

# KIC 008972489

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
008972489-01	OBS	No	3.067119	132.401159	130.6	11.021	11.8	12.7	1.67	7022	2.22	2772.73
008972489-02	OBS	No	0.766848	131.556569	125.8	9.202	11.2	16.1	1.67	7022	3.65	17603.67

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008972489-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT
008972489-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—SAME_NTL_PERIOD

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

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

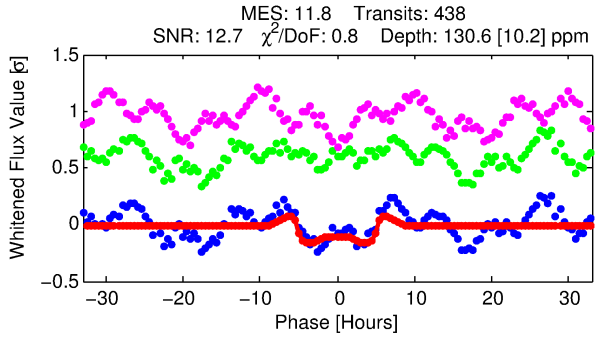
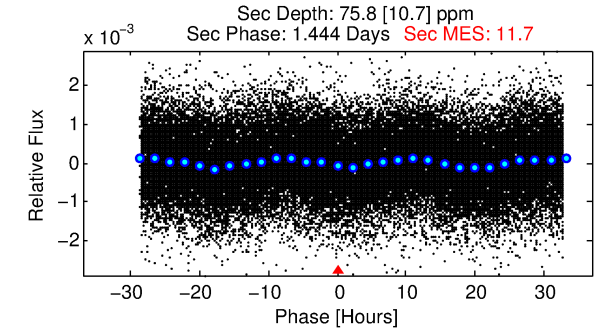
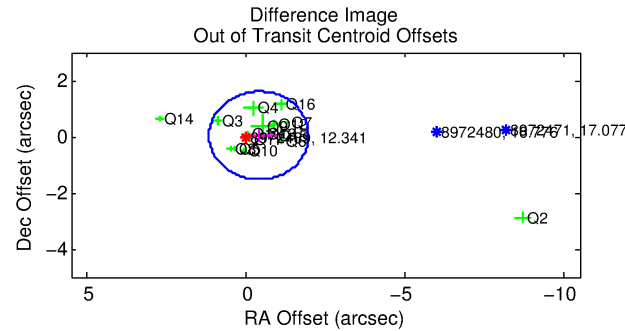
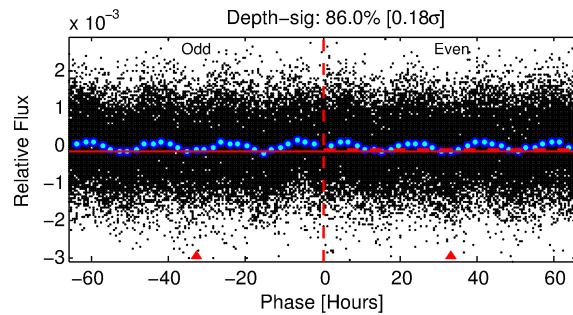
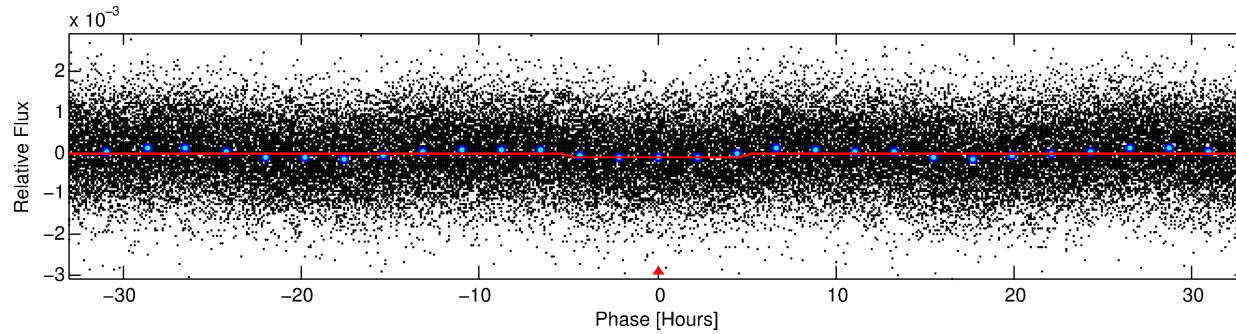
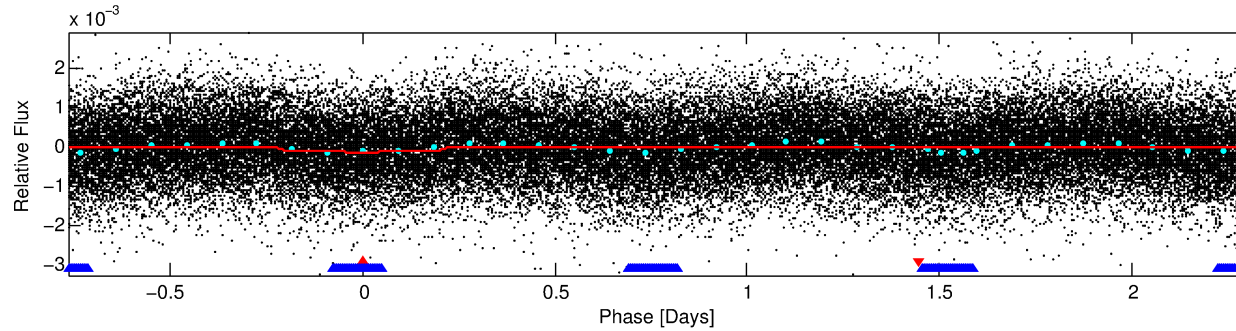
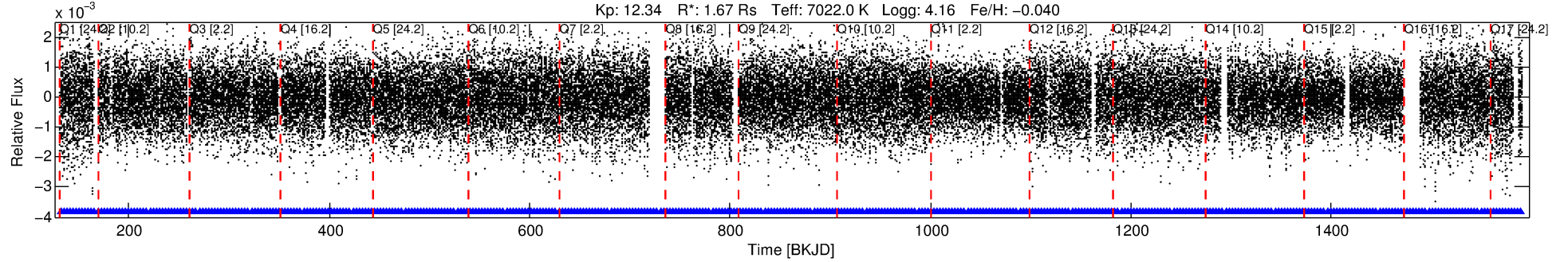
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 008972489-01

No Significant Match Found

# DV One-Page Summary

KIC: 8972489 Candidate: 1 of 2 Period: 3.067 d



## DV Fit Results:

Period = 3.06712 [0.00003] d  
Epoch = 132.4012 [0.0069] BKJD  
Rp/R\* = 0.0122 [0.0013]  
a/R\* = 1.36 [0.38]  
b = 0.90 [0.13]  
Seff = 2772.73 [1116.57]  
Teq = 1850 [186] K  
Rp = 2.22 [0.75] Re  
a = 0.0468 [0.0123] AU  
Ag = 18.53 [8.41] [2.09 $\sigma$ ]  
Teffp = 5936 [449] K [8.41 $\sigma$ ]

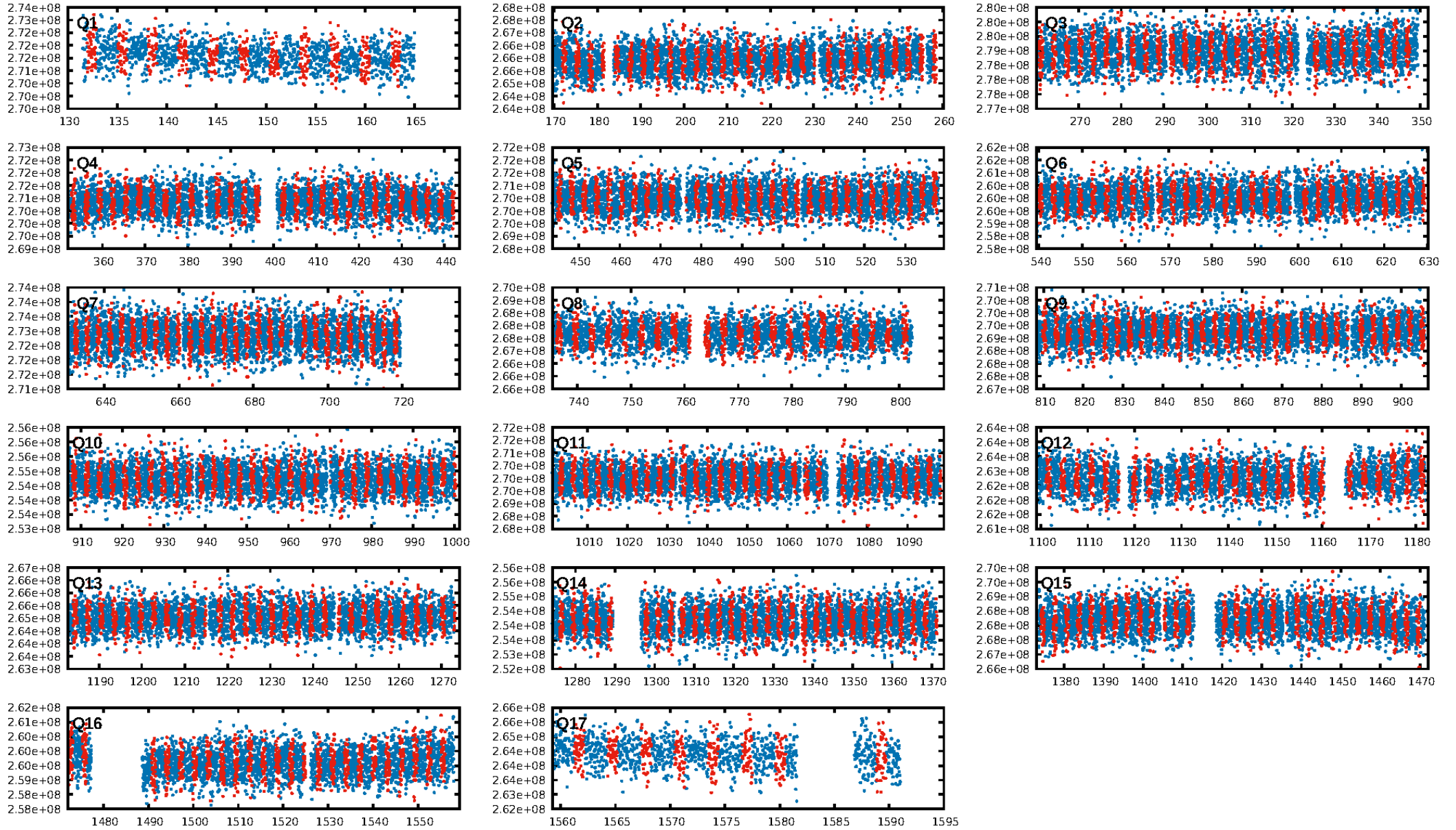
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [3.85 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [419/419]  
GhostDiagnostic-chr: -2.488  
Centroid-sig: 0.0%  
Centroid-so: 0.322 arcsec [1.99 $\sigma$ ]  
OotOffset-rm: 0.404 arcsec [0.77 $\sigma$ ]  
KicOffset-rm: 0.481 arcsec [0.79 $\sigma$ ]  
OotOffset-st: 4/4/4 [16]  
KicOffset-st: 4/4/4 [16]  
DiffImageQuality-fgm: 0.88 [14/16]  
DiffImageOverlap-fno: 0.00 [0/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 02-Feb-2016 01:27:57 Z

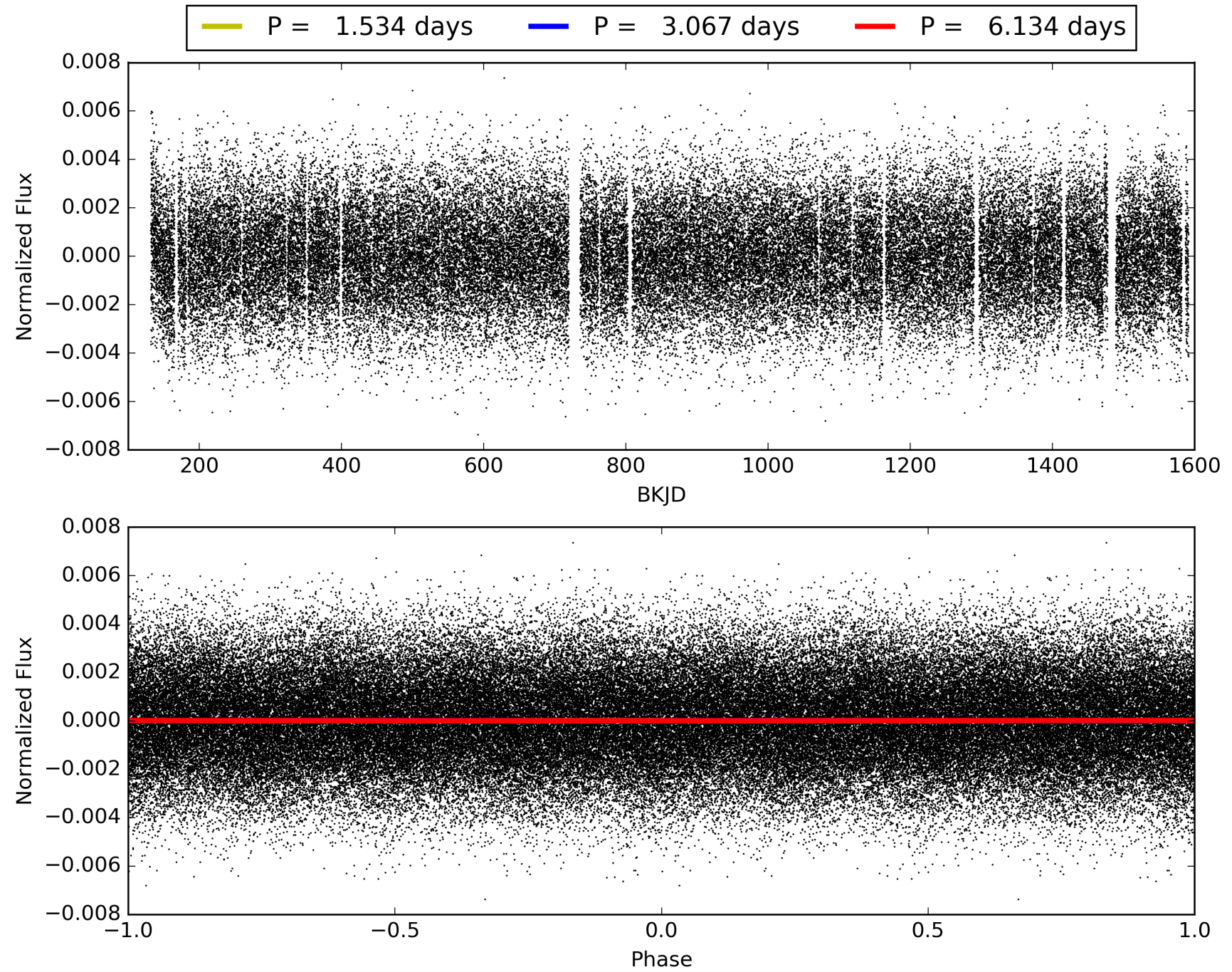
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 008972489-01, PDC Light Curves



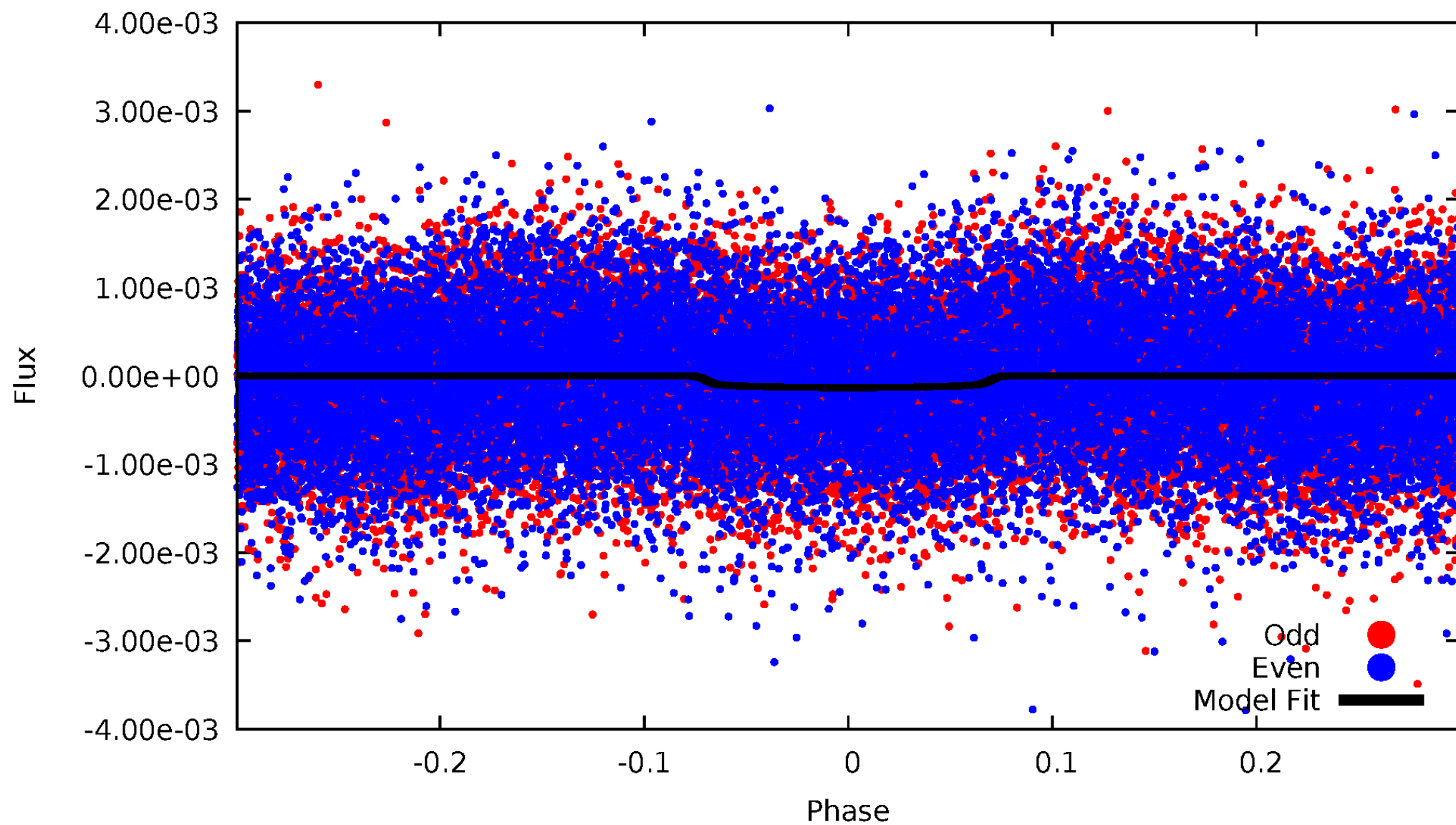


# TCE 008972489-01



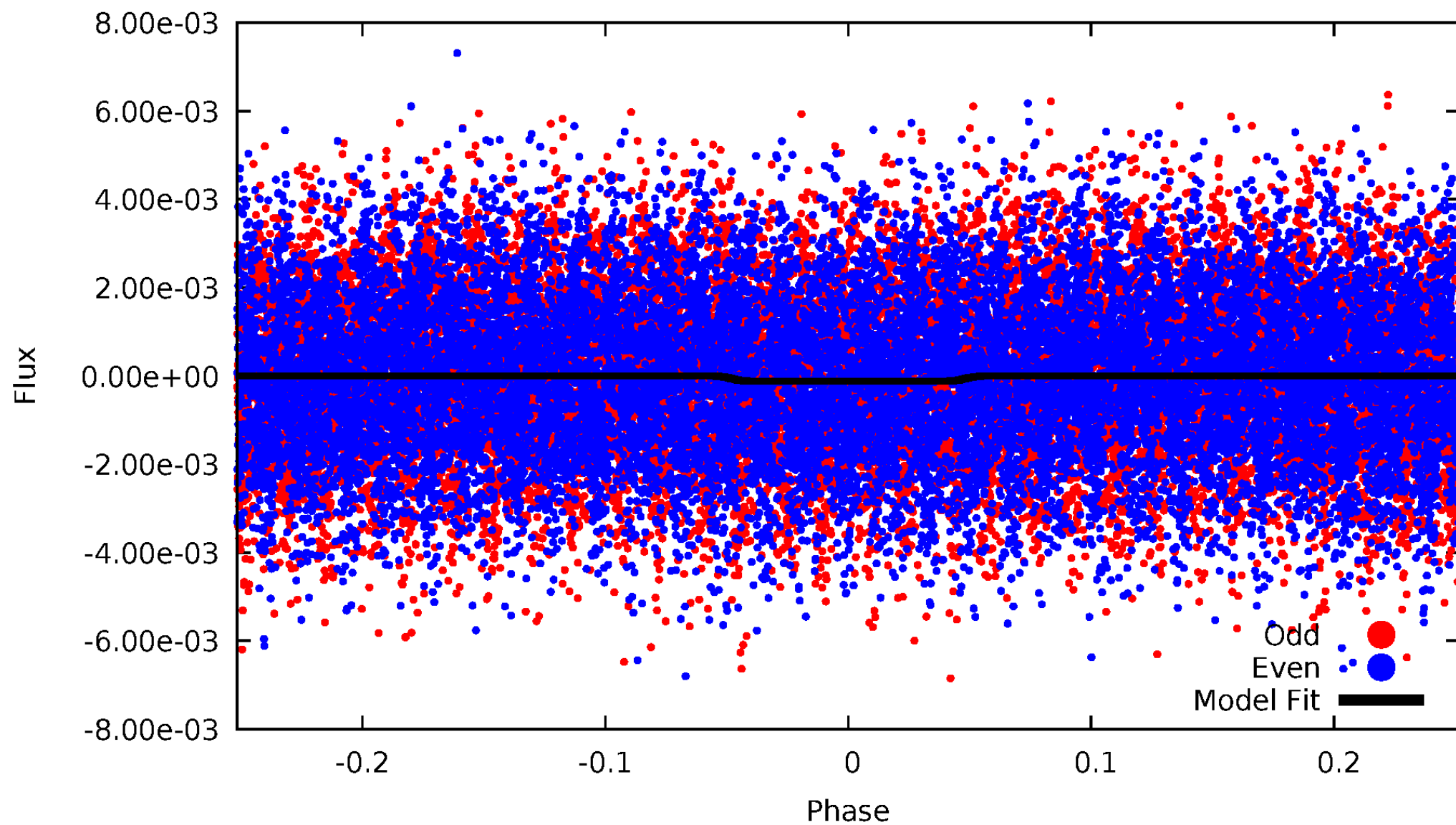
# DV Odd/Even

TCE 008972489-01



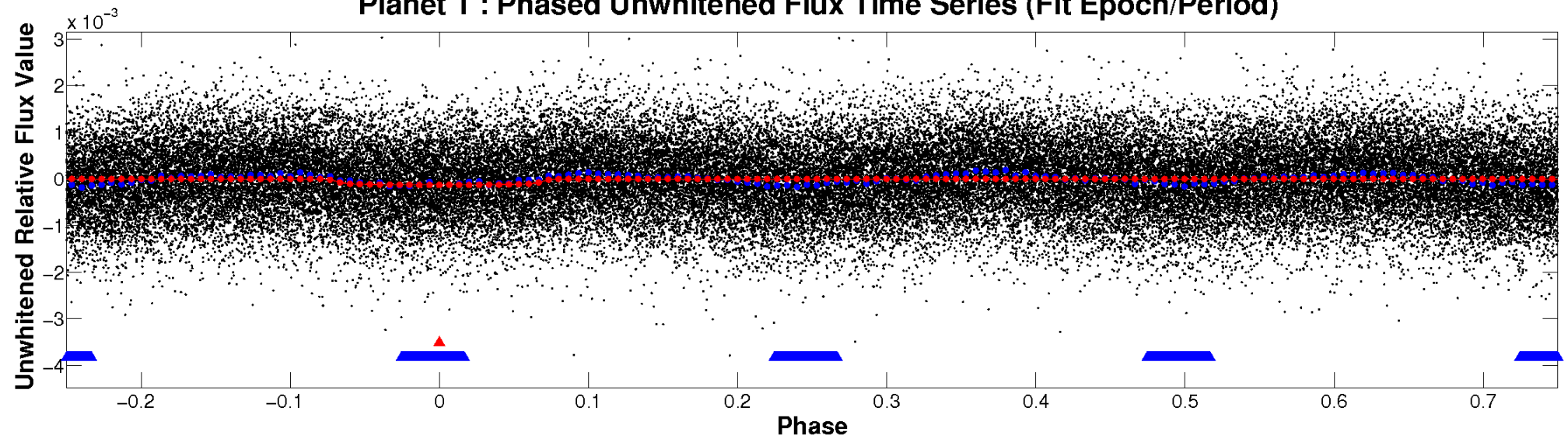
# ALT Odd/Even

TCE 008972489-01

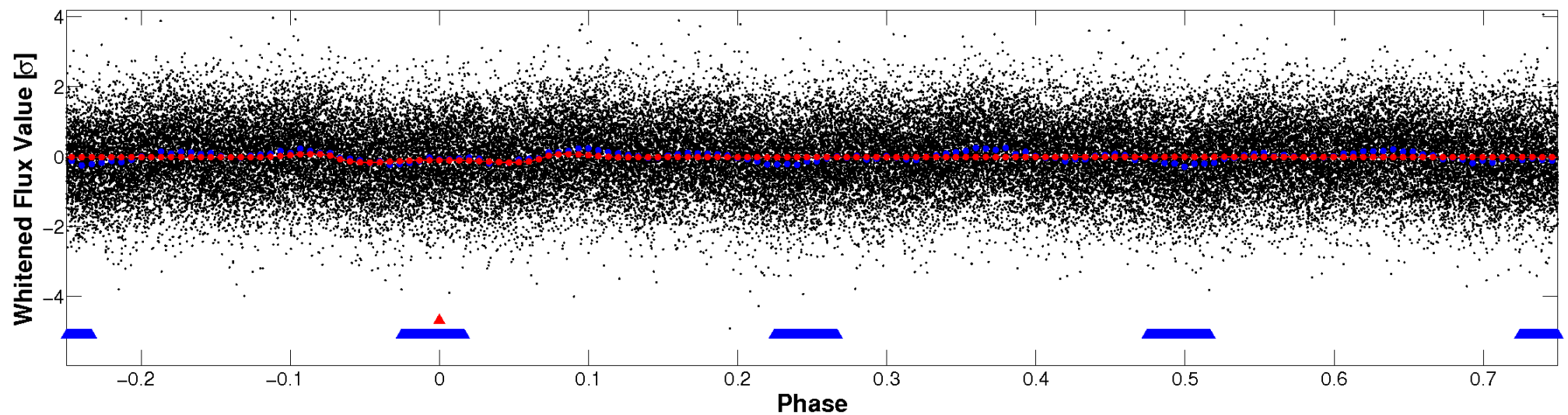


# Non-Whitened Vs. Whitened Light Curve

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



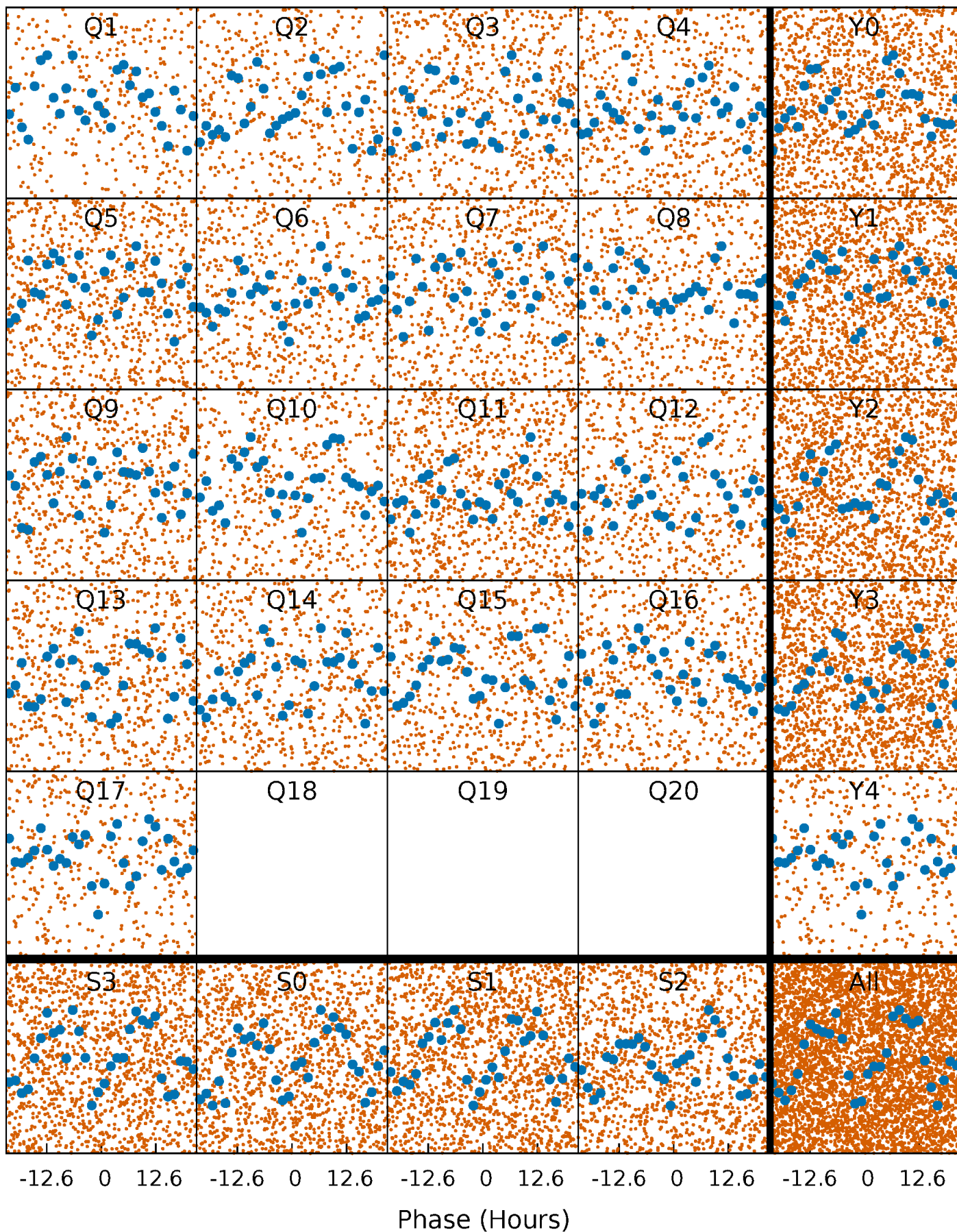
**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**





# PDC Quarter-Phased Transit Curves

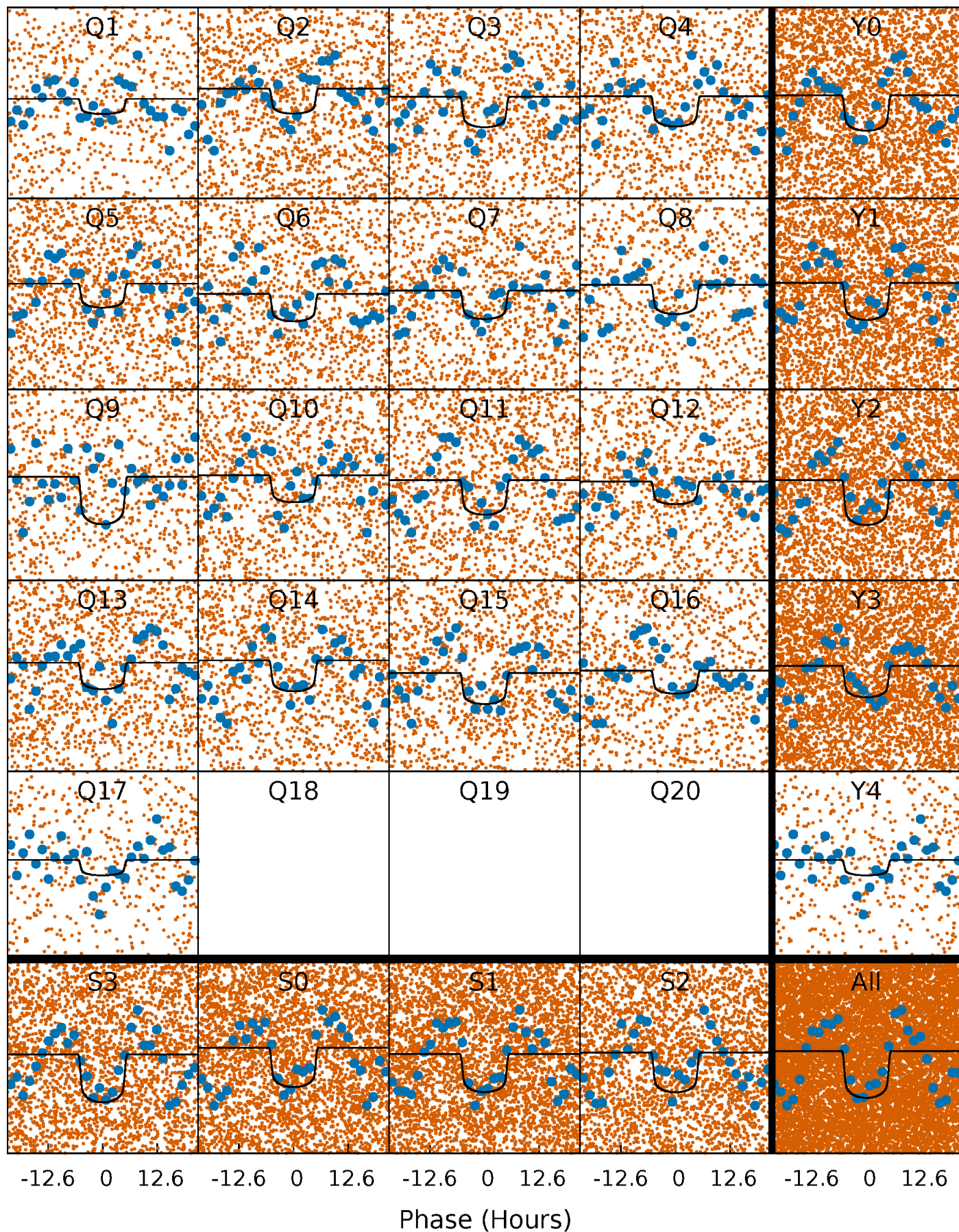
TCE 008972489-01 P= 3.067119 Days  $T_0=132.401159$  (BKJD)





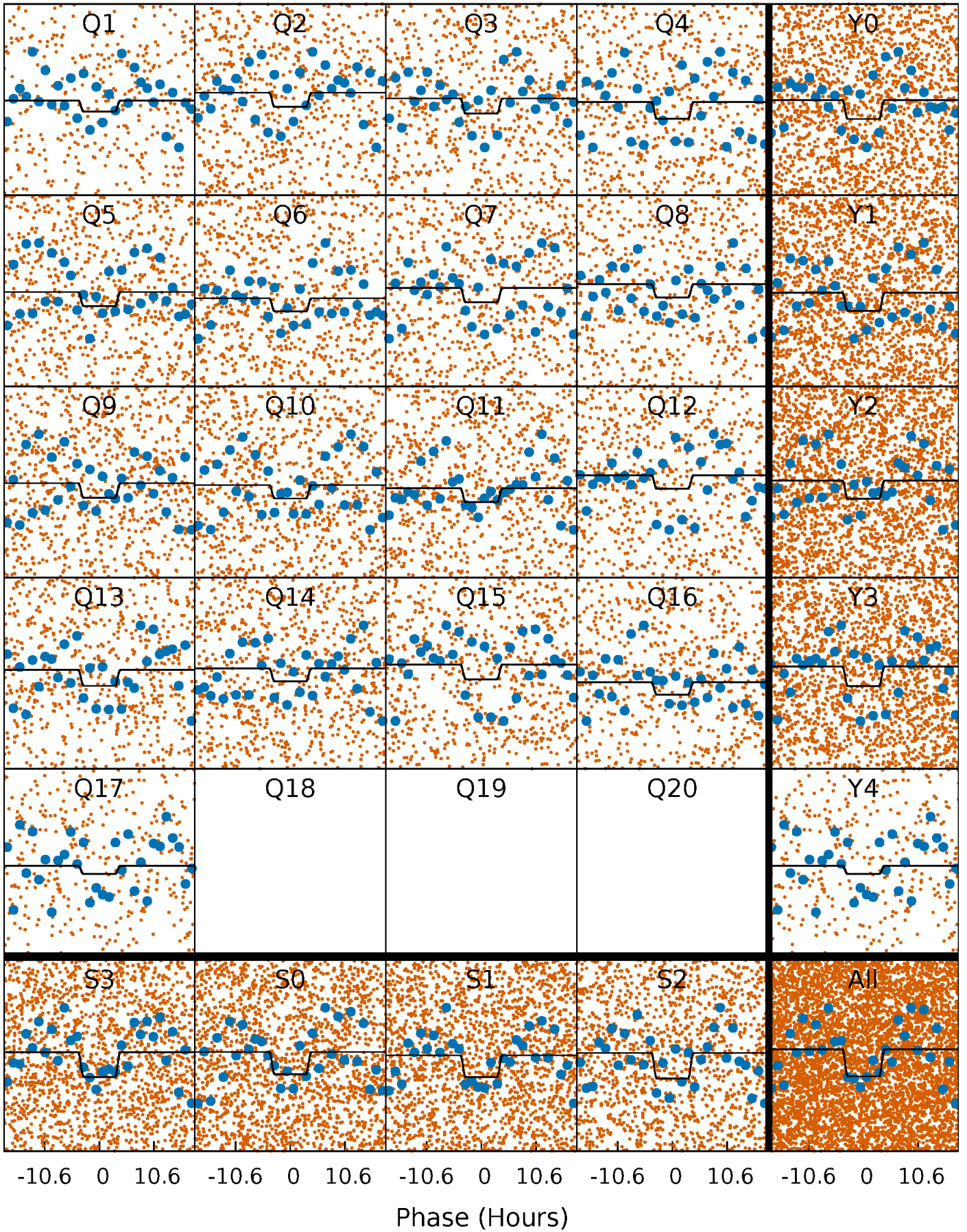
# DV Quarter-Phased Transit Curves

TCE 008972489-01 P= 3.067119 Days  $T_0=132.401159$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 008972489-01 P= 3.067039 Days  $T_0=132.398842$  (BKJD)

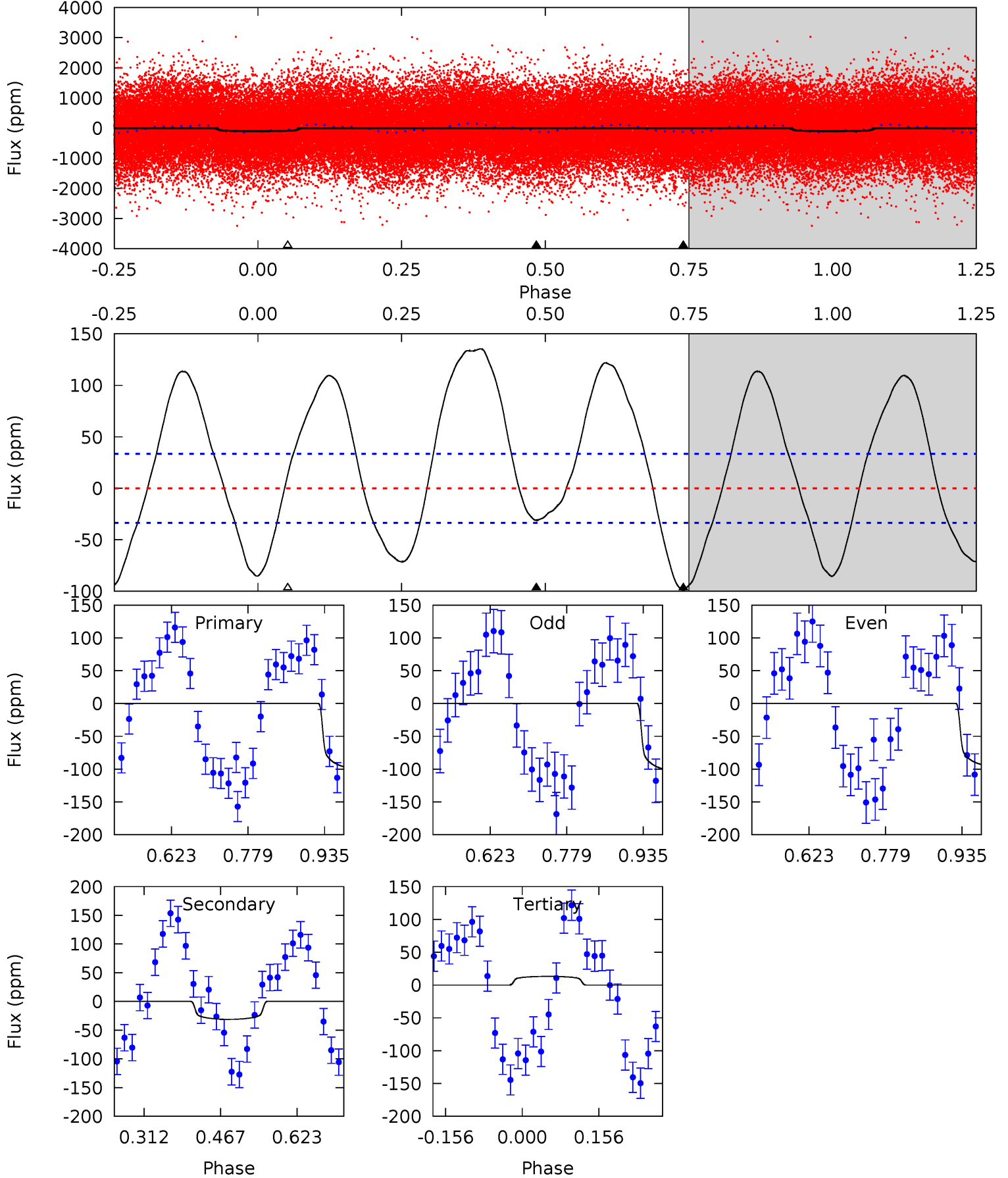




# DV Model-Shift Uniqueness Test

008972489-01, P = 3.067119 Days, E = 129.334040 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
13.2	4.16	-1.76	0	4.47	1.42	8.21	14.9	13.2	5.92	4.16	0.45	0.96	0.58	2.20

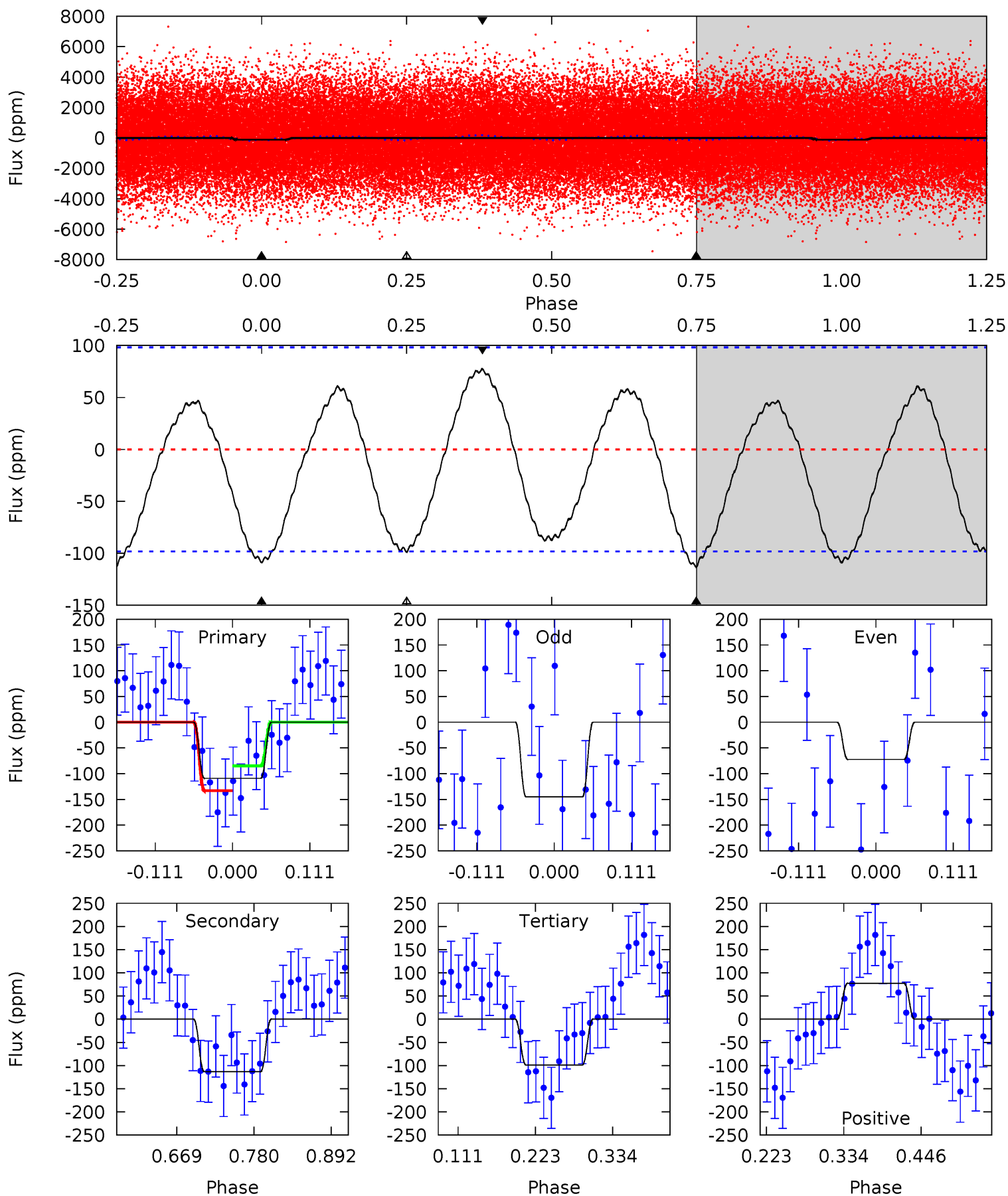




# Alt Model-Shift Uniqueness Test

008972489-01, P = 3.067039 Days, E = 129.331803 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
5.04	5.23	4.57	3.59	4.54	1.59	2.64	0.47	1.45	0.66	1.64	1.68	0.75	0.41	1.09



### Stellar Parameters For KIC 008972489

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7022^{+197}_{-271}$	$4.155^{+0.132}_{-0.198}$	$-0.040^{+0.250}_{-0.350}$	$1.670^{+0.537}_{-0.313}$	$1.459^{+0.220}_{-0.242}$	$0.441^{+0.289}_{-0.233}$
	+3%/-4%	+3%/-5%	+625%/-875%	+32%/-19%	+15%/-17%	+66%/-53%
Source	PHO1	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 008972489-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-31 \pm 7$	$2.28^{+0.39}_{-0.37}$	$2602^{+206}_{-160}$	$4777^{+348}_{-356}$	$7.102^{+3.526}_{-2.382}$
Alt.	$-113 \pm 22$	$1.97^{+0.41}_{-0.34}$	$2596^{+212}_{-166}$	$6949^{+766}_{-613}$	$34^{+18}_{-11}$

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

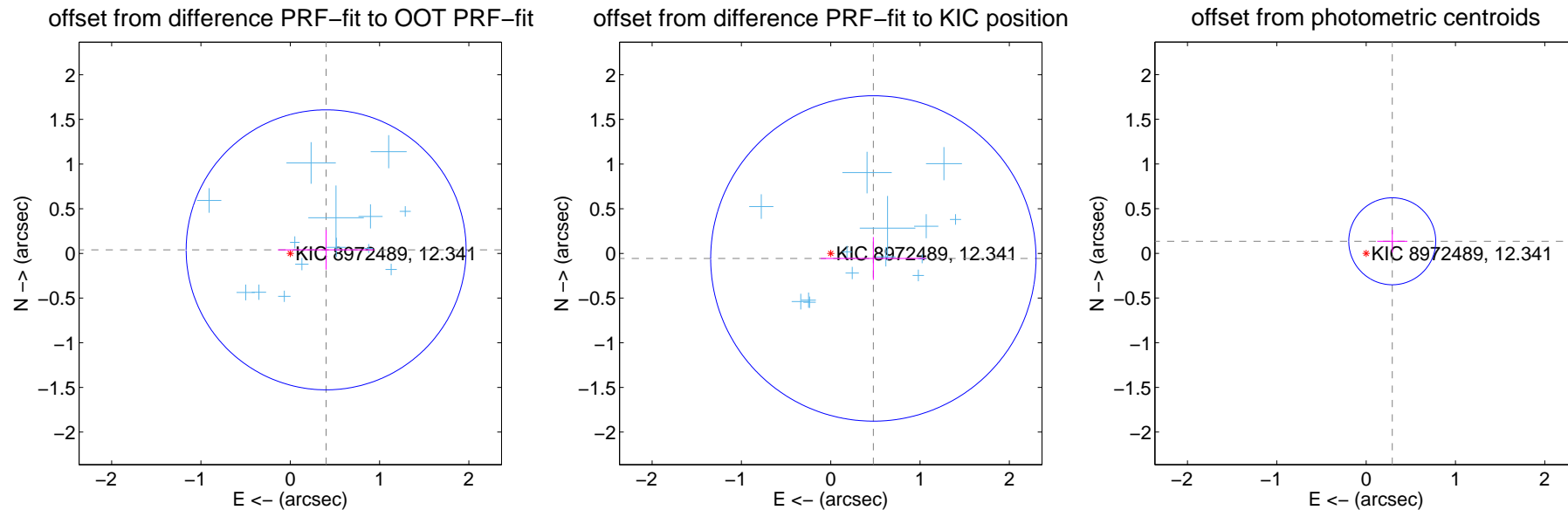
## DV Centroid Data

Supplemental centroid analysis for 008972489-01. Kepler magnitude: 12.34. Transit SNR 12.70

There are 14 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.15 arcsec

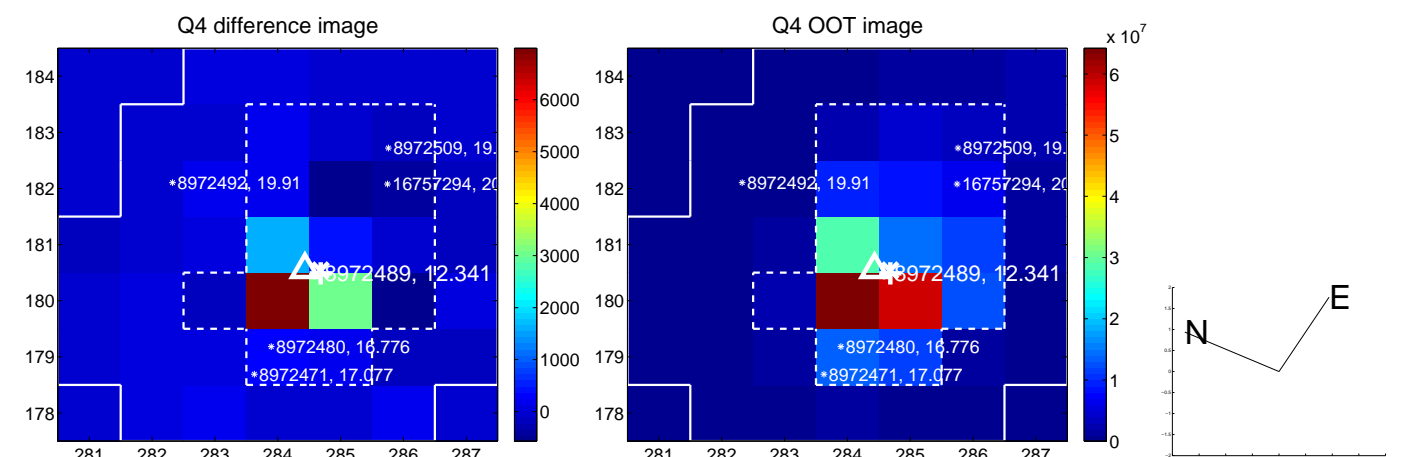
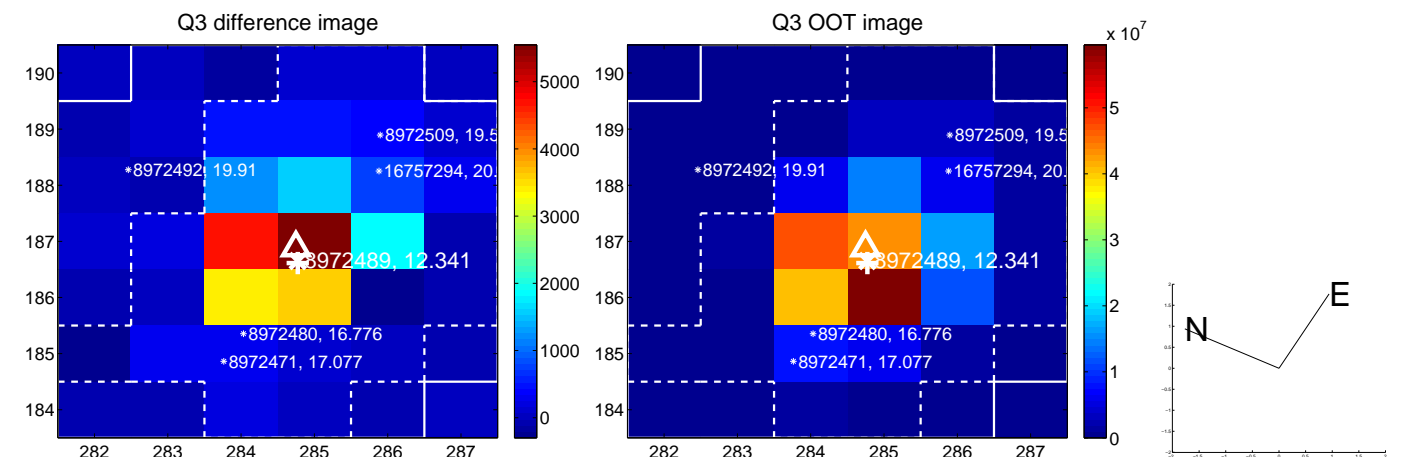
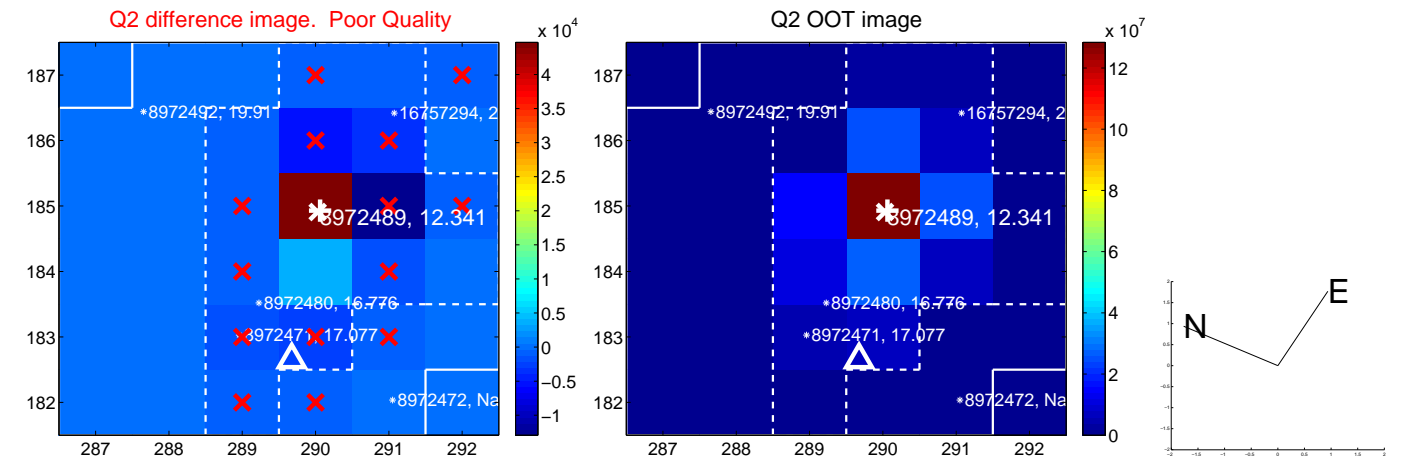
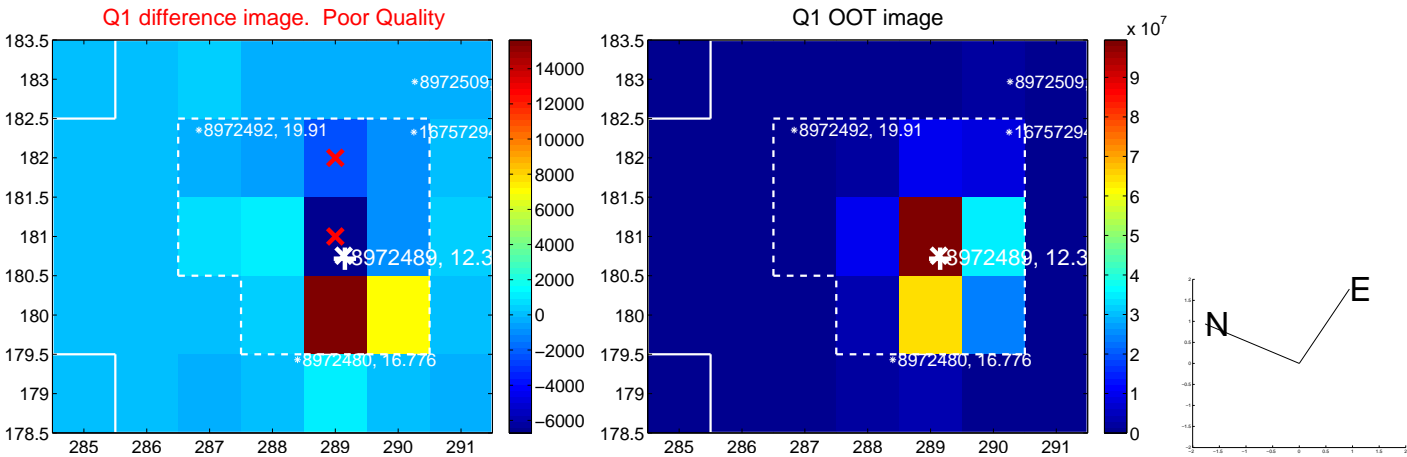
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.404 \pm 0.522$	0.77	$-0.402 \pm 0.540$	$0.040 \pm 0.221$
PRF-fit source offset from KIC position	$0.481 \pm 0.607$	0.79	$-0.477 \pm 0.590$	$-0.056 \pm 0.240$
photometric centroid source offset	$0.32 \pm 0.16$	1.99	$-0.29 \pm 0.17$	$0.14 \pm 0.13$



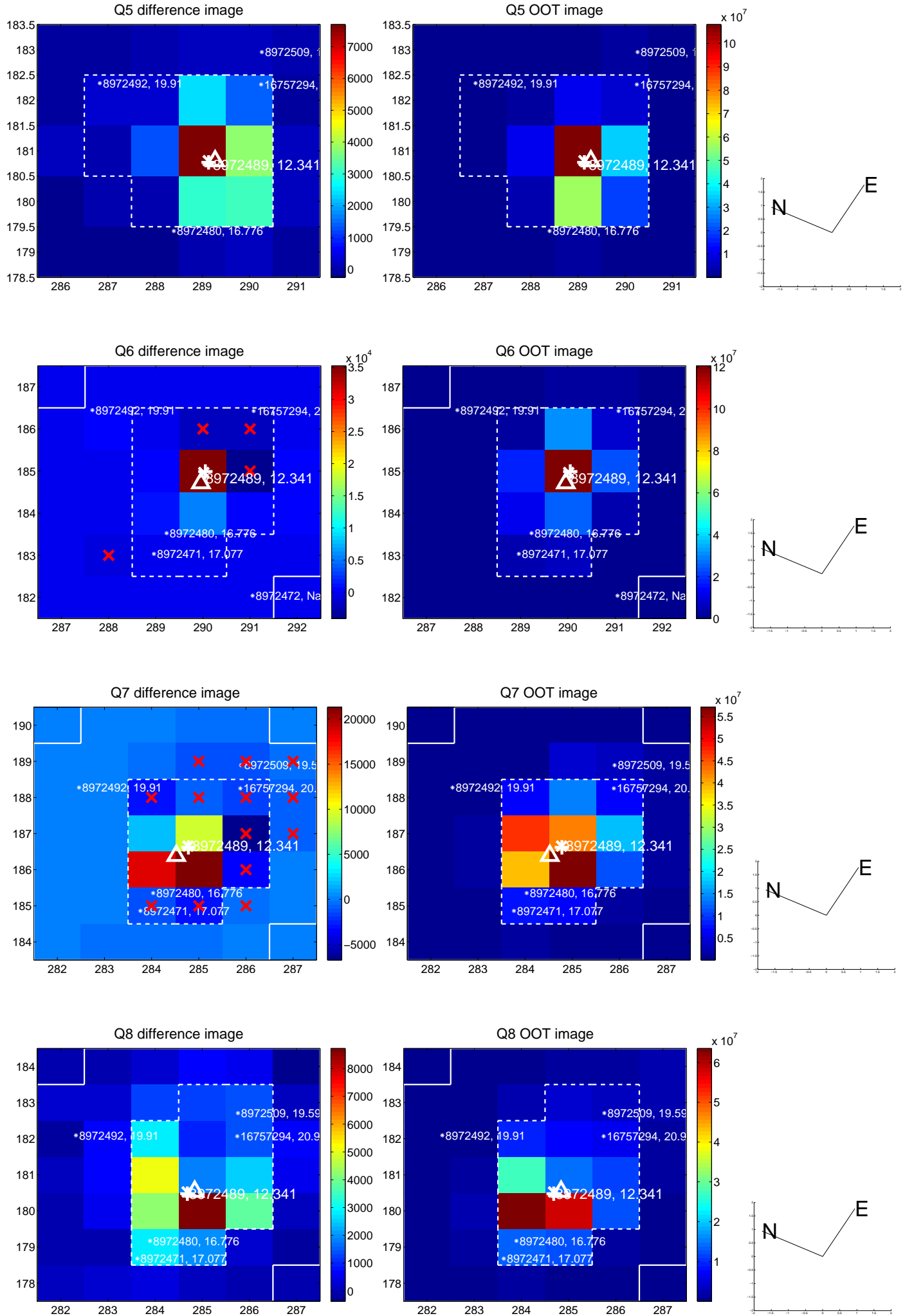
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



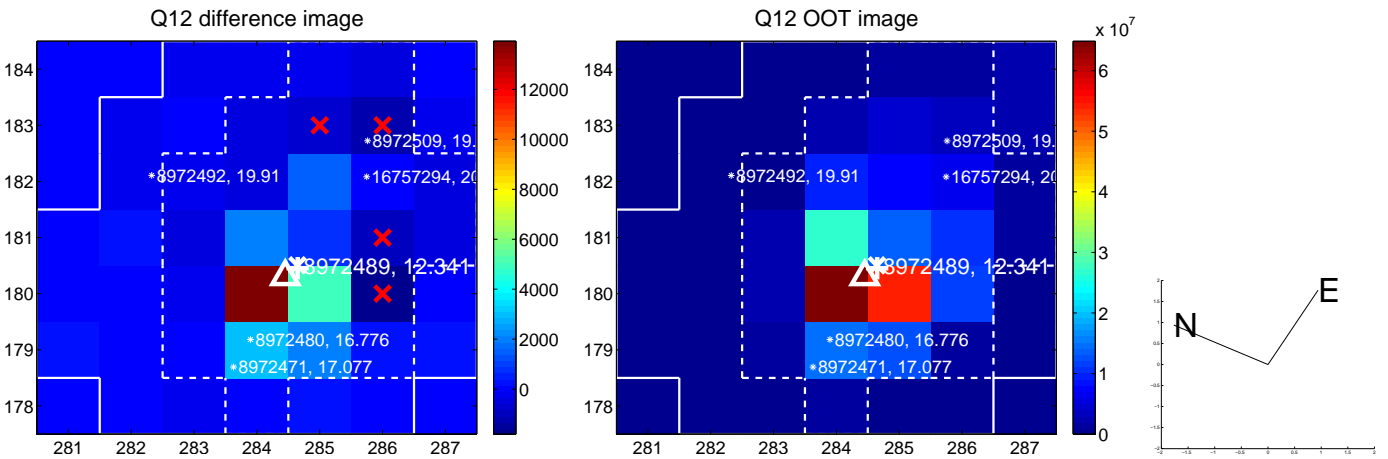
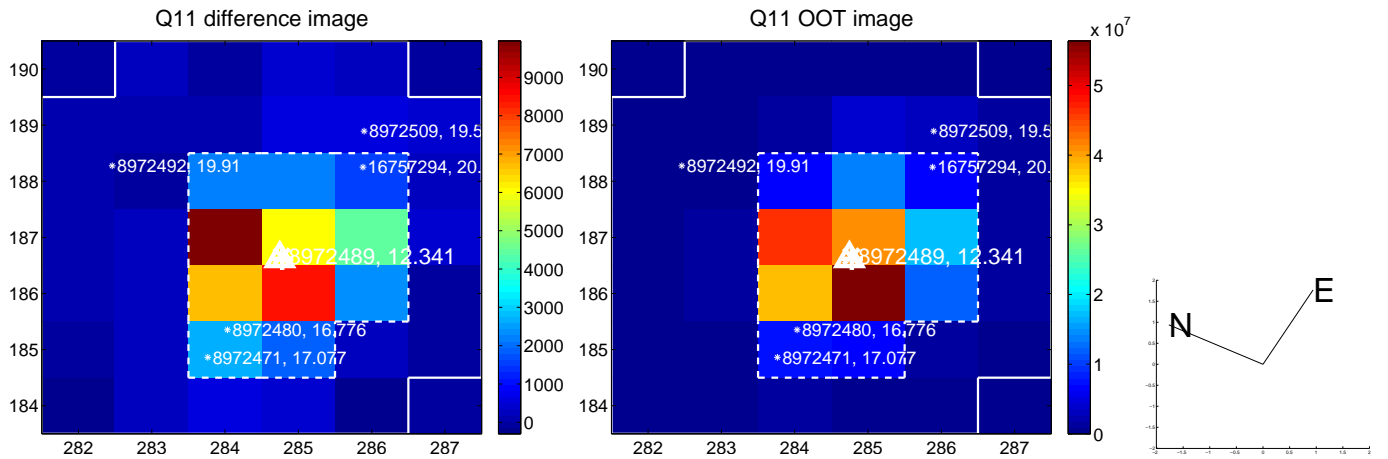
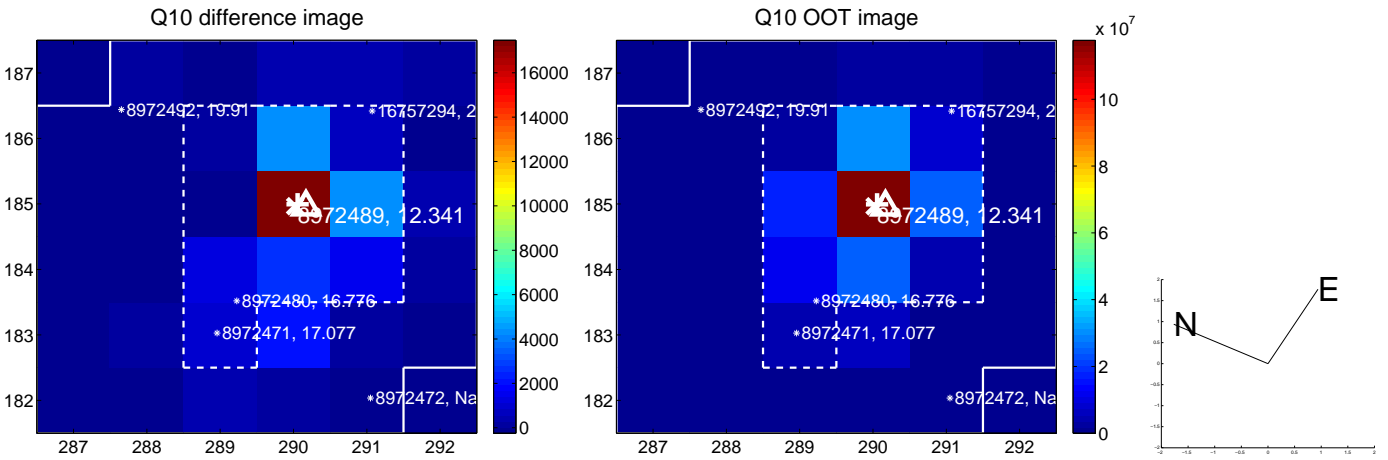
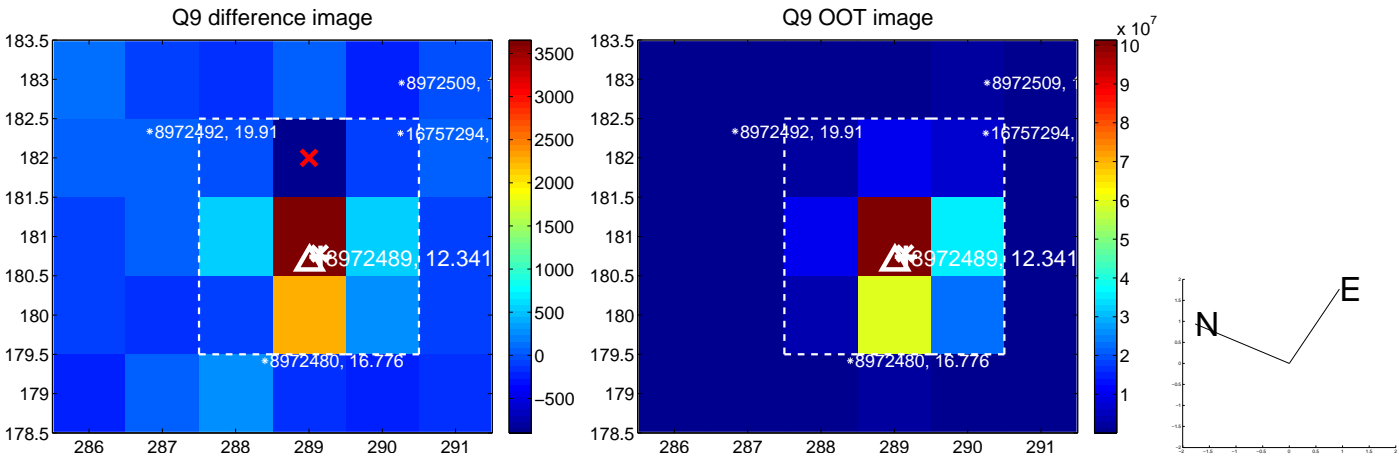
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

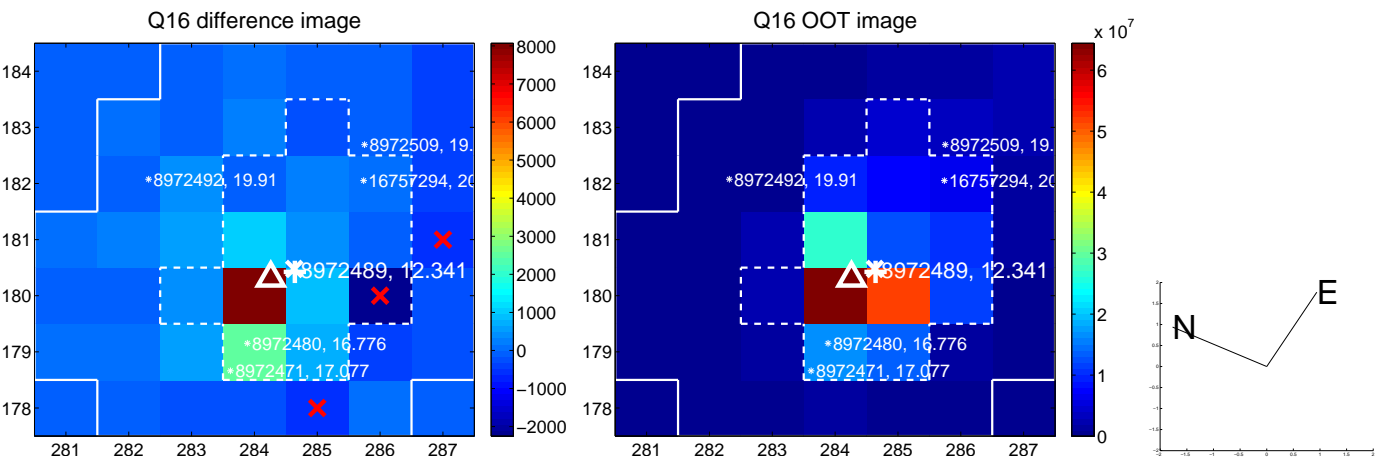
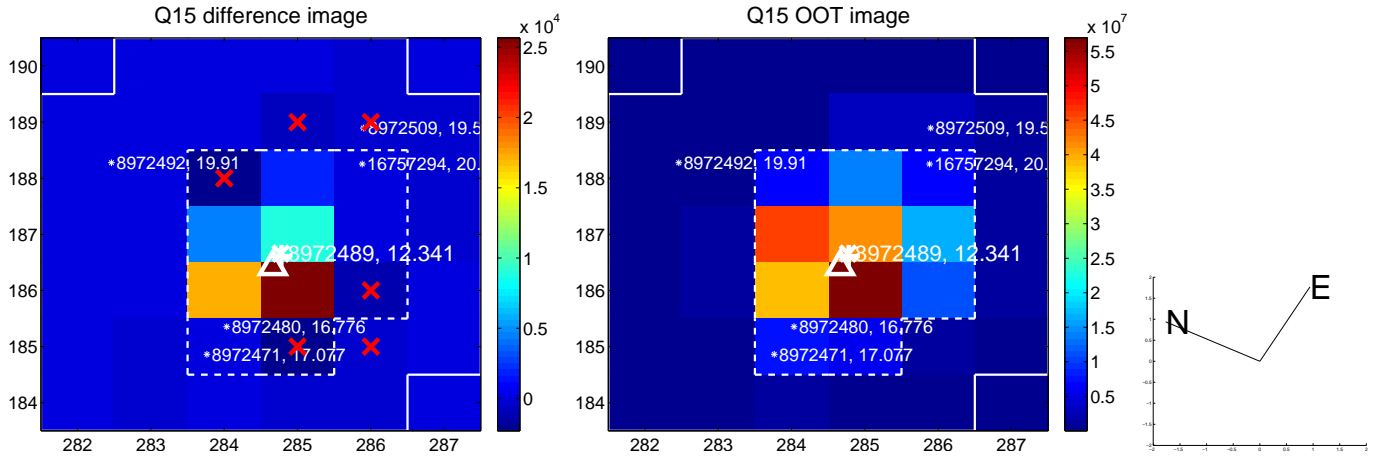
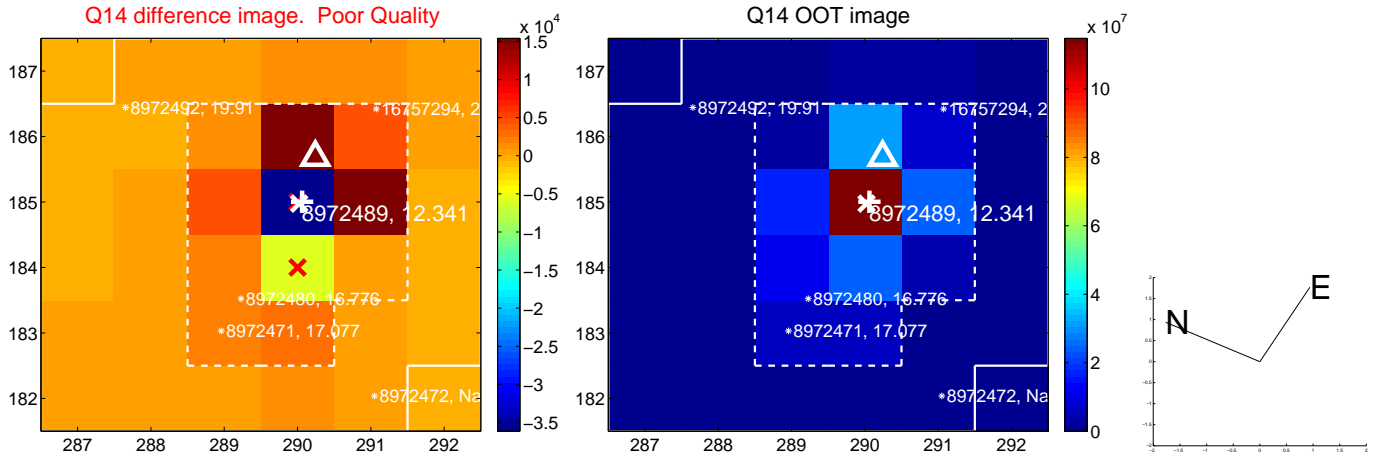
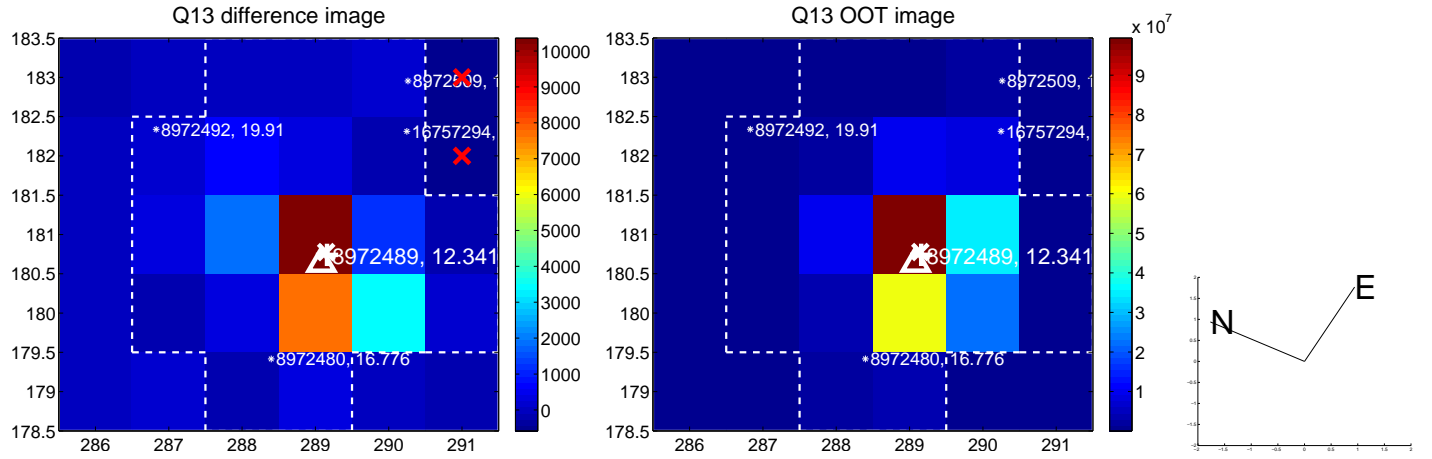


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

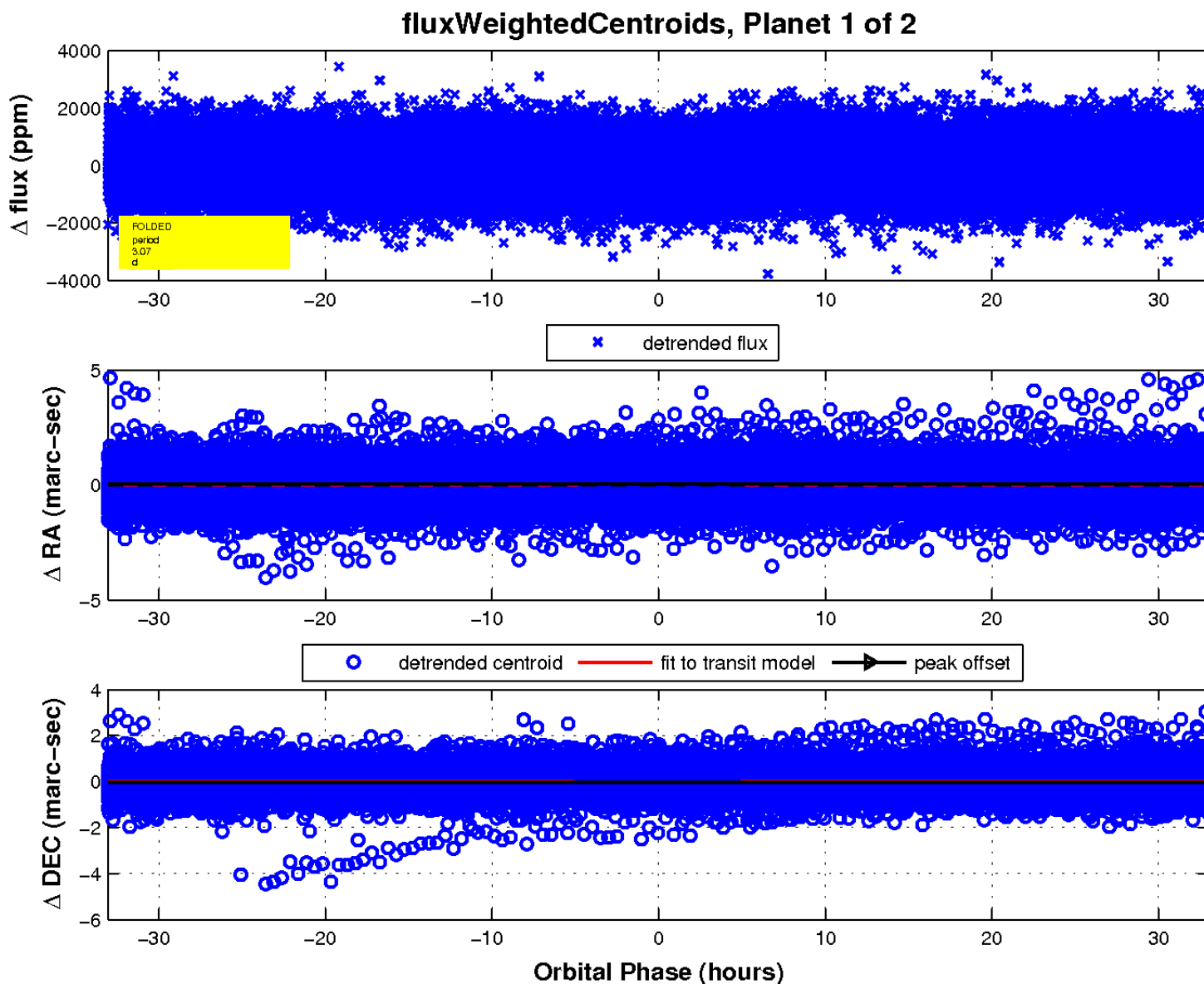
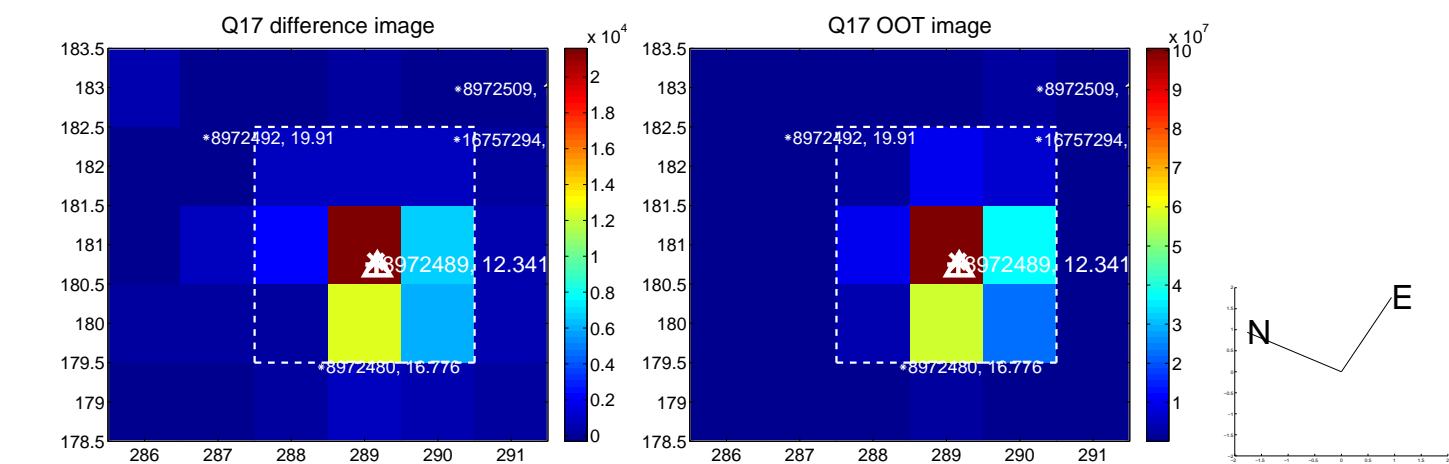




white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

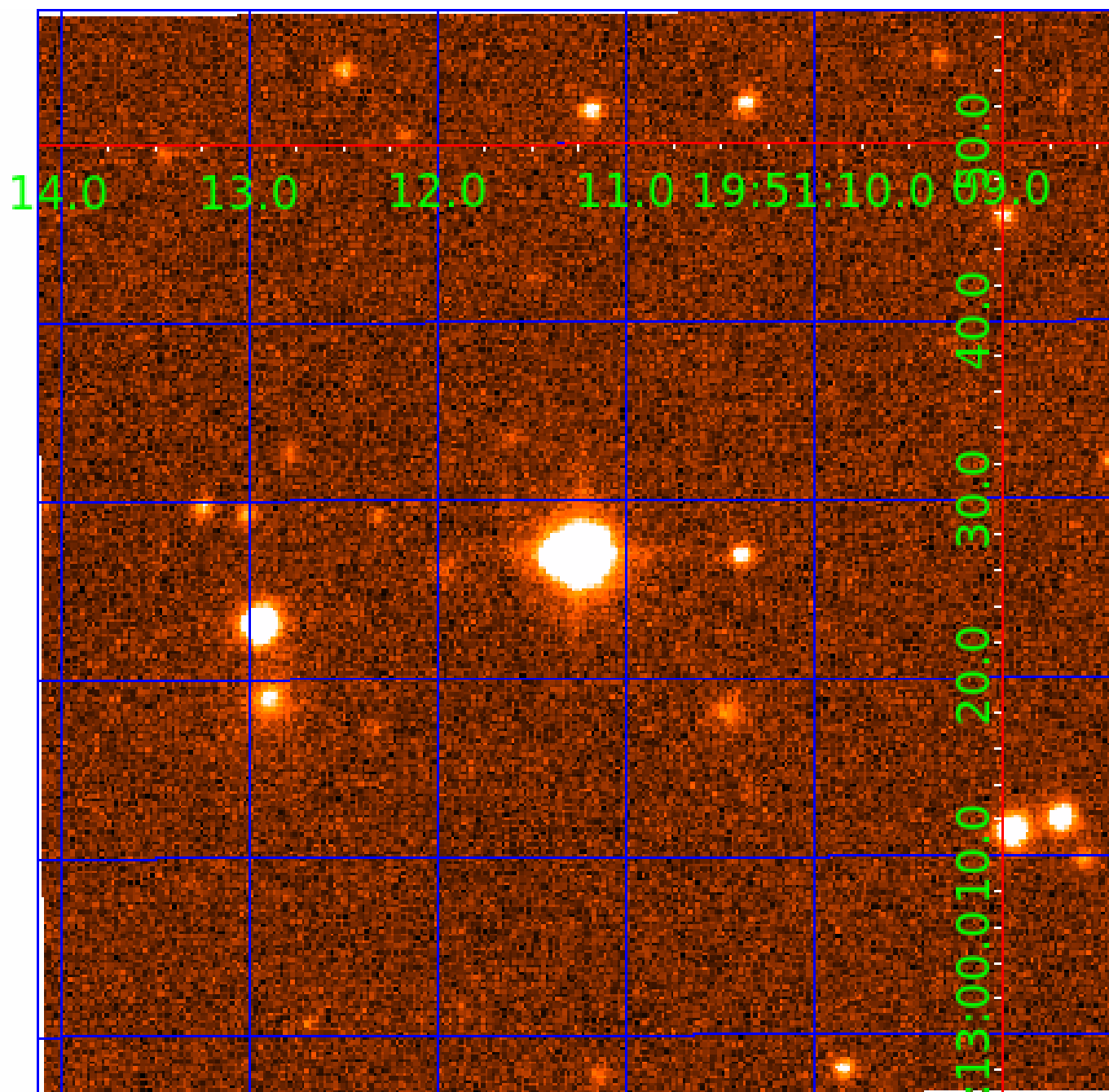


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 008972489

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
008972489-01	OBS	No	3.067119	132.401159	130.6	11.021	11.8	12.7	1.67	7022	2.22	2772.73
008972489-02	OBS	No	0.766848	131.556569	125.8	9.202	11.2	16.1	1.67	7022	3.65	17603.67

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008972489-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT
008972489-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—SAME_NTL_PERIOD

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

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

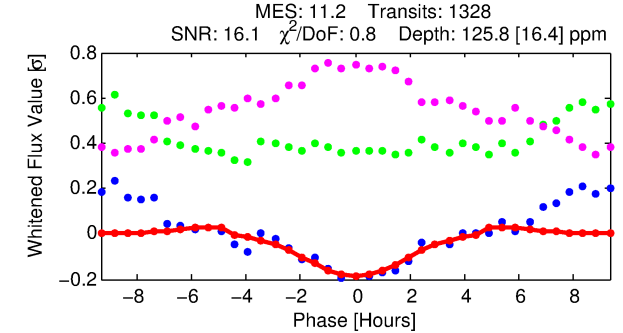
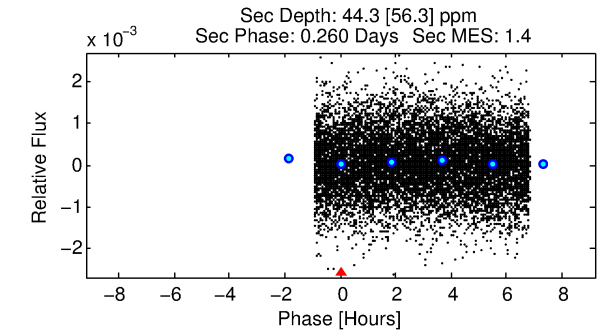
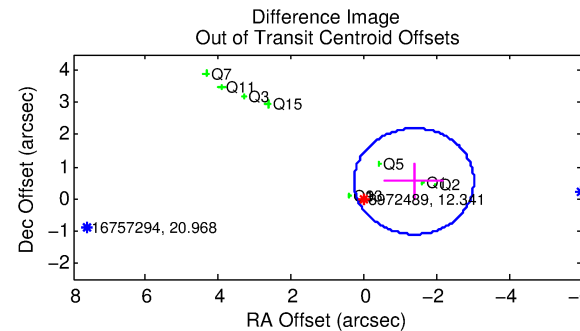
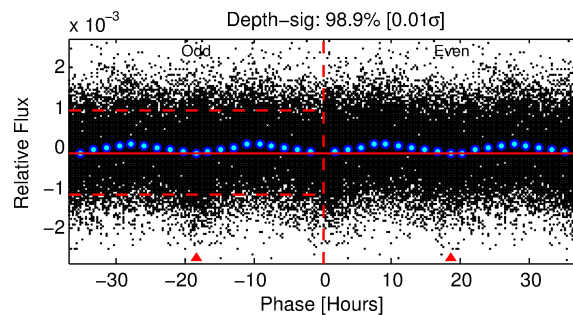
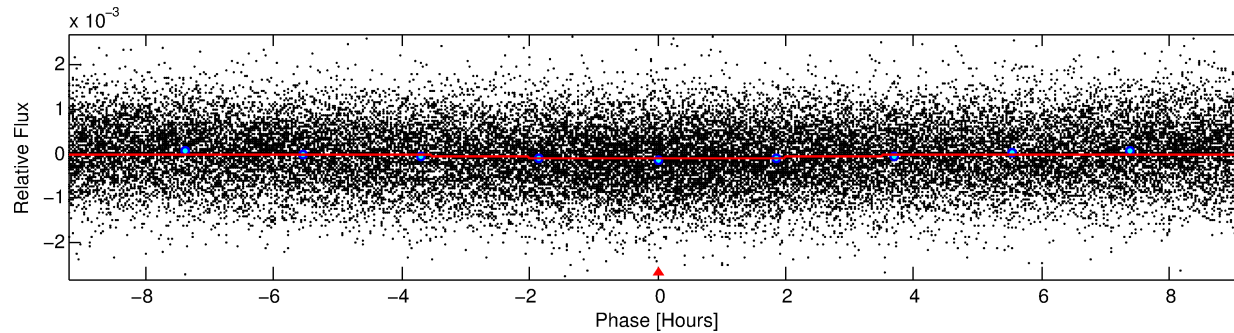
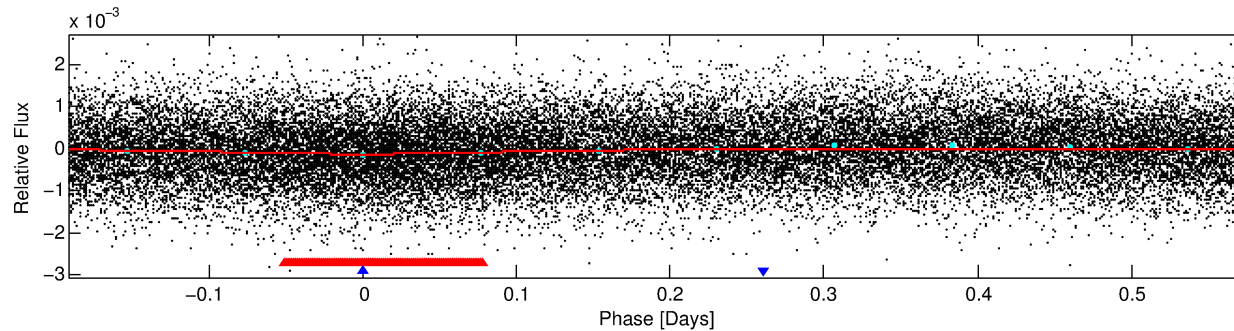
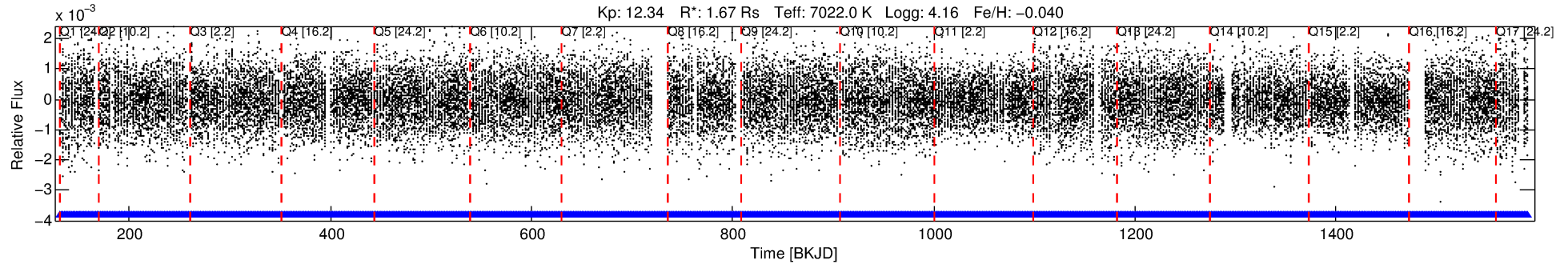
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 008972489-02

No Significant Match Found

# DV One-Page Summary

KIC: 8972489 Candidate: 2 of 2 Period: 0.767 d



## DV Fit Results:

Period = 0.76685 [0.00001] d  
Epoch = 131.5566 [0.0073] BKJD  
Rp/R\* = 0.0200 [0.0369]  
a/R\* = 1.01 [0.04]  
b = 1.00 [0.06]  
Sef = 17603.67 [7088.97]  
Teq = 2937 [296] K  
Rp = 3.65 [6.83] Re  
a = 0.0186 [0.0049] AU  
Ag = 0.63 [2.47] [-0.15 $\sigma$ ]  
Teffp = 4047 [3950] K [0.28 $\sigma$ ]

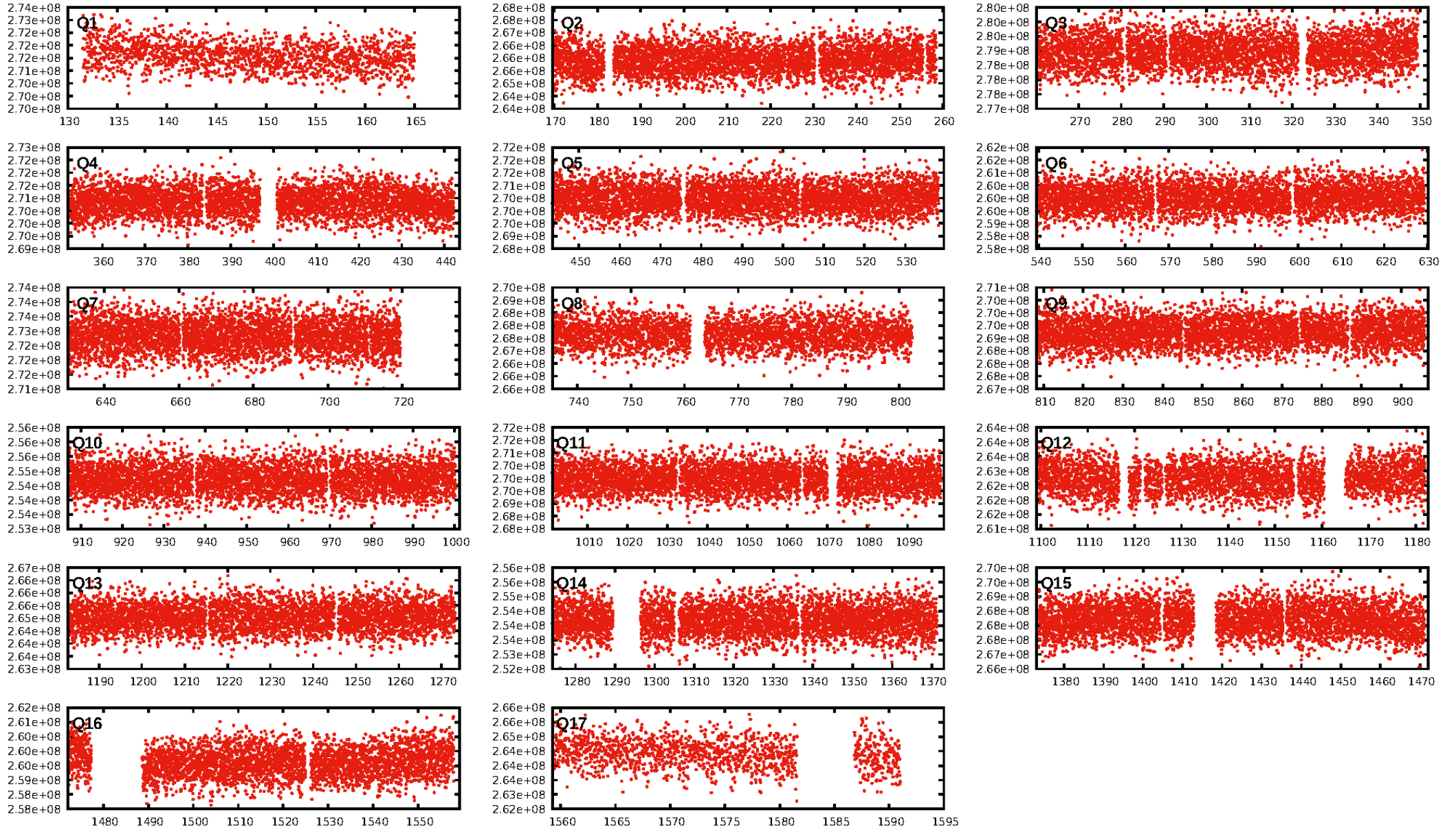
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [3.85 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [1267/1267]  
GhostDiagnostic-chr: 1.388  
Centroid-sig: 0.0%  
Centroid-so: 0.454 arcsec [4.32 $\sigma$ ]  
OotOffset-rm: 1.480 arcsec [2.69 $\sigma$ ]  
KicOffset-rm: 1.402 arcsec [2.55 $\sigma$ ]  
OotOffset-st: 1/4/0/4 [9]  
KicOffset-st: 1/4/0/4 [9]  
DiffImageQuality-fgm: 0.56 [5/9]  
DiffImageOverlap-fno: 1.00 [17/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 02-Feb-2016 01:28:14 Z

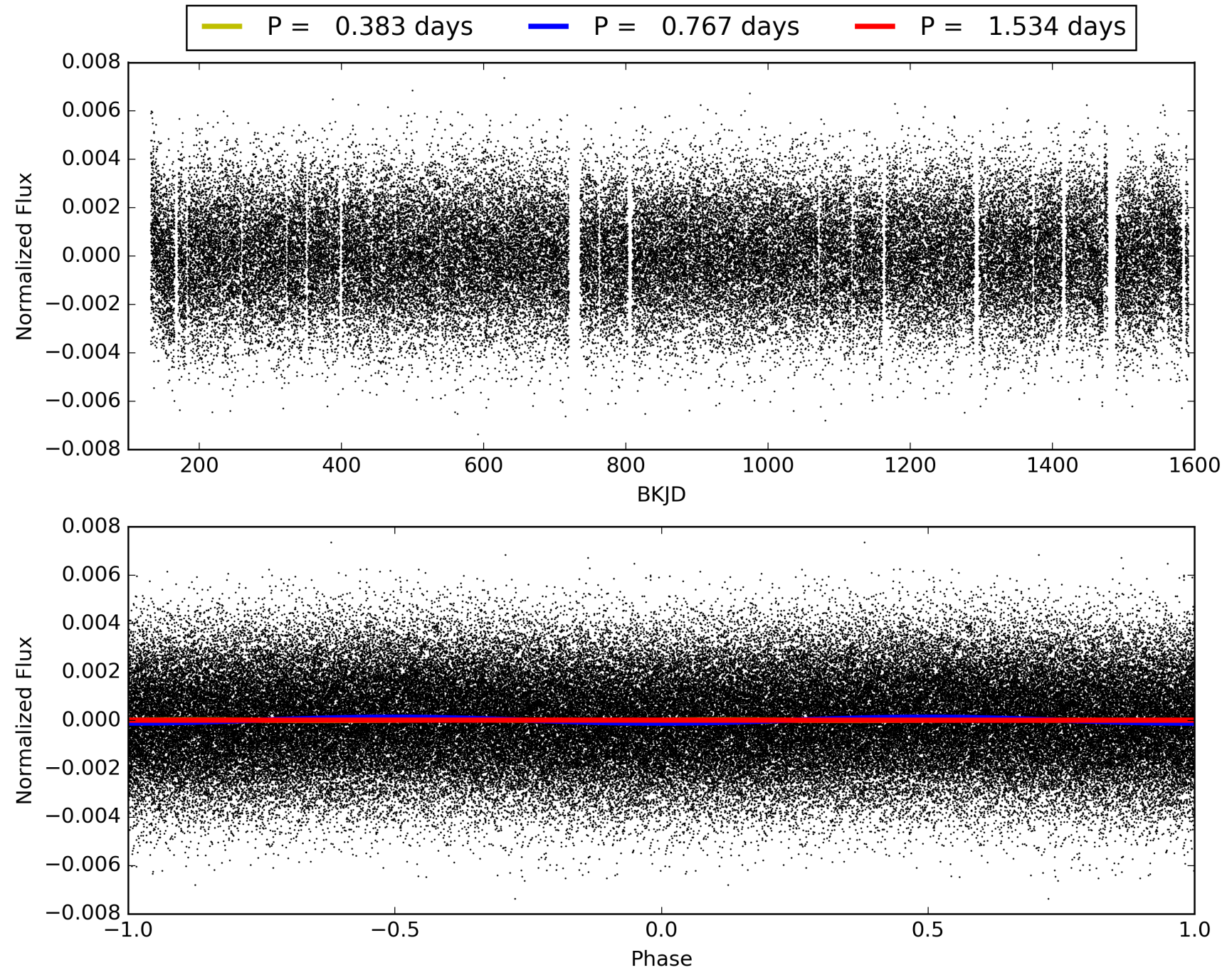
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 008972489-02, PDC Light Curves





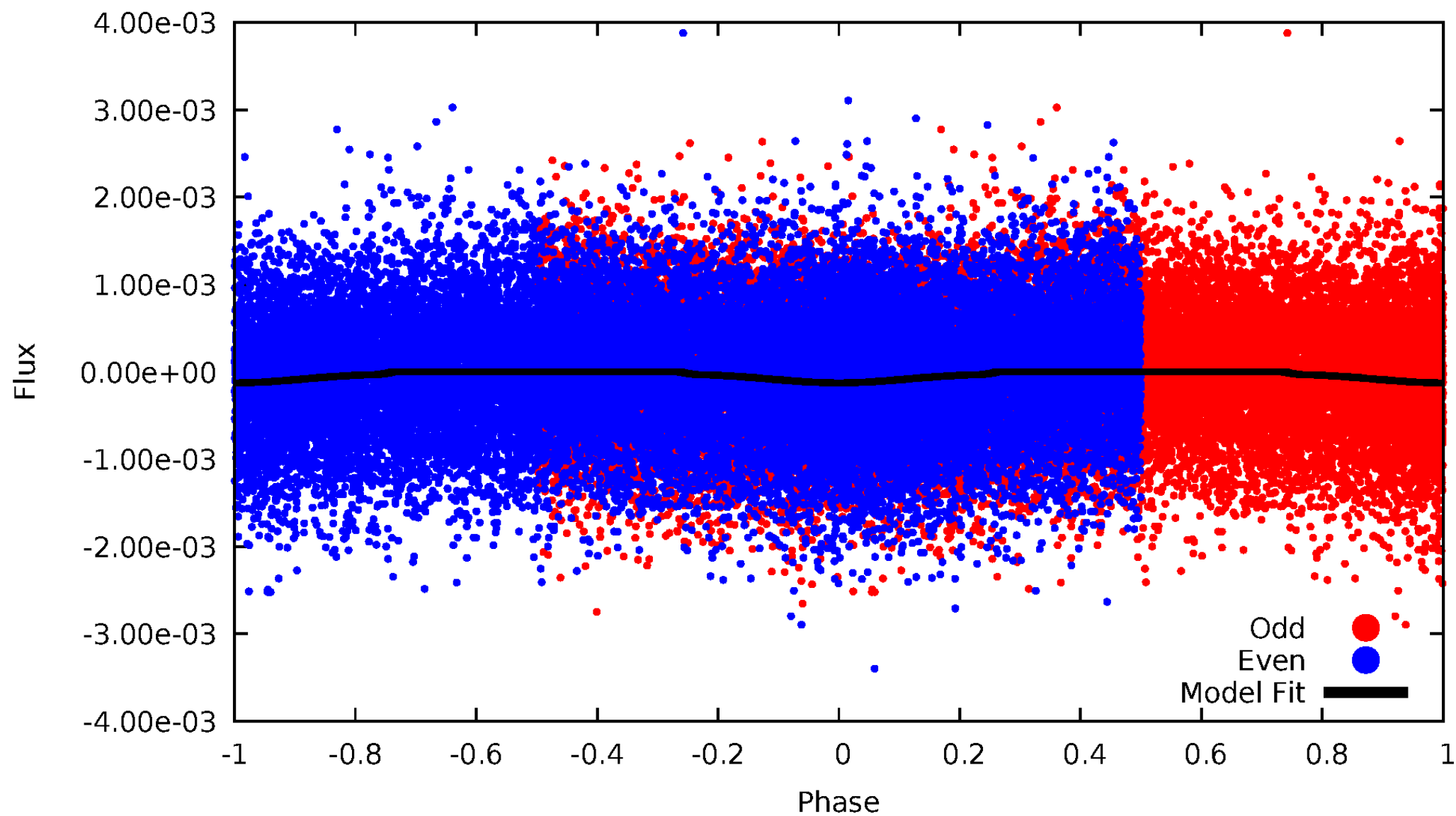
# TCE 008972489-02





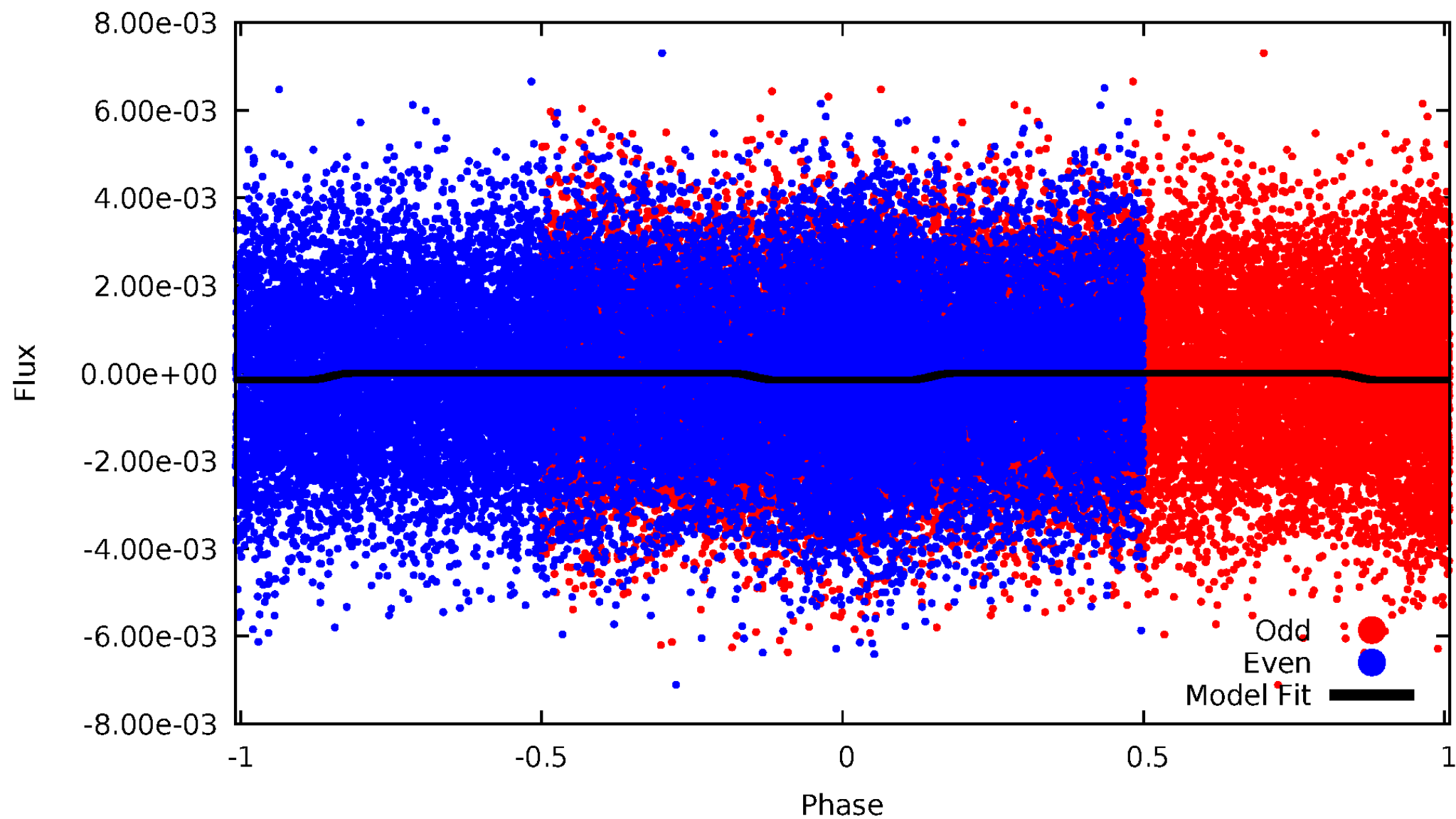
# DV Odd/Even

TCE 008972489-02



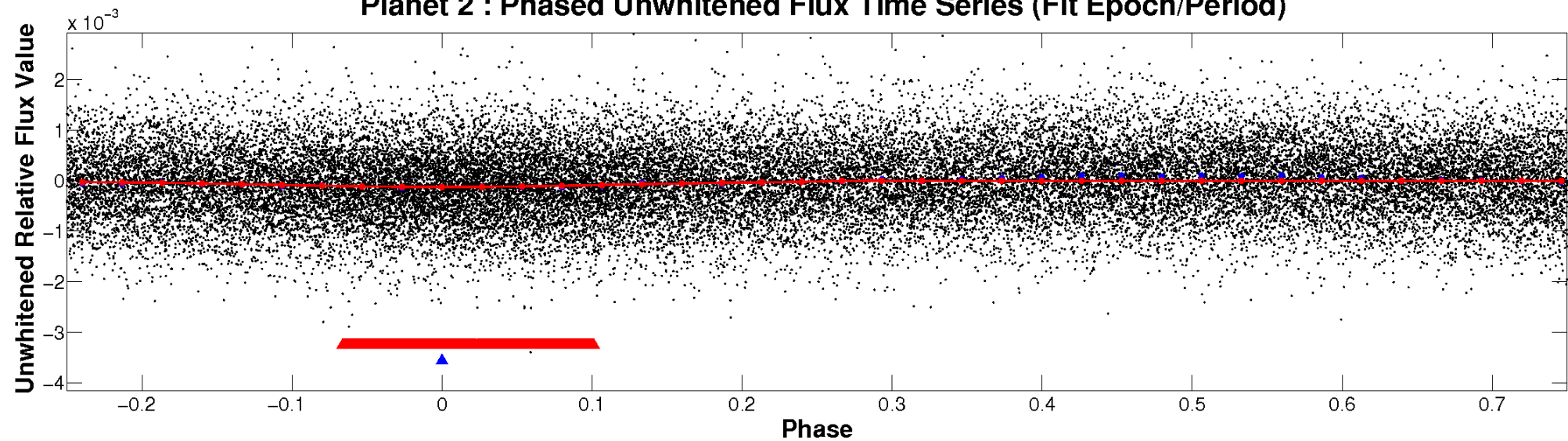
# ALT Odd/Even

TCE 008972489-02

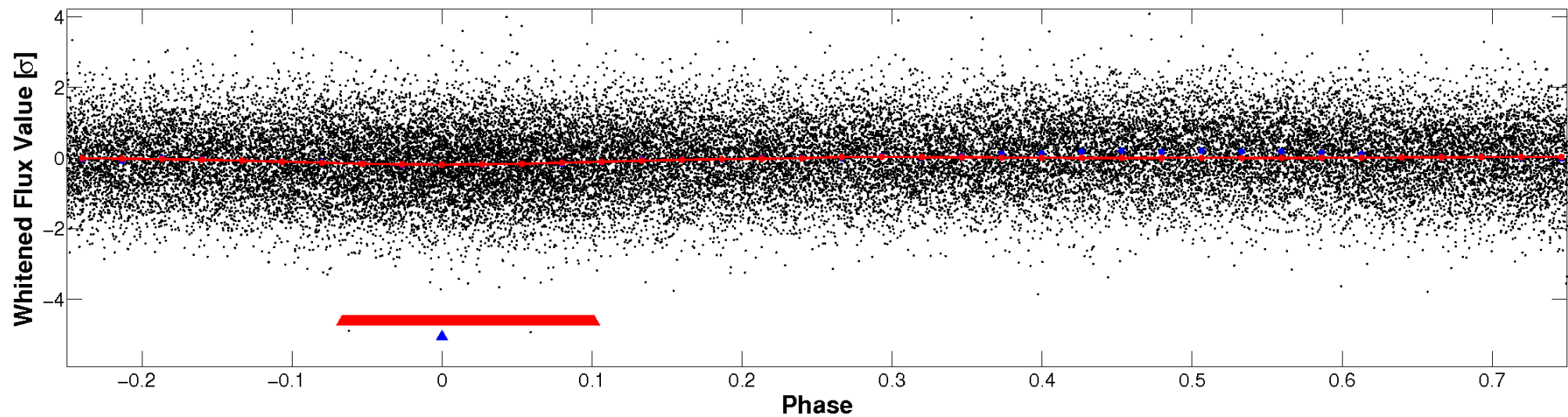


# Non-Whitened Vs. Whitened Light Curve

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

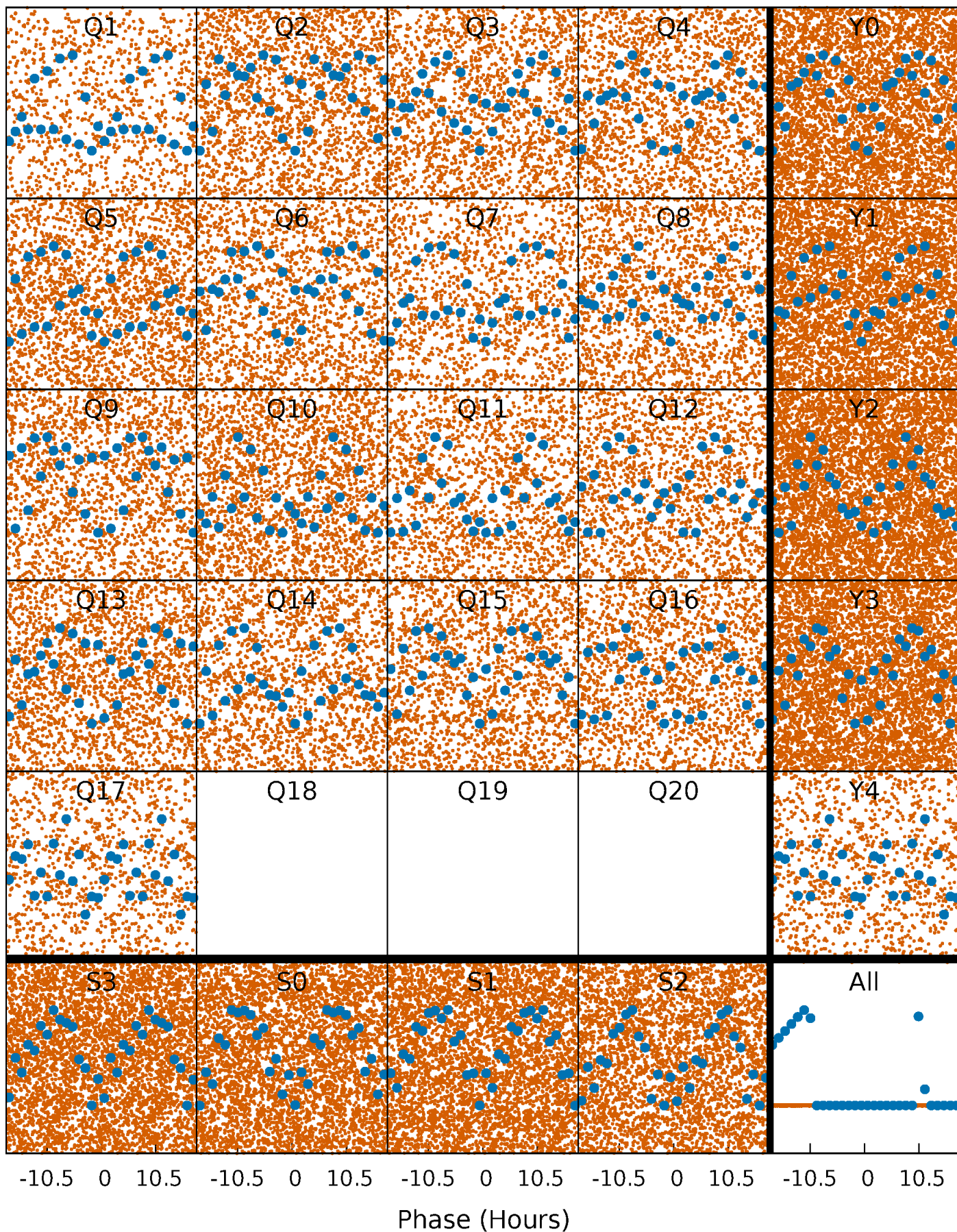


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

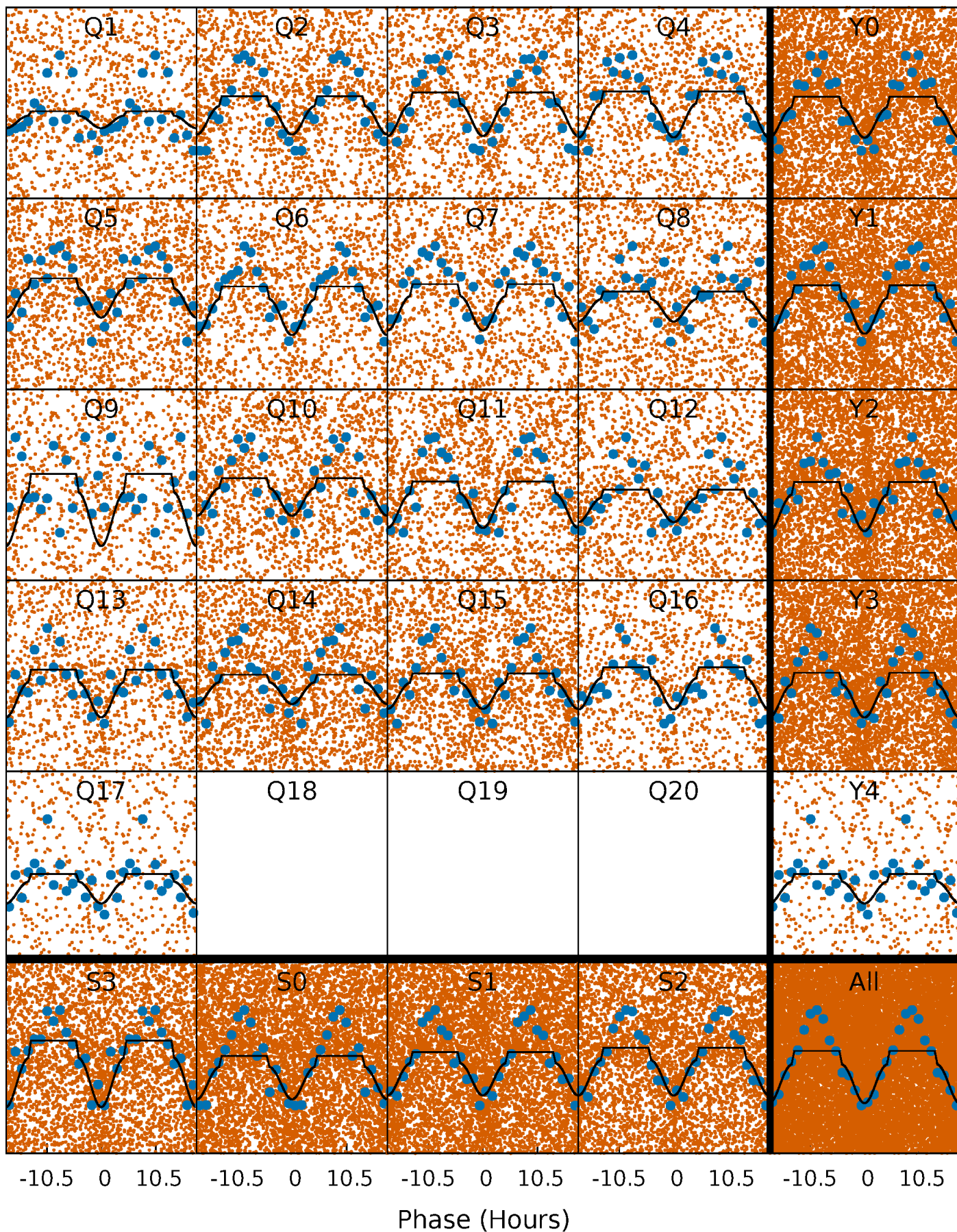
TCE 008972489-02   P= 0.766848 Days    $T_0=131.556569$  (BKJD)





# DV Quarter-Phased Transit Curves

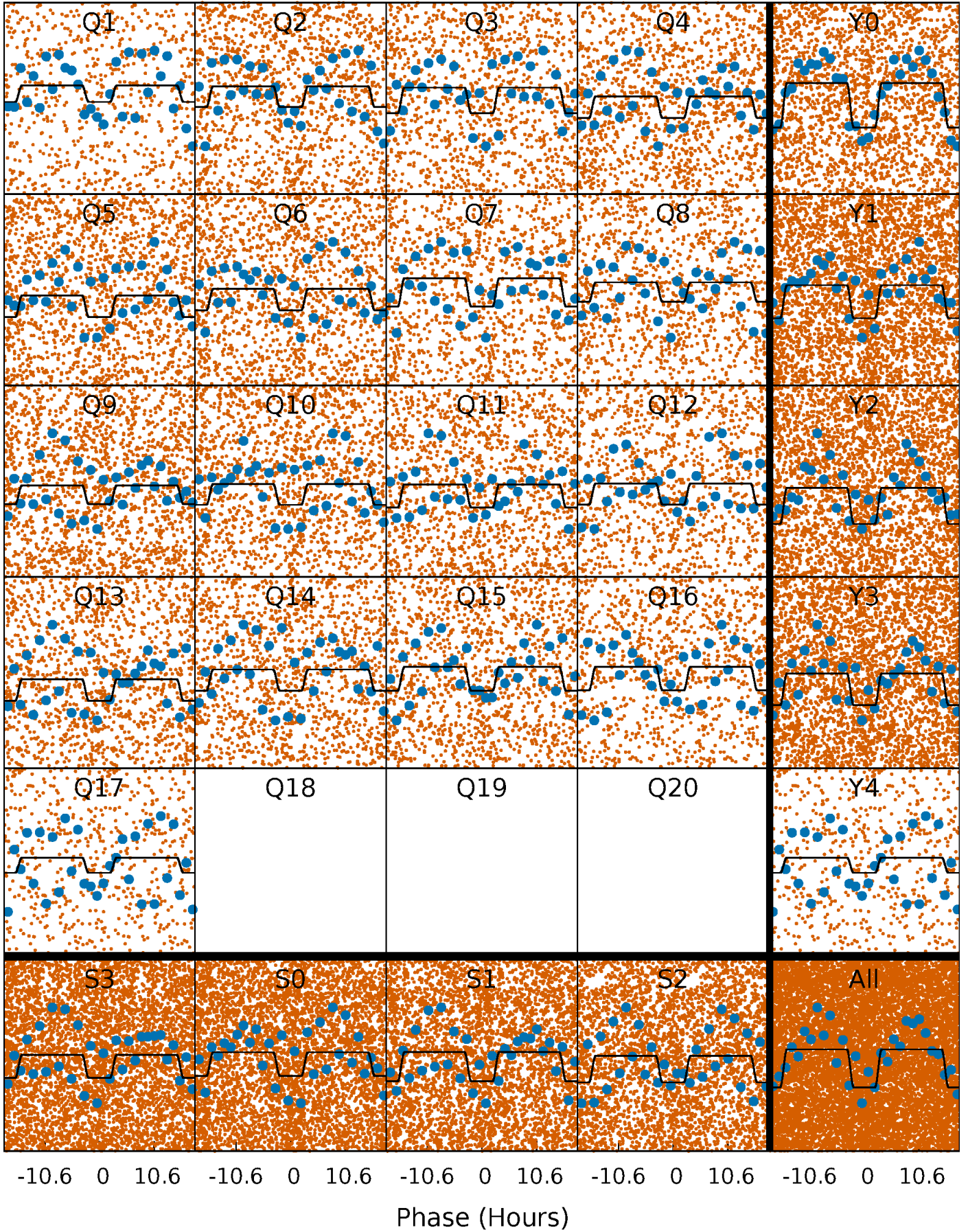
TCE 008972489-02   P= 0.766848 Days    $T_0=131.556569$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

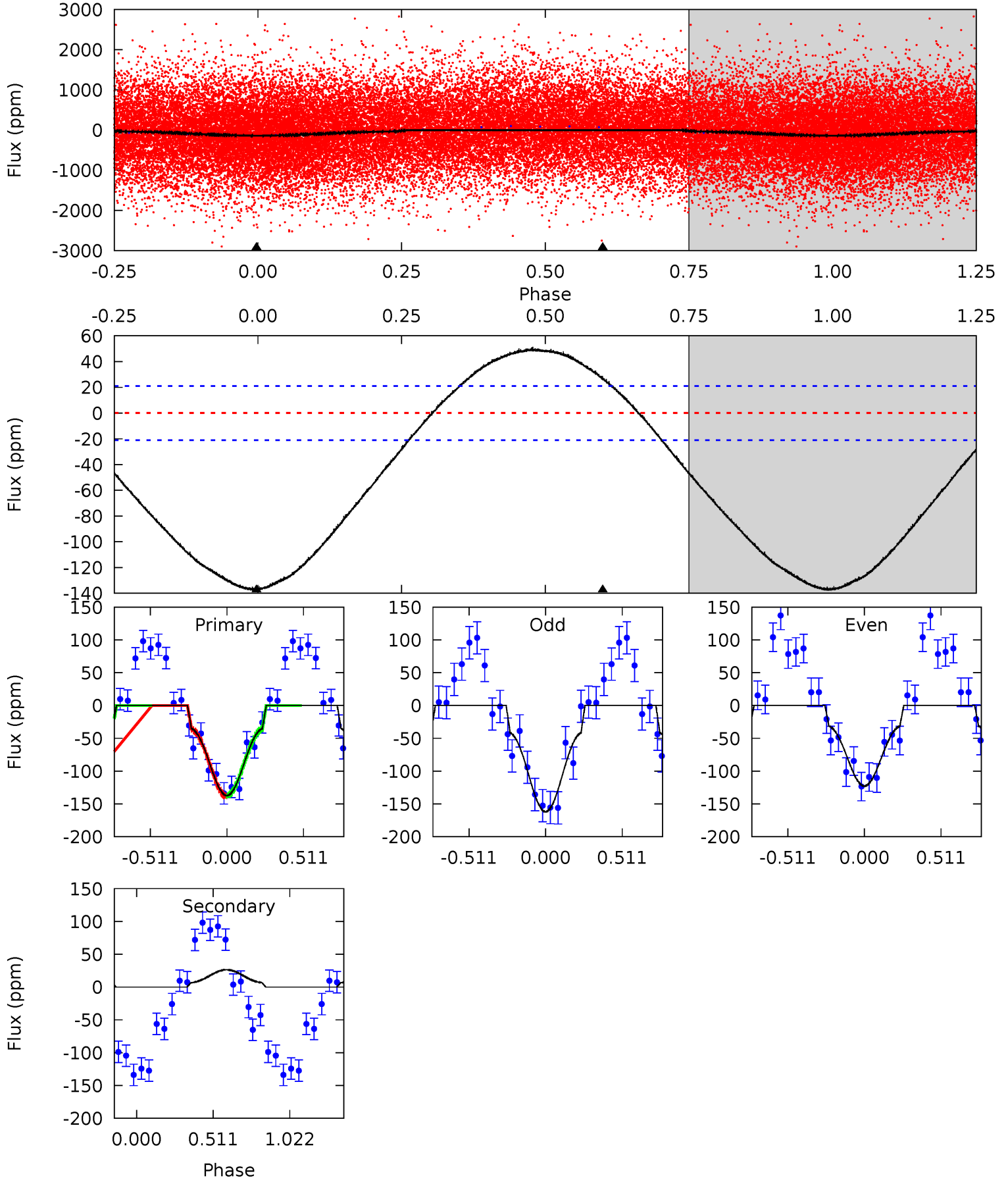
TCE 008972489-02   P= 0.766814 Days    $T_0=131.577954$  (BKJD)



# DV Model-Shift Uniqueness Test

008972489-02, P = 0.766848 Days, E = 130.789721 Days

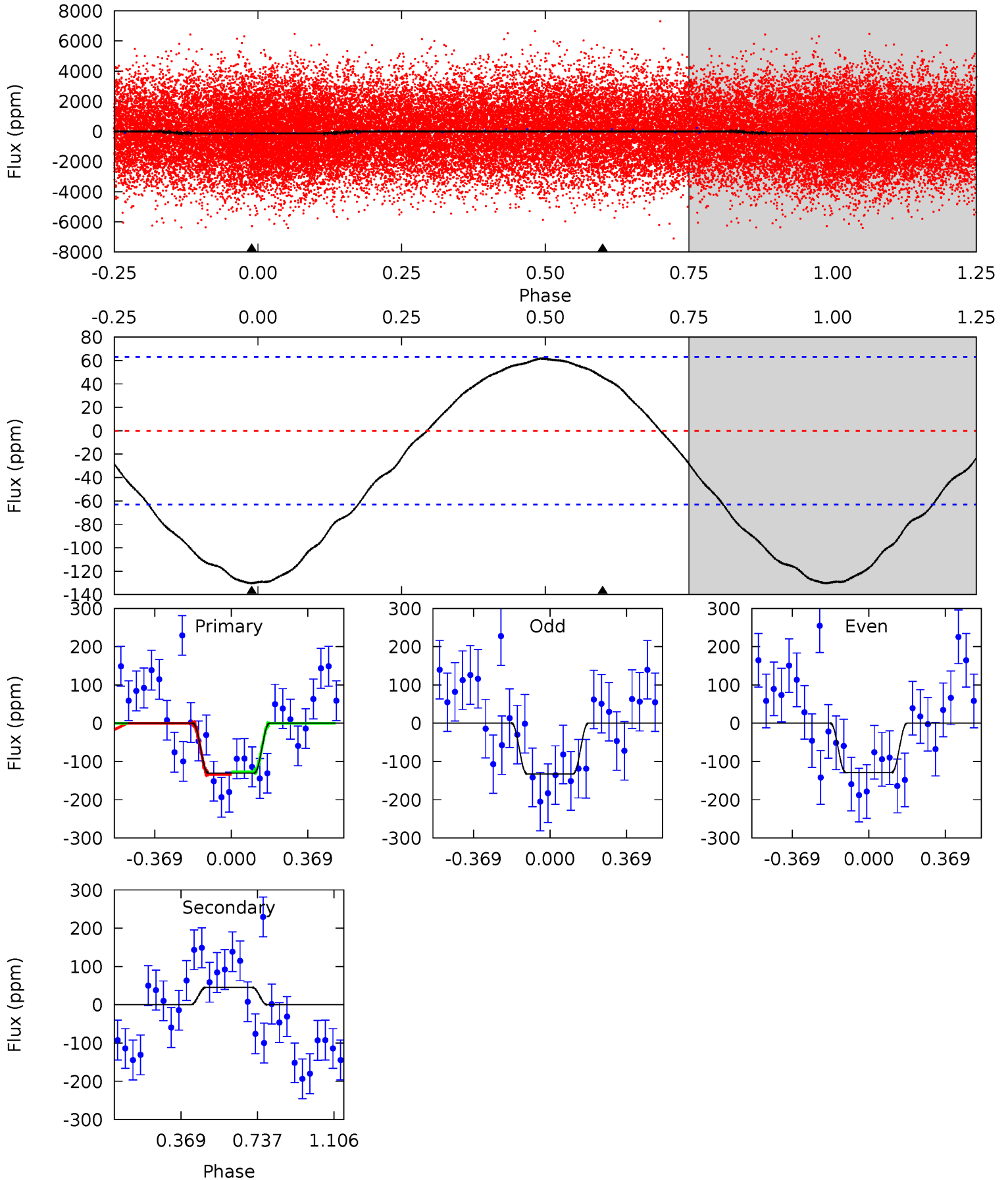
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
27.5	-5.27	0	0	4.21	0.66	3.11	27.5	27.5	-5.27	-5.27	3.89	1.05	0.27	0.15



# Alt Model-Shift Uniqueness Test

008972489-02, P = 0.766814 Days, E = 130.811140 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
8.85	-3.10	0	0	4.28	0.90	1.09	8.85	8.85	-3.10	-3.10	0.13	1.28	0.32	0.21



### Stellar Parameters For KIC 008972489

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7022^{+197}_{-271}$	$4.155^{+0.132}_{-0.198}$	$-0.040^{+0.250}_{-0.350}$	$1.670^{+0.537}_{-0.313}$	$1.459^{+0.220}_{-0.242}$	$0.441^{+0.289}_{-0.233}$
	+3%/-4%	+3%/-5%	+625%/-875%	+32%/-19%	+15%/-17%	+66%/-53%
Source	PHO1	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 008972489-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$26 \pm 5$	$6.50^{+5.98}_{-4.39}$	$4108^{+318}_{-250}$	$-4046^{+265}_{-959}$	$-0.115^{+0.084}_{-0.946}$
Alt.	$46 \pm 15$	$5.22^{+5.42}_{-3.28}$	$4109^{+343}_{-259}$	$-4296^{+438}_{-1457}$	$-0.306^{+0.238}_{-2.017}$

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

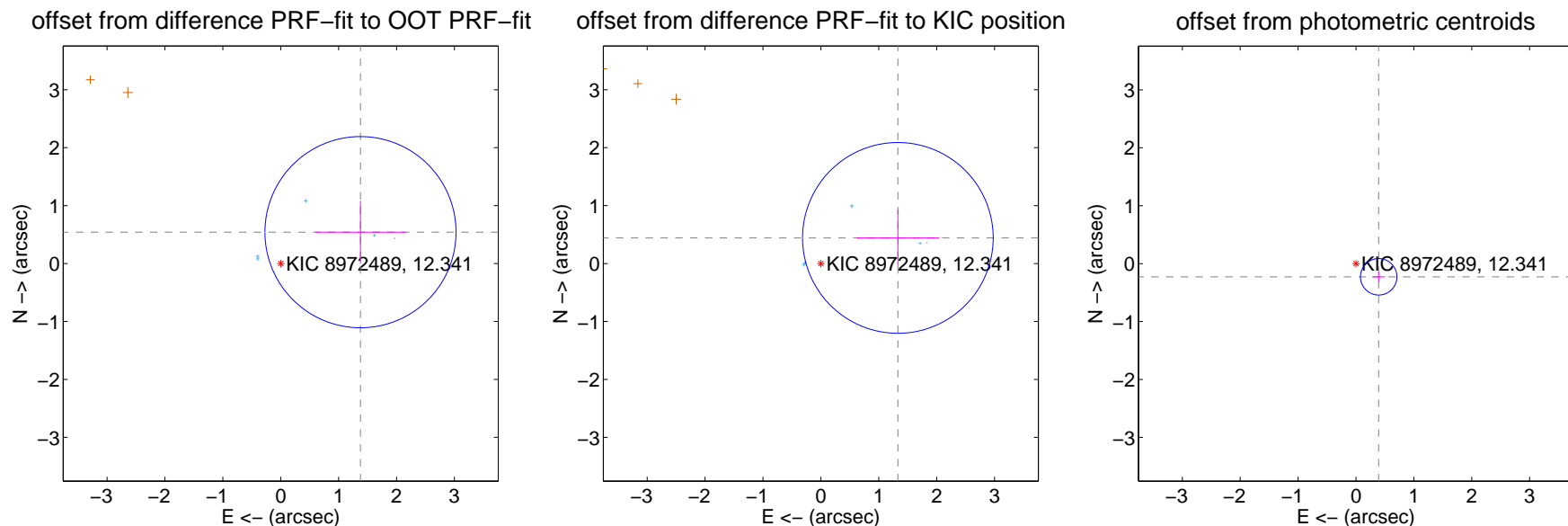
## DV Centroid Data

Supplemental centroid analysis for 008972489-02. Kepler magnitude: 12.34. Transit SNR 16.09

There are 5 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.18 arcsec

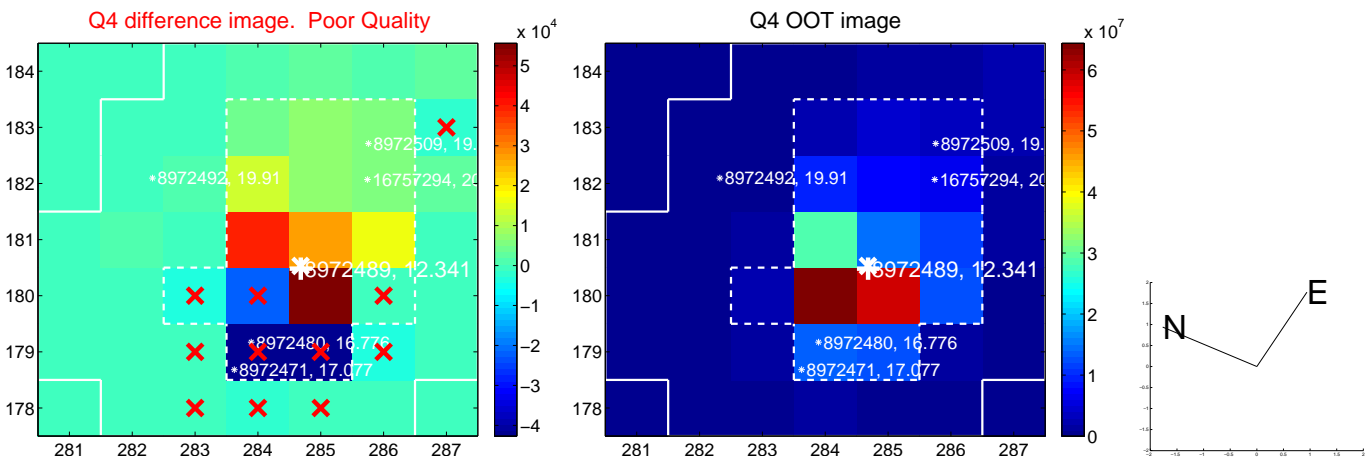
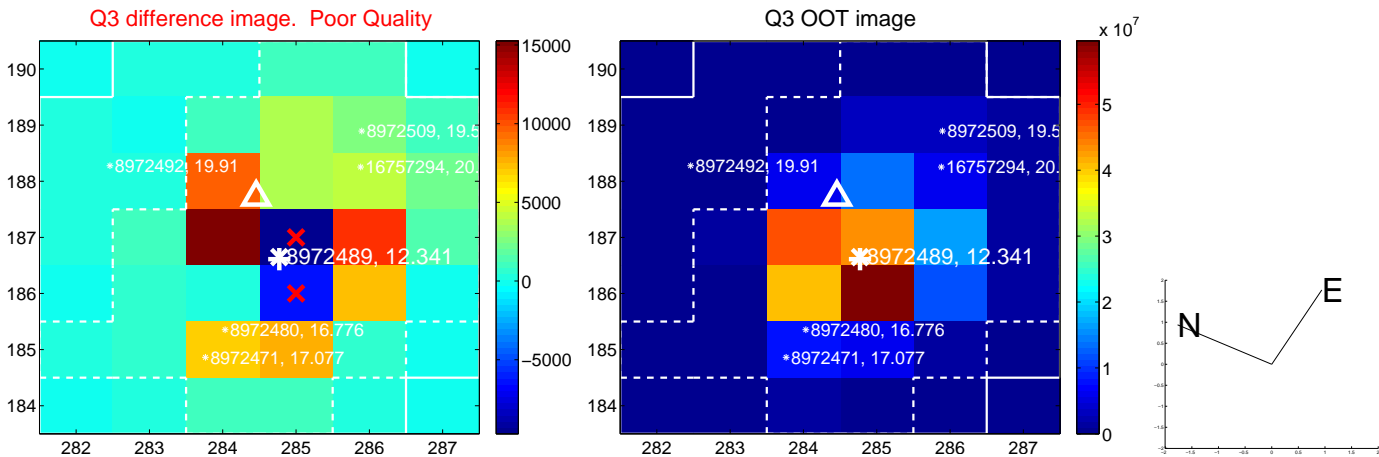
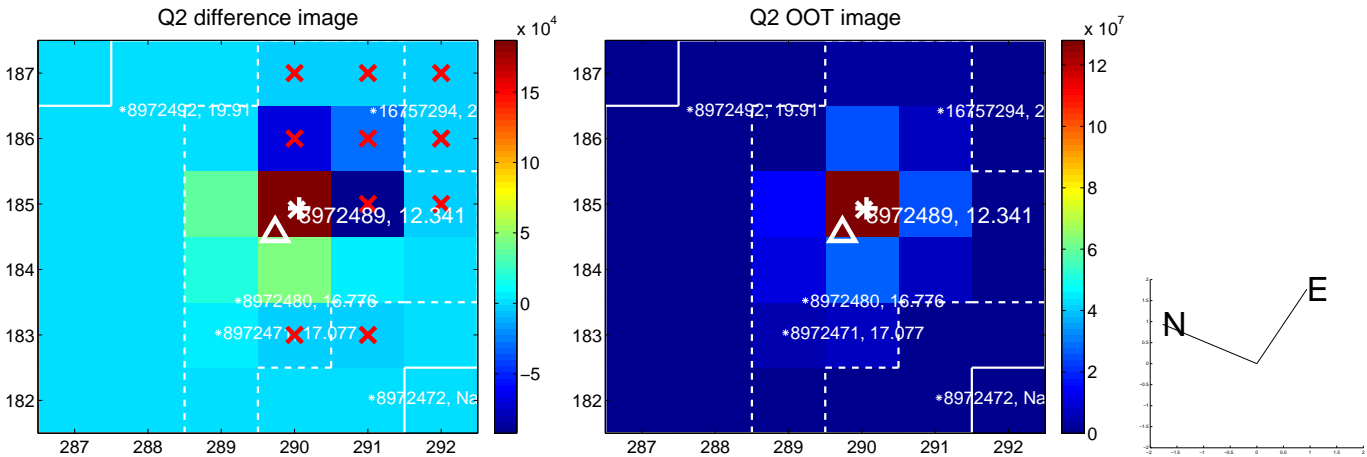
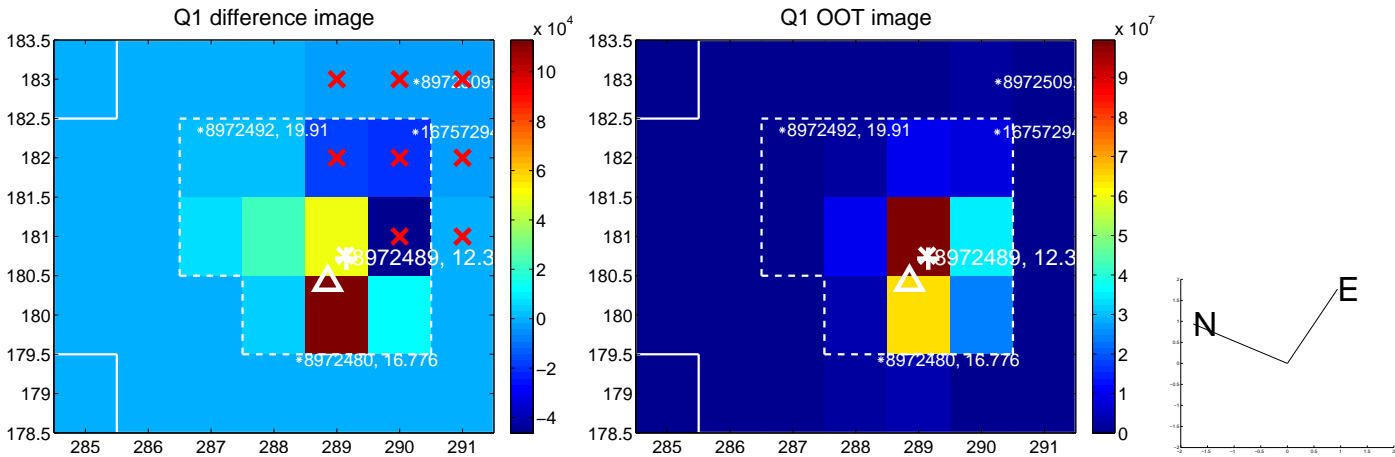
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.480 \pm 0.550$	2.69	$-1.377 \pm 0.782$	$0.541 \pm 0.539$
PRF-fit source offset from KIC position	$1.402 \pm 0.549$	2.55	$-1.330 \pm 0.712$	$0.442 \pm 0.486$
photometric centroid source offset	$0.45 \pm 0.10$	4.32	$-0.39 \pm 0.11$	$-0.23 \pm 0.09$



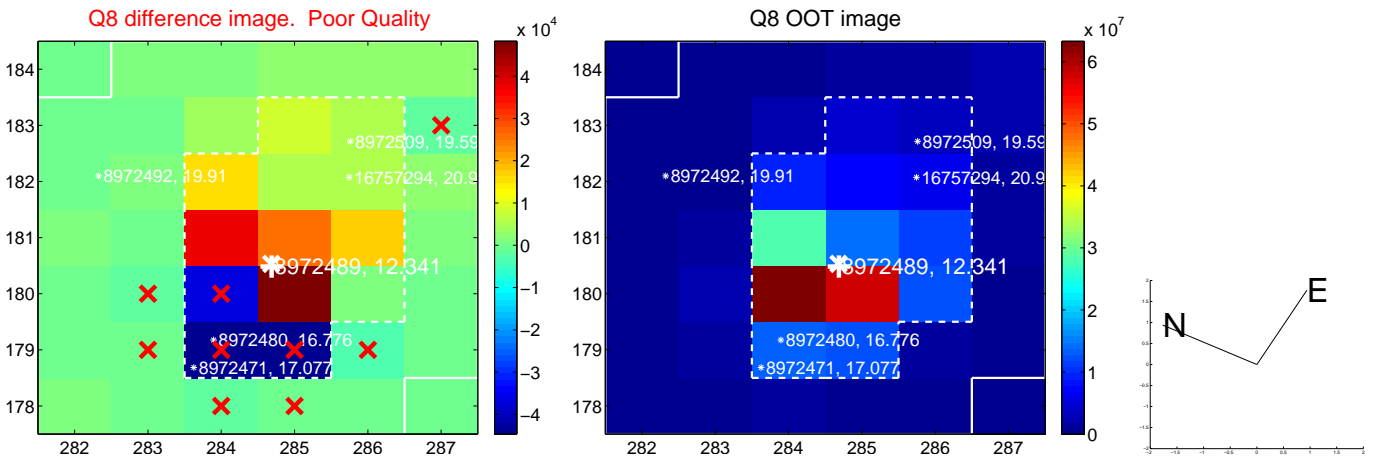
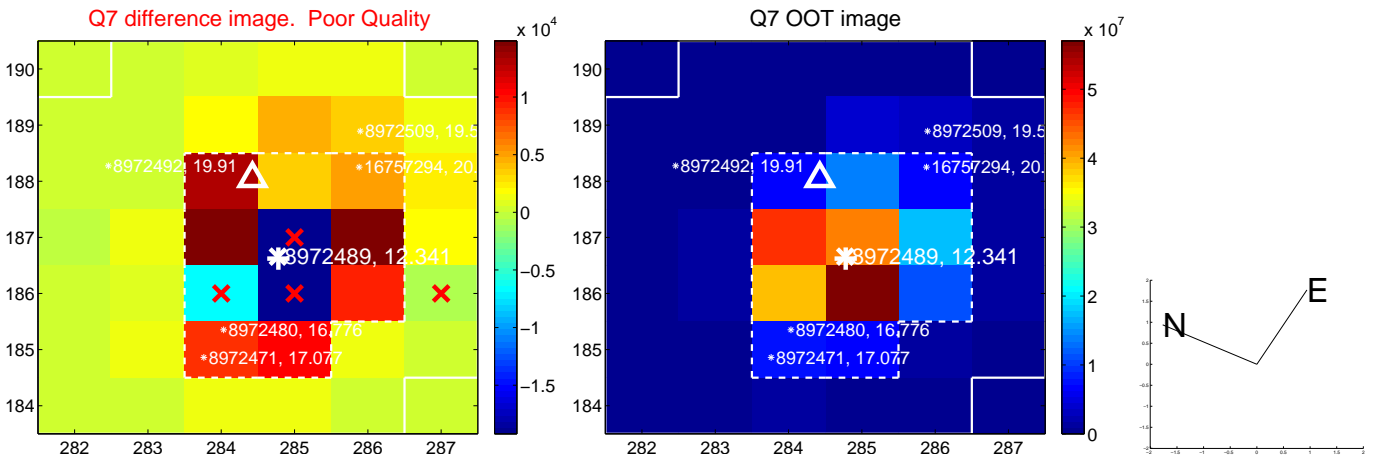
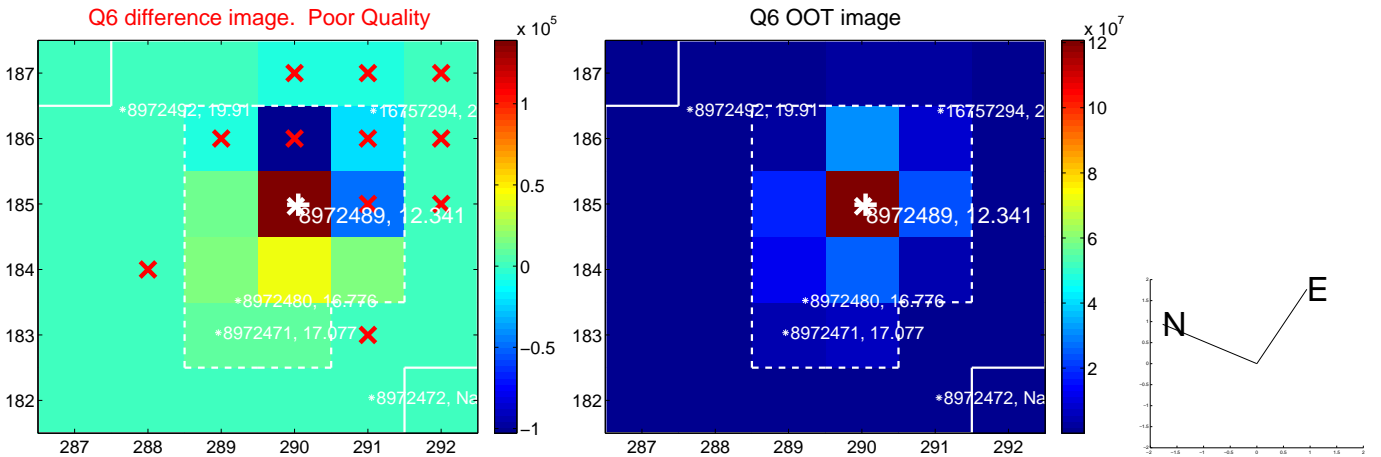
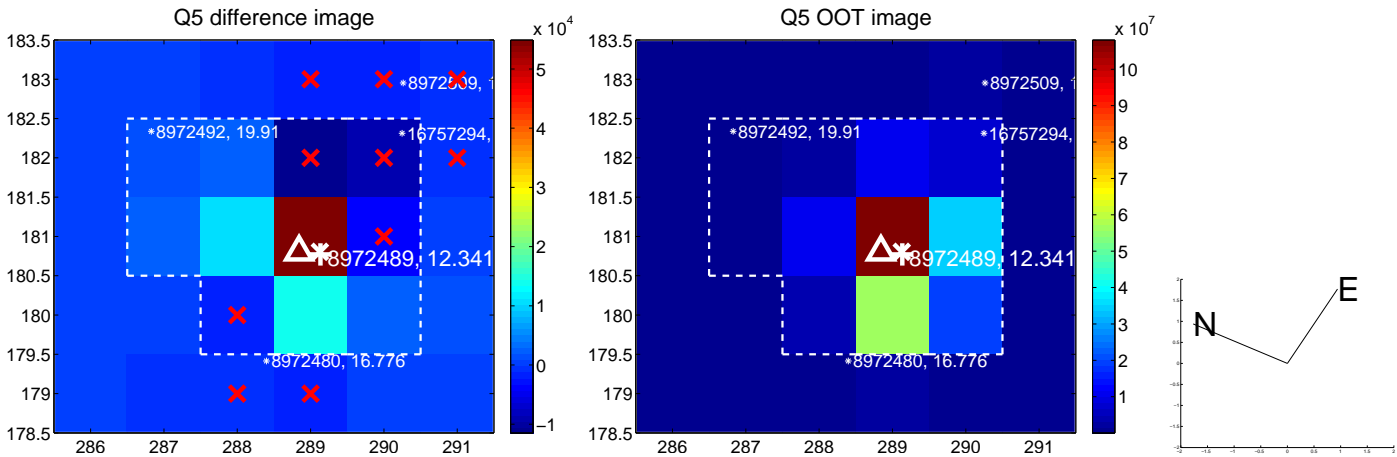
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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



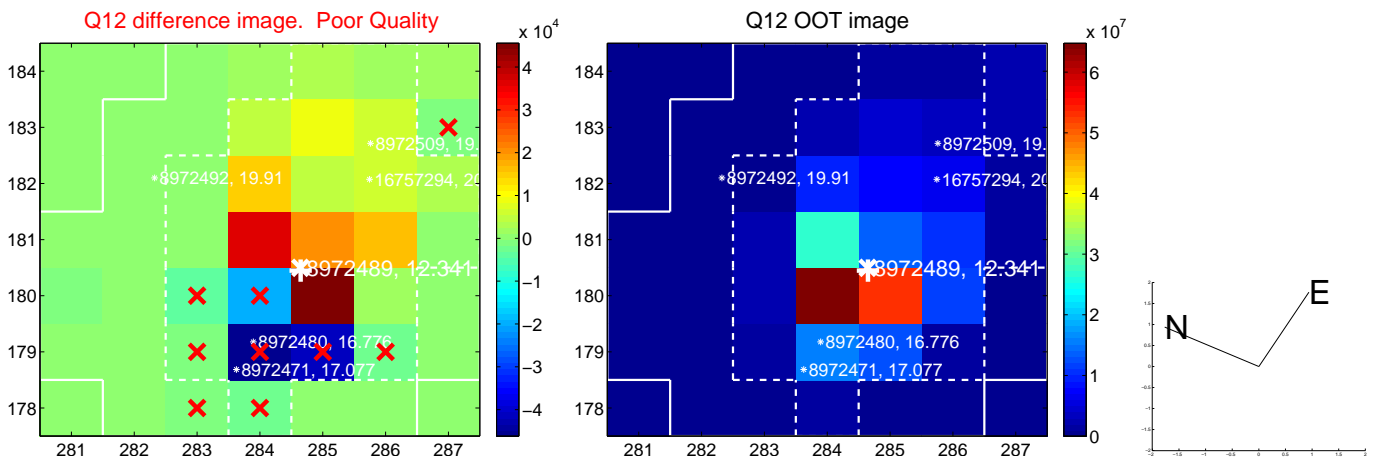
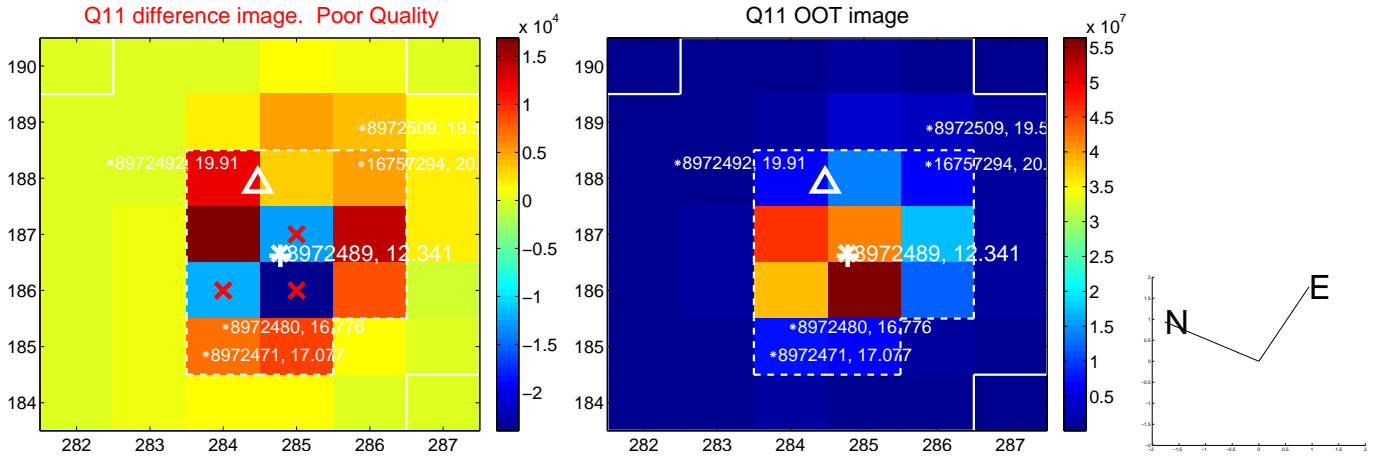
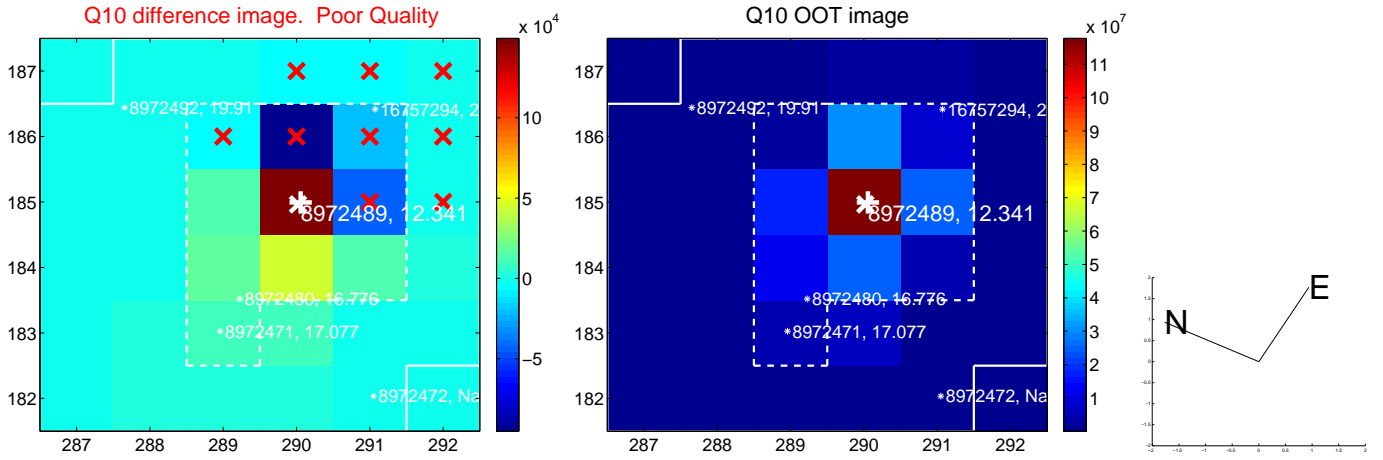
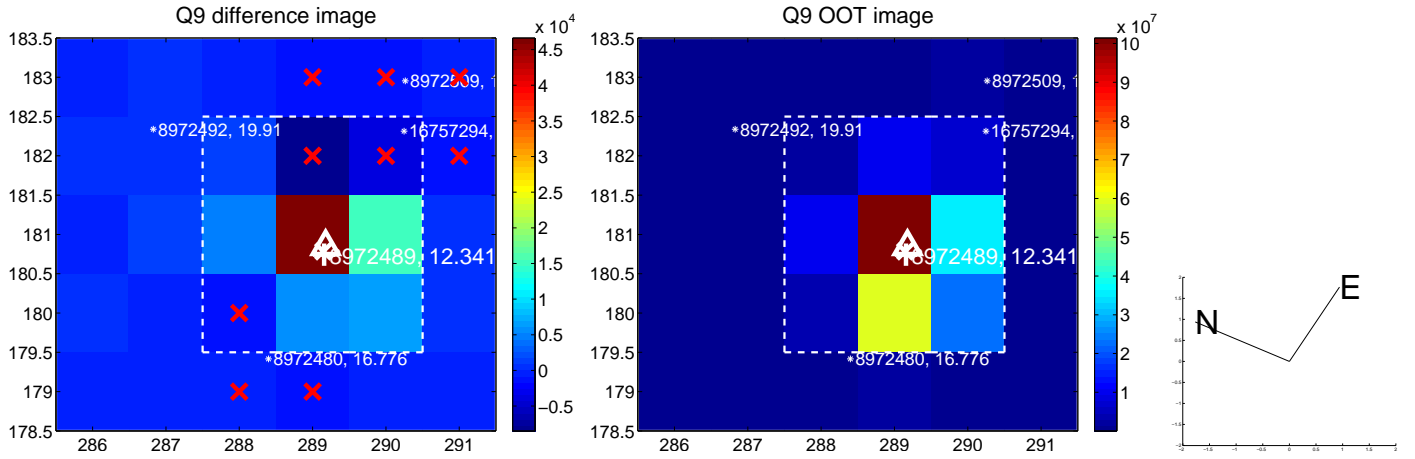
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



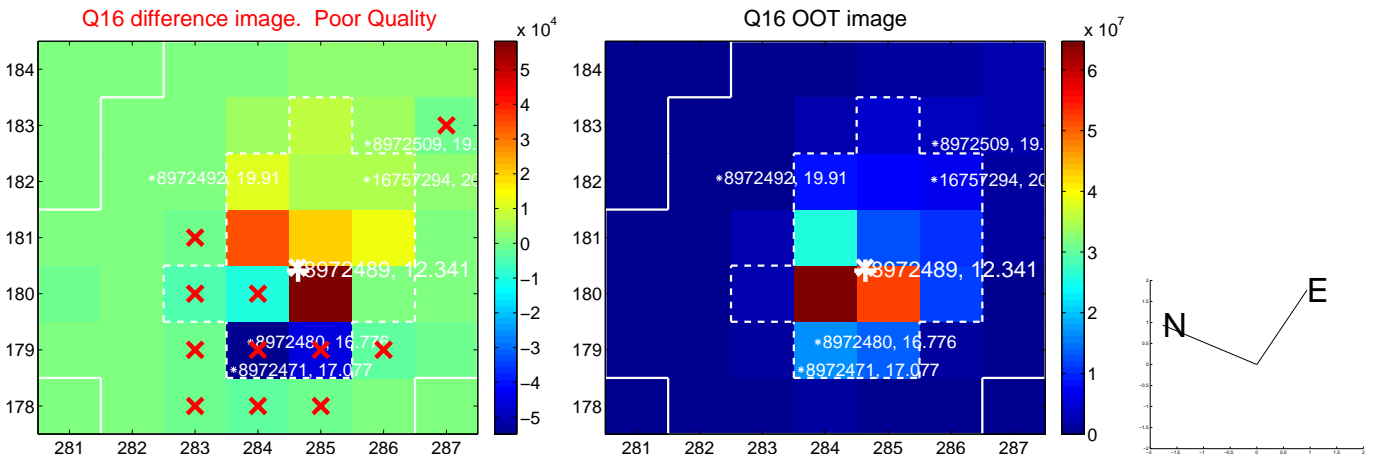
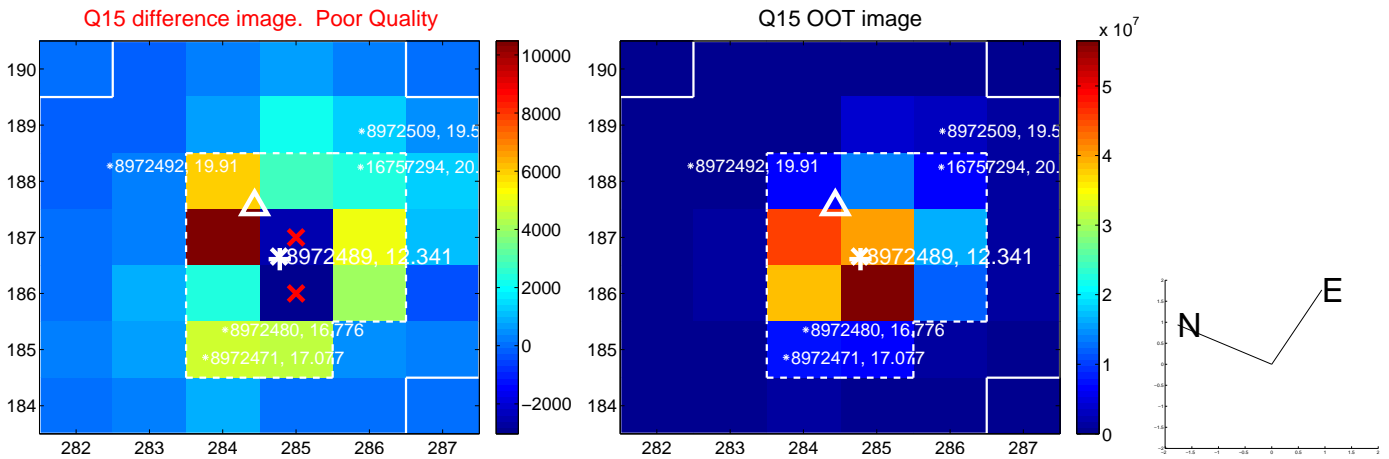
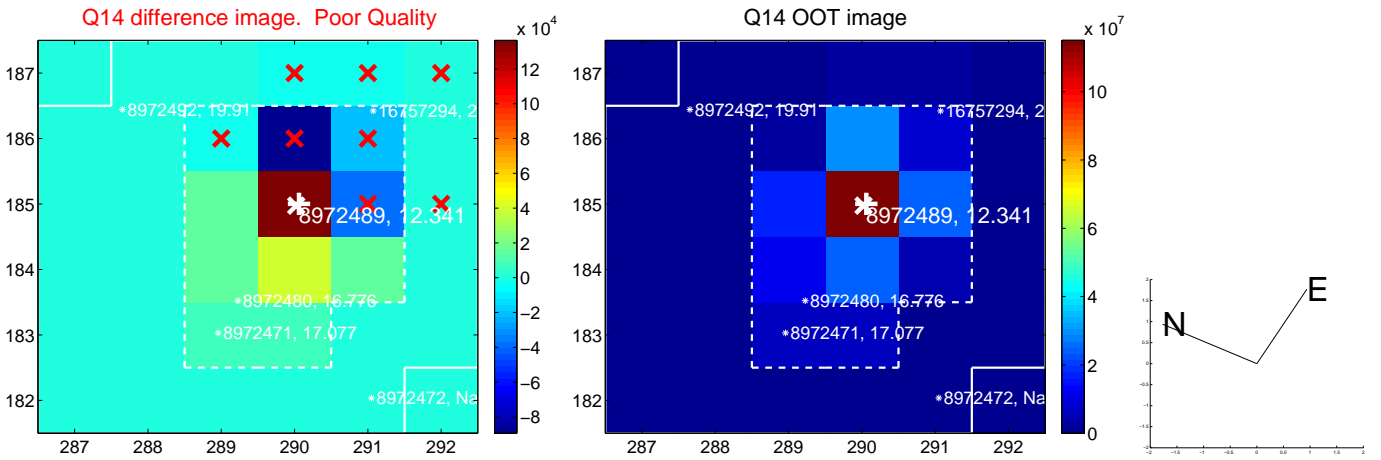
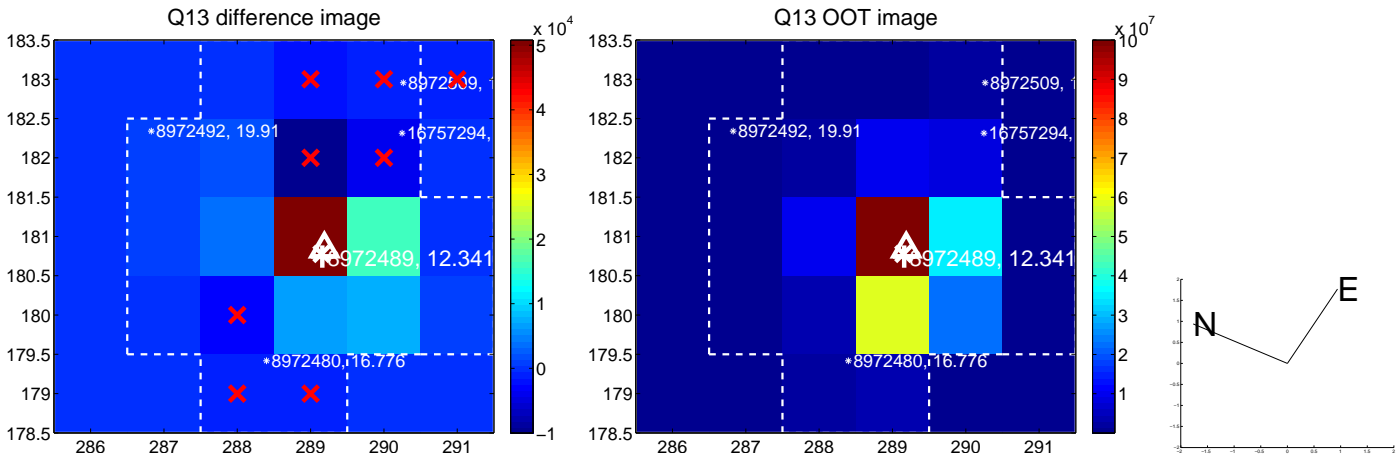
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



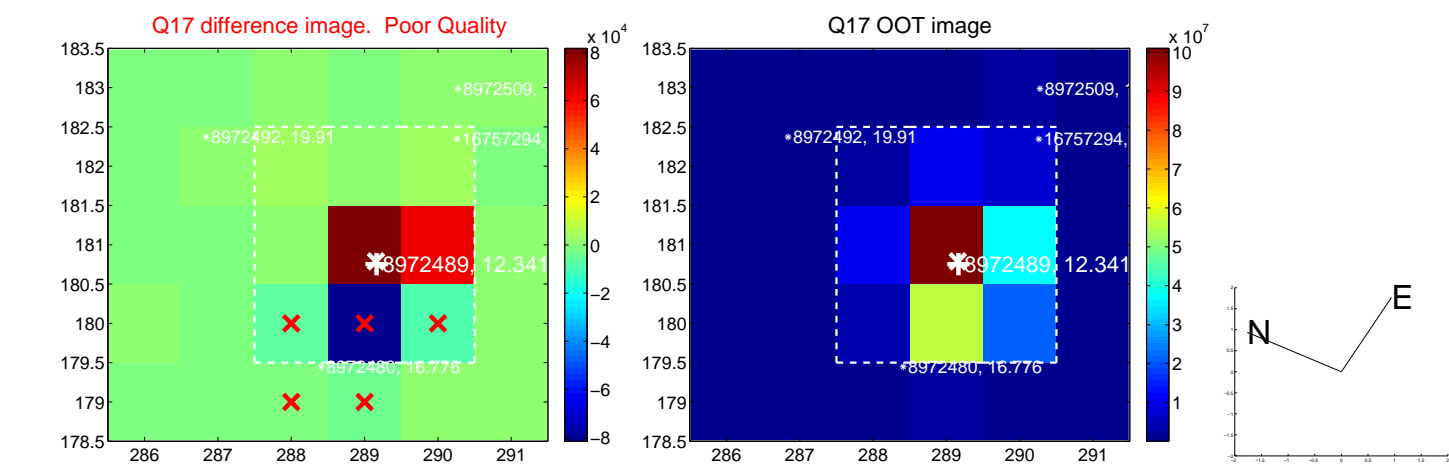
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



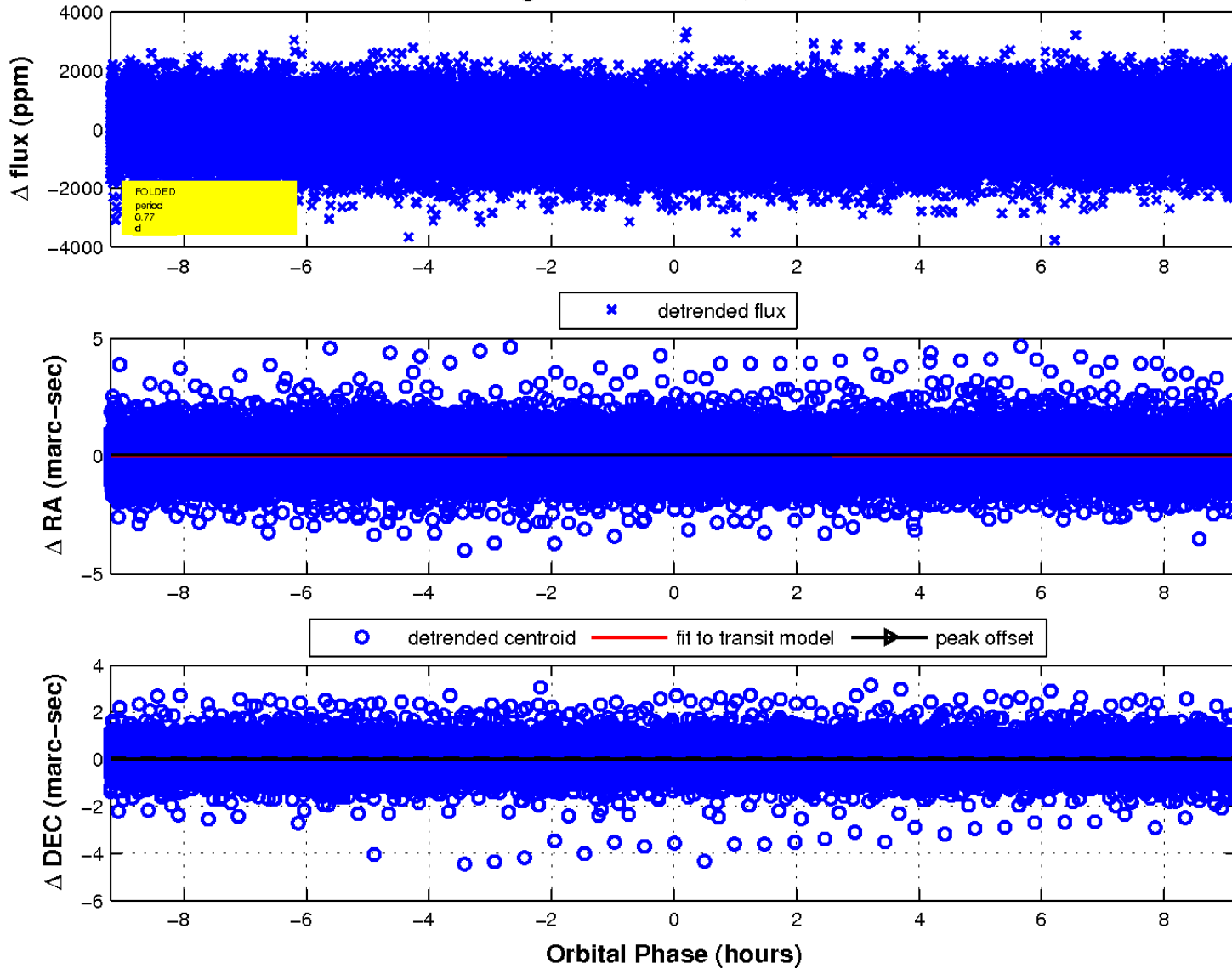
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



fluxWeightedCentroids, Planet 2 of 2





UKIRT Image

Declination

