

# KIC 012117857

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
012117857-02	OBS	No	387.773658	378.775797	993.7	11.206	14.8	6.7	1.68	5237	5.47	1.89
012117857-03	OBS	No	355.444630	396.925055	951.3	6.408	11.8	7.4	1.68	5237	5.43	2.13
012117857-04	OBS	No	497.000312	243.583308	1124.8	8.669	10.9	8.1	1.68	5237	5.64	1.36
012117857-05	OBS	No	481.939135	556.910468	1431.1	3.500	10.1	-1.0	1.68	5237	6.20	1.42

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
012117857-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
012117857-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_FEW_DIFFS
012117857-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_POS_DV
012117857-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_SKYE—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_NOFITS

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

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

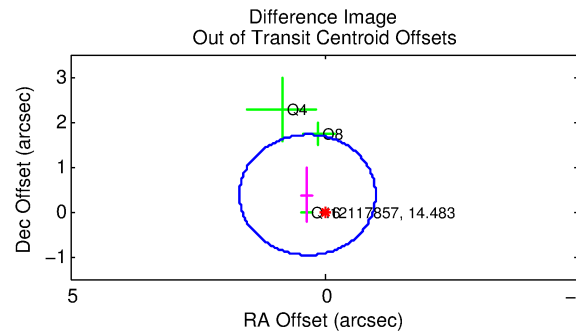
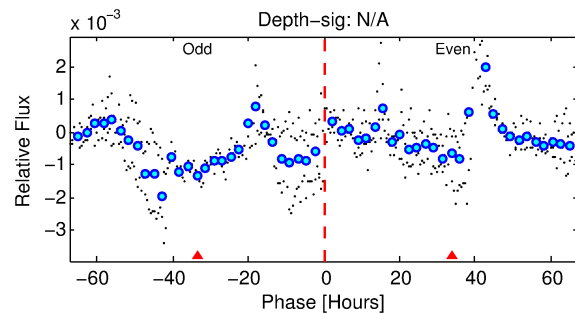
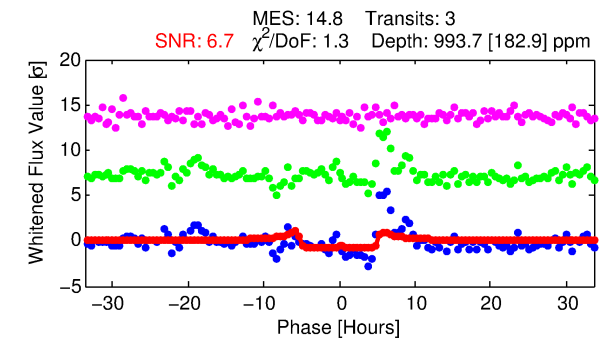
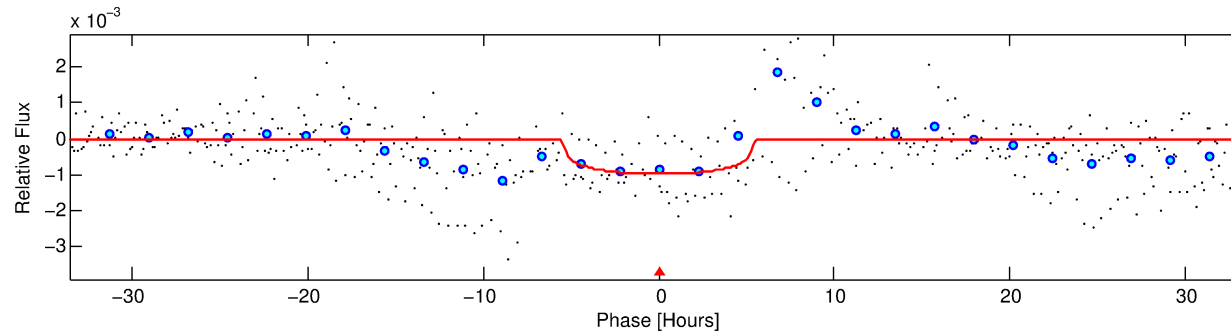
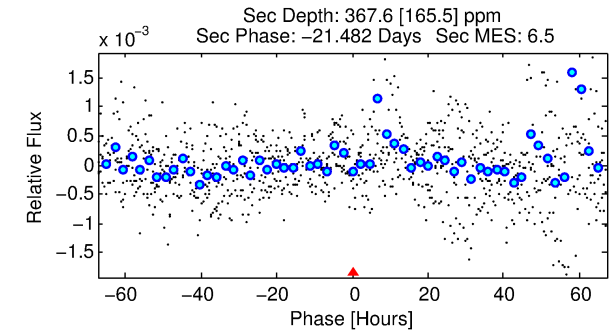
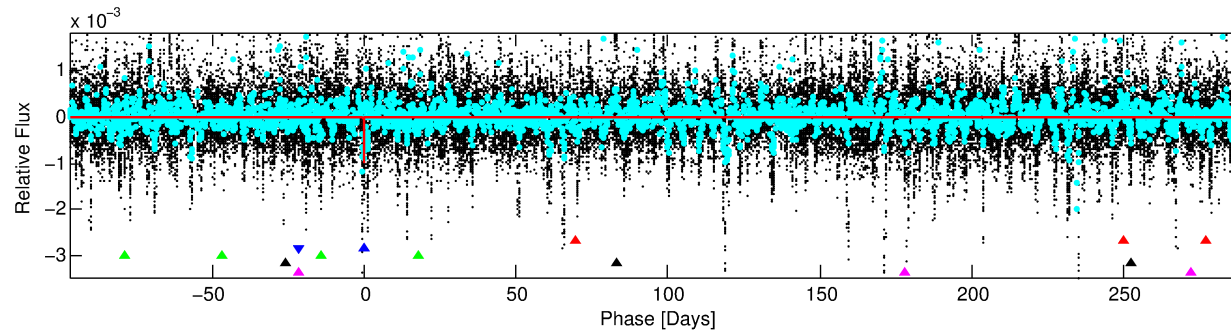
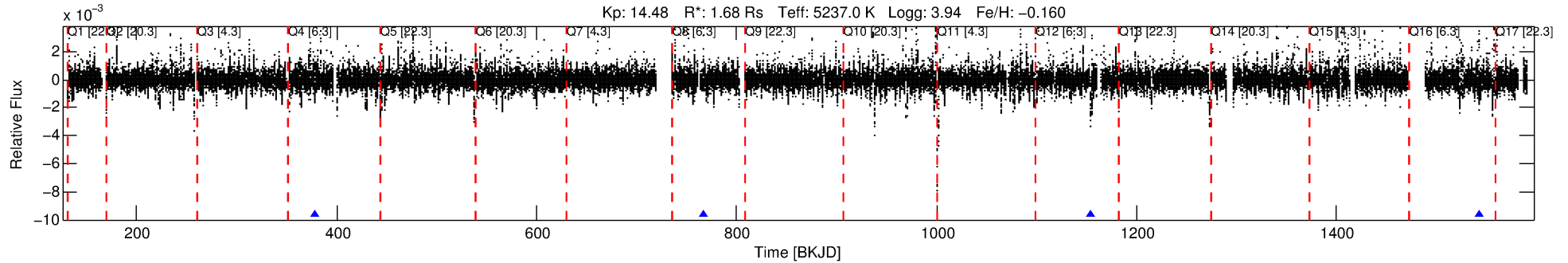
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## Ephemeris Match Information For 012117857-02

No Significant Match Found

# DV One-Page Summary

KIC: 12117857 Candidate: 2 of 5 Period: 387.774 d



## DV Fit Results:

Period = 387.77366 [0.00592] d  
Epoch = 378.7758 [0.0109] BKJD  
Rp/R\* = 0.0300 [0.0140]  
a/R\* = 220.00 [374.02]  
b = 0.61 [1.80]  
Seff = 1.89 [2.02]  
Teq = 299 [80] K  
Rp = 5.48 [3.90] Re  
a = 0.9994 [0.6140] AU  
Ag = 6739.05 [10004.47] [0.67σ]  
Teffp = 4190 [1095] K [3.55σ]

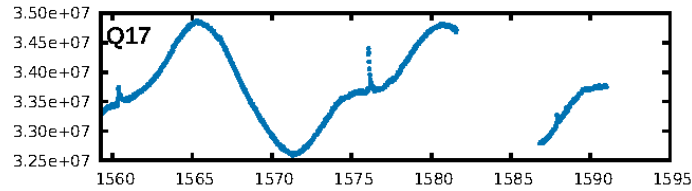
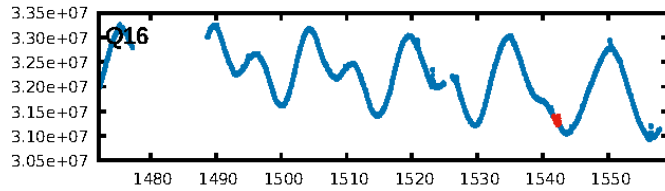
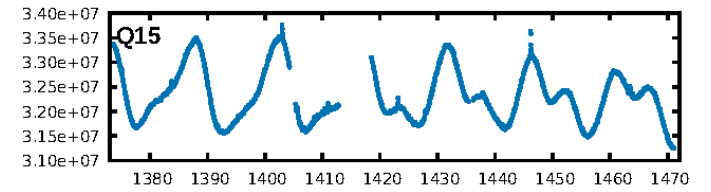
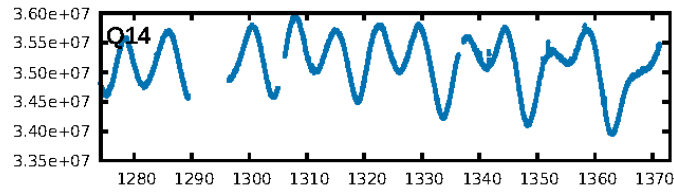
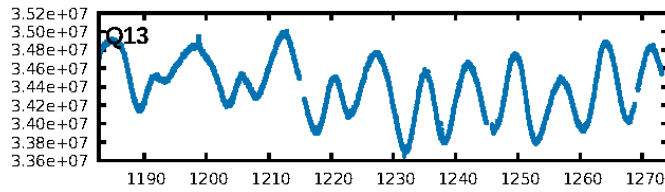
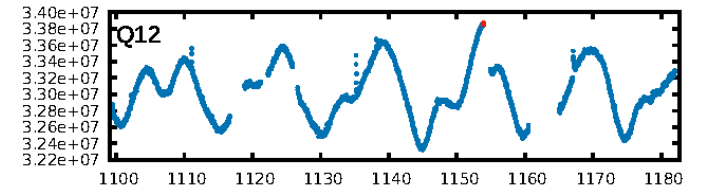
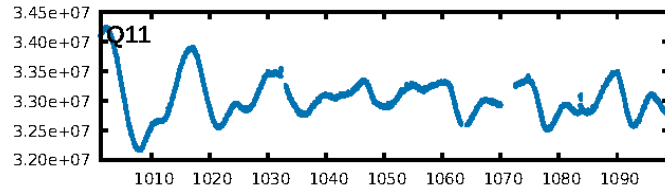
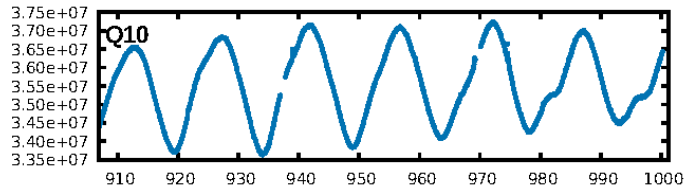
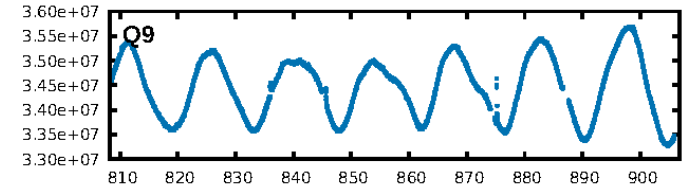
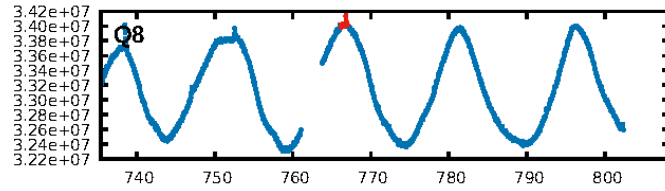
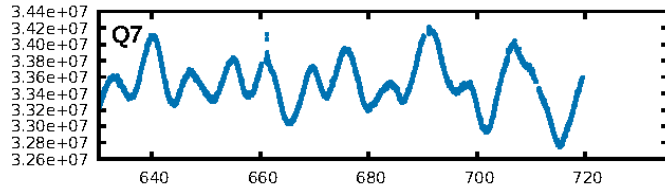
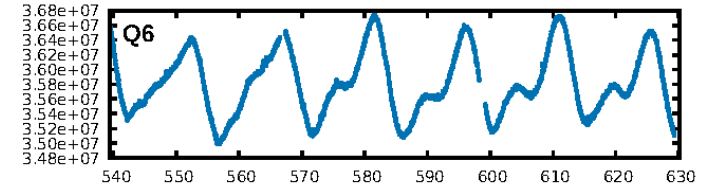
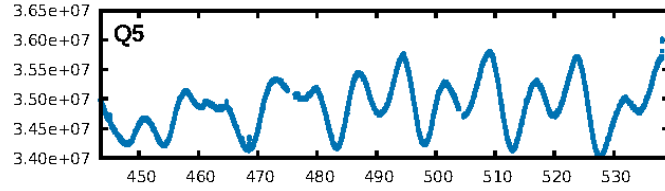
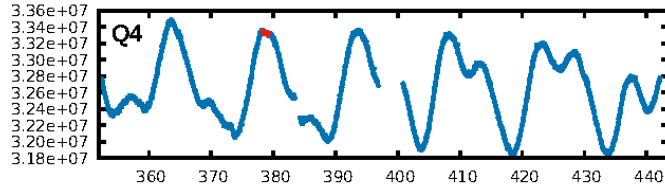
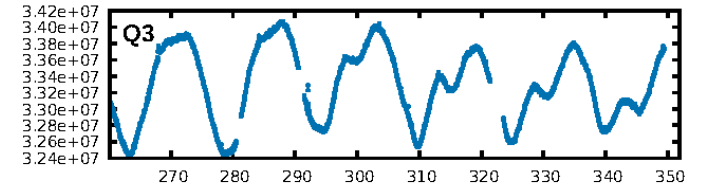
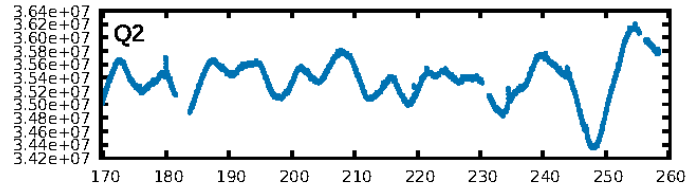
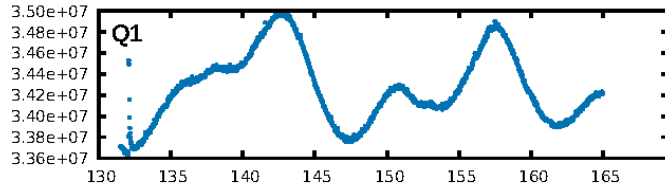
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [60.11σ]  
LongPeriod-sig: 100.0% [192.51σ]  
ModelChiSquare2-sig: 0.5%  
ModelChiSquareGof-sig: 87.8%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: 1.73  
Centroid-sig: 0.1%  
Centroid-so: 1.416 arcsec [1.74σ]  
OotOffset-rm: 0.502 arcsec [1.12σ]  
KicOffset-rm: 0.486 arcsec [0.93σ]  
OotOffset-st: 0/0/3/0 [3]  
KicOffset-st: 0/0/3/0 [3]  
DiffImageQuality-fgm: 0.33 [1/3]  
DiffImageOverlap-fno: 1.00 [3/3]

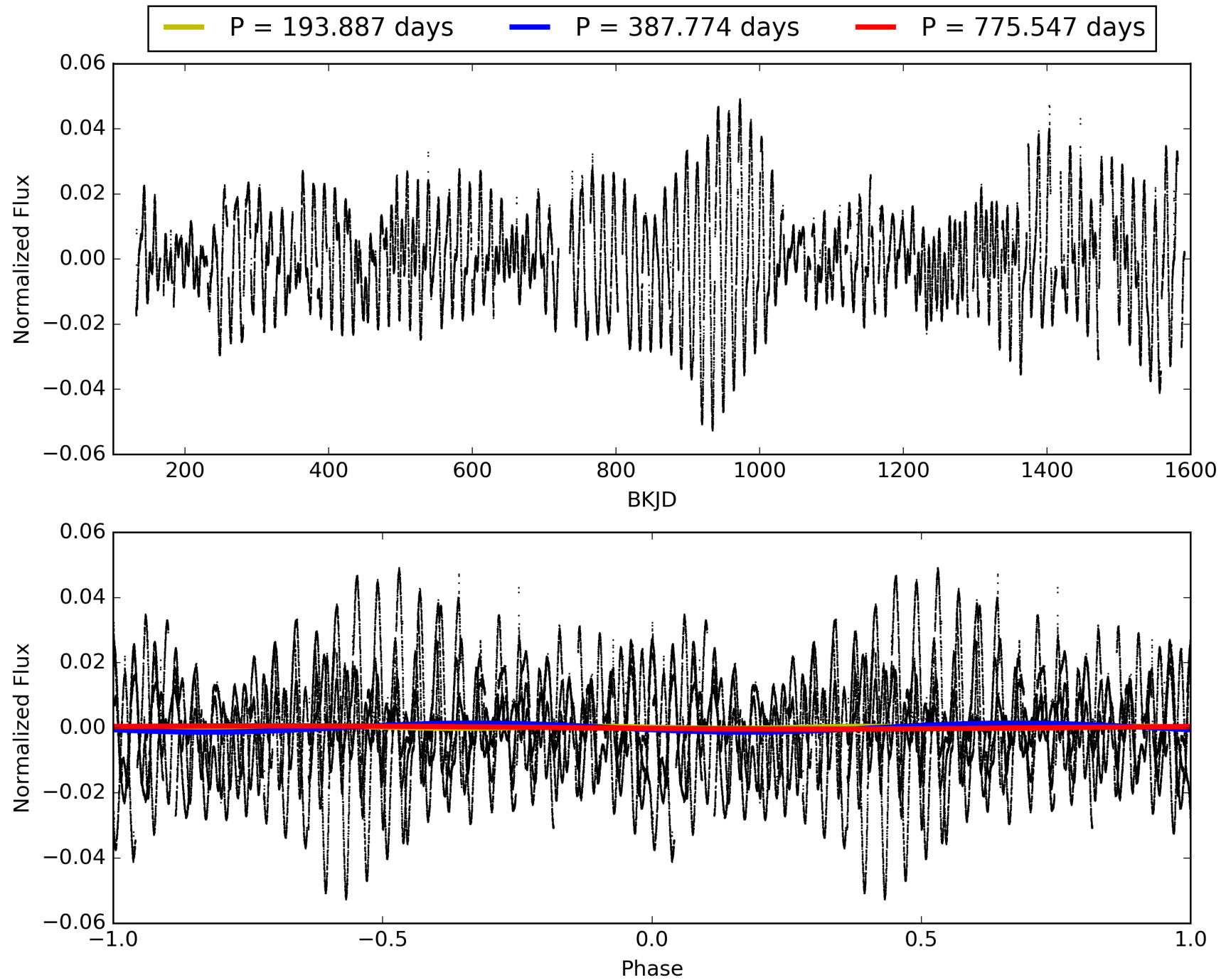
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This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 012117857-02, PDC Light Curves

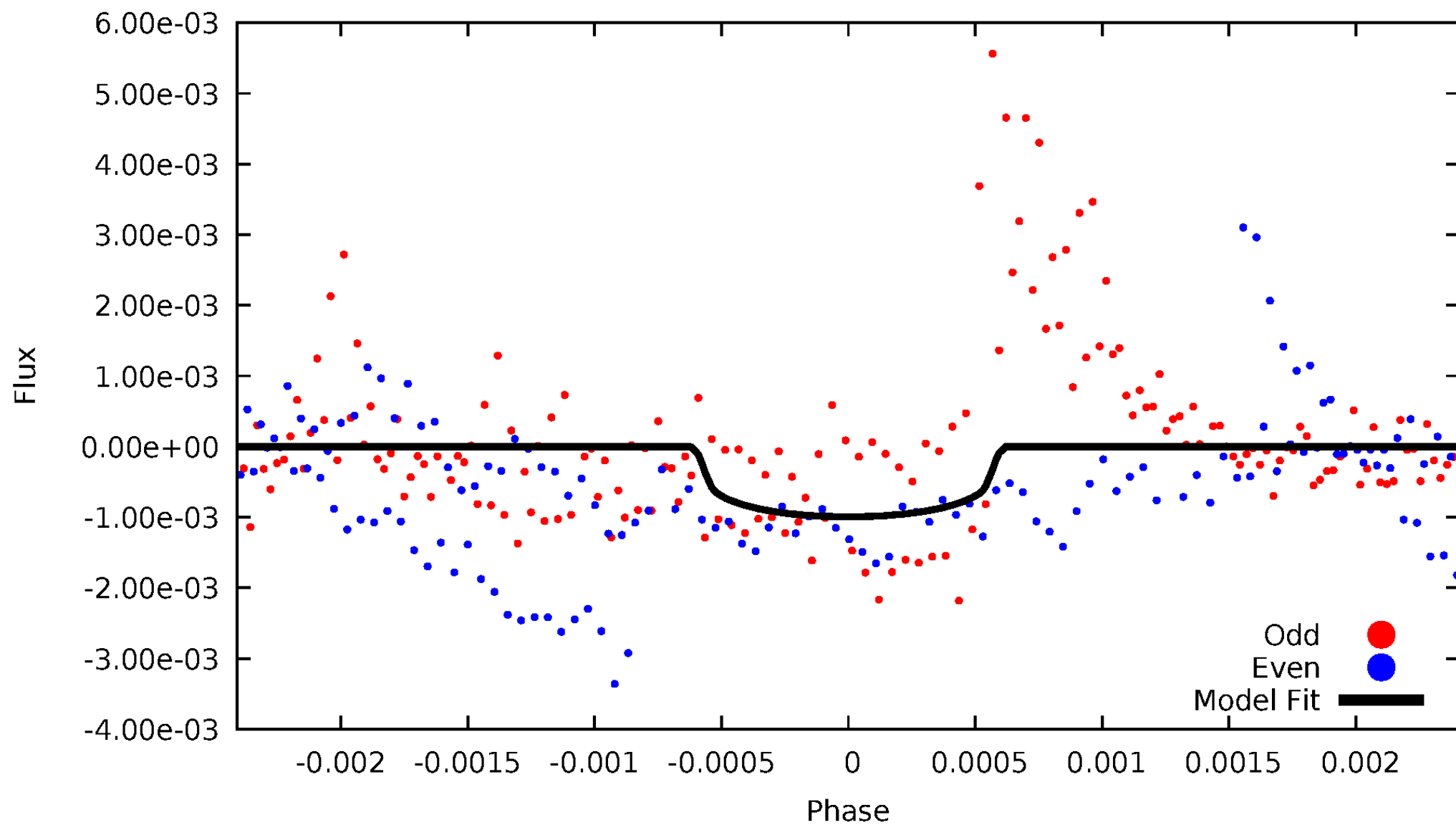


# TCE 012117857-02



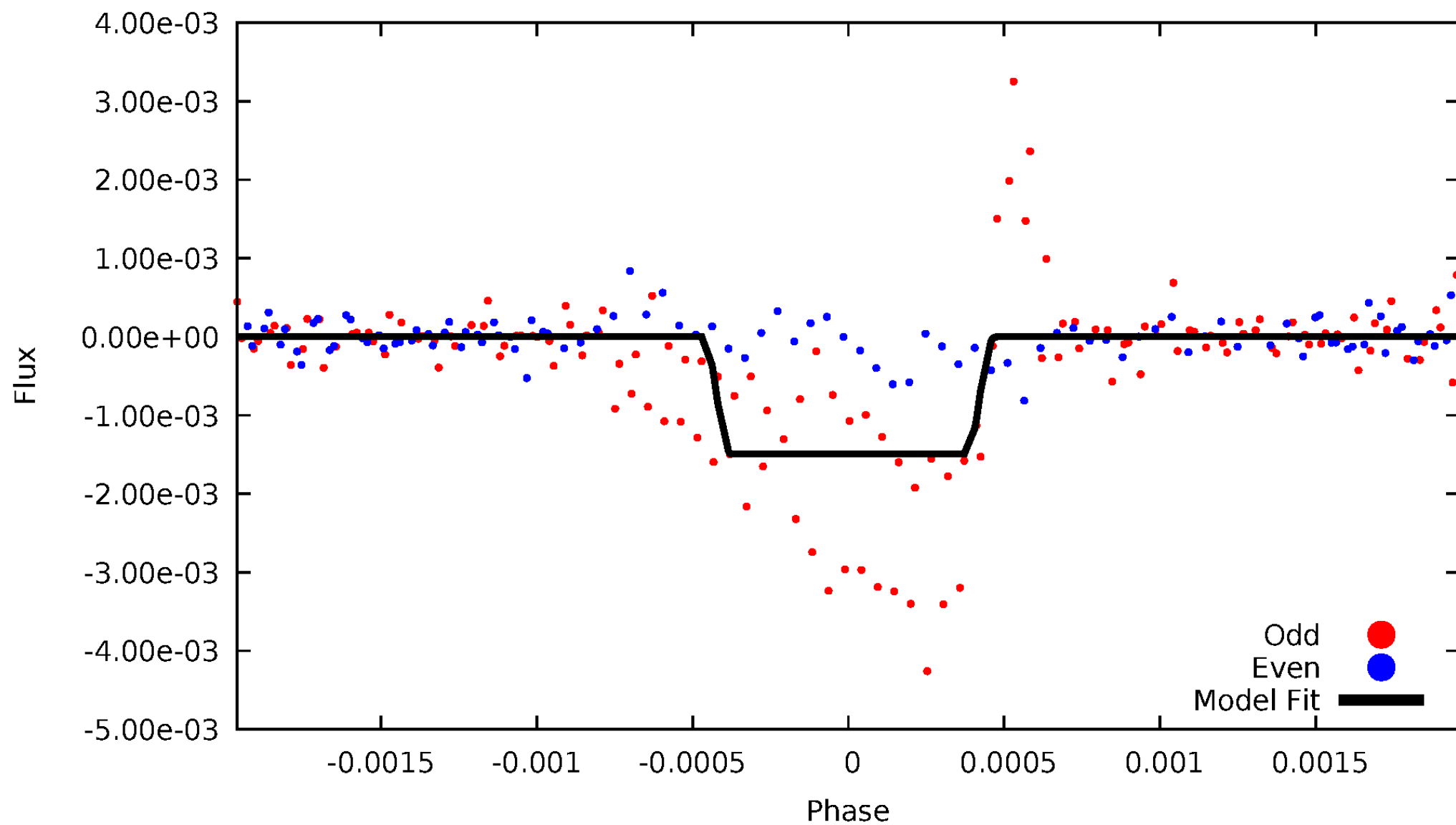
# DV Odd/Even

TCE 012117857-02



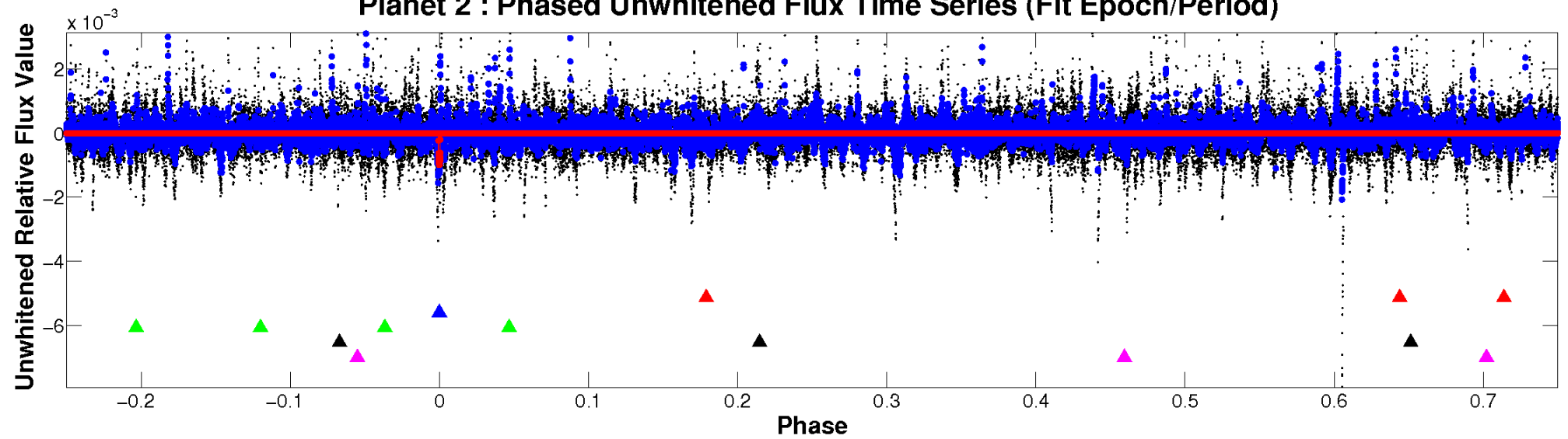
# ALT Odd/Even

TCE 012117857-02

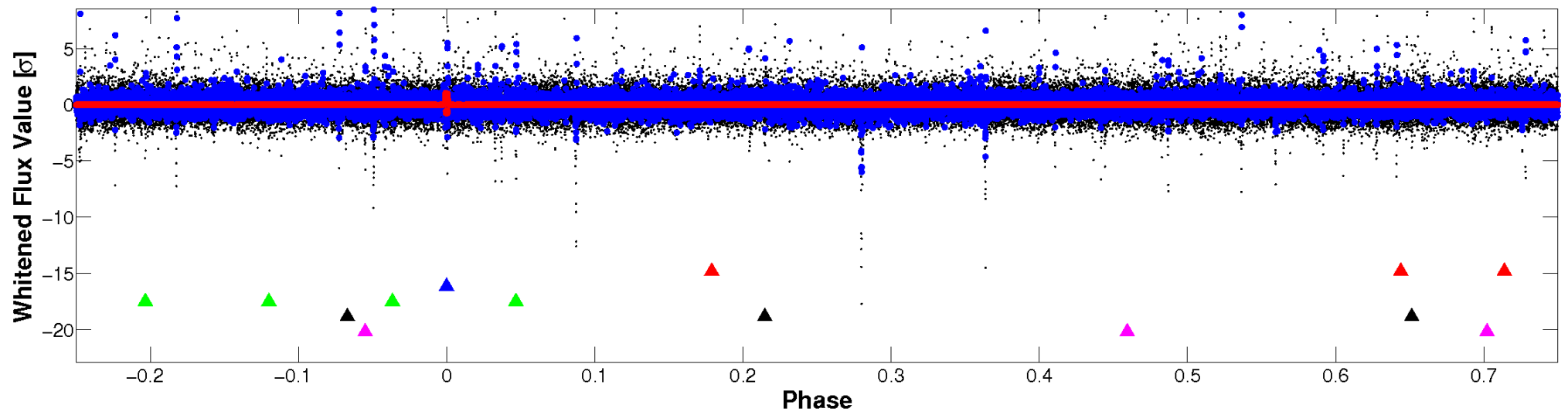


# Non-Whitened Vs. Whitened Light Curve

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

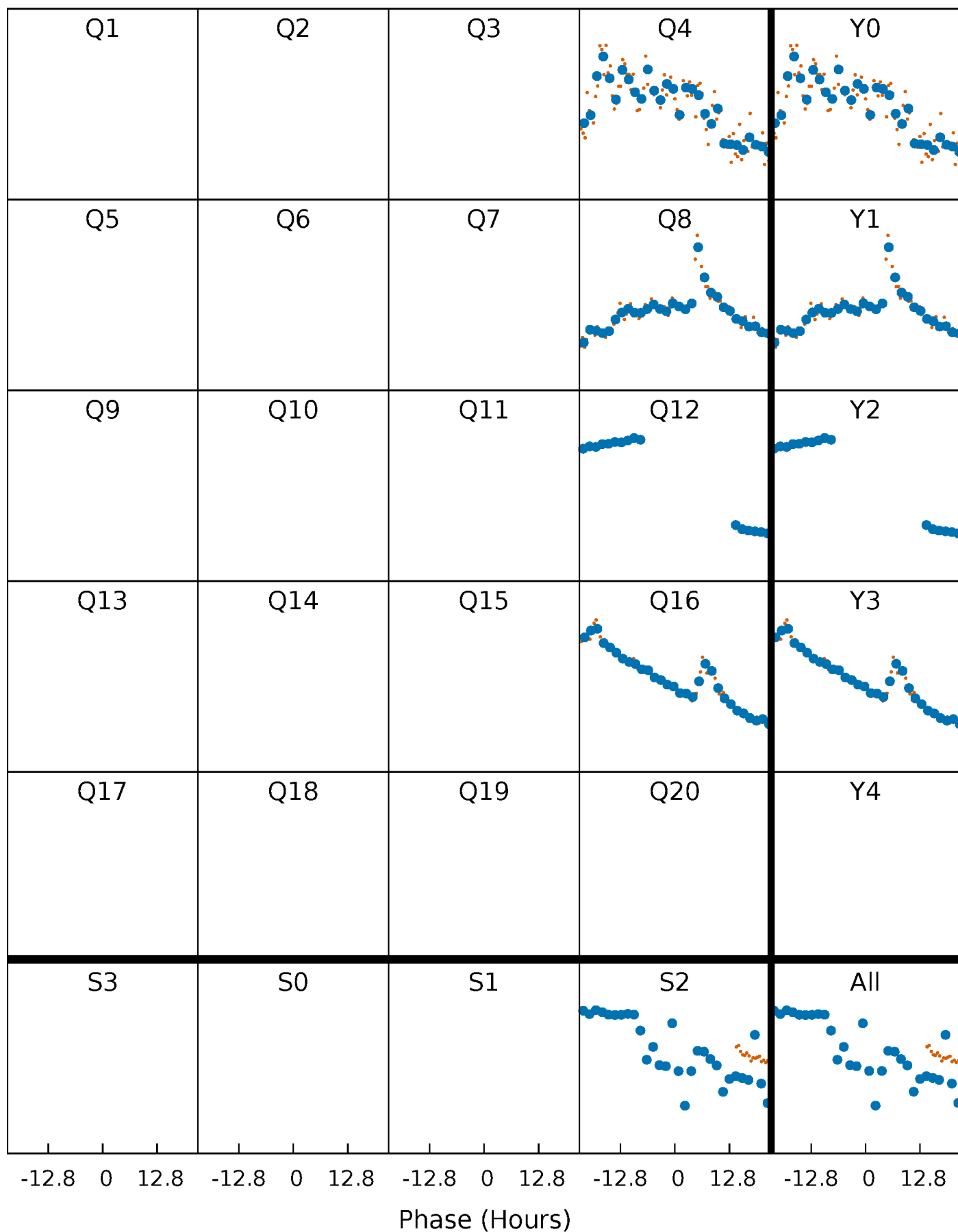


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

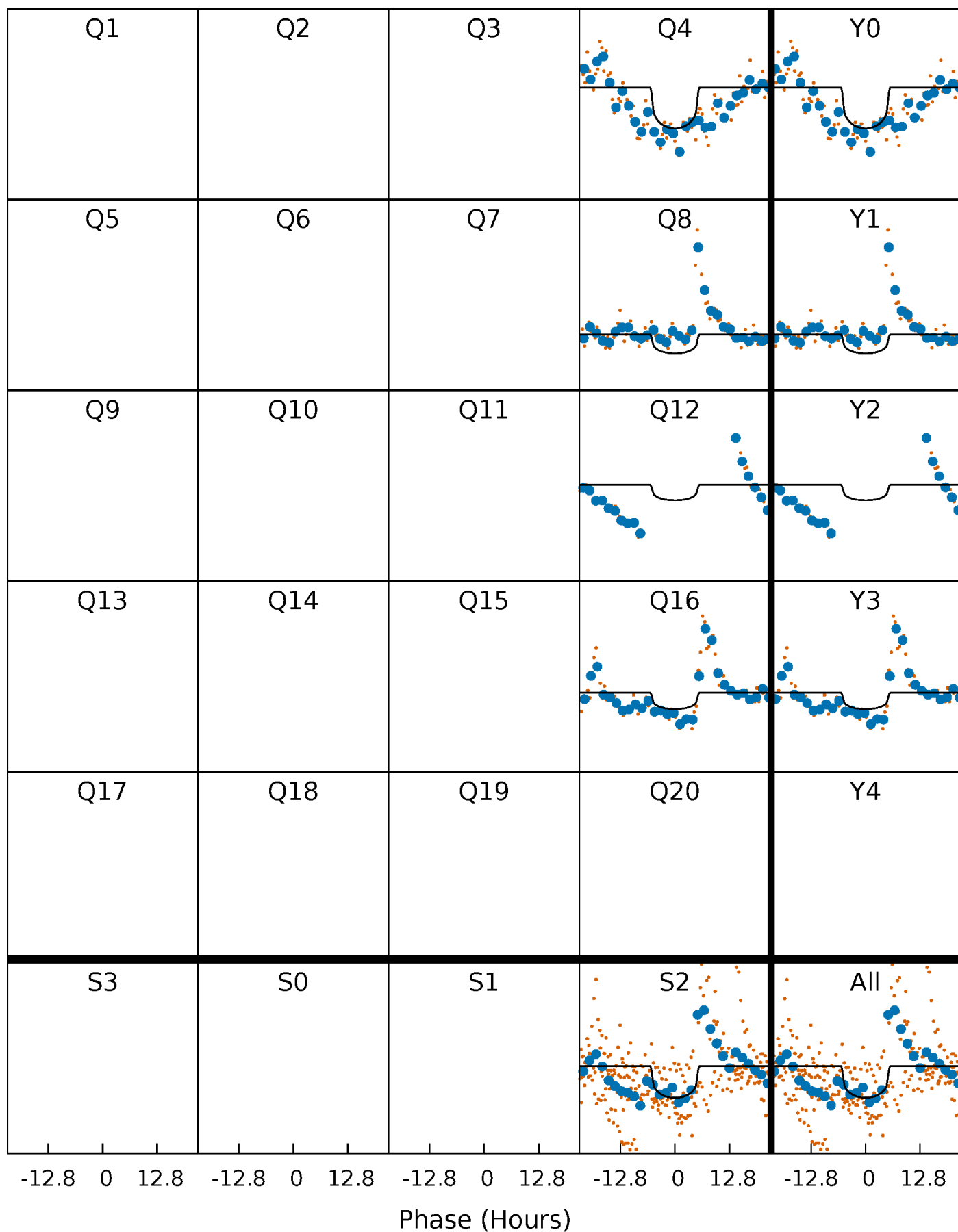
TCE 012117857-02     $P=387.773658$  Days     $T_0=378.775797$  (BKJD)





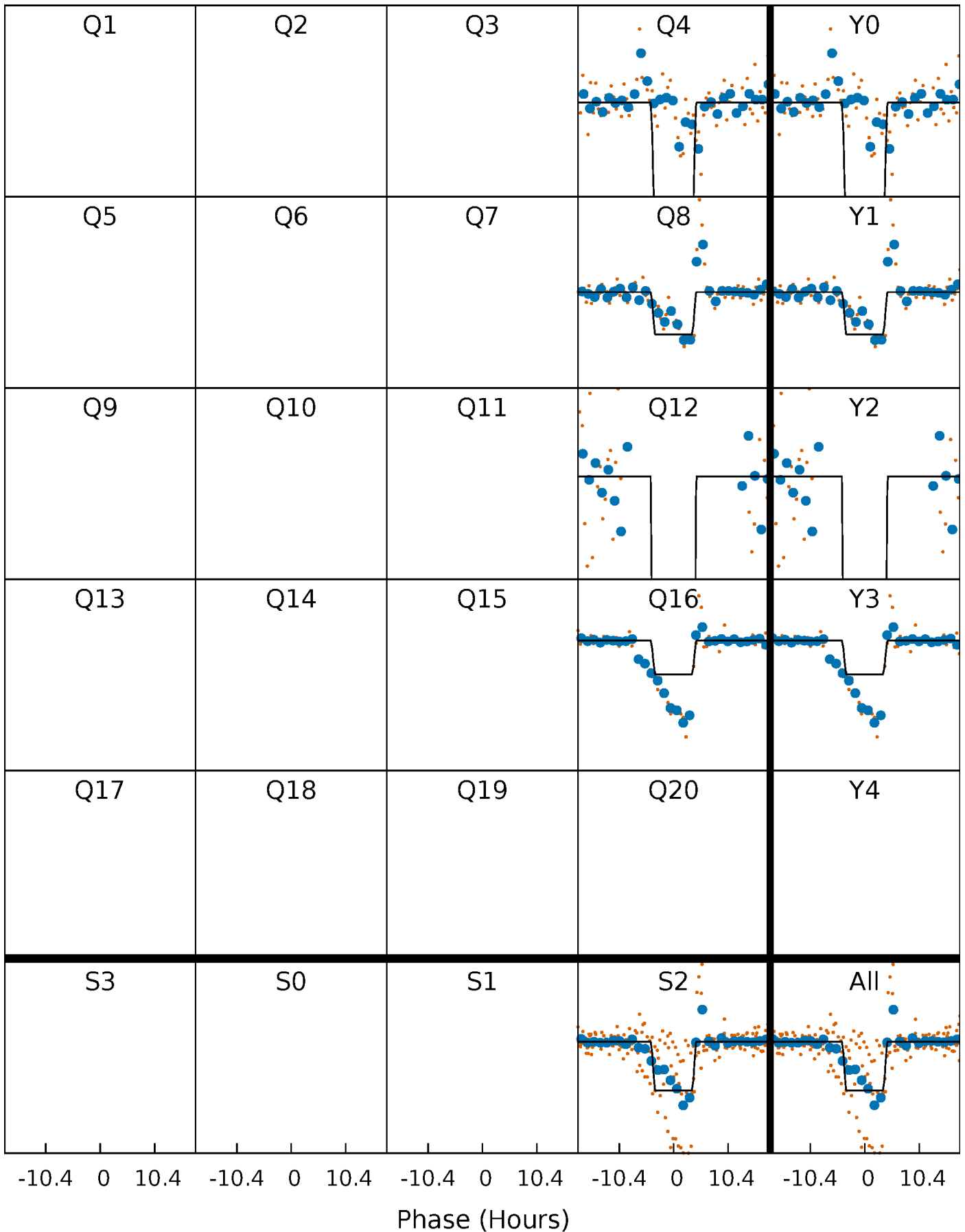
# DV Quarter-Phased Transit Curves

TCE 012117857-02     $P=387.773658$  Days     $T_0=378.775797$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

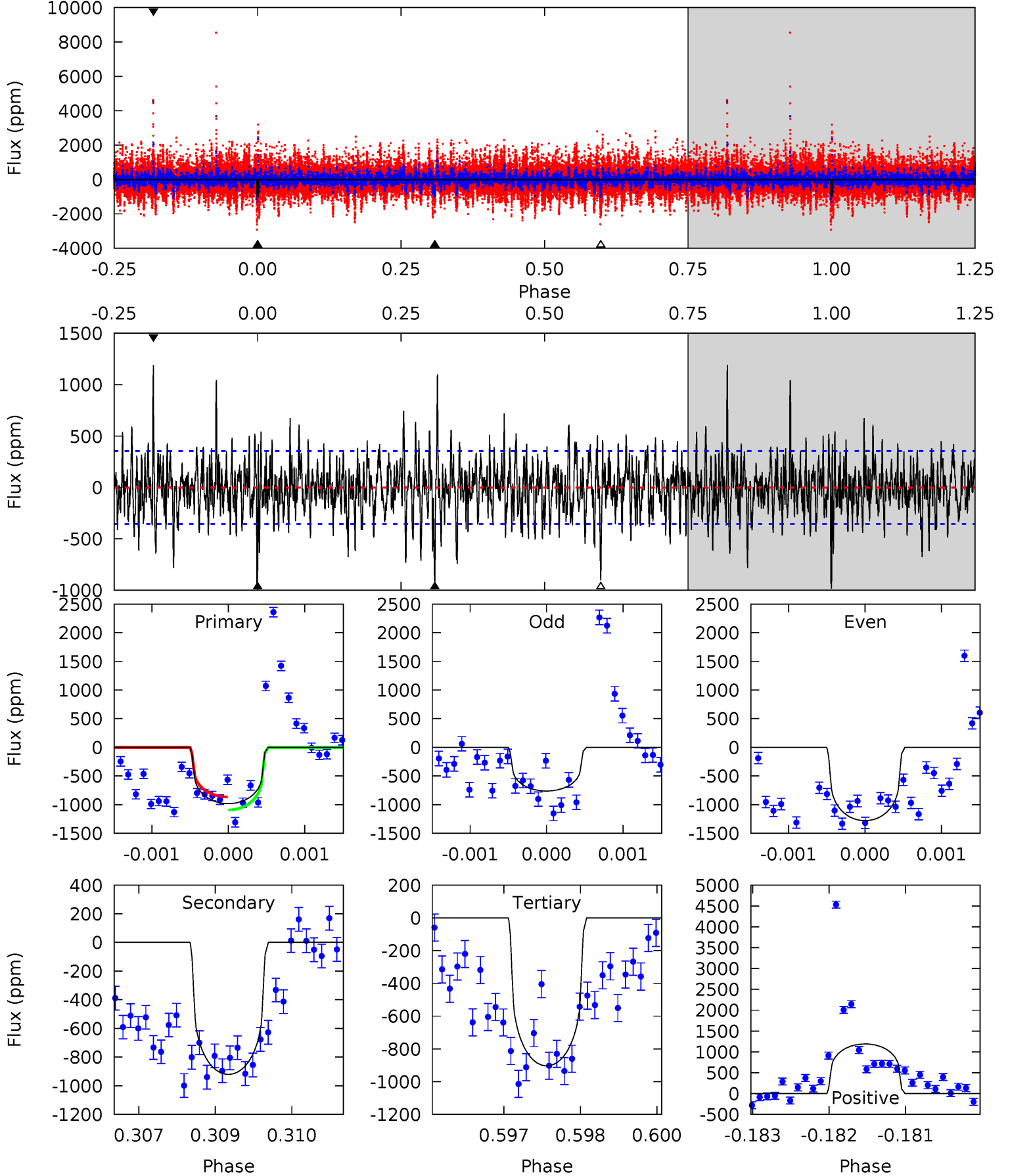
TCE 012117857-02 P=387.801724 Days  $T_0=378.762681$  (BKJD)



# DV Model-Shift Uniqueness Test

012117857-02, P = 387.773658 Days, E = 378.775797 Days

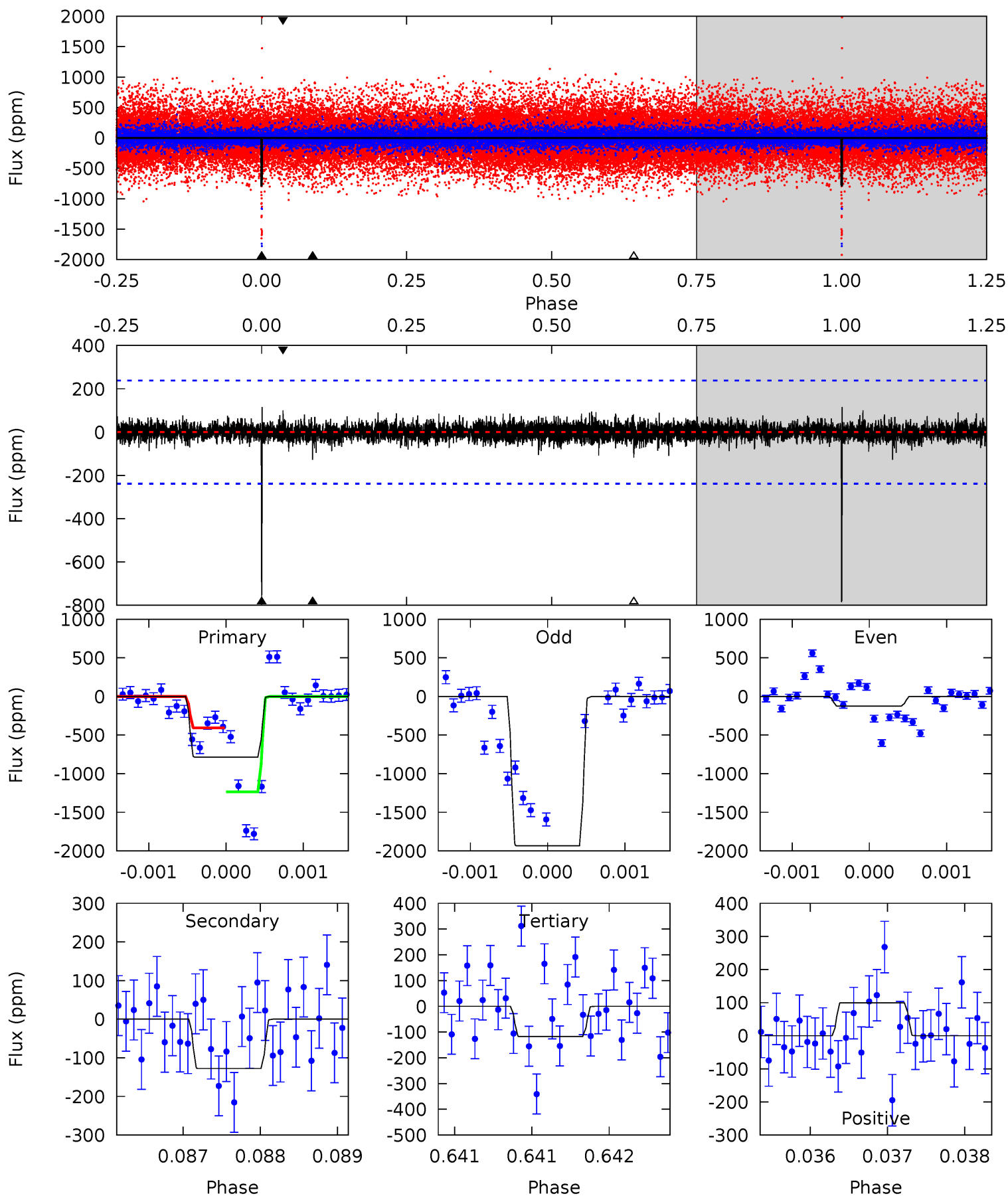
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
15.0	14.1	13.8	18.2	5.41	3.23	3.46	1.20	-3.16	0.26	-4.11	3.28	0.70	0.55	1.76



# Alt Model-Shift Uniqueness Test

012117857-02, P = 387.801724 Days, E = 378.762681 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
18.0	2.93	2.70	2.29	5.47	3.32	0.52	15.3	15.7	0.23	0.64	25.0	1.19	0.13	0



### Stellar Parameters For KIC 012117857

	$T_{\text{eff}}(K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5237^{+158}_{-158}$	$3.937^{+0.651}_{-0.279}$	$-0.160^{+0.300}_{-0.300}$	$1.675^{+0.898}_{-0.898}$	$0.885^{+0.078}_{-0.135}$	$0.265^{+2.323}_{-0.155}$
	+3%/-3%	+17%/-7%	+188%/-188%	+54%/-54%	+9%/-15%	+876%/-58%
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 012117857-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-921 \pm 65$	$4.93^{+3.33}_{-2.35}$	$408^{+57}_{-62}$	$5254^{+1755}_{-809}$	$20351^{+54585}_{-13078}$
Alt.	$-128 \pm 44$	$6.37^{+3.69}_{-2.88}$	$405^{+59}_{-66}$	$3318^{+561}_{-350}$	$1697^{+3632}_{-1078}$

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

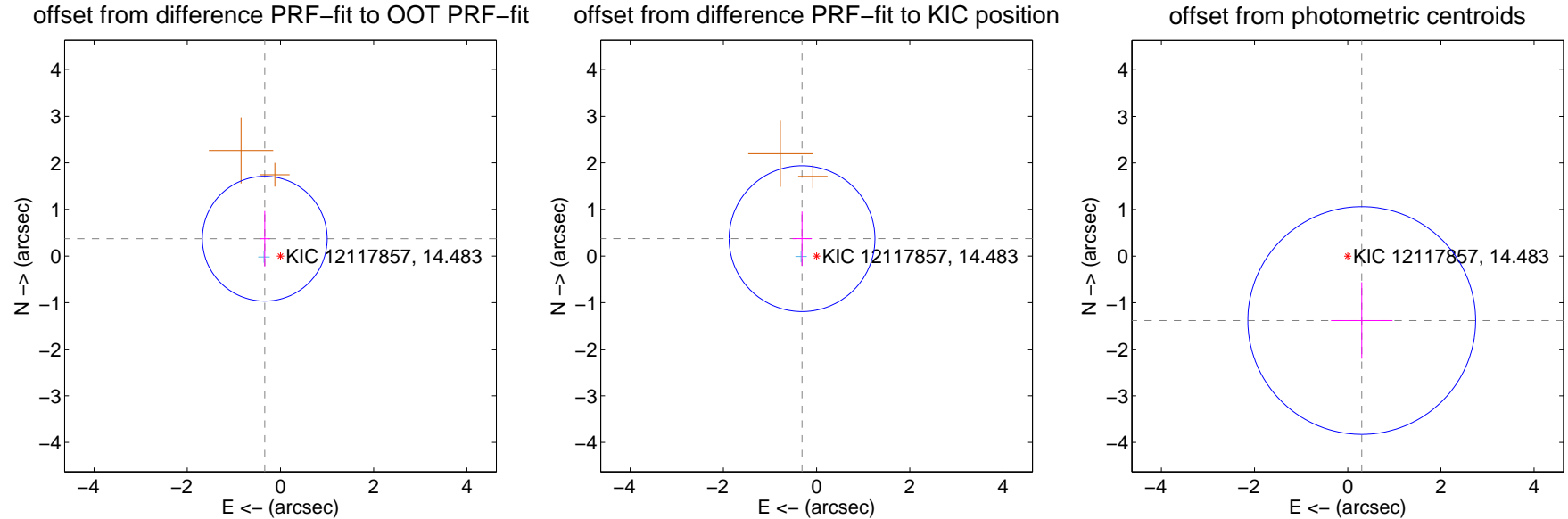
## DV Centroid Data

Supplemental centroid analysis for 012117857-02. Kepler magnitude: 14.48. Transit SNR 6.67

There are 1 quarters with good PRF difference image offsets

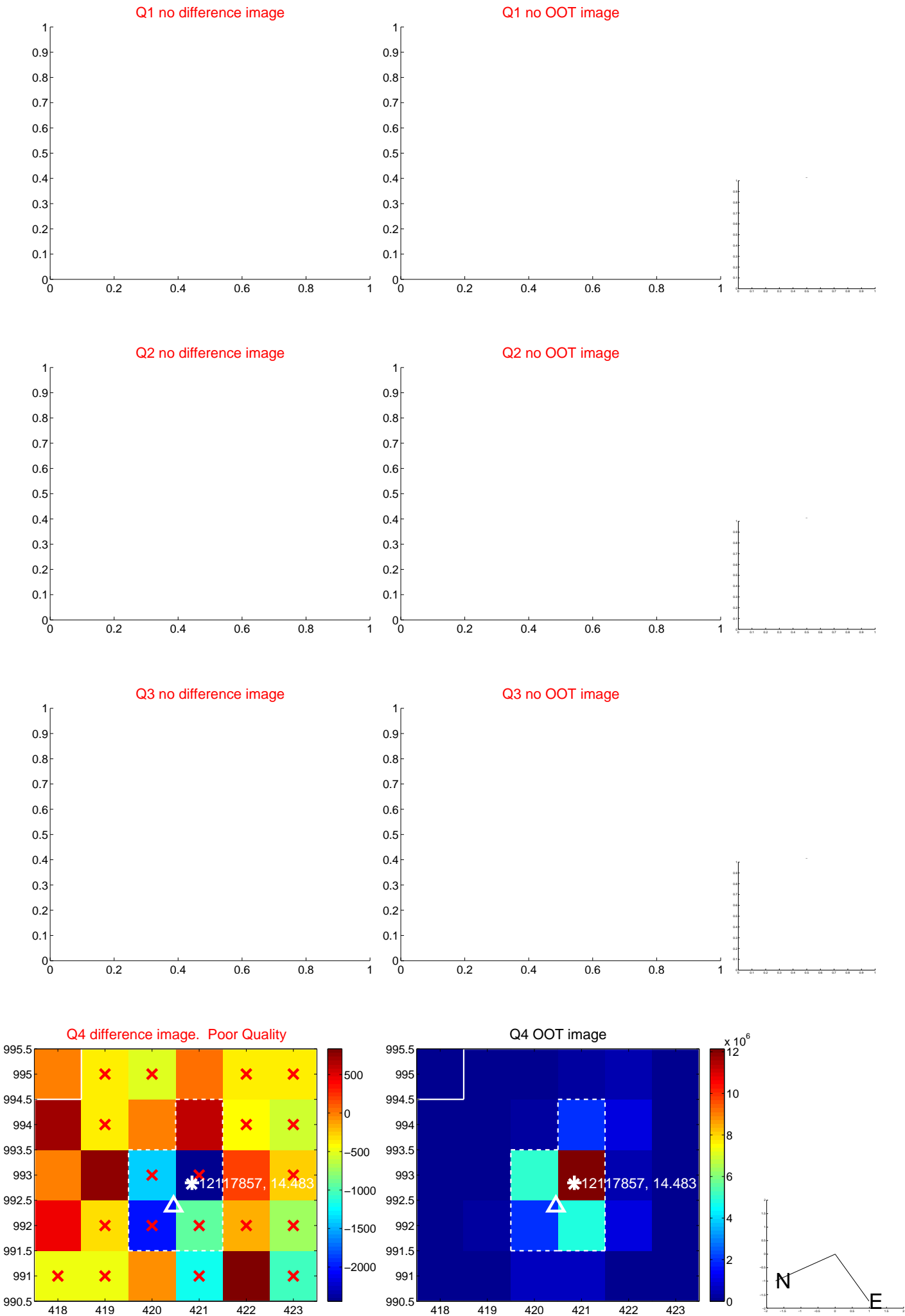
The direct PRF centroid is offset from the target star catalog position by about 0.02 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.502 \pm 0.447$	1.12	$0.337 \pm 0.111$	$0.372 \pm 0.594$
PRF-fit source offset from KIC position	$0.486 \pm 0.522$	0.93	$0.312 \pm 0.208$	$0.373 \pm 0.583$
photometric centroid source offset	$1.42 \pm 0.81$	1.74	$-0.30 \pm 0.66$	$-1.38 \pm 0.82$

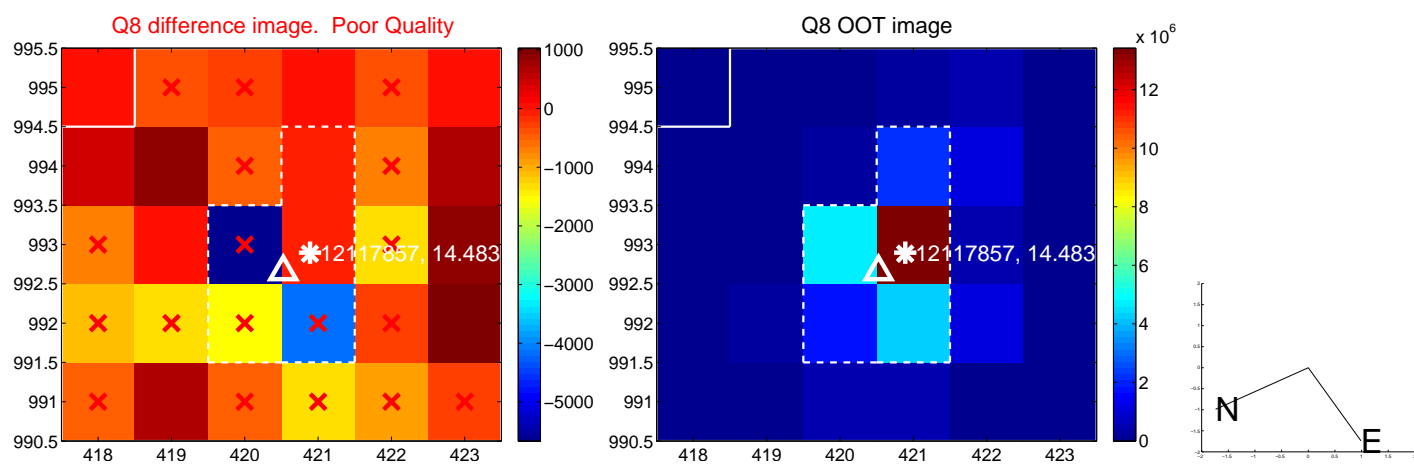
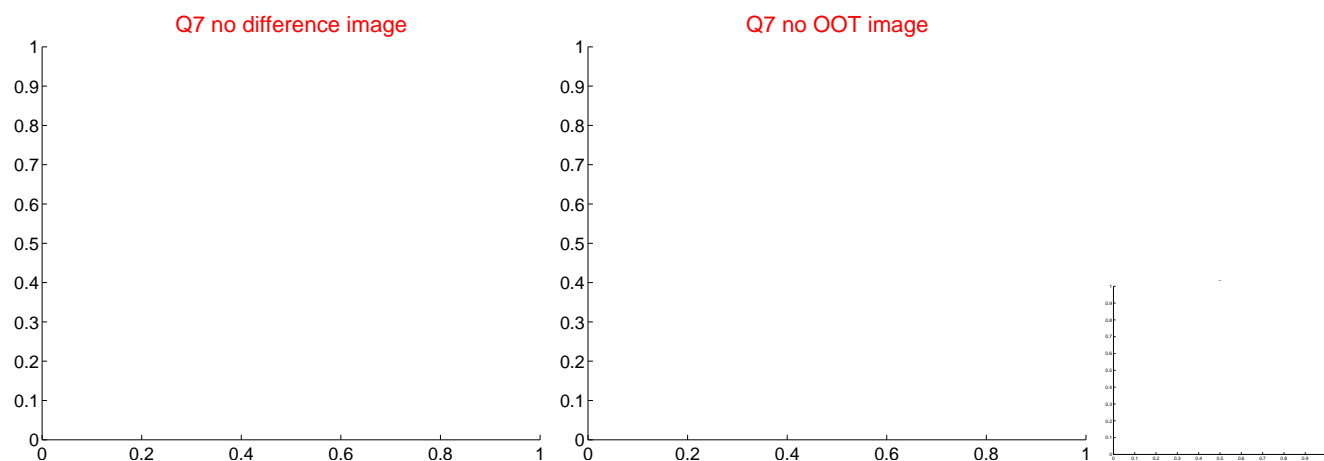
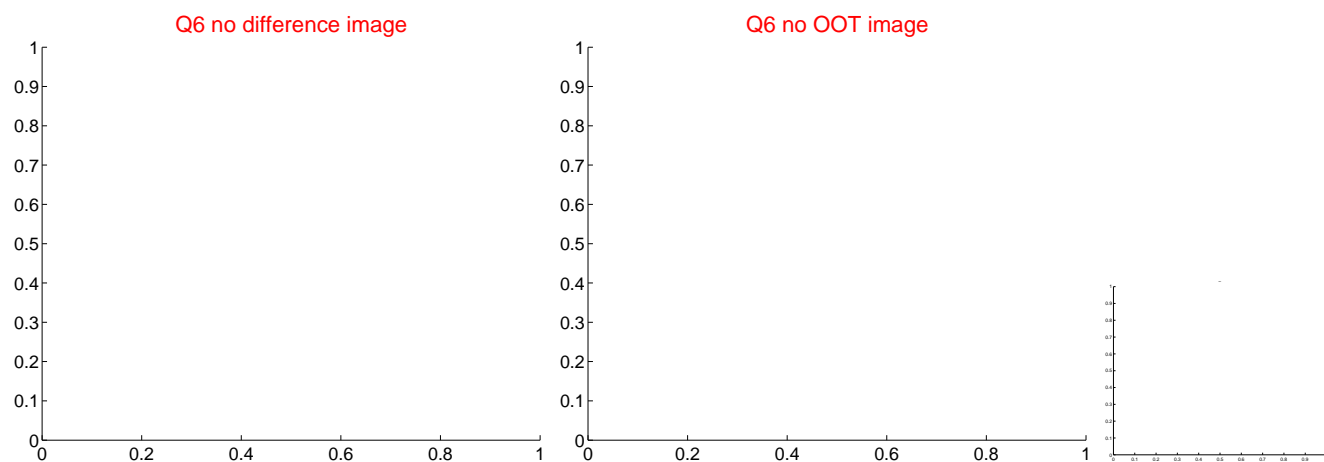
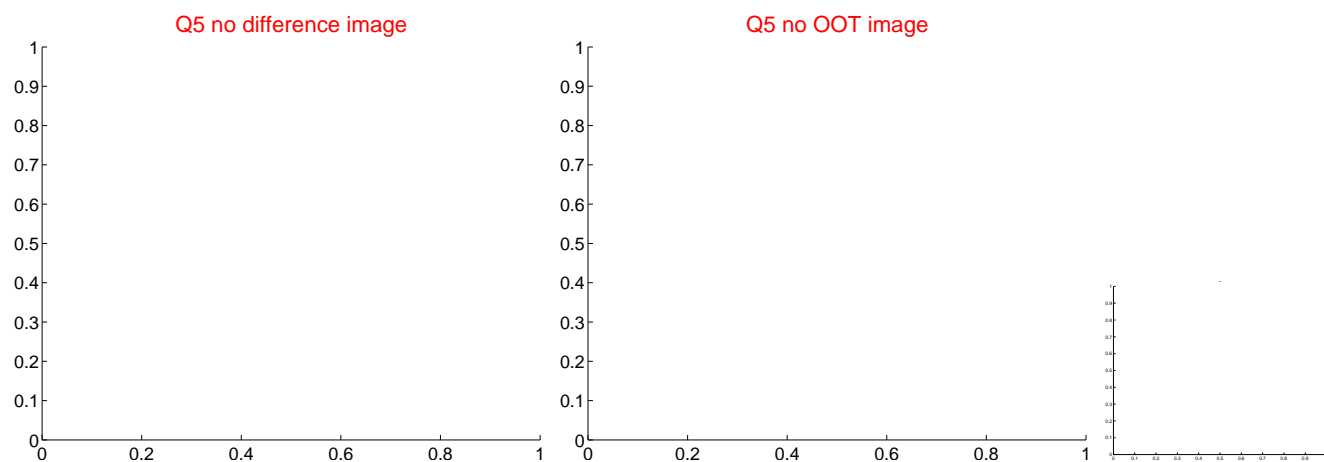


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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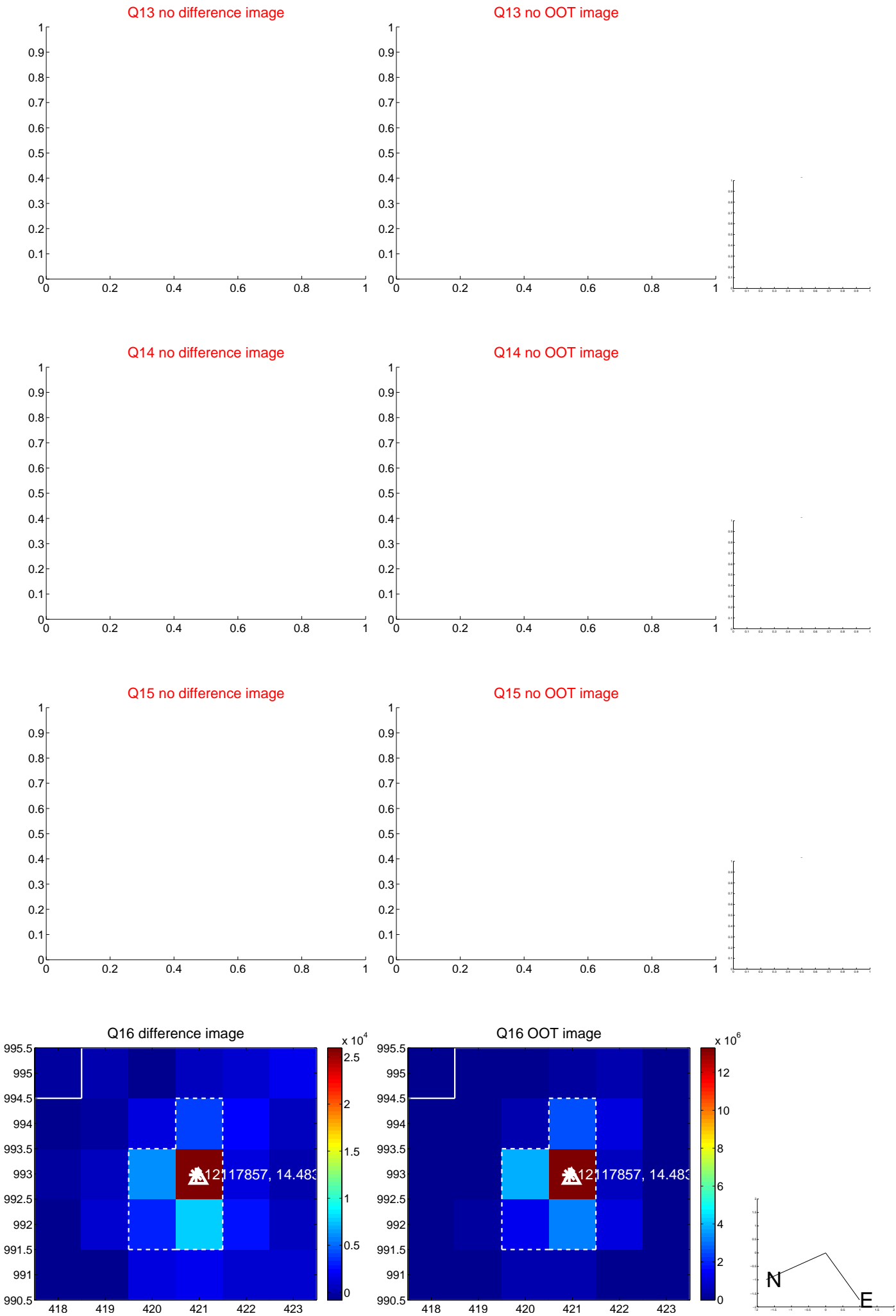




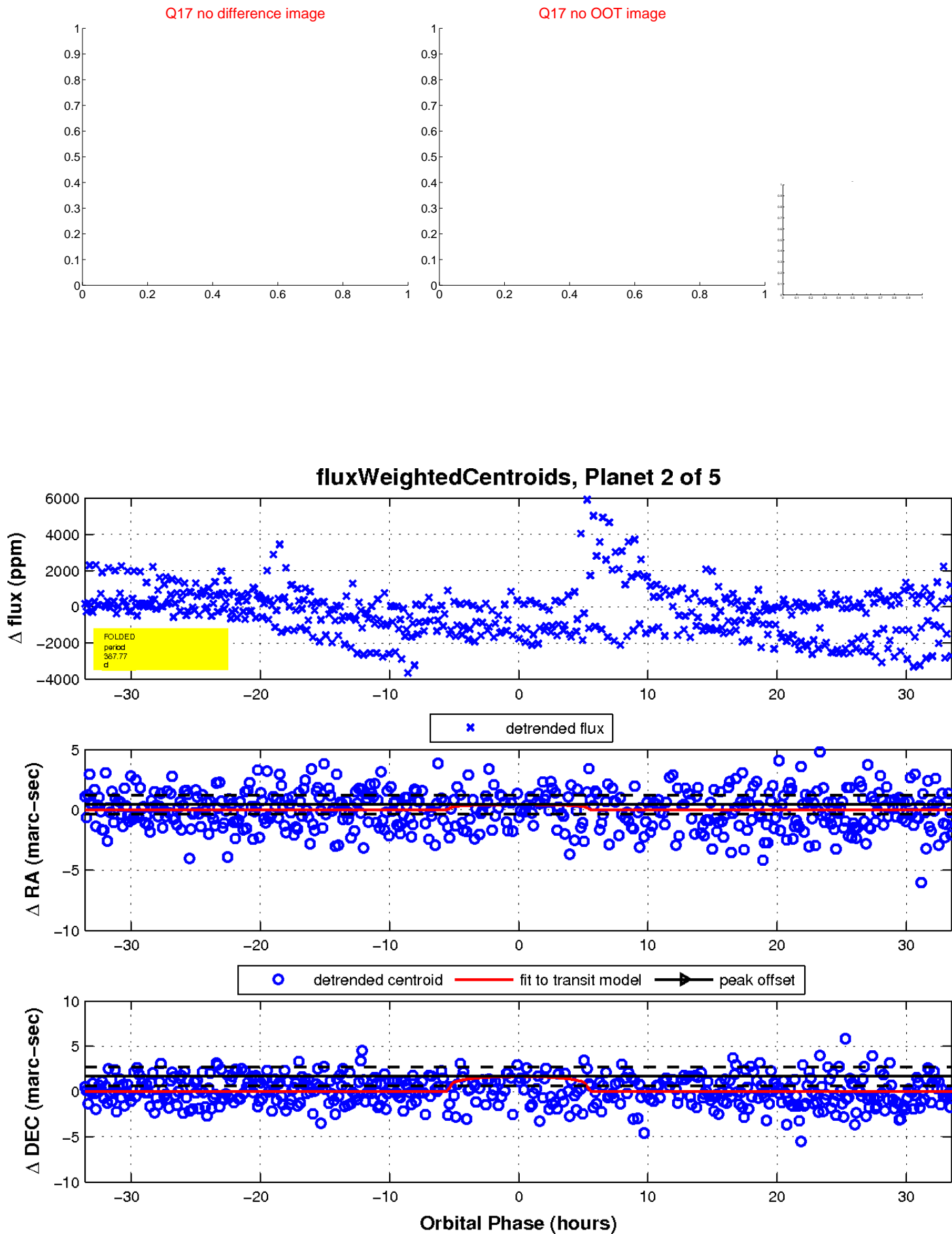
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white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.

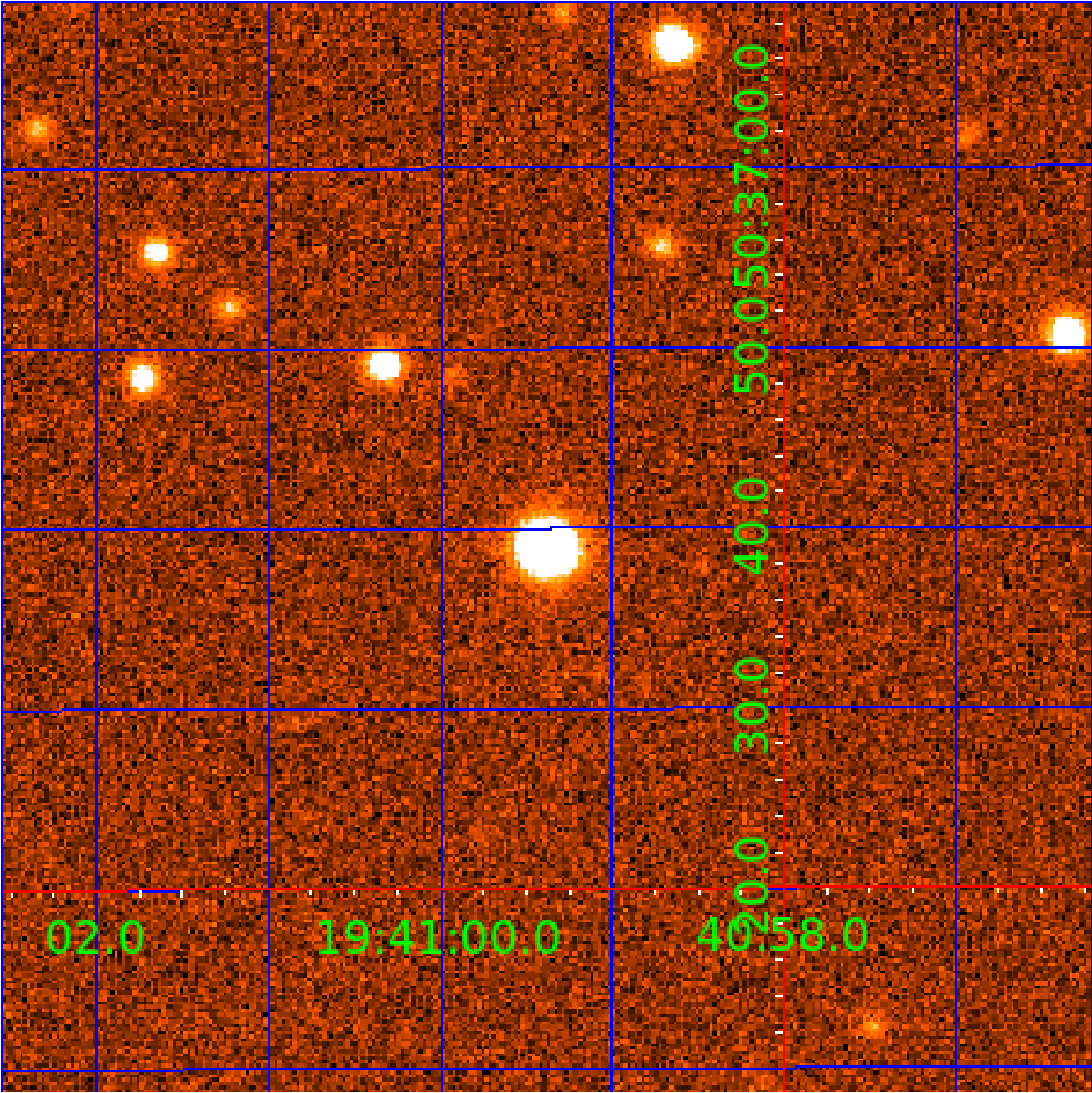


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UKIRT Image

Declination



# KIC 012117857

## Q1-17 DR25 TCE Parameters

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## Robovetter Results

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012117857-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_FEW_DIFFS
012117857-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_POS_DV
012117857-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_SKYE—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_NOFITS

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

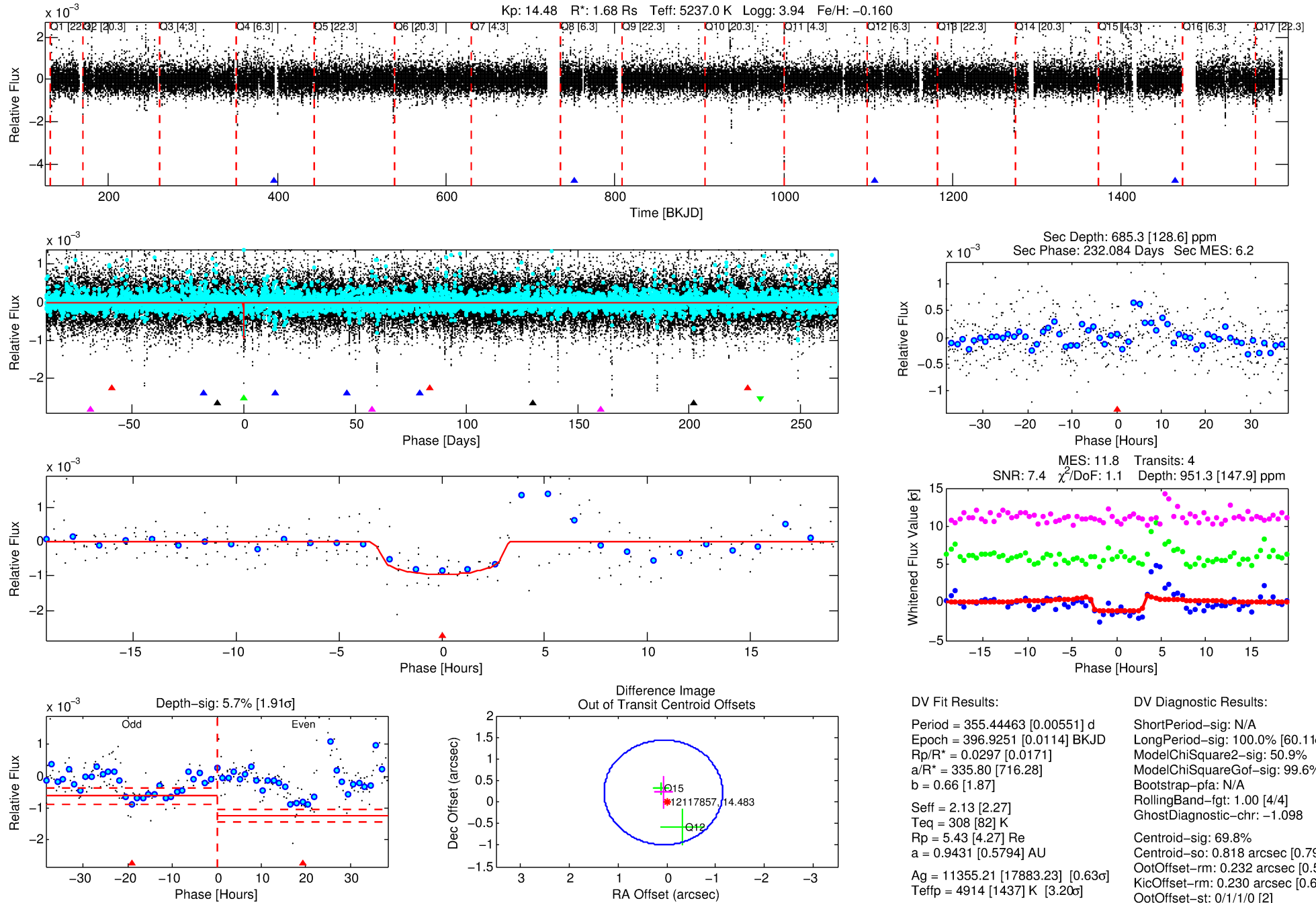
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 012117857-03

No Significant Match Found

# DV One-Page Summary

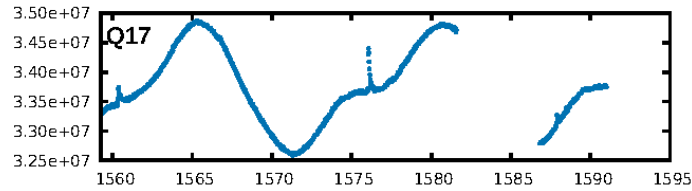
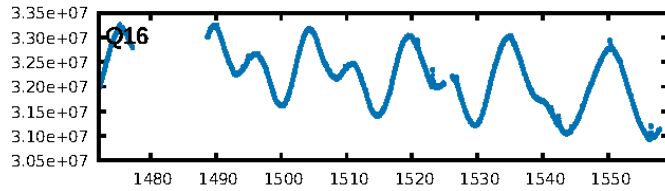
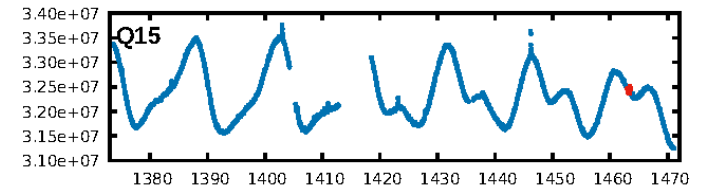
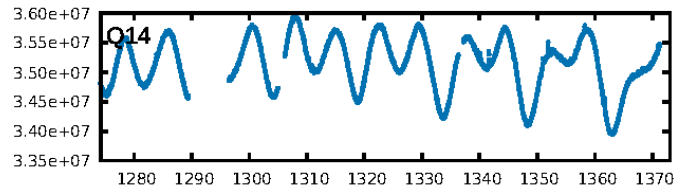
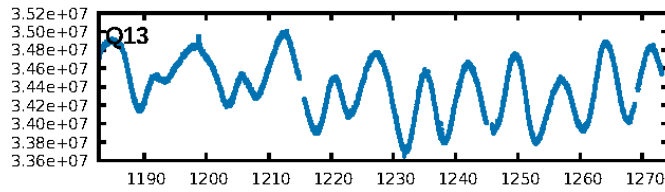
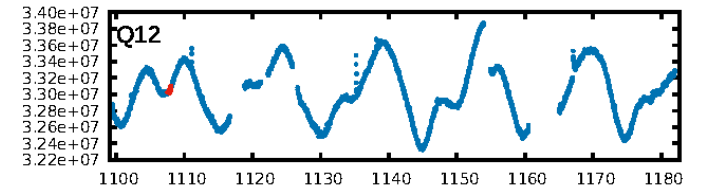
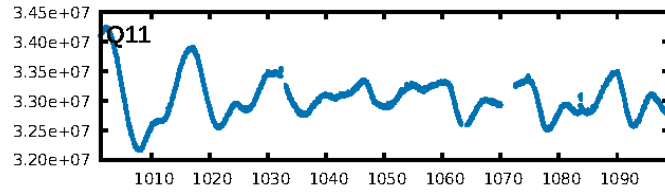
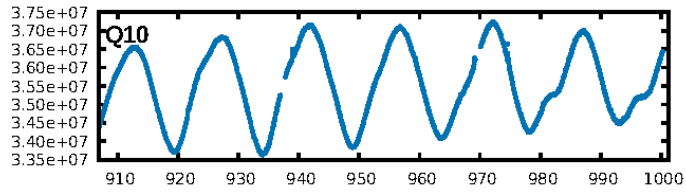
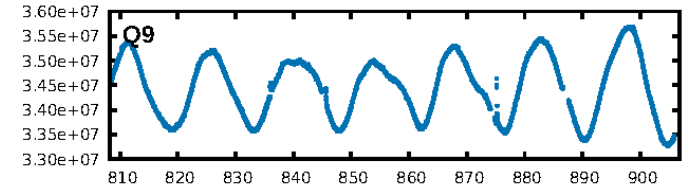
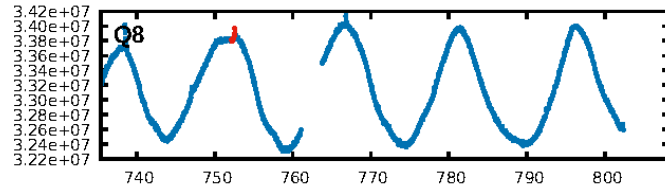
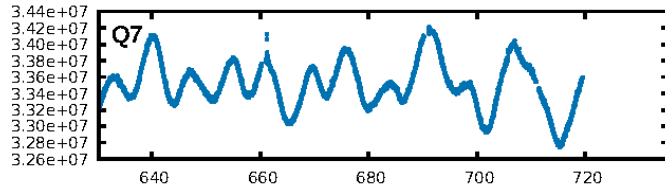
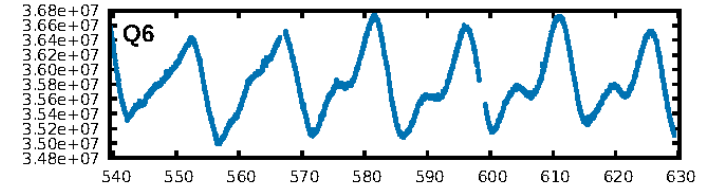
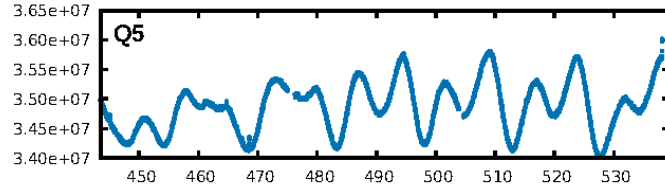
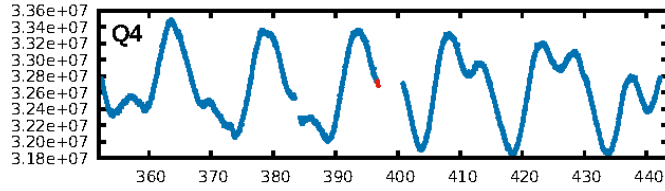
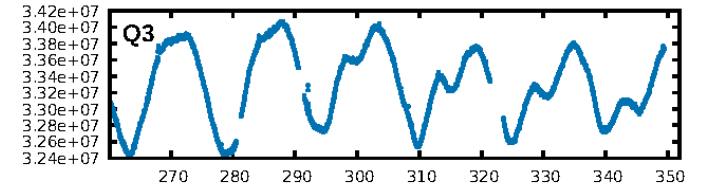
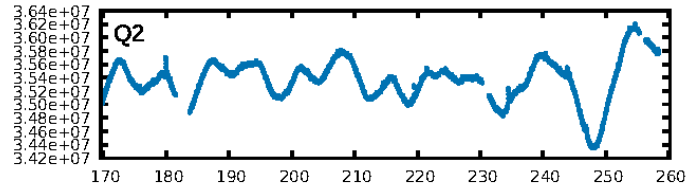
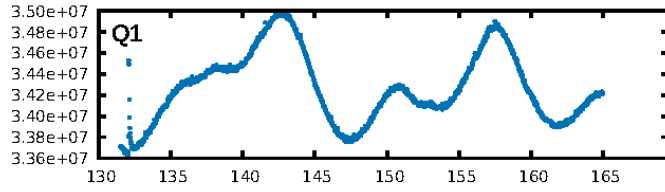
KIC: 12117857 Candidate: 3 of 5 Period: 355.445 d



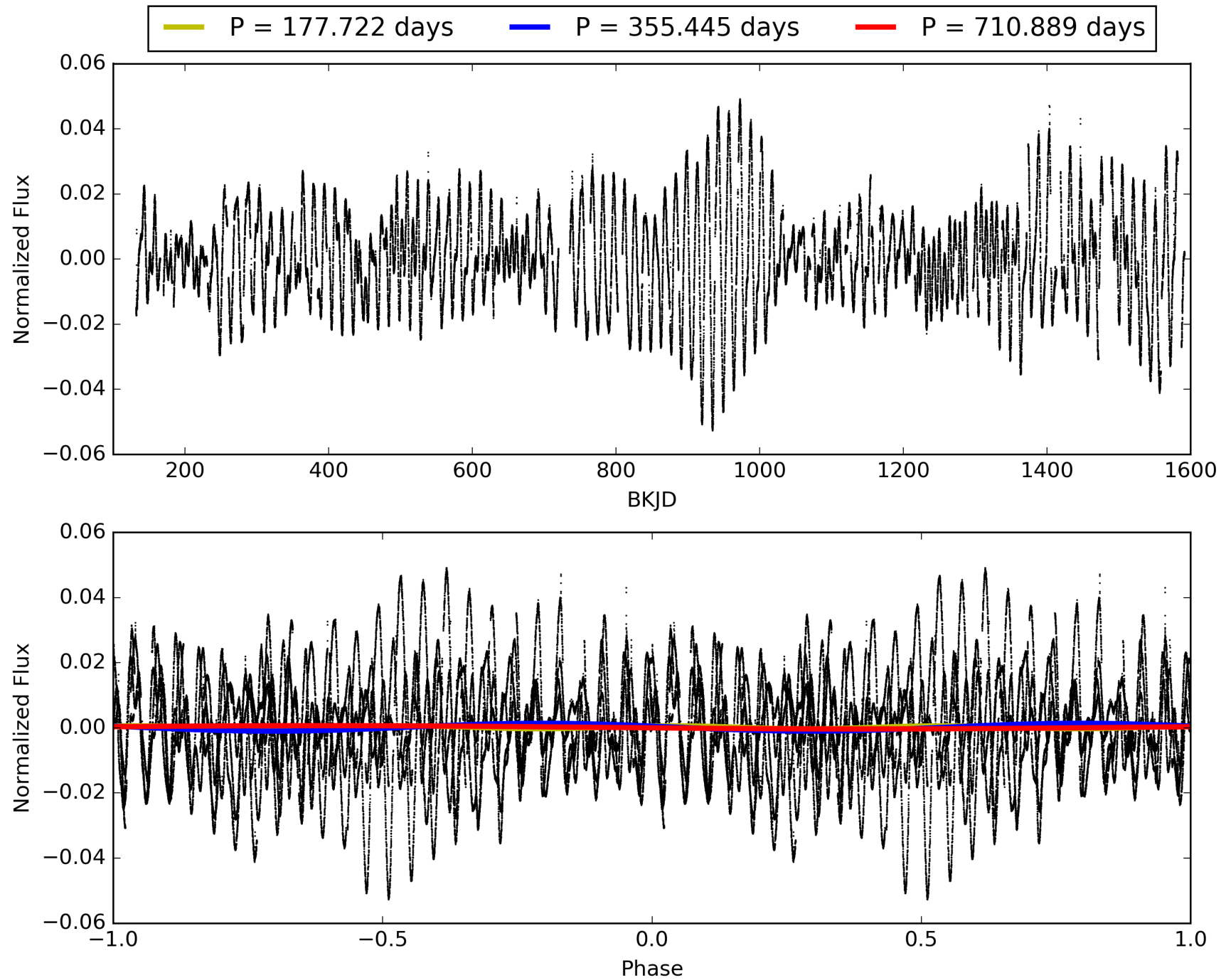
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 05:29:45 Z

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

# TCE 012117857-03, PDC Light Curves



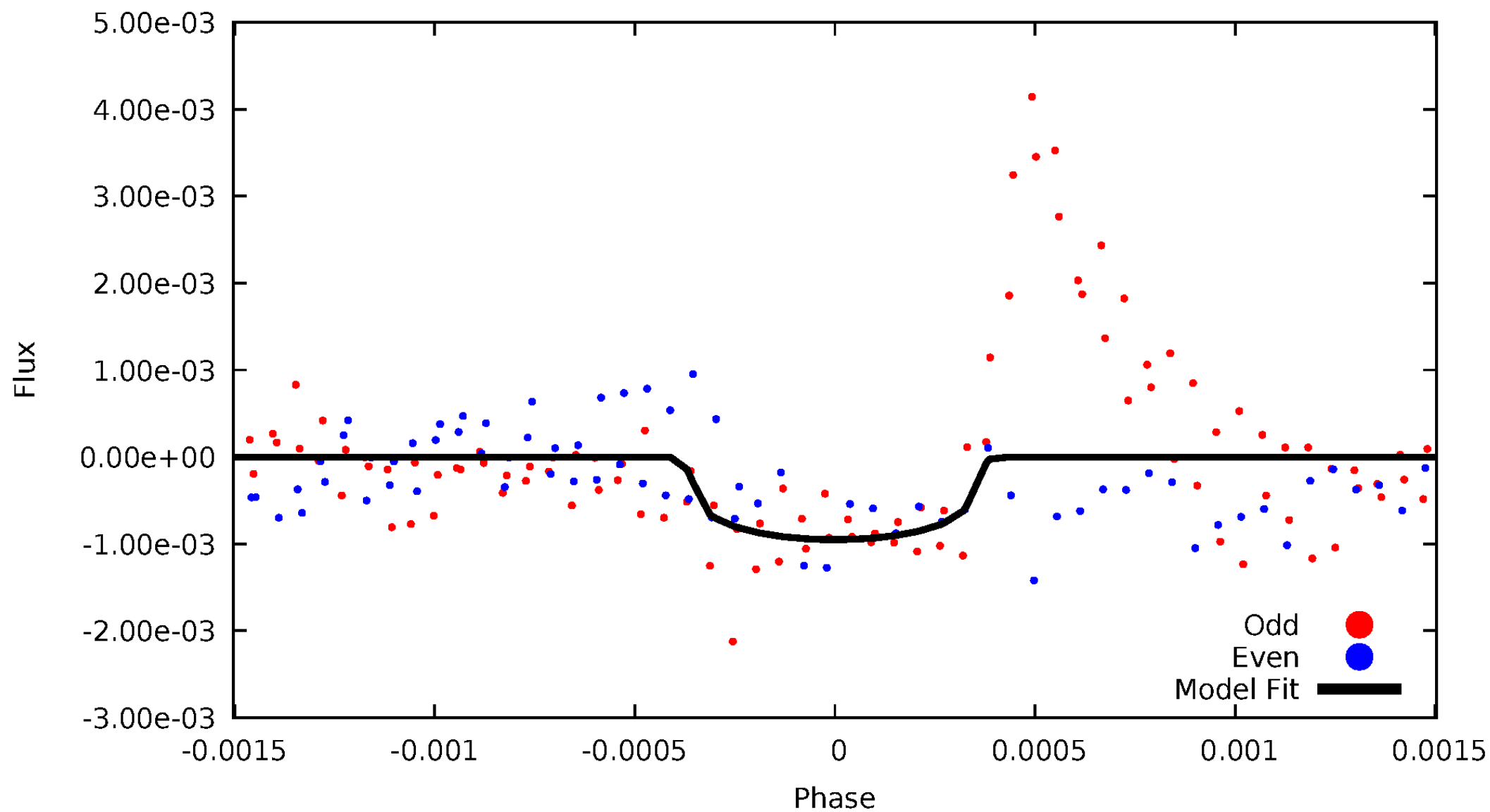
# TCE 012117857-03





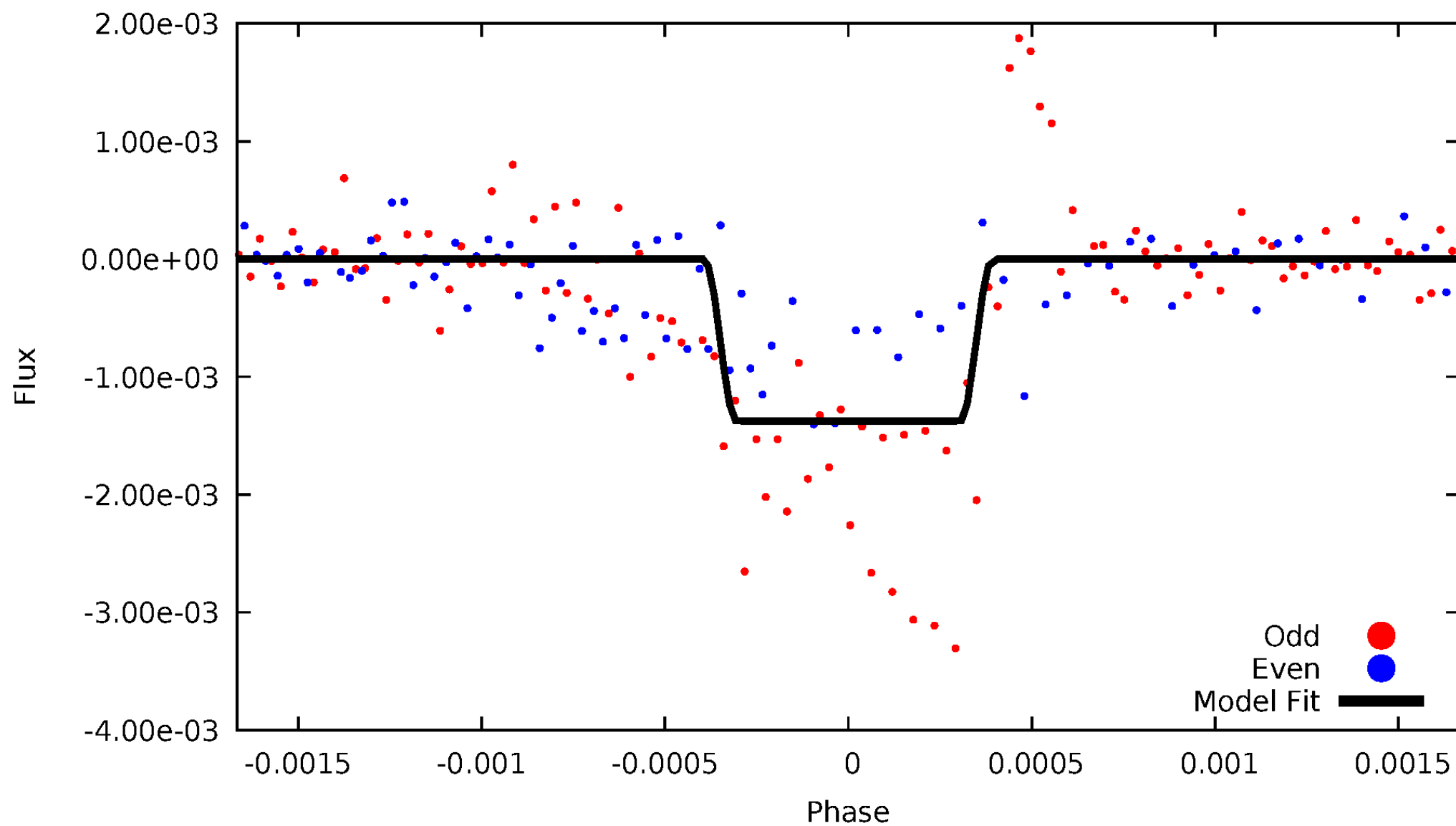
# DV Odd/Even

TCE 012117857-03



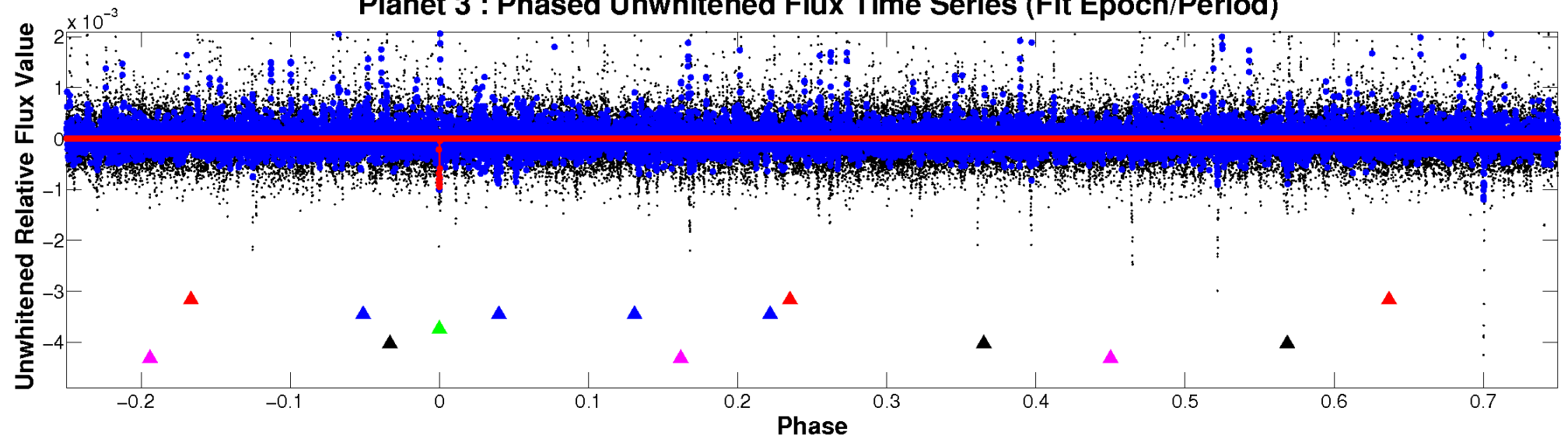
# ALT Odd/Even

TCE 012117857-03

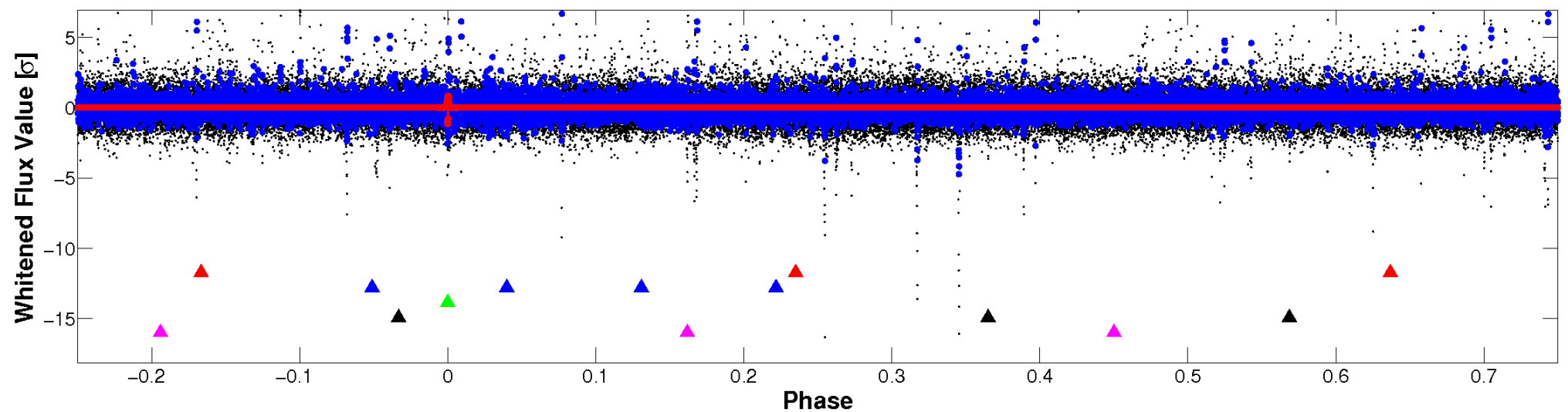


# Non-Whitened Vs. Whitened Light Curve

Planet 3 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

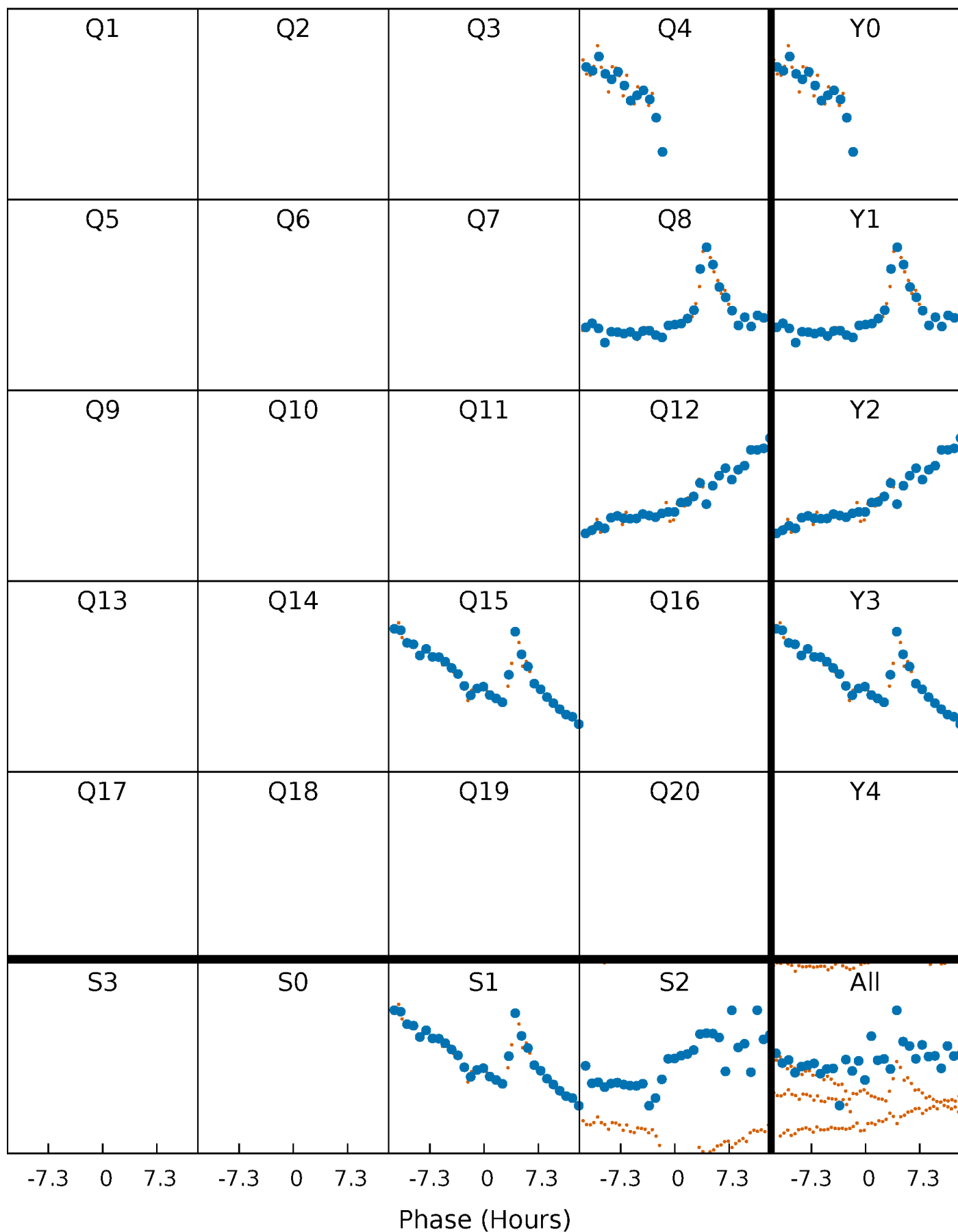


Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



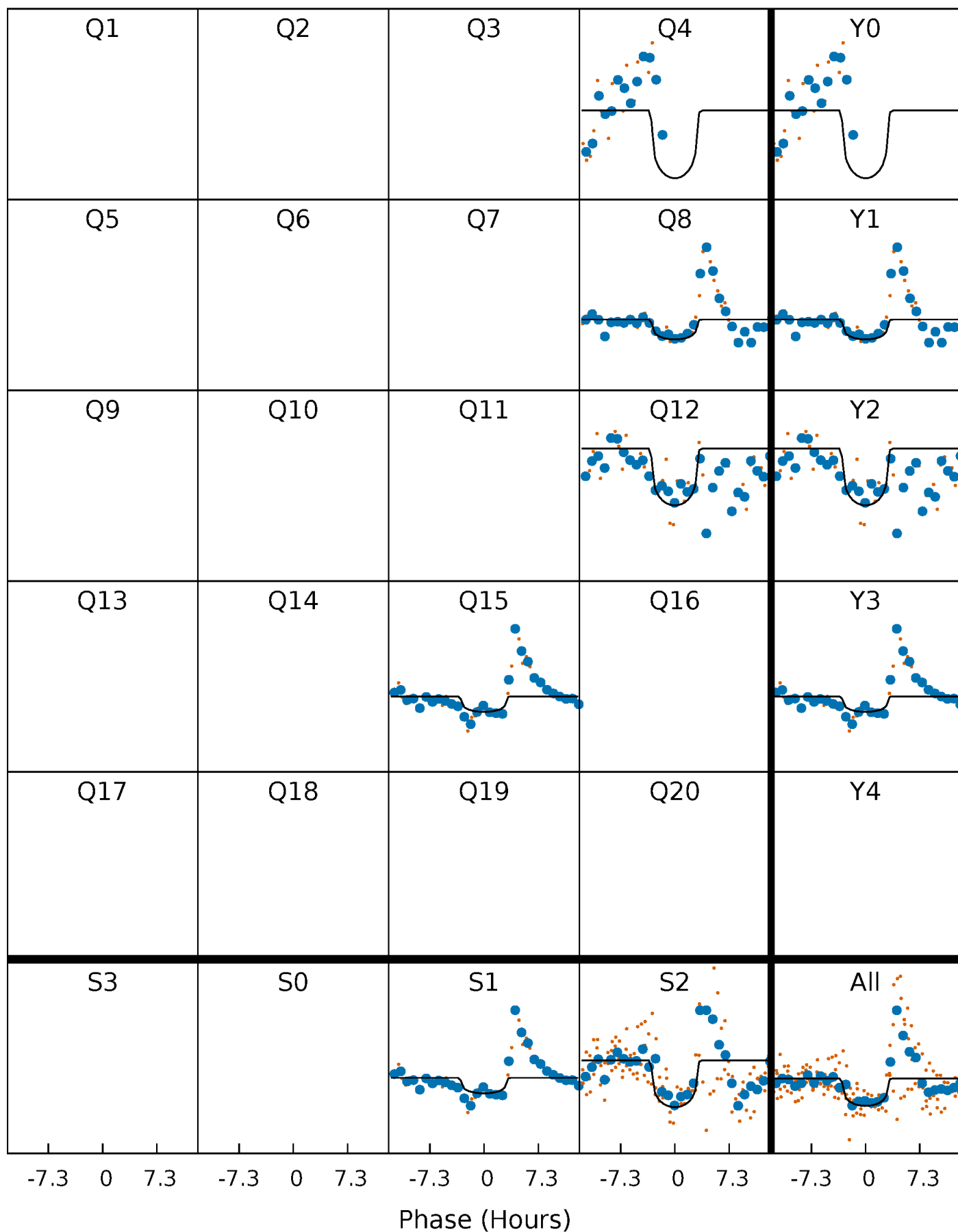
# PDC Quarter-Phased Transit Curves

TCE 012117857-03   P=355.444630 Days    $T_0=396.925055$  (BKJD)



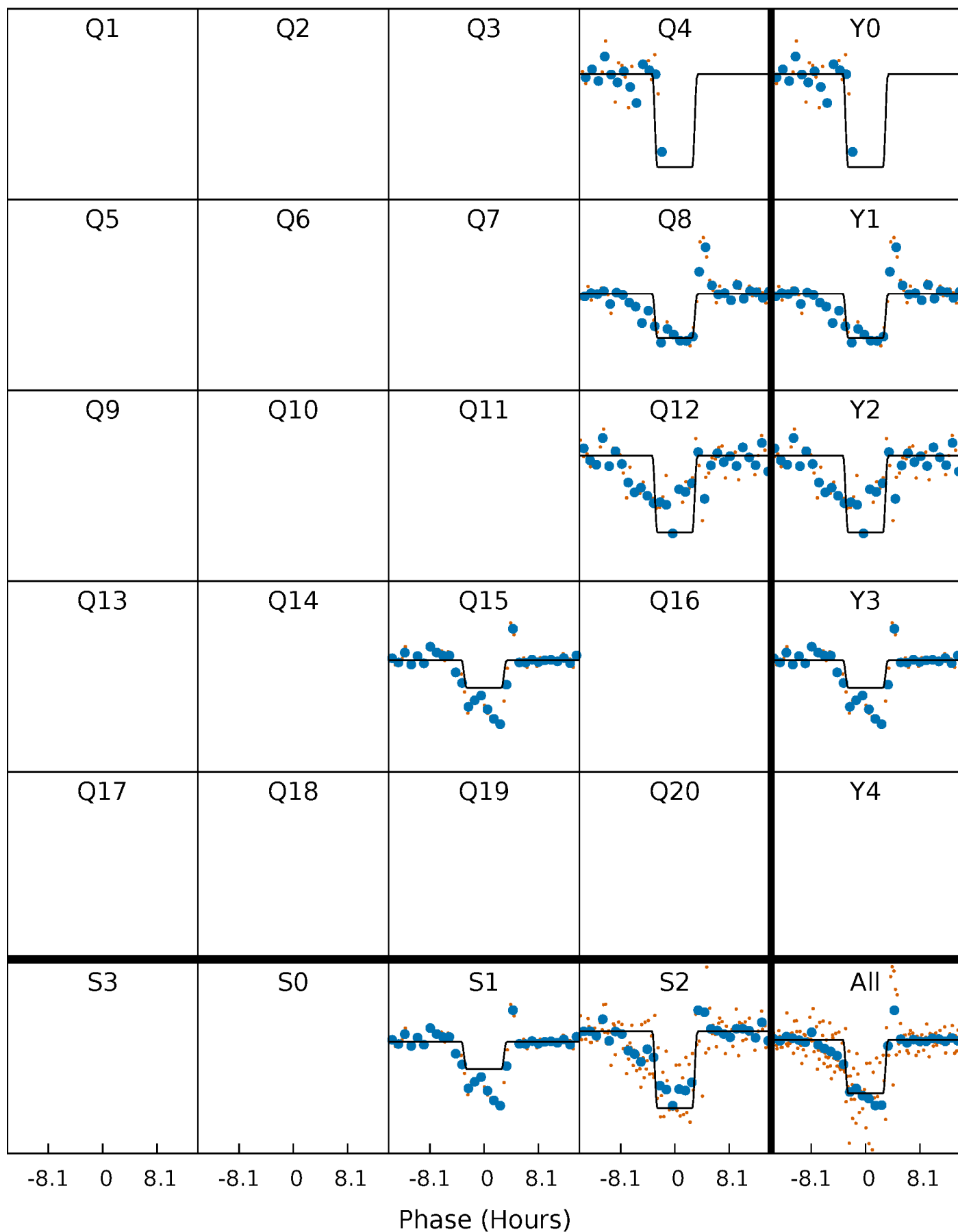
# DV Quarter-Phased Transit Curves

TCE 012117857-03     $P=355.444630$  Days     $T_0=396.925055$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

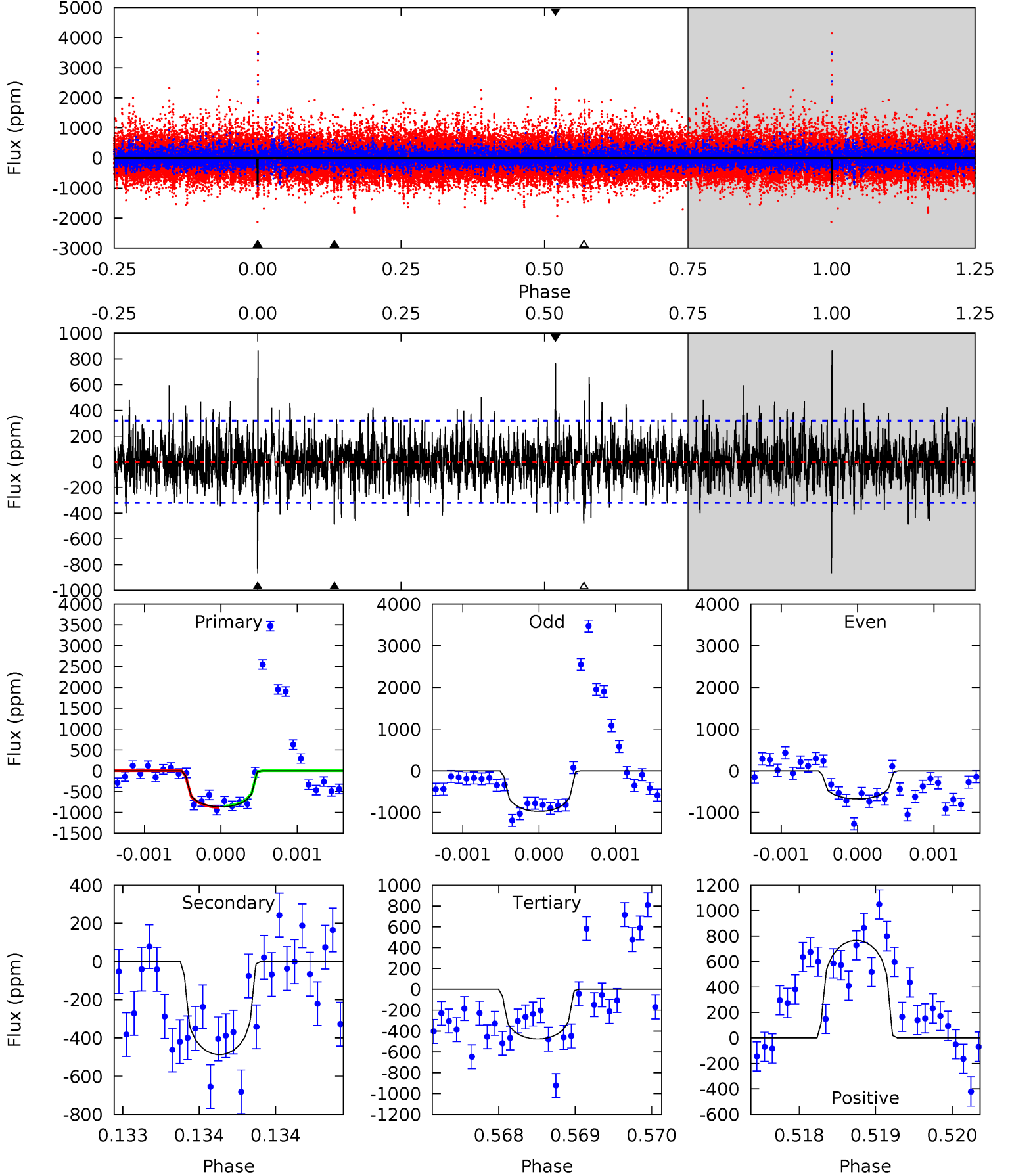
TCE 012117857-03 P=355.448587 Days  $T_0=396.923098$  (BKJD)



# DV Model-Shift Uniqueness Test

012117857-03, P = 355.444630 Days, E = 41.480425 Days

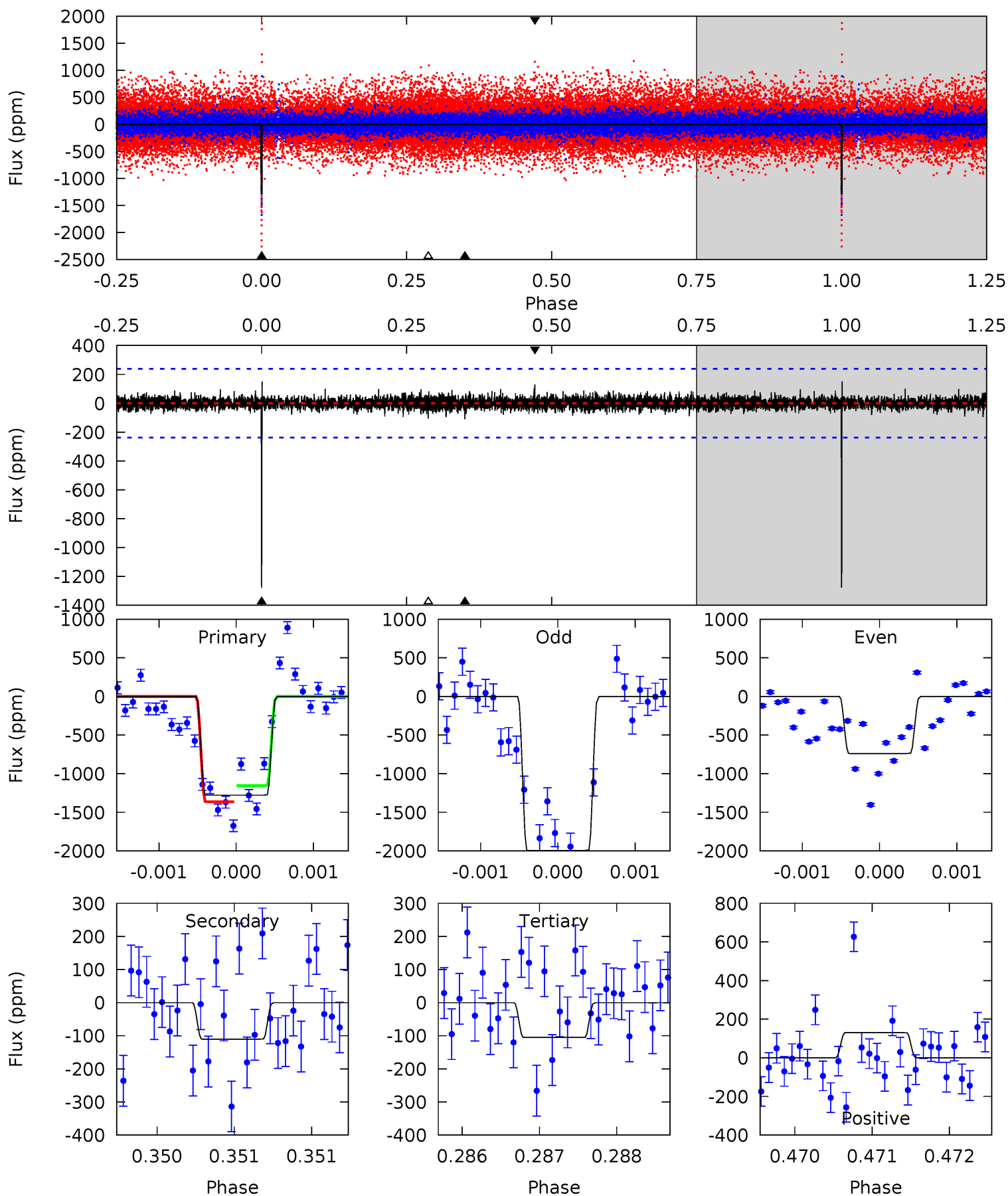
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
14.9	8.36	8.18	13.1	5.49	3.35	2.29	6.68	1.73	0.18	-4.77	2.26	0.79	0.50	0.25



# Alt Model-Shift Uniqueness Test

012117857-03,  $P = 355.448587$  Days,  $E = 41.474511$  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
29.5	2.55	2.43	3.01	5.50	3.37	0.53	27.1	26.5	0.12	-0.46	16.4	1.22	0.10	2.38





### Stellar Parameters For KIC 012117857

	$T_{\text{eff}}(K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5237^{+158}_{-158}$	$3.937^{+0.651}_{-0.279}$	$-0.160^{+0.300}_{-0.300}$	$1.675^{+0.898}_{-0.898}$	$0.885^{+0.078}_{-0.135}$	$0.265^{+2.323}_{-0.155}$
	+3%/-3%	+17%/-7%	+188%/-188%	+54%/-54%	+9%/-15%	+876%/-58%
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 012117857-03 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-487 \pm 58$	$5.04^{+3.64}_{-2.98}$	$419^{+65}_{-63}$	$4594^{+1850}_{-683}$	$9355^{+46136}_{-6273}$
Alt.	$-110 \pm 43$	$6.07^{+4.13}_{-3.07}$	$419^{+60}_{-63}$	$3288^{+772}_{-398}$	$1412^{+4062}_{-1003}$

$T_{\text{max}}$  = 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

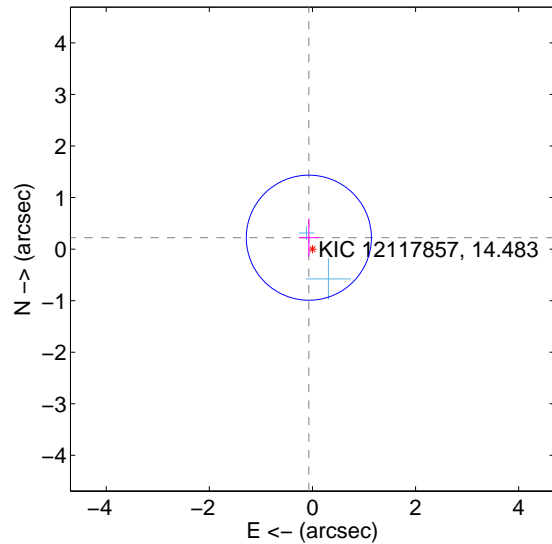
Supplemental centroid analysis for 012117857-03. Kepler magnitude: 14.48. Transit SNR 7.39

There are 2 quarters with good PRF difference image offsets

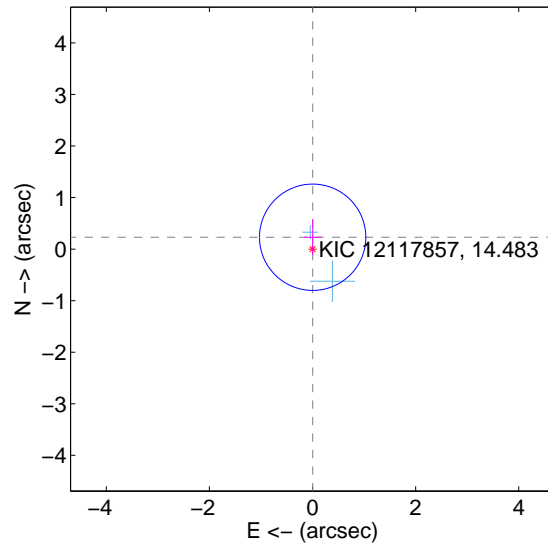
The direct PRF centroid is offset from the target star catalog position by about 0.07 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.232 \pm 0.404$	0.57	$0.069 \pm 0.186$	$0.221 \pm 0.370$
PRF-fit source offset from KIC position	$0.230 \pm 0.344$	0.67	$-0.002 \pm 0.168$	$0.230 \pm 0.344$
photometric centroid source offset	$0.82 \pm 1.03$	0.79	$0.39 \pm 0.87$	$0.72 \pm 1.07$

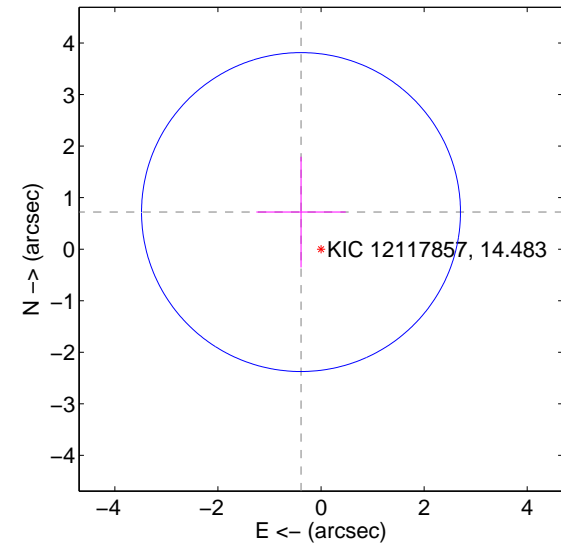
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position



offset from photometric centroids

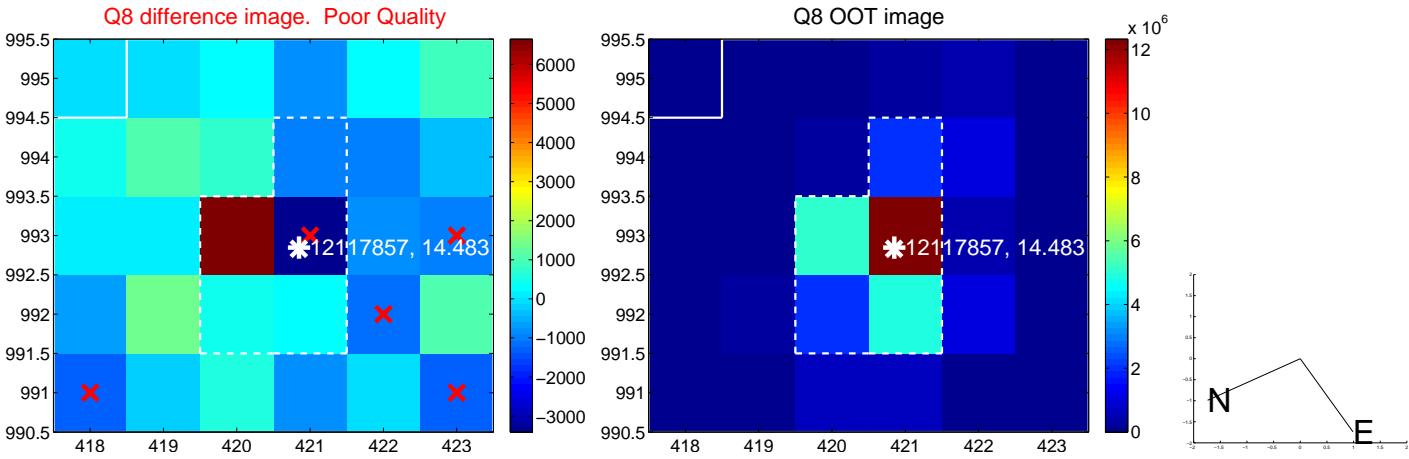
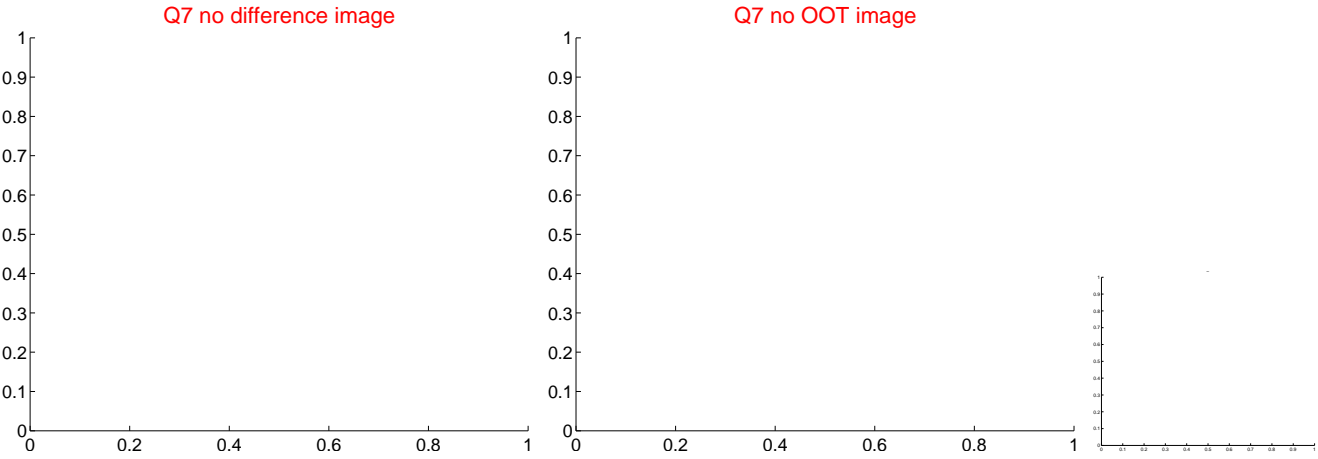
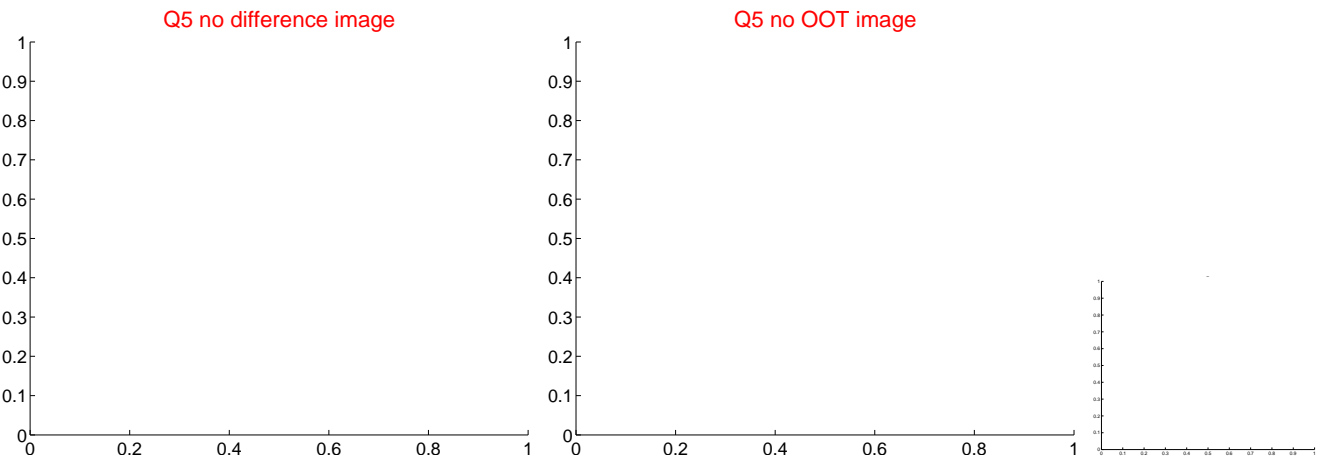


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

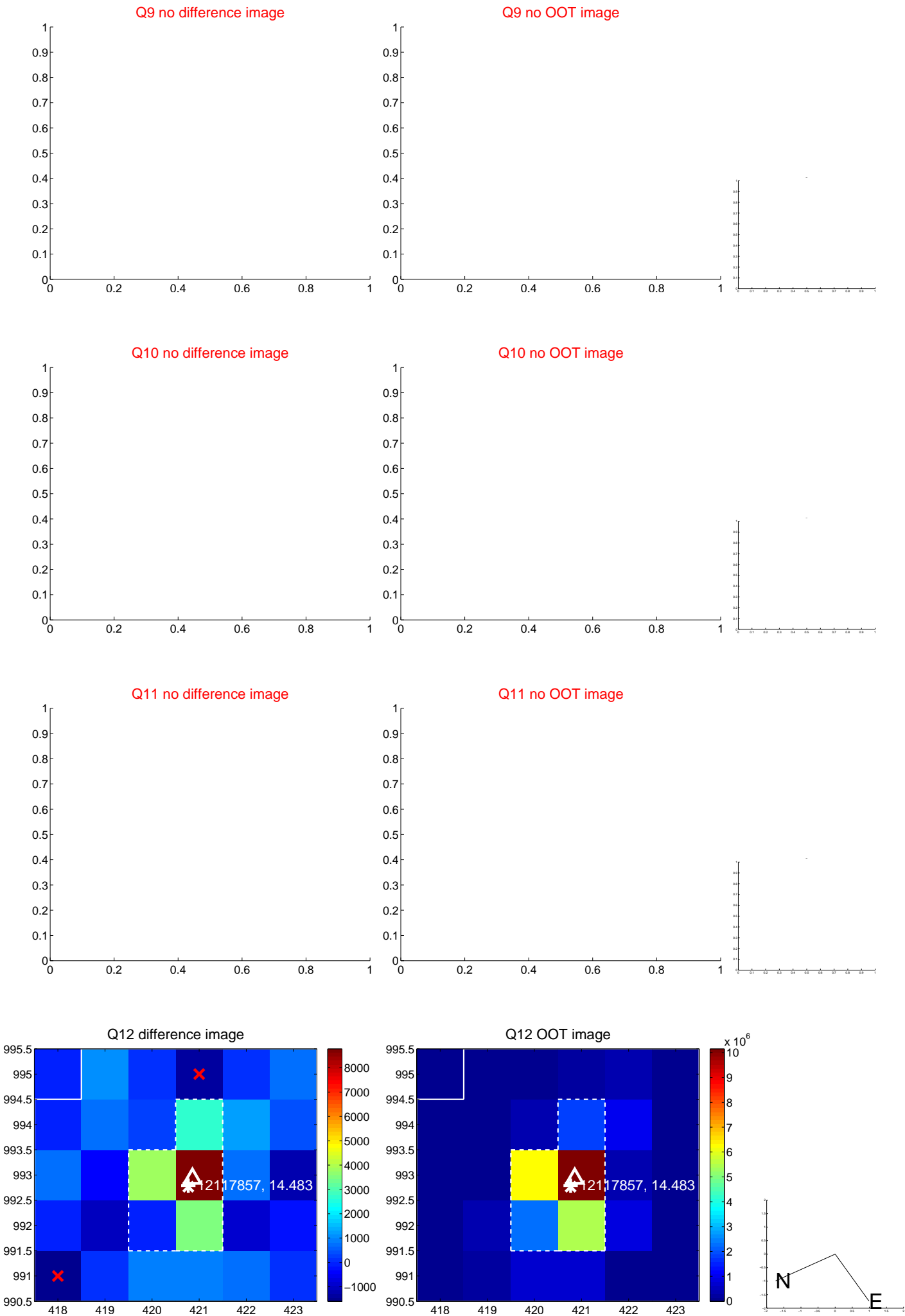
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



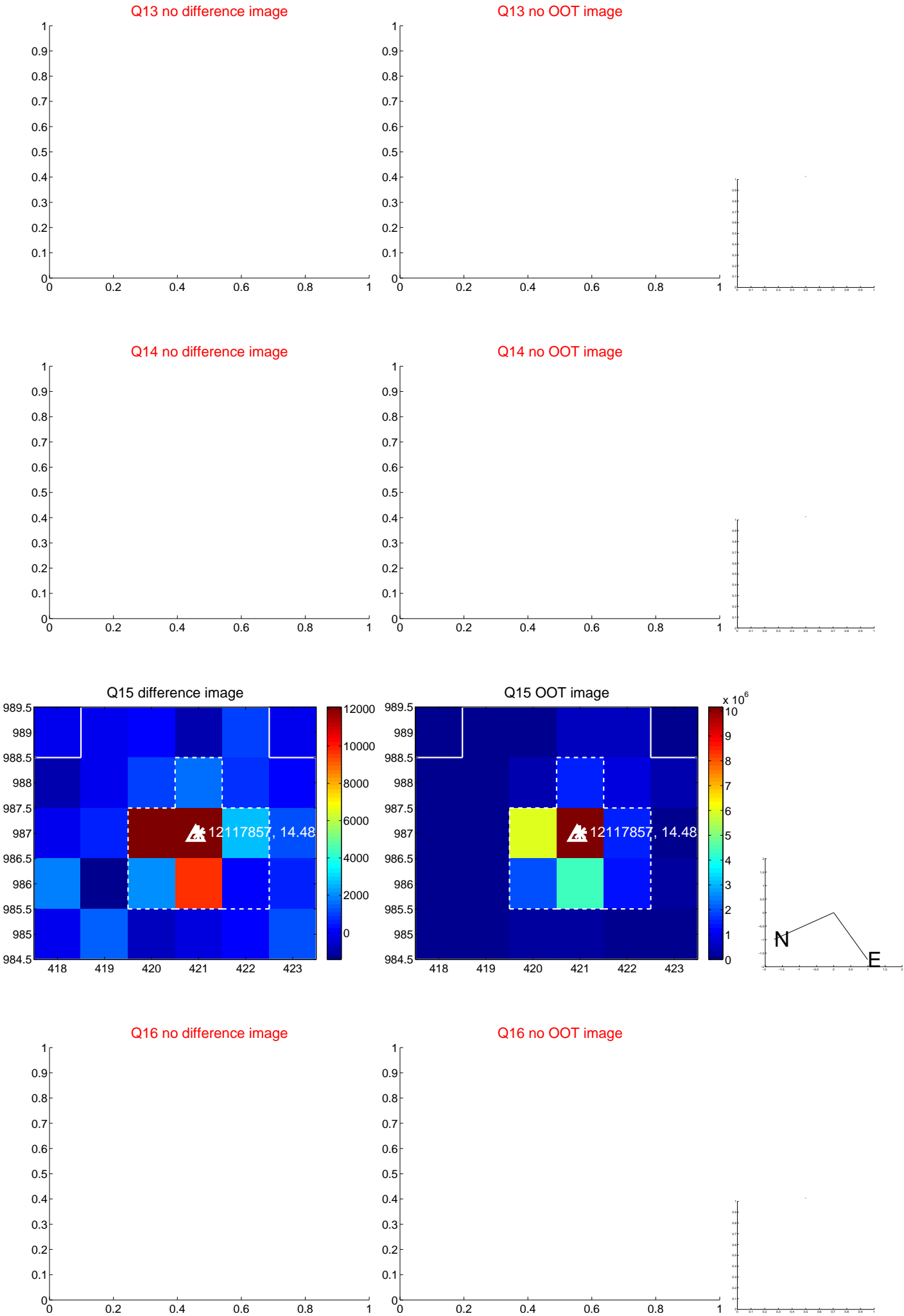
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.



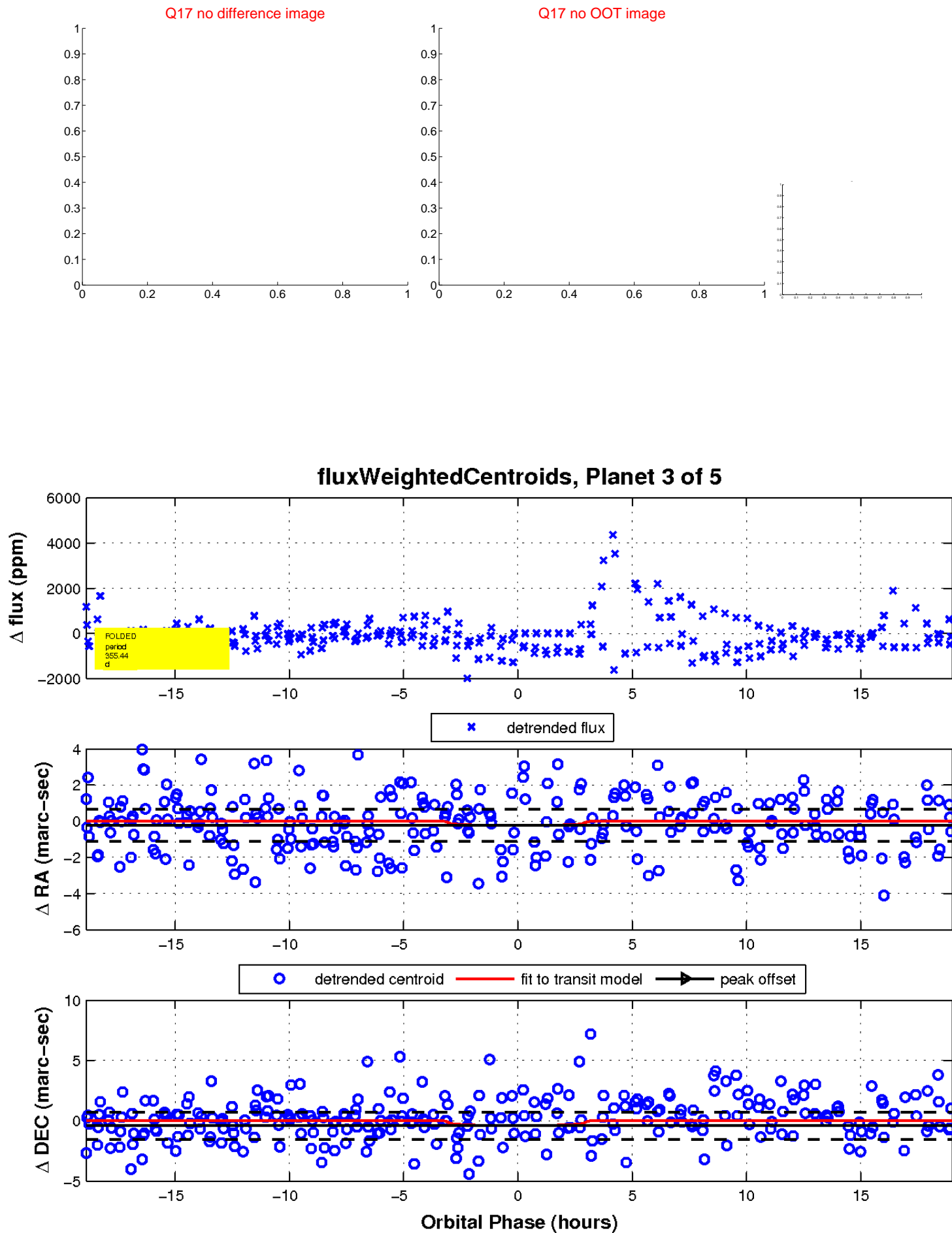
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

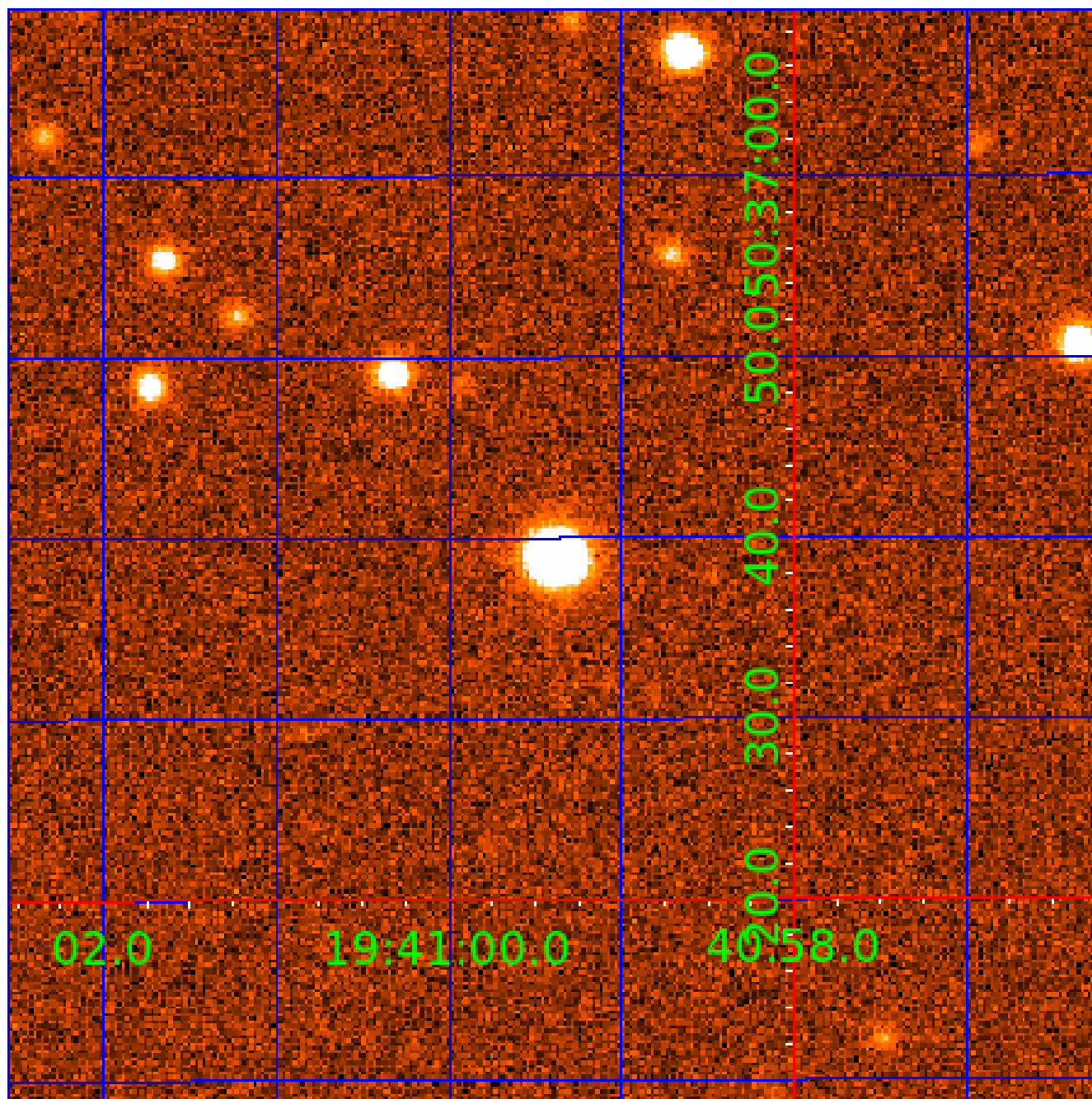


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 012117857

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
012117857-02	OBS	No	387.773658	378.775797	993.7	11.206	14.8	6.7	1.68	5237	5.47	1.89
012117857-03	OBS	No	355.444630	396.925055	951.3	6.408	11.8	7.4	1.68	5237	5.43	2.13
012117857-04	OBS	No	497.000312	243.583308	1124.8	8.669	10.9	8.1	1.68	5237	5.64	1.36
012117857-05	OBS	No	481.939135	556.910468	1431.1	3.500	10.1	-1.0	1.68	5237	6.20	1.42

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
012117857-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
012117857-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_FEW_DIFFS
012117857-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_POS_DV
012117857-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_SKYE—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_NOFITS

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

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

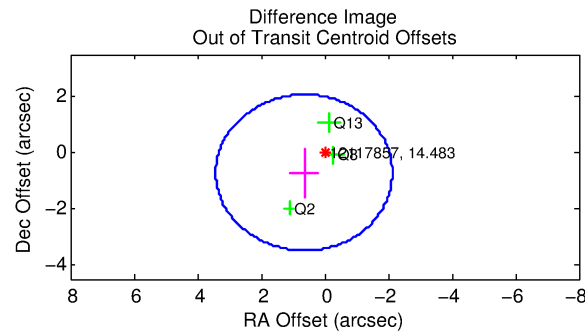
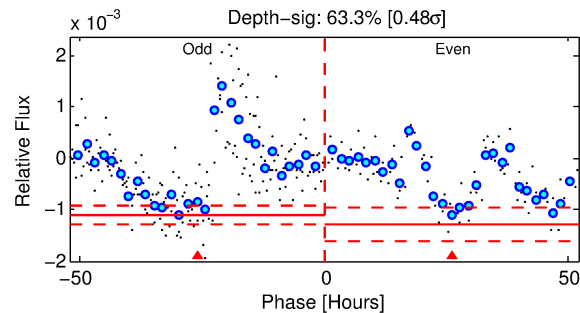
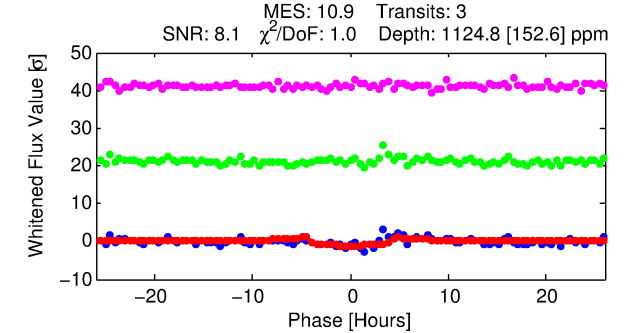
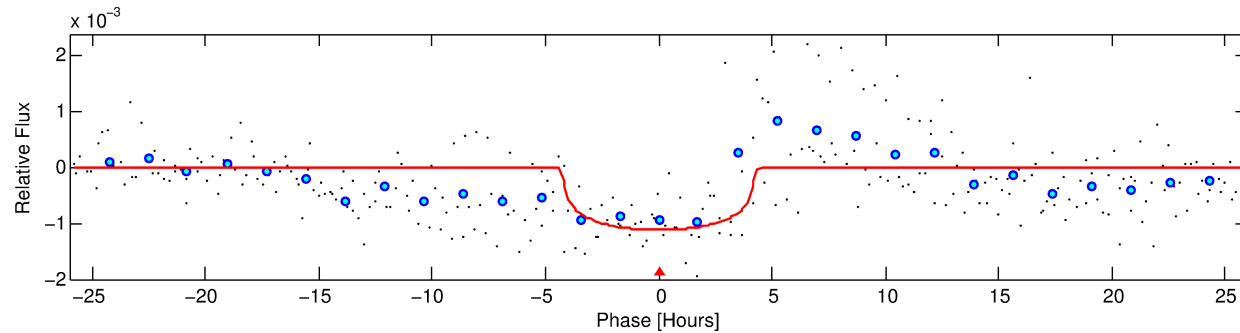
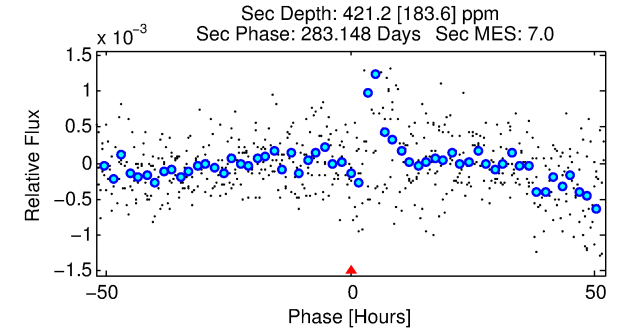
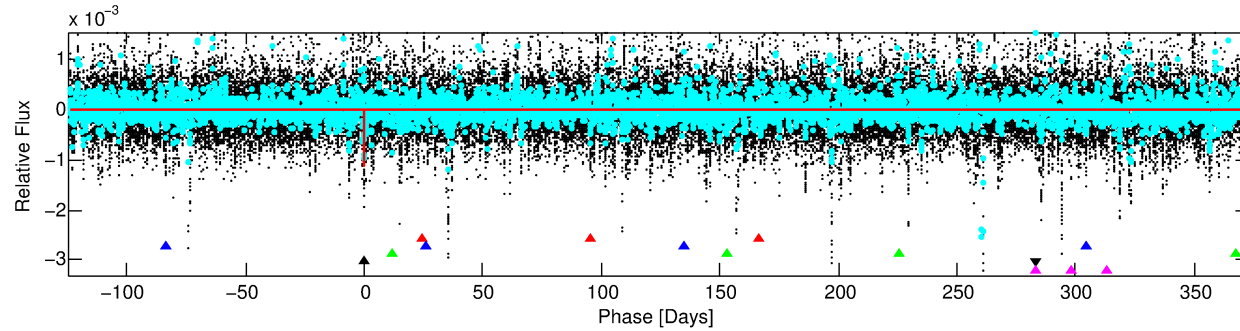
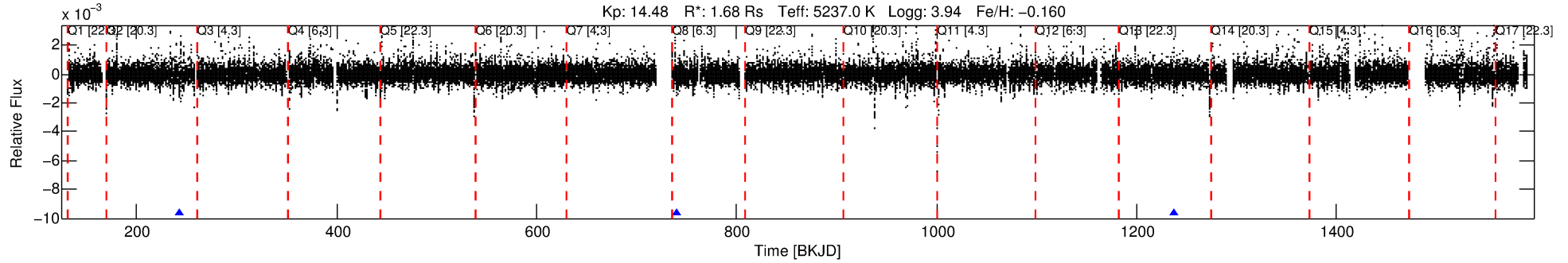
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 012117857-04

No Significant Match Found

# DV One-Page Summary

KIC: 12117857 Candidate: 4 of 5 Period: 497.000 d



## DV Fit Results:

Period = 497.00031 [0.00715] d  
Epoch = 243.5833 [0.0086] BKJD  
Rp/R\* = 0.0309 [0.0211]  
a/R\* = 408.85 [1043.16]  
b = 0.44 [4.77]  
Seff = 1.36 [1.45]  
Teff = 275 [74] K  
Rp = 5.64 [4.90] Re  
a = 1.1793 [0.7245] AU  
Ag = 10131.94 [18089.88] [0.56 $\sigma$ ]  
Teffp = 4271 [1538] K [2.59 $\sigma$ ]

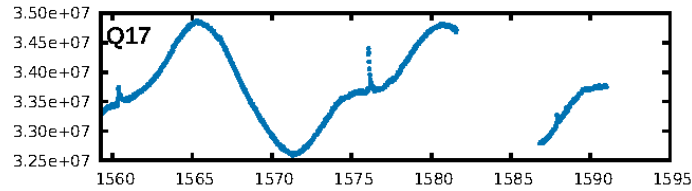
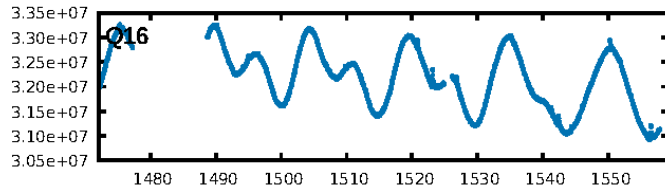
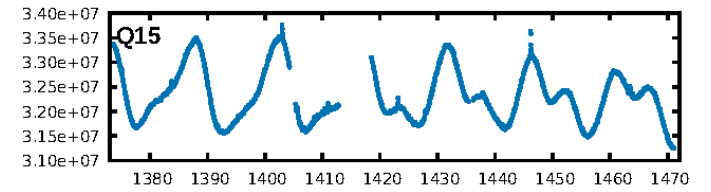
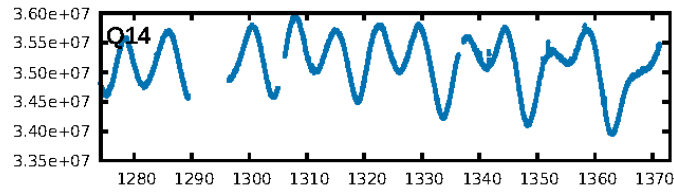
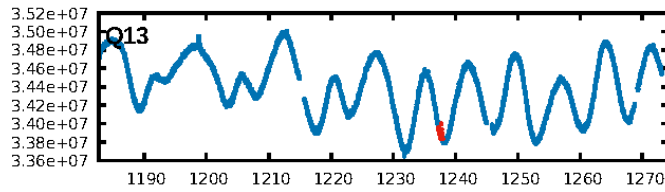
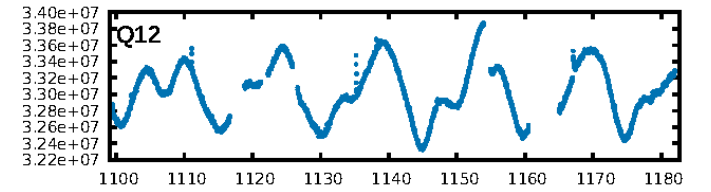
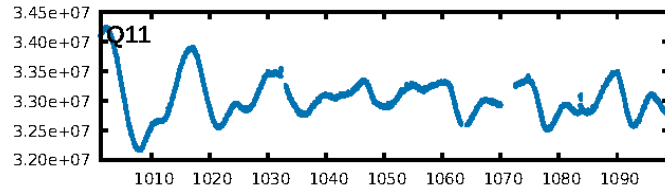
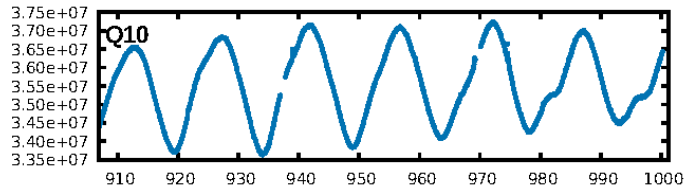
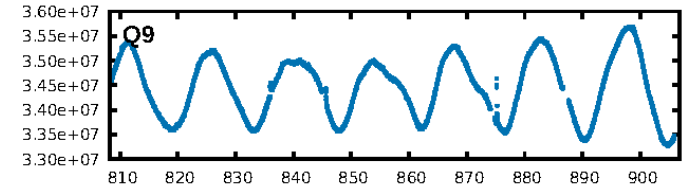
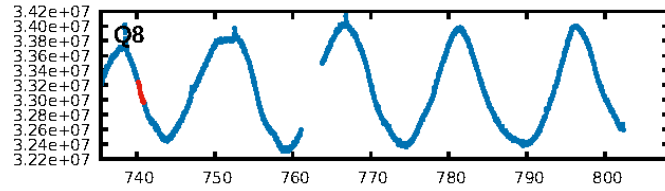
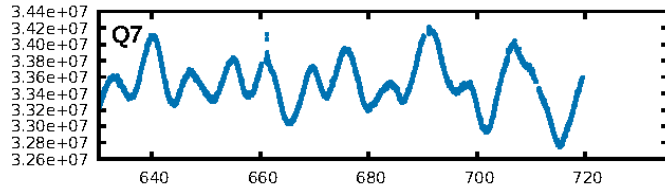
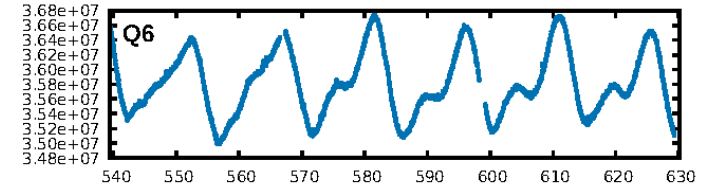
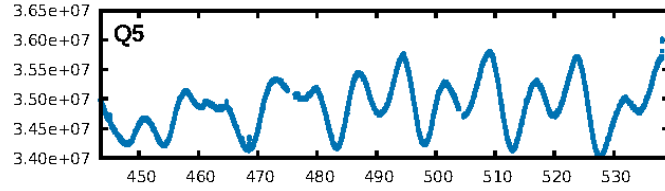
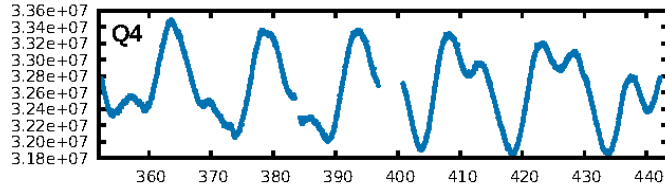
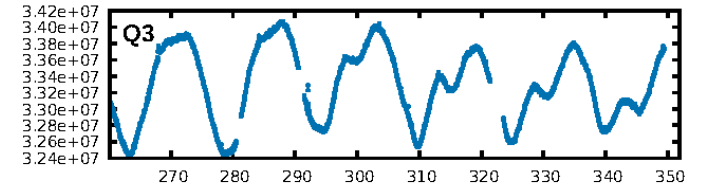
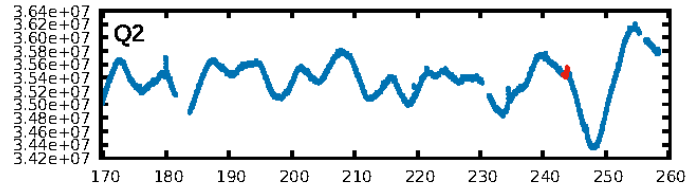
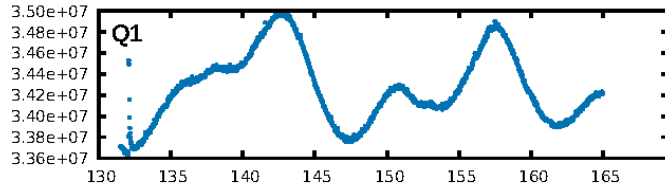
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [38.67 $\sigma$ ]  
LongPeriod-sig: 100.0% [167.64 $\sigma$ ]  
ModelChiSquare2-sig: 41.7%  
ModelChiSquareGof-sig: 96.1%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [3/3]  
**GhostDiagnostic-chr: 4.298**  
Centroid-sig: 26.5%  
Centroid-so: 0.928 arcsec [1.31 $\sigma$ ]  
OotOffset-rm: 0.960 arcsec [1.04 $\sigma$ ]  
OotOffset-st: 1/0/1/1 [3]  
KicOffset-rm: 0.911 arcsec [1.01 $\sigma$ ]  
KicOffset-st: 1/0/1/1 [3]  
DiffImageQuality-fgm: 1.00 [3/3]  
DiffImageOverlap-fno: 1.00 [3/3]

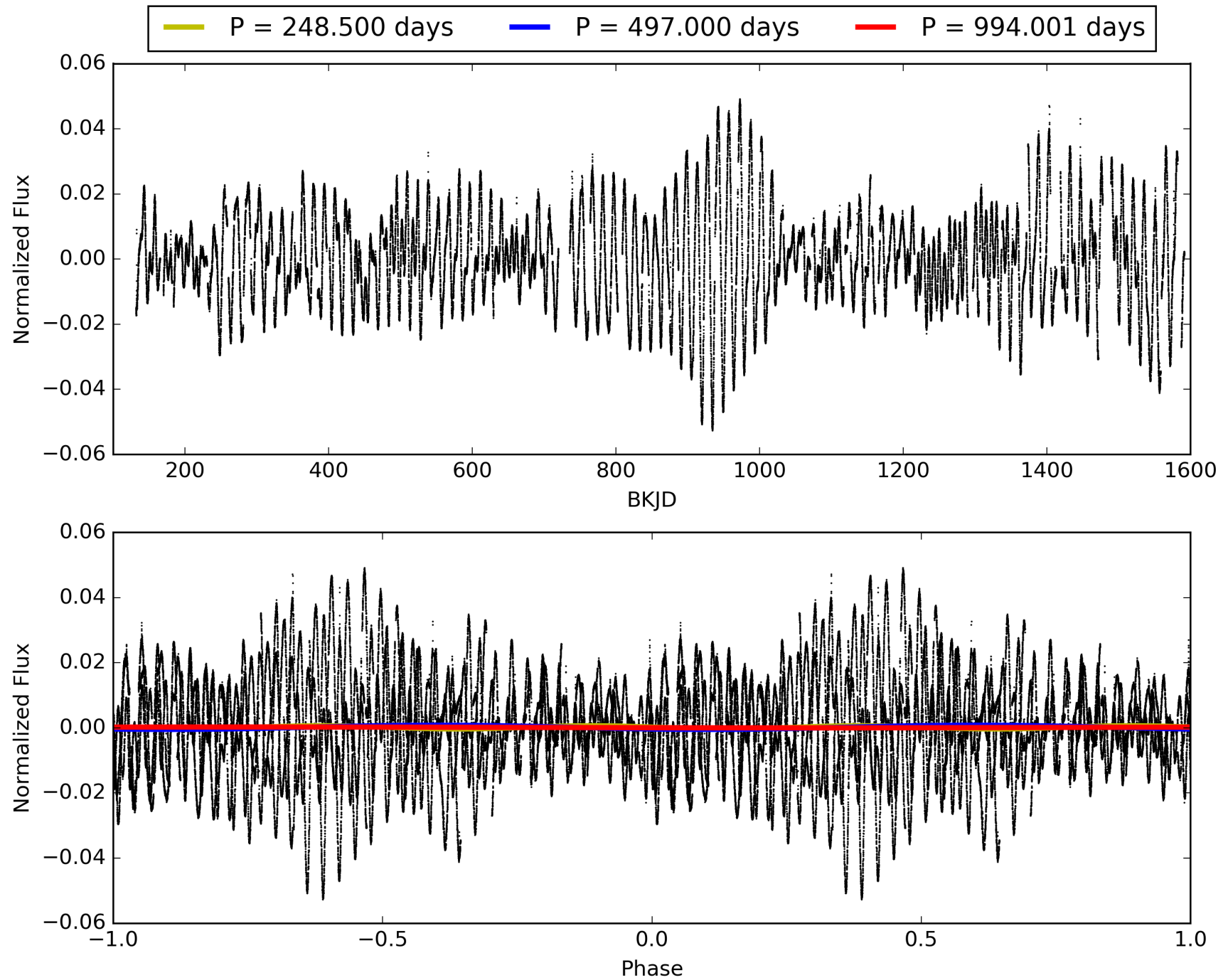
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 05:29:56 Z

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

# TCE 012117857-04, PDC Light Curves

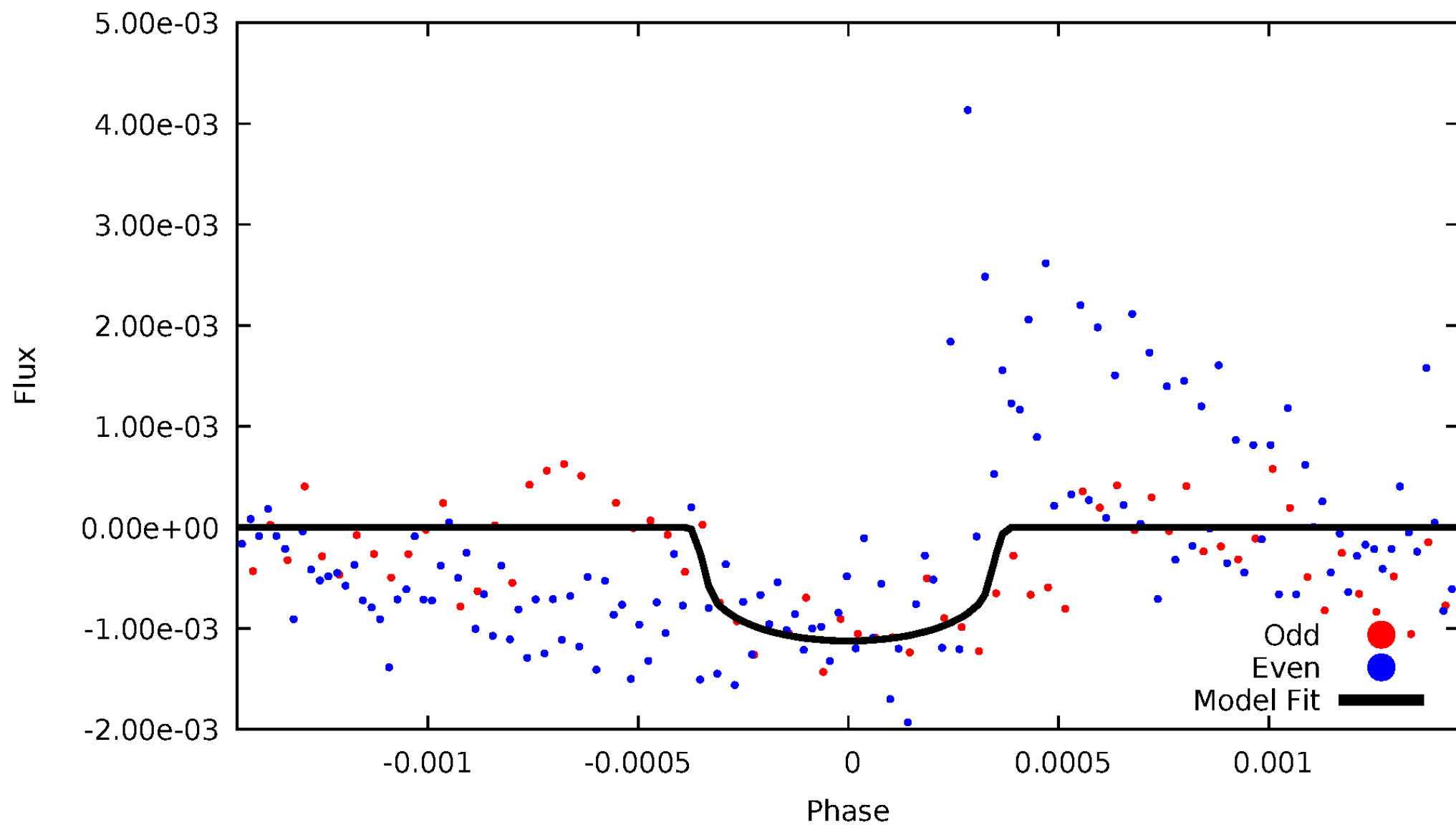


# TCE 012117857-04



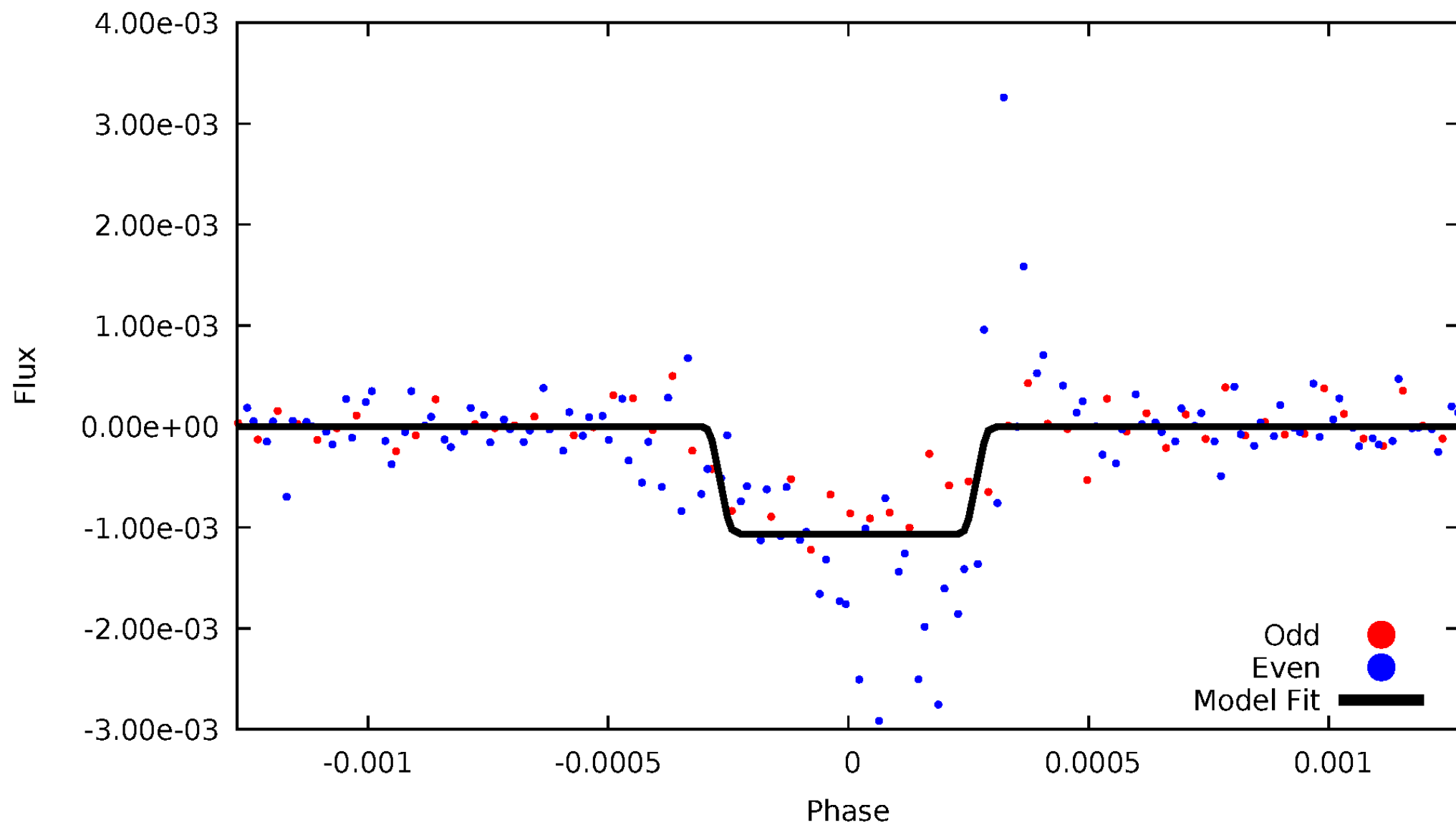
# DV Odd/Even

TCE 012117857-04



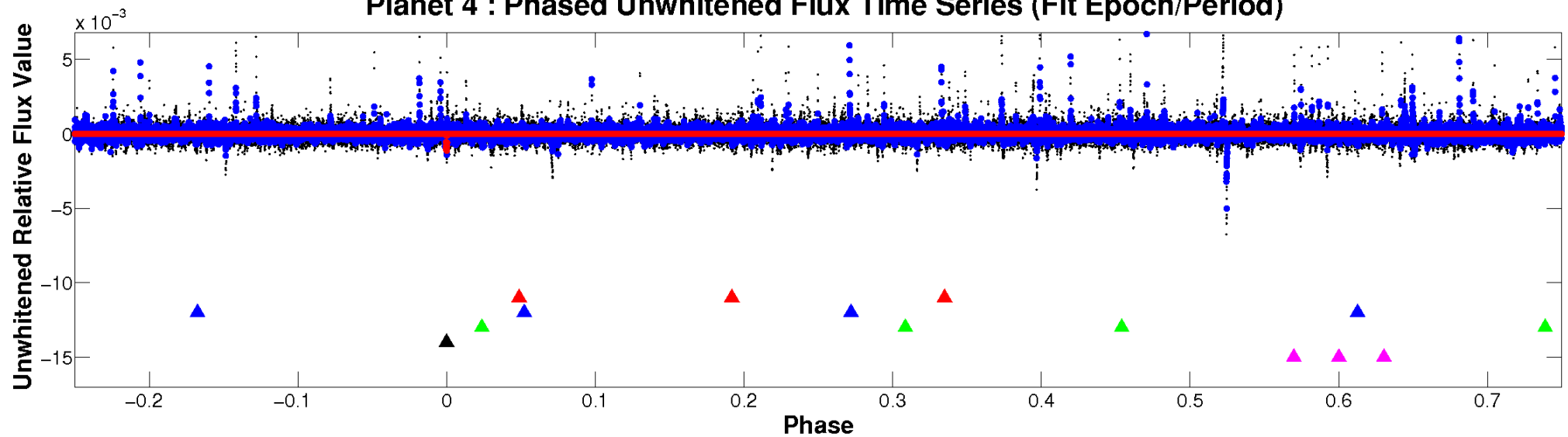
# ALT Odd/Even

TCE 012117857-04

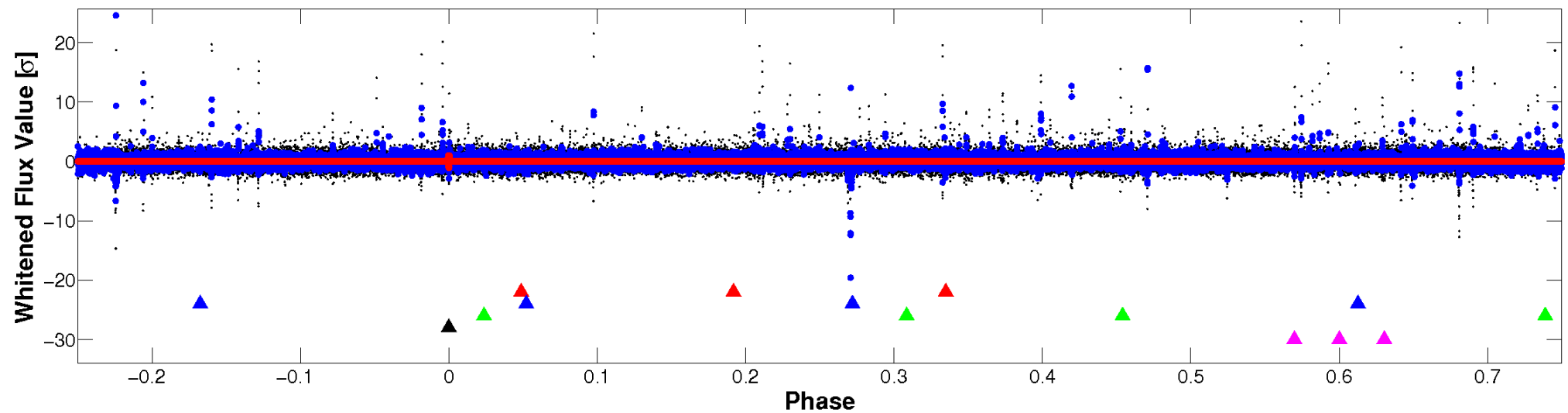


# Non-Whitened Vs. Whitened Light Curve

## Planet 4 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

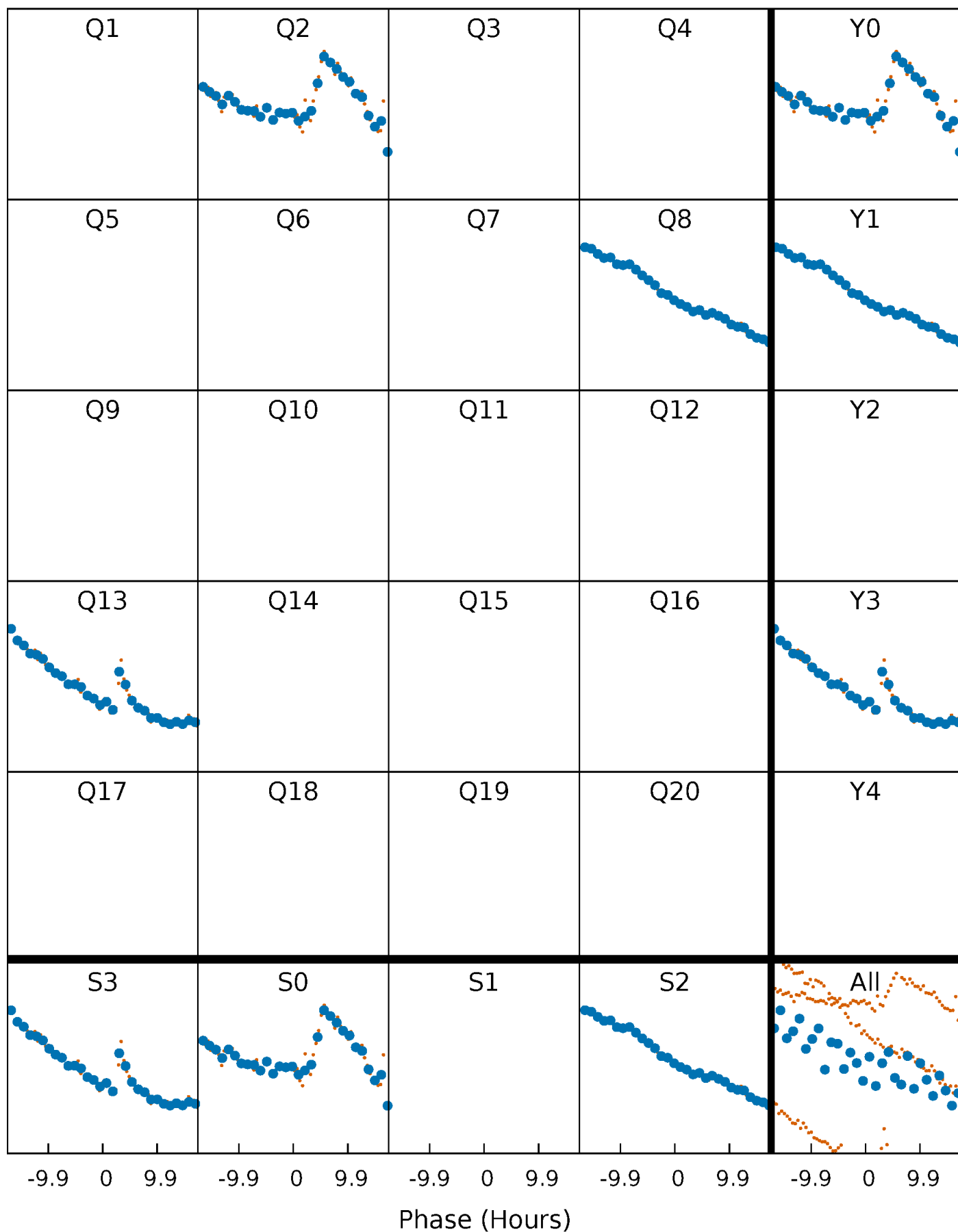


## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

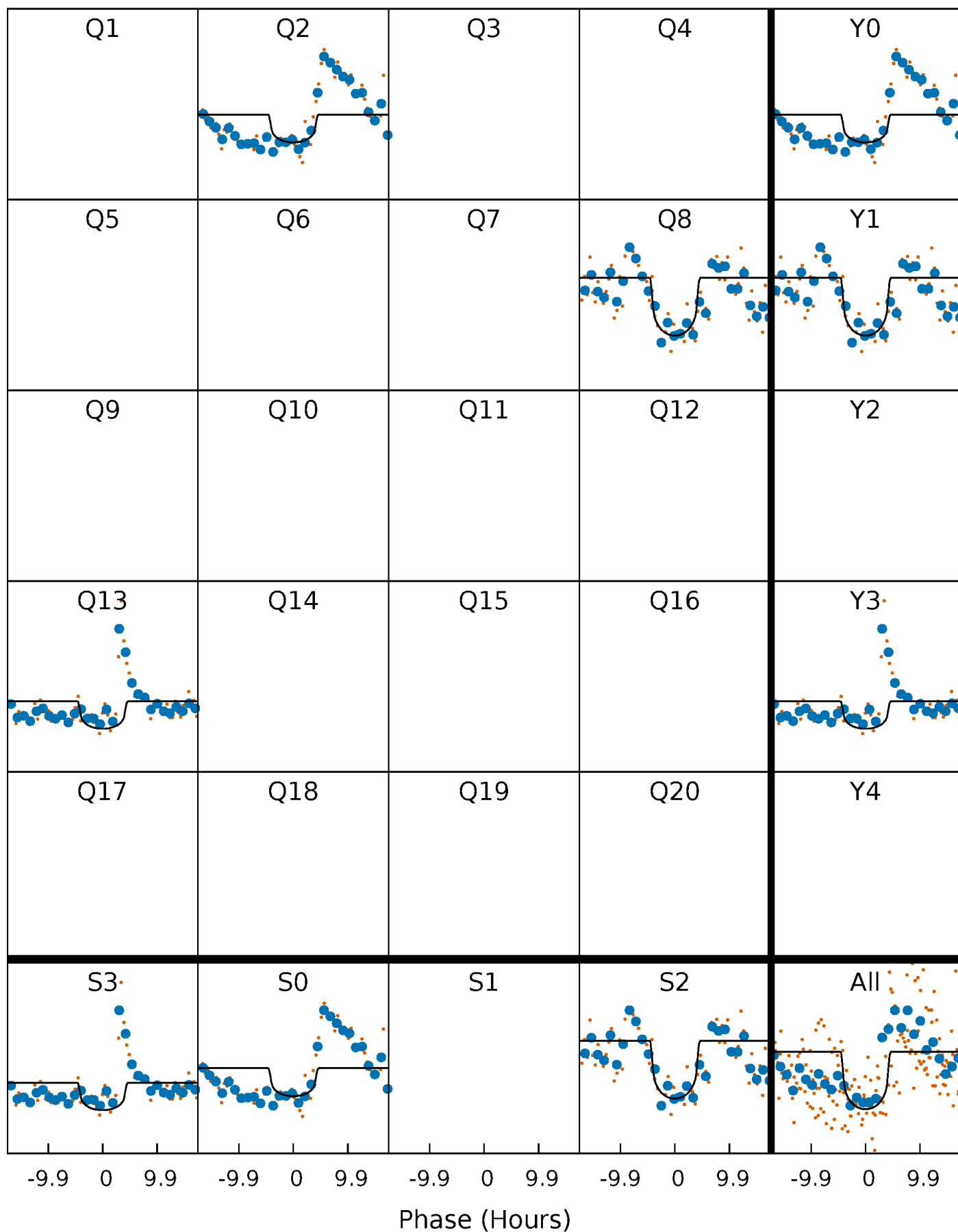
TCE 012117857-04     $P=497.000312$  Days     $T_0=243.583308$  (BKJD)





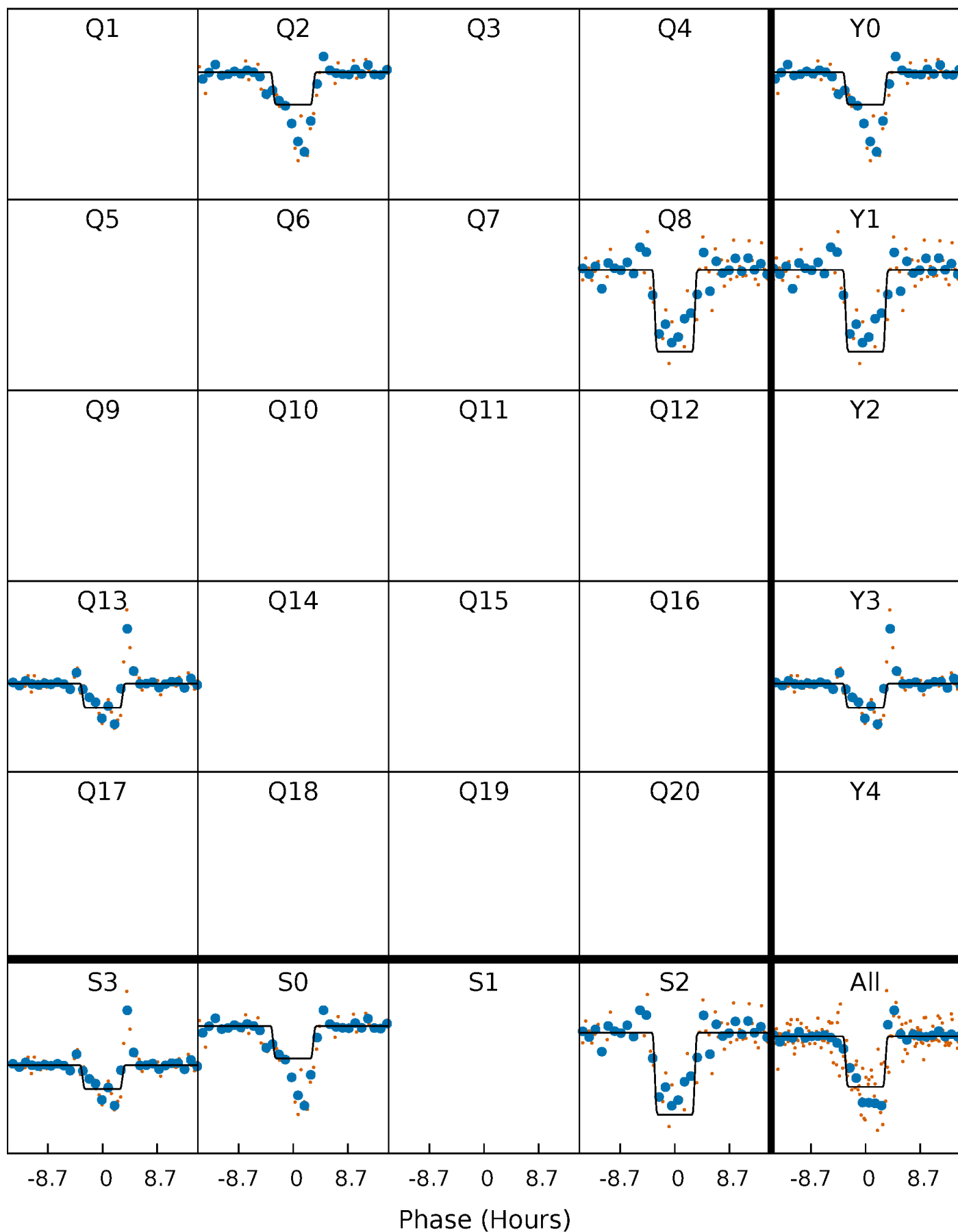
# DV Quarter-Phased Transit Curves

TCE 012117857-04     $P=497.000312$  Days     $T_0=243.583308$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

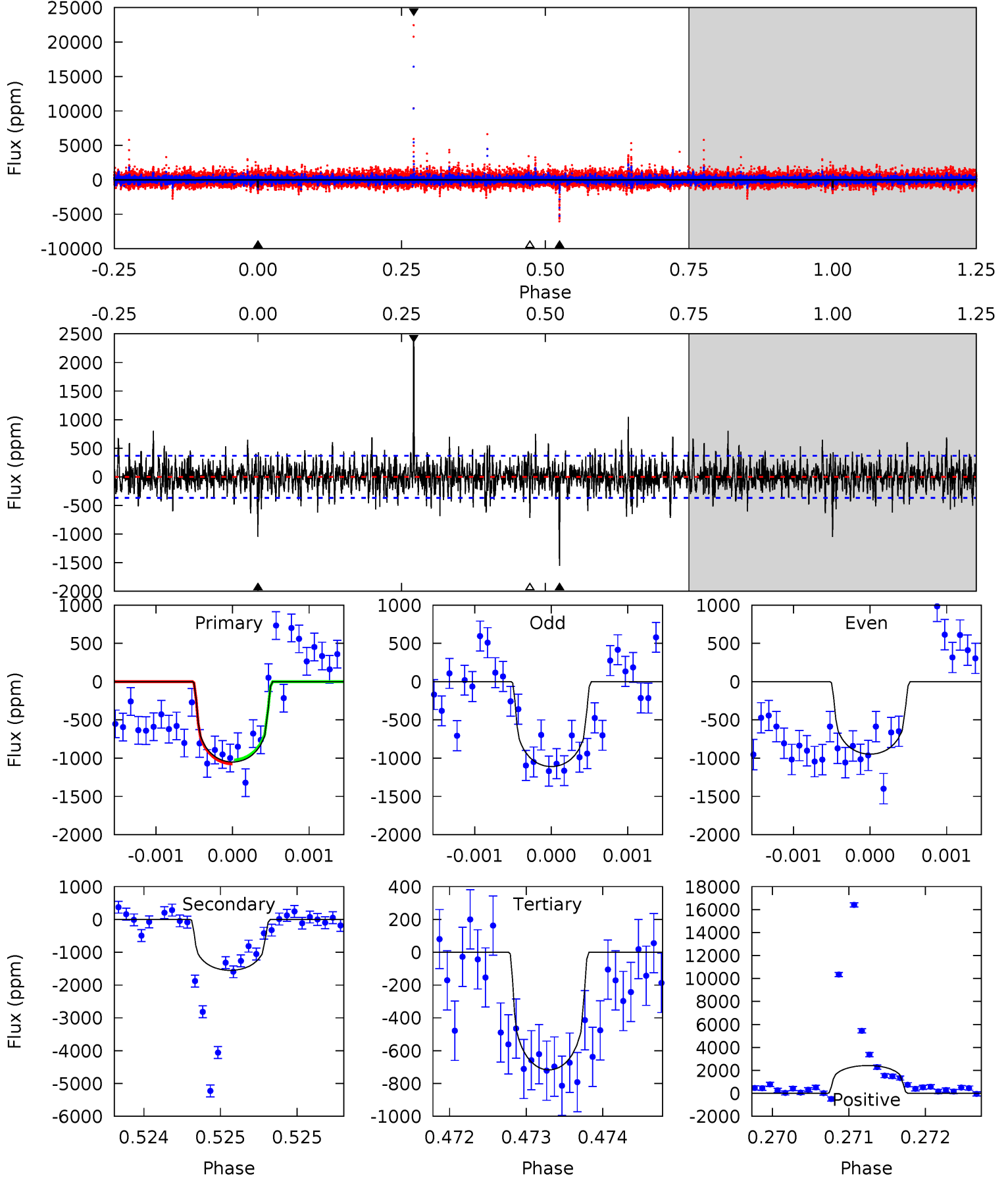
TCE 012117857-04     $P=496.971424$  Days     $T_0=243.621534$  (BKJD)



# DV Model-Shift Uniqueness Test

012117857-04, P = 497.000312 Days, E = 243.583308 Days

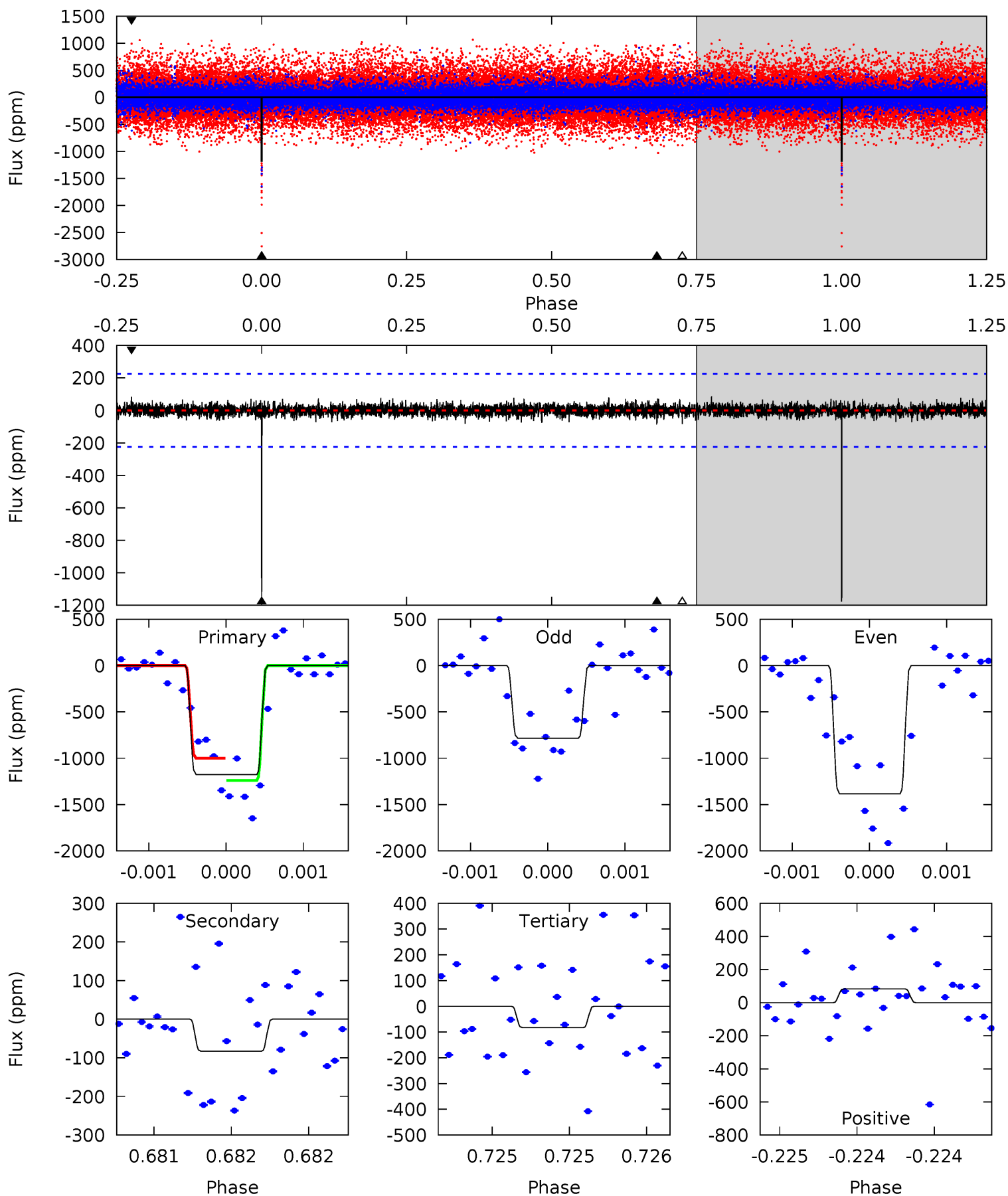
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
15.7	23.2	10.7	36.2	5.50	3.37	2.92	4.97	-20.5	12.5	-13.0	0.98	0.77	0.61	0.39



# Alt Model-Shift Uniqueness Test

012117857-04, P = 496.971424 Days, E = 243.621534 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
29.0	2.05	2.04	2.05	5.55	3.44	0.46	27.0	27.0	0.00	-0.00	7.05	1.12	0.07	2.82



### Stellar Parameters For KIC 012117857

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5237^{+158}_{-158}$	$3.937^{+0.651}_{-0.279}$	$-0.160^{+0.300}_{-0.300}$	$1.675^{+0.898}_{-0.898}$	$0.885^{+0.078}_{-0.135}$	$0.265^{+2.323}_{-0.155}$
	+3%/-3%	+17%/-7%	+188%/-188%	+54%/-54%	+9%/-15%	+876%/-58%
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 012117857-04 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-1552 \pm 67$	$5.59^{+4.10}_{-3.29}$	$377^{+56}_{-58}$	$5586^{+3015}_{-983}$	$36717^{+188237}_{-24616}$
Alt.	$-83 \pm 41$	$5.70^{+4.23}_{-3.28}$	$378^{+54}_{-57}$	$3245^{+962}_{-523}$	$1824^{+8108}_{-1390}$

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

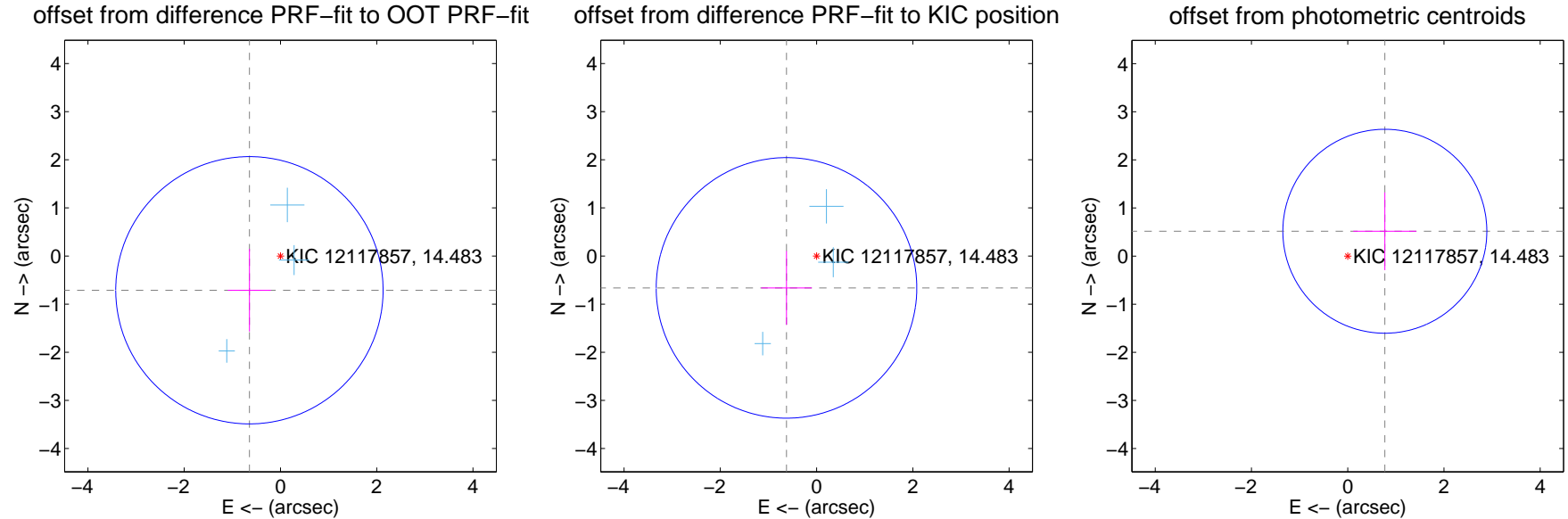
## DV Centroid Data

Supplemental centroid analysis for 012117857-04. Kepler magnitude: 14.48. Transit SNR 8.12

There are 3 quarters with good PRF difference image offsets

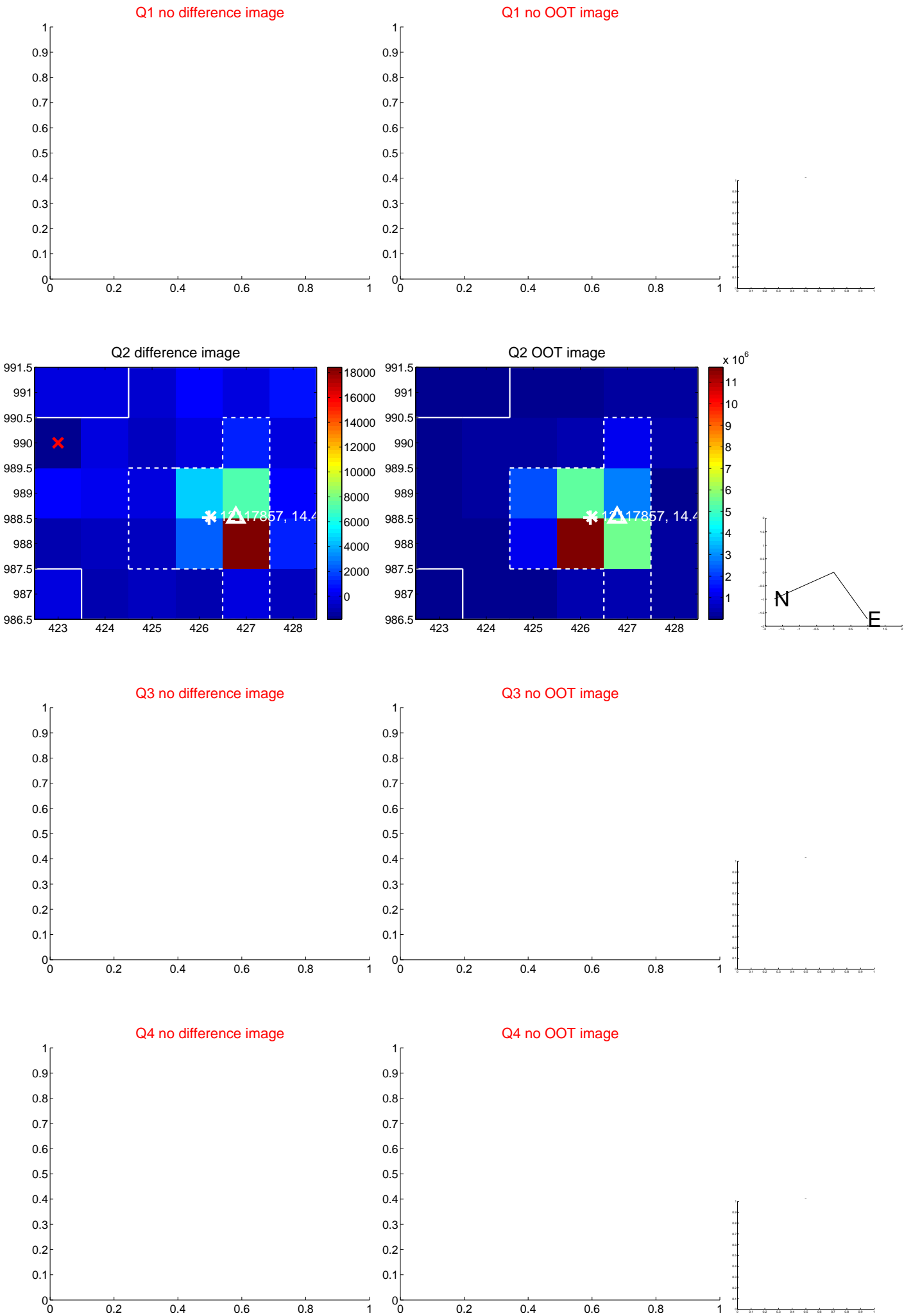
The direct PRF centroid is offset from the target star catalog position by about 0.07 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.960 \pm 0.926$	1.04	$0.645 \pm 0.446$	$-0.711 \pm 0.859$
PRF-fit source offset from KIC position	$0.911 \pm 0.902$	1.01	$0.625 \pm 0.525$	$-0.662 \pm 0.768$
photometric centroid source offset	$0.93 \pm 0.71$	1.31	$-0.77 \pm 0.66$	$0.52 \pm 0.81$

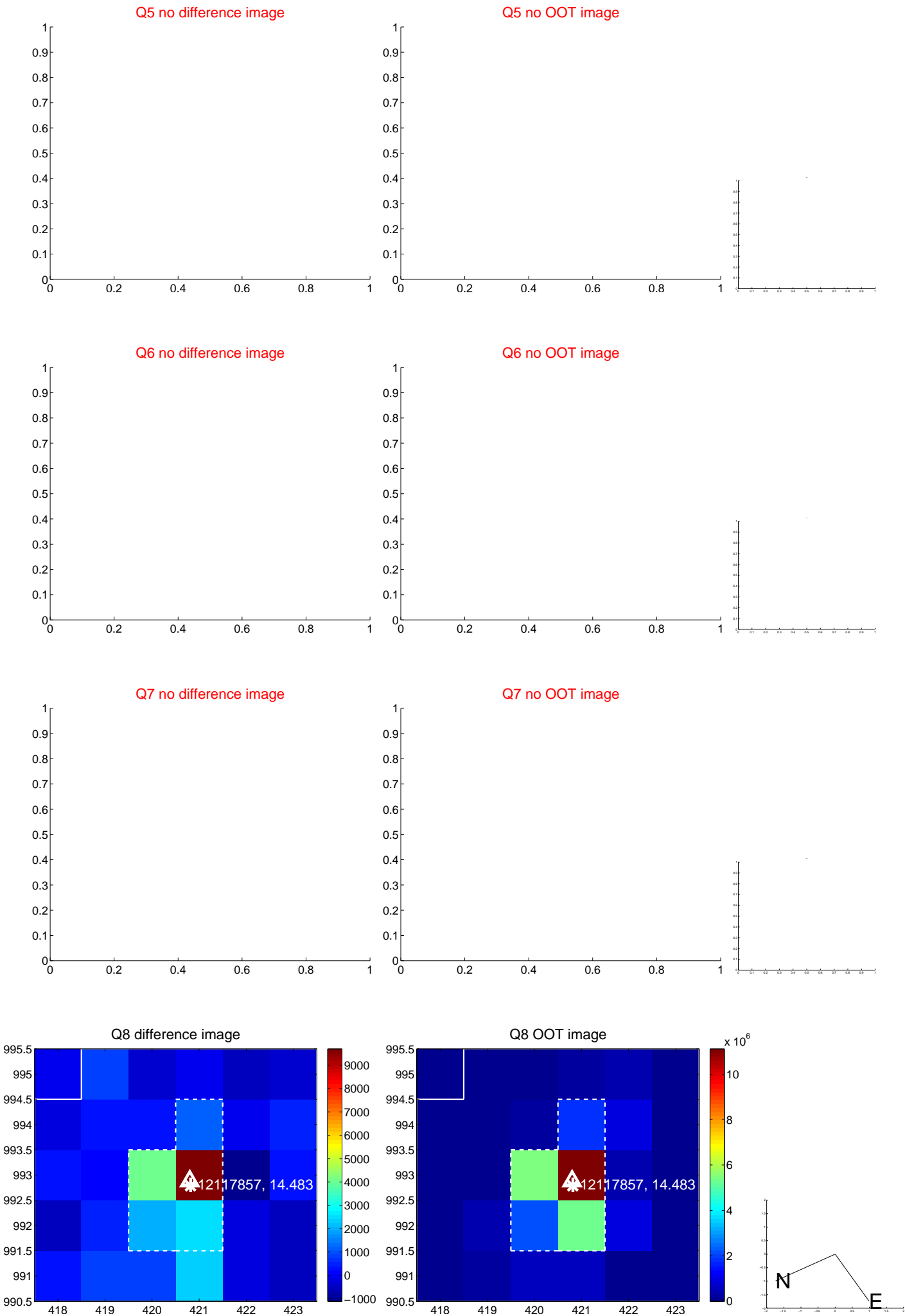


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

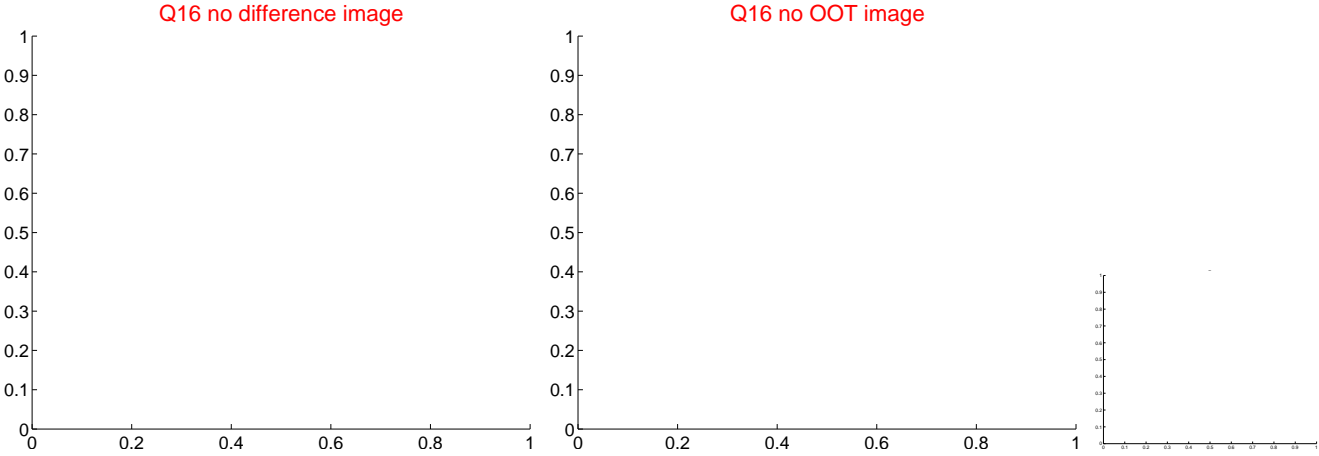
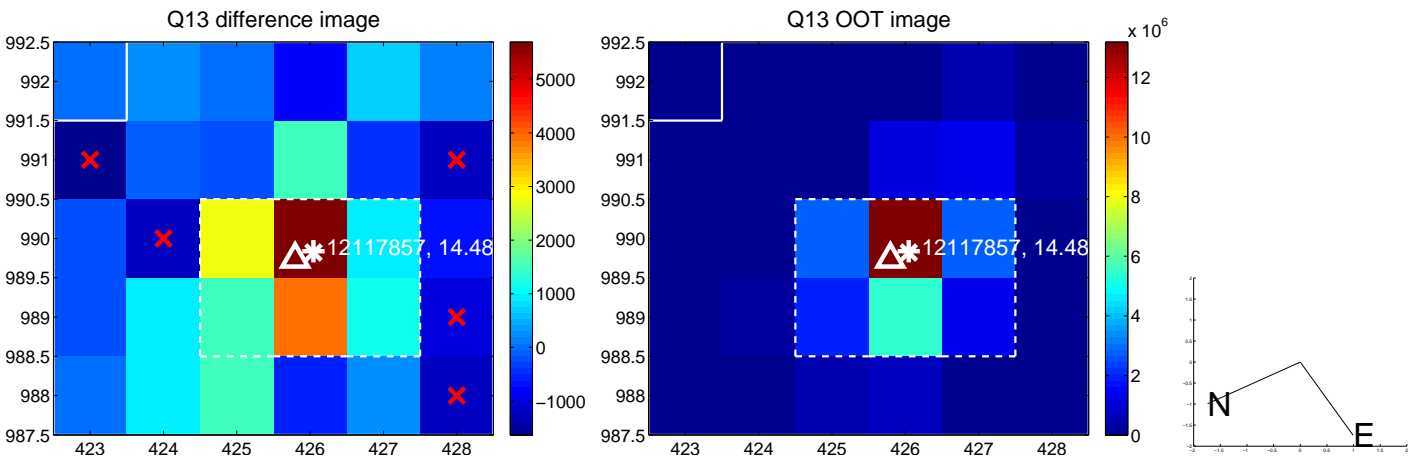




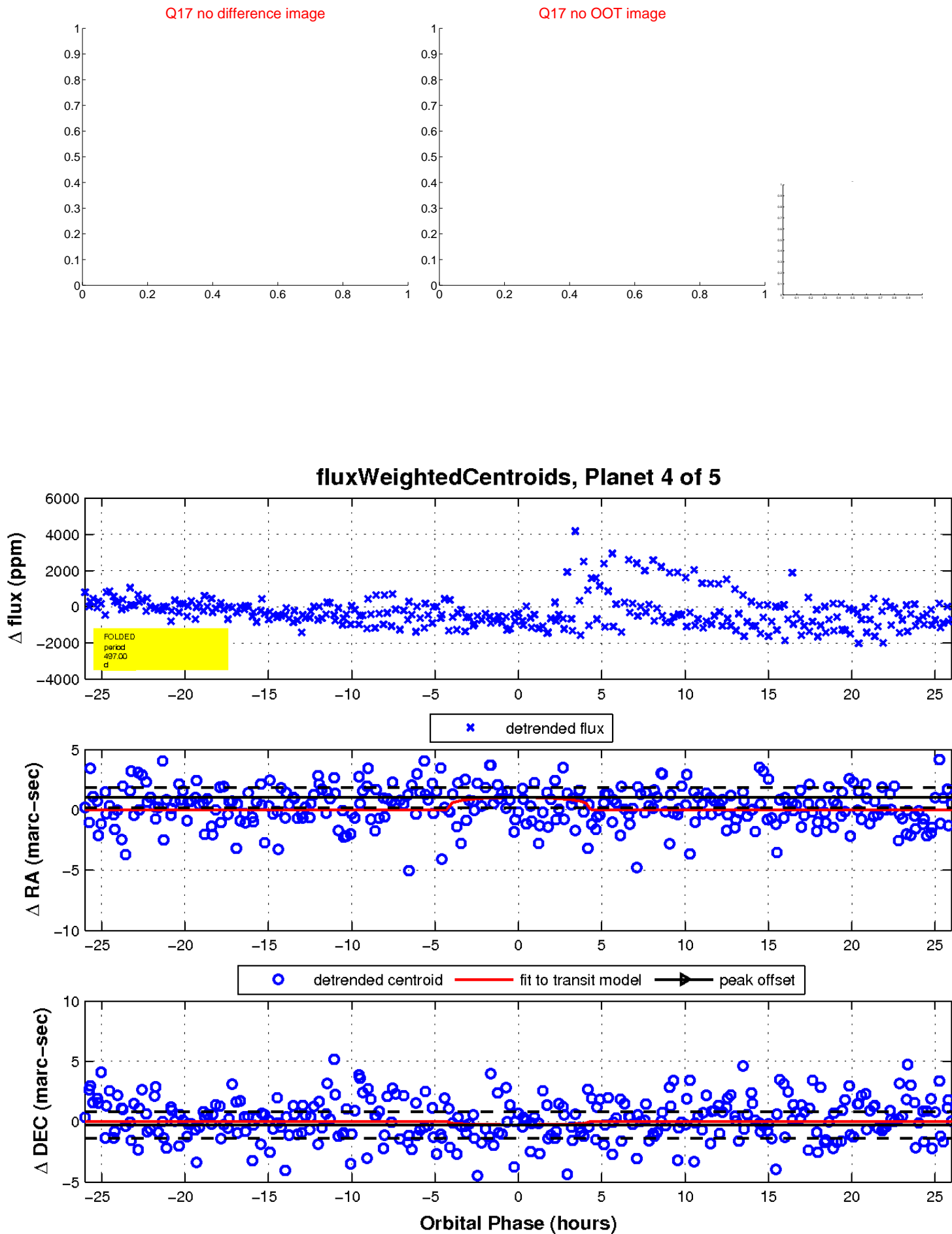
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

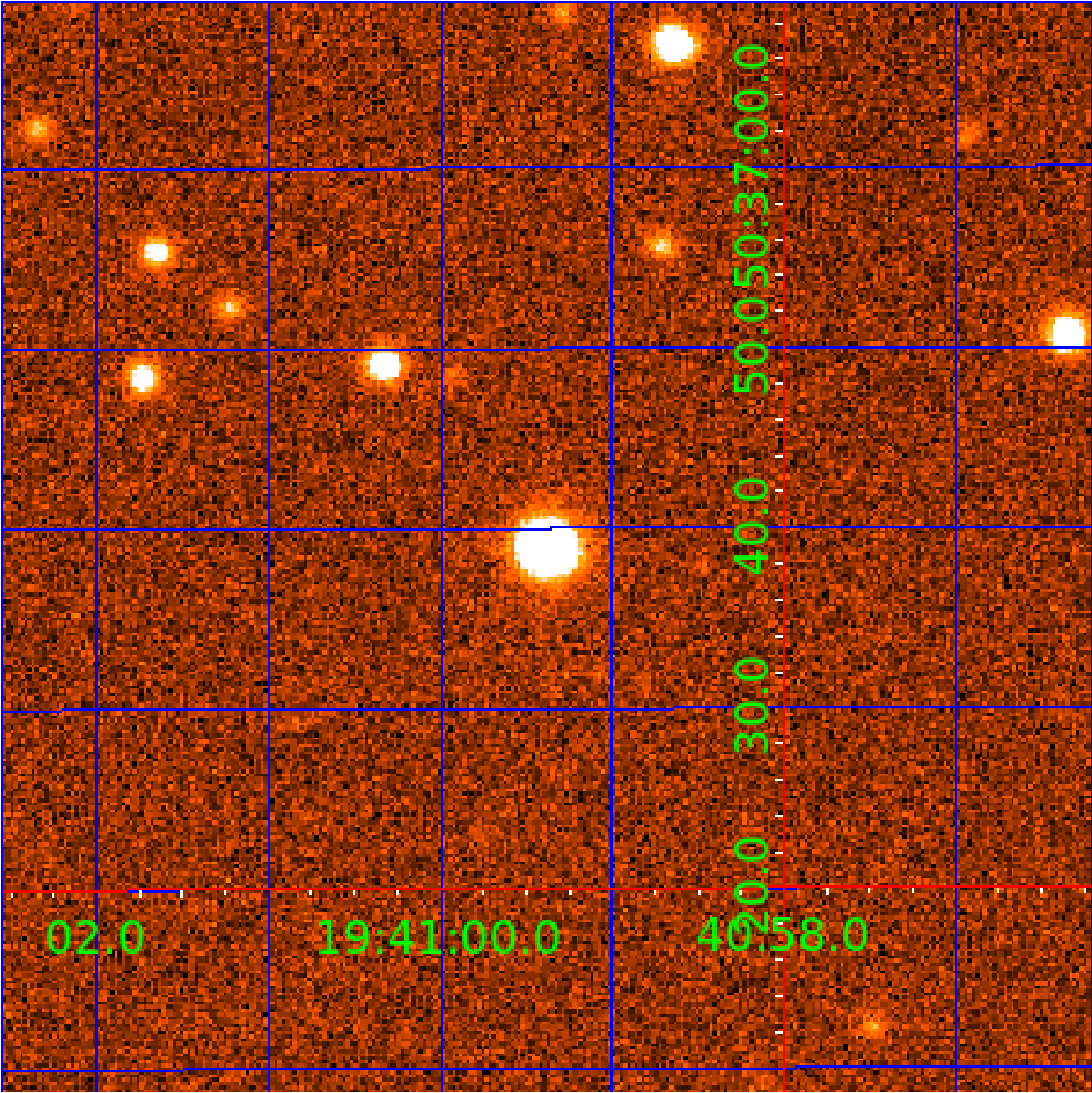


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 012117857

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
012117857-02	OBS	No	387.773658	378.775797	993.7	11.206	14.8	6.7	1.68	5237	5.47	1.89
012117857-03	OBS	No	355.444630	396.925055	951.3	6.408	11.8	7.4	1.68	5237	5.43	2.13
012117857-04	OBS	No	497.000312	243.583308	1124.8	8.669	10.9	8.1	1.68	5237	5.64	1.36
012117857-05	OBS	No	481.939135	556.910468	1431.1	3.500	10.1	-1.0	1.68	5237	6.20	1.42

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
012117857-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
012117857-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_FEW_DIFFS
012117857-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—MOD_POS_DV
012117857-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_SKYE—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_NOFITS

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

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

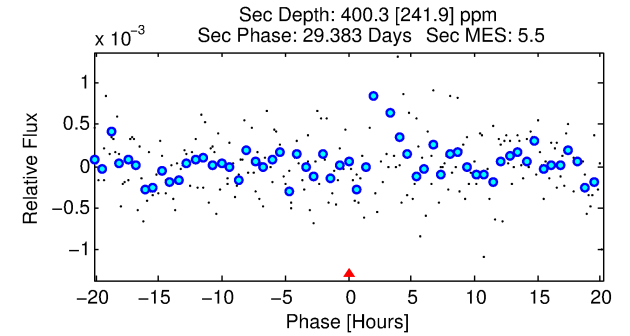
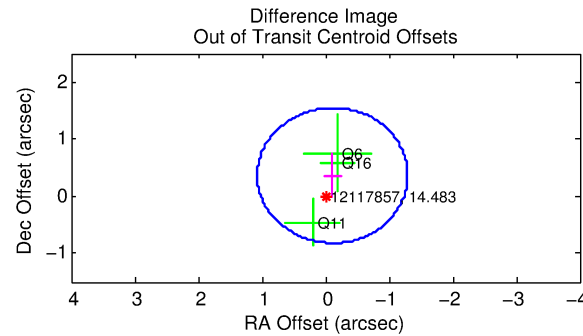
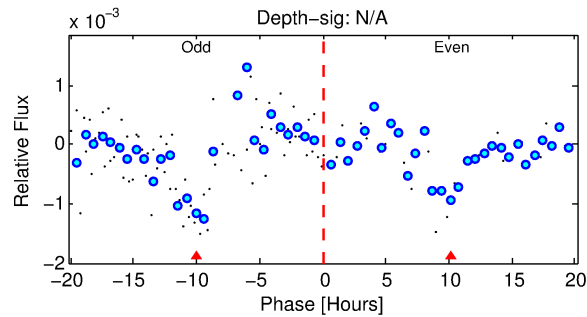
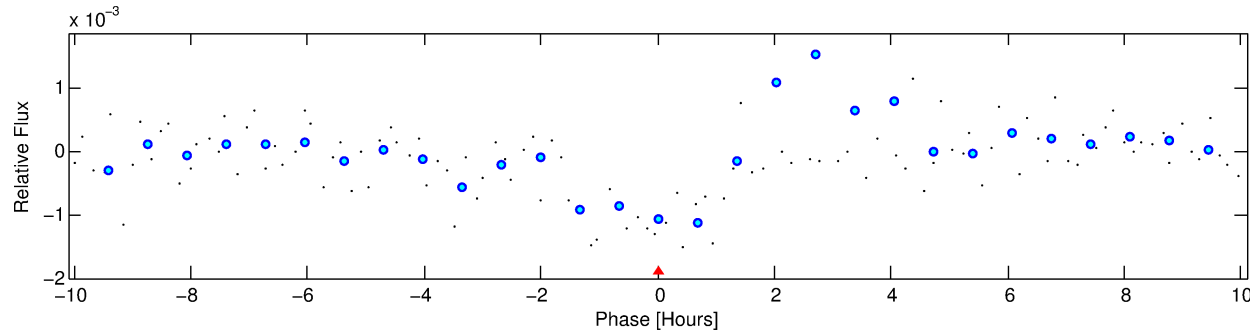
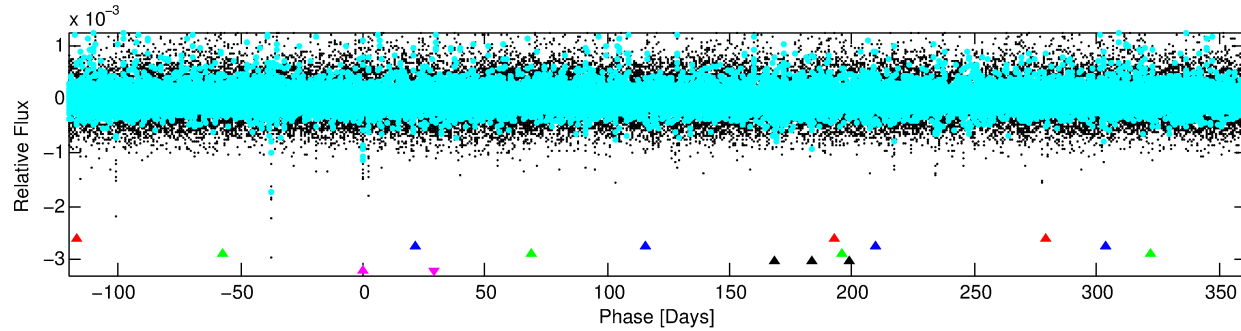
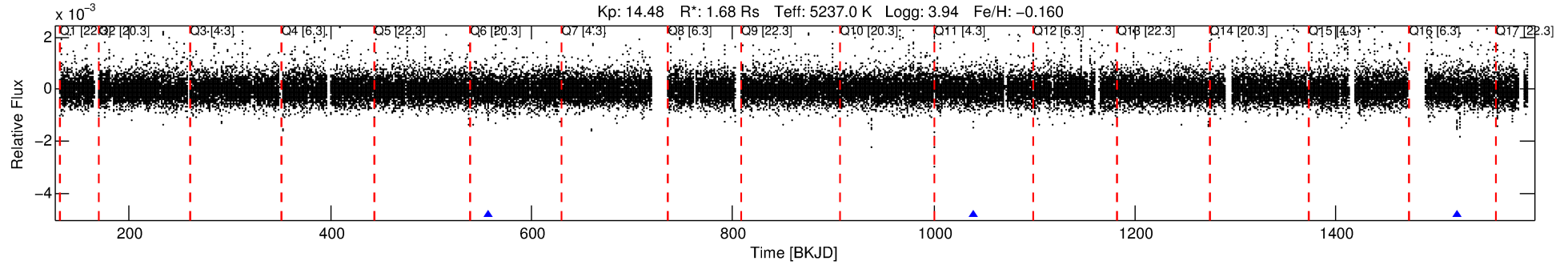
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 012117857-05

No Significant Match Found

# DV One-Page Summary

KIC: 12117857 Candidate: 5 of 5 Period: 481.939 d



## TPS TCE Results:

Period = 481.93913 d  
Epoch = 556.9105 BKJD

DV fit results are unavailable

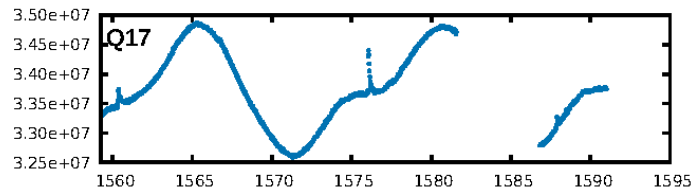
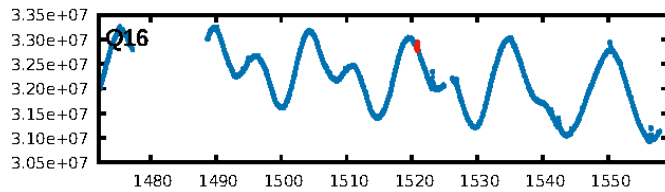
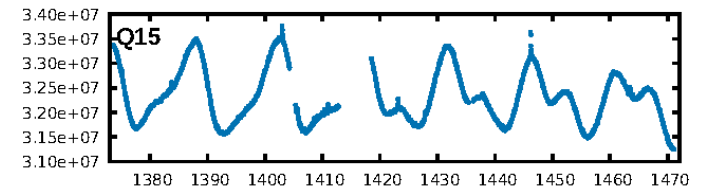
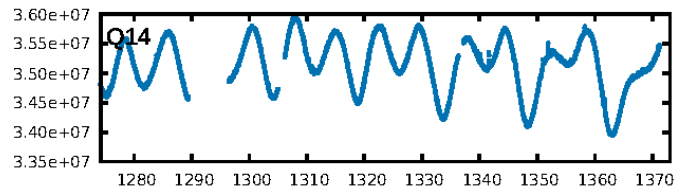
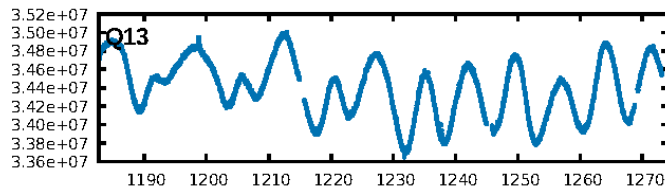
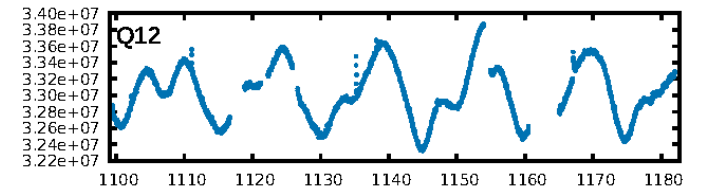
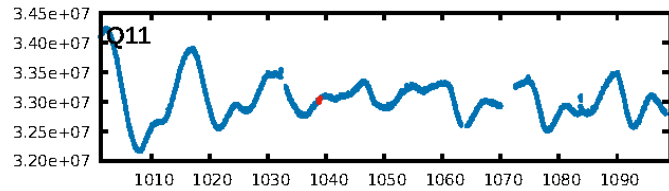
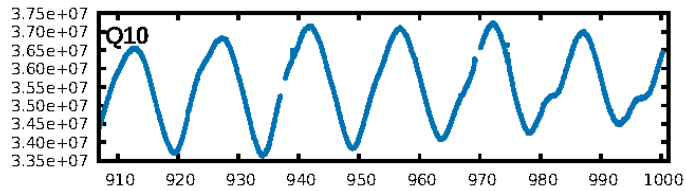
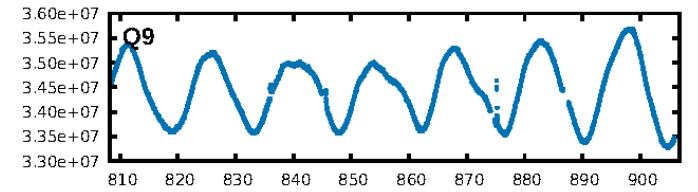
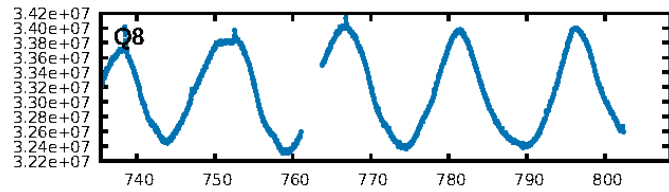
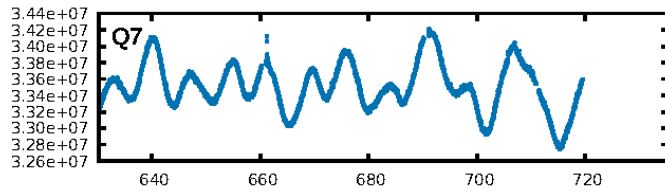
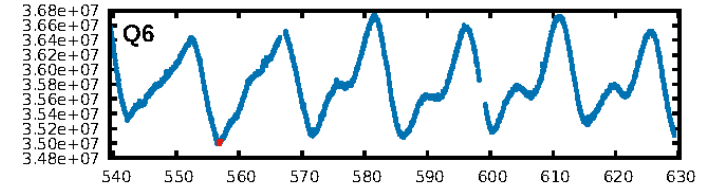
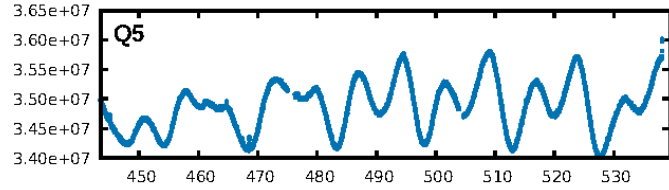
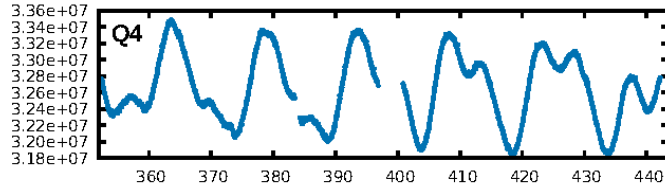
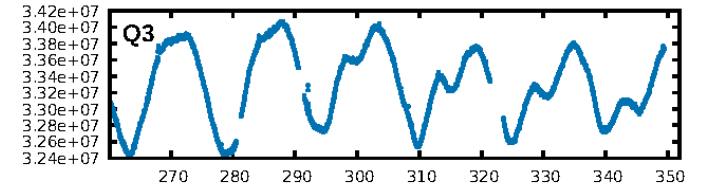
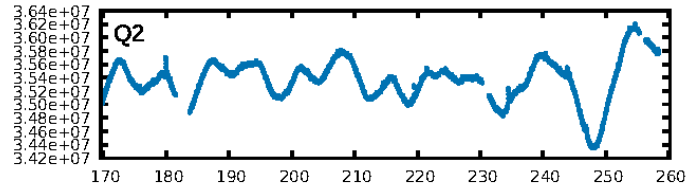
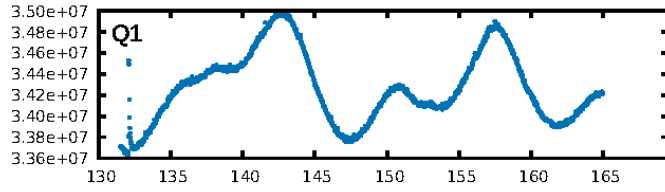
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [192.51 $\sigma$ ]  
LongPeriod-sig: 100.0% [38.67 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: 11.18  
Centroid-sig: 21.0%  
Centroid-so: 1.078 arcsec [1.19 $\sigma$ ]  
OotOffset-rm: 0.381 arcsec [0.96 $\sigma$ ]  
KicOffset-rm: 0.420 arcsec [1.03 $\sigma$ ]  
OotOffset-st: 1/1/1/0 [3]  
KicOffset-st: 1/1/1/0 [3]  
DiffImageQuality-fgm: 1.00 [3/3]  
DiffImageOverlap-fno: 1.00 [3/3]

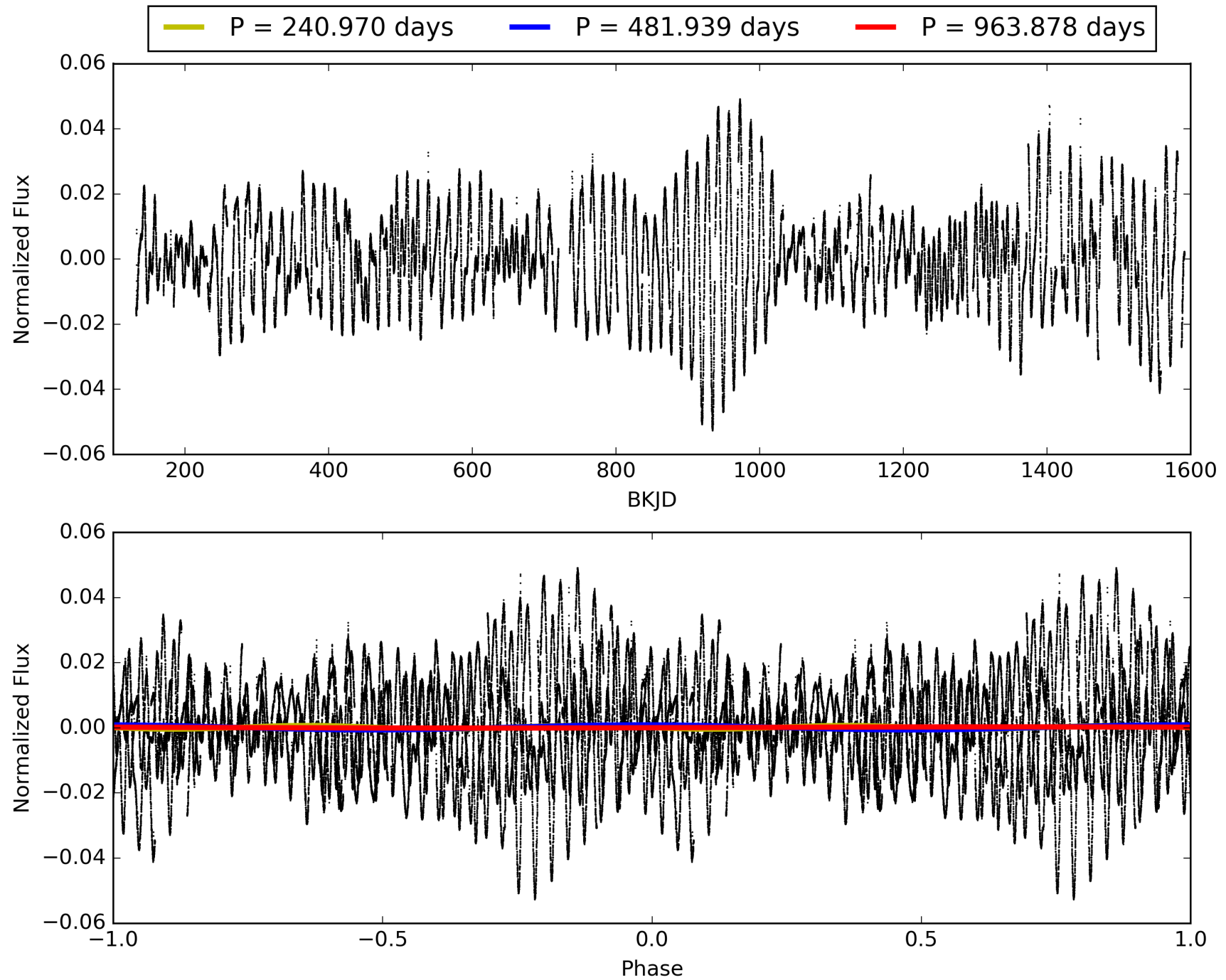
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This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 012117857-05, PDC Light Curves



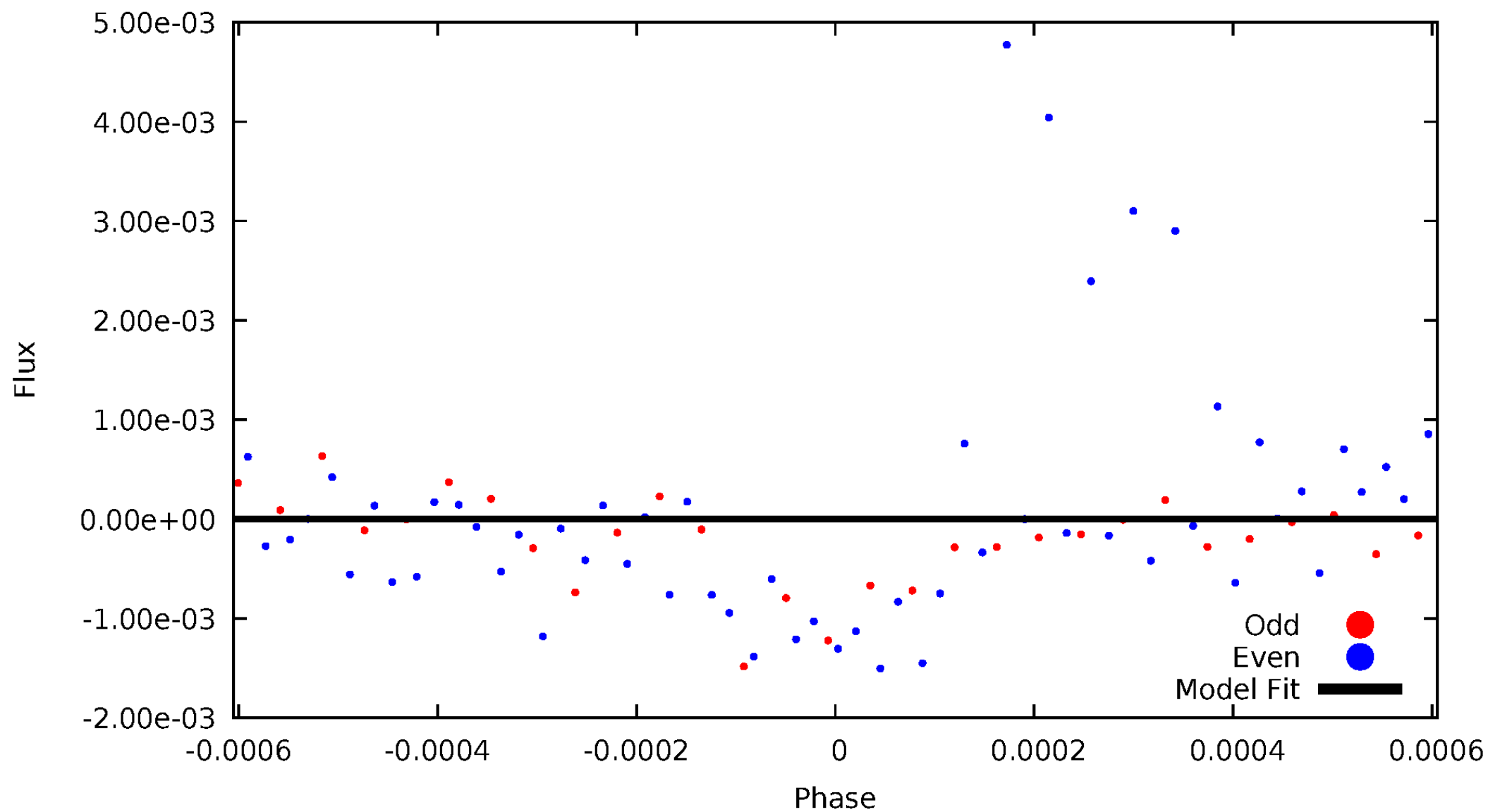
# TCE 012117857-05





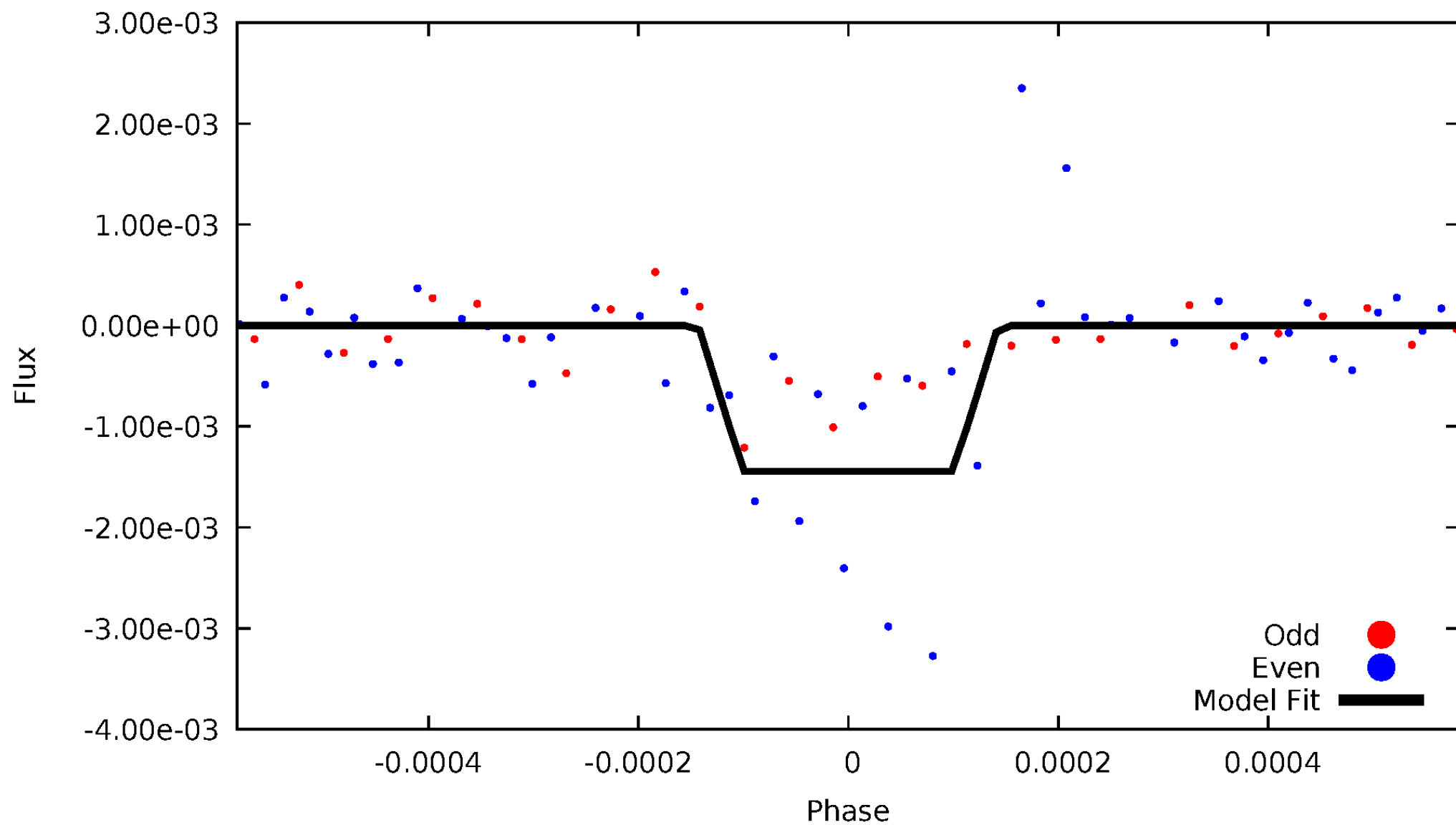
# DV Odd/Even

TCE 012117857-05



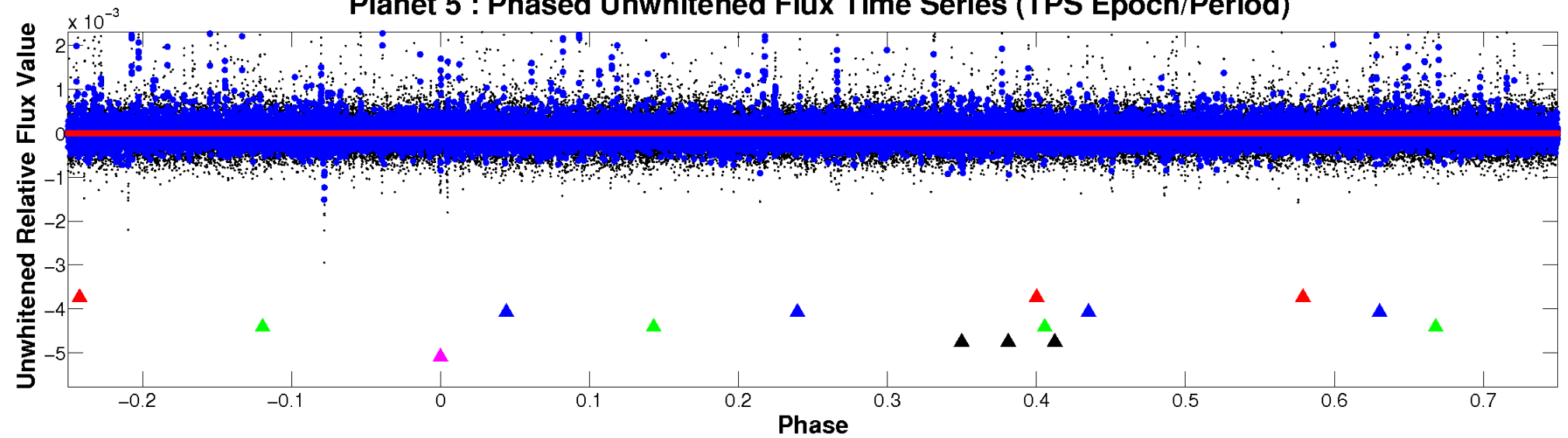
# ALT Odd/Even

TCE 012117857-05

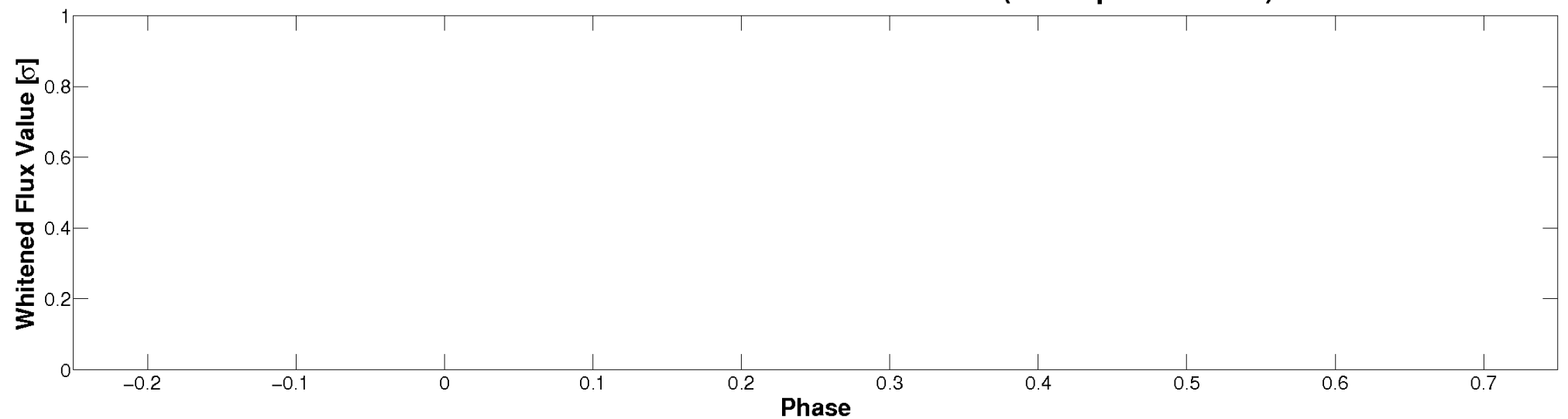


# Non-Whitened Vs. Whitened Light Curve

**Planet 5 : Phased Unwhitened Flux Time Series (TPS Epoch/Period)**

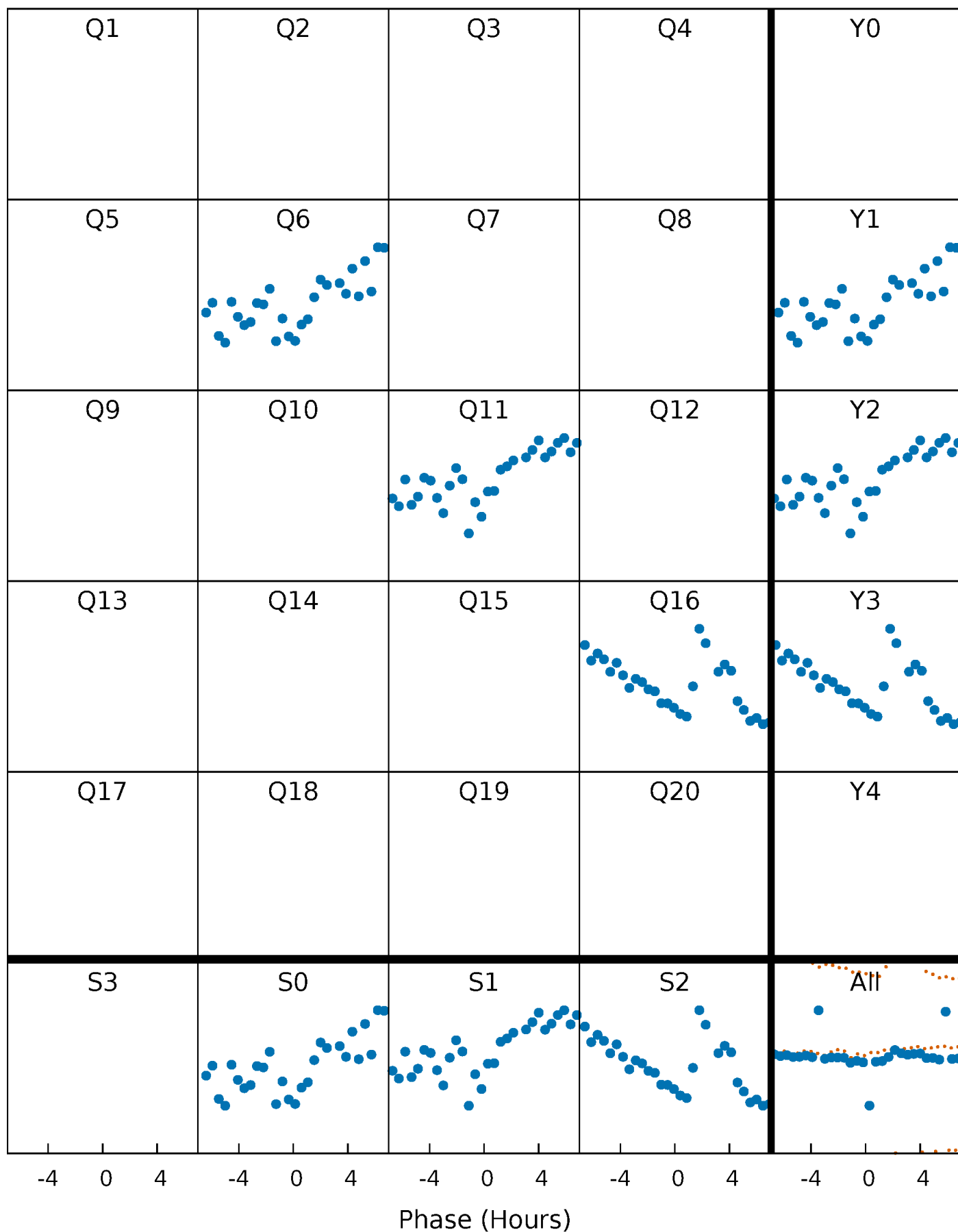


**Planet 5 : Phased Whitened Flux Time Series (TPS Epoch/Period)**



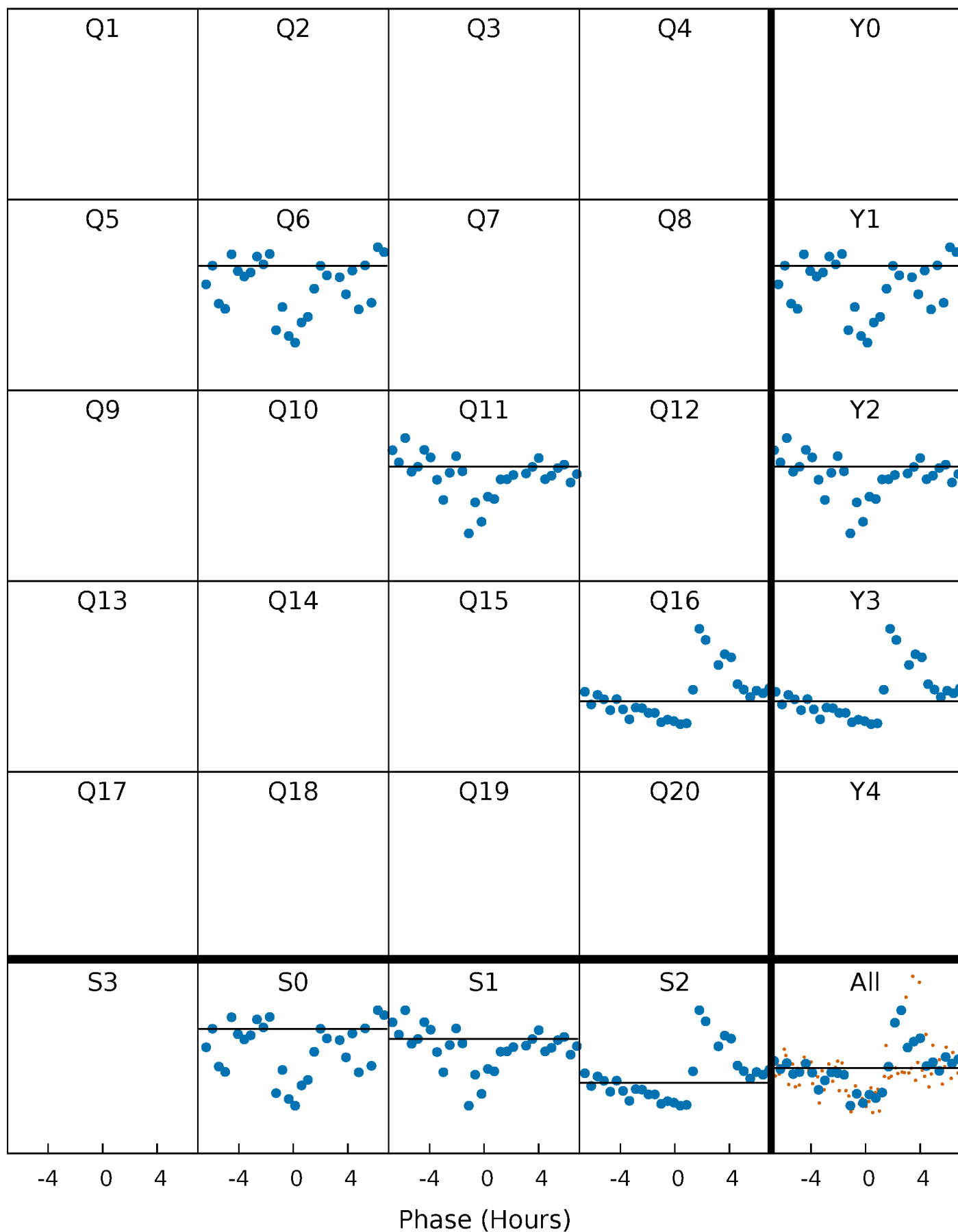
# PDC Quarter-Phased Transit Curves

TCE 012117857-05     $P=481.939135$  Days     $T_0=556.910468$  (BKJD)



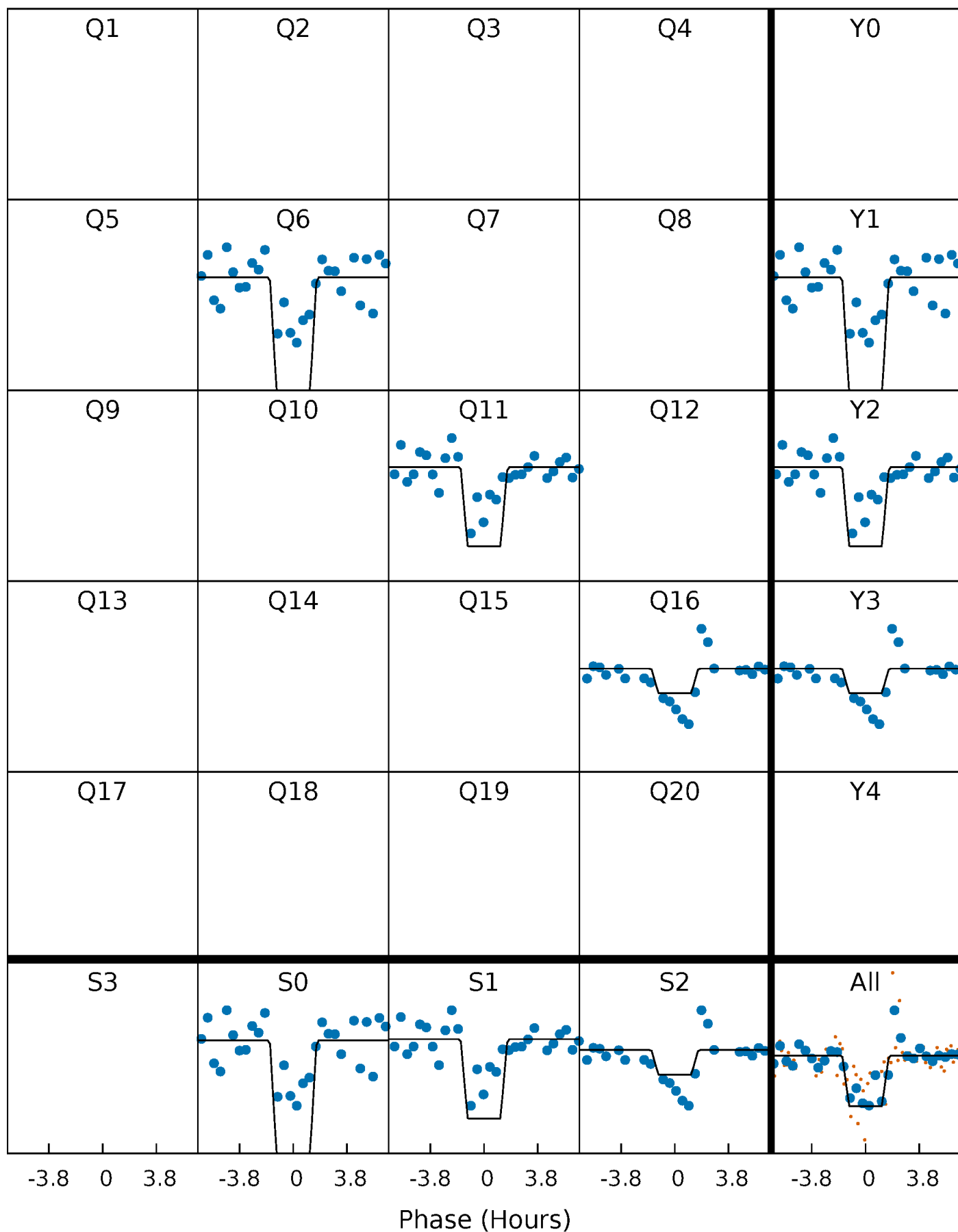
# DV Quarter-Phased Transit Curves

TCE 012117857-05     $P=481.939135$  Days     $T_0=556.910468$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

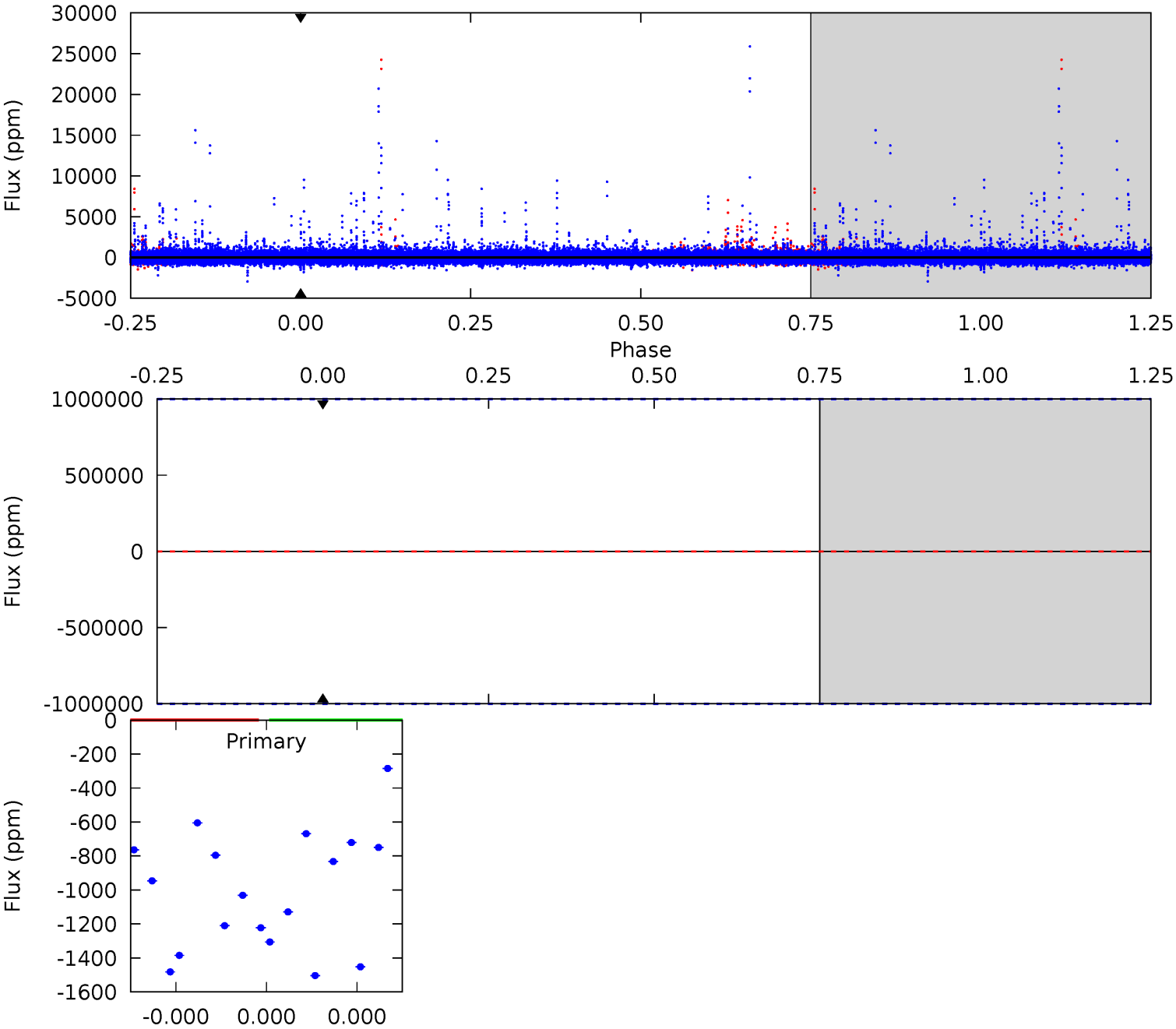
TCE 012117857-05     $P=481.939135$  Days     $T_0=556.913891$  (BKJD)



# DV Model-Shift Uniqueness Test

012117857-05, P = 481.939135 Days, E = 74.971333 Days

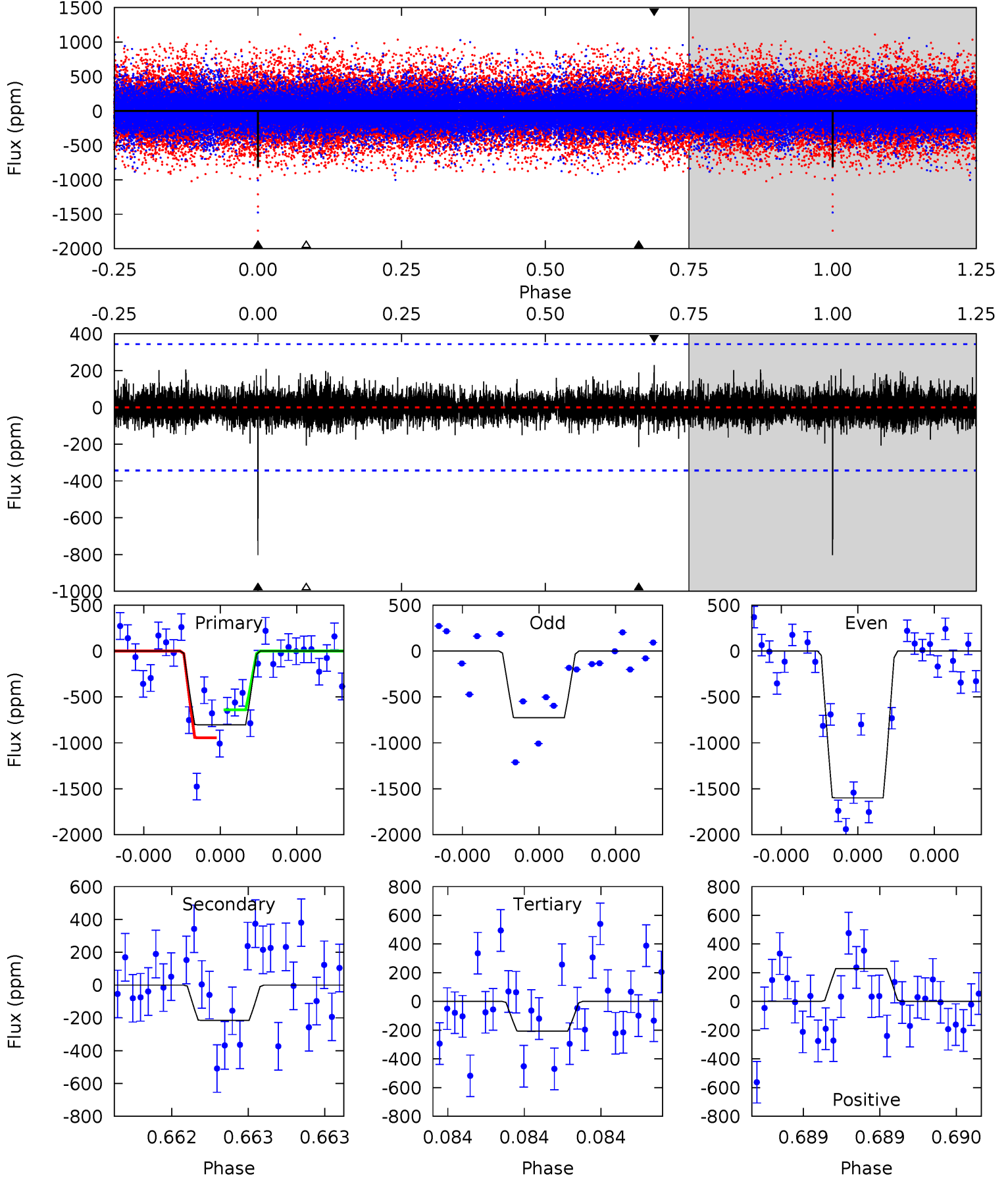
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
0	0	0	0	1.00	1.00	1.00	0	0	0	0	0	0	0	0



# Alt Model-Shift Uniqueness Test

012117857-05, P = 481.939135 Days, E = 74.974756 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
13.2	3.54	3.40	3.78	5.66	3.62	0.68	9.82	9.44	0.14	-0.24	7.03	1.75	0.22	0





### Stellar Parameters For KIC 012117857

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5237^{+158}_{-158}$	$3.937^{+0.651}_{-0.279}$	$-0.160^{+0.300}_{-0.300}$	$1.675^{+0.898}_{-0.898}$	$0.885^{+0.078}_{-0.135}$	$0.265^{+2.323}_{-0.155}$
	+3%/-3%	+17%/-7%	+188%/-188%	+54%/-54%	+9%/-15%	+876%/-58%
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 012117857-05 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$0 \pm 1000000$	$13.27^{+14.43}_{-9.40}$	$382^{+51}_{-65}$	$3902^{+12342}_{-17240}$	$6680^{+926774}_{-698759}$
Alt.	$-215 \pm 61$	$13.60^{+14.98}_{-9.36}$	$381^{+57}_{-60}$	$2882^{+1289}_{-475}$	$870^{+8003}_{-699}$

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

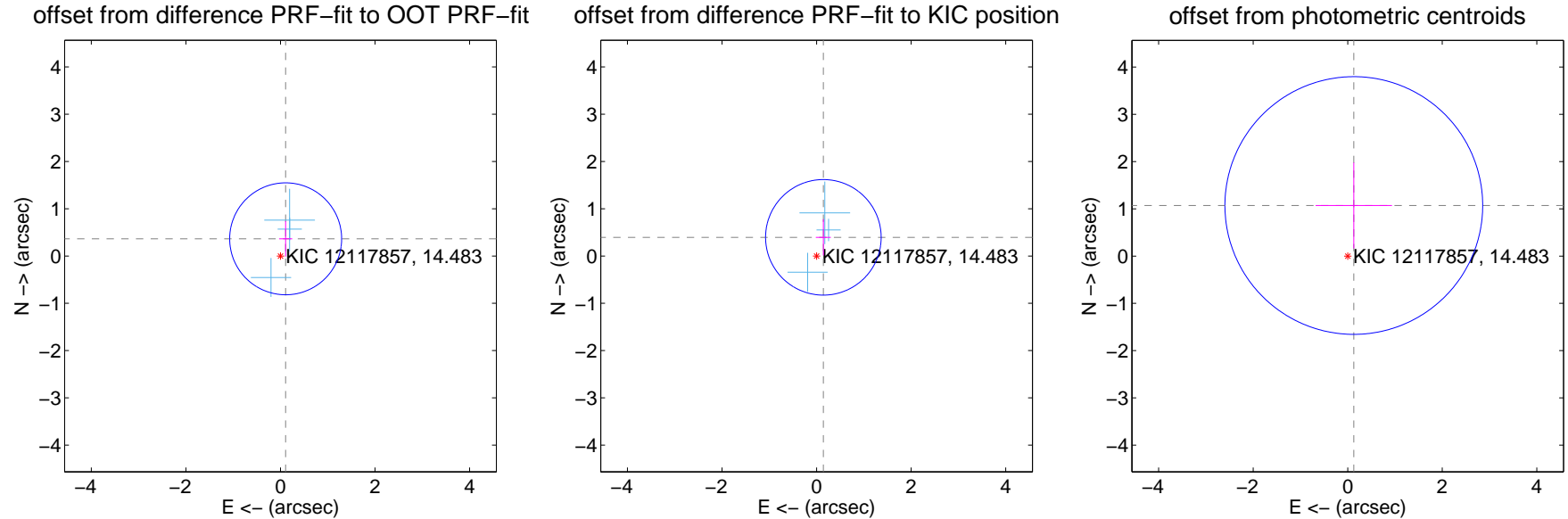
## DV Centroid Data

Supplemental centroid analysis for 012117857-05. Kepler magnitude: 14.48. Transit SNR -1.00

There are 3 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.06 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.381 \pm 0.395$	0.96	$-0.110 \pm 0.138$	$0.364 \pm 0.376$
PRF-fit source offset from KIC position	$0.420 \pm 0.407$	1.03	$-0.143 \pm 0.159$	$0.395 \pm 0.383$
photometric centroid source offset	$1.08 \pm 0.91$	1.19	$-0.13 \pm 0.81$	$1.07 \pm 0.91$

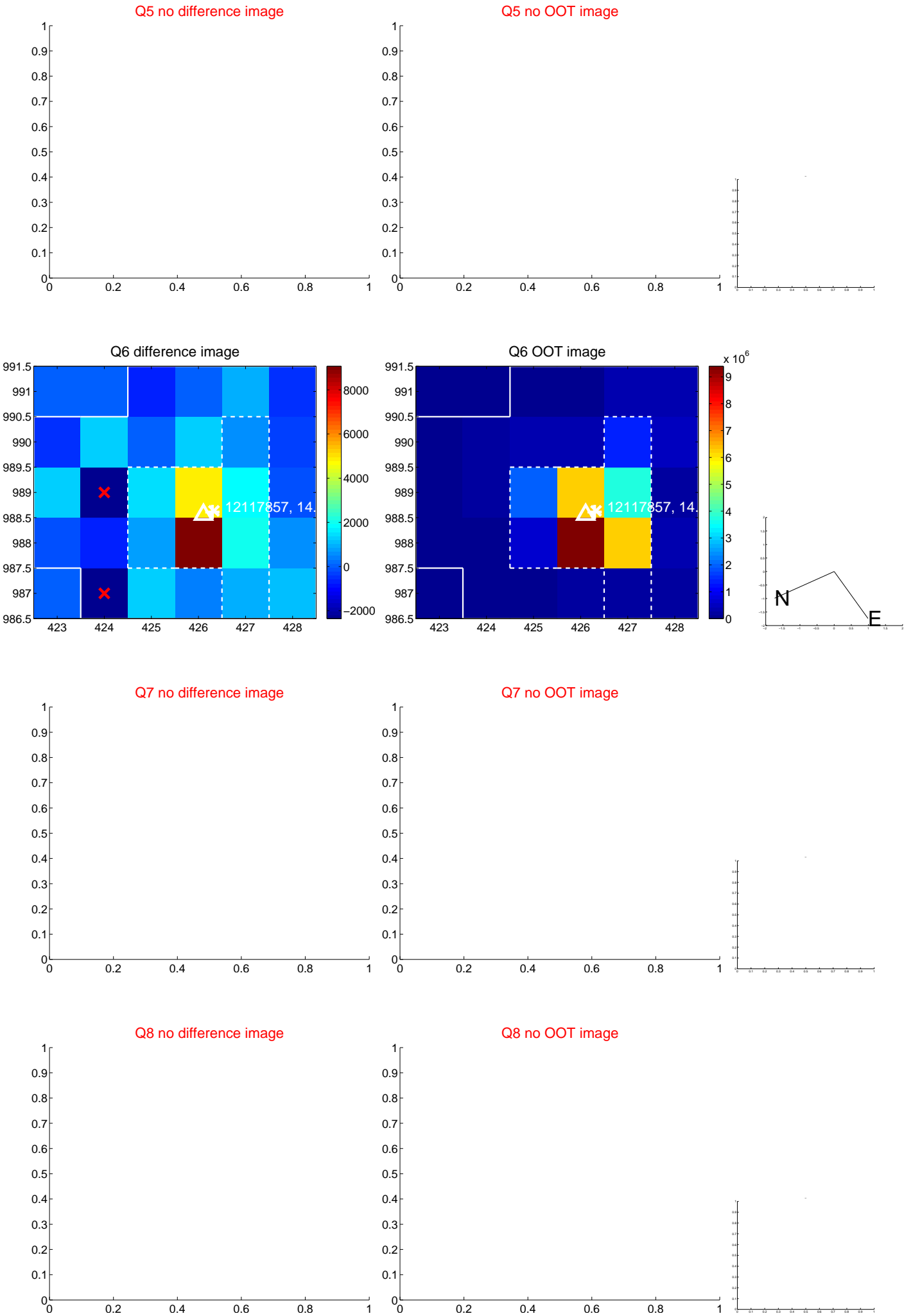


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

Q9 no difference image



Q9 no OOT image



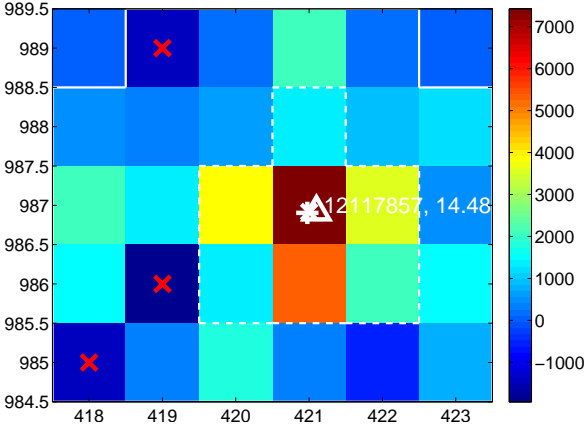
Q10 no difference image



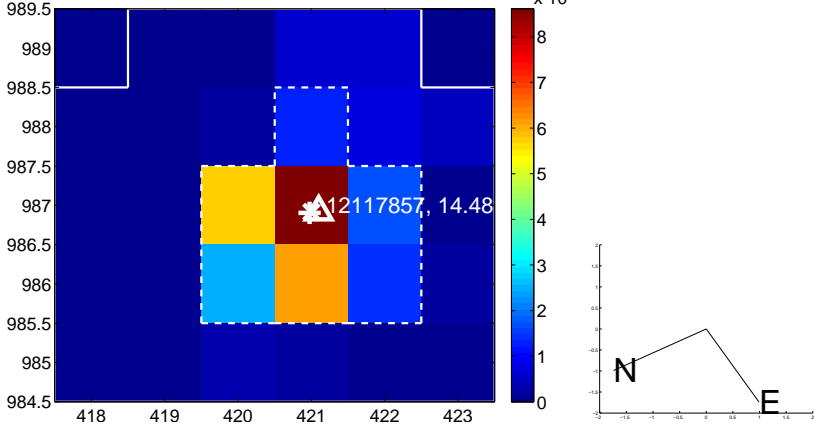
Q10 no OOT image



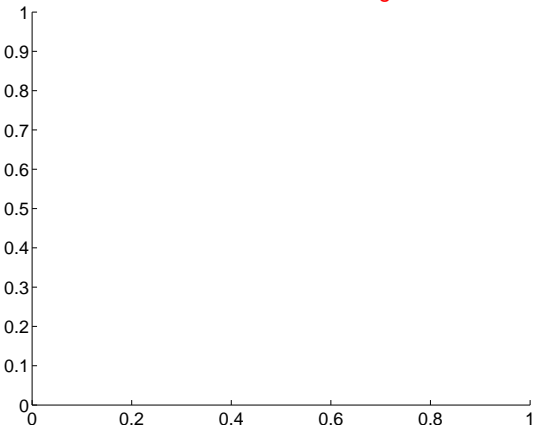
Q11 difference image



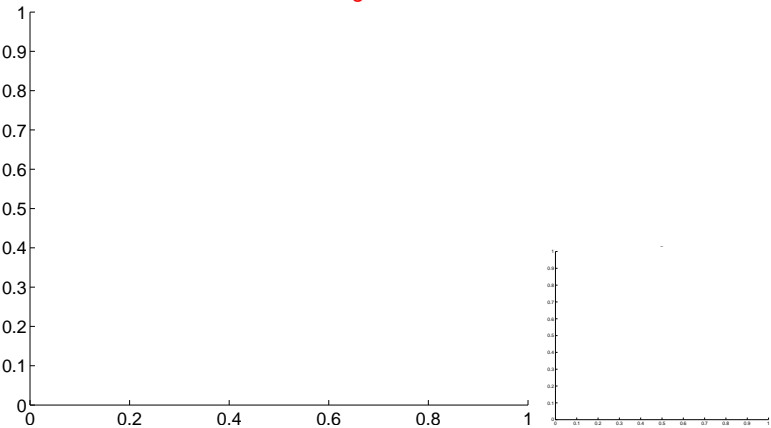
Q11 OOT image



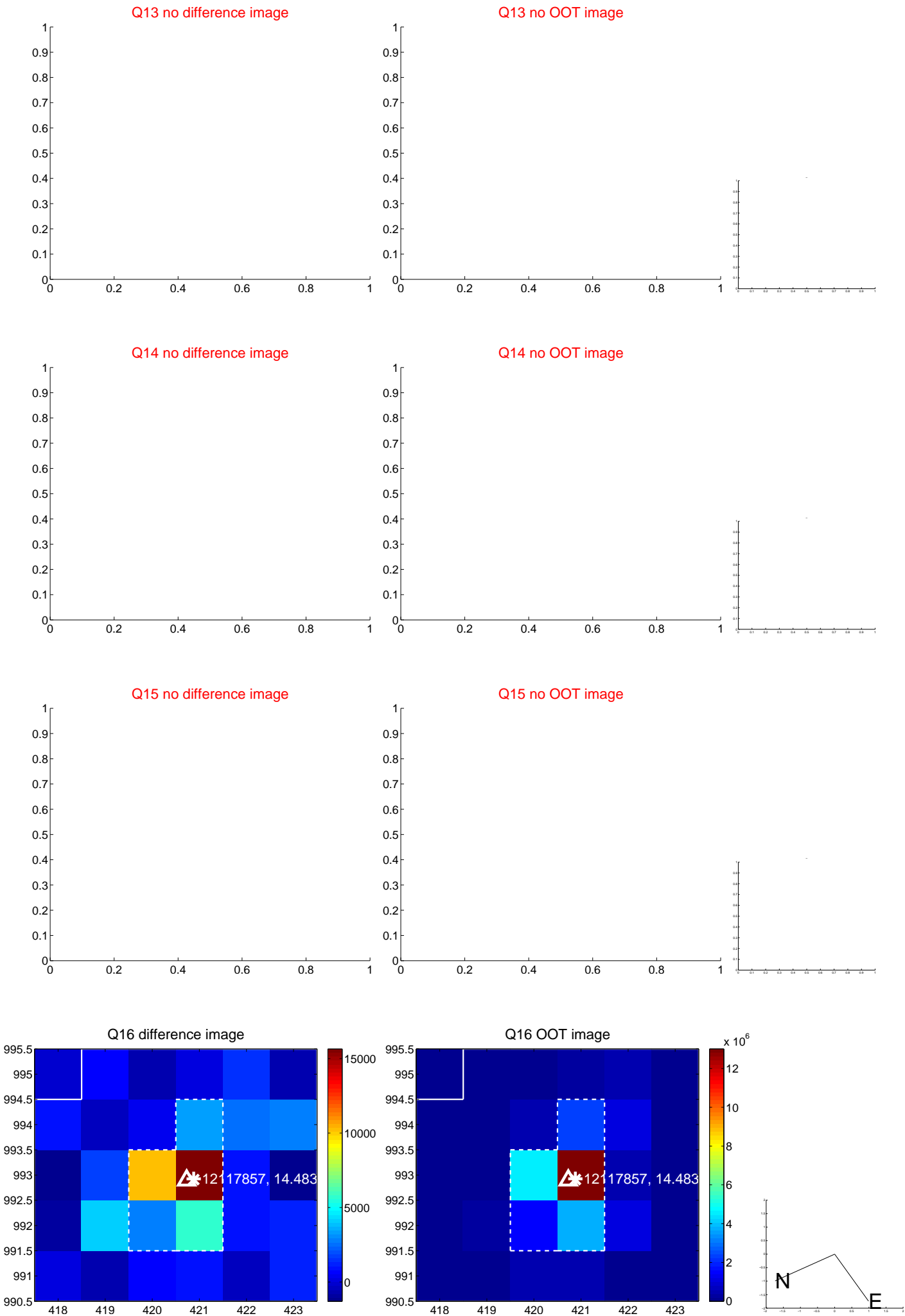
Q12 no difference image



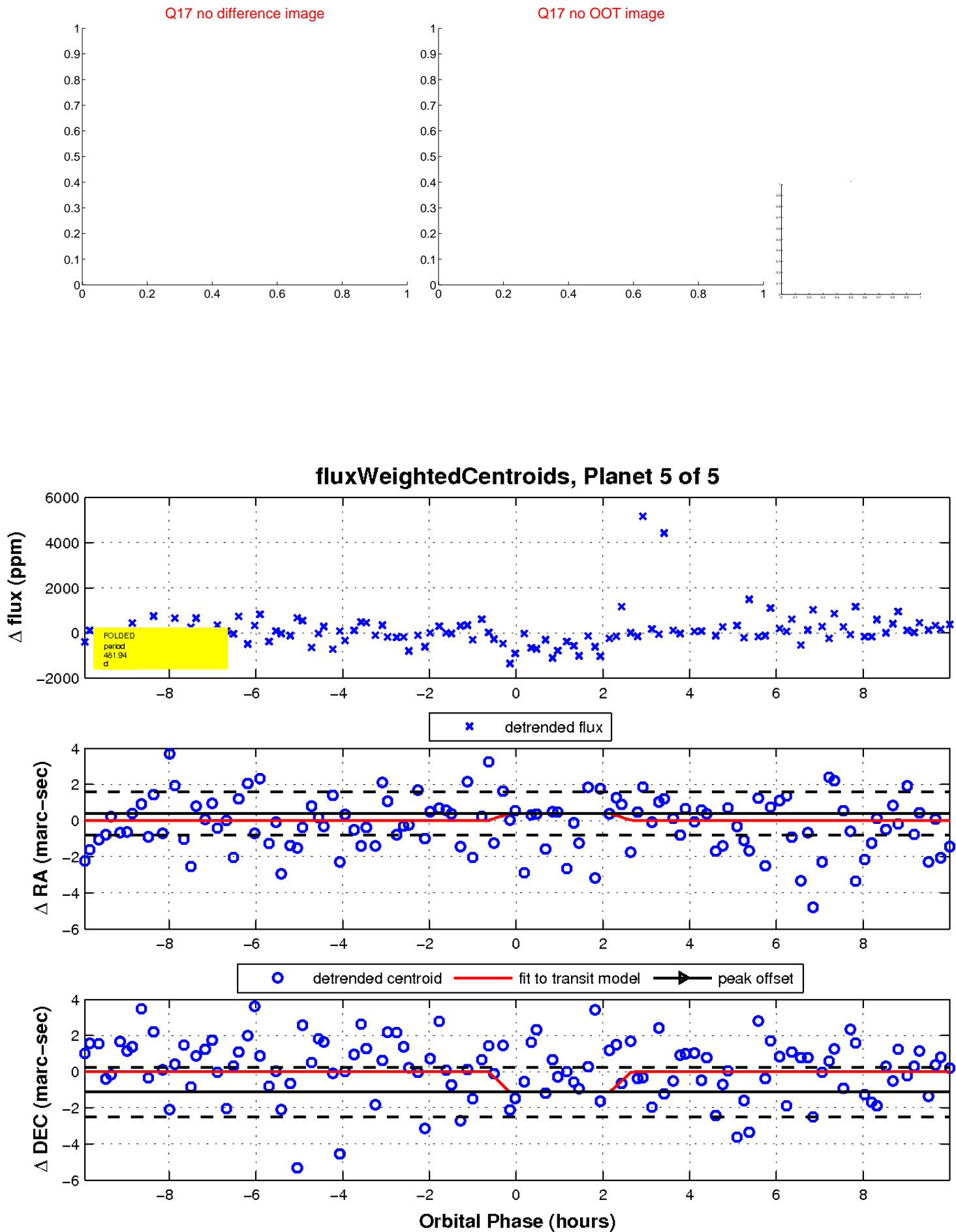
Q12 no OOT image



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

