

# KIC 009161894

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009161894-01	OBS	No	0.503086	131.949172	28.6	1.648	9.6	11.5	1.85	7345	1.15	43762.20
009161894-02	OBS	No	1.536418	132.929197	47.0	5.837	9.3	9.6	1.85	7345	1.48	9876.65
009161894-04	OBS	No	73.490483	193.692114	113.3	1.005	7.3	1.8	1.85	7345	2.13	56.88

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009161894-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
009161894-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_ZUMA—LPP_DV—MOD_NONUNIQ_ALT
009161894-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT

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

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

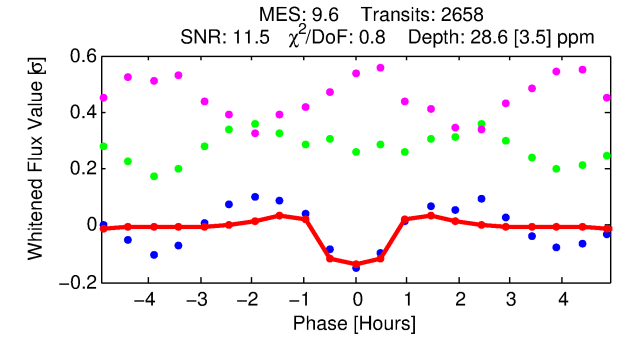
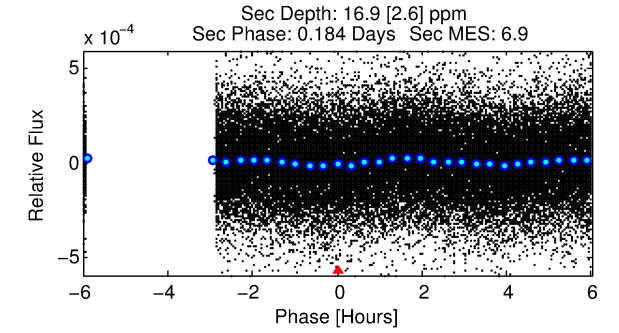
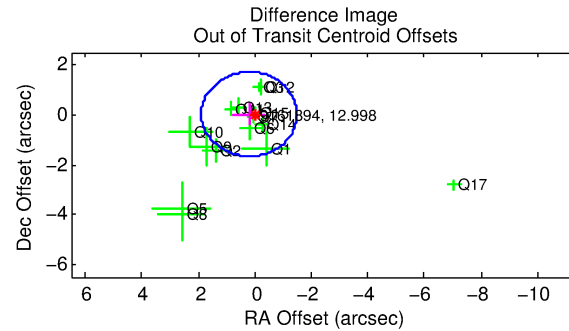
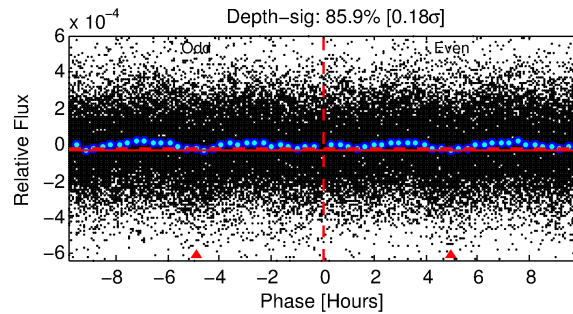
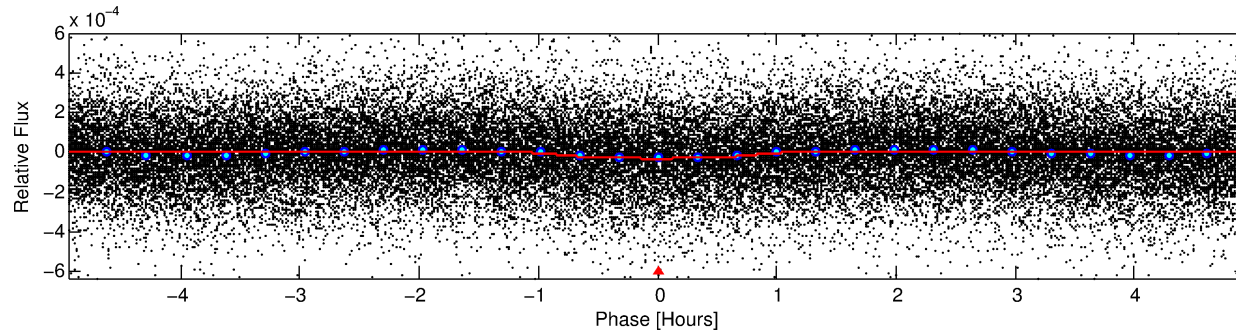
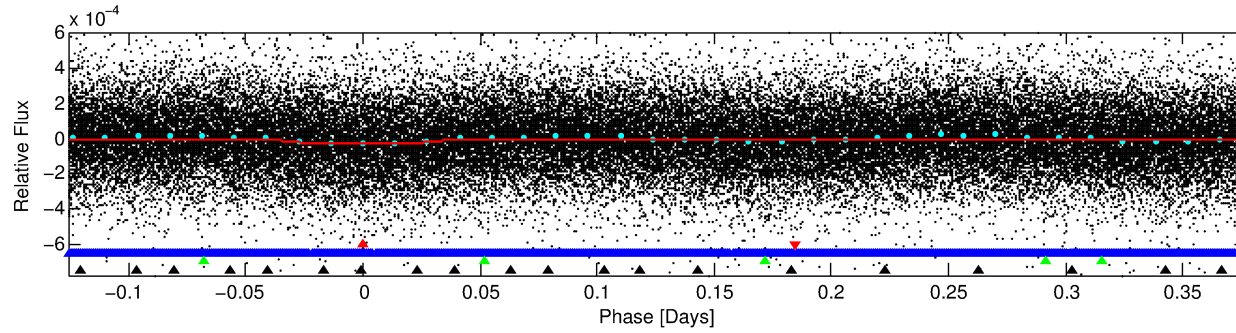
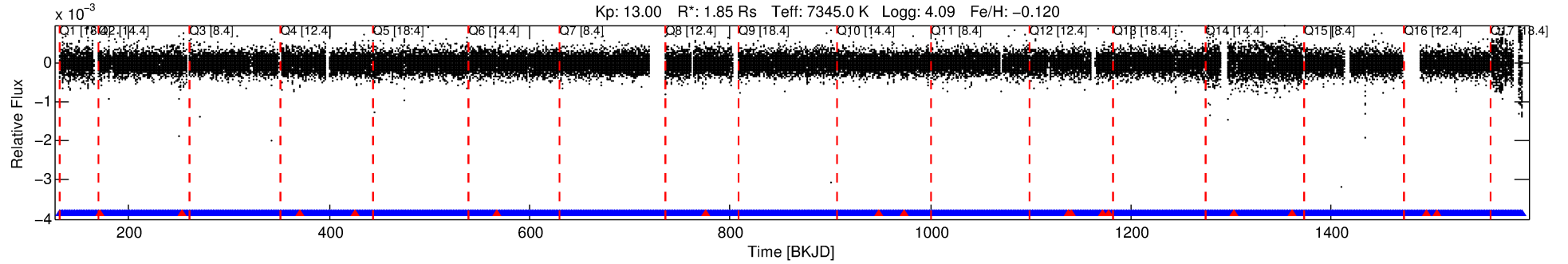
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009161894-01

No Significant Match Found

# DV One-Page Summary

KIC: 9161894 Candidate: 1 of 4 Period: 0.503 d



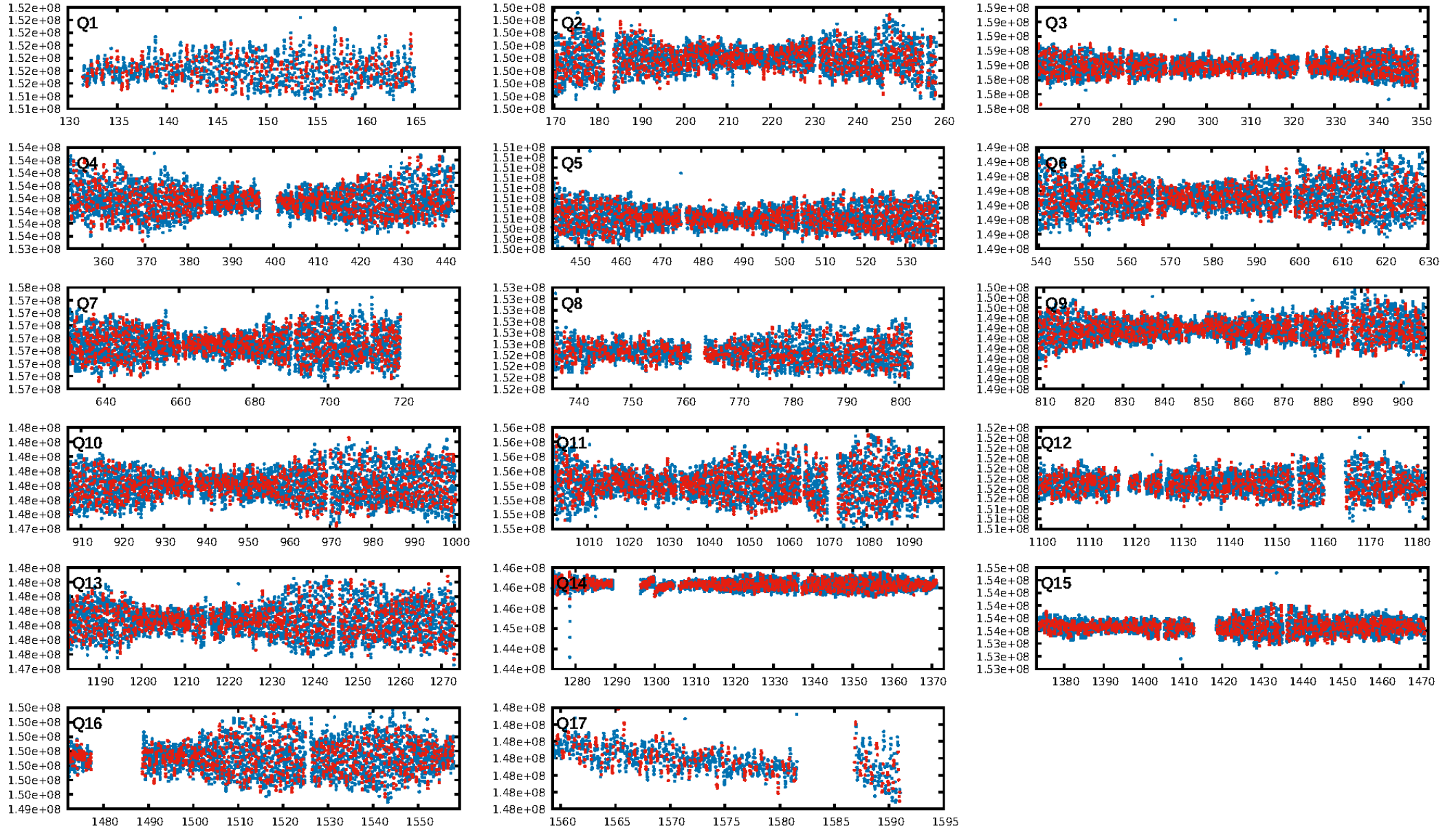
## DV Fit Results:

Period = 0.50309 [0.00001] d  
Epoch = 131.9492 [0.0015] BKJD  
Rp/R\* = 0.0057 [0.0013]  
a/R\* = 1.41 [0.94]  
b = 0.90 [0.29]  
Seff = 43762.20 [16169.63]  
Teq = 3688 [341] K  
Rp = 1.15 [0.42] Re  
a = 0.0143 [0.0033] AU  
Ag = 1.43 [0.82] [0.52 $\sigma$ ]  
Teffp = 6234 [789] K [2.96 $\sigma$ ]

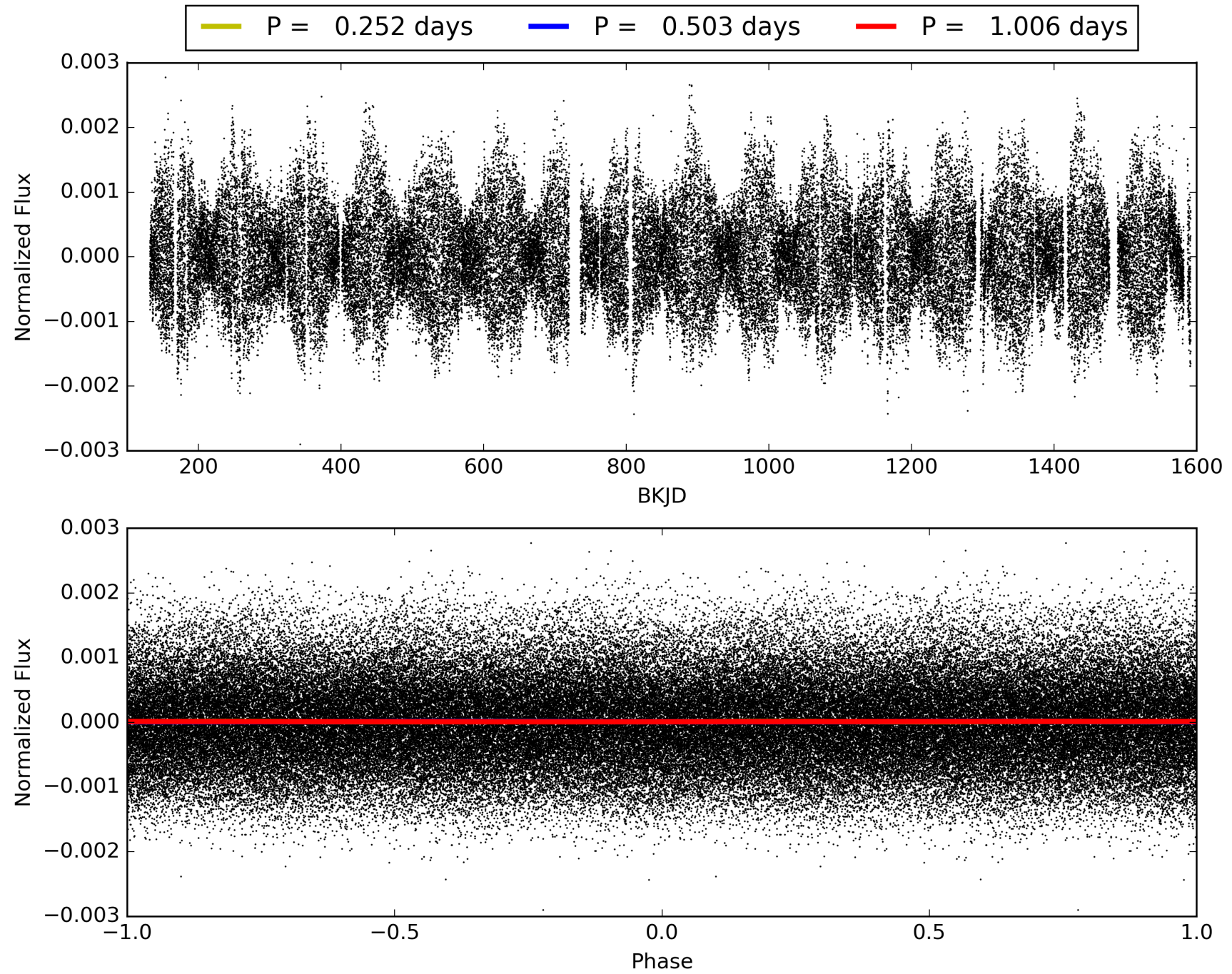
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [4.09 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 3.12e-19  
RollingBand-fgt: 0.99 [2521/2538]  
GhostDiagnostic-chr: 7.71  
Centroid-sig: 0.0%  
Centroid-so: 0.812 arcsec [1.20 $\sigma$ ]  
OotOffset-rm: 0.208 arcsec [0.37 $\sigma$ ]  
KicOffset-rm: 0.150 arcsec [0.27 $\sigma$ ]  
OotOffset-st: 4/4/2/5 [15]  
KicOffset-st: 4/4/2/5 [15]  
DiffImageQuality-fgm: 0.53 [8/15]  
DiffImageOverlap-fno: 1.00 [17/17]

# TCE 009161894-01, PDC Light Curves

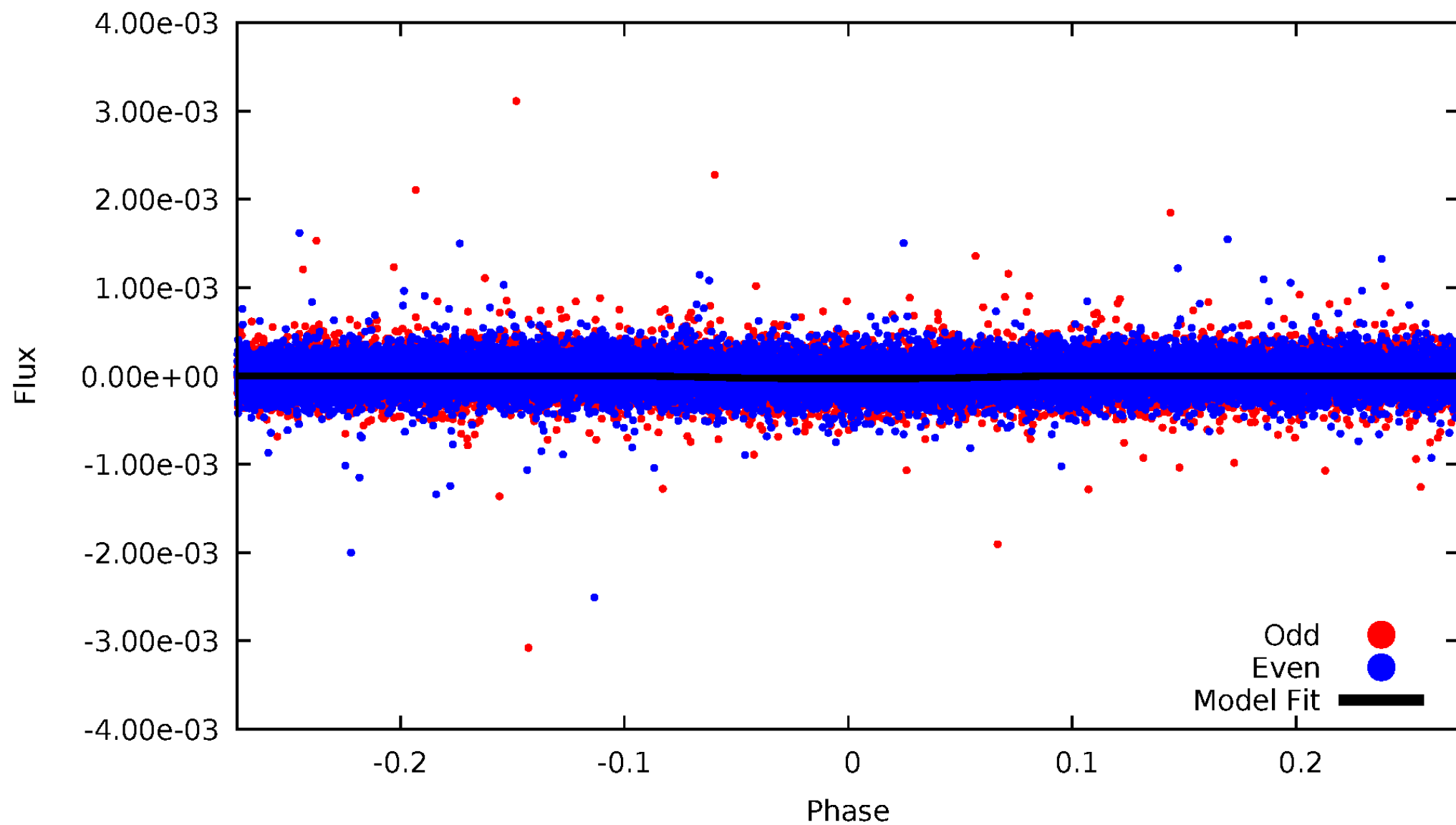


# TCE 009161894-01



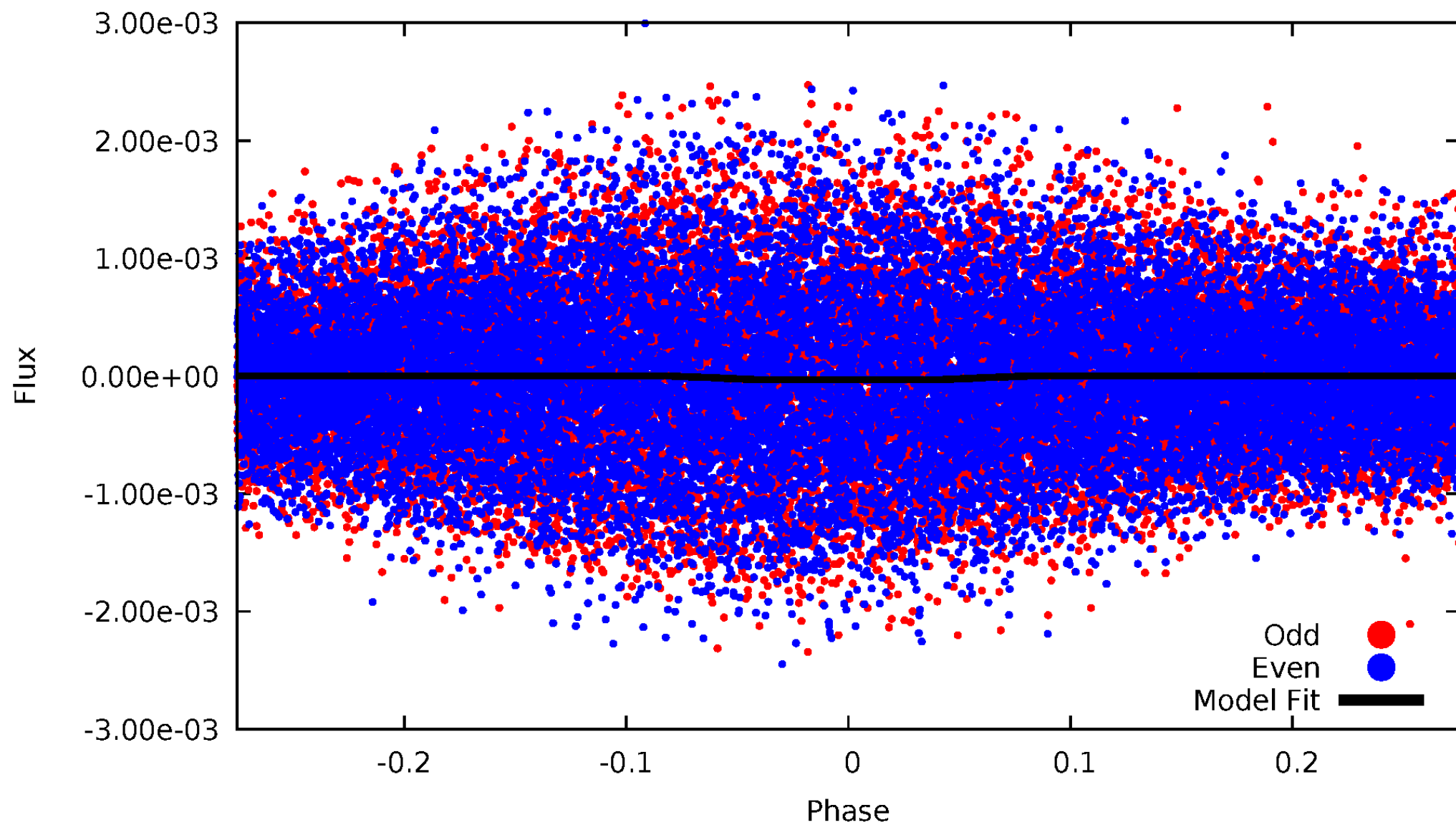
# DV Odd/Even

TCE 009161894-01



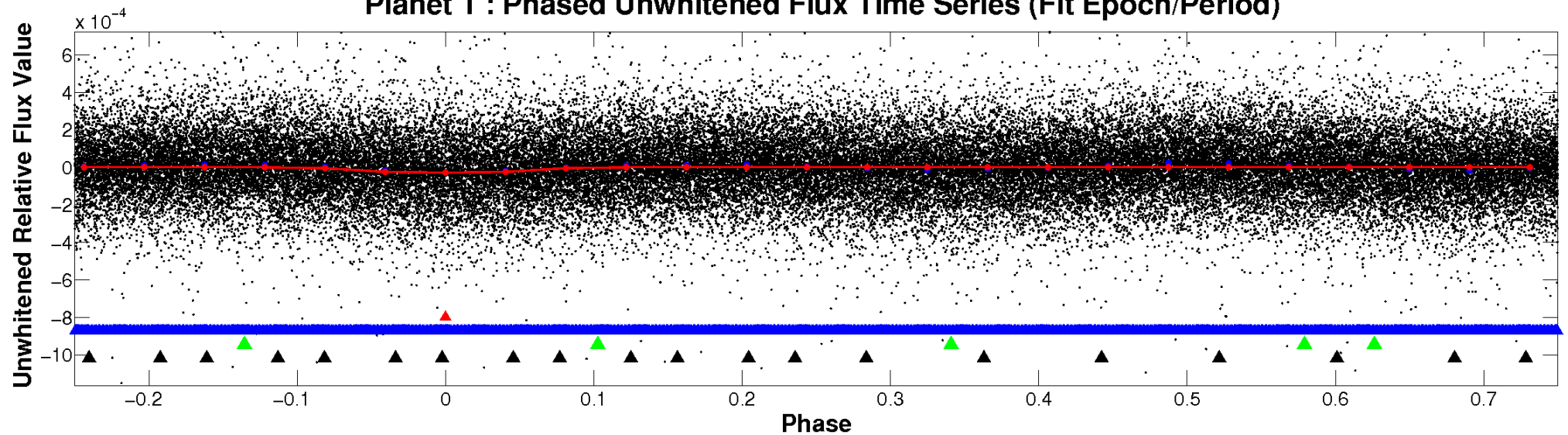
# ALT Odd/Even

TCE 009161894-01

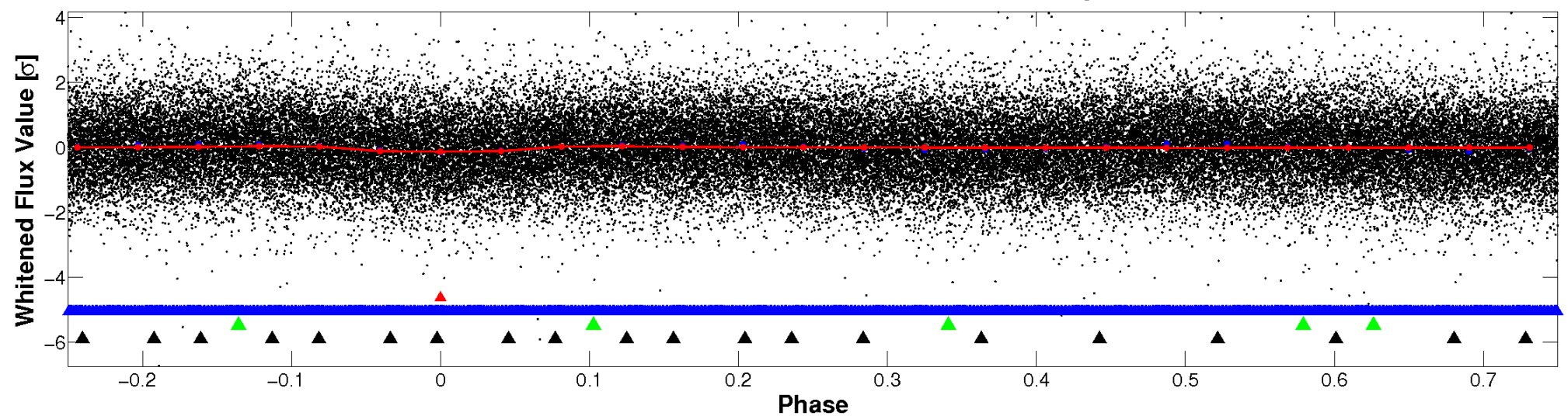


# Non-Whitened Vs. Whitened Light Curve

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

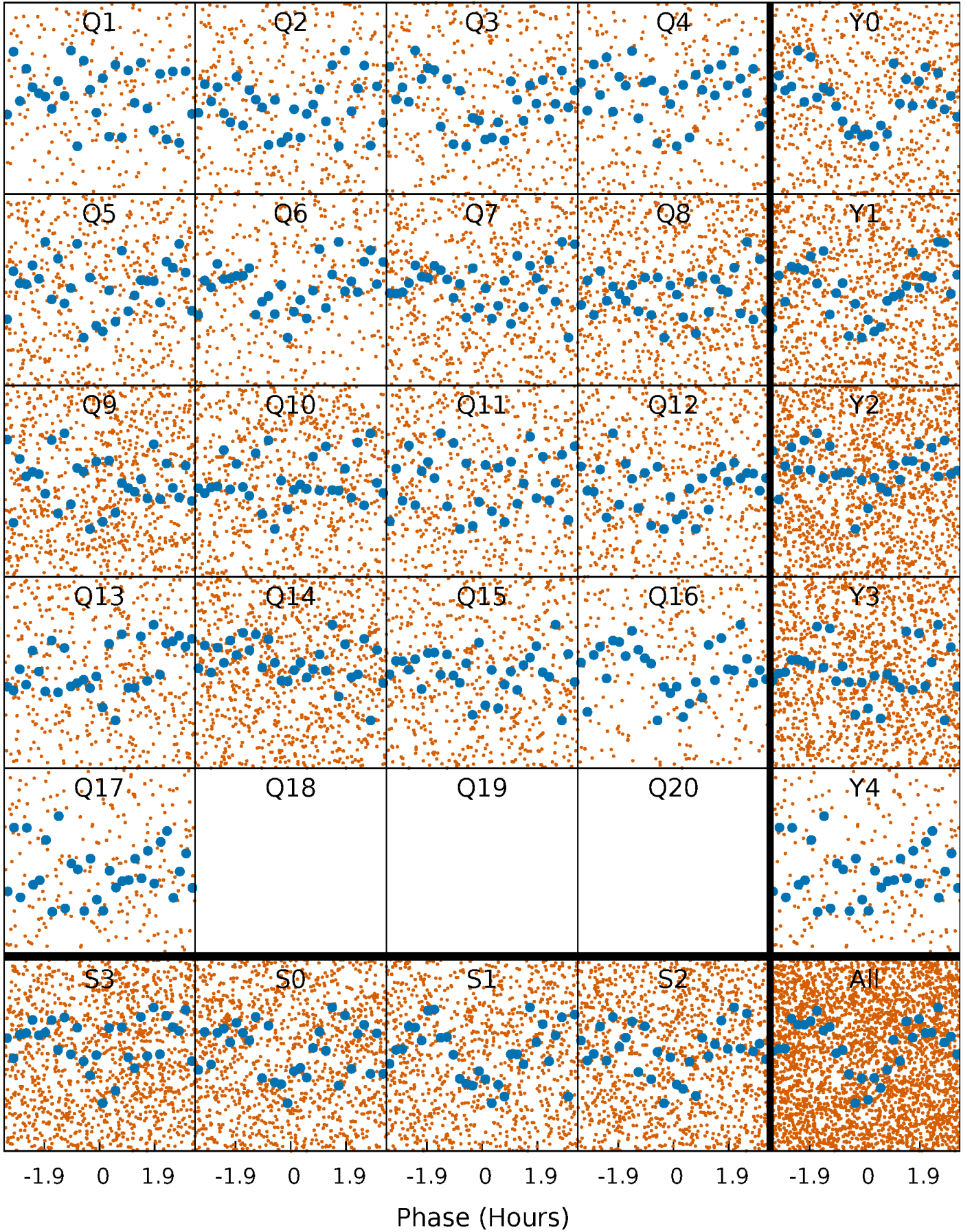


## Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



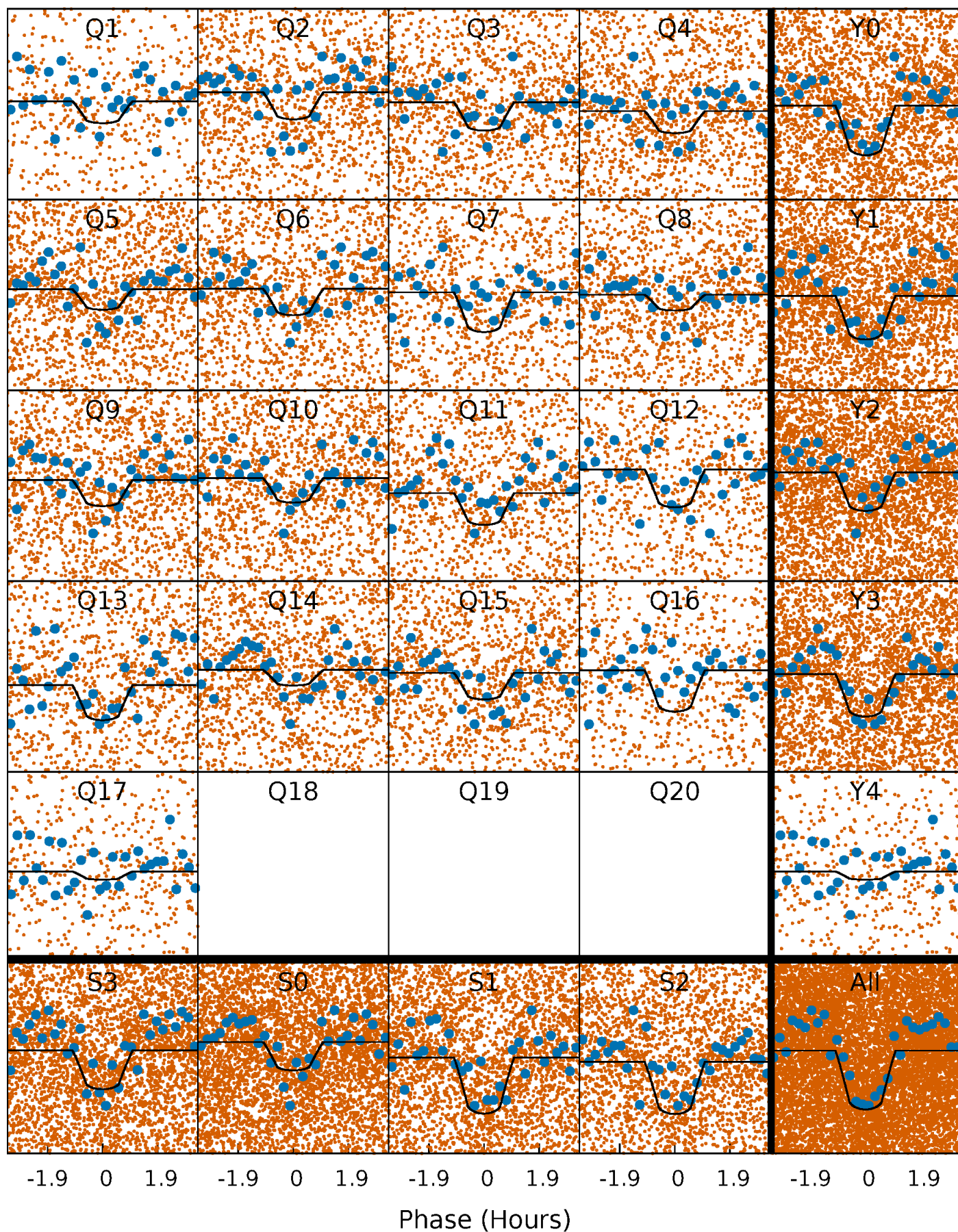
# PDC Quarter-Phased Transit Curves

TCE 009161894-01     $P = 0.503086$  Days     $T_0 = 131.949172$  (BKJD)



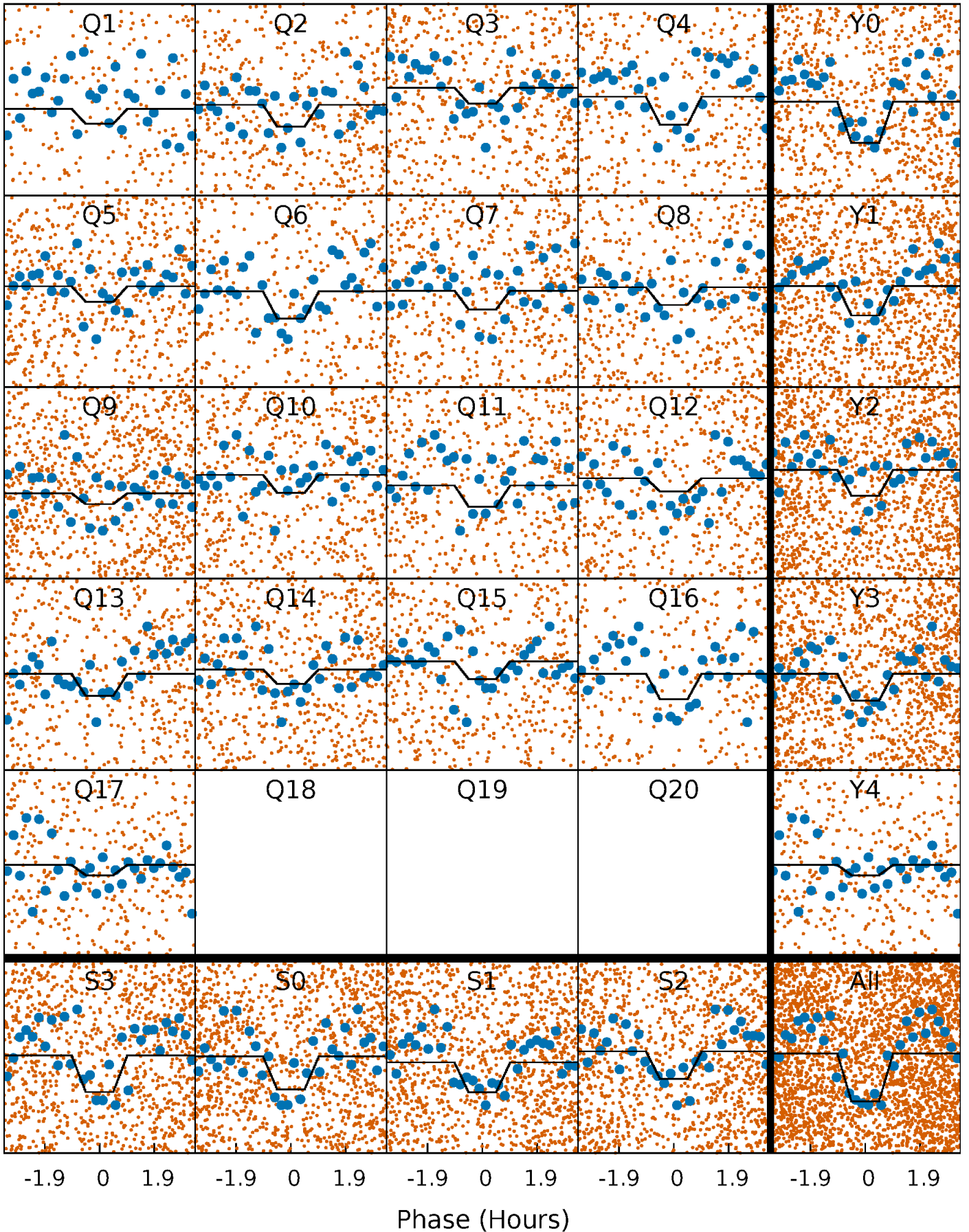
# DV Quarter-Phased Transit Curves

TCE 009161894-01 P= 0.503086 Days  $T_0=131.949172$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

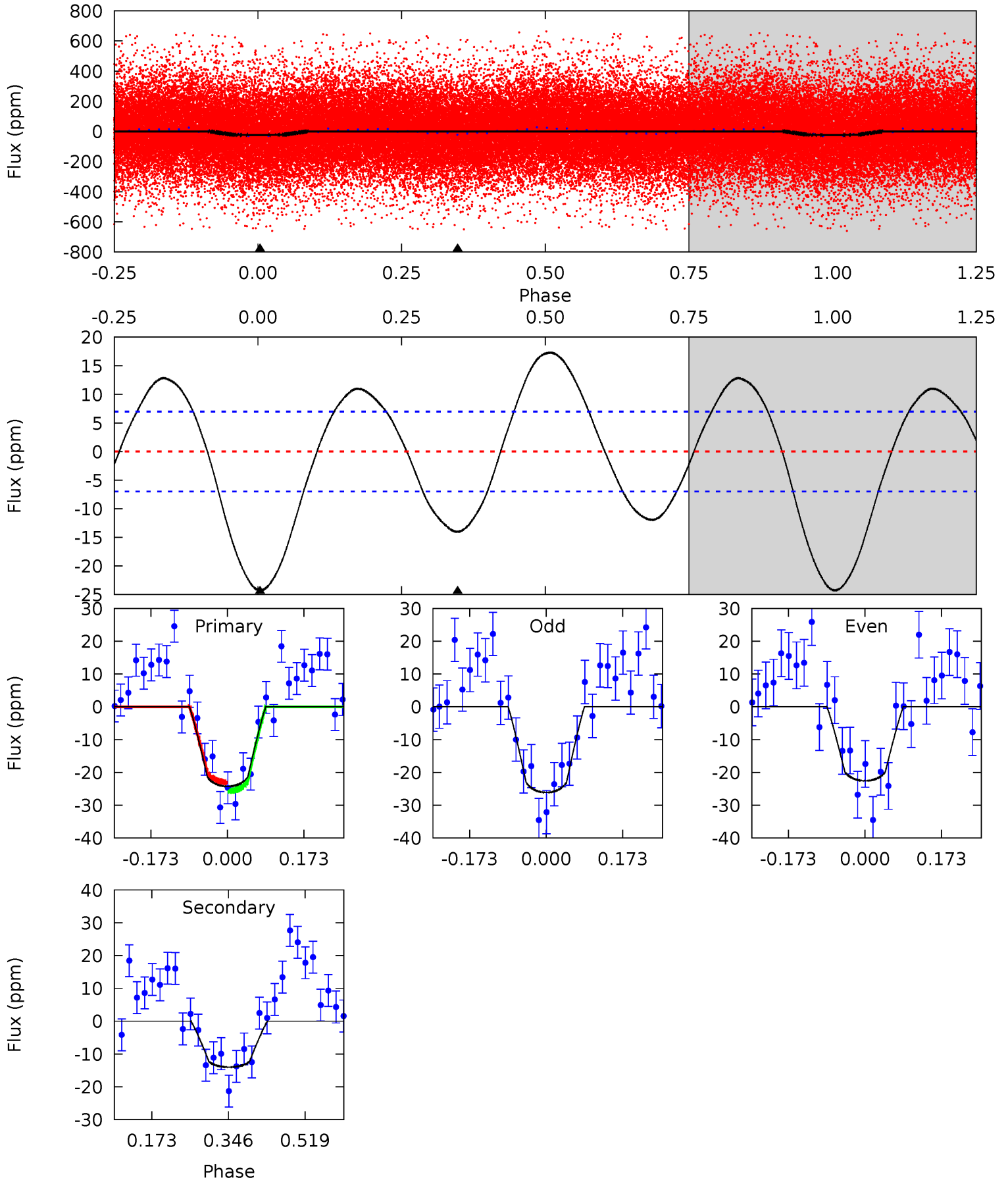
TCE 009161894-01 P= 0.503088 Days  $T_0=131.949373$  (BKJD)



# DV Model-Shift Uniqueness Test

009161894-01, P = 0.503086 Days, E = 131.446086 Days

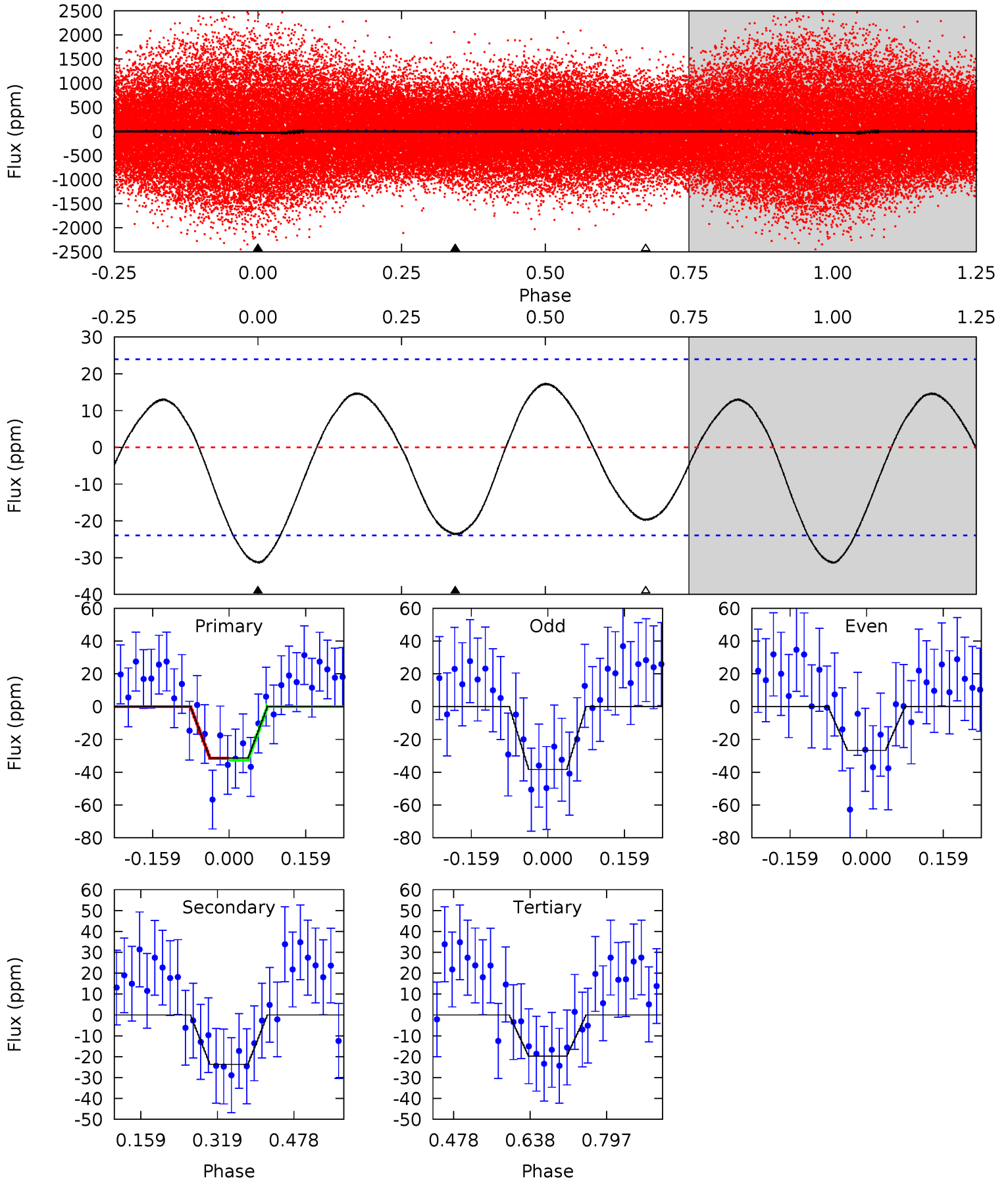
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
15.5	8.95	0	0	4.45	1.36	5.84	15.5	15.5	8.95	8.95	1.14	1.04	0.42	0.86



# Alt Model-Shift Uniqueness Test

009161894-01, P = 0.503088 Days, E = 131.446285 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
5.86	4.41	3.68	0	4.47	1.41	2.34	2.18	5.86	0.73	4.41	1.08	1.59	0.36	0.12



### Stellar Parameters For KIC 009161894

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7345^{+203}_{-330}$	$4.090^{+0.153}_{-0.170}$	$-0.120^{+0.250}_{-0.350}$	$1.852^{+0.528}_{-0.432}$	$1.538^{+0.234}_{-0.257}$	$0.341^{+0.299}_{-0.157}$
	+3%/-4%	+4%/-4%	+208%/-292%	+29%/-23%	+15%/-17%	+88%/-46%
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 009161894-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-14 \pm 2$	$1.17^{+0.34}_{-0.28}$	$5149^{+401}_{-356}$	$5380^{+971}_{-725}$	$1.130^{+0.854}_{-0.441}$
Alt.	$-24 \pm 5$	$1.16^{+0.32}_{-0.30}$	$5140^{+377}_{-350}$	$6391^{+1211}_{-897}$	$1.970^{+1.565}_{-0.847}$

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

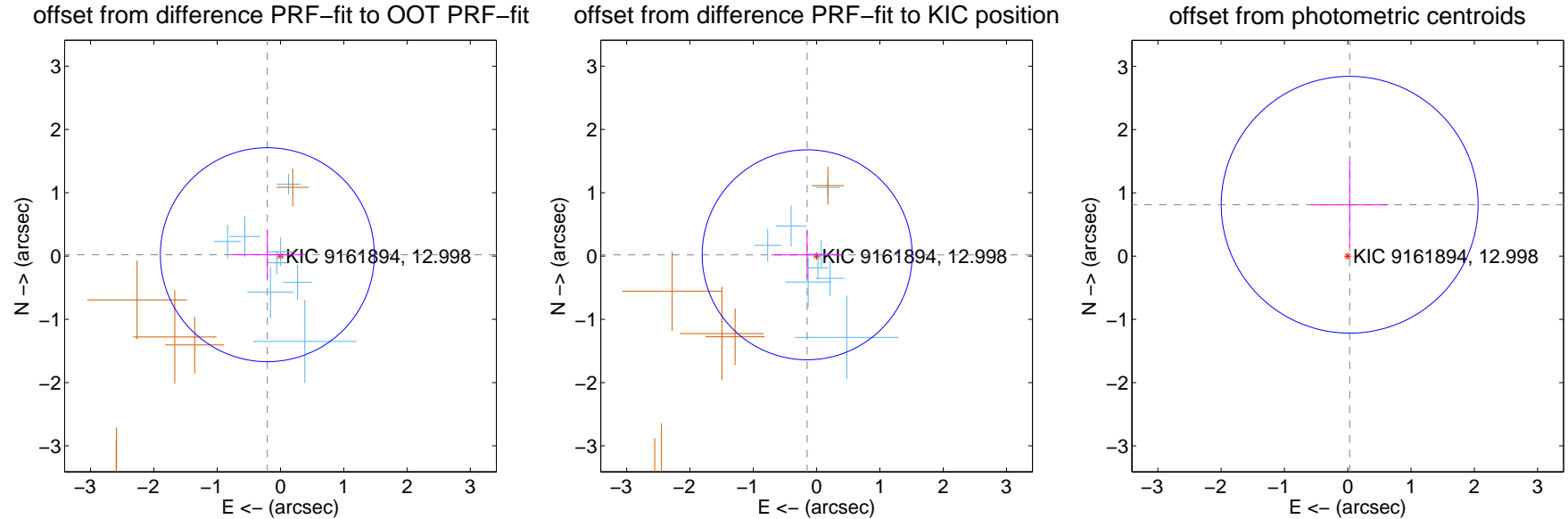
## DV Centroid Data

Supplemental centroid analysis for 009161894-01. Kepler magnitude: 13.00. Transit SNR 11.52

There are 8 quarters with good PRF difference image offsets

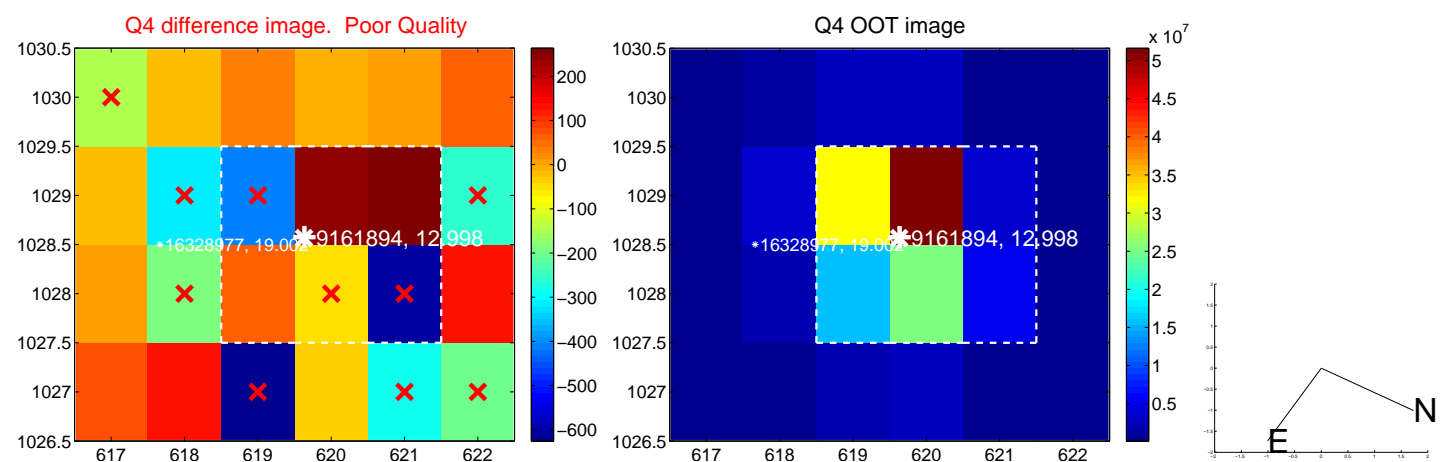
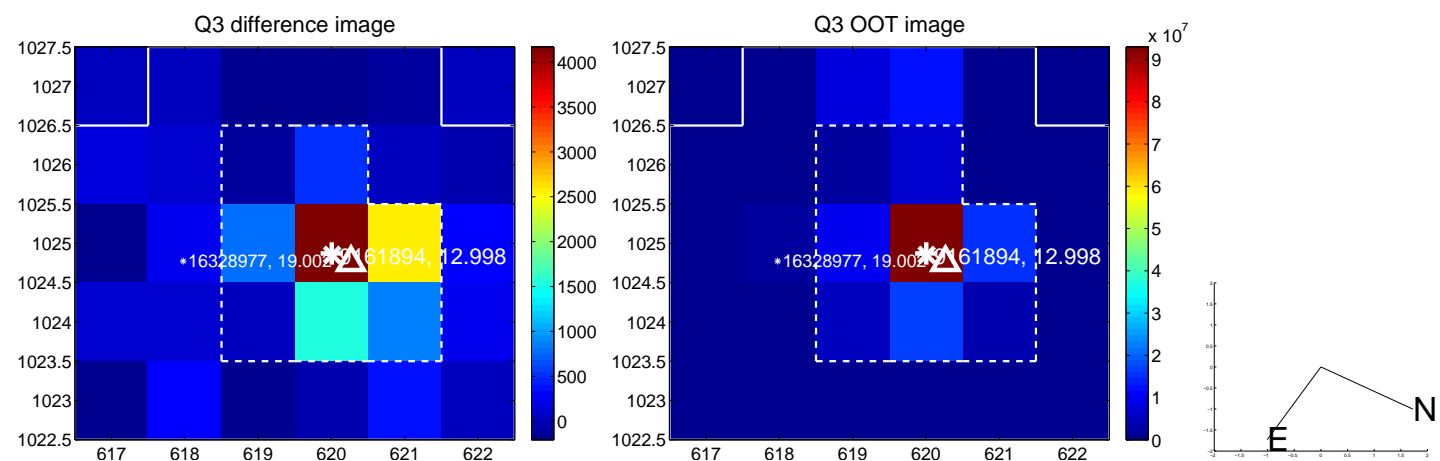
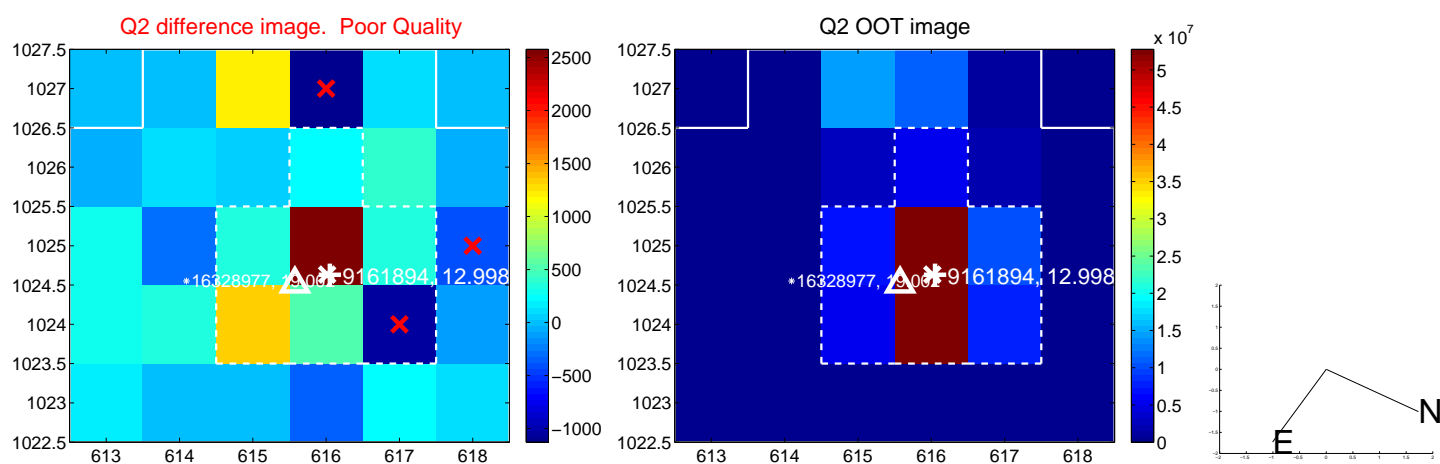
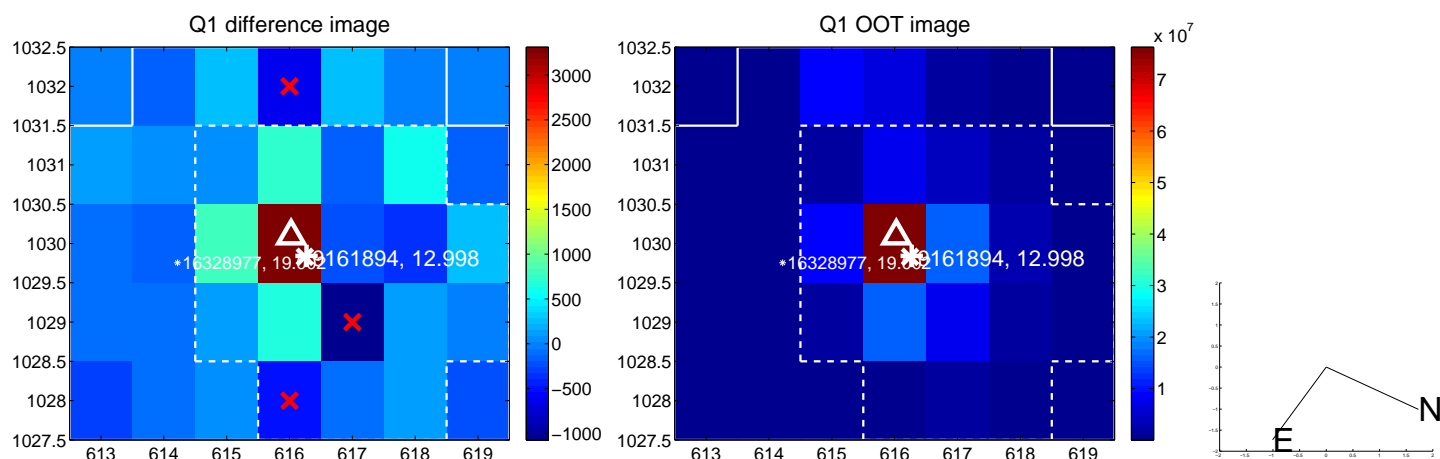
The direct PRF centroid is offset from the target star catalog position by about 0.15 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.208 \pm 0.563$	0.37	$0.207 \pm 0.564$	$0.021 \pm 0.382$
PRF-fit source offset from KIC position	$0.150 \pm 0.553$	0.27	$0.149 \pm 0.563$	$0.019 \pm 0.378$
photometric centroid source offset	$0.81 \pm 0.68$	1.20	$-0.03 \pm 0.61$	$0.81 \pm 0.68$

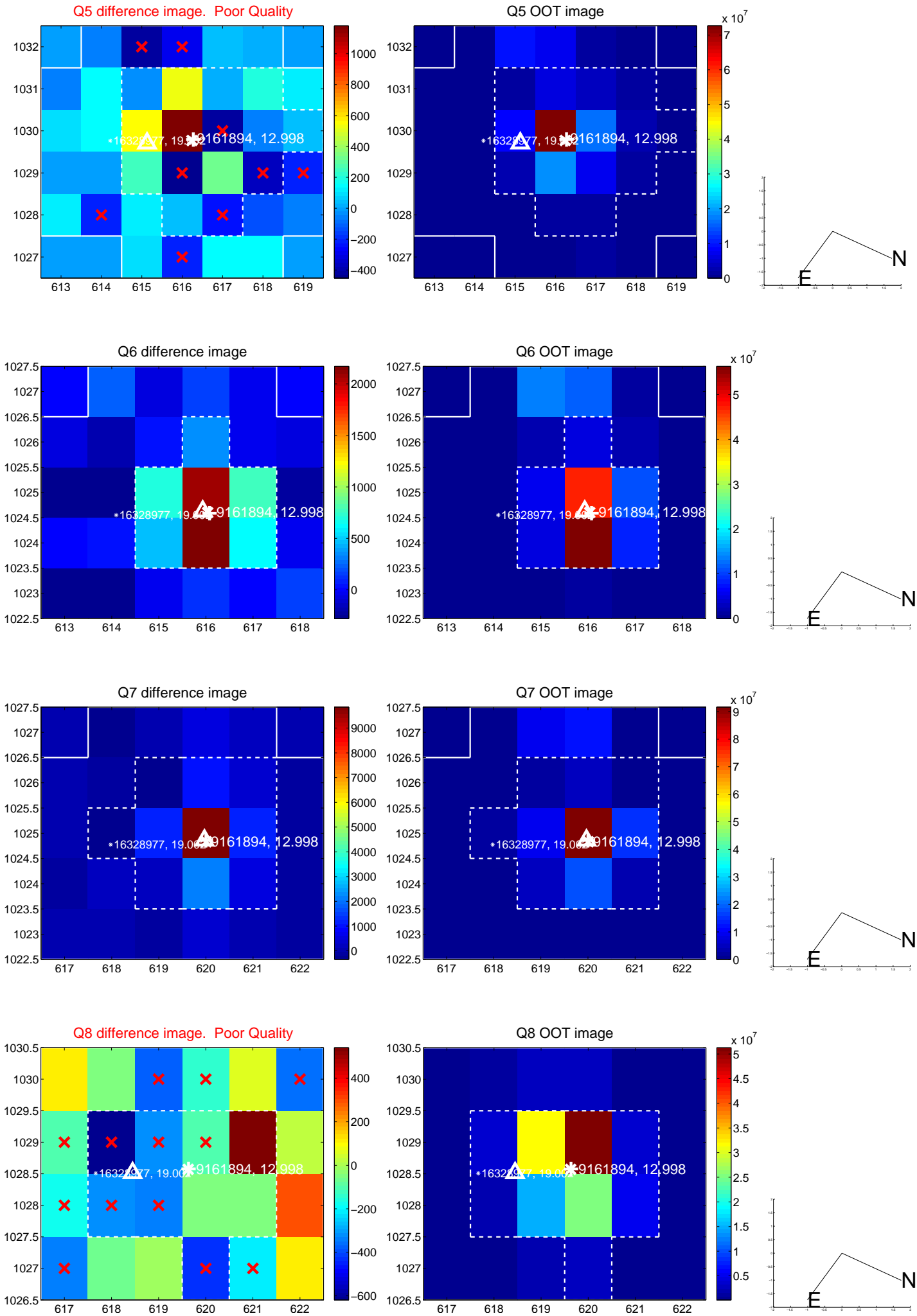


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets**; **Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

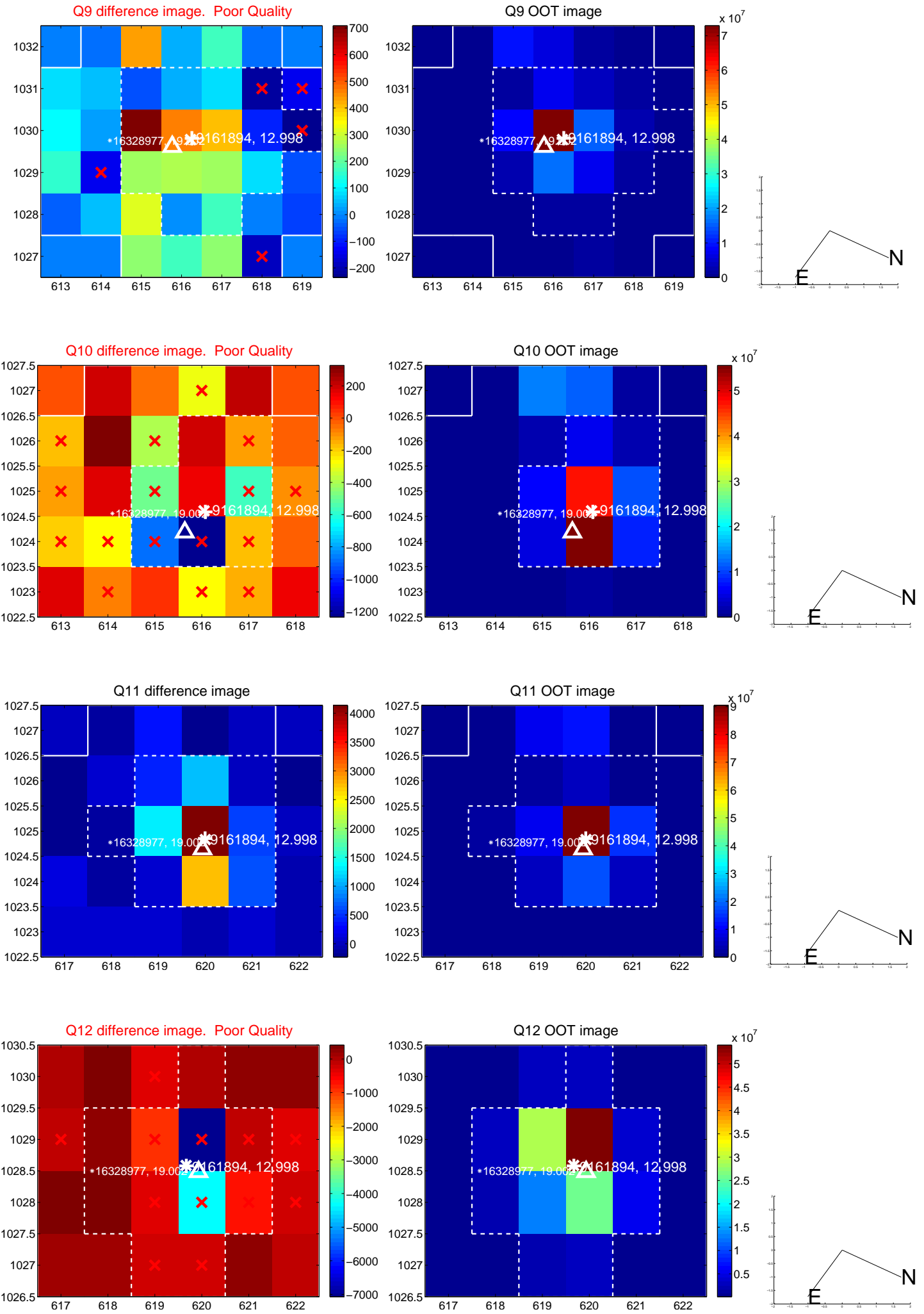
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



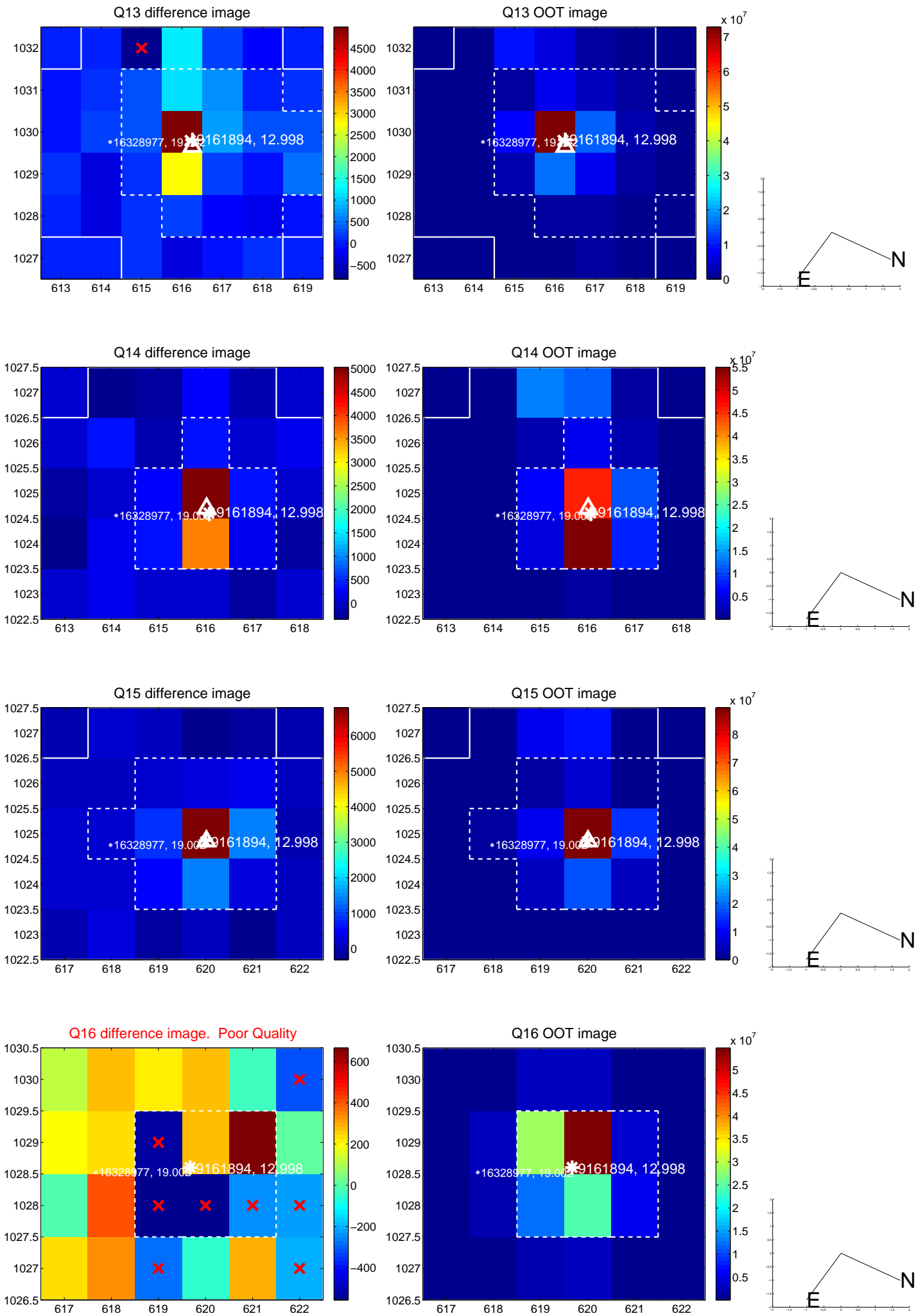
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



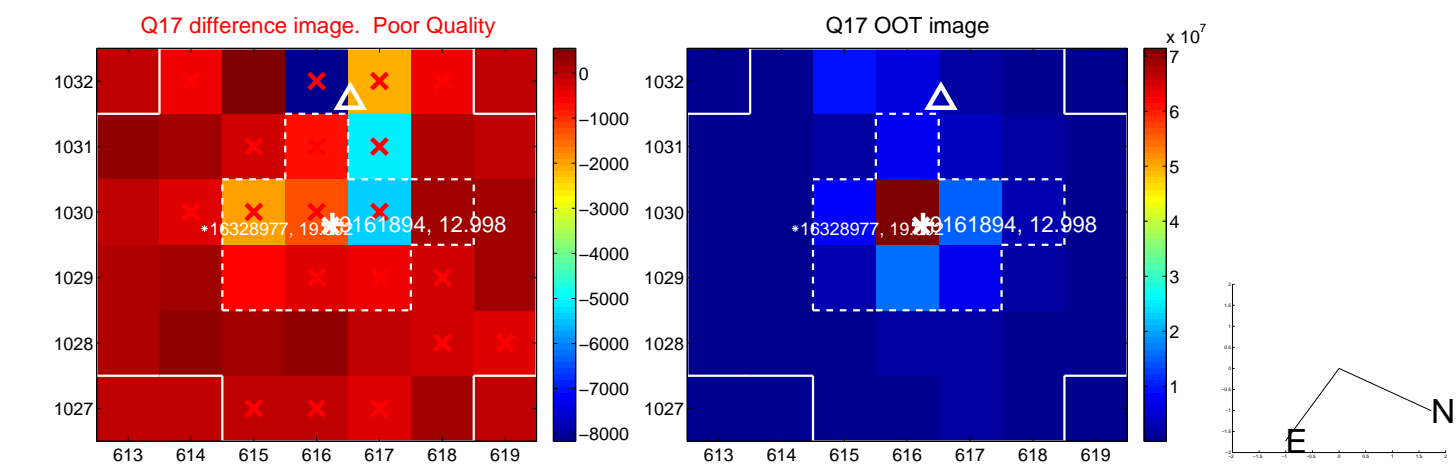
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



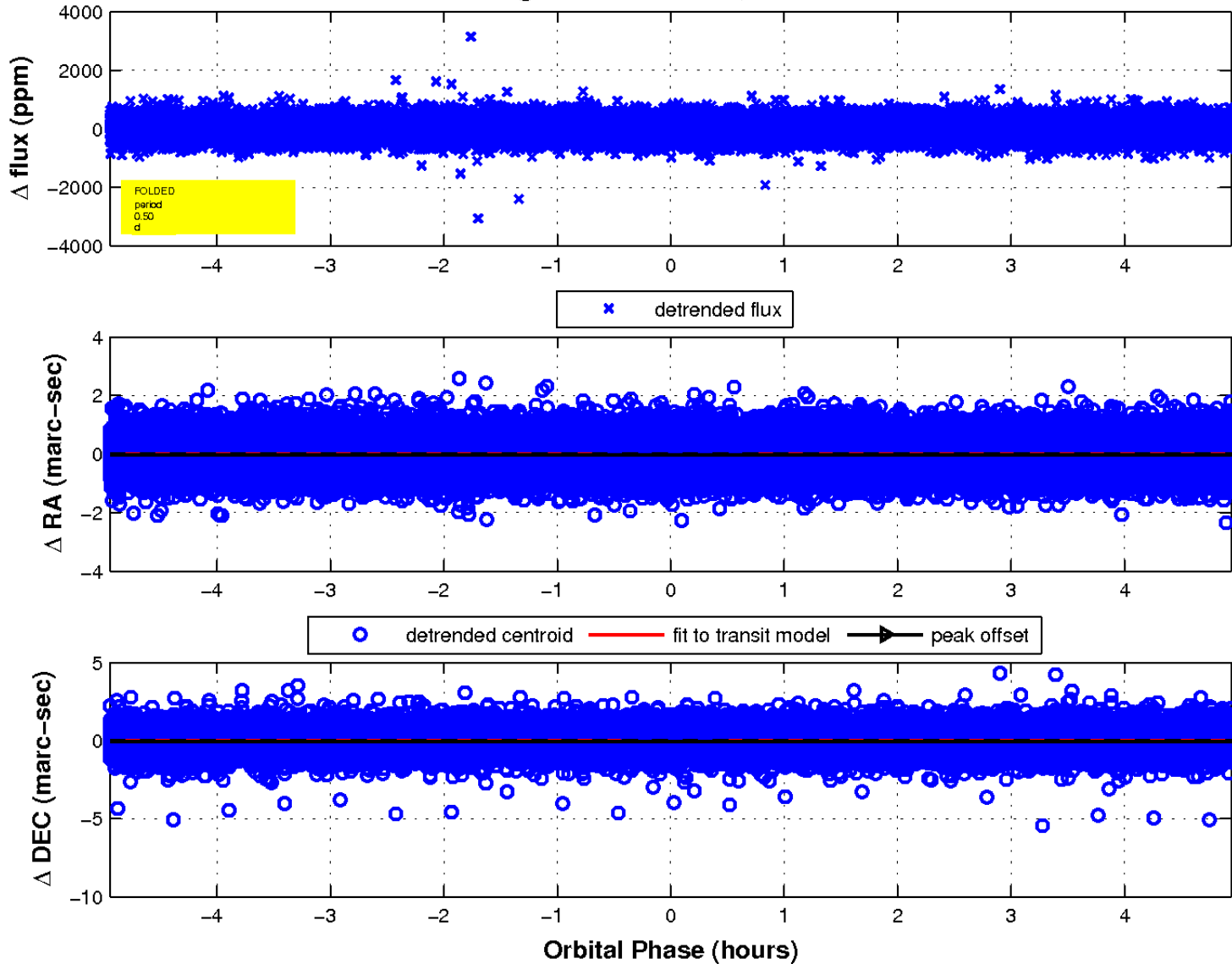
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

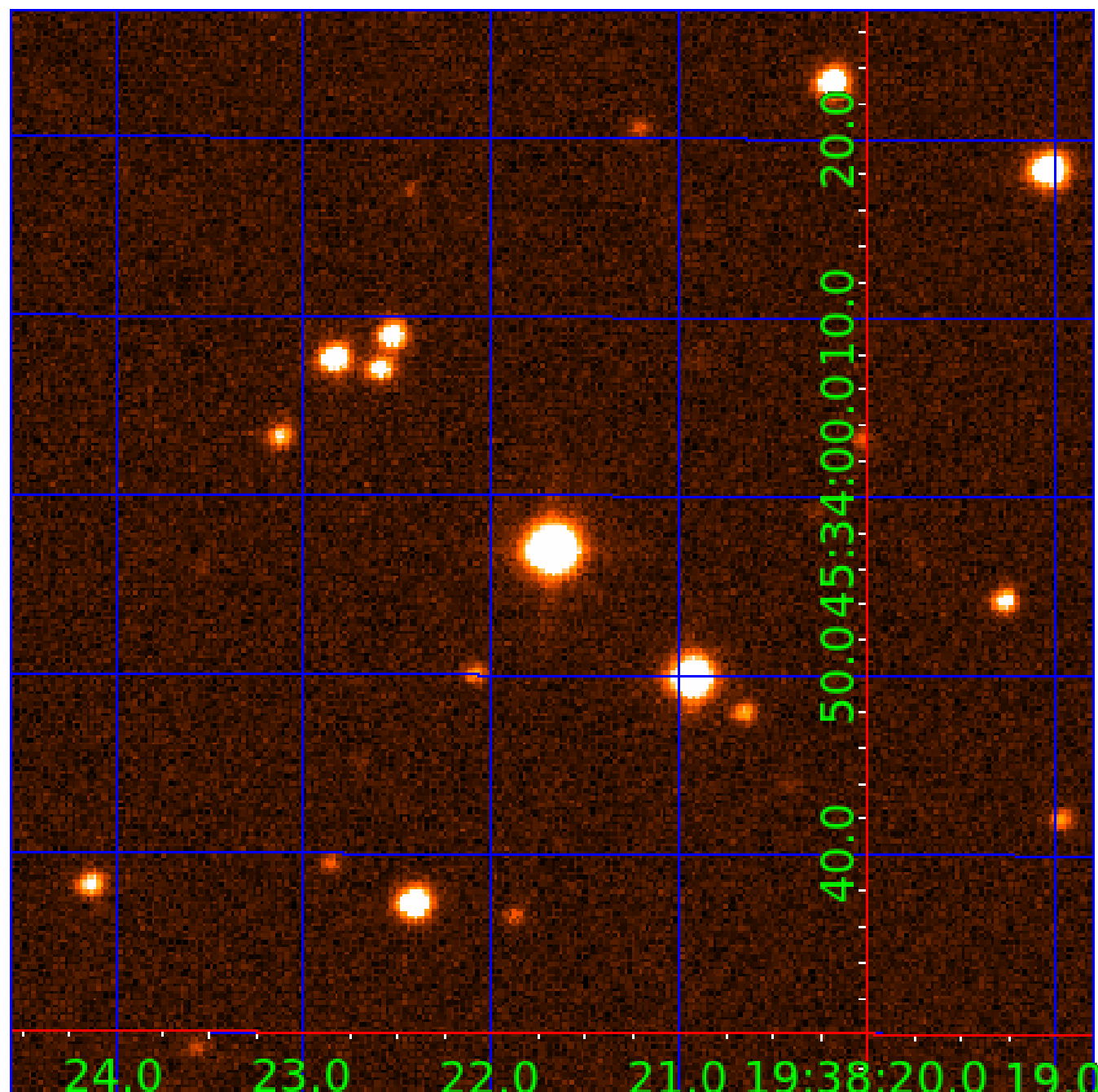


fluxWeightedCentroids, Planet 1 of 4



UKIRT Image

Declination



# KIC 009161894

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009161894-01	OBS	No	0.503086	131.949172	28.6	1.648	9.6	11.5	1.85	7345	1.15	43762.20
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## Robovetter Results

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009161894-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_ZUMA—LPP_DV—MOD_NONUNIQ_ALT
009161894-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT

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

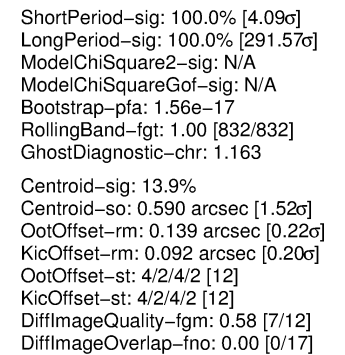
N = Not Transit-Like. S = Stellar Eclipse. C = Centroid Offset. E = Ephemeris Match.

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

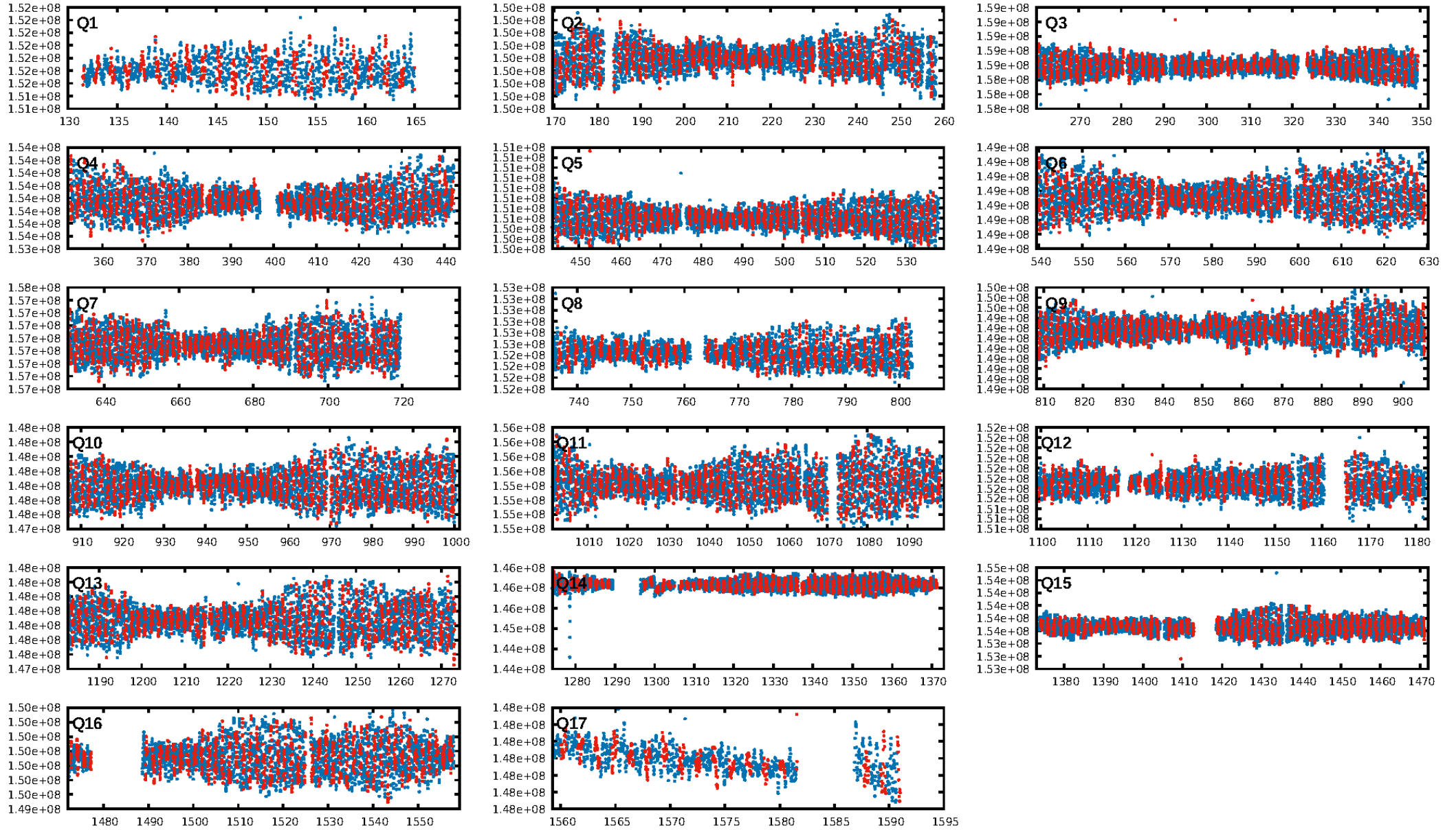
## Ephemeris Match Information For 009161894-02

No Significant Match Found

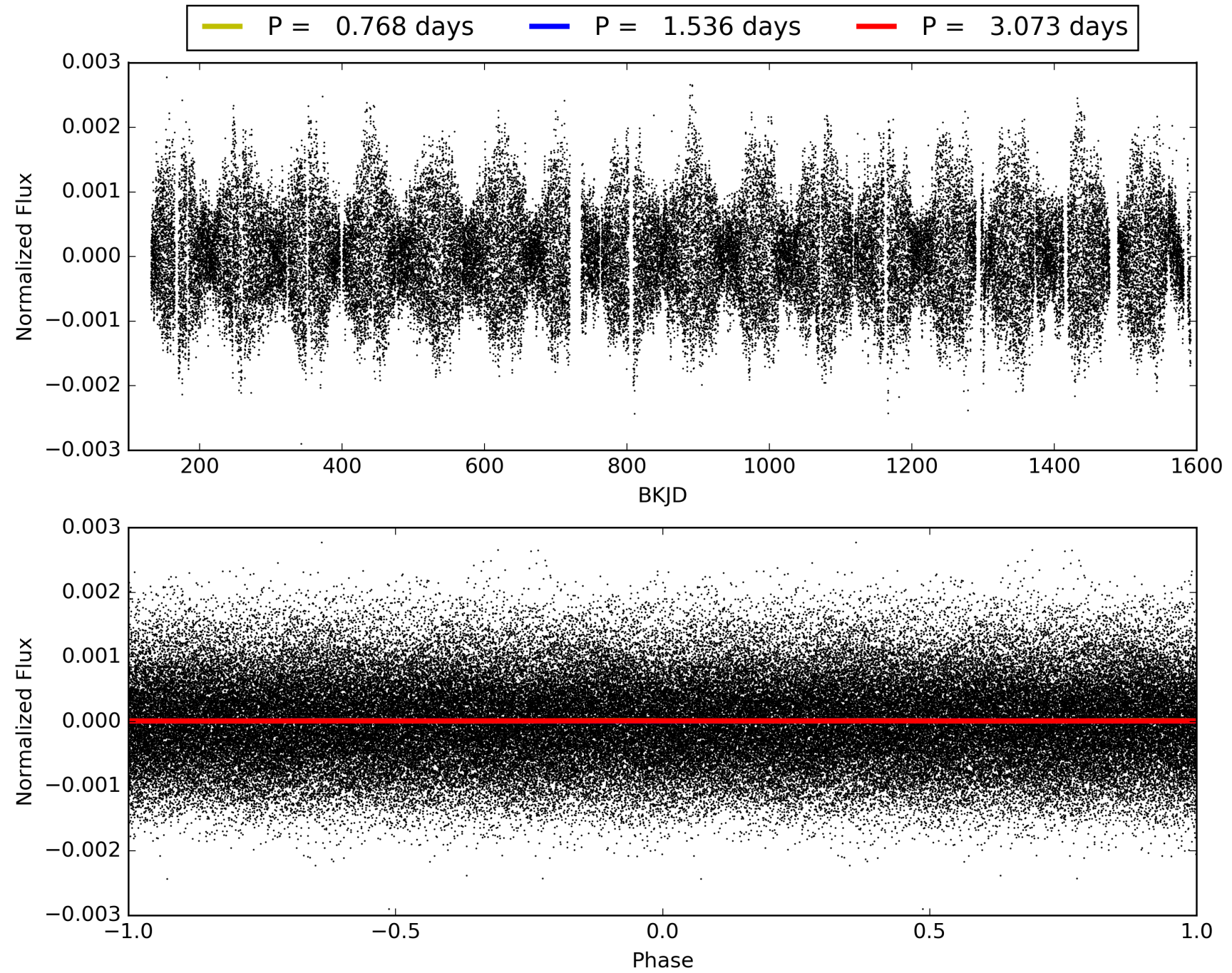
## KIC: 9161894    Candidate: 2 of 4    Period: 1.536 d



# TCE 009161894-02, PDC Light Curves

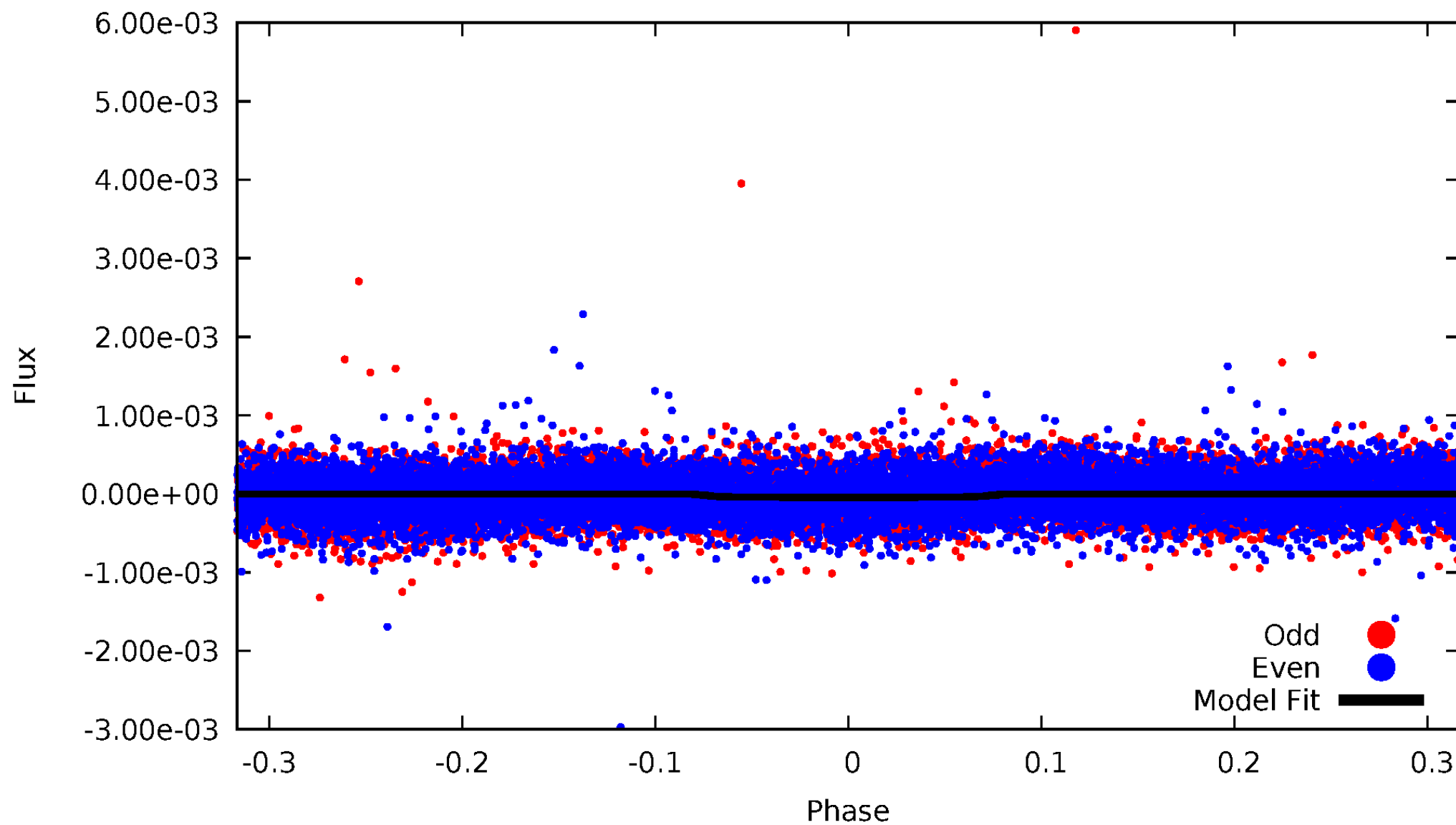


# TCE 009161894-02



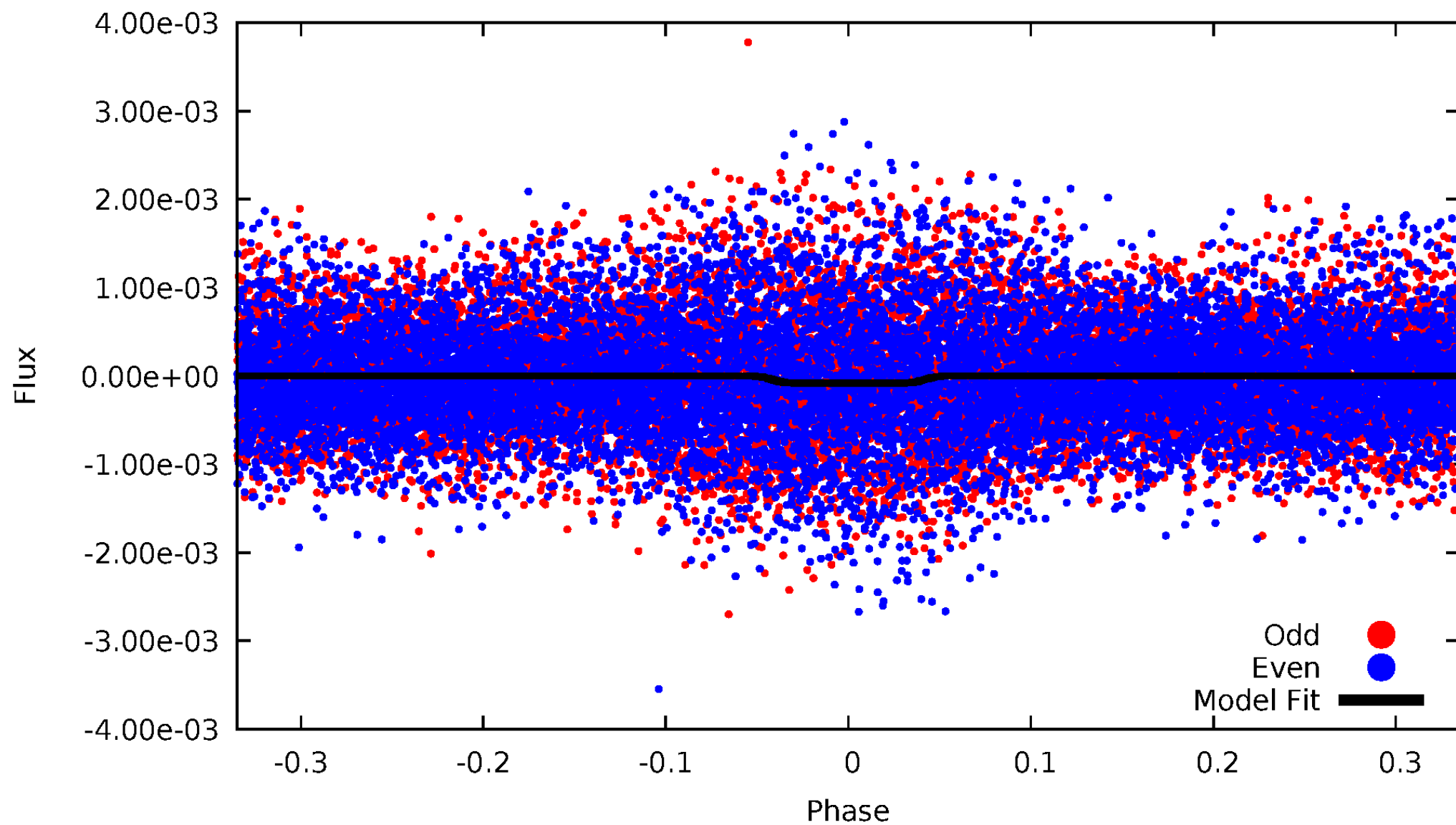
# DV Odd/Even

TCE 009161894-02



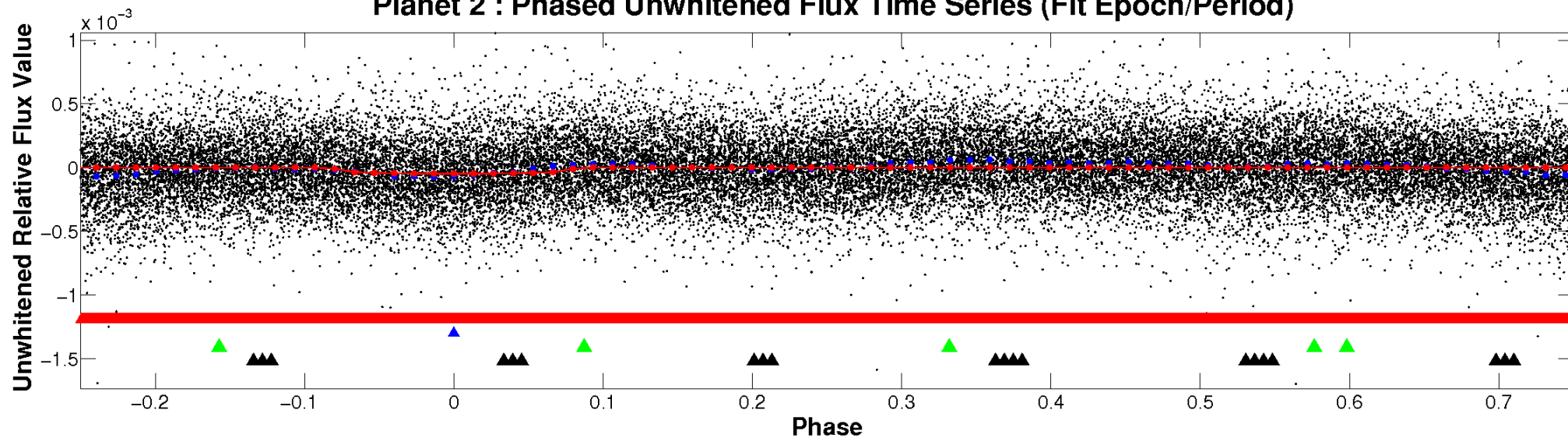
# ALT Odd/Even

TCE 009161894-02

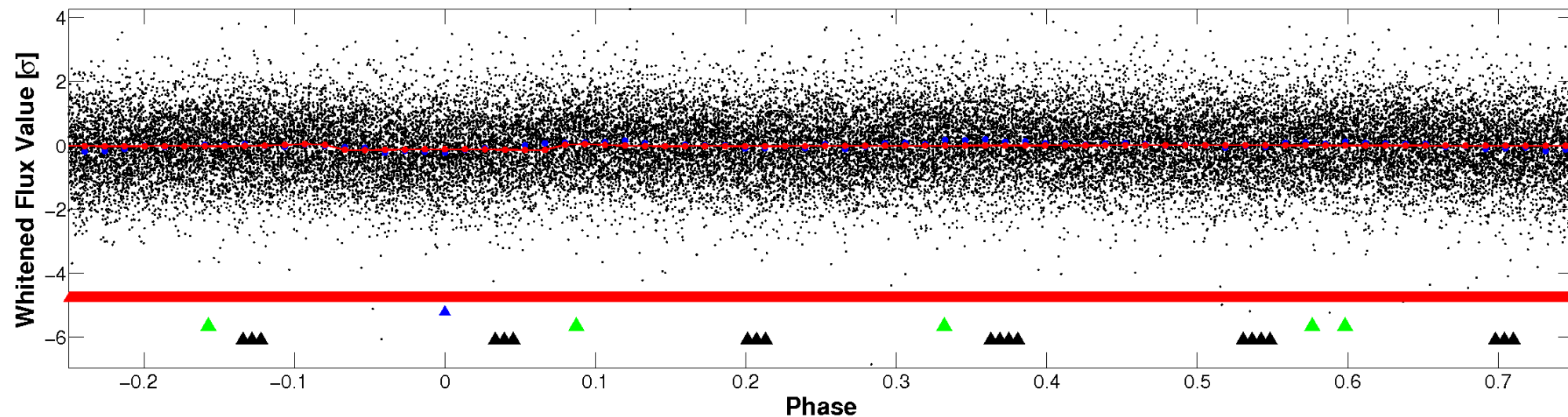


# Non-Whitened Vs. Whitened Light Curve

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

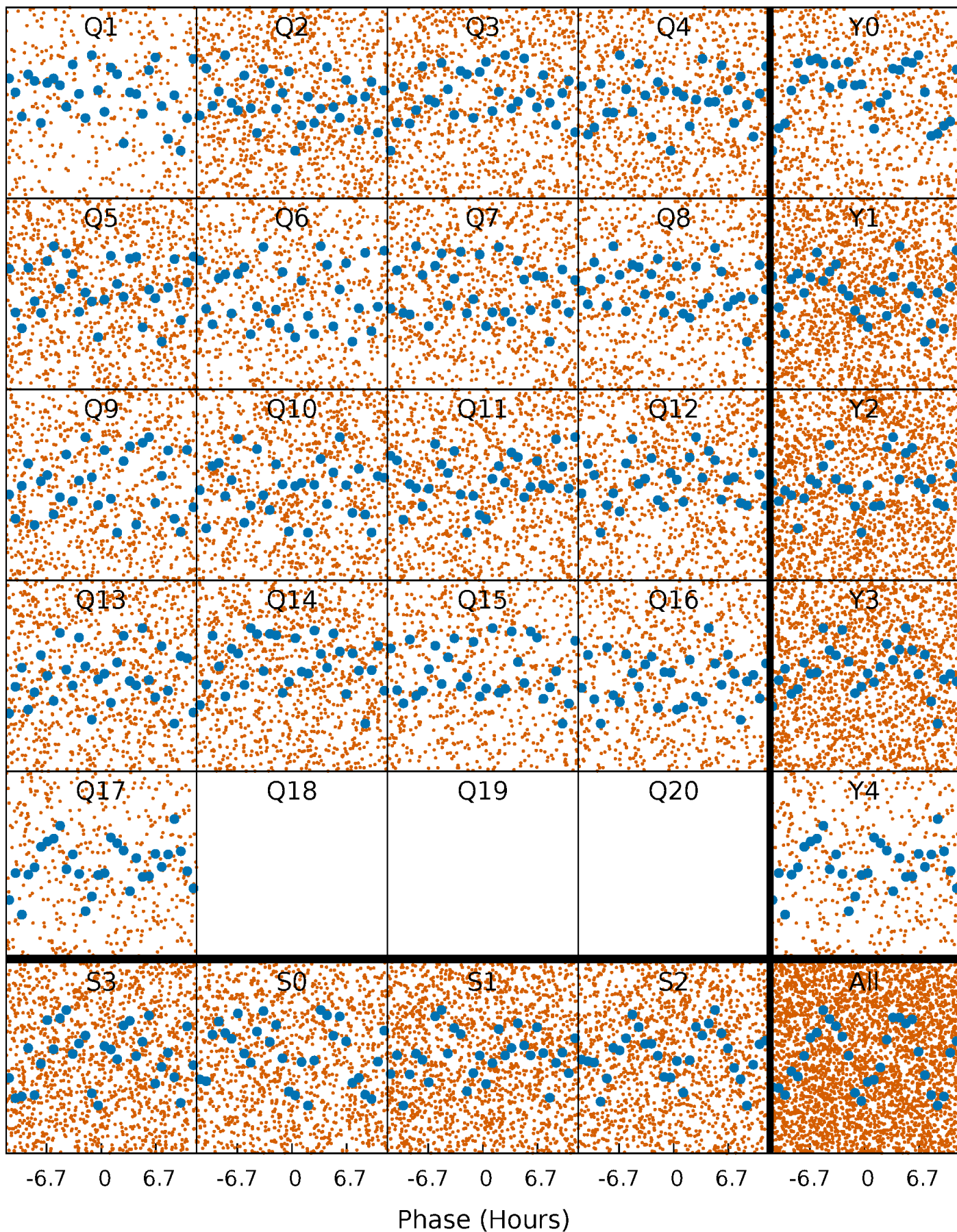


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



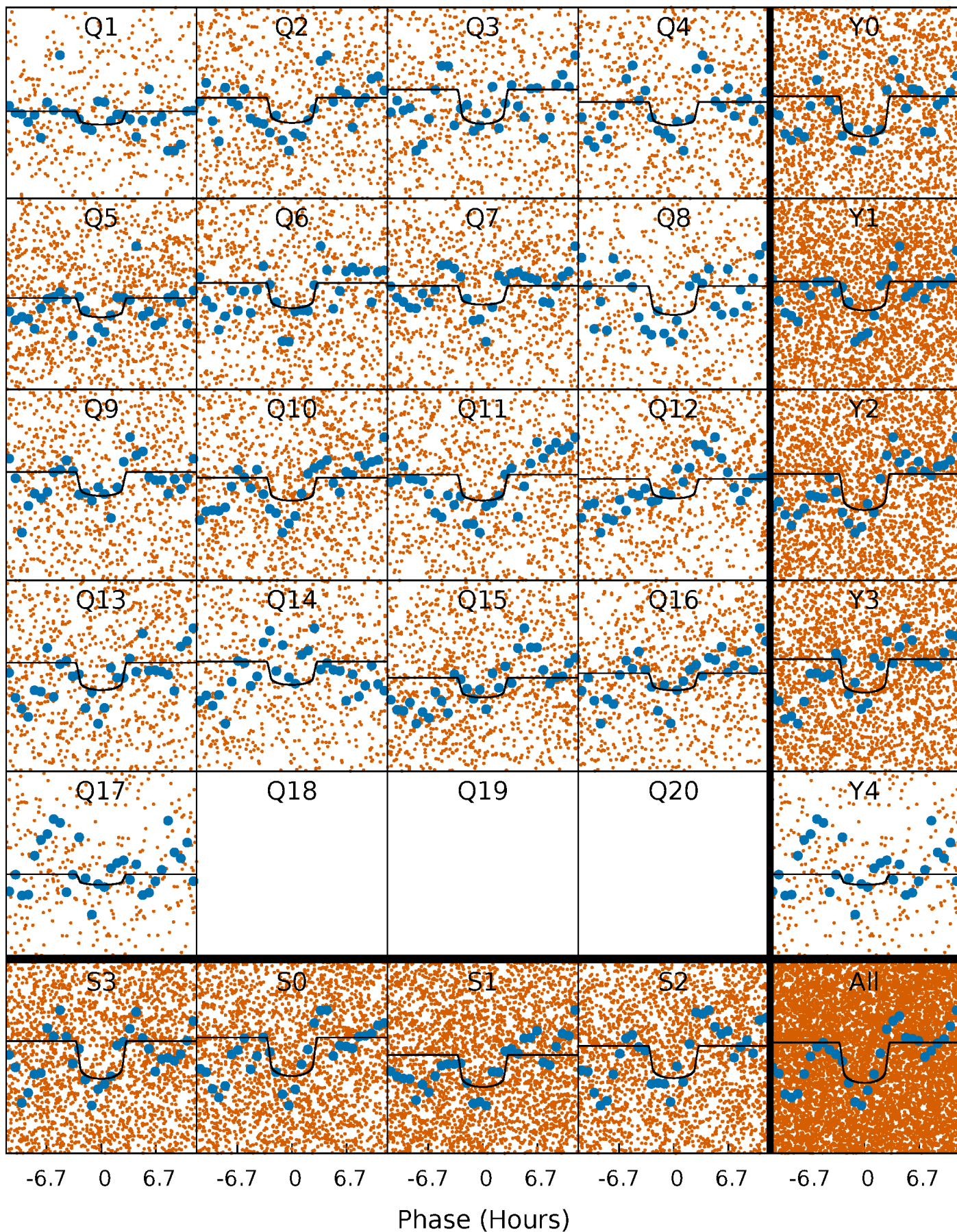
# PDC Quarter-Phased Transit Curves

TCE 009161894-02 P= 1.536418 Days  $T_0=132.929197$  (BKJD)



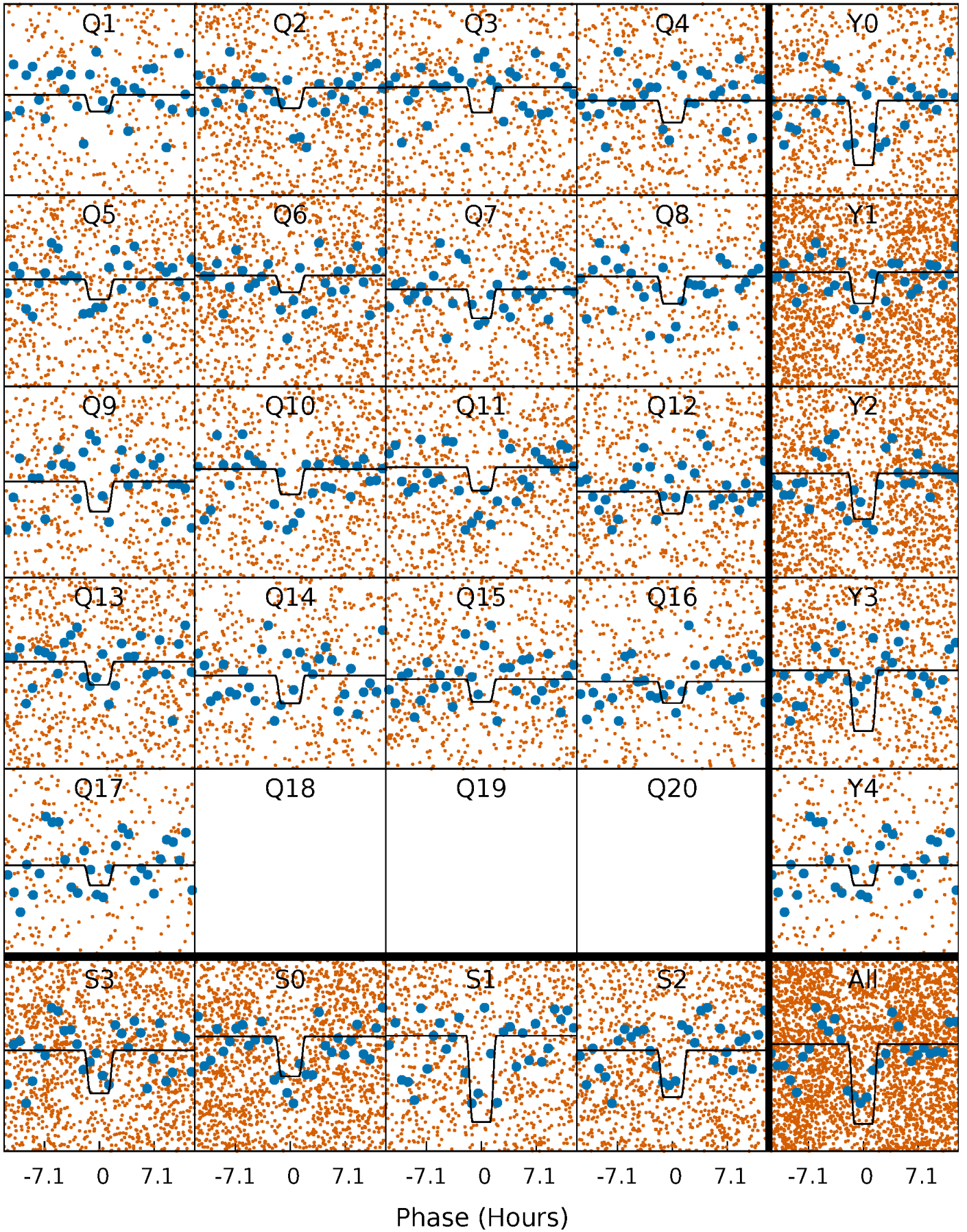
# DV Quarter-Phased Transit Curves

TCE 009161894-02 P= 1.536418 Days  $T_0=132.929197$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

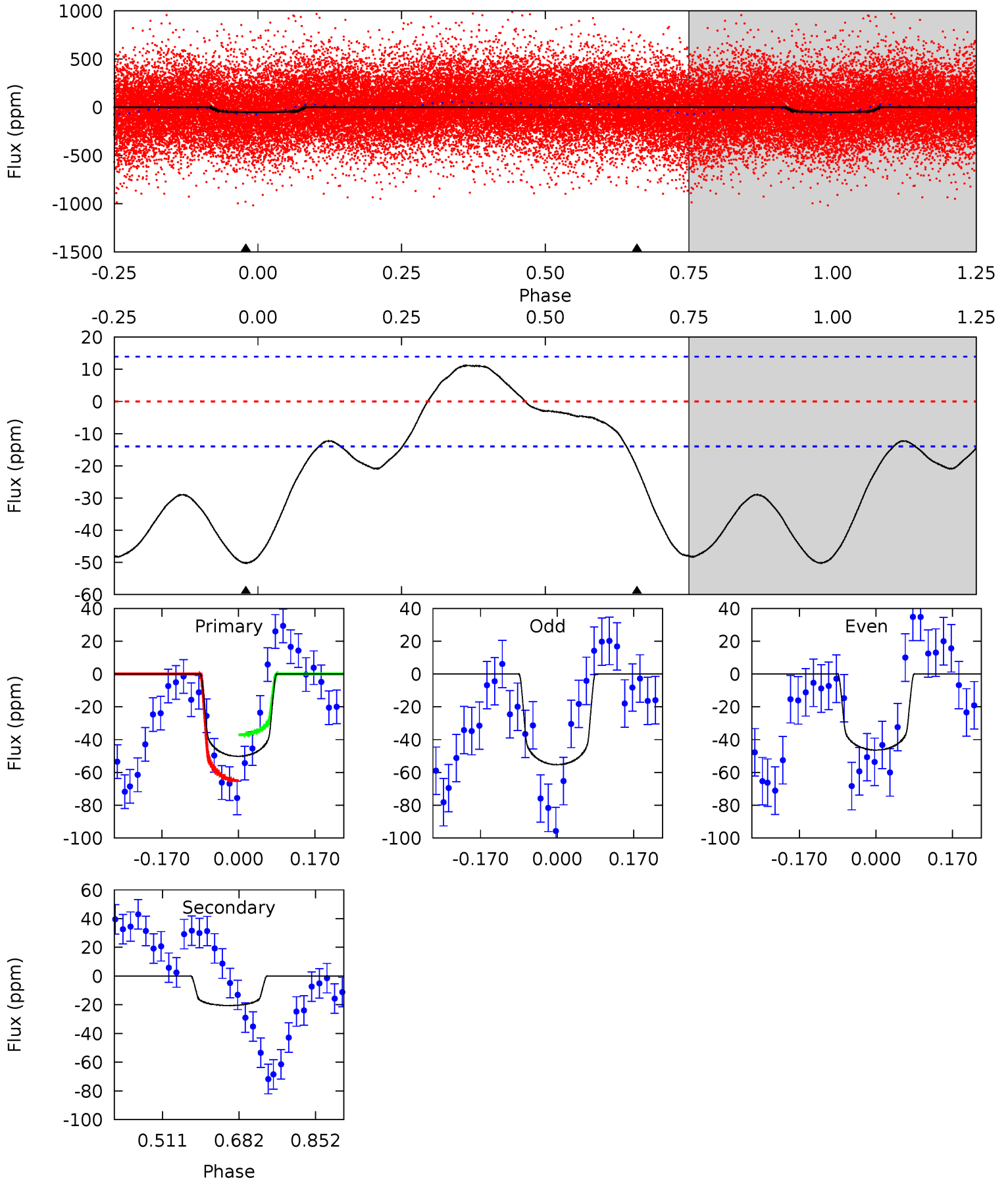
TCE 009161894-02 P= 1.536390 Days  $T_0=132.931419$  (BKJD)



# DV Model-Shift Uniqueness Test

009161894-02, P = 1.536418 Days, E = 131.392779 Days

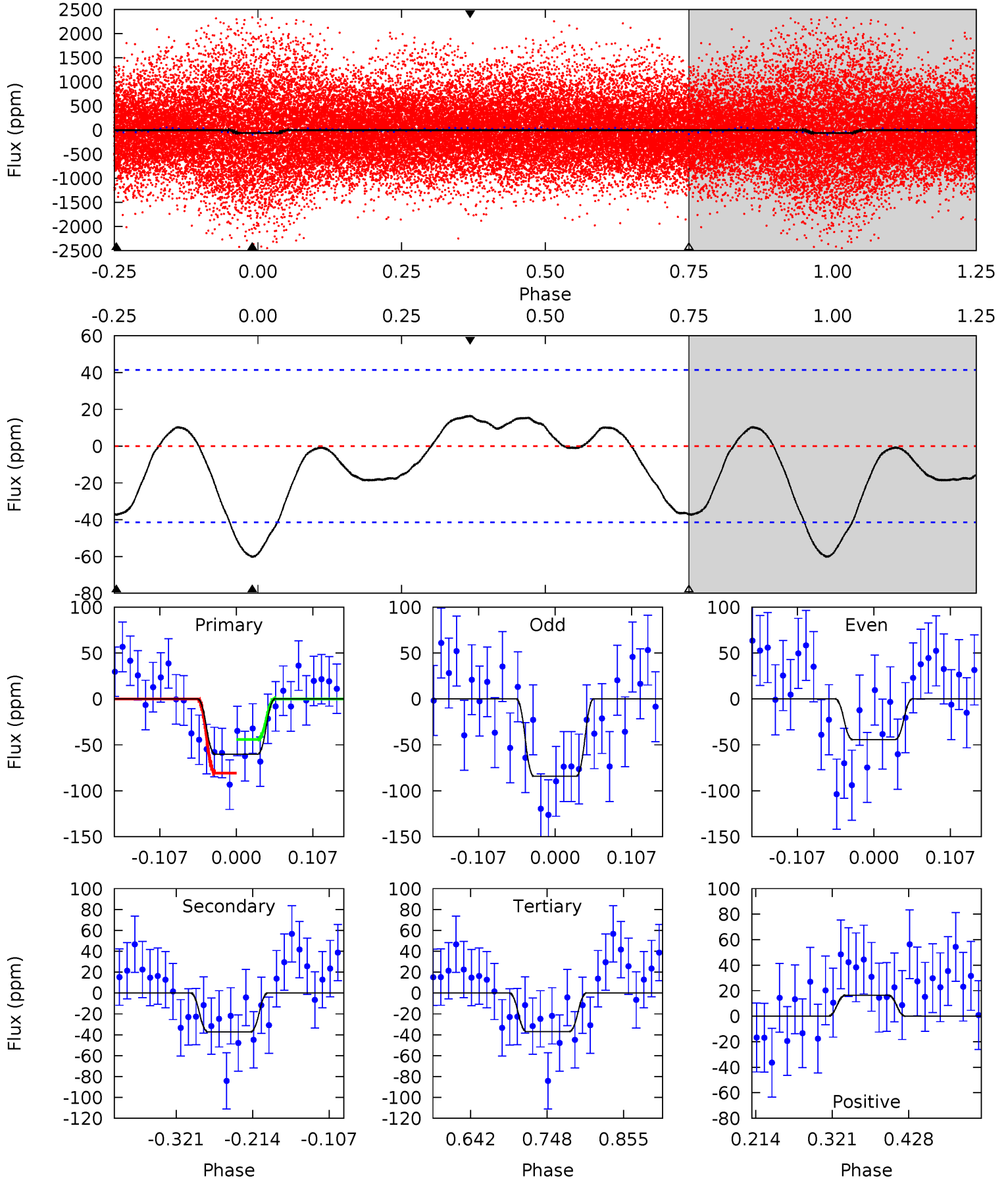
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
16.0	6.57	0	0	4.45	1.37	3.72	16.0	16.0	6.57	6.57	1.42	0.76	0.18	4.47



# Alt Model-Shift Uniqueness Test

009161894-02, P = 1.536390 Days, E = 131.395029 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
6.61	4.09	4.07	1.80	4.55	1.61	1.58	2.54	4.81	0.02	2.29	2.19	0.82	0.21	2.03



### Stellar Parameters For KIC 009161894

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7345^{+203}_{-330}$	$4.090^{+0.153}_{-0.170}$	$-0.120^{+0.250}_{-0.350}$	$1.852^{+0.528}_{-0.432}$	$1.538^{+0.234}_{-0.257}$	$0.341^{+0.299}_{-0.157}$
	+3%/-4%	+4%/-4%	+208%/-292%	+29%/-23%	+15%/-17%	+88%/-46%
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 009161894-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-21 \pm 3$	$1.48^{+0.35}_{-0.32}$	$3543^{+269}_{-231}$	$5602^{+728}_{-542}$	$4.581^{+3.096}_{-1.713}$
Alt.	$-37 \pm 9$	$1.81^{+0.37}_{-0.36}$	$3558^{+262}_{-254}$	$5874^{+645}_{-564}$	$5.496^{+3.304}_{-2.109}$

$T_{\text{max}}$  = 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

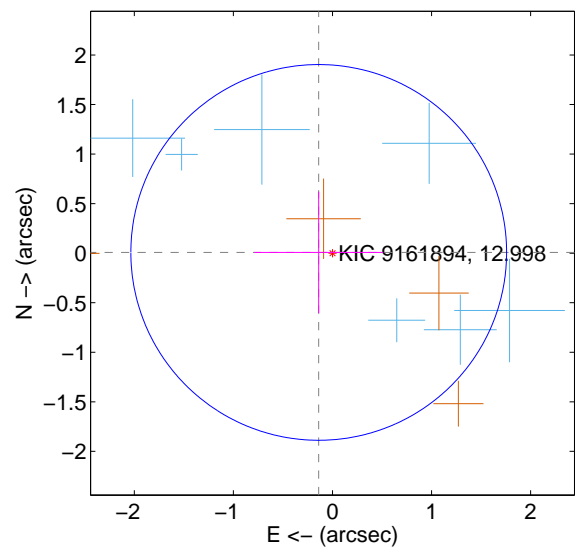
Supplemental centroid analysis for 009161894-02. Kepler magnitude: 13.00. Transit SNR 9.58

There are 7 quarters with good PRF difference image offsets

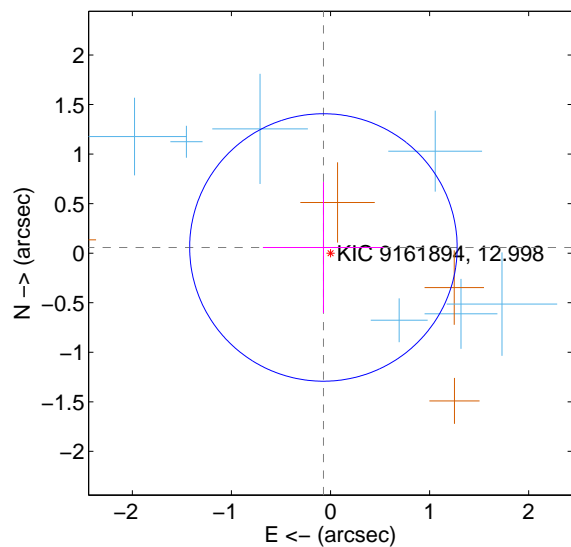
The direct PRF centroid is offset from the target star catalog position by about 0.01 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.139 \pm 0.632$	0.22	$0.139 \pm 0.649$	$0.008 \pm 0.612$
PRF-fit source offset from KIC position	$0.092 \pm 0.450$	0.20	$0.072 \pm 0.611$	$0.057 \pm 0.661$
photometric centroid source offset	$0.59 \pm 0.39$	1.52	$-0.56 \pm 0.38$	$-0.20 \pm 0.43$

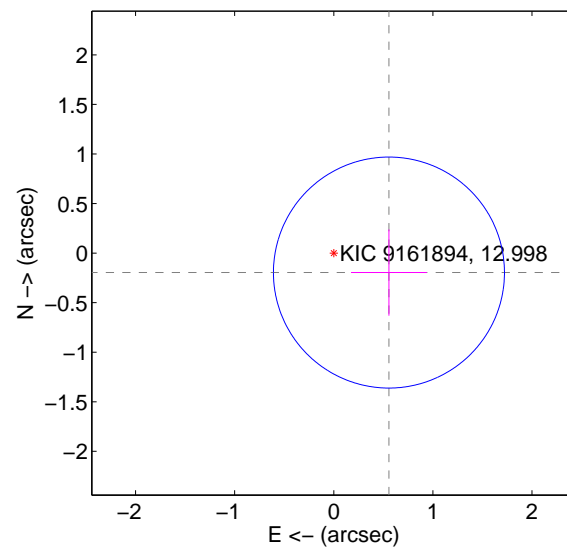
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

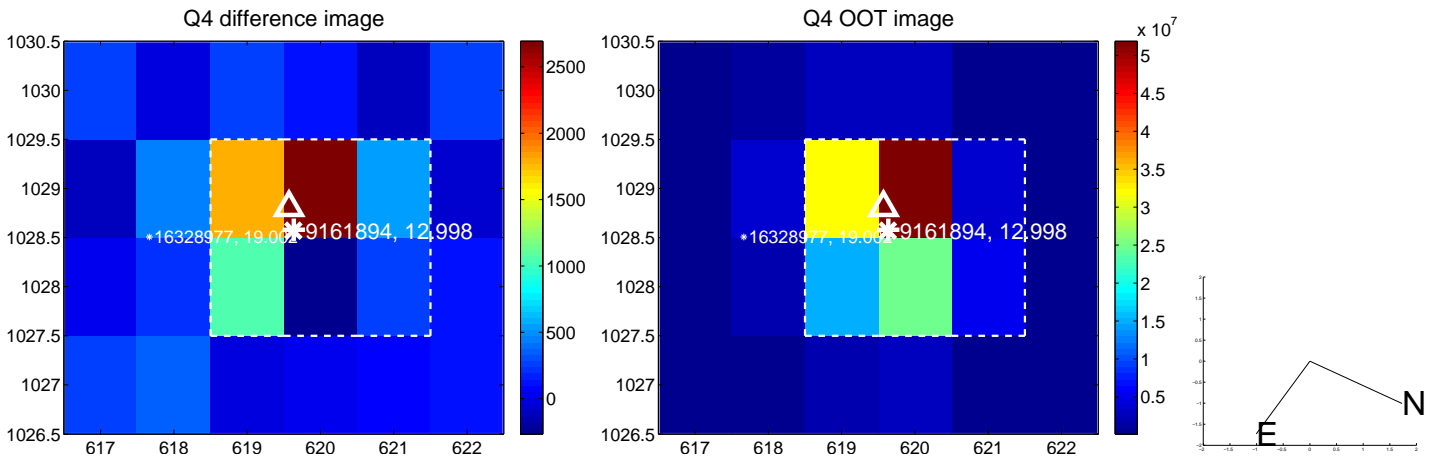
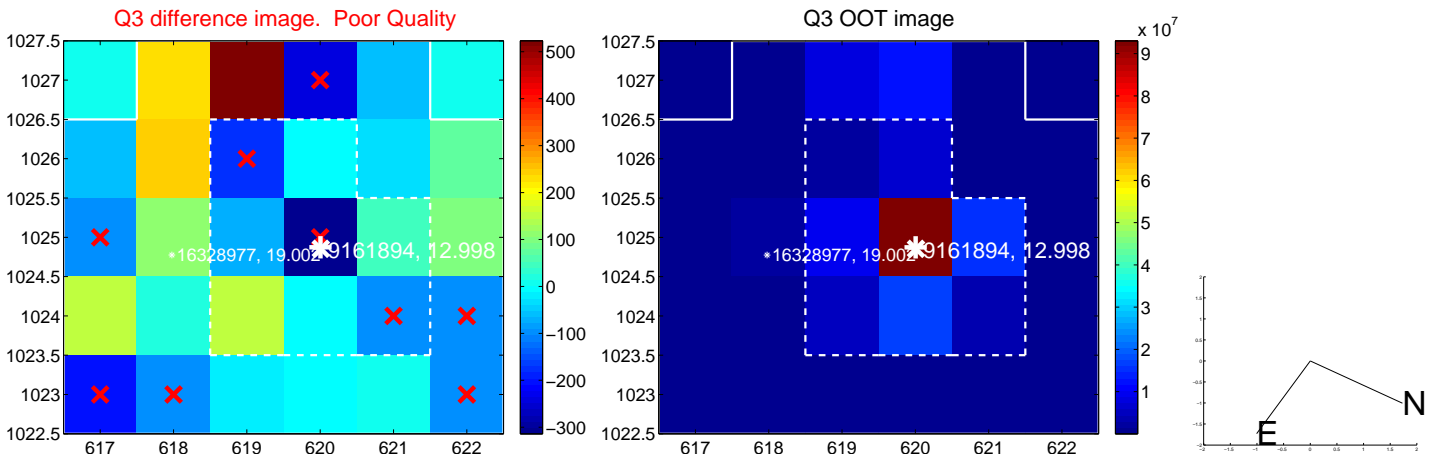
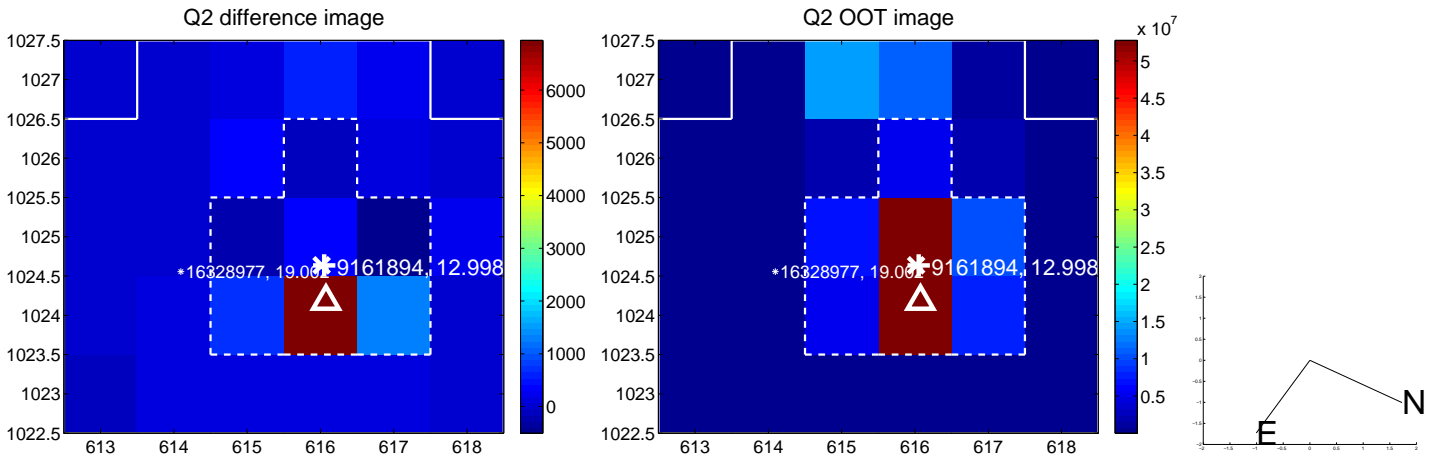
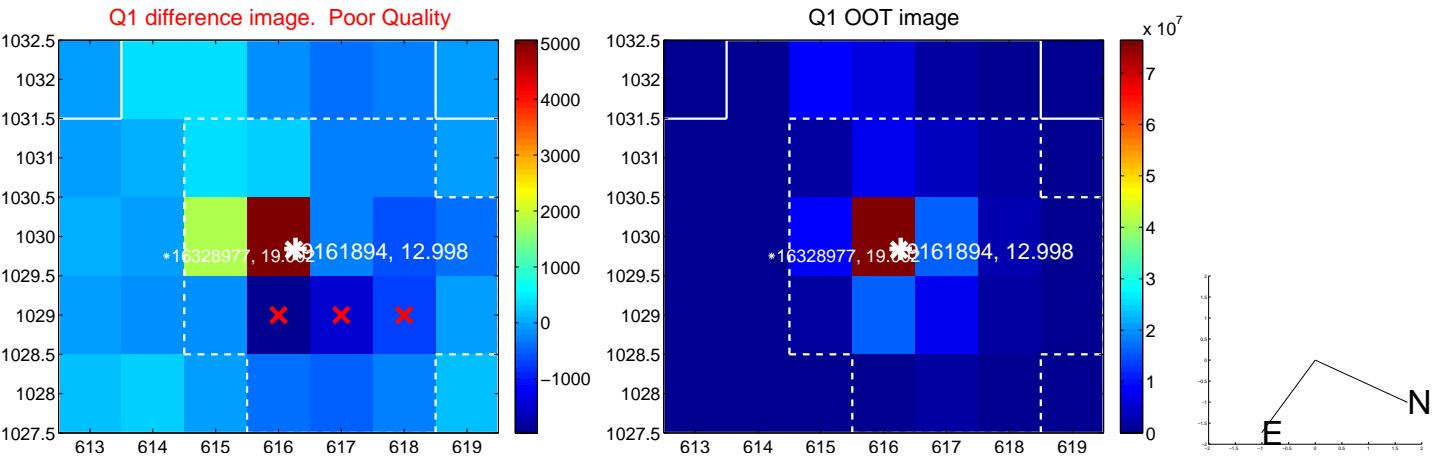


offset from photometric centroids

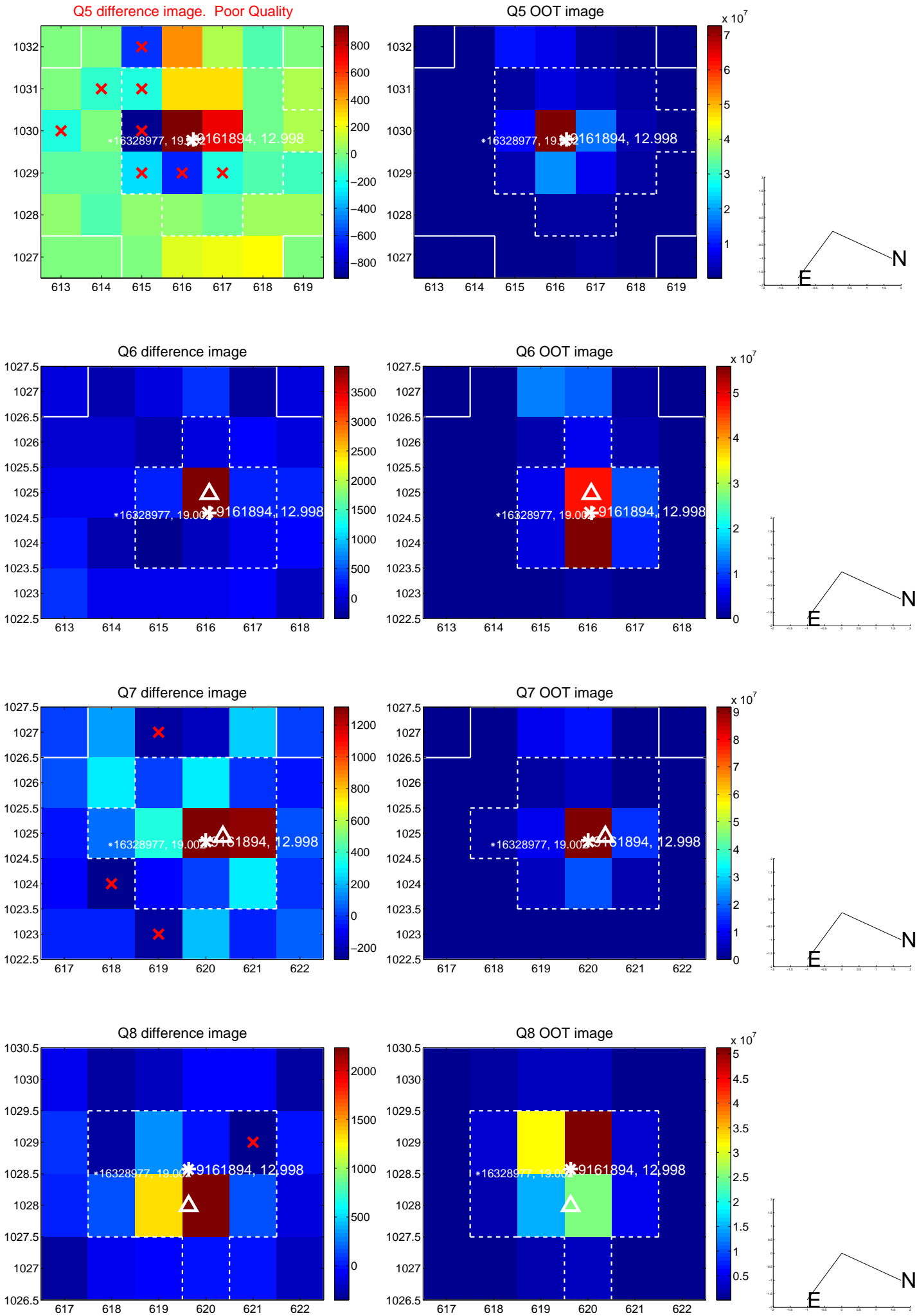


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

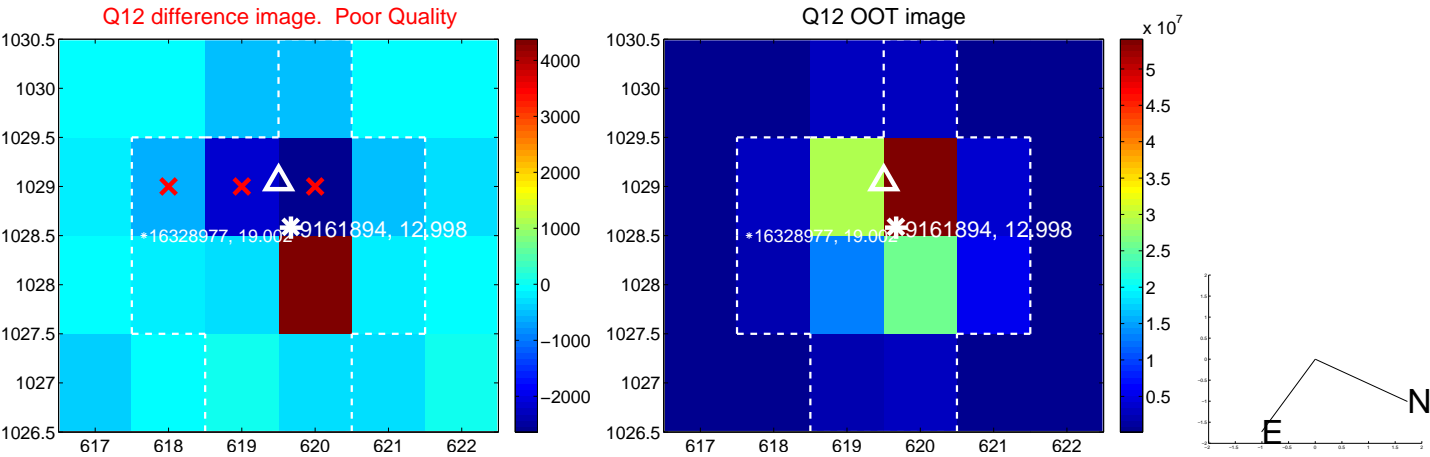
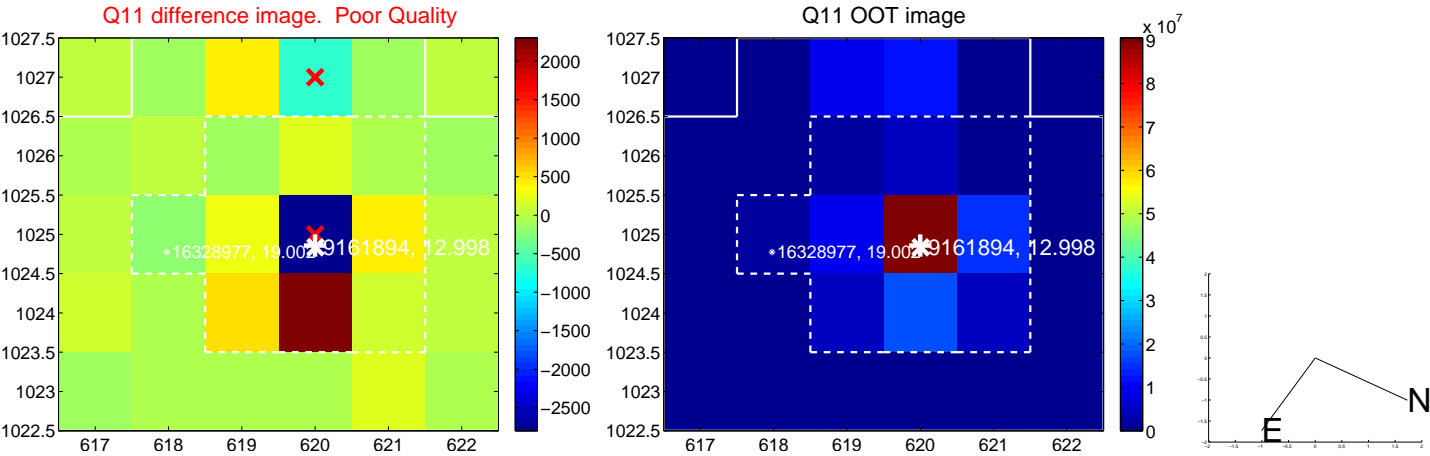
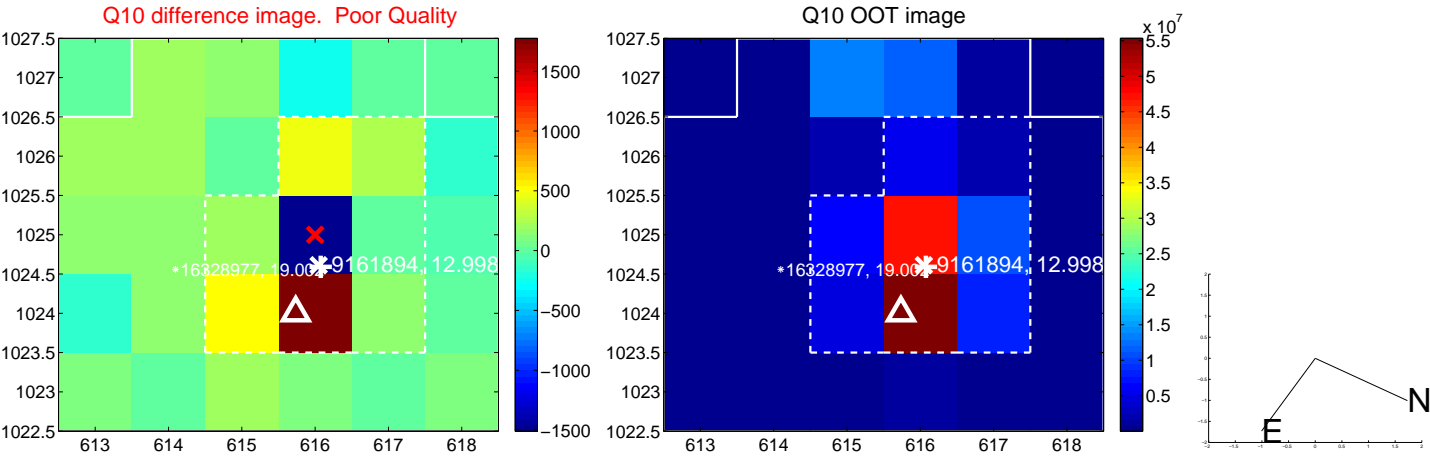
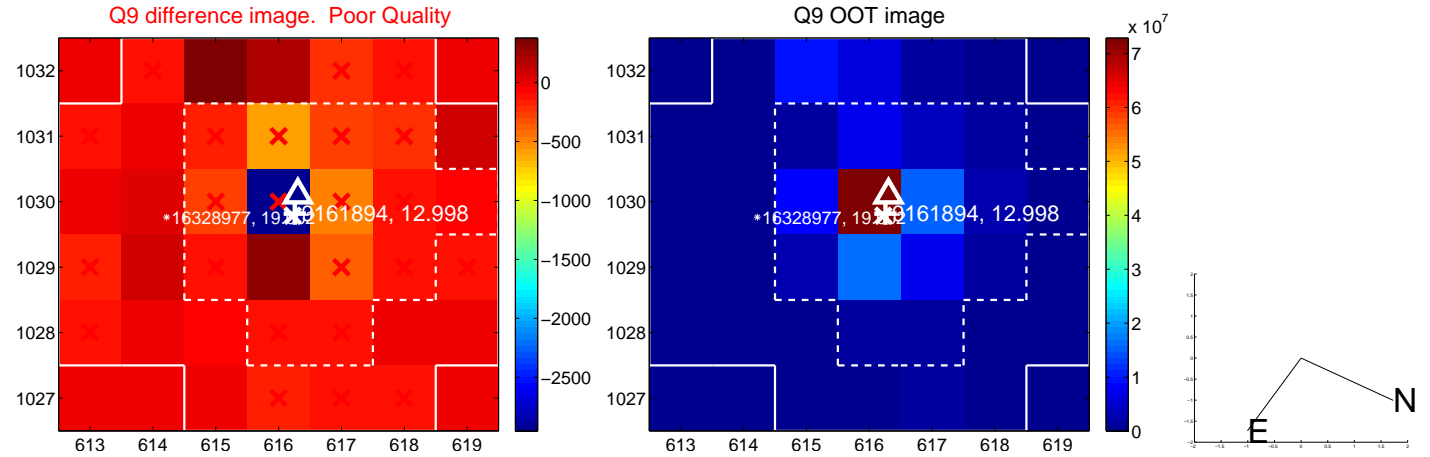
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



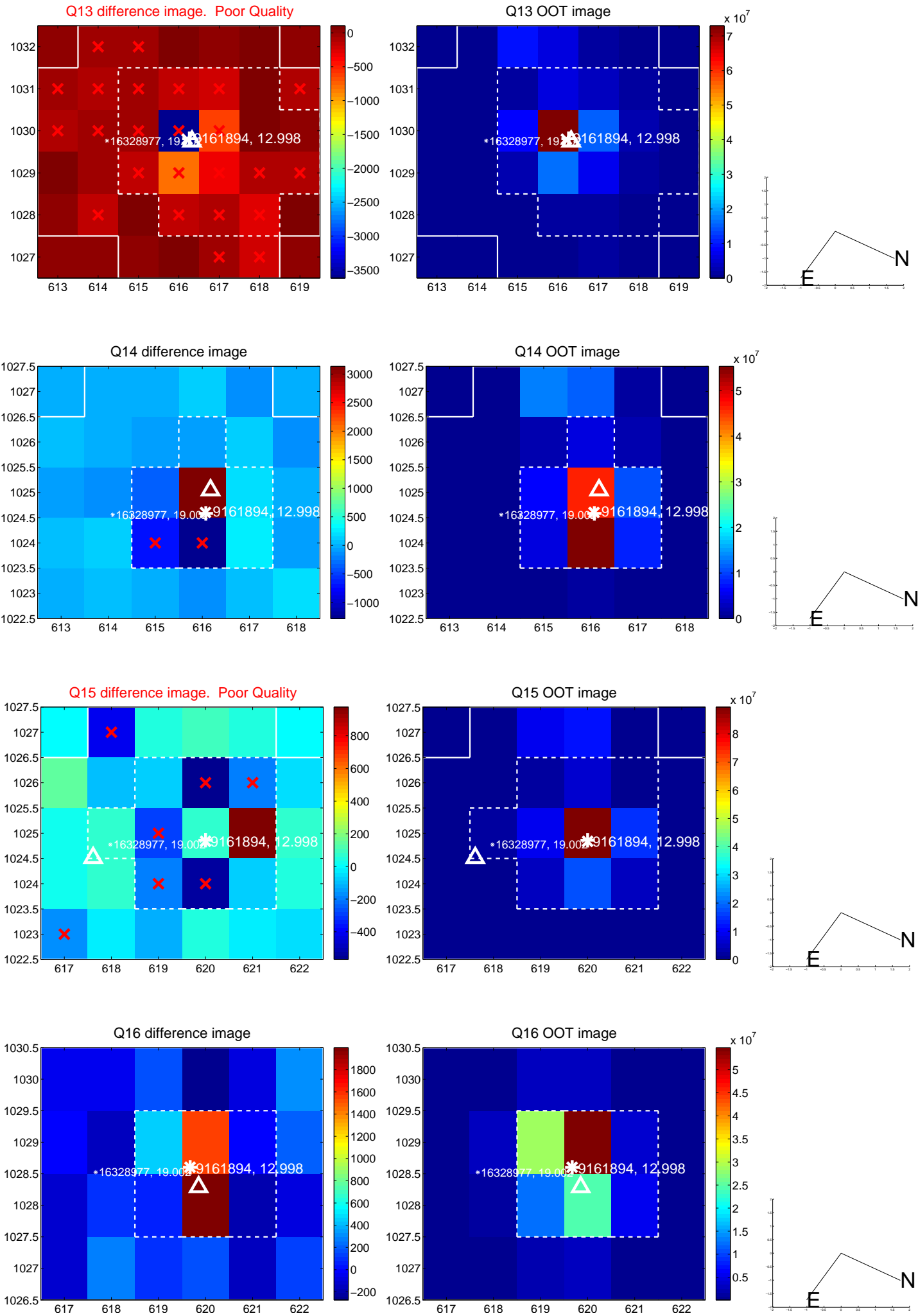
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



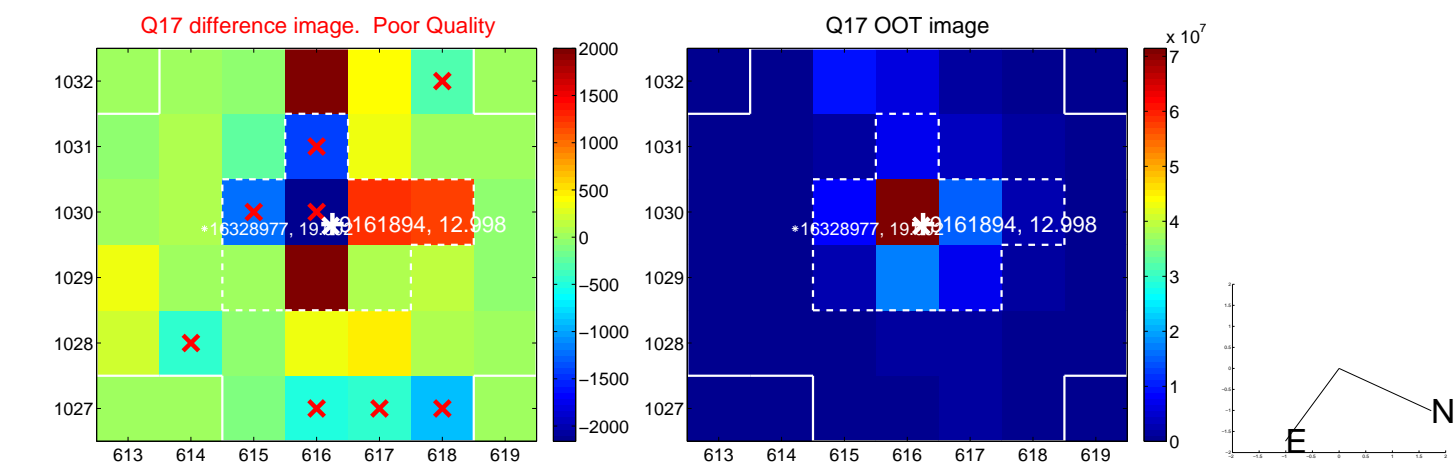
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



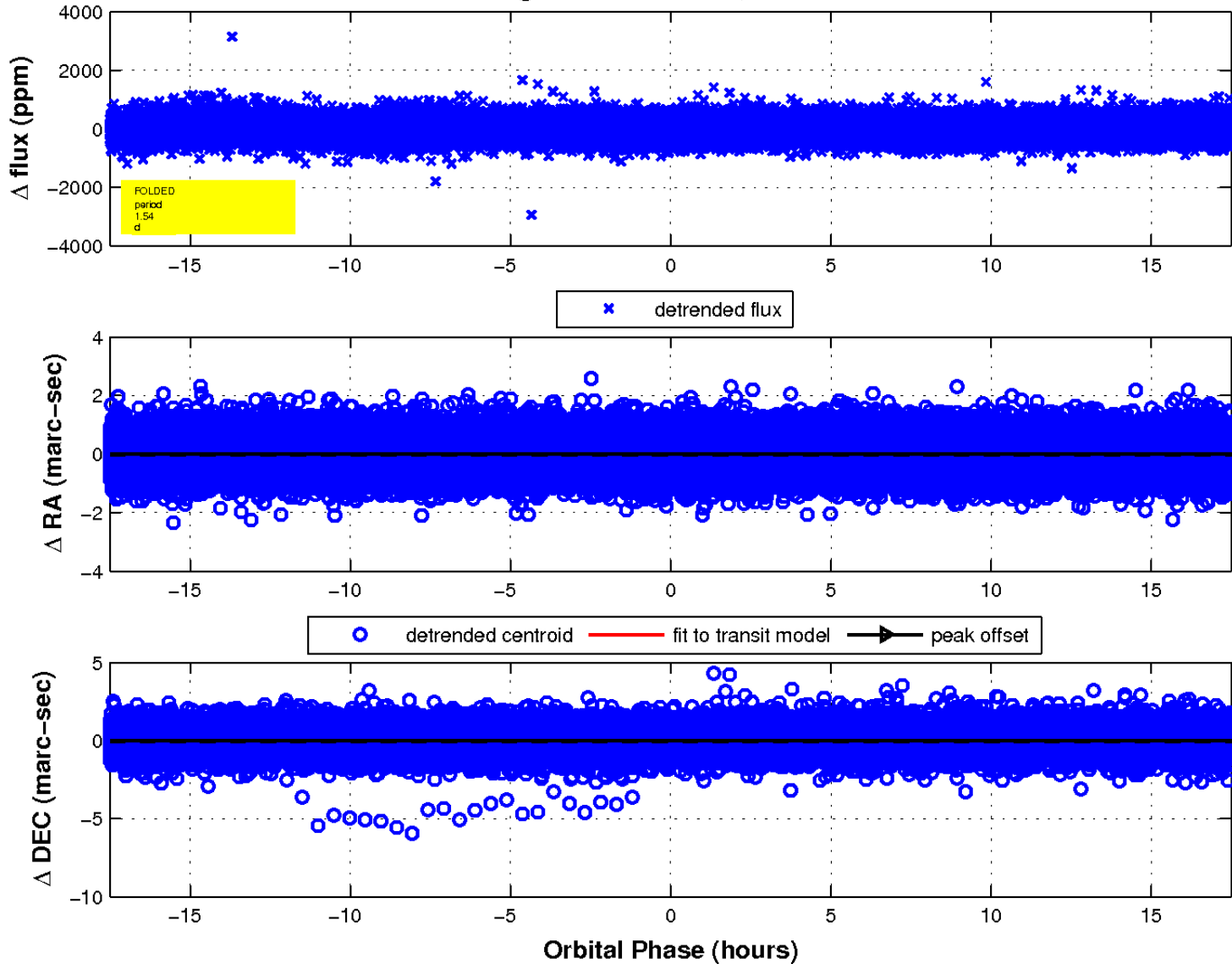
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

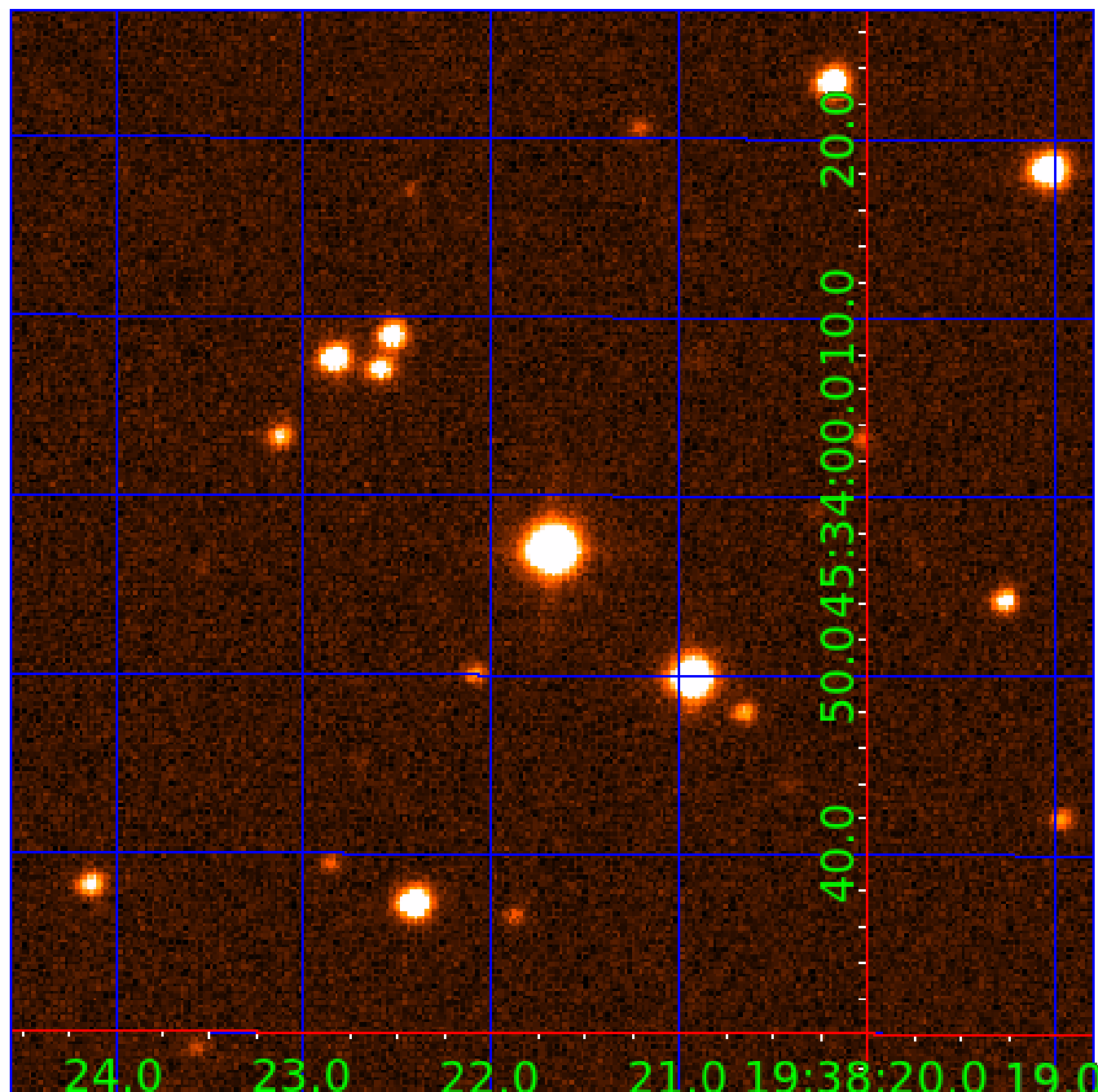


fluxWeightedCentroids, Planet 2 of 4



UKIRT Image

Declination



# KIC 009161894

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009161894-01	OBS	No	0.503086	131.949172	28.6	1.648	9.6	11.5	1.85	7345	1.15	43762.20
009161894-02	OBS	No	1.536418	132.929197	47.0	5.837	9.3	9.6	1.85	7345	1.48	9876.65
009161894-04	OBS	No	73.490483	193.692114	113.3	1.005	7.3	1.8	1.85	7345	2.13	56.88

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009161894-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
009161894-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_ZUMA—LPP_DV—MOD_NONUNIQ_ALT
009161894-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT

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

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

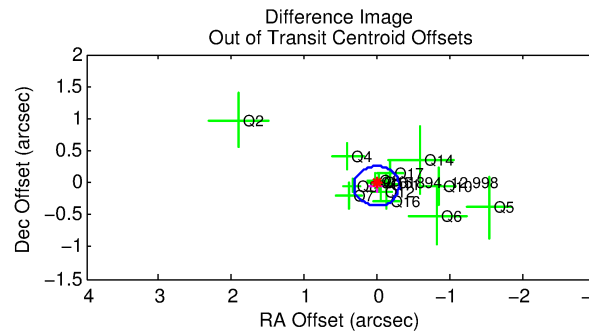
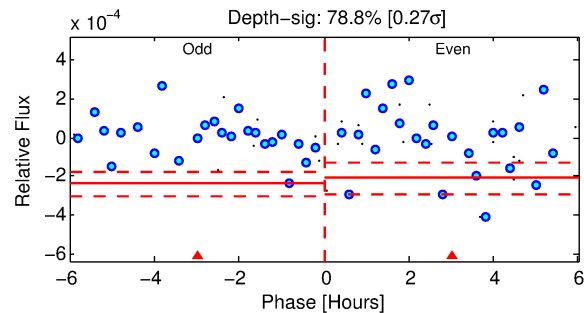
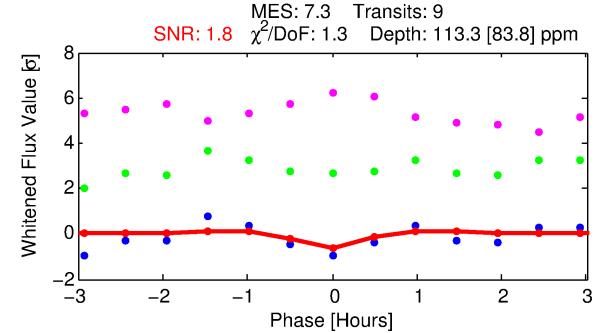
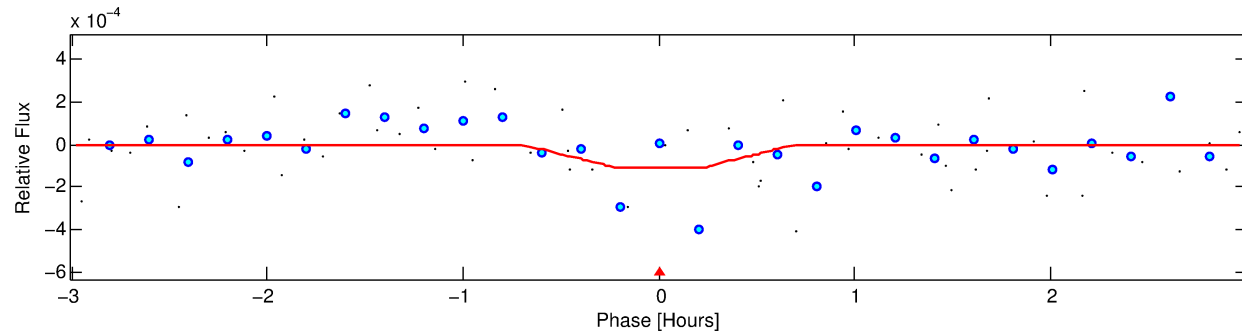
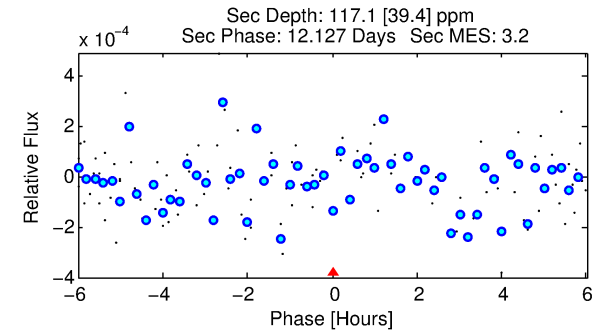
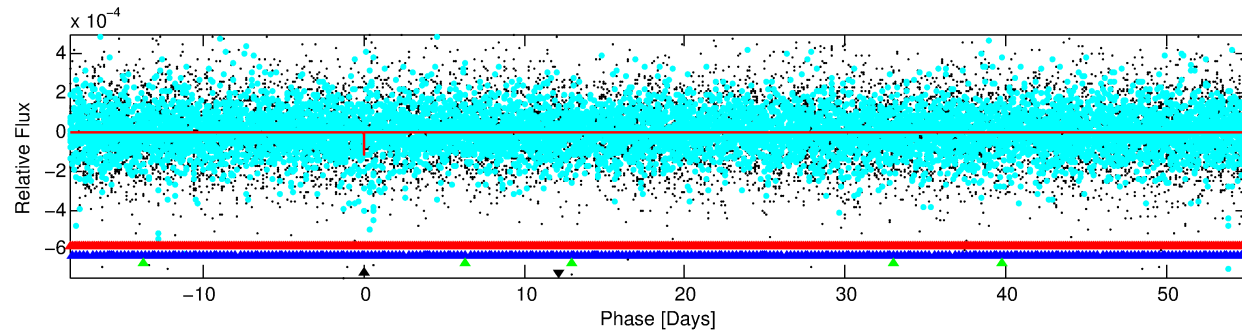
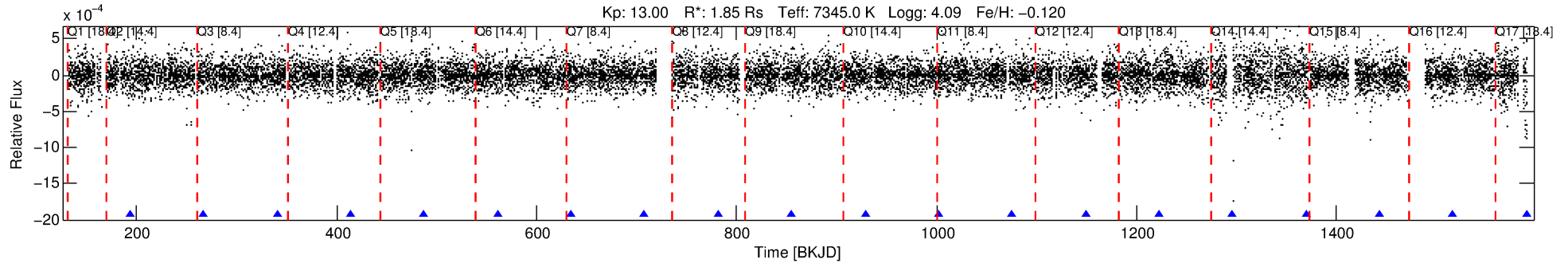
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009161894-04

No Significant Match Found

# DV One-Page Summary

KIC: 9161894 Candidate: 4 of 4 Period: 73.490 d



## DV Fit Results:

Period = 73.49048 [0.00166] d  
Epoch = 193.6921 [0.0184] BKJD  
Rp/R\* = 0.0105 [0.0296]  
a/R\* = 406.95 [6729.14]  
b = 0.70 [12.16]  
Seff = 56.88 [21.02]  
Teq = 700 [65] K  
Rp = 2.13 [6.01] Re  
a = 0.3965 [0.0914] AU  
Ag = 2238.23 [12631.33] [0.18σ]  
Teffp = 7447 [10495] K [0.64σ]

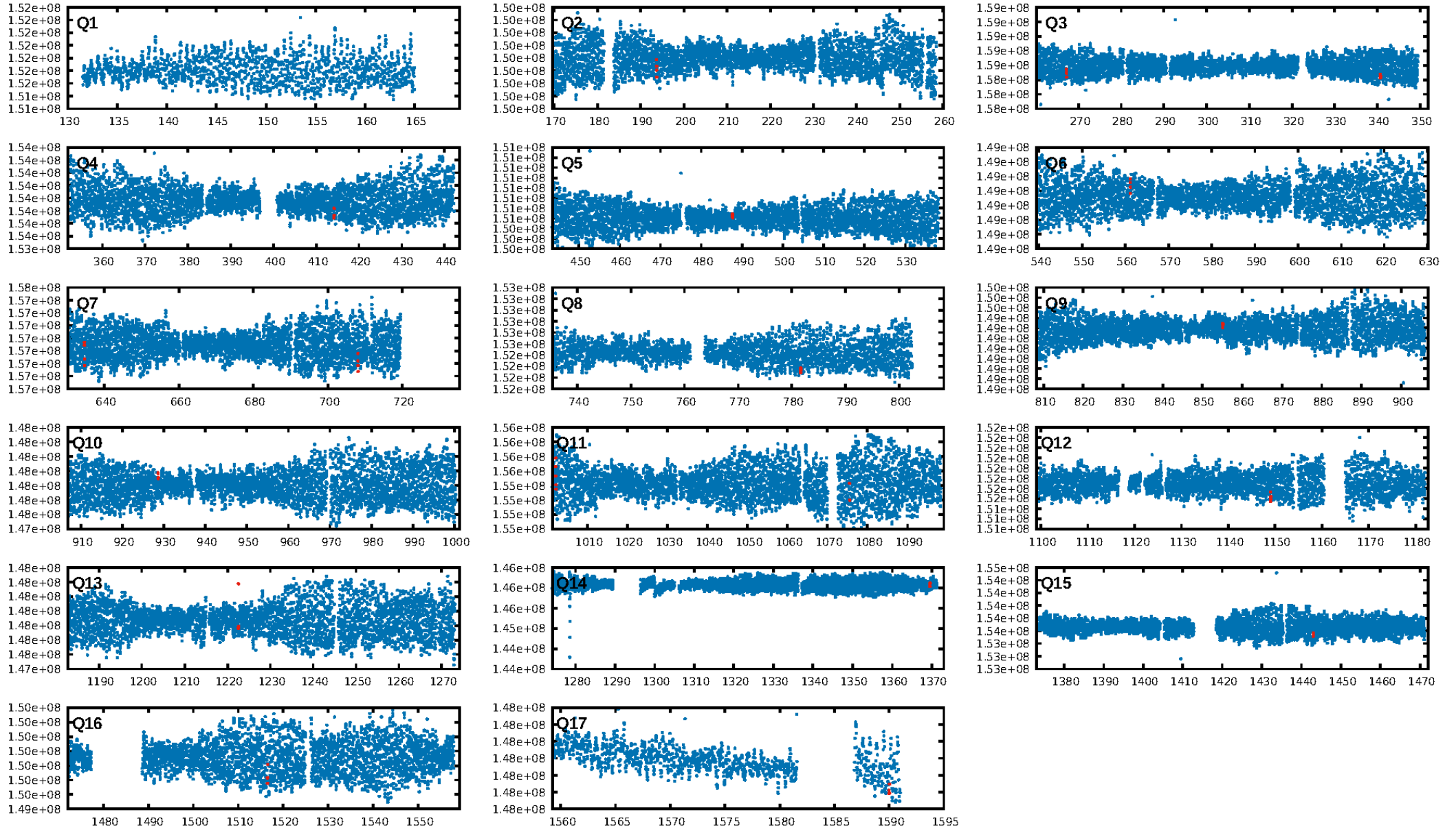
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [291.57σ]  
LongPeriod-sig: 100.0% [743.62σ]  
ModelChiSquare2-sig: 19.8%  
ModelChiSquareGof-sig: 74.7%  
**Bootstrap-pfa: 1.35e-12**  
RollingBand-fgt: 1.00 [8/8]  
**GhostDiagnostic-chr: -24.08**  
Centroid-sig: 99.6%  
Centroid-so: 0.884 arcsec [0.37σ]  
OotOffset-rm: 0.054 arcsec [0.52σ]  
KicOffset-rm: 0.076 arcsec [0.37σ]  
OotOffset-st: 4/4/4/2 [14]  
KicOffset-st: 4/4/4/2 [14]  
DiffImageQuality-fgm: 0.71 [10/14]  
DiffImageOverlap-fno: 0.00 [0/16]

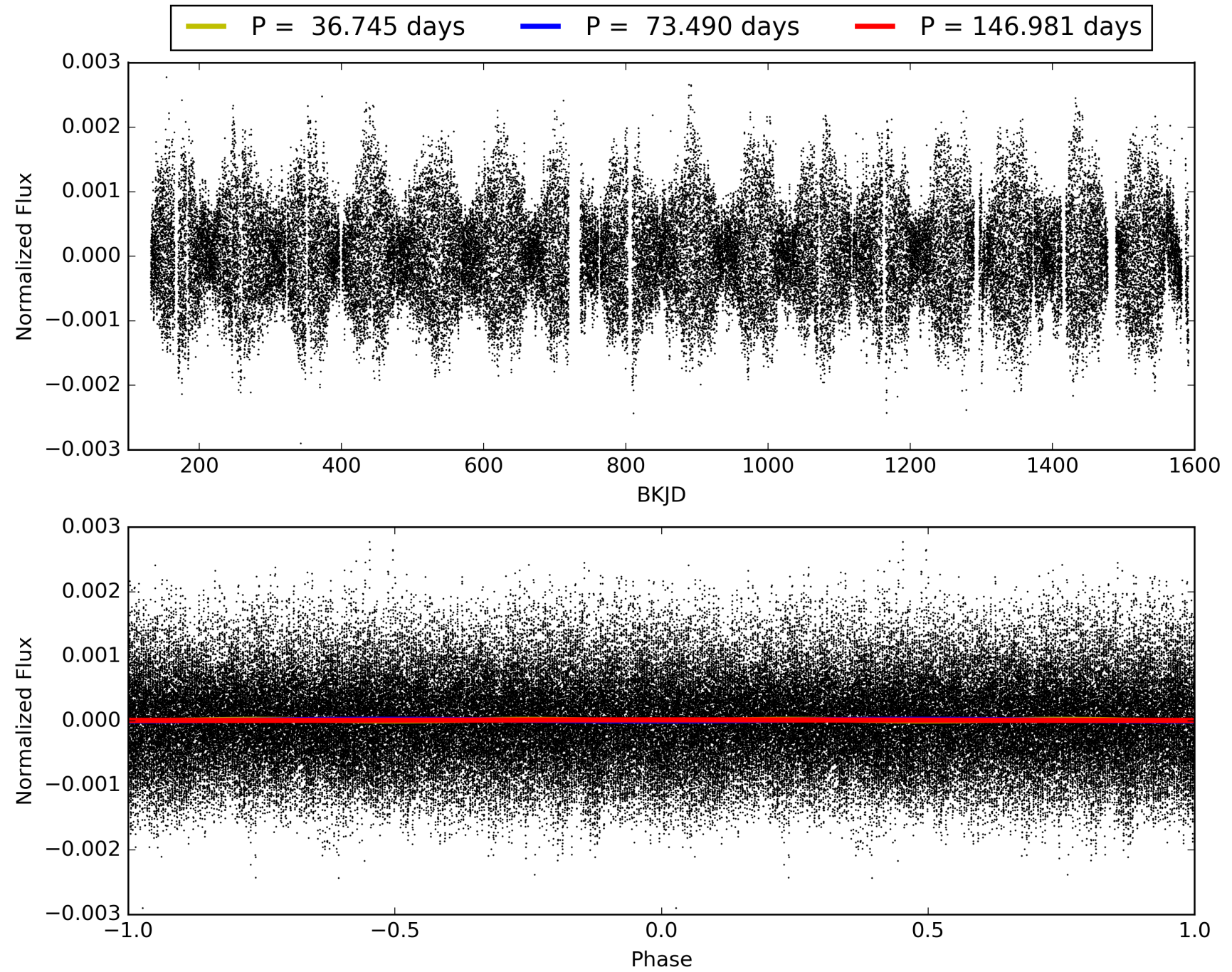
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 02-Feb-2016 19:16:17 Z

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

# TCE 009161894-04, PDC Light Curves

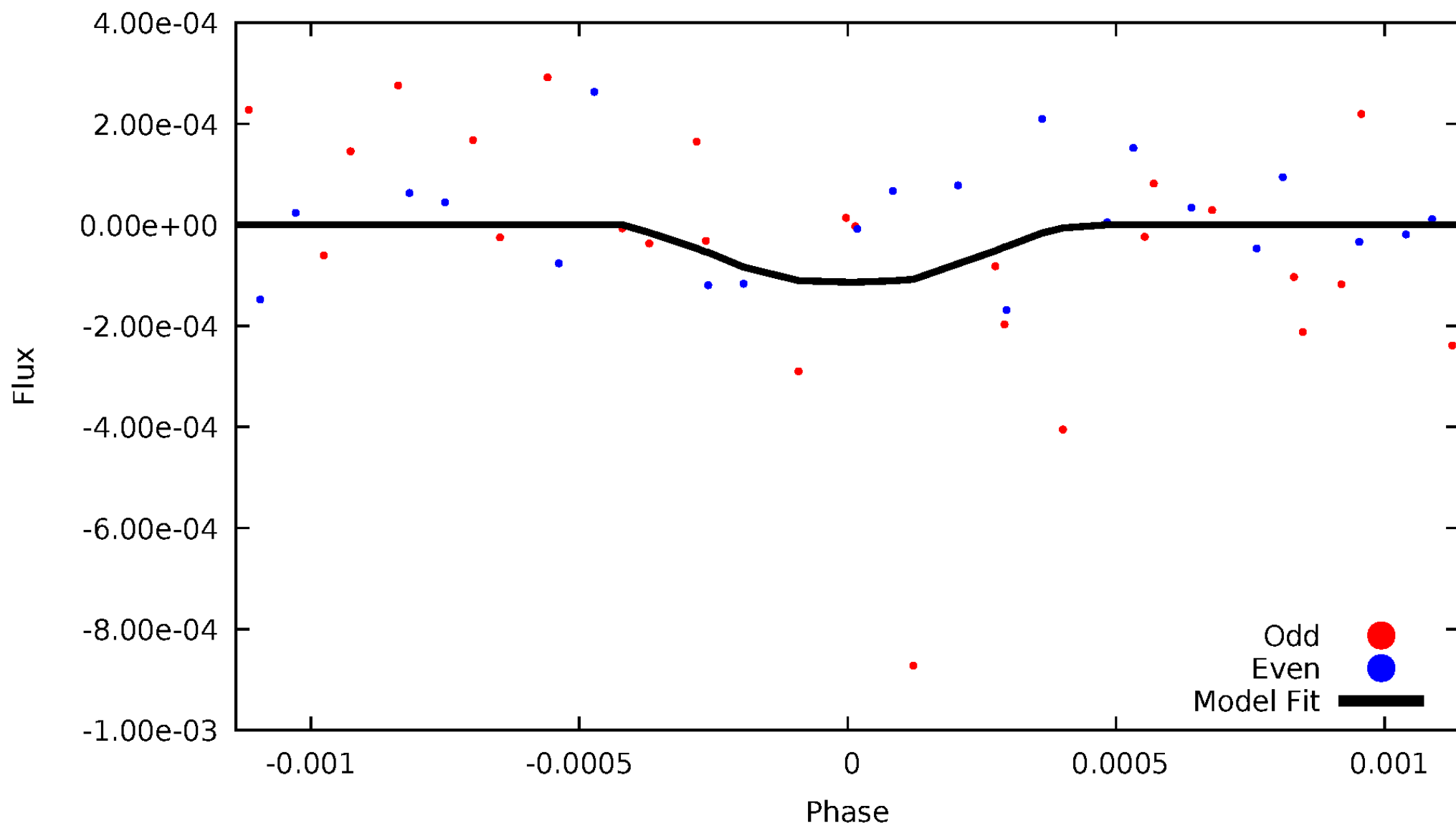


# TCE 009161894-04



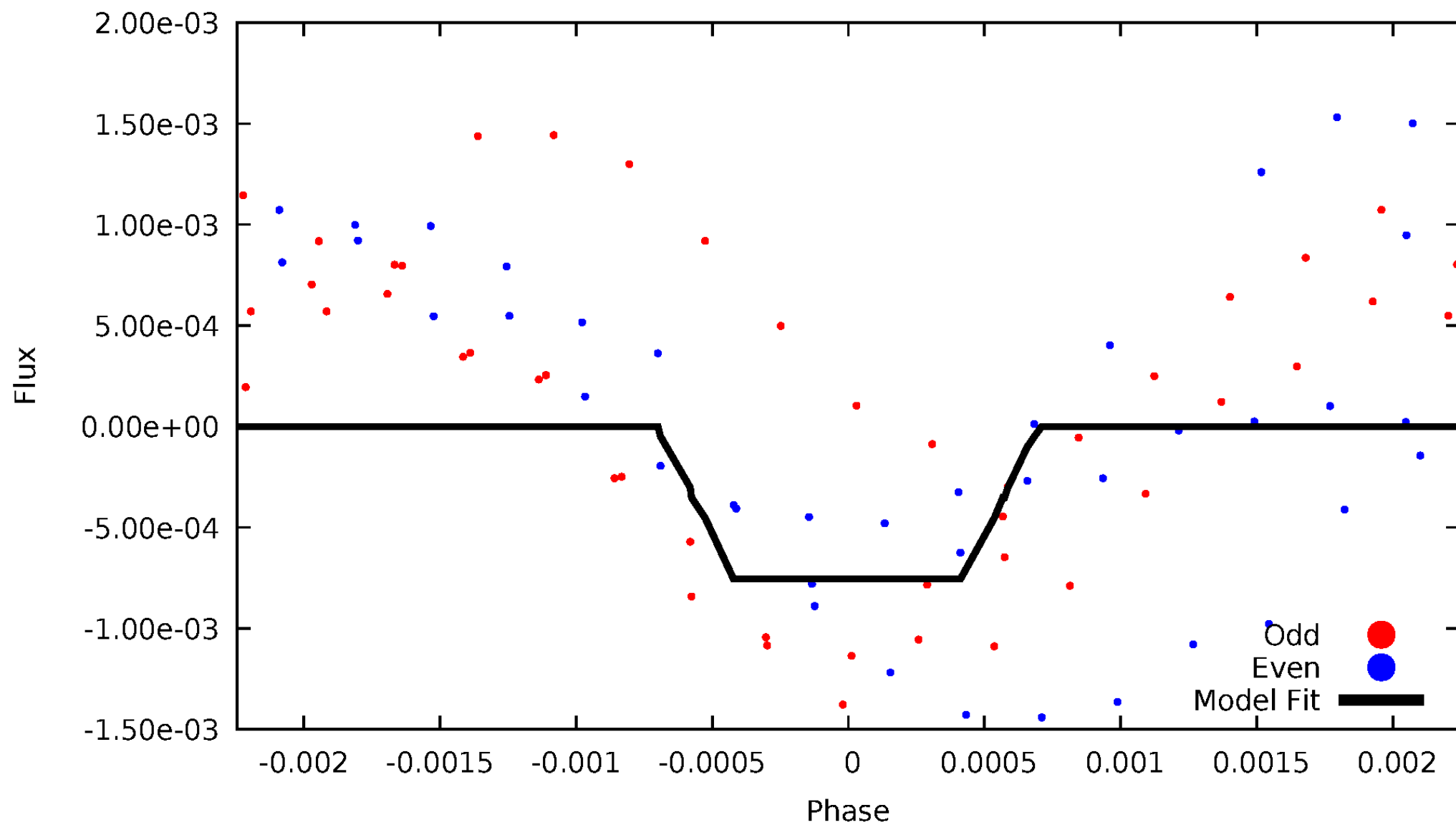
# DV Odd/Even

TCE 009161894-04



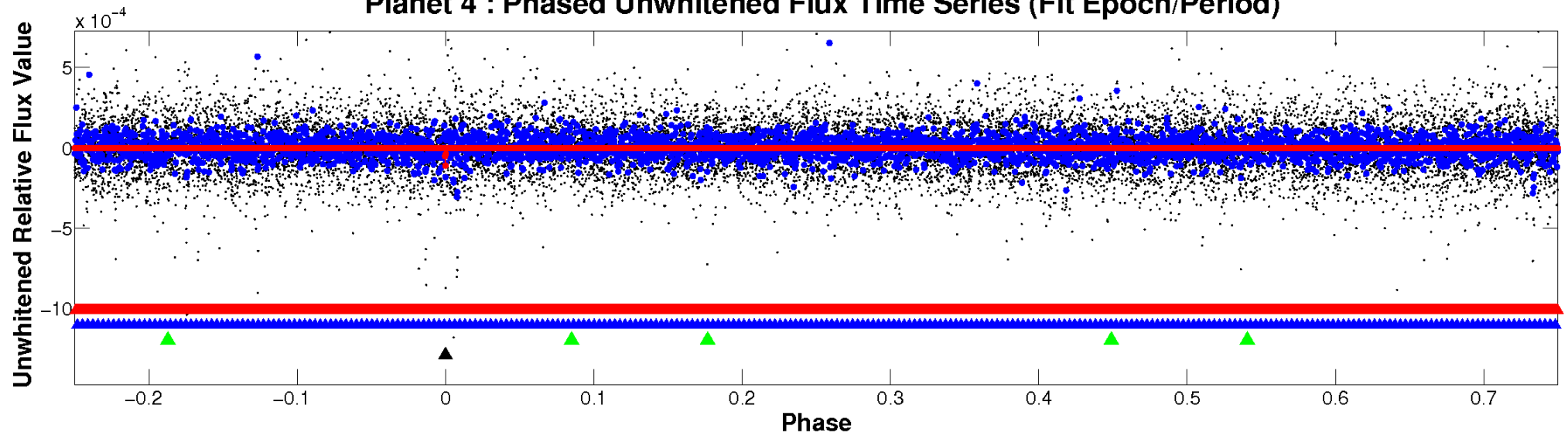
# ALT Odd/Even

TCE 009161894-04

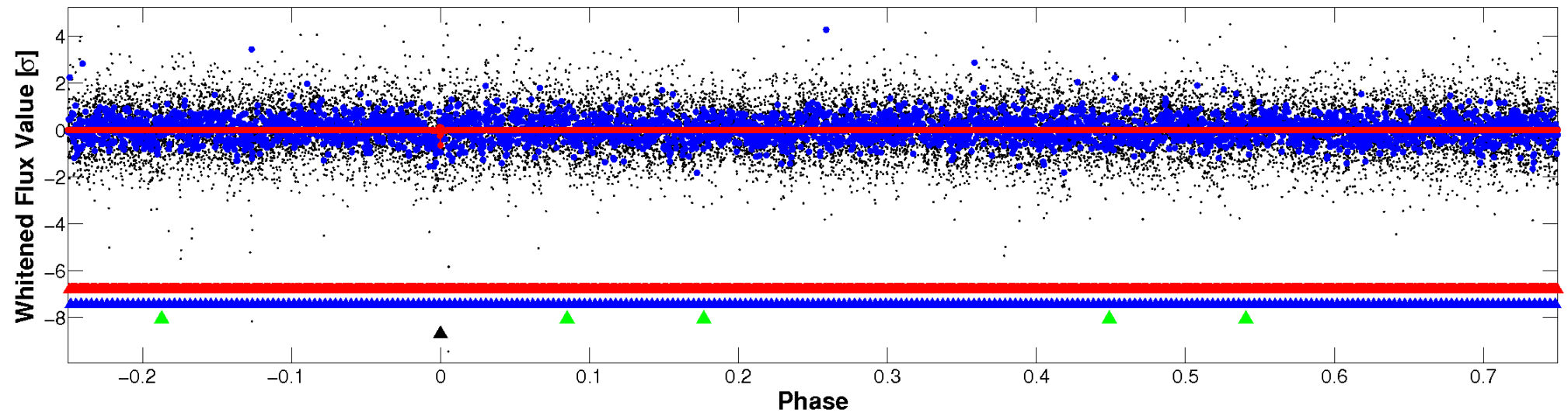


# Non-Whitened Vs. Whitened Light Curve

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

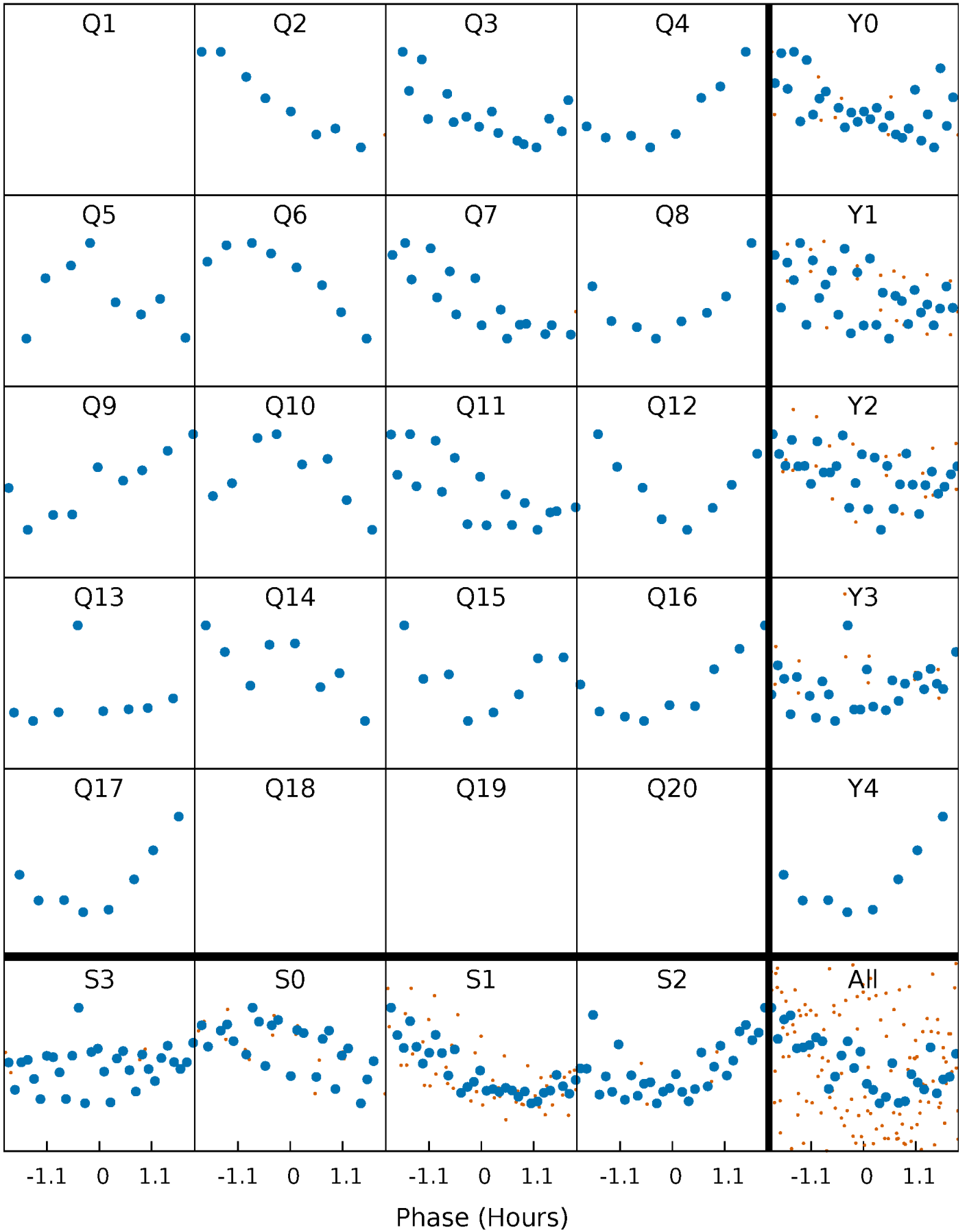


## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



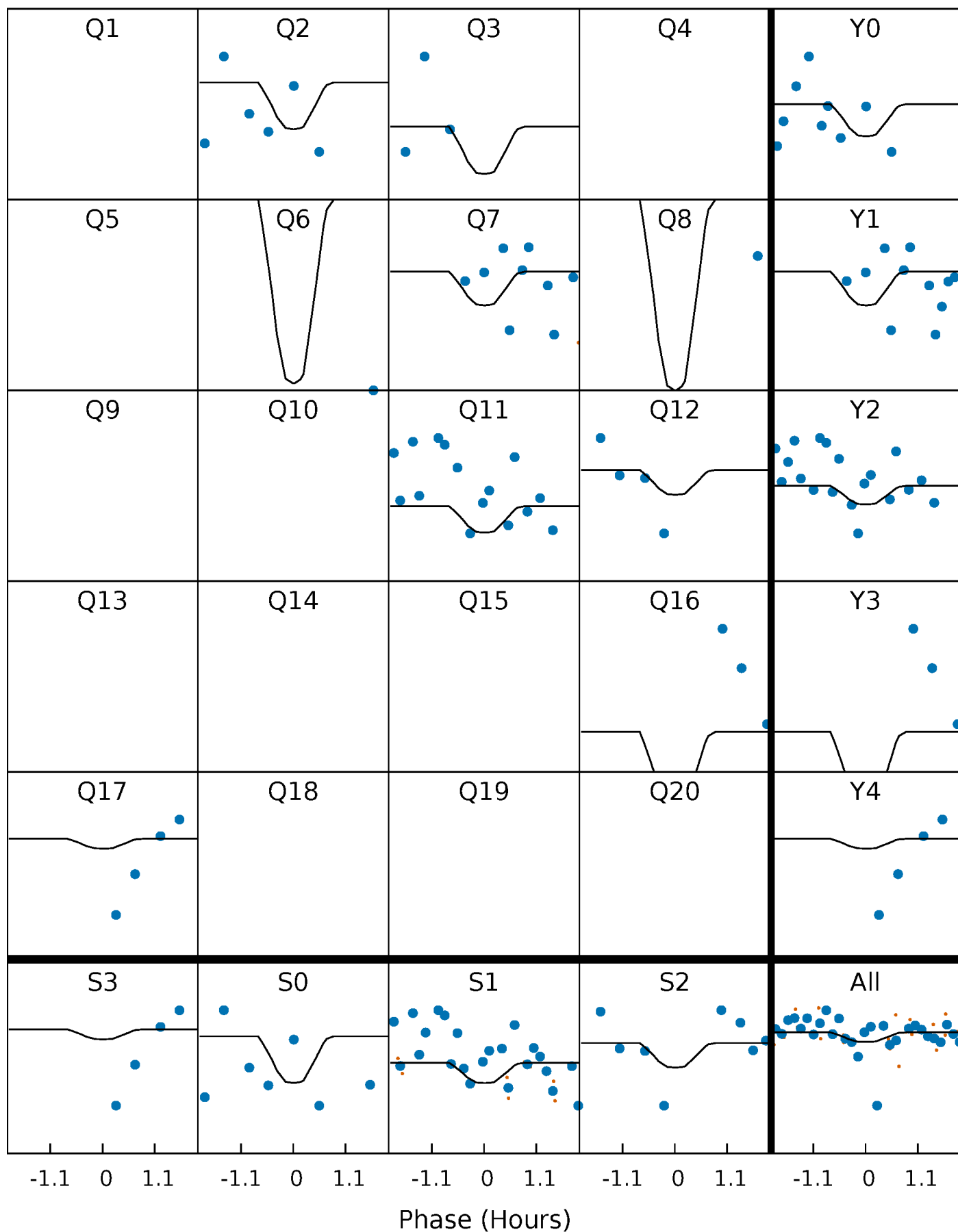
# PDC Quarter-Phased Transit Curves

TCE 009161894-04   P= 73.490483 Days    $T_0=193.692114$  (BKJD)



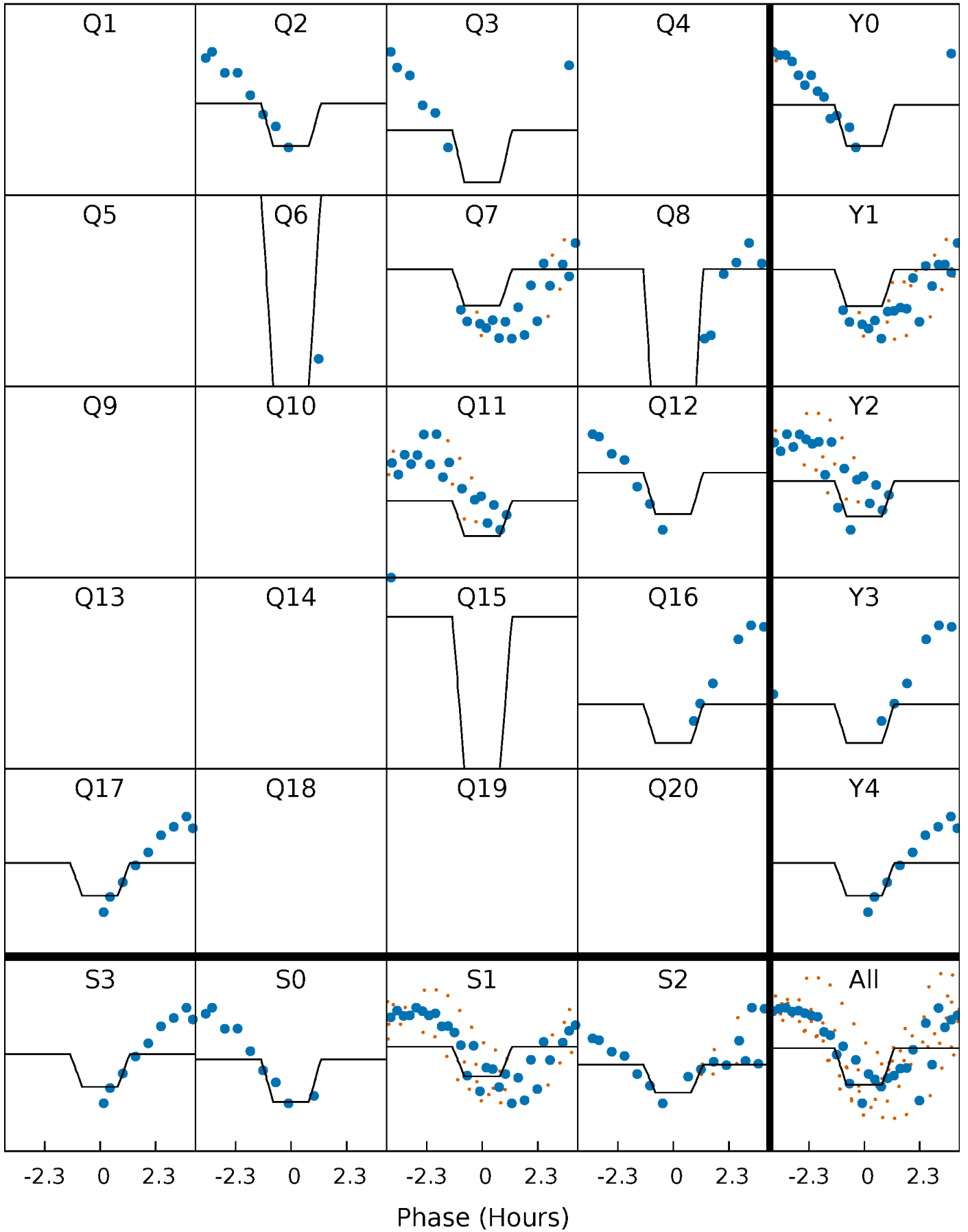
# DV Quarter-Phased Transit Curves

TCE 009161894-04   P= 73.490483 Days    $T_0=193.692114$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

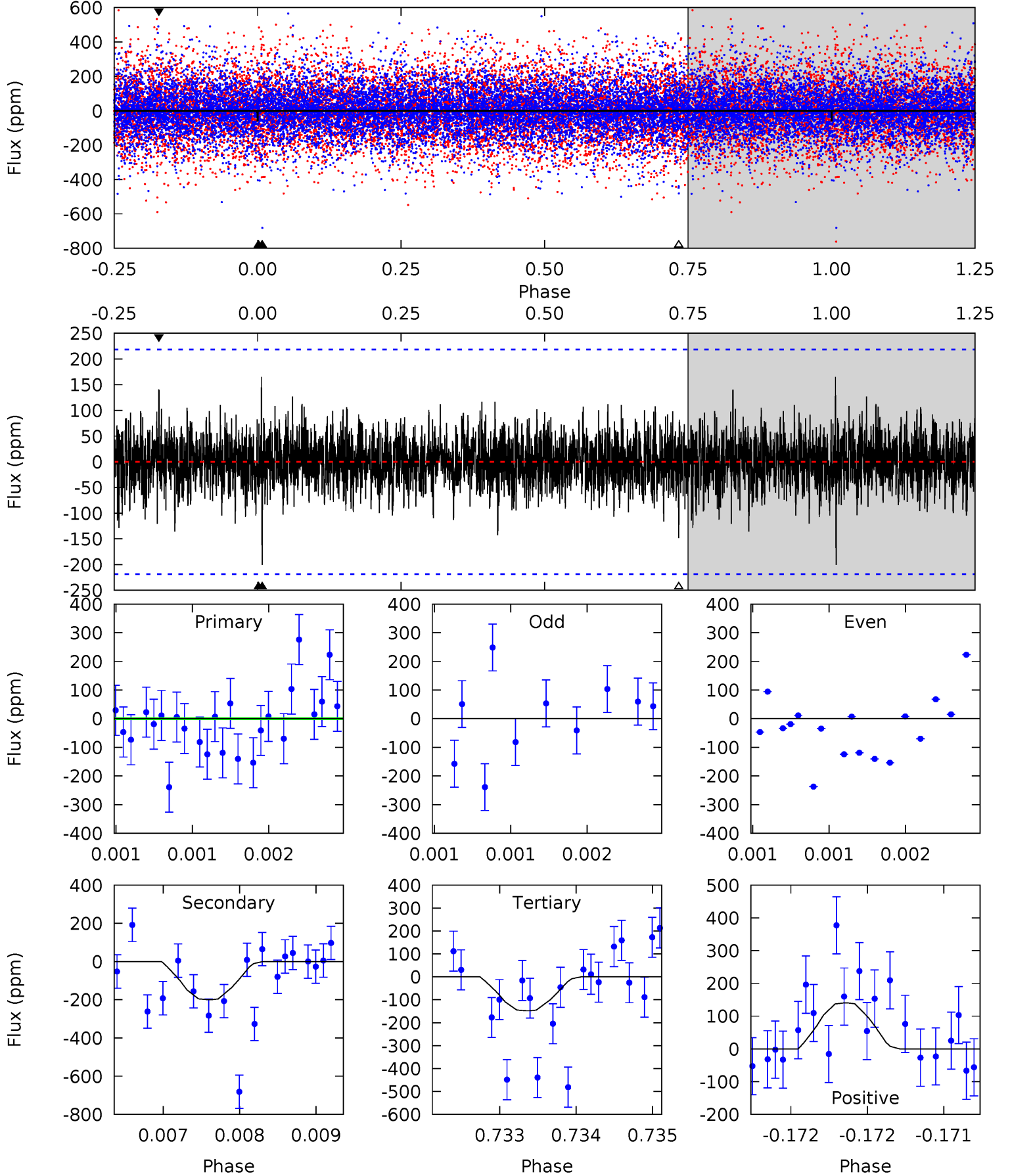
TCE 009161894-04   P= 73.489250 Days    $T_0=193.723673$  (BKJD)



# DV Model-Shift Uniqueness Test

009161894-04, P = 73.490483 Days, E = 120.201631 Days

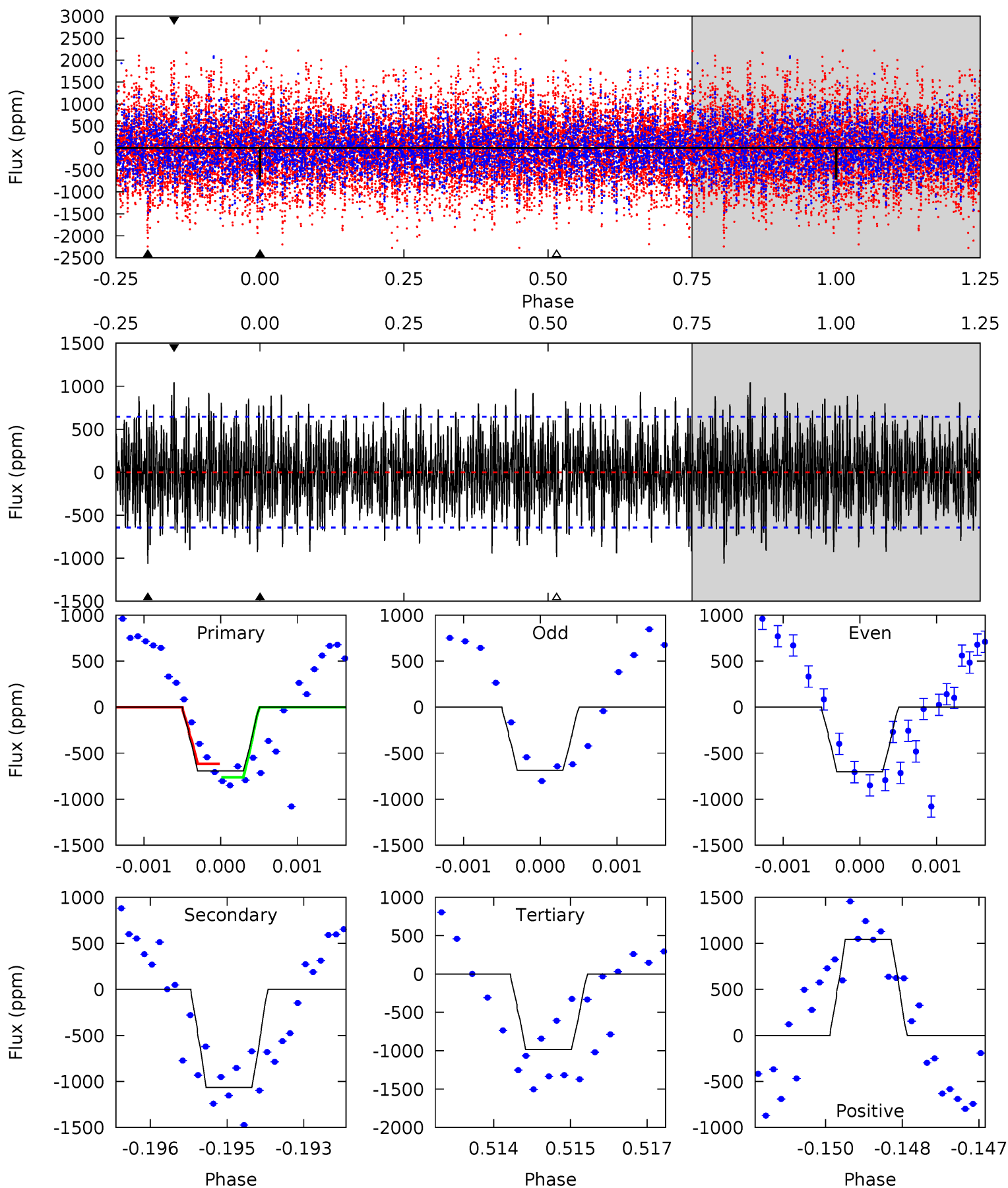
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
1.52	5.06	3.74	3.55	5.52	3.40	0.96	-2.22	-2.03	1.31	1.51	0.96	2.79	0.45	1.24



# Alt Model-Shift Uniqueness Test

009161894-04, P = 73.489250 Days, E = 120.234423 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
5.80	8.91	8.25	8.73	5.39	3.19	3.07	-2.45	-2.93	0.66	0.18	0.07	0.91	0.49	0.60



### Stellar Parameters For KIC 009161894

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7345^{+203}_{-330}$	$4.090^{+0.153}_{-0.170}$	$-0.120^{+0.250}_{-0.350}$	$1.852^{+0.528}_{-0.432}$	$1.538^{+0.234}_{-0.257}$	$0.341^{+0.299}_{-0.157}$
	+3%/-4%	+4%/-4%	+208%/-292%	+29%/-23%	+15%/-17%	+88%/-46%
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 009161894-04 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-200 \pm 40$	$5.18^{+4.58}_{-3.40}$	$978^{+69}_{-70}$	$5398^{+4489}_{-1273}$	$630^{+5122}_{-461}$
Alt.	$-1064 \pm 119$	$7.08^{+5.47}_{-4.24}$	$977^{+76}_{-65}$	$6962^{+6767}_{-1712}$	$1768^{+9535}_{-1209}$

$T_{\text{max}}$  = 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

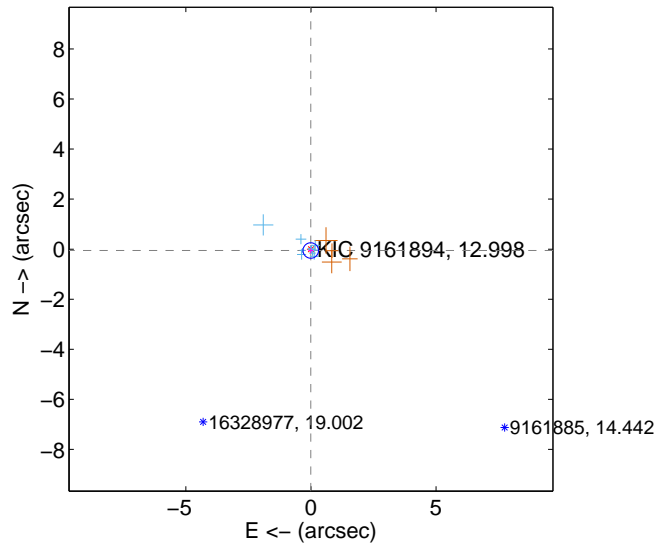
Supplemental centroid analysis for 009161894-04. Kepler magnitude: 13.00. Transit SNR 1.79

There are 10 quarters with good PRF difference image offsets

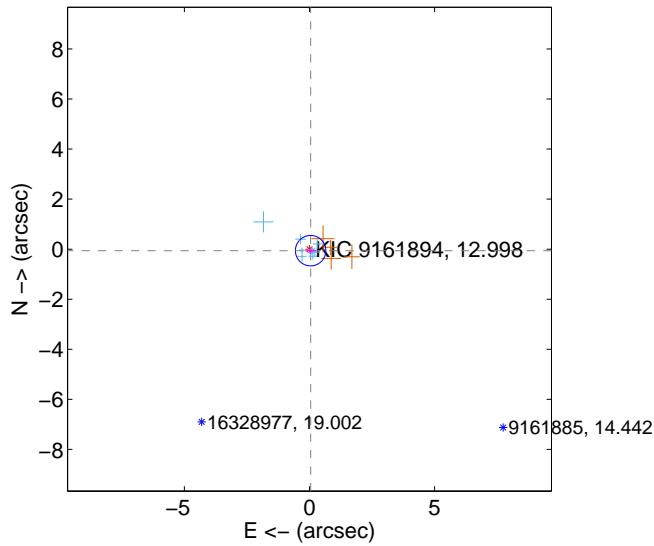
The direct PRF centroid is offset from the target star catalog position by about 0.15 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.054 \pm 0.103$	0.52	$0.008 \pm 0.096$	$-0.053 \pm 0.103$
PRF-fit source offset from KIC position	$0.076 \pm 0.203$	0.37	$-0.046 \pm 0.219$	$-0.060 \pm 0.119$
photometric centroid source offset	$0.88 \pm 2.39$	0.37	$-0.71 \pm 2.31$	$-0.52 \pm 2.54$

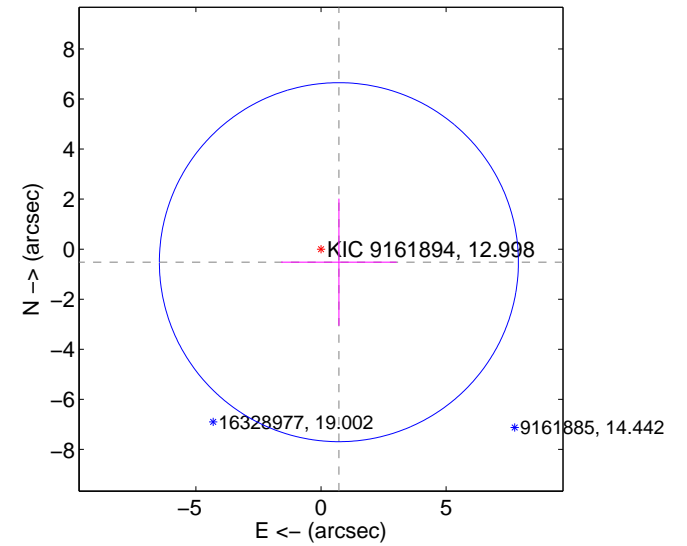
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

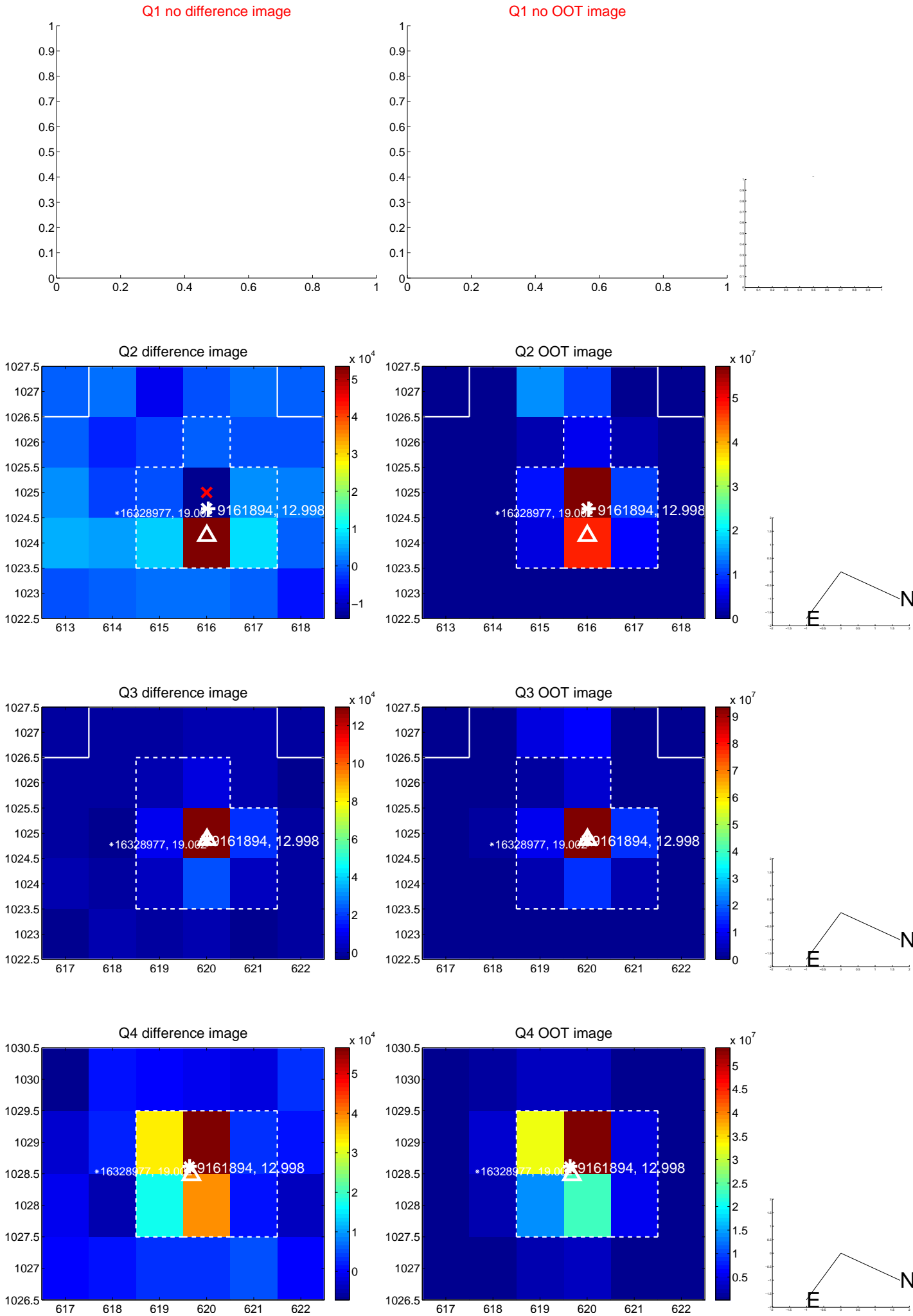


offset from photometric centroids

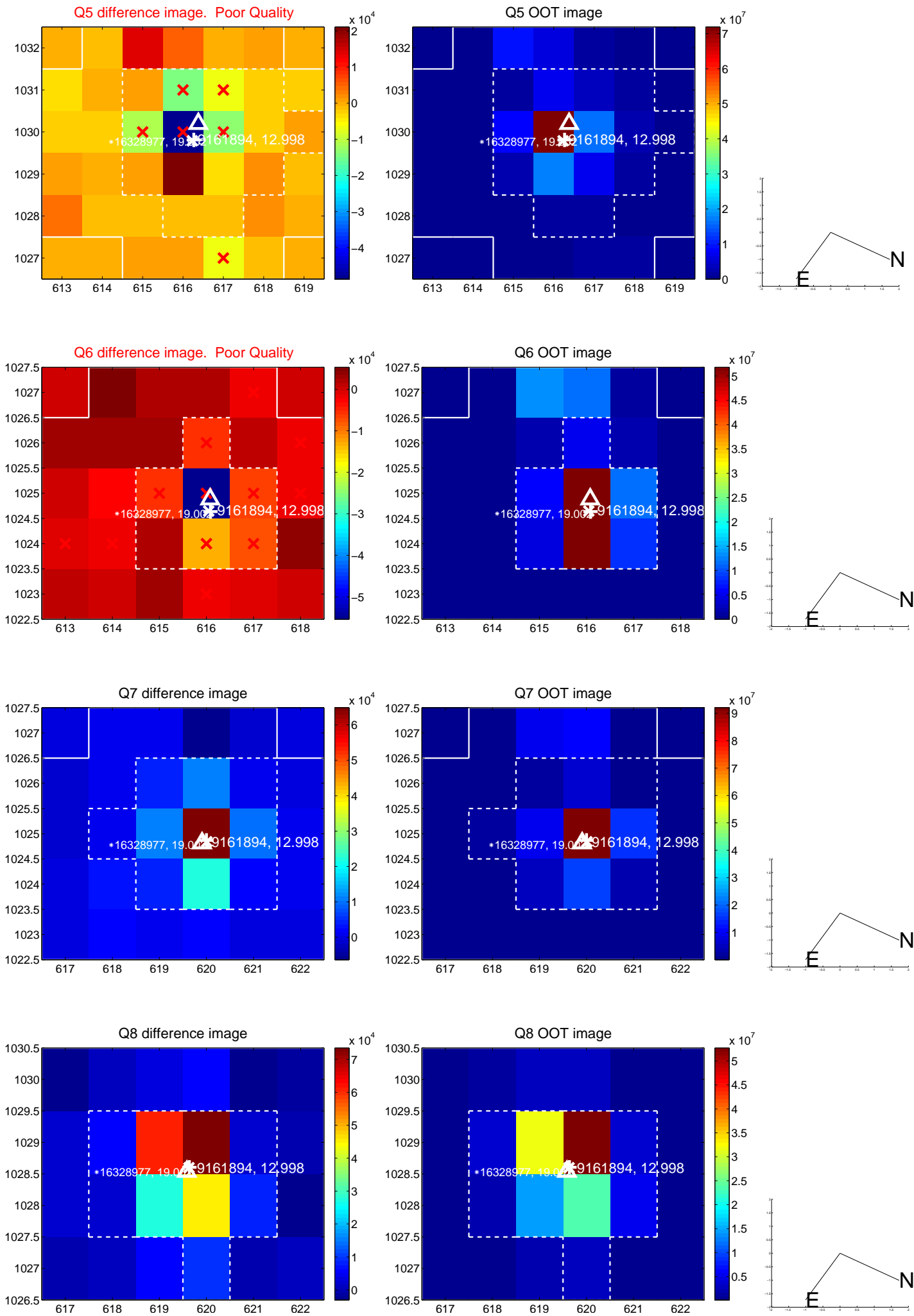


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

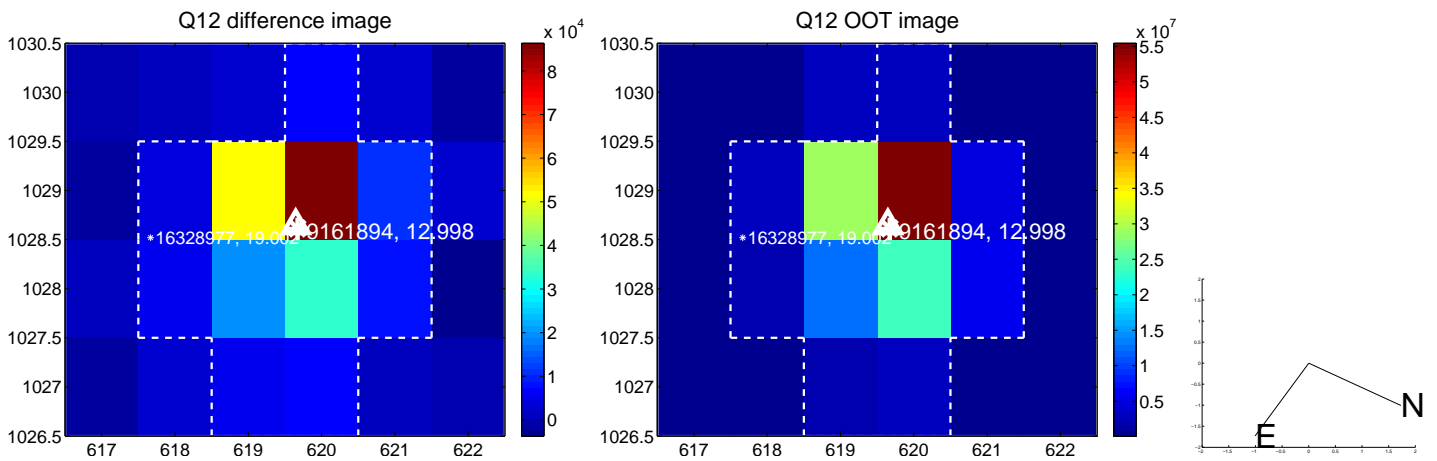
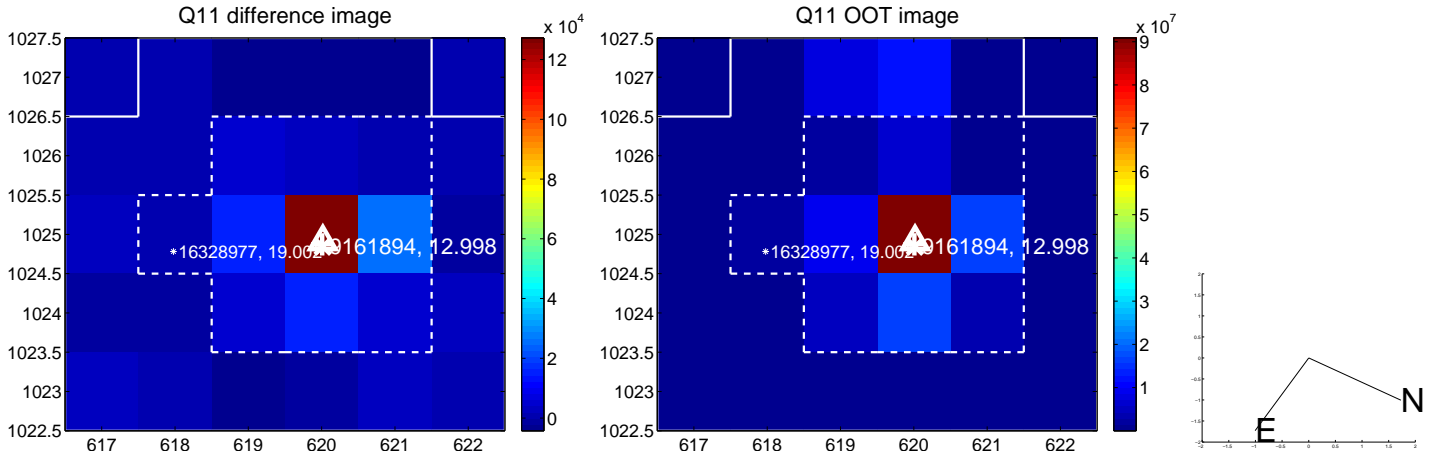
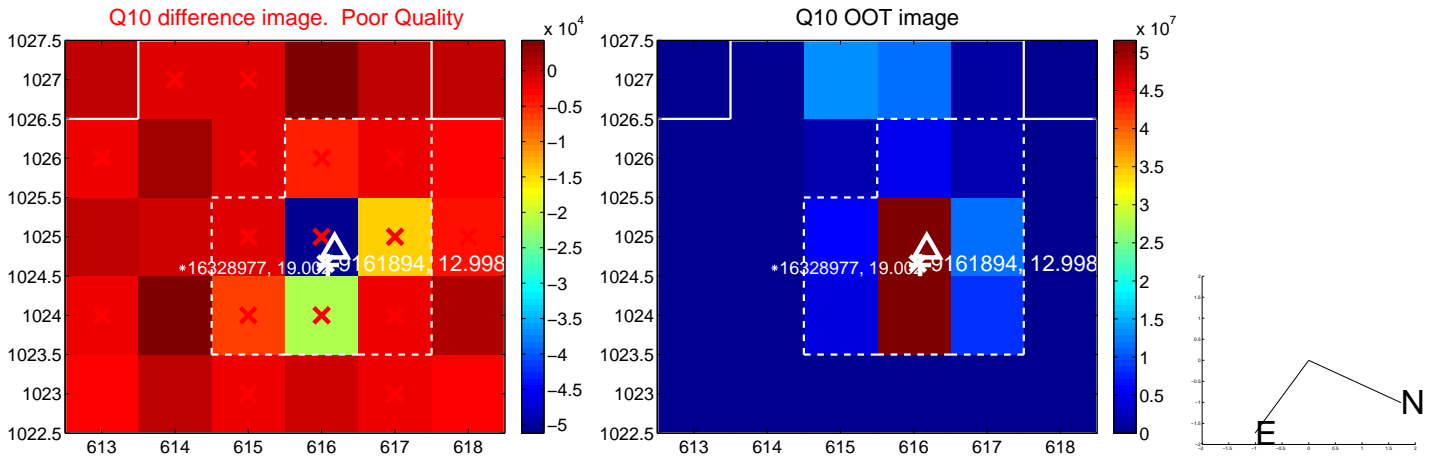
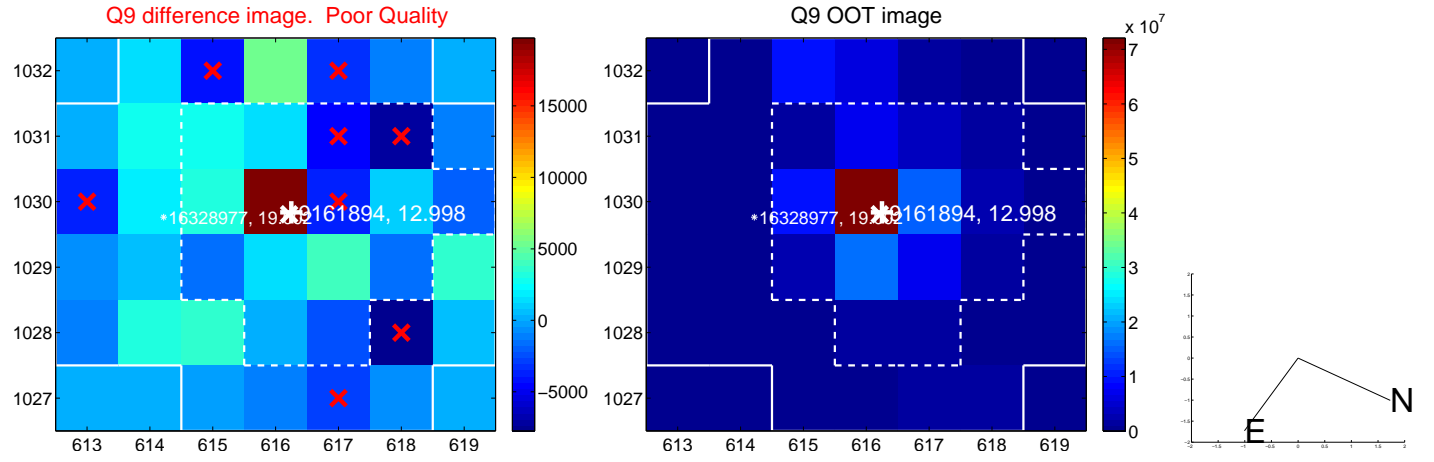
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



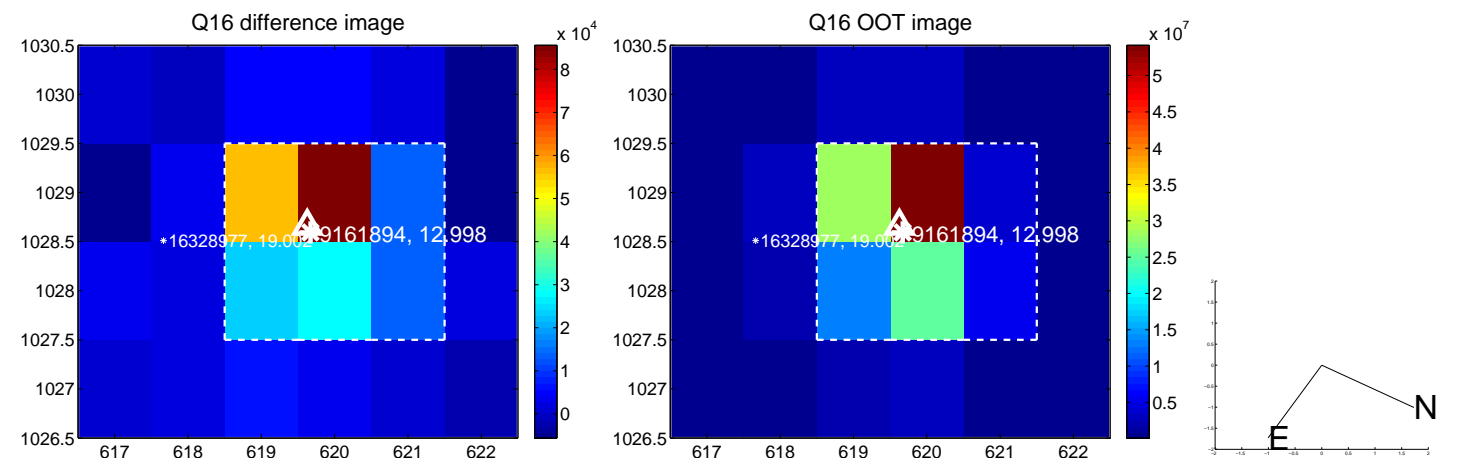
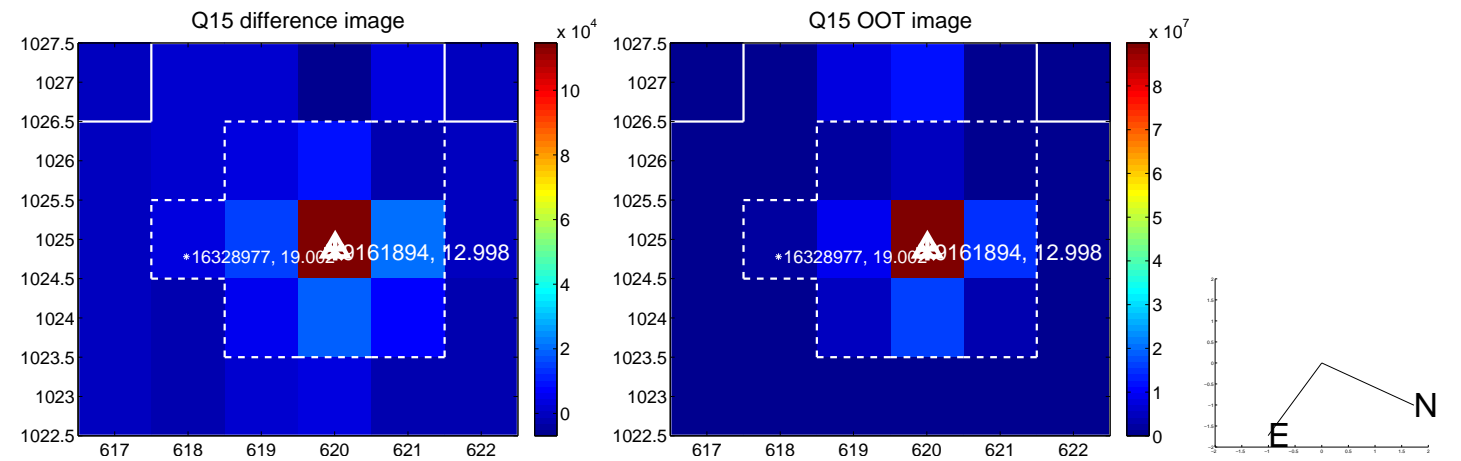
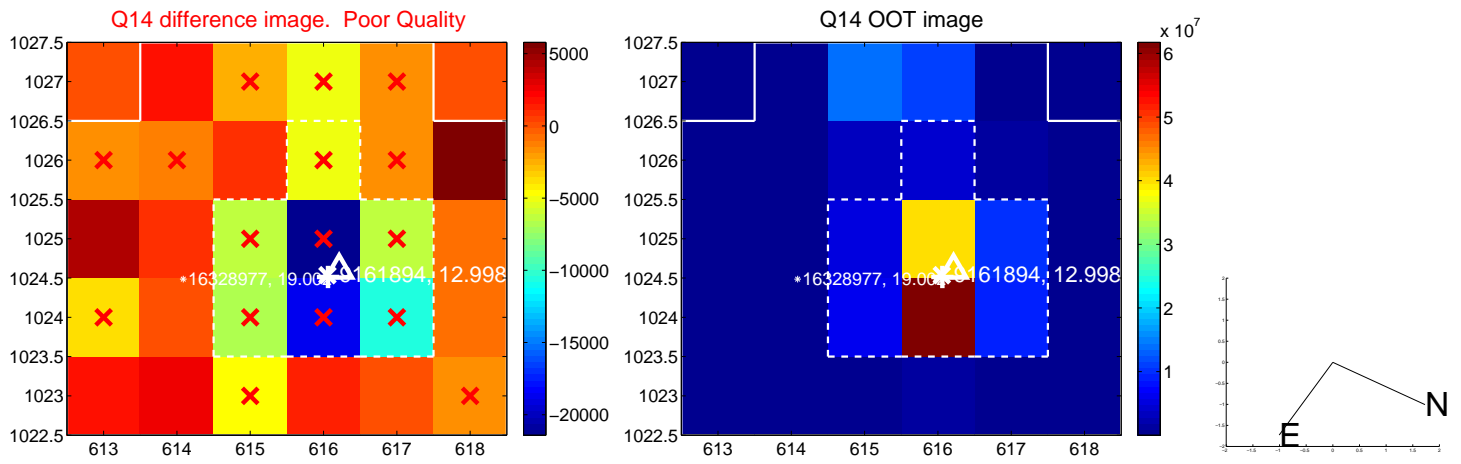
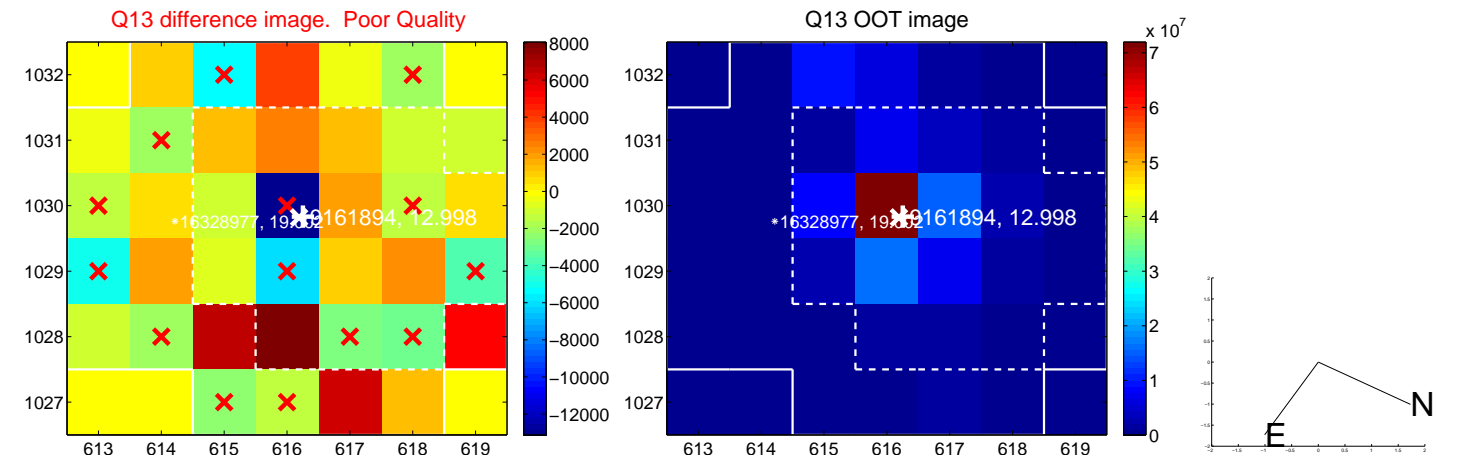
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



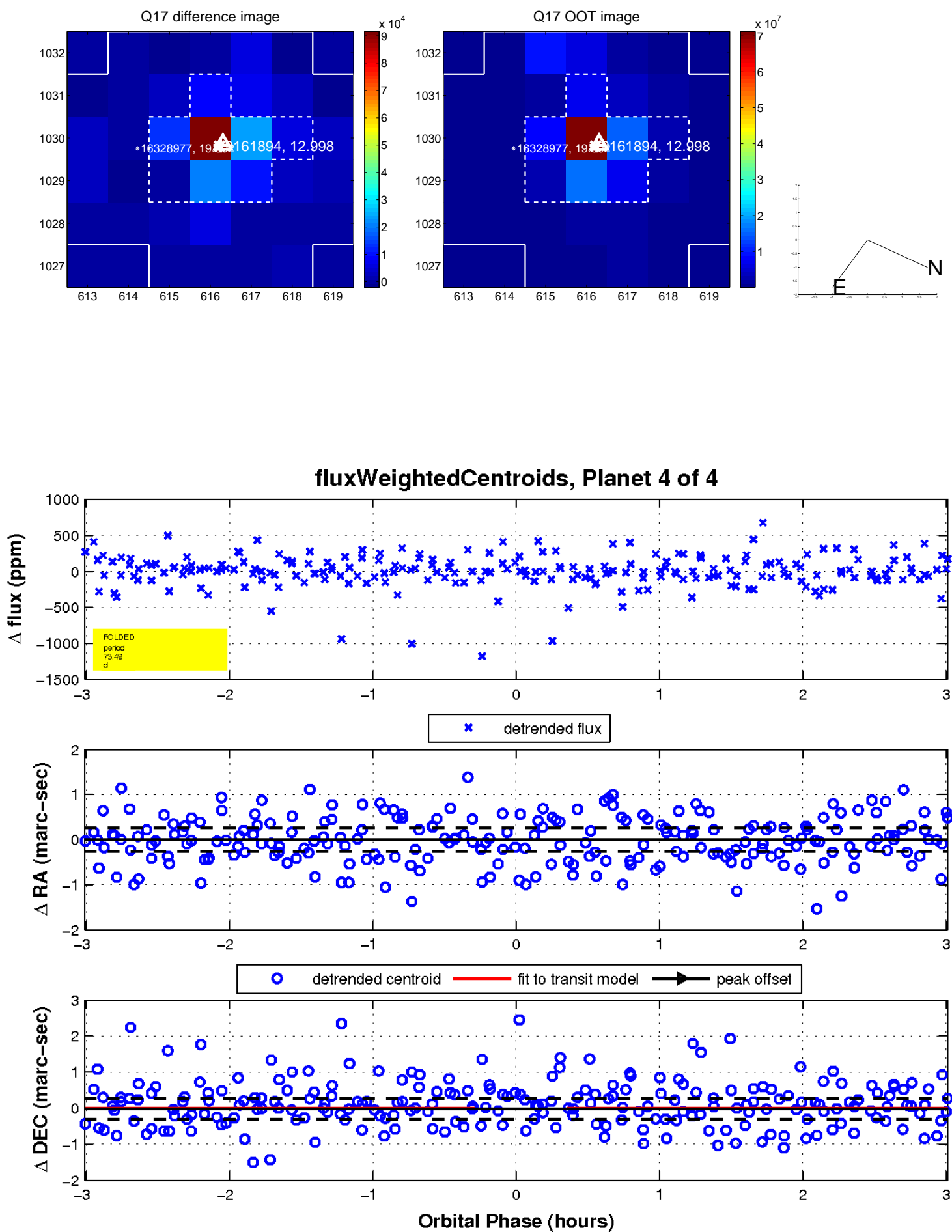
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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.



UKIRT Image

Declination

