

# KIC 009304976

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009304976-01	OBS	5654.01	54.694934	155.272501	1096.5	7.122	10.4	10.8	0.76	5299	3.25	6.36
009304976-02	OBS	No	2.856896	132.960012	150.4	24.238	8.6	11.4	0.76	5299	0.98	325.49

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009304976-01	OBS	FP	0.09	0	0	1	0	CENT_RESOLVED_OFFSET
009304976-02	OBS	FP	0.00	1	0	1	0	LPP_DV—CENT_RESOLVED_OFFSET—HALO_GHOST

**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.

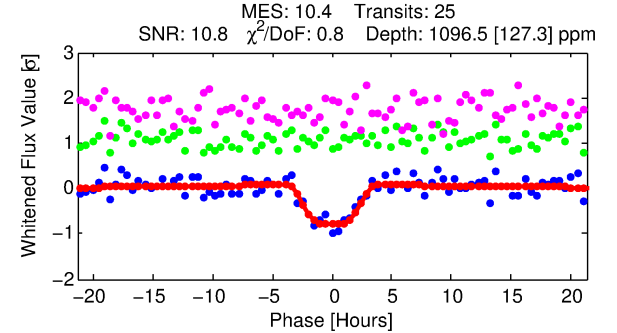
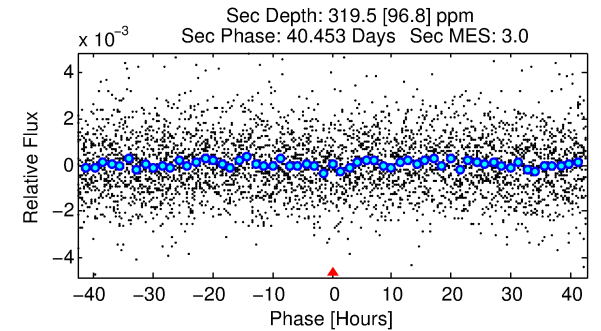
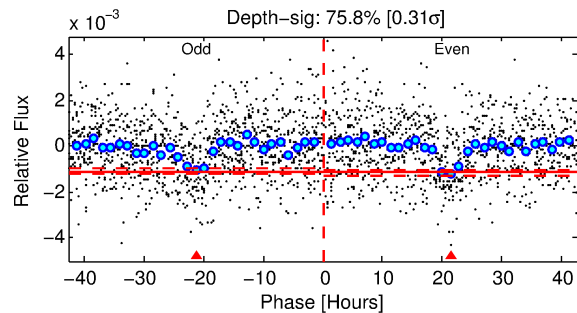
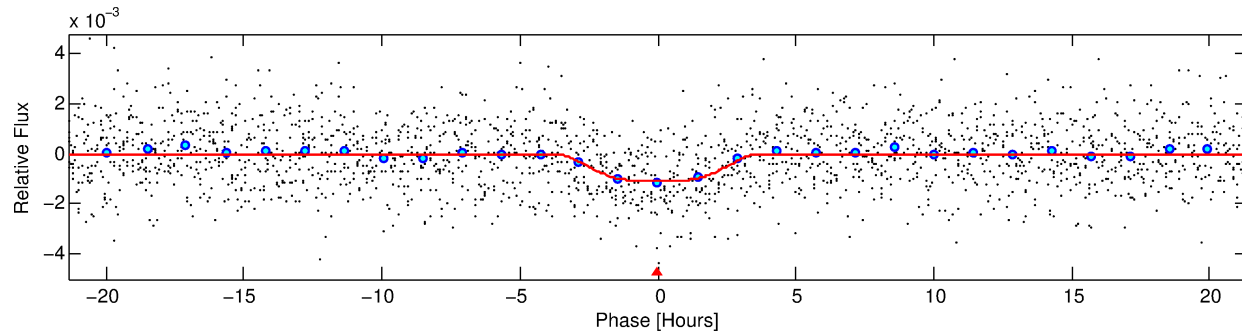
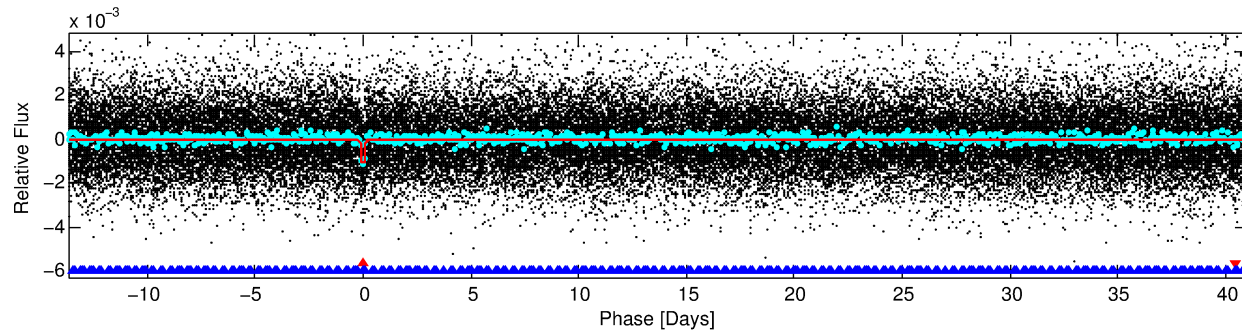
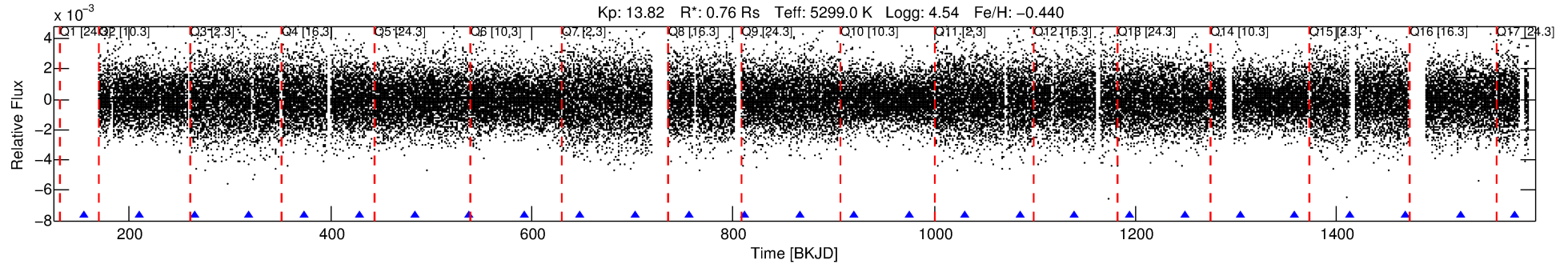
## Ephemeris Match Information For 009304976-01

No Significant Match Found

# DV One-Page Summary

KIC: 9304976 Candidate: 1 of 2 Period: 54.695 d  
KOI: K05654.01 Corr: 0.876

Kp: 13.82 R\*: 0.76 Rs Teff: 5299.0 K Logg: 4.54 Fe/H: -0.440



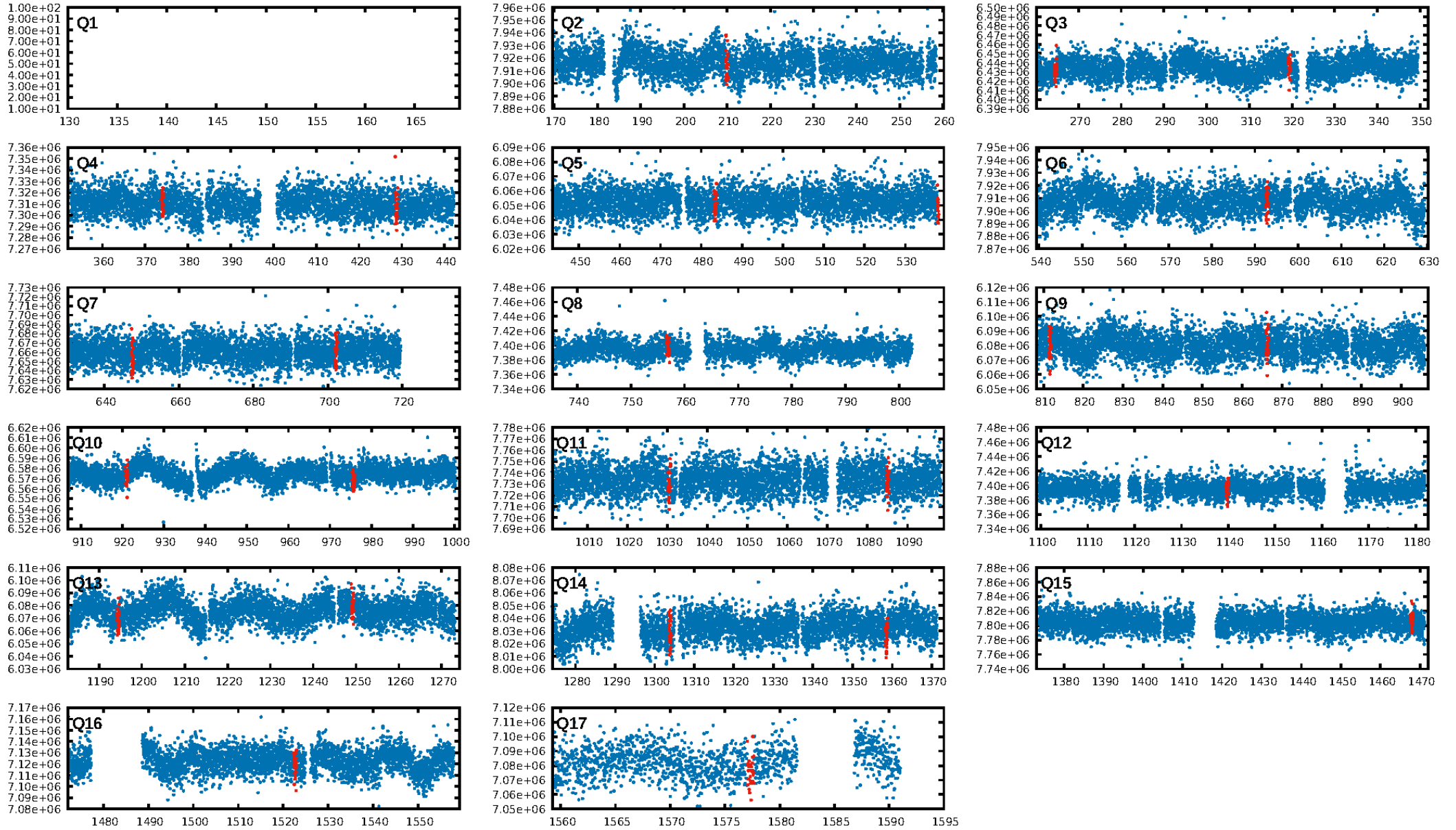
## DV Fit Results:

Period = 54.69493 [0.00098] d  
Epoch = 155.2725 [0.0150] BKJD  
Rp/R\* = 0.0394 [0.0037]  
a/R\* = 24.54 [4.90]  
b = 0.95 [0.02]  
Seff = 6.36 [1.39]  
Teq = 405 [22] K  
Rp = 3.25 [0.54] Re  
a = 0.2524 [0.0290] AU  
Ag = 1059.05 [418.97] [2.53σ]  
Teffp = 3571 [343] K [9.21σ]

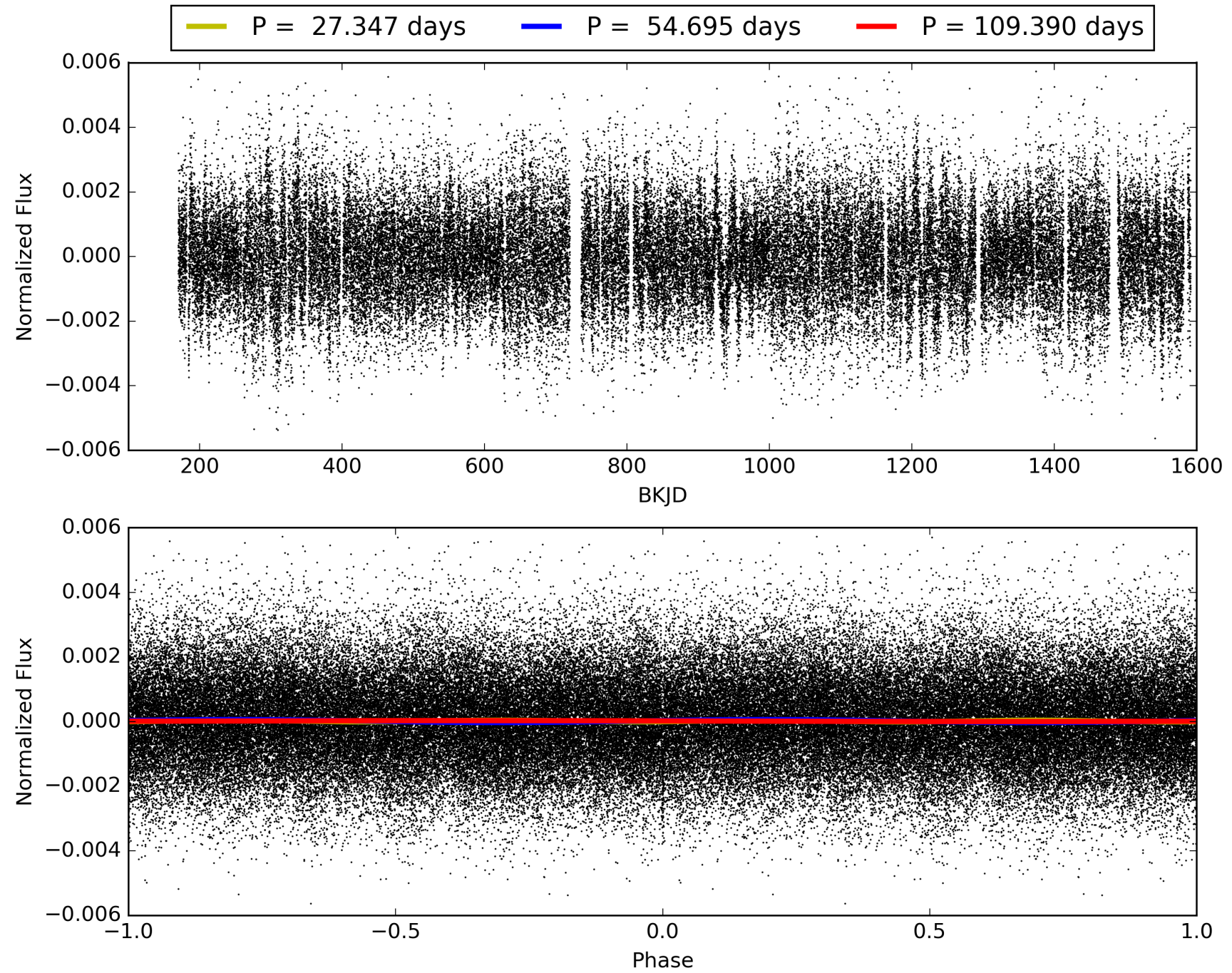
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [49.25σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 54.3%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [24/24]  
GhostDiagnostic-chr: -1.788  
Centroid-sig: 36.2%  
Centroid-so: 4.318 arcsec [4.78σ]  
OotOffset-rm: N/A  
KicOffset-rm: N/A  
OotOffset-st: 0/0/0/0 [0]  
KicOffset-st: 0/0/0/0 [0]  
DiffImageQuality-fgm: N/A  
DiffImageOverlap-fno: 0.44 [7/16]

# TCE 009304976-01, PDC Light Curves

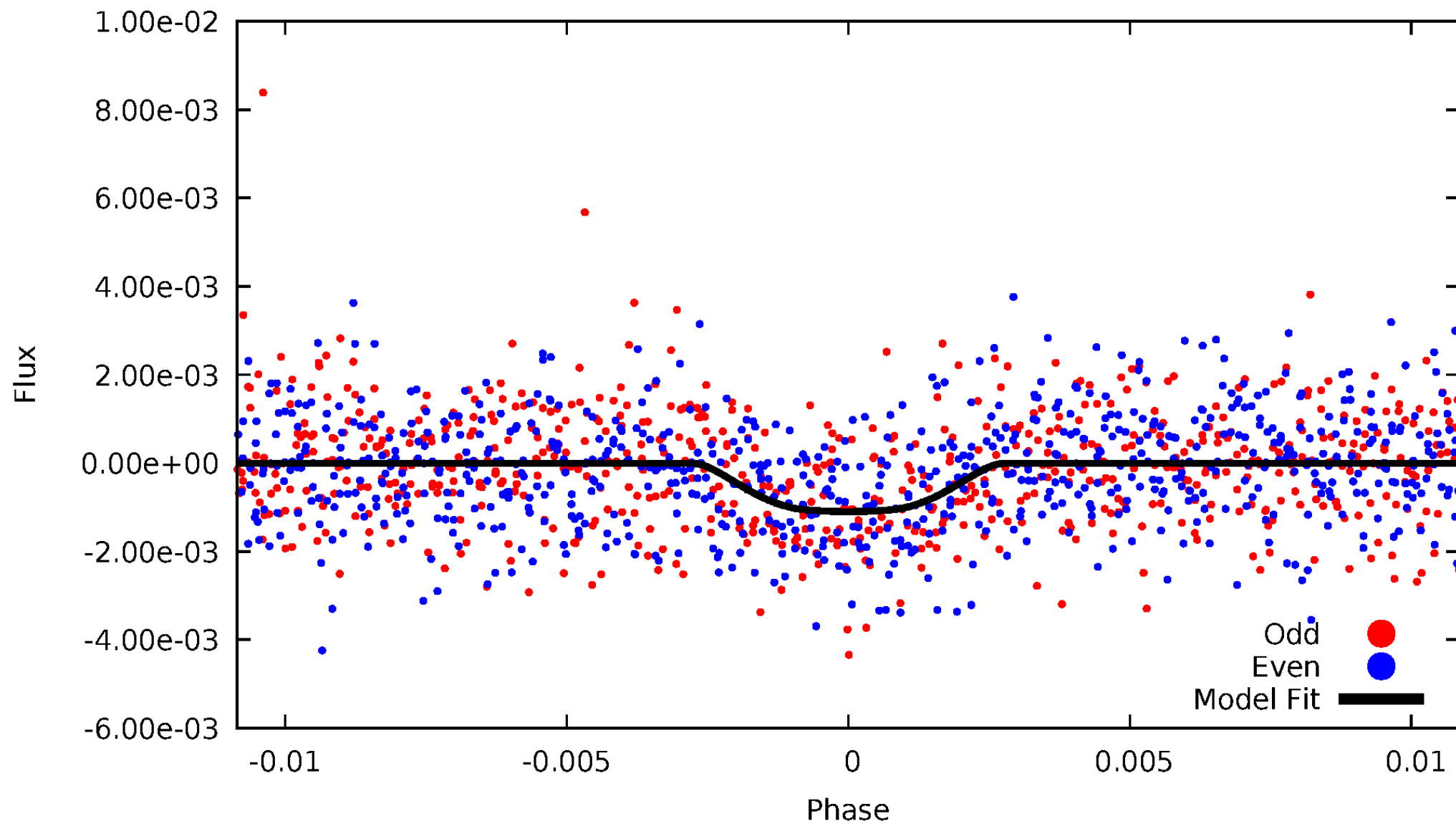


TCE 009304976-01



# DV Odd/Even

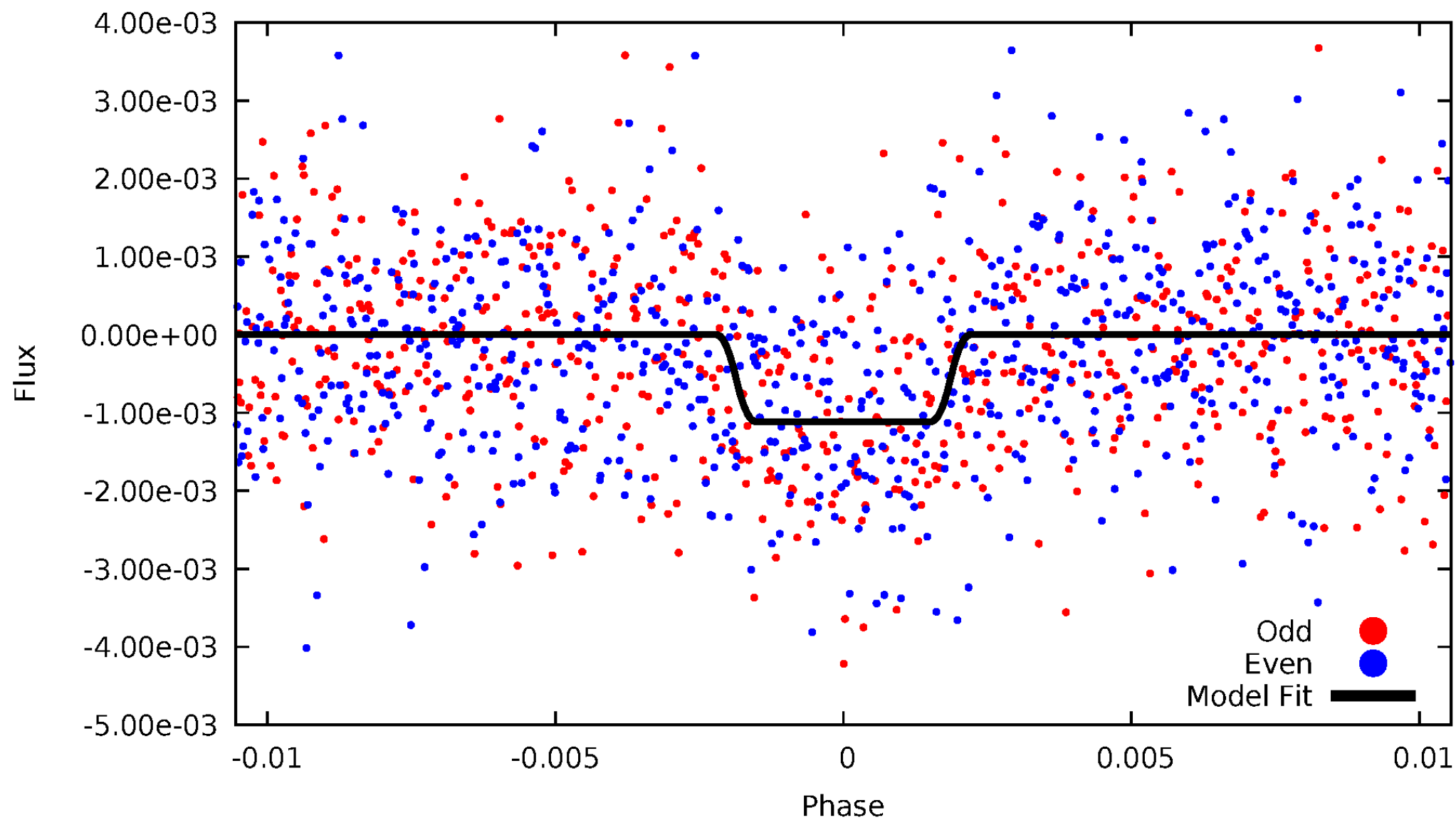
TCE 009304976-01





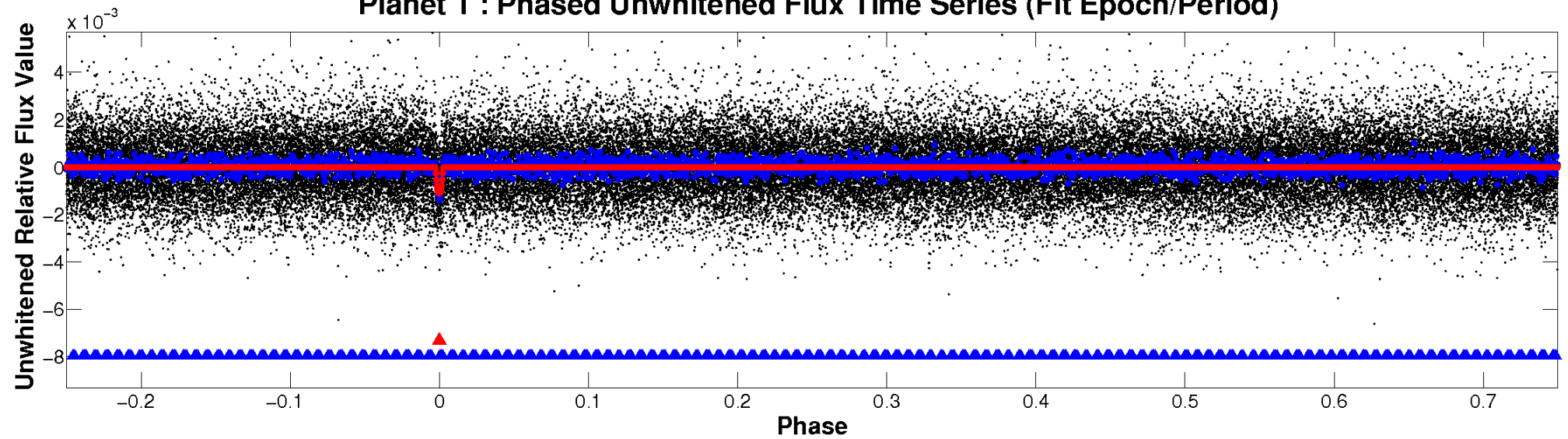
# ALT Odd/Even

TCE 009304976-01

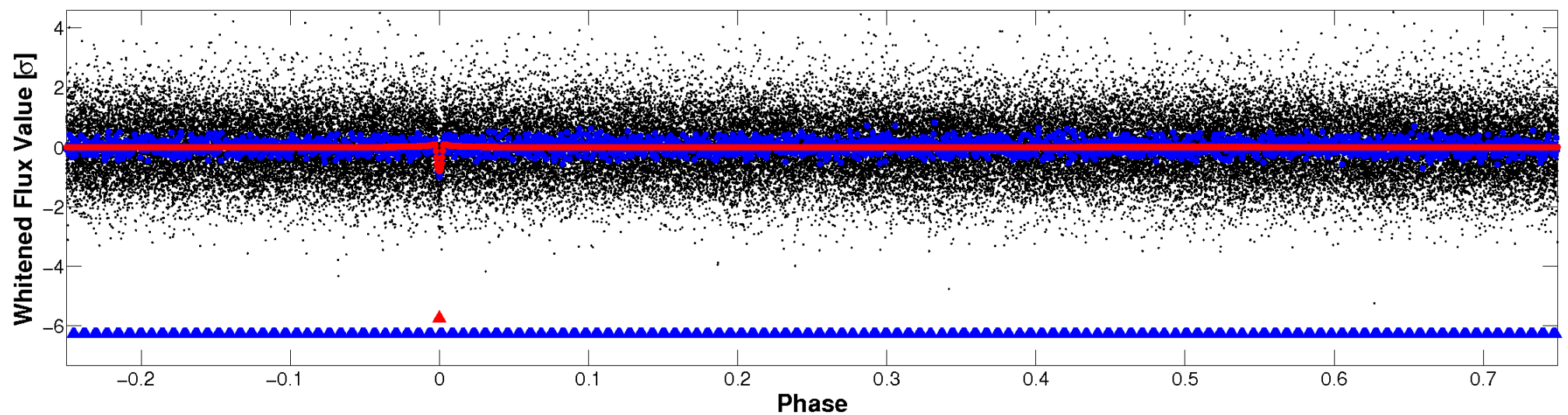


# Non-Whitened Vs. Whitened Light Curve

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

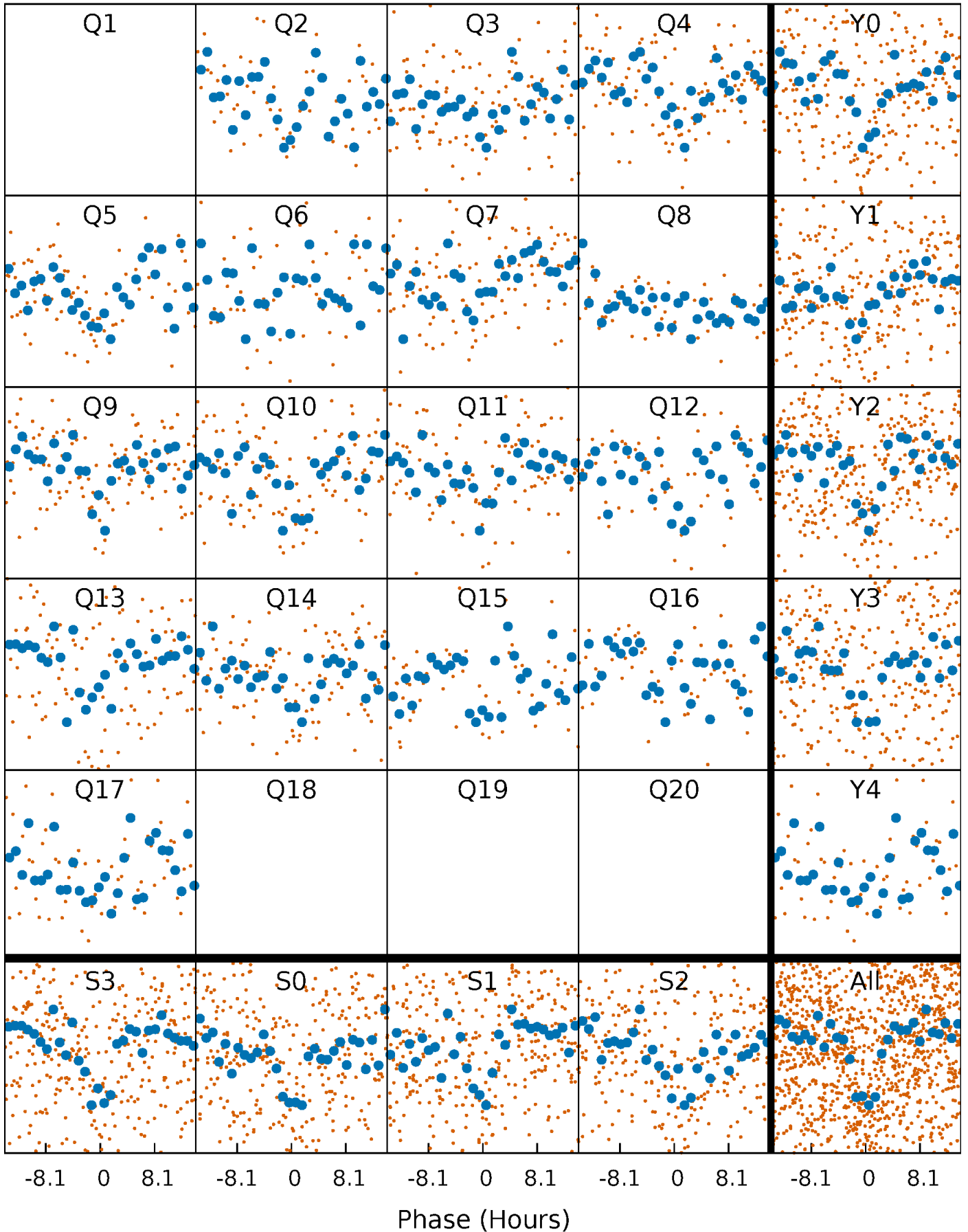


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

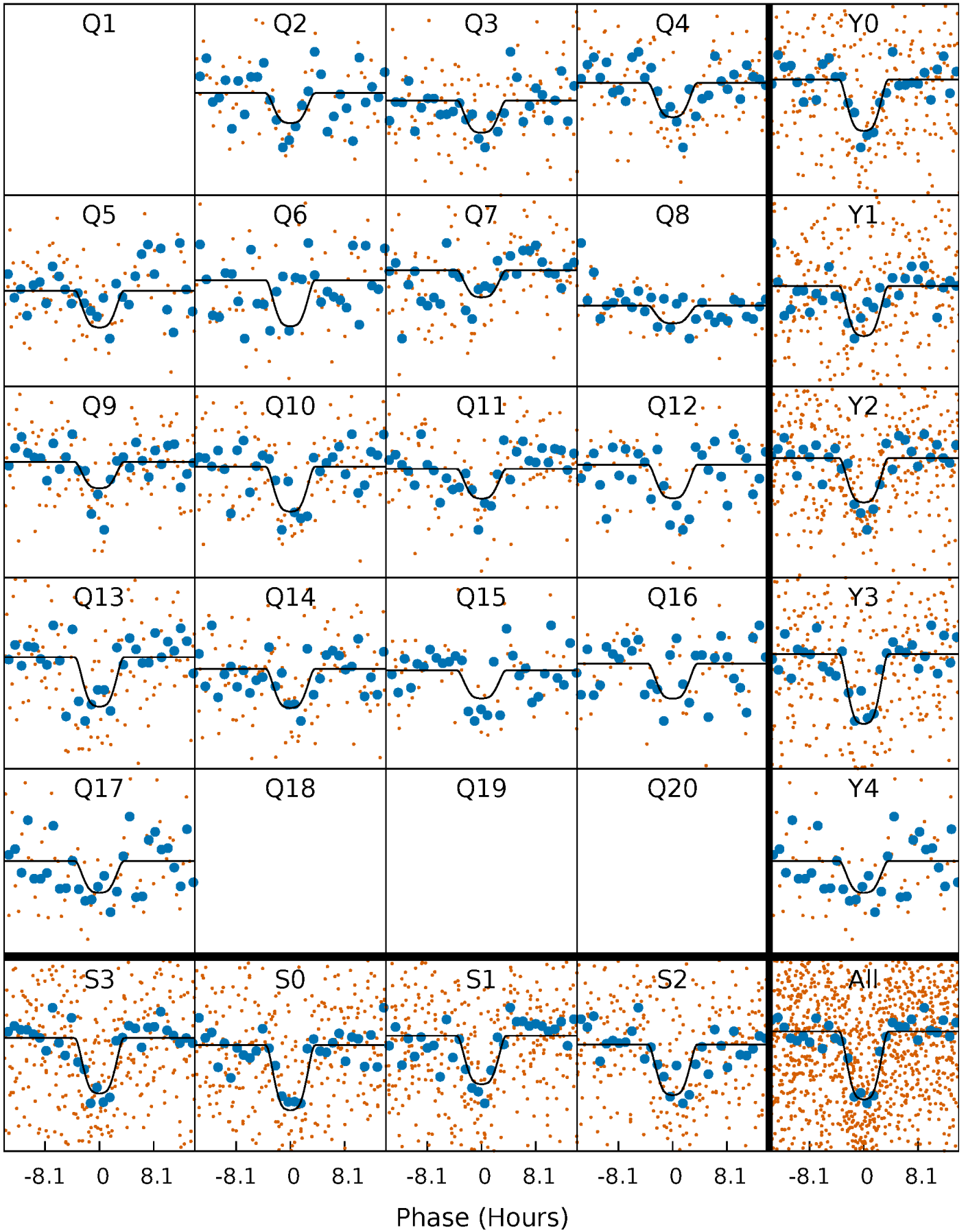
TCE 009304976-01 P= 54.694934 Days  $T_0=155.272501$  (BKJD)





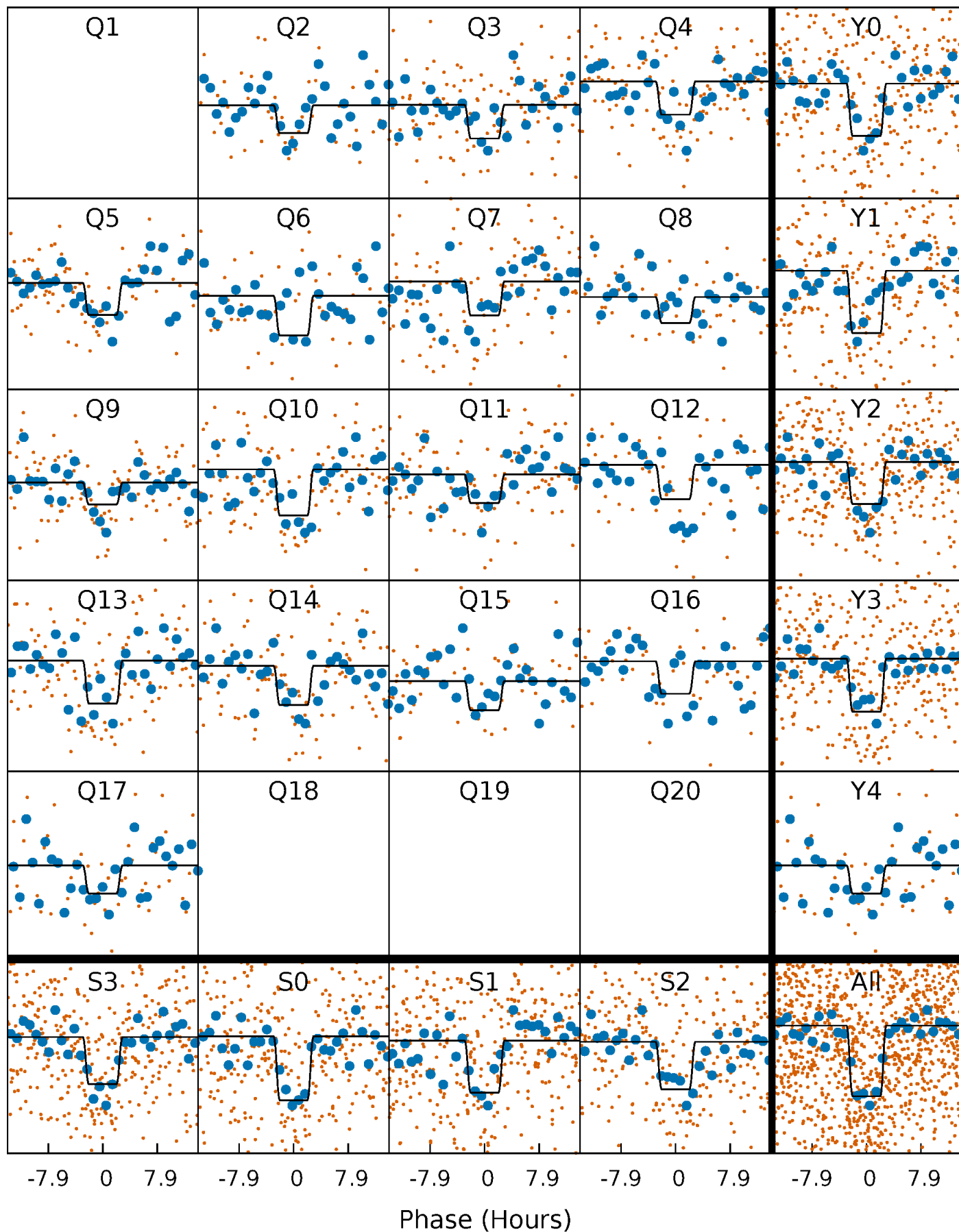
# DV Quarter-Phased Transit Curves

TCE 009304976-01 P= 54.694934 Days  $T_0=155.272501$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

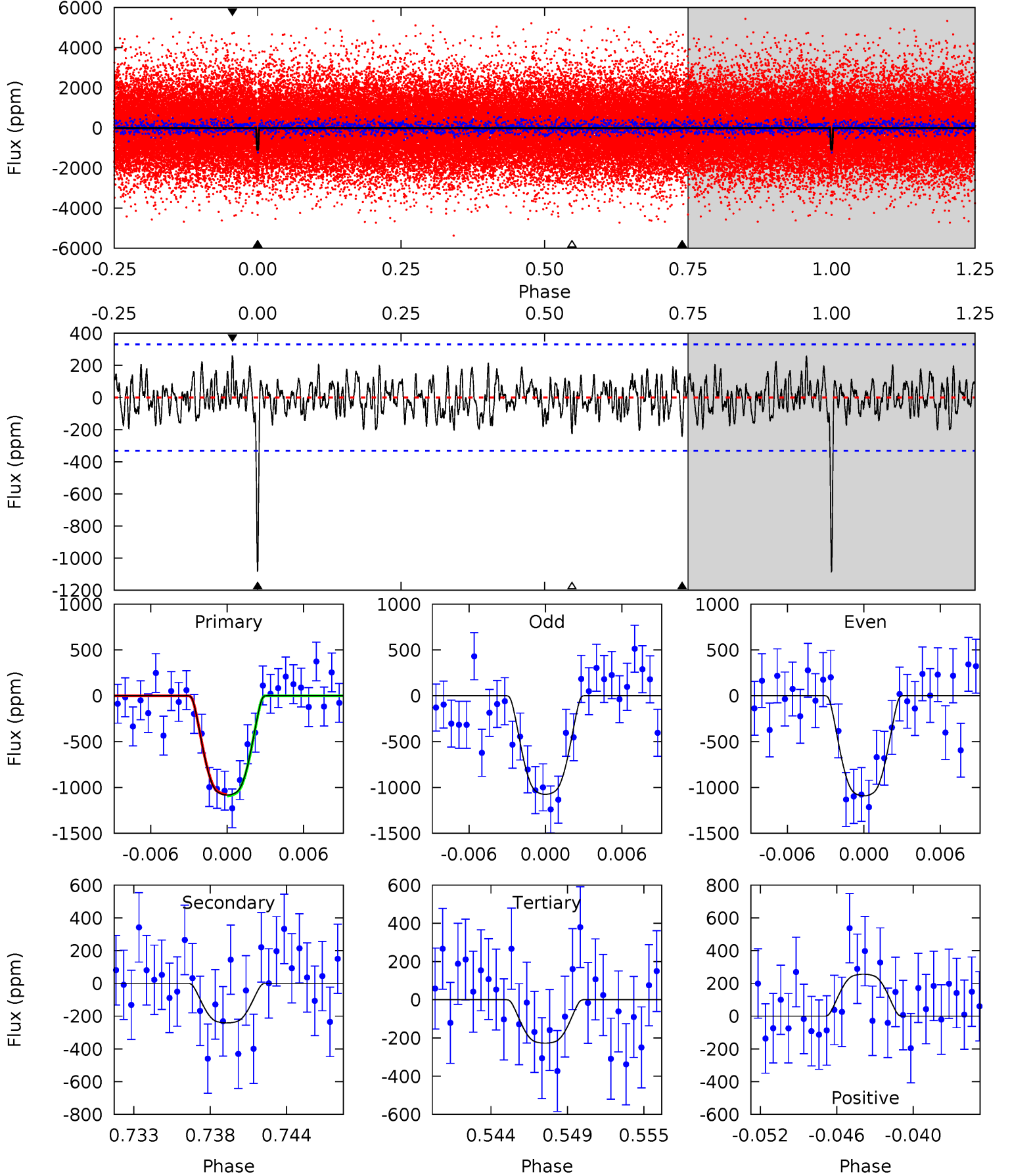
TCE 009304976-01 P= 54.694745 Days  $T_0=155.273345$  (BKJD)



# DV Model-Shift Uniqueness Test

009304976-01, P = 54.694934 Days, E = 155.272501 Days

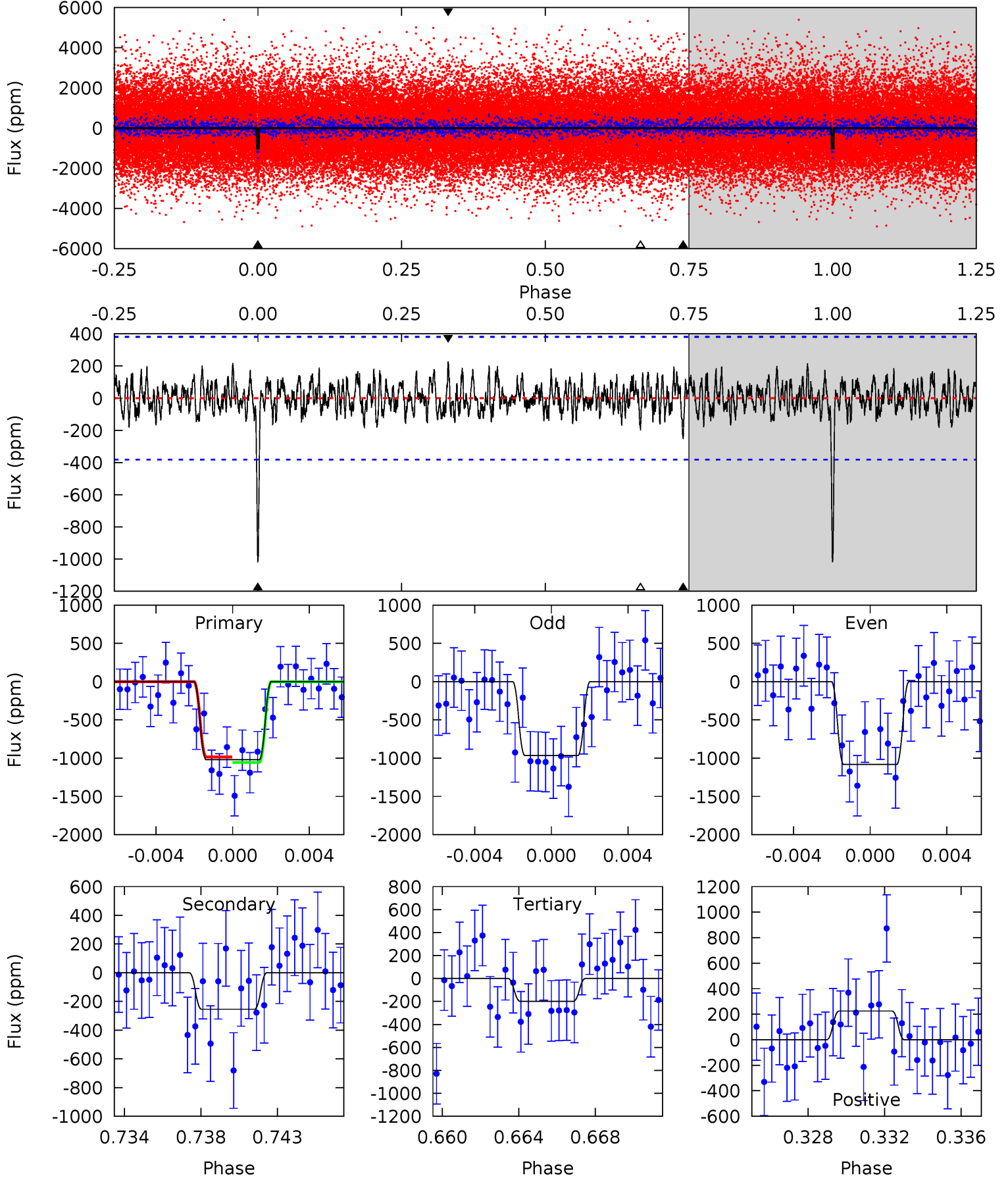
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
16.8	3.74	3.52	3.96	5.13	2.76	1.31	13.3	12.8	0.22	-0.22	0.13	0.95	0.19	0.12



# Alt Model-Shift Uniqueness Test

009304976-01, P = 54.694745 Days, E = 155.273345 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
13.9	3.46	2.70	3.06	5.18	2.85	1.02	11.2	10.8	0.75	0.40	0.80	0.98	0.18	0.49



### Stellar Parameters For KIC 009304976

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5299^{+186}_{-186}$	$4.535^{+0.093}_{-0.076}$	$-0.440^{+0.350}_{-0.300}$	$0.757^{+0.102}_{-0.092}$	$0.715^{+0.104}_{-0.045}$	$2.324^{+0.853}_{-0.571}$
	+4%/-4%	+2%/-2%	+80%/-68%	+13%/-12%	+15%/-6%	+37%/-25%
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 009304976-01 / KOI 5654.01

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-241 \pm 65$	$3.24^{+0.41}_{-0.36}$	$564^{+27}_{-26}$	$3691^{+230}_{-234}$	$804^{+303}_{-270}$
Alt.	$-254 \pm 74$	$2.75^{+0.38}_{-0.36}$	$565^{+27}_{-27}$	$3957^{+267}_{-279}$	$1192^{+502}_{-427}$

$T_{max}$  = 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

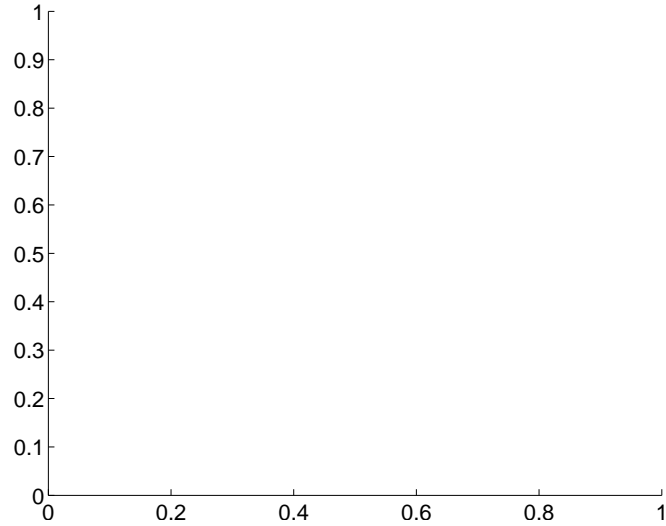
Supplemental centroid analysis for 009304976-01. Kepler magnitude: 13.82. Transit SNR 10.79

There are 0 quarters with good PRF difference image offsets

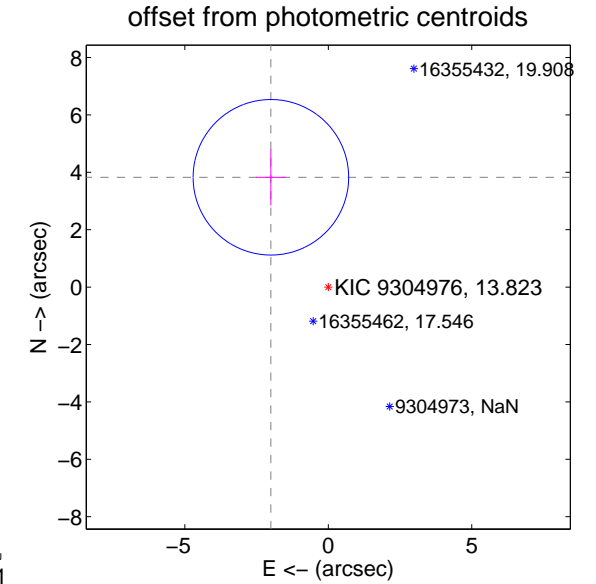
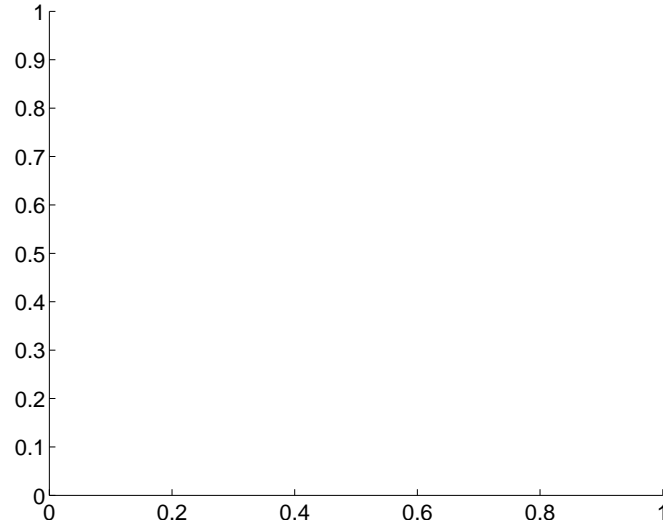
The direct PRF centroid is offset from the target star catalog position by about NaN arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	—	—	—	—
PRF-fit source offset from KIC position	—	—	—	—
photometric centroid source offset	$4.32 \pm 0.90$	4.78	$2.00 \pm 0.52$	$3.83 \pm 0.98$

There is no PRF-fit offset from OOT-fit



There is no PRF-fit offset from KIC



Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three- $\sigma$ . Red \*: target star. Blue \*: Other stars. Text next to a star gives its KIC ID and kepmag. KIC IDs > 15,000,000 are from the UKIRT catalog.

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

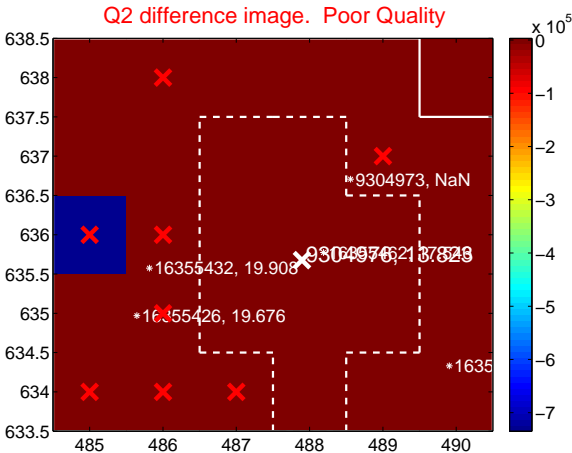
Q1 no difference image



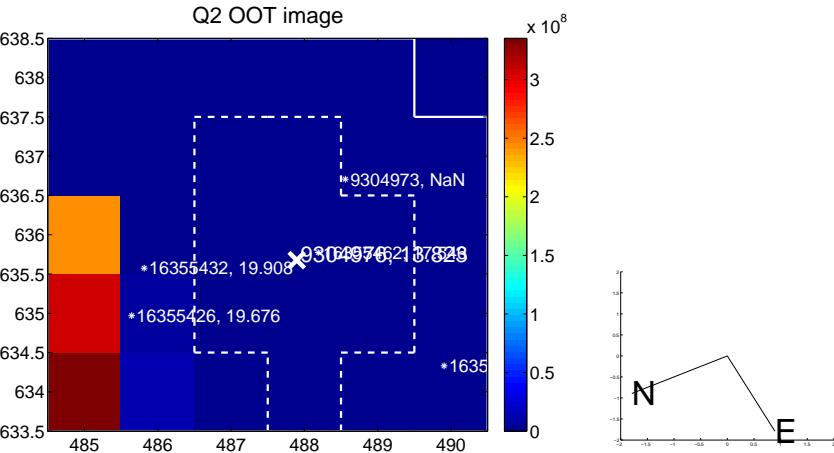
Q1 no OOT image



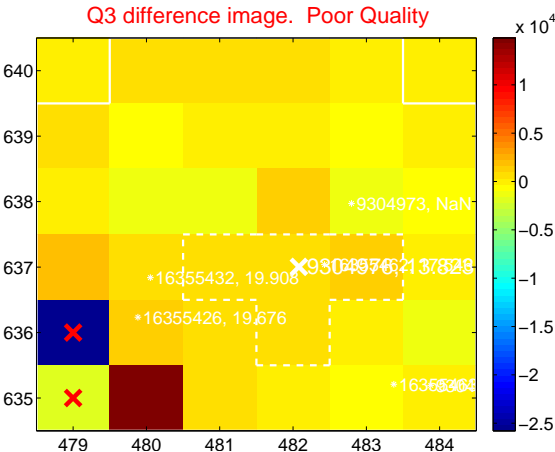
Q2 difference image. Poor Quality



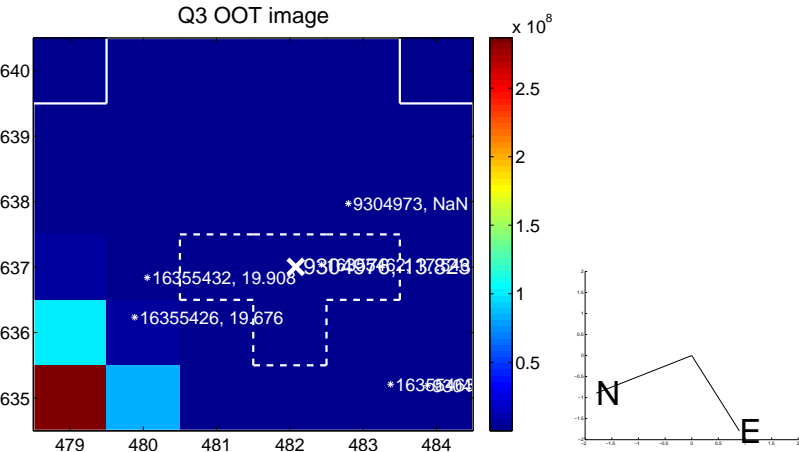
Q2 OOT image



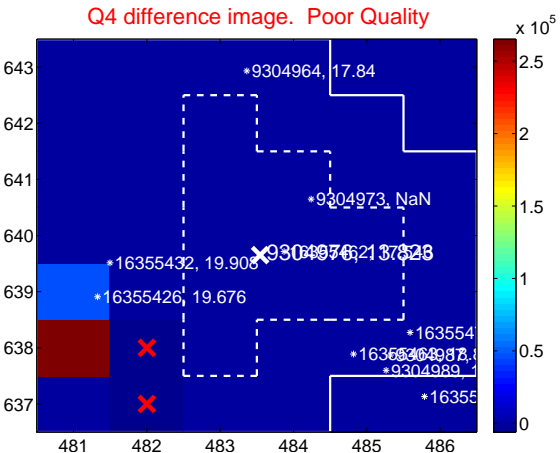
Q3 difference image. Poor Quality



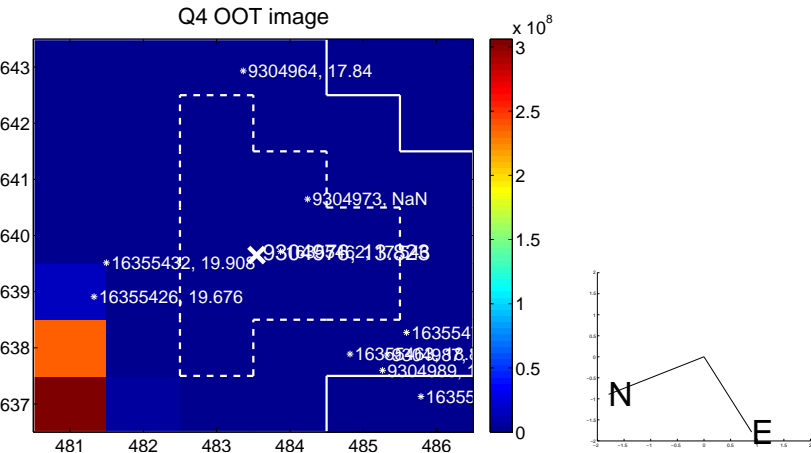
Q3 OOT image



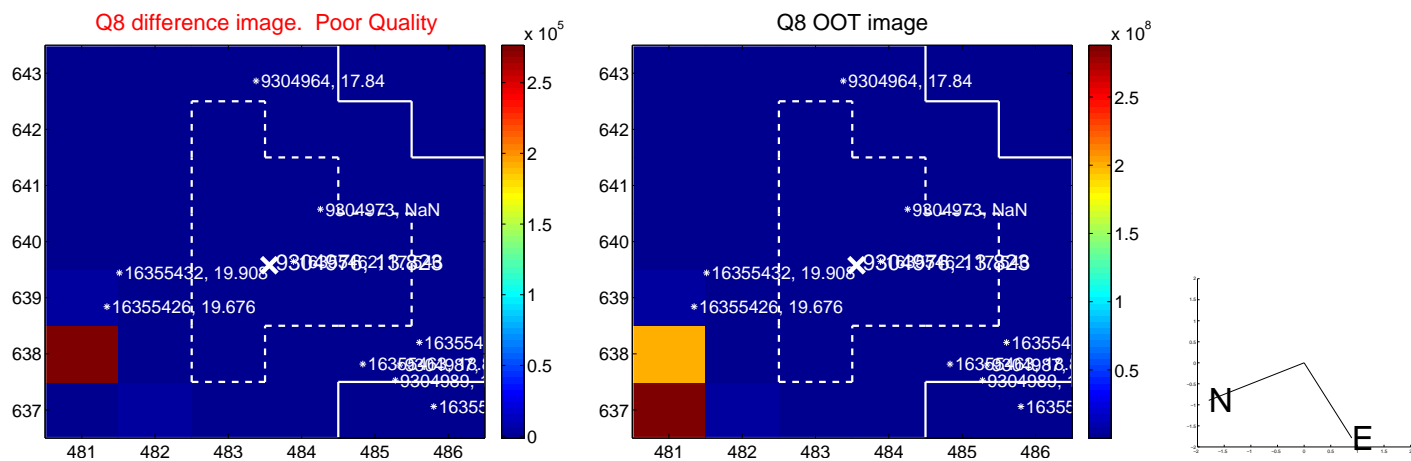
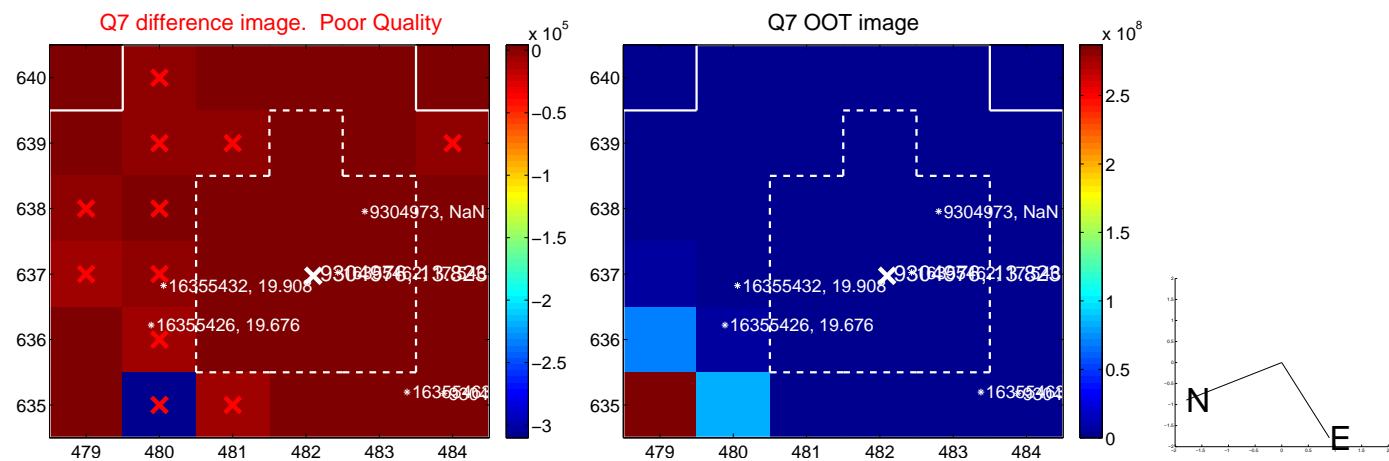
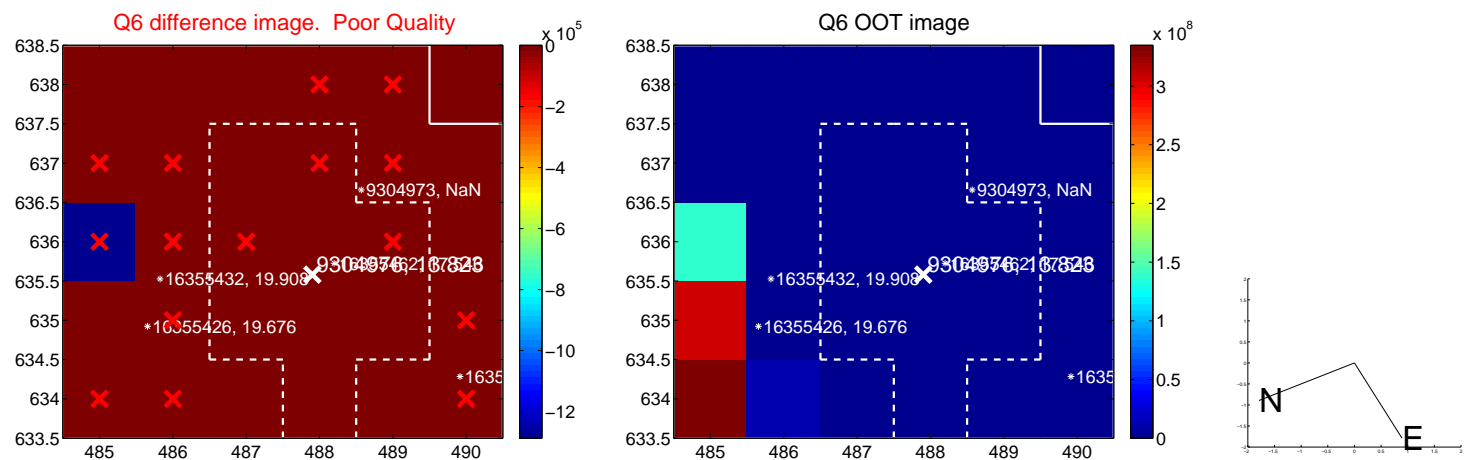
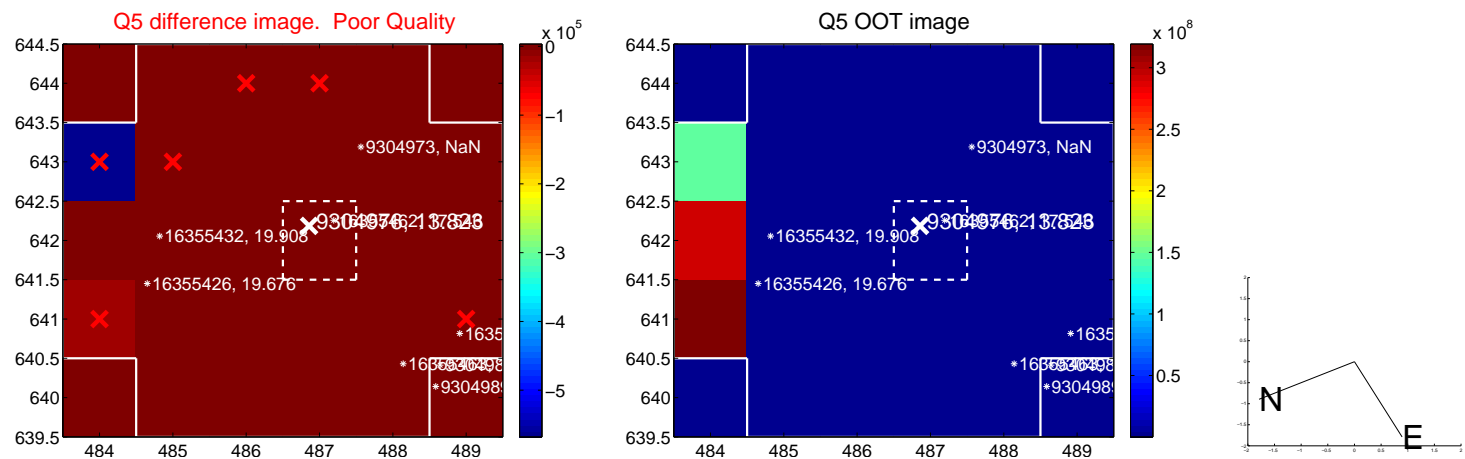
Q4 difference image. Poor Quality



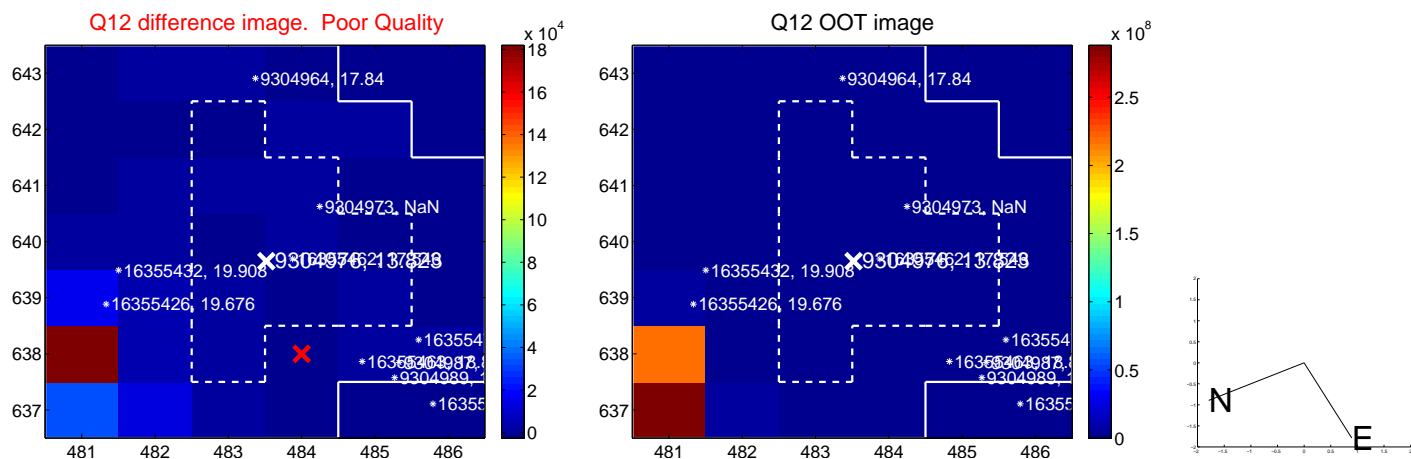
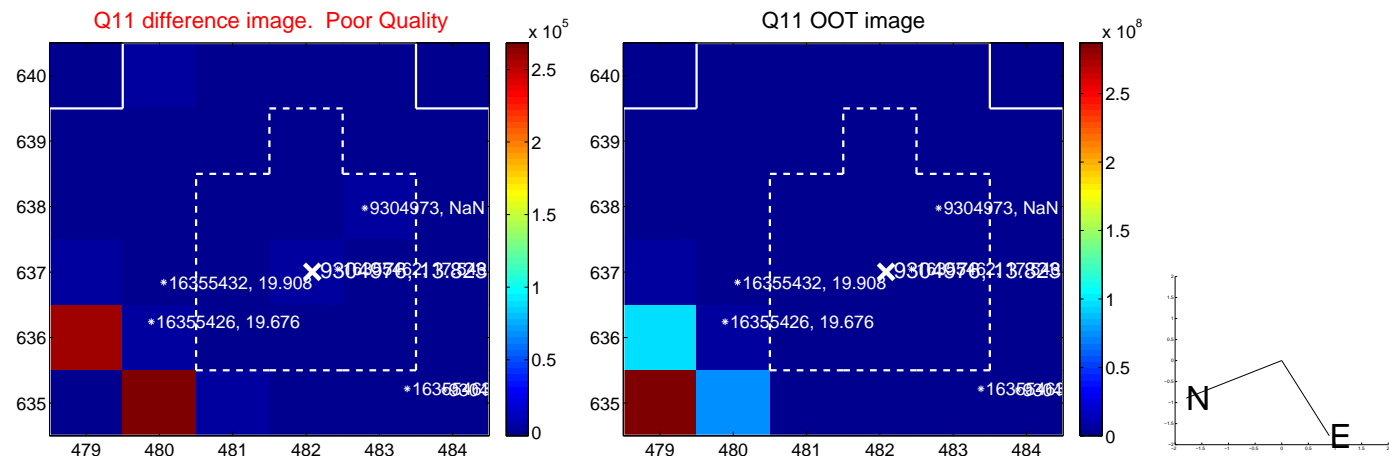
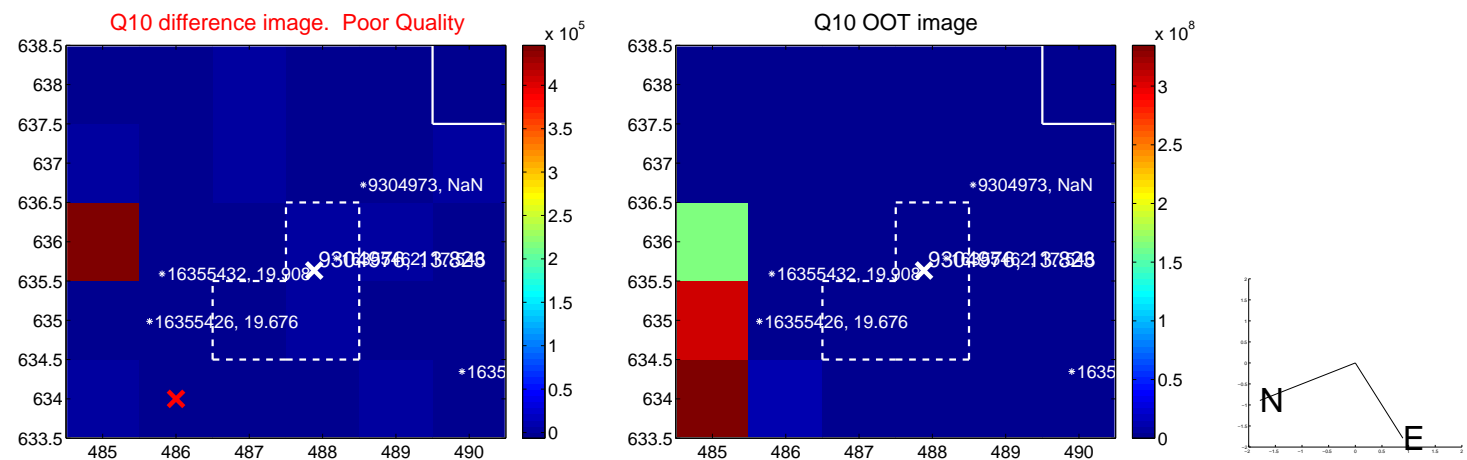
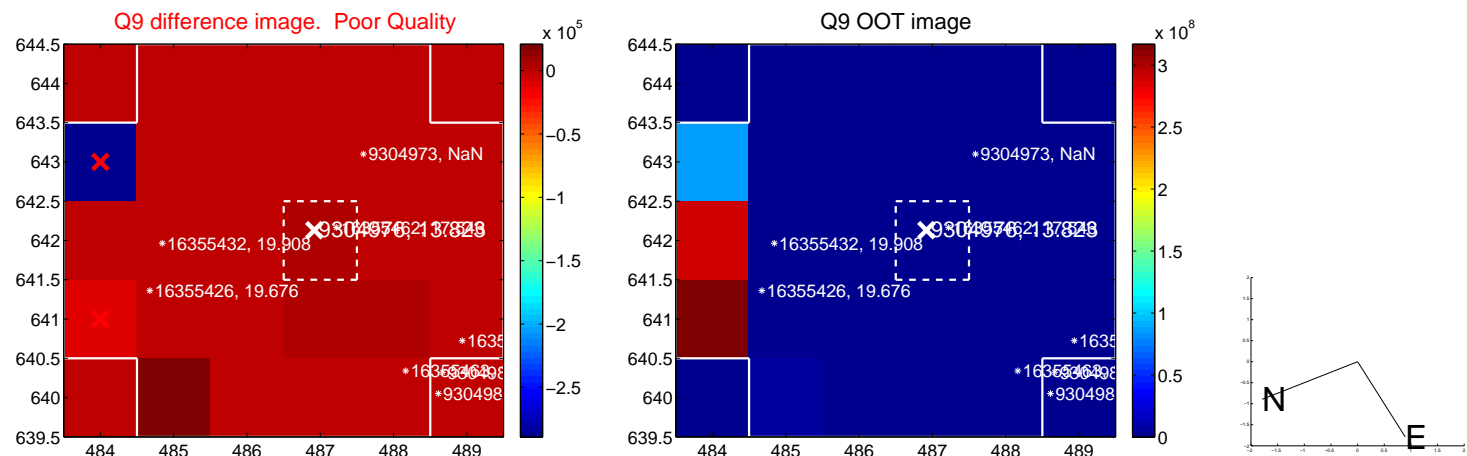
Q4 OOT image



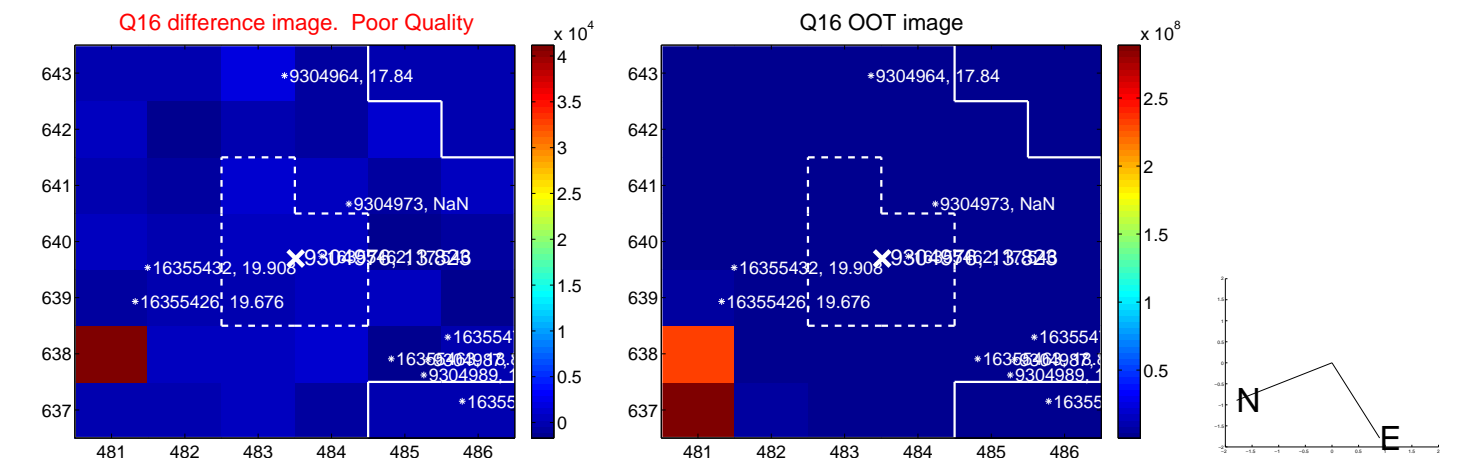
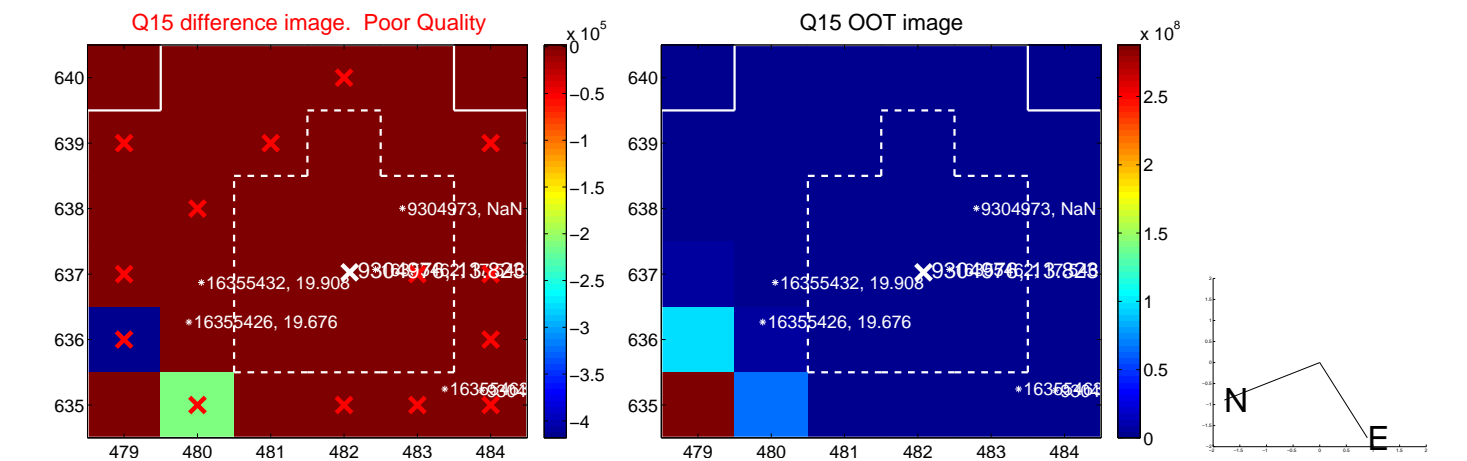
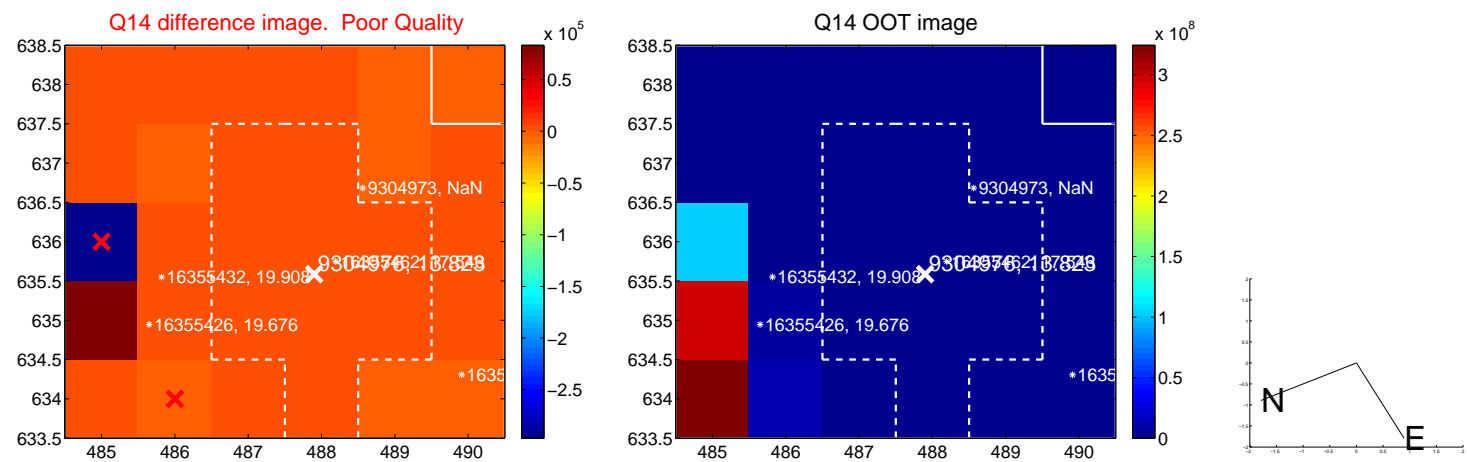
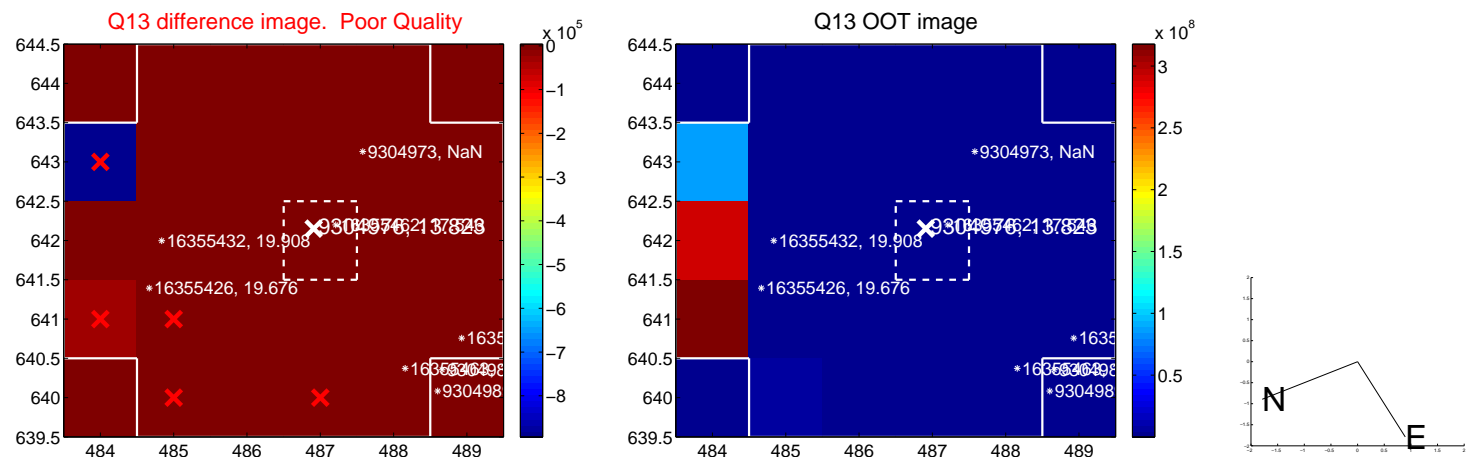
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

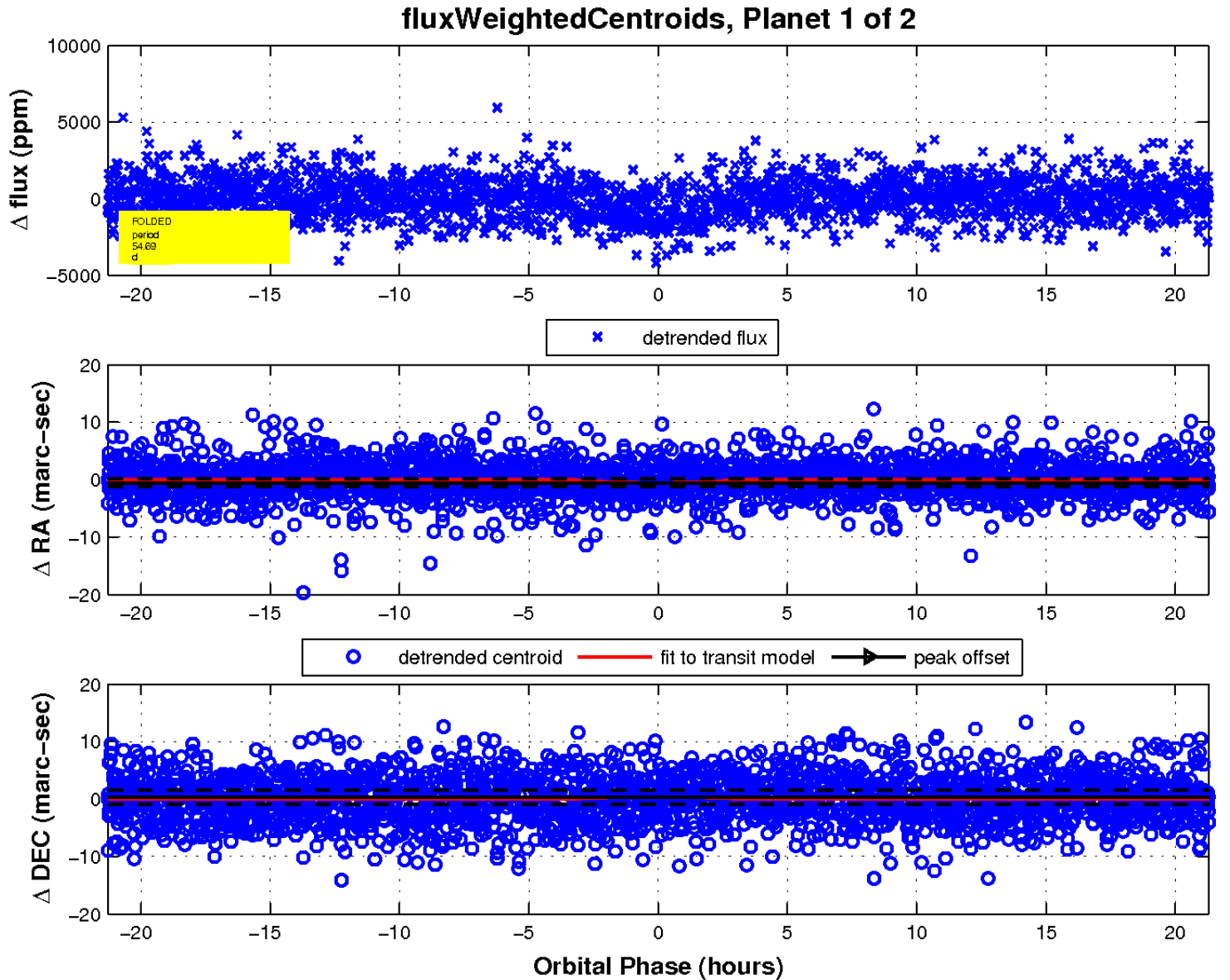
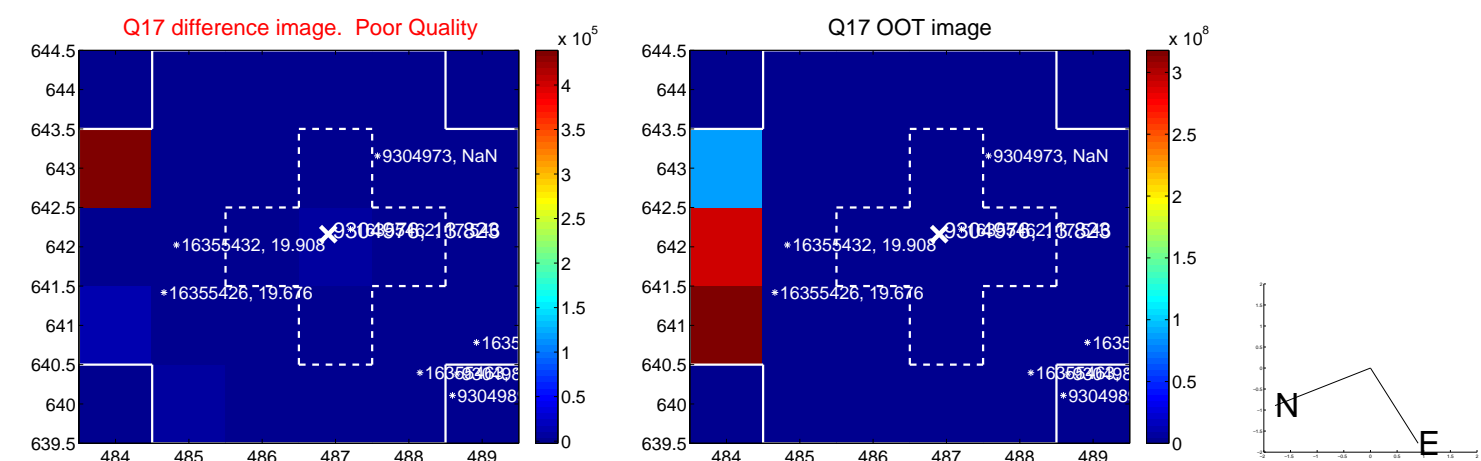


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



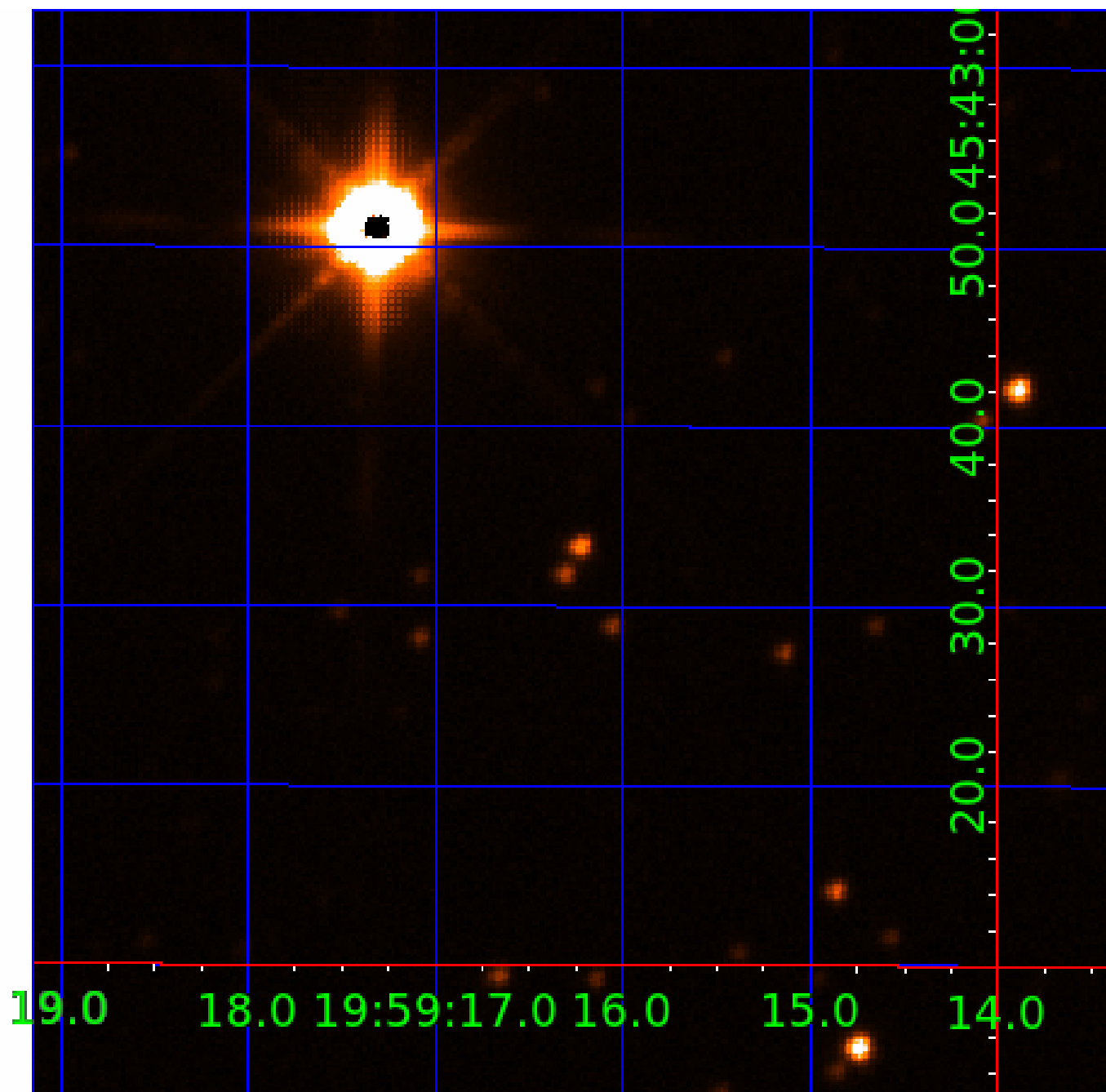


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 009304976

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009304976-01	OBS	5654.01	54.694934	155.272501	1096.5	7.122	10.4	10.8	0.76	5299	3.25	6.36
009304976-02	OBS	No	2.856896	132.960012	150.4	24.238	8.6	11.4	0.76	5299	0.98	325.49

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009304976-01	OBS	FP	0.09	0	0	1	0	CENT_RESOLVED_OFFSET
009304976-02	OBS	FP	0.00	1	0	1	0	LPP_DV—CENT_RESOLVED_OFFSET—HALO_GHOST

**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.

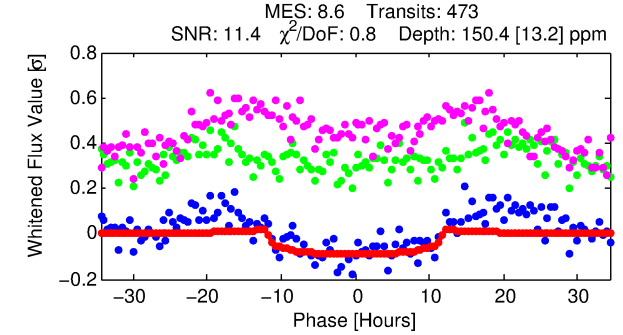
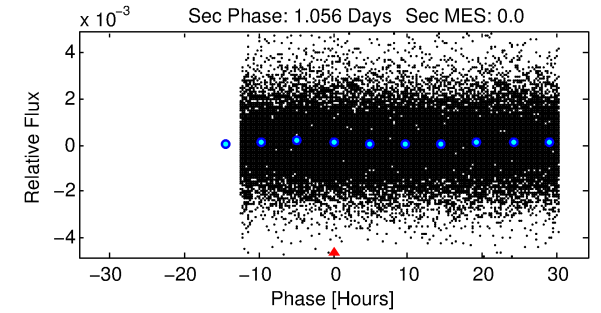
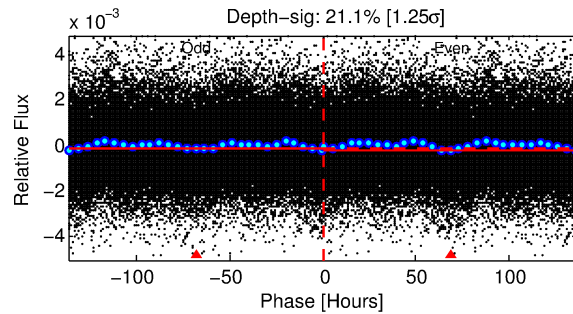
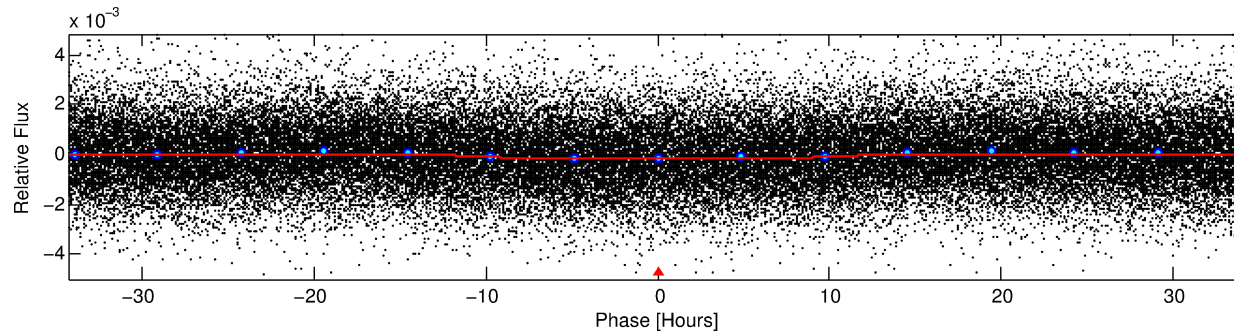
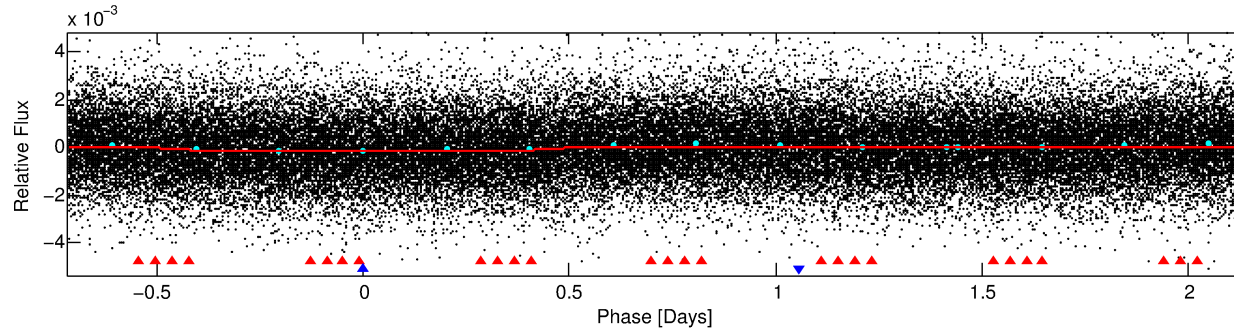
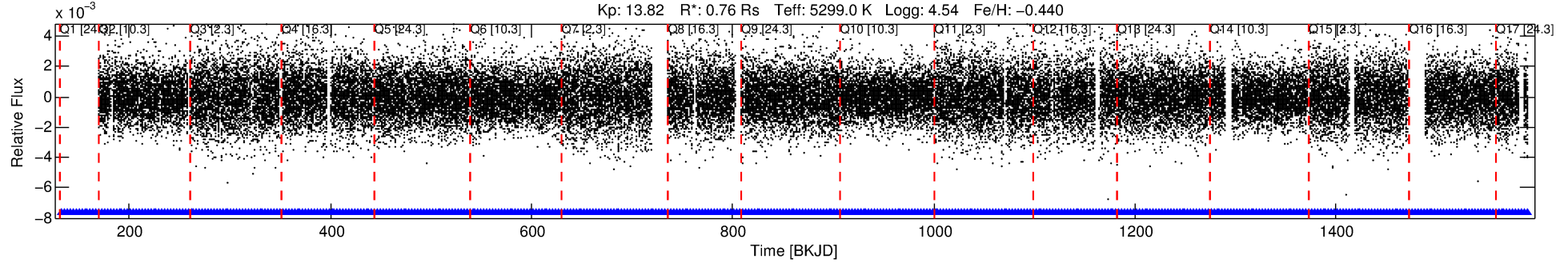
## Ephemeris Match Information For 009304976-02

No Significant Match Found

# DV One-Page Summary

KIC: 9304976 Candidate: 2 of 2 Period: 2.857 d  
KOI: K05654 Corr: No Ephemeris Match

Kp: 13.82 R\*: 0.76 Rs Teff: 5299.0 K Logg: 4.54 Fe/H: -0.440



## DV Fit Results:

Period = 2.85690 [0.00008] d  
Epoch = 132.9600 [0.0204] BKJD  
Rp/R\* = 0.0118 [0.0038]  
a/R\* = 1.08 [0.21]  
b = 0.65 [1.18]  
Seff = 325.49 [71.43]  
Teq = 1083 [59] K  
Rp = 0.98 [0.34] Re  
a = 0.0353 [0.0040] AU  
Ag = N/A  
Teffp = N/A

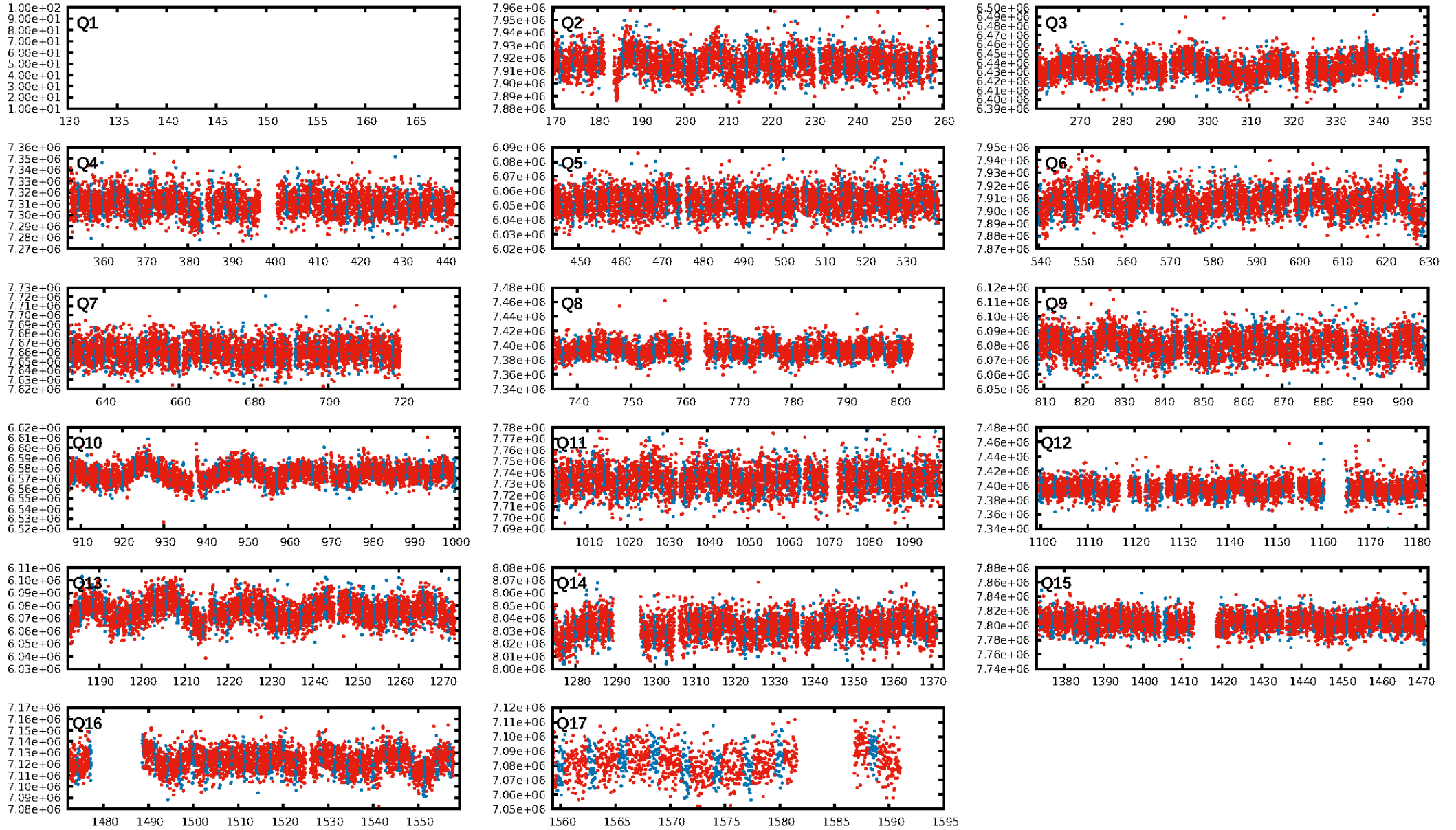
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [49.25σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [463/463]  
GhostDiagnostic-chr: 0.0609  
Centroid-sig: 0.0%  
Centroid-so: 1.300 arcsec [2.48σ]  
OotOffset-rm: N/A  
KicOffset-rm: N/A  
OotOffset-st: 0/0/0/0 [0]  
KicOffset-st: 0/0/0/0 [0]  
DiffImageQuality-fgm: N/A  
DiffImageOverlap-fno: 1.00 [16/16]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 19:33:22 Z

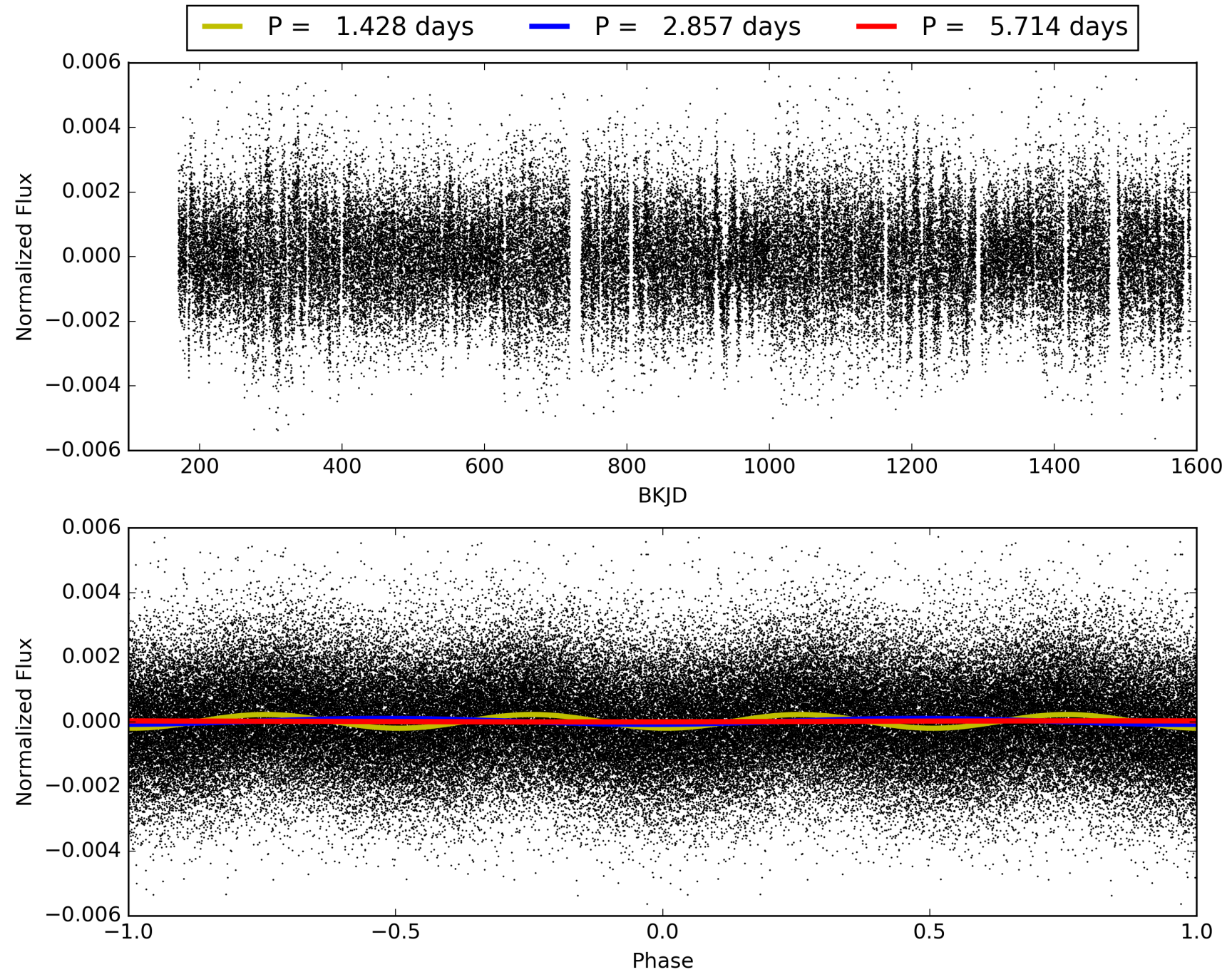
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 009304976-02, PDC Light Curves



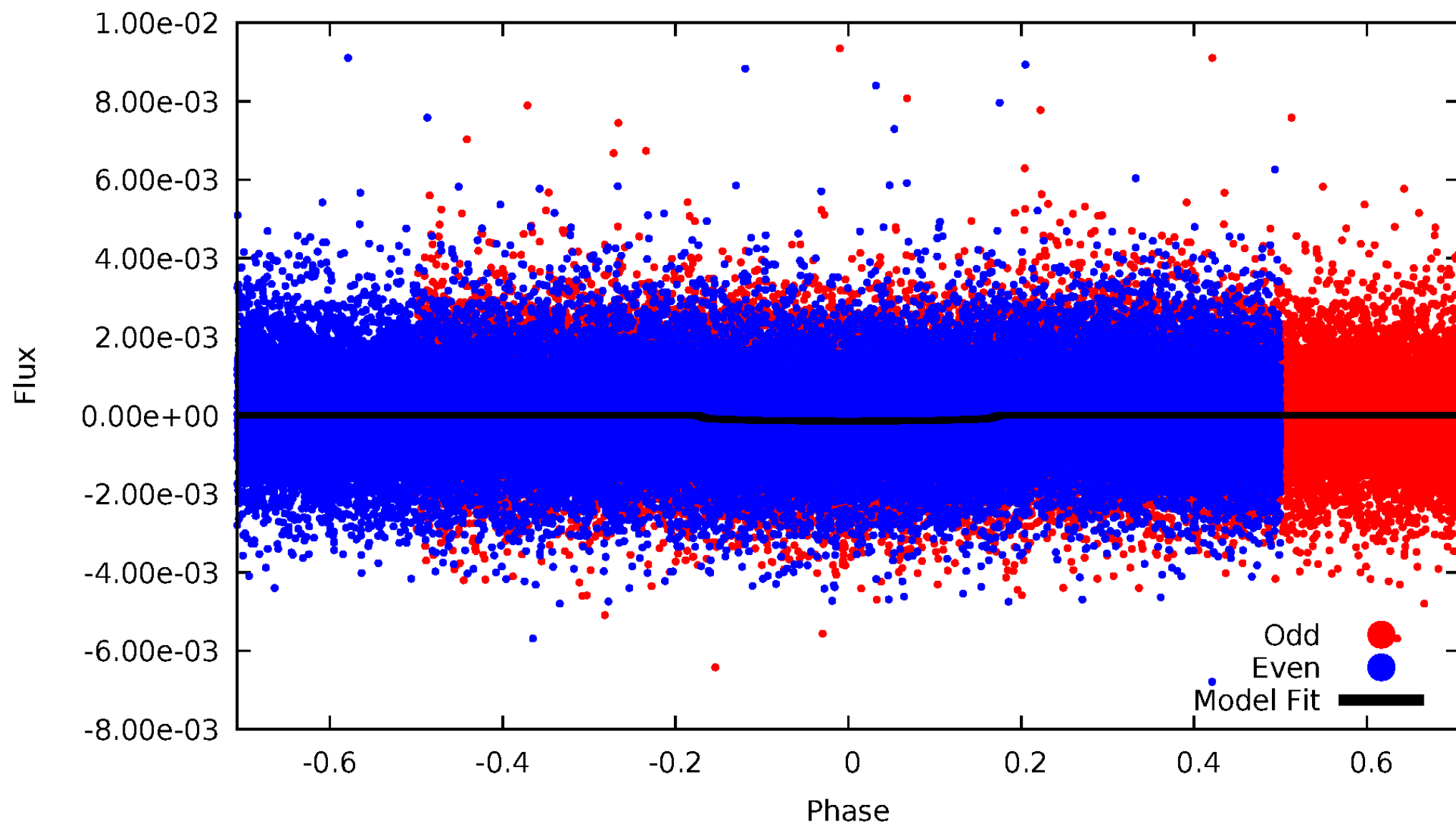


TCE 009304976-02



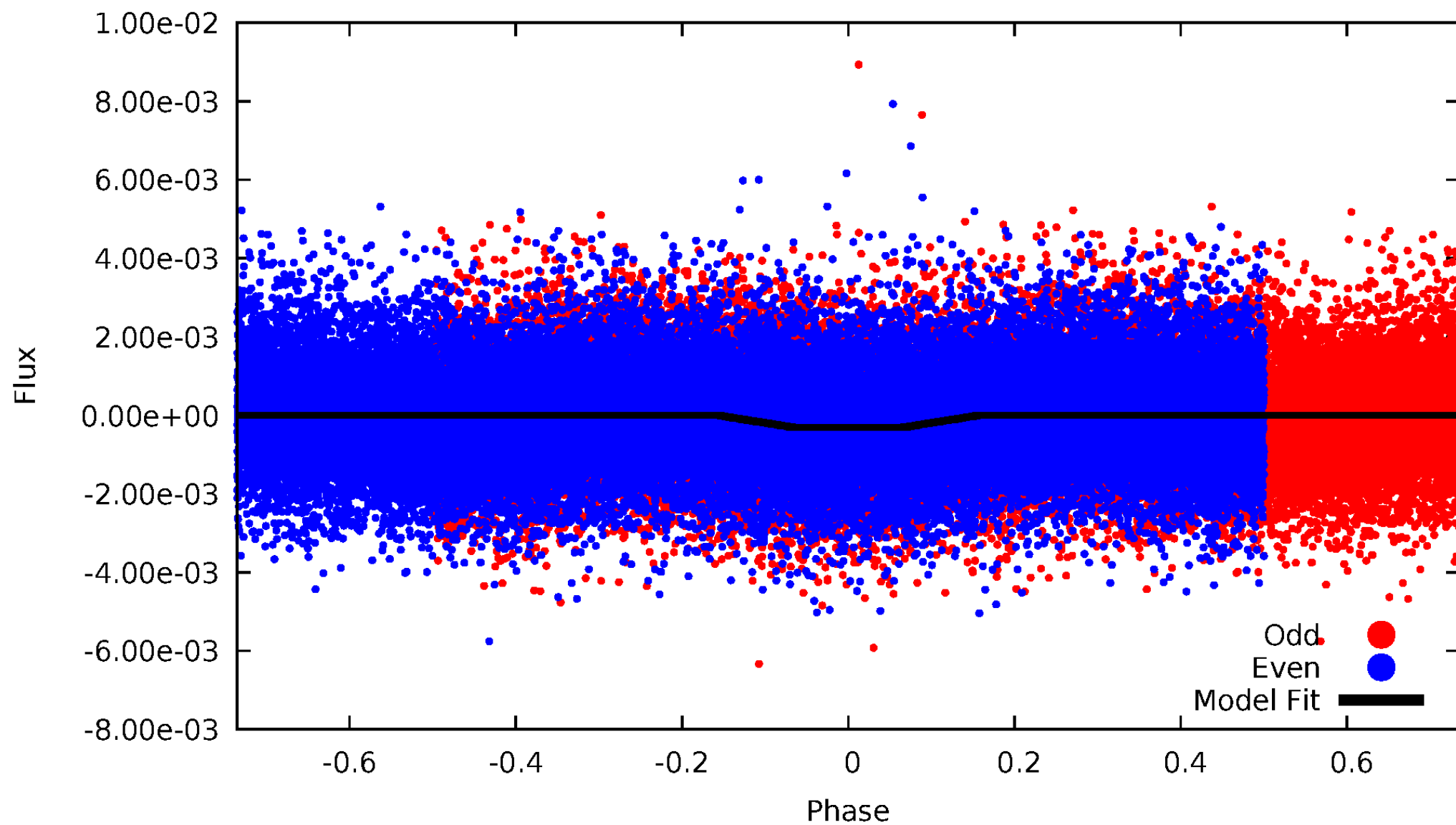
# DV Odd/Even

TCE 009304976-02



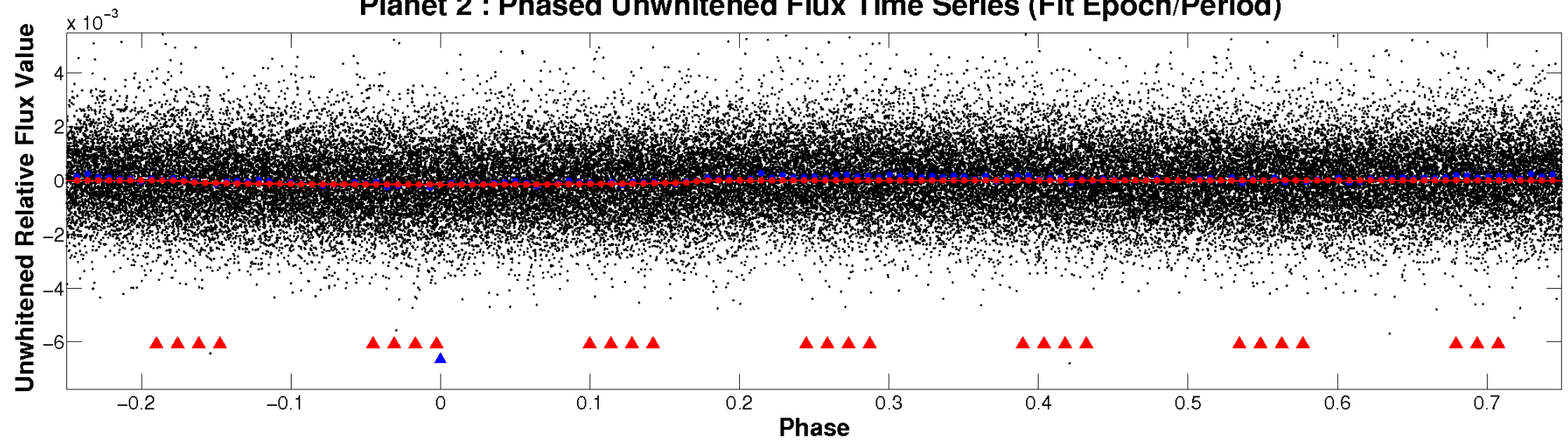
# ALT Odd/Even

TCE 009304976-02

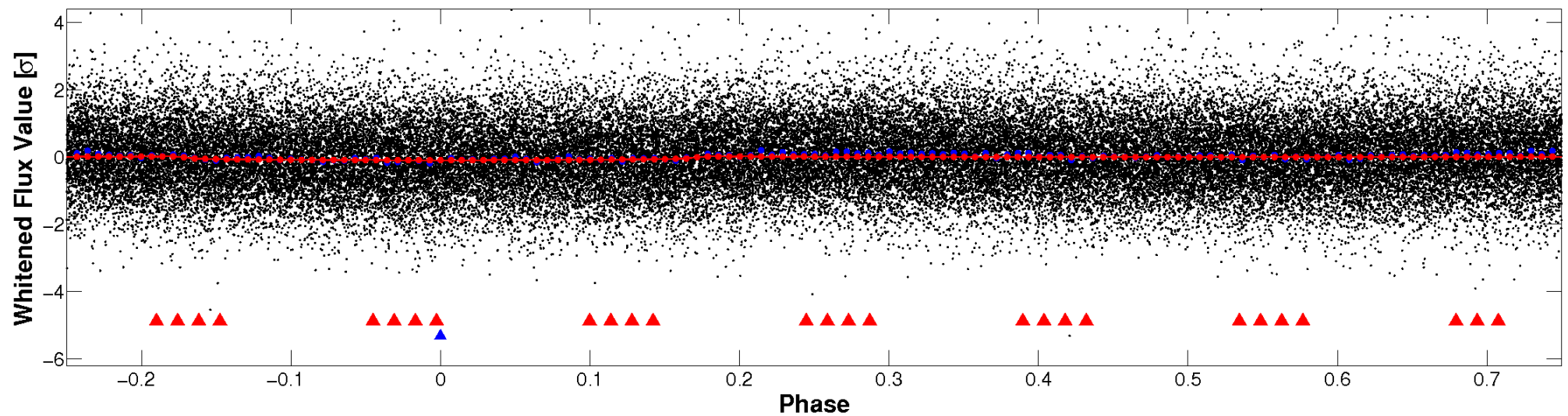


# Non-Whitened Vs. Whitened Light Curve

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



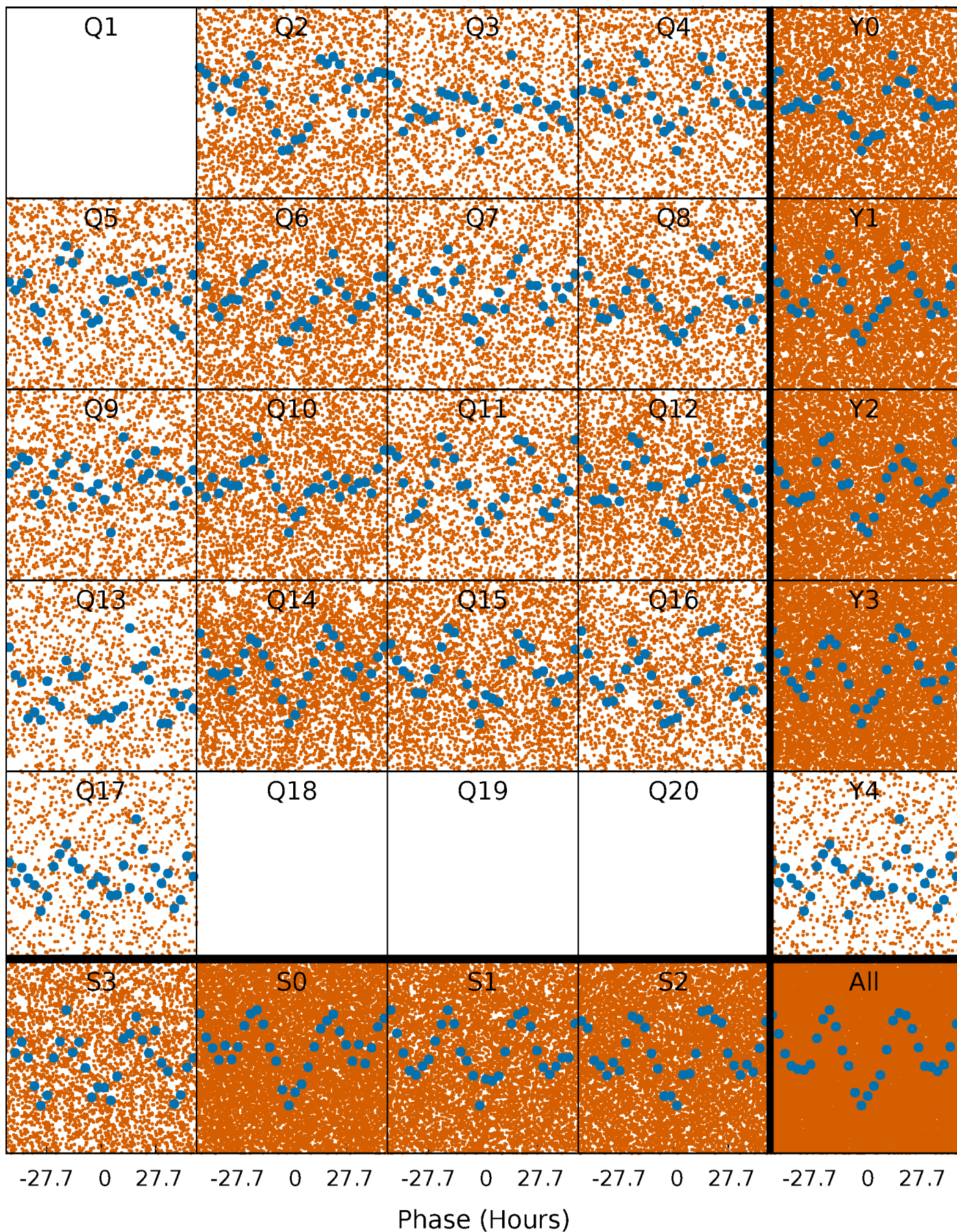
## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)





# PDC Quarter-Phased Transit Curves

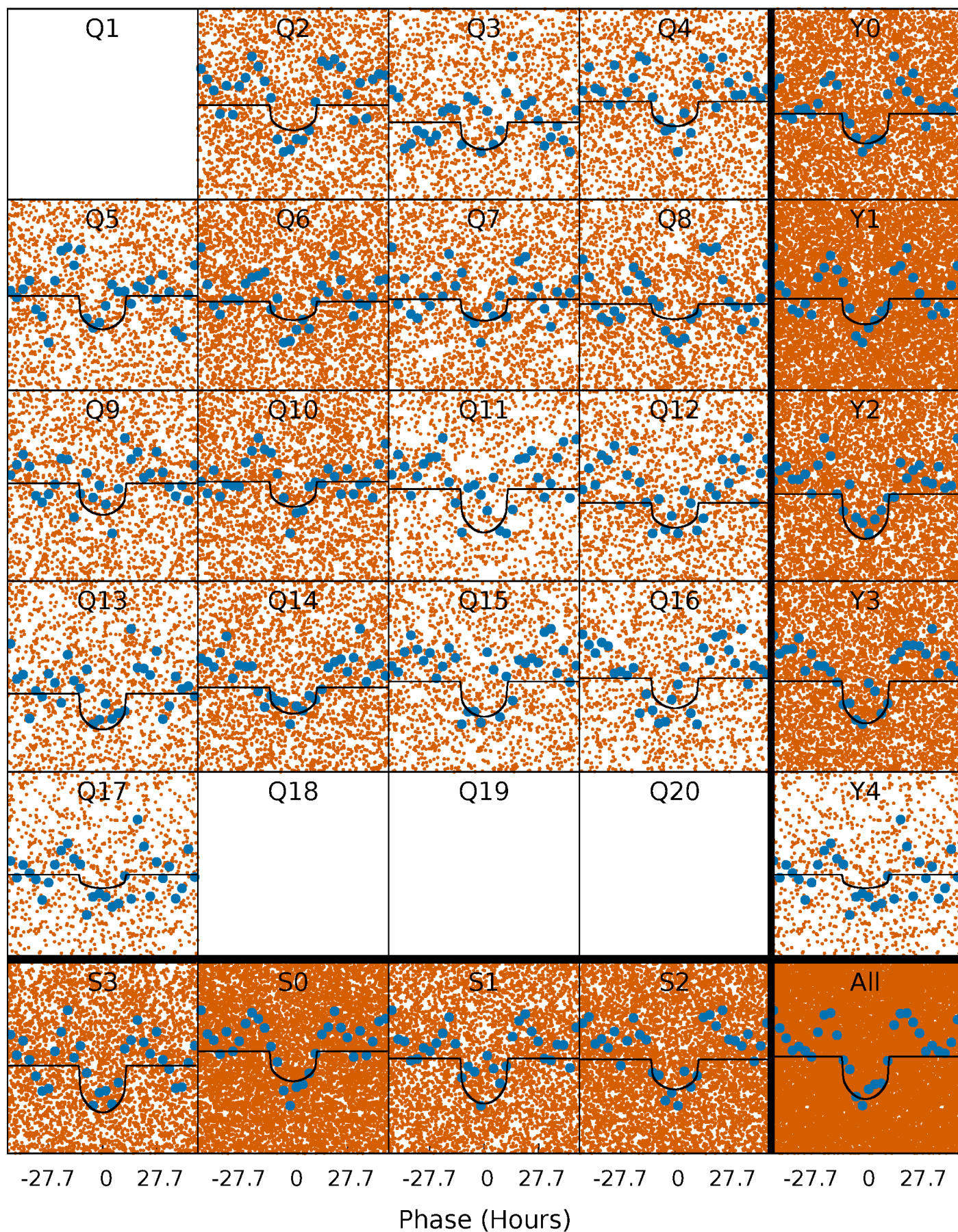
TCE 009304976-02   P= 2.856896 Days    $T_0=132.960012$  (BKJD)





# DV Quarter-Phased Transit Curves

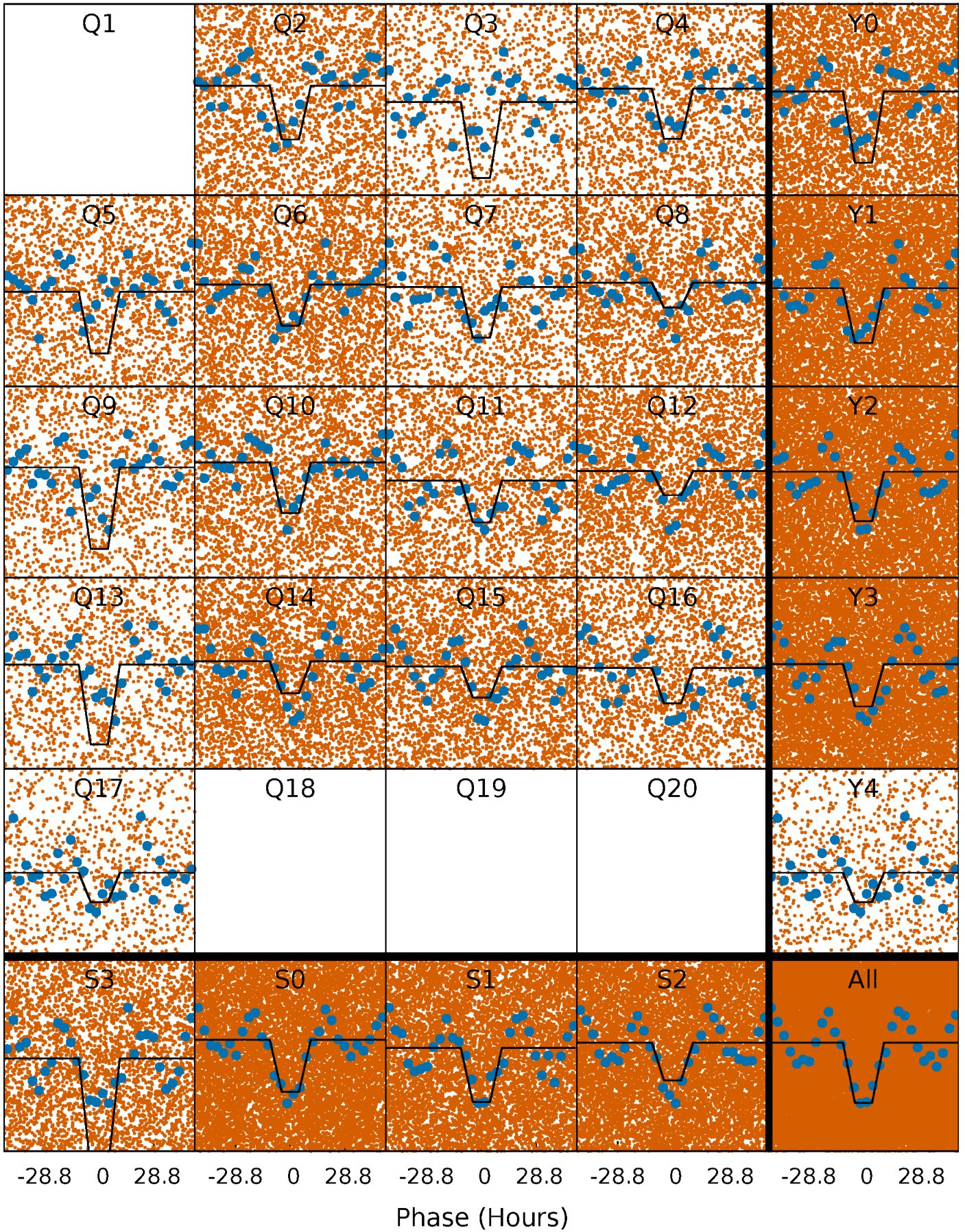
TCE 009304976-02    P= 2.856896 Days     $T_0=132.960012$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

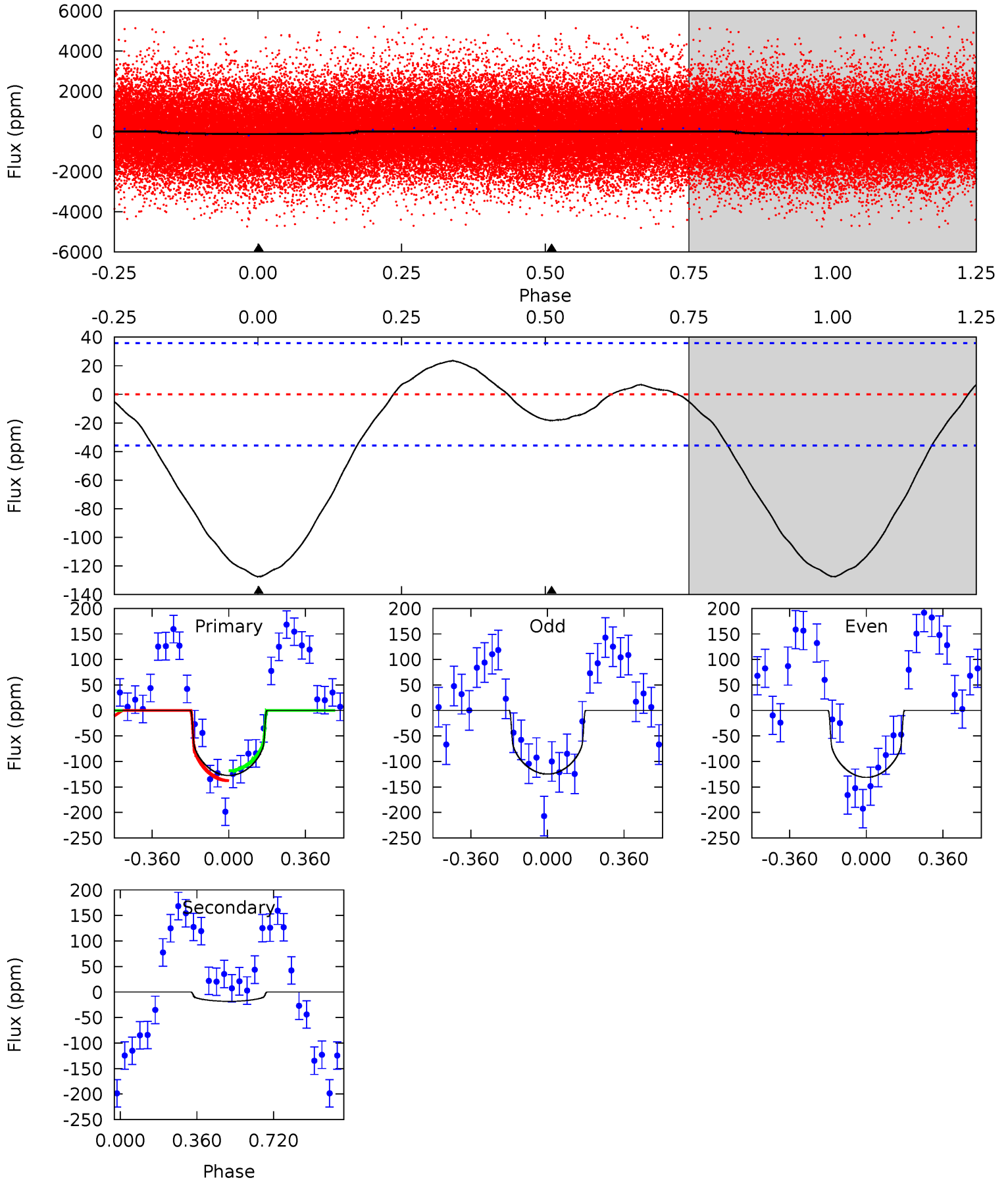
TCE 009304976-02 P= 2.856064 Days  $T_0=133.199261$  (BKJD)



# DV Model-Shift Uniqueness Test

009304976-02, P = 2.856896 Days, E = 132.960012 Days

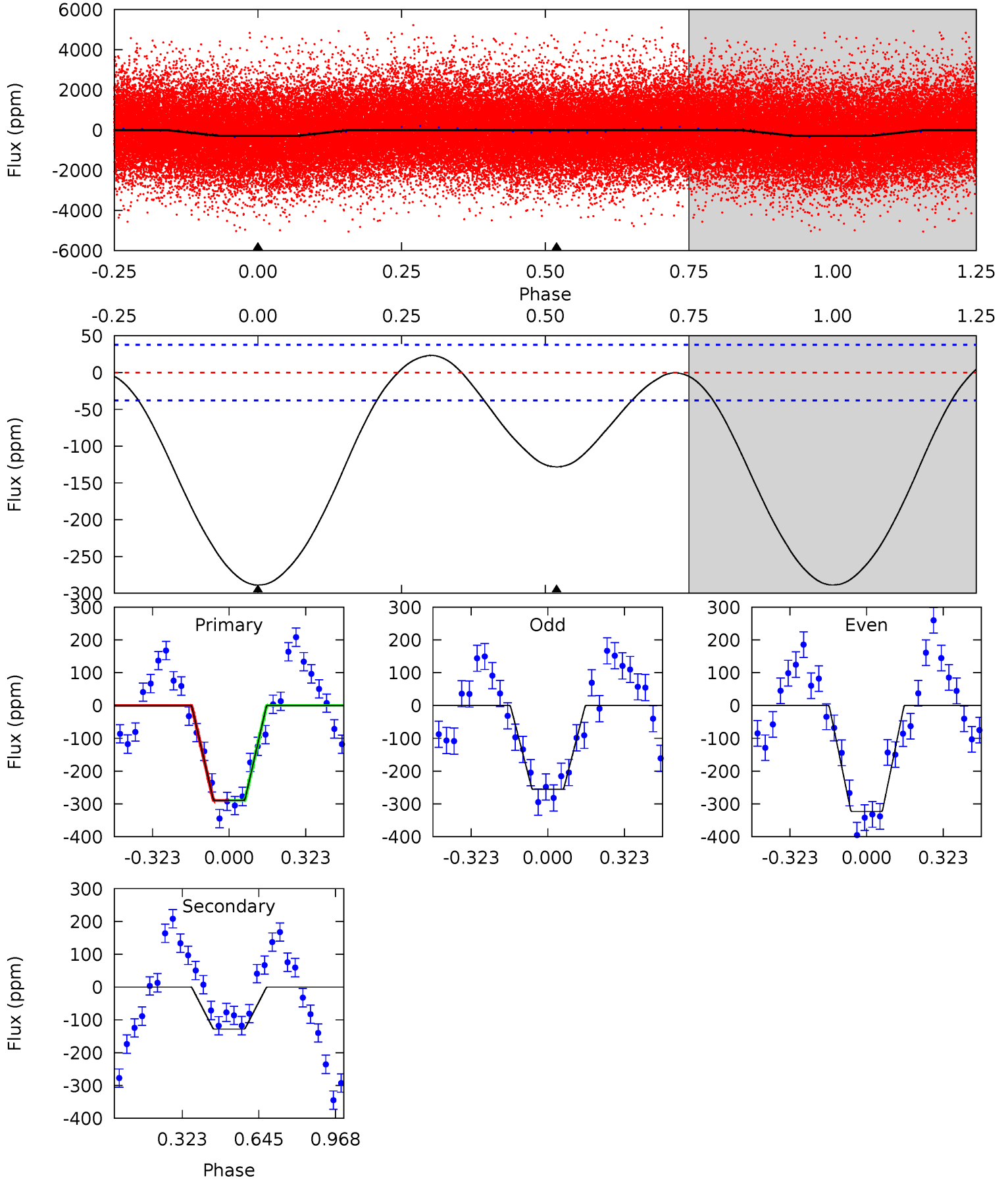
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
15.3	2.19	0	0	4.29	0.92	1.07	15.3	15.3	2.19	2.19	0.39	0.84	0.16	1.16



# Alt Model-Shift Uniqueness Test

009304976-02, P = 2.856064 Days, E = 133.199261 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
33.0	14.6	0	0	4.31	0.99	1.55	33.0	33.0	14.6	14.6	3.83	1.26	0.08	0.02



### Stellar Parameters For KIC 009304976

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5299^{+186}_{-186}$	$4.535^{+0.093}_{-0.076}$	$-0.440^{+0.350}_{-0.300}$	$0.757^{+0.102}_{-0.092}$	$0.715^{+0.104}_{-0.045}$	$2.324^{+0.853}_{-0.571}$
	+4%/-4%	+2%/-2%	+80%/-68%	+13%/-12%	+15%/-6%	+37%/-25%
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 009304976-02 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-18 \pm 8$	$0.96^{+0.34}_{-0.31}$	$1508^{+74}_{-72}$	$3587^{+613}_{-426}$	$13^{+19}_{-7}$
Alt.	$-128 \pm 9$	$1.44^{+0.34}_{-0.33}$	$1513^{+69}_{-72}$	$4433^{+508}_{-353}$	$43^{+29}_{-15}$

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

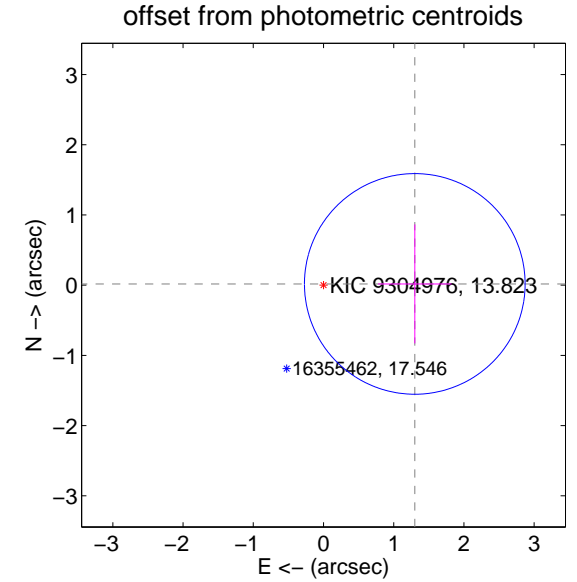
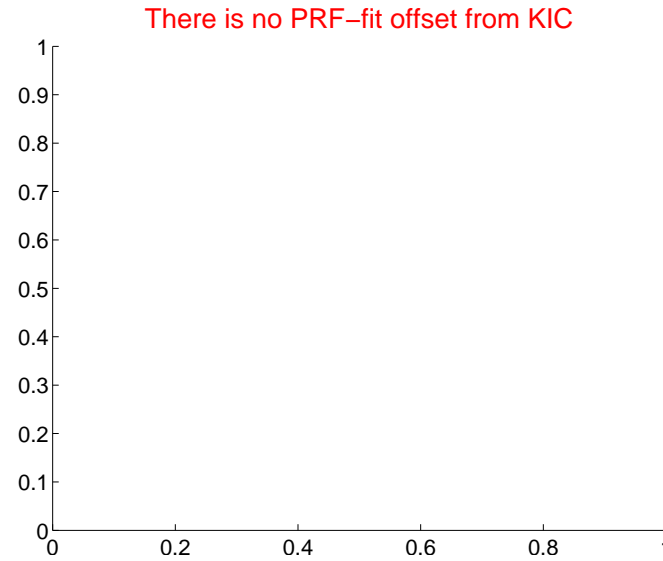
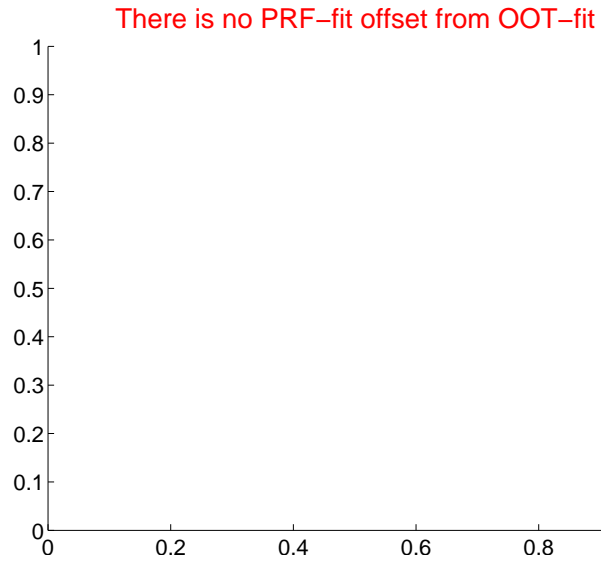
## DV Centroid Data

Supplemental centroid analysis for 009304976-02. Kepler magnitude: 13.82. Transit SNR 11.36

There are 0 quarters with good PRF difference image offsets

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

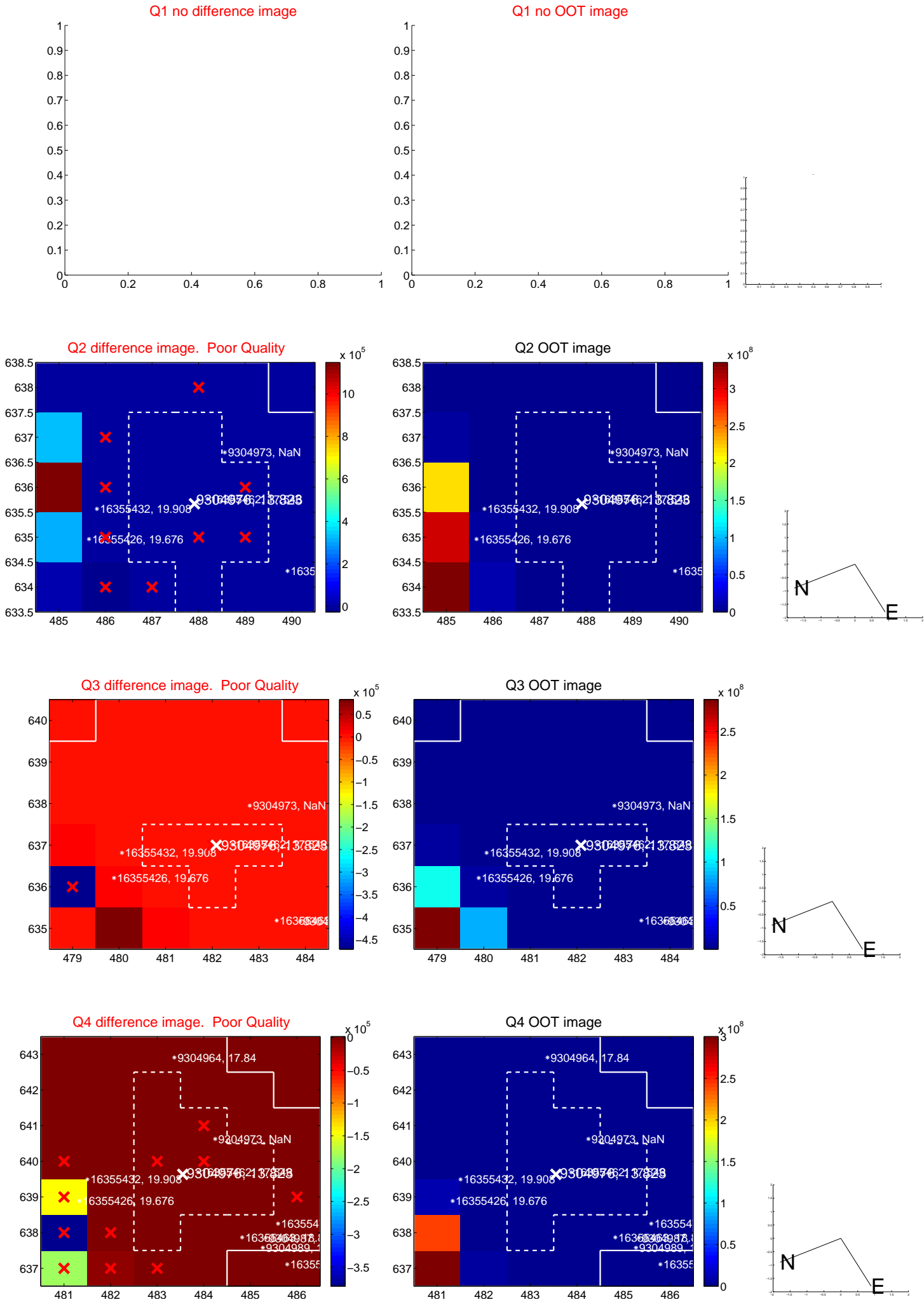
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	—	—	—	—
PRF-fit source offset from KIC position	—	—	—	—
photometric centroid source offset	$1.30 \pm 0.52$	2.48	$-1.30 \pm 0.52$	$0.02 \pm 0.85$



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.

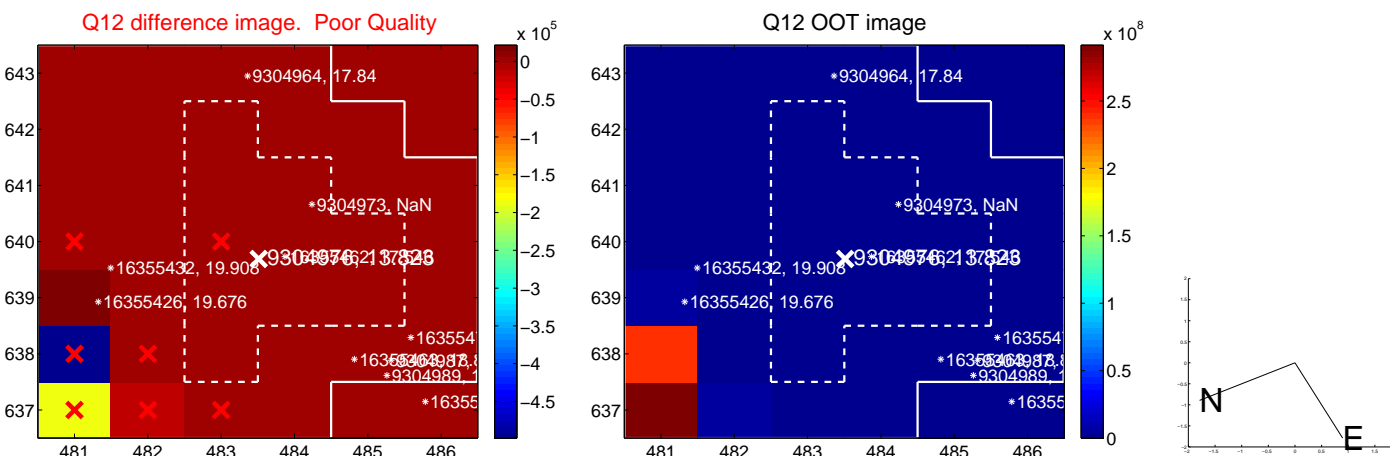
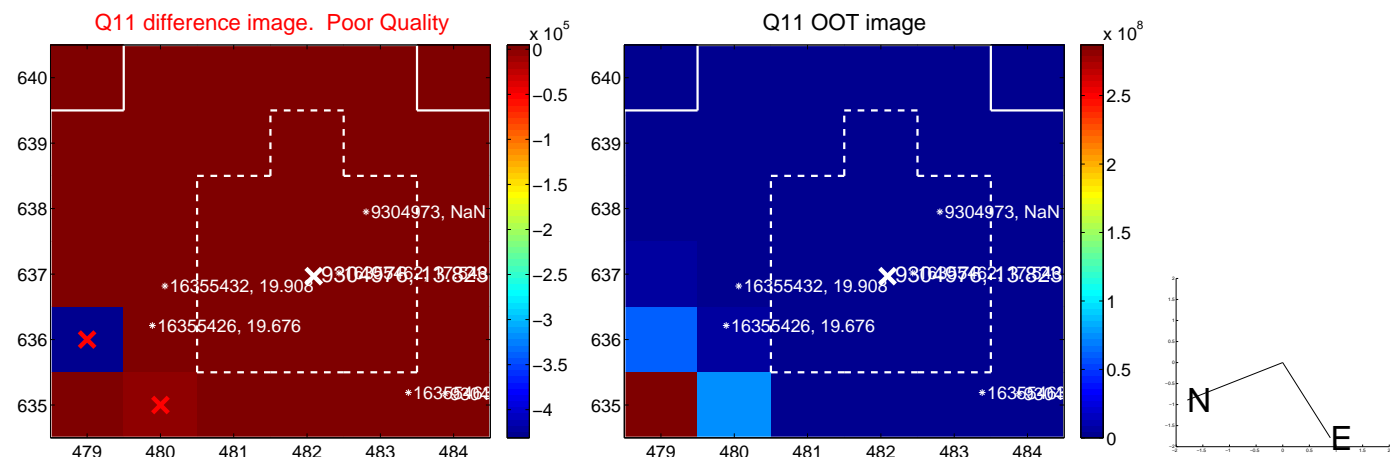
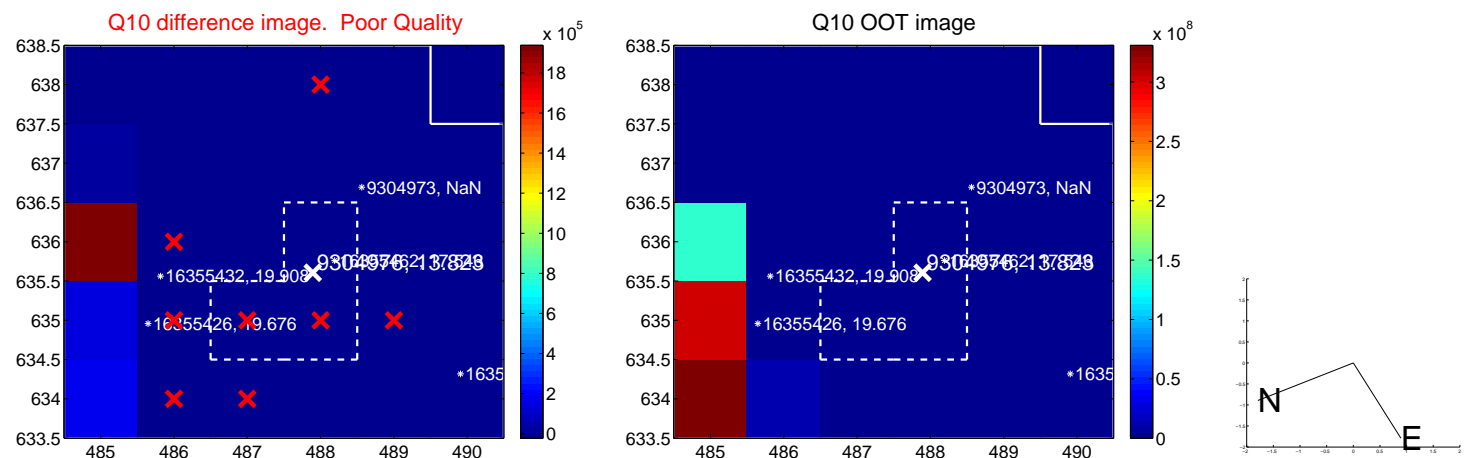
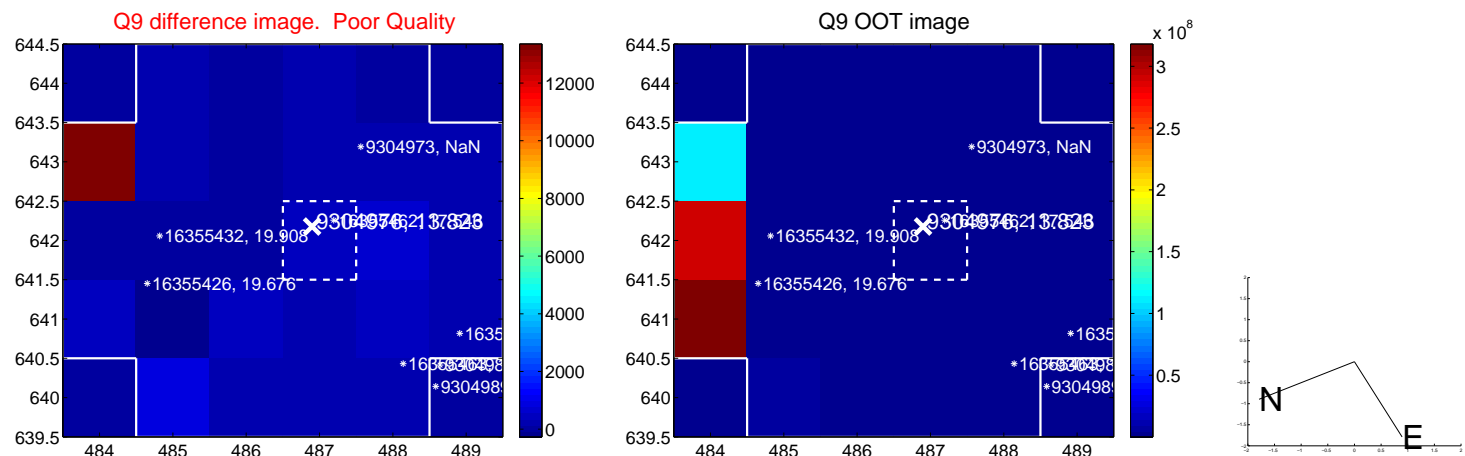


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

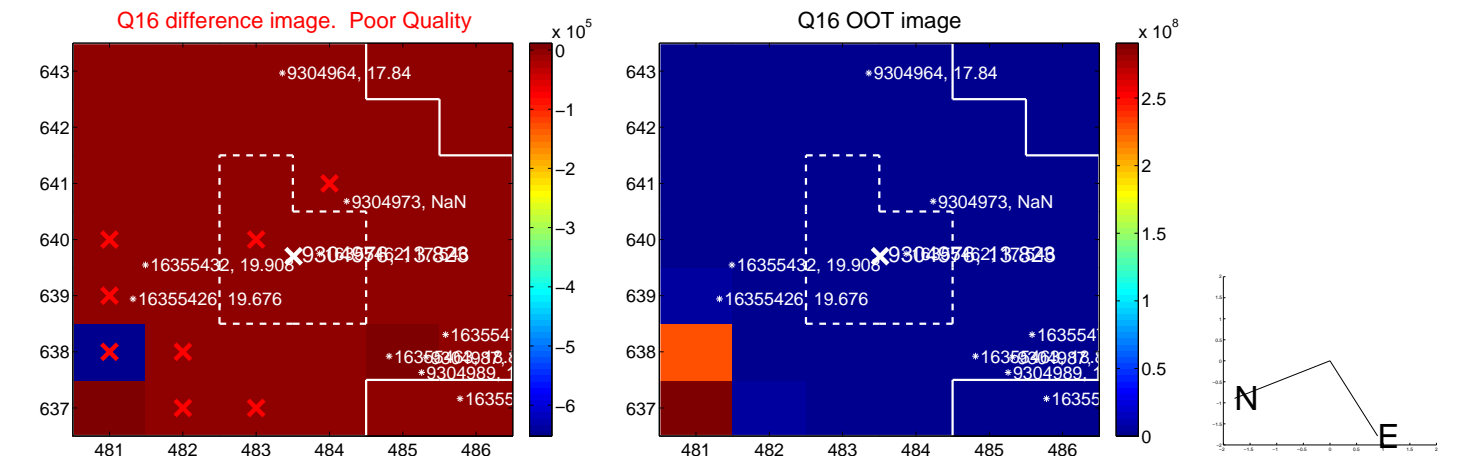
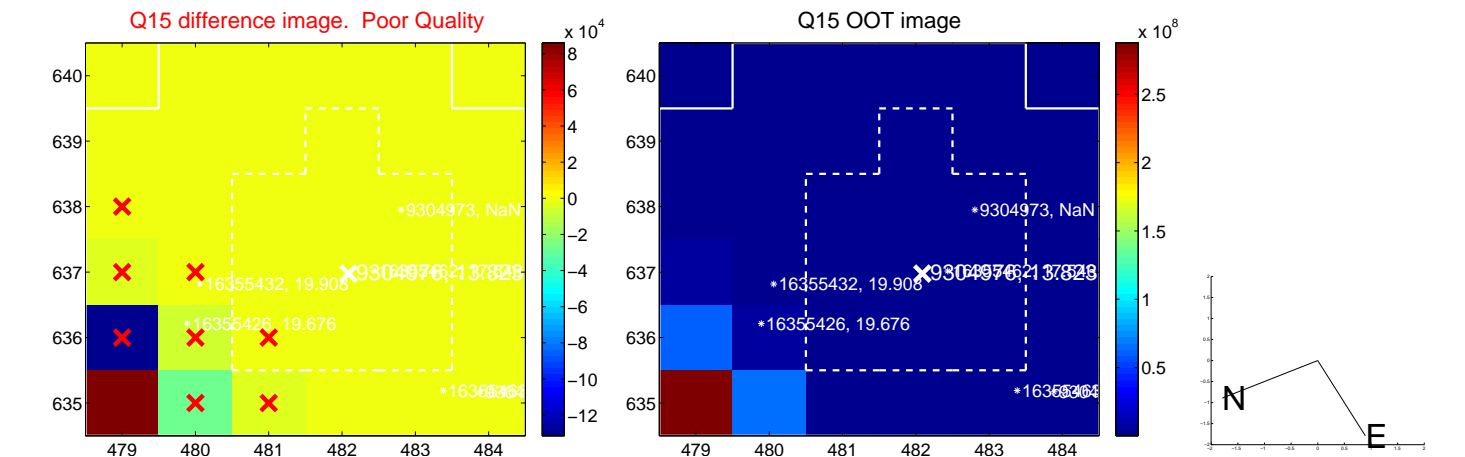
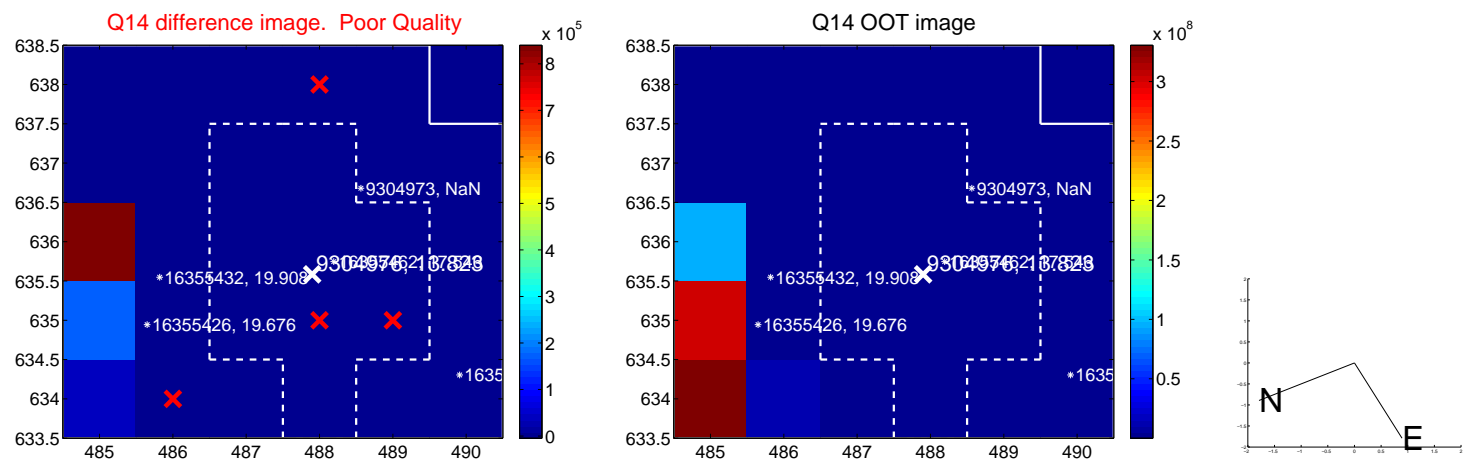
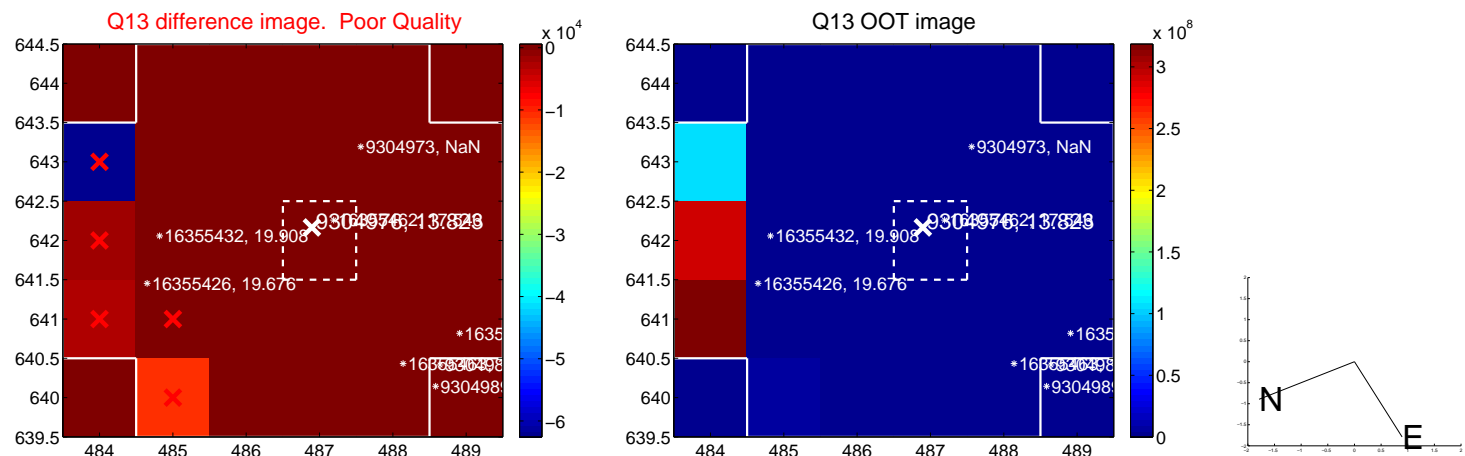




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white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





UKIRT Image

