

# KIC 007515212

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
007515212-01	OBS	0679.01	31.804807	158.448239	347.4	8.620	45.1	49.7	1.36	5867	2.90	46.00
007515212-02	OBS	0679.02	16.258137	139.638931	51.4	6.300	9.1	9.3	1.36	5867	1.15	112.54

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
007515212-01	OBS	PC	0.99	0	0	0	0	NO_COMMENT
007515212-02	OBS	PC	0.77	0	0	0	0	NO_COMMENT

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

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

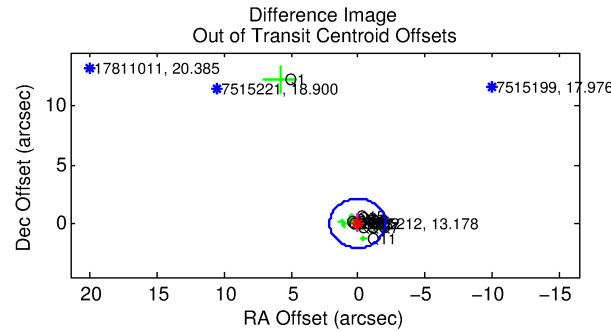
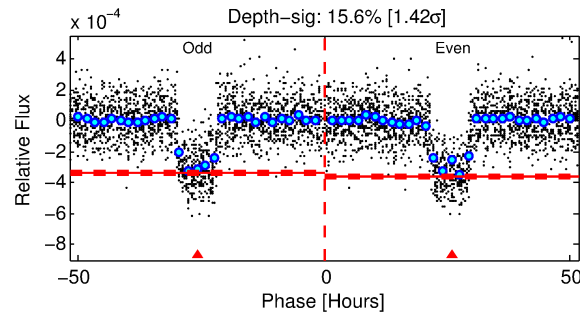
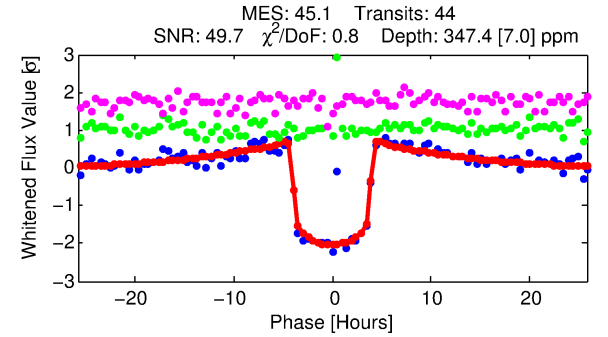
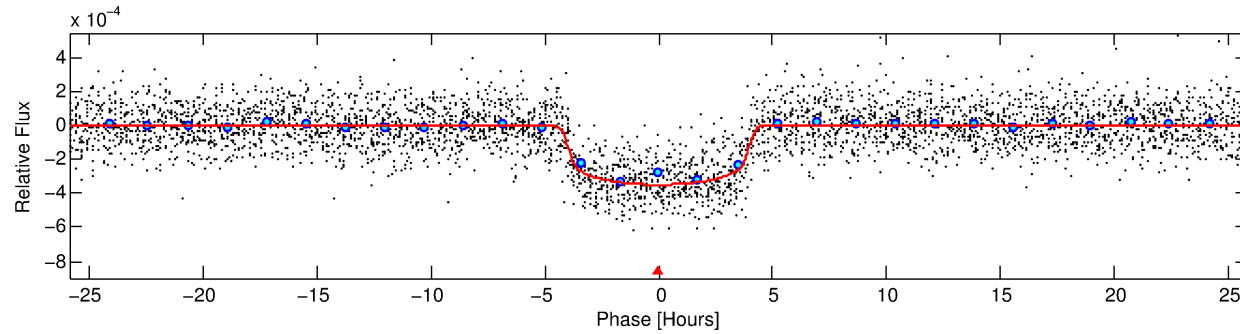
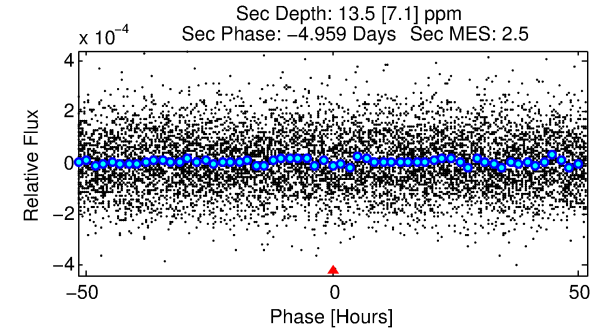
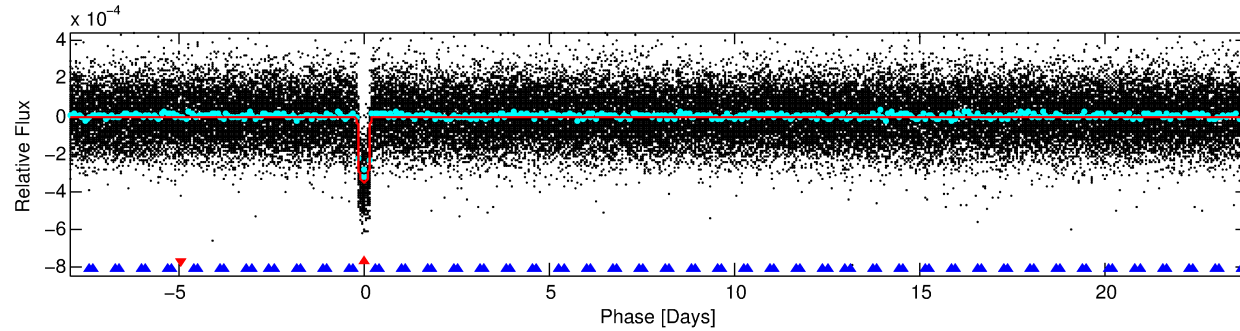
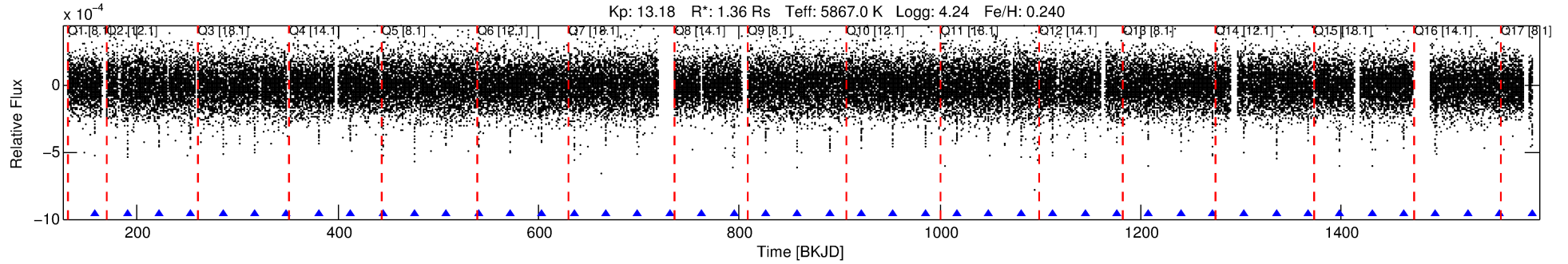
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 007515212-01

No Significant Match Found

# DV One-Page Summary

KIC: 7515212 Candidate: 1 of 2 Period: 31.805 d  
KOI: K00679.01 Name: Kepler-212c Corr: 0.977



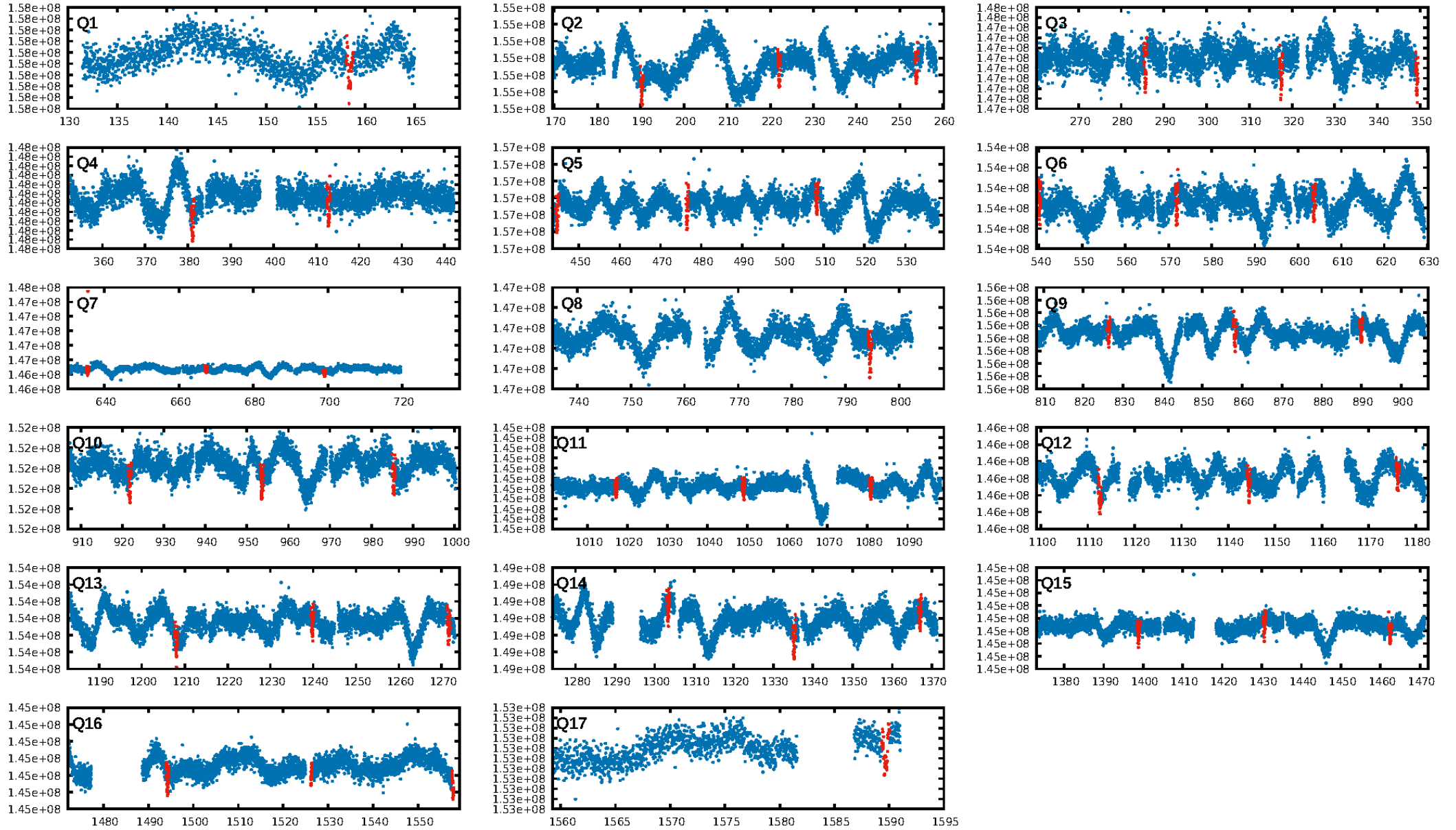
## DV Fit Results:

Period = 31.80481 [0.00010] d  
Epoch = 158.4482 [0.0026] BKJD  
Rp/R\* = 0.0196 [0.0008]  
a/R\* = 15.54 [2.67]  
b = 0.86 [0.05]  
Seff = 46.00 [12.34]  
Teq = 664 [45] K  
Rp = 2.90 [0.57] Re  
a = 0.2060 [0.0346] AU  
Ag = 37.28 [22.03] [1.65σ]  
Teffp = 2537 [343] K [5.42σ]

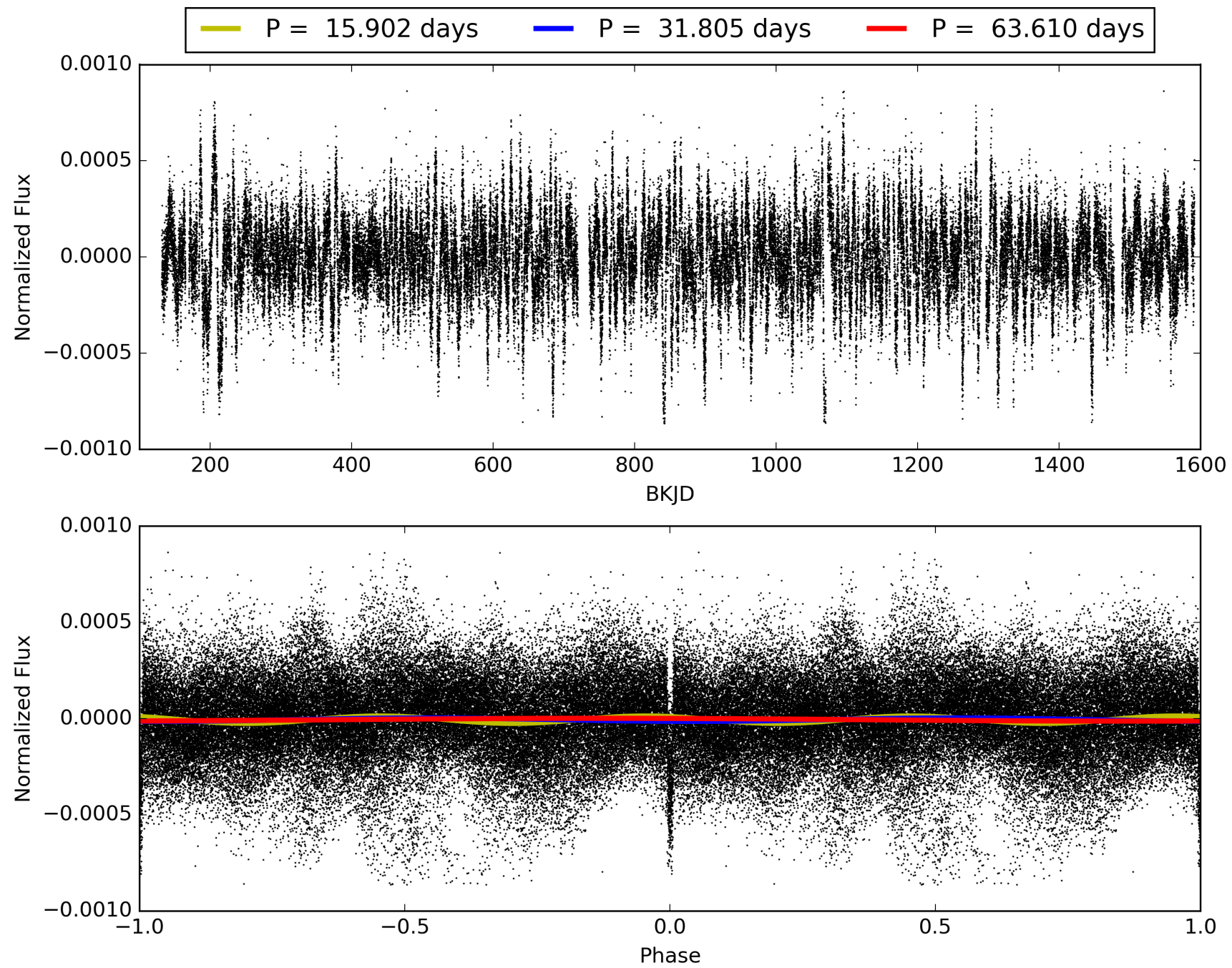
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [34.95σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 0.7%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [42/42]  
GhostDiagnostic-chr: 12.21  
Centroid-sig: 43.9%  
Centroid-so: 0.188 arcsec [1.02σ]  
OotOffset-rm: 0.076 arcsec [0.11σ]  
KicOffset-rm: 0.145 arcsec [0.22σ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 0.94 [16/17]  
DiffImageOverlap-fno: 1.00 [17/17]

# TCE 007515212-01, PDC Light Curves

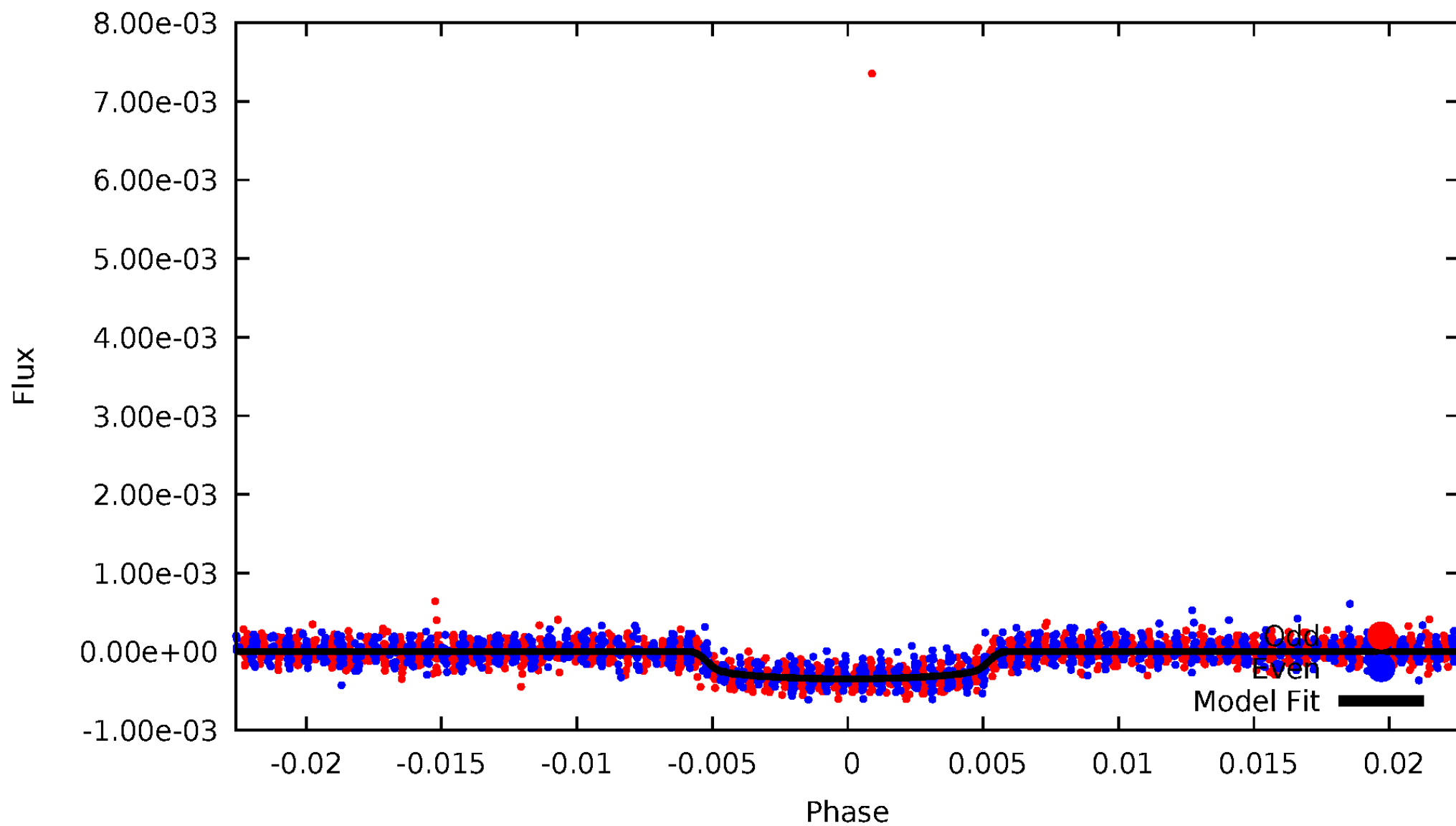


# TCE 007515212-01



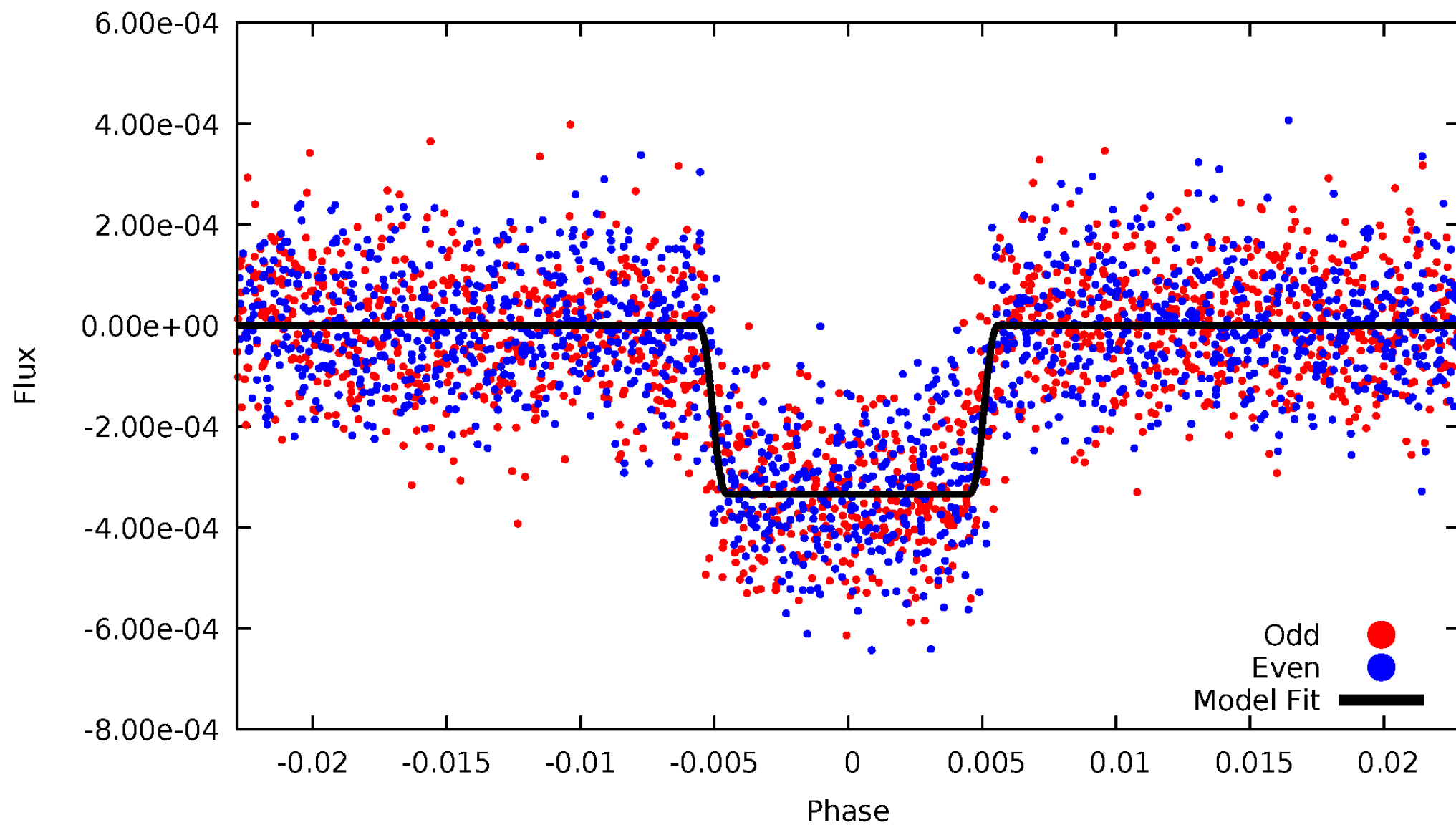
# DV Odd/Even

TCE 007515212-01



# ALT Odd/Even

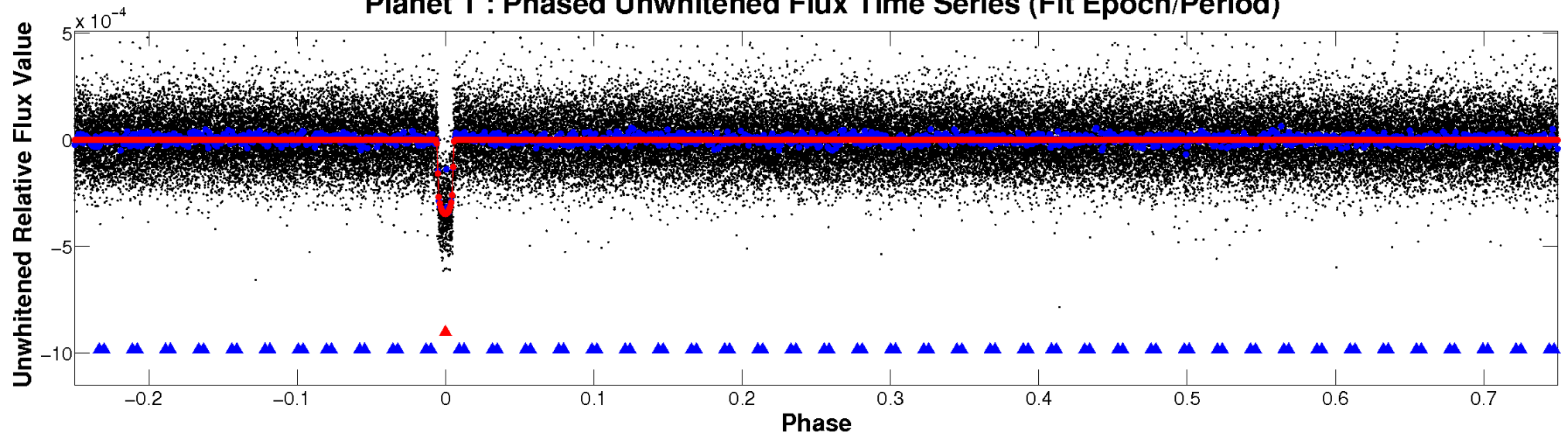
TCE 007515212-01



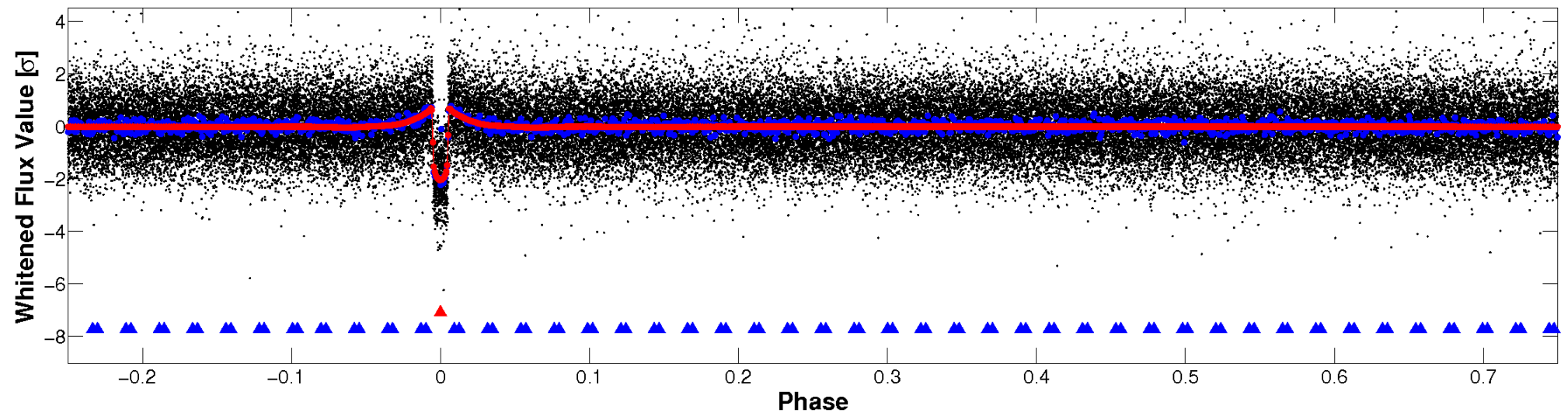


# Non-Whitened Vs. Whitened Light Curve

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

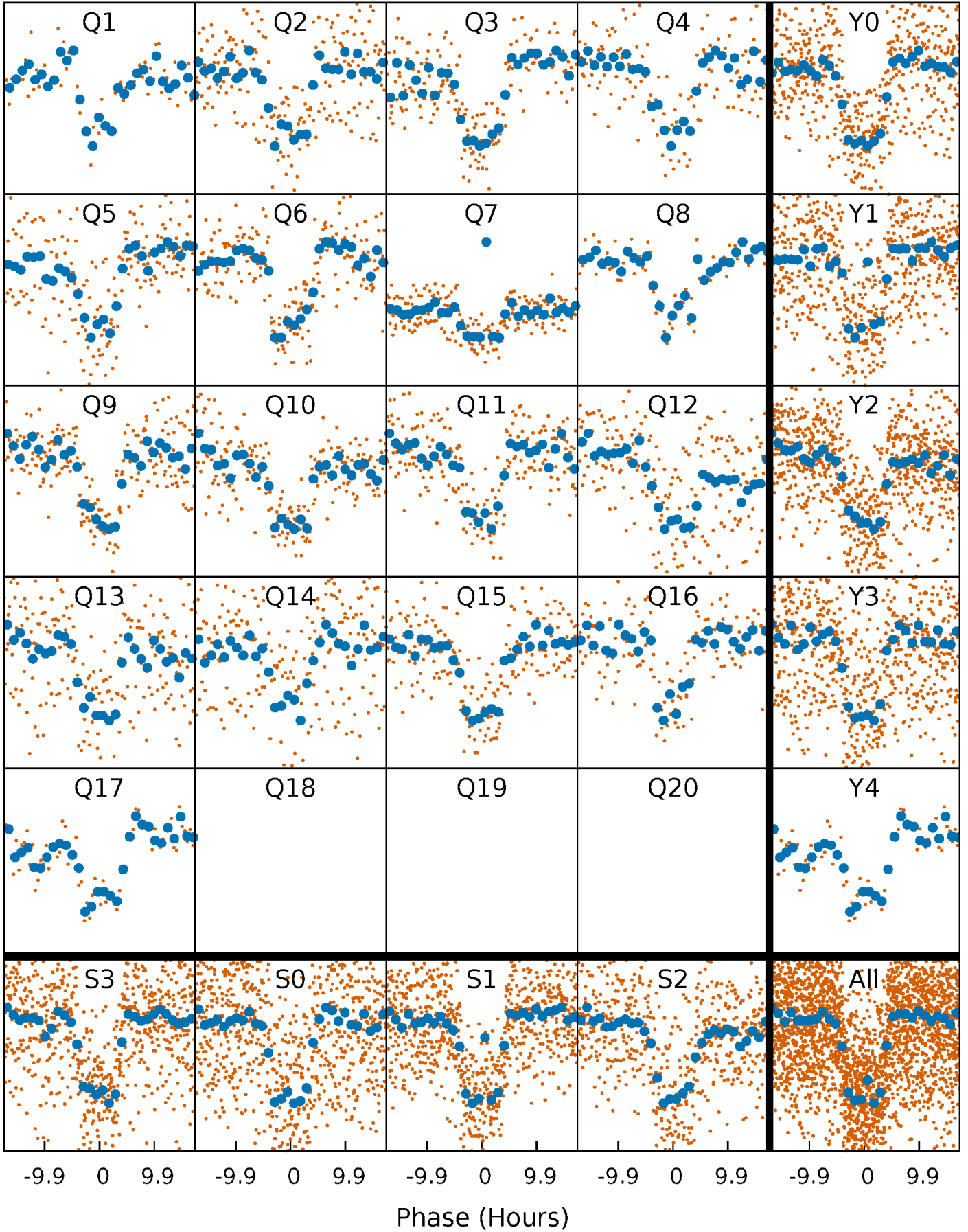


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

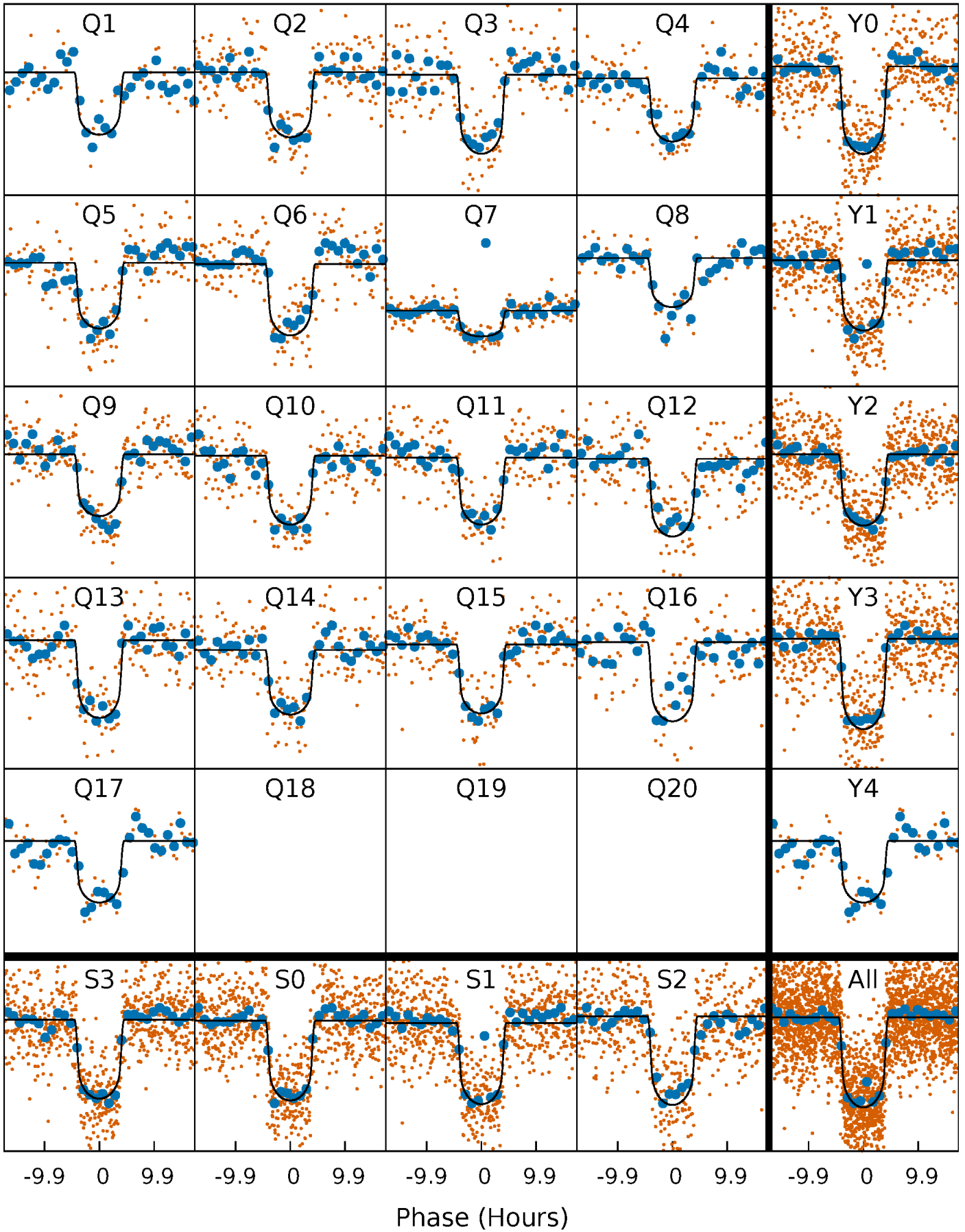
TCE 007515212-01 P= 31.804807 Days  $T_0=158.448239$  (BKJD)





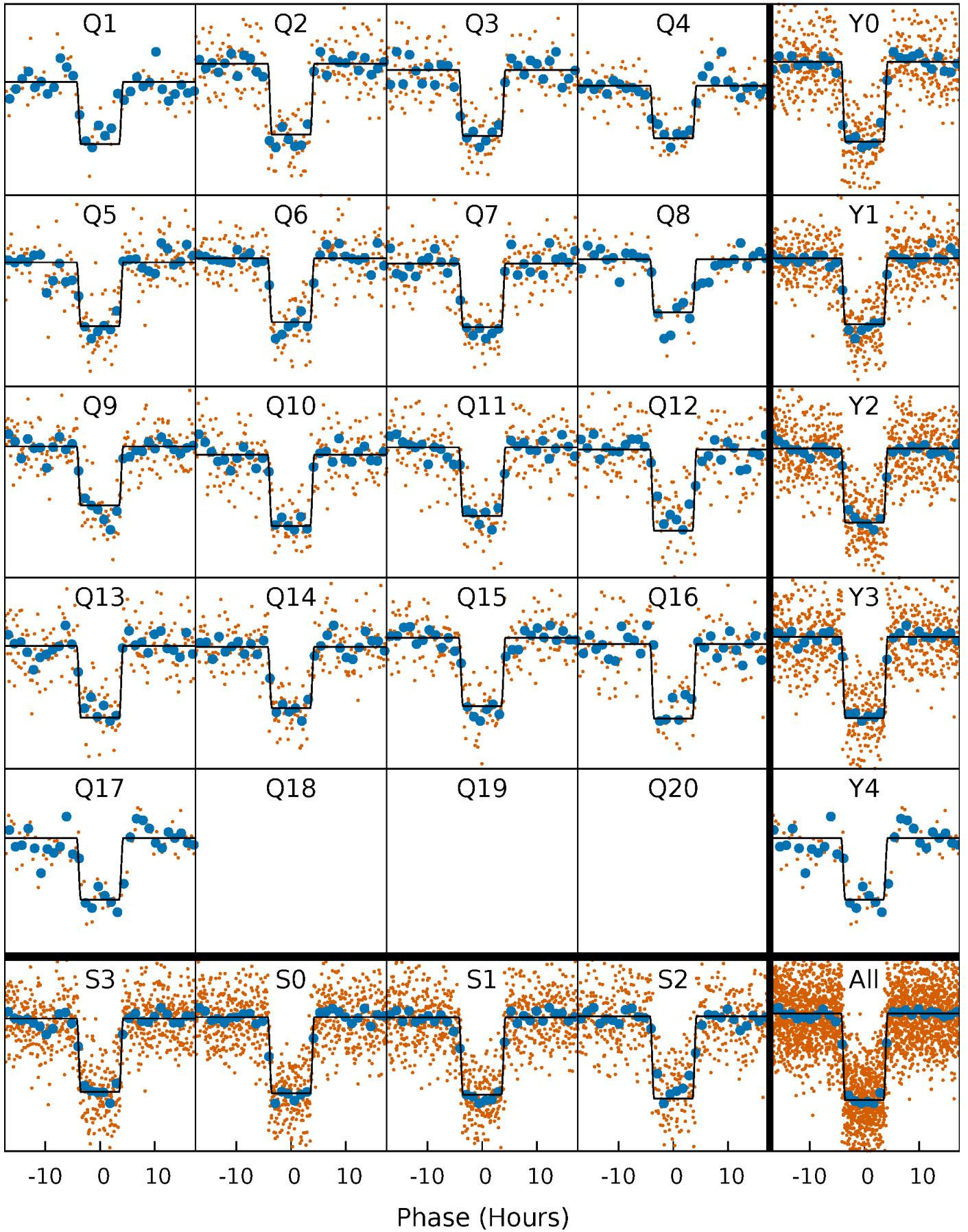
# DV Quarter-Phased Transit Curves

TCE 007515212-01 P= 31.804807 Days  $T_0=158.448239$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

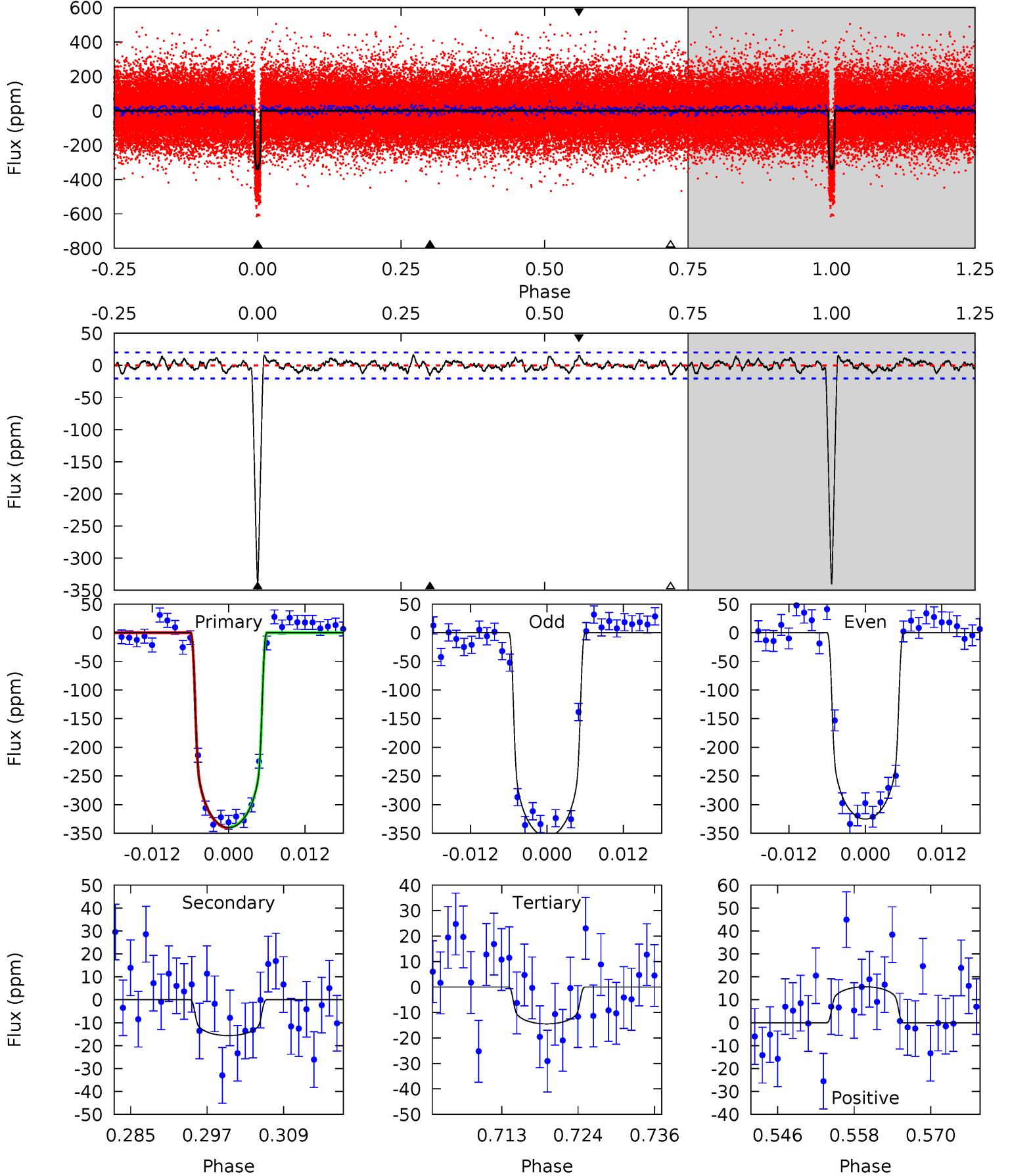
TCE 007515212-01 P= 31.804213 Days  $T_0=158.462580$  (BKJD)



# DV Model-Shift Uniqueness Test

007515212-01,  $P = 31.804807$  Days,  $E = 126.643432$  Days

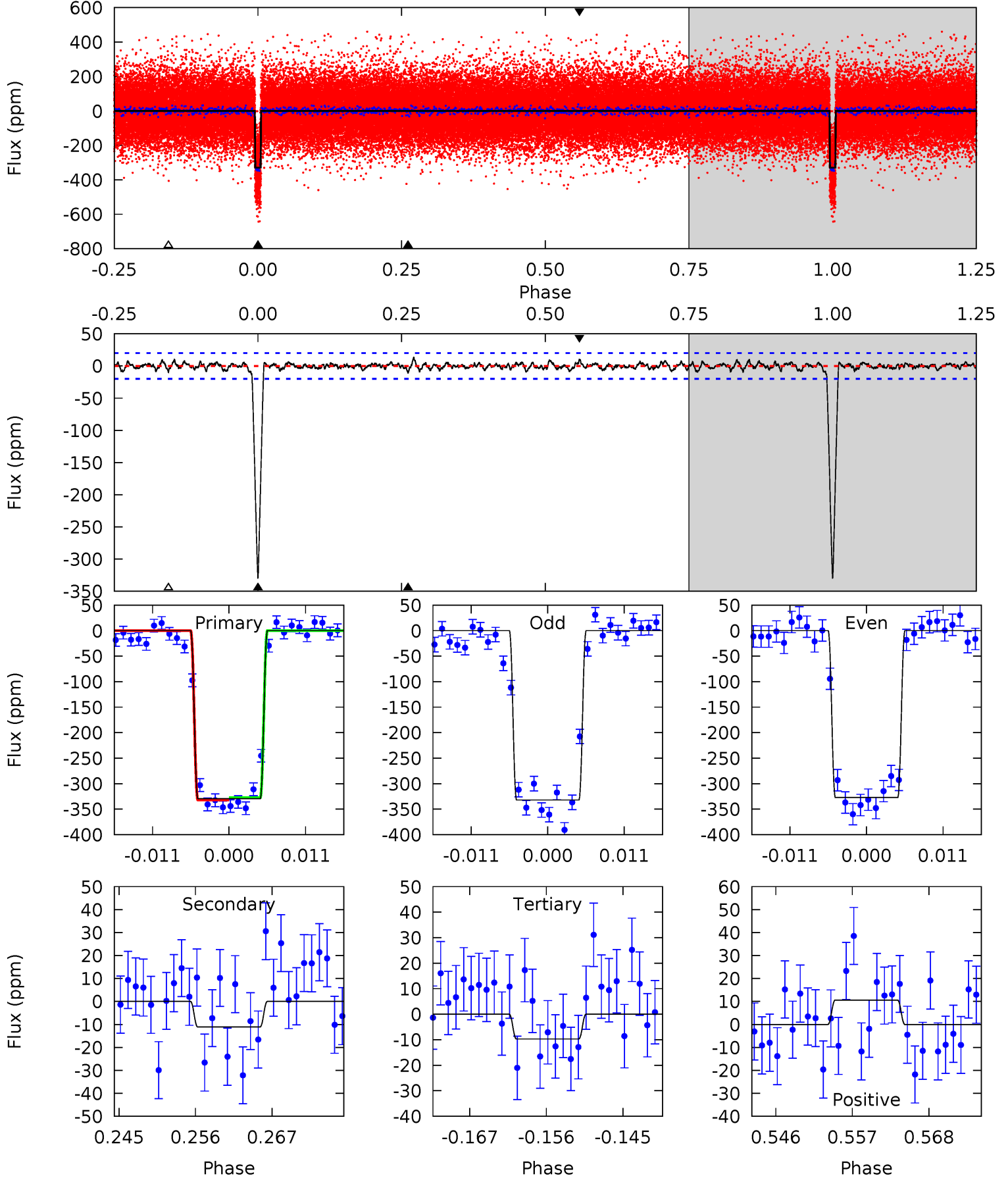
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
84.1	3.86	3.58	3.87	4.99	2.52	1.38	80.5	80.2	0.29	-0.00	3.75	0.94	0.05	0.16



# Alt Model-Shift Uniqueness Test

007515212-01,  $P = 31.804213$  Days,  $E = 126.658367$  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
82.3	2.78	2.42	2.65	5.01	2.54	0.86	79.9	79.6	0.36	0.13	0.60	1.01	0.04	0.53



### Stellar Parameters For KIC 007515212

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5867^{+104}_{-128}$	$4.235^{+0.143}_{-0.117}$	$0.240^{+0.150}_{-0.150}$	$1.356^{+0.212}_{-0.259}$	$1.153^{+0.081}_{-0.111}$	$0.651^{+0.448}_{-0.228}$
	+2%/-2%	+3%/-3%	+62%/-62%	+16%/-19%	+7%/-10%	+69%/-35%
Source	SPE59	SPE59	SPE59	DSEP		

KIC = Kepler Input Catalog; PHO = Photometry; SPE = Spectroscopy; AST = Asteroseismology  
 TRA = Transits; DESP = Dartmouth Models; MULT = Multiple Models

### Secondary Eclipse Parameters for KIC 007515212-01 / KOI 0679.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-16 \pm 4$	$2.91^{+0.29}_{-0.31}$	$926^{+45}_{-48}$	$3209^{+124}_{-151}$	$43^{+15}_{-13}$
Alt.	$-11 \pm 4$	$2.70^{+0.27}_{-0.28}$	$929^{+44}_{-47}$	$3125^{+160}_{-200}$	$35^{+18}_{-14}$

$T_{max}$  = Theoretical Maximum Planetary Temperature

$T_{obs}$  = Observed Planetary Temperature (Assuming  $A=0.3$ )

$A_{obs}$  = Observed Albedo (Assuming  $T=0$ )

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



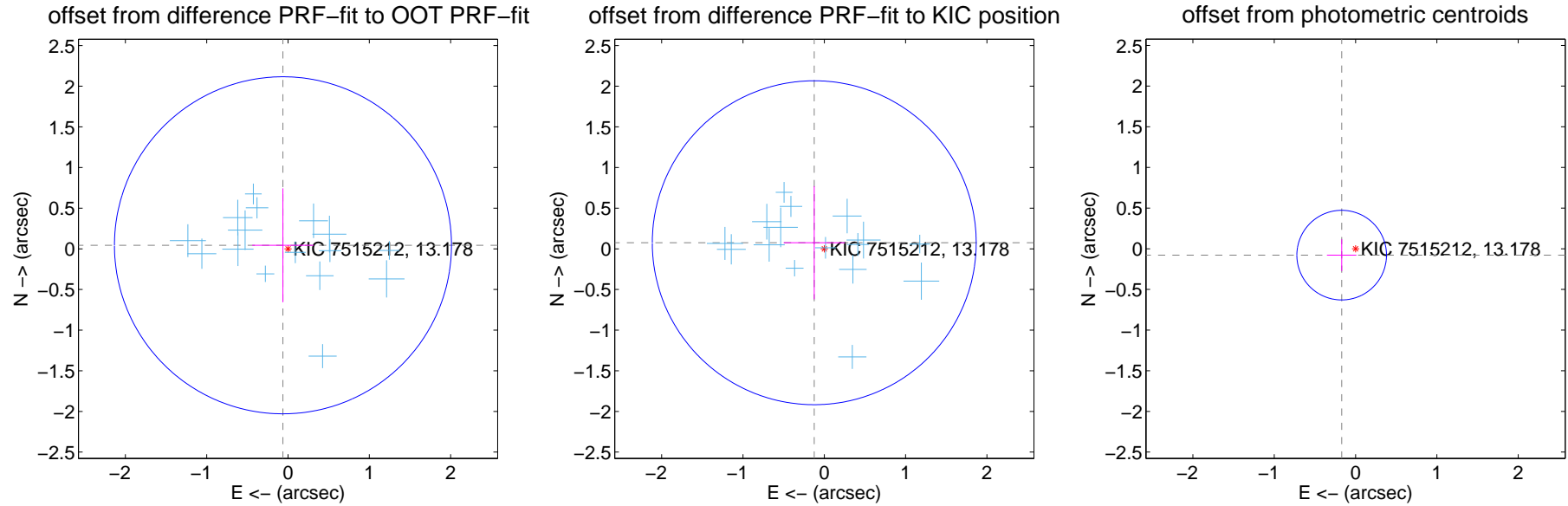
## DV Centroid Data

Supplemental centroid analysis for 007515212-01. Kepler magnitude: 13.18. Transit SNR 49.71

There are 16 quarters with good PRF difference image offsets

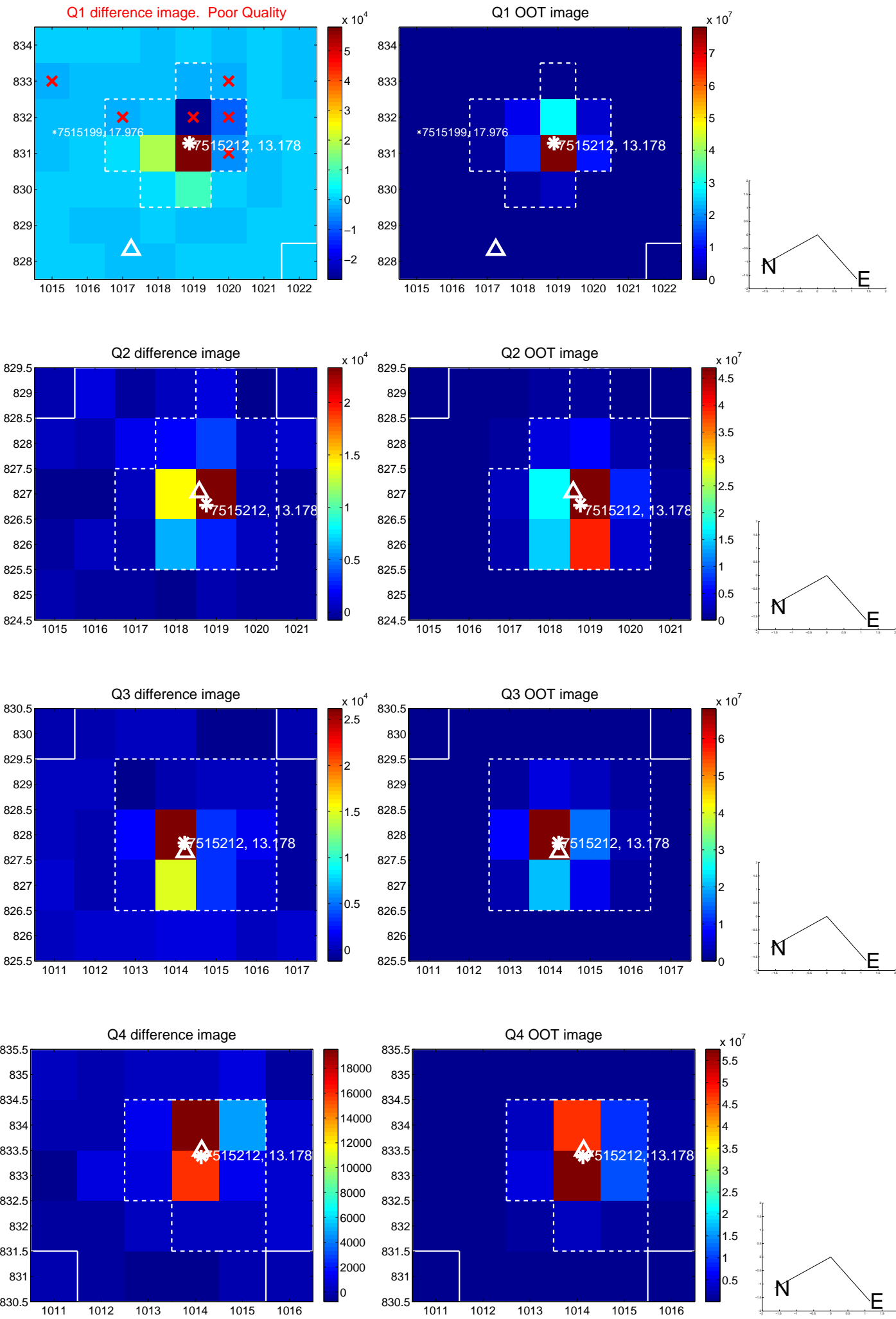
The direct PRF centroid is offset from the target star catalog position by about 0.10 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.076 \pm 0.691$	0.11	$0.062 \pm 0.377$	$0.043 \pm 0.700$
PRF-fit source offset from KIC position	$0.145 \pm 0.664$	0.22	$0.124 \pm 0.377$	$0.075 \pm 0.695$
photometric centroid source offset	$0.19 \pm 0.18$	1.02	$0.17 \pm 0.18$	$-0.08 \pm 0.19$

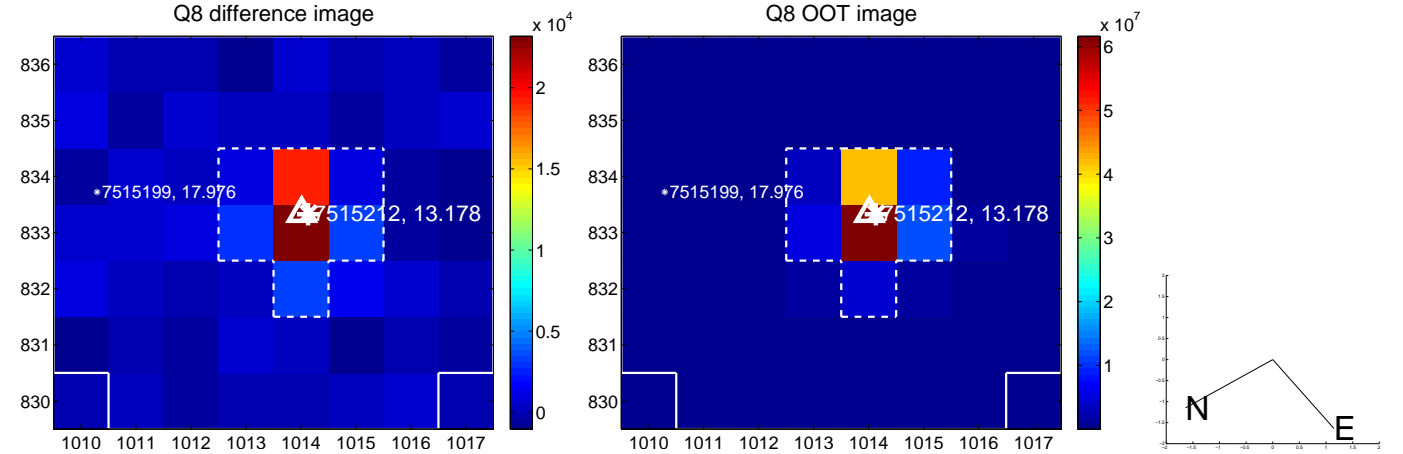
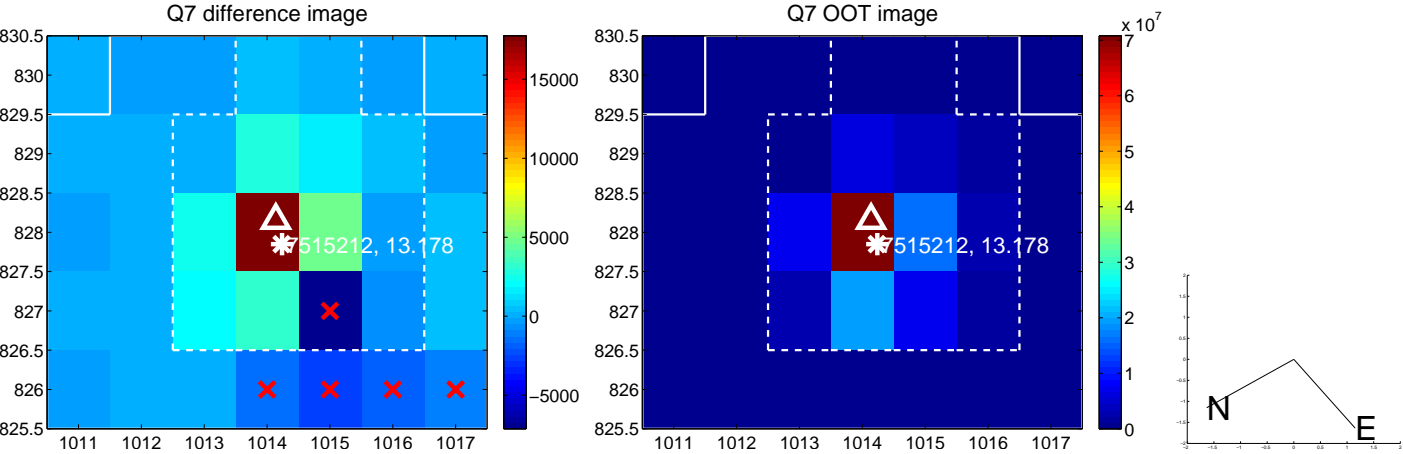
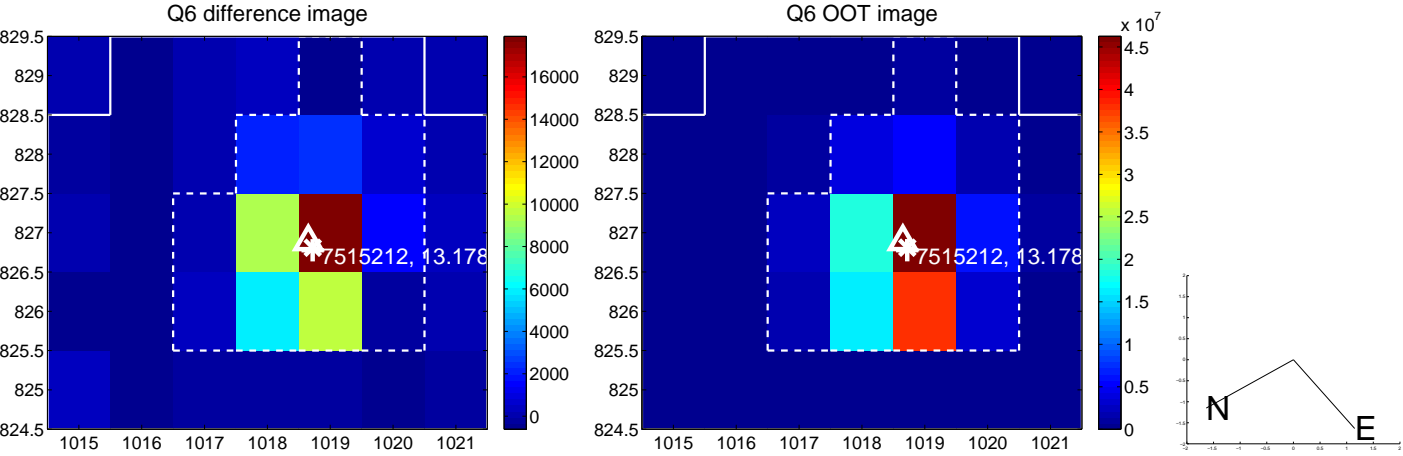
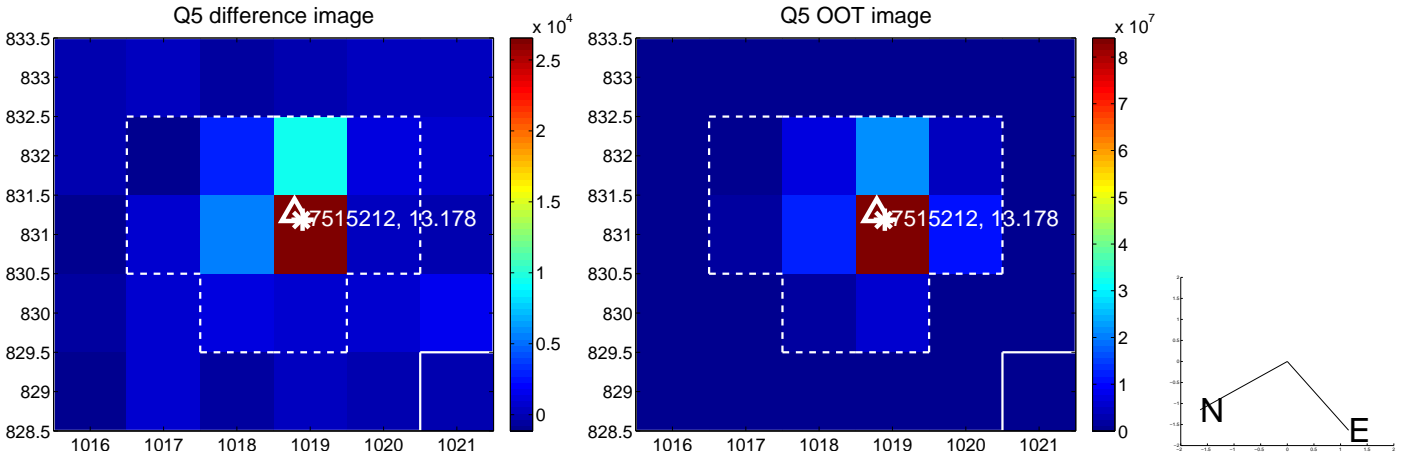


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

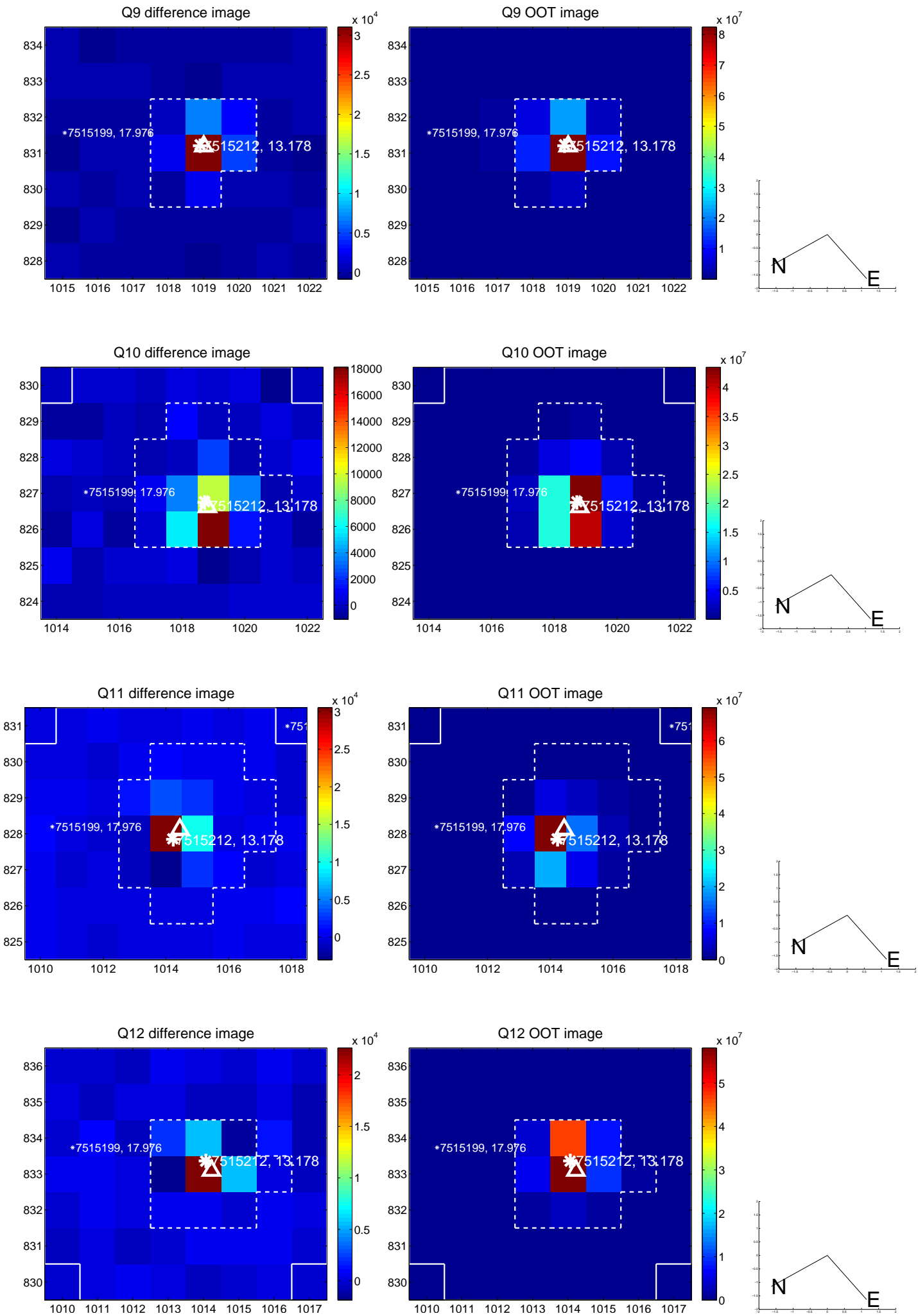
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



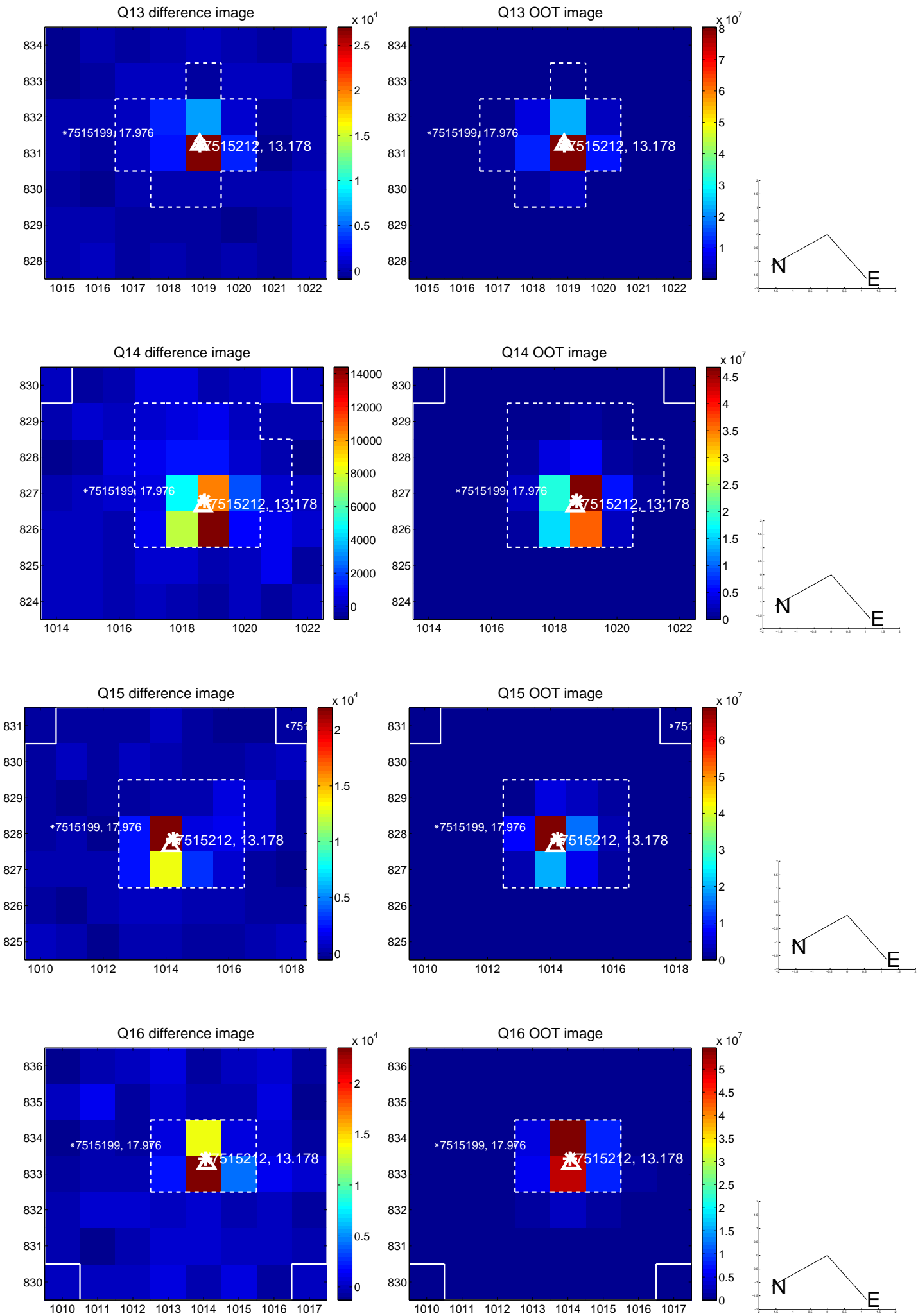
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

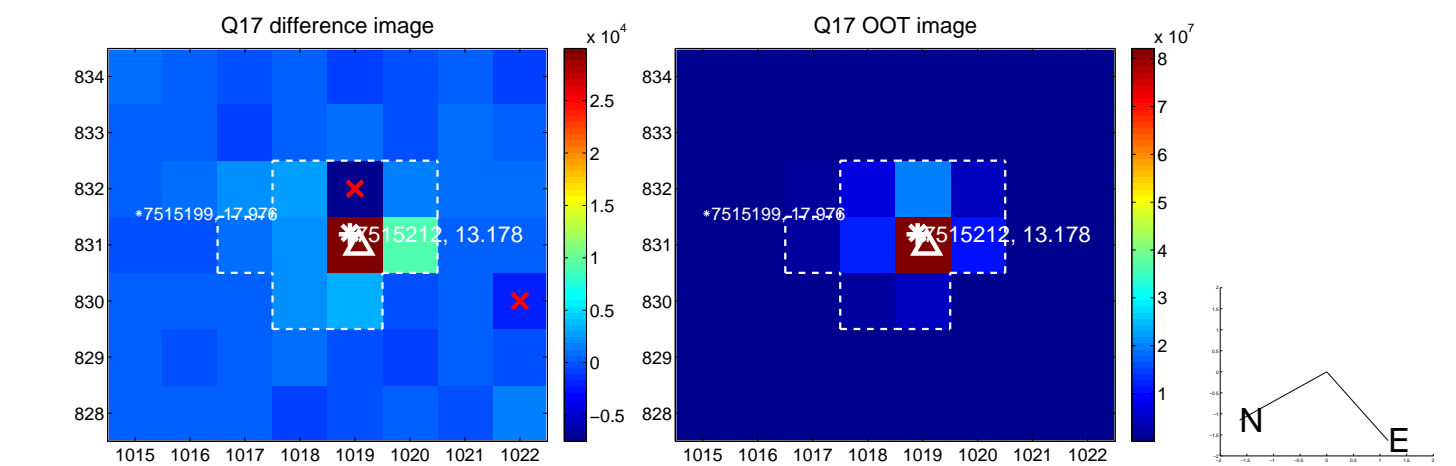


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

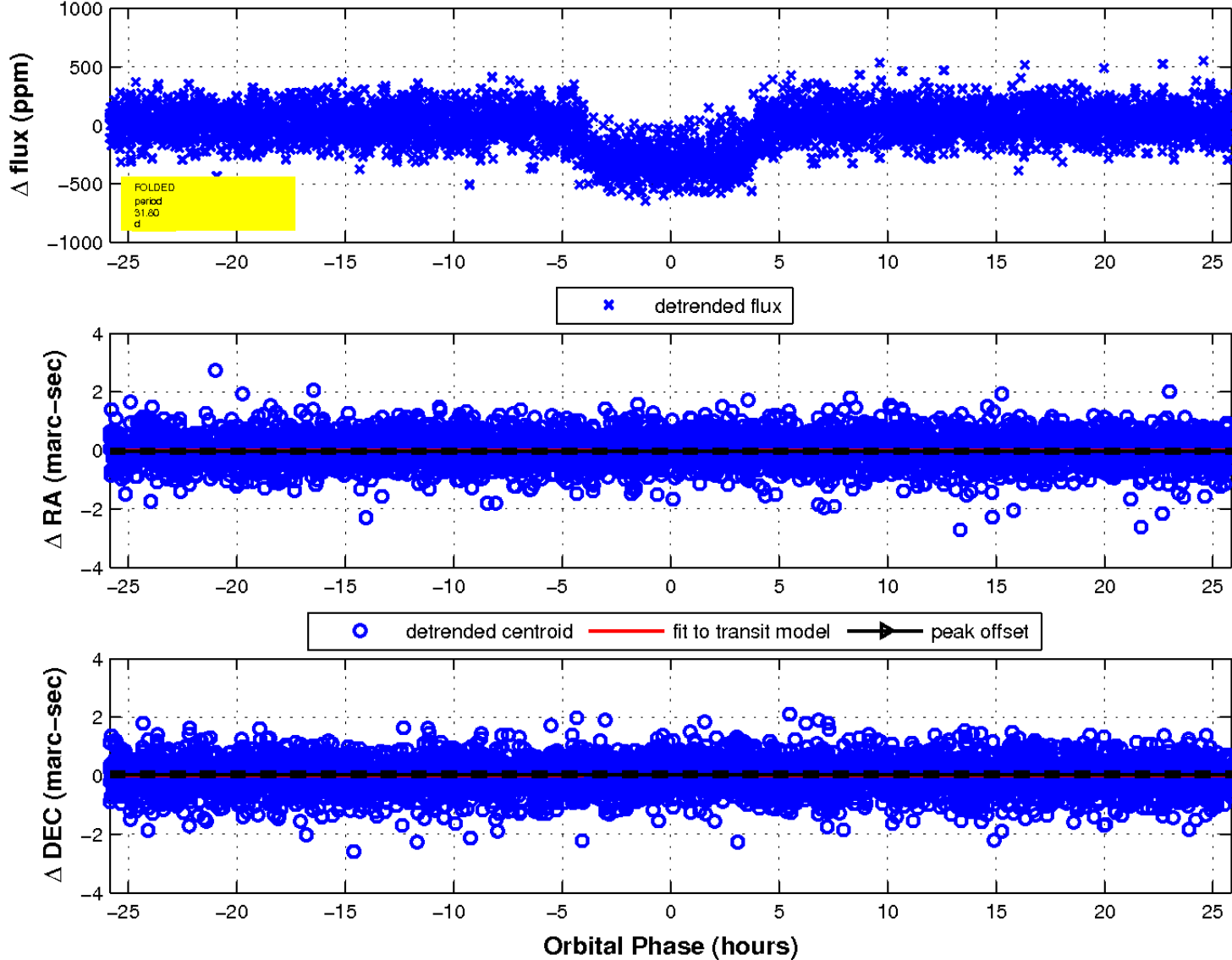




white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

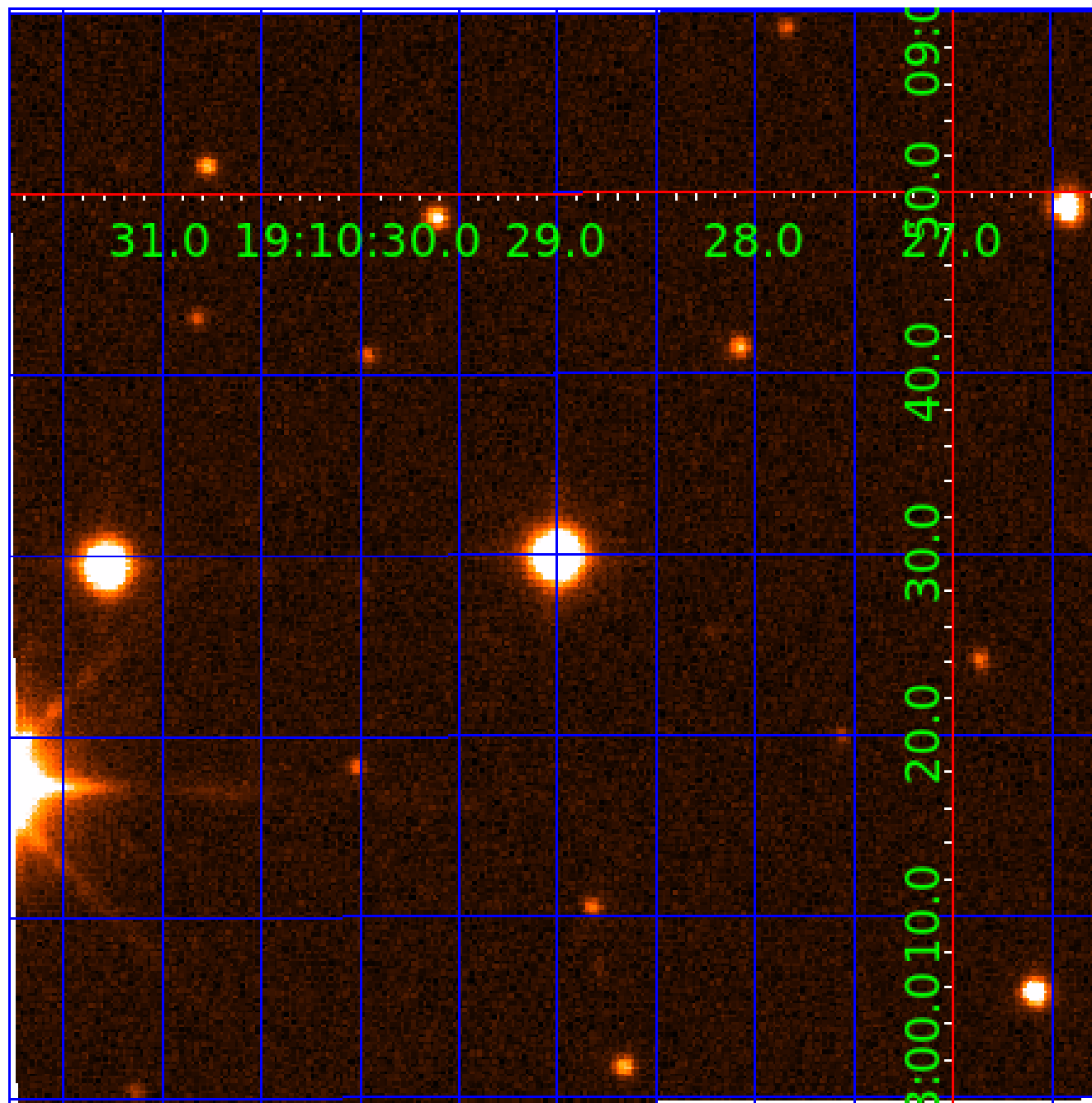


fluxWeightedCentroids, Planet 1 of 2



UKIRT Image

Declination



# KIC 007515212

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
007515212-01	OBS	0679.01	31.804807	158.448239	347.4	8.620	45.1	49.7	1.36	5867	2.90	46.00
007515212-02	OBS	0679.02	16.258137	139.638931	51.4	6.300	9.1	9.3	1.36	5867	1.15	112.54

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
007515212-01	OBS	PC	0.99	0	0	0	0	NO_COMMENT
007515212-02	OBS	PC	0.77	0	0	0	0	NO_COMMENT

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

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

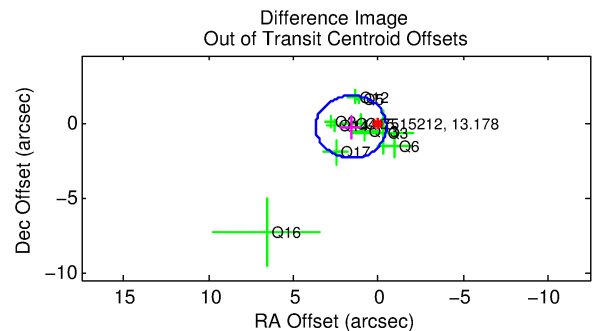
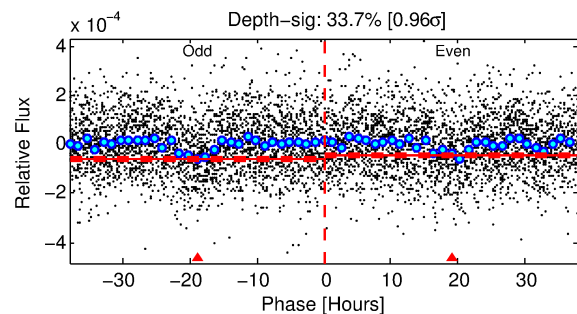
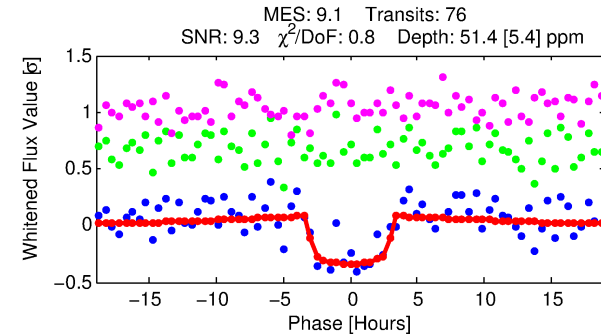
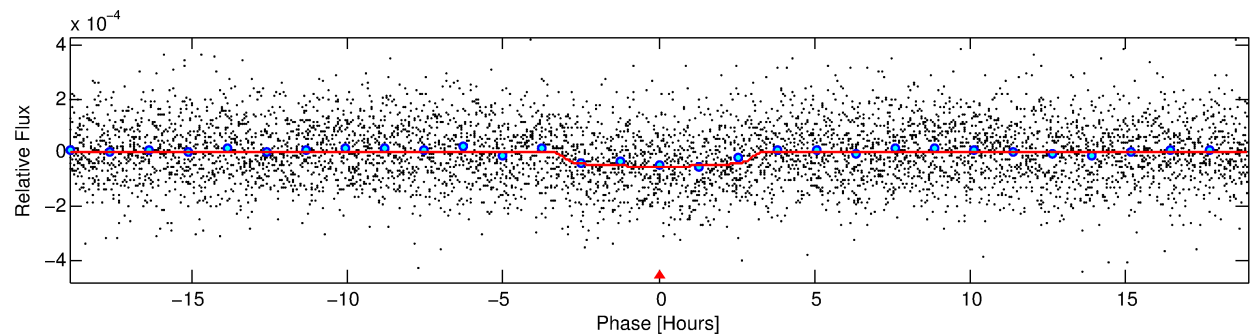
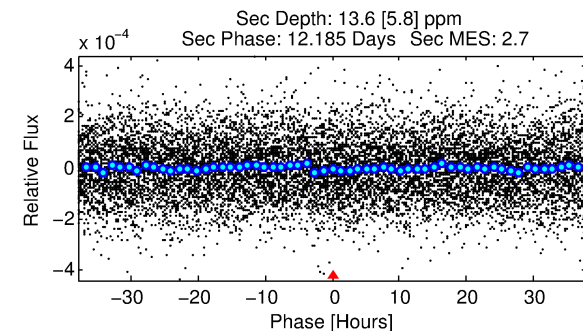
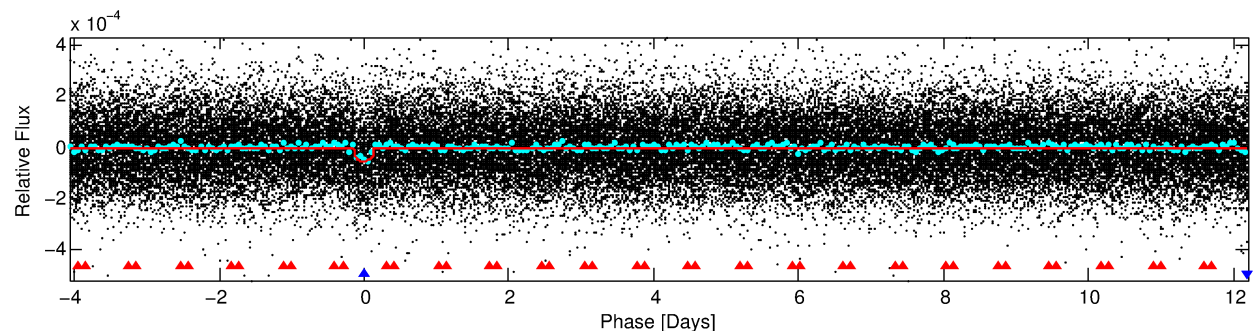
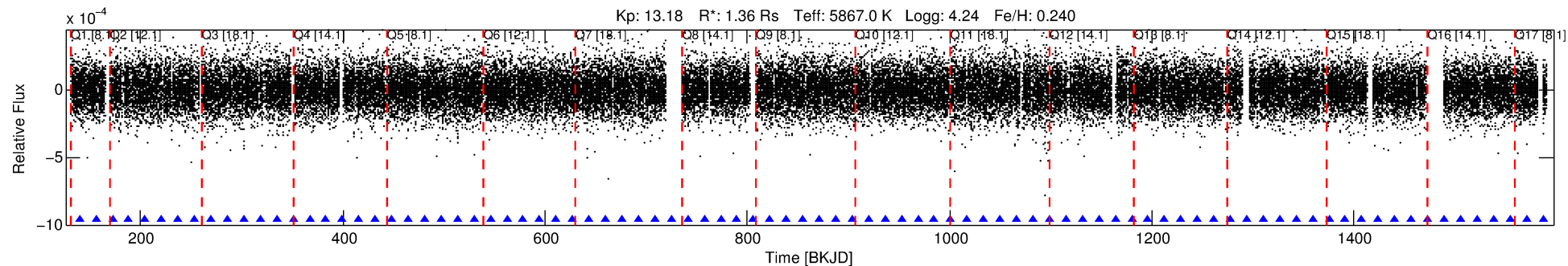
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 007515212-02

No Significant Match Found

# DV One-Page Summary

KIC: 7515212 Candidate: 2 of 2 Period: 16.258 d  
KOI: K00679.02 Name: Kepler-212b Corr: 0.949



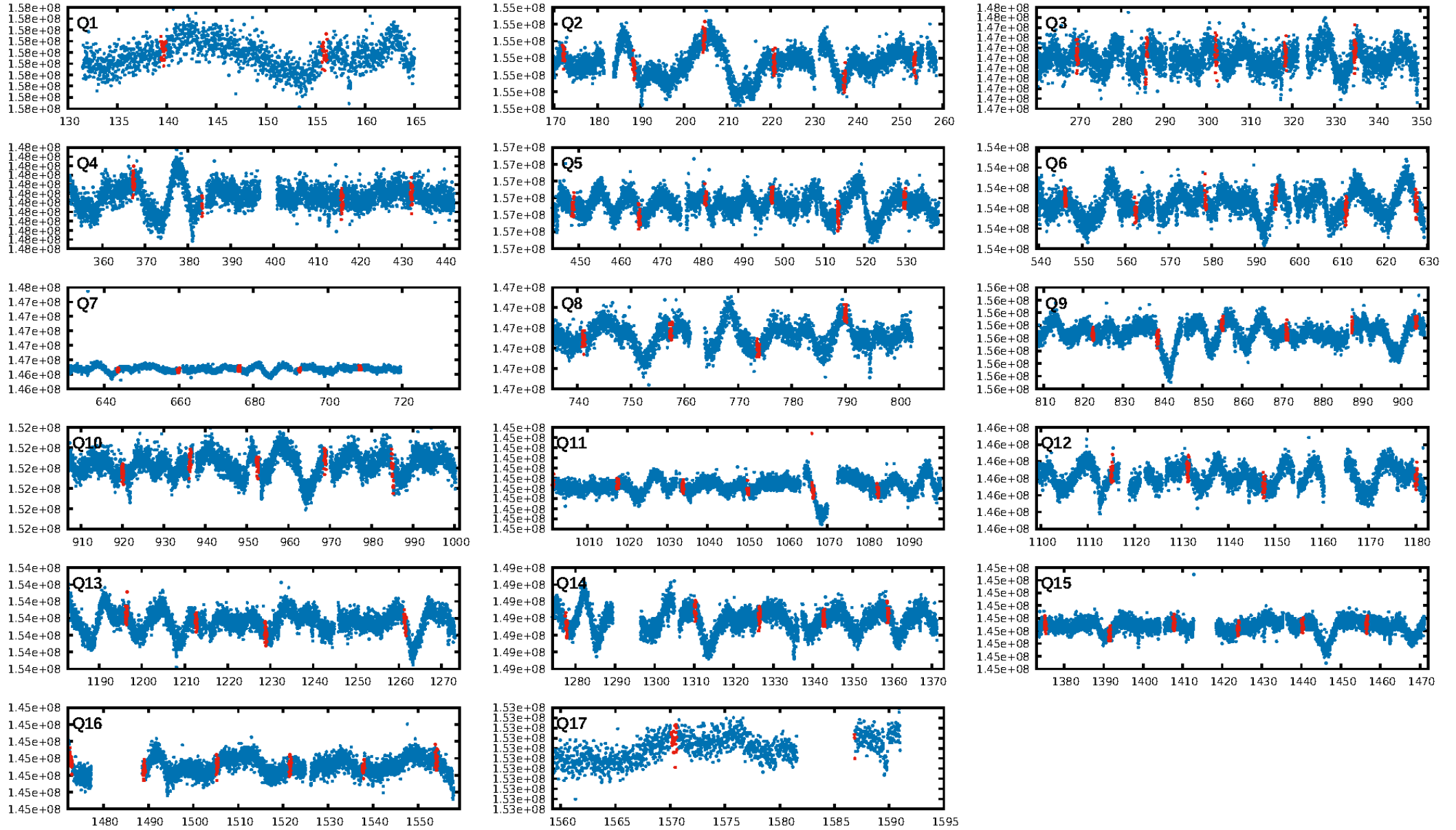
## DV Fit Results:

Period = 16.25814 [0.00020] d  
Epoch = 139.6389 [0.0103] BKJD  
Rp/R\* = 0.0078 [0.0030]  
a/R\* = 9.19 [16.73]  
b = 0.89 [0.42]  
Seff = 112.54 [30.20]  
Teff = 831 [56] K  
Rp = 1.15 [0.49] Re  
a = 0.1317 [0.0221] AU  
Ag = 98.02 [89.72] [1.08σ]  
Teffp = 4040 [893] K [3.59σ]

## DV Diagnostic Results:

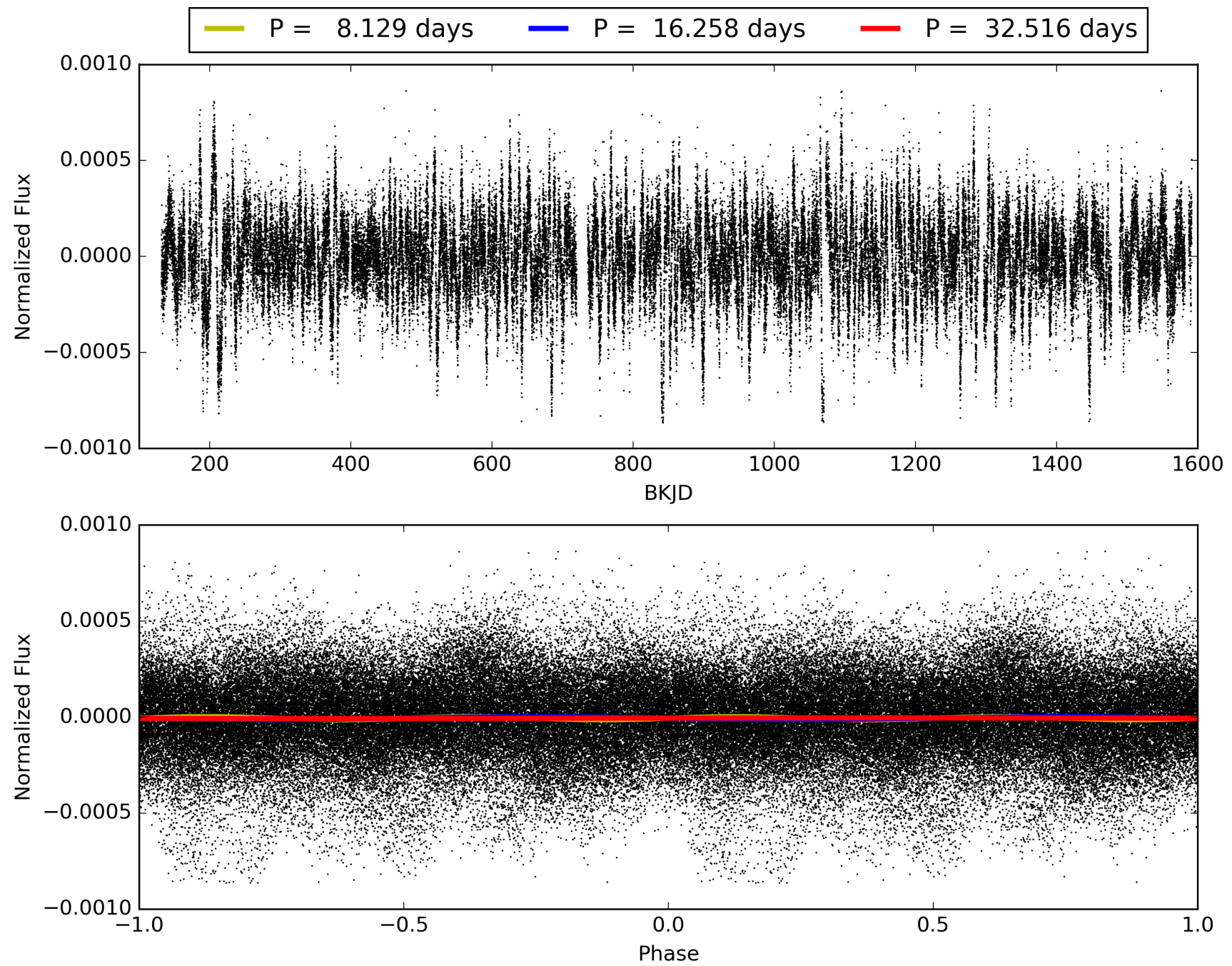
ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [34.95σ]  
ModelChiSquare2-sig: 99.7%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 1.72e-19  
RollingBand-fgt: 1.00 [73/73]  
GhostDiagnostic-chr: 2.107  
Centroid-sig: 31.2%  
Centroid-so: 0.961 arcsec [0.93σ]  
OotOffset-rm: 1.609 arcsec [2.31σ]  
KicOffset-rm: 1.689 arcsec [4.16σ]  
OotOffset-st: 3/2/3/3 [11]  
KicOffset-st: 3/2/3/3 [11]  
DiffImageQuality-fgm: 0.82 [9/11]  
DiffImageOverlap-fno: 1.00 [17/17]

# TCE 007515212-02, PDC Light Curves



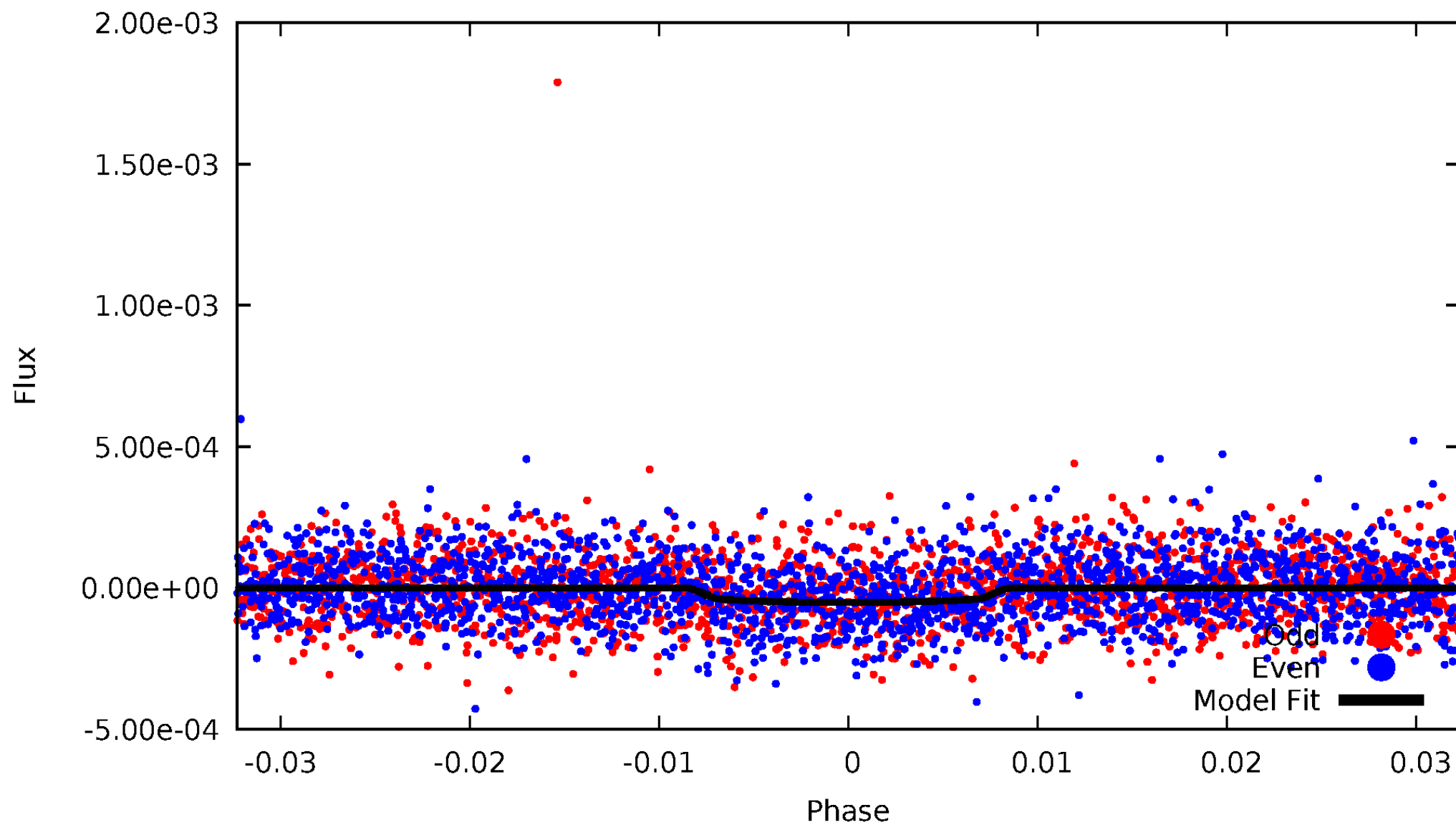


TCE 007515212-02



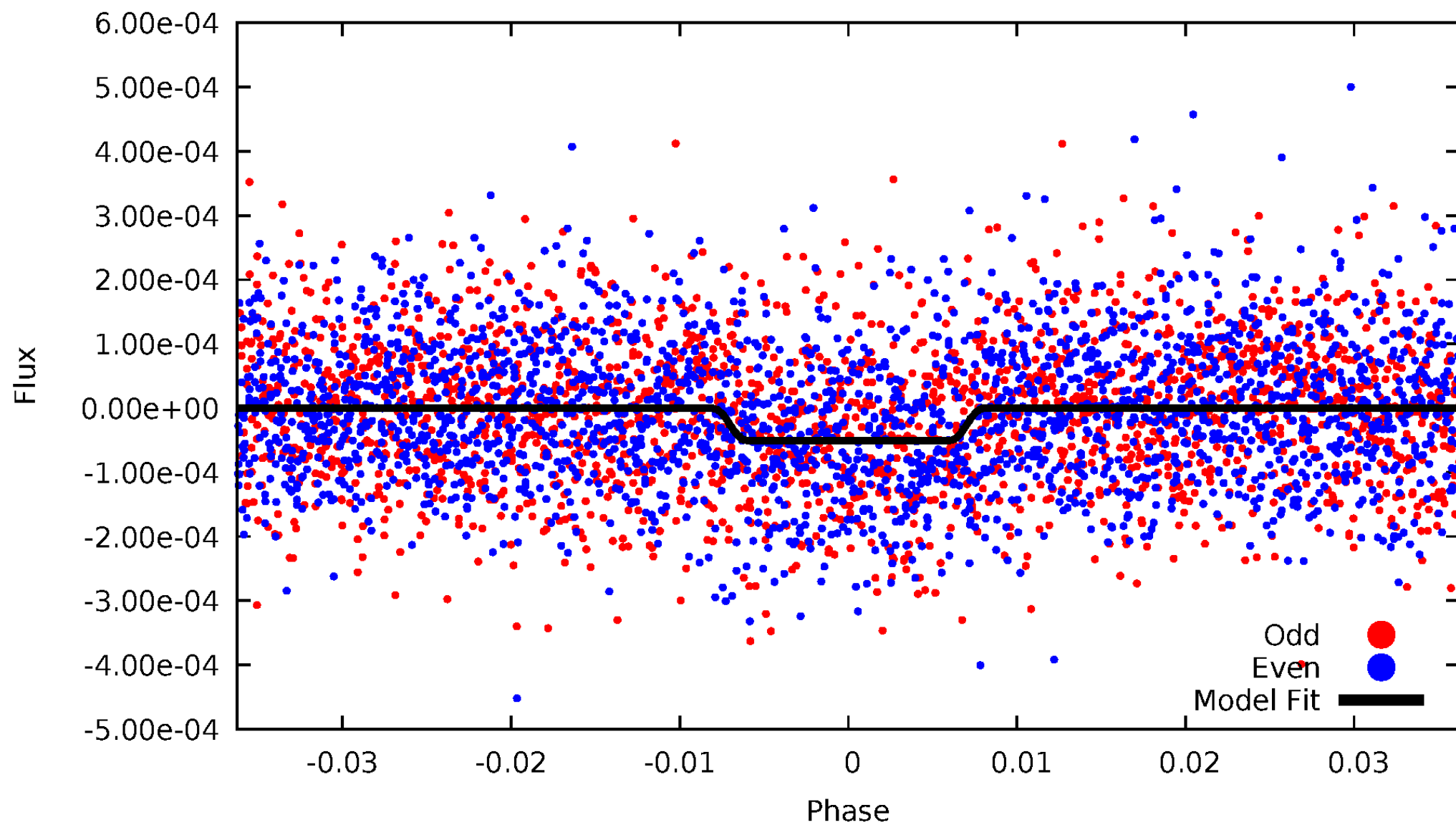
# DV Odd/Even

TCE 007515212-02



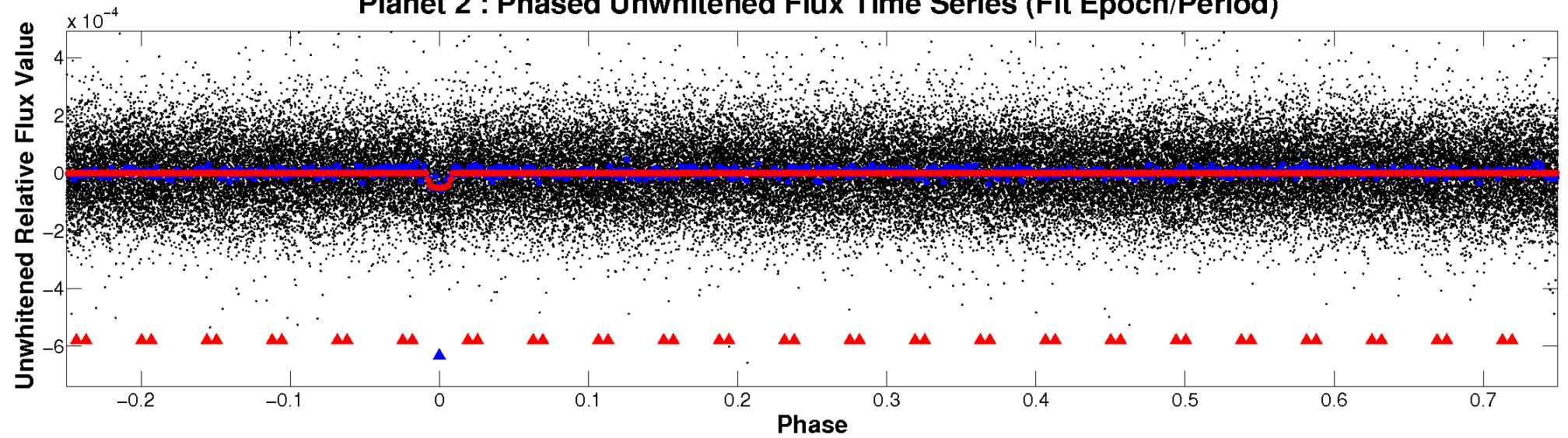
# ALT Odd/Even

TCE 007515212-02

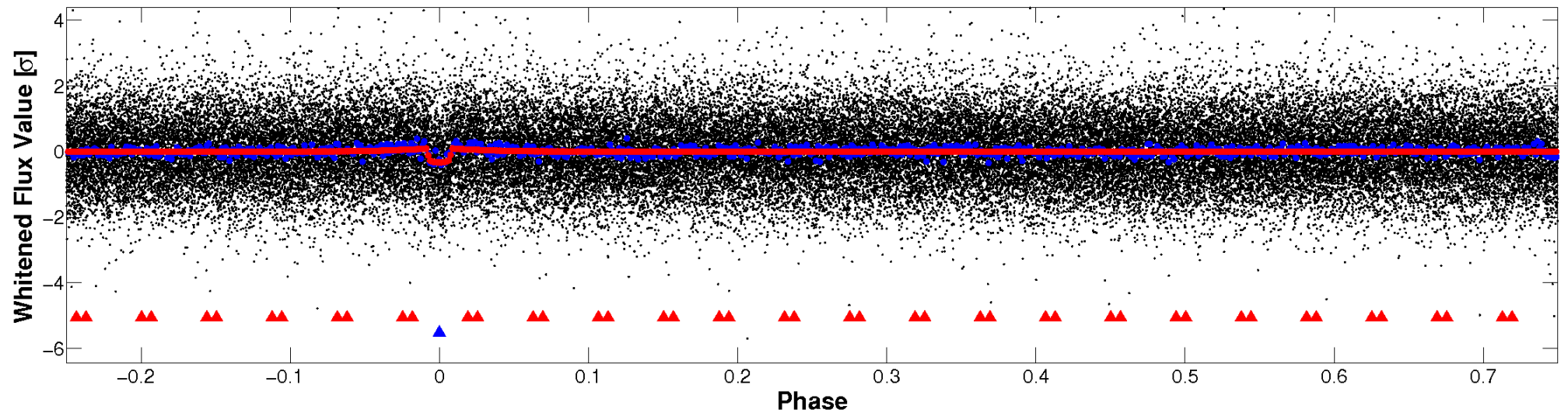


# Non-Whitened Vs. Whitened Light Curve

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

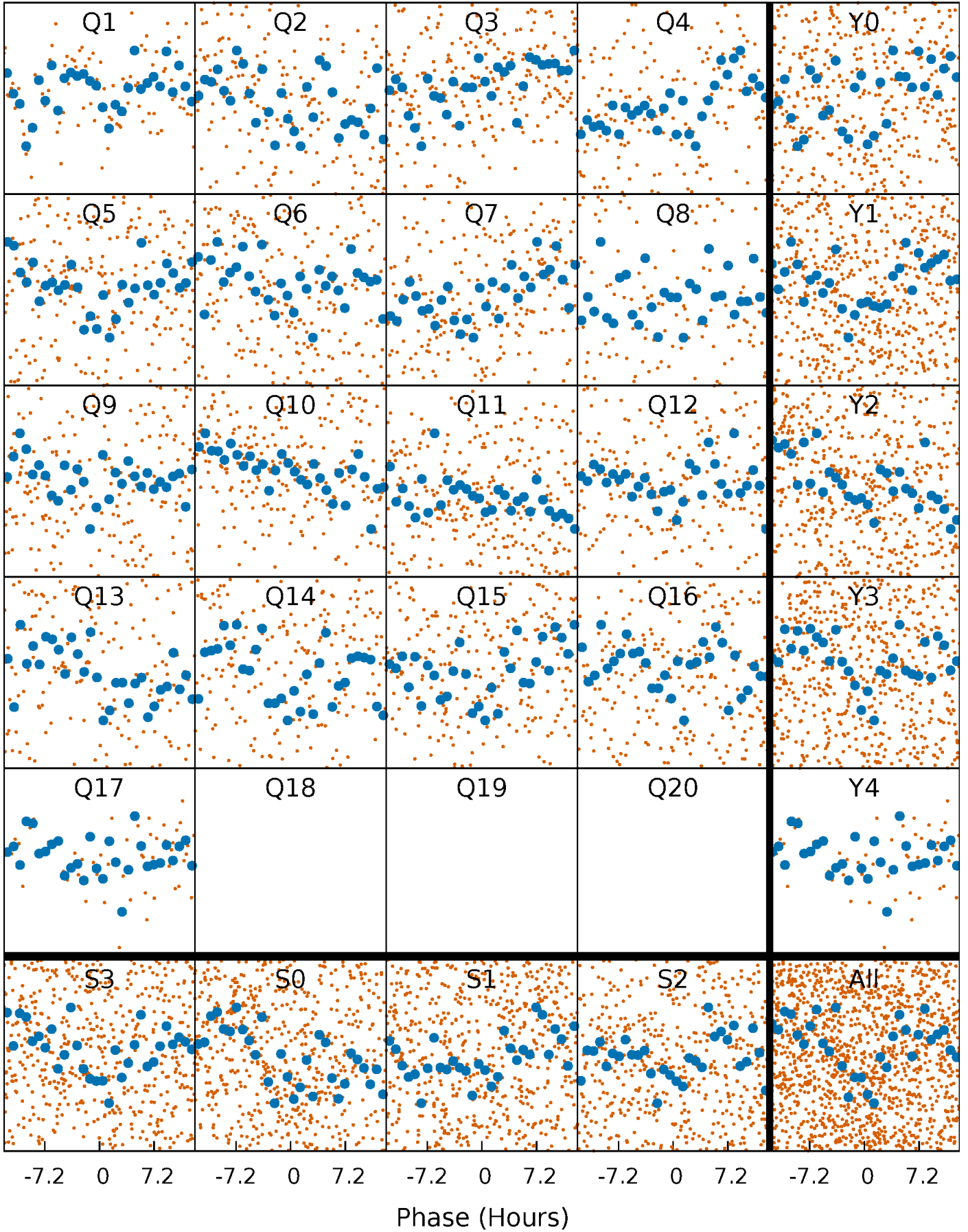


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

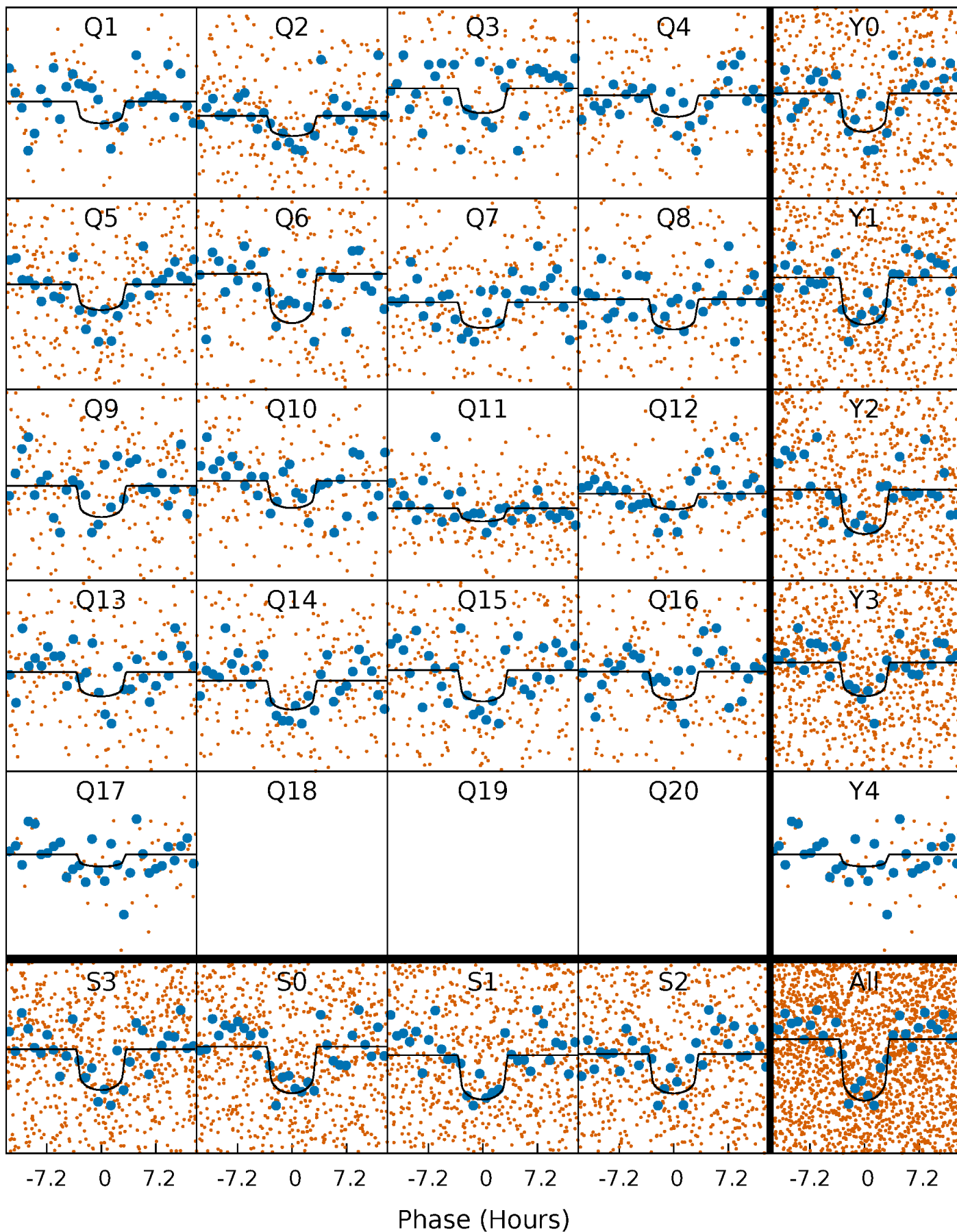
TCE 007515212-02 P= 16.258137 Days  $T_0=139.638931$  (BKJD)





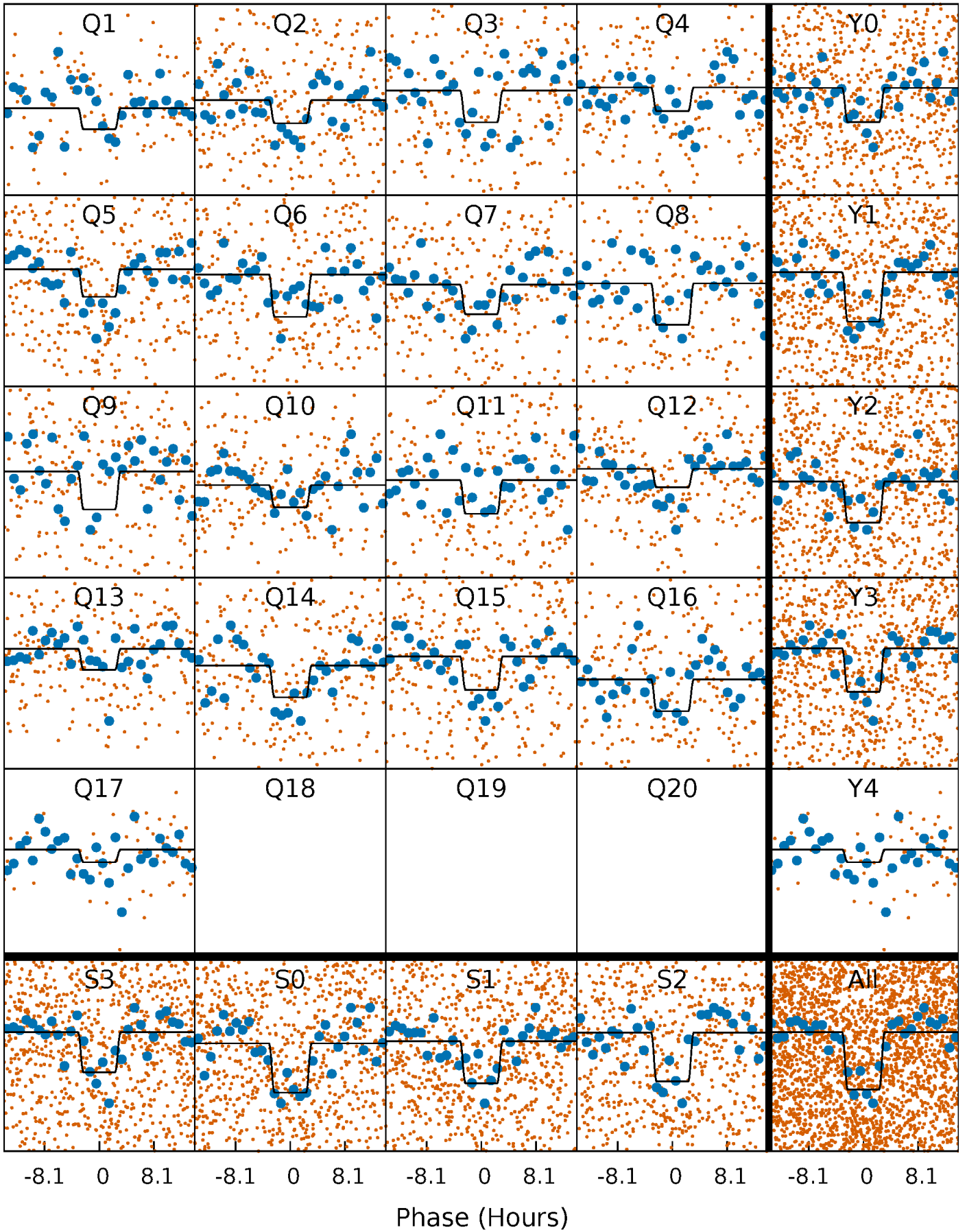
# DV Quarter-Phased Transit Curves

TCE 007515212-02 P= 16.258137 Days  $T_0=139.638931$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

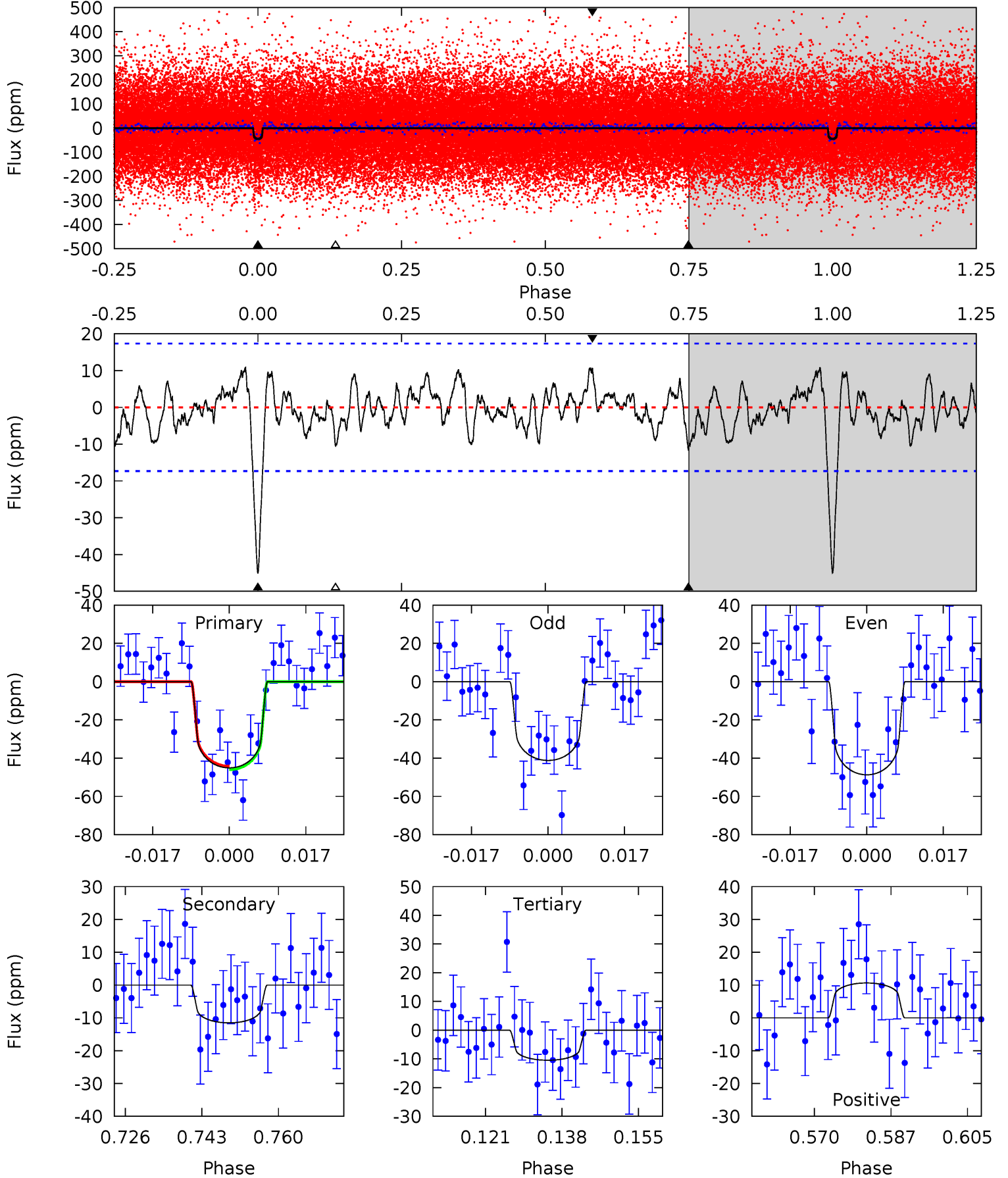
TCE 007515212-02 P= 16.257923 Days  $T_0=139.640628$  (BKJD)



# DV Model-Shift Uniqueness Test

007515212-02, P = 16.258137 Days, E = 123.380794 Days

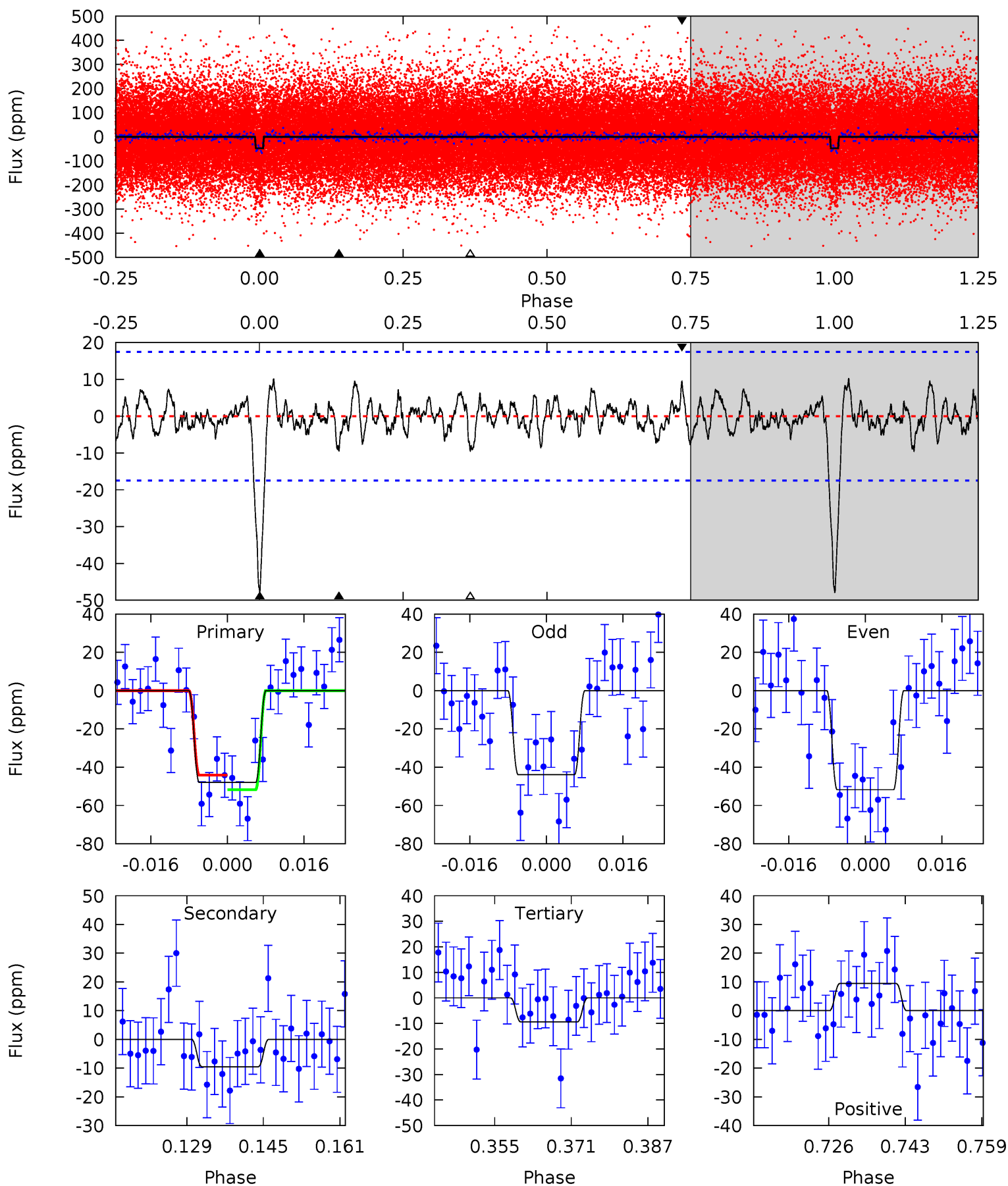
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
12.8	3.27	2.98	3.02	4.92	2.38	1.24	9.82	9.78	0.30	0.25	1.07	1.08	0.19	0.24



# Alt Model-Shift Uniqueness Test

007515212-02, P = 16.257923 Days, E = 123.382705 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
13.5	2.69	2.66	2.67	4.93	2.41	0.96	10.9	10.9	0.03	0.02	1.11	0.91	0.18	1.07



### Stellar Parameters For KIC 007515212

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5867^{+104}_{-128}$	$4.235^{+0.143}_{-0.117}$	$0.240^{+0.150}_{-0.150}$	$1.356^{+0.212}_{-0.259}$	$1.153^{+0.081}_{-0.111}$	$0.651^{+0.448}_{-0.228}$
	+2%/-2%	+3%/-3%	+62%/-62%	+16%/-19%	+7%/-10%	+69%/-35%
Source	SPE59	SPE59	SPE59	DSEP		

KIC = Kepler Input Catalog; PHO = Photometry; SPE = Spectroscopy; AST = Asteroseismology  
 TRA = Transits; DESP = Dartmouth Models; MULT = Multiple Models

### Secondary Eclipse Parameters for KIC 007515212-02 / KOI 0679.02

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-12 \pm 4$	$1.15^{+0.45}_{-0.43}$	$1157^{+58}_{-54}$	$4109^{+868}_{-484}$	$80^{+136}_{-42}$
Alt.	$-10 \pm 4$	$1.05^{+0.45}_{-0.41}$	$1160^{+52}_{-58}$	$4105^{+991}_{-557}$	$79^{+164}_{-46}$

$T_{max}$  = Theoretical Maximum Planetary Temperature

$T_{obs}$  = Observed Planetary Temperature (Assuming  $A=0.3$ )

$A_{obs}$  = Observed Albedo (Assuming  $T=0$ )

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

## DV Centroid Data

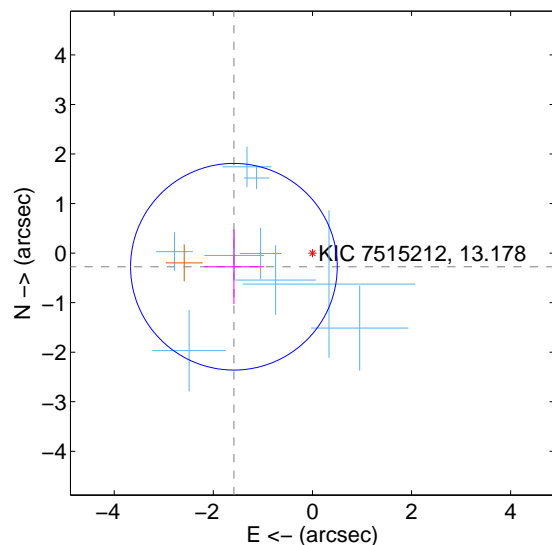
Supplemental centroid analysis for 007515212-02. Kepler magnitude: 13.18. Transit SNR 9.27

There are 9 quarters with good PRF difference image offsets

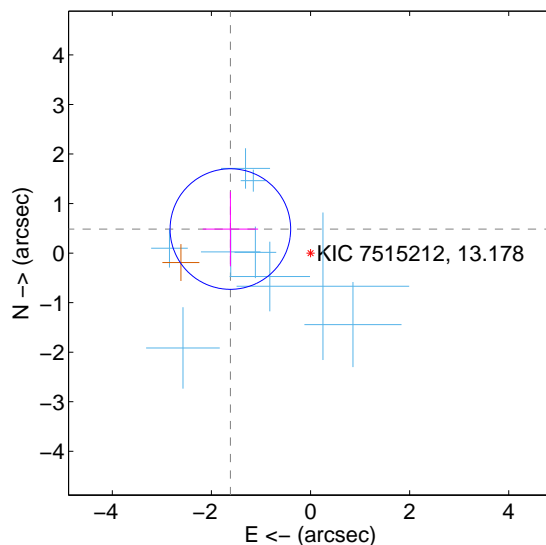
The direct PRF centroid is offset from the target star catalog position by about 0.10 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.609 \pm 0.695$	2.31	$1.585 \pm 0.608$	$-0.275 \pm 0.754$
PRF-fit source offset from KIC position	<b><math>1.689 \pm 0.406</math></b>	<b>4.16</b>	$1.618 \pm 0.559$	$0.485 \pm 0.753$
photometric centroid source offset	$0.96 \pm 1.04$	0.93	$-0.80 \pm 1.01$	$0.54 \pm 1.09$

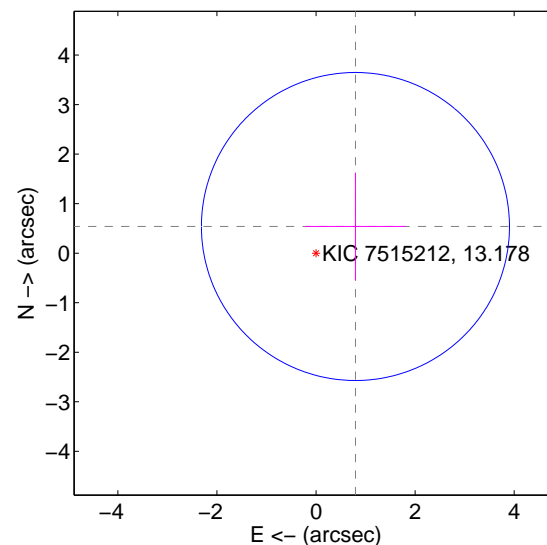
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

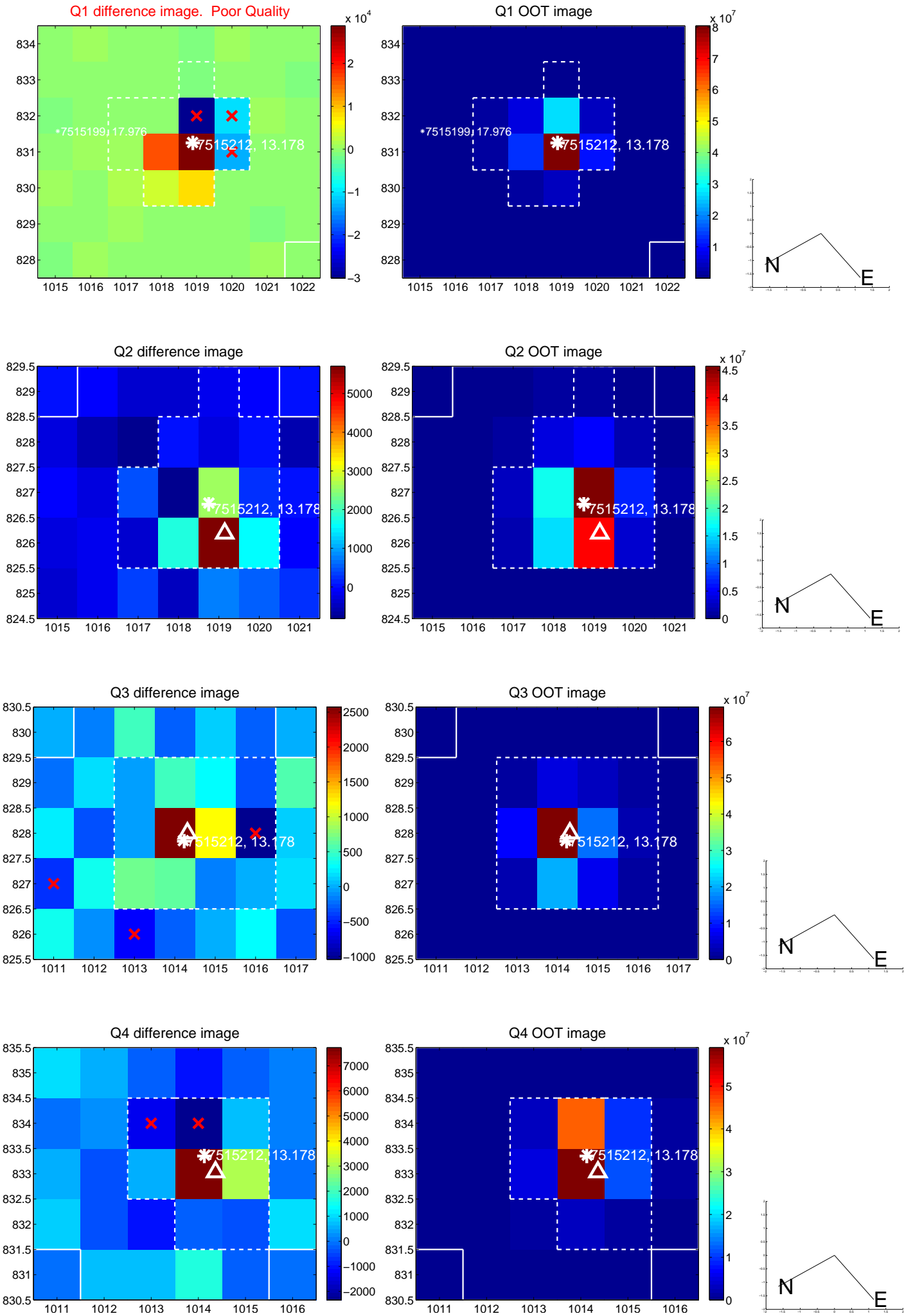


offset from photometric centroids



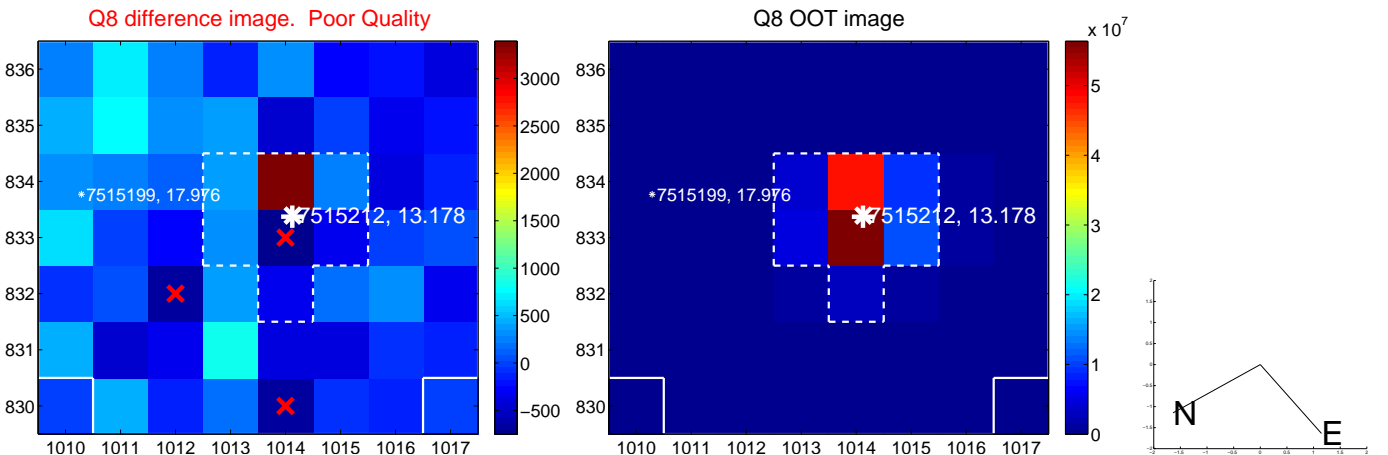
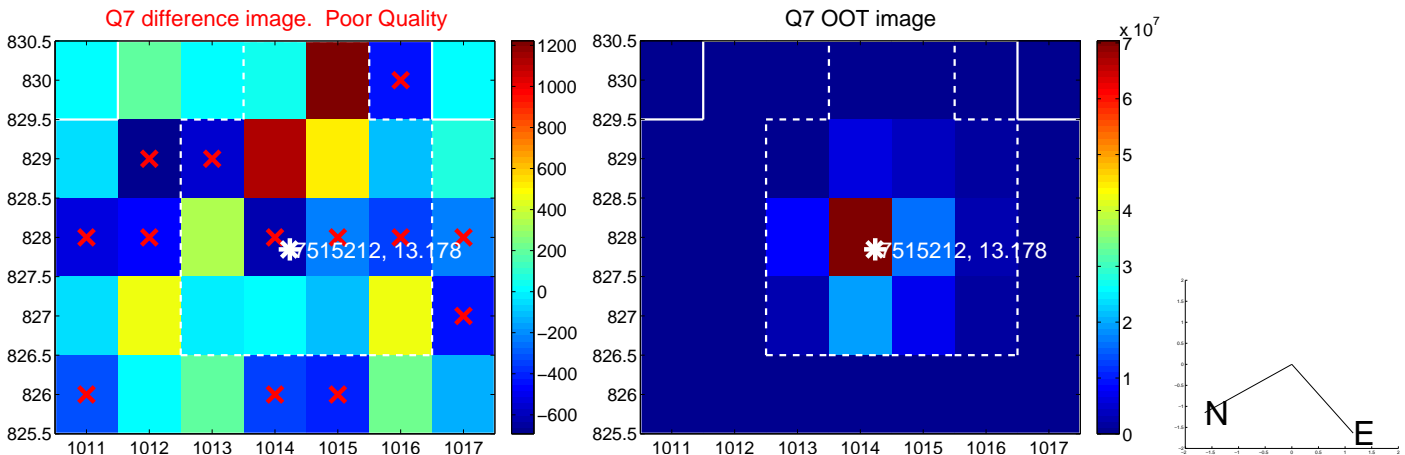
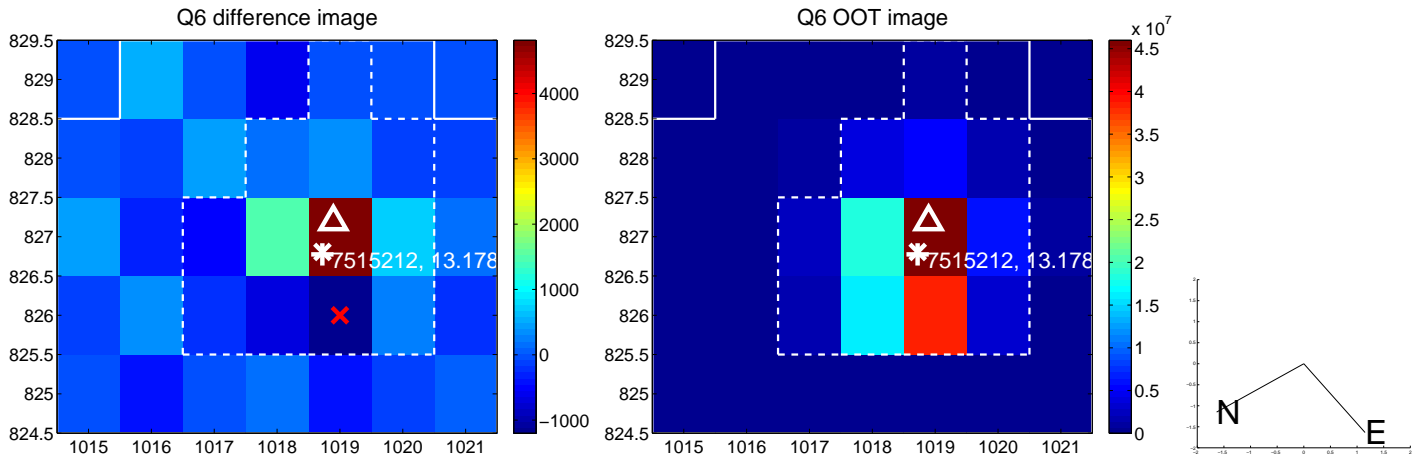
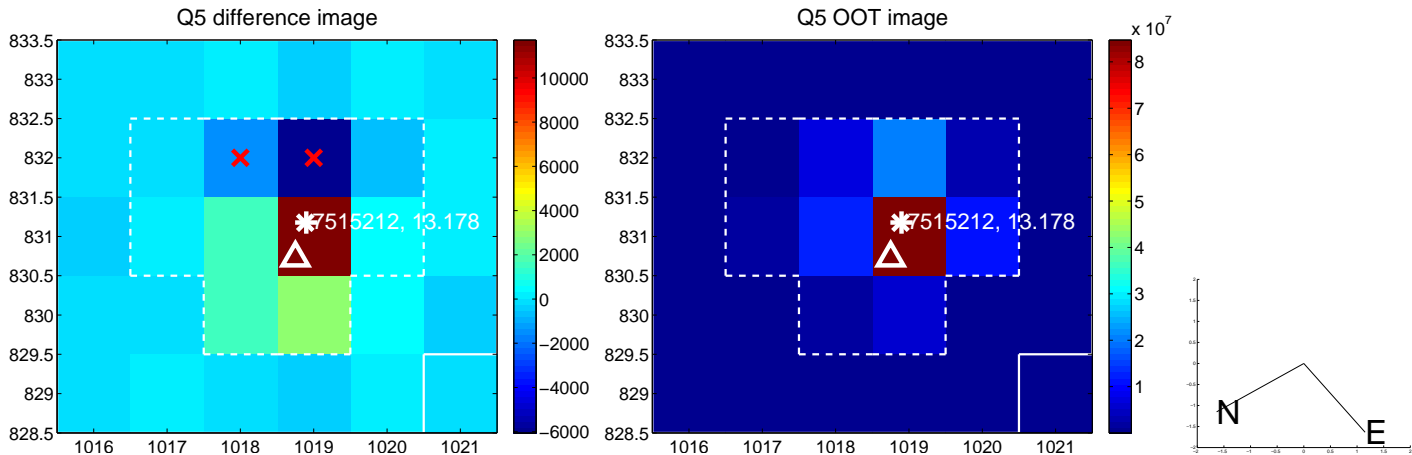
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

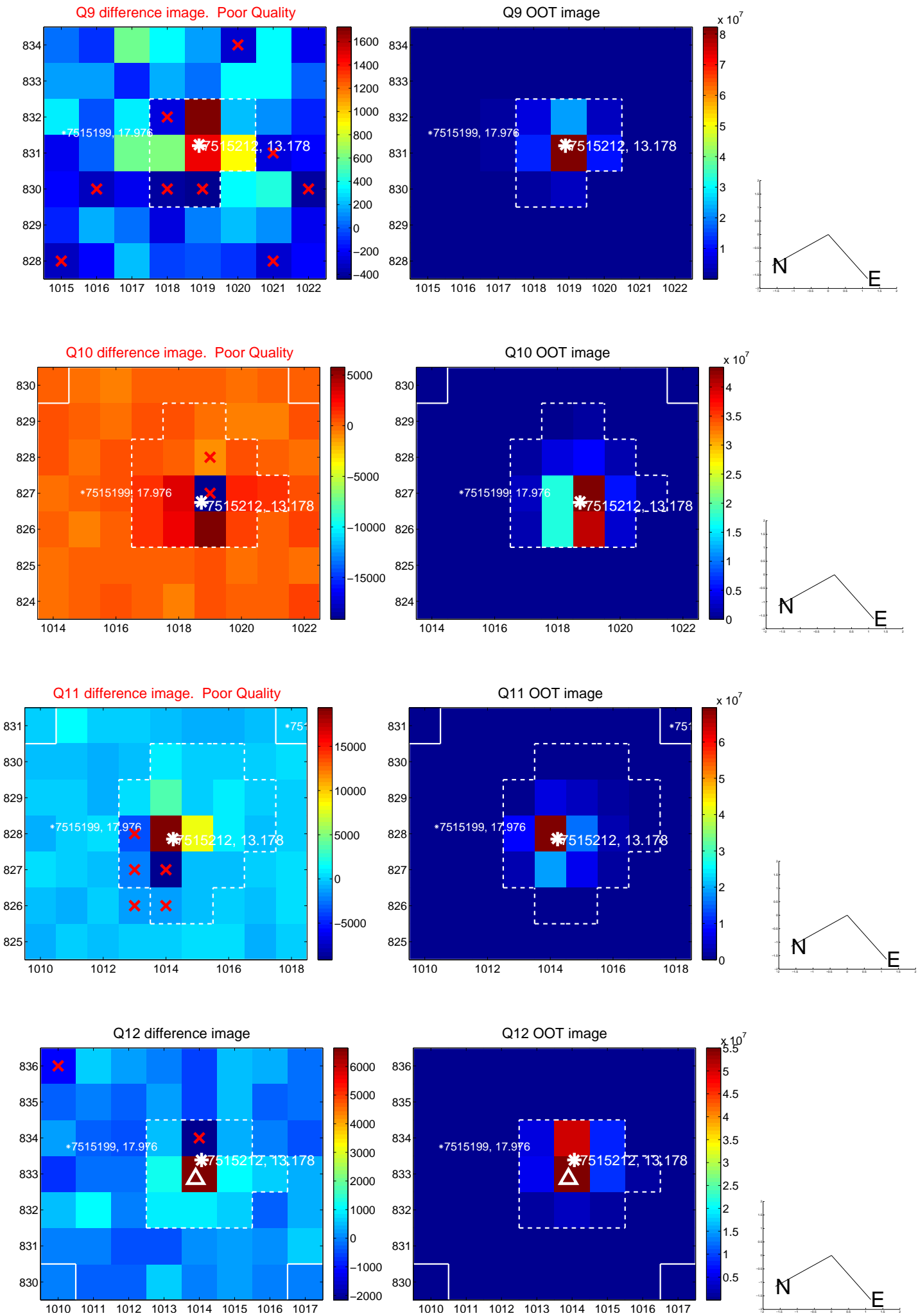




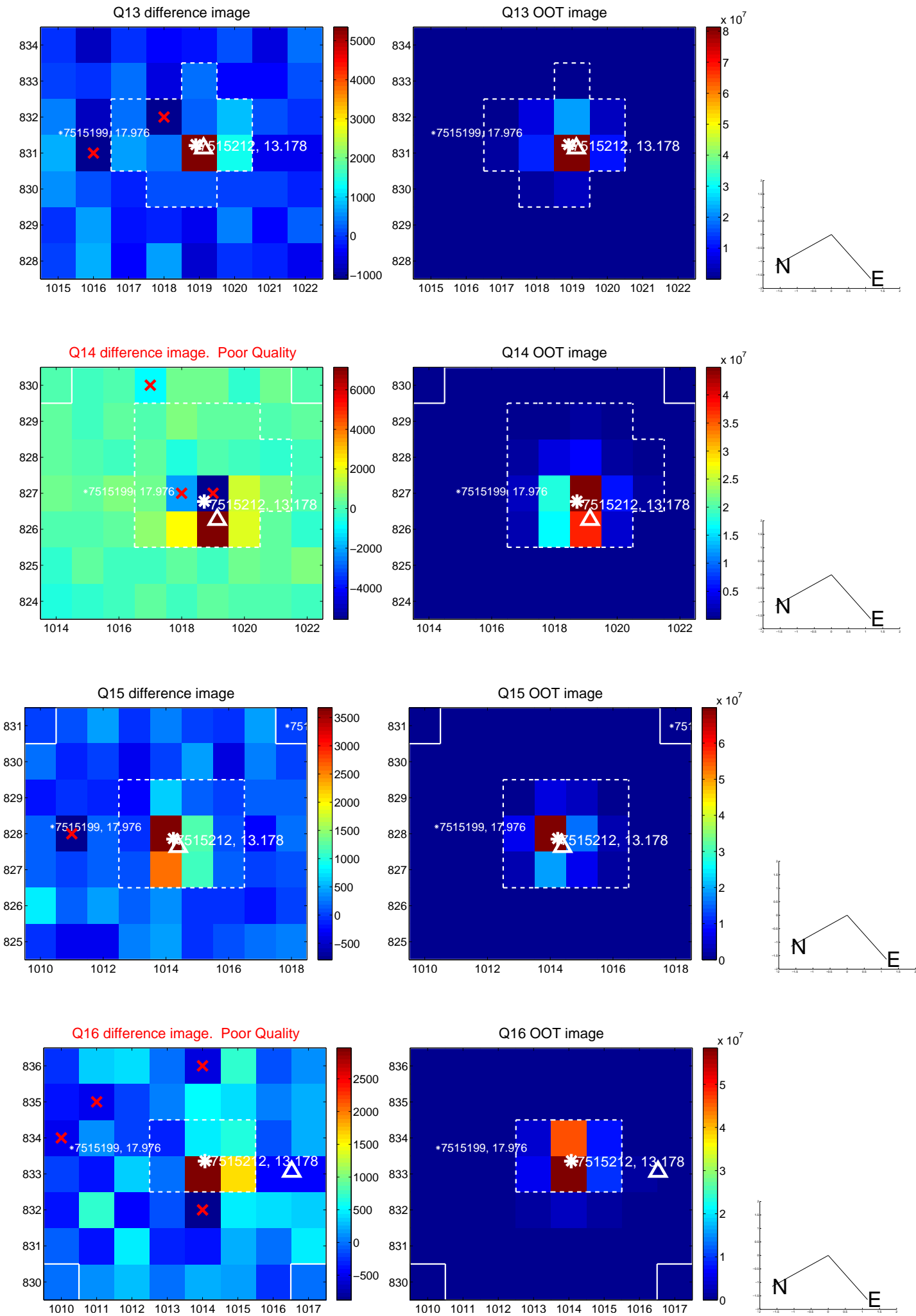
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



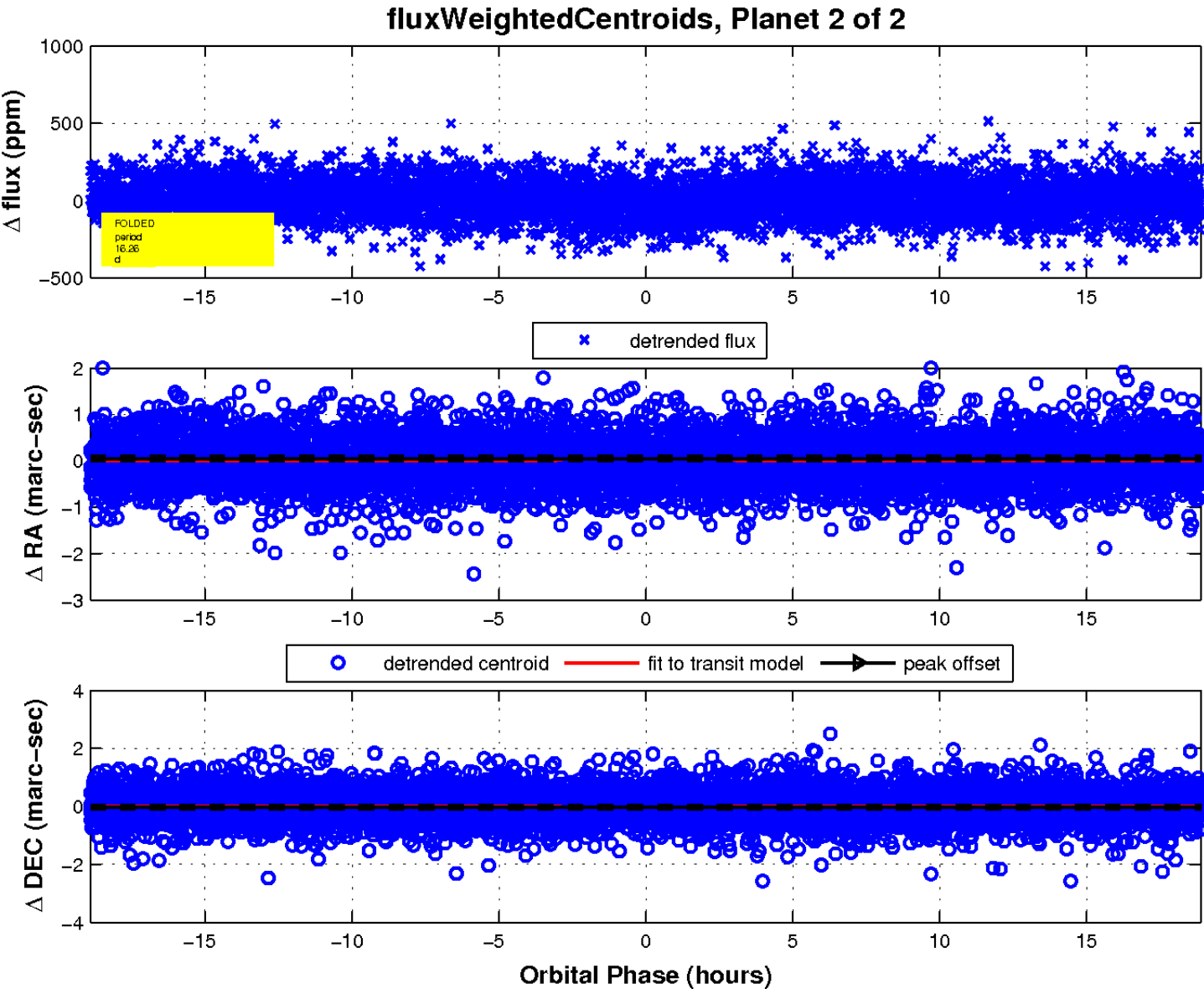
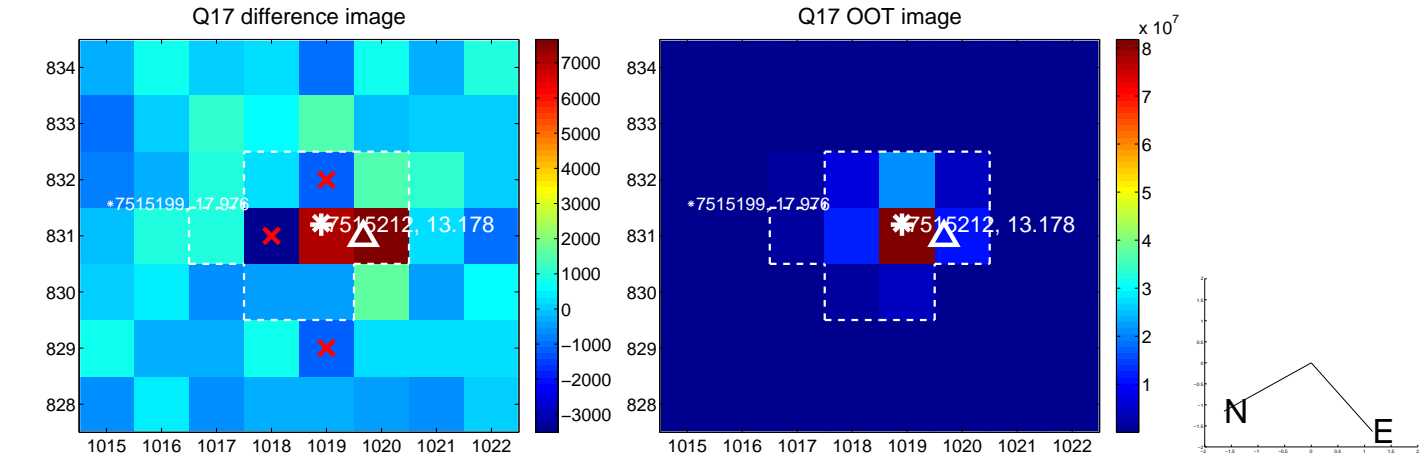
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

