

# KIC 005649956

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
005649956-01	OBS	1540.01	1.207861	132.311517	49051.0	3.490	2296.5	1371.1	0.80	5601	24.66	1329.15
005649956-02	OBS	No	391.641099	169.773739	3665.9	12.701	10.5	5.8	0.80	5601	5.71	0.60

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
005649956-01	OBS	FP	0.00	0	1	0	0	SWEET_EB—DEPTH_ODDEVEN_DV—DEPTH_ODDEVEN_ALT—MOD_ODDEVEN_DV—MOD_ODDEVEN_ALT—DEEP_V_SHAPED
005649956-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES—ALL_TRANS_CHASES—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS

**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.

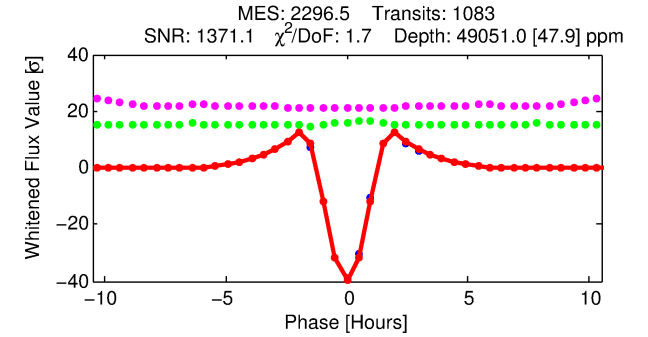
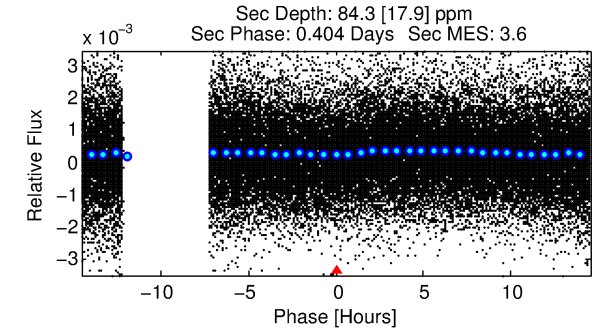
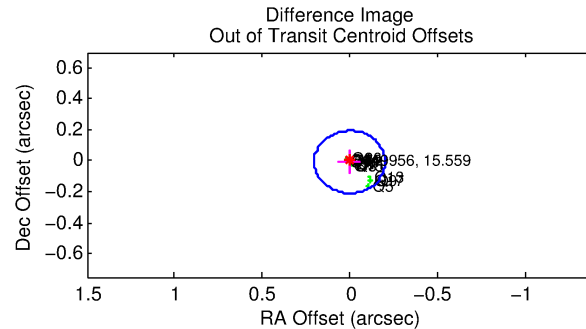
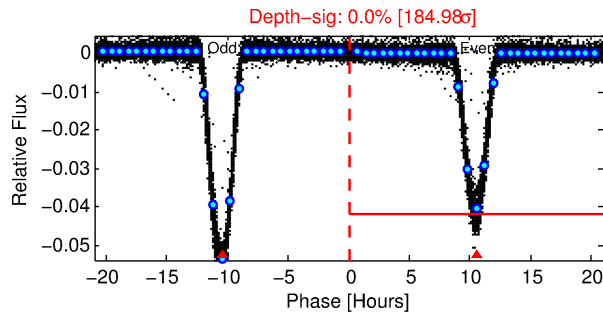
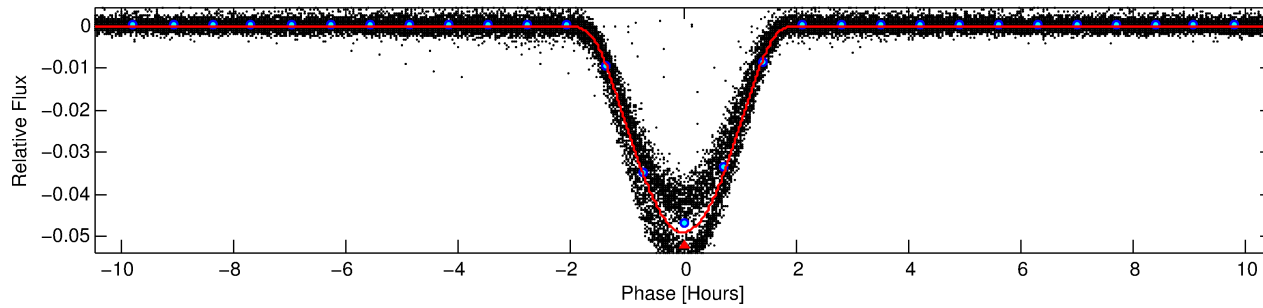
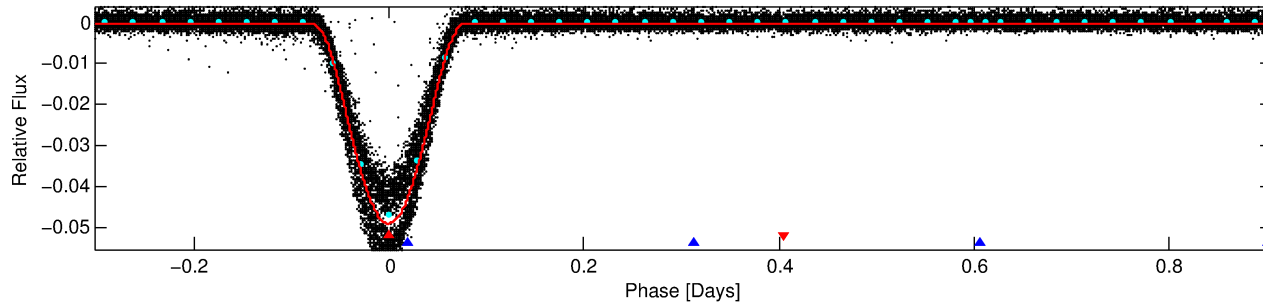
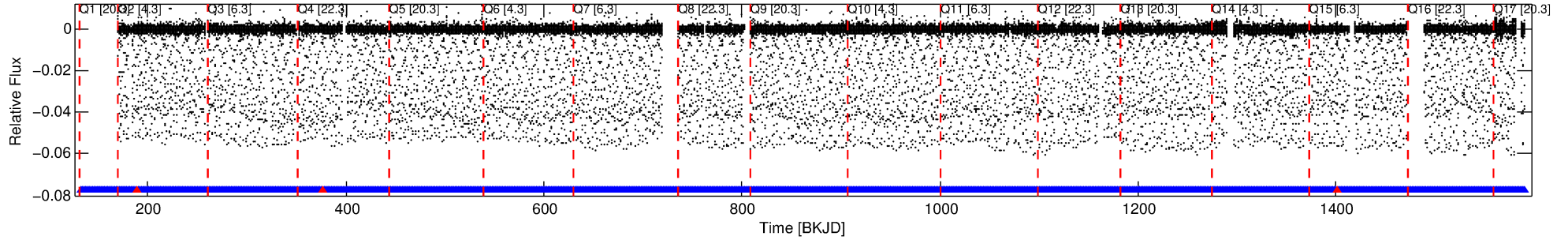
## Ephemeris Match Information For 005649956-01

No Significant Match Found

# DV One-Page Summary

KIC: 5649956 Candidate: 1 of 2 Period: 1.208 d  
KOI: K01540.01 Corr: 0.981

Kp: 15.56 R\*: 0.80 Rs Teff: 5601.0 K Logg: 4.53 Fe/H: -0.440



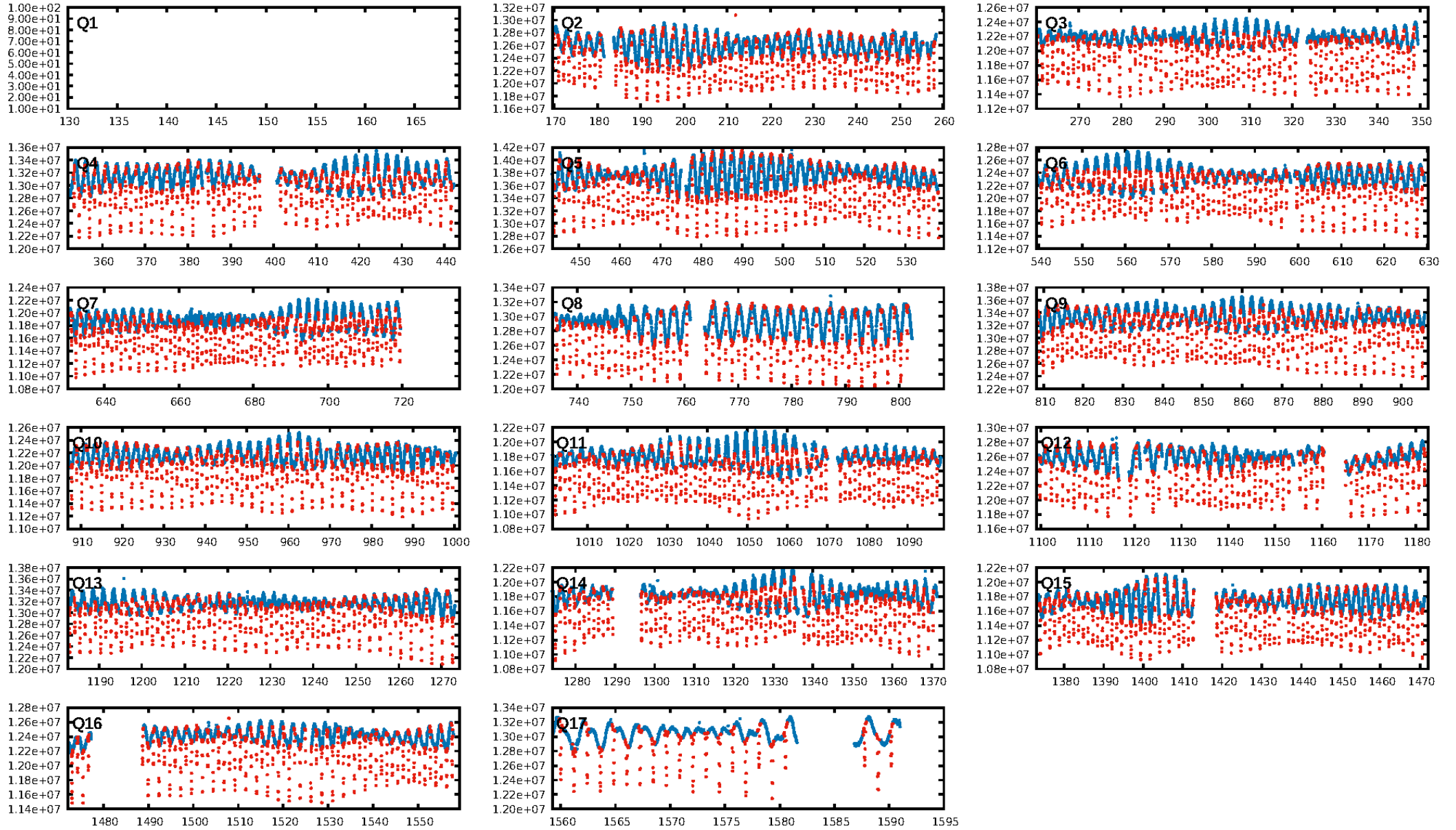
## DV Fit Results:

Period = 1.20786 [0.00000] d  
Epoch = 132.3115 [0.0000] BKJD  
Rp/R\* = 0.2835 [0.0044]  
a/R\* = 2.64 [0.00]  
b = 0.90 [0.01]  
Seff = 1329.15 [369.90]  
Teff = 1540 [107] K  
Rp = 24.66 [5.24] Re  
a = 0.0205 [0.0036] AU  
Ag = 0.03 [0.01] [-92.60σ]  
Teffp = 1008 [64] K [-4.27σ]

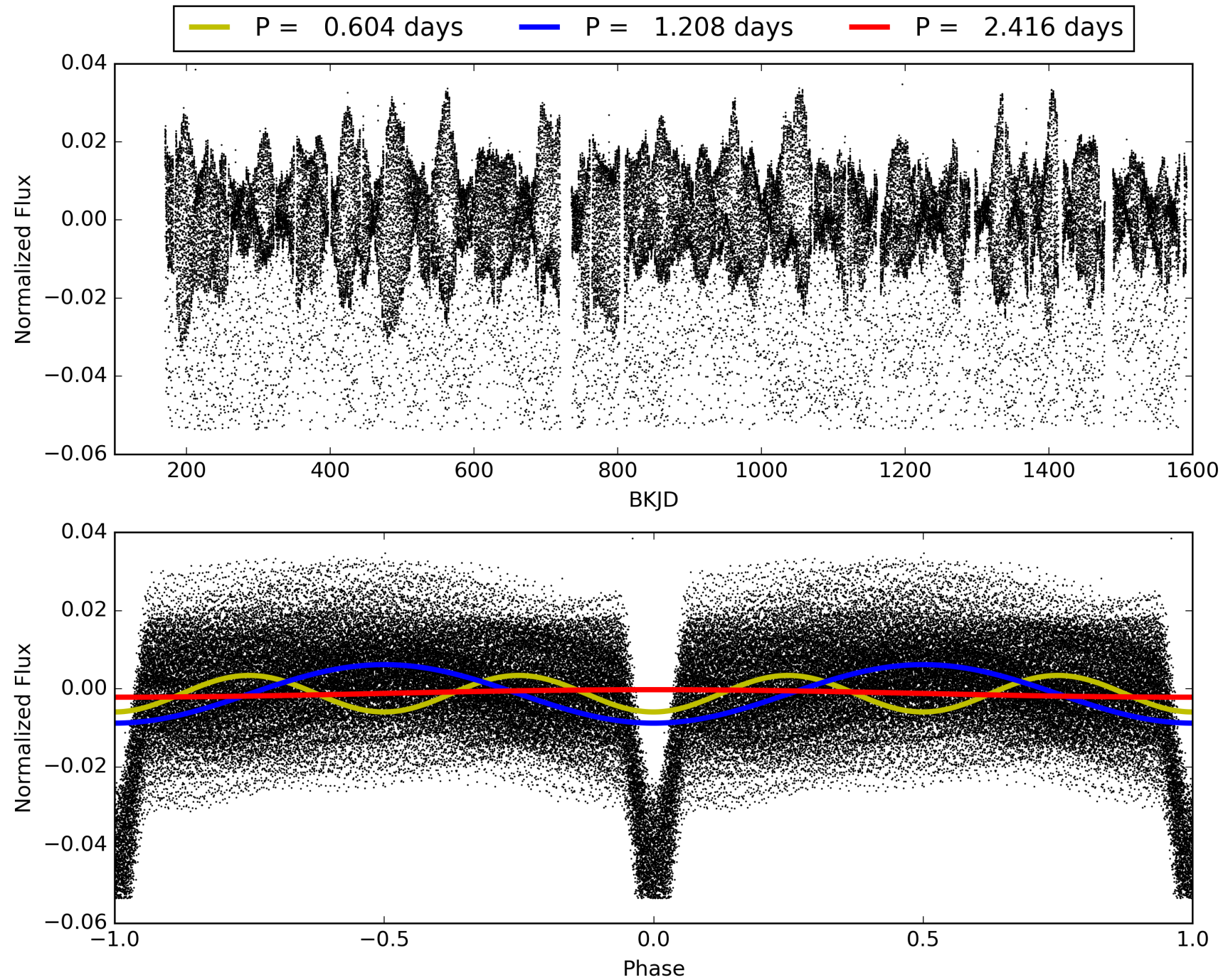
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [711.39σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [1059/1062]  
GhostDiagnostic-chr: 1.481  
Centroid-sig: 0.0%  
Centroid-so: 0.542 arcsec [136.85σ]  
OotOffset-rm: 0.009 arcsec [0.13σ]  
KicOffset-rm: 0.102 arcsec [1.52σ]  
OotOffset-st: 4/4/4/4 [16]  
KicOffset-st: 4/4/4/4 [16]  
DiffImageQuality-fgm: 1.00 [16/16]  
DiffImageOverlap-fno: 1.00 [16/16]

# TCE 005649956-01, PDC Light Curves

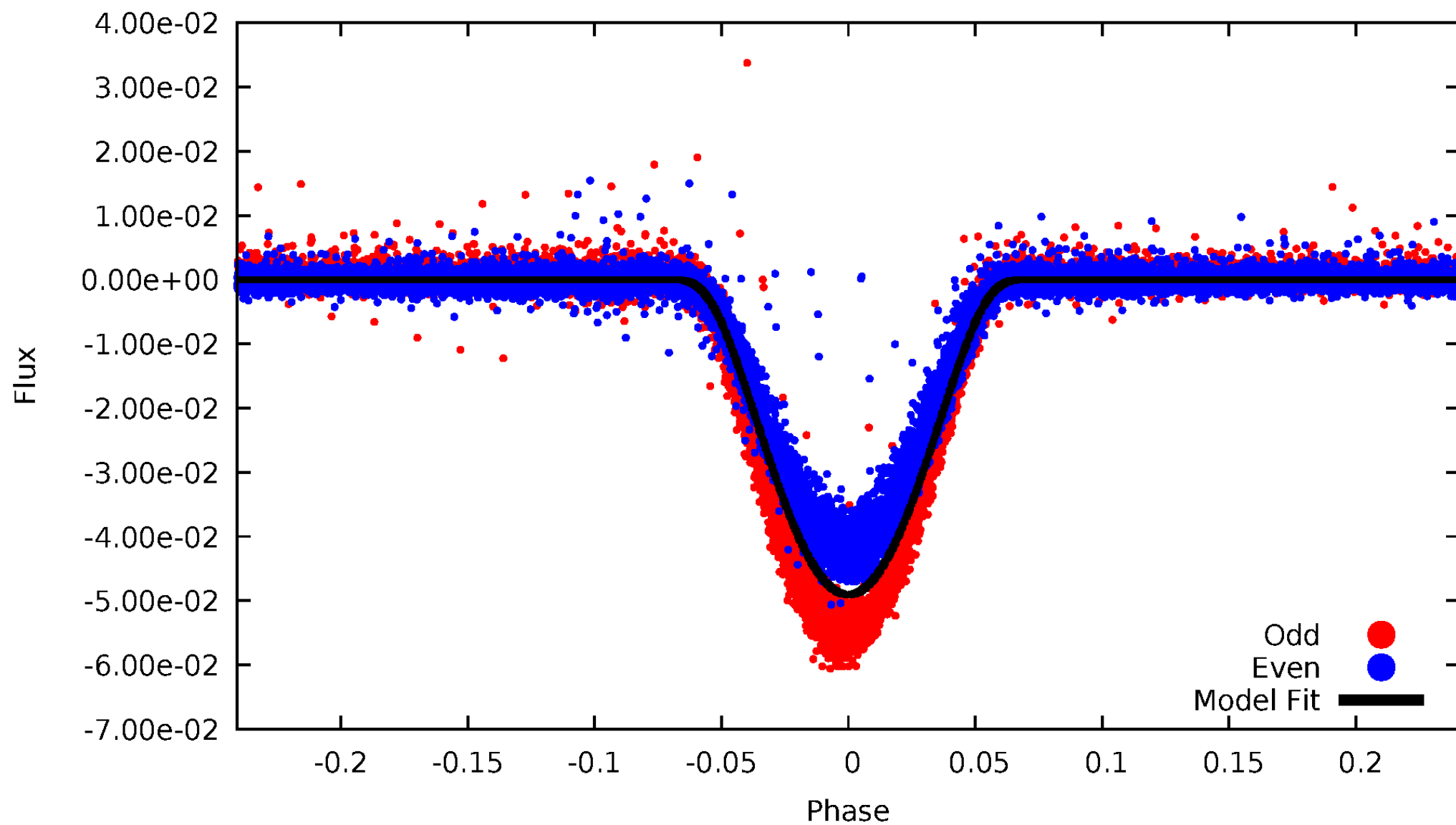


TCE 005649956-01



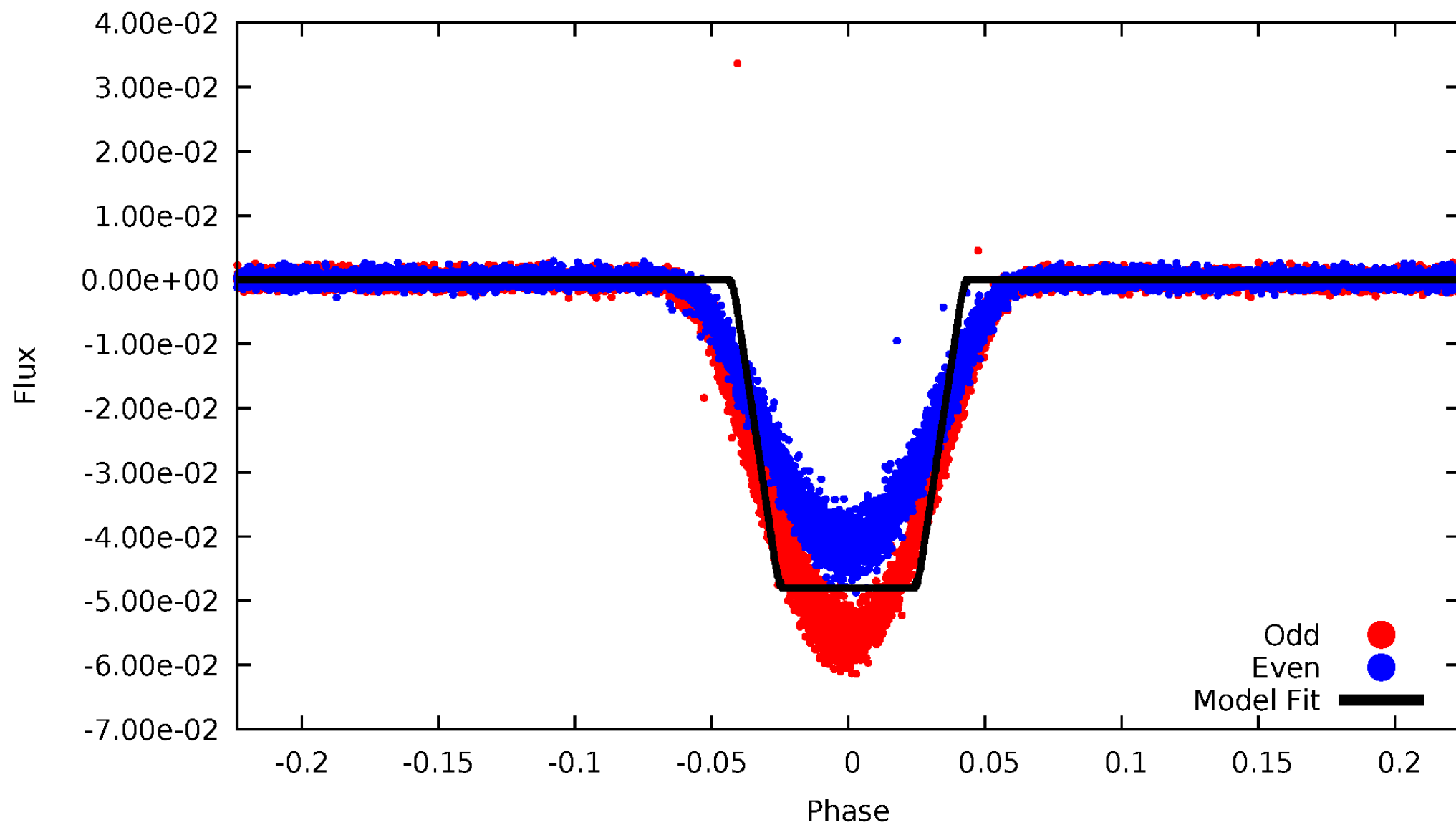
# DV Odd/Even

TCE 005649956-01



# ALT Odd/Even

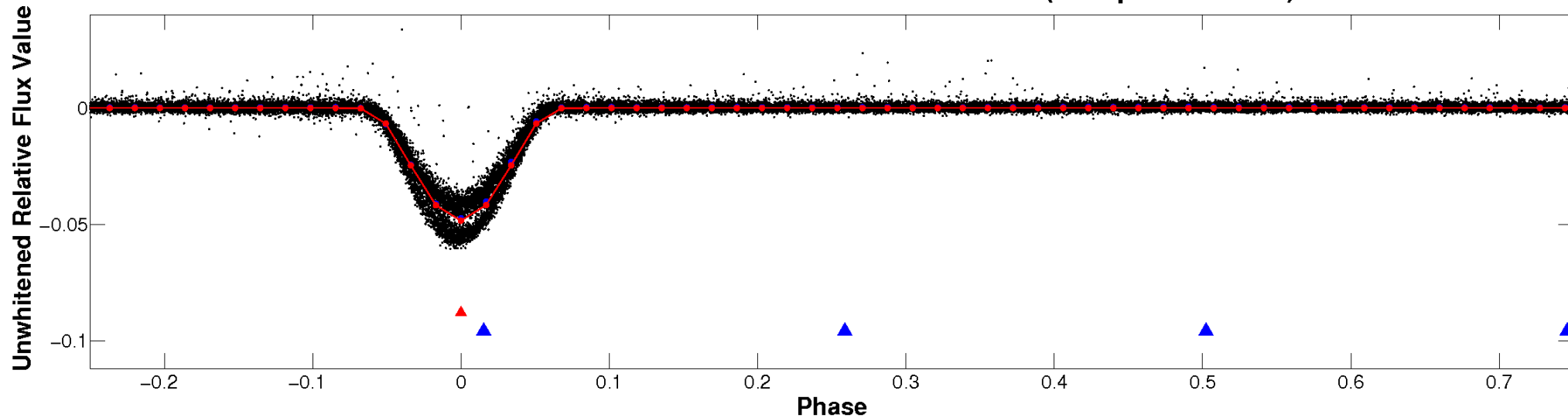
TCE 005649956-01



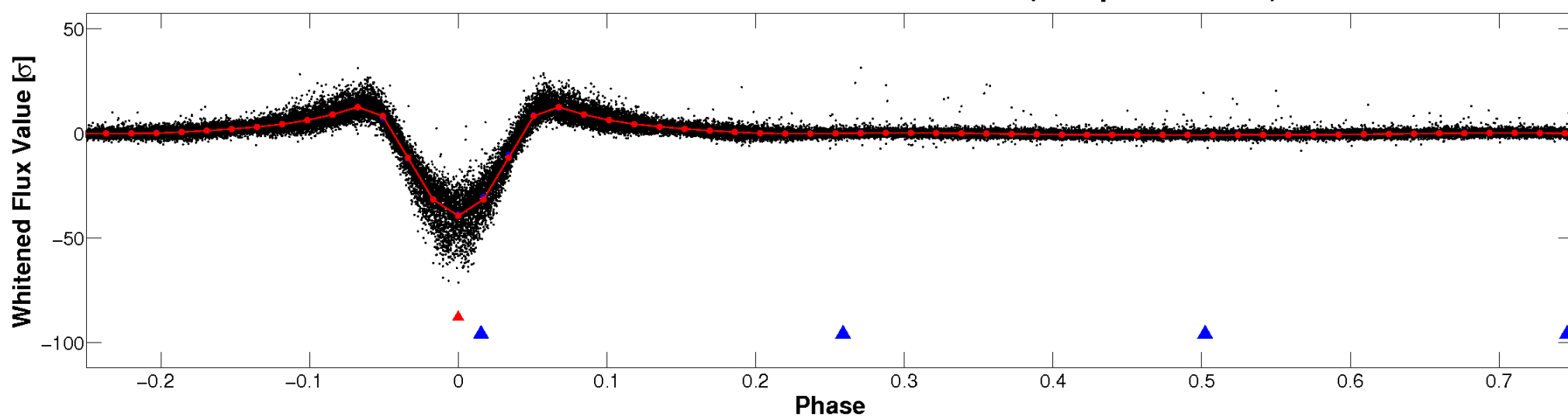


# Non-Whitened Vs. Whitened Light Curve

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

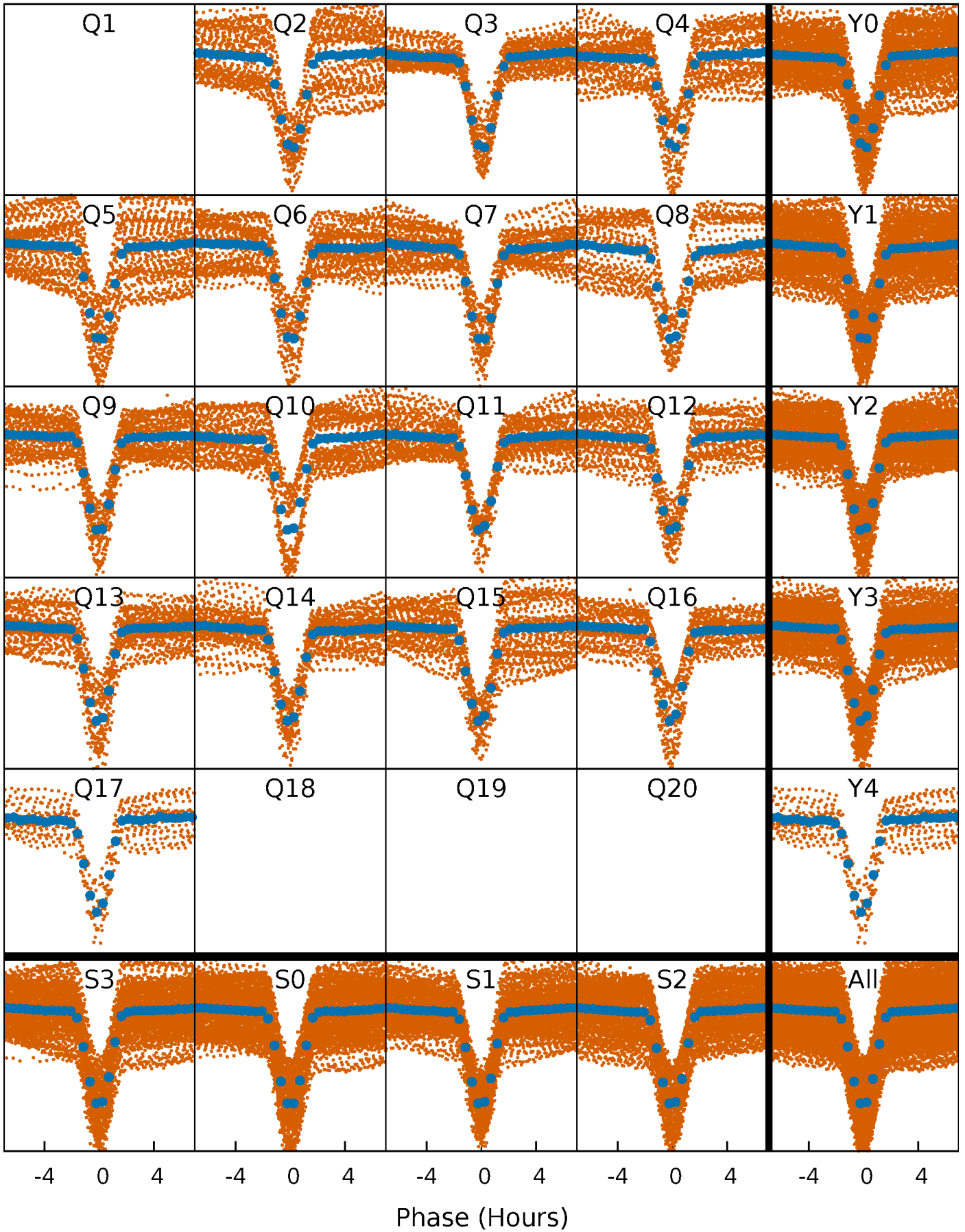


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

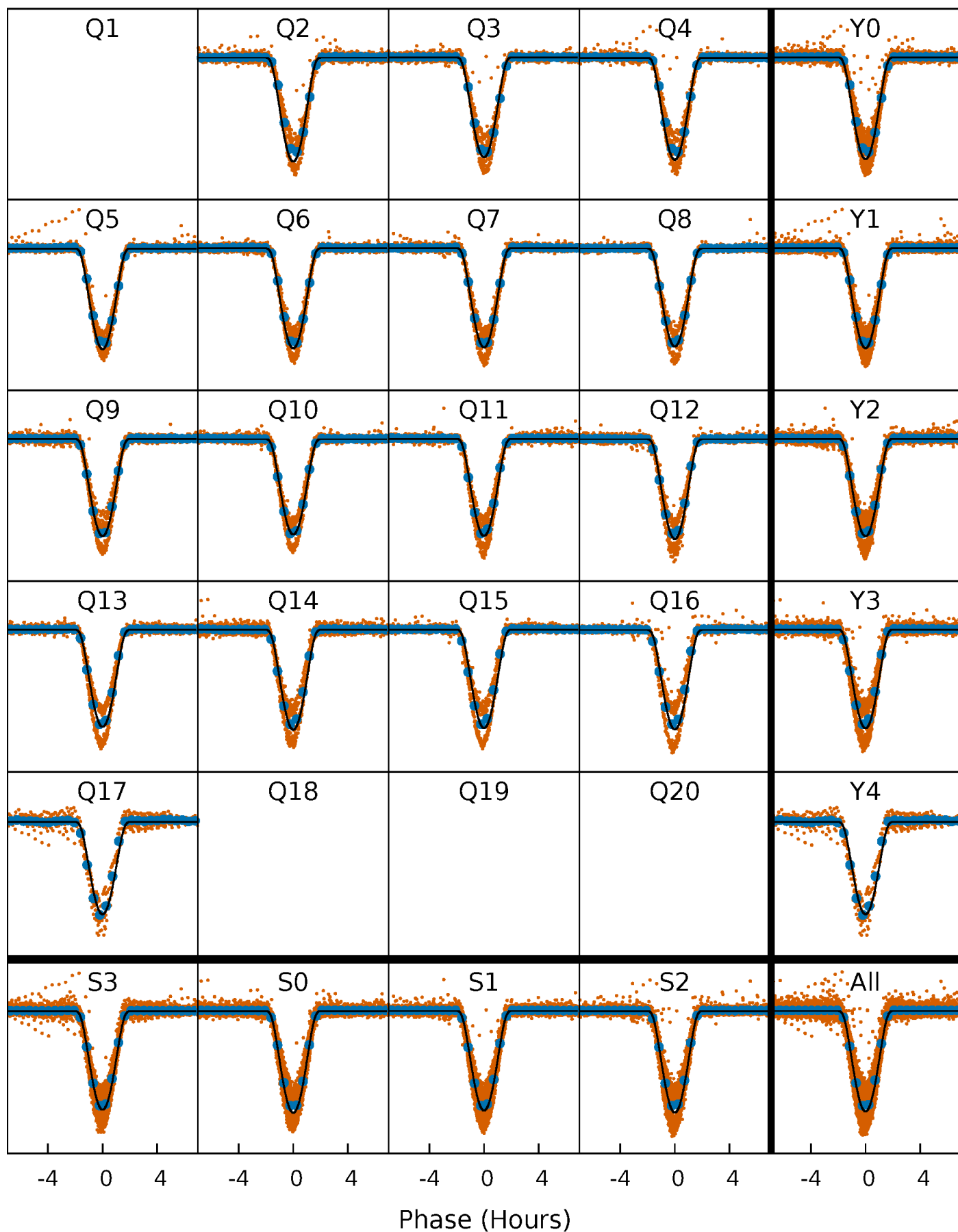
TCE 005649956-01 P= 1.207861 Days  $T_0=132.311517$  (BKJD)





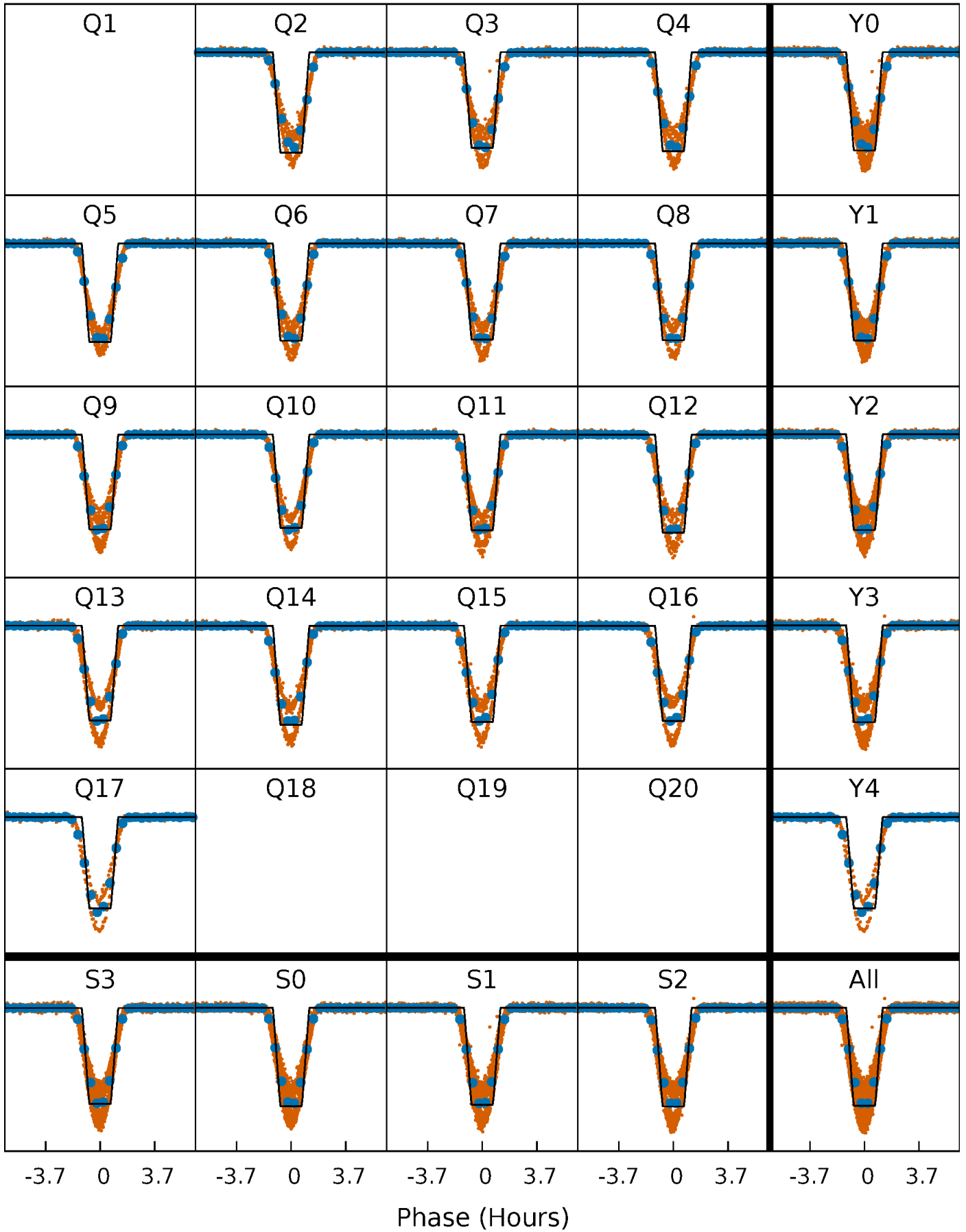
# DV Quarter-Phased Transit Curves

TCE 005649956-01 P= 1.207861 Days  $T_0=132.311517$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

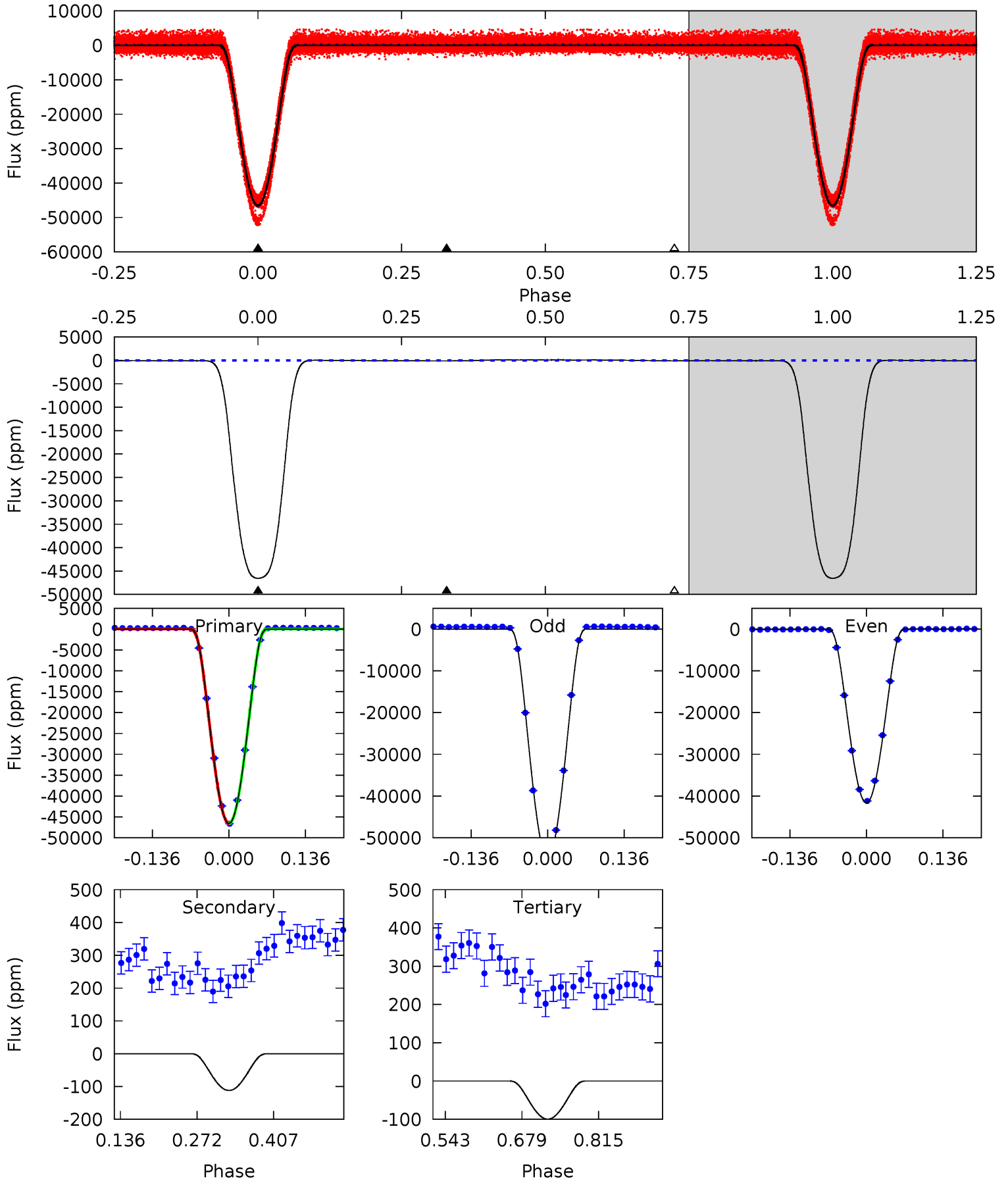
TCE 005649956-01   P= 1.207858 Days    $T_0=132.312599$  (BKJD)



# DV Model-Shift Uniqueness Test

005649956-01, P = 1.207861 Days, E = 132.311517 Days

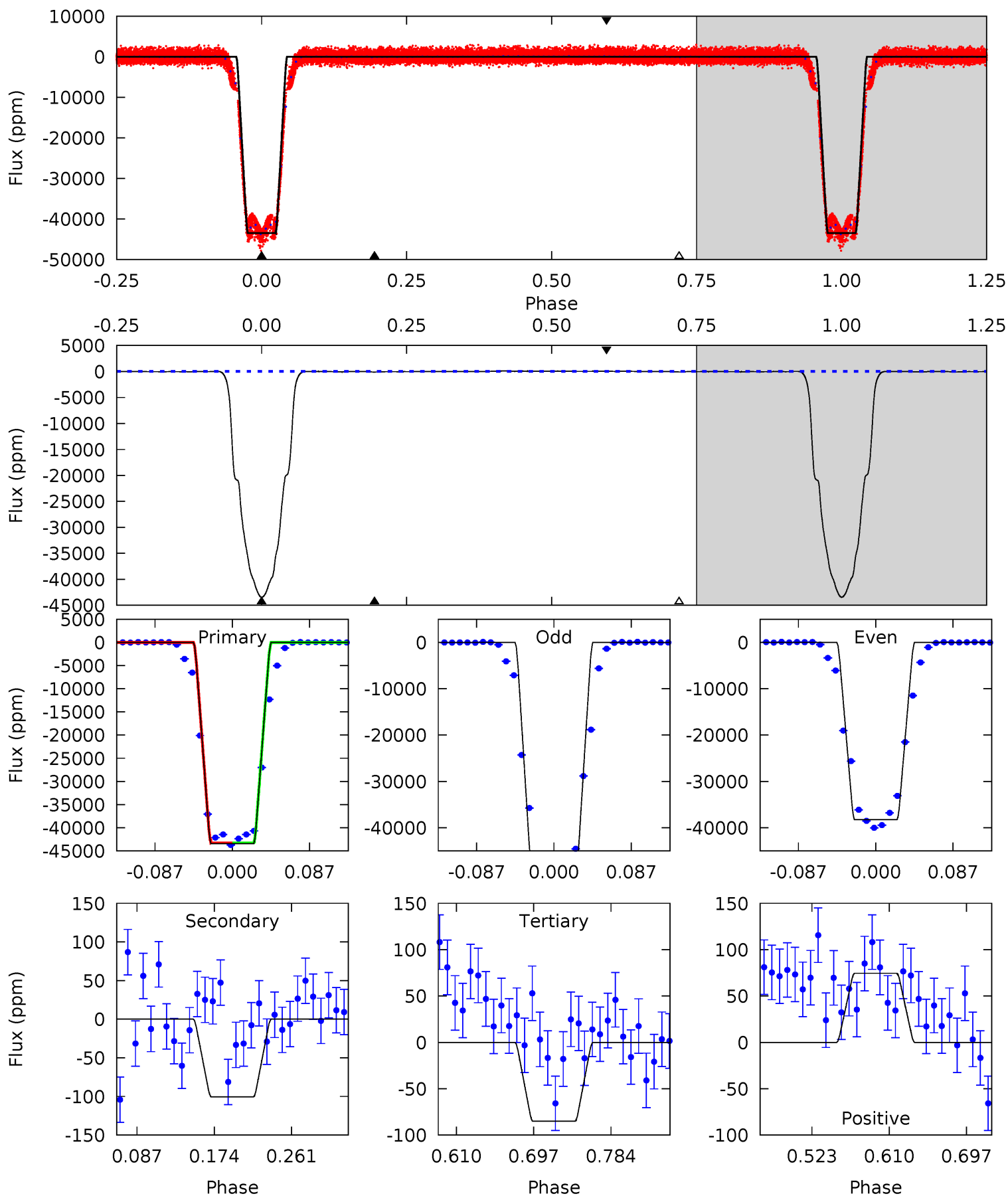
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
3314	7.98	7.09	0	4.50	1.49	5.13	3306	3314	0.90	7.98	547.9	1.00	0.00	0



# Alt Model-Shift Uniqueness Test

005649956-01, P = 1.207858 Days, E = 132.312599 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
2479	5.73	4.85	4.25	4.59	1.71	2.31	2475	2475	0.88	1.48	512.5	1.00	0.00	0



### Stellar Parameters For KIC 005649956

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5601^{+186}_{-169}$	$4.533^{+0.070}_{-0.130}$	$-0.440^{+0.300}_{-0.300}$	$0.797^{+0.169}_{-0.085}$	$0.791^{+0.097}_{-0.062}$	$2.199^{+0.675}_{-0.864}$
	+3%/-3%	+2%/-3%	+68%/-68%	+21%/-11%	+12%/-8%	+31%/-39%
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 005649956-01 / KOI 1540.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-112 \pm 14$	$24.79^{+3.01}_{-1.47}$	$2172^{+119}_{-99}$	$-2547^{+65}_{-80}$	$0.041^{+0.008}_{-0.008}$
Alt.	$-100 \pm 18$	$19.29^{+2.02}_{-1.29}$	$2167^{+119}_{-95}$	$-2519^{+66}_{-79}$	$0.061^{+0.015}_{-0.014}$

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

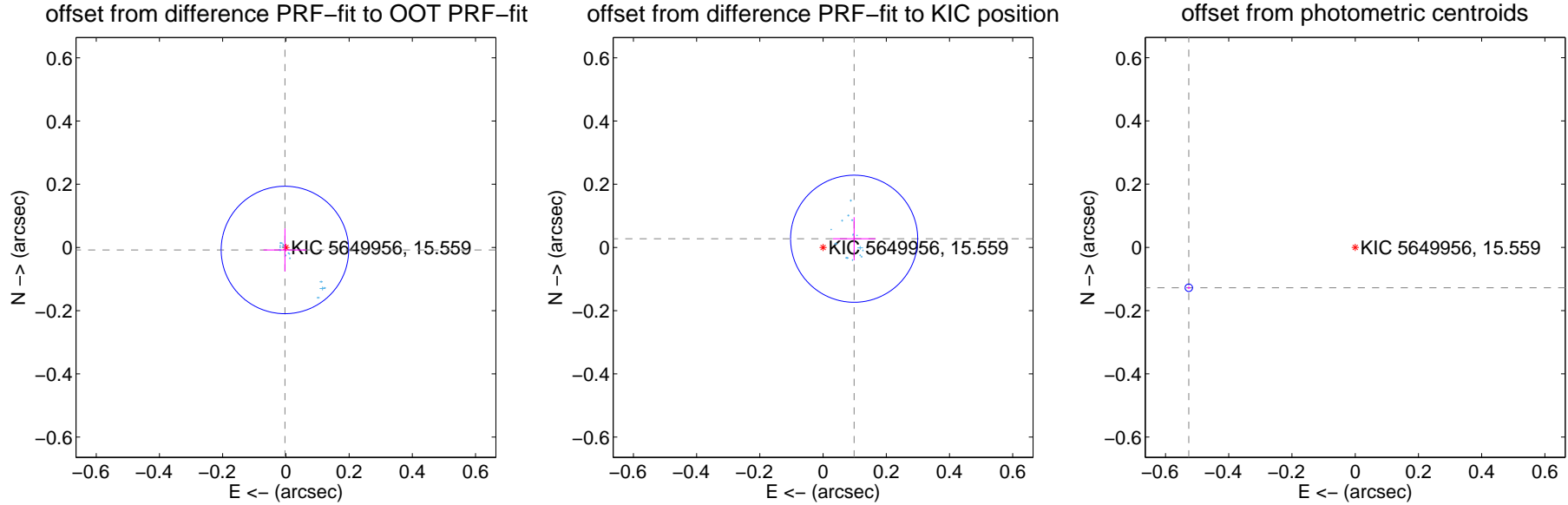
## DV Centroid Data

Supplemental centroid analysis for 005649956-01. Kepler magnitude: 15.56. Transit SNR 1371.05

There are 16 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.13 arcsec

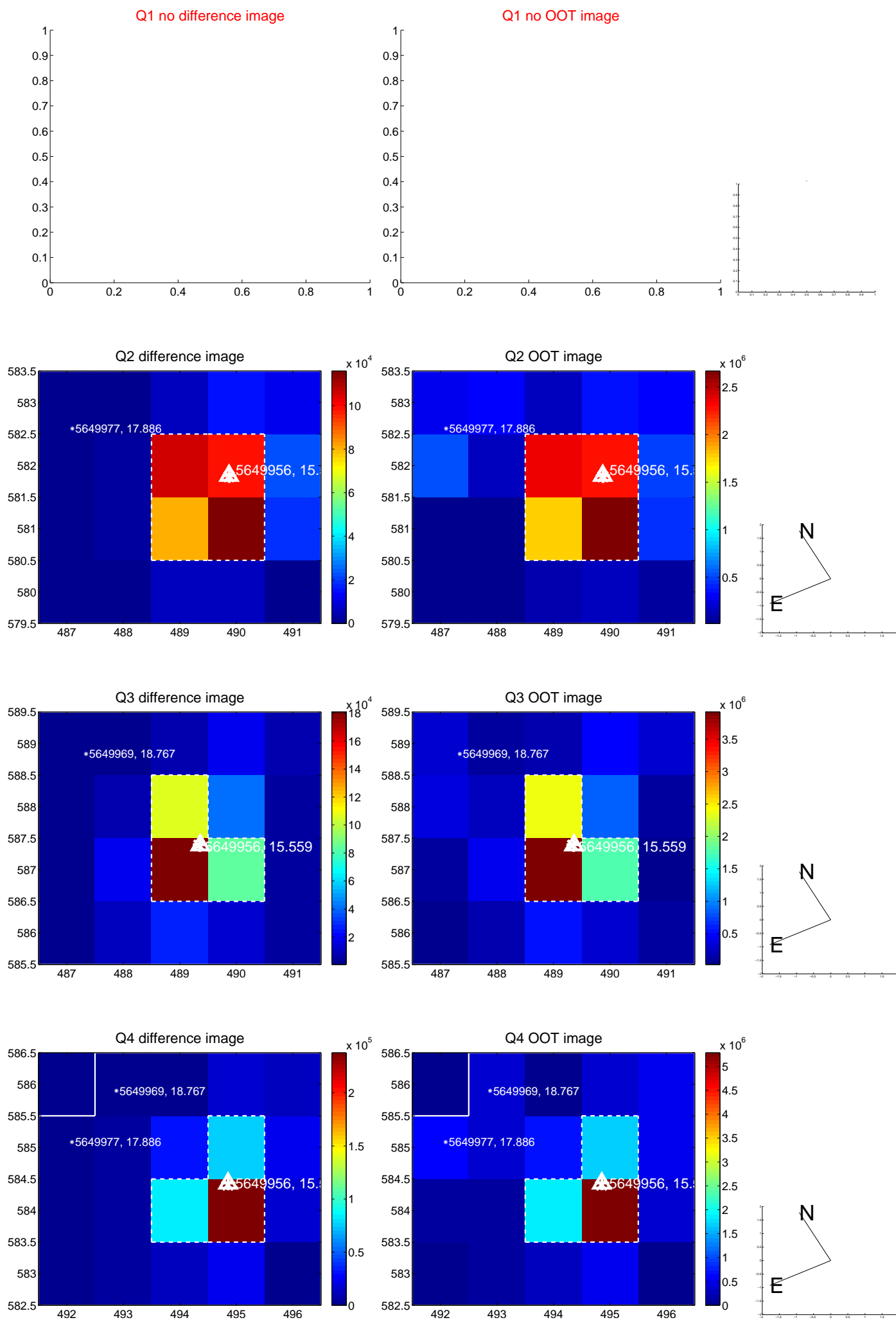
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.009 \pm 0.067$	0.13	$0.003 \pm 0.068$	$-0.008 \pm 0.068$
PRF-fit source offset from KIC position	$0.102 \pm 0.067$	1.52	$-0.098 \pm 0.067$	$0.028 \pm 0.068$
photometric centroid source offset	$0.54 \pm 0.00$	136.85	$0.53 \pm 0.00$	$-0.13 \pm 0.00$



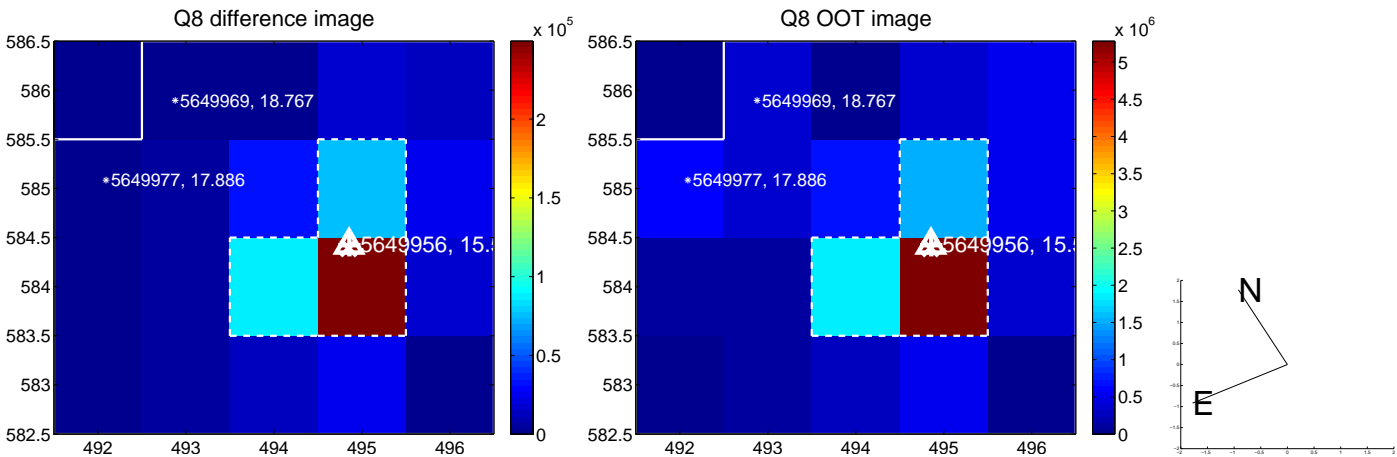
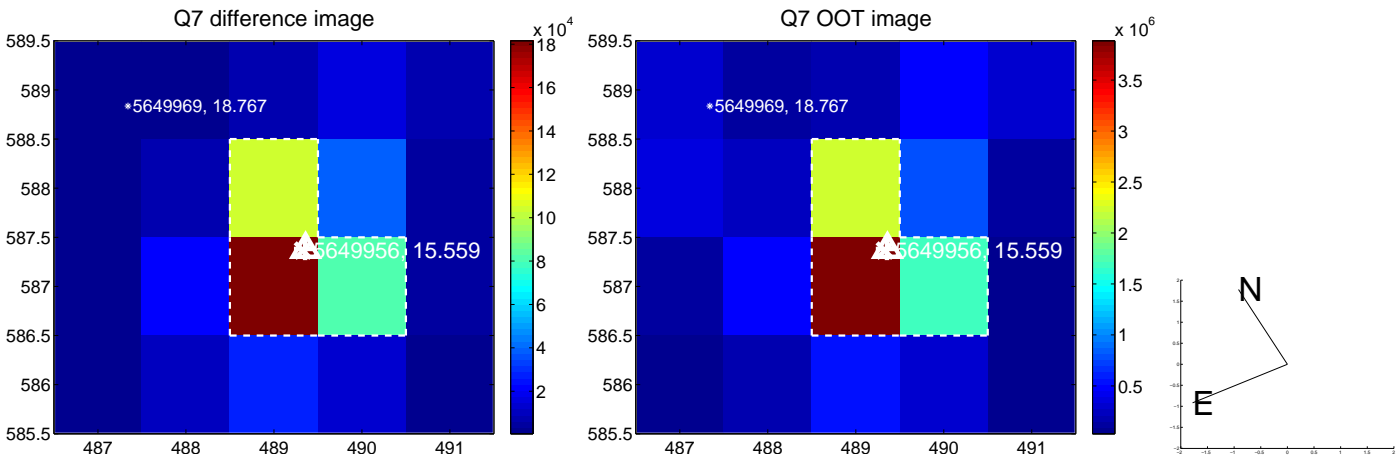
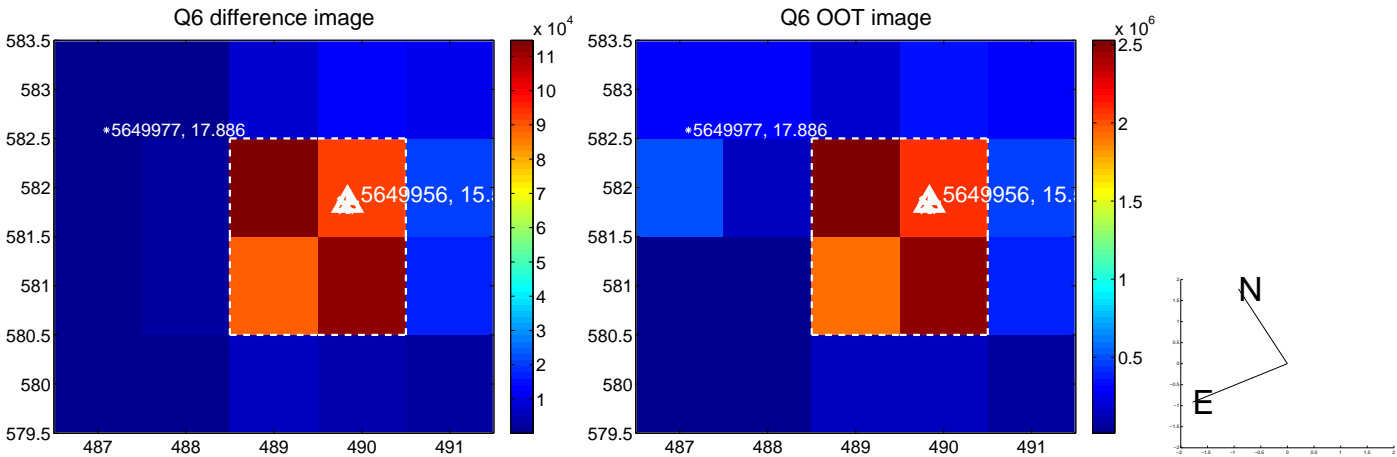
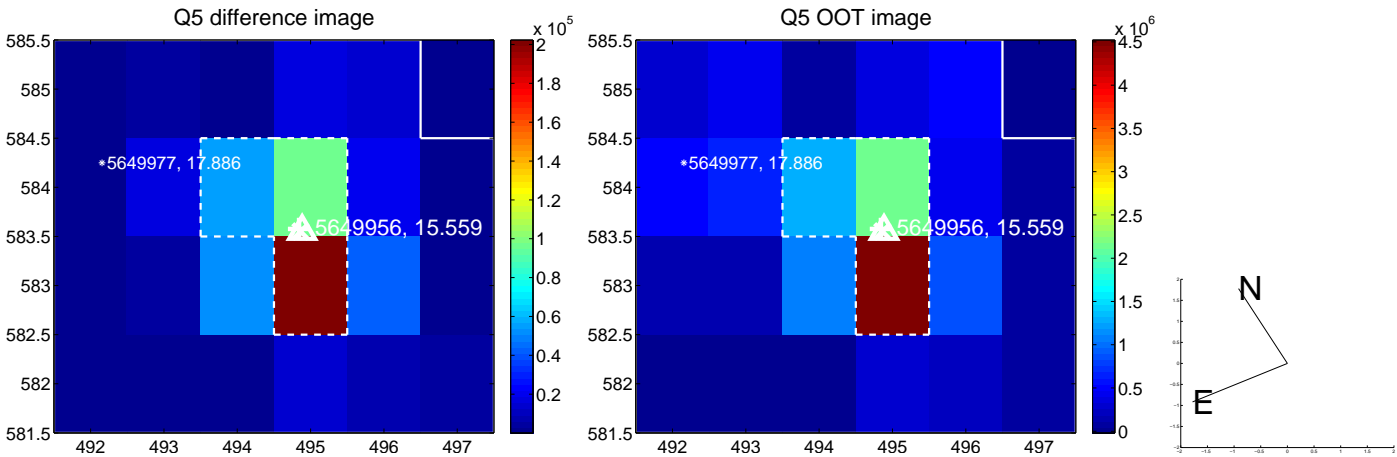
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets**; **Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



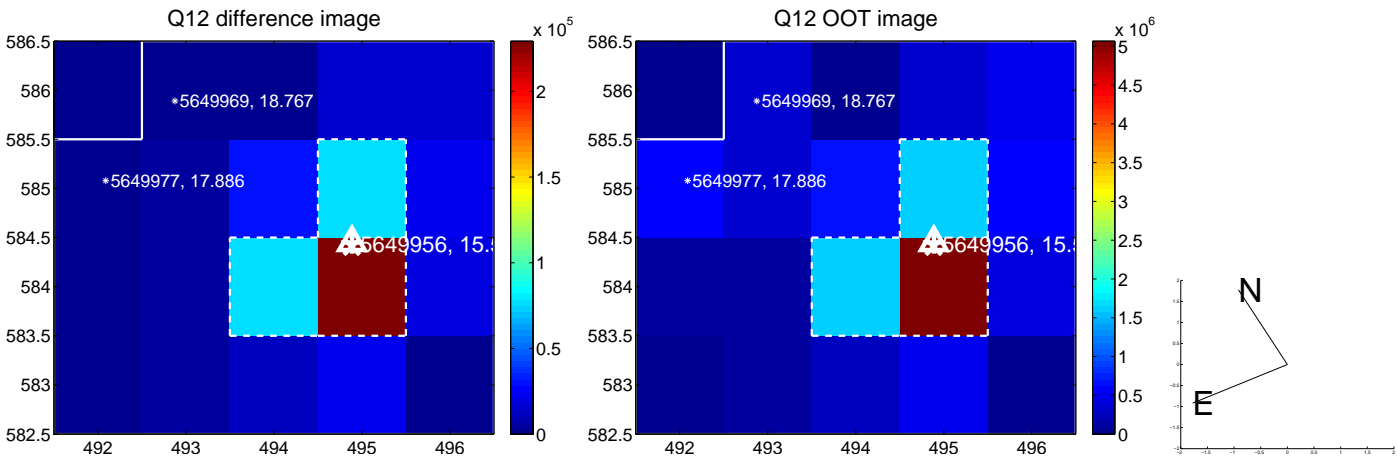
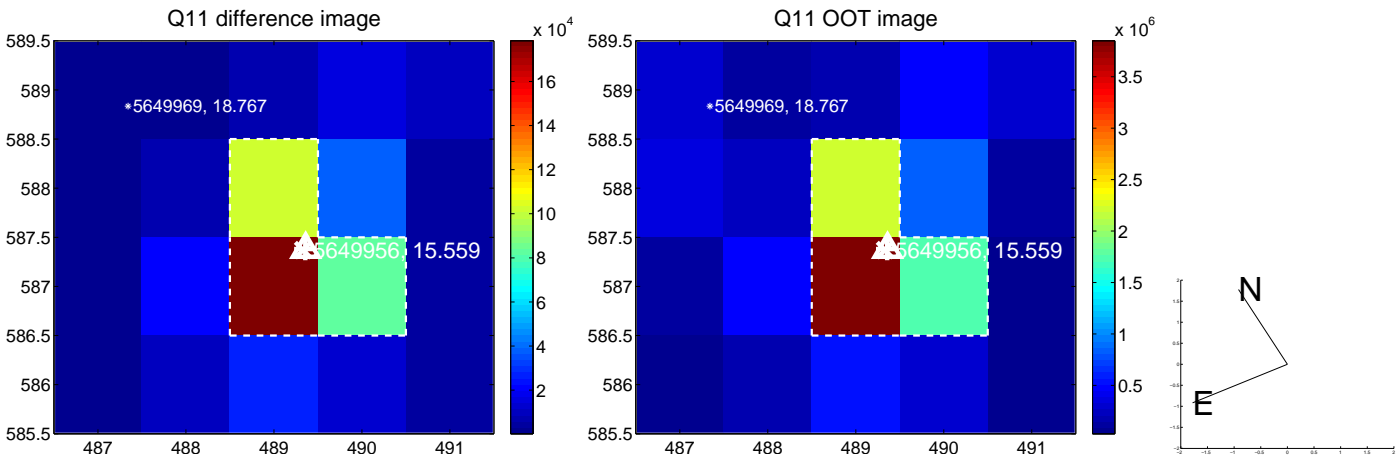
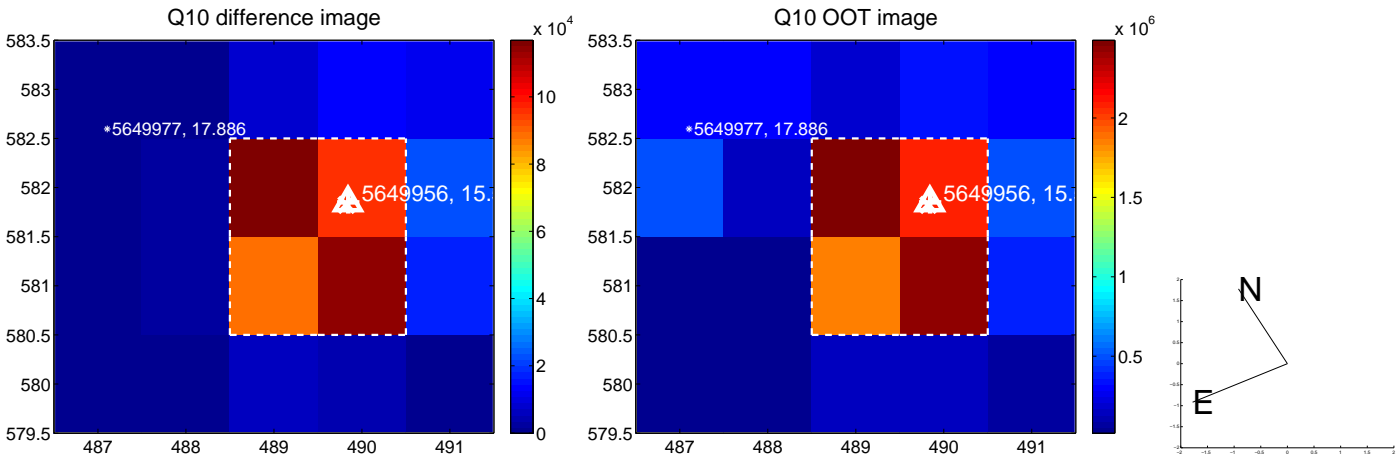
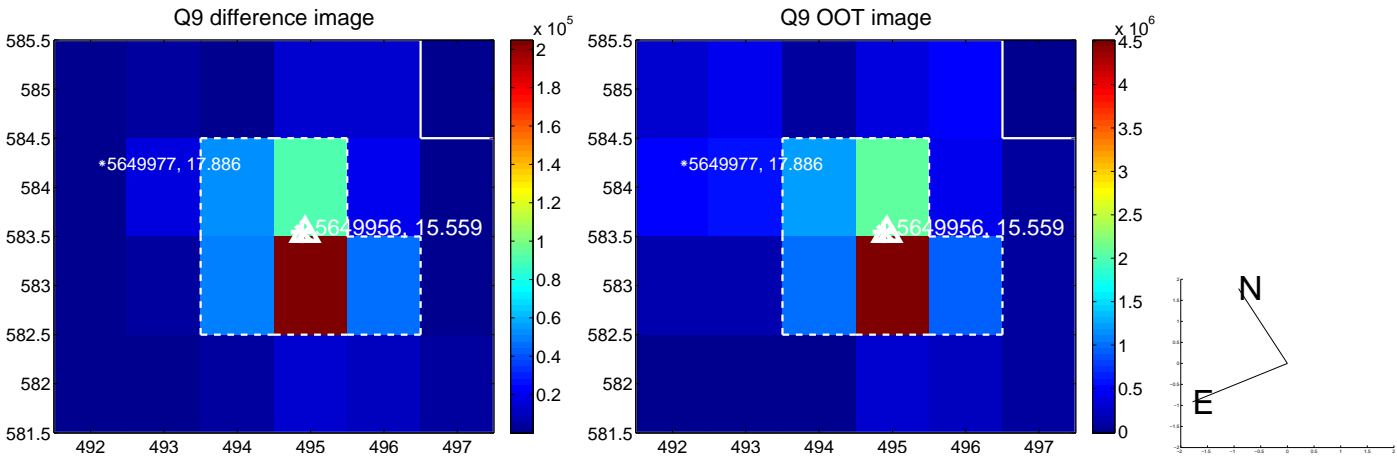
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value



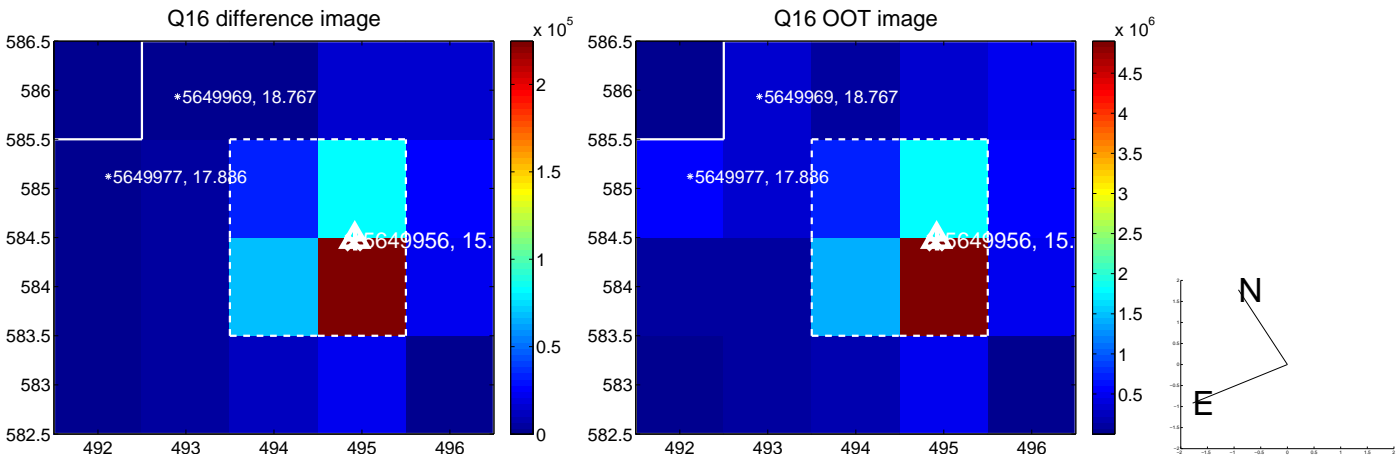
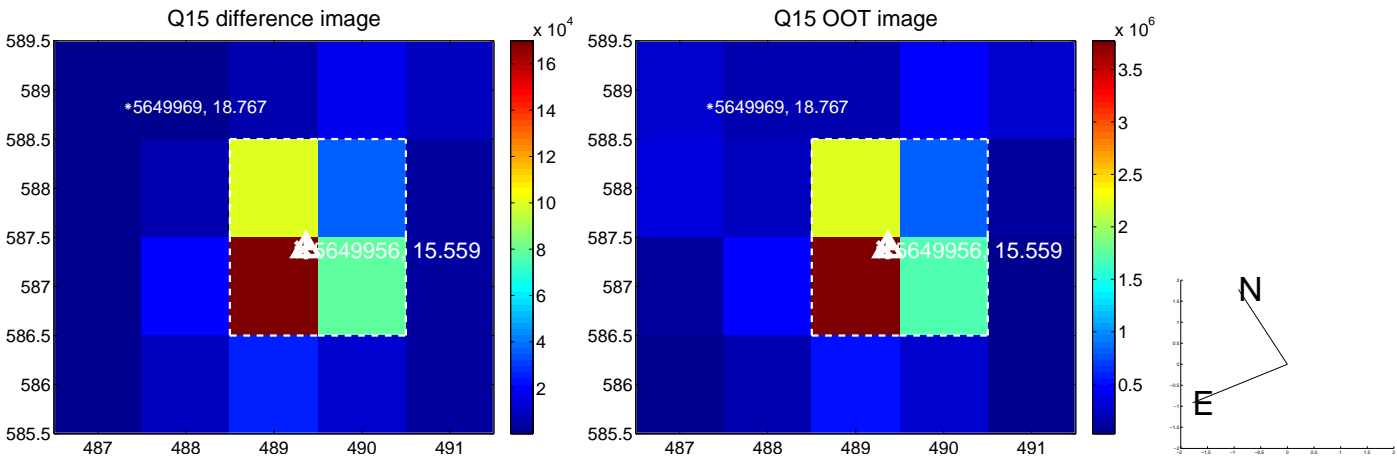
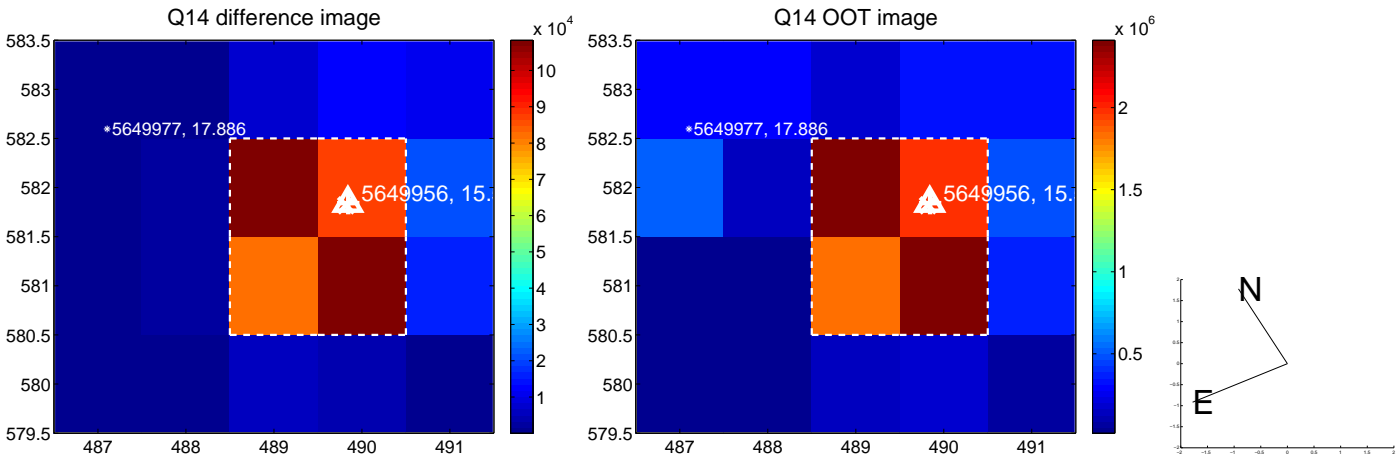
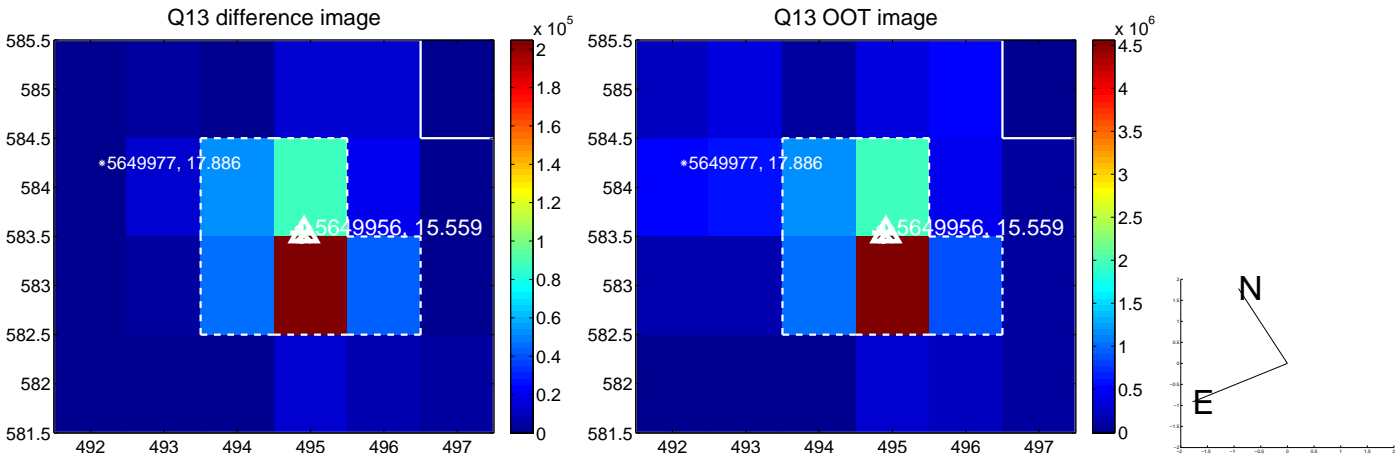
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



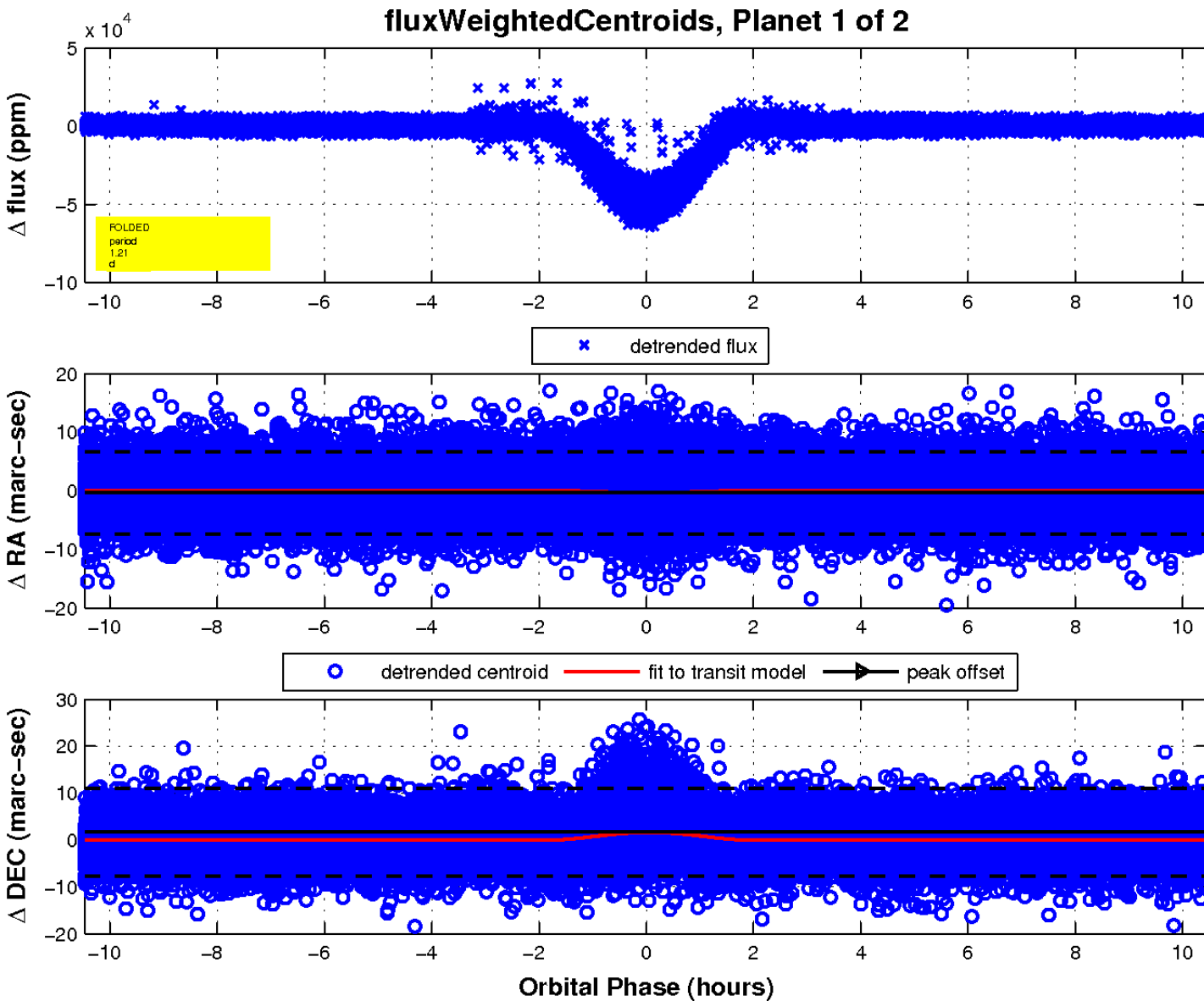
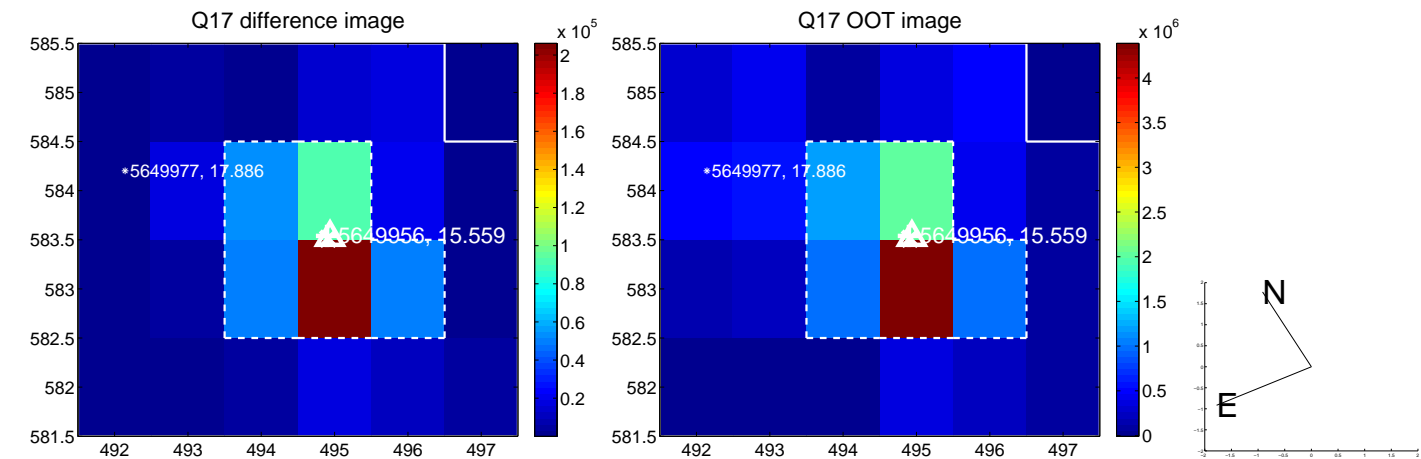
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

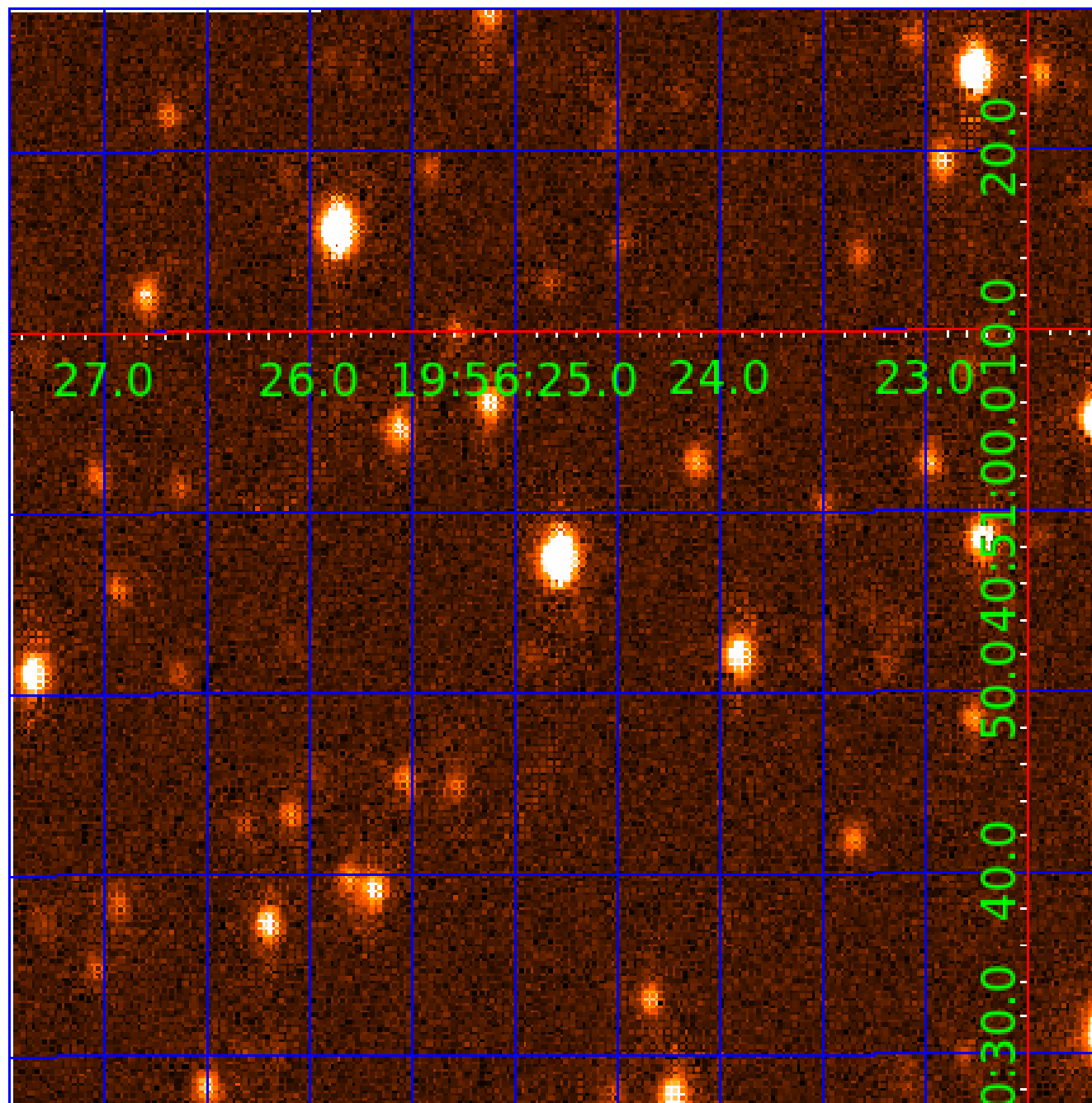


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 005649956

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
005649956-01	OBS	1540.01	1.207861	132.311517	49051.0	3.490	2296.5	1371.1	0.80	5601	24.66	1329.15
005649956-02	OBS	No	391.641099	169.773739	3665.9	12.701	10.5	5.8	0.80	5601	5.71	0.60

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
005649956-01	OBS	FP	0.00	0	1	0	0	SWEET_EB—DEPTH_ODDEVEN_DV—DEPTH_ODDEVEN_ALT—MOD_ODDEVEN_DV—MOD_ODDEVEN_ALT—DEEP_V_SHAPED
005649956-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES—ALL_TRANS_CHASES—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS

**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.

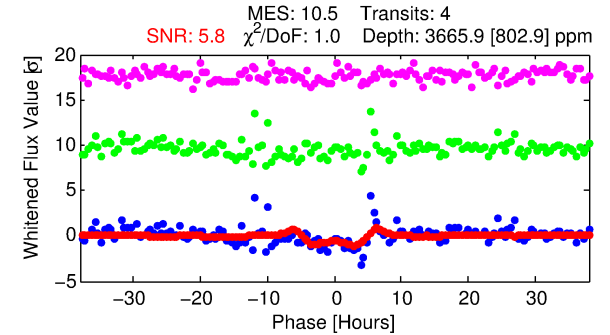
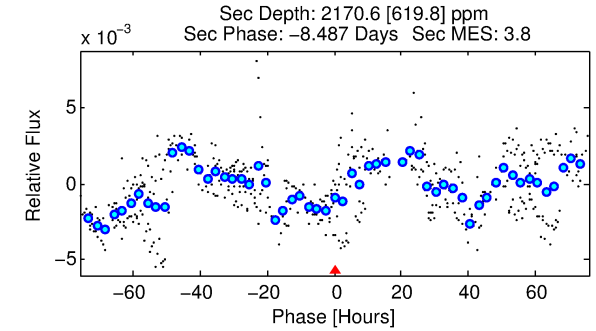
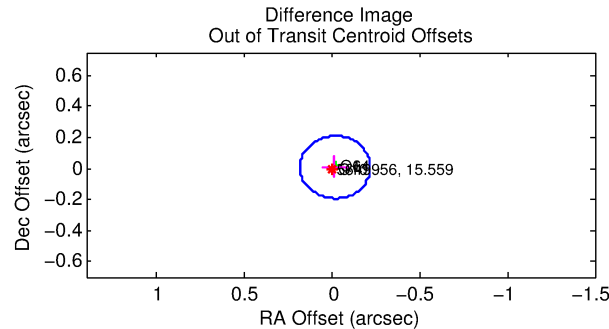
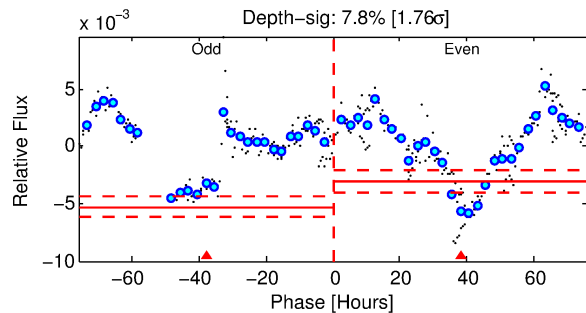
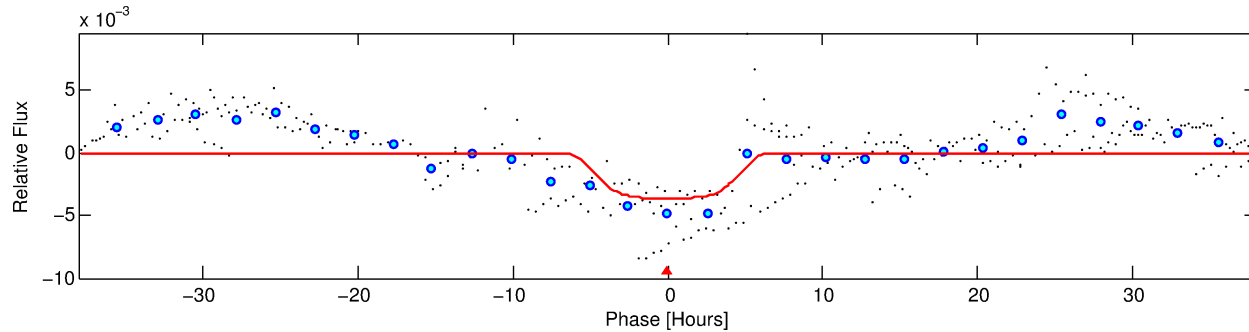
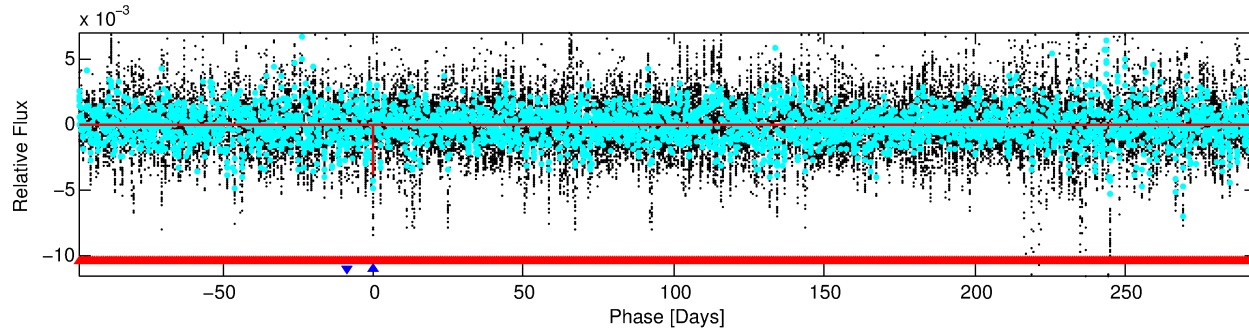
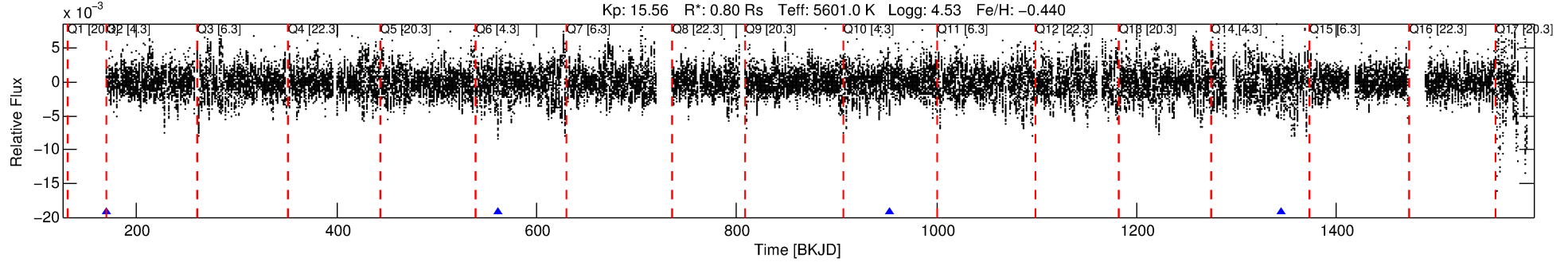
## Ephemeris Match Information For 005649956-02

No Significant Match Found

# DV One-Page Summary

KIC: 5649956 Candidate: 2 of 2 Period: 391.641 d  
KOI: K01540 Corr: No Ephemeris Match

Kp: 15.56 R\*: 0.80 Rs Teff: 5601.0 K Logg: 4.53 Fe/H: -0.440



## DV Fit Results:

Period = 391.64110 [0.01994] d  
Epoch = 169.7737 [0.0383] BKJD  
Rp/R\* = 0.0657 [0.0081]  
a/R\* = 136.78 [21.99]  
b = 0.89 [0.04]  
Seff = 0.60 [0.17]  
Teq = 224 [16] K  
Rp = 5.71 [1.40] Re  
a = 0.9689 [0.1676] AU  
Ag = 34326.38 [15411.89] [2.23σ]  
Teffp = 4716 [471] K [9.54σ]

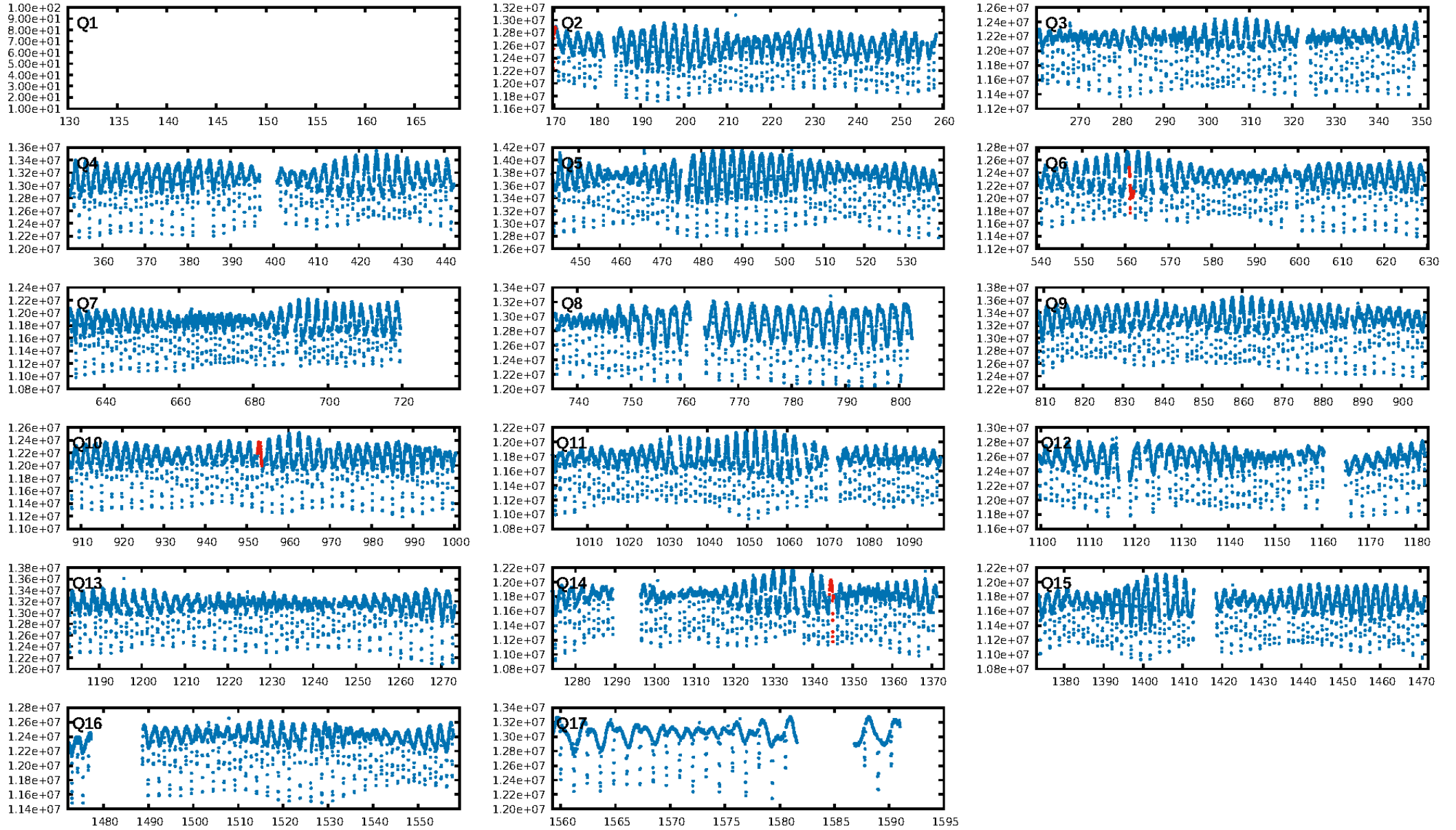
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [711.39σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 69.8%  
ModelChiSquareGof-sig: 100.0%  
**Bootstrap-pfa: 1.67e-11**  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: 32.36  
Centroid-sig: 47.2%  
Centroid-so: 0.748 arcsec [1.32σ]  
OotOffset-rm: 0.020 arcsec [0.30σ]  
KicOffset-rm: 0.156 arcsec [2.24σ]  
OotOffset-st: 3/0/0/0 [3]  
KicOffset-st: 3/0/0/0 [3]  
DiffImageQuality-fgm: 0.33 [1/3]  
DiffImageOverlap-fno: 0.00 [0/3]

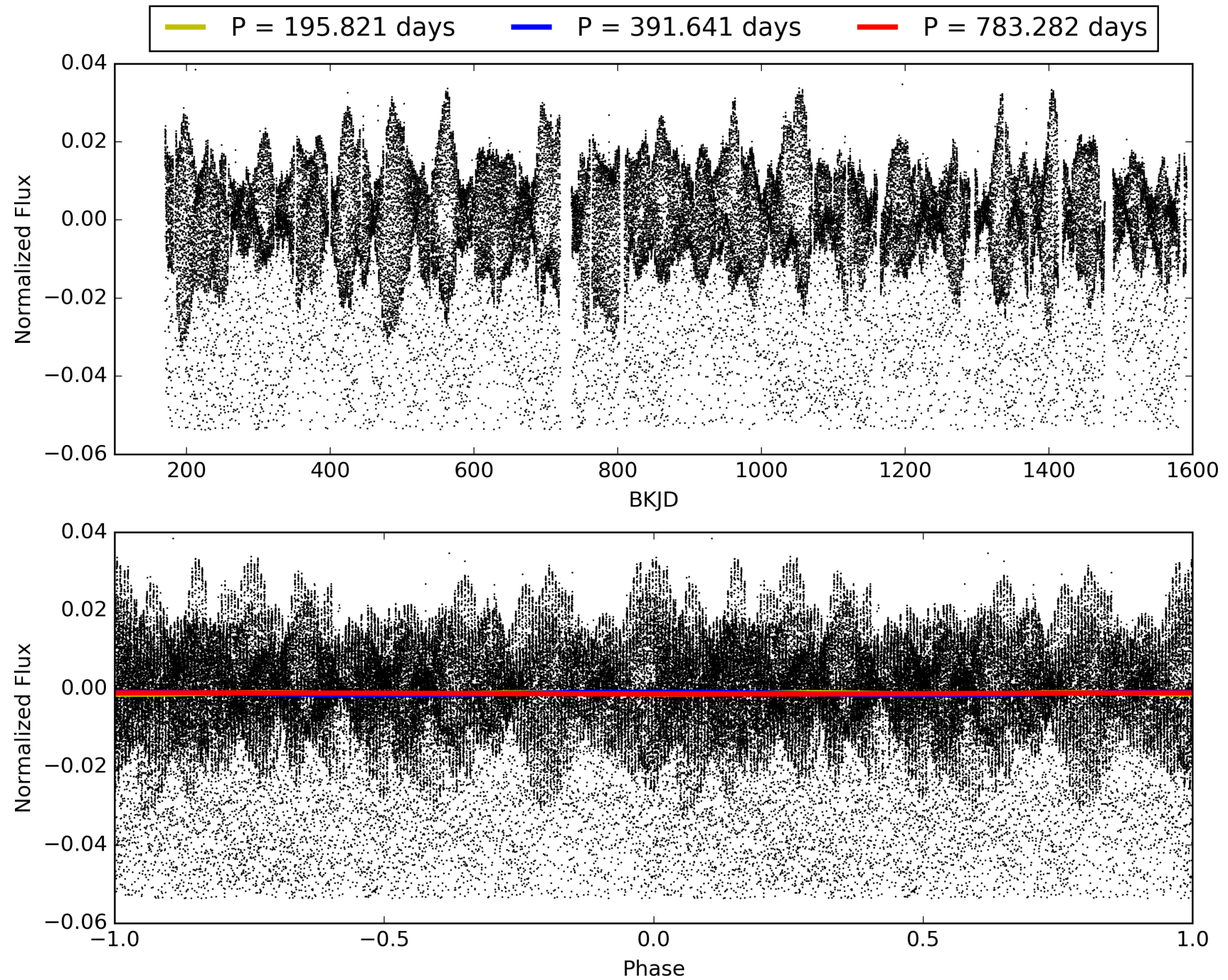
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 02:49:46 Z

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

# TCE 005649956-02, PDC Light Curves

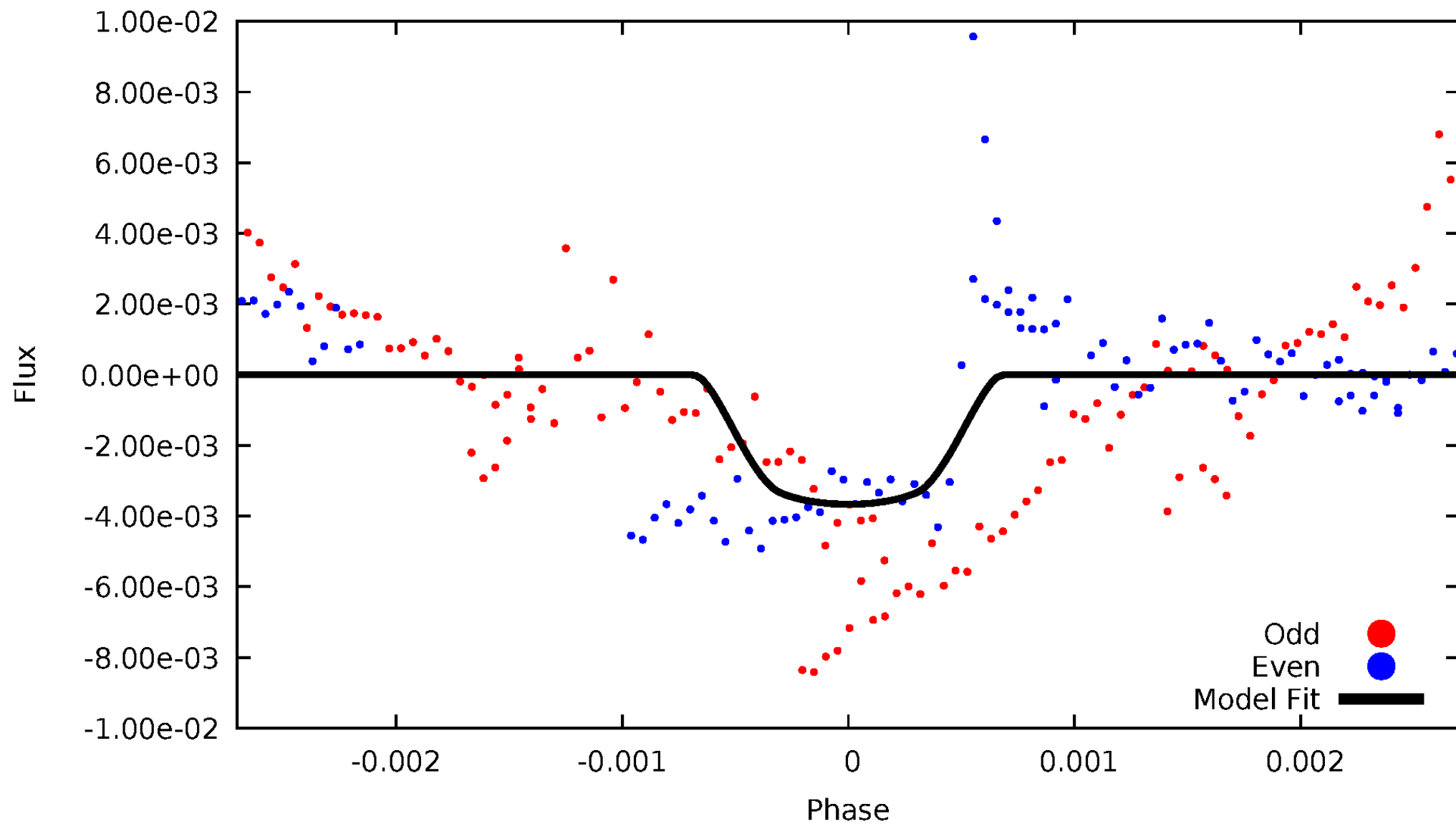


TCE 005649956-02



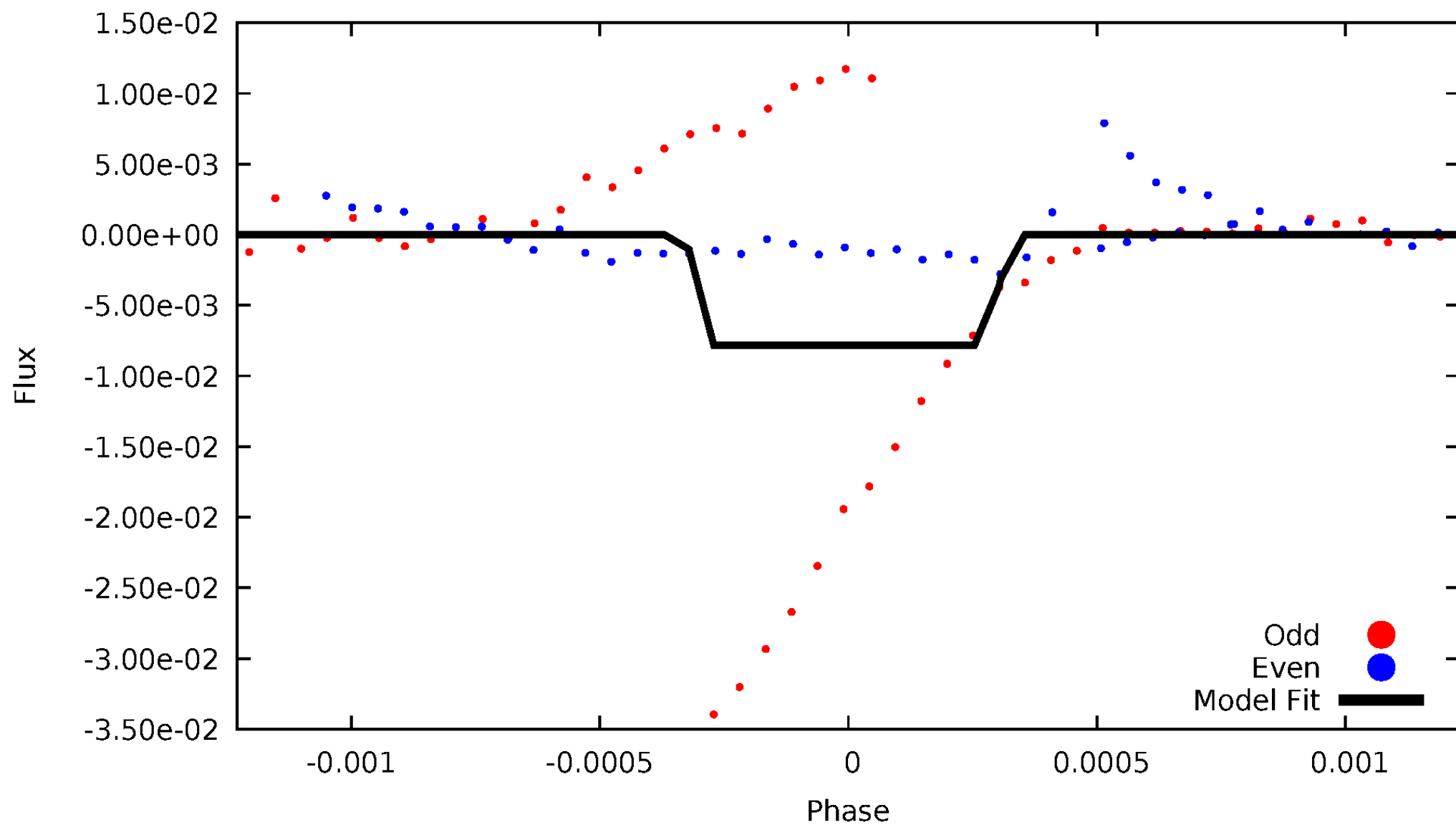
# DV Odd/Even

TCE 005649956-02



# ALT Odd/Even

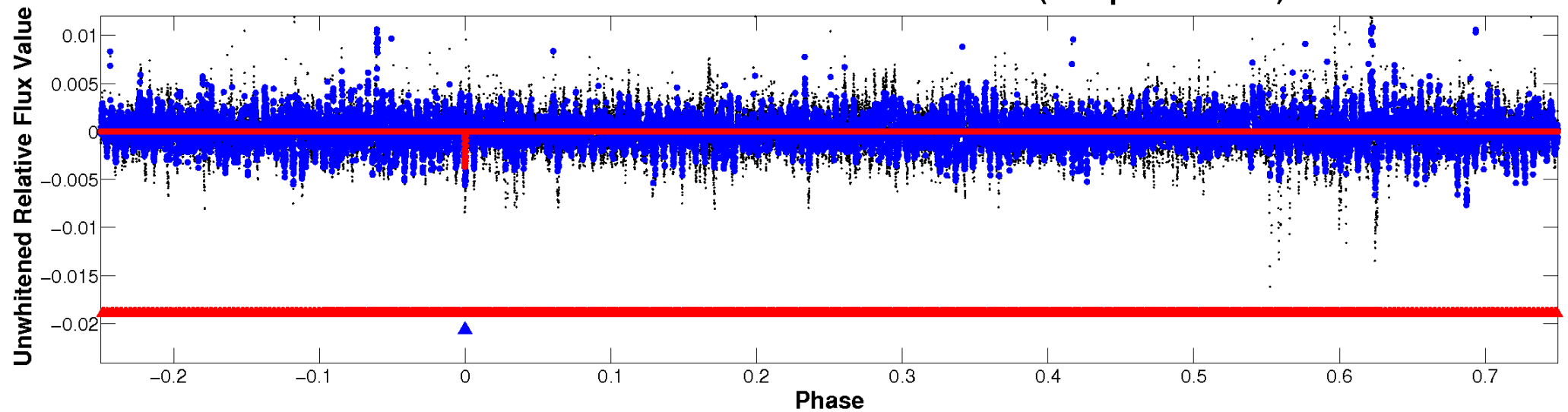
TCE 005649956-02



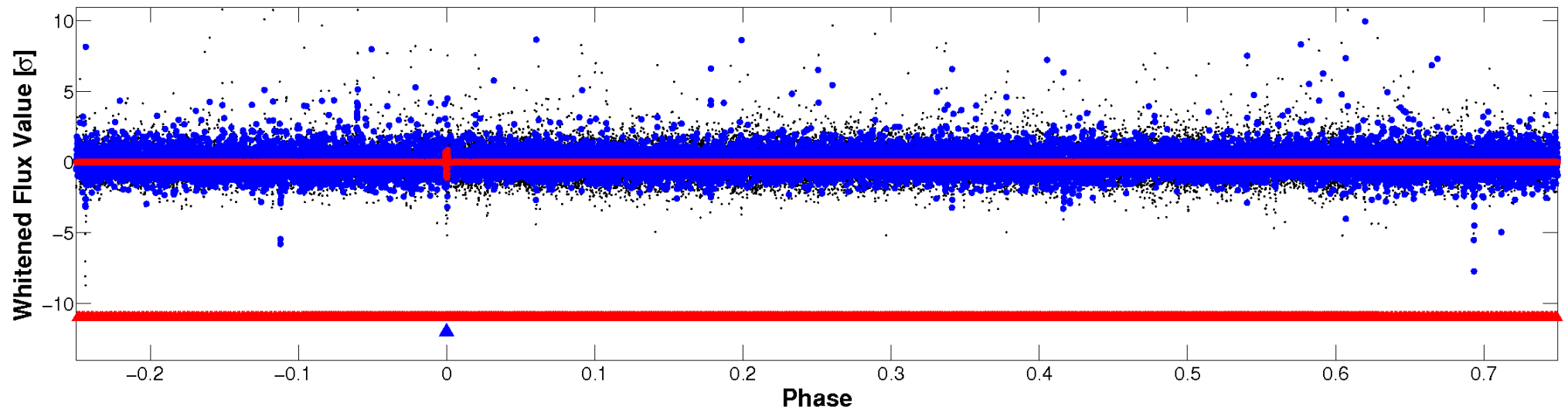


# Non-Whitened Vs. Whitened Light Curve

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

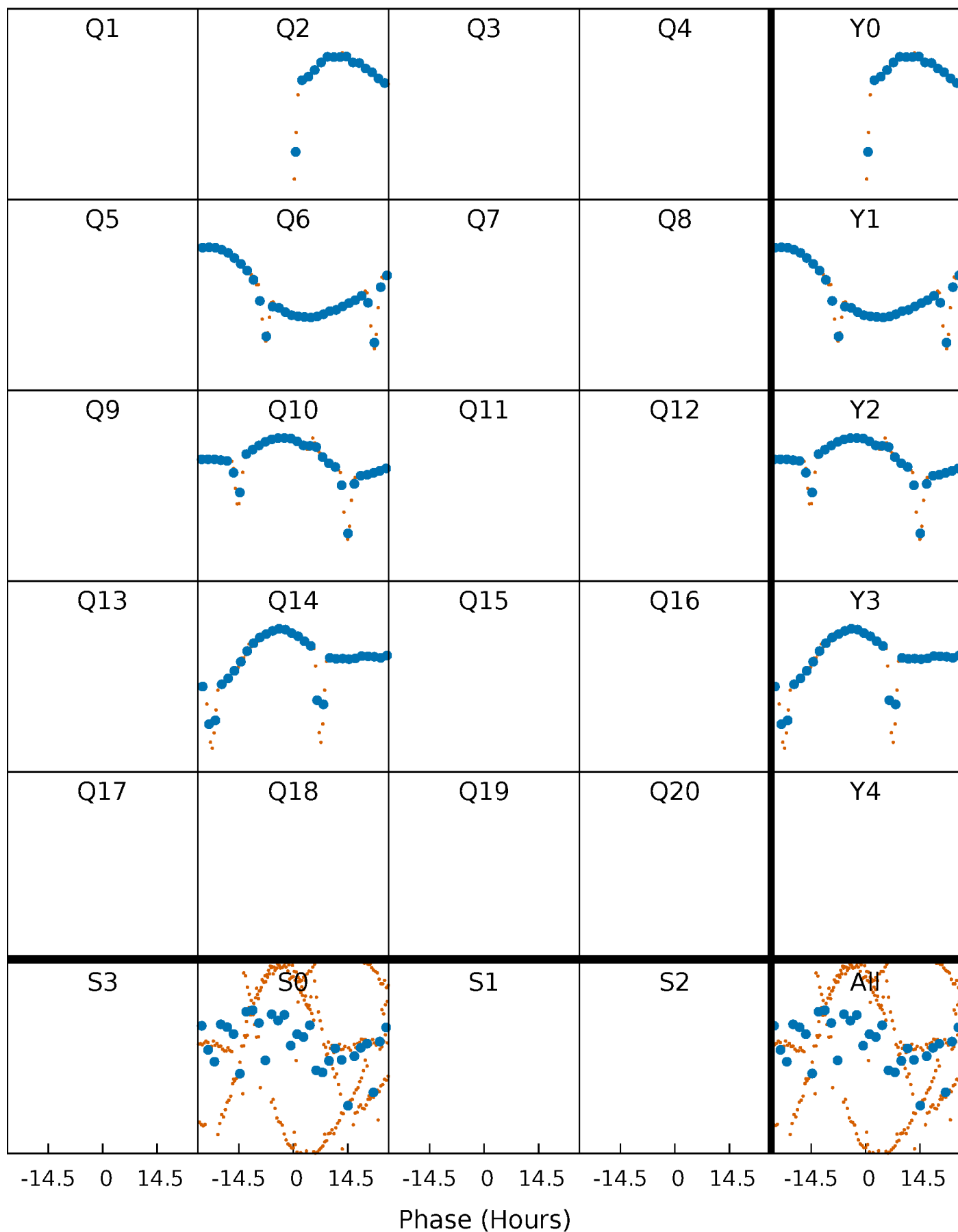


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



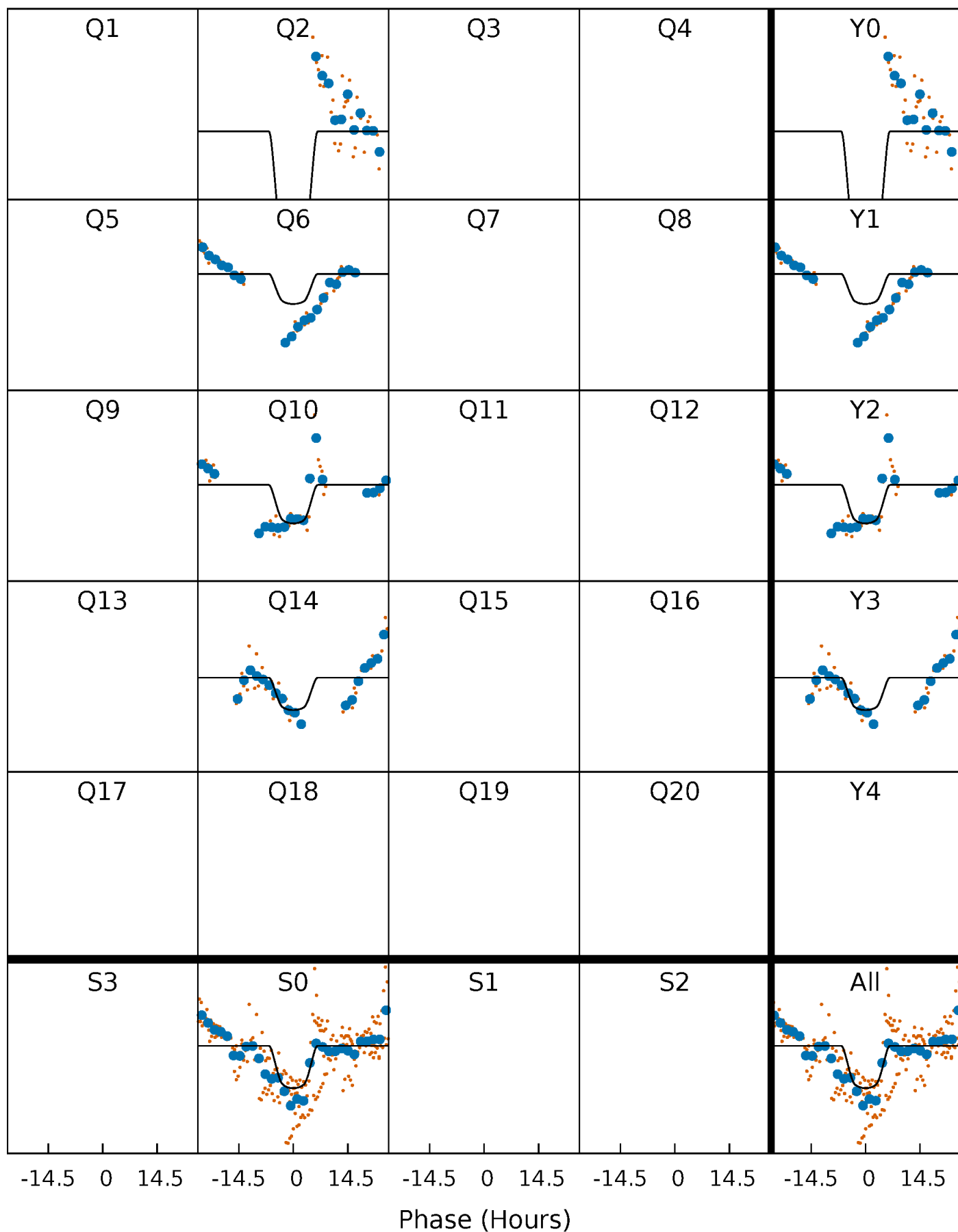
# PDC Quarter-Phased Transit Curves

TCE 005649956-02 P=391.641099 Days  $T_0=169.773739$  (BKJD)



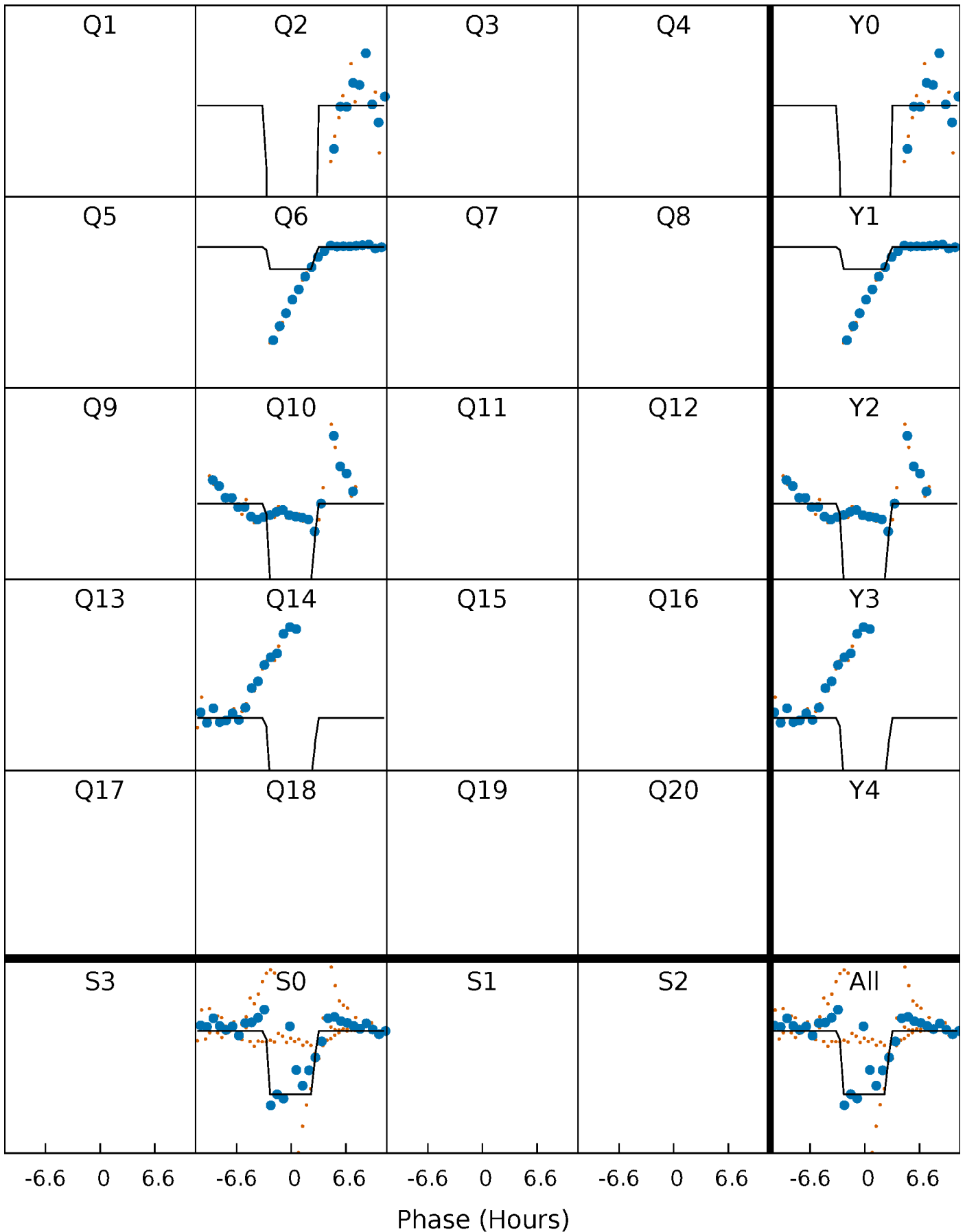
# DV Quarter-Phased Transit Curves

TCE 005649956-02 P=391.641099 Days  $T_0=169.773739$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

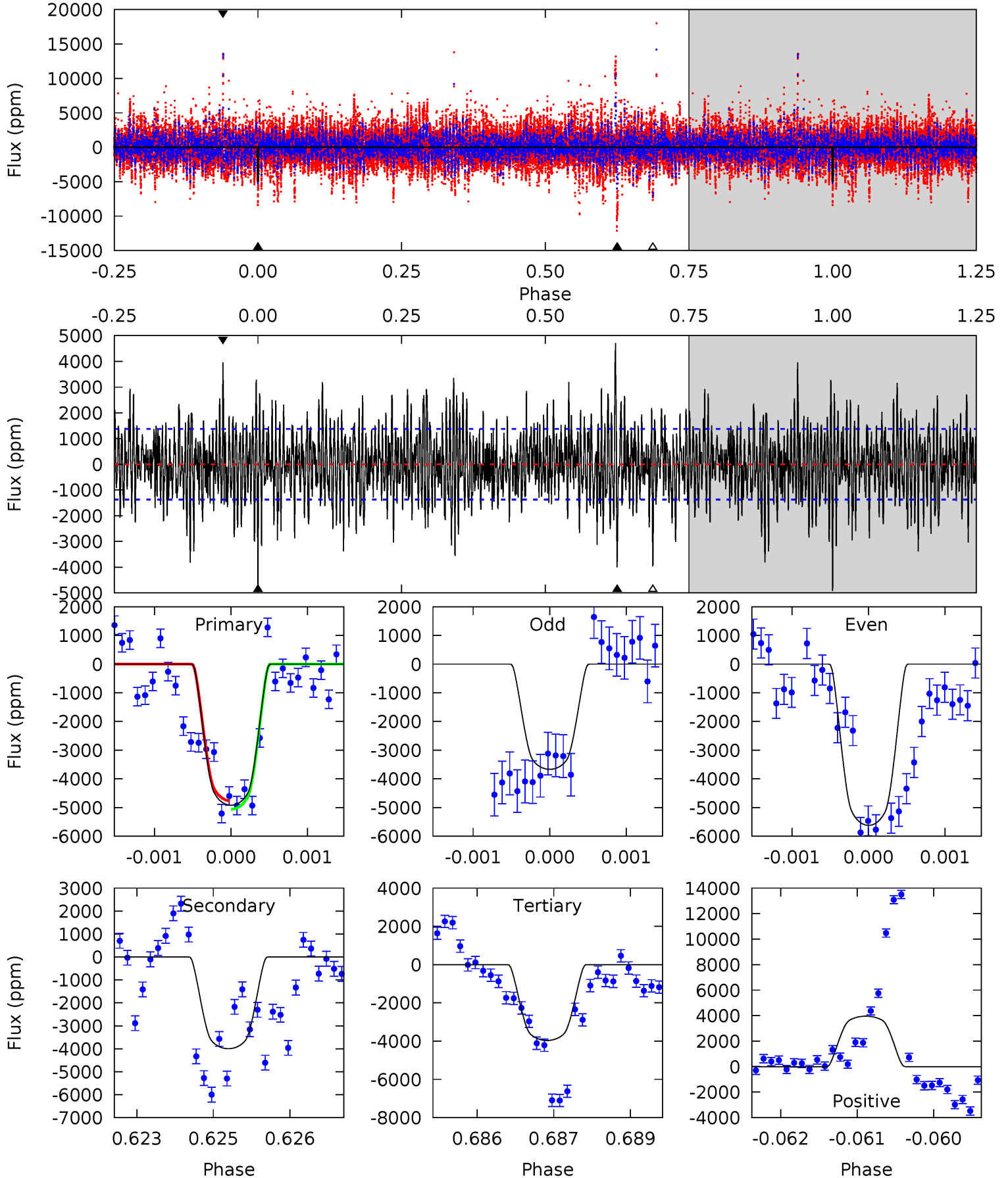
TCE 005649956-02 P=391.650044 Days  $T_0=169.791038$  (BKJD)



# DV Model-Shift Uniqueness Test

005649956-02, P = 391.641099 Days, E = 169.773739 Days

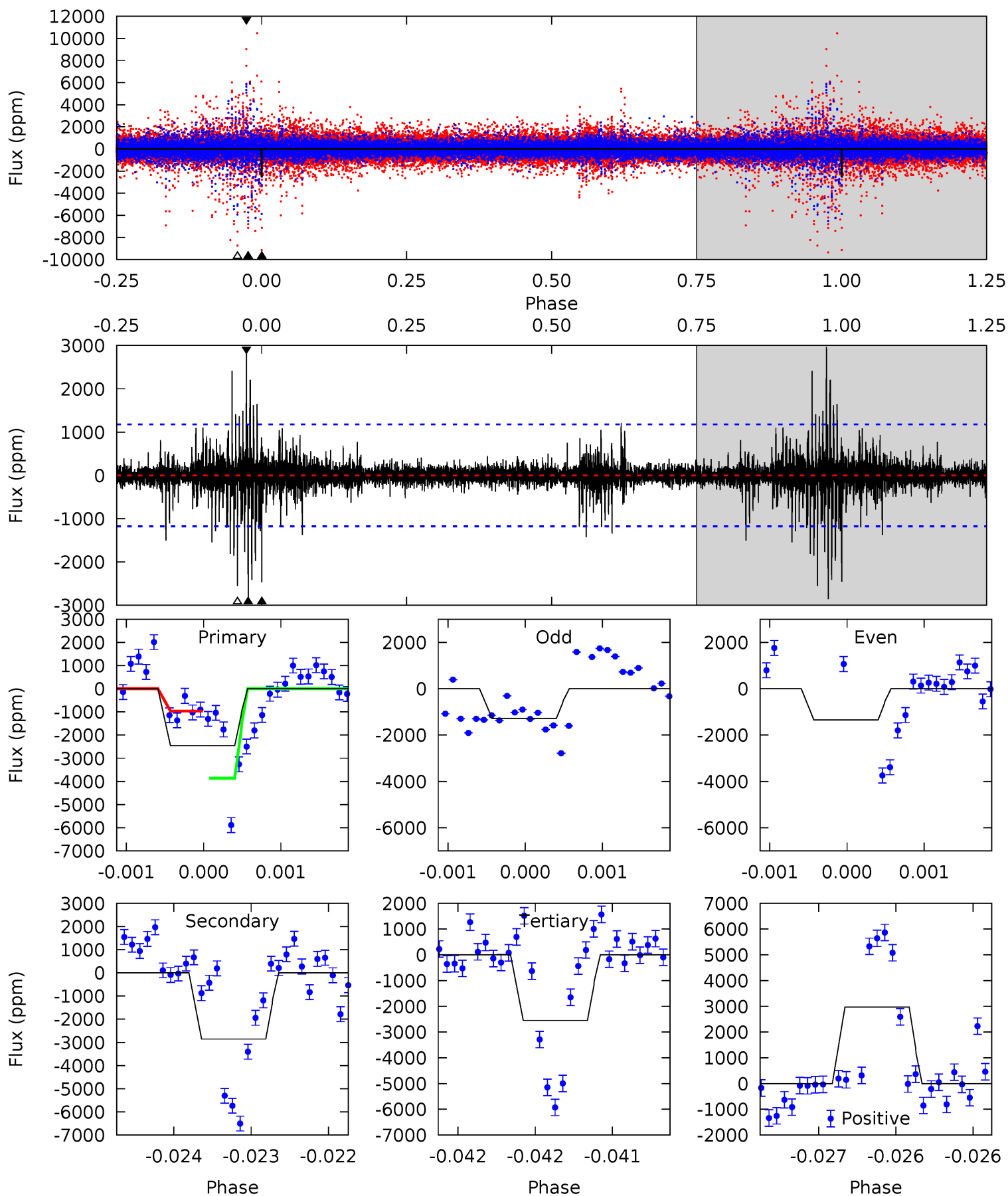
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
19.3	15.7	15.6	15.5	5.40	3.20	4.45	3.74	3.78	0.12	0.16	3.82	0.25	0.49	0.57



# Alt Model-Shift Uniqueness Test

005649956-02, P = 391.650044 Days, E = 169.791038 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
11.5	13.4	12.0	14.0	5.53	3.42	1.07	-0.45	-2.43	1.44	-0.55	0.17	3.05	0.51	0





### Stellar Parameters For KIC 005649956

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5601^{+186}_{-169}$	$4.533^{+0.070}_{-0.130}$	$-0.440^{+0.300}_{-0.300}$	$0.797^{+0.169}_{-0.085}$	$0.791^{+0.097}_{-0.062}$	$2.199^{+0.675}_{-0.864}$
	+3%/-3%	+2%/-3%	+68%/-68%	+21%/-11%	+12%/-8%	+31%/-39%
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 005649956-02 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-3997 \pm 255$	$5.78^{+0.99}_{-0.79}$	$317^{+16}_{-14}$	$5535^{+404}_{-349}$	$61761^{+21570}_{-16613}$
Alt.	$-2855 \pm 213$	$7.83^{+1.07}_{-0.96}$	$317^{+18}_{-14}$	$4534^{+237}_{-204}$	$24130^{+7089}_{-5654}$

$T_{\text{max}}$  = 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

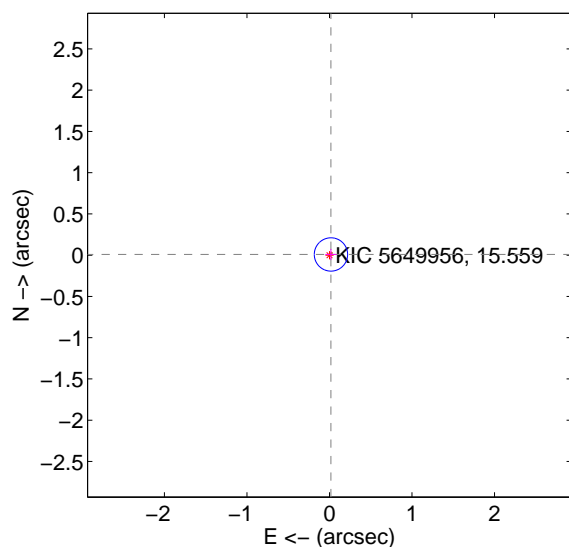
Supplemental centroid analysis for 005649956-02. Kepler magnitude: 15.56. Transit SNR 5.80

There are 1 quarters with good PRF difference image offsets

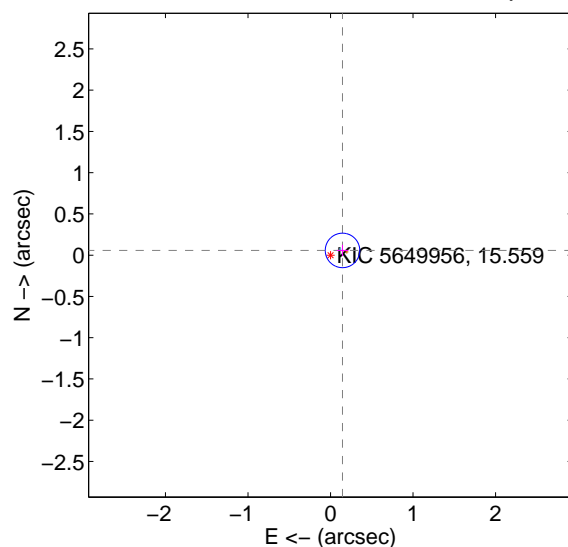
The direct PRF centroid is offset from the target star catalog position by about 0.18 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.020 \pm 0.067$	0.30	$-0.018 \pm 0.067$	$0.009 \pm 0.067$
PRF-fit source offset from KIC position	$0.156 \pm 0.070$	2.24	$-0.145 \pm 0.070$	$0.058 \pm 0.067$
photometric centroid source offset	$0.75 \pm 0.57$	1.32	$0.68 \pm 0.55$	$0.32 \pm 0.64$

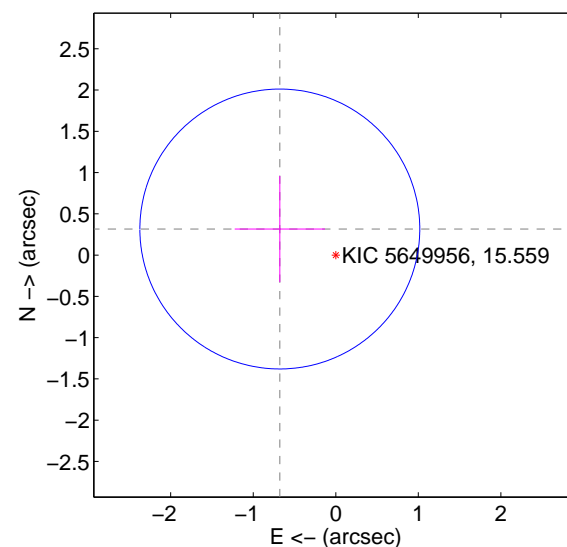
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position



offset from photometric centroids

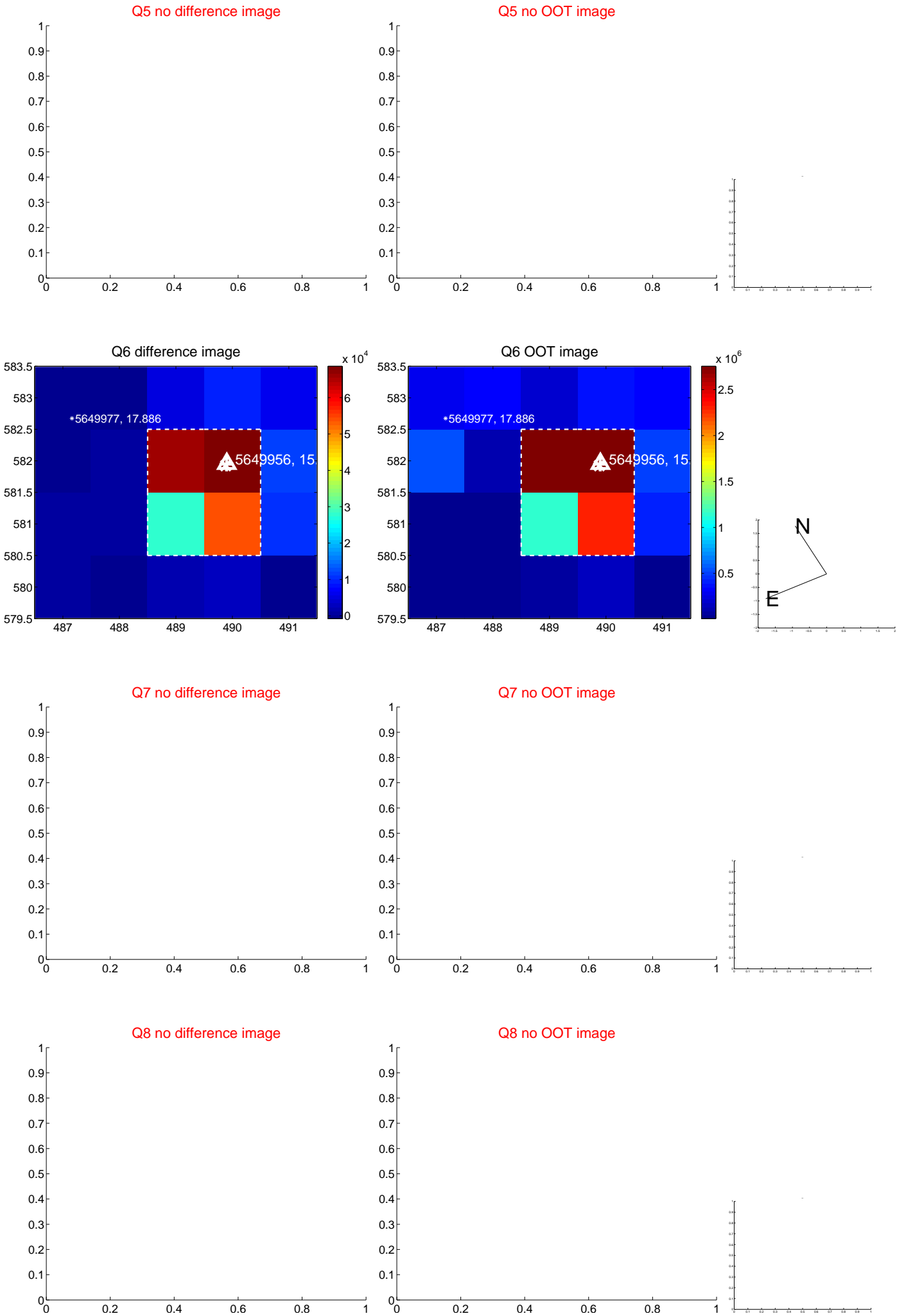


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

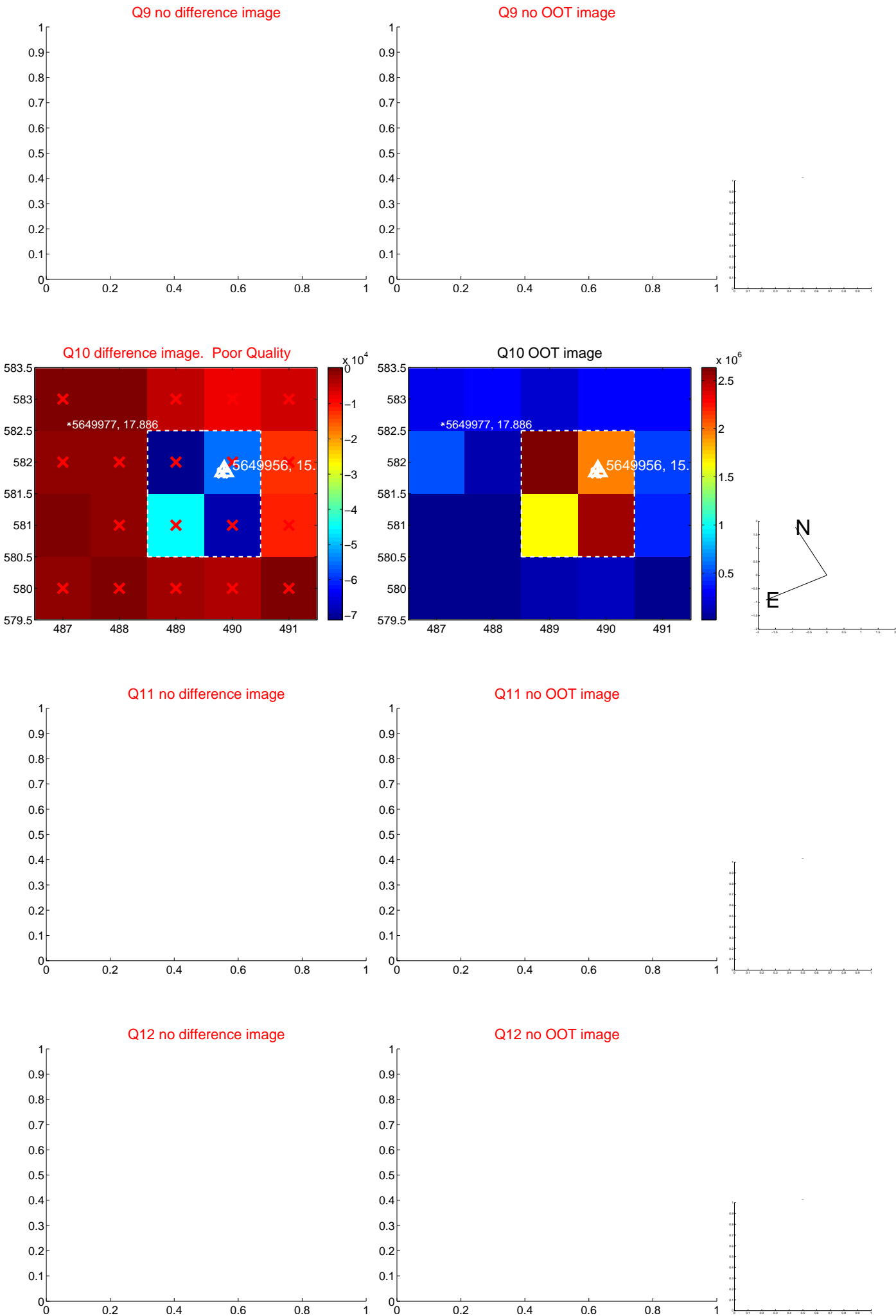
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



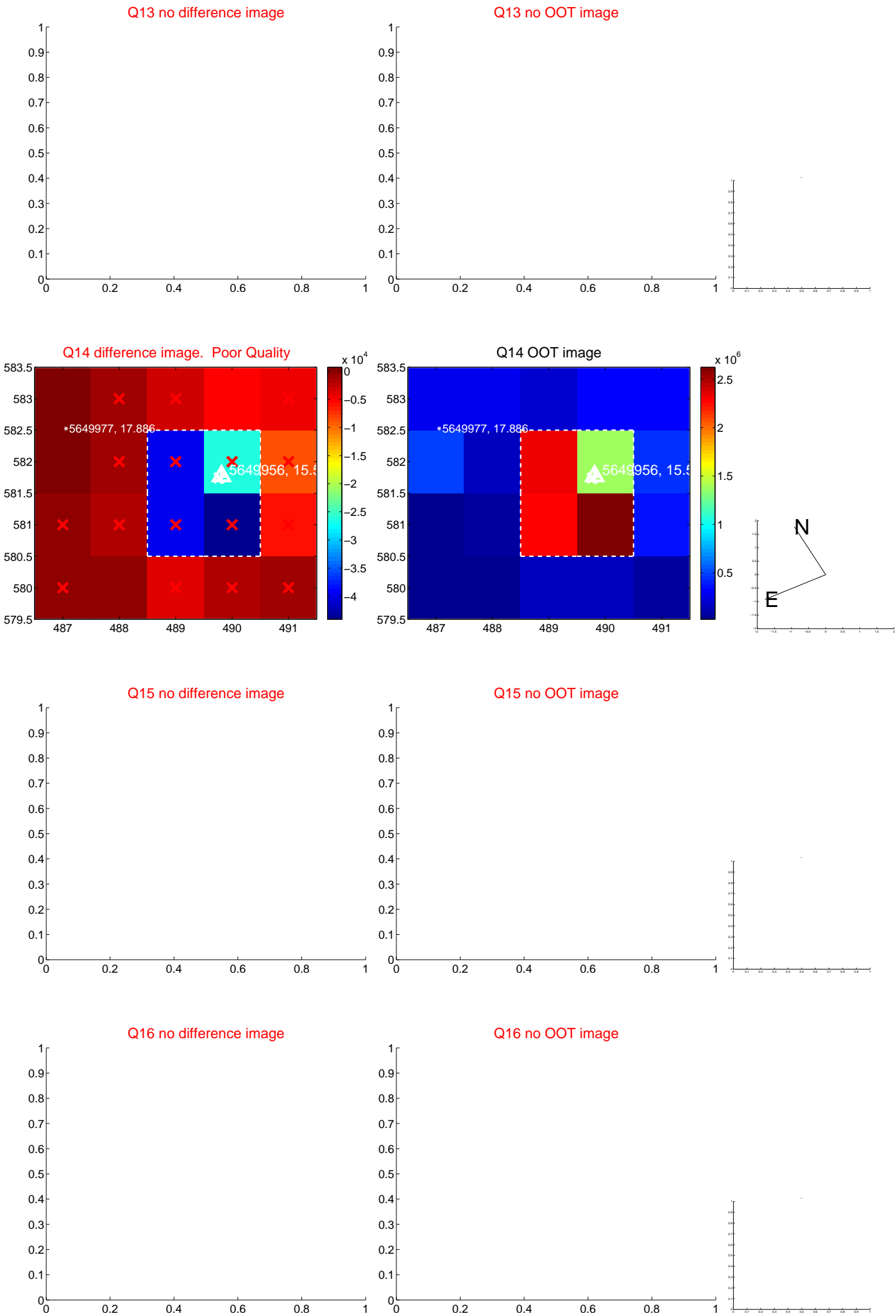
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



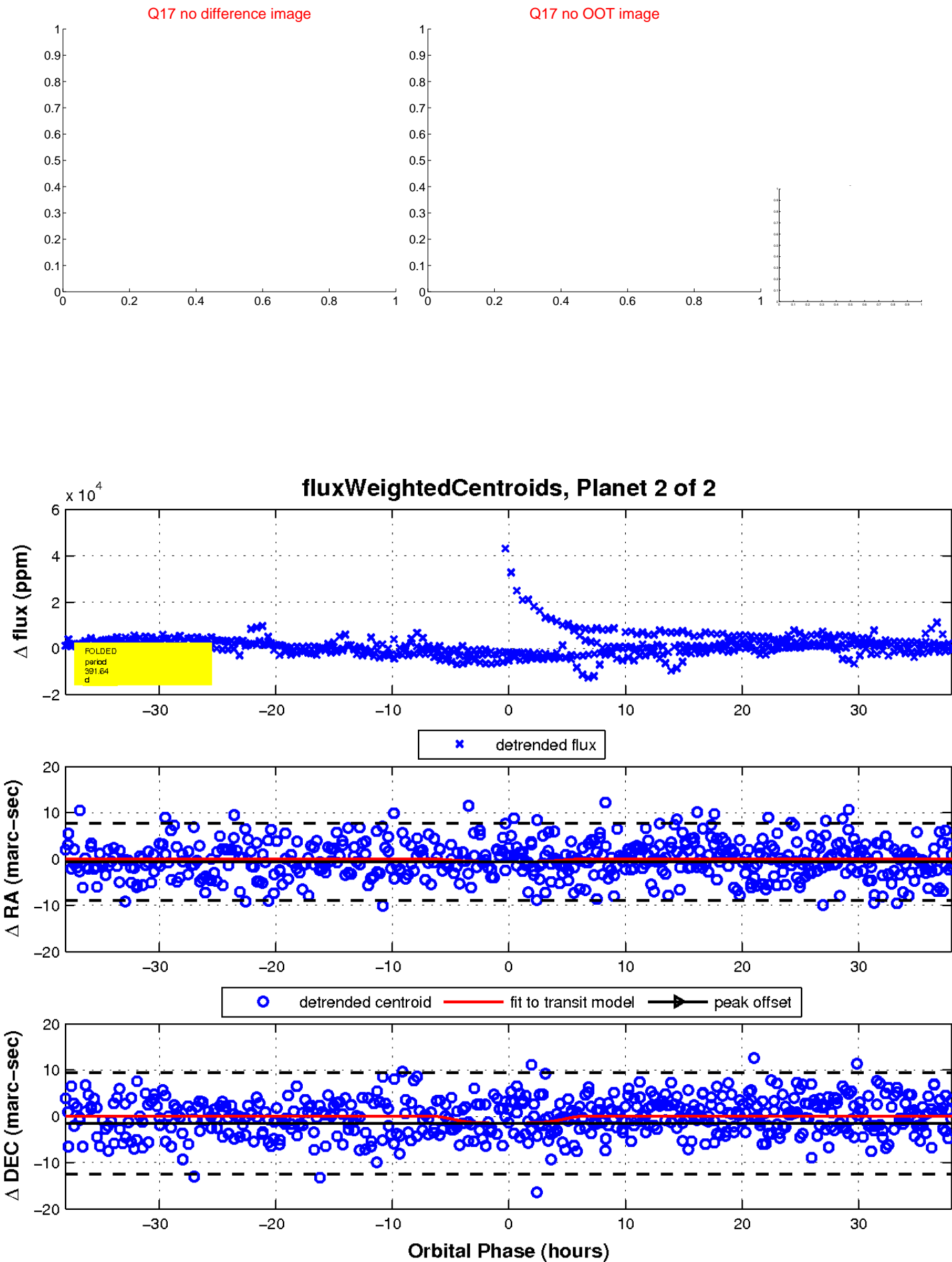
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ×: large negative pixel value.



white ×: KIC target position; +: OOT centroid; △: difference centroid. red ×: large negative pixel value.



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



UKIRT Image

Declination

