

# KIC 009536515

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009536515-01	OBS	No	0.748728	131.815059	105.8	1.720	10.5	12.4	2.66	8094	2.98	64160.43
009536515-02	OBS	No	1.251740	131.643637	137.5	15.021	7.5	16.2	2.66	8094	4.11	32335.55

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009536515-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
009536515-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE_ZUMA—LPP_DV—CENT_FEW_DIFFS

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

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

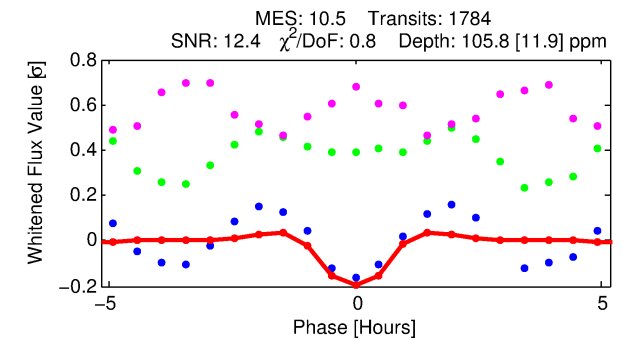
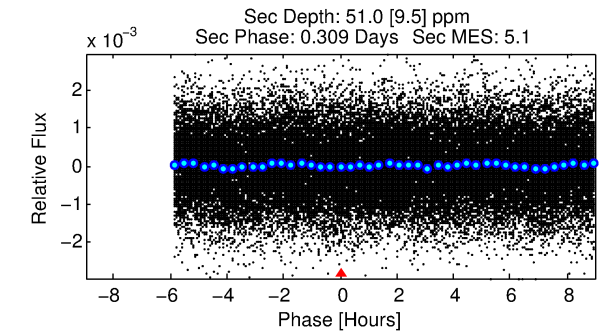
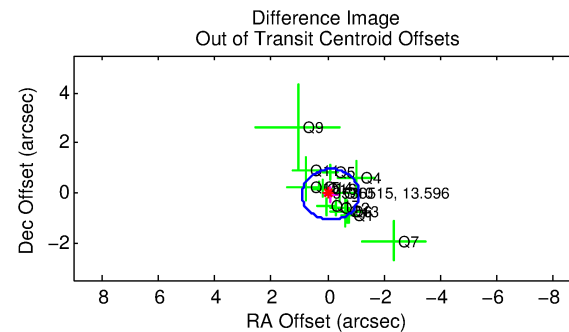
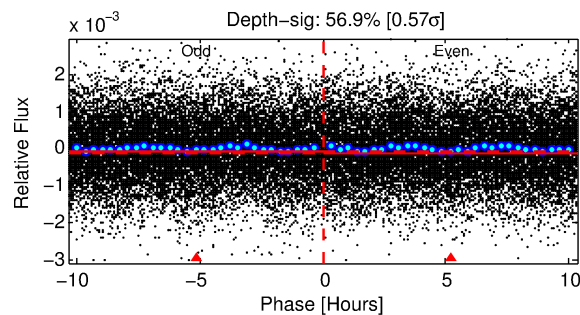
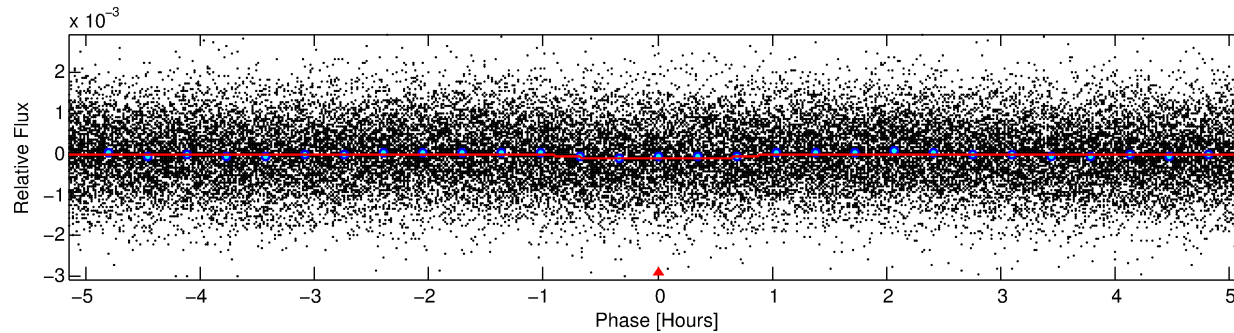
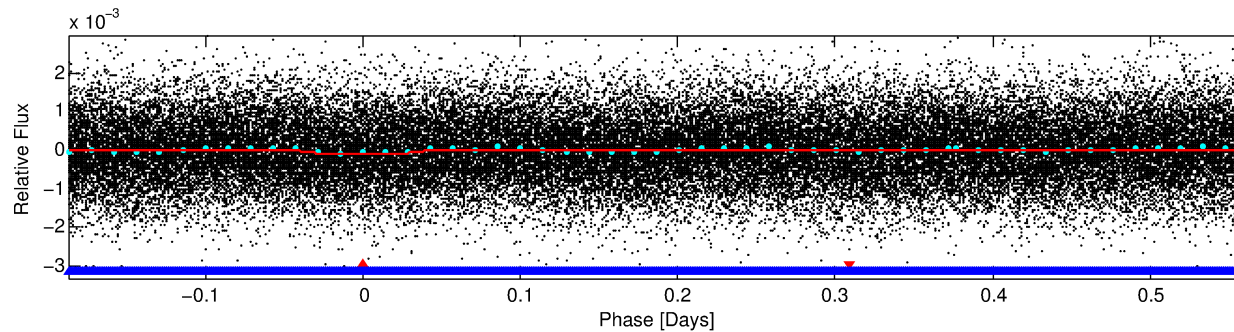
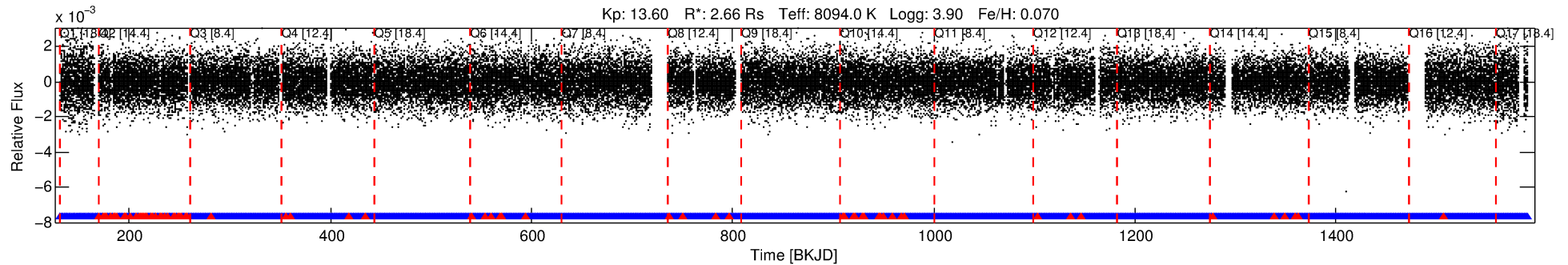
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009536515-01

No Significant Match Found

# DV One-Page Summary

KIC: 9536515 Candidate: 1 of 2 Period: 0.749 d



## DV Fit Results:

Period = 0.74873 [0.00001] d  
Epoch = 131.8151 [0.0020] BKJD  
Rp/R\* = 0.0103 [0.0035]  
a/R\* = 2.37 [3.92]  
b = 0.76 [1.12]  
Seff = 64160.43 [32531.83]  
Teq = 4058 [514] K  
Rp = 2.98 [1.49] Re  
a = 0.0206 [0.0065] AU  
Ag = 1.33 [1.14] [0.29 $\sigma$ ]  
Teffp = 6742 [1239] K [2.00 $\sigma$ ]

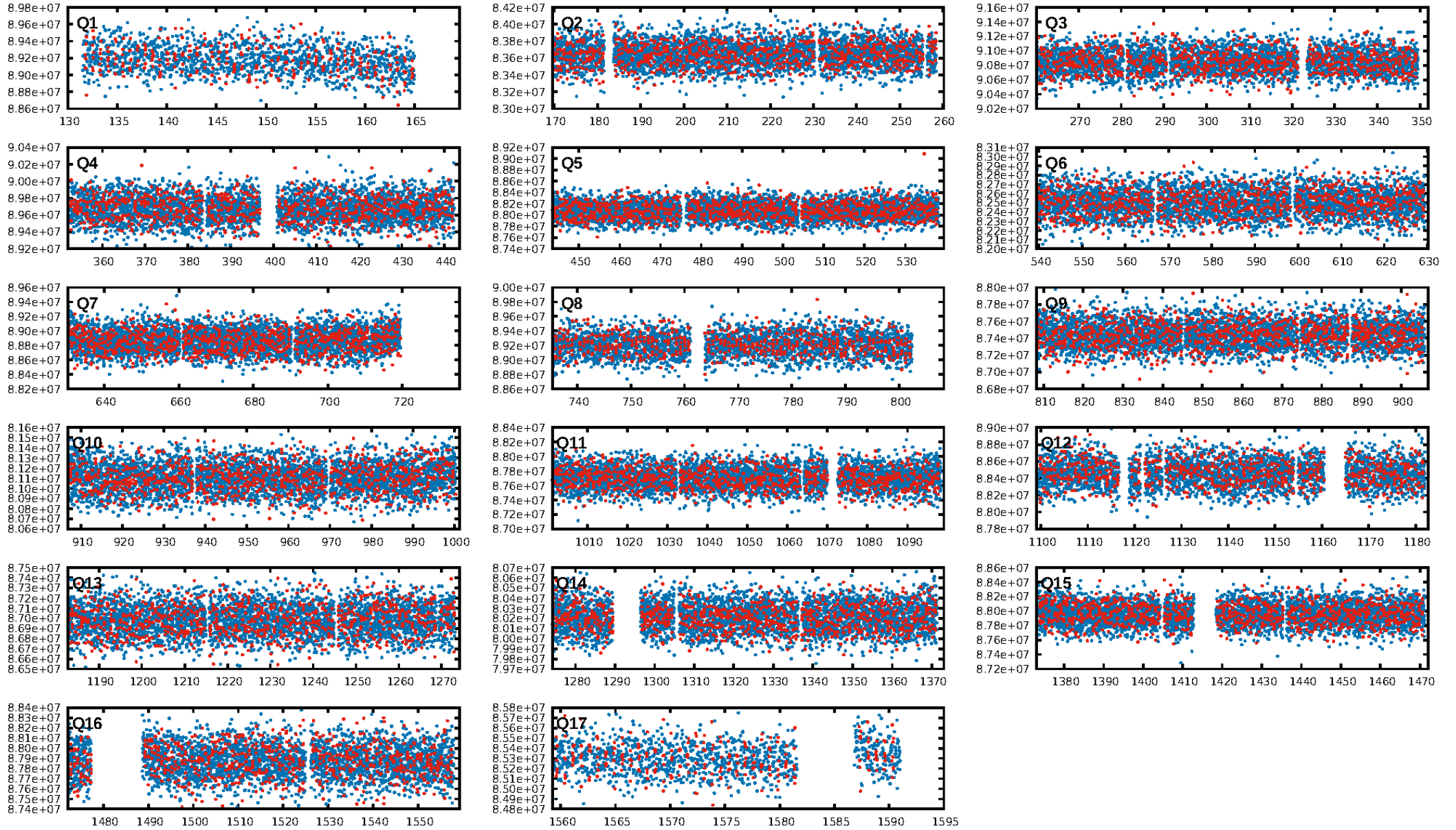
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 57.5% [0.80 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 0.96 [1631/1704]  
GhostDiagnostic-chr: 2.331  
Centroid-sig: 61.6%  
Centroid-so: 0.189 arcsec [0.65 $\sigma$ ]  
OotOffset-rm: 0.126 arcsec [0.37 $\sigma$ ]  
OotOffset-st: 3/3/3/5 [14]  
KicOffset-rm: 0.150 arcsec [0.46 $\sigma$ ]  
KicOffset-st: 3/3/3/5 [14]  
DiffImageQuality-fgm: 0.50 [7/14]  
DiffImageOverlap-fno: 1.00 [17/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 03-Feb-2016 06:11:04 Z

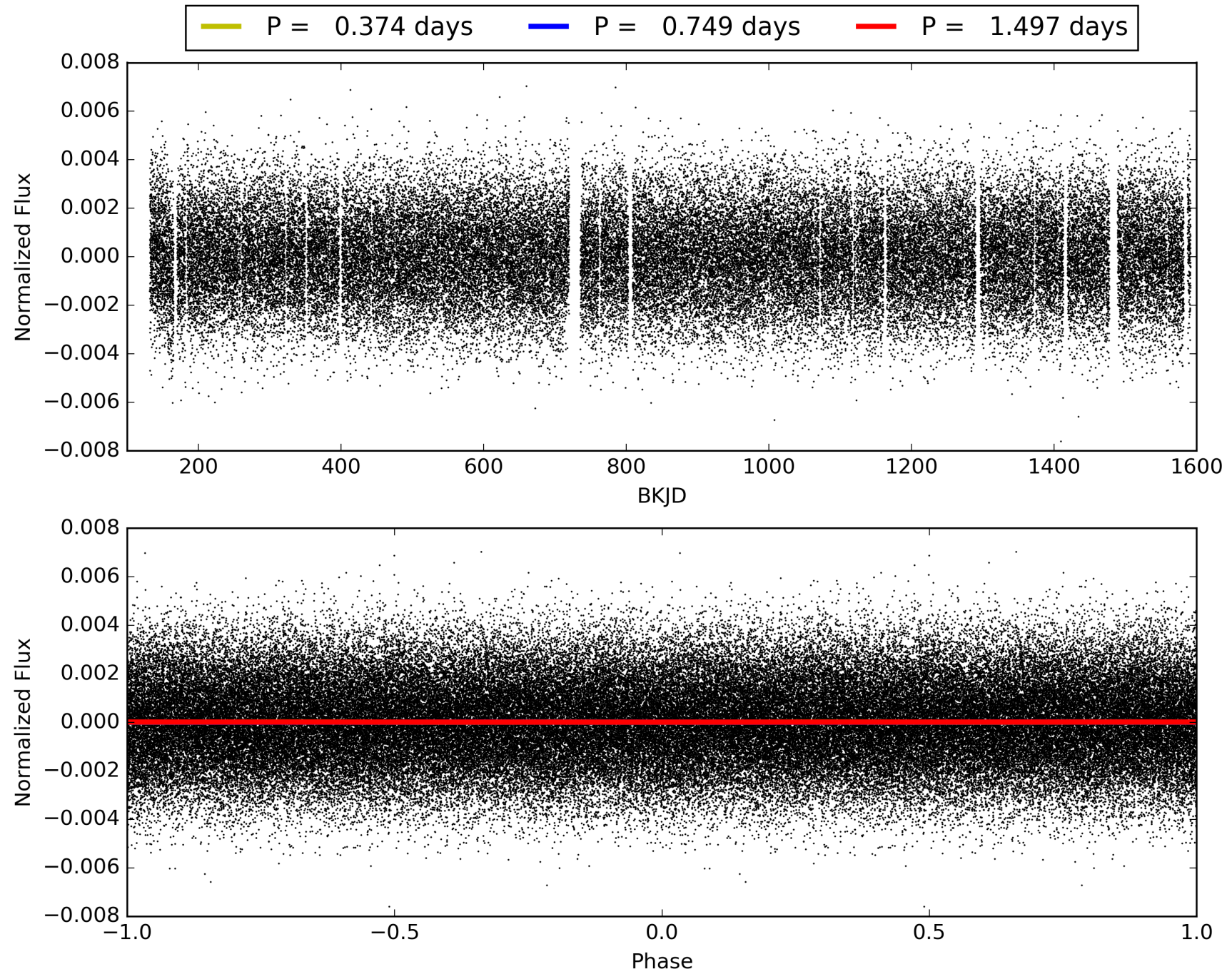
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 009536515-01, PDC Light Curves



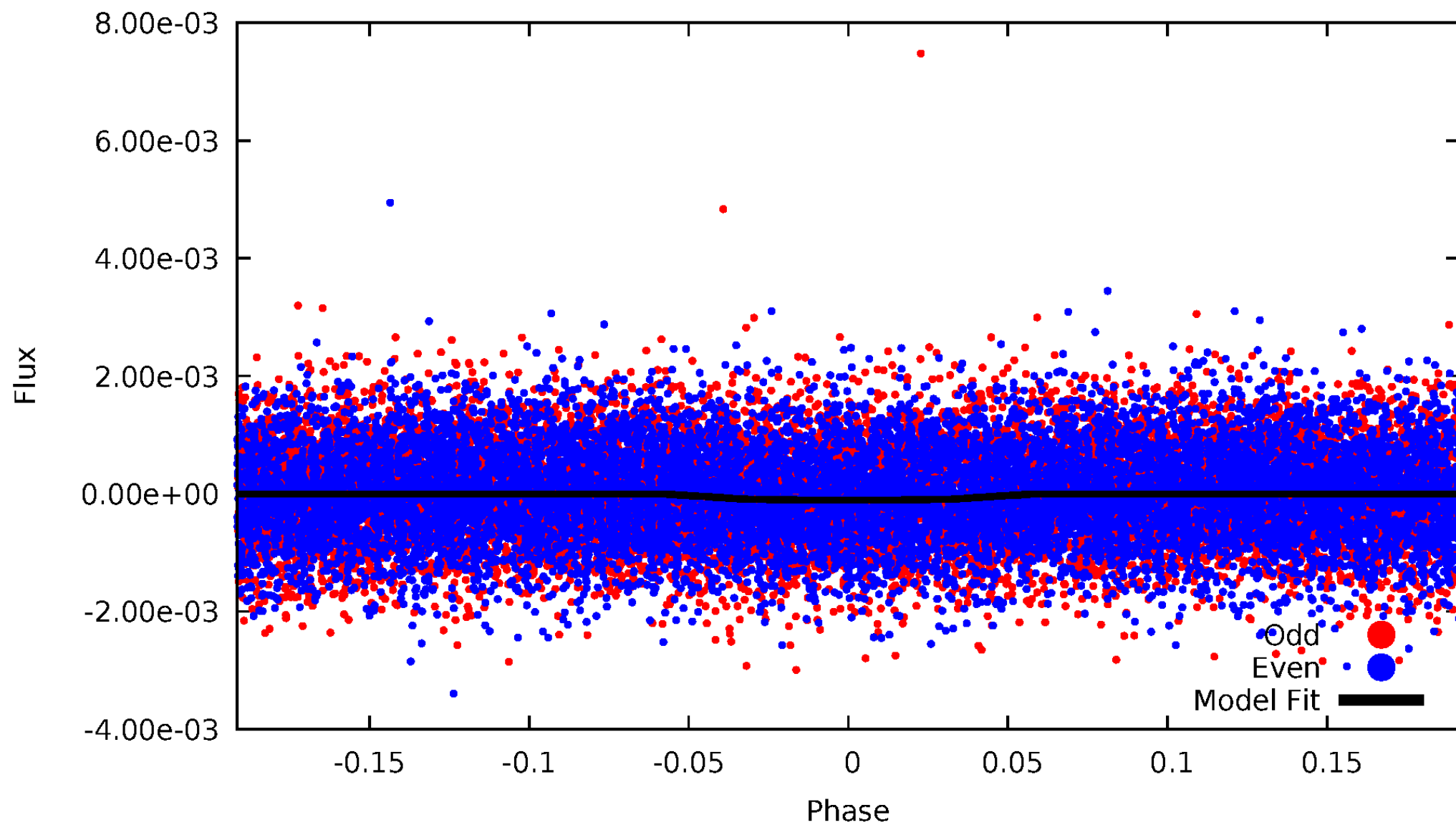


TCE 009536515-01



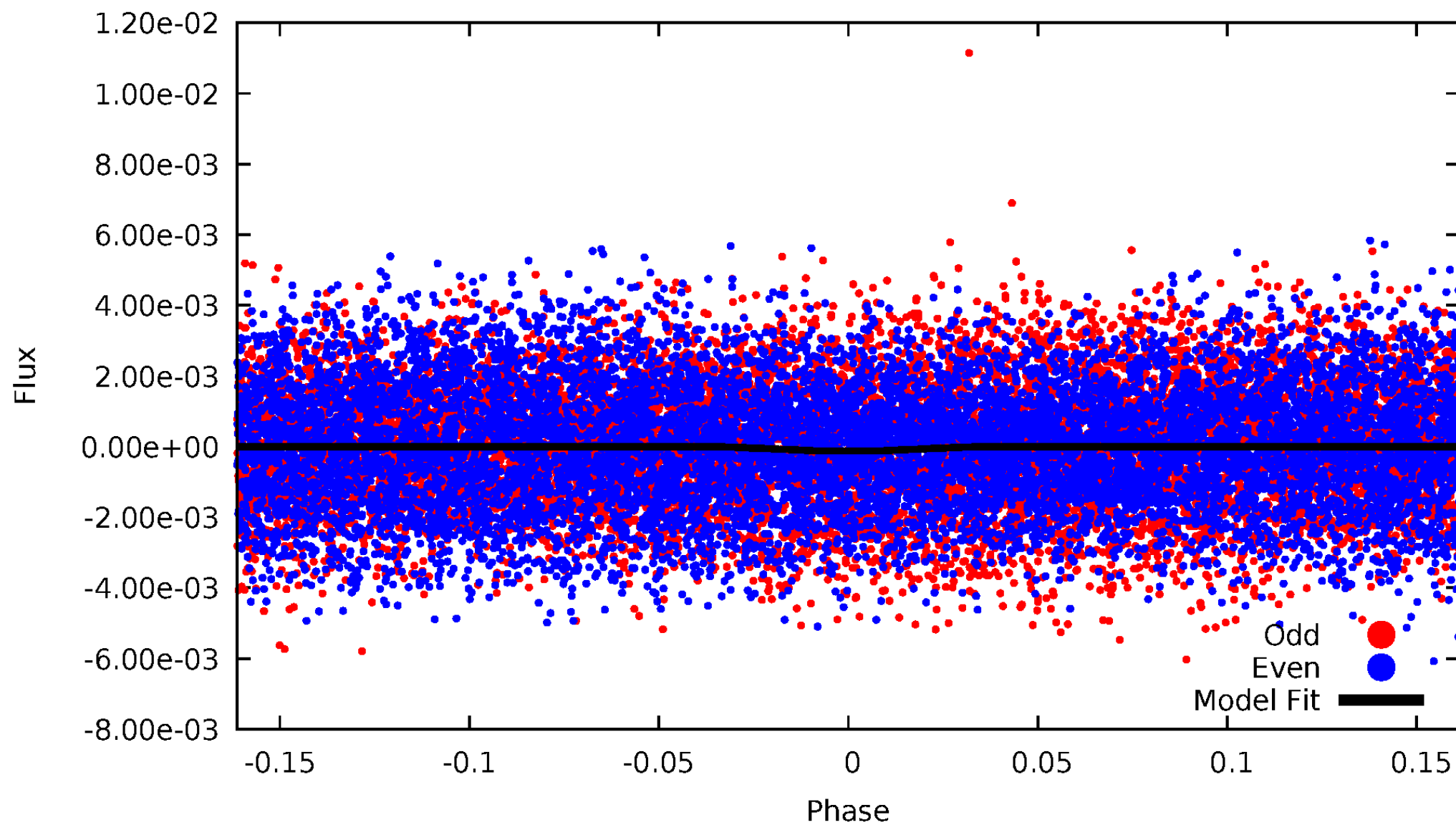
# DV Odd/Even

TCE 009536515-01



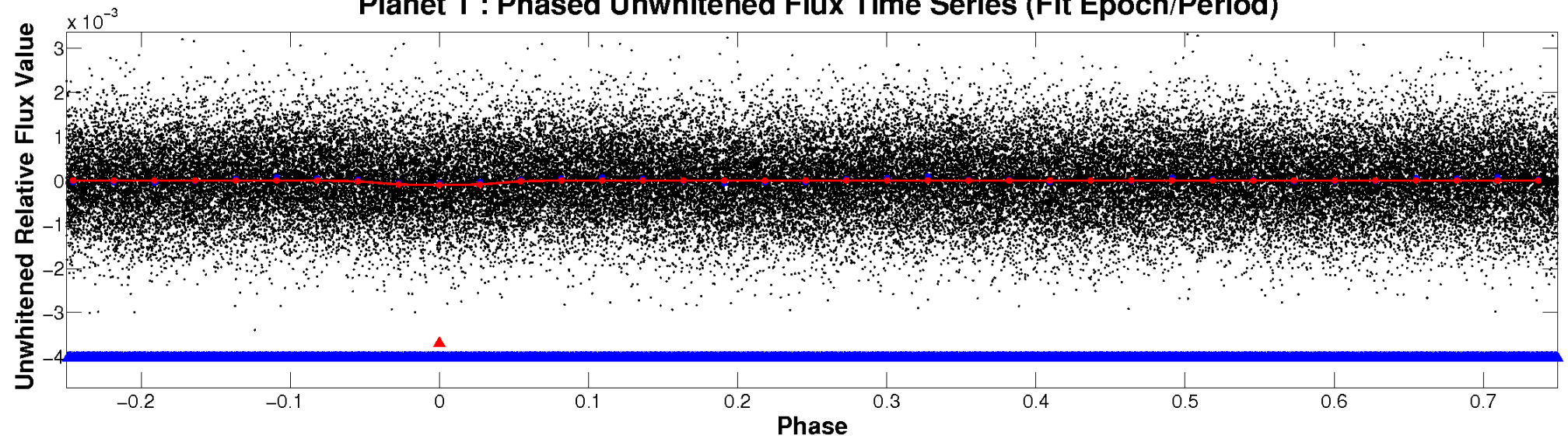
# ALT Odd/Even

TCE 009536515-01

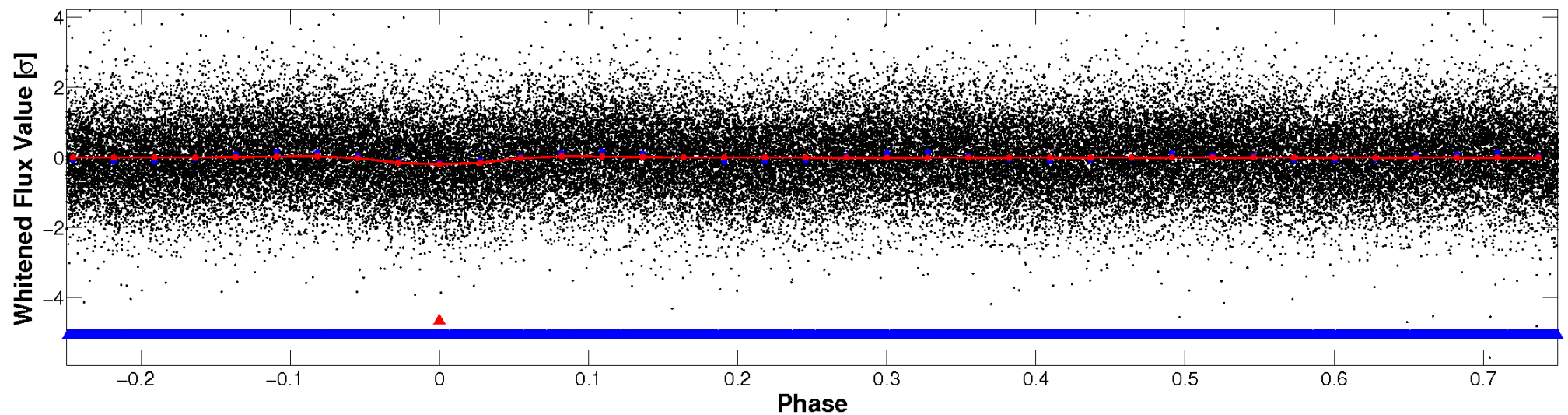


# Non-Whitened Vs. Whitened Light Curve

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



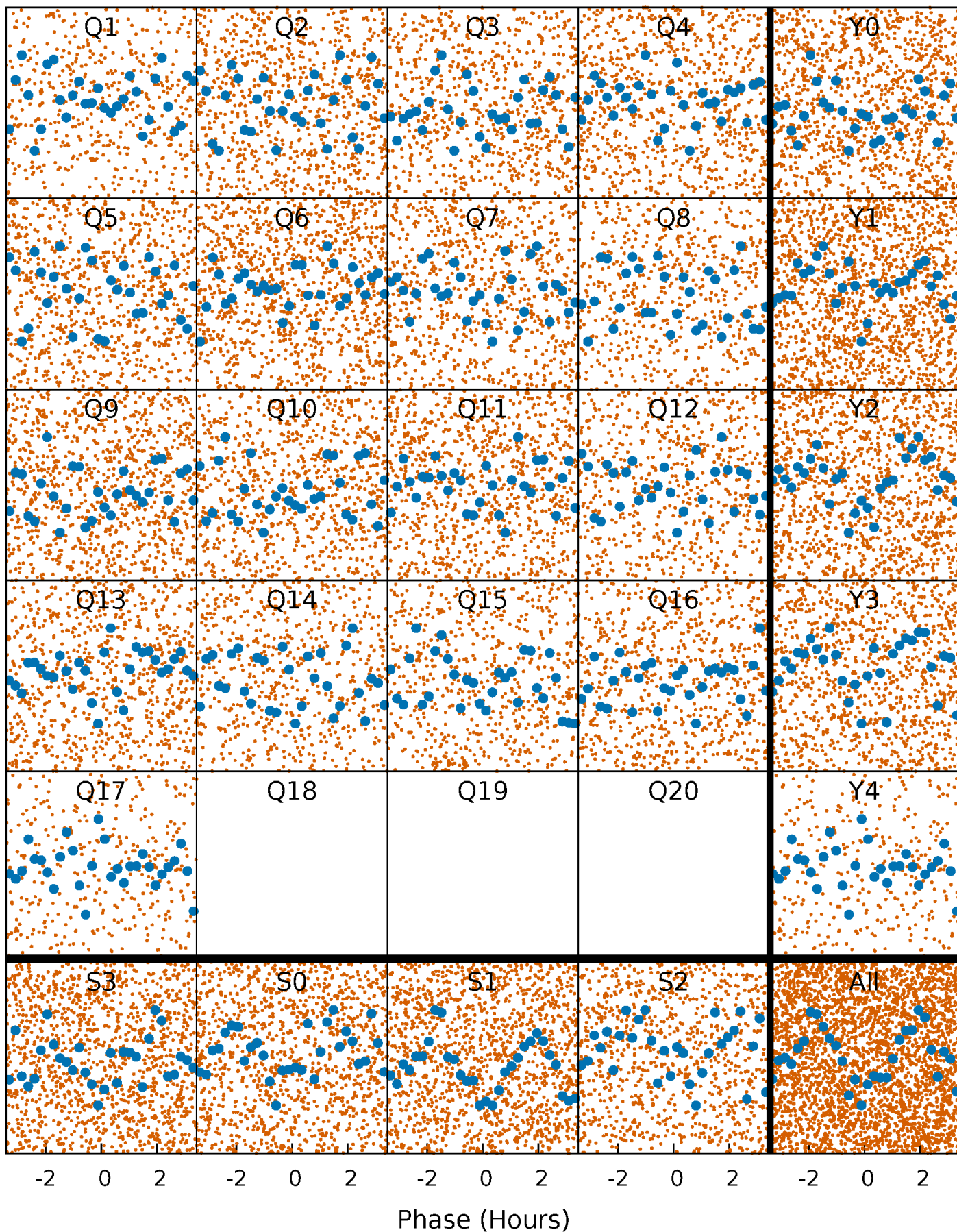
**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**





# PDC Quarter-Phased Transit Curves

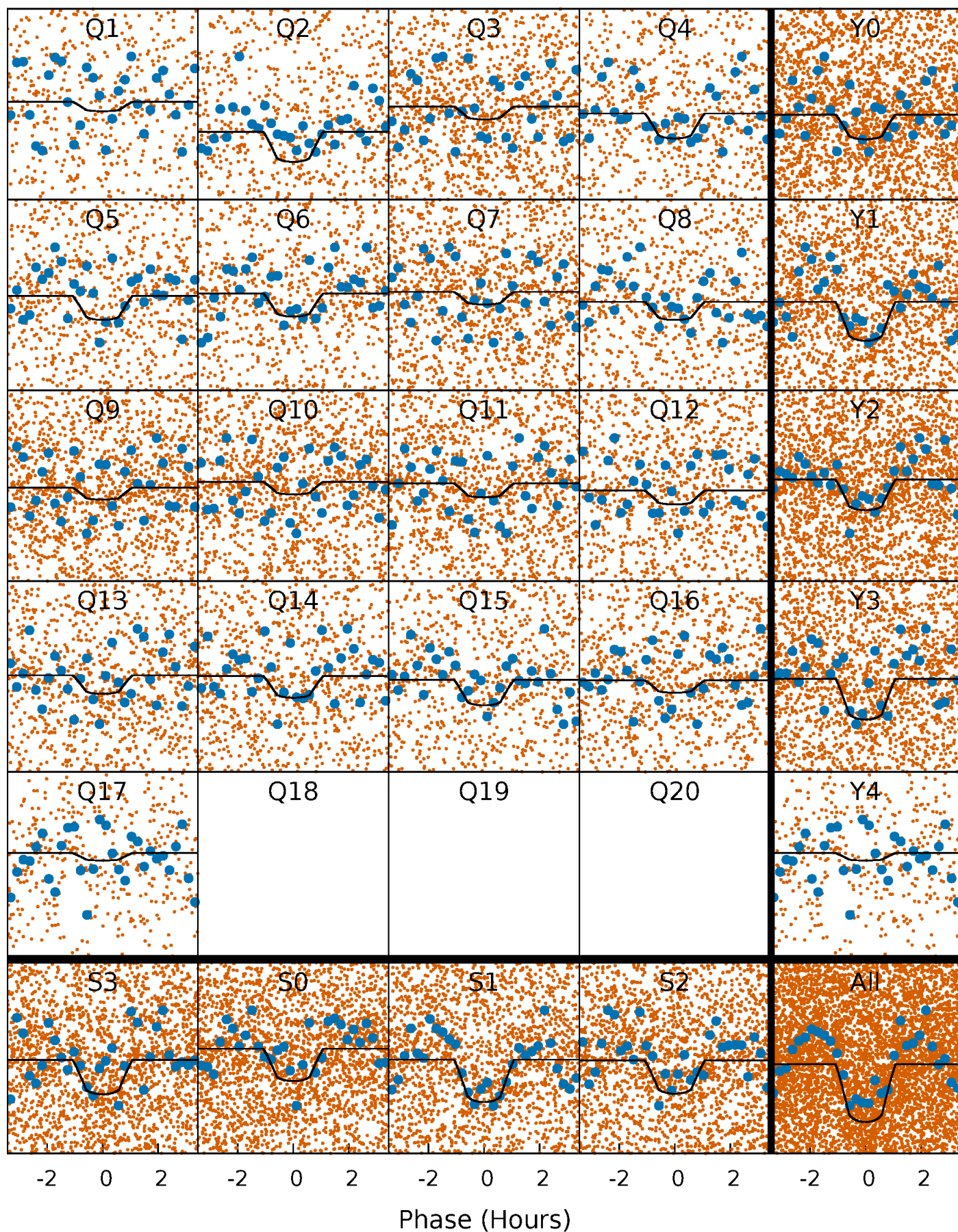
TCE 009536515-01 P= 0.748728 Days  $T_0=131.815059$  (BKJD)





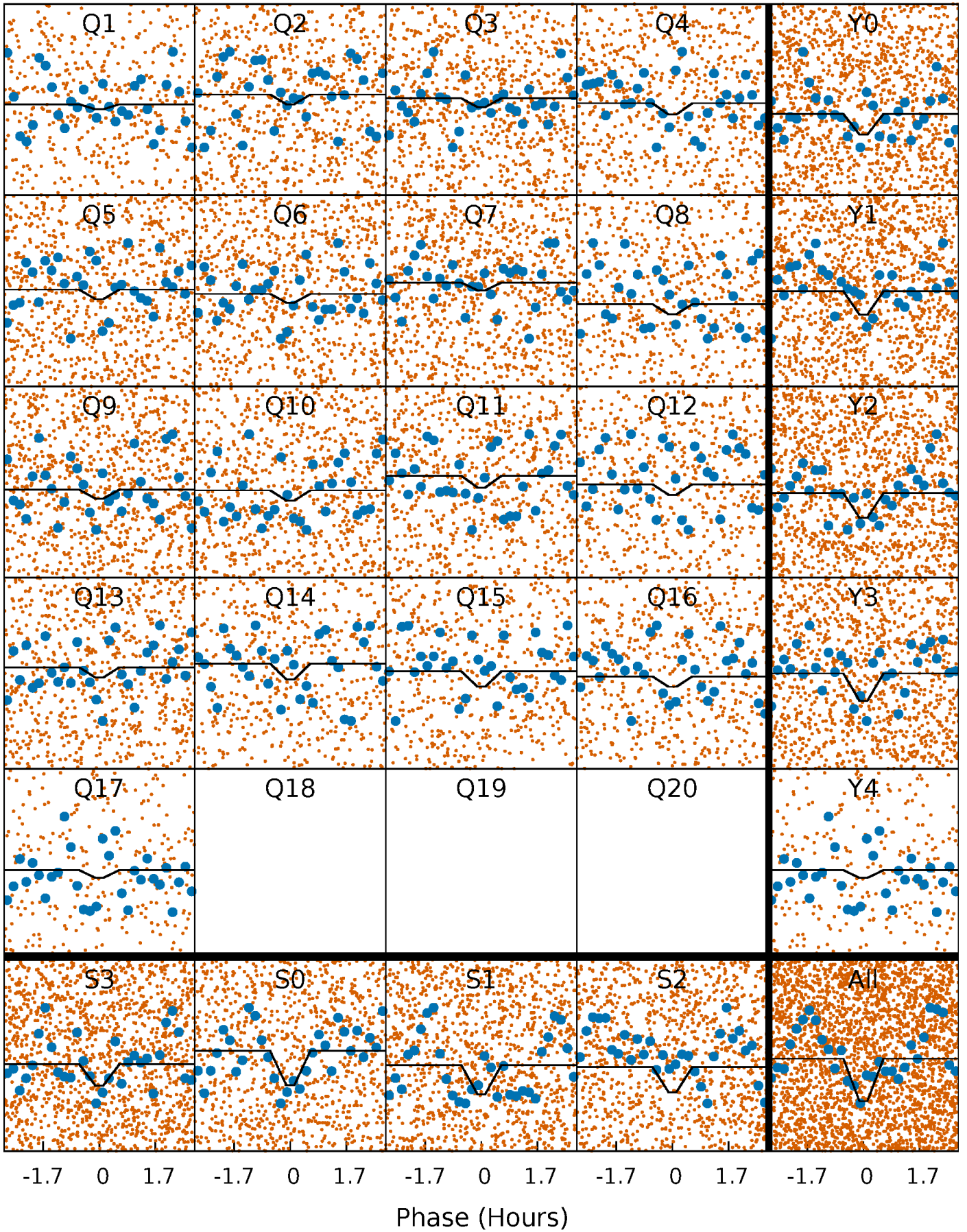
# DV Quarter-Phased Transit Curves

TCE 009536515-01 P= 0.748728 Days  $T_0=131.815059$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

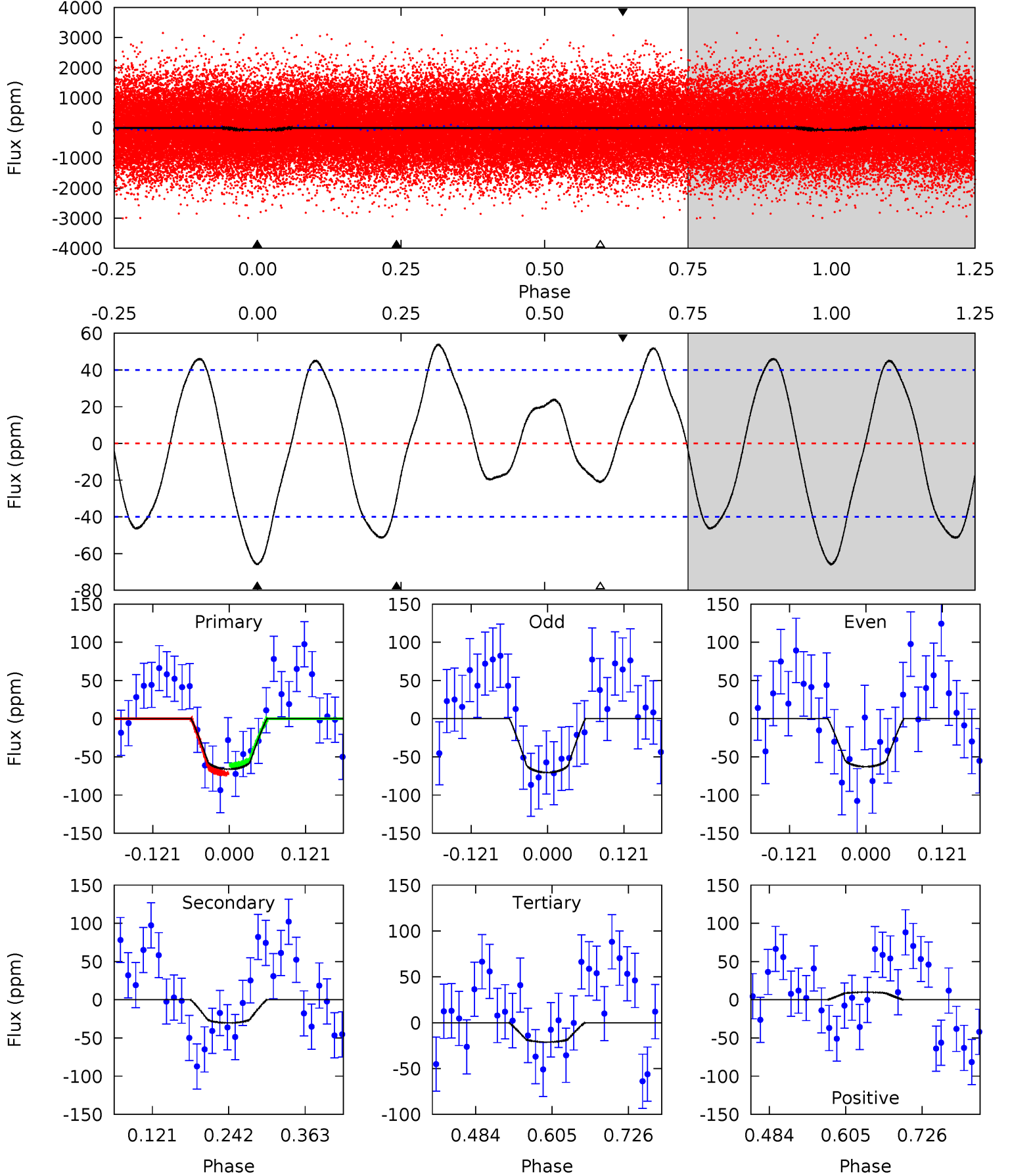
TCE 009536515-01 P= 0.748726 Days  $T_0=131.809165$  (BKJD)



# DV Model-Shift Uniqueness Test

009536515-01, P = 0.748728 Days, E = 131.066331 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
7.47	3.42	2.39	1.11	4.52	1.55	2.81	5.08	6.36	1.04	2.32	0.43	0.94	0.45	0.60

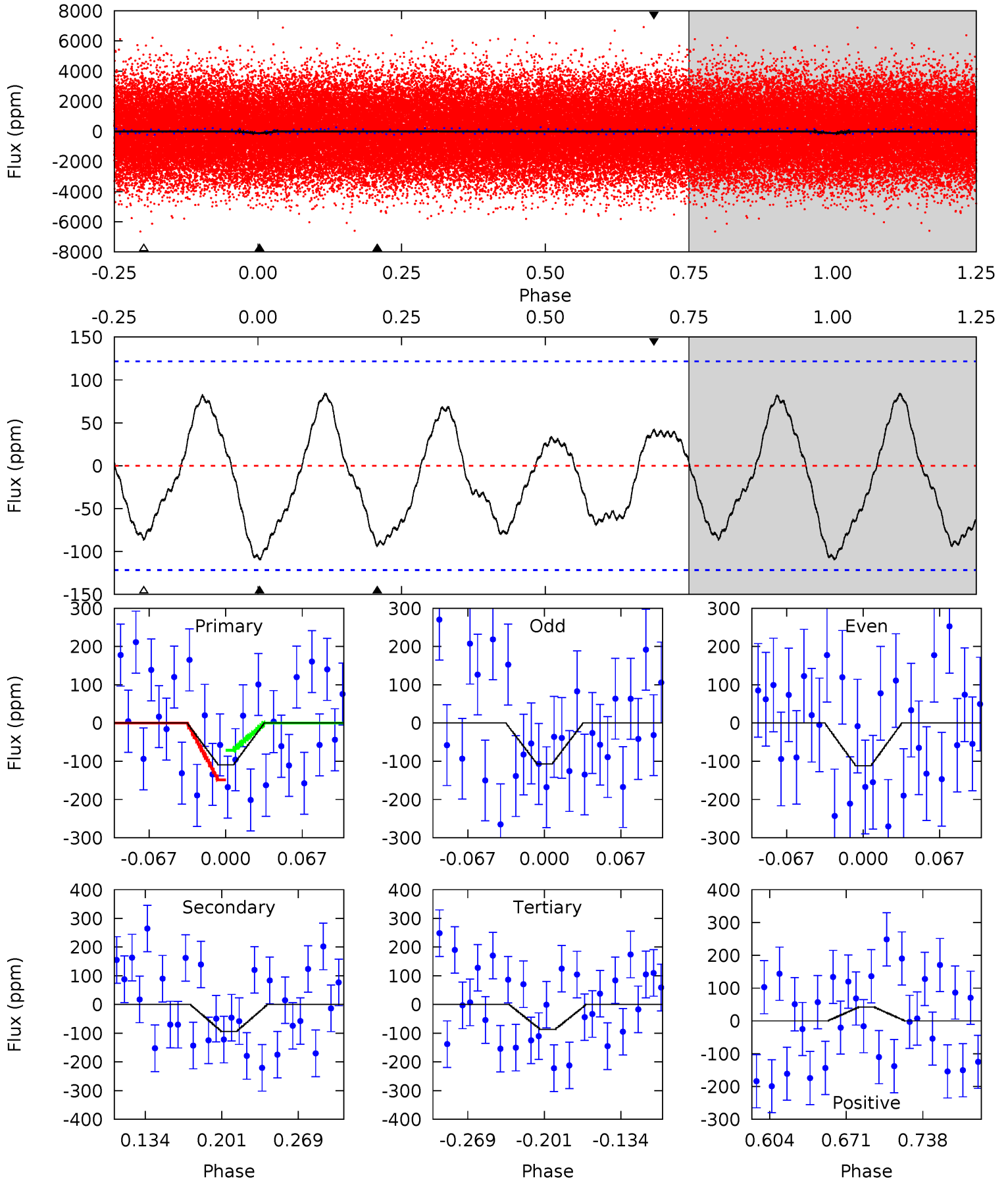




# Alt Model-Shift Uniqueness Test

009536515-01, P = 0.748726 Days, E = 131.060439 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
4.18	3.59	3.30	1.61	4.65	1.83	1.80	0.88	2.57	0.29	1.97	0.09	1.22	0.43	1.48





### Stellar Parameters For KIC 009536515

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$\rho_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$8094^{+224}_{-365}$	$3.905^{+0.266}_{-0.114}$	$0.070^{+0.250}_{-0.450}$	$2.656^{+0.516}_{-0.958}$	$2.067^{+0.319}_{-0.518}$	$0.155^{+0.282}_{-0.055}$
	+3%/-5%	+7%/-3%	+357%/-643%	+19%/-36%	+15%/-25%	+181%/-35%
Source	KIC0	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 009536515-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-30 \pm 9$	$2.81^{+1.13}_{-1.00}$	$5563^{+365}_{-516}$	$5216^{+1672}_{-1249}$	$0.877^{+1.283}_{-0.454}$
Alt.	$-94 \pm 26$	$3.04^{+1.23}_{-1.03}$	$5568^{+377}_{-491}$	$7125^{+2271}_{-1331}$	$2.357^{+3.098}_{-1.211}$

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

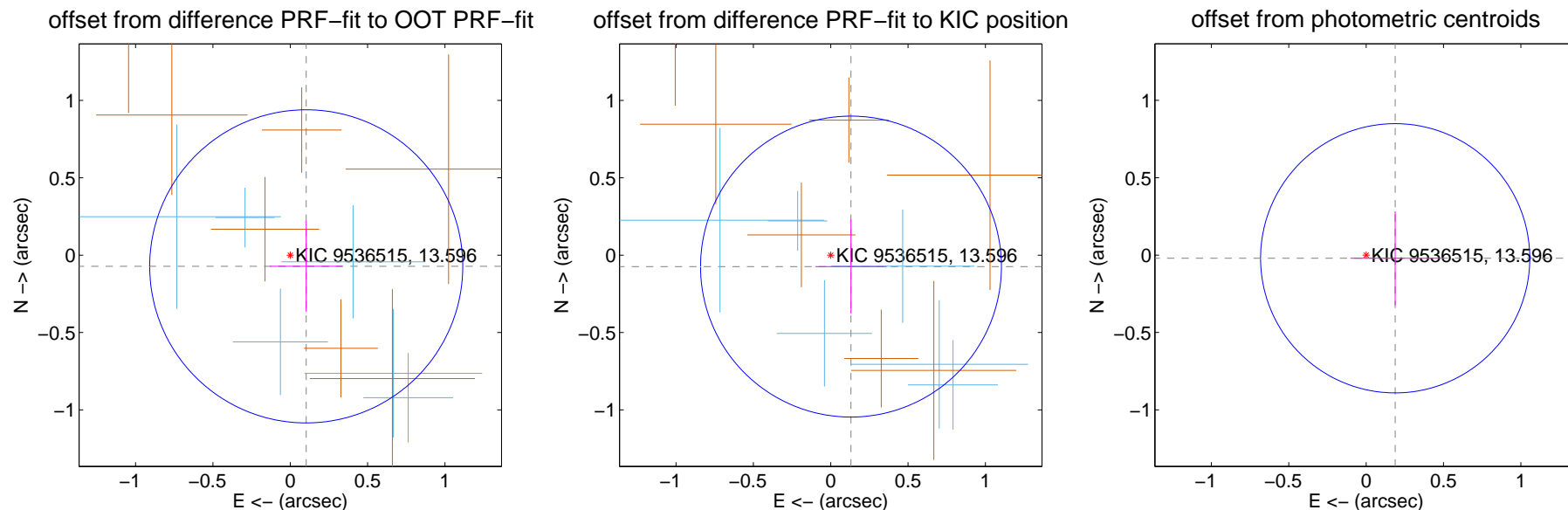
## DV Centroid Data

Supplemental centroid analysis for 009536515-01. Kepler magnitude: 13.60. Transit SNR 12.39

There are 7 quarters with good PRF difference image offsets

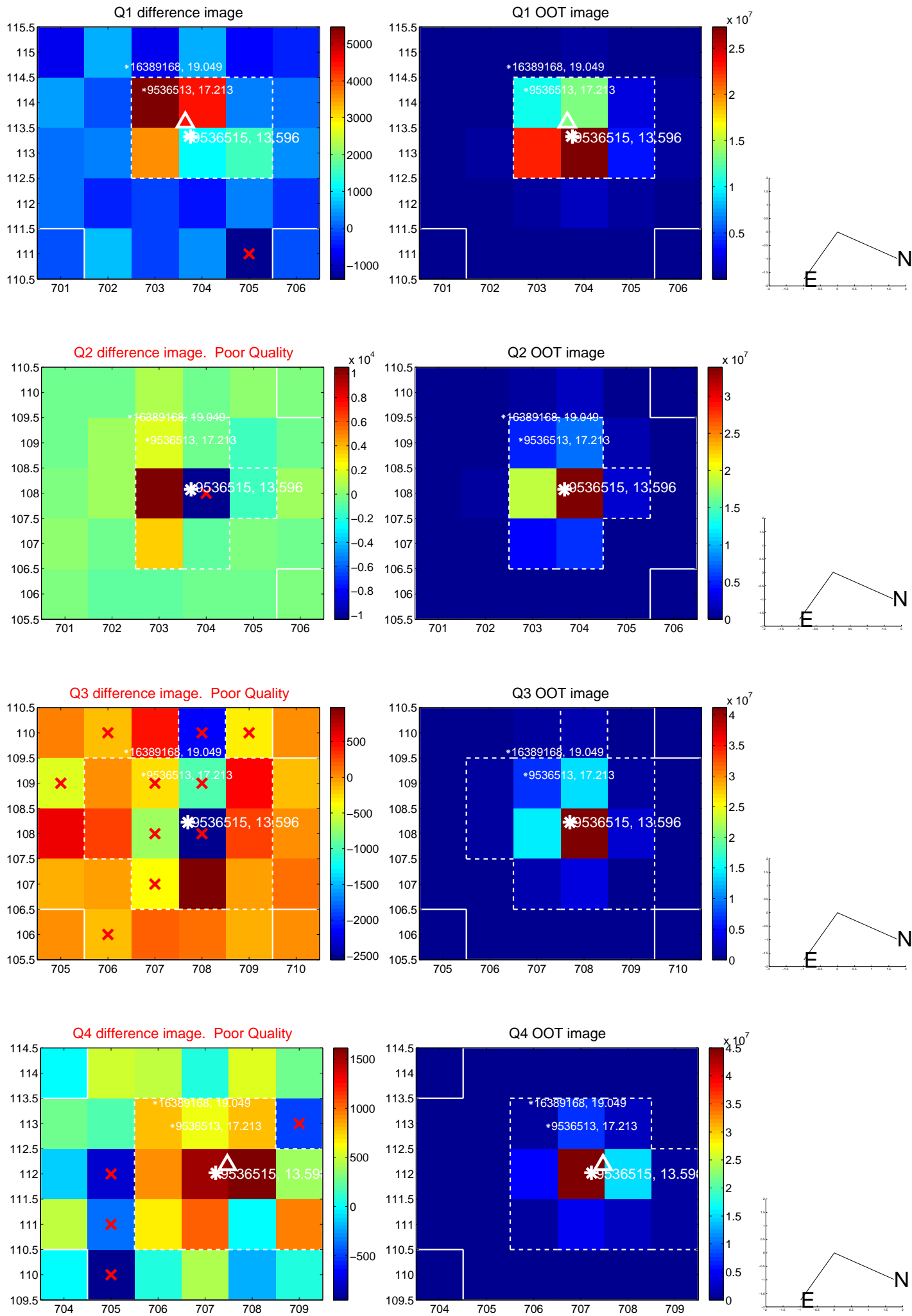
The direct PRF centroid is offset from the target star catalog position by about 0.06 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.126 \pm 0.337$	0.37	$-0.103 \pm 0.234$	$-0.072 \pm 0.294$
PRF-fit source offset from KIC position	$0.150 \pm 0.324$	0.46	$-0.131 \pm 0.229$	$-0.074 \pm 0.304$
photometric centroid source offset	$0.19 \pm 0.29$	0.65	$-0.19 \pm 0.29$	$-0.02 \pm 0.30$

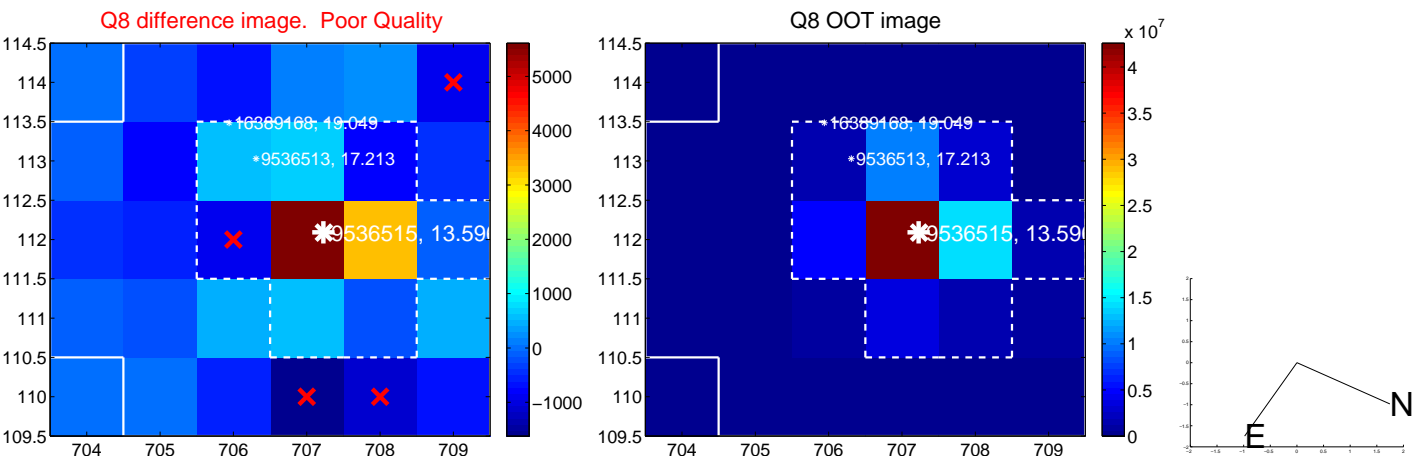
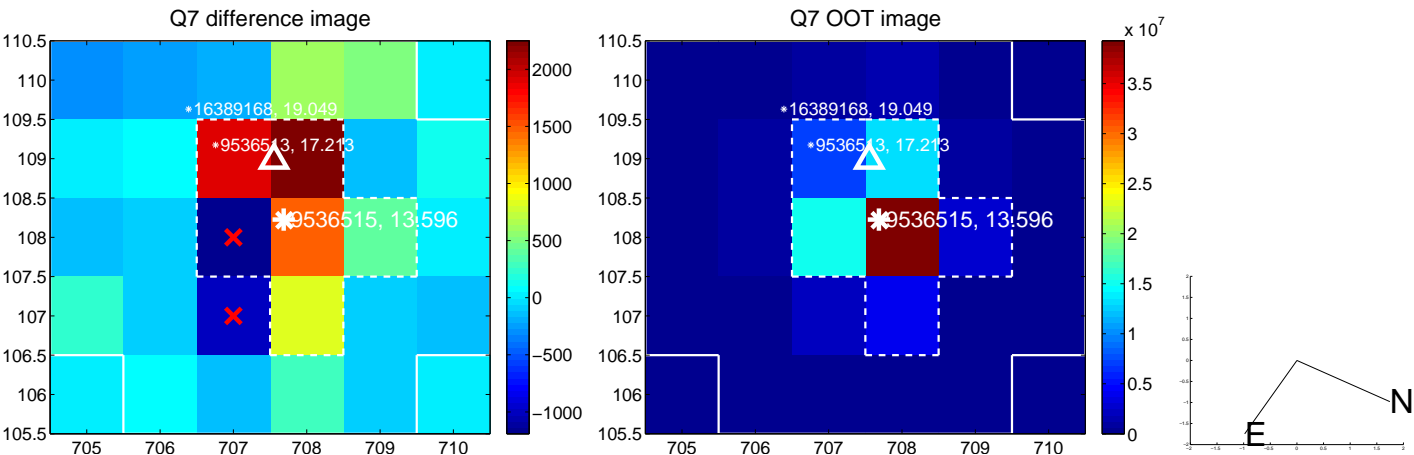
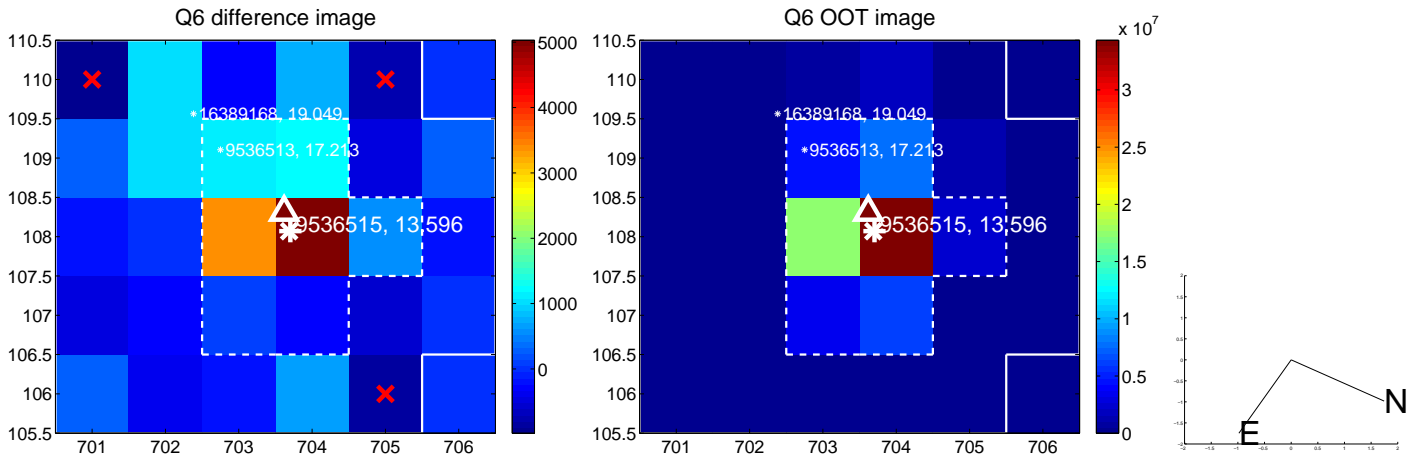
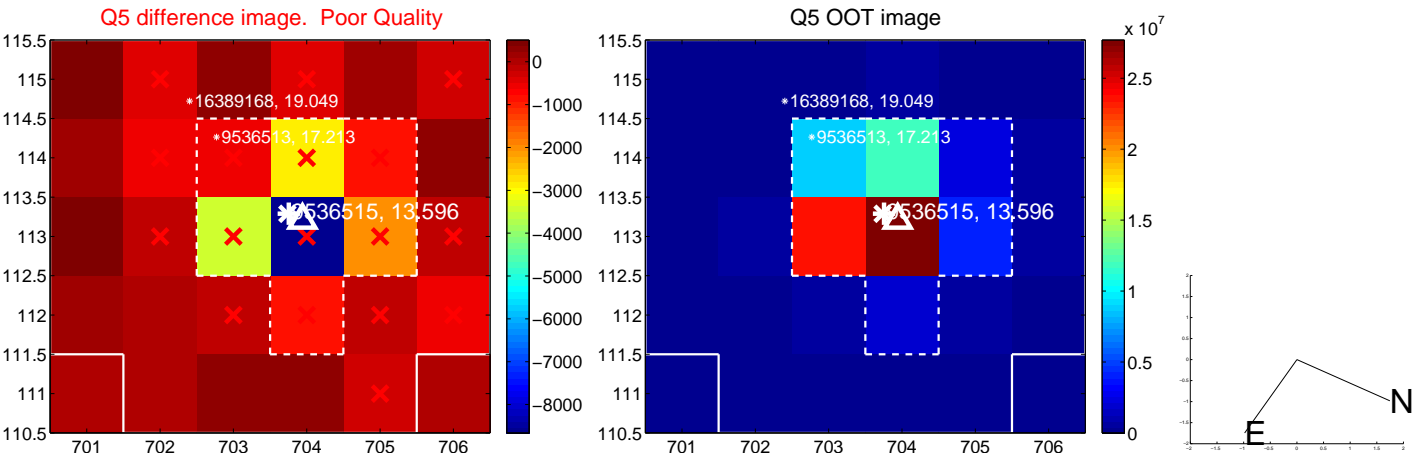


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

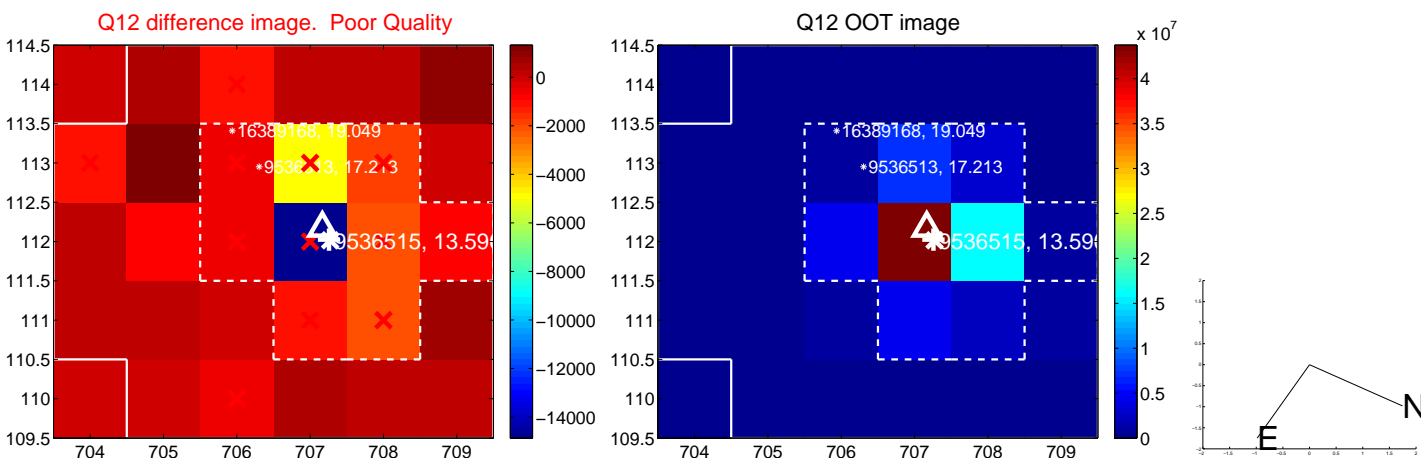
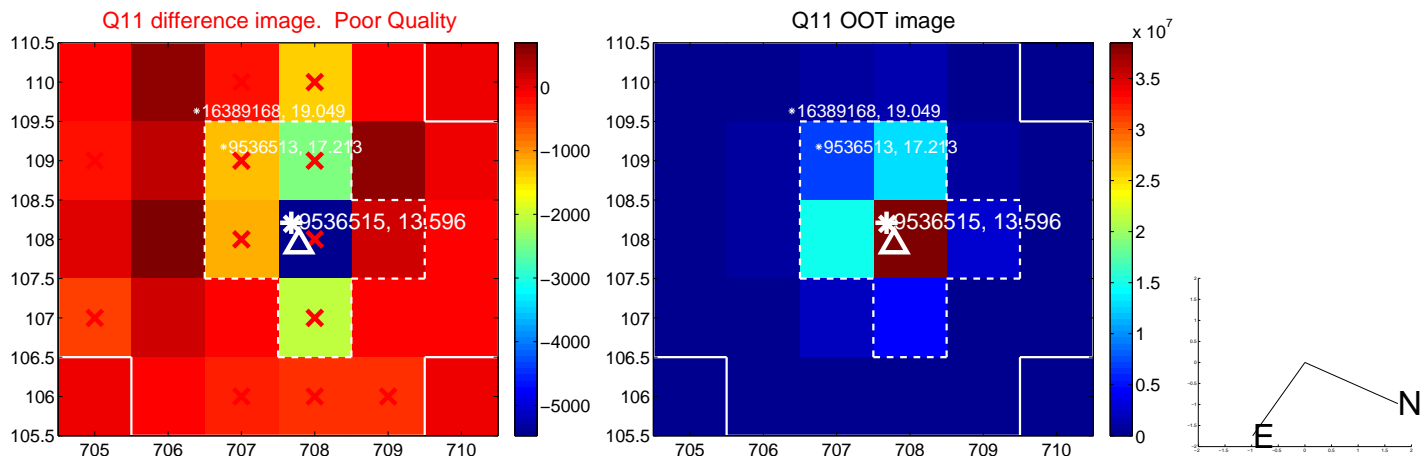
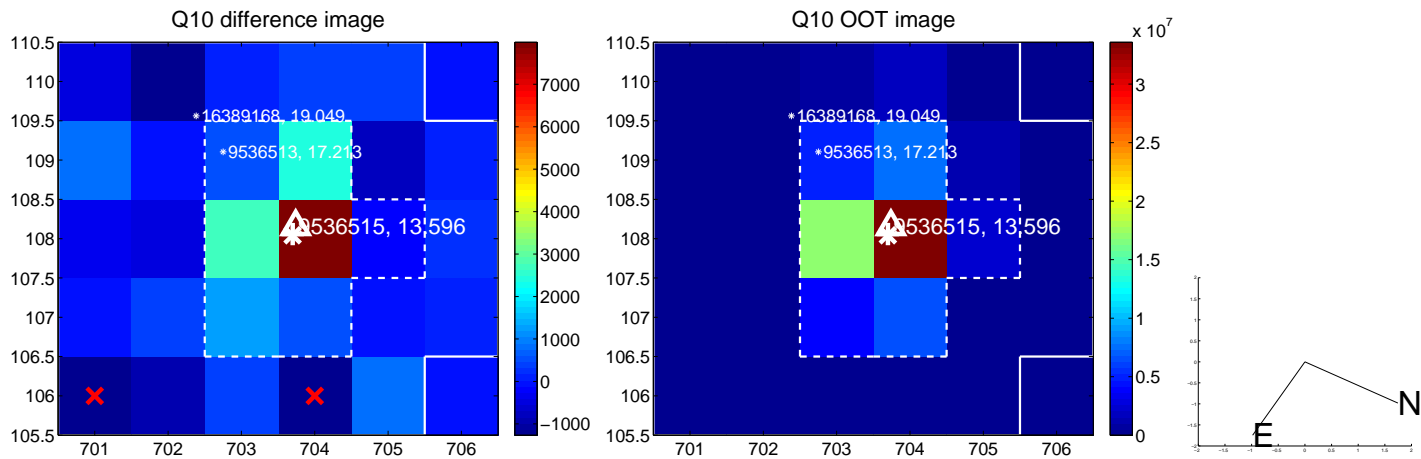
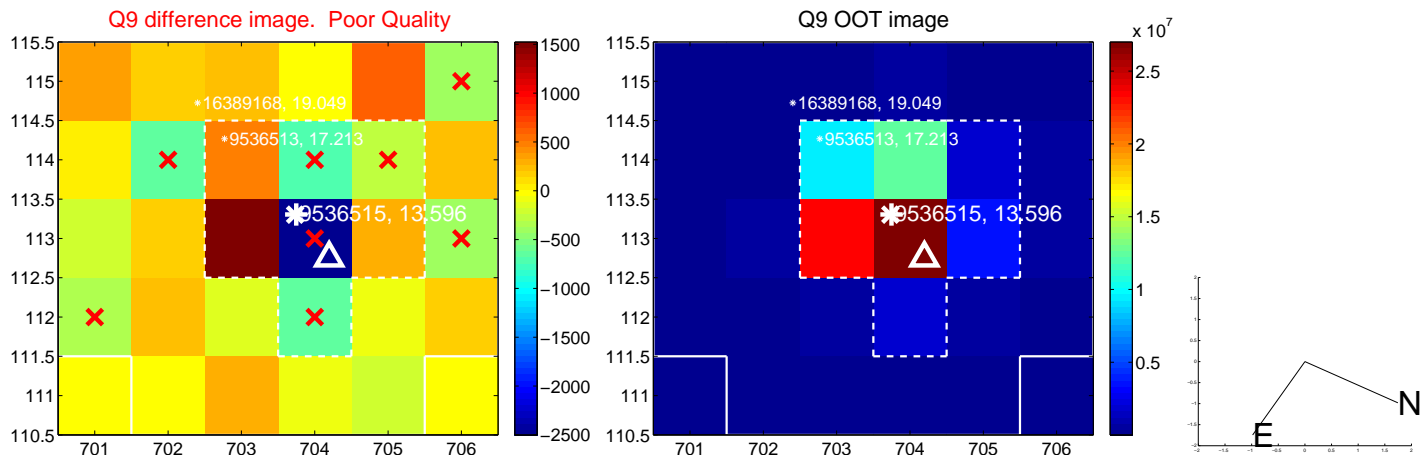


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

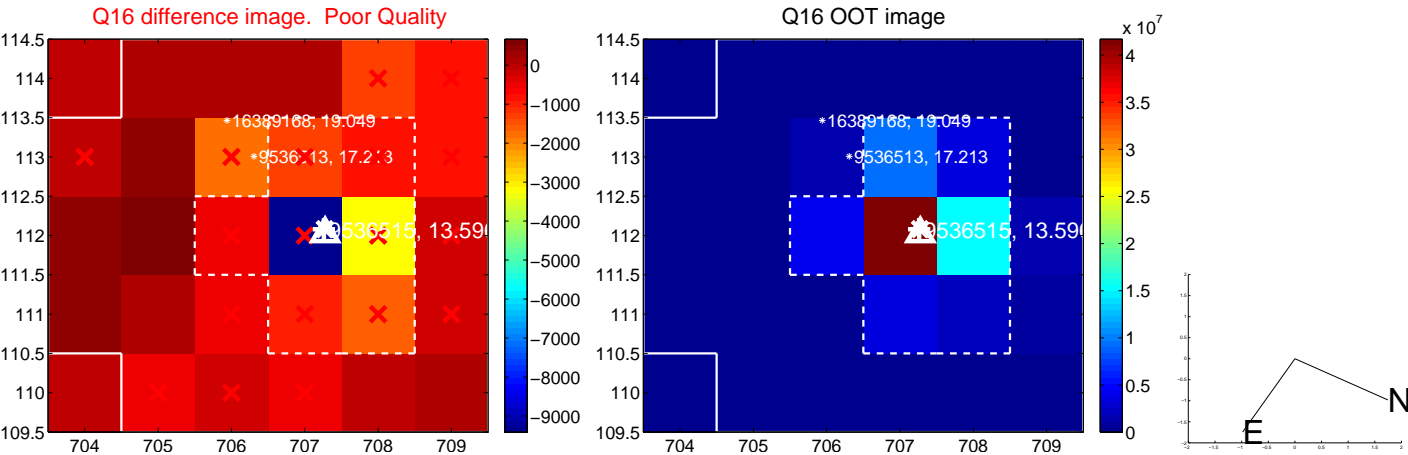
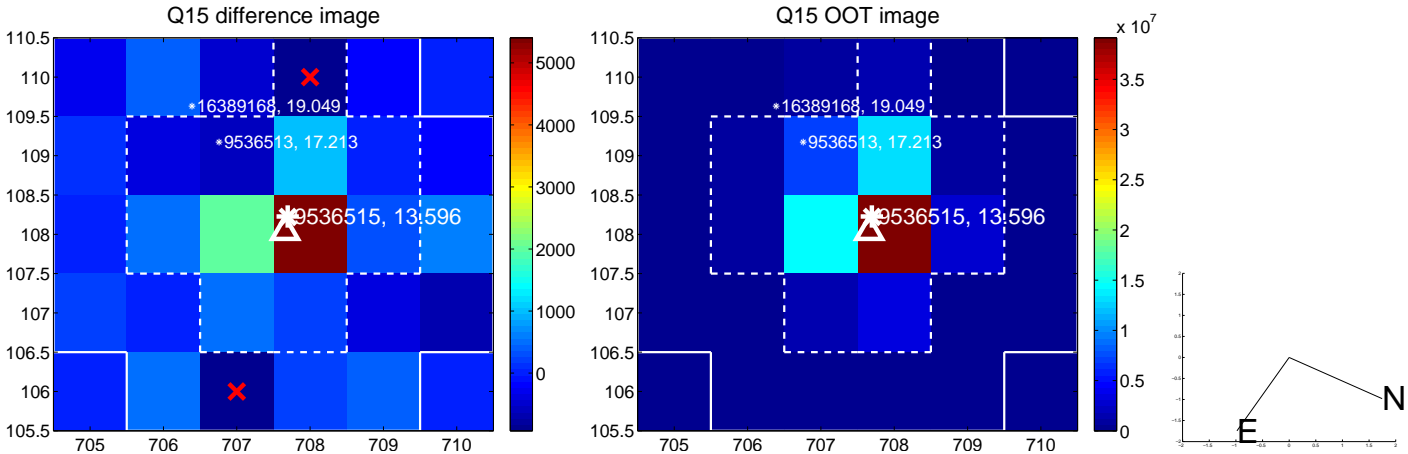
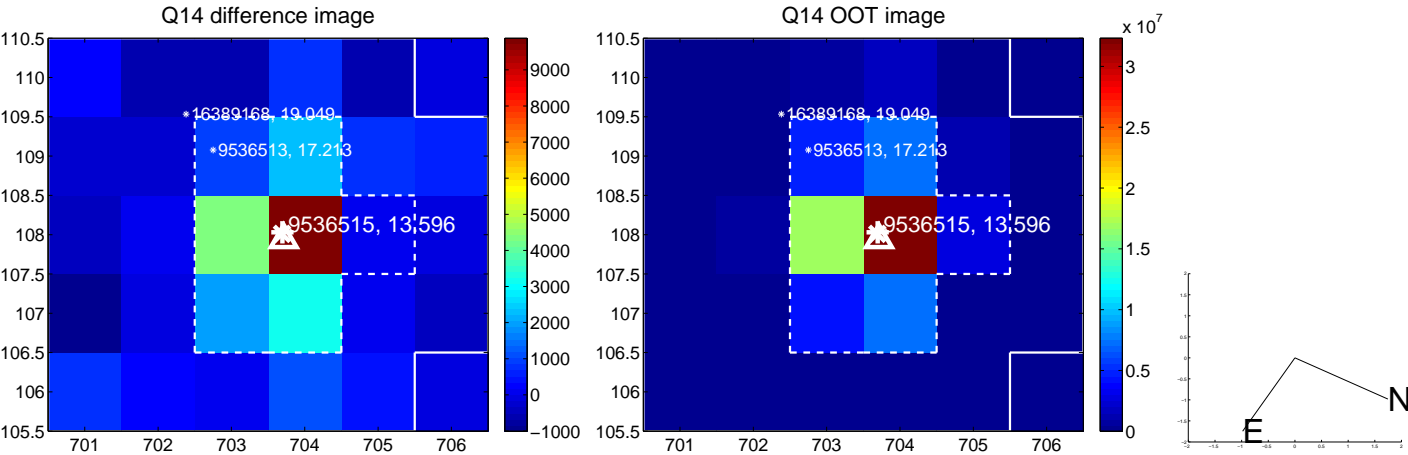
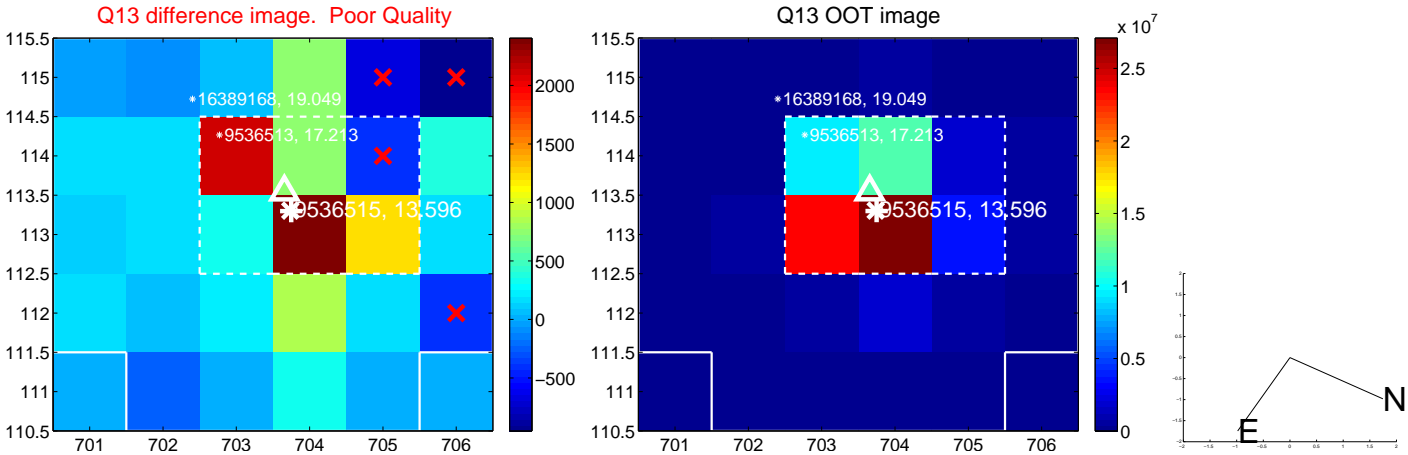




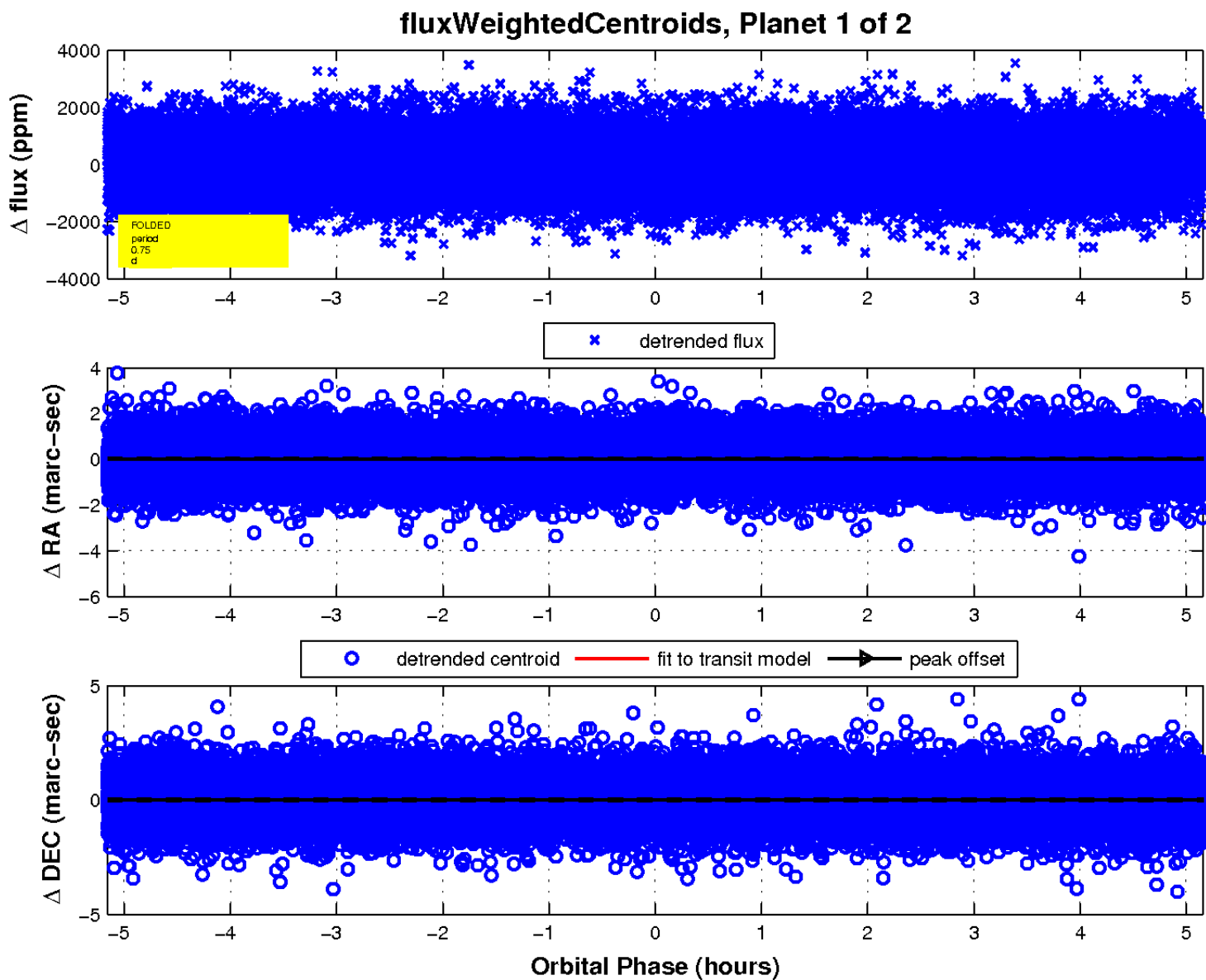
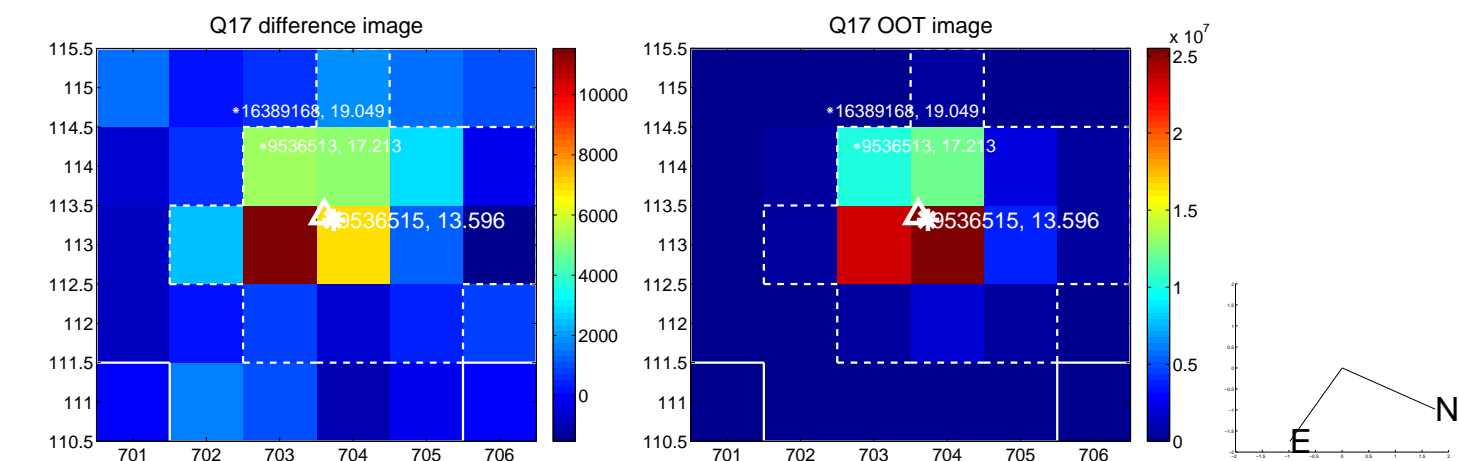
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

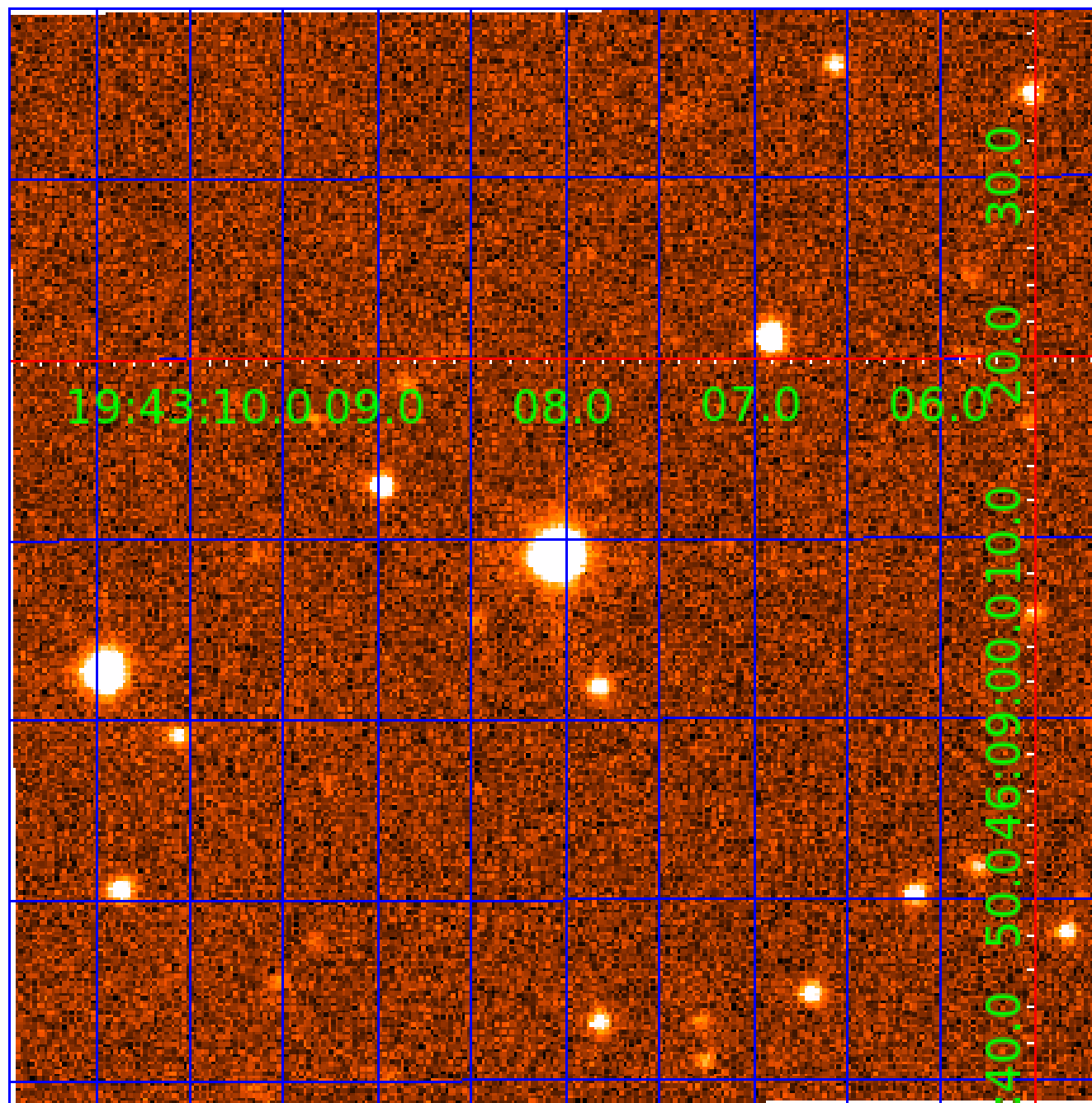


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 009536515

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009536515-01	OBS	No	0.748728	131.815059	105.8	1.720	10.5	12.4	2.66	8094	2.98	64160.43
009536515-02	OBS	No	1.251740	131.643637	137.5	15.021	7.5	16.2	2.66	8094	4.11	32335.55

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009536515-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
009536515-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE_ZUMA—LPP_DV—CENT_FEW_DIFFS

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

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

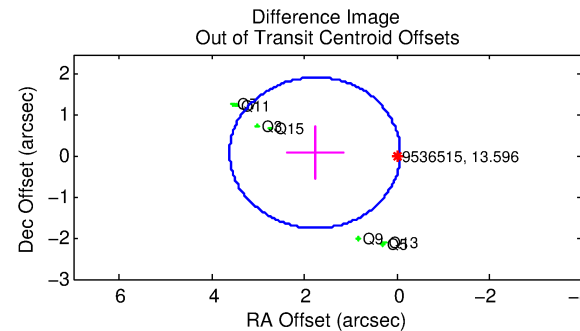
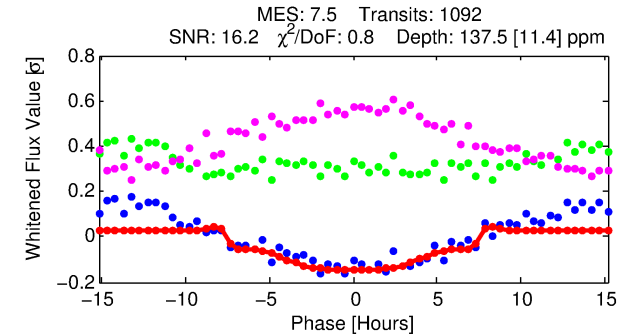
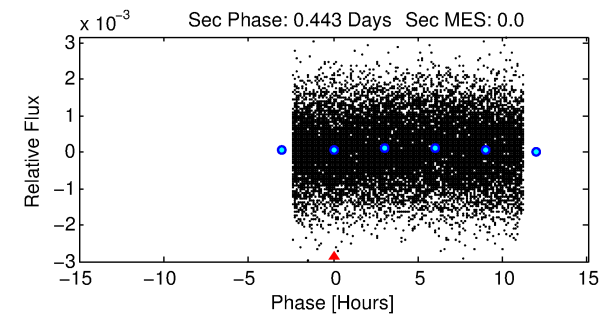
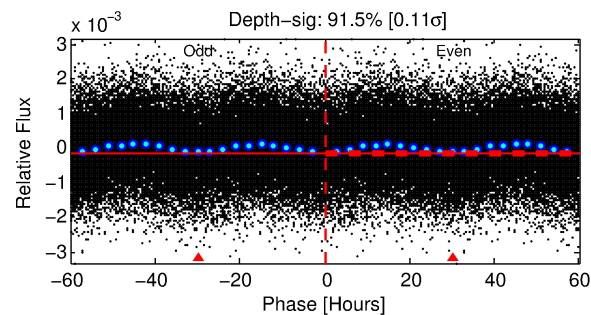
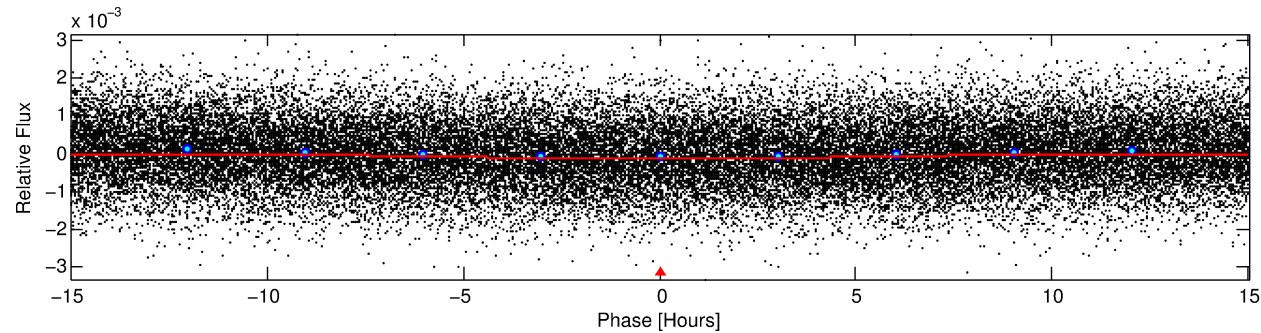
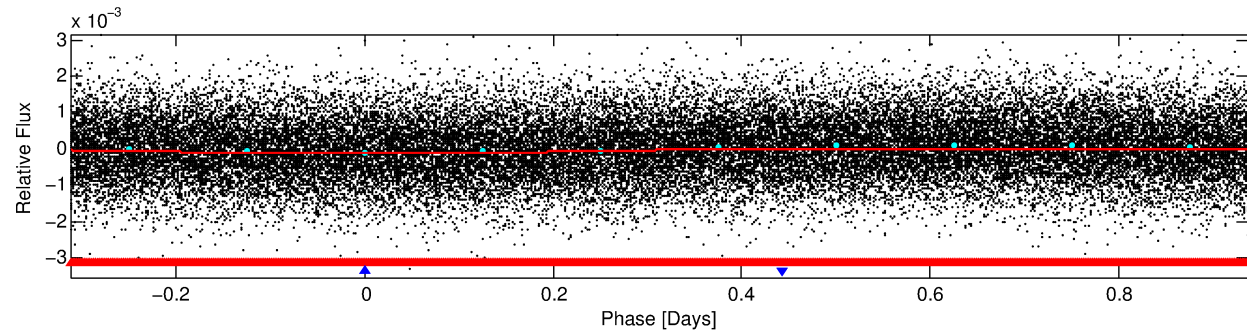
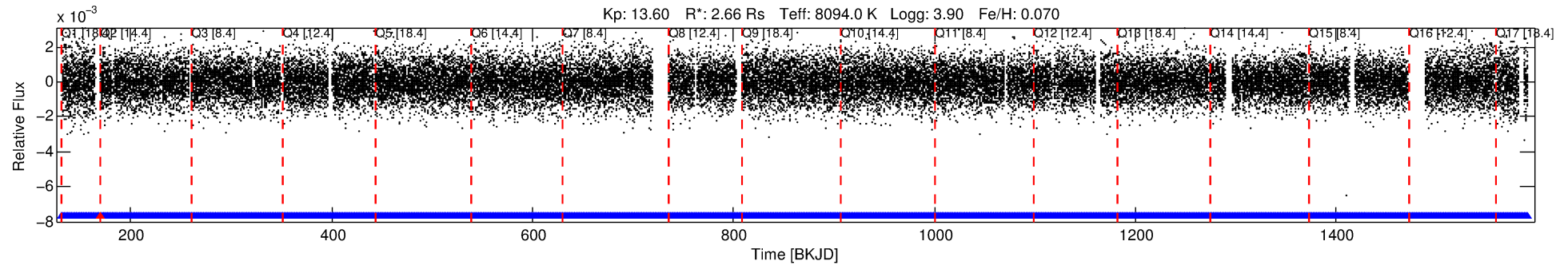
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009536515-02

No Significant Match Found

# DV One-Page Summary

KIC: 9536515 Candidate: 2 of 2 Period: 1.252 d



## DV Fit Results:

Period = 1.25174 [0.00002] d  
Epoch = 131.6436 [0.0072] BKJD  
Rp/R\* = 0.0142 [0.0007]  
a/R\* = 1.00 [0.00]  
b = 0.98 [0.00]  
Seff = 32335.55 [16395.38]  
Teq = 3419 [433] K  
Rp = 4.11 [1.50] Re  
a = 0.0290 [0.0091] AU  
Ag = N/A  
Teffp = N/A

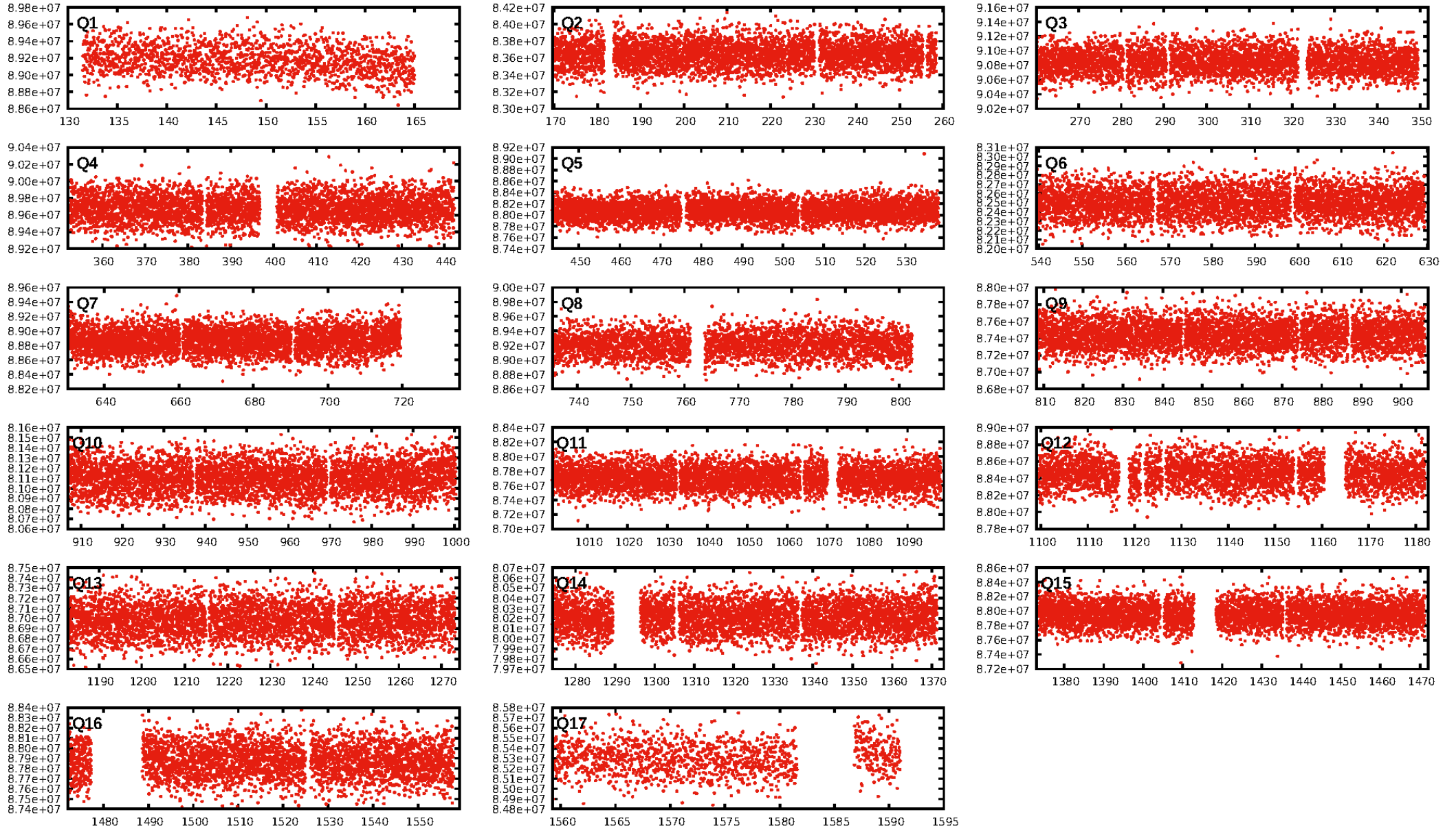
## DV Diagnostic Results:

ShortPeriod-sig: 57.5% [0.80 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [1042/1043]  
GhostDiagnostic-chr: 2.024  
Centroid-sig: 0.0%  
Centroid-so: 0.413 arcsec [3.52 $\sigma$ ]  
OotOffset-rm: 1.772 arcsec [2.88 $\sigma$ ]  
KicOffset-rm: 1.750 arcsec [2.83 $\sigma$ ]  
OotOffset-st: 0/4/0/3 [7]  
KicOffset-st: 0/4/0/3 [7]  
DiffImageQuality-fgm: 0.00 [0/7]  
DiffImageOverlap-fno: 0.00 [0/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 03-Feb-2016 06:11:20 Z

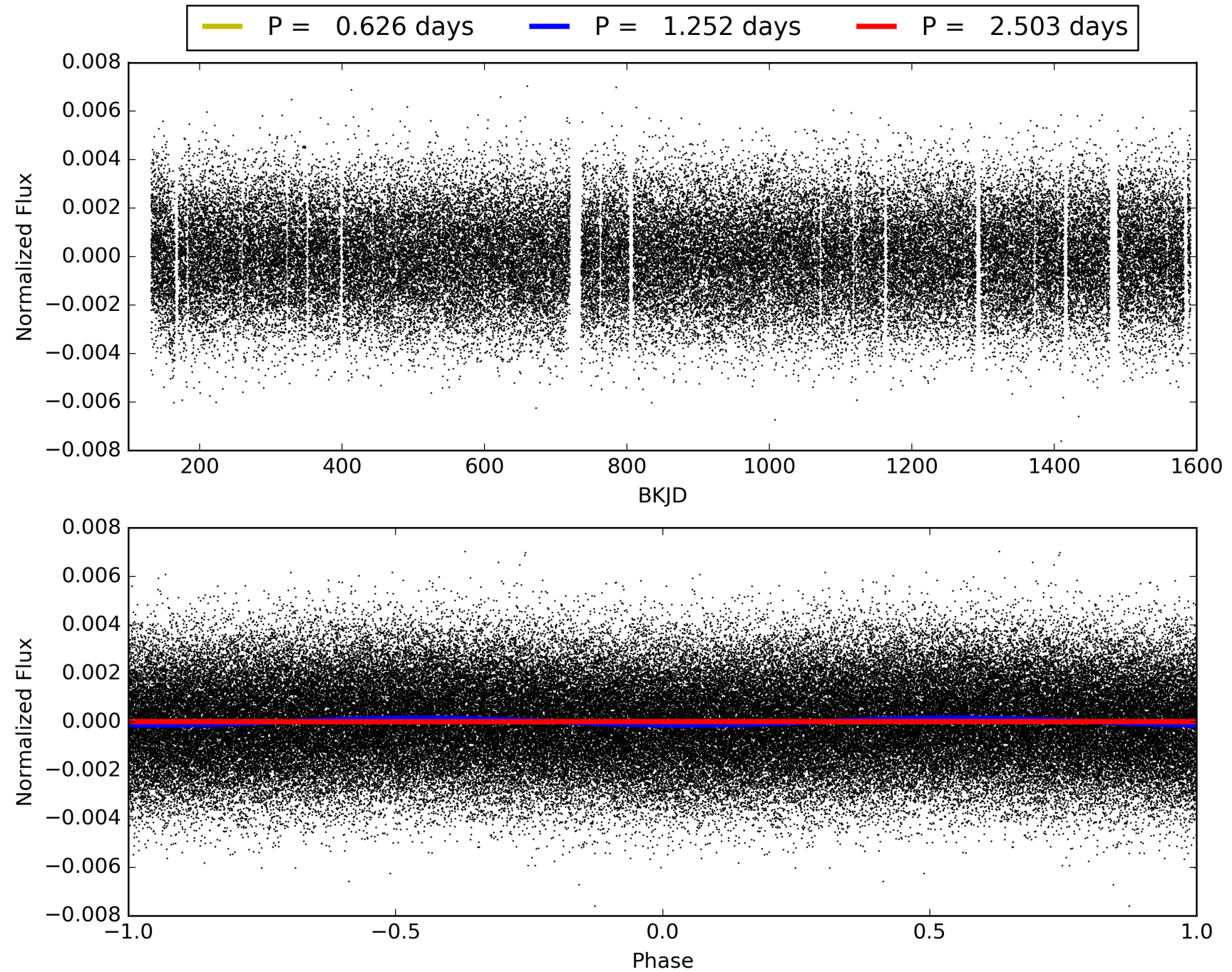
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 009536515-02, PDC Light Curves





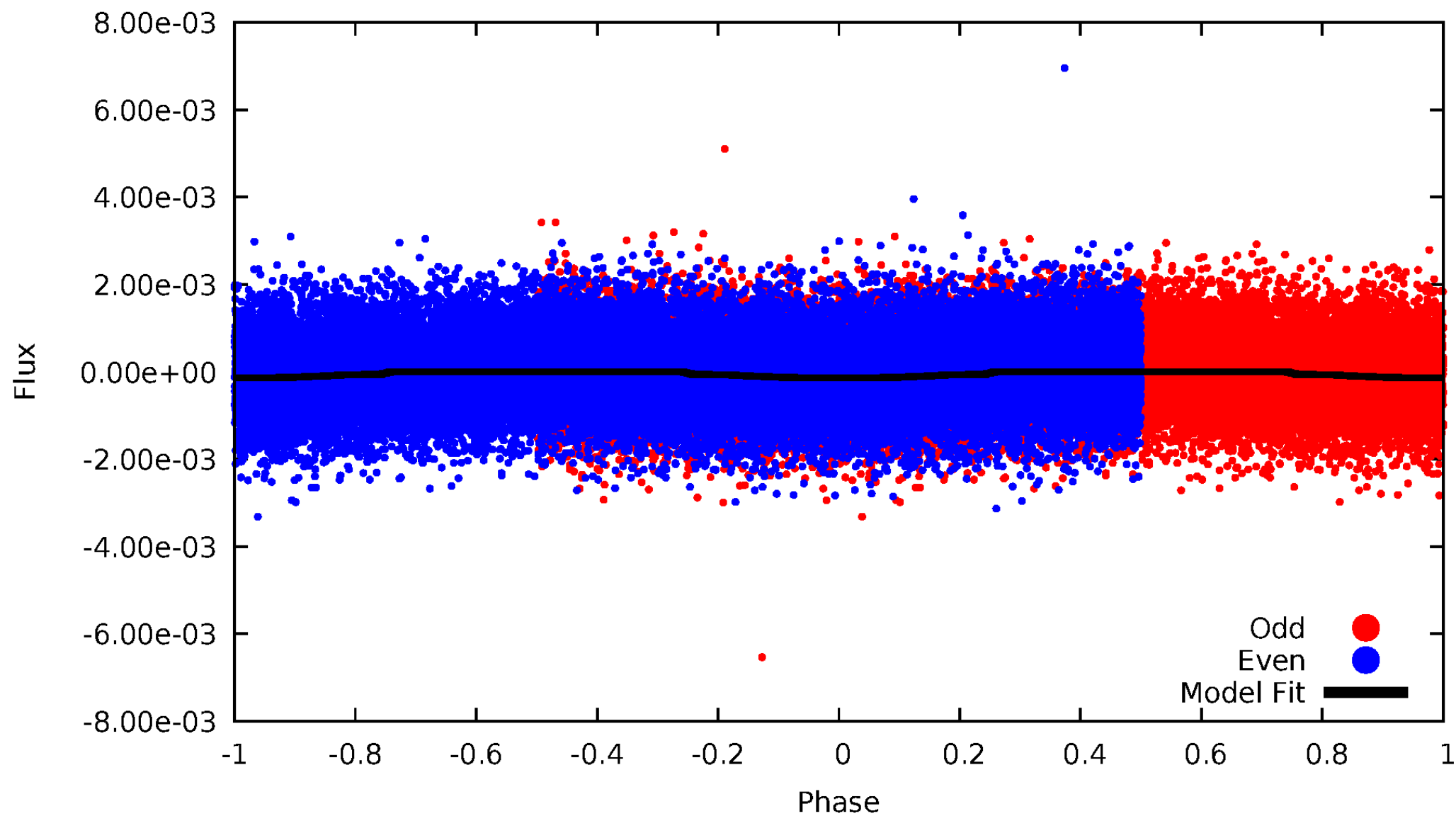
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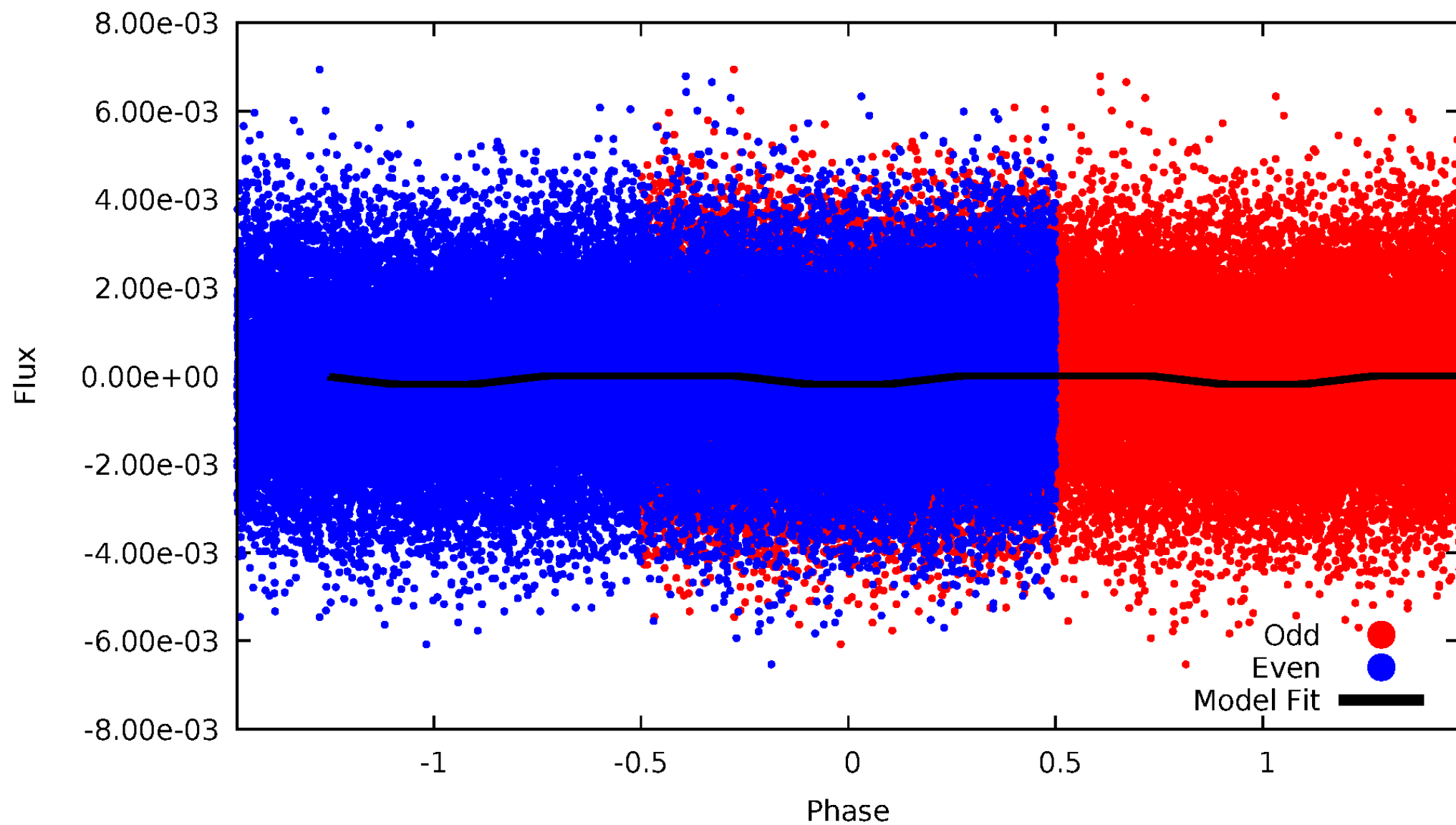
# DV Odd/Even

TCE 009536515-02



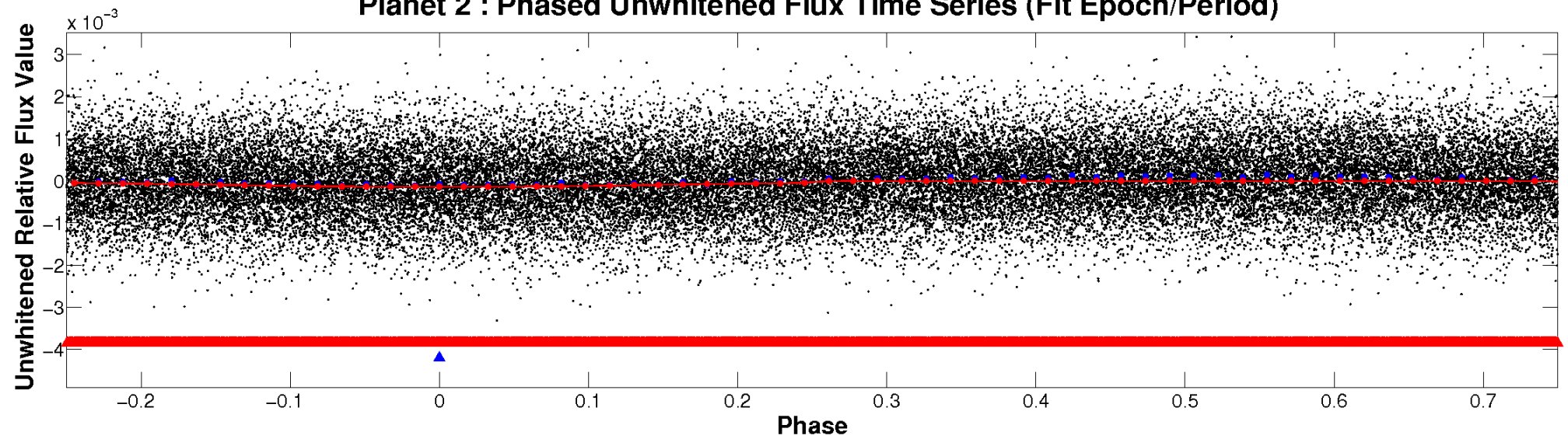
# ALT Odd/Even

TCE 009536515-02

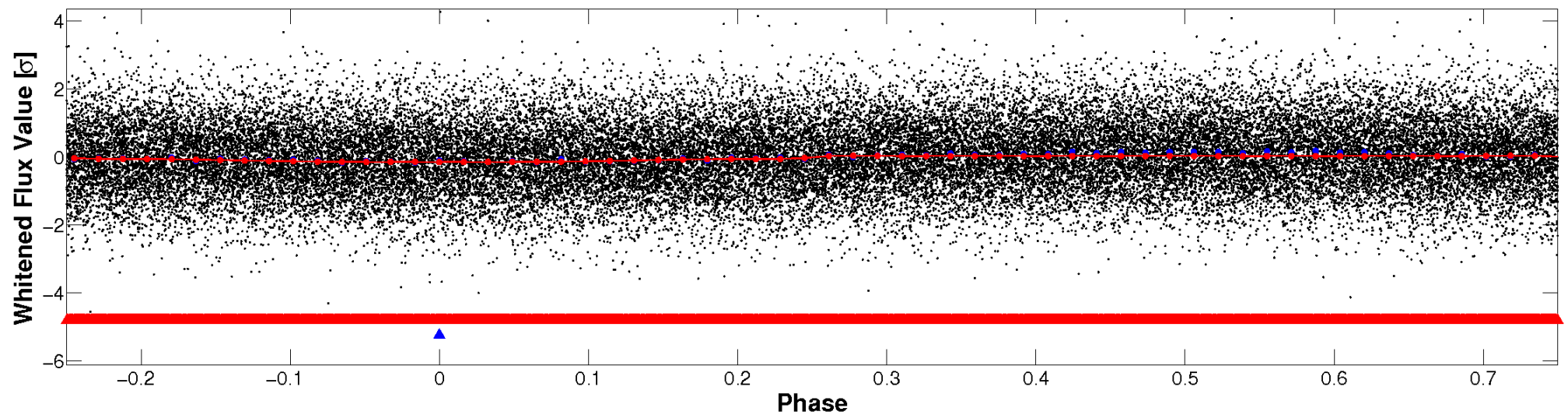


# Non-Whitened Vs. Whitened Light Curve

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

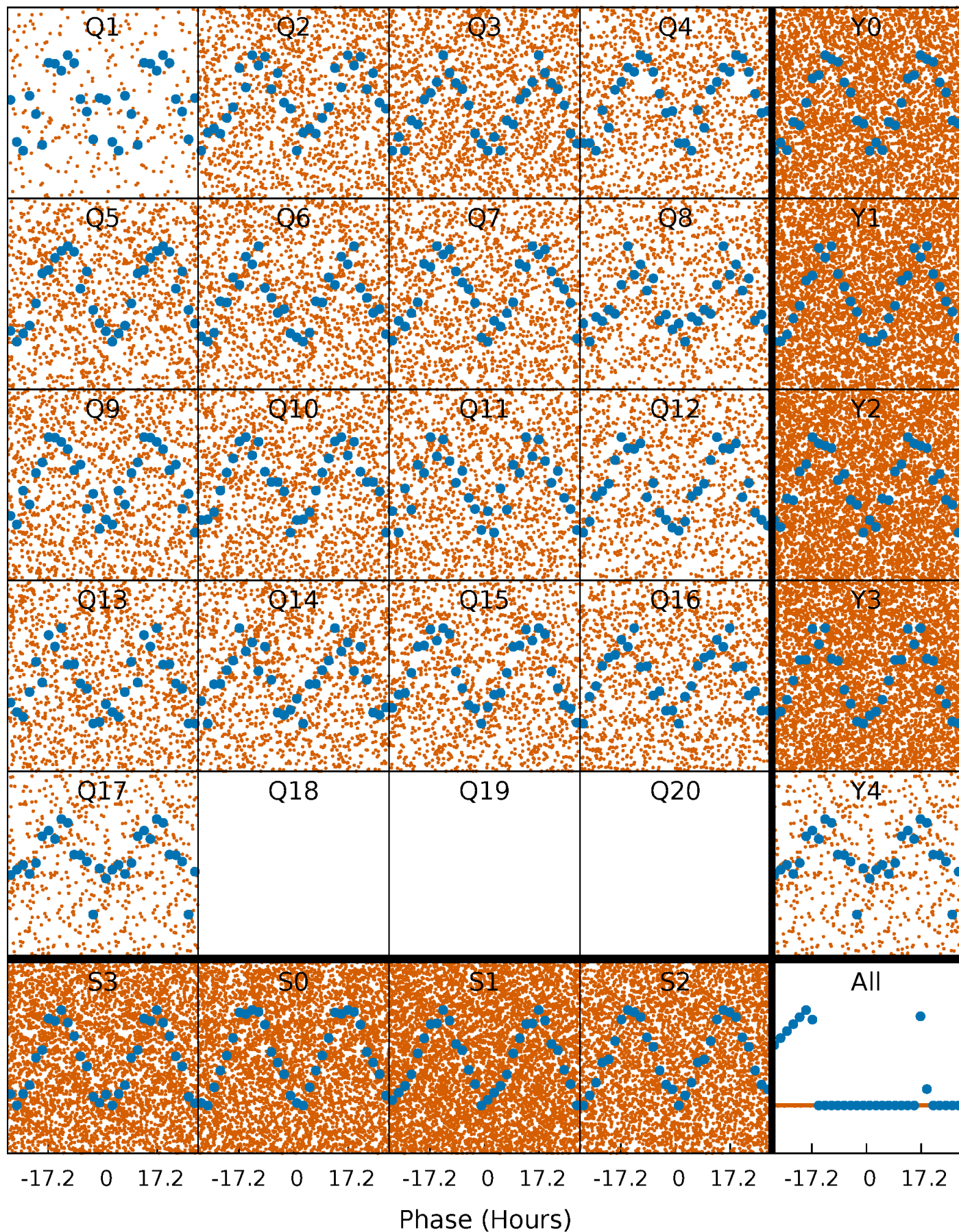


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

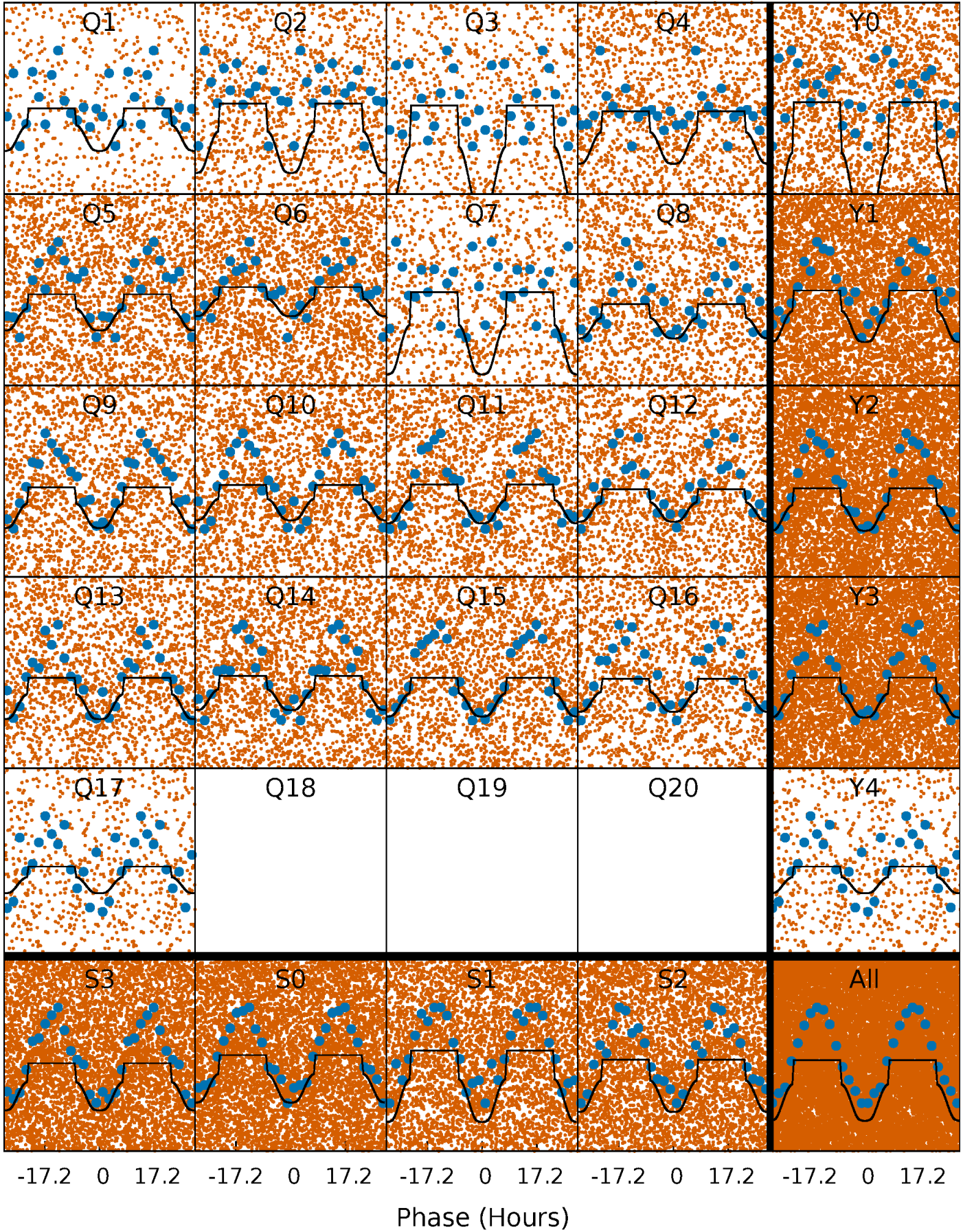
TCE 009536515-02 P= 1.251740 Days  $T_0=131.643637$  (BKJD)





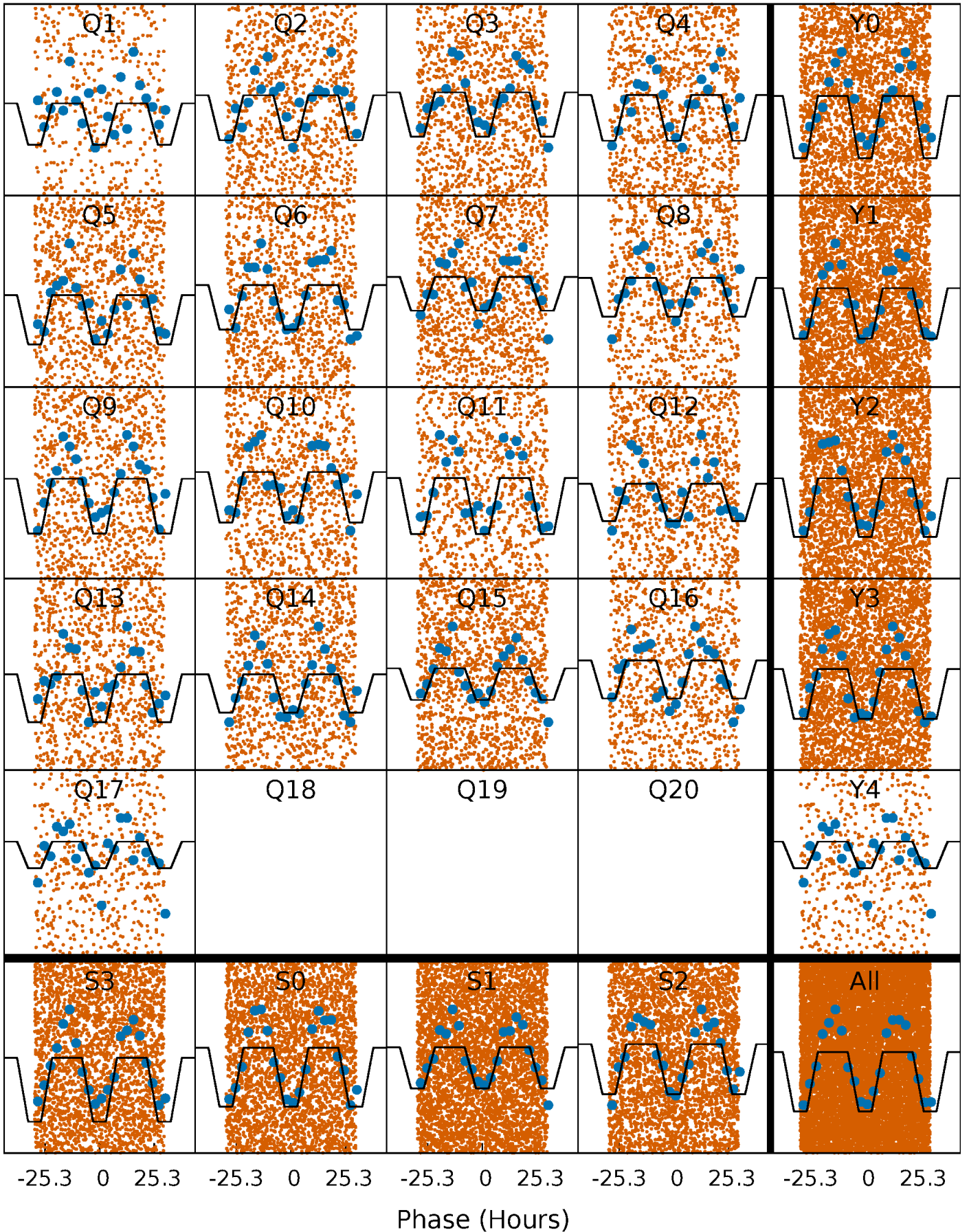
# DV Quarter-Phased Transit Curves

TCE 009536515-02 P= 1.251740 Days  $T_0=131.643637$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 009536515-02   P= 1.251769 Days    $T_0=131.659328$  (BKJD)

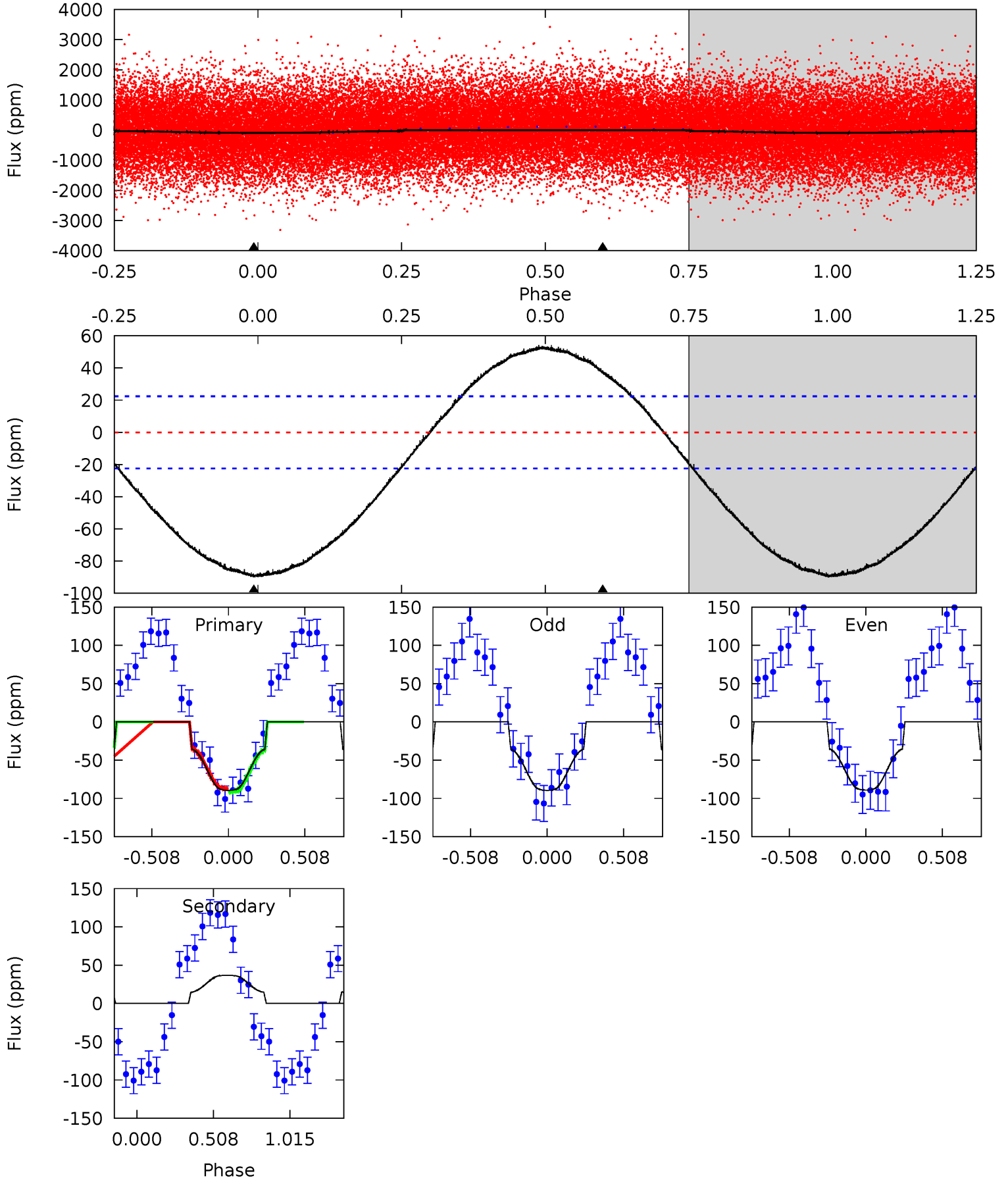




# DV Model-Shift Uniqueness Test

009536515-02, P = 1.251740 Days, E = 130.391897 Days

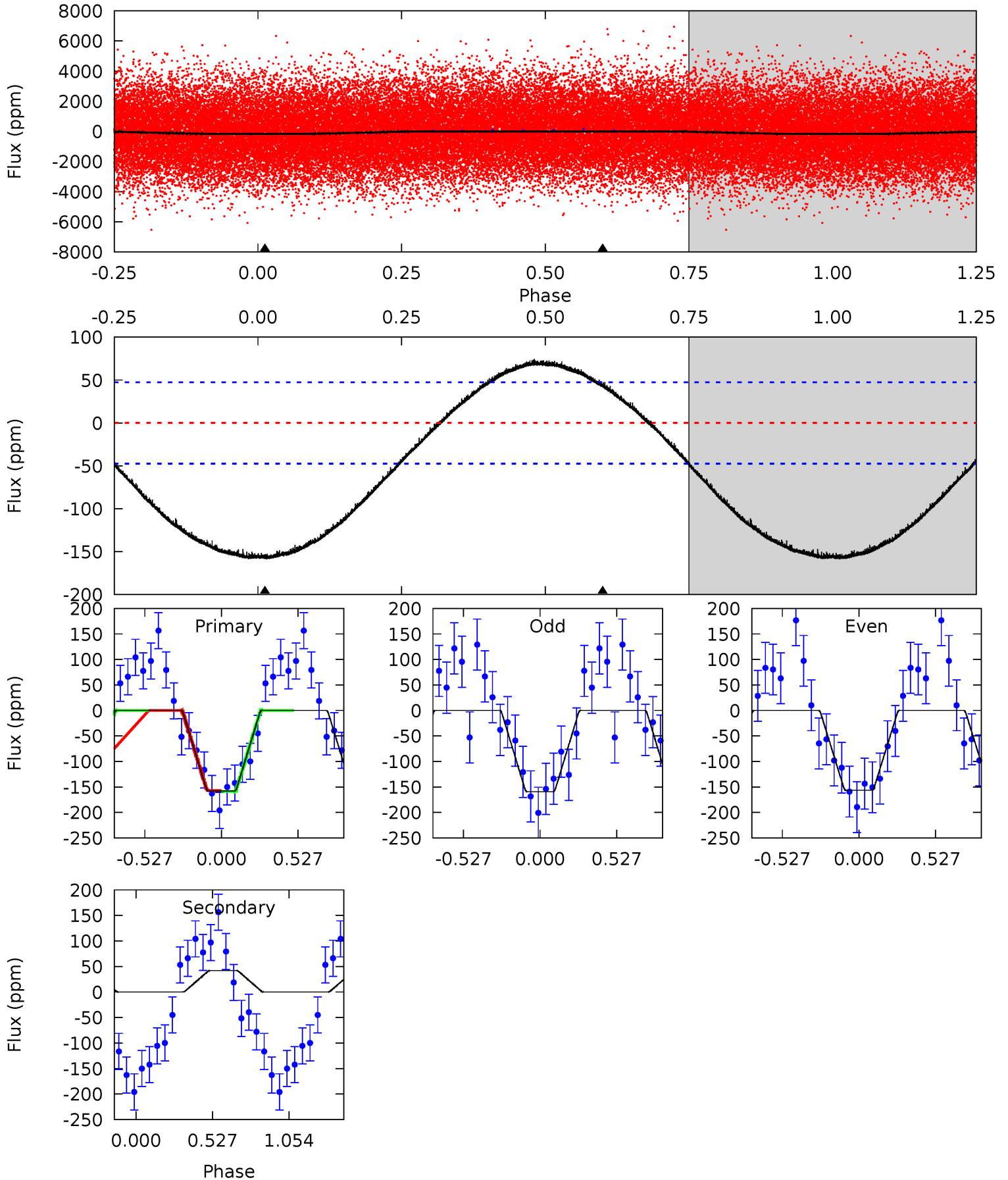
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
16.8	-6.91	0	0	4.21	0.66	2.40	16.8	16.8	-6.91	-6.91	0.04	0.94	0.38	0.43



# Alt Model-Shift Uniqueness Test

009536515-02, P = 1.251769 Days, E = 130.407559 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
14.0	-3.73	0	0	4.20	0.63	1.66	14.0	14.0	-3.73	-3.73	0.13	0.83	0.32	0.07



### Stellar Parameters For KIC 009536515

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$8094^{+224}_{-365}$	$3.905^{+0.266}_{-0.114}$	$0.070^{+0.250}_{-0.450}$	$2.656^{+0.516}_{-0.958}$	$2.067^{+0.319}_{-0.518}$	$0.155^{+0.282}_{-0.055}$
	+3%/-5%	+7%/-3%	+357%/-643%	+19%/-36%	+15%/-25%	+181%/-35%
Source	KIC0	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 009536515-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$37 \pm 5$	$4.09^{+0.54}_{-0.77}$	$4698^{+323}_{-427}$	$-5470^{+231}_{-241}$	$-1.032^{+0.242}_{-0.496}$
Alt.	$42 \pm 11$	$3.90^{+0.54}_{-0.74}$	$4709^{+335}_{-405}$	$-5696^{+353}_{-366}$	$-1.295^{+0.428}_{-0.705}$

$T_{\text{max}}$  = 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

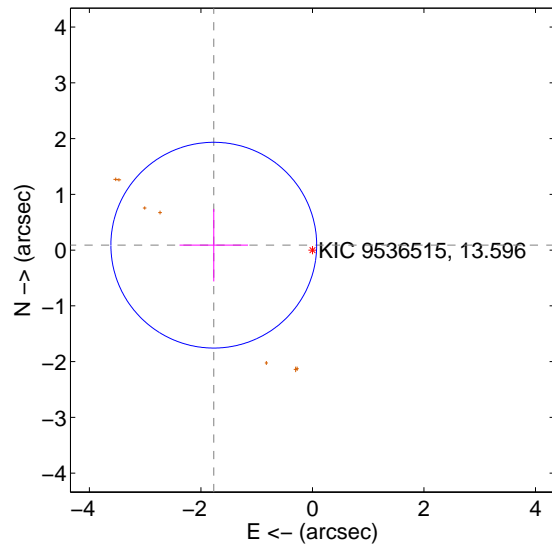
Supplemental centroid analysis for 009536515-02. Kepler magnitude: 13.60. Transit SNR 16.23

There are 0 quarters with good PRF difference image offsets

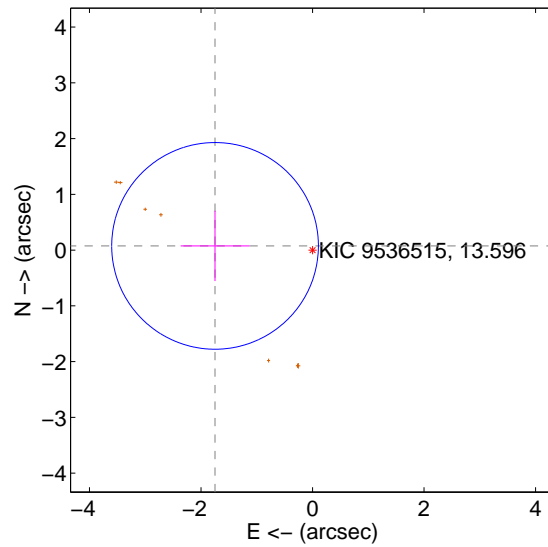
The direct PRF centroid is offset from the target star catalog position by about 0.04 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.772 \pm 0.615$	2.88	$1.770 \pm 0.615$	$0.088 \pm 0.650$
PRF-fit source offset from KIC position	$1.750 \pm 0.618$	2.83	$1.748 \pm 0.618$	$0.075 \pm 0.630$
photometric centroid source offset	$0.41 \pm 0.12$	3.52	$-0.34 \pm 0.11$	$0.24 \pm 0.12$

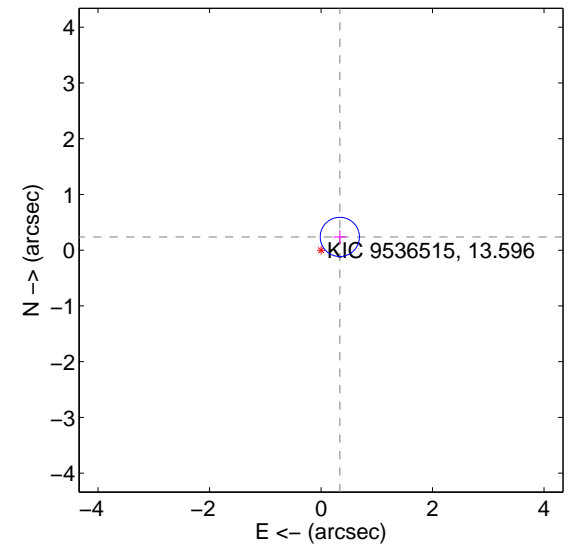
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position



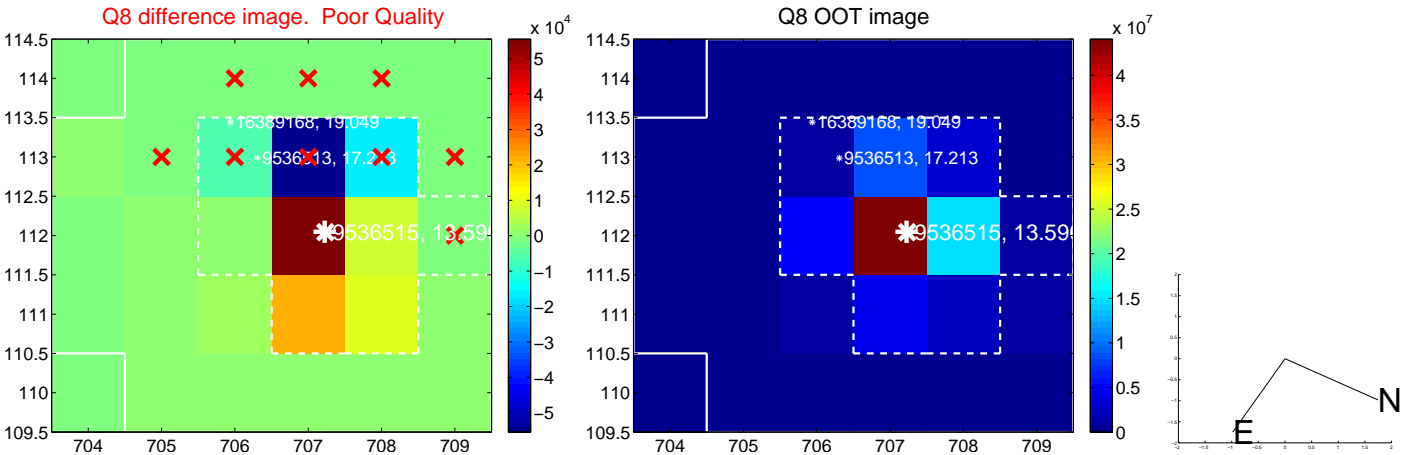
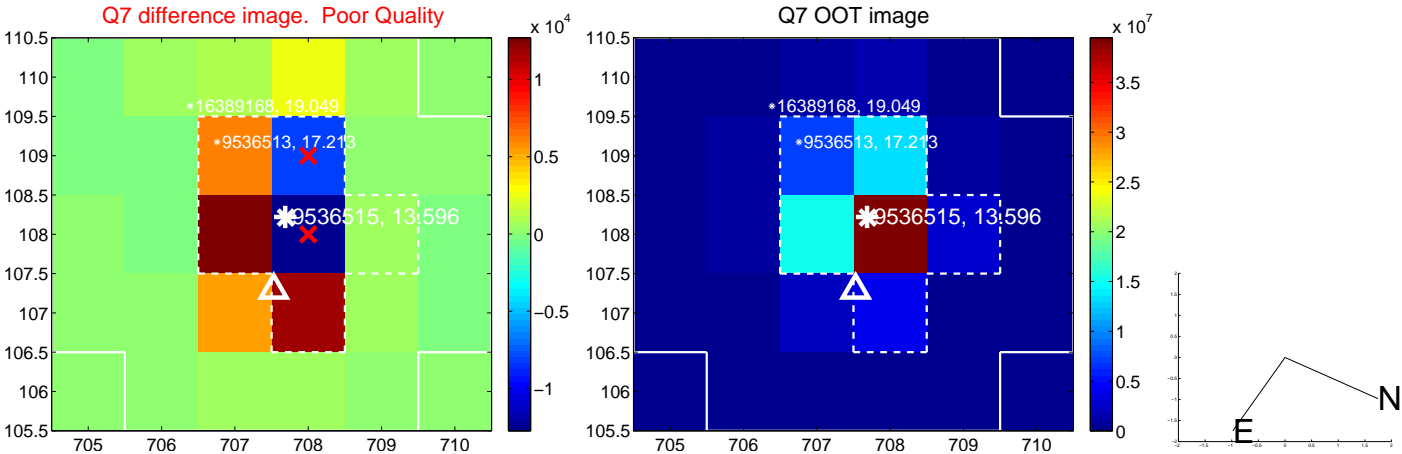
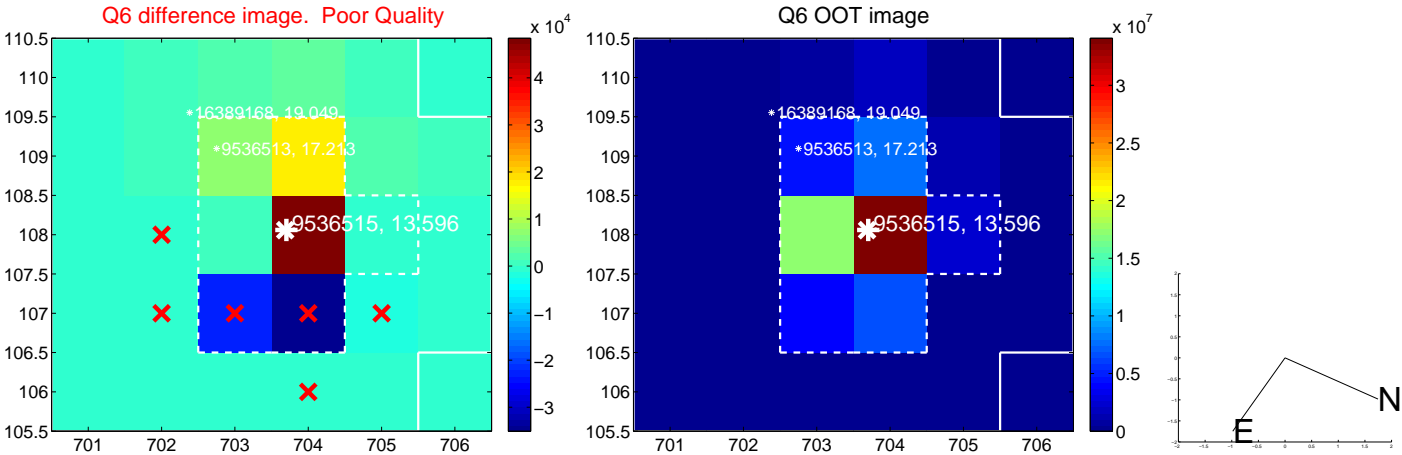
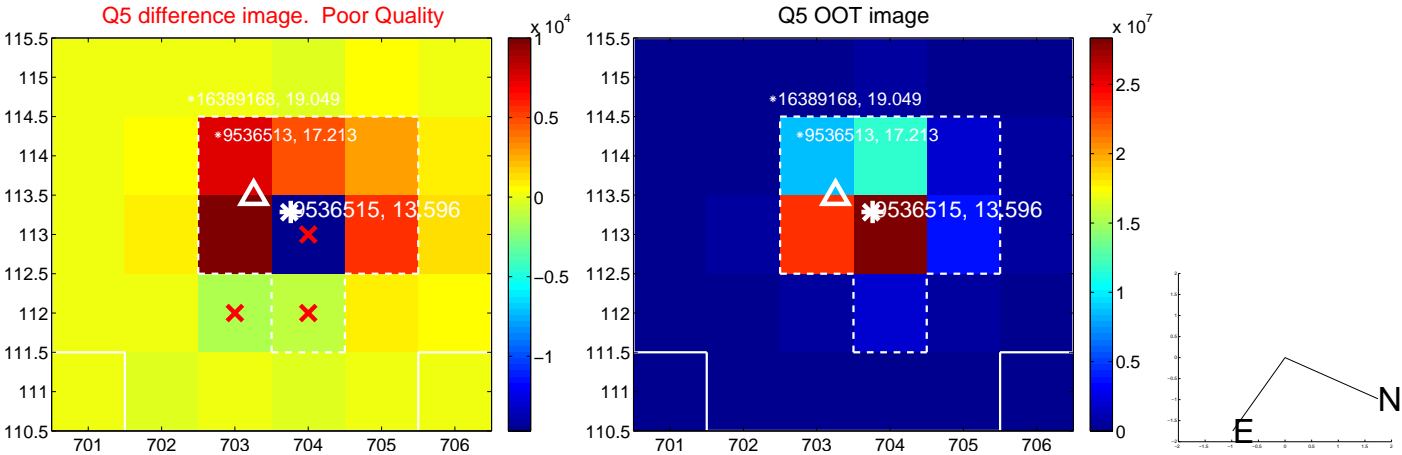
offset from photometric centroids



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

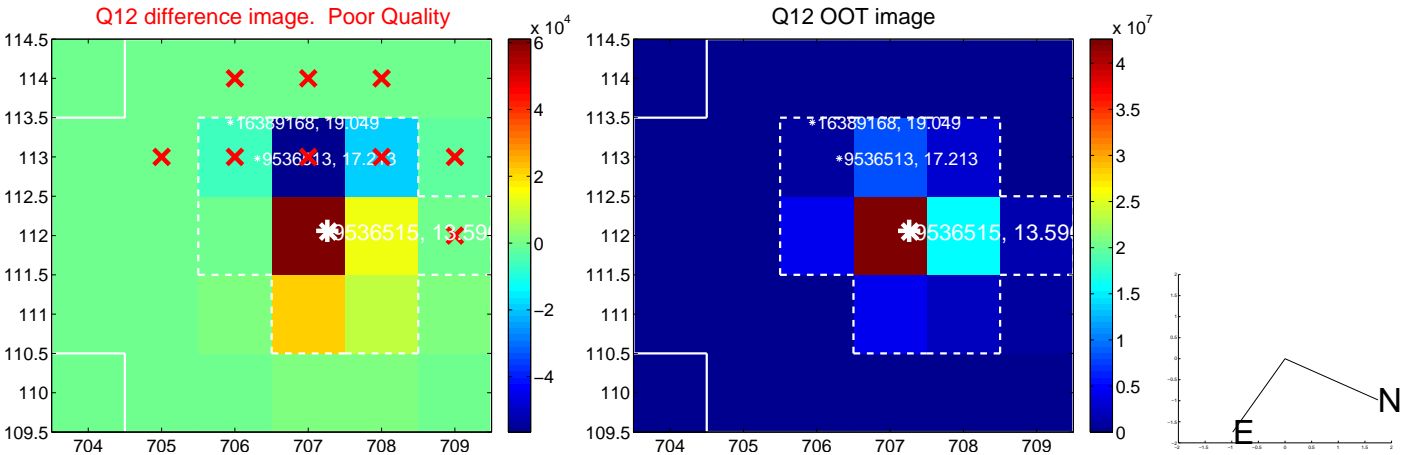
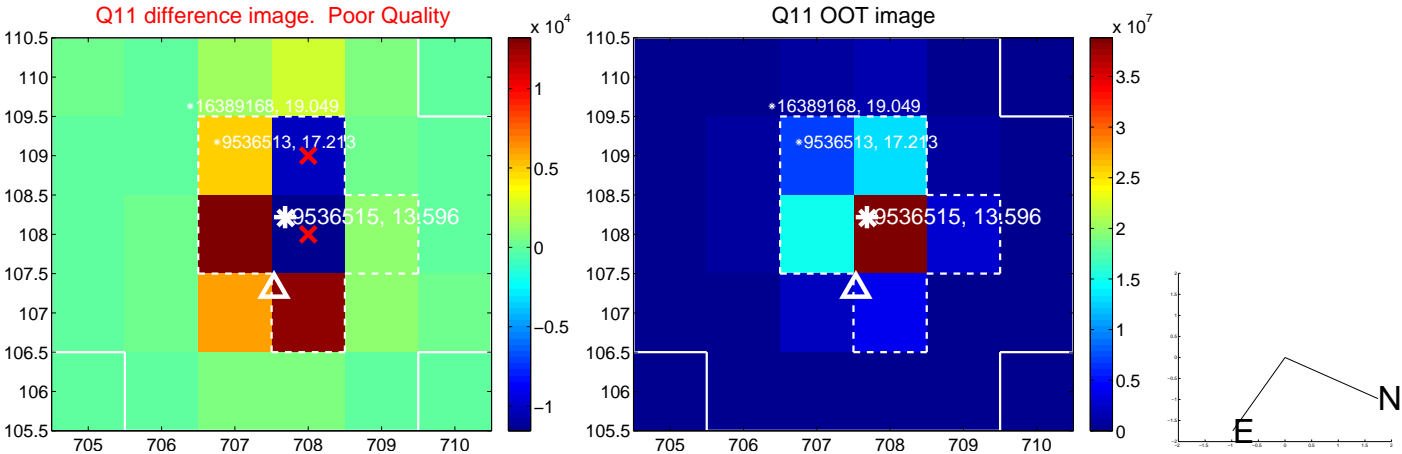
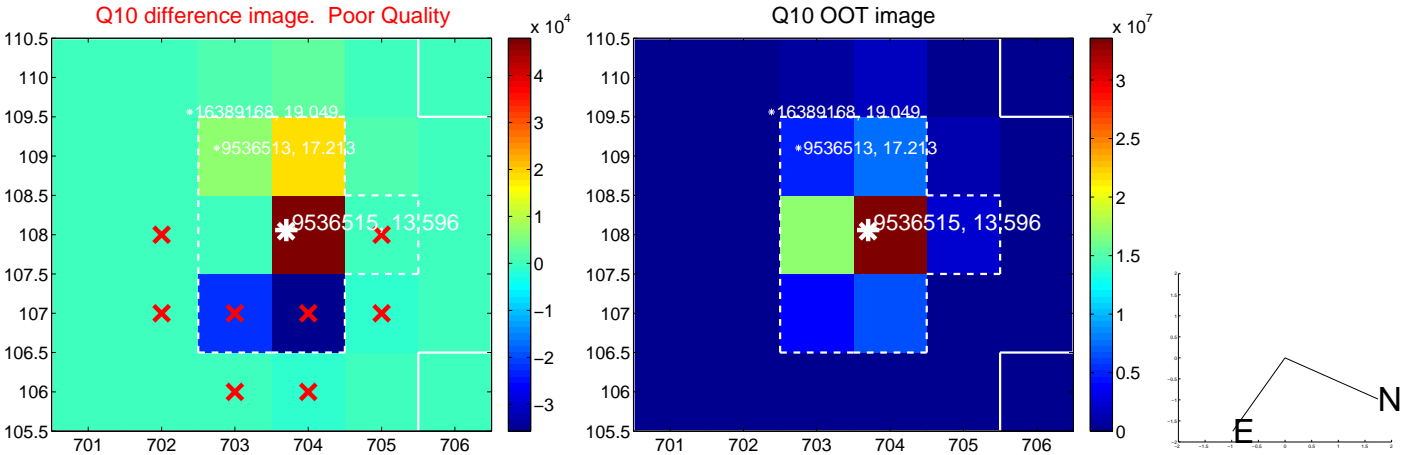
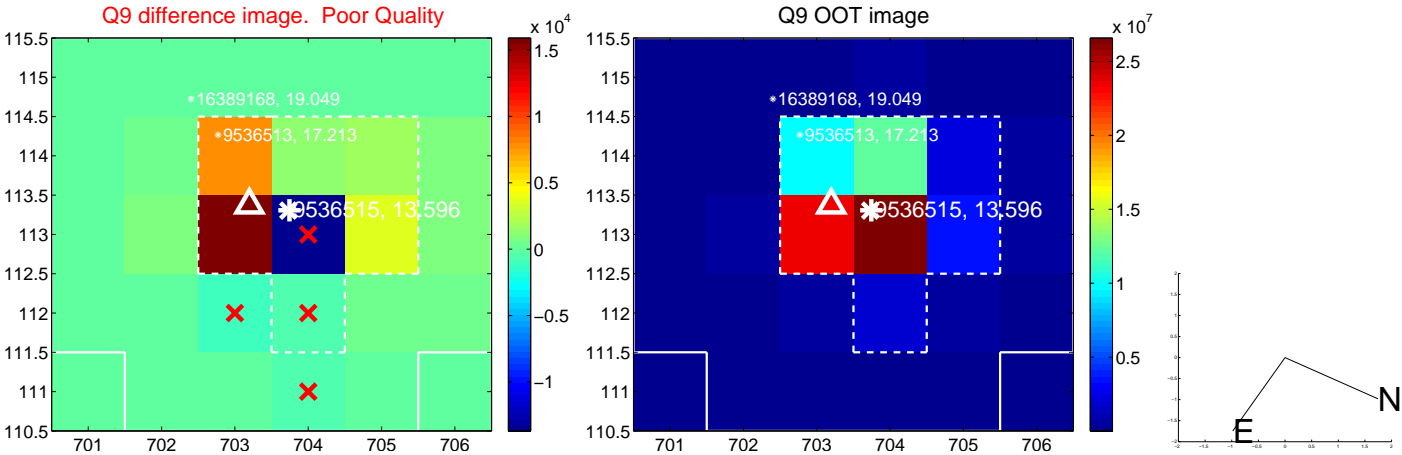


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

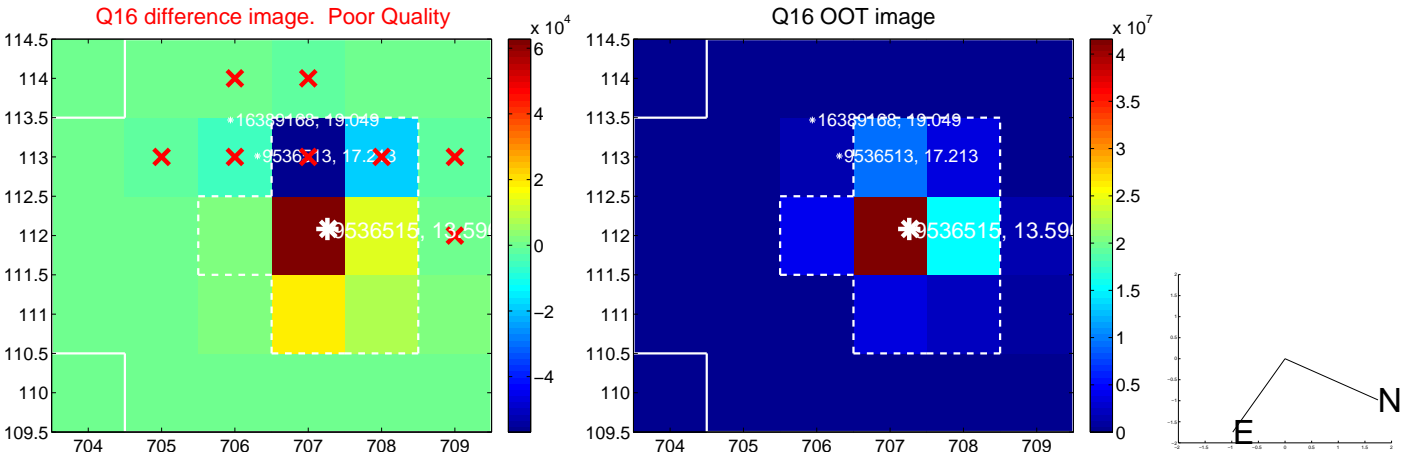
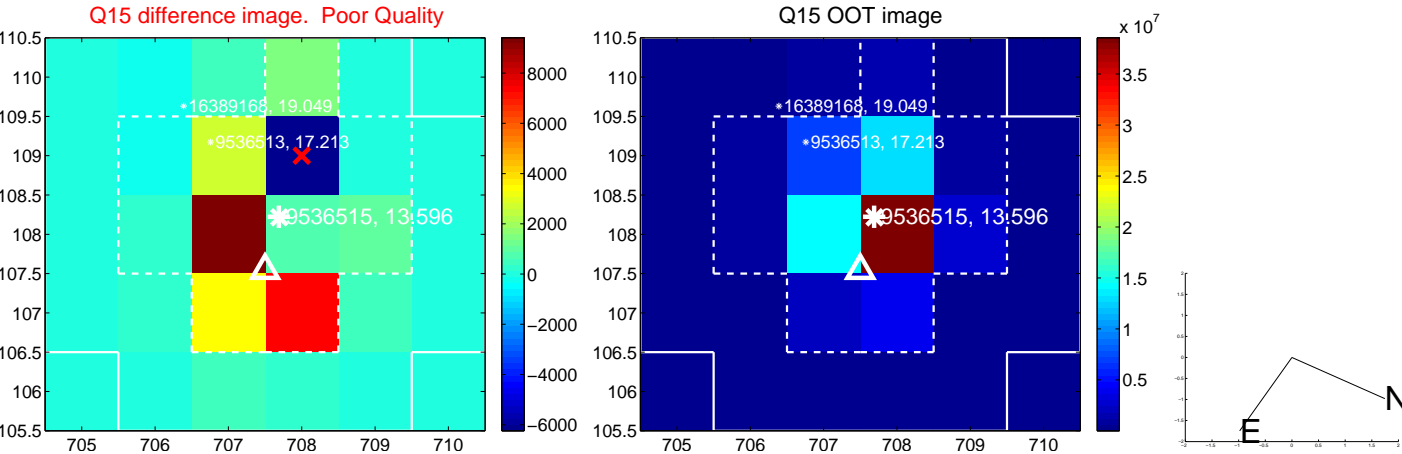
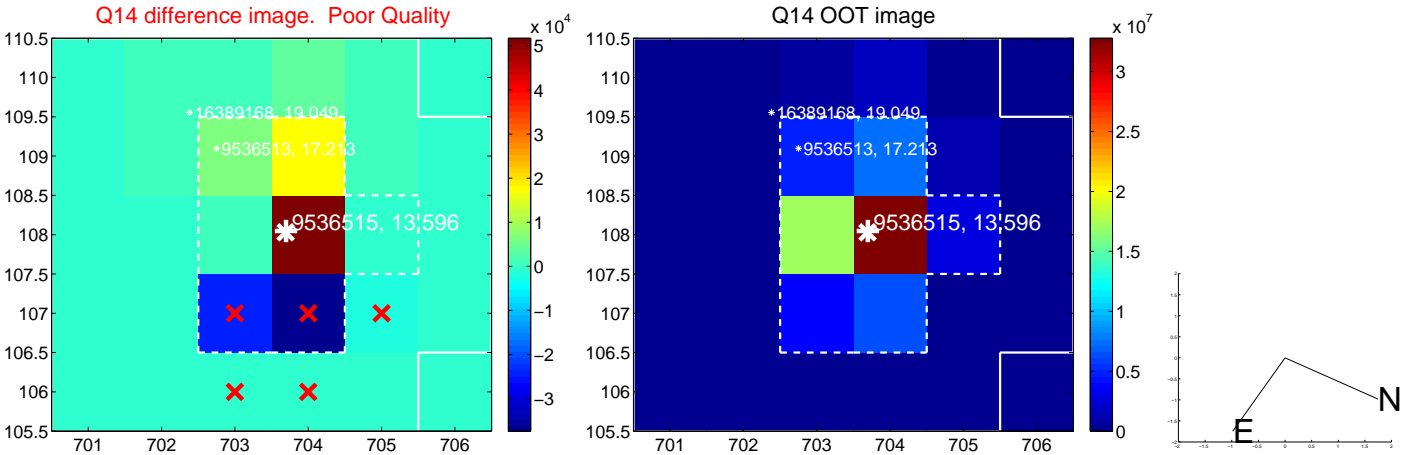
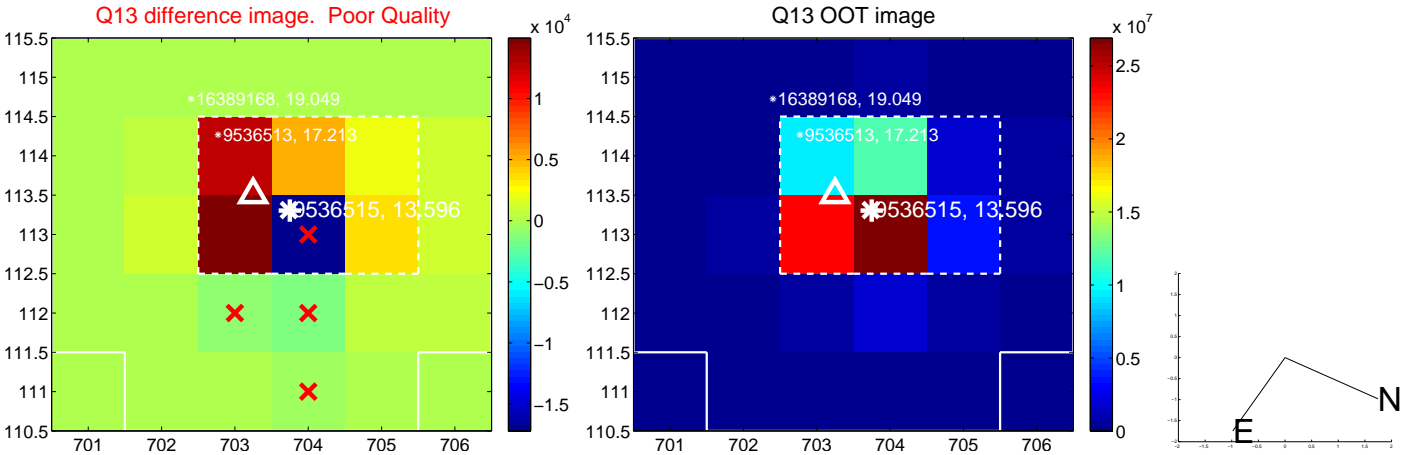




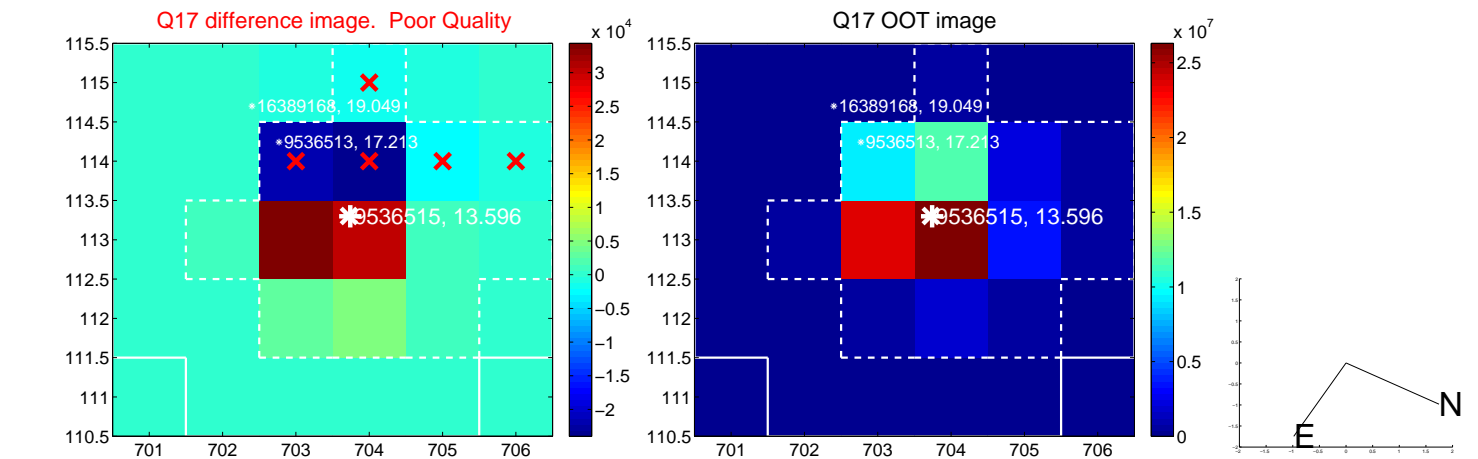
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



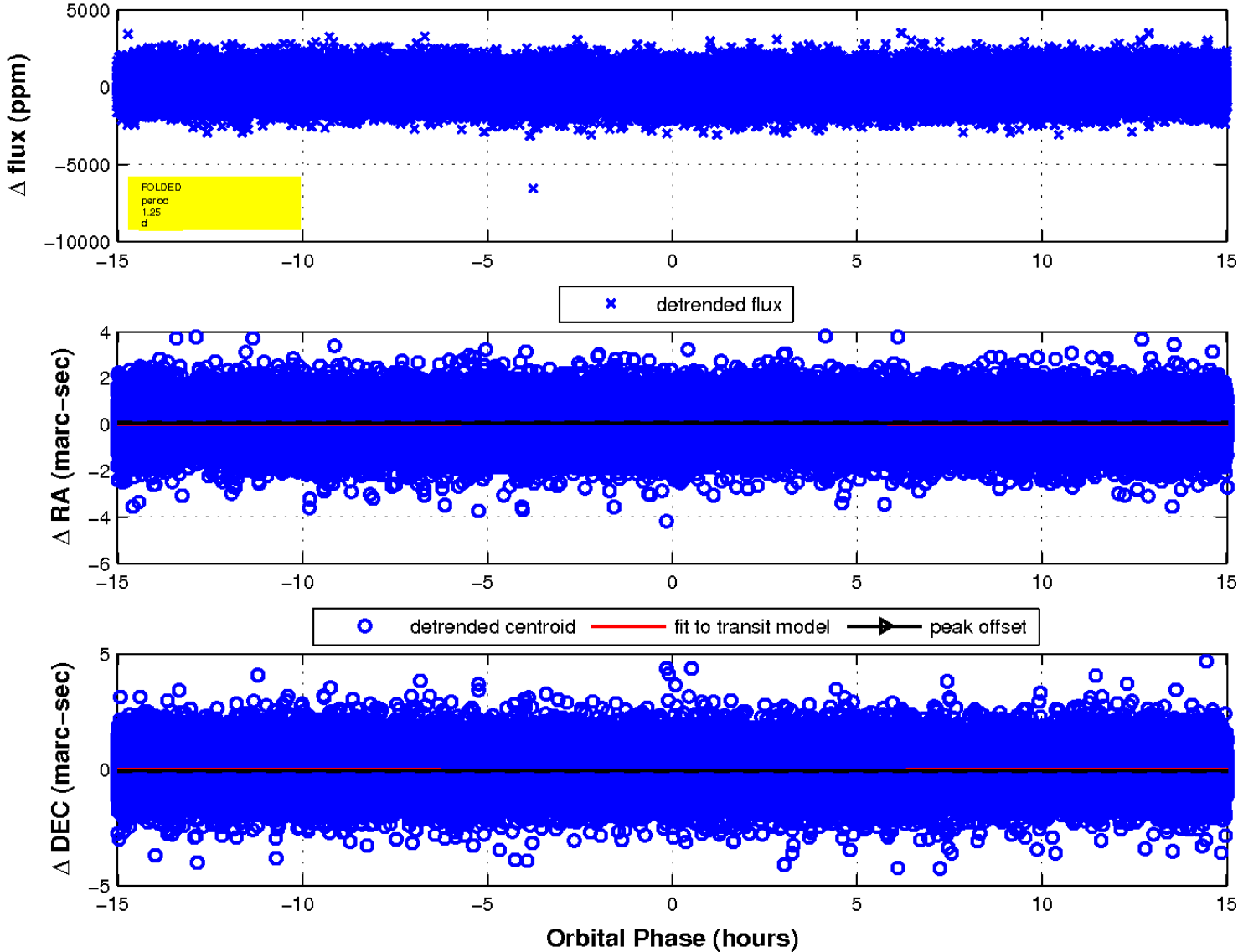
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



fluxWeightedCentroids, Planet 2 of 2



UKIRT Image

Declination

