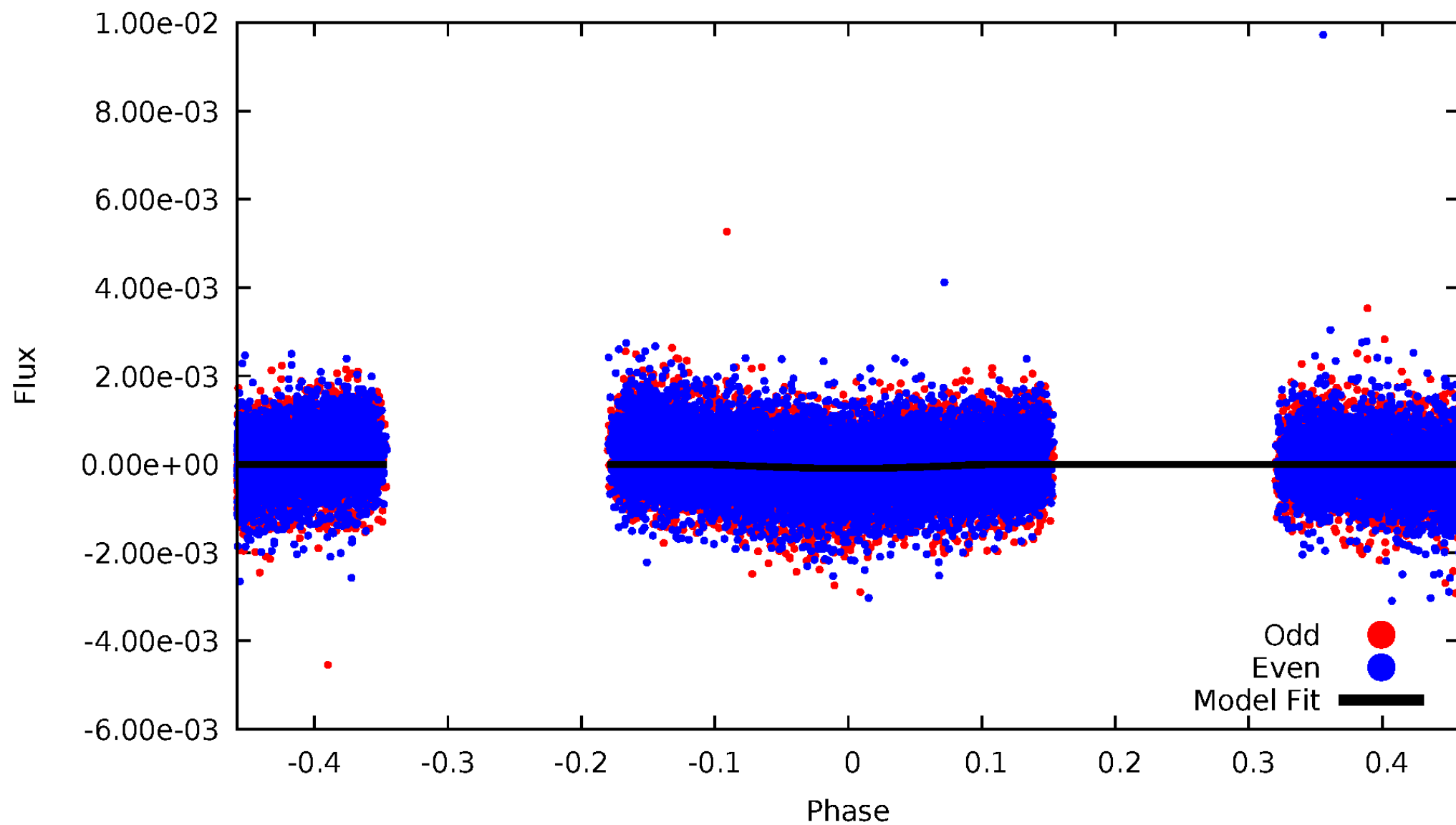


TCE 009716385-04



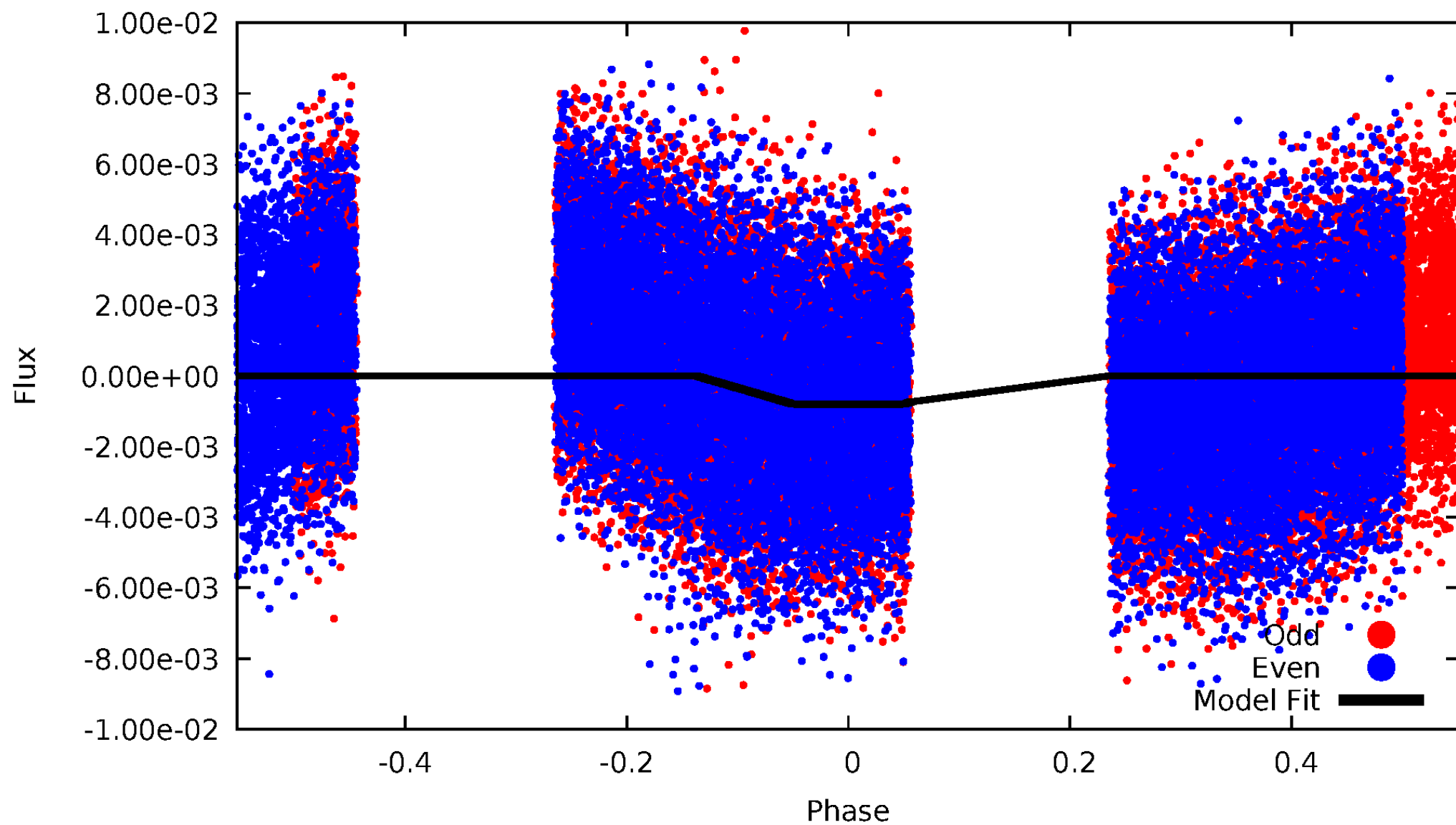
# DV Odd/Even

TCE 009716385-04



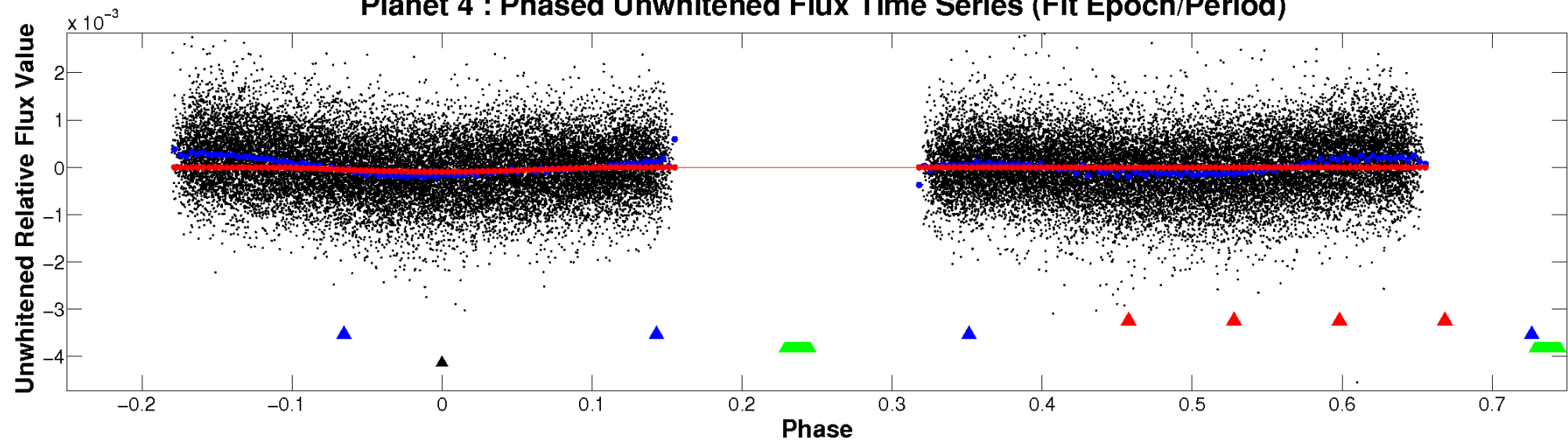
# ALT Odd/Even

TCE 009716385-04

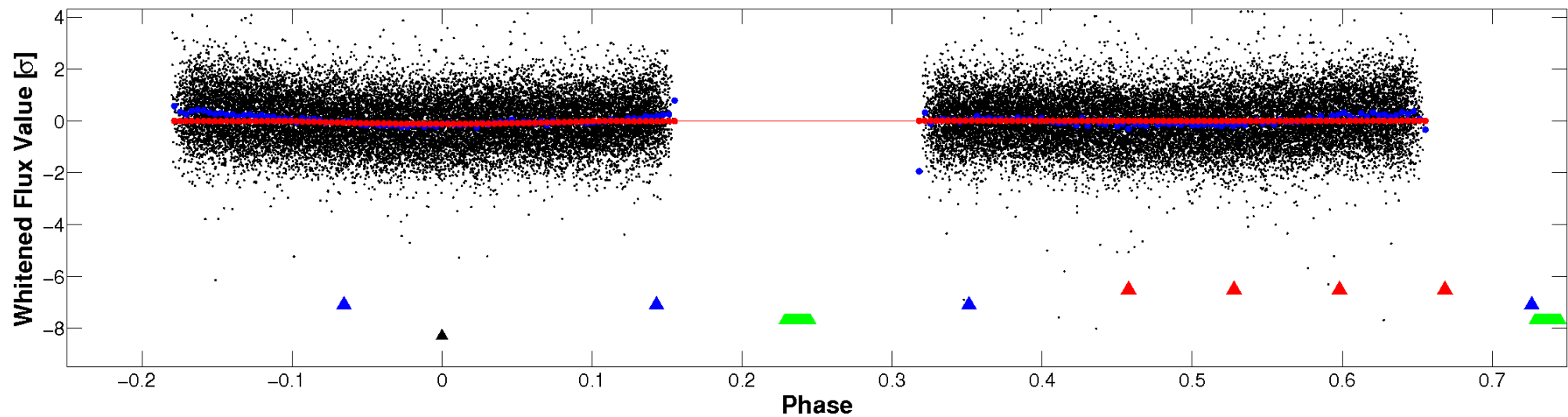


# Non-Whitened Vs. Whitened Light Curve

## Planet 4 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)



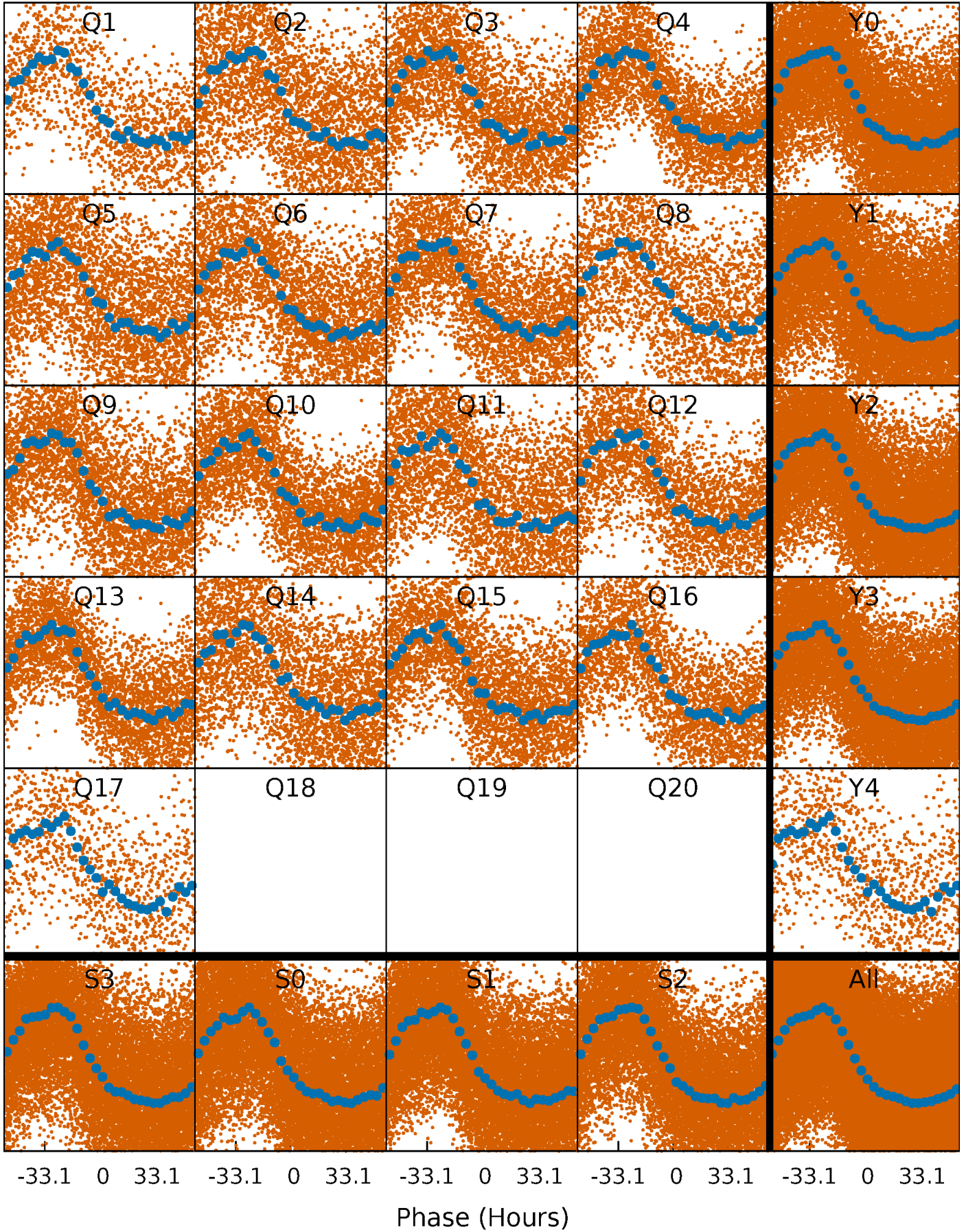
## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)





# PDC Quarter-Phased Transit Curves

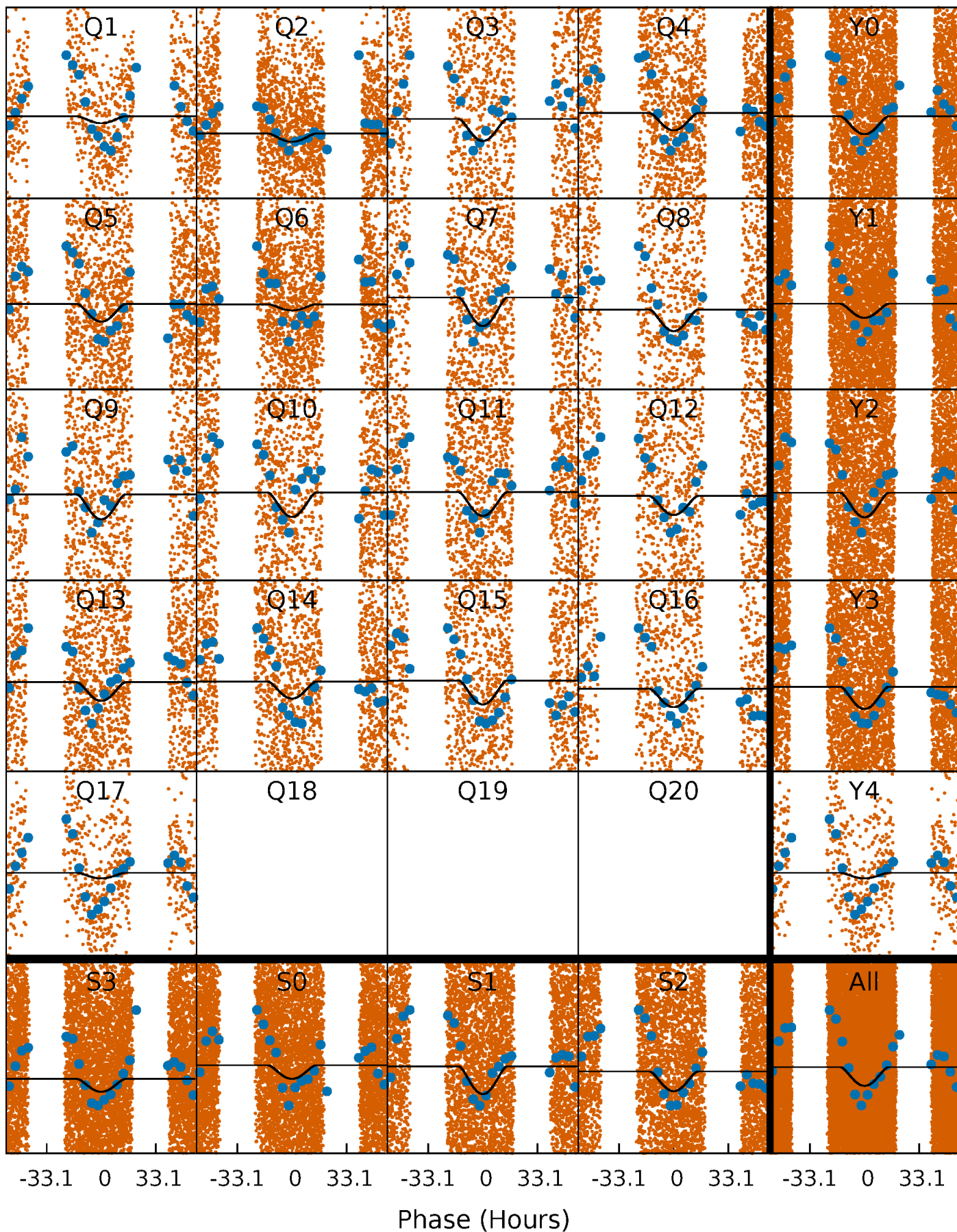
TCE 009716385-04 P= 5.268418 Days  $T_0=136.140060$  (BKJD)





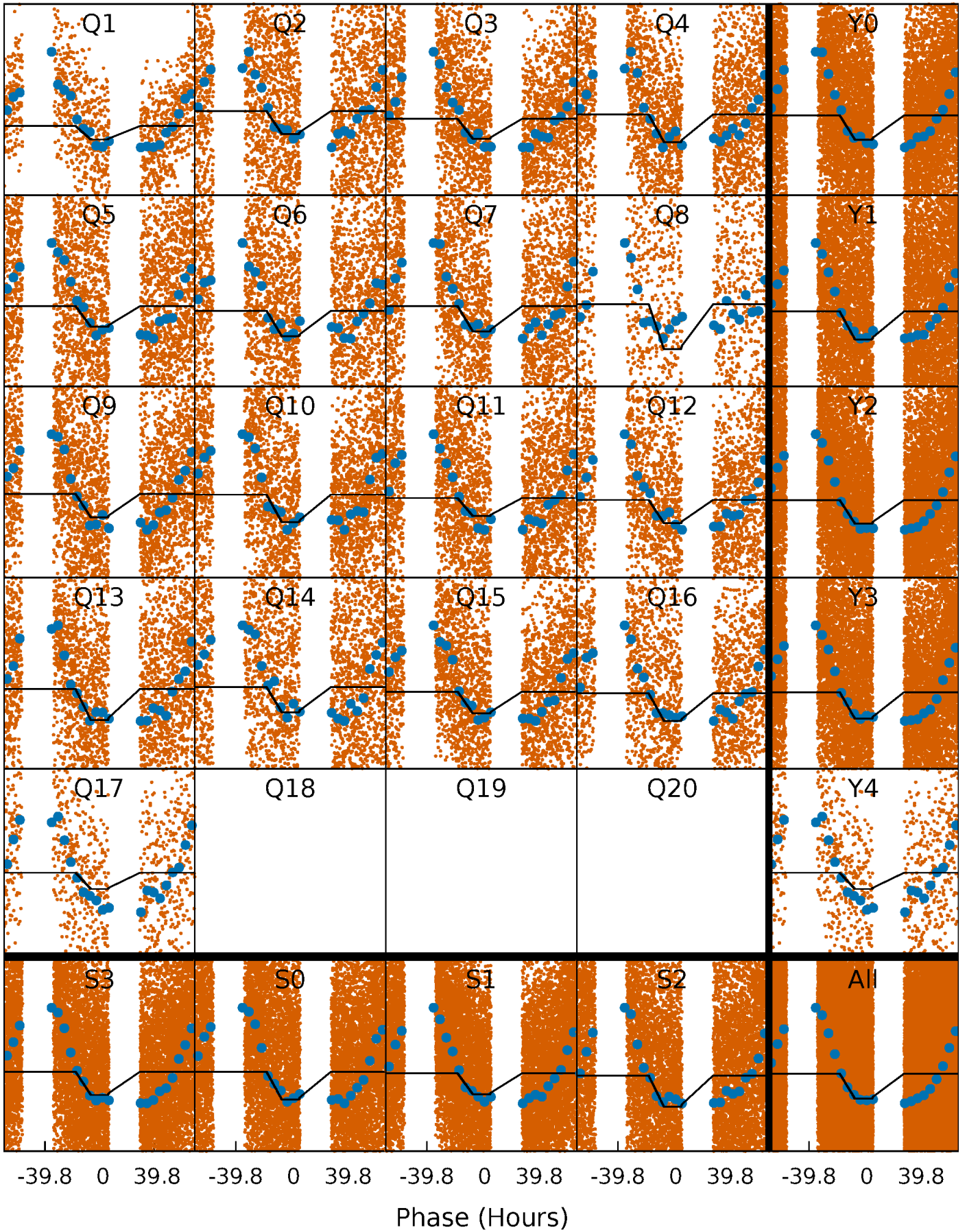
# DV Quarter-Phased Transit Curves

TCE 009716385-04   P= 5.268418 Days    $T_0=136.140060$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

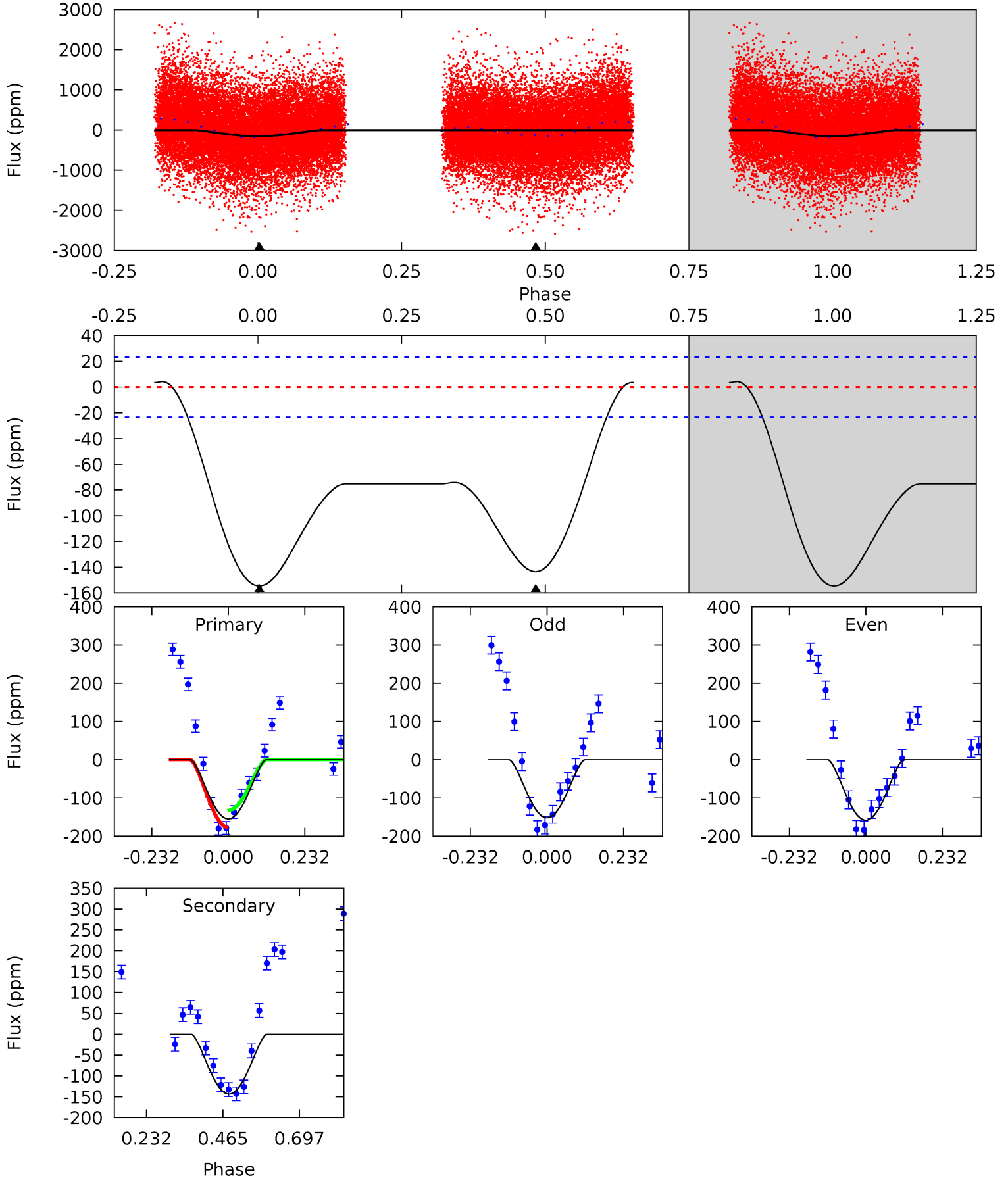
TCE 009716385-04     $P = 5.268176$  Days     $T_0 = 136.654229$  (BKJD)



# DV Model-Shift Uniqueness Test

009716385-04, P = 5.268418 Days, E = 130.871642 Days

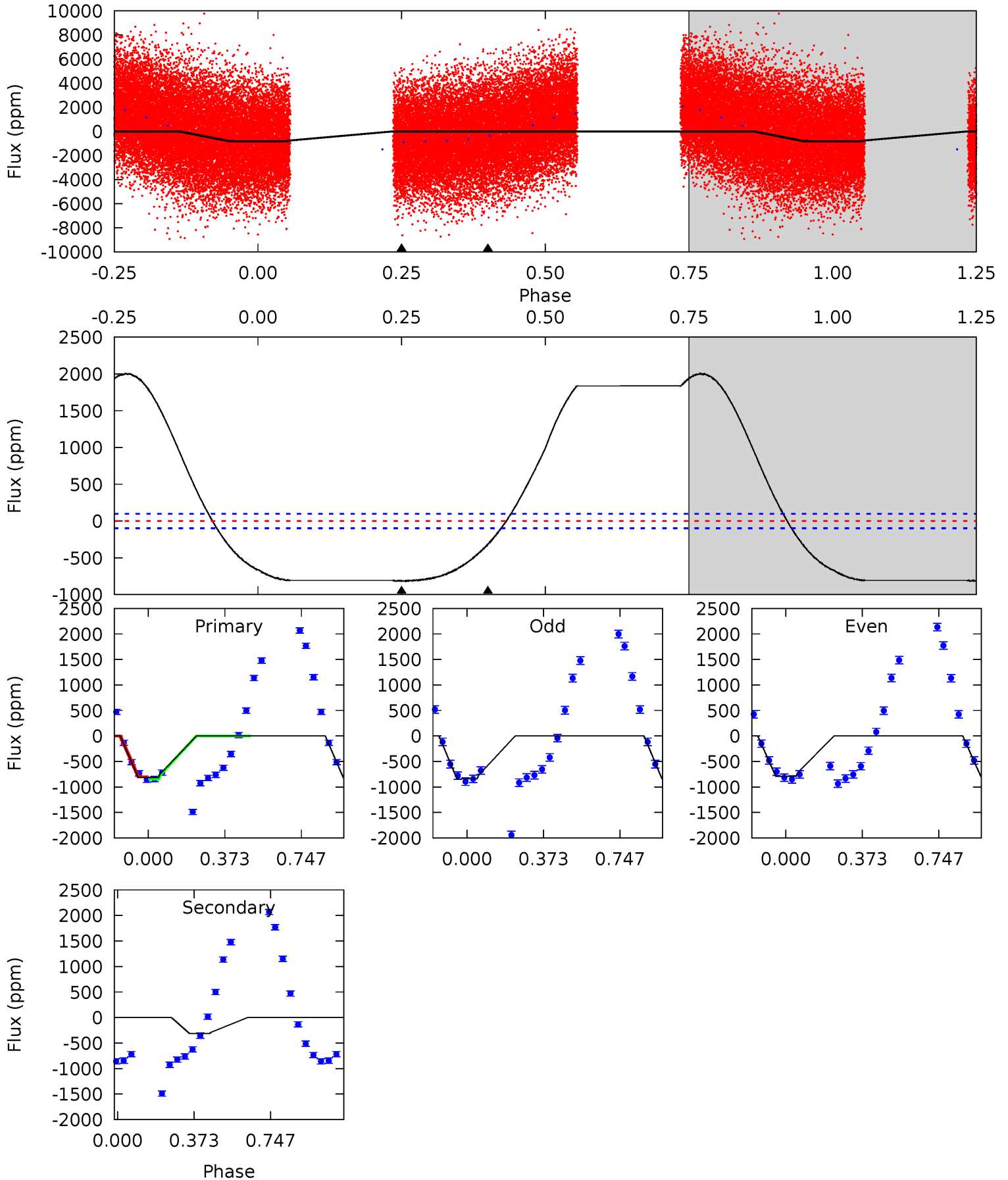
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
28.9	26.8	0	0	4.38	1.19	5.97	28.9	28.9	26.8	26.8	0.60	1.02	0.03	4.39



# Alt Model-Shift Uniqueness Test

009716385-04, P = 5.268176 Days, E = 131.386053 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
35.6	13.7	0	0	4.28	0.89	17.4	35.6	35.6	13.7	13.7	1.07	1.08	0.71	0.92



### Stellar Parameters For KIC 009716385

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7452^{+206}_{-335}$	$3.805^{+0.338}_{-0.113}$	$0.080^{+0.200}_{-0.350}$	$2.921^{+0.493}_{-1.231}$	$1.985^{+0.089}_{-0.503}$	$0.112^{+0.293}_{-0.039}$
	+3%/-4%	+9%/-3%	+250%/-438%	+17%/-42%	+4%/-25%	+261%/-35%
Source	PHO54	PHO54	PHO54	DSEP		

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

### Secondary Eclipse Parameters for KIC 009716385-04 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-143 \pm 5$	$7.57^{+7.51}_{-5.15}$	$2811^{+195}_{-304}$	$4932^{+4401}_{-1142}$	$7.356^{+66.271}_{-5.433}$
Alt.	$-314 \pm 23$	$9.43^{+8.71}_{-6.13}$	$2824^{+193}_{-284}$	$5381^{+4729}_{-1235}$	$10^{+74}_{-7}$

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



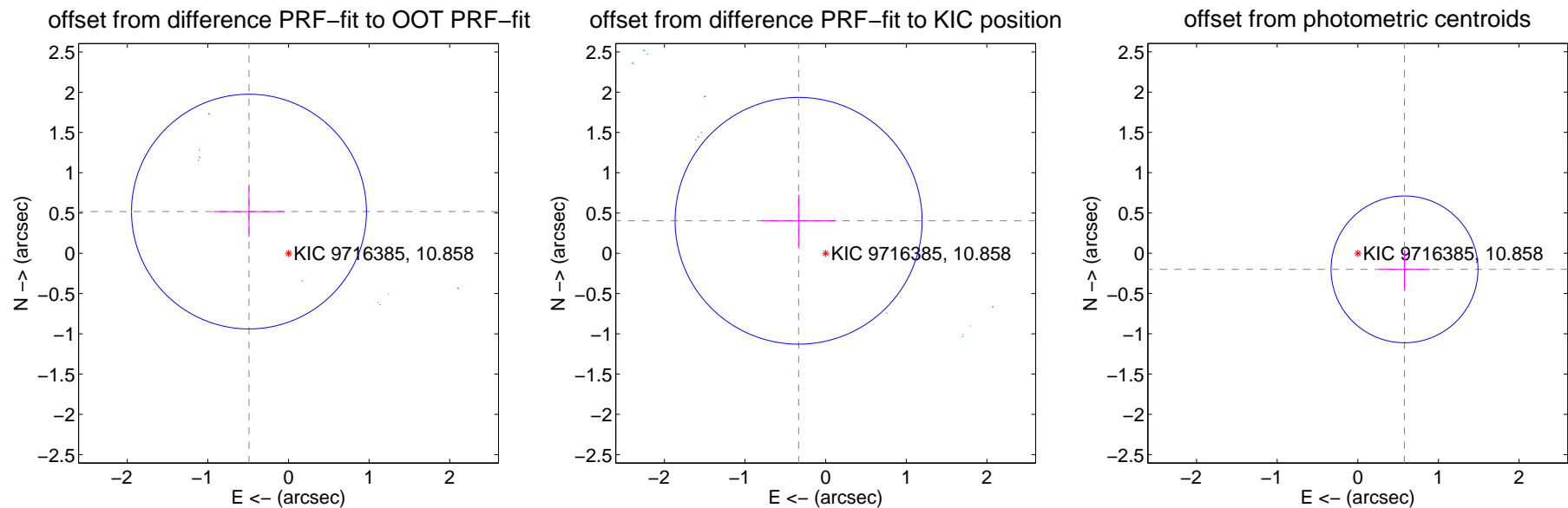
## DV Centroid Data

Supplemental centroid analysis for 009716385-04. **Kepler magnitude: 10.86.** Transit SNR 9.70

There are 15 quarters with good PRF difference image offsets

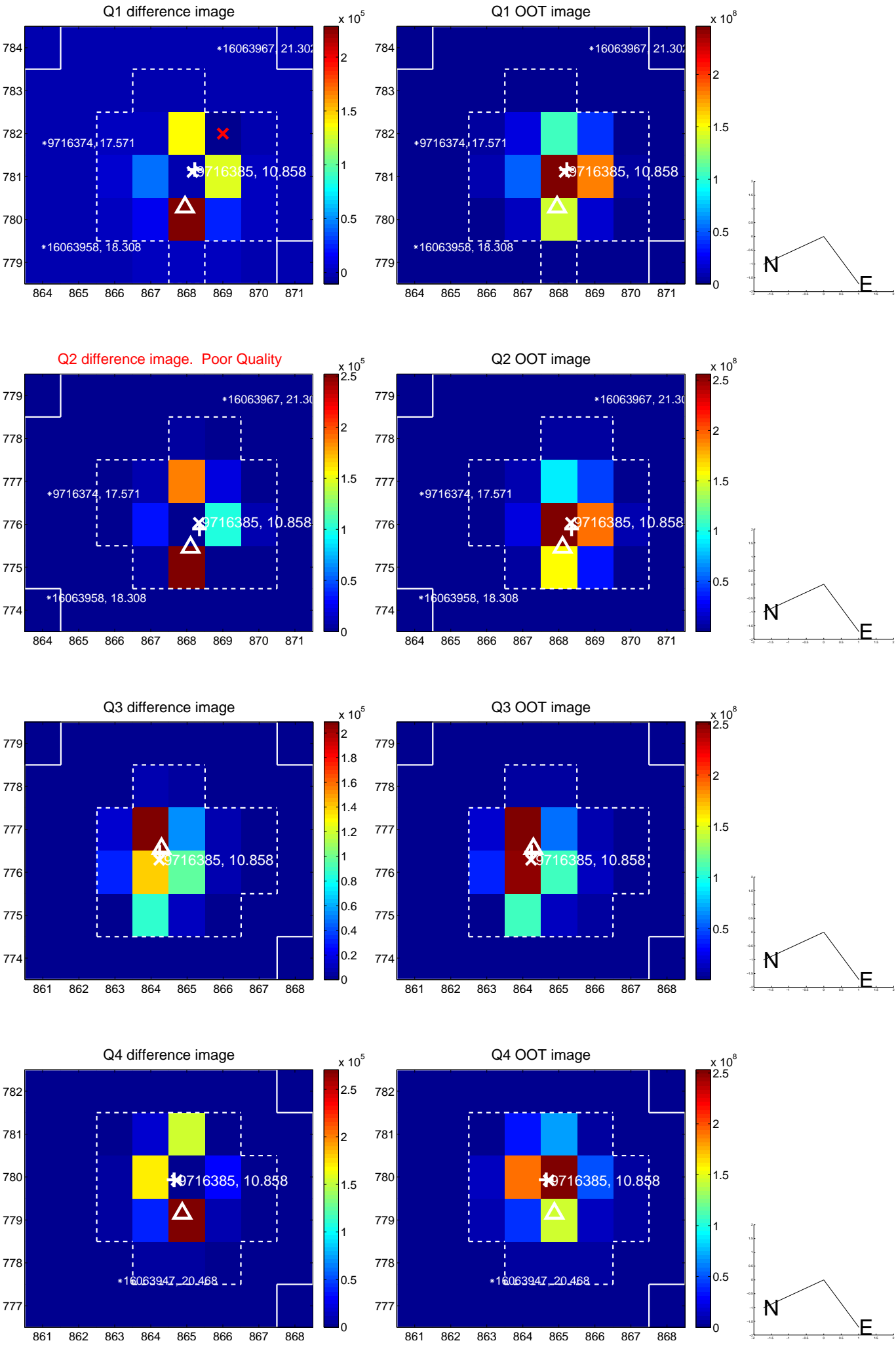
The direct PRF centroid is offset from the target star catalog position by about 0.25 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.713 \pm 0.486$	1.47	$0.490 \pm 0.443$	$0.518 \pm 0.317$
PRF-fit source offset from KIC position	$0.525 \pm 0.511$	1.03	$0.336 \pm 0.463$	$0.404 \pm 0.322$
photometric centroid source offset	$0.61 \pm 0.30$	2.02	$-0.58 \pm 0.31$	$-0.20 \pm 0.24$



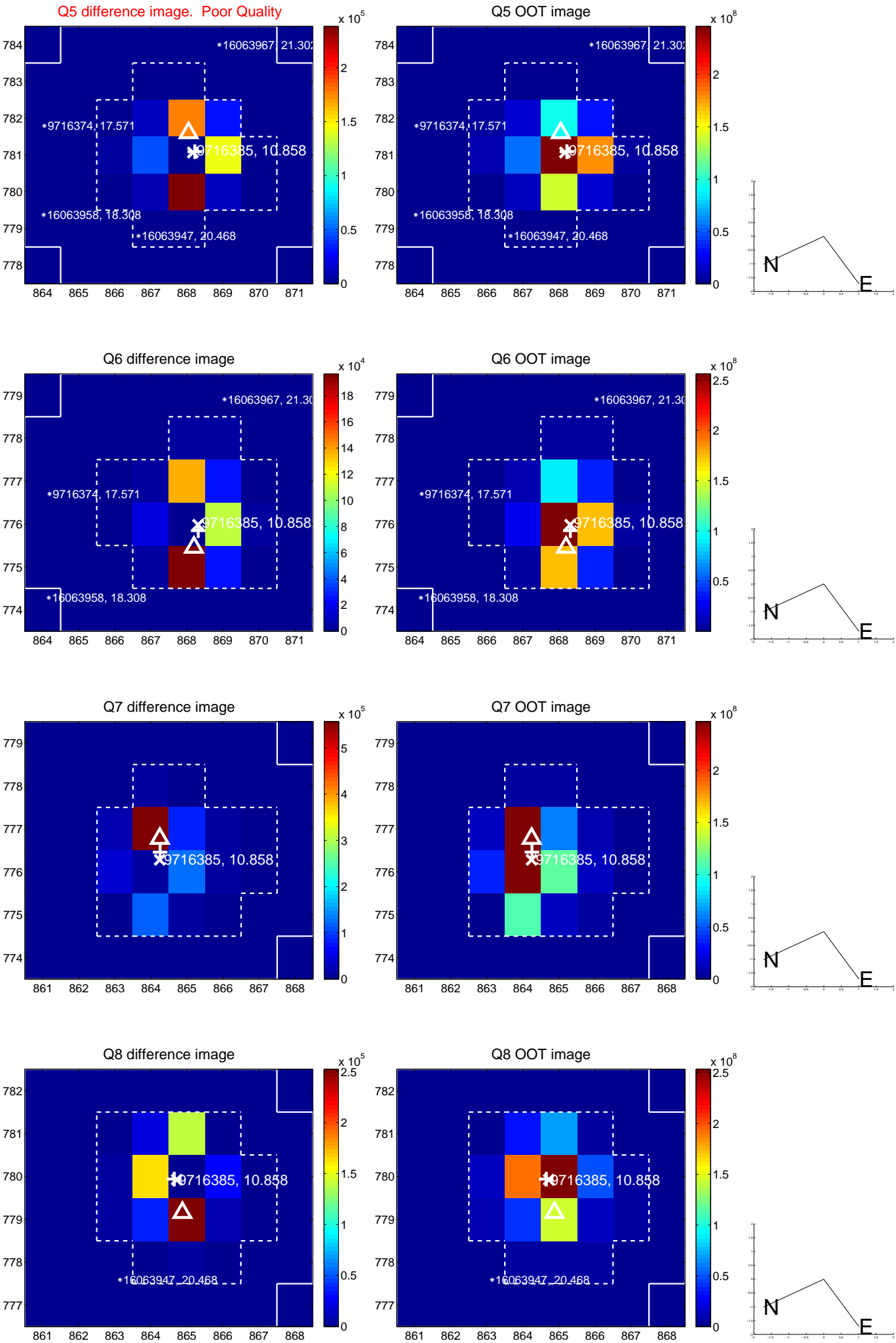
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

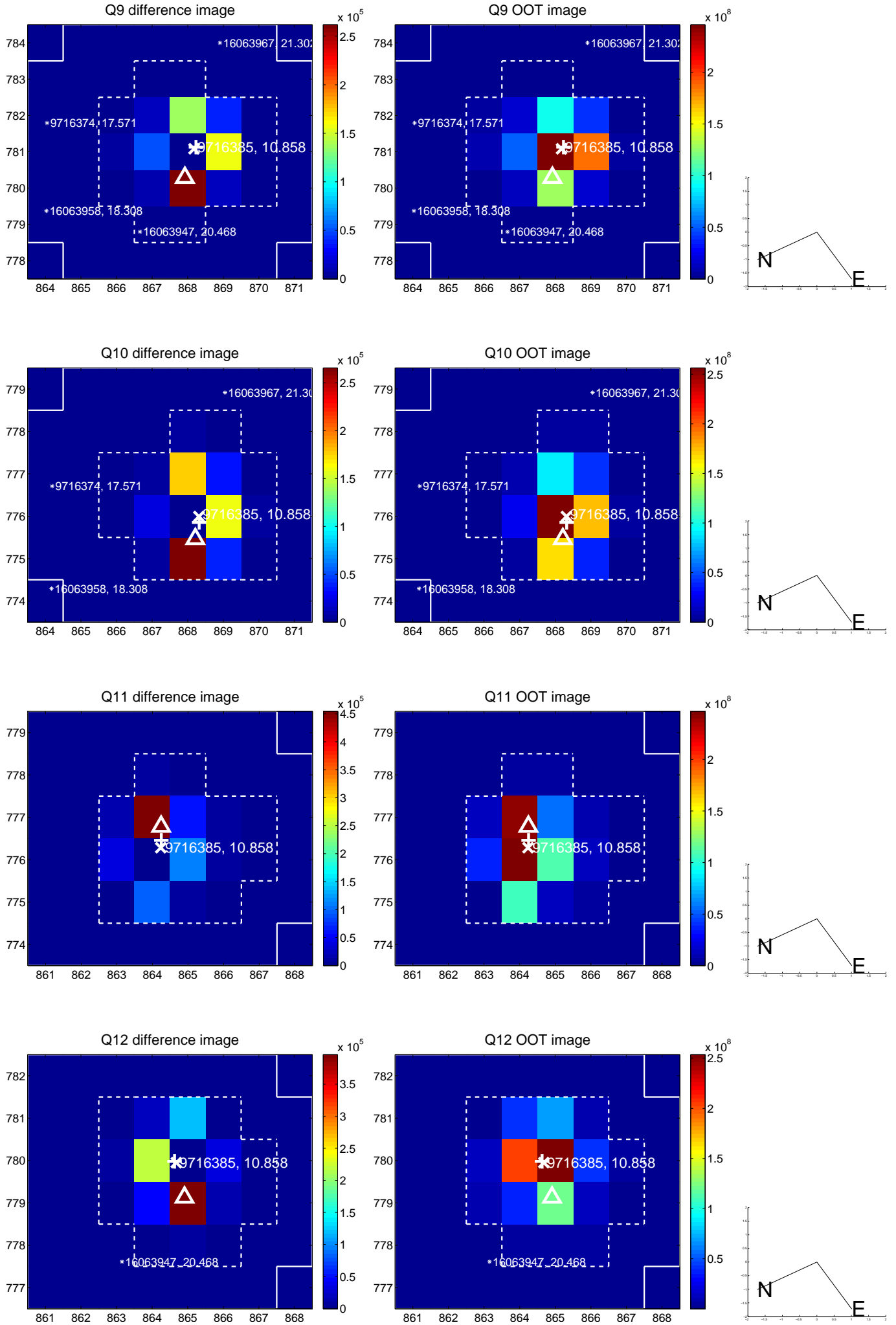




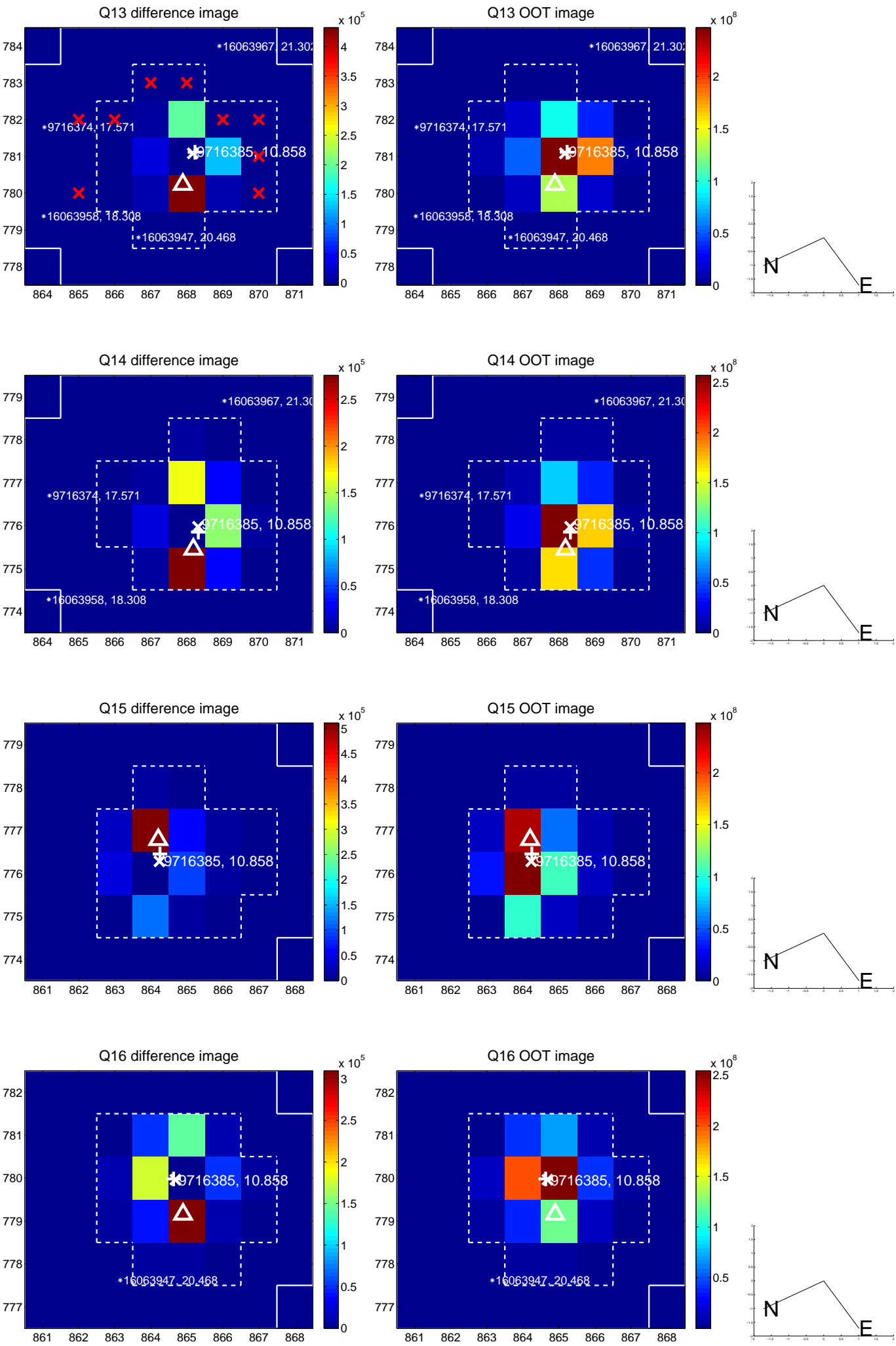
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



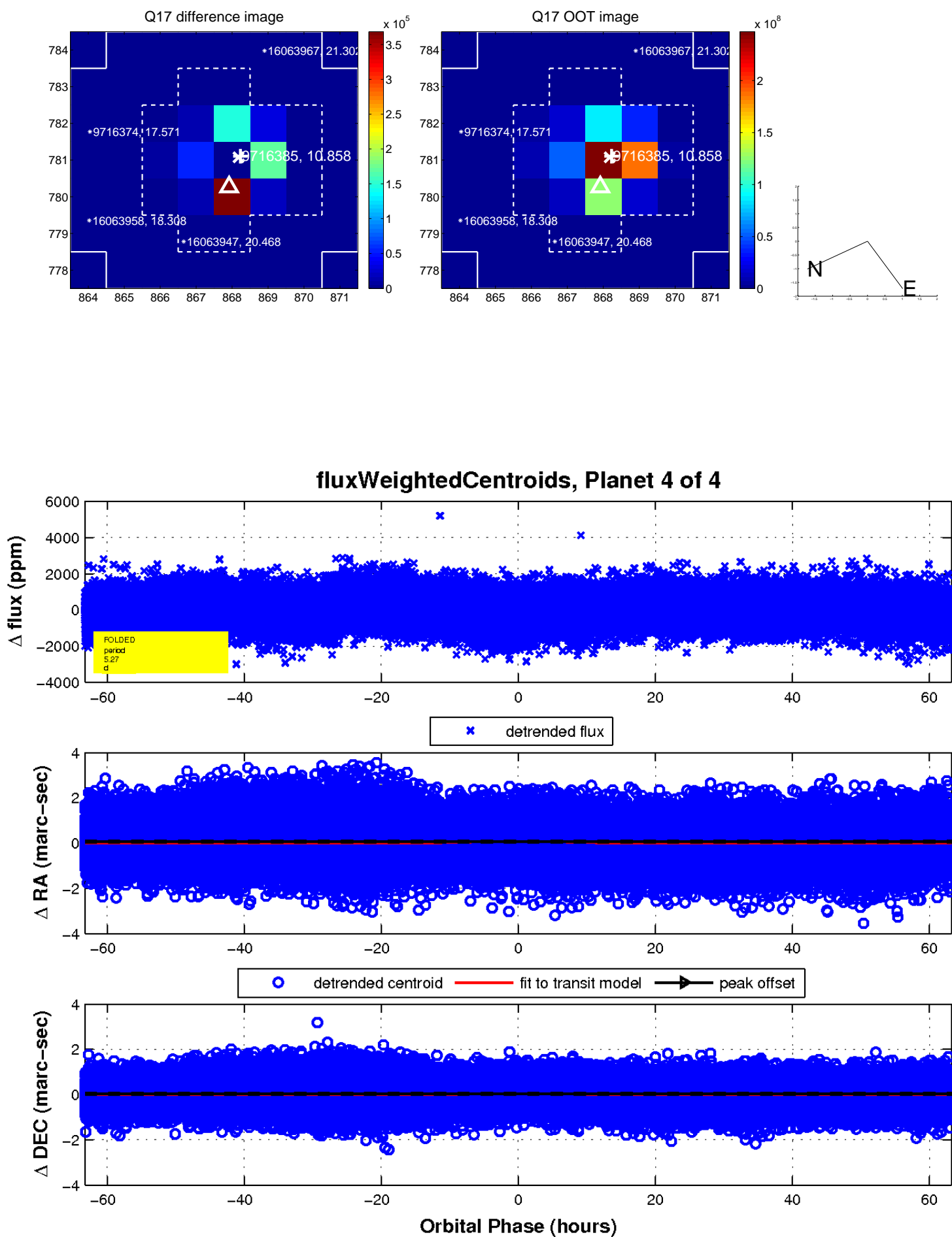
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

