

# KIC 009642018

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009642018-01	OBS	4430.01	0.505113	131.766322	176.4	0.669	12.0	17.4	0.78	5262	1.05	2997.93
009642018-02	OBS	No	0.505108	131.521470	145.3	0.564	11.1	13.7	0.78	5262	1.19	2997.96

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009642018-01	OBS	FP	0.00	0	1	0	0	MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE
009642018-02	OBS	FP	0.00	1	1	0	0	IS_SEC_TCE

**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.

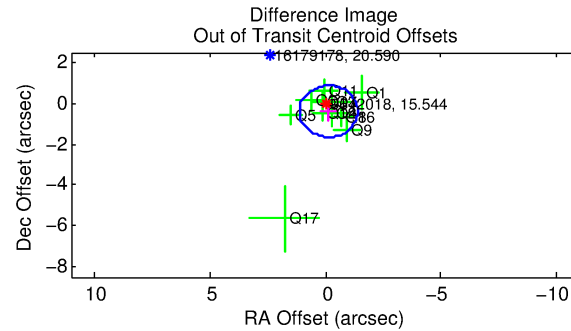
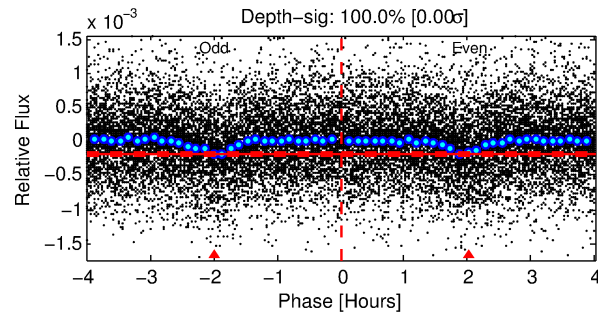
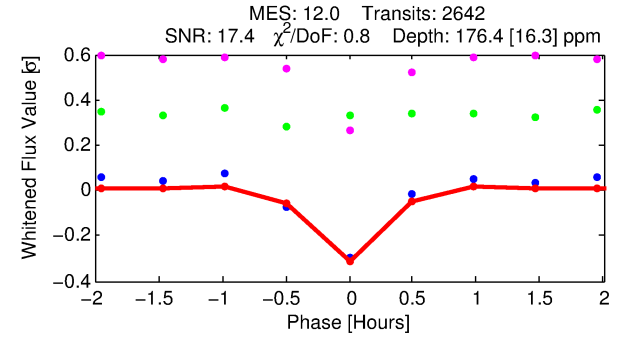
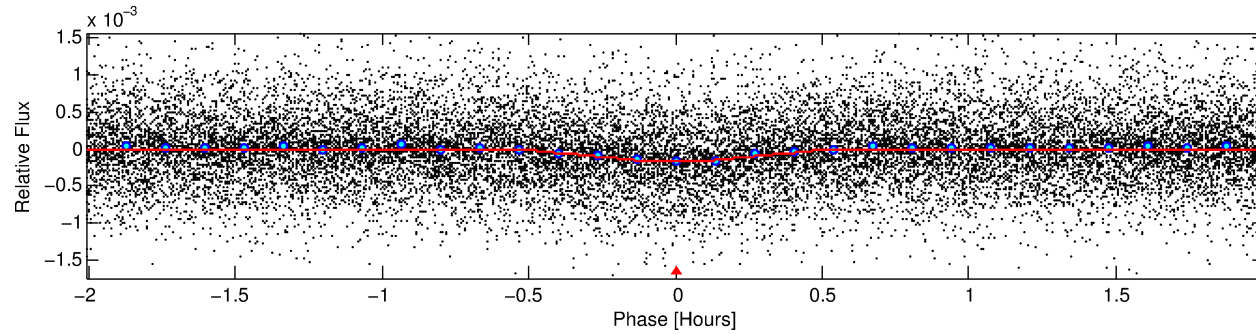
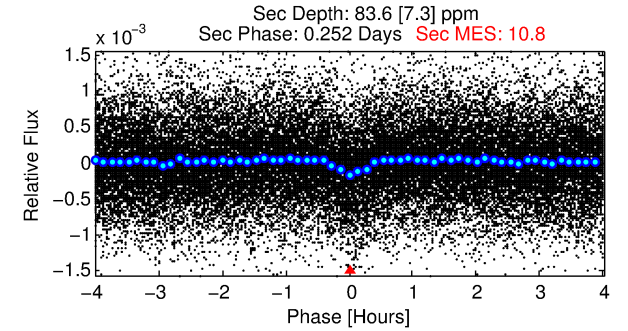
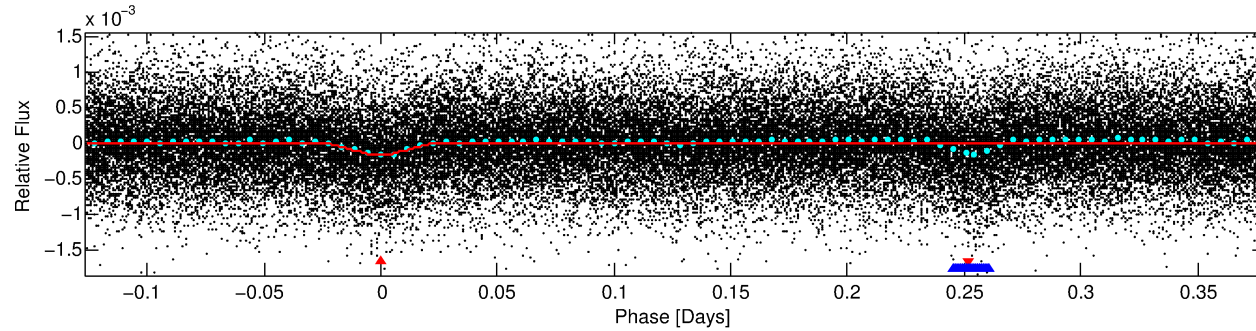
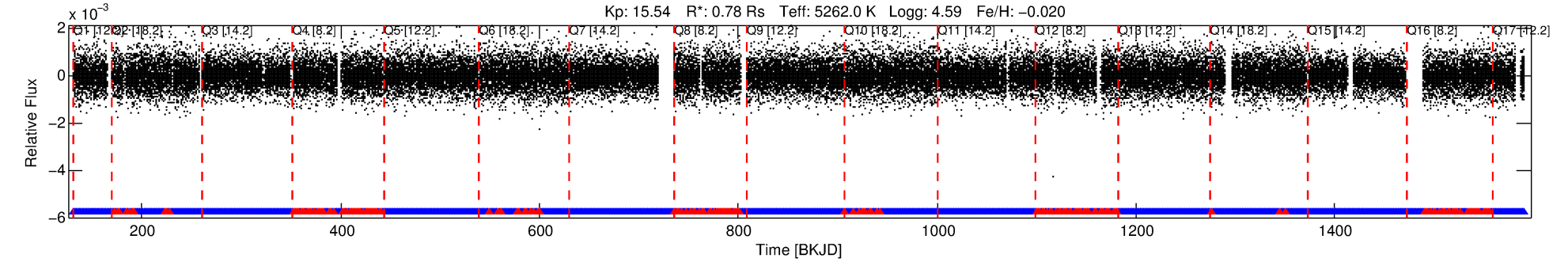
## Ephemeris Match Information For 009642018-01

No Significant Match Found

# DV One-Page Summary

KIC: 9642018 Candidate: 1 of 2 Period: 0.505 d  
KOI: K04430 Corr: No Ephemeris Match

Kp: 15.54 R\*: 0.78 Rs Teff: 5262.0 K Logg: 4.59 Fe/H: -0.020



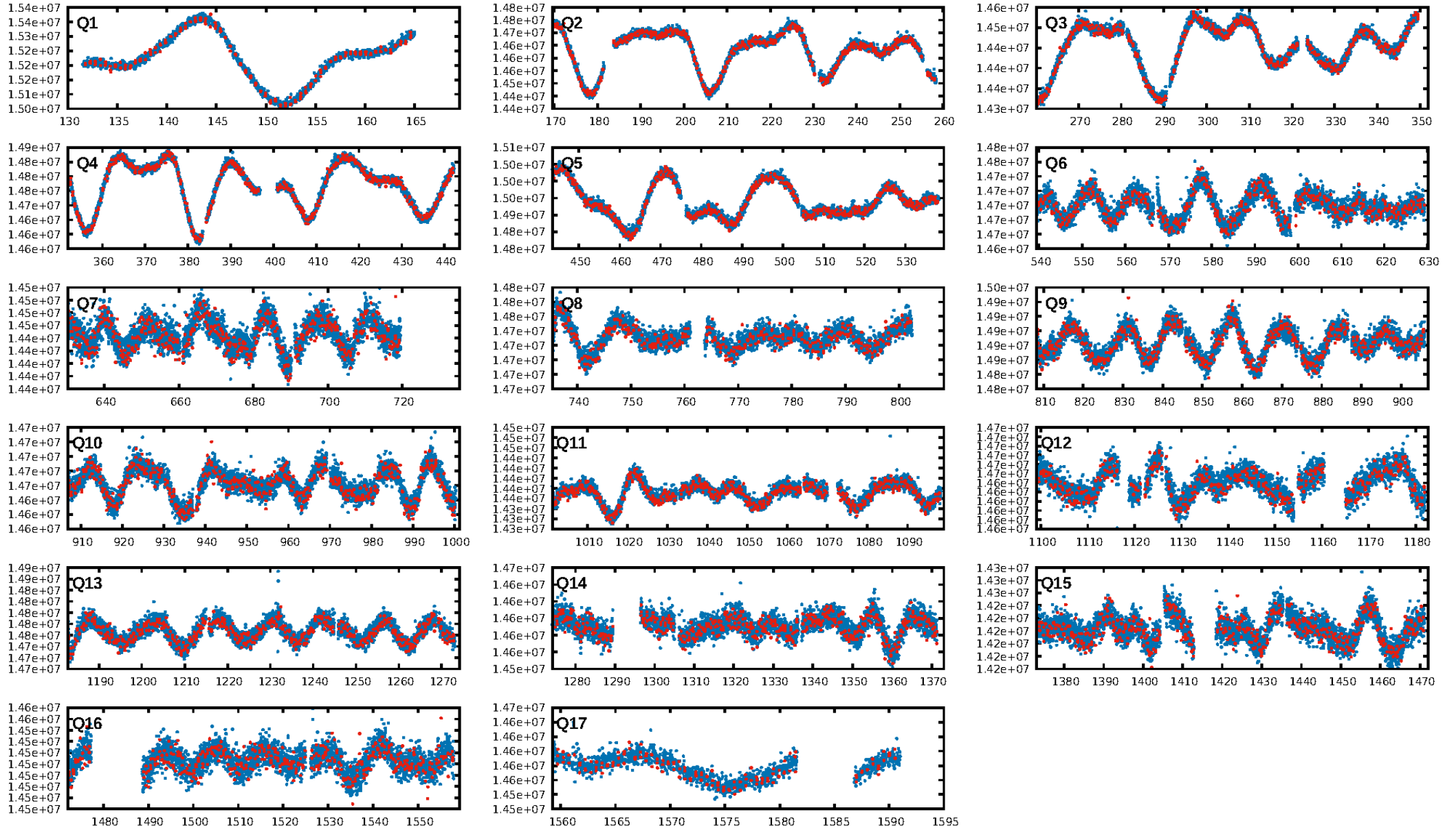
## DV Fit Results:

Period = 0.50511 [0.00001] d  
Epoch = 131.7663 [0.0007] BKJD  
Rp/R\* = 0.0122 [0.0138]  
a/R\* = 5.81 [23.95]  
b = 0.14 [30.15]  
Seff = 2997.92 [675.05]  
Teff = 1887 [106] K  
Rp = 1.05 [1.19] Re  
a = 0.0119 [0.0016] AU  
Ag = 5.91 [13.35] [0.37σ]  
Teffp = 4548 [2565] K [1.04σ]

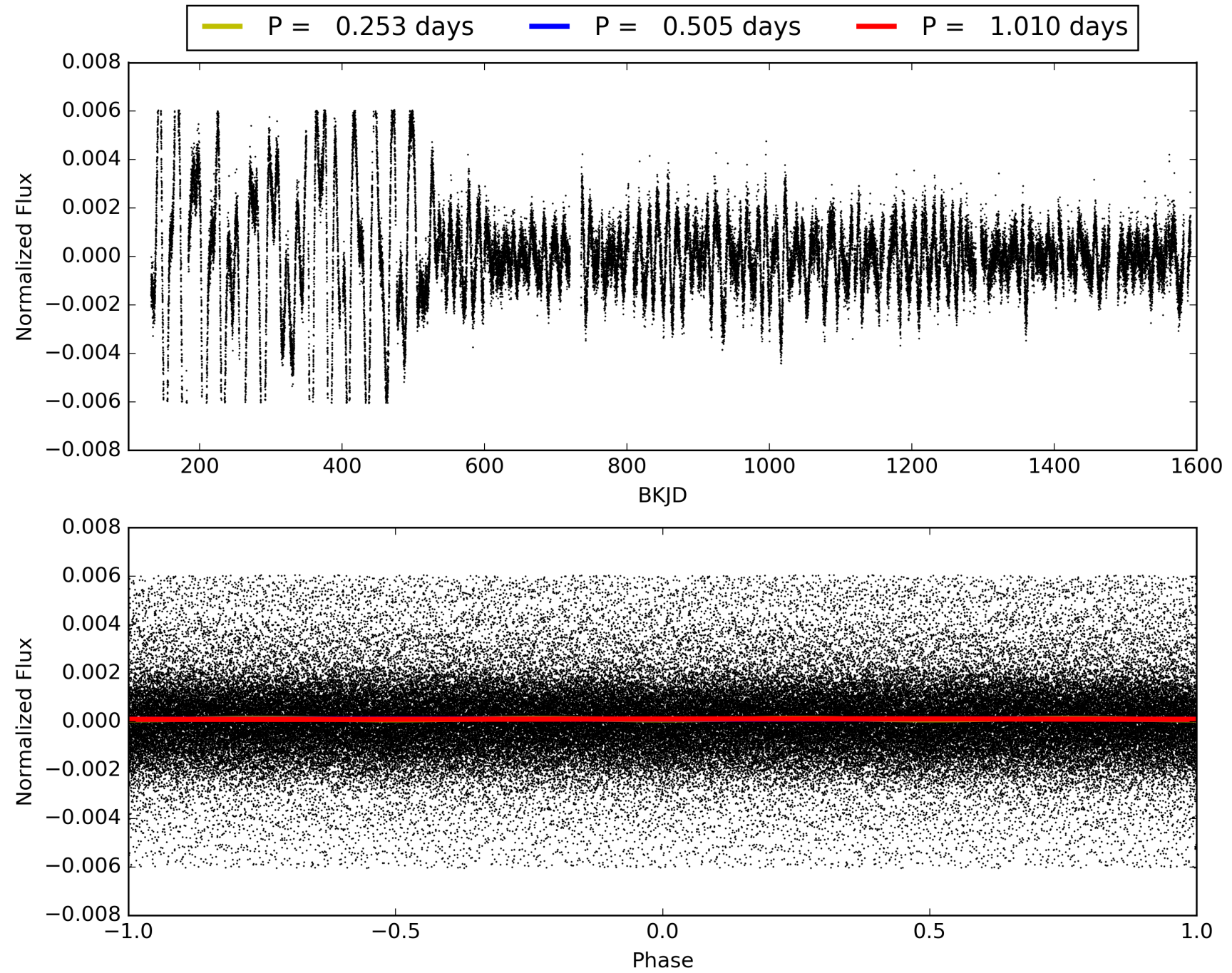
## DV Diagnostic Results:

ShortPeriod-sig: 0.0% [0.00σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 3.26e-34  
RollingBand-fgt: 0.91 [2301/2522]  
GhostDiagnostic-chr: 2.011  
Centroid-sig: 1.8%  
Centroid-so: 1.235 arcsec [1.75σ]  
OotOffset-rm: 0.411 arcsec [0.98σ]  
KicOffset-rm: 0.397 arcsec [1.02σ]  
OotOffset-st: 1/2/4/5 [12]  
KicOffset-st: 1/2/4/5 [12]  
DiffImageQuality-fgm: 0.83 [10/12]  
DiffImageOverlap-fno: 0.00 [0/17]

# TCE 009642018-01, PDC Light Curves

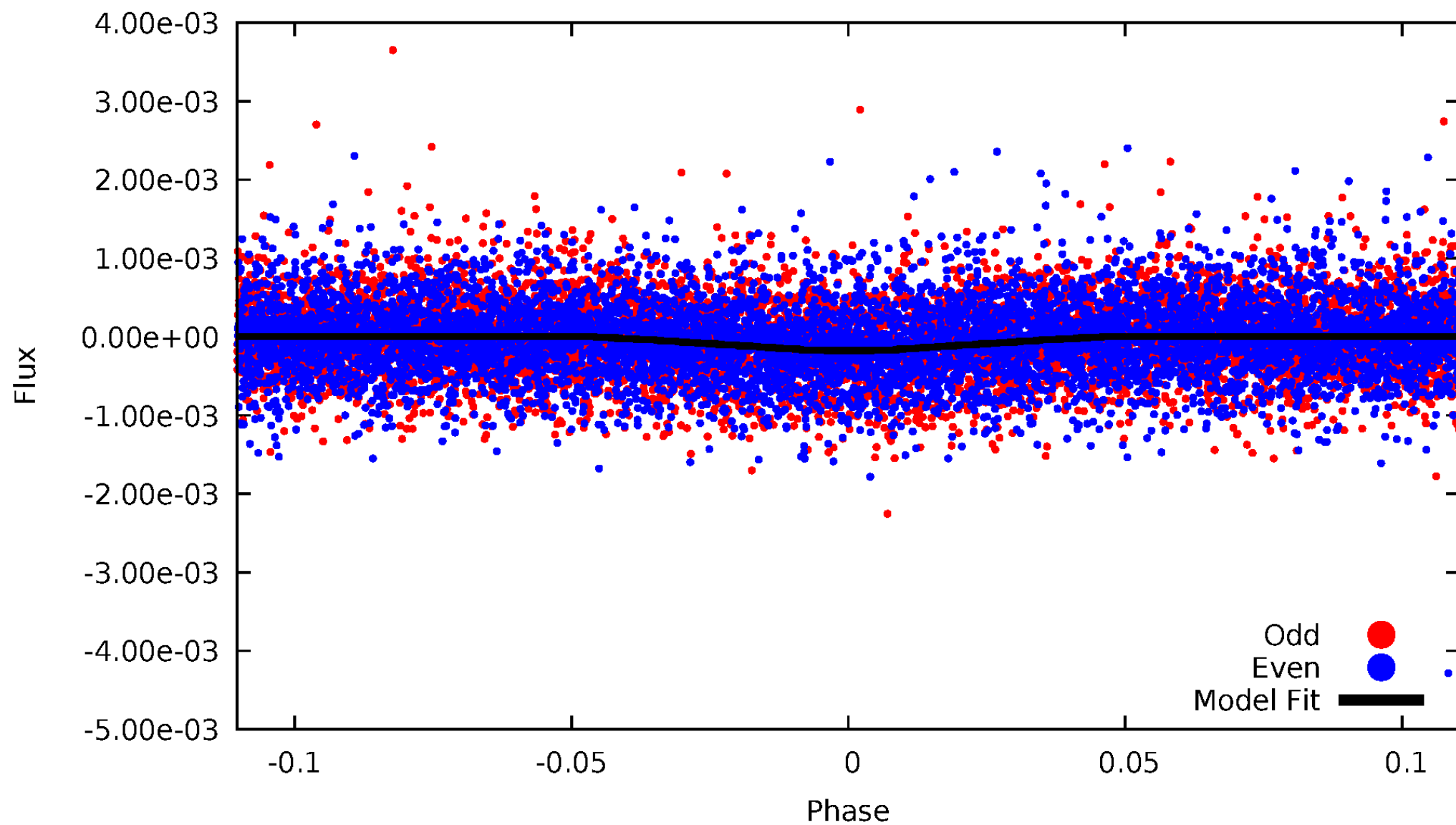


TCE 009642018-01



# DV Odd/Even

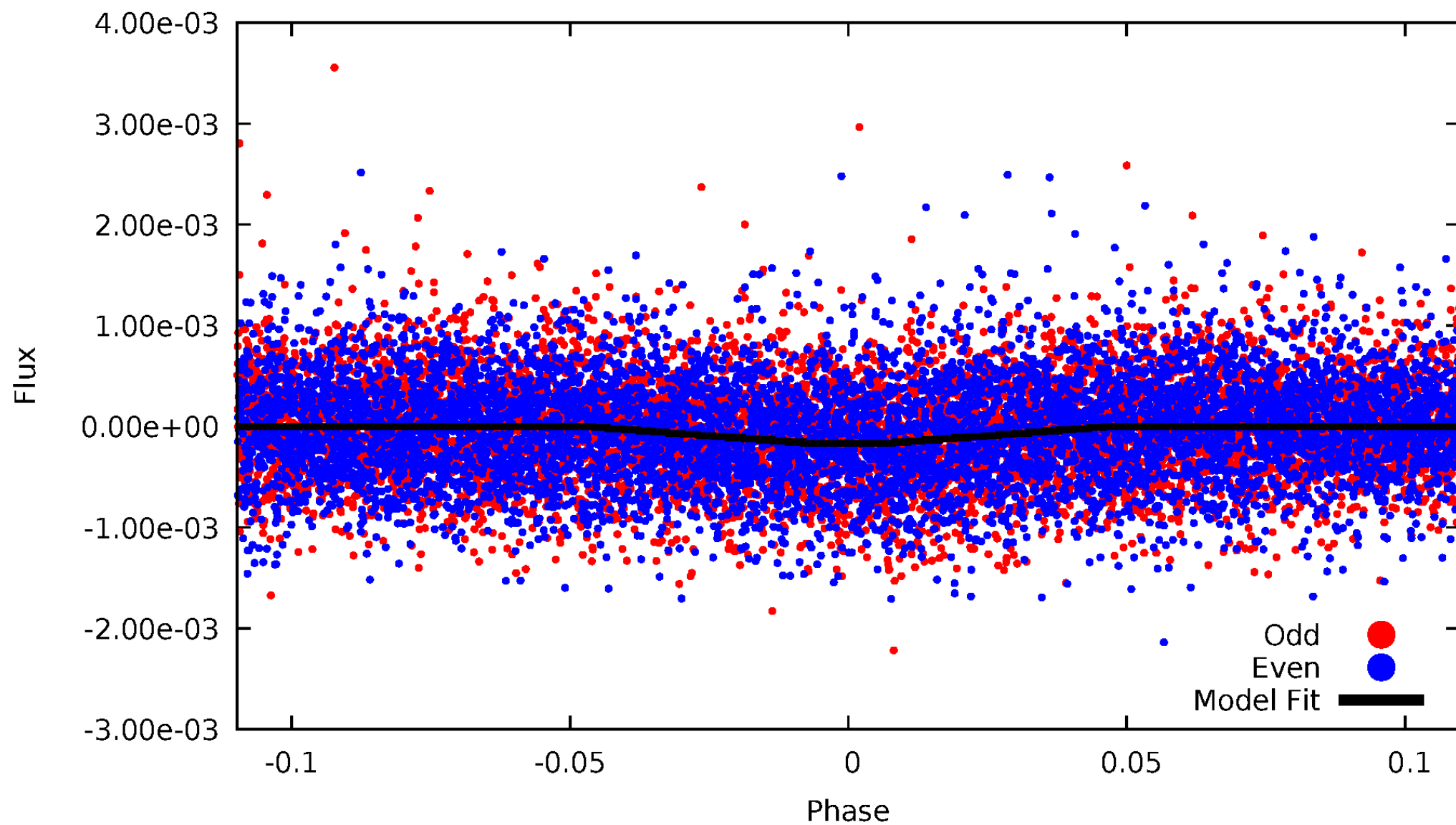
TCE 009642018-01





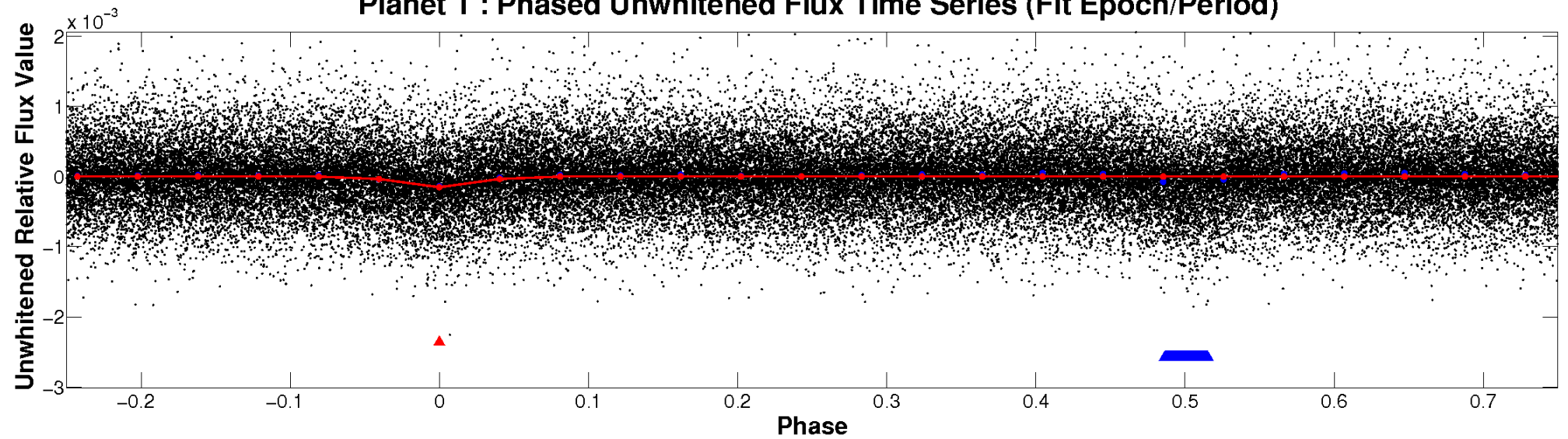
# ALT Odd/Even

TCE 009642018-01

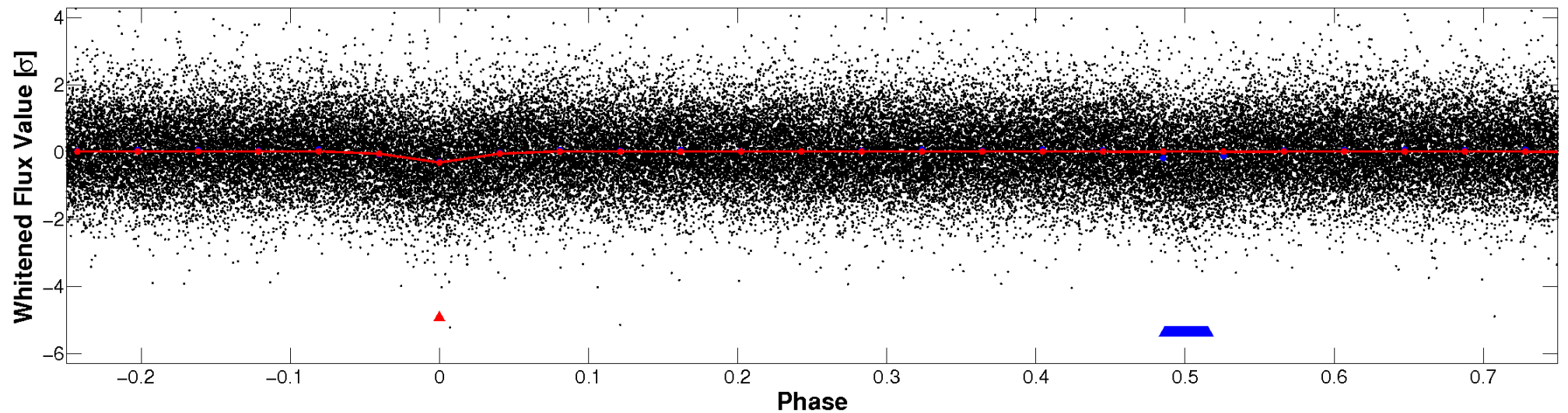


# Non-Whitened Vs. Whitened Light Curve

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

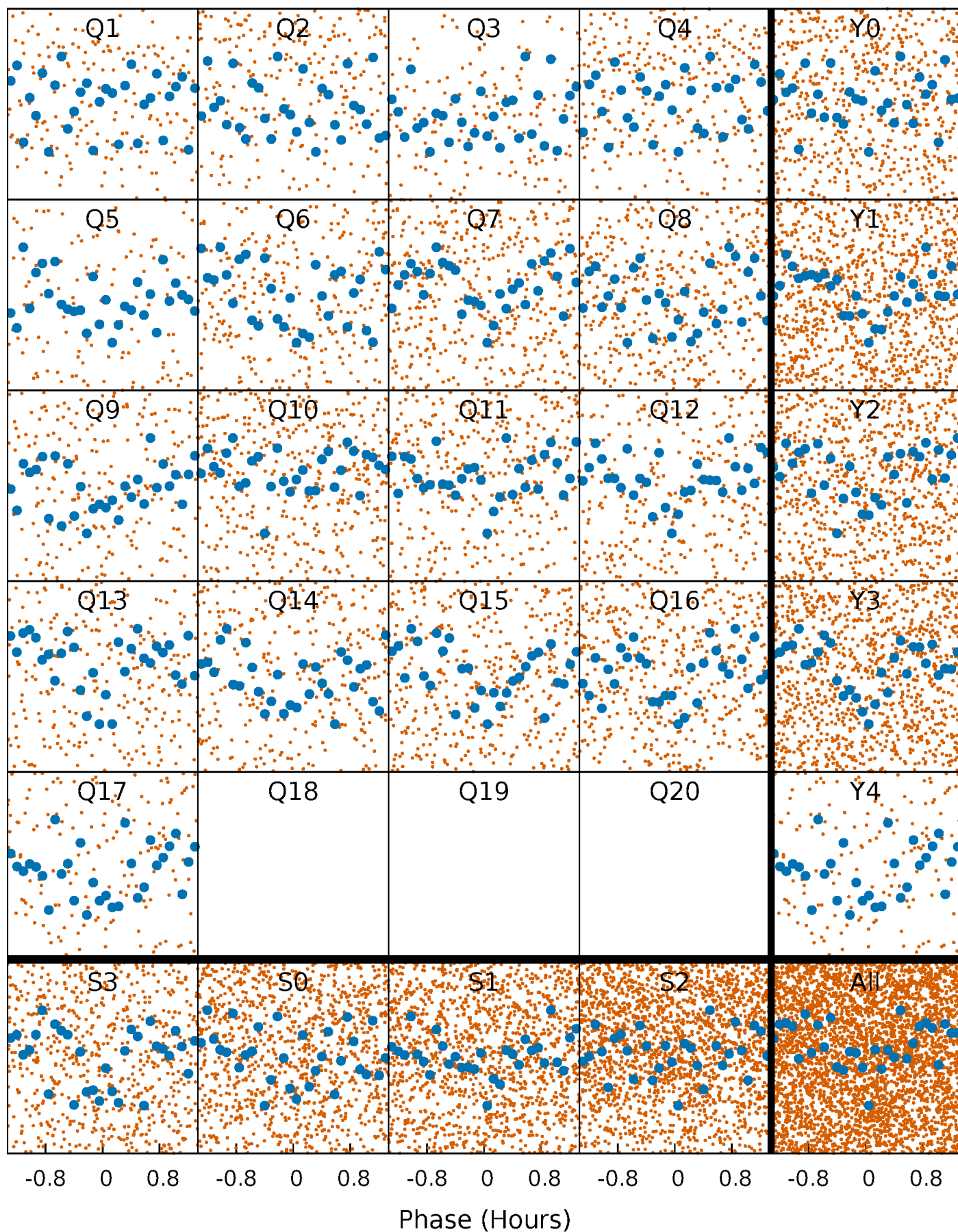


**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

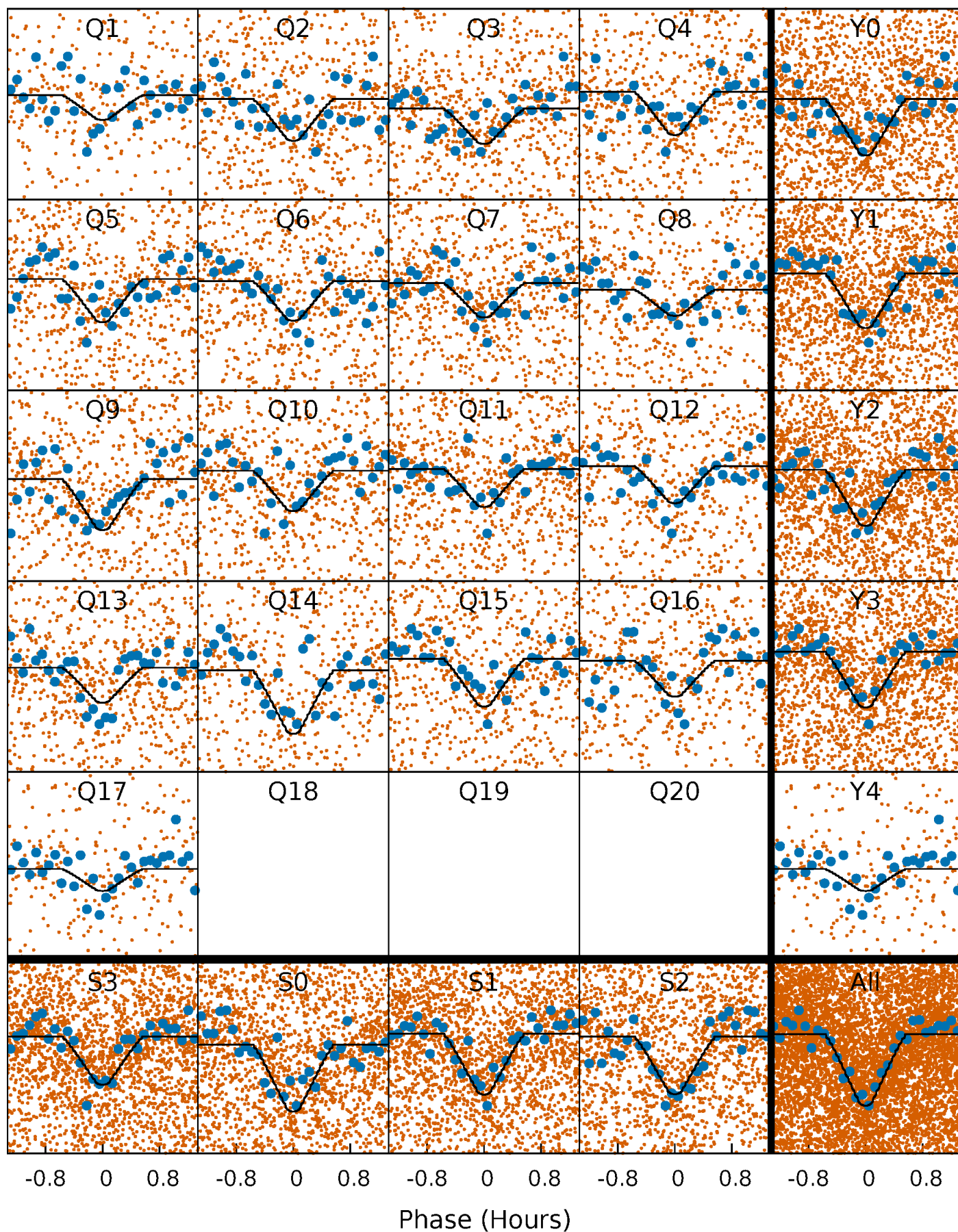
TCE 009642018-01 P= 0.505113 Days  $T_0=131.766322$  (BKJD)





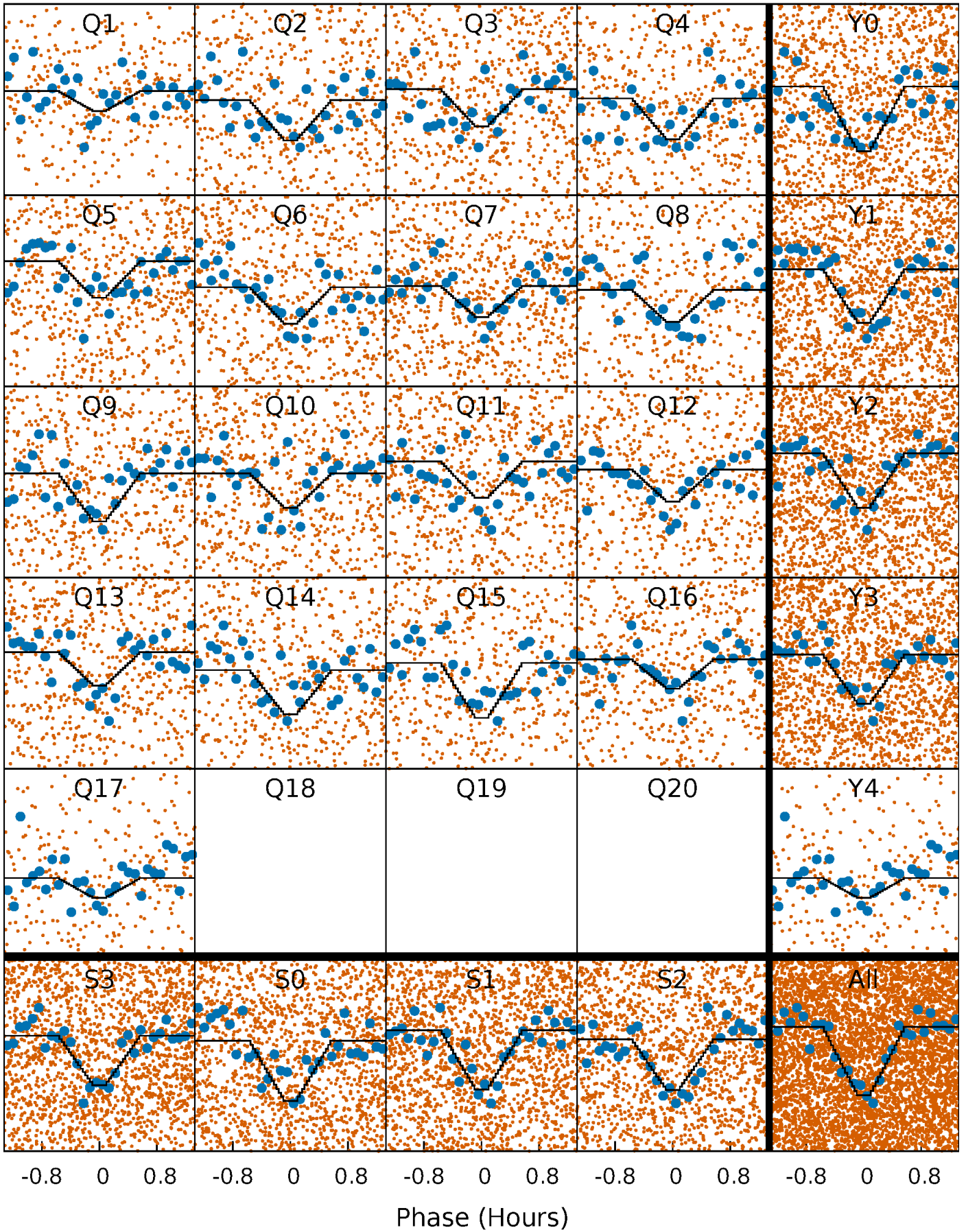
# DV Quarter-Phased Transit Curves

TCE 009642018-01 P= 0.505113 Days  $T_0=131.766322$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

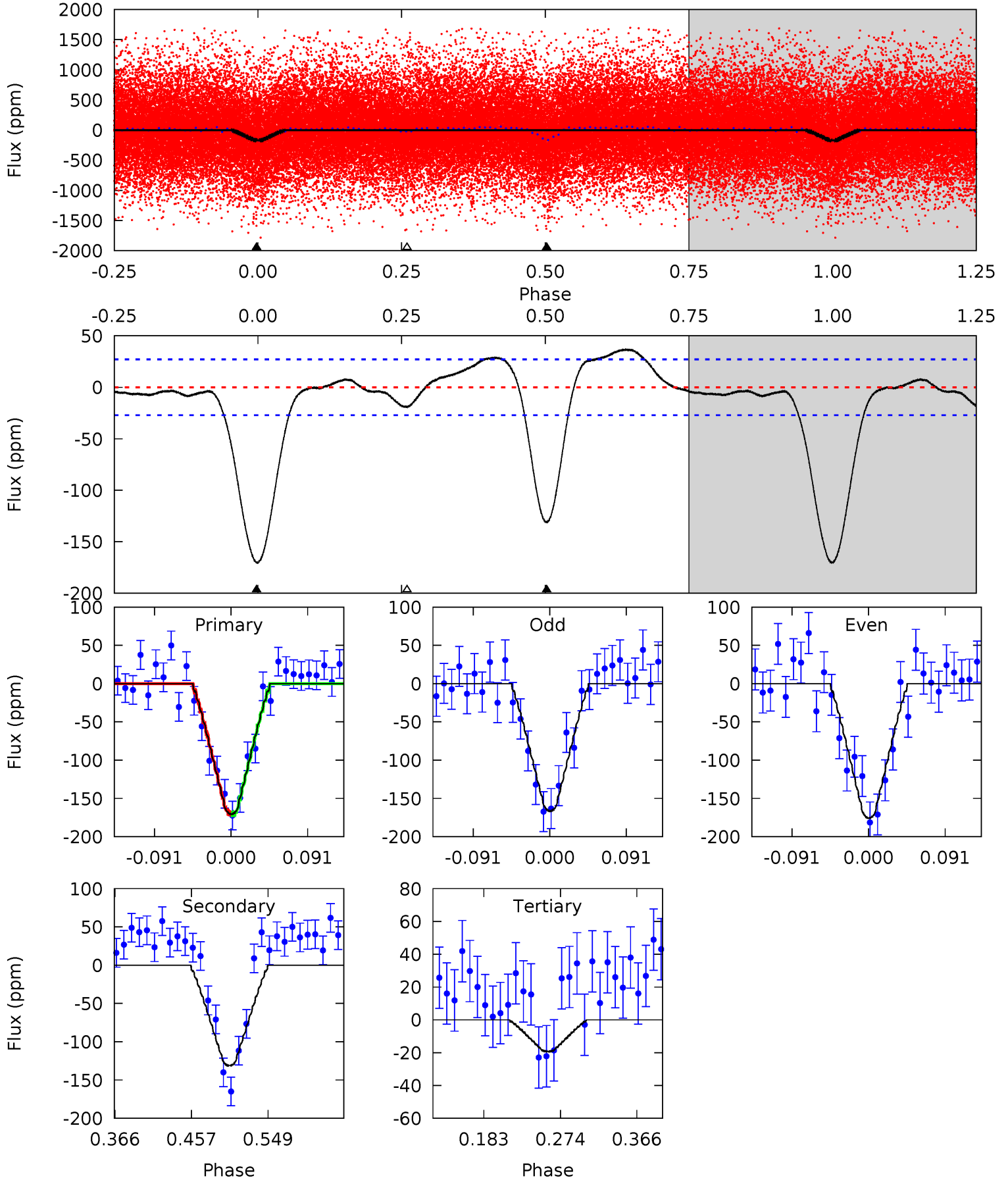
TCE 009642018-01 P= 0.505112 Days  $T_0=131.766440$  (BKJD)



# DV Model-Shift Uniqueness Test

009642018-01, P = 0.505113 Days, E = 131.261209 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
28.8	22.2	3.26	0	4.58	1.69	2.48	25.6	28.8	18.9	22.2	0.78	1.01	0.18	0.08

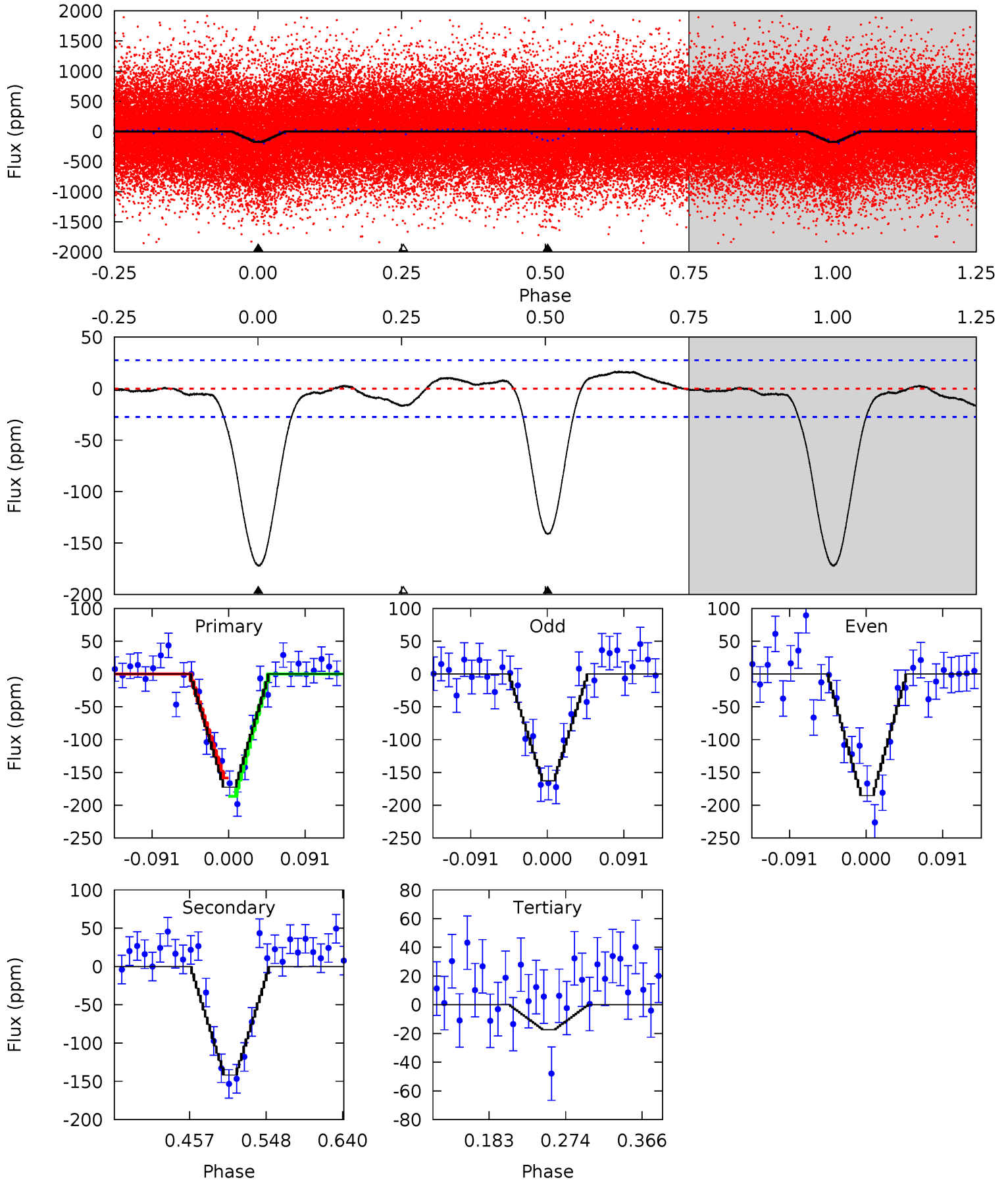




# Alt Model-Shift Uniqueness Test

009642018-01, P = 0.505112 Days, E = 131.261328 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
28.7	23.6	2.89	0	4.58	1.69	1.35	25.8	28.7	20.7	23.6	1.88	0.98	0.09	2.31





### Stellar Parameters For KIC 009642018

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5262^{+158}_{-142}$	$4.590^{+0.032}_{-0.104}$	$-0.020^{+0.300}_{-0.300}$	$0.783^{+0.122}_{-0.066}$	$0.875^{+0.062}_{-0.093}$	$2.569^{+0.439}_{-0.836}$
	+3%/-3%	+1%/-2%	+1500%/-1500%	+16%/-8%	+7%/-11%	+17%/-33%
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 009642018-01 / KOI 4430.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-131 \pm 6$	$1.41^{+1.03}_{-0.93}$	$2675^{+115}_{-99}$	$4500^{+2998}_{-852}$	$5.026^{+35.235}_{-3.384}$
Alt.	$-142 \pm 6$	$1.45^{+1.09}_{-0.93}$	$2682^{+111}_{-105}$	$4527^{+2941}_{-886}$	$5.160^{+33.951}_{-3.499}$

$T_{\text{max}}$  = 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

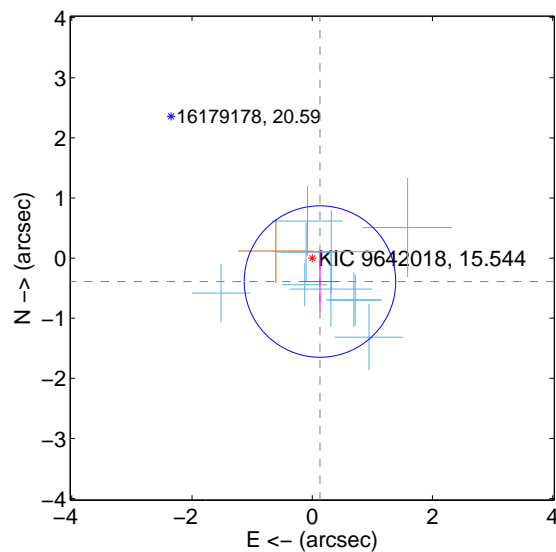
Supplemental centroid analysis for 009642018-01. Kepler magnitude: 15.54. Transit SNR 17.42

There are 10 quarters with good PRF difference image offsets

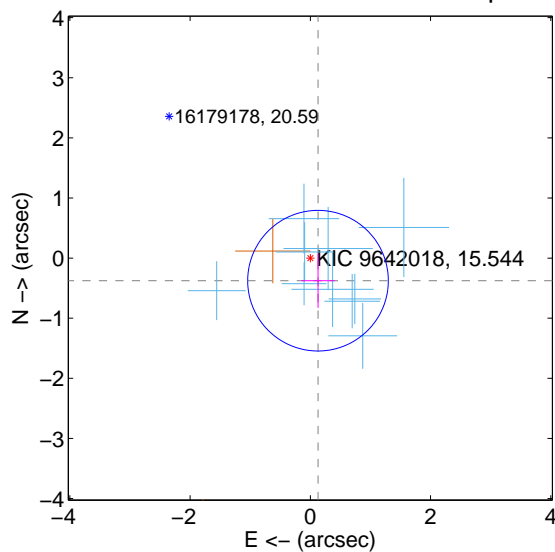
The direct PRF centroid is offset from the target star catalog position by about 0.01 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.411 \pm 0.420$	0.98	$-0.128 \pm 0.316$	$-0.390 \pm 0.501$
PRF-fit source offset from KIC position	$0.397 \pm 0.390$	1.02	$-0.128 \pm 0.277$	$-0.376 \pm 0.453$
photometric centroid source offset	$1.23 \pm 0.71$	1.75	$-0.78 \pm 0.73$	$-0.96 \pm 0.69$

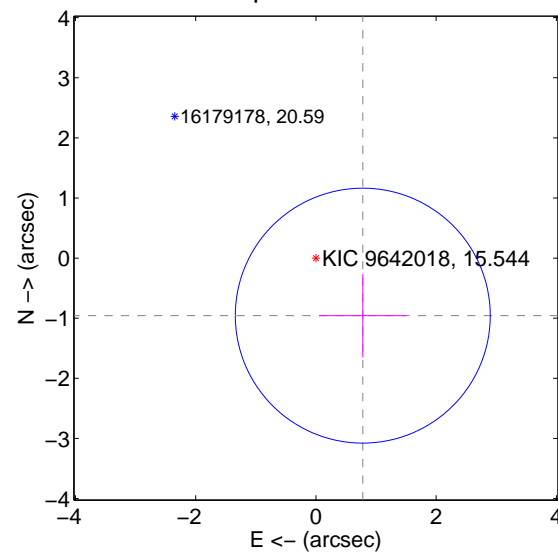
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

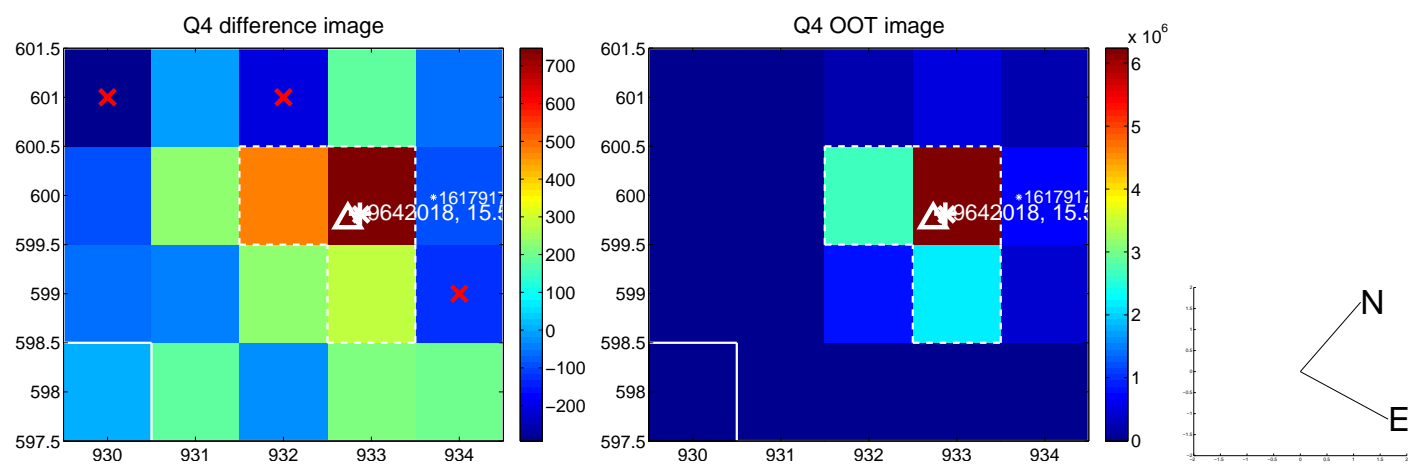
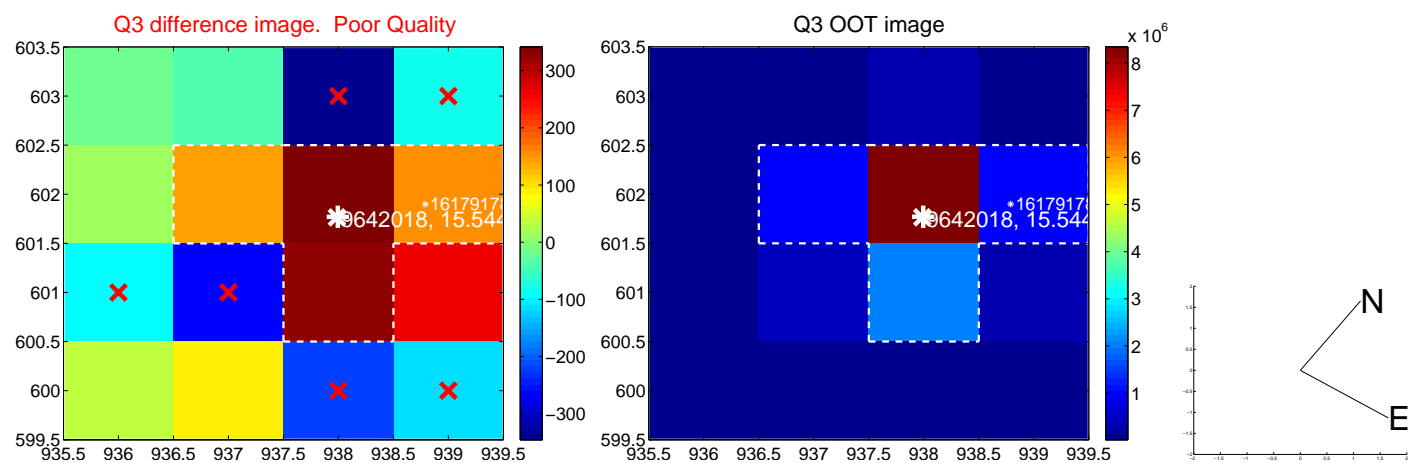
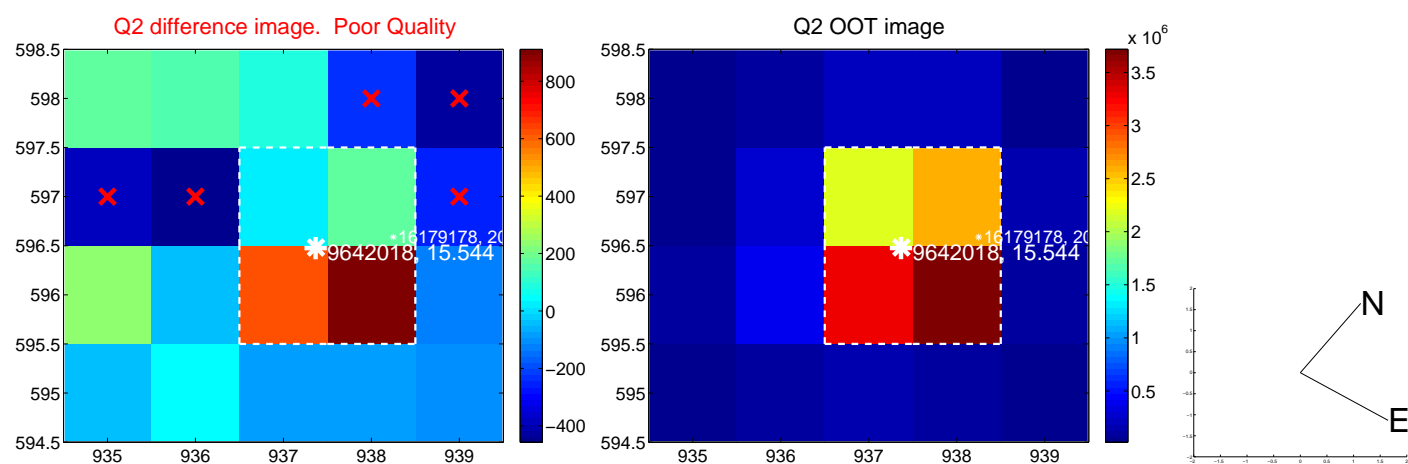
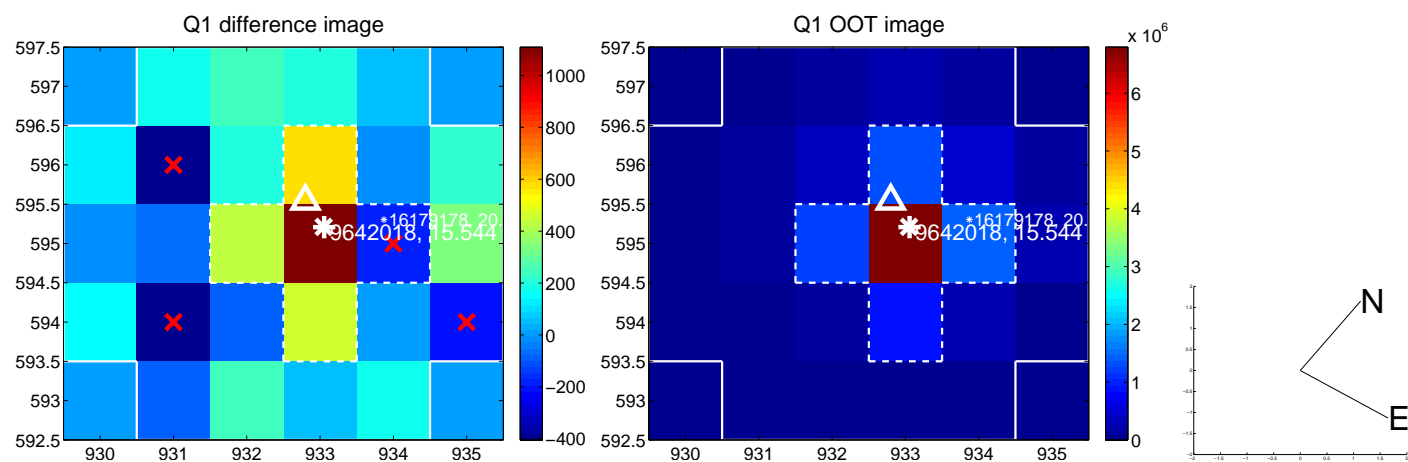


offset from photometric centroids

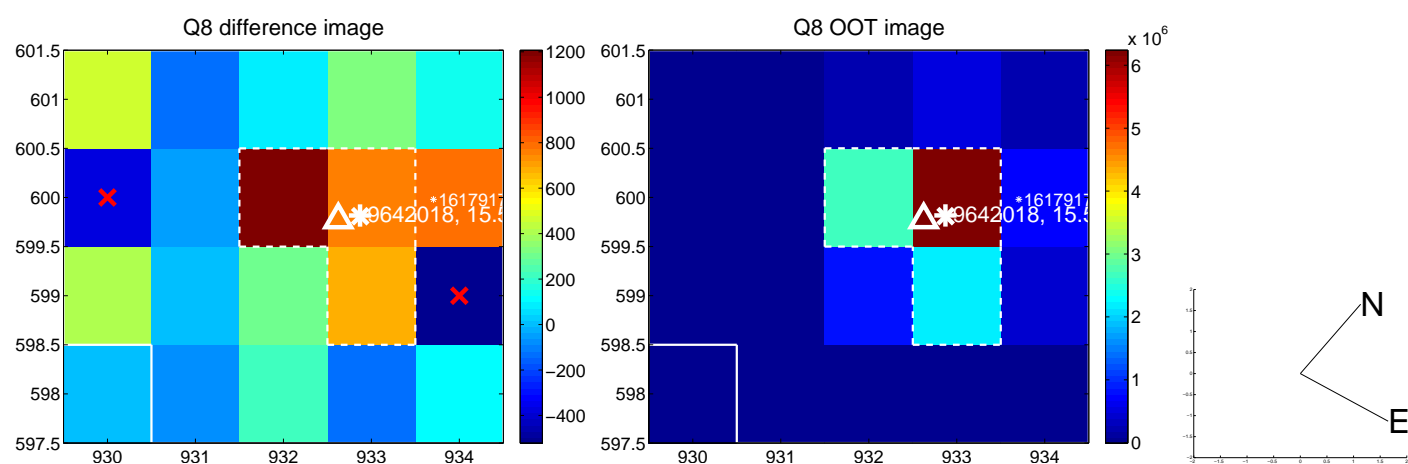
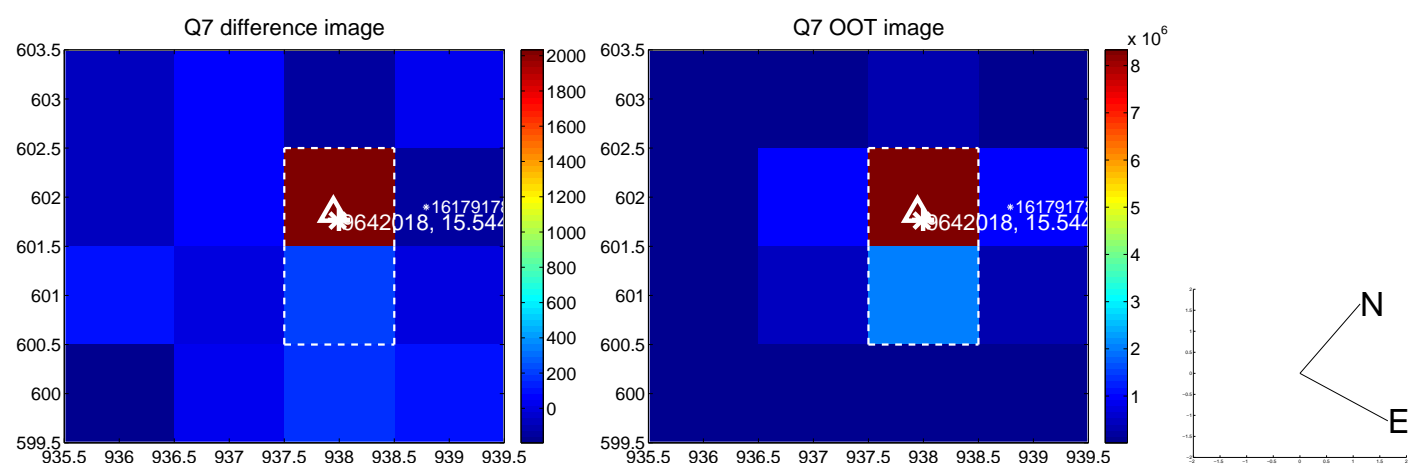
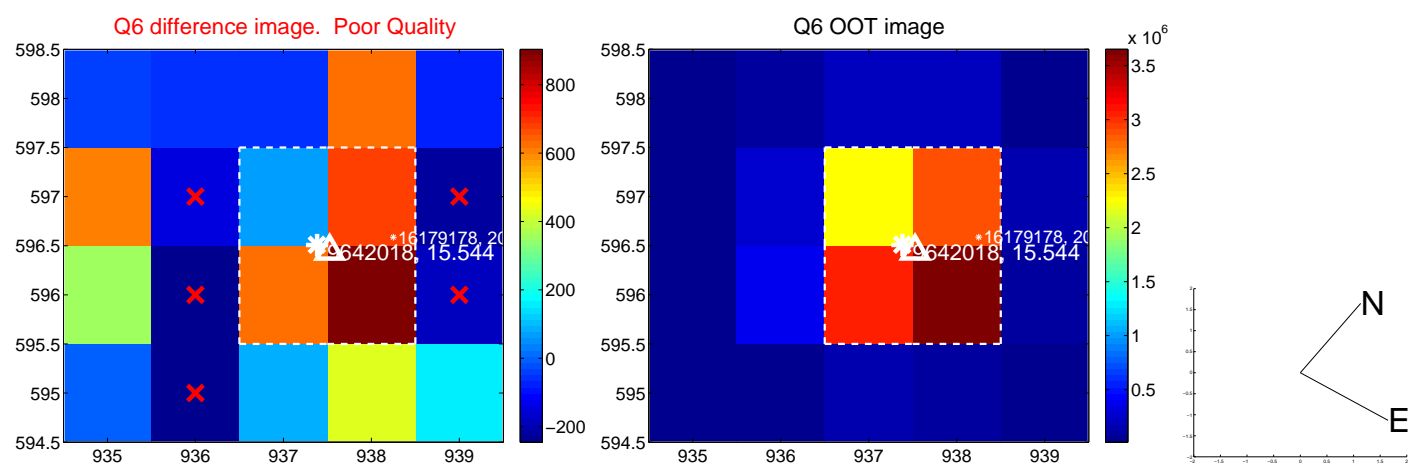
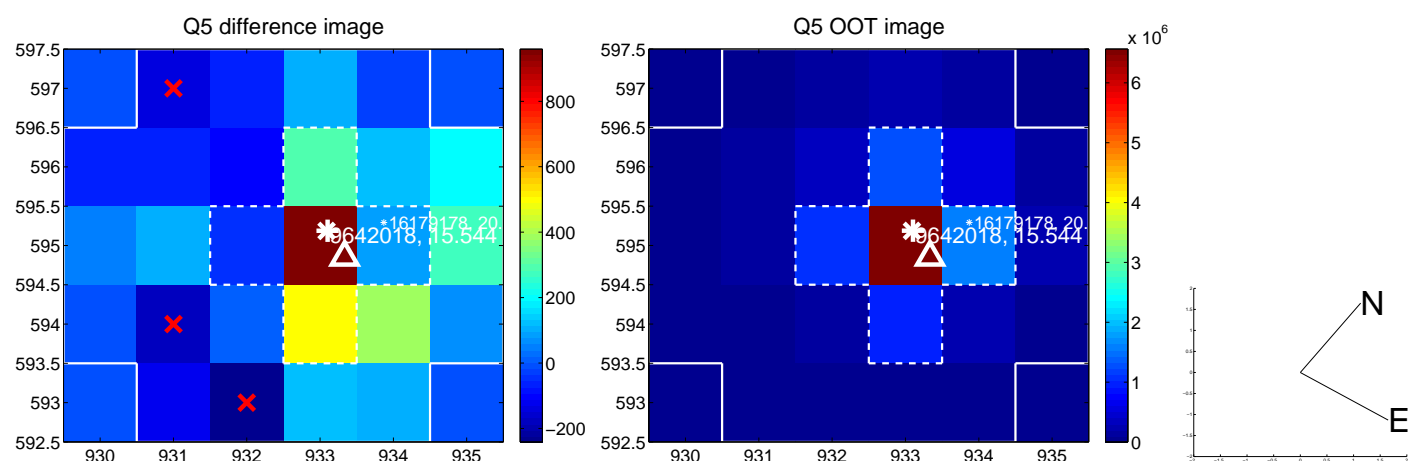


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

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

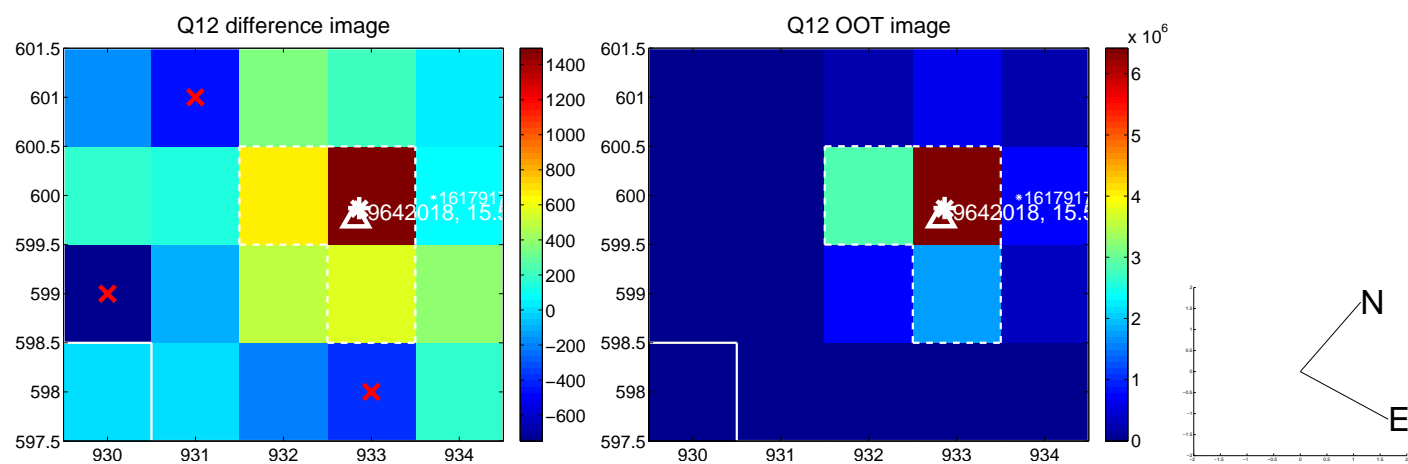
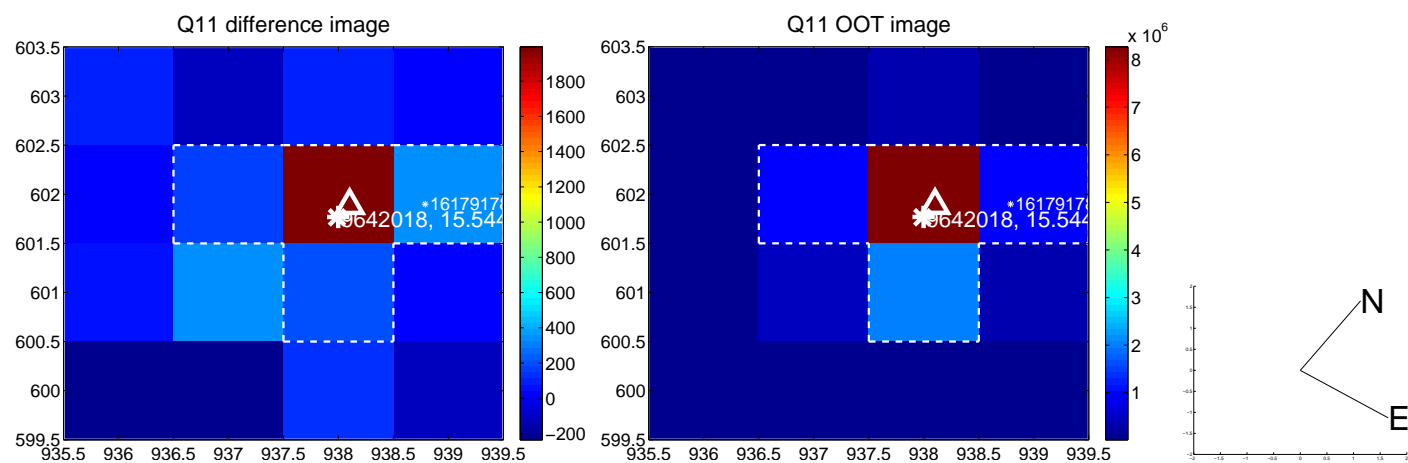
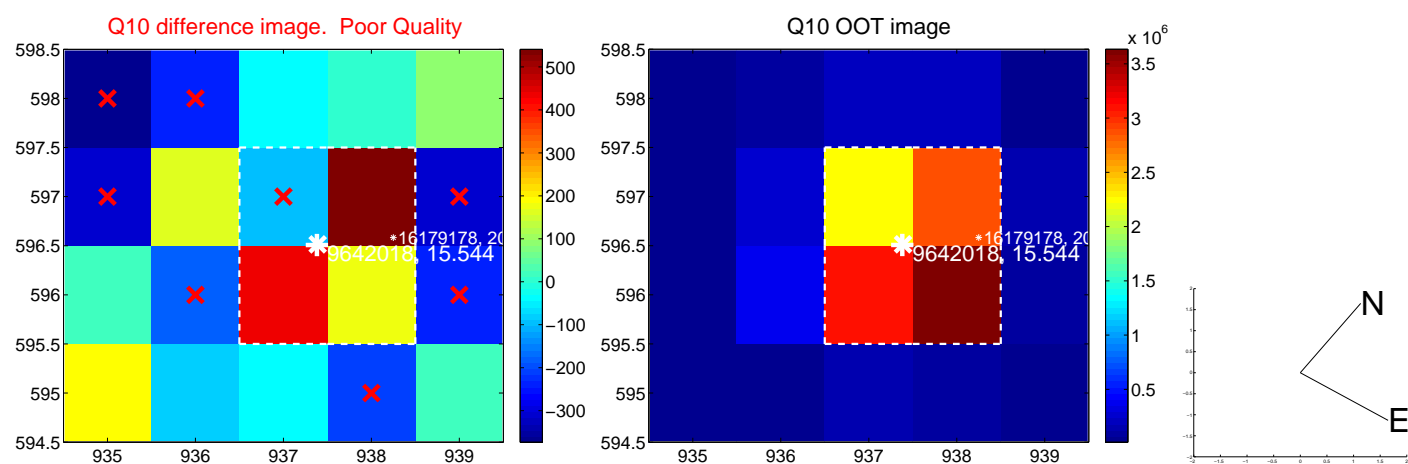
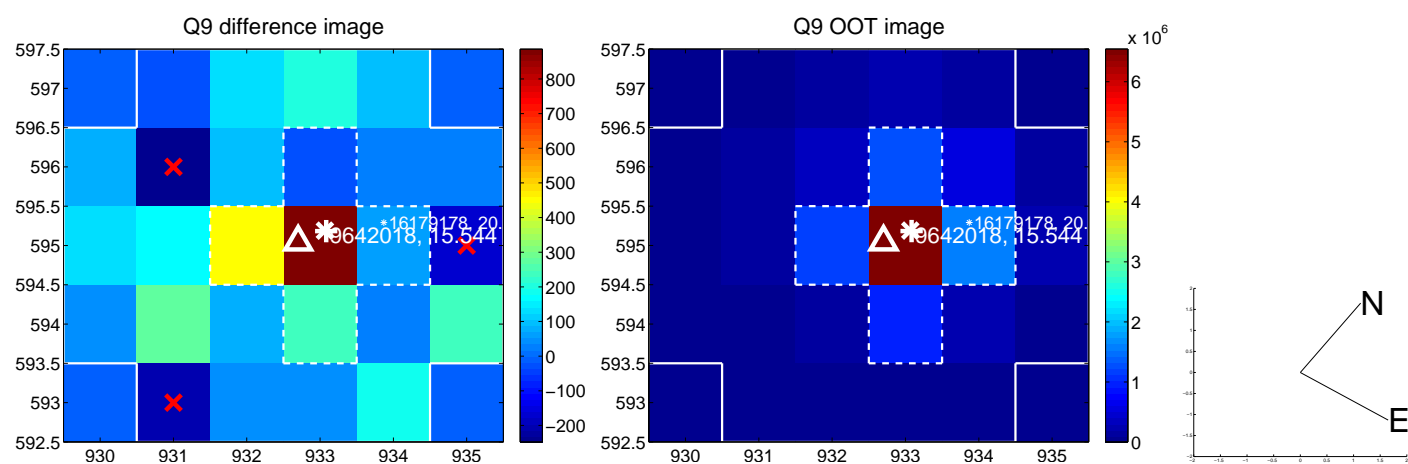


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

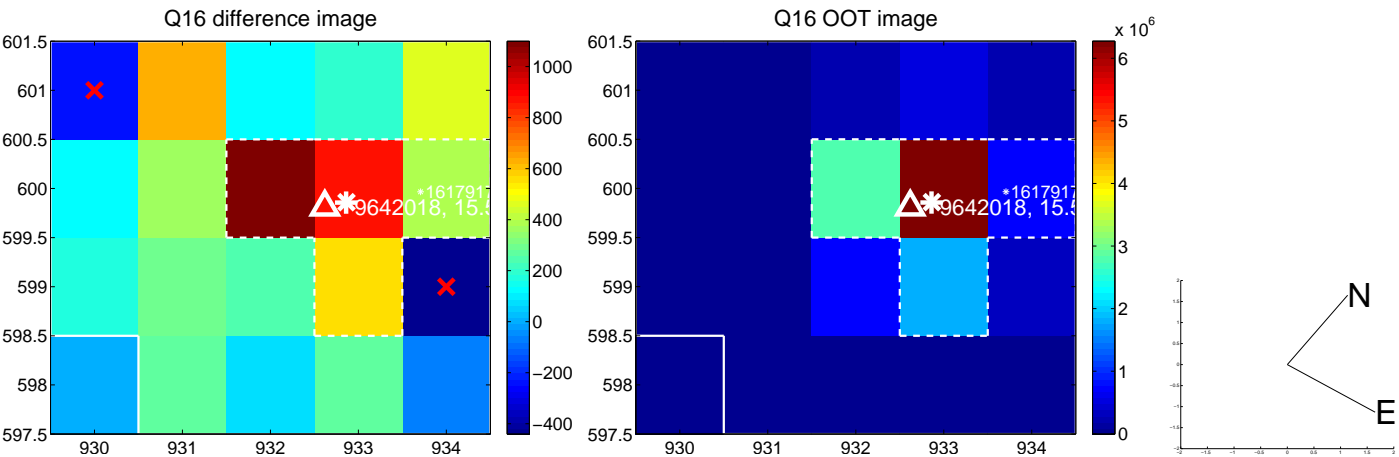
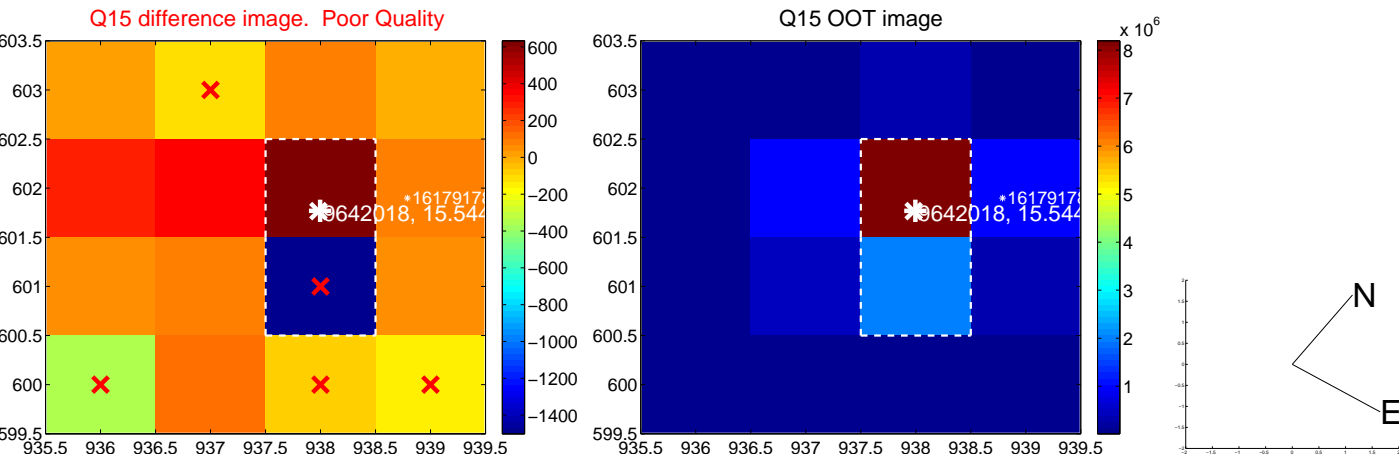
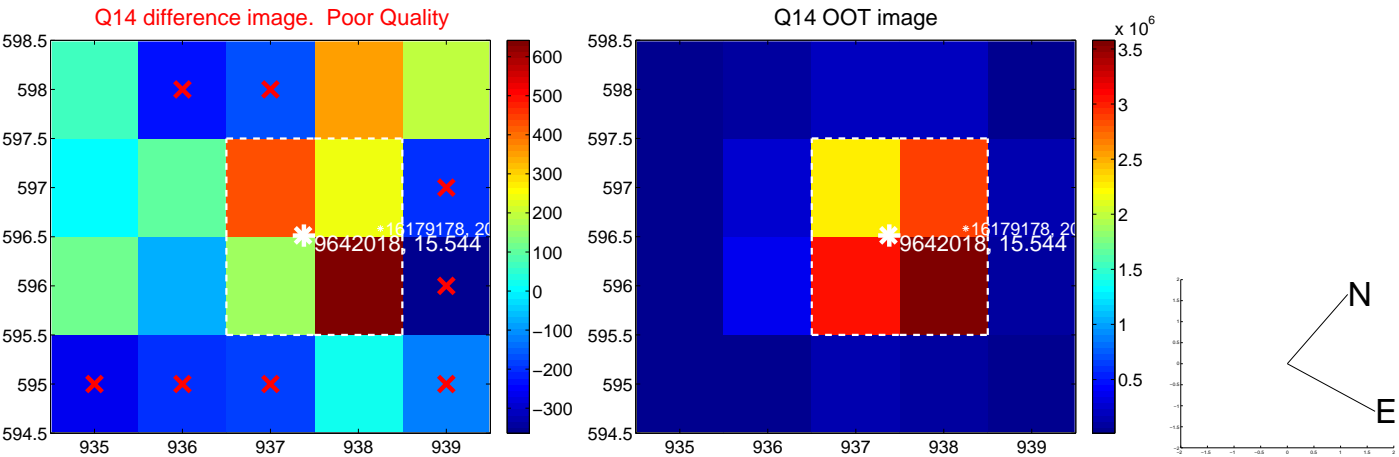
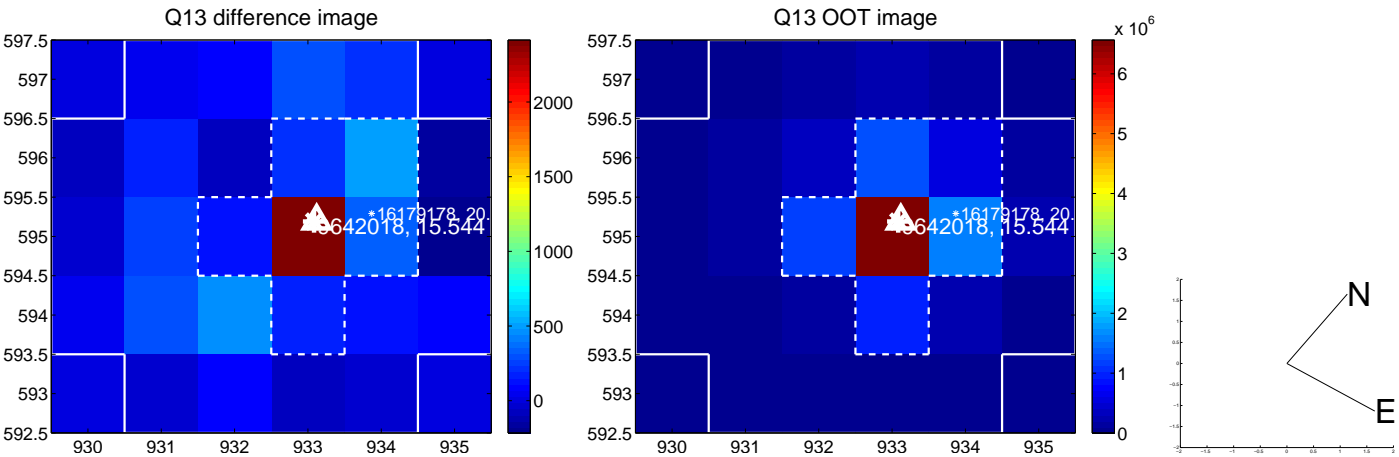




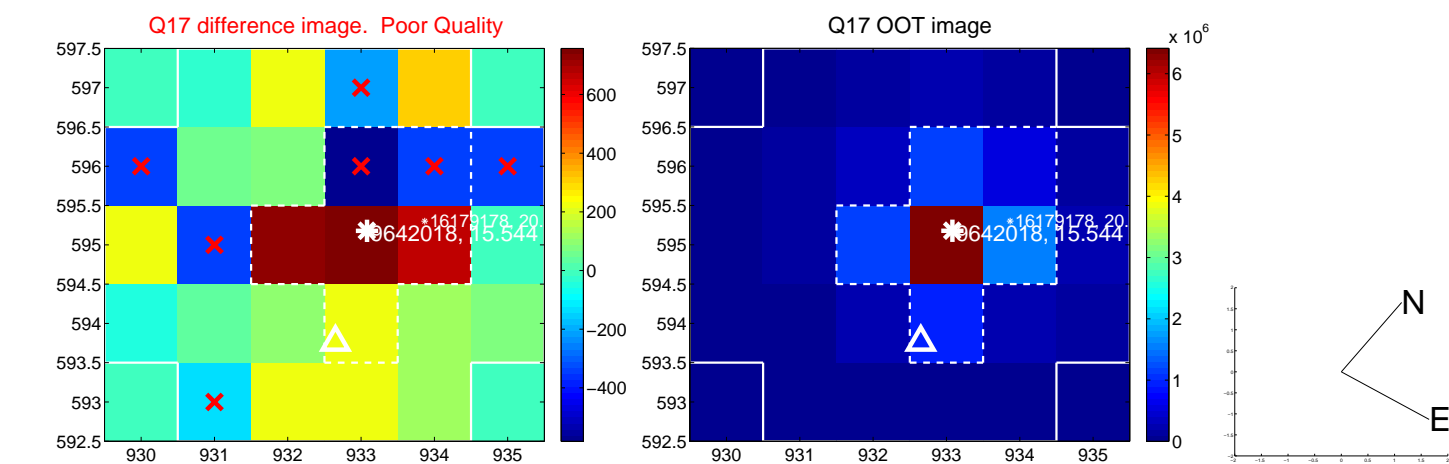
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



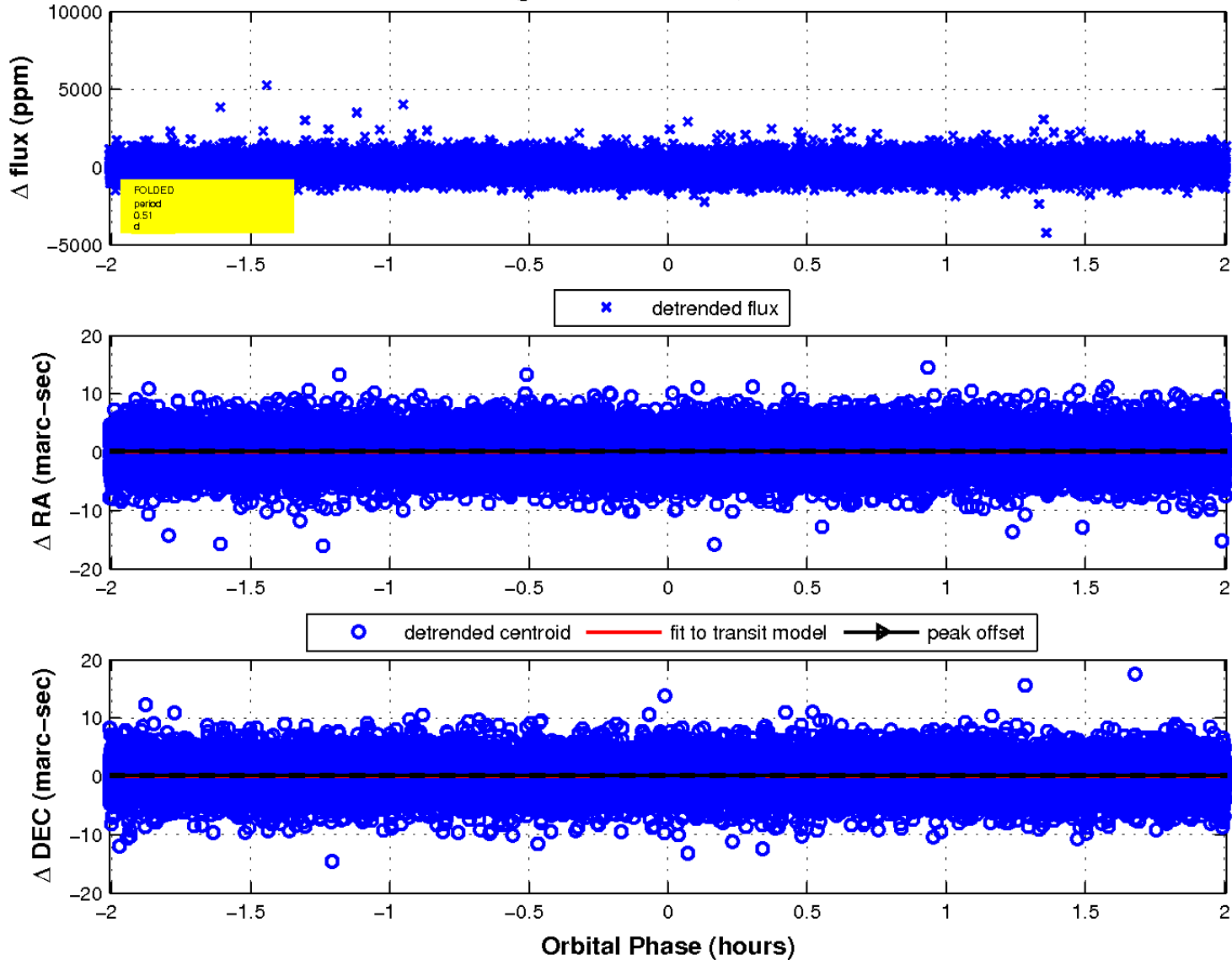
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

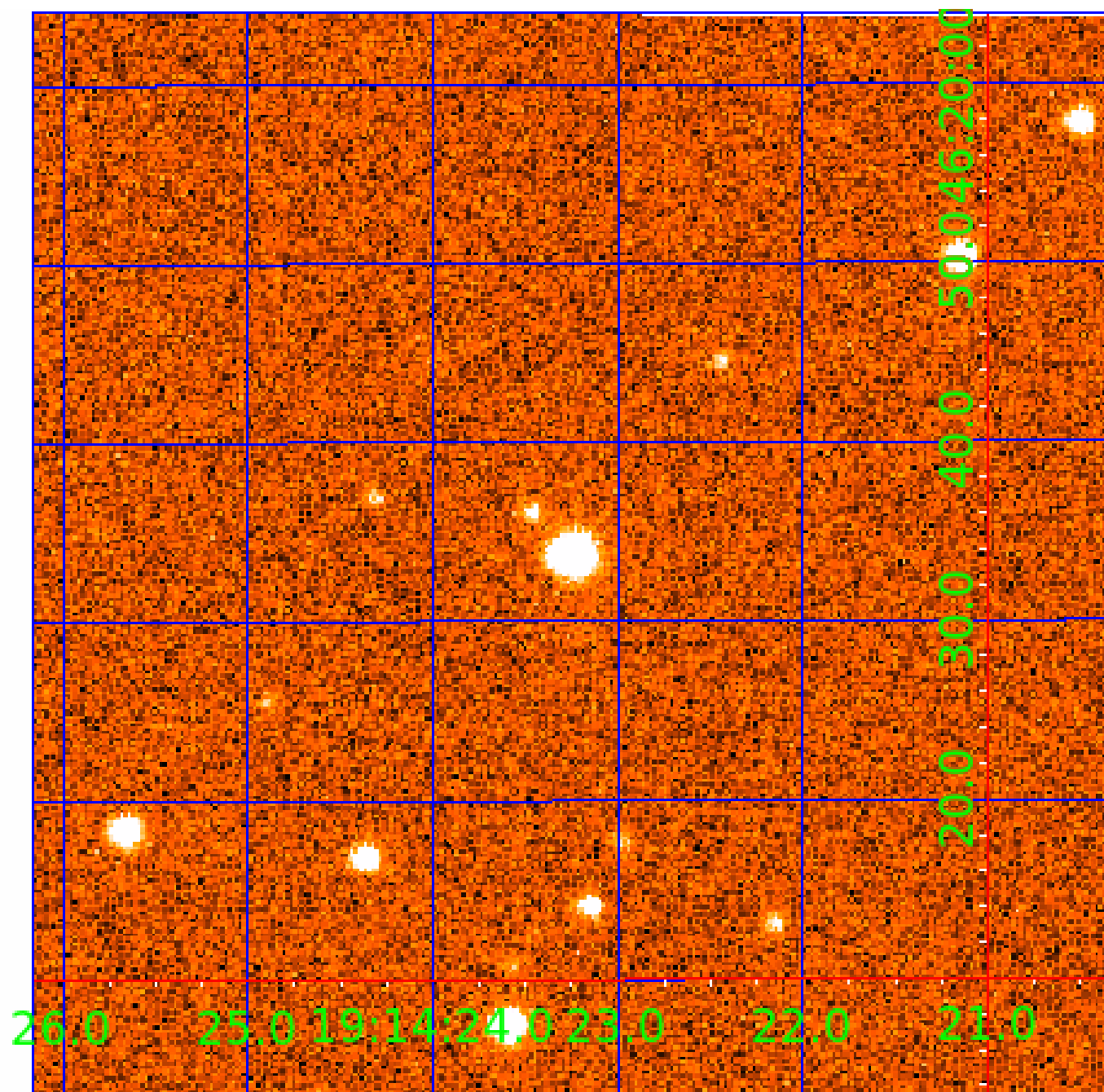


fluxWeightedCentroids, Planet 1 of 2



# UKIRT Image

Declination





# KIC 009642018

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
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## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009642018-01	OBS	FP	0.00	0	1	0	0	MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE
009642018-02	OBS	FP	0.00	1	1	0	0	IS_SEC_TCE

**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.

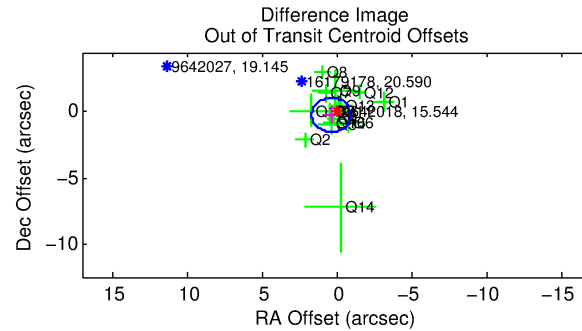
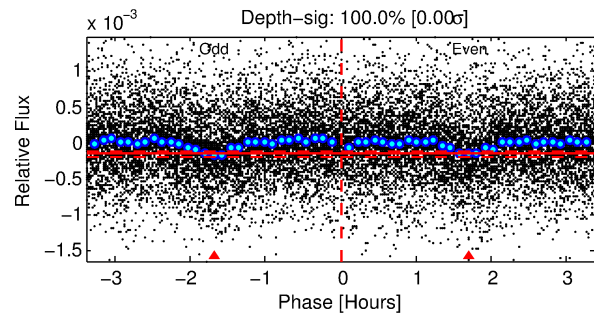
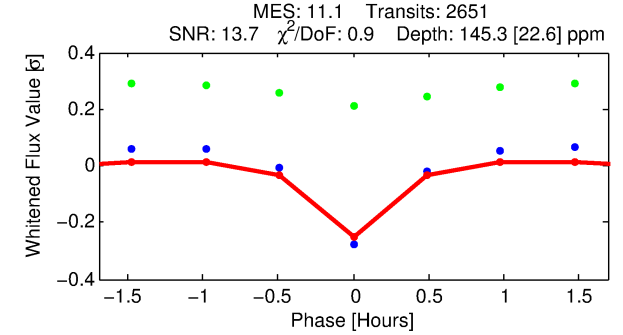
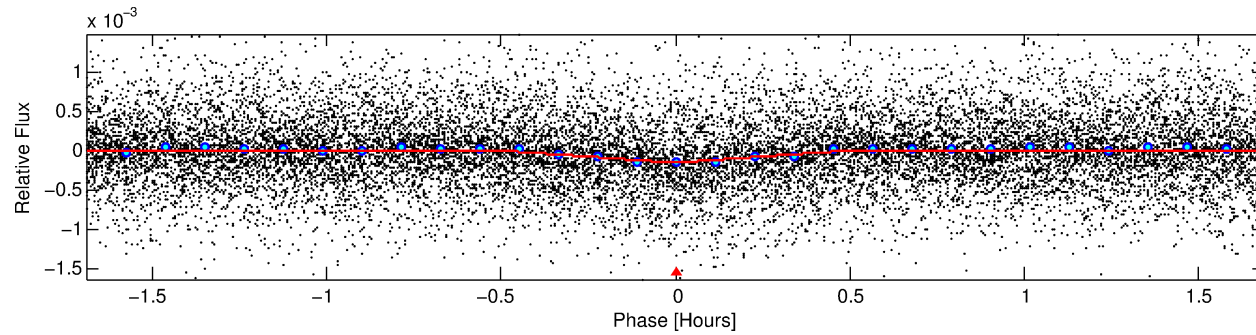
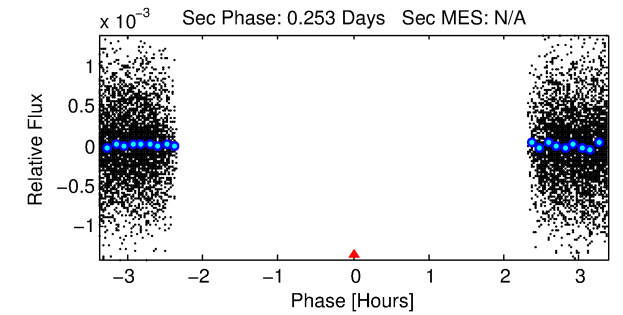
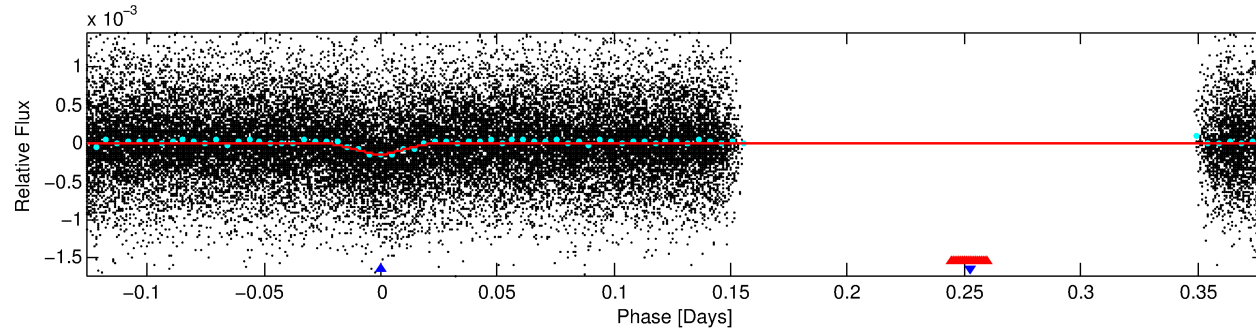
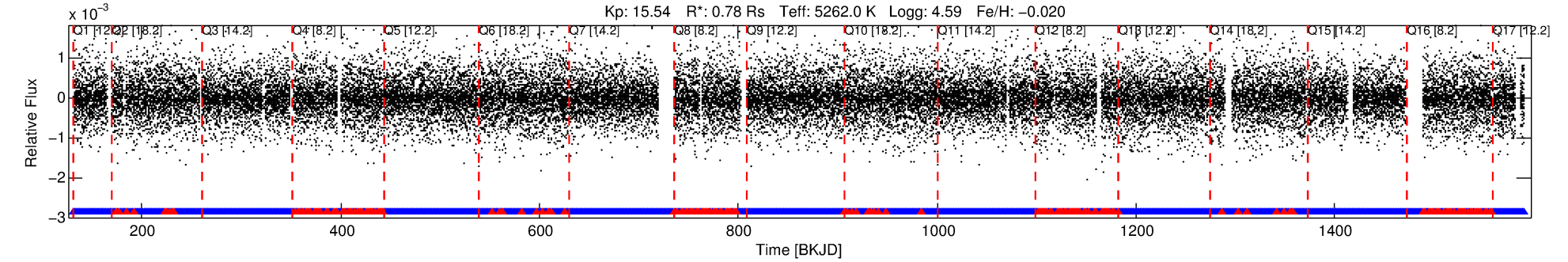
## Ephemeris Match Information For 009642018-02

No Significant Match Found

# DV One-Page Summary

KIC: 9642018 Candidate: 2 of 2 Period: 0.505 d

KOI: K04430.01 Corr: 0.834



## DV Fit Results:

Period = 0.50511 [0.00001] d  
Epoch = 131.5215 [0.0009] BKJD  
Rp/R\* = 0.0139 [0.0044]  
a/R\* = 3.33 [4.01]  
b = 0.90 [0.29]  
Seff = 2997.96 [675.06]  
Teff = 1887 [106] K  
Rp = 1.19 [0.42] Re  
a = 0.0119 [0.0016] AU

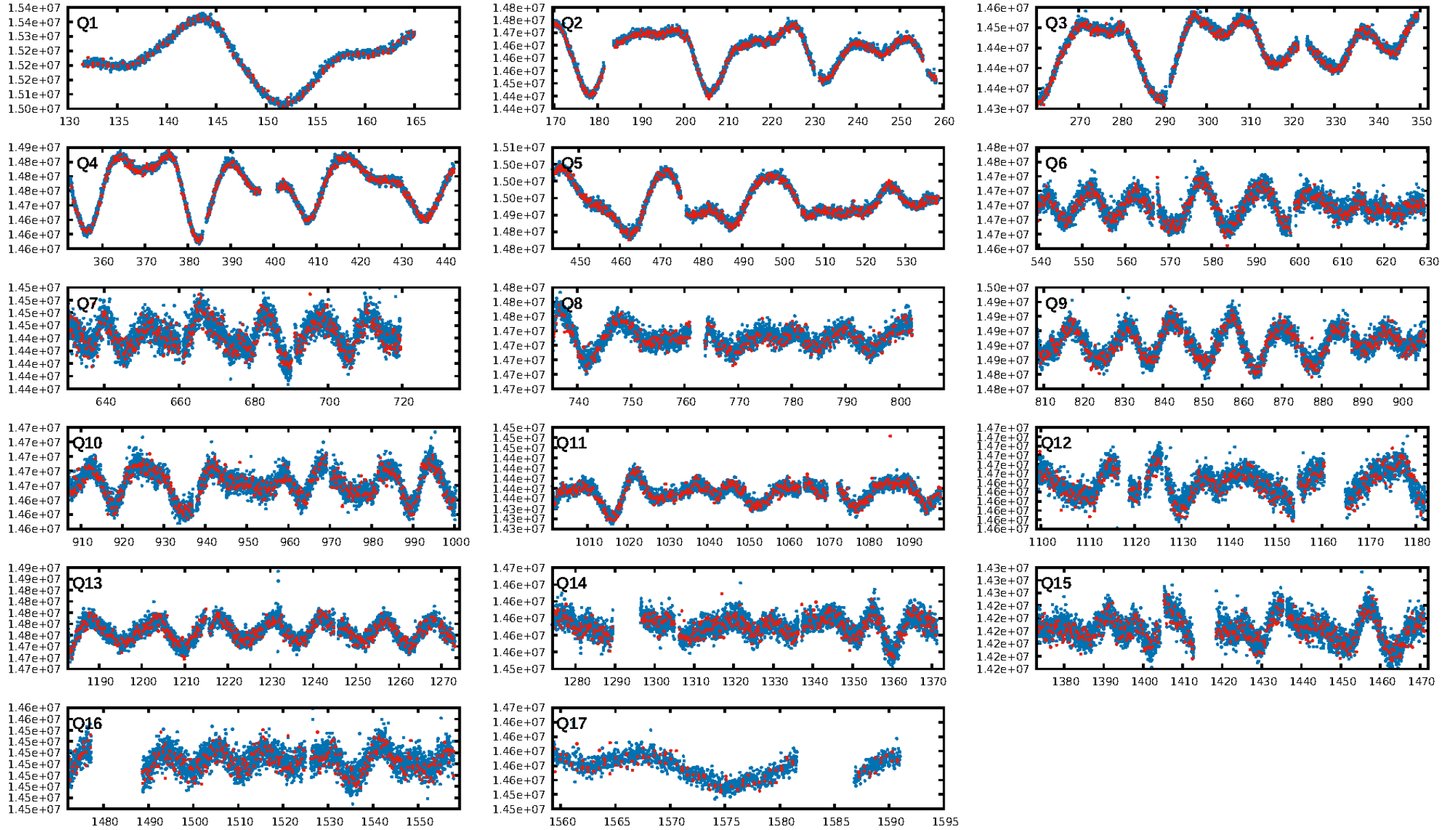
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.0% [0.00σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 4.19e-30  
RollingBand-fgt: 0.91 [2298/2532]  
GhostDiagnostic-chr: 2.373  
Centroid-sig: 0.0%  
Centroid-so: 2.531 arcsec [2.74σ]  
OotOffset-rm: 0.443 arcsec [1.03σ]  
KicOffset-rm: 0.433 arcsec [0.99σ]  
OotOffset-st: 4/3/4/4 [15]  
KicOffset-st: 4/3/4/4 [15]  
DiffImageQuality-fgm: 0.53 [8/15]  
DiffImageOverlap-fno: 0.00 [0/17]

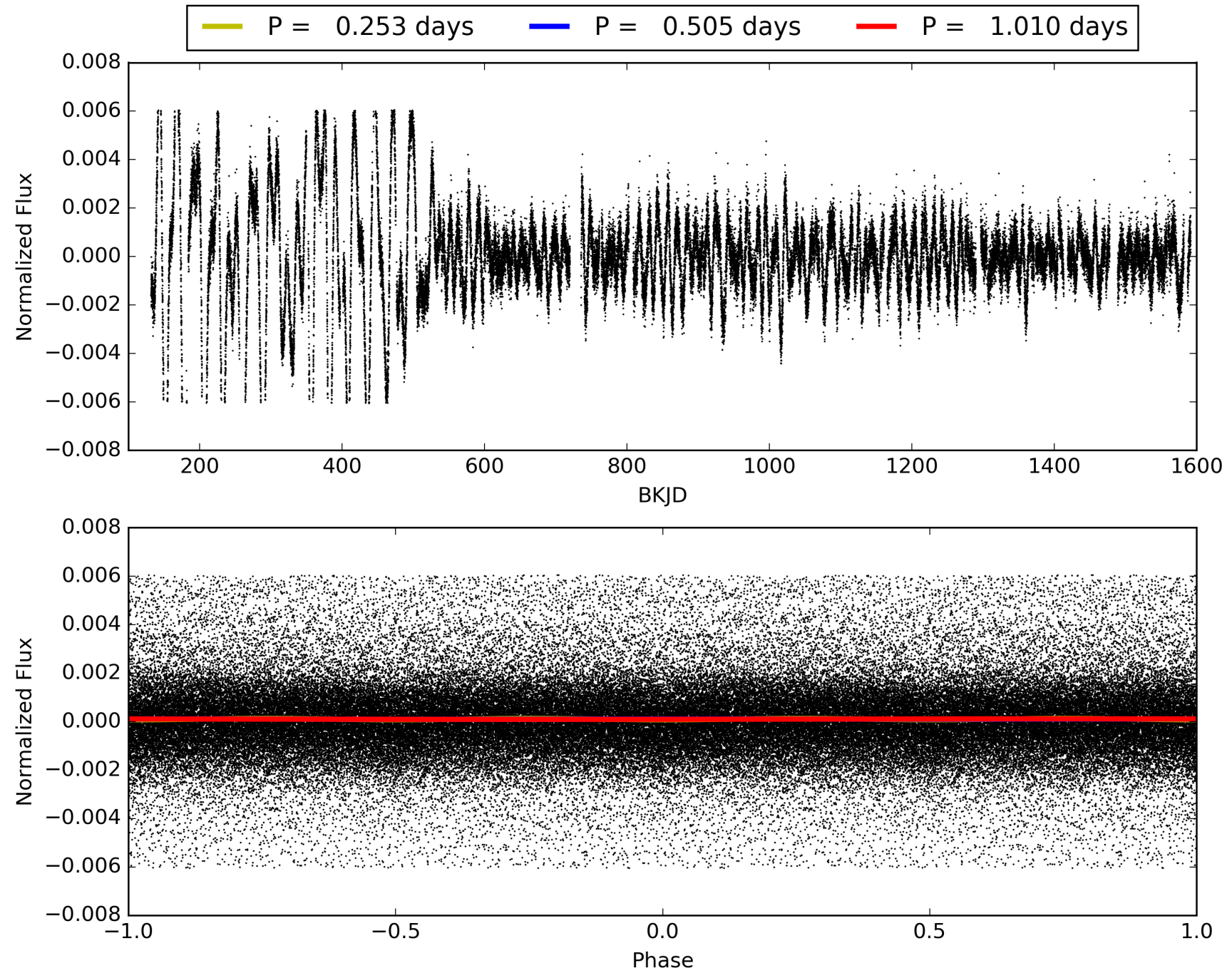
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 14:18:37 Z

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

# TCE 009642018-02, PDC Light Curves



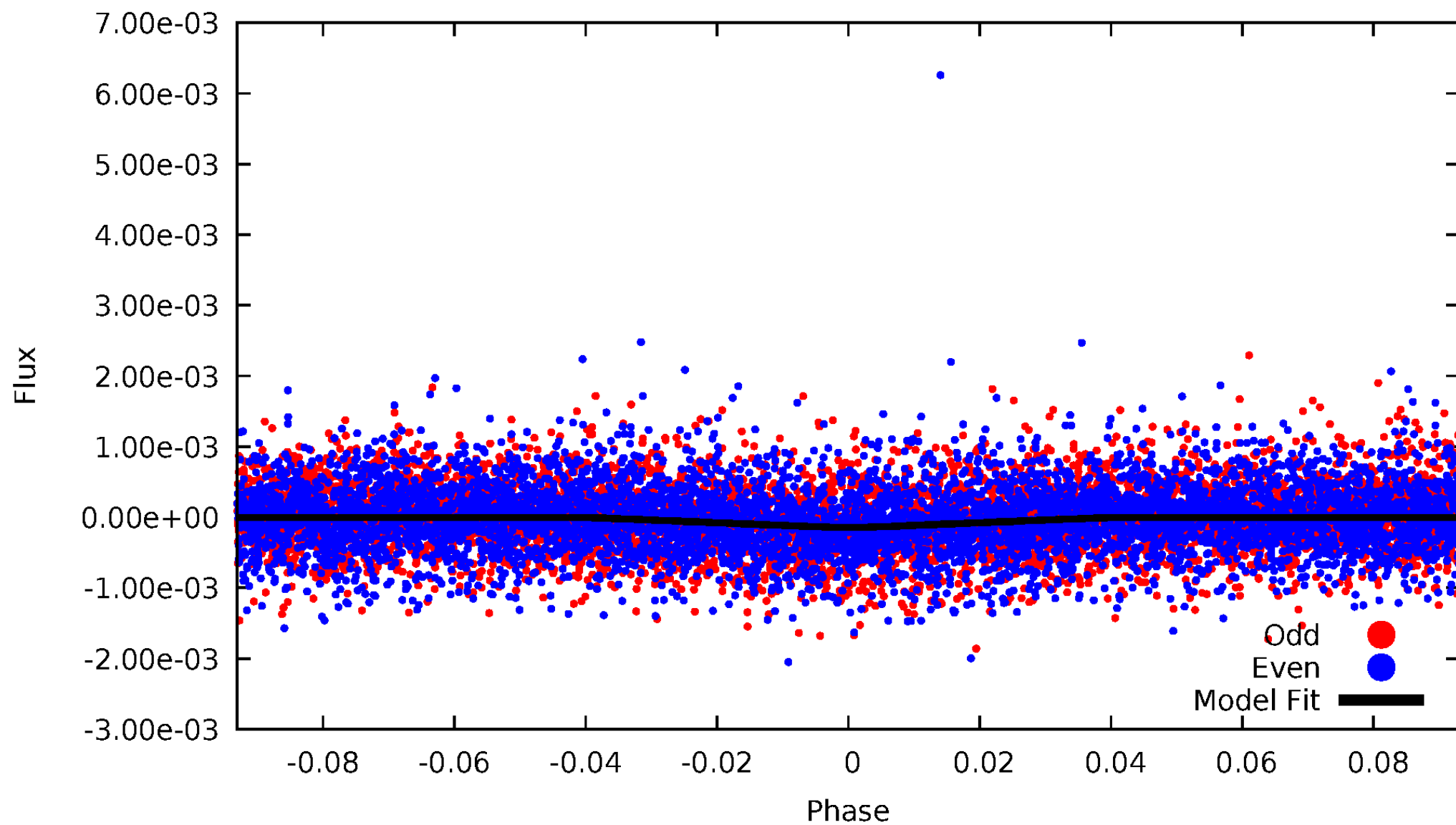
TCE 009642018-02





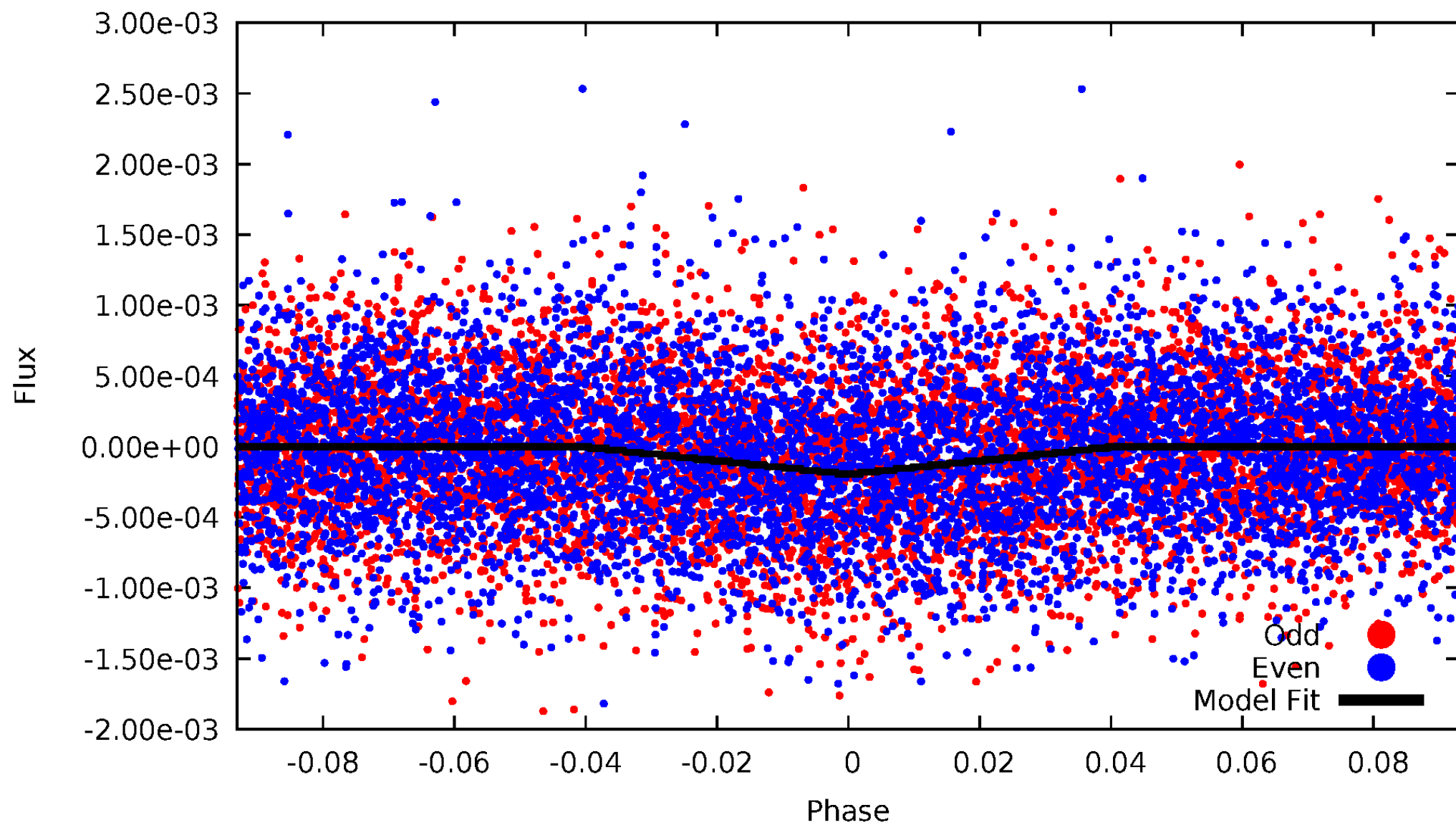
# DV Odd/Even

TCE 009642018-02



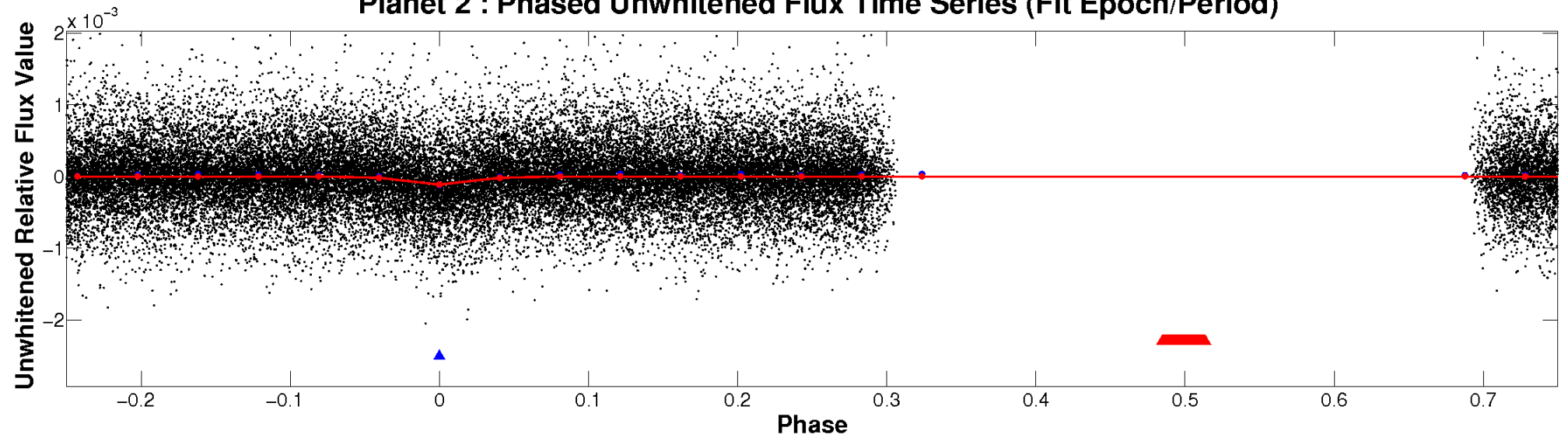
# ALT Odd/Even

TCE 009642018-02

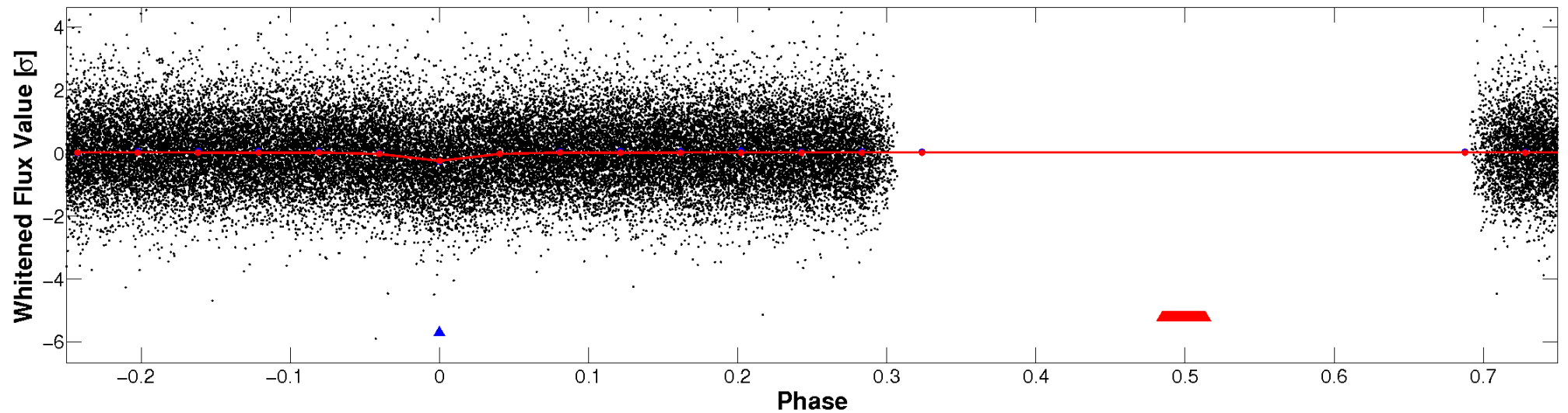


# Non-Whitened Vs. Whitened Light Curve

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

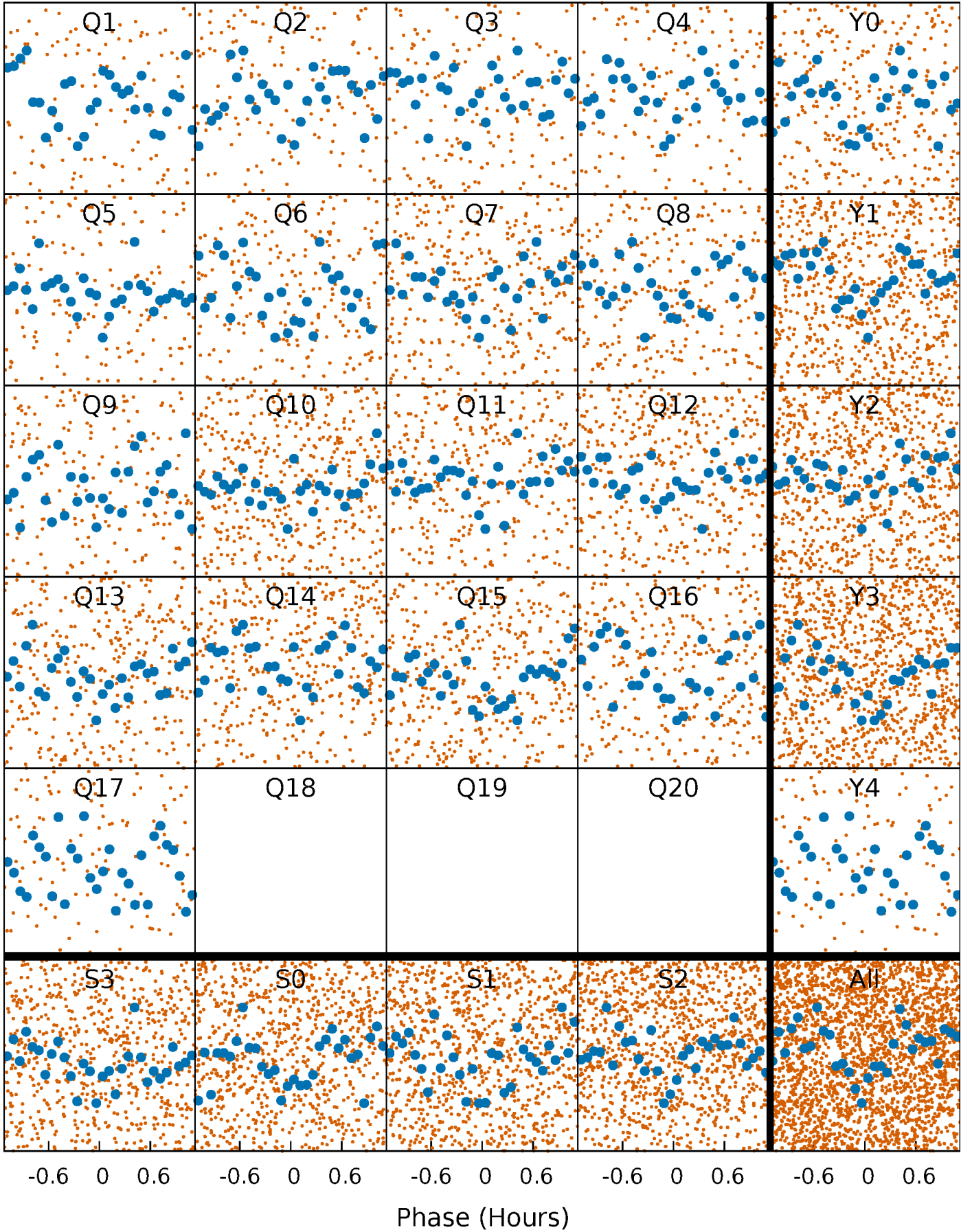


**Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

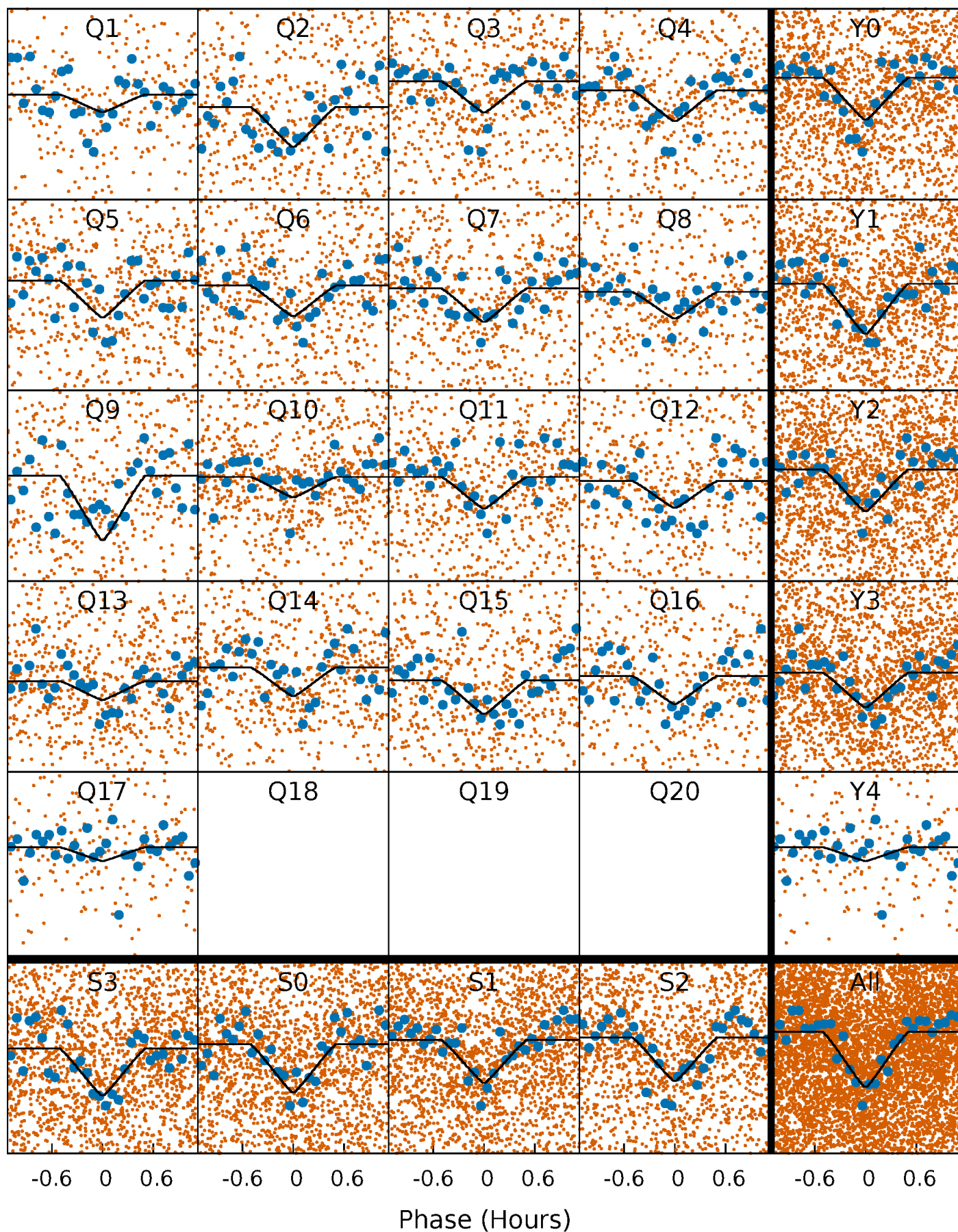
TCE 009642018-02   P= 0.505108 Days    $T_0=131.521470$  (BKJD)





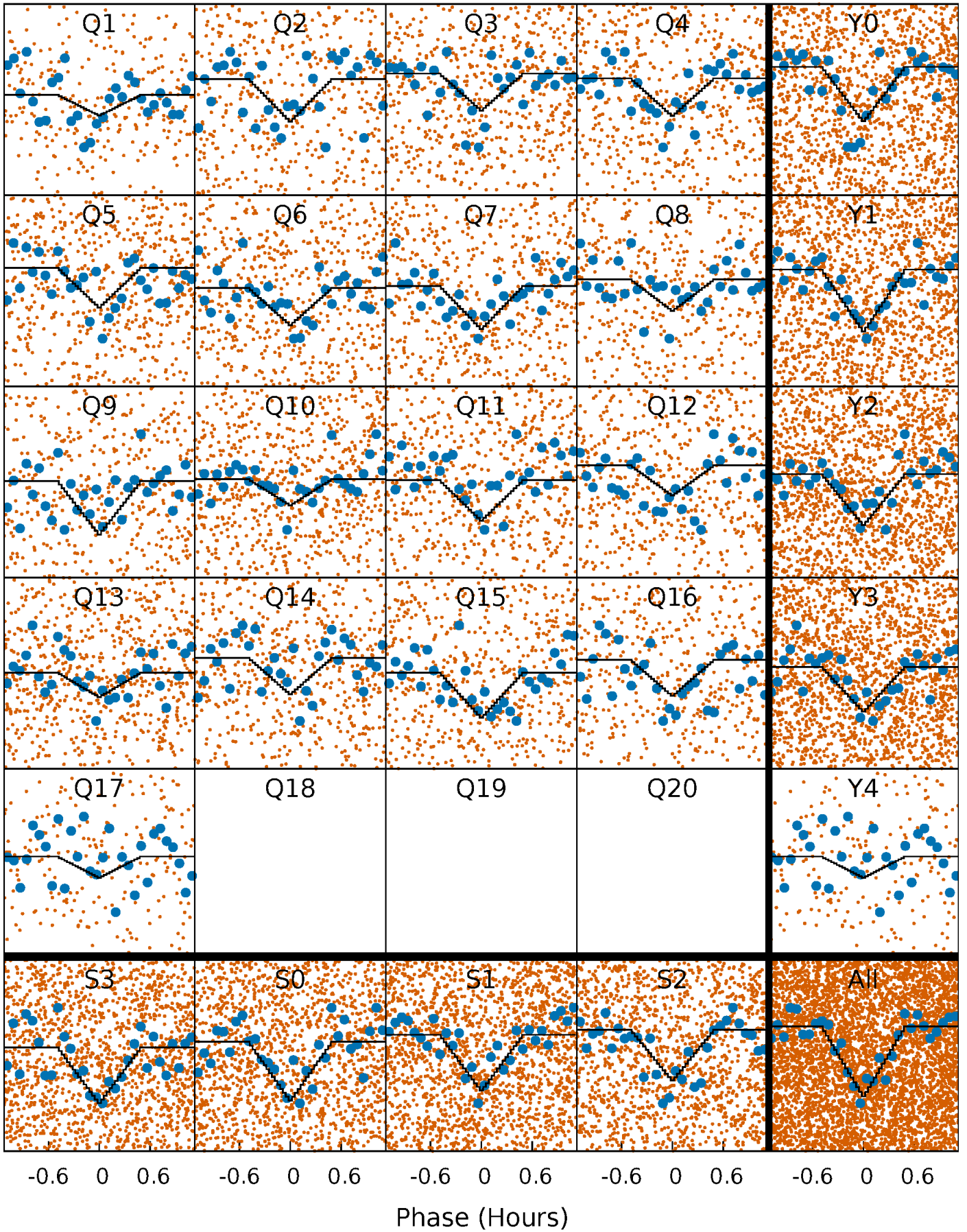
# DV Quarter-Phased Transit Curves

TCE 009642018-02 P= 0.505108 Days  $T_0=131.521470$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

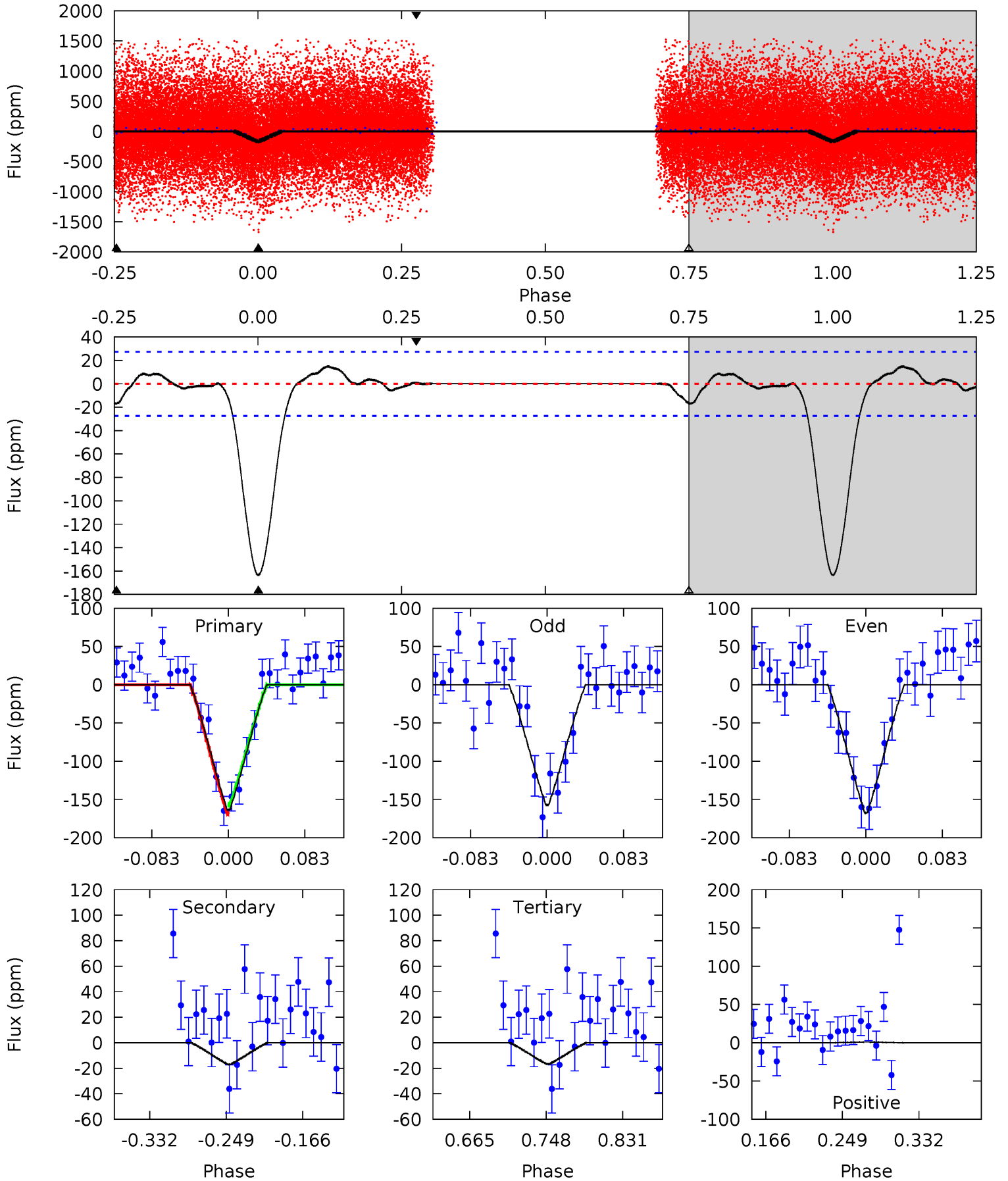
TCE 009642018-02 P= 0.505108 Days  $T_0=131.521470$  (BKJD)



# DV Model-Shift Uniqueness Test

009642018-02, P = 0.505108 Days, E = 131.016362 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
27.4	2.84	2.80	0.16	4.60	1.73	1.07	24.6	27.3	0.04	2.68	0.87	0.98	0.08	0.89

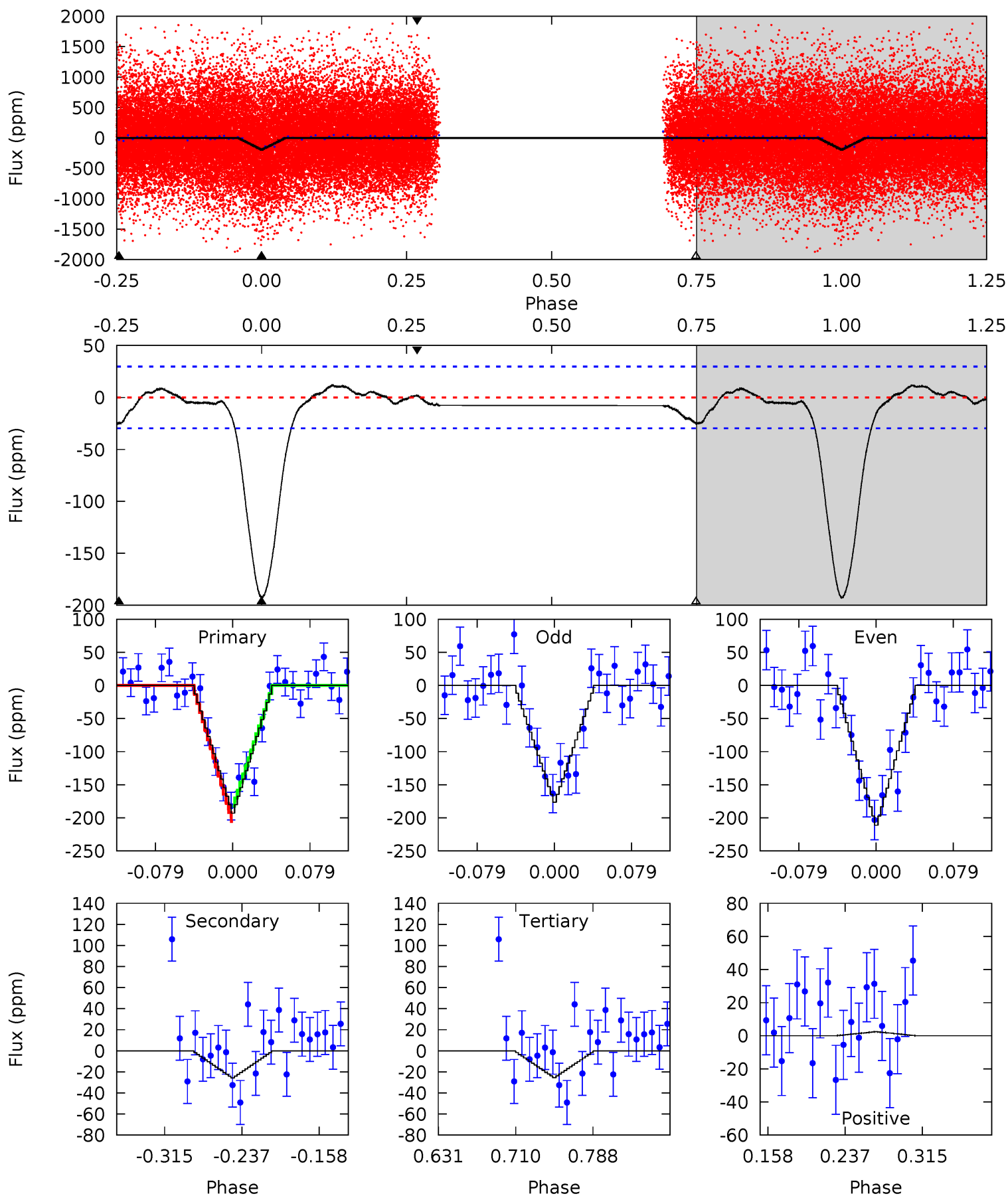




# Alt Model-Shift Uniqueness Test

009642018-02, P = 0.505108 Days, E = 131.016362 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
30.0	4.00	3.95	0.38	4.61	1.76	1.25	26.0	29.6	0.05	3.62	2.71	0.93	0.06	1.81



### Stellar Parameters For KIC 009642018

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5262^{+158}_{-142}$	$4.590^{+0.032}_{-0.104}$	$-0.020^{+0.300}_{-0.300}$	$0.783^{+0.122}_{-0.066}$	$0.875^{+0.062}_{-0.093}$	$2.569^{+0.439}_{-0.836}$
	+3%/-3%	+1%/-2%	+1500%/-1500%	+16%/-8%	+7%/-11%	+17%/-33%
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 009642018-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-17 \pm 6$	$1.23^{+0.41}_{-0.40}$	$2675^{+115}_{-99}$	$3132^{+619}_{-557}$	$0.833^{+1.111}_{-0.413}$
Alt.	$-26 \pm 6$	$1.21^{+0.40}_{-0.36}$	$2671^{+111}_{-95}$	$3460^{+552}_{-445}$	$1.358^{+1.453}_{-0.668}$

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

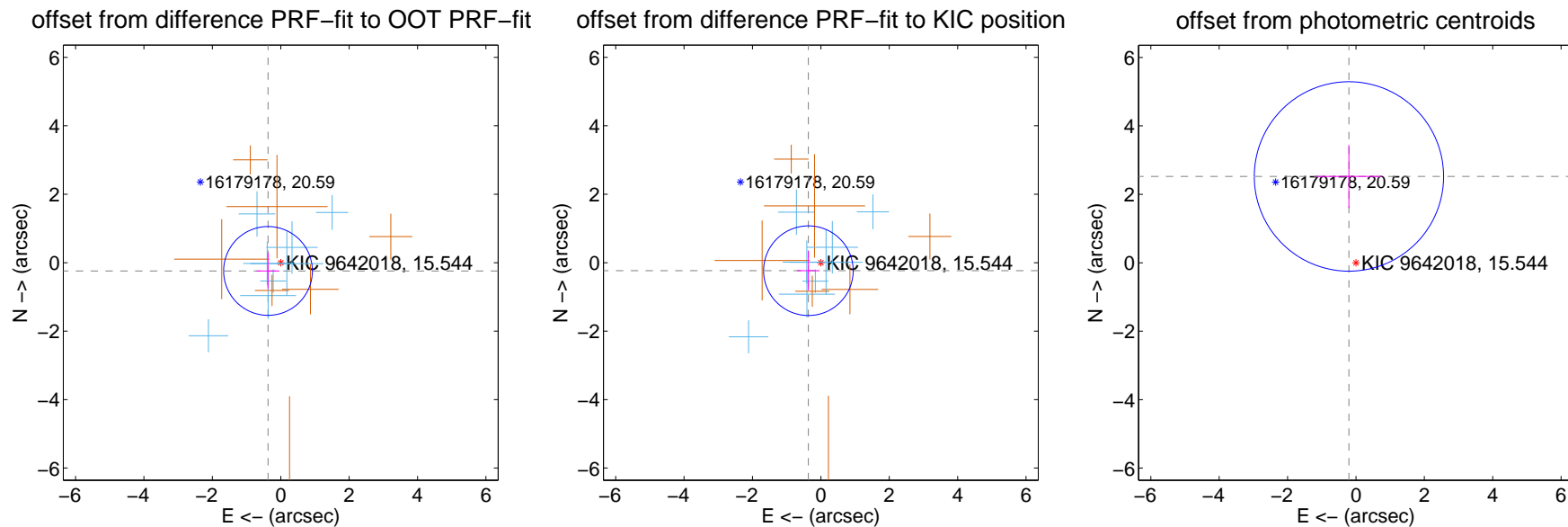
## DV Centroid Data

Supplemental centroid analysis for 009642018-02. Kepler magnitude: 15.54. Transit SNR 13.74

There are 8 quarters with good PRF difference image offsets

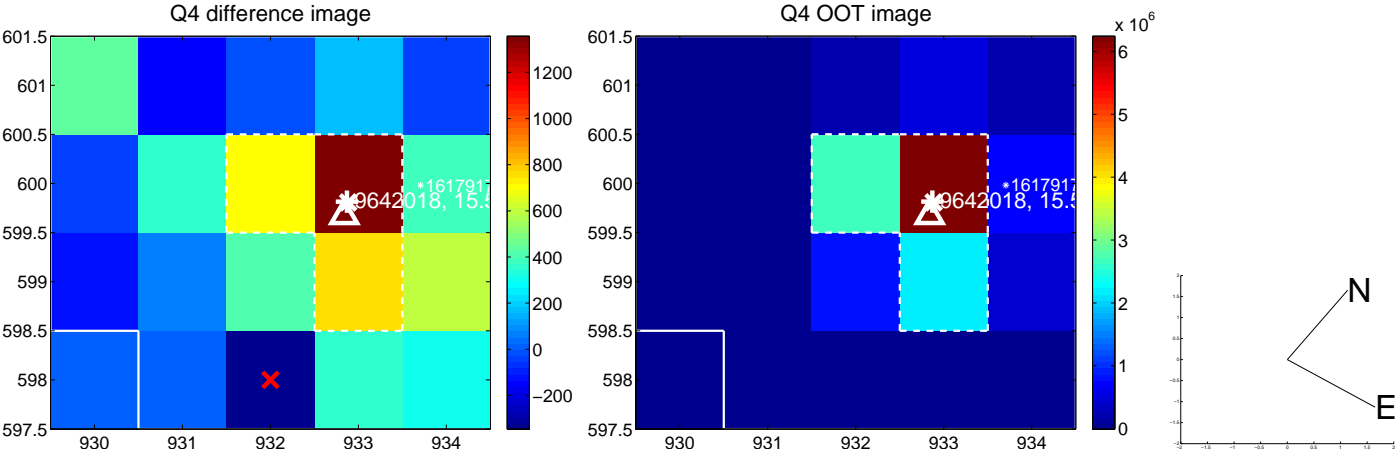
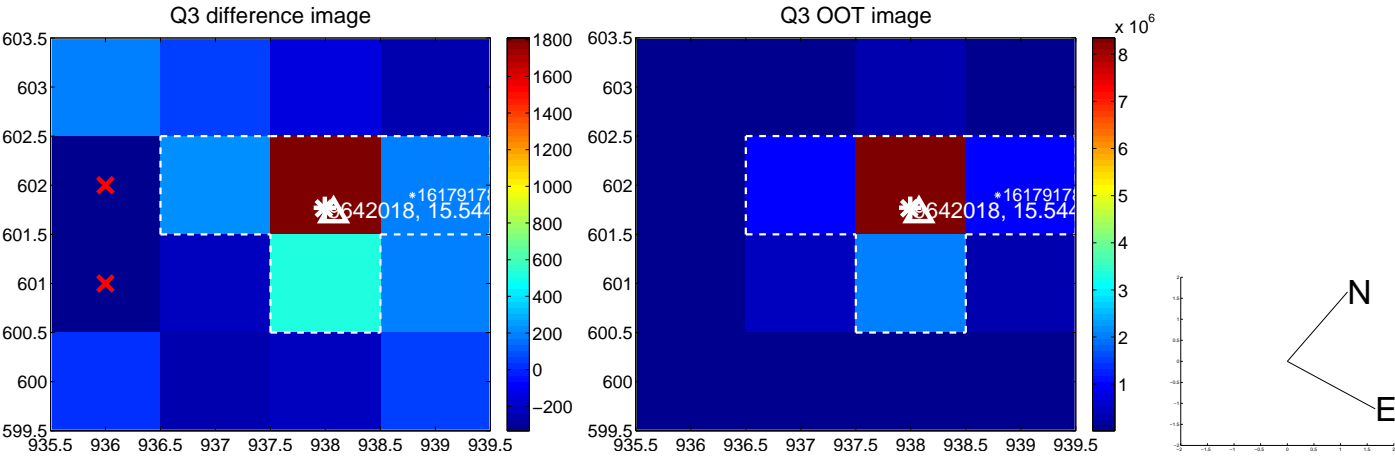
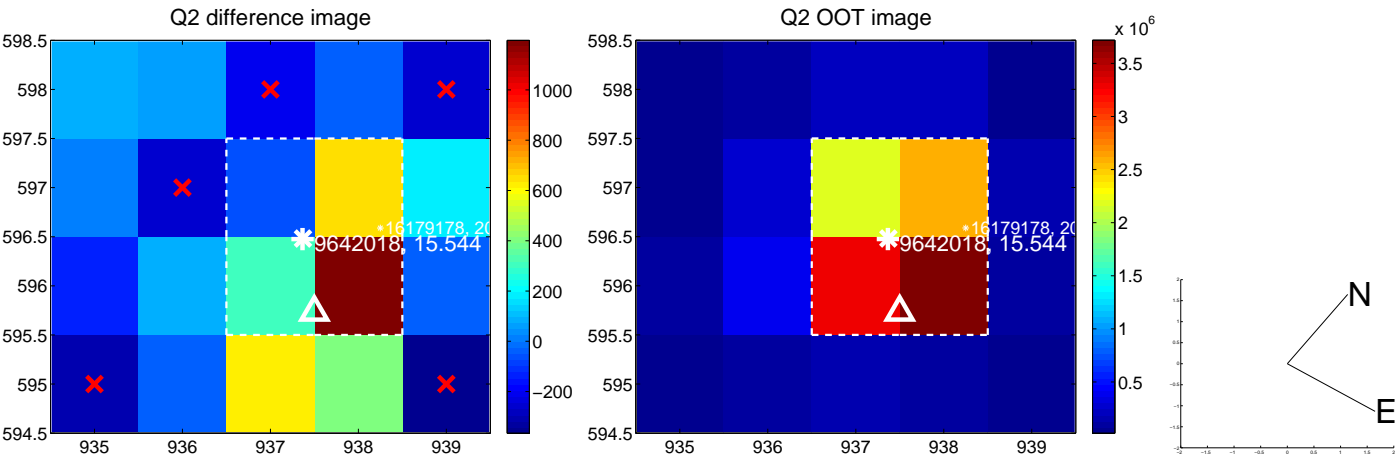
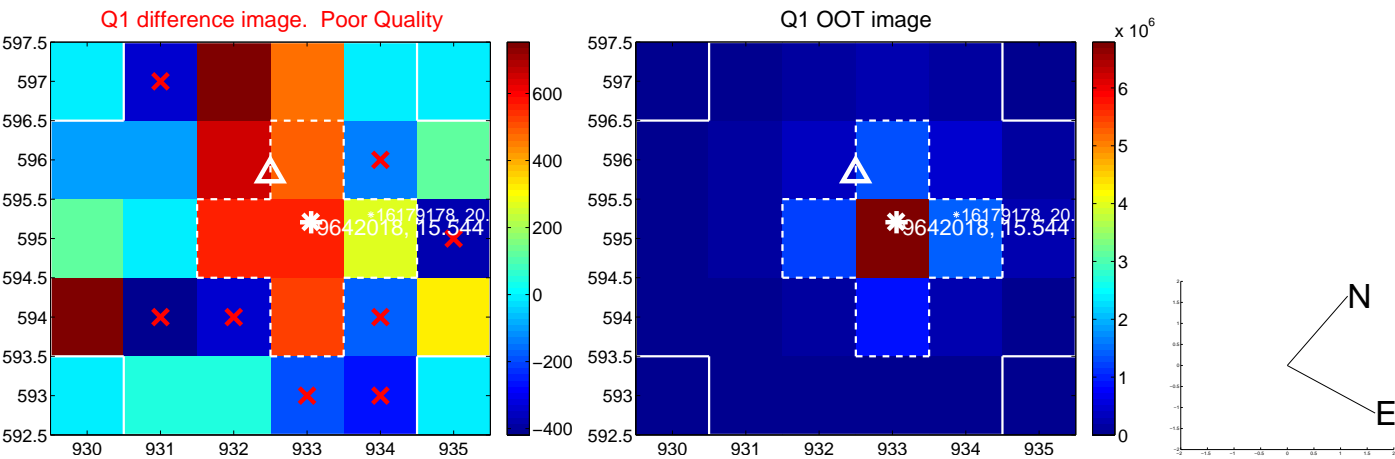
The direct PRF centroid is offset from the target star catalog position by about 0.02 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.443 \pm 0.432$	1.03	$0.372 \pm 0.336$	$-0.241 \pm 0.524$
PRF-fit source offset from KIC position	$0.433 \pm 0.437$	0.99	$0.365 \pm 0.331$	$-0.234 \pm 0.576$
photometric centroid source offset	$2.53 \pm 0.92$	2.74	$0.21 \pm 0.97$	$2.52 \pm 0.92$

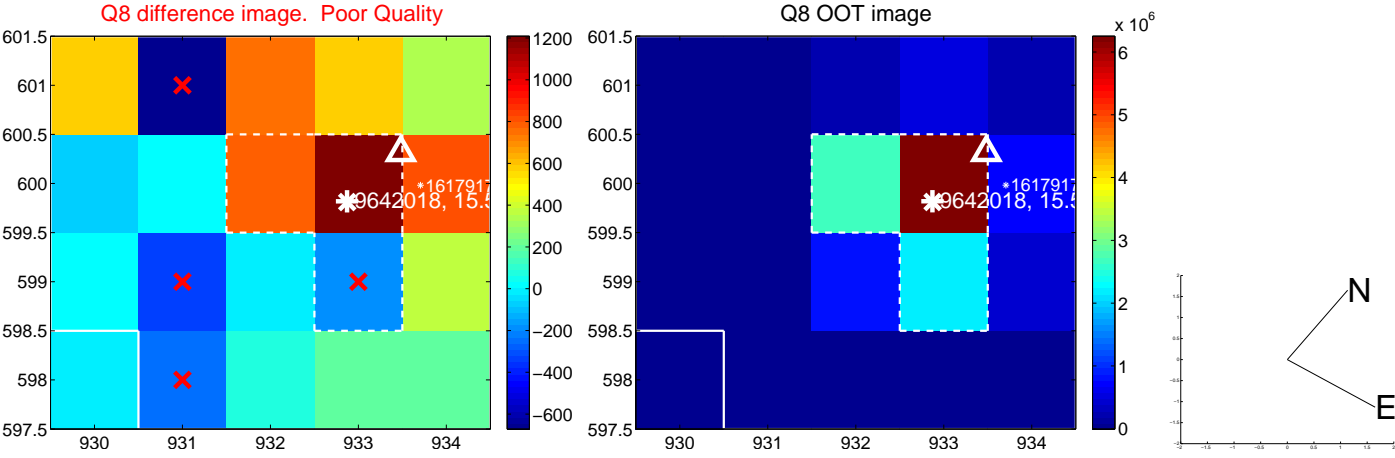
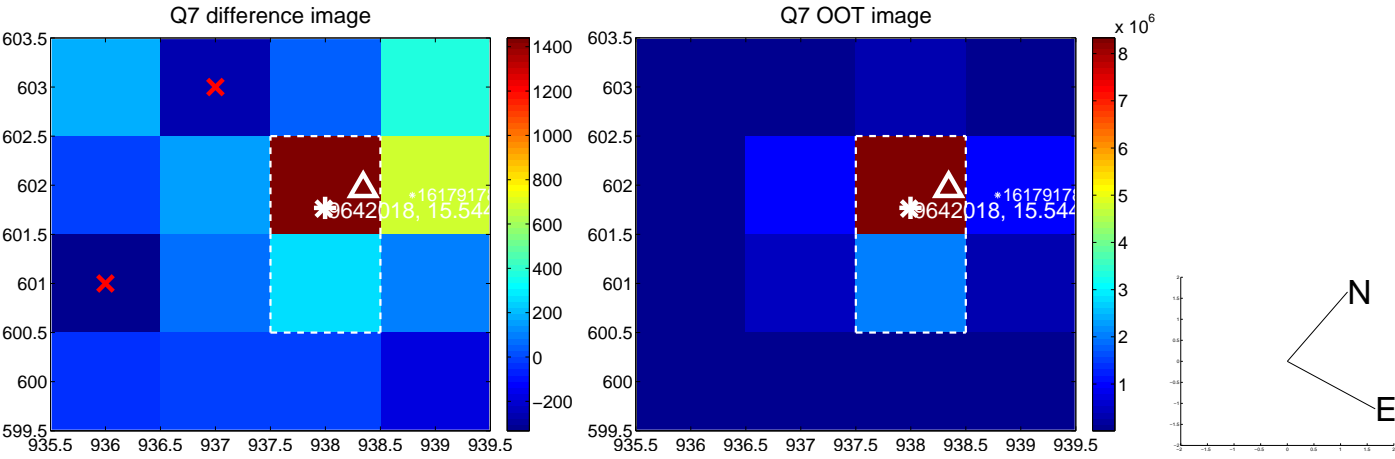
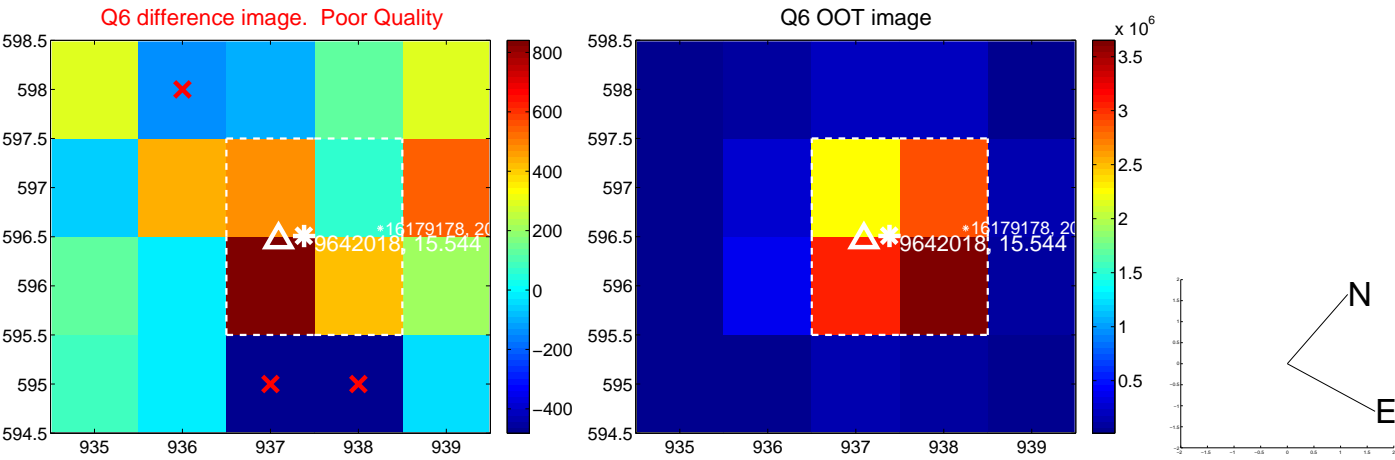
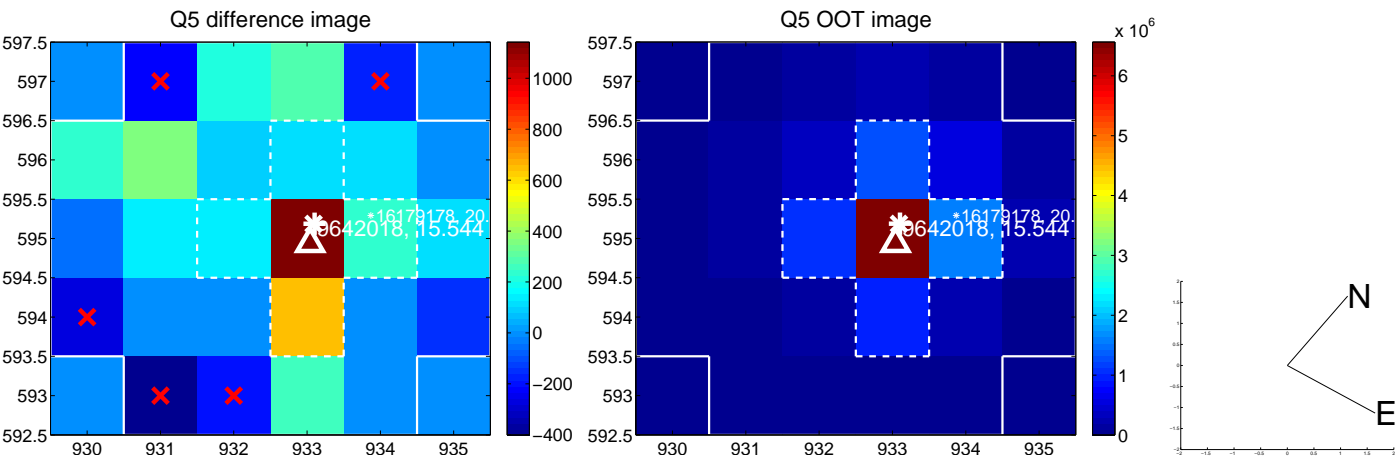


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

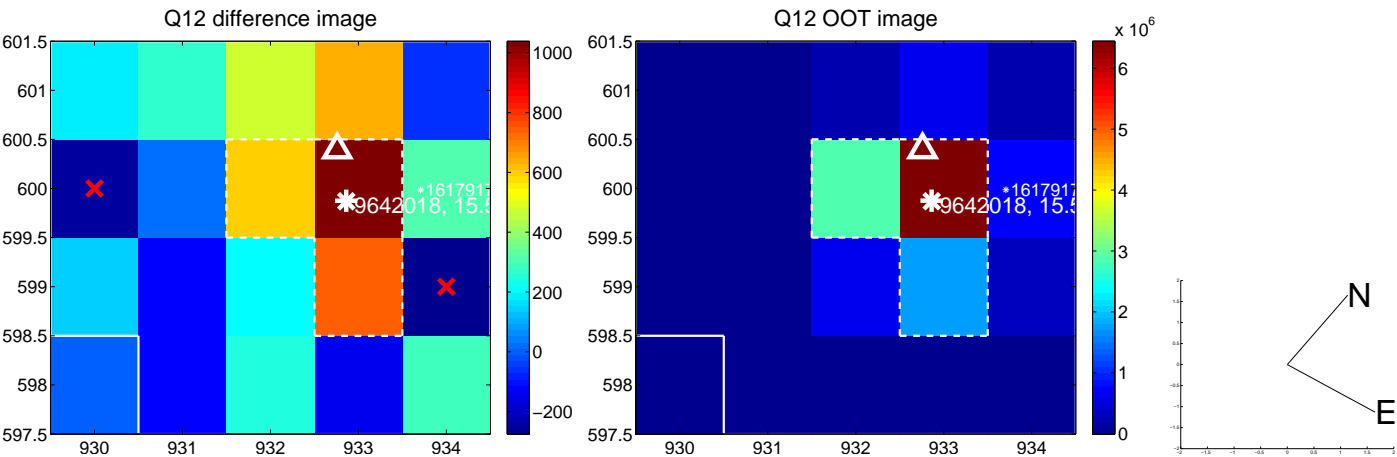
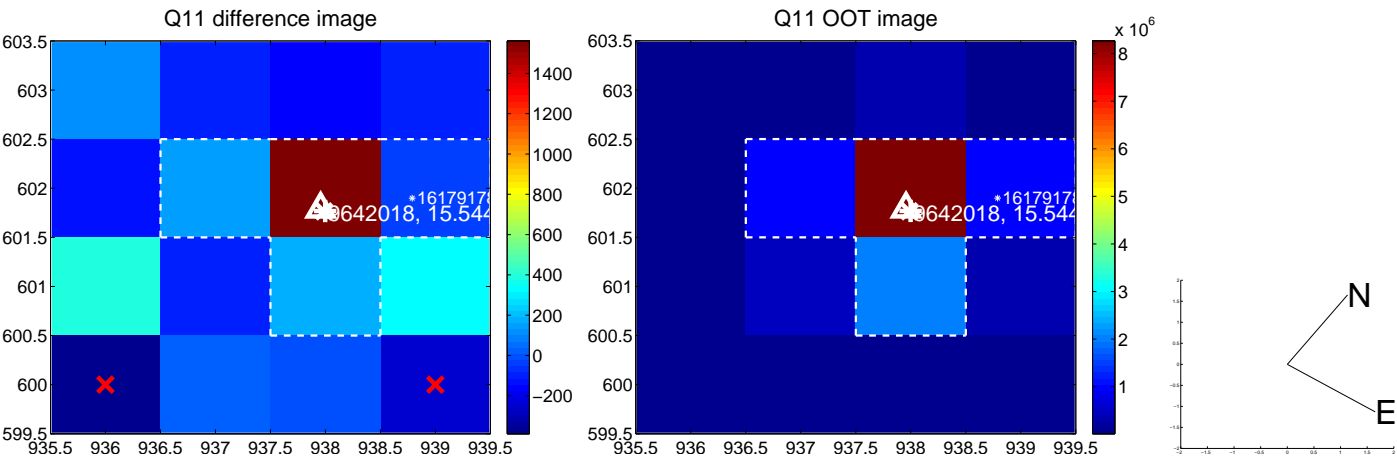
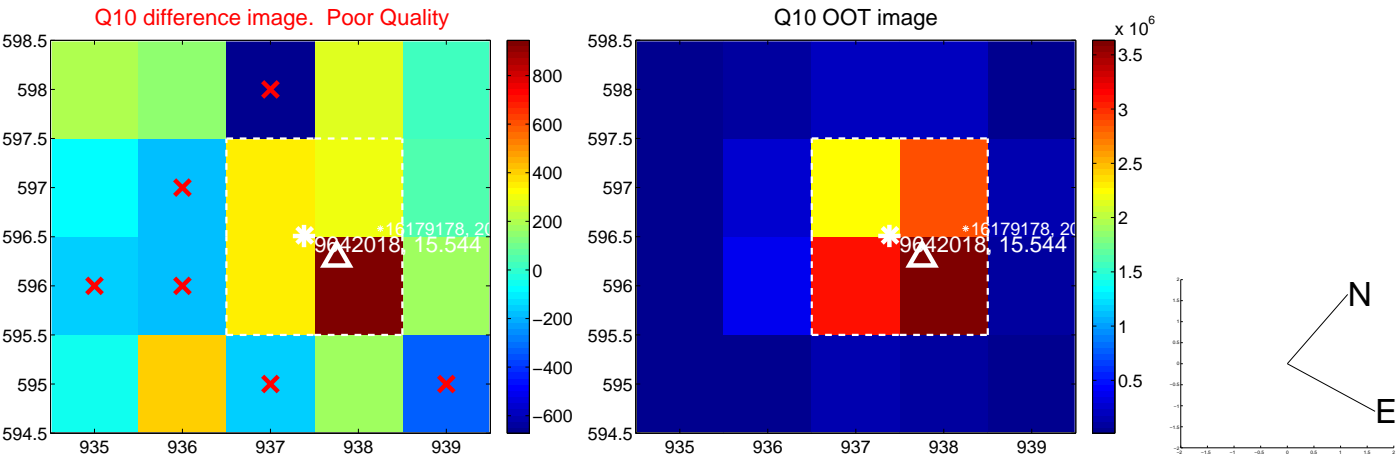
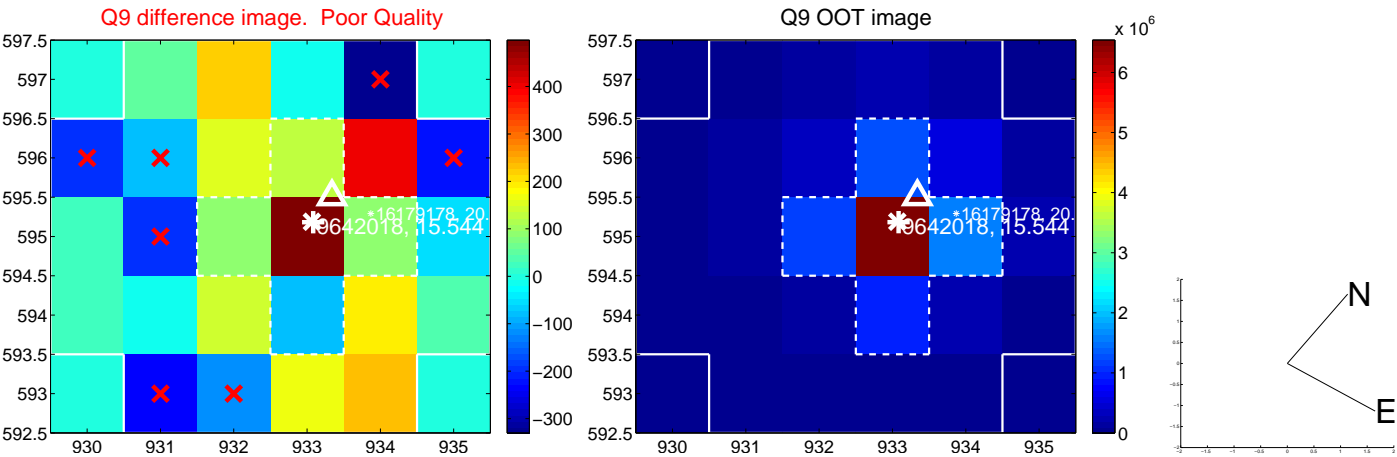
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



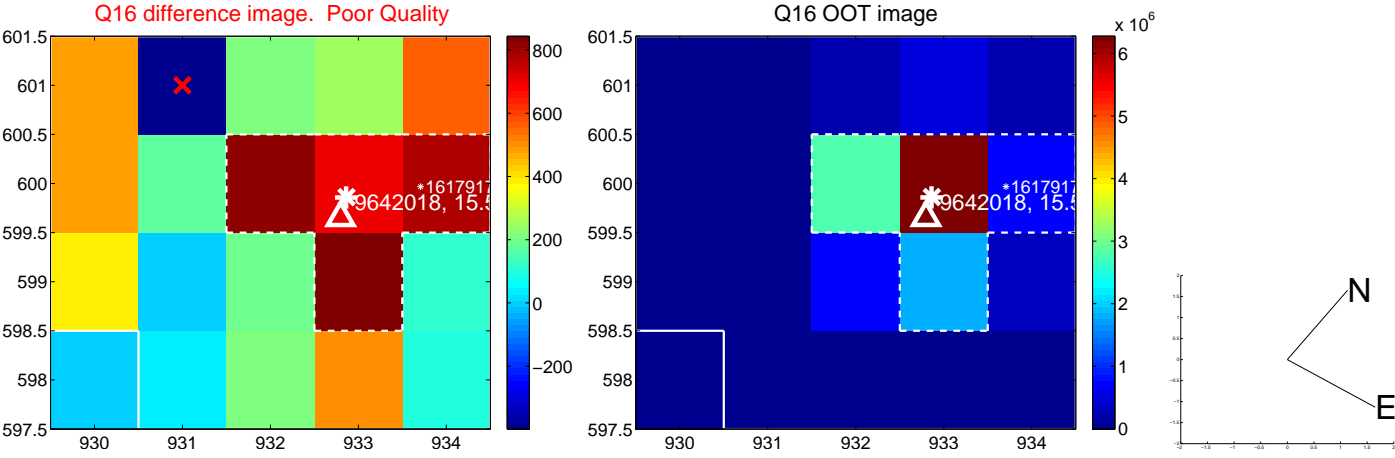
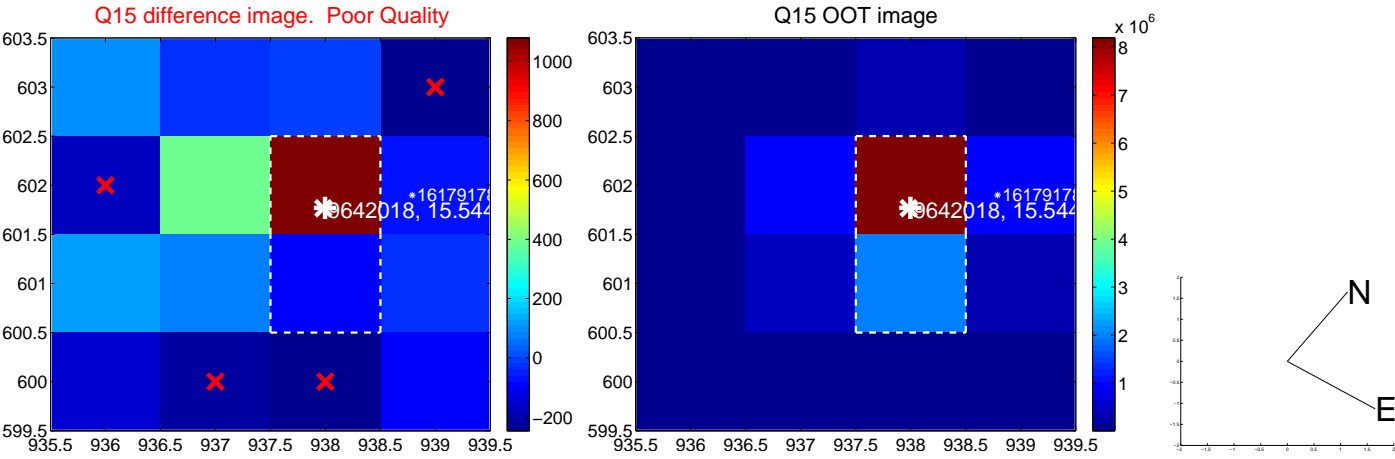
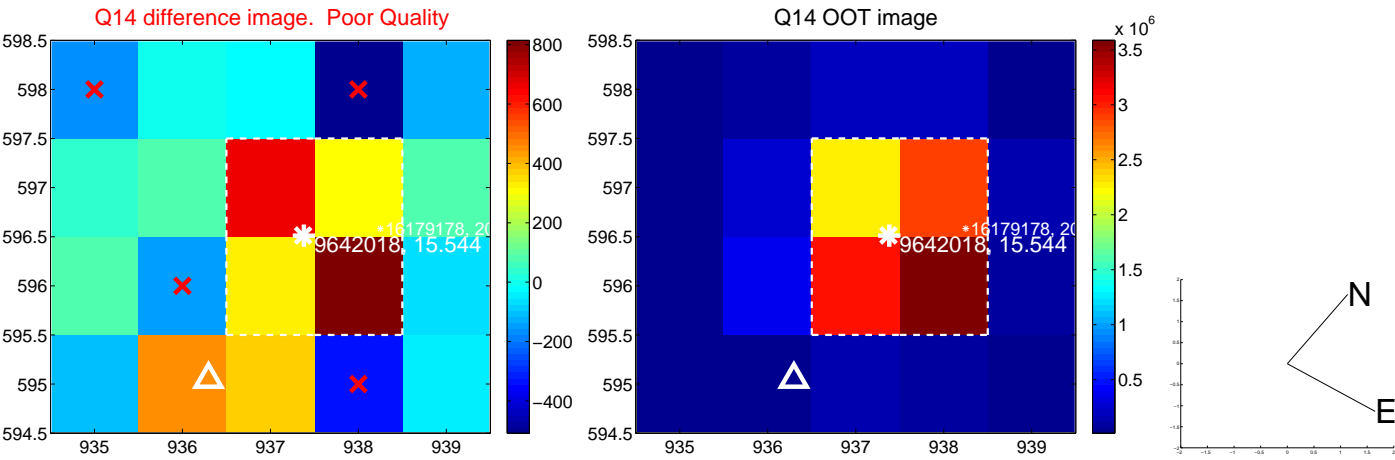
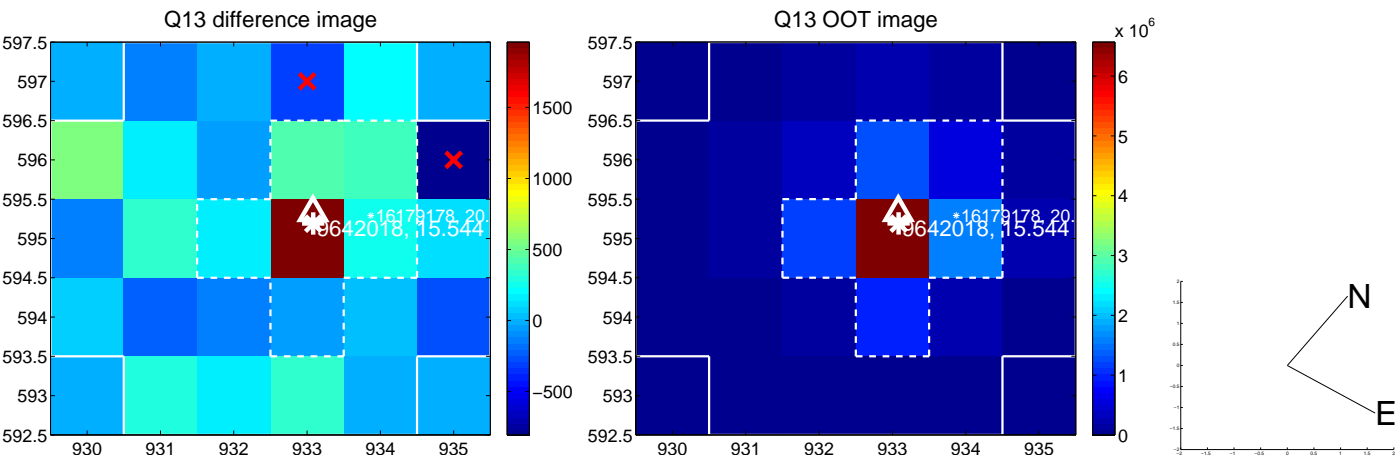
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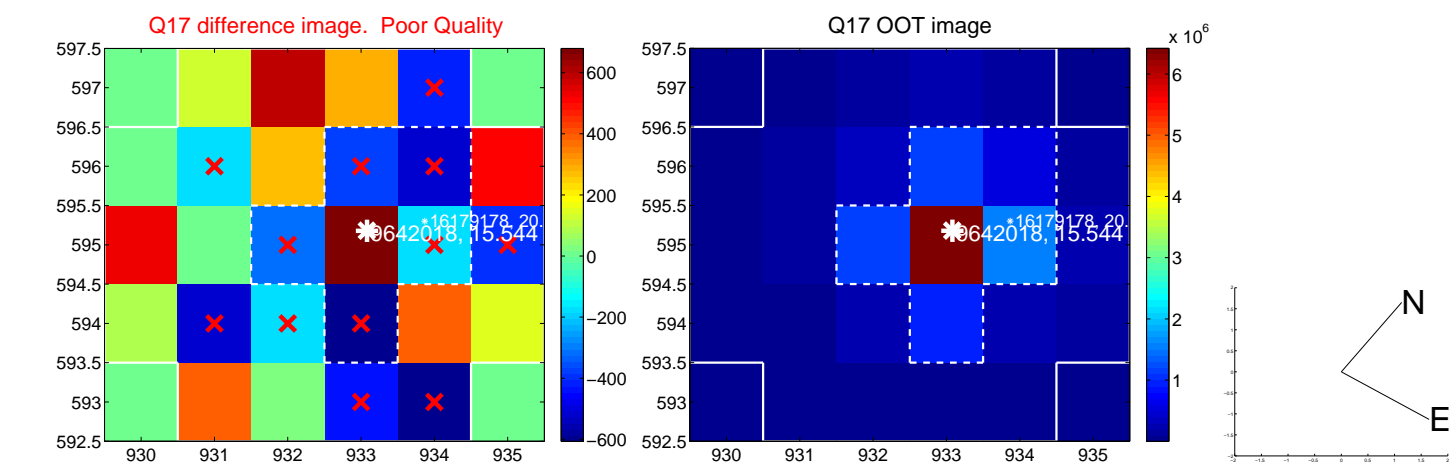


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

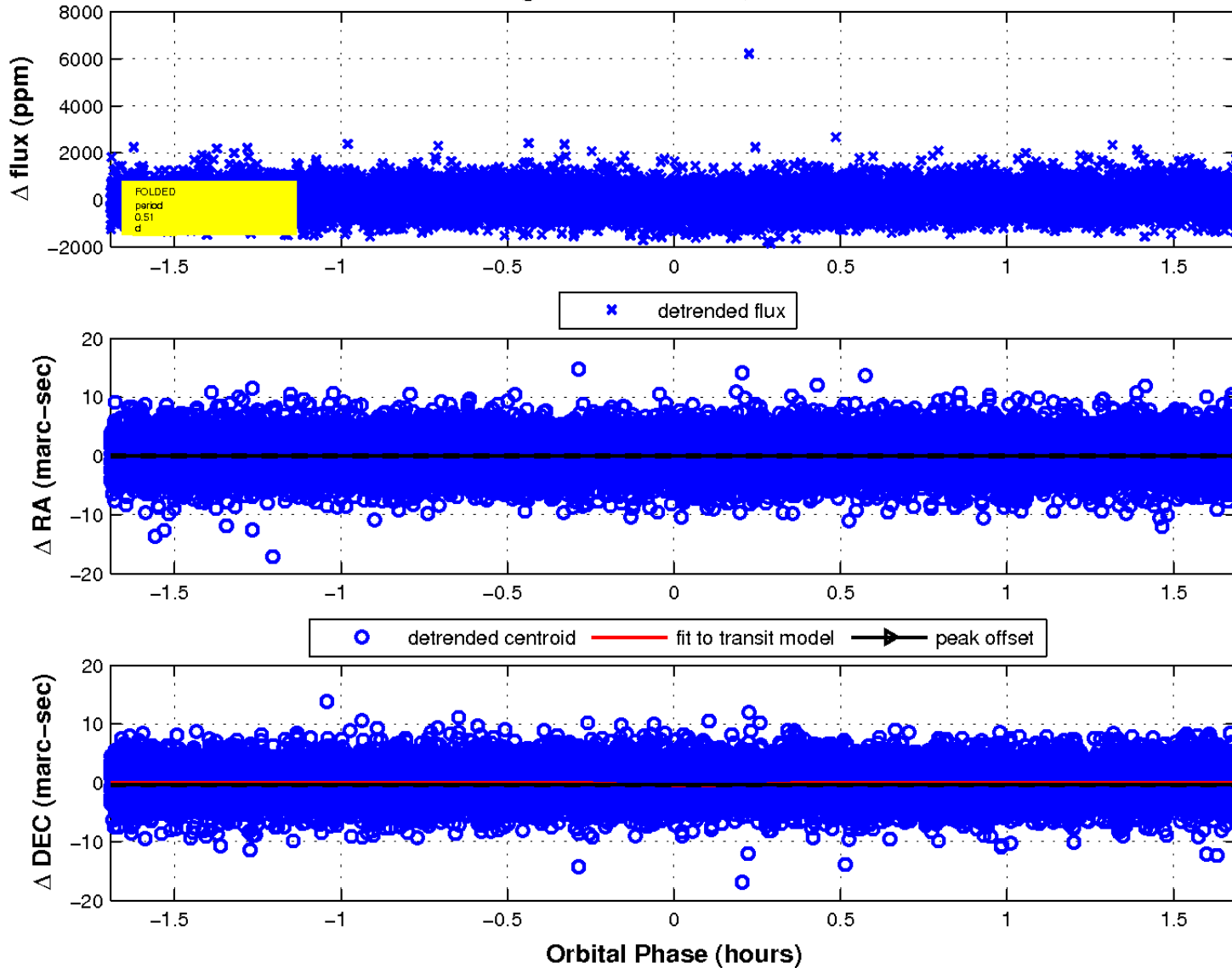




white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



fluxWeightedCentroids, Planet 2 of 2



# UKIRT Image

Declination

