

# KIC 012010534

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
012010534-01	OBS	6092.01	2.581585	132.950638	168544.2	4.835	3224.0	3165.6	0.99	5720	40.52	735.80
012010534-02	OBS	No	2.581588	131.658888	18735.4	4.673	575.4	599.0	0.99	5720	14.68	735.80

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
012010534-01	OBS	FP	0.00	0	1	0	0	MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE
012010534-02	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.

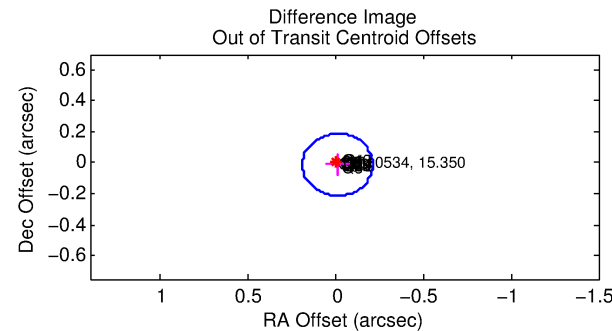
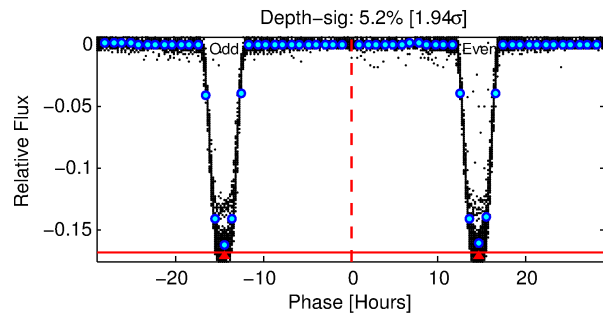
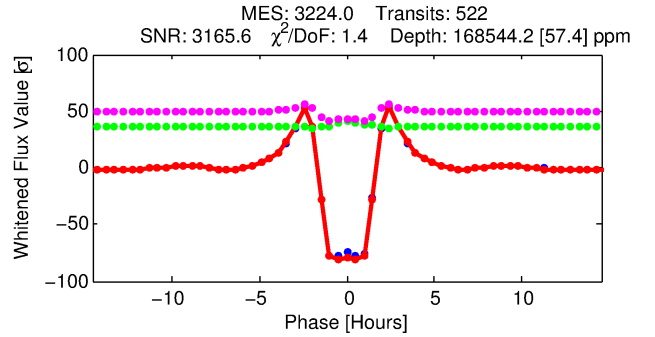
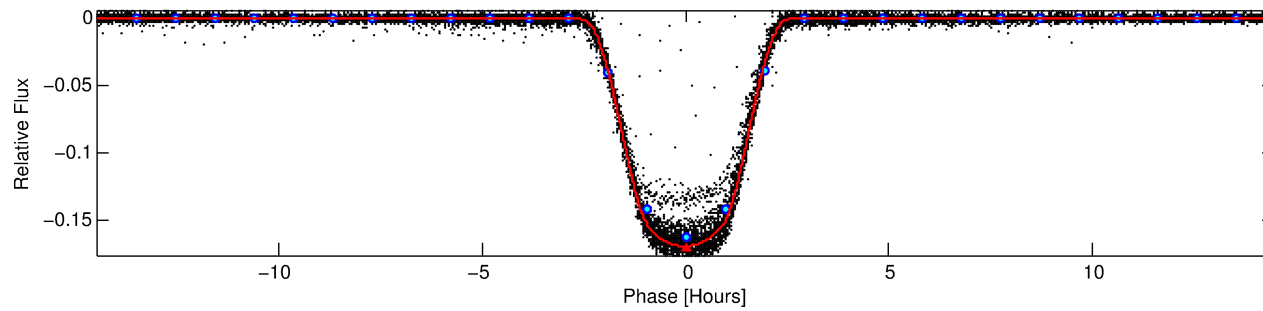
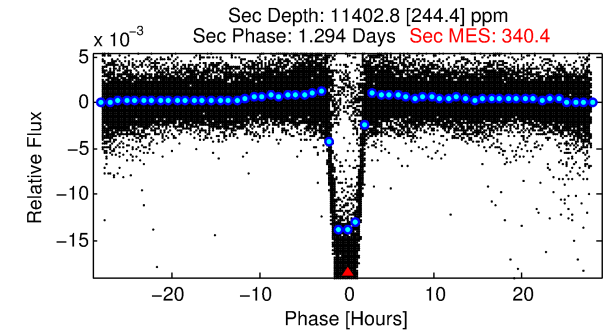
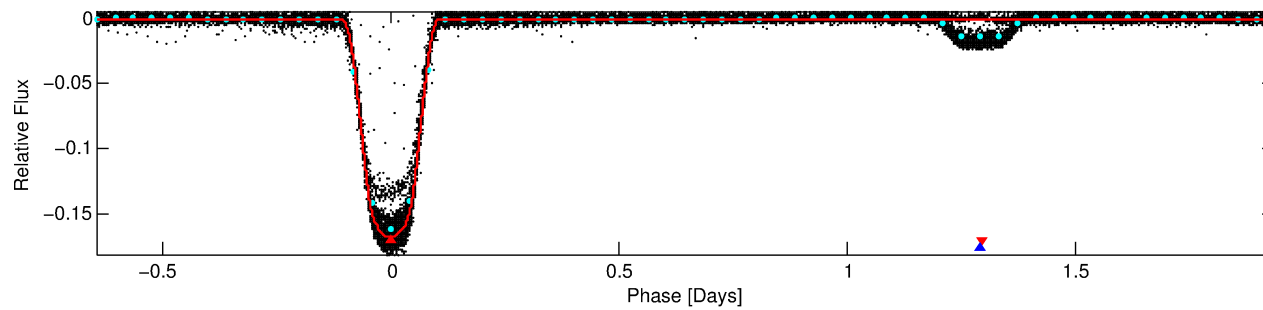
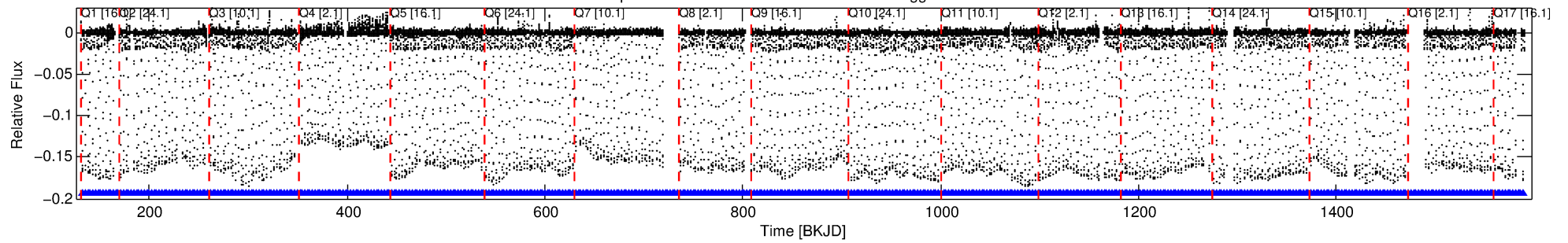
## Ephemeris Match Information For 012010534-01

No Significant Match Found

# DV One-Page Summary

KIC: 12010534 Candidate: 1 of 2 Period: 2.582 d  
KOI: K06092.01 Corr: 0.991

Kp: 15.35 R\*: 0.99 Rs Teff: 5720.0 K Logg: 4.41 Fe/H: -0.100



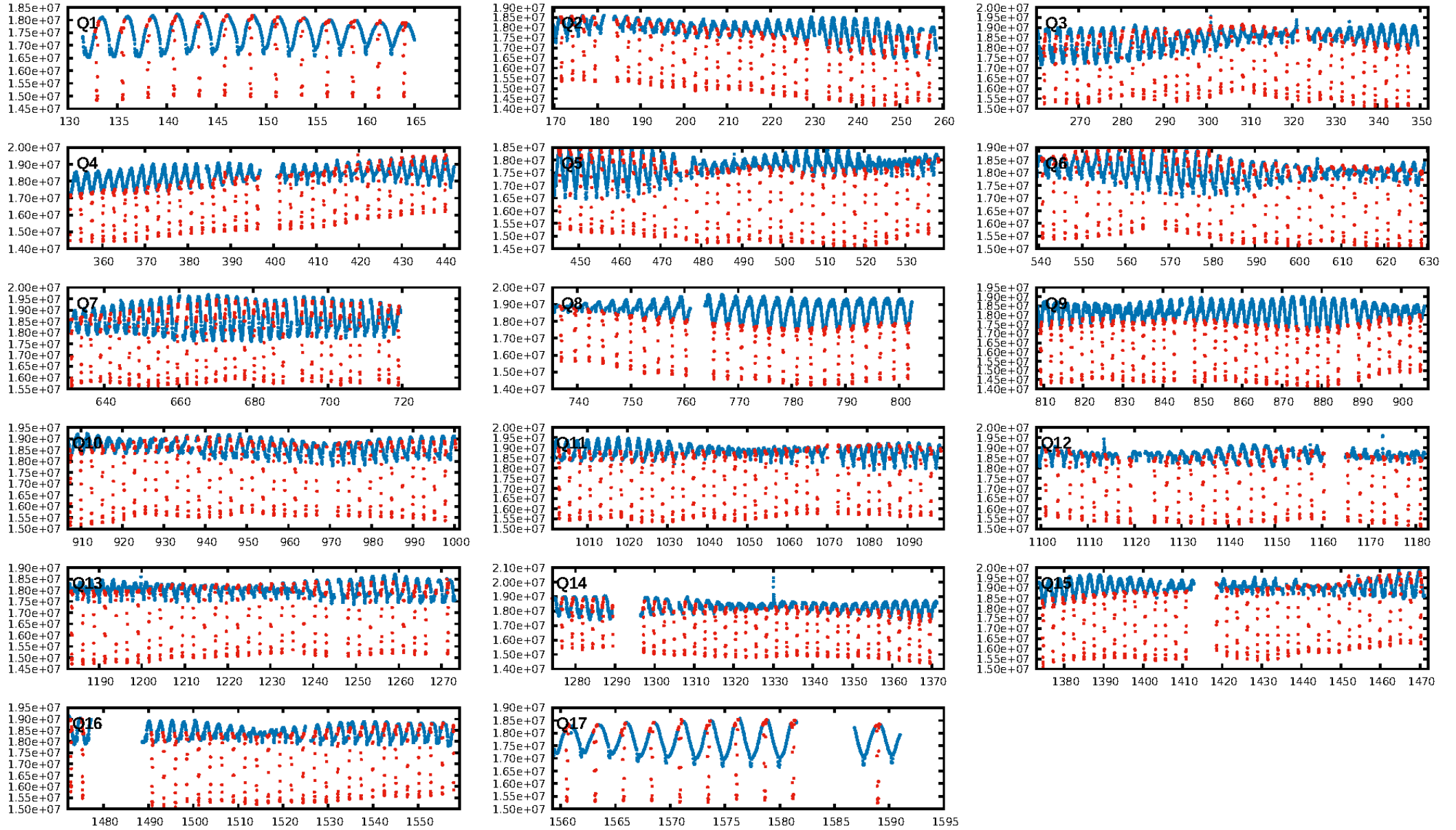
## DV Fit Results:

Period = 2.58158 [0.00000] d  
Epoch = 132.9506 [0.0000] BKJD  
Rp/R\* = 0.3755 [0.0001]  
a/R\* = 5.67 [0.00]  
b = 0.01 [0.02]  
Seff = 735.80 [261.12]  
Teff = 1328 [118] K  
Rp = 40.52 [11.47] Re  
a = 0.0357 [0.0084] AU  
Ag = 4.87 [1.63] [2.37 $\sigma$ ]  
Teffp = 3050 [92] K [11.54 $\sigma$ ]

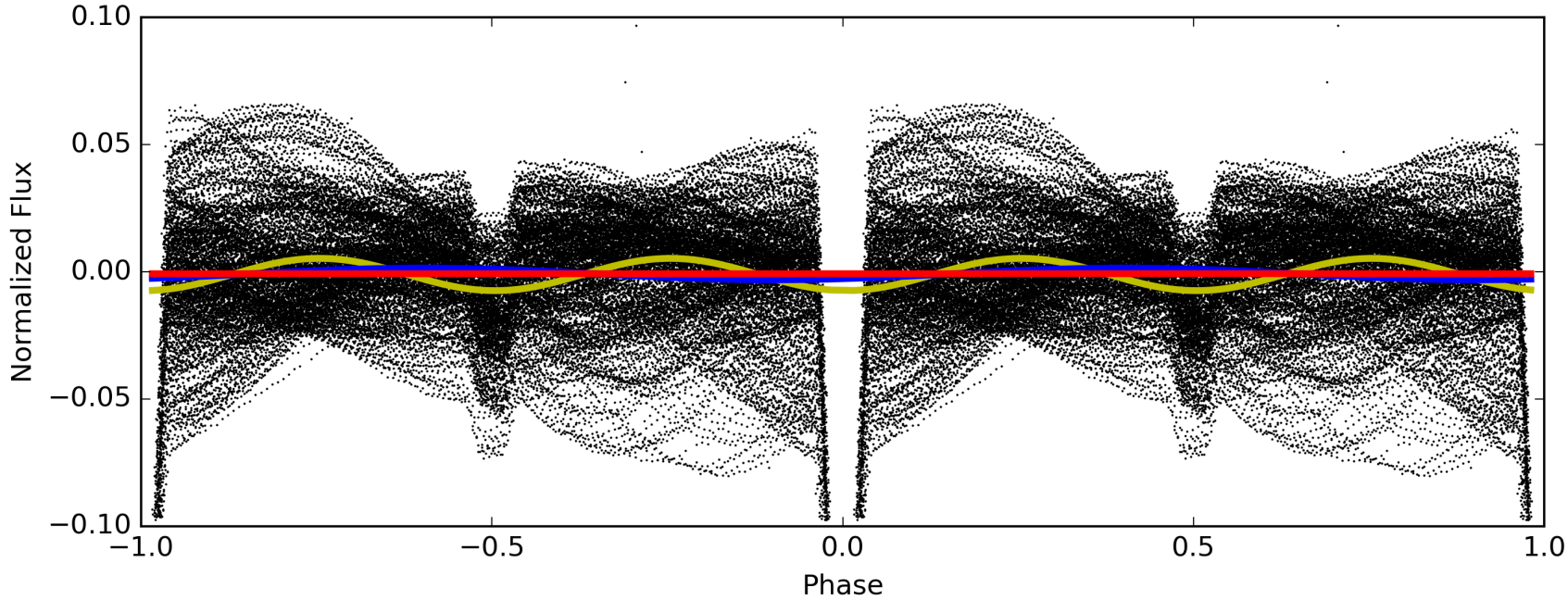
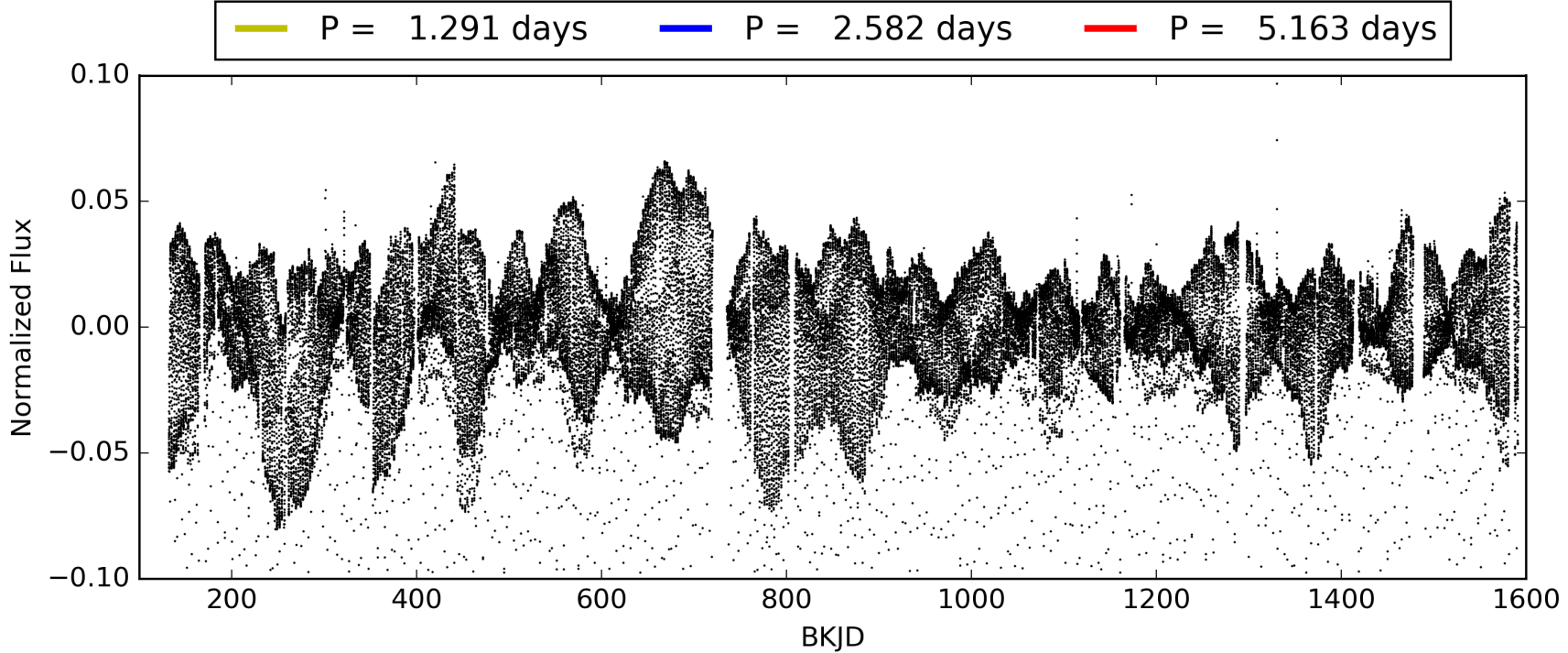
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.0% [0.00 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [499/499]  
GhostDiagnostic-chr: 1.975  
Centroid-sig: 0.0%  
Centroid-so: 0.115 arcsec [116.71 $\sigma$ ]  
OotOffset-rm: 0.017 arcsec [0.25 $\sigma$ ]  
KicOffset-rm: 0.140 arcsec [2.06 $\sigma$ ]  
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 012010534-01, PDC Light Curves

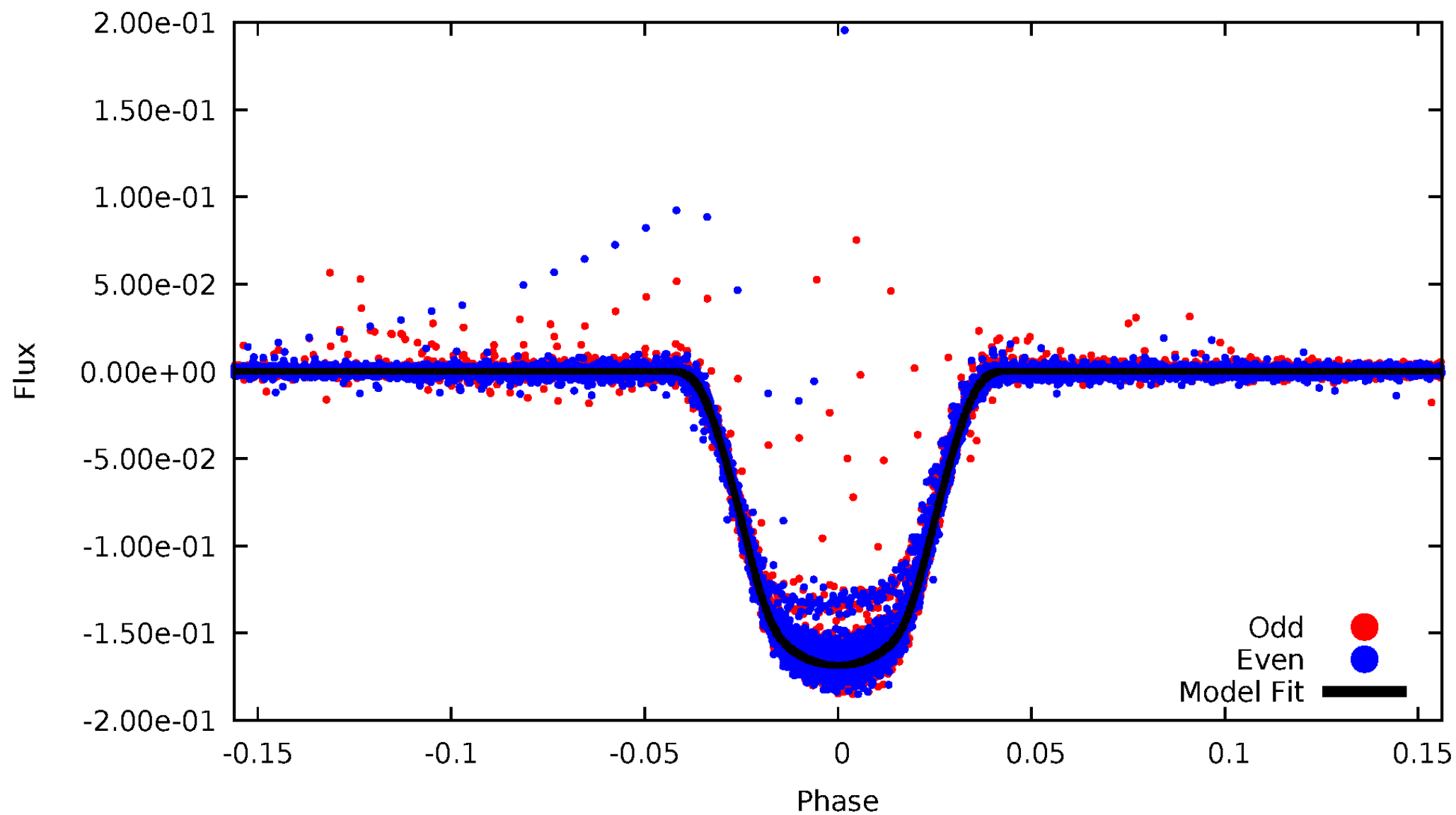


TCE 012010534-01



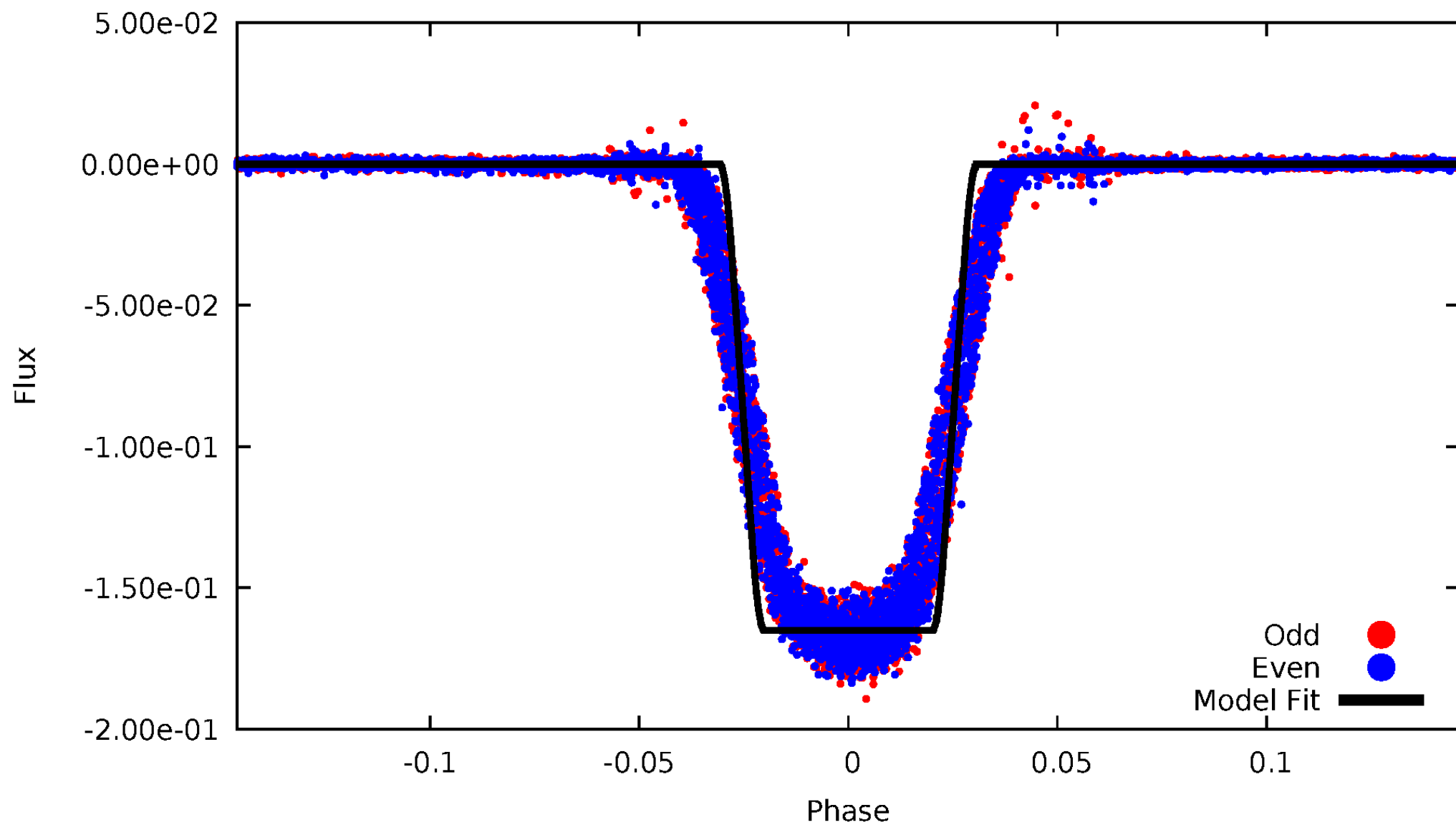
# DV Odd/Even

TCE 012010534-01



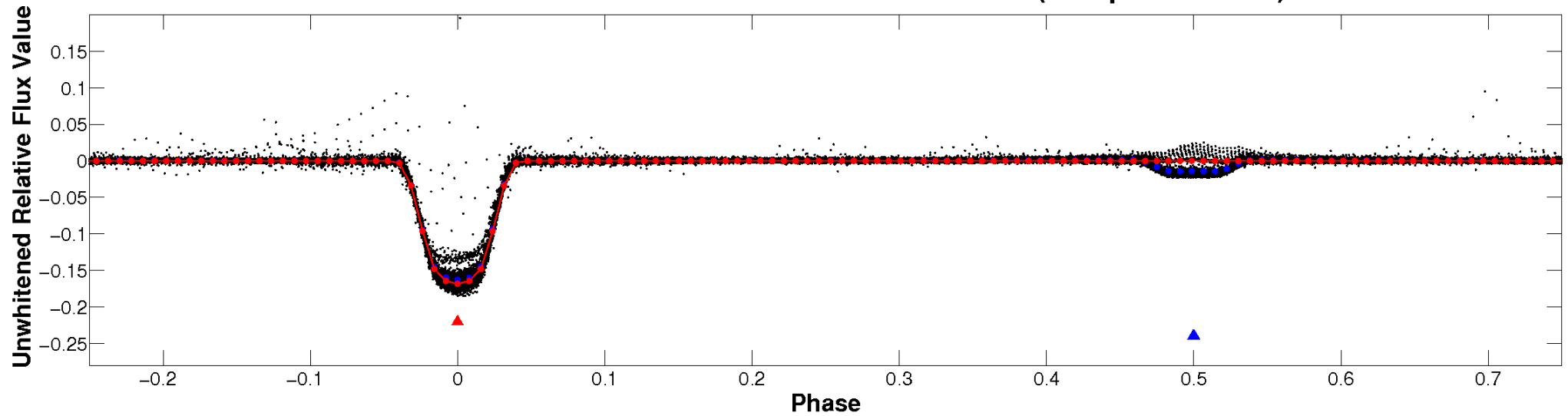
# ALT Odd/Even

TCE 012010534-01

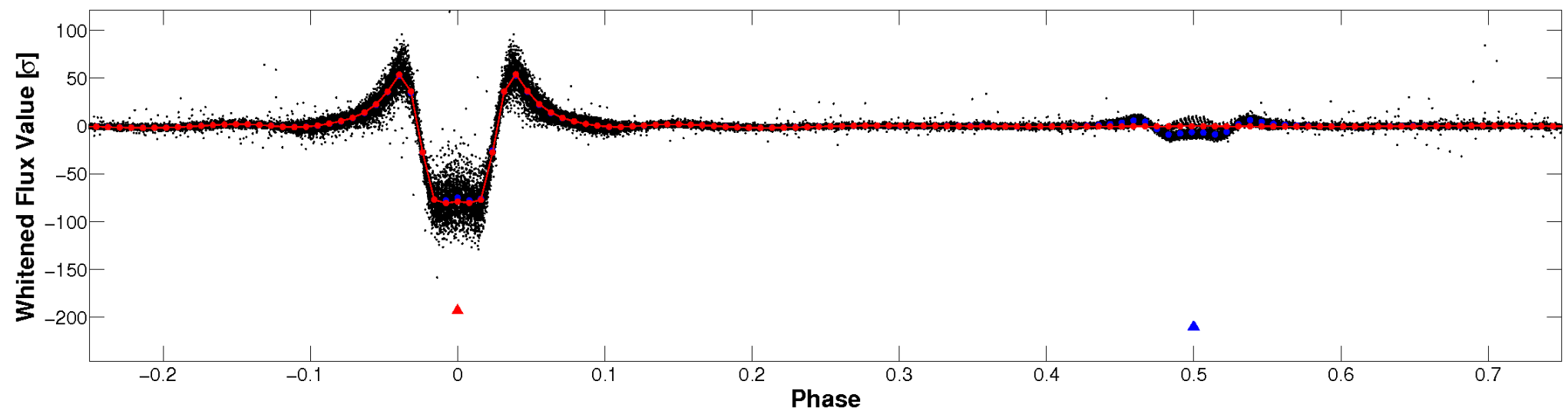


# Non-Whitened Vs. Whitened Light Curve

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



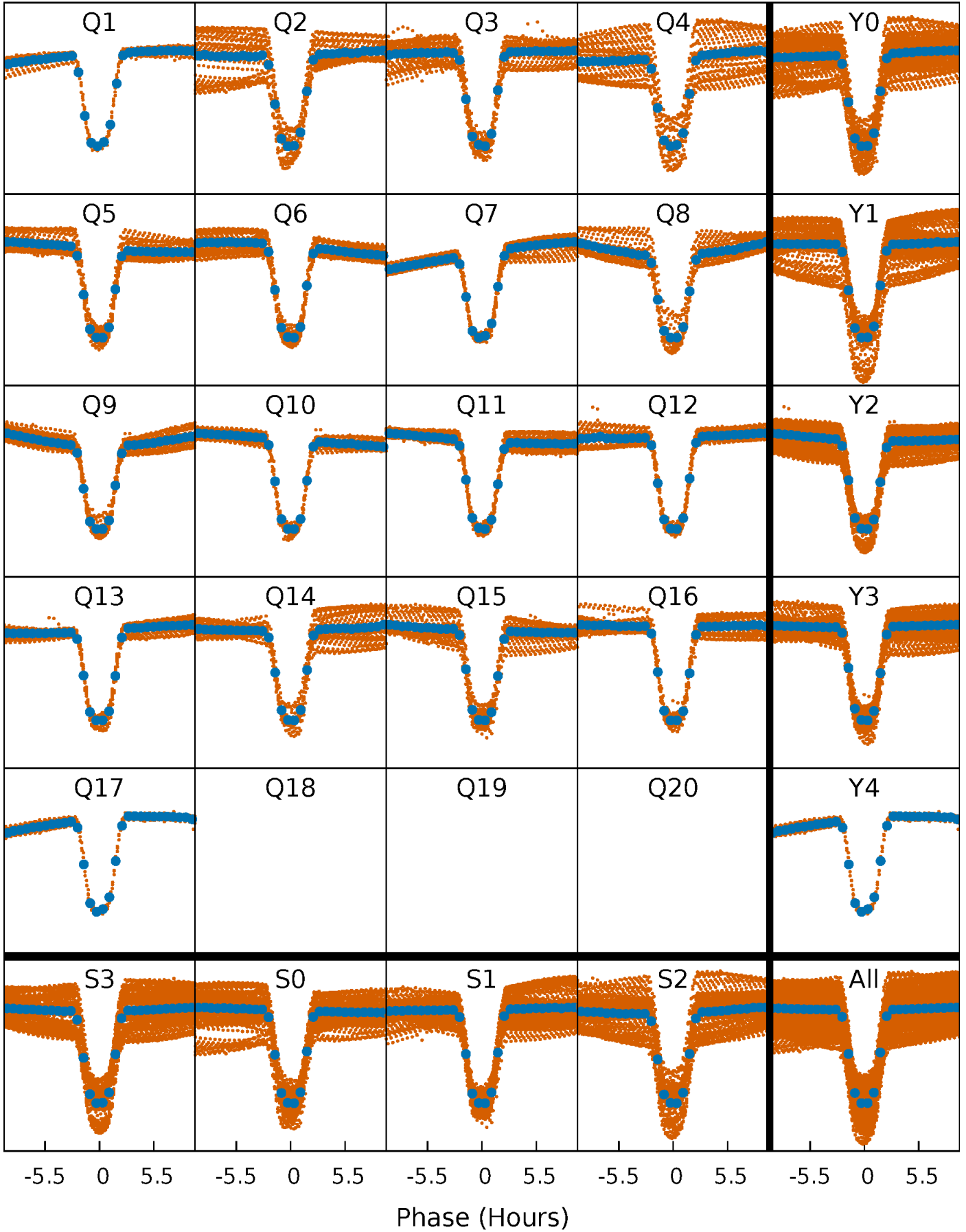
**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**





# PDC Quarter-Phased Transit Curves

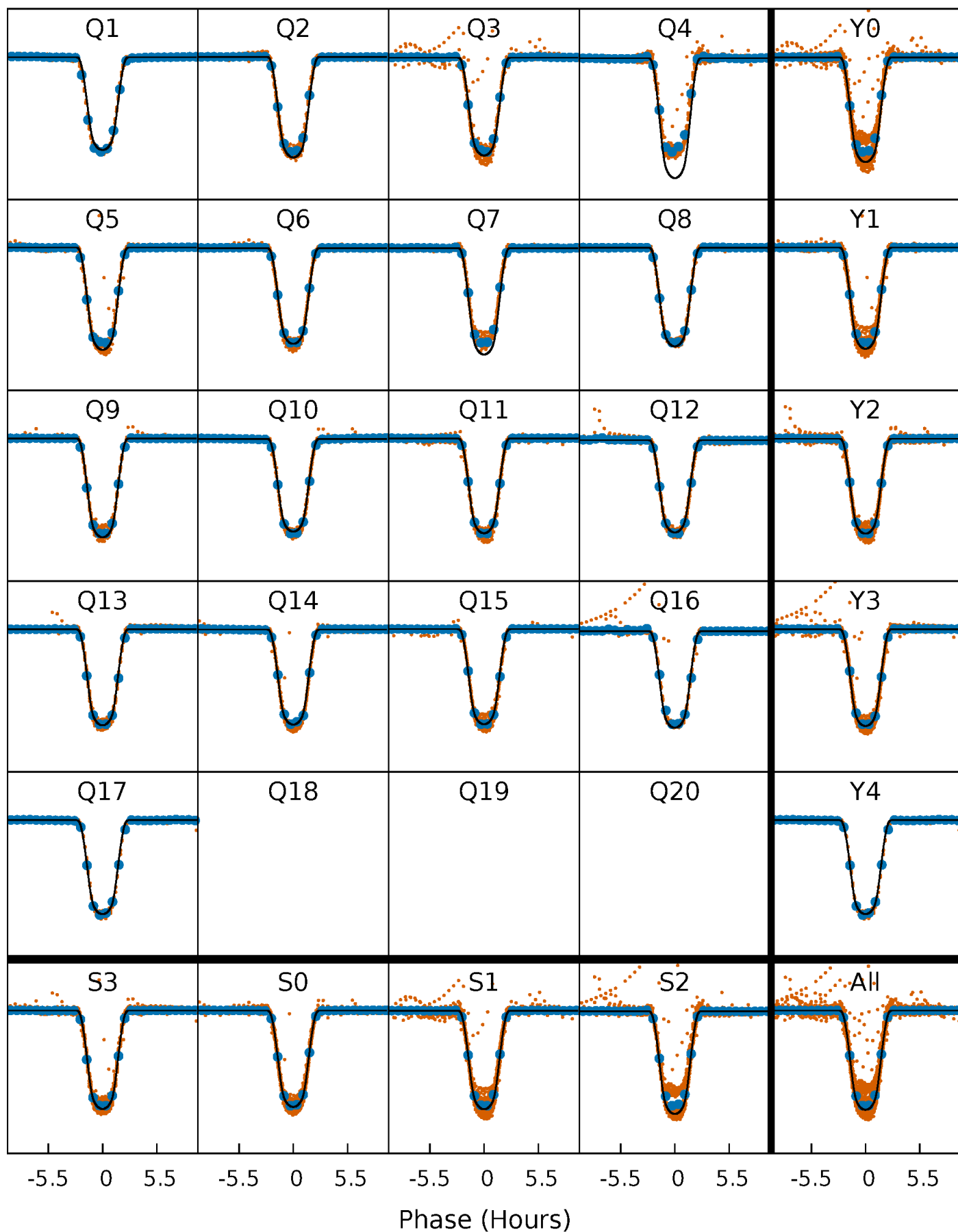
TCE 012010534-01 P= 2.581585 Days  $T_0=132.950637$  (BKJD)





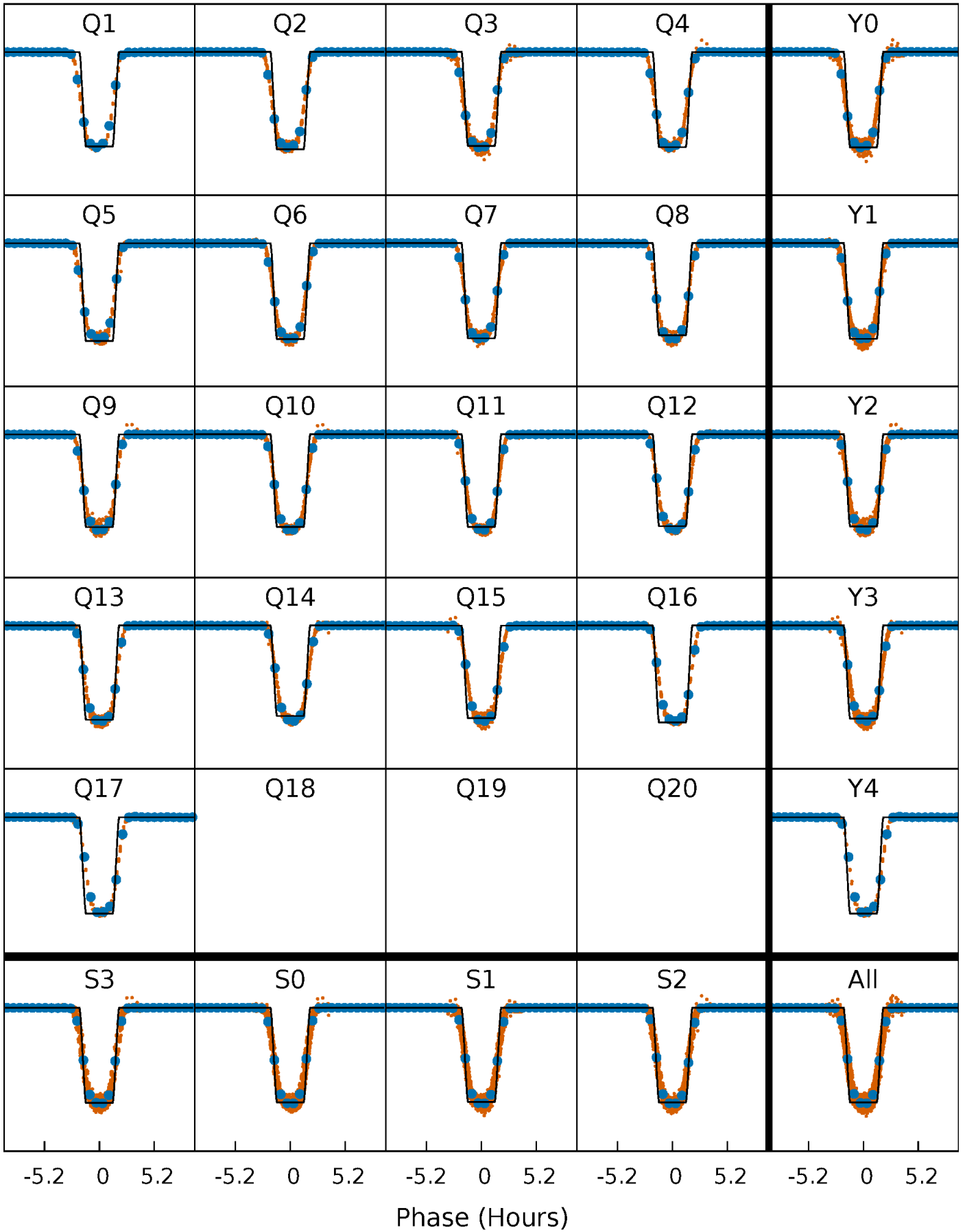
# DV Quarter-Phased Transit Curves

TCE 012010534-01 P= 2.581585 Days  $T_0=132.950637$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

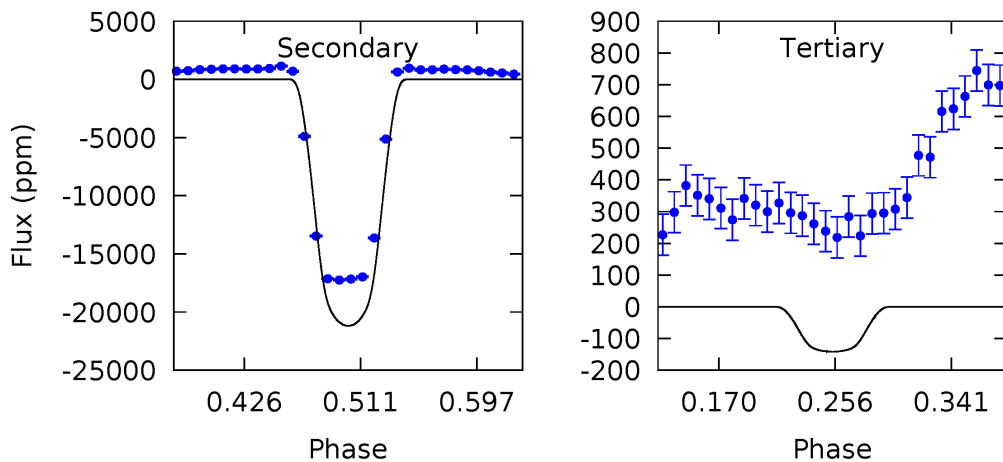
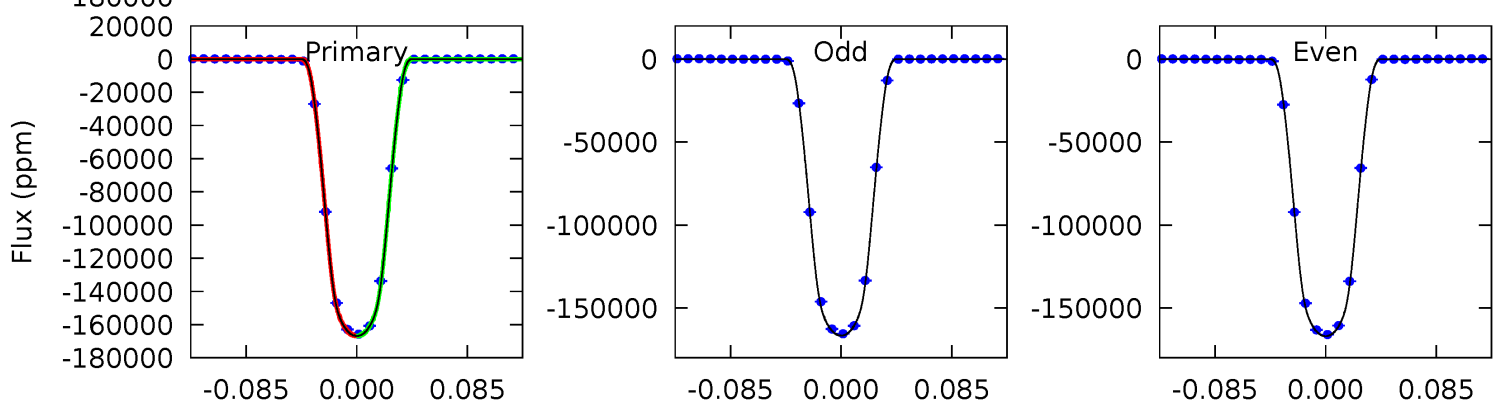
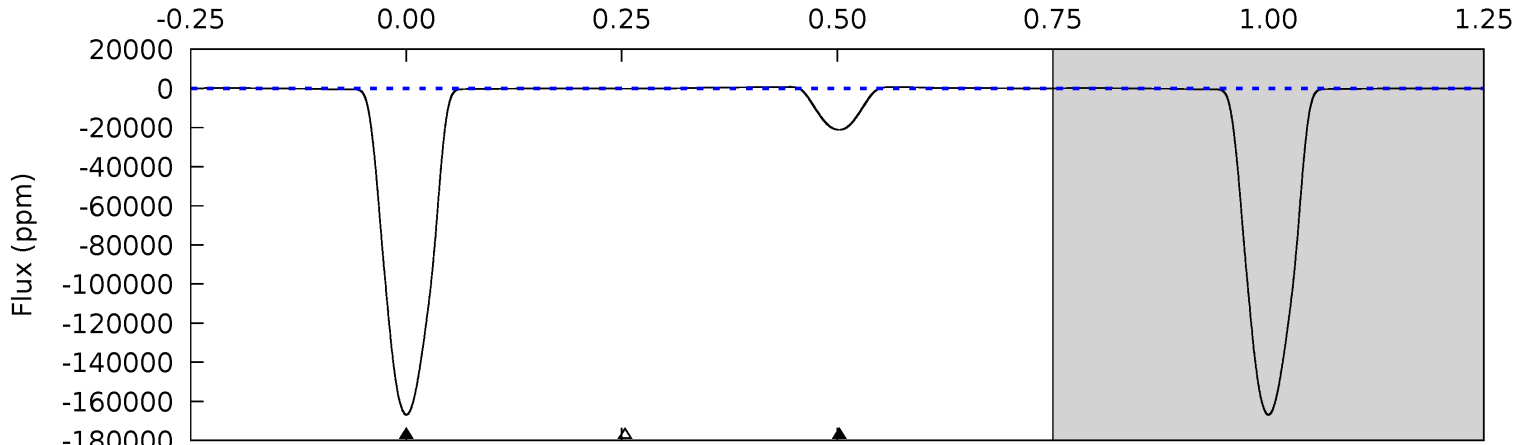
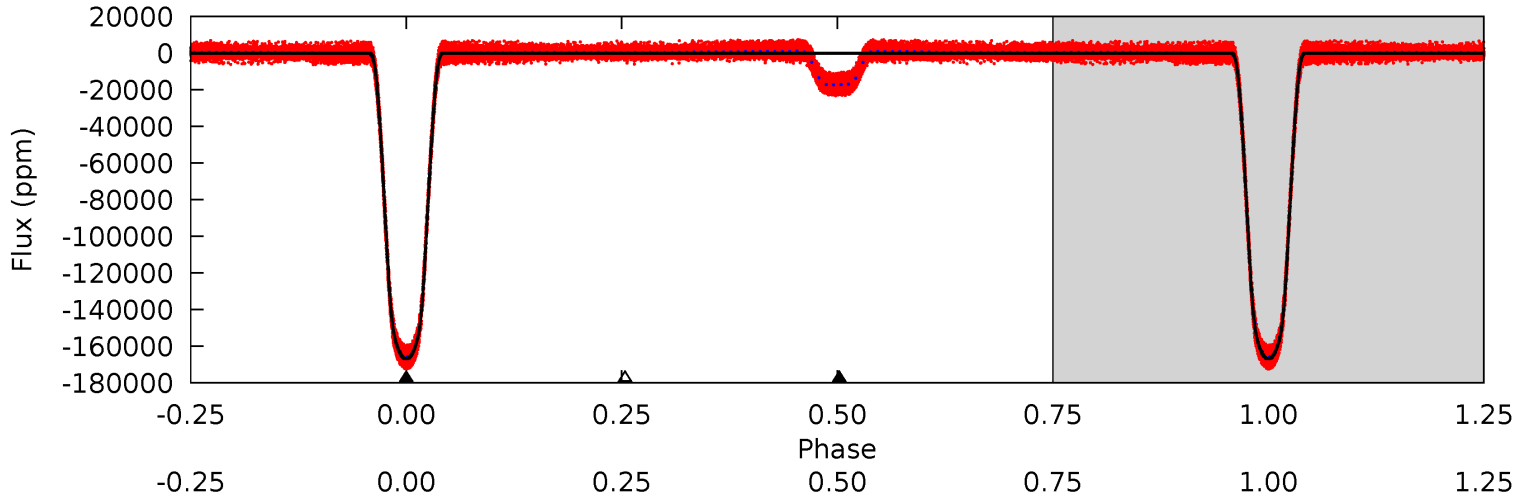
TCE 012010534-01 P= 2.581561 Days  $T_0=132.956425$  (BKJD)



# DV Model-Shift Uniqueness Test

012010534-01, P = 2.581585 Days, E = 130.369052 Days

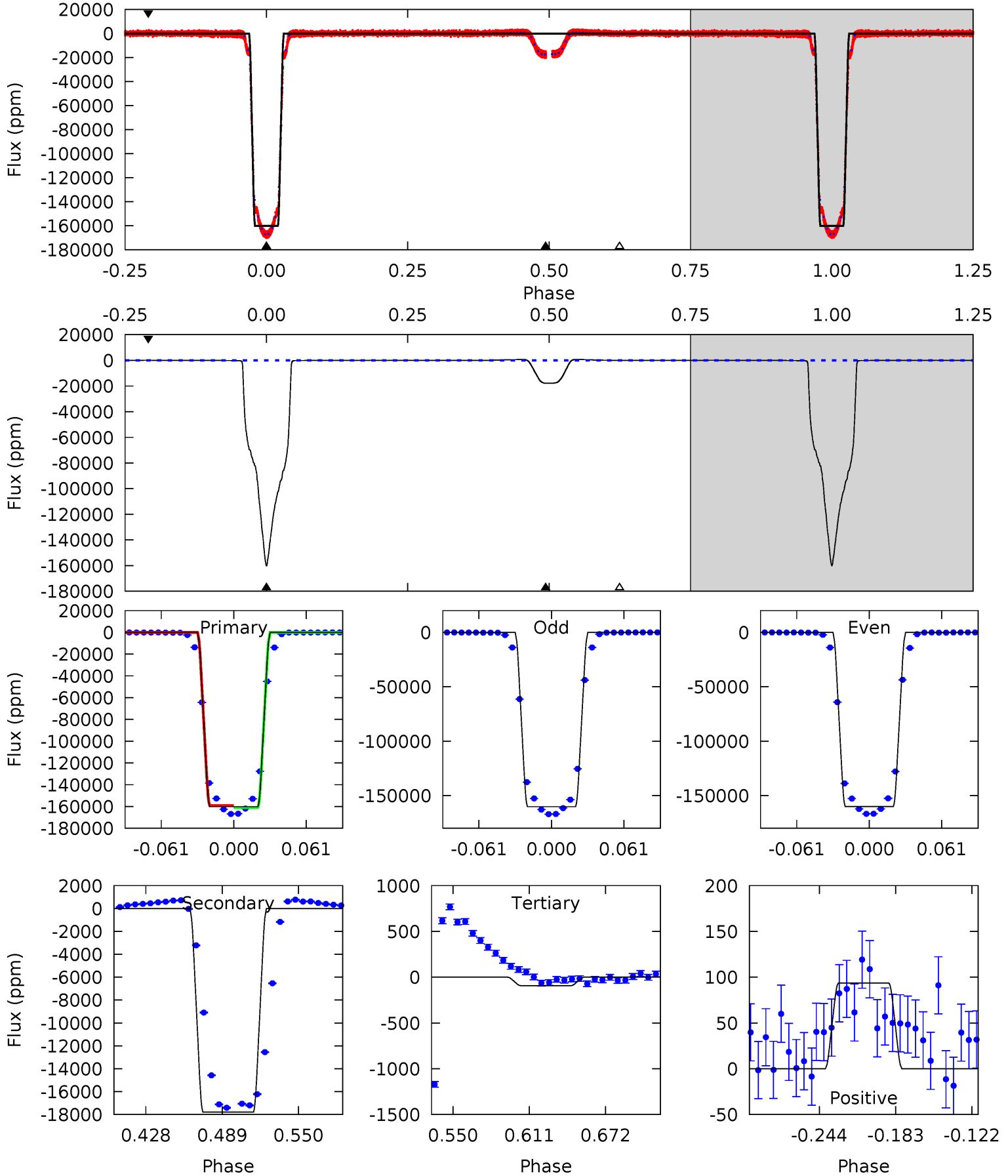
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
6736	855.2	5.72	0	4.60	1.72	9.22	6731	6736	849.5	855.2	7.07	0.98	0.00	0



# Alt Model-Shift Uniqueness Test

012010534-01, P = 2.581561 Days, E = 130.374864 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
7272	808.1	4.19	4.25	4.67	1.87	5.56	7268	7268	803.9	803.9	1.43	1.00	0.00	37.1



### Stellar Parameters For KIC 012010534

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5720^{+152}_{-169}$	$4.407^{+0.120}_{-0.180}$	$-0.100^{+0.300}_{-0.300}$	$0.989^{+0.280}_{-0.151}$	$0.912^{+0.125}_{-0.083}$	$1.327^{+0.740}_{-0.645}$
	+3%/-3%	+3%/-4%	+300%/-300%	+28%/-15%	+14%/-9%	+56%/-49%
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 012010534-01 / KOI 6092.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-21185 \pm 25$	$40.56^{+6.45}_{-3.29}$	$1859^{+142}_{-91}$	$3894^{+74}_{-81}$	$9.127^{+1.814}_{-2.185}$
Alt.	$-17794 \pm 22$	$44.42^{+7.23}_{-4.24}$	$1869^{+140}_{-106}$	$3673^{+63}_{-75}$	$6.455^{+1.419}_{-1.628}$

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

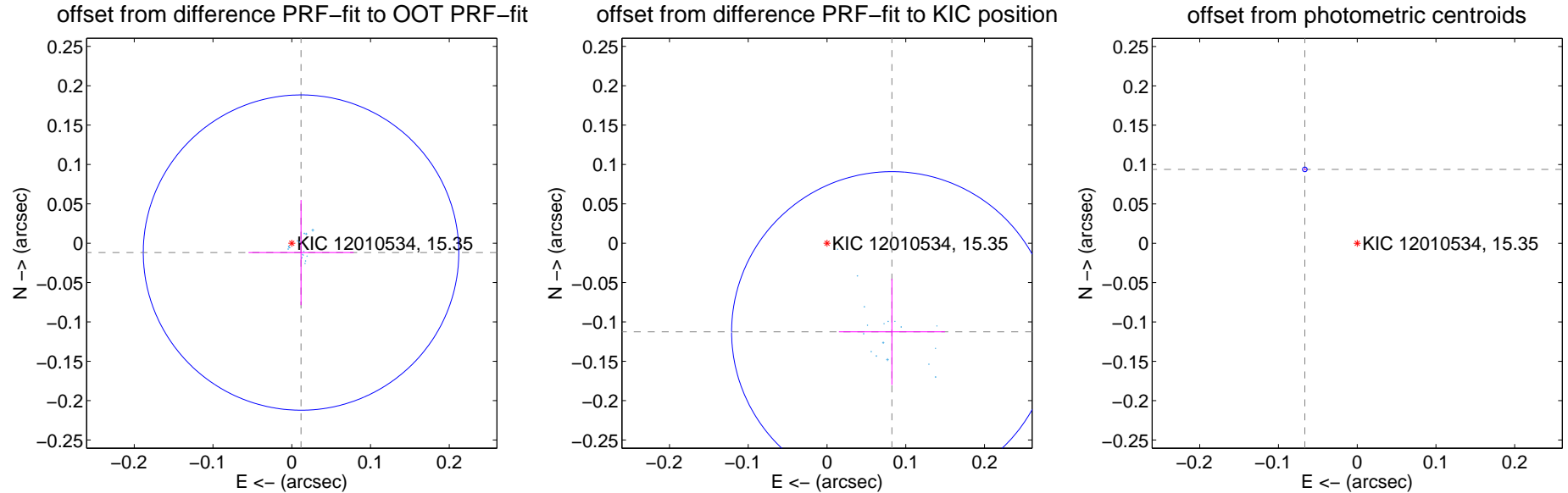
## DV Centroid Data

Supplemental centroid analysis for 012010534-01. Kepler magnitude: 15.35. Transit SNR 3165.59

There are 17 quarters with good PRF difference image offsets

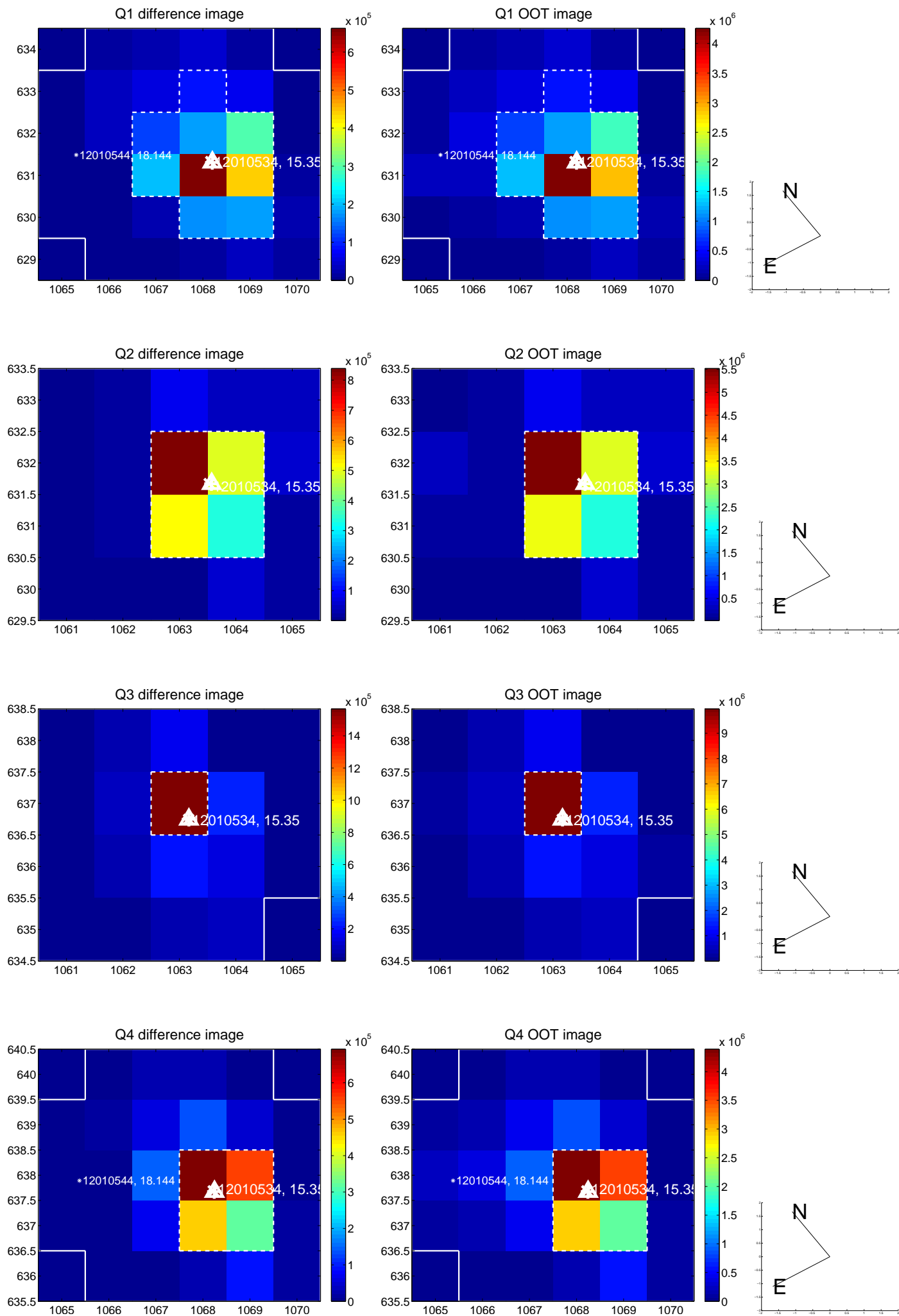
The direct PRF centroid is offset from the target star catalog position by about 0.17 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.017 \pm 0.067$	0.25	$-0.012 \pm 0.067$	$-0.012 \pm 0.067$
PRF-fit source offset from KIC position	$0.140 \pm 0.068$	2.06	$-0.082 \pm 0.067$	$-0.113 \pm 0.067$
photometric centroid source offset	$0.12 \pm 0.00$	116.71	$0.07 \pm 0.00$	$0.09 \pm 0.00$



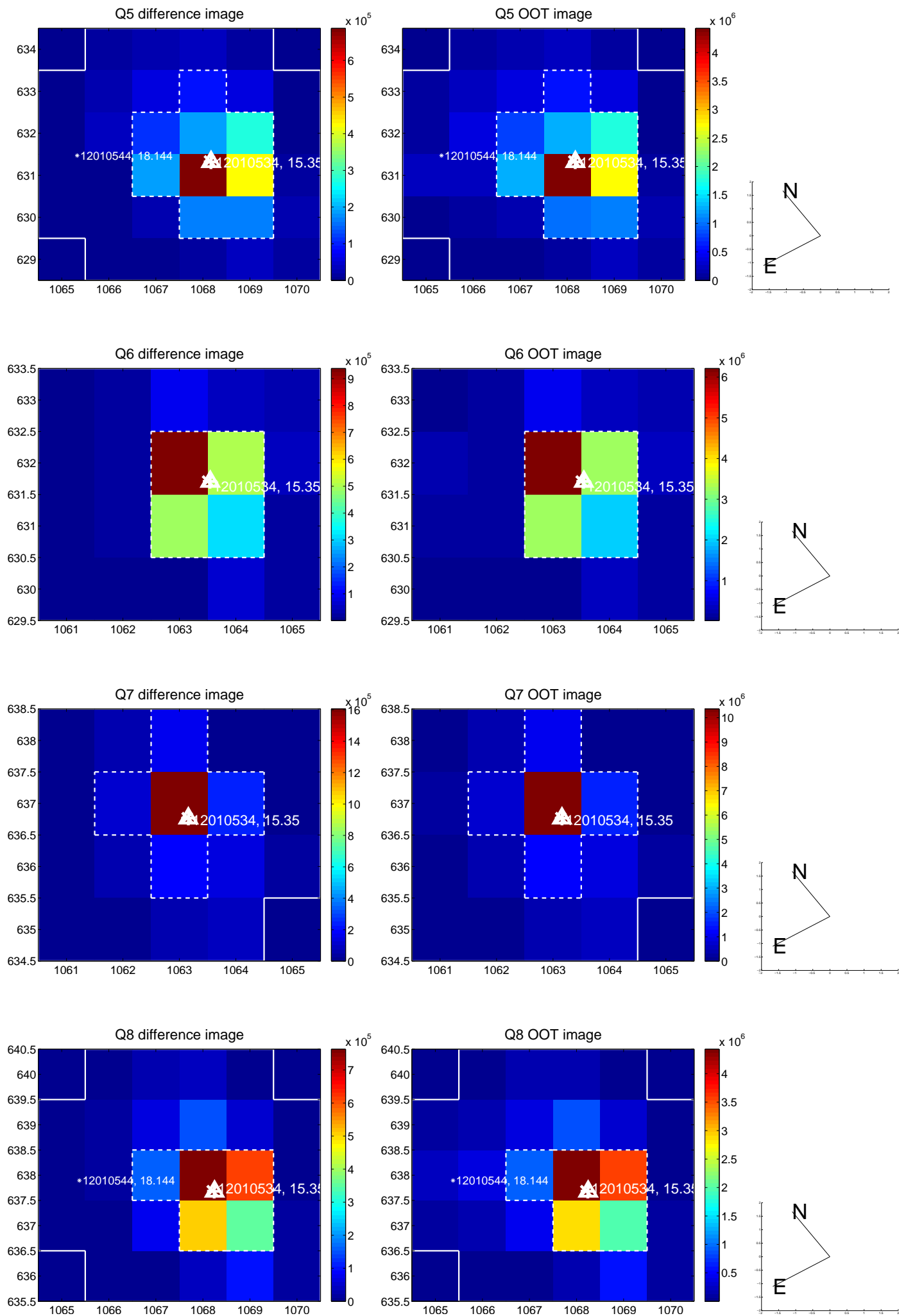
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

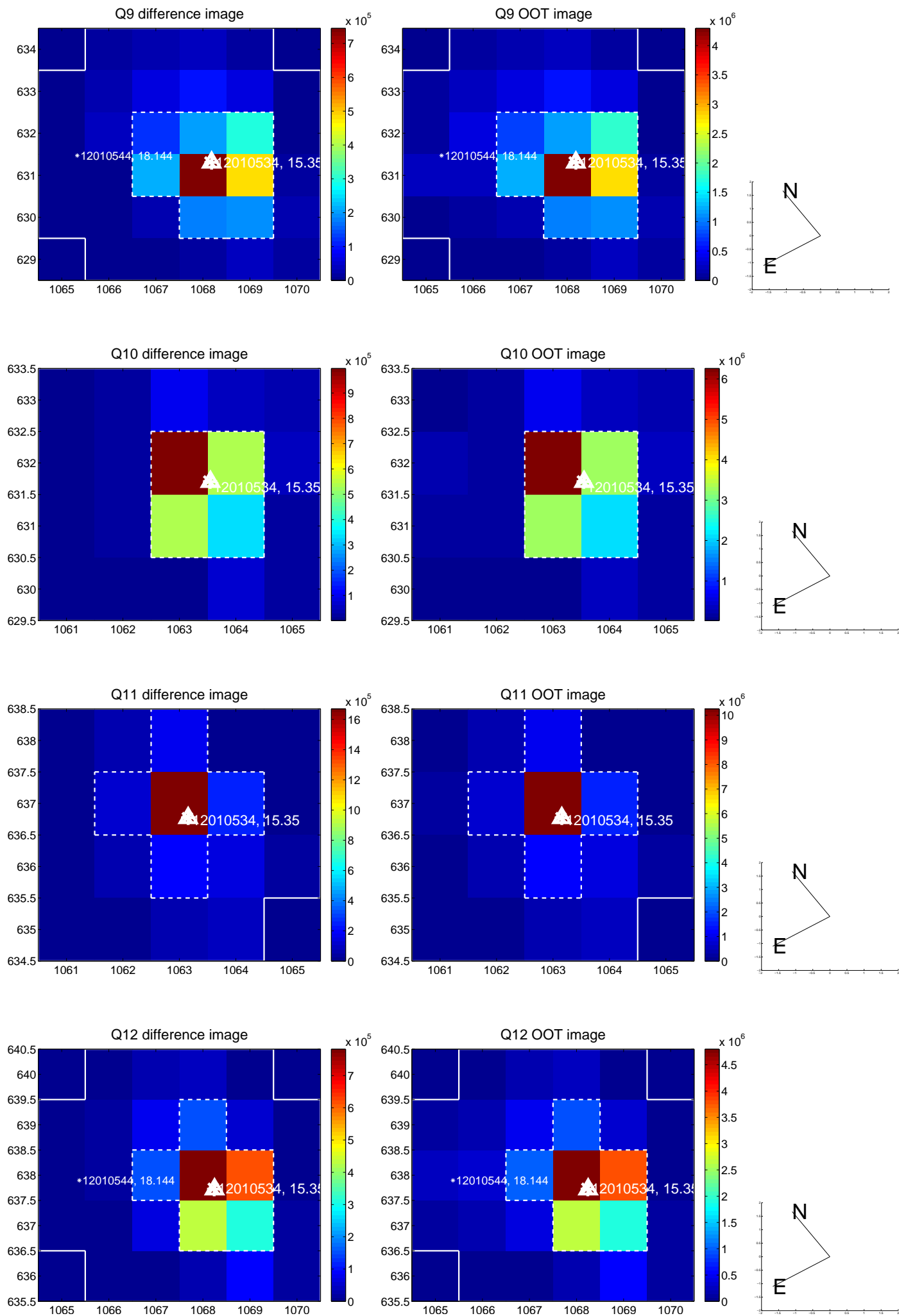




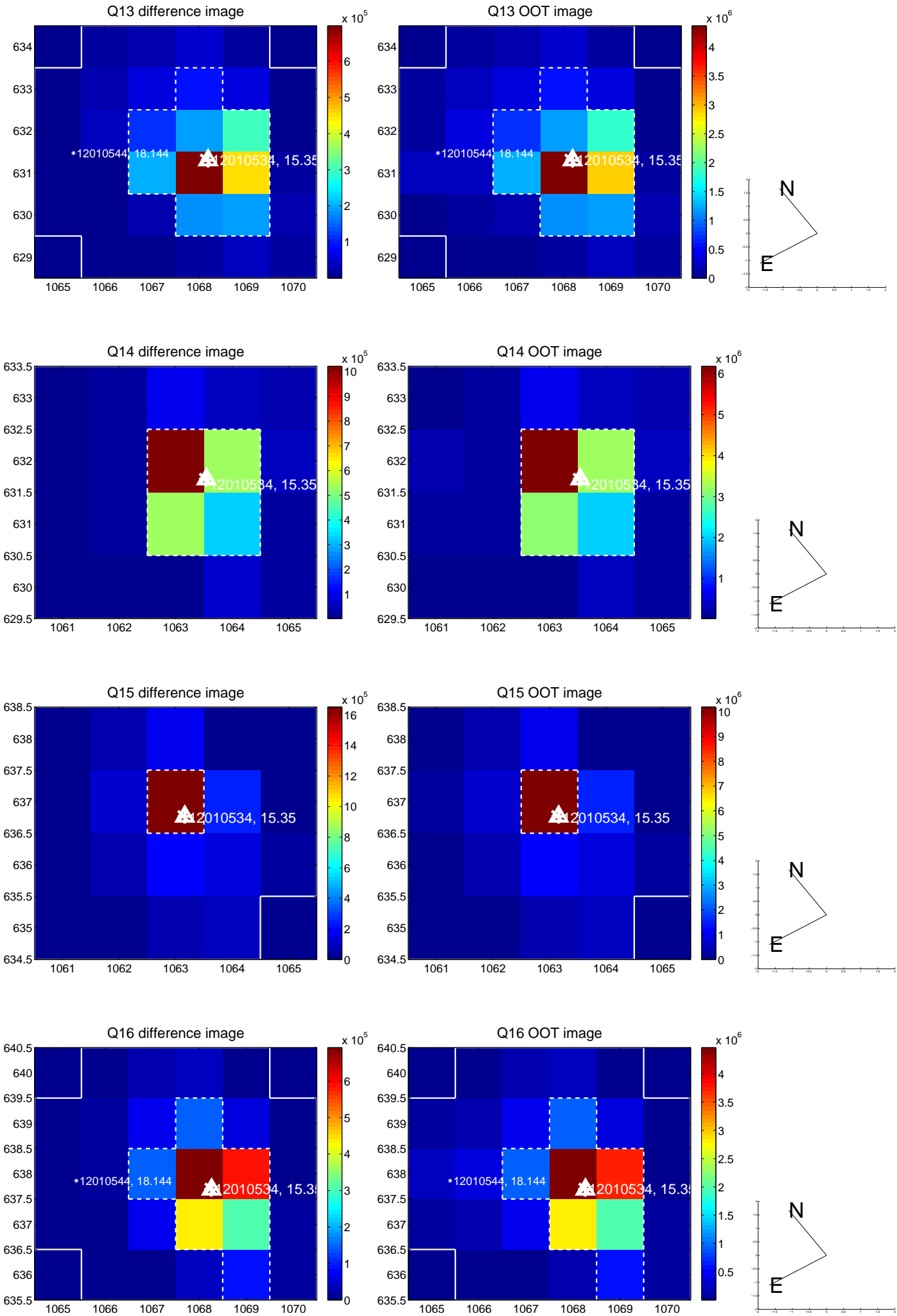
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



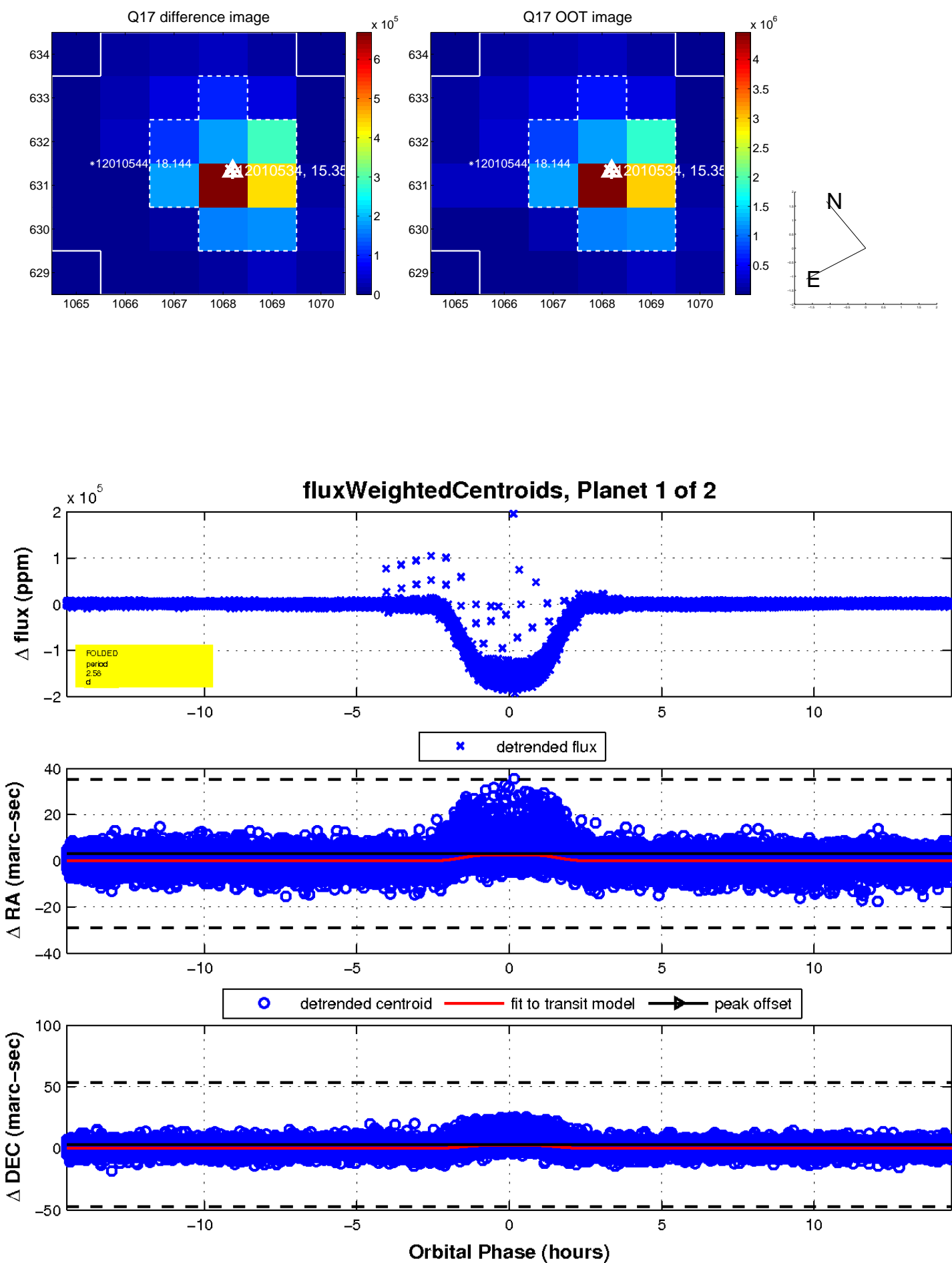
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

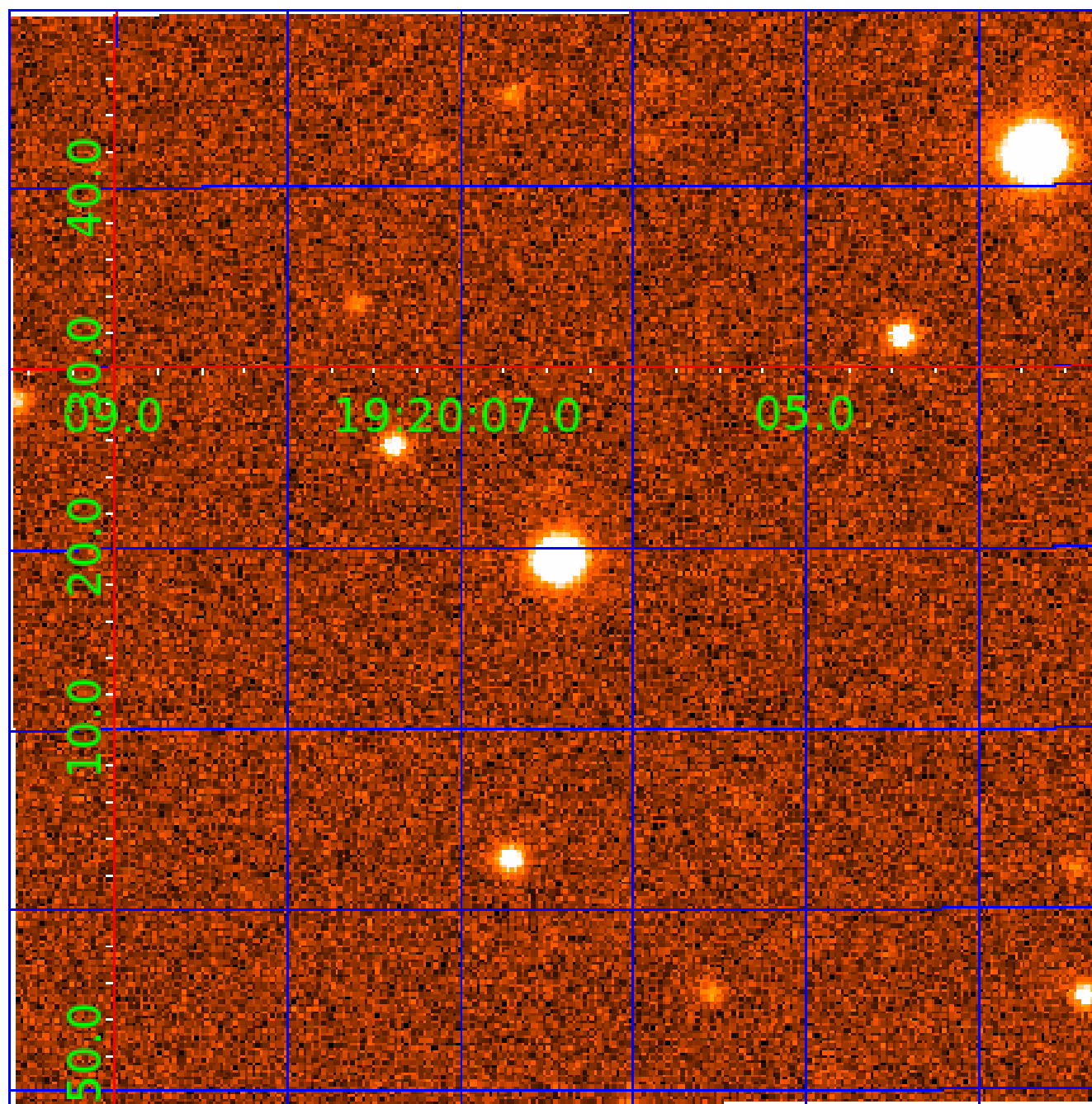


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 012010534

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
012010534-01	OBS	6092.01	2.581585	132.950638	168544.2	4.835	3224.0	3165.6	0.99	5720	40.52	735.80
012010534-02	OBS	No	2.581588	131.658888	18735.4	4.673	575.4	599.0	0.99	5720	14.68	735.80

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
012010534-01	OBS	FP	0.00	0	1	0	0	MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE
012010534-02	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.

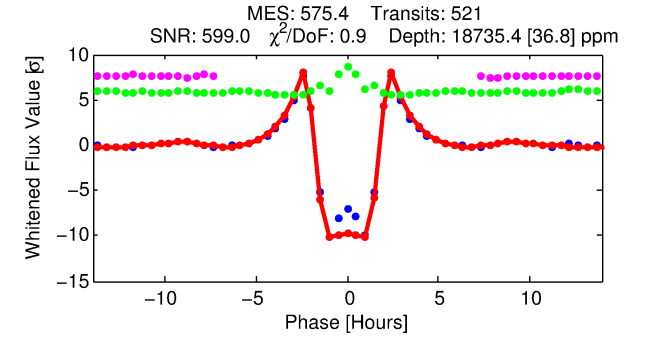
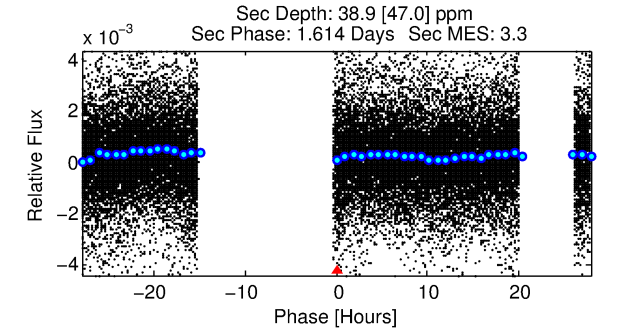
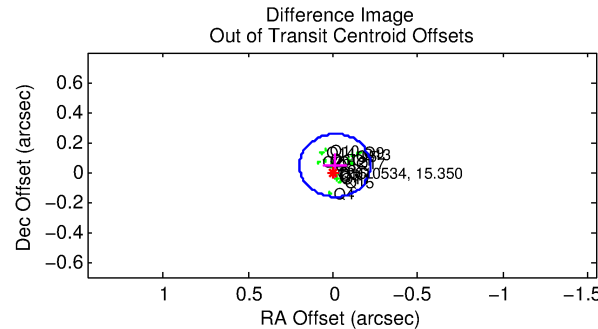
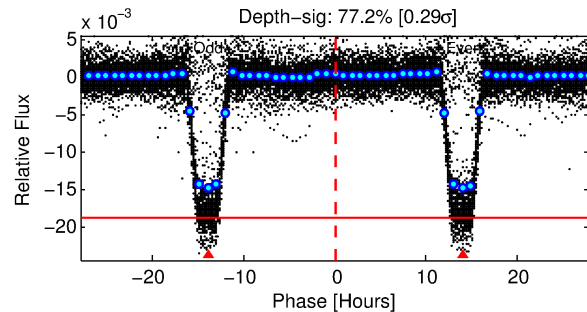
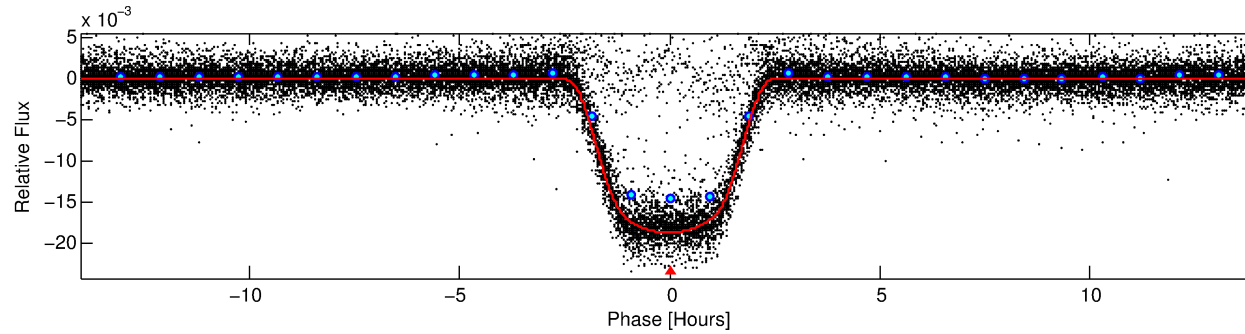
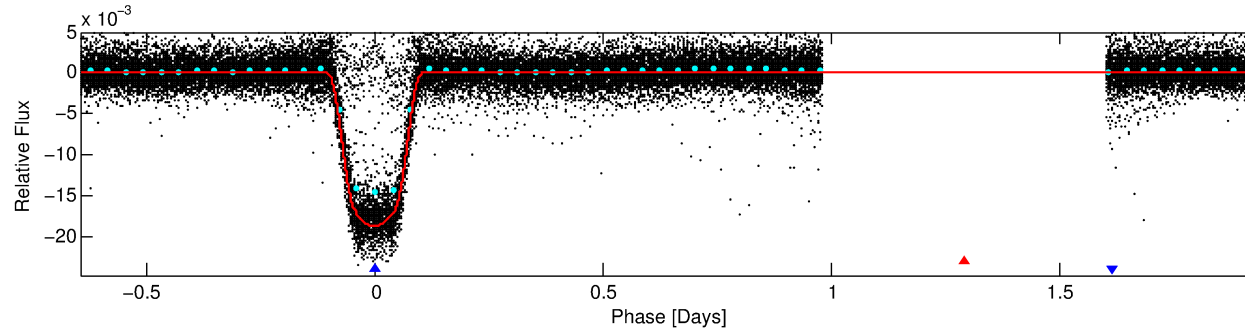
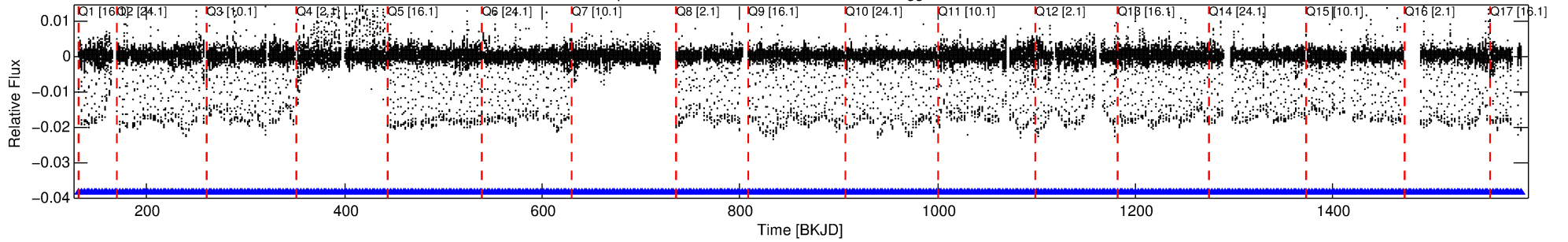
## Ephemeris Match Information For 012010534-02

No Significant Match Found

# DV One-Page Summary

KIC: 12010534 Candidate: 2 of 2 Period: 2.582 d  
KOI: K06092 Corr: No Ephemeris Match

Kp: 15.35 R\*: 0.99 Rs Teff: 5720.0 K Logg: 4.41 Fe/H: -0.100



## DV Fit Results:

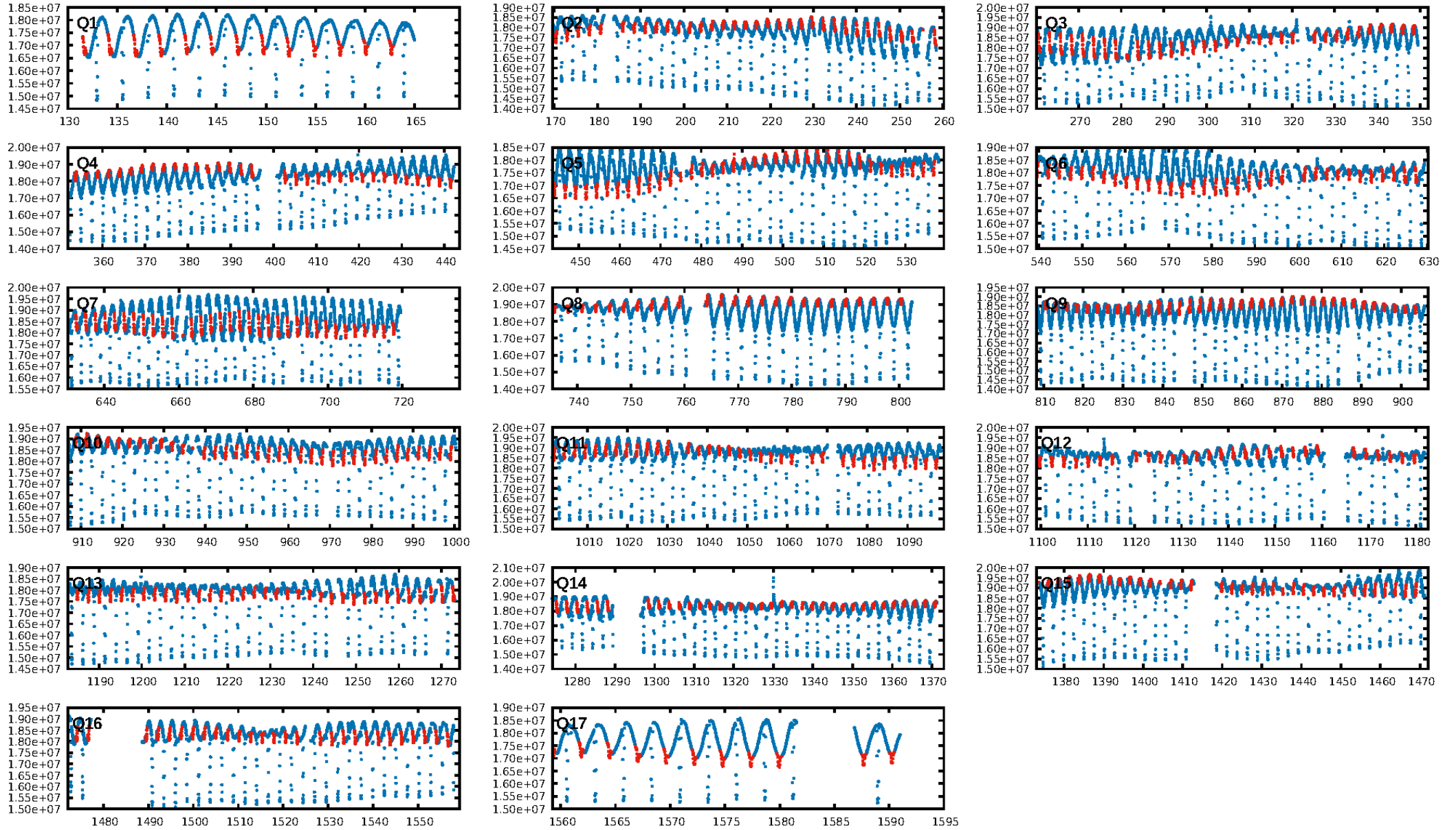
Period = 2.58159 [0.00000] d  
Epoch = 131.6589 [0.0001] BKJD  
Rp/R\* = 0.1360 [0.0002]  
a/R\* = 3.77 [0.01]  
b = 0.73 [0.00]  
Seff = 735.80 [261.12]  
Teq = 1328 [118] K  
Rp = 14.67 [4.15] Re  
a = 0.0357 [0.0084] AU  
Ag = 0.13 [0.16] [-5.50σ]  
Teffp = 1225 [372] K [-0.26σ]

## DV Diagnostic Results:

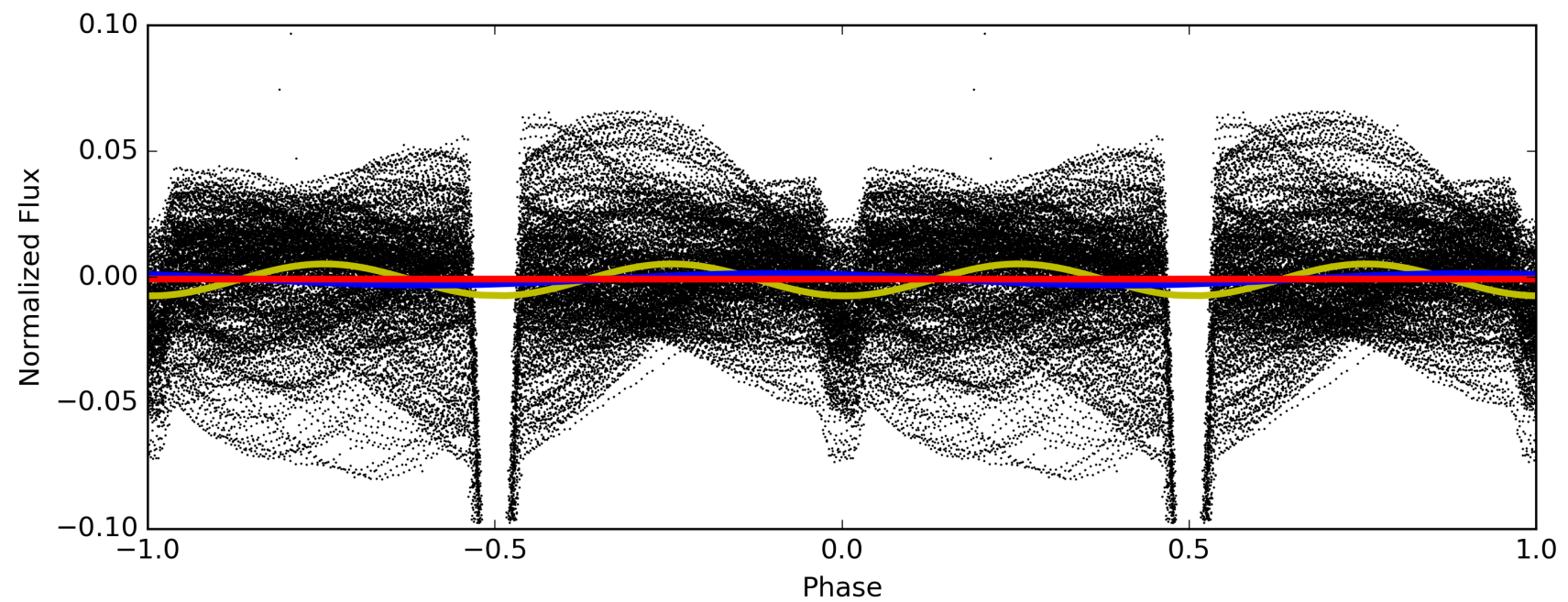
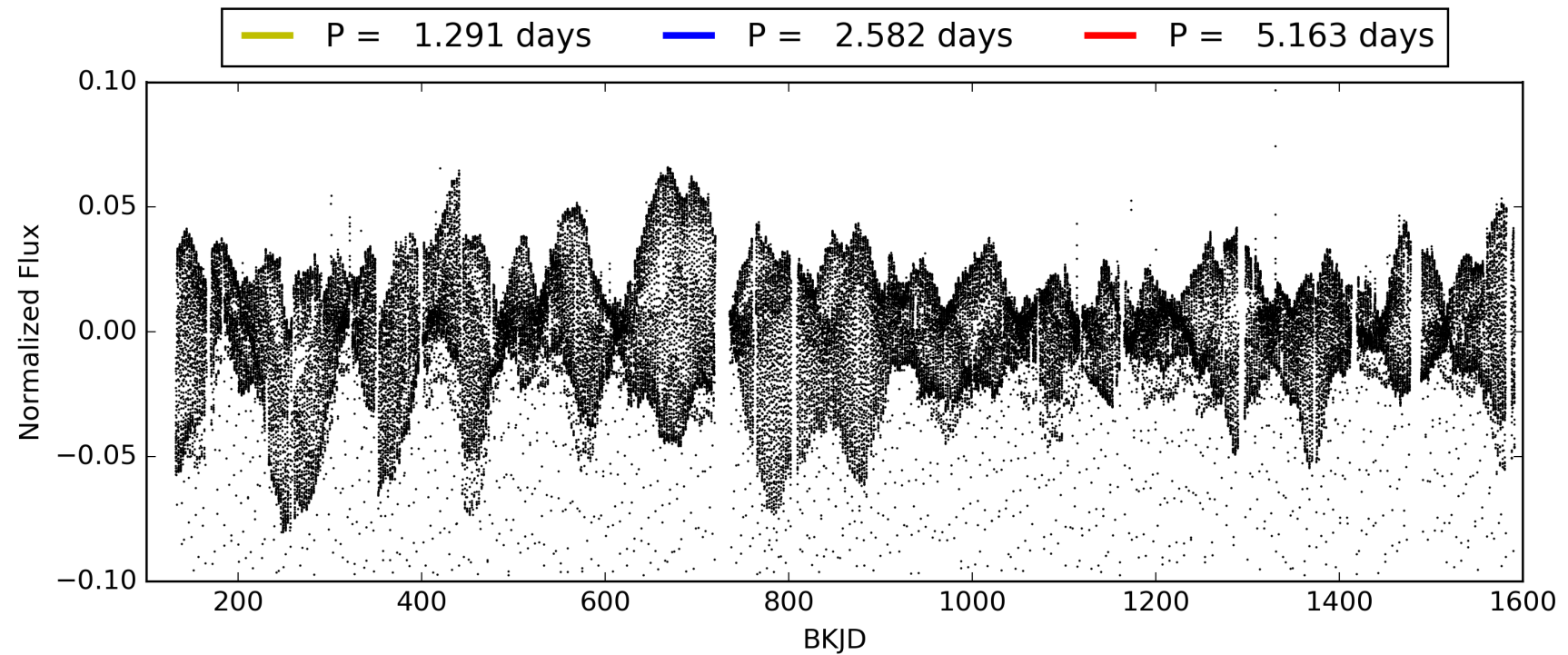
ShortPeriod-sig: 0.0% [0.00σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [497/497]  
GhostDiagnostic-chr: 7.392  
Centroid-sig: 0.0%  
Centroid-so: 0.114 arcsec [15.21σ]  
OotOffset-rm: 0.046 arcsec [0.65σ]  
KicOffset-rm: 0.092 arcsec [1.33σ]  
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 012010534-02, PDC Light Curves

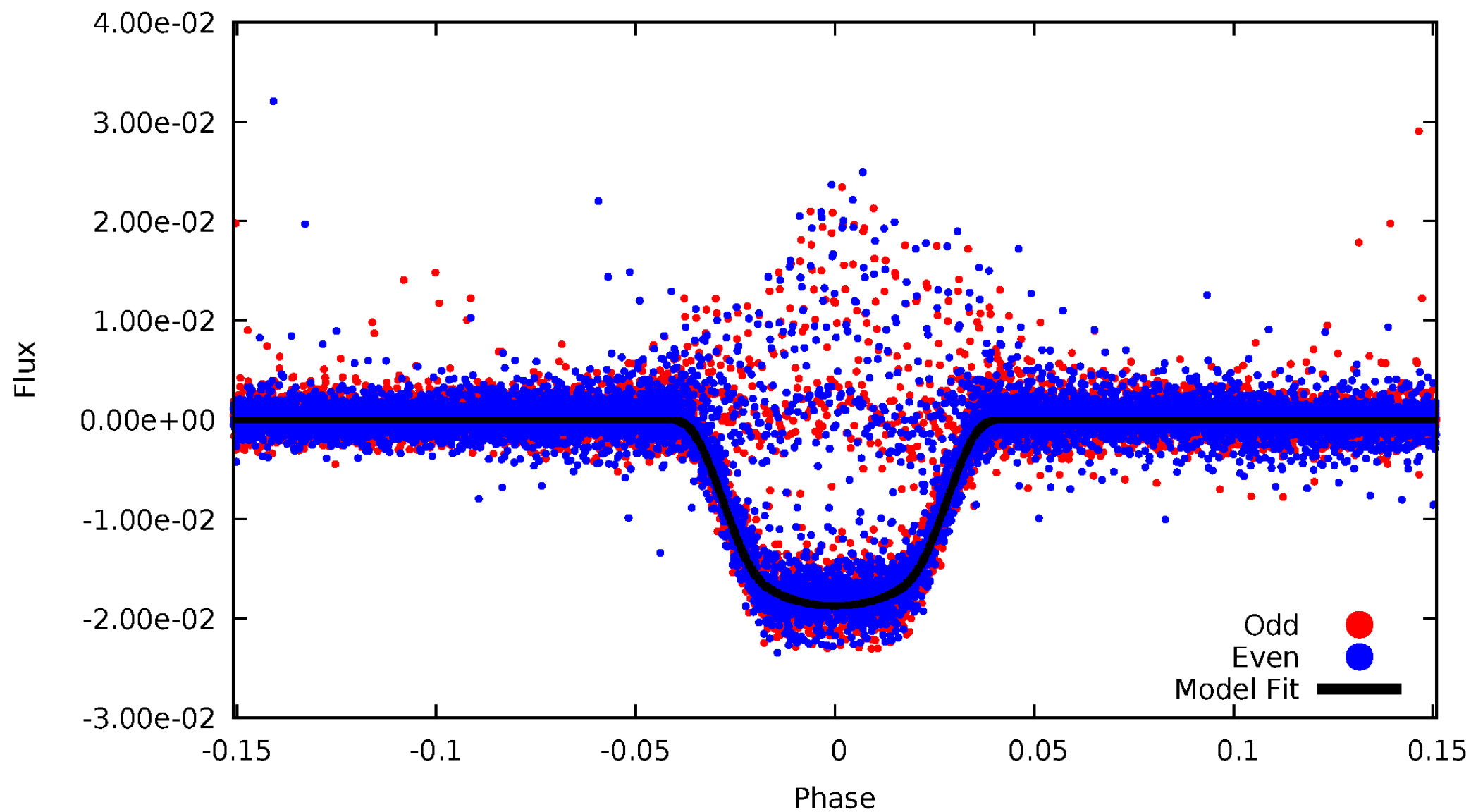


TCE 012010534-02



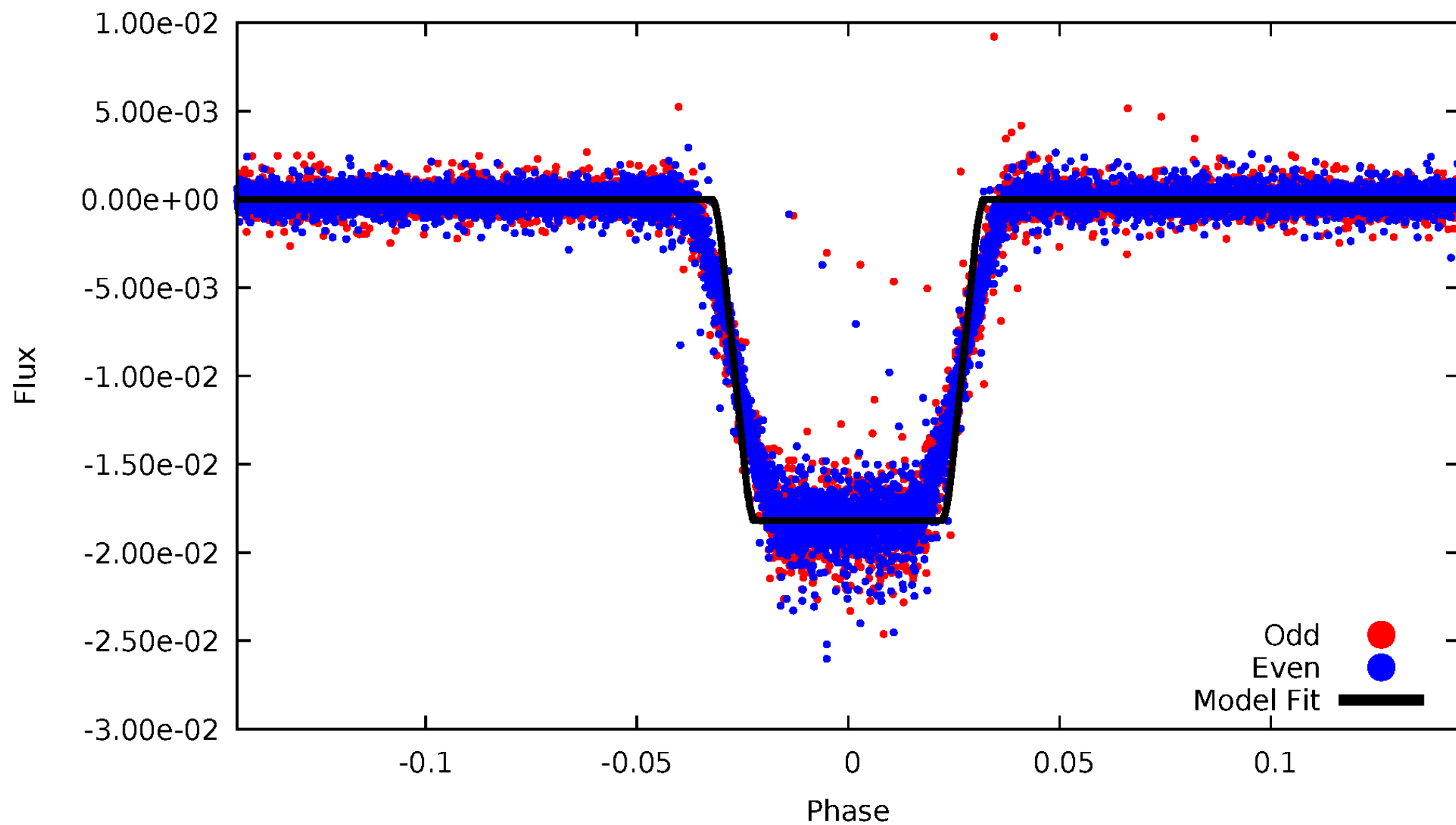
# DV Odd/Even

TCE 012010534-02



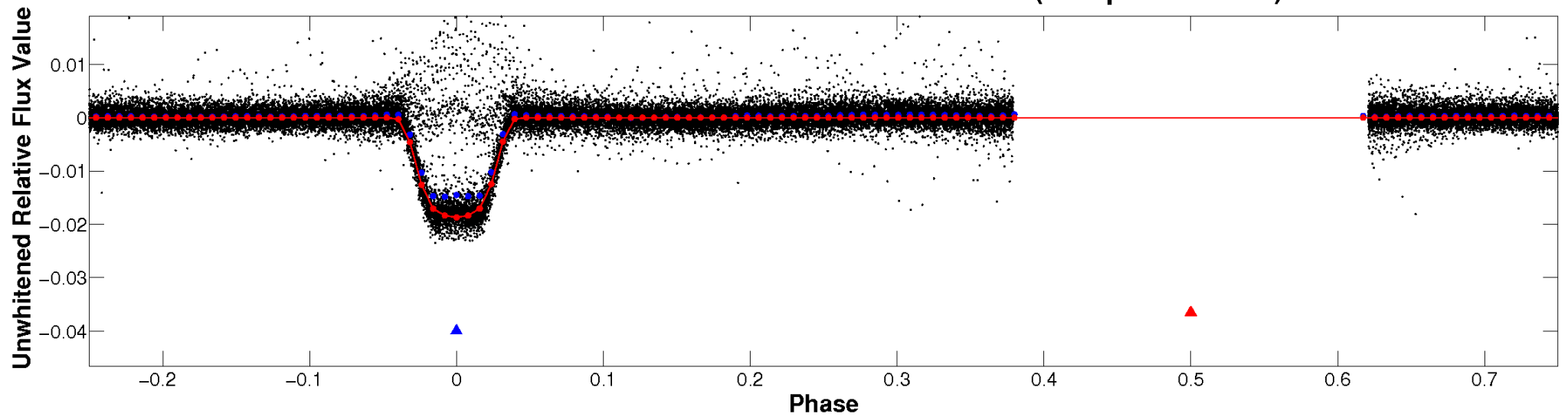
# ALT Odd/Even

TCE 012010534-02

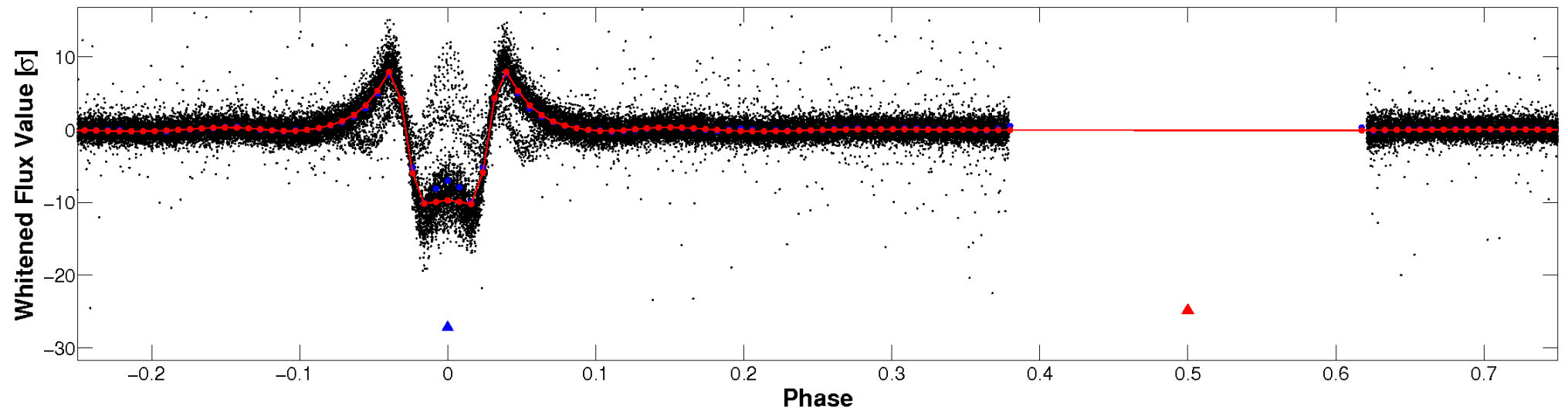


# Non-Whitened Vs. Whitened Light Curve

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



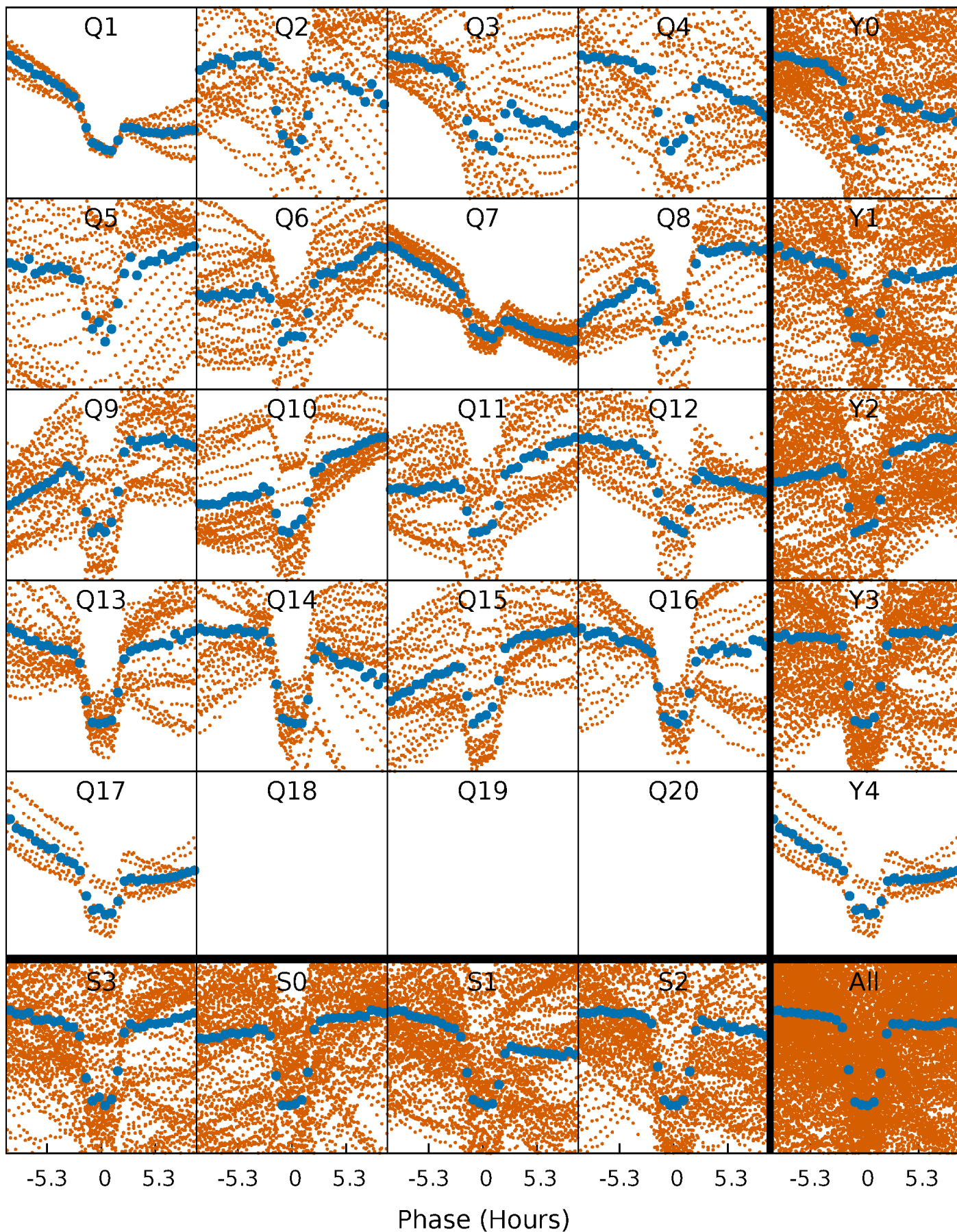
## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)





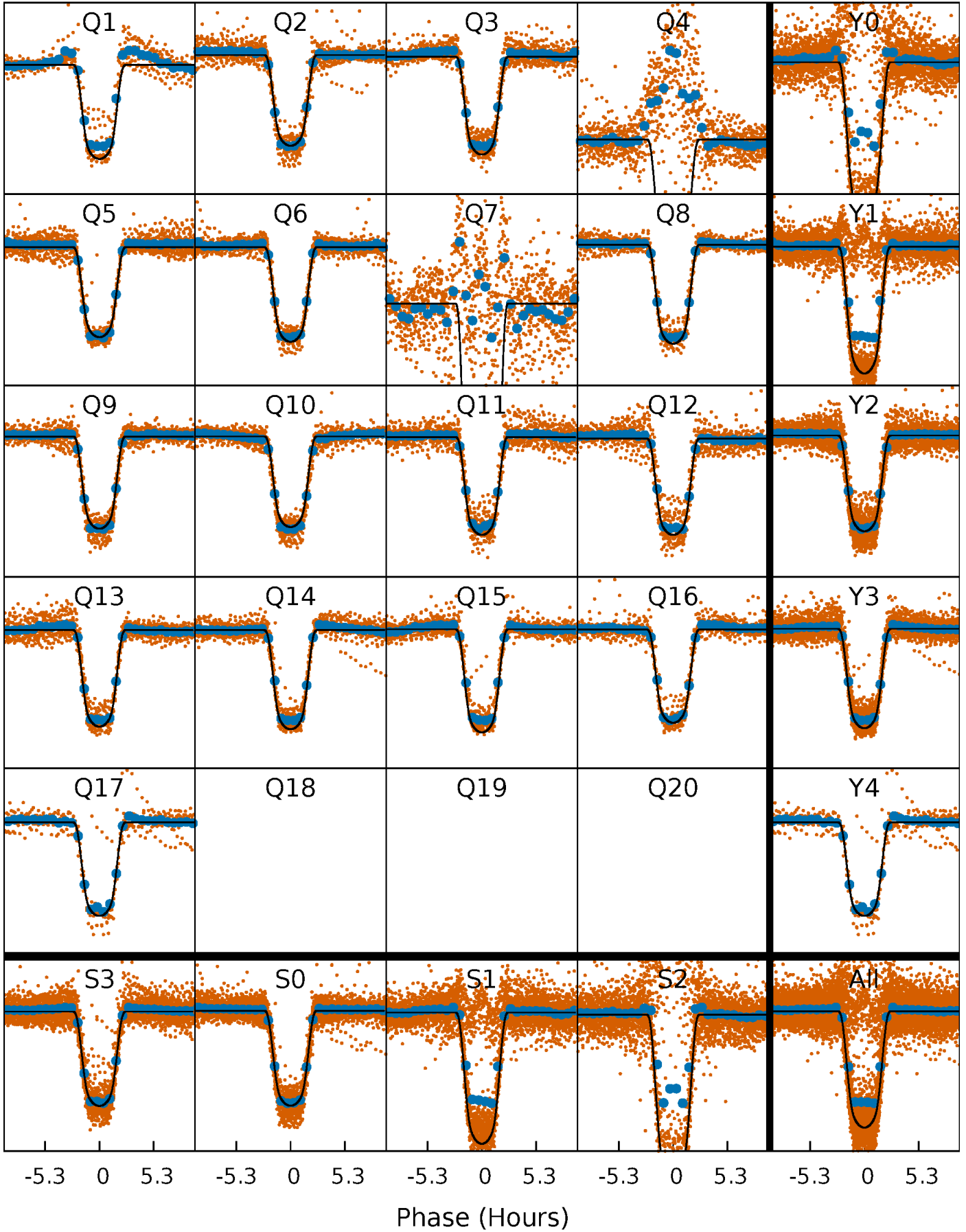
# PDC Quarter-Phased Transit Curves

TCE 012010534-02 P= 2.581588 Days  $T_0=131.658888$  (BKJD)



# DV Quarter-Phased Transit Curves

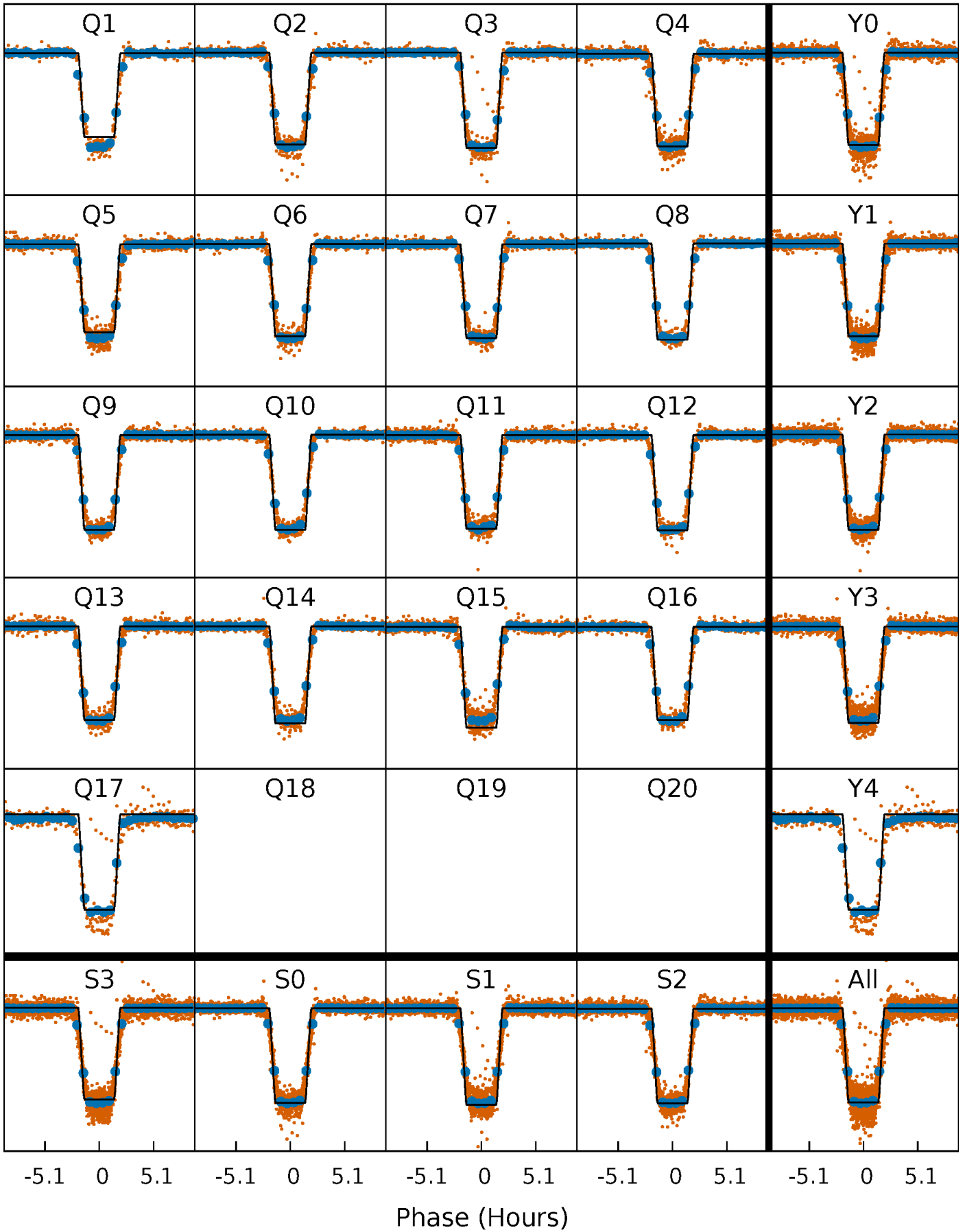
TCE 012010534-02 P= 2.581588 Days  $T_0=131.658888$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

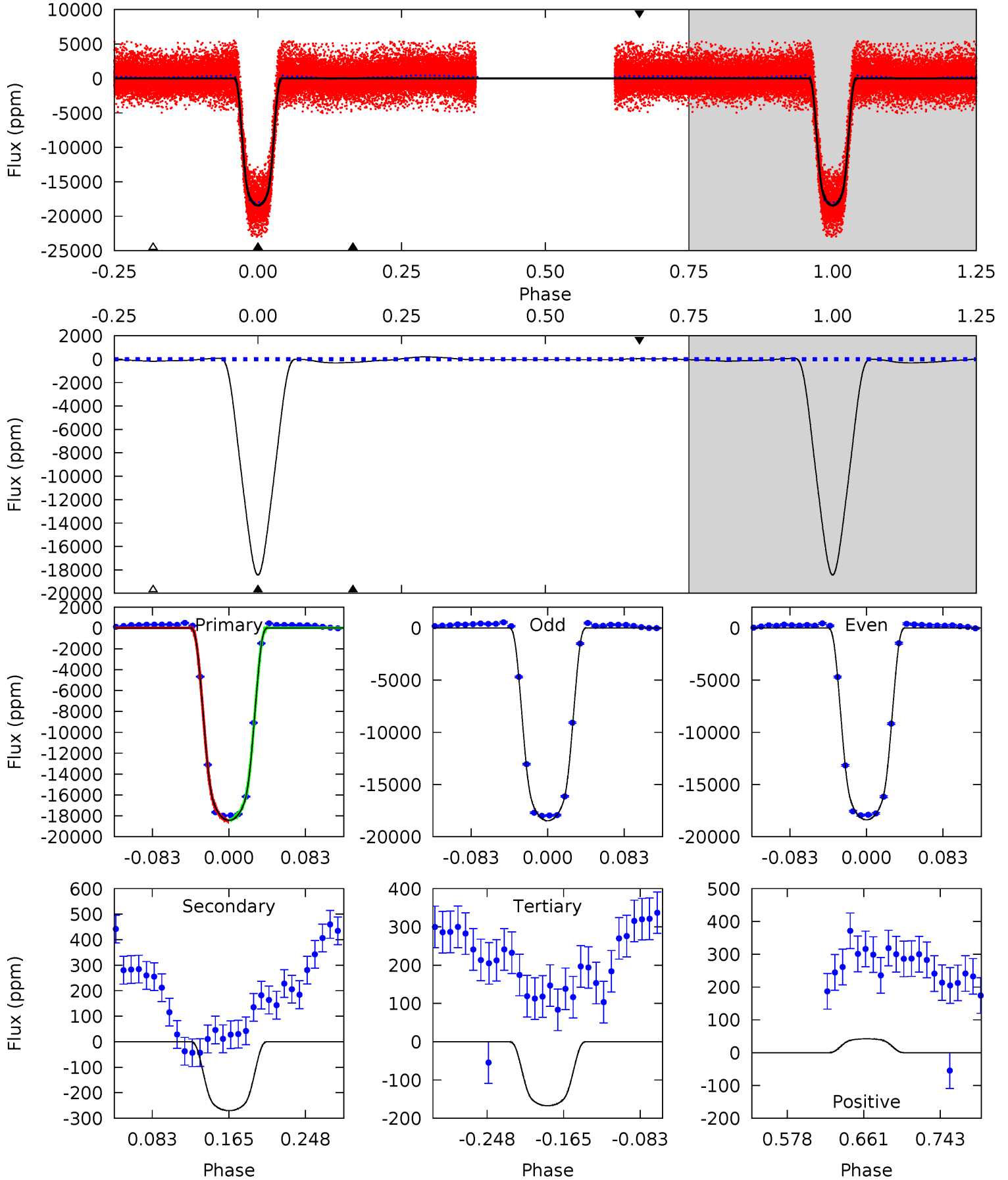
TCE 012010534-02 P= 2.581600 Days  $T_0=131.655657$  (BKJD)



# DV Model-Shift Uniqueness Test

012010534-02, P = 2.581588 Days, E = 129.077300 Days

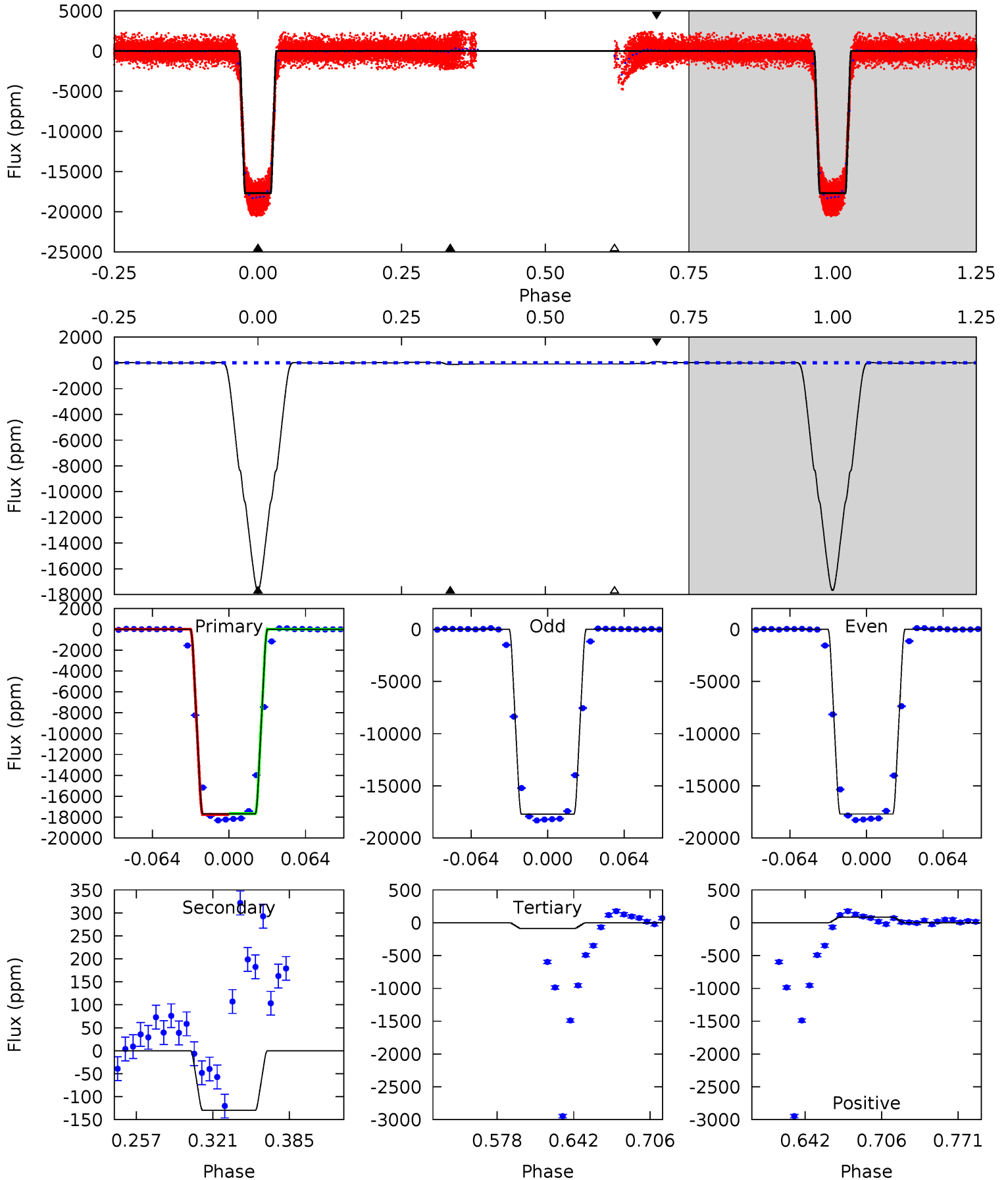
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
940.1	13.8	8.53	2.15	4.60	1.74	5.15	931.6	938.0	5.24	11.6	2.31	0.84	0.01	0



# Alt Model-Shift Uniqueness Test

012010534-02, P = 2.581600 Days, E = 129.074057 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
1803	13.2	9.03	8.57	4.66	1.85	2.49	1794	1794	4.21	4.67	0.74	1.00	0.00	4.80



### Stellar Parameters For KIC 012010534

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5720^{+152}_{-169}$	$4.407^{+0.120}_{-0.180}$	$-0.100^{+0.300}_{-0.300}$	$0.989^{+0.280}_{-0.151}$	$0.912^{+0.125}_{-0.083}$	$1.327^{+0.740}_{-0.645}$
	+3%/-3%	+3%/-4%	+300%/-300%	+28%/-15%	+14%/-9%	+56%/-49%
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 012010534-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-270 \pm 20$	$14.74^{+2.26}_{-1.33}$	$1867^{+140}_{-113}$	$2592^{+64}_{-77}$	$0.864^{+0.201}_{-0.208}$
Alt.	$-130 \pm 10$	$14.67^{+2.35}_{-1.28}$	$1870^{+130}_{-109}$	$2164^{+111}_{-334}$	$0.417^{+0.090}_{-0.099}$

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

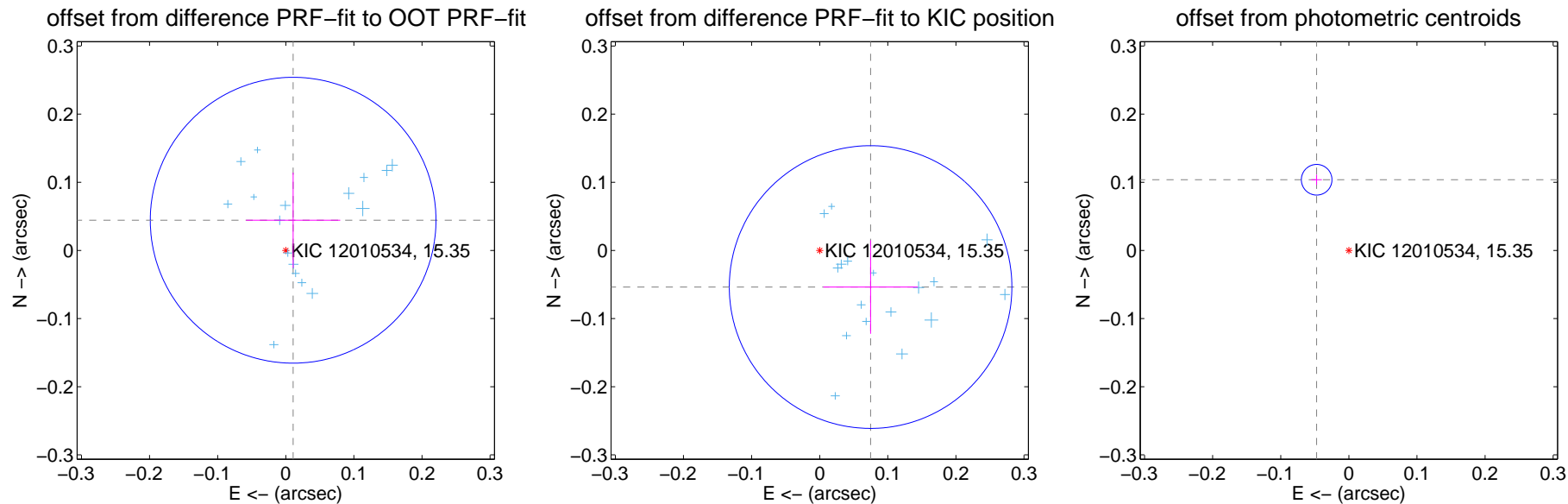
## DV Centroid Data

Supplemental centroid analysis for 012010534-02. Kepler magnitude: 15.35. Transit SNR 599.00

There are 17 quarters with good PRF difference image offsets

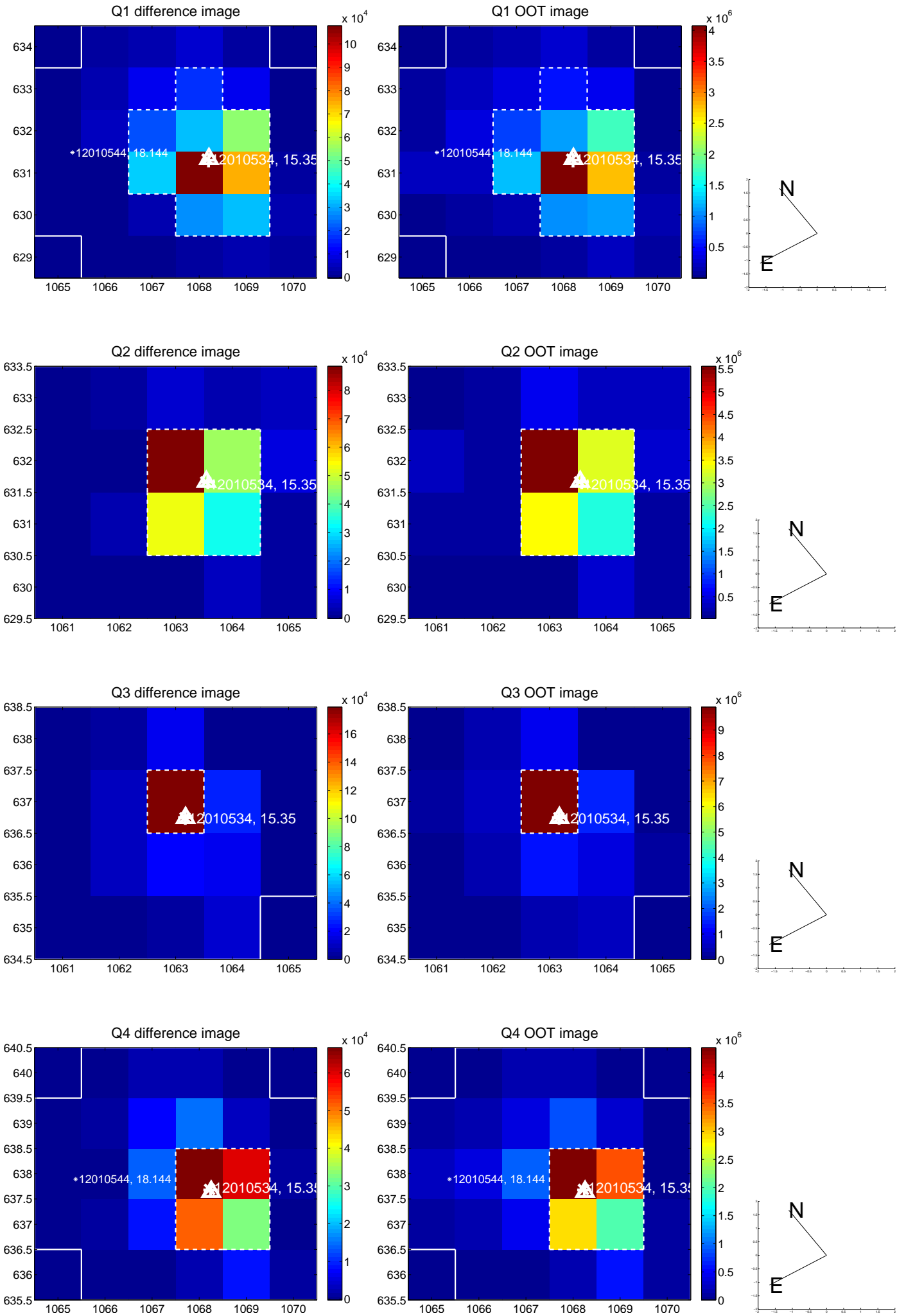
The direct PRF centroid is offset from the target star catalog position by about 0.17 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.046 \pm 0.070$	0.65	$-0.011 \pm 0.069$	$0.044 \pm 0.070$
PRF-fit source offset from KIC position	$0.092 \pm 0.069$	1.33	$-0.075 \pm 0.069$	$-0.054 \pm 0.069$
photometric centroid source offset	$0.11 \pm 0.01$	15.21	$0.05 \pm 0.01$	$0.10 \pm 0.01$

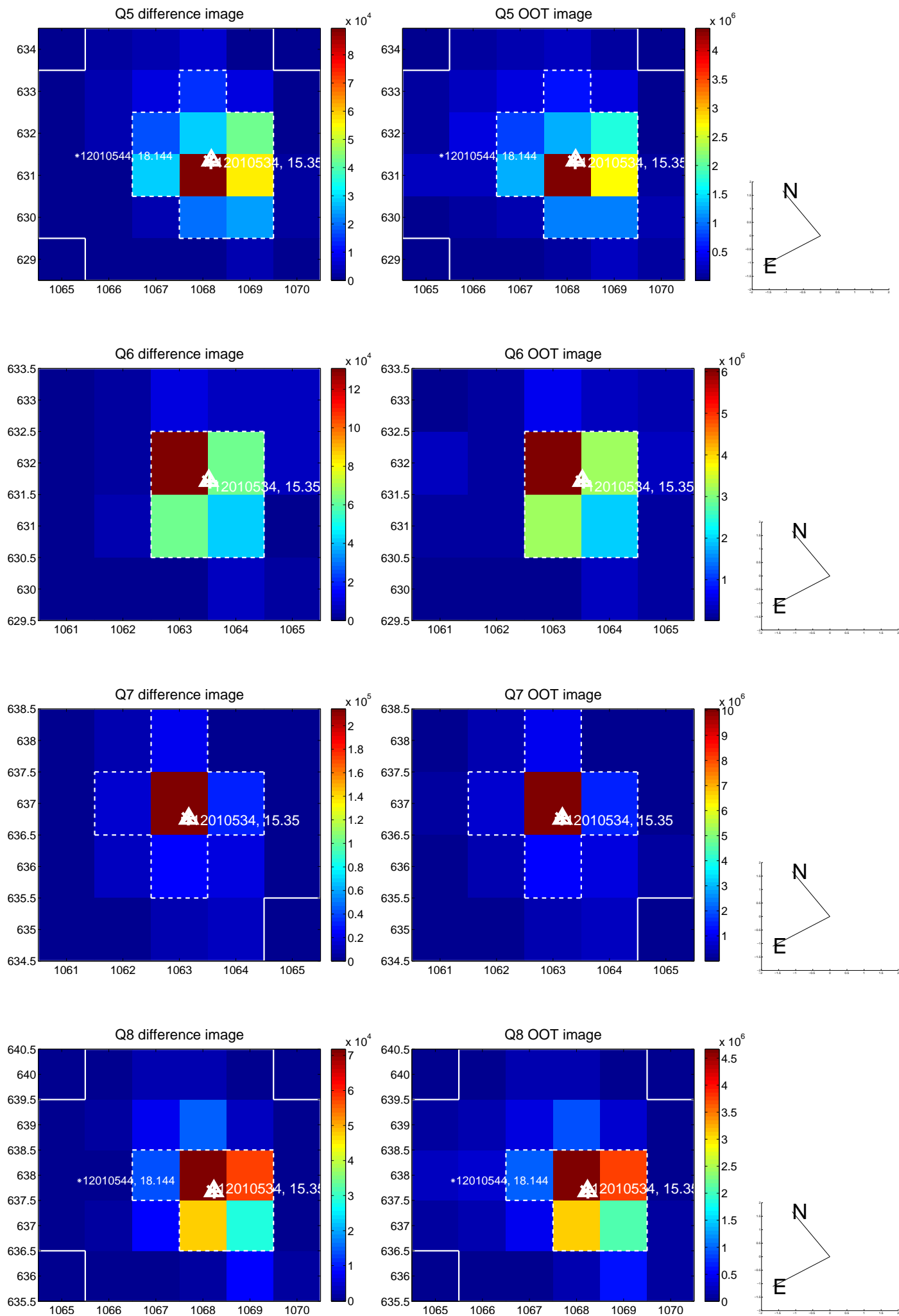


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

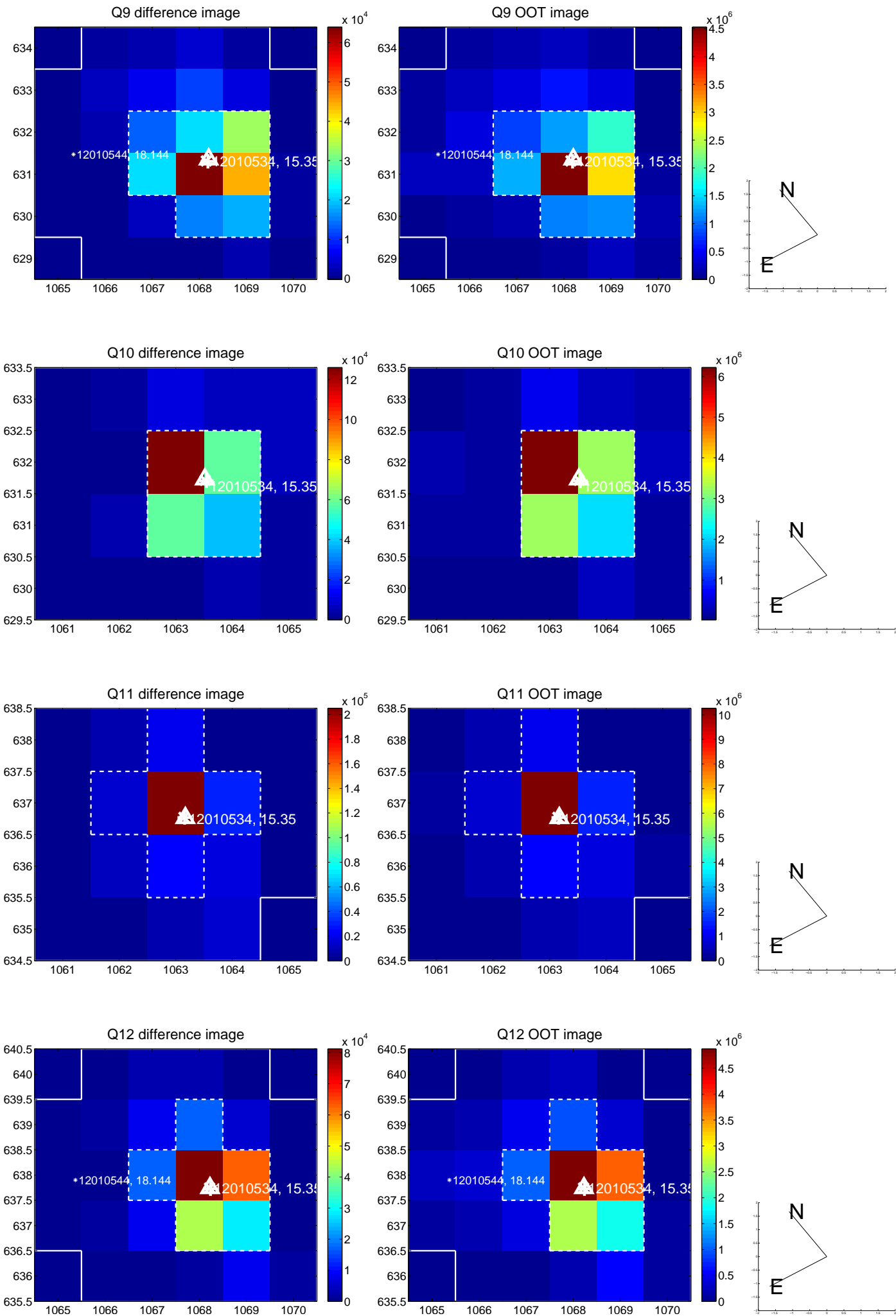


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

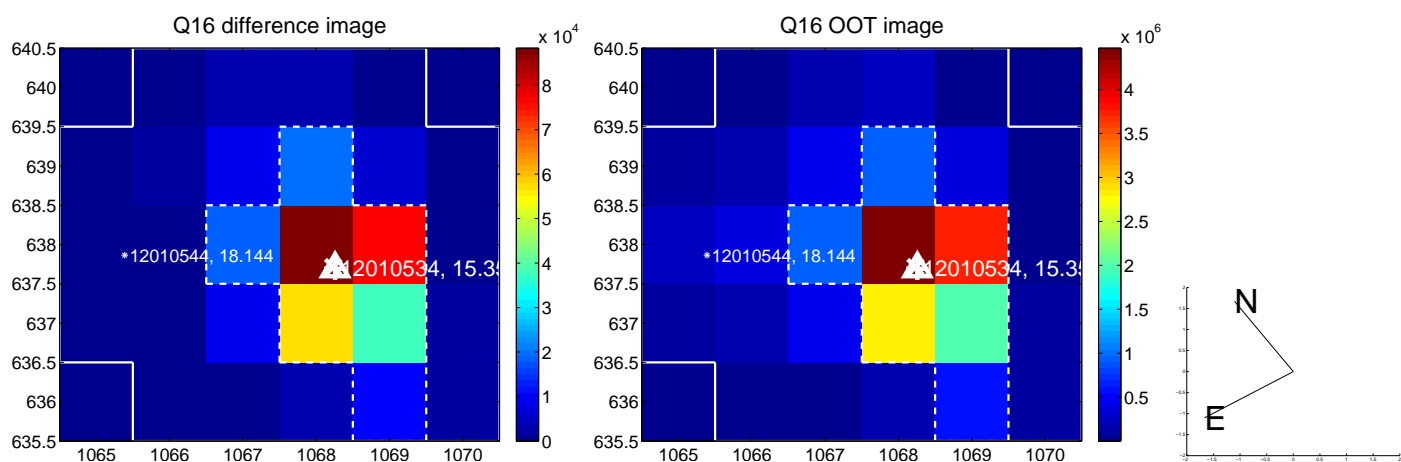
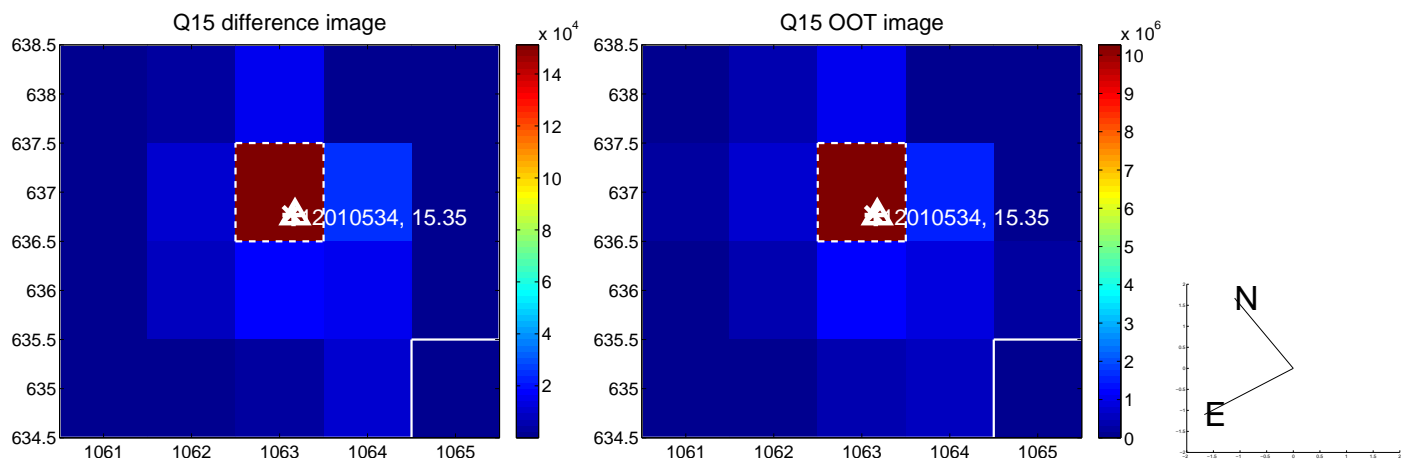
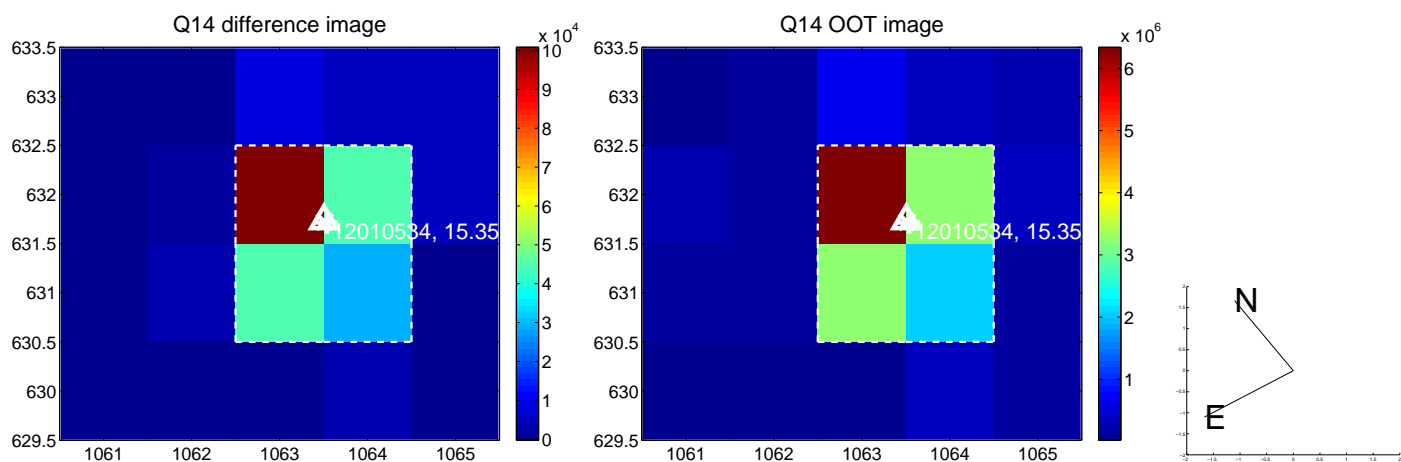
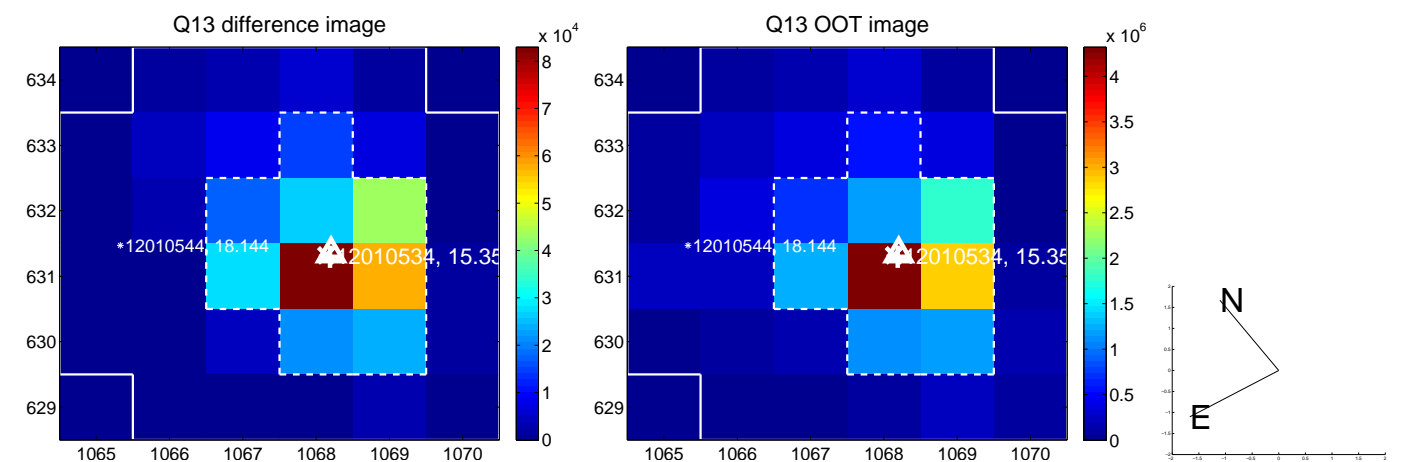




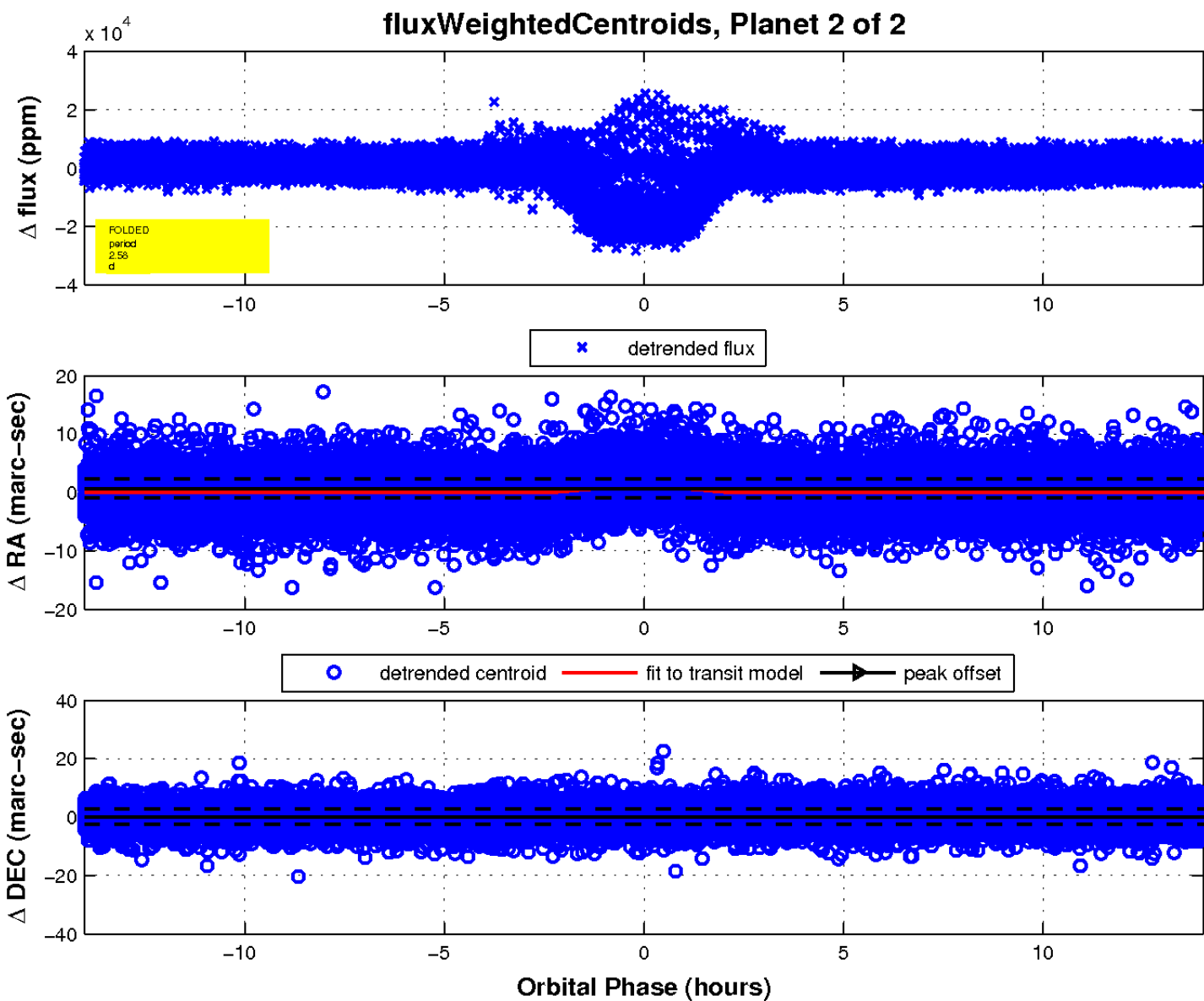
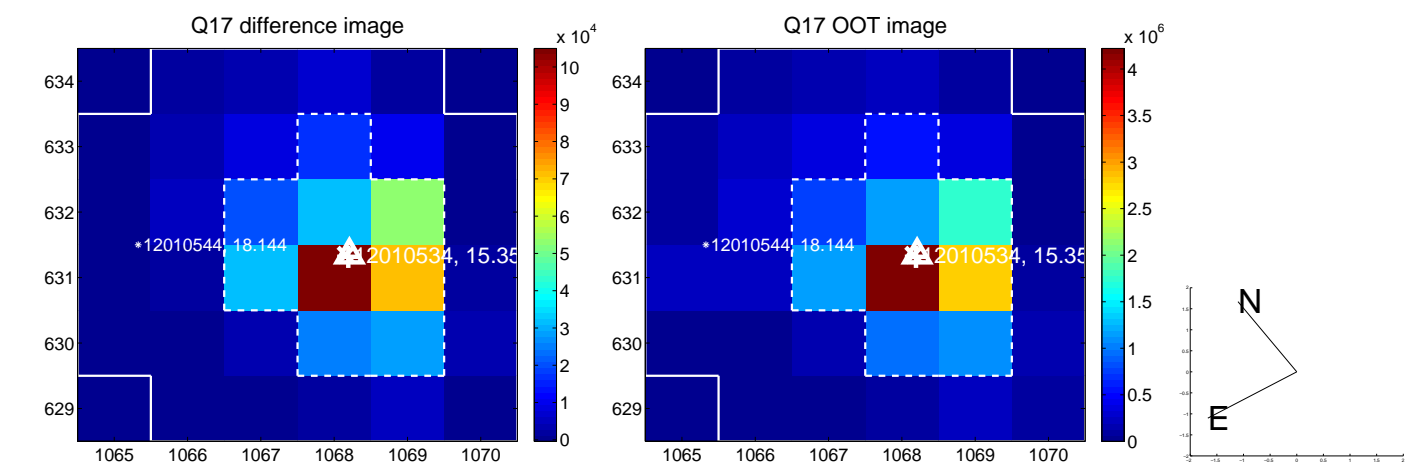
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UKIRT Image

Declination

