

# KIC 010491554

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010491554-01	OBS	3576.01	22.771959	140.486845	304496.0	8.421	2263.9	1260.3	1.56	6049	100.71	115.16
010491554-02	OBS	No	22.771960	133.842230	242218.4	10.853	1980.1	1254.5	1.56	6049	99.20	115.16

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010491554-01	OBS	FP	0.00	0	1	0	0	MOD_SEC_DV—MOD_SEC_ALT—MOD_ODDEVEN_DV—DEEP_V_SHAPED—HAS_SEC_TCE—SEASONAL_DEPTH_DV—SEASONAL_DEPTH_ALT—CENT_KIC_POS
010491554-02	OBS	FP	0.00	1	1	0	0	IS_SEC_TCE—CENT_KIC_POS

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

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

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

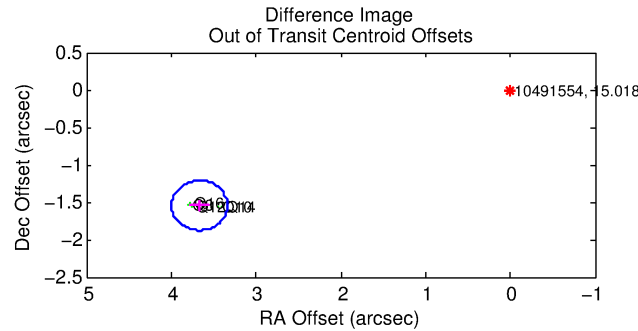
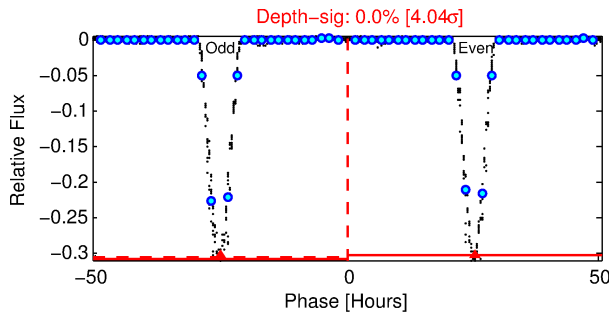
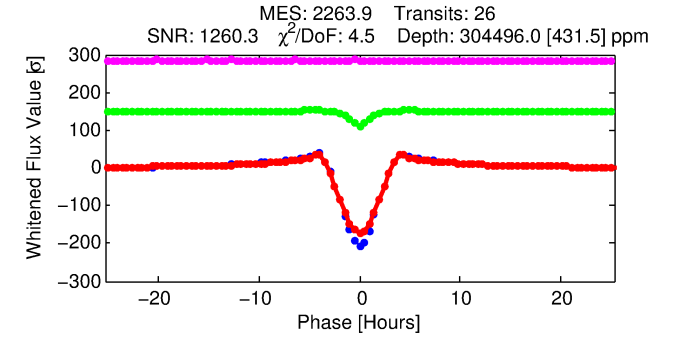
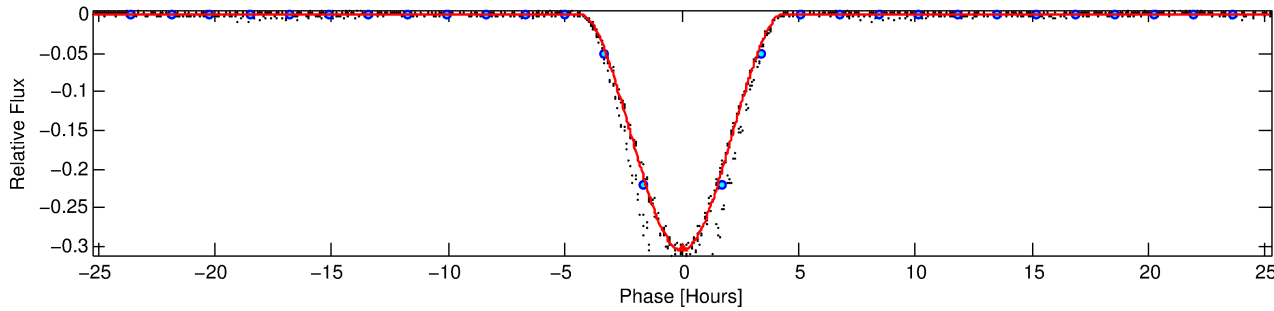
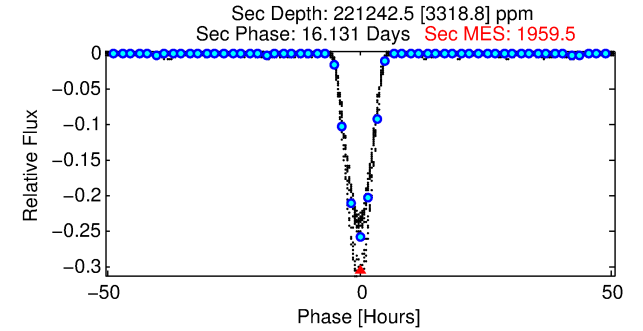
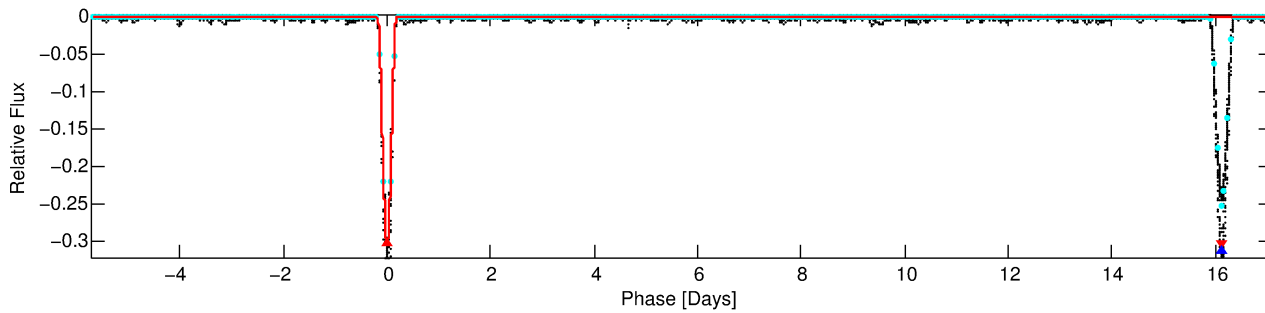
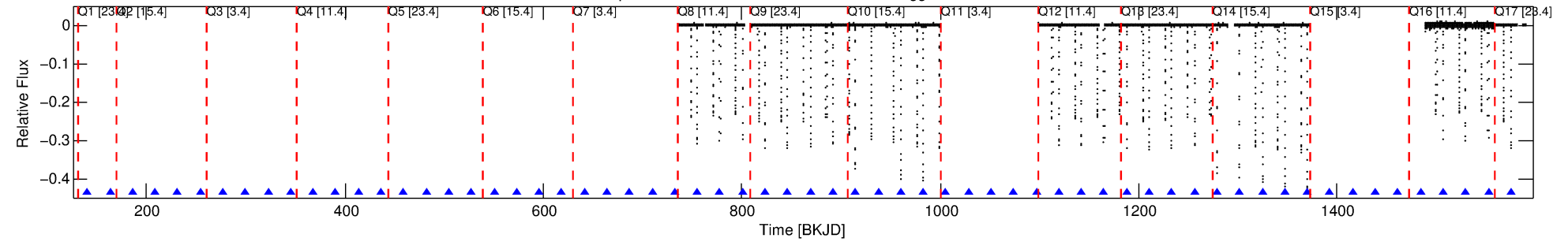
## Ephemeris Match Information For 010491554-01

No Significant Match Found

# DV One-Page Summary

KIC: 10491554 Candidate: 1 of 2 Period: 22.772 d  
KOI: K03576.01 Corr: 0.994

Kp: 15.02 R\*: 1.56 Rs Teff: 6049.0 K Logg: 4.07 Fe/H: -0.220



## DV Fit Results:

Period = 22.77196 [0.00001] d  
Epoch = 140.4868 [0.0004] BKJD  
Rp/R\* = 0.5927 [0.0319]  
a/R\* = 30.36 [0.23]  
b = 0.62 [0.06]  
Seff = 115.16 [69.95]  
Teff = 835 [127] K  
Rp = 100.71 [37.65] Re  
a = 0.1589 [0.0580] AU  
Ag = 303.08 [182.18] [1.66σ]  
Teffp = 5389 [238] K [16.86σ]

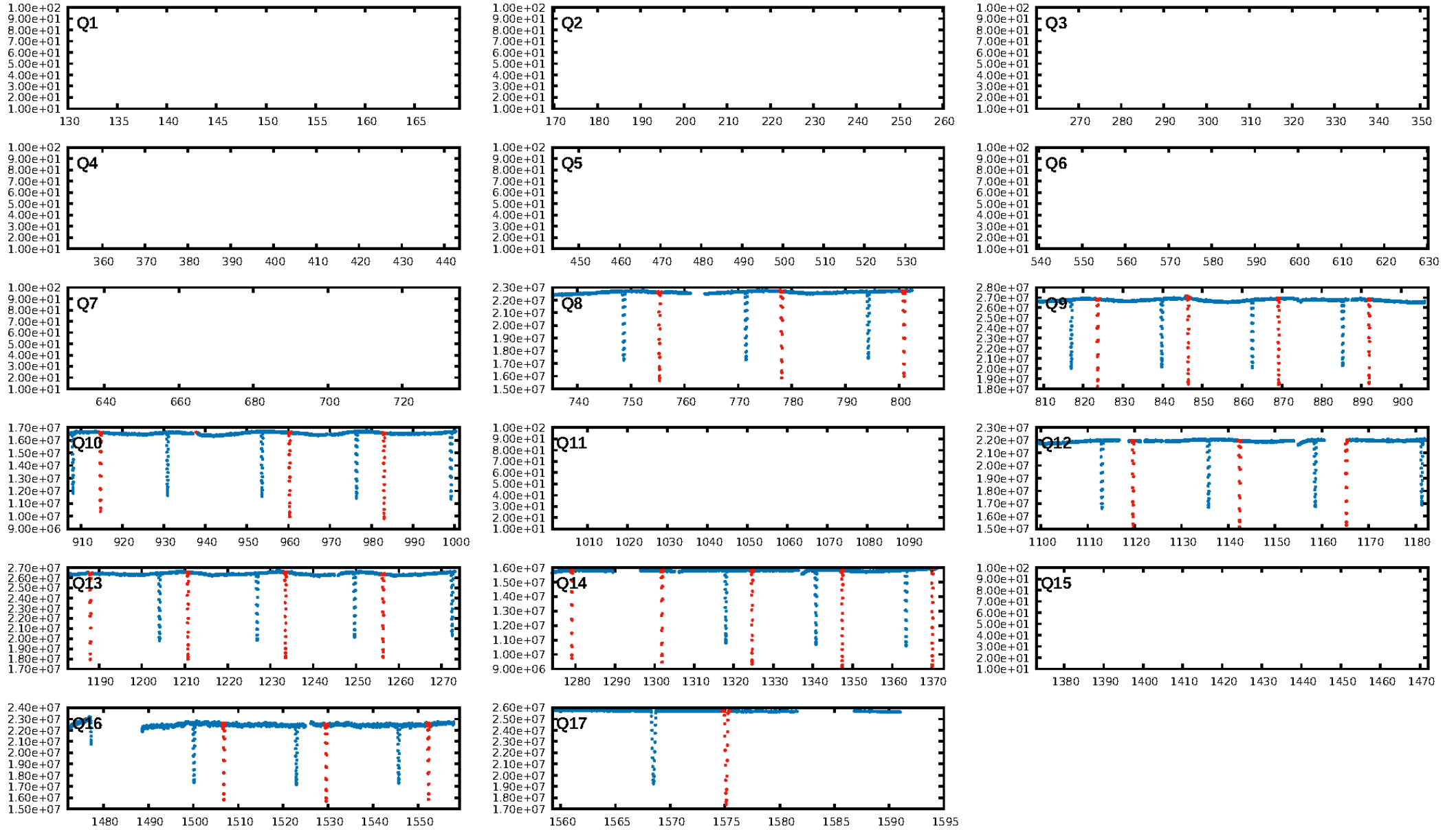
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.0% [0.00σ]  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 0.0%  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [25/25]  
GhostDiagnostic-chr: 2.115  
Centroid-sig: 0.0%  
Centroid-so: 1.988 arcsec [3048.22σ]  
OotOffset-rm: 3.980 arcsec [36.10σ]  
KicOffset-rm: 0.075 arcsec [1.02σ]  
OotOffset-st: 2/0/3/0 [5]  
KicOffset-st: 2/0/3/3 [8]  
DiffImageQuality-fgm: 1.00 [8/8]  
DiffImageOverlap-fno: 1.00 [8/8]

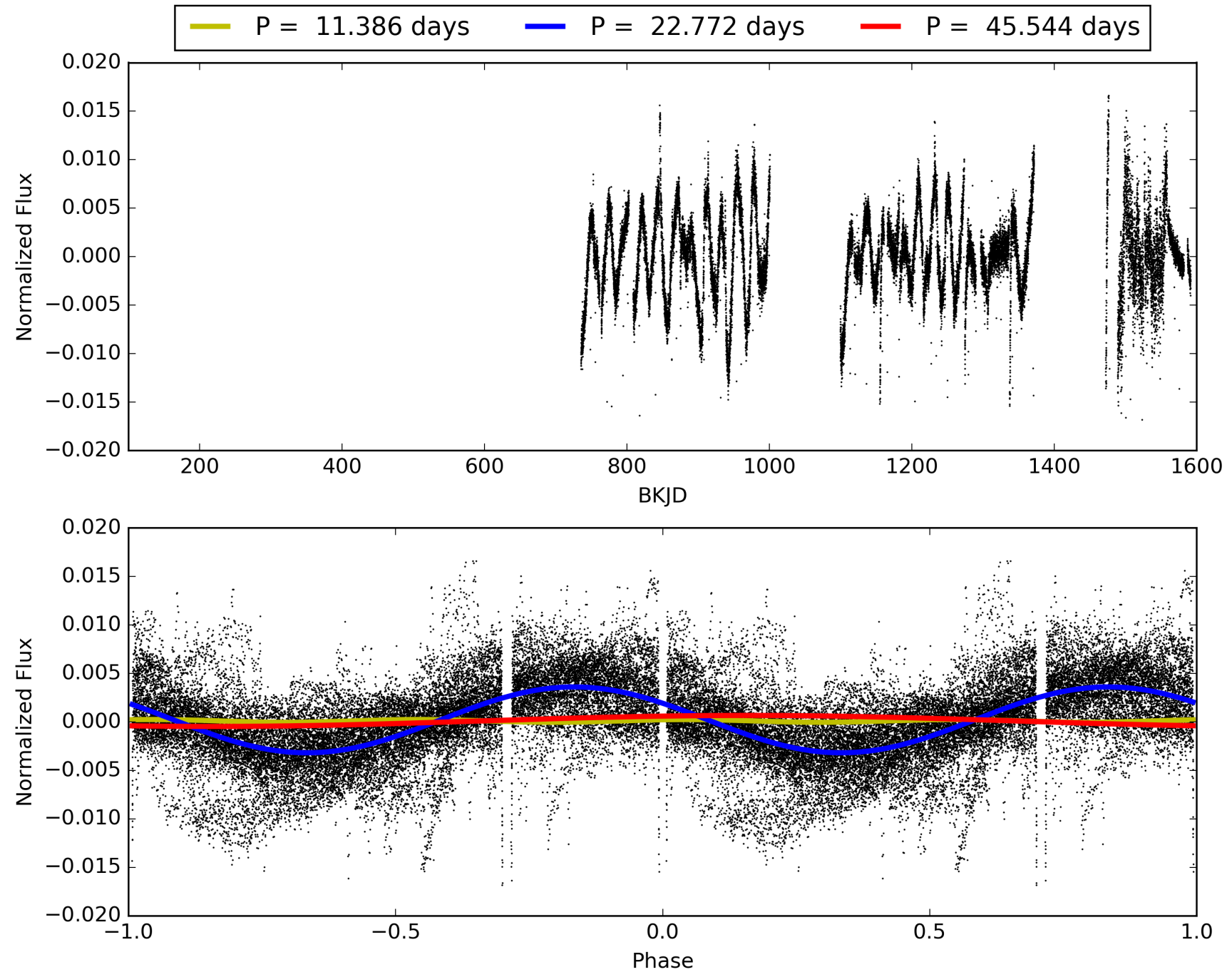
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 10:42:03 Z

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

# TCE 010491554-01, PDC Light Curves

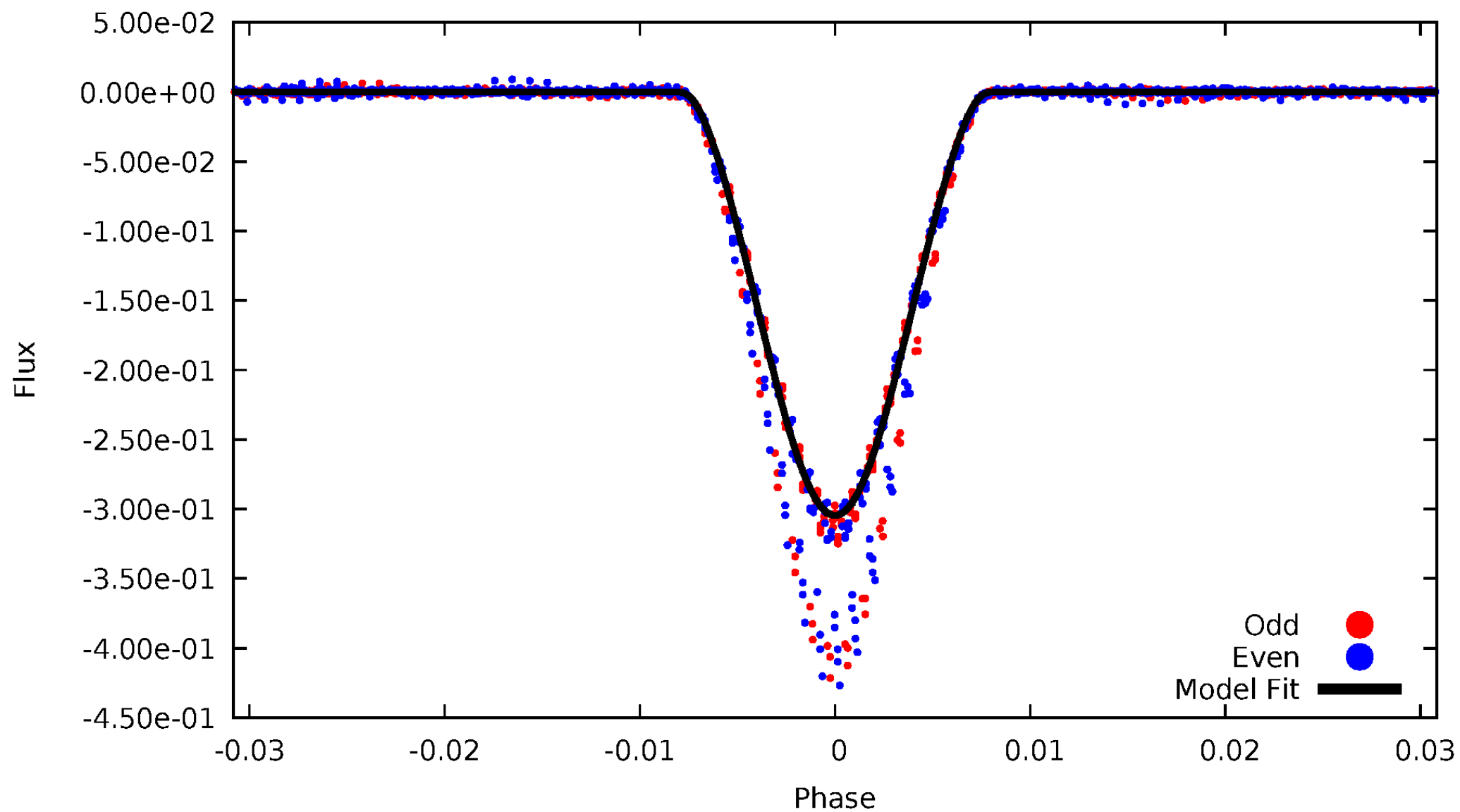


TCE 010491554-01



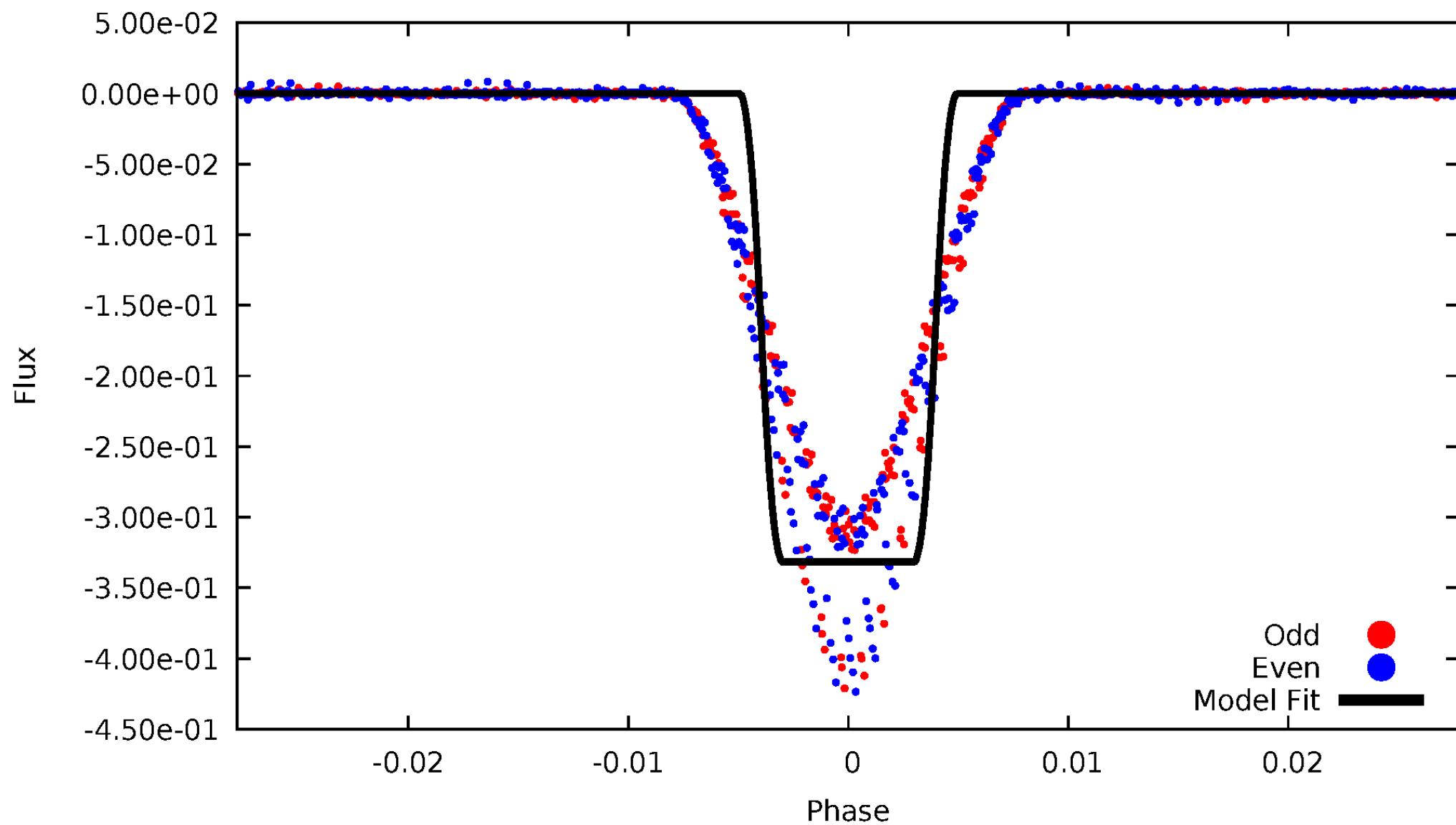
# DV Odd/Even

TCE 010491554-01



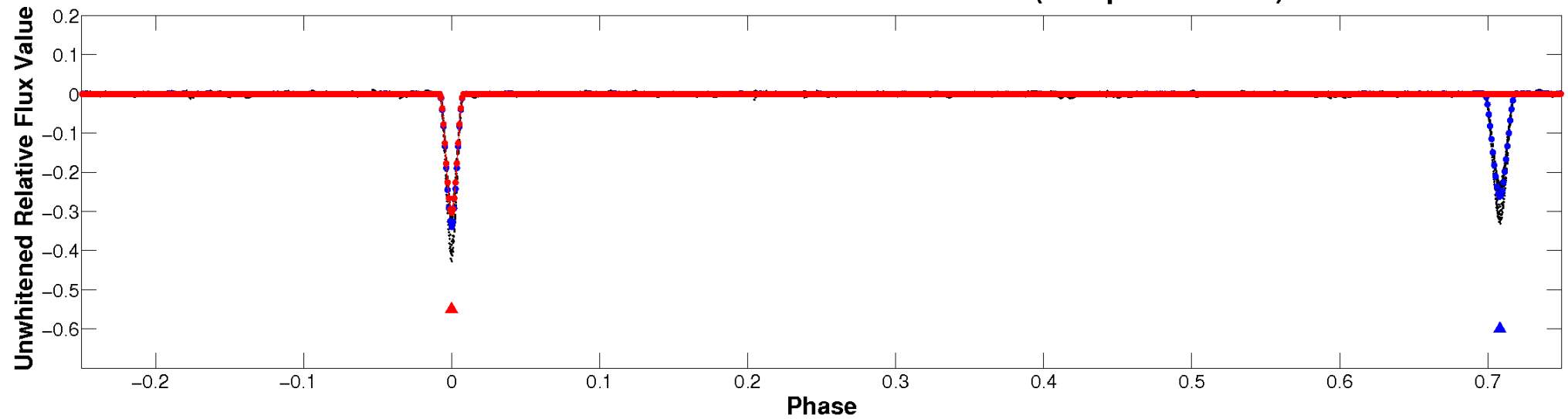
# ALT Odd/Even

TCE 010491554-01

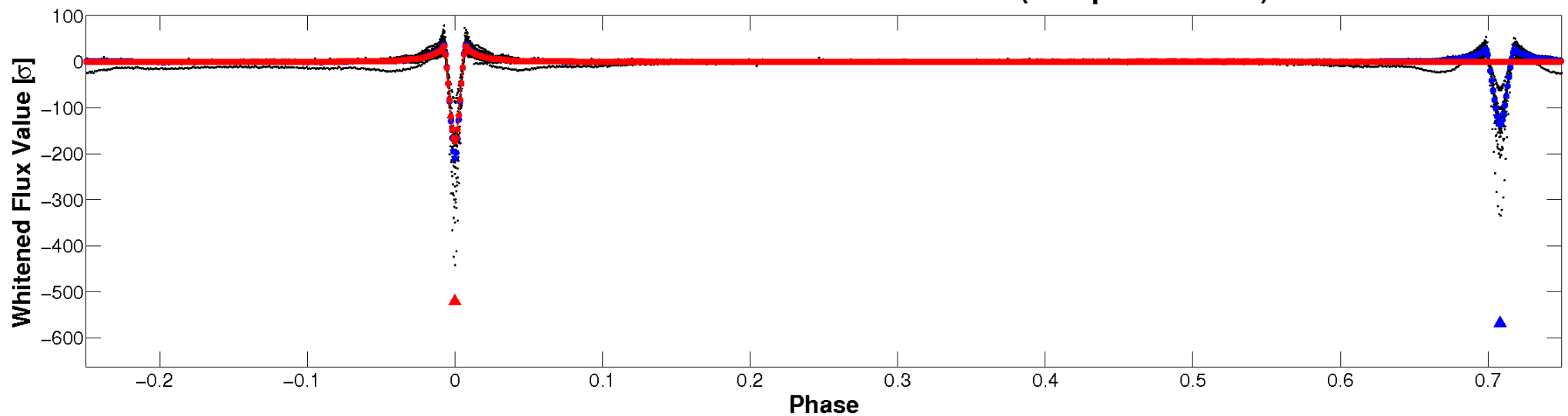


# Non-Whitened Vs. Whitened Light Curve

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

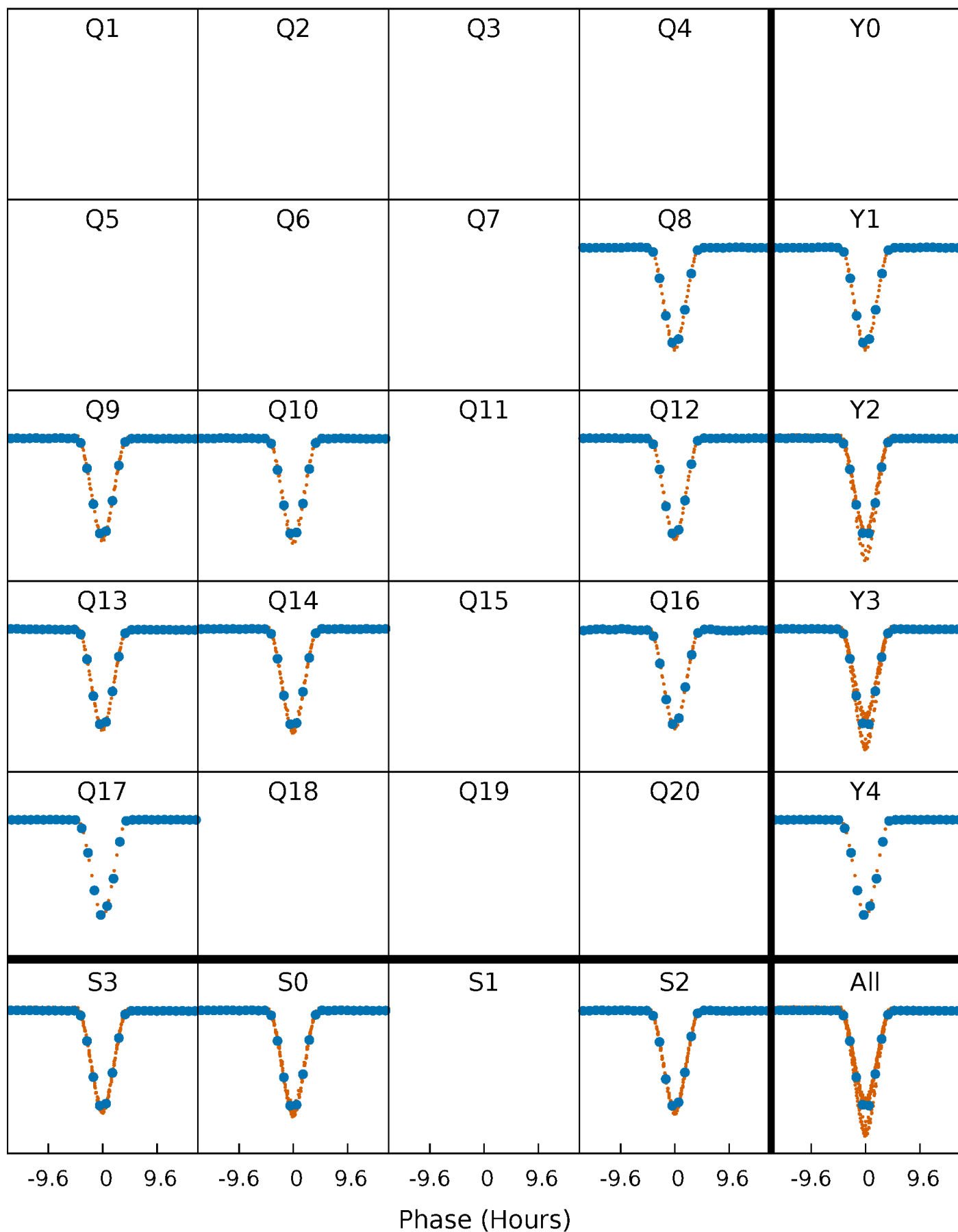


**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

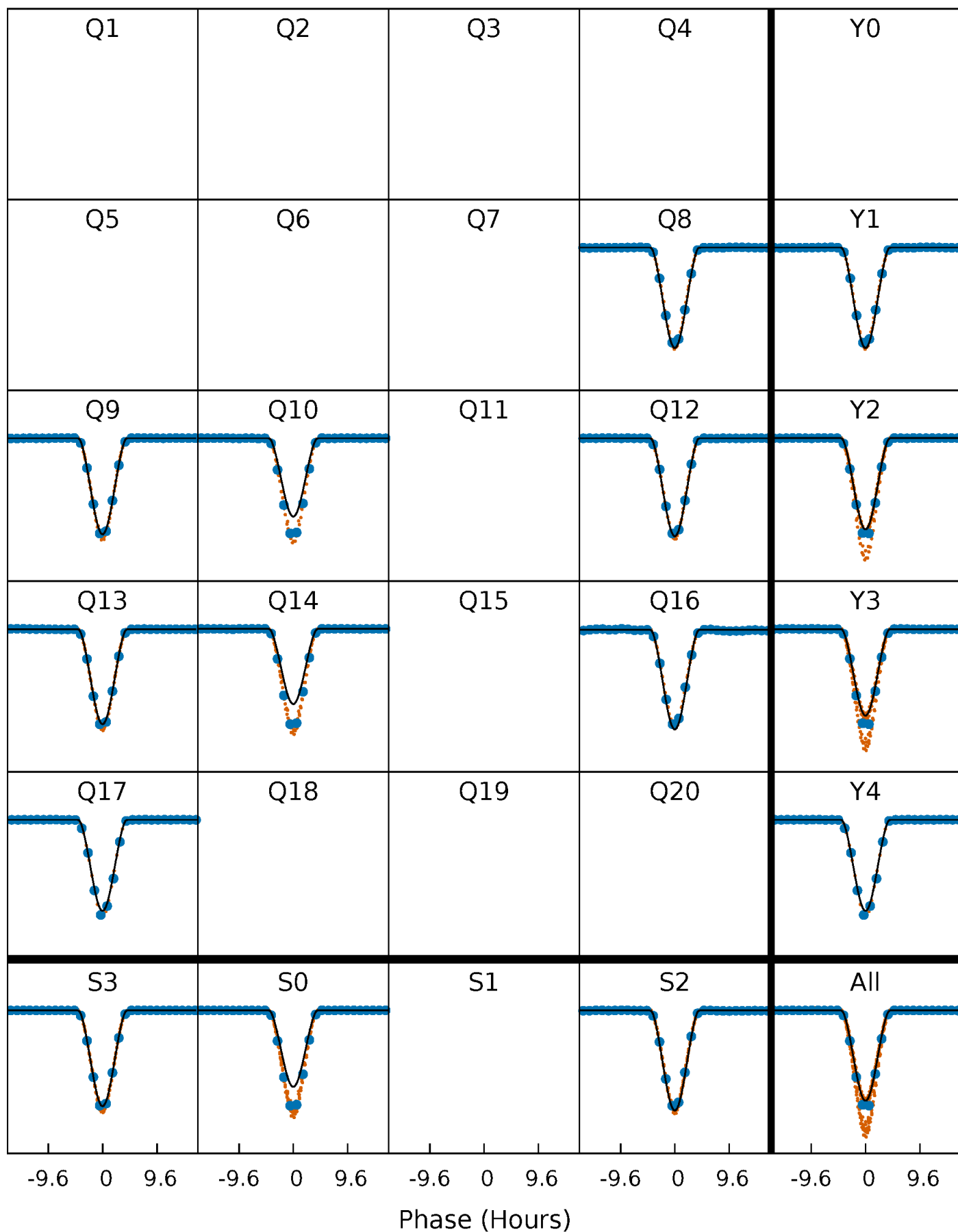
TCE 010491554-01 P= 22.771959 Days  $T_0=140.486845$  (BKJD)





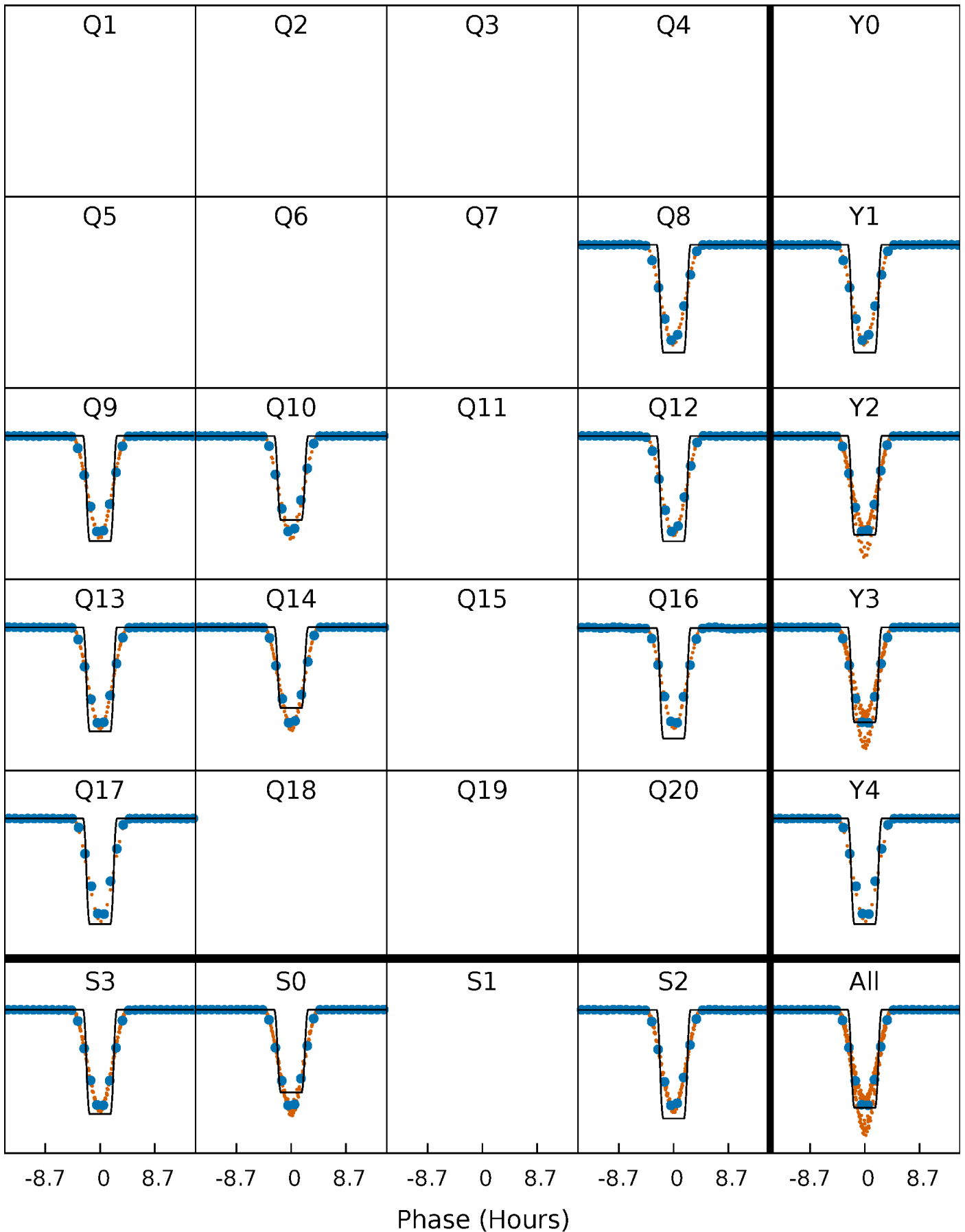
# DV Quarter-Phased Transit Curves

TCE 010491554-01 P= 22.771959 Days  $T_0=140.486845$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

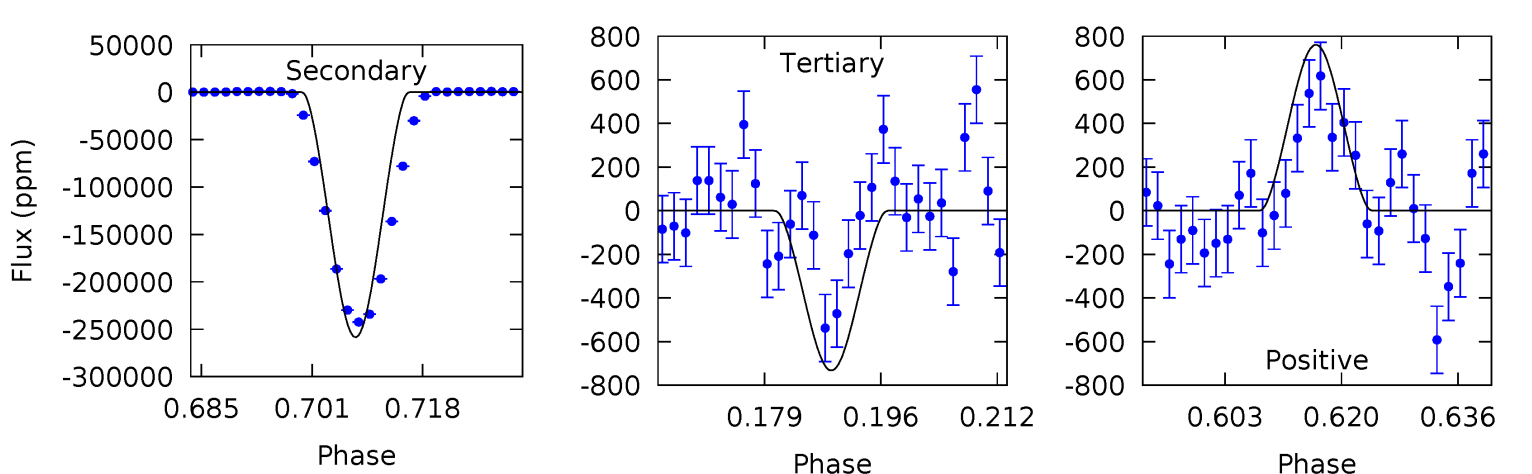
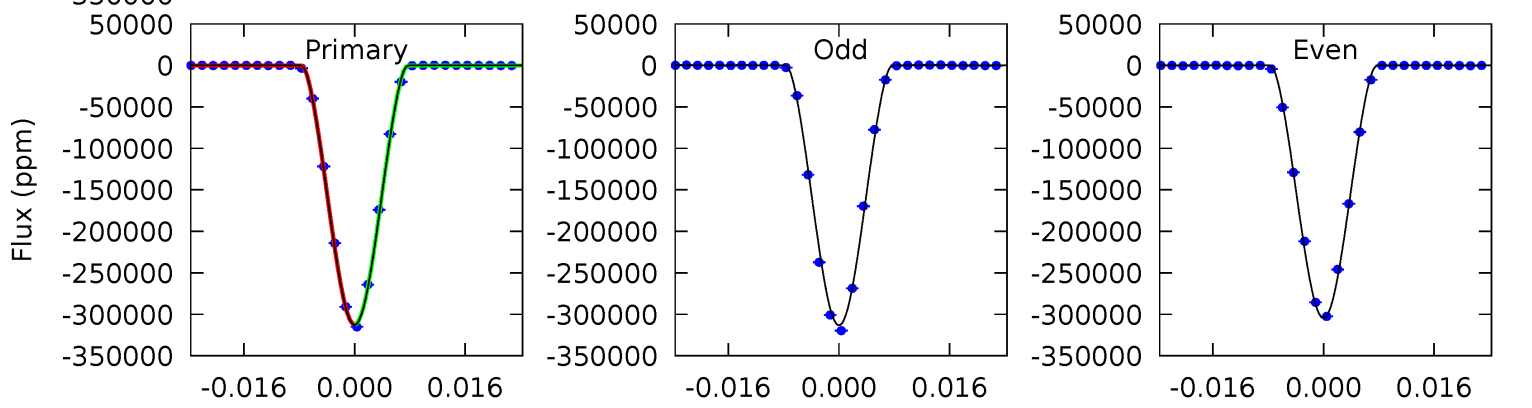
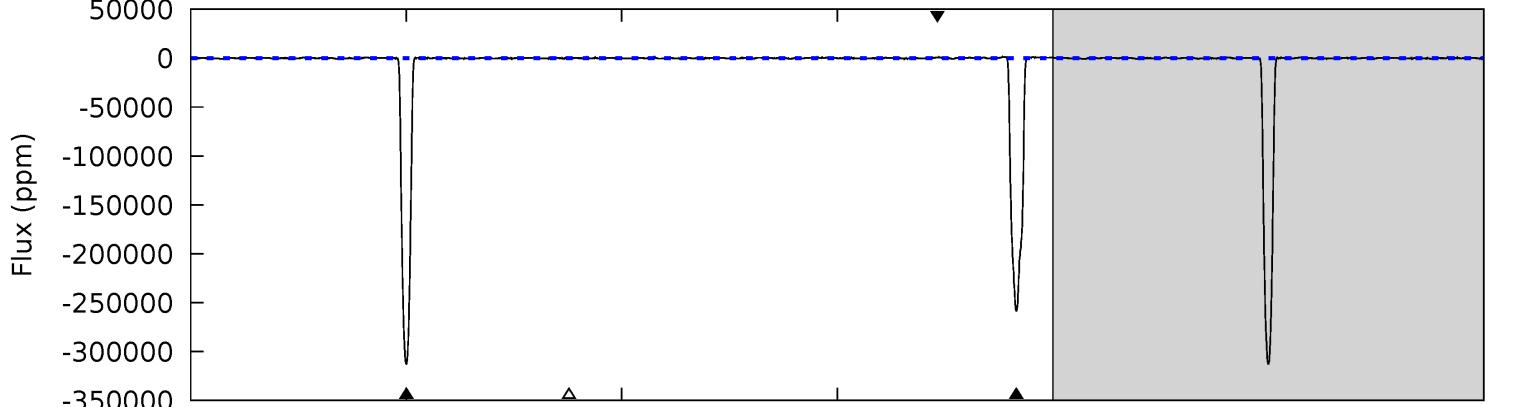
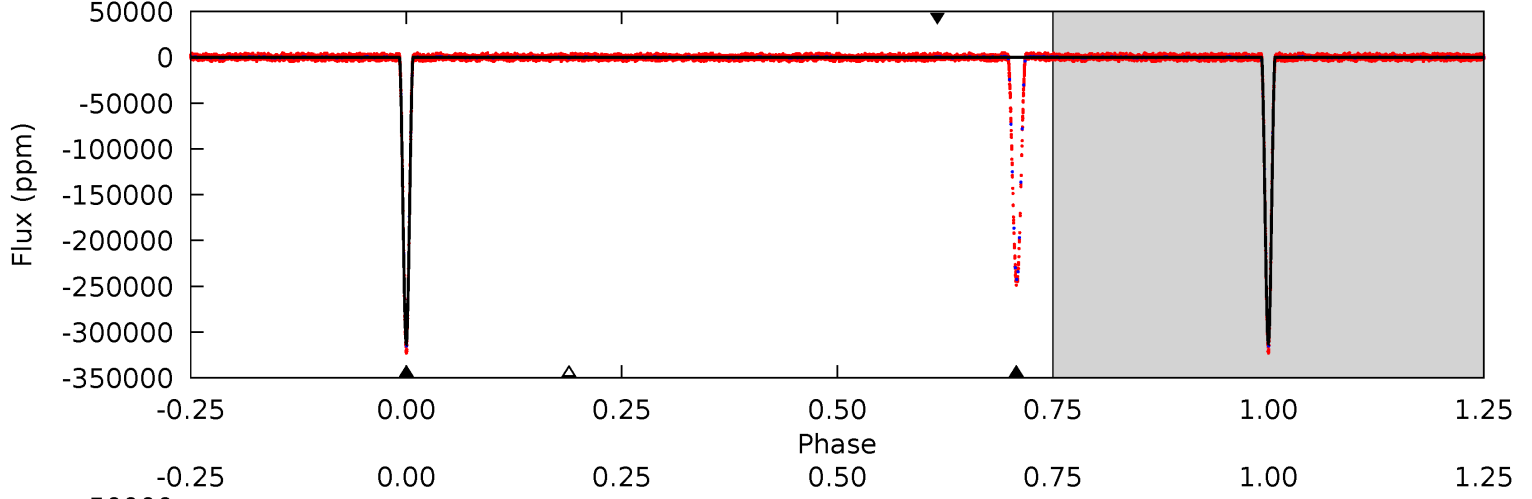
TCE 010491554-01 P= 22.771787 Days  $T_0=140.494167$  (BKJD)



# DV Model-Shift Uniqueness Test

010491554-01, P = 22.771959 Days, E = 140.486845 Days

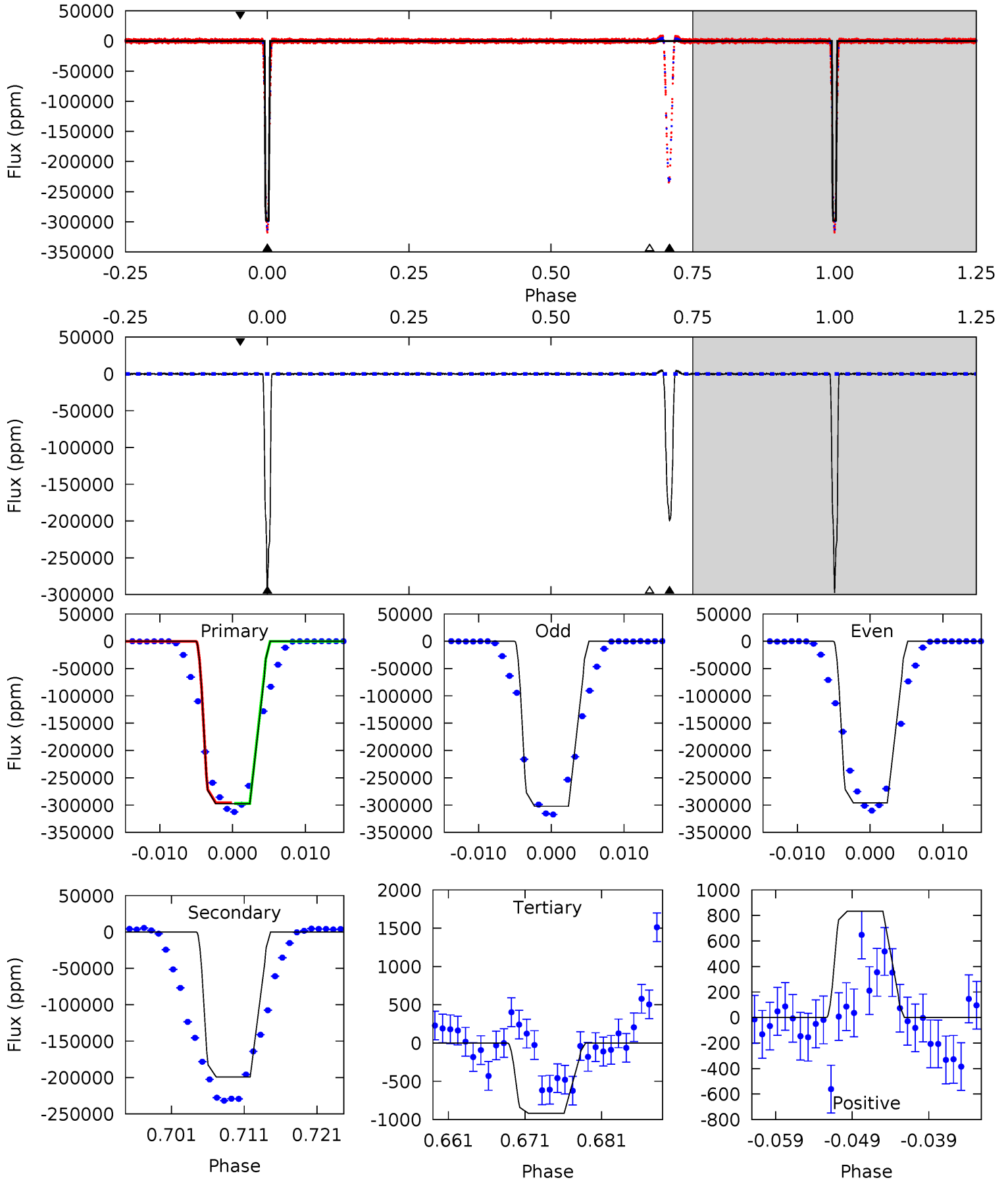
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
3951	3265	9.26	9.62	4.93	2.40	3.74	3942	3941	3256	3256	53.5	1.06	0.00	0



# Alt Model-Shift Uniqueness Test

010491554-01, P = 22.771787 Days, E = 140.494167 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
1518	1015	4.68	4.25	5.03	2.58	2.35	1513	1514	1011	1011	17.7	1.07	0.02	0



### Stellar Parameters For KIC 010491554

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6049^{+211}_{-211}$	$4.067^{+0.350}_{-0.150}$	$-0.220^{+0.300}_{-0.300}$	$1.557^{+0.432}_{-0.576}$	$1.032^{+0.165}_{-0.150}$	$0.385^{+0.897}_{-0.167}$
	+3%/-3%	+9%/-4%	+136%/-136%	+28%/-37%	+16%/-15%	+233%/-43%
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 010491554-01 / KOI 3576.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-258291 \pm 79$	$98.51^{+18.44}_{-19.18}$	$1151^{+98}_{-122}$	$6029^{+283}_{-262}$	$501^{+273}_{-134}$
Alt.	$-199164 \pm 196$	$95.87^{+15.82}_{-18.16}$	$1150^{+84}_{-114}$	$5634^{+241}_{-216}$	$385^{+183}_{-100}$

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

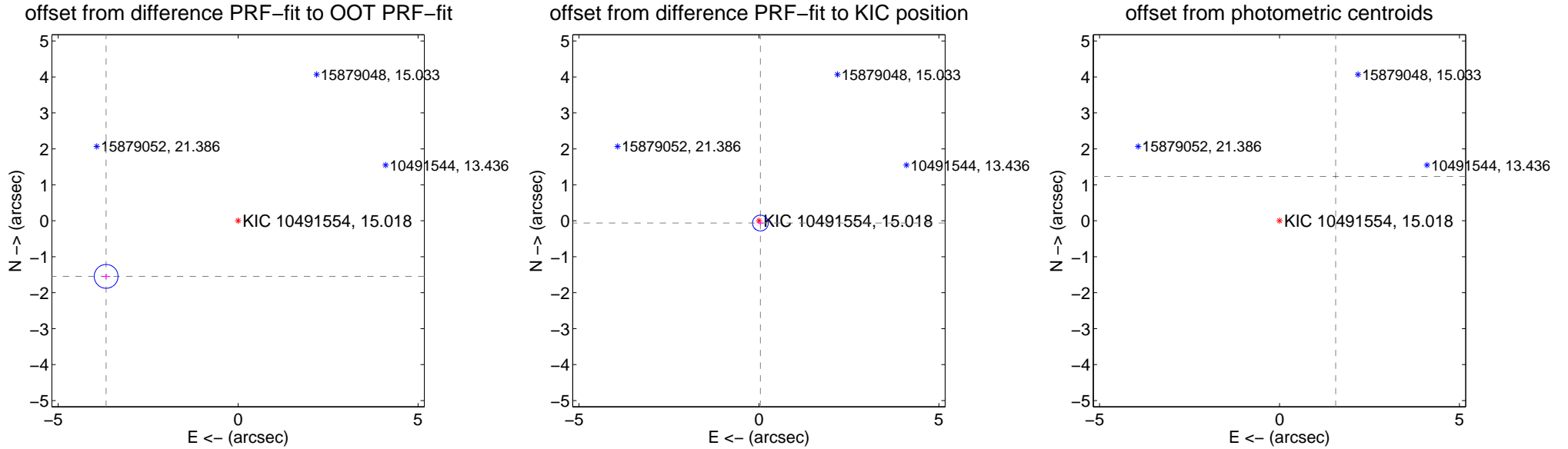
## DV Centroid Data

Supplemental centroid analysis for 010491554-01. Kepler magnitude: 15.02. Transit SNR 1260.34

There are 8 quarters with good PRF difference image offsets

The OOT PRF centroid is offset from the target star catalog position by about 3.97 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$3.980 \pm 0.110$	36.10	$3.667 \pm 0.116$	$-1.546 \pm 0.068$
PRF-fit source offset from KIC position	$0.075 \pm 0.073$	1.02	$-0.040 \pm 0.078$	$-0.063 \pm 0.071$
photometric centroid source offset	$1.99 \pm 0.00$	3048.22	$-1.56 \pm 0.00$	$1.23 \pm 0.00$

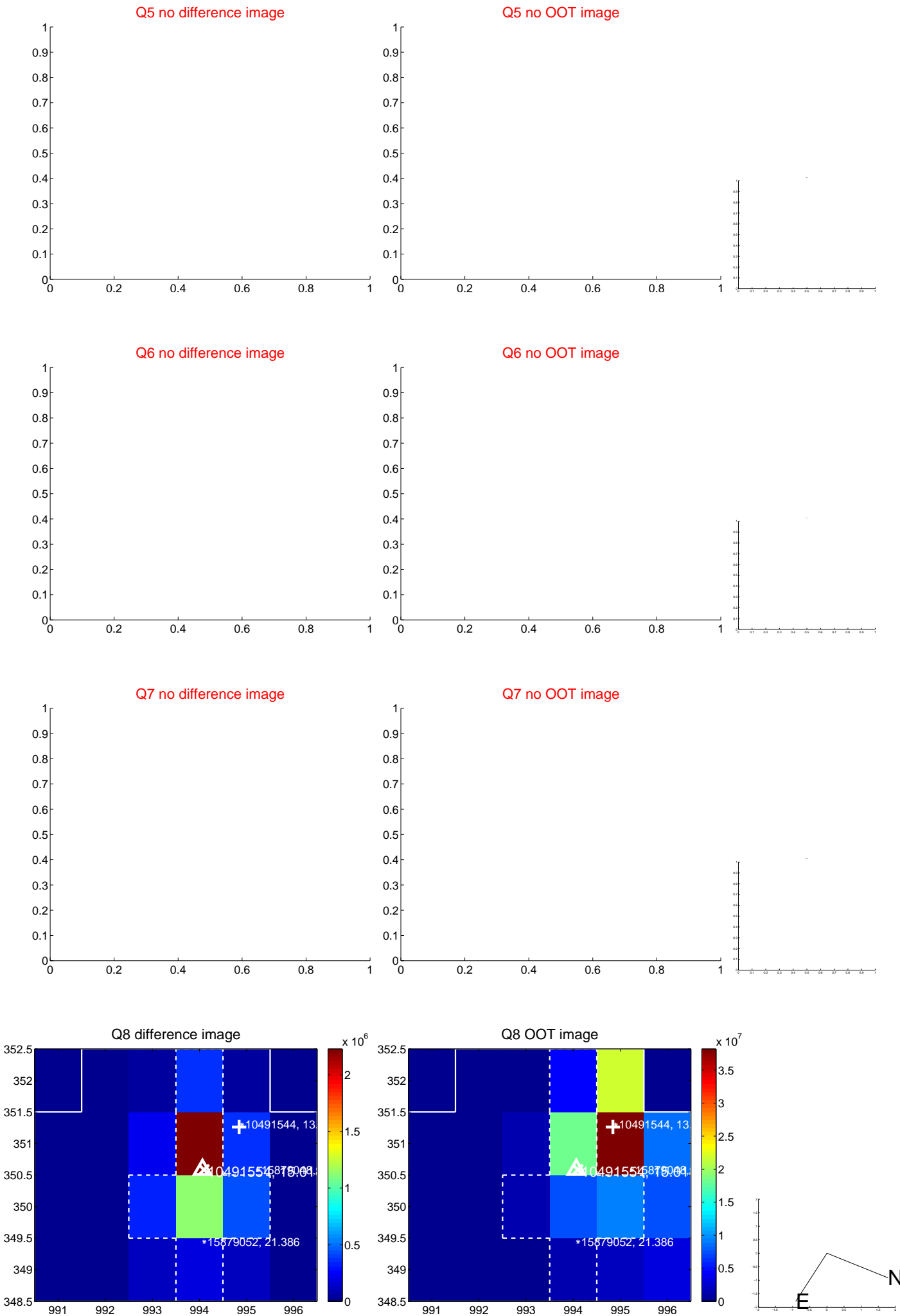


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

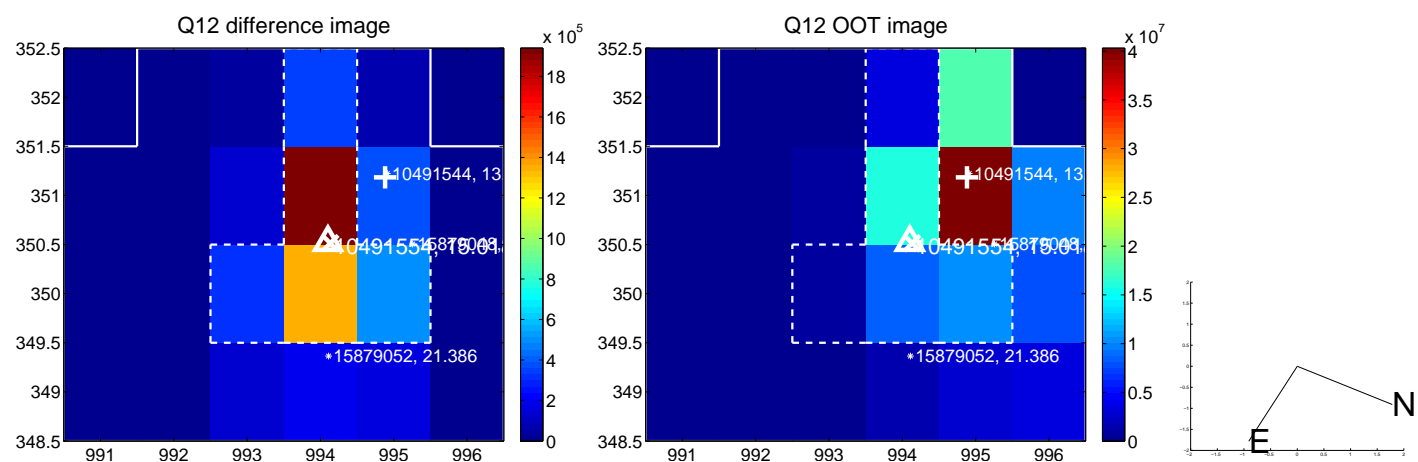
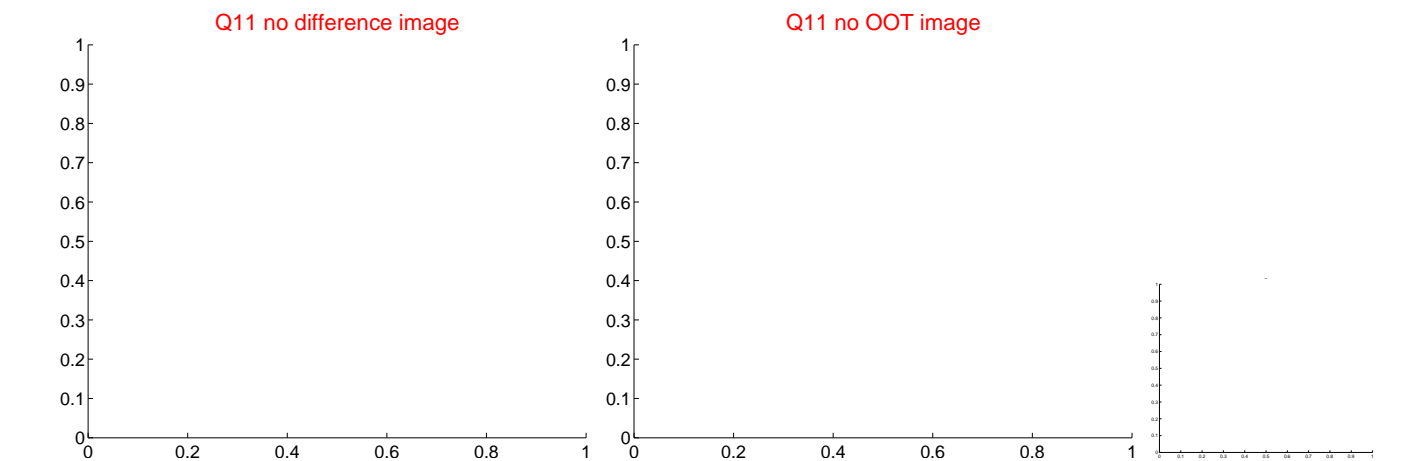
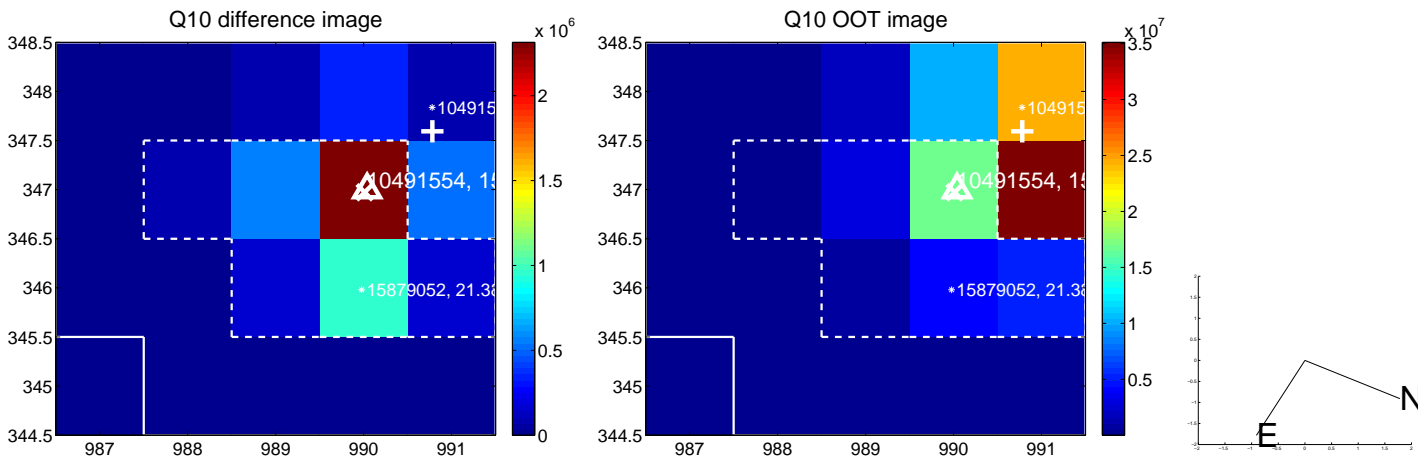
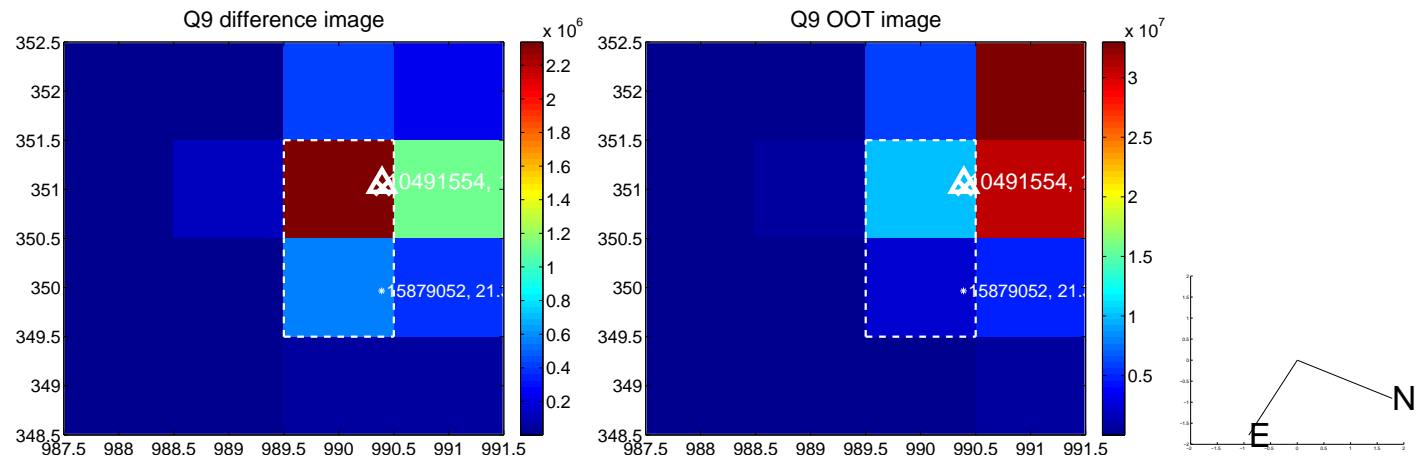


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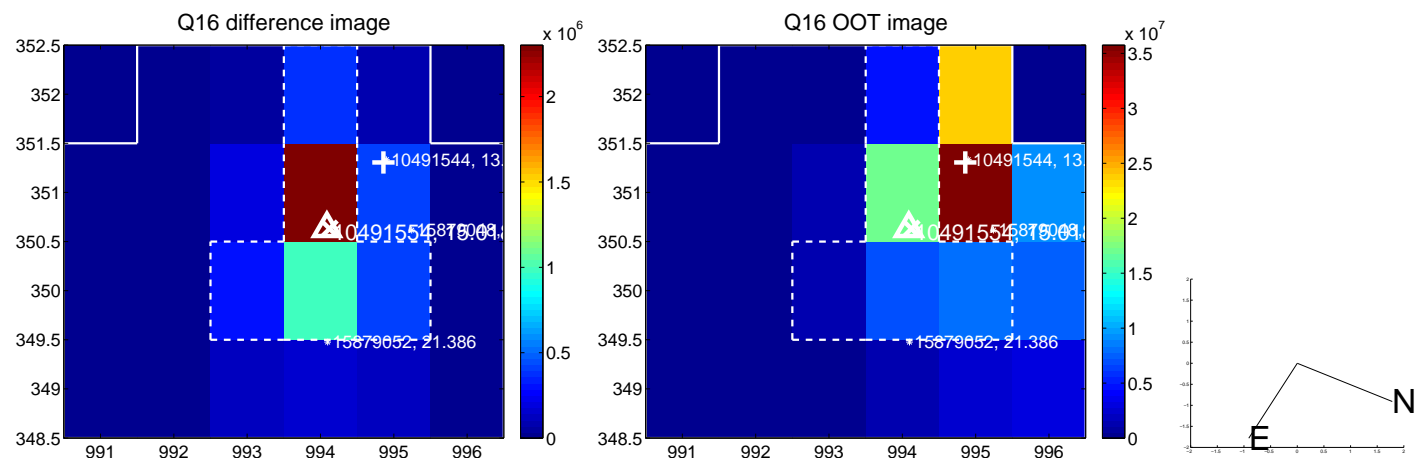
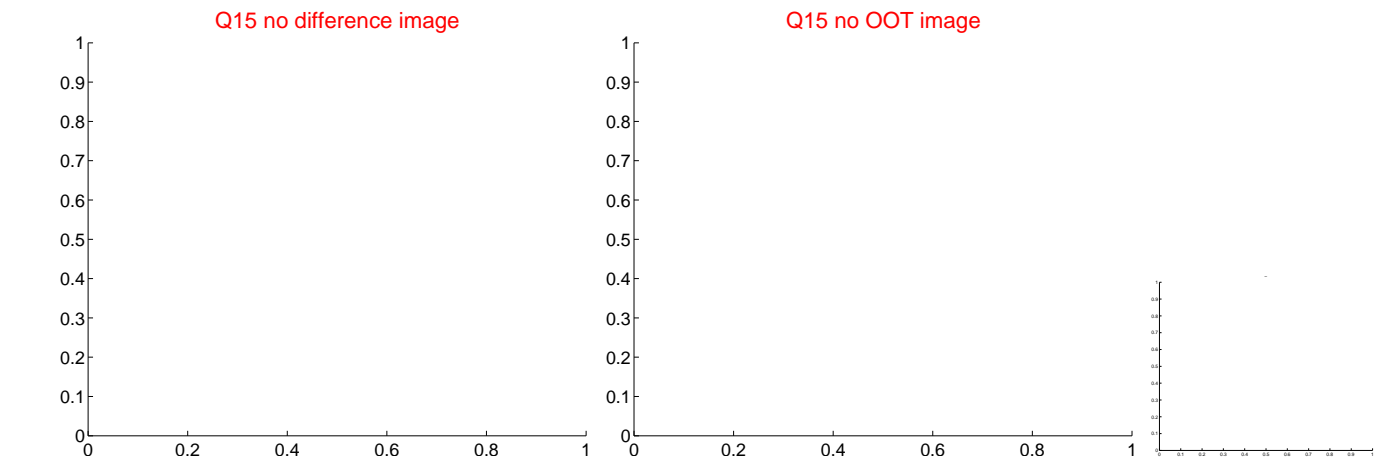
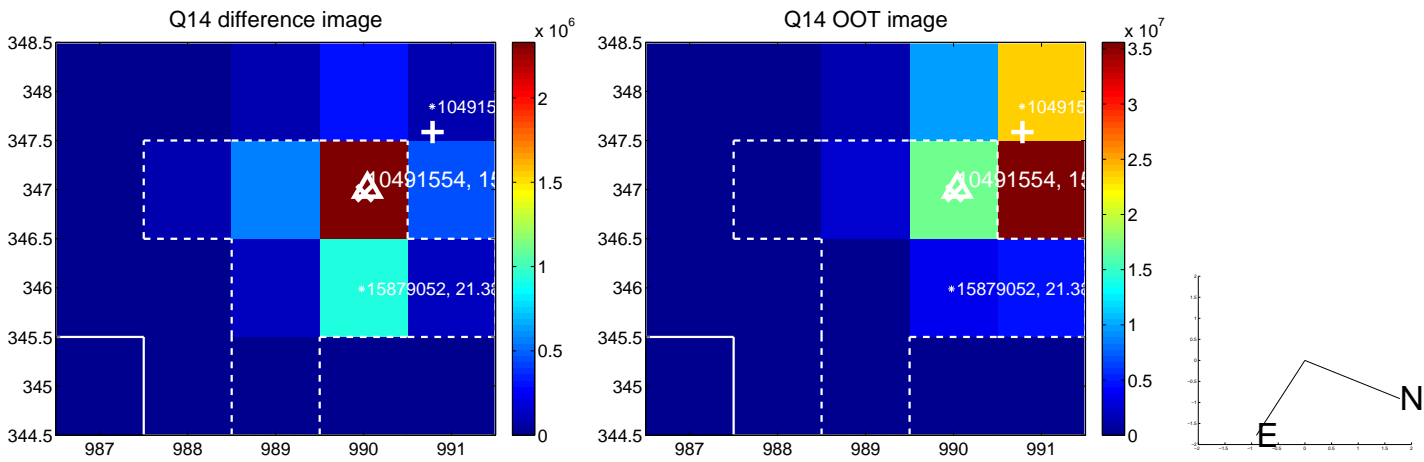
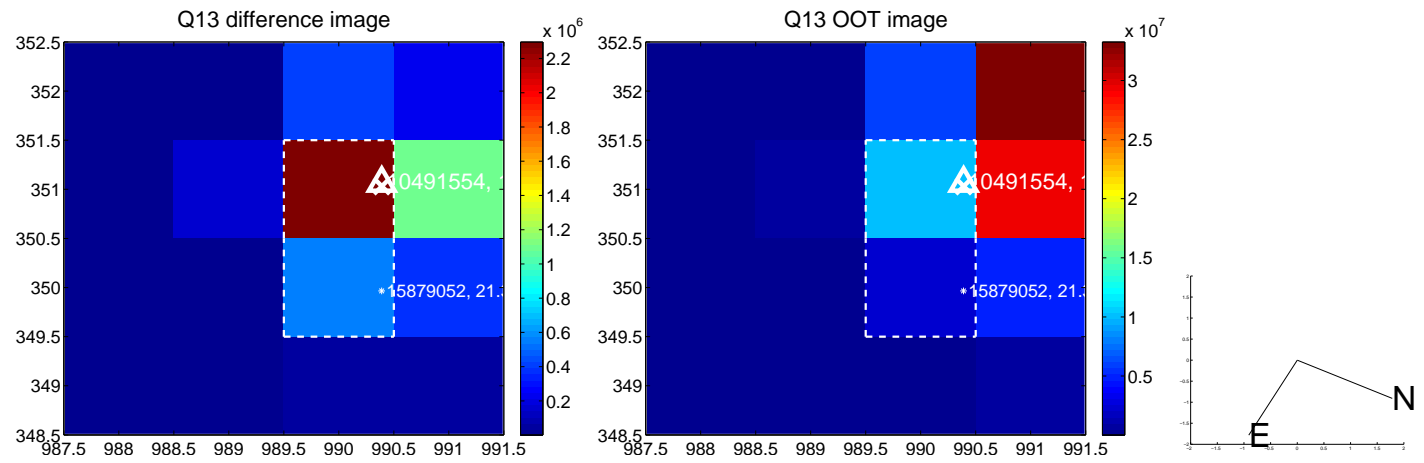




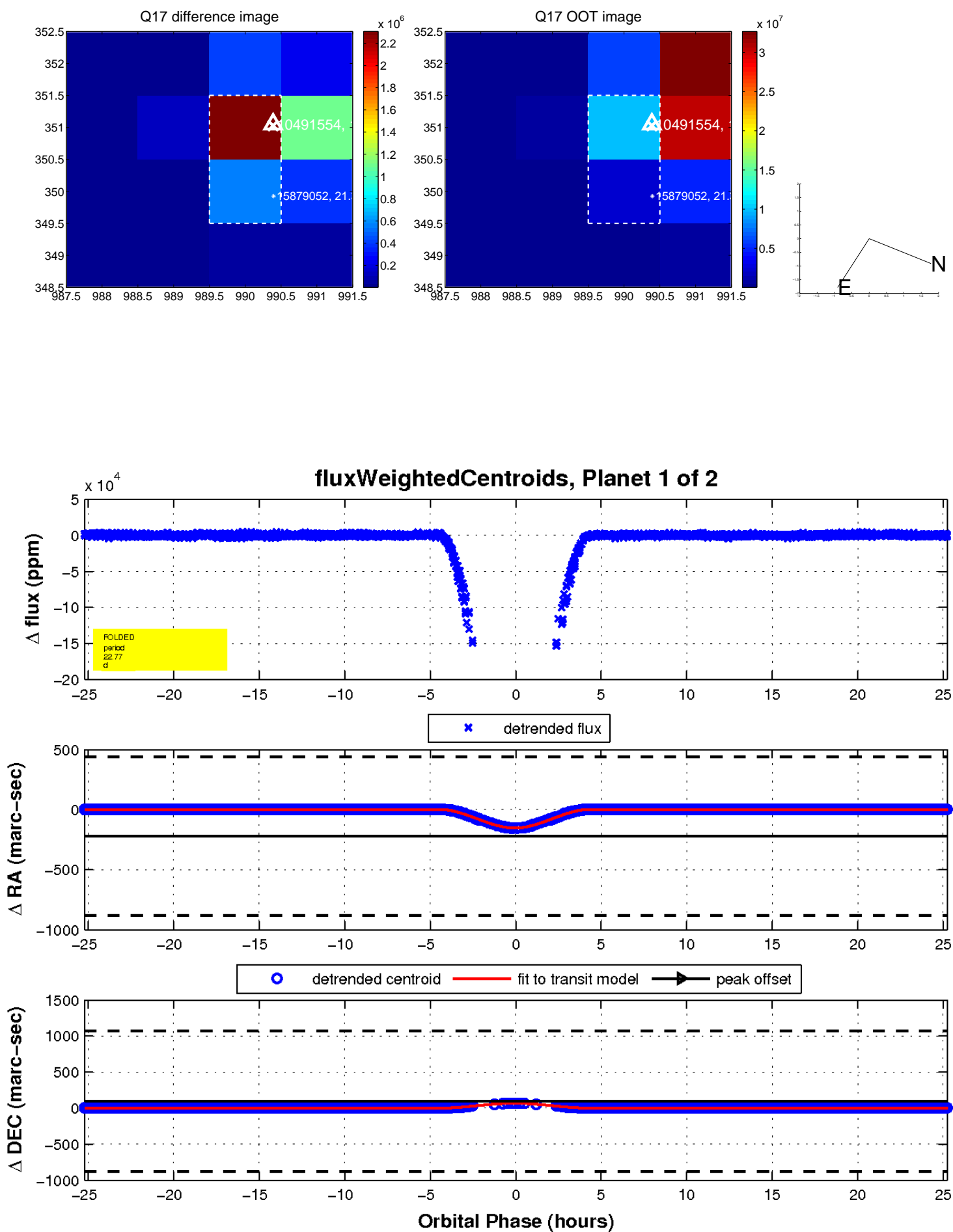
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



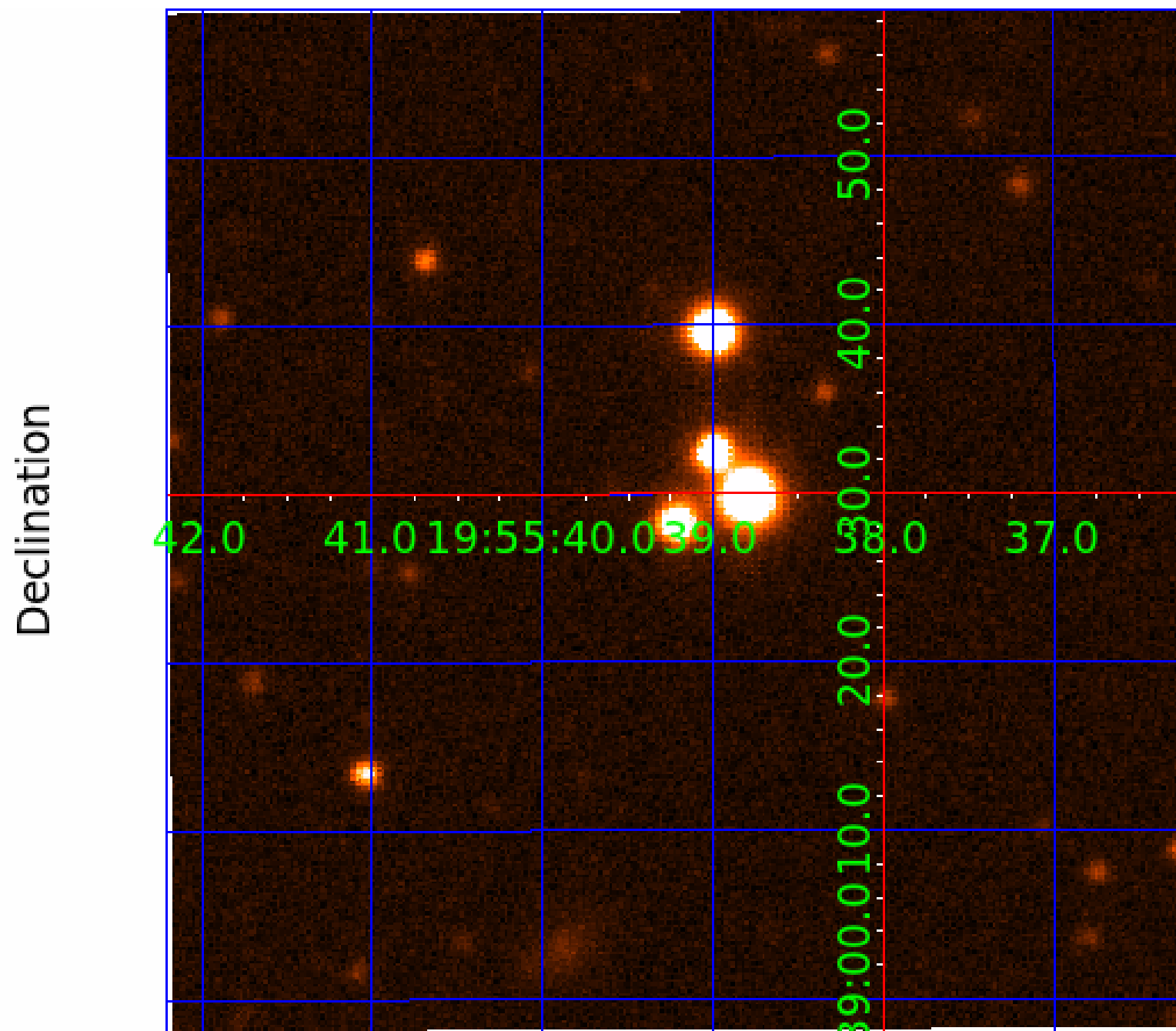
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white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image



# KIC 010491554

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010491554-01	OBS	3576.01	22.771959	140.486845	304496.0	8.421	2263.9	1260.3	1.56	6049	100.71	115.16
010491554-02	OBS	No	22.771960	133.842230	242218.4	10.853	1980.1	1254.5	1.56	6049	99.20	115.16

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010491554-01	OBS	FP	0.00	0	1	0	0	MOD_SEC_DV—MOD_SEC_ALT—MOD_ODDEVEN_DV—DEEP_V_SHAPED—HAS_SEC_TCE—SEASONAL_DEPTH_DV—SEASONAL_DEPTH_ALT—CENT_KIC_POS
010491554-02	OBS	FP	0.00	1	1	0	0	IS_SEC_TCE—CENT_KIC_POS

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

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

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

## Ephemeris Match Information For 010491554-02

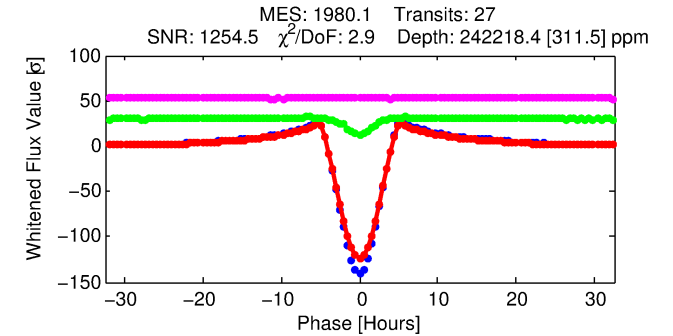
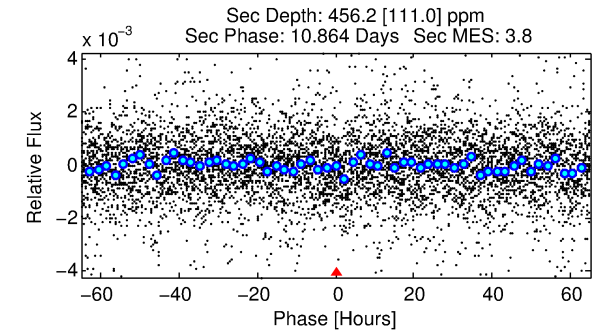
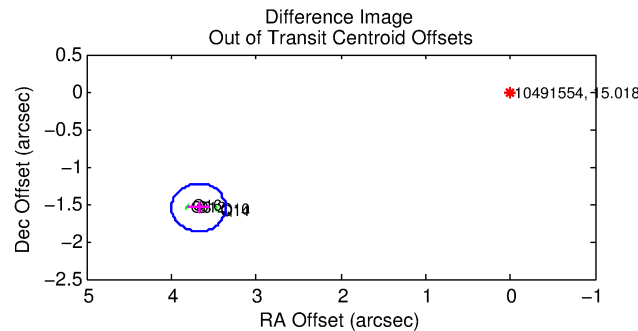
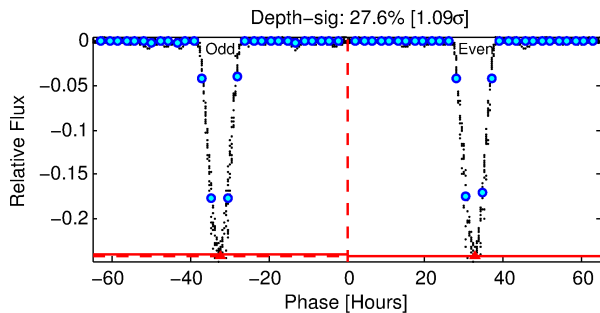
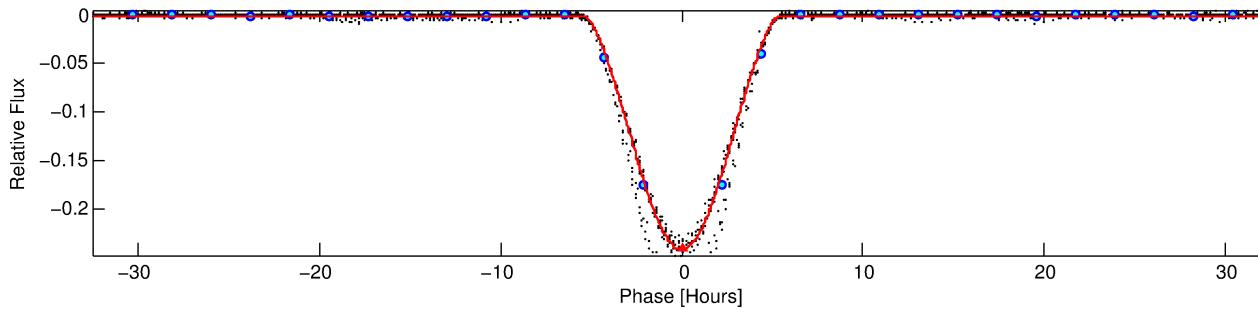
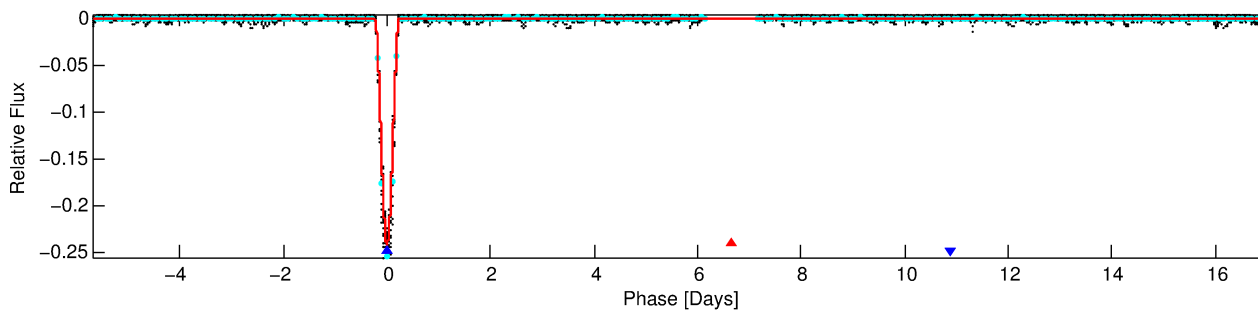
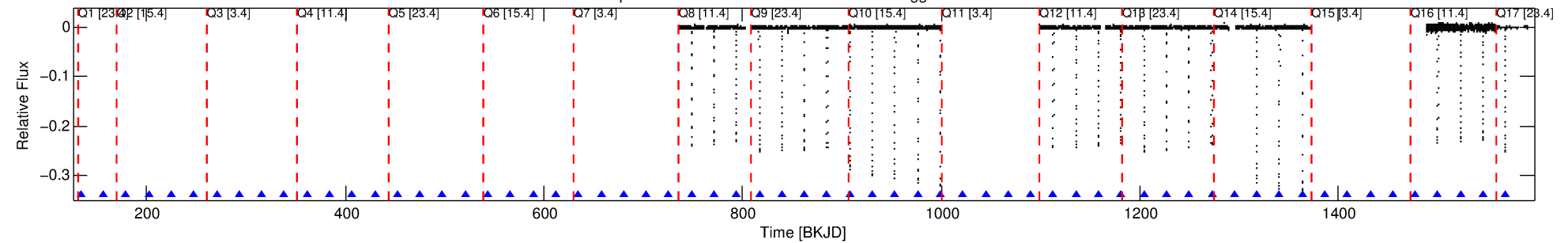
No Significant Match Found

# DV One-Page Summary

KIC: 10491554 Candidate: 2 of 2 Period: 22.772 d

KOI: K03576 Corr: No Ephemeris Match

Kp: 15.02 R\*: 1.56 Rs Teff: 6049.0 K Logg: 4.07 Fe/H: -0.220



## DV Fit Results:

Period = 22.77196 [0.00001] d  
Epoch = 133.8422 [0.0004] BKJD  
Rp/R\* = 0.5839 [0.0604]  
a/R\* = 22.39 [0.33]  
b = 0.75 [0.09]  
Seff = 115.16 [69.95]  
Teff = 835 [127] K  
Rp = 99.21 [38.11] Re  
a = 0.1589 [0.0580] AU  
Ag = 0.64 [0.43] [-0.82σ]  
Teffp = 1157 [101] K [1.98σ]

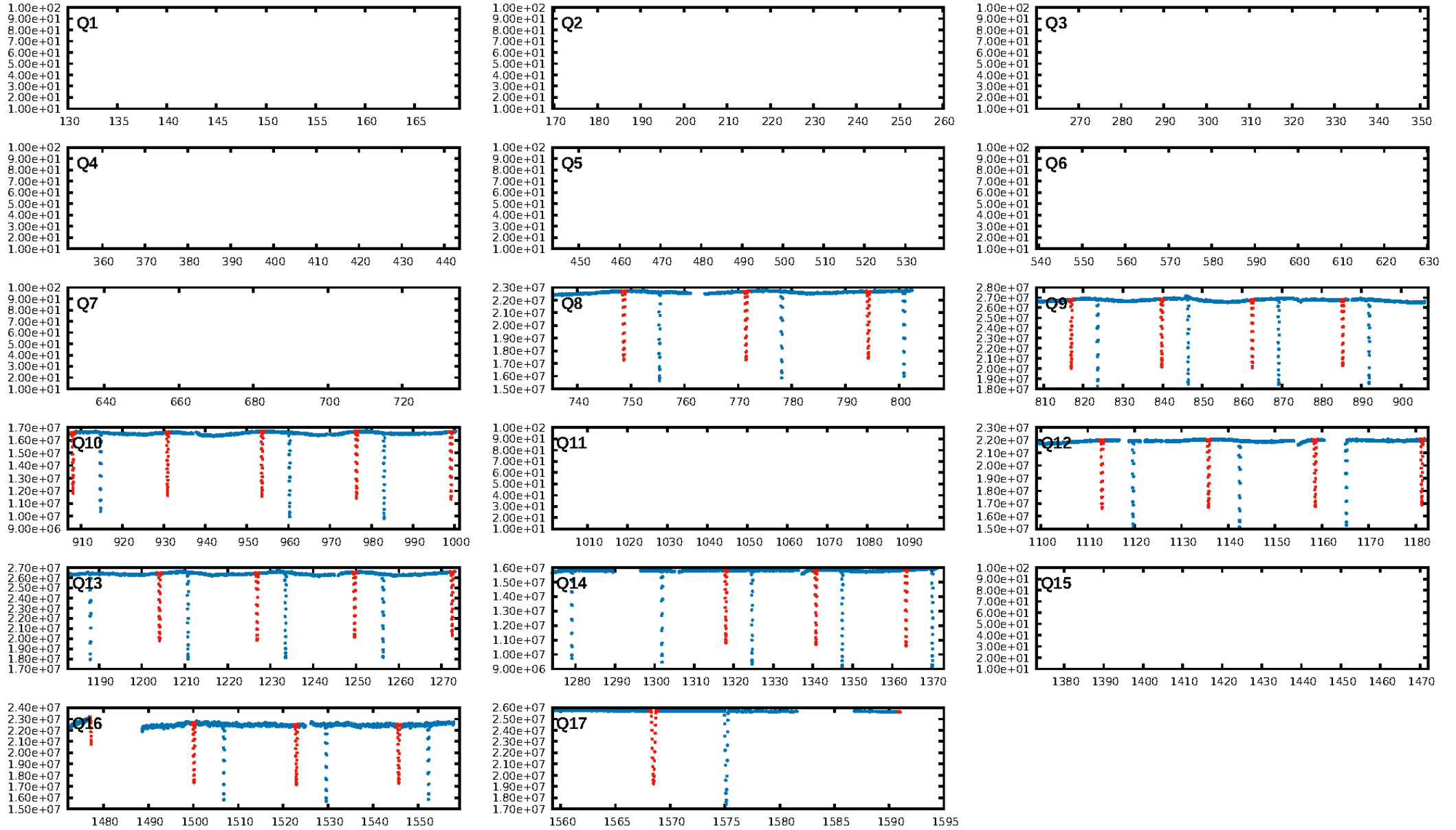
## DV Diagnostic Results:

ShortPeriod-sig: 0.0% [0.00σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 0.0%  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [26/26]  
GhostDiagnostic-chr: 1.912  
Centroid-sig: 0.0%  
Centroid-so: 1.975 arcsec [2751.44σ]  
OotOffset-rm: 3.988 arcsec [37.58σ]  
KicOffset-rm: 0.073 arcsec [1.00σ]  
OotOffset-st: 2/0/3/0 [5]  
KicOffset-st: 2/0/3/3 [8]  
DiffImageQuality-fgm: 1.00 [8/8]  
DiffImageOverlap-fno: 1.00 [8/8]

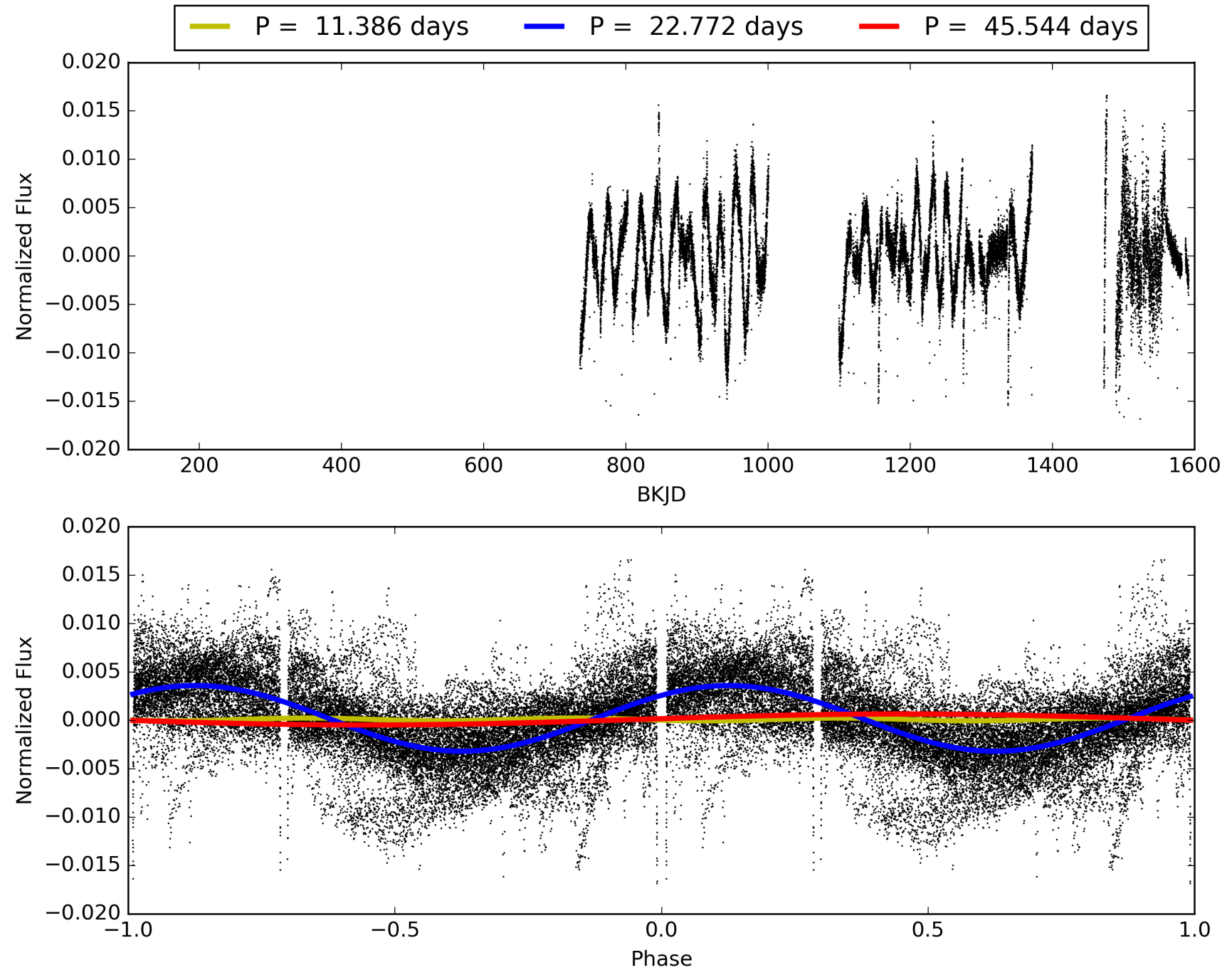
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 10:42:07 Z

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

# TCE 010491554-02, PDC Light Curves



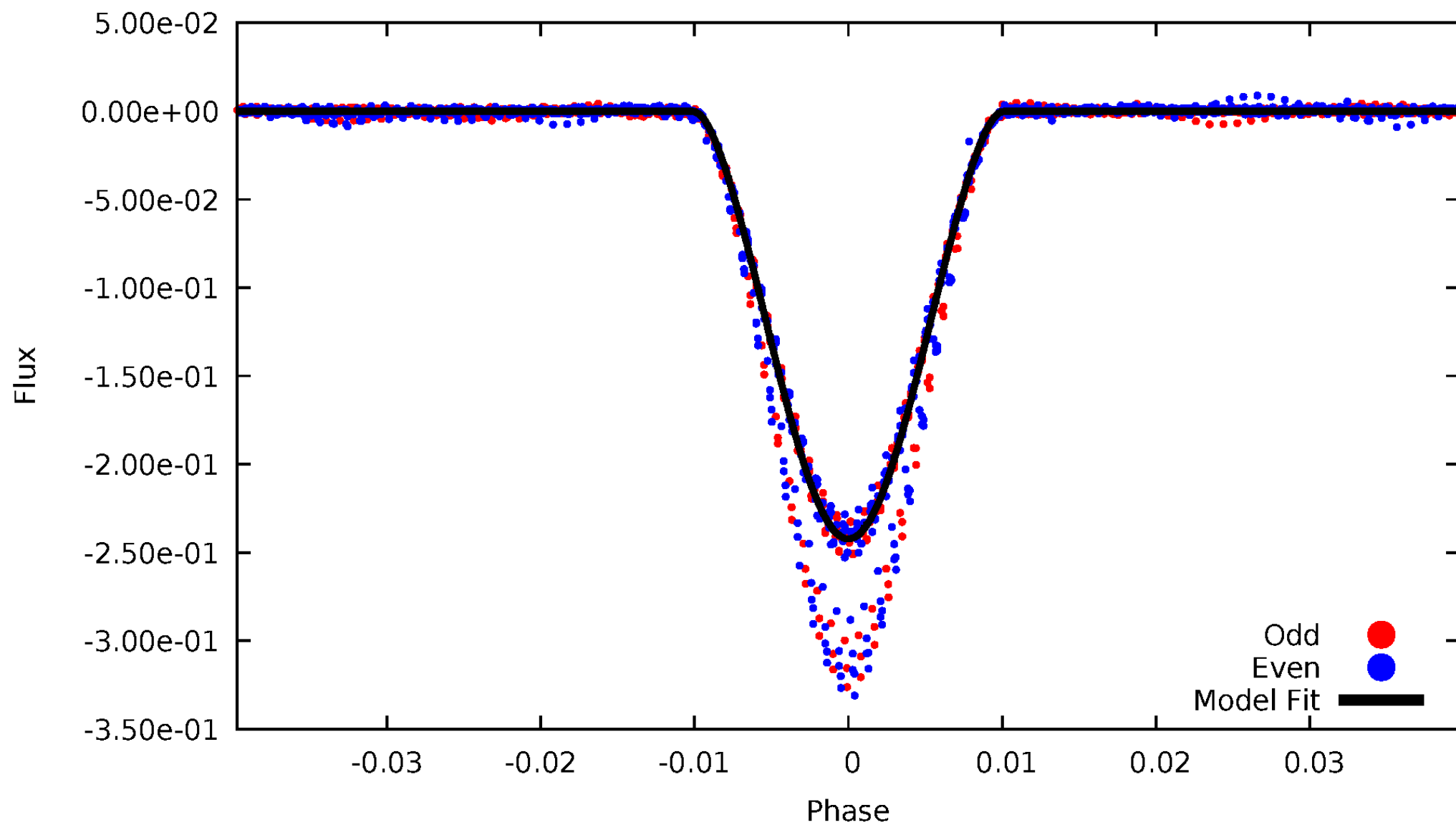
# TCE 010491554-02





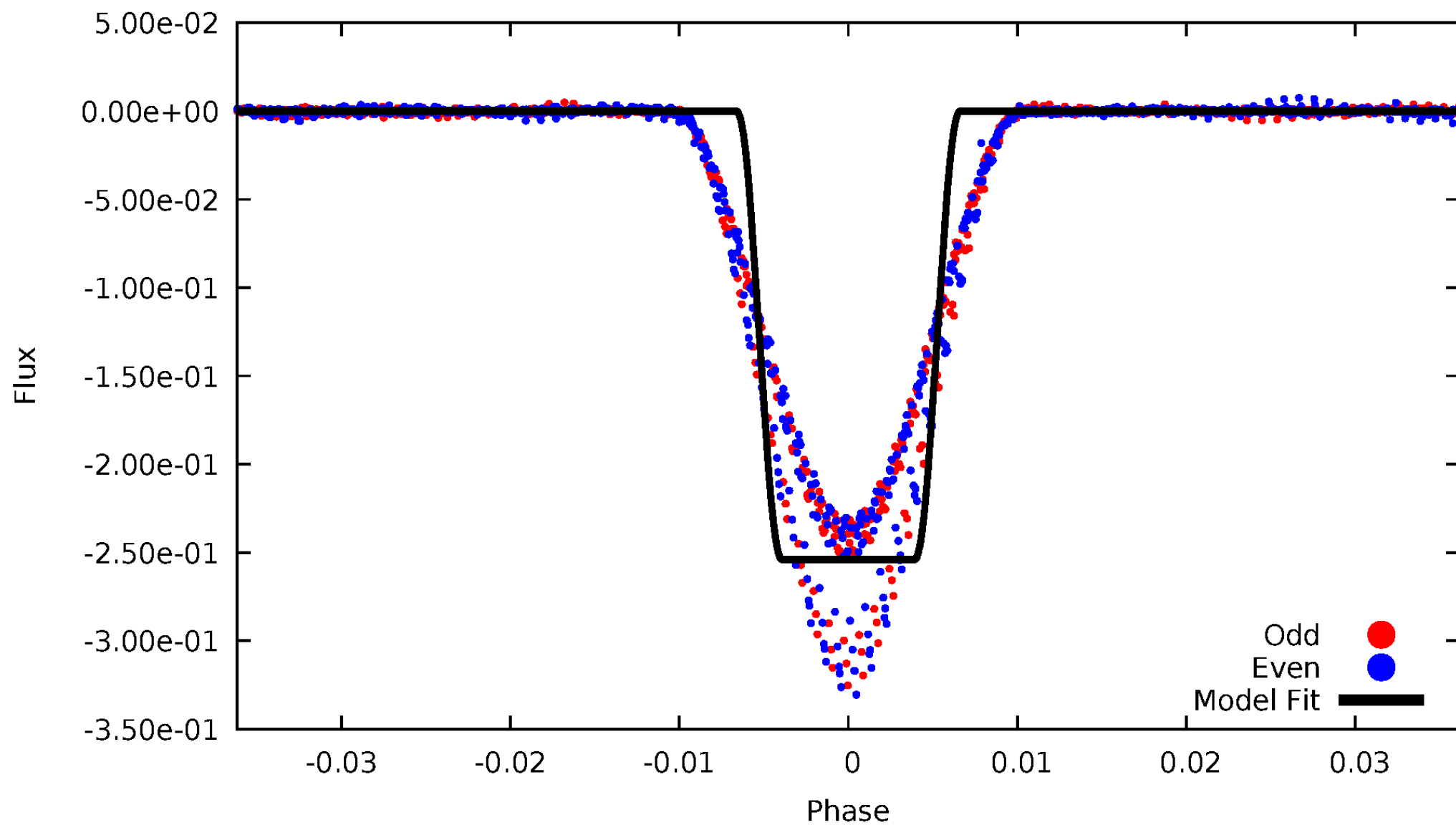
# DV Odd/Even

TCE 010491554-02



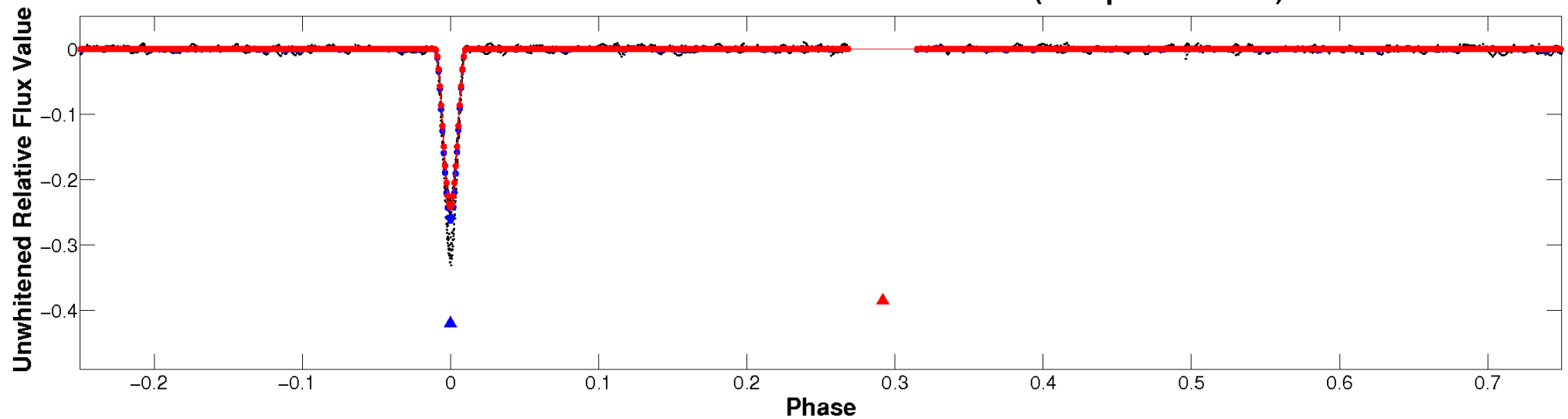
# ALT Odd/Even

TCE 010491554-02

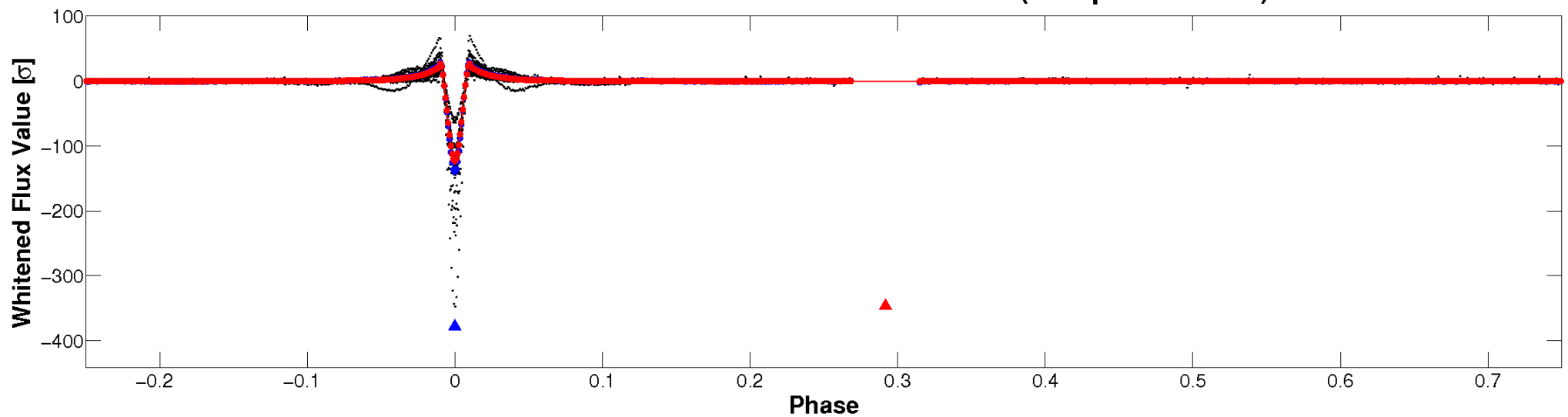


# Non-Whitened Vs. Whitened Light Curve

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

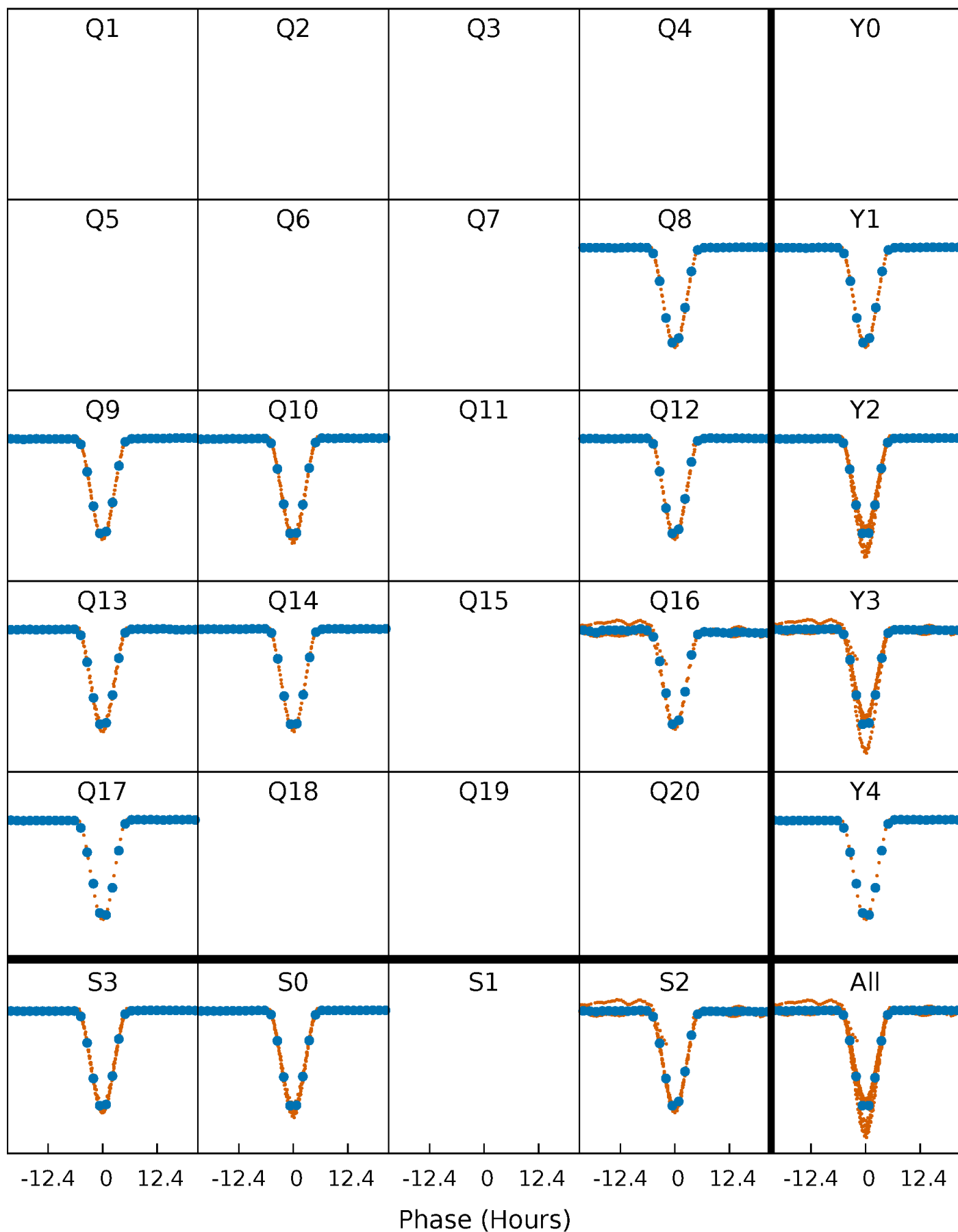


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



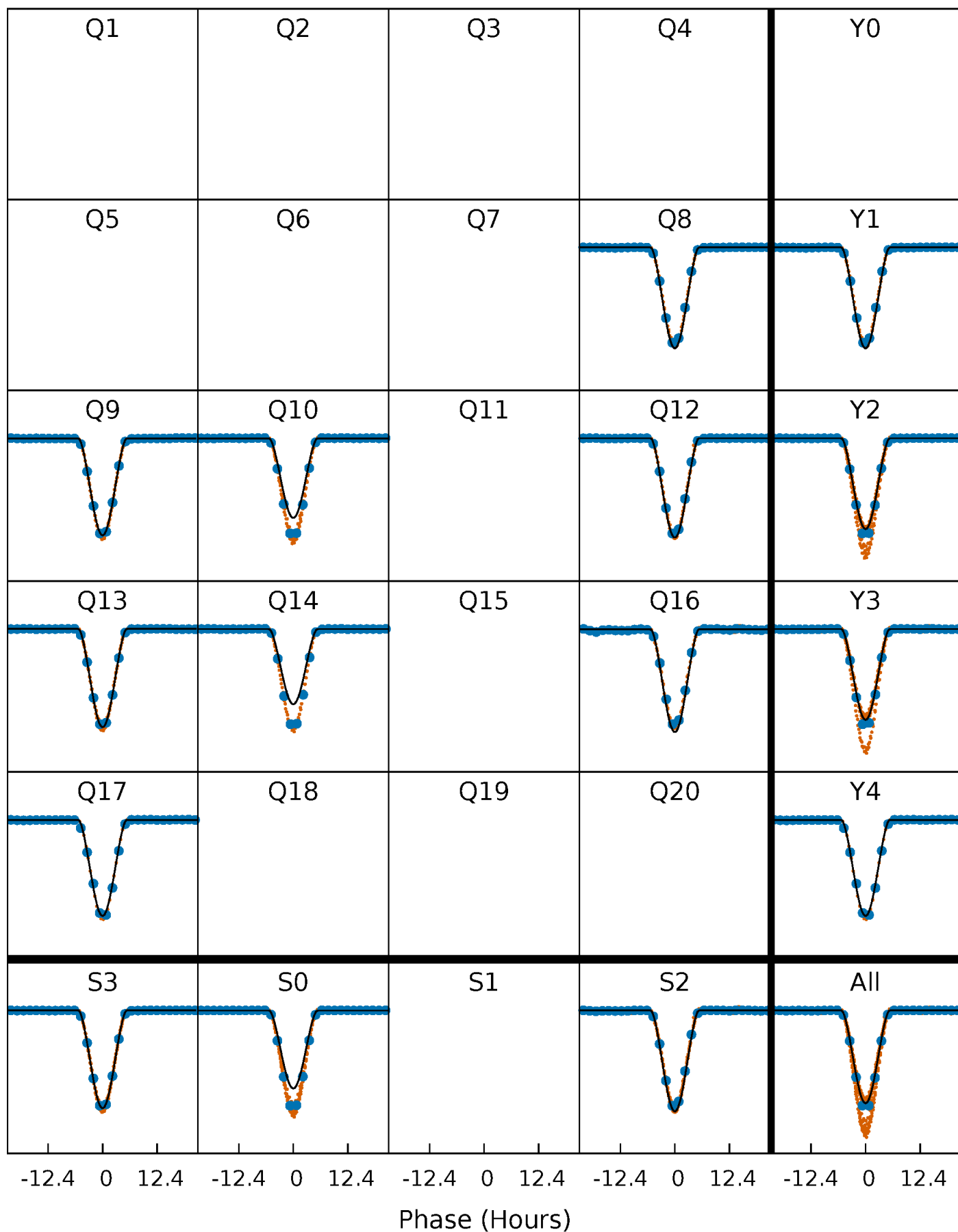
# PDC Quarter-Phased Transit Curves

TCE 010491554-02 P= 22.771960 Days  $T_0=133.842230$  (BKJD)



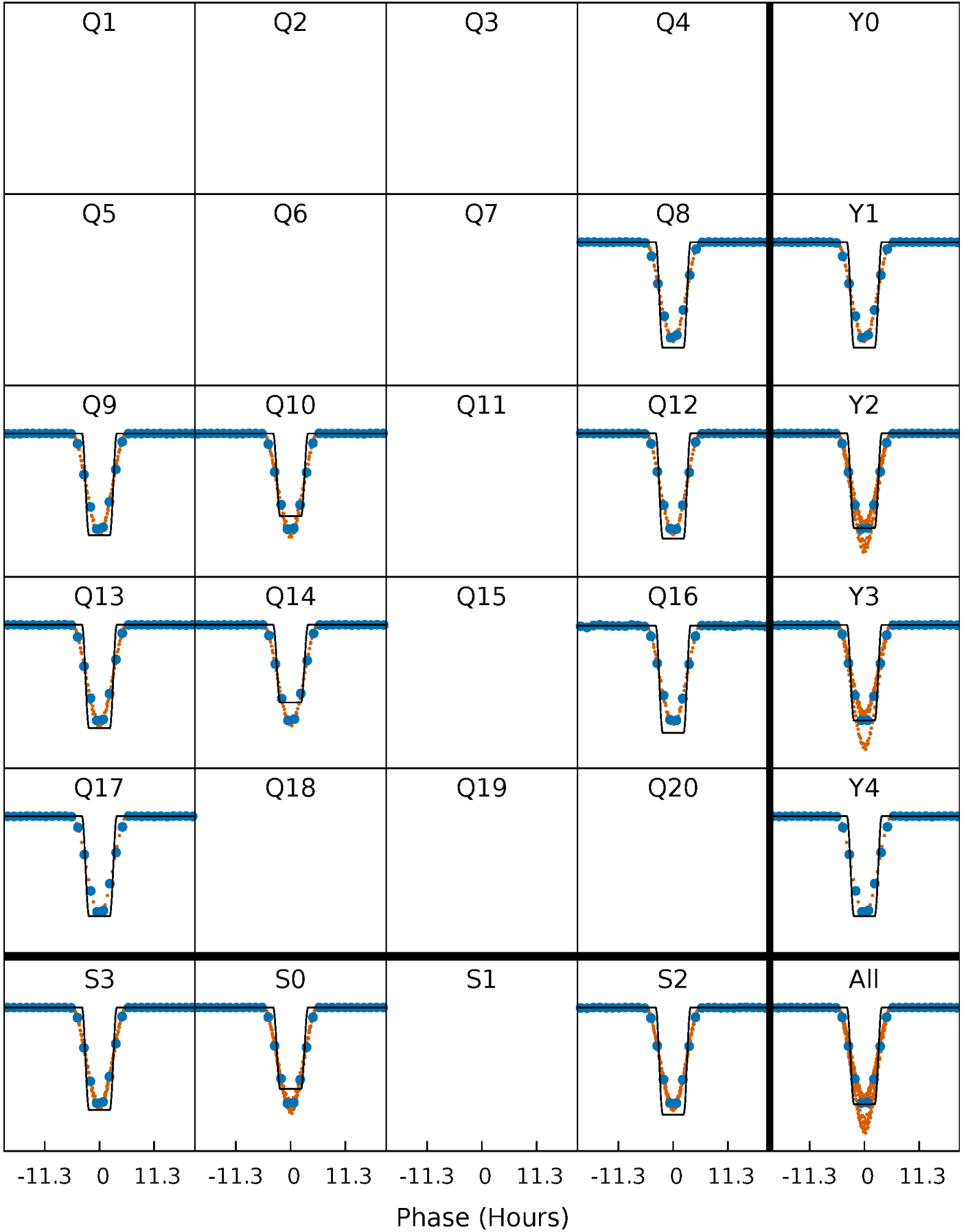
# DV Quarter-Phased Transit Curves

TCE 010491554-02 P= 22.771960 Days  $T_0=133.842230$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

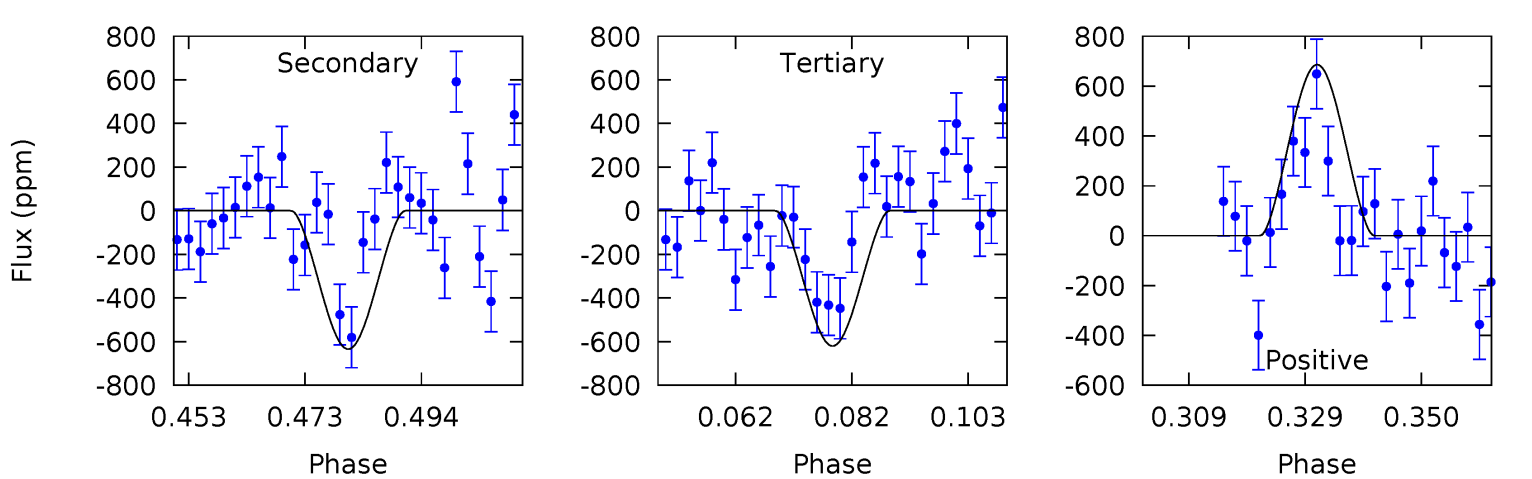
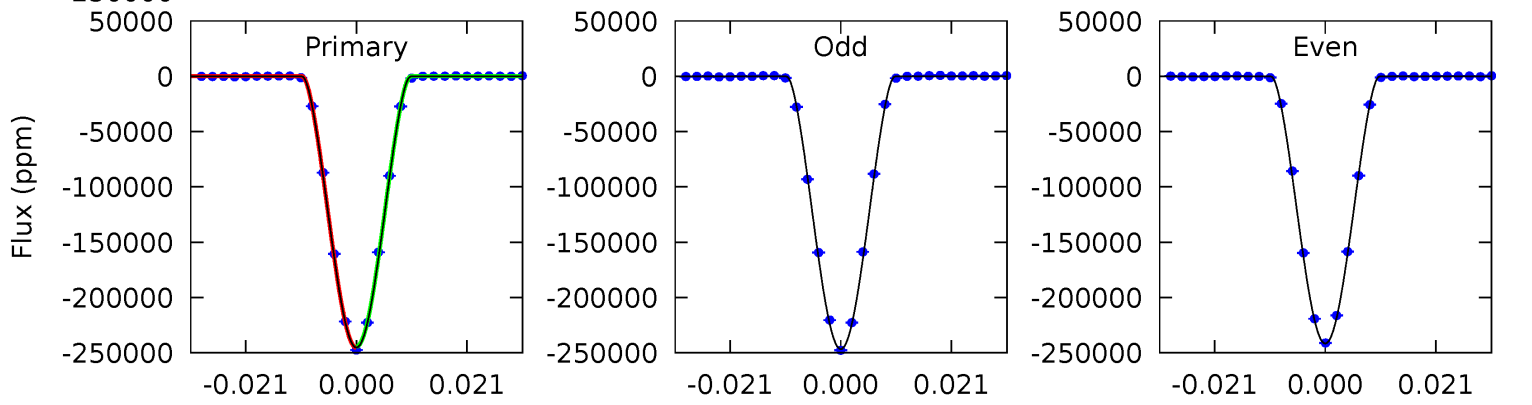
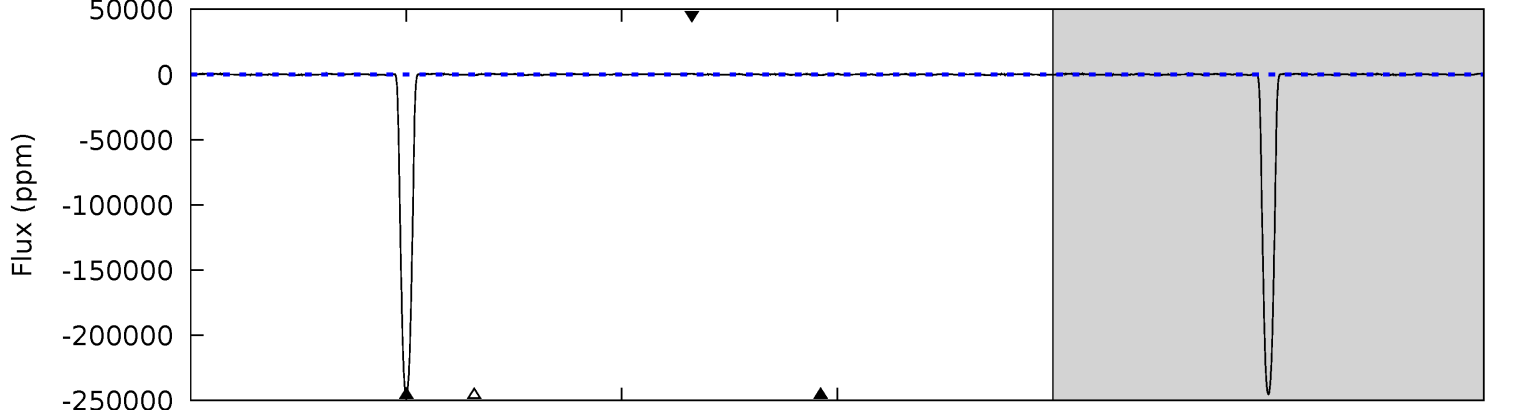
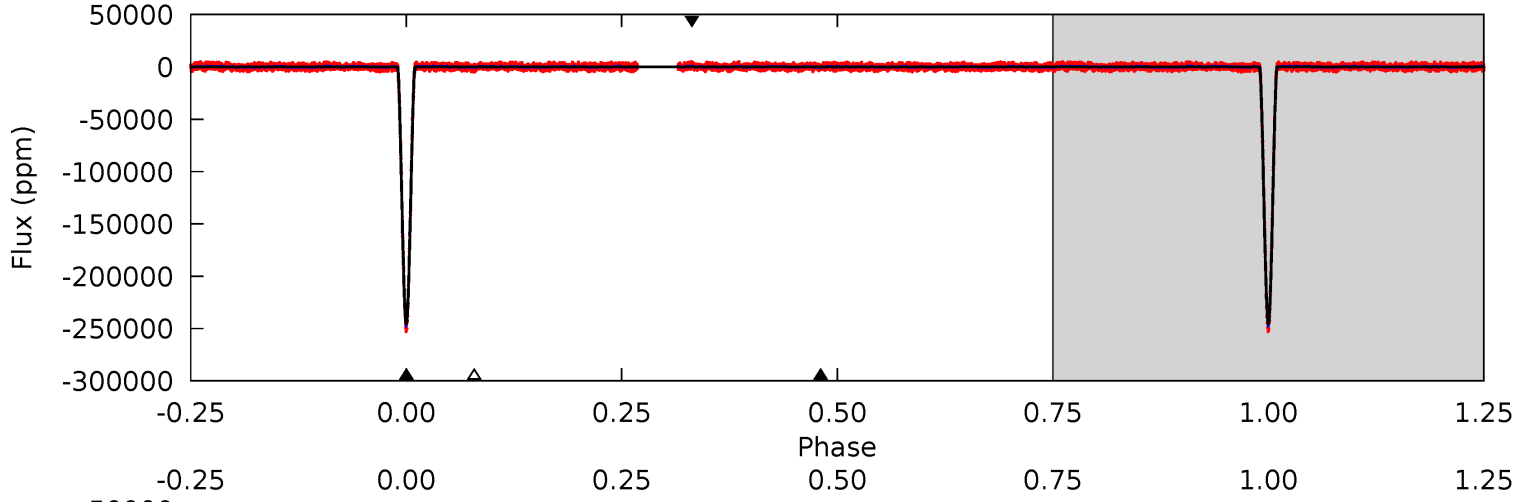
TCE 010491554-02 P= 22.771849 Days  $T_0=133.846812$  (BKJD)



# DV Model-Shift Uniqueness Test

010491554-02, P = 22.771960 Days, E = 133.842230 Days

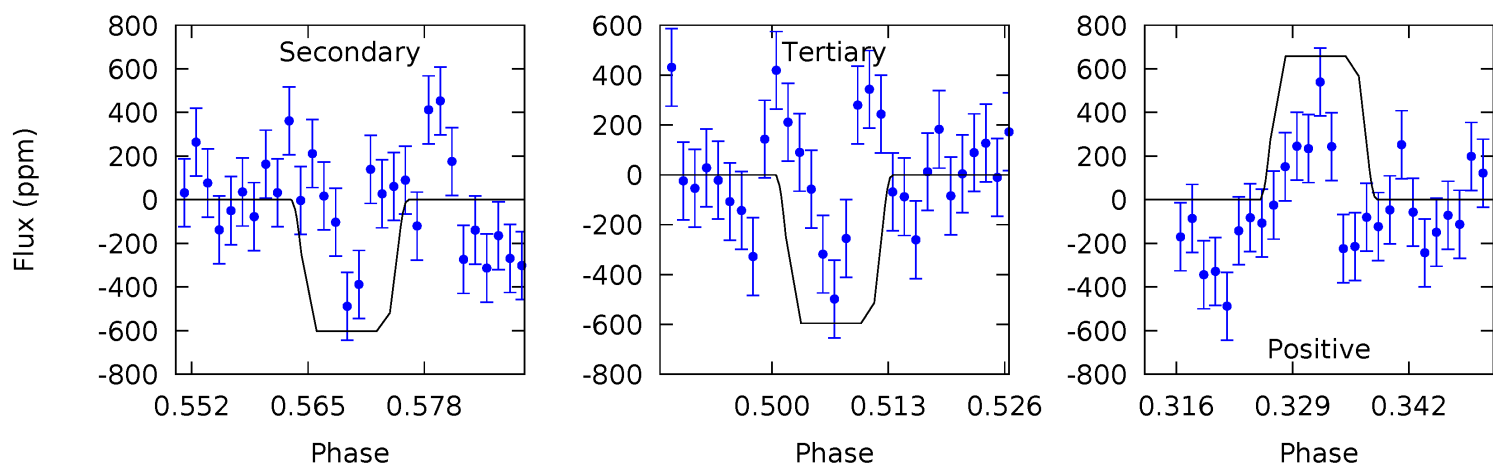
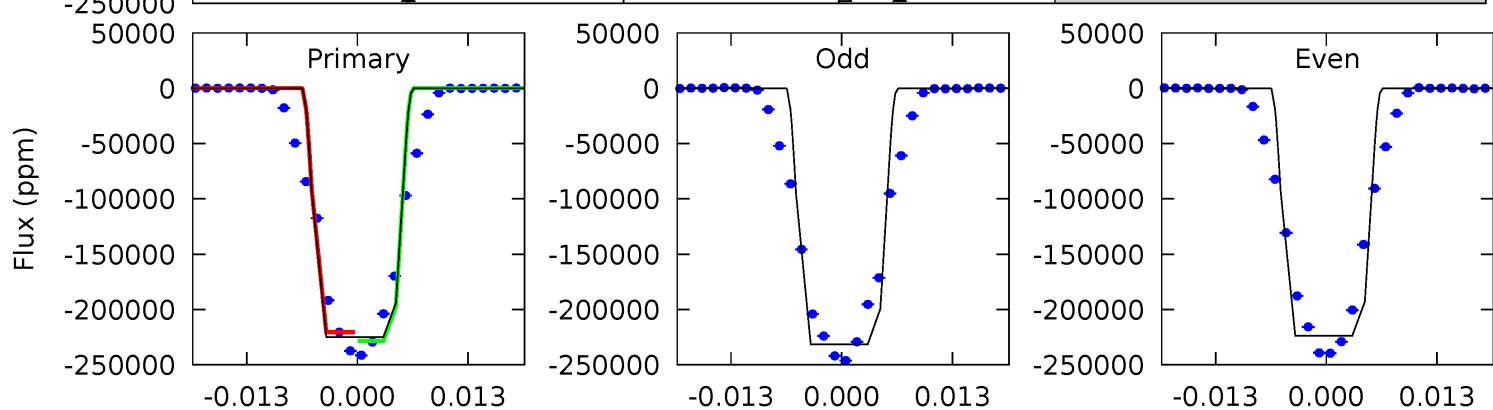
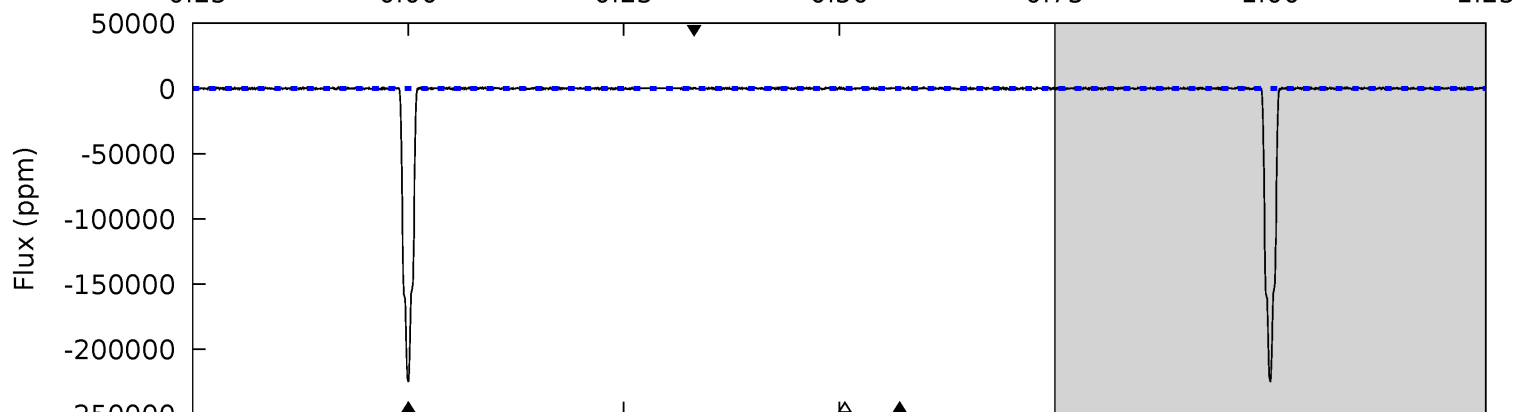
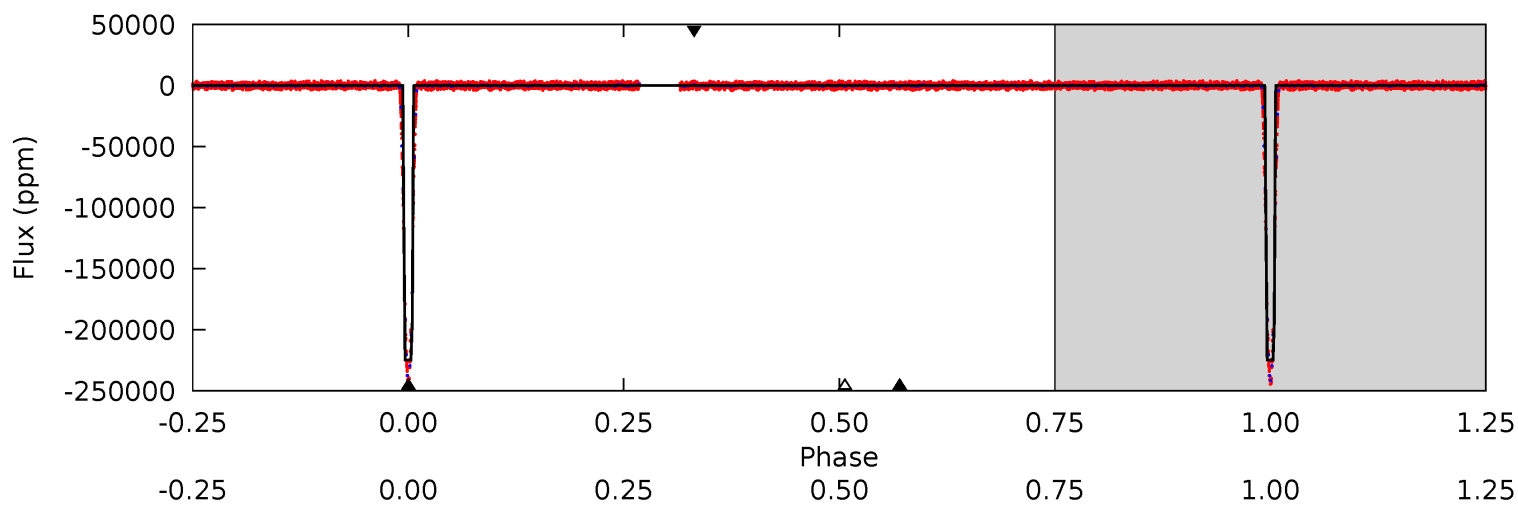
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
3730	9.65	9.43	10.4	4.89	2.32	3.74	3720	3719	0.22	-0.78	37.0	1.06	0.00	7.71



# Alt Model-Shift Uniqueness Test

010491554-02, P = 22.771849 Days, E = 133.846812 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
1693	4.54	4.48	4.95	4.97	2.48	1.37	1689	1688	0.05	-0.42	34.3	1.06	0.00	0





### Stellar Parameters For KIC 010491554

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6049^{+211}_{-211}$	$4.067^{+0.350}_{-0.150}$	$-0.220^{+0.300}_{-0.300}$	$1.557^{+0.432}_{-0.576}$	$1.032^{+0.165}_{-0.150}$	$0.385^{+0.897}_{-0.167}$
	+3%/-3%	+9%/-4%	+136%/-136%	+28%/-37%	+16%/-15%	+233%/-43%
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 010491554-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-635 \pm 66$	$95.96^{+19.34}_{-20.38}$	$1145^{+101}_{-115}$	$2119^{+88}_{-92}$	$0.986^{+0.513}_{-0.313}$
Alt.	$-602 \pm 133$	$83.33^{+17.83}_{-17.90}$	$1151^{+93}_{-114}$	$2190^{+116}_{-124}$	$1.210^{+0.760}_{-0.440}$

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

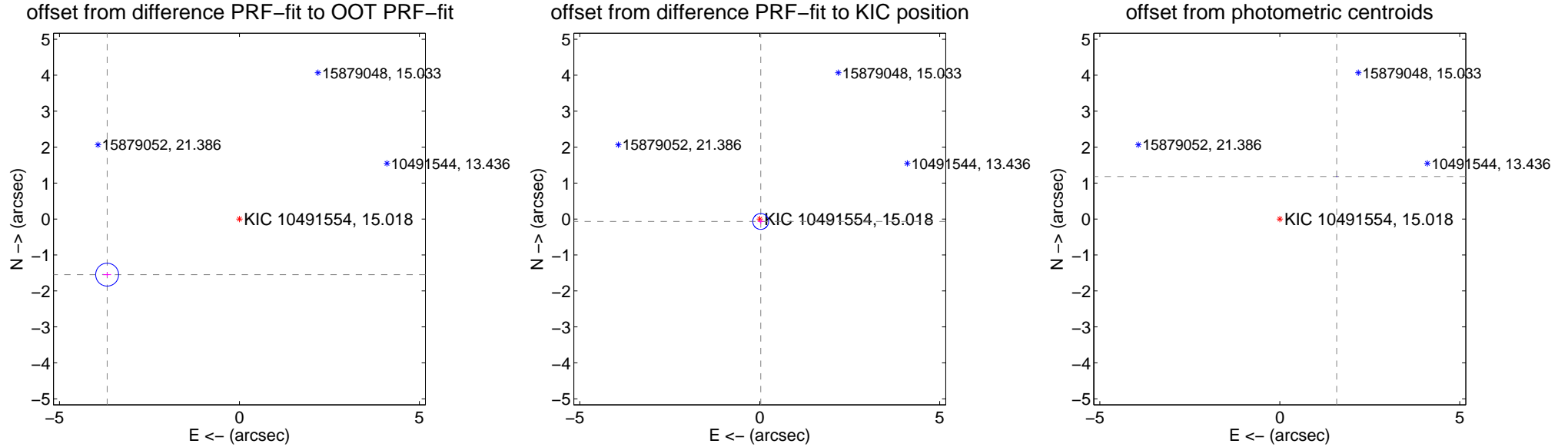
## DV Centroid Data

Supplemental centroid analysis for 010491554-02. Kepler magnitude: 15.02. Transit SNR 1254.54

There are 8 quarters with good PRF difference image offsets

The OOT PRF centroid is offset from the target star catalog position by about 3.97 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$3.988 \pm 0.106$	37.58	$3.676 \pm 0.111$	$-1.547 \pm 0.068$
PRF-fit source offset from KIC position	$0.073 \pm 0.074$	1.00	$-0.027 \pm 0.078$	$-0.068 \pm 0.073$
photometric centroid source offset	$1.97 \pm 0.00$	2751.45	$-1.58 \pm 0.00$	$1.18 \pm 0.00$

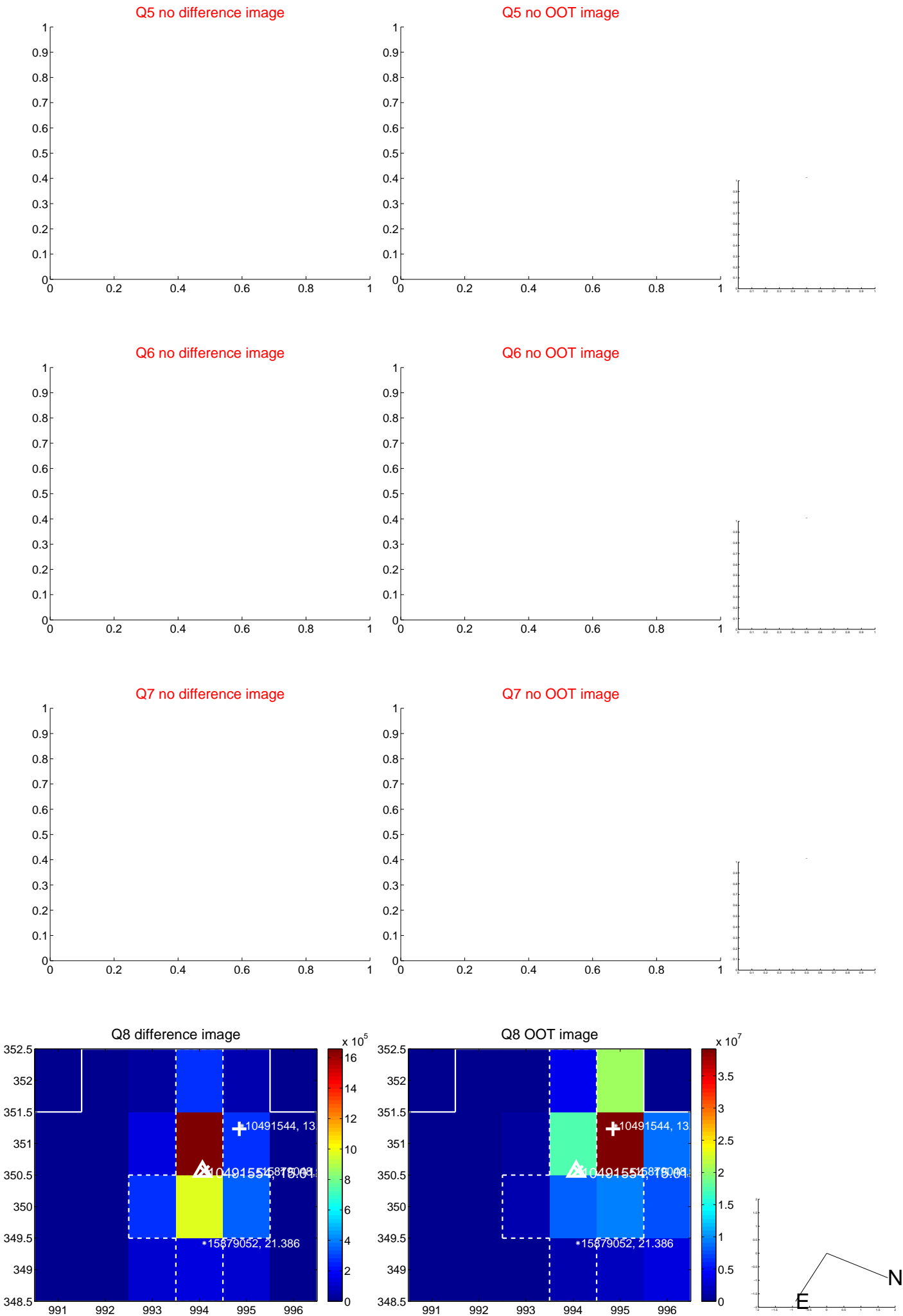


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

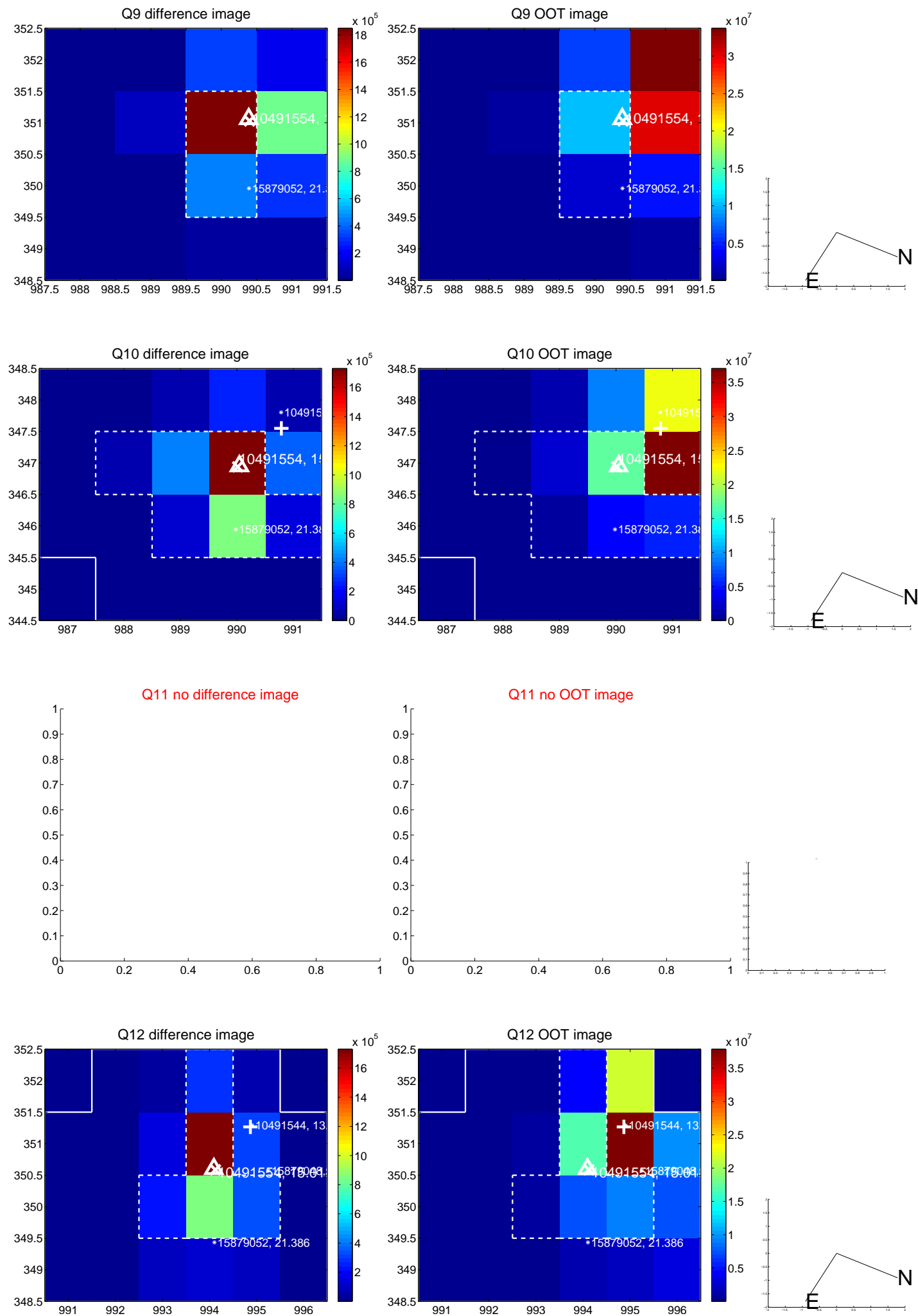
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



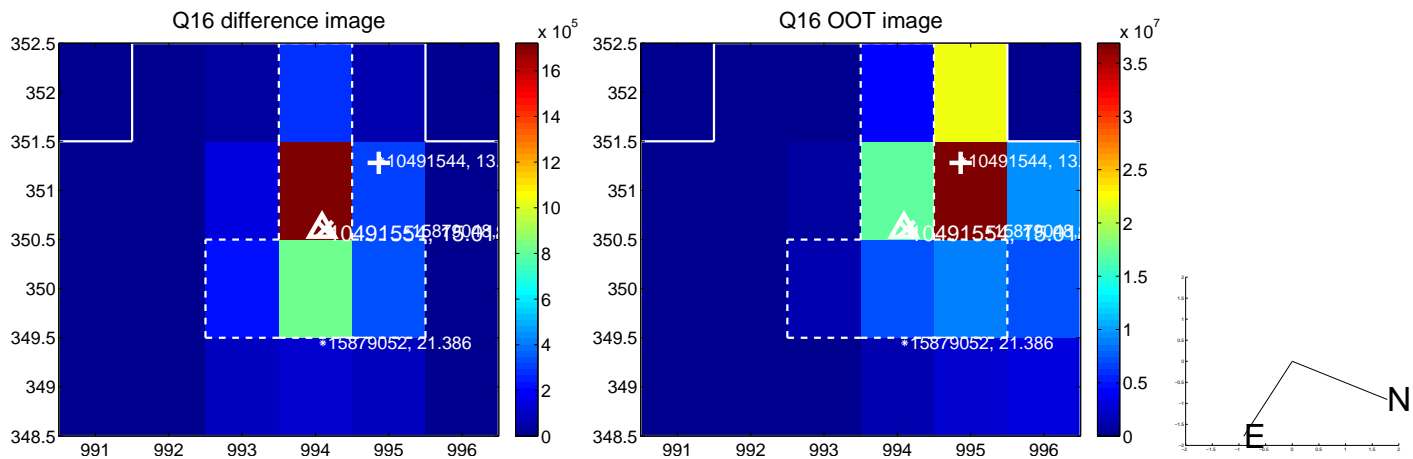
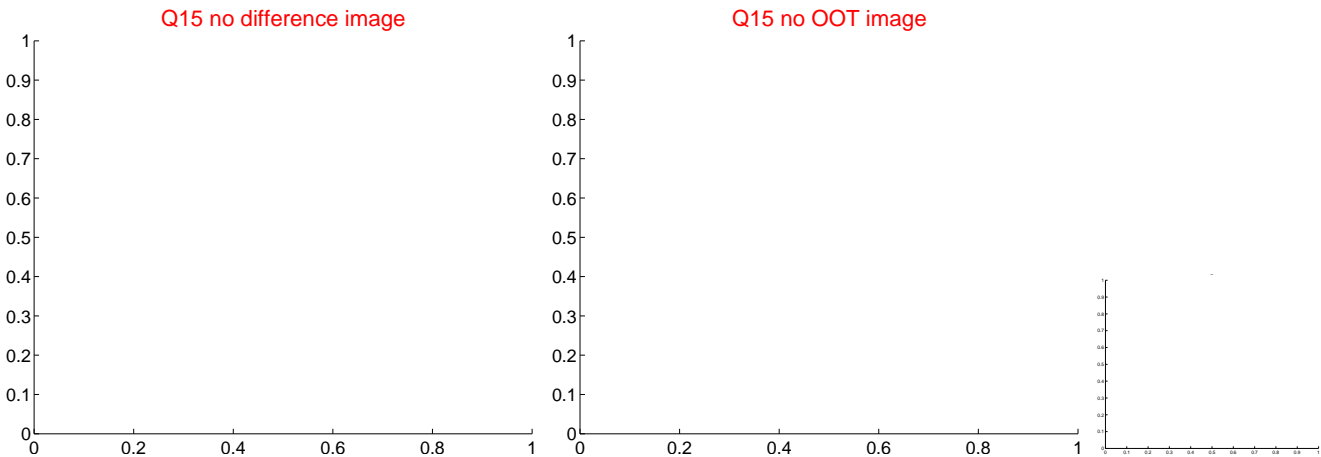
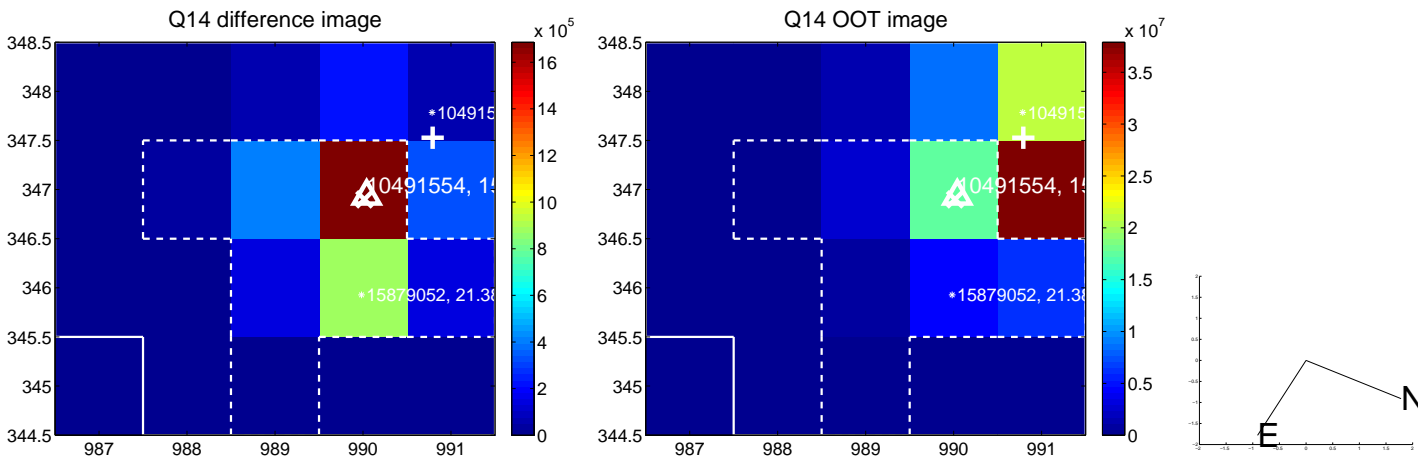
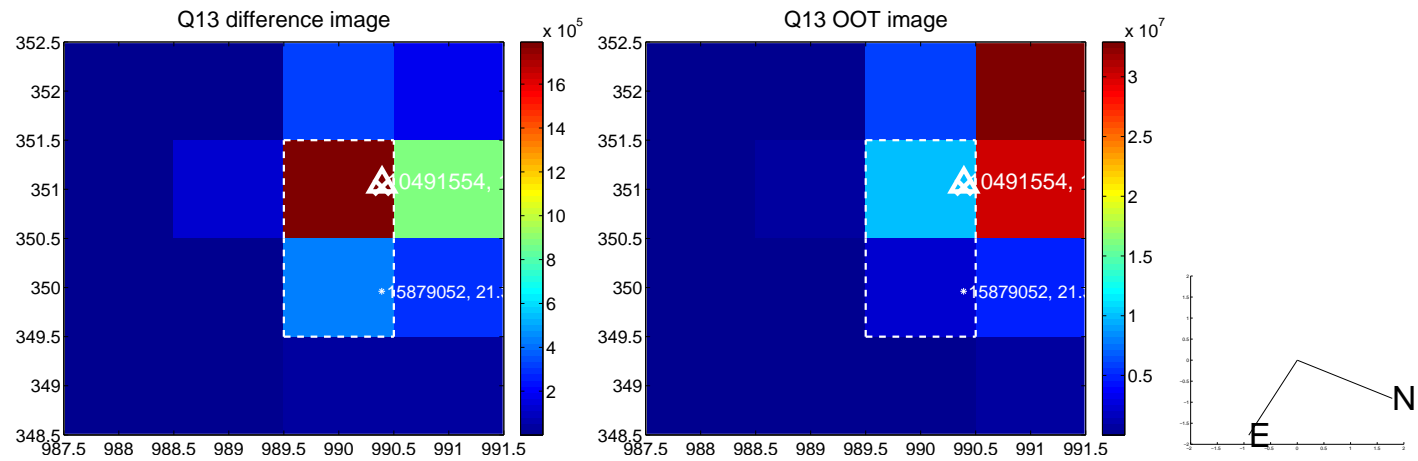
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



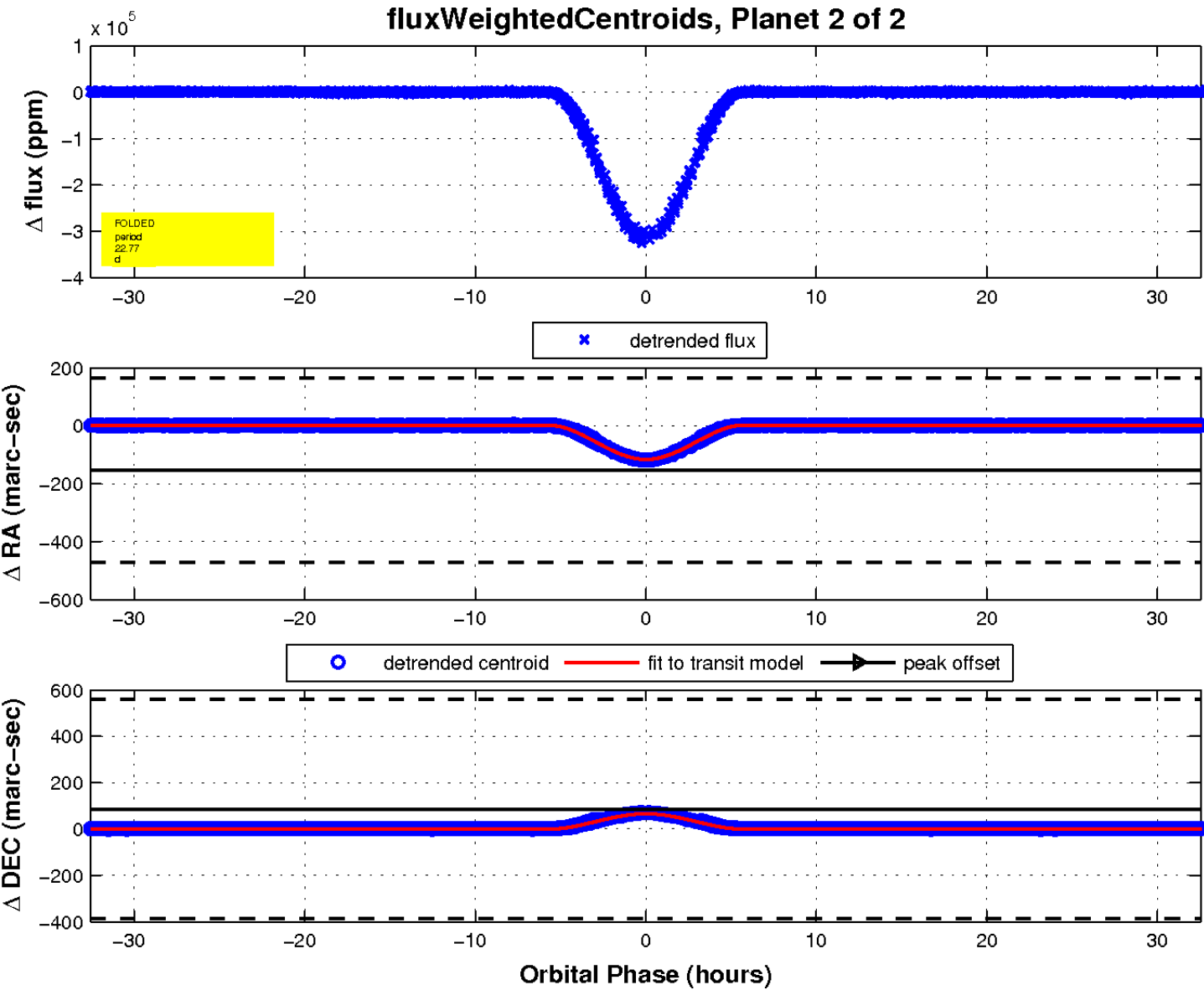
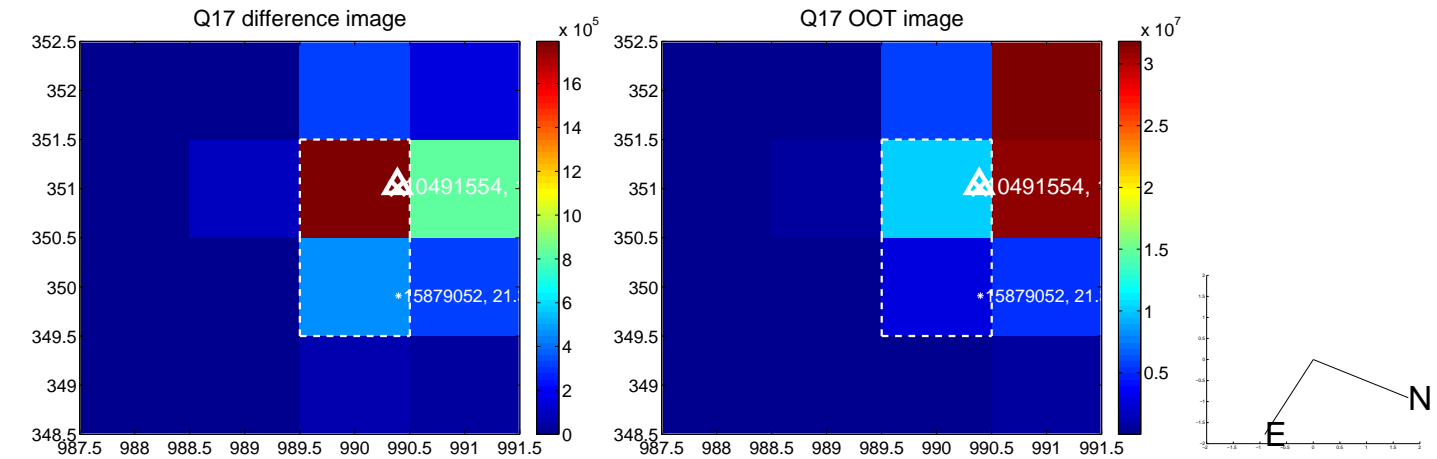
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

