

# KIC 011403216

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
011403216-01	OBS	3561.01	4.053253	134.744977	109512.3	4.062	4482.9	3611.0	1.04	6022	37.30	477.01
011403216-02	OBS	No	4.053258	132.717853	3992.2	3.953	170.2	172.2	1.04	6022	8.09	477.01

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
011403216-01	OBS	FP	0.00	0	1	0	0	MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE
011403216-02	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.

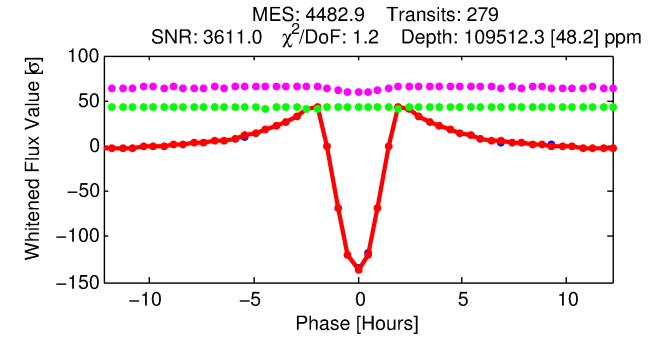
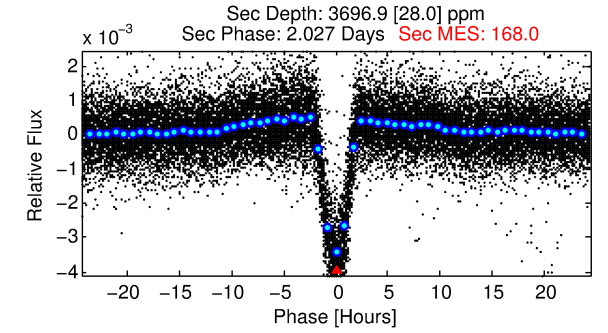
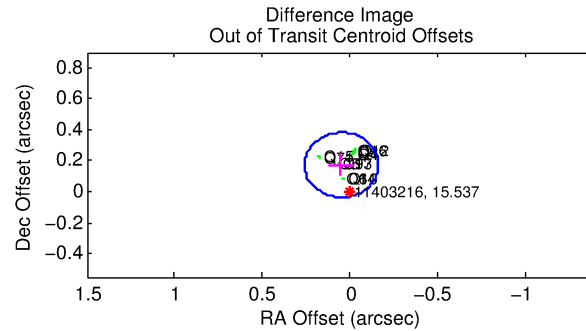
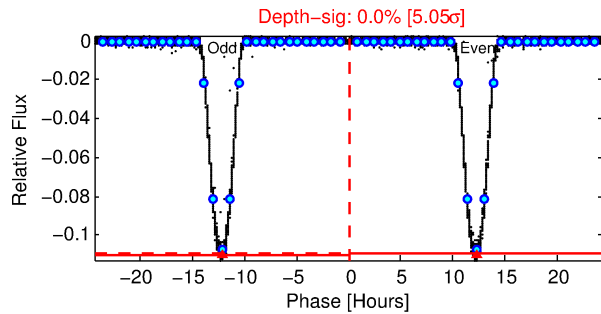
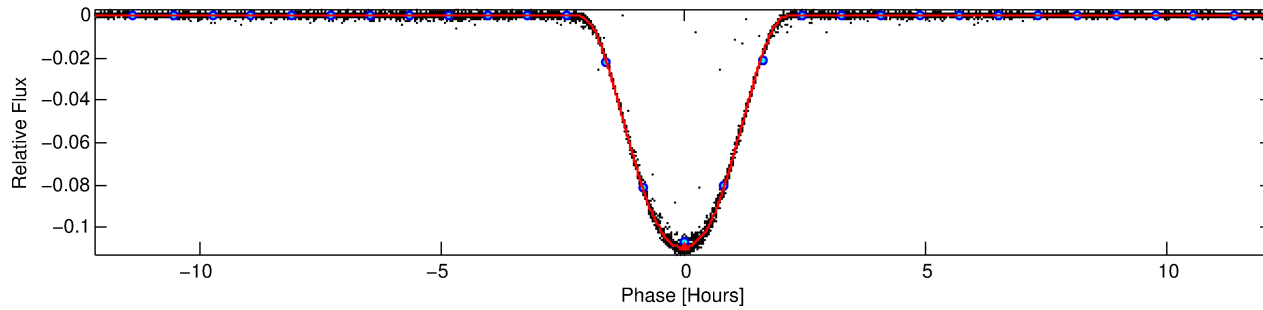
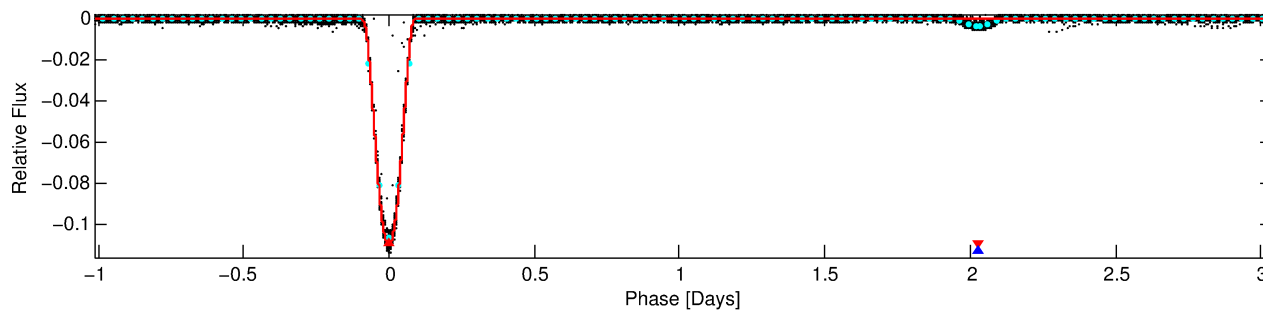
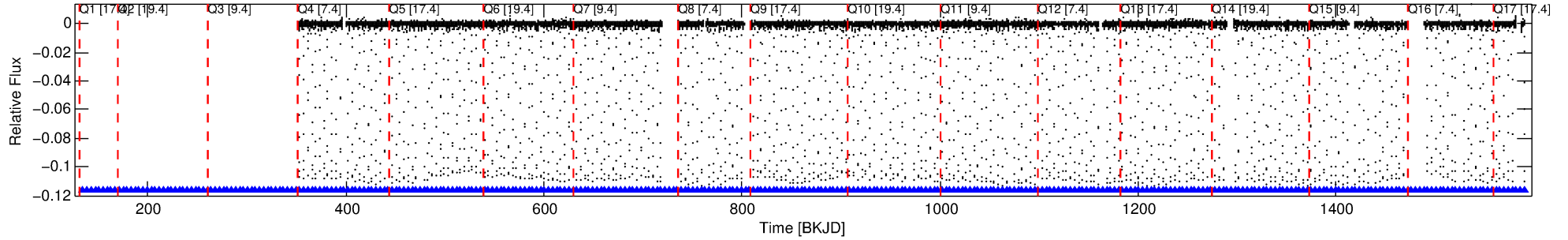
## Ephemeris Match Information For 011403216-01

No Significant Match Found

# DV One-Page Summary

KIC: 11403216 Candidate: 1 of 2 Period: 4.053 d  
KOI: K03561.01 Corr: 0.992

Kp: 15.54 R\*: 1.04 Rs Teff: 6022.0 K Logg: 4.45 Fe/H: 0.120



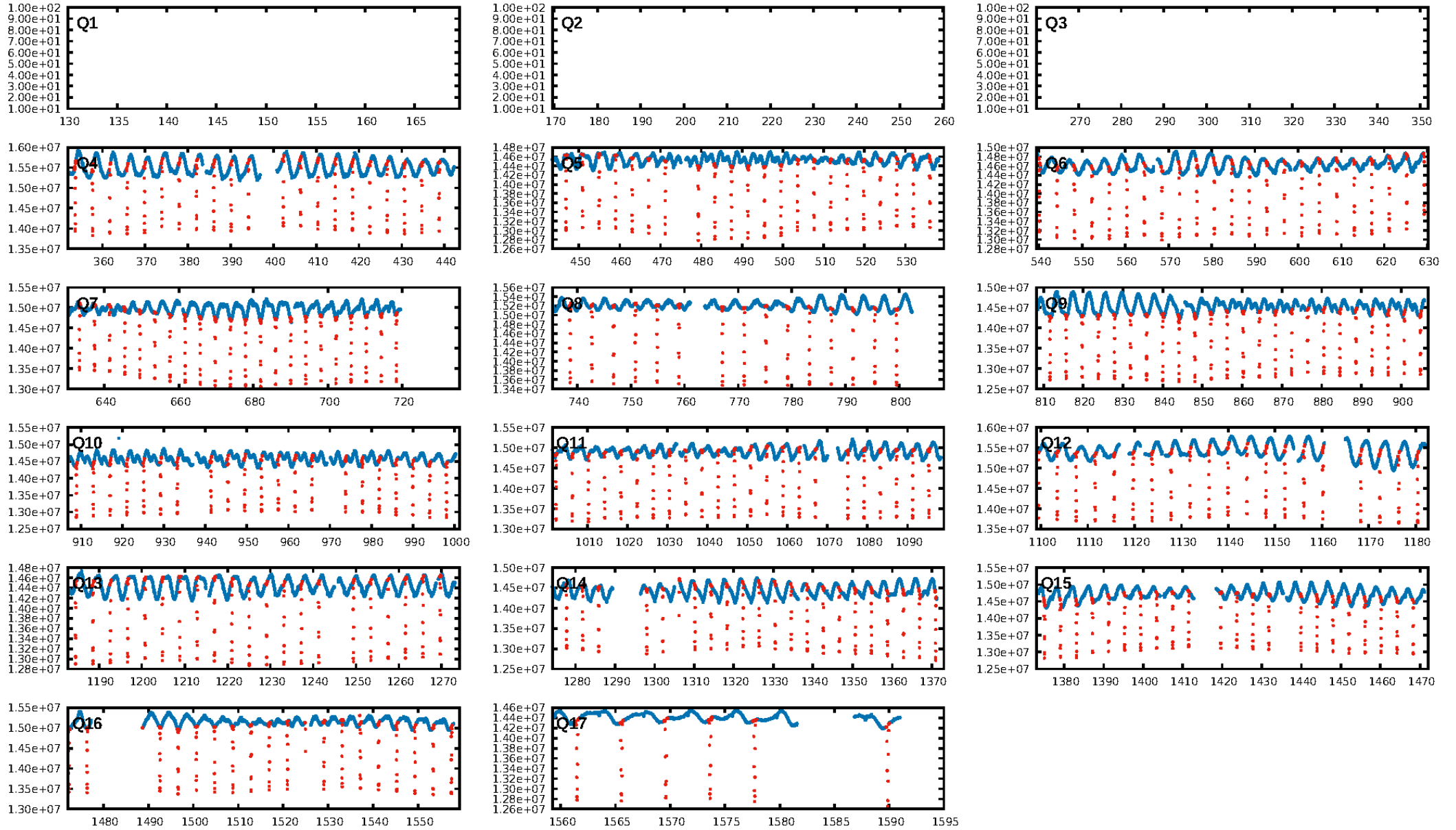
## DV Fit Results:

Period = 4.05325 [0.00000] d  
Epoch = 134.7450 [0.0000] BKJD  
Rp/R\* = 0.3290 [0.0002]  
a/R\* = 8.80 [0.00]  
b = 0.67 [0.00]  
Seff = 477.01 [210.03]  
Teff = 1192 [131] K  
Rp = 37.30 [12.75] Re  
a = 0.0516 [0.0147] AU  
Ag = 3.90 [1.61] [1.80σ]  
Teffp = 2589 [100] K [8.47σ]

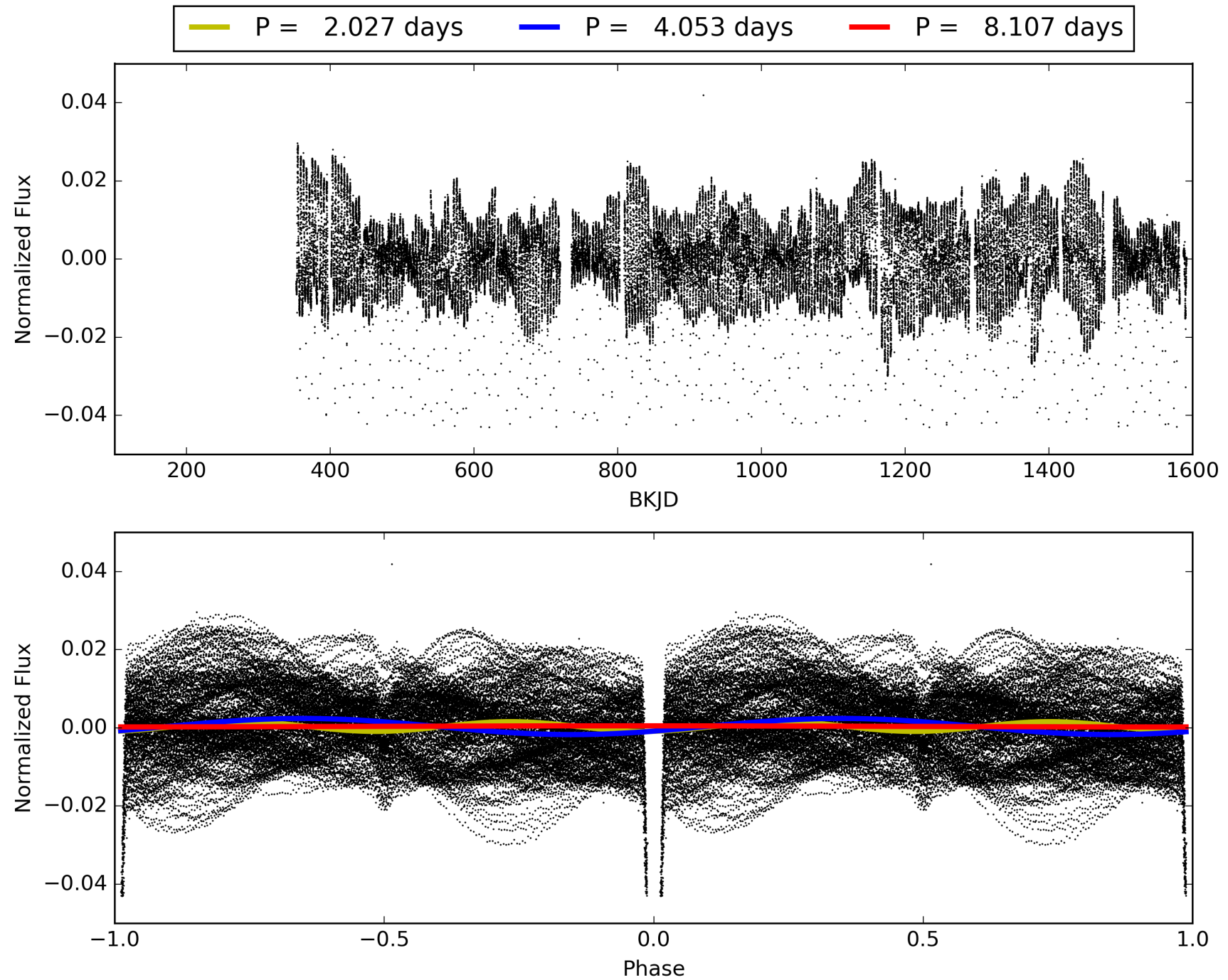
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.0% [0.00σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [273/273]  
GhostDiagnostic-chr: 3.386  
Centroid-sig: 0.0%  
Centroid-so: 0.408 arcsec [149.11σ]  
OotOffset-rm: 0.180 arcsec [2.58σ]  
KicOffset-rm: 0.021 arcsec [0.31σ]  
OotOffset-st: 3/3/4/4 [14]  
KicOffset-st: 3/3/4/4 [14]  
DiffImageQuality-fgm: 1.00 [14/14]  
DiffImageOverlap-fno: 1.00 [14/14]

# TCE 011403216-01, PDC Light Curves

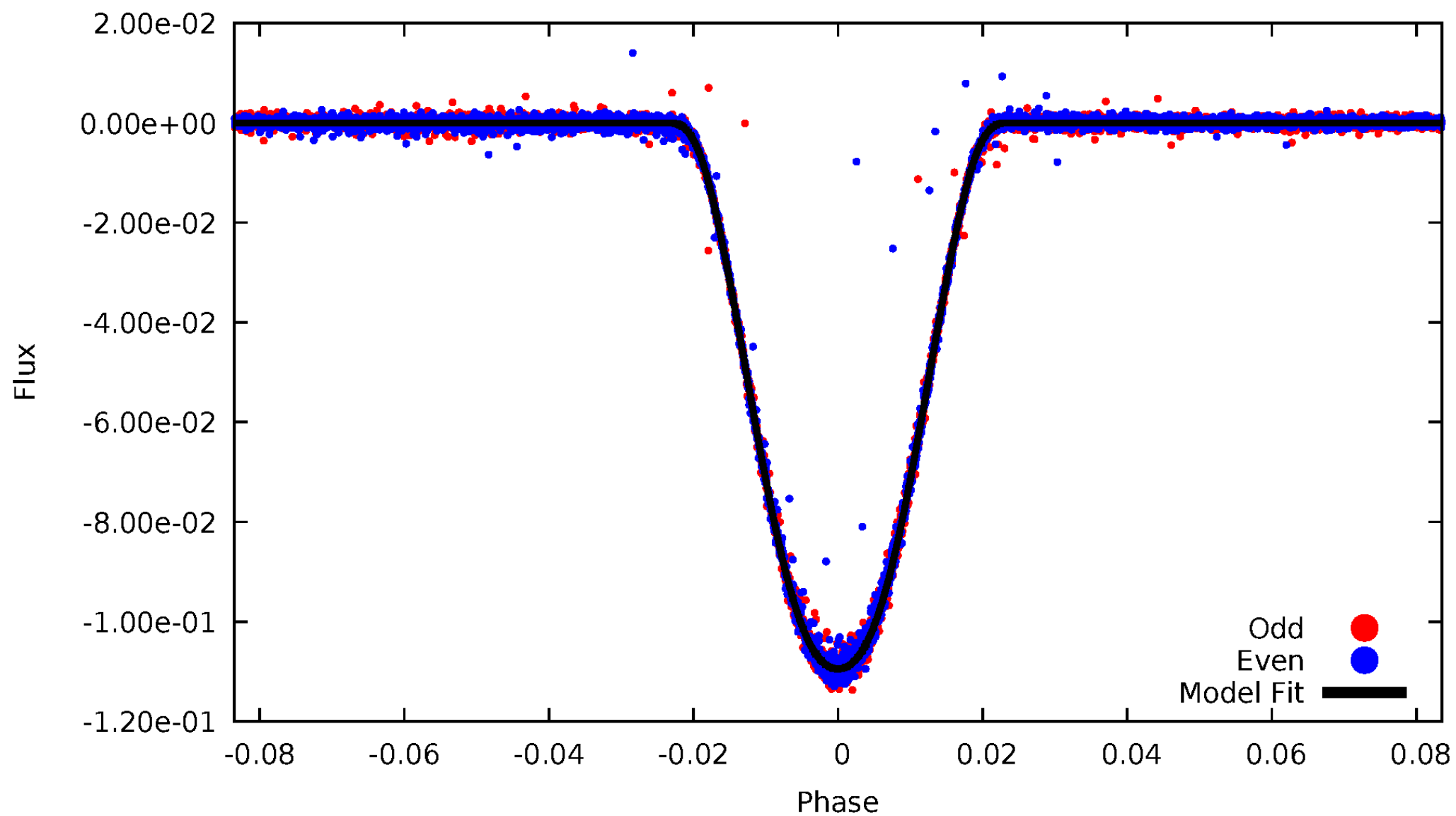


TCE 011403216-01



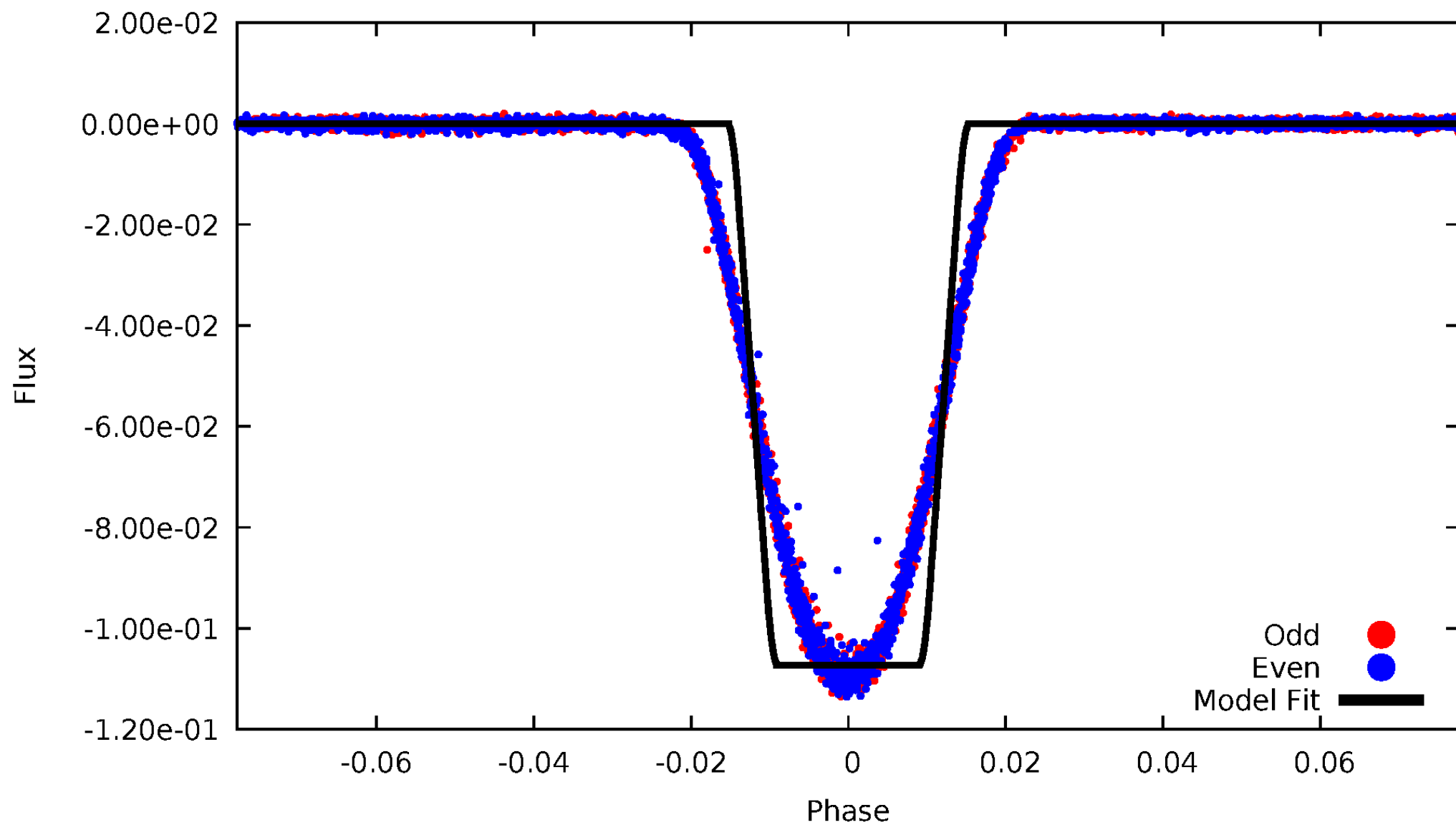
# DV Odd/Even

TCE 011403216-01



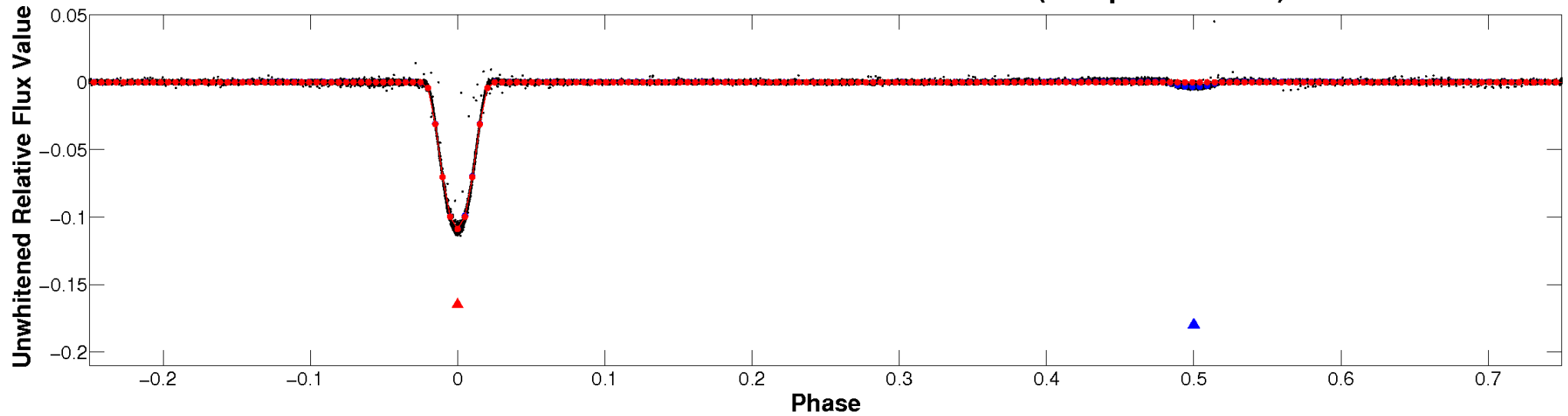
# ALT Odd/Even

TCE 011403216-01

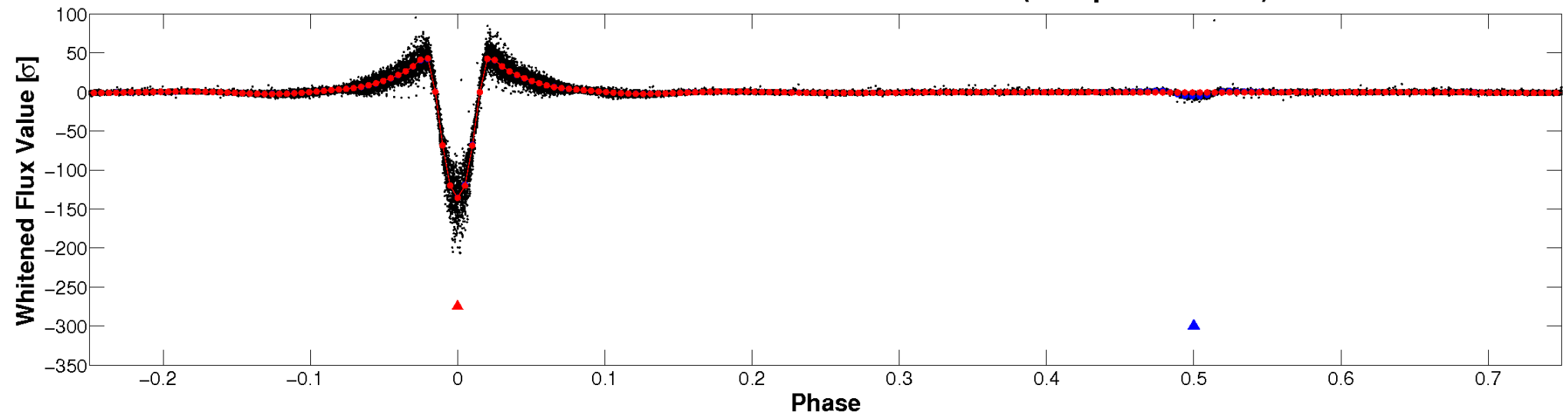


# Non-Whitened Vs. Whitened Light Curve

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

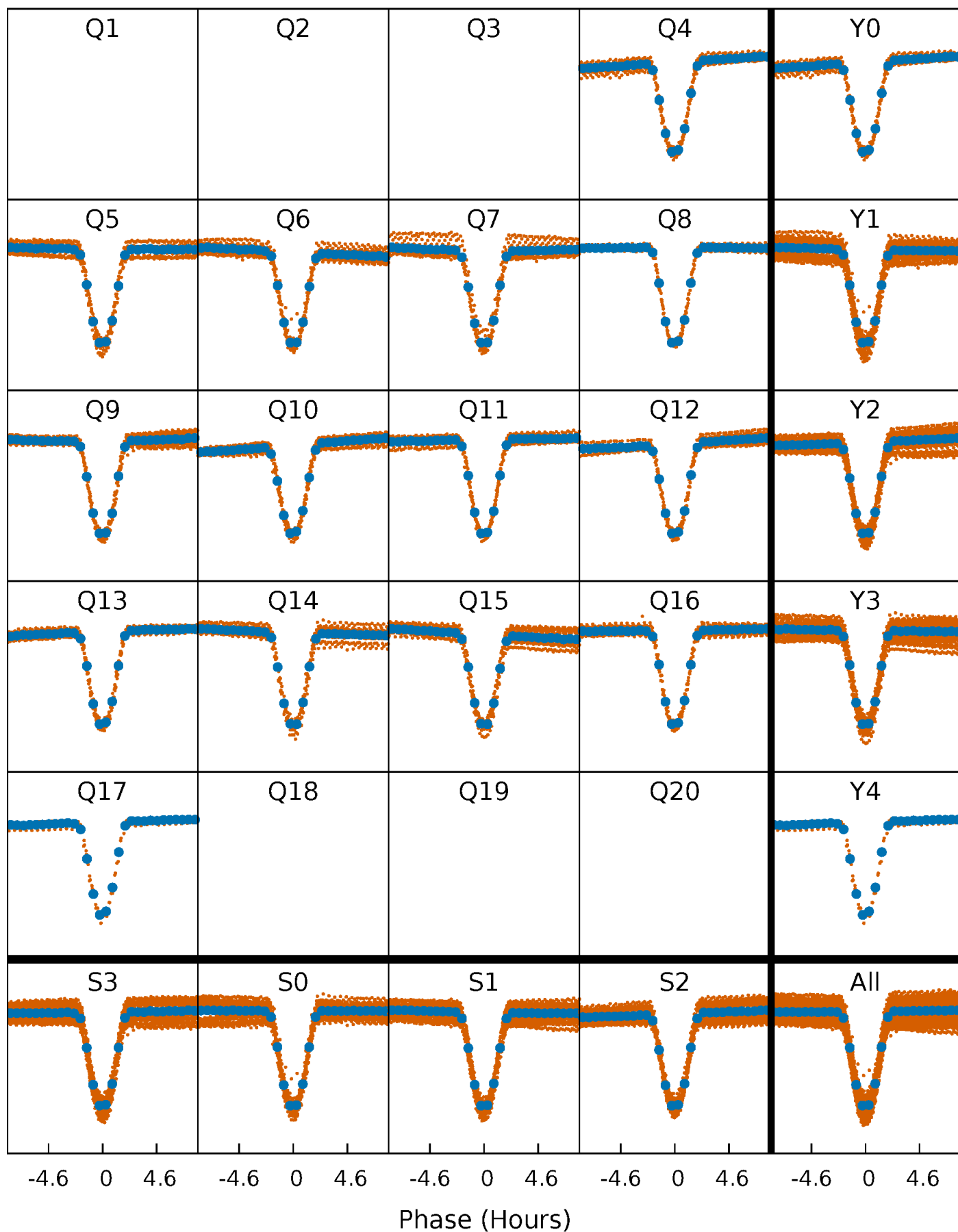


**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

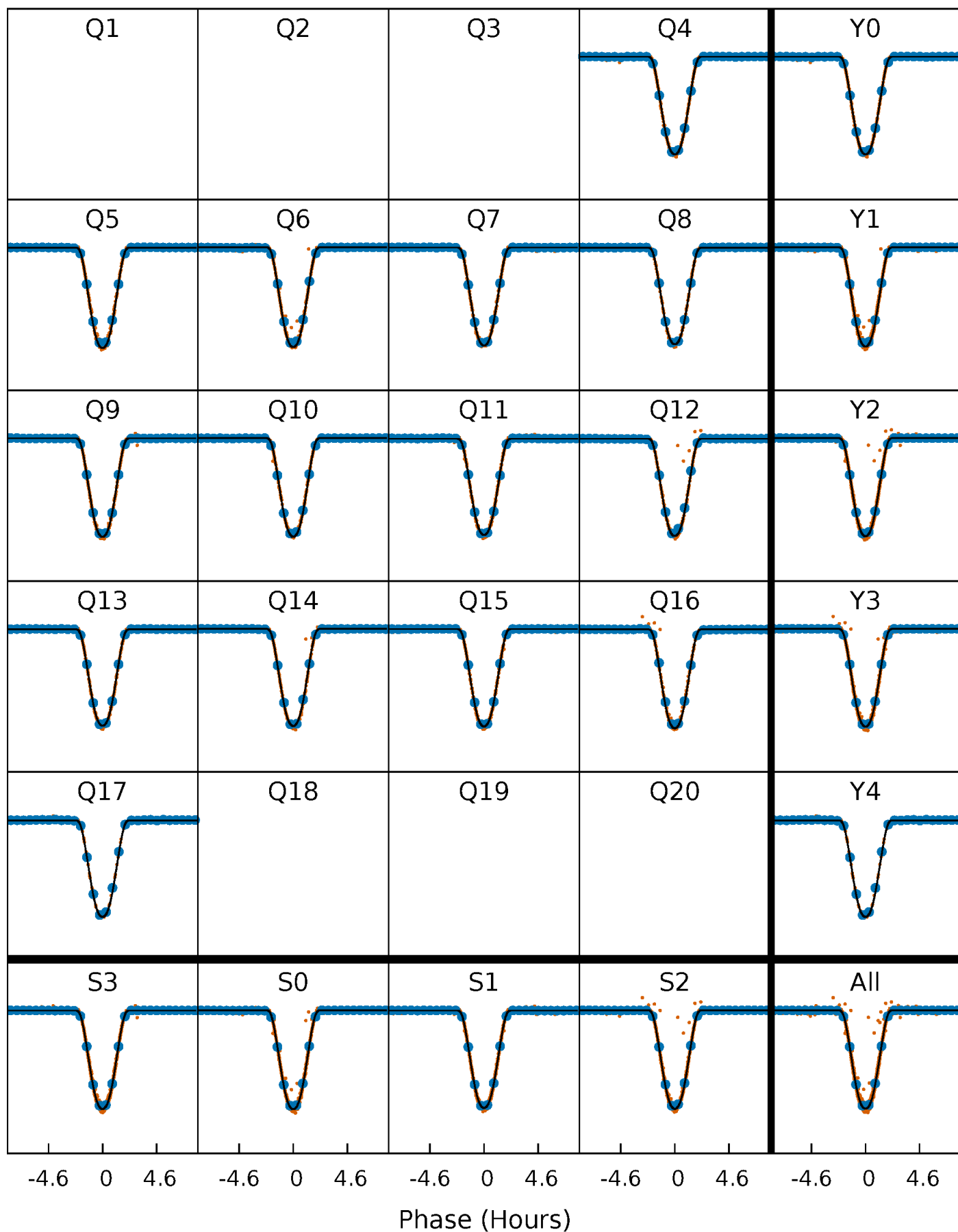
TCE 011403216-01 P= 4.053253 Days  $T_0=134.744977$  (BKJD)





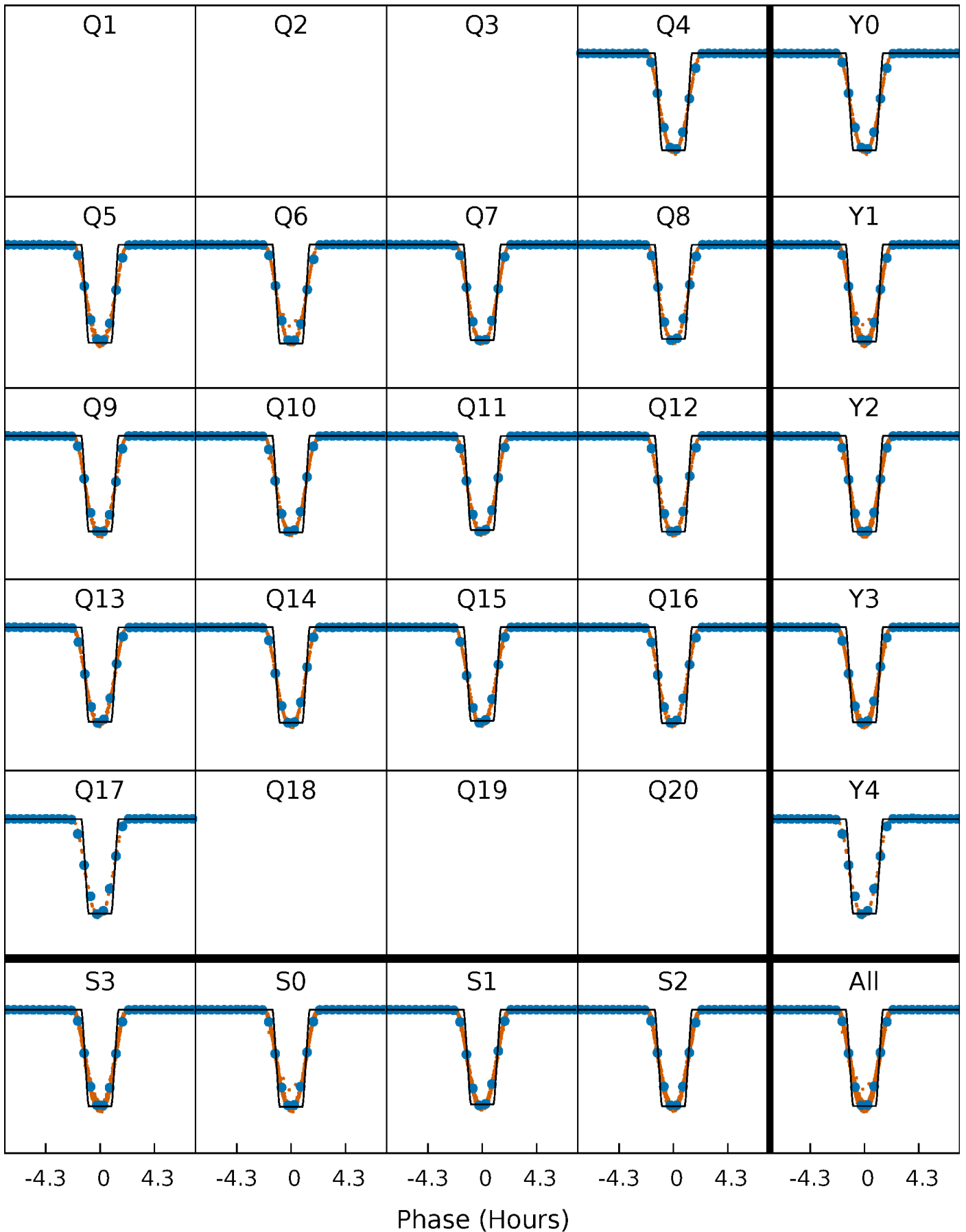
# DV Quarter-Phased Transit Curves

TCE 011403216-01 P= 4.053253 Days  $T_0=134.744977$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

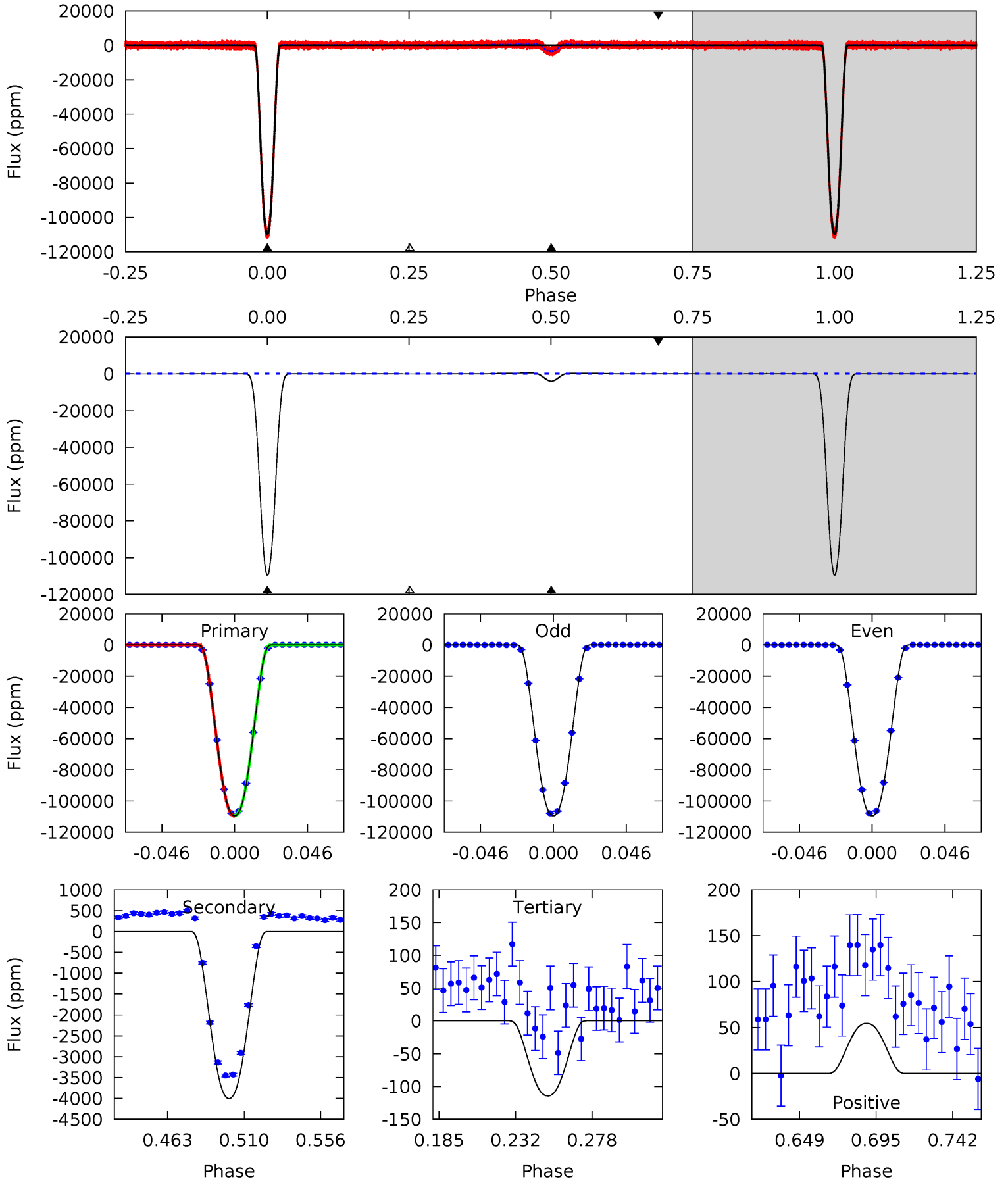
TCE 011403216-01 P= 4.053268 Days  $T_0=134.741880$  (BKJD)



# DV Model-Shift Uniqueness Test

011403216-01, P = 4.053253 Days, E = 134.744977 Days

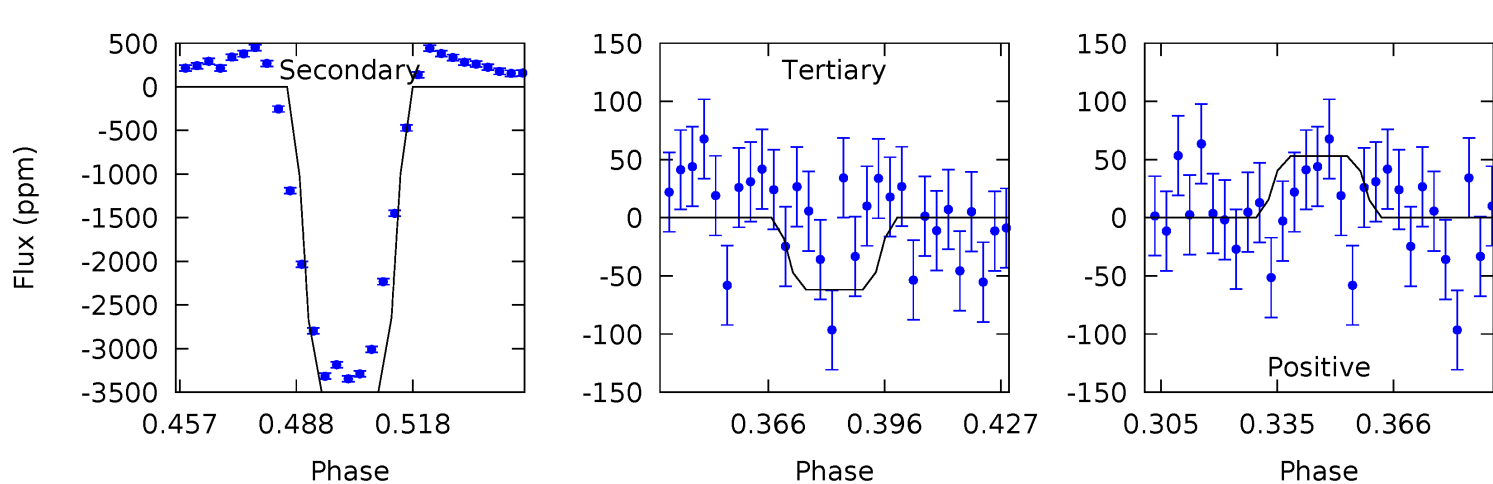
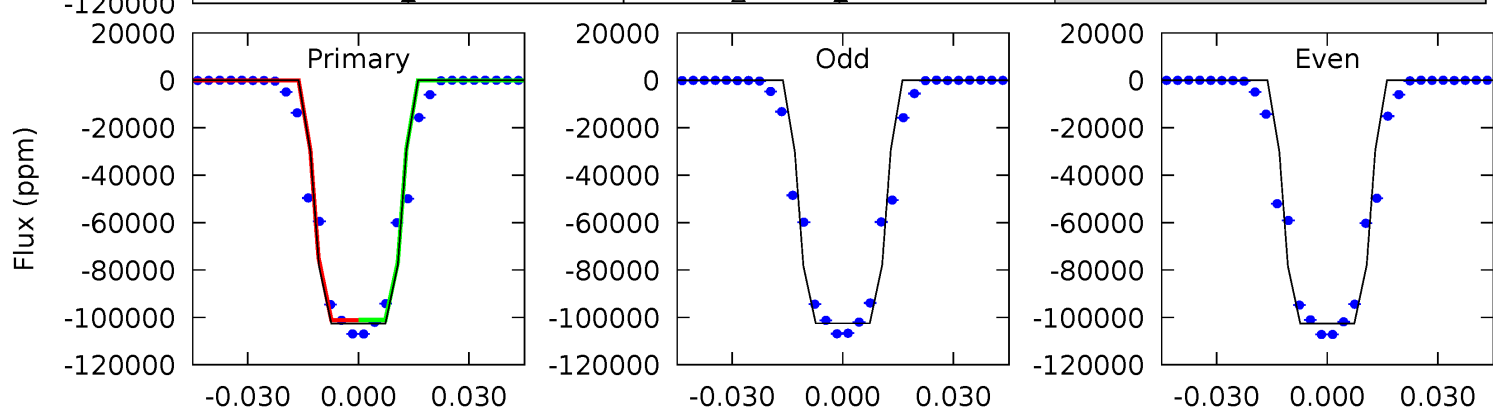
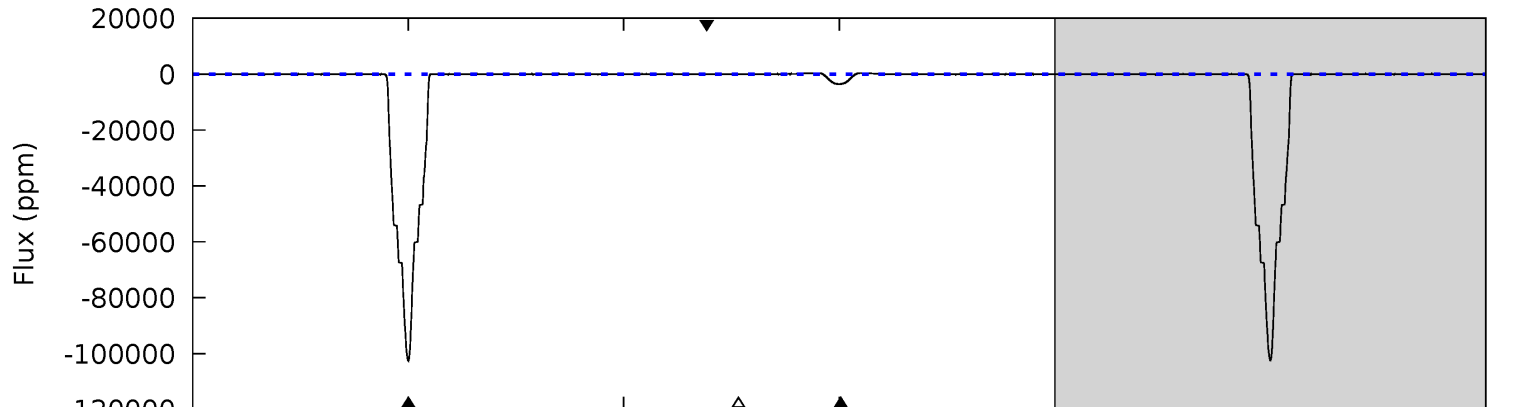
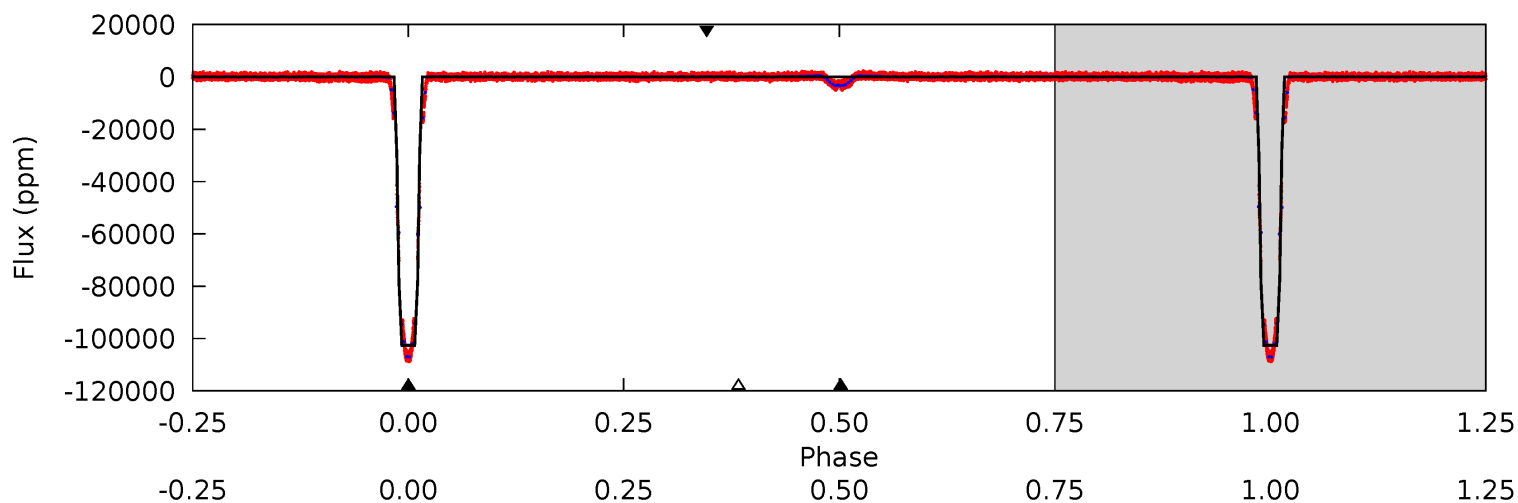
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
8427	308.0	8.81	4.20	4.72	1.99	9.27	8418	8422	299.2	303.9	1.08	0.99	0.00	11.8



# Alt Model-Shift Uniqueness Test

011403216-01, P = 4.053268 Days, E = 134.741880 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
5046	172.0	3.04	2.61	4.81	2.16	2.60	5043	5044	169.0	169.4	2.99	1.00	0.00	2.05



### Stellar Parameters For KIC 011403216

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6022^{+190}_{-232}$	$4.453^{+0.056}_{-0.224}$	$0.120^{+0.200}_{-0.300}$	$1.039^{+0.355}_{-0.118}$	$1.116^{+0.136}_{-0.151}$	$1.402^{+0.404}_{-0.739}$
	+3%/-4%	+1%/-5%	+167%/-250%	+34%/-11%	+12%/-14%	+29%/-53%
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 011403216-01 / KOI 3561.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-4004 \pm 13$	$38.34^{+6.85}_{-2.99}$	$1708^{+132}_{-91}$	$3186^{+60}_{-73}$	$3.879^{+0.645}_{-1.005}$
Alt.	$-3497 \pm 20$	$37.93^{+6.96}_{-2.88}$	$1701^{+126}_{-96}$	$3124^{+62}_{-75}$	$3.473^{+0.553}_{-0.922}$

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

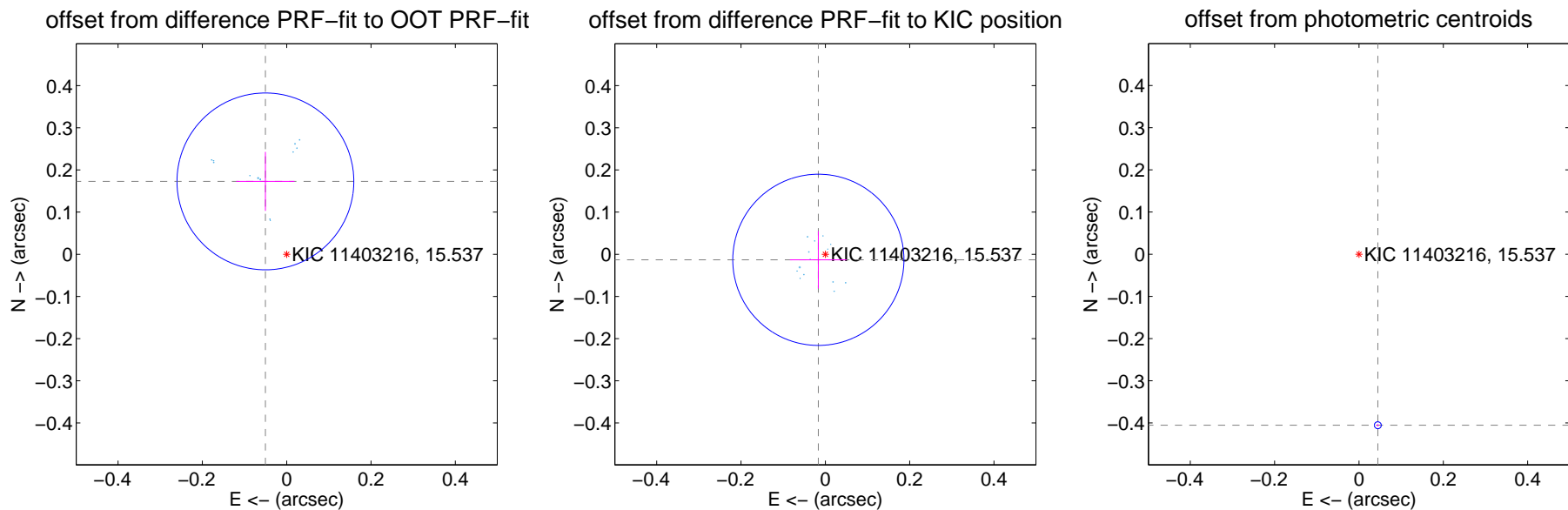
## DV Centroid Data

Supplemental centroid analysis for 011403216-01. Kepler magnitude: 15.54. Transit SNR 3611.03

There are 14 quarters with good PRF difference image offsets

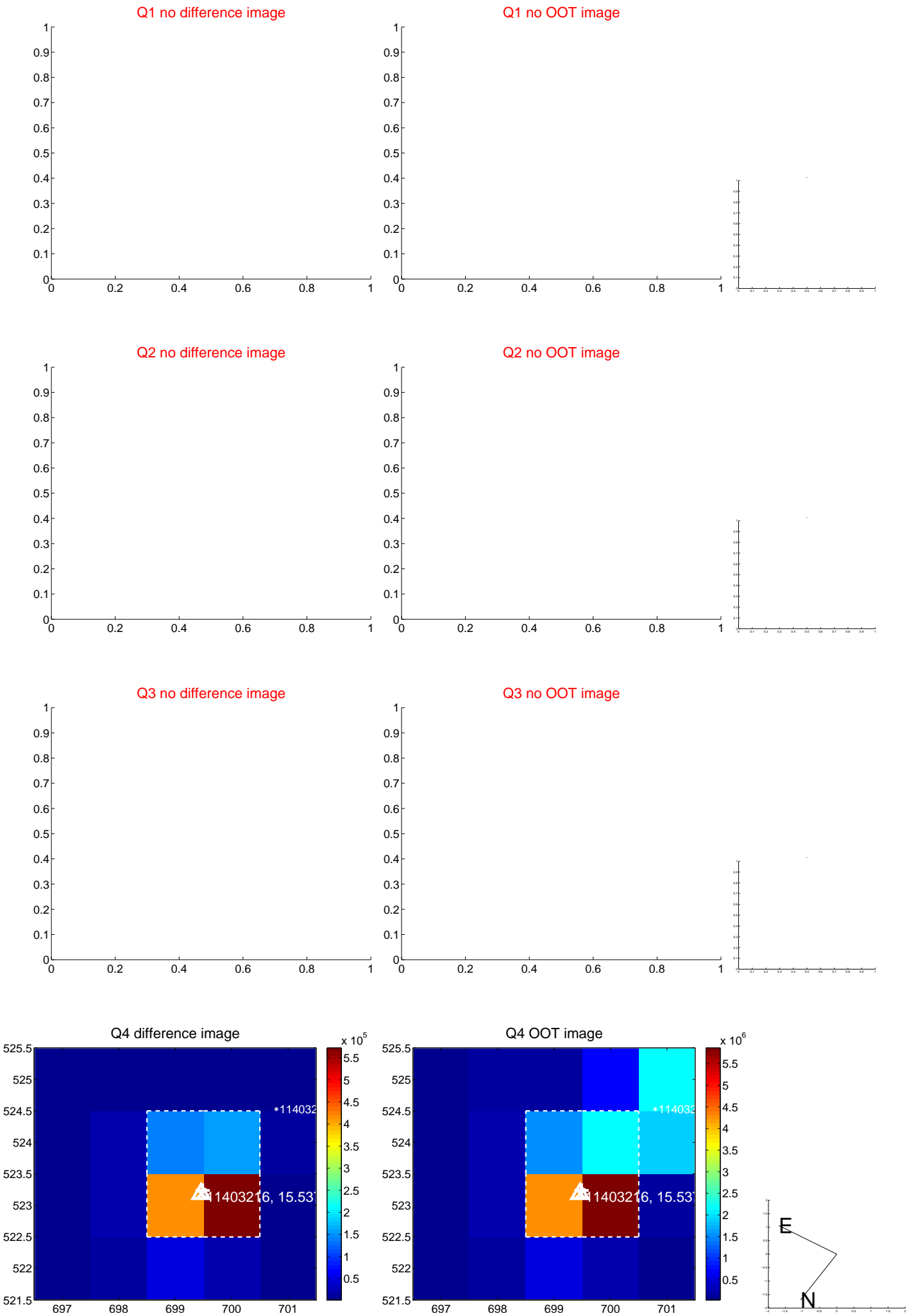
The direct PRF centroid is offset from the target star catalog position by about 0.21 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.180 \pm 0.070$	2.58	$0.050 \pm 0.069$	$0.173 \pm 0.070$
PRF-fit source offset from KIC position	$0.021 \pm 0.068$	0.31	$0.017 \pm 0.067$	$-0.013 \pm 0.068$
photometric centroid source offset	$0.41 \pm 0.00$	149.11	$-0.04 \pm 0.00$	$-0.41 \pm 0.00$

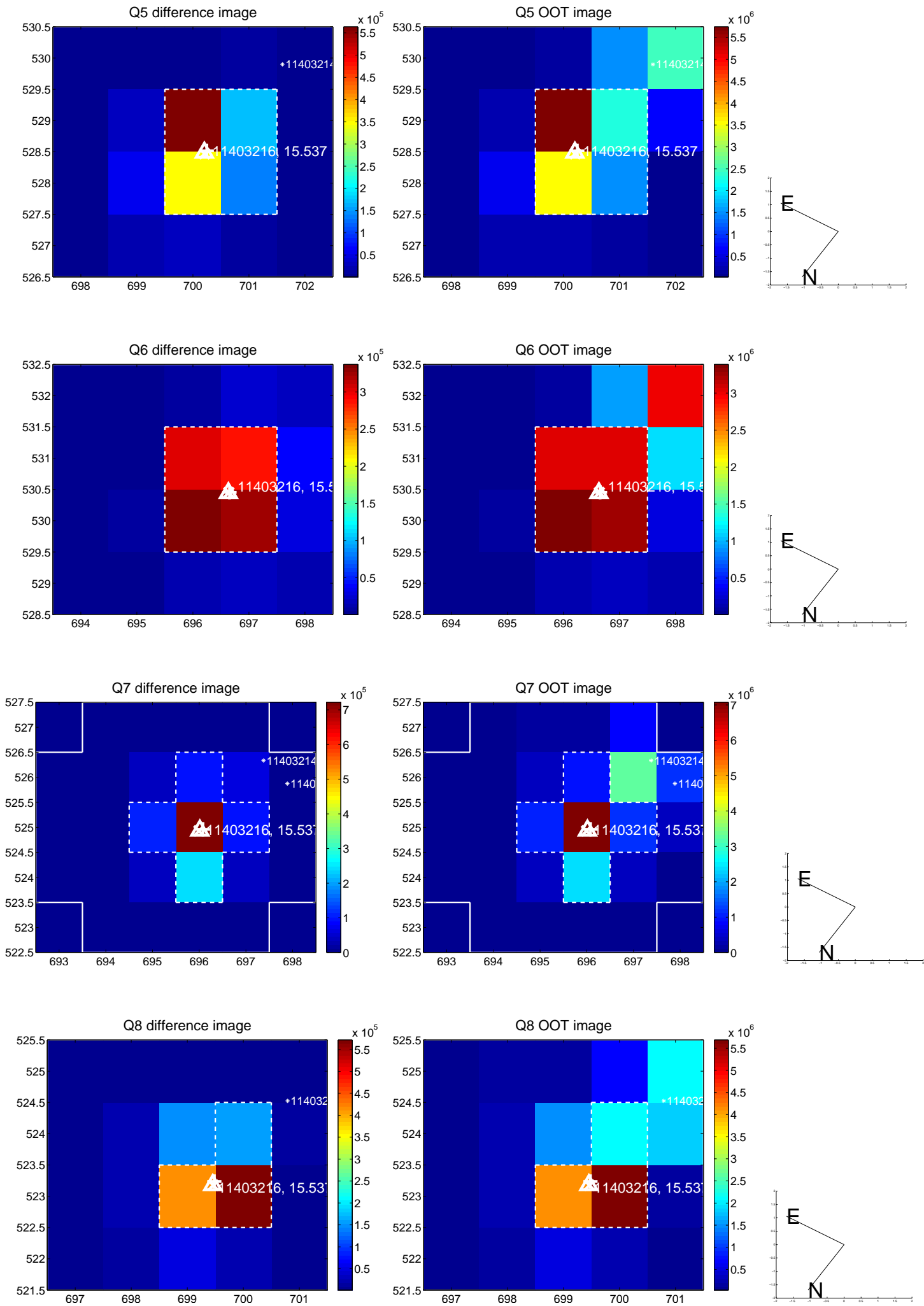


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

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

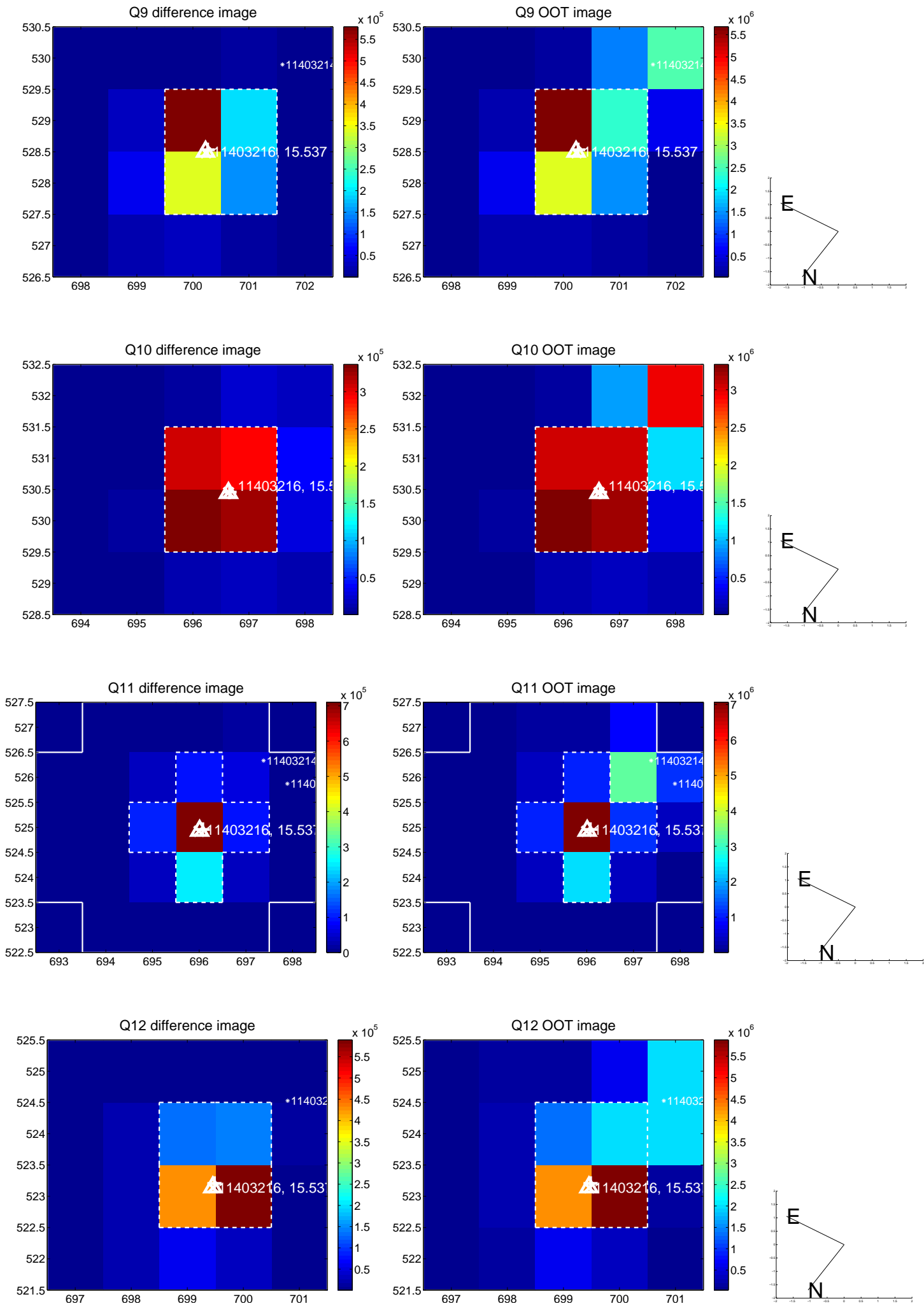


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

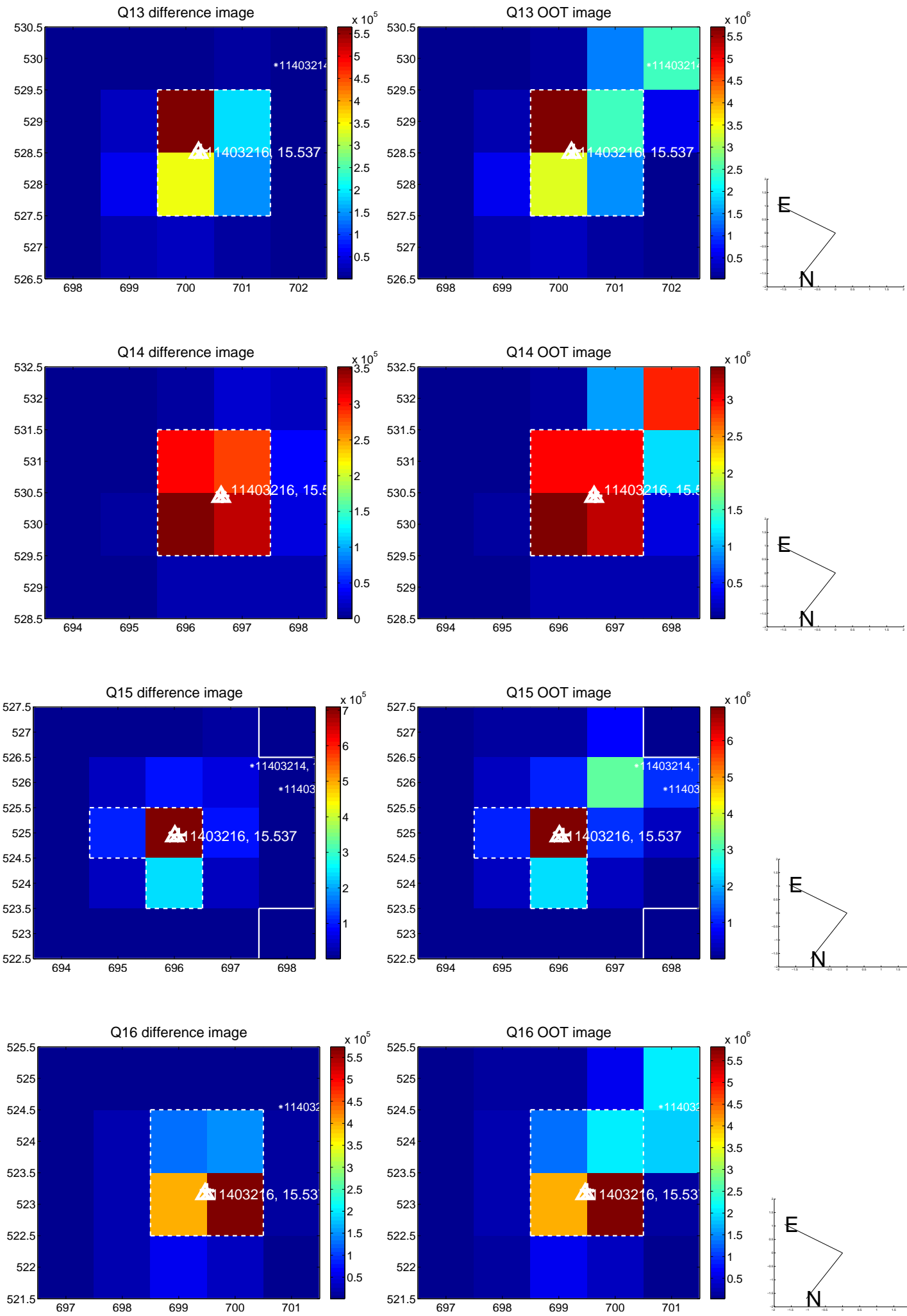




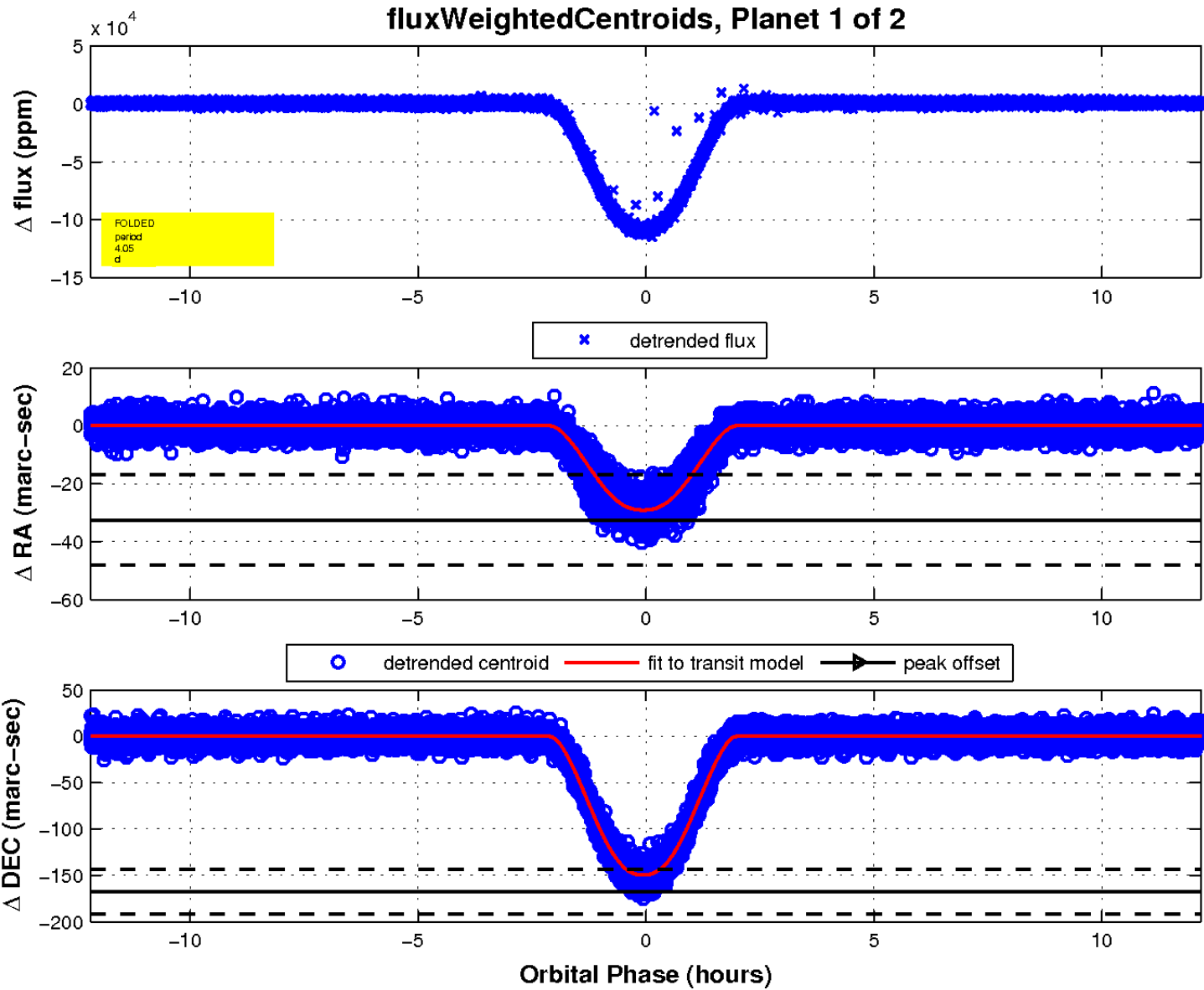
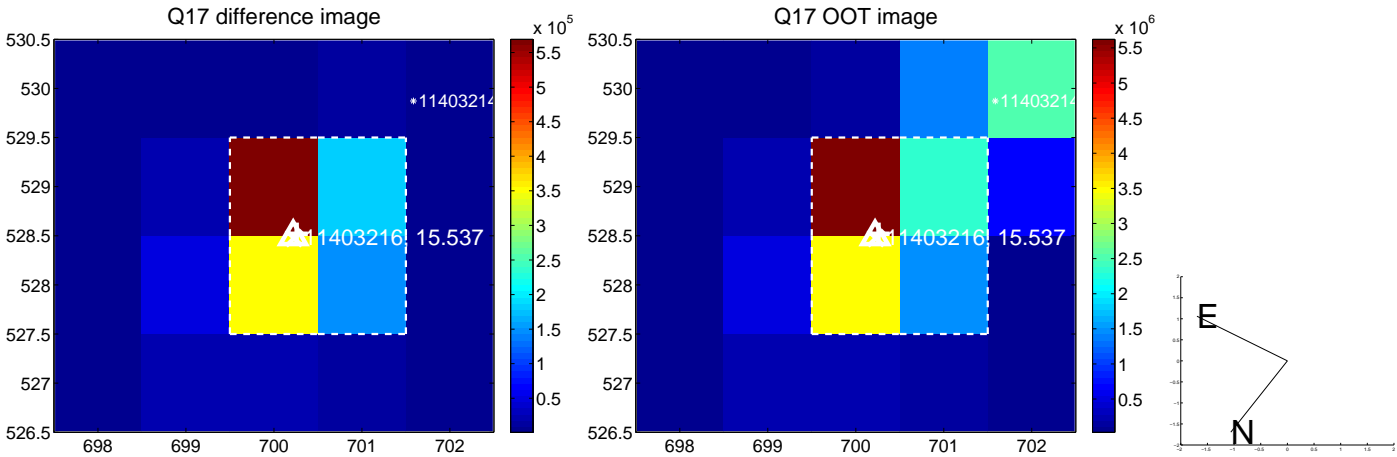
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

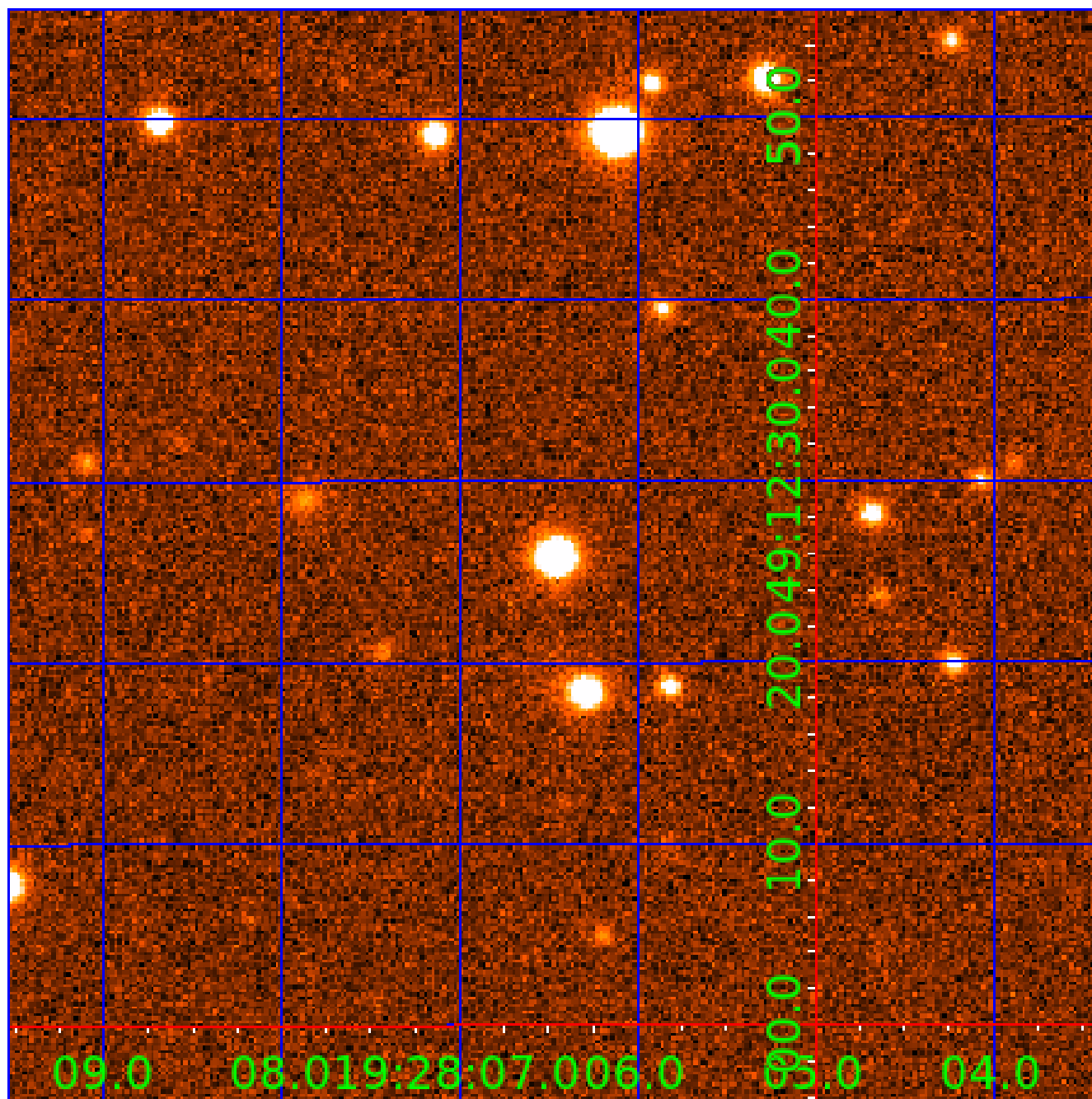


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 011403216

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
011403216-01	OBS	3561.01	4.053253	134.744977	109512.3	4.062	4482.9	3611.0	1.04	6022	37.30	477.01
011403216-02	OBS	No	4.053258	132.717853	3992.2	3.953	170.2	172.2	1.04	6022	8.09	477.01

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
011403216-01	OBS	FP	0.00	0	1	0	0	MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE
011403216-02	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 011403216-02

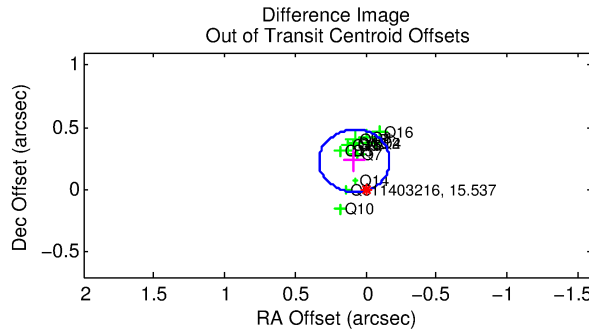
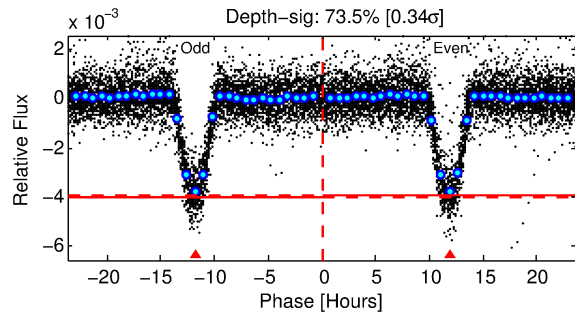
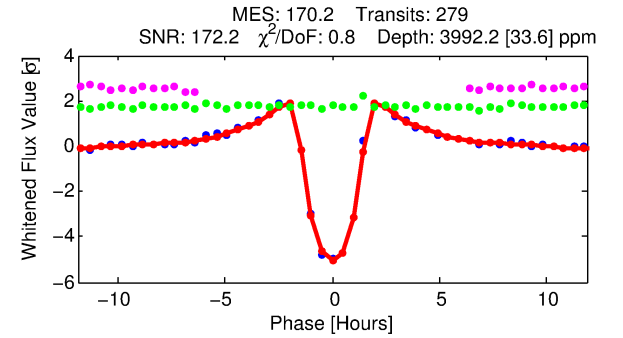
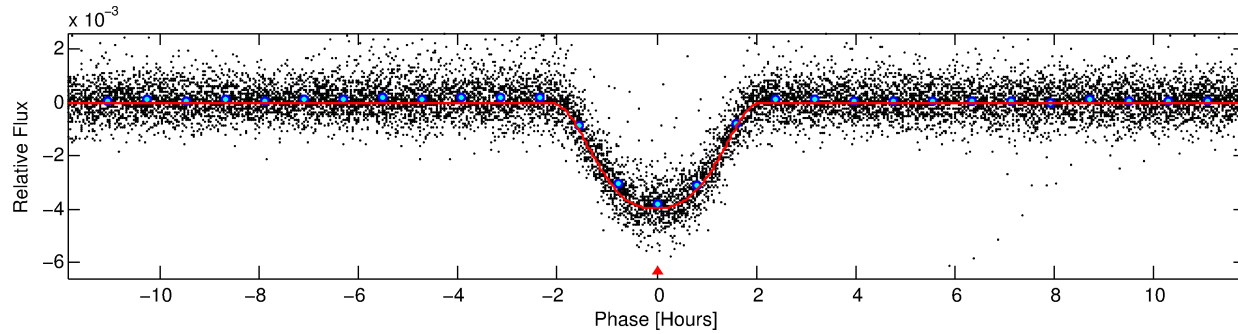
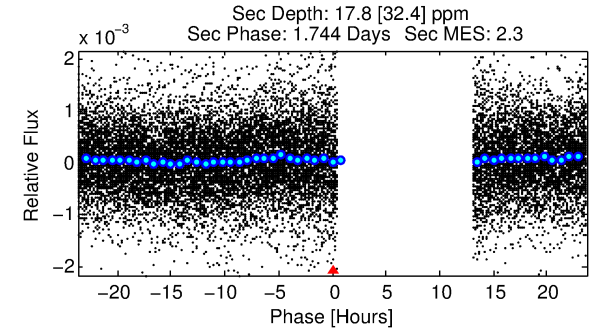
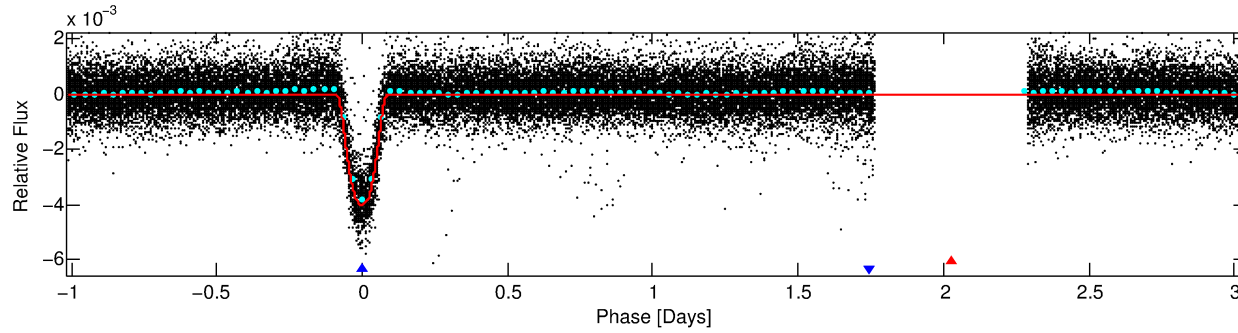
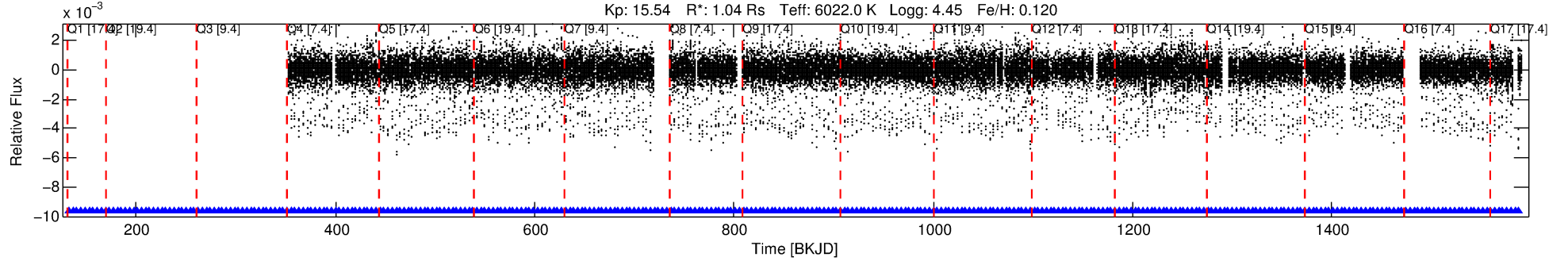
No Significant Match Found

# DV One-Page Summary

KIC: 11403216 Candidate: 2 of 2 Period: 4.053 d

KOI: K03561 Corr: No Ephemeris Match

Kp: 15.54 R\*: 1.04 Rs Teff: 6022.0 K Logg: 4.45 Fe/H: 0.120



## DV Fit Results:

Period = 4.05326 [0.00000] d  
Epoch = 132.7179 [0.0004] BKJD  
Rp/R\* = 0.0713 [0.0005]  
a/R\* = 4.32 [0.04]  
b = 0.93 [0.00]  
Seff = 477.01 [210.03]  
Teq = 1192 [131] K  
Rp = 8.09 [2.76] Re  
a = 0.0516 [0.0147] AU  
Ag = 0.40 [0.74] [-0.81σ]  
Teffp = 1465 [667] K [0.40σ]

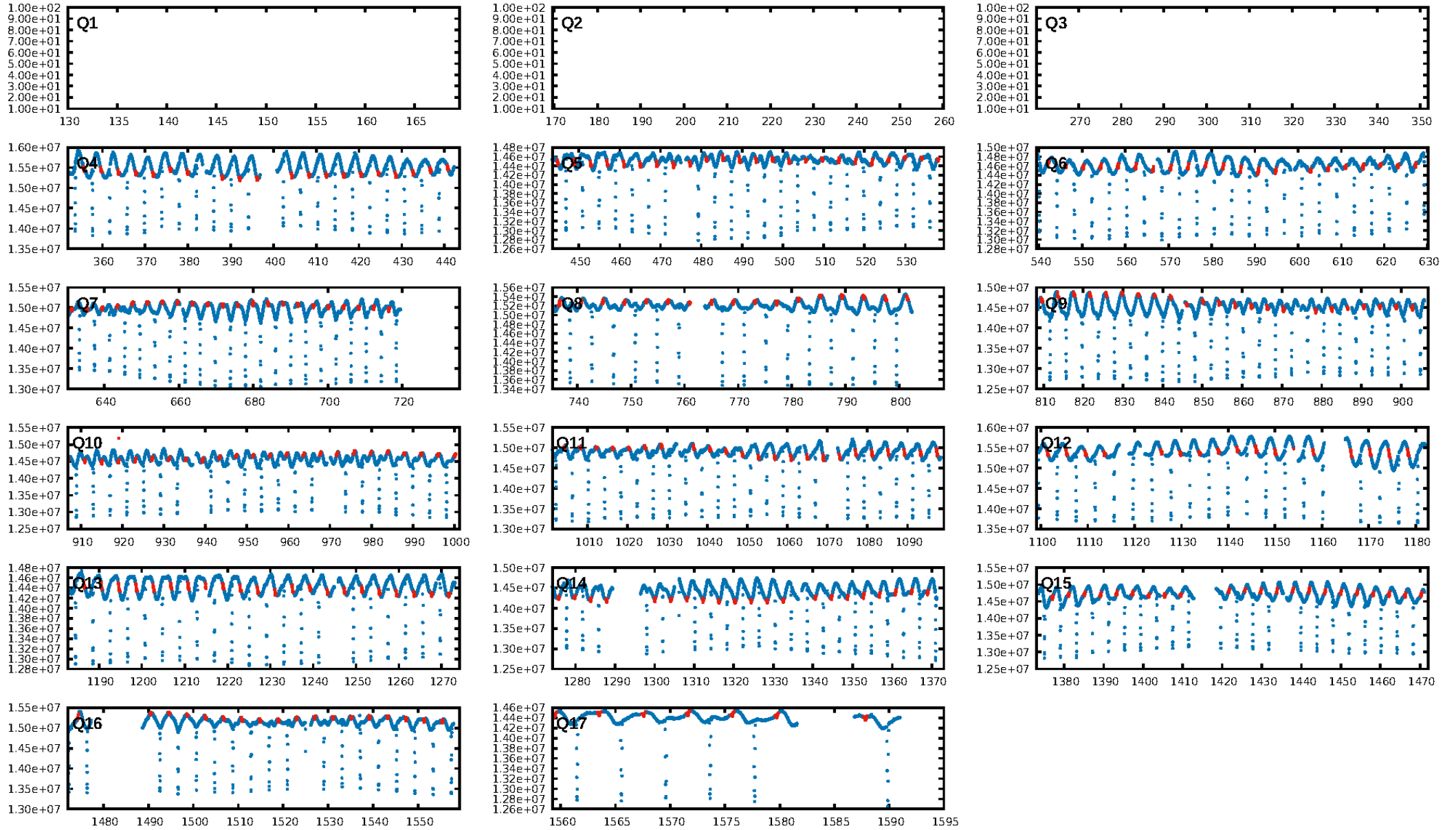
## DV Diagnostic Results:

ShortPeriod-sig: 0.0% [0.00σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [272/272]  
GhostDiagnostic-chr: 3.29  
Centroid-sig: 0.0%  
Centroid-so: 0.413 arcsec [5.78σ]  
OotOffset-rm: 0.244 arcsec [2.93σ]  
KicOffset-rm: 0.060 arcsec [0.84σ]  
OotOffset-st: 3/3/4/4 [14]  
KicOffset-st: 3/3/4/4 [14]  
DiffImageQuality-fgm: 1.00 [14/14]  
DiffImageOverlap-fno: 1.00 [14/14]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 19:57:19 Z

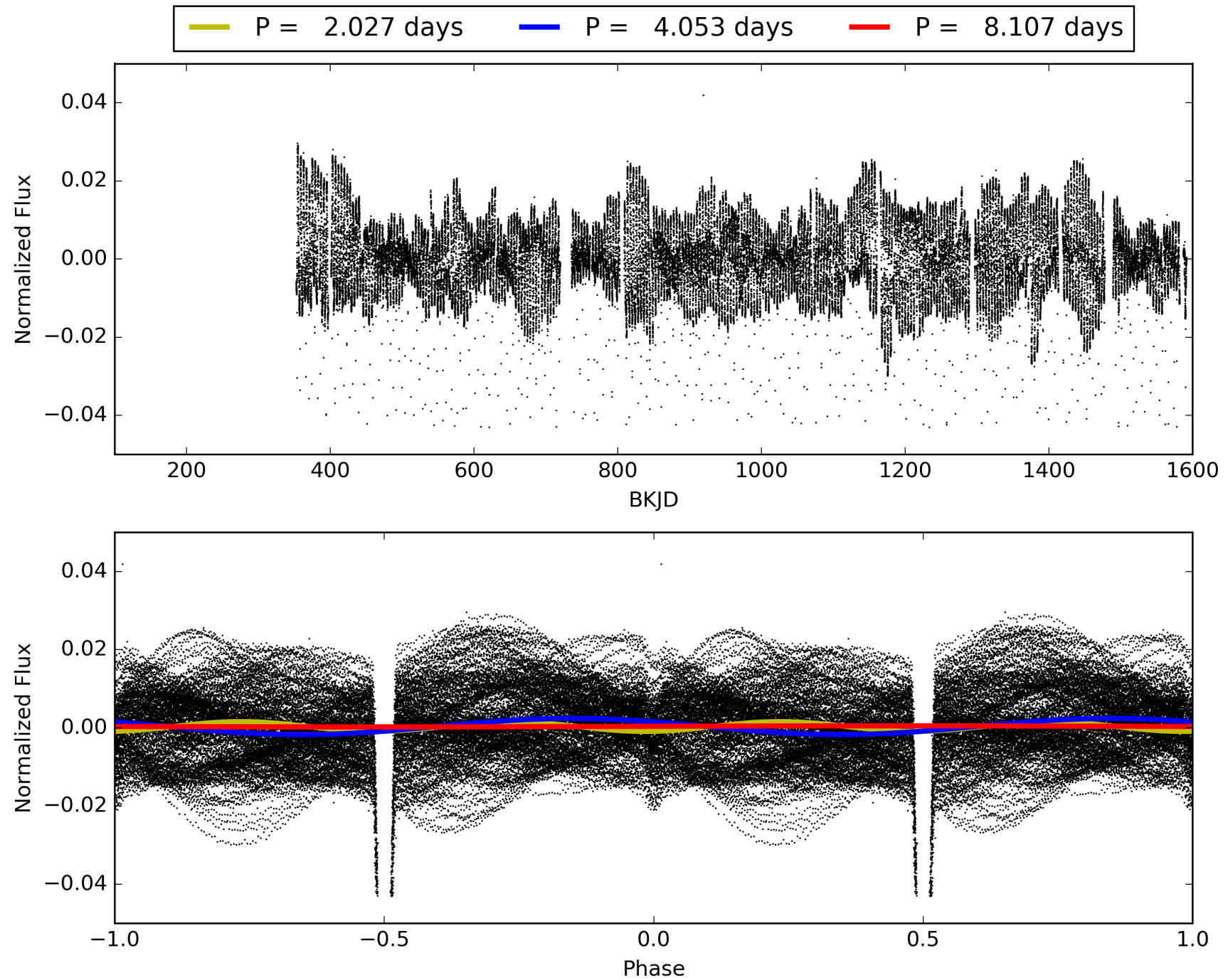
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 011403216-02, PDC Light Curves





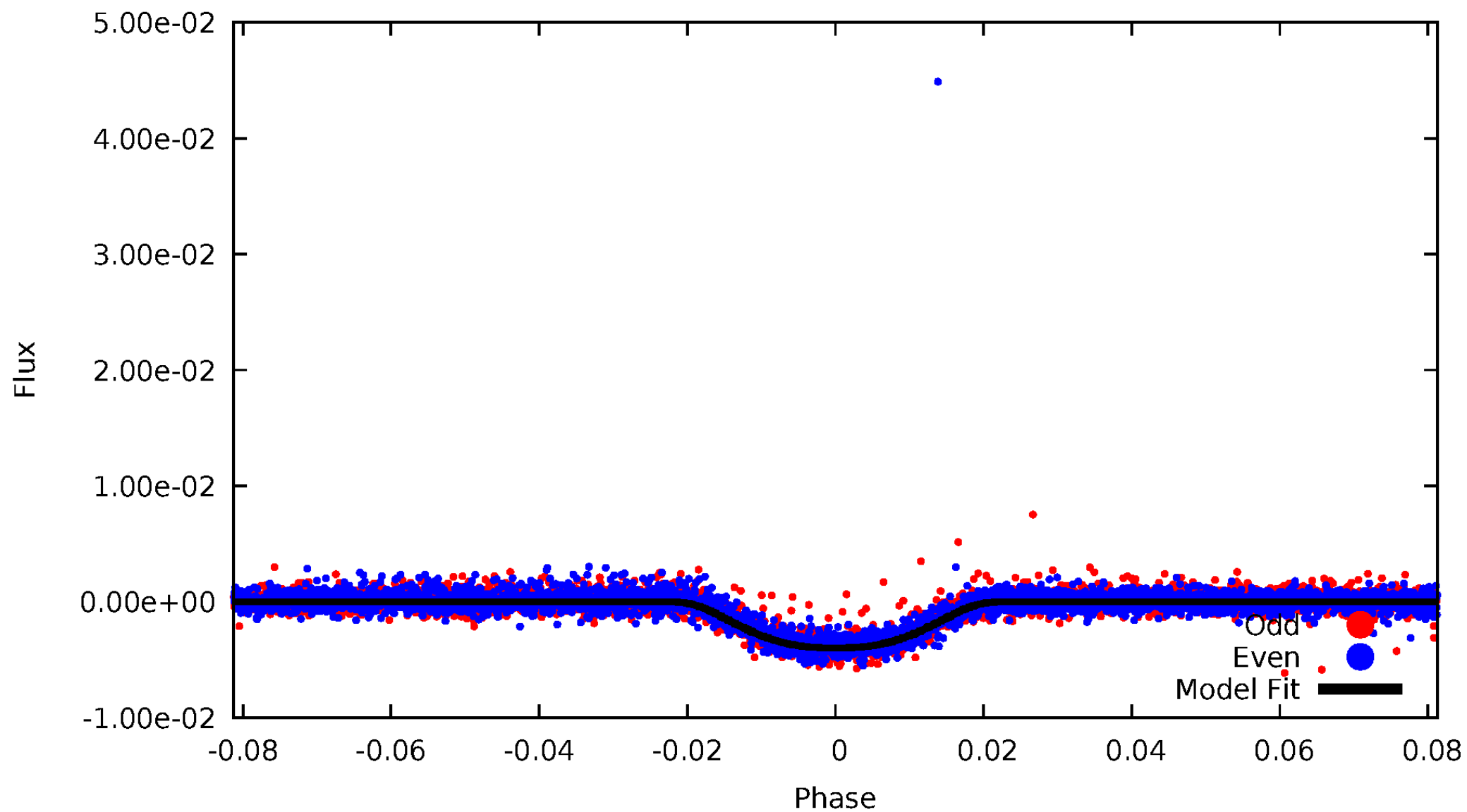
TCE 011403216-02





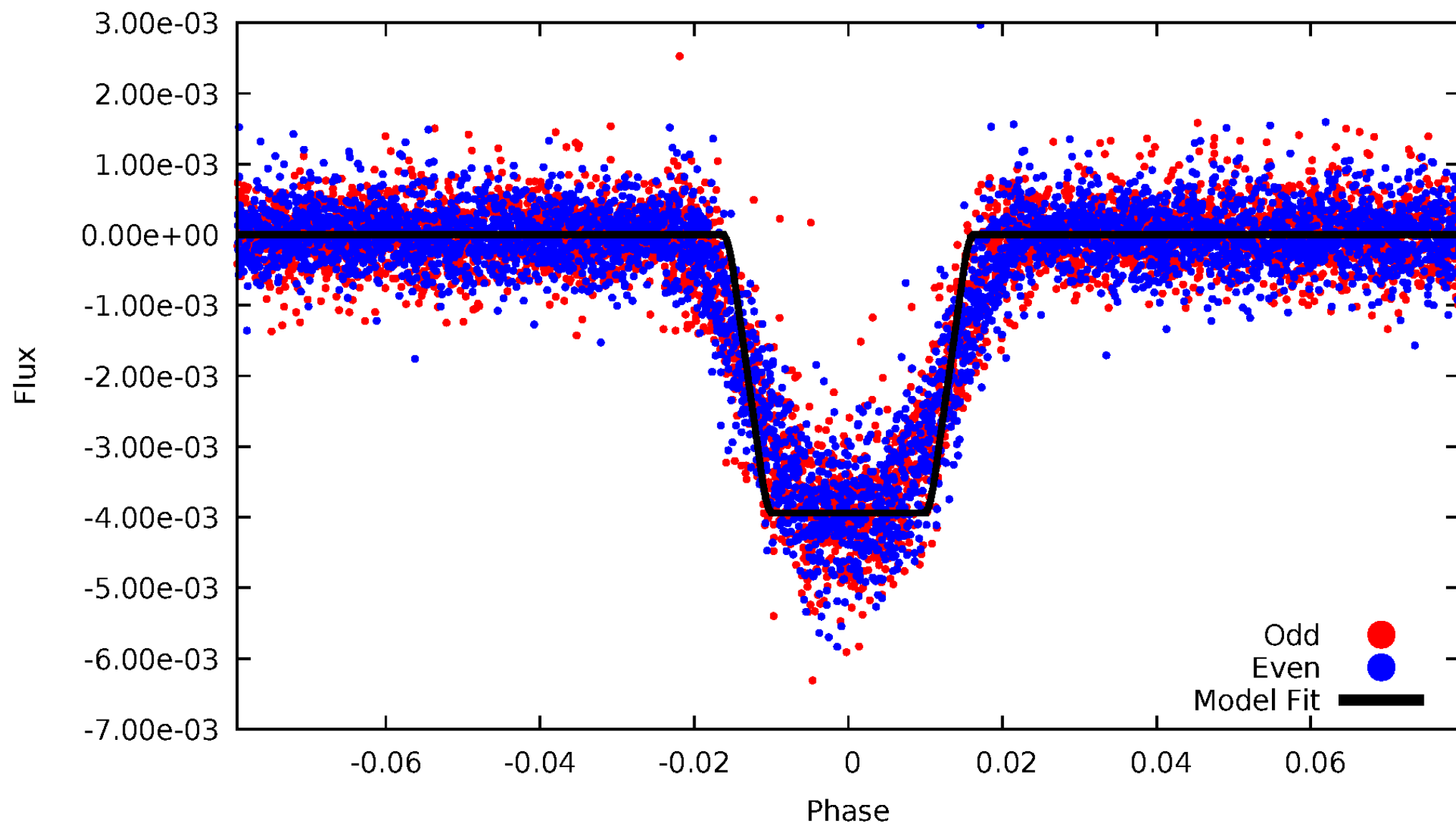
# DV Odd/Even

TCE 011403216-02



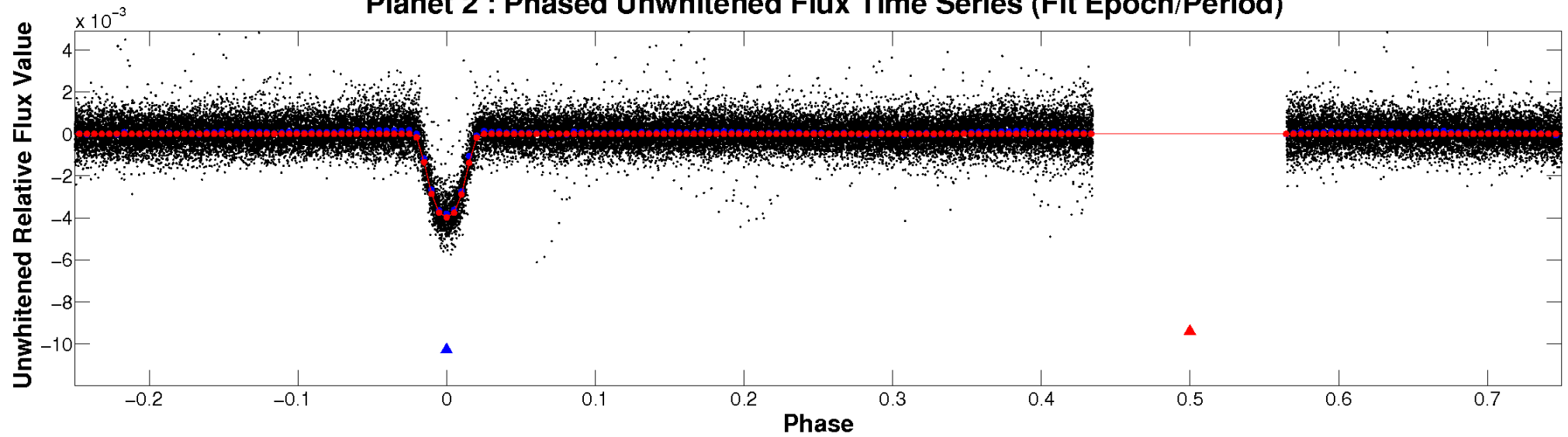
# ALT Odd/Even

TCE 011403216-02

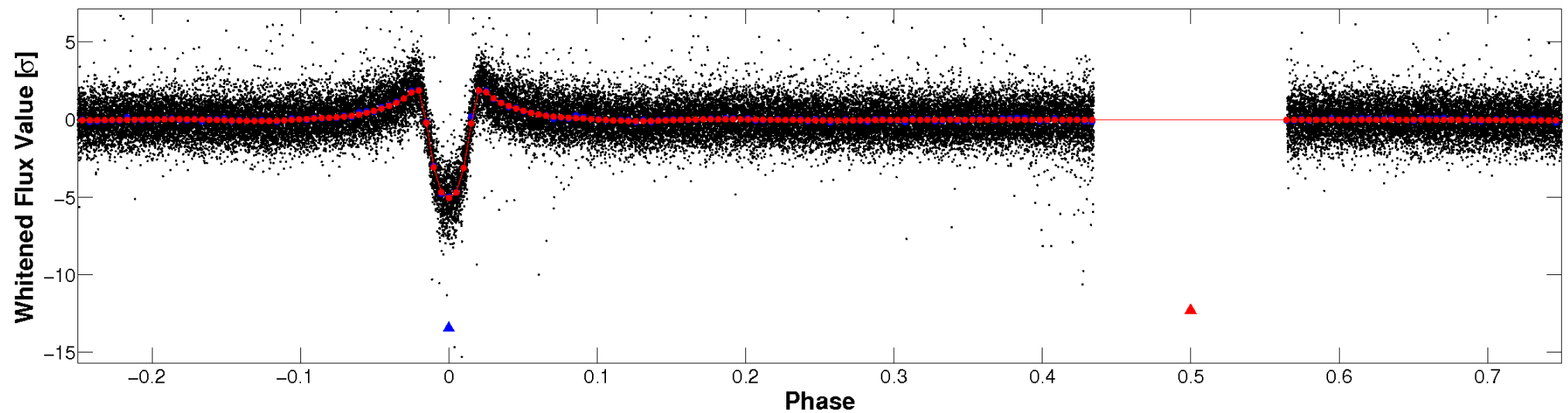


# Non-Whitened Vs. Whitened Light Curve

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

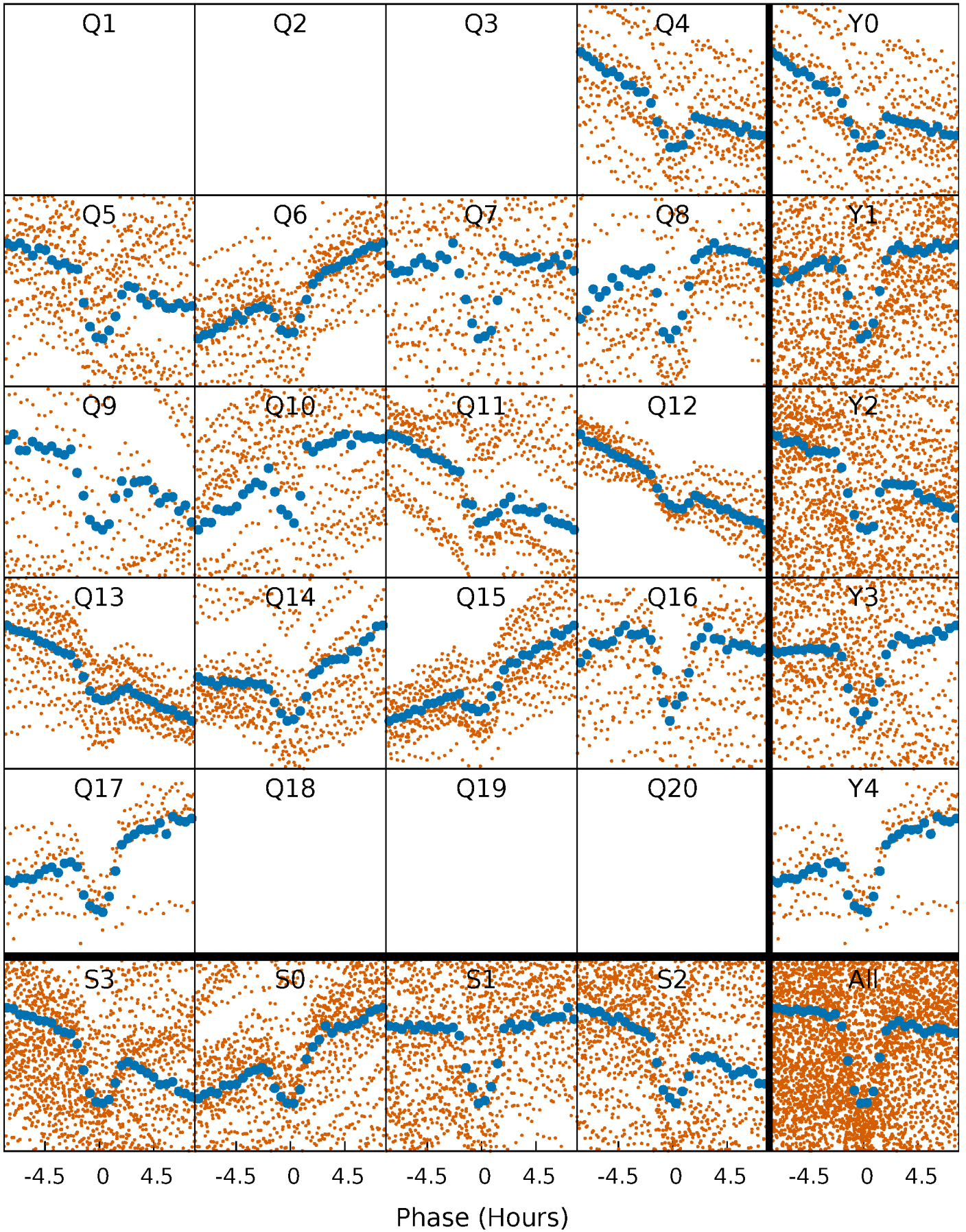


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



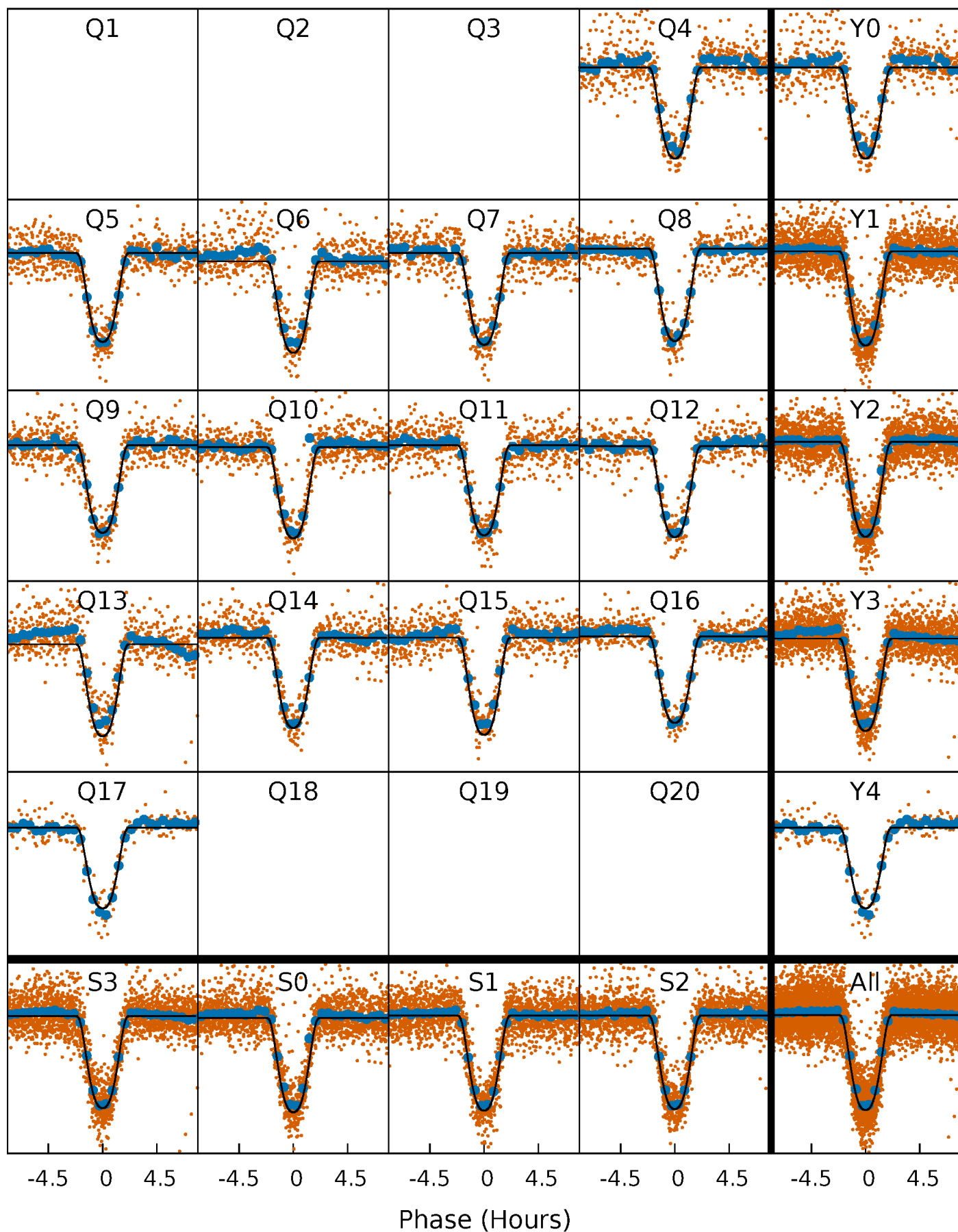
# PDC Quarter-Phased Transit Curves

TCE 011403216-02   P= 4.053258 Days    $T_0=132.717853$  (BKJD)



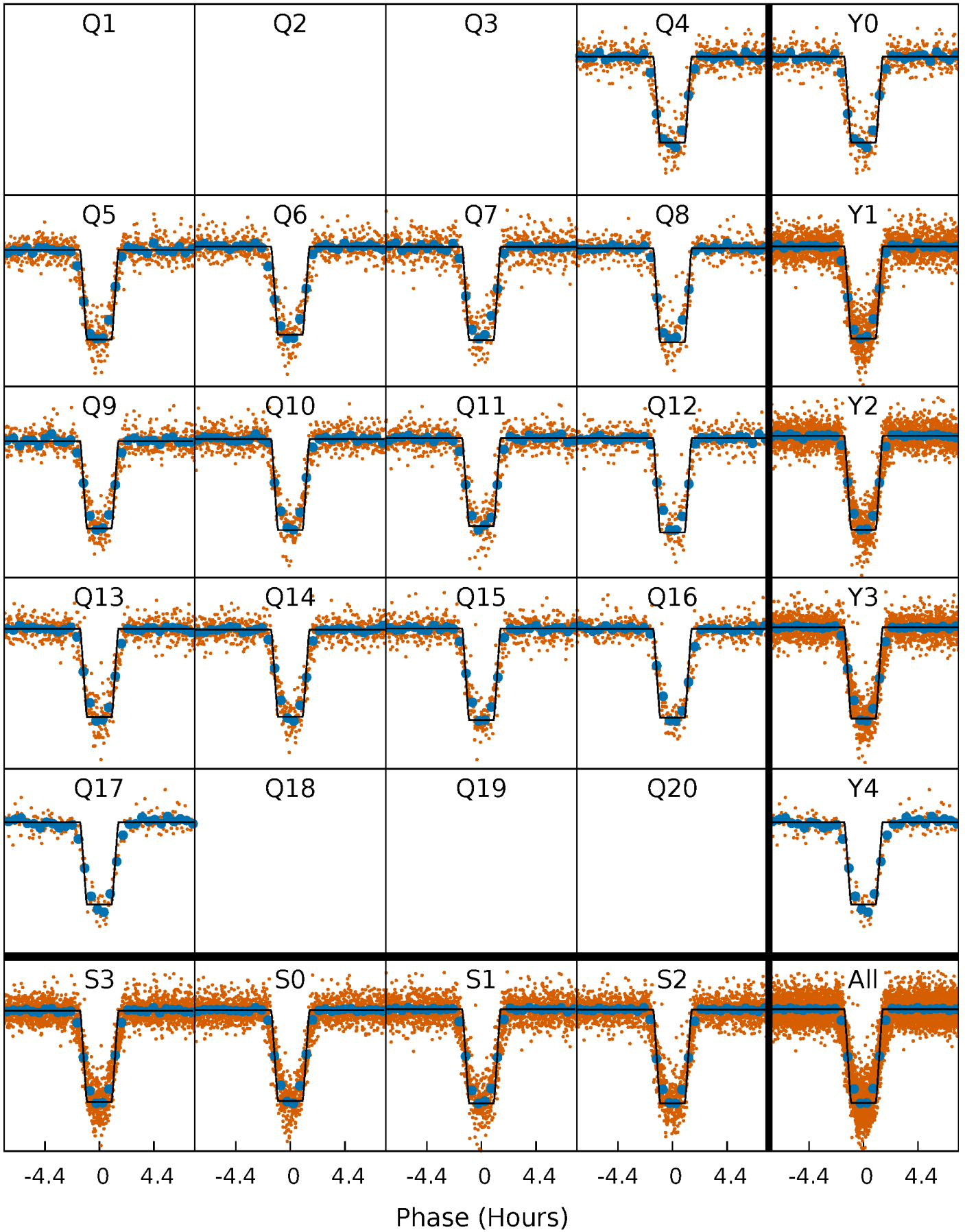
# DV Quarter-Phased Transit Curves

TCE 011403216-02   P= 4.053258 Days    $T_0=132.717853$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 011403216-02 P= 4.053225 Days  $T_0=132.724480$  (BKJD)

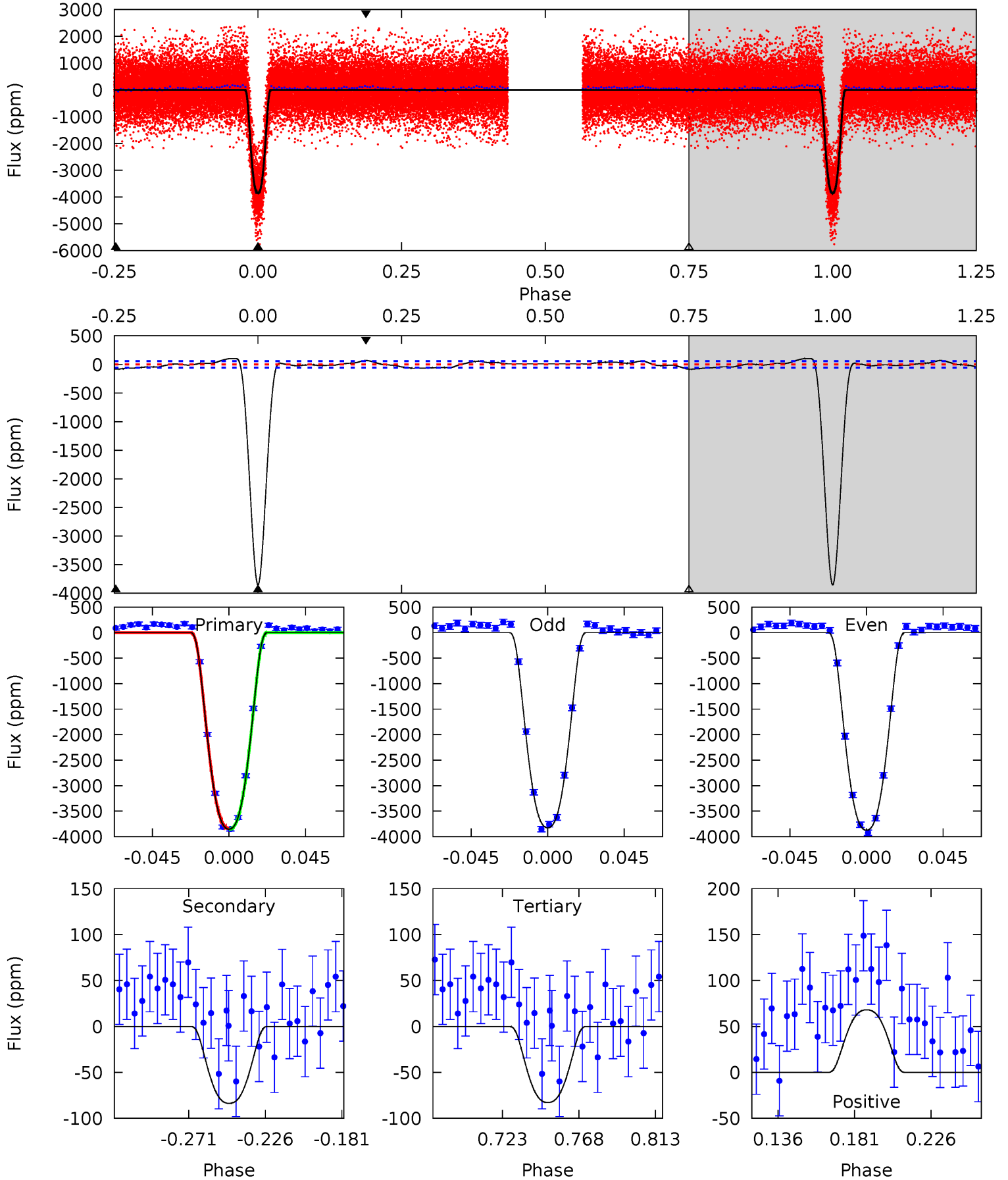




# DV Model-Shift Uniqueness Test

011403216-02, P = 4.053258 Days, E = 132.717853 Days

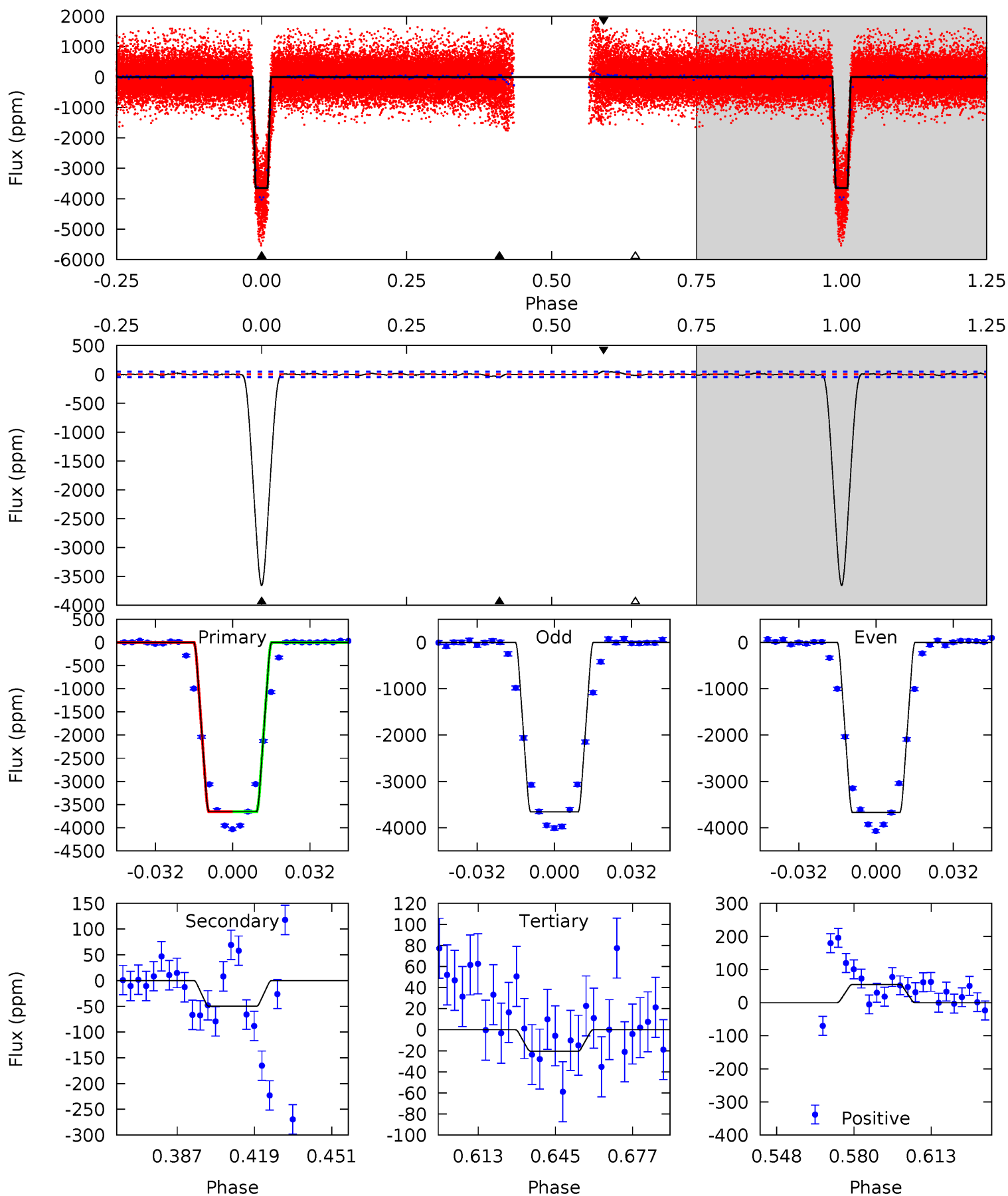
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
321.3	6.99	6.91	5.68	4.73	2.00	3.20	314.3	315.6	0.08	1.31	1.92	0.98	0.03	0.84



# Alt Model-Shift Uniqueness Test

011403216-02, P = 4.053225 Days, E = 132.724480 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
368.0	5.03	2.05	5.51	4.80	2.14	1.16	366.0	362.5	2.98	-0.48	0.49	1.01	0.01	0.07





### Stellar Parameters For KIC 011403216

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6022^{+190}_{-232}$	$4.453^{+0.056}_{-0.224}$	$0.120^{+0.200}_{-0.300}$	$1.039^{+0.355}_{-0.118}$	$1.116^{+0.136}_{-0.151}$	$1.402^{+0.404}_{-0.739}$
	+3%/-4%	+1%/-5%	+167%/-250%	+34%/-11%	+12%/-14%	+29%/-53%
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 011403216-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-84 \pm 12$	$8.32^{+1.58}_{-0.72}$	$1699^{+145}_{-89}$	$2796^{+80}_{-98}$	$1.681^{+0.463}_{-0.455}$
Alt.	$-50 \pm 10$	$7.24^{+1.31}_{-0.55}$	$1696^{+132}_{-94}$	$2670^{+106}_{-123}$	$1.294^{+0.404}_{-0.378}$

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

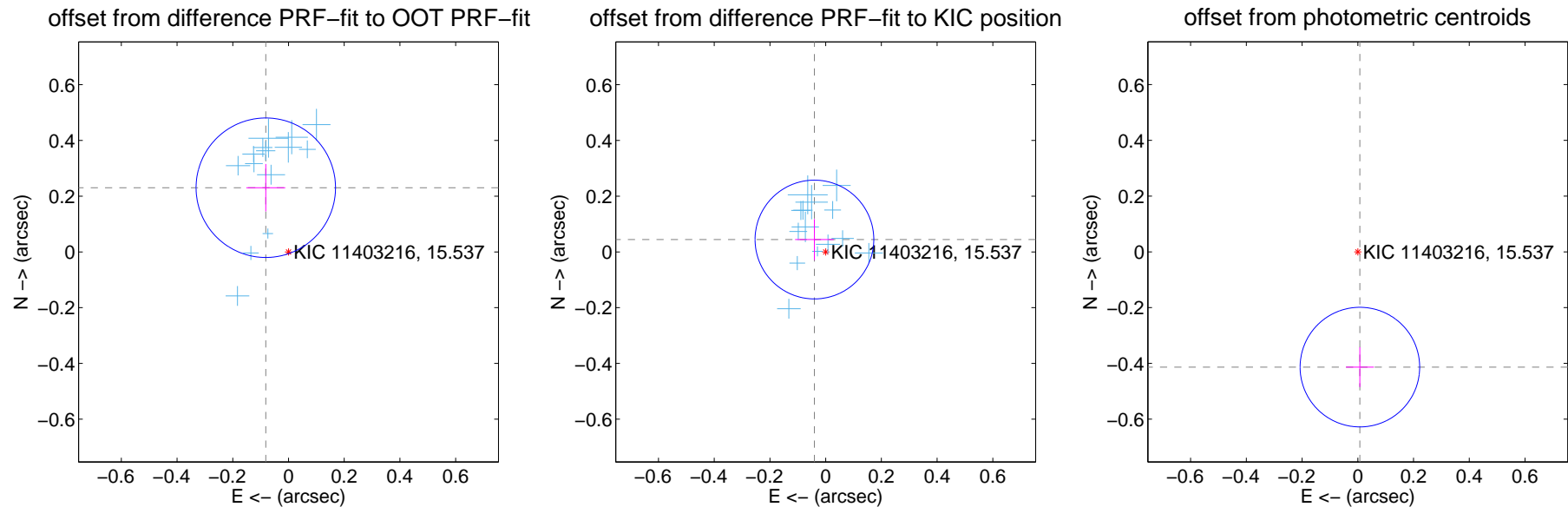
## DV Centroid Data

Supplemental centroid analysis for 011403216-02. Kepler magnitude: 15.54. Transit SNR 172.16

There are 14 quarters with good PRF difference image offsets

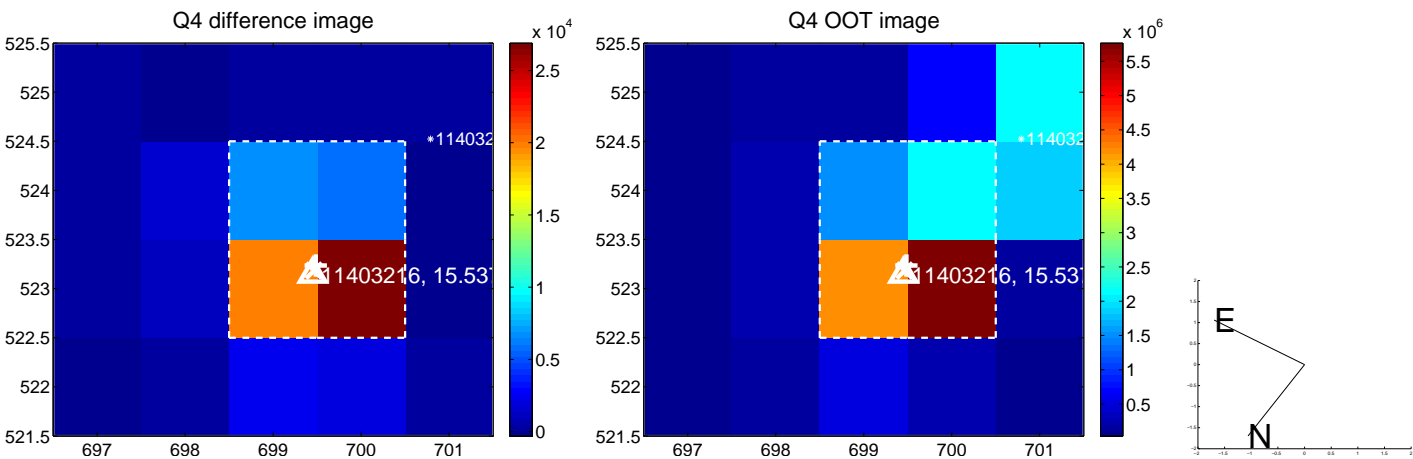
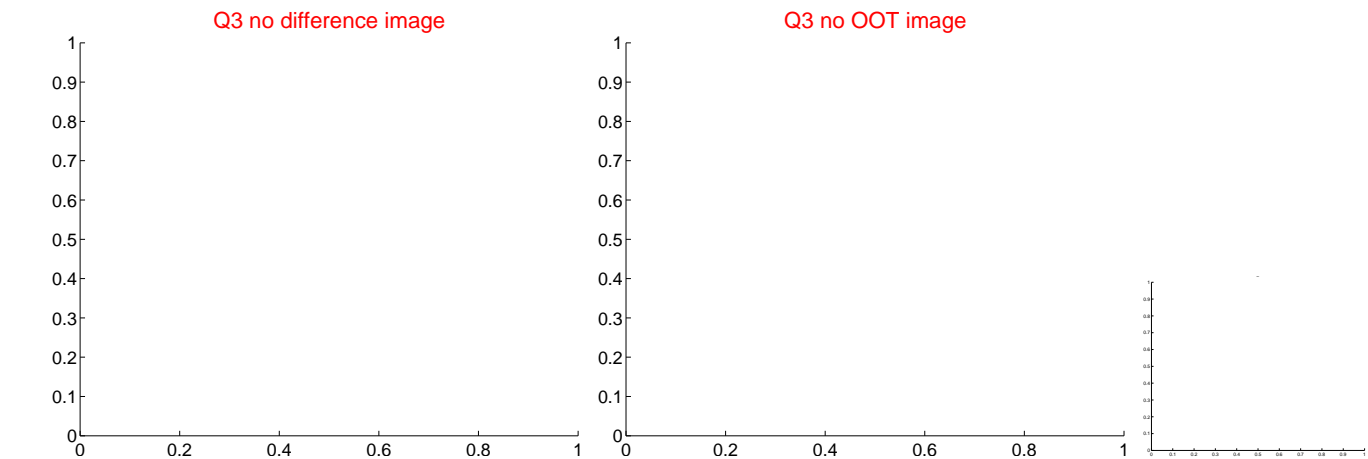
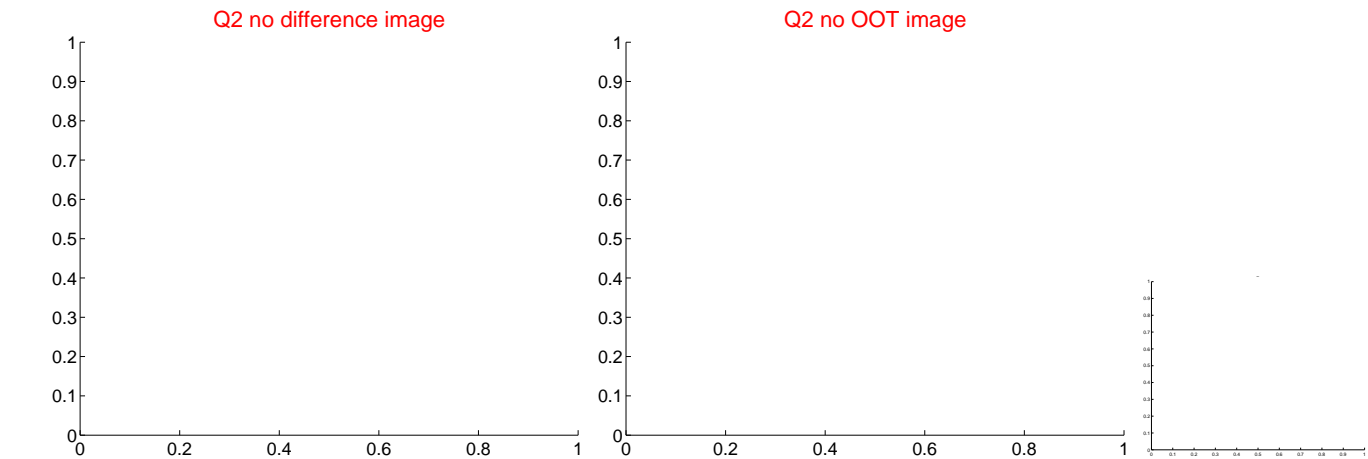
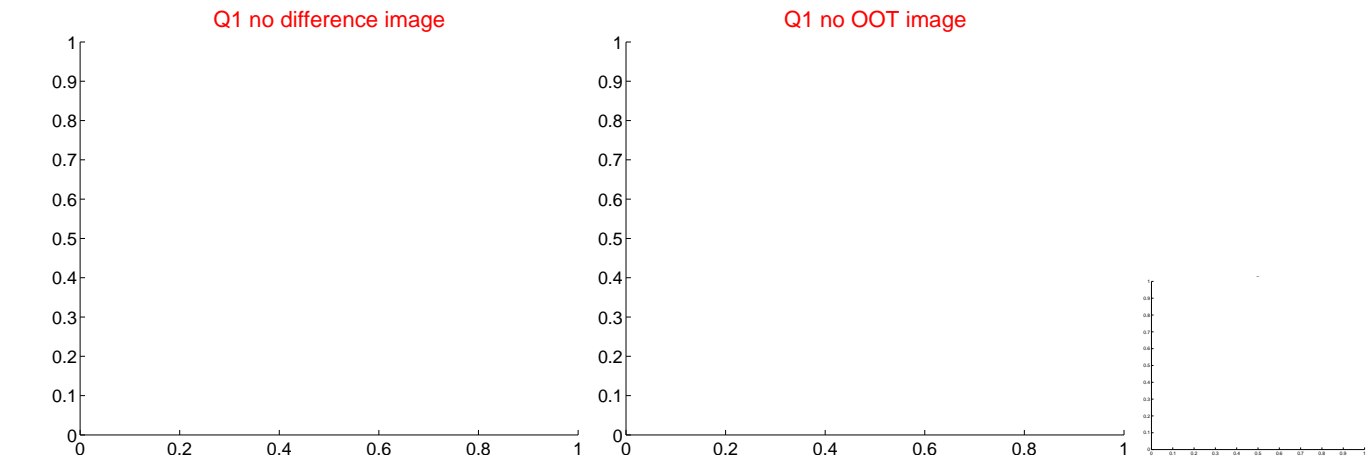
The direct PRF centroid is offset from the target star catalog position by about 0.20 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.244 \pm 0.083$	2.93	$0.081 \pm 0.070$	$0.230 \pm 0.085$
PRF-fit source offset from KIC position	$0.060 \pm 0.071$	0.84	$0.040 \pm 0.069$	$0.044 \pm 0.074$
photometric centroid source offset	$0.41 \pm 0.07$	5.78	$-0.01 \pm 0.05$	$-0.41 \pm 0.07$

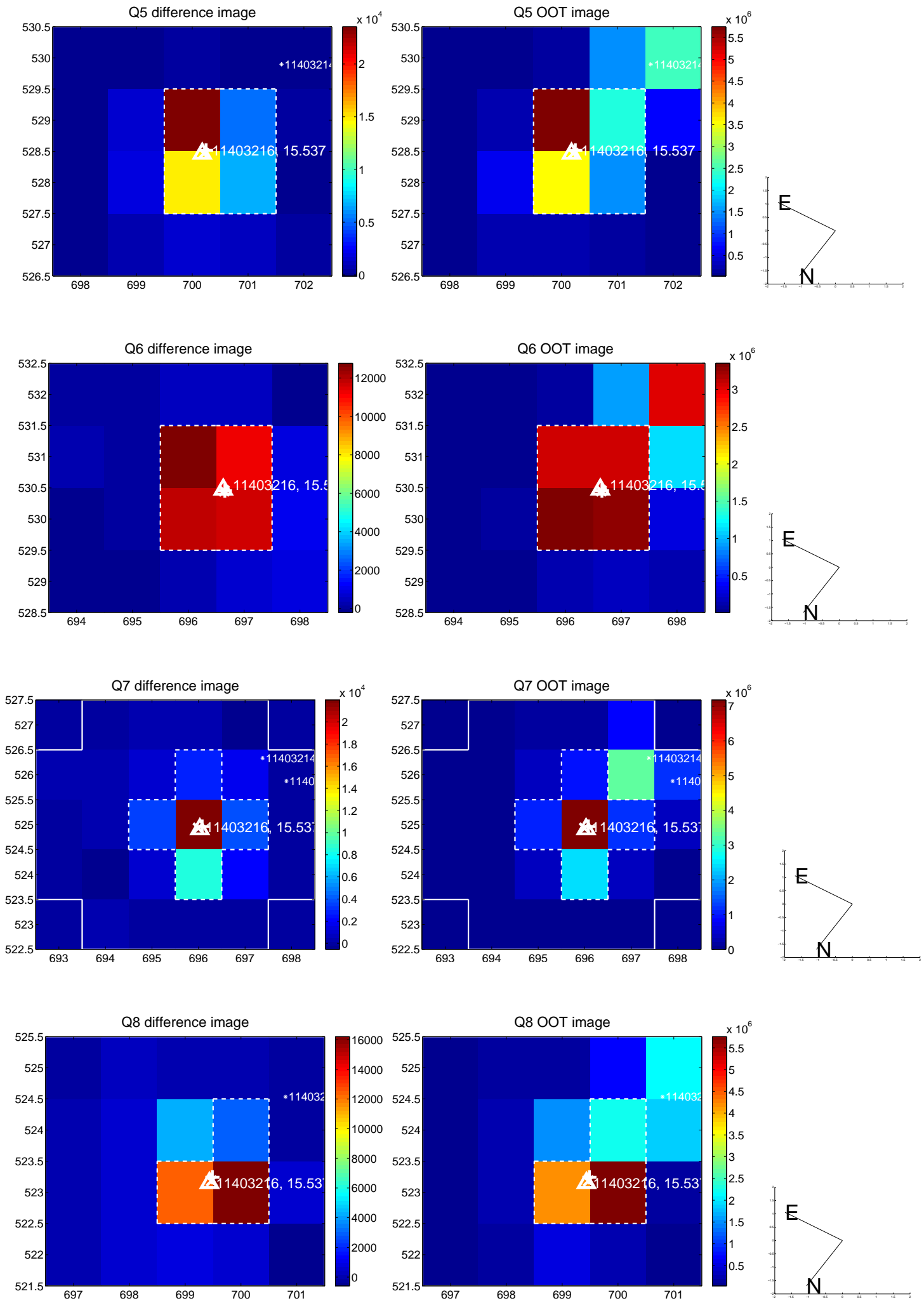


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

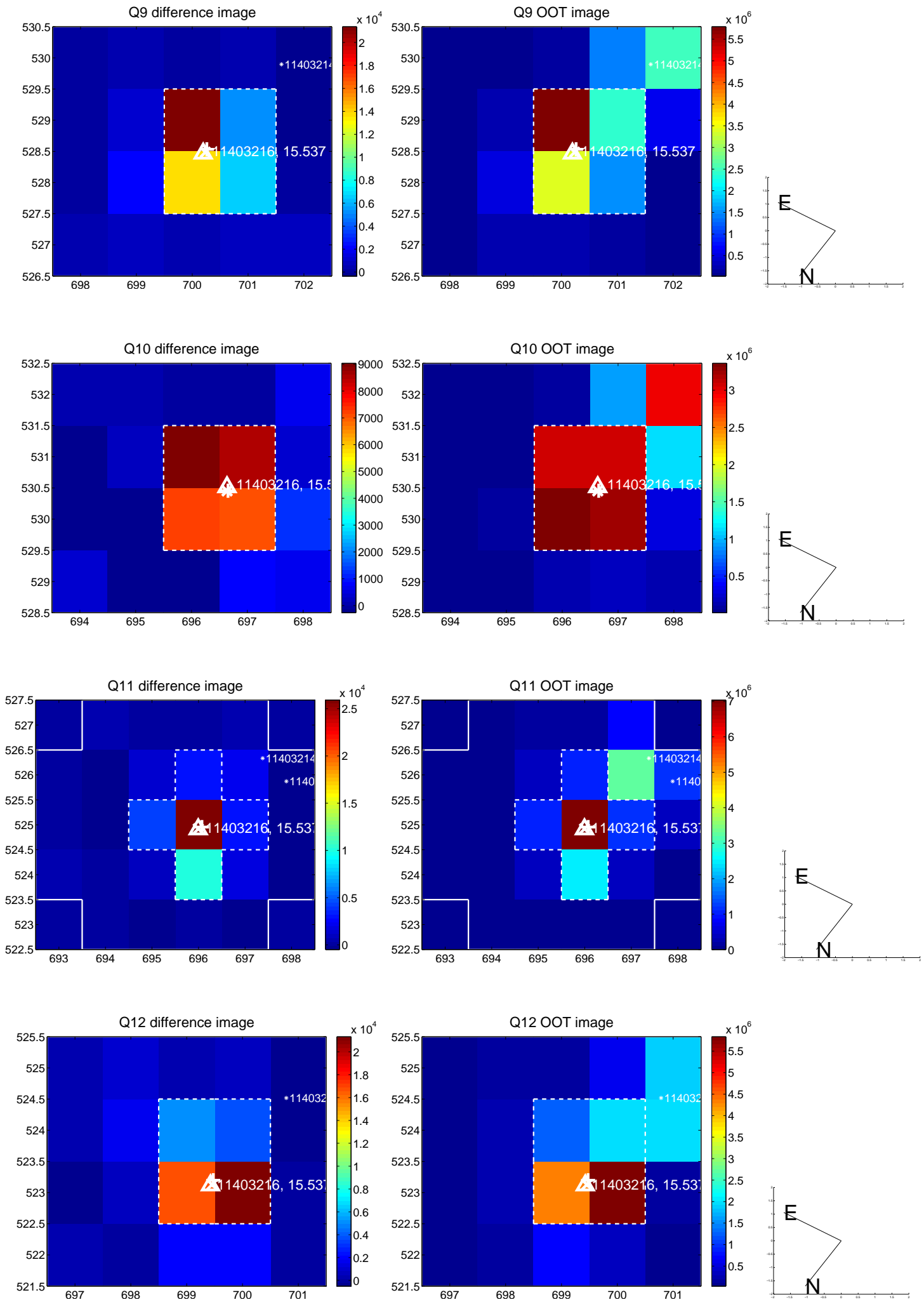
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



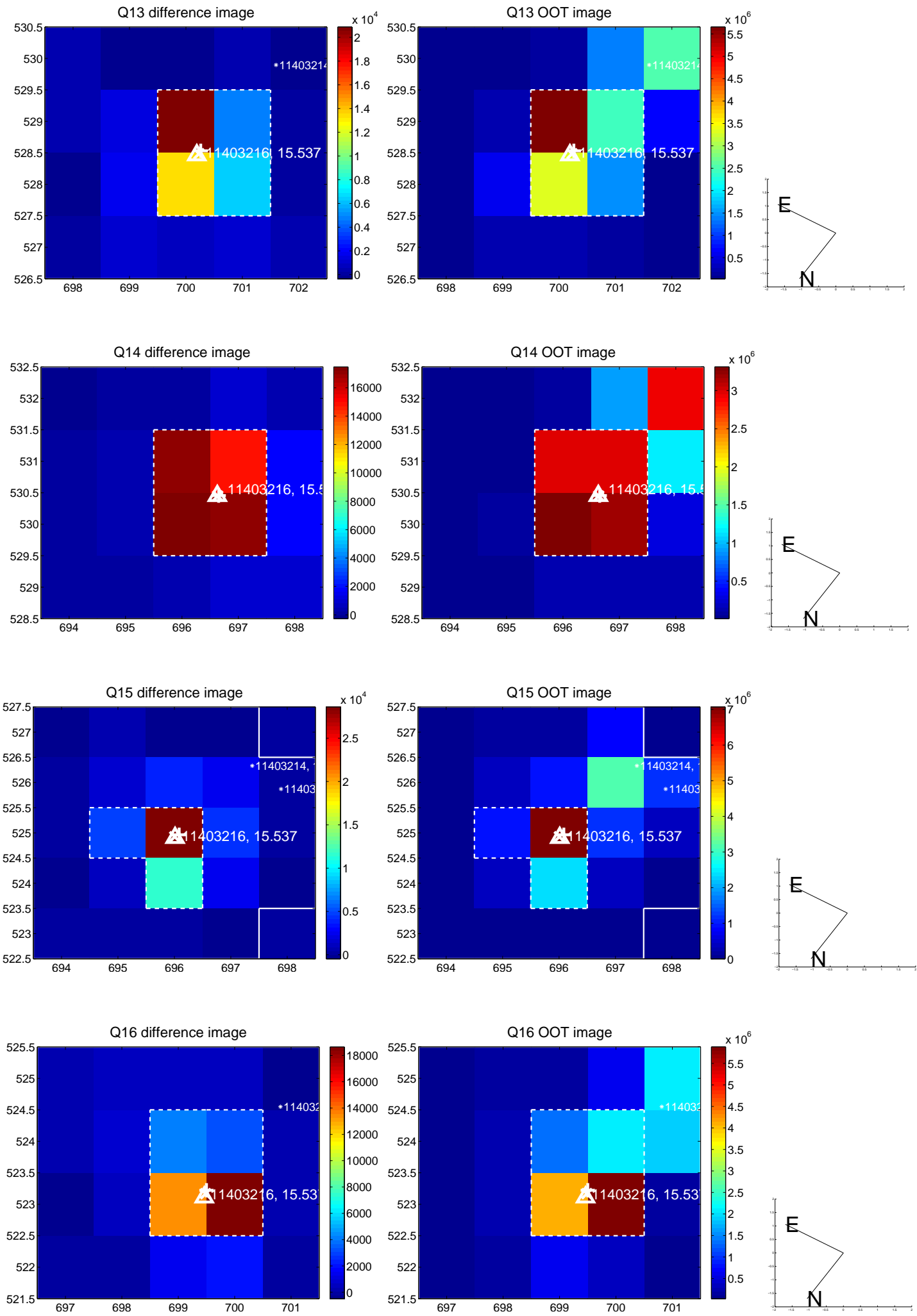
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



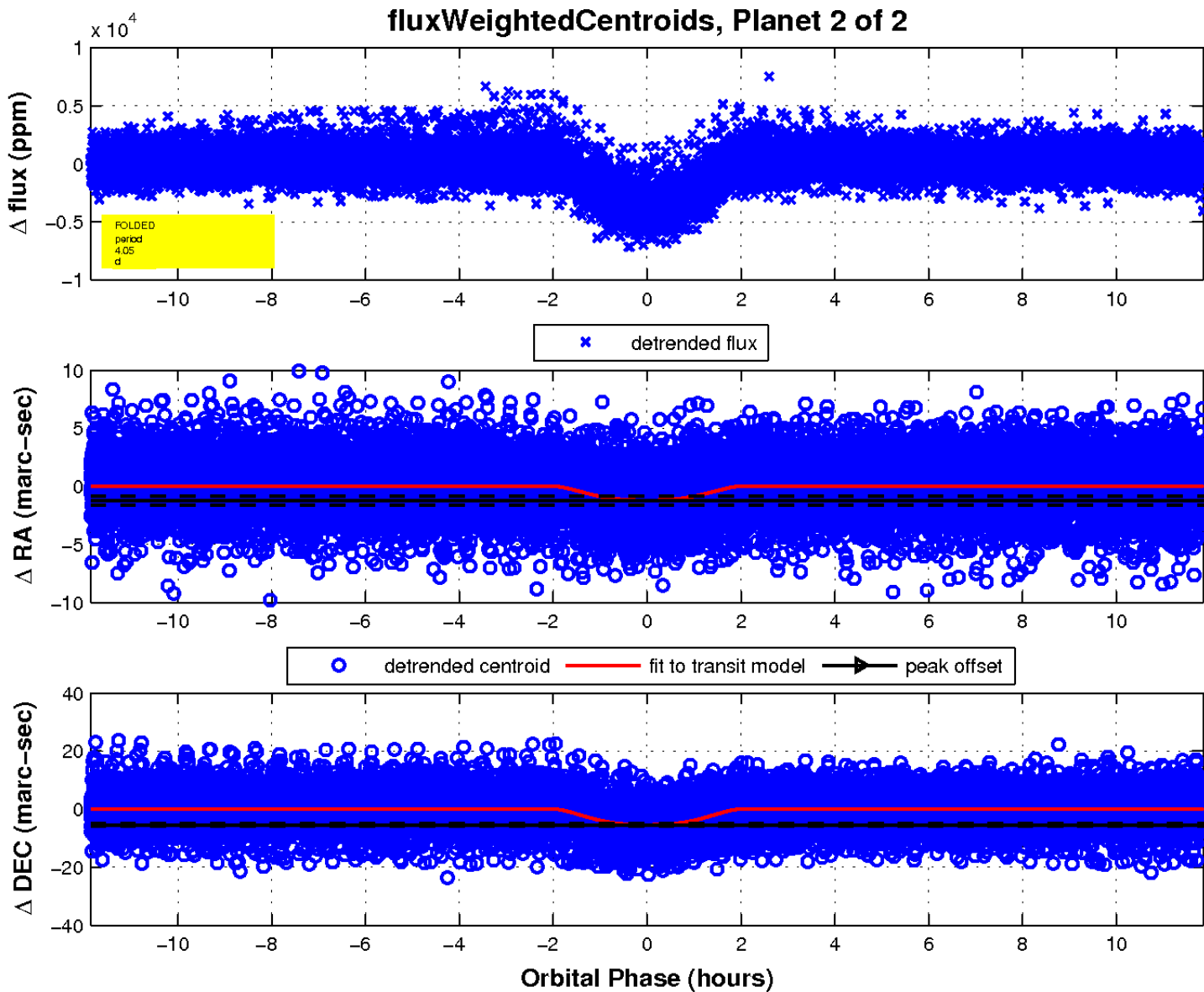
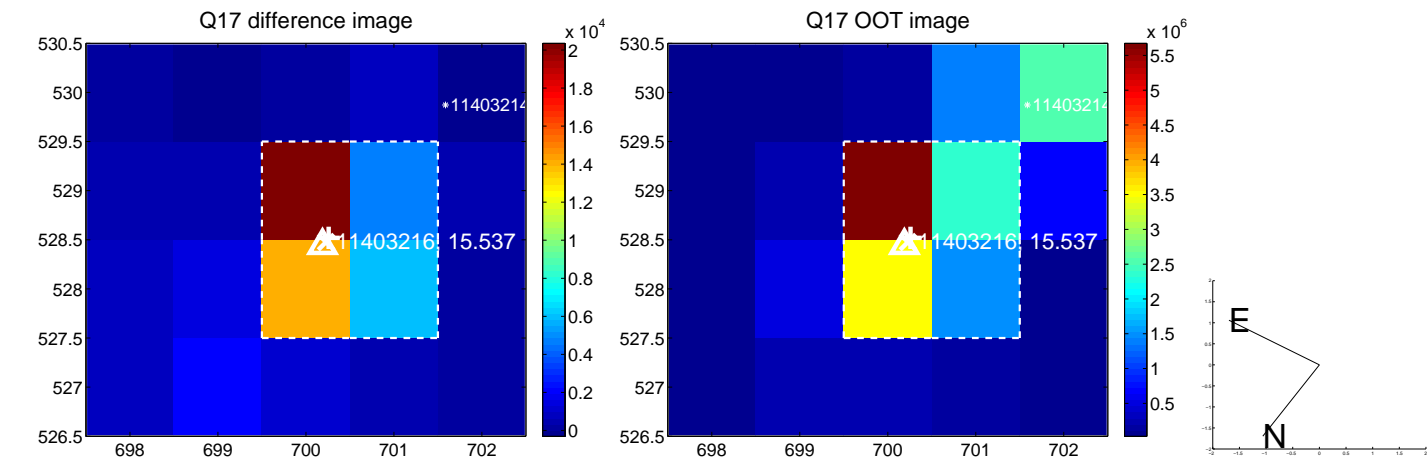
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

