

# KIC 010513530

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010513530-01	OBS	0533.01	16.549670	138.594431	739.8	4.365	40.9	43.7	0.92	5372	2.96	43.82
010513530-02	OBS	0533.02	3.524664	131.643143	139.1	1.921	11.1	12.4	0.92	5372	1.30	344.52

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010513530-01	OBS	PC	1.00	0	0	0	0	CENT_KIC_POS
010513530-02	OBS	PC	1.00	0	0	0	0	CENT_KIC_POS

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

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

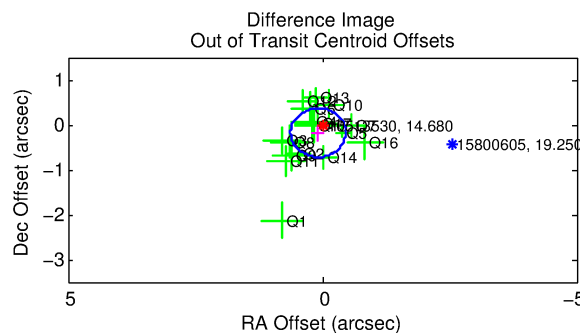
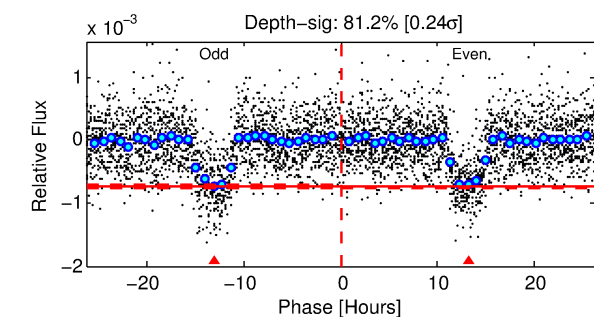
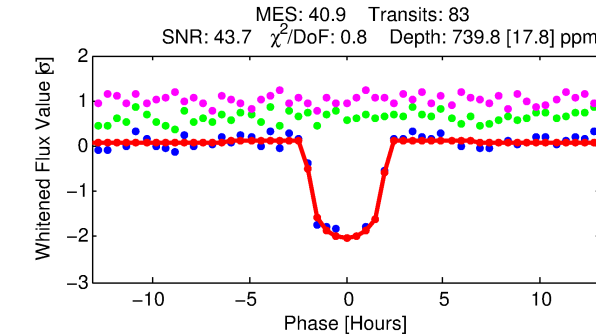
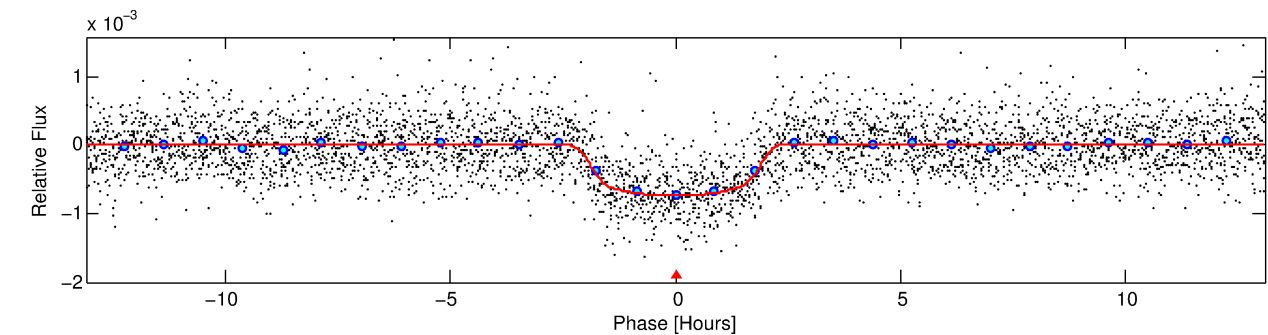
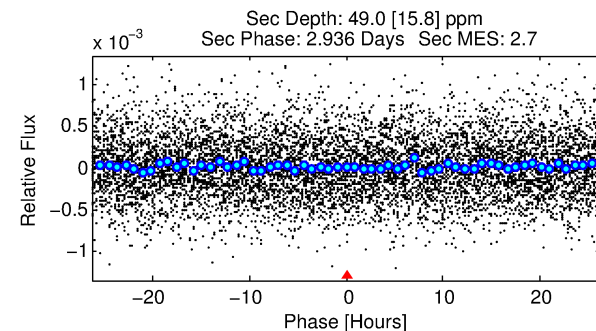
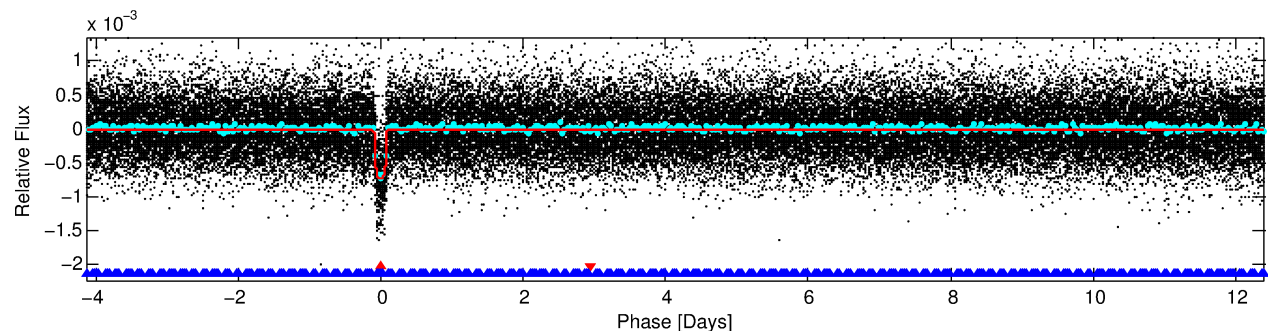
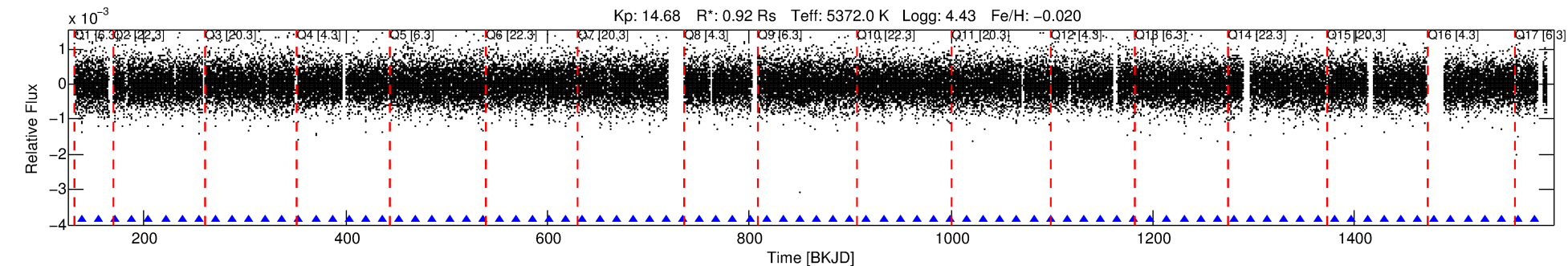
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 010513530-01

No Significant Match Found

# DV One-Page Summary

KIC: 10513530 Candidate: 1 of 2 Period: 16.550 d  
KOI: K00533.01 Corr: 0.958



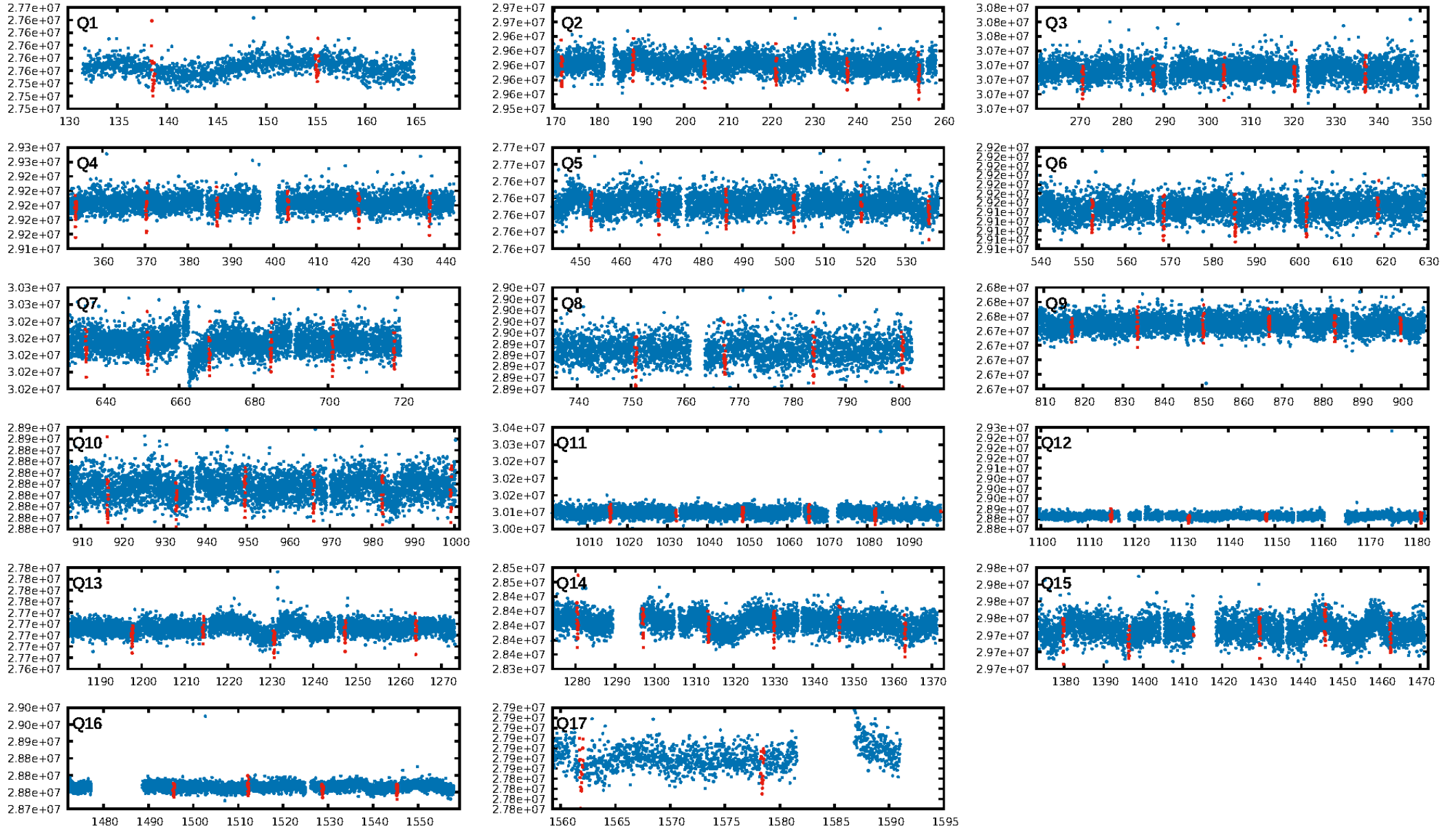
## DV Fit Results:

Period = 16.54967 [0.00004] d  
Epoch = 138.5944 [0.0022] BKJD  
Rp/R\* = 0.0296 [0.0017]  
a/R\* = 15.22 [3.39]  
b = 0.89 [0.06]  
Seff = 43.82 [13.15]  
Teq = 656 [49] K  
Rp = 2.96 [0.65] Re  
a = 0.1195 [0.0220] AU  
Ag = 44.03 [19.34] [2.23σ]  
Teffp = 2613 [237] K [8.10σ]

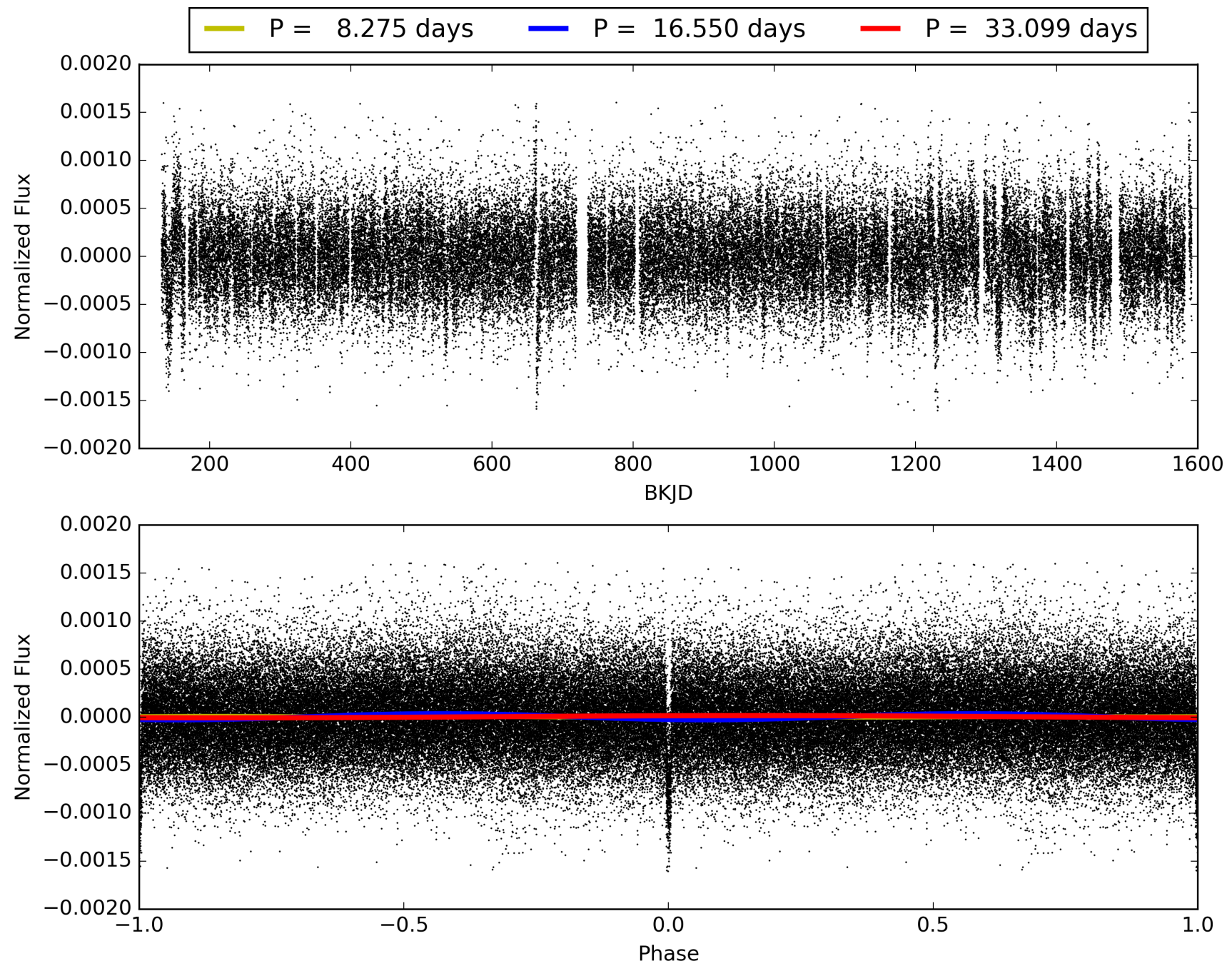
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [65.55σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 99.5%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [79/79]  
GhostDiagnostic-chr: 10.13  
Centroid-sig: N/A  
Centroid-so: 1.376 arcsec [4.00σ]  
OotOffset-rm: 0.197 arcsec [1.09σ]  
KicOffset-rm: 0.205 arcsec [1.42σ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 1.00 [17/17]  
DiffImageOverlap-fno: 1.00 [17/17]

# TCE 010513530-01, PDC Light Curves

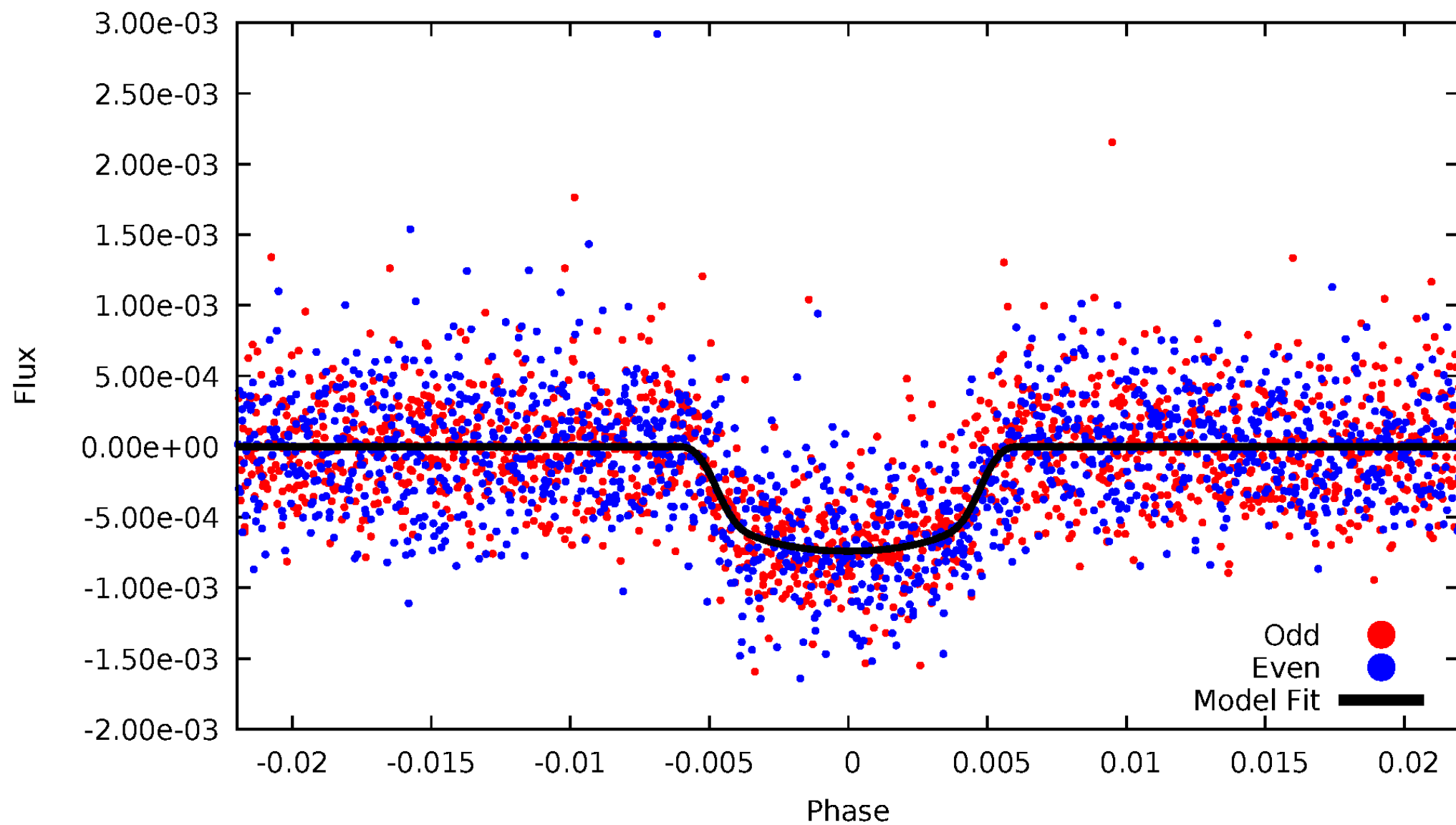


TCE 010513530-01



# DV Odd/Even

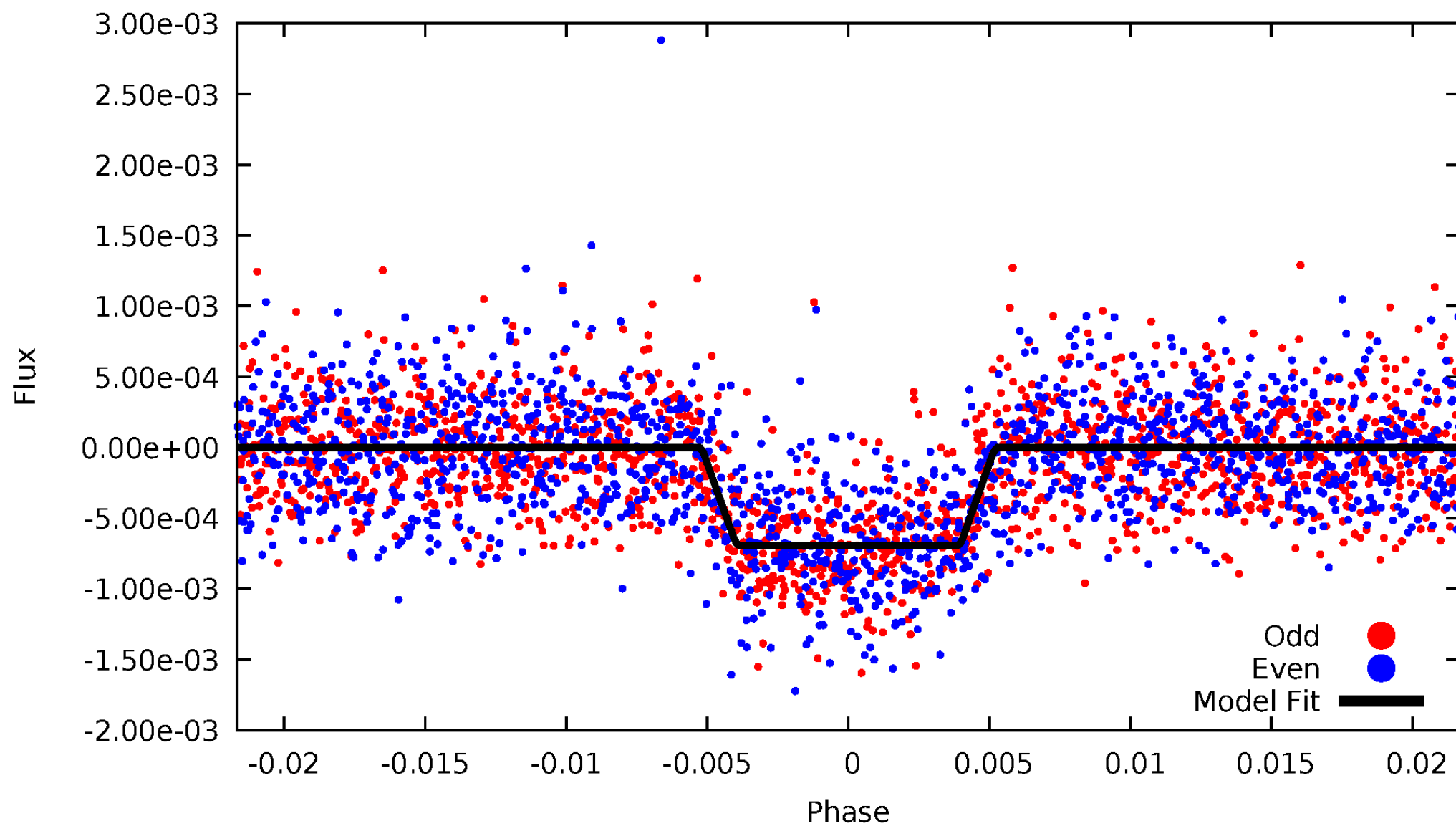
TCE 010513530-01



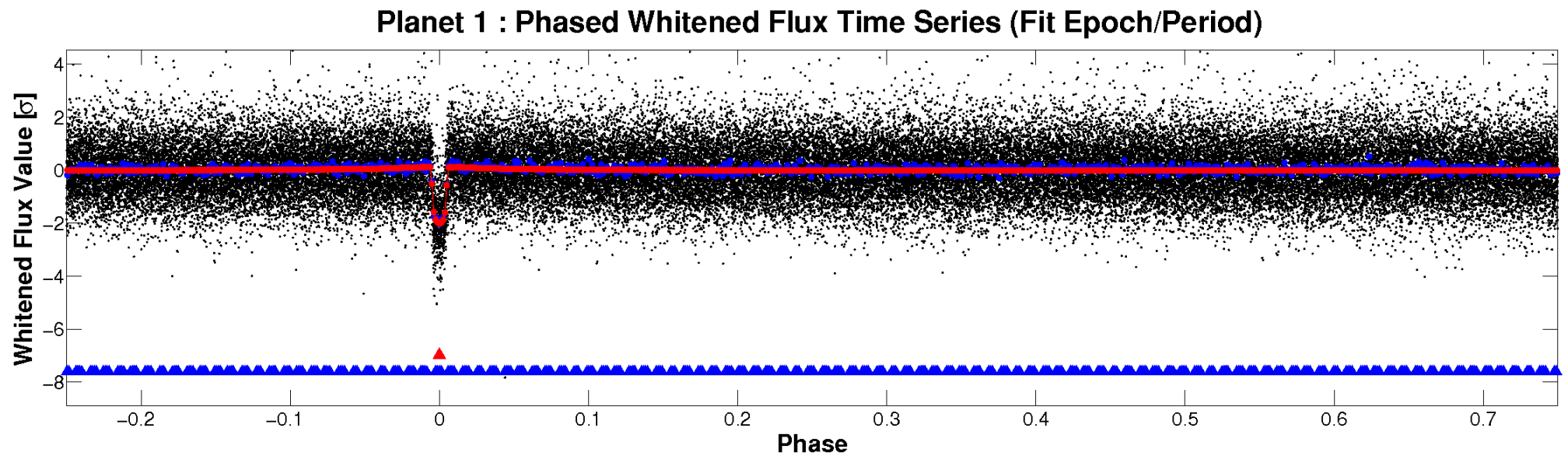
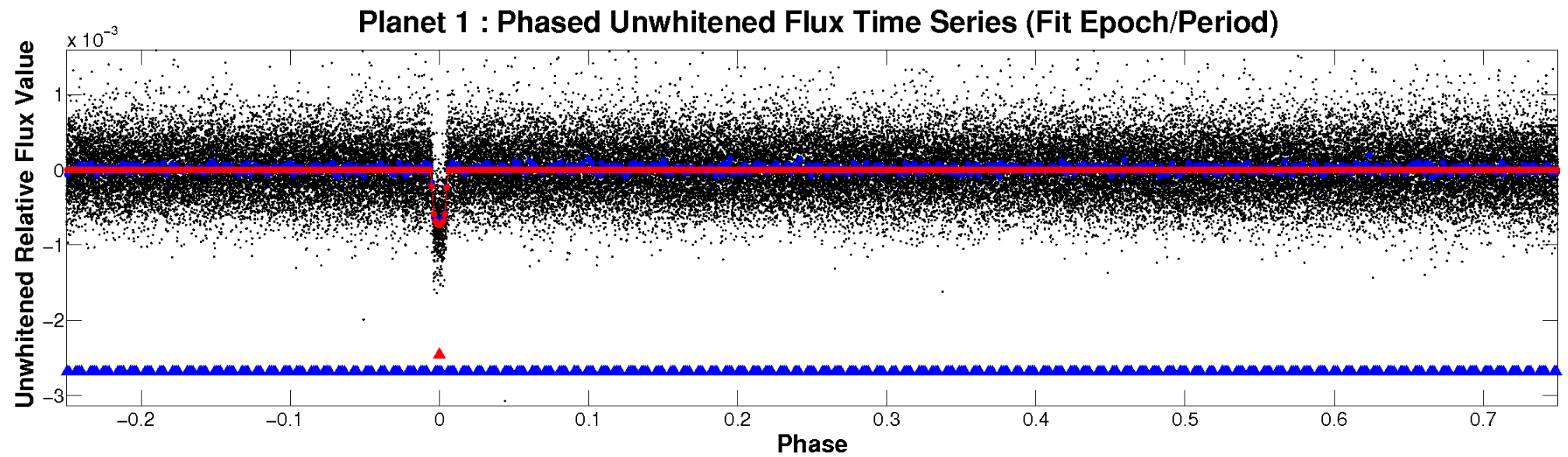


# ALT Odd/Even

TCE 010513530-01

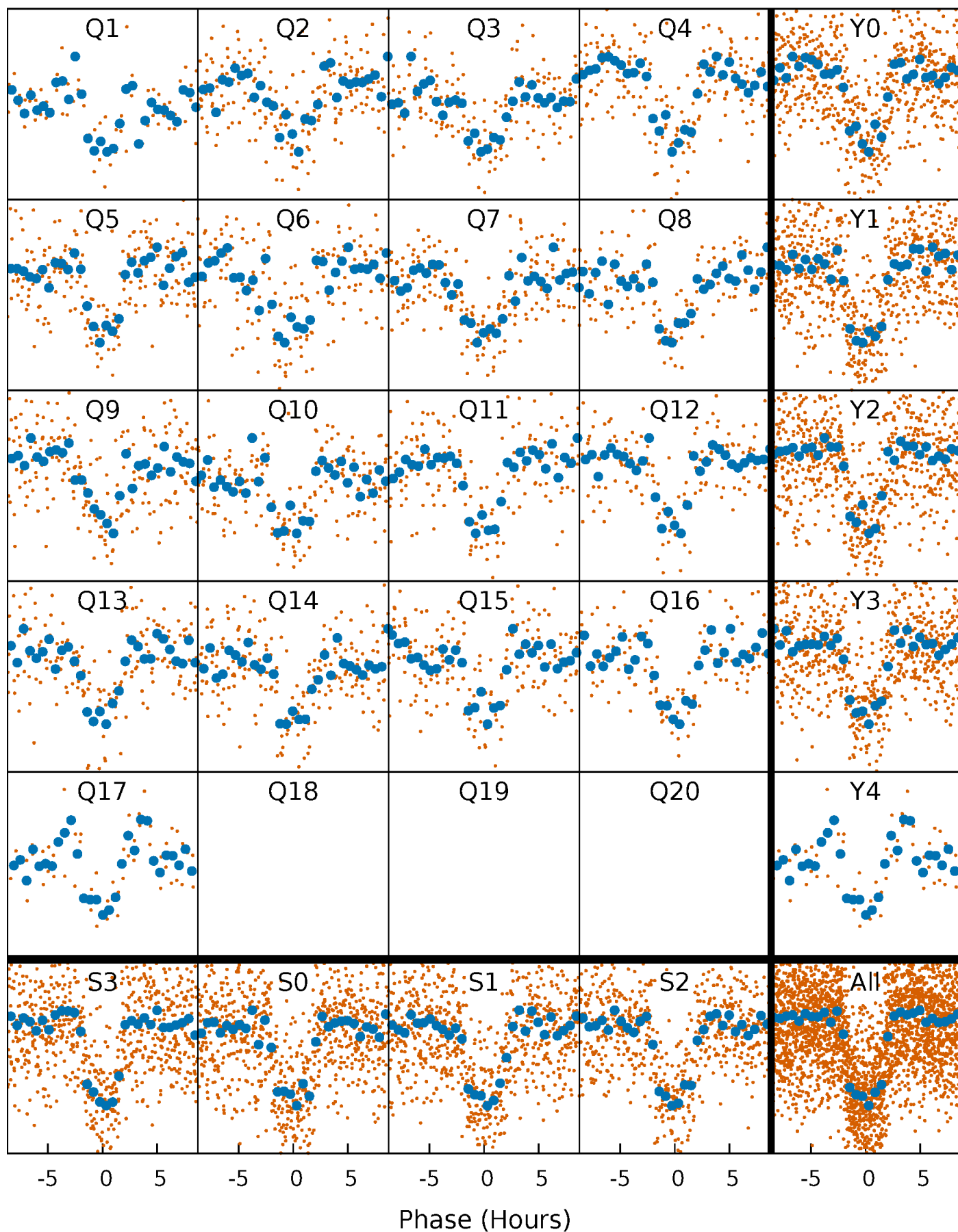


# Non-Whitened Vs. Whitened Light Curve



# PDC Quarter-Phased Transit Curves

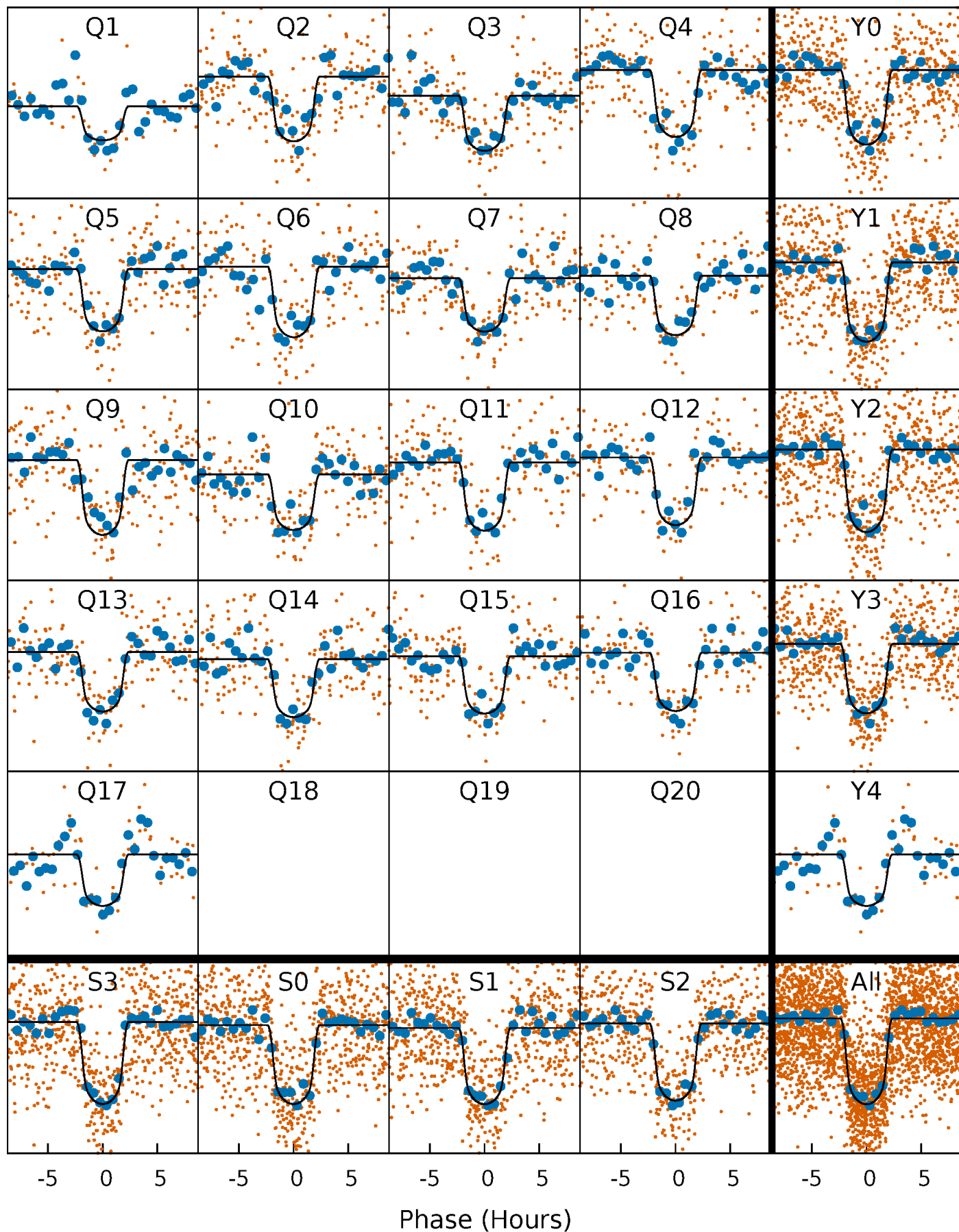
TCE 010513530-01 P= 16.549670 Days  $T_0=138.594431$  (BKJD)





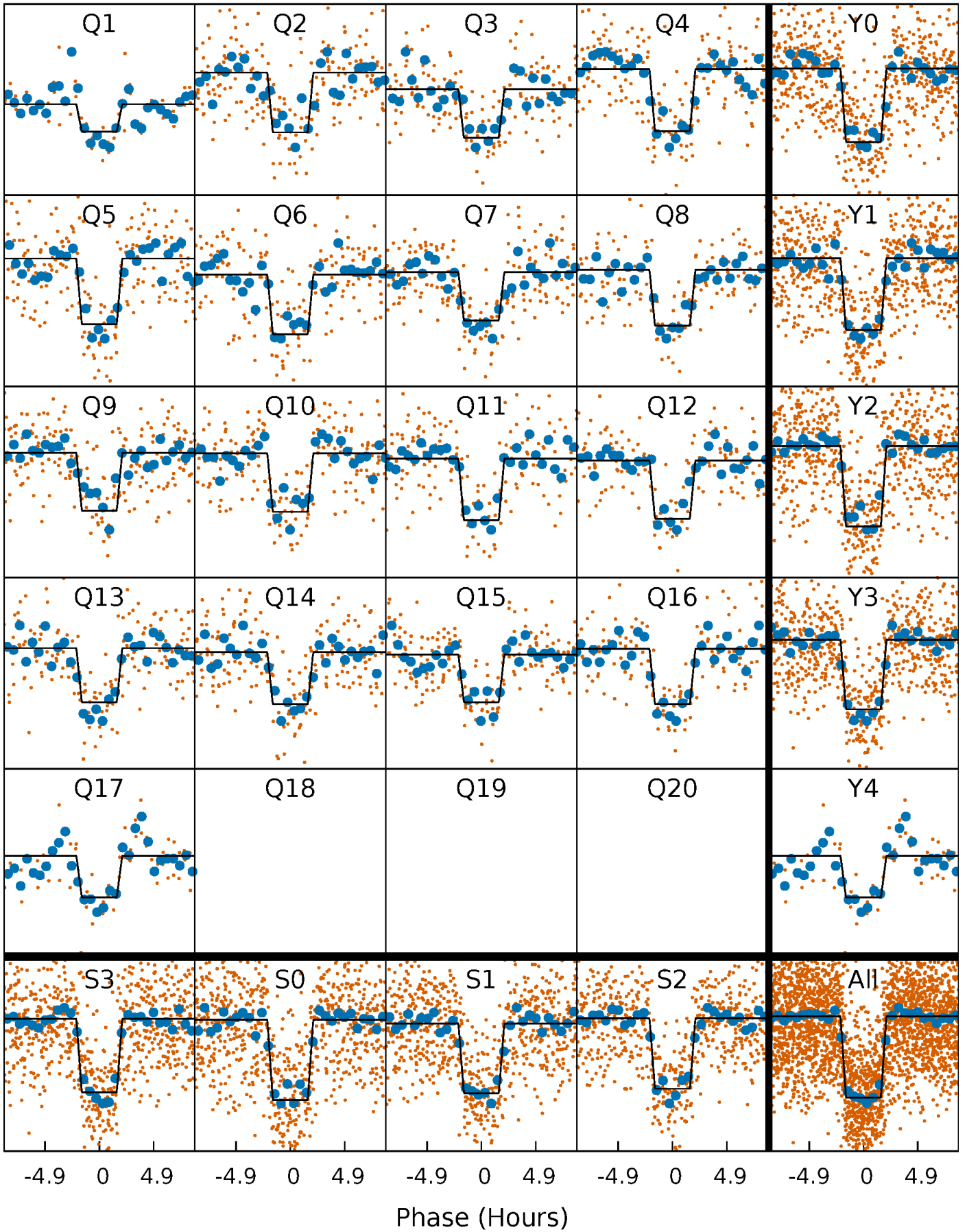
# DV Quarter-Phased Transit Curves

TCE 010513530-01 P= 16.549670 Days  $T_0=138.594431$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

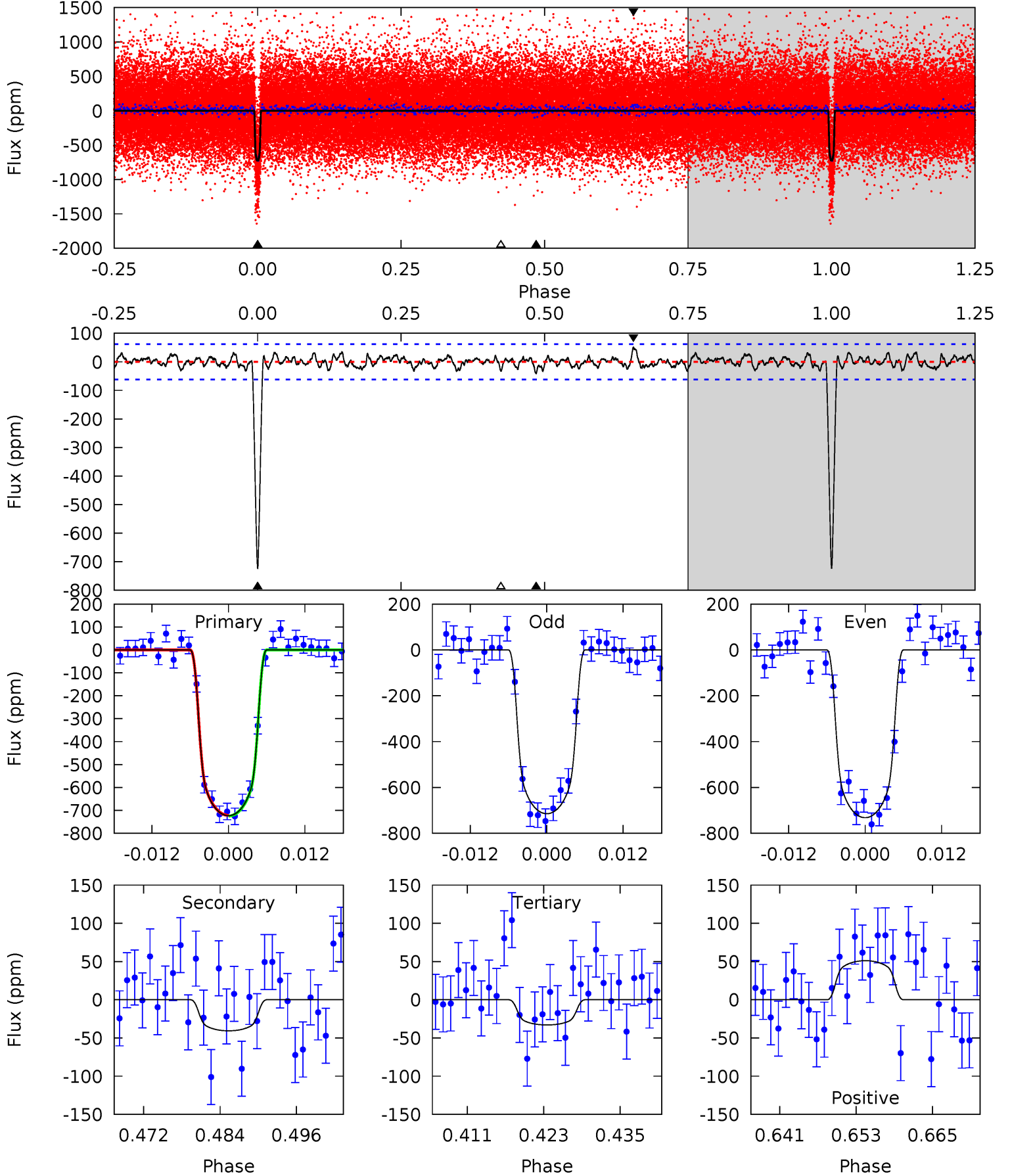
TCE 010513530-01 P= 16.549764 Days  $T_0=138.590572$  (BKJD)



# DV Model-Shift Uniqueness Test

010513530-01,  $P = 16.549670$  Days,  $E = 122.044761$  Days

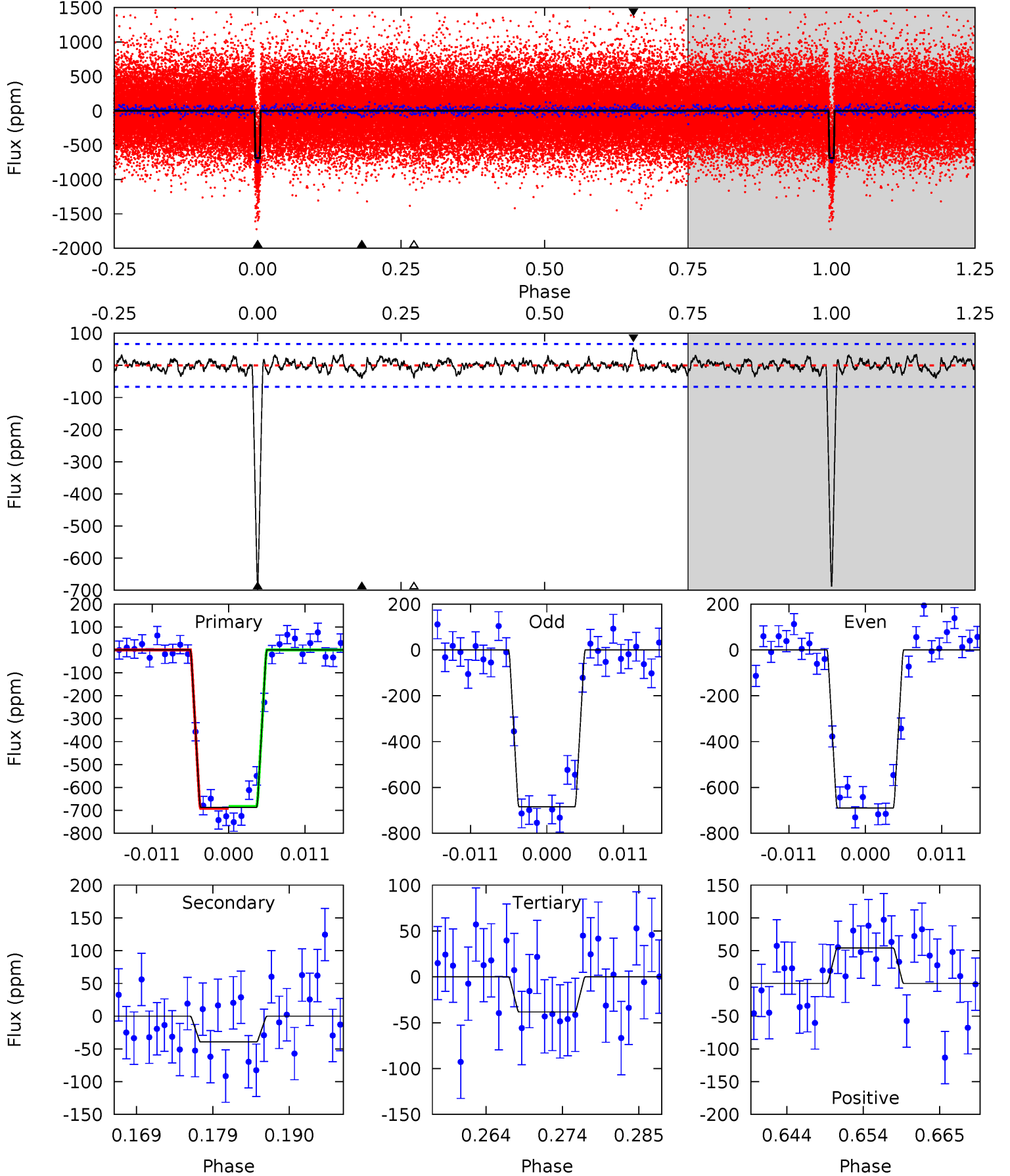
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
58.2	3.27	2.66	4.12	4.99	2.51	1.12	55.6	54.1	0.62	-0.84	0.70	0.99	0.07	0.12



# Alt Model-Shift Uniqueness Test

010513530-01,  $P = 16.549764$  Days,  $E = 122.040808$  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
51.8	2.97	2.89	4.07	5.02	2.56	0.99	48.9	47.8	0.08	-1.10	0.18	0.98	0.07	0.34



### Stellar Parameters For KIC 010513530

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5372^{+160}_{-160}$	$4.434^{+0.112}_{-0.154}$	$-0.020^{+0.300}_{-0.300}$	$0.916^{+0.194}_{-0.129}$	$0.832^{+0.108}_{-0.063}$	$1.522^{+0.731}_{-0.638}$
	+3%/-3%	+3%/-3%	+1500%/-1500%	+21%/-14%	+13%/-8%	+48%/-42%
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 010513530-01 / KOI 0533.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-41 \pm 12$	$3.01^{+0.39}_{-0.31}$	$924^{+57}_{-50}$	$3095^{+149}_{-173}$	$34^{+15}_{-11}$
Alt.	$-39 \pm 13$	$2.67^{+0.32}_{-0.30}$	$920^{+55}_{-47}$	$3198^{+187}_{-204}$	$44^{+21}_{-17}$

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



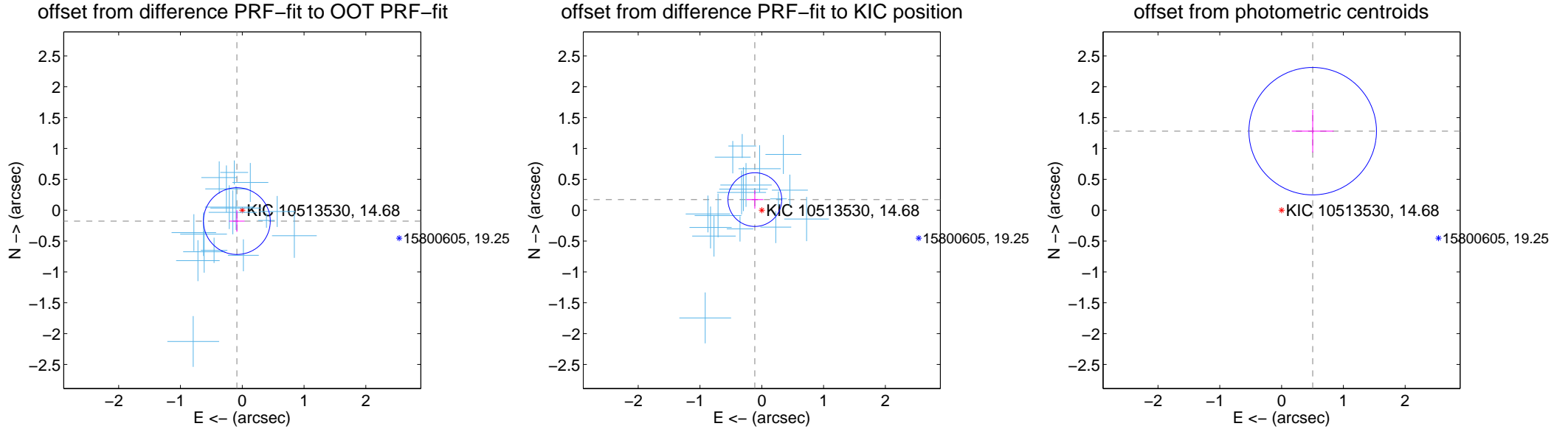
## DV Centroid Data

Supplemental centroid analysis for 010513530-01. Kepler magnitude: 14.68. Transit SNR 43.69

There are 17 quarters with good PRF difference image offsets

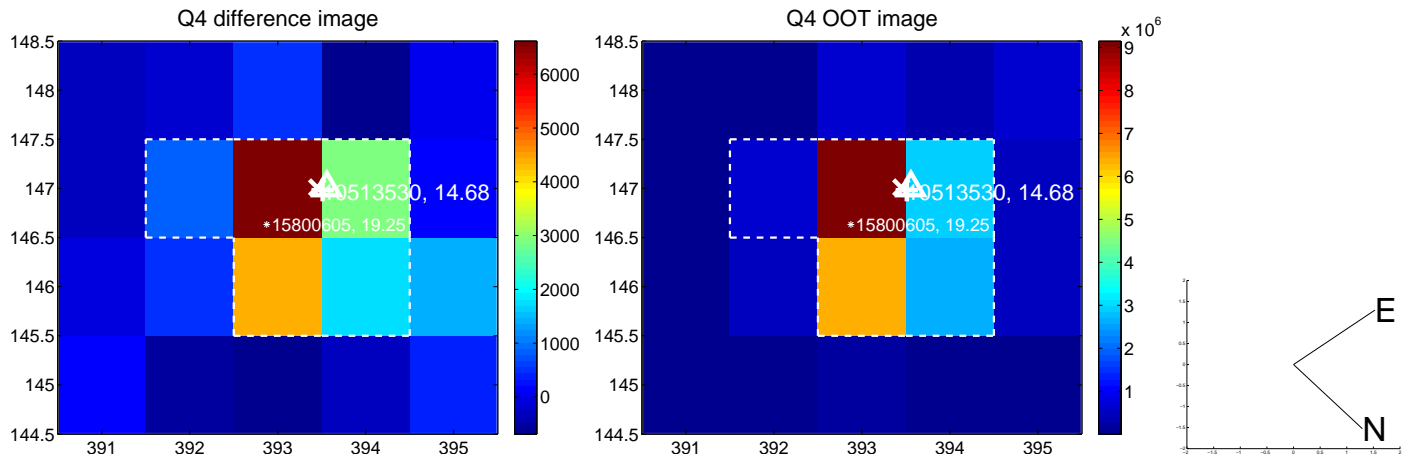
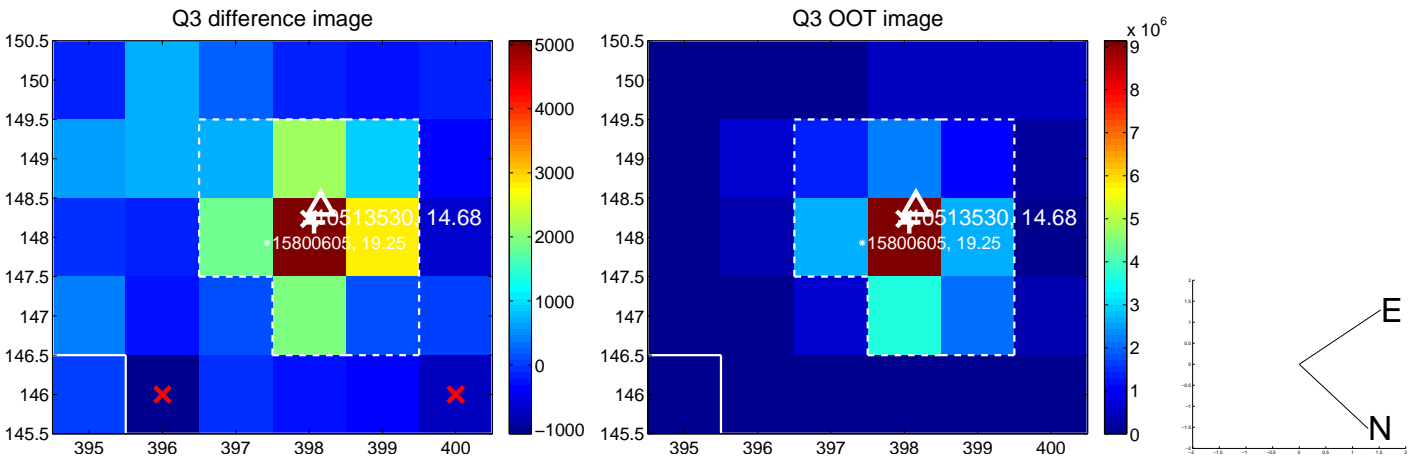
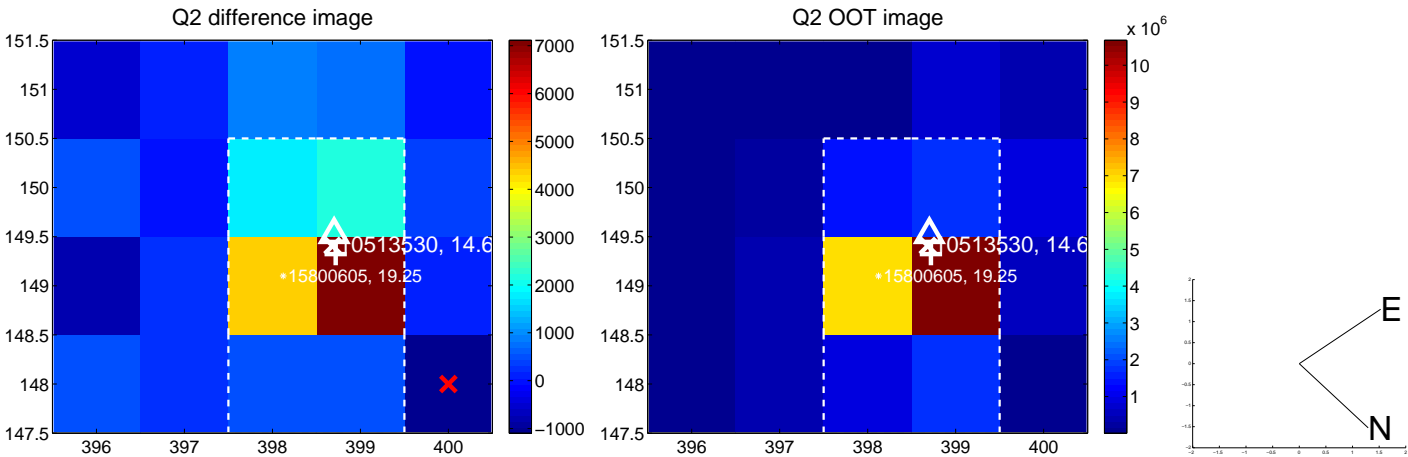
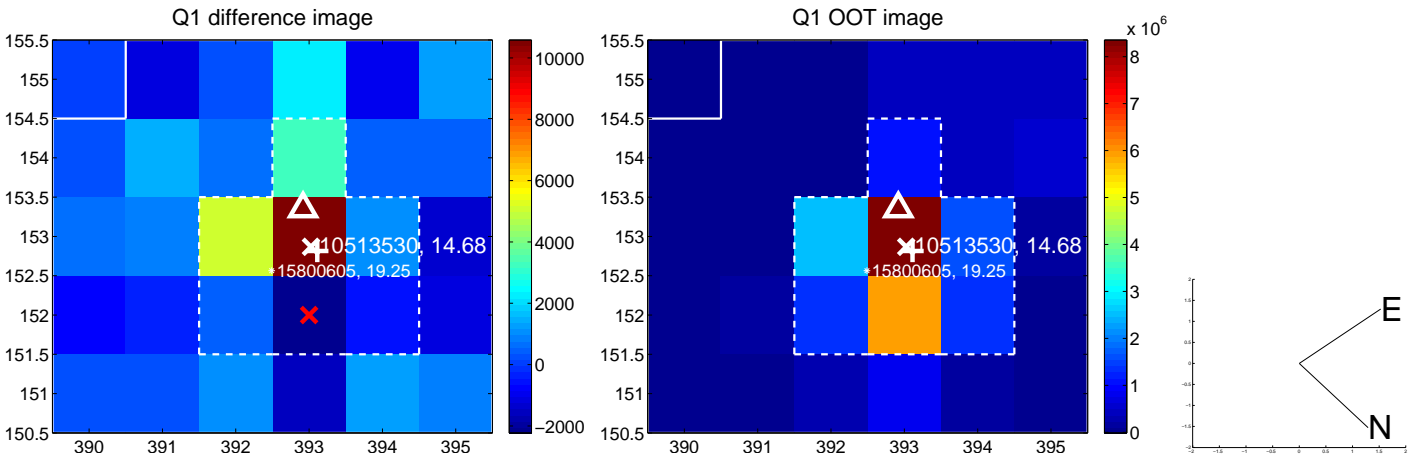
The direct PRF centroid is offset from the target star catalog position by about 0.40 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.197 \pm 0.180$	1.09	$0.087 \pm 0.124$	$-0.177 \pm 0.175$
PRF-fit source offset from KIC position	$0.205 \pm 0.145$	1.42	$0.112 \pm 0.138$	$0.172 \pm 0.148$
photometric centroid source offset	$1.38 \pm 0.34$	4.00	$-0.50 \pm 0.34$	$1.28 \pm 0.34$

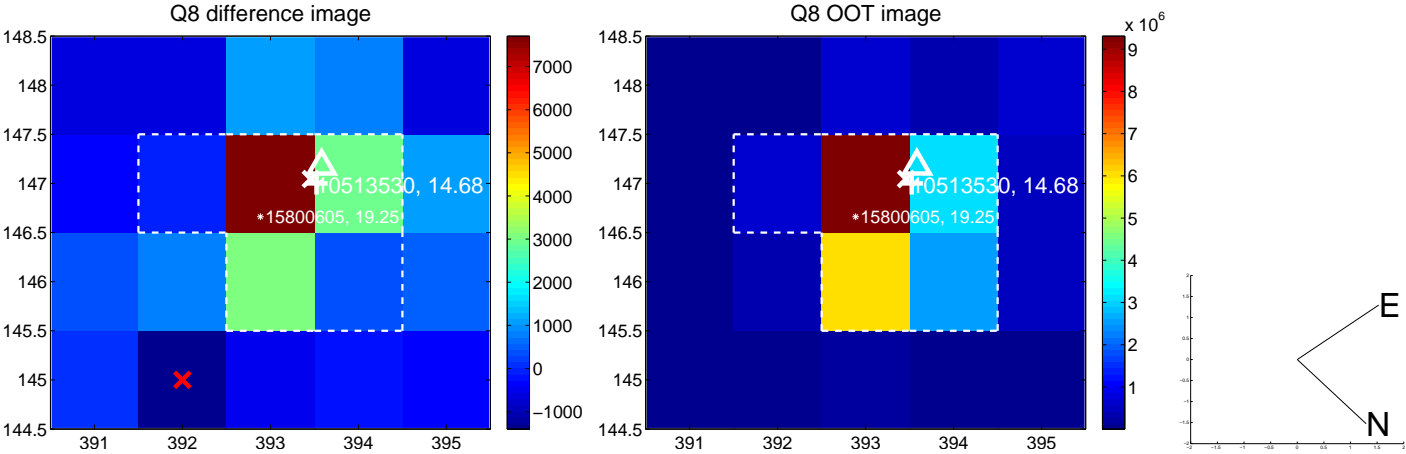
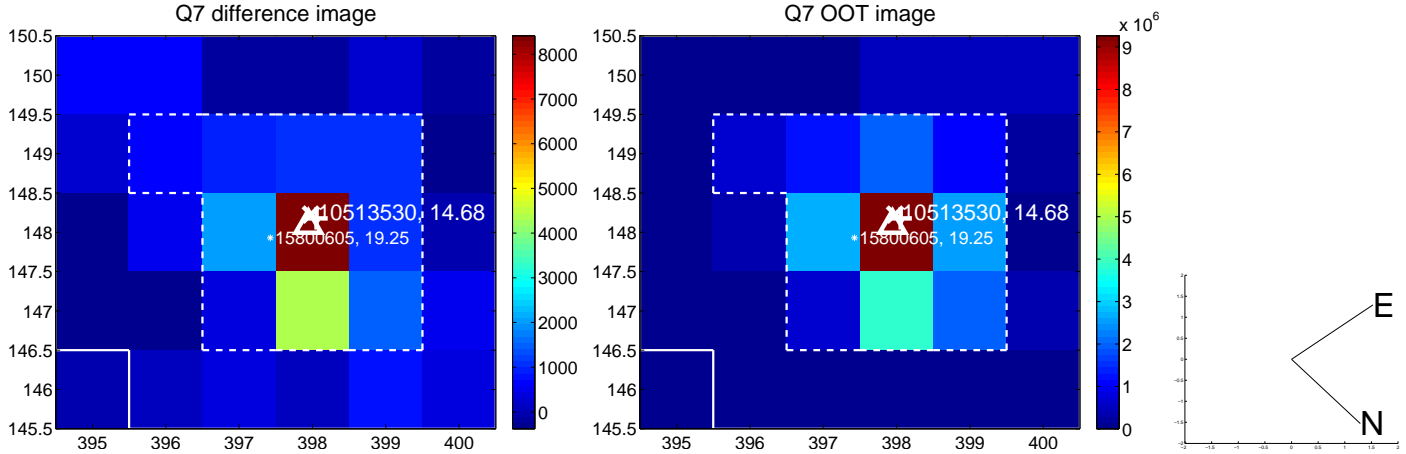
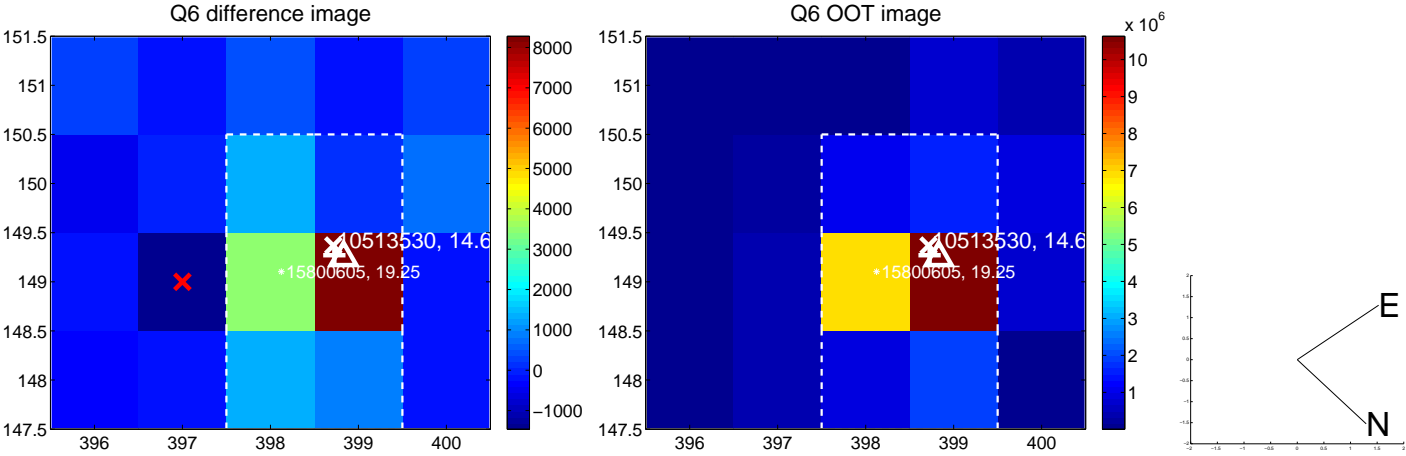
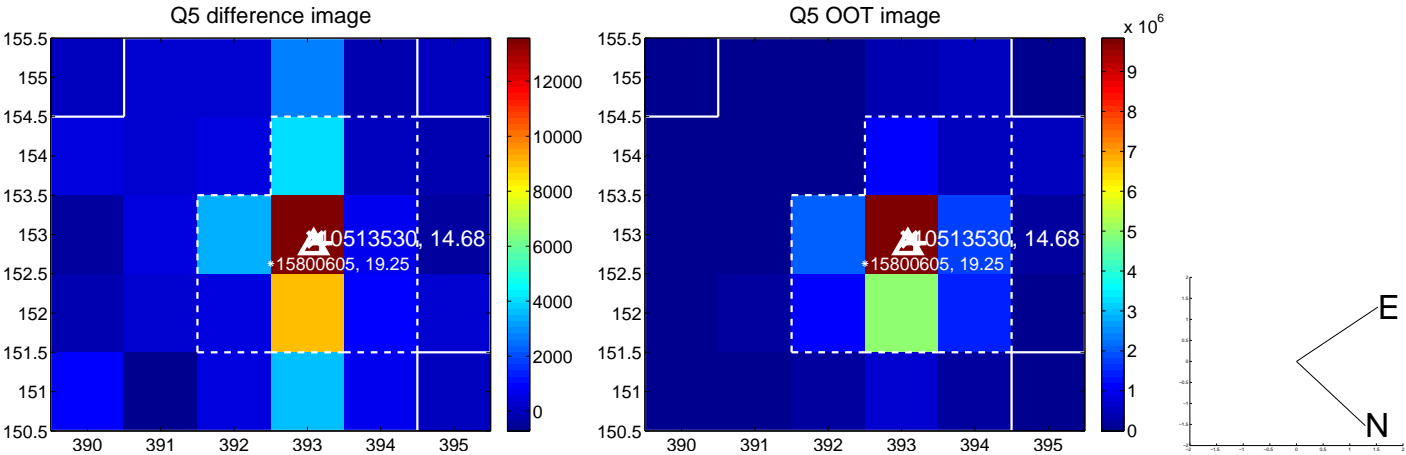


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

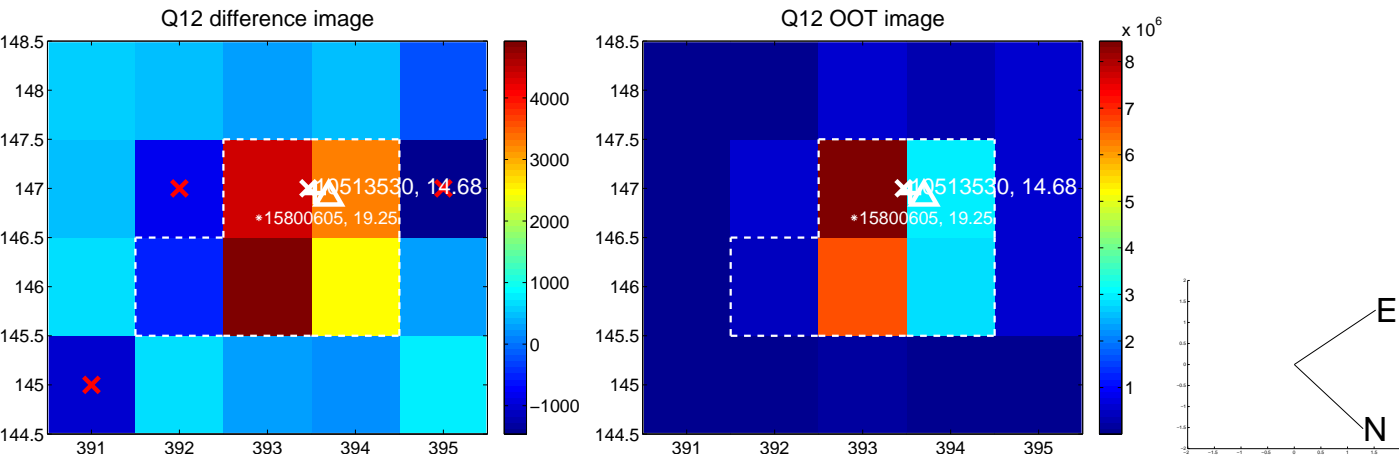
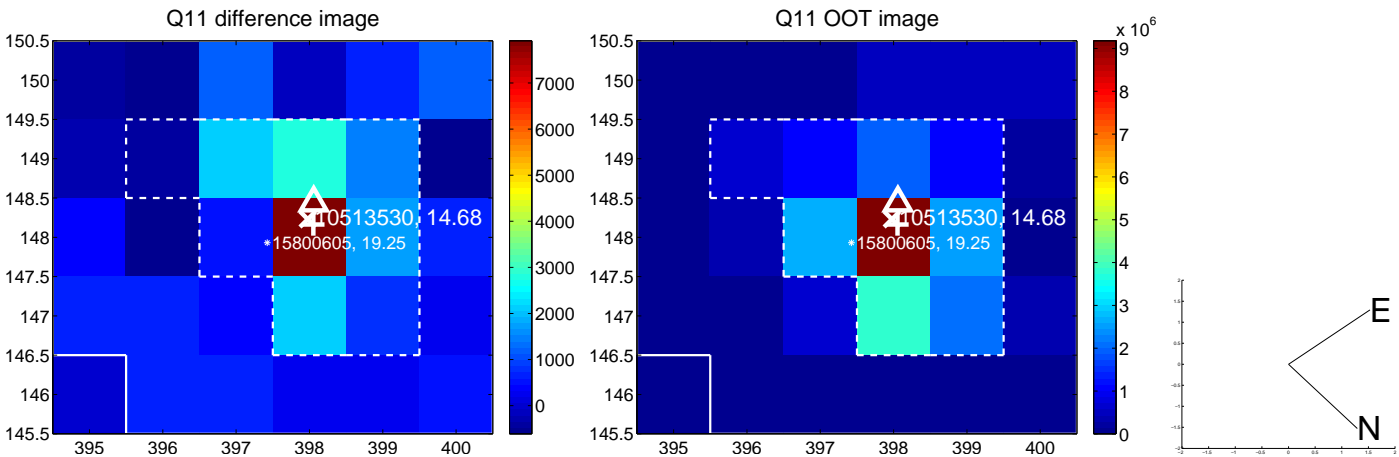
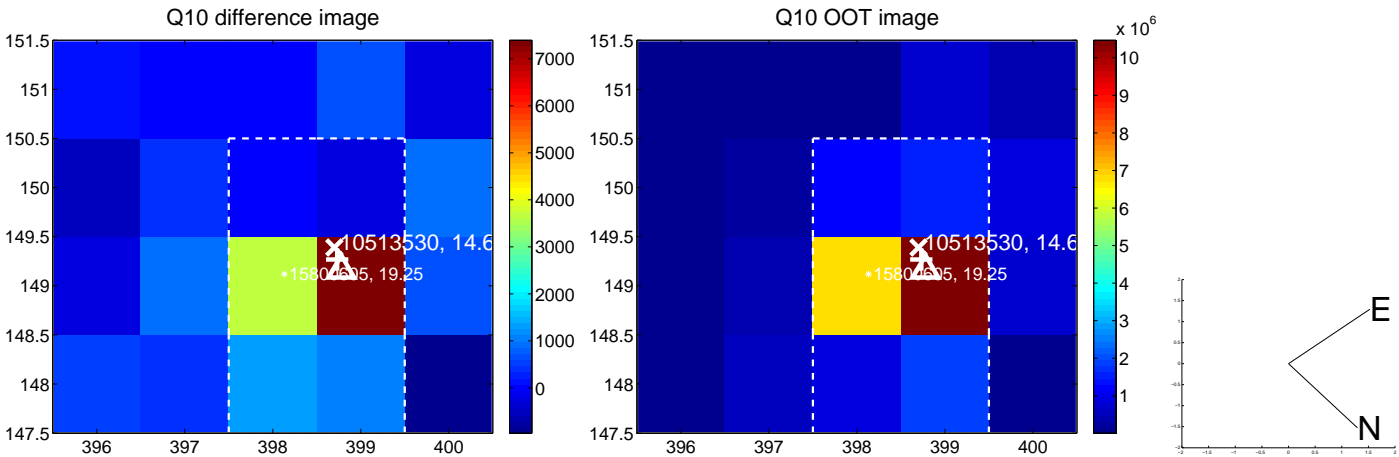
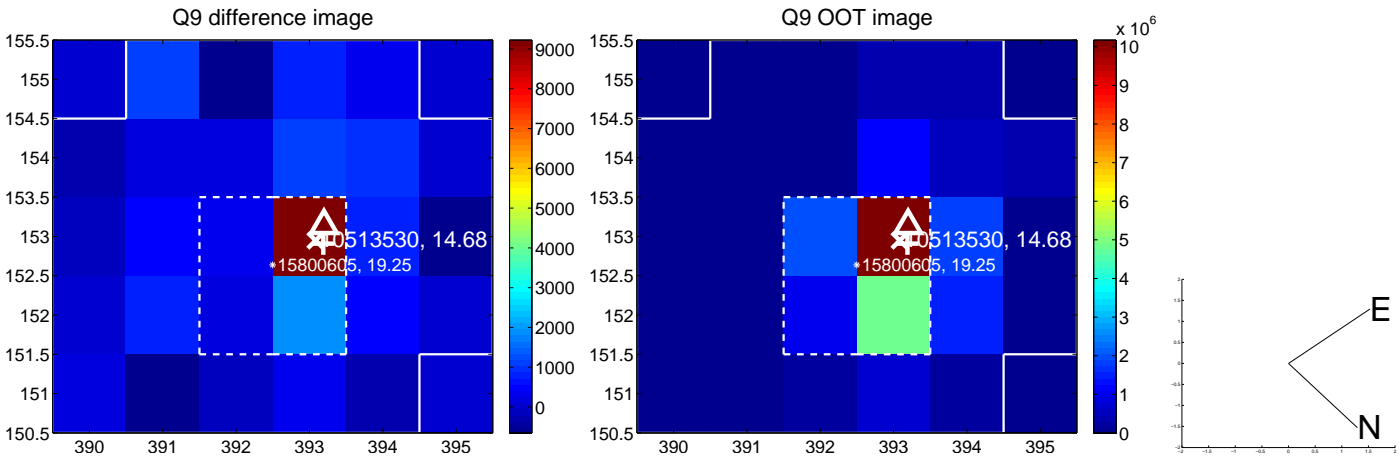
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



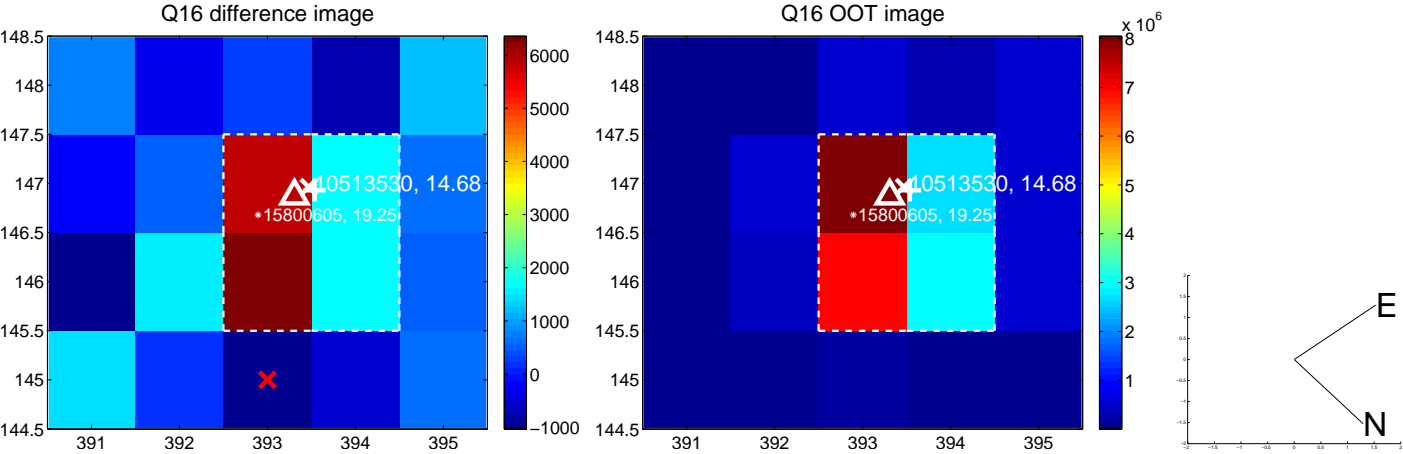
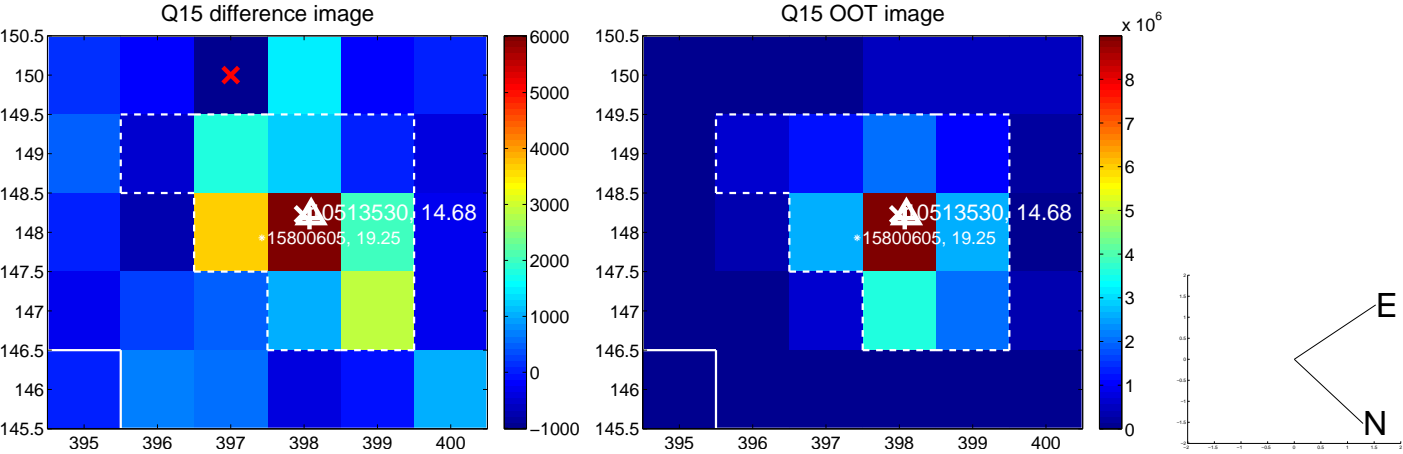
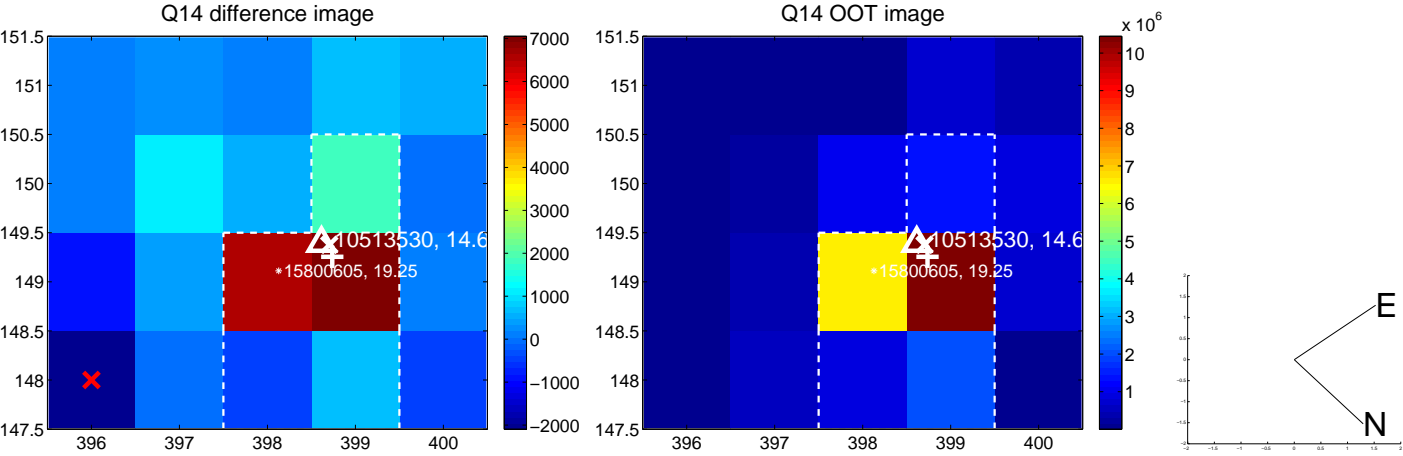
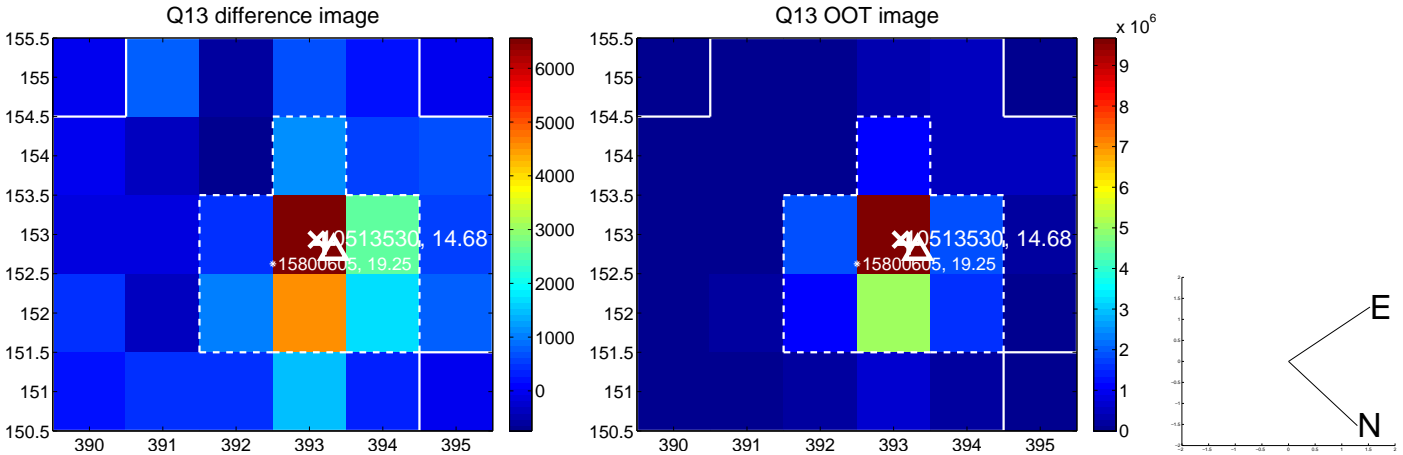
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

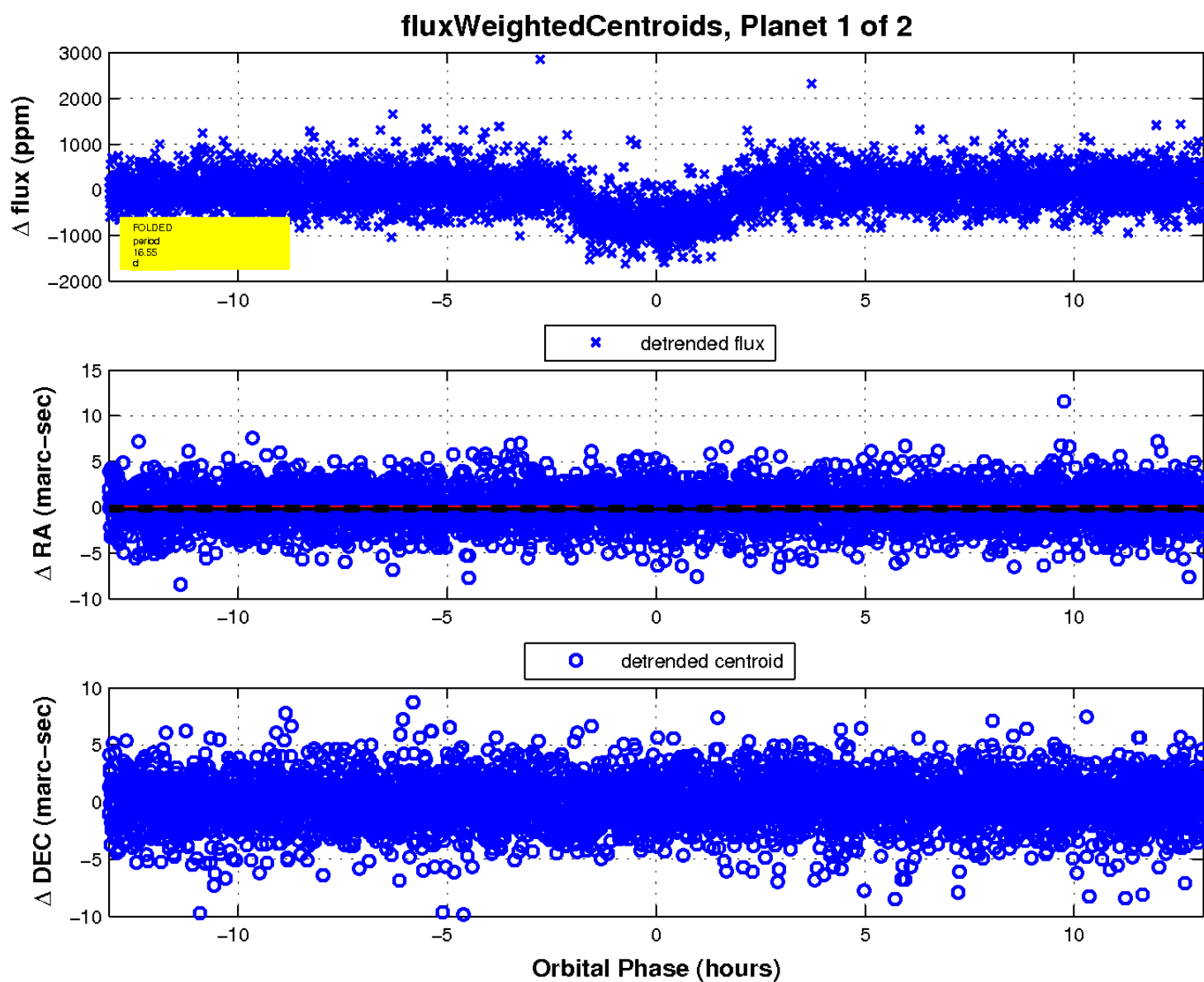
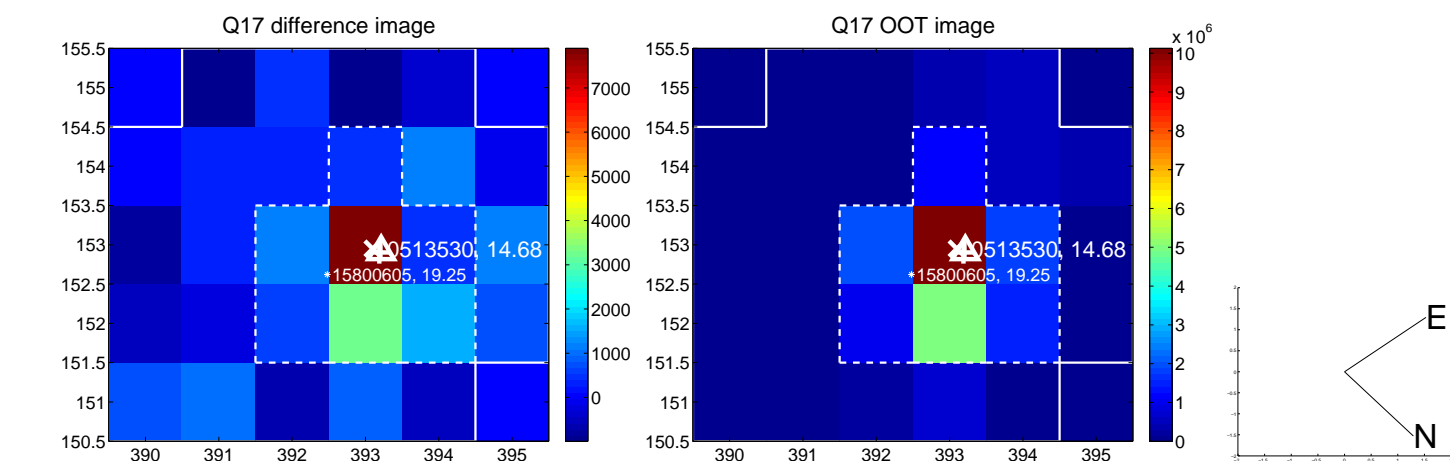


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



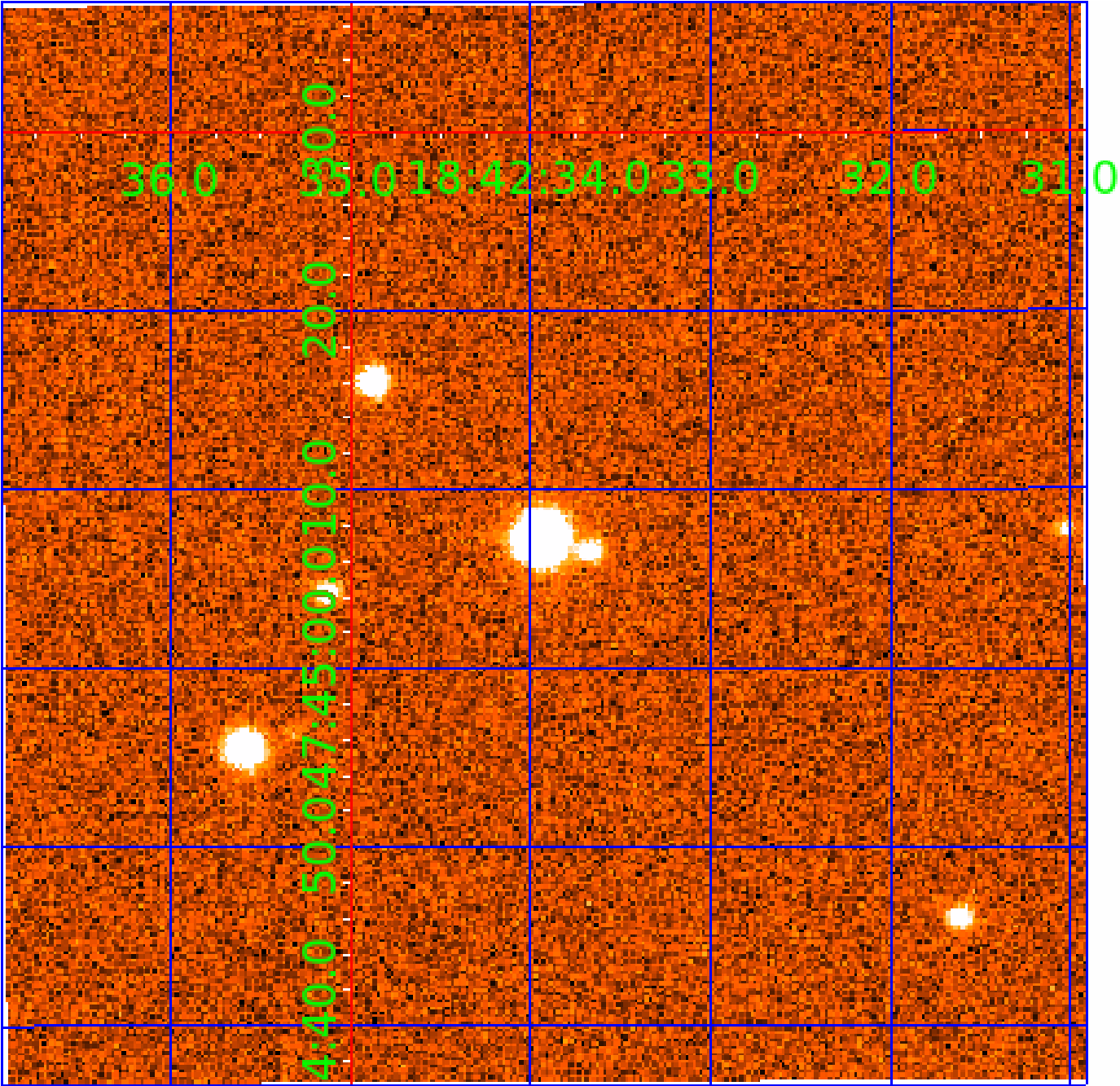


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\Delta$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 010513530

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010513530-01	OBS	0533.01	16.549670	138.594431	739.8	4.365	40.9	43.7	0.92	5372	2.96	43.82
010513530-02	OBS	0533.02	3.524664	131.643143	139.1	1.921	11.1	12.4	0.92	5372	1.30	344.52

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010513530-01	OBS	PC	1.00	0	0	0	0	CENT_KIC_POS
010513530-02	OBS	PC	1.00	0	0	0	0	CENT_KIC_POS

**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.

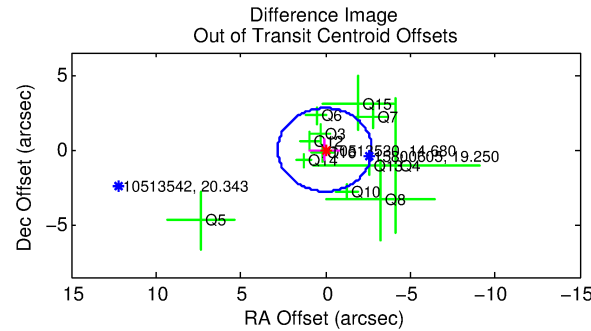
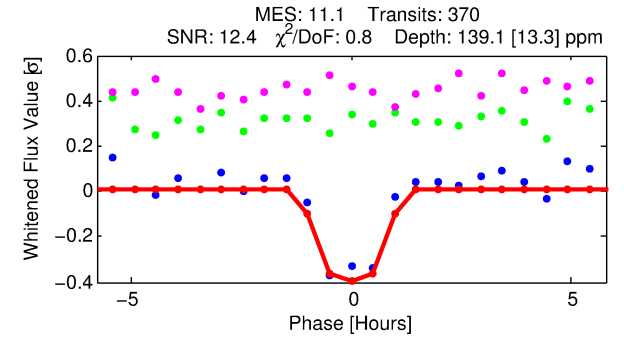
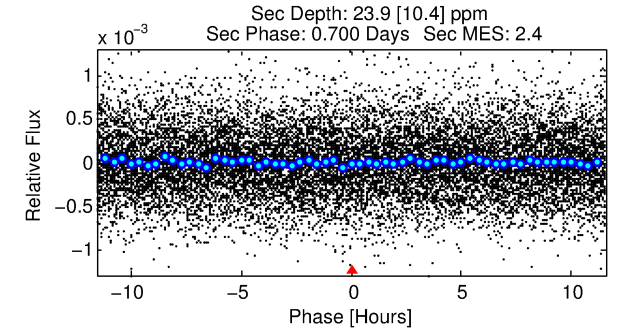
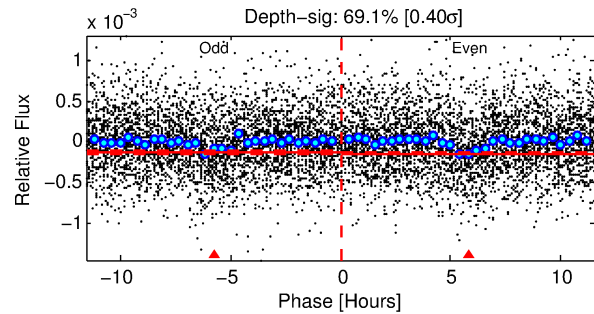
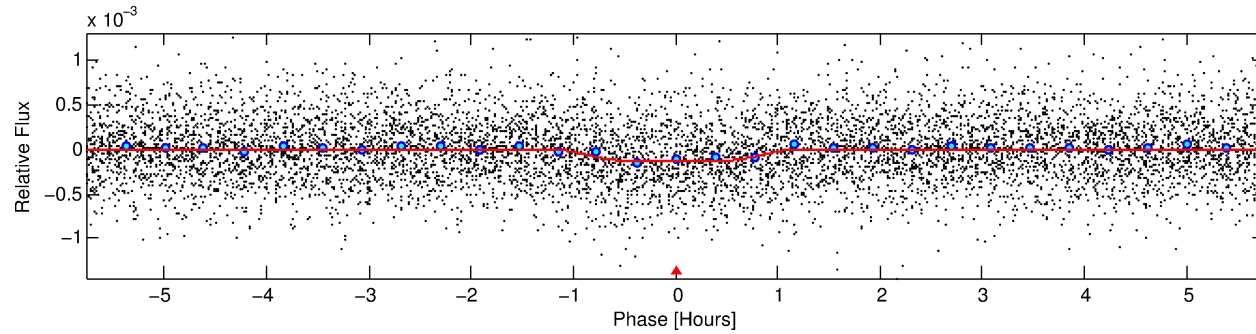
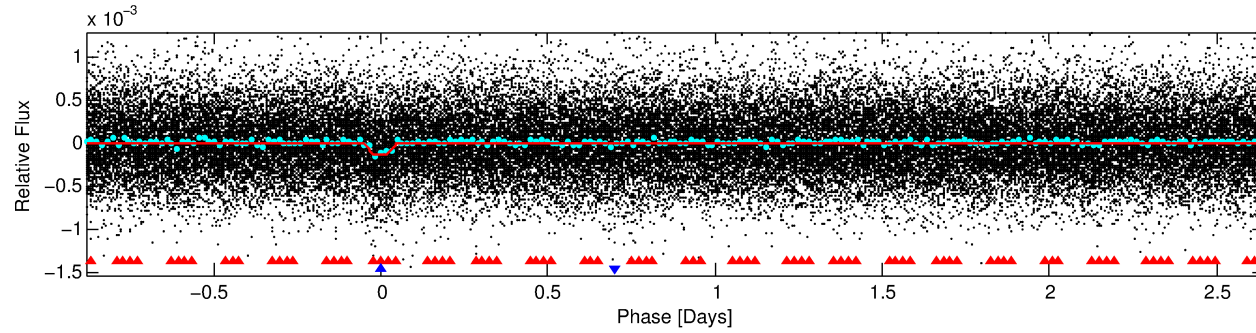
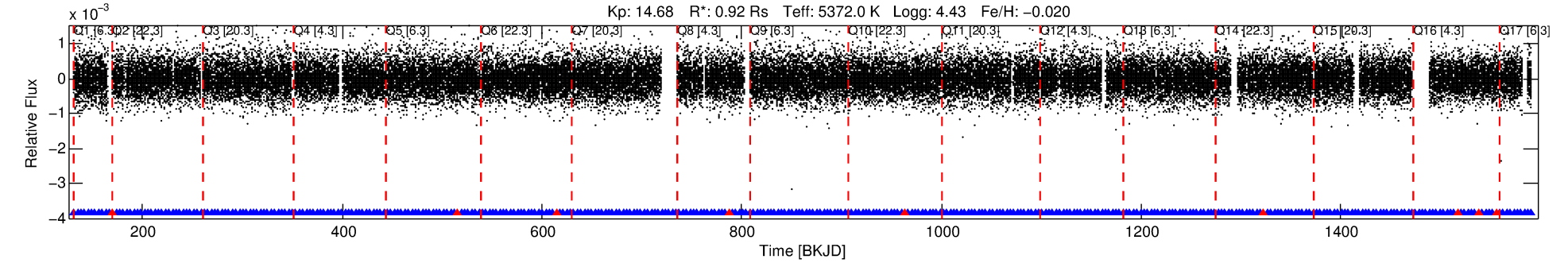
## Ephemeris Match Information For 010513530-02

No Significant Match Found

# DV One-Page Summary

KIC: 10513530 Candidate: 2 of 2 Period: 3.525 d

KOI: K00533.02 Corr: 0.965



## DV Fit Results:

Period = 3.52466 [0.00002] d  
Epoch = 131.6431 [0.0029] BKJD  
Rp/R\* = 0.0130 [0.0096]  
a/R\* = 6.60 [20.79]  
b = 0.90 [0.70]  
Seff = 344.52 [103.36]  
Teff = 1099 [82] K  
Rp = 1.30 [1.00] Re  
a = 0.0426 [0.0078] AU  
Ag = 14.12 [22.13] [0.59 $\sigma$ ]  
Teffp = 3293 [1274] K [1.72 $\sigma$ ]

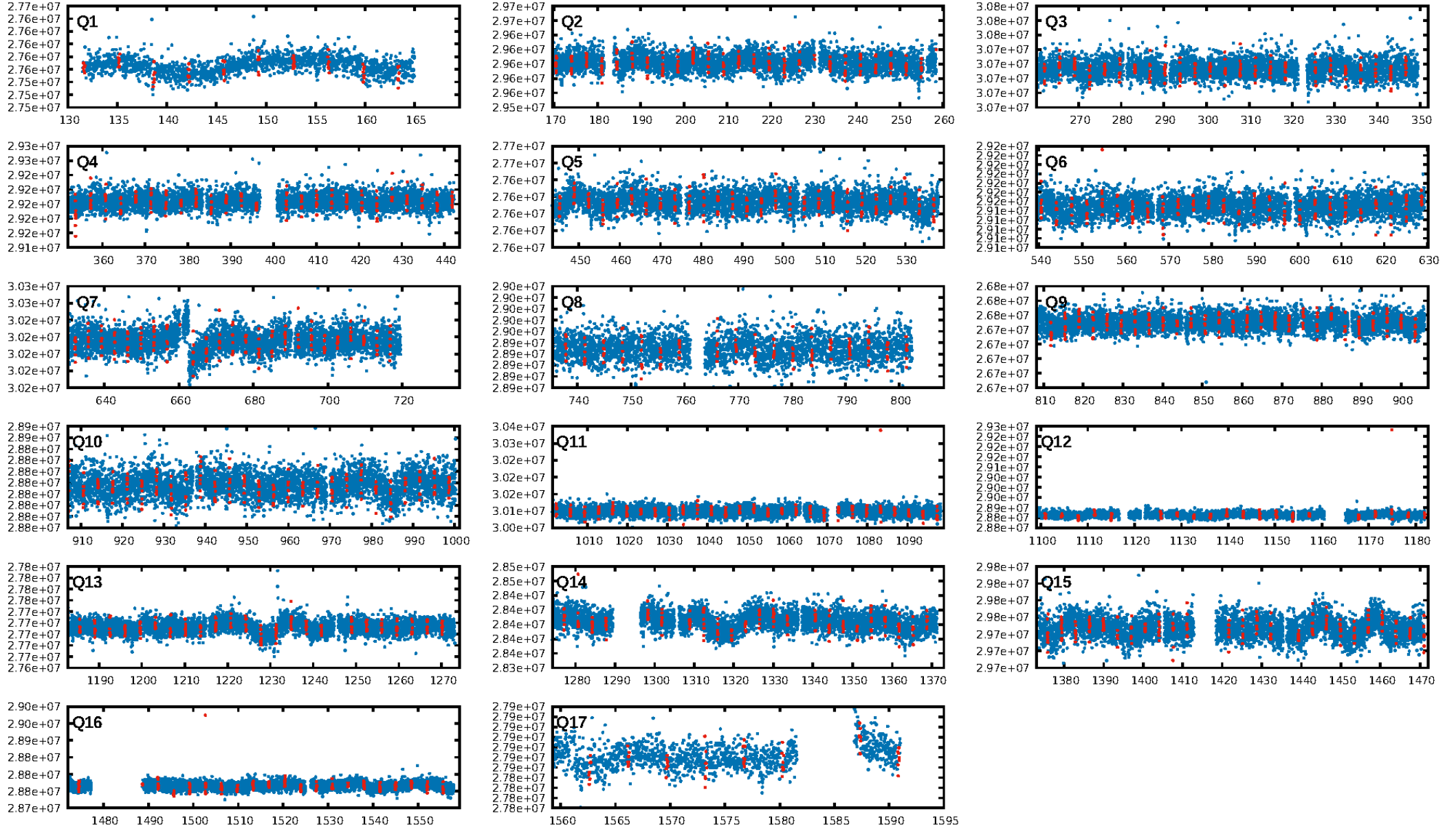
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [65.55 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 4.45e-28  
RollingBand-fgt: 0.97 [344/353]  
GhostDiagnostic-chr: 3.374  
Centroid-sig: N/A  
Centroid-so: 2.184 arcsec [1.76 $\sigma$ ]  
OotOffset-rm: 0.045 arcsec [0.05 $\sigma$ ]  
KicOffset-rm: 0.358 arcsec [0.53 $\sigma$ ]  
OotOffset-st: 3/3/4/2 [12]  
KicOffset-st: 3/3/4/2 [12]  
DiffImageQuality-fgm: 0.58 [7/12]  
DiffImageOverlap-fno: 1.00 [17/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 21:45:01 Z

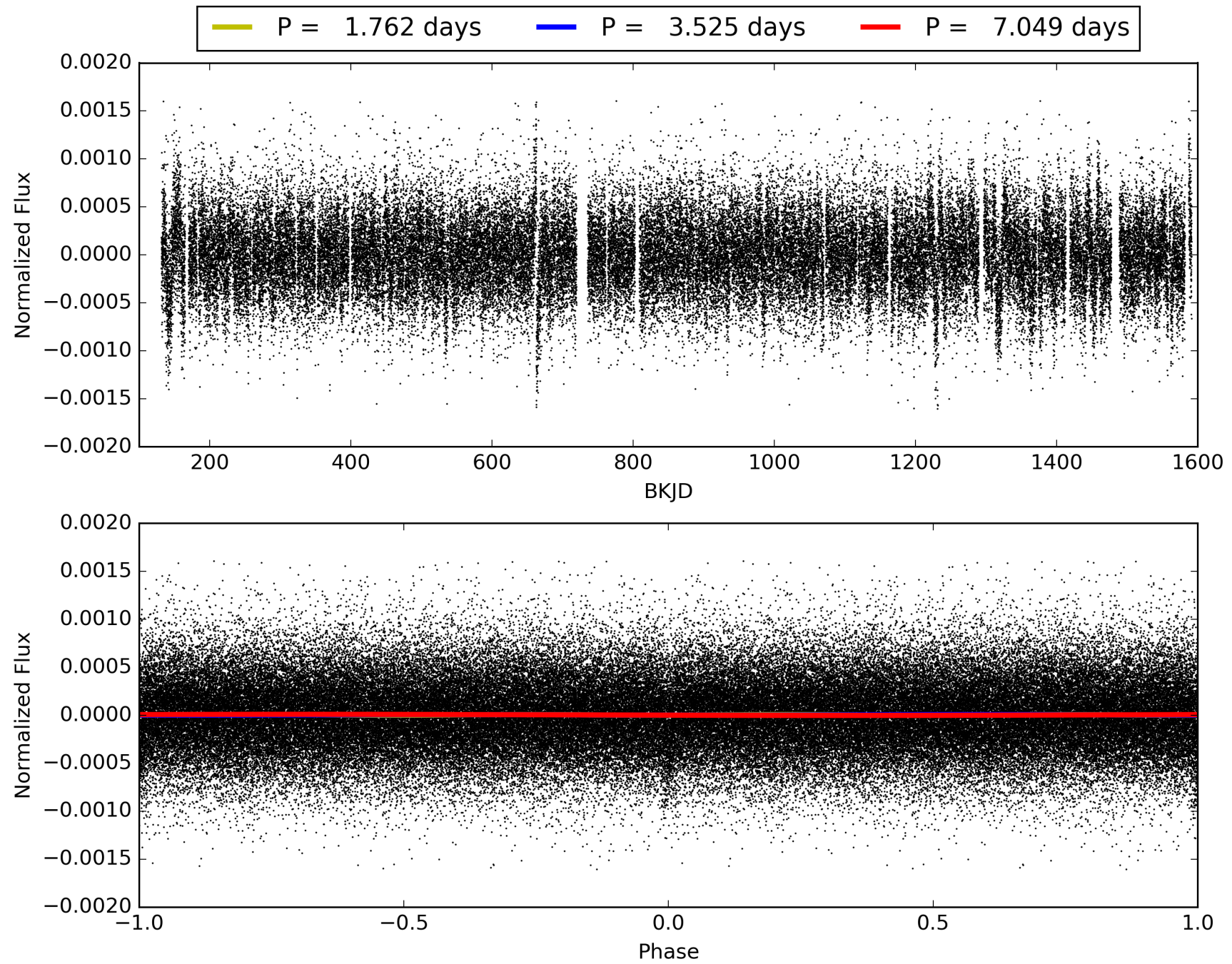
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 010513530-02, PDC Light Curves



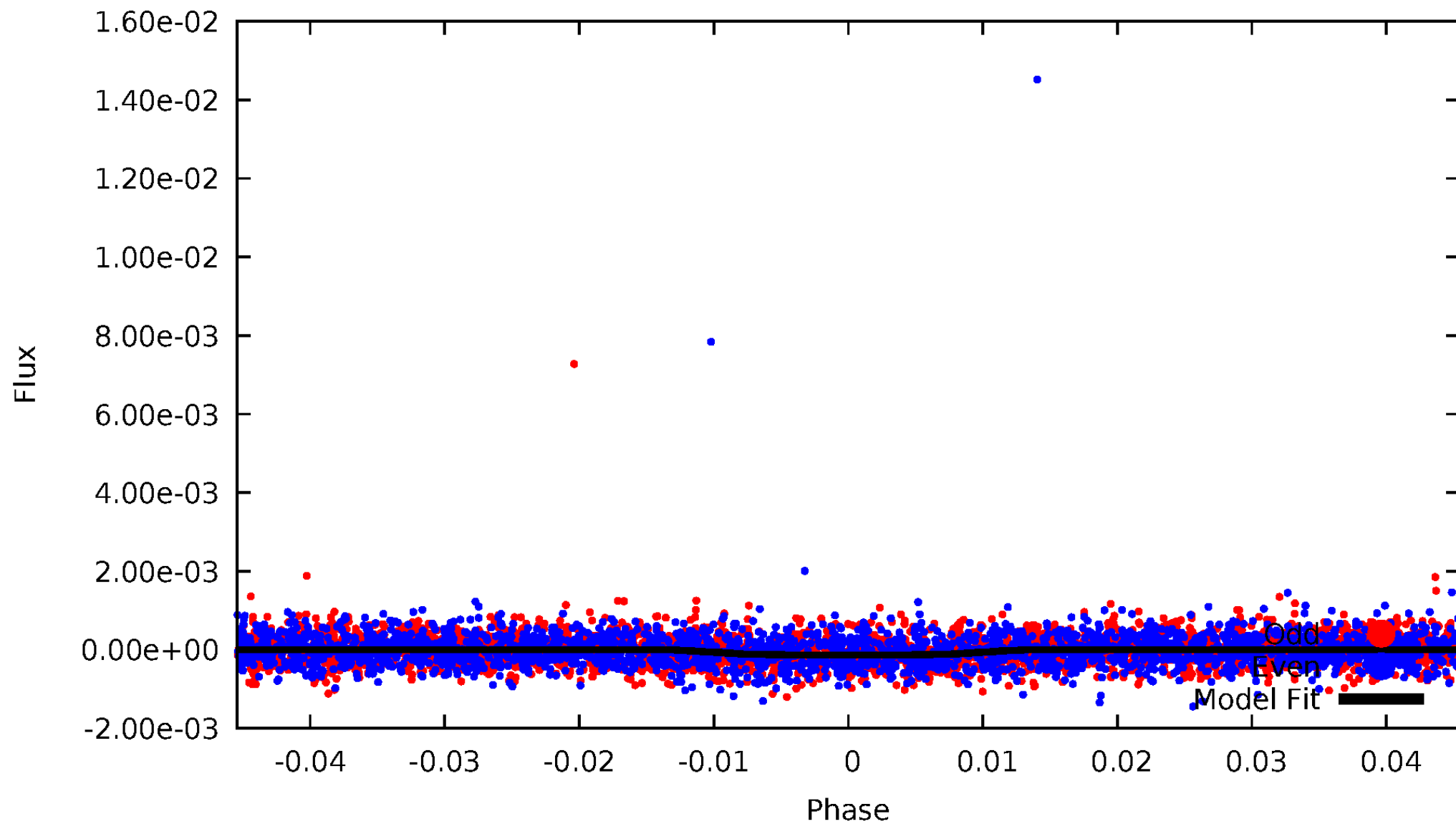


TCE 010513530-02



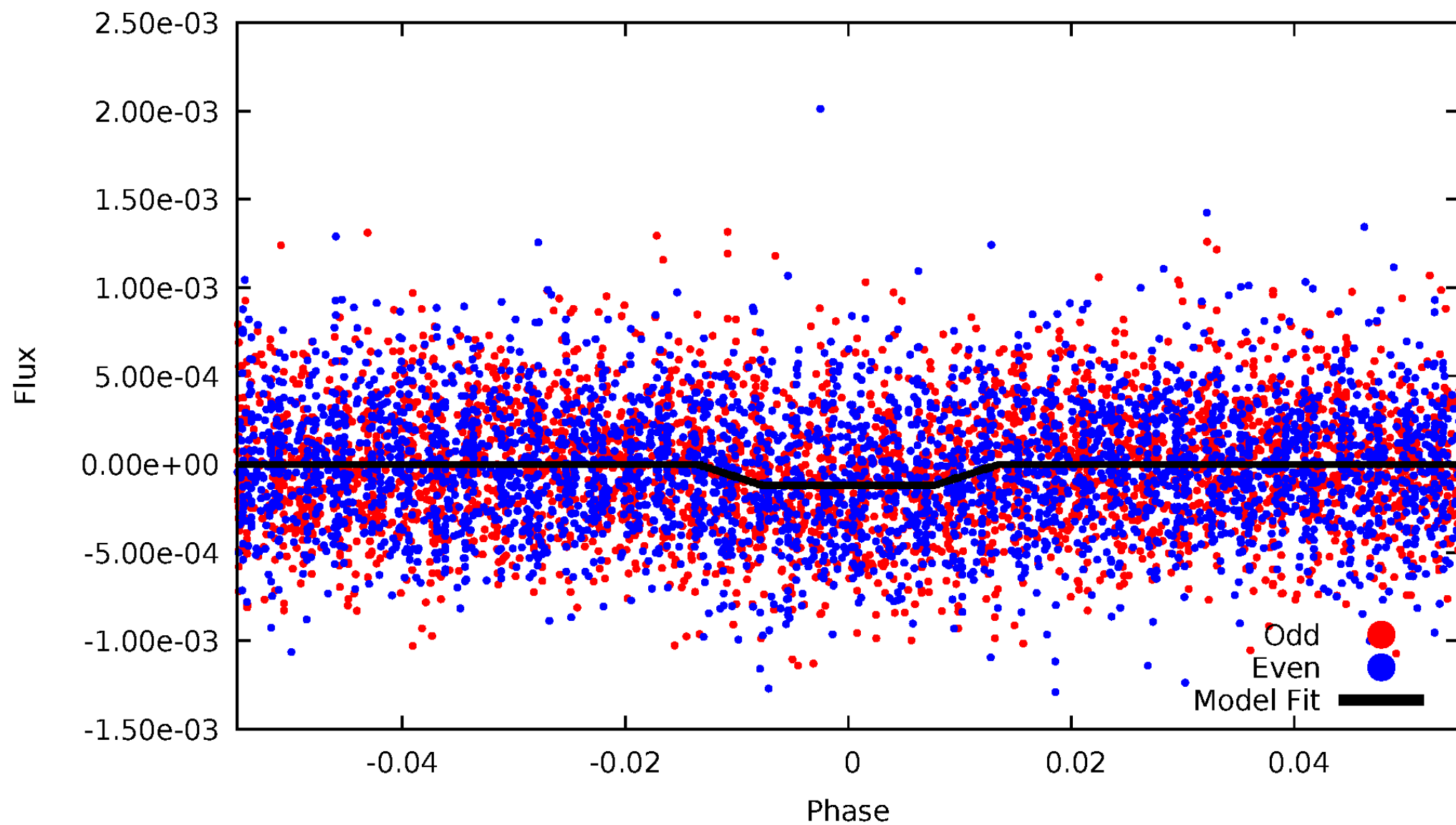
# DV Odd/Even

TCE 010513530-02



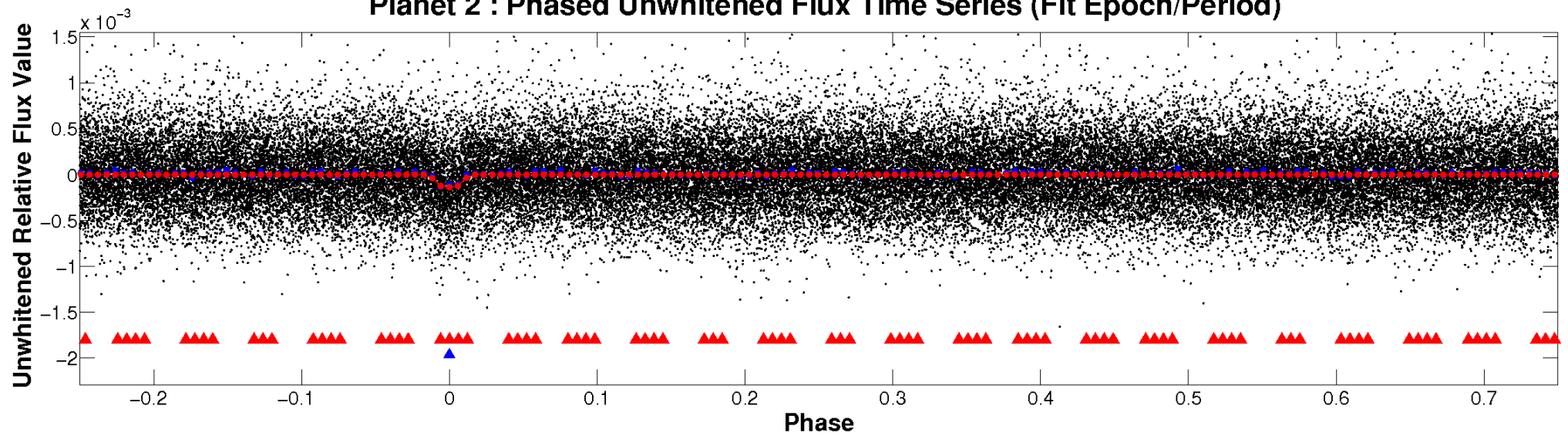
# ALT Odd/Even

TCE 010513530-02

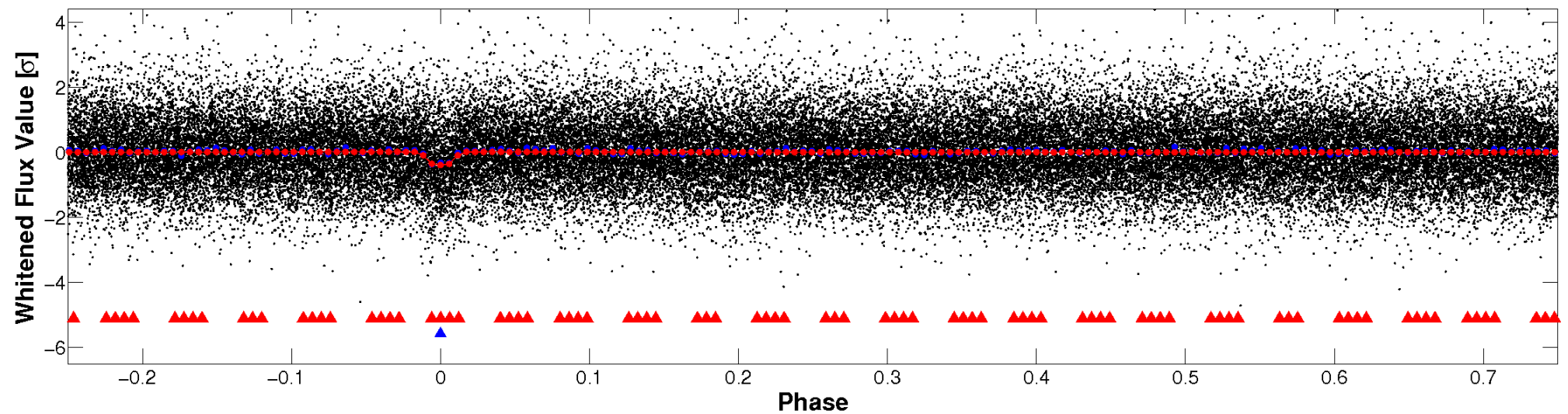


# Non-Whitened Vs. Whitened Light Curve

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



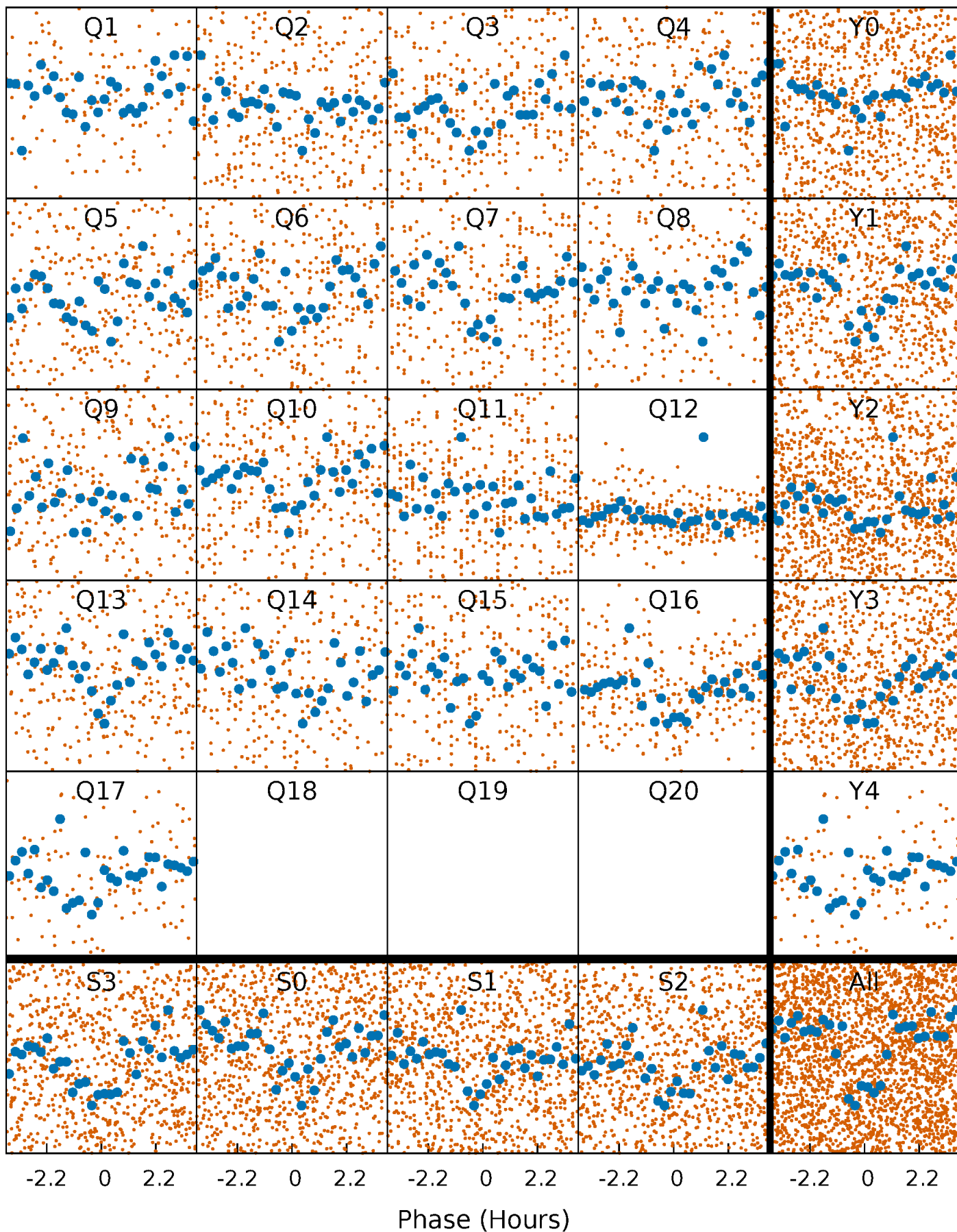
## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)





# PDC Quarter-Phased Transit Curves

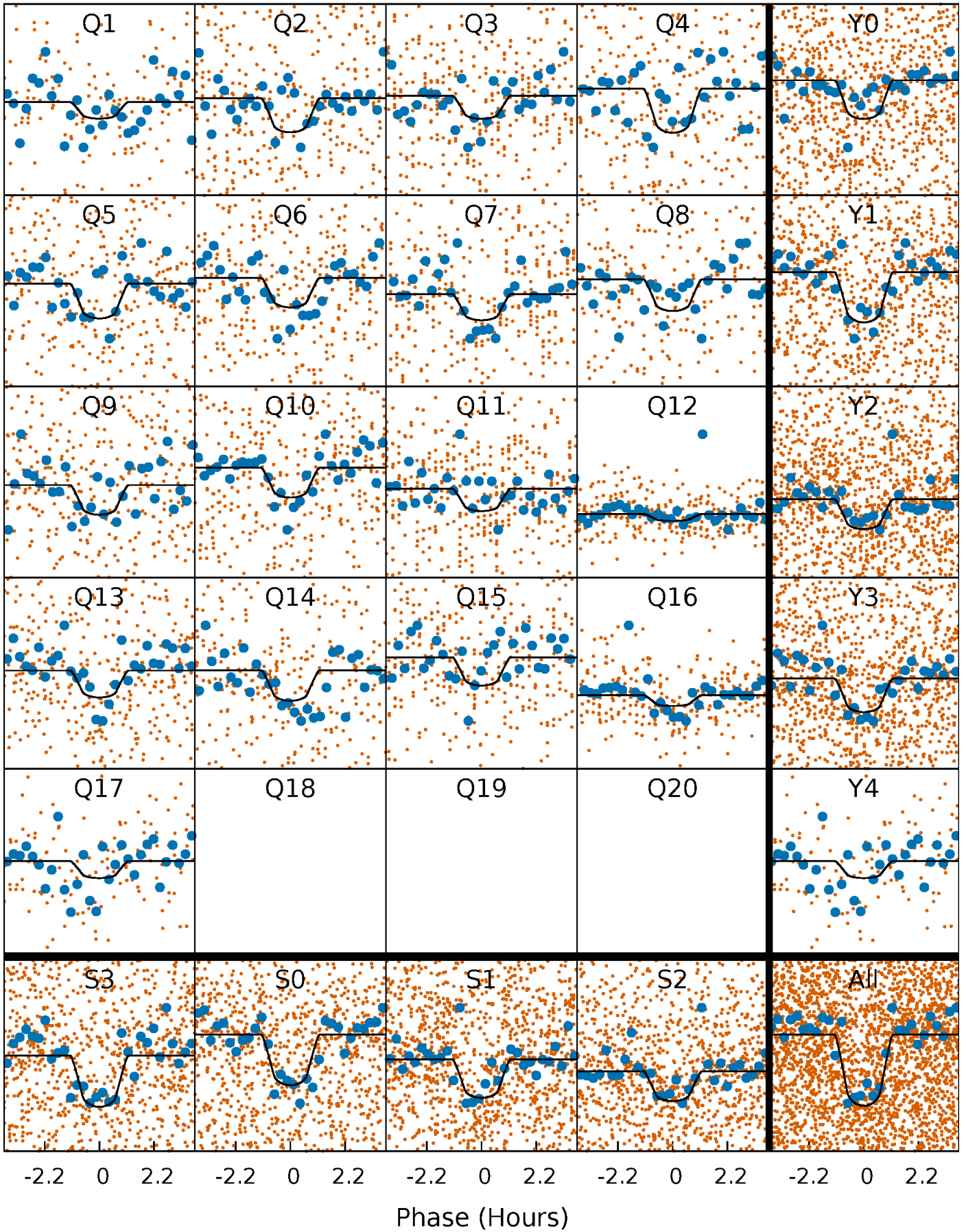
TCE 010513530-02   P= 3.524664 Days    $T_0=131.643143$  (BKJD)





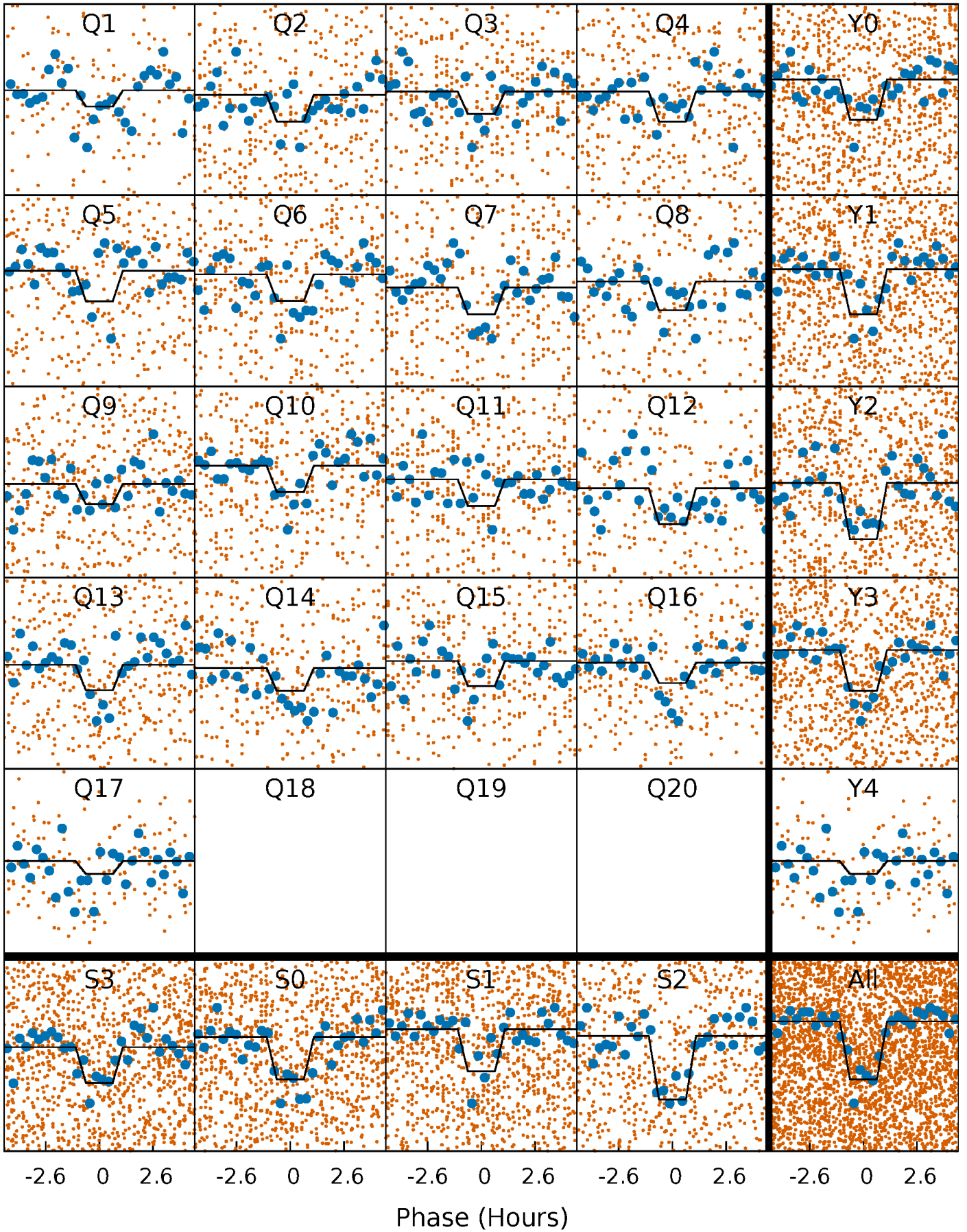
# DV Quarter-Phased Transit Curves

TCE 010513530-02 P= 3.524664 Days  $T_0=131.643143$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

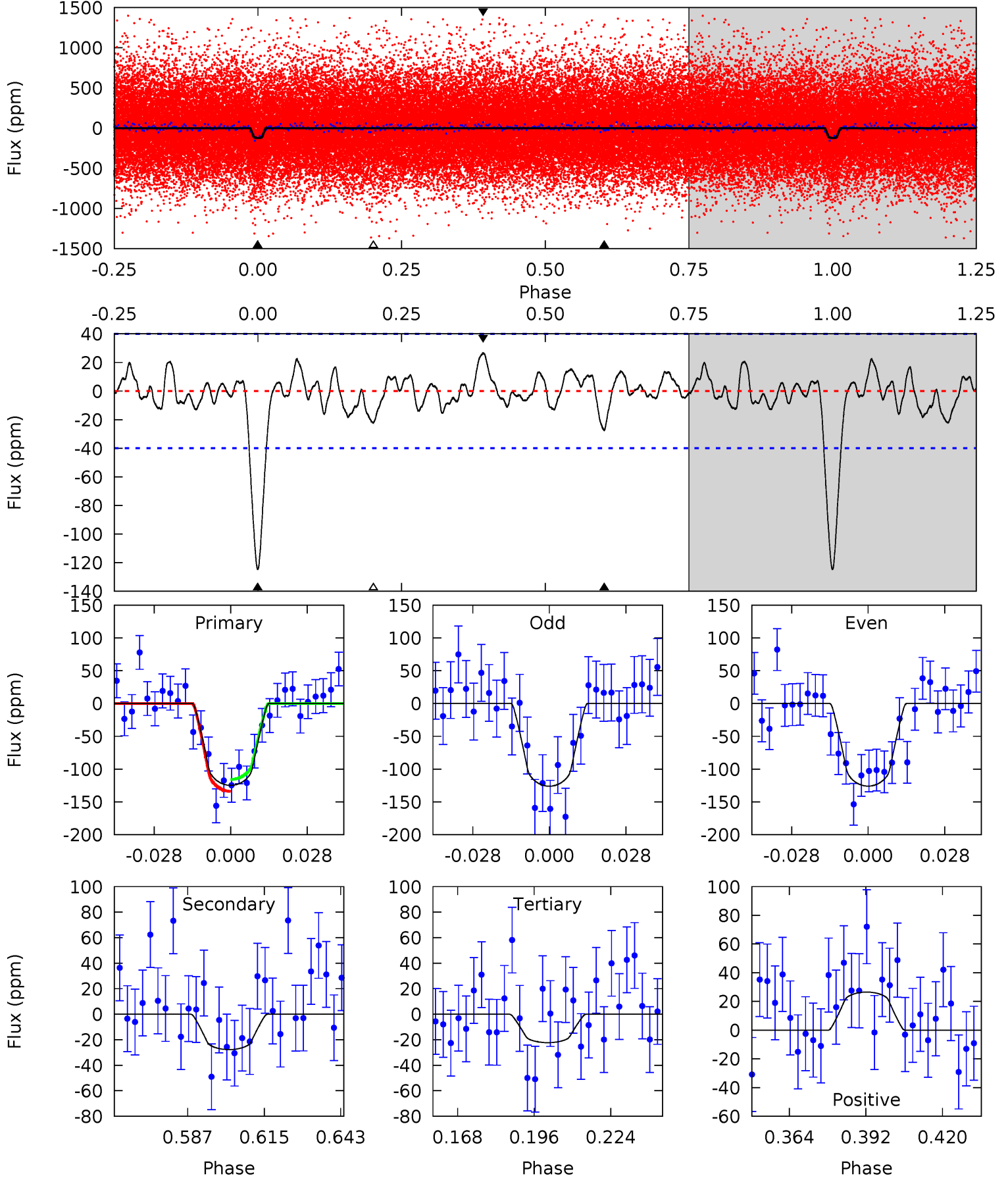
TCE 010513530-02 P= 3.524686 Days  $T_0=131.637889$  (BKJD)



# DV Model-Shift Uniqueness Test

010513530-02, P = 3.524664 Days, E = 128.118479 Days

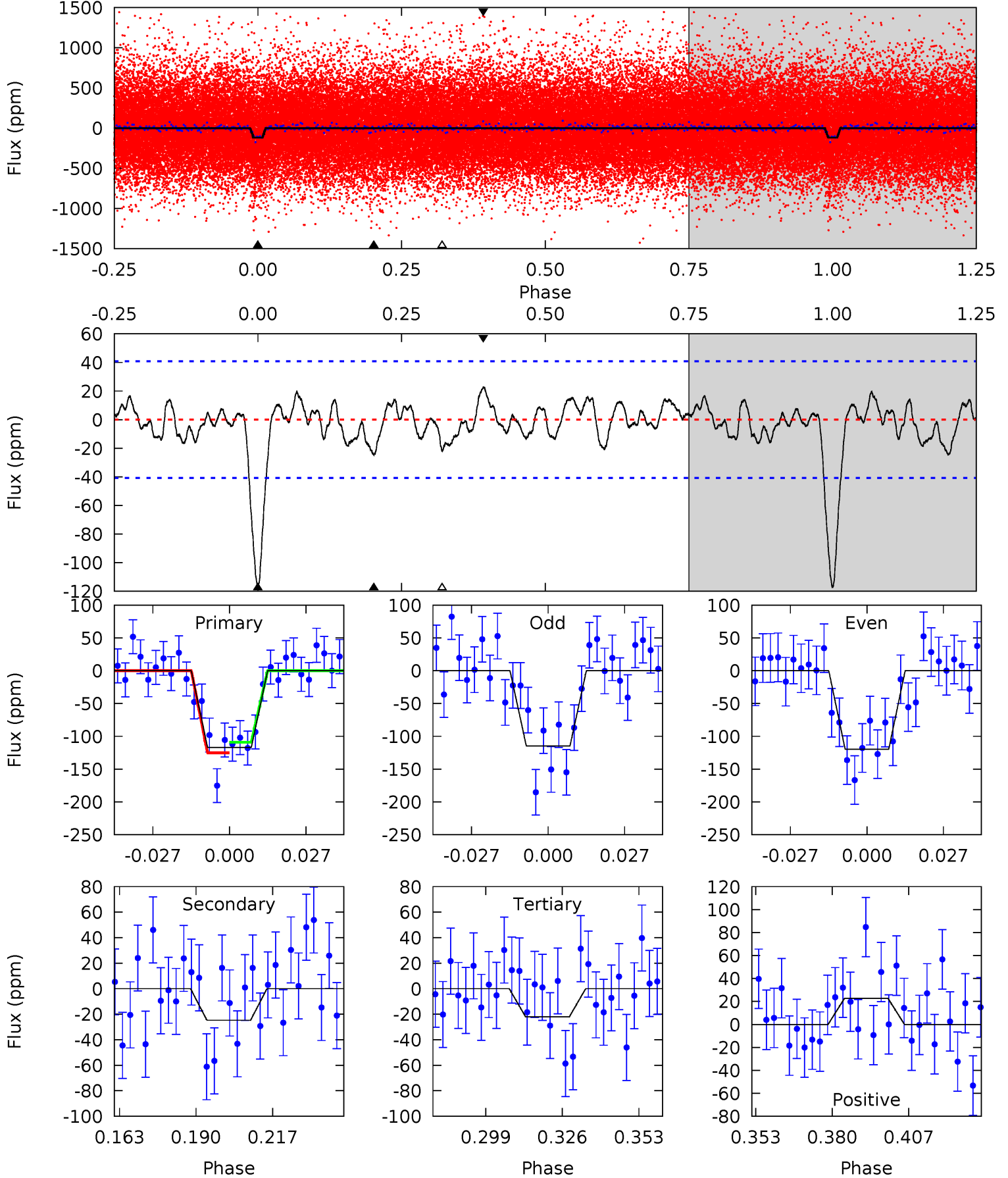
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
15.1	3.35	2.69	3.20	4.83	2.20	1.12	12.4	11.9	0.66	0.14	0.01	0.81	0.18	1.10



# Alt Model-Shift Uniqueness Test

010513530-02, P = 3.524686 Days, E = 128.113203 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
13.9	2.93	2.62	2.68	4.83	2.21	1.12	11.2	11.2	0.31	0.25	0.28	0.86	0.16	0.95



### Stellar Parameters For KIC 010513530

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5372^{+160}_{-160}$	$4.434^{+0.112}_{-0.154}$	$-0.020^{+0.300}_{-0.300}$	$0.916^{+0.194}_{-0.129}$	$0.832^{+0.108}_{-0.063}$	$1.522^{+0.731}_{-0.638}$
	+3%/-3%	+3%/-3%	+1500%/-1500%	+21%/-14%	+13%/-8%	+48%/-42%
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 010513530-02 / KOI 0533.02

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-28 \pm 8$	$1.48^{+0.96}_{-0.81}$	$1538^{+103}_{-79}$	$3627^{+1190}_{-580}$	$12^{+49}_{-8}$
Alt.	$-25 \pm 8$	$1.26^{+0.95}_{-0.77}$	$1546^{+95}_{-80}$	$3736^{+1666}_{-670}$	$15^{+83}_{-11}$

$T_{\text{max}}$  = Theoretical Maximum Planetary Temperature  
 $T_{\text{obs}}$  = Observed Planetary Temperature (Assuming  $A=0.3$ )  
 $A_{\text{obs}}$  = Observed Albedo (Assuming  $T=0$ )

If a secondary eclipse is present, the system is likely an EB if  $T_{\text{obs}} \gg T_{\text{max}}$  AND  $A_{\text{obs}} \gg 1.0$



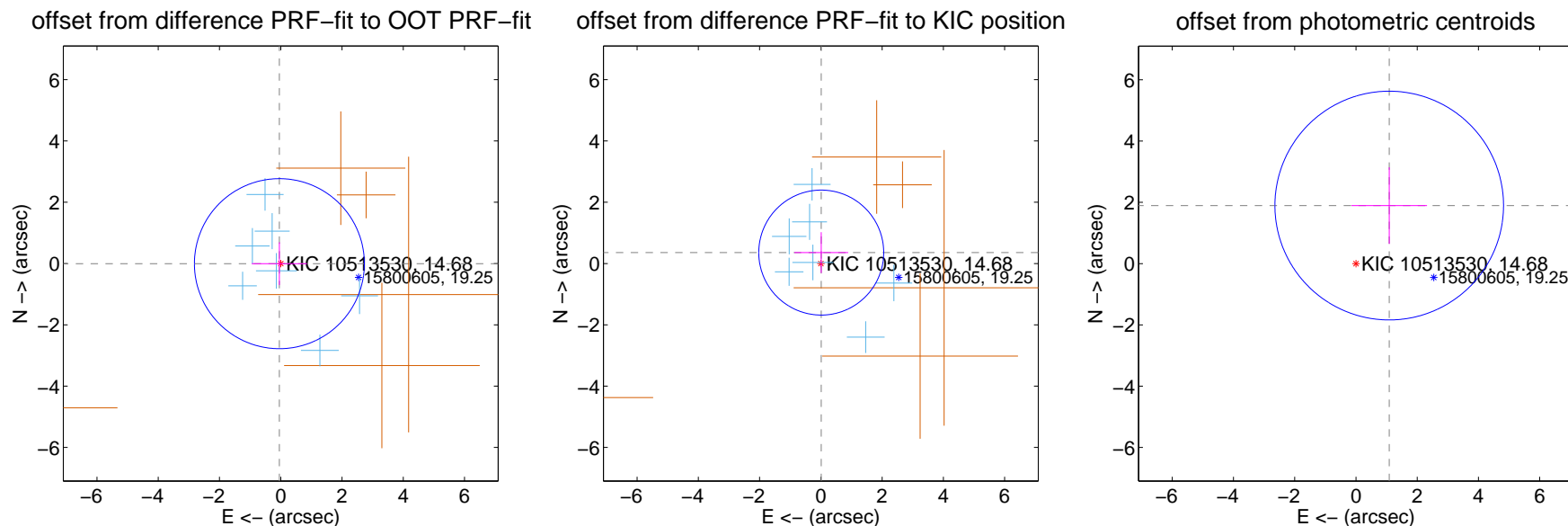
## DV Centroid Data

Supplemental centroid analysis for 010513530-02. Kepler magnitude: 14.68. Transit SNR 12.37

There are 7 quarters with good PRF difference image offsets

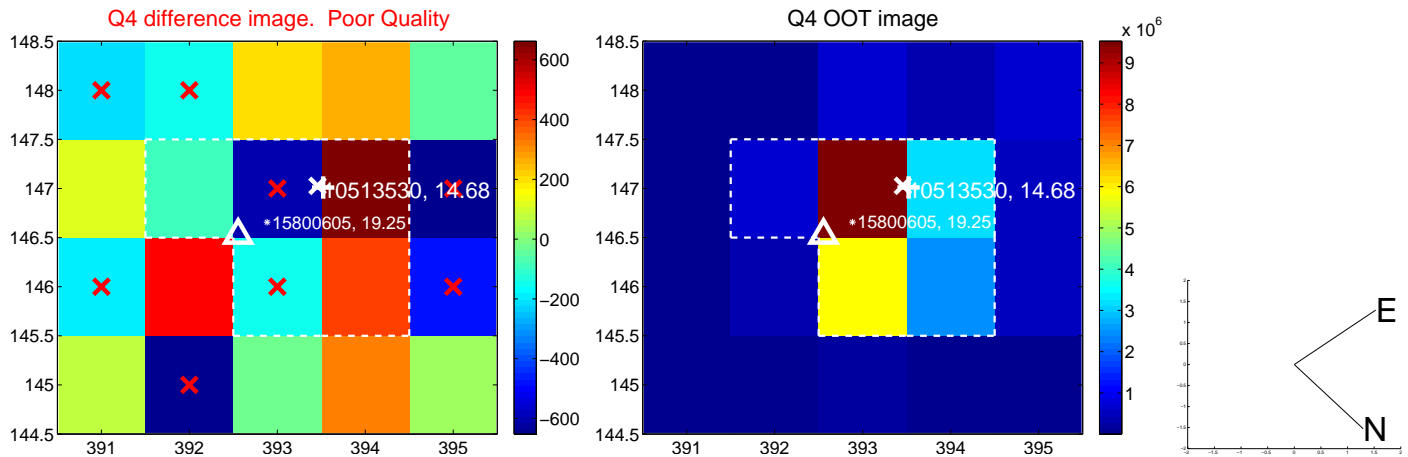
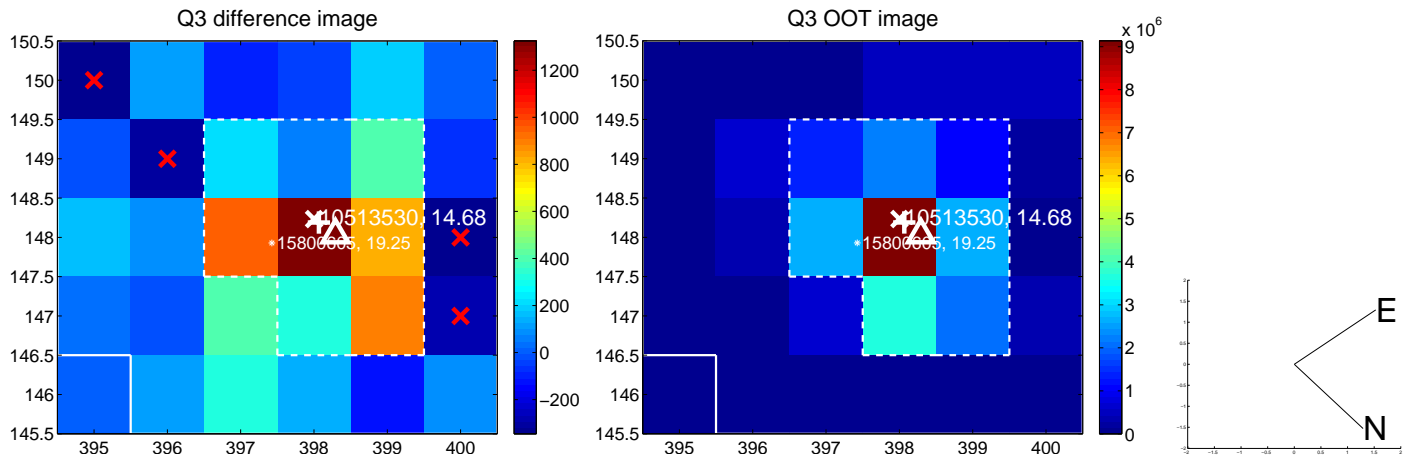
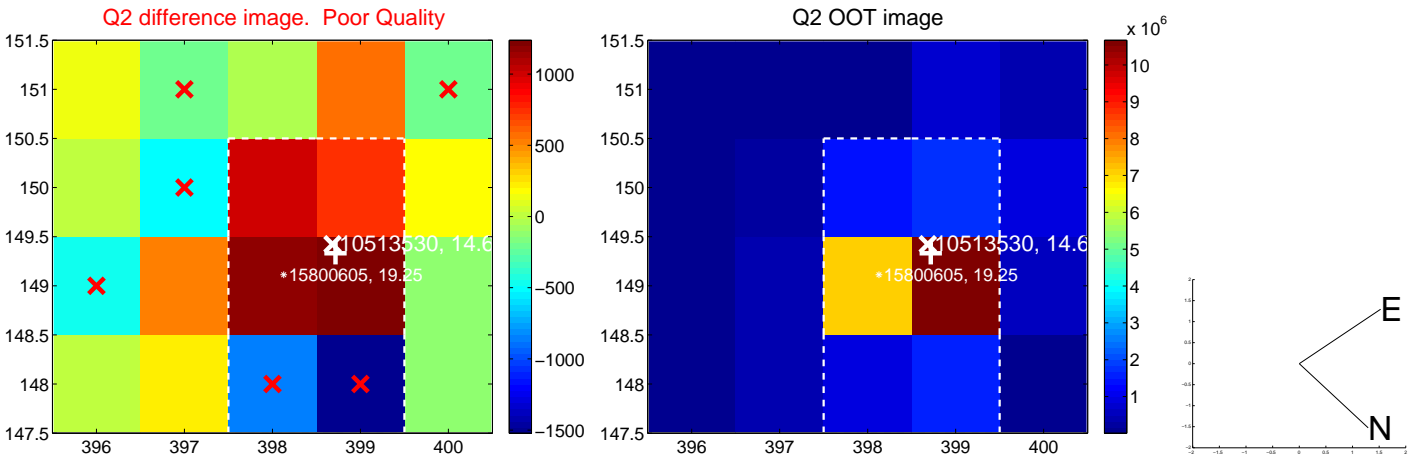
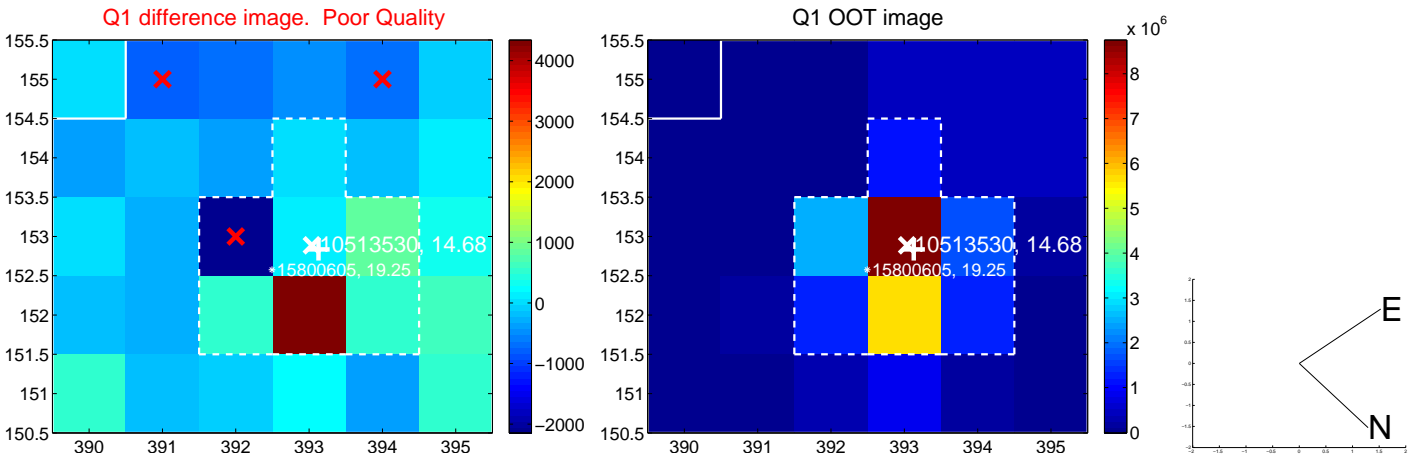
The direct PRF centroid is offset from the target star catalog position by about 0.30 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.045 \pm 0.925$	0.05	$0.044 \pm 0.902$	$-0.005 \pm 0.697$
PRF-fit source offset from KIC position	$0.358 \pm 0.680$	0.53	$-0.012 \pm 0.879$	$0.358 \pm 0.665$
photometric centroid source offset	$2.18 \pm 1.24$	1.76	$-1.09 \pm 1.23$	$1.89 \pm 1.25$



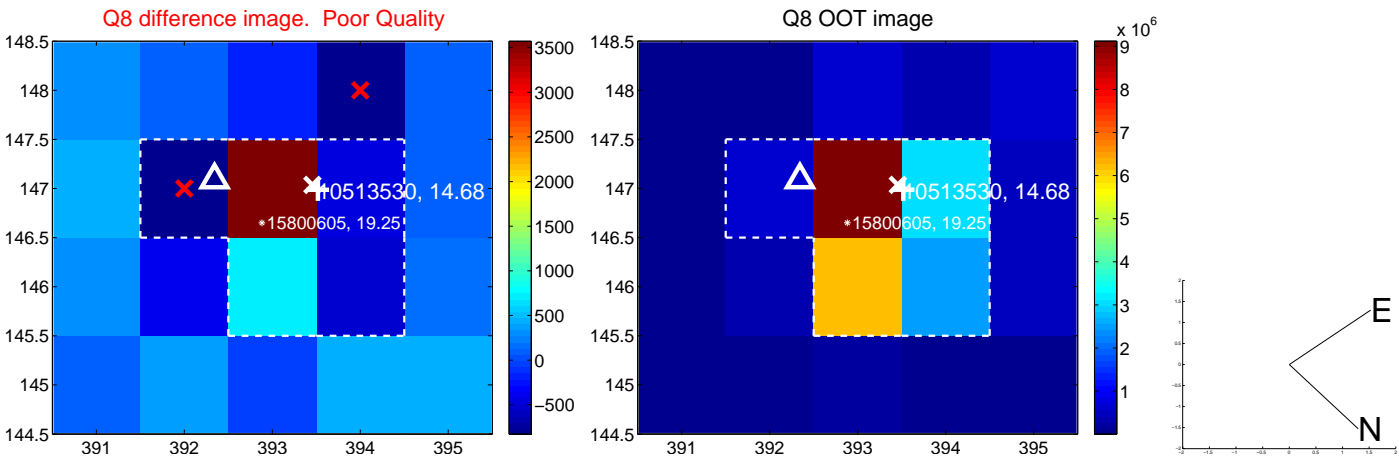
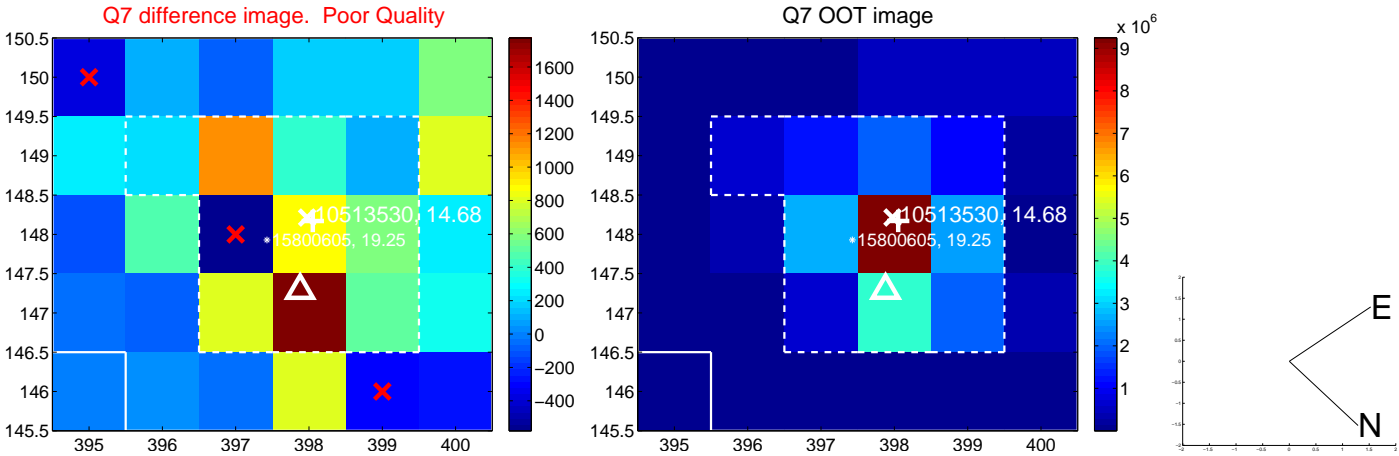
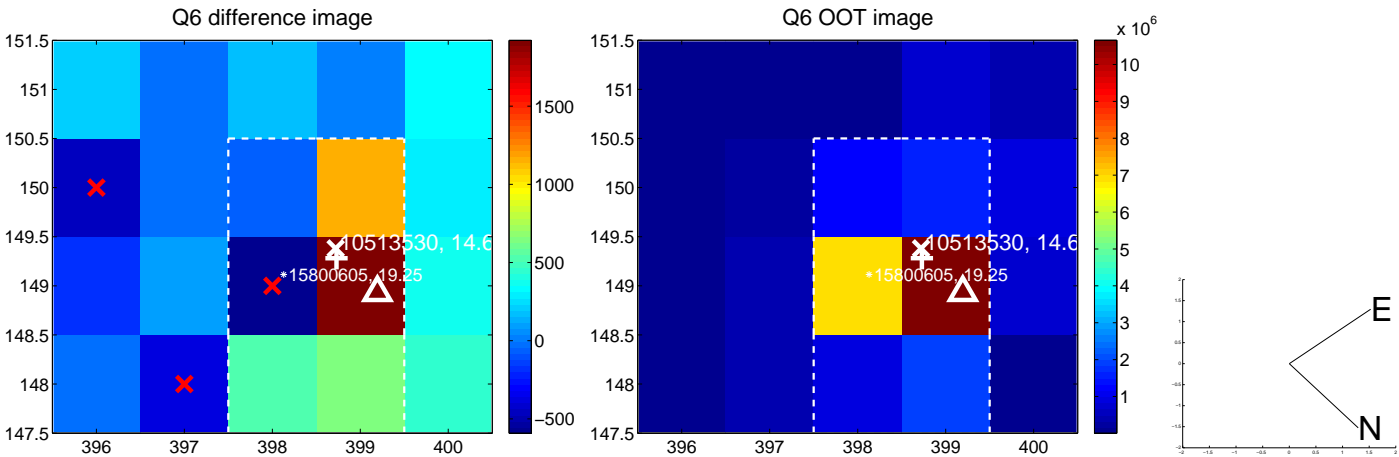
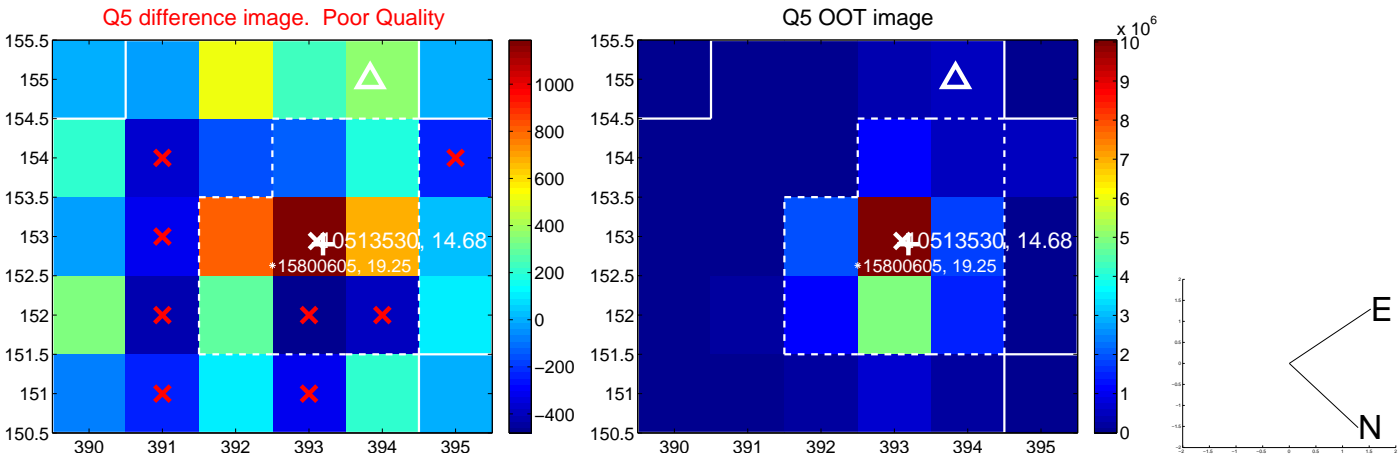
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

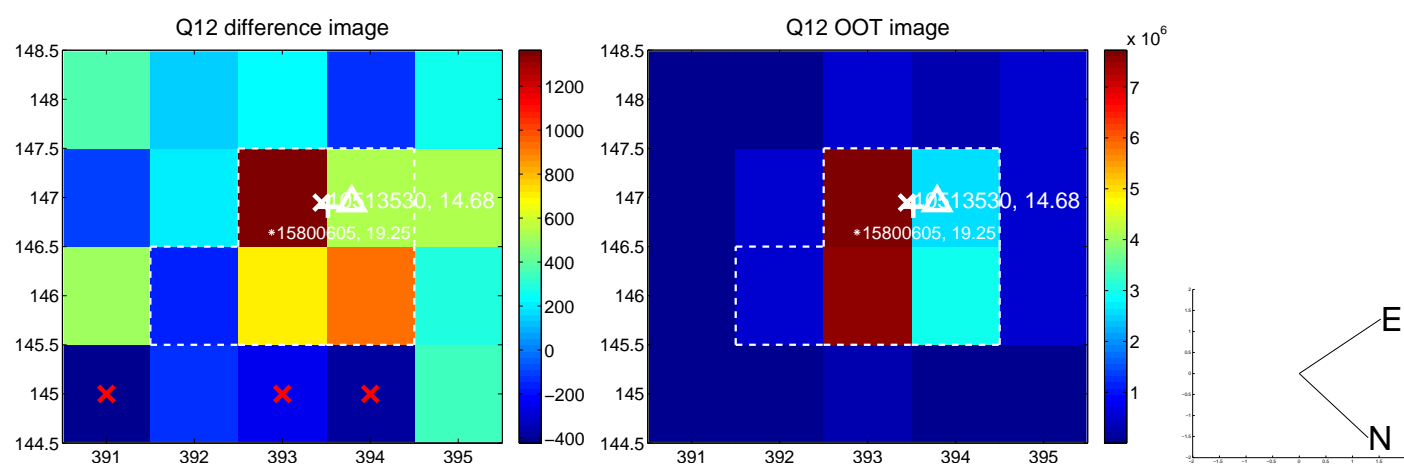
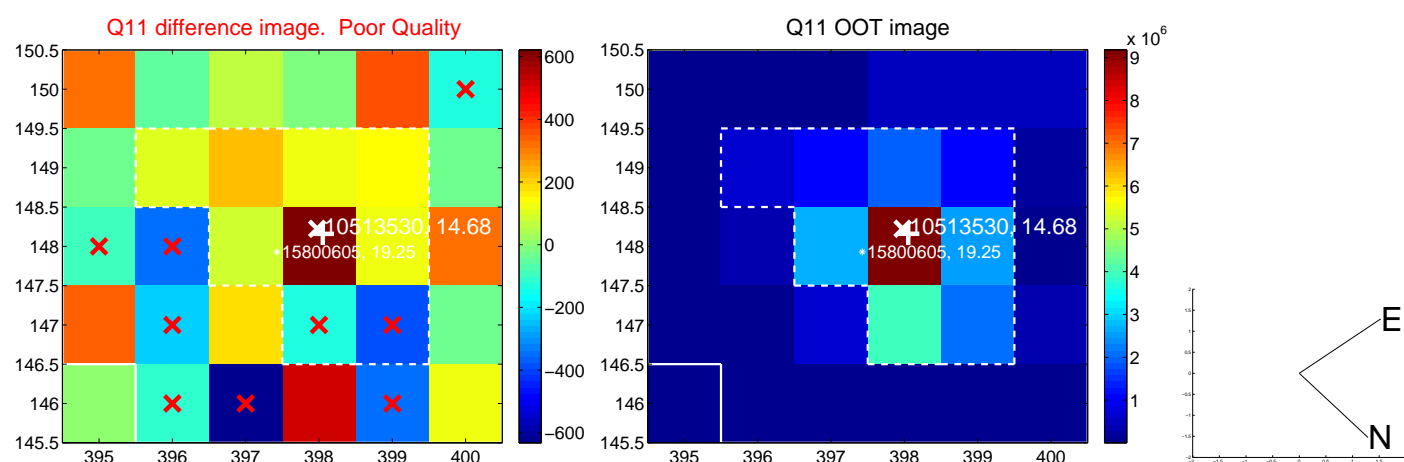
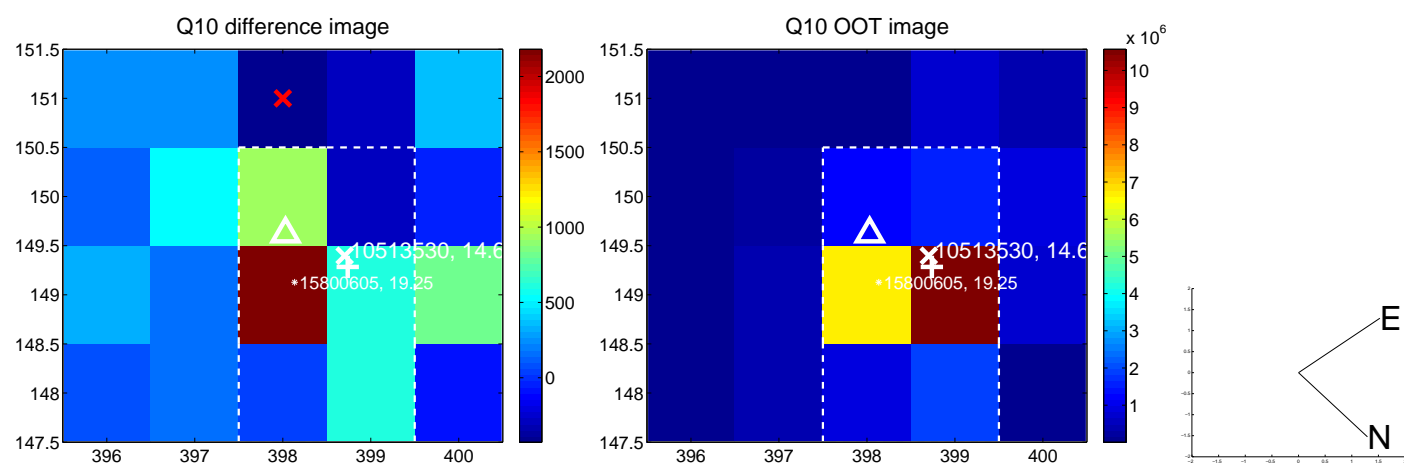
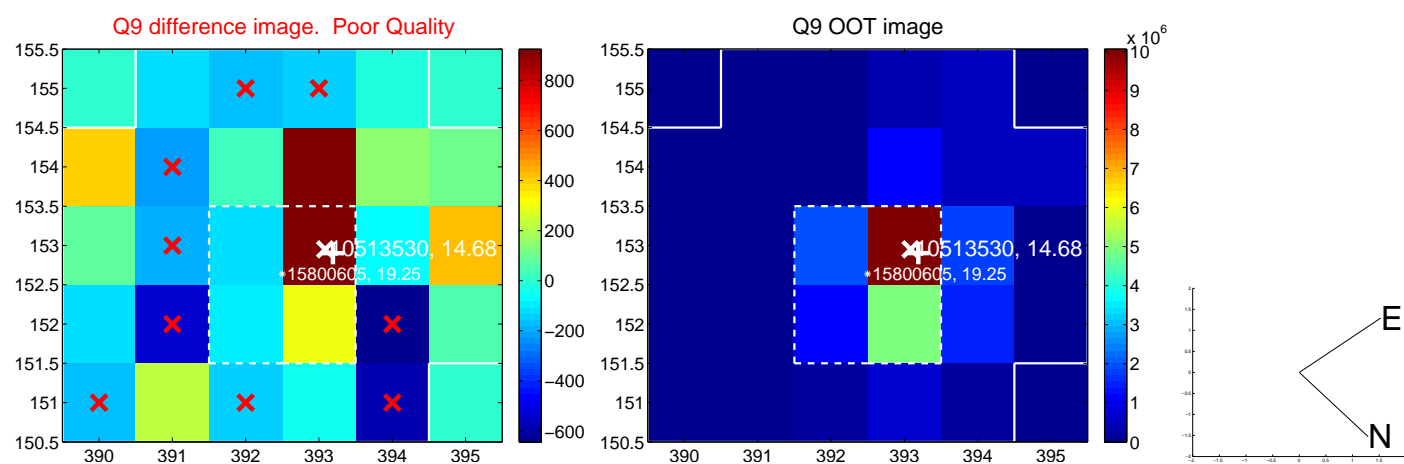




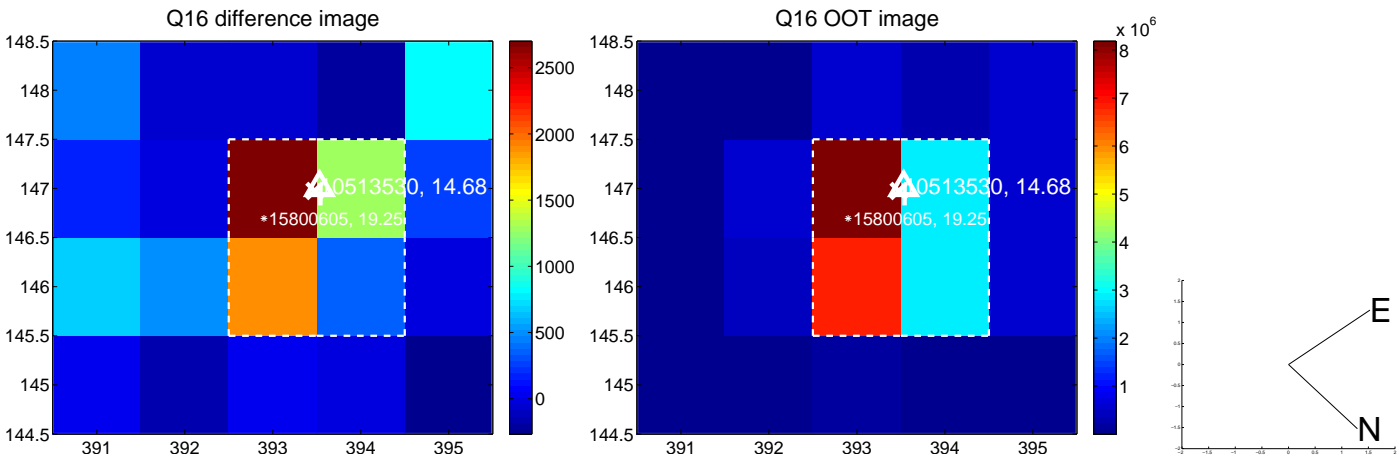
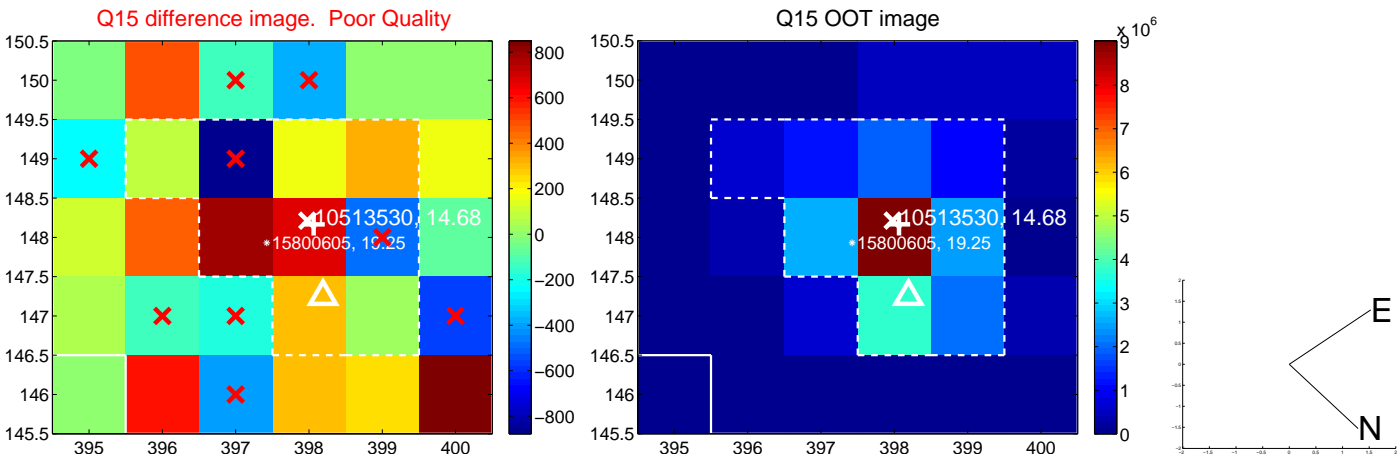
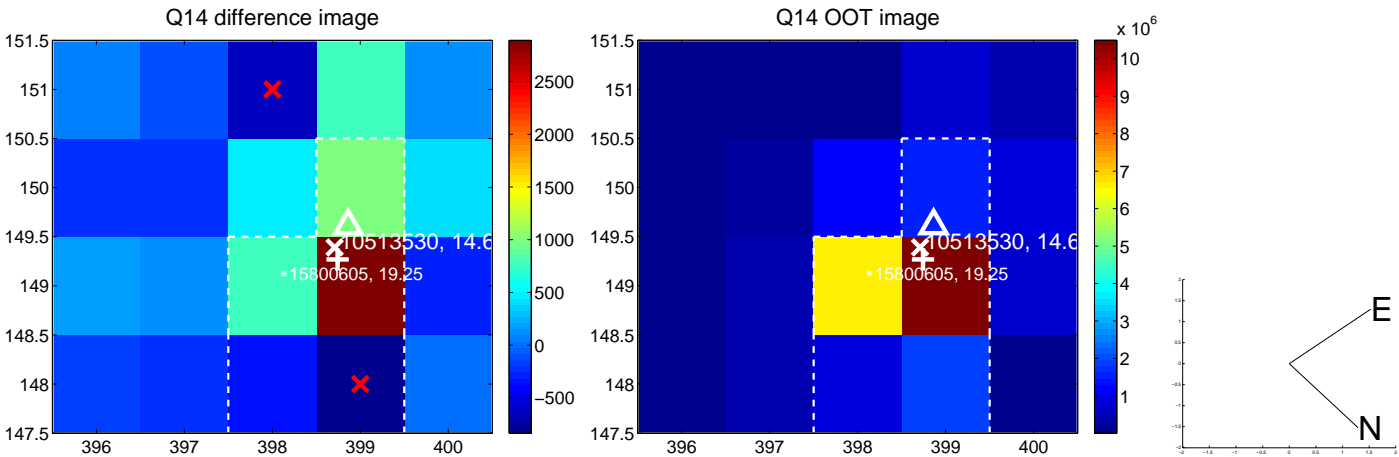
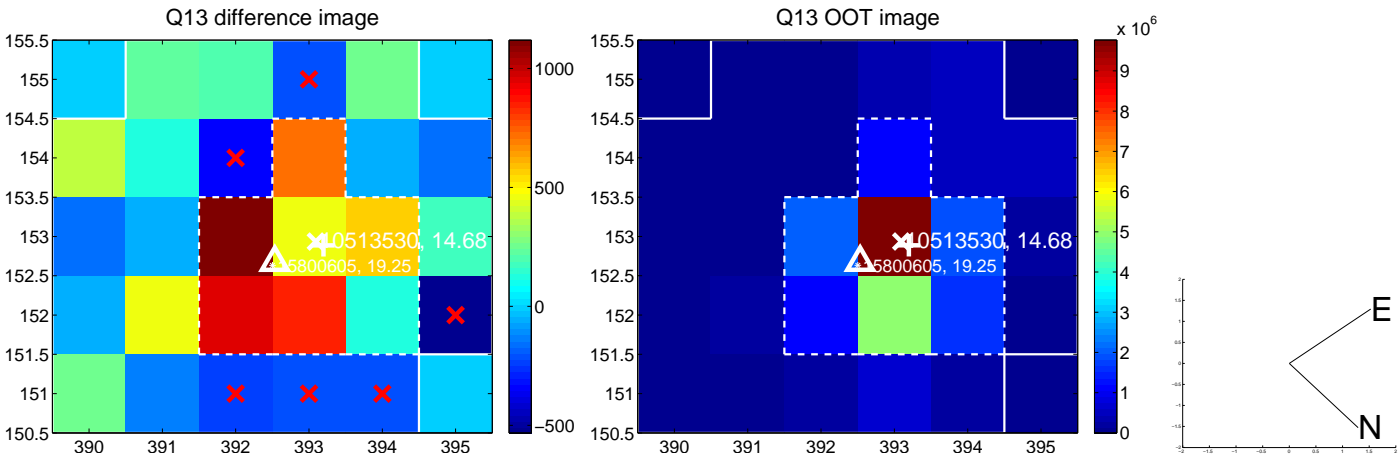
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



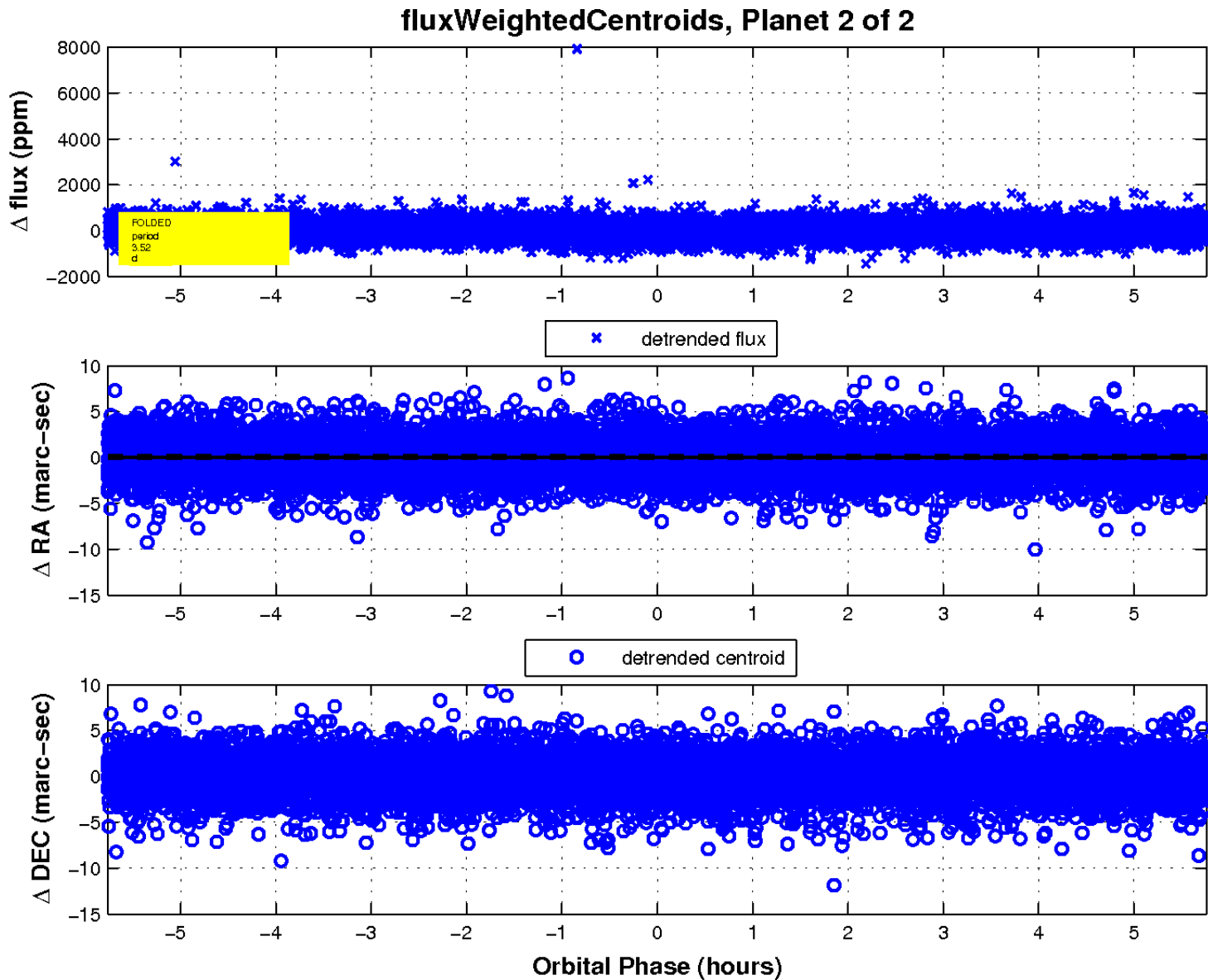
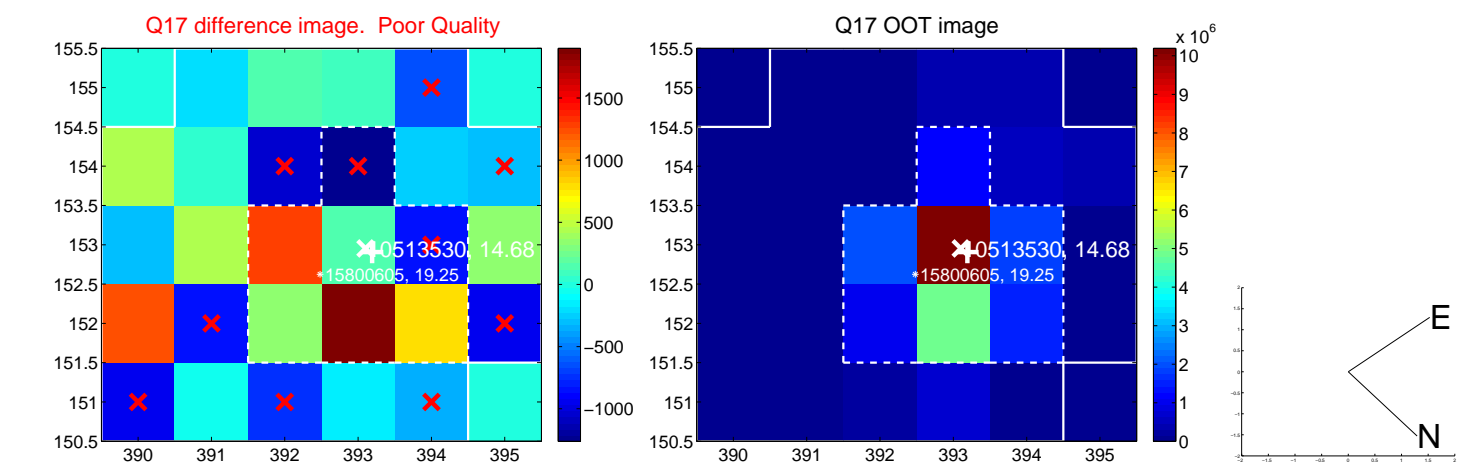
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

