

# KIC 009471846

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009471846-01	OBS	No	2.377260	132.402215	20.0	3.857	7.7	7.3	2.29	7069	1.17	7081.87
009471846-02	OBS	No	0.792506	131.698644	15.8	3.051	8.7	8.1	2.29	7069	1.09	30637.06
009471846-03	OBS	No	308.407453	297.528650	181.5	7.805	8.1	7.6	2.29	7069	3.43	10.78
009471846-04	OBS	No	298.851305	344.279561	242.6	3.233	7.4	8.2	2.29	7069	4.09	11.24

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009471846-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE_ZUMA_TRACKER—SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
009471846-02	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD
009471846-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—INCONSISTENT_TRANS
009471846-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT

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

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

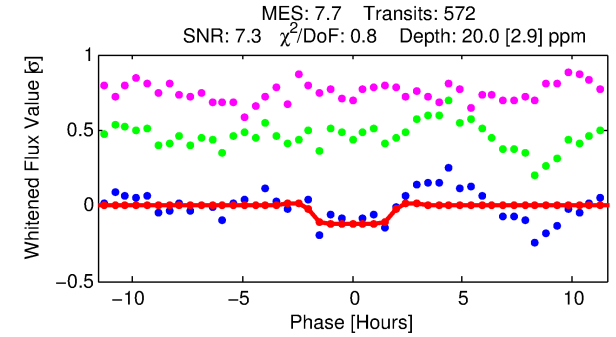
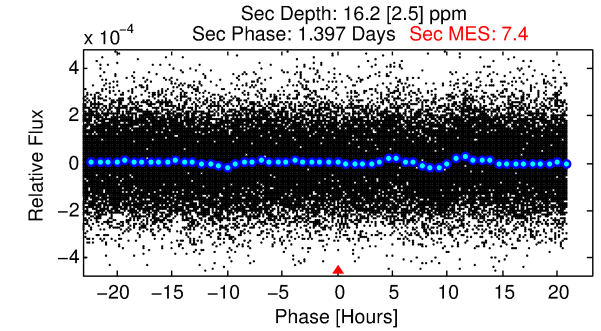
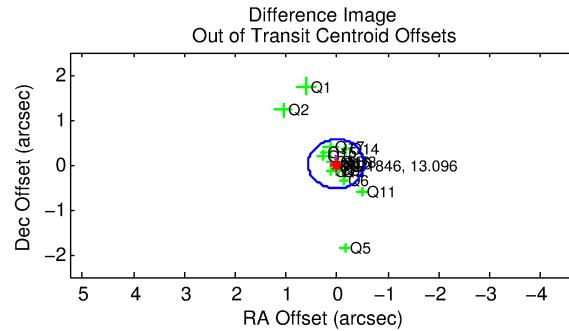
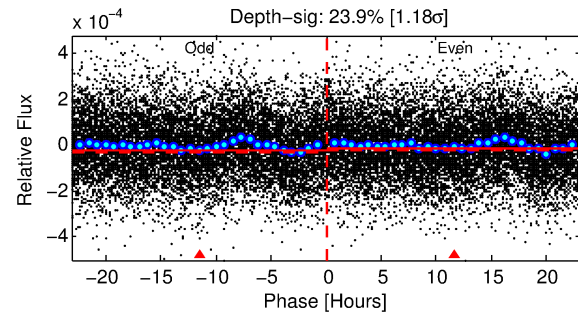
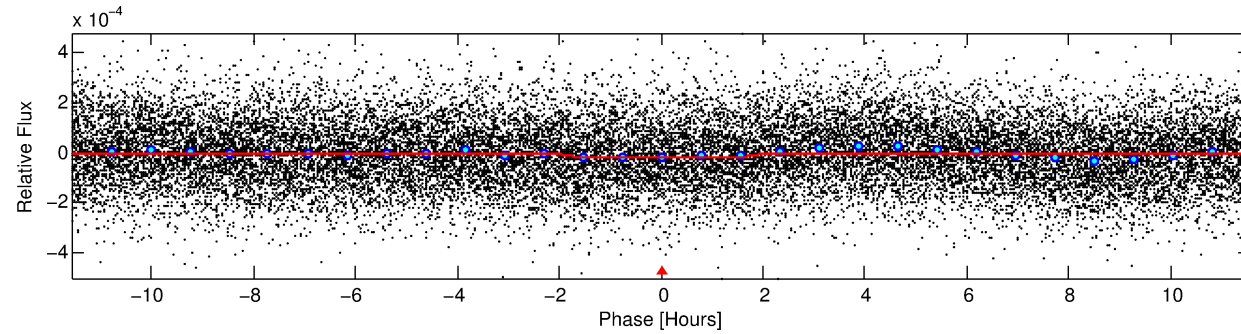
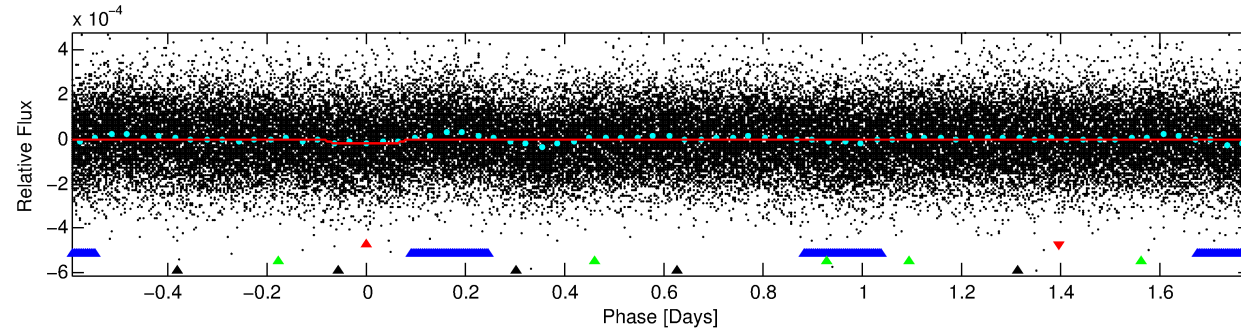
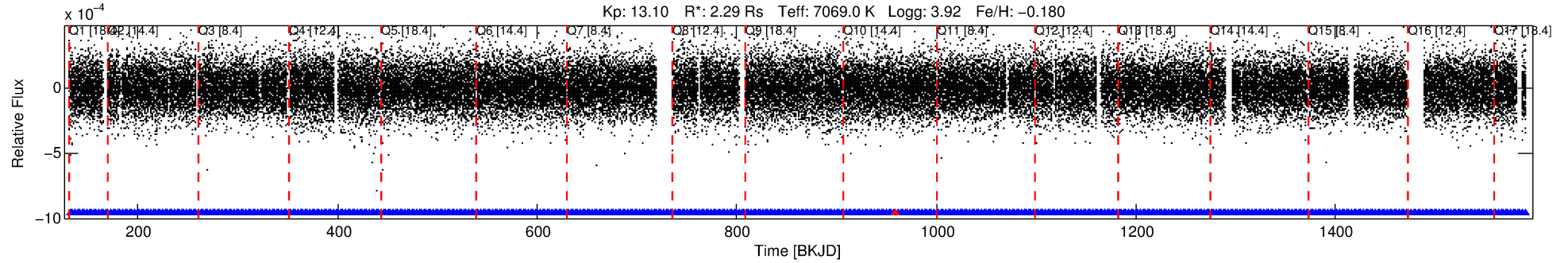
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009471846-01

No Significant Match Found

# DV One-Page Summary

KIC: 9471846 Candidate: 1 of 4 Period: 2.377 d



## DV Fit Results:

Period = 2.37726 [0.00003] d  
Epoch = 132.4022 [0.0056] BKJD  
Rp/R\* = 0.0047 [0.0013]  
a/R\* = 2.45 [3.32]  
b = 0.88 [0.42]  
Seff = 7081.87 [3023.48]  
Teq = 2339 [250] K  
Rp = 1.17 [0.48] Re  
a = 0.0406 [0.0109] AU  
Ag = 10.67 [7.51] [1.29 $\sigma$ ]  
Teffp = 6536 [969] K [4.19 $\sigma$ ]

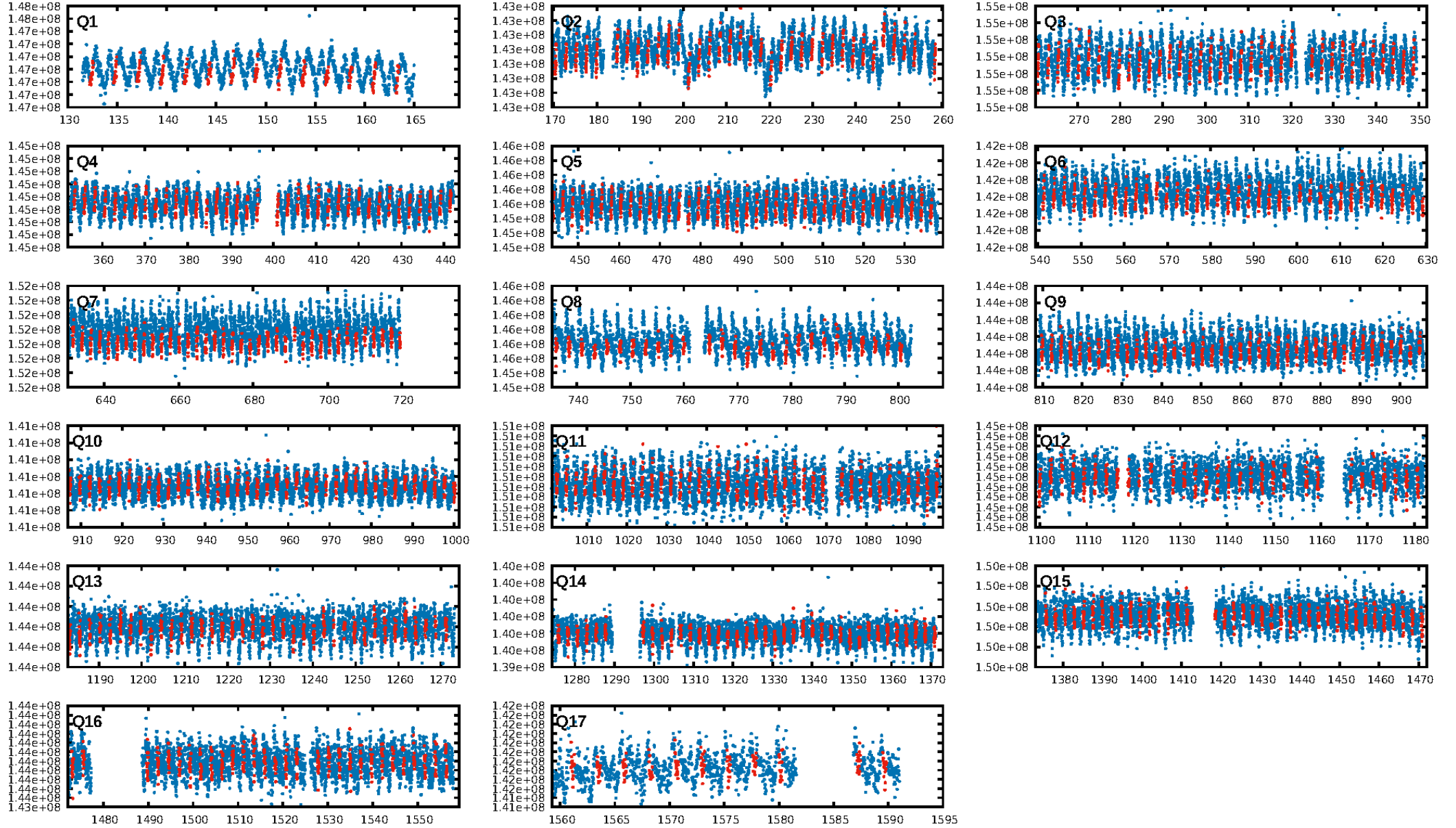
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [7.73 $\sigma$ ]  
LongPeriod-sig: 100.0% [1413.82 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 5.16e-11  
RollingBand-fgt: 1.00 [546/547]  
GhostDiagnostic-chr: 3.976  
Centroid-sig: 0.0%  
Centroid-so: 2.932 arcsec [2.24 $\sigma$ ]  
OotOffset-rm: 0.023 arcsec [0.12 $\sigma$ ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-rm: 0.096 arcsec [0.49 $\sigma$ ]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 1.00 [17/17]  
DiffImageOverlap-fno: 0.00 [0/17]

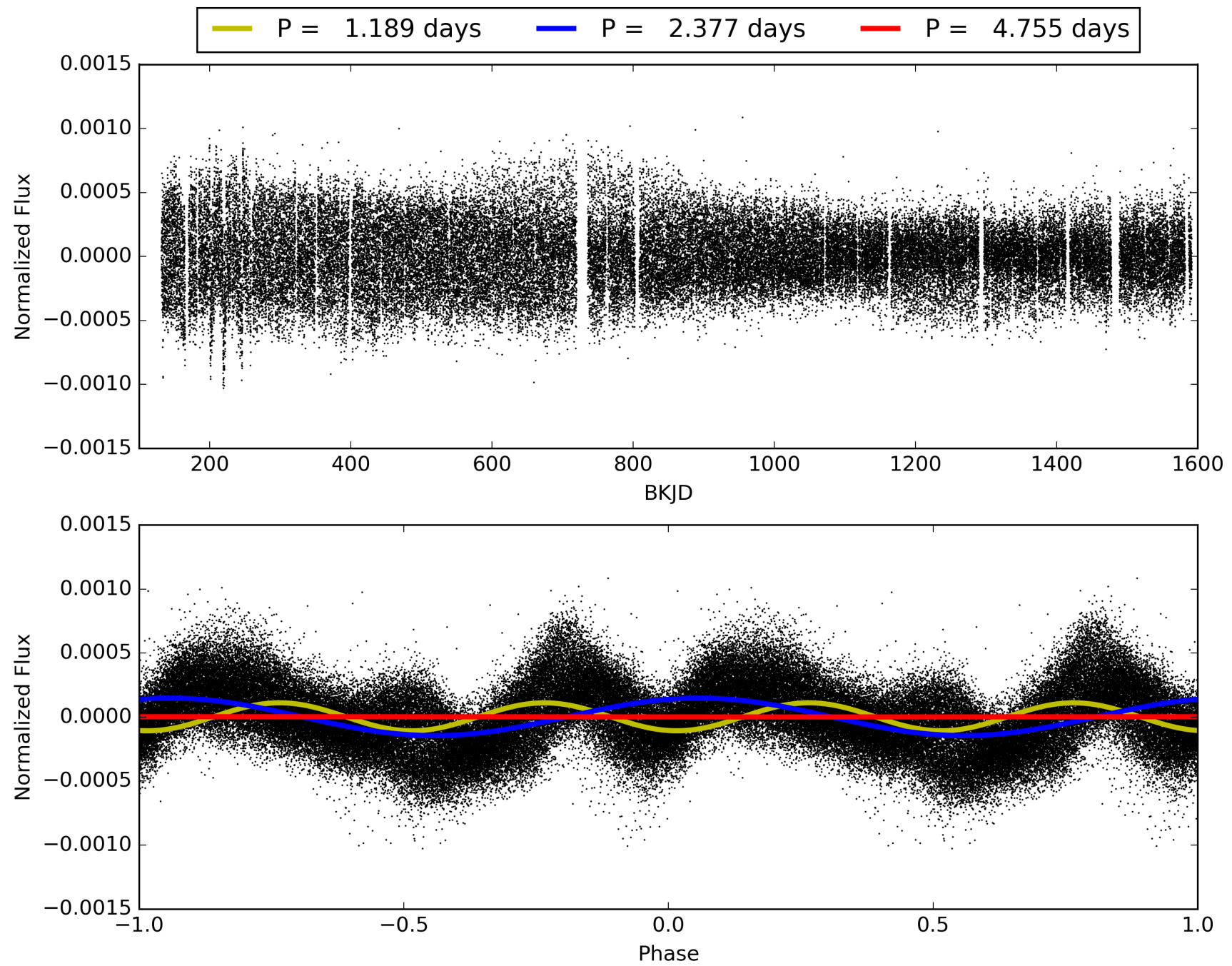
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 02-Feb-2016 16:28:20 Z

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

# TCE 009471846-01, PDC Light Curves



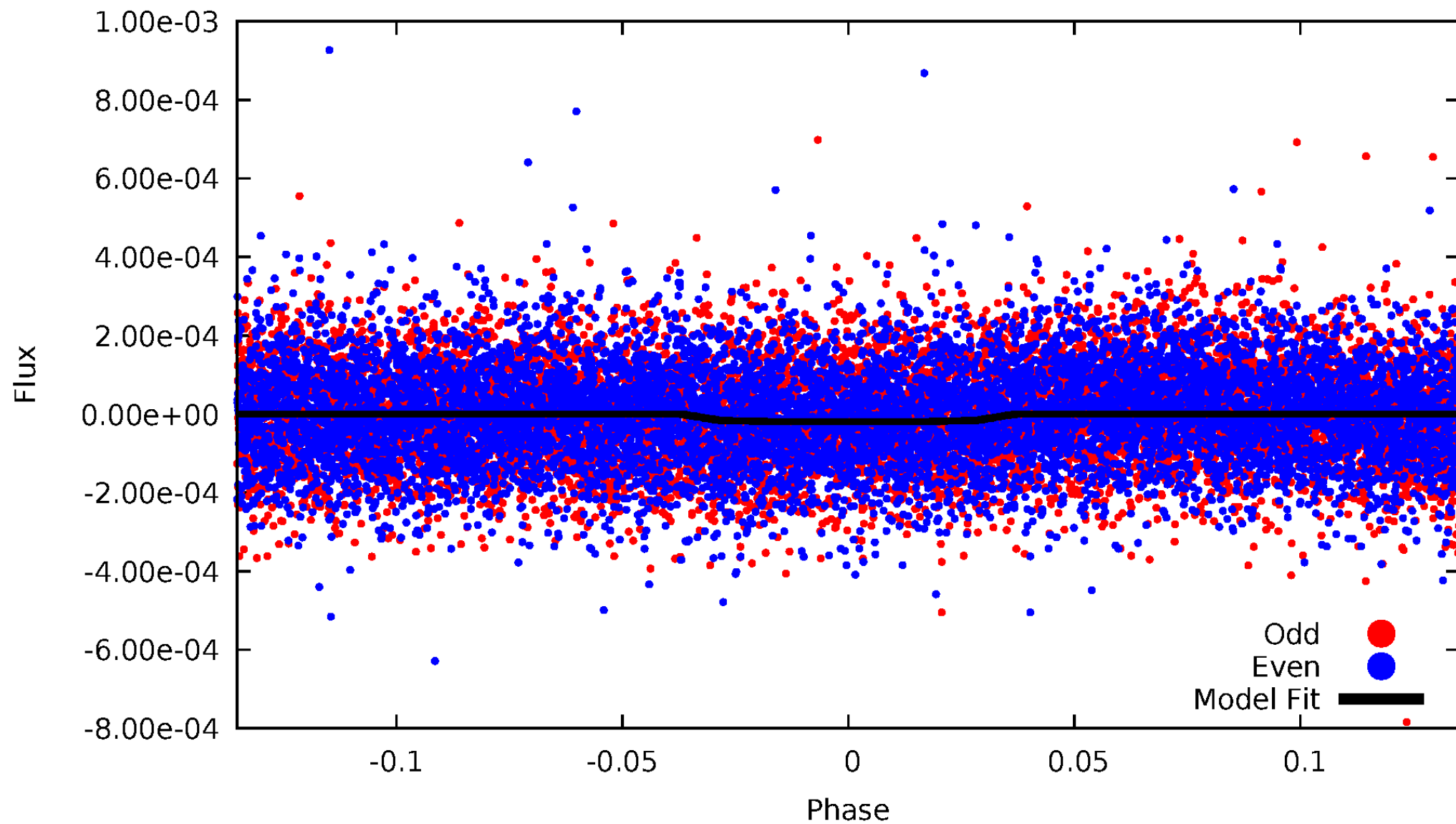
TCE 009471846-01





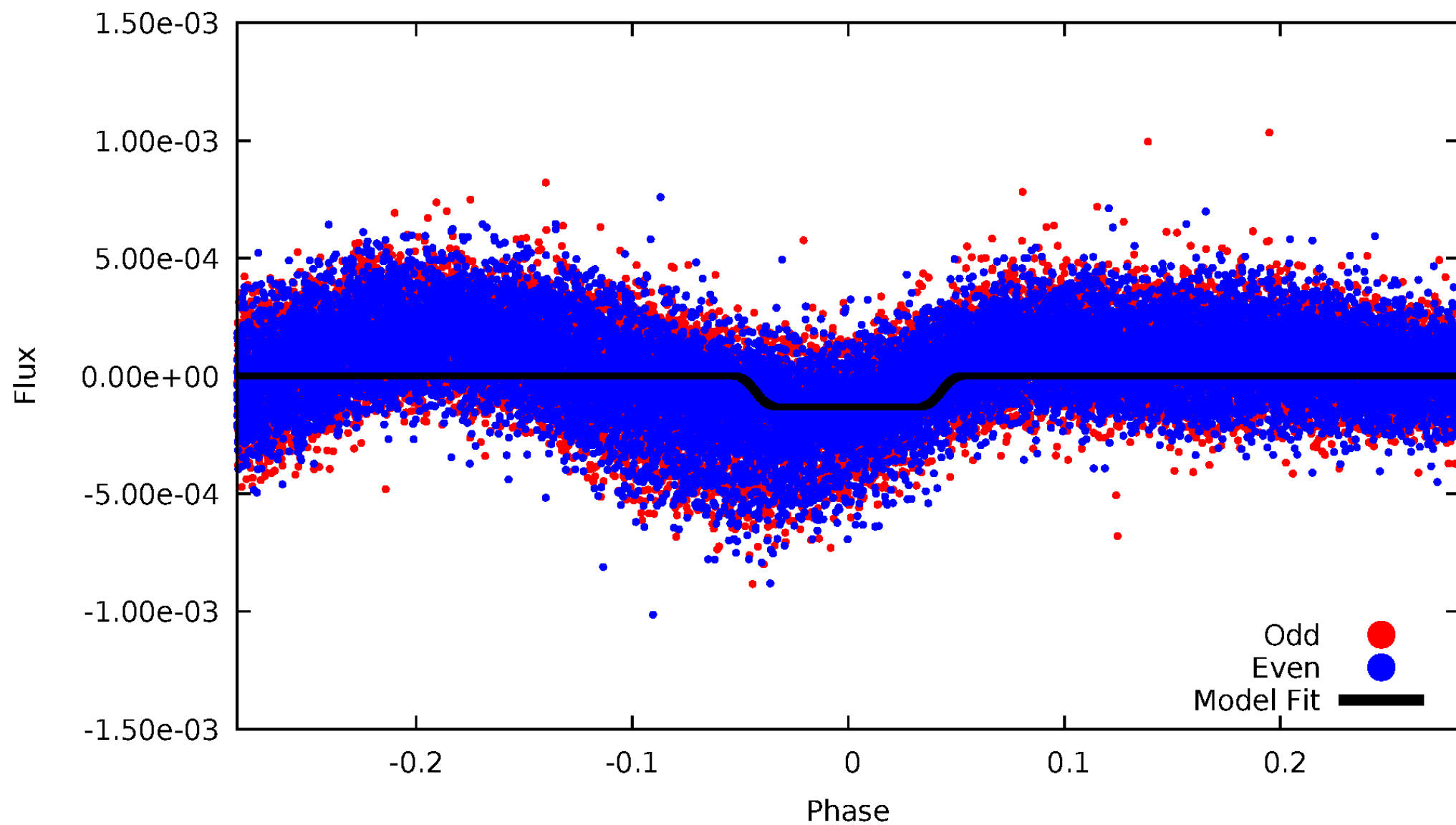
# DV Odd/Even

TCE 009471846-01



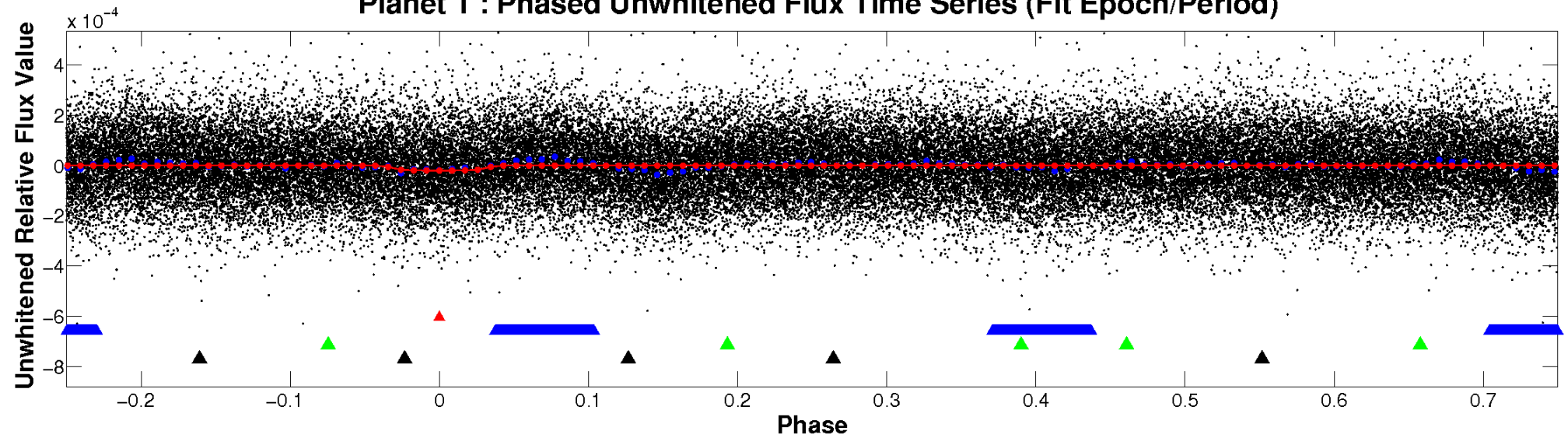
# ALT Odd/Even

TCE 009471846-01

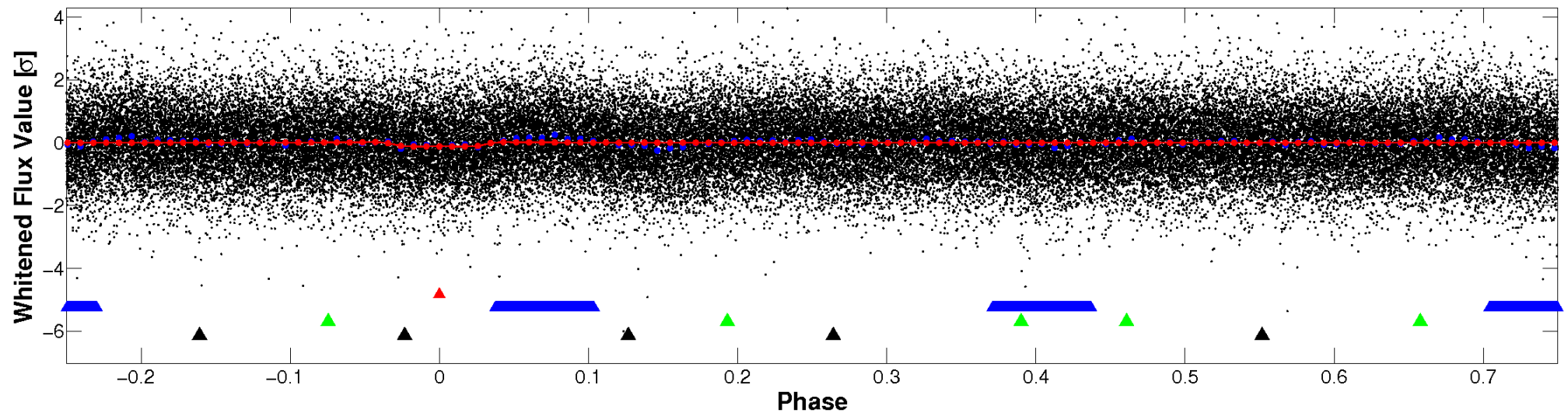


# Non-Whitened Vs. Whitened Light Curve

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

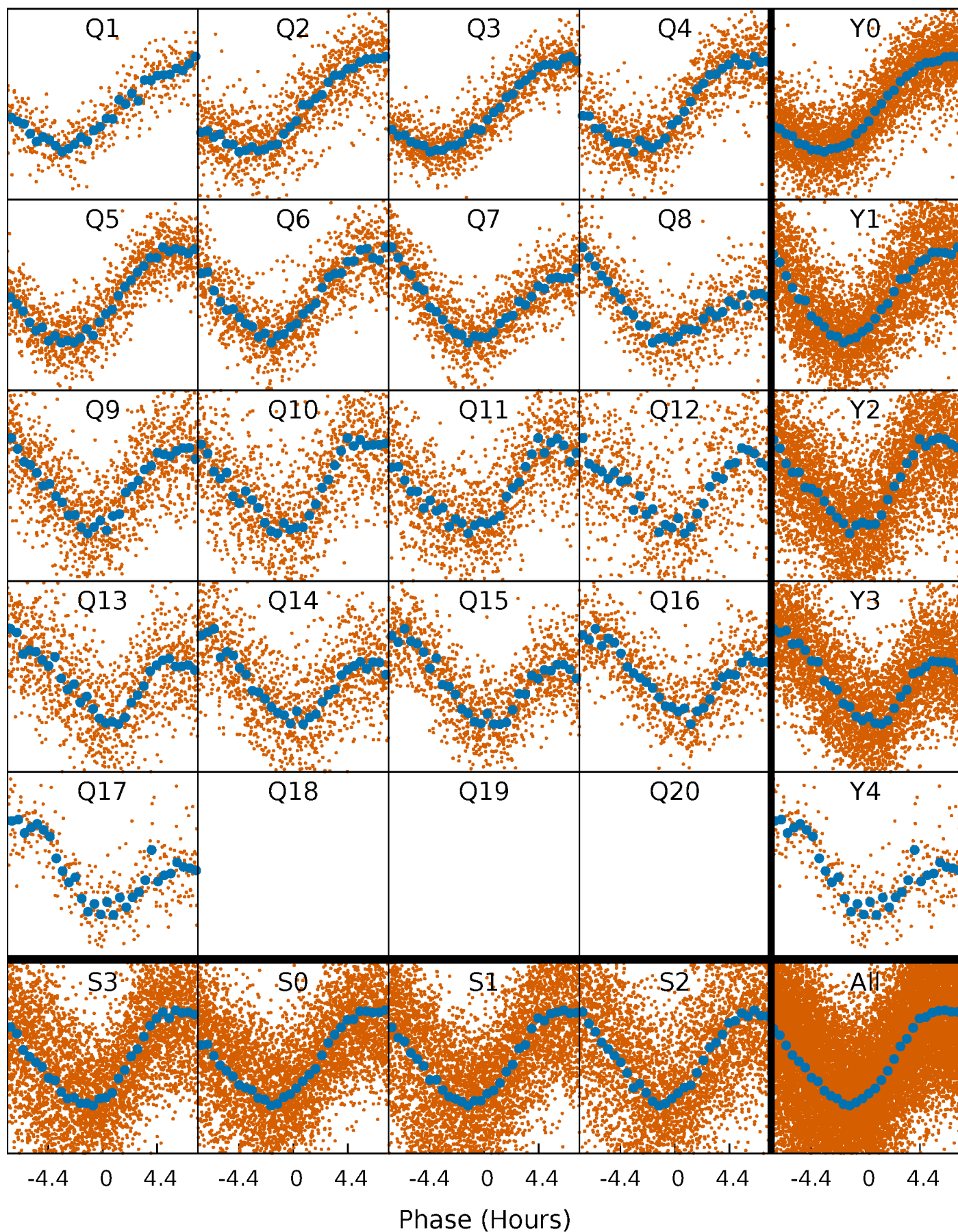


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

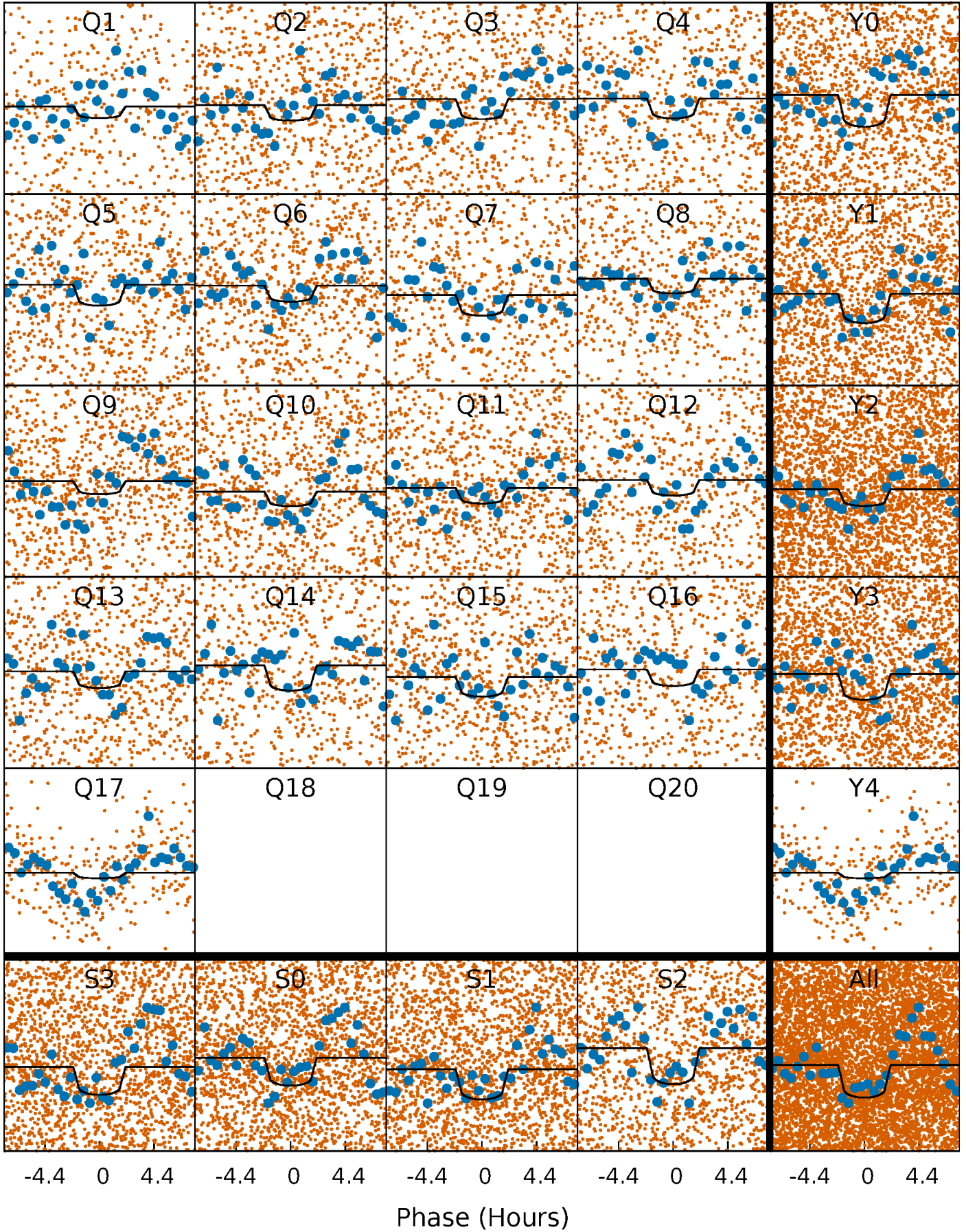
TCE 009471846-01 P= 2.377260 Days  $T_0=132.402215$  (BKJD)





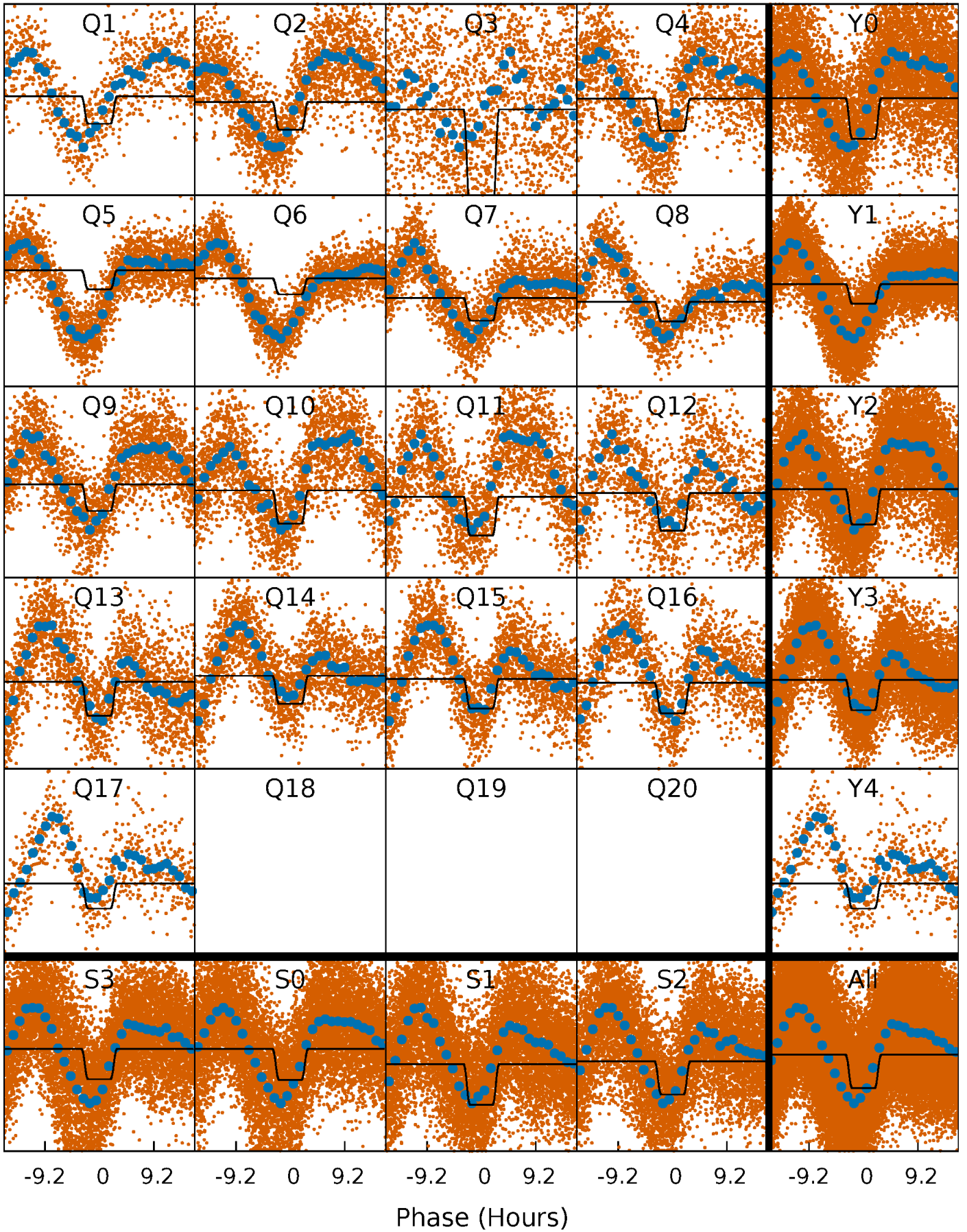
# DV Quarter-Phased Transit Curves

TCE 009471846-01 P= 2.377260 Days  $T_0=132.402215$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

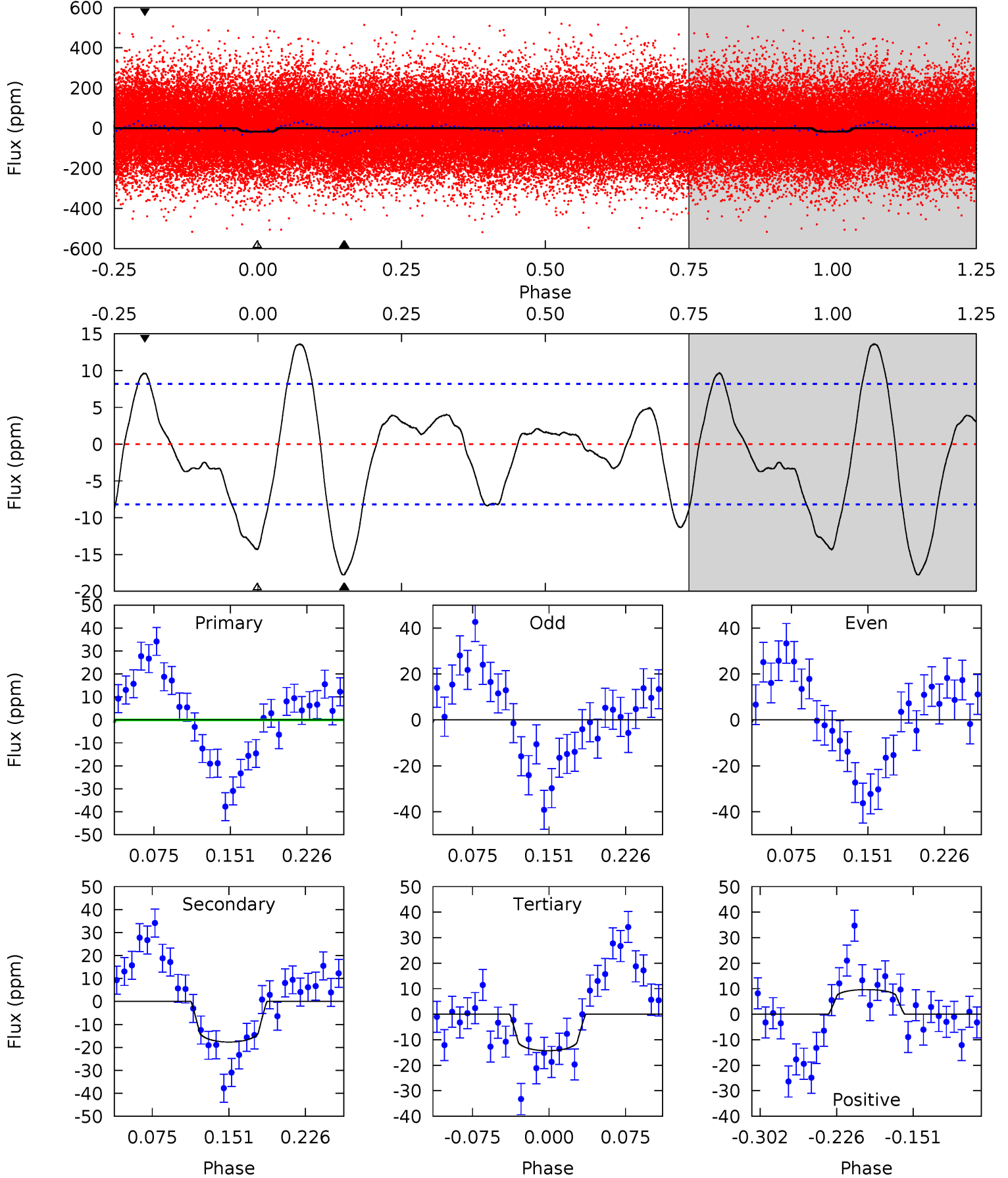
TCE 009471846-01 P= 2.377359 Days  $T_0=132.386628$  (BKJD)



# DV Model-Shift Uniqueness Test

009471846-01, P = 2.377260 Days, E = 130.024955 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
10.0	9.97	8.07	5.45	4.62	1.78	3.18	1.95	4.58	1.90	4.53	1.42	1.03	0.43	1.43

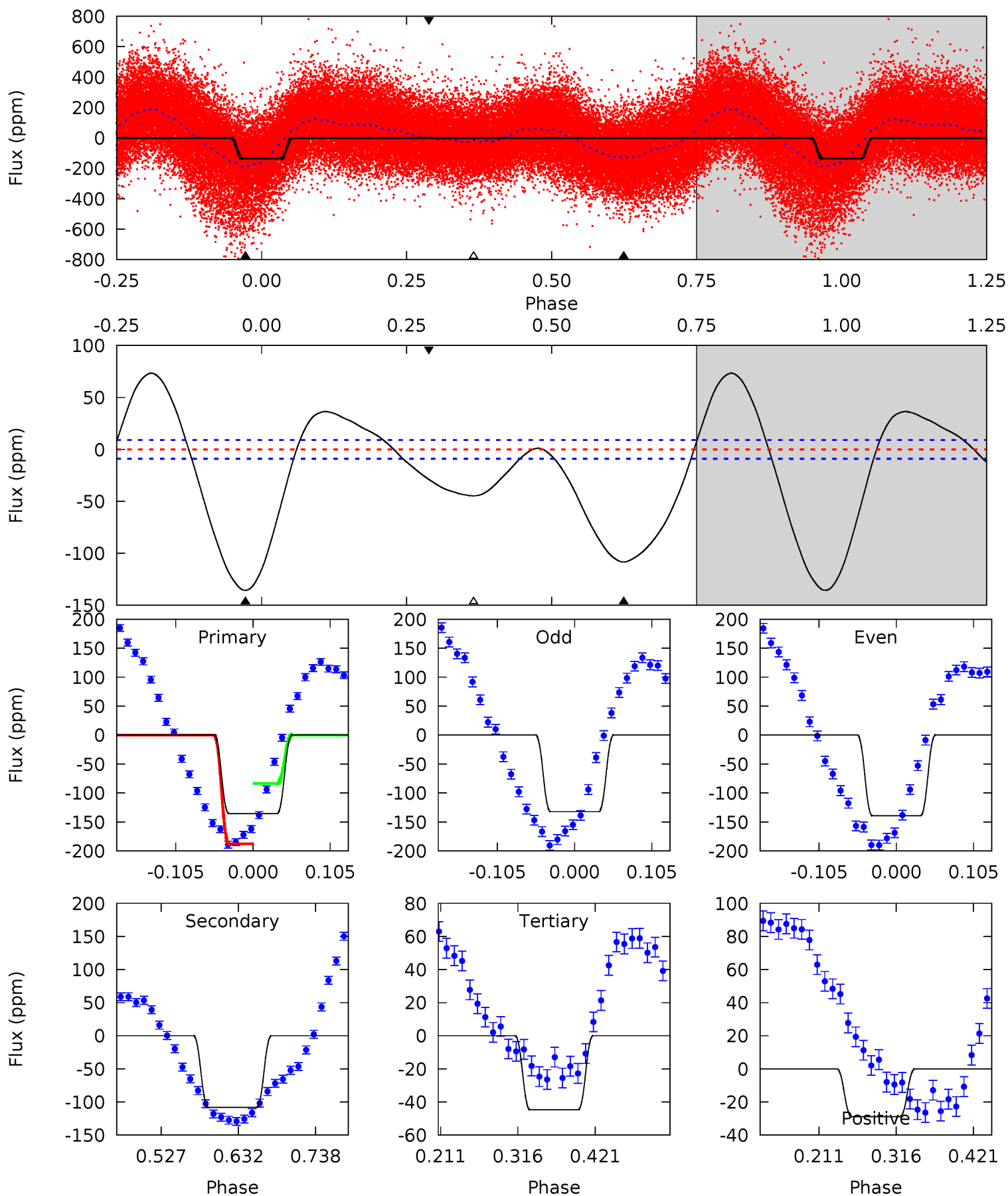




# Alt Model-Shift Uniqueness Test

009471846-01, P = 2.377359 Days, E = 130.009269 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
68.5	54.7	22.6	-14.6	4.55	1.62	17.1	45.9	83.0	32.1	69.3	1.74	1.21	0.35	25.0





### Stellar Parameters For KIC 009471846

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7069^{+197}_{-246}$	$3.919^{+0.227}_{-0.122}$	$-0.180^{+0.300}_{-0.300}$	$2.285^{+0.466}_{-0.698}$	$1.578^{+0.208}_{-0.278}$	$0.186^{+0.254}_{-0.069}$
	+3%/-3%	+6%/-3%	+167%/-167%	+20%/-31%	+13%/-18%	+136%/-37%
Source	PHO1	FLK73	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 009471846-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-18 \pm 2$	$1.11^{+0.40}_{-0.33}$	$3222^{+195}_{-230}$	$6580^{+1499}_{-858}$	$13^{+12}_{-6}$
Alt.	$-108 \pm 2$	$2.78^{+0.49}_{-0.51}$	$3229^{+197}_{-253}$	$6644^{+544}_{-410}$	$13^{+6}_{-3}$

$T_{max}$  = 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

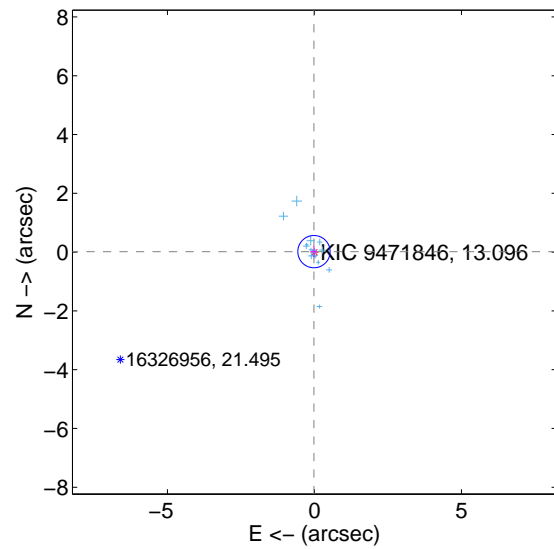
Supplemental centroid analysis for 009471846-01. Kepler magnitude: 13.10. Transit SNR 7.30

There are 17 quarters with good PRF difference image offsets

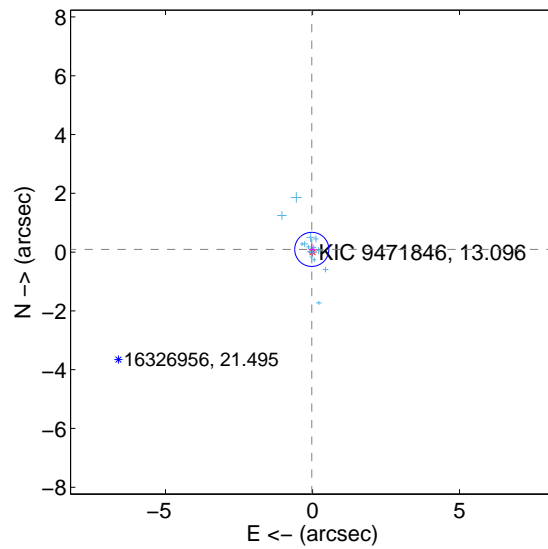
The direct PRF centroid is offset from the target star catalog position by about 0.13 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.023 \pm 0.183$	0.12	$0.016 \pm 0.107$	$0.016 \pm 0.189$
PRF-fit source offset from KIC position	$0.096 \pm 0.193$	0.49	$0.026 \pm 0.103$	$0.092 \pm 0.184$
photometric centroid source offset	$2.93 \pm 1.31$	2.24	$0.77 \pm 1.19$	$-2.83 \pm 1.32$

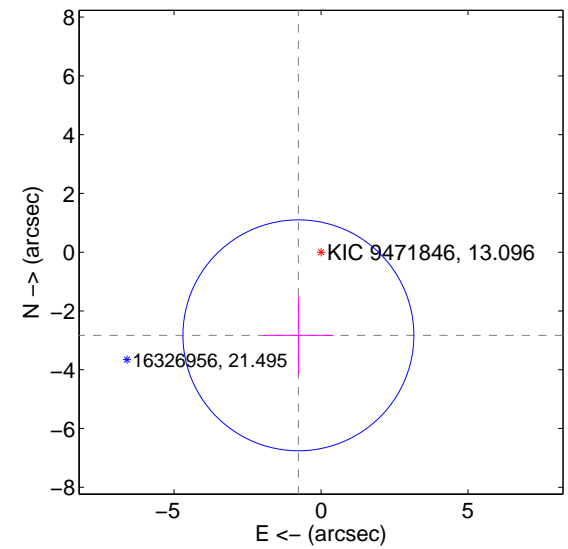
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

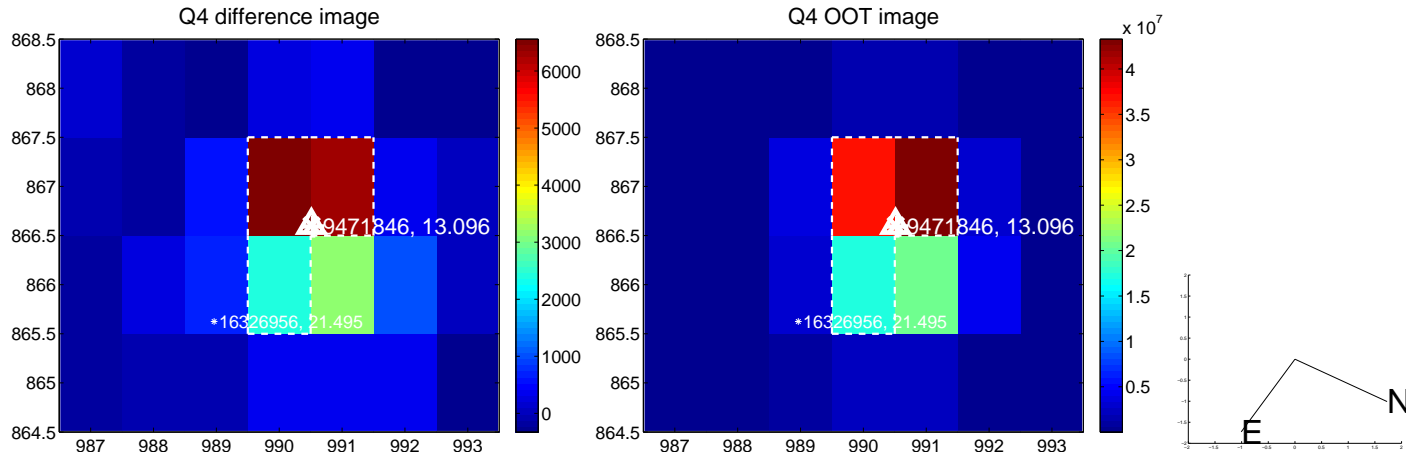
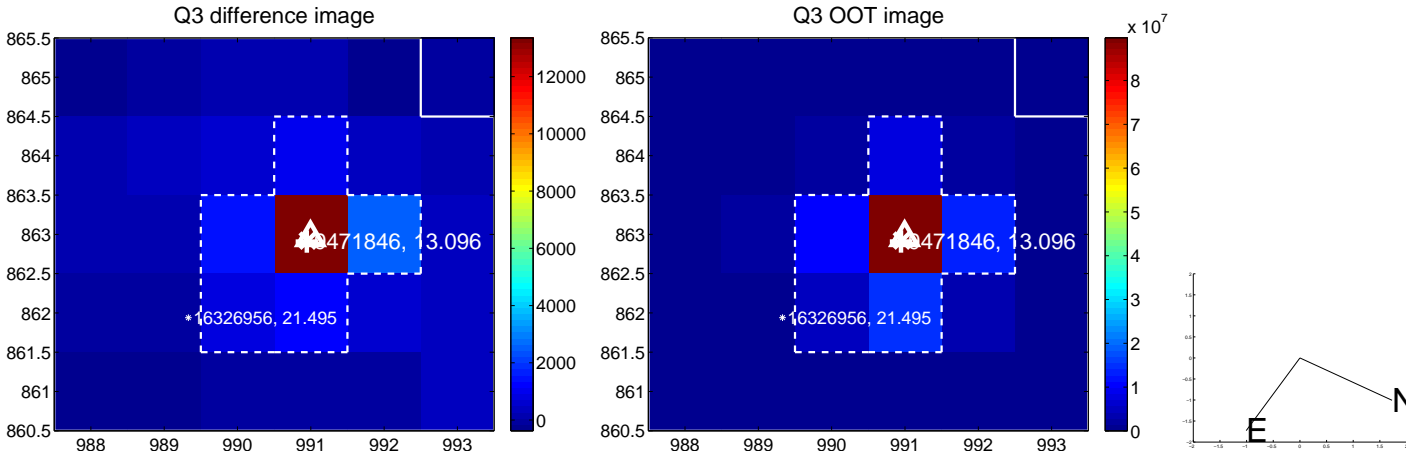
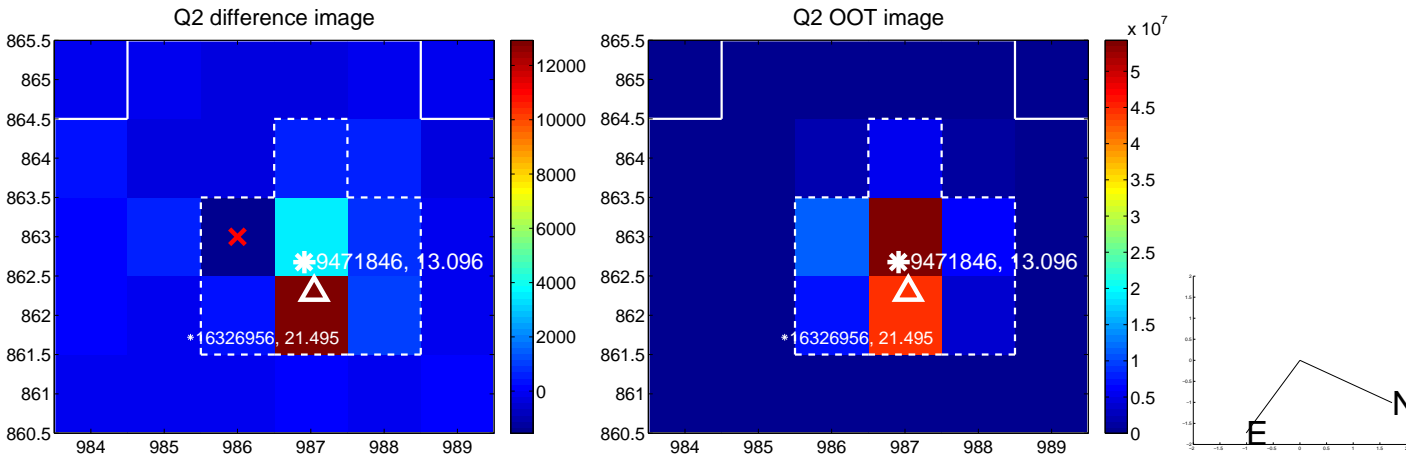
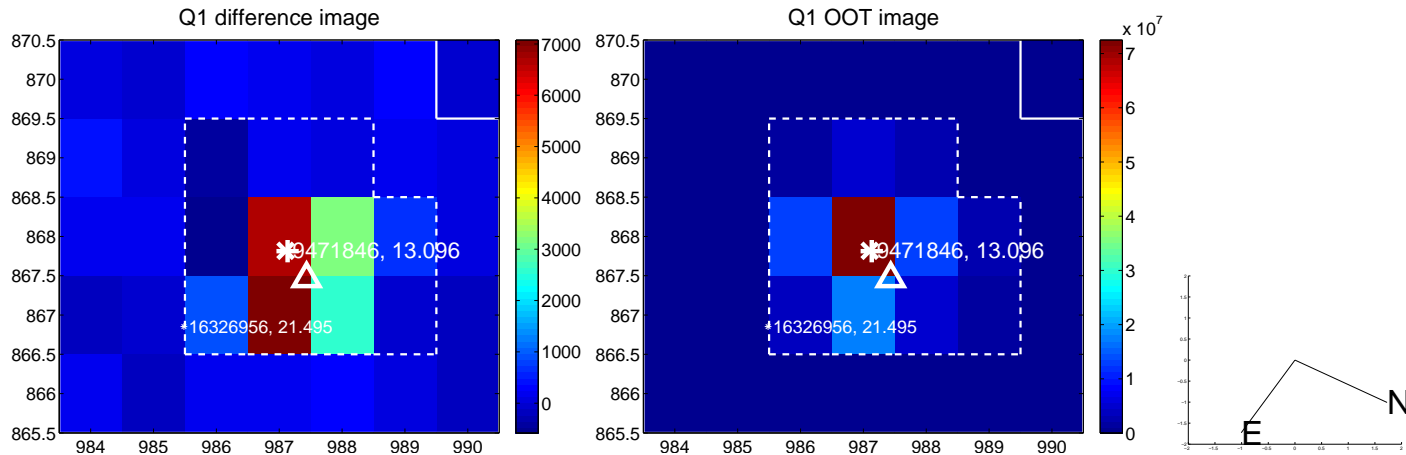


offset from photometric centroids

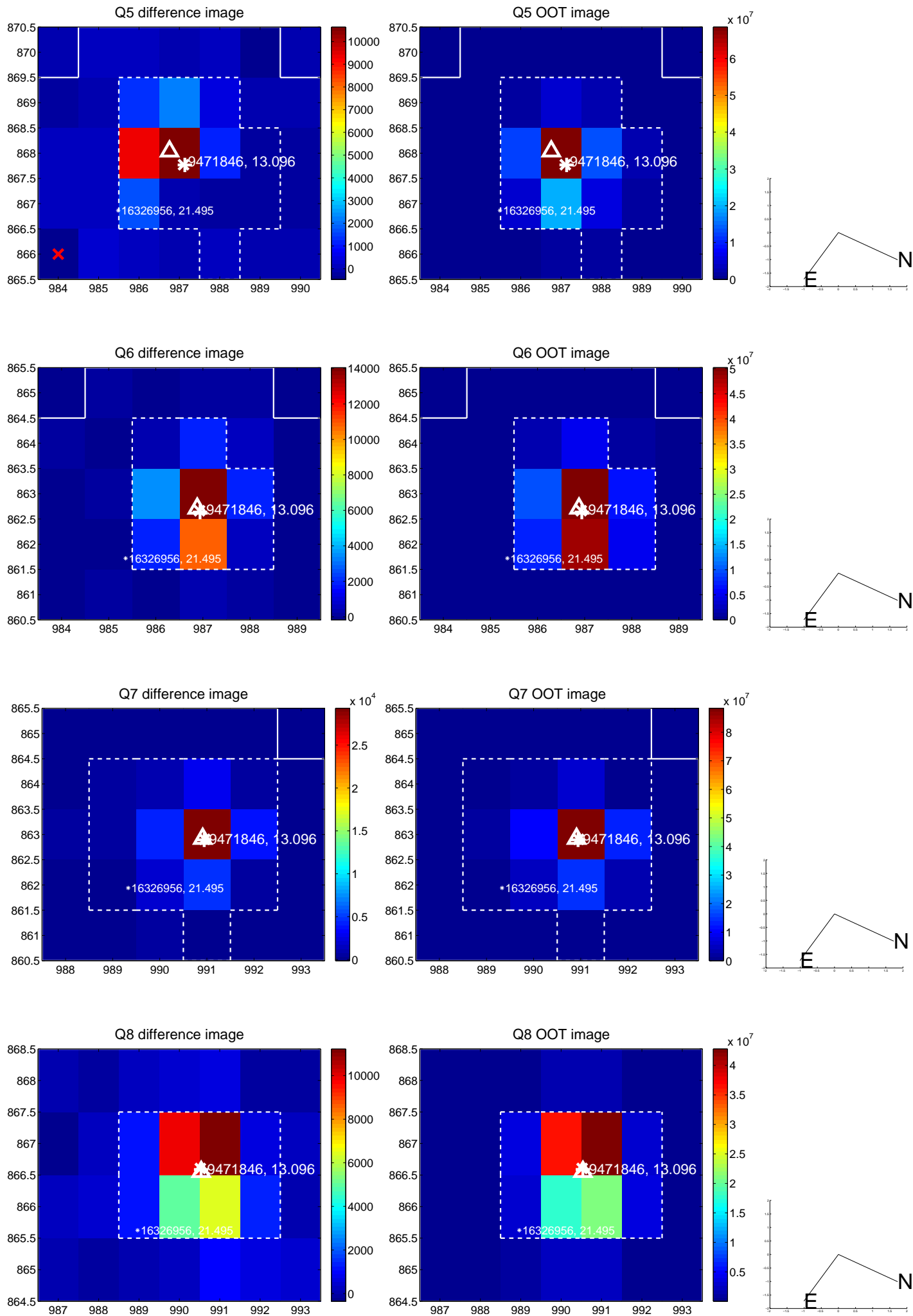


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

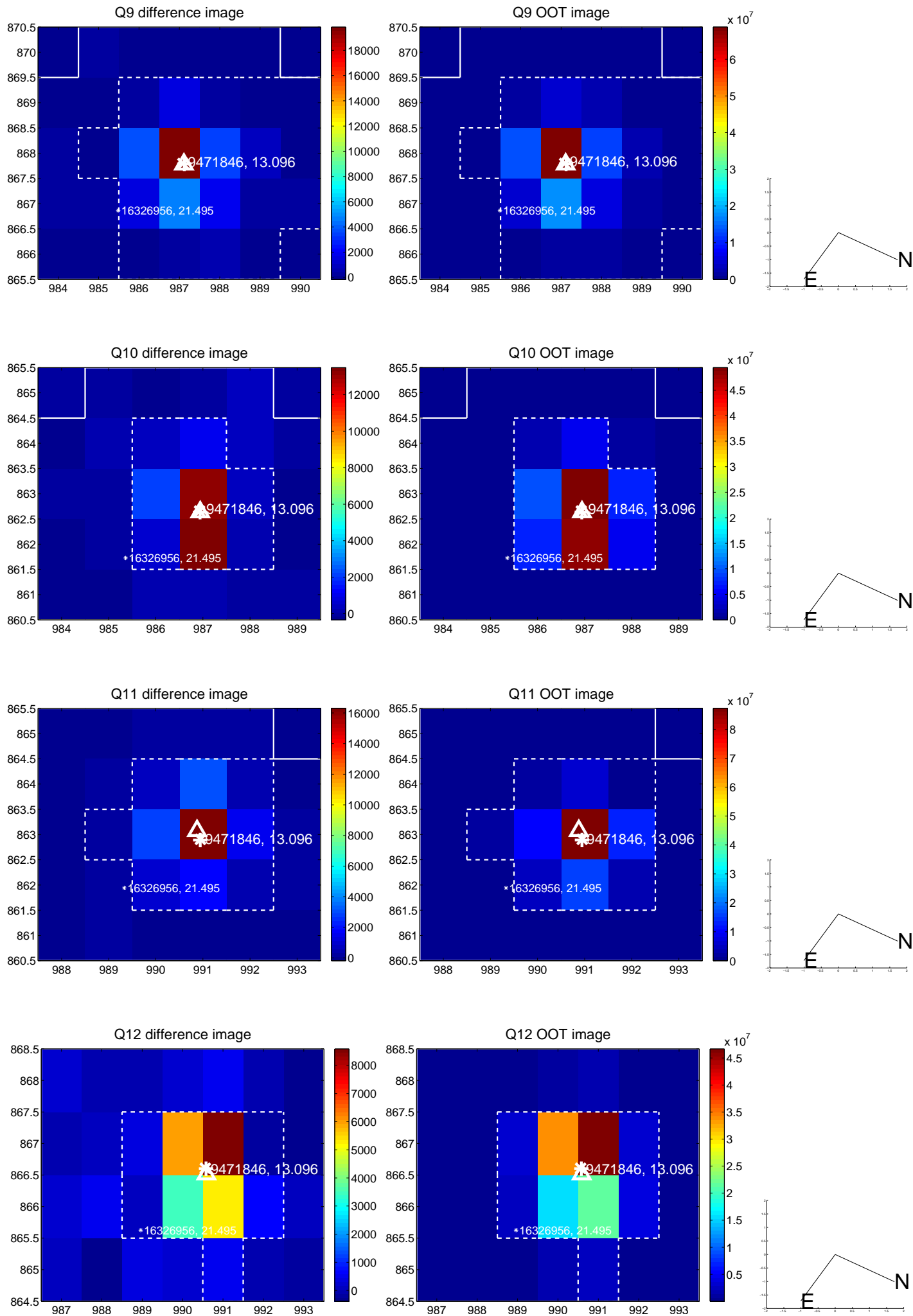


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

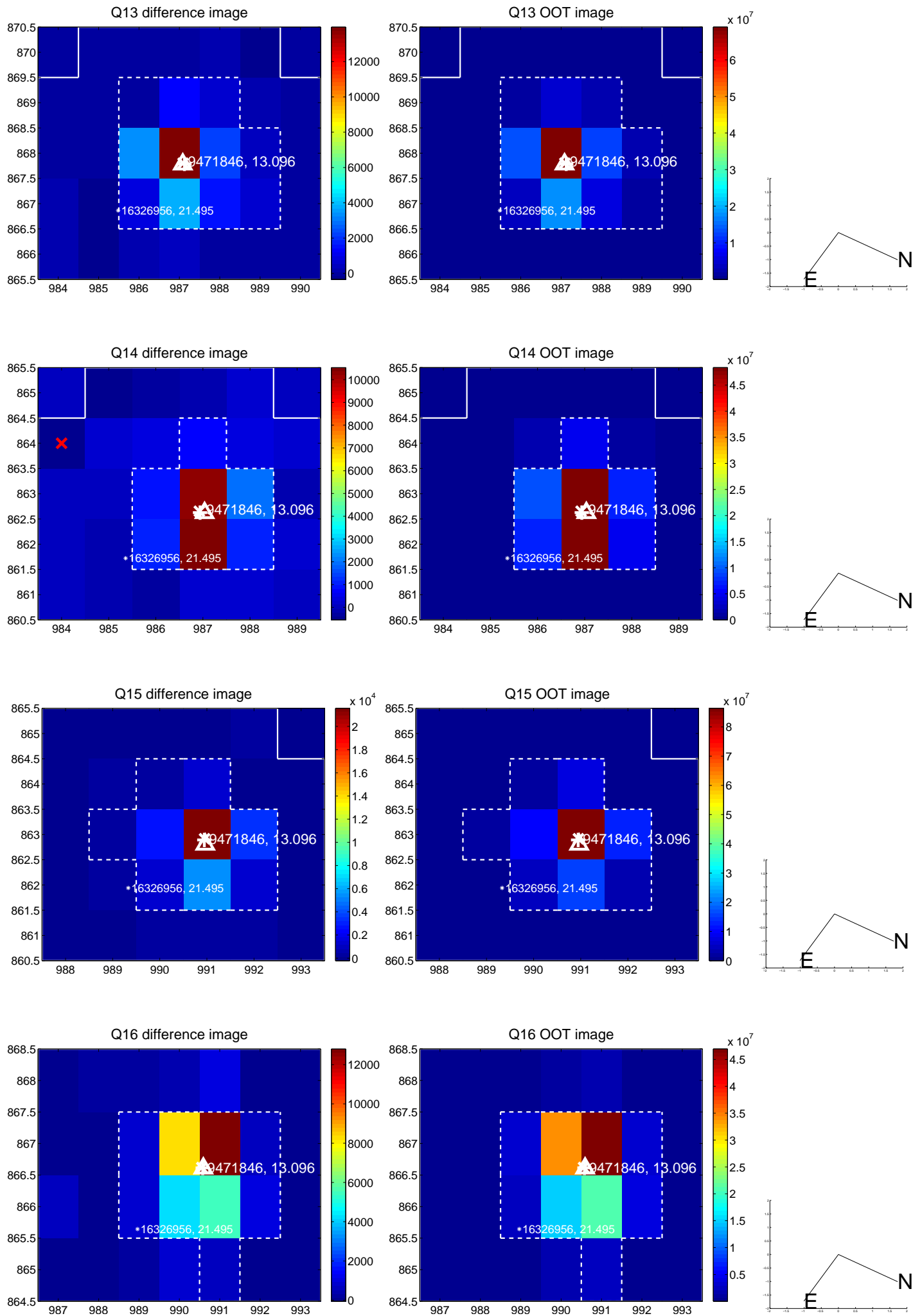




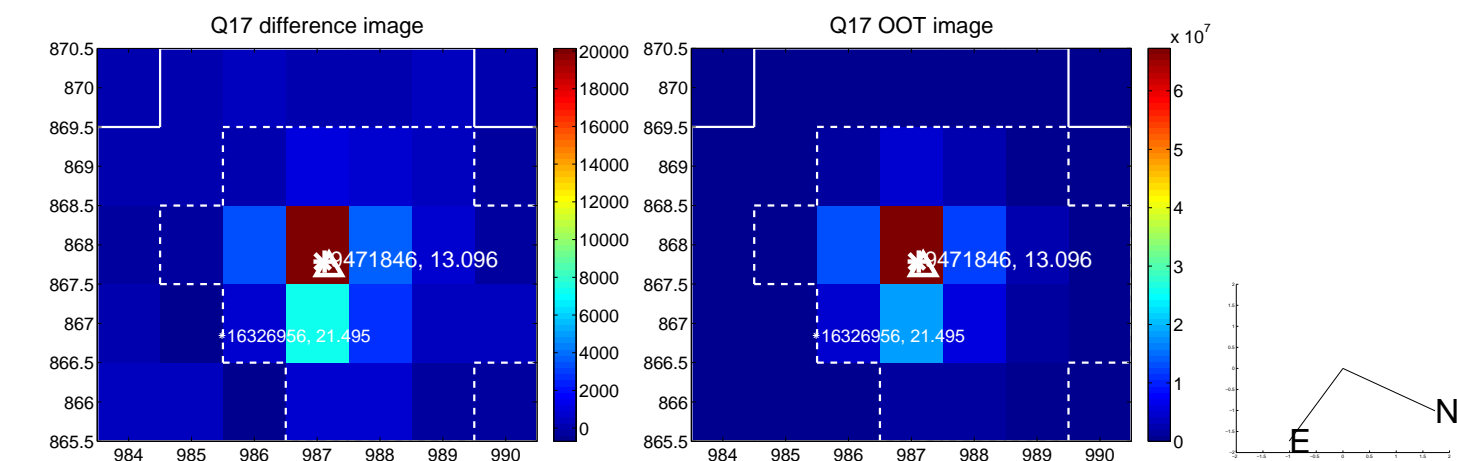
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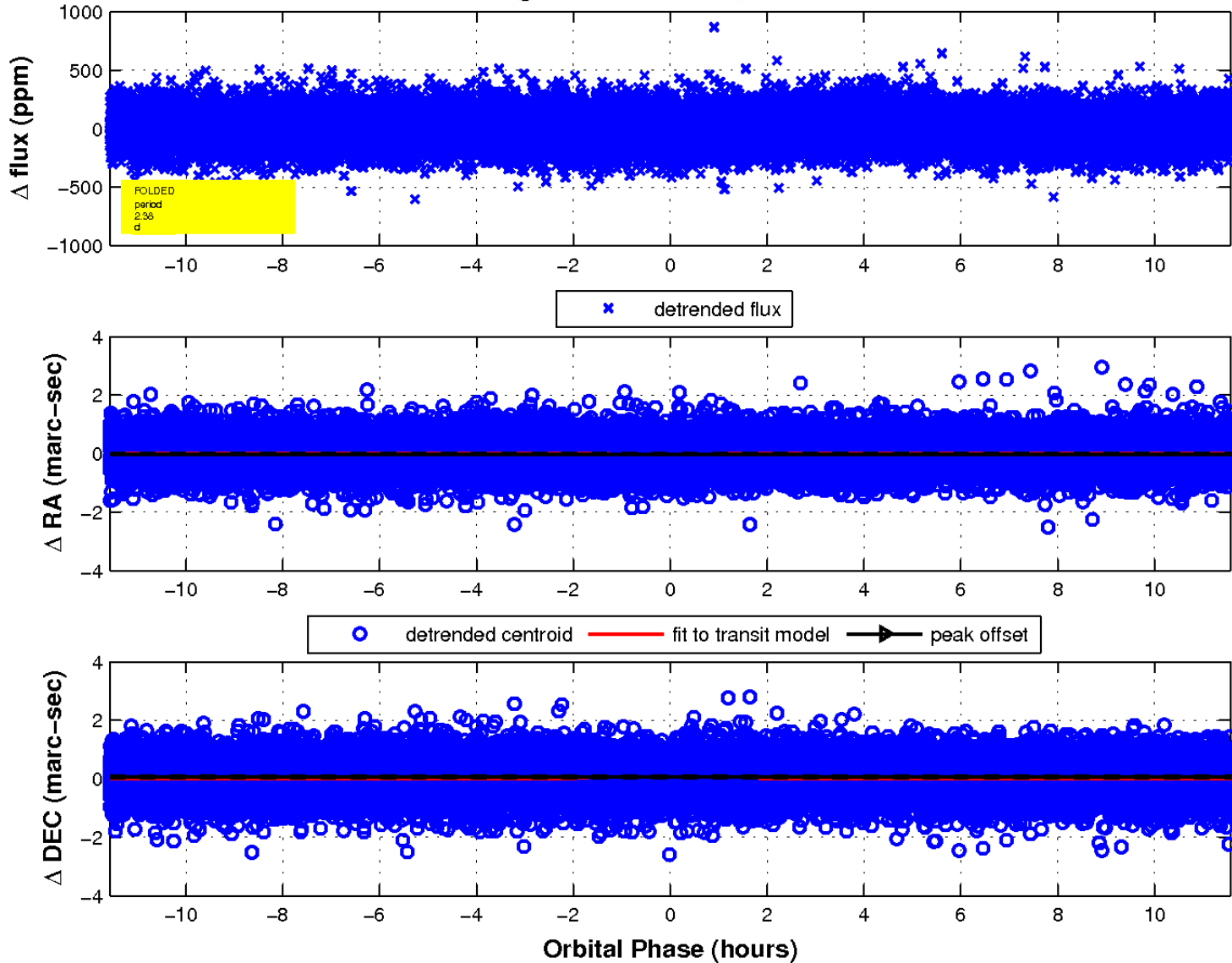
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

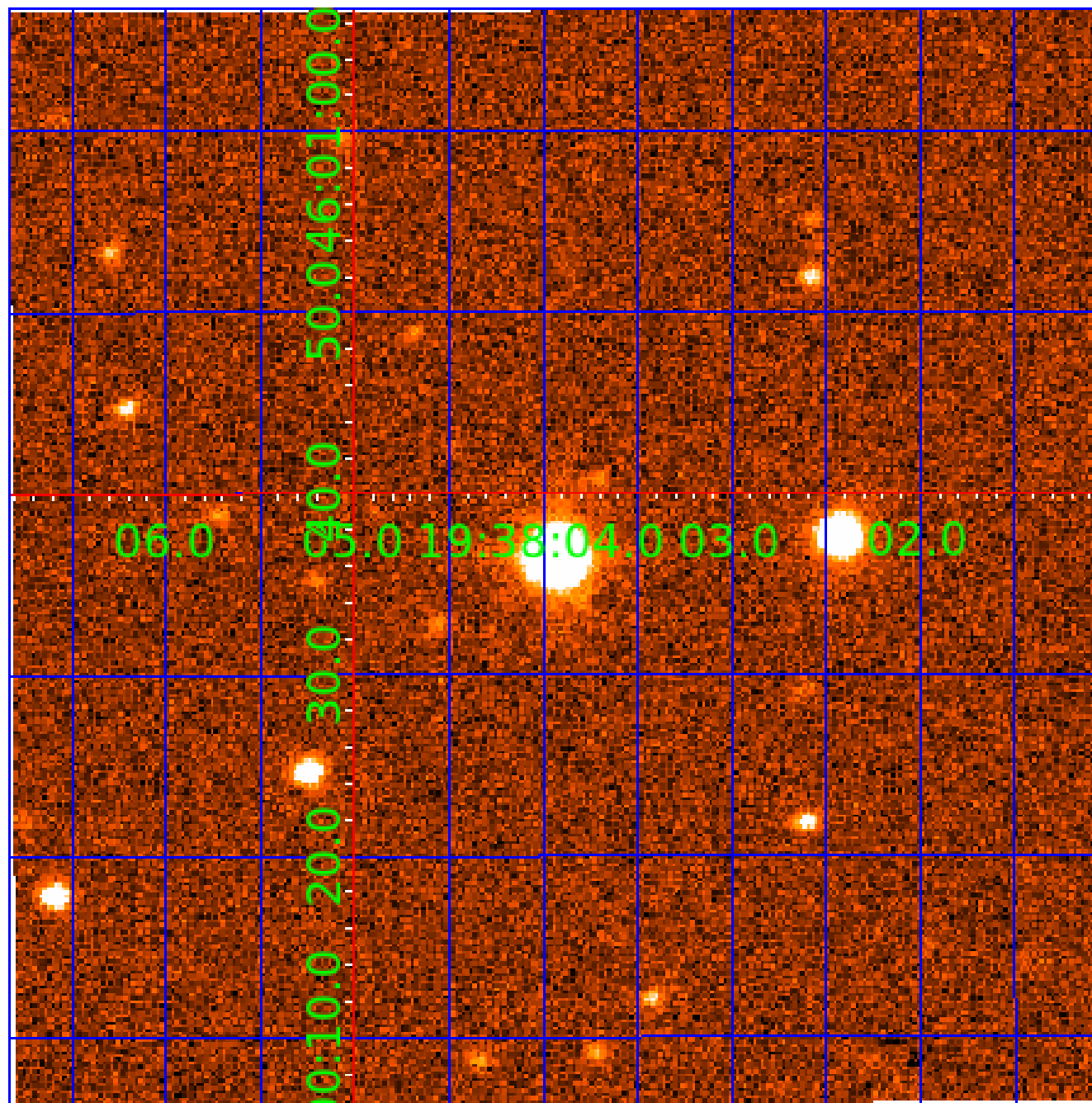


fluxWeightedCentroids, Planet 1 of 4



UKIRT Image

Declination





# KIC 009471846

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009471846-01	OBS	No	2.377260	132.402215	20.0	3.857	7.7	7.3	2.29	7069	1.17	7081.87
009471846-02	OBS	No	0.792506	131.698644	15.8	3.051	8.7	8.1	2.29	7069	1.09	30637.06
009471846-03	OBS	No	308.407453	297.528650	181.5	7.805	8.1	7.6	2.29	7069	3.43	10.78
009471846-04	OBS	No	298.851305	344.279561	242.6	3.233	7.4	8.2	2.29	7069	4.09	11.24

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
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009471846-02	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD
009471846-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—INCONSISTENT_TRANS
009471846-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT

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

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

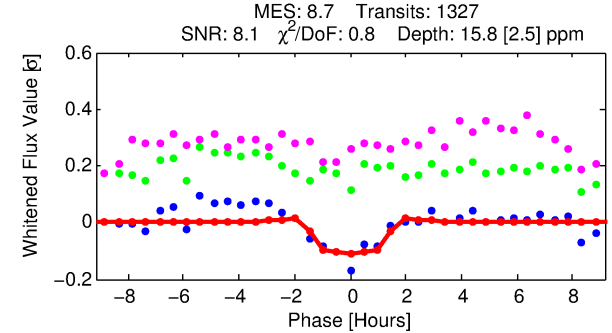
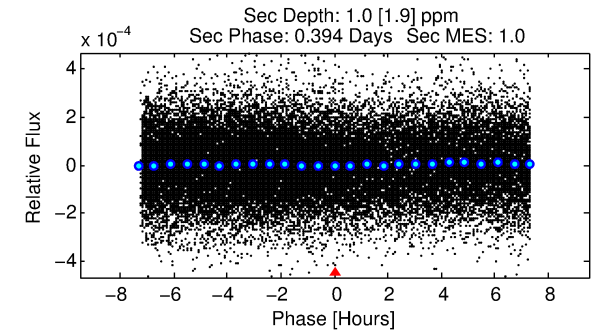
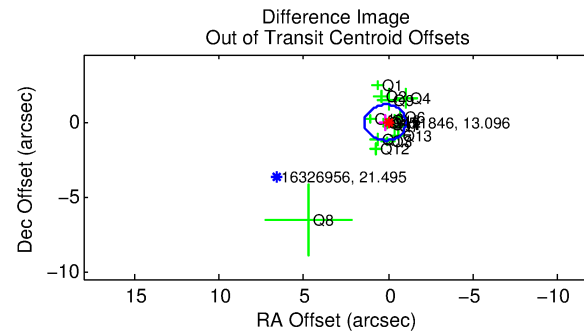
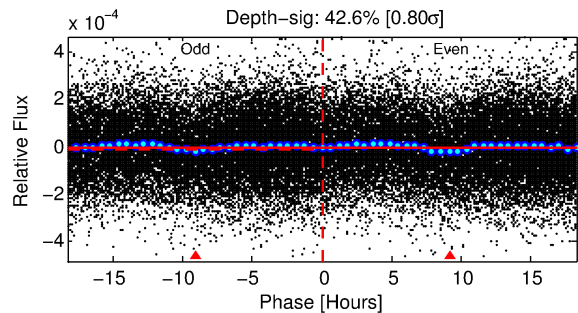
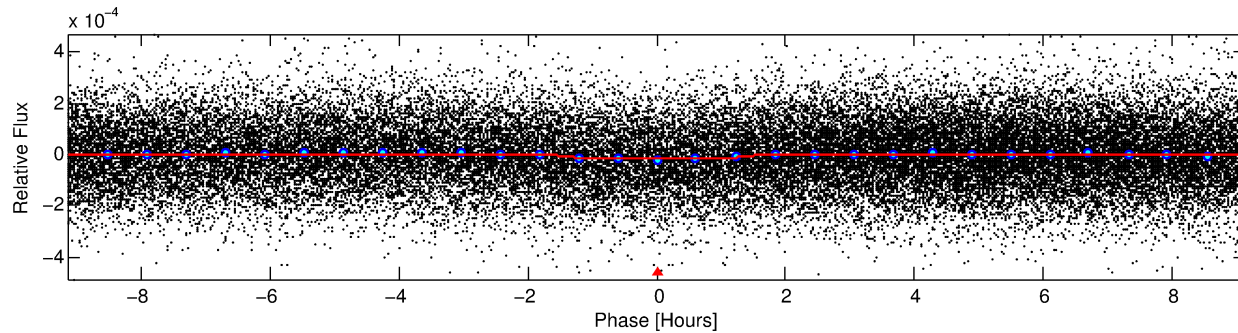
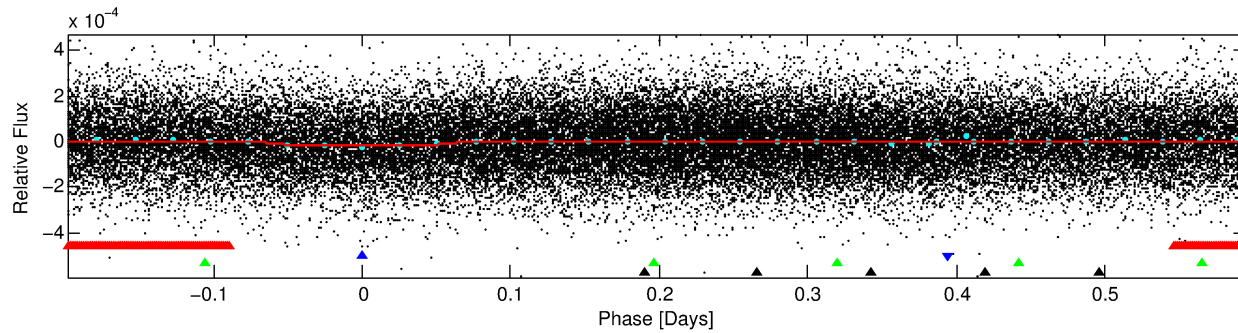
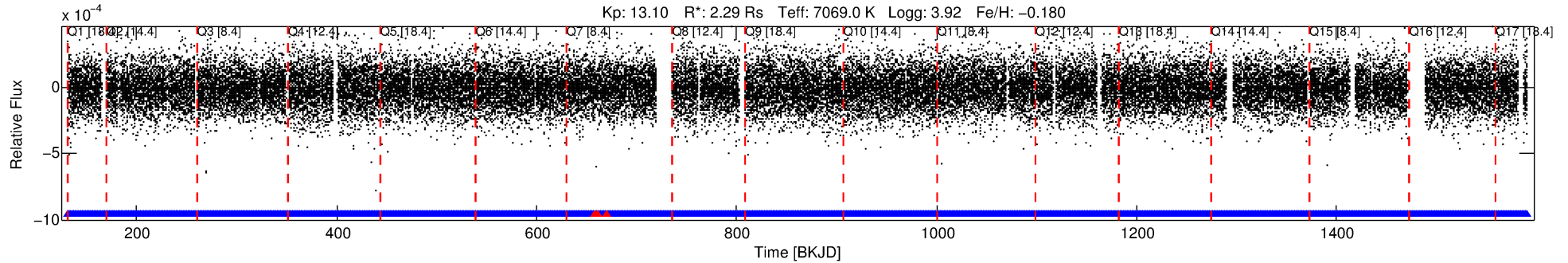
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009471846-02

No Significant Match Found

# DV One-Page Summary

KIC: 9471846 Candidate: 2 of 4 Period: 0.793 d



## DV Fit Results:

Period = 0.79251 [0.00001] d  
Epoch = 131.6986 [0.0040] BKJD  
Rp/R\* = 0.0044 [0.0021]  
a/R\* = 1.21 [1.13]  
b = 0.93 [0.41]  
Seff = 30637.06 [13079.96]  
Teff = 3374 [360] K  
Rp = 1.09 [0.62] Re  
a = 0.0195 [0.0052] AU  
Ag = 0.17 [0.38] [-2.19 $\sigma$ ]  
Teffp = 3339 [1861] K [-0.02 $\sigma$ ]

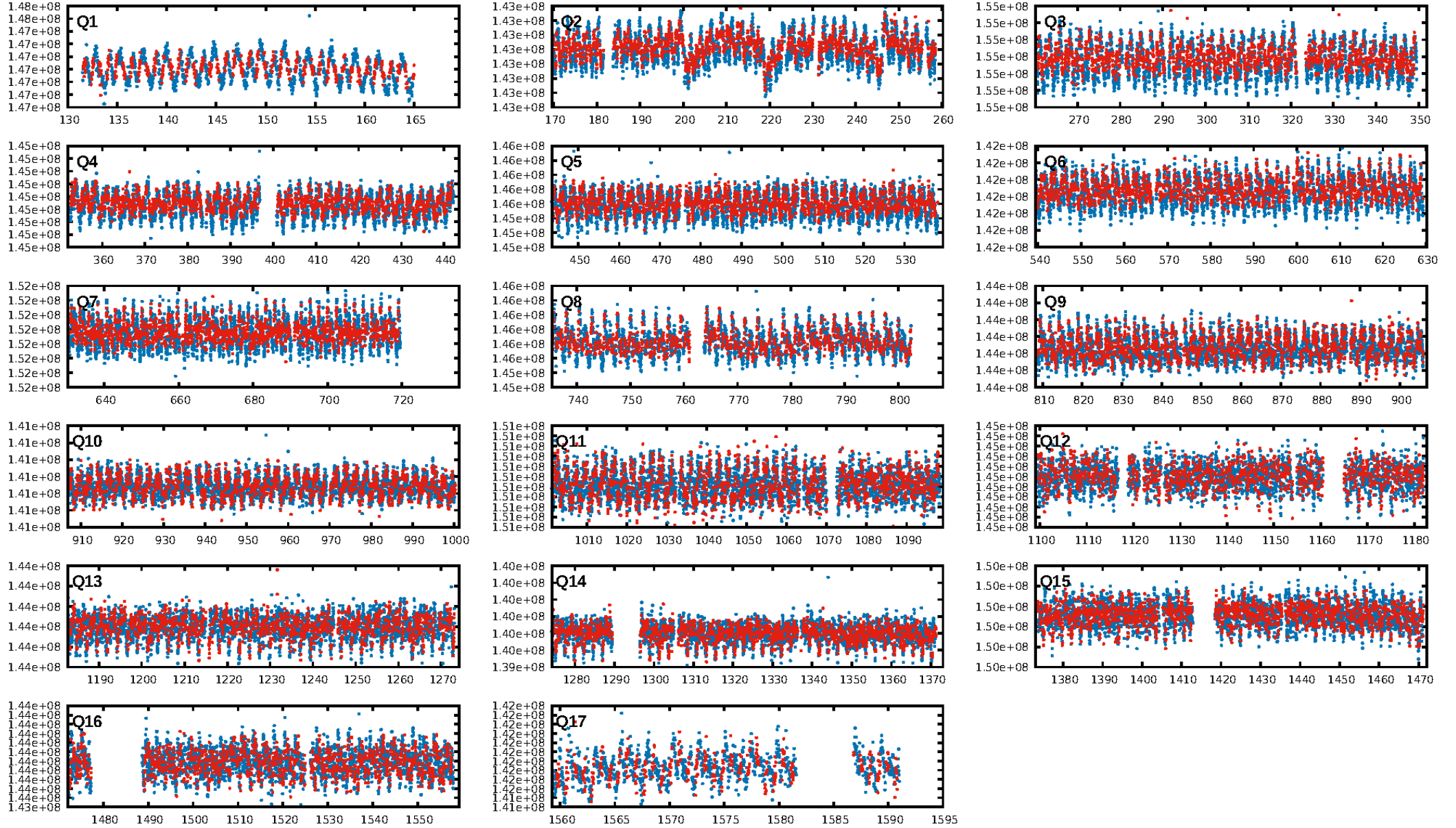
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [7.73 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 6.70e-15  
RollingBand-fgt: 1.00 [1262/1265]  
GhostDiagnostic-chr: -1.02  
Centroid-sig: 49.4%  
Centroid-so: 0.801 arcsec [0.76 $\sigma$ ]  
OotOffset-rm: 0.200 arcsec [0.50 $\sigma$ ]  
KicOffset-rm: 0.232 arcsec [0.82 $\sigma$ ]  
OotOffset-st: 4/4/4/4 [16]  
KicOffset-st: 4/4/4/4 [16]  
DiffImageQuality-fgm: 0.56 [9/16]  
DiffImageOverlap-fno: 1.00 [17/17]

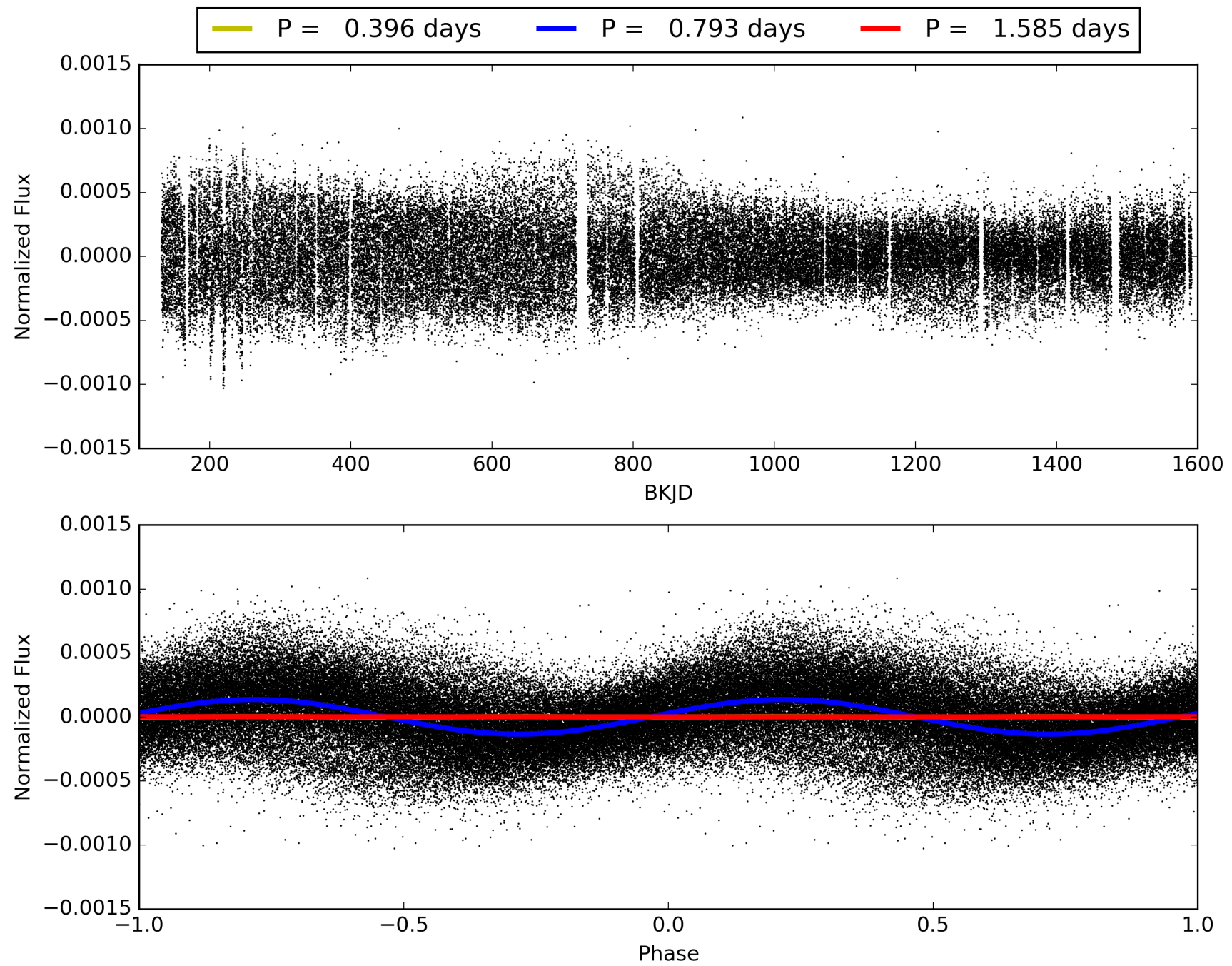
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 02-Feb-2016 16:28:31 Z

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

# TCE 009471846-02, PDC Light Curves



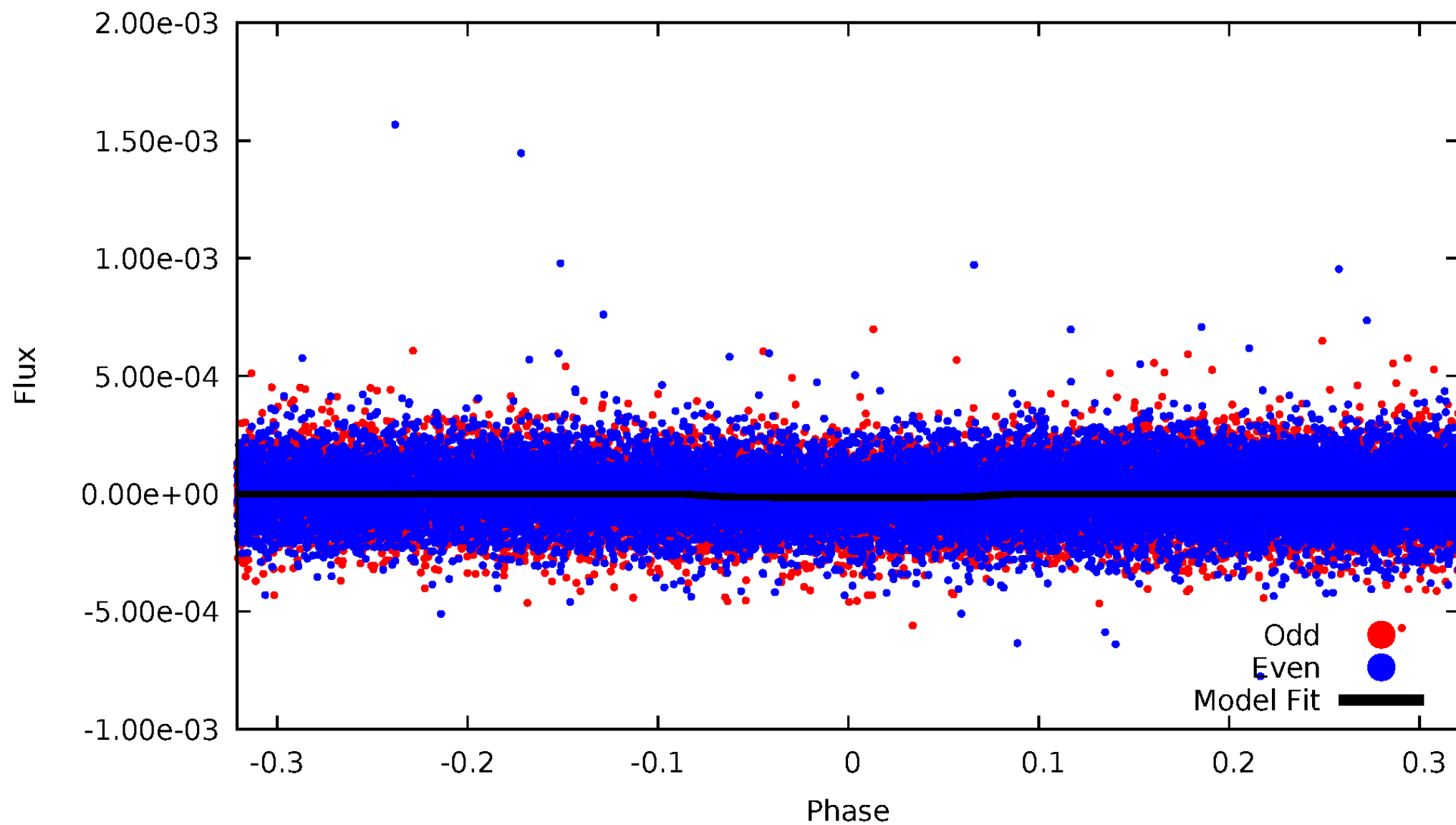
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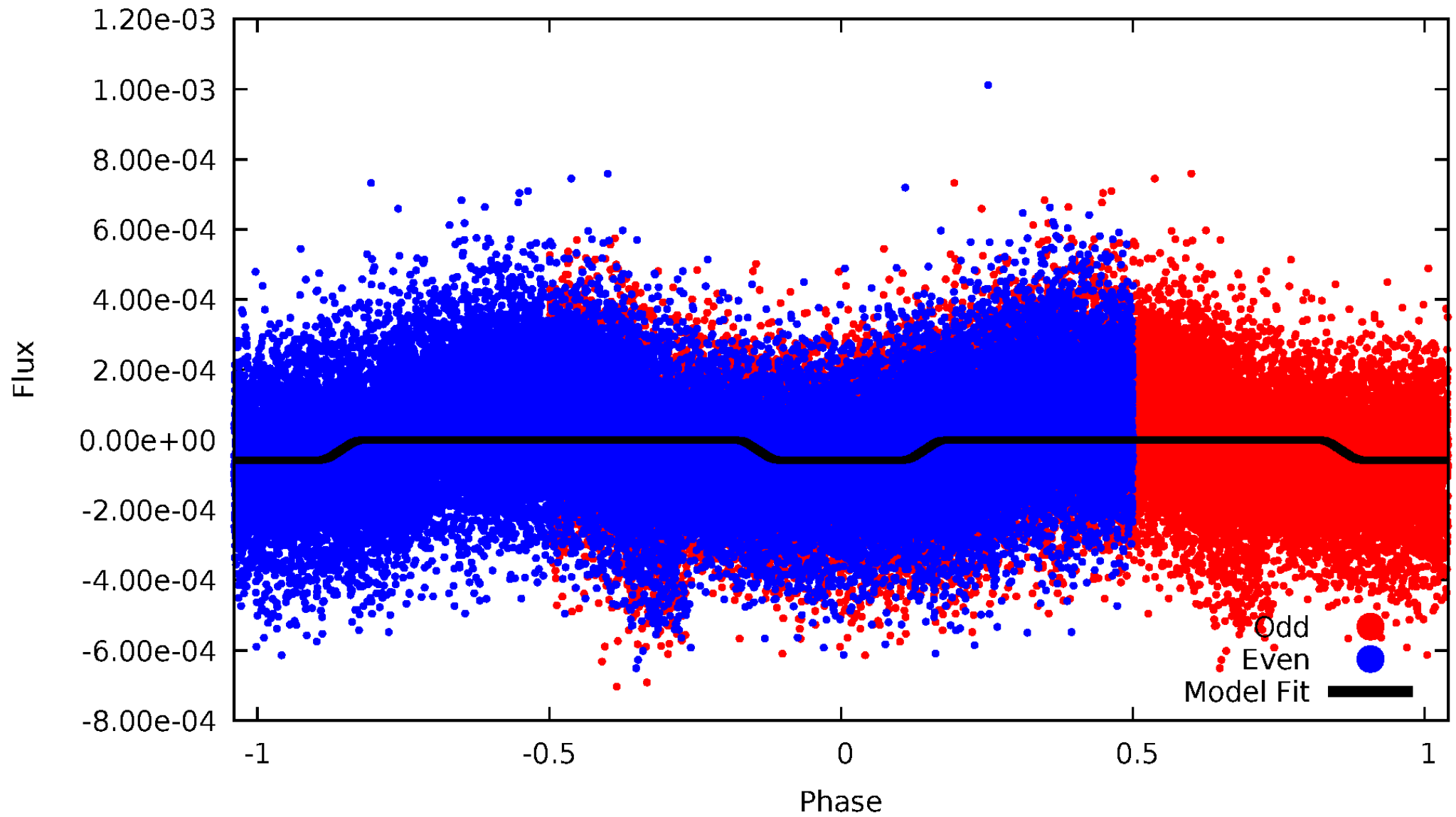
# DV Odd/Even

TCE 009471846-02



# ALT Odd/Even

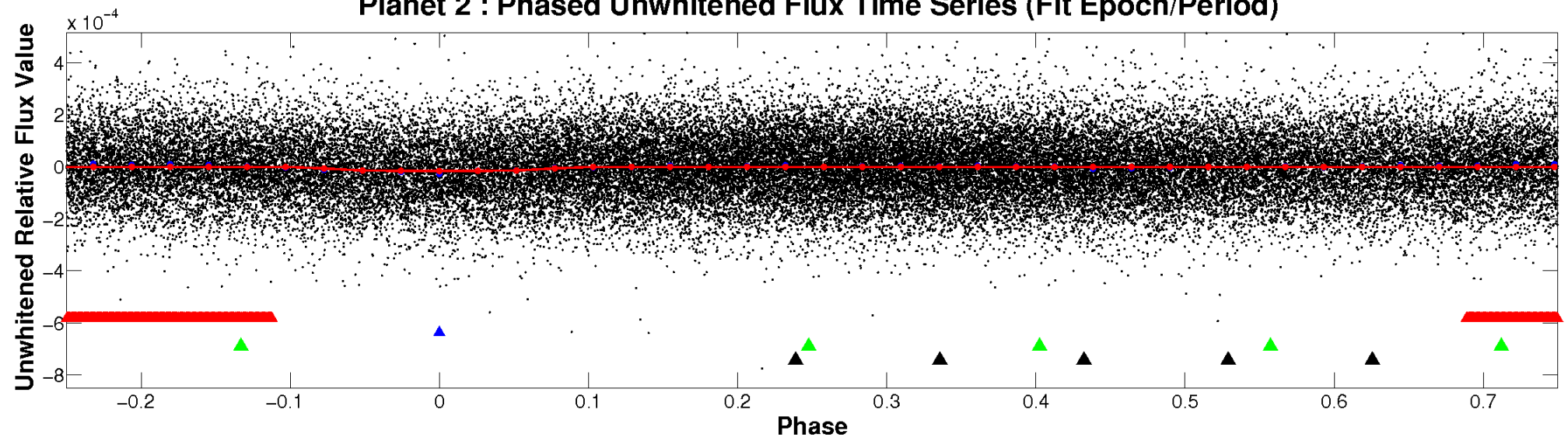
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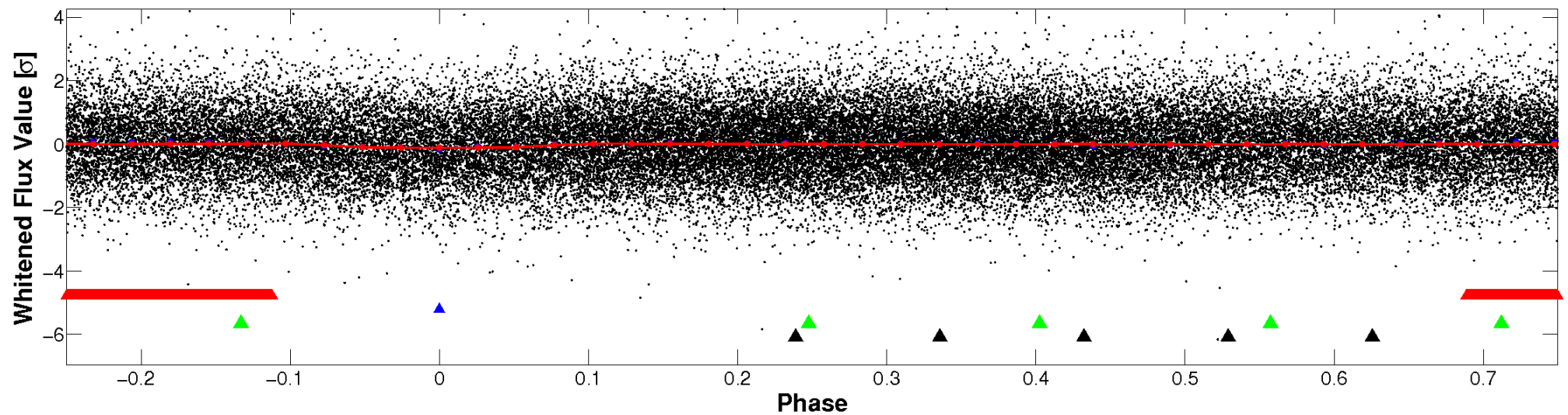


# Non-Whitened Vs. Whitened Light Curve

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

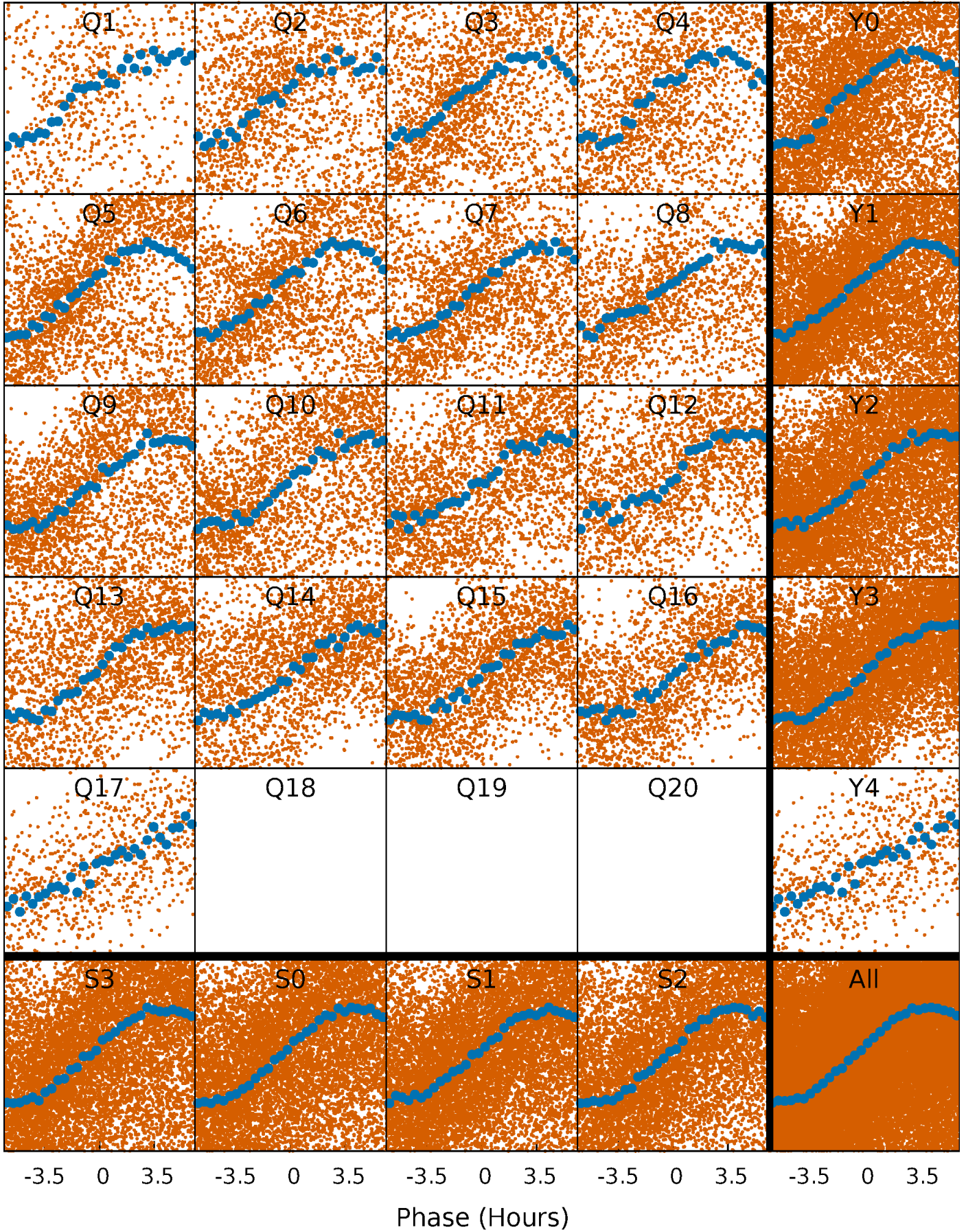


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

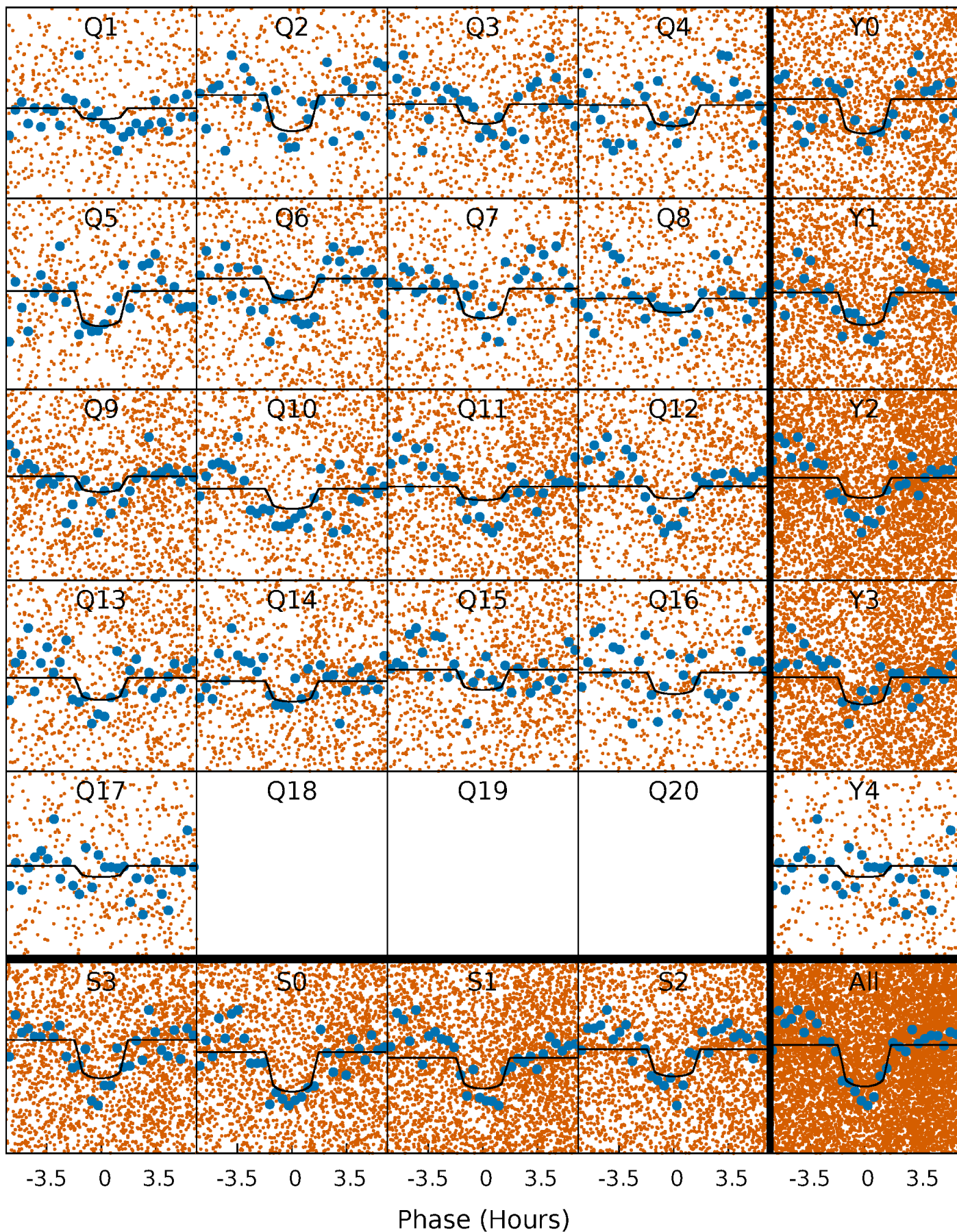
TCE 009471846-02   P= 0.792506 Days    $T_0=131.698644$  (BKJD)





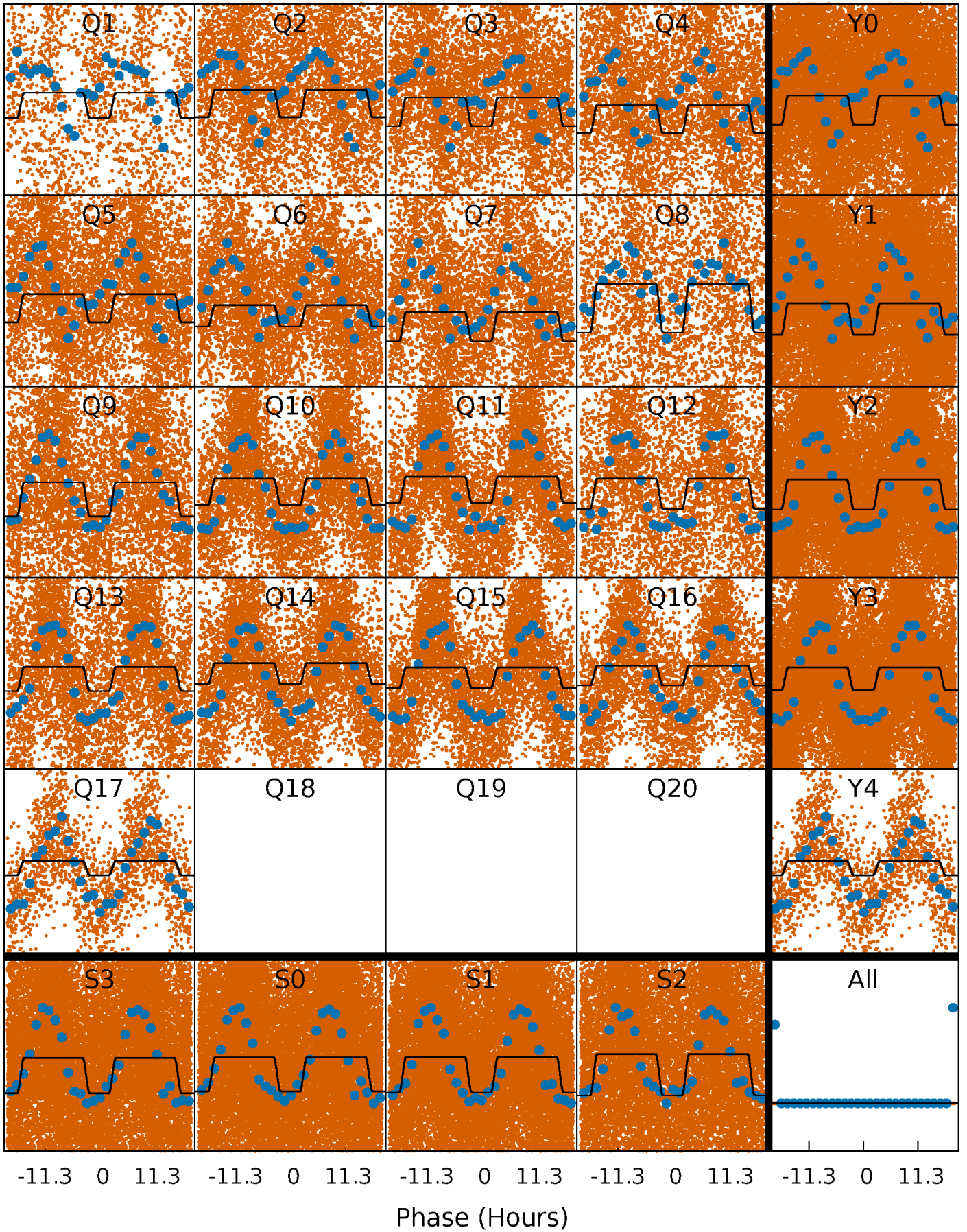
# DV Quarter-Phased Transit Curves

TCE 009471846-02   P= 0.792506 Days    $T_0=131.698644$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 009471846-02   P= 0.792460 Days    $T_0=131.564610$  (BKJD)

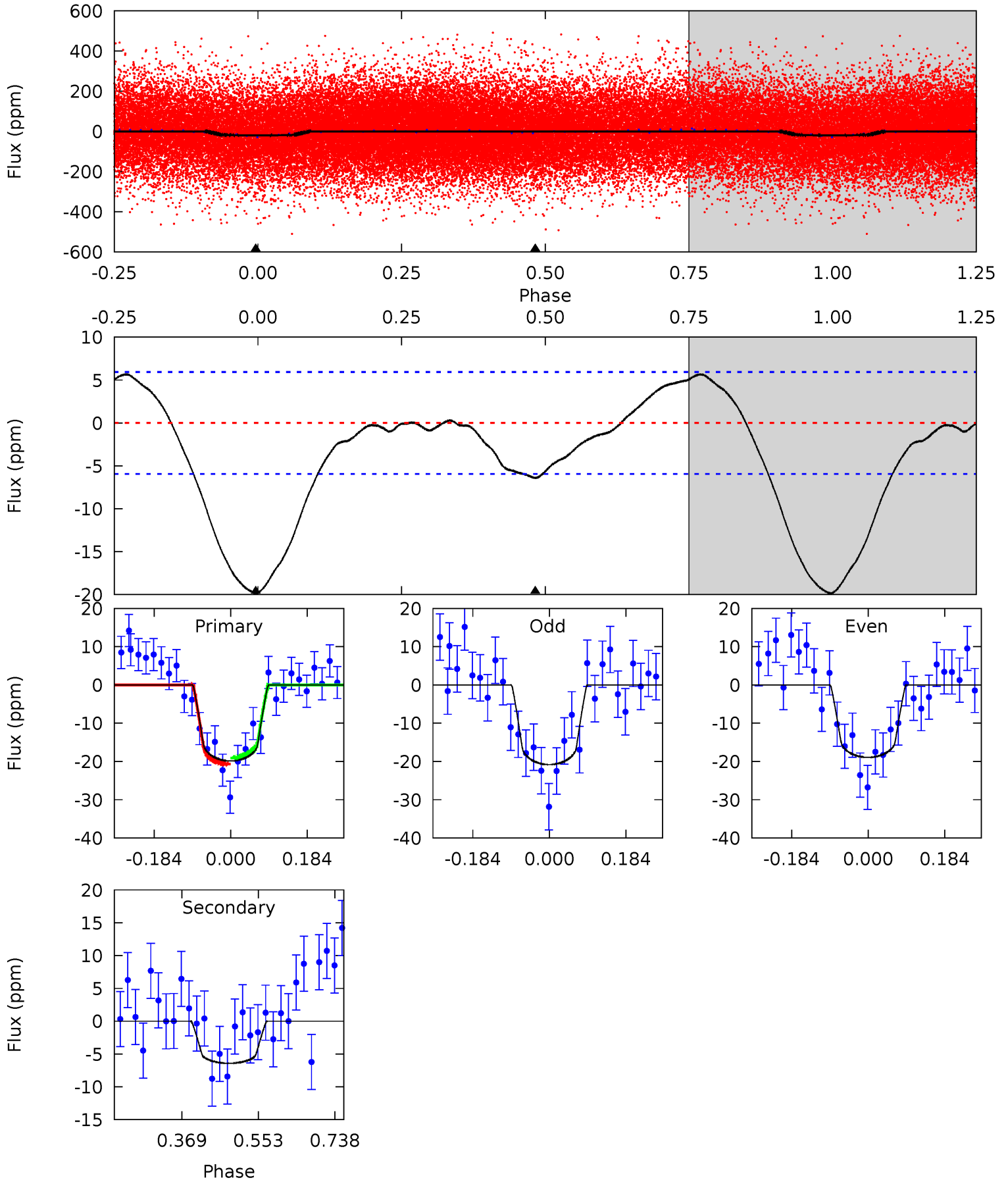




# DV Model-Shift Uniqueness Test

009471846-02, P = 0.792506 Days, E = 130.906138 Days

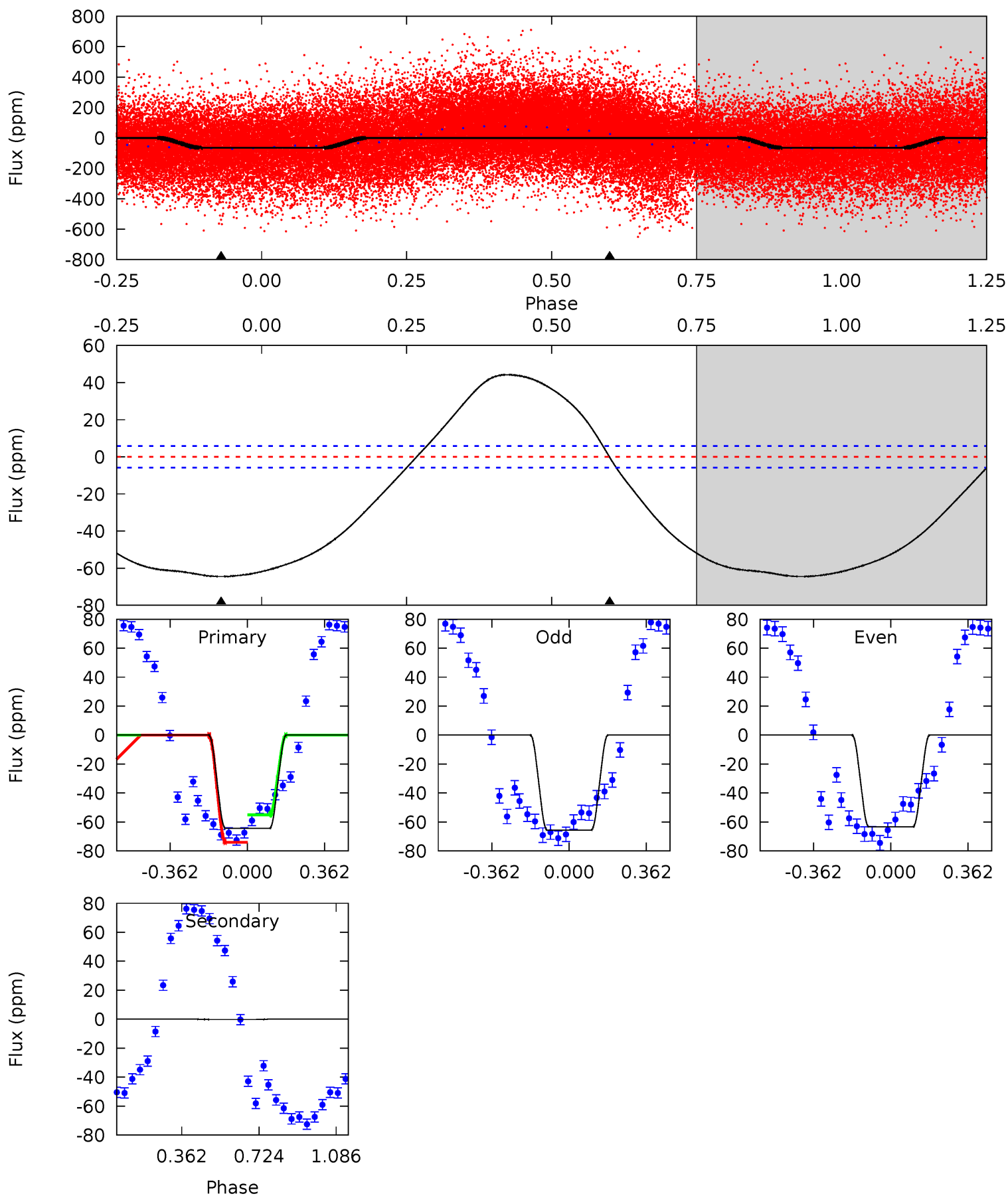
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
14.8	4.79	0	0	4.43	1.33	1.87	14.8	14.8	4.79	4.79	0.71	1.03	0.22	0.58



# Alt Model-Shift Uniqueness Test

009471846-02, P = 0.792460 Days, E = 130.772150 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
47.6	0.15	0	0	4.29	0.91	8.51	47.6	47.6	0.15	0.15	0.81	1.59	0.41	7.33





### Stellar Parameters For KIC 009471846

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$\rho_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$7069^{+197}_{-246}$	$3.919^{+0.227}_{-0.122}$	$-0.180^{+0.300}_{-0.300}$	$2.285^{+0.466}_{-0.698}$	$1.578^{+0.208}_{-0.278}$	$0.186^{+0.254}_{-0.069}$
	+3%/-3%	+6%/-3%	+167%/-167%	+20%/-31%	+13%/-18%	+136%/-37%
Source	PHO1	FLK73	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 009471846-02 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-6 \pm 1$	$1.07^{+0.54}_{-0.50}$	$4665^{+299}_{-367}$	$5024^{+2124}_{-1147}$	$1.208^{+3.072}_{-0.686}$
Alt.	$-0 \pm 1$	$1.84^{+0.57}_{-0.56}$	$4694^{+291}_{-380}$	$-4081^{+391}_{-276}$	$0.011^{+0.093}_{-0.087}$

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

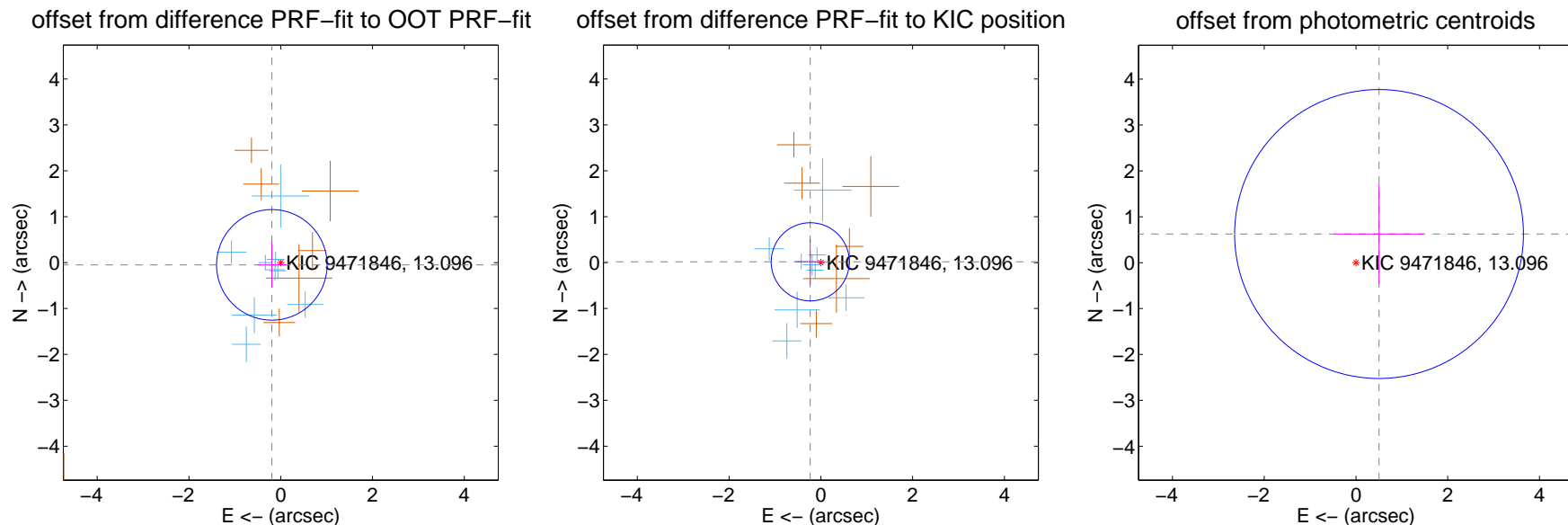
## DV Centroid Data

Supplemental centroid analysis for 009471846-02. Kepler magnitude: 13.10. Transit SNR 8.08

There are 9 quarters with good PRF difference image offsets

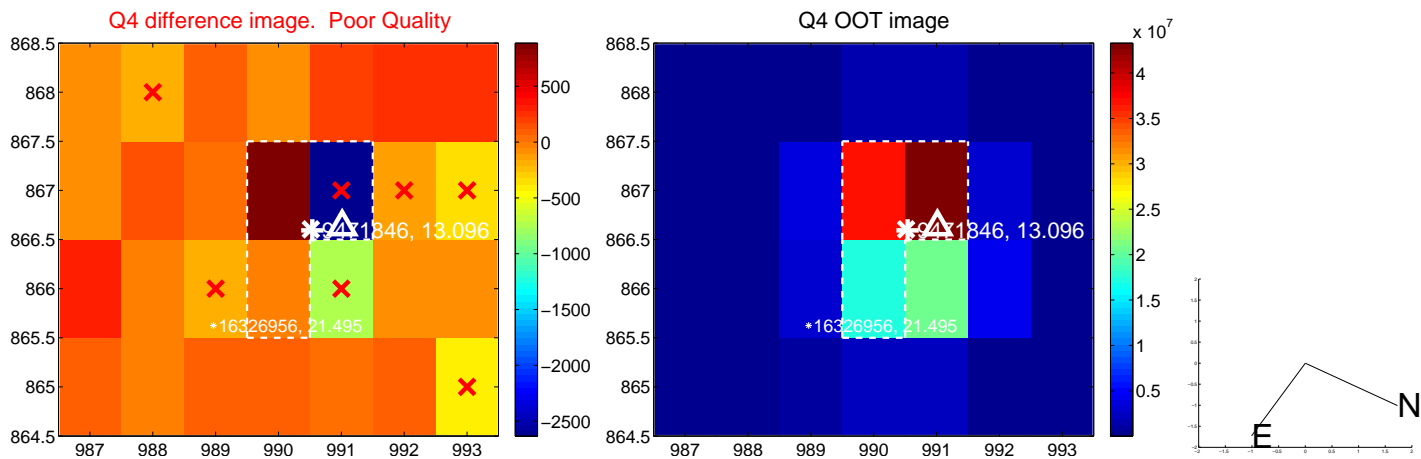
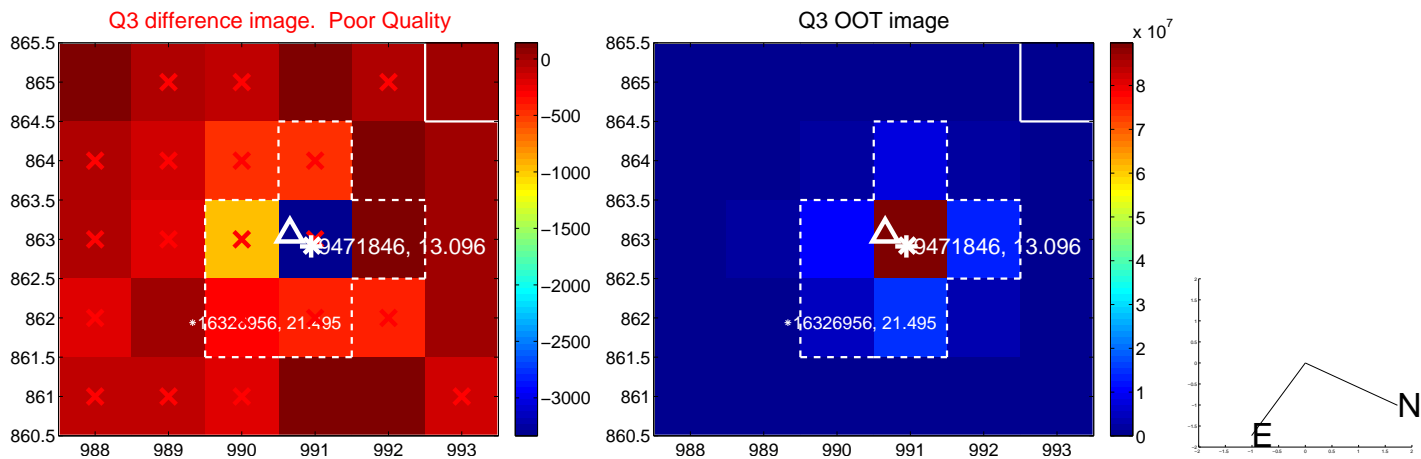
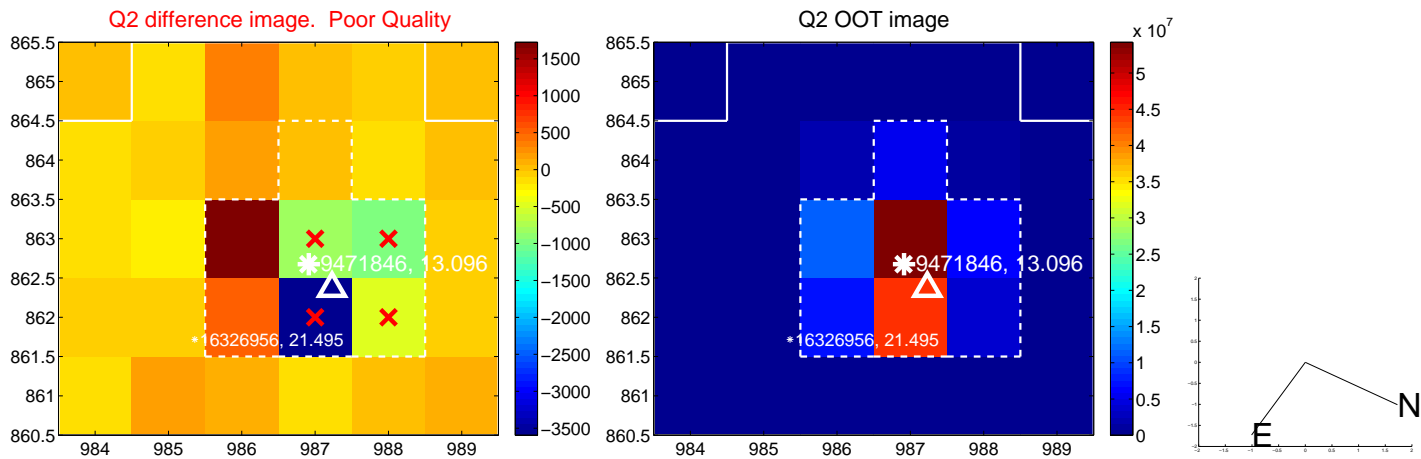
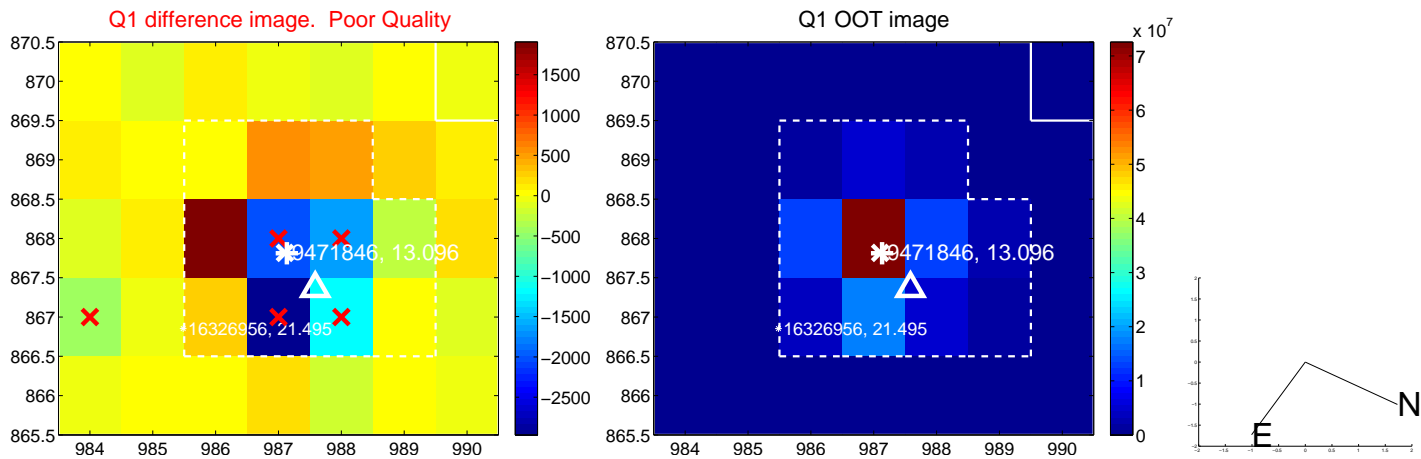
The direct PRF centroid is offset from the target star catalog position by about 0.13 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.200 \pm 0.401$	0.50	$0.194 \pm 0.314$	$-0.050 \pm 0.491$
PRF-fit source offset from KIC position	$0.232 \pm 0.284$	0.82	$0.231 \pm 0.310$	$0.017 \pm 0.498$
photometric centroid source offset	$0.80 \pm 1.05$	0.76	$-0.50 \pm 0.98$	$0.62 \pm 1.09$

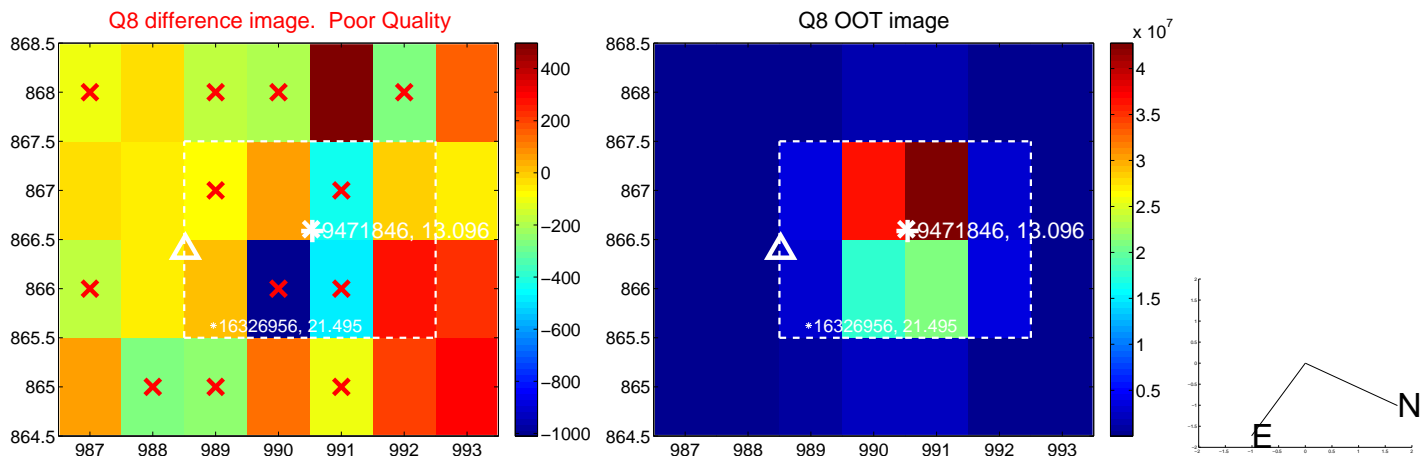
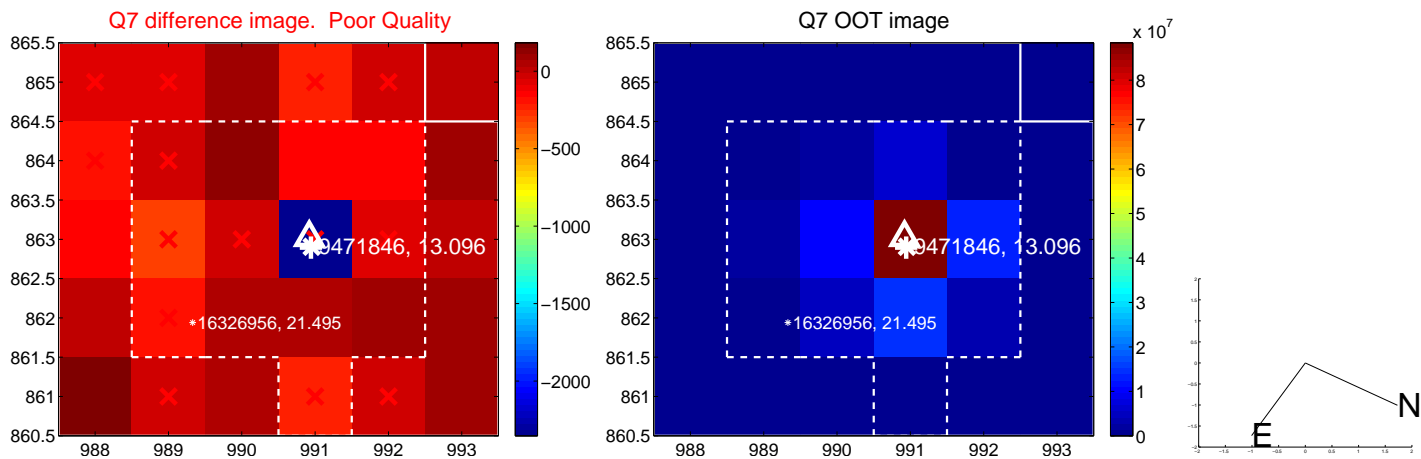
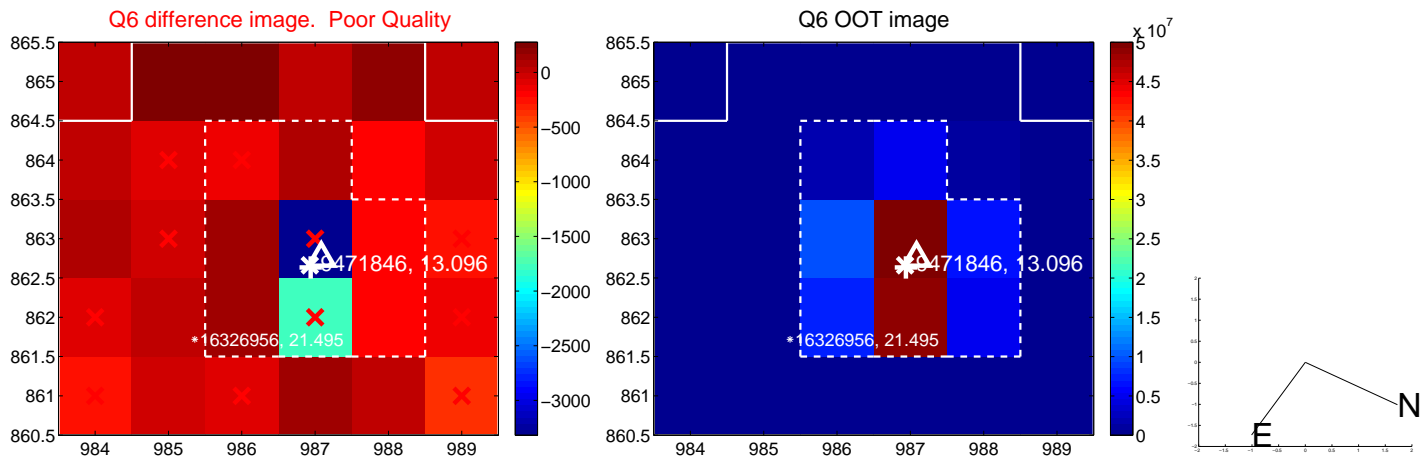
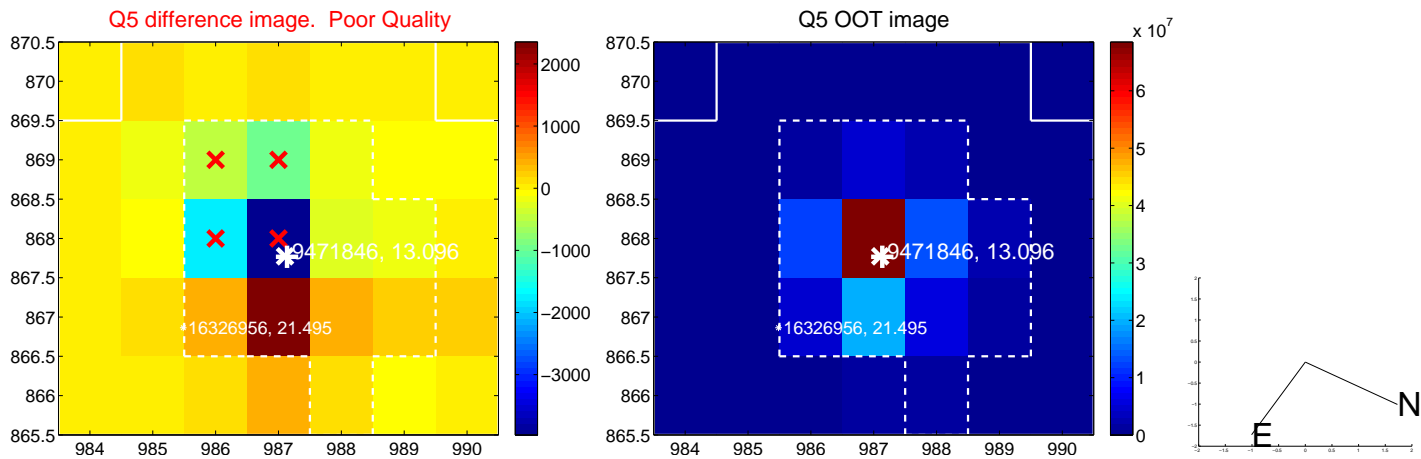


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

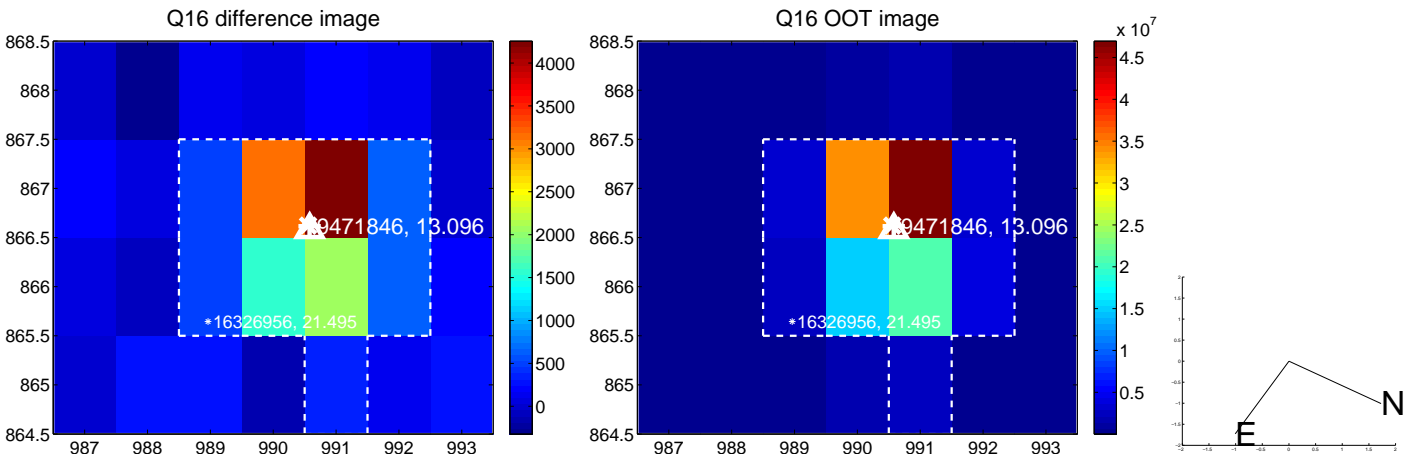
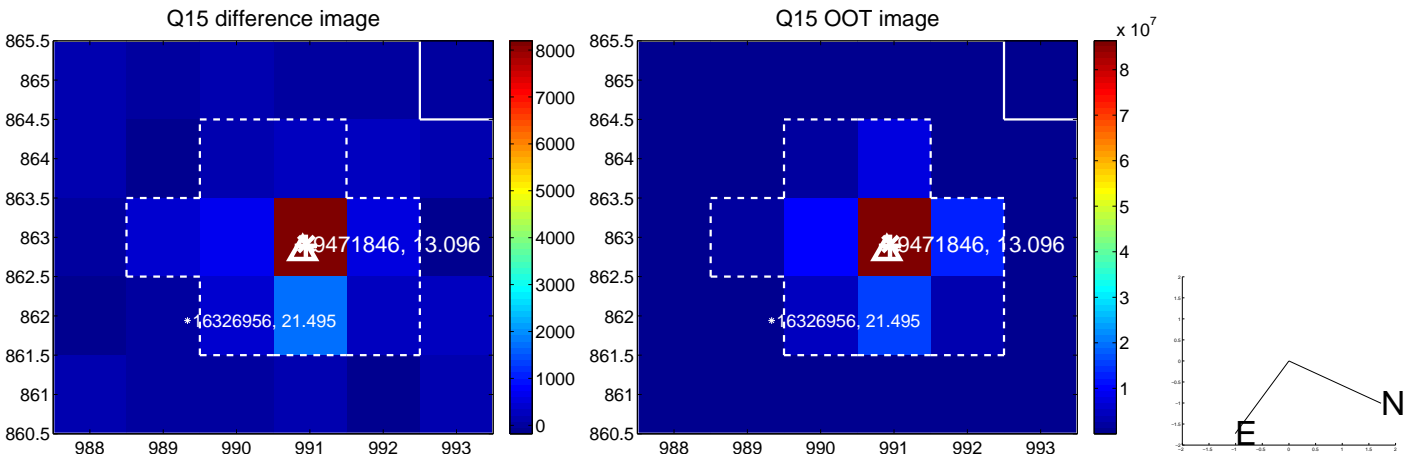
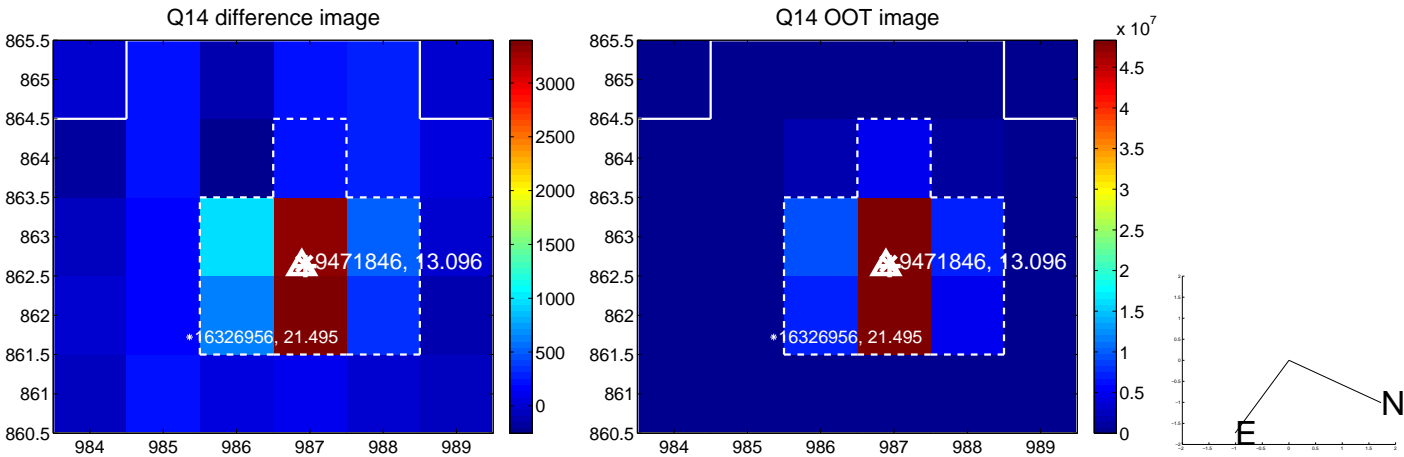
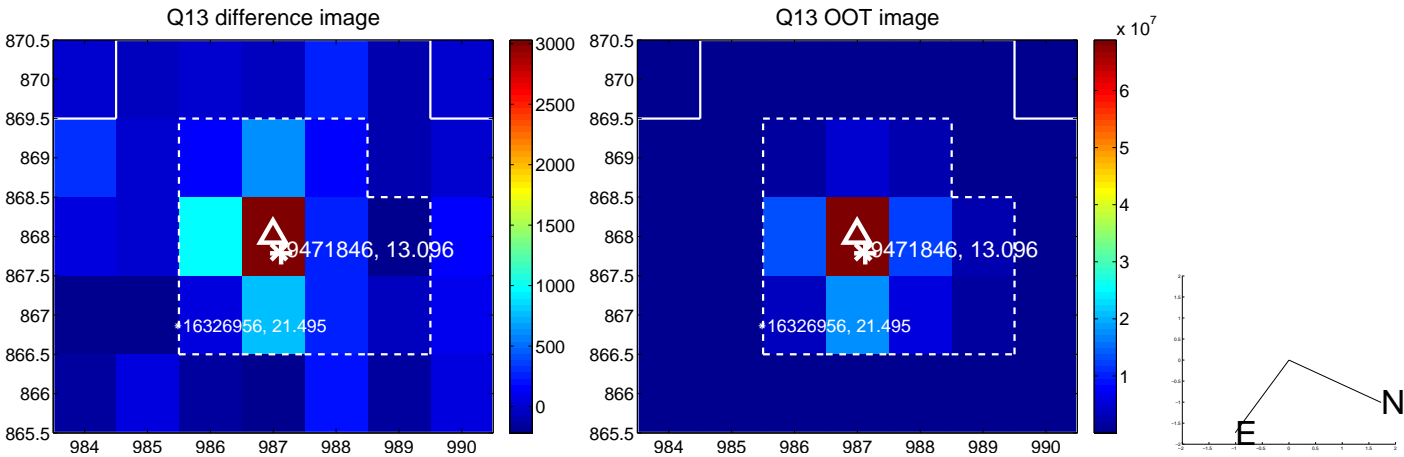


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



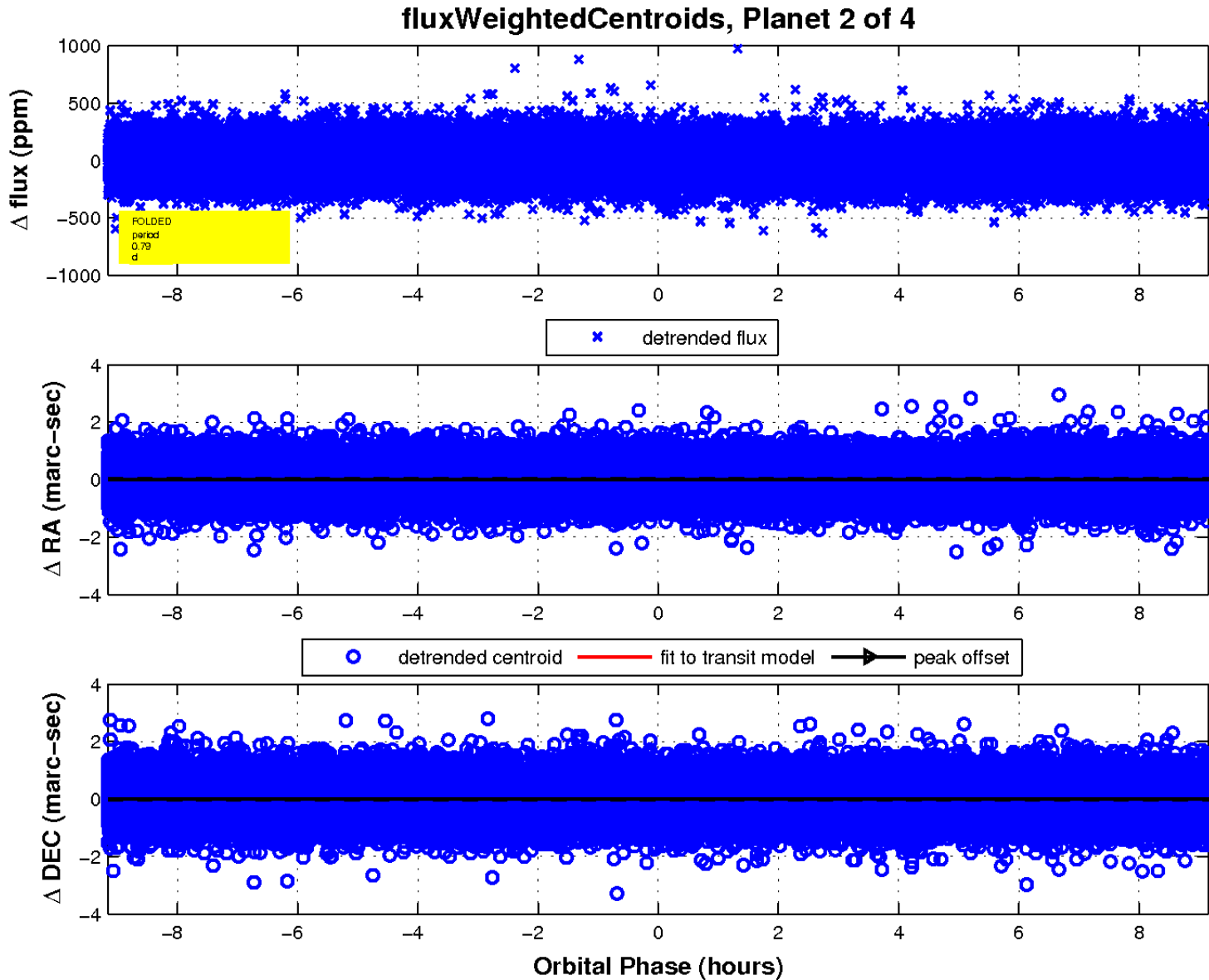
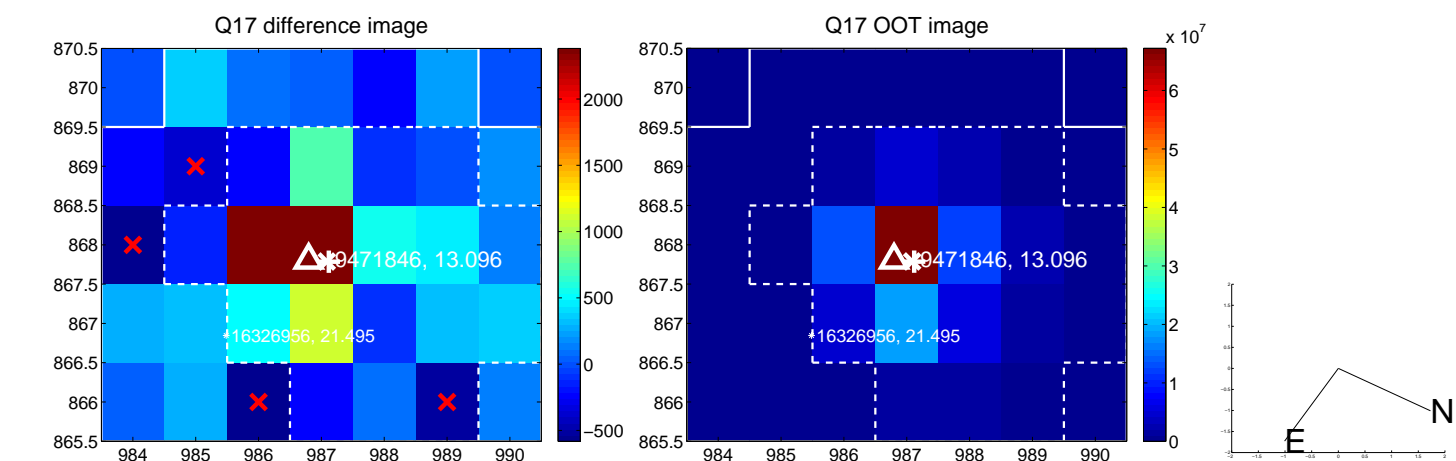


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



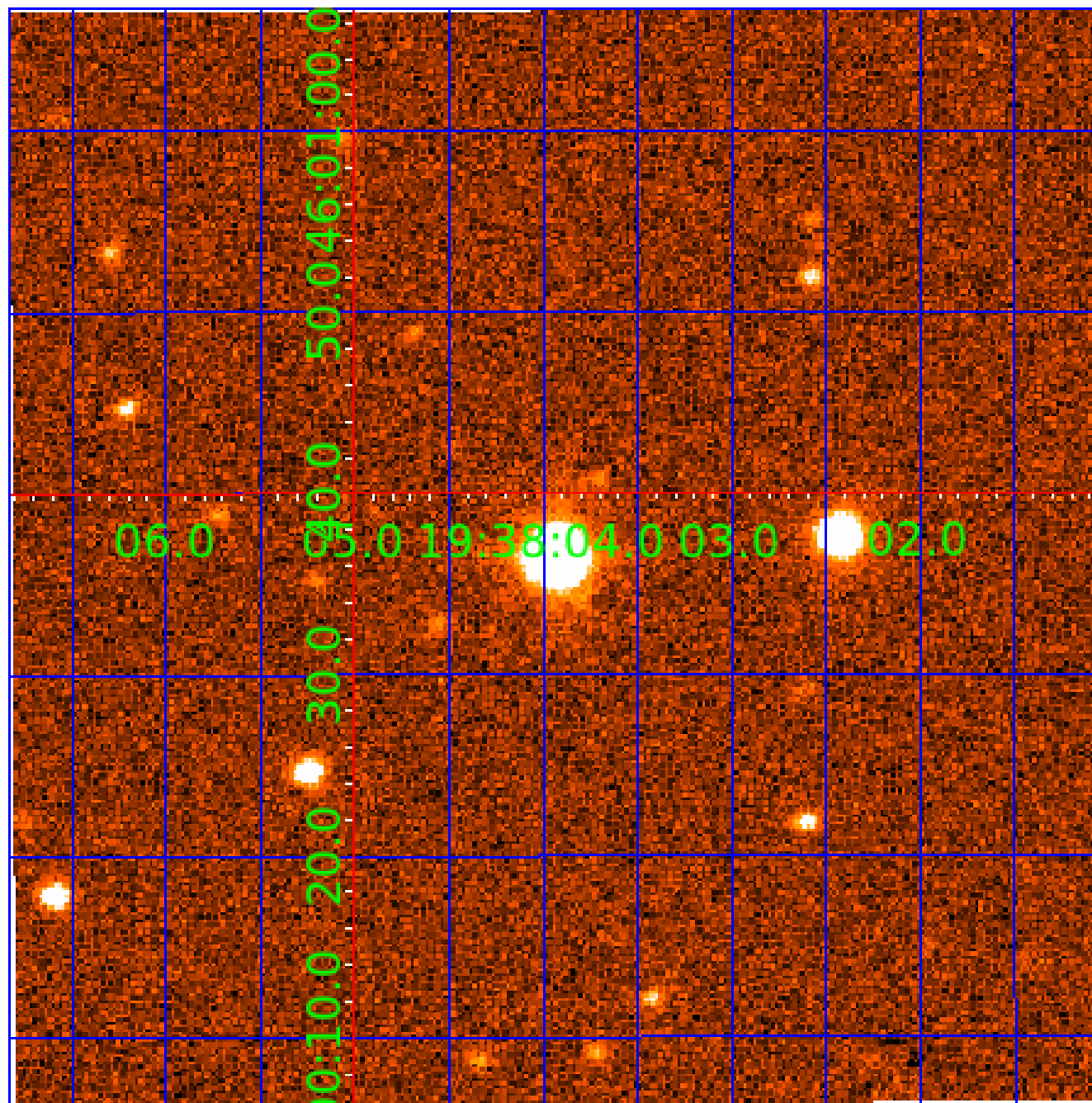


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\Delta$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 009471846

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009471846-01	OBS	No	2.377260	132.402215	20.0	3.857	7.7	7.3	2.29	7069	1.17	7081.87
009471846-02	OBS	No	0.792506	131.698644	15.8	3.051	8.7	8.1	2.29	7069	1.09	30637.06
009471846-03	OBS	No	308.407453	297.528650	181.5	7.805	8.1	7.6	2.29	7069	3.43	10.78
009471846-04	OBS	No	298.851305	344.279561	242.6	3.233	7.4	8.2	2.29	7069	4.09	11.24

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009471846-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE_ZUMA_TRACKER—SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
009471846-02	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD
009471846-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—INCONSISTENT_TRANS
009471846-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT

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

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

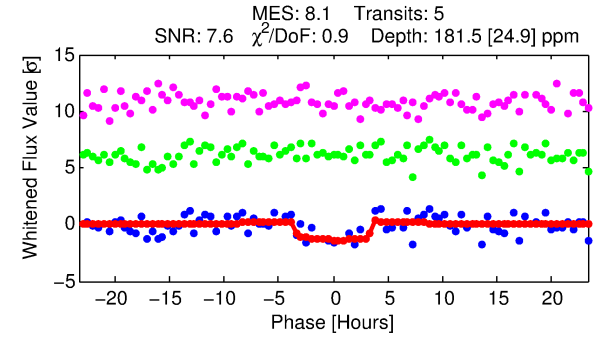
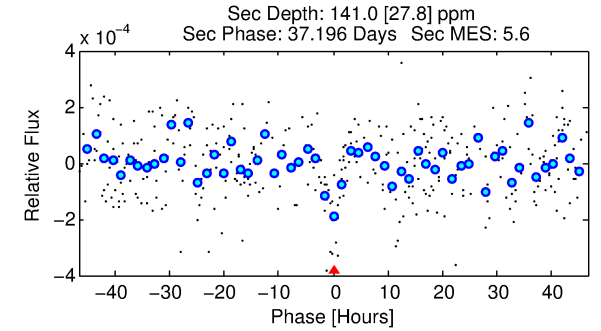
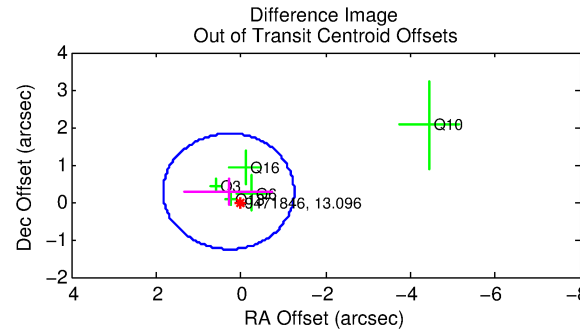
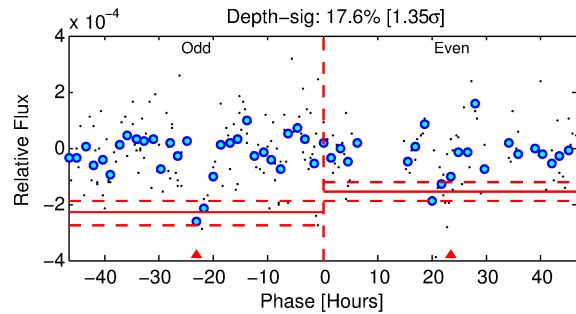
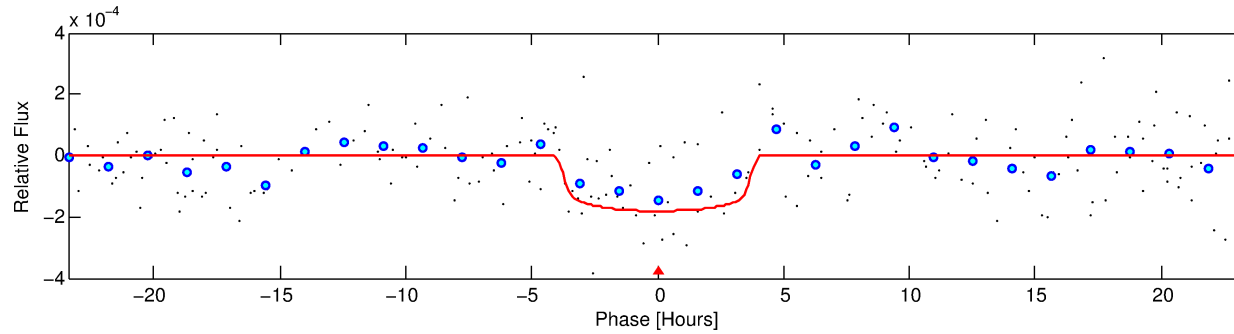
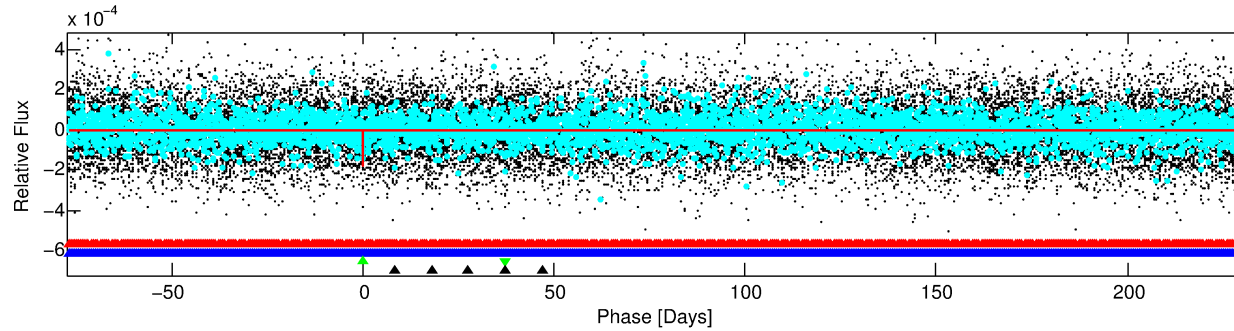
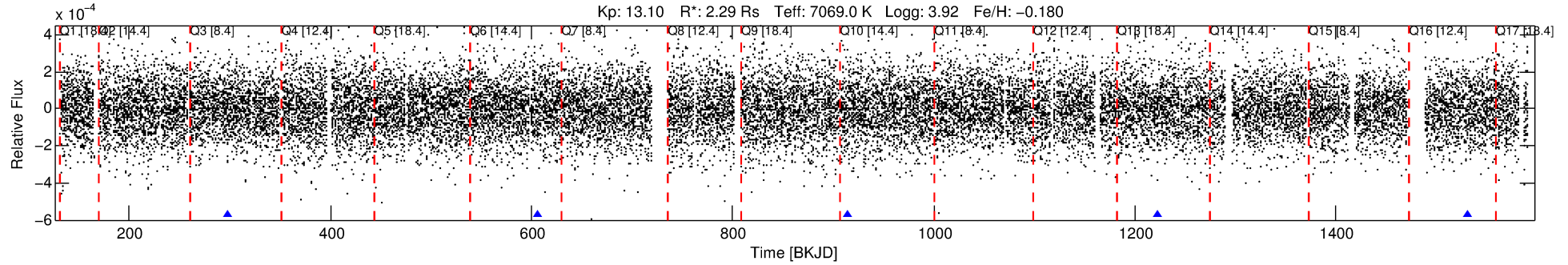
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009471846-03

No Significant Match Found

# DV One-Page Summary

KIC: 9471846 Candidate: 3 of 4 Period: 308.407 d



## DV Fit Results:

Period = 308.40745 [0.01191] d  
Epoch = 297.5286 [0.0224] BKJD  
Rp/R\* = 0.0138 [0.0056]  
a/R\* = 177.56 [420.03]  
b = 0.83 [0.90]  
Seff = 10.78 [4.60]  
Teq = 462 [49] K  
Rp = 3.43 [1.74] Re  
a = 1.0408 [0.2789] AU  
Ag = 7135.49 [6616.15] [1.08 $\sigma$ ]  
Teffp = 6566 [1389] K [4.39 $\sigma$ ]

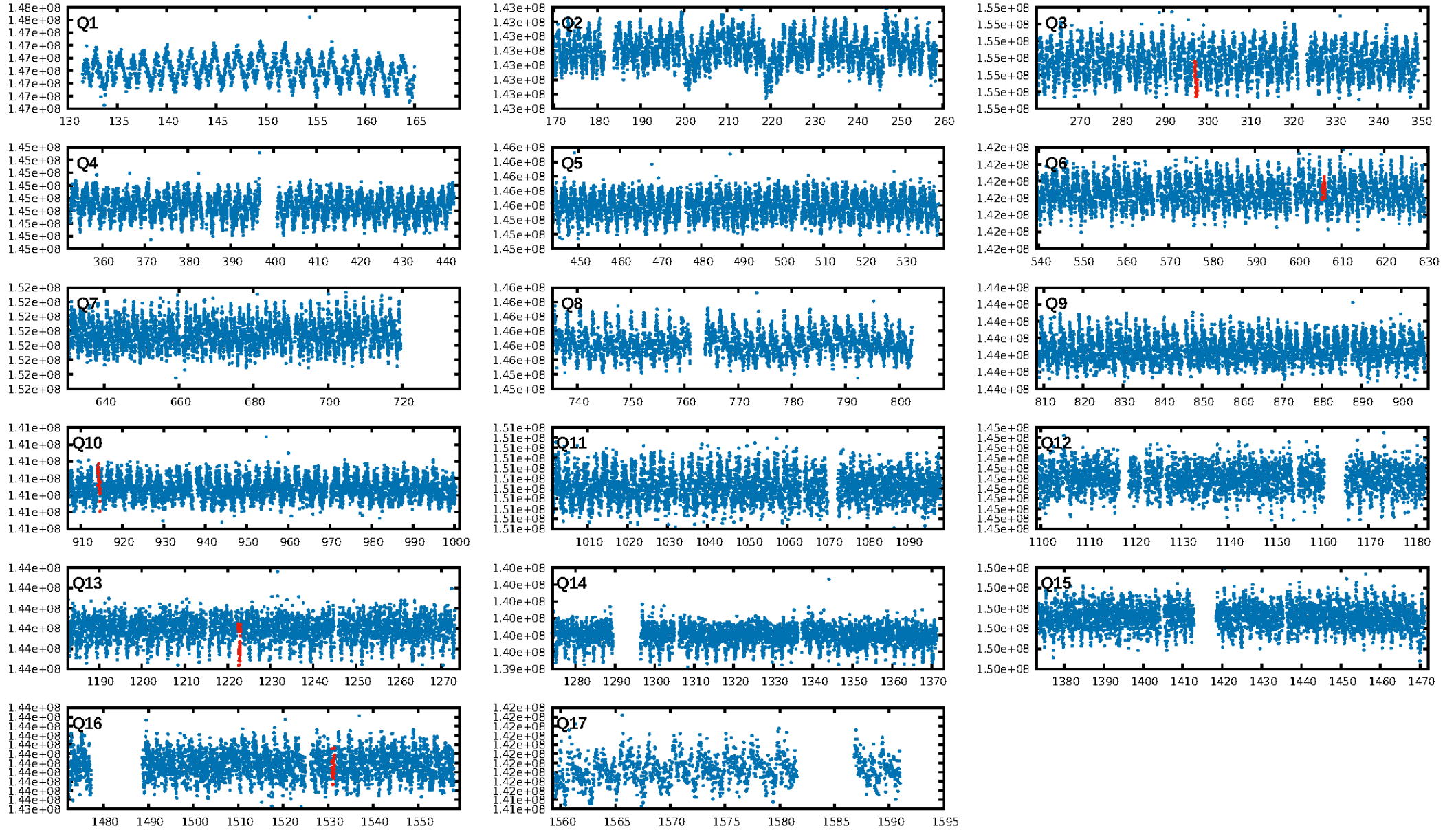
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [27.15 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 5.7%  
ModelChiSquareGof-sig: 100.0%  
**Bootstrap-pfa: 6.43e-12**  
RollingBand-fgt: 1.00 [5/5]  
GhostDiagnostic-chr: 1.378  
Centroid-sig: 24.0%  
Centroid-so: 1.246 arcsec [1.17 $\sigma$ ]  
OotOffset-rm: 0.403 arcsec [0.78 $\sigma$ ]  
KicOffset-rm: 0.471 arcsec [1.61 $\sigma$ ]  
OotOffset-st: 2/1/1/1 [5]  
KicOffset-st: 2/1/1/1 [5]  
DiffImageQuality-fgm: 0.60 [3/5]  
DiffImageOverlap-fno: 0.00 [0/5]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 02-Feb-2016 16:28:41 Z

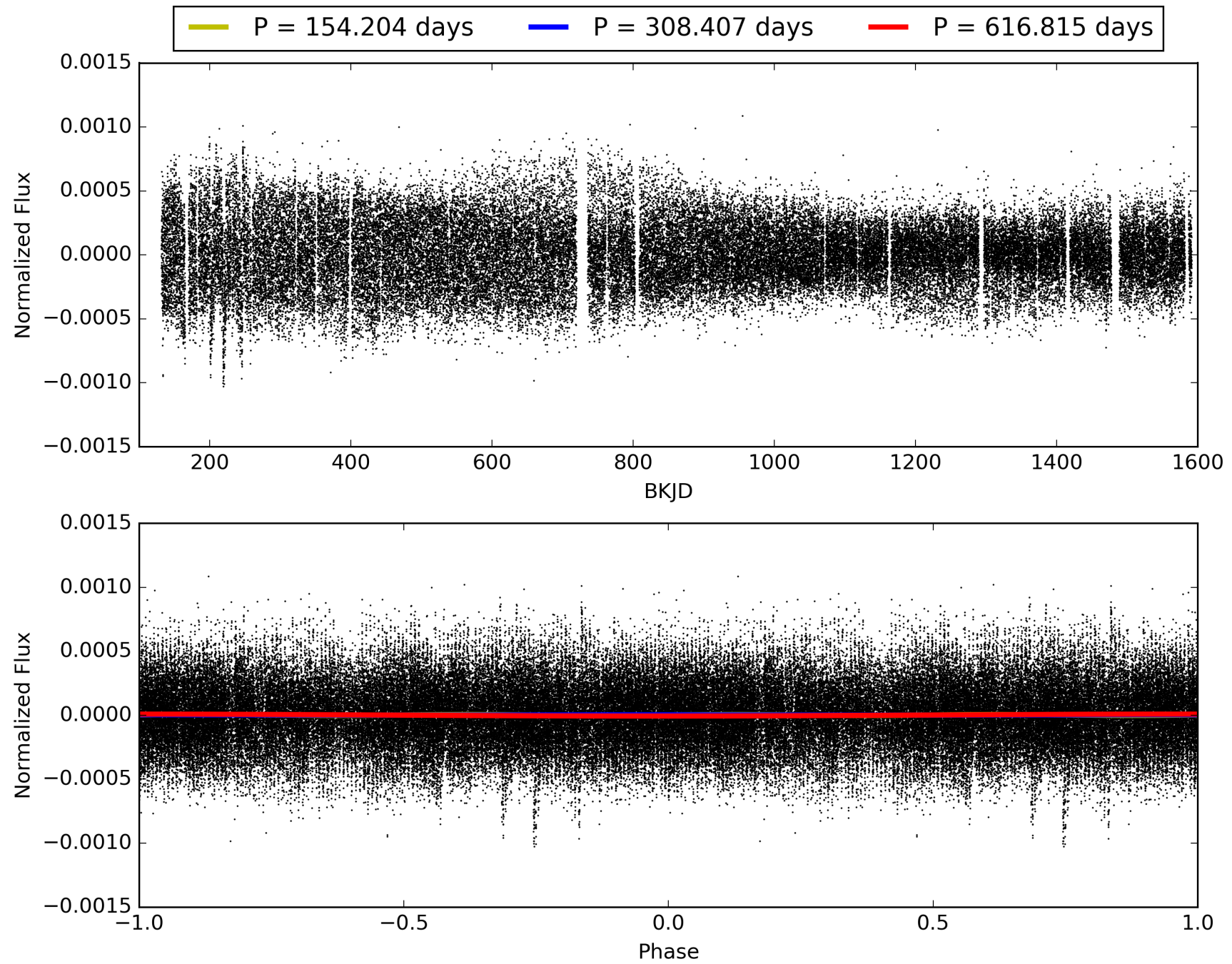
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 009471846-03, PDC Light Curves



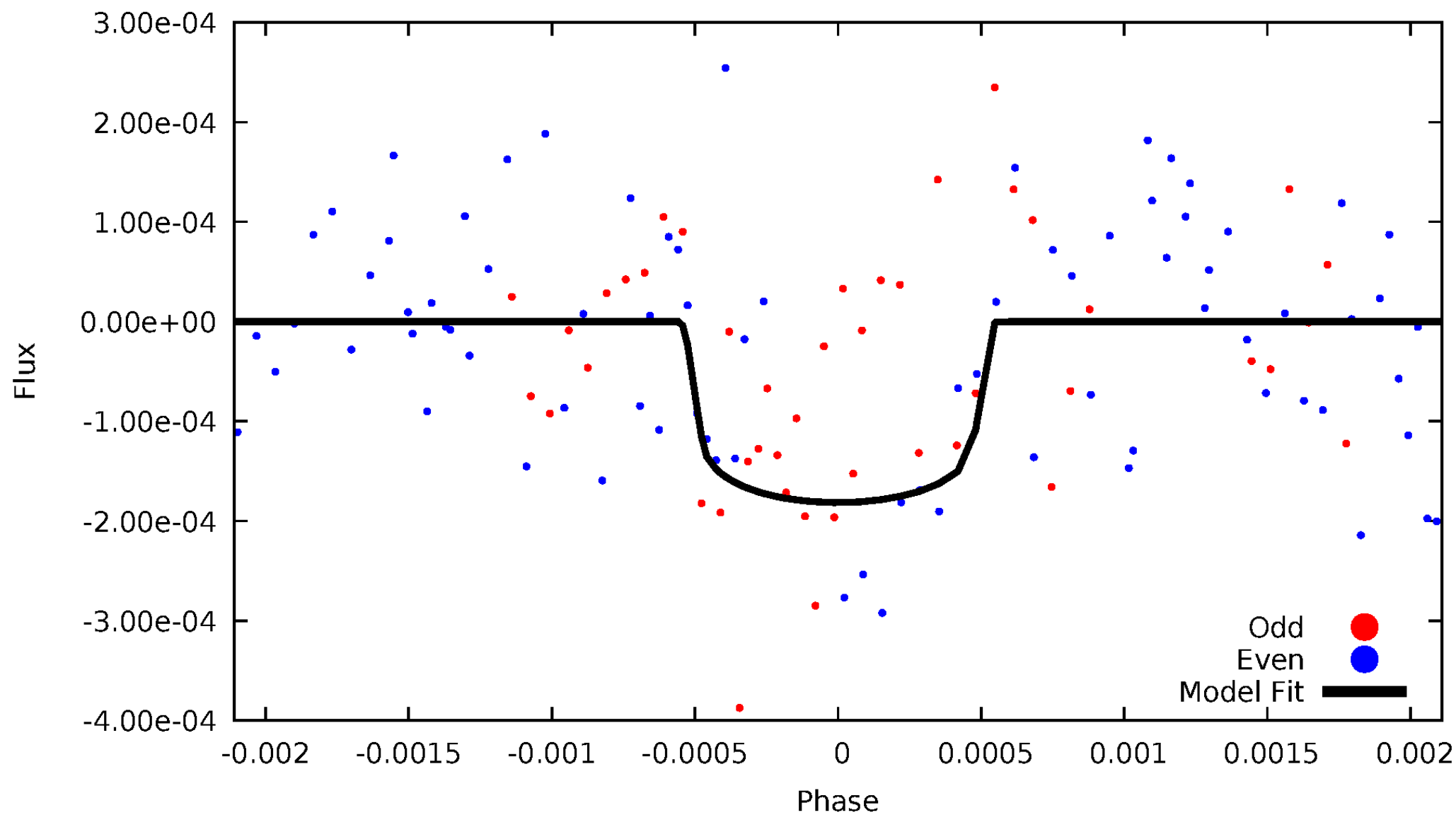


TCE 009471846-03



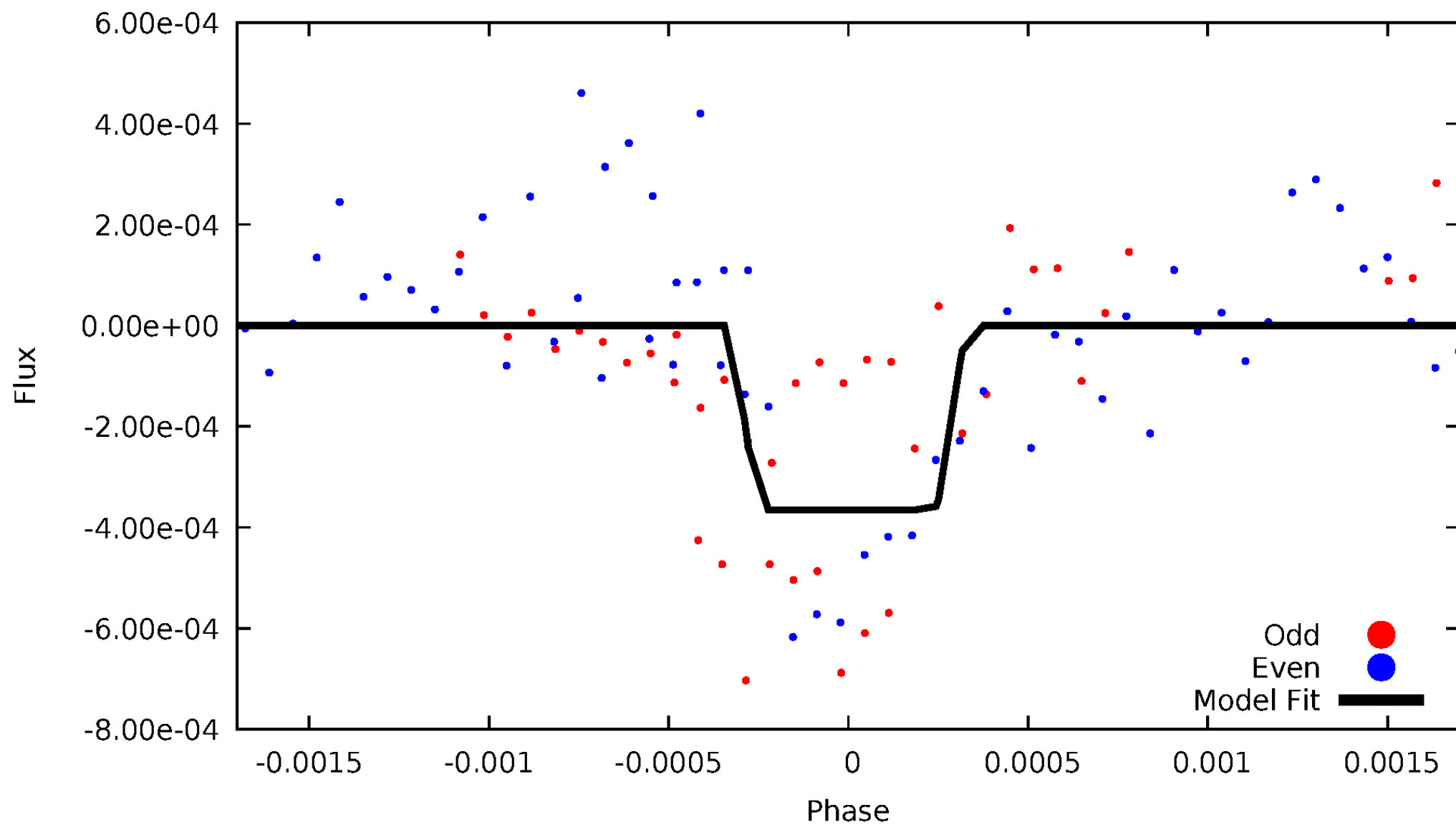
# DV Odd/Even

TCE 009471846-03

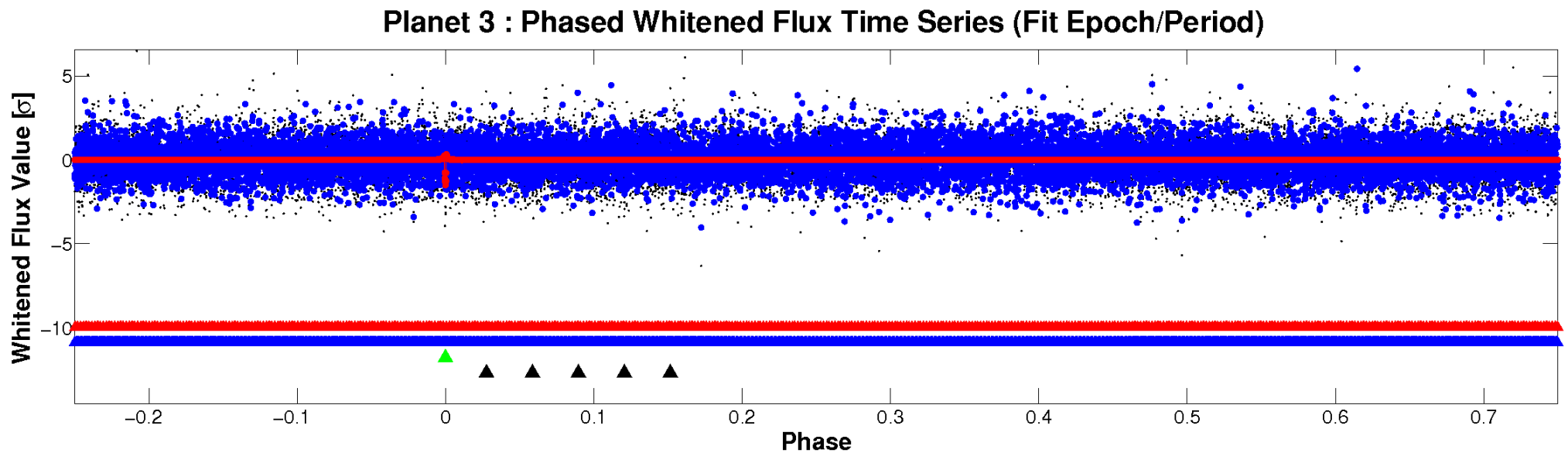
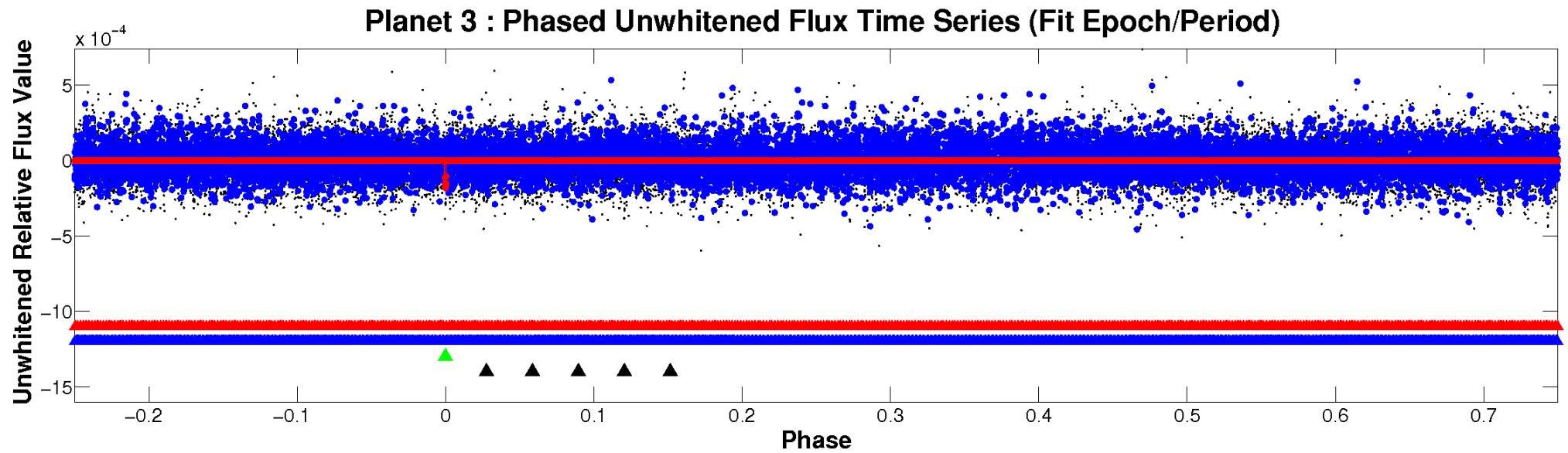


# ALT Odd/Even

TCE 009471846-03

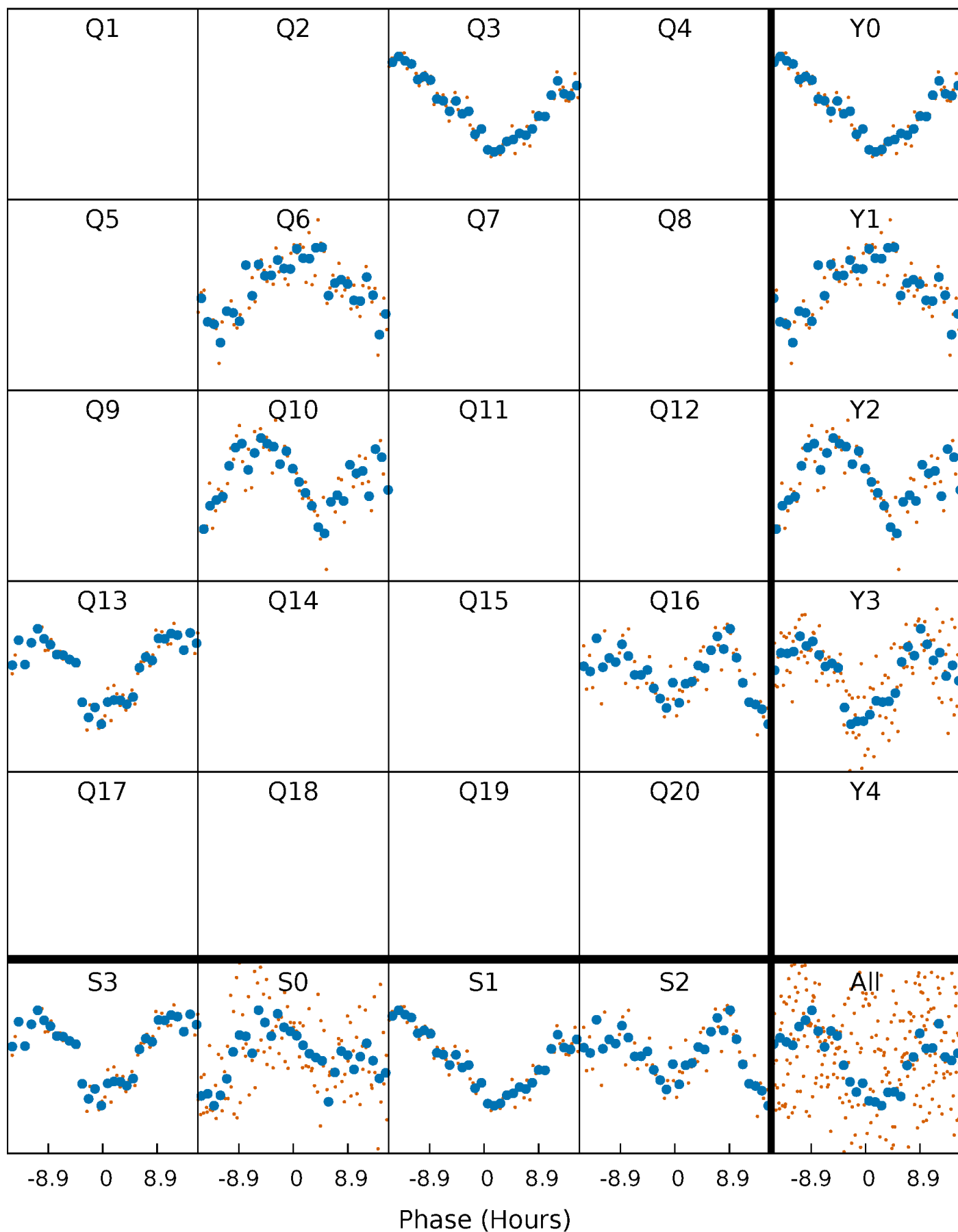


# Non-Whitened Vs. Whitened Light Curve



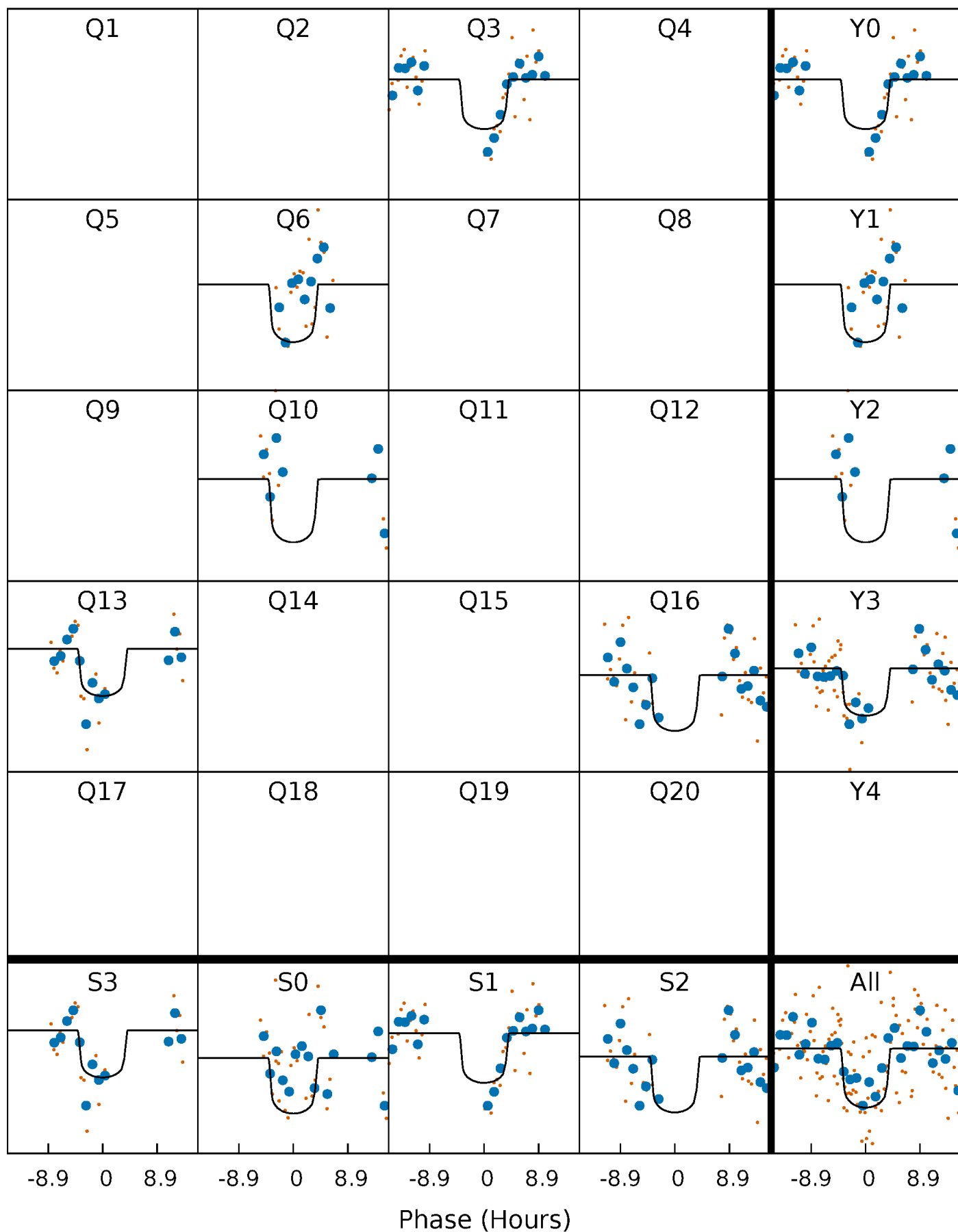
# PDC Quarter-Phased Transit Curves

TCE 009471846-03     $P=308.407453$  Days     $T_0=297.528650$  (BKJD)



# DV Quarter-Phased Transit Curves

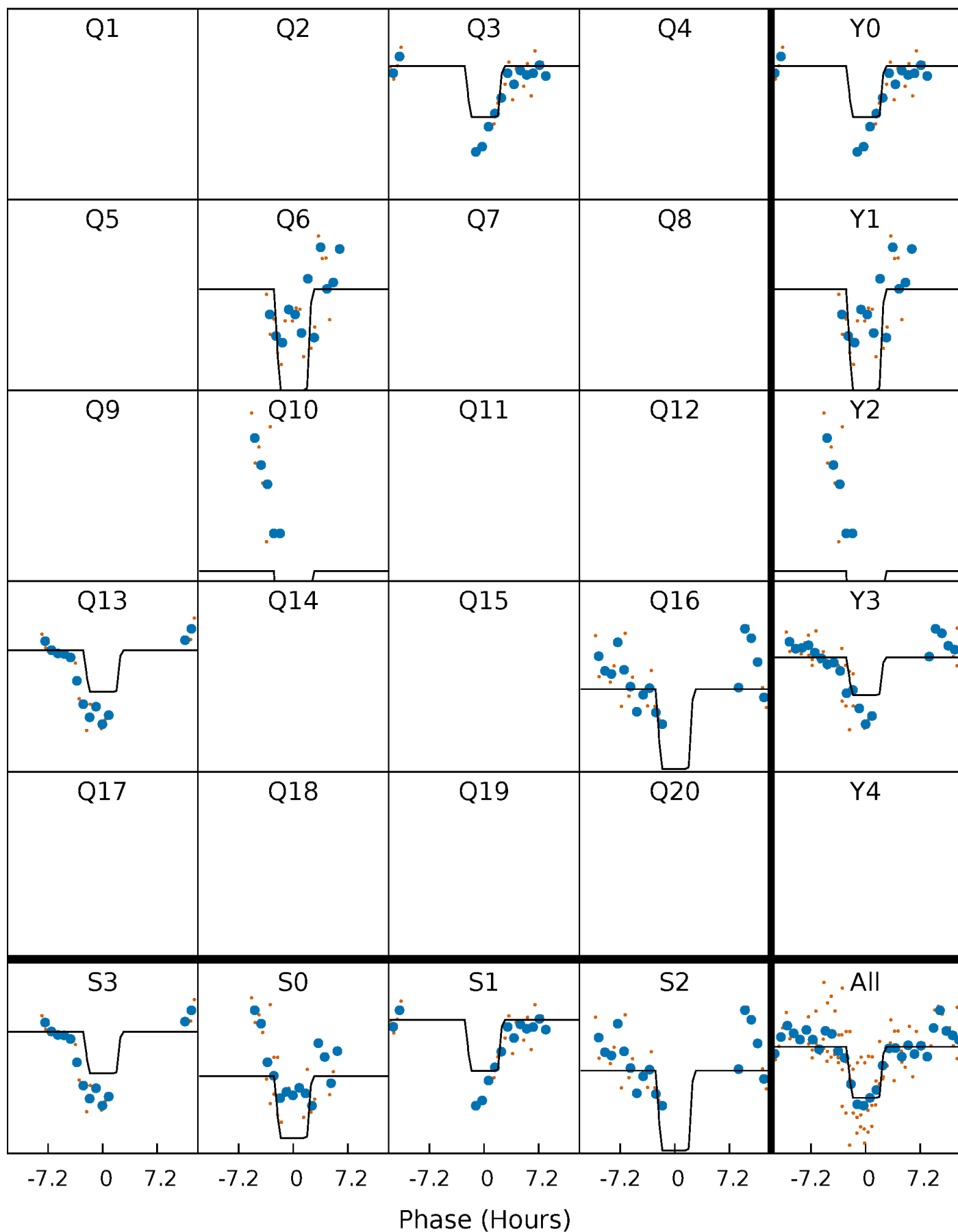
TCE 009471846-03     $P=308.407453$  Days     $T_0=297.528650$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

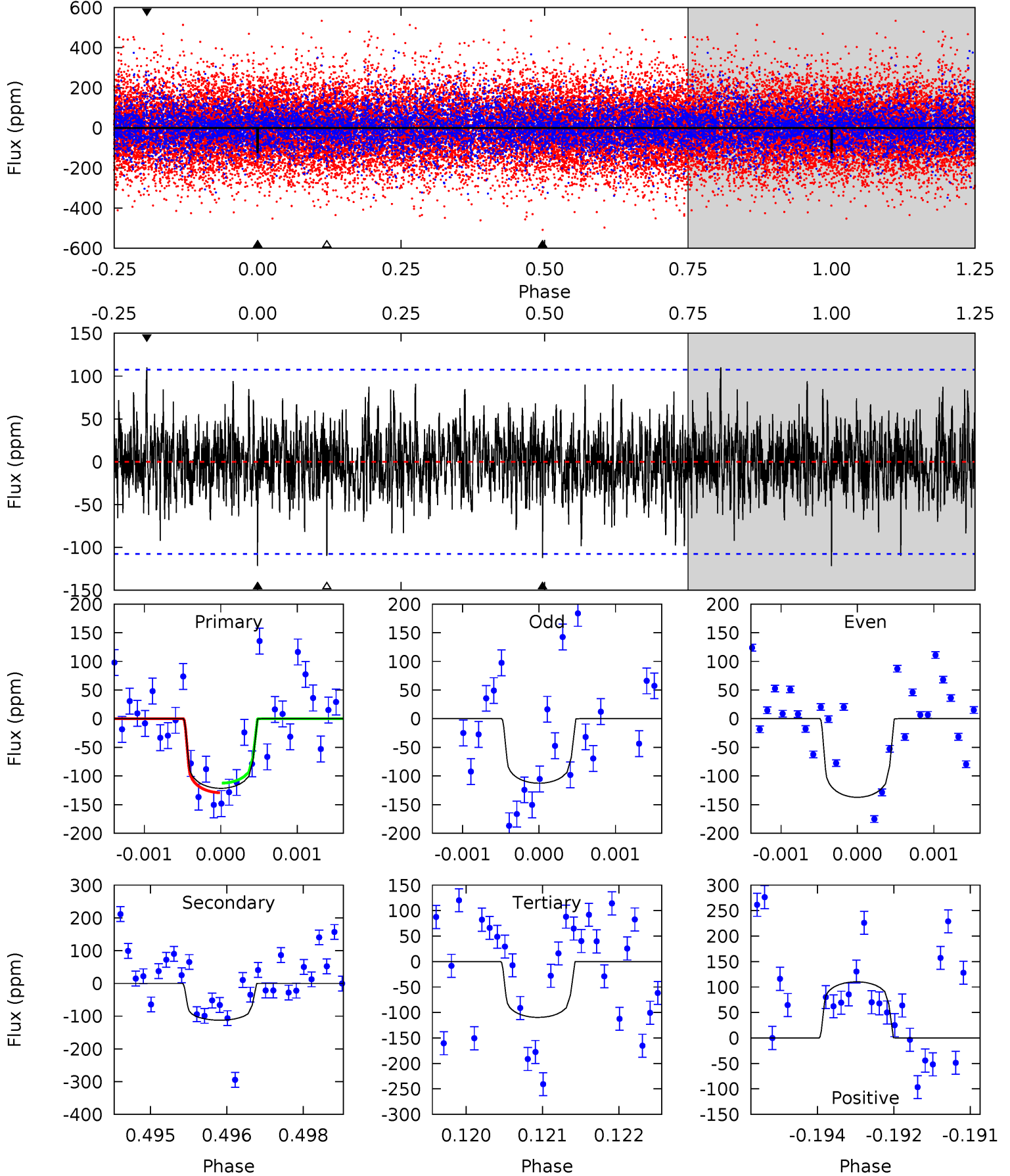
TCE 009471846-03 P=308.383287 Days  $T_0=297.582877$  (BKJD)



# DV Model-Shift Uniqueness Test

009471846-03, P = 308.407453 Days, E = 297.528650 Days

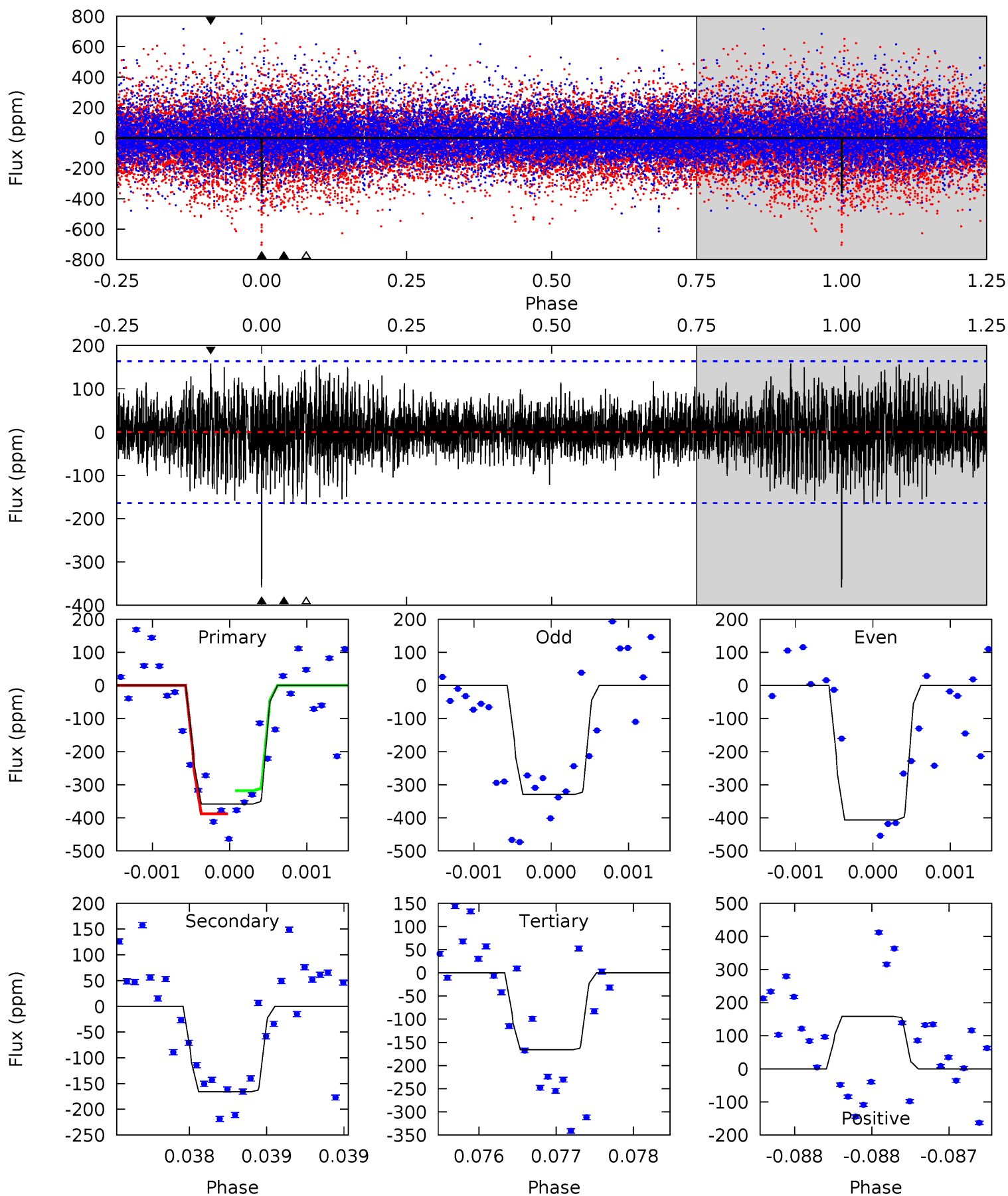
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
6.14	5.67	5.53	5.56	5.43	3.25	1.45	0.60	0.57	0.14	0.11	0.61	0.72	0.48	0.42



# Alt Model-Shift Uniqueness Test

009471846-03, P = 308.383287 Days, E = 297.582877 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
12.1	5.62	5.61	5.35	5.54	3.43	1.52	6.49	6.76	0.00	0.27	1.27	1.04	0.31	1.16



### Stellar Parameters For KIC 009471846

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7069^{+197}_{-246}$	$3.919^{+0.227}_{-0.122}$	$-0.180^{+0.300}_{-0.300}$	$2.285^{+0.466}_{-0.698}$	$1.578^{+0.208}_{-0.278}$	$0.186^{+0.254}_{-0.069}$
	+3%/-3%	+6%/-3%	+167%/-167%	+20%/-31%	+13%/-18%	+136%/-37%
Source	PHO1	FLK73	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 009471846-03 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-112 \pm 20$	$3.36^{+1.45}_{-1.39}$	$638^{+38}_{-51}$	$6132^{+1877}_{-947}$	$5807^{+11079}_{-3003}$
Alt.	$-166 \pm 30$	$4.60^{+1.62}_{-1.53}$	$636^{+45}_{-48}$	$5744^{+1202}_{-672}$	$4557^{+5902}_{-2077}$

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

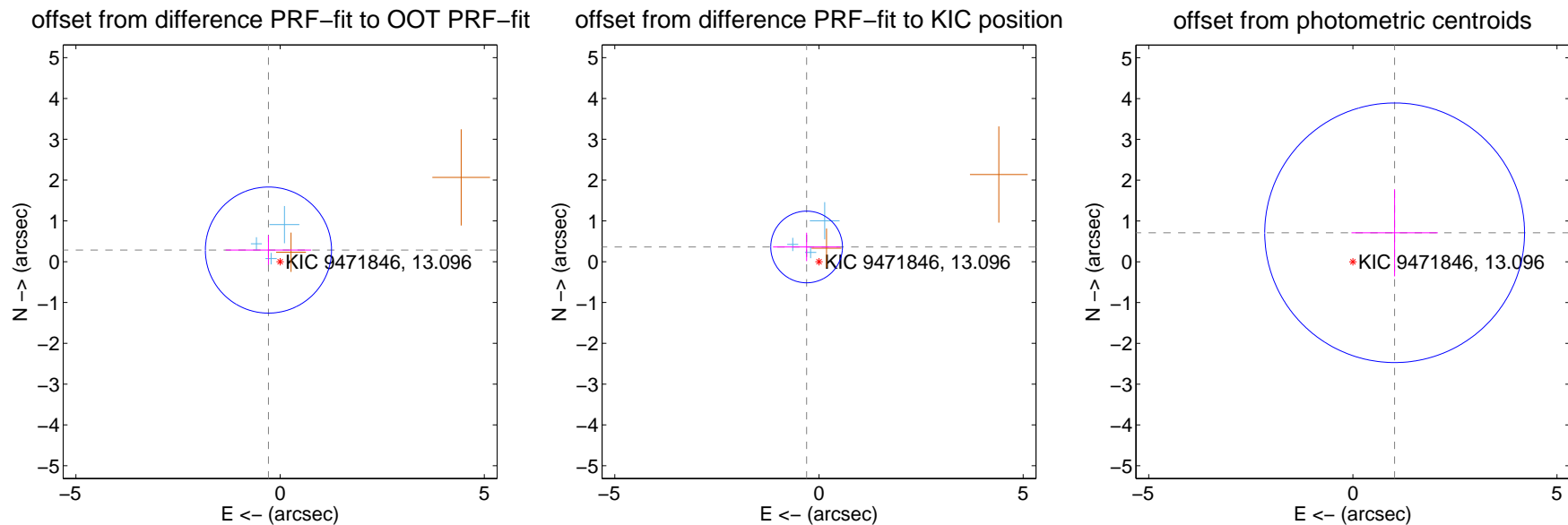
## DV Centroid Data

Supplemental centroid analysis for 009471846-03. Kepler magnitude: 13.10. Transit SNR 7.62

There are 3 quarters with good PRF difference image offsets

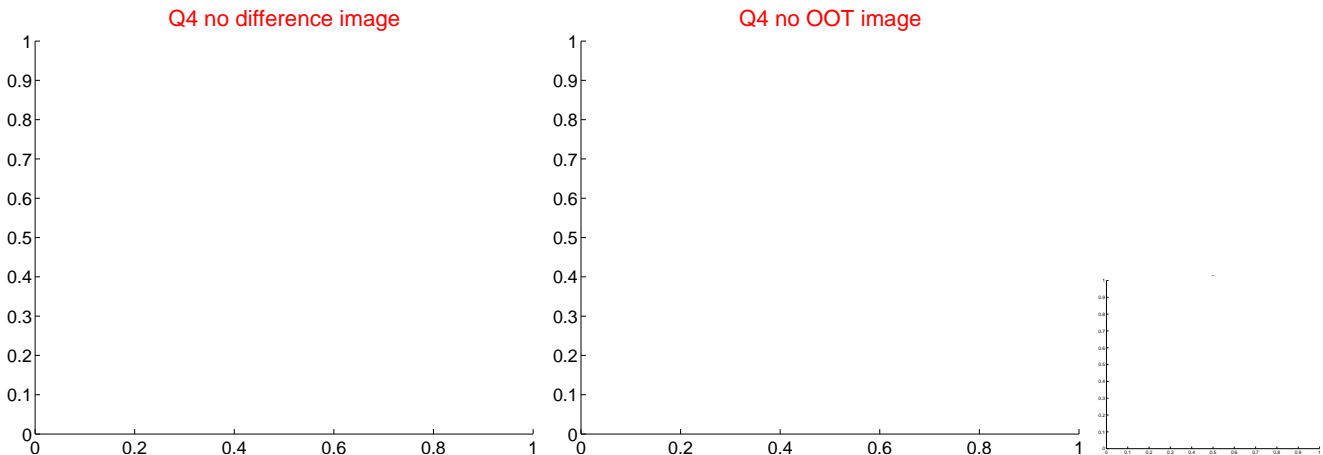
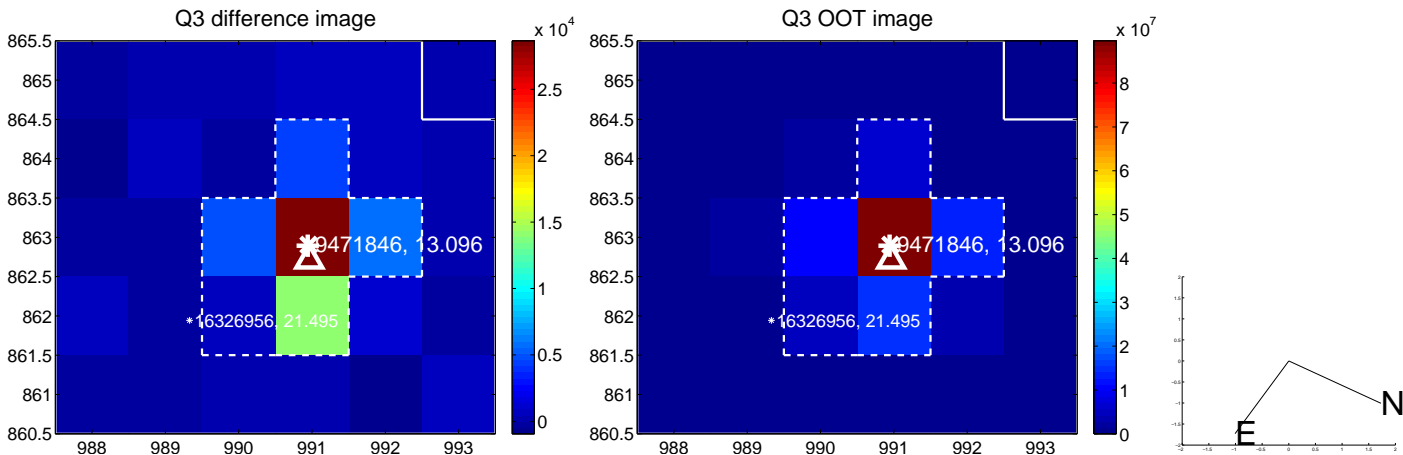
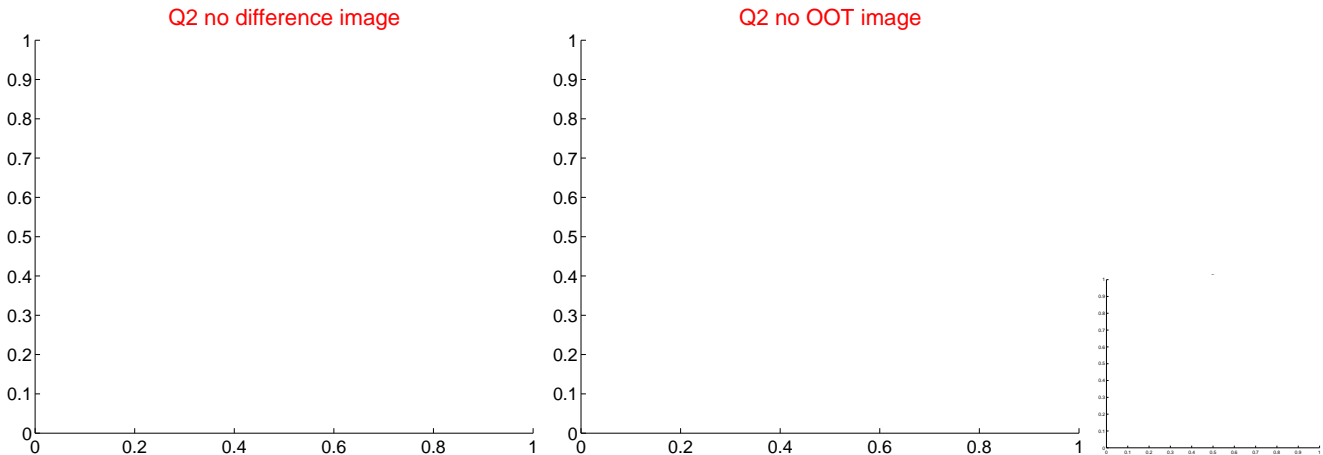
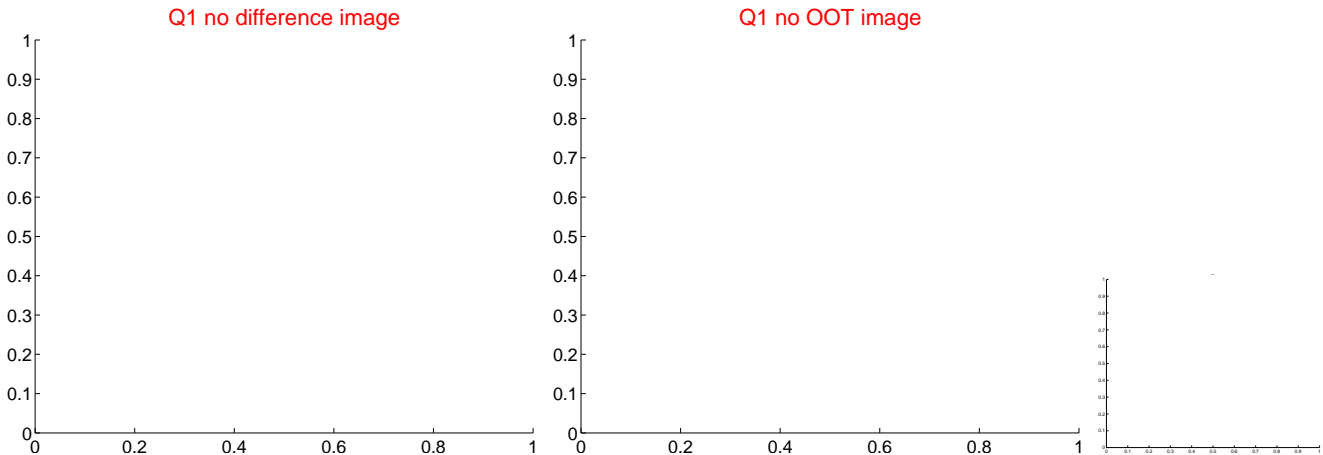
The direct PRF centroid is offset from the target star catalog position by about 0.10 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.403 \pm 0.515$	0.78	$0.285 \pm 1.049$	$0.285 \pm 0.360$
PRF-fit source offset from KIC position	$0.471 \pm 0.293$	1.61	$0.303 \pm 0.823$	$0.361 \pm 0.348$
photometric centroid source offset	$1.25 \pm 1.06$	1.17	$-1.02 \pm 1.06$	$0.71 \pm 1.07$



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.

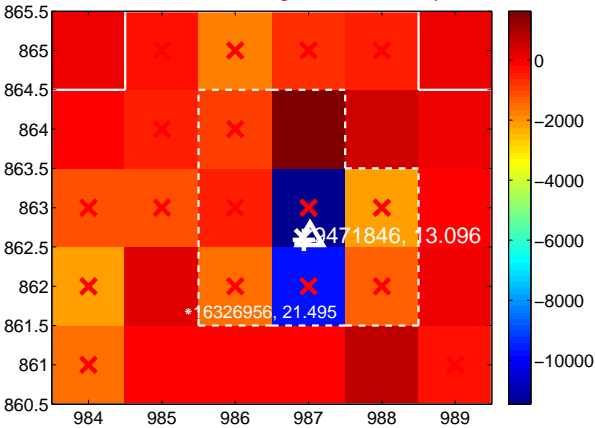
Q5 no difference image



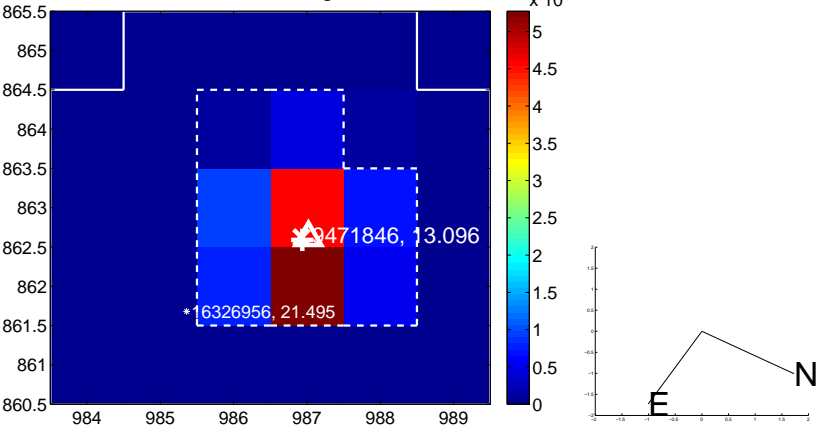
Q5 no OOT image



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.

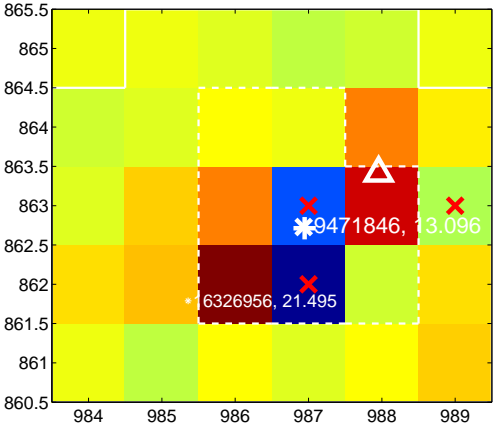
Q9 no difference image



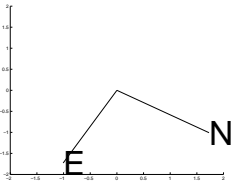
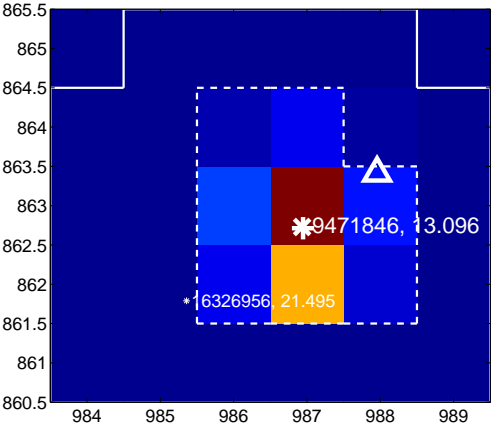
Q9 no OOT image



Q10 difference image. Poor Quality



Q10 OOT image



Q11 no difference image



Q11 no OOT image



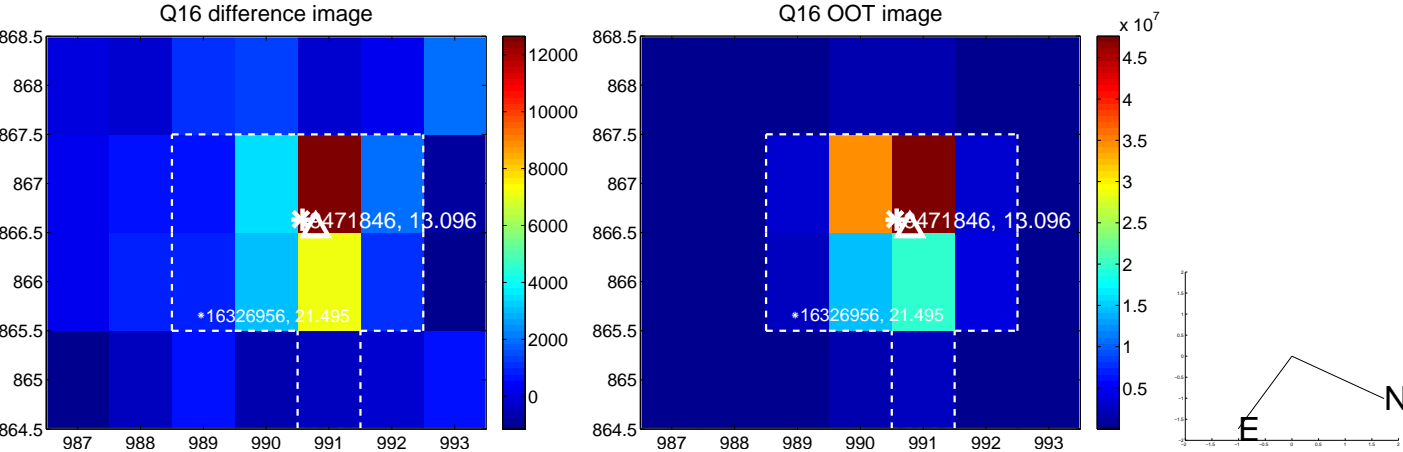
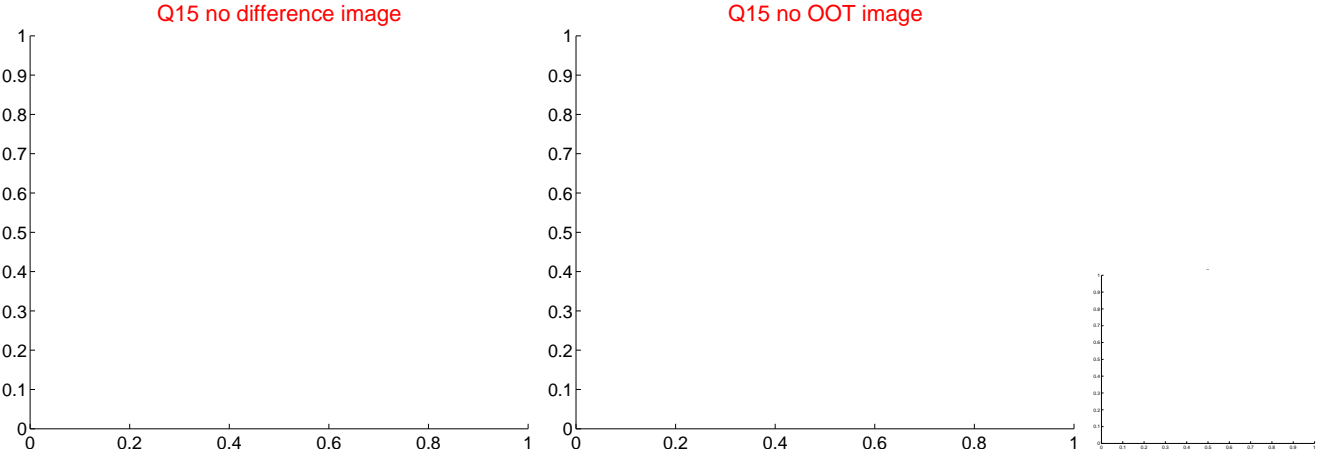
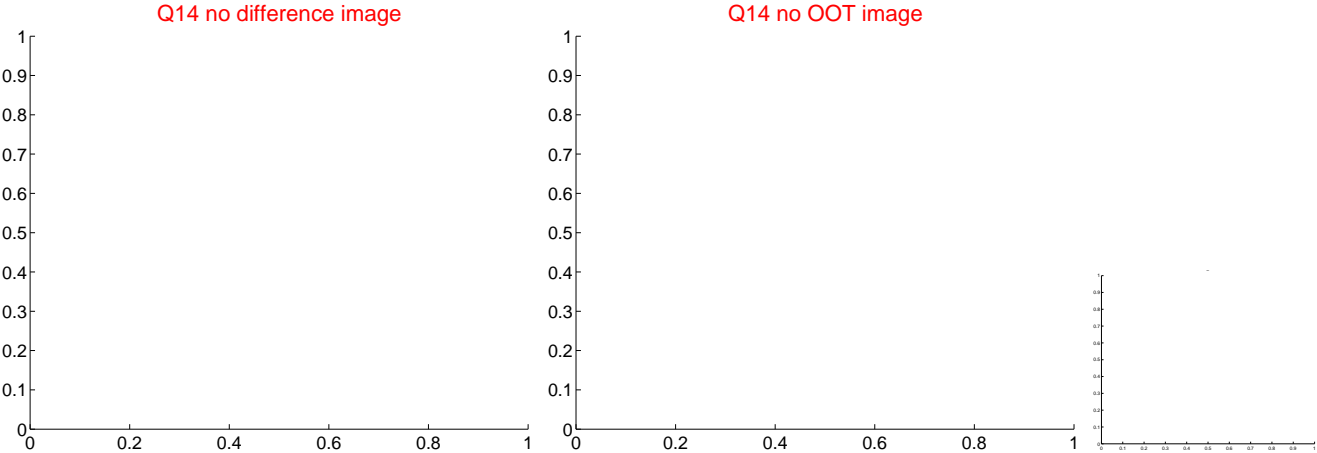
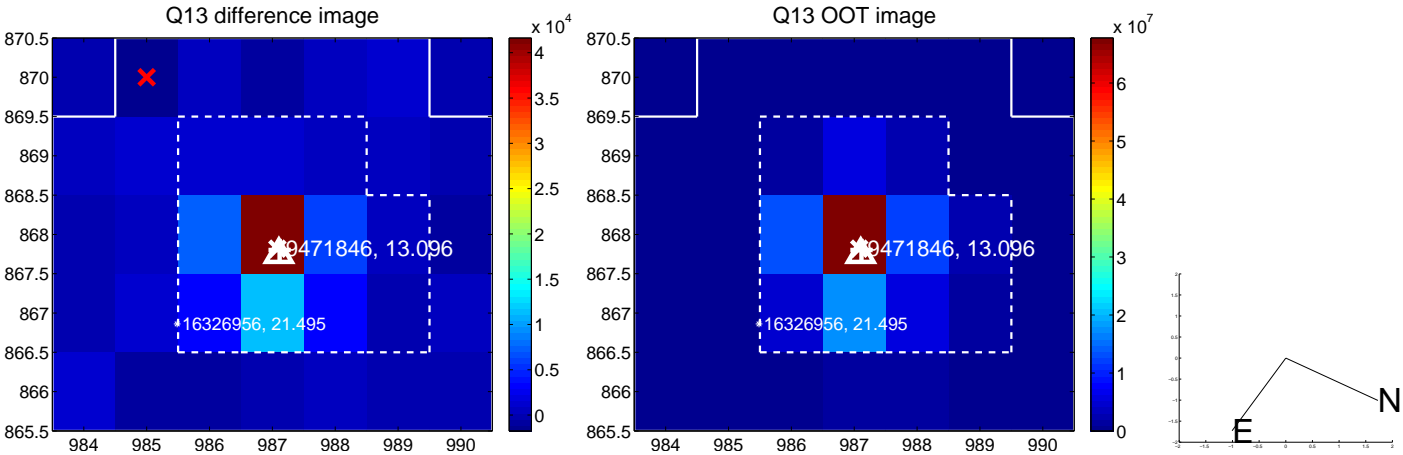
Q12 no difference image



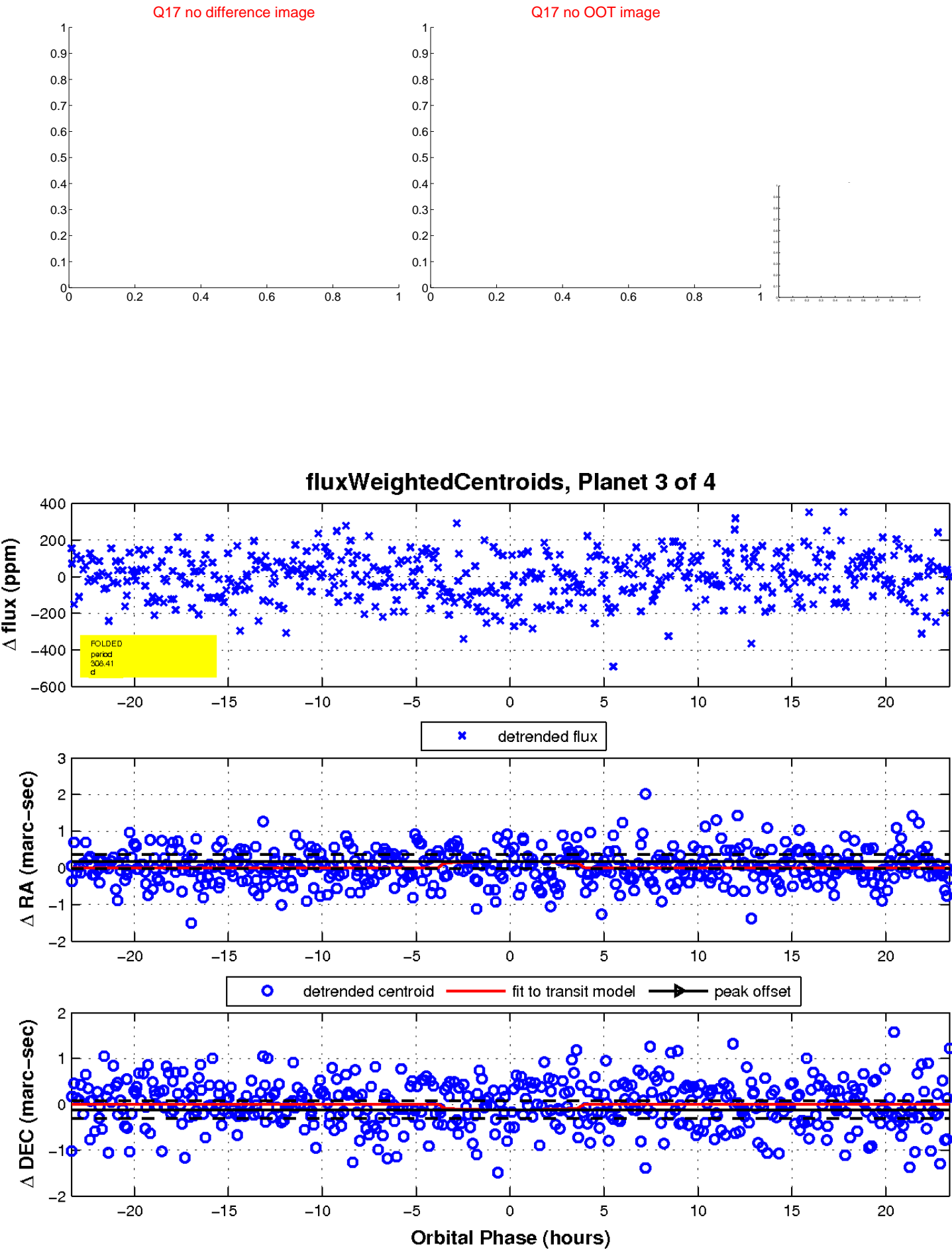
Q12 no OOT image



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

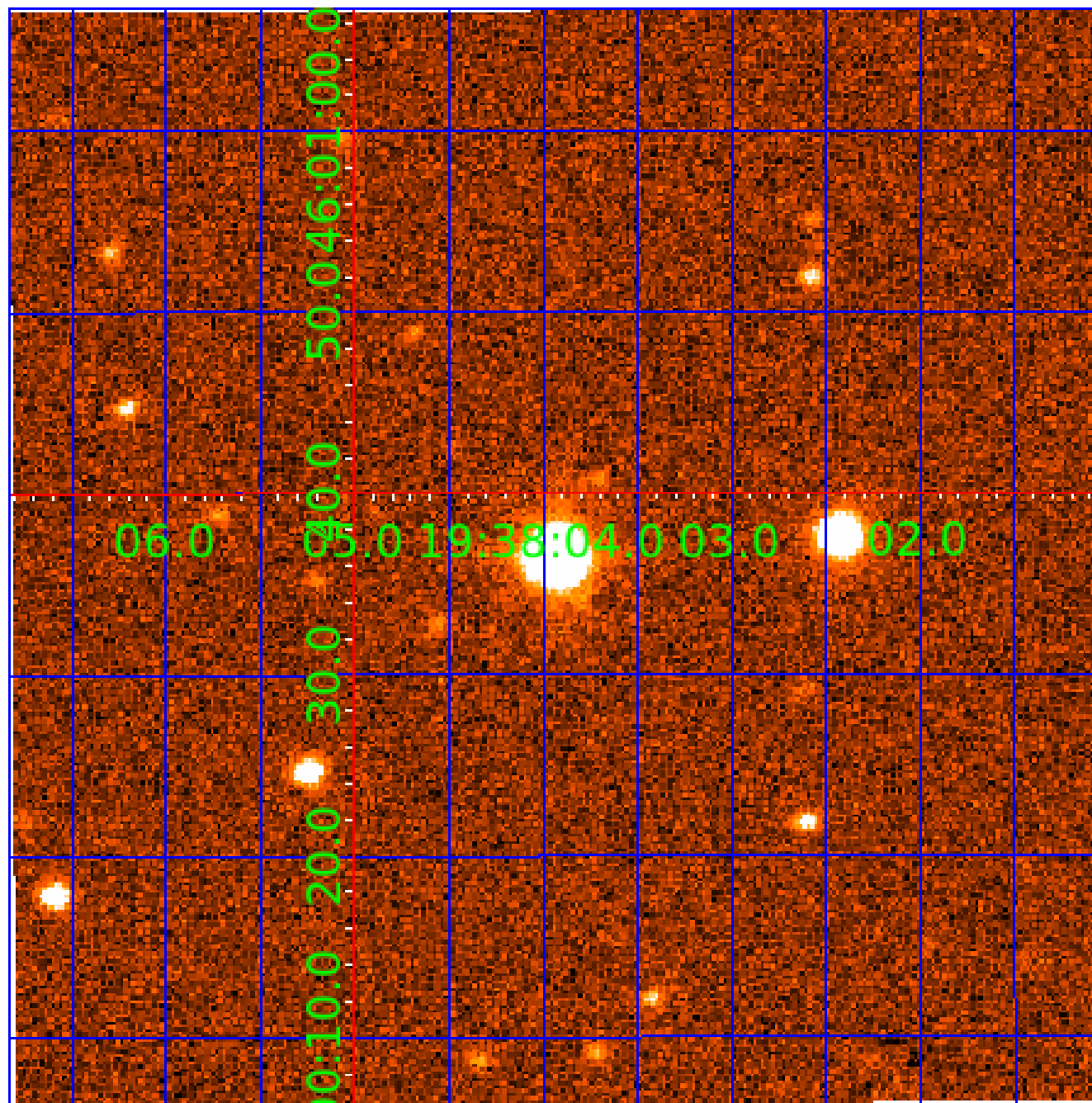


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 009471846

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009471846-01	OBS	No	2.377260	132.402215	20.0	3.857	7.7	7.3	2.29	7069	1.17	7081.87
009471846-02	OBS	No	0.792506	131.698644	15.8	3.051	8.7	8.1	2.29	7069	1.09	30637.06
009471846-03	OBS	No	308.407453	297.528650	181.5	7.805	8.1	7.6	2.29	7069	3.43	10.78
009471846-04	OBS	No	298.851305	344.279561	242.6	3.233	7.4	8.2	2.29	7069	4.09	11.24

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009471846-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE_ZUMA_TRACKER—SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
009471846-02	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD
009471846-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_NONUNIQ_ALT—INCONSISTENT_TRANS
009471846-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_ALT—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT

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

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

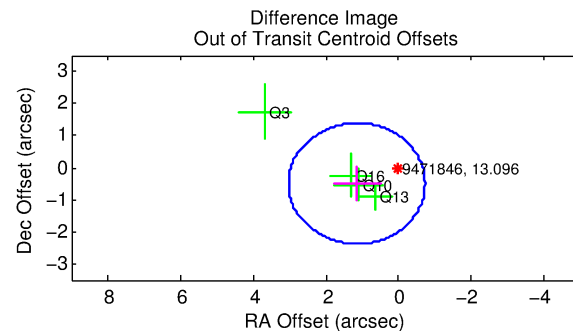
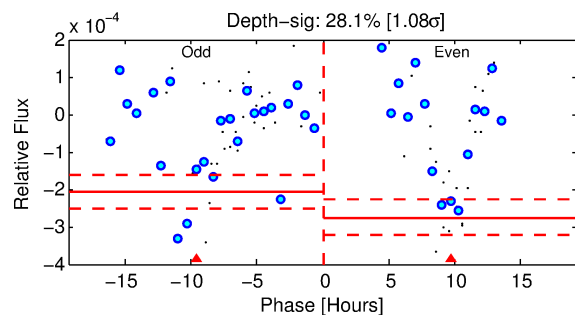
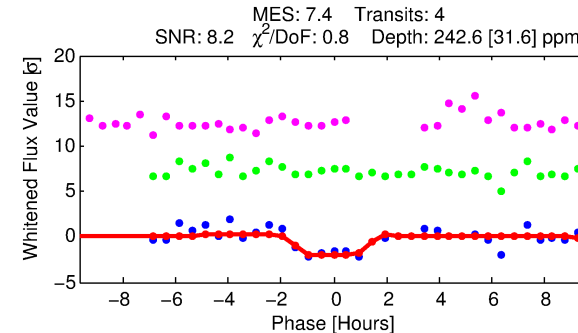
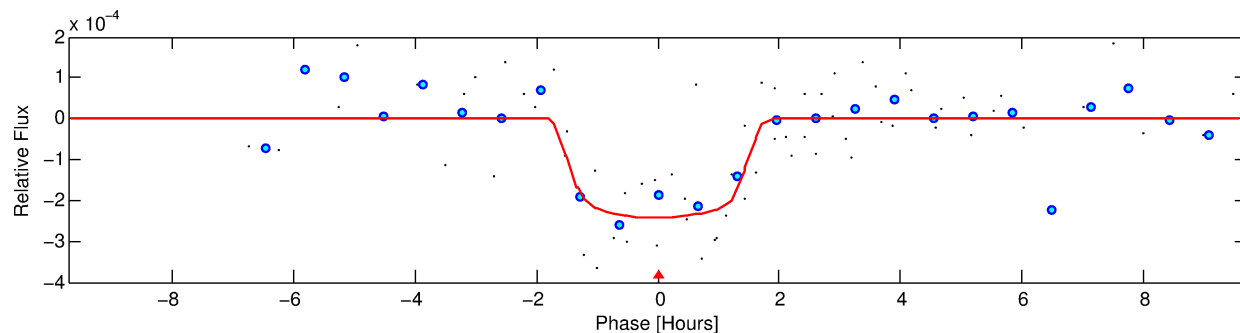
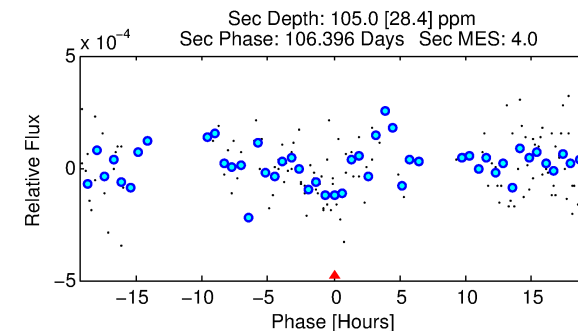
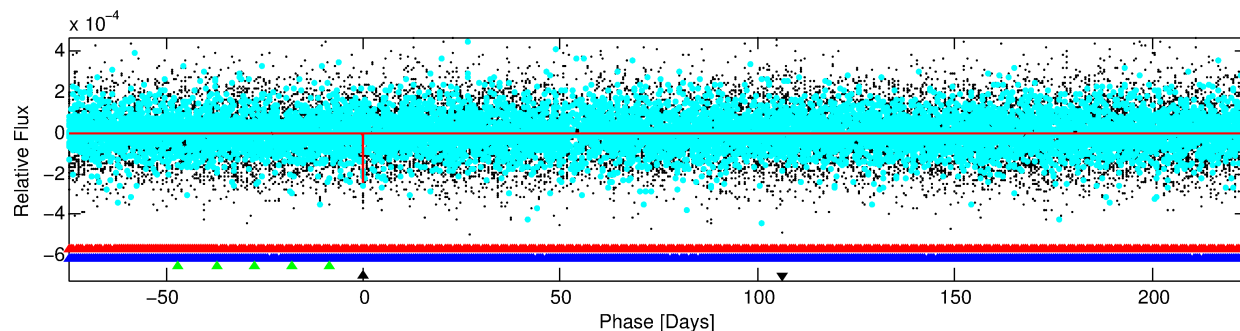
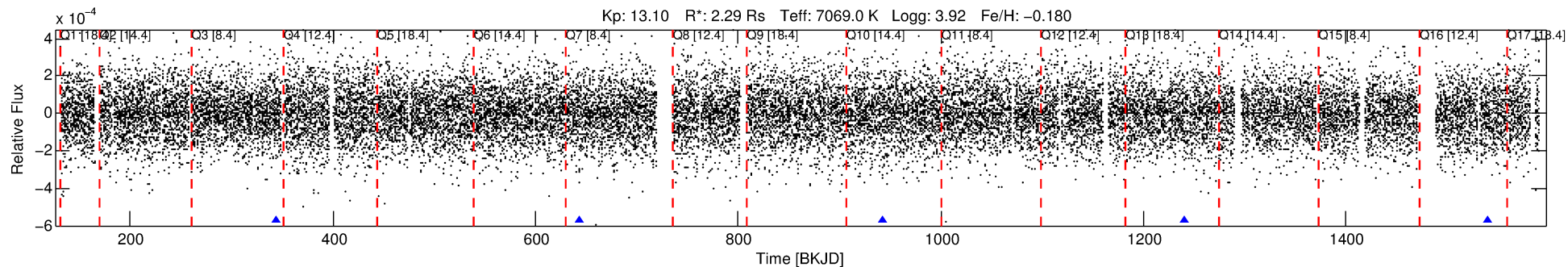
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009471846-04

No Significant Match Found

# DV One-Page Summary

KIC: 9471846 Candidate: 4 of 4 Period: 298.851 d



## DV Fit Results:

Period = 298.85131 [0.00391] d  
Epoch = 344.2796 [0.0090] BKJD  
Rp/R\* = 0.0164 [0.0103]  
a/R\* = 358.92 [1318.07]  
b = 0.88 [0.95]  
Seff = 11.25 [4.80]  
Teq = 467 [50] K  
Rp = 4.09 [2.85] Re  
a = 1.0192 [0.2732] AU  
Ag = 3590.72 [4823.74] [0.74σ]  
Teff = 5589 [1801] K [2.84σ]

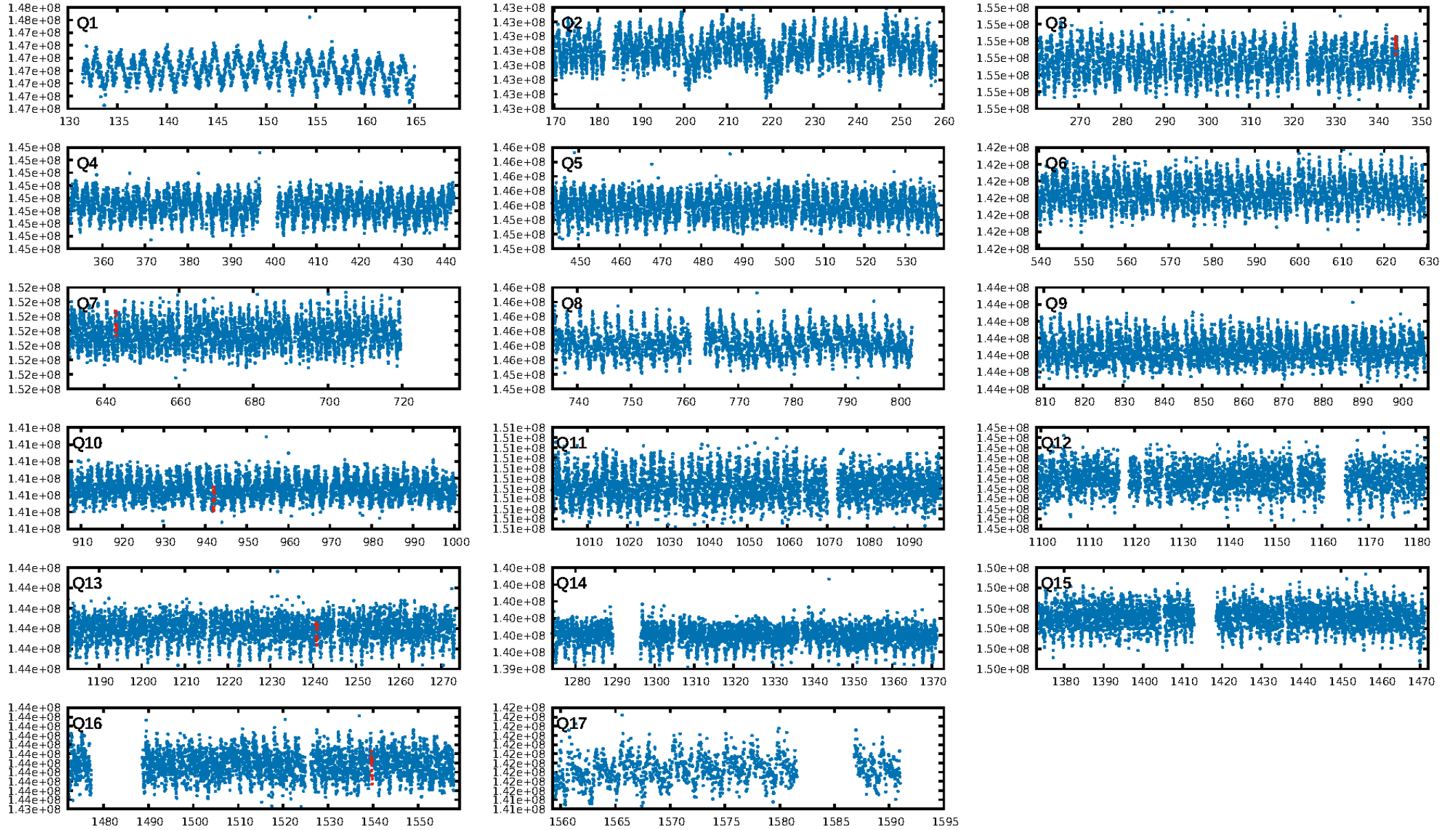
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [1413.82σ]  
LongPeriod-sig: 100.0% [27.15σ]  
ModelChiSquare2-sig: 19.0%  
ModelChiSquareGof-sig: 97.6%  
**Bootstrap-pfa: 1.47e-09**  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: -0.5338  
Centroid-sig: 26.3%  
Centroid-so: 1.165 arcsec [0.93σ]  
OotOffset-rm: 1.250 arcsec [1.99σ]  
KicOffset-rm: 1.186 arcsec [1.94σ]  
OotOffset-st: 1/1/1/1 [4]  
KicOffset-st: 1/1/1/1 [4]  
DiffImageQuality-fgm: 0.75 [3/4]  
DiffImageOverlap-fno: 0.00 [0/5]

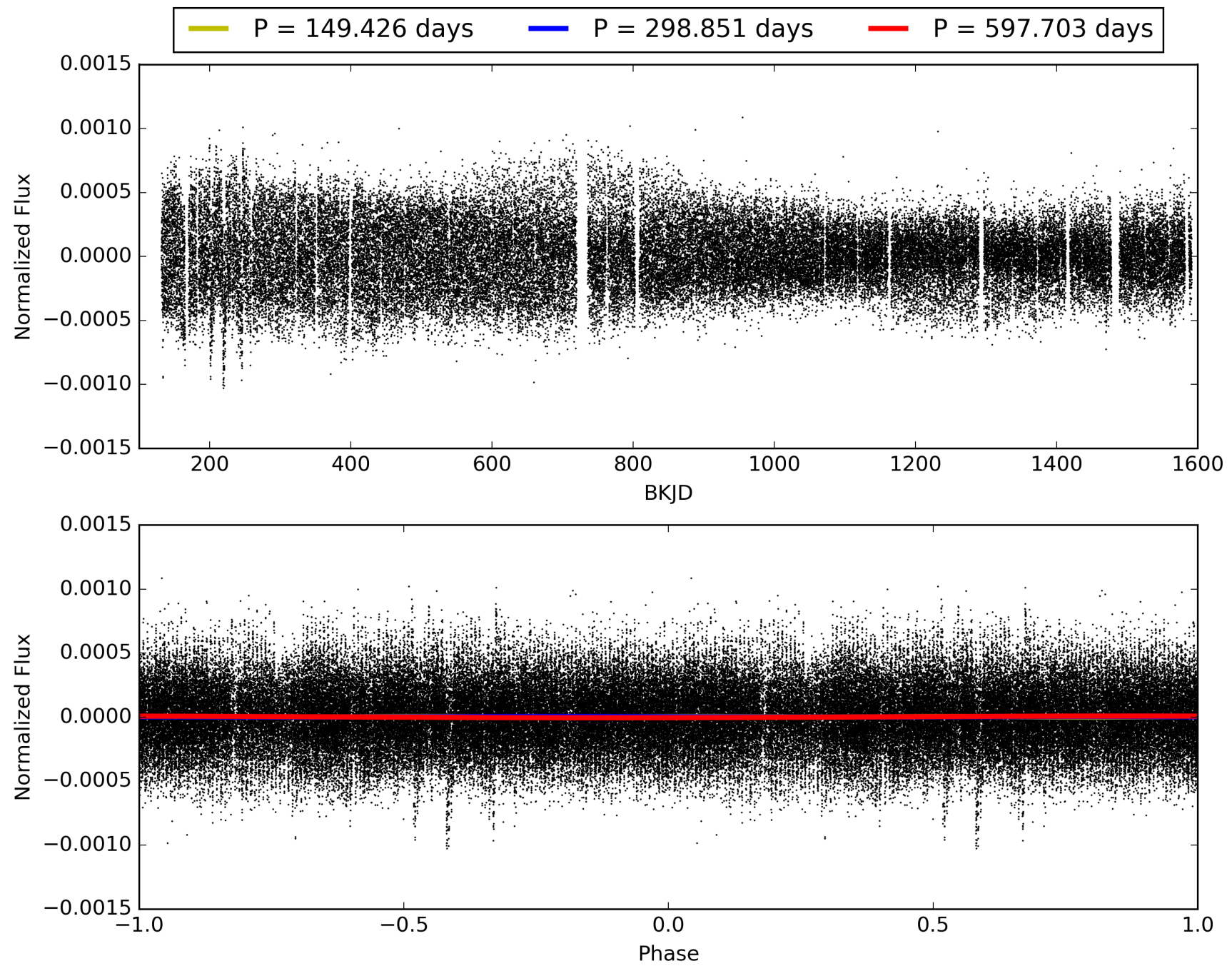
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 02-Feb-2016 16:28:49 Z

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

# TCE 009471846-04, PDC Light Curves

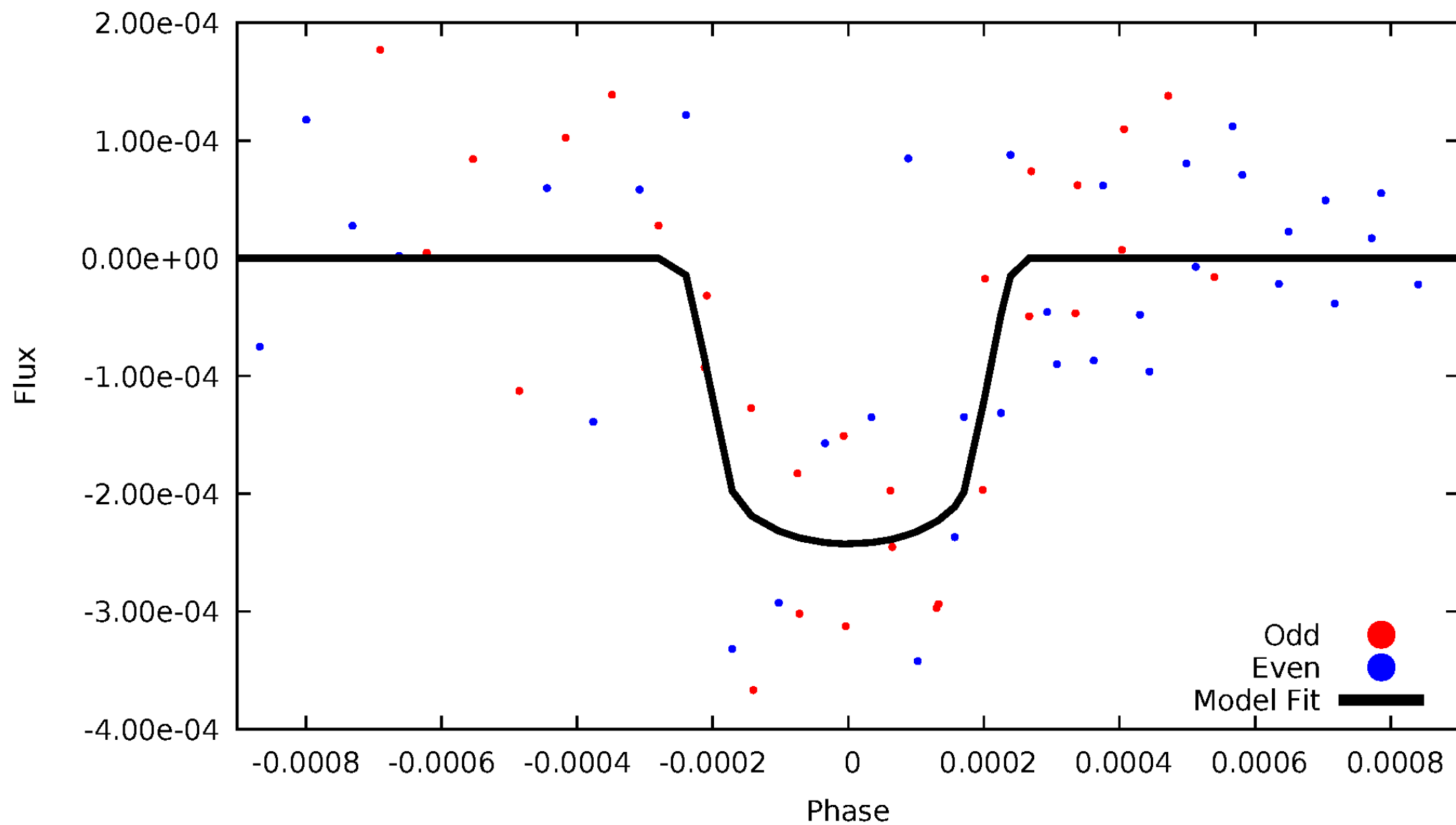


TCE 009471846-04



# DV Odd/Even

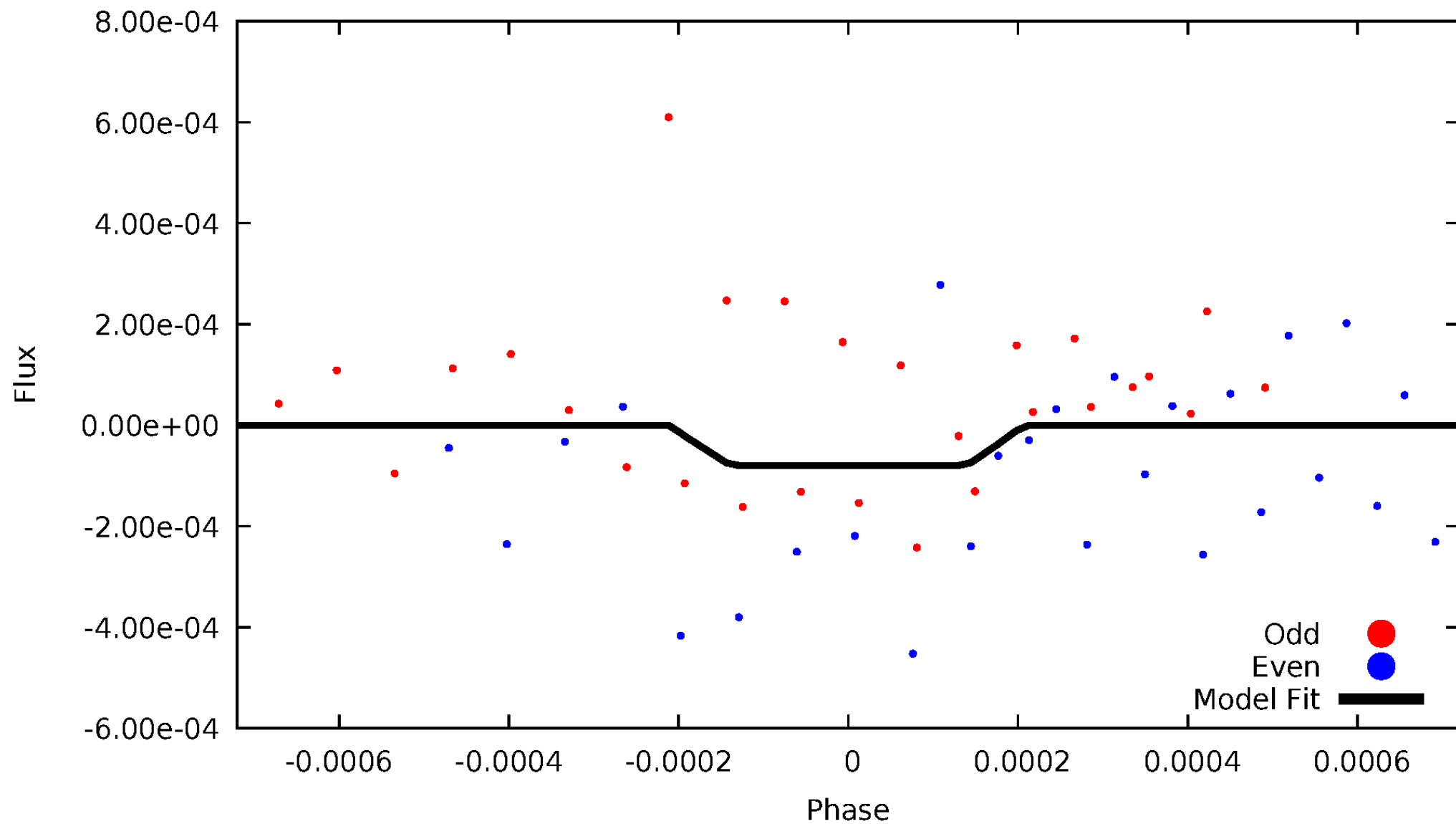
TCE 009471846-04





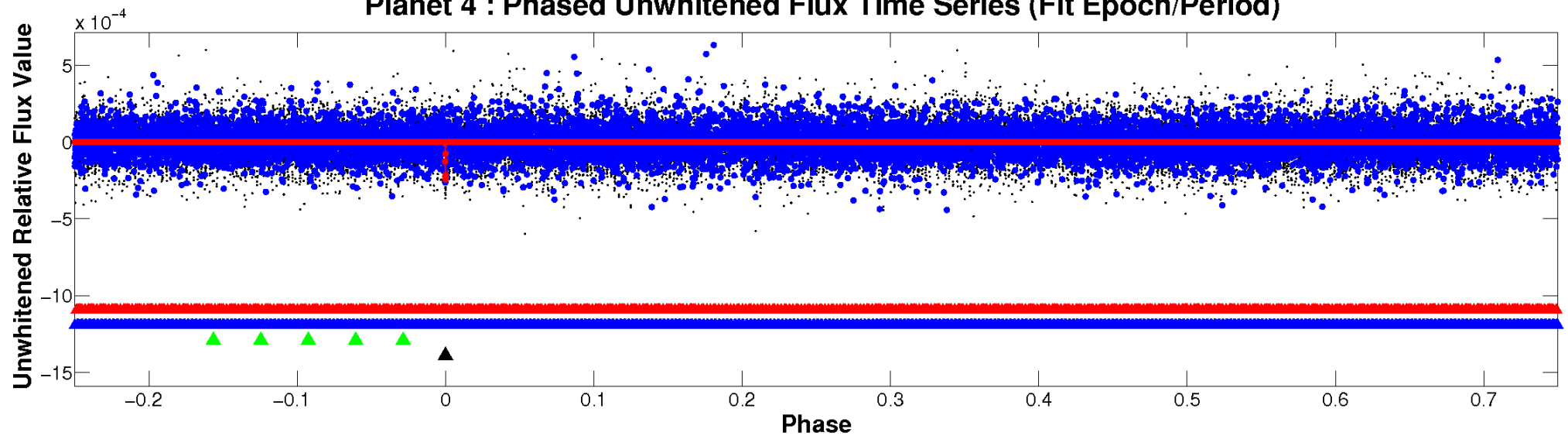
# ALT Odd/Even

TCE 009471846-04

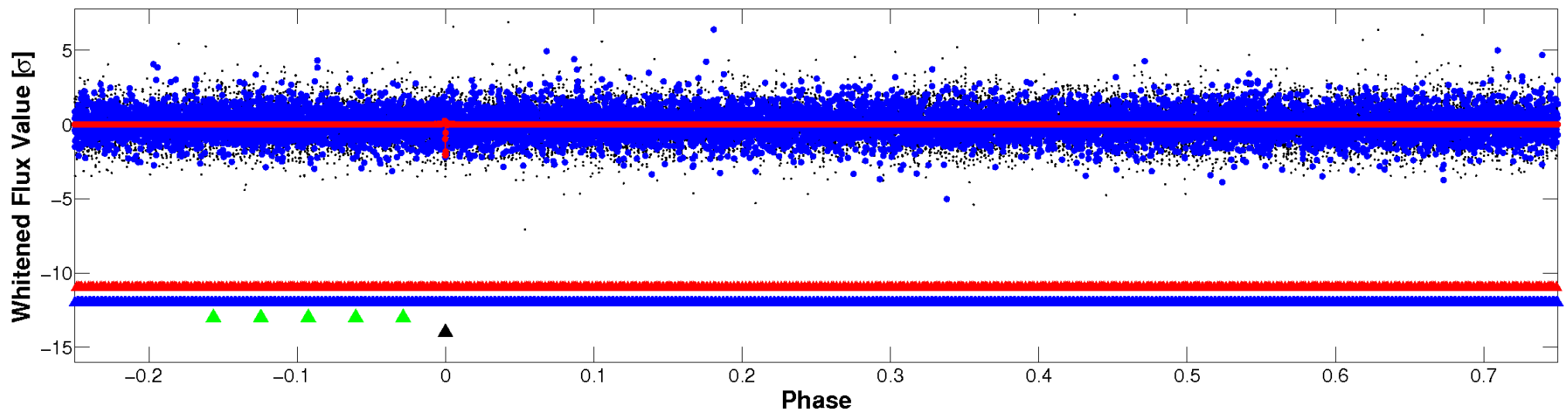


# Non-Whitened Vs. Whitened Light Curve

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

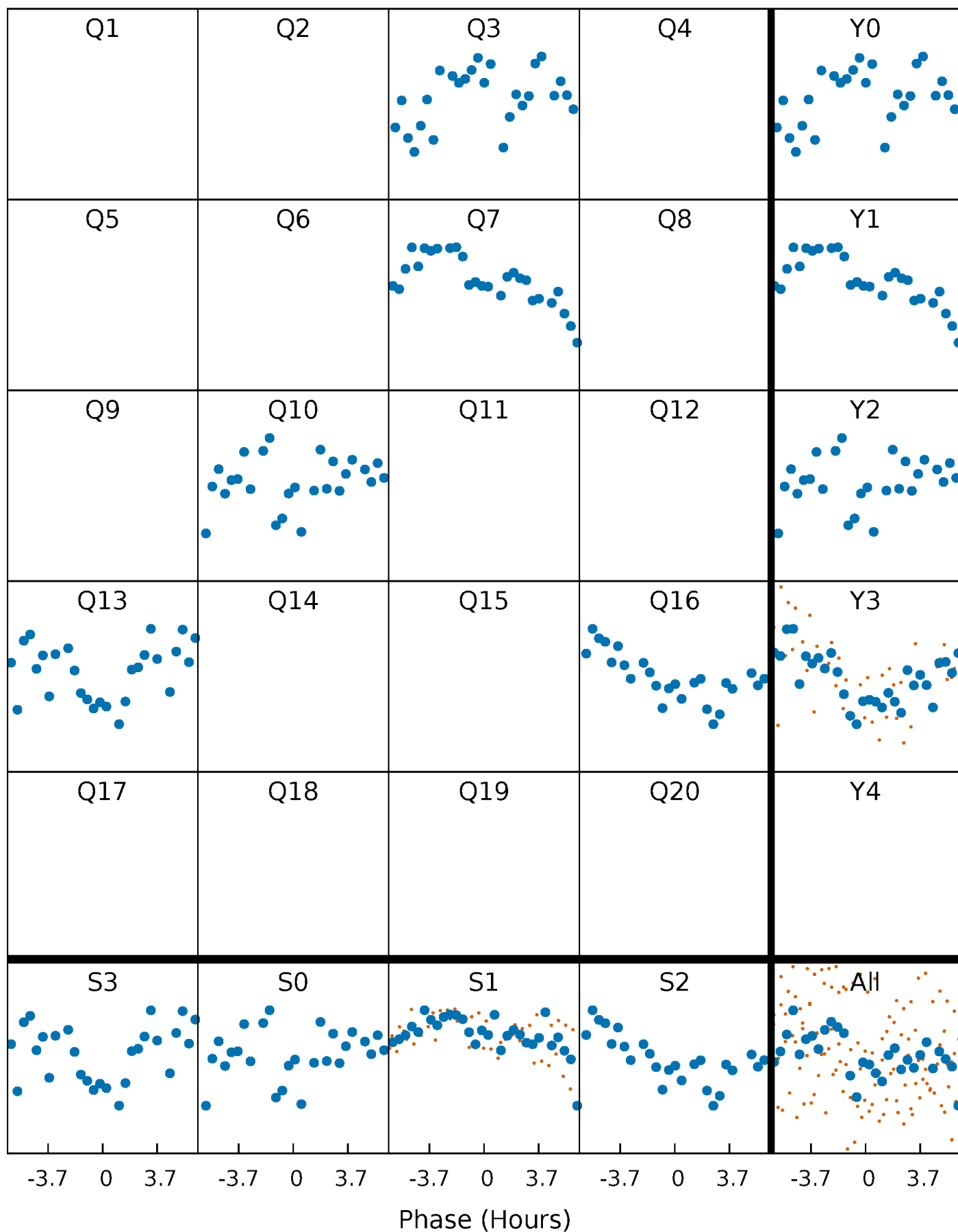


Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



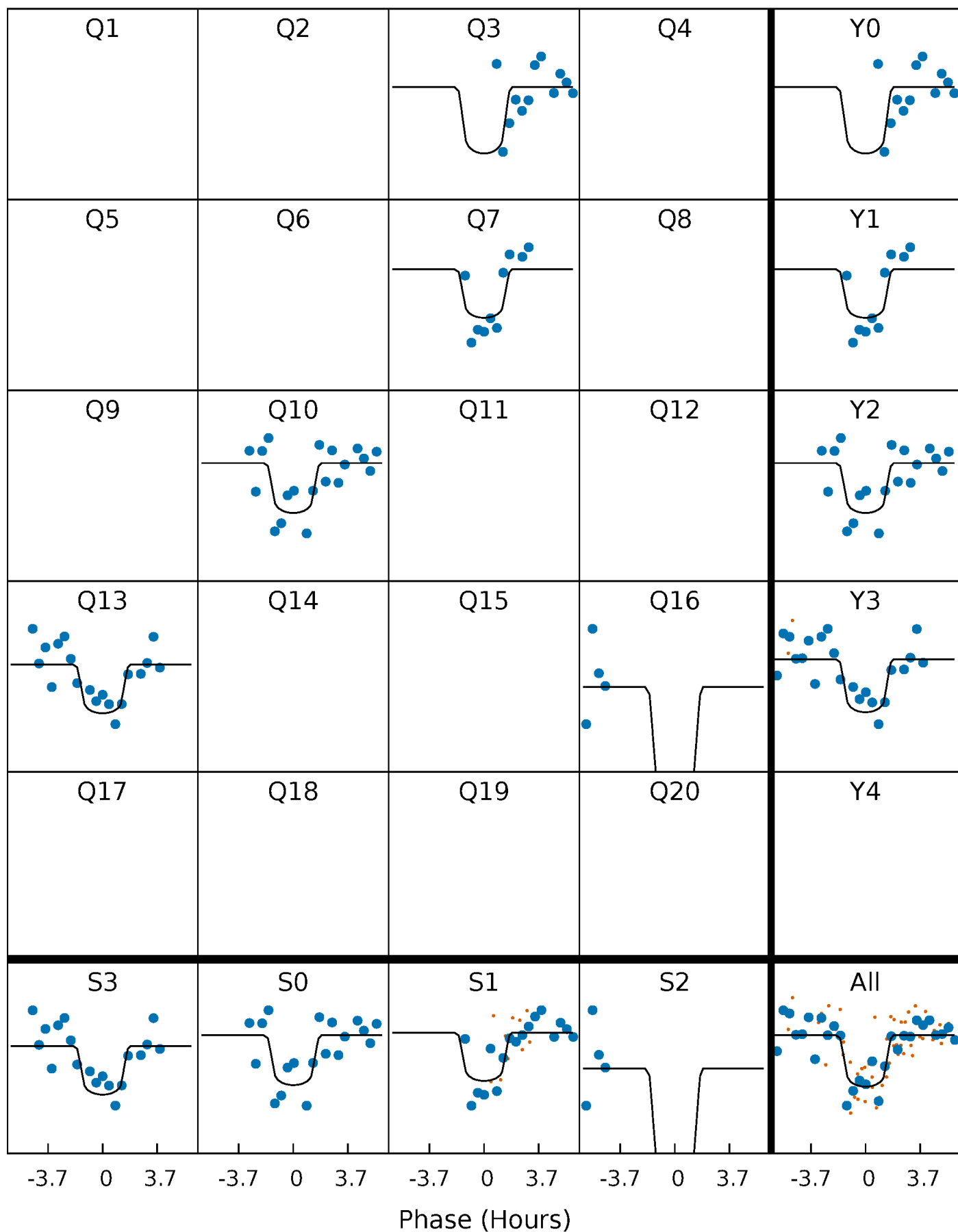
# PDC Quarter-Phased Transit Curves

TCE 009471846-04 P=298.851305 Days  $T_0=344.279561$  (BKJD)



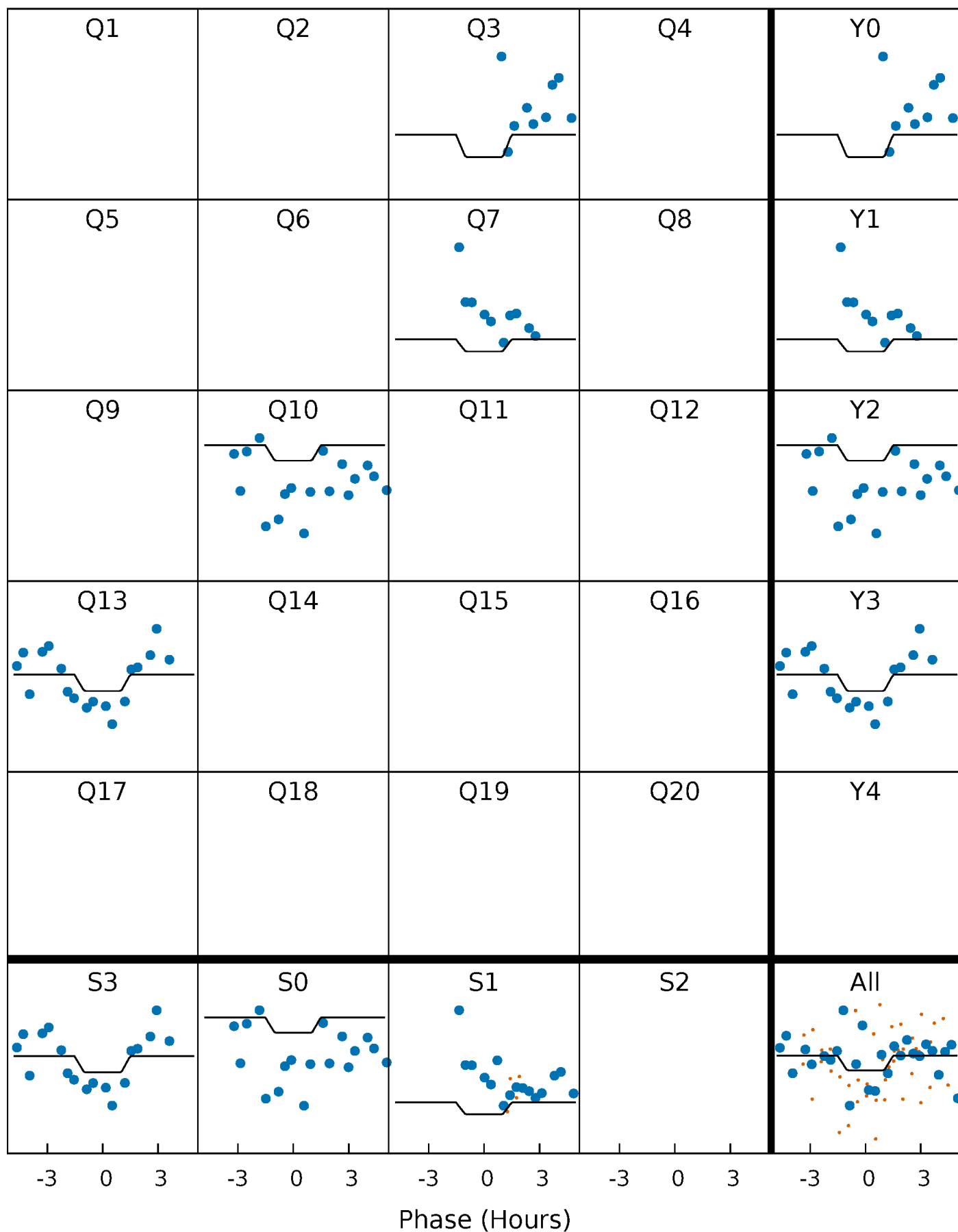
# DV Quarter-Phased Transit Curves

TCE 009471846-04 P=298.851305 Days  $T_0=344.279561$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

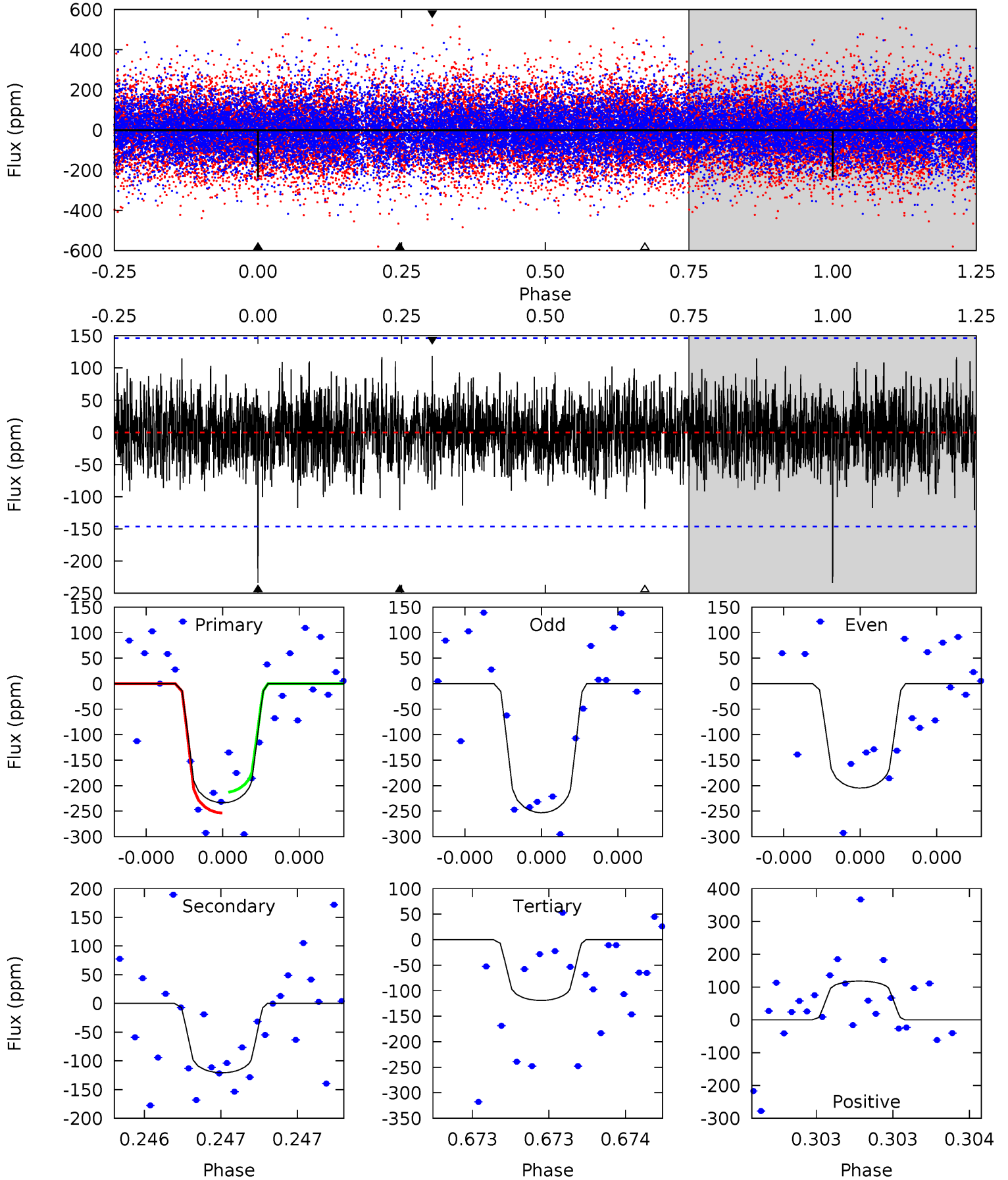
TCE 009471846-04 P=298.858171 Days  $T_0=344.273650$  (BKJD)



# DV Model-Shift Uniqueness Test

009471846-04, P = 298.851305 Days, E = 45.428256 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
8.93	4.61	4.55	4.52	5.59	3.51	1.32	4.38	4.41	0.06	0.09	0.91	0.92	0.34	0.77

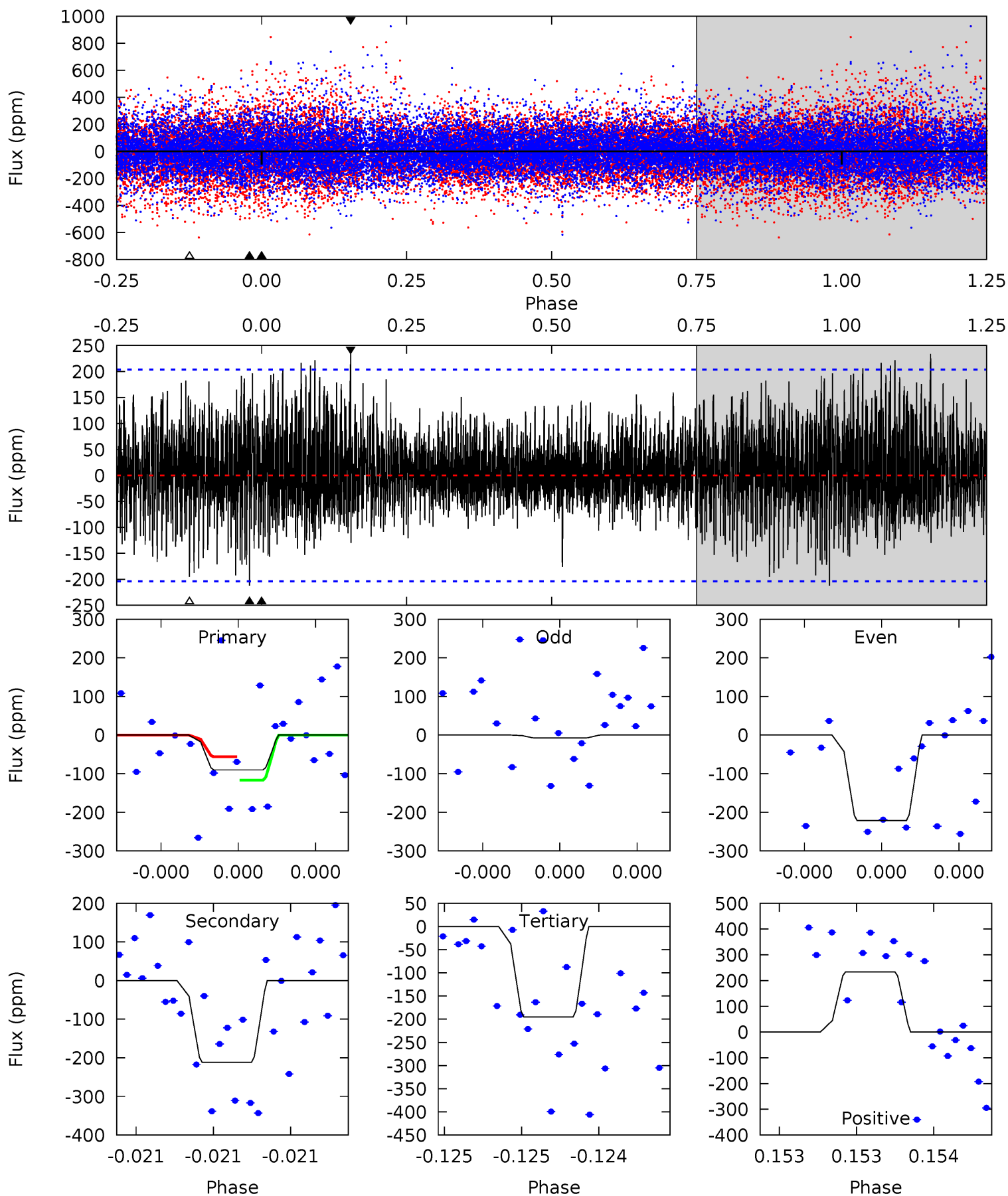




# Alt Model-Shift Uniqueness Test

009471846-04, P = 298.858171 Days, E = 45.415479 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
2.49	5.83	5.37	6.43	5.61	3.54	1.57	-2.89	-3.95	0.46	-0.60	2.86	3.99	0.52	0.82



### Stellar Parameters For KIC 009471846

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$\rho_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7069^{+197}_{-246}$	$3.919^{+0.227}_{-0.122}$	$-0.180^{+0.300}_{-0.300}$	$2.285^{+0.466}_{-0.698}$	$1.578^{+0.208}_{-0.278}$	$0.186^{+0.254}_{-0.069}$
	+3%/-3%	+6%/-3%	+167%/-167%	+20%/-31%	+13%/-18%	+136%/-37%
Source	PHO1	FLK73	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 009471846-04 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-121 \pm 26$	$4.00^{+2.50}_{-2.27}$	$646^{+42}_{-50}$	$5710^{+3469}_{-1106}$	$4319^{+17409}_{-2707}$
Alt.	$-212 \pm 36$	$2.79^{+2.17}_{-1.77}$	$643^{+42}_{-45}$	$7924^{+9656}_{-2072}$	$15233^{+97541}_{-10542}$

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

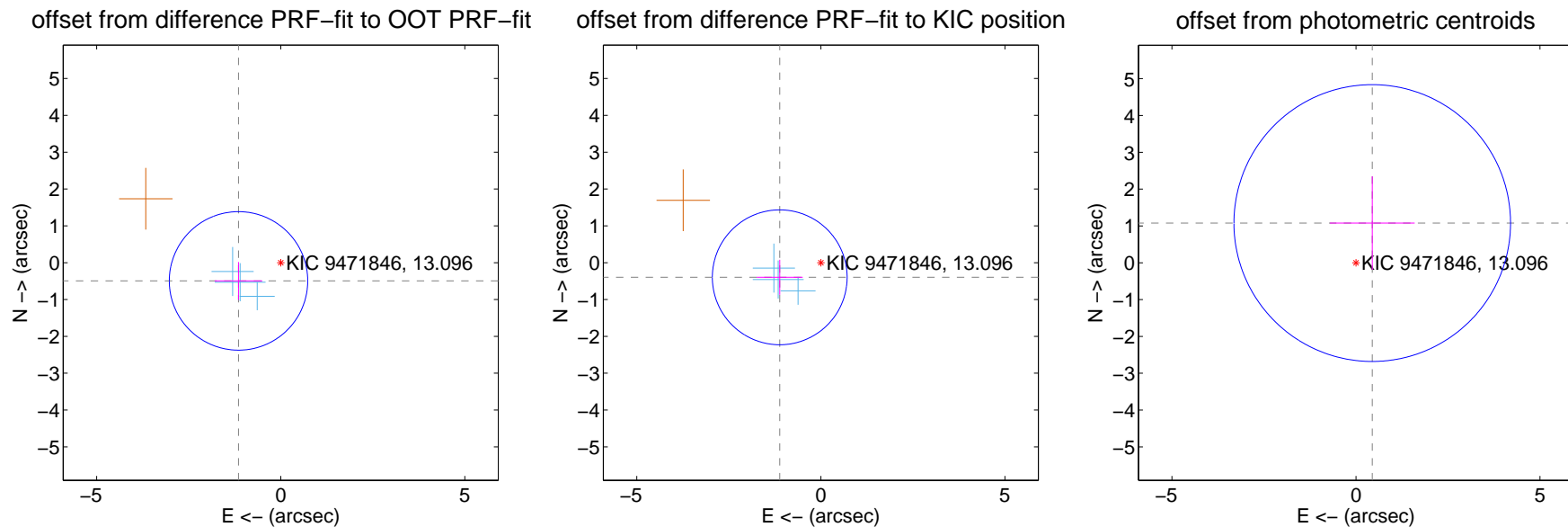
## DV Centroid Data

Supplemental centroid analysis for 009471846-04. Kepler magnitude: 13.10. Transit SNR 8.21

There are 3 quarters with good PRF difference image offsets

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

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.250 \pm 0.627$	1.99	$1.148 \pm 0.646$	$-0.494 \pm 0.514$
PRF-fit source offset from KIC position	$1.186 \pm 0.610$	1.94	$1.118 \pm 0.625$	$-0.397 \pm 0.477$
photometric centroid source offset	$1.17 \pm 1.25$	0.93	$-0.44 \pm 1.15$	$1.08 \pm 1.27$



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

Q1 no difference image



Q1 no OOT image



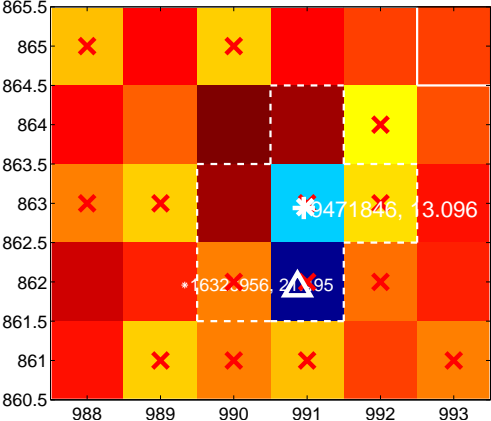
Q2 no difference image



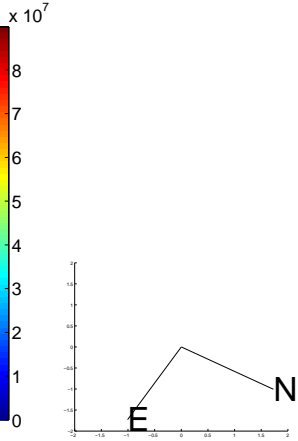
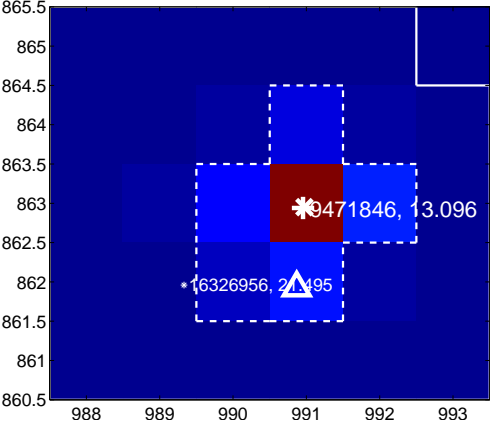
Q2 no OOT image



Q3 difference image. Poor Quality



Q3 OOT image



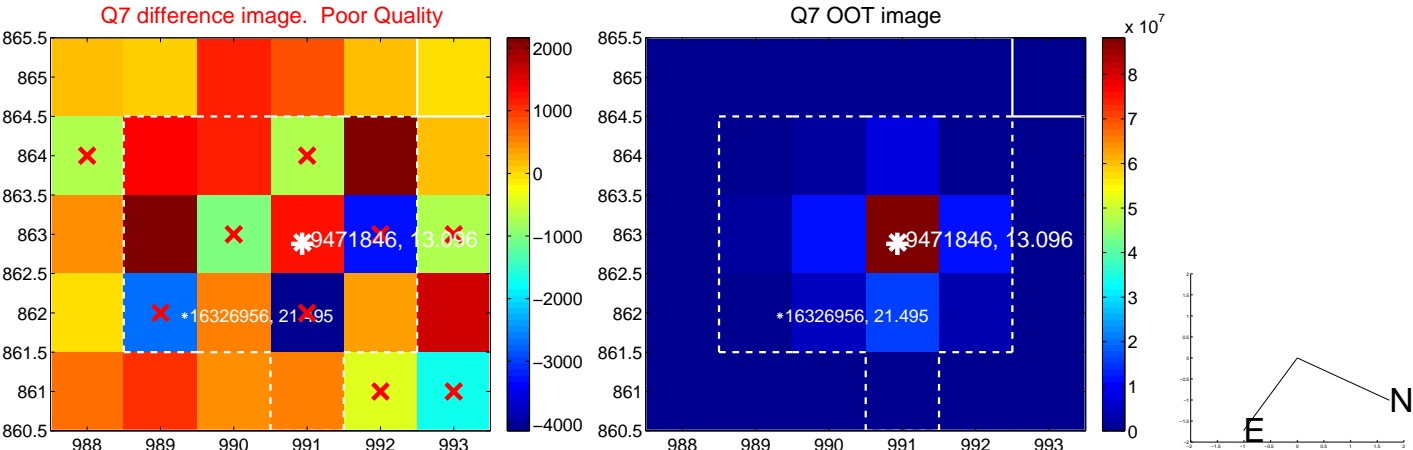
Q4 no difference image



Q4 no OOT image



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

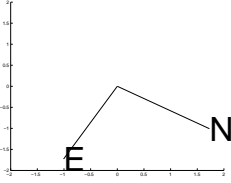
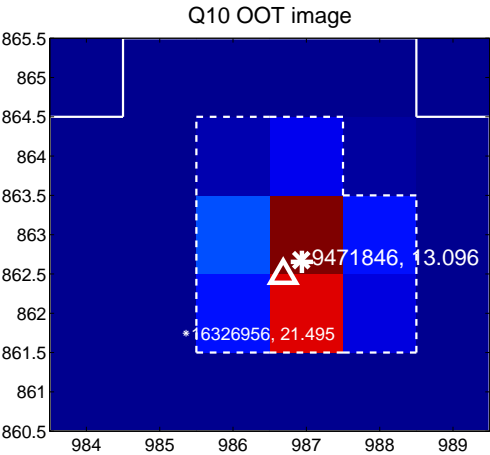
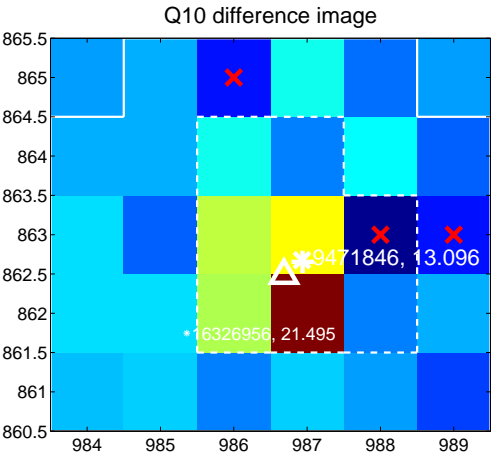


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

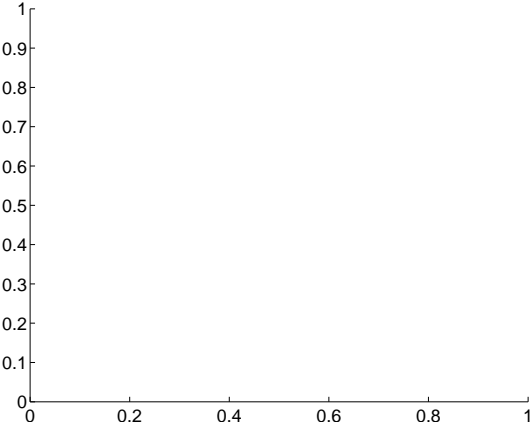
Q9 no difference image



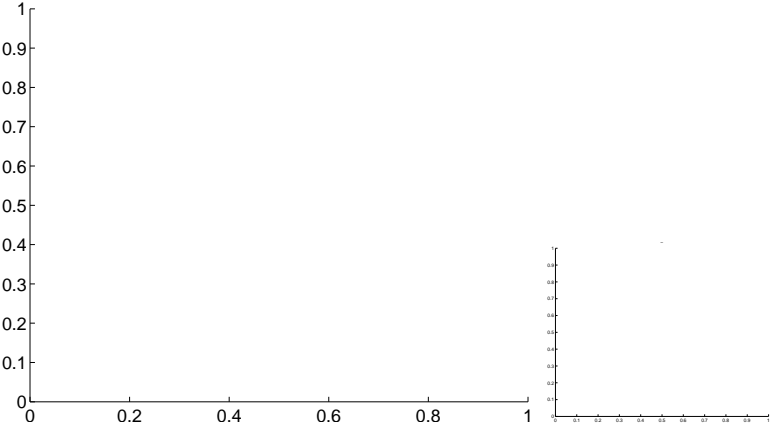
Q9 no OOT image



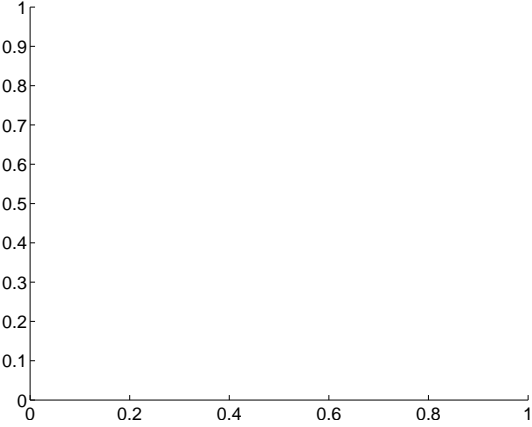
Q11 no difference image



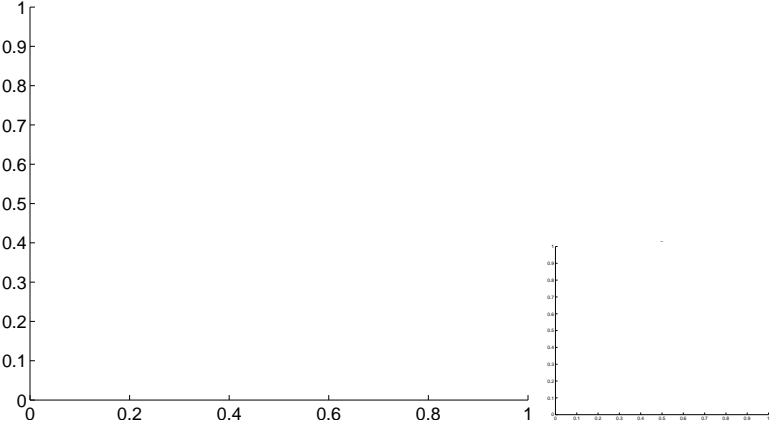
Q11 no OOT image



Q12 no difference image

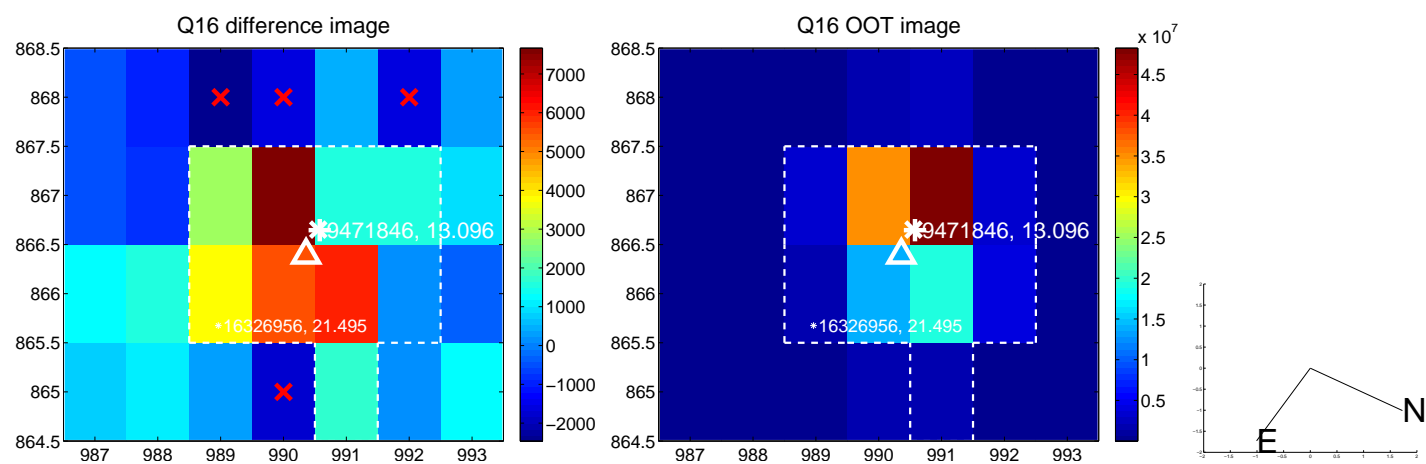
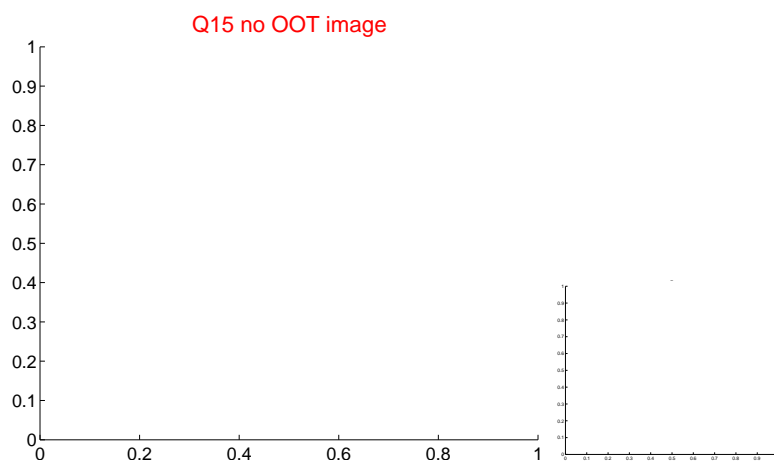
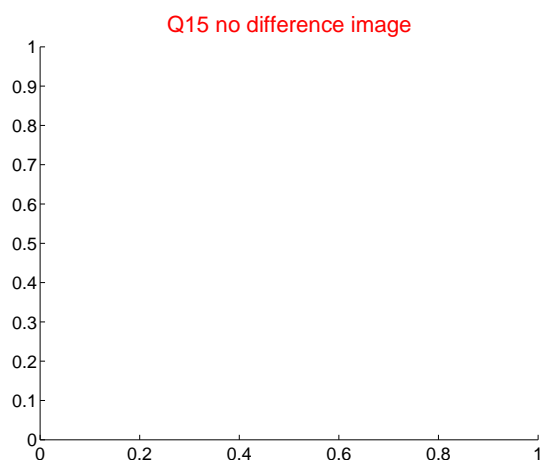
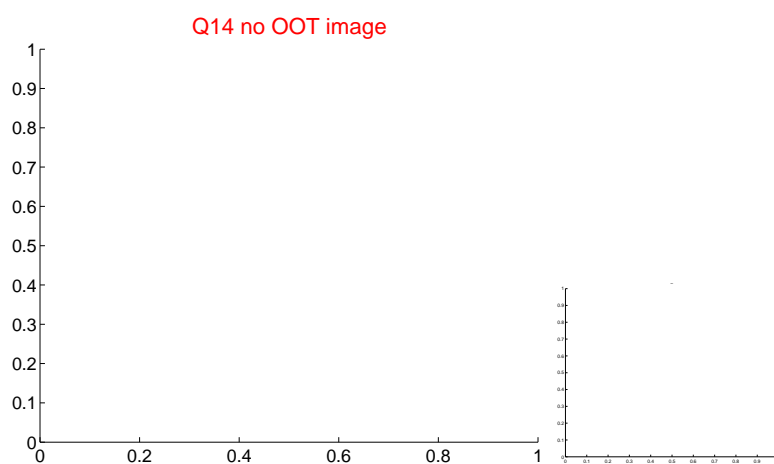
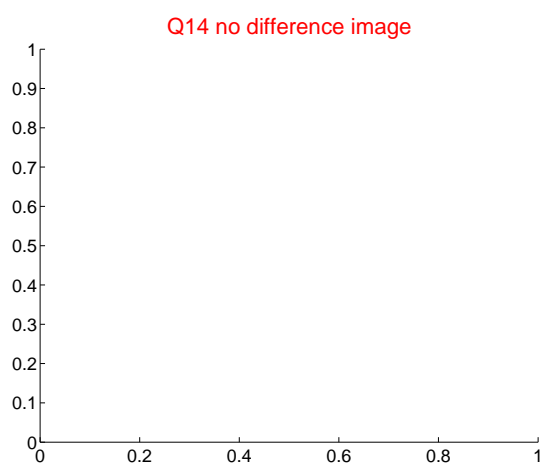
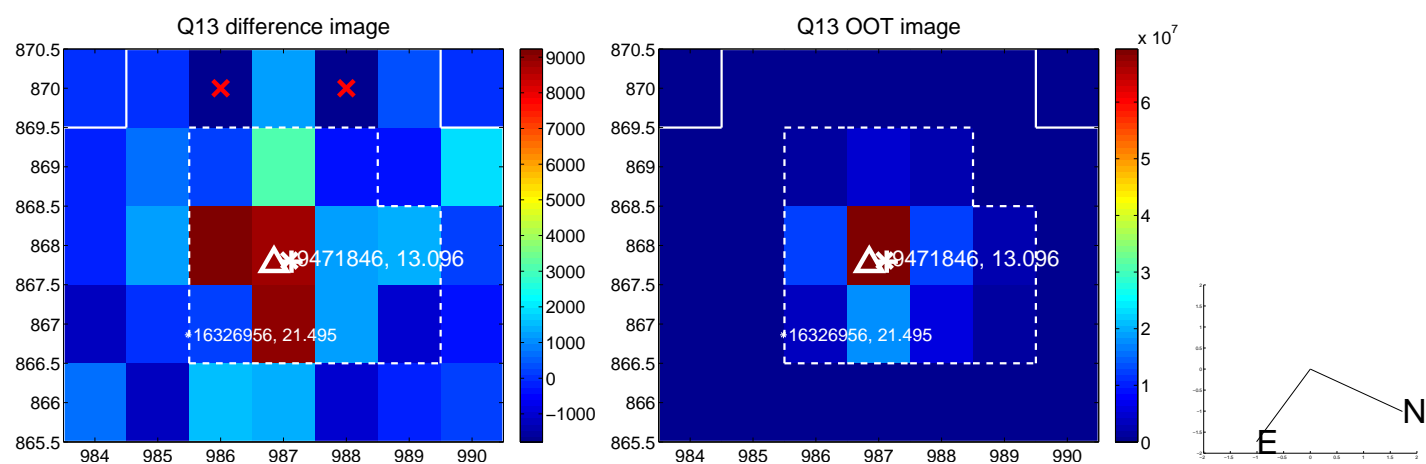


Q12 no OOT image

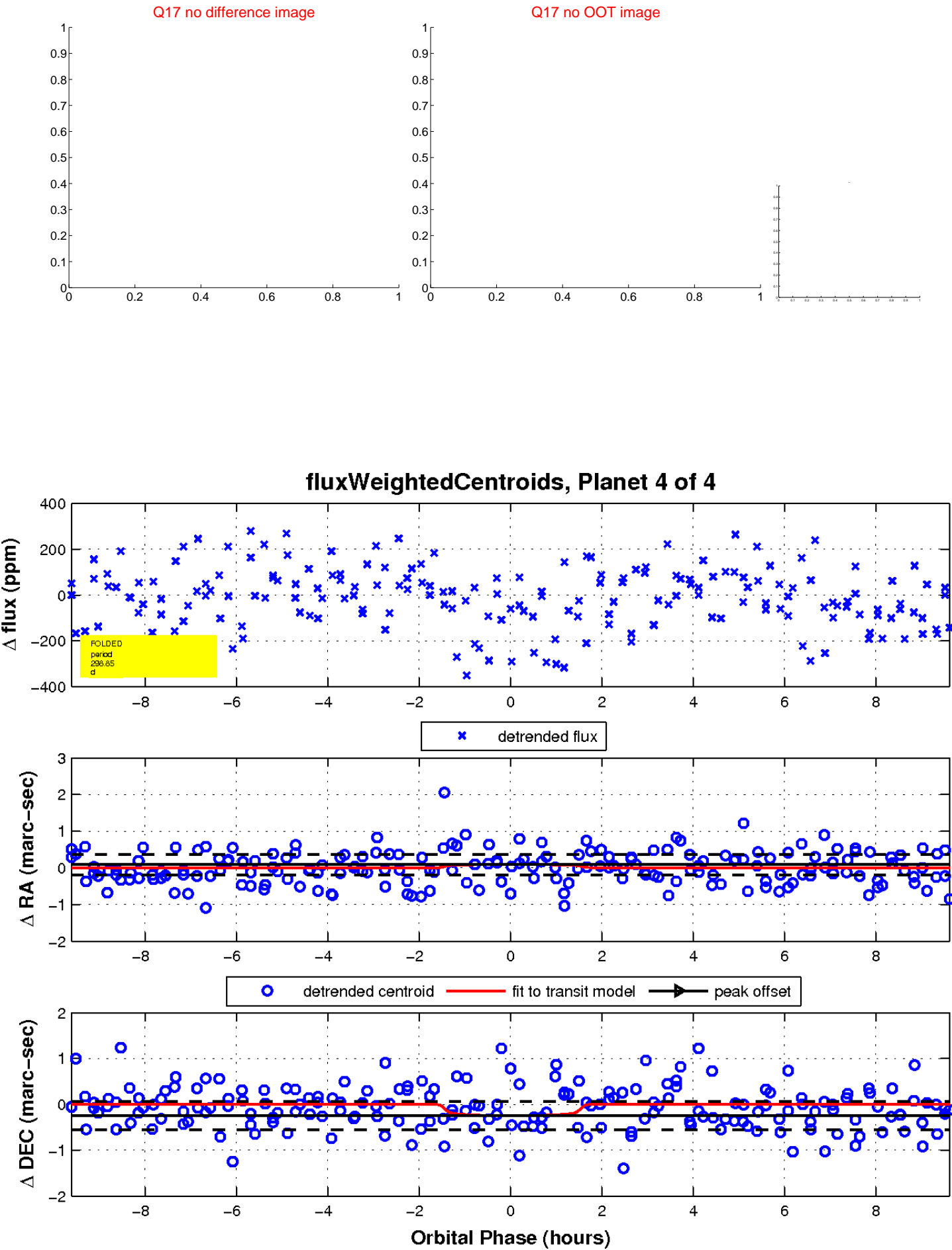




white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value



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



UKIRT Image

Declination

