

# KIC 005098150

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
005098150-01	OBS	No	366.745359	491.094434	865.9	0.640	17.3	1.4	0.83	5328	2.76	0.59
005098150-02	OBS	No	495.967471	262.511597	2824.4	16.798	16.2	6.5	0.83	5328	4.32	0.40
005098150-03	OBS	No	326.099826	377.381770	2170.5	3.821	14.6	8.1	0.83	5328	3.78	0.69
005098150-04	OBS	No	285.843848	268.378494	98.5	1.451	10.4	0.4	0.83	5328	0.82	0.82
005098150-05	OBS	No	316.084541	438.389119	6140.2	53.938	10.4	6.6	0.83	5328	12.04	0.72
005098150-06	OBS	No	404.564736	426.463441	1512.7	3.963	10.8	4.5	0.83	5328	3.32	0.52

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
005098150-01	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_CHASES_MARSHALL_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV— MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS—HALO_GHOST
005098150-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_ZUMA—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
005098150-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_SKYE—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV— MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
005098150-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_ZUMA_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV— MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
005098150-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
005098150-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_TRACKER—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—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.

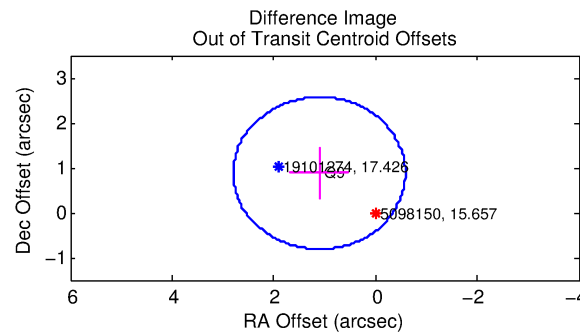
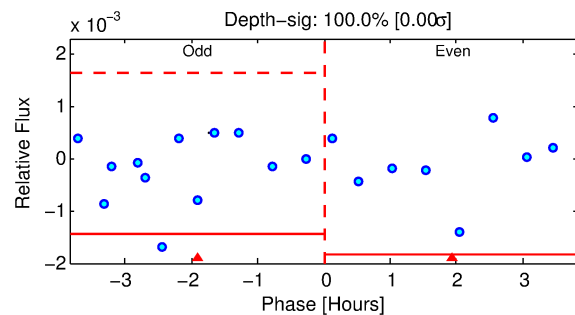
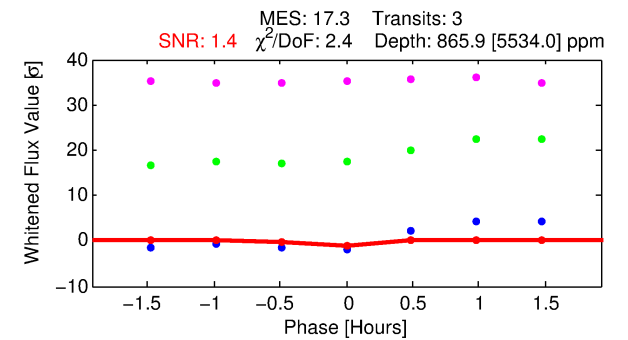
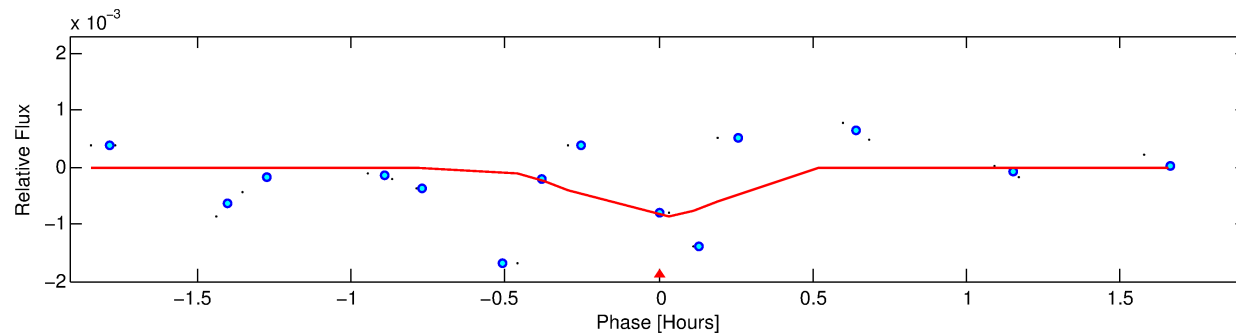
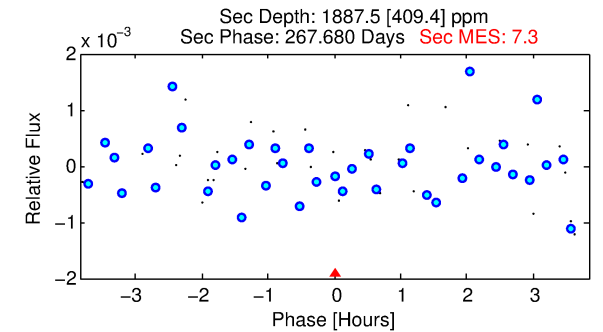
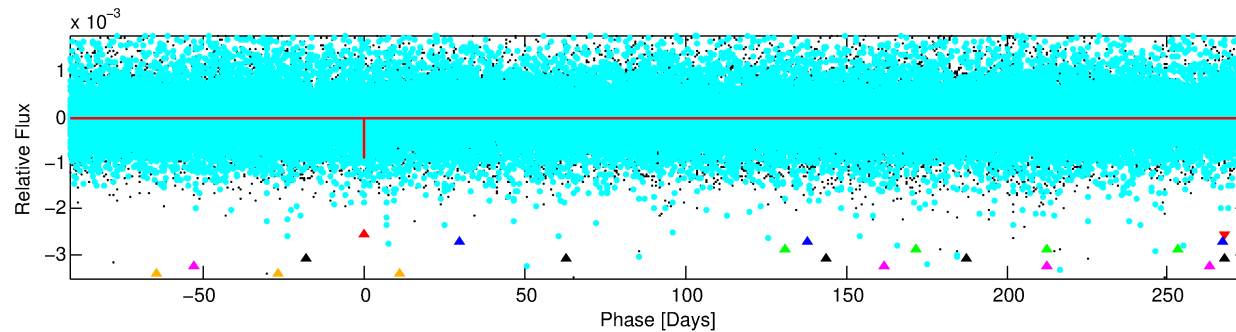
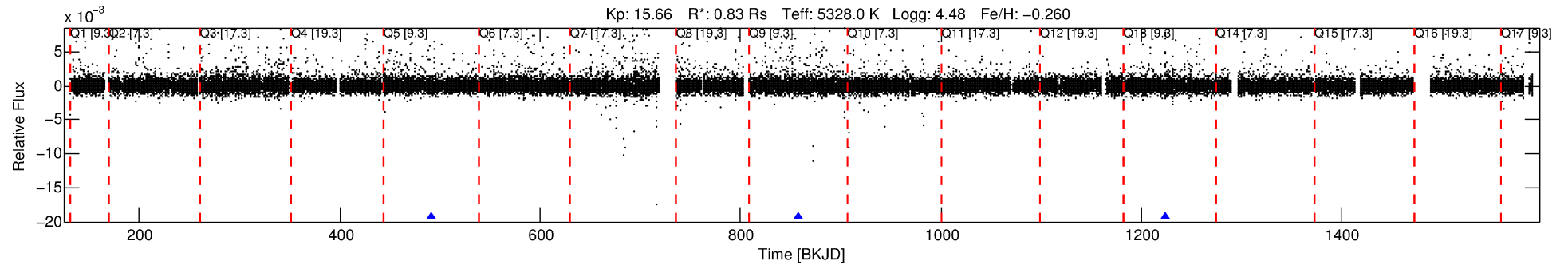
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 005098150-01

No Significant Match Found

# DV One-Page Summary

KIC: 5098150 Candidate: 1 of 6 Period: 366.745 d



## DV Fit Results:

Period = 366.74536 [0.09161] d  
Epoch = 491.0944 [0.0936] BKJD  
Rp/R\* = 0.0306 [1.5914]  
a/R\* = 3016.56 [638101.18]  
b = 0.77 [113.12]  
Seff = 0.59 [0.14]  
Teq = 224 [13] K  
Rp = 2.76 [143.61] Re  
a = 0.9140 [0.1230] AU  
Ag = 113523.08 [11795913.59] [0.01 $\sigma$ ]  
Teffp = 6345 [164832] K [0.04 $\sigma$ ]

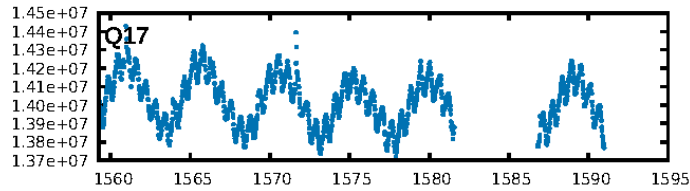
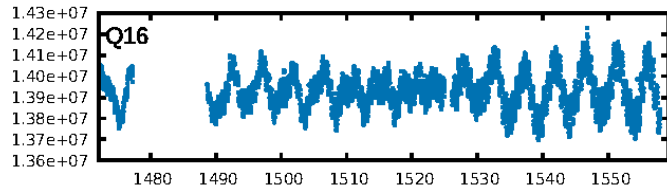
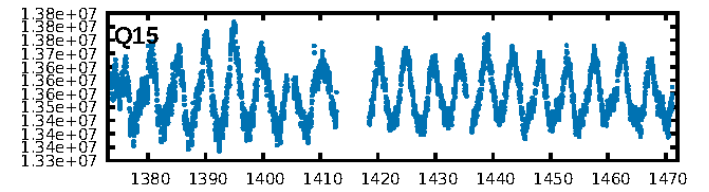
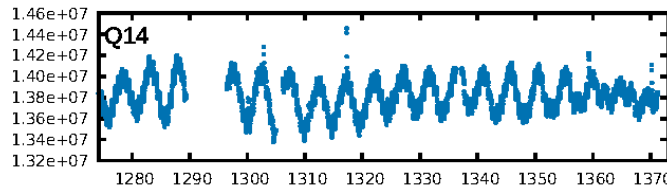
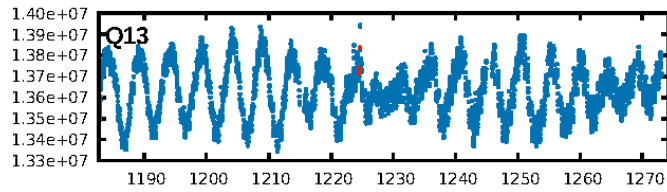
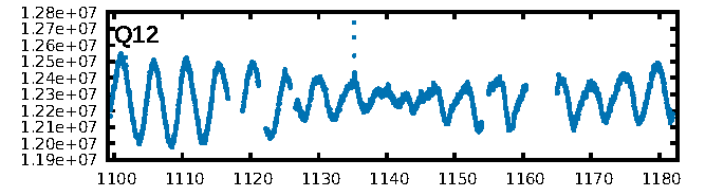
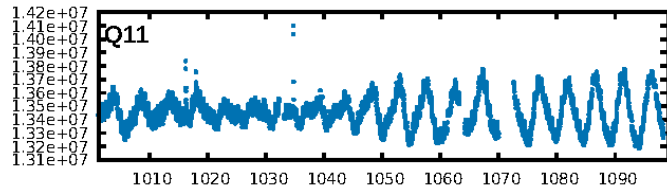
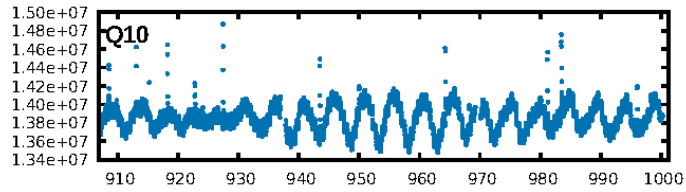
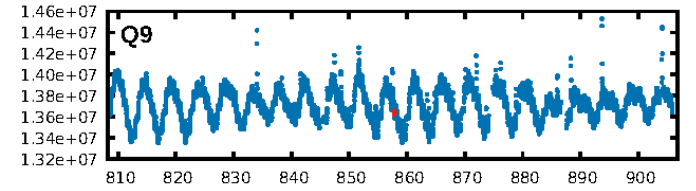
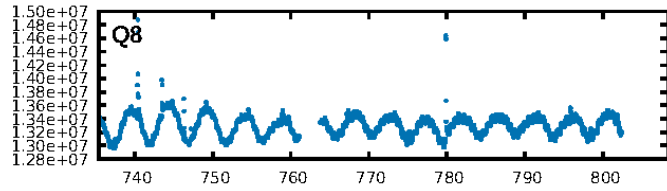
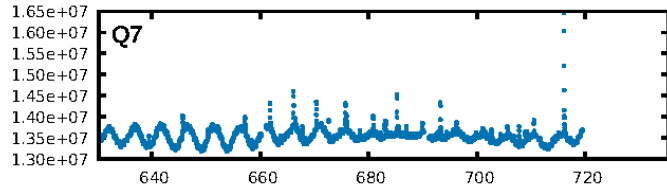
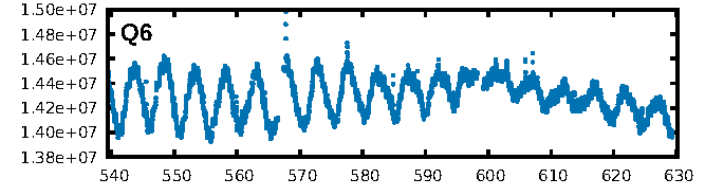
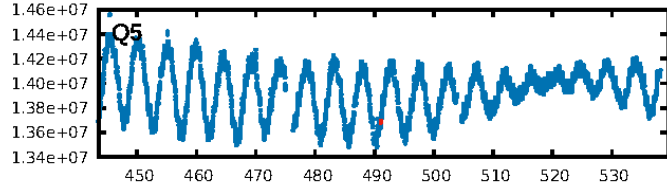
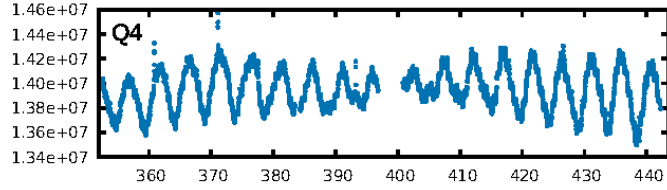
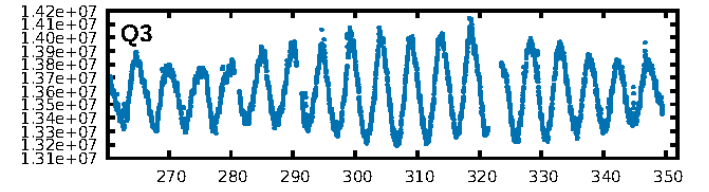
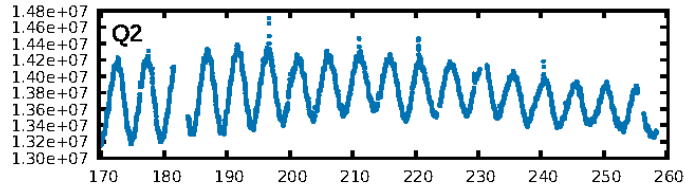
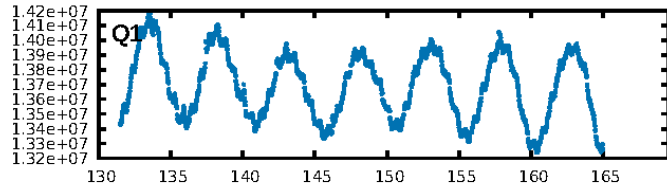
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [251.76 $\sigma$ ]  
LongPeriod-sig: 100.0% [226.11 $\sigma$ ]  
**ModelChiSquare2-sig: 0.0%**  
ModelChiSquareGof-sig: 9.9%  
Bootstrap-pfa: 6.54e-15  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: -0.0646  
Centroid-sig: 51.0%  
Centroid-so: 2.347 arcsec [0.43 $\sigma$ ]  
OotOffset-rm: 1.410 arcsec [2.50 $\sigma$ ]  
KicOffset-rm: 1.382 arcsec [2.45 $\sigma$ ]  
OotOffset-st: 0/0/0/1 [1]  
KicOffset-st: 0/0/0/1 [1]  
DiffImageQuality-fgm: 1.00 [1/1]  
DiffImageOverlap-fno: 1.00 [2/2]

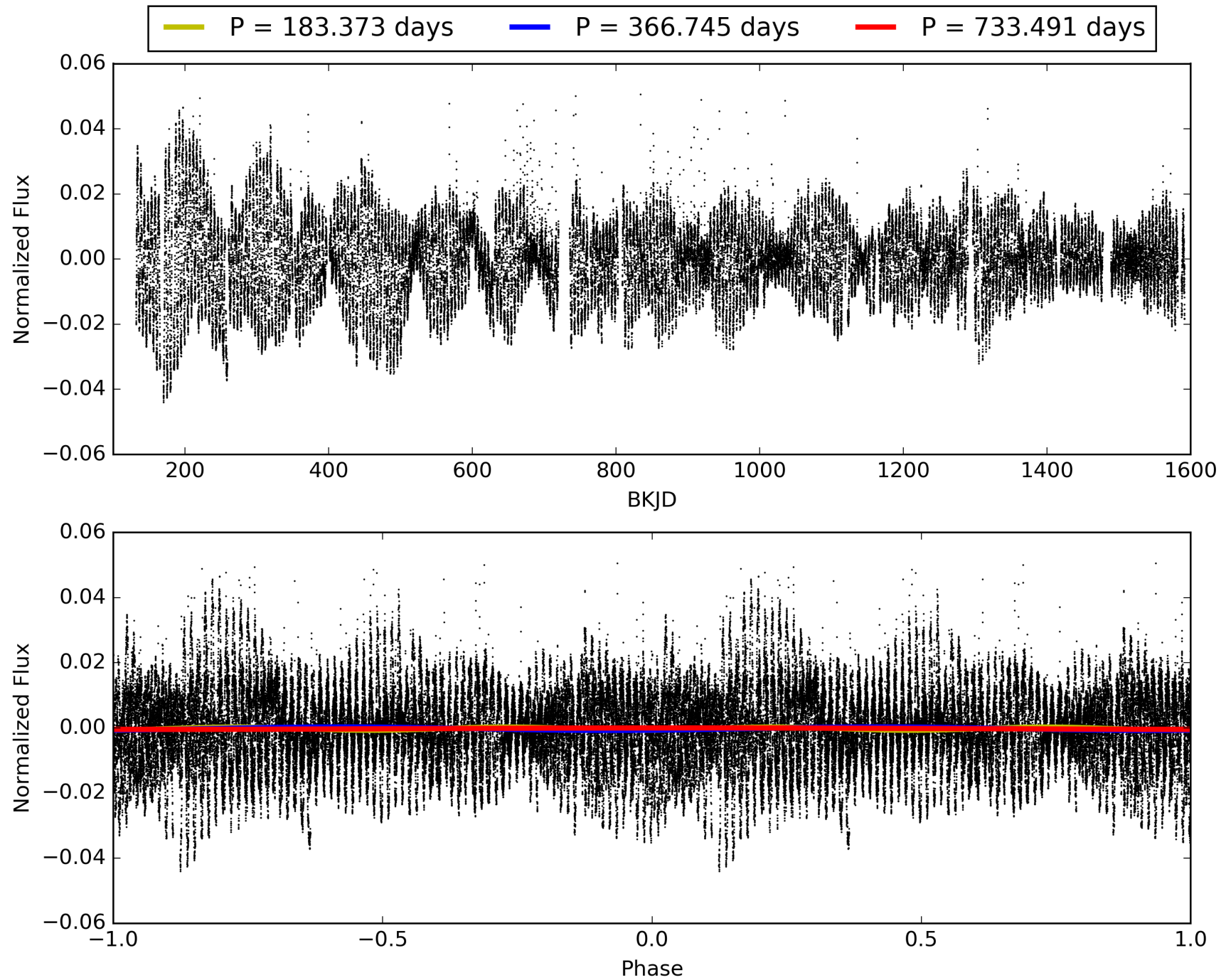
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This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 005098150-01, PDC Light Curves



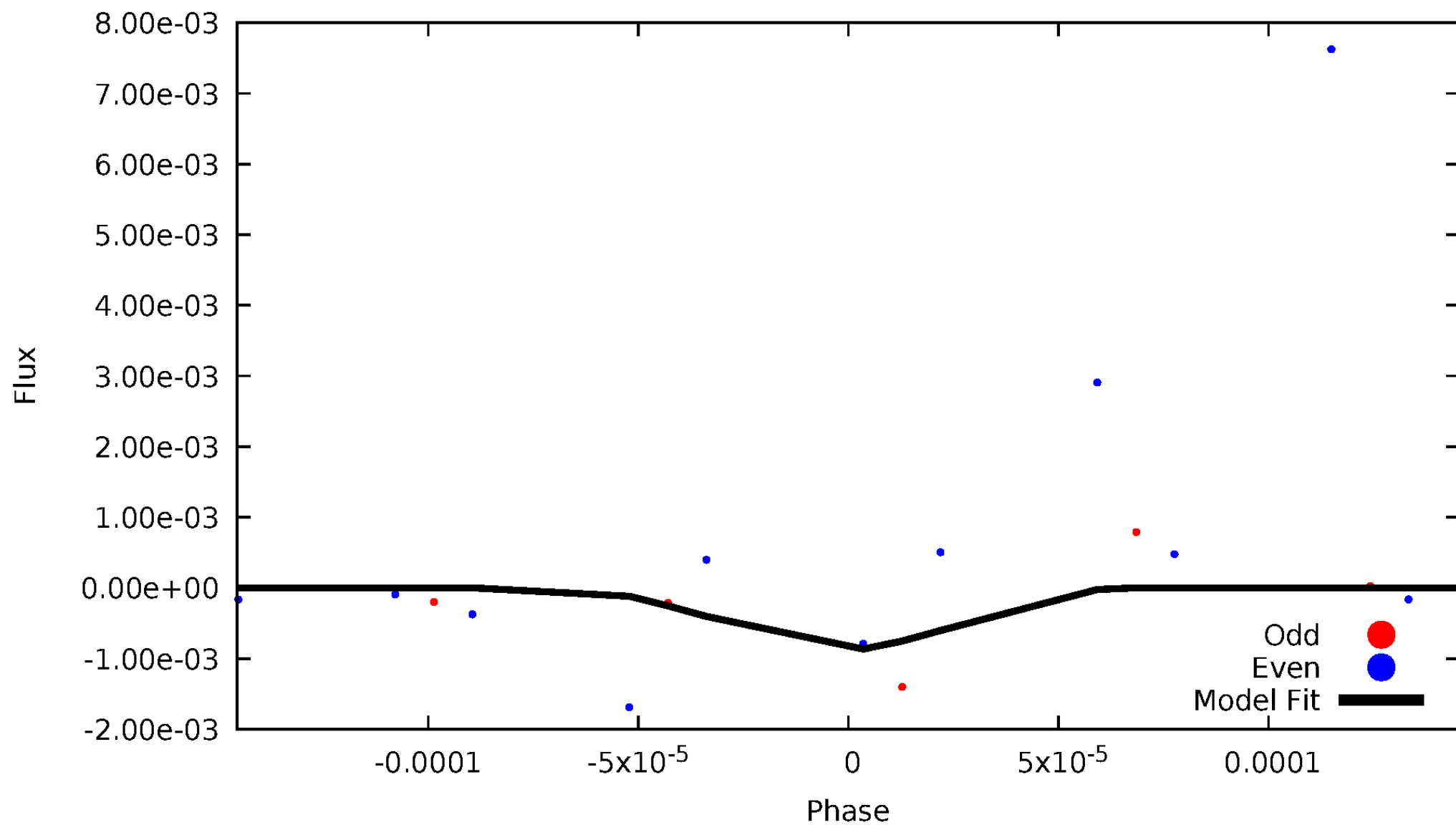
TCE 005098150-01





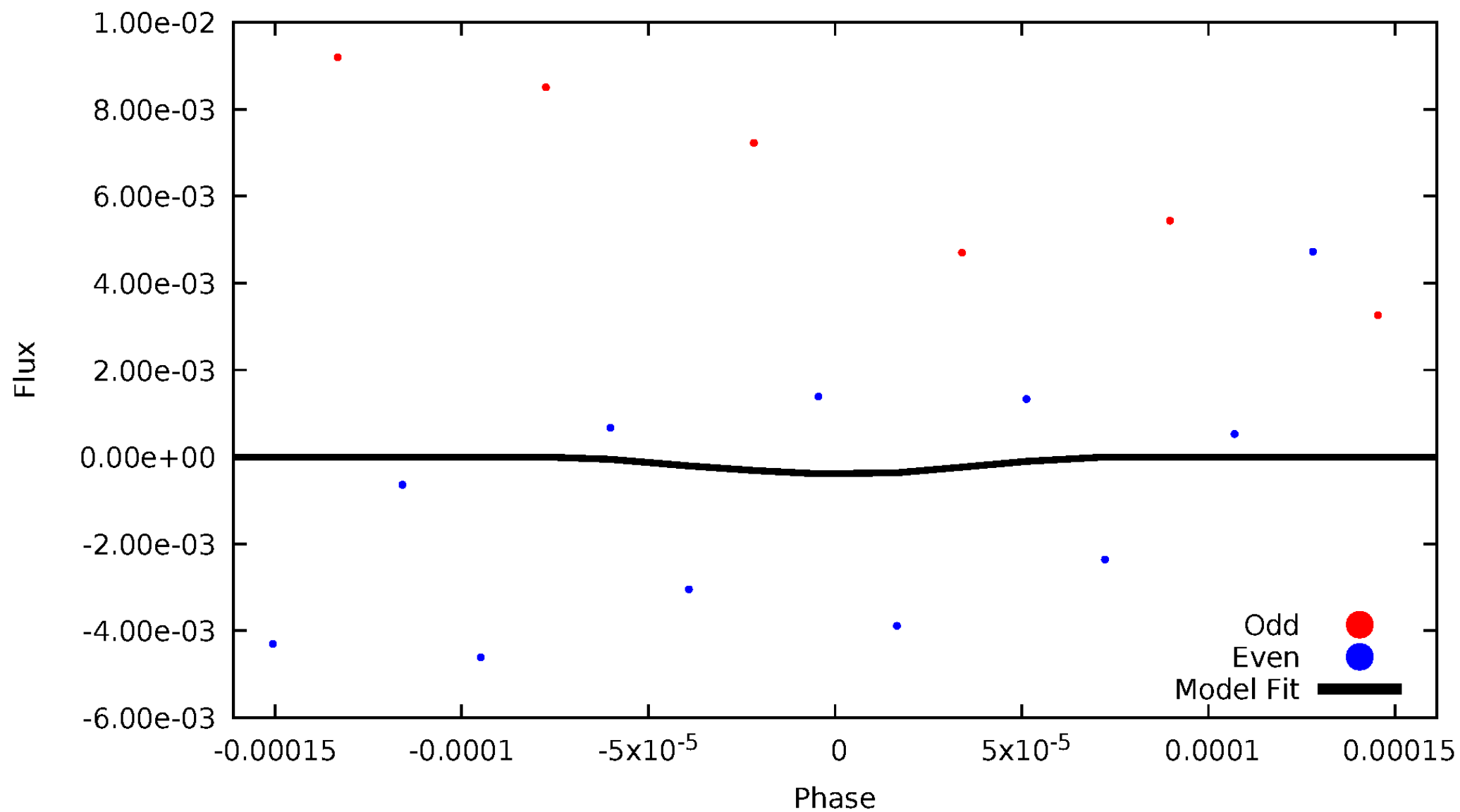
# DV Odd/Even

TCE 005098150-01

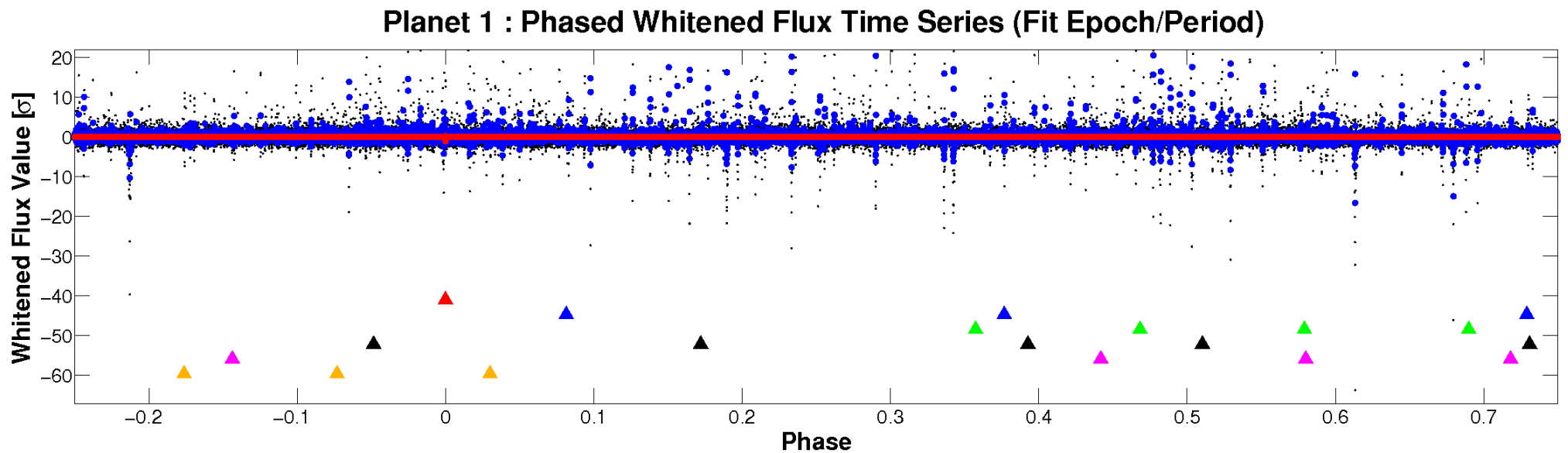
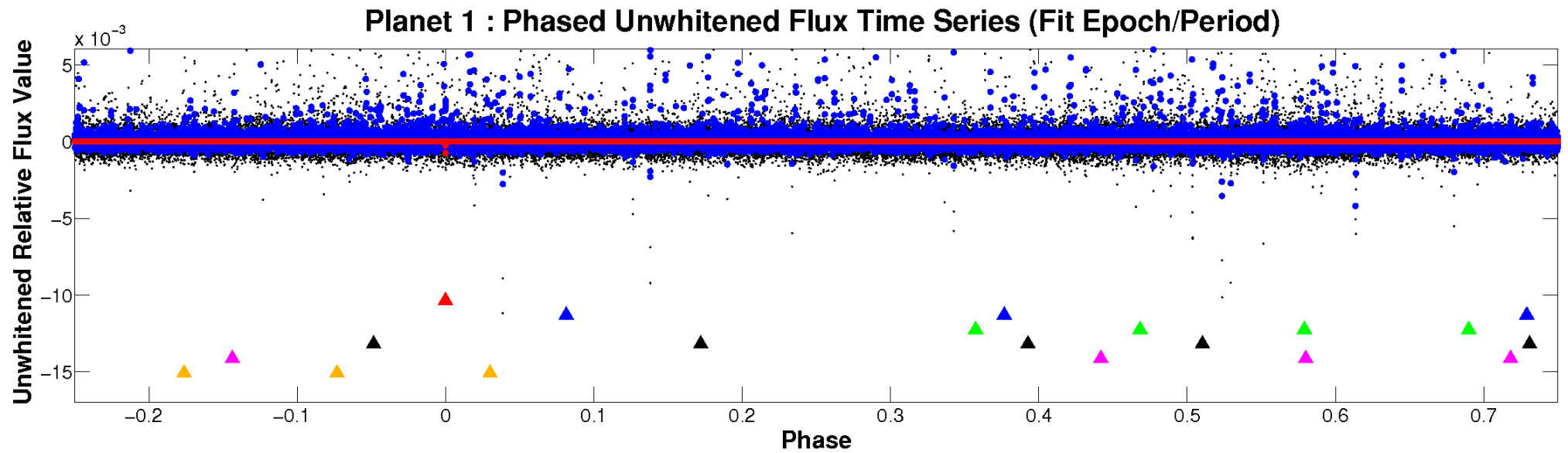


# ALT Odd/Even

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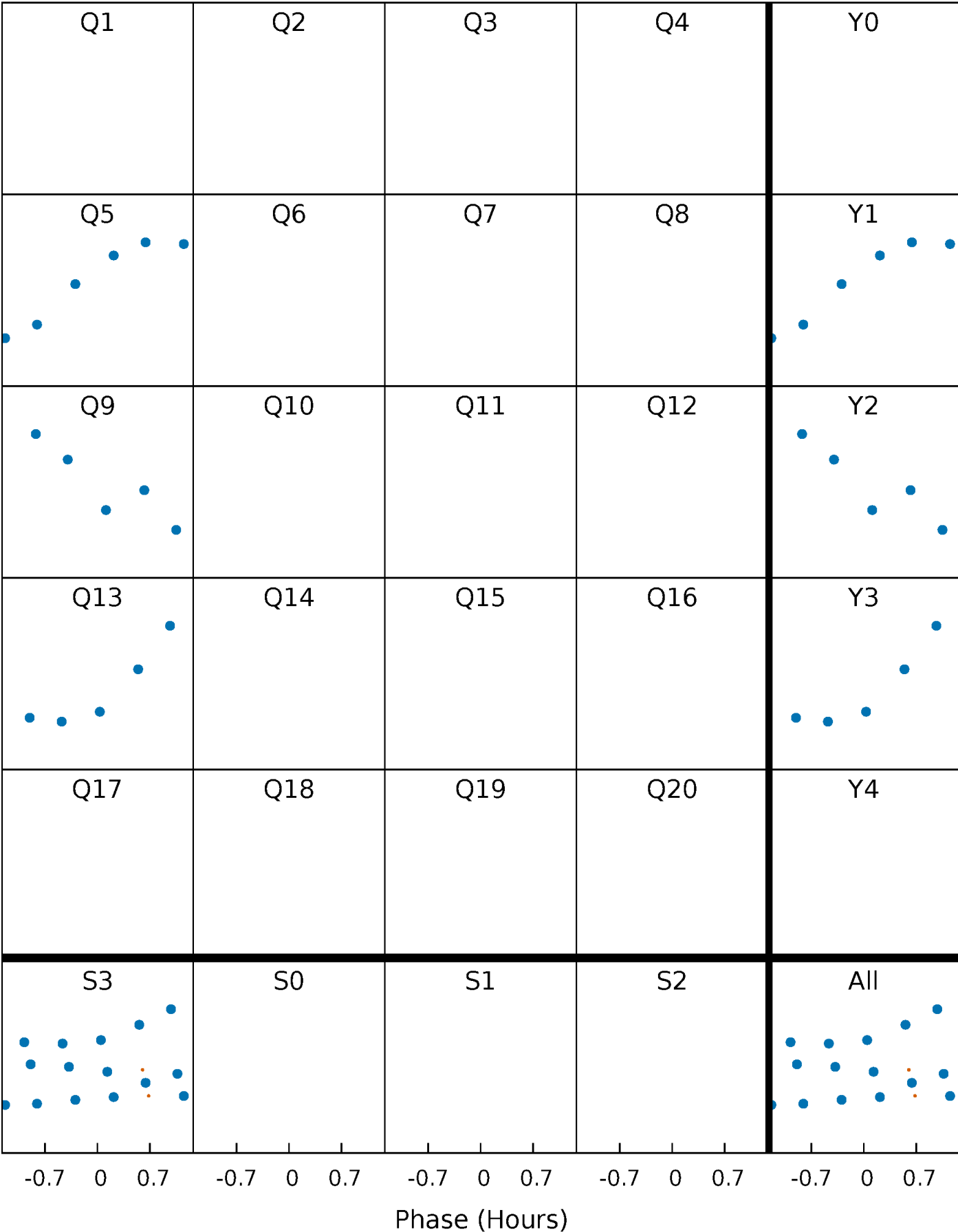


# Non-Whitened Vs. Whitened Light Curve



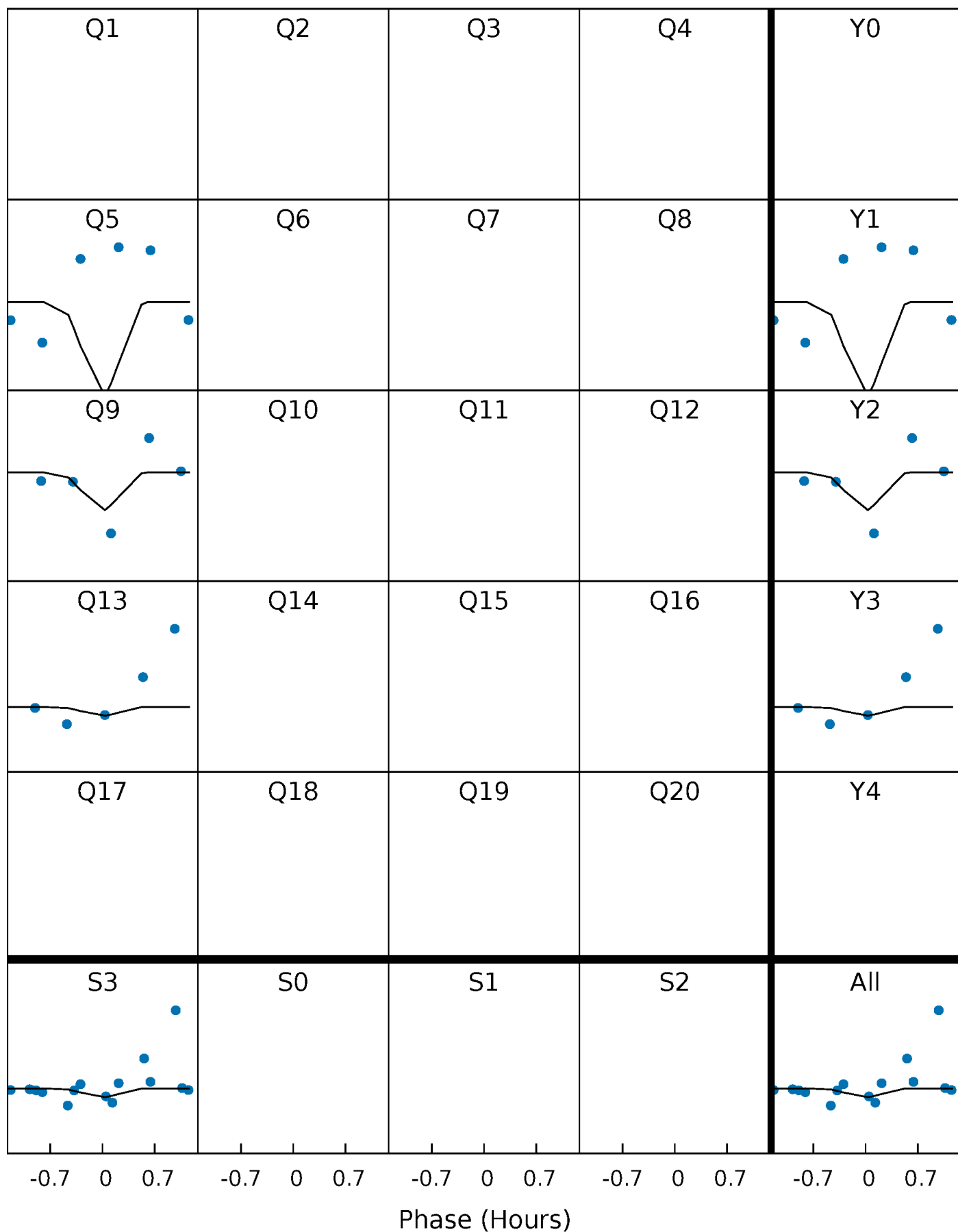
PDC Quarter-Phased Transit Curves

TCE 005098150-01    P=366.745359 Days    T<sub>0</sub>=491.094434 (BKJD)



# DV Quarter-Phased Transit Curves

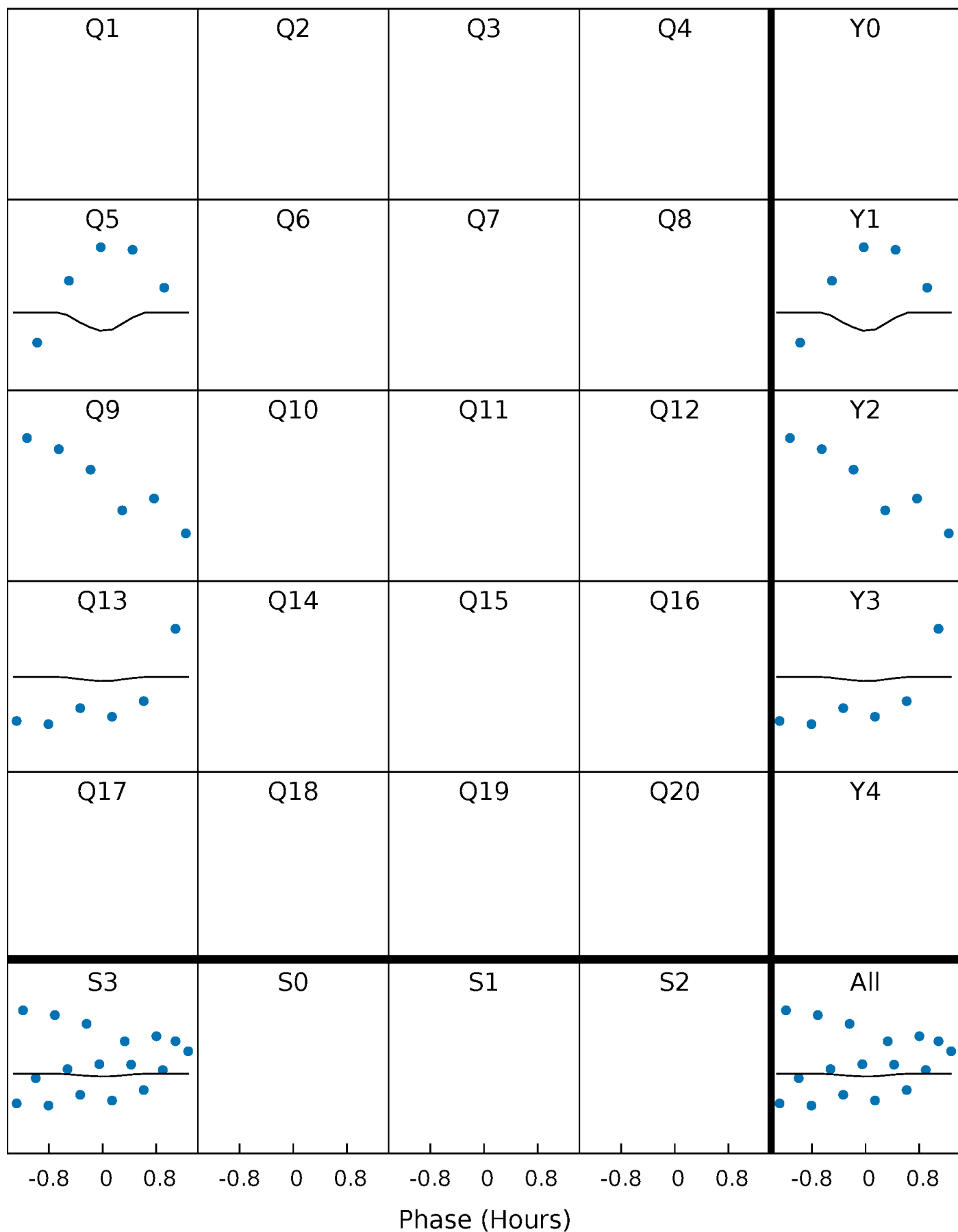
TCE 005098150-01 P=366.745359 Days  $T_0=491.094434$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

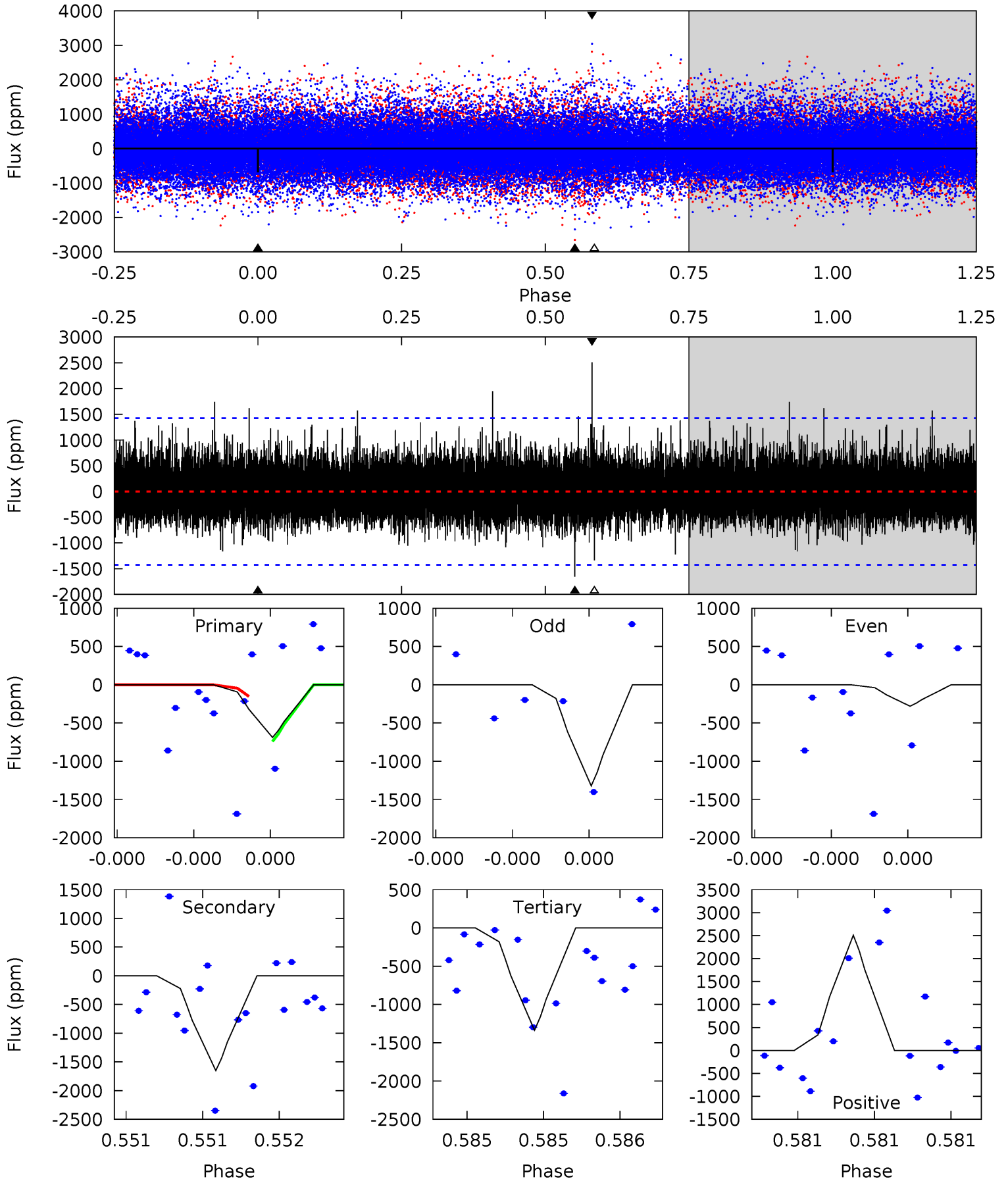
TCE 005098150-01 P=366.727913 Days  $T_0=491.104103$  (BKJD)



# DV Model-Shift Uniqueness Test

005098150-01, P = 366.745359 Days, E = 124.349075 Days

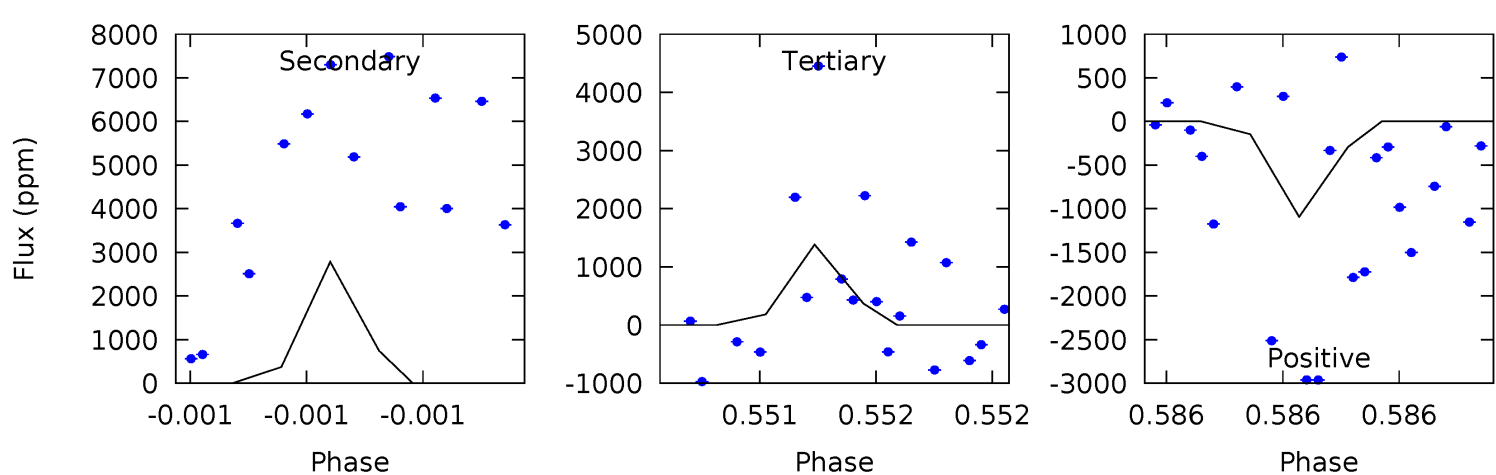
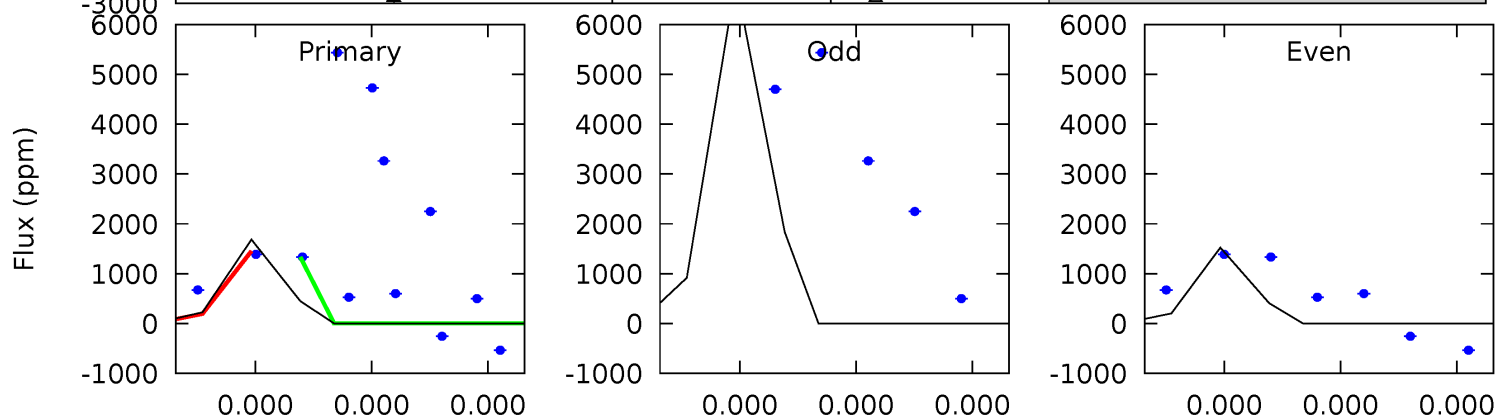
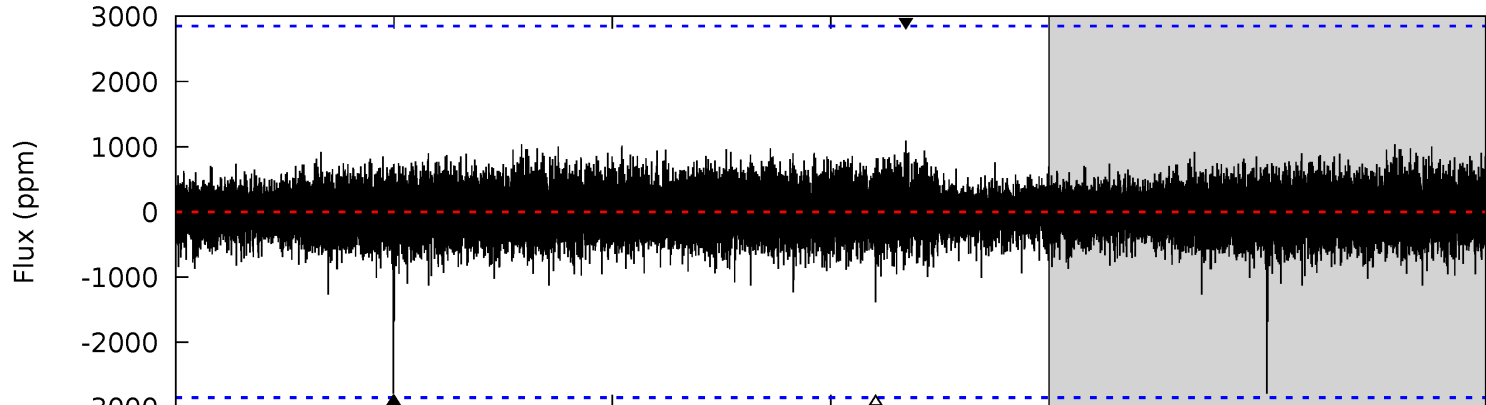
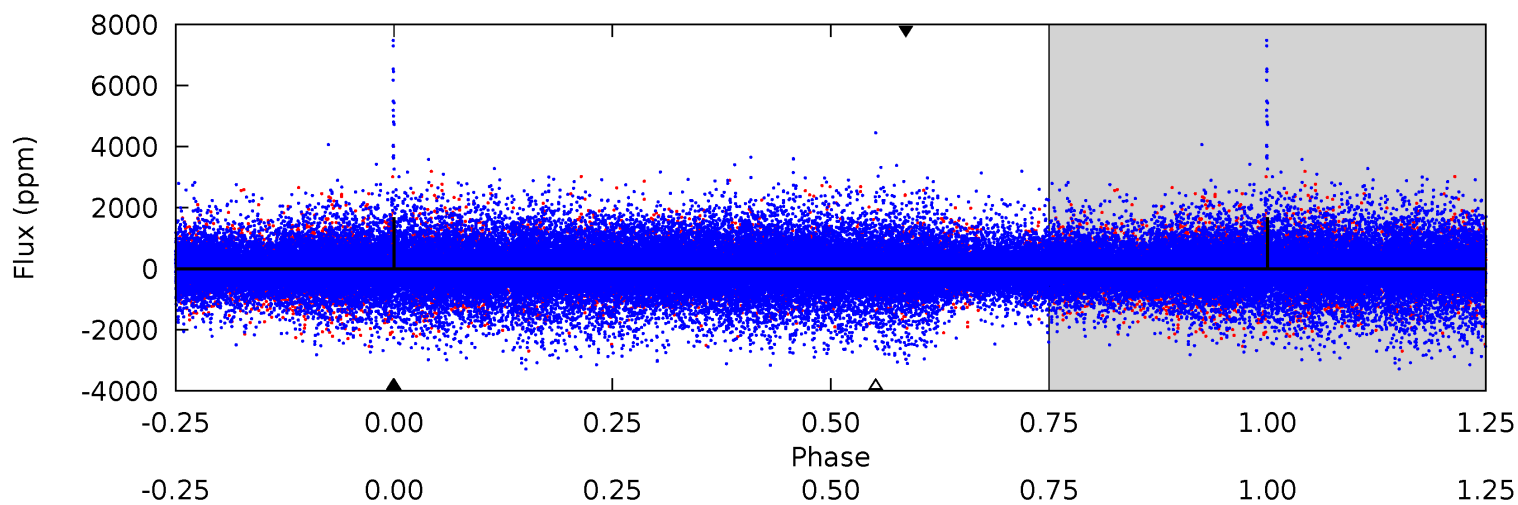
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
2.81	6.74	5.46	10.2	5.82	3.84	1.21	-2.65	-7.43	1.28	-3.49	1.56	0.61	0.60	1.18



# Alt Model-Shift Uniqueness Test

005098150-01, P = 366.727913 Days, E = 124.376190 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
3.43	5.66	2.82	2.23	5.80	3.82	0.45	0.61	1.20	2.85	3.44	7.77	1.14	0.28	0.12



### Stellar Parameters For KIC 005098150

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5328^{+159}_{-159}$	$4.482^{+0.110}_{-0.110}$	$-0.260^{+0.350}_{-0.300}$	$0.827^{+0.130}_{-0.106}$	$0.756^{+0.113}_{-0.052}$	$1.886^{+0.879}_{-0.601}$
	+3%/-3%	+2%/-2%	+135%/-115%	+16%/-13%	+15%/-7%	+47%/-32%
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 005098150-01 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-1652 \pm 245$	$106.52^{+100.51}_{-70.88}$	$313^{+15}_{-16}$	$1987^{+544}_{-246}$	$69^{+517}_{-52}$
Alt.	$-2784 \pm 491$	$93.38^{+107.66}_{-67.64}$	$312^{+16}_{-14}$	$2169^{+803}_{-332}$	$148^{+1778}_{-116}$

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

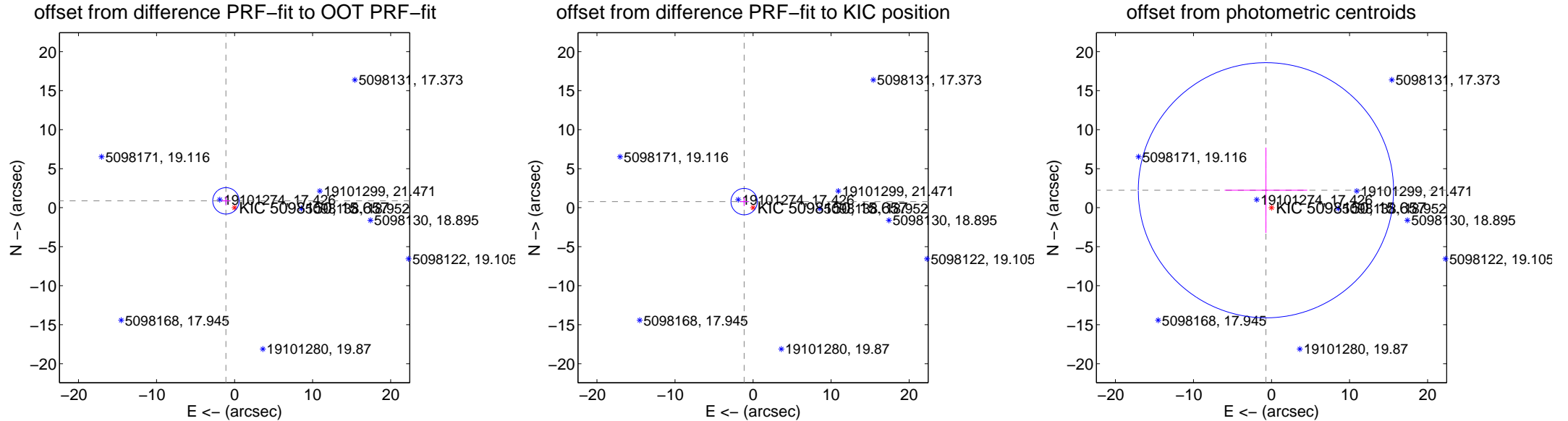
## DV Centroid Data

Supplemental centroid analysis for 005098150-01. Kepler magnitude: 15.66. Transit SNR 1.37

There are 1 quarters with good PRF difference image offsets

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

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.410 \pm 0.564$	2.50	$1.105 \pm 0.560$	$0.876 \pm 0.570$
PRF-fit source offset from KIC position	$1.382 \pm 0.563$	2.45	$1.142 \pm 0.560$	$0.779 \pm 0.570$
photometric centroid source offset	$2.35 \pm 5.45$	0.43	$0.72 \pm 5.29$	$2.23 \pm 5.47$



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.



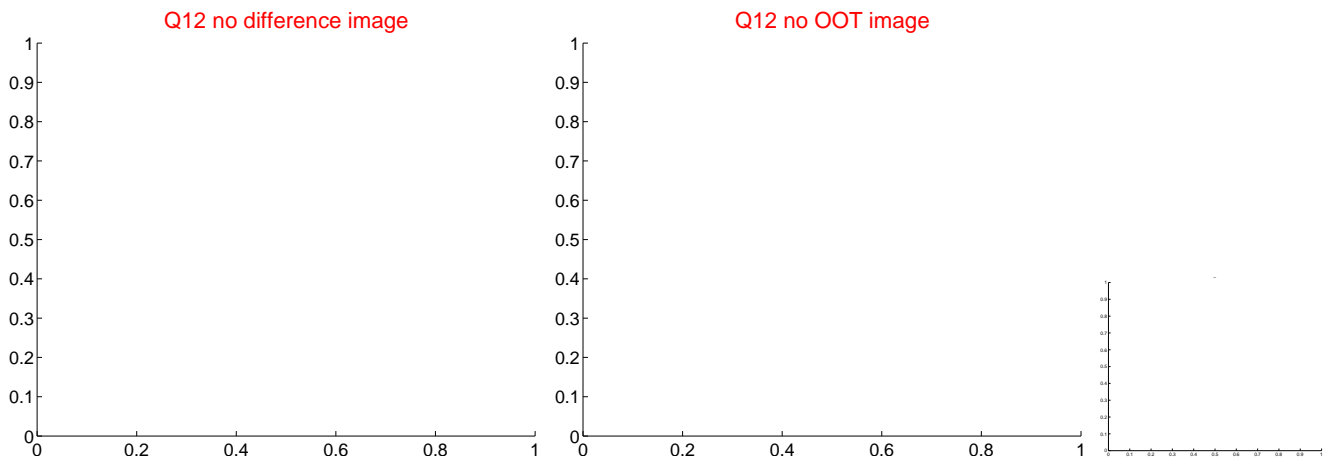
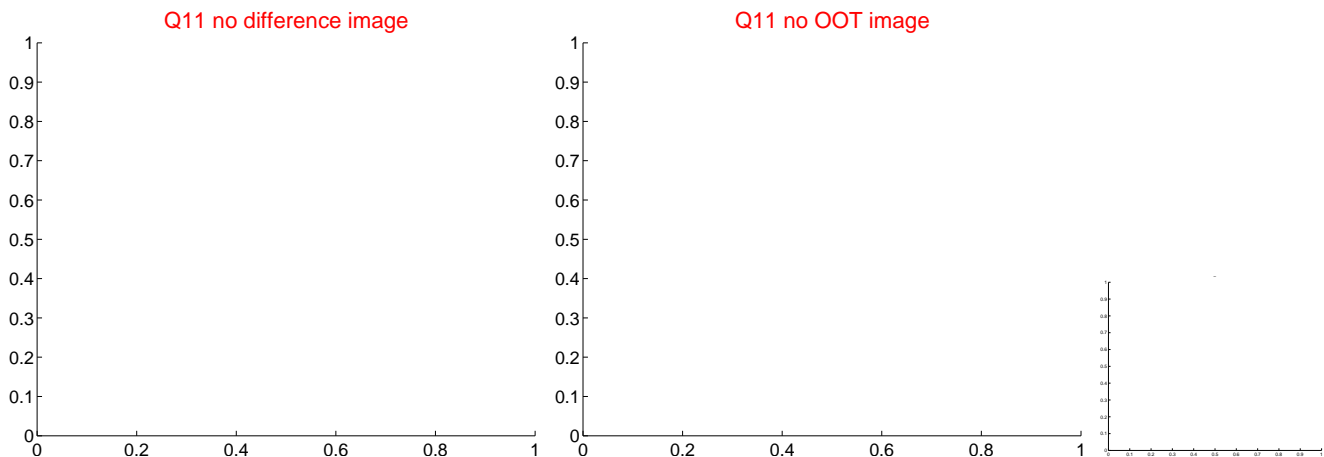
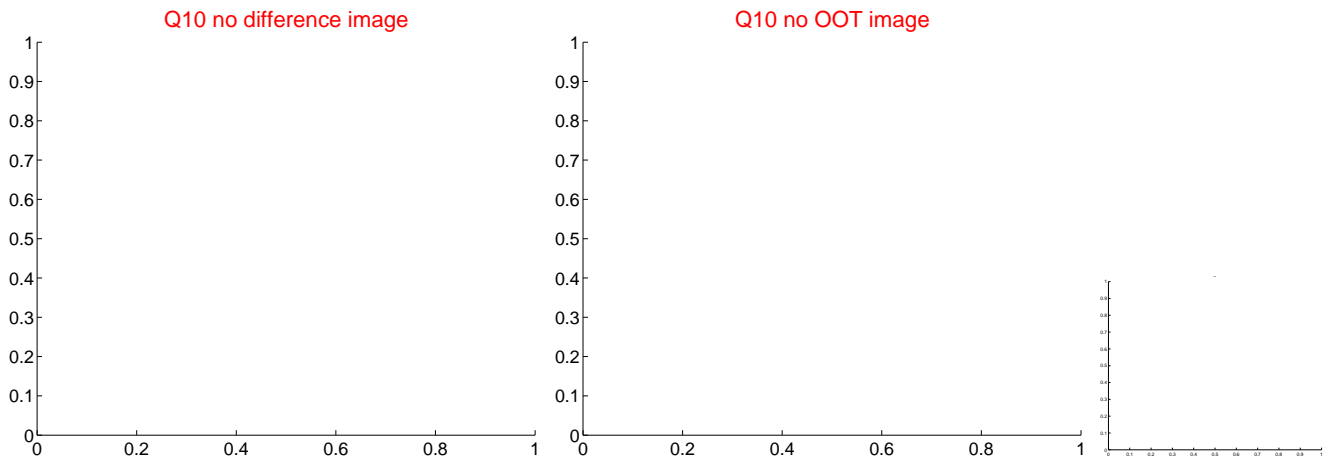
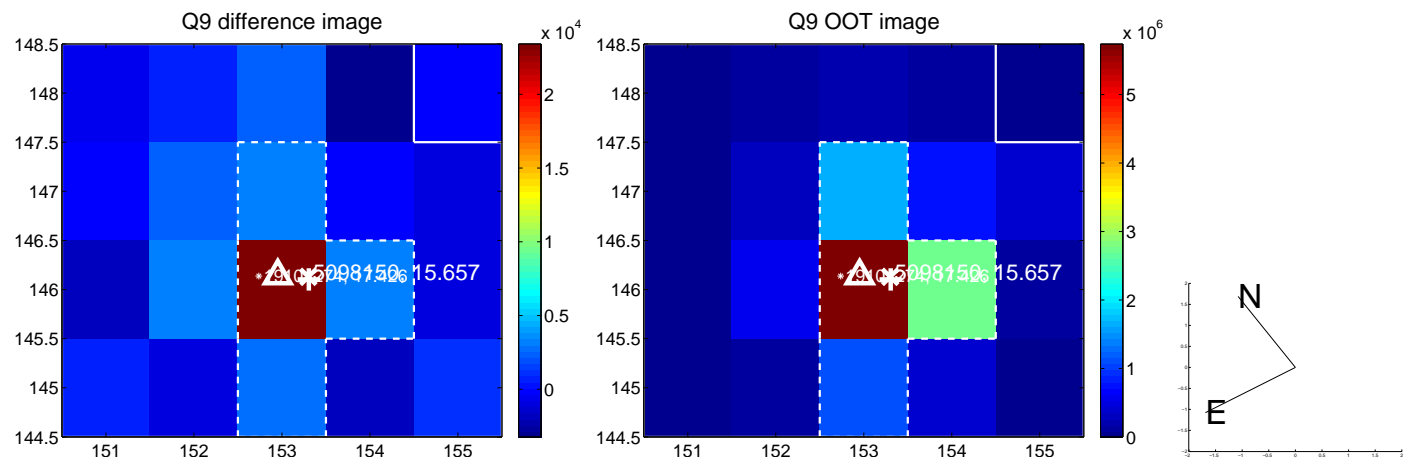
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



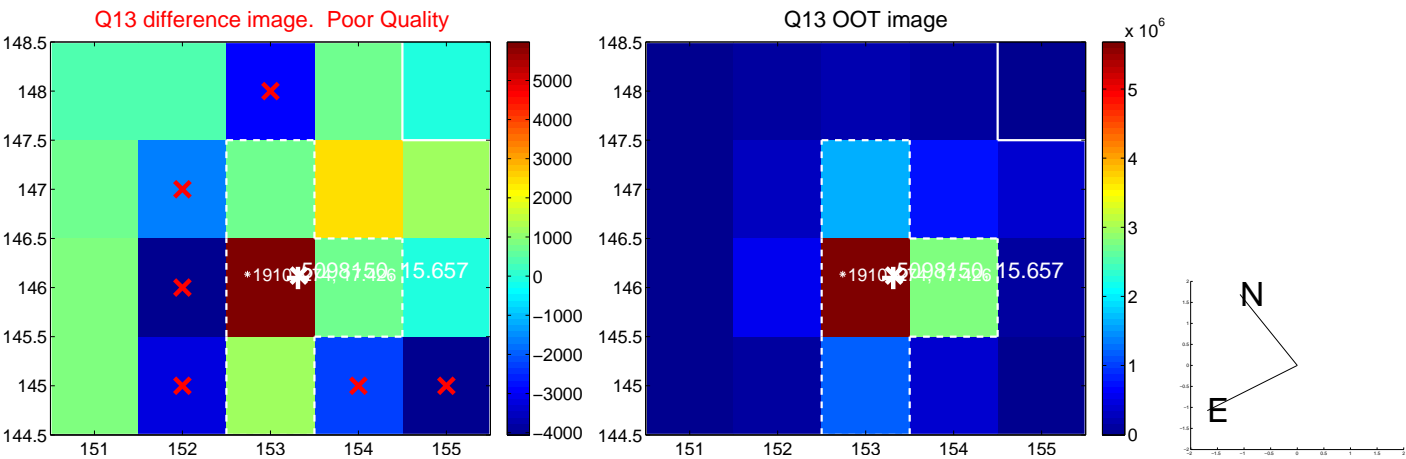
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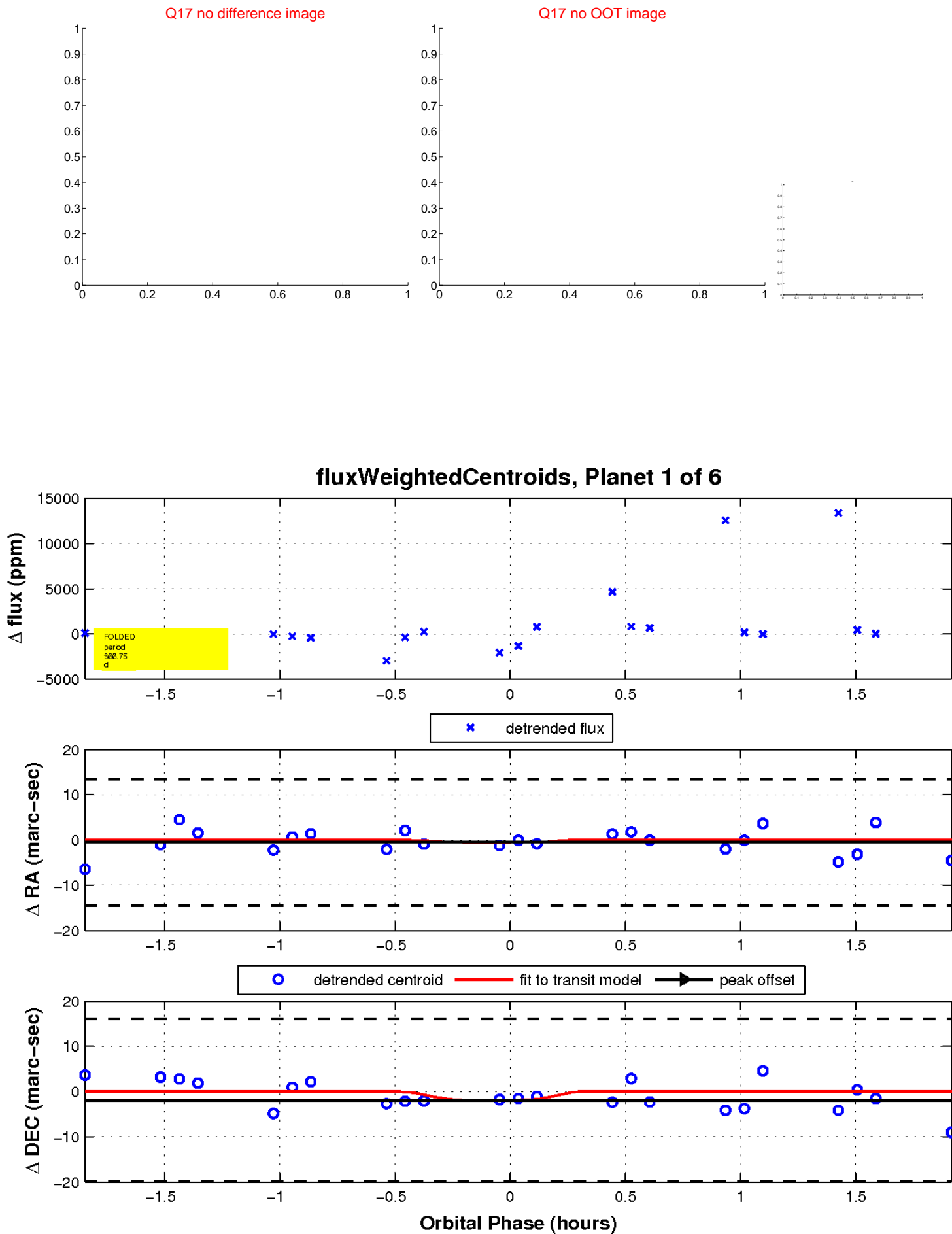
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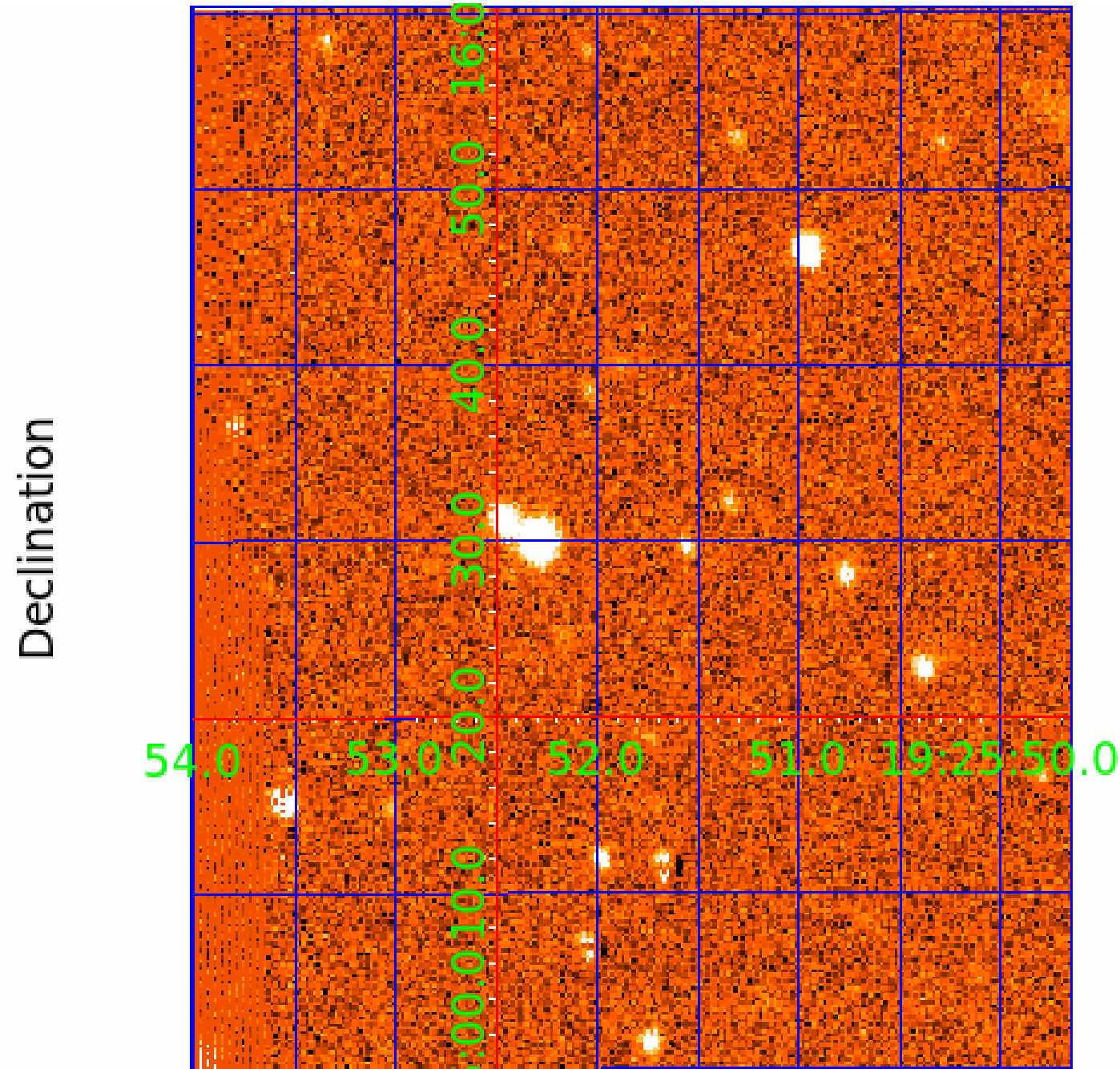


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





UKIRT Image



# KIC 005098150

## Q1-17 DR25 TCE Parameters

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005098150-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_ZUMA—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
005098150-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_SKYE—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV— MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
005098150-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_ZUMA_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV— MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
005098150-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
005098150-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_TRACKER—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—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.

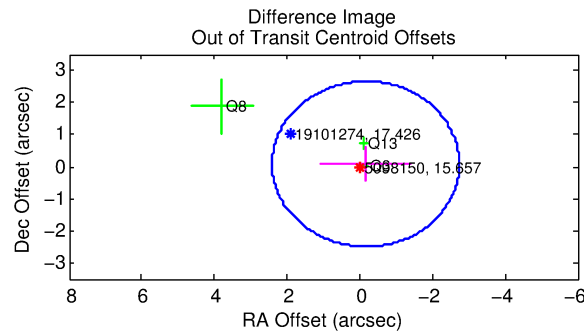
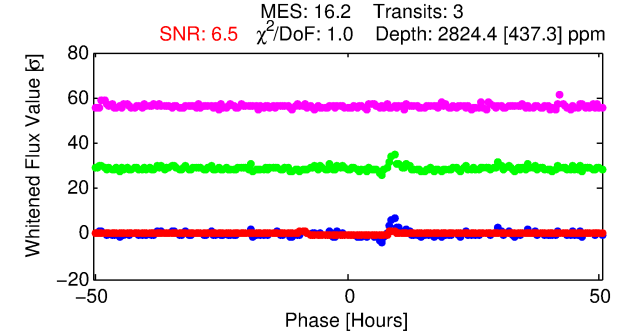
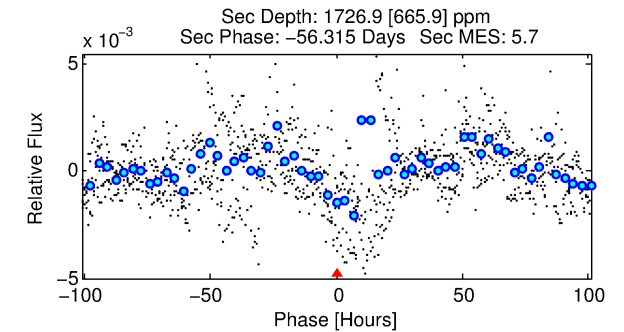
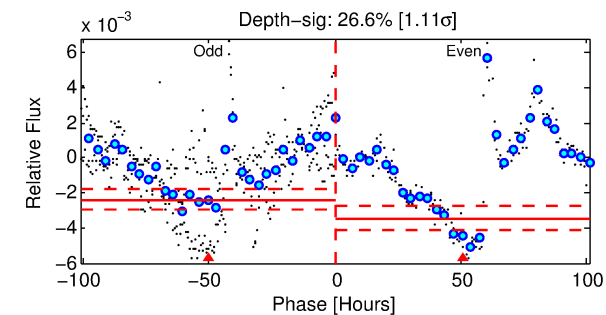
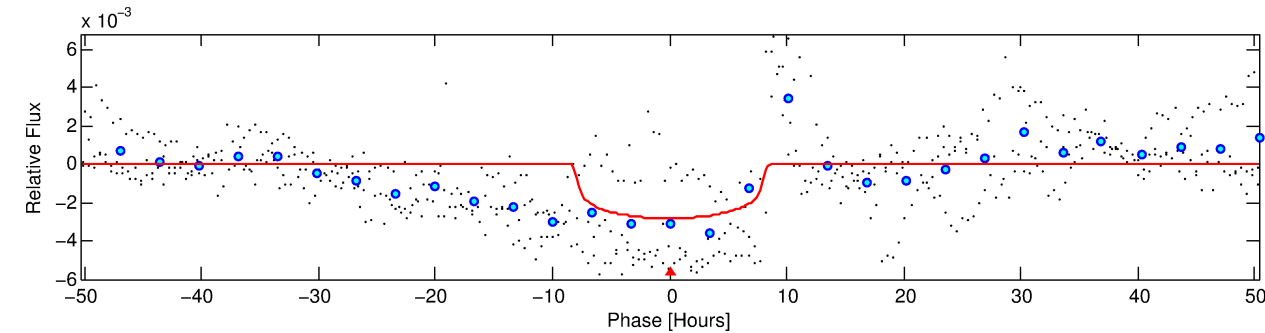
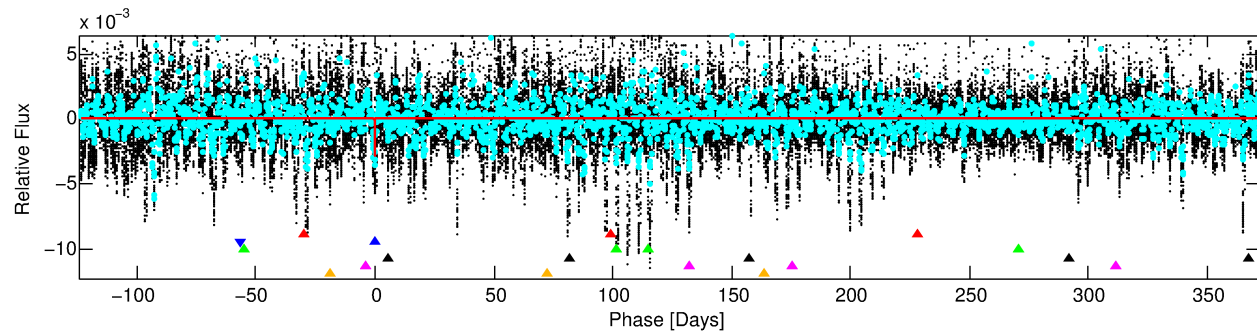
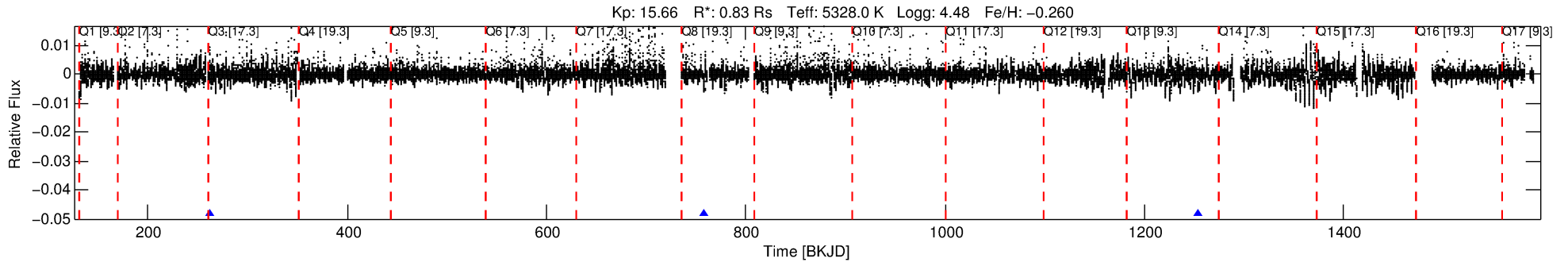
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 005098150-02

No Significant Match Found

# DV One-Page Summary

KIC: 5098150 Candidate: 2 of 6 Period: 495.967 d



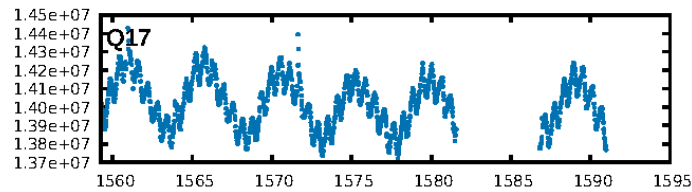
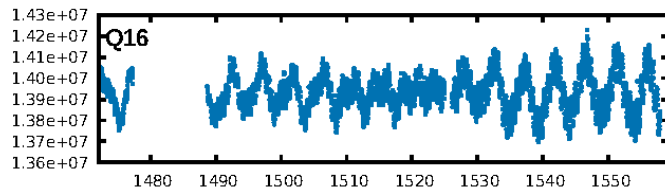
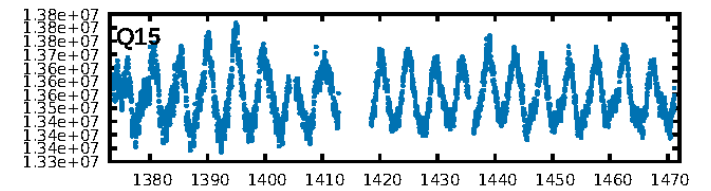
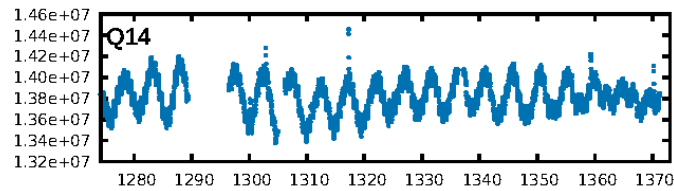
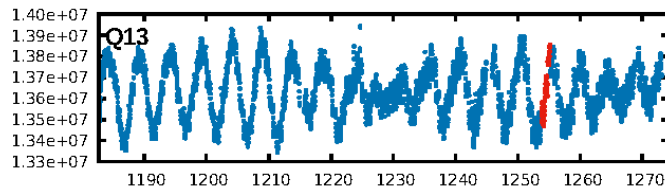
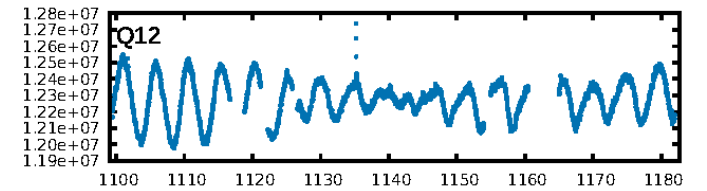
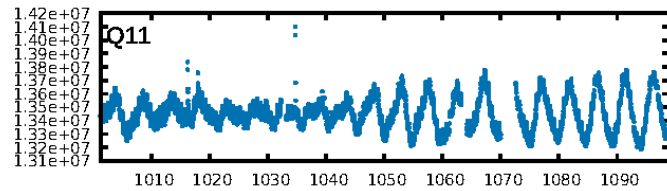
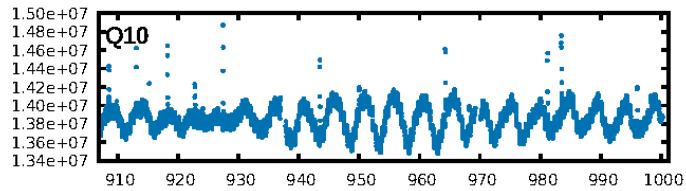
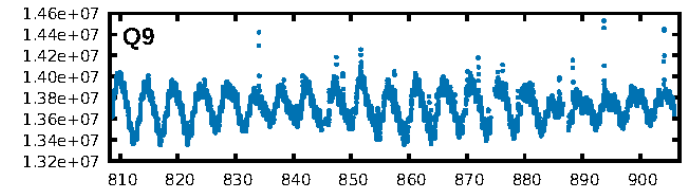
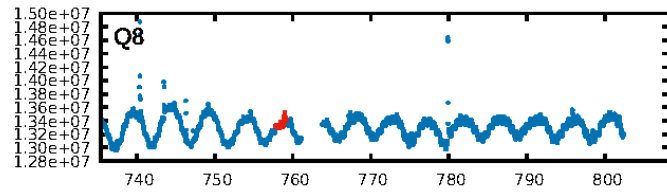
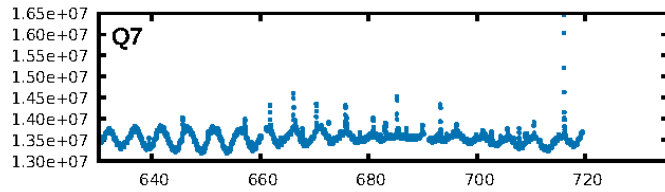
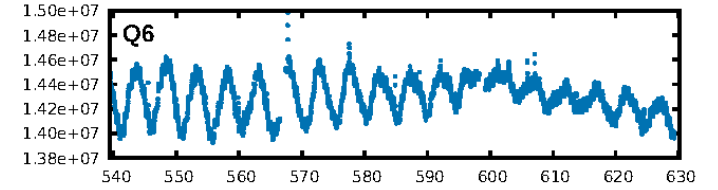
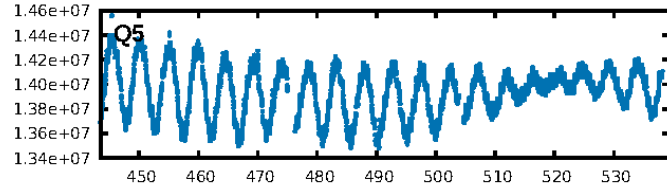
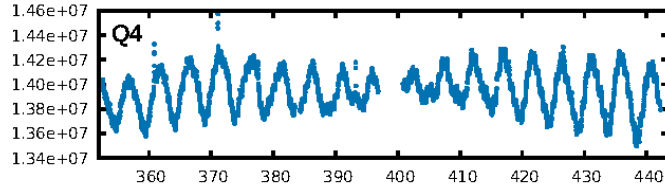
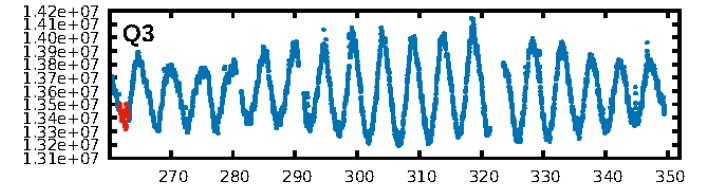
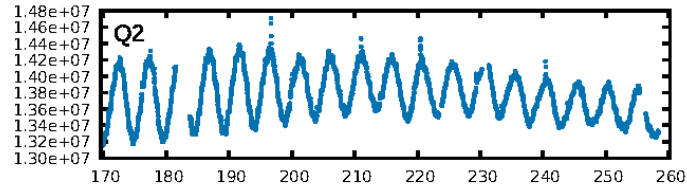
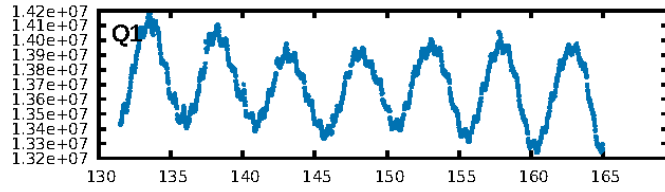
## DV Fit Results:

Period = 495.96747 [0.00698] d  
Epoch = 262.5116 [0.0098] BKJD  
Rp/R\* = 0.0479 [0.0075]  
a/R\* = 234.00 [112.48]  
b = 0.15 [3.20]  
Seff = 0.40 [0.09]  
Teq = 202 [12] K  
Rp = 4.32 [0.96] Re  
a = 1.1177 [0.1504] AU  
Ag = 63624.15 [34082.06] [1.87 $\sigma$ ]  
Teffp = 4965 [635] K [7.50 $\sigma$ ]

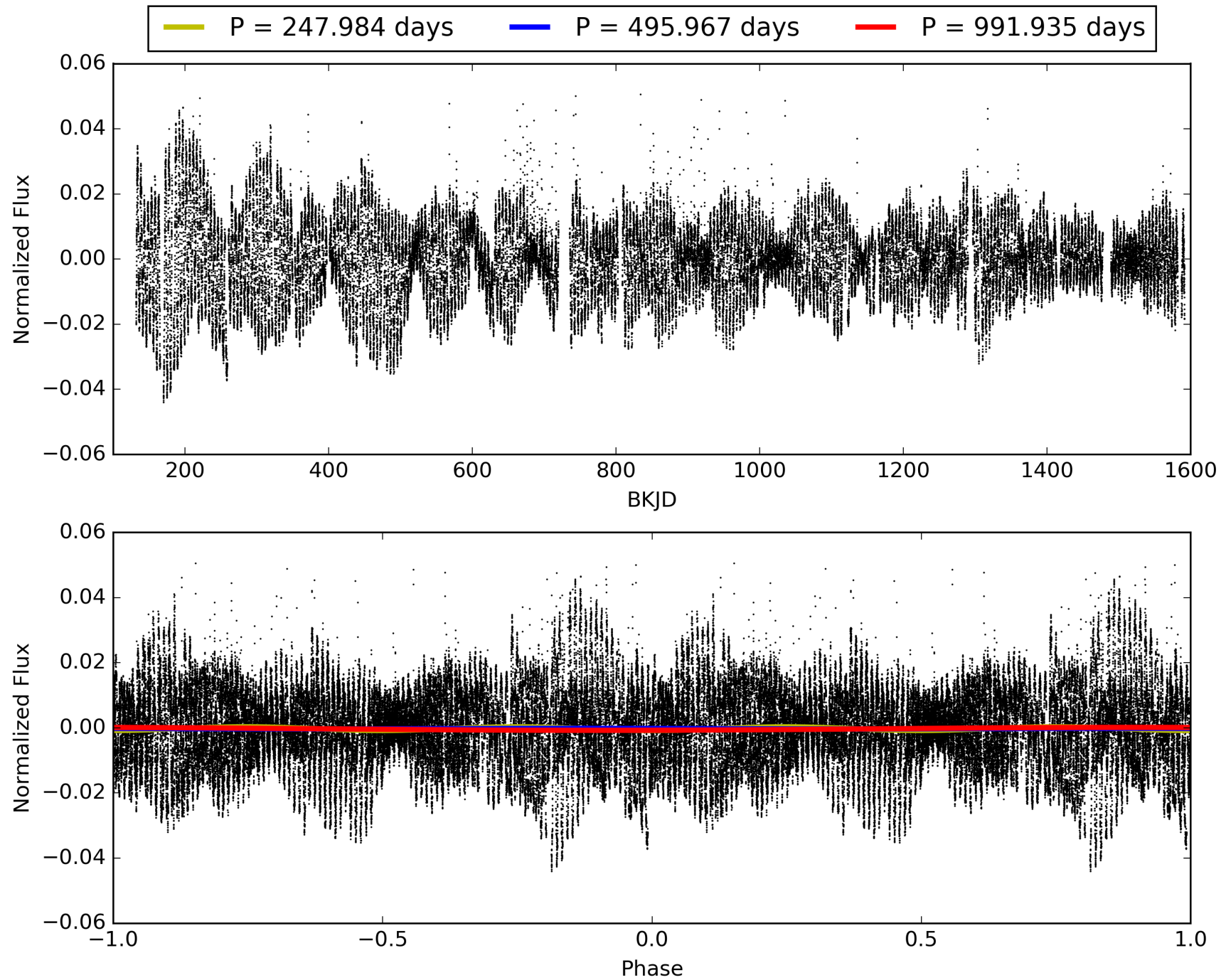
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [127.10 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 79.9%  
ModelChiSquareGof-sig: 98.6%  
Bootstrap-pfa: 2.52e-14  
RollingBand-fgt: 1.00 [3/3]  
**GhostDiagnostic-chr: 0.6535**  
Centroid-sig: 0.1%  
Centroid-so: 0.879 arcsec [1.91 $\sigma$ ]  
OotOffset-rm: 0.178 arcsec [0.21 $\sigma$ ]  
KicOffset-rm: 0.064 arcsec [0.08 $\sigma$ ]  
OotOffset-st: 0/1/1/1 [3]  
KicOffset-st: 0/1/1/1 [3]  
DiffImageQuality-fgm: 0.67 [2/3]  
DiffImageOverlap-fno: 1.00 [3/3]

# TCE 005098150-02, PDC Light Curves



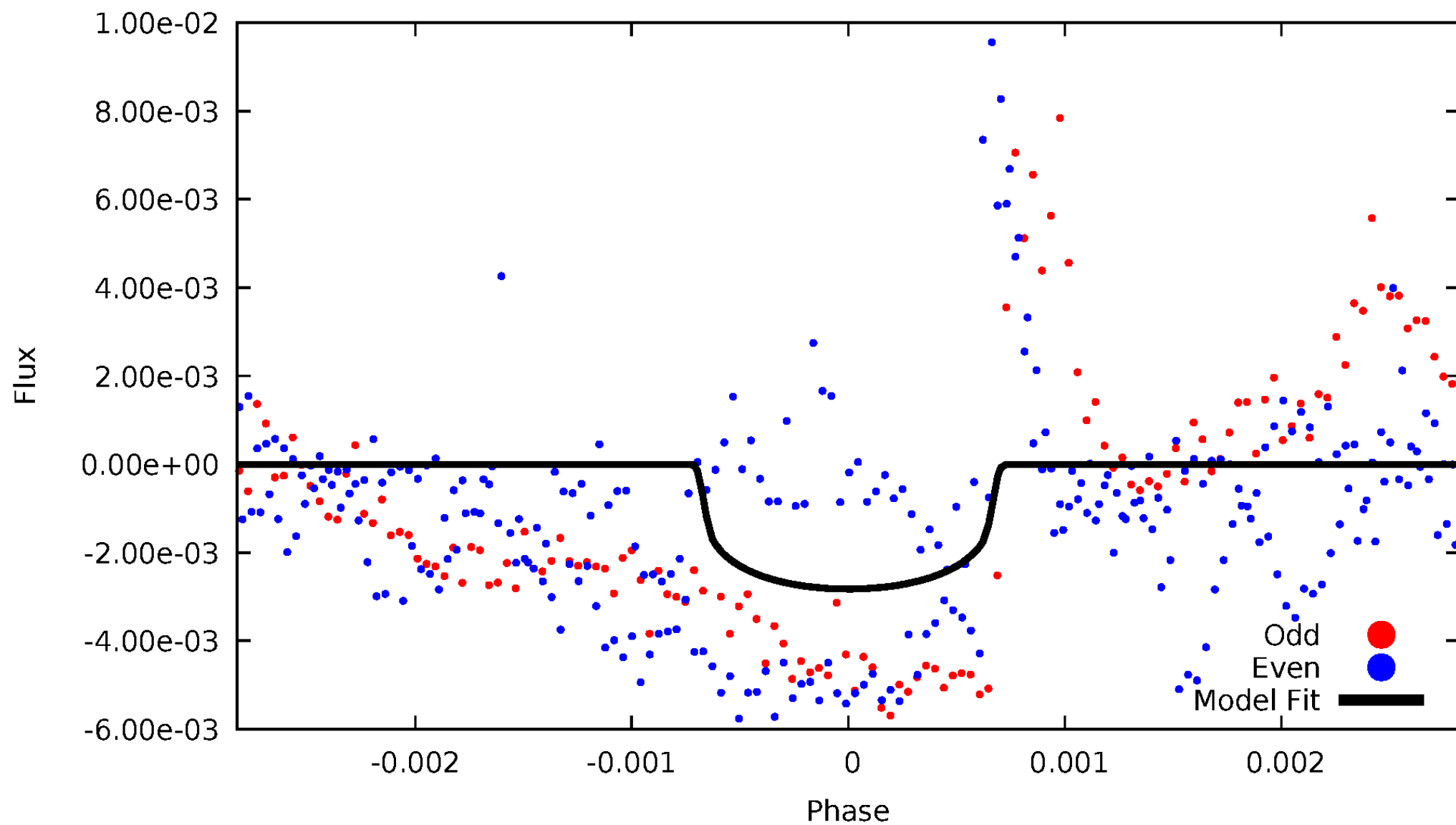
TCE 005098150-02





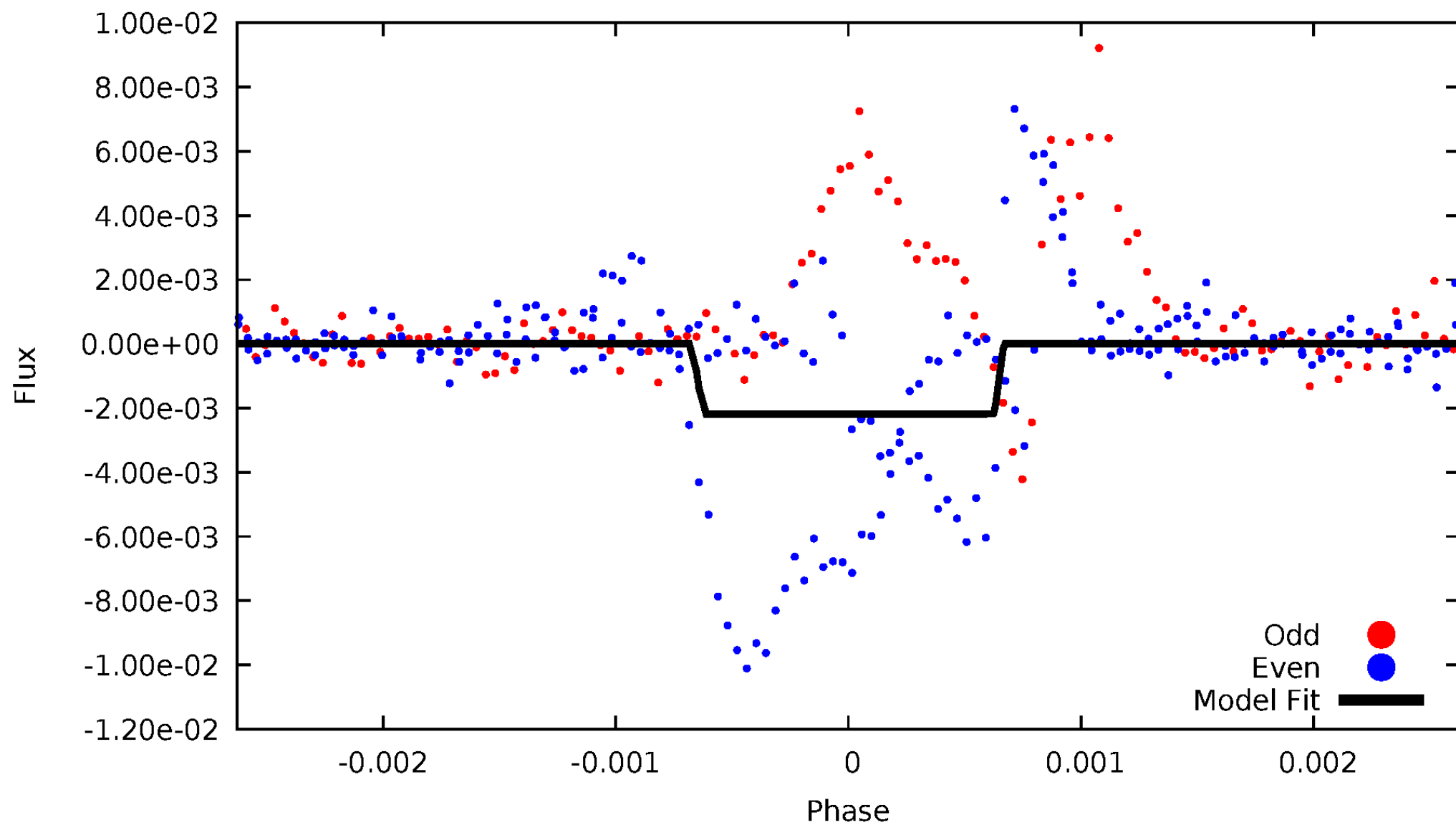
# DV Odd/Even

TCE 005098150-02



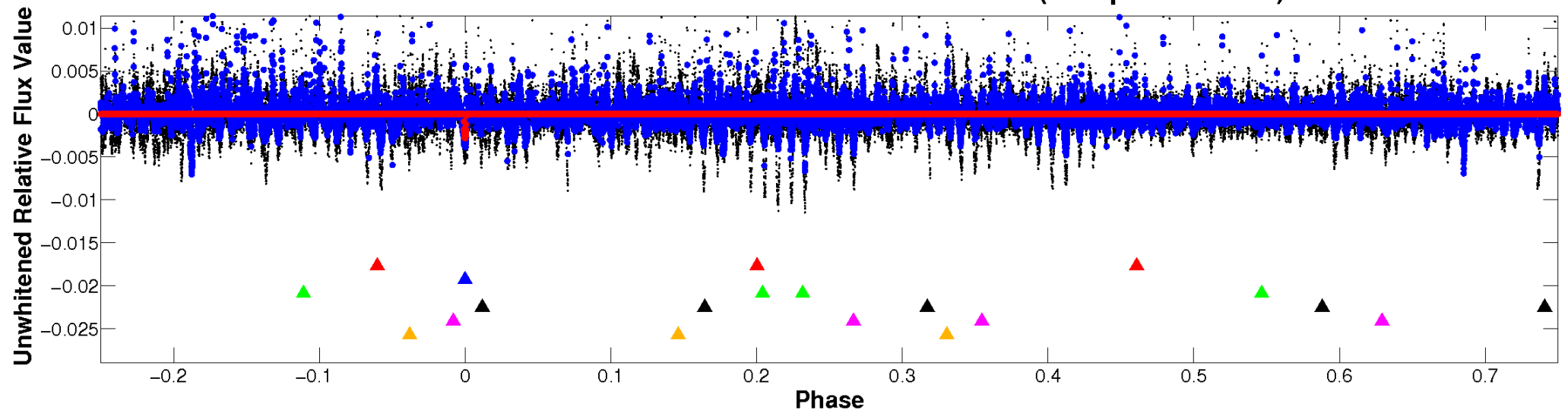
# ALT Odd/Even

TCE 005098150-02

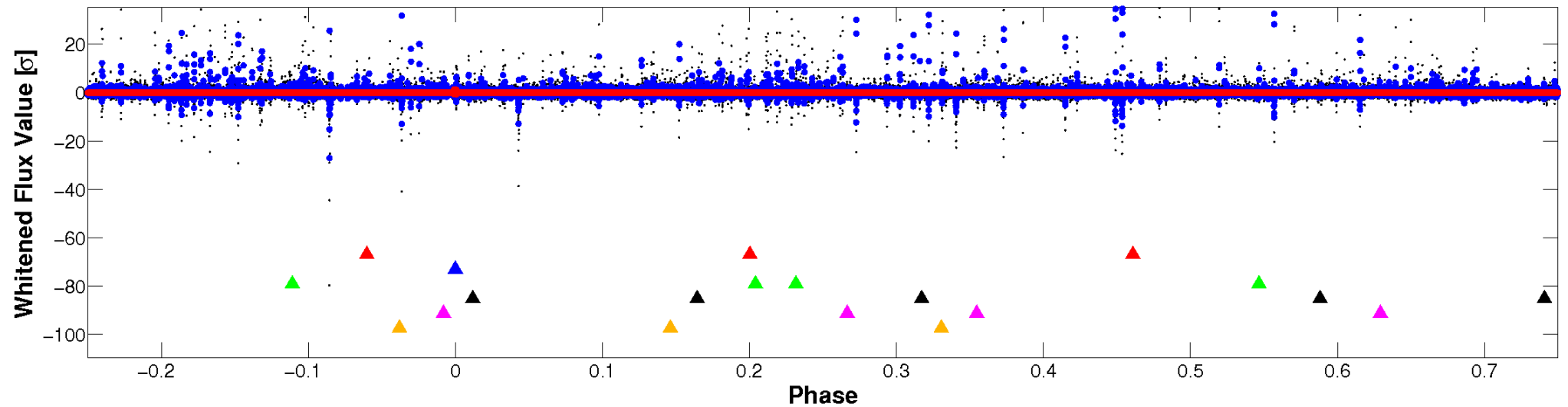


# Non-Whitened Vs. Whitened Light Curve

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

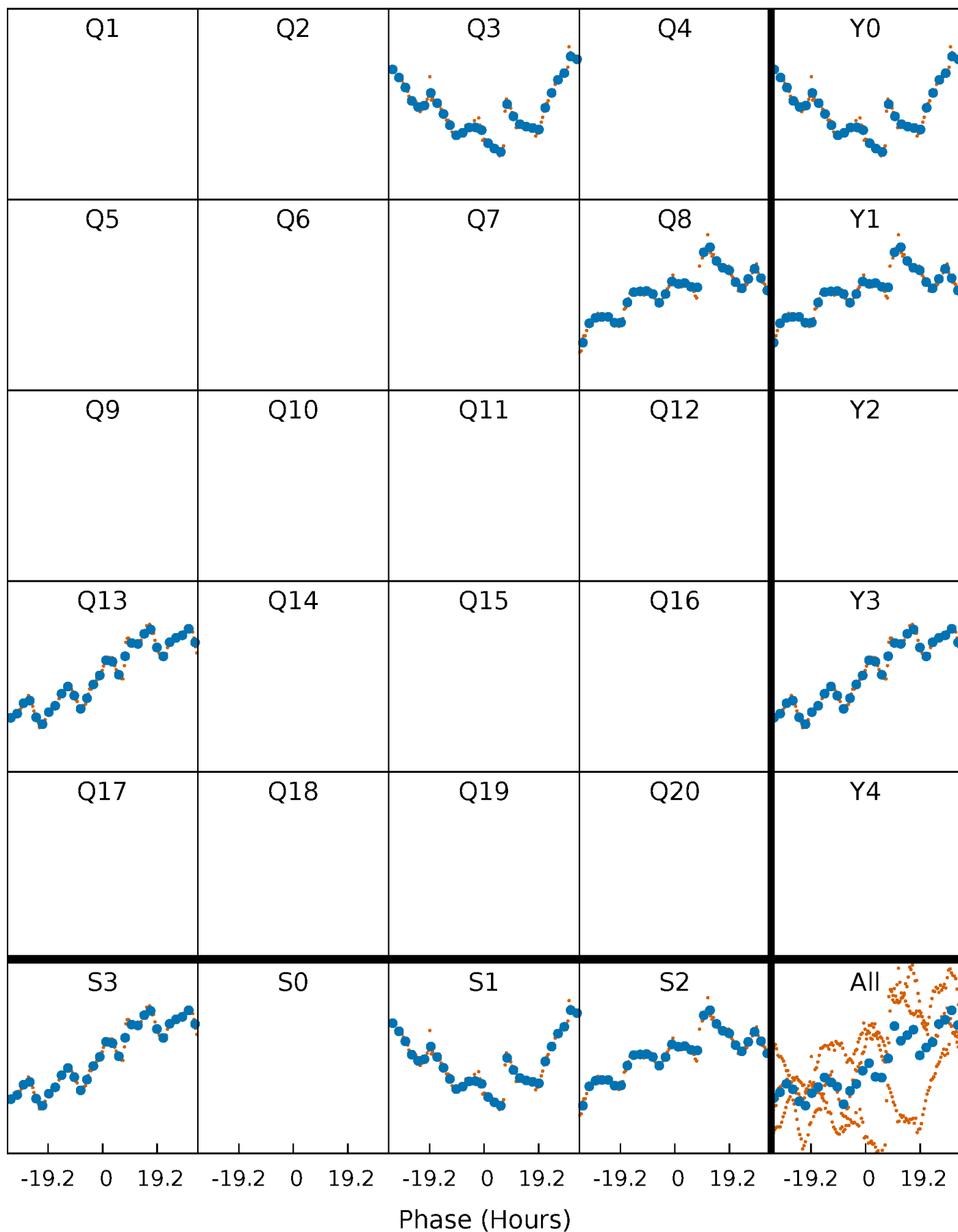


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

TCE 005098150-02     $P=495.967471$  Days     $T_0=262.511597$  (BKJD)



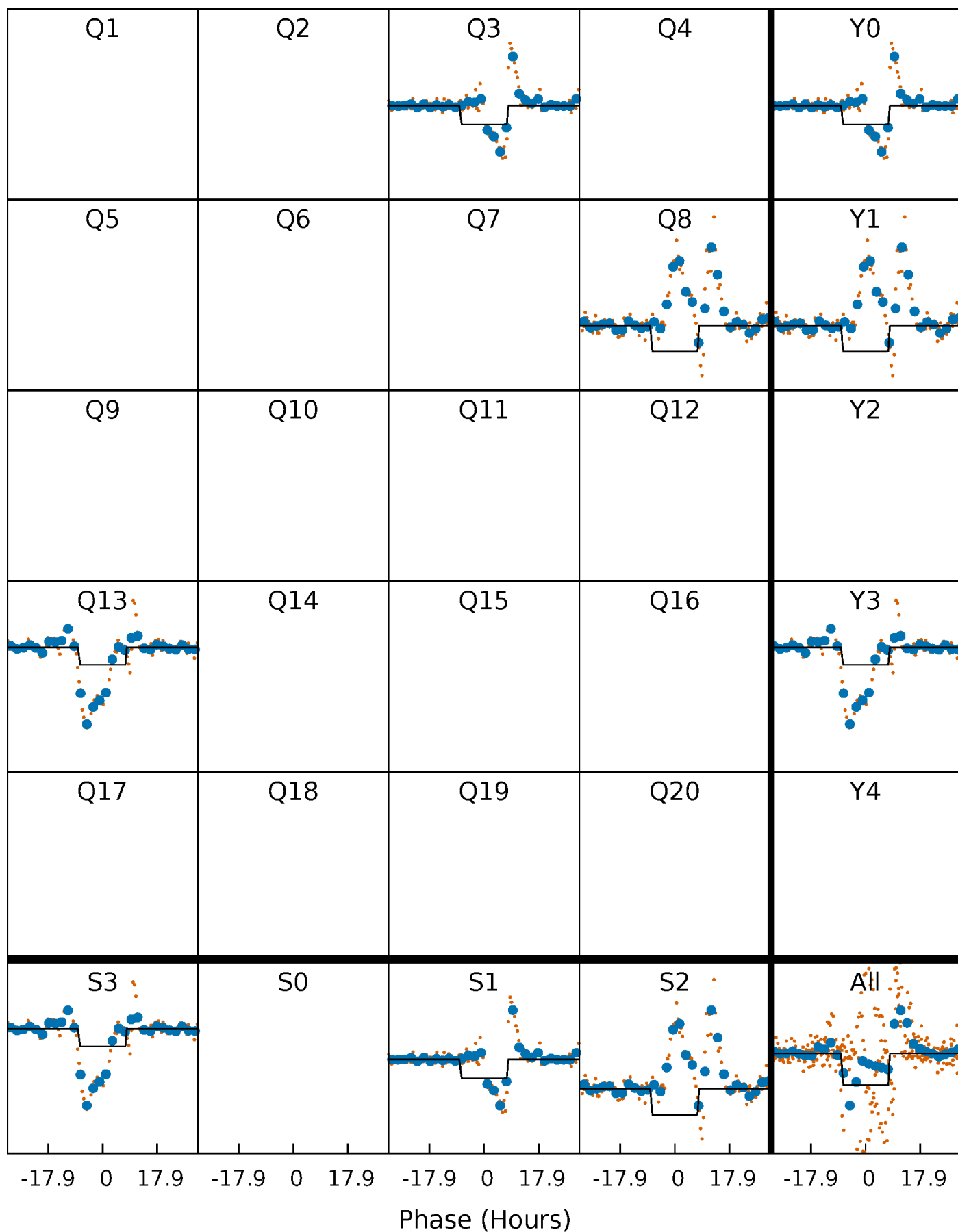
# DV Quarter-Phased Transit Curves

TCE 005098150-02     $P=495.967471$  Days     $T_0=262.511597$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

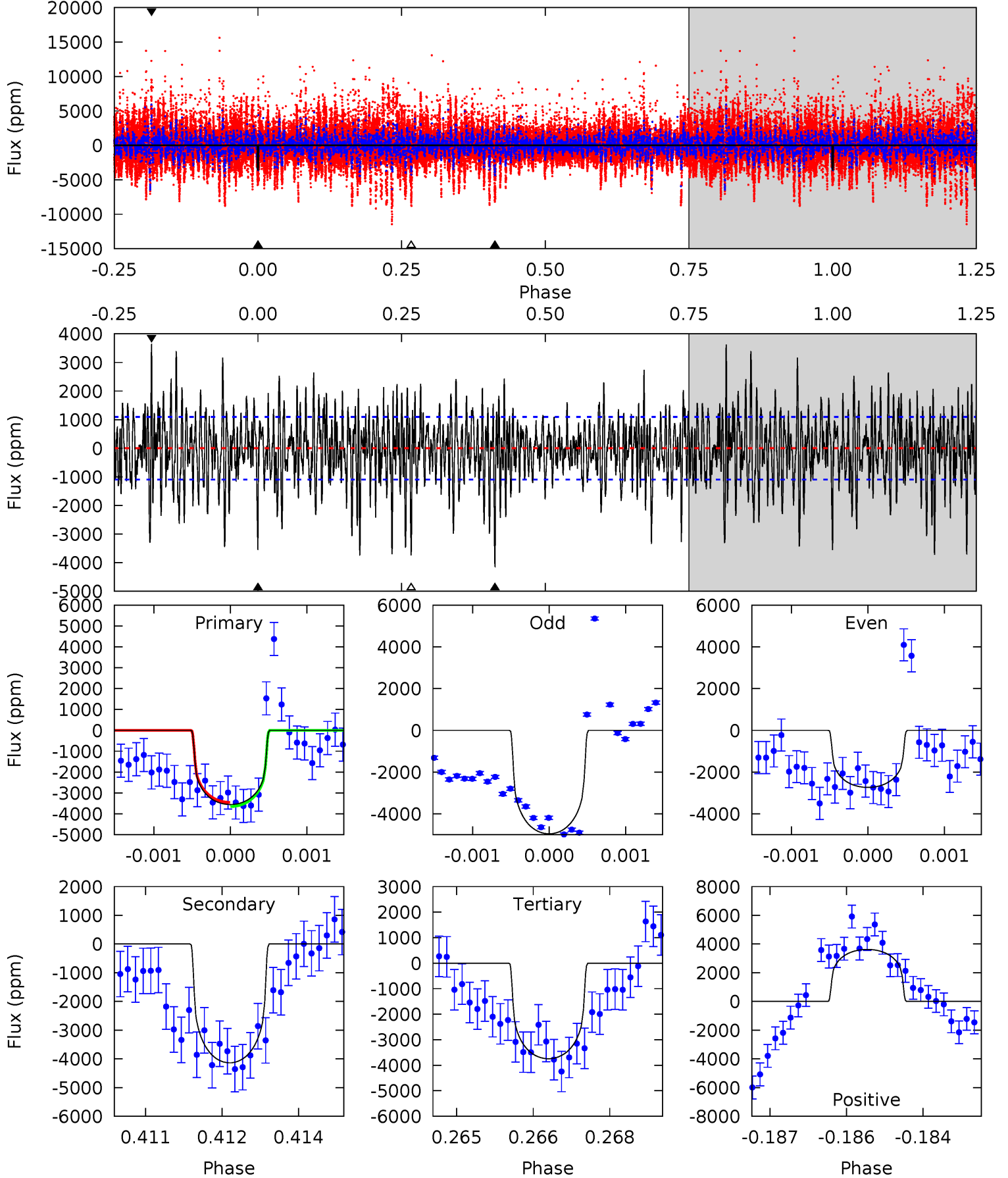
TCE 005098150-02 P=495.942935 Days  $T_0=262.486005$  (BKJD)



# DV Model-Shift Uniqueness Test

005098150-02, P = 495.967471 Days, E = 262.511597 Days

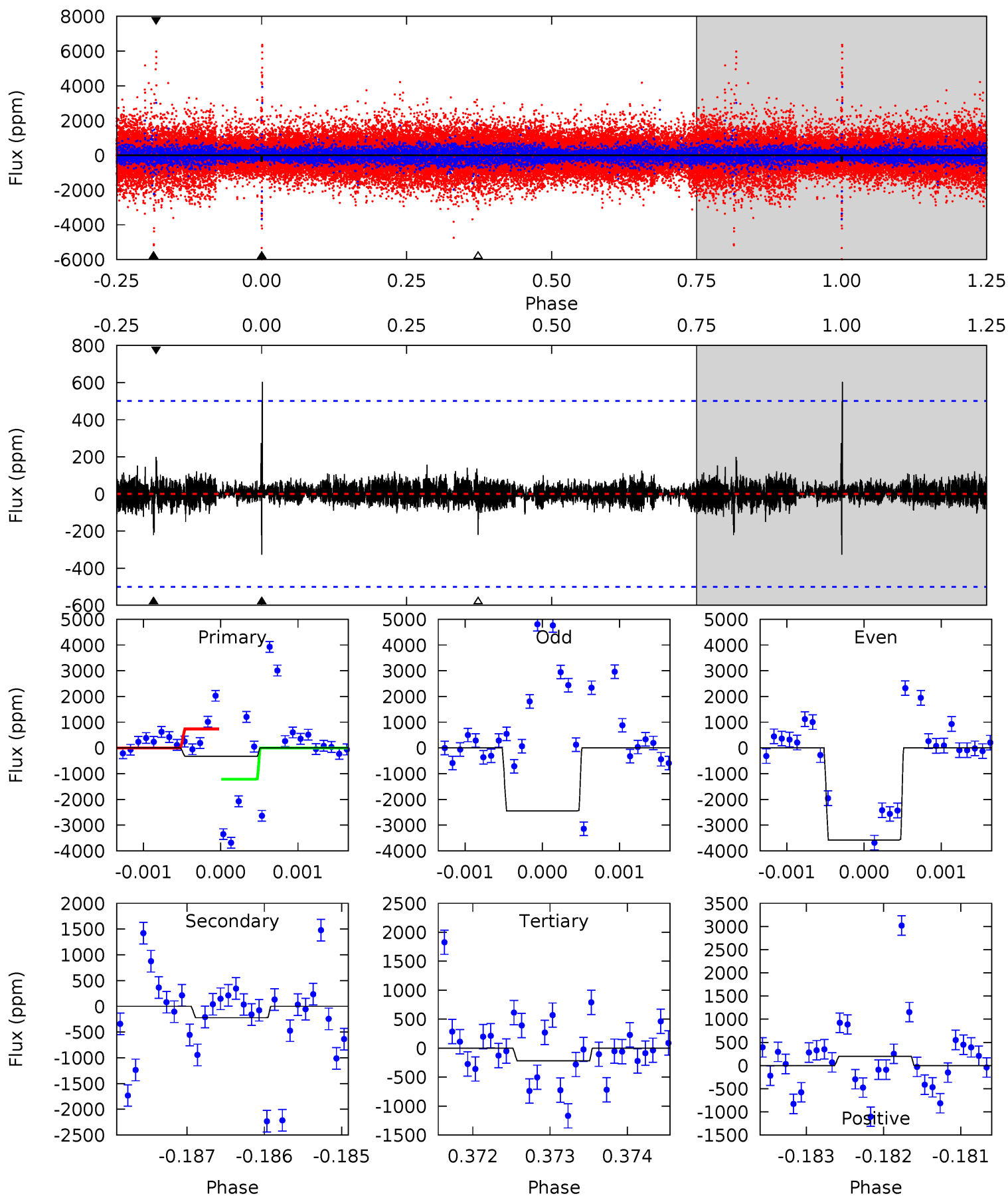
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
17.5	20.4	18.4	17.8	5.39	3.19	5.00	-0.94	-0.35	1.94	2.52	3.30	0.69	0.47	0.49



# Alt Model-Shift Uniqueness Test

005098150-02, P = 495.942935 Days, E = 262.486005 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
3.53	2.38	2.37	2.15	5.40	3.21	0.38	1.16	1.38	0.01	0.23	5.56	0.78	0.65	0





### Stellar Parameters For KIC 005098150

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5328^{+159}_{-159}$	$4.482^{+0.110}_{-0.110}$	$-0.260^{+0.350}_{-0.300}$	$0.827^{+0.130}_{-0.106}$	$0.756^{+0.113}_{-0.052}$	$1.886^{+0.879}_{-0.601}$
	+3%/-3%	+2%/-2%	+135%/-115%	+16%/-13%	+15%/-7%	+47%/-32%
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 005098150-02 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-4137 \pm 203$	$4.34^{+0.82}_{-0.73}$	$283^{+12}_{-13}$	$6139^{+608}_{-453}$	$152785^{+68217}_{-43608}$
Alt.	$-221 \pm 93$	$4.16^{+0.79}_{-0.72}$	$281^{+15}_{-13}$	$3476^{+314}_{-342}$	$8442^{+6240}_{-4015}$

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

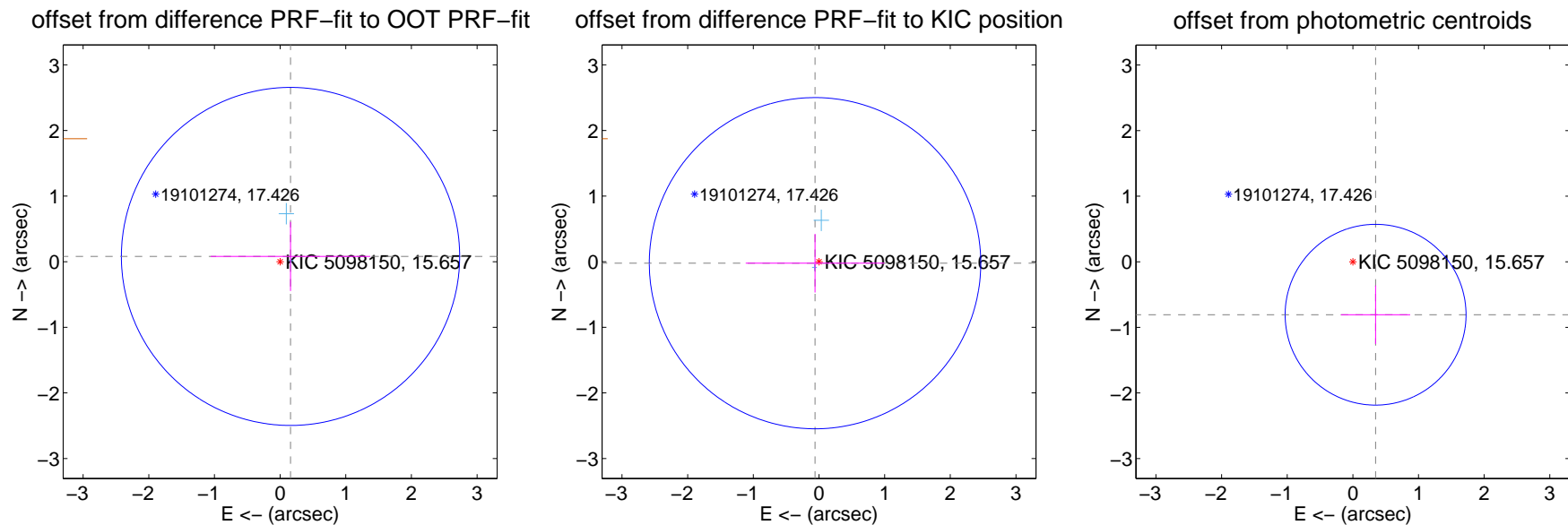
## DV Centroid Data

Supplemental centroid analysis for 005098150-02. Kepler magnitude: 15.66. Transit SNR 6.52

There are 2 quarters with good PRF difference image offsets

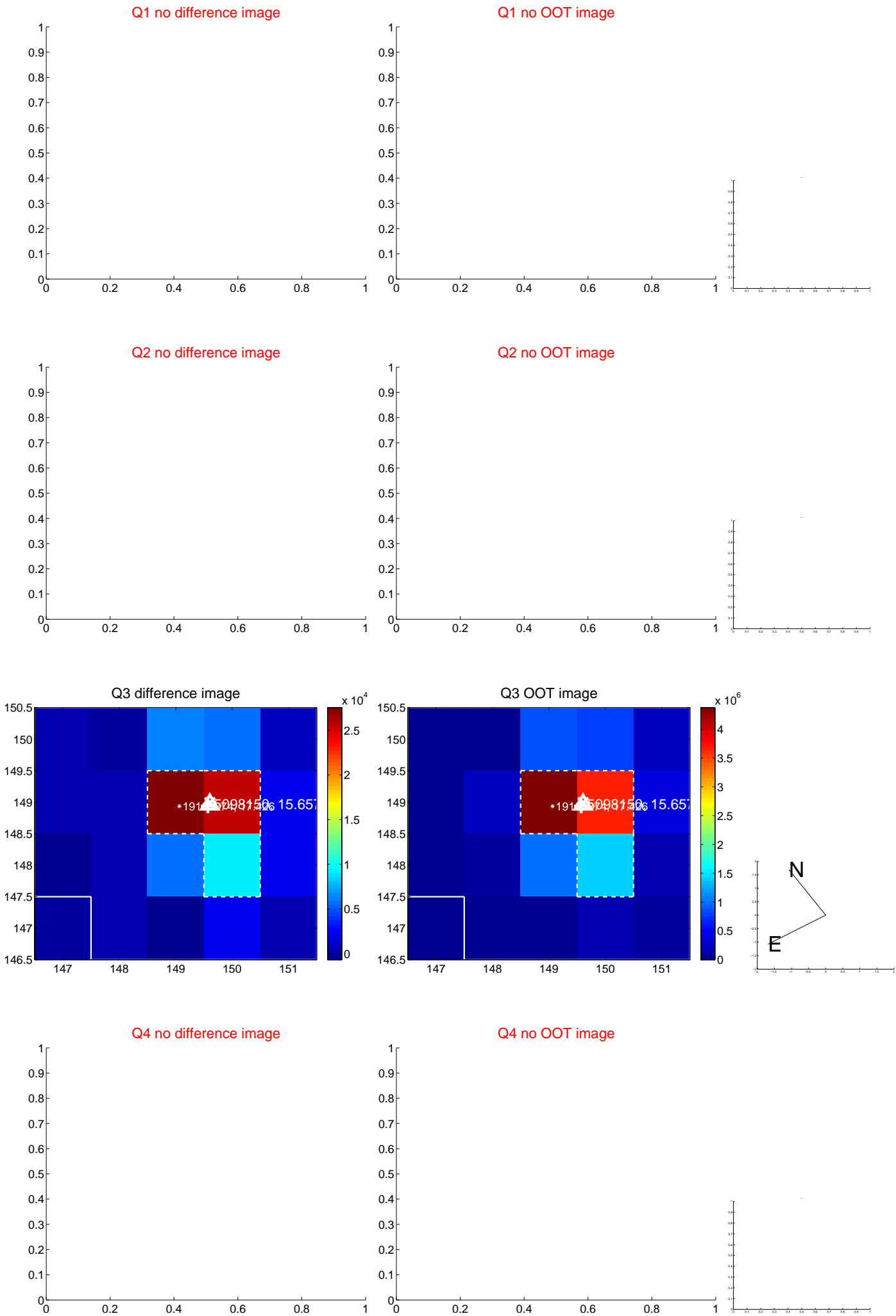
The direct PRF centroid is offset from the target star catalog position by about 0.12 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.178 \pm 0.859$	0.21	$-0.159 \pm 1.216$	$0.080 \pm 0.527$
PRF-fit source offset from KIC position	$0.064 \pm 0.841$	0.08	$0.060 \pm 1.056$	$-0.023 \pm 0.448$
photometric centroid source offset	$0.88 \pm 0.46$	1.91	$-0.35 \pm 0.53$	$-0.81 \pm 0.45$

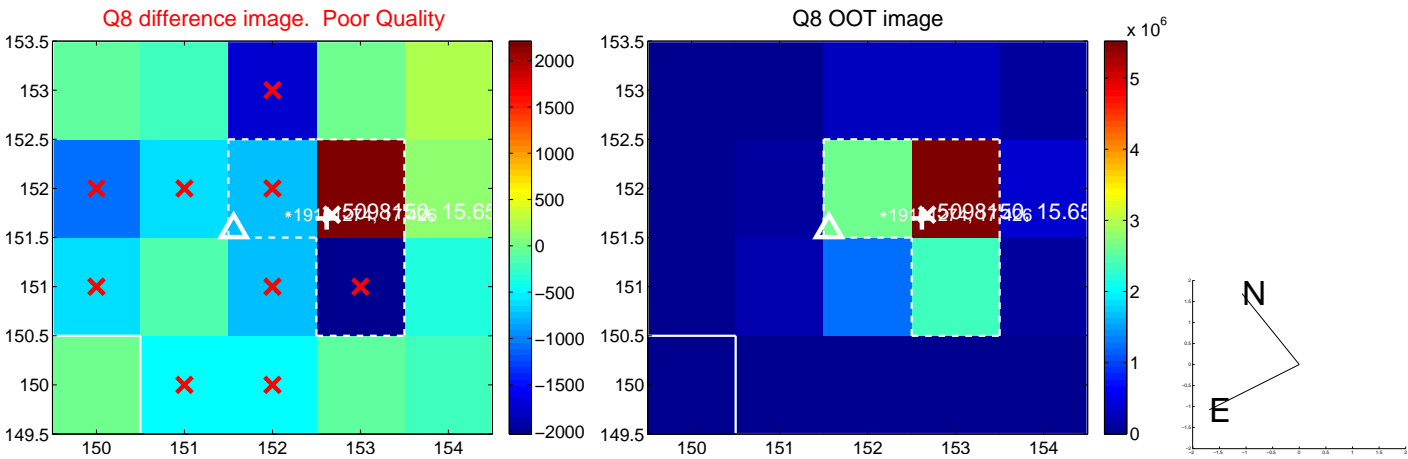


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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



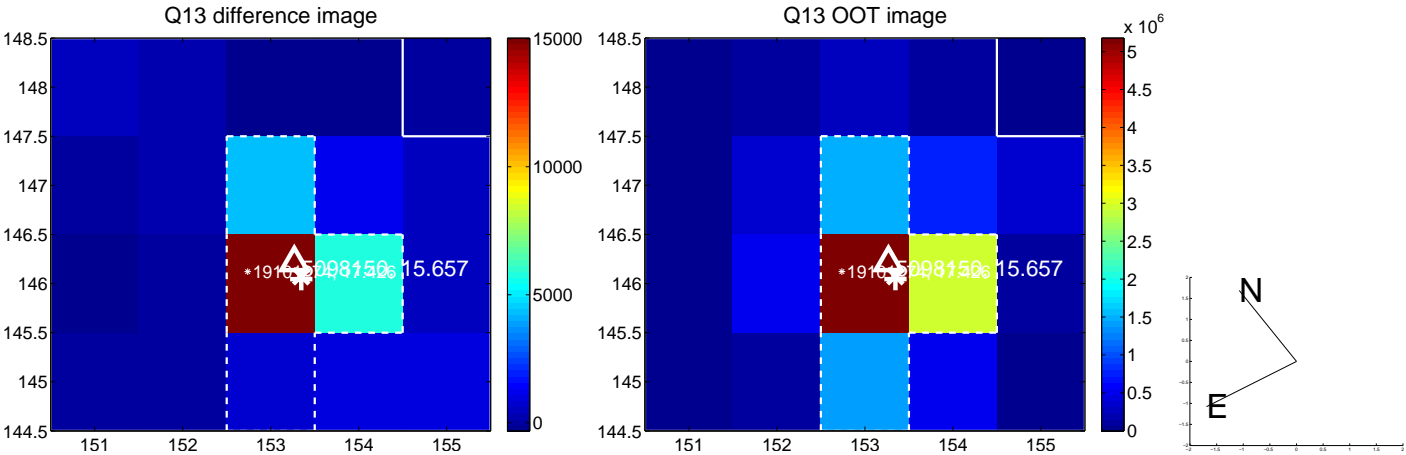
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



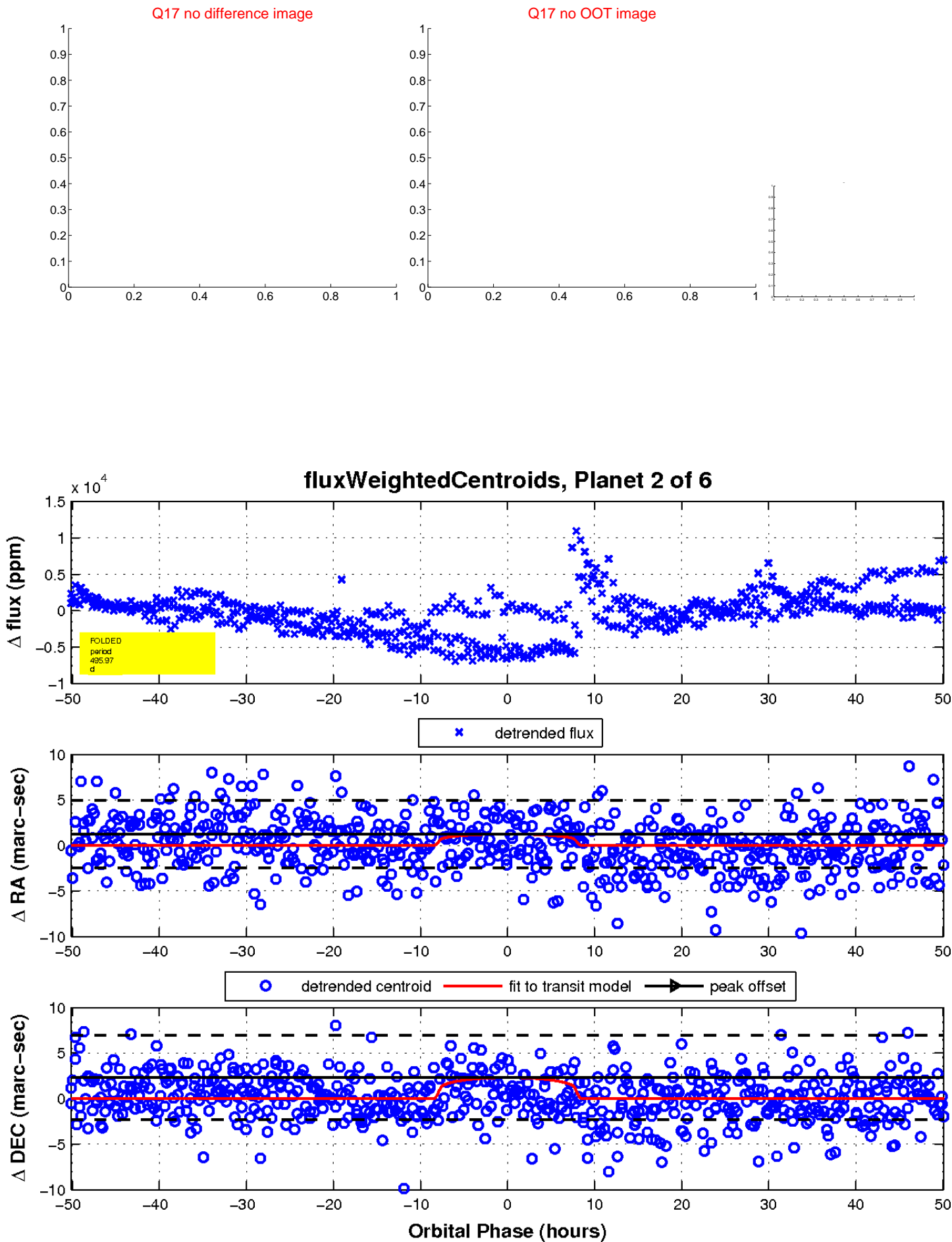
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

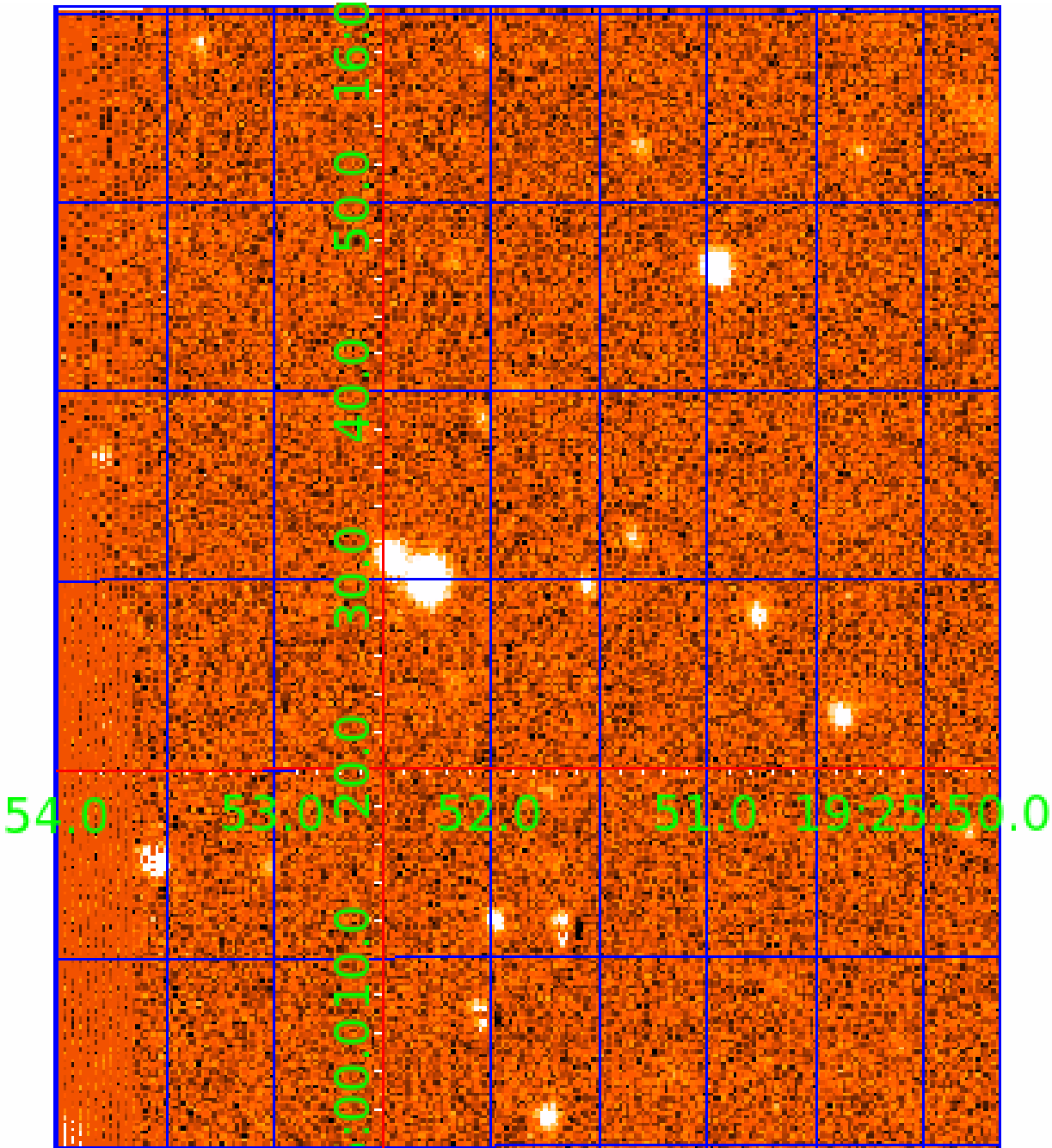


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 005098150

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
005098150-01	OBS	No	366.745359	491.094434	865.9	0.640	17.3	1.4	0.83	5328	2.76	0.59
005098150-02	OBS	No	495.967471	262.511597	2824.4	16.798	16.2	6.5	0.83	5328	4.32	0.40
005098150-03	OBS	No	326.099826	377.381770	2170.5	3.821	14.6	8.1	0.83	5328	3.78	0.69
005098150-04	OBS	No	285.843848	268.378494	98.5	1.451	10.4	0.4	0.83	5328	0.82	0.82
005098150-05	OBS	No	316.084541	438.389119	6140.2	53.938	10.4	6.6	0.83	5328	12.04	0.72
005098150-06	OBS	No	404.564736	426.463441	1512.7	3.963	10.8	4.5	0.83	5328	3.32	0.52

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
005098150-01	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_CHASES_MARSHALL_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV— MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS—HALO_GHOST
005098150-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_ZUMA—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
005098150-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_SKYE—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV— MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
005098150-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_ZUMA_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV— MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
005098150-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
005098150-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_TRACKER—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—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.

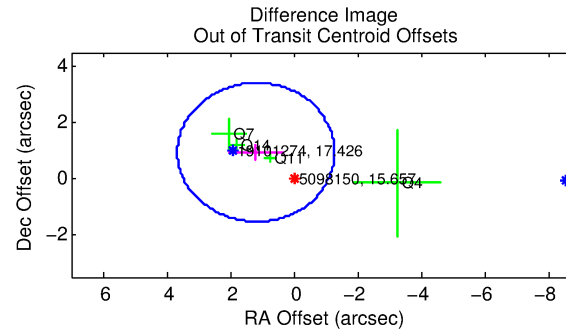
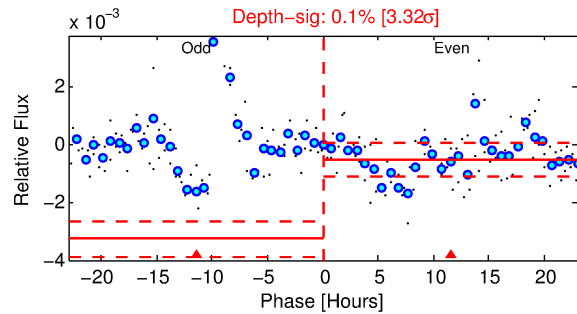
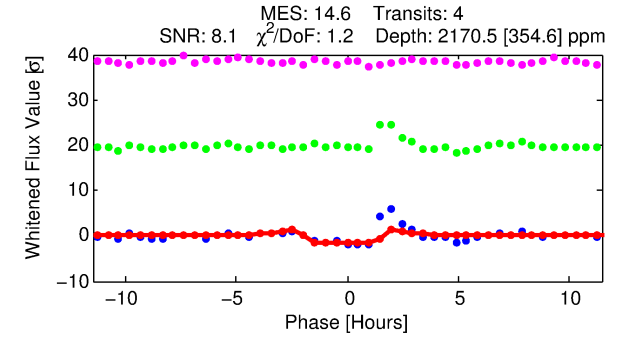
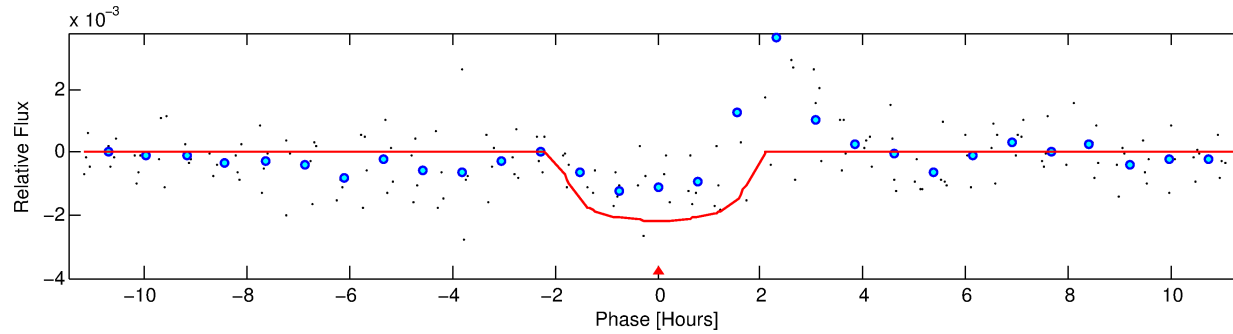
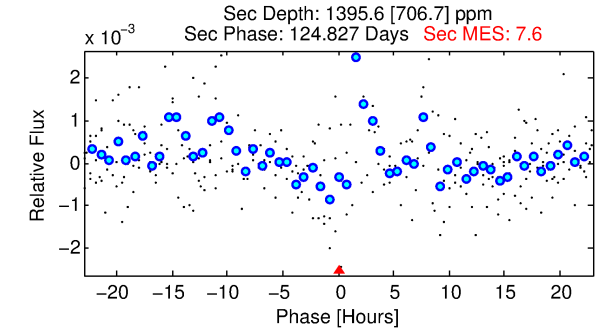
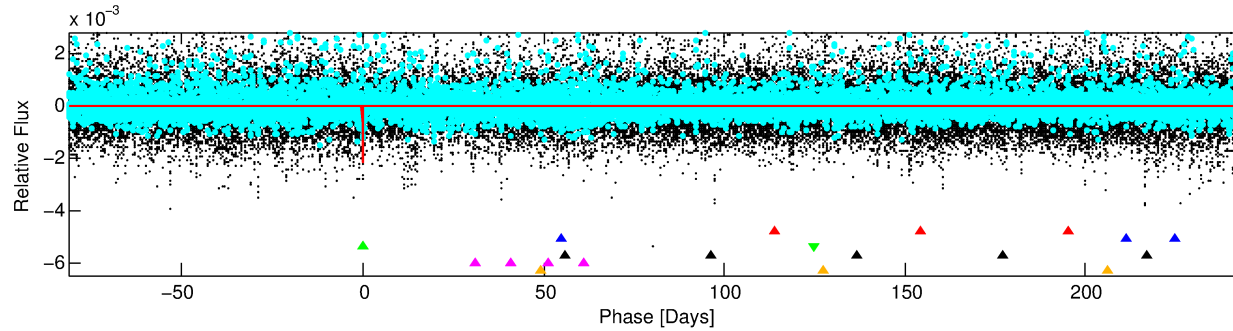
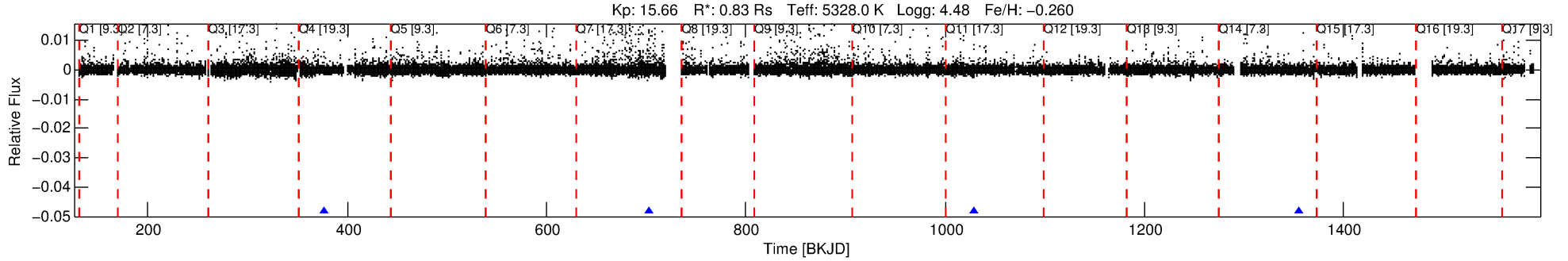
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 005098150-03

No Significant Match Found

# DV One-Page Summary

KIC: 5098150 Candidate: 3 of 6 Period: 326.100 d



## DV Fit Results:

Period = 326.09983 [0.00305] d  
Epoch = 377.3818 [0.0066] BKJD  
Rp/R\* = 0.0419 [0.0603]  
a/R\* = 679.21 [3797.11]  
b = 0.01 [1058.56]  
Seff = 0.69 [0.16]  
Teq = 233 [13] K  
Rp = 3.78 [5.47] Re  
a = 0.8452 [0.1137] AU  
Ag = 38375.76 [112363.91] [0.34σ]  
Teffp = 5032 [3678] K [1.30σ]

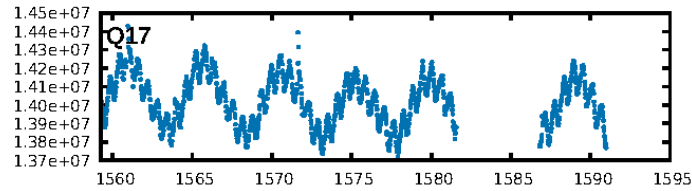
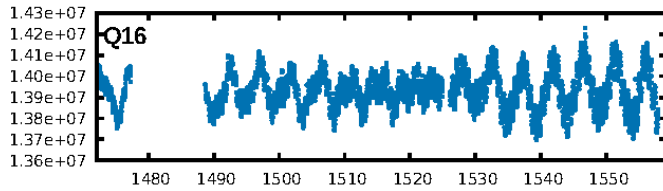
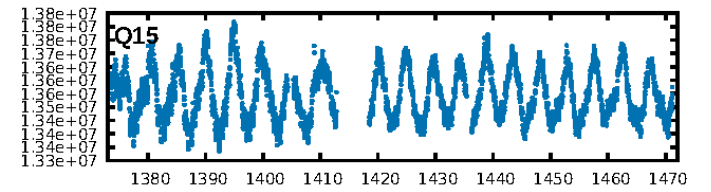
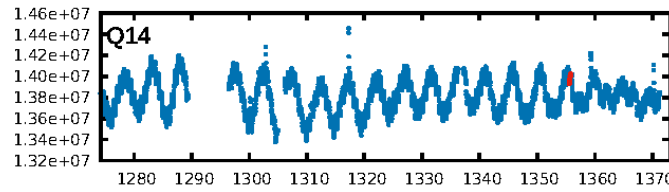
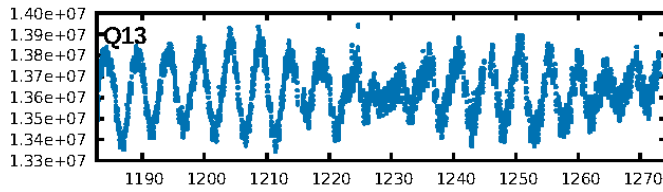
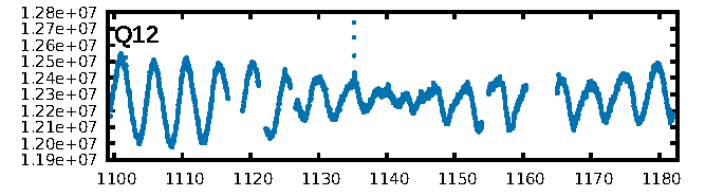
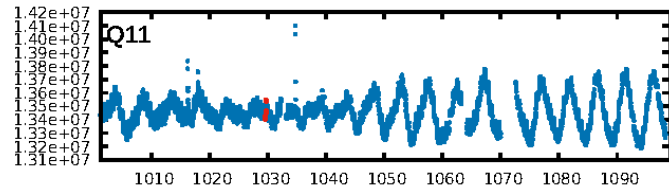
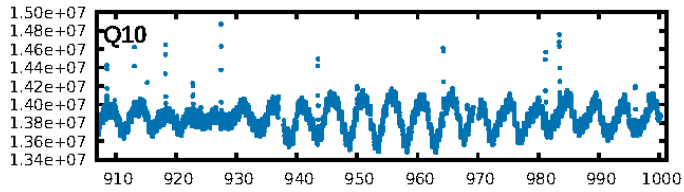
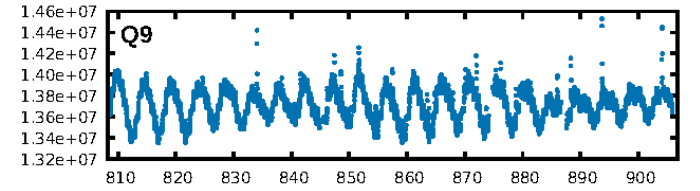
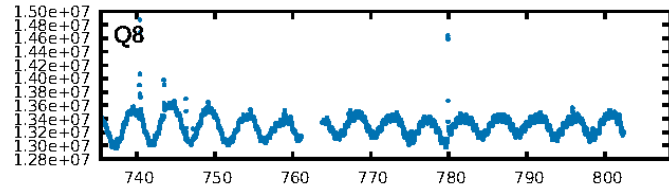
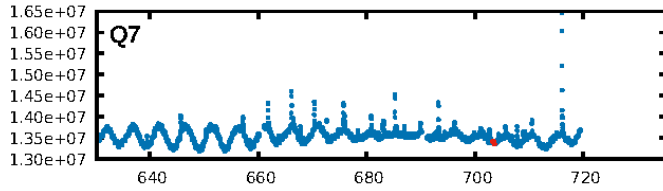
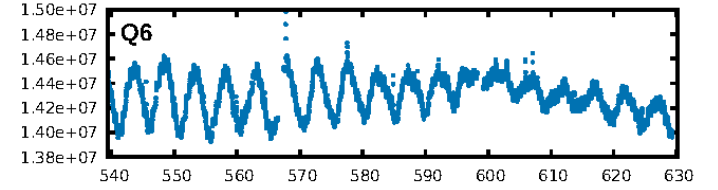
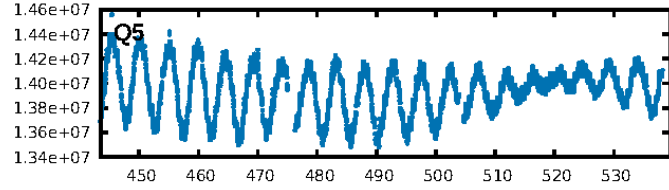
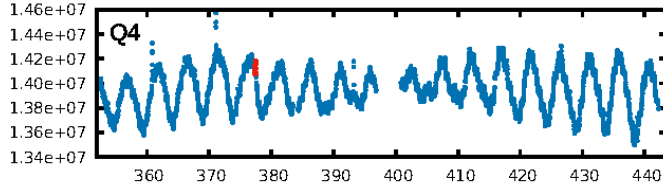
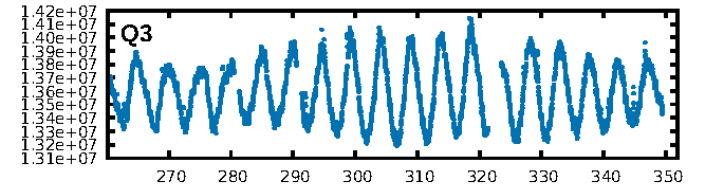
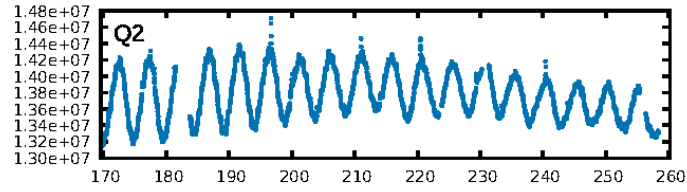
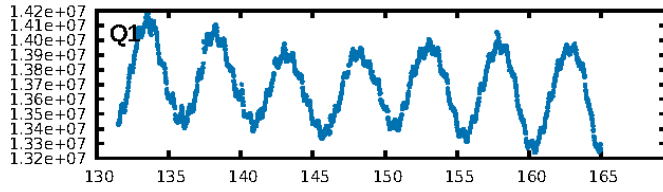
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [4.45σ]  
LongPeriod-sig: 100.0% [251.76σ]  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 71.4%  
Bootstrap-pfa: 3.66e-13  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: 0.7398  
Centroid-sig: 47.3%  
Centroid-so: 0.551 arcsec [0.62σ]  
OotOffset-rm: 1.513 arcsec [1.84σ]  
KicOffset-rm: 1.644 arcsec [1.73σ]  
OotOffset-st: 1/2/1/0 [4]  
KicOffset-st: 1/2/1/0 [4]  
DiffImageQuality-fgm: 0.50 [2/4]  
DiffImageOverlap-fno: 1.00 [4/4]

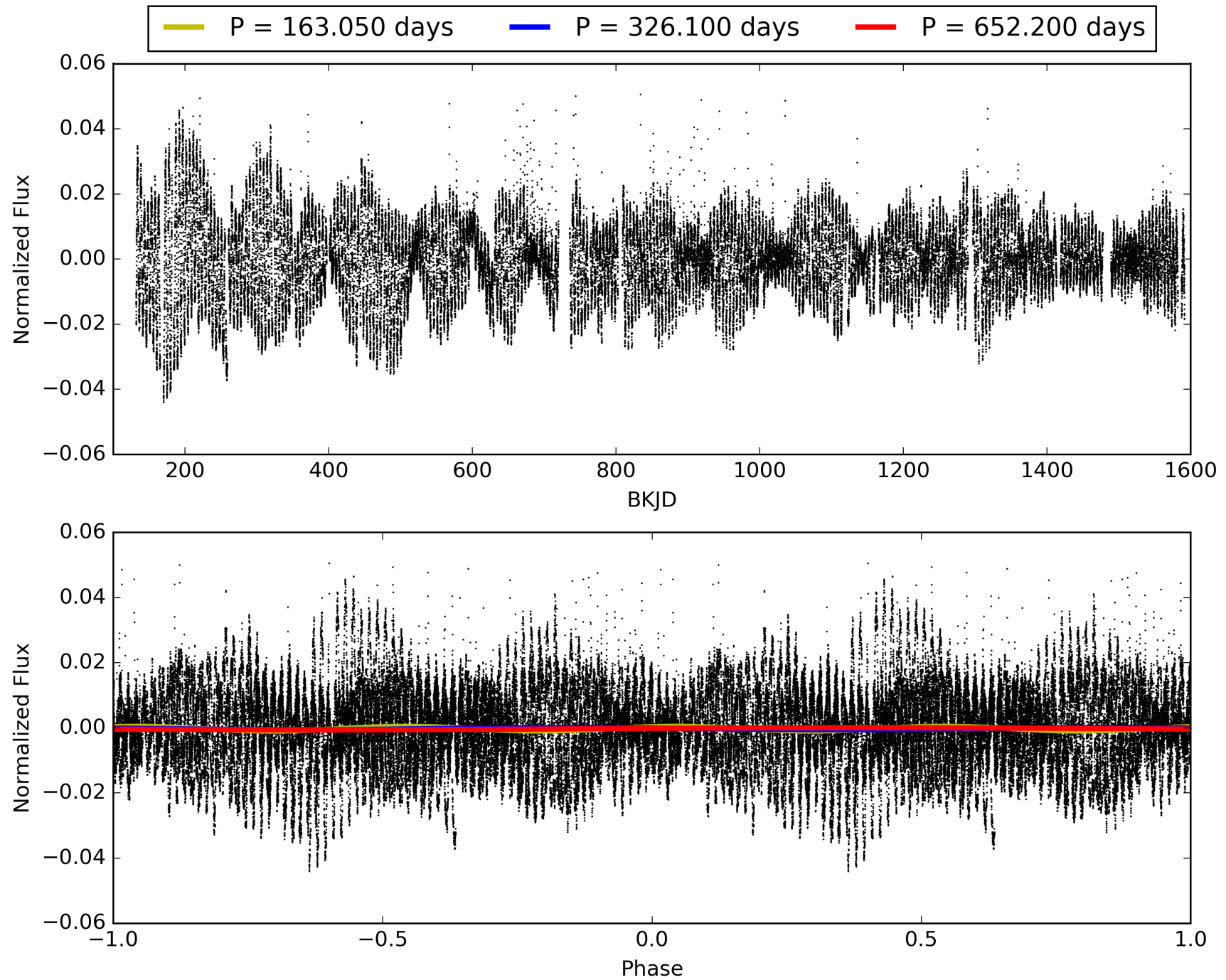
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 12:55:21 Z

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

# TCE 005098150-03, PDC Light Curves

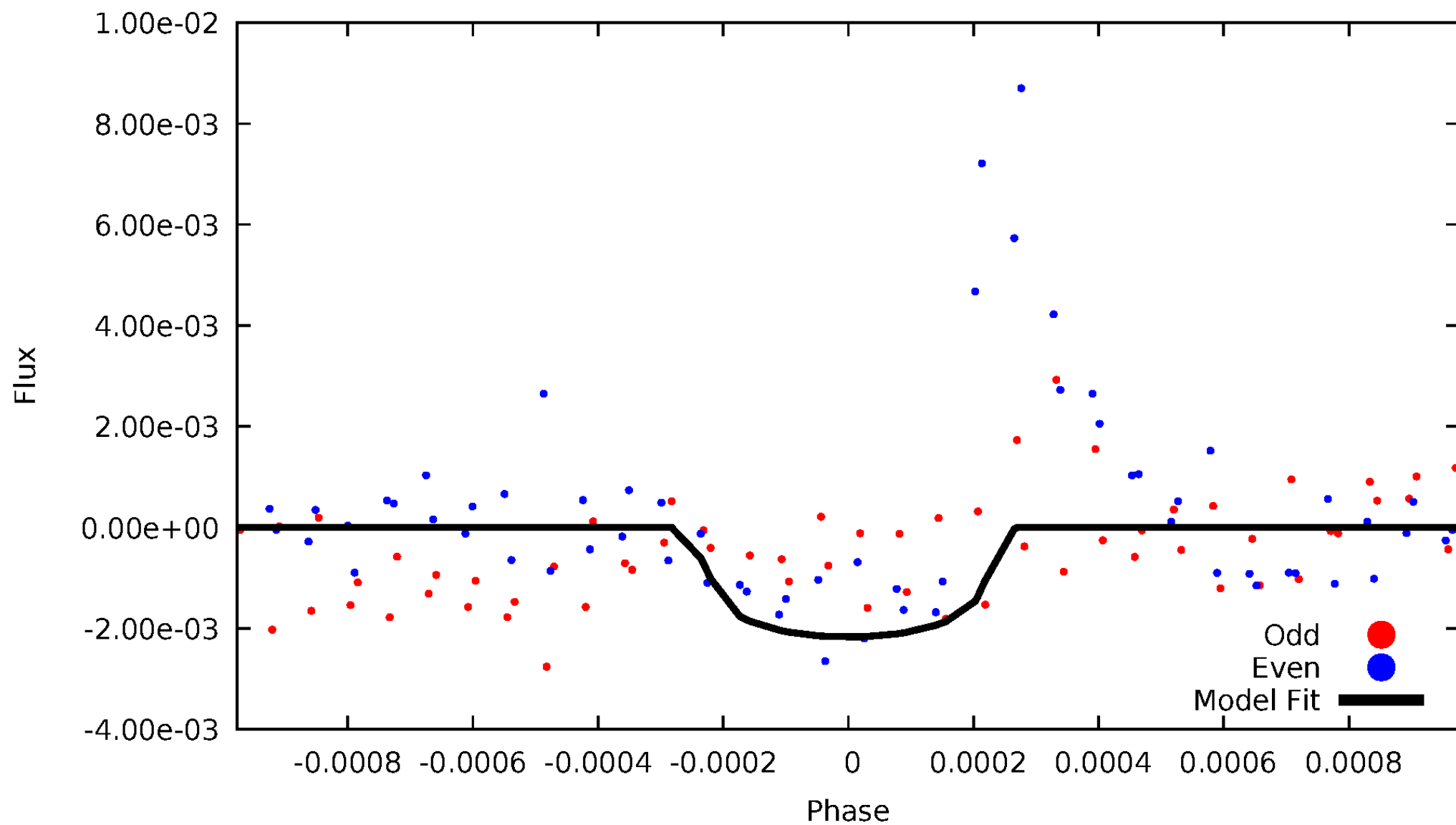


TCE 005098150-03



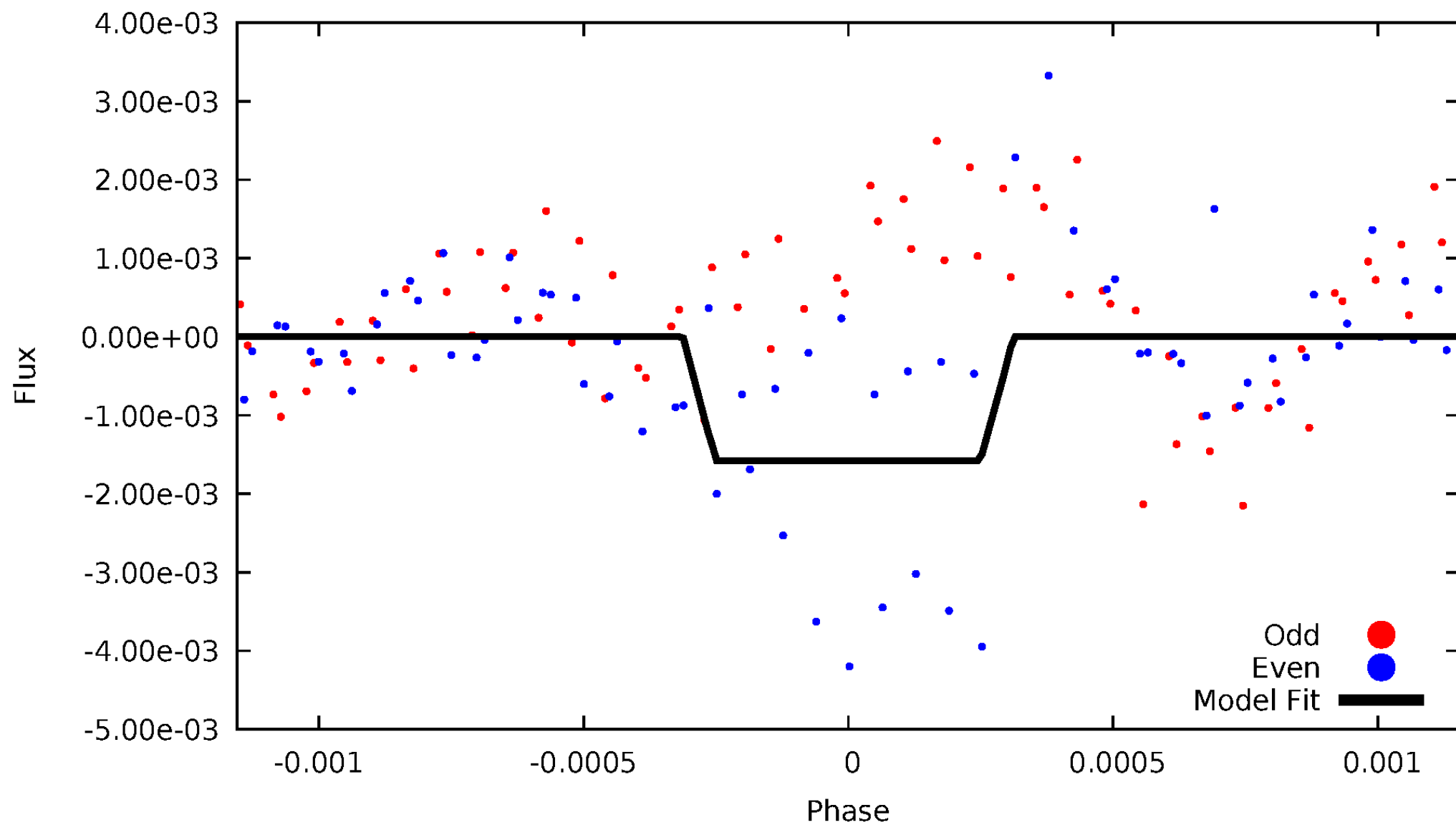
# DV Odd/Even

TCE 005098150-03

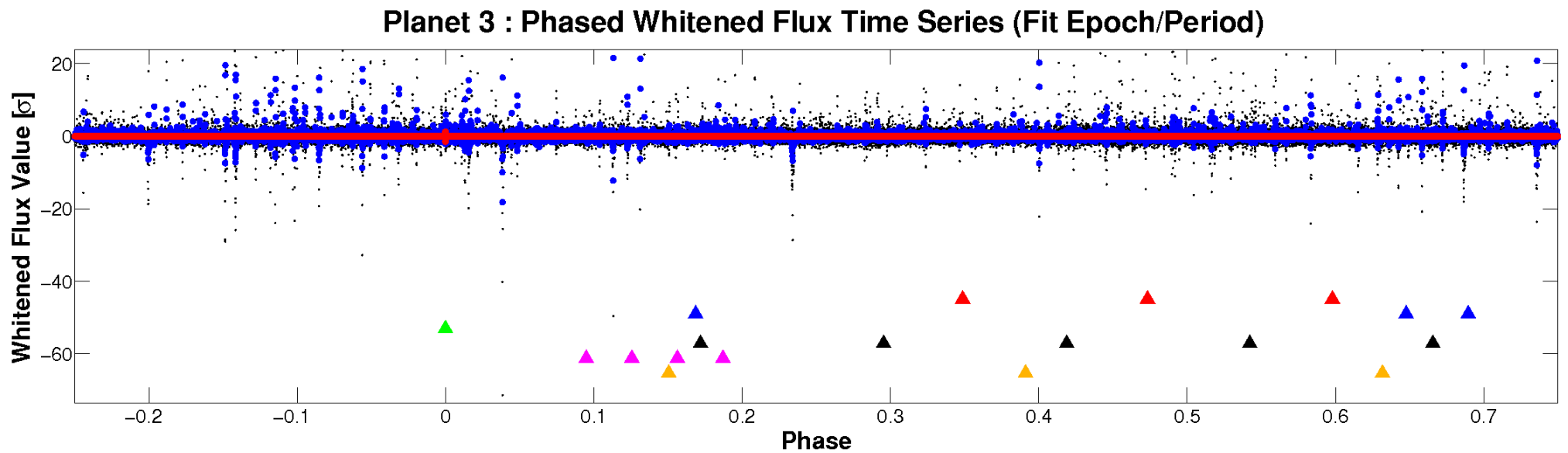
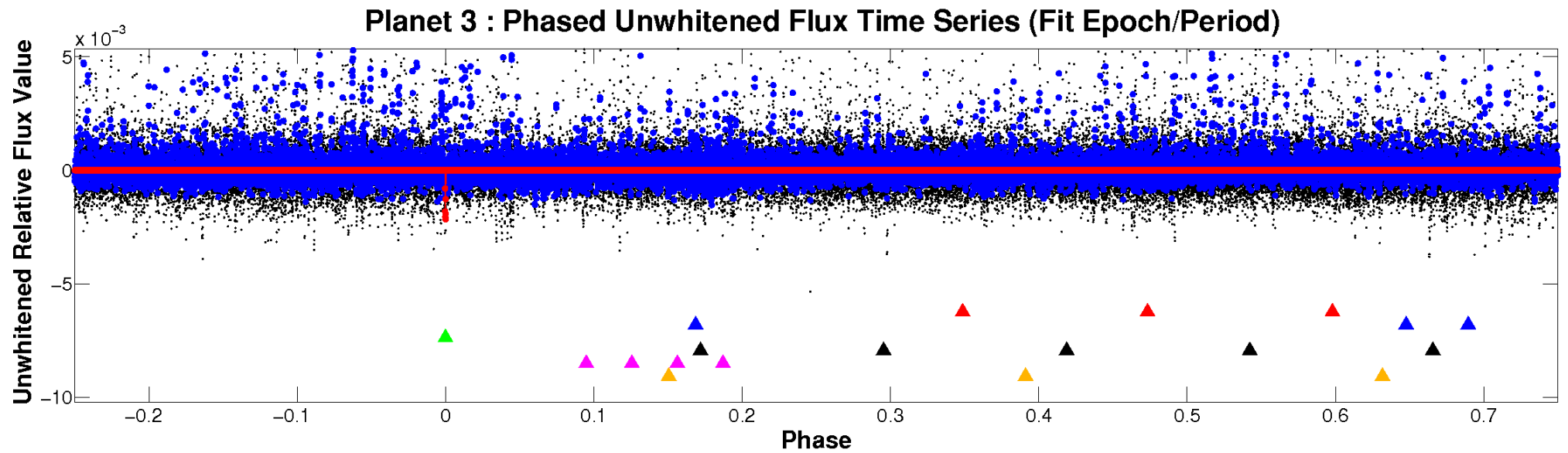


# ALT Odd/Even

TCE 005098150-03

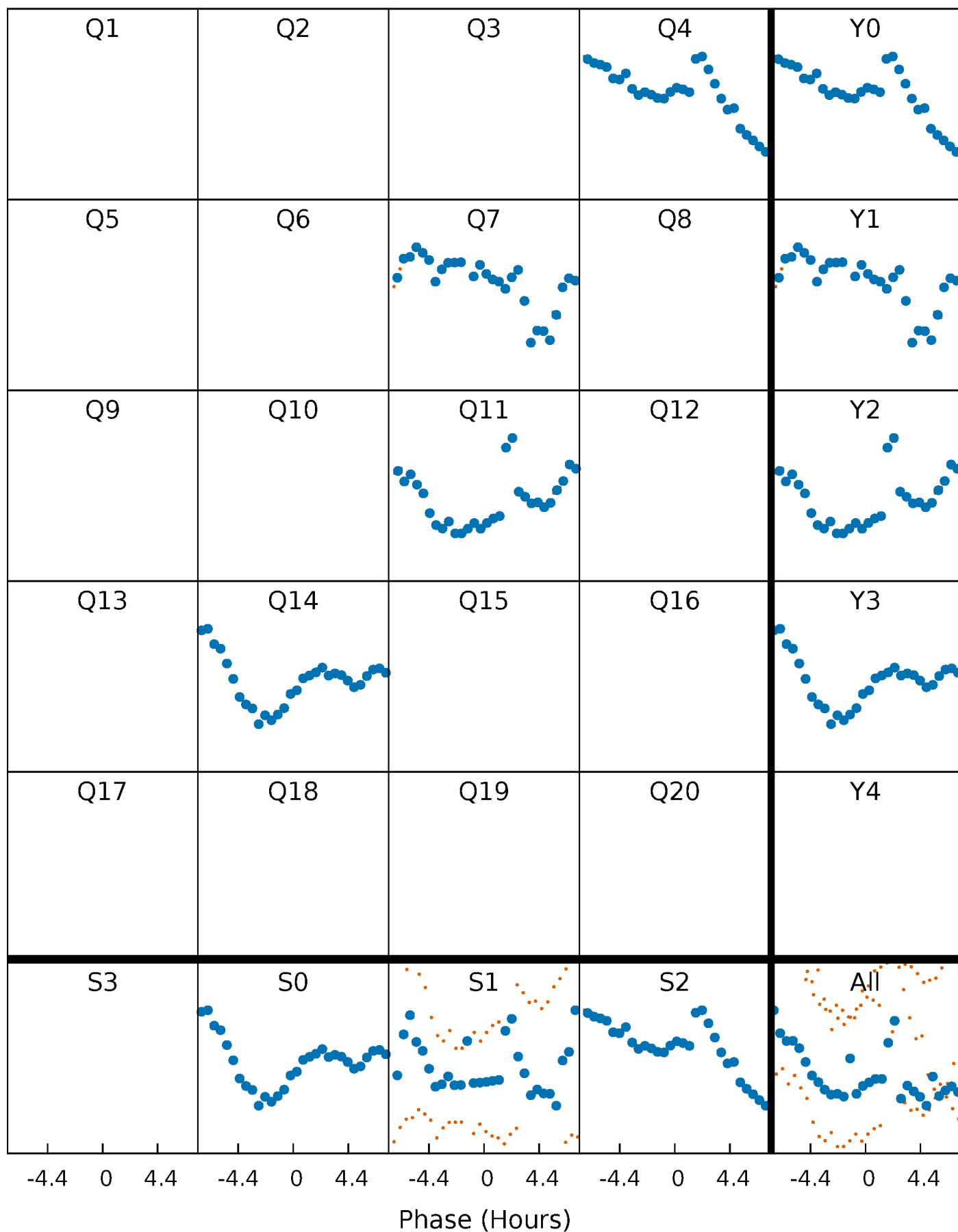


# Non-Whitened Vs. Whitened Light Curve



# PDC Quarter-Phased Transit Curves

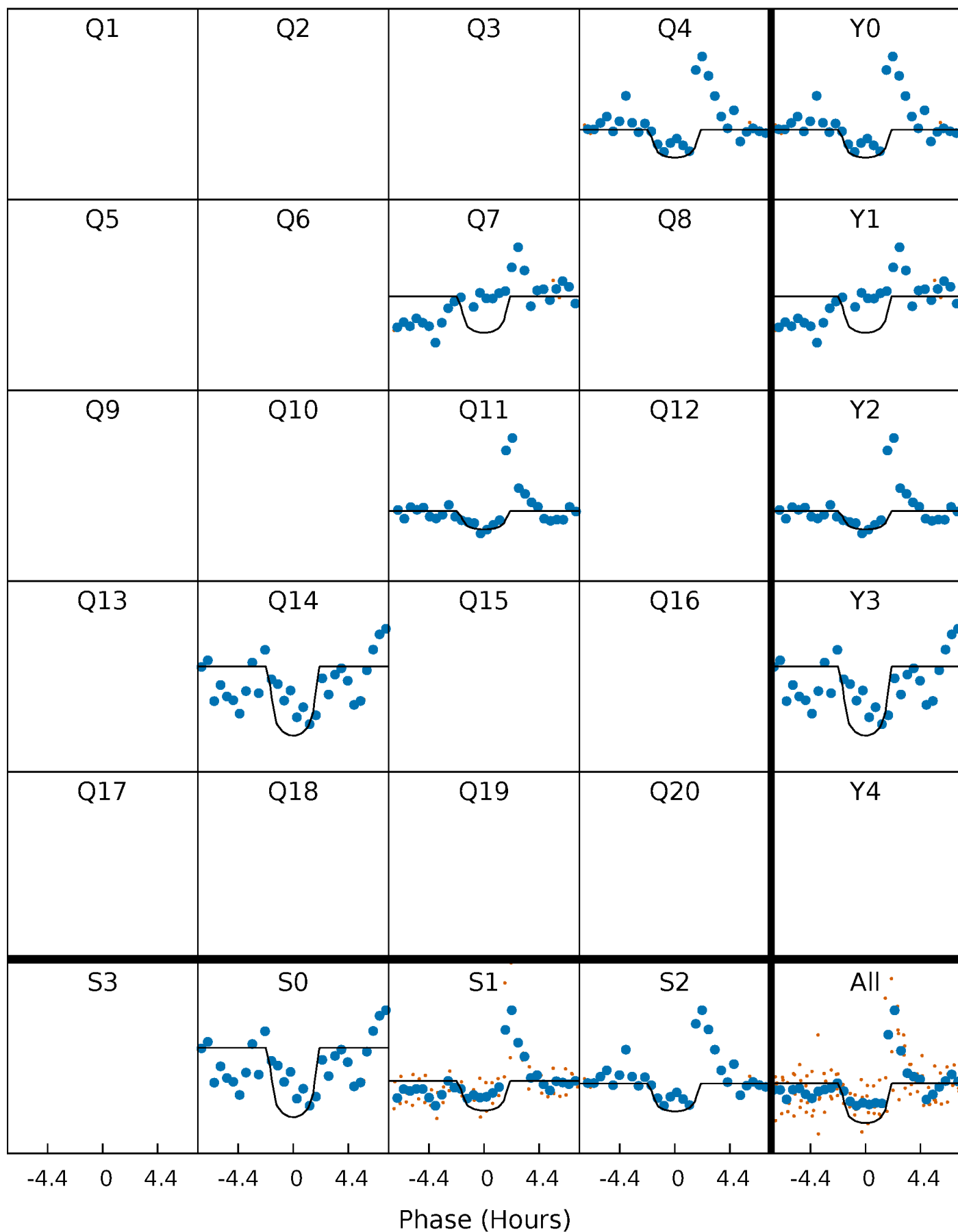
TCE 005098150-03     $P=326.099826$  Days     $T_0=377.381770$  (BKJD)





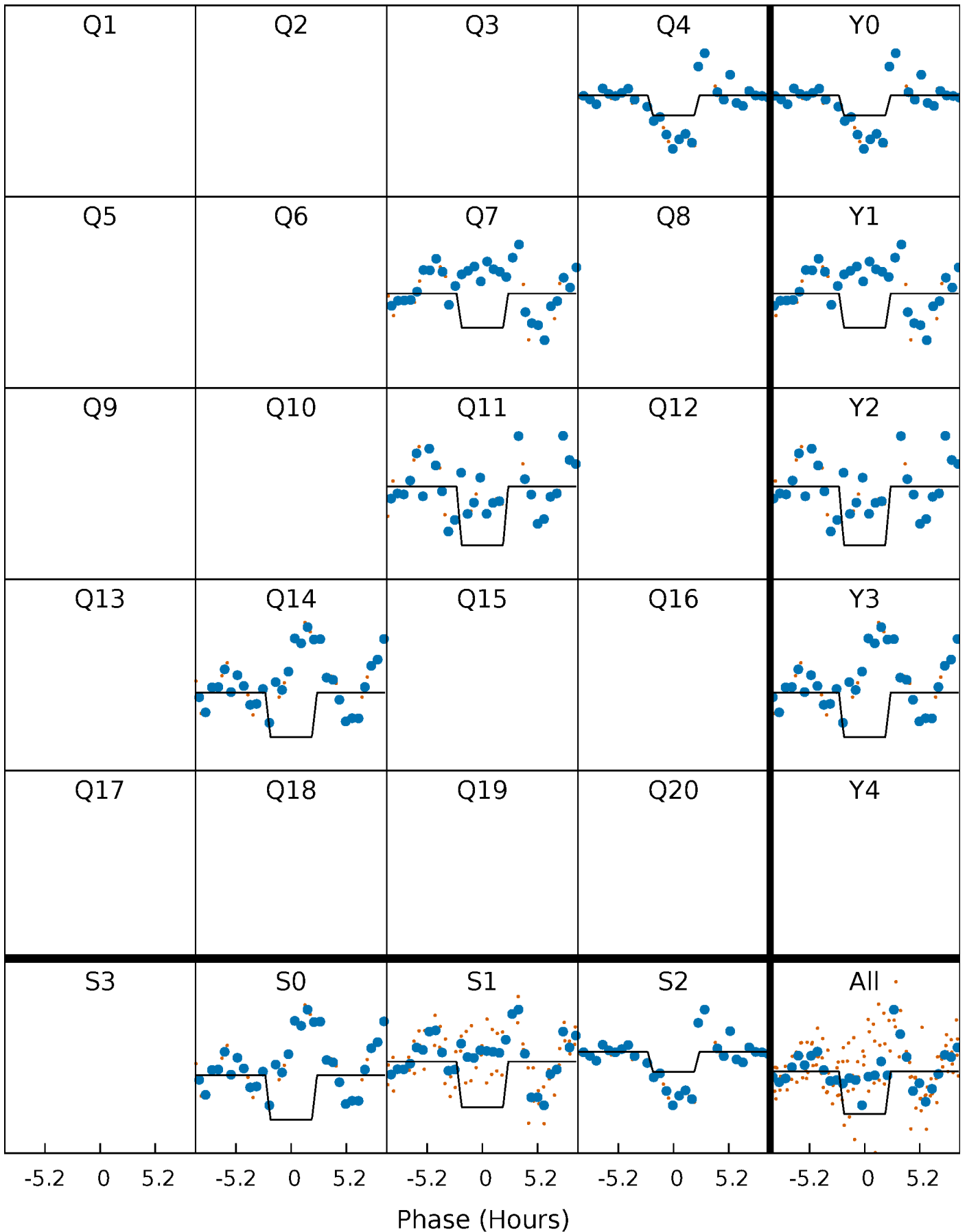
# DV Quarter-Phased Transit Curves

TCE 005098150-03     $P=326.099826$  Days     $T_0=377.381770$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

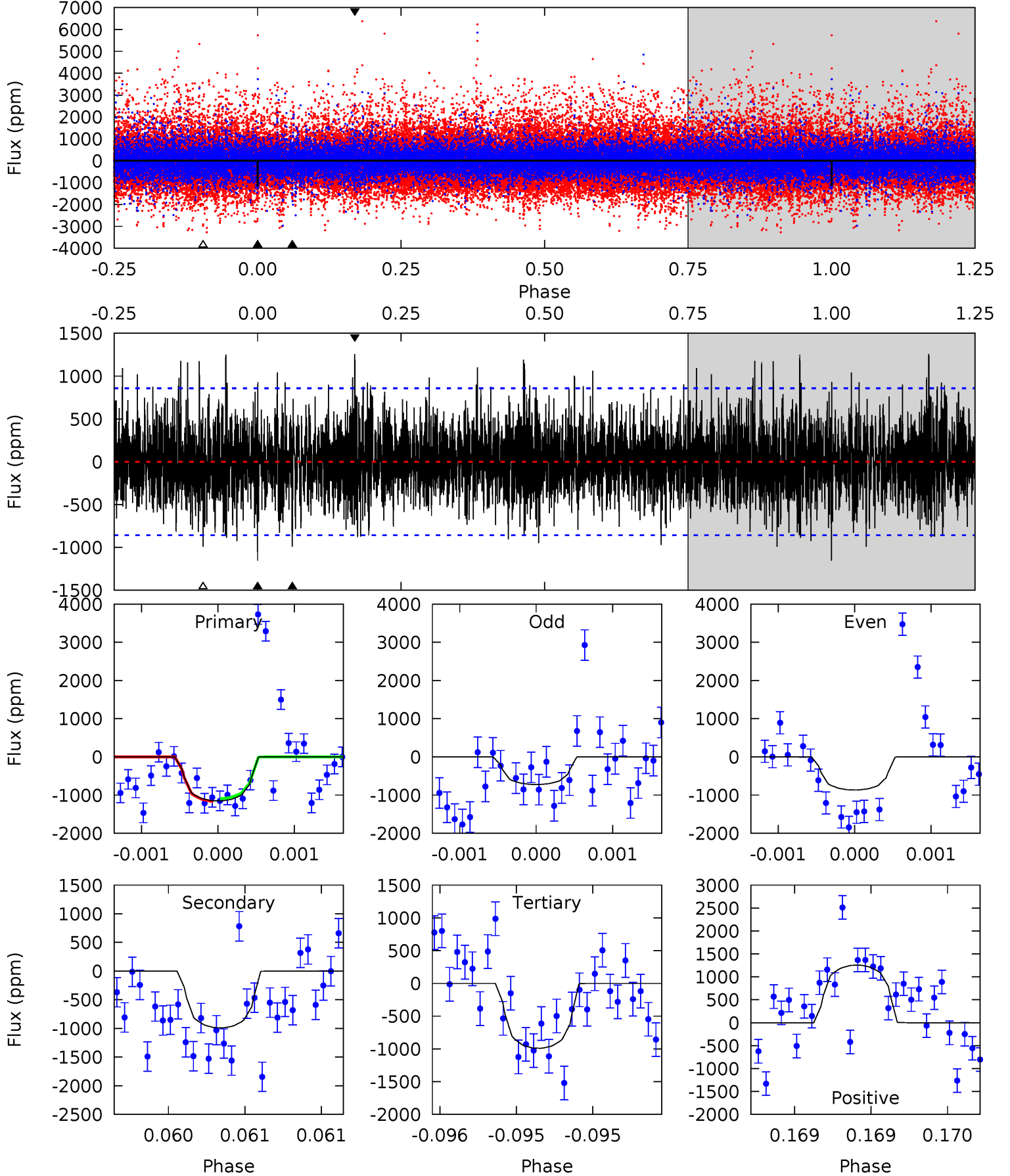
TCE 005098150-03 P=326.104071 Days  $T_0=377.344987$  (BKJD)



# DV Model-Shift Uniqueness Test

005098150-03, P = 326.099826 Days, E = 51.281944 Days

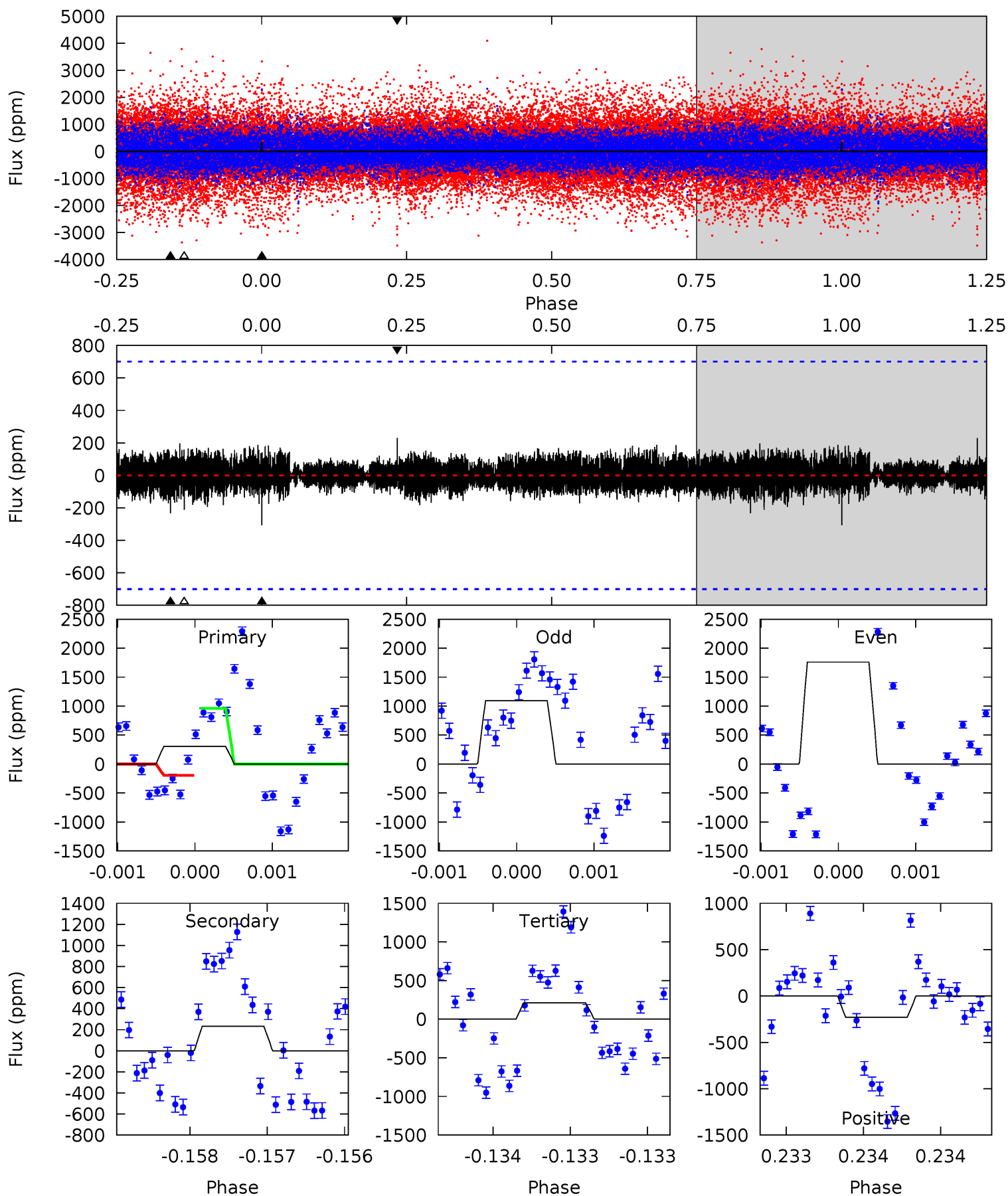
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
7.50	6.44	6.44	8.16	5.57	3.48	1.96	1.06	-0.66	0.00	-1.72	0.41	0.90	0.52	0.23



# Alt Model-Shift Uniqueness Test

005098150-03, P = 326.104071 Days, E = 51.240916 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
2.42	1.83	1.67	1.81	5.54	3.42	0.50	0.75	0.61	0.16	0.02	2.80	-0.91	0.43	3.04



### Stellar Parameters For KIC 005098150

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5328^{+159}_{-159}$	$4.482^{+0.110}_{-0.110}$	$-0.260^{+0.350}_{-0.300}$	$0.827^{+0.130}_{-0.106}$	$0.756^{+0.113}_{-0.052}$	$1.886^{+0.879}_{-0.601}$
	+3%/-3%	+2%/-2%	+135%/-115%	+16%/-13%	+15%/-7%	+47%/-32%
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 005098150-03 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-991 \pm 154$	$5.49^{+4.61}_{-3.76}$	$325^{+17}_{-16}$	$4086^{+2662}_{-746}$	$12788^{+127699}_{-8910}$
Alt.	$-232 \pm 127$	$5.34^{+5.18}_{-3.34}$	$325^{+16}_{-14}$	$3173^{+1294}_{-606}$	$2687^{+17460}_{-2150}$

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

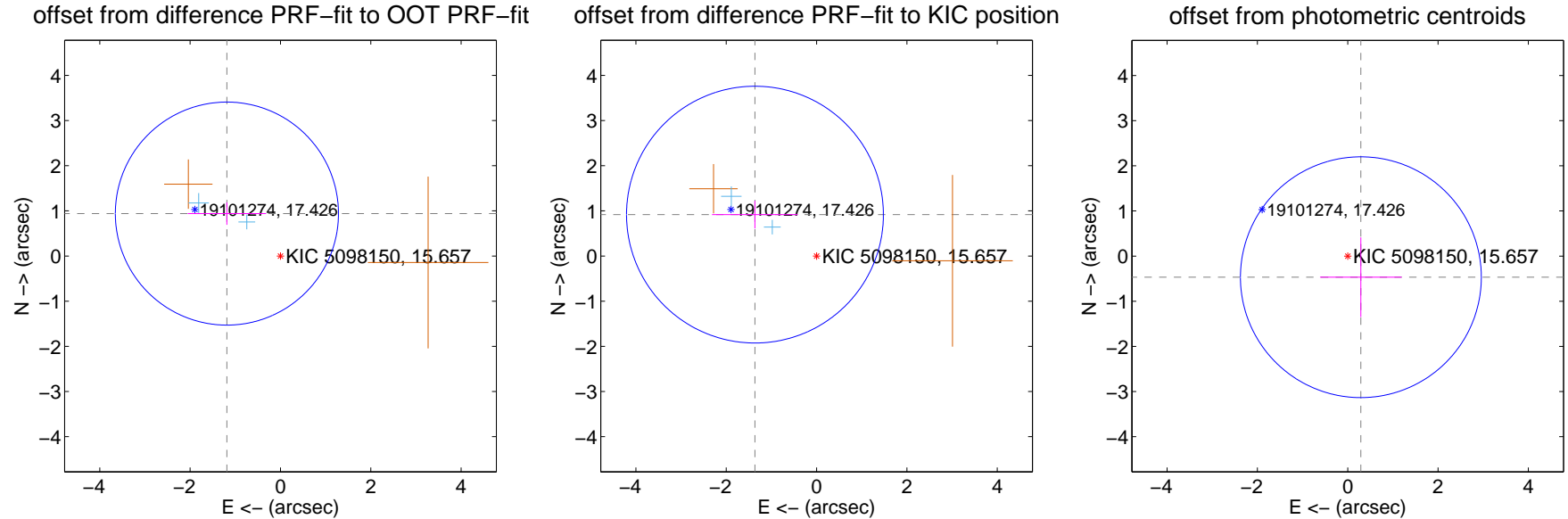
## DV Centroid Data

Supplemental centroid analysis for 005098150-03. Kepler magnitude: 15.66. Transit SNR 8.14

There are 2 quarters with good PRF difference image offsets

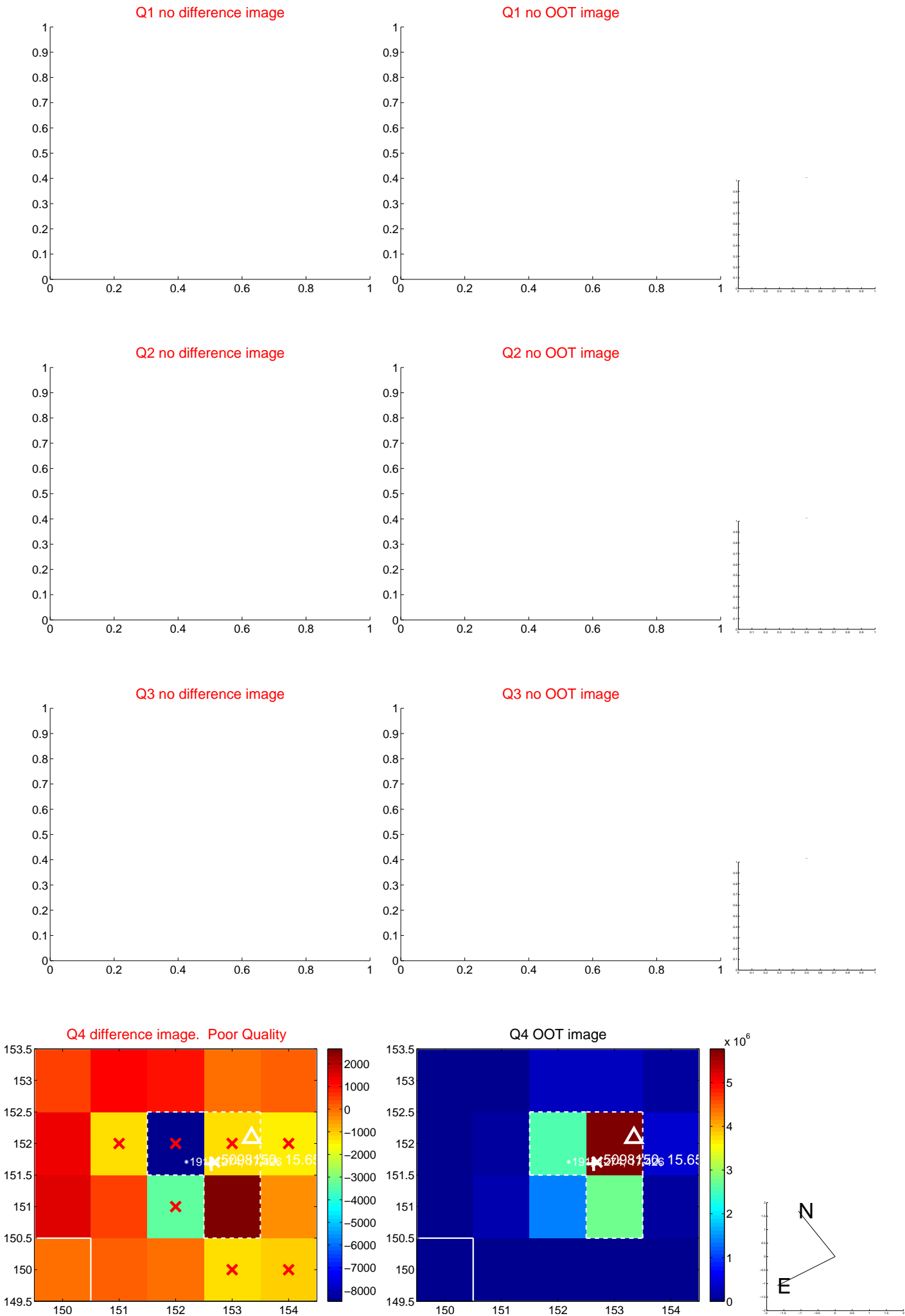
The direct PRF centroid is offset from the target star catalog position by about 0.17 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.513 \pm 0.823$	1.84	$1.186 \pm 0.868$	$0.940 \pm 0.250$
PRF-fit source offset from KIC position	$1.644 \pm 0.948$	1.73	$1.364 \pm 0.950$	$0.917 \pm 0.306$
photometric centroid source offset	$0.55 \pm 0.89$	0.62	$-0.29 \pm 0.91$	$-0.47 \pm 0.88$

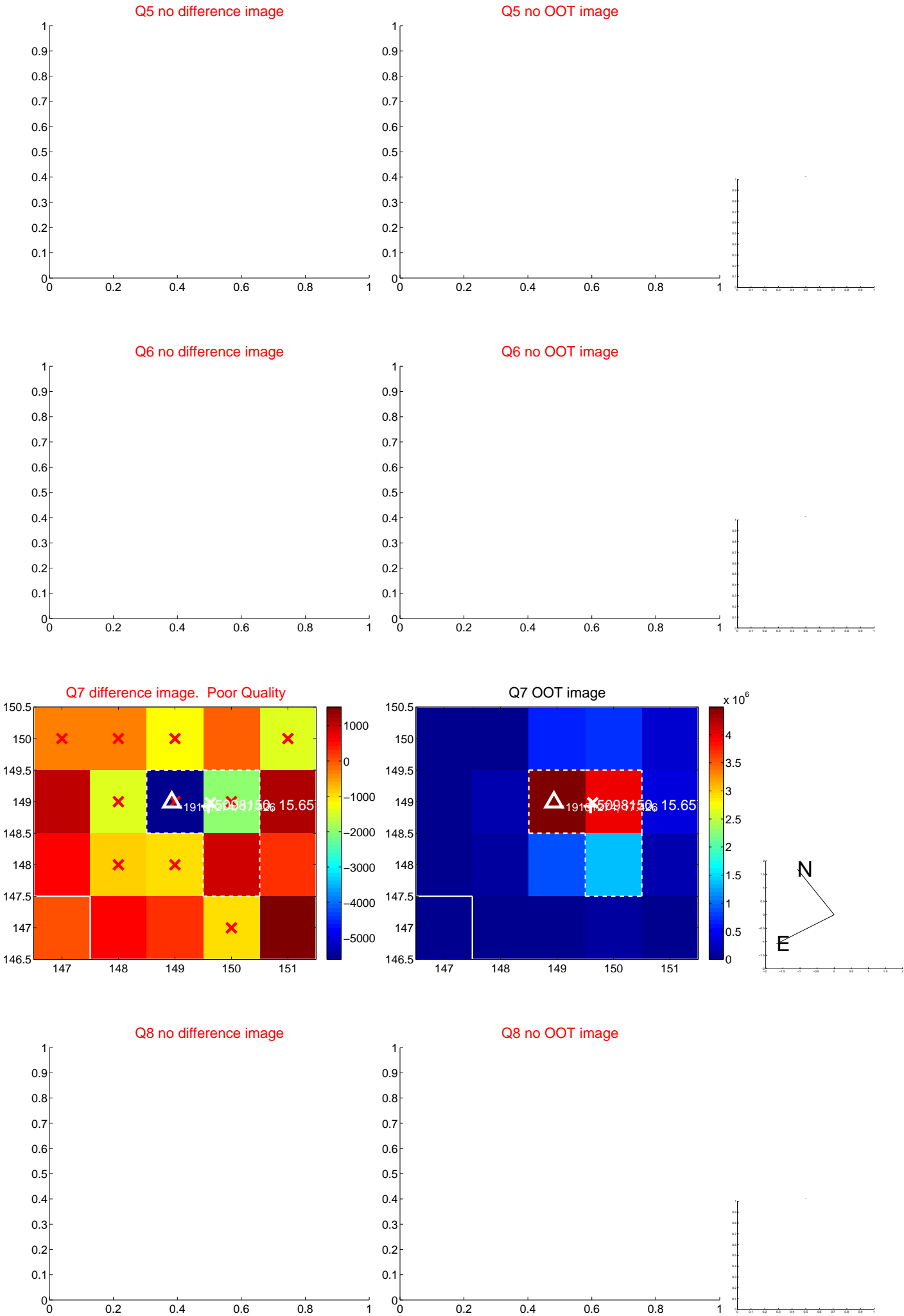


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: 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 ×: KIC target position; +: OOT centroid; △: difference centroid. red ✕: large negative pixel value.

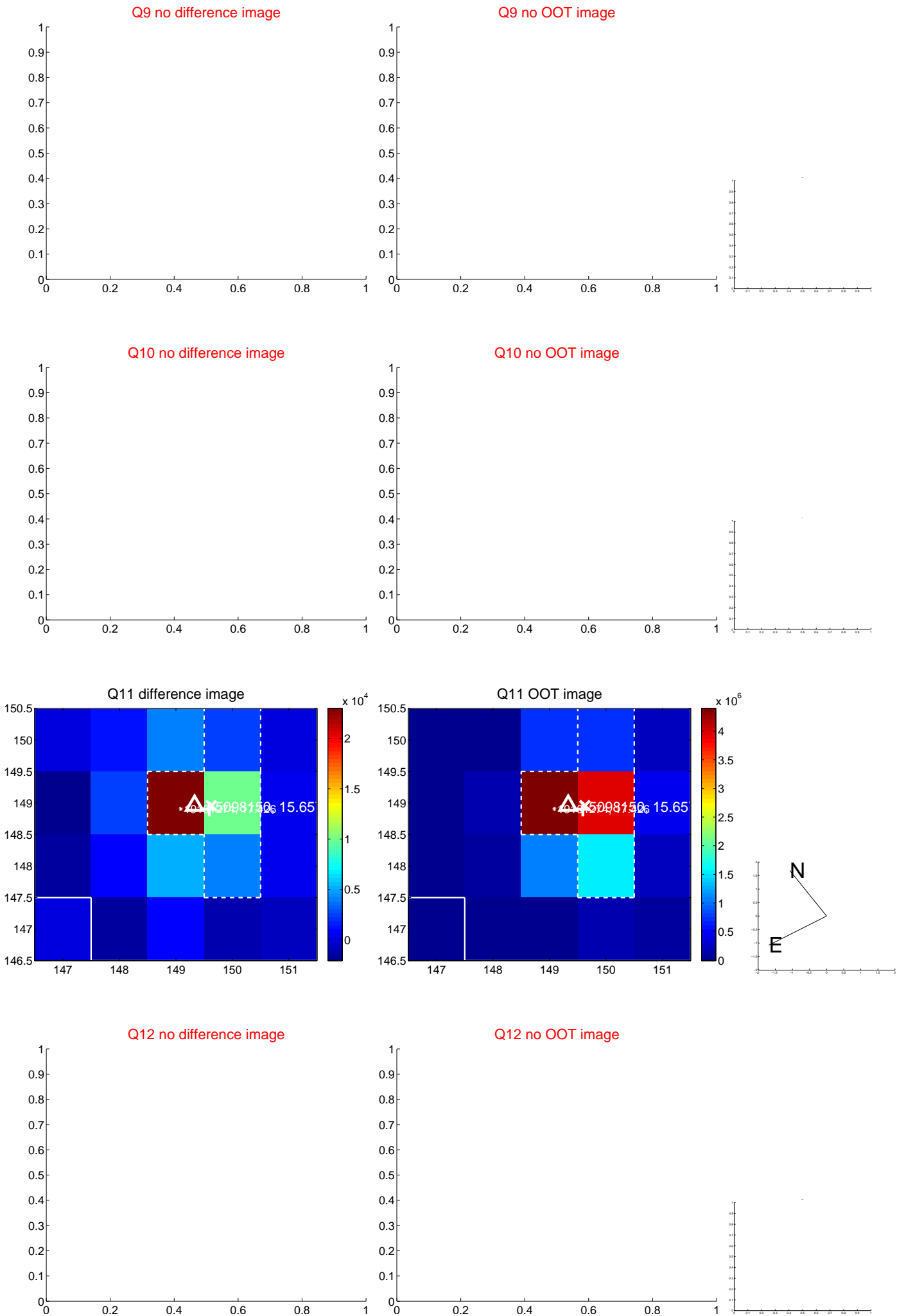


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





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



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

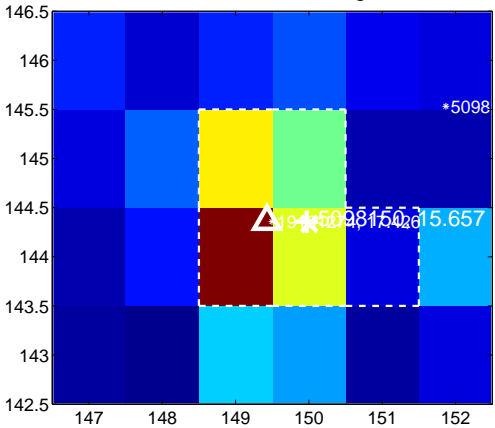
Q13 no difference image



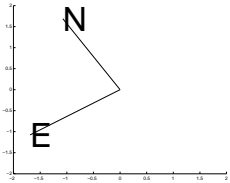
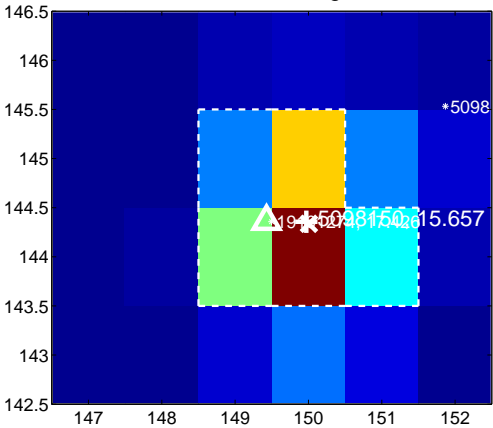
Q13 no OOT image



Q14 difference image



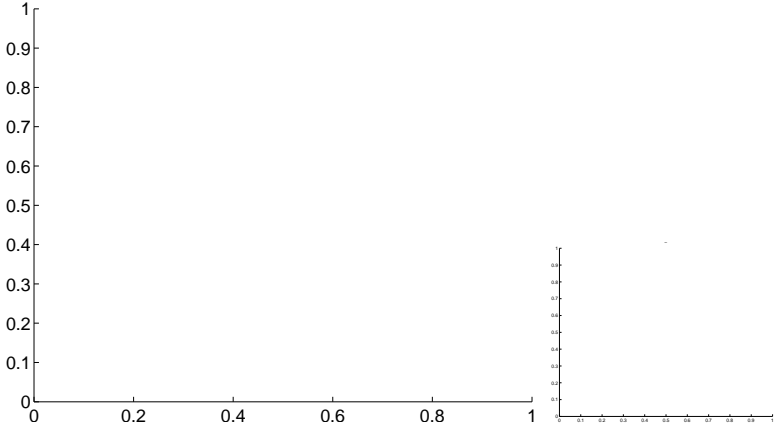
Q14 OOT image



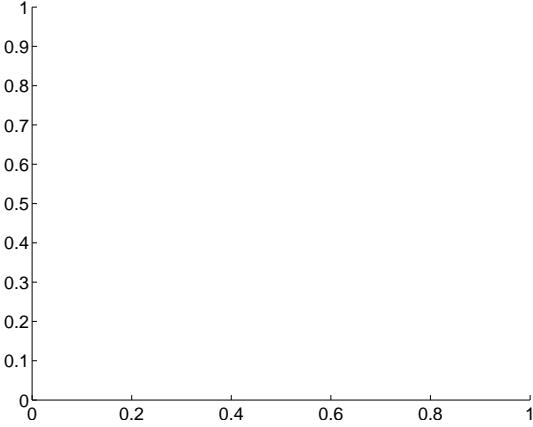
Q15 no difference image



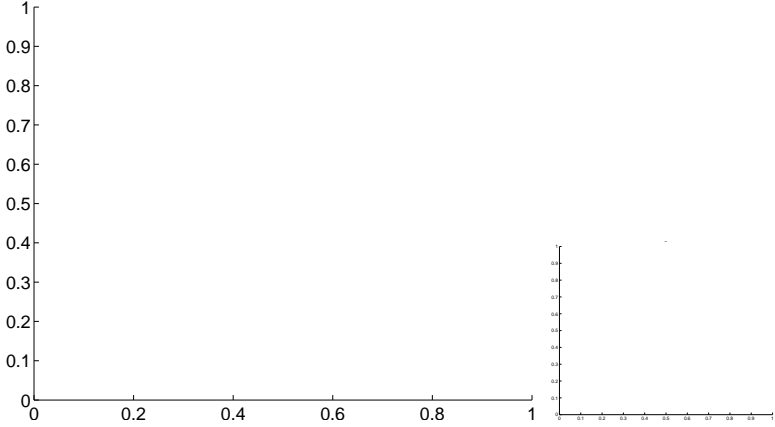
Q15 no OOT image



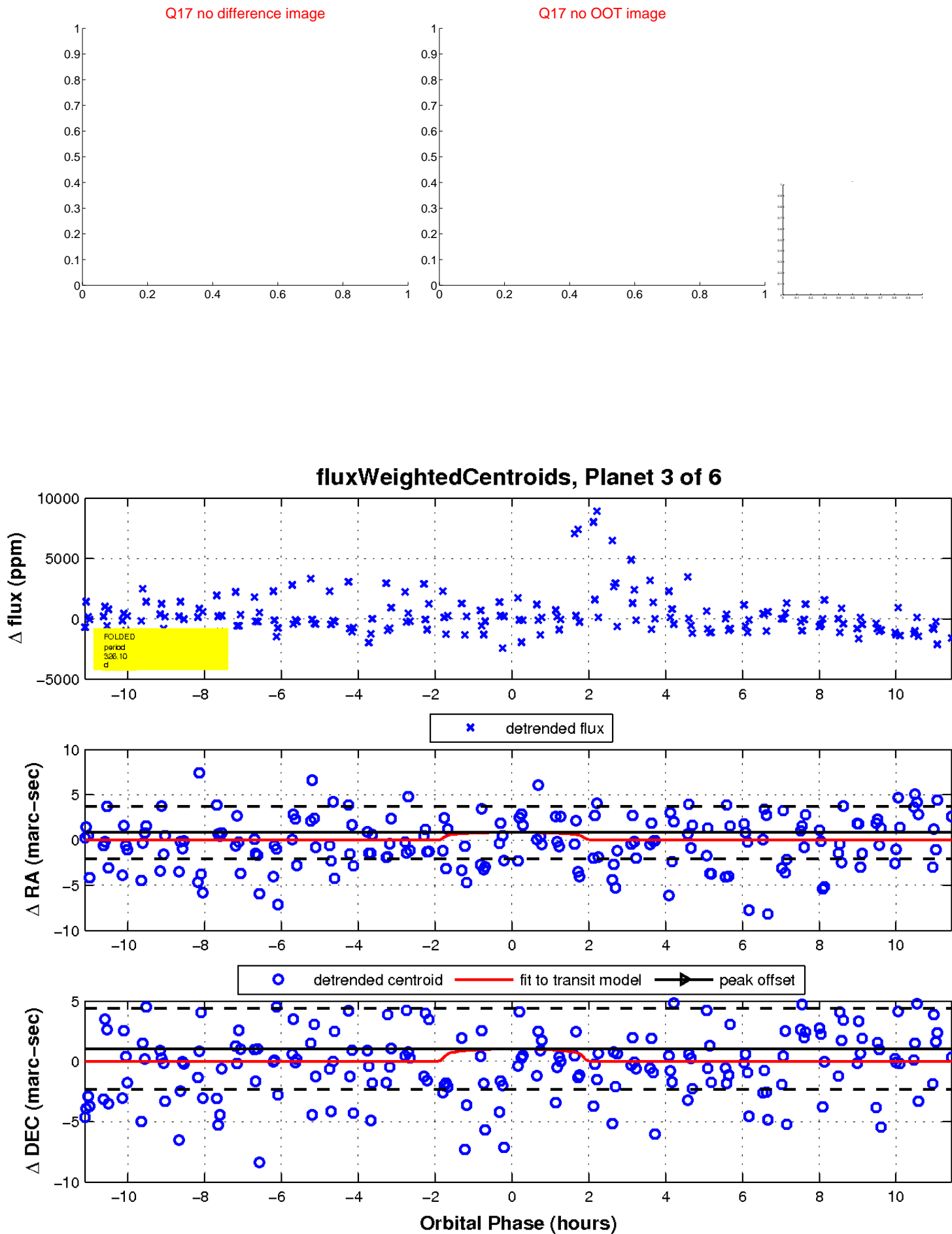
Q16 no difference image



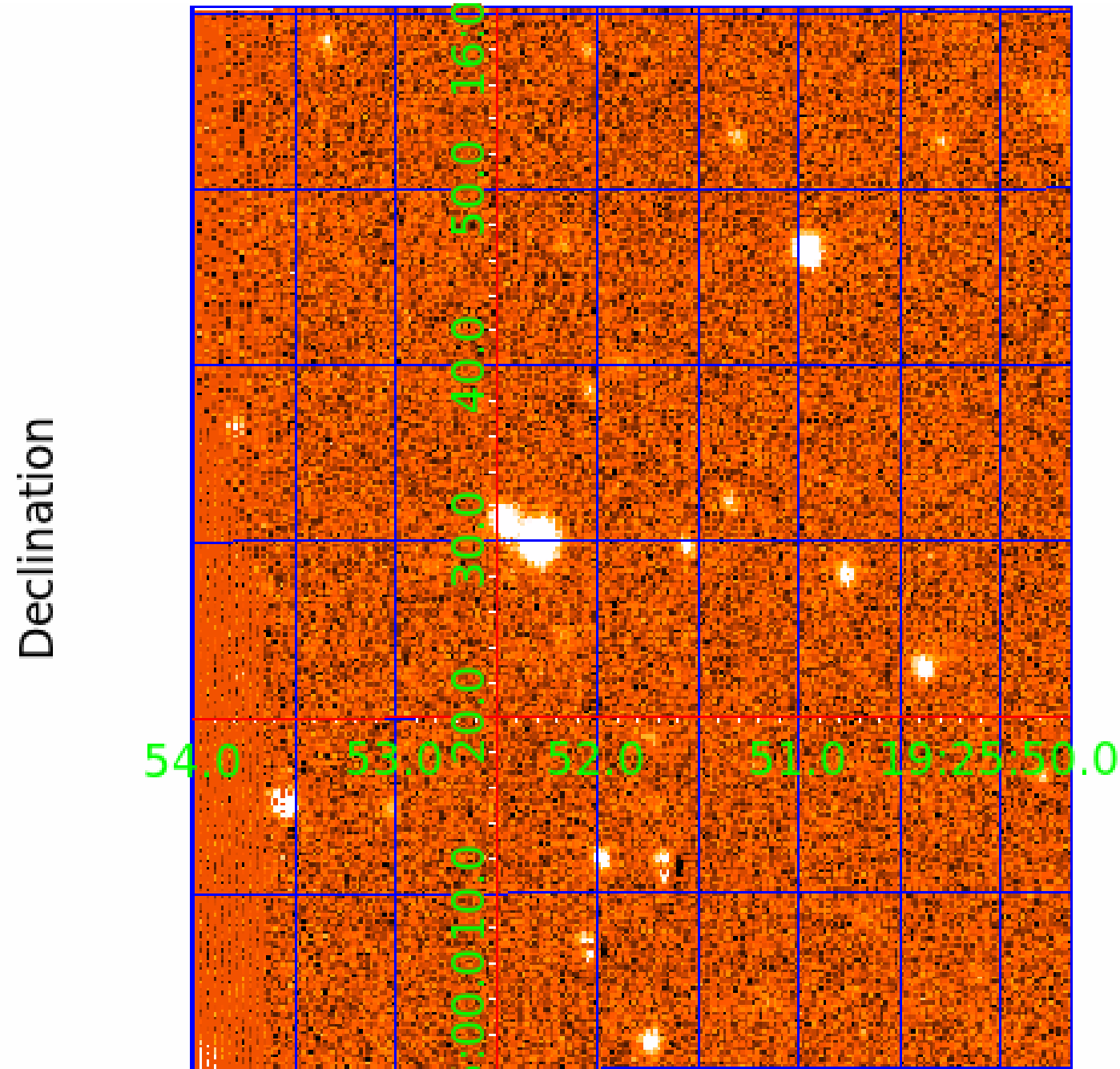
Q16 no OOT image



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



UKIRT Image



# KIC 005098150

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
005098150-01	OBS	No	366.745359	491.094434	865.9	0.640	17.3	1.4	0.83	5328	2.76	0.59
005098150-02	OBS	No	495.967471	262.511597	2824.4	16.798	16.2	6.5	0.83	5328	4.32	0.40
005098150-03	OBS	No	326.099826	377.381770	2170.5	3.821	14.6	8.1	0.83	5328	3.78	0.69
005098150-04	OBS	No	285.843848	268.378494	98.5	1.451	10.4	0.4	0.83	5328	0.82	0.82
005098150-05	OBS	No	316.084541	438.389119	6140.2	53.938	10.4	6.6	0.83	5328	12.04	0.72
005098150-06	OBS	No	404.564736	426.463441	1512.7	3.963	10.8	4.5	0.83	5328	3.32	0.52

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
005098150-01	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_CHASES_MARSHALL_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV— MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS—HALO_GHOST
005098150-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_ZUMA—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
005098150-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_SKYE—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV— MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
005098150-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_ZUMA_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV— MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
005098150-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
005098150-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_TRACKER—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—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.

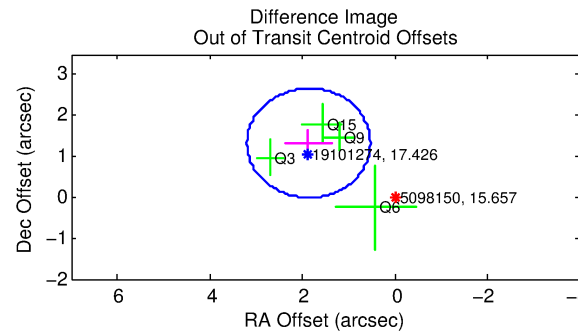
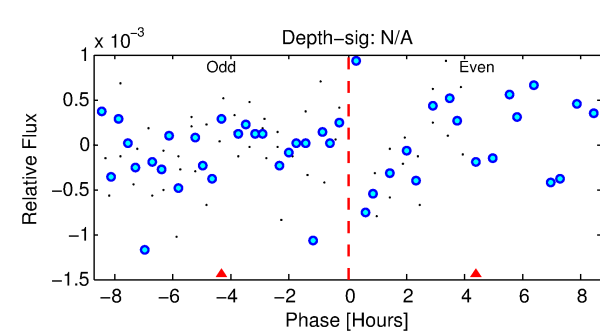
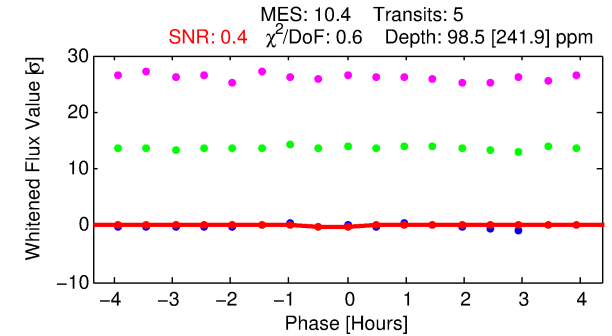
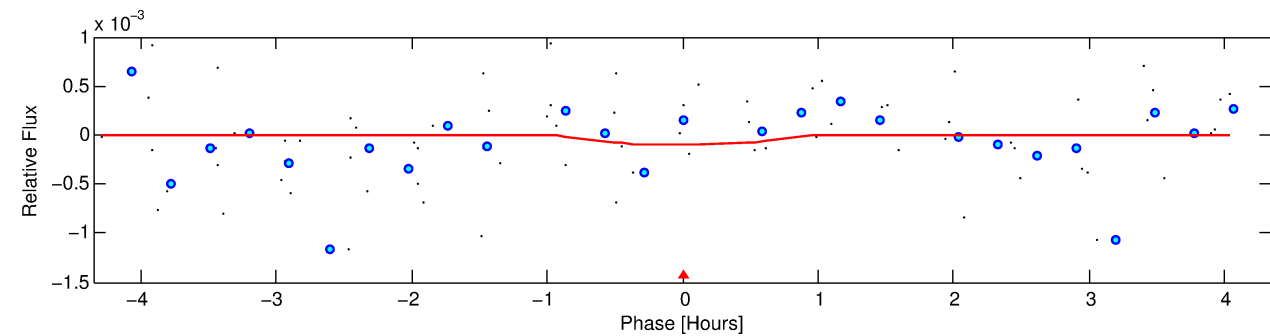
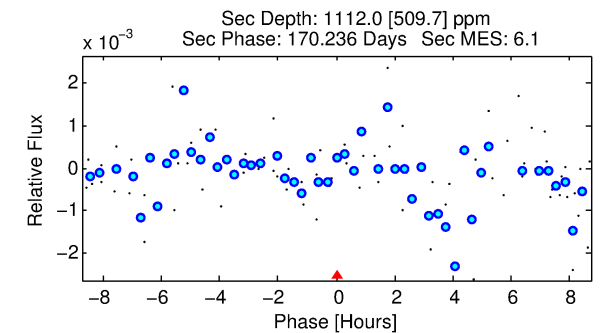
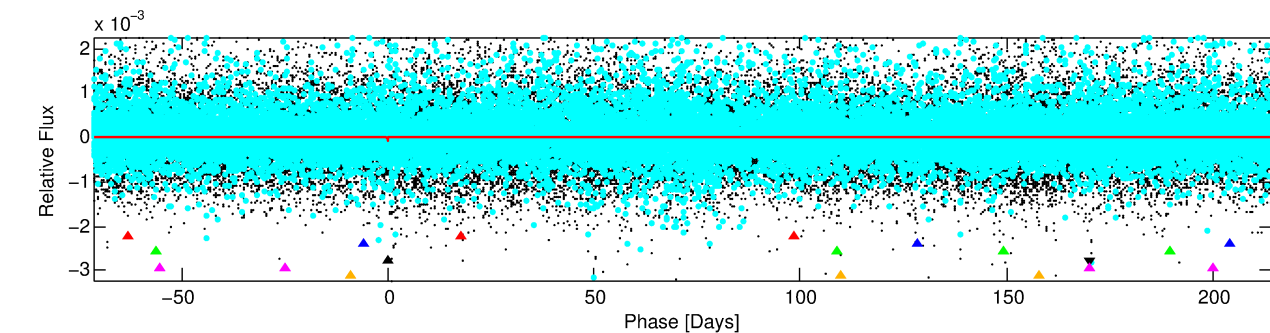
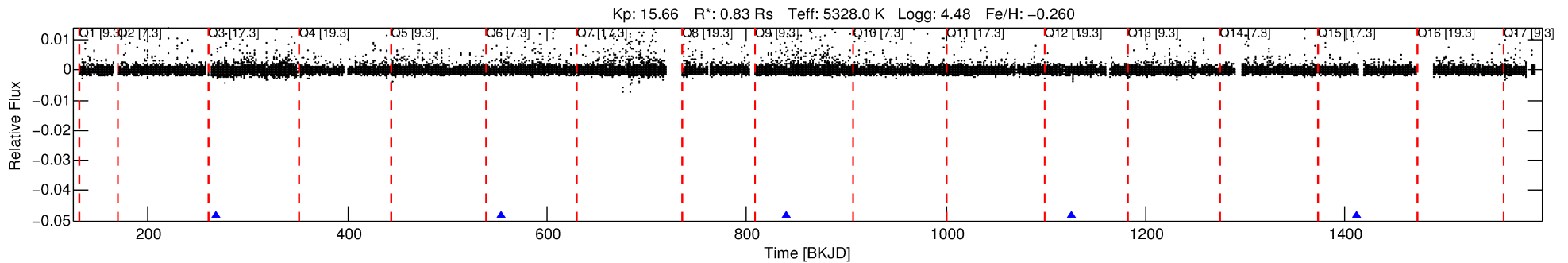
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 005098150-04

No Significant Match Found

# DV One-Page Summary

KIC: 5098150 Candidate: 4 of 6 Period: 285.844 d



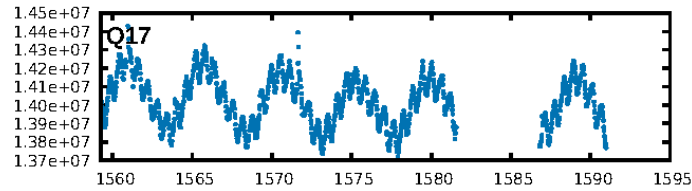
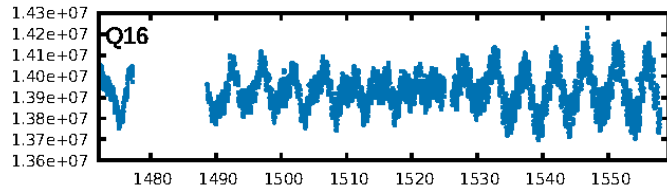
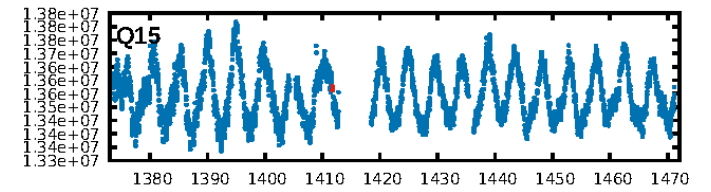
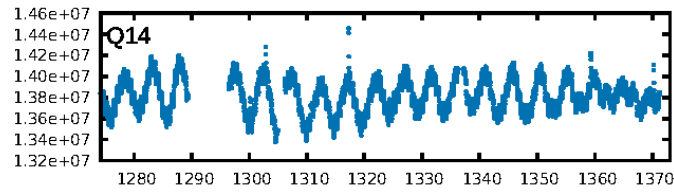
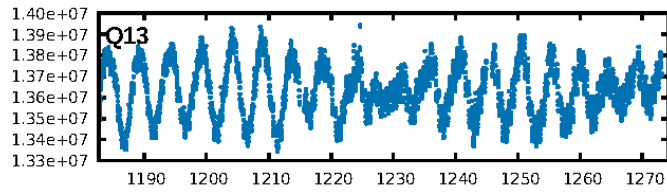
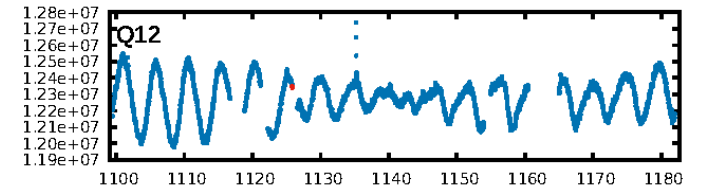
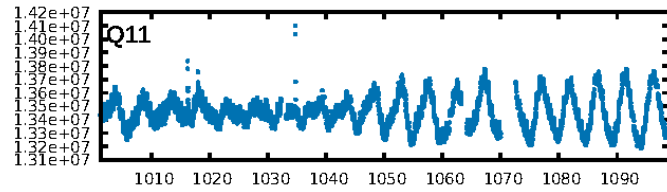
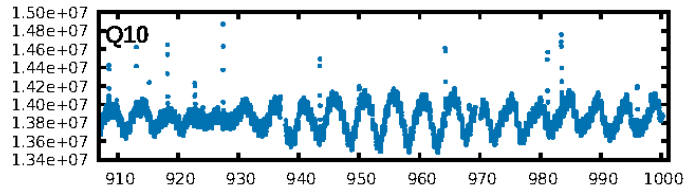
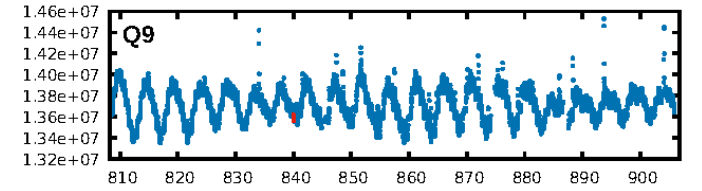
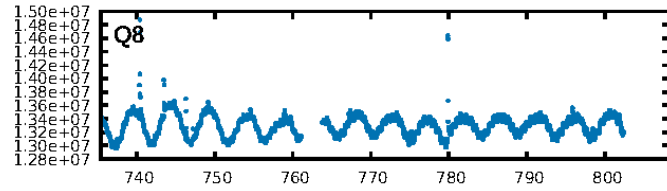
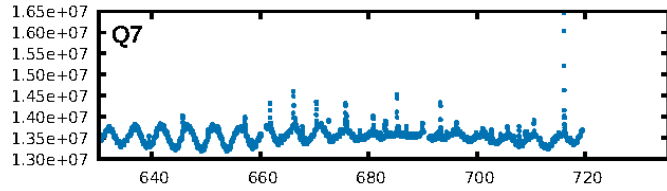
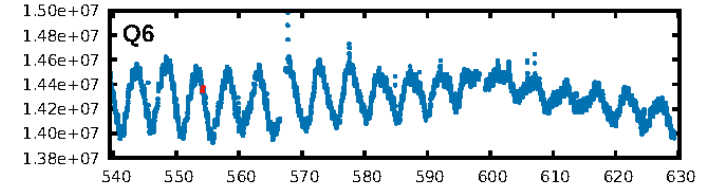
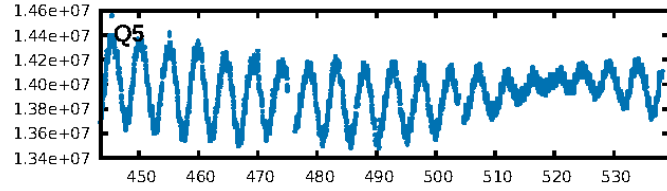
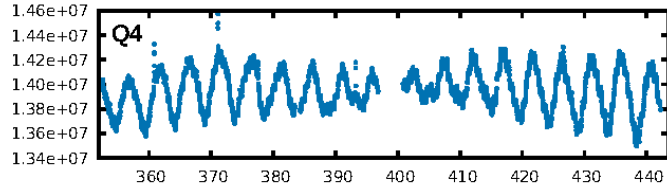
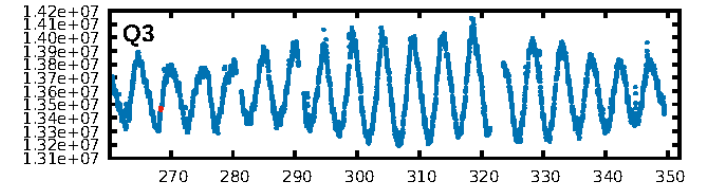
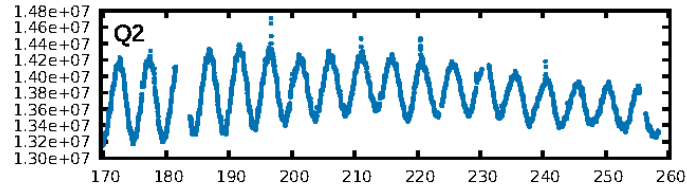
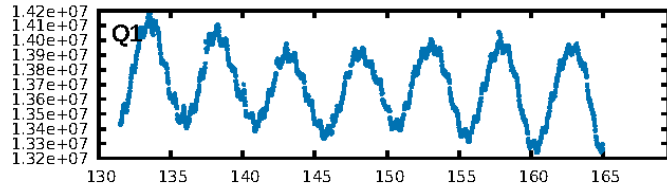
## DV Fit Results:

Period = 285.84385 [0.02606] d  
Epoch = 268.3785 [0.0660] BKJD  
Rp/R\* = 0.0091 [0.3248]  
a/R\* = 1429.37 [205168.01]  
b = 0.34 [371.76]  
Seff = 0.82 [0.19]  
Teq = 243 [14] K  
Rp = 0.82 [29.31] Re  
a = 0.7741 [0.1042] AU  
Ag = 544284.79 [38878159.78] [0.01]  
Teffp = 10203 [182195] K [0.05]

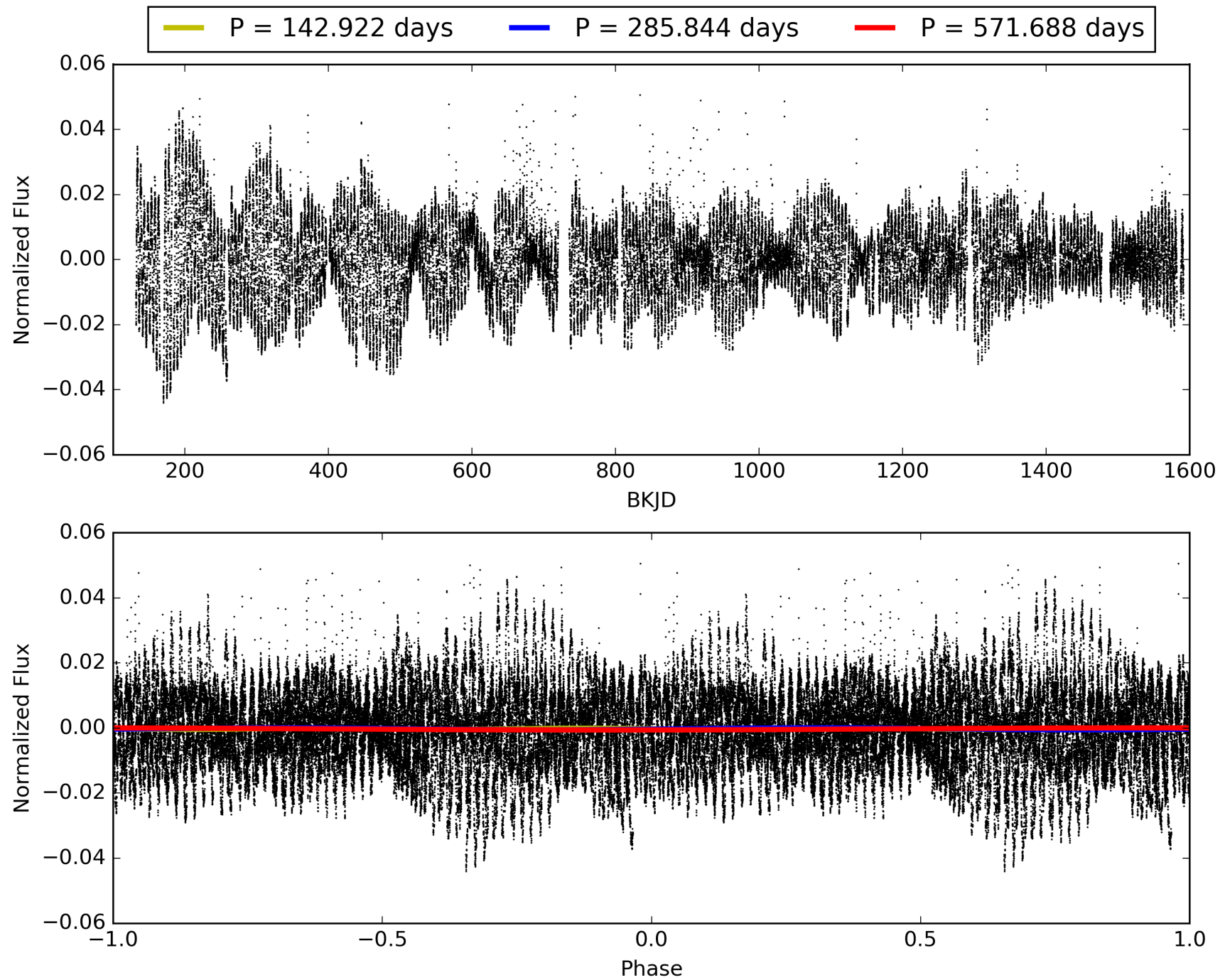
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [13.45σ]  
ModelChiSquare2-sig: 44.3%  
ModelChiSquareGof-sig: 98.6%  
**Bootstrap-pfa: 3.84e-09**  
RollingBand-fgt: 1.00 [5/5]  
GhostDiagnostic-chr: -1.506  
Centroid-sig: 43.8%  
Centroid-so: 17.919 arcsec [0.69σ]  
**OotOffset-rm: 2.287 arcsec [5.13σ]**  
**KicOffset-rm: 2.385 arcsec [4.90σ]**  
OotOffset-st: 1/2/0/1 [4]  
KicOffset-st: 1/2/0/1 [4]  
DiffImageQuality-fgm: 0.25 [1/4]  
DiffImageOverlap-fno: 1.00 [4/4]

# TCE 005098150-04, PDC Light Curves



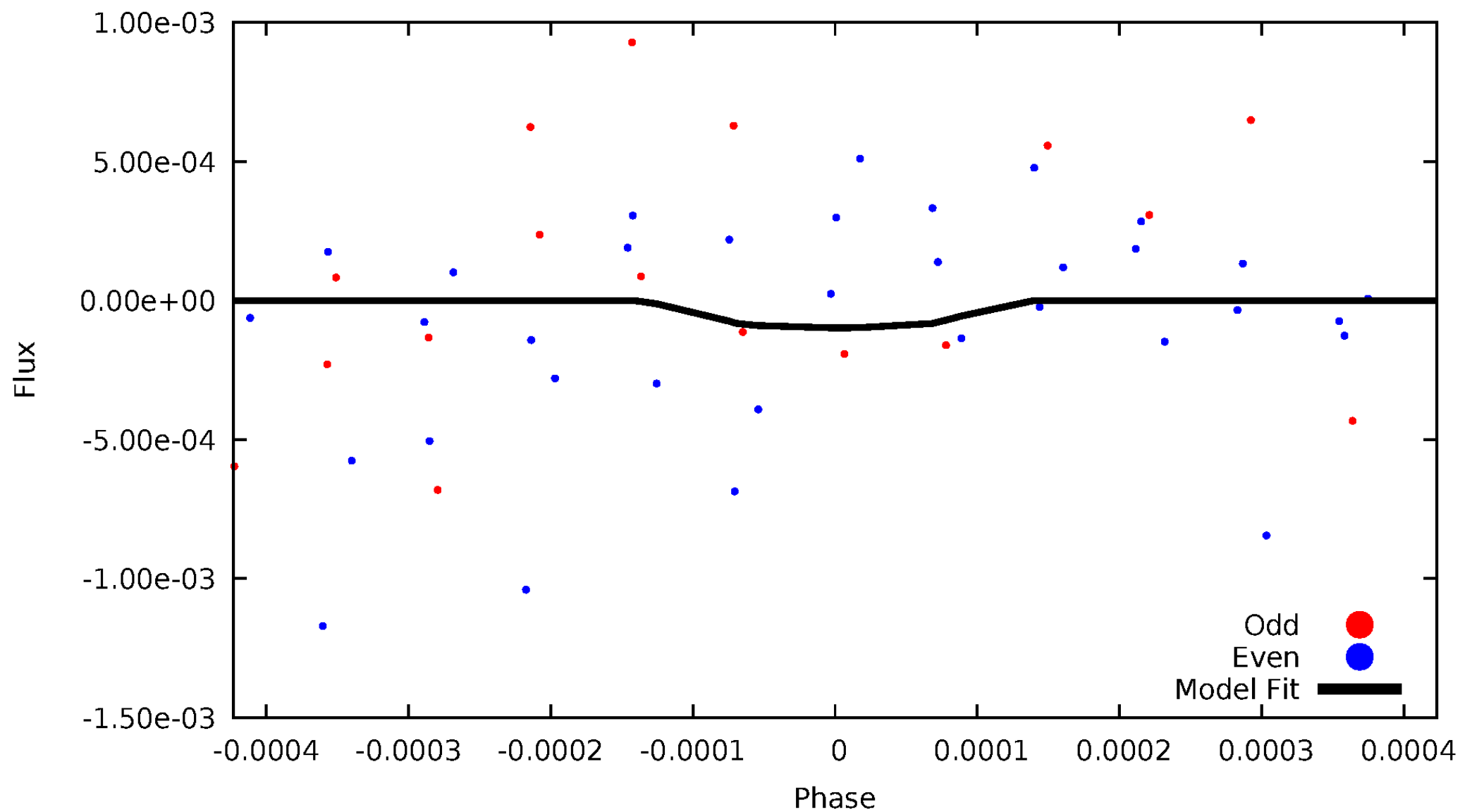
TCE 005098150-04





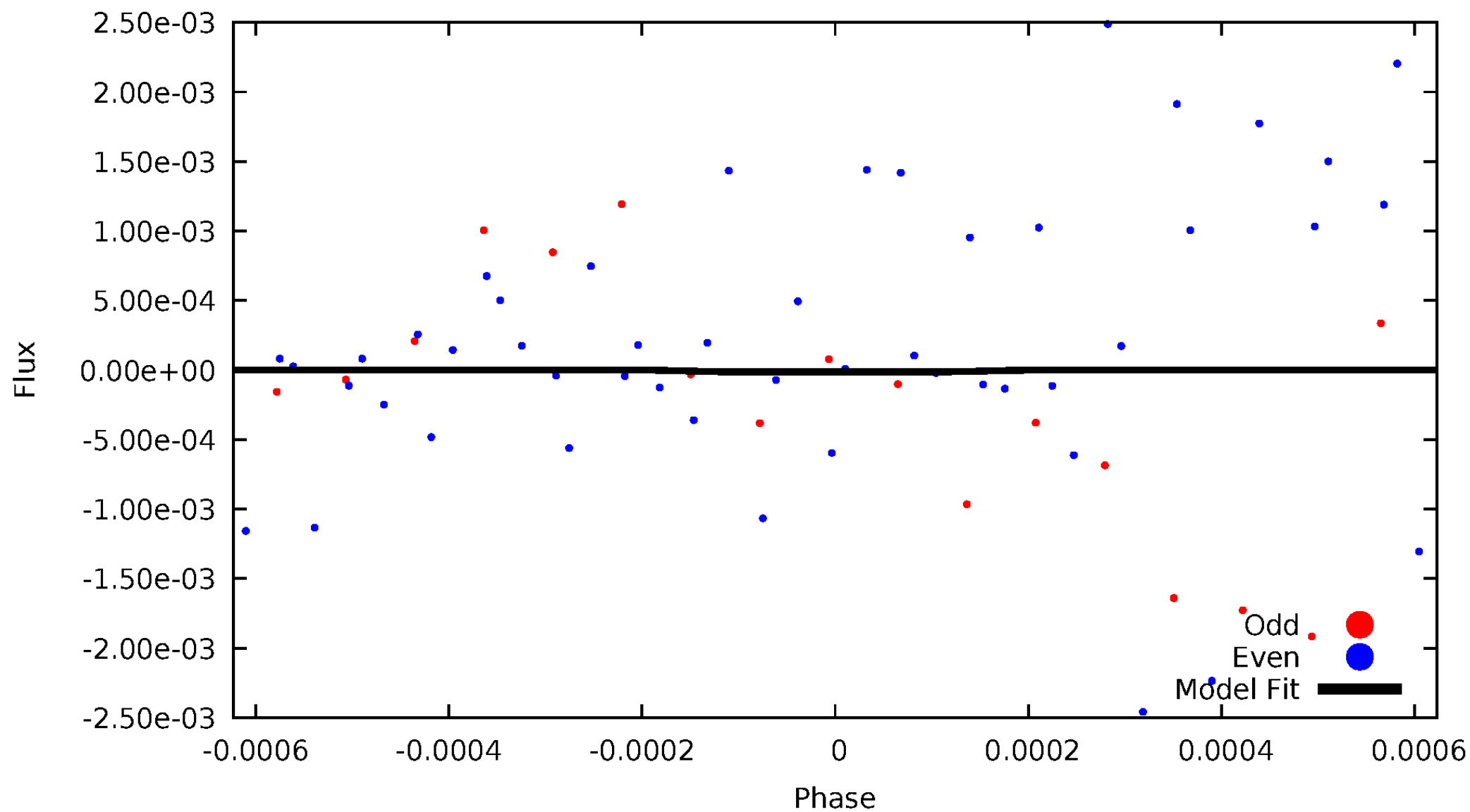
# DV Odd/Even

TCE 005098150-04



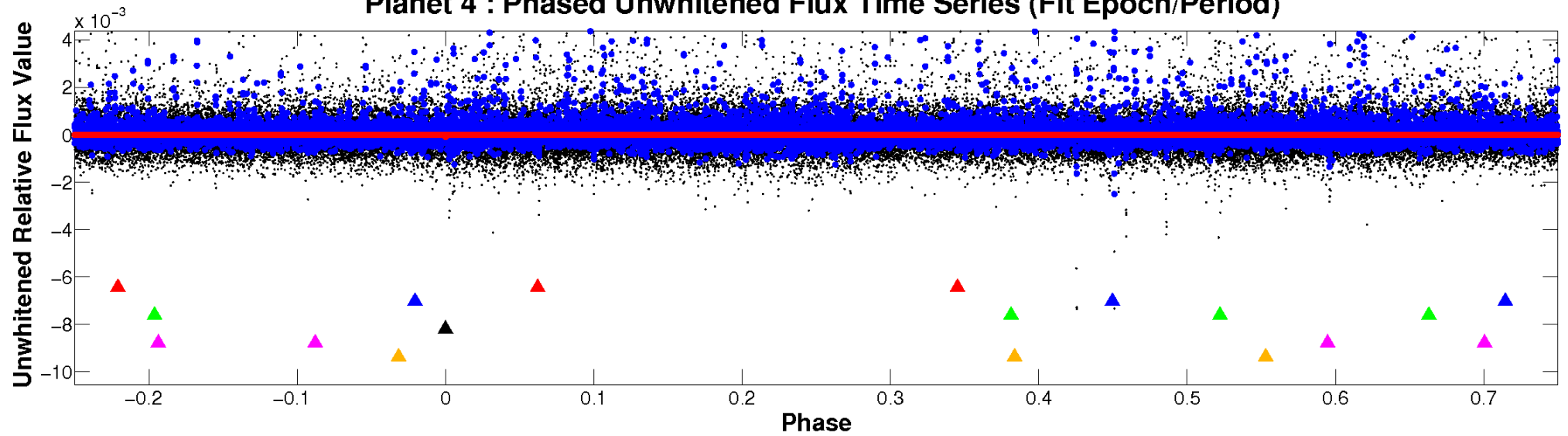
# ALT Odd/Even

TCE 005098150-04

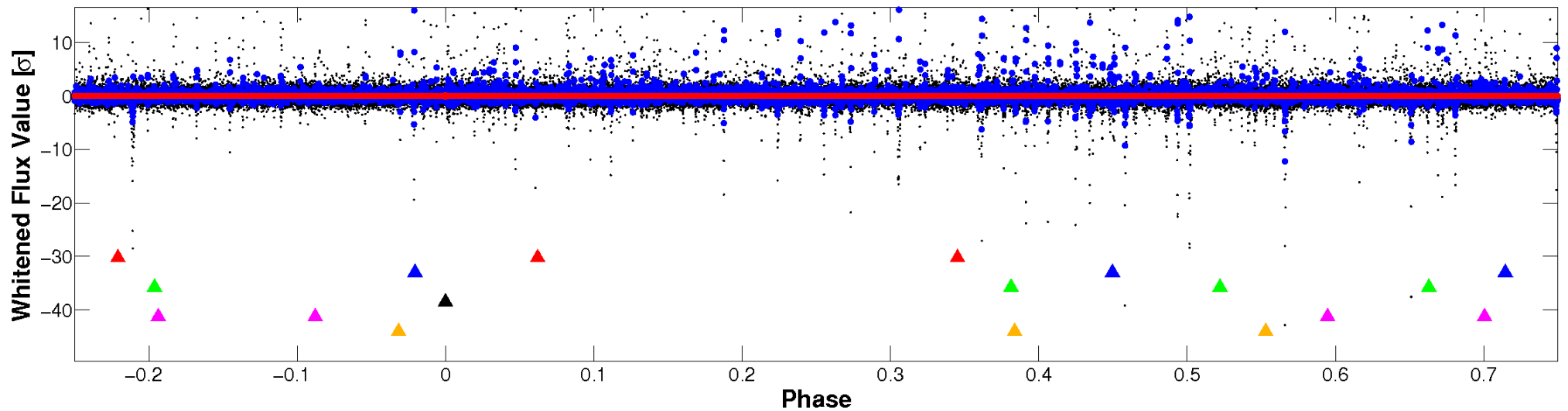


# Non-Whitened Vs. Whitened Light Curve

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

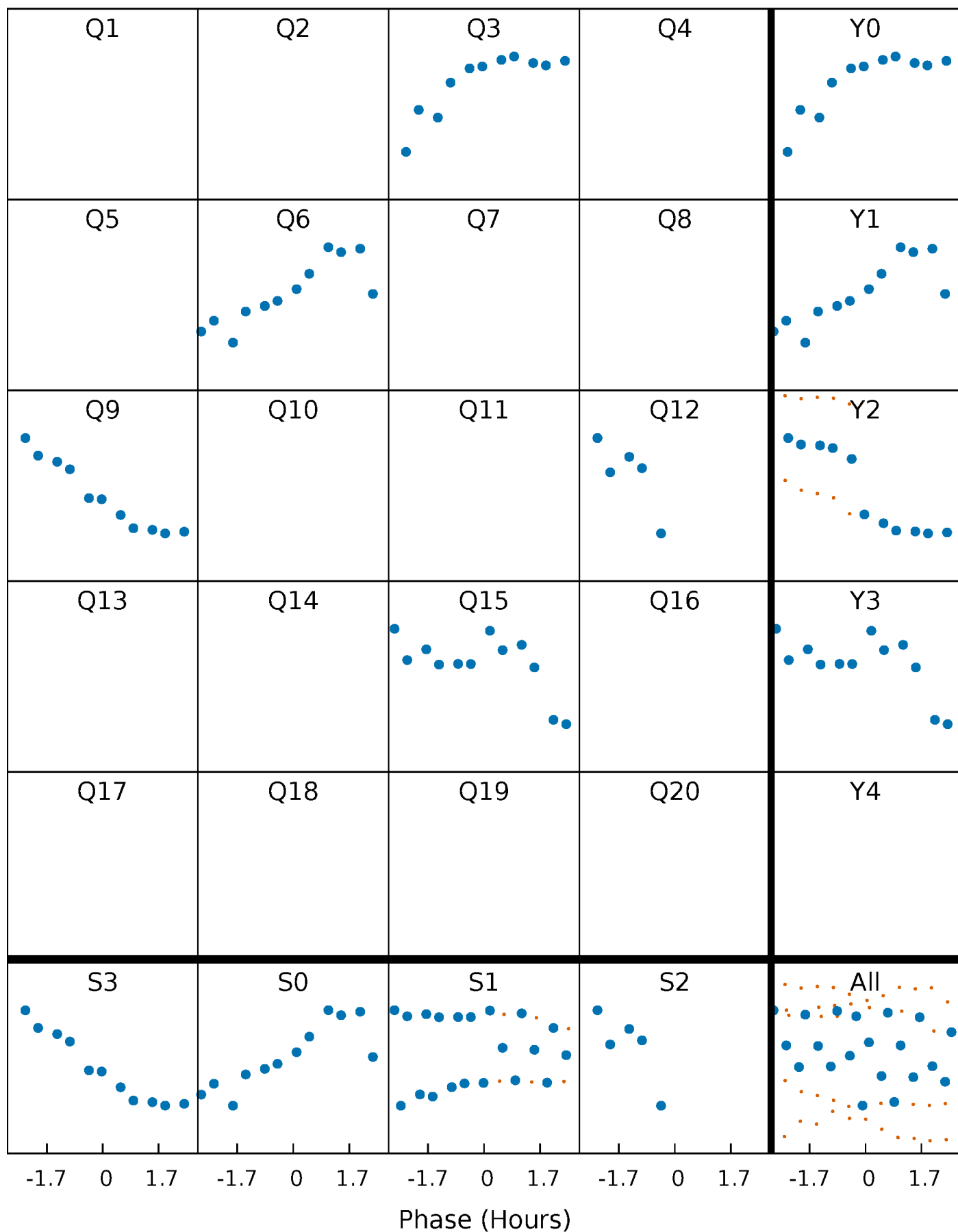


## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



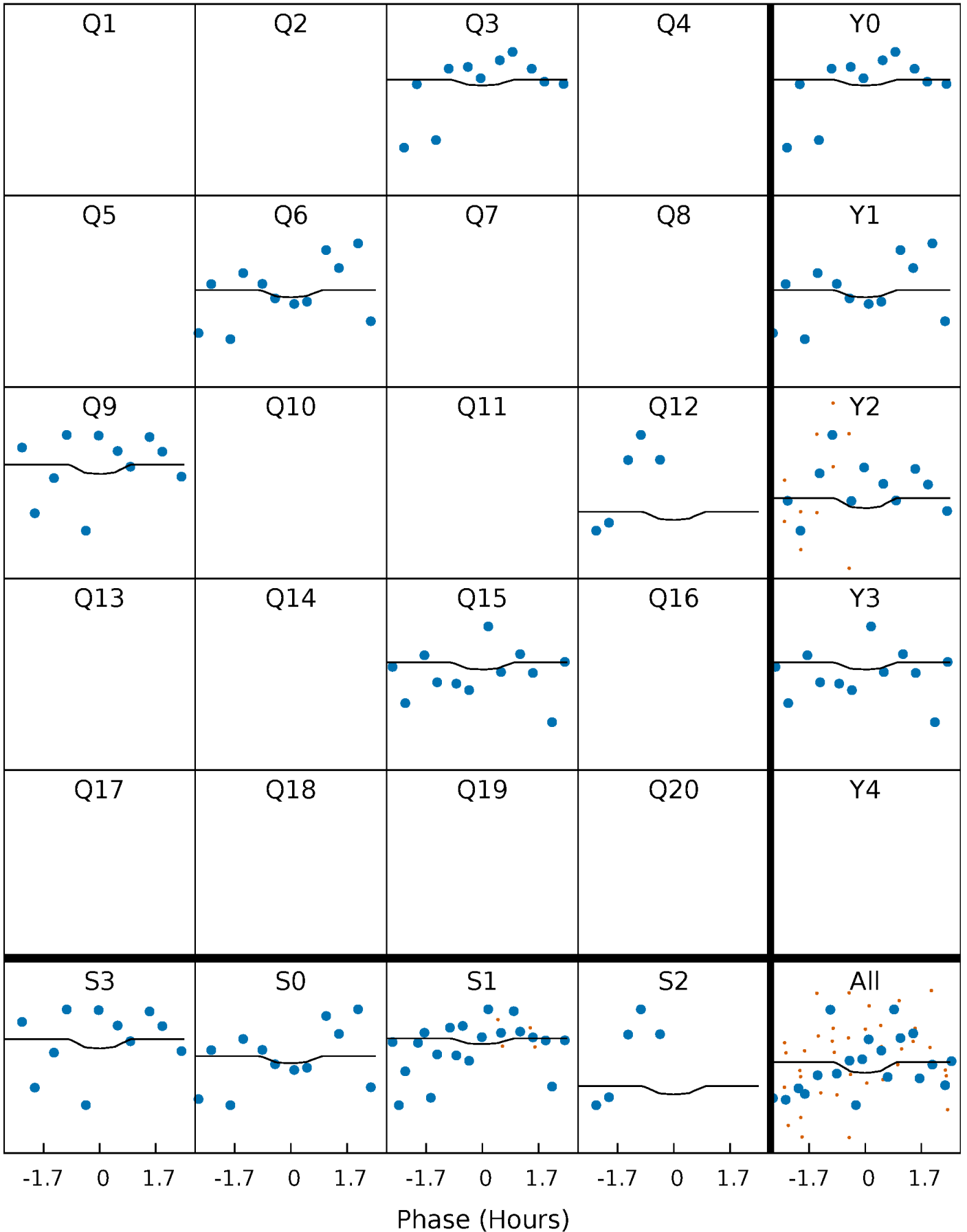
# PDC Quarter-Phased Transit Curves

TCE 005098150-04   P=285.843848 Days    $T_0=268.378494$  (BKJD)



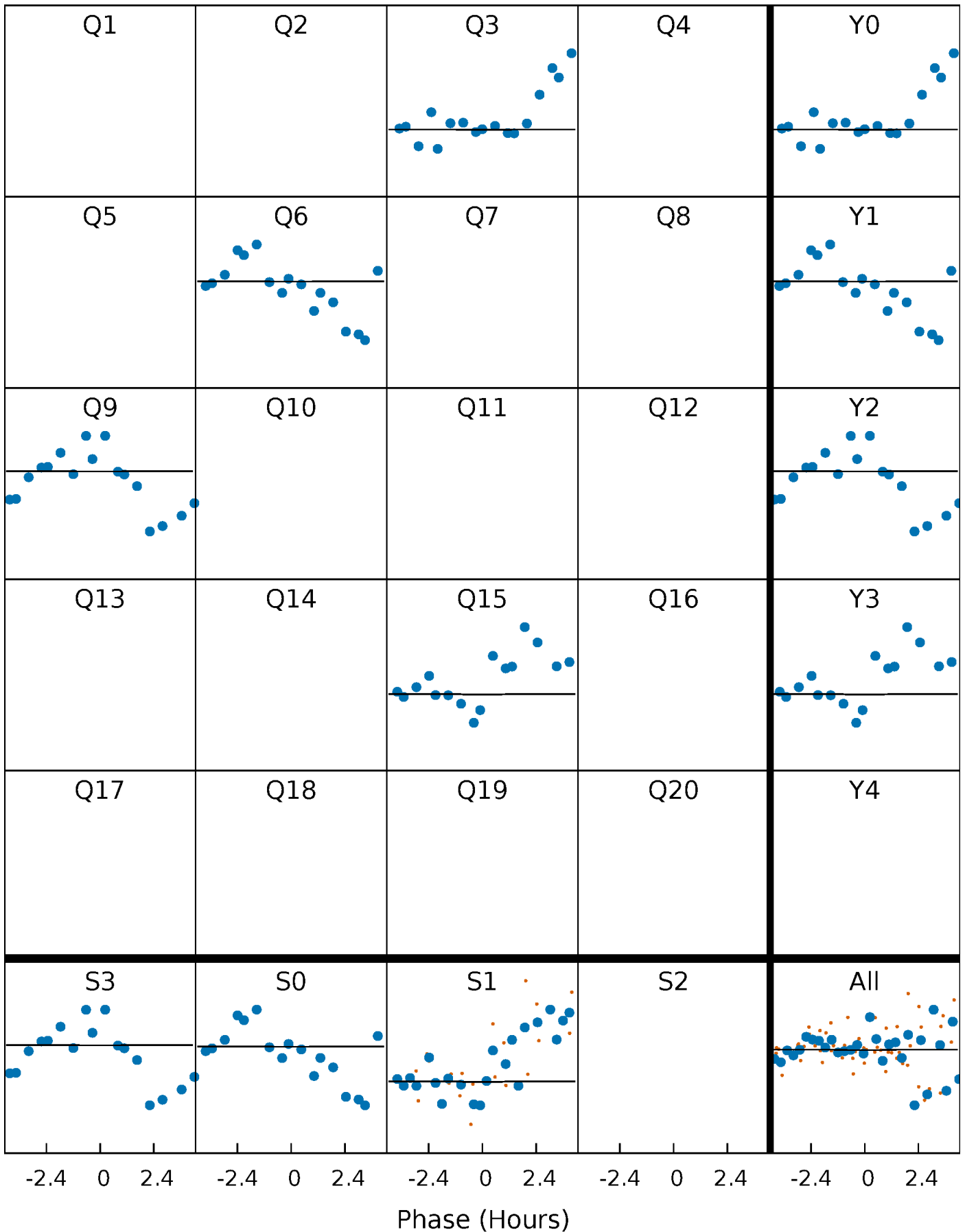
# DV Quarter-Phased Transit Curves

TCE 005098150-04     $P=285.843848$  Days     $T_0=268.378494$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

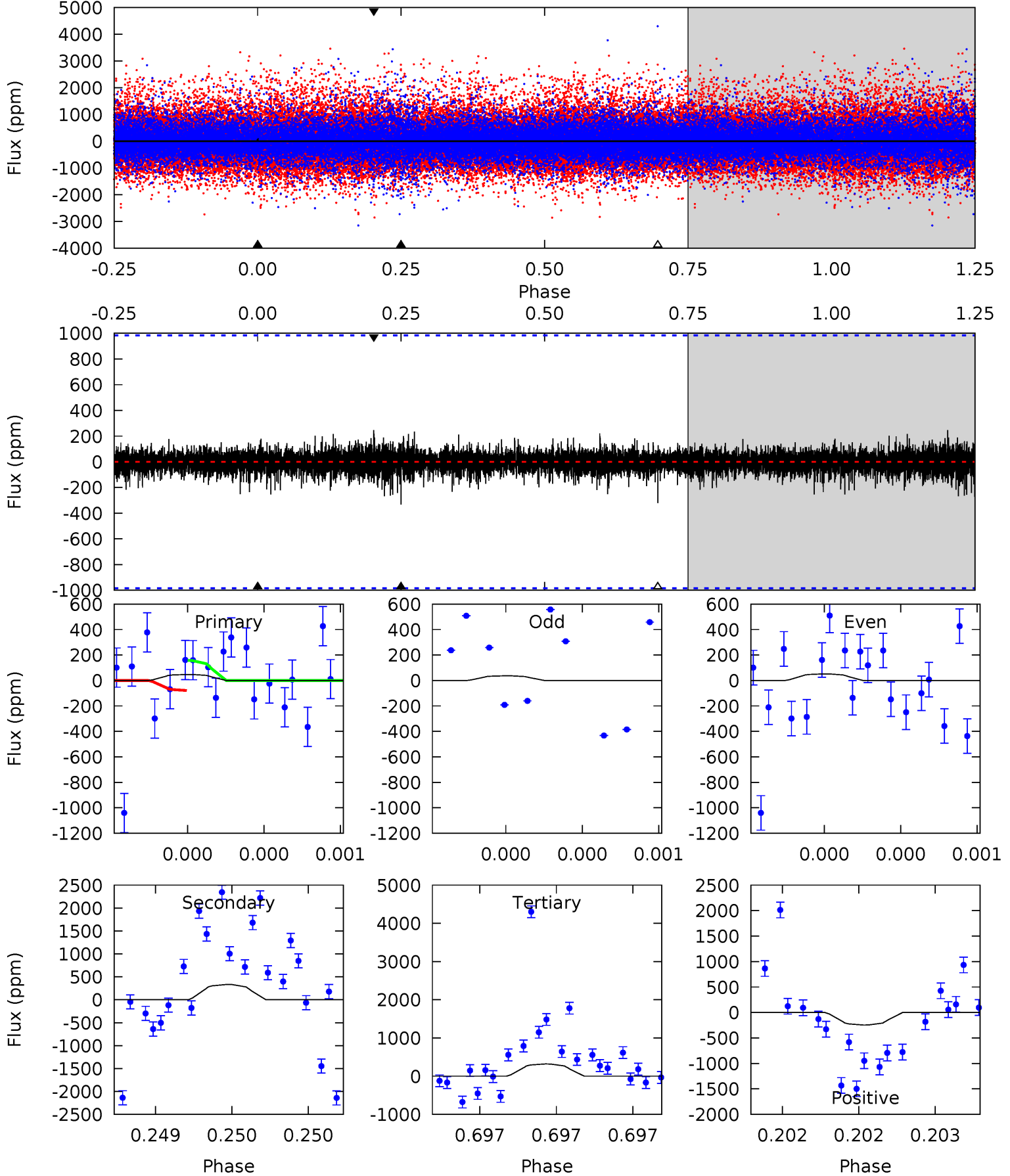
TCE 005098150-04 P=285.974001 Days  $T_0=268.395116$  (BKJD)



# DV Model-Shift Uniqueness Test

005098150-04, P = 285.843848 Days, E = 268.378494 Days

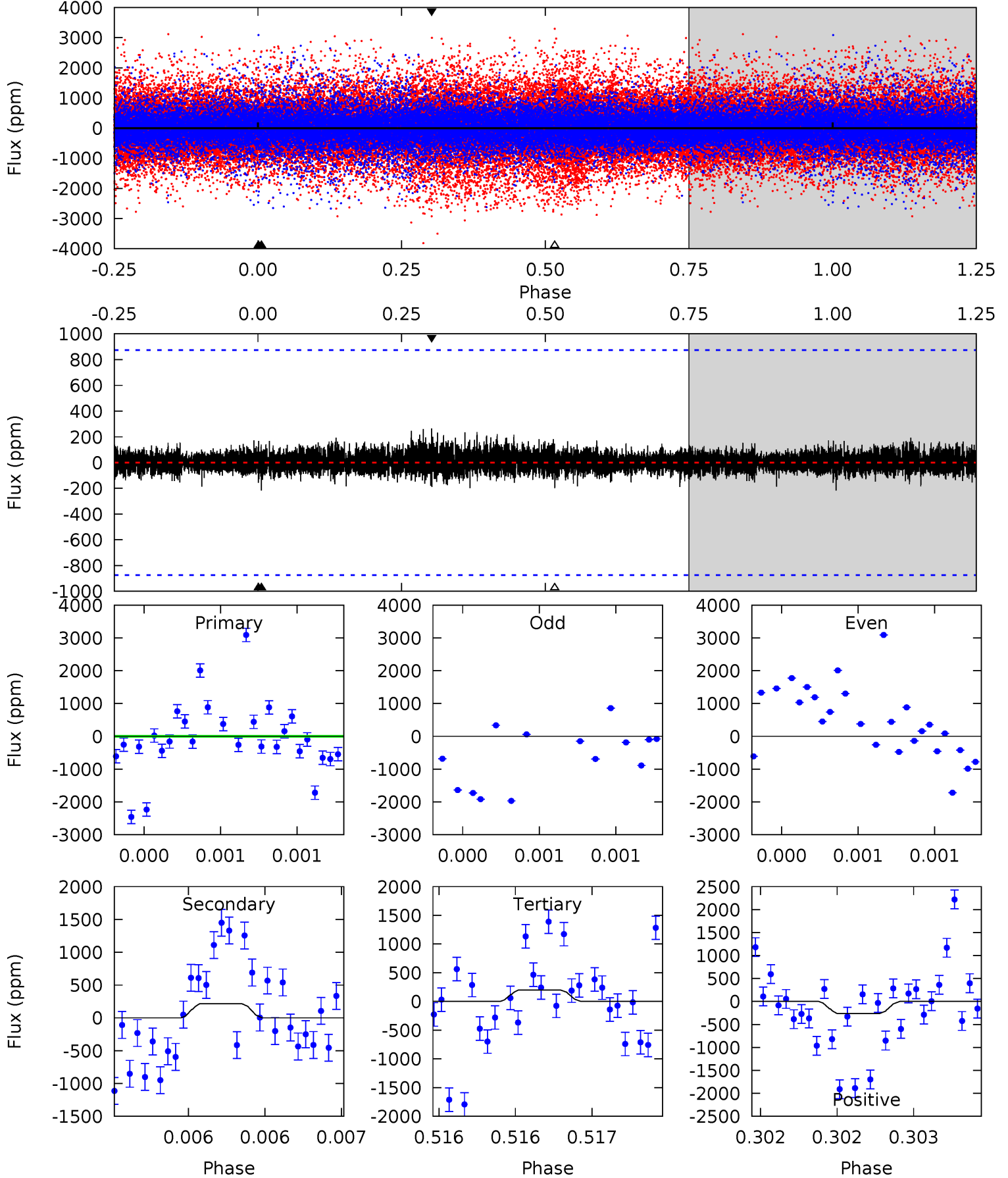
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
0.27	1.92	1.85	1.42	5.68	3.64	0.32	-1.58	-1.15	0.07	0.50	0.04	0.23	0.42	0.23



# Alt Model-Shift Uniqueness Test

005098150-04, P = 285.974001 Days, E = 268.395116 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
1.01	1.39	1.28	1.69	5.62	3.55	0.36	-0.27	-0.69	0.11	-0.30	0.03	3.15	0.55	1.08





### Stellar Parameters For KIC 005098150

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5328^{+159}_{-159}$	$4.482^{+0.110}_{-0.110}$	$-0.260^{+0.350}_{-0.300}$	$0.827^{+0.130}_{-0.106}$	$0.756^{+0.113}_{-0.052}$	$1.886^{+0.879}_{-0.601}$
	+3%/-3%	+2%/-2%	+135%/-115%	+16%/-13%	+15%/-7%	+47%/-32%
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 005098150-04 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-333 \pm 173$	$19.63^{+23.33}_{-13.60}$	$339^{+17}_{-17}$	$2364^{+957}_{-401}$	$255^{+2649}_{-212}$
Alt.	$-216 \pm 156$	$19.49^{+23.79}_{-14.08}$	$340^{+17}_{-17}$	$2242^{+872}_{-485}$	$144^{+1988}_{-130}$

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

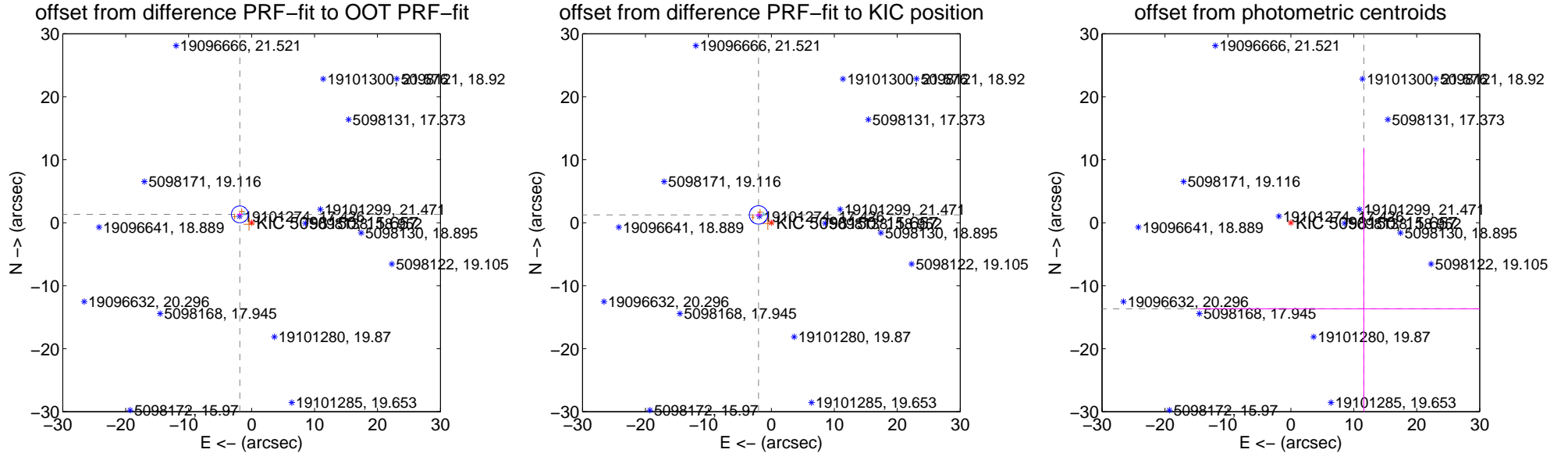
## DV Centroid Data

Supplemental centroid analysis for 005098150-04. Kepler magnitude: 15.66. Transit SNR 0.37

There are 1 quarters with good PRF difference image offsets

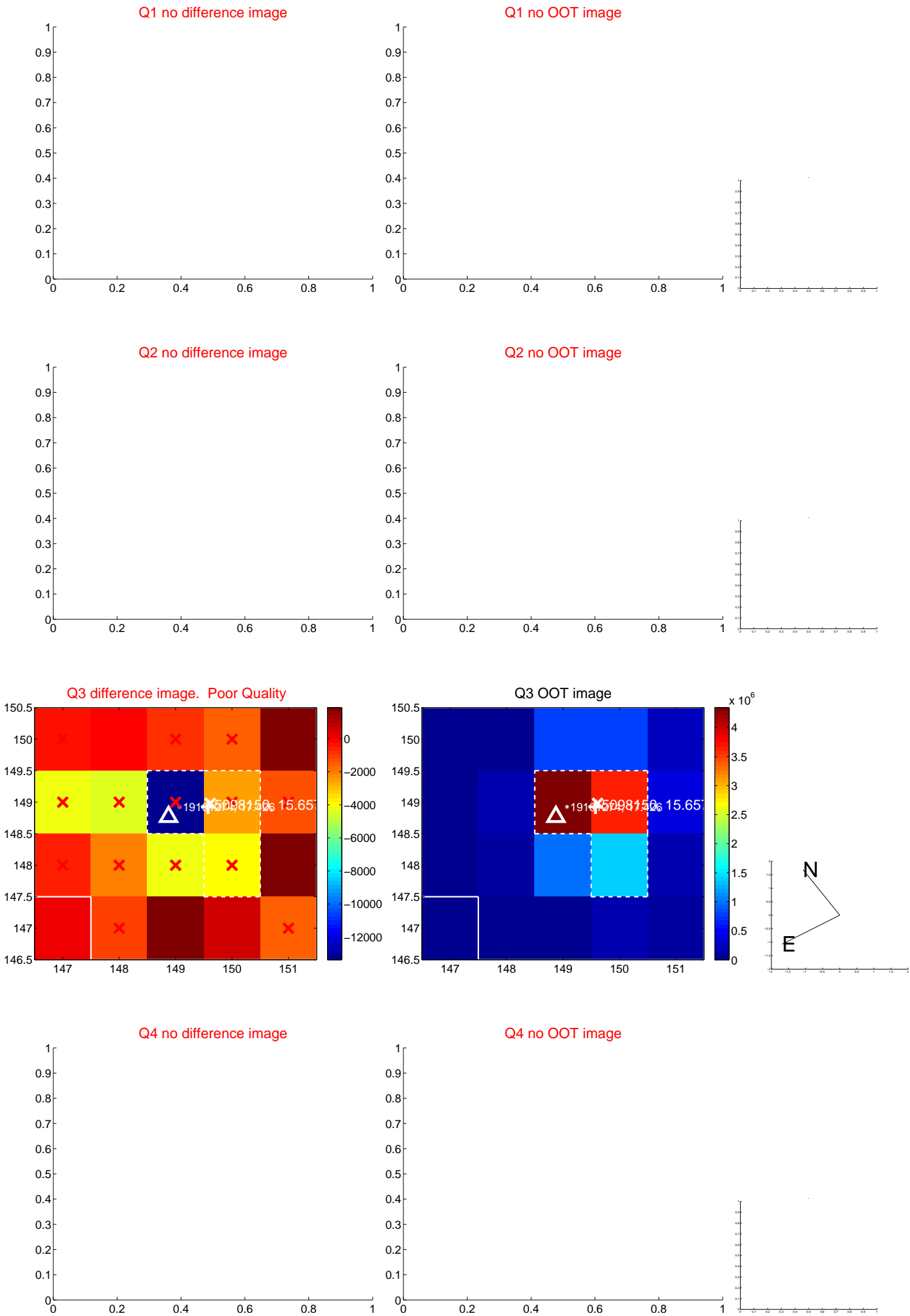
The direct PRF centroid is offset from the target star catalog position by about 0.25 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$2.287 \pm 0.446$	5.13	$1.864 \pm 0.501$	$1.325 \pm 0.310$
PRF-fit source offset from KIC position	$2.385 \pm 0.487$	4.90	$2.038 \pm 0.543$	$1.239 \pm 0.286$
photometric centroid source offset	$17.92 \pm 25.87$	0.69	$-11.59 \pm 26.42$	$-13.67 \pm 25.47$

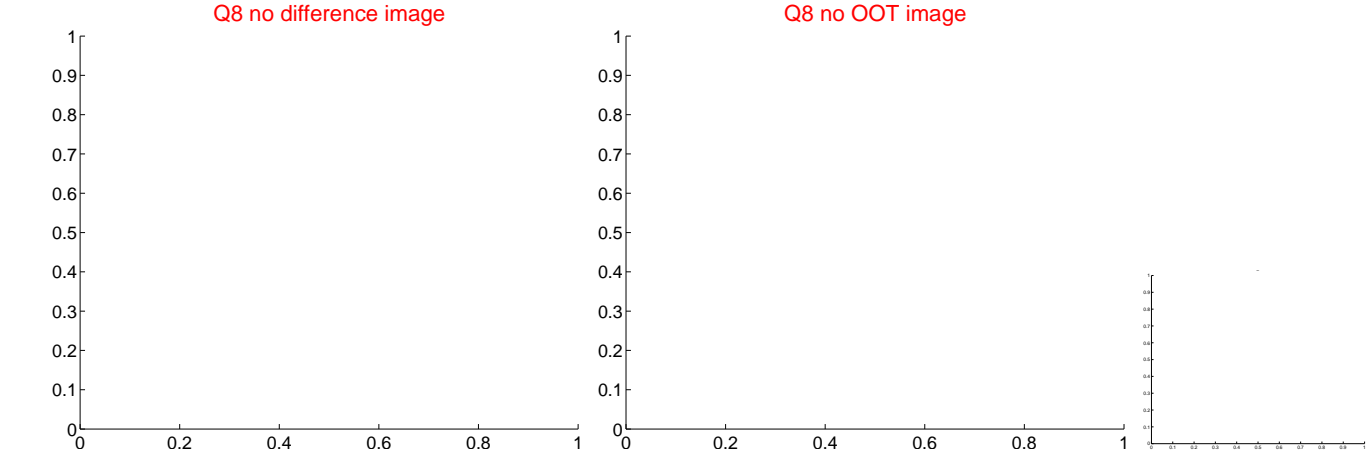
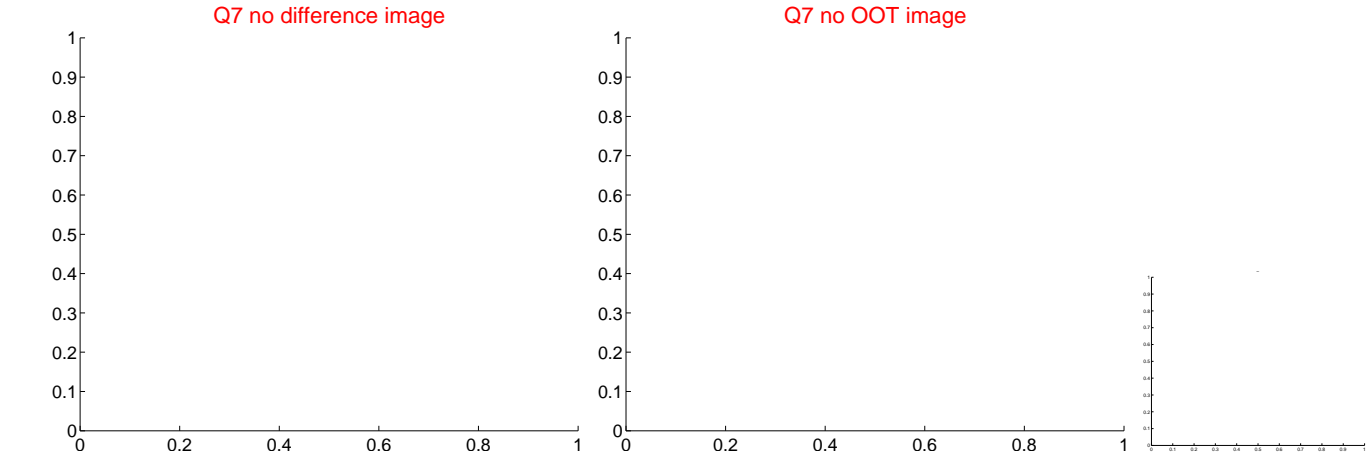
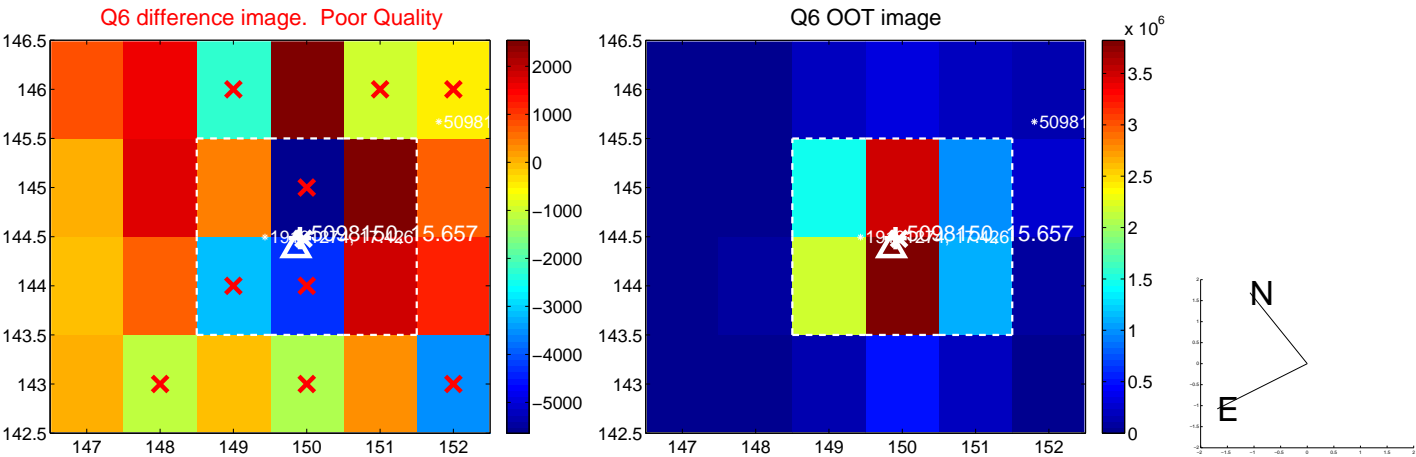
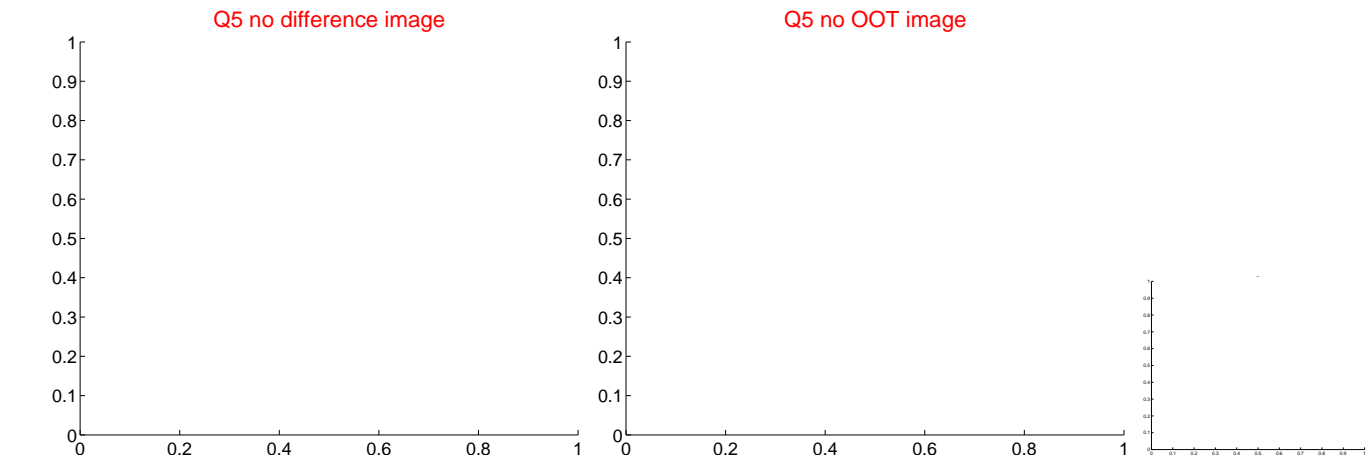


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

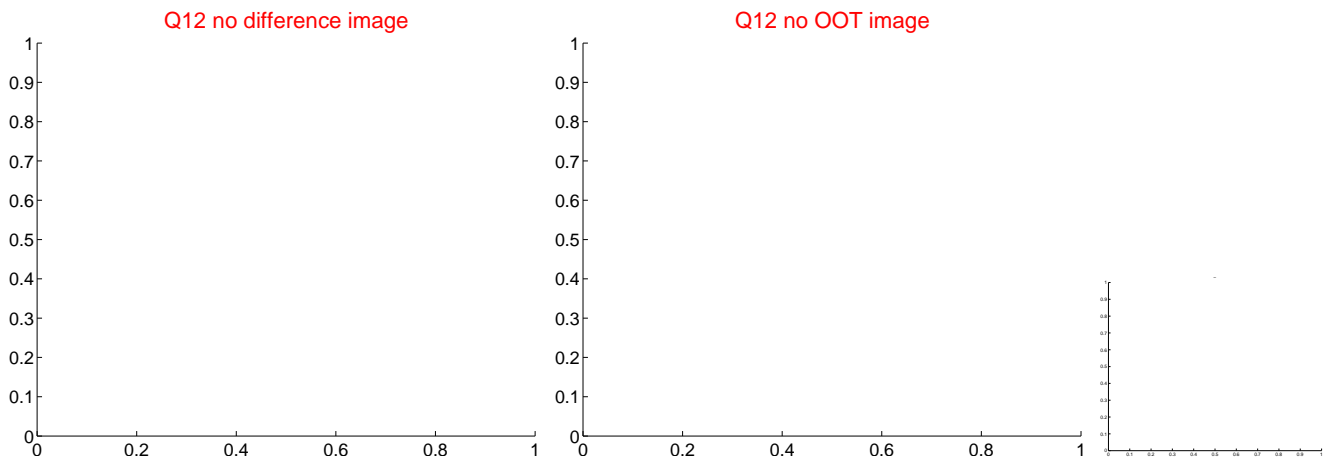
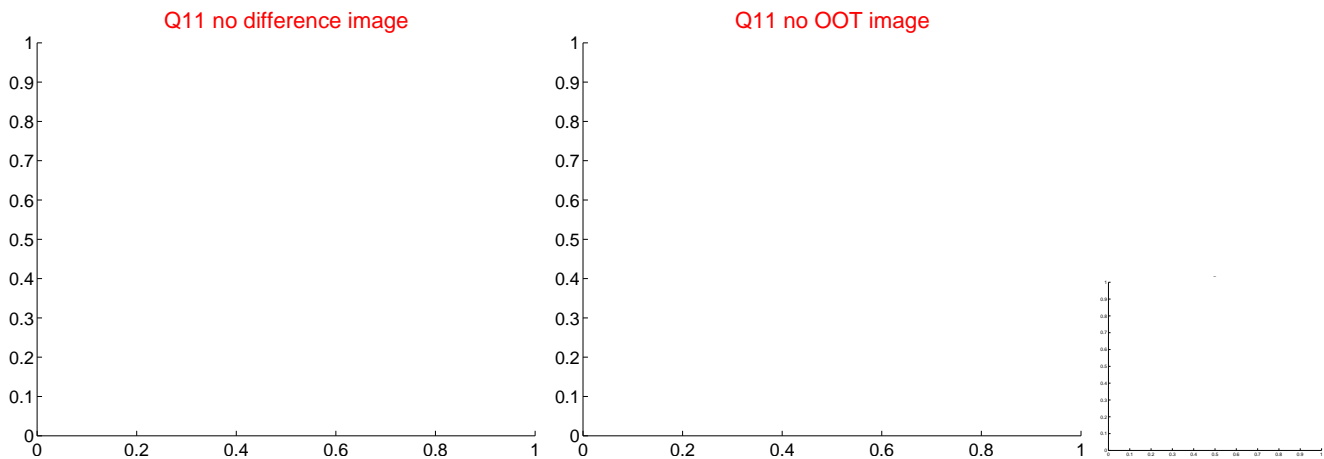
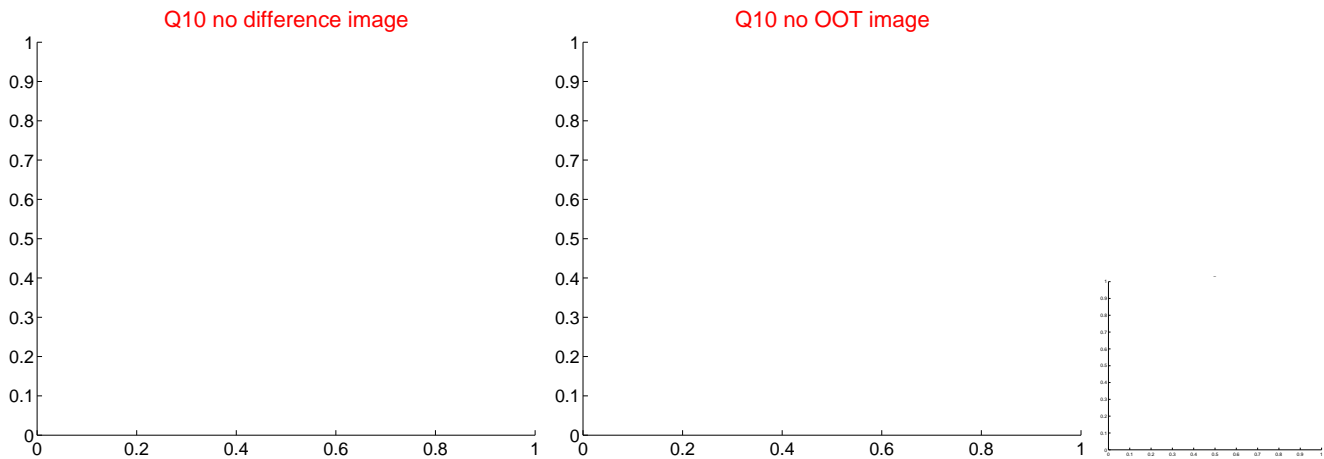
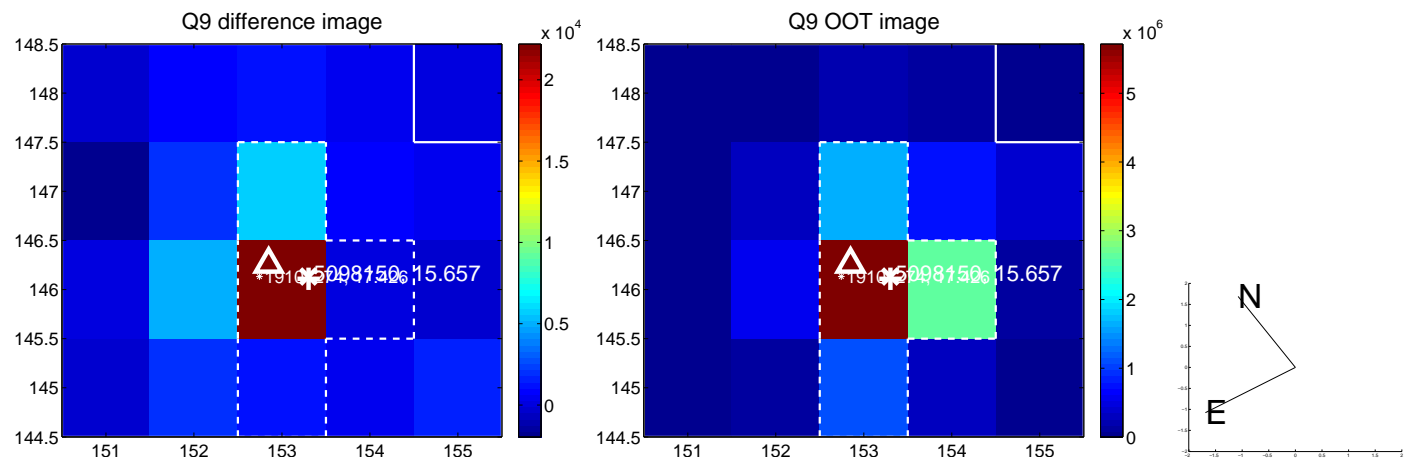
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



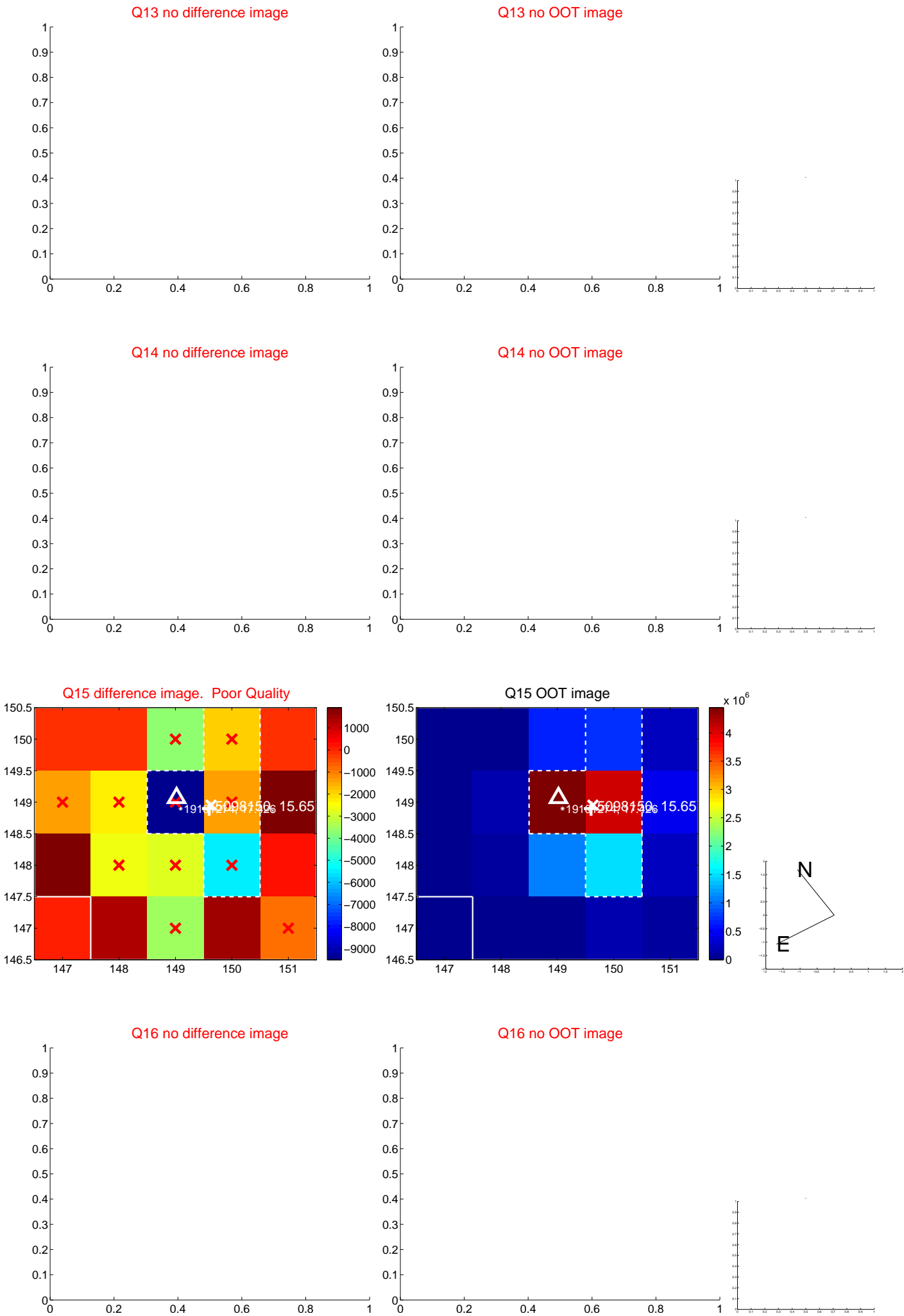
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



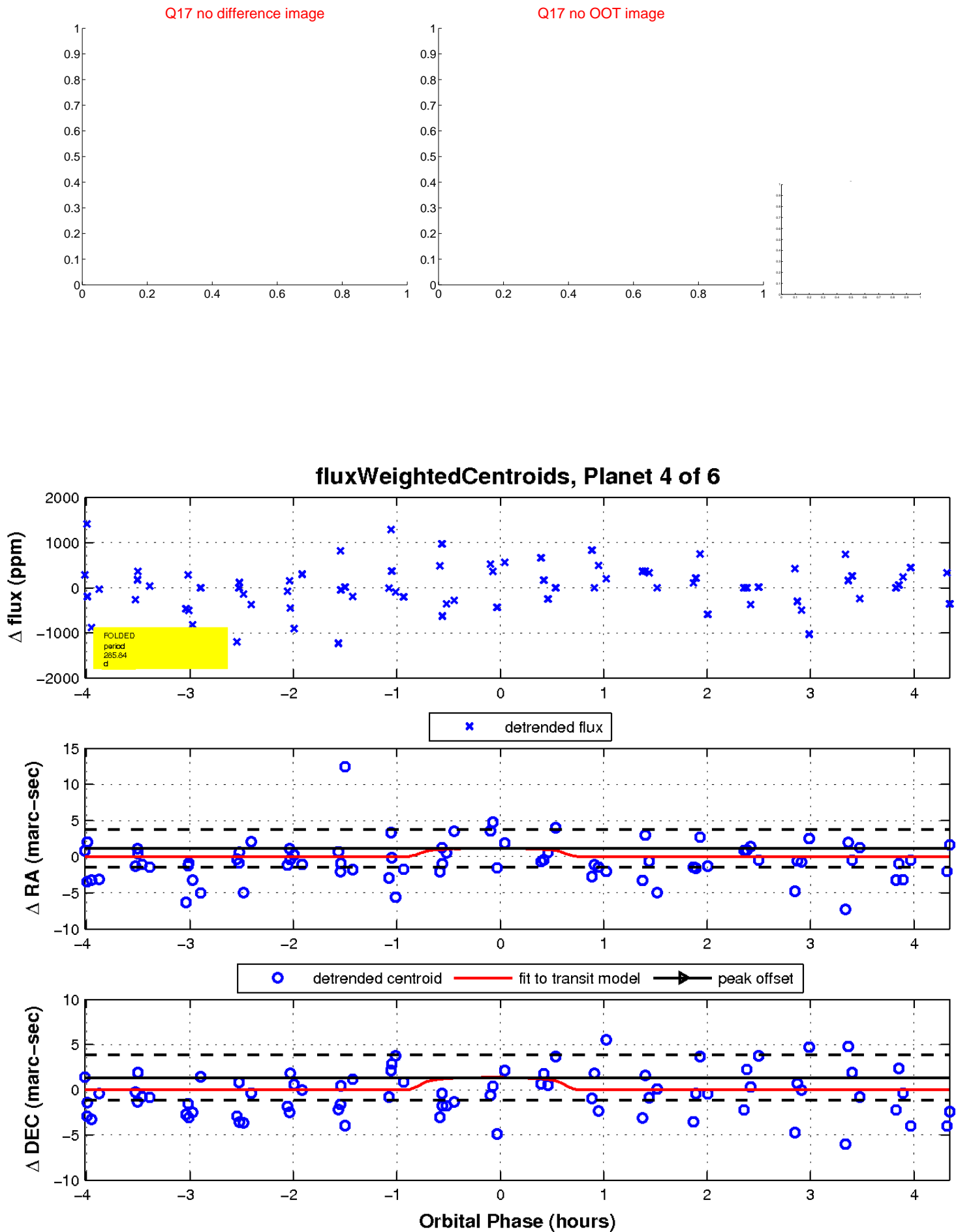
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



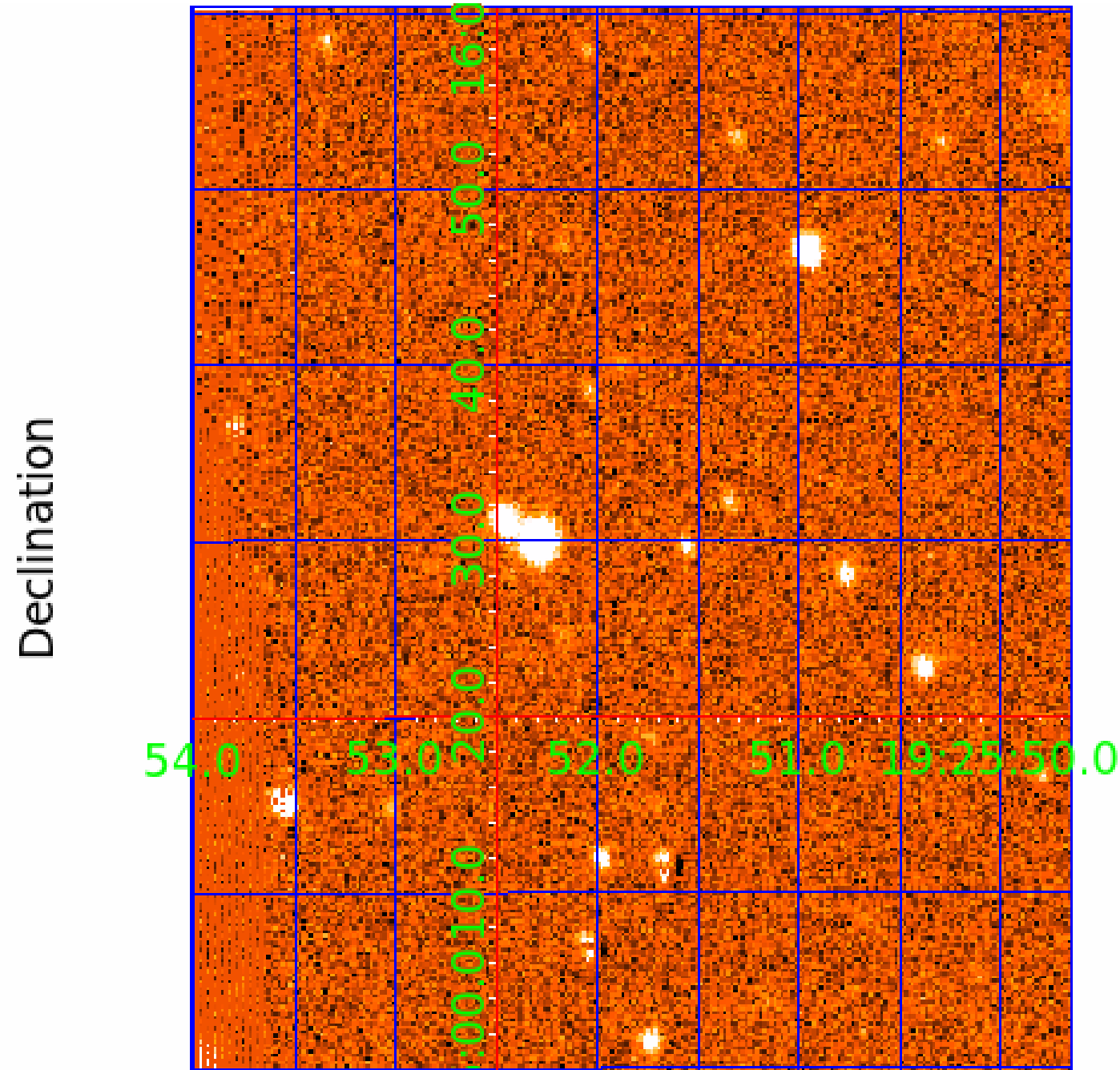
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



UKIRT Image





# KIC 005098150

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
005098150-01	OBS	No	366.745359	491.094434	865.9	0.640	17.3	1.4	0.83	5328	2.76	0.59
005098150-02	OBS	No	495.967471	262.511597	2824.4	16.798	16.2	6.5	0.83	5328	4.32	0.40
005098150-03	OBS	No	326.099826	377.381770	2170.5	3.821	14.6	8.1	0.83	5328	3.78	0.69
005098150-04	OBS	No	285.843848	268.378494	98.5	1.451	10.4	0.4	0.83	5328	0.82	0.82
005098150-05	OBS	No	316.084541	438.389119	6140.2	53.938	10.4	6.6	0.83	5328	12.04	0.72
005098150-06	OBS	No	404.564736	426.463441	1512.7	3.963	10.8	4.5	0.83	5328	3.32	0.52

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
005098150-01	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_CHASES_MARSHALL_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV— MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS—HALO_GHOST
005098150-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_ZUMA—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
005098150-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_SKYE—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV— MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
005098150-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_ZUMA_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV— MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
005098150-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
005098150-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_TRACKER—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—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.

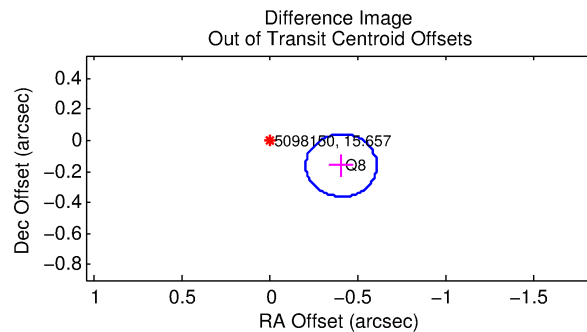
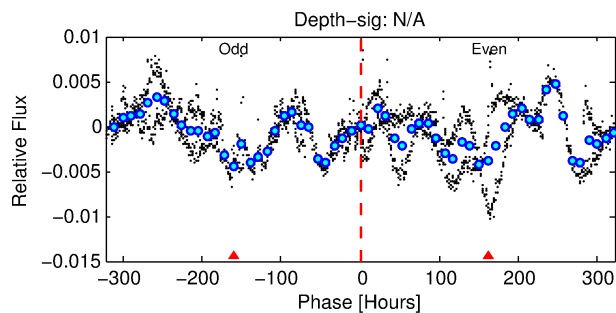
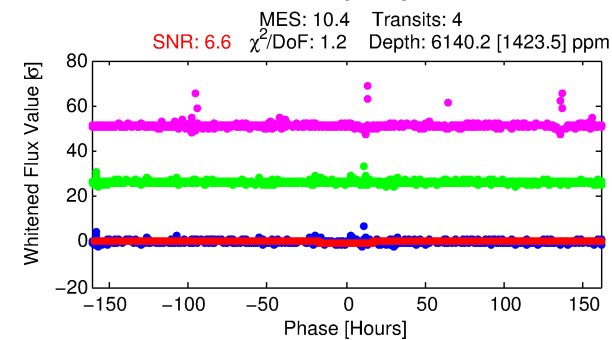
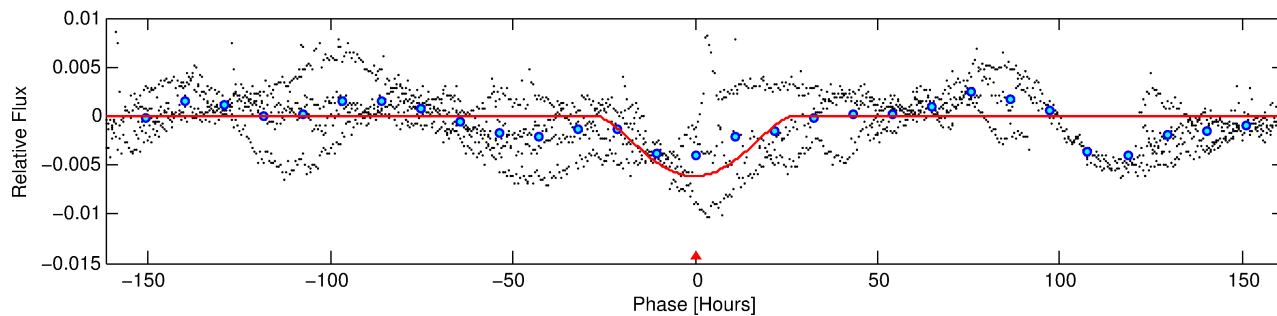
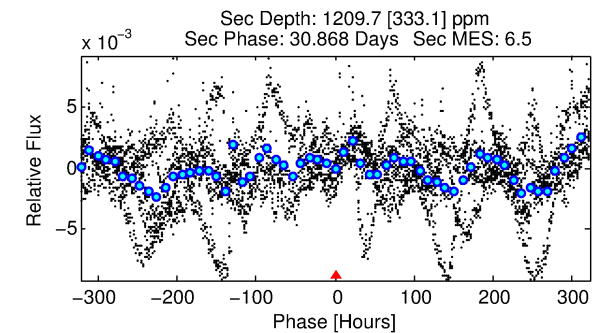
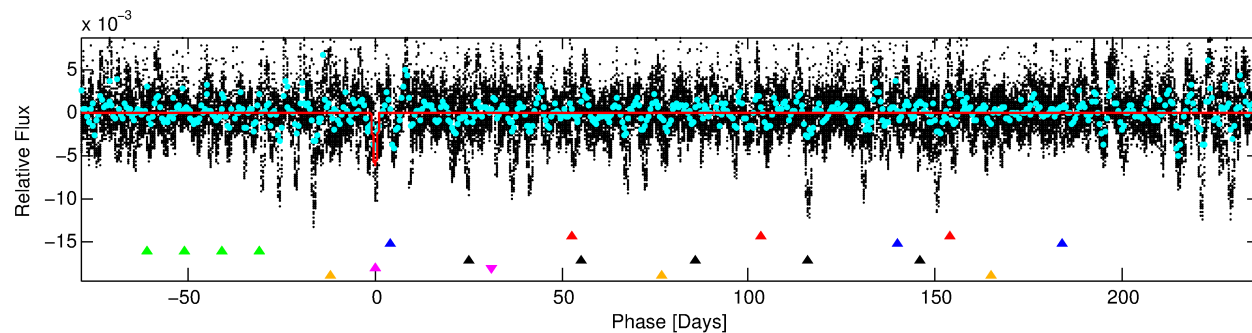
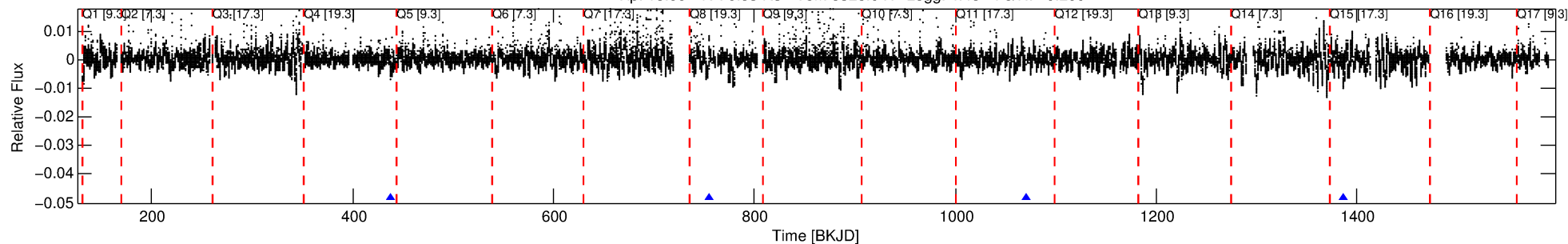
Ephemeris Match Information For 005098150-05

No Significant Match Found

# DV One-Page Summary

KIC: 5098150 Candidate: 5 of 6 Period: 316.085 d

Kp: 15.66 R\*: 0.83 Rs Teff: 5328.0 K Logg: 4.48 Fe/H: -0.260



## DV Fit Results:

Period = 316.08454 [0.07403] d  
Epoch = 438.3891 [0.1068] BKJD  
Rp/R\* = 0.1334 [0.3122]  
a/R\* = 23.92 [9.39]  
b = 1.00 [0.42]  
Seff = 0.72 [0.17]  
Teq = 235 [14] K  
Rp = 12.03 [28.24] Re  
a = 0.8278 [0.1114] AU  
Ag = 3148.57 [14781.01] [0.21σ]  
Teffp = 2721 [3192] K [0.78σ]

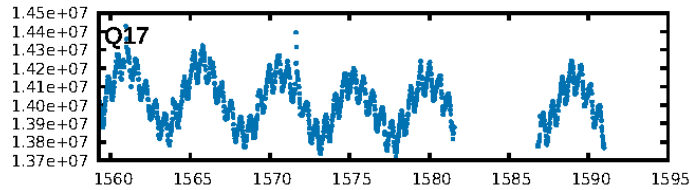
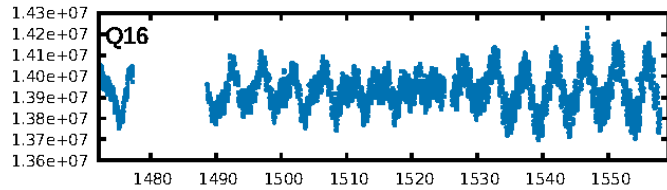
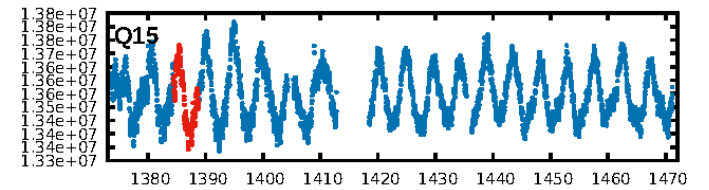
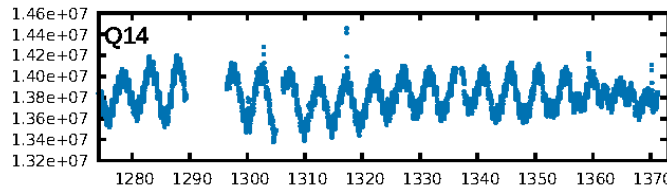
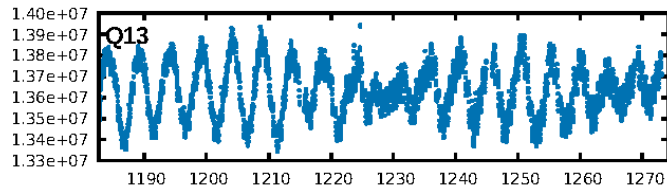
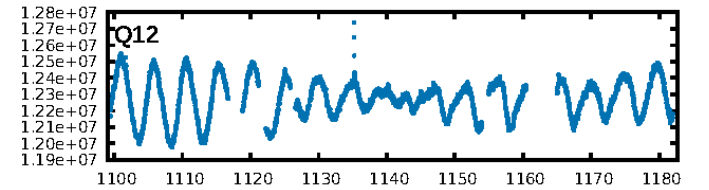
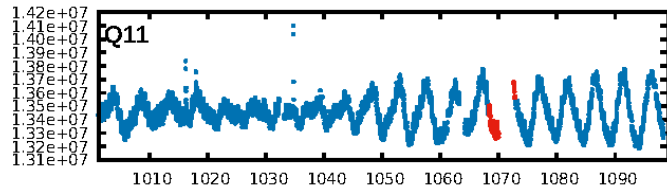
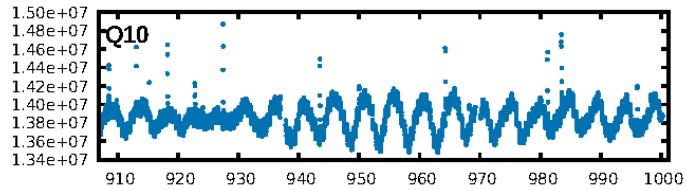
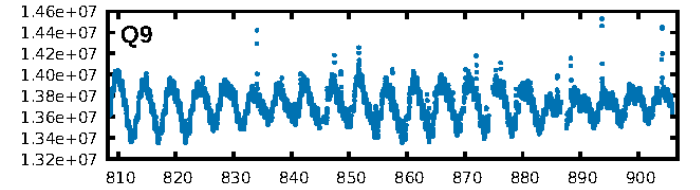
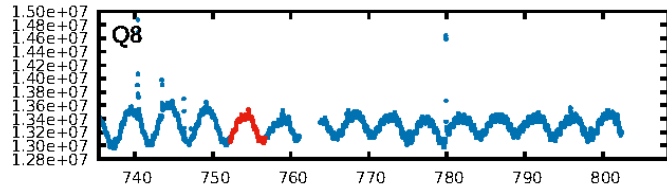
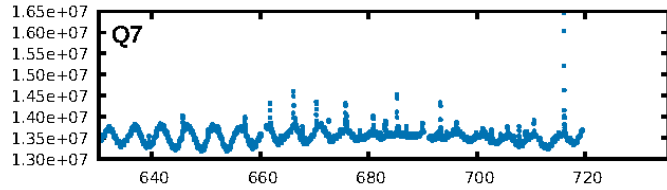
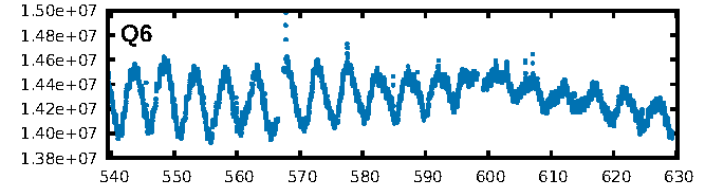
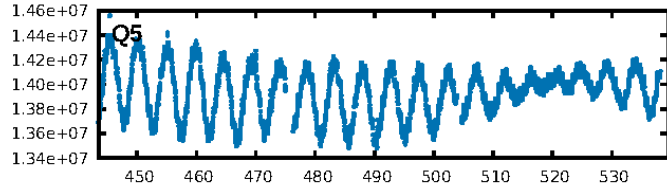
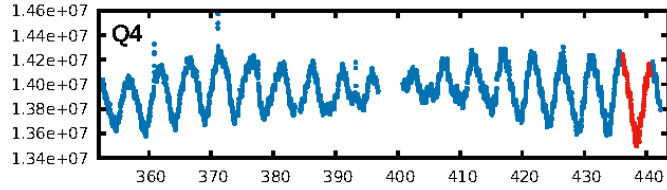
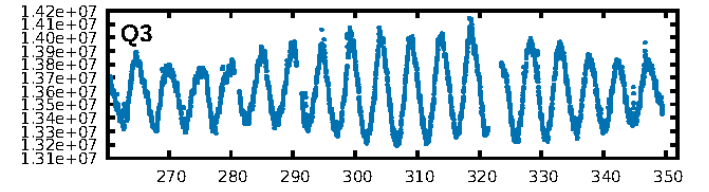
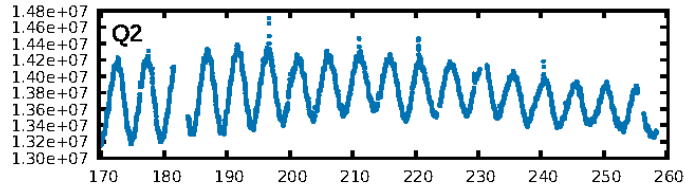
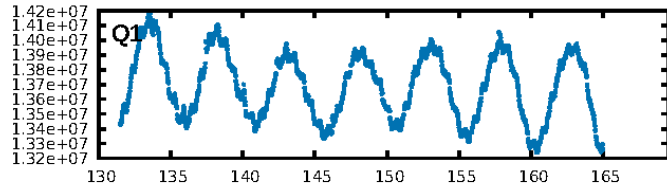
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [13.45σ]  
LongPeriod-sig: 100.0% [4.45σ]  
ModelChiSquare2-sig: 18.4%  
ModelChiSquareGof-sig: 100.0%  
**Bootstrap-pfa: 2.70e-08**  
RollingBand-fgt: 1.00 [4/4]  
**GhostDiagnostic-chr: 0.3619**  
Centroid-sig: 61.8%  
Centroid-so: 0.080 arcsec [0.45σ]  
**OotOffset-rm: 0.437 arcsec [6.48σ]**  
KicOffset-rm: 0.197 arcsec [2.93σ]  
OotOffset-st: 0/0/1/0 [1]  
KicOffset-st: 0/0/1/0 [1]  
DiffImageQuality-fgm: 0.00 [0/1]  
DiffImageOverlap-fno: 1.00 [1/1]

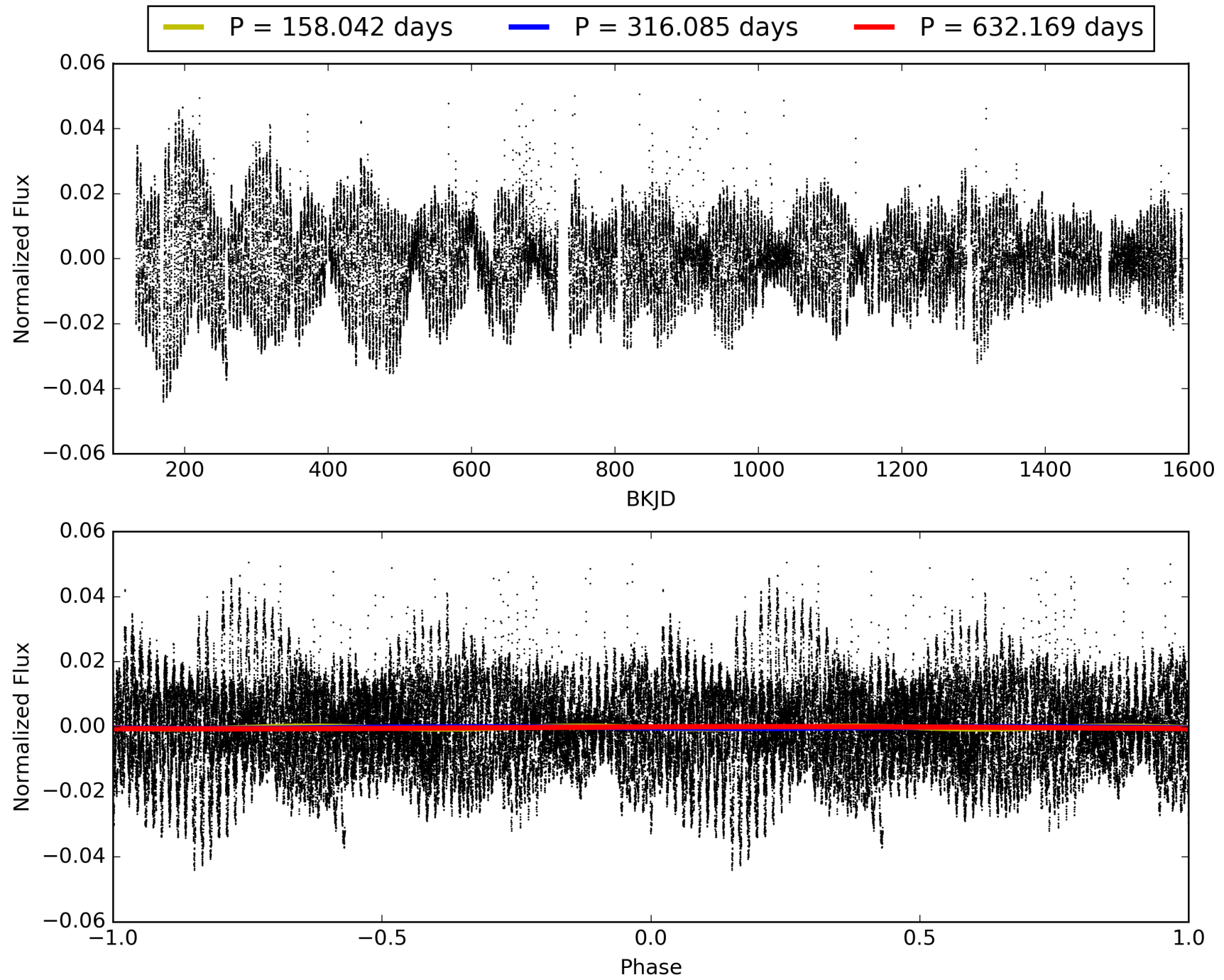
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 12:55:54 Z

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

# TCE 005098150-05, PDC Light Curves

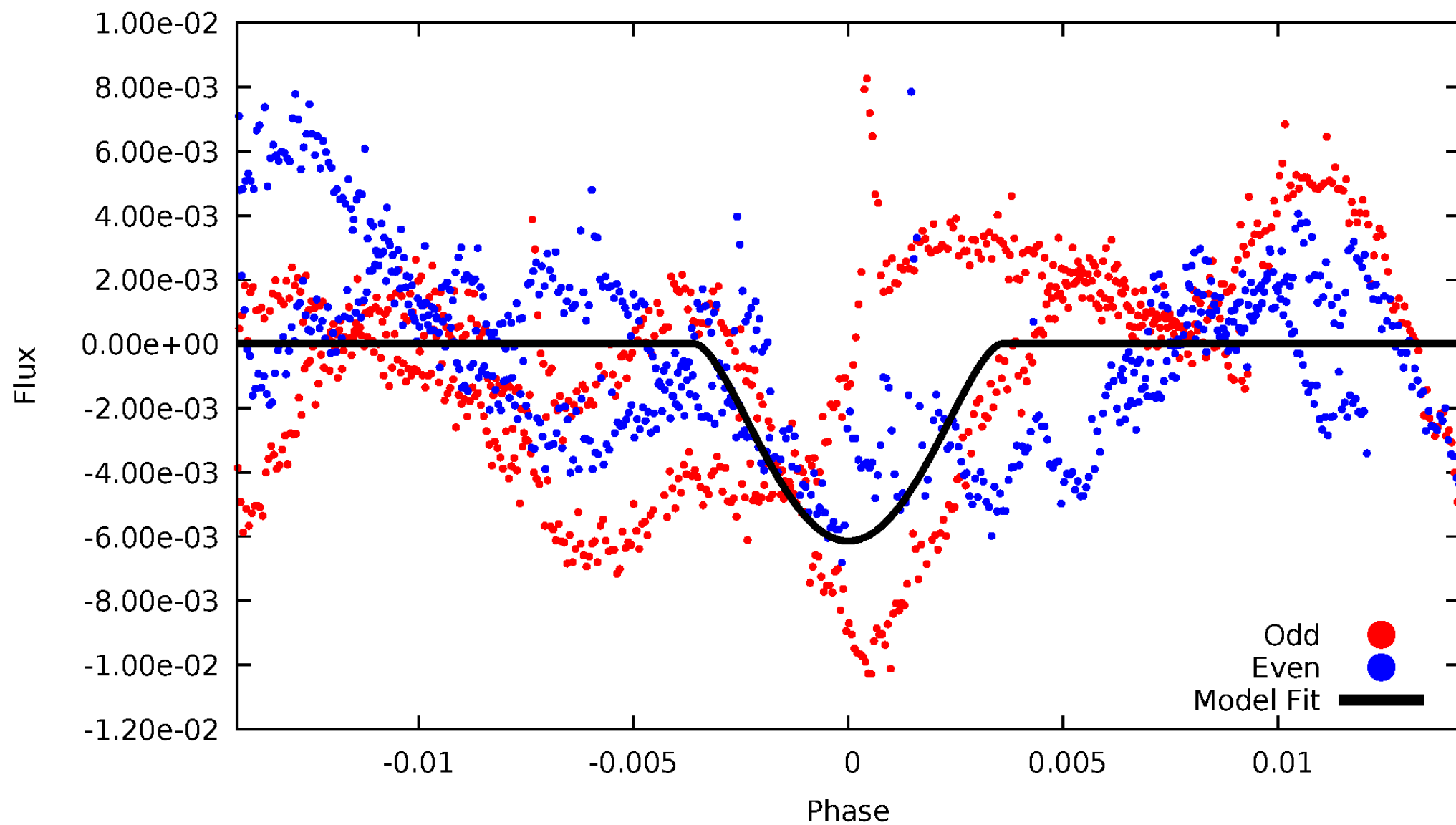


TCE 005098150-05



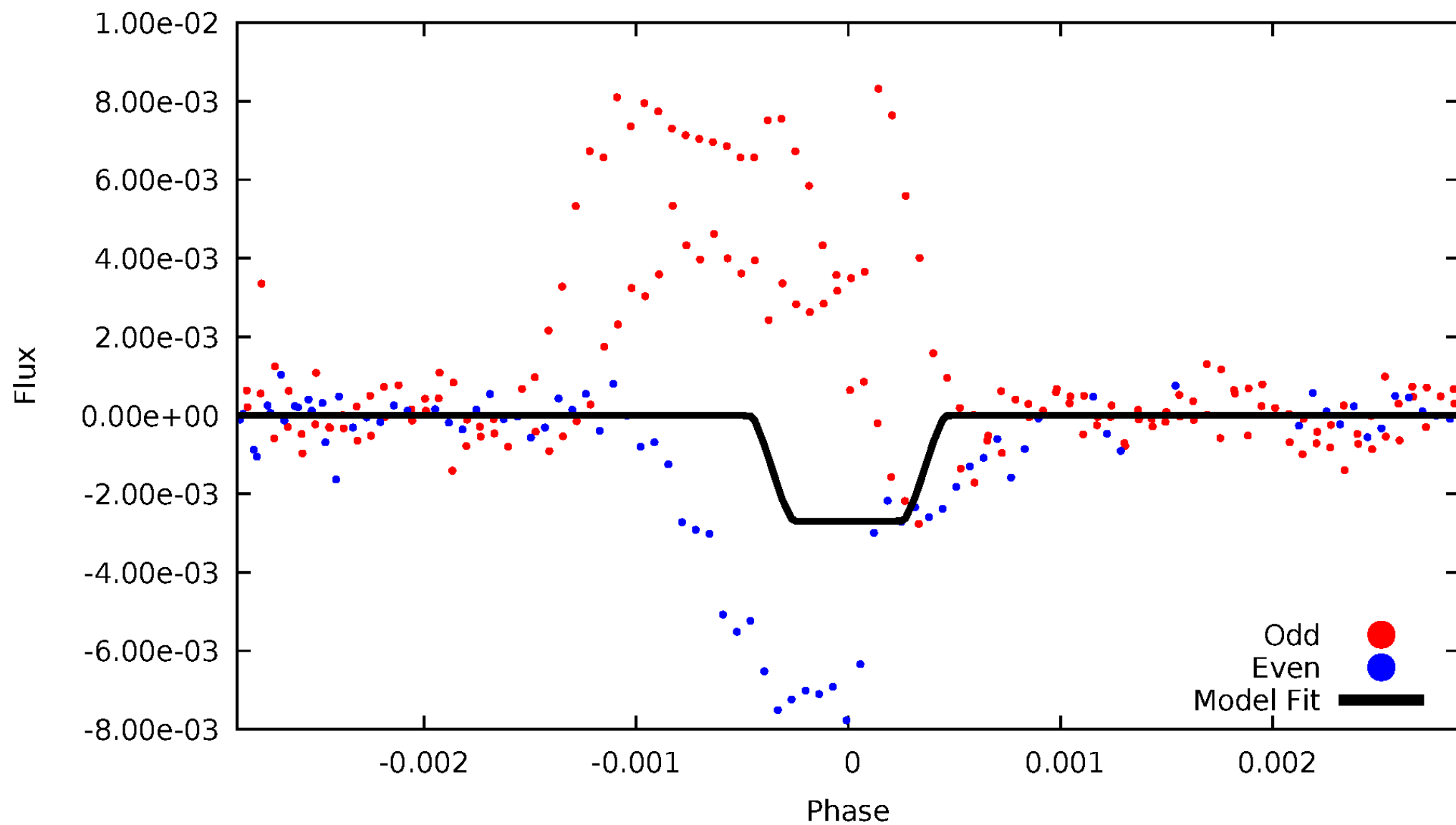
# DV Odd/Even

TCE 005098150-05



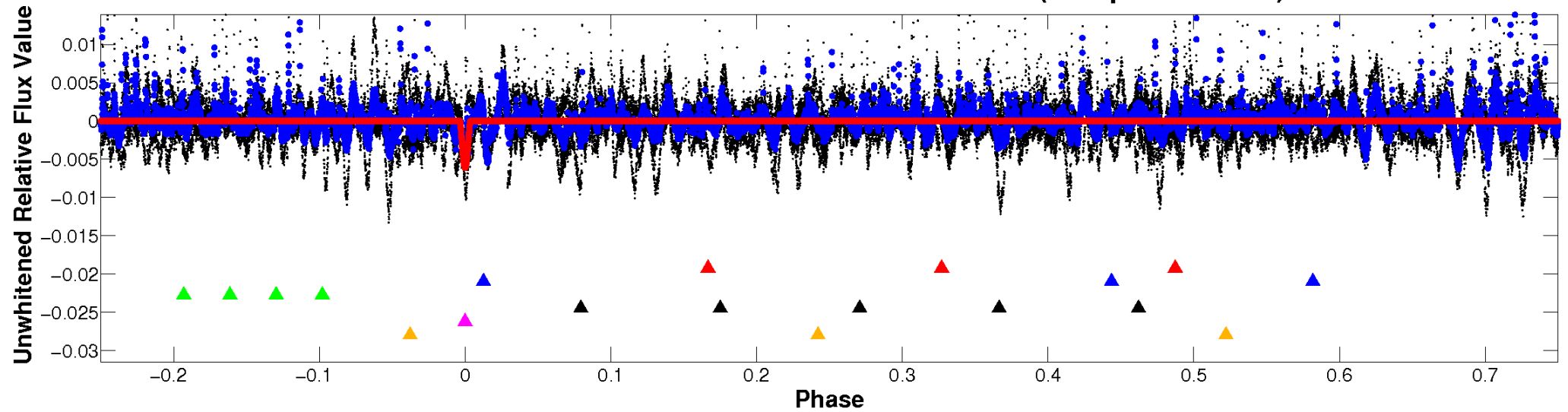
# ALT Odd/Even

TCE 005098150-05

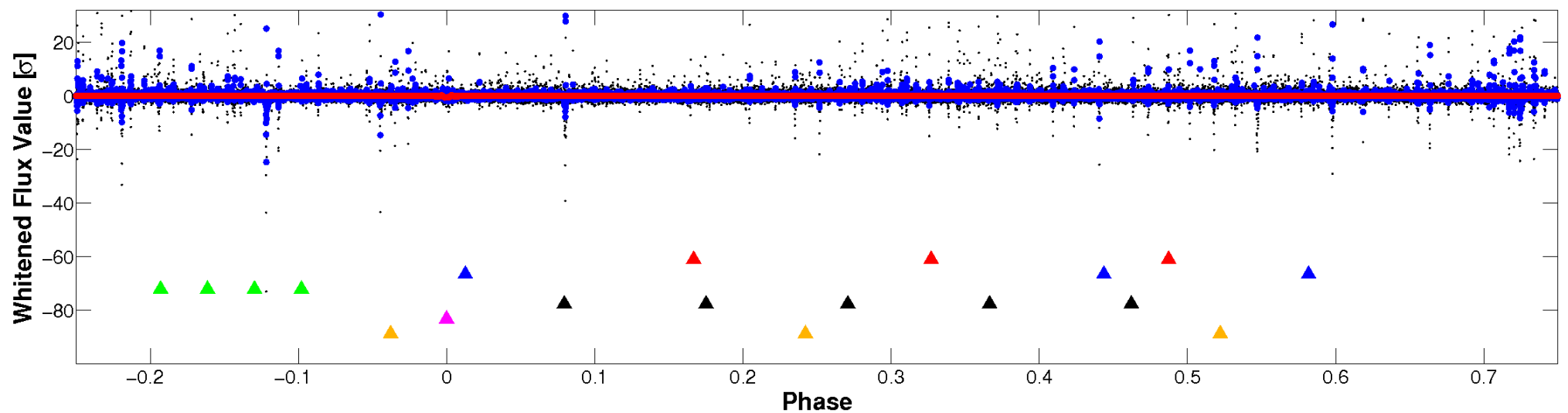


# Non-Whitened Vs. Whitened Light Curve

## Planet 5 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)



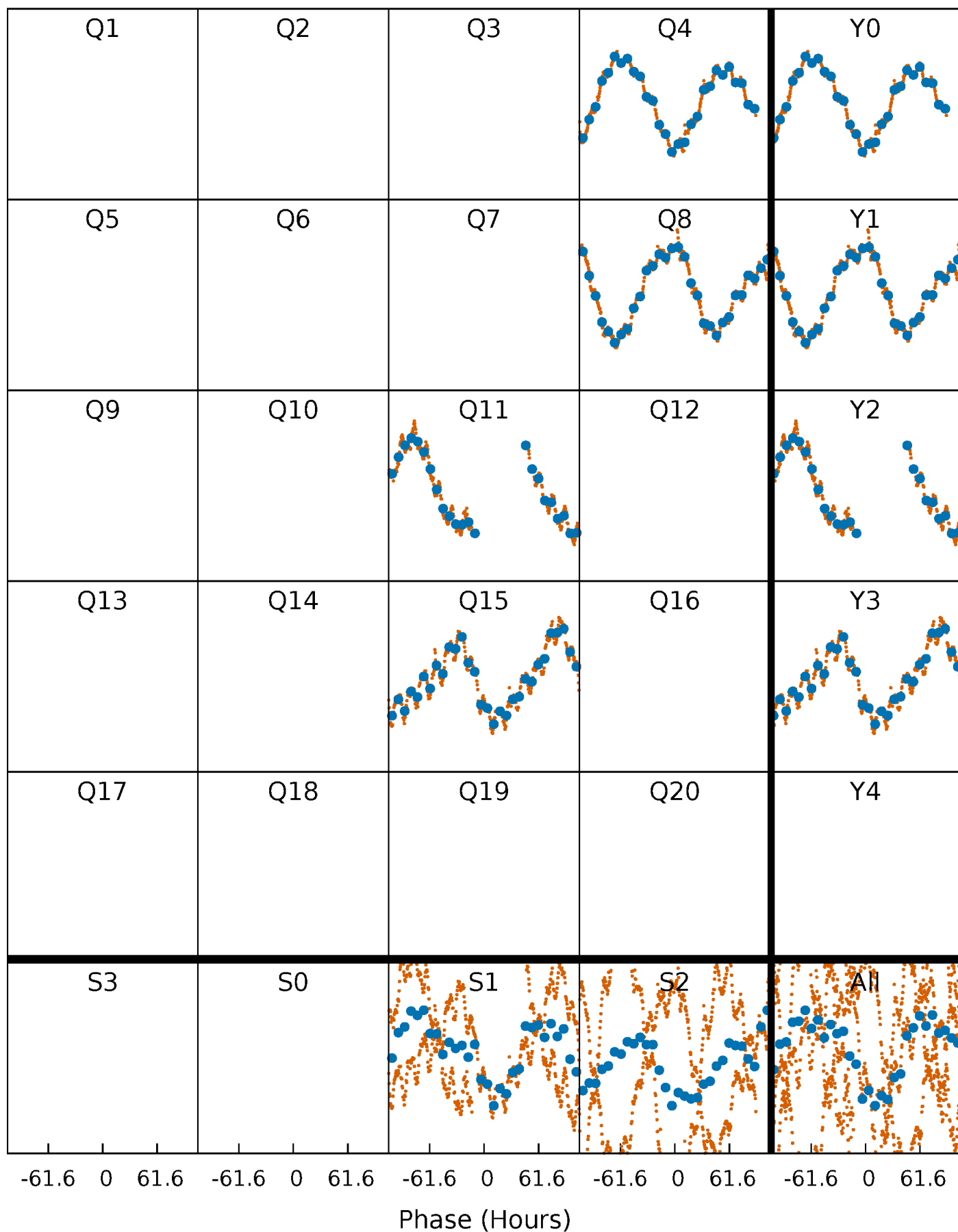
## Planet 5 : Phased Whitened Flux Time Series (Fit Epoch/Period)





# PDC Quarter-Phased Transit Curves

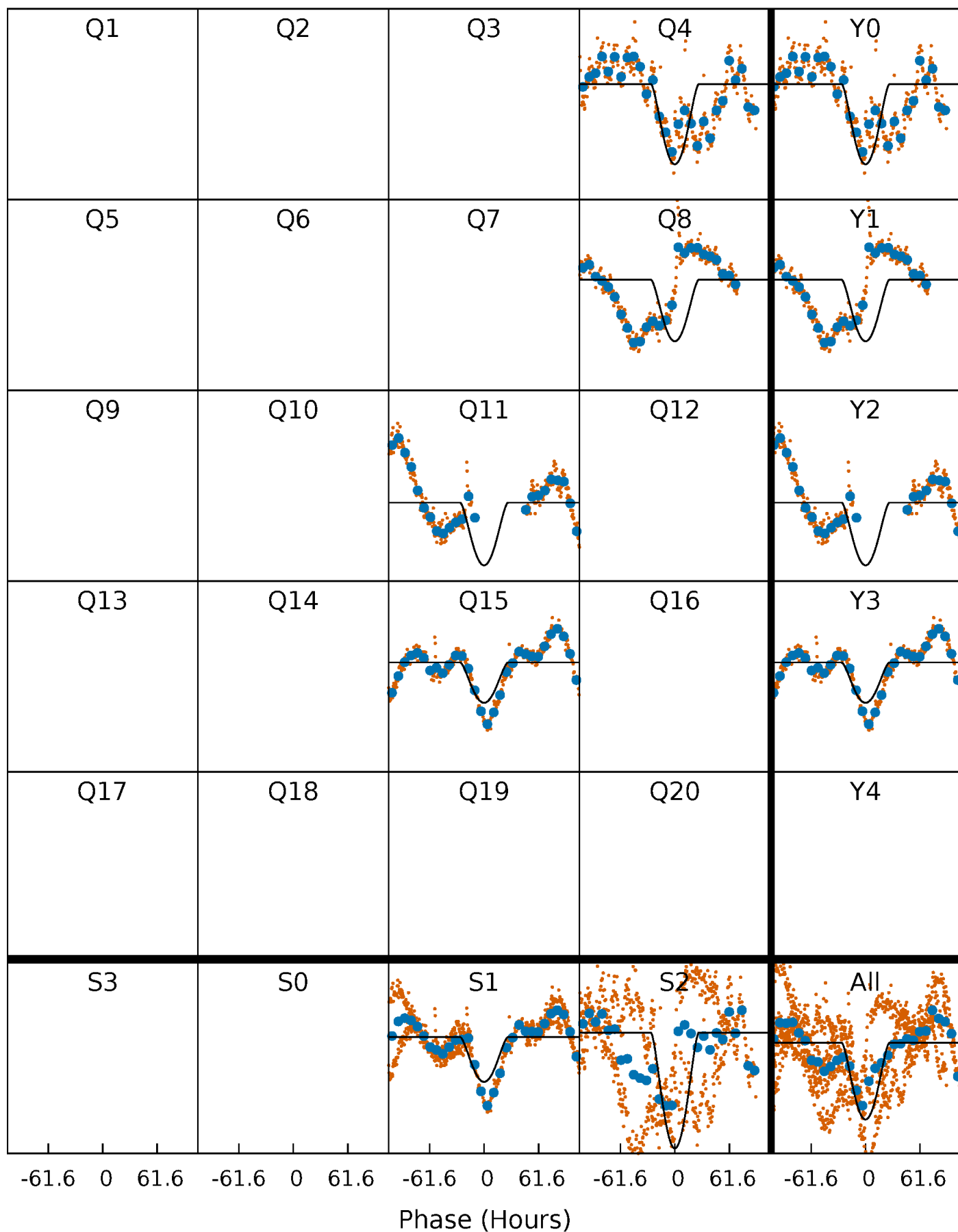
TCE 005098150-05     $P=316.084541$  Days     $T_0=438.389119$  (BKJD)





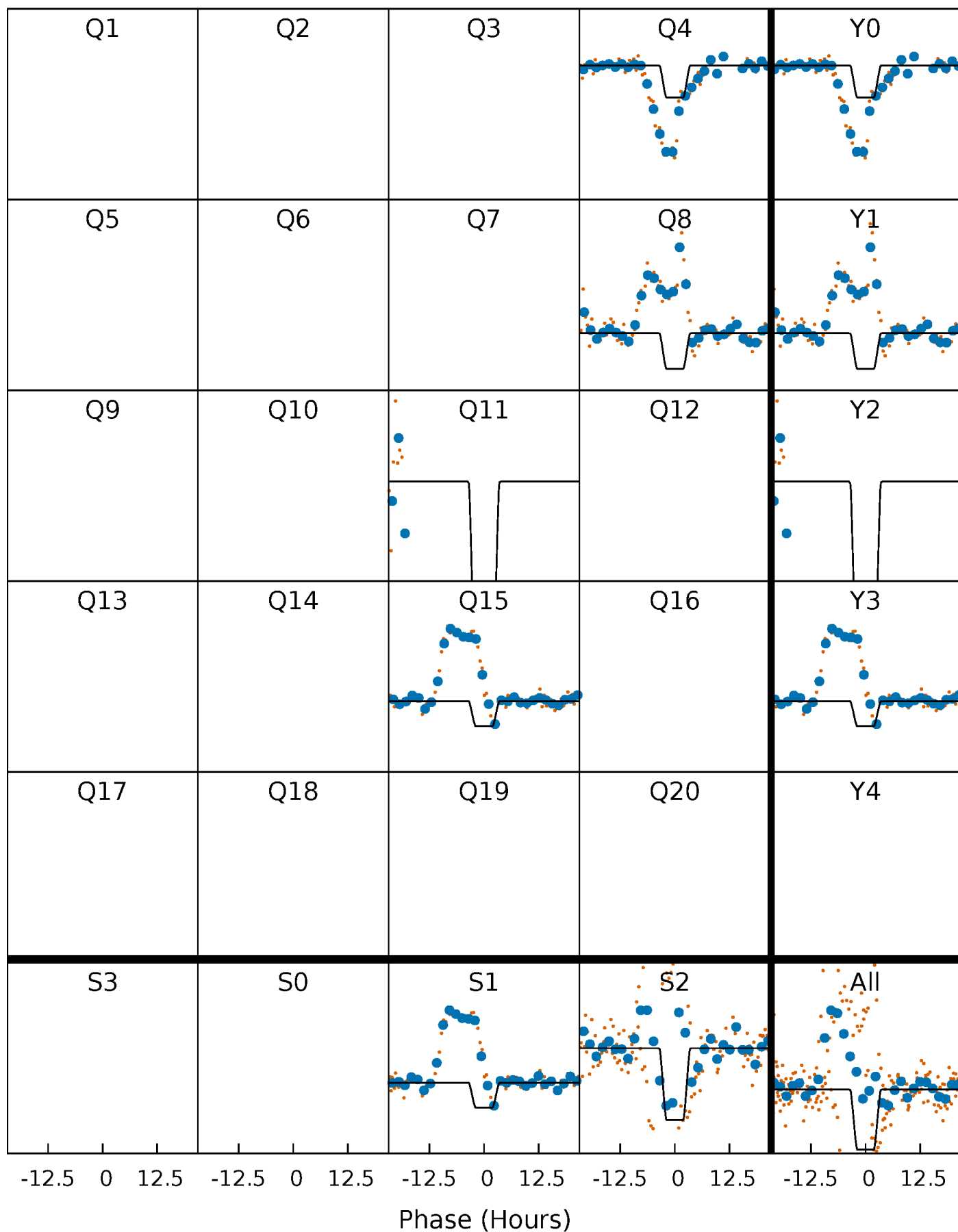
# DV Quarter-Phased Transit Curves

TCE 005098150-05     $P=316.084541$  Days     $T_0=438.389119$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

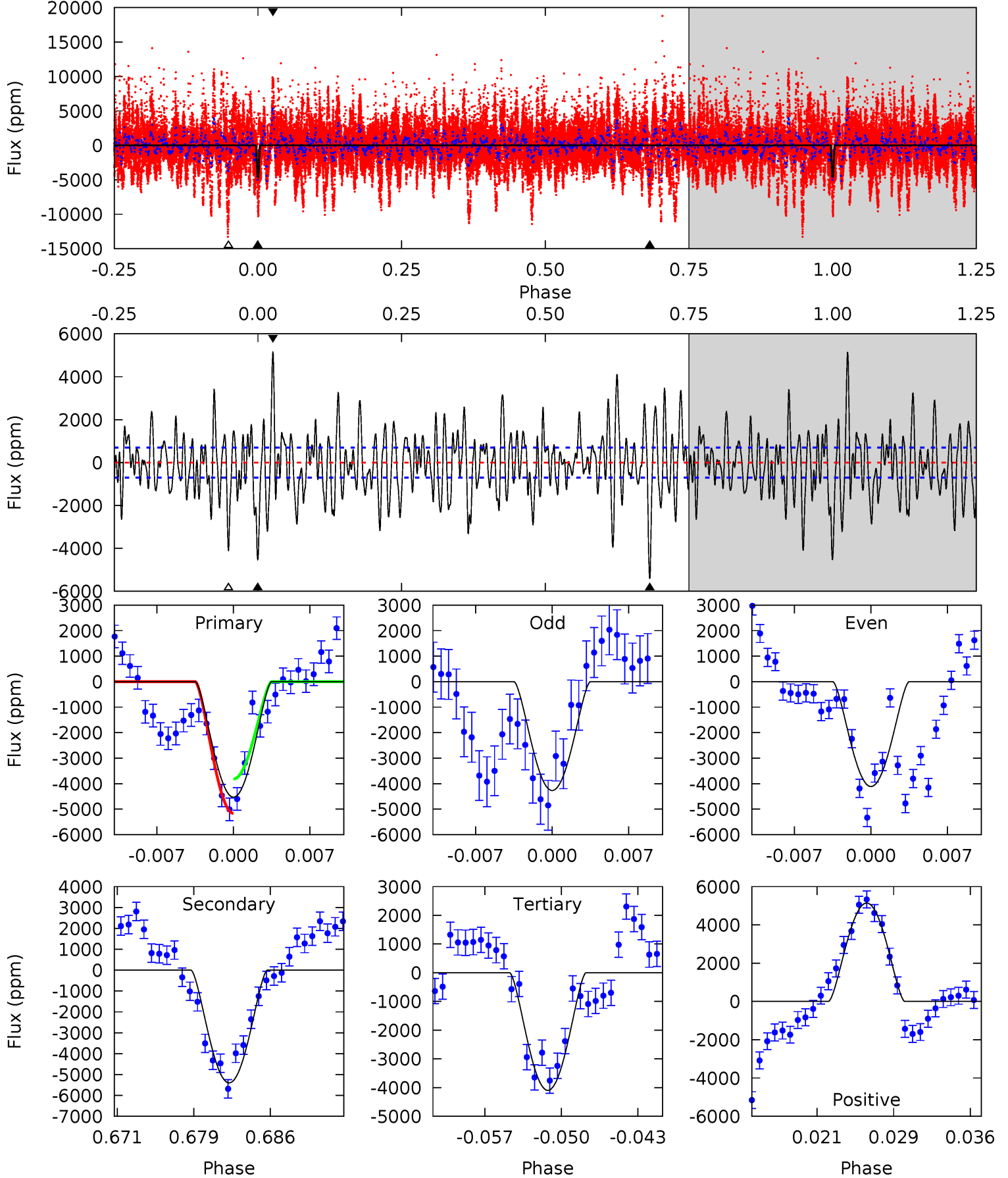
TCE 005098150-05     $P=316.202530$  Days     $T_0=438.343362$  (BKJD)



# DV Model-Shift Uniqueness Test

005098150-05, P = 316.084541 Days, E = 122.304578 Days

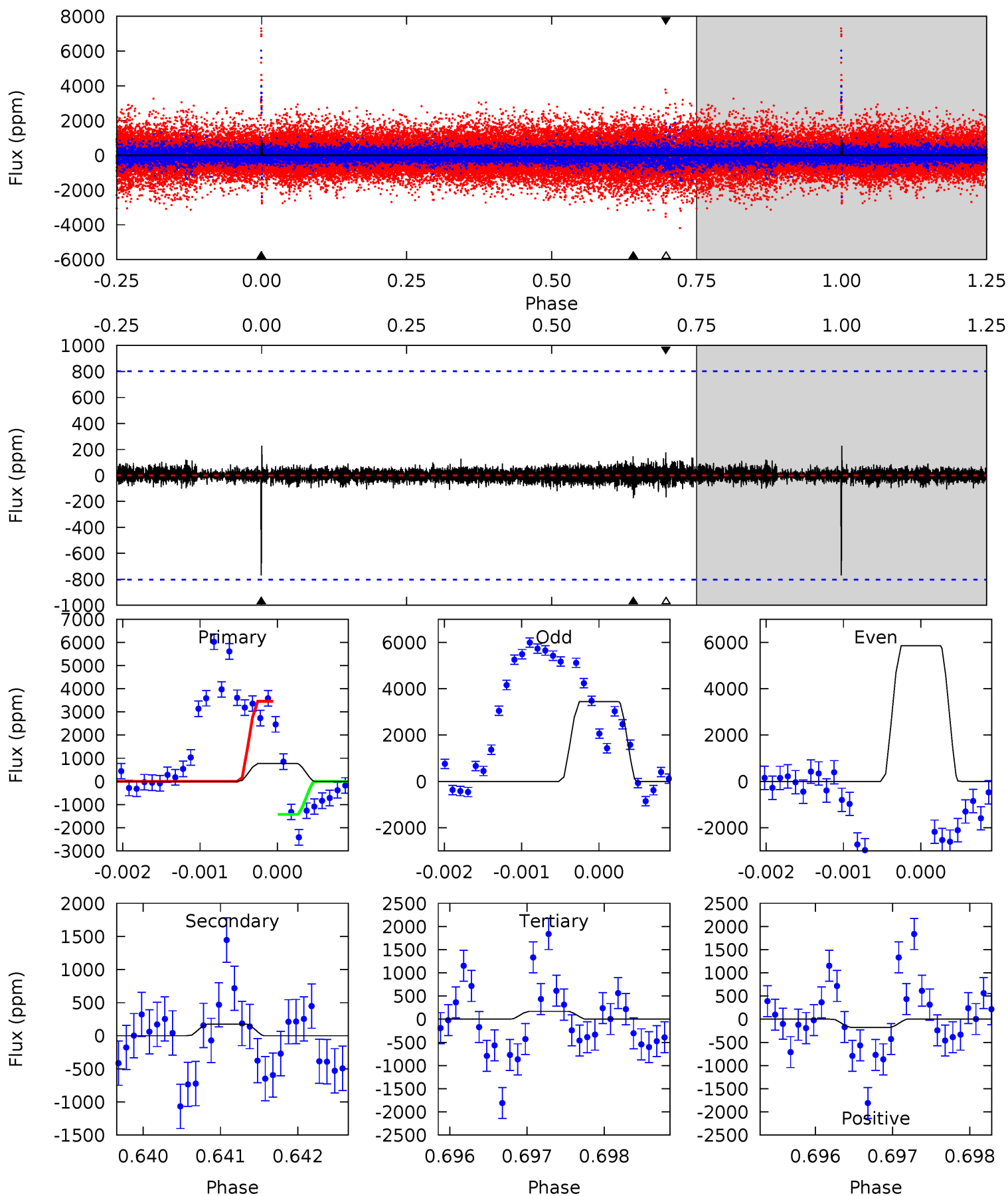
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
32.9	39.2	29.8	37.3	5.09	2.69	9.48	3.13	-4.44	9.46	1.89	0.53	1.32	0.49	4.87



# Alt Model-Shift Uniqueness Test

005098150-05, P = 316.202530 Days, E = 122.140832 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
5.23	1.18	1.14	1.20	5.46	3.30	0.22	4.09	4.03	0.04	-0.01	10.5	0.16	0.23	0



### Stellar Parameters For KIC 005098150

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5328^{+159}_{-159}$	$4.482^{+0.110}_{-0.110}$	$-0.260^{+0.350}_{-0.300}$	$0.827^{+0.130}_{-0.106}$	$0.756^{+0.113}_{-0.052}$	$1.886^{+0.879}_{-0.601}$
	+3%/-3%	+2%/-2%	+135%/-115%	+16%/-13%	+15%/-7%	+47%/-32%
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 005098150-05 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-5399 \pm 138$	$25.53^{+22.64}_{-16.31}$	$329^{+16}_{-15}$	$3297^{+1429}_{-567}$	$3156^{+21945}_{-2266}$
Alt.	$-174 \pm 147$	$21.32^{+21.71}_{-15.04}$	$329^{+15}_{-16}$	$2152^{+792}_{-432}$	$118^{+1305}_{-107}$

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

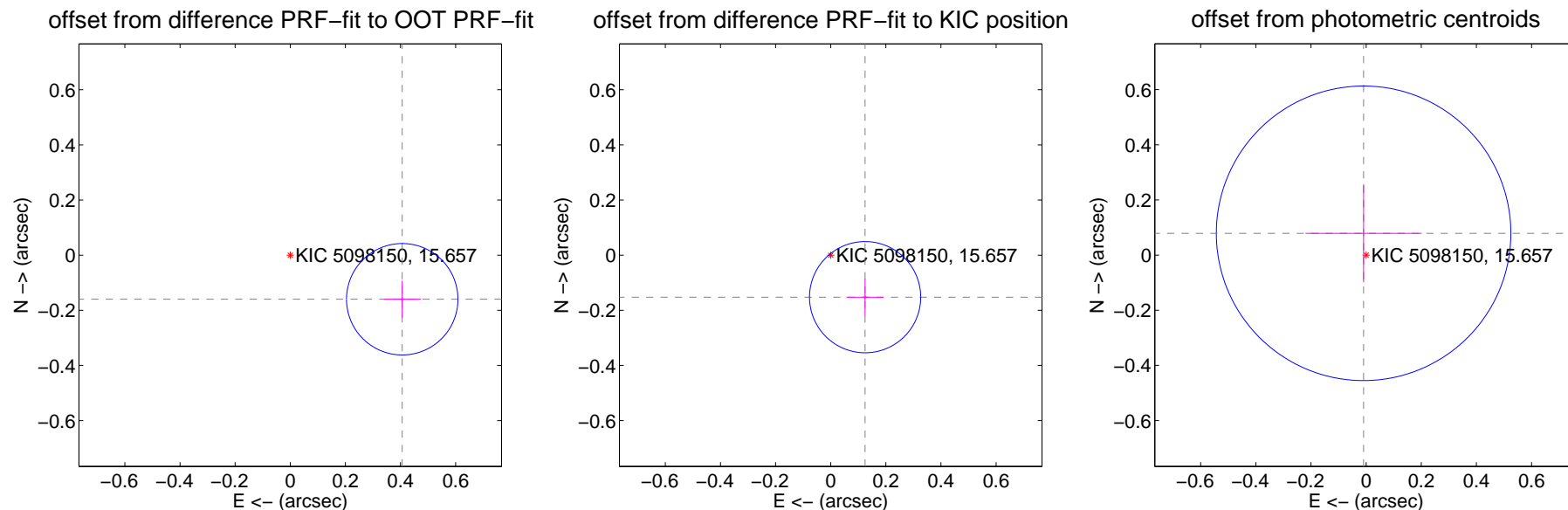
## DV Centroid Data

Supplemental centroid analysis for 005098150-05. Kepler magnitude: 15.66. Transit SNR 6.63

There are 0 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.28 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.437 \pm 0.067$	6.48	$-0.406 \pm 0.067$	$-0.160 \pm 0.067$
PRF-fit source offset from KIC position	$0.197 \pm 0.067$	2.93	$-0.125 \pm 0.067$	$-0.152 \pm 0.067$
photometric centroid source offset	$0.08 \pm 0.18$	0.45	$0.01 \pm 0.21$	$0.08 \pm 0.18$

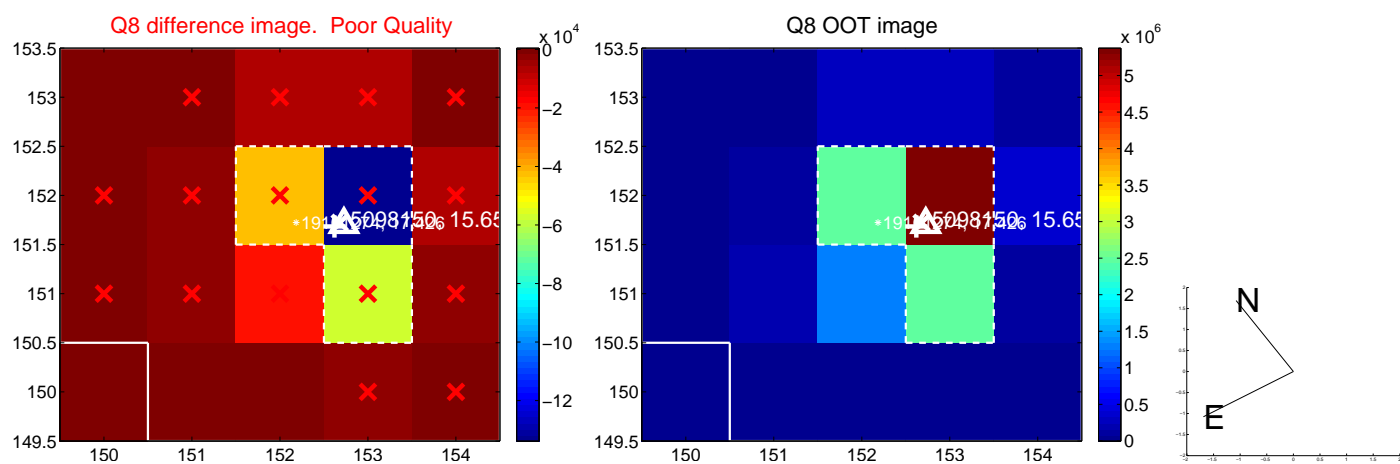


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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





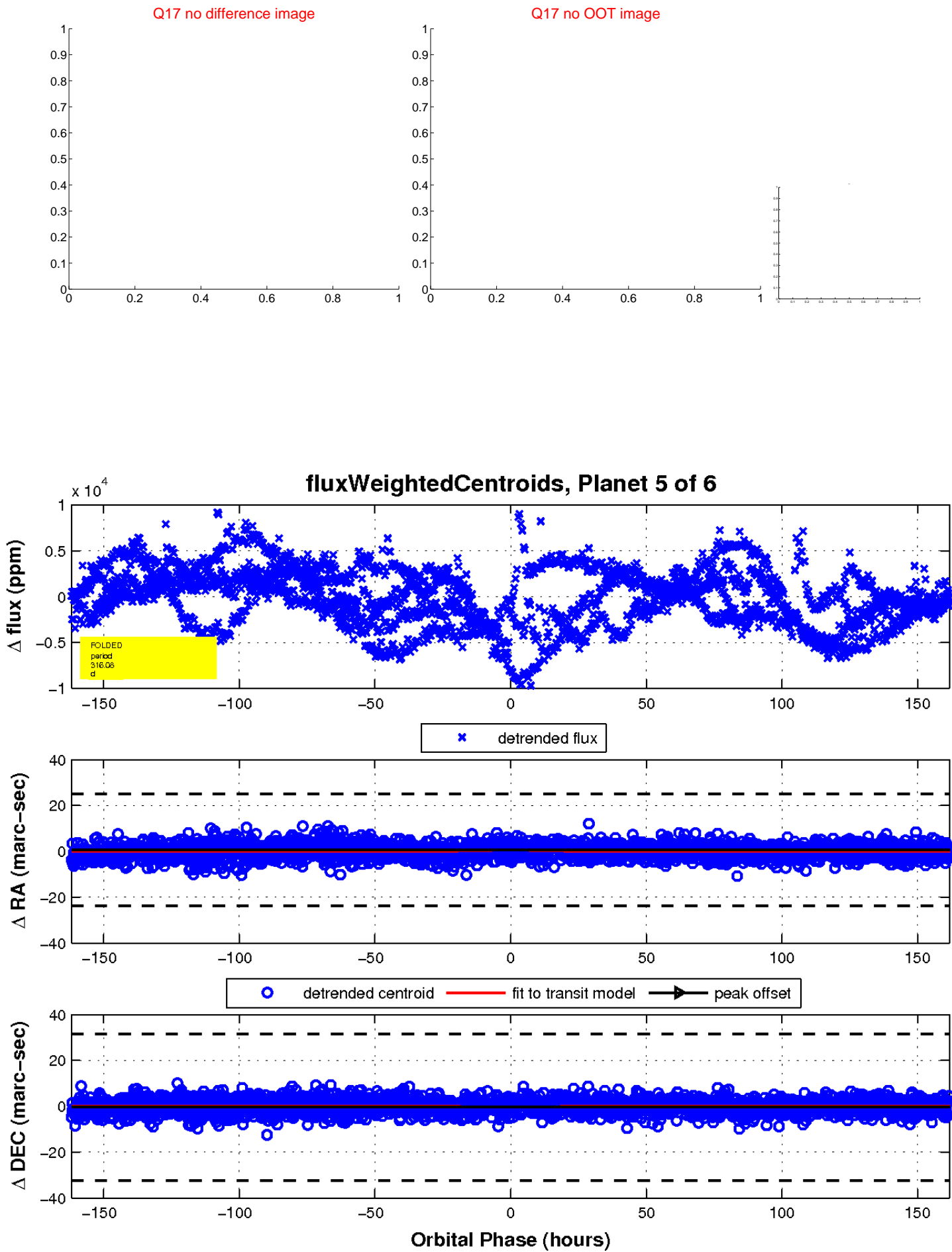
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



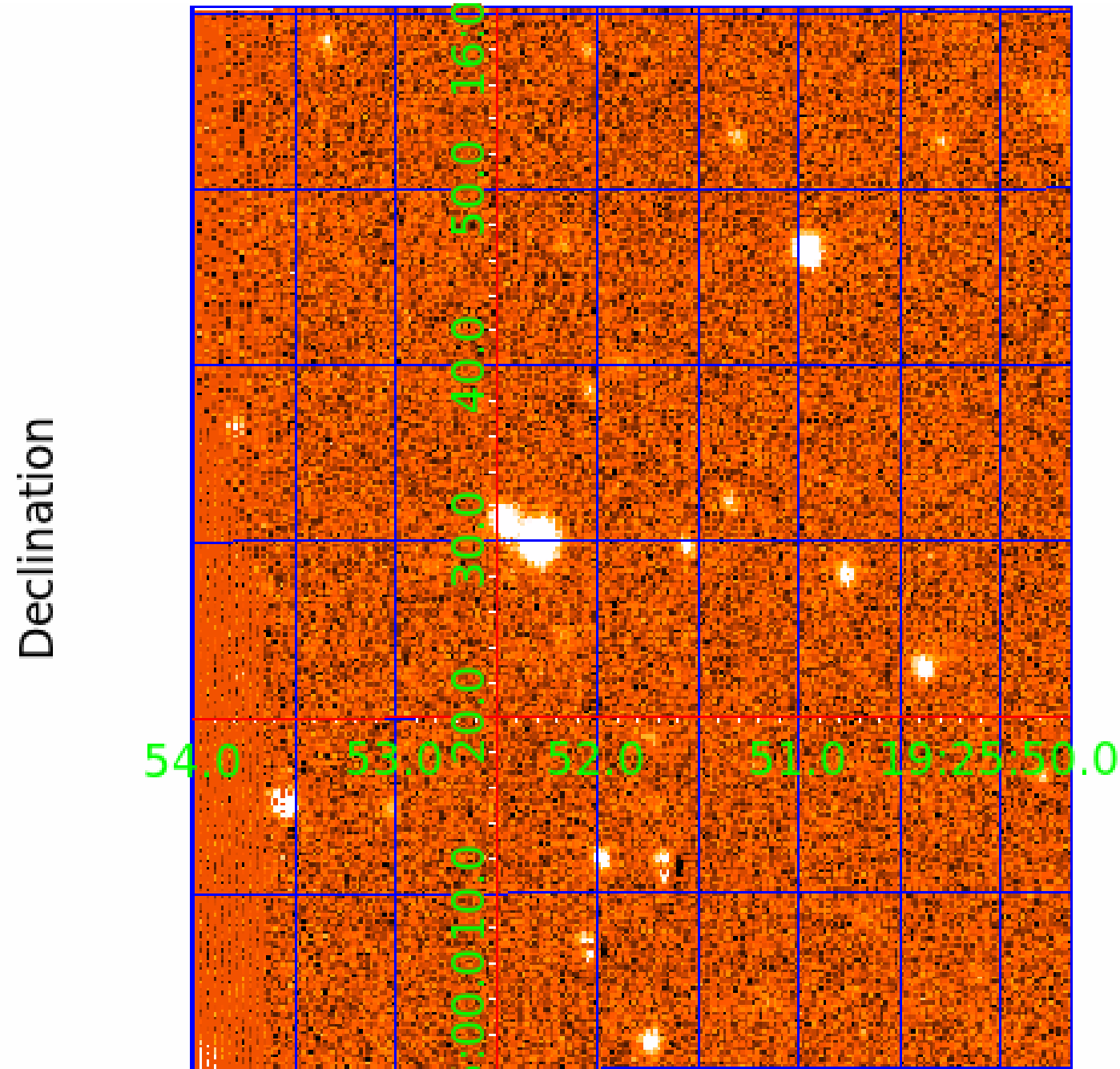
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



UKIRT Image



# KIC 005098150

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
005098150-01	OBS	No	366.745359	491.094434	865.9	0.640	17.3	1.4	0.83	5328	2.76	0.59
005098150-02	OBS	No	495.967471	262.511597	2824.4	16.798	16.2	6.5	0.83	5328	4.32	0.40
005098150-03	OBS	No	326.099826	377.381770	2170.5	3.821	14.6	8.1	0.83	5328	3.78	0.69
005098150-04	OBS	No	285.843848	268.378494	98.5	1.451	10.4	0.4	0.83	5328	0.82	0.82
005098150-05	OBS	No	316.084541	438.389119	6140.2	53.938	10.4	6.6	0.83	5328	12.04	0.72
005098150-06	OBS	No	404.564736	426.463441	1512.7	3.963	10.8	4.5	0.83	5328	3.32	0.52

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
005098150-01	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_CHASES_MARSHALL_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS—HALO_GHOST
005098150-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_ZUMA—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
005098150-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_SKYE—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
005098150-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL_ZUMA_TRACKER—LPP_DV—LPP_ALT—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—INCONSISTENT_TRANS—CENT_FEW_DIFFS
005098150-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
005098150-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_TRACKER—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—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.

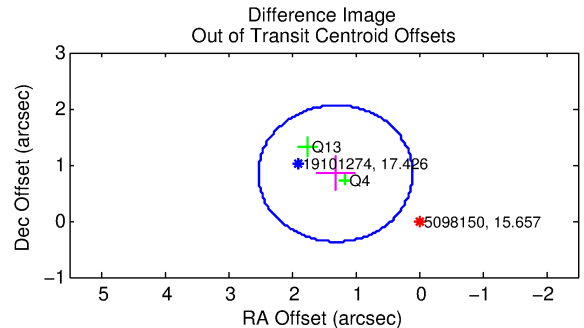
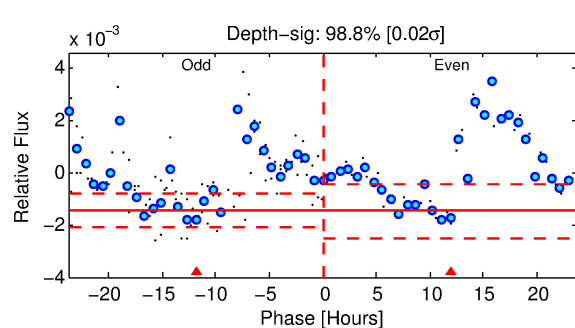
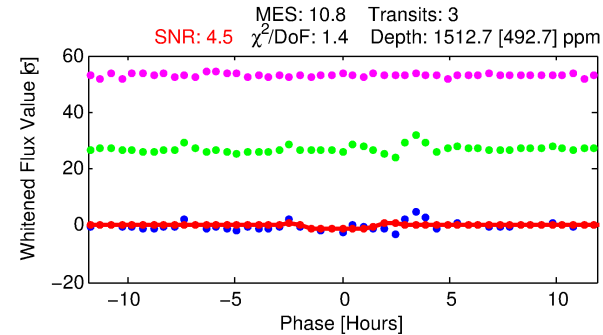
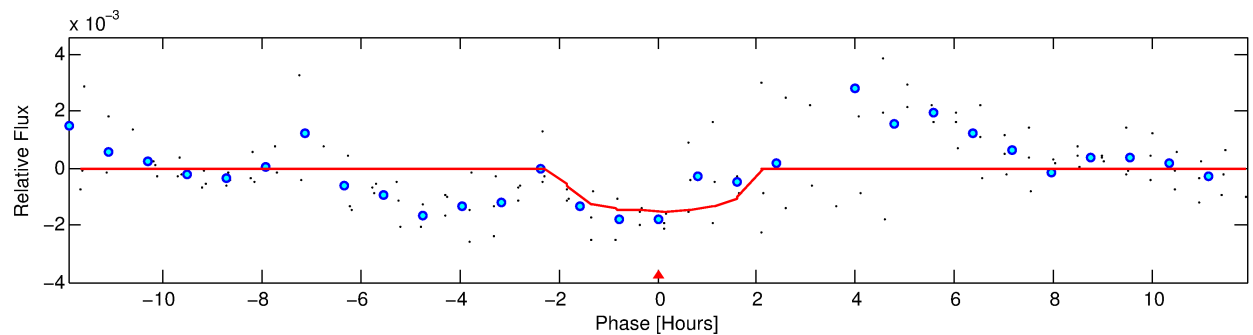
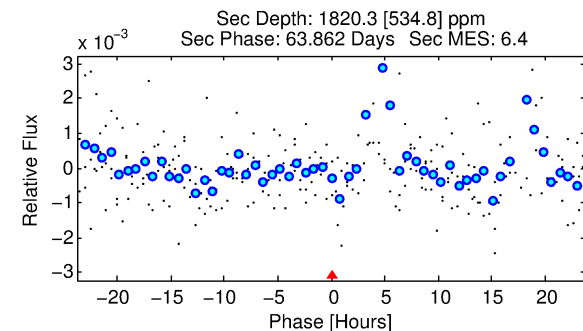
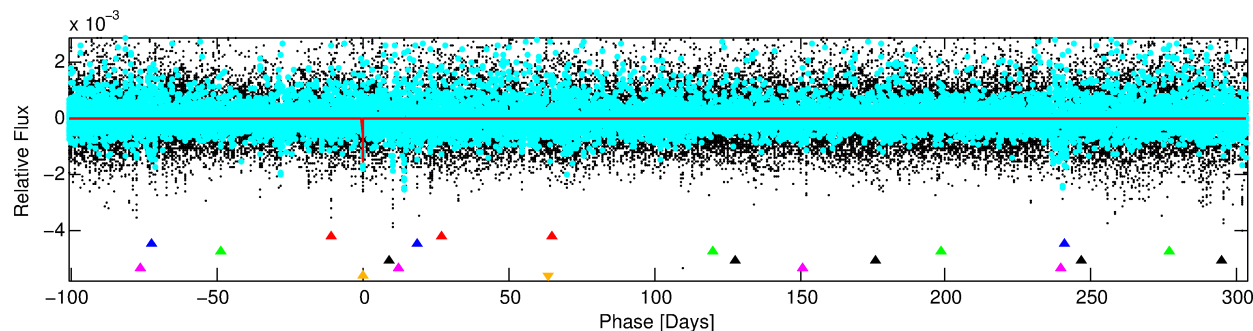
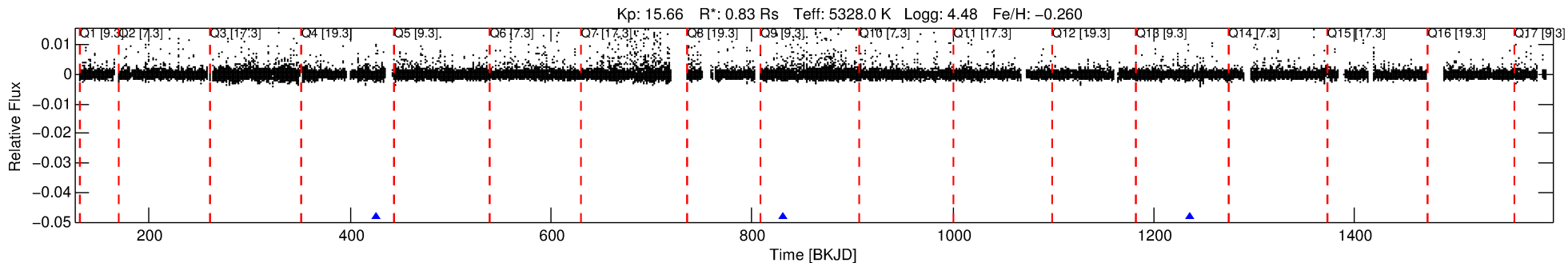
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 005098150-06

No Significant Match Found

# DV One-Page Summary

KIC: 5098150 Candidate: 6 of 6 Period: 404.565 d



## DV Fit Results:

Period = 404.56474 [0.00934] d  
Epoch = 426.4634 [0.0128] BKJD  
Rp/R\* = 0.0368 [0.0557]  
a/R\* = 671.77 [3837.62]  
b = 0.58 [6.70]  
Seff = 0.52 [0.12]  
Teq = 216 [13] K  
Rp = 3.32 [5.06] Re  
a = 0.9758 [0.1313] AU  
Ag = 86492.49 [263852.01] [0.33σ]  
Teffp = 5737 [4370] K [1.26σ]

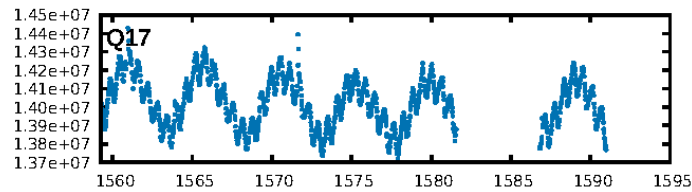
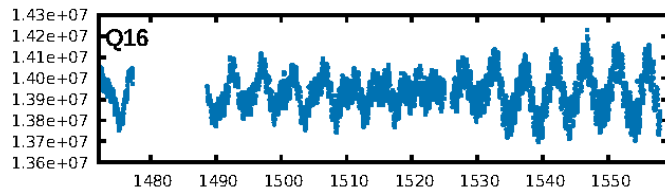
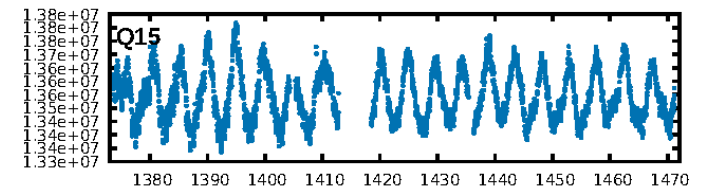
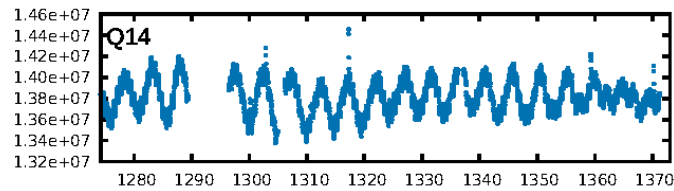
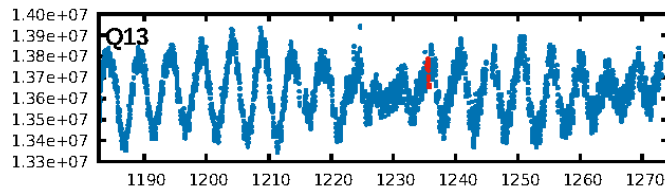
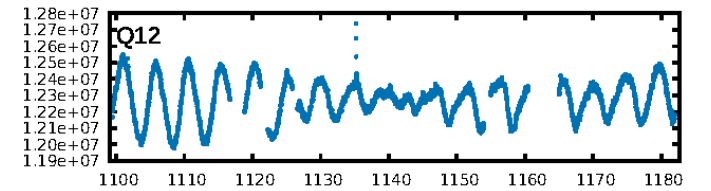
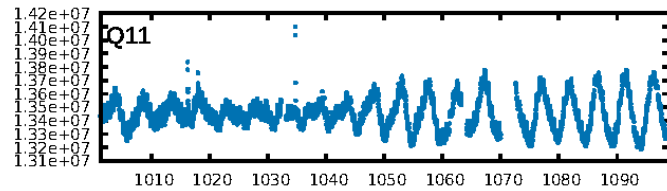
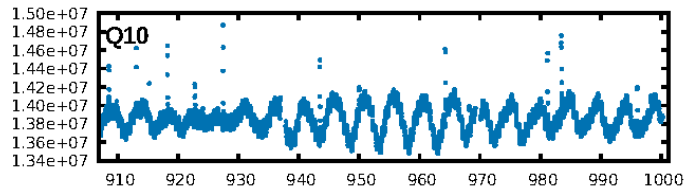
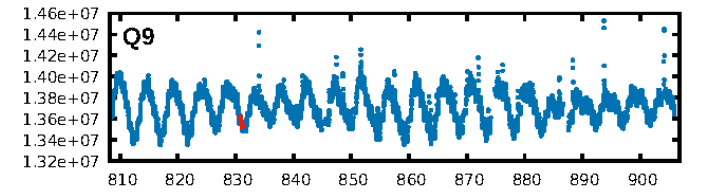
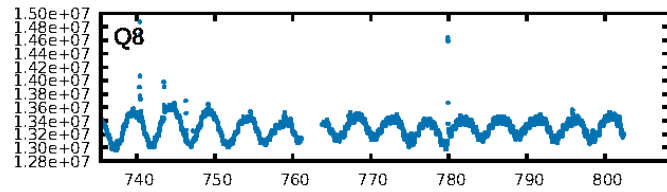
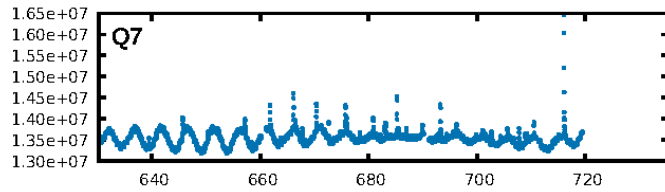
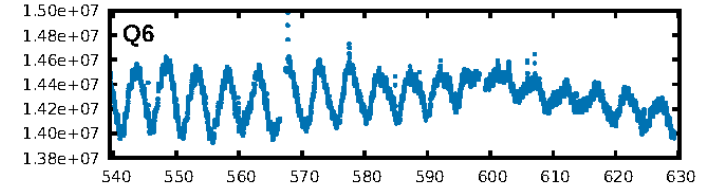
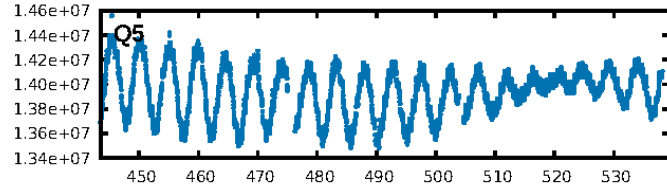
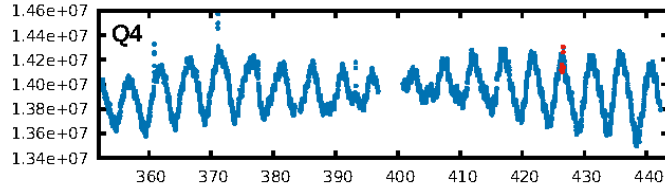
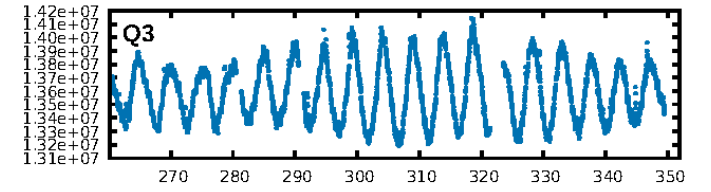
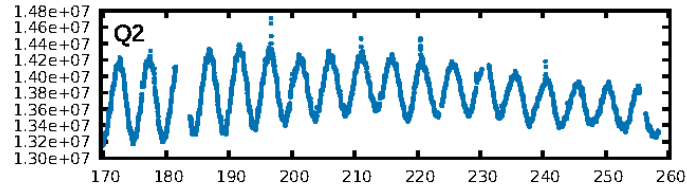
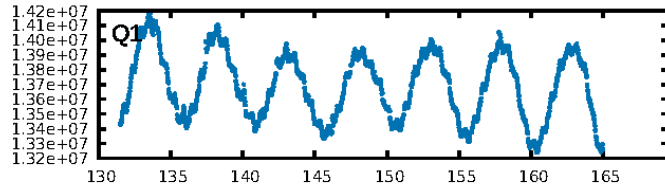
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [226.11σ]  
LongPeriod-sig: 100.0% [127.10σ]  
ModelChiSquare2-sig: 5.2%  
ModelChiSquareGof-sig: 51.8%  
**Bootstrap-pfa: 2.05e-08**  
RollingBand-fgt: 1.00 [3/3]  
**GhostDiagnostic-chr: 0.4885**  
Centroid-sig: 48.7%  
Centroid-so: 1.013 arcsec [0.74σ]  
**OotOffset-rm: 1.559 arcsec [3.85σ]**  
**KicOffset-rm: 1.738 arcsec [5.68σ]**  
OotOffset-st: 0/0/1/1 [2]  
KicOffset-st: 0/0/1/1 [2]  
DiffImageQuality-fgm: 0.50 [1/2]  
DiffImageOverlap-fno: 1.00 [3/3]

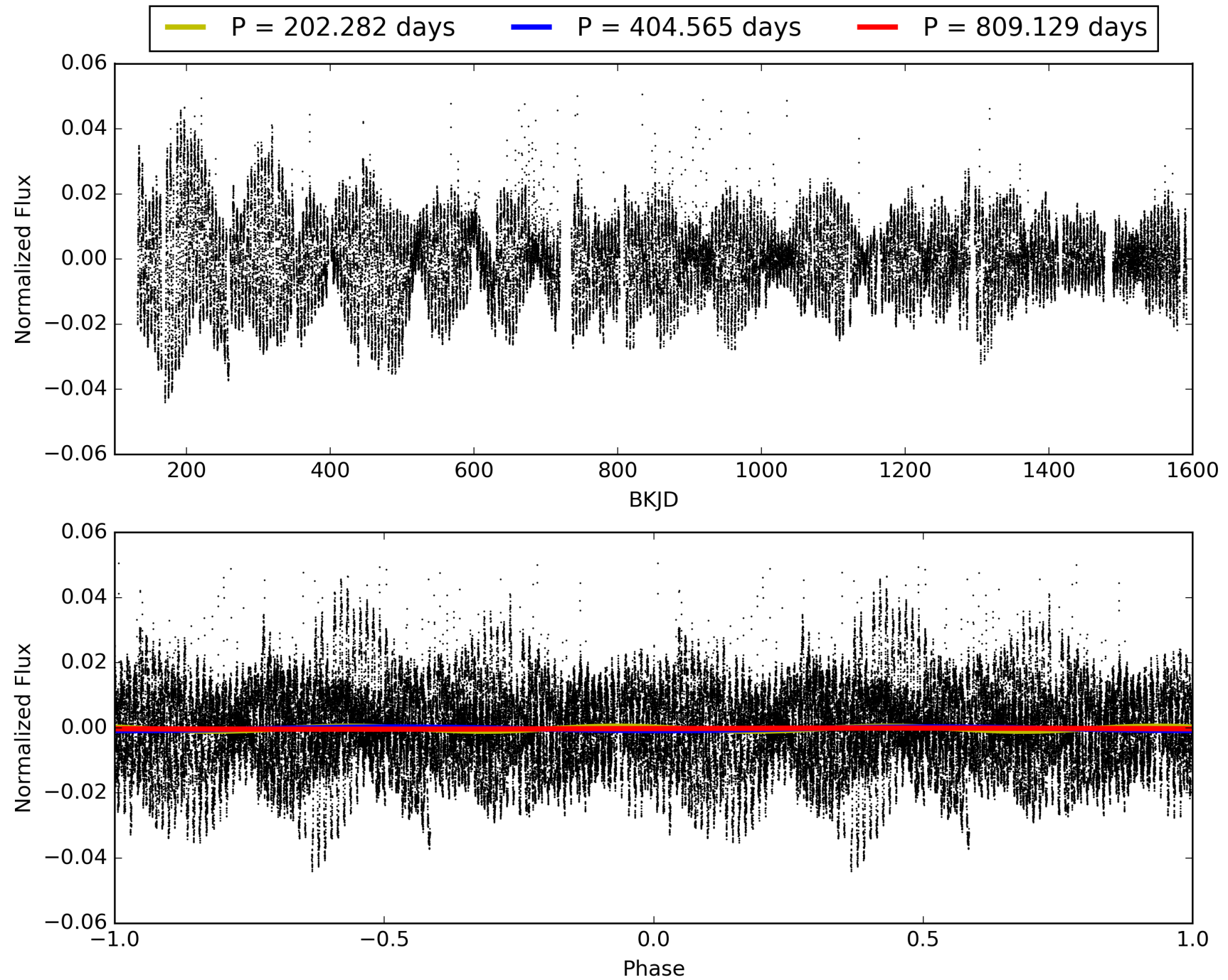
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 12:56:09 Z

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

# TCE 005098150-06, PDC Light Curves



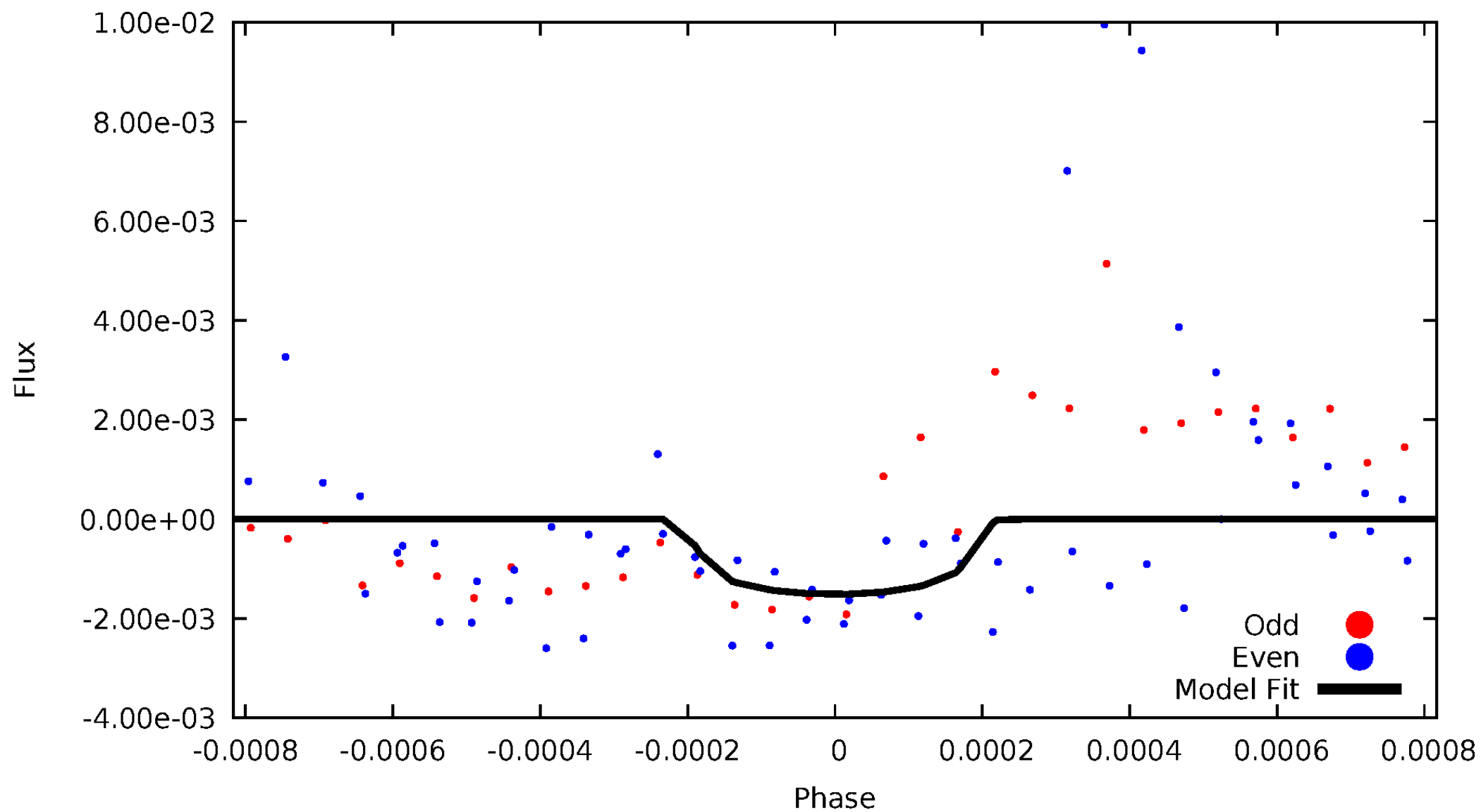
TCE 005098150-06





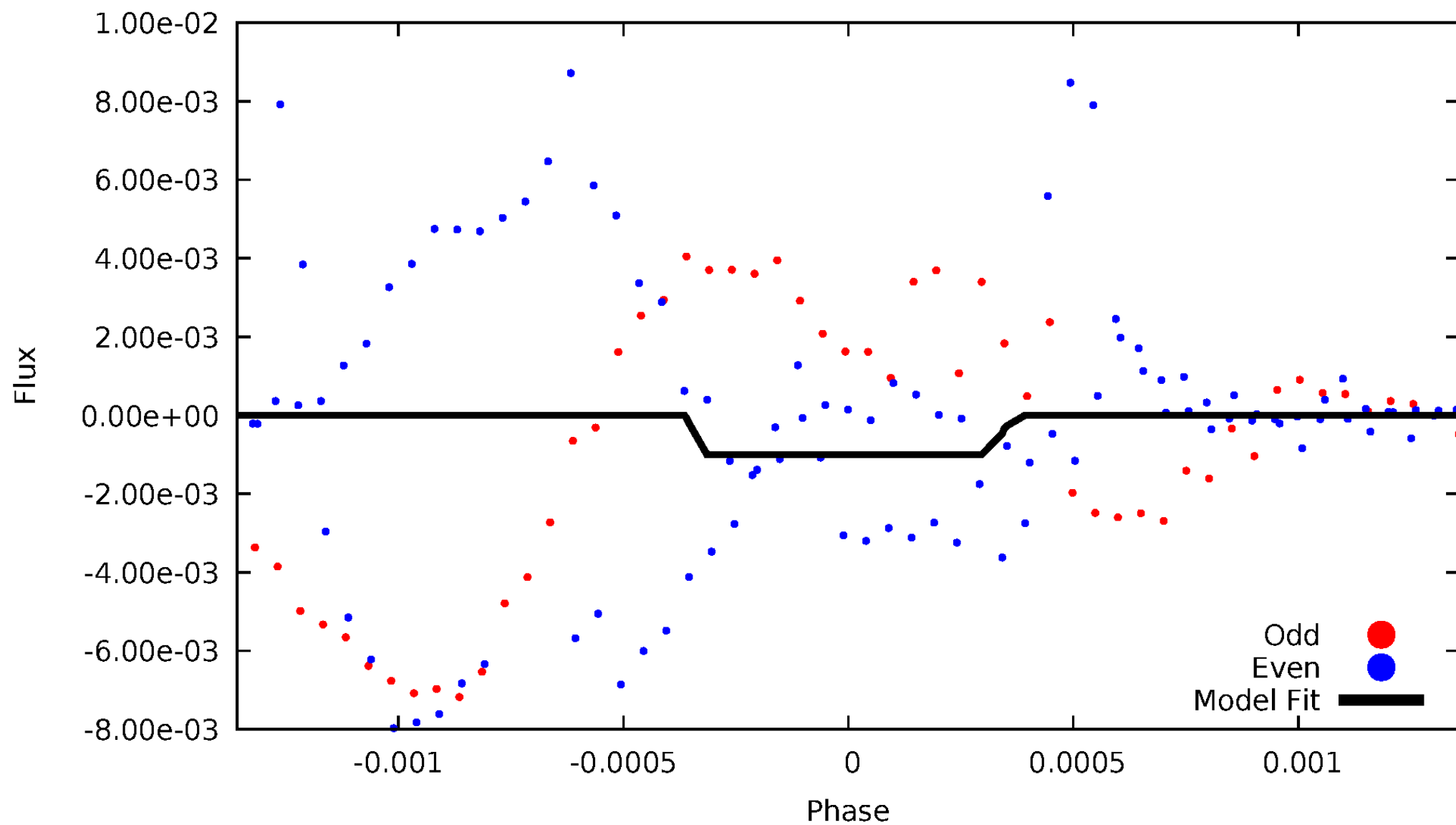
# DV Odd/Even

TCE 005098150-06



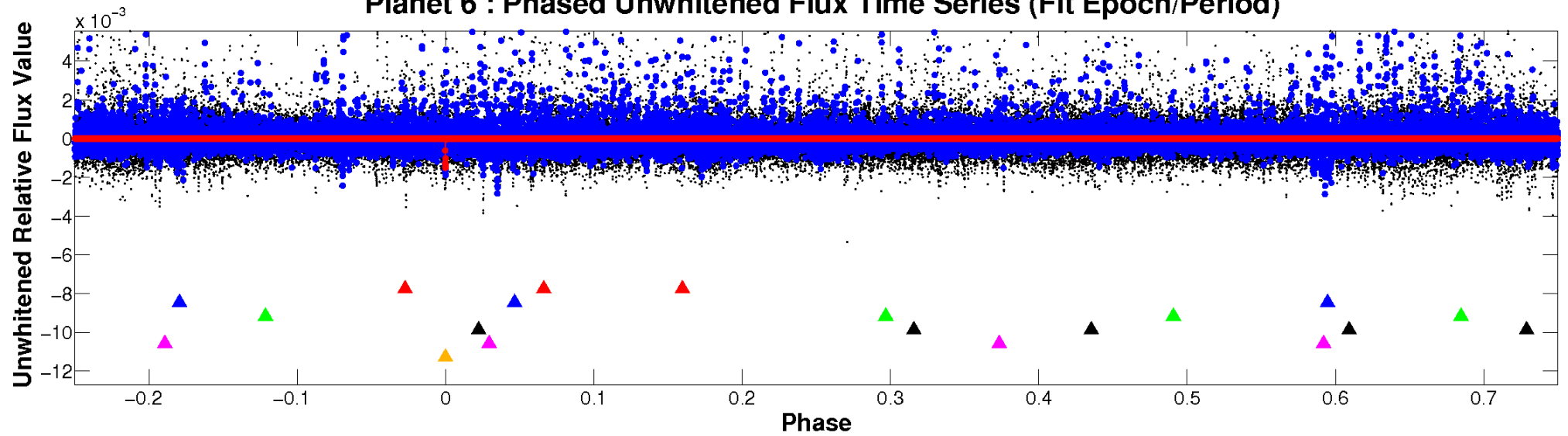
# ALT Odd/Even

TCE 005098150-06

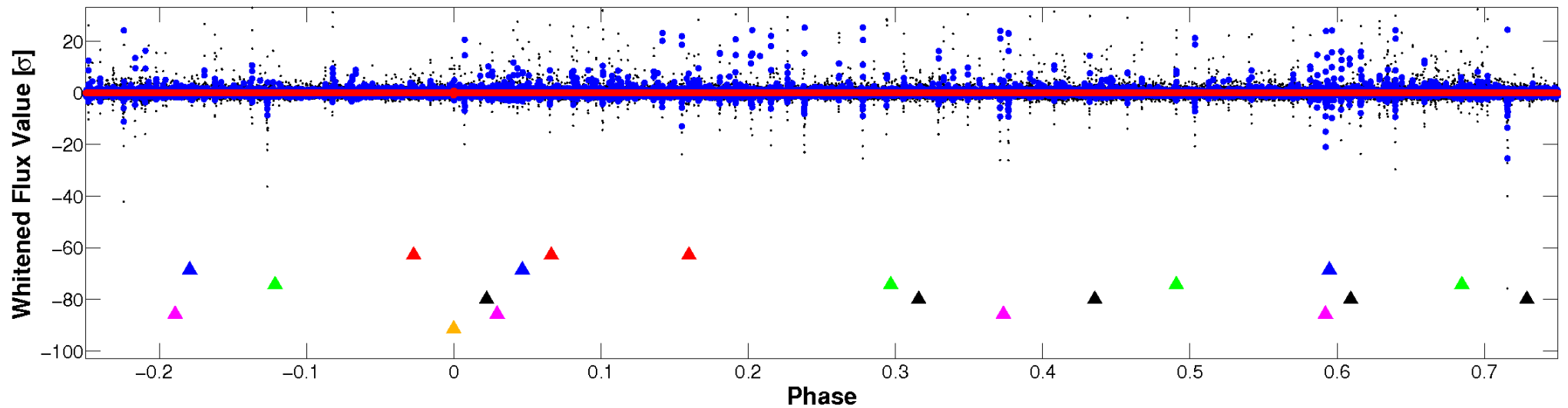


# Non-Whitened Vs. Whitened Light Curve

## Planet 6 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

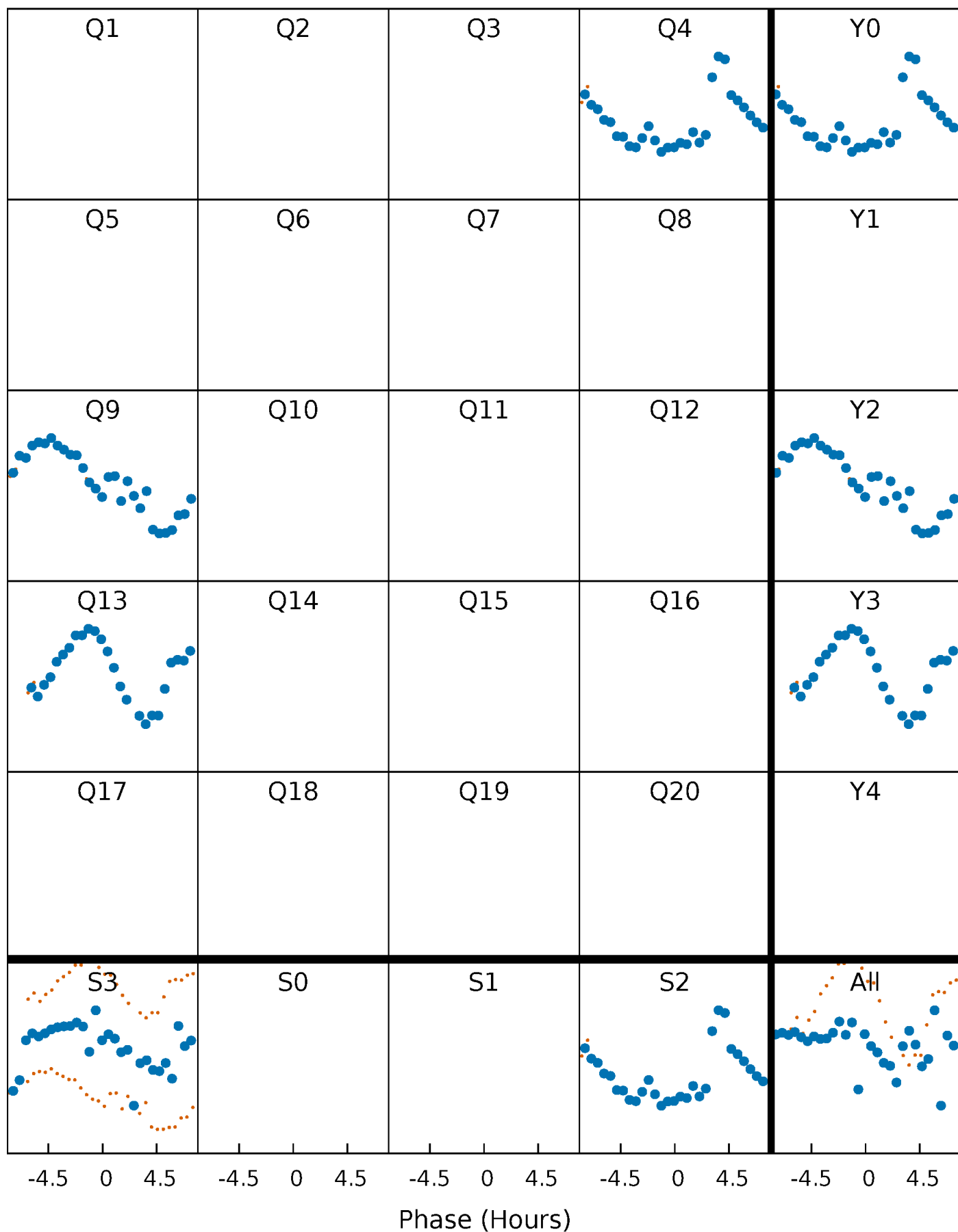


## Planet 6 : Phased Whitened Flux Time Series (Fit Epoch/Period)



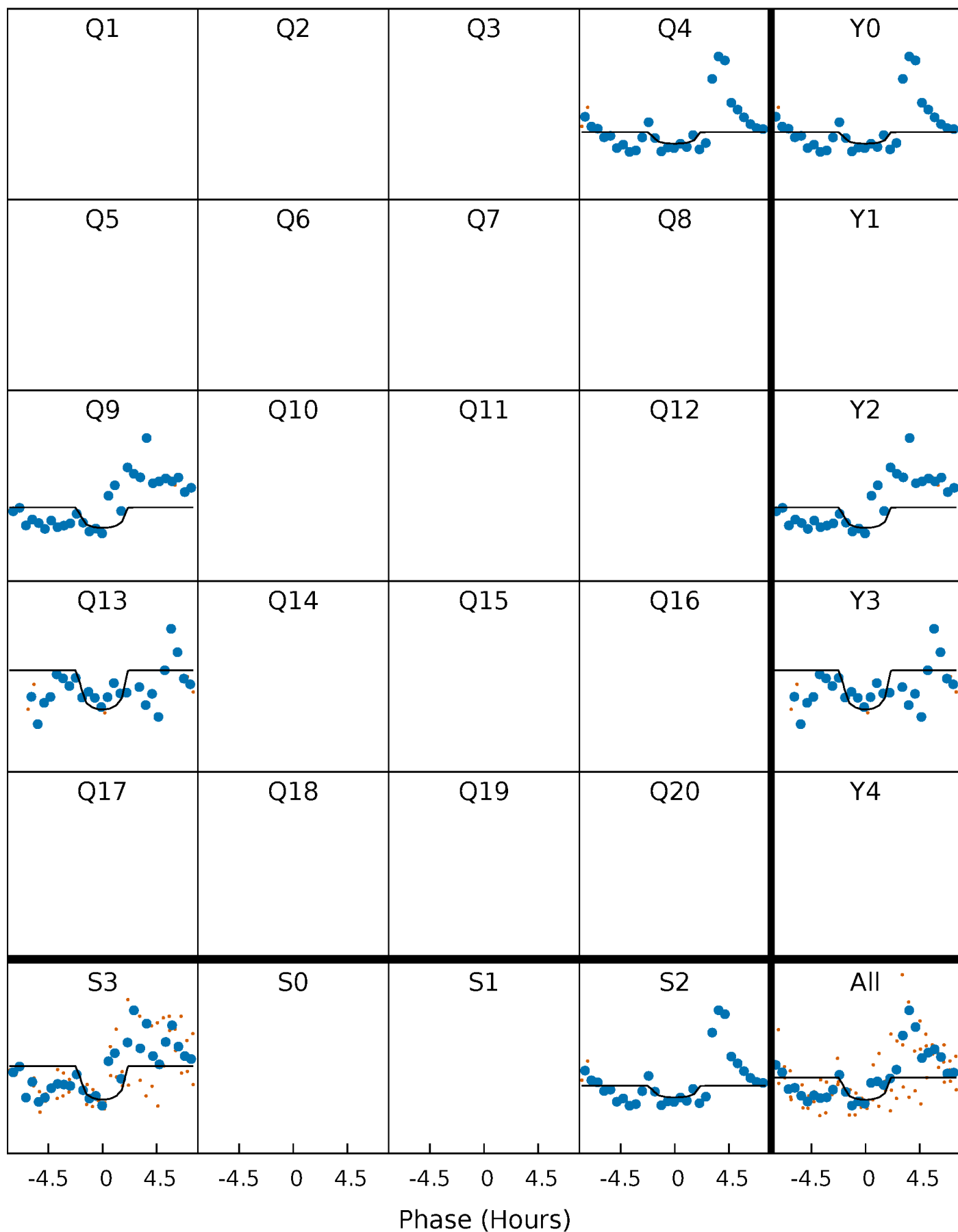
# PDC Quarter-Phased Transit Curves

TCE 005098150-06 P=404.564736 Days  $T_0=426.463441$  (BKJD)



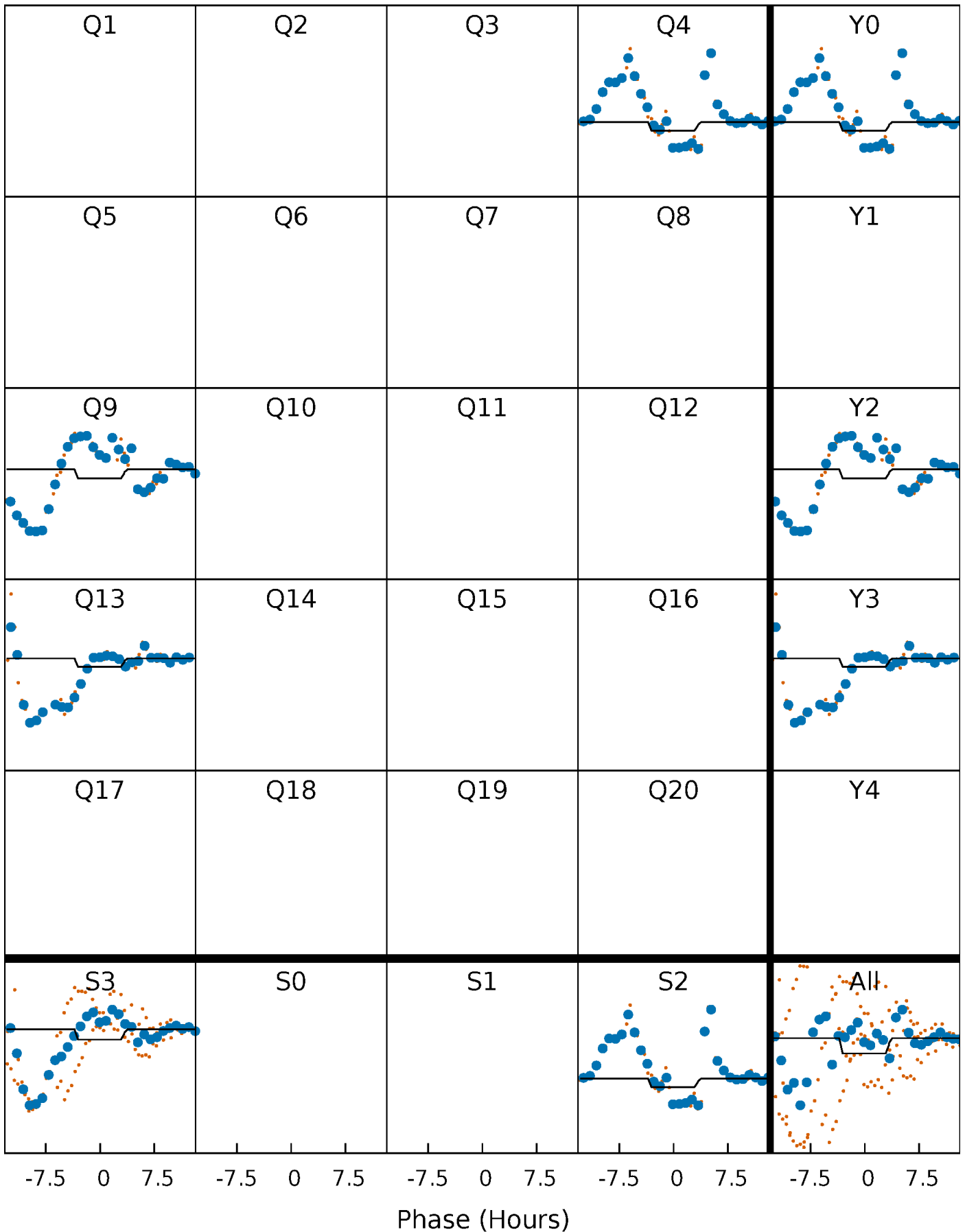
# DV Quarter-Phased Transit Curves

TCE 005098150-06     $P=404.564736$  Days     $T_0=426.463441$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

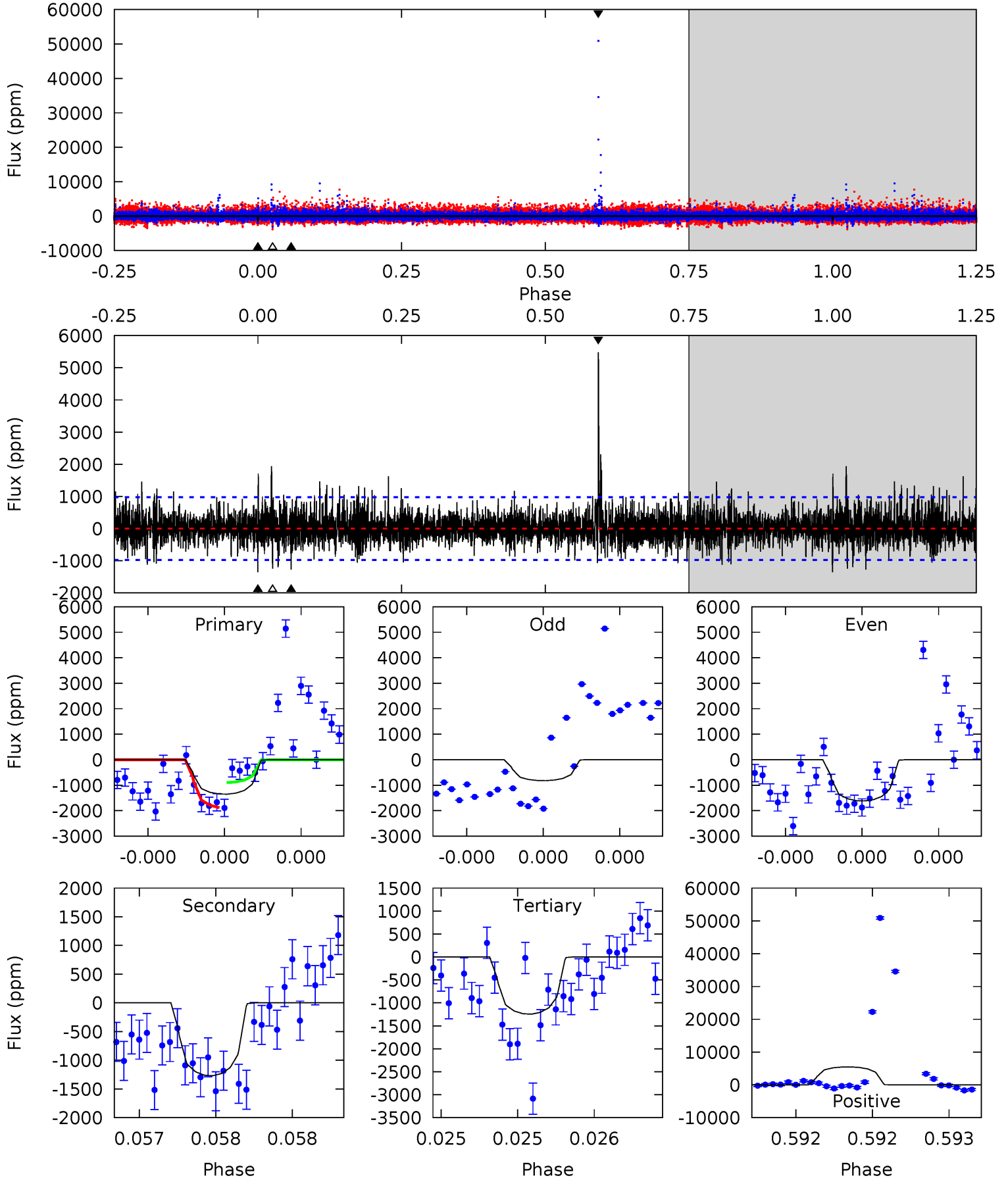
TCE 005098150-06     $P=404.584488$  Days     $T_0=426.411605$  (BKJD)



# DV Model-Shift Uniqueness Test

005098150-06, P = 404.564736 Days, E = 21.898705 Days

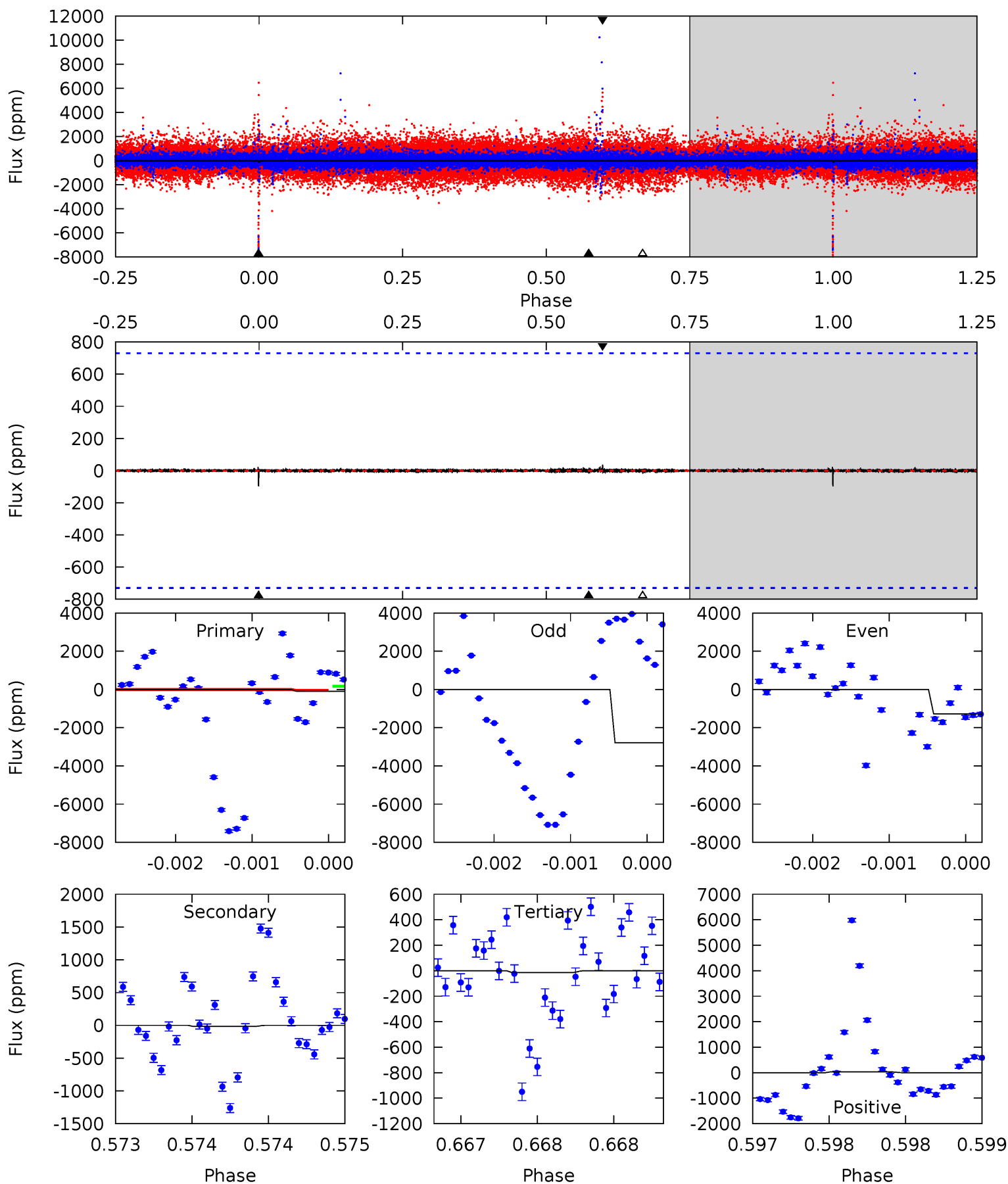
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
7.75	7.28	7.14	31.4	5.59	3.51	1.95	0.61	-23.7	0.14	-24.2	1.03	1.20	0.80	2.73



# Alt Model-Shift Uniqueness Test

005098150-06, P = 404.584488 Days, E = 21.827117 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
0.73	0.13	0.11	0.24	5.50	3.37	0.03	0.62	0.49	0.02	-0.11	5.63	-0.14	0.25	0.47





### Stellar Parameters For KIC 005098150

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5328^{+159}_{-159}$	$4.482^{+0.110}_{-0.110}$	$-0.260^{+0.350}_{-0.300}$	$0.827^{+0.130}_{-0.106}$	$0.756^{+0.113}_{-0.052}$	$1.886^{+0.879}_{-0.601}$
	+3%/-3%	+2%/-2%	+135%/-115%	+16%/-13%	+15%/-7%	+47%/-32%
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 005098150-06 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	-1269±174	$5.19^{+4.66}_{-3.57}$	$303^{+14}_{-15}$	$4379^{+3360}_{-866}$	$26035^{+219212}_{-18981}$
Alt.	-18±133	$4.53^{+4.44}_{-2.97}$	$302^{+16}_{-14}$	$2151^{+1261}_{-5428}$	$165^{+6050}_{-4411}$

$T_{max}$  = 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

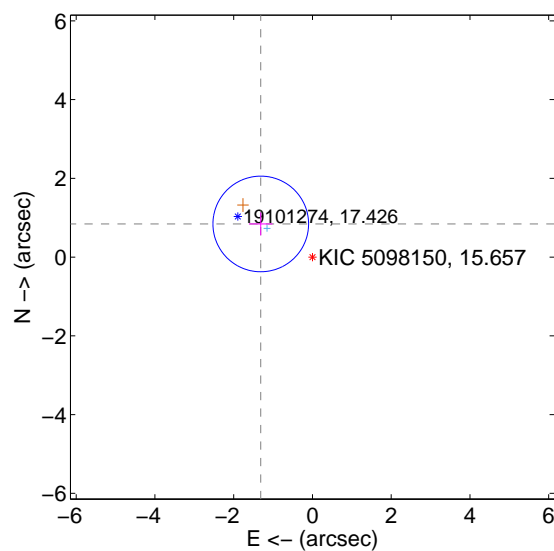
Supplemental centroid analysis for 005098150-06. Kepler magnitude: 15.66. Transit SNR 4.52

There are 1 quarters with good PRF difference image offsets

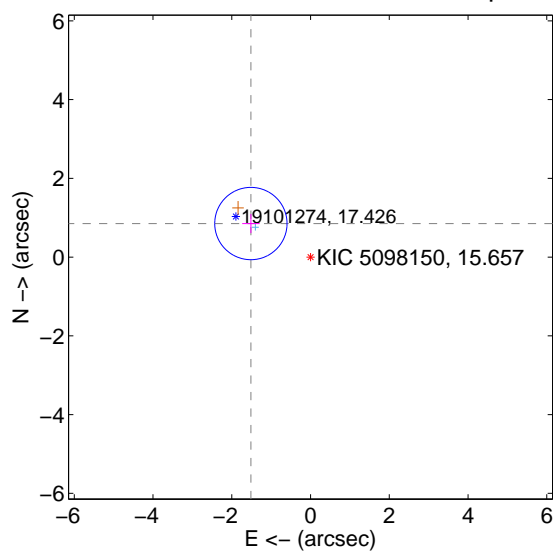
The direct PRF centroid is offset from the target star catalog position by about 0.11 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.559 \pm 0.405$	3.85	$1.312 \pm 0.299$	$0.842 \pm 0.292$
PRF-fit source offset from KIC position	$1.738 \pm 0.306$	5.68	$1.514 \pm 0.221$	$0.852 \pm 0.243$
photometric centroid source offset	$1.01 \pm 1.37$	0.74	$0.94 \pm 1.37$	$0.38 \pm 1.35$

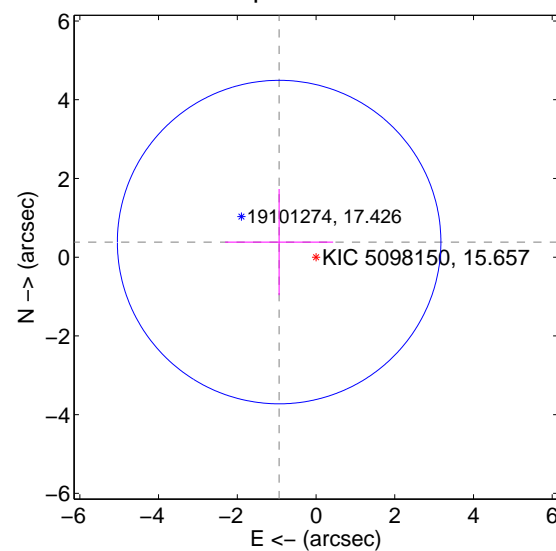
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

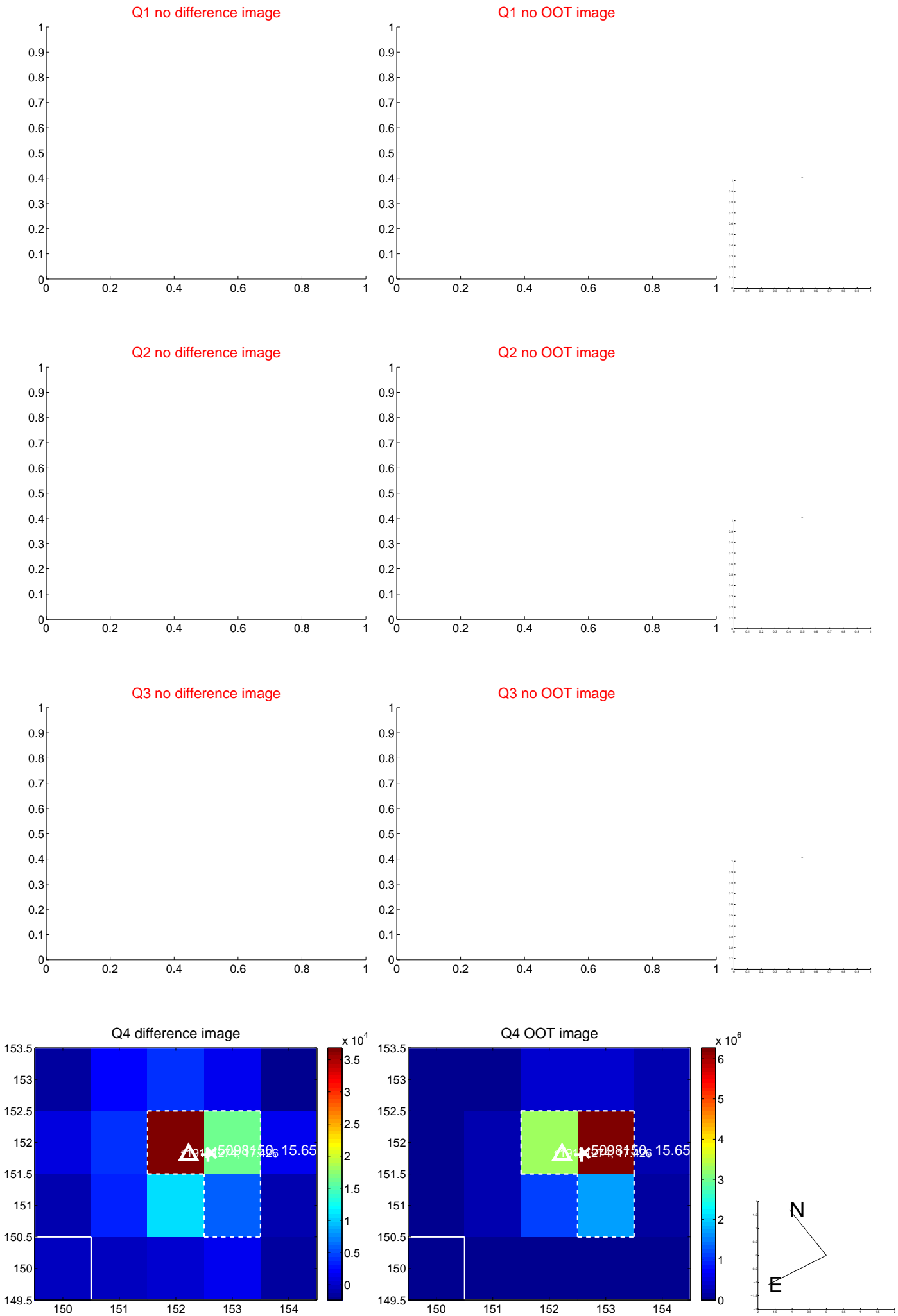


offset from photometric centroids



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.

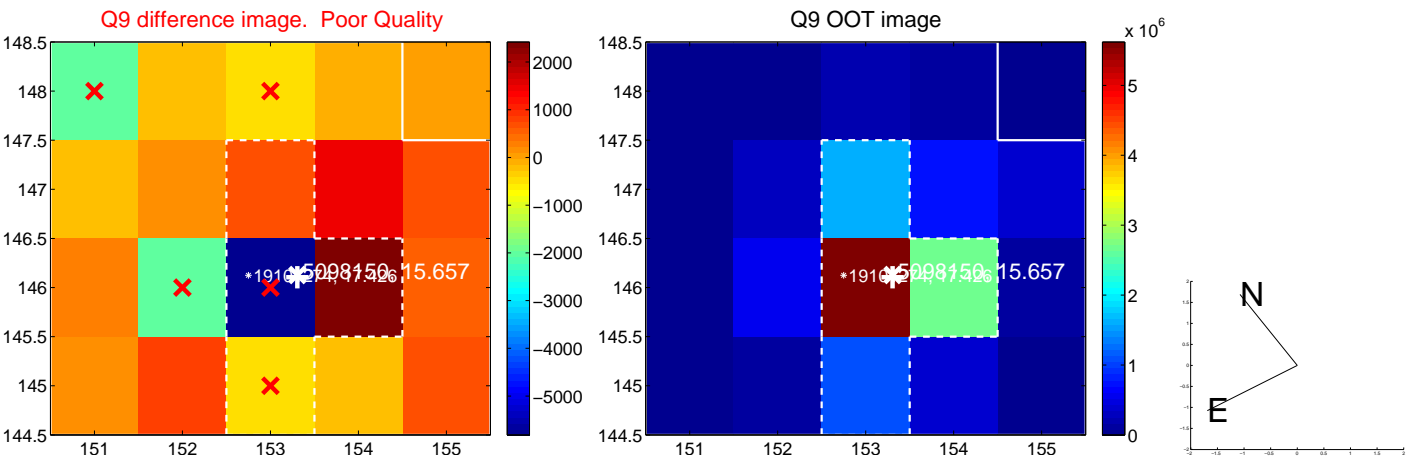
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



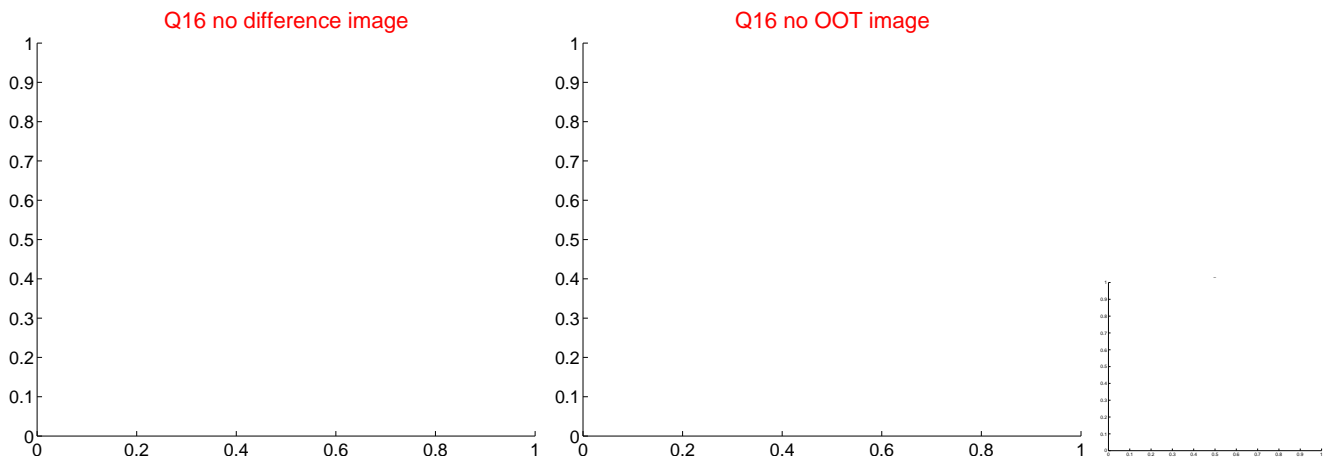
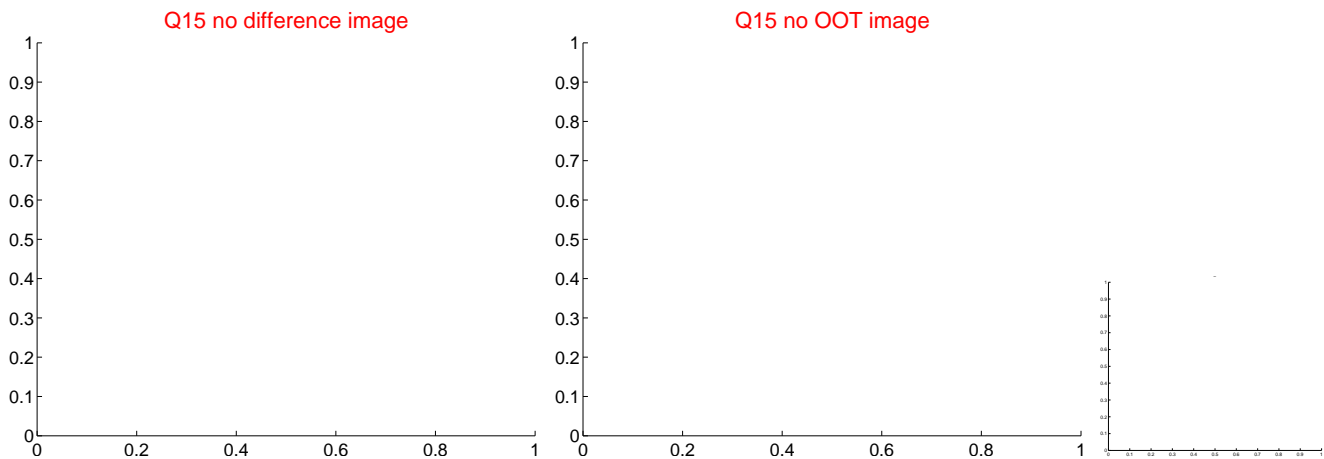
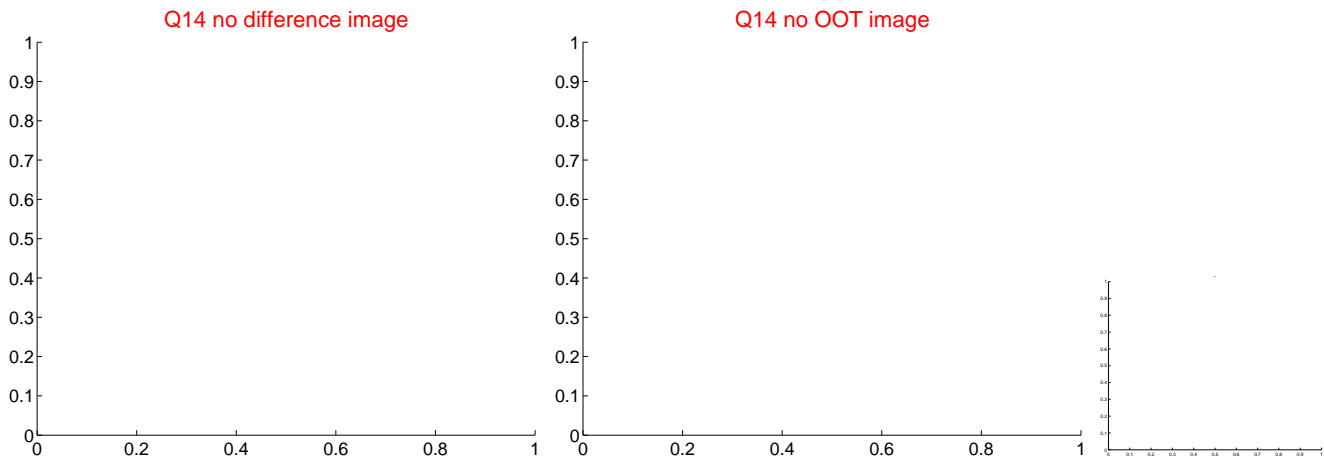
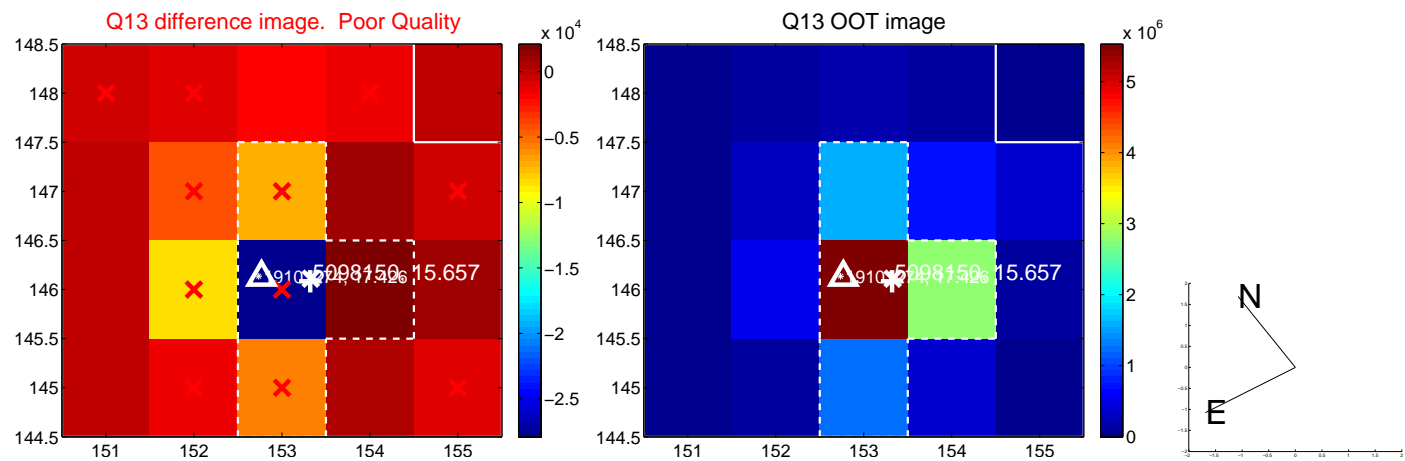
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



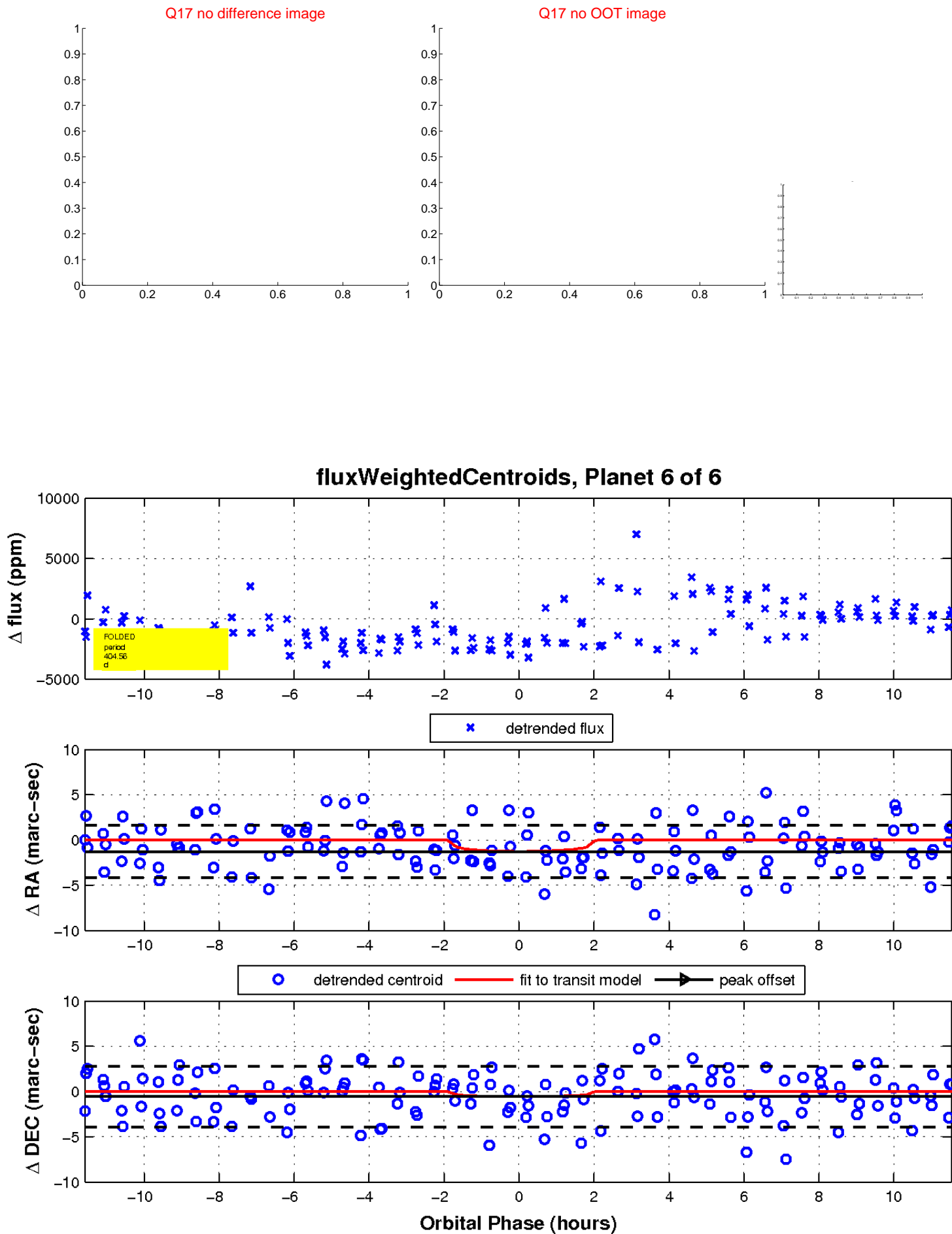
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ×: large negative pixel value.



white  $\times$ : 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

