

# KIC 009664215

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009664215-01	OBS	6072.01	3.319529	131.923891	38439.2	3.345	2110.4	1471.7	0.79	5761	23.44	357.19
009664215-02	OBS	No	3.319522	133.589220	6745.5	3.190	376.0	353.8	0.79	5761	11.86	357.19

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009664215-01	OBS	FP	0.00	0	1	0	0	MOD_SEC_DV—MOD_SEC_ALT—DEEP_V_SHAPED—HAS_SEC_TCE
009664215-02	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.

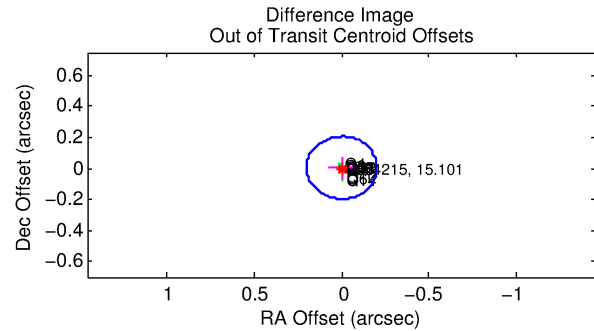
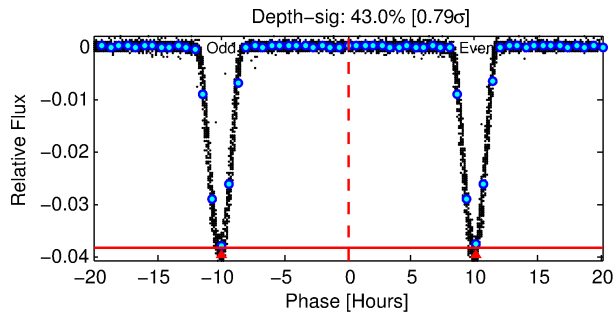
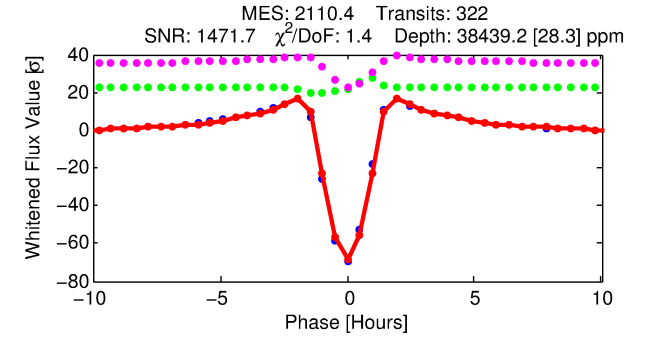
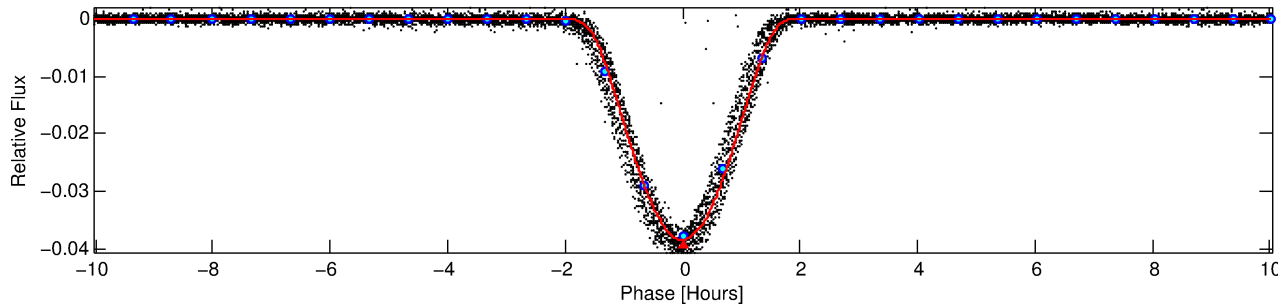
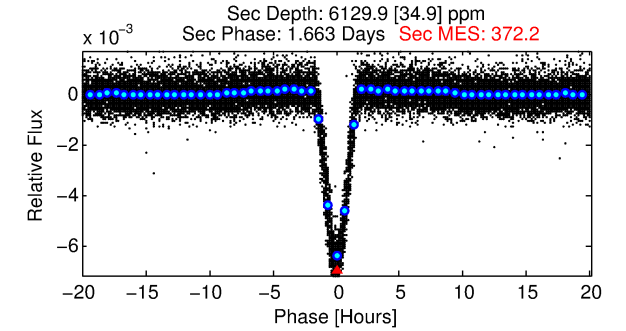
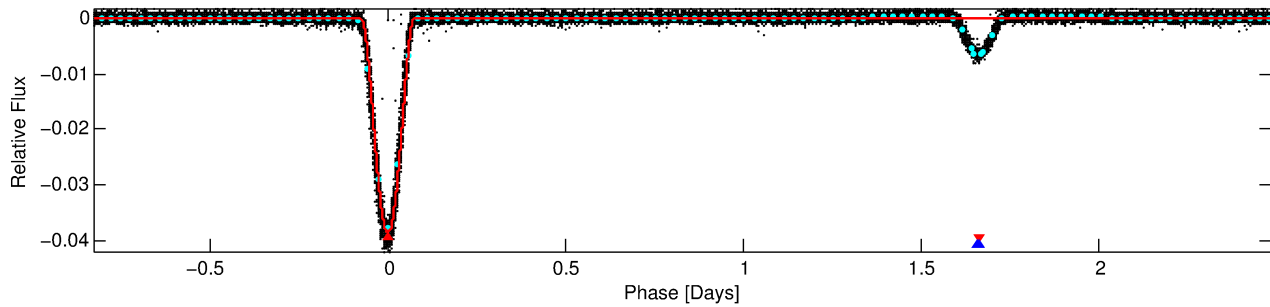
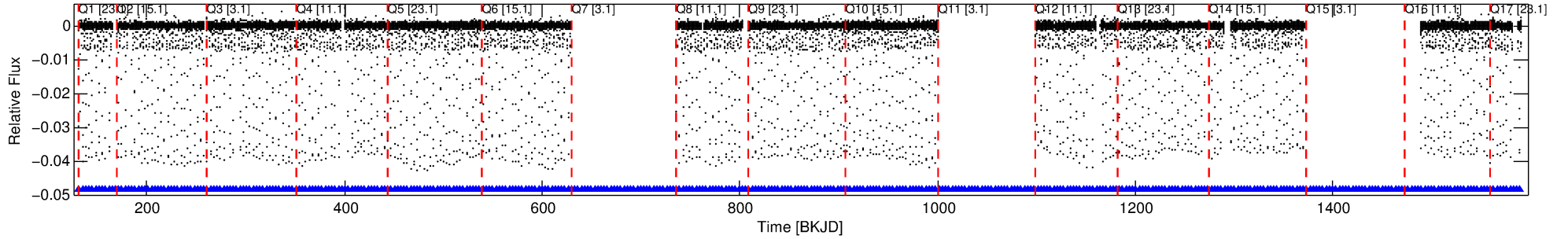
## Ephemeris Match Information For 009664215-01

No Significant Match Found

# DV One-Page Summary

KIC: 9664215 Candidate: 1 of 2 Period: 3.320 d  
KOI: K06072.01 Corr: 0.986

Kp: 15.10 R\*: 0.79 Rs Teff: 5761.0 K Logg: 4.58 Fe/H: -0.400



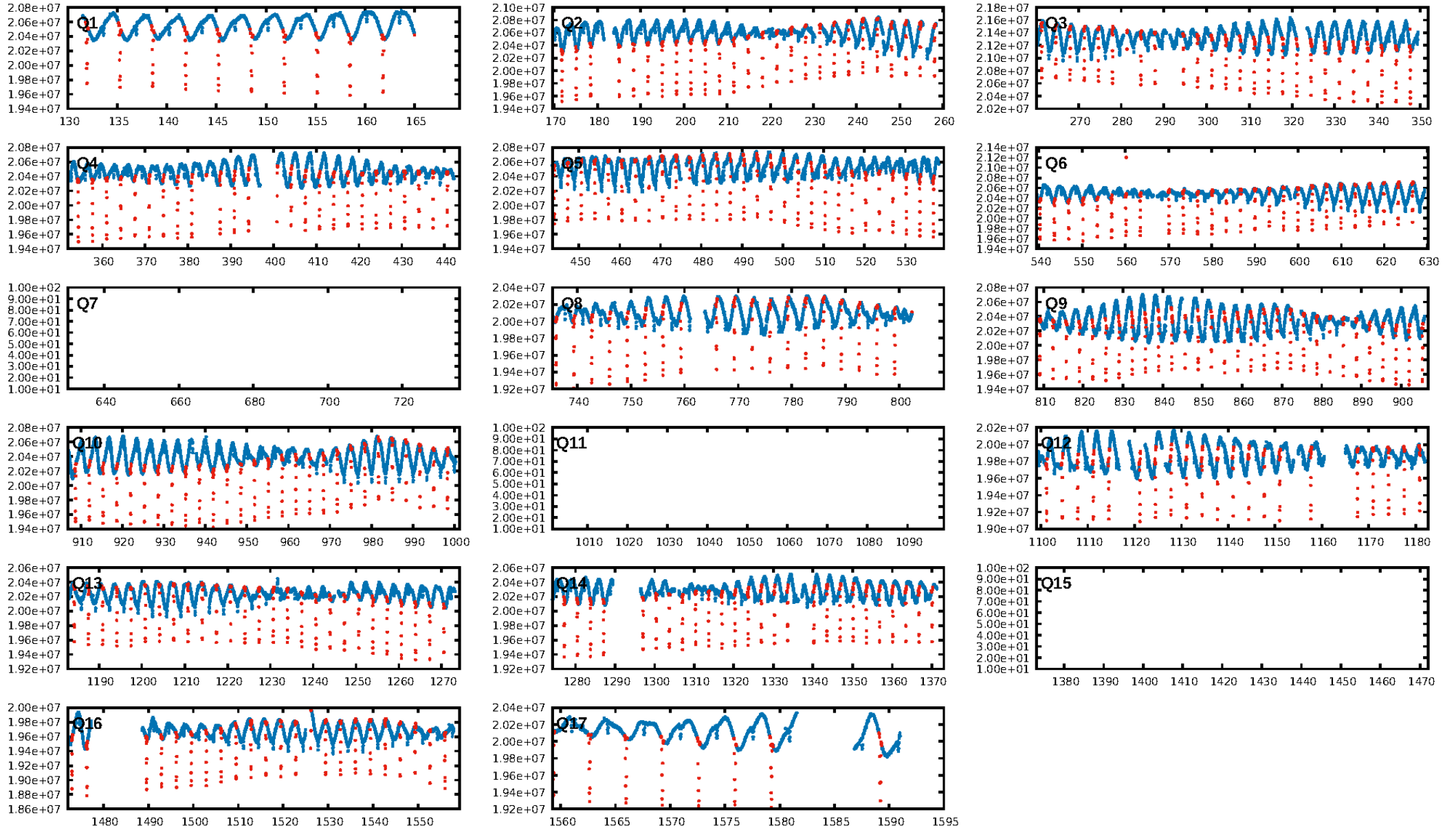
## DV Fit Results:

Period = 3.31953 [0.00000] d  
Epoch = 131.9239 [0.0000] BKJD  
Rp/R\* = 0.2716 [0.0070]  
a/R\* = 6.56 [0.02]  
b = 0.94 [0.01]  
Seff = 357.19 [112.03]  
Teq = 1109 [87] K  
Rp = 23.44 [5.75] Re  
a = 0.0416 [0.0085] AU  
Ag = 10.61 [3.17] [3.03σ]  
Teffp = 3093 [92] K [15.66σ]

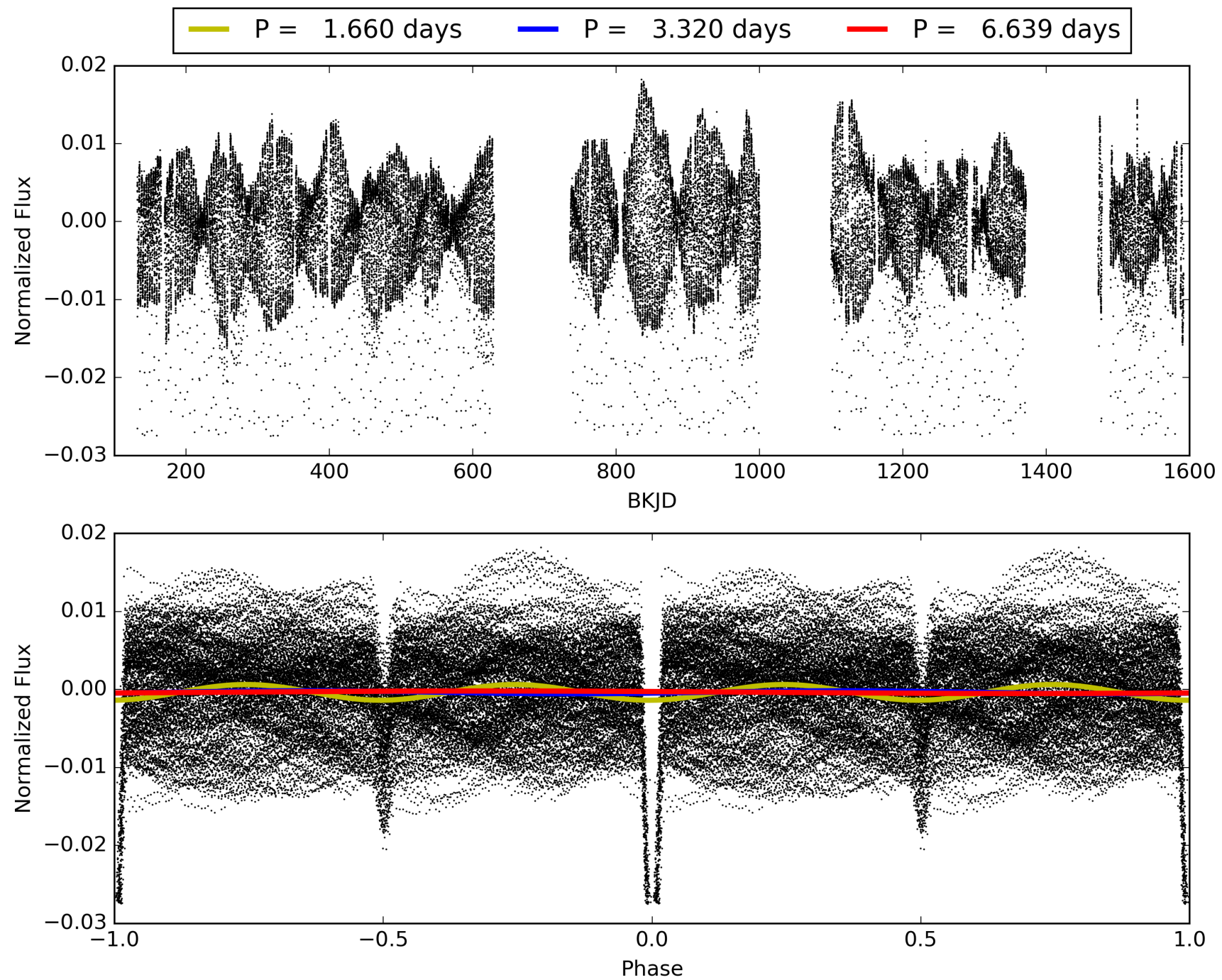
## DV Diagnostic Results:

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 [304/304]  
GhostDiagnostic-chr: 2.09  
Centroid-sig: 2.7%  
Centroid-so: 0.041 arcsec [7.87σ]  
OotOffset-rm: 0.005 arcsec [0.08σ]  
KicOffset-rm: 0.098 arcsec [1.45σ]  
OotOffset-st: 4/1/4/5 [14]  
KicOffset-st: 4/1/4/5 [14]  
DiffImageQuality-fgm: 1.00 [14/14]  
DiffImageOverlap-fno: 1.00 [14/14]

# TCE 009664215-01, PDC Light Curves

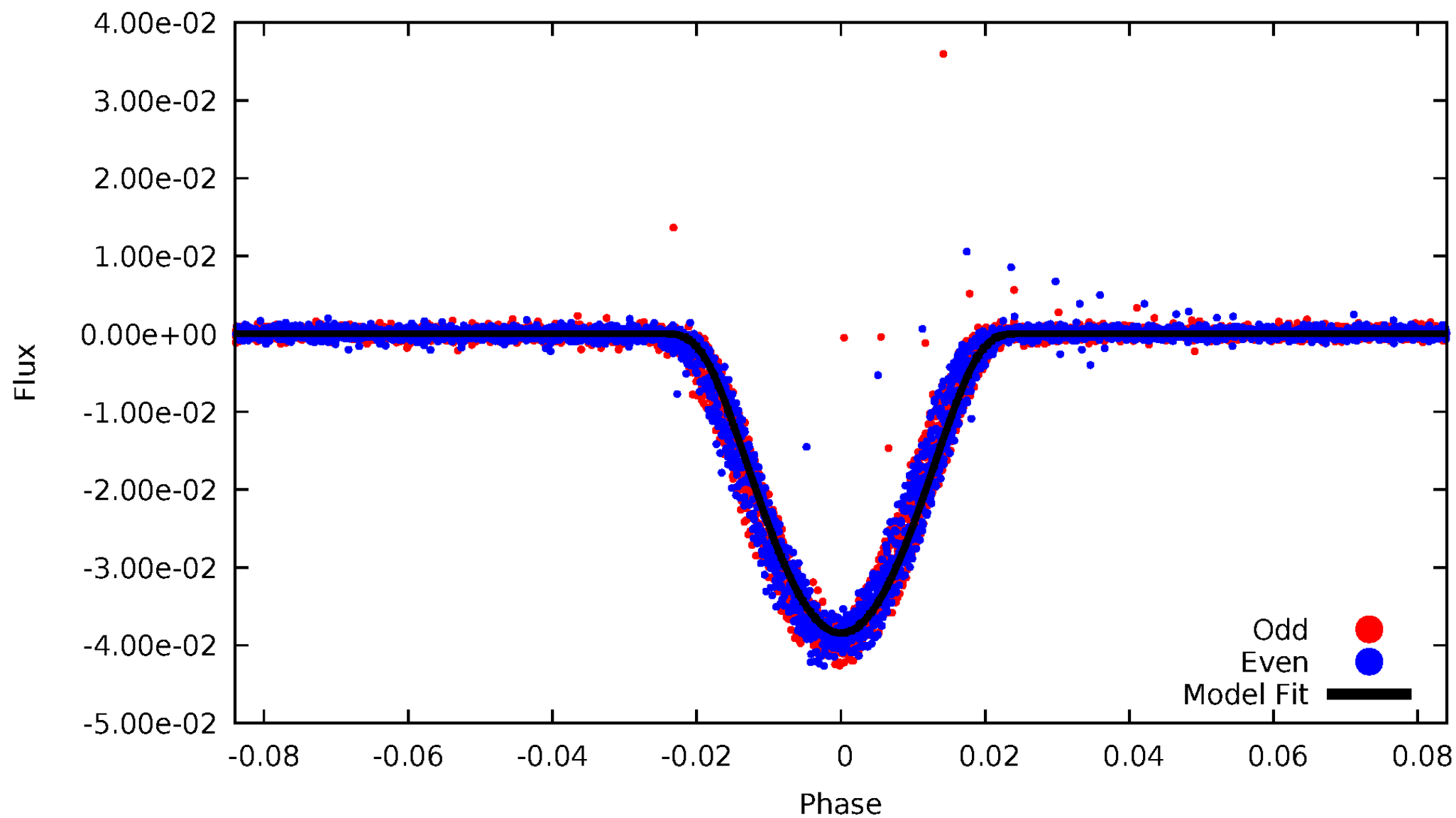


TCE 009664215-01



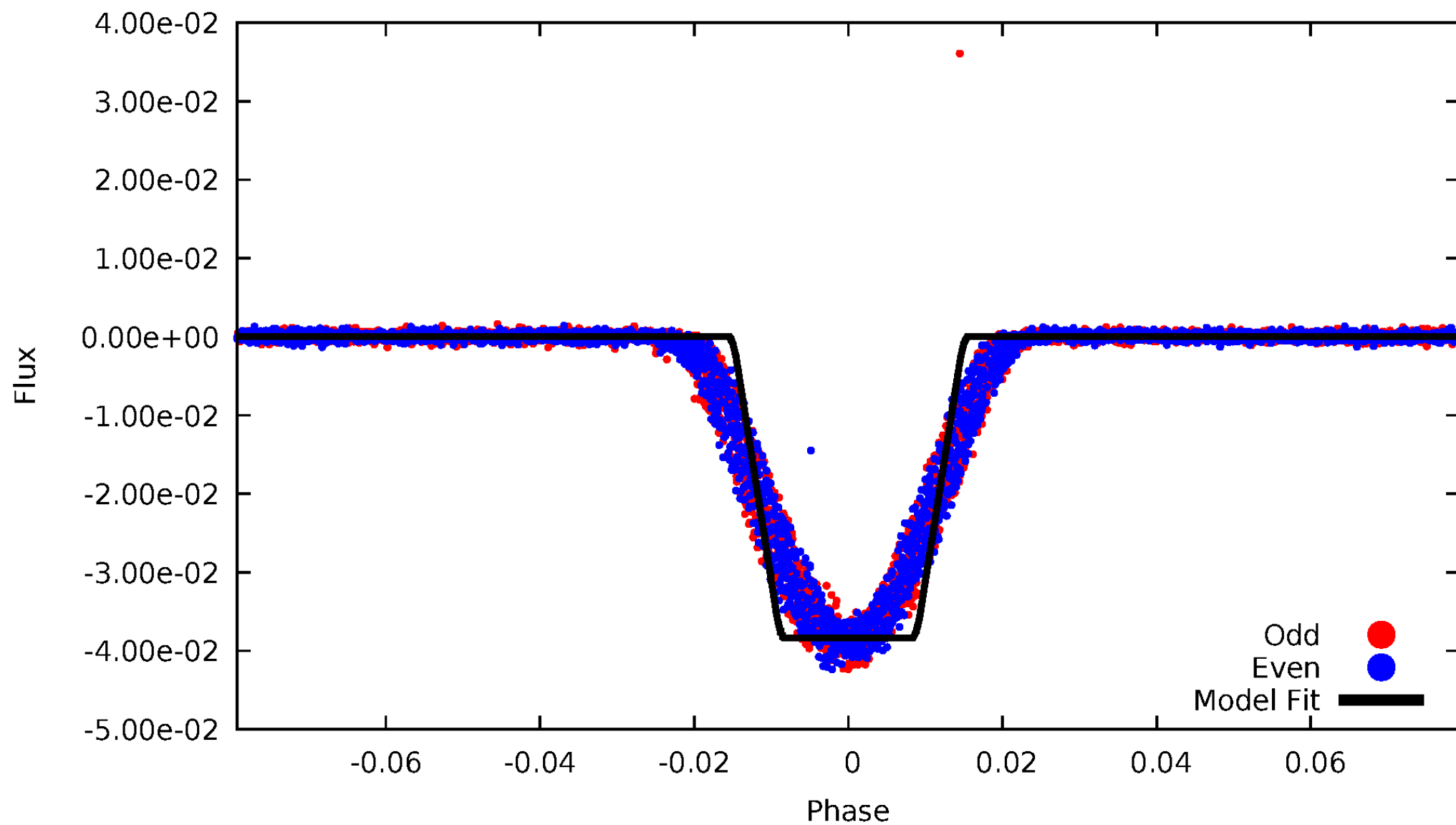
# DV Odd/Even

TCE 009664215-01



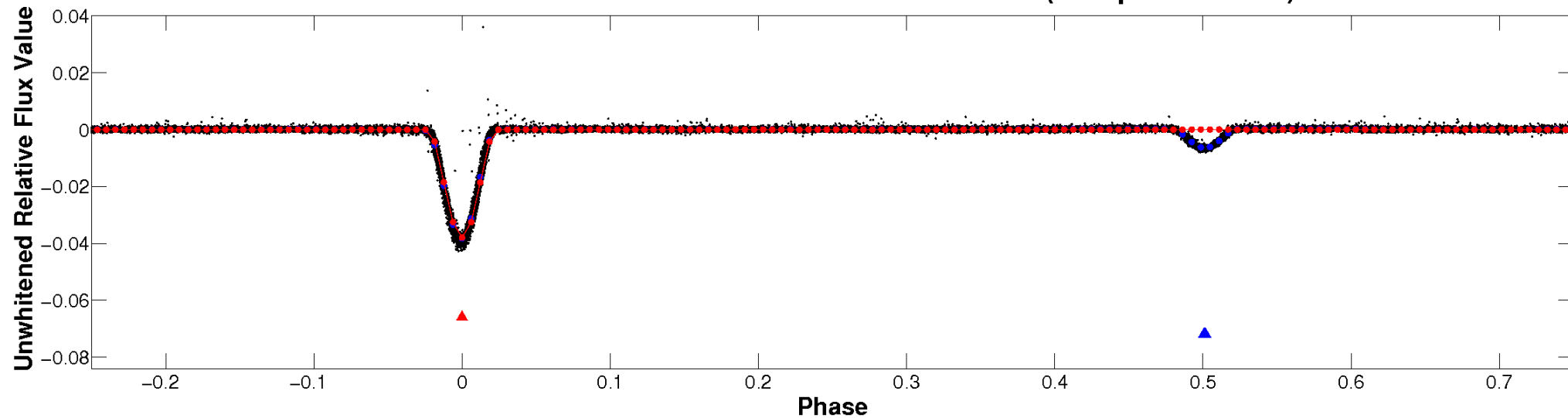
# ALT Odd/Even

TCE 009664215-01

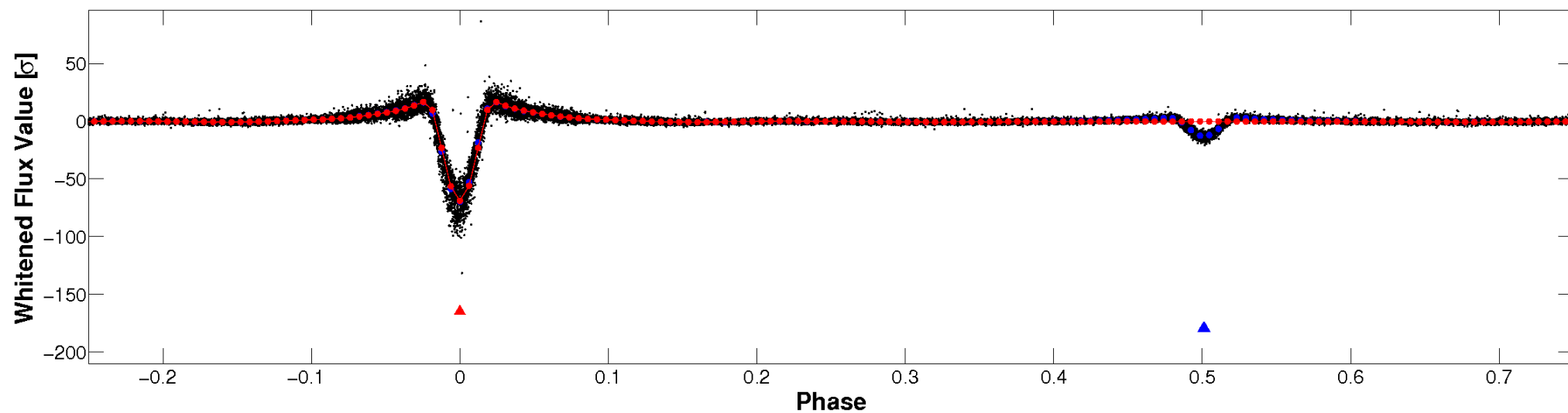


# Non-Whitened Vs. Whitened Light Curve

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



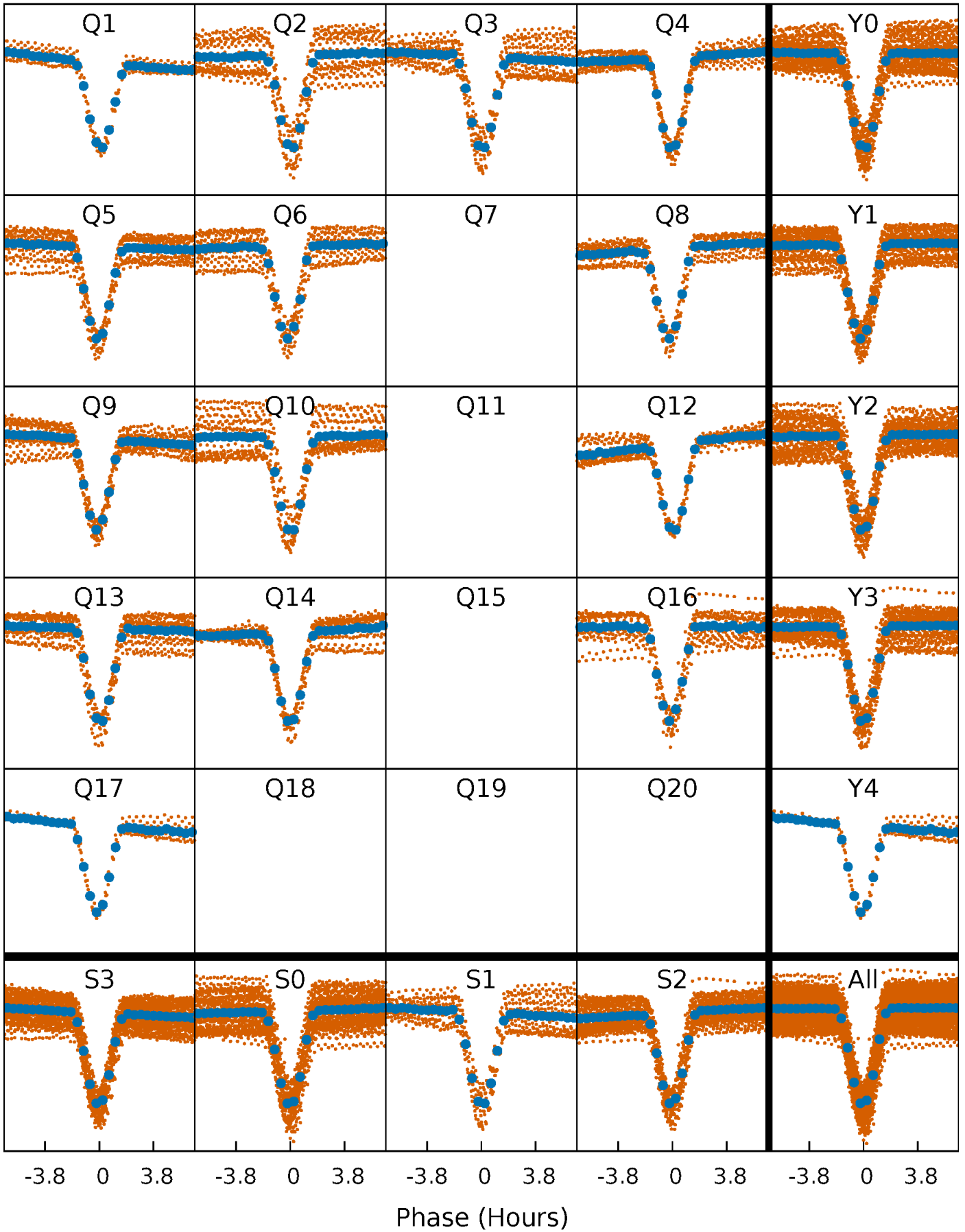
**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**





# PDC Quarter-Phased Transit Curves

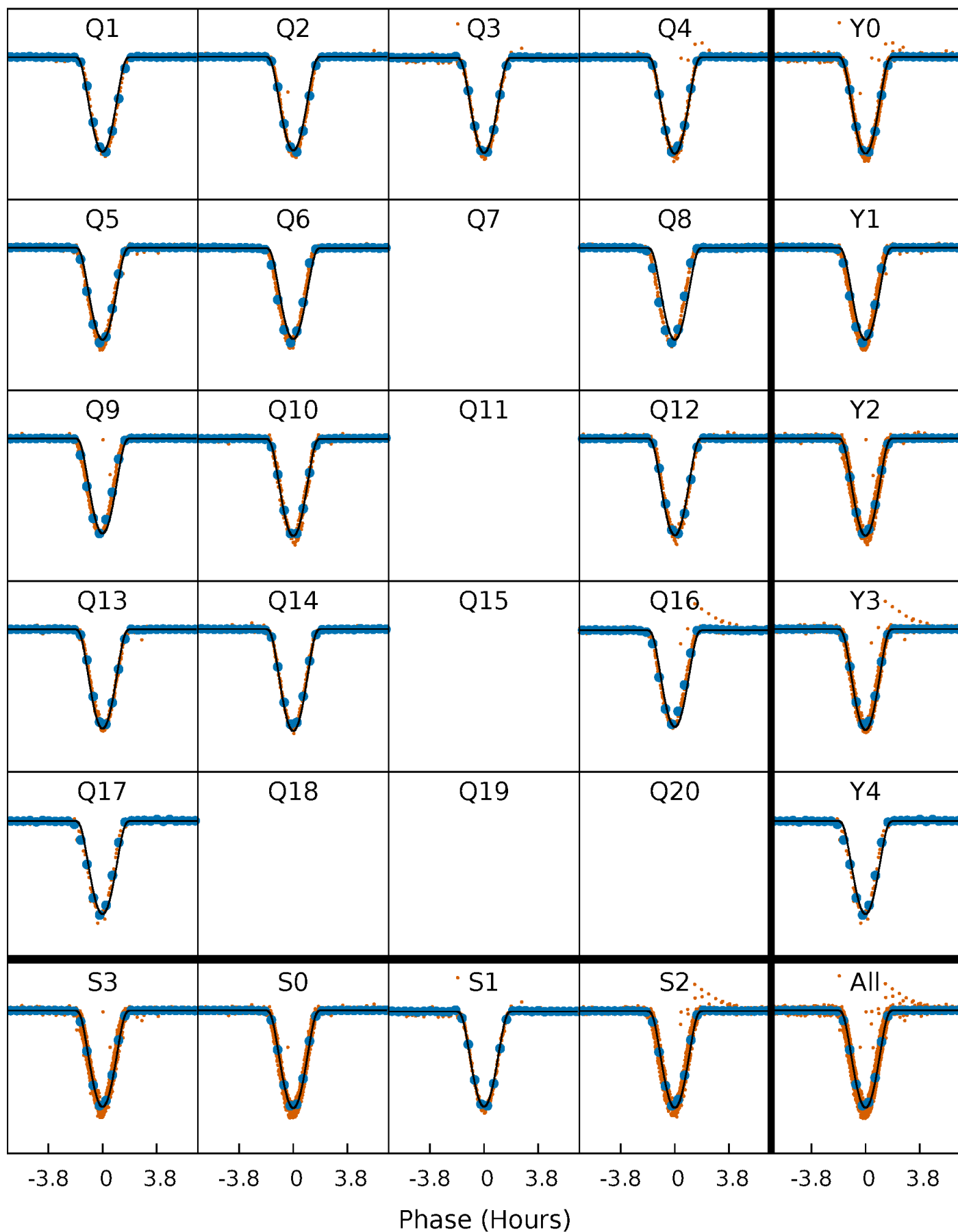
TCE 009664215-01 P= 3.319529 Days  $T_0=131.923891$  (BKJD)





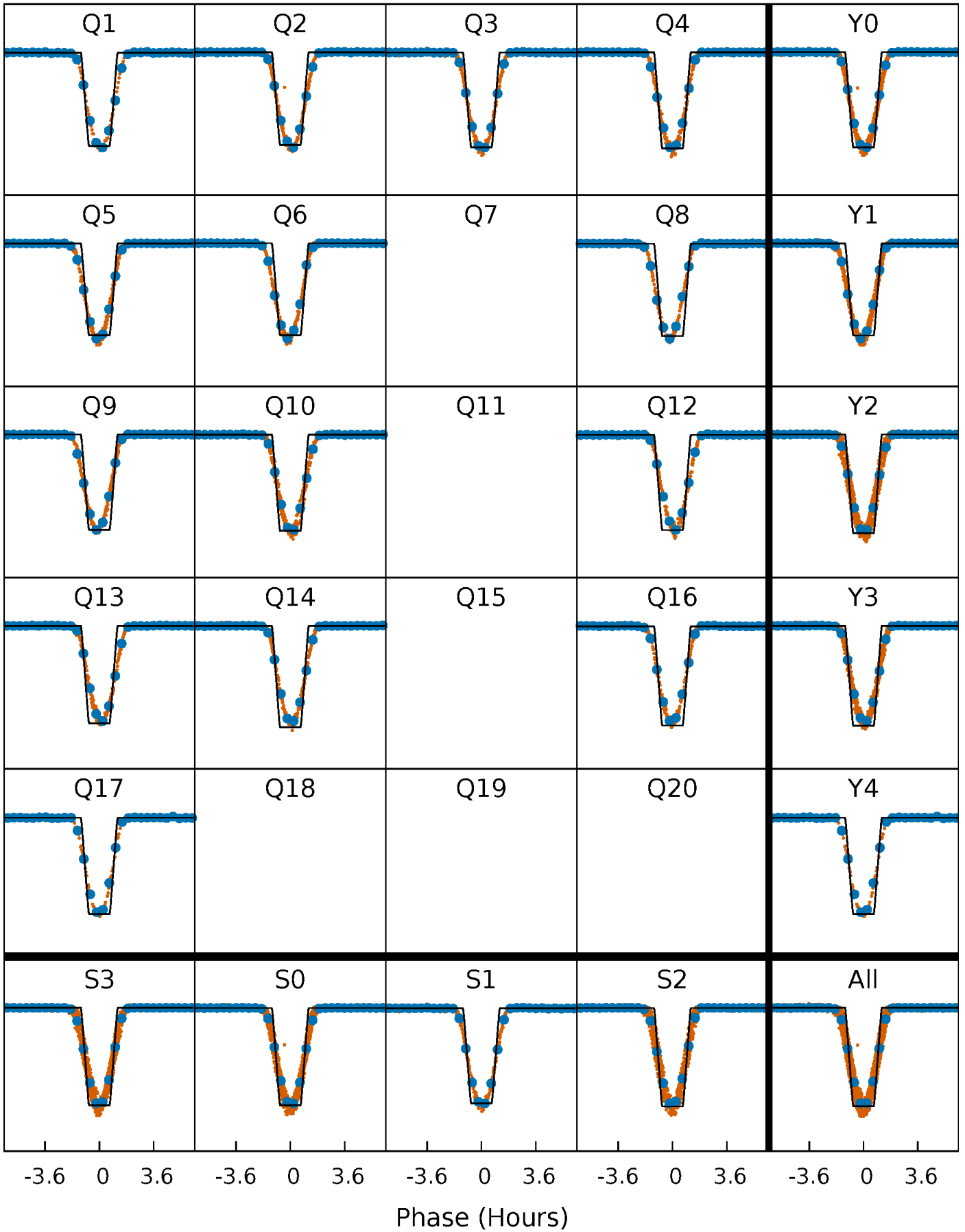
# DV Quarter-Phased Transit Curves

TCE 009664215-01 P= 3.319529 Days  $T_0=131.923891$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

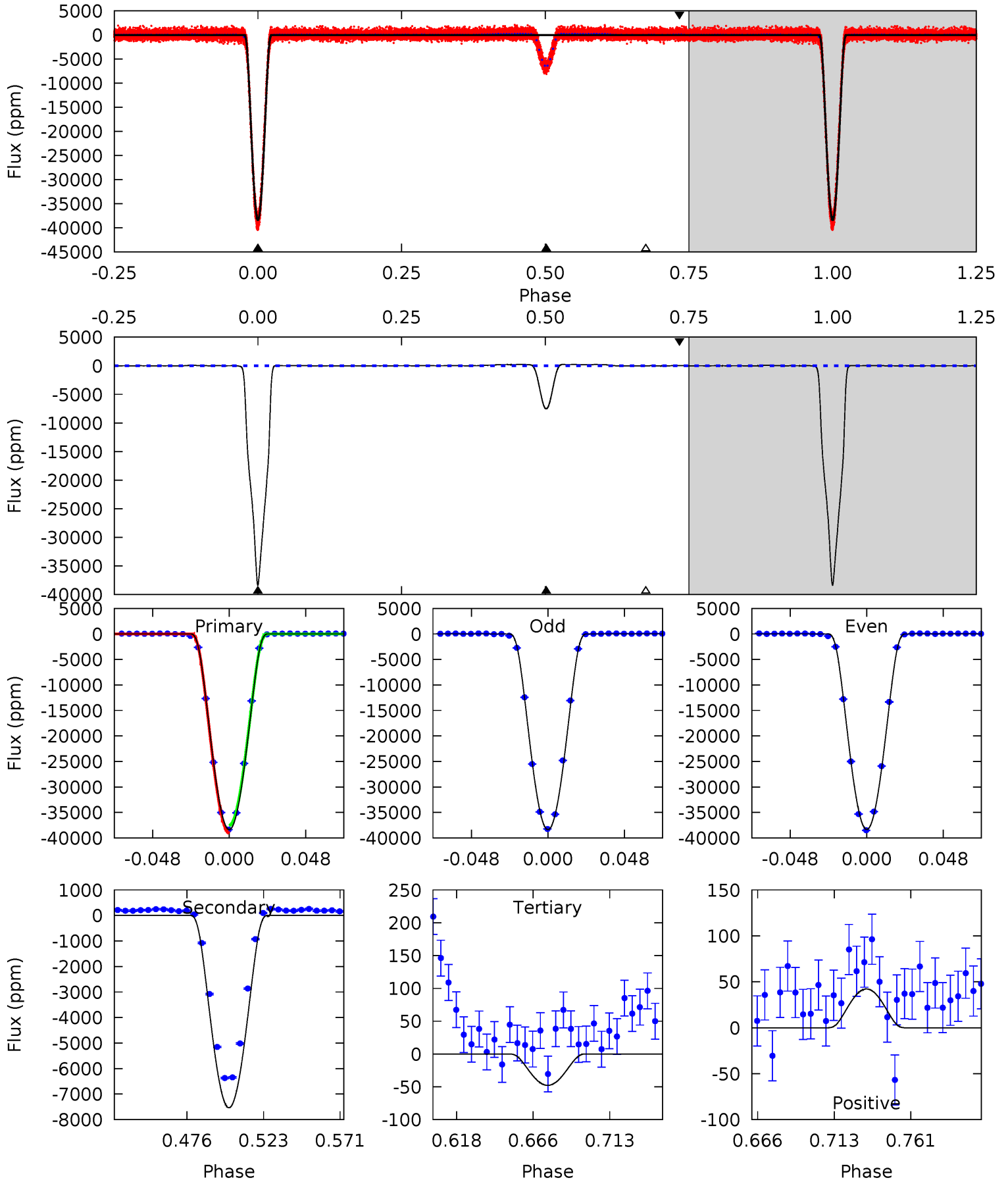
TCE 009664215-01   P= 3.319517 Days    $T_0=131.924537$  (BKJD)



# DV Model-Shift Uniqueness Test

009664215-01, P = 3.319529 Days, E = 128.604362 Days

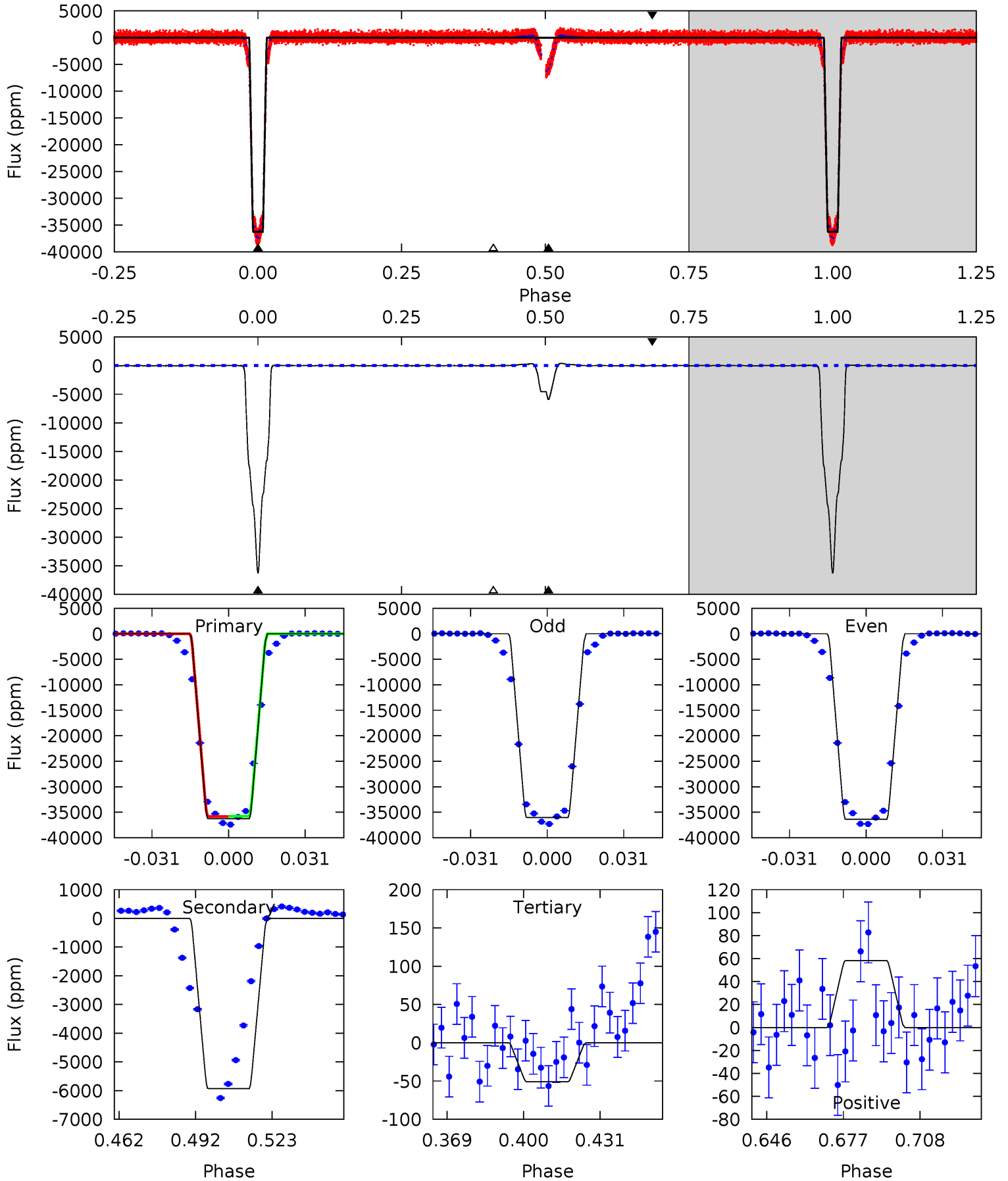
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
3128	614.6	3.90	3.44	4.72	1.98	5.50	3124	3124	610.7	611.2	1.91	0.99	0.01	60.2



# Alt Model-Shift Uniqueness Test

009664215-01, P = 3.319517 Days, E = 128.605020 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
2189	358.0	3.08	3.51	4.81	2.16	3.12	2186	2185	354.9	354.5	10.5	1.00	0.01	0



### Stellar Parameters For KIC 009664215

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5761^{+155}_{-155}$	$4.581^{+0.040}_{-0.160}$	$-0.400^{+0.300}_{-0.300}$	$0.791^{+0.193}_{-0.064}$	$0.881^{+0.087}_{-0.106}$	$2.505^{+0.517}_{-1.073}$
	+3%/-3%	+1%/-3%	+75%/-75%	+24%/-8%	+10%/-12%	+21%/-43%
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 009664215-01 / KOI 6072.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-7536 \pm 12$	$24.00^{+3.02}_{-1.58}$	$1578^{+89}_{-62}$	$3672^{+75}_{-78}$	$12^{+2}_{-2}$
Alt.	$-5930 \pm 17$	$17.32^{+2.35}_{-1.24}$	$1584^{+93}_{-68}$	$3946^{+95}_{-99}$	$18^{+3}_{-3}$

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

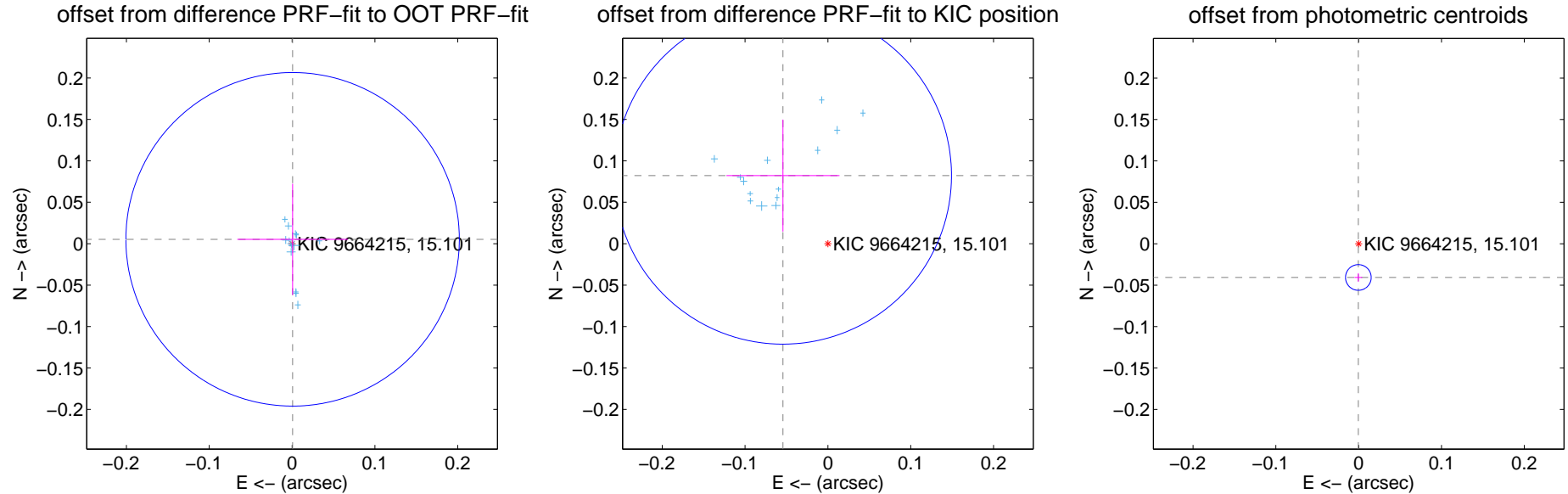
## DV Centroid Data

Supplemental centroid analysis for 009664215-01. Kepler magnitude: 15.10. Transit SNR 1471.73

There are 14 quarters with good PRF difference image offsets

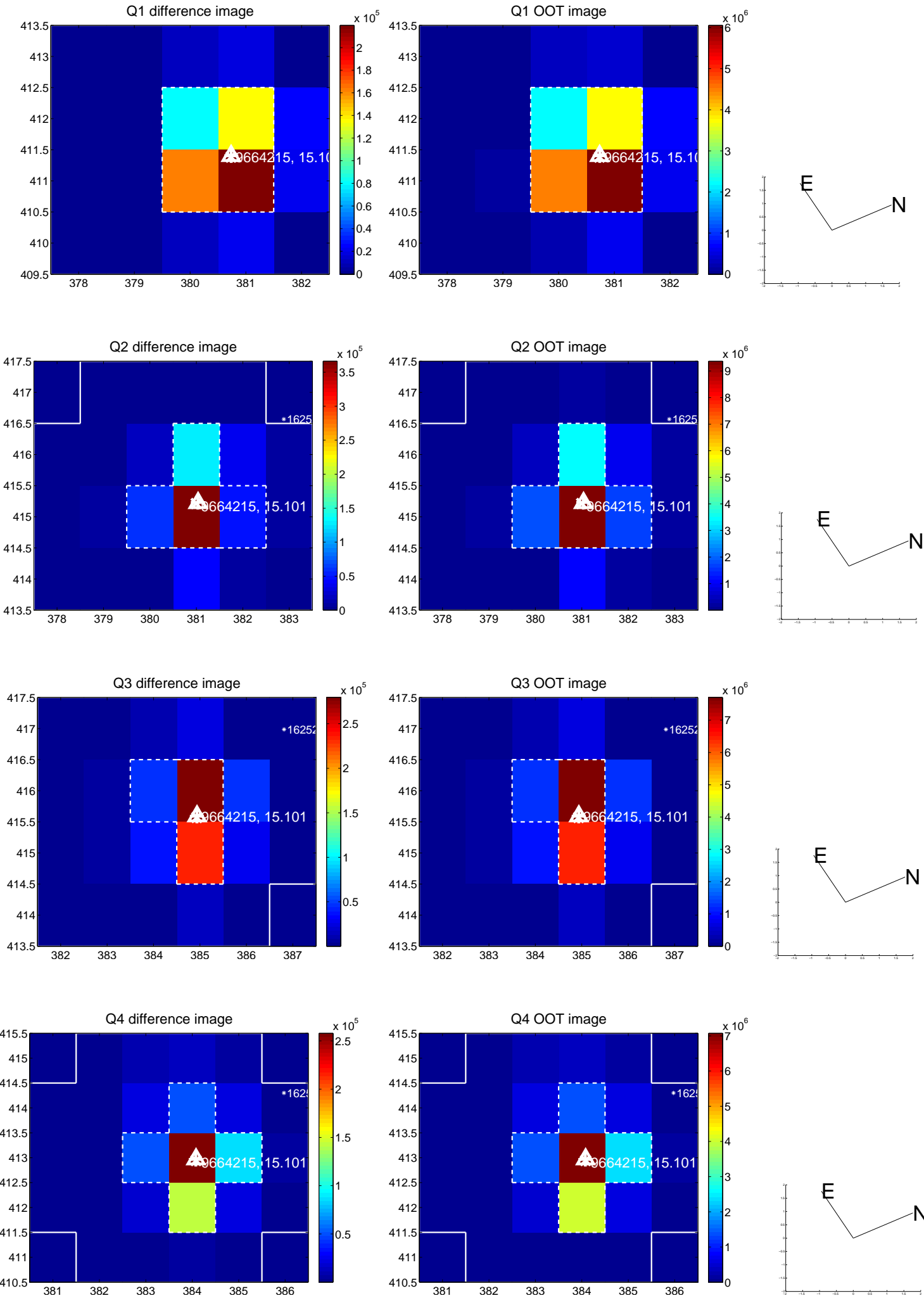
The direct PRF centroid is offset from the target star catalog position by about 0.10 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.005 \pm 0.067$	0.08	$-0.001 \pm 0.067$	$0.005 \pm 0.067$
PRF-fit source offset from KIC position	$0.098 \pm 0.068$	1.45	$0.054 \pm 0.068$	$0.082 \pm 0.068$
photometric centroid source offset	$0.04 \pm 0.01$	7.87	$0.00 \pm 0.00$	$-0.04 \pm 0.01$



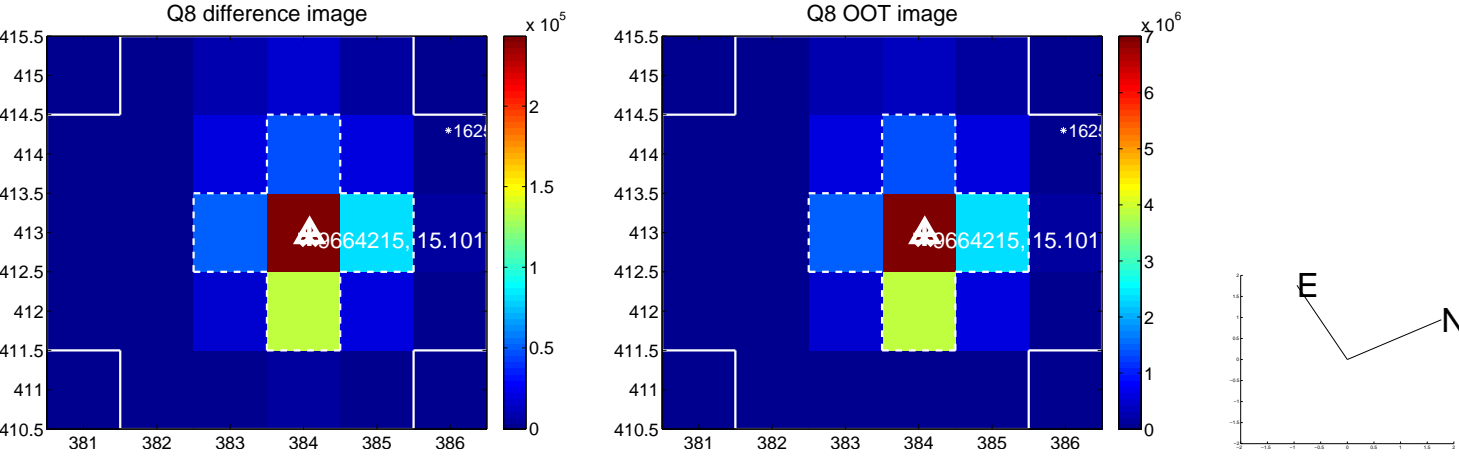
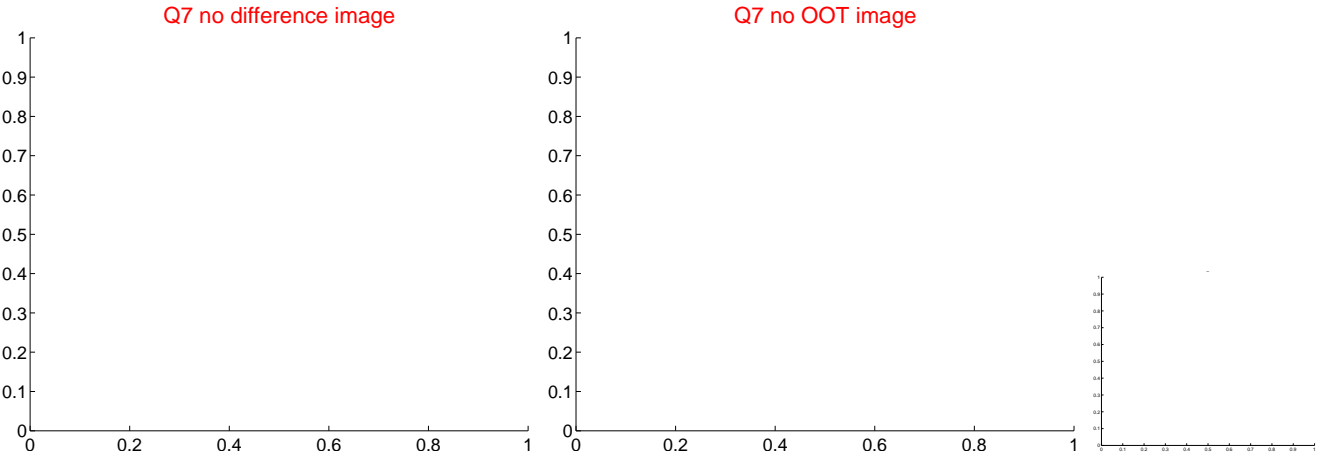
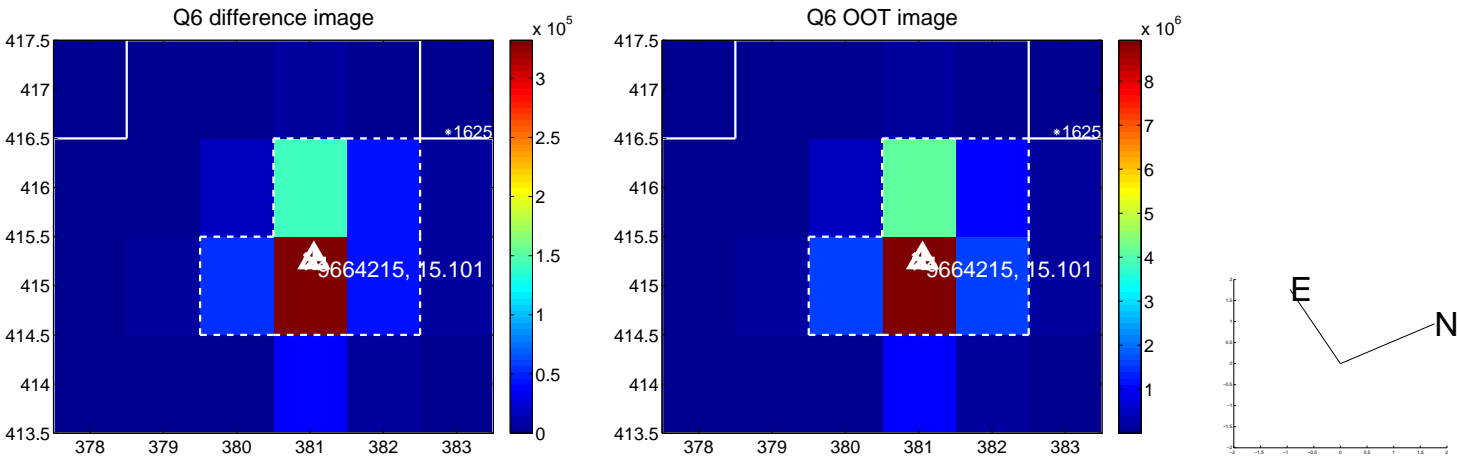
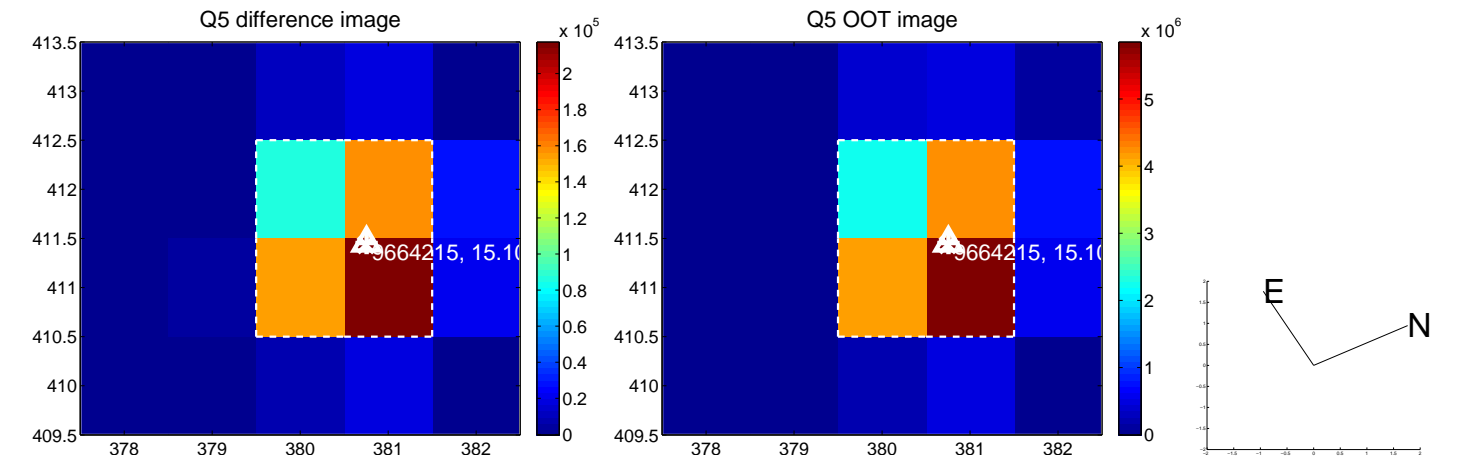
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

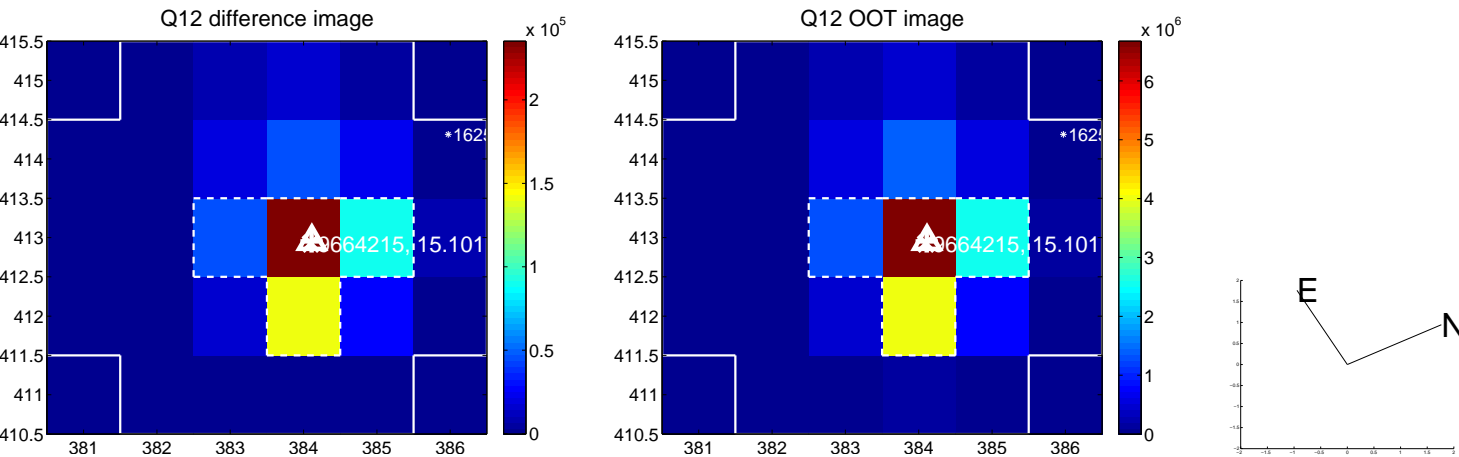
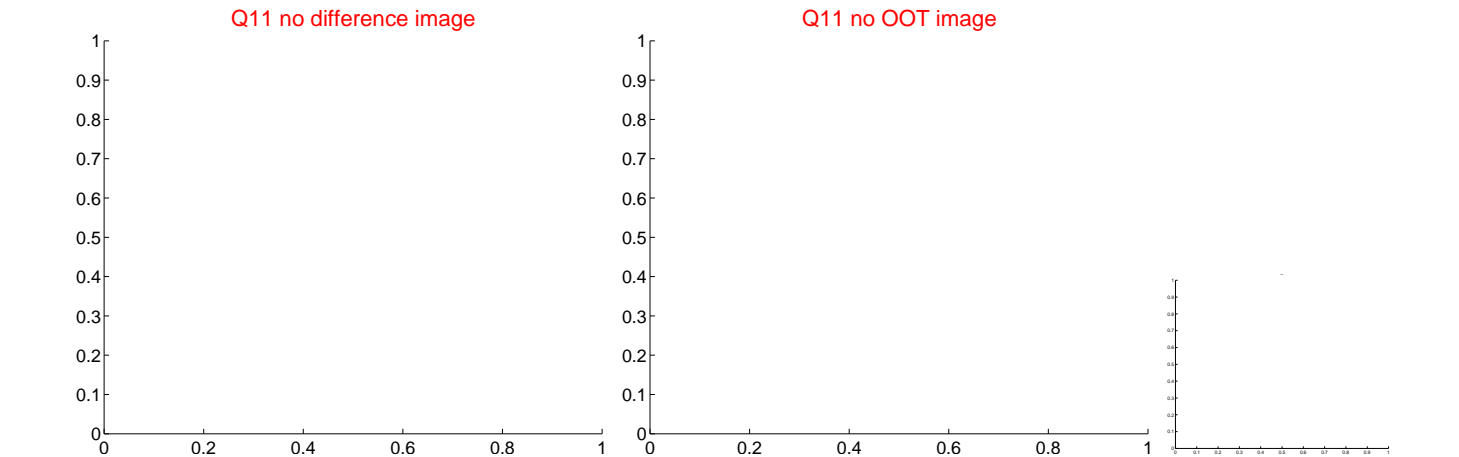
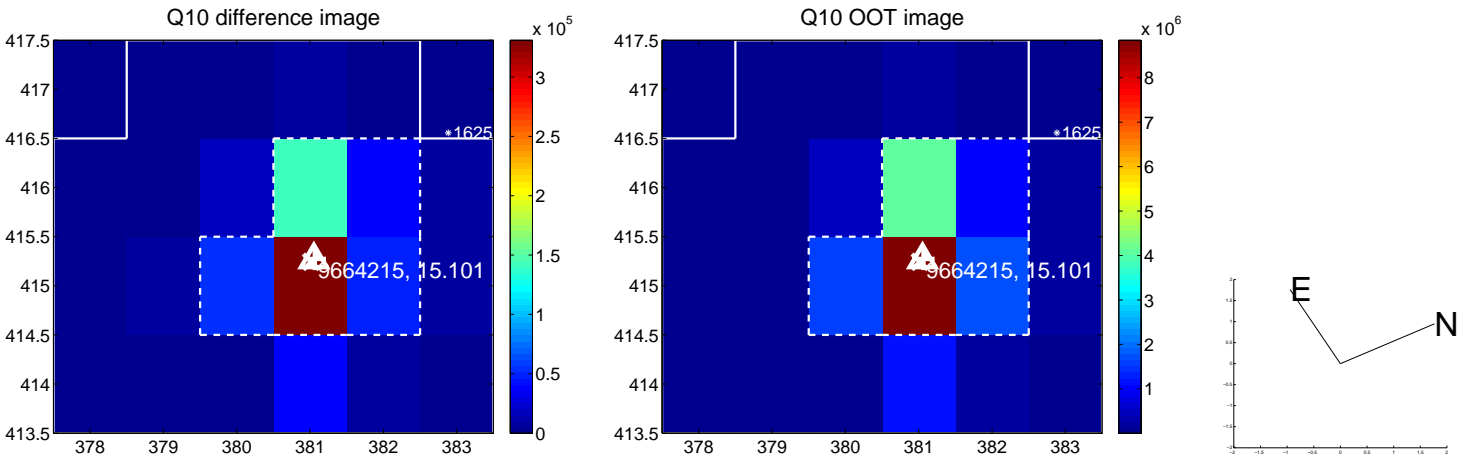
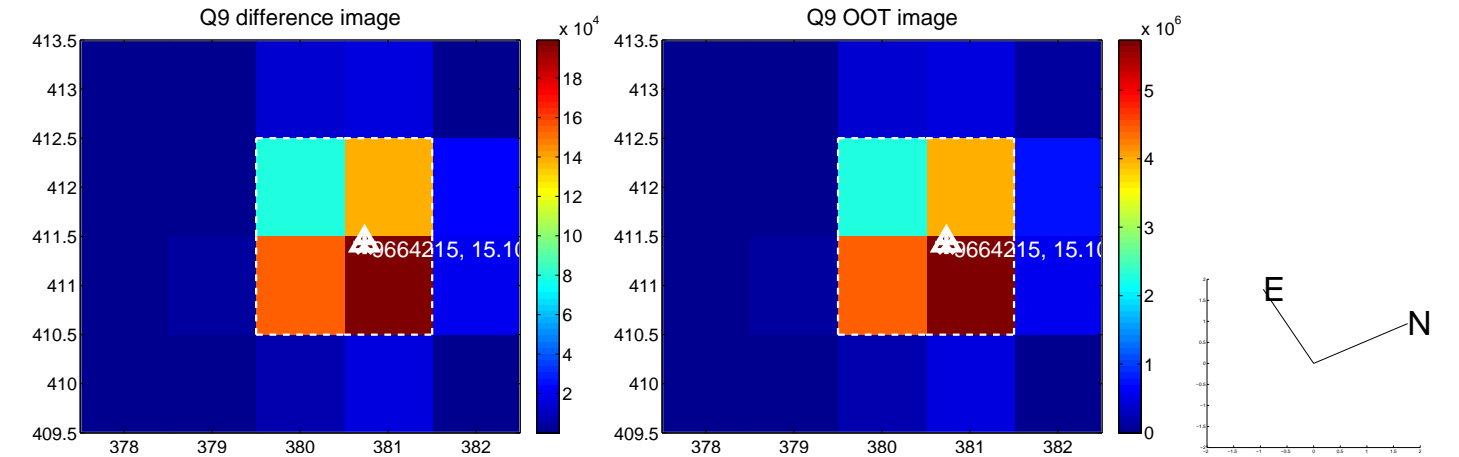




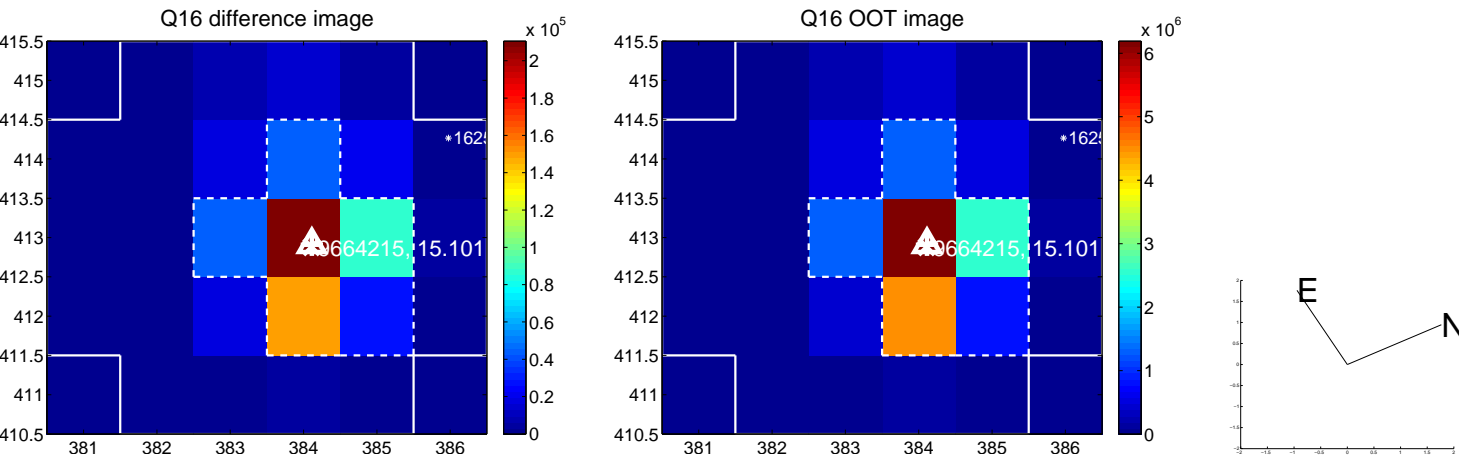
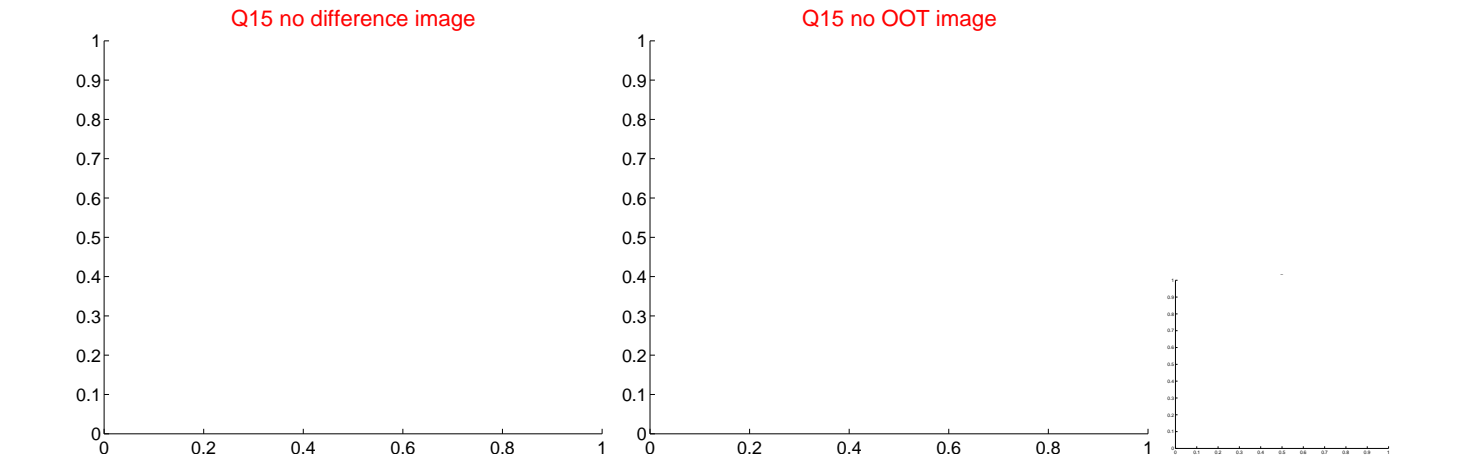
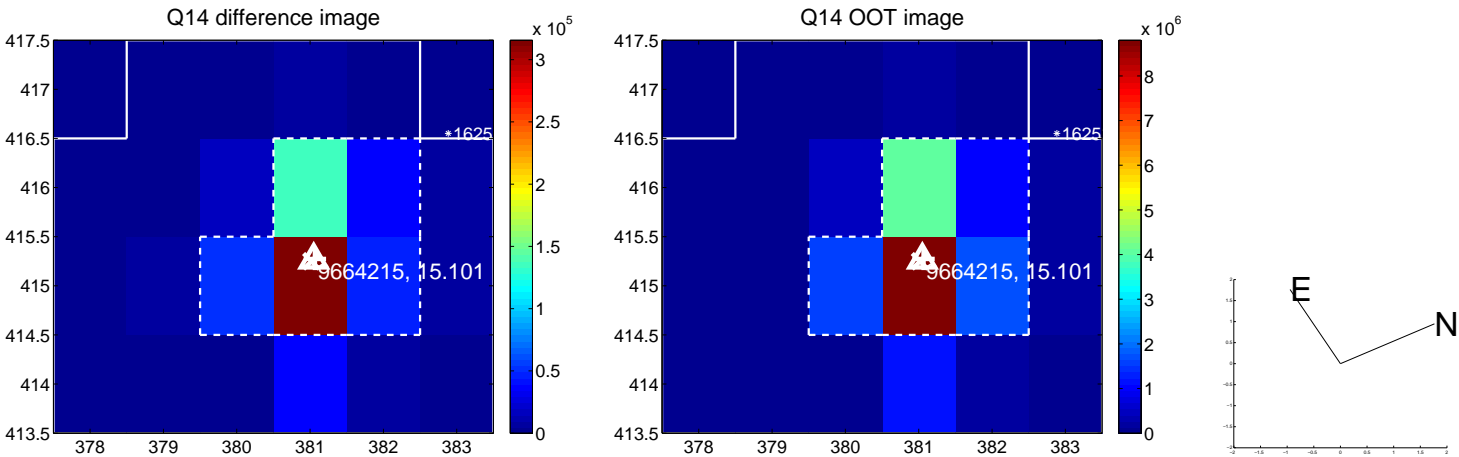
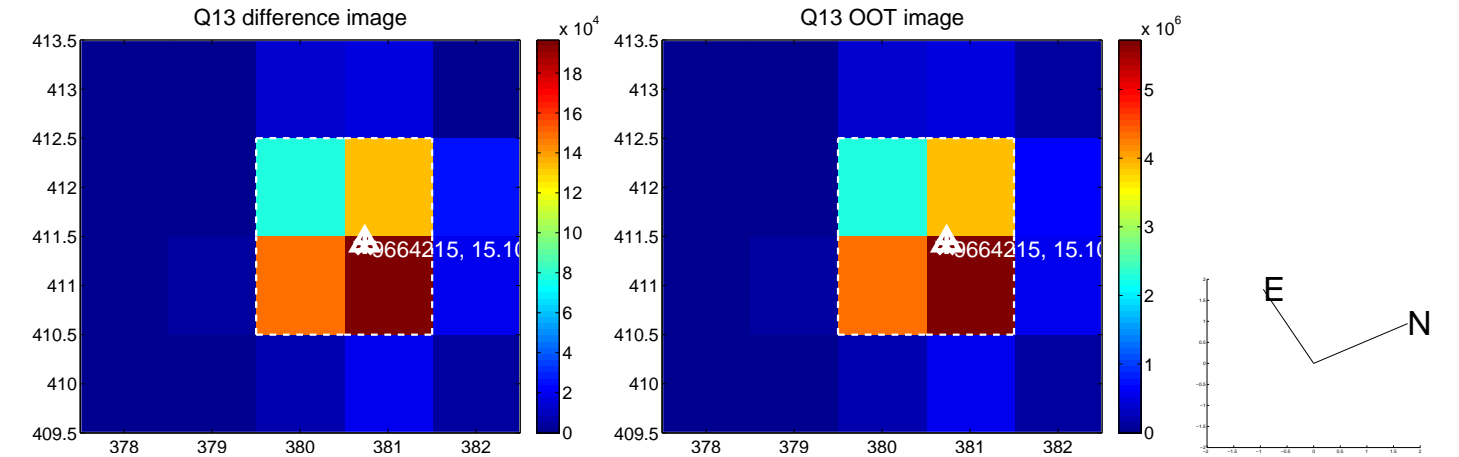
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



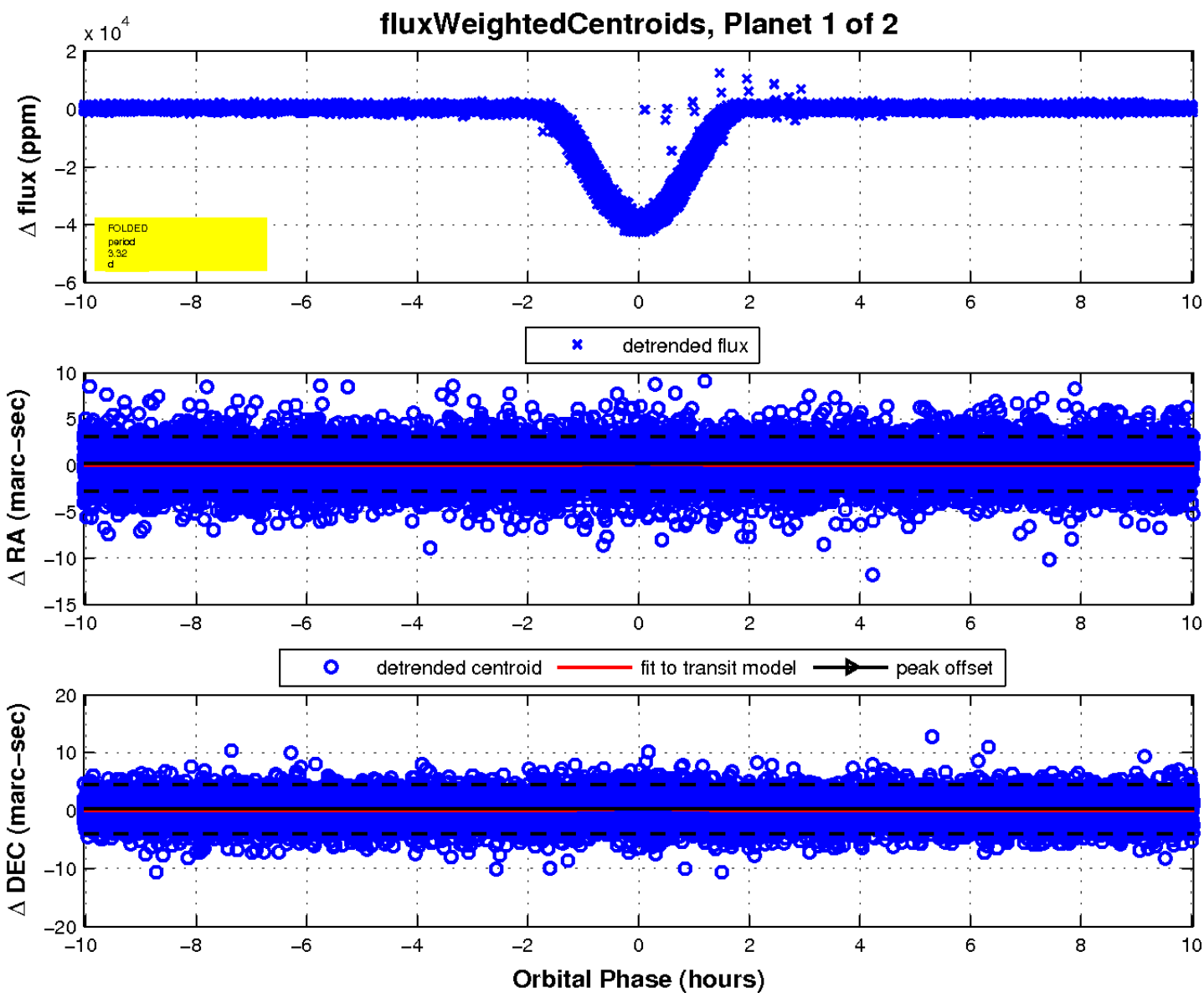
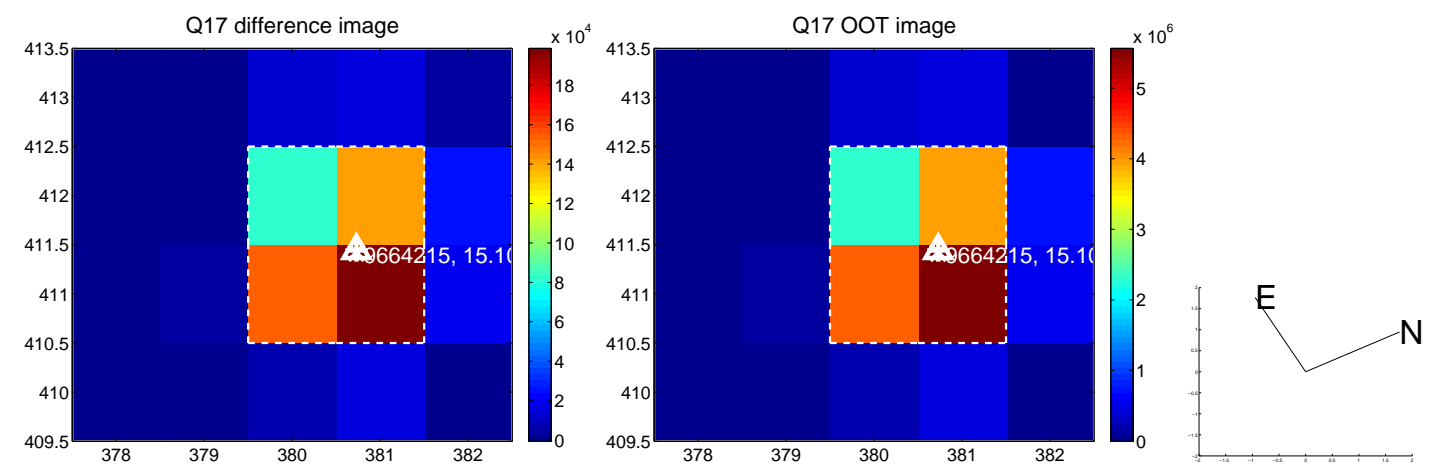
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

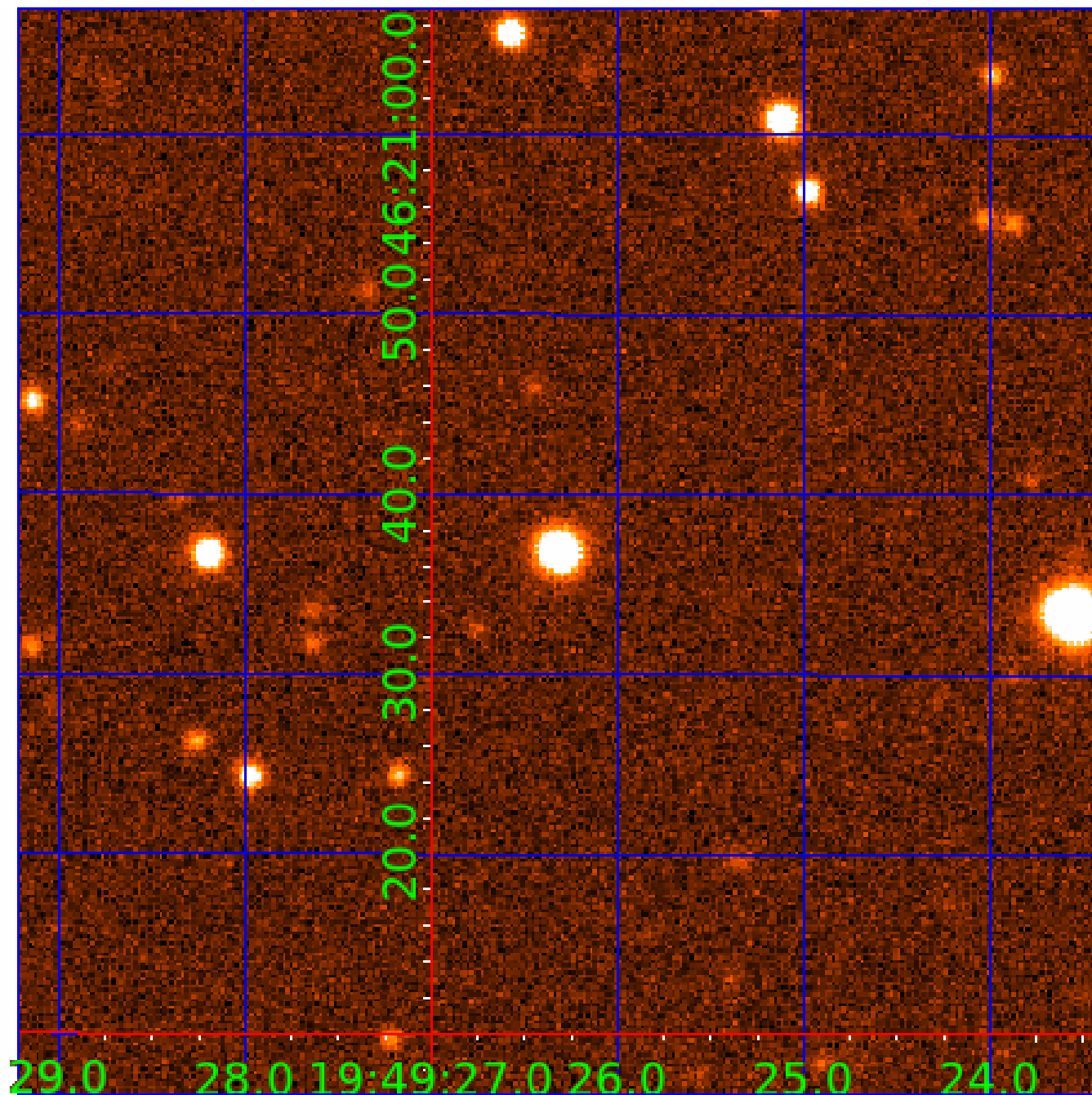


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 009664215

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009664215-01	OBS	6072.01	3.319529	131.923891	38439.2	3.345	2110.4	1471.7	0.79	5761	23.44	357.19
009664215-02	OBS	No	3.319522	133.589220	6745.5	3.190	376.0	353.8	0.79	5761	11.86	357.19

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009664215-01	OBS	FP	0.00	0	1	0	0	MOD_SEC_DV—MOD_SEC_ALT—DEEP_V_SHAPED—HAS_SEC_TCE
009664215-02	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.

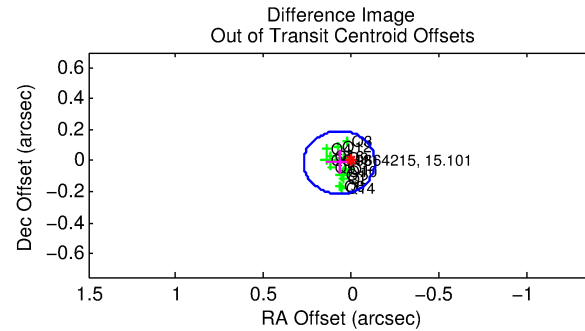
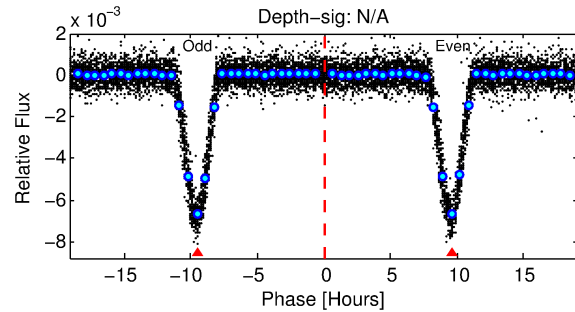
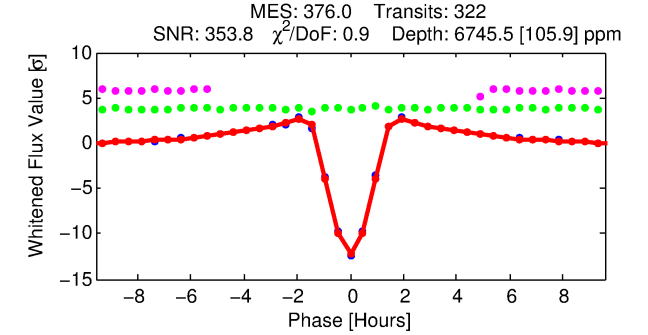
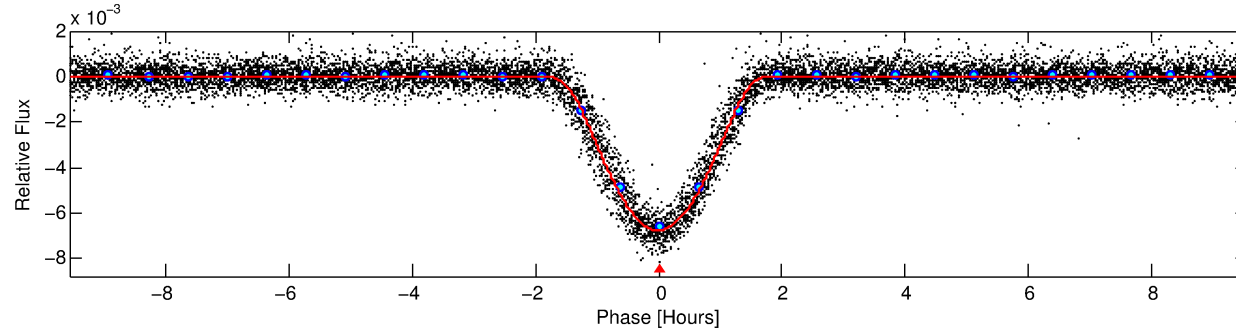
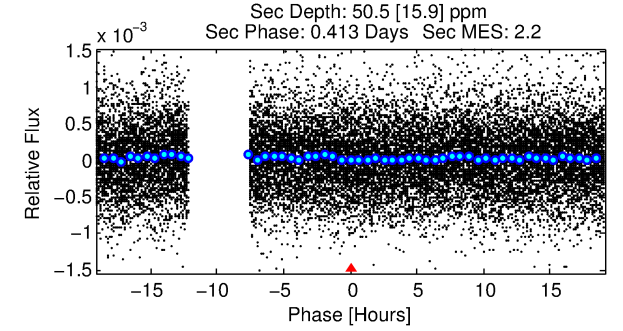
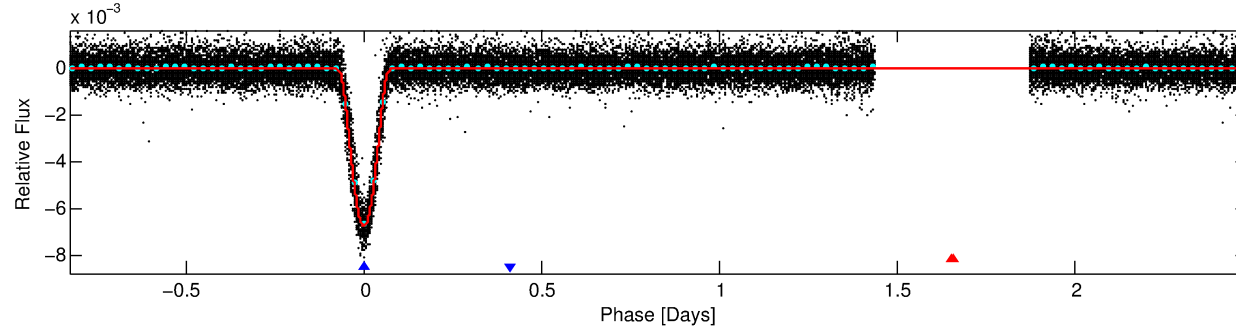
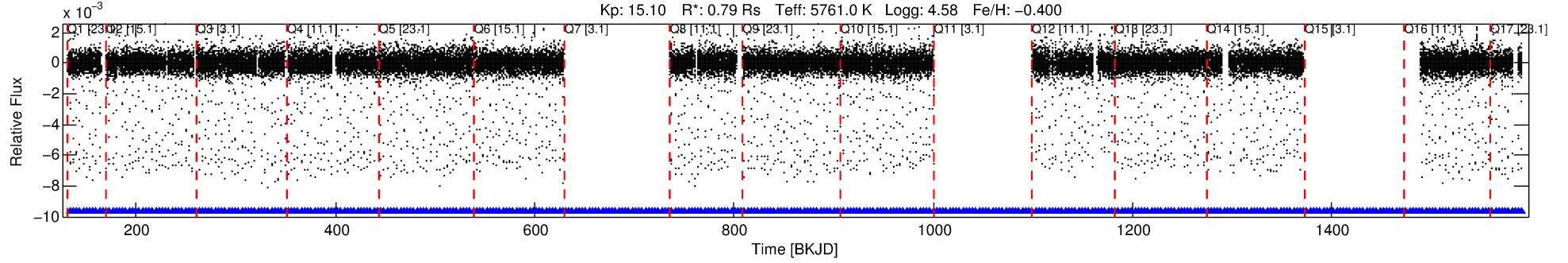
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009664215-02

No Significant Match Found

# DV One-Page Summary

KIC: 9664215 Candidate: 2 of 2 Period: 3.320 d  
KOI: K06072 Corr: No Ephemeris Match



## DV Fit Results:

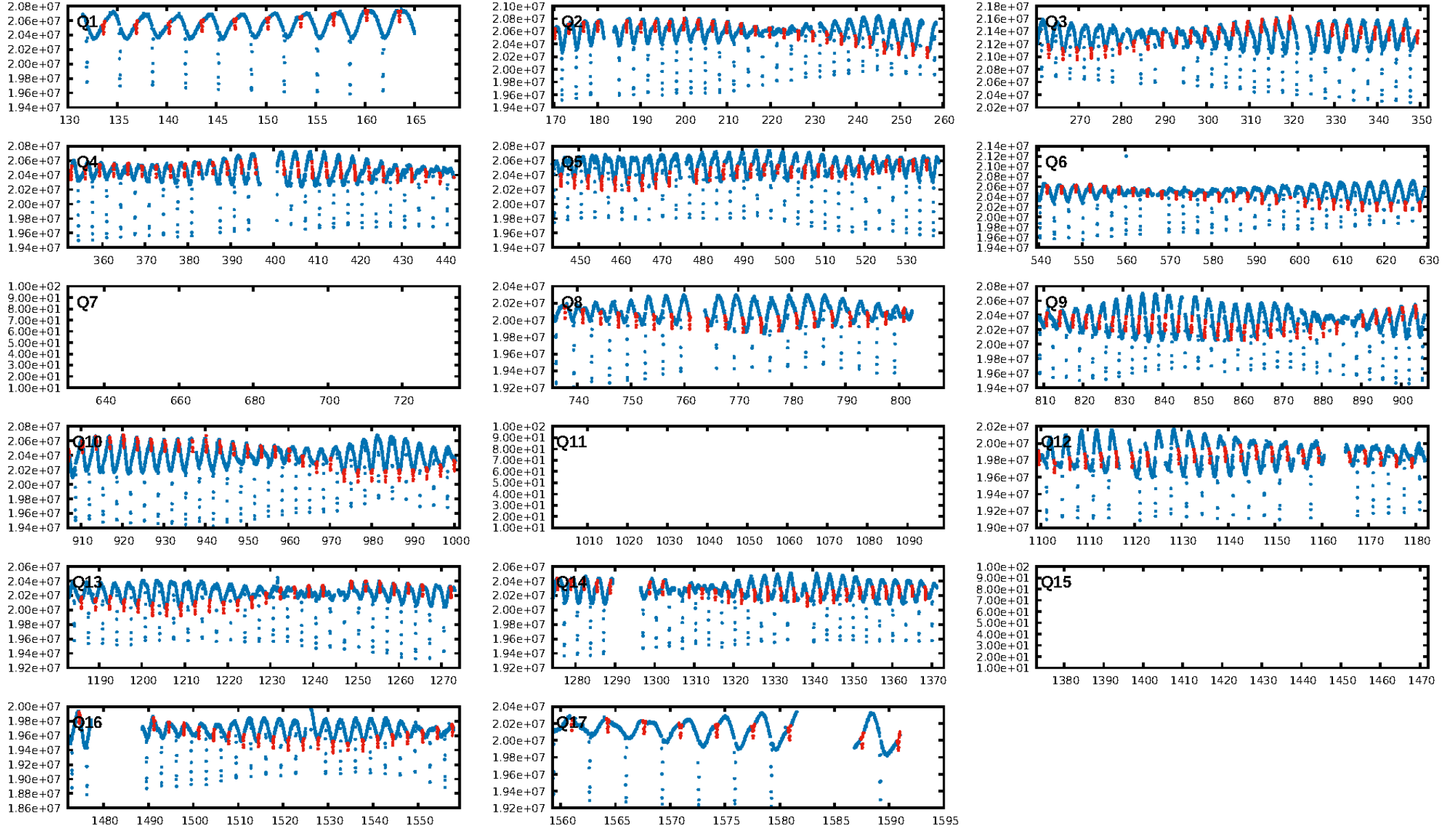
Period = 3.31952 [0.00000] d  
Epoch = 133.5892 [0.0001] BKJD  
Rp/R\* = 0.1373 [0.0174]  
a/R\* = 4.44 [0.09]  
b = 1.00 [0.03]  
Seff = 357.19 [112.03]  
Teq = 1109 [87] K  
Rp = 11.86 [3.26] Re  
a = 0.0416 [0.0085] AU  
Ag = 0.34 [0.17] [-3.86 $\sigma$ ]  
Teffp = 1310 [137] K [1.24 $\sigma$ ]

## DV Diagnostic Results:

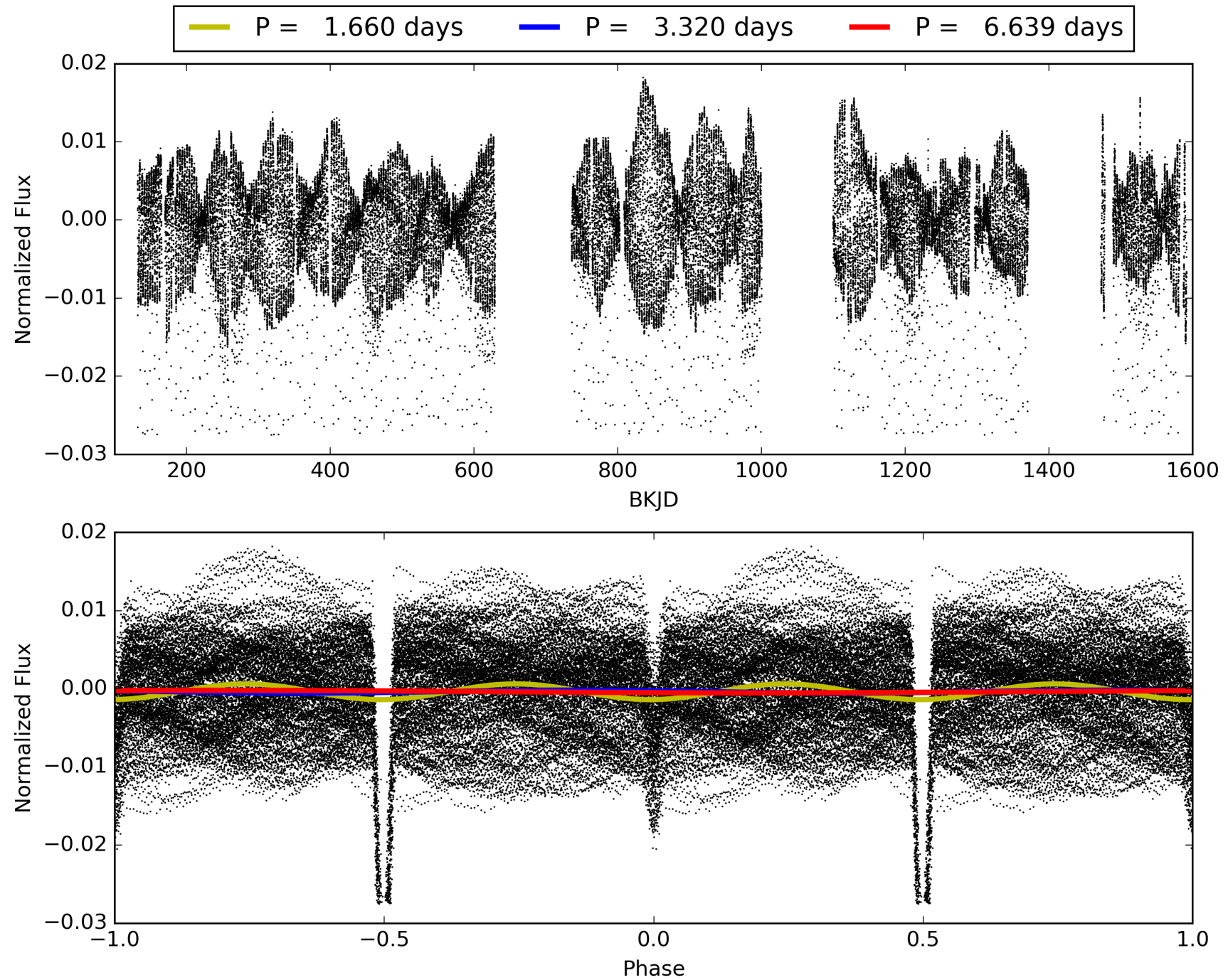
ShortPeriod-sig: N/A  
LongPeriod-sig: 0.0% [0.00 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [303/303]  
GhostDiagnostic-chr: 3.166  
Centroid-sig: 5.0%  
Centroid-so: 0.042 arcsec [1.56 $\sigma$ ]  
OotOffset-rm: 0.070 arcsec [1.04 $\sigma$ ]  
KicOffset-rm: 0.147 arcsec [2.11 $\sigma$ ]  
OotOffset-st: 4/1/4/5 [14]  
KicOffset-st: 4/1/4/5 [14]  
DiffImageQuality-fgm: 1.00 [14/14]  
DiffImageOverlap-fno: 1.00 [14/14]



# TCE 009664215-02, PDC Light Curves

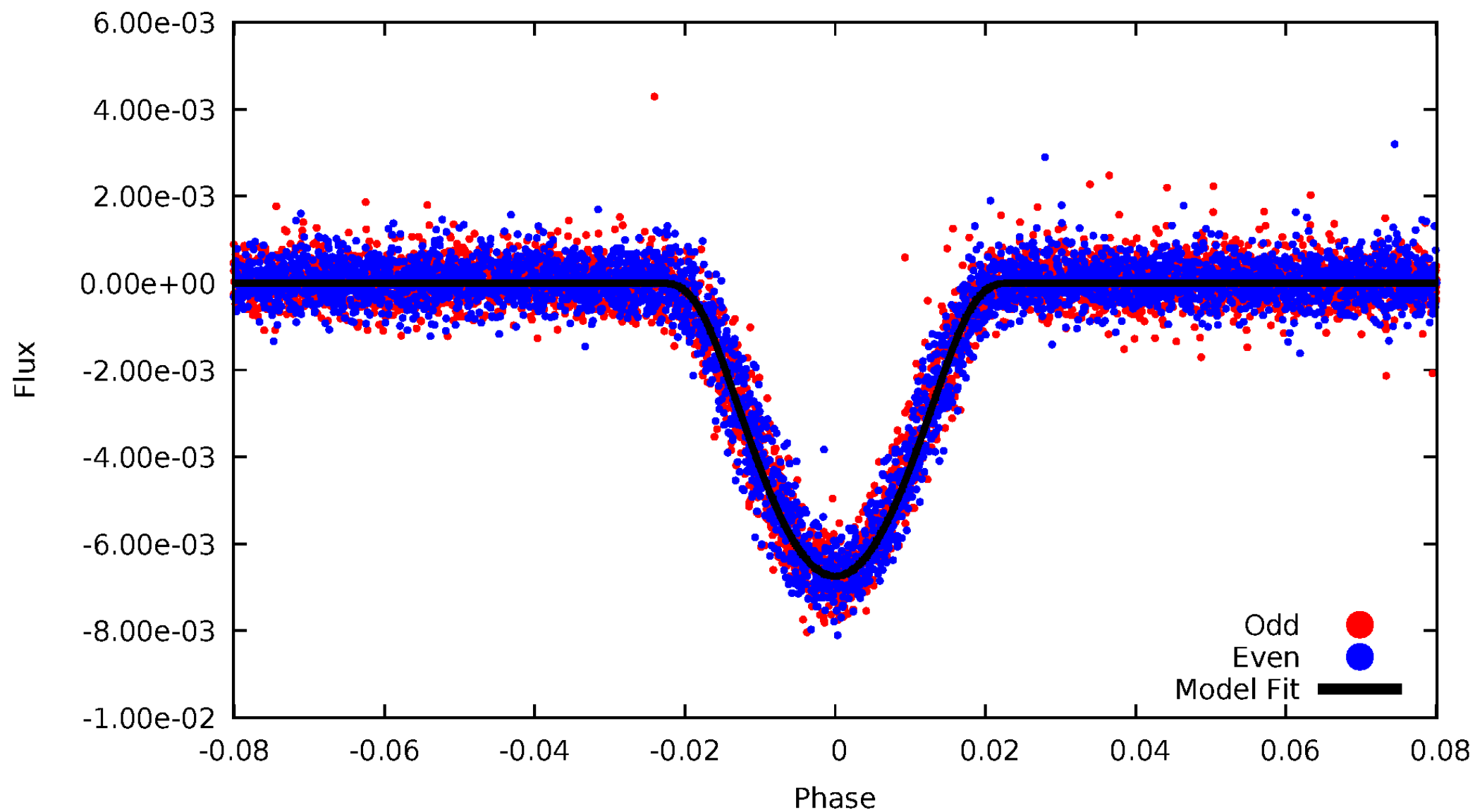


TCE 009664215-02



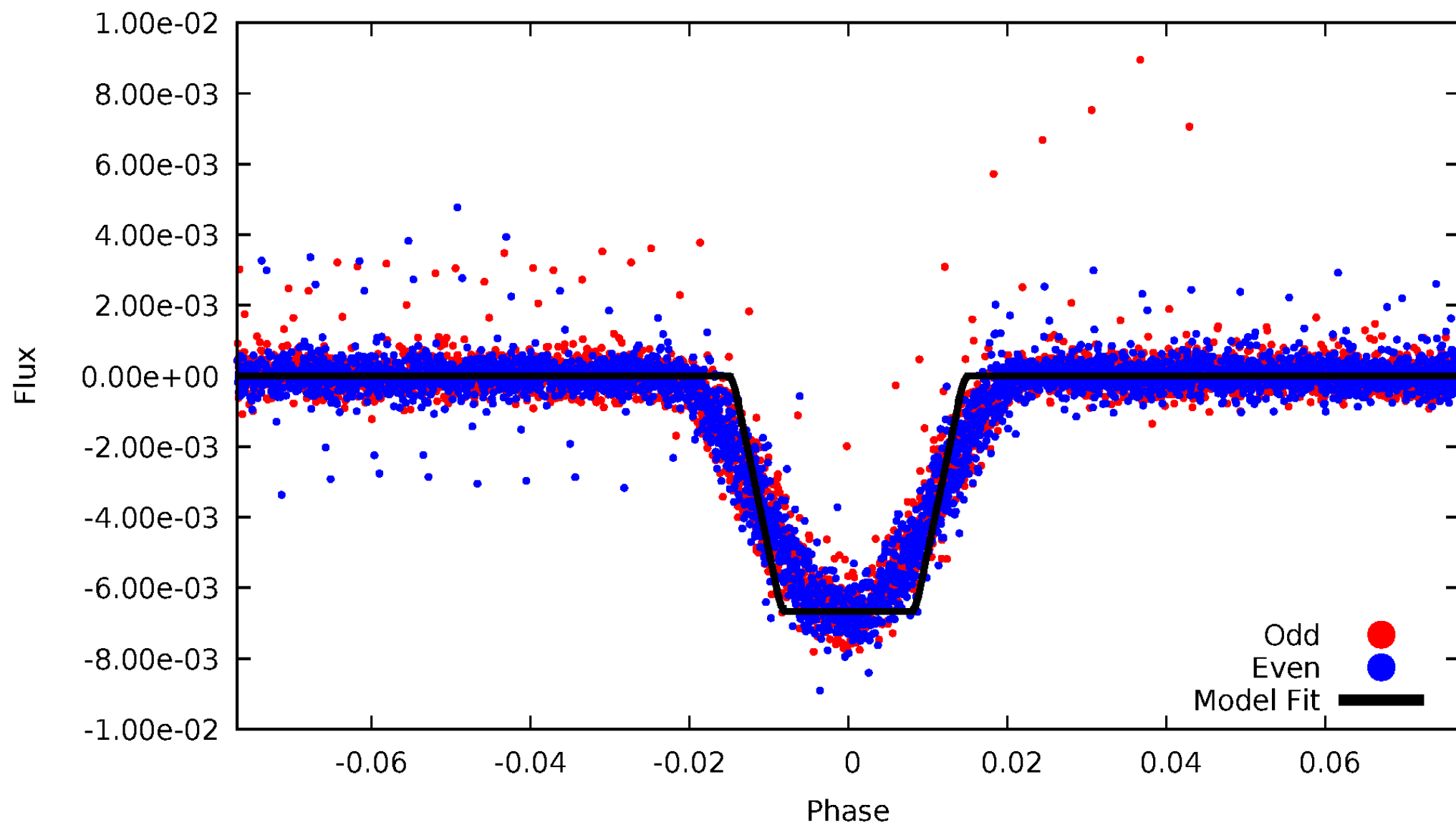
# DV Odd/Even

TCE 009664215-02



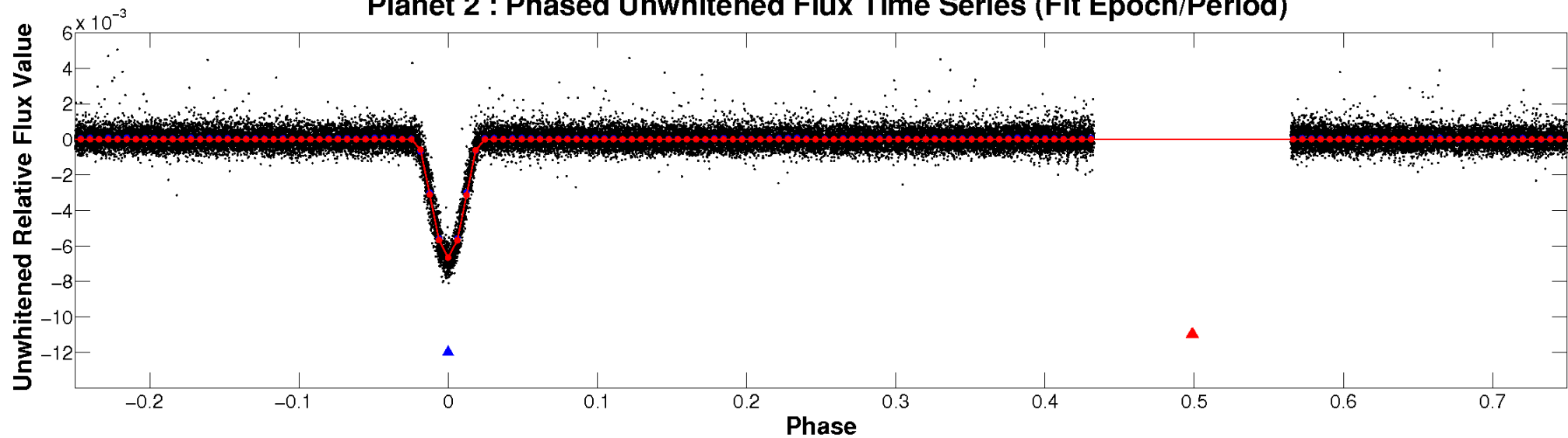
# ALT Odd/Even

TCE 009664215-02

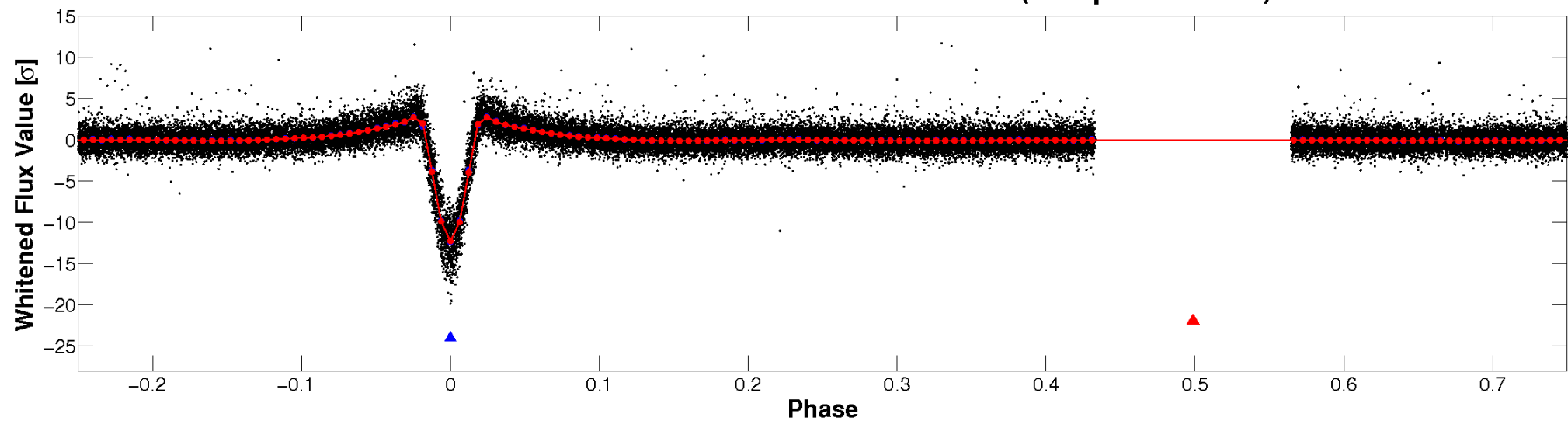


# Non-Whitened Vs. Whitened Light Curve

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



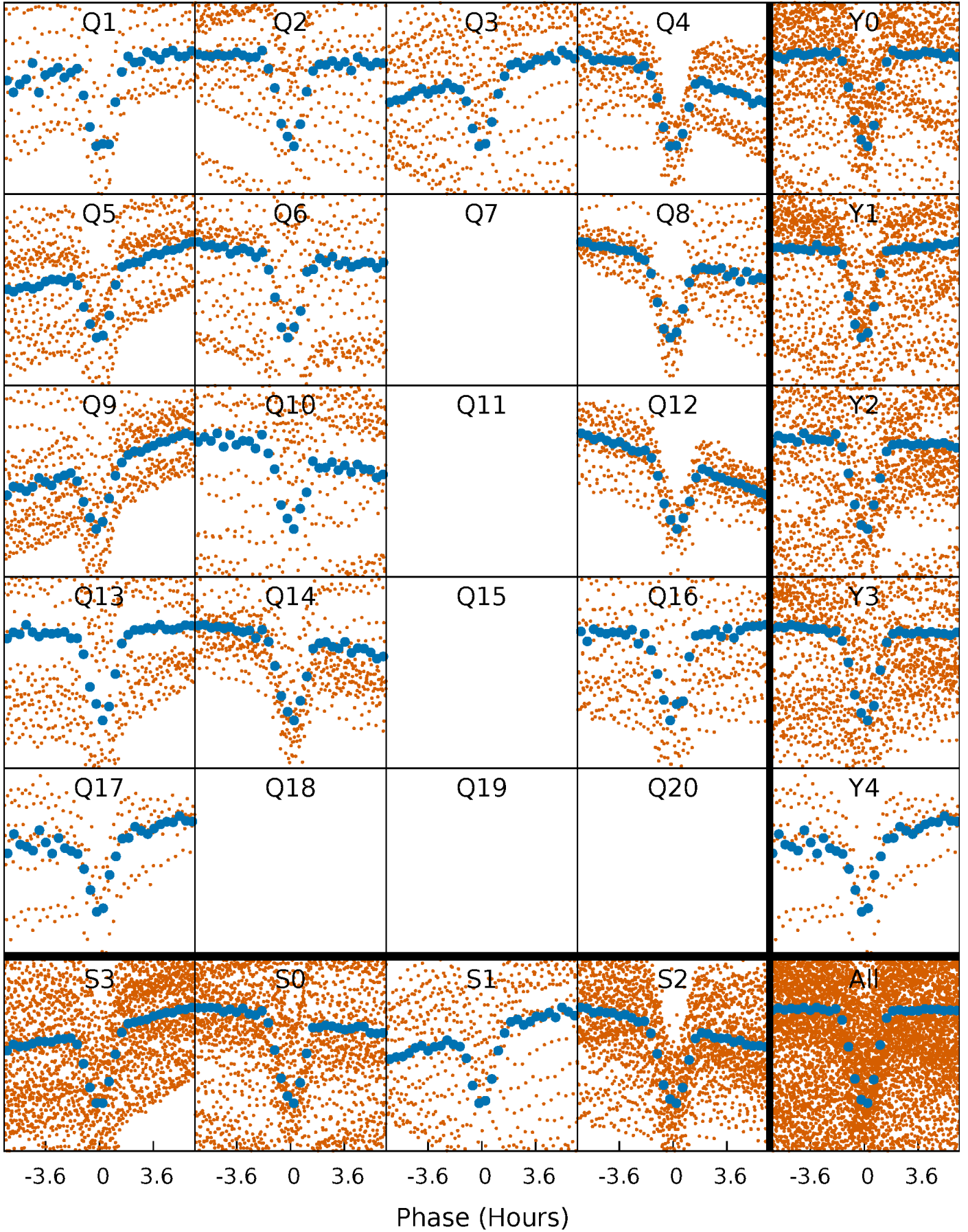
**Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)**





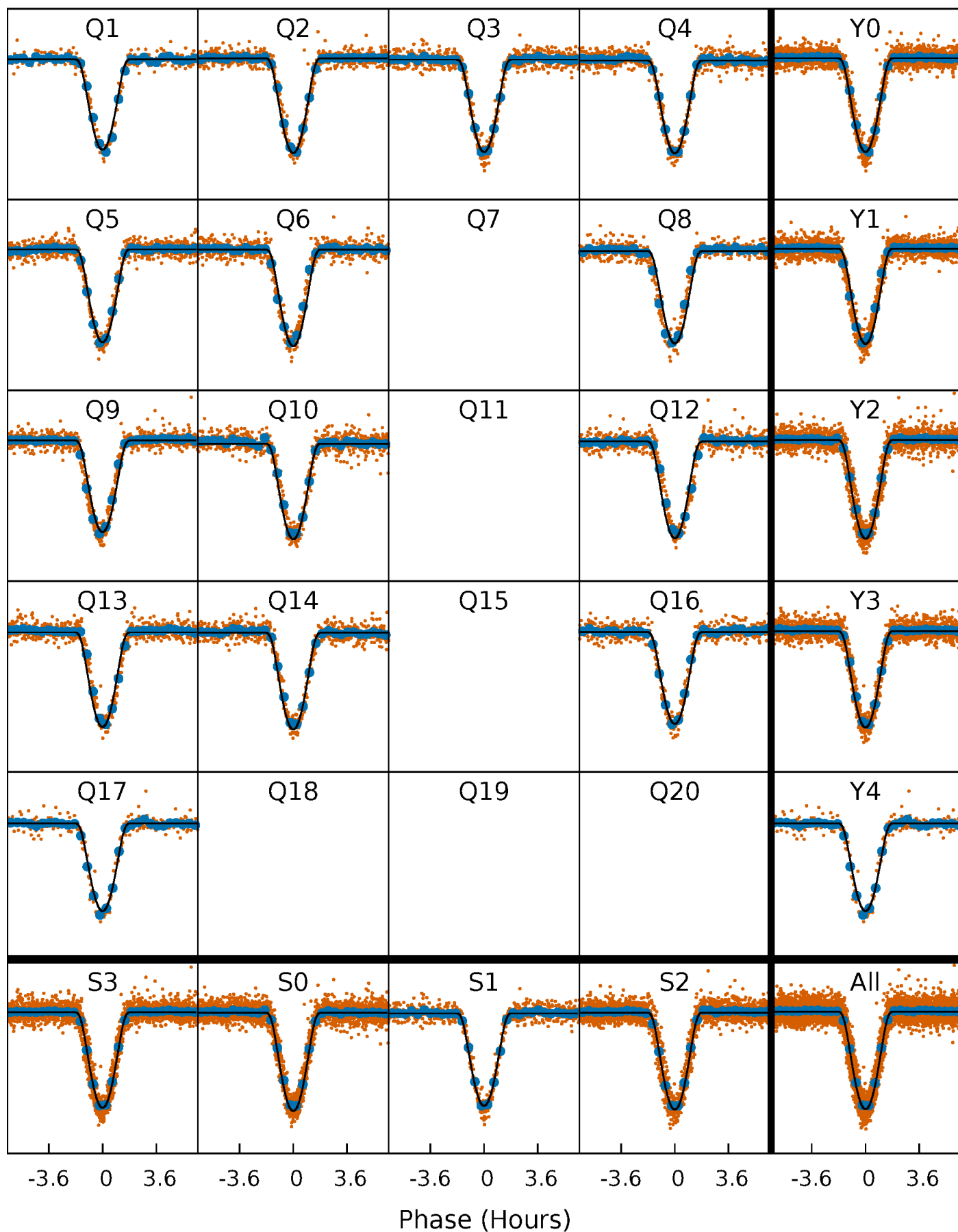
# PDC Quarter-Phased Transit Curves

TCE 009664215-02     $P = 3.319522$  Days     $T_0 = 133.589220$  (BKJD)



# DV Quarter-Phased Transit Curves

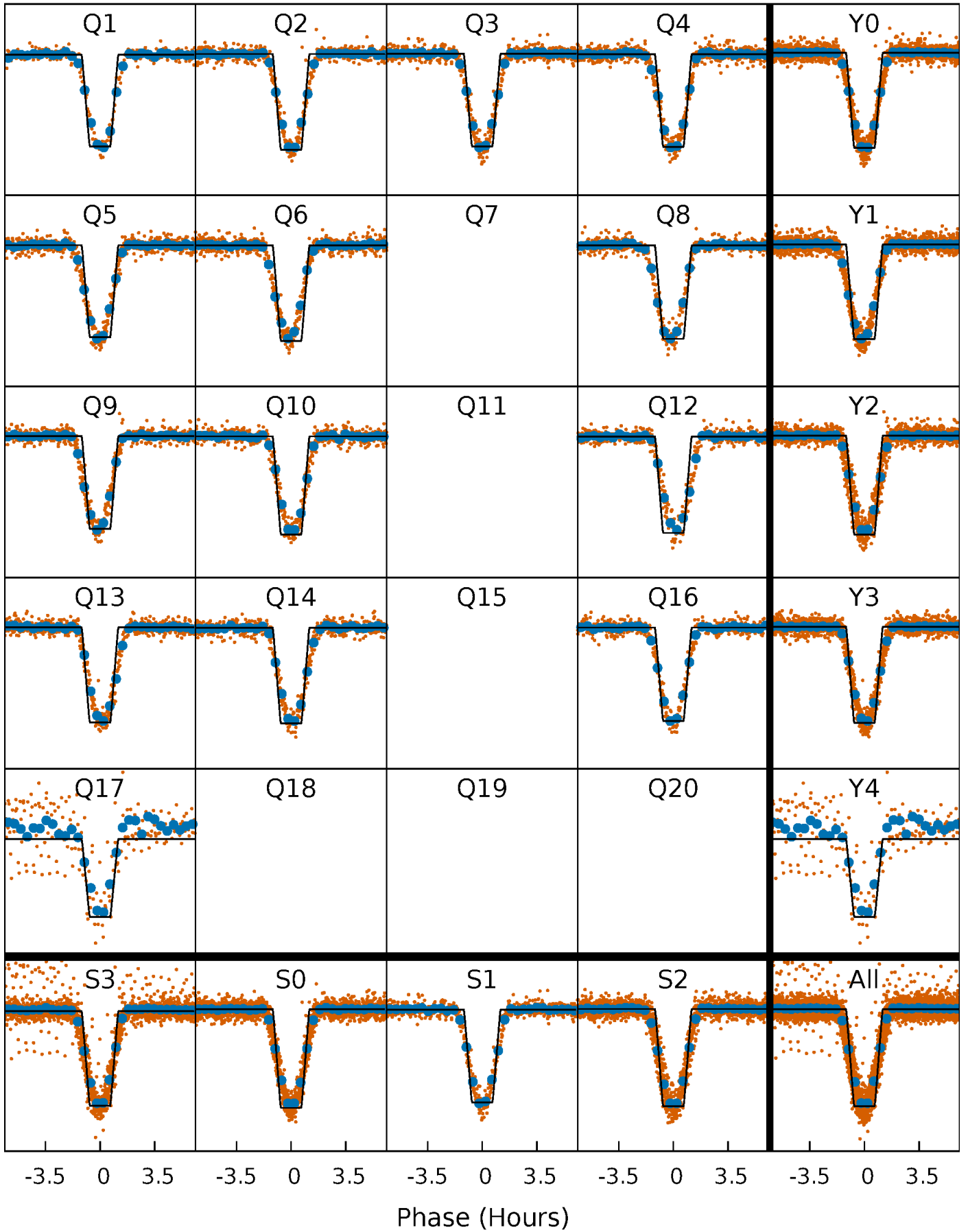
TCE 009664215-02 P= 3.319522 Days  $T_0=133.589220$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

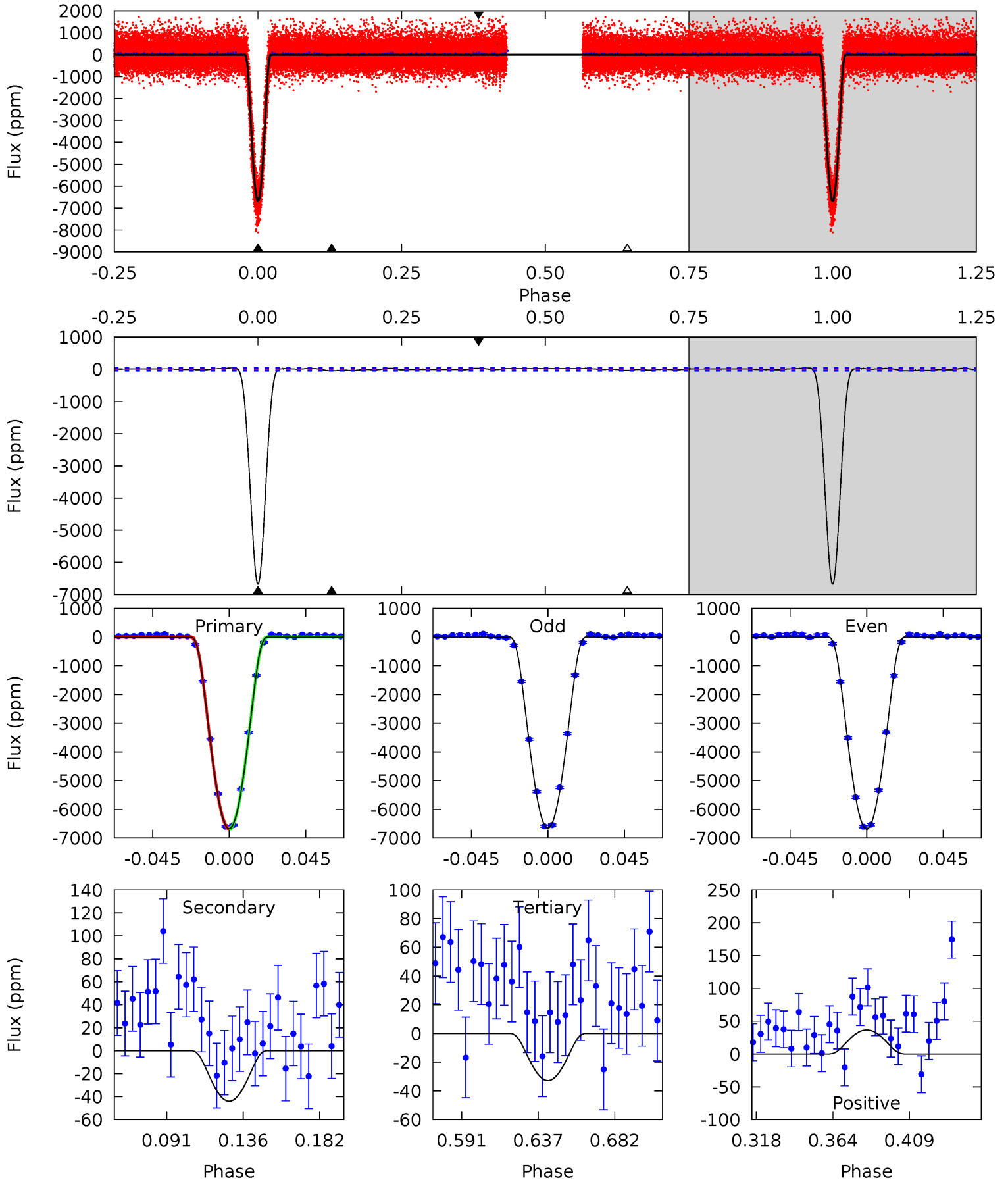
TCE 009664215-02 P= 3.319517 Days  $T_0=133.590447$  (BKJD)



# DV Model-Shift Uniqueness Test

009664215-02, P = 3.319522 Days, E = 130.269698 Days

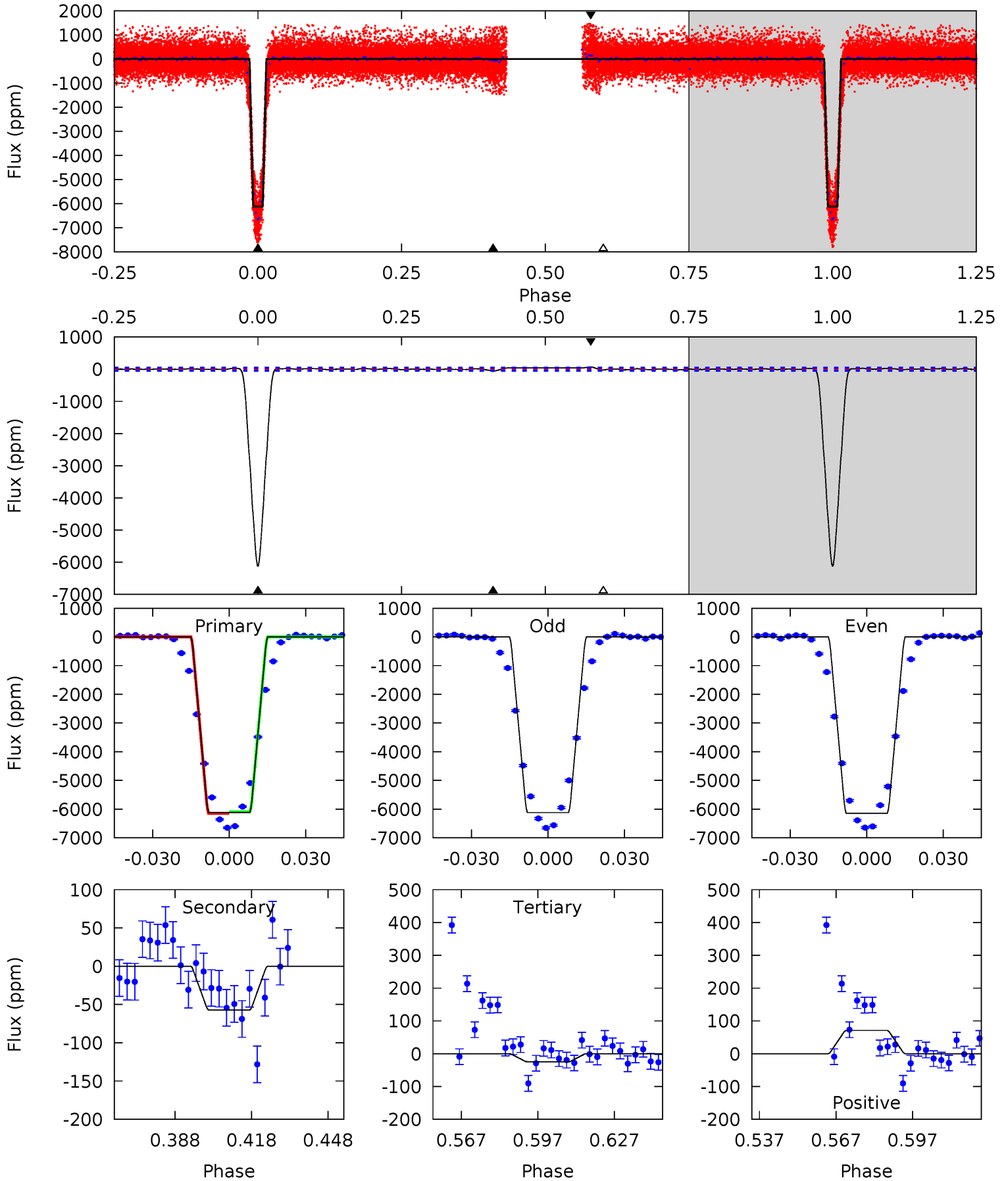
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
750.1	4.95	3.69	4.12	4.73	2.00	1.69	746.4	746.0	1.26	0.83	1.94	1.00	0.01	0.28



# Alt Model-Shift Uniqueness Test

009664215-02, P = 3.319517 Days, E = 130.270930 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
642.3	6.01	2.62	7.44	4.81	2.17	1.33	639.7	634.9	3.39	-1.43	1.25	0.99	0.01	3.20



### Stellar Parameters For KIC 009664215

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5761^{+155}_{-155}$	$4.581^{+0.040}_{-0.160}$	$-0.400^{+0.300}_{-0.300}$	$0.791^{+0.193}_{-0.064}$	$0.881^{+0.087}_{-0.106}$	$2.505^{+0.517}_{-1.073}$
	+3%/-3%	+1%/-3%	+75%/-75%	+24%/-8%	+10%/-12%	+21%/-43%
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 009664215-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-44 \pm 9$	$12.29^{+2.15}_{-1.81}$	$1574^{+87}_{-60}$	$-1768^{+3733}_{-272}$	$0.268^{+0.127}_{-0.082}$
Alt.	$-57 \pm 10$	$7.31^{+1.84}_{-1.66}$	$1578^{+97}_{-66}$	$2473^{+218}_{-188}$	$1.019^{+0.691}_{-0.367}$

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

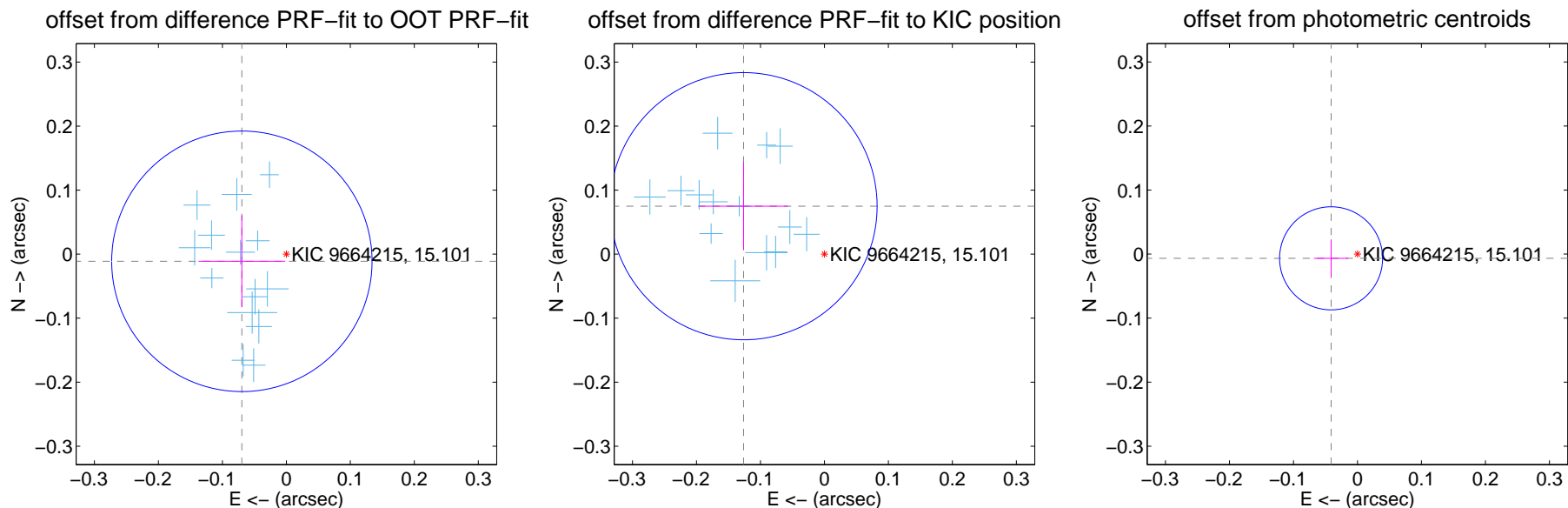
## DV Centroid Data

Supplemental centroid analysis for 009664215-02. Kepler magnitude: 15.10. Transit SNR 353.76

There are 14 quarters with good PRF difference image offsets

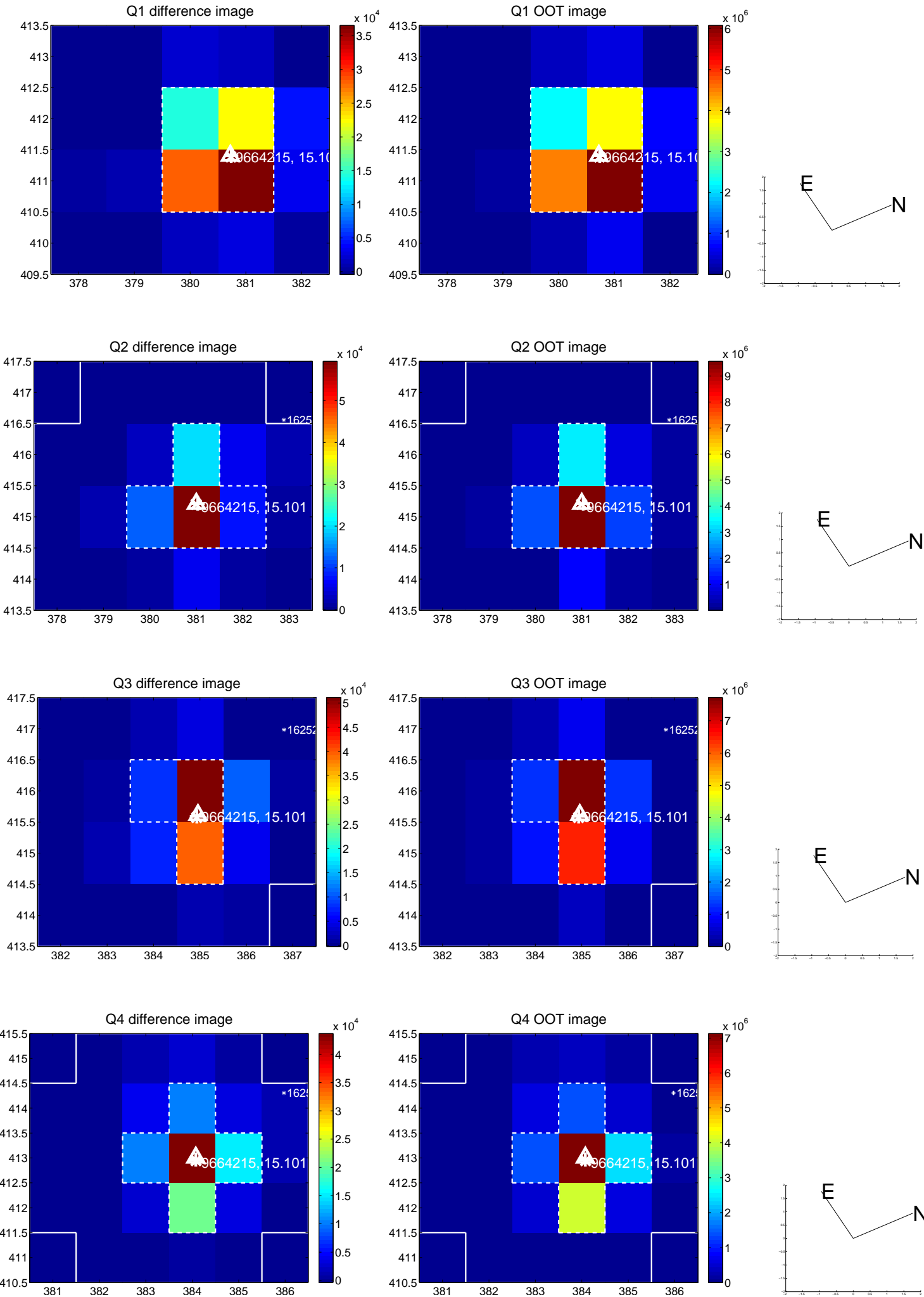
The direct PRF centroid is offset from the target star catalog position by about 0.10 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.070 \pm 0.068$	1.04	$0.070 \pm 0.068$	$-0.011 \pm 0.072$
PRF-fit source offset from KIC position	$0.147 \pm 0.070$	2.11	$0.126 \pm 0.069$	$0.075 \pm 0.069$
photometric centroid source offset	$0.04 \pm 0.03$	1.56	$0.04 \pm 0.03$	$-0.01 \pm 0.03$

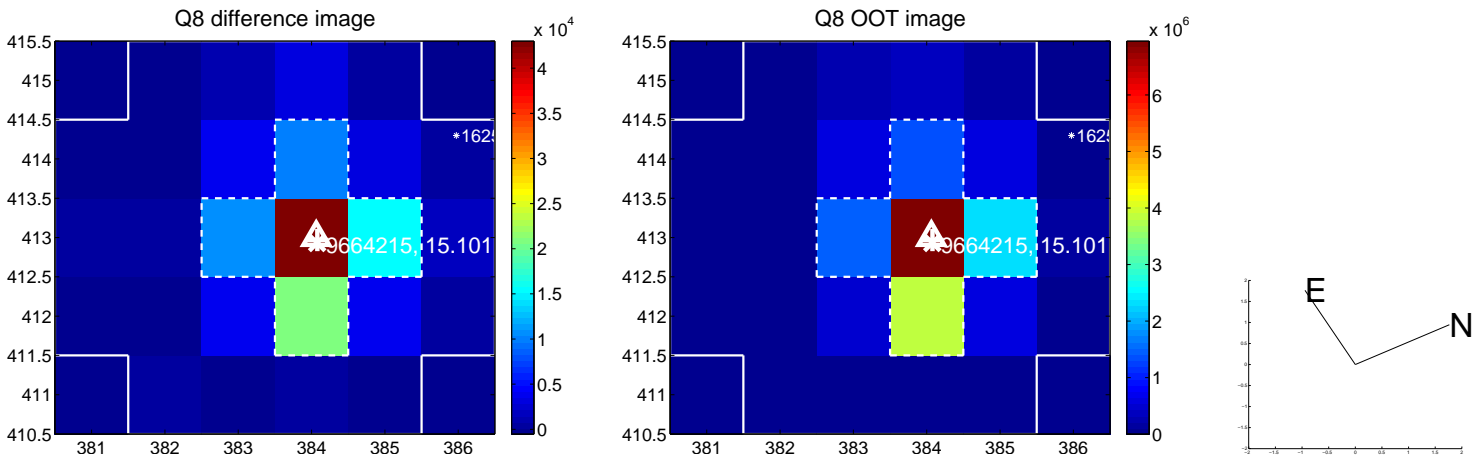
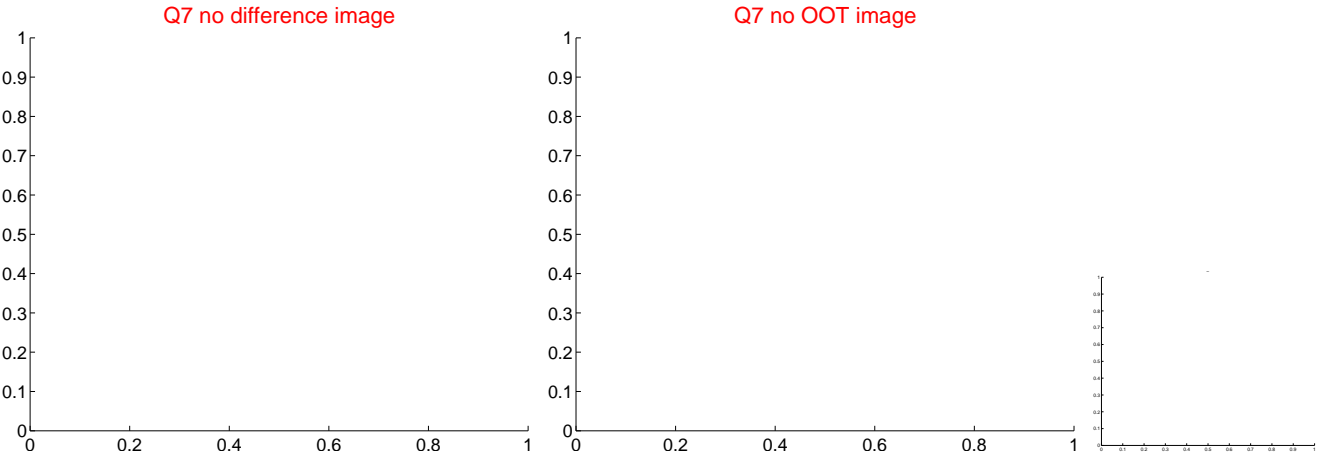
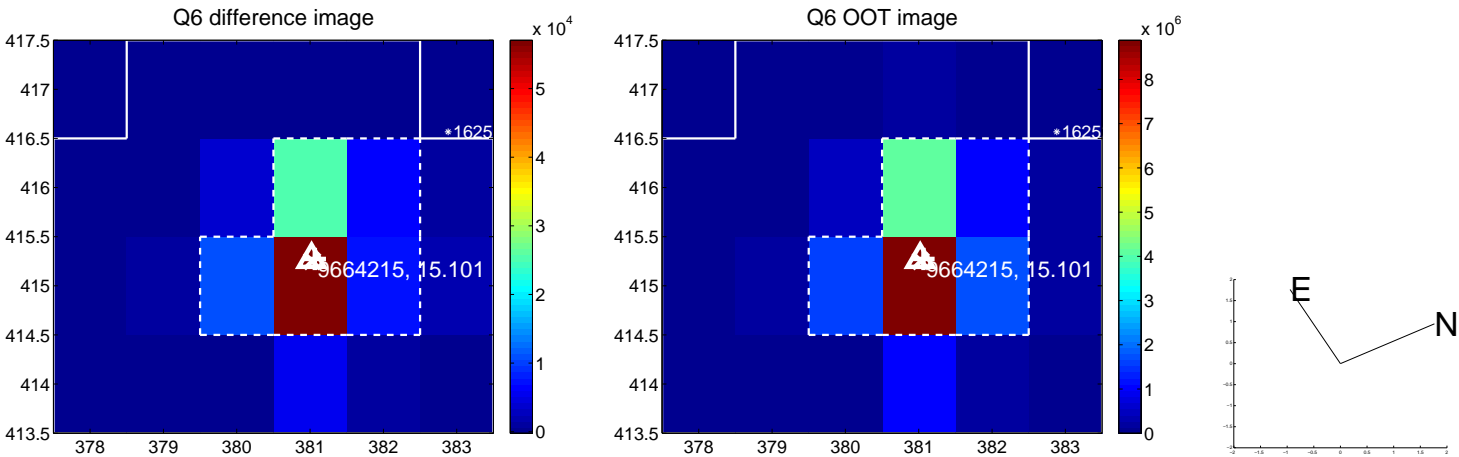
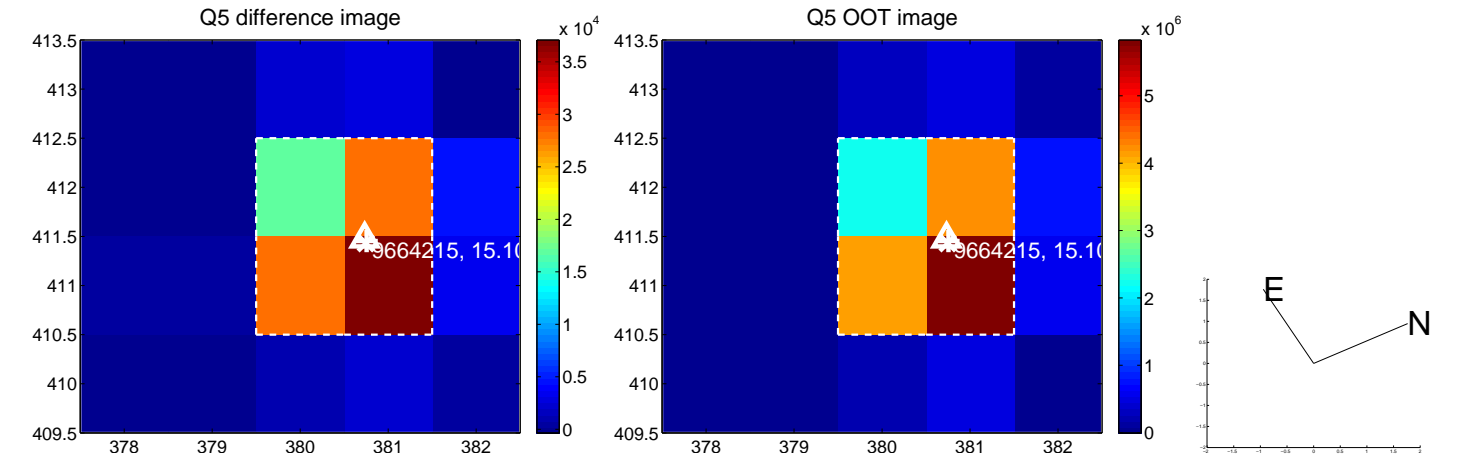


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

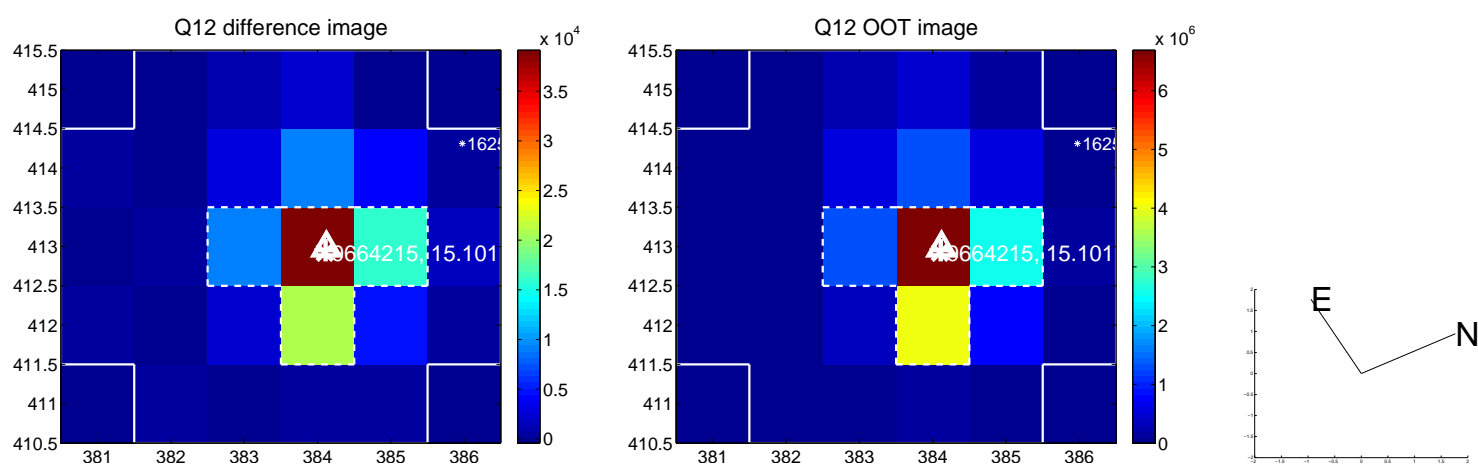
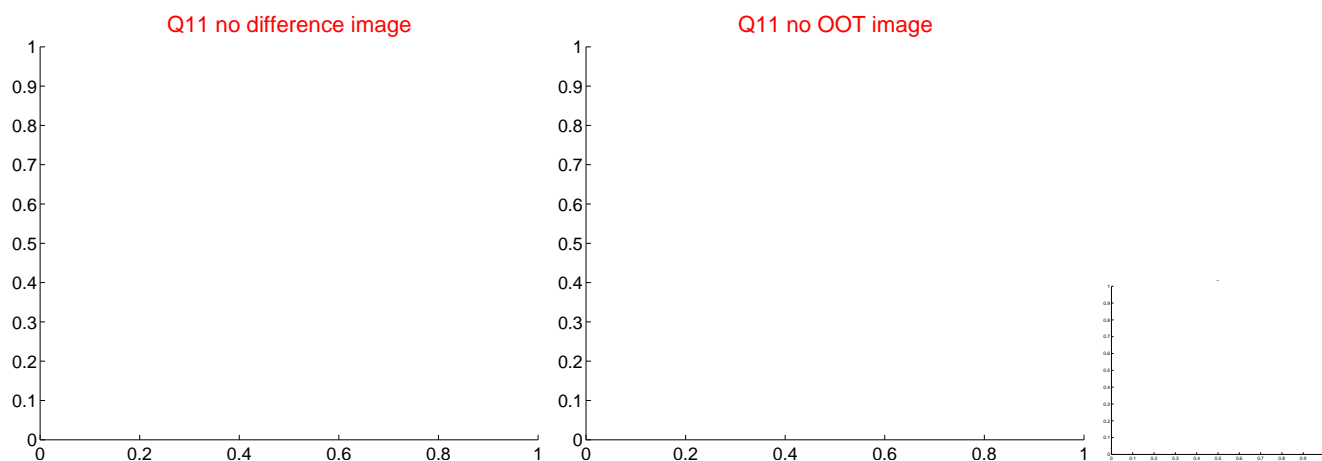
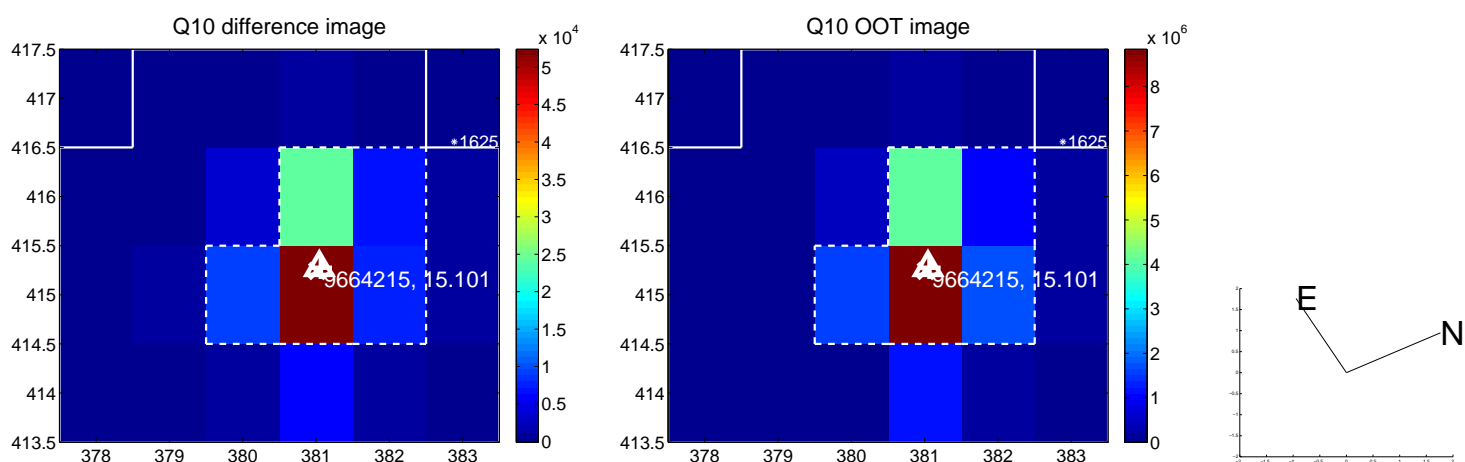
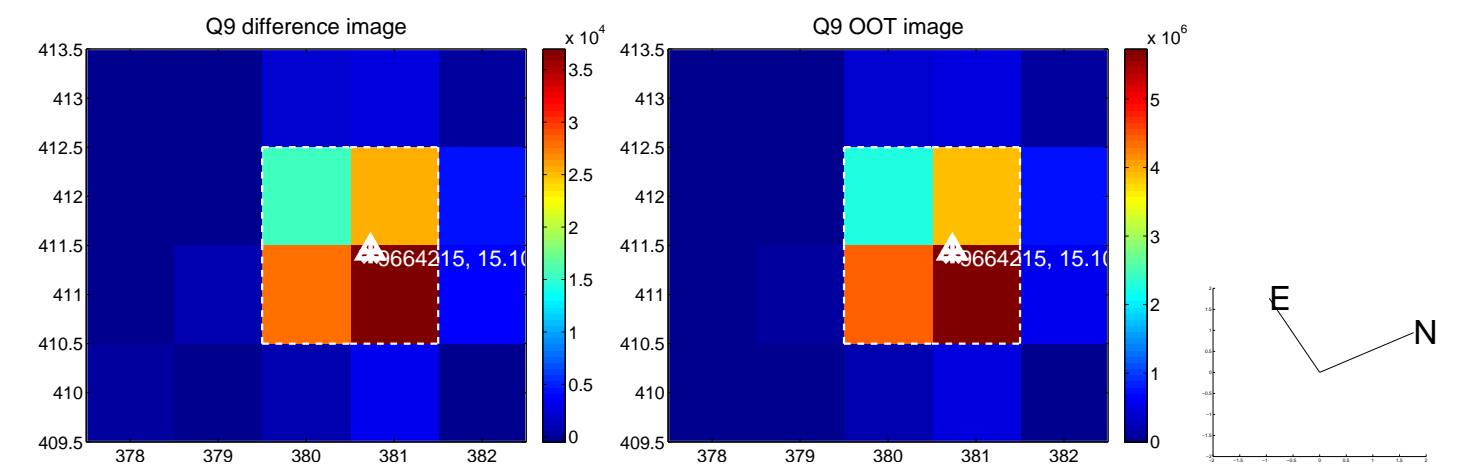


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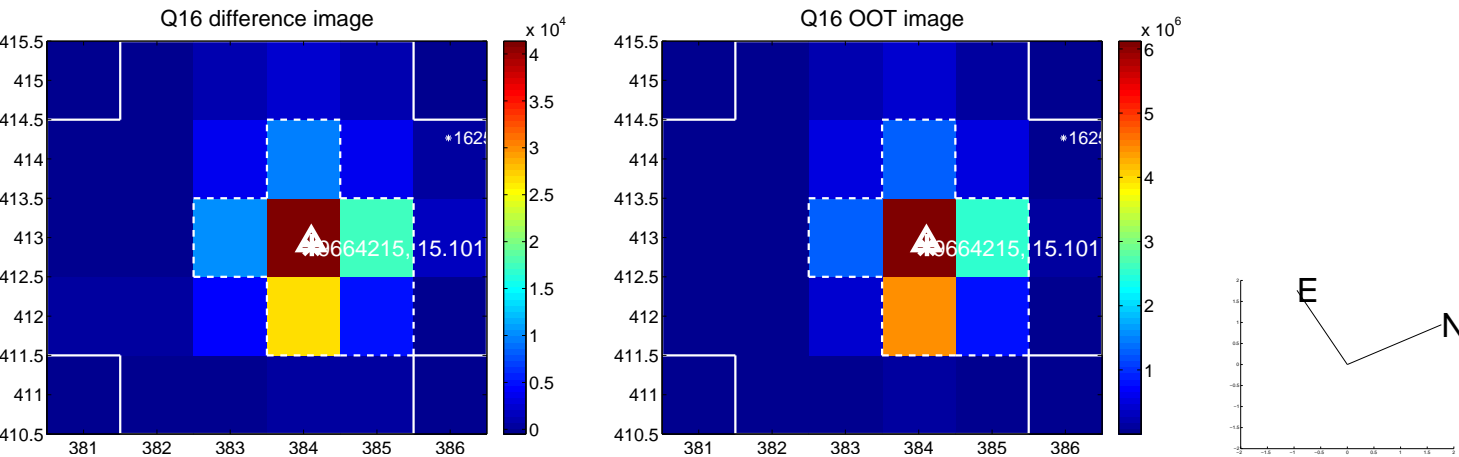
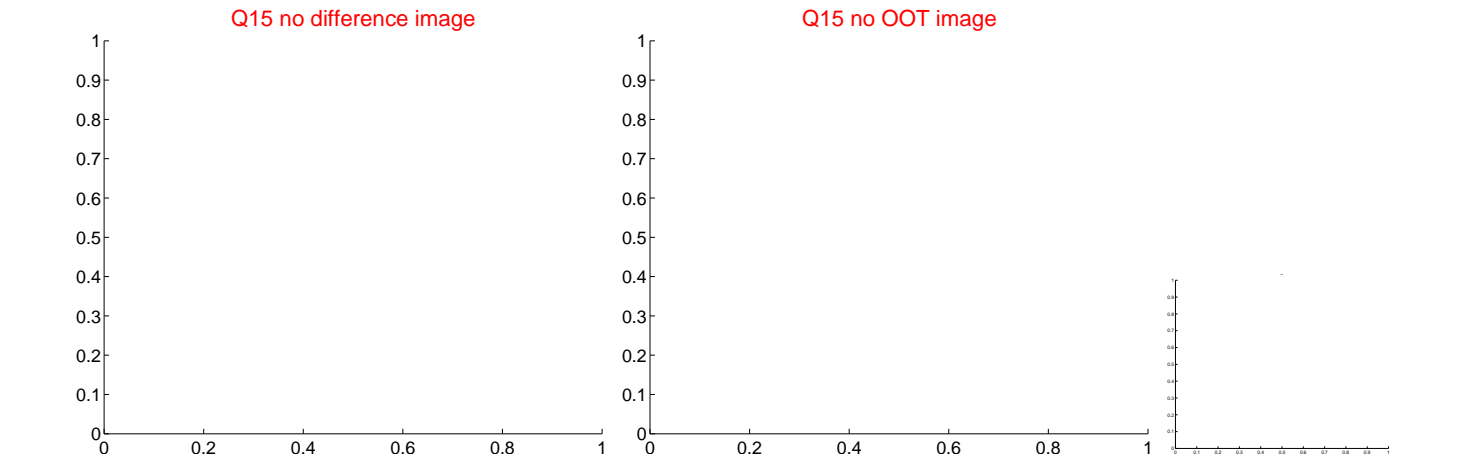
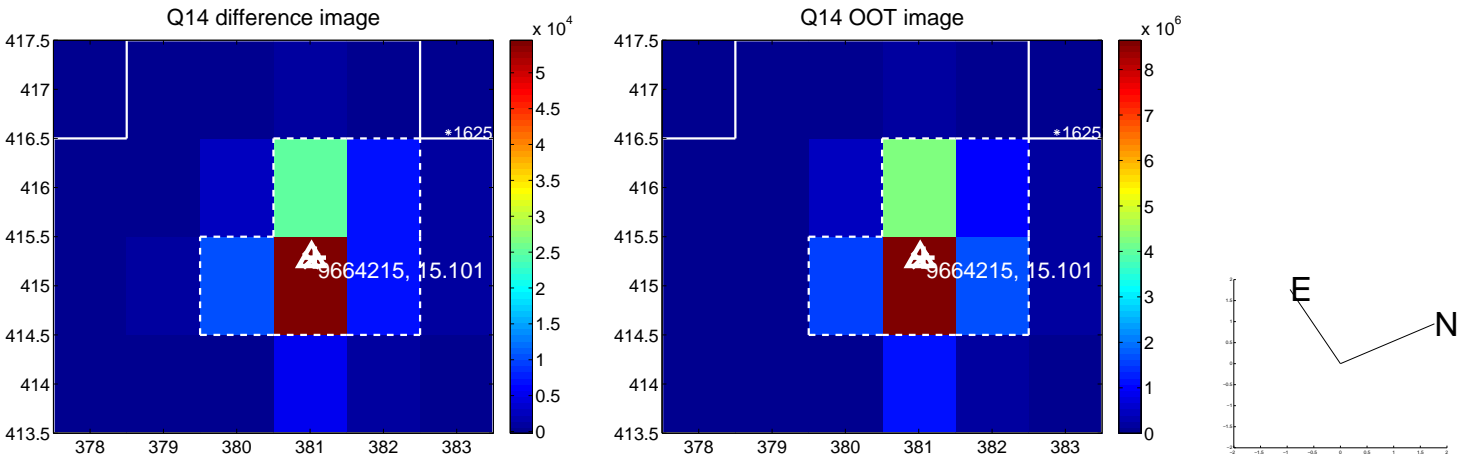
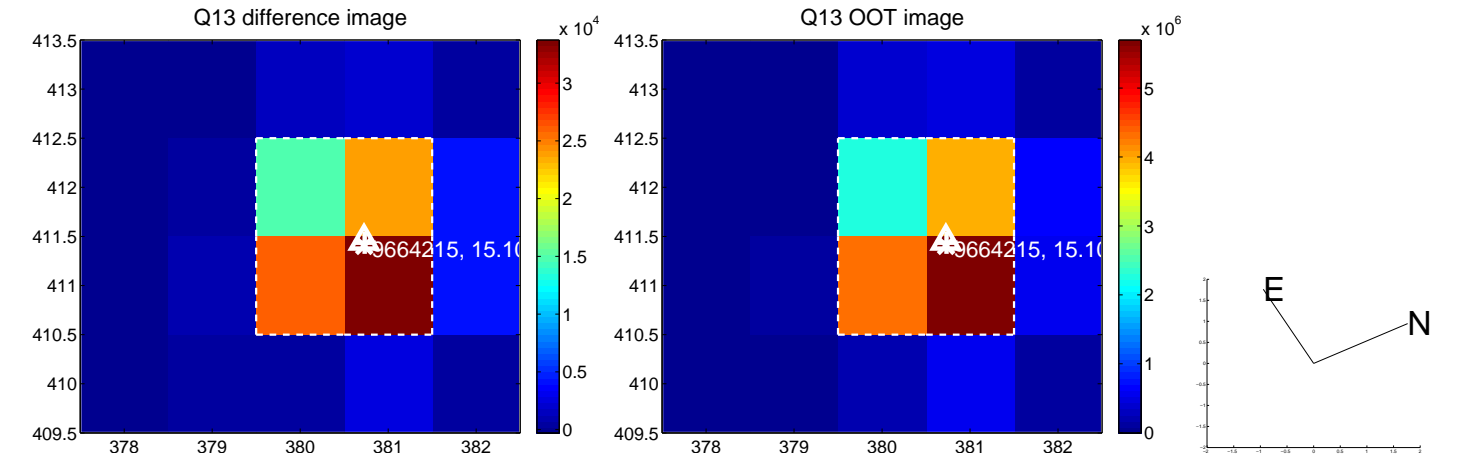




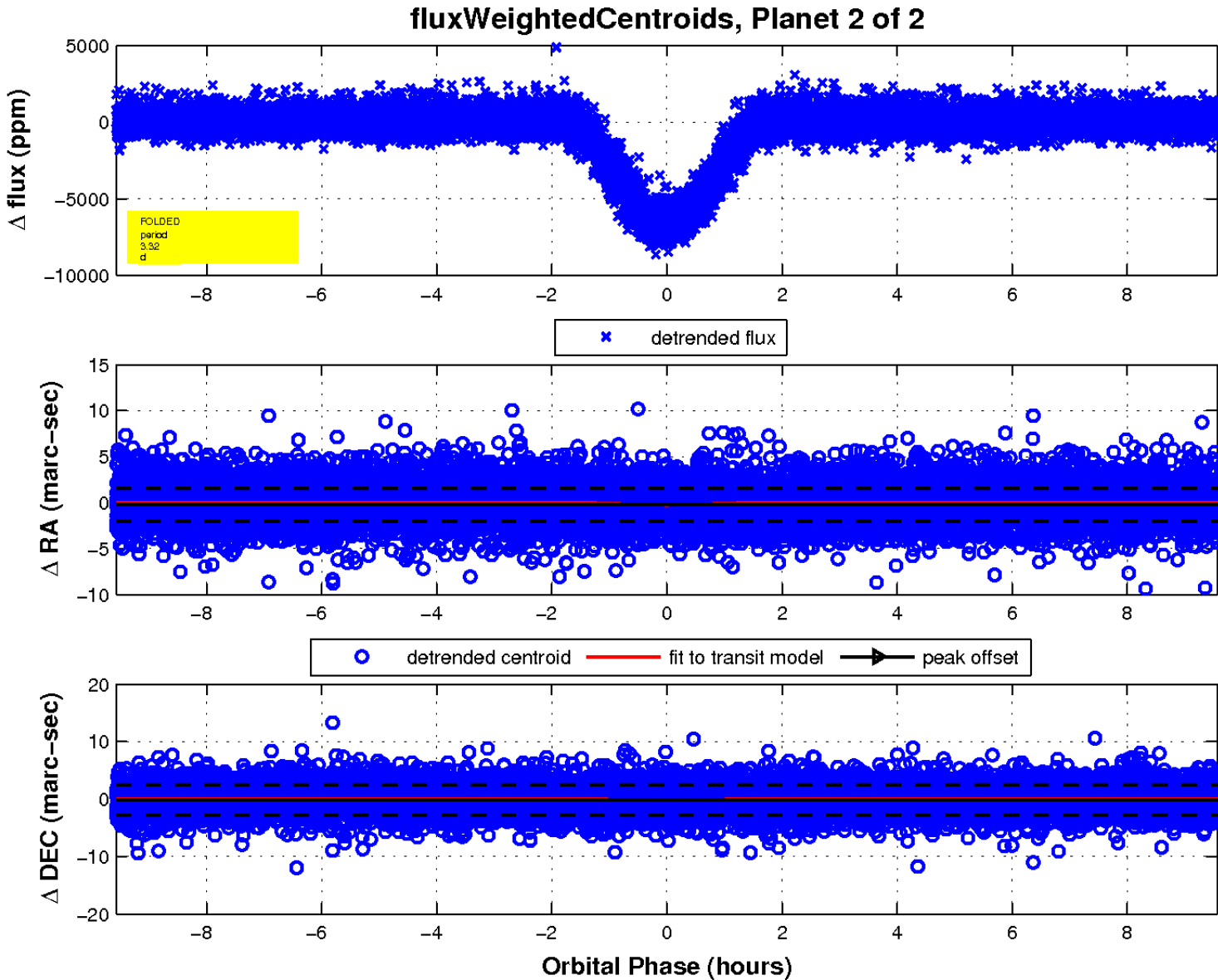
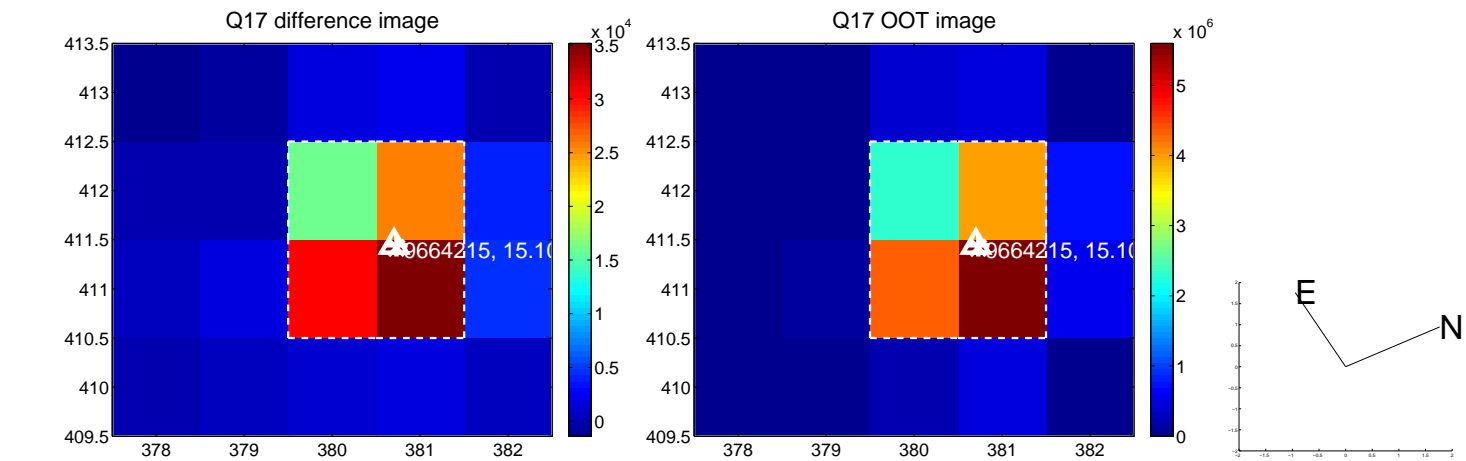
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UKIRT Image

Declination

