

# KIC 010253547

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010253547-01	OBS	2153.01	59.981024	176.151109	277.9	7.659	20.8	21.4	1.38	6103	2.79	24.64
010253547-02	OBS	2153.02	25.745731	135.949697	124.6	7.090	14.1	14.9	1.38	6103	1.75	76.09

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010253547-01	OBS	PC	0.86	0	0	0	0	NO_COMMENT
010253547-02	OBS	PC	0.99	0	0	0	0	NO_COMMENT

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

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

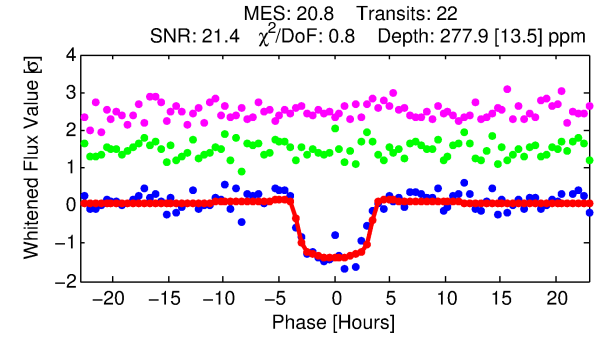
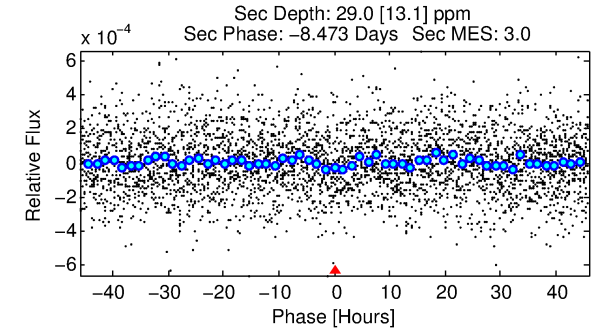
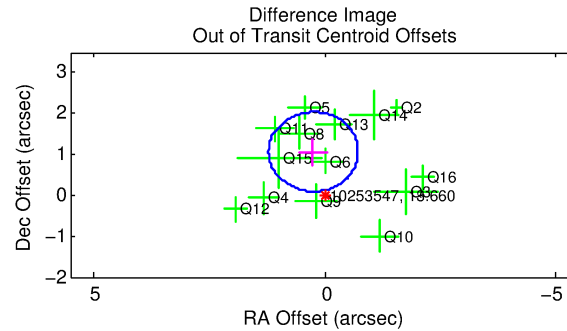
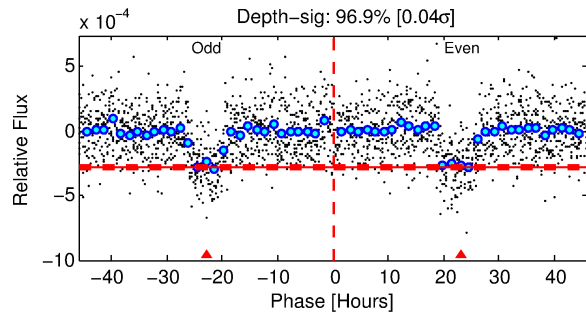
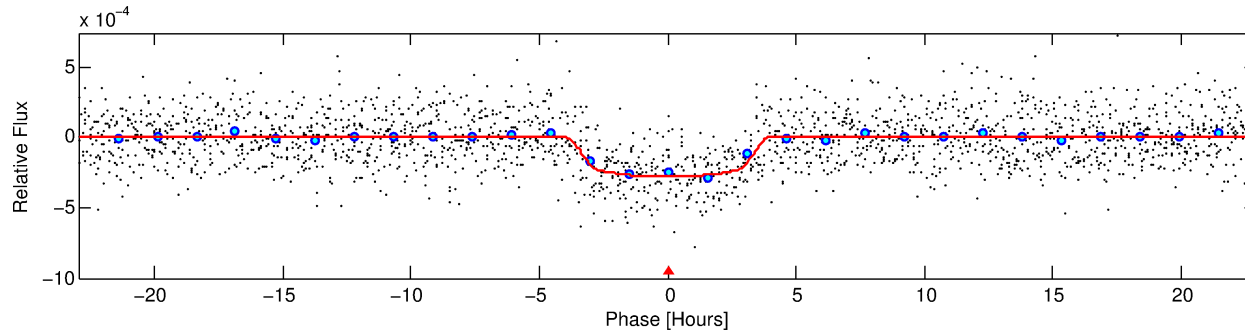
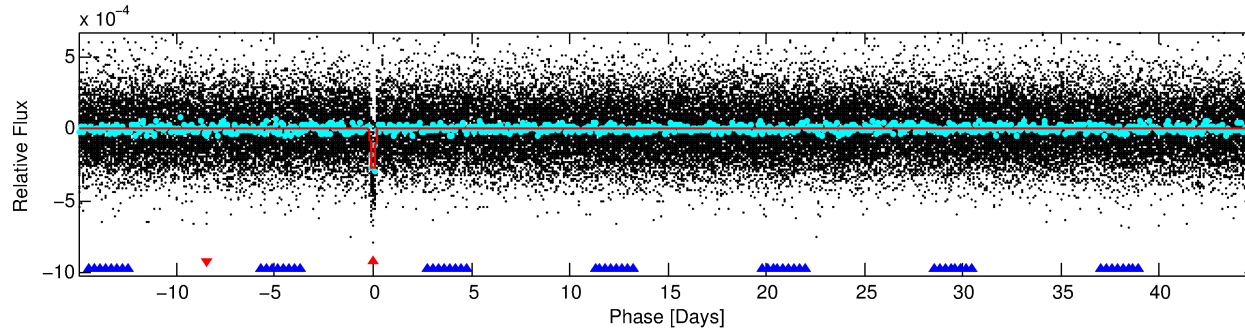
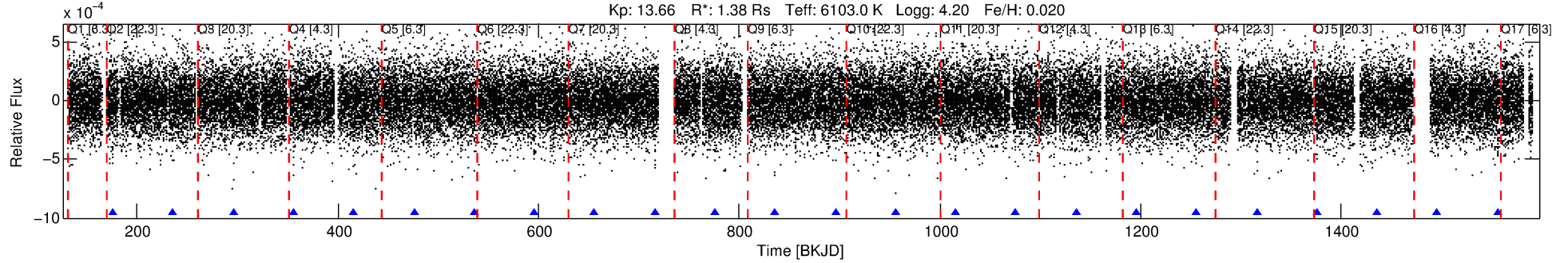
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 010253547-01

No Significant Match Found

# DV One-Page Summary

KIC: 10253547 Candidate: 1 of 2 Period: 59.981 d  
KOI: K02153.01 Name: Kepler-364c Corr: 0.958



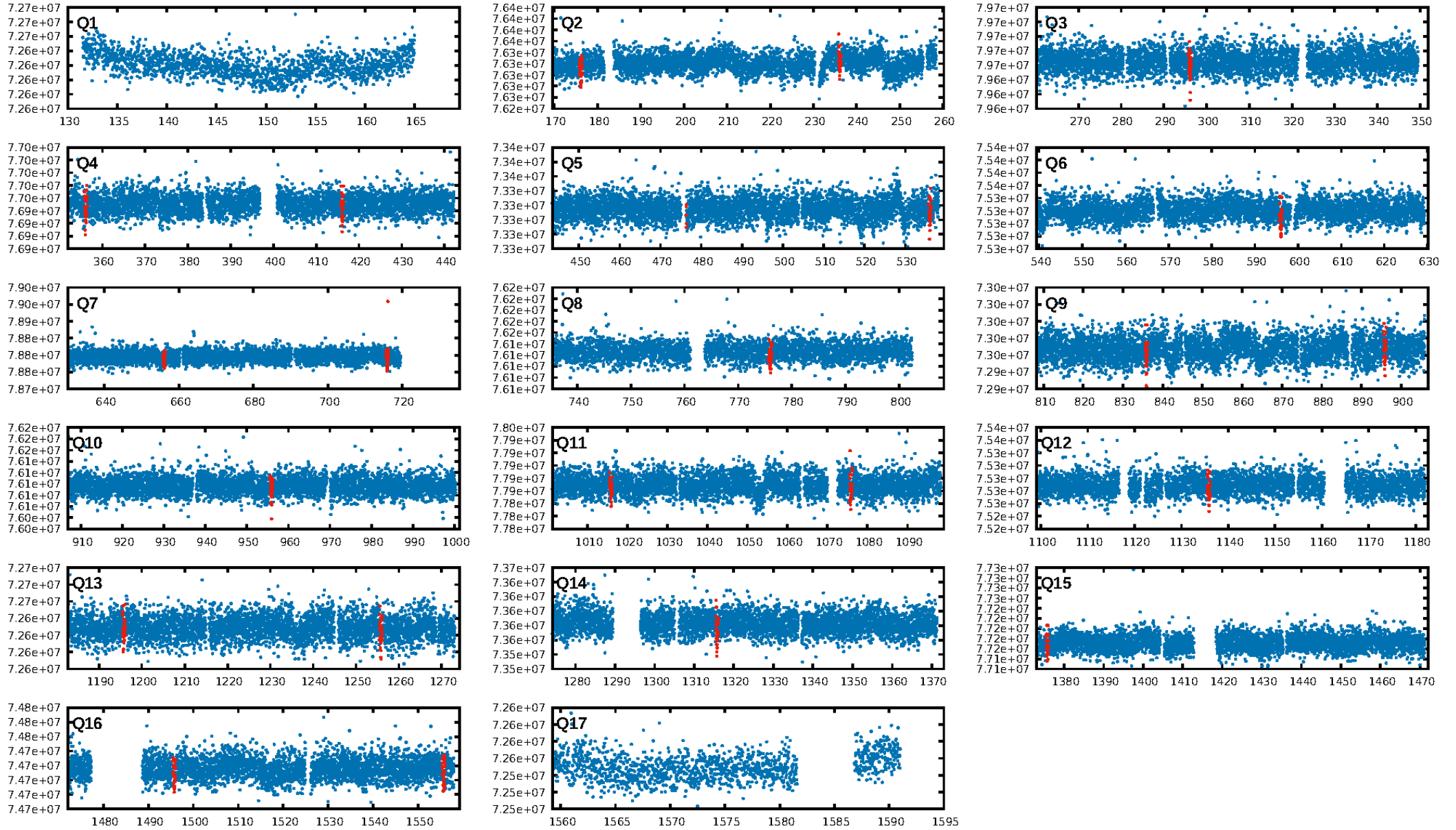
## DV Fit Results:

Period = 59.98102 [0.00050] d  
Epoch = 176.1511 [0.0067] BKJD  
Rp/R\* = 0.0185 [0.0011]  
a/R\* = 25.39 [6.92]  
b = 0.93 [0.04]  
Seff = 24.64 [6.74]  
Teq = 568 [39] K  
Rp = 2.79 [0.53] Re  
a = 0.3106 [0.0518] AU  
Ag = 197.26 [105.24] [1.86 $\sigma$ ]  
Teffp = 3292 [391] K [6.94 $\sigma$ ]

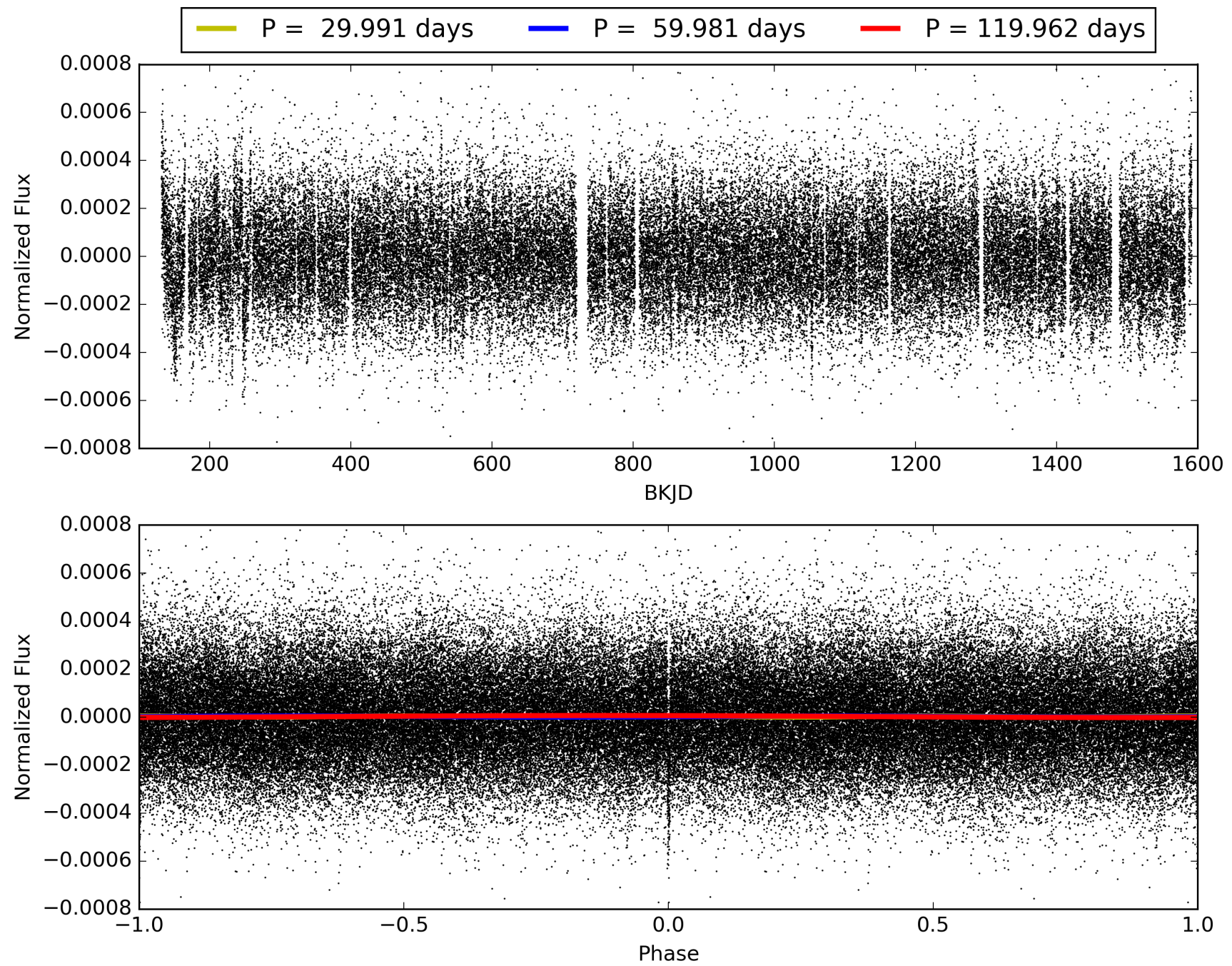
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [78.73 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 78.8%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 6.01e-94  
RollingBand-fgt: 1.00 [22/22]  
GhostDiagnostic-chr: 7.79  
Centroid-sig: 3.8%  
Centroid-so: 1.112 arcsec [1.56 $\sigma$ ]  
OotOffset-rm: 1.094 arcsec [3.38 $\sigma$ ]  
KicOffset-rm: 0.976 arcsec [3.09 $\sigma$ ]  
OotOffset-st: 4/3/4/3 [14]  
KicOffset-st: 4/3/4/3 [14]  
DiffImageQuality-fgm: 1.00 [14/14]  
DiffImageOverlap-fno: 1.00 [15/15]

# TCE 010253547-01, PDC Light Curves

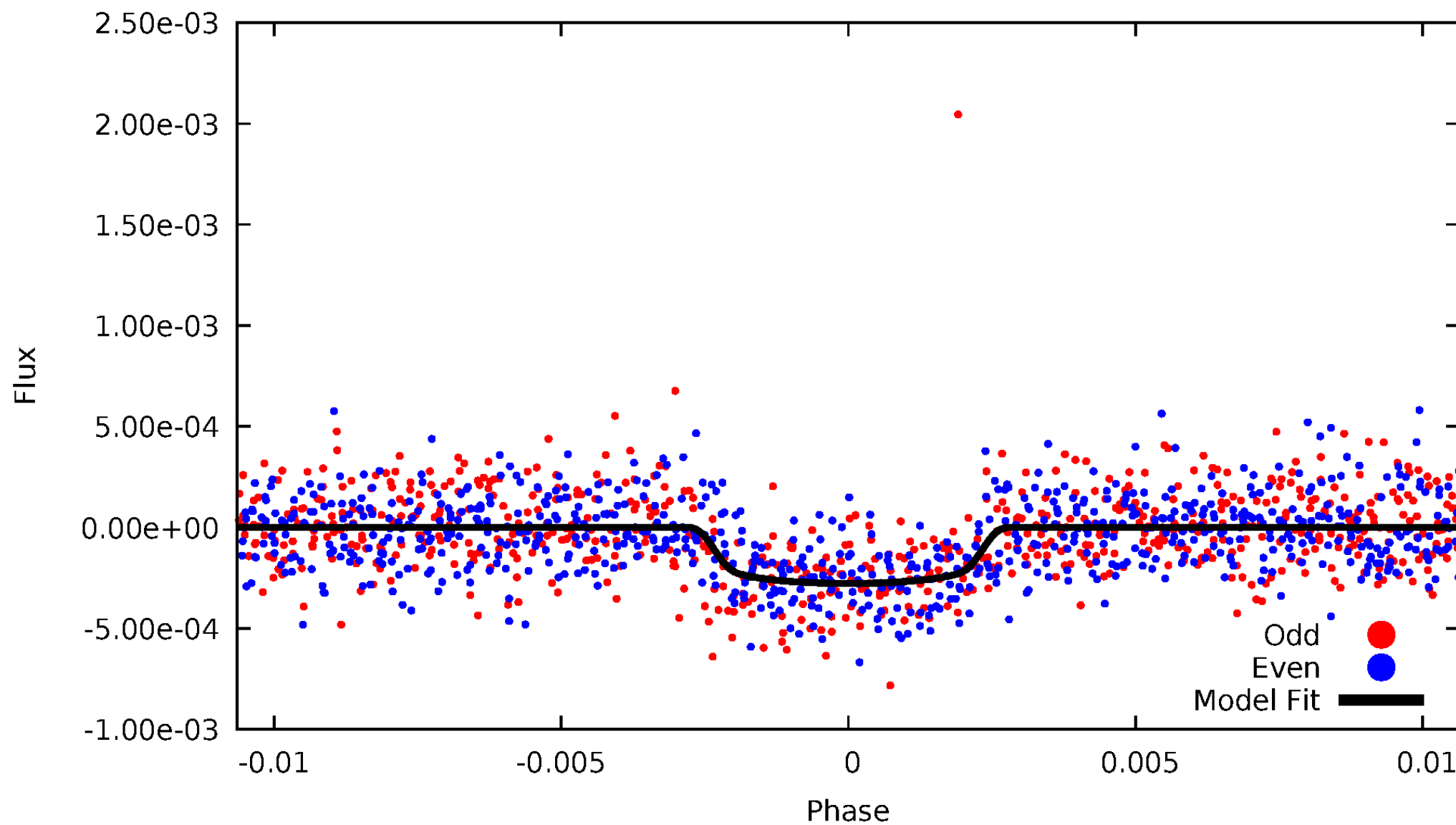


TCE 010253547-01



# DV Odd/Even

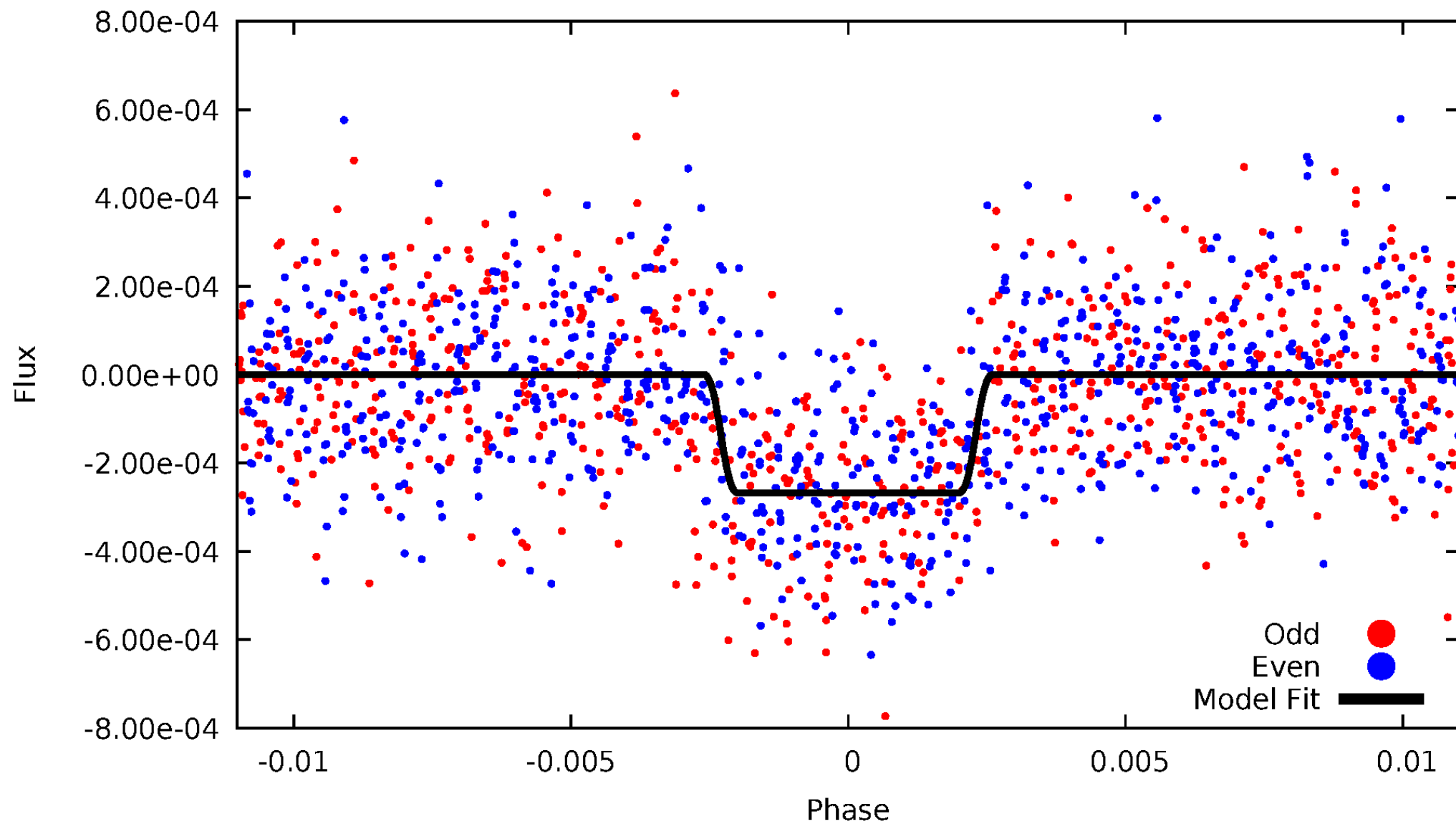
TCE 010253547-01



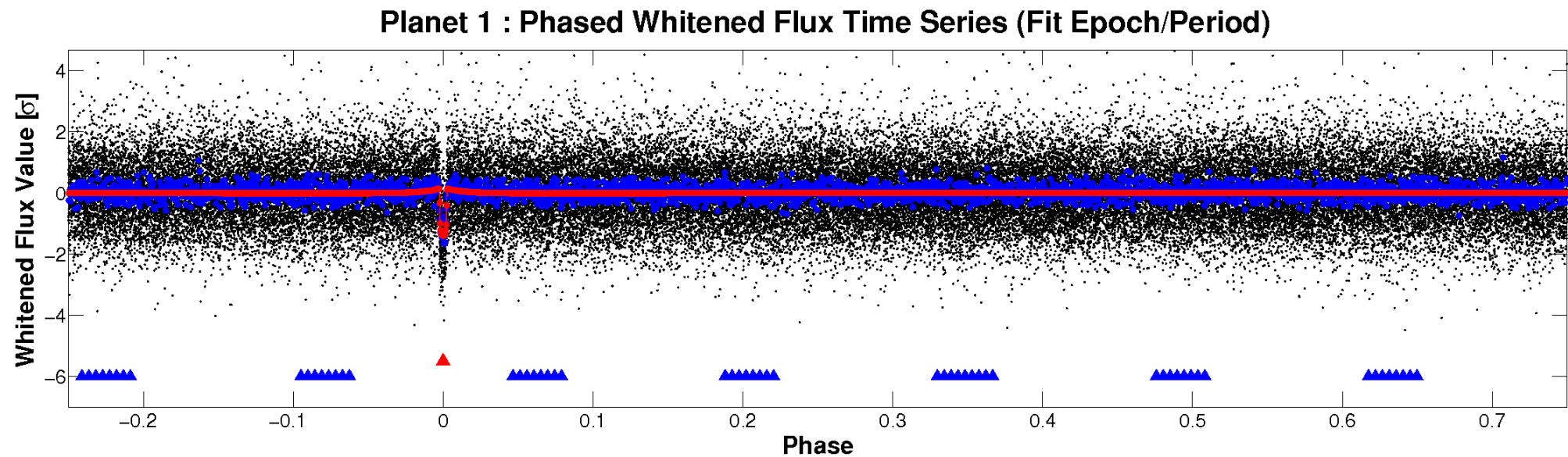
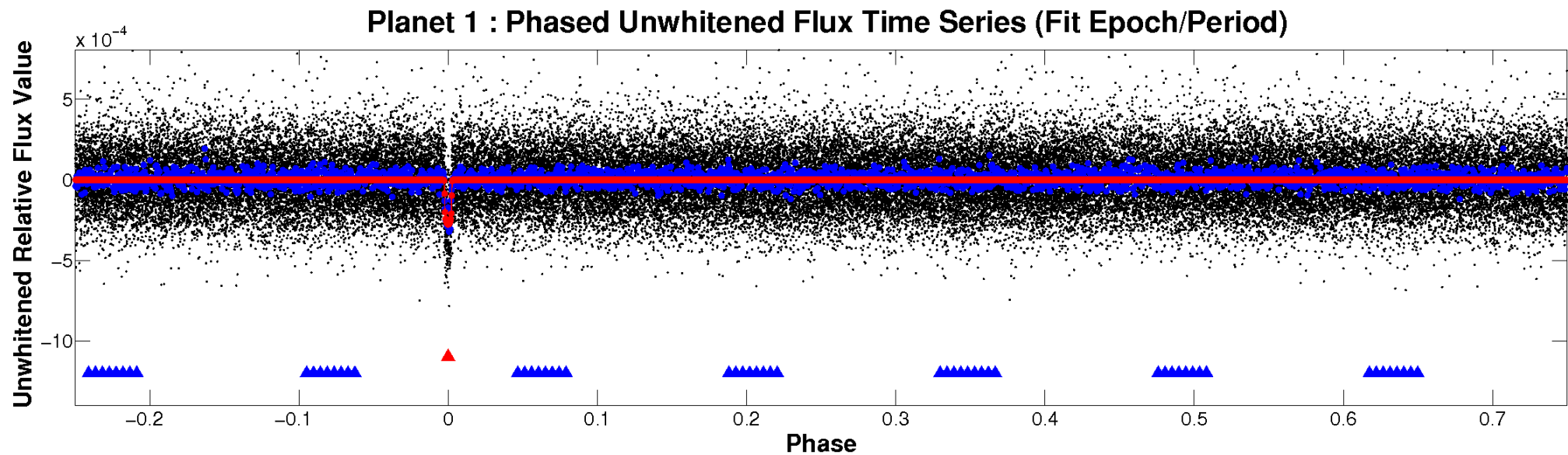


# ALT Odd/Even

TCE 010253547-01

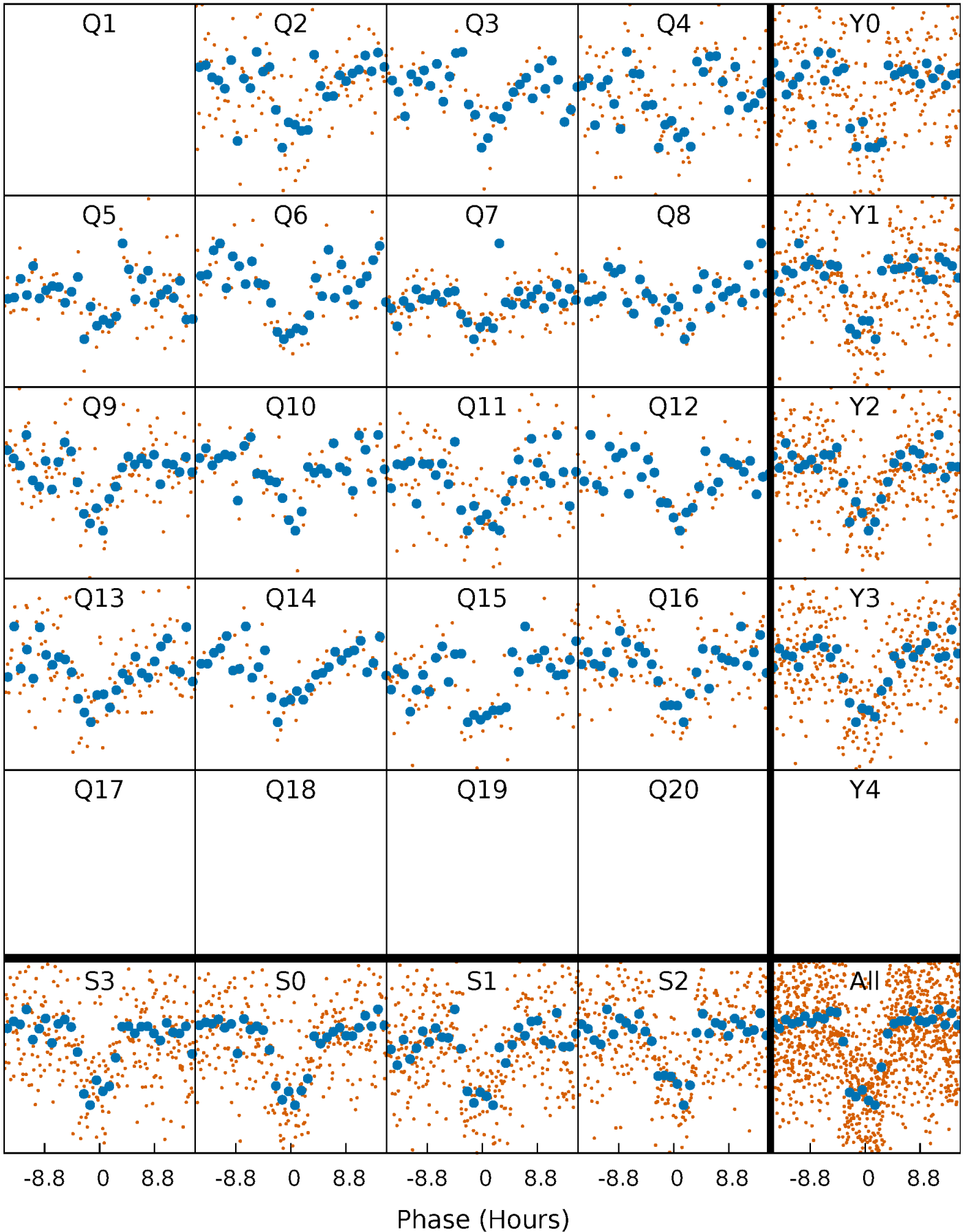


# Non-Whitened Vs. Whitened Light Curve



# PDC Quarter-Phased Transit Curves

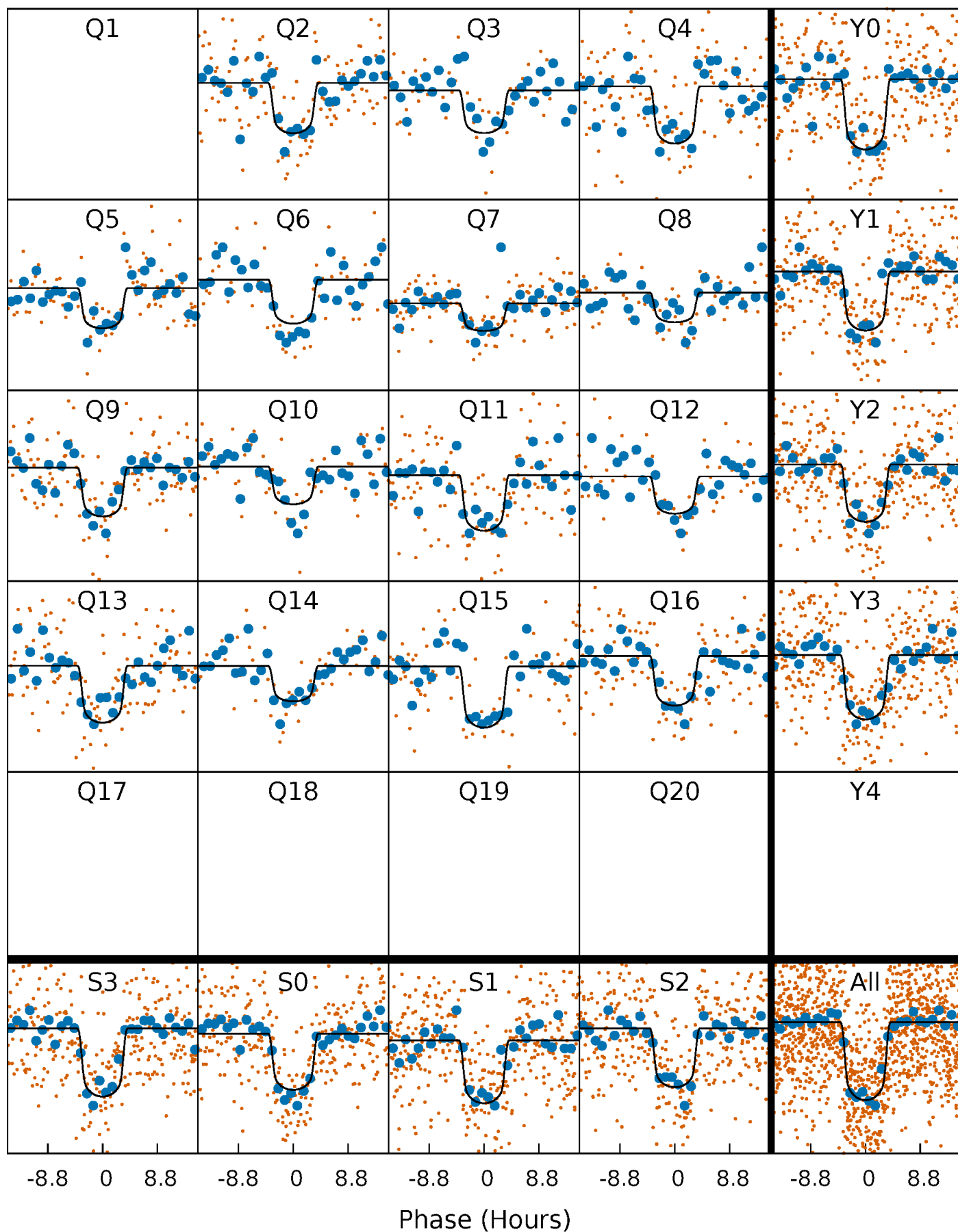
TCE 010253547-01 P= 59.981024 Days  $T_0=176.151109$  (BKJD)





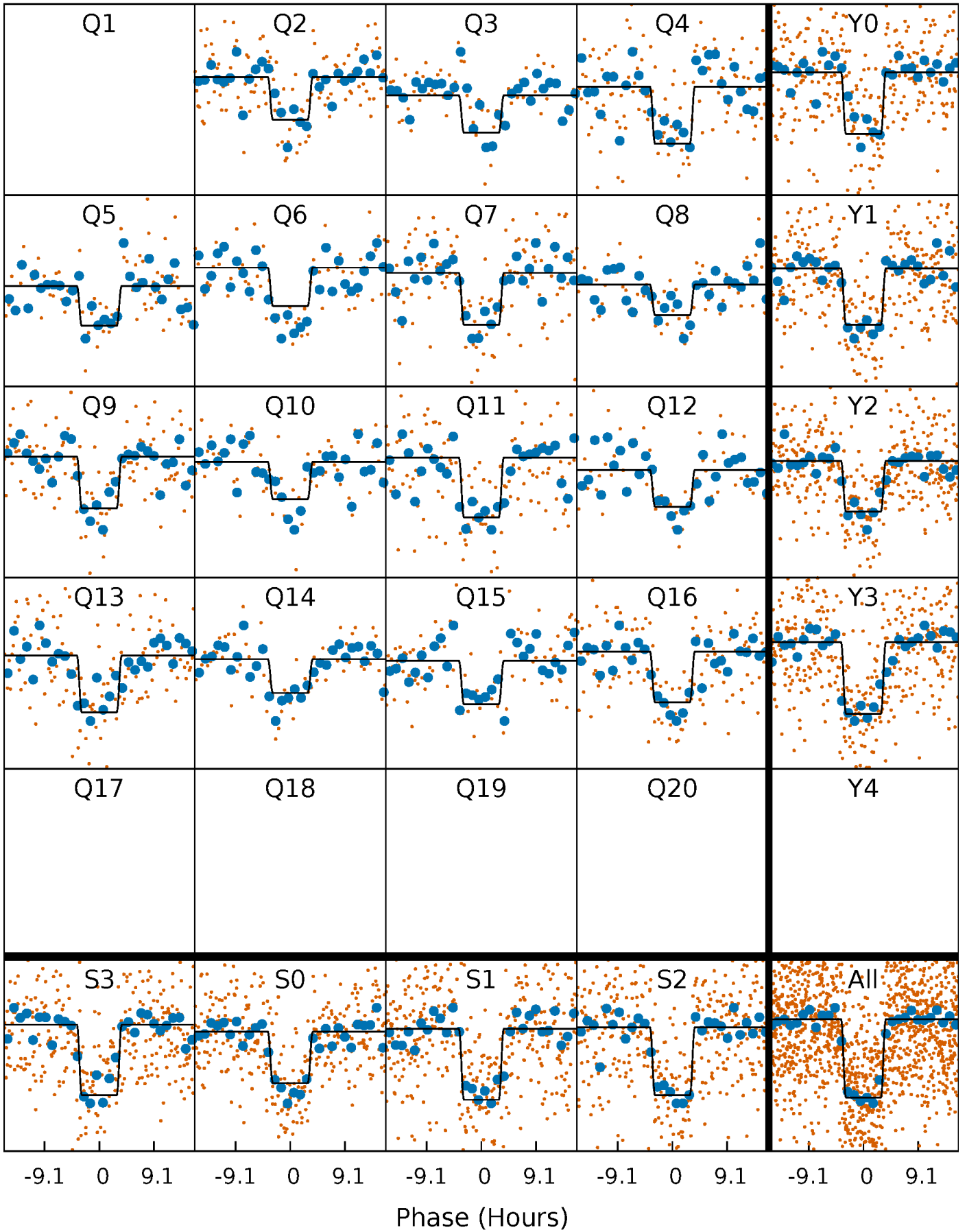
# DV Quarter-Phased Transit Curves

TCE 010253547-01 P= 59.981024 Days  $T_0=176.151109$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

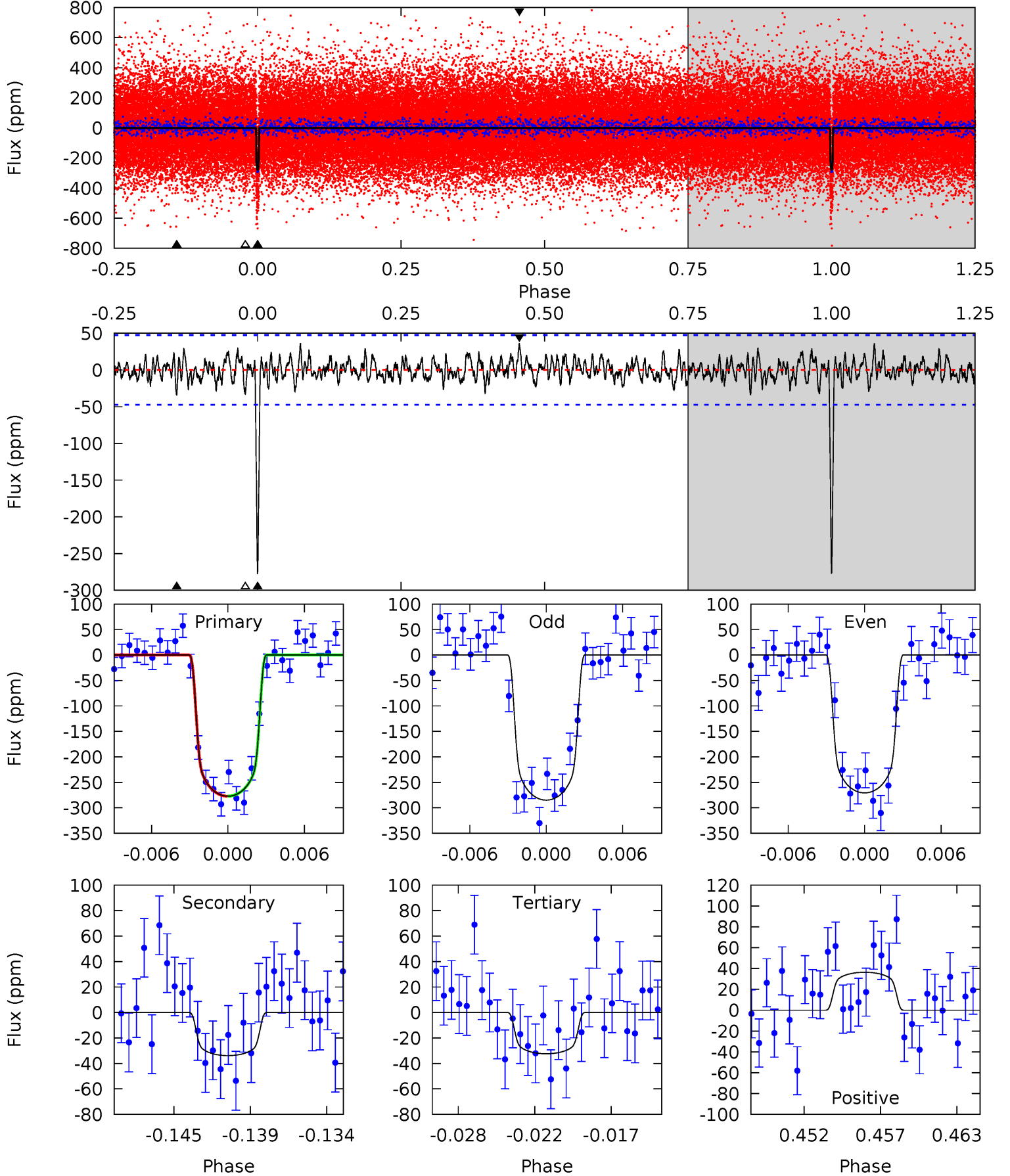
TCE 010253547-01 P= 59.982548 Days  $T_0=176.134944$  (BKJD)



# DV Model-Shift Uniqueness Test

010253547-01,  $P = 59.981024$  Days,  $E = 116.170085$  Days

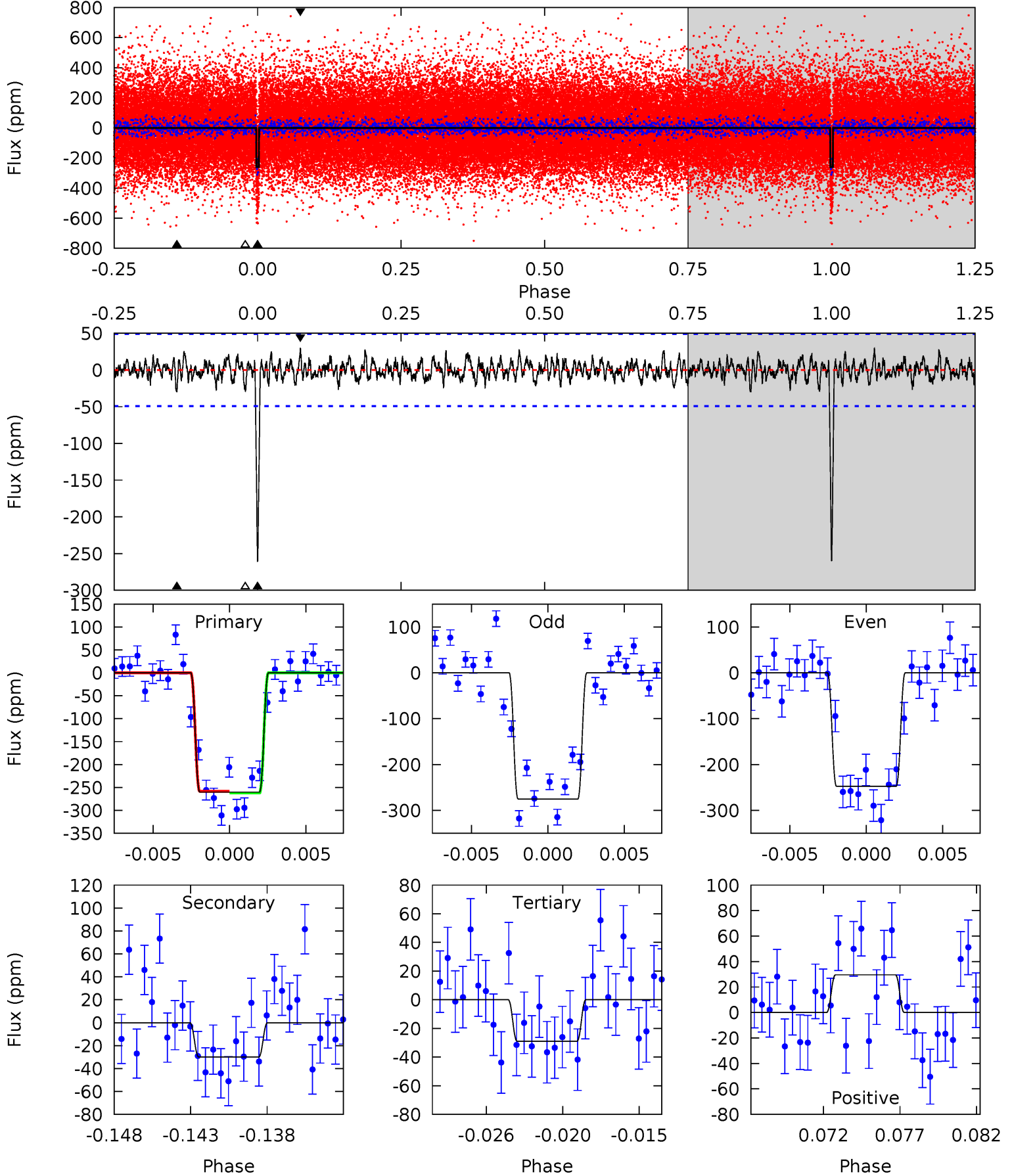
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
30.1	3.67	3.51	3.95	5.14	2.77	1.23	26.5	26.1	0.16	-0.27	0.77	1.00	0.12	0.01



# Alt Model-Shift Uniqueness Test

010253547-01, P = 59.982548 Days, E = 116.152396 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
27.3	3.15	3.03	3.10	5.15	2.80	1.01	24.3	24.2	0.11	0.04	1.45	1.02	0.10	0.19



### Stellar Parameters For KIC 010253547

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6103^{+122}_{-134}$	$4.202^{+0.149}_{-0.122}$	$0.020^{+0.150}_{-0.150}$	$1.383^{+0.252}_{-0.252}$	$1.109^{+0.112}_{-0.082}$	$0.591^{+0.457}_{-0.205}$
	+2%/-2%	+4%/-3%	+750%/-750%	+18%/-18%	+10%/-7%	+77%/-35%
Source	SPE59	SPE59	SPE59	DSEP		

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

### Secondary Eclipse Parameters for KIC 010253547-01 / KOI 2153.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-34 \pm 9$	$2.77^{+0.36}_{-0.30}$	$794^{+43}_{-42}$	$3804^{+184}_{-210}$	$229^{+95}_{-75}$
Alt.	$-30 \pm 10$	$2.45^{+0.31}_{-0.28}$	$790^{+40}_{-41}$	$3871^{+247}_{-261}$	$262^{+116}_{-99}$

$T_{max}$  = 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

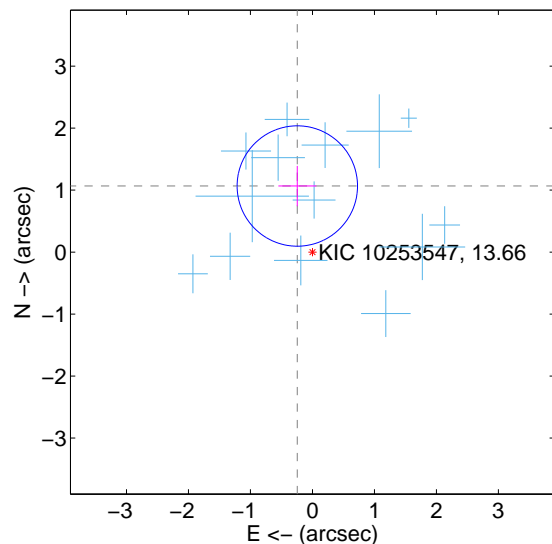
Supplemental centroid analysis for 010253547-01. Kepler magnitude: 13.66. Transit SNR 21.40

There are 14 quarters with good PRF difference image offsets

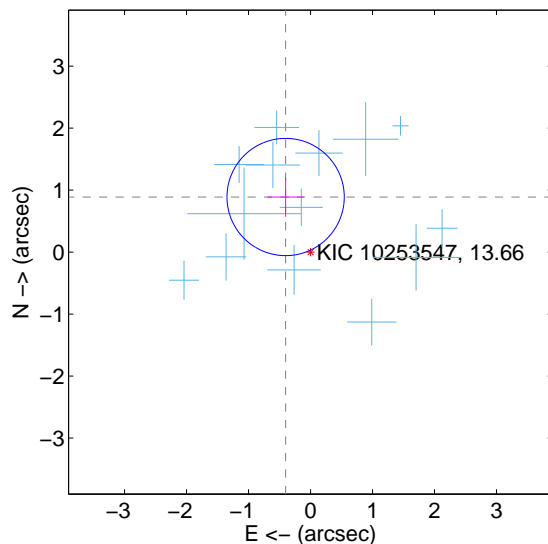
The direct PRF centroid is offset from the target star catalog position by about 0.05 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	<b>1.094 <math>\pm</math> 0.324</b>	<b>3.38</b>	0.244 $\pm$ 0.307	1.067 $\pm$ 0.325
PRF-fit source offset from KIC position	<b>0.976 <math>\pm</math> 0.315</b>	<b>3.09</b>	0.402 $\pm$ 0.294	0.889 $\pm$ 0.320
photometric centroid source offset	1.11 $\pm$ 0.71	1.56	-0.58 $\pm$ 0.73	-0.95 $\pm$ 0.71

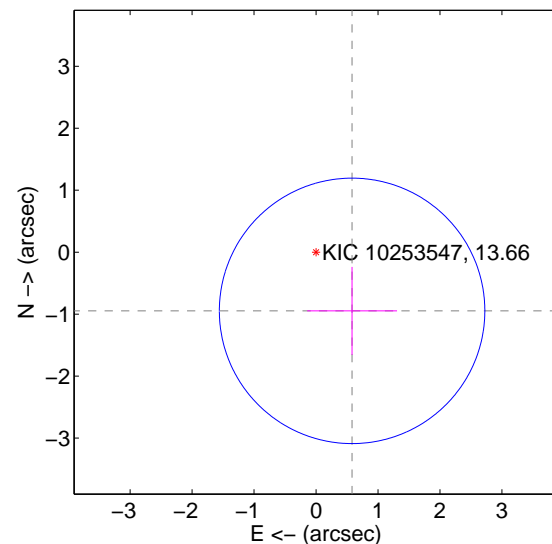
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

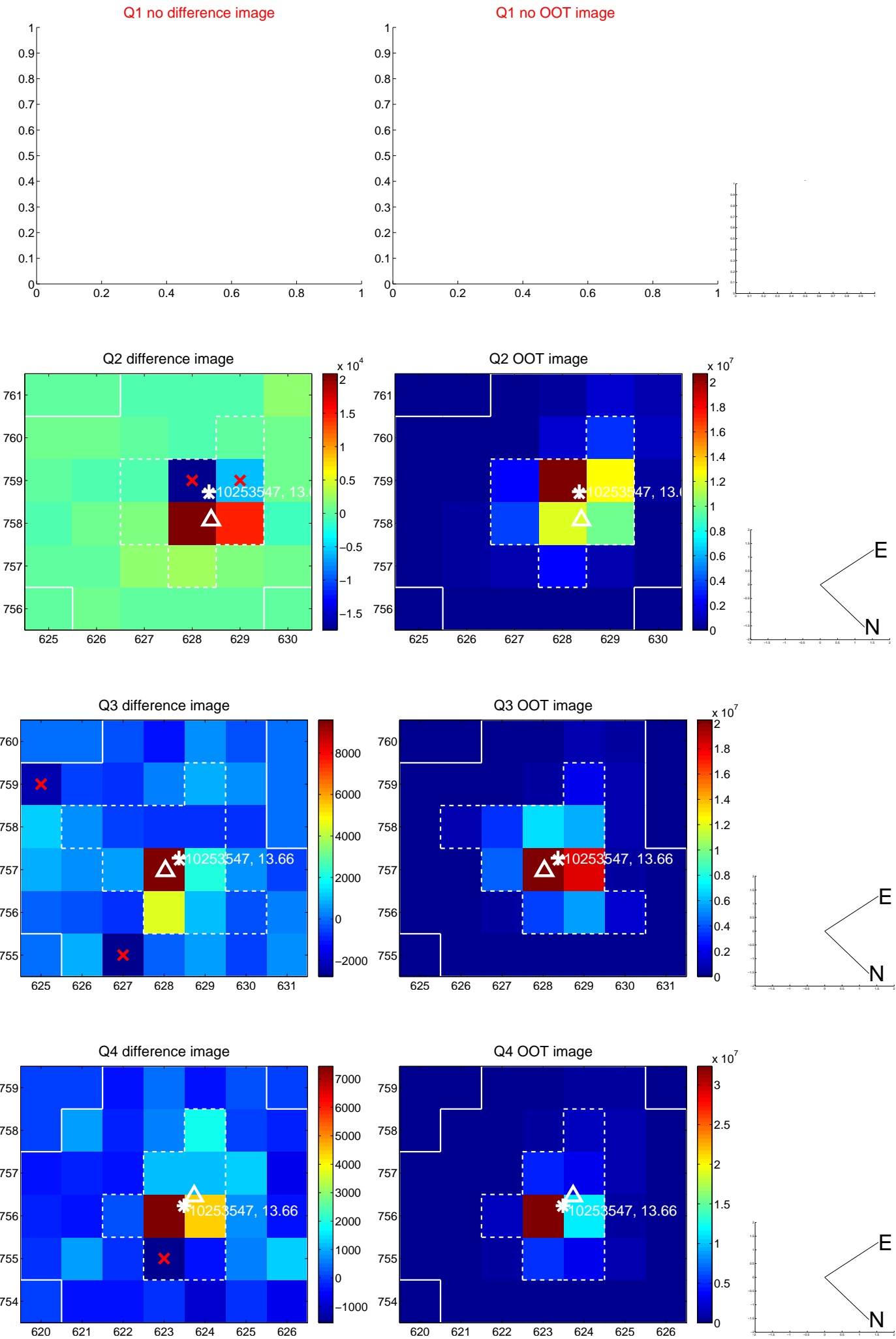


offset from photometric centroids



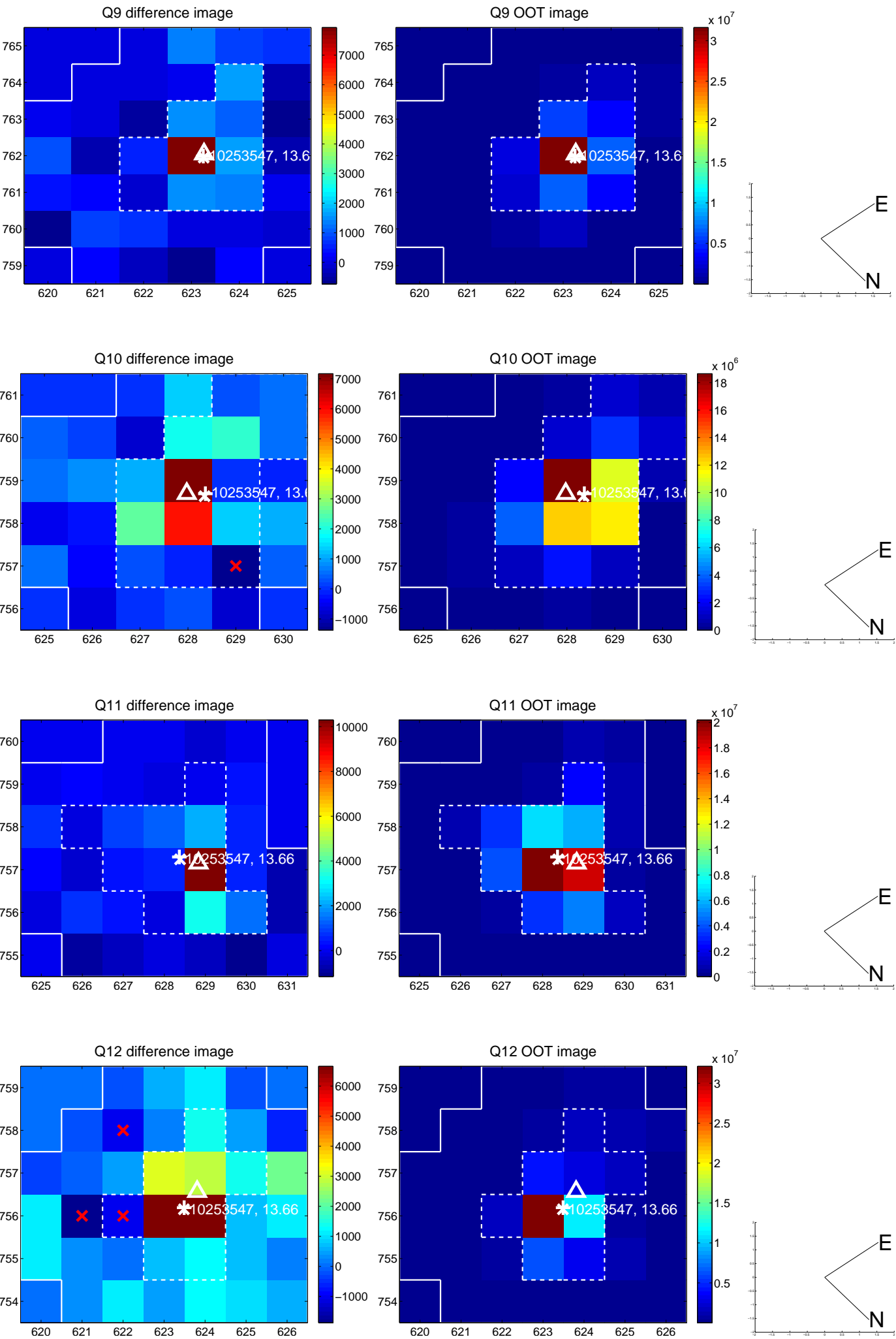
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets**; **Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

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

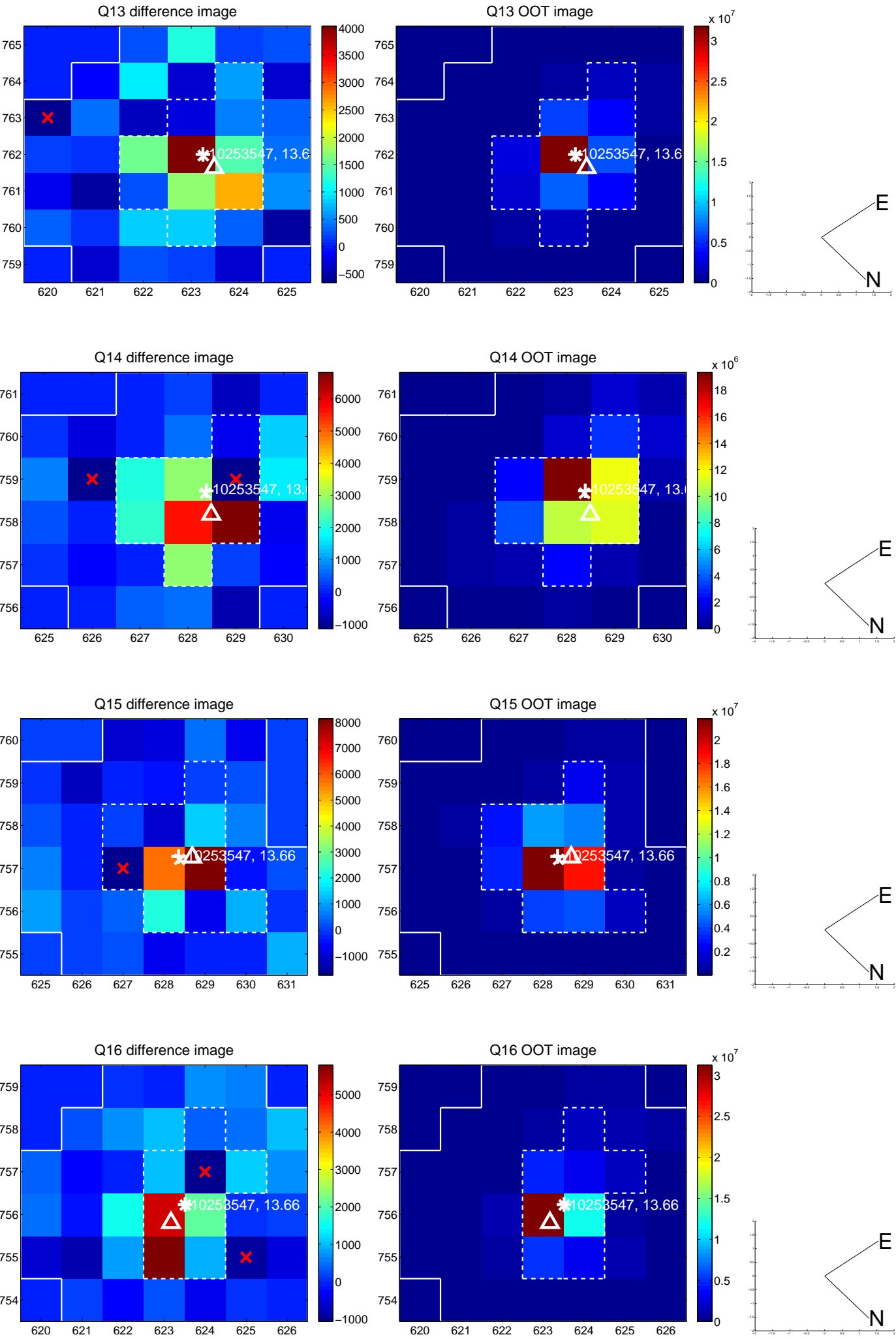




white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

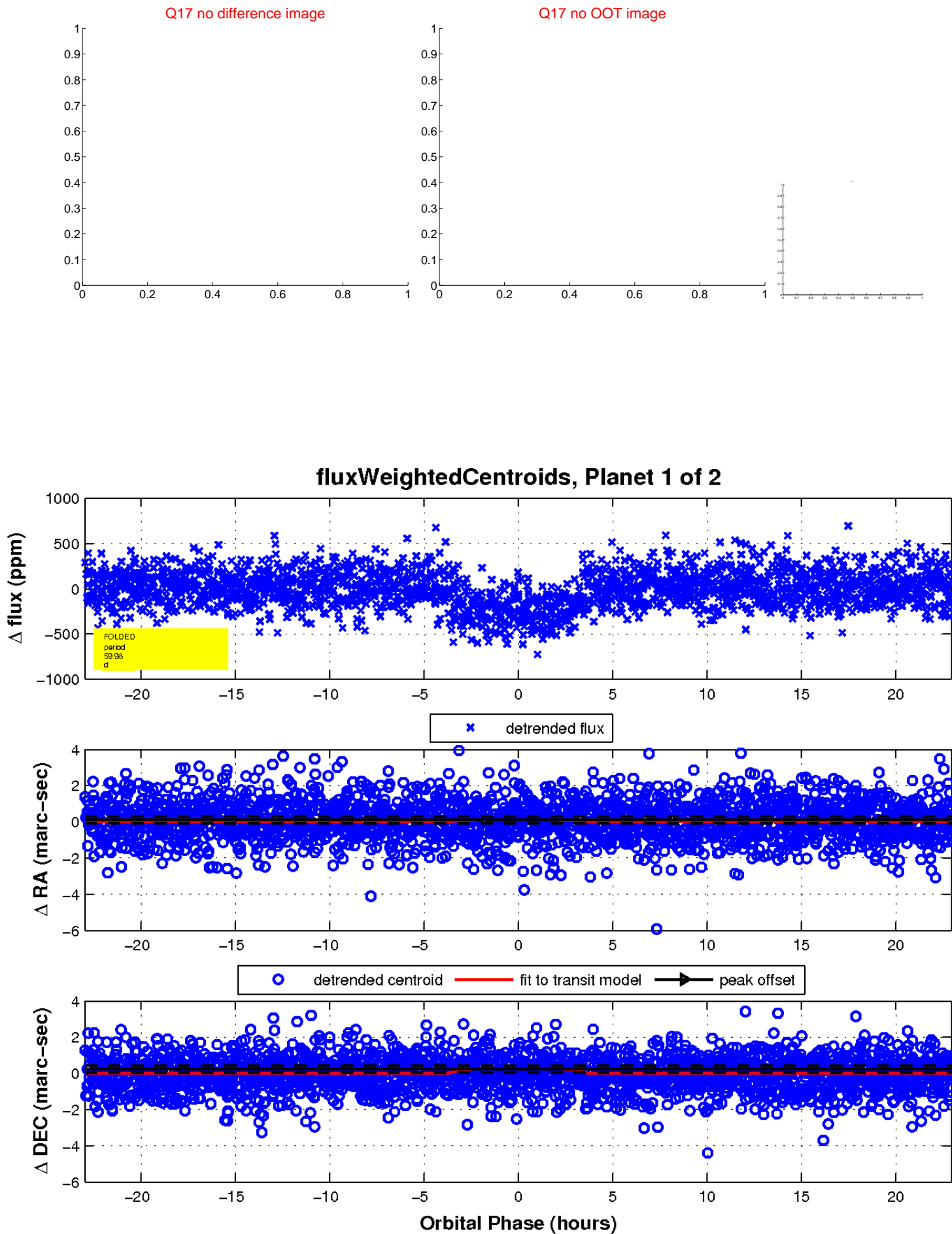


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



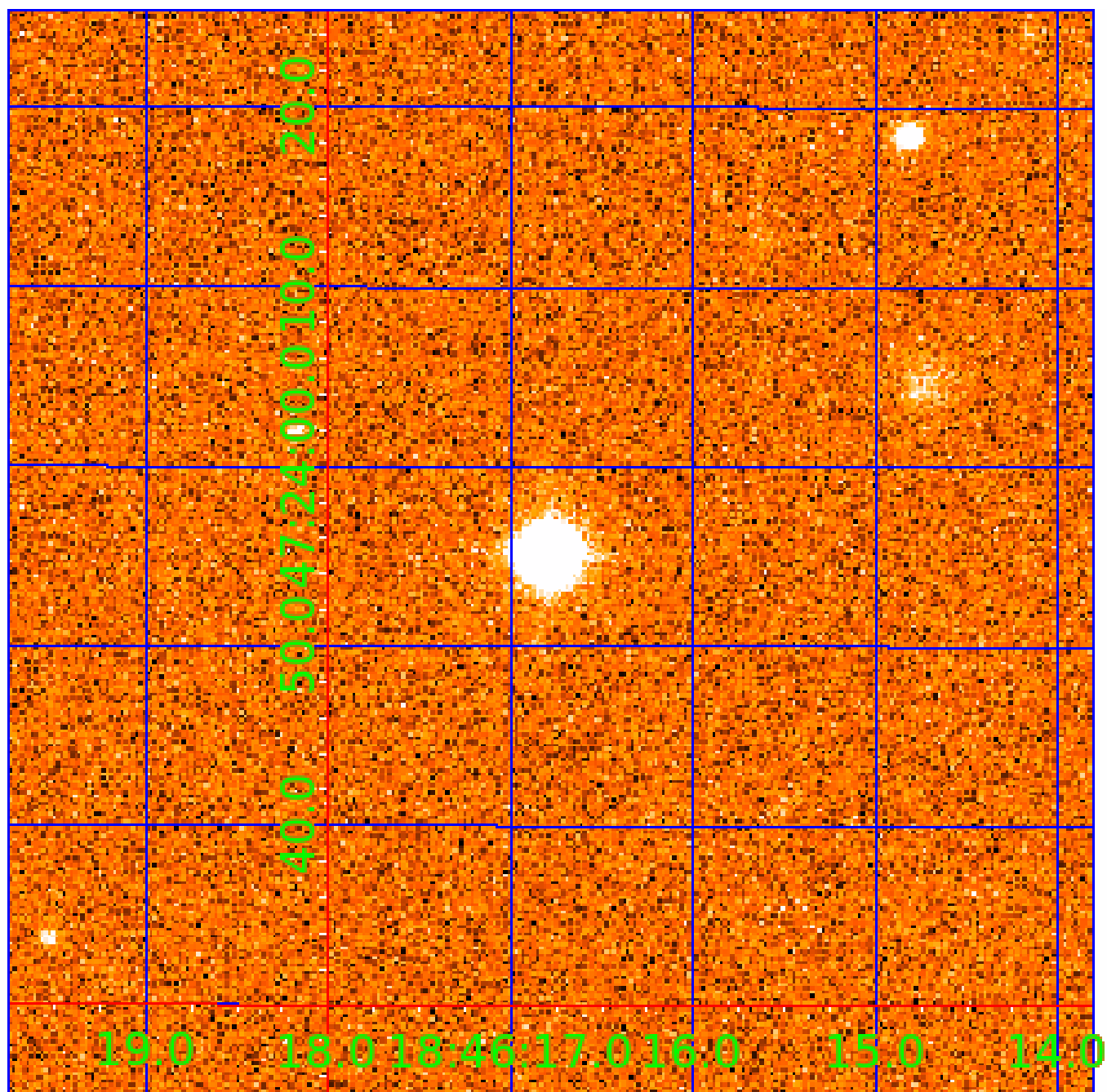


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



# UKIRT Image

Declination



# KIC 010253547

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010253547-01	OBS	2153.01	59.981024	176.151109	277.9	7.659	20.8	21.4	1.38	6103	2.79	24.64
010253547-02	OBS	2153.02	25.745731	135.949697	124.6	7.090	14.1	14.9	1.38	6103	1.75	76.09

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010253547-01	OBS	PC	0.86	0	0	0	0	NO_COMMENT
010253547-02	OBS	PC	0.99	0	0	0	0	NO_COMMENT

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

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

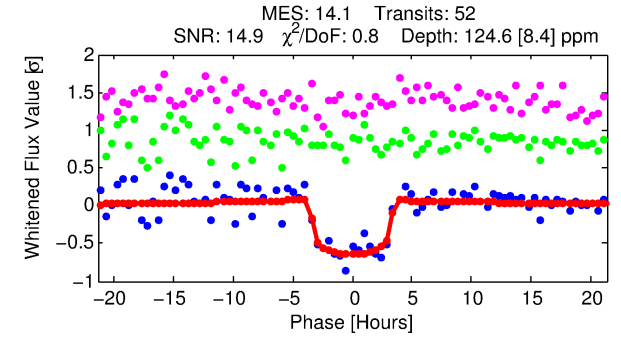
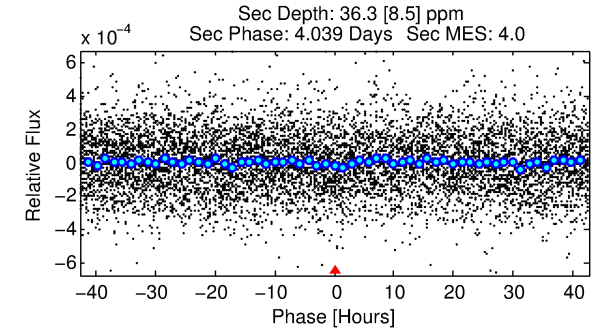
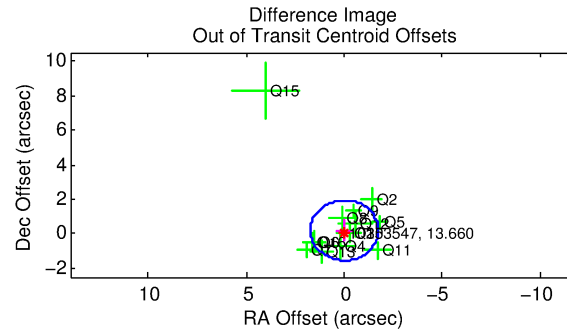
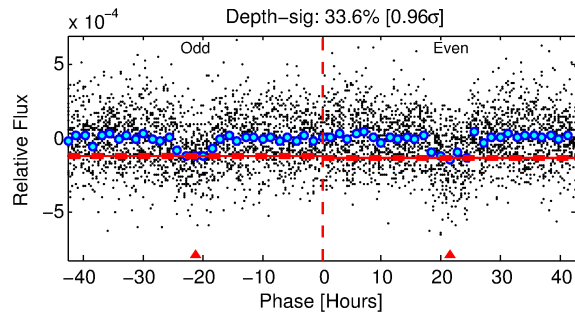
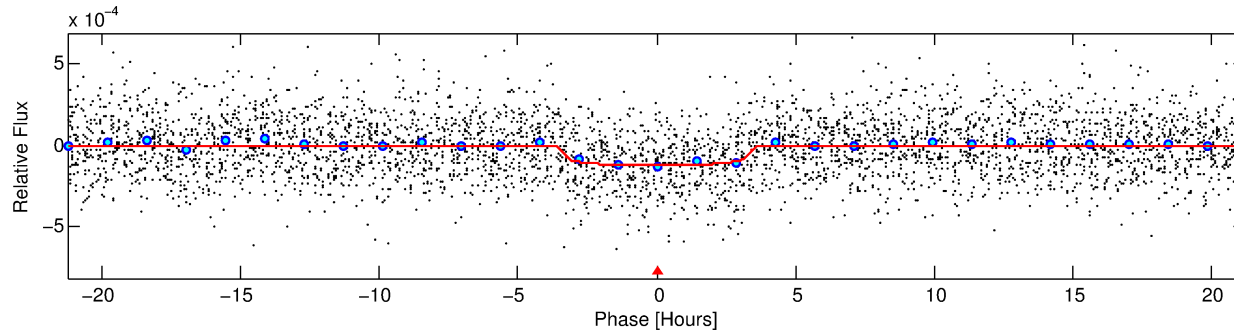
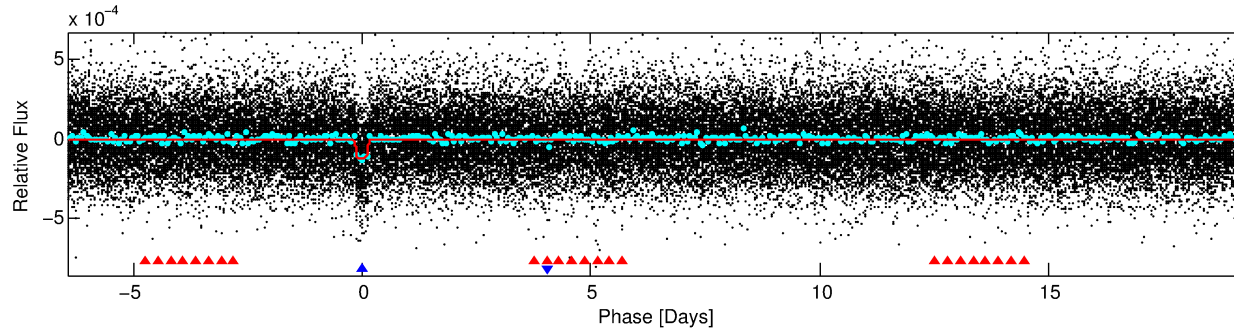
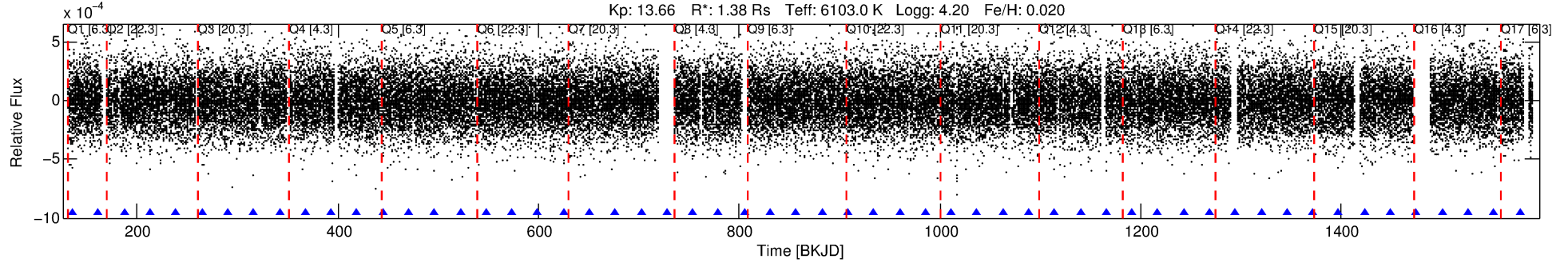
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 010253547-02

No Significant Match Found

# DV One-Page Summary

KIC: 10253547 Candidate: 2 of 2 Period: 25.746 d  
KOI: K02153.02 Name: Kepler-364b Corr: 0.994



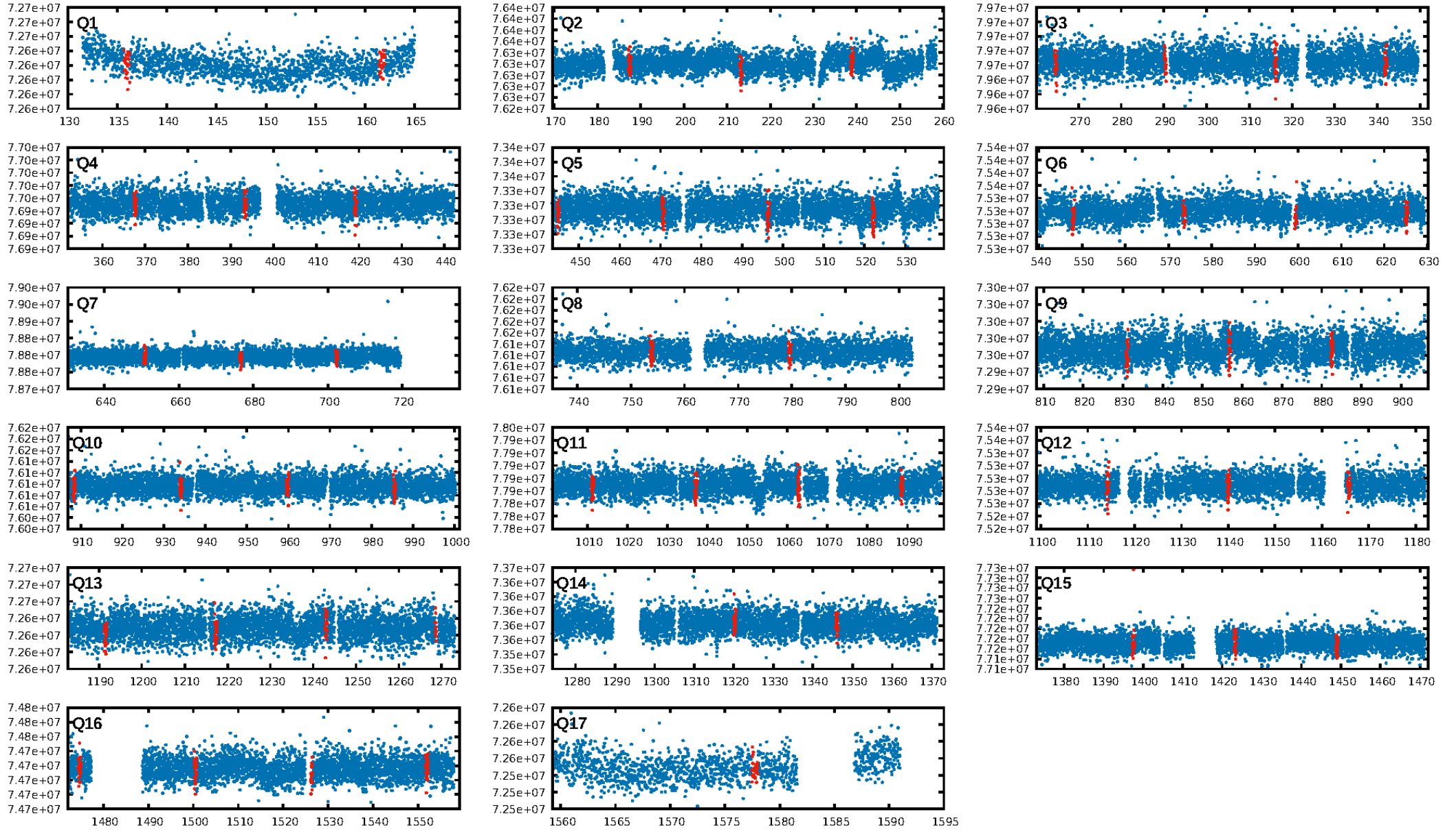
## DV Fit Results:

Period = 25.74573 [0.00026] d  
Epoch = 135.9497 [0.0080] BKJD  
Rp/R\* = 0.0116 [0.0035]  
a/R\* = 15.18 [23.30]  
b = 0.85 [0.50]  
Seff = 76.09 [20.81]  
Teq = 753 [51] K  
Rp = 1.76 [0.62] Re  
a = 0.1768 [0.0295] AU  
Ag = 202.25 [141.90] [1.42 $\sigma$ ]  
Teffp = 4391 [722] K [5.02 $\sigma$ ]

## DV Diagnostic Results:

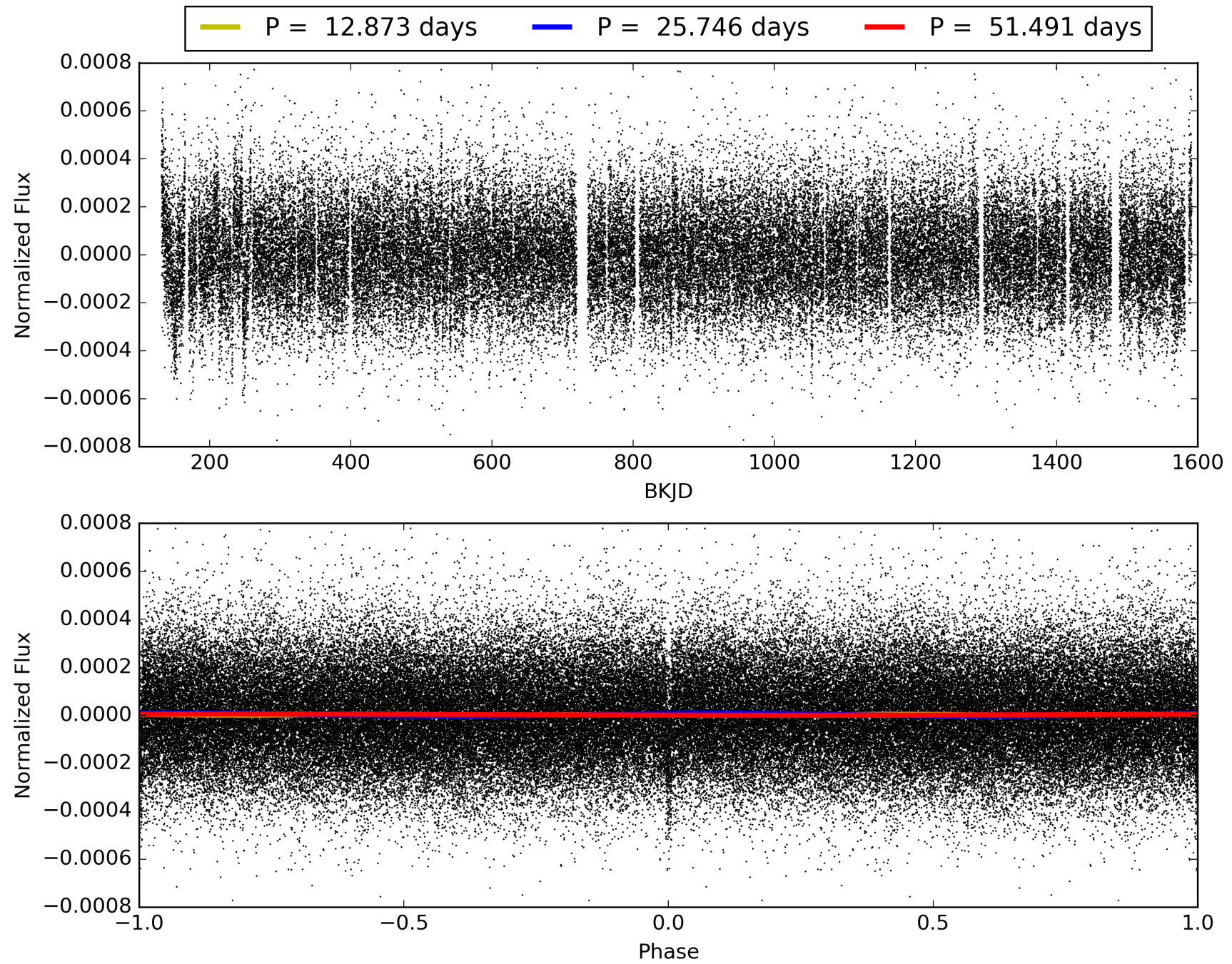
ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [78.73 $\sigma$ ]  
ModelChiSquare2-sig: 48.5%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 5.48e-44  
RollingBand-fgt: 1.00 [49/49]  
GhostDiagnostic-chr: 4.612  
Centroid-sig: 3.7%  
Centroid-so: 1.445 arcsec [1.38 $\sigma$ ]  
OotOffset-rm: 0.189 arcsec [0.33 $\sigma$ ]  
KicOffset-rm: 0.102 arcsec [0.15 $\sigma$ ]  
OotOffset-st: 3/4/4/3 [14]  
KicOffset-st: 3/4/4/3 [14]  
DiffImageQuality-fgm: 0.86 [12/14]  
DiffImageOverlap-fno: 1.00 [17/17]

# TCE 010253547-02, PDC Light Curves



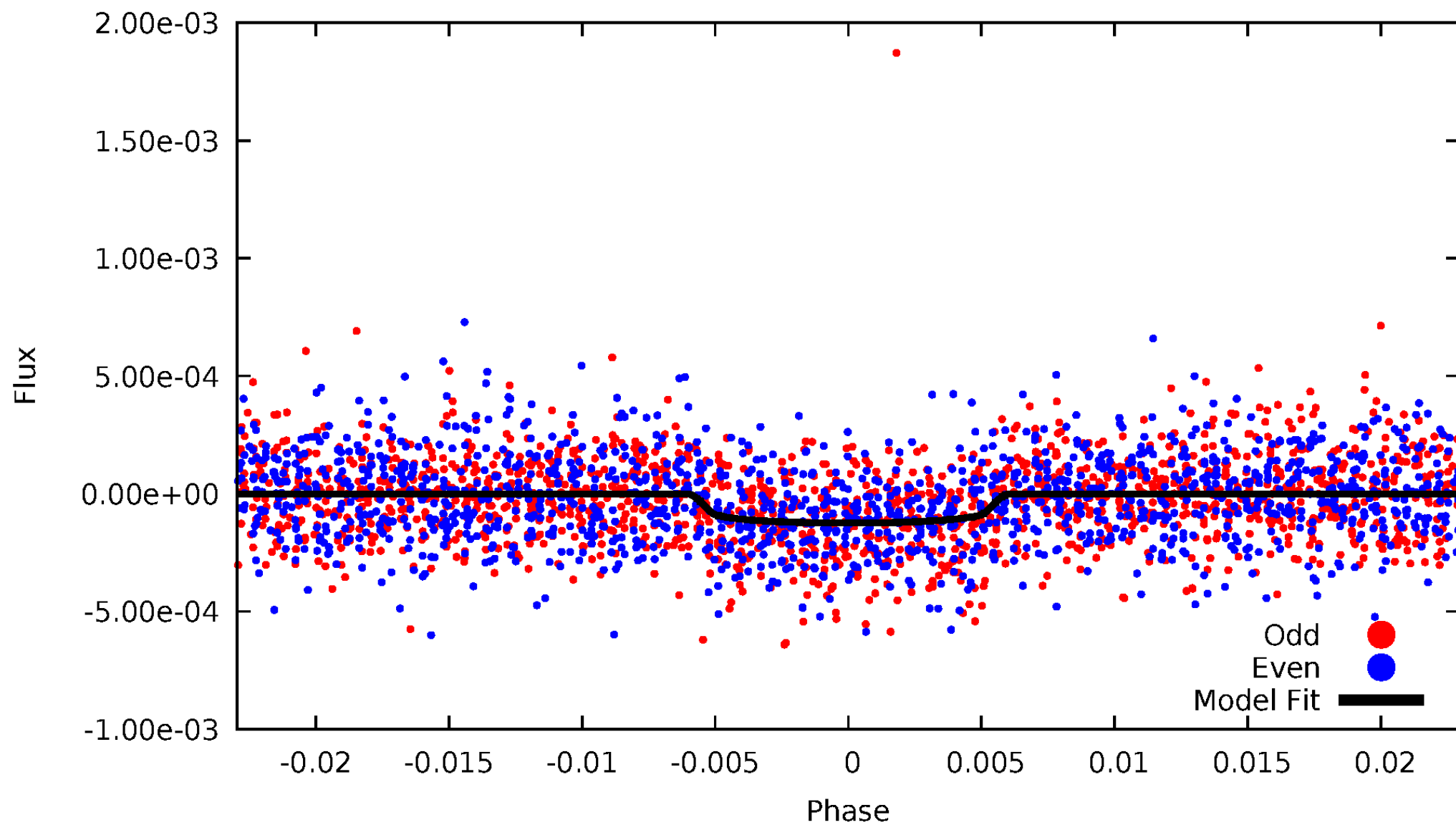


TCE 010253547-02



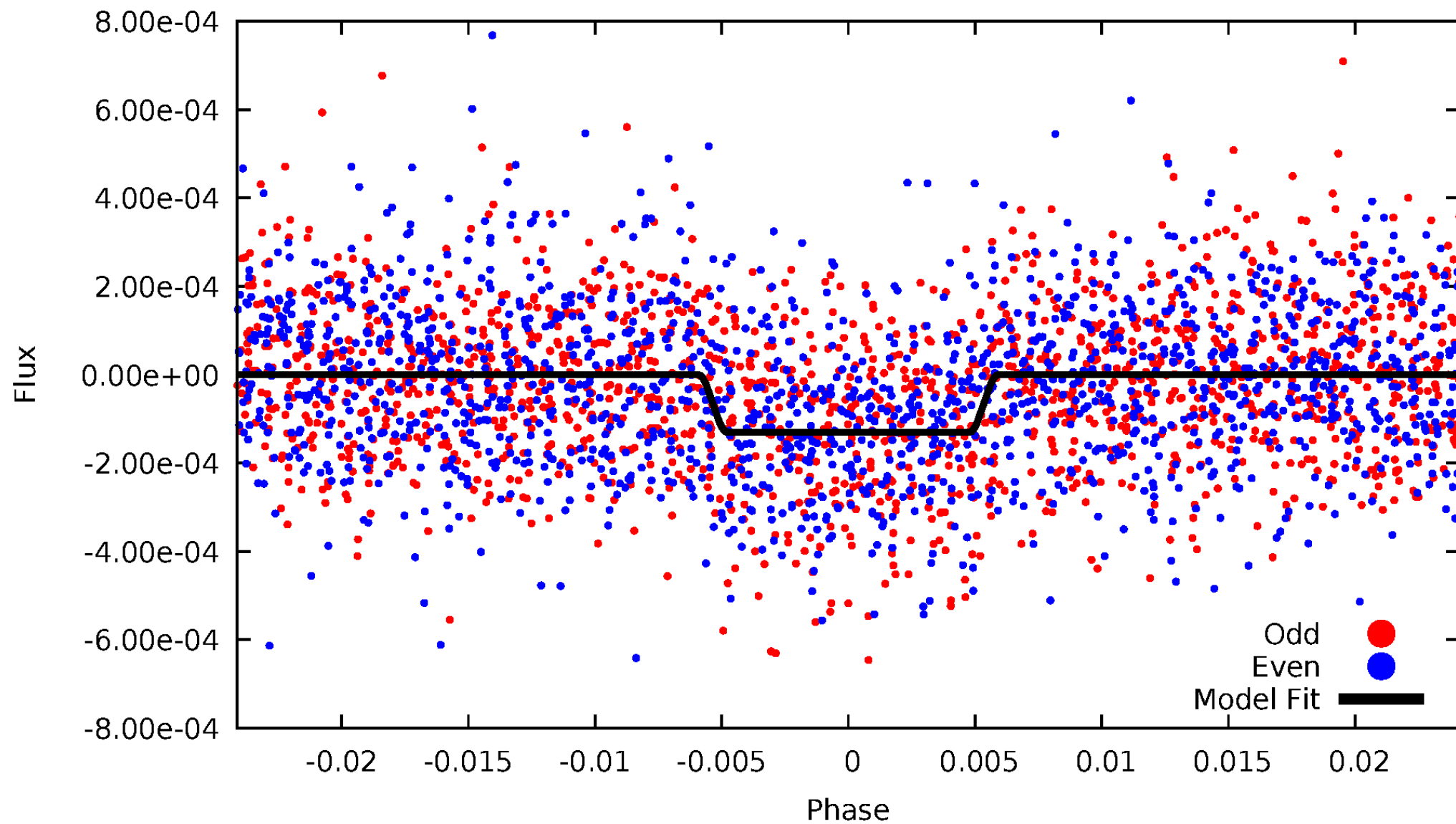
# DV Odd/Even

TCE 010253547-02



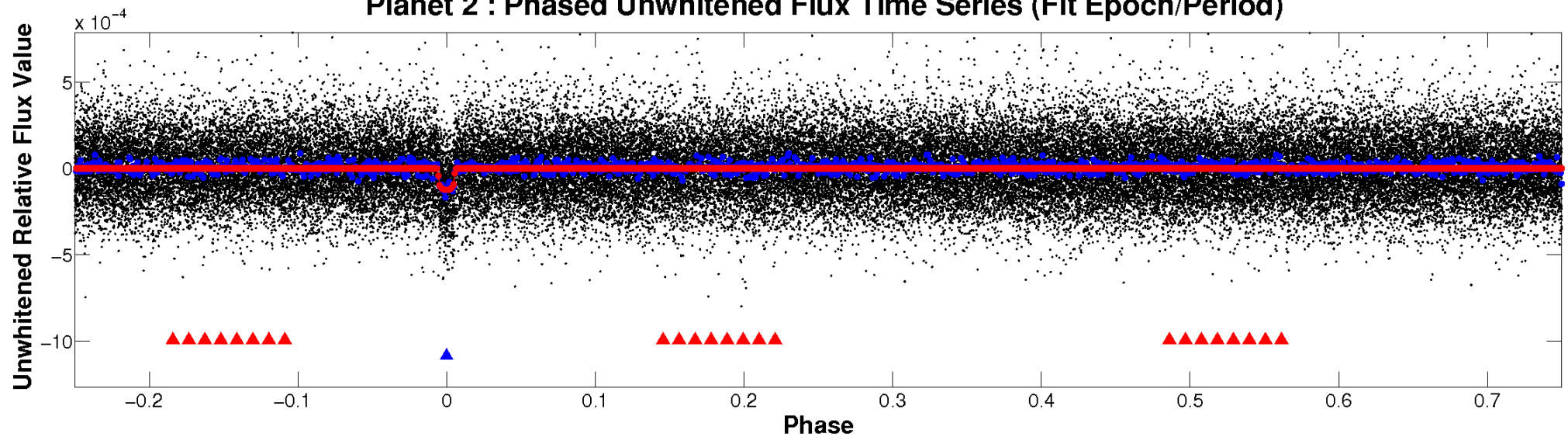
# ALT Odd/Even

TCE 010253547-02

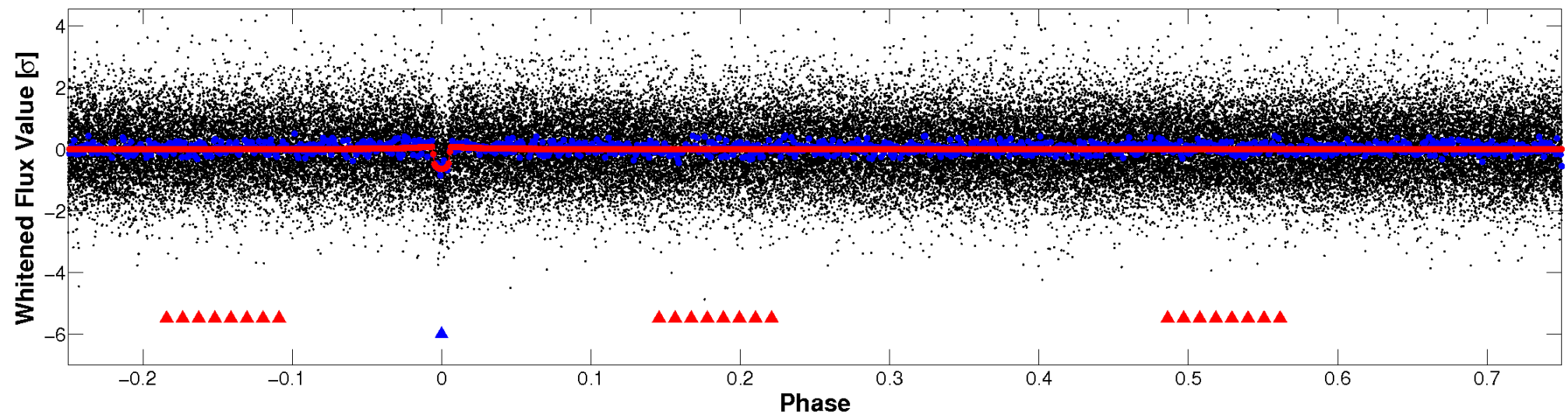


# Non-Whitened Vs. Whitened Light Curve

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



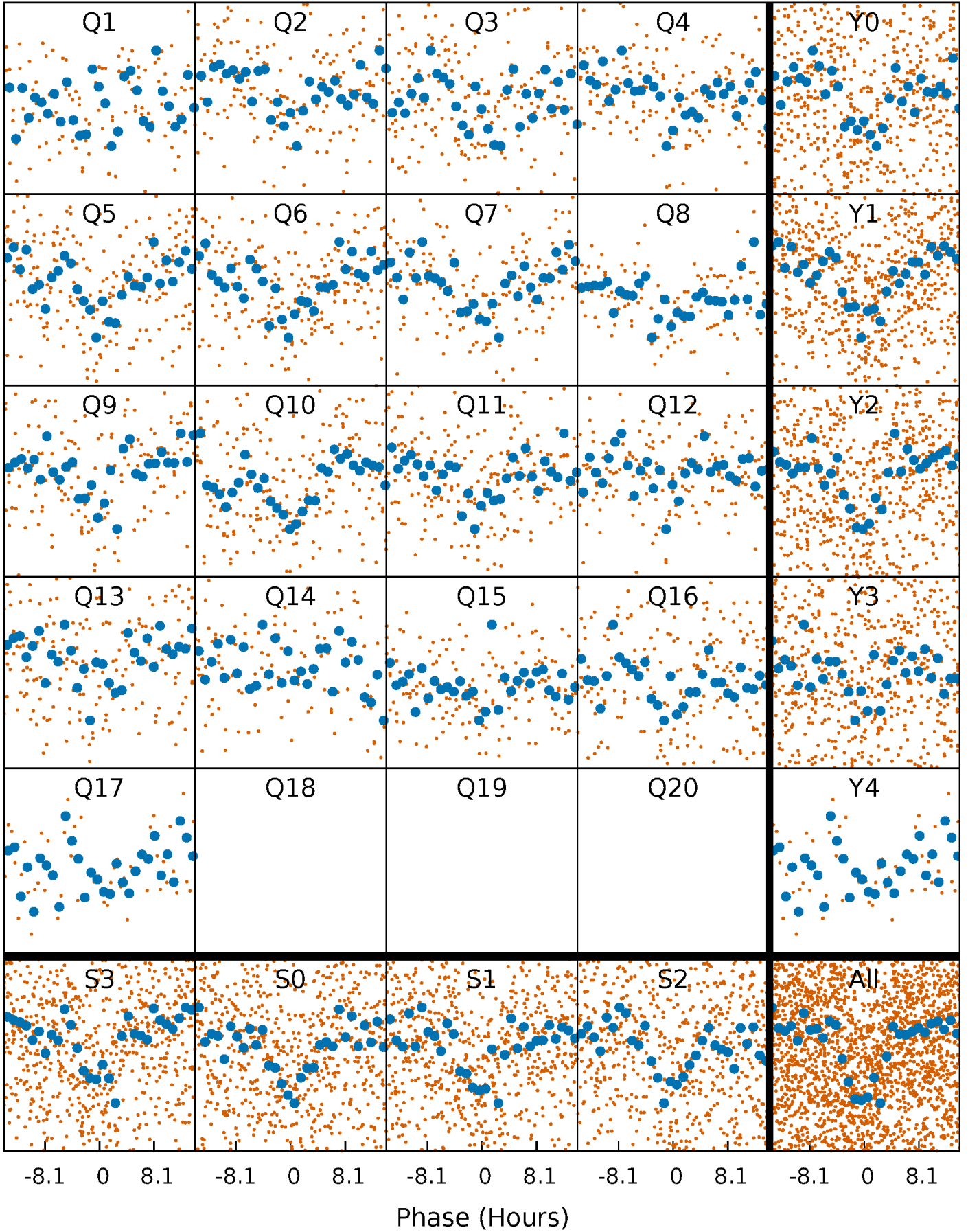
## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)





# PDC Quarter-Phased Transit Curves

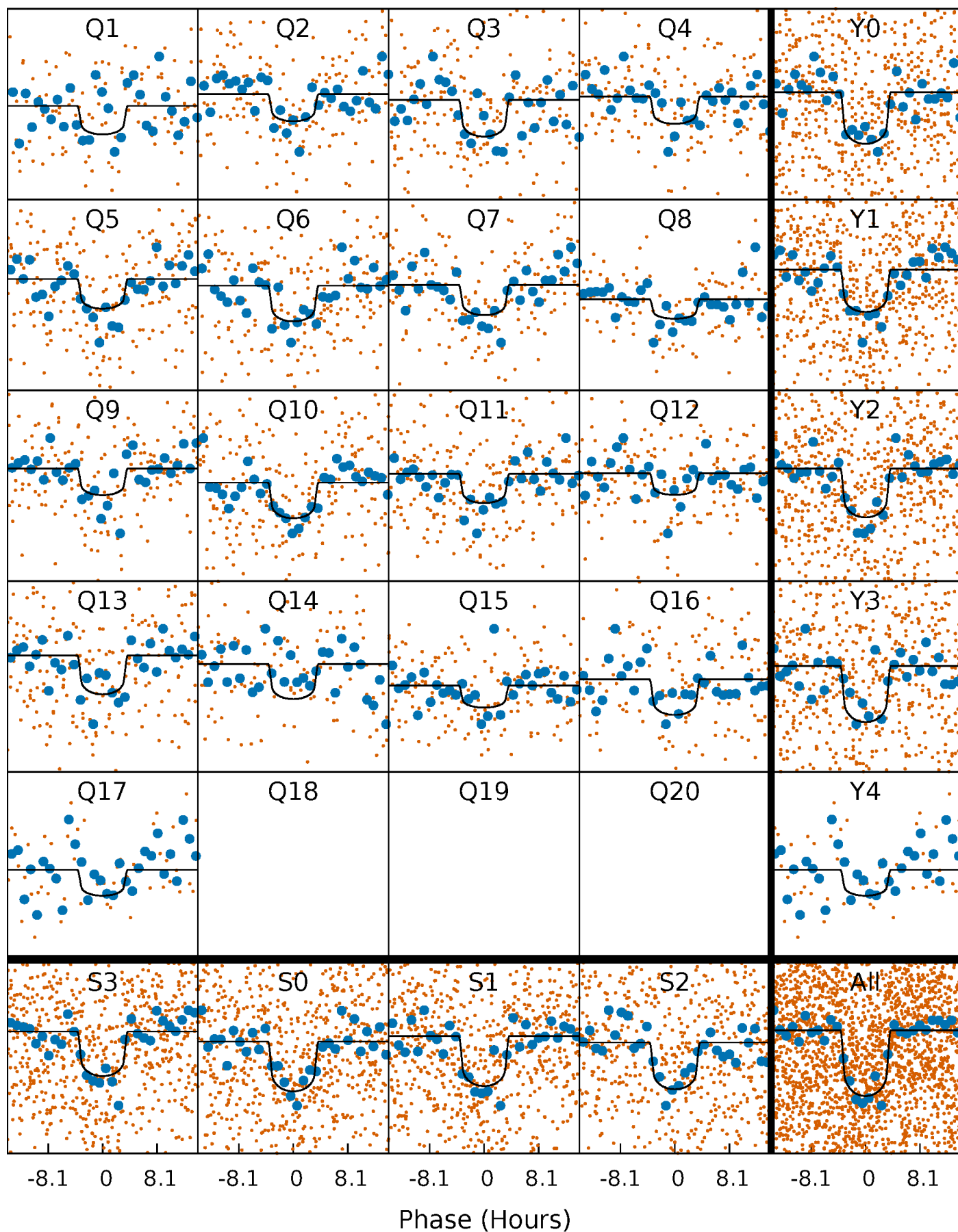
TCE 010253547-02 P= 25.745731 Days  $T_0=135.949697$  (BKJD)





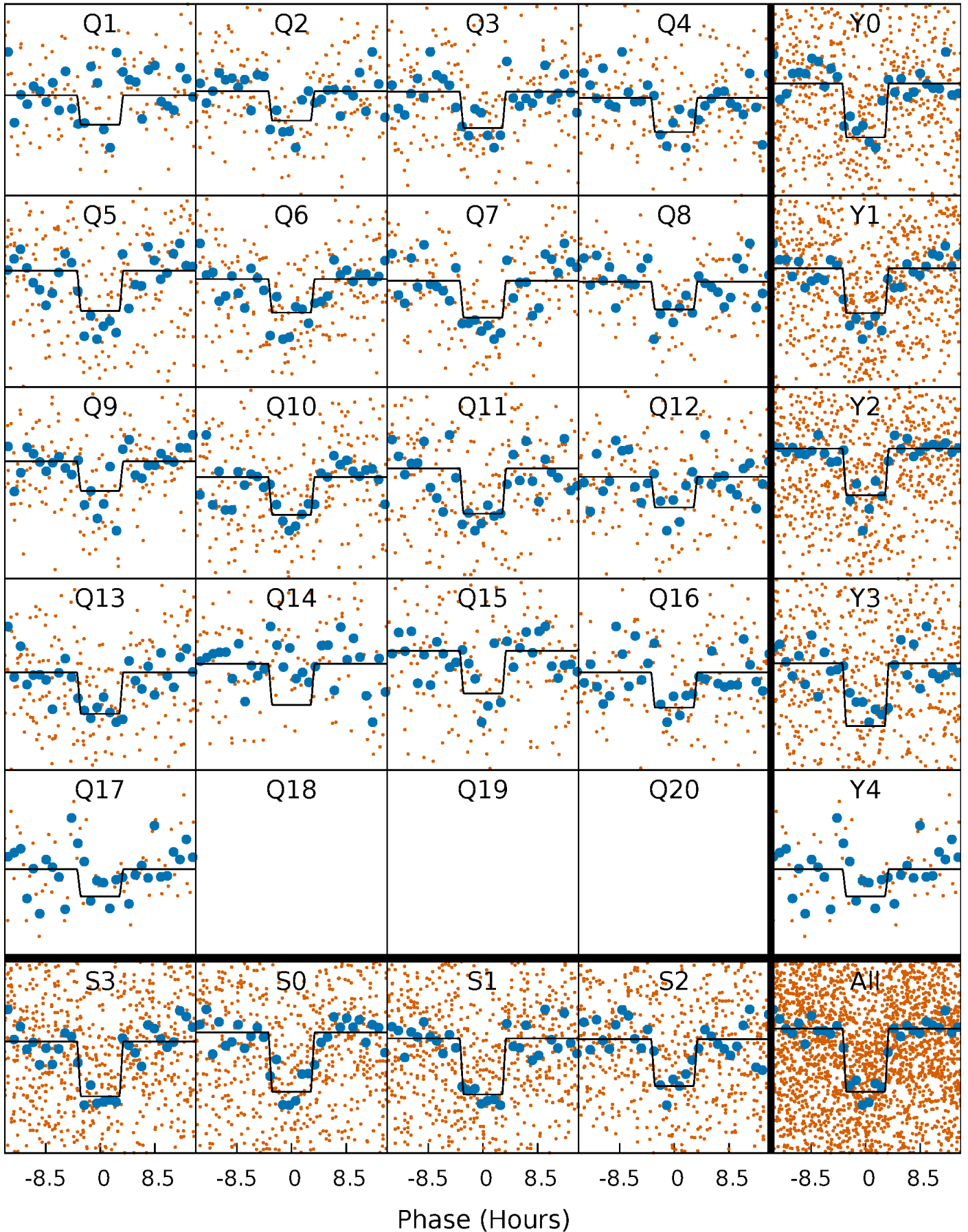
# DV Quarter-Phased Transit Curves

TCE 010253547-02     $P = 25.745731$  Days     $T_0 = 135.949697$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

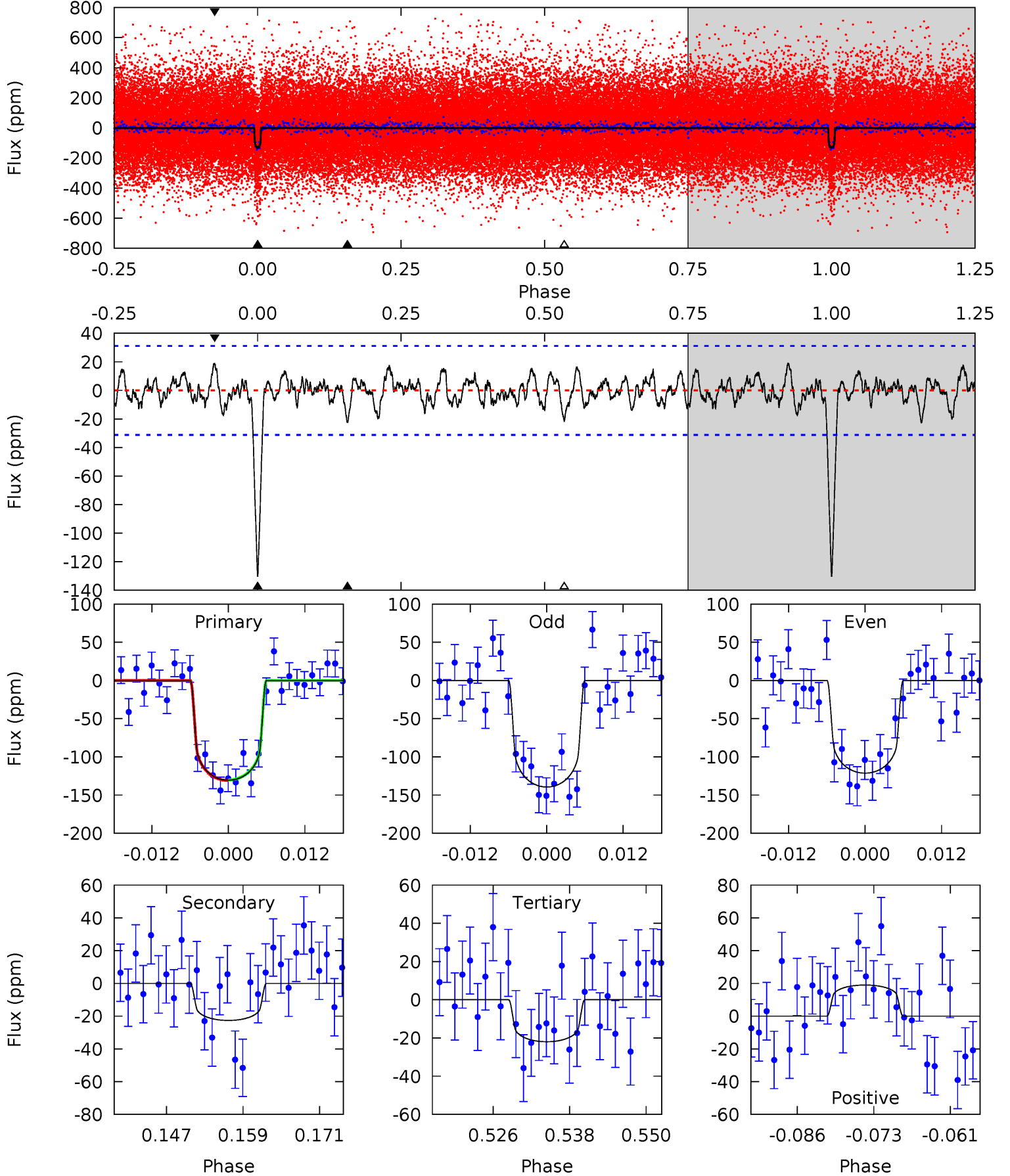
TCE 010253547-02   P= 25.744888 Days    $T_0=135.972526$  (BKJD)



# DV Model-Shift Uniqueness Test

010253547-02, P = 25.745731 Days, E = 110.203966 Days

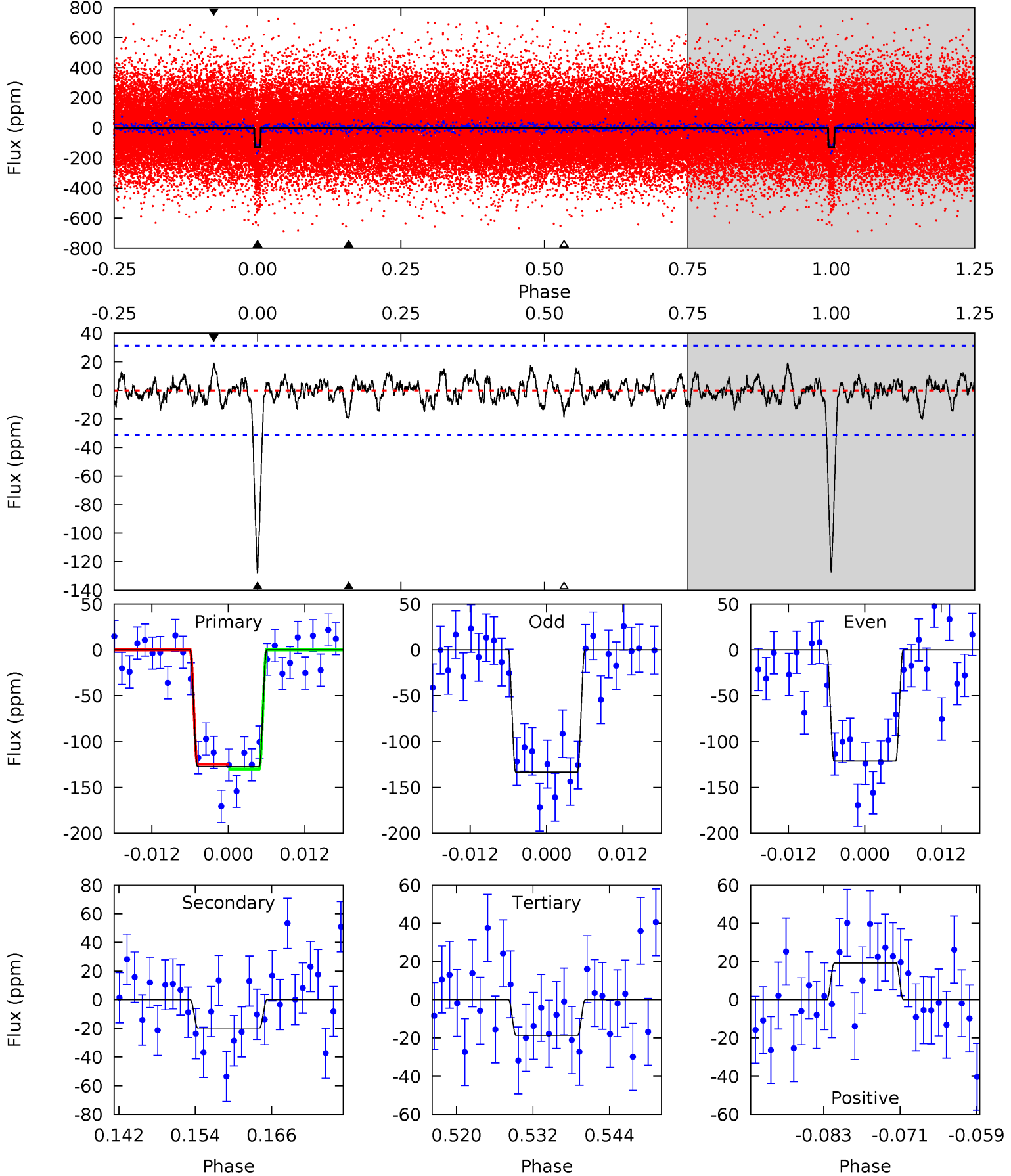
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
20.9	3.62	3.52	3.04	4.99	2.51	1.15	17.4	17.9	0.11	0.58	1.45	0.88	0.13	0.07



# Alt Model-Shift Uniqueness Test

010253547-02,  $P = 25.744888$  Days,  $E = 110.227638$  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
20.3	3.15	2.98	3.06	4.99	2.52	0.99	17.4	17.3	0.17	0.09	0.96	0.94	0.13	0.42



### Stellar Parameters For KIC 010253547

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6103^{+122}_{-134}$	$4.202^{+0.149}_{-0.122}$	$0.020^{+0.150}_{-0.150}$	$1.383^{+0.252}_{-0.252}$	$1.109^{+0.112}_{-0.082}$	$0.591^{+0.457}_{-0.205}$
	+2%/-2%	+4%/-3%	+750%/-750%	+18%/-18%	+10%/-7%	+77%/-35%
Source	SPE59	SPE59	SPE59	DSEP		

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

### Secondary Eclipse Parameters for KIC 010253547-02 / KOI 2153.02

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-23 \pm 6$	$1.77^{+0.56}_{-0.54}$	$1052^{+55}_{-58}$	$4142^{+682}_{-412}$	$125^{+150}_{-60}$
Alt.	$-20 \pm 6$	$1.73^{+0.57}_{-0.56}$	$1052^{+53}_{-61}$	$4065^{+682}_{-416}$	$111^{+135}_{-52}$

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

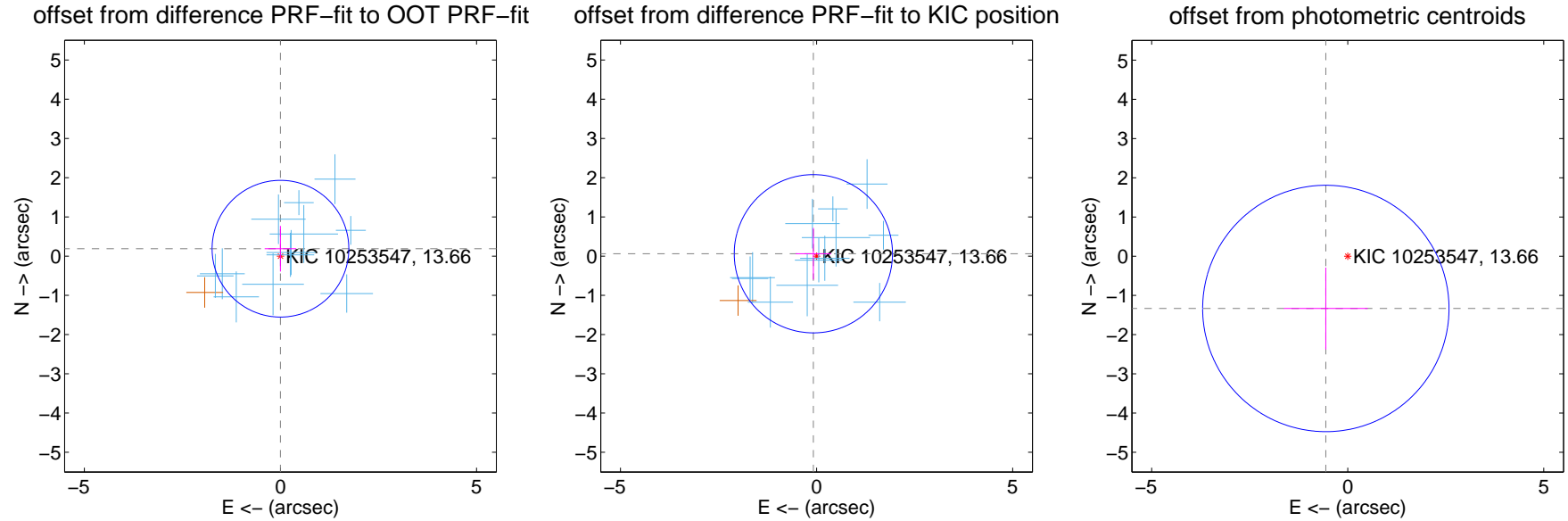
## DV Centroid Data

Supplemental centroid analysis for 010253547-02. Kepler magnitude: 13.66. Transit SNR 14.86

There are 12 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.07 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.189 \pm 0.581$	0.33	$0.000 \pm 0.403$	$0.189 \pm 0.581$
PRF-fit source offset from KIC position	$0.102 \pm 0.673$	0.15	$0.082 \pm 0.451$	$0.061 \pm 0.658$
photometric centroid source offset	$1.45 \pm 1.05$	1.38	$0.56 \pm 1.07$	$-1.33 \pm 1.04$

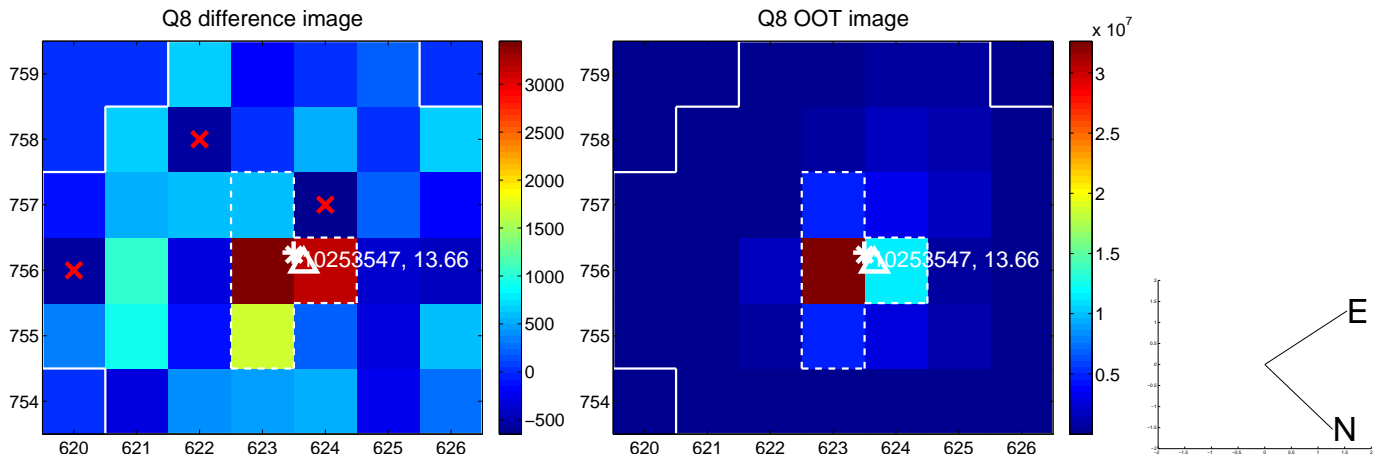
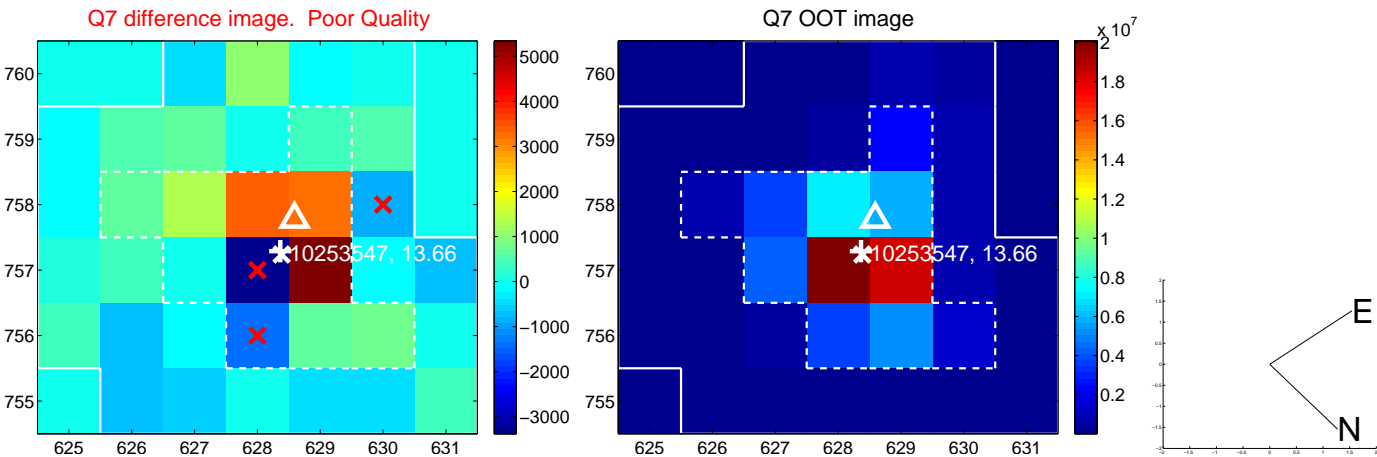
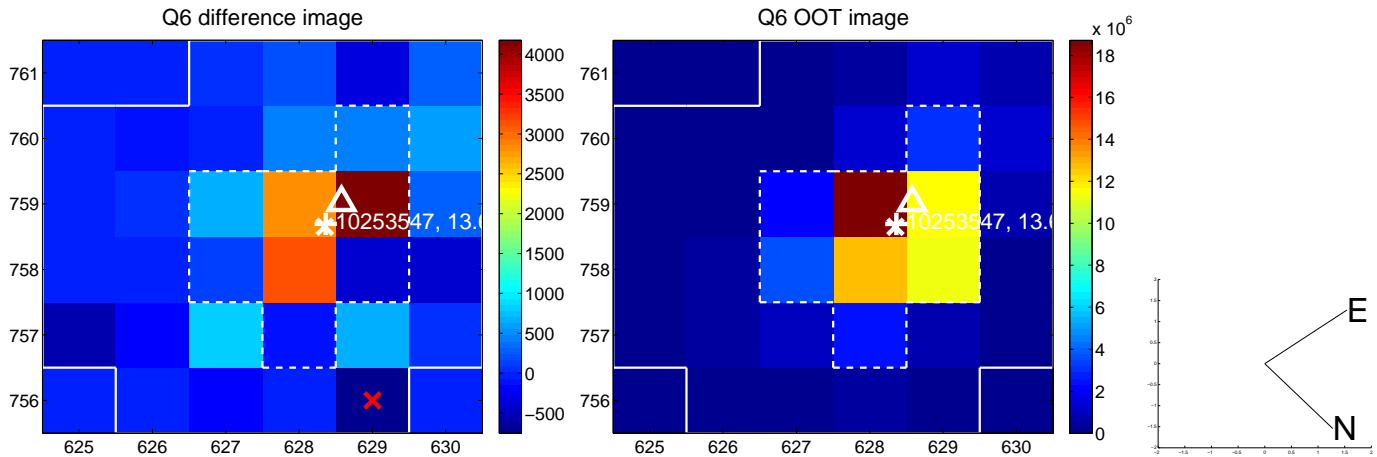
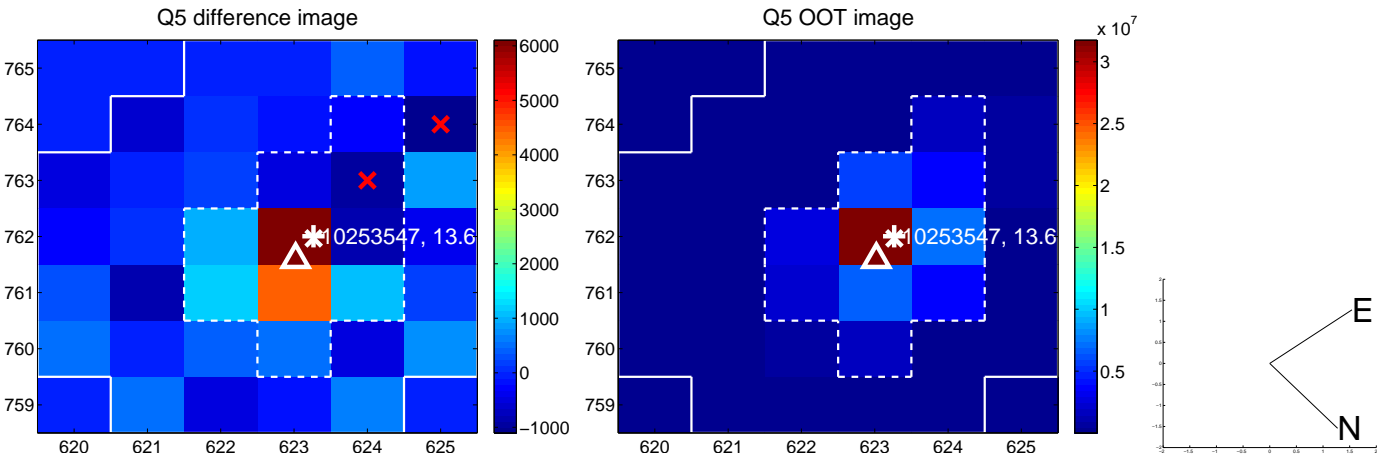


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

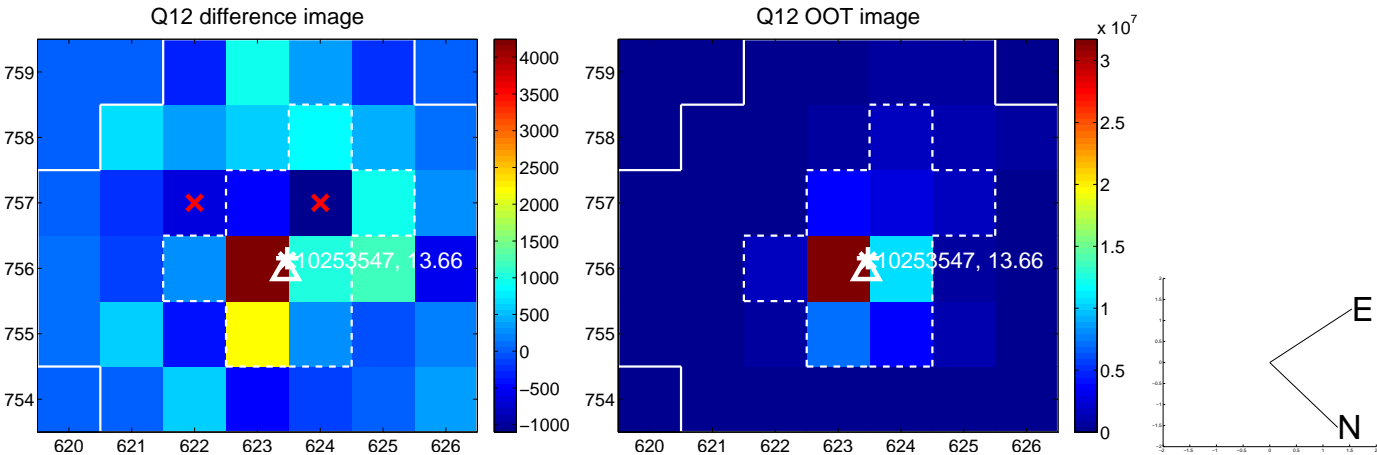
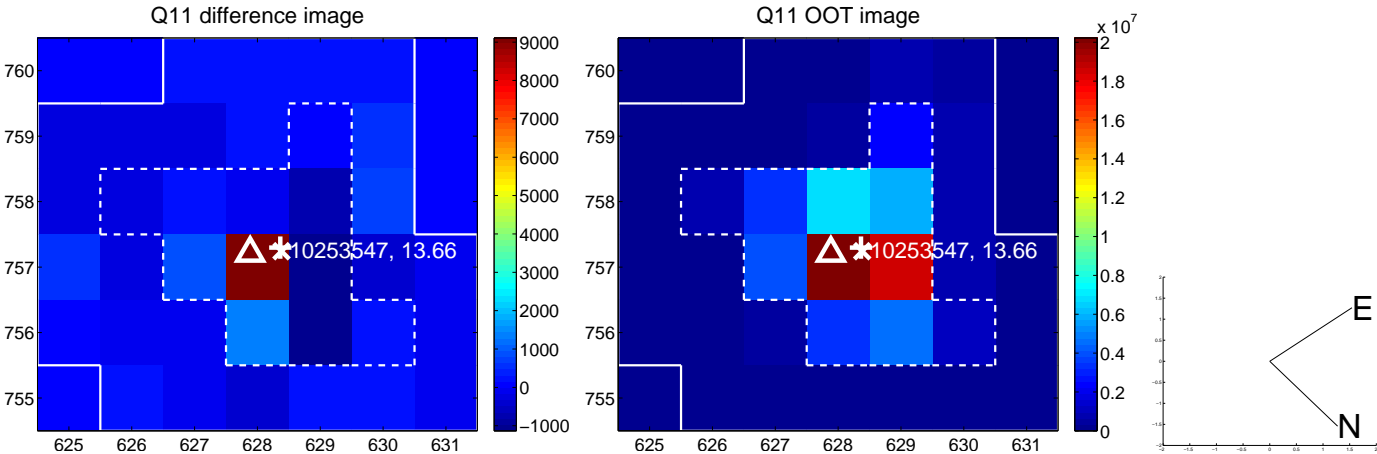
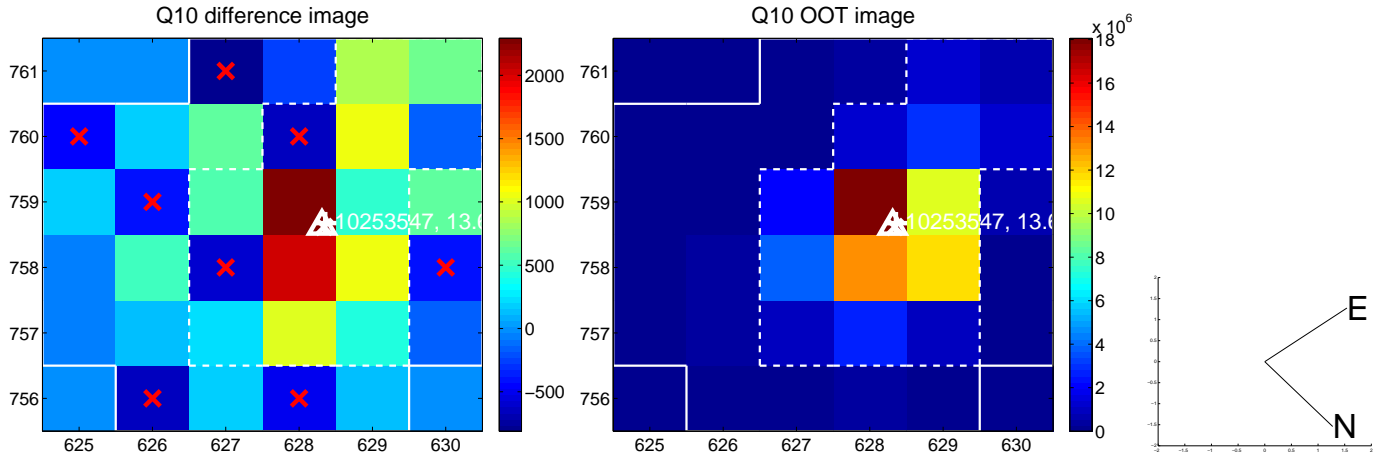
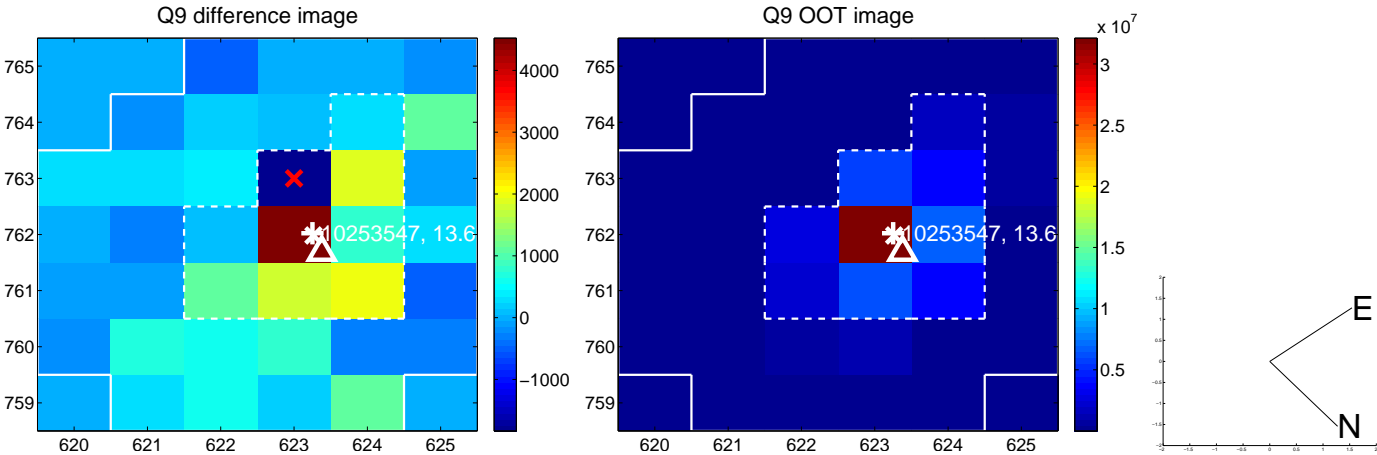




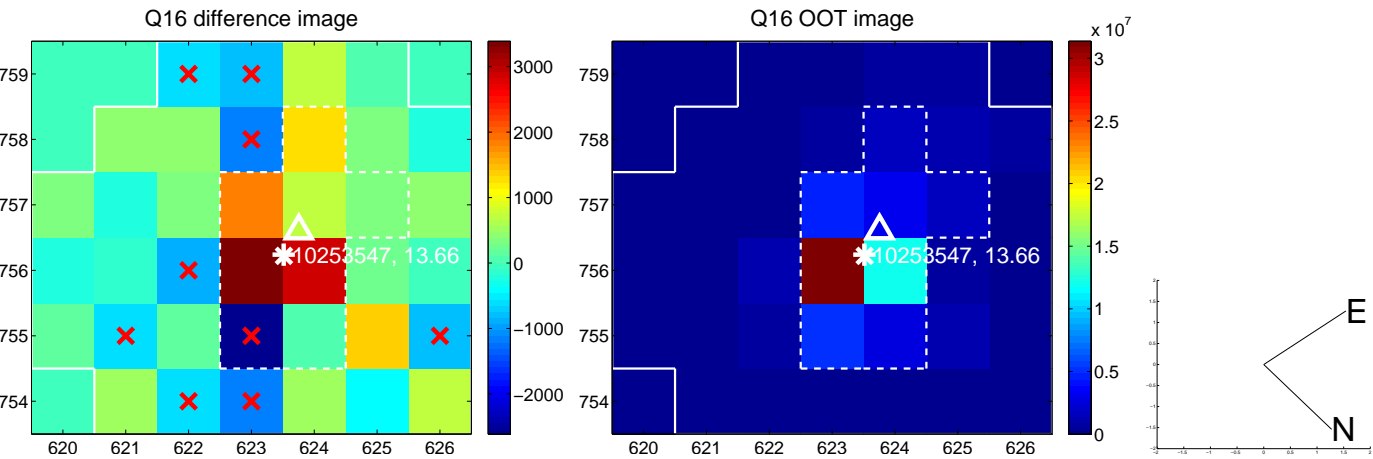
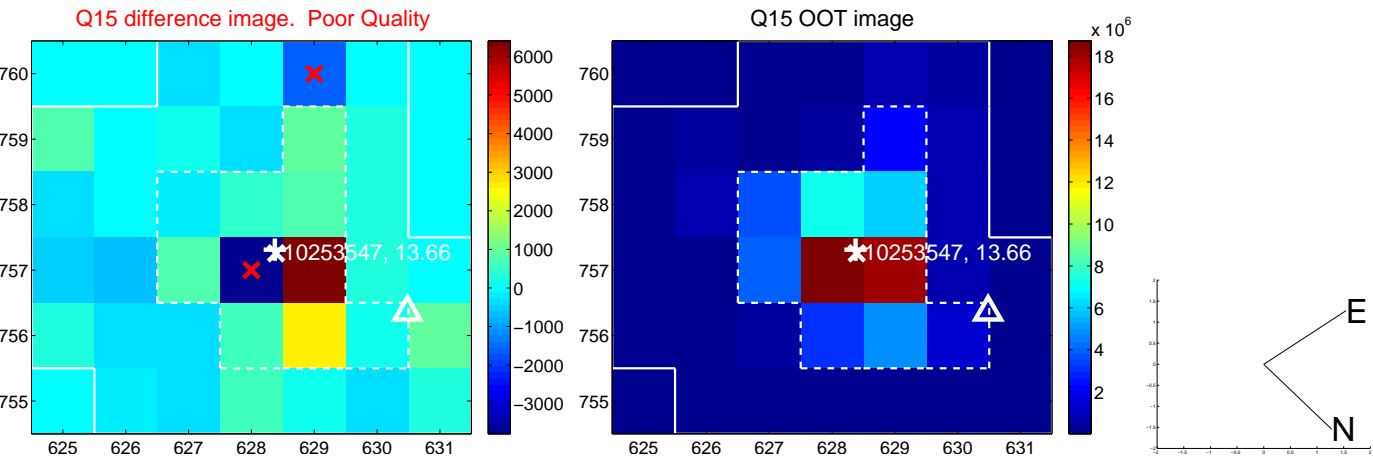
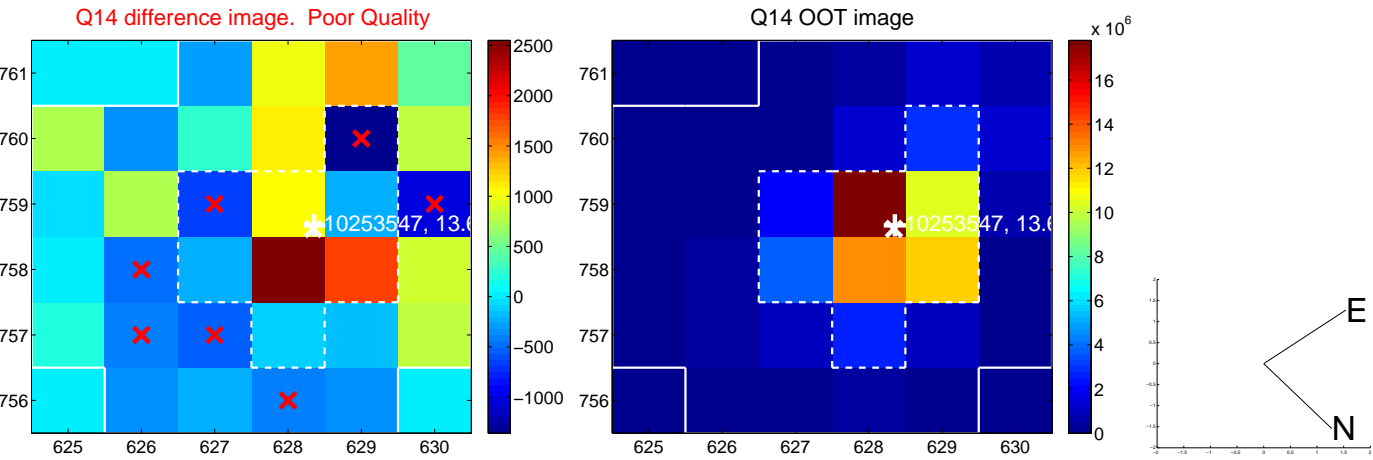
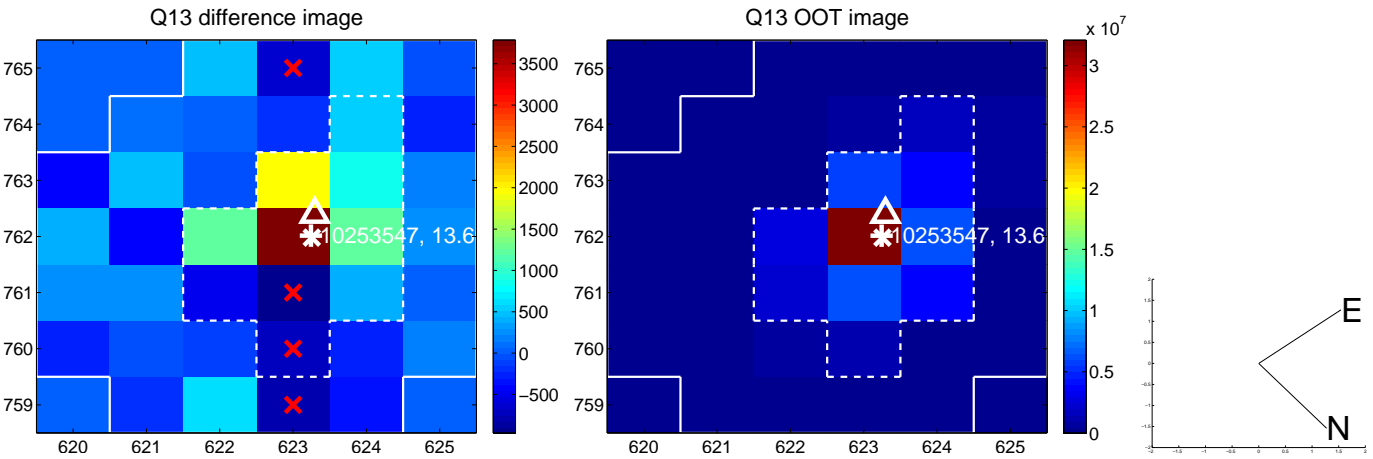
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



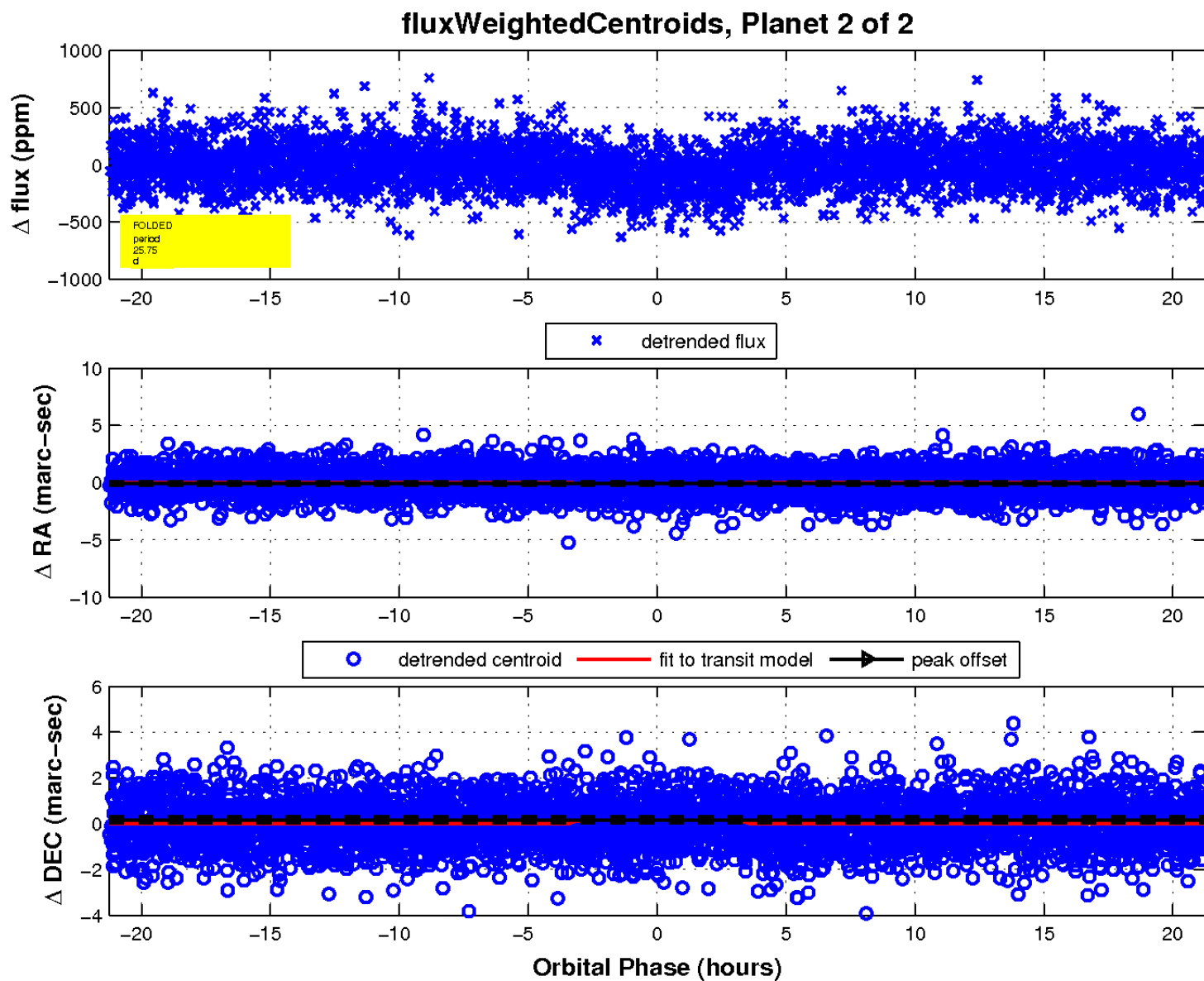
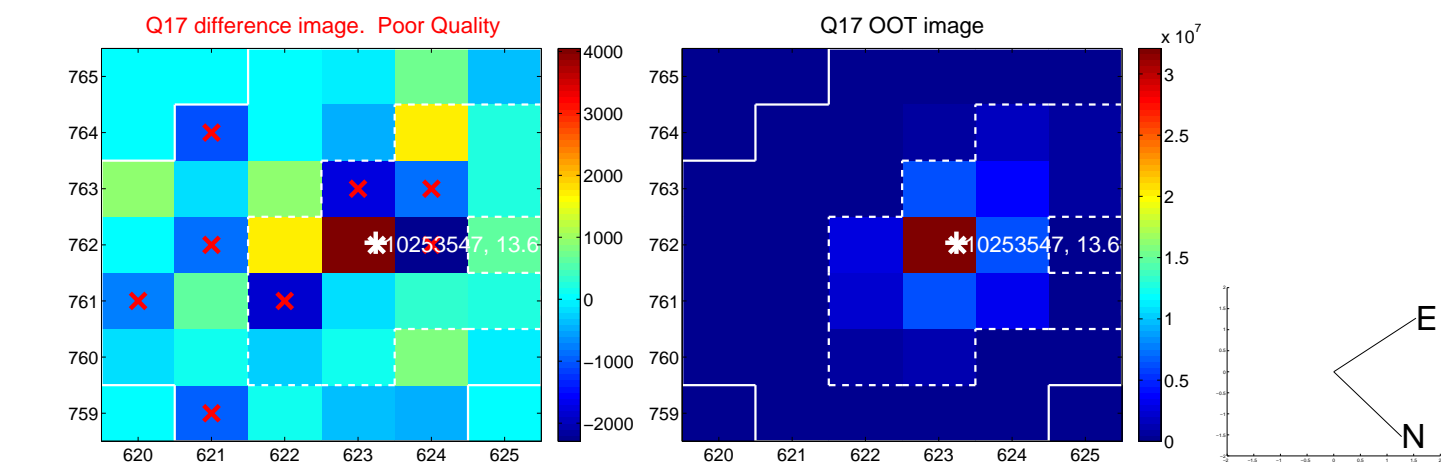
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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.



# UKIRT Image

Declination

