

# KIC 009226540

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009226540-01	OBS	No	0.894169	132.237372	29.1	6.218	11.1	2.2	1.88	7550	1.09	22081.21
009226540-02	OBS	No	38.433322	151.183296	2192.5	0.970	15.0	1.8	1.88	7550	10.43	146.66
009226540-03	OBS	No	38.428952	151.481393	952.2	4.500	13.9	-1.0	1.88	7550	5.90	146.68
009226540-04	OBS	No	8.046167	133.530511	538.1	6.000	14.1	-1.0	1.88	7550	4.44	1179.77

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009226540-01	OBS	FP	0.00	1	0	0	0	LPP_DV—MOD_NONUNIQ_DV
009226540-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
009226540-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—SAME_NTL_PERIOD—CENT_NOFITS
009226540-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_ZUMA—TRANS_GAPPED—LPP_DV—LPP_ALT—CENT_NOFITS

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

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

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

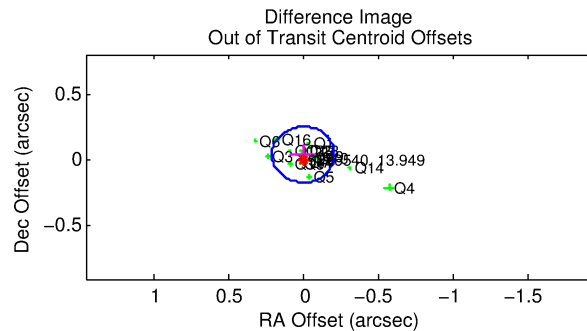
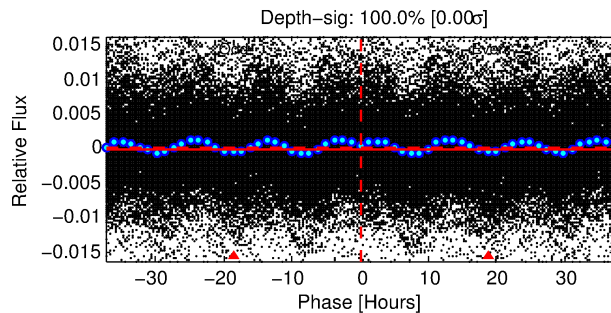
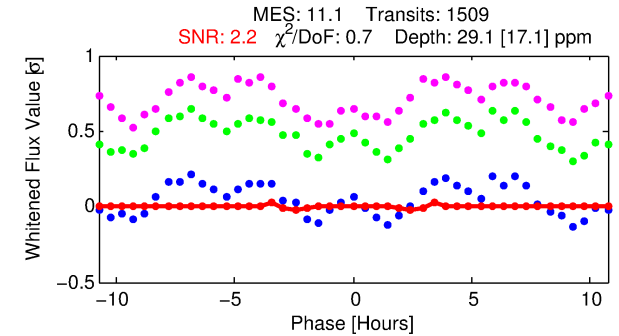
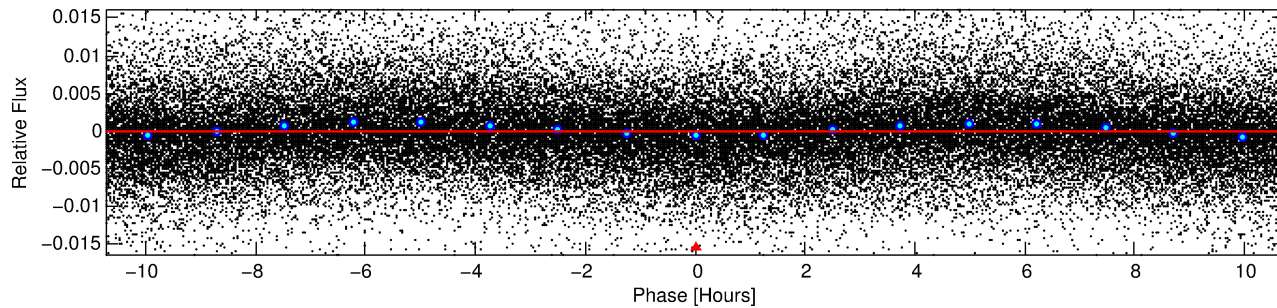
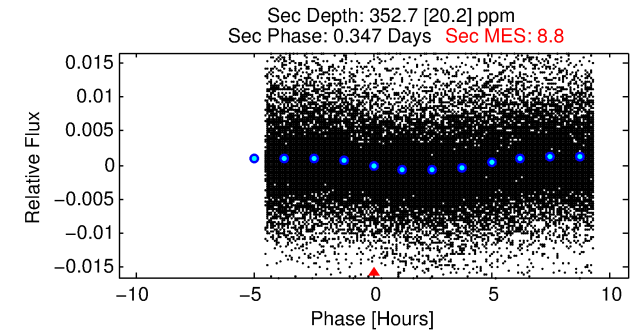
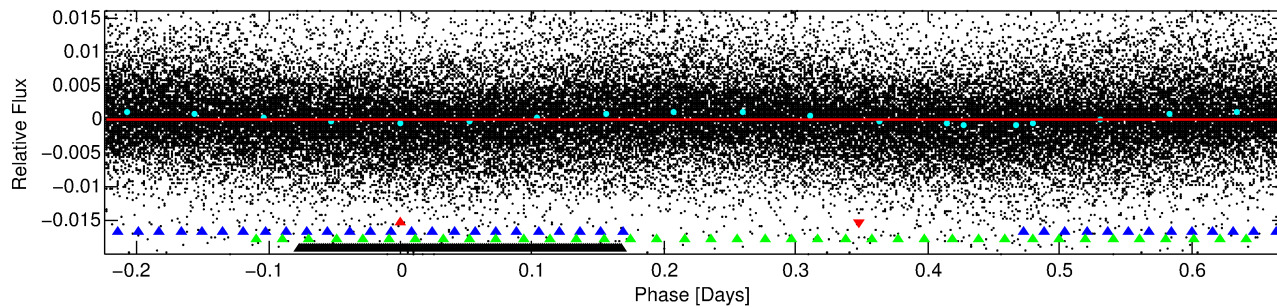
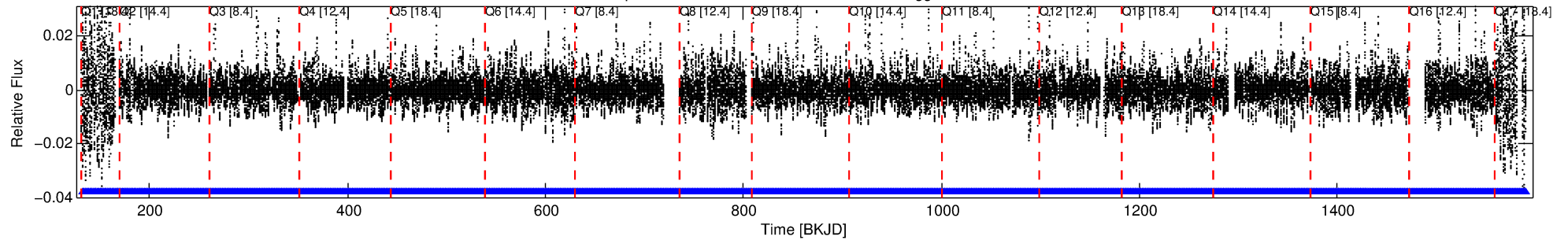
Ephemeris Match Information For 009226540-01

No Significant Match Found

# DV One-Page Summary

KIC: 9226540 Candidate: 1 of 4 Period: 0.894 d

Kp: 13.95 R\*: 1.88 Rs Teff: 7550.0 K Logg: 4.12 Fe/H: 0.070



## DV Fit Results:

Period = 0.89417 [0.00004] d  
Epoch = 132.2374 [0.0049] BKJD  
Rp/R\* = 0.0053 [0.0033]  
a/R\* = 1.15 [1.01]  
b = 0.70 [2.62]  
Seff = 22081.21 [8325.40]  
Teq = 3108 [293] K  
Rp = 1.09 [0.74] Re  
a = 0.0216 [0.0052] AU  
Ag = 76.39 [97.42] [0.77σ]  
Teffp = 14208 [4408] K [2.51σ]

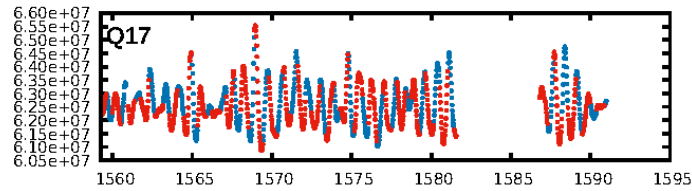
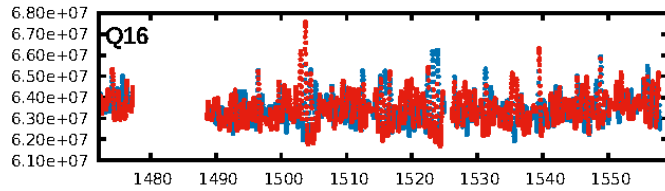
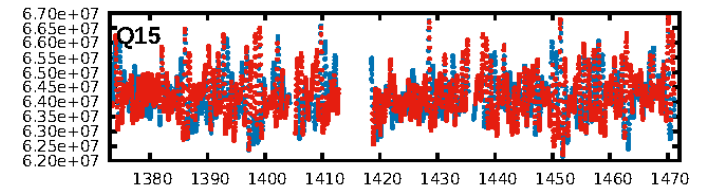
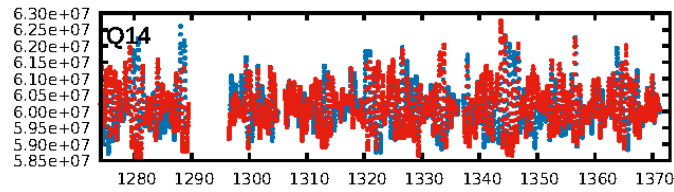
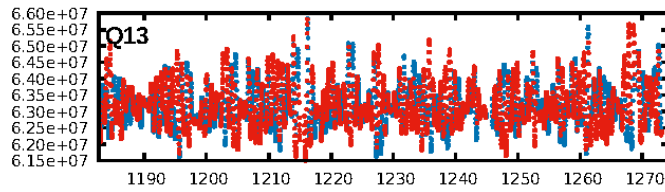
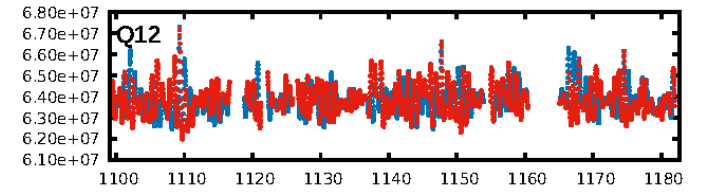
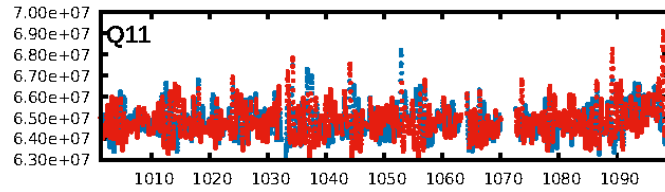
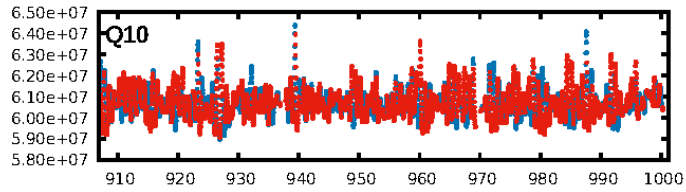
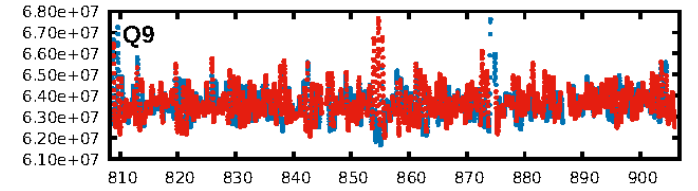
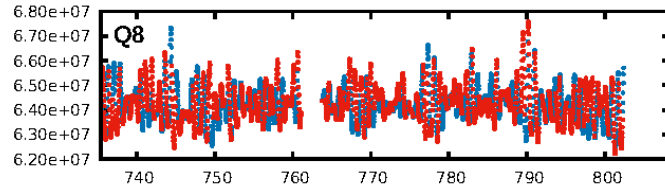
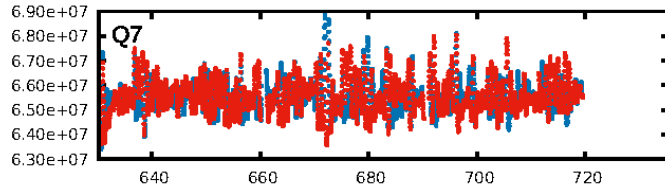
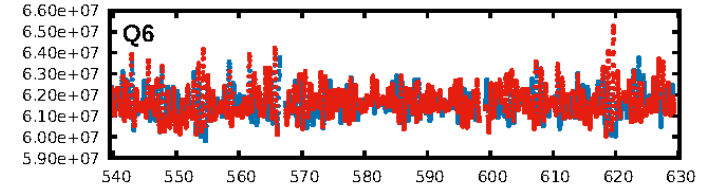
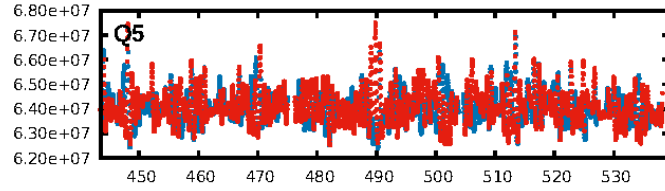
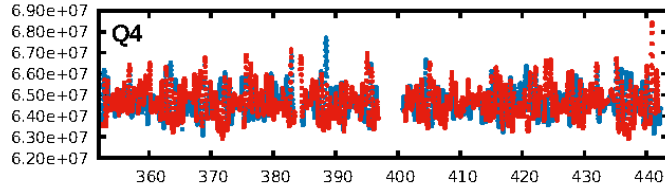
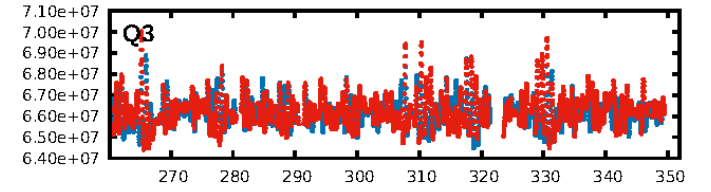
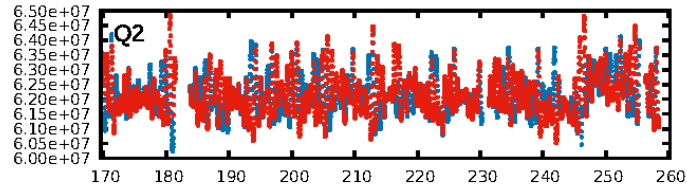
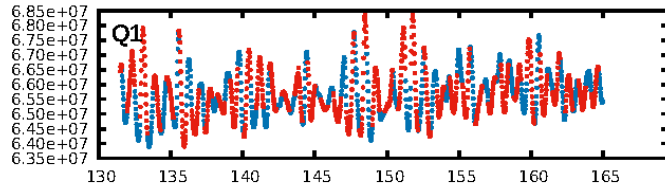
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [19.87σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [1441/1441]  
GhostDiagnostic-chr: 0.9301  
Centroid-sig: 11.7%  
Centroid-so: 1.250 arcsec [1.56σ]  
OotOffset-rm: 0.041 arcsec [0.59σ]  
KicOffset-rm: 0.095 arcsec [1.10σ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 0.65 [11/17]  
DiffImageOverlap-fno: 1.00 [17/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 03-Feb-2016 08:14:16 Z

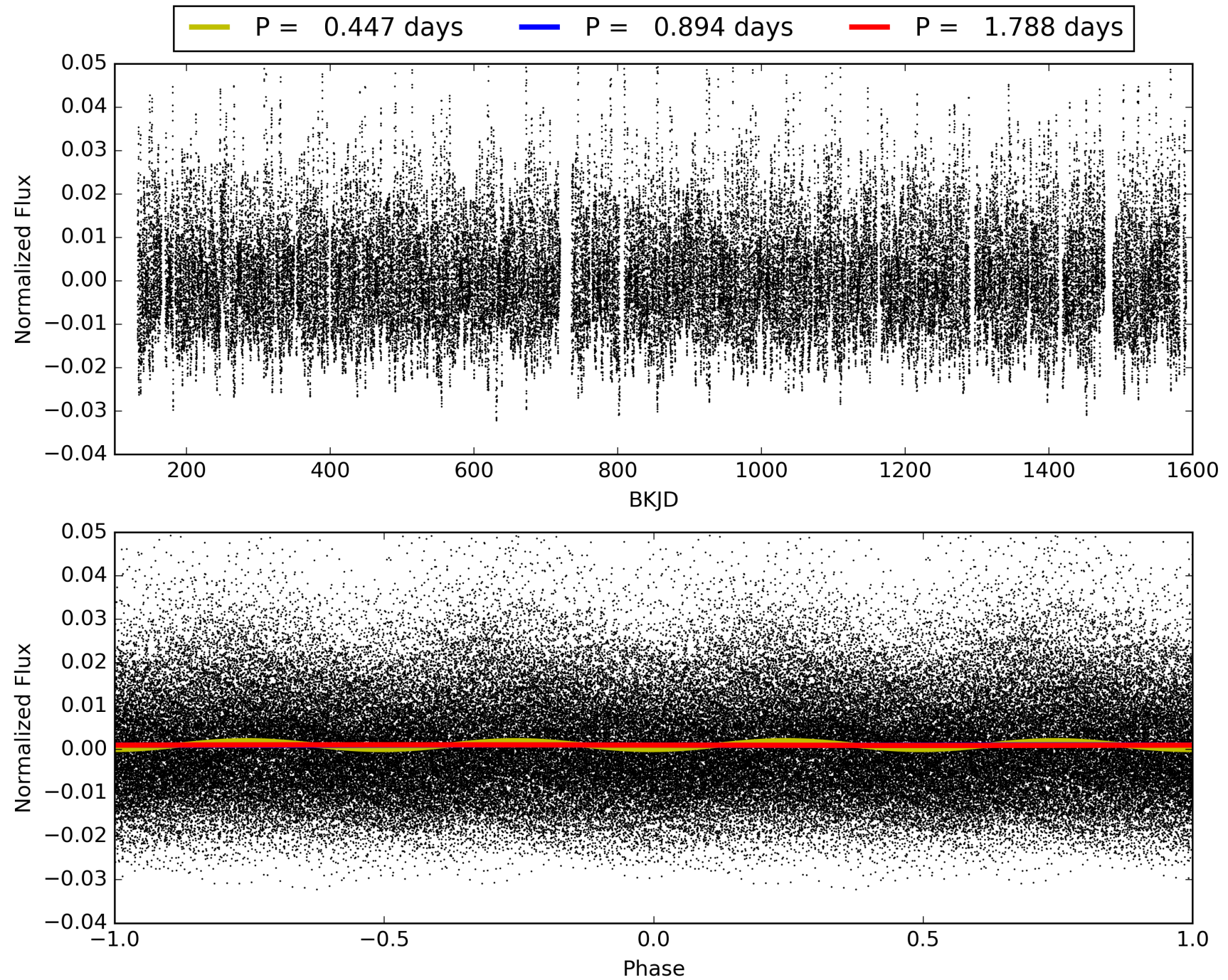
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 009226540-01, PDC Light Curves





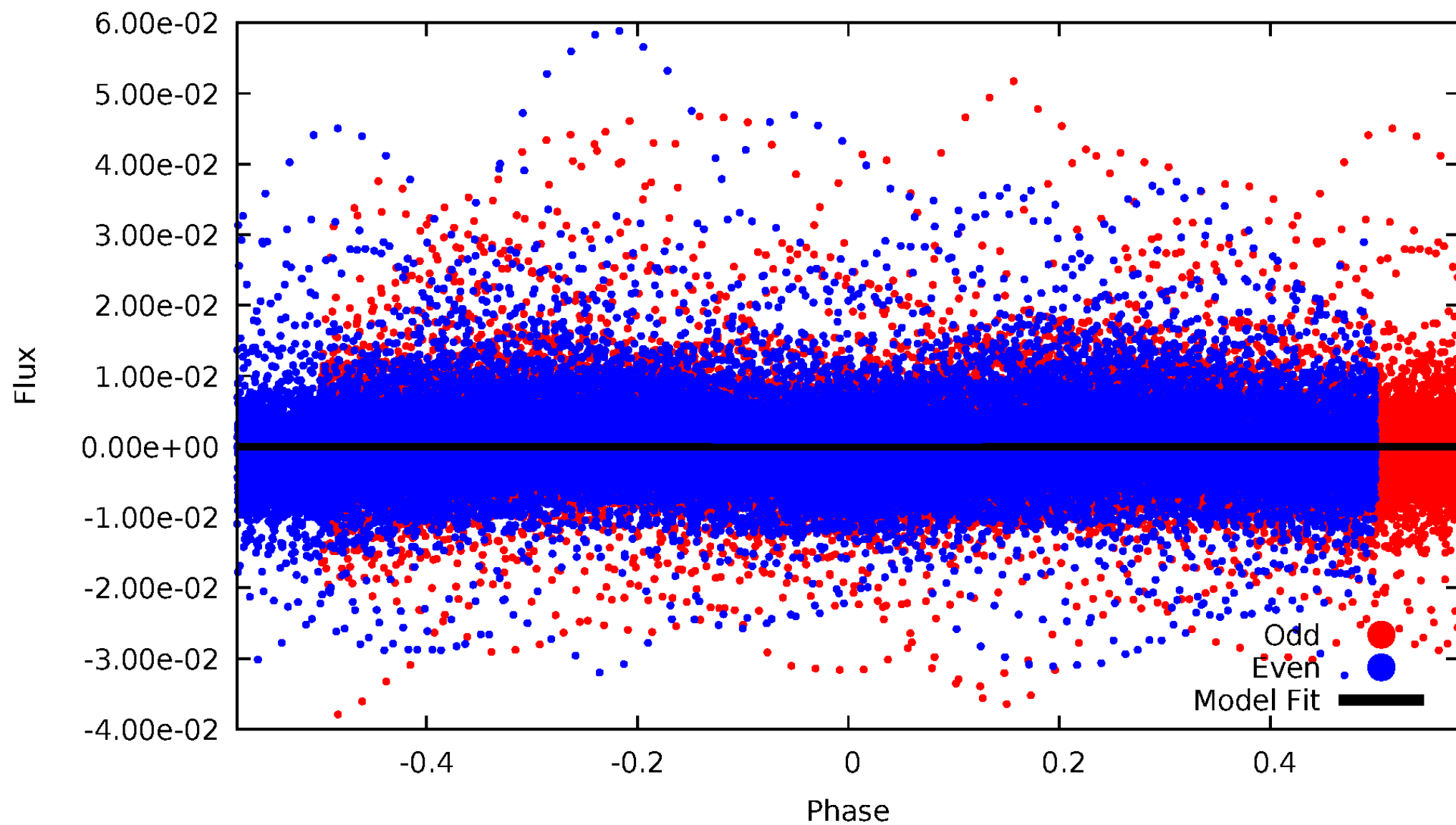
TCE 009226540-01





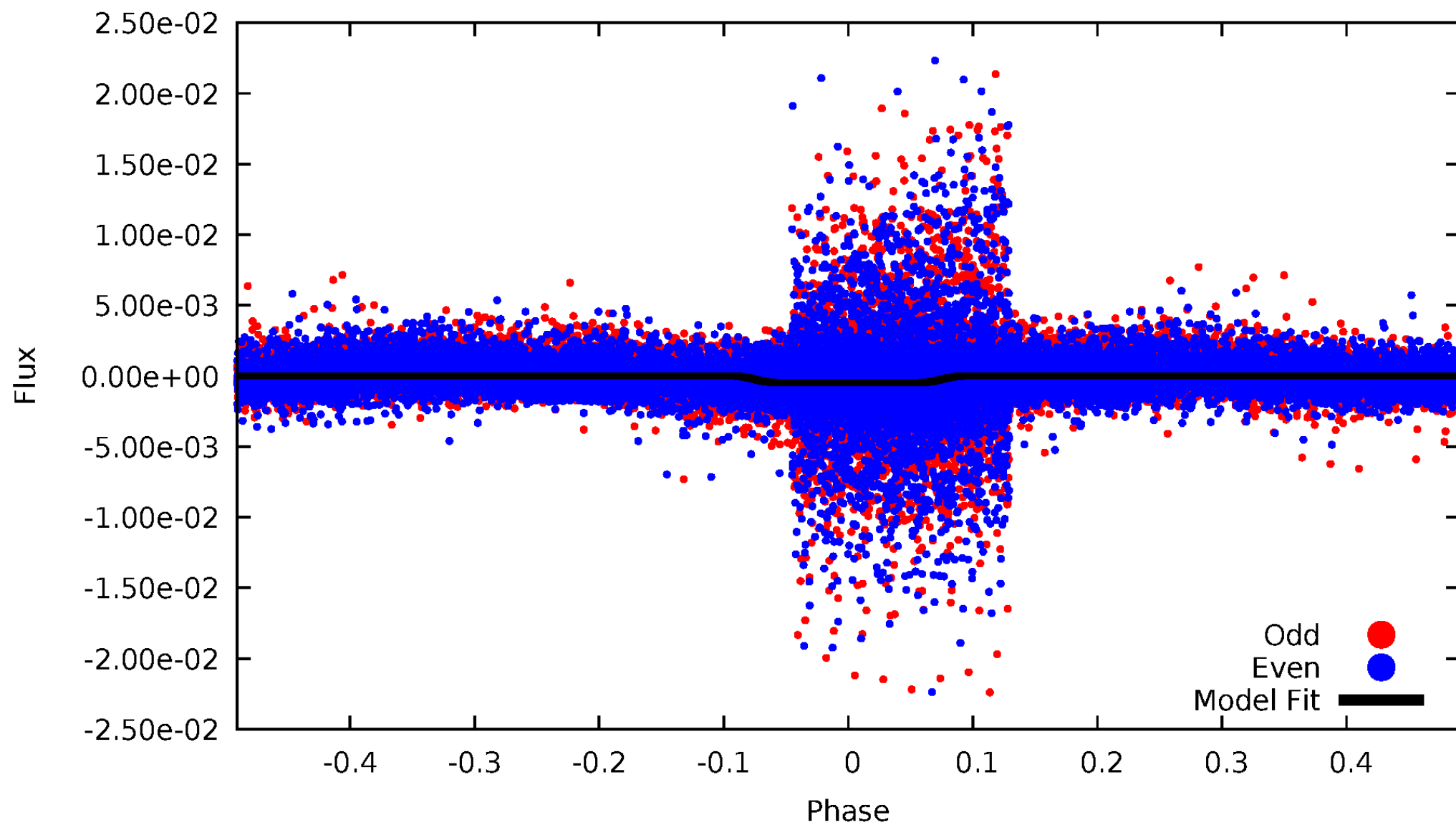
# DV Odd/Even

TCE 009226540-01



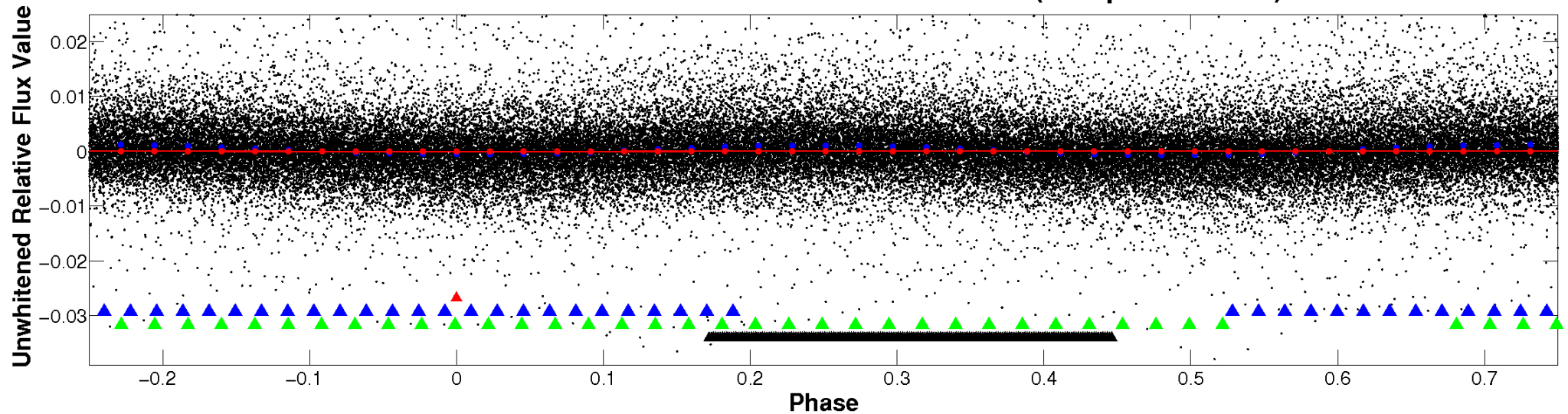
# ALT Odd/Even

TCE 009226540-01

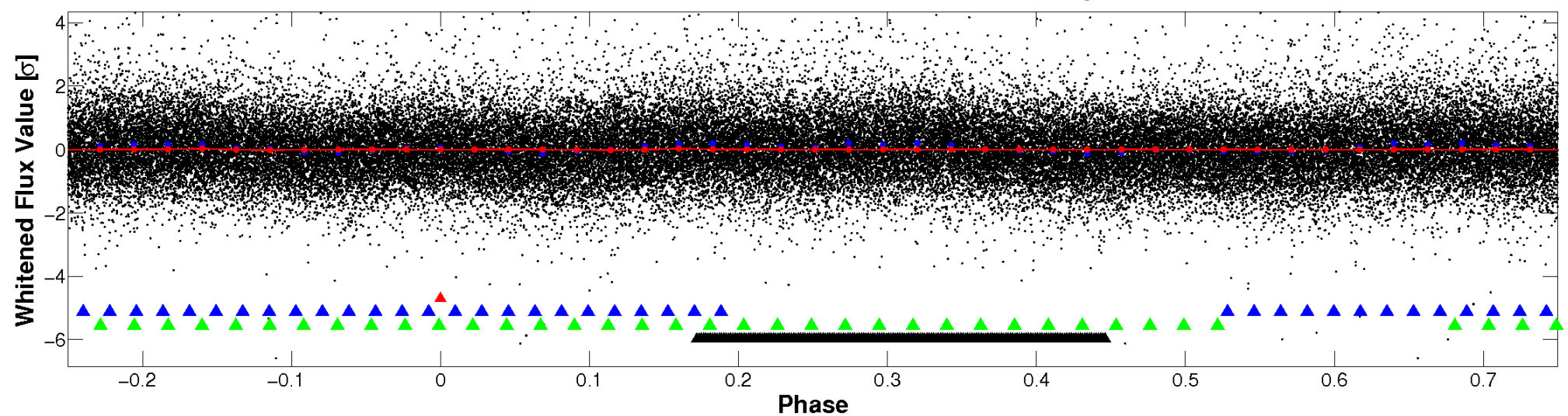


# Non-Whitened Vs. Whitened Light Curve

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



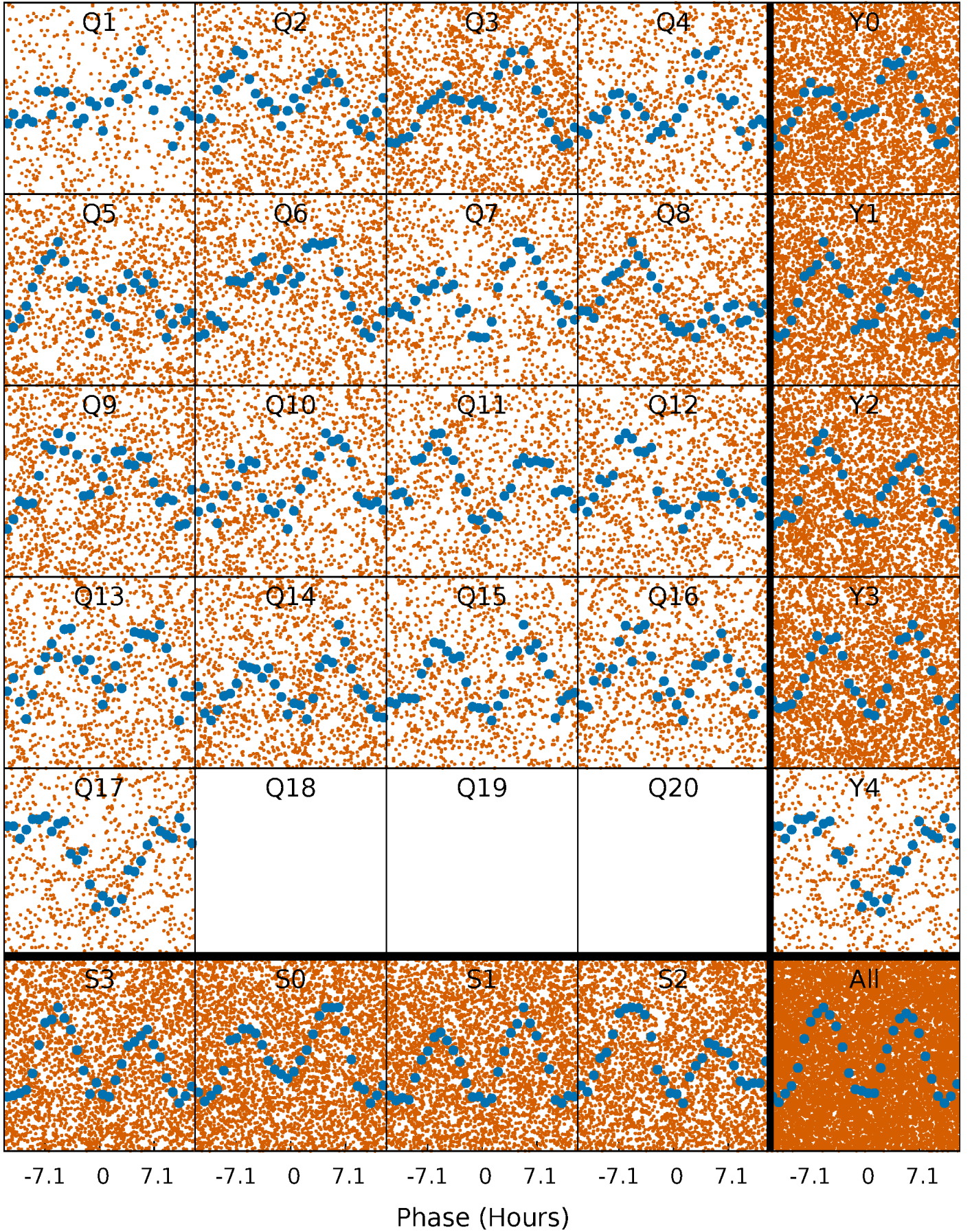
**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**





# PDC Quarter-Phased Transit Curves

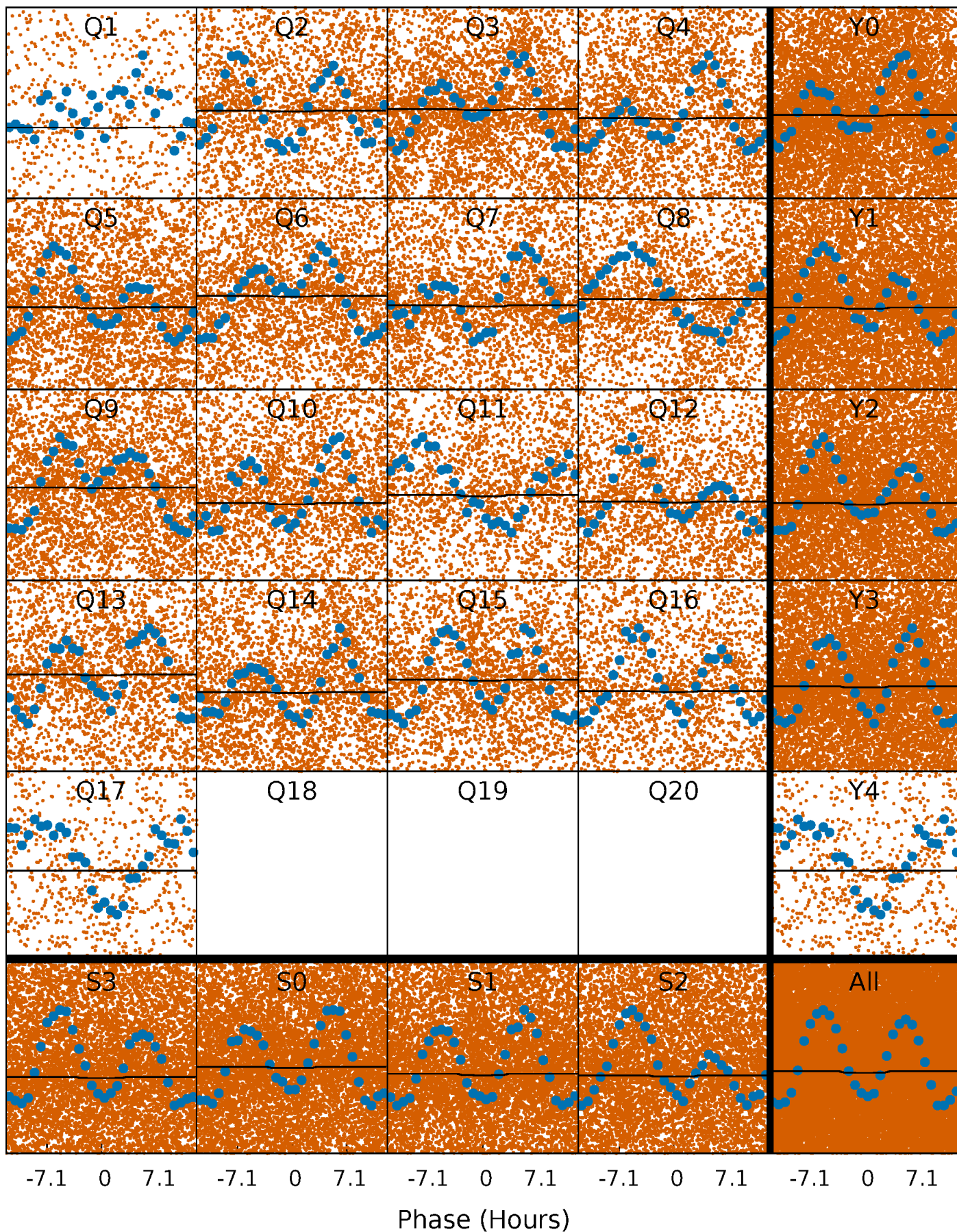
TCE 009226540-01 P= 0.894169 Days  $T_0=132.237371$  (BKJD)





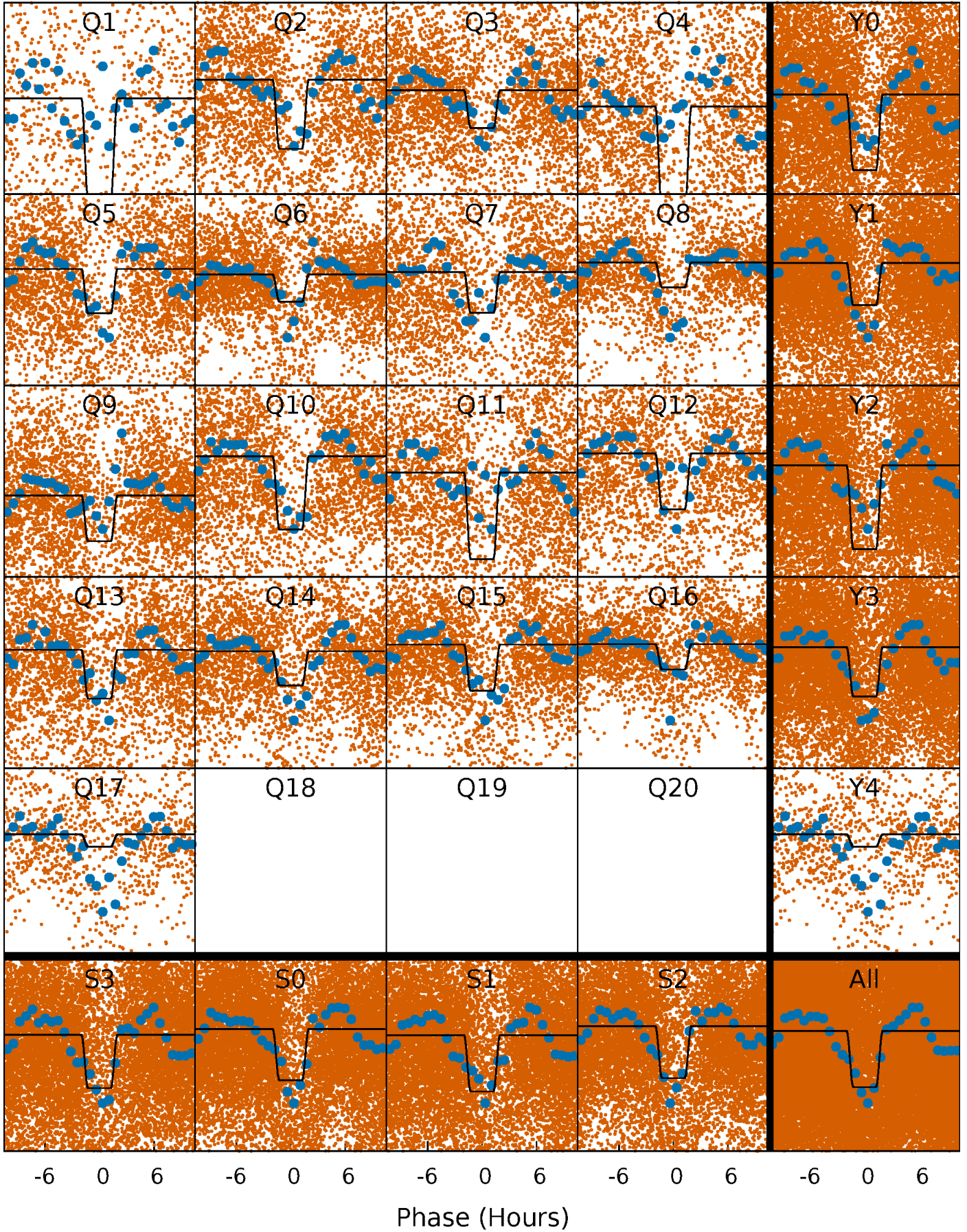
# DV Quarter-Phased Transit Curves

TCE 009226540-01 P= 0.894169 Days  $T_0=132.237371$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 009226540-01 P= 0.894203 Days  $T_0=132.250940$  (BKJD)

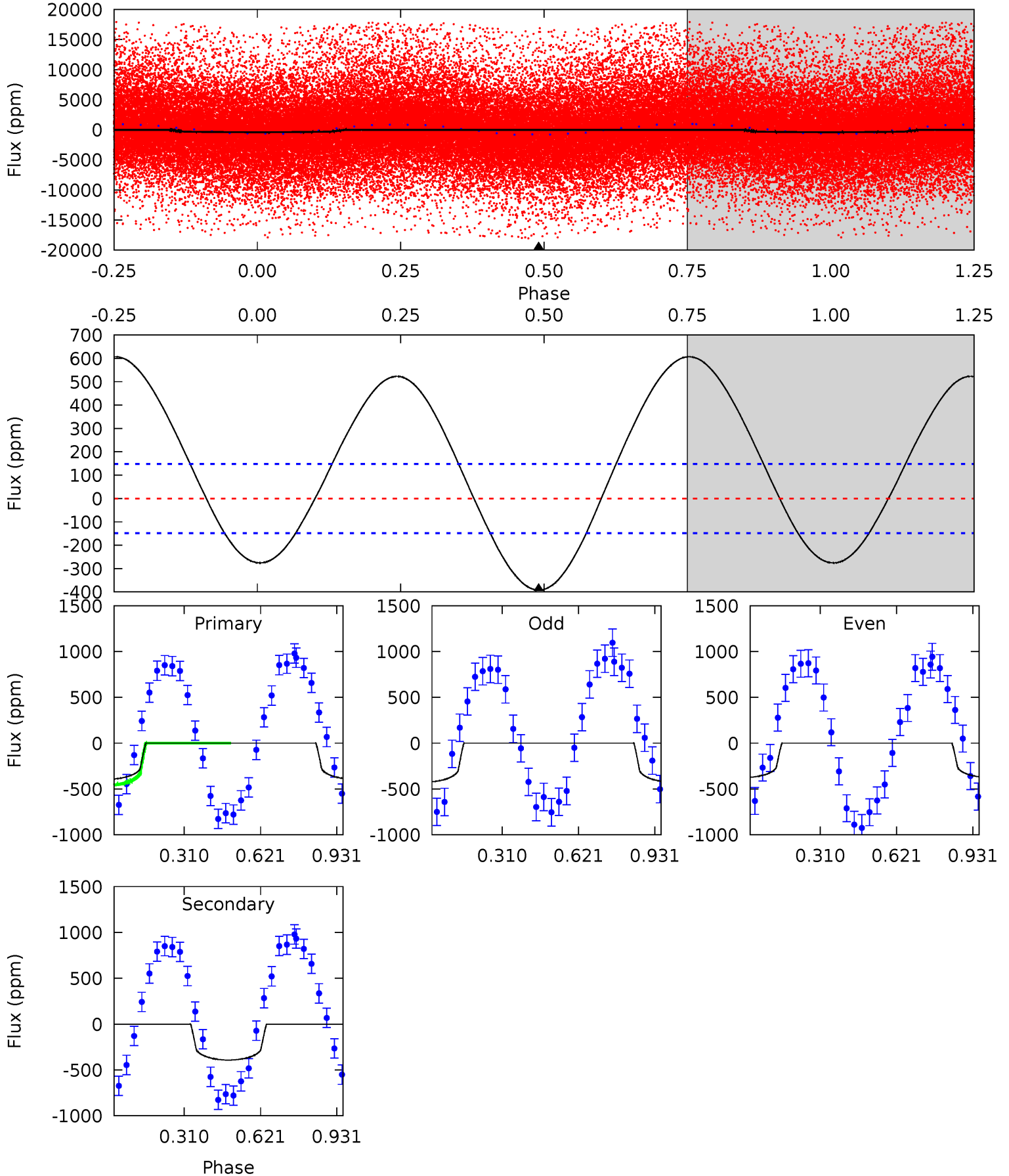




# DV Model-Shift Uniqueness Test

009226540-01, P = 0.894169 Days, E = 131.343202 Days

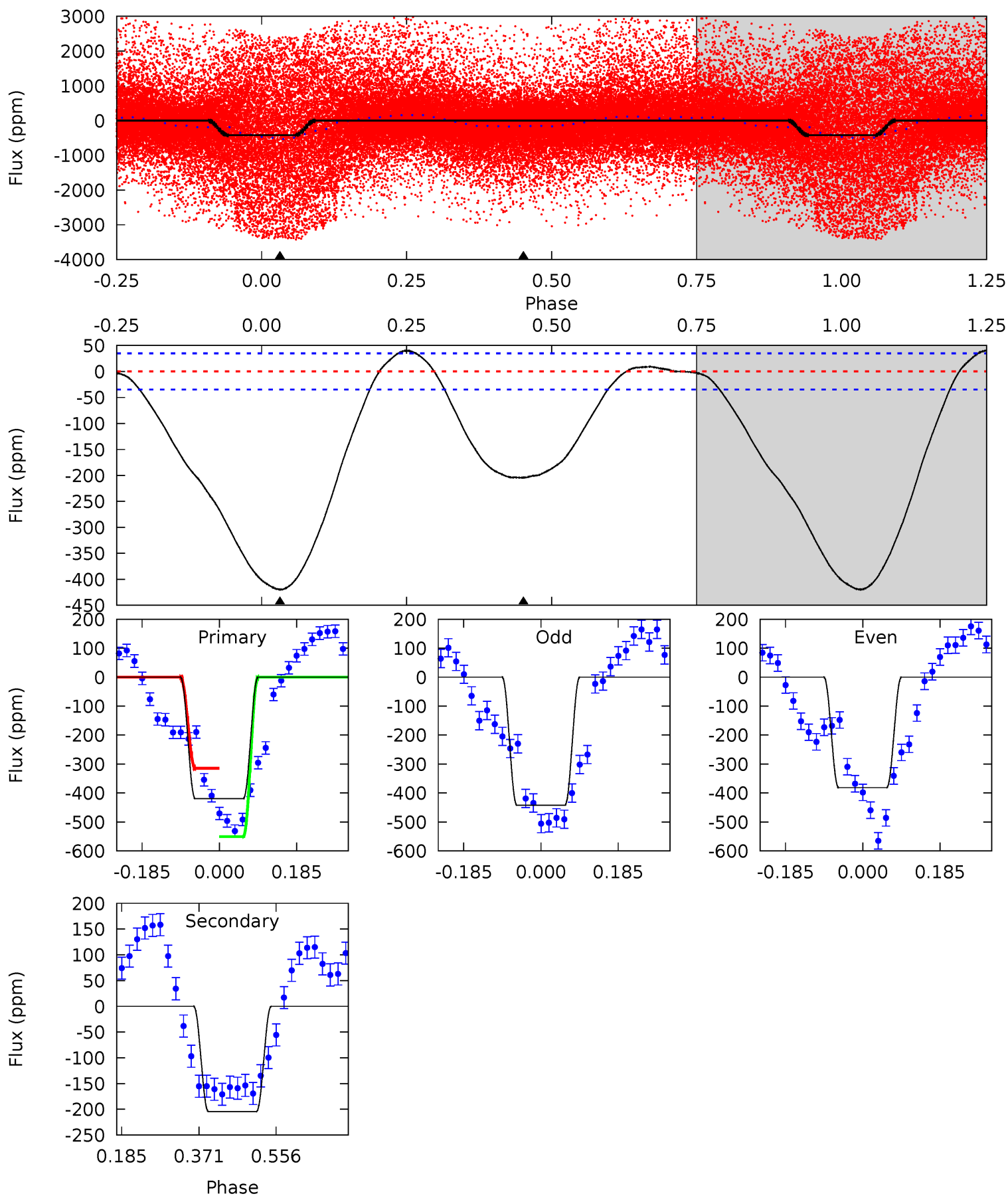
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
11.5	11.5	0	0	4.32	1.01	7.08	11.5	11.5	11.5	11.5	0.72	2.24	0.61	1.74



# Alt Model-Shift Uniqueness Test

009226540-01, P = 0.894203 Days, E = 131.356737 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
53.5	26.1	0	0	4.43	1.32	5.47	53.5	53.5	26.1	26.1	3.89	1.11	0.09	14.9



### Stellar Parameters For KIC 009226540

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7550^{+211}_{-316}$	$4.115^{+0.120}_{-0.180}$	$0.070^{+0.150}_{-0.350}$	$1.883^{+0.549}_{-0.366}$	$1.685^{+0.204}_{-0.272}$	$0.355^{+0.212}_{-0.179}$
	+3%/-4%	+3%/-4%	+214%/-500%	+29%/-19%	+12%/-16%	+60%/-50%
Source	KIC0	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 009226540-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-393 \pm 34$	$1.19^{+0.68}_{-0.62}$	$4363^{+324}_{-275}$	$20442^{+38016}_{-6973}$	$68^{+224}_{-39}$
Alt.	$-204 \pm 8$	$4.42^{+0.98}_{-0.79}$	$4354^{+312}_{-260}$	$5829^{+585}_{-451}$	$2.618^{+1.213}_{-0.828}$

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



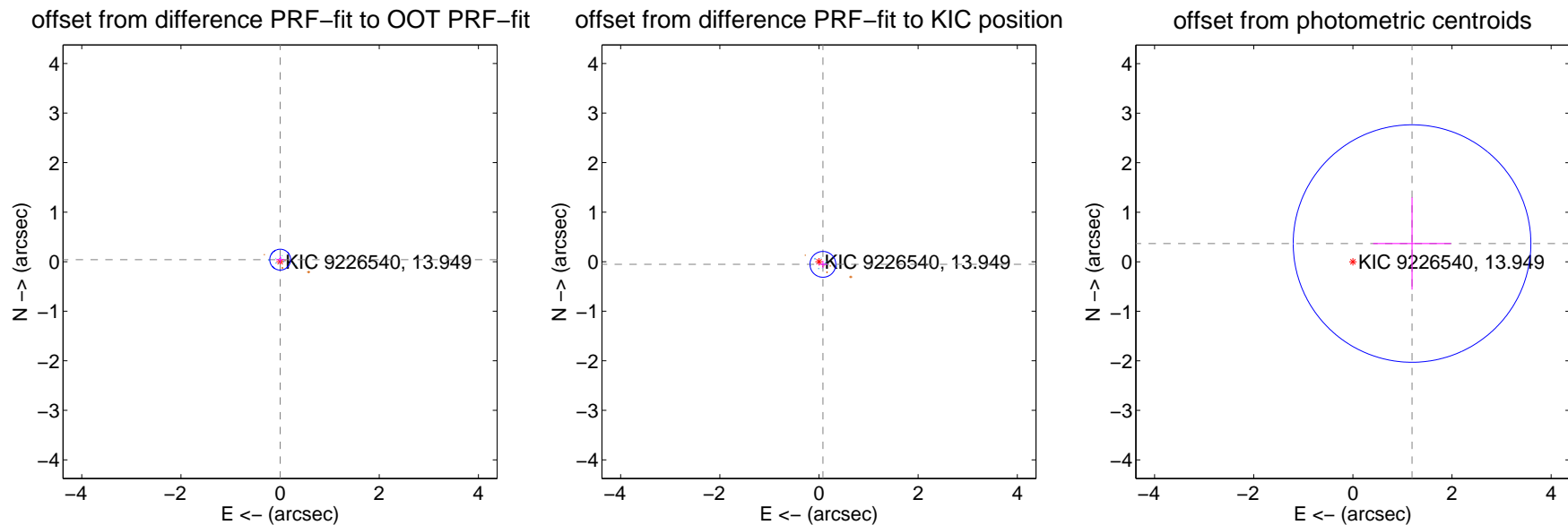
## DV Centroid Data

Supplemental centroid analysis for 009226540-01. Kepler magnitude: 13.95. Transit SNR 2.16

There are 11 quarters with good PRF difference image offsets

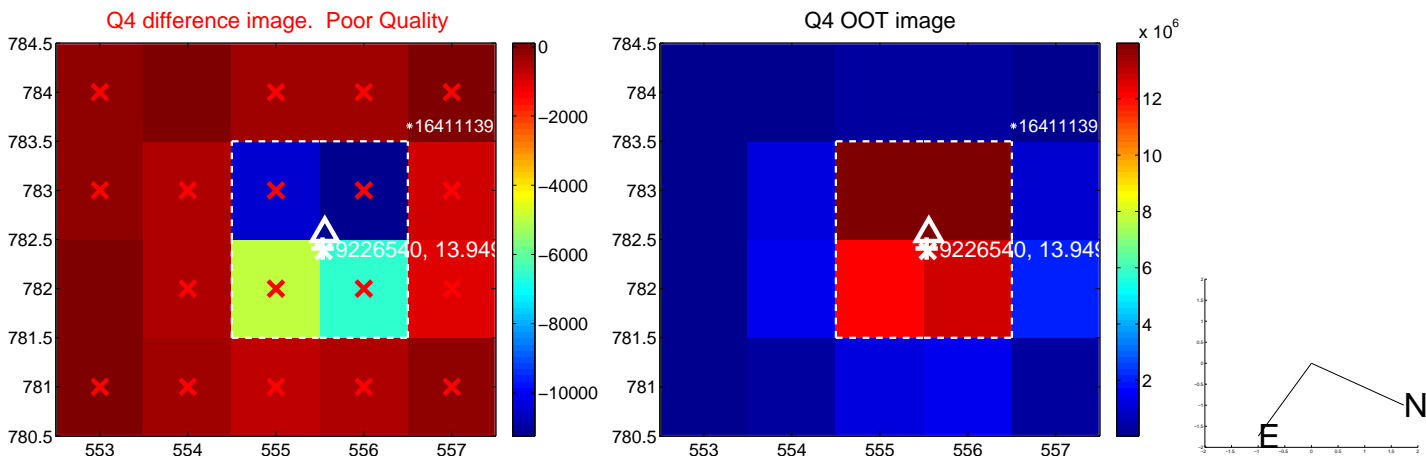
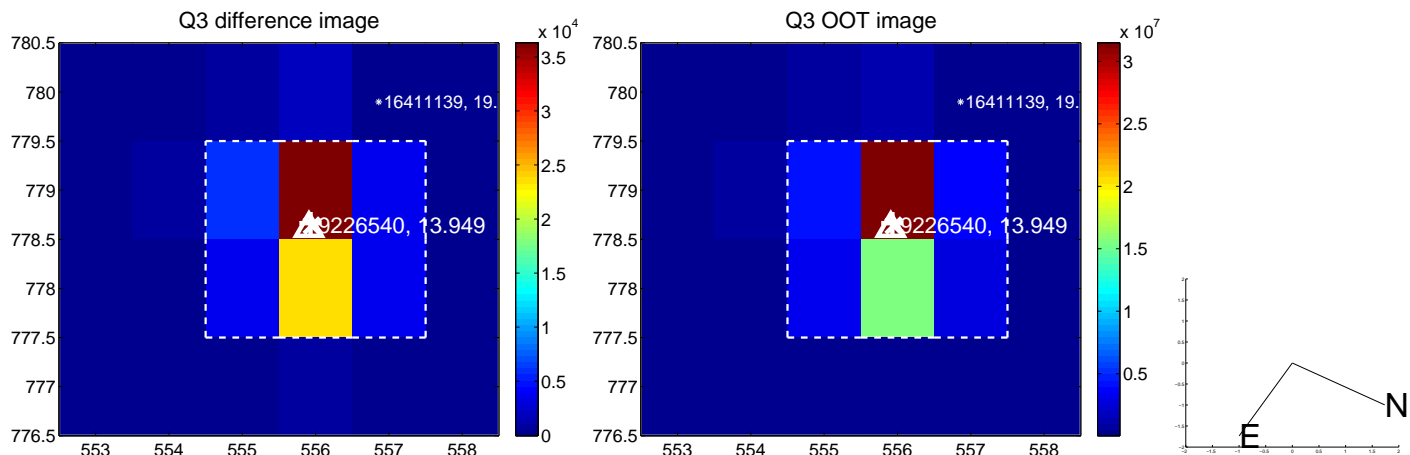
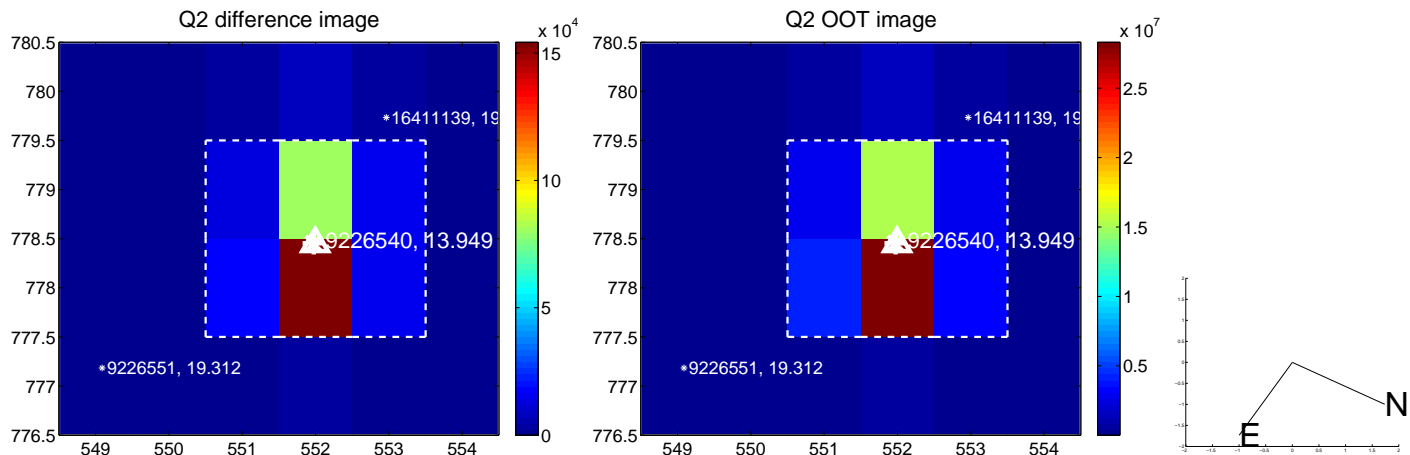
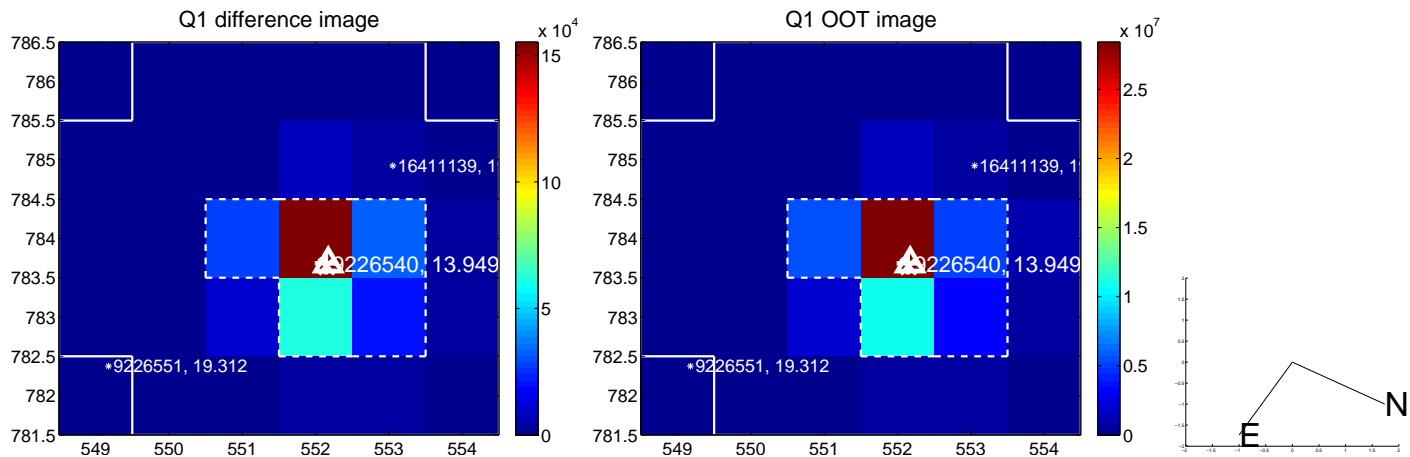
The direct PRF centroid is offset from the target star catalog position by about 0.16 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.041 \pm 0.070$	0.59	$-0.002 \pm 0.083$	$0.041 \pm 0.071$
PRF-fit source offset from KIC position	$0.095 \pm 0.087$	1.10	$-0.079 \pm 0.085$	$-0.054 \pm 0.072$
photometric centroid source offset	$1.25 \pm 0.80$	1.56	$-1.19 \pm 0.79$	$0.37 \pm 0.93$

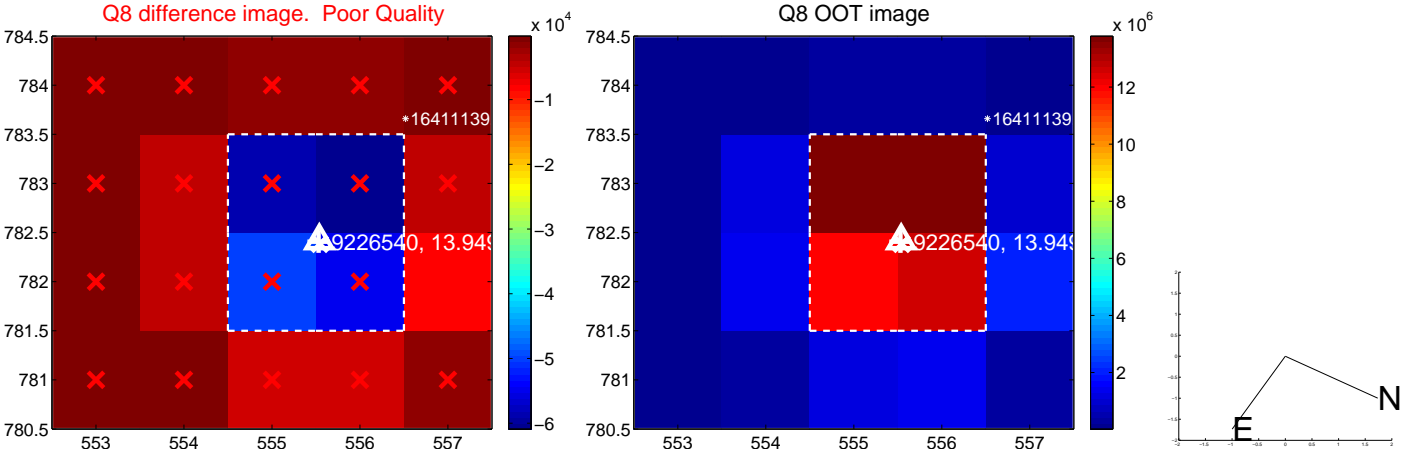
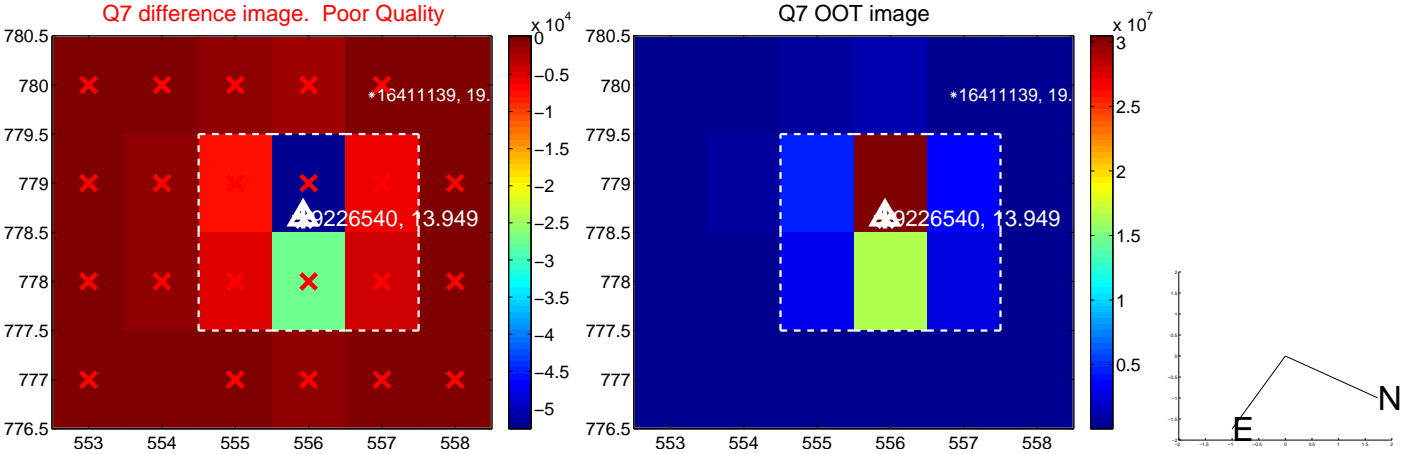
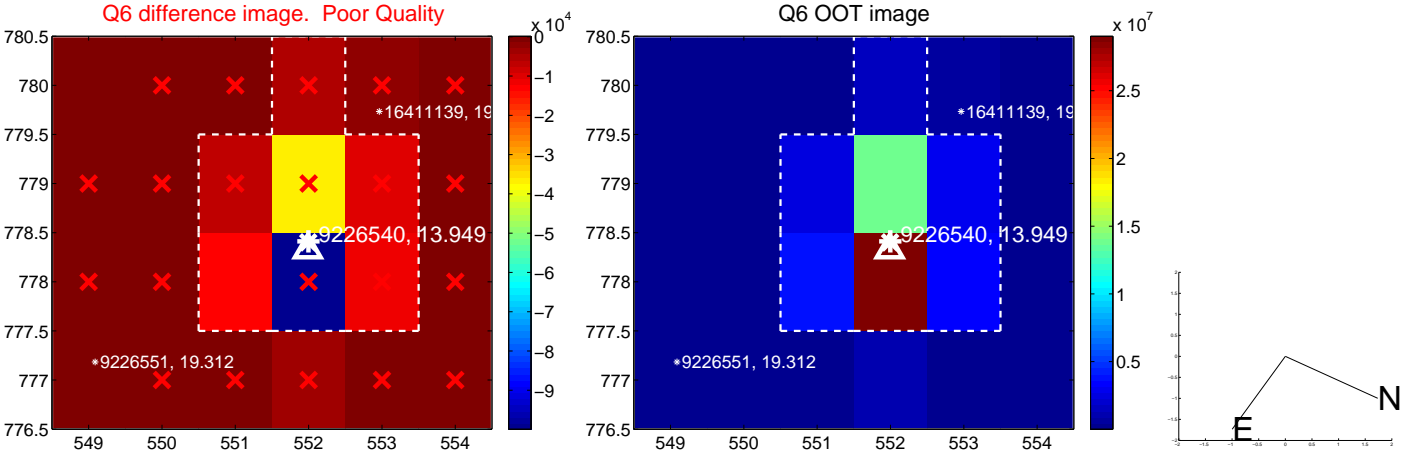
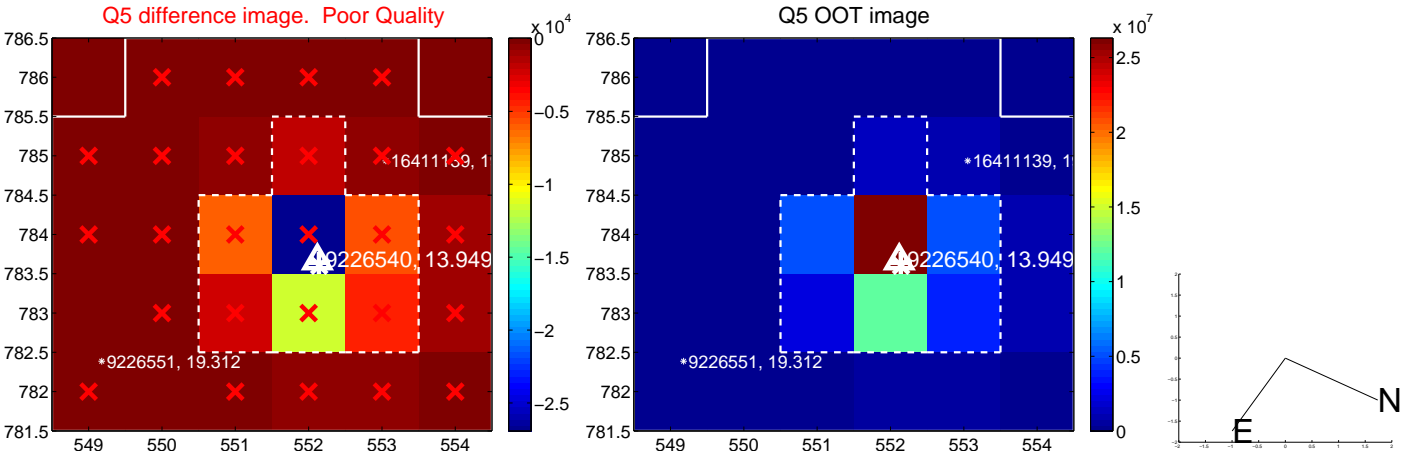


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

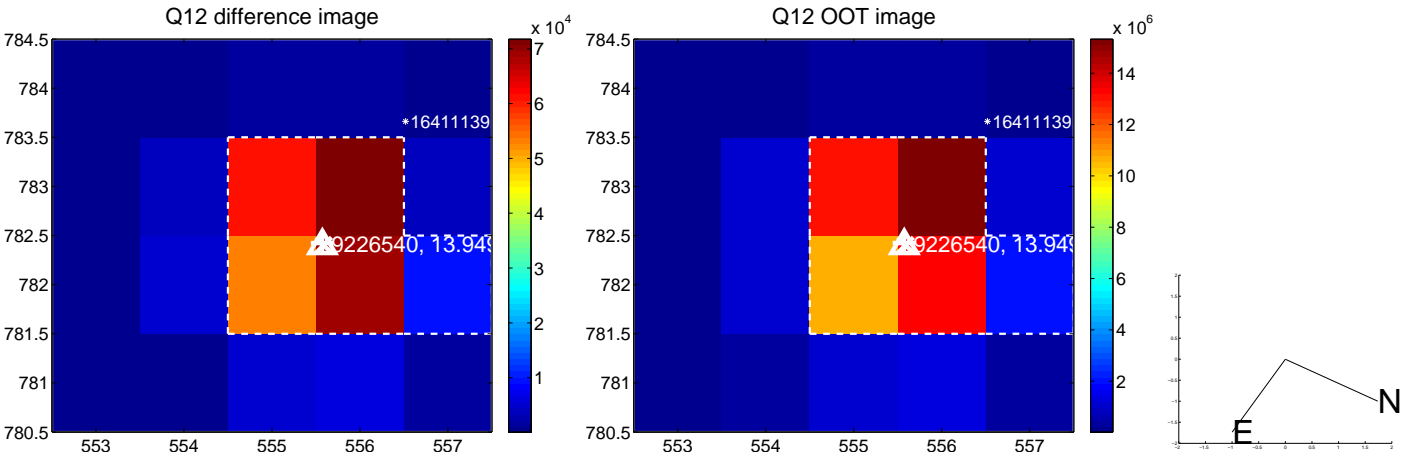
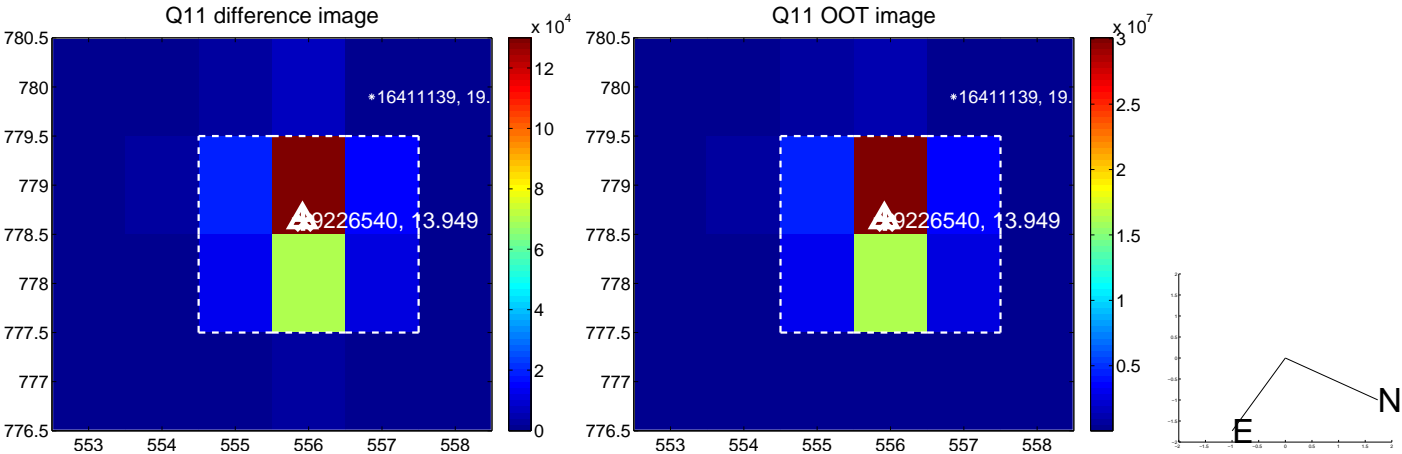
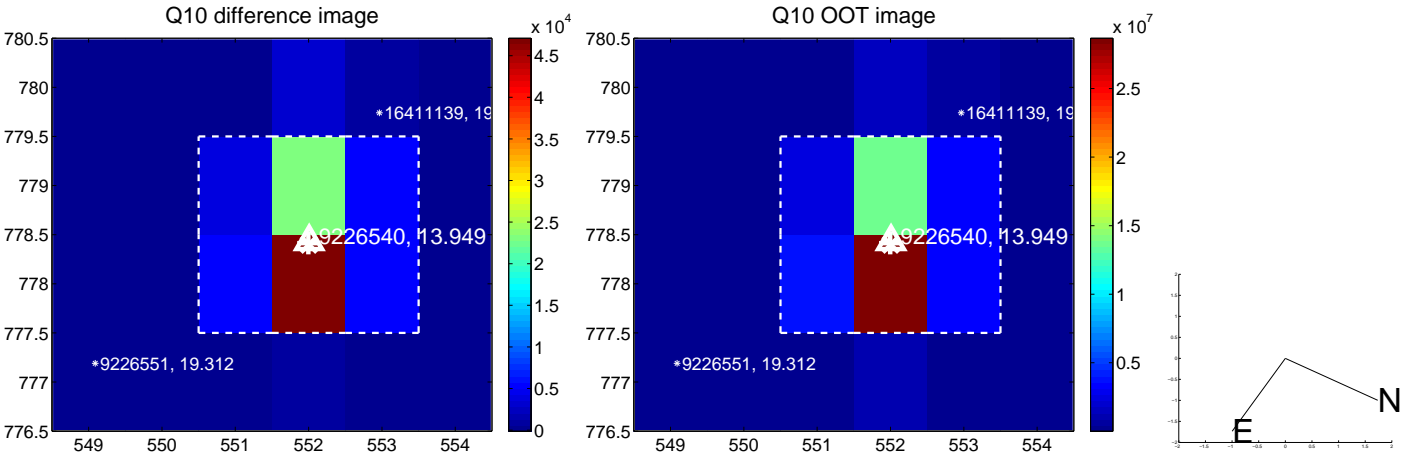
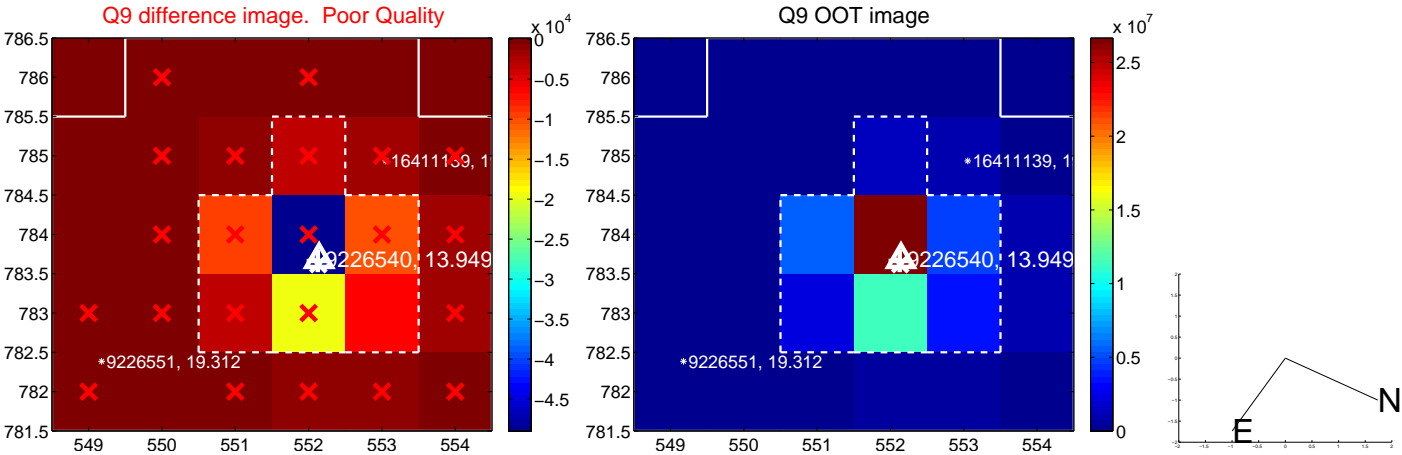


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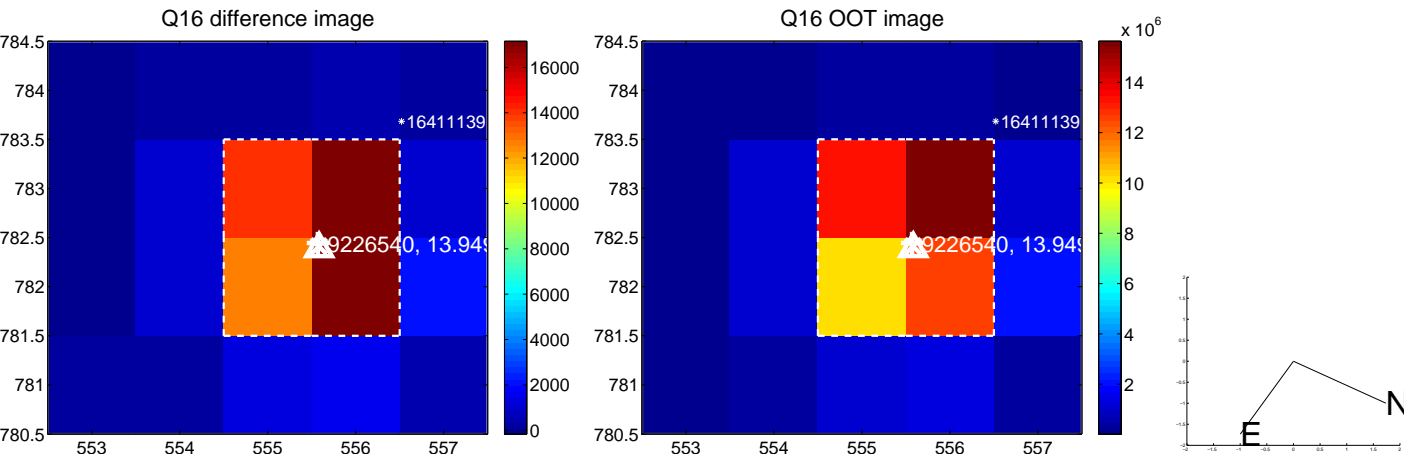
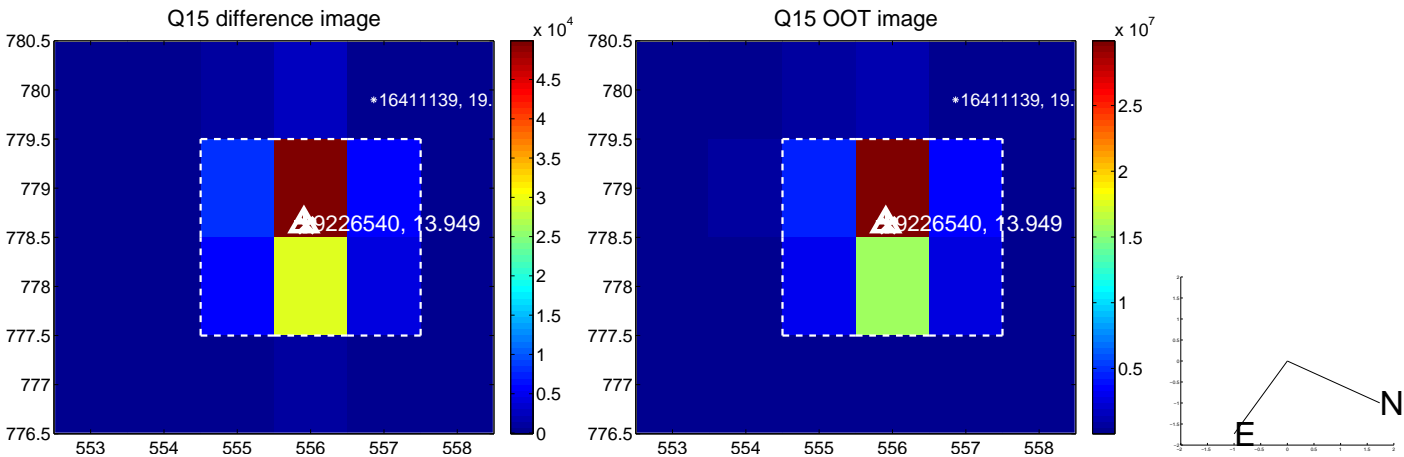
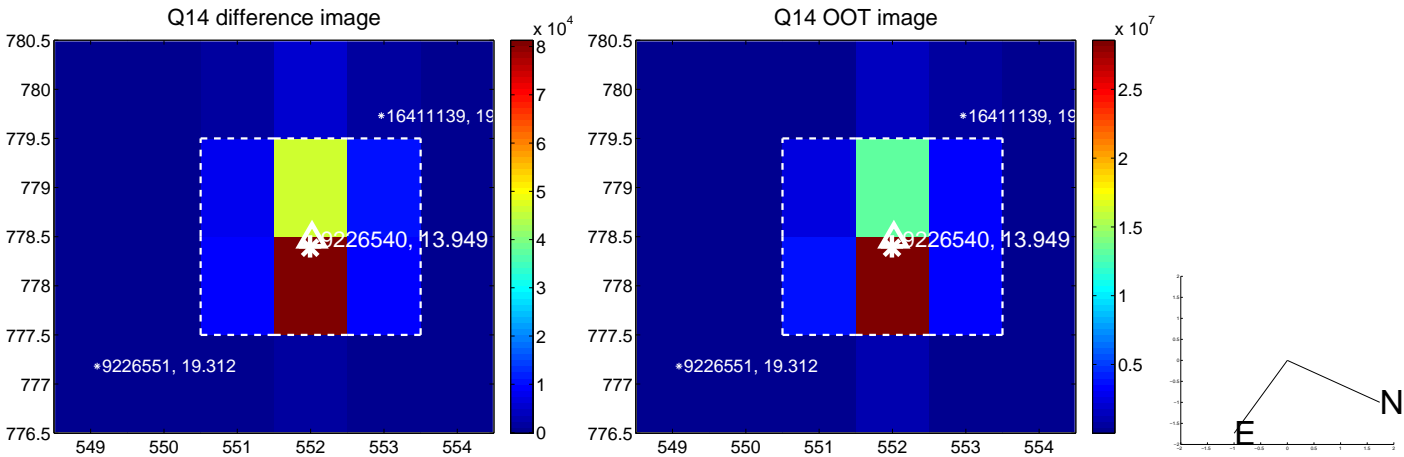
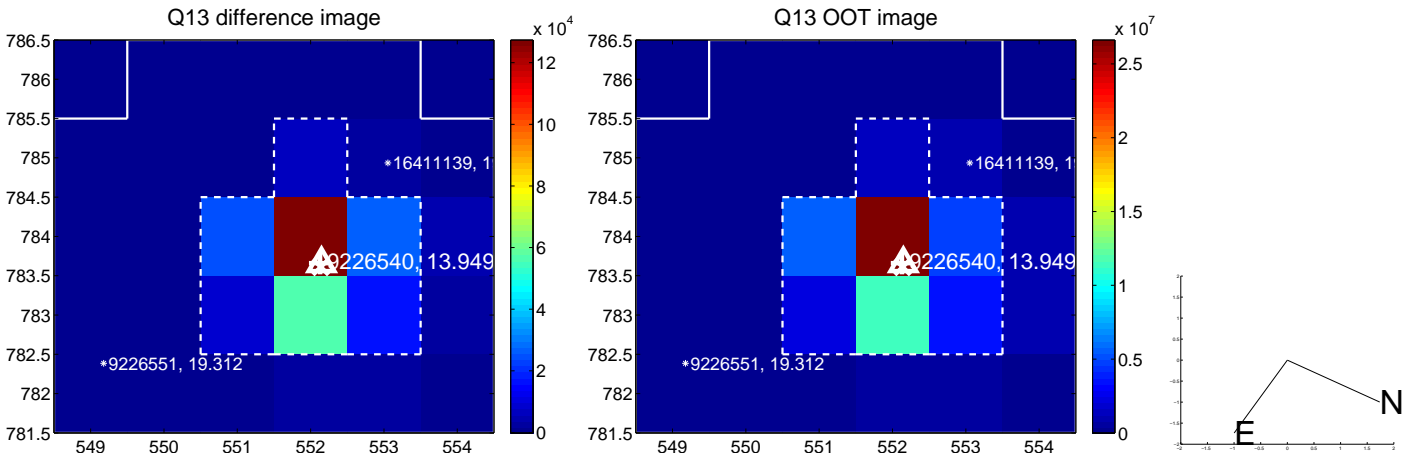




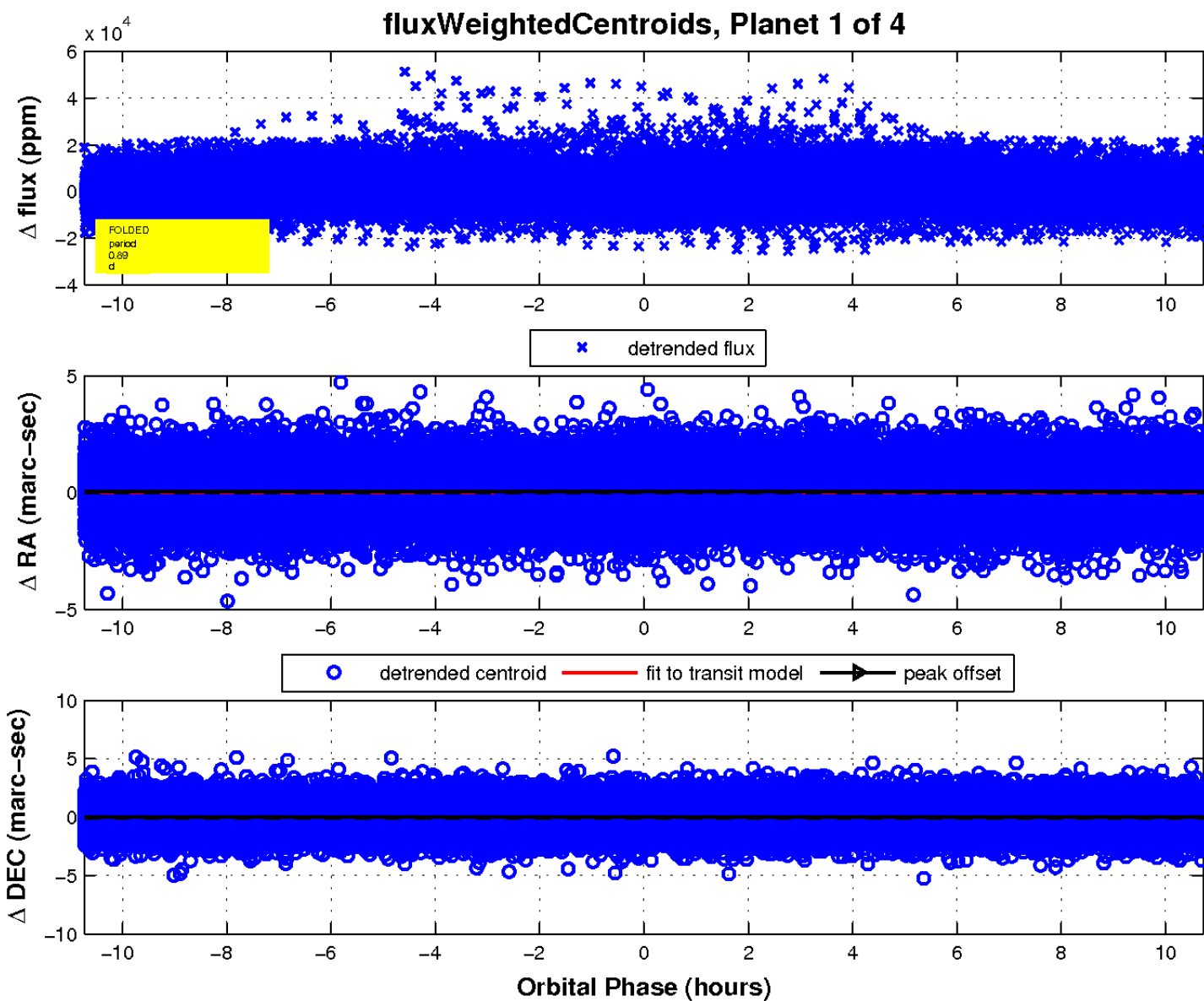
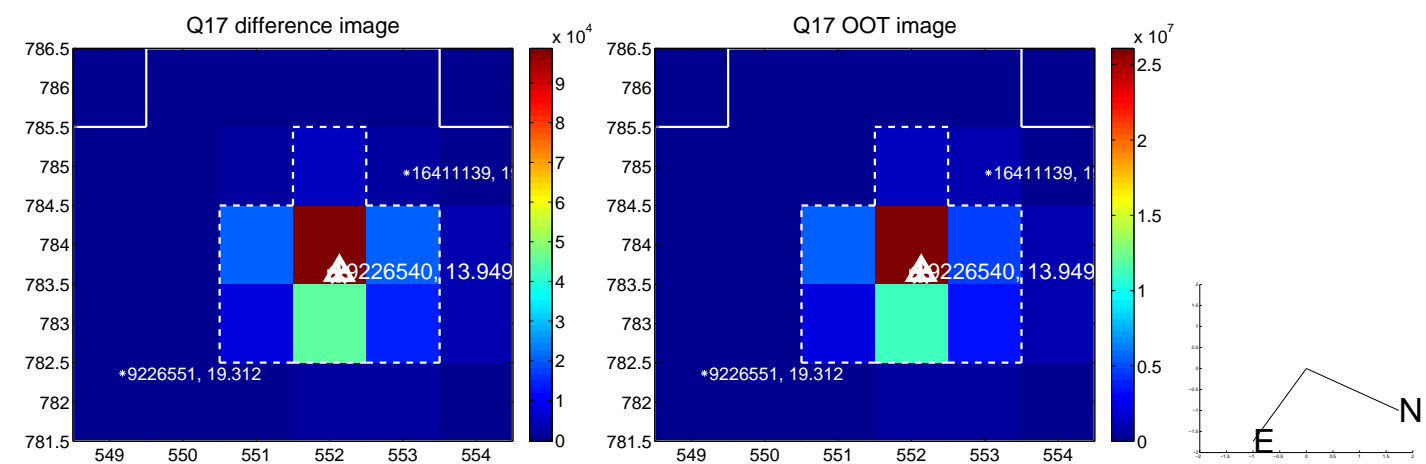
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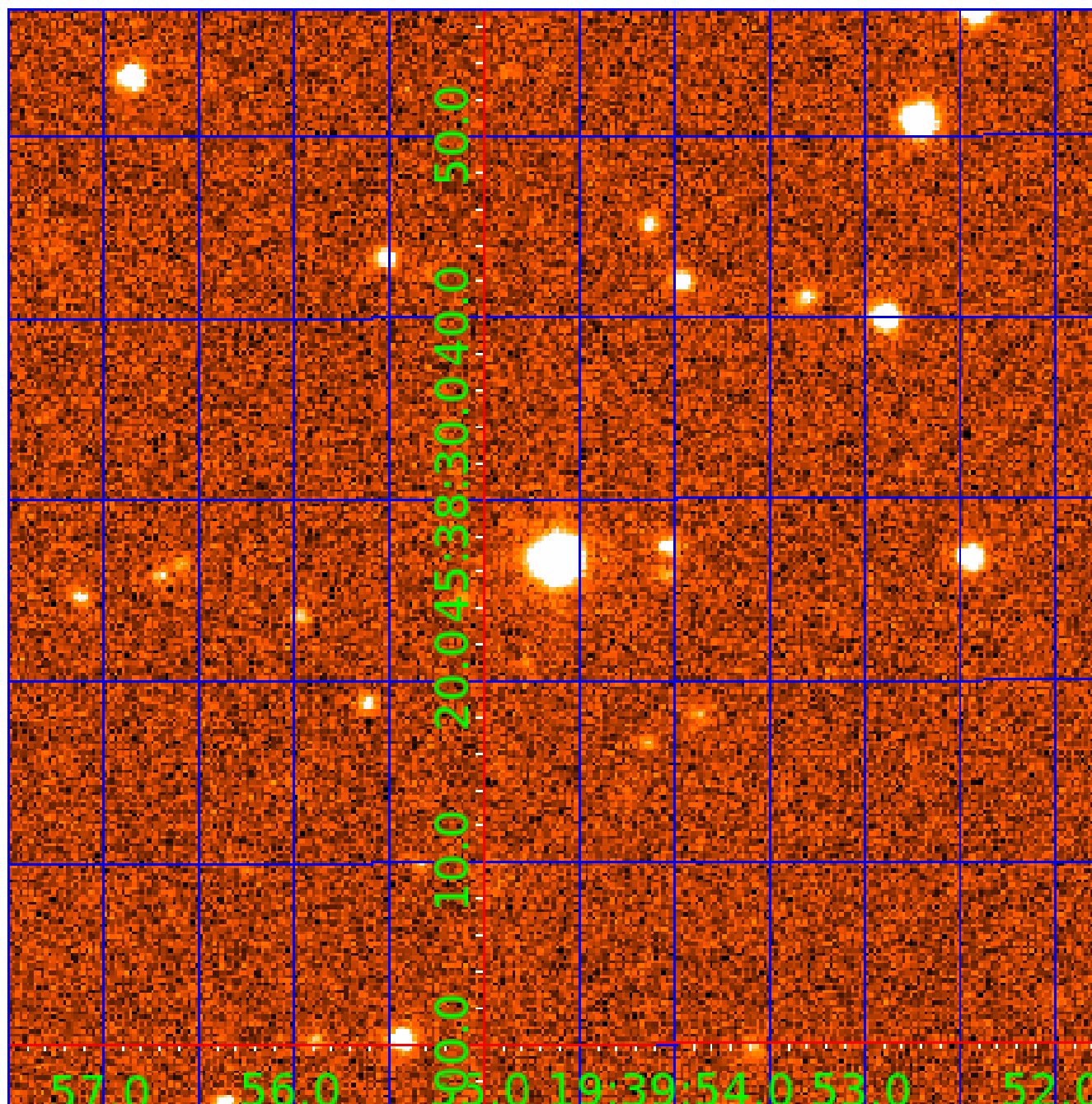


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UKIRT Image

Declination





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

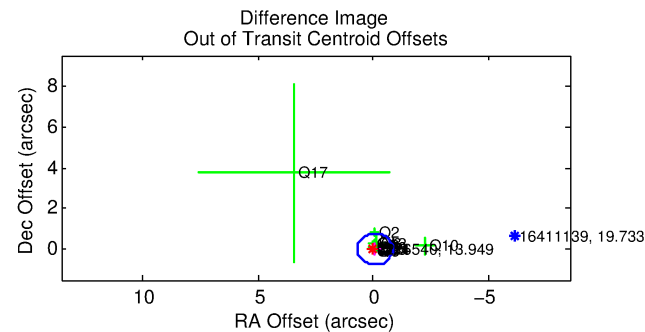
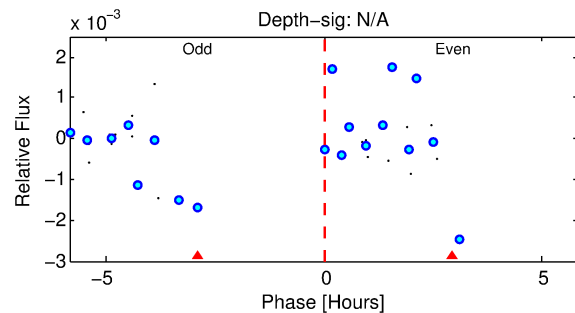
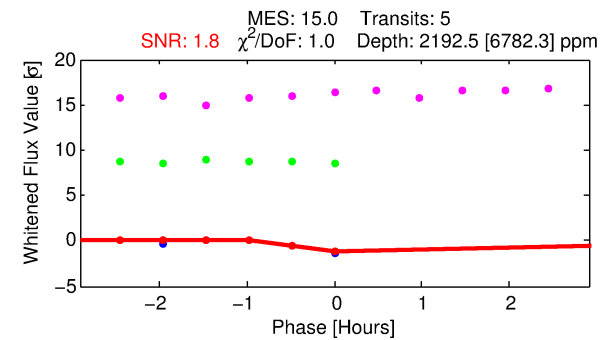
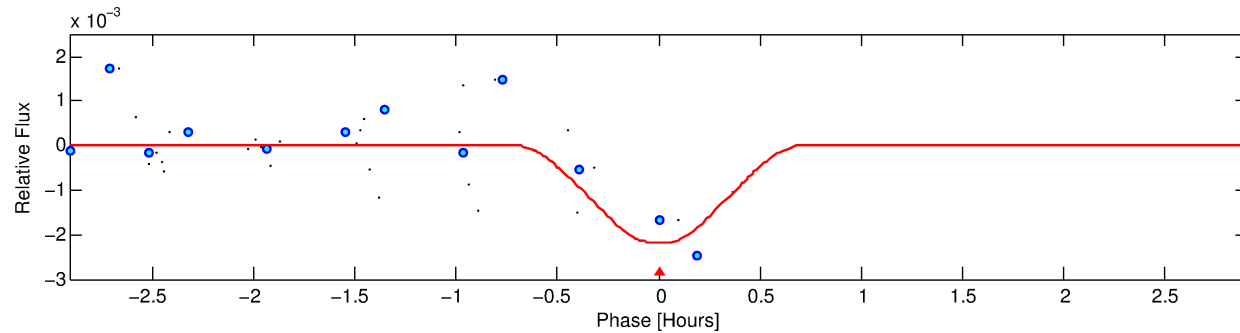
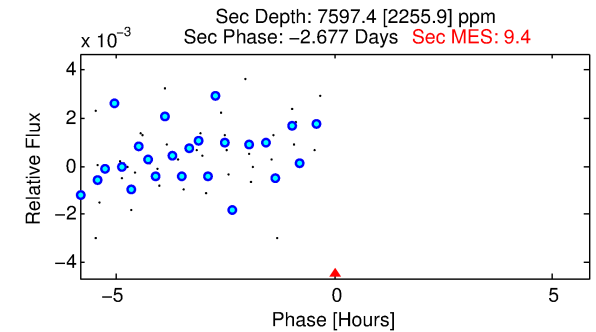
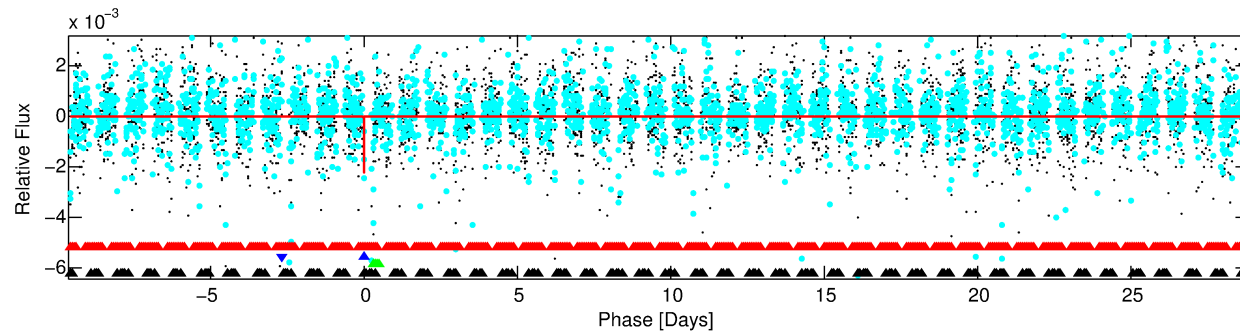
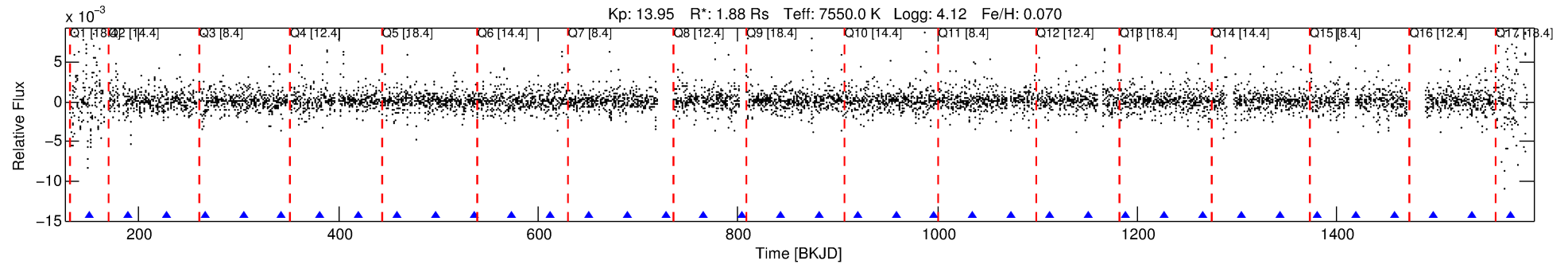
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009226540-02

No Significant Match Found

# DV One-Page Summary

KIC: 9226540 Candidate: 2 of 4 Period: 38.433 d



## DV Fit Results:

Period = 38.43332 [0.01942] d  
Epoch = 151.1833 [0.7242] BKJD  
Rp/R\* = 0.0508 [0.2905]  
a/R\* = 159.01 [4118.39]  
b = 0.91 [5.13]  
Seff = 146.66 [55.30]  
Teq = 887 [84] K  
Rp = 10.43 [59.76] Re  
a = 0.2653 [0.0633] AU  
Ag = 2704.66 [30978.47] [0.09σ]  
Teffp = 9894 [28323] K [0.32σ]

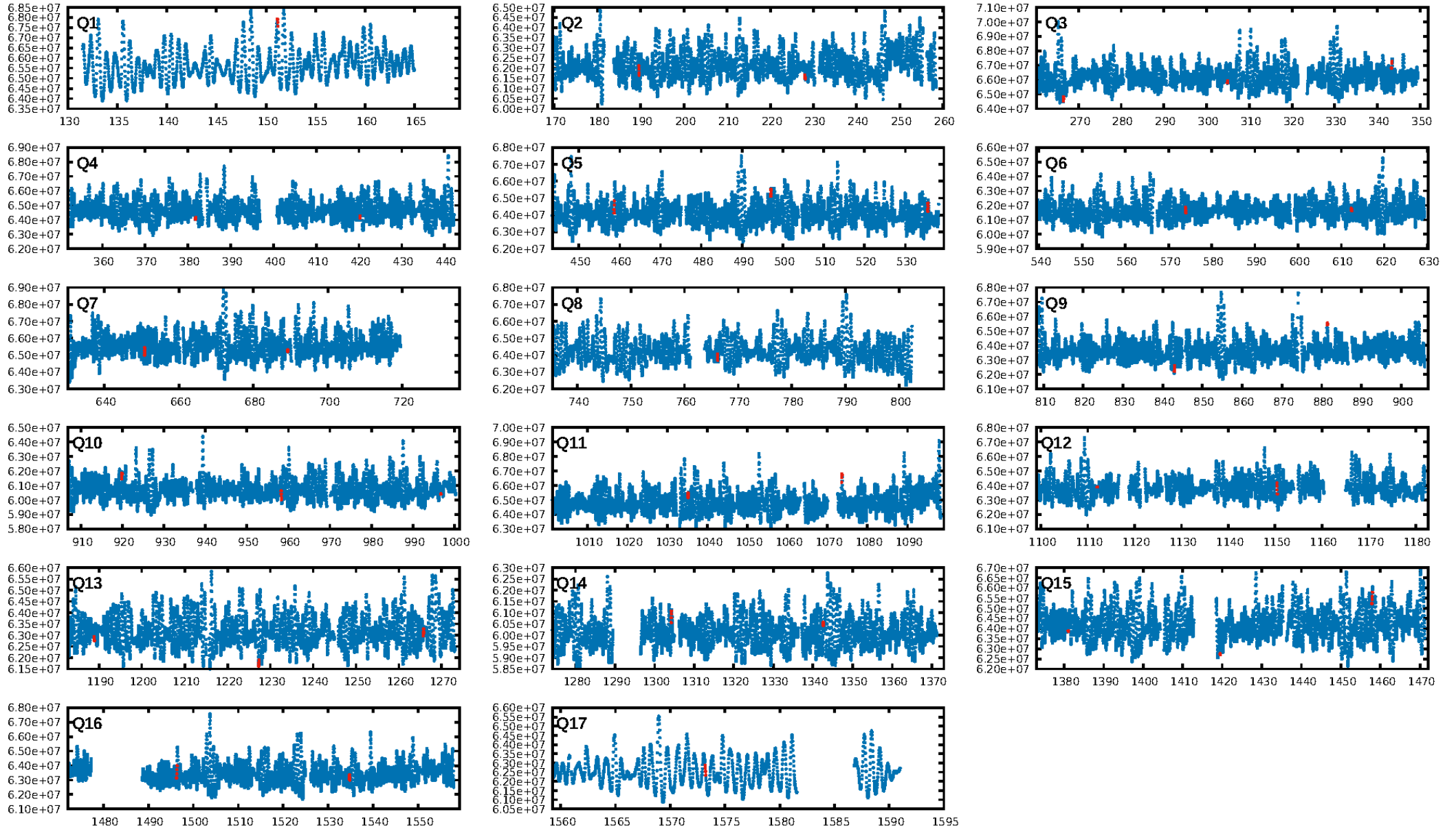
## DV Diagnostic Results:

ShortPeriod-sig: 1.8% [0.02σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 83.2%  
ModelChiSquareGof-sig: 99.3%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [4/4]  
**GhostDiagnostic-chr: -2.288**  
Centroid-sig: 6.1%  
Centroid-so: 0.220 arcsec [1.20σ]  
OotOffset-rm: 0.071 arcsec [0.28σ]  
KicOffset-rm: 0.181 arcsec [0.61σ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 0.41 [7/17]  
DiffImageOverlap-fno: 0.12 [2/17]

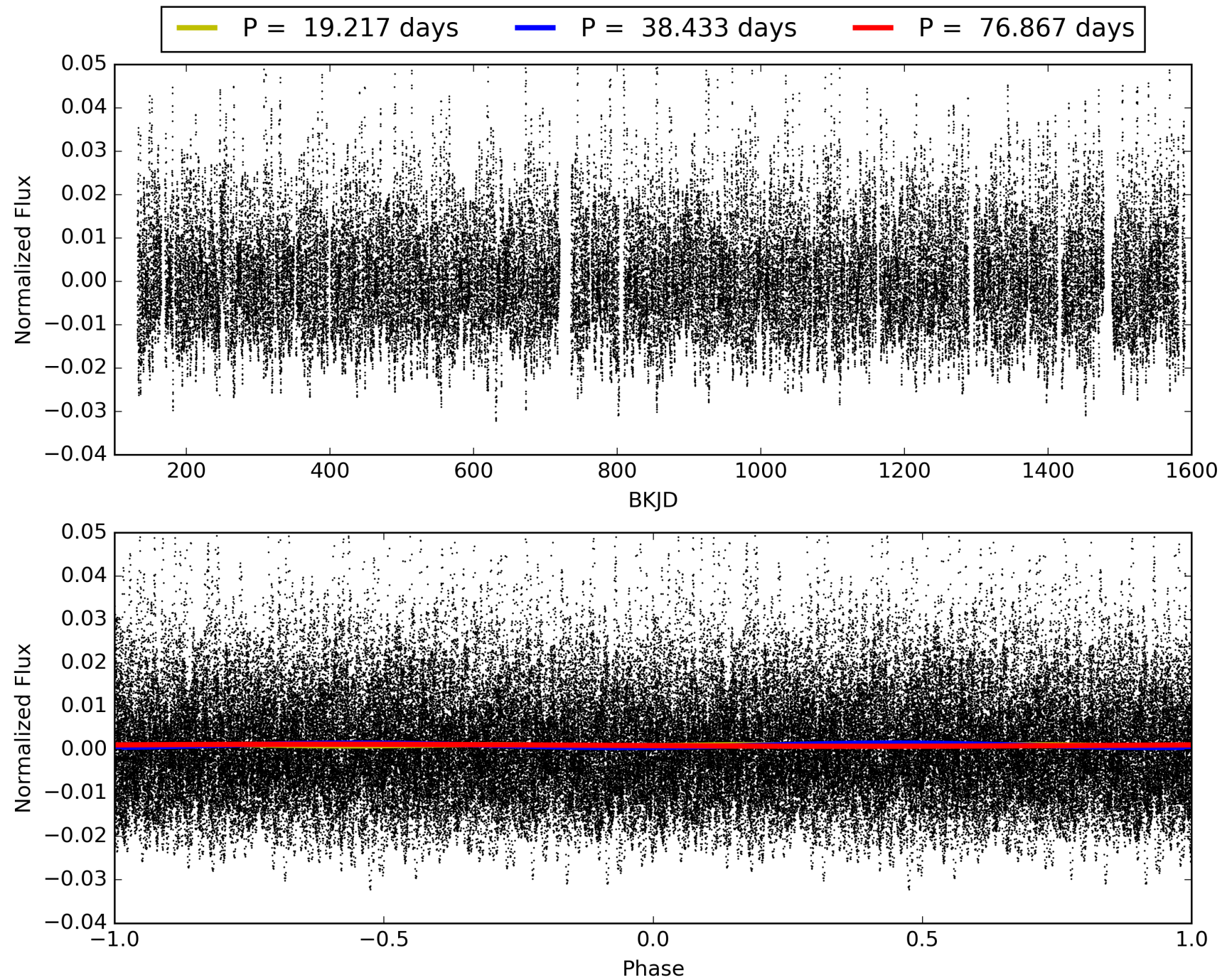
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 03-Feb-2016 08:14:27 Z

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

# TCE 009226540-02, PDC Light Curves

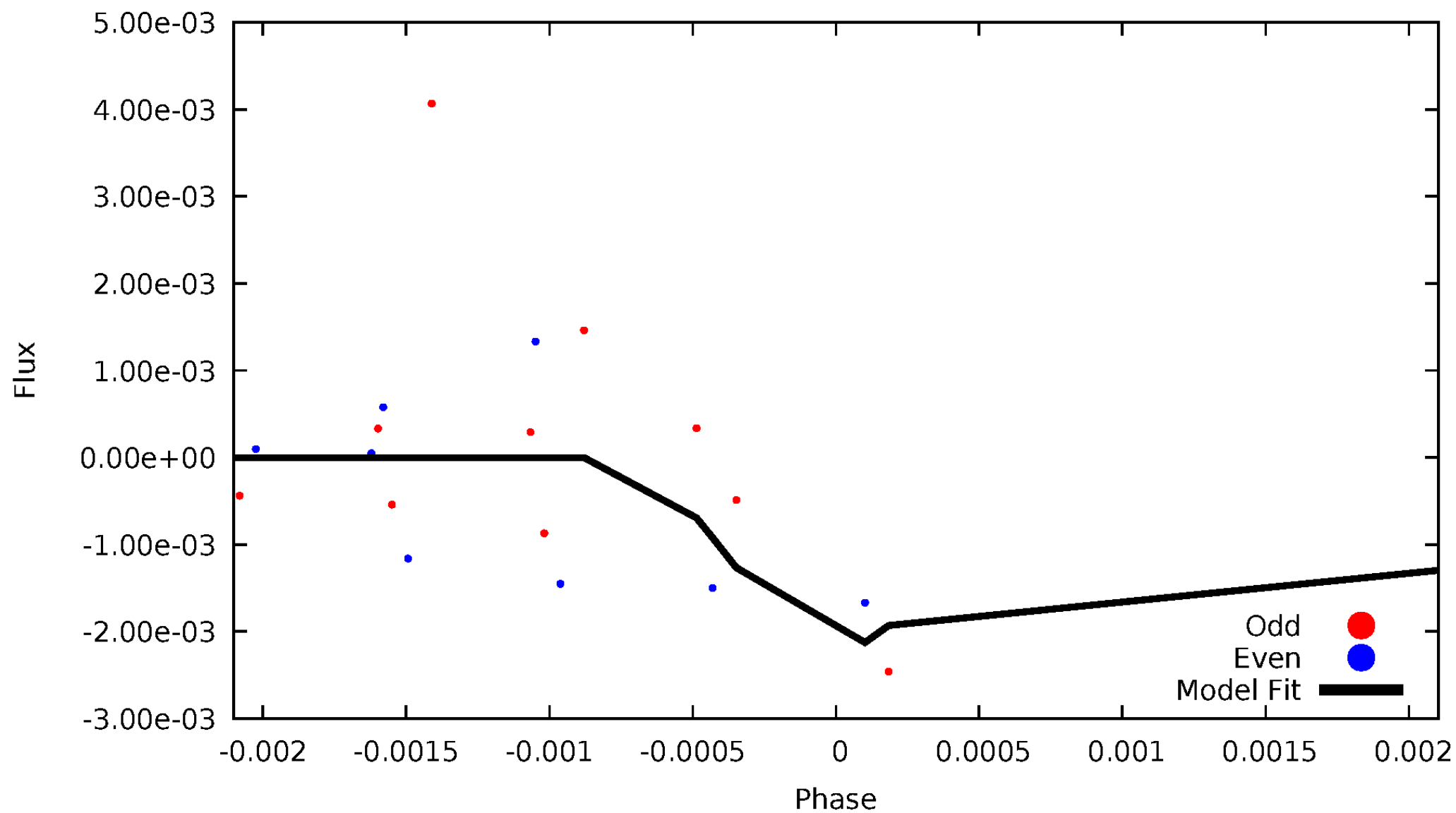


TCE 009226540-02



# DV Odd/Even

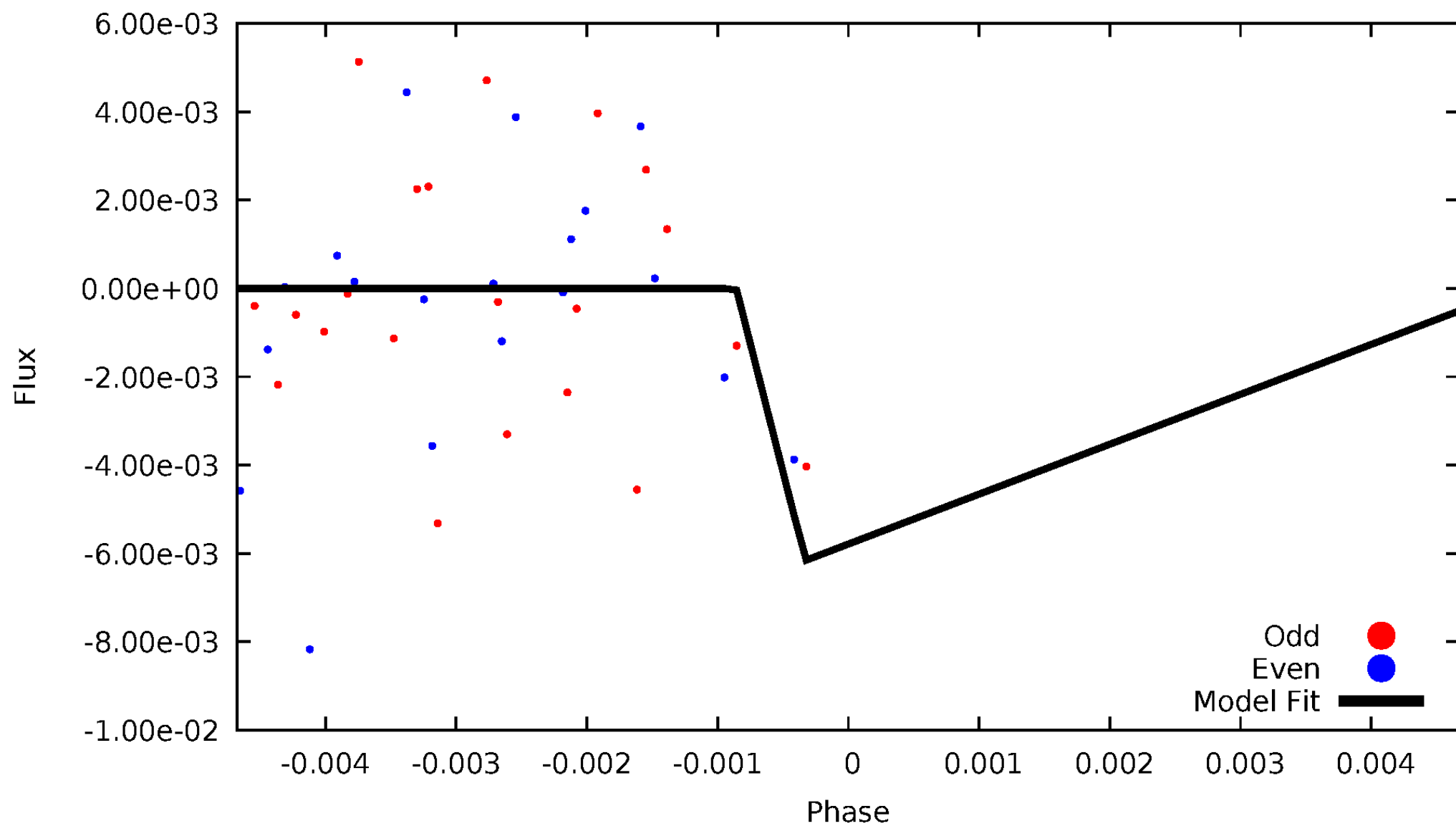
TCE 009226540-02





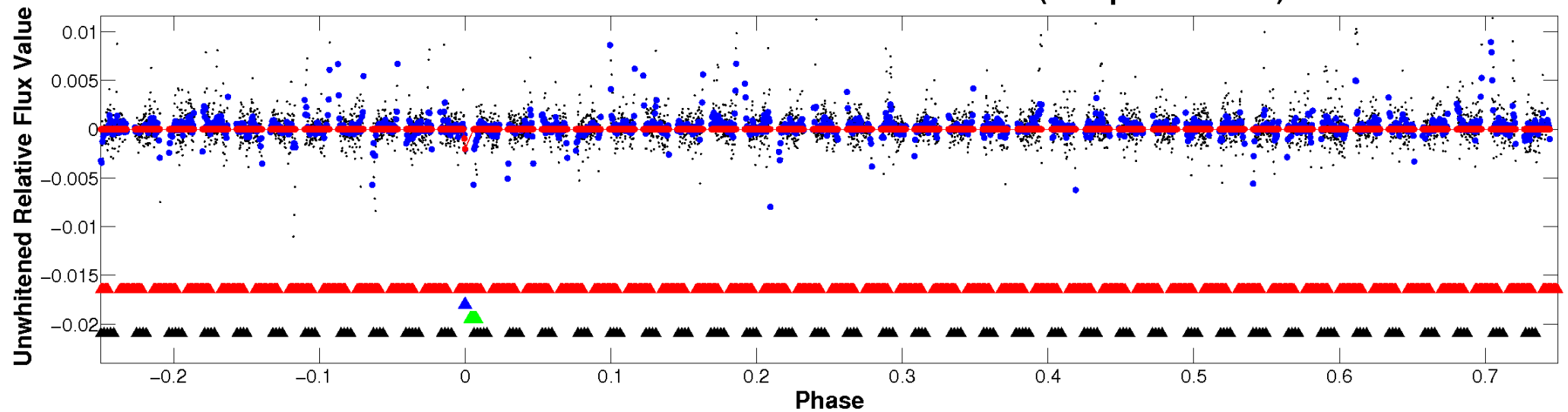
# ALT Odd/Even

TCE 009226540-02

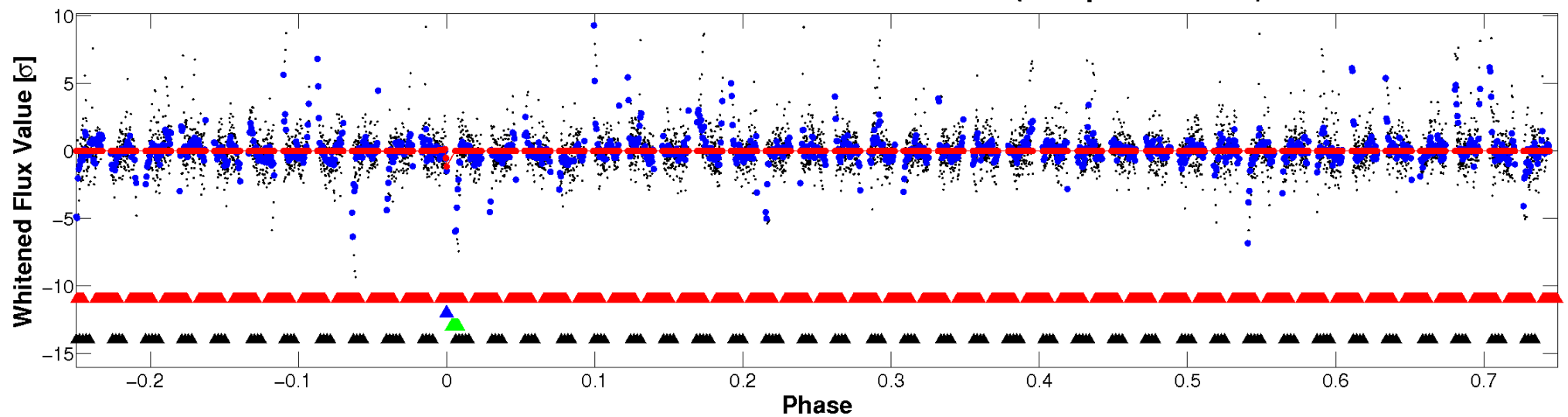


# Non-Whitened Vs. Whitened Light Curve

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

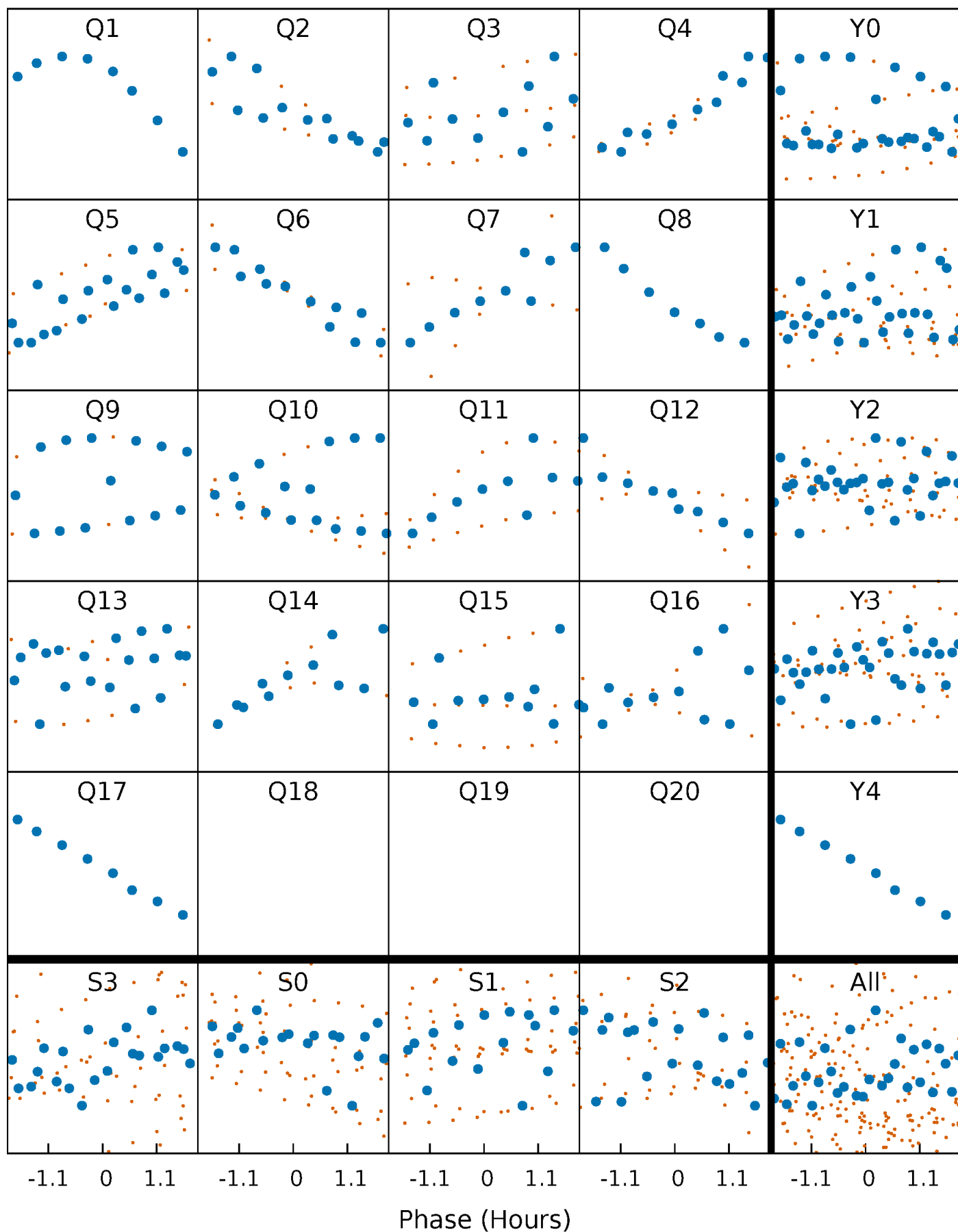


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



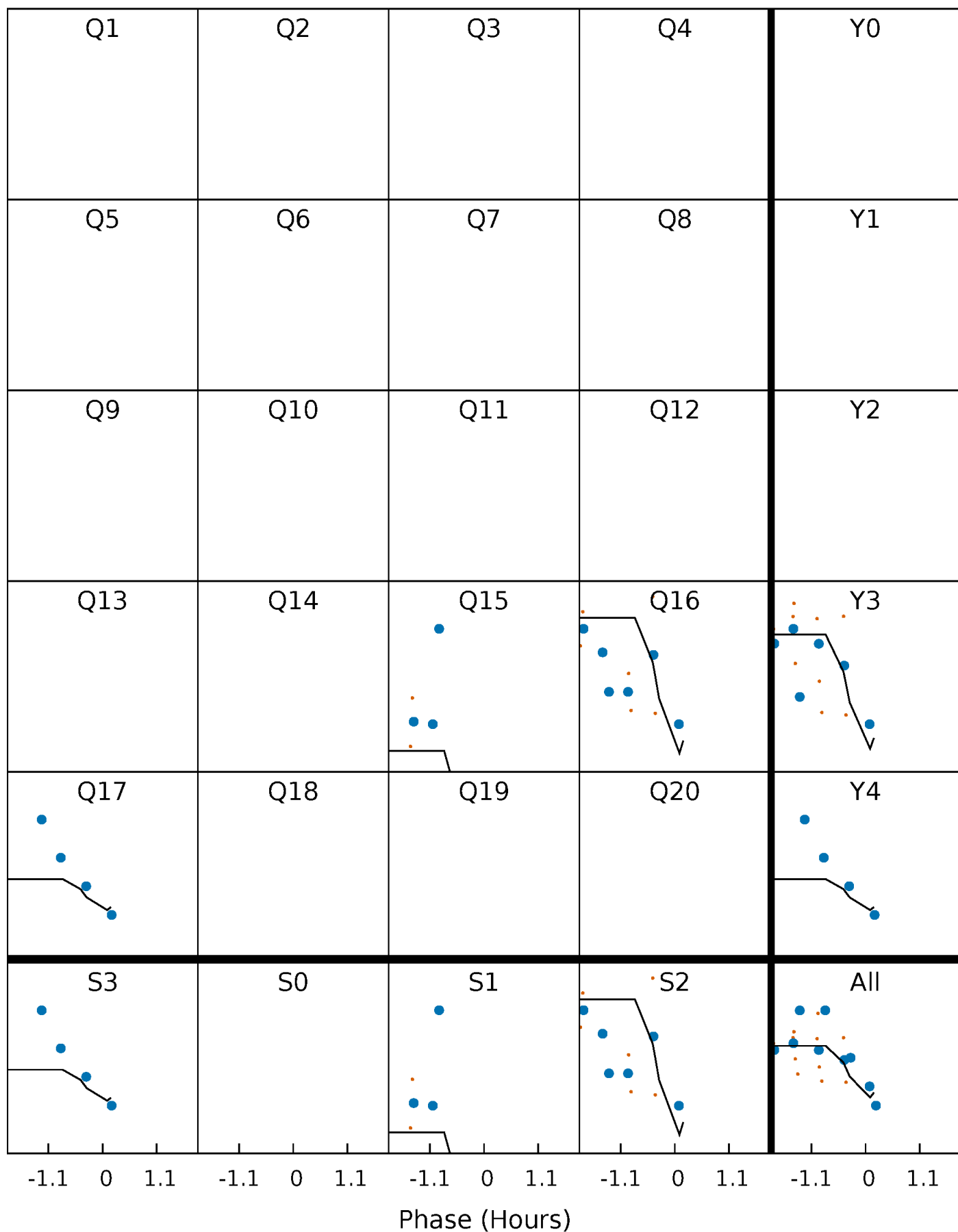
# PDC Quarter-Phased Transit Curves

TCE 009226540-02   P= 38.433322 Days    $T_0=151.183296$  (BKJD)



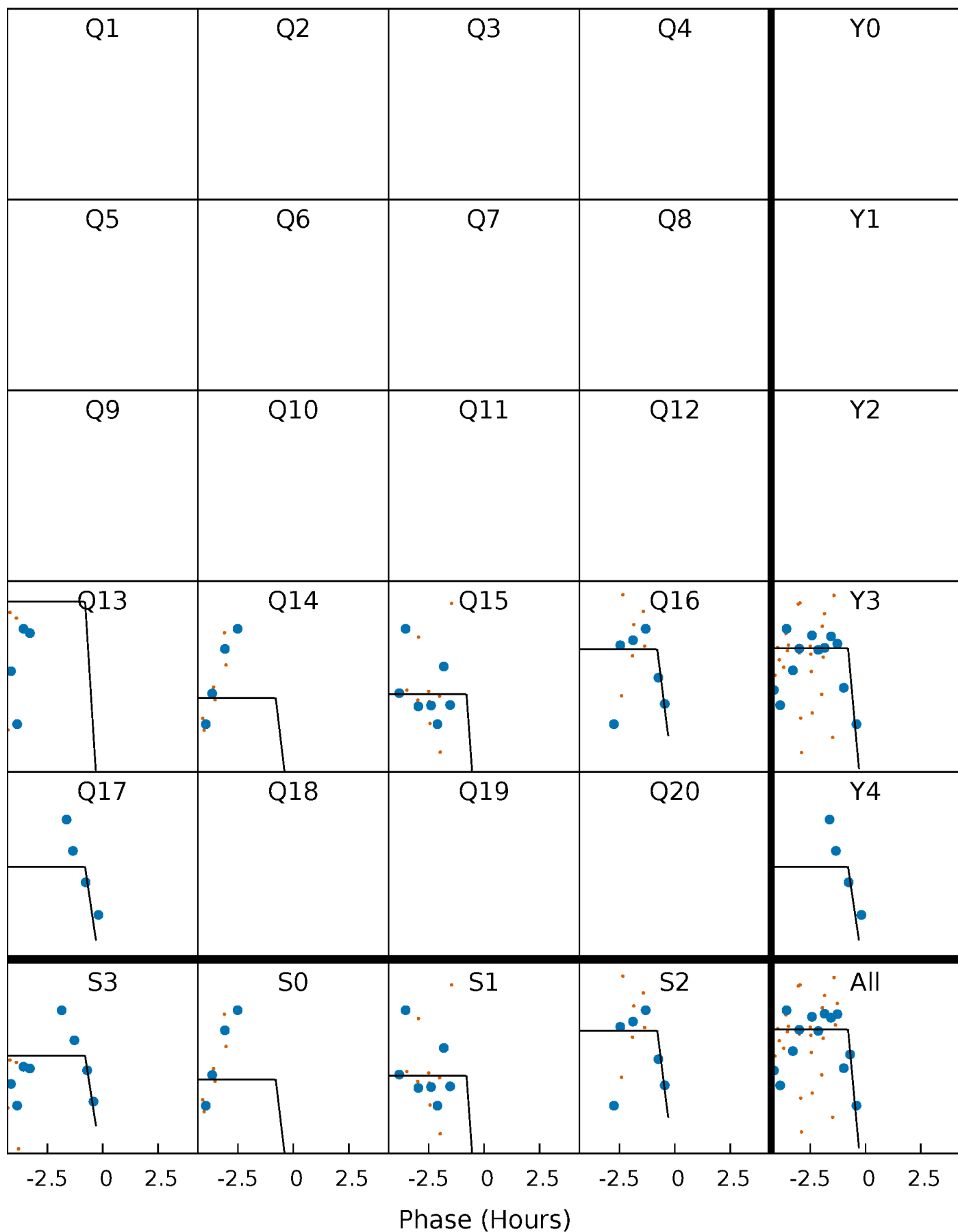
# DV Quarter-Phased Transit Curves

TCE 009226540-02 P= 38.433322 Days  $T_0=151.183296$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 009226540-02   P= 38.432900 Days    $T_0=151.218354$  (BKJD)

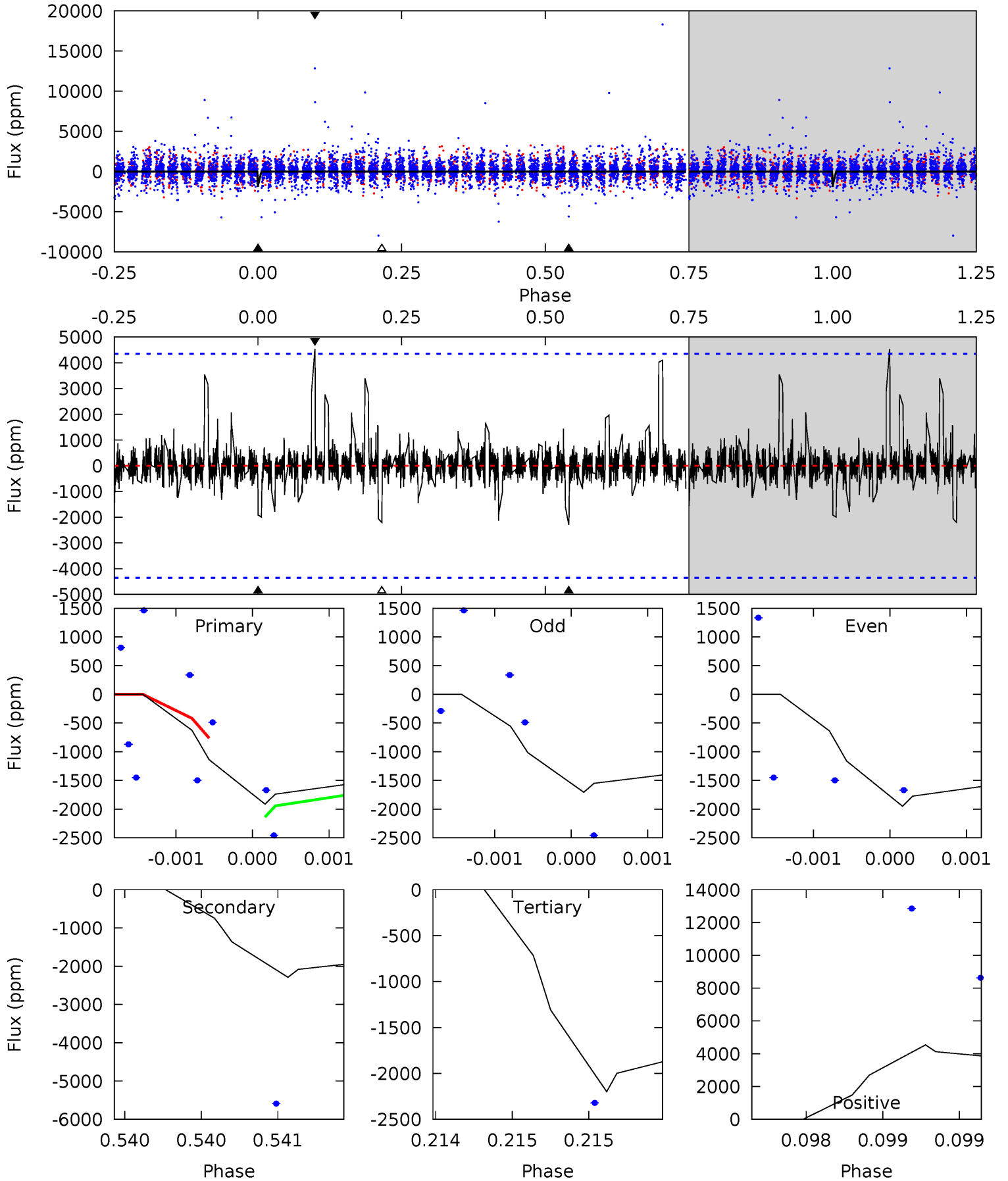




# DV Model-Shift Uniqueness Test

009226540-02, P = 38.433322 Days, E = 112.749974 Days

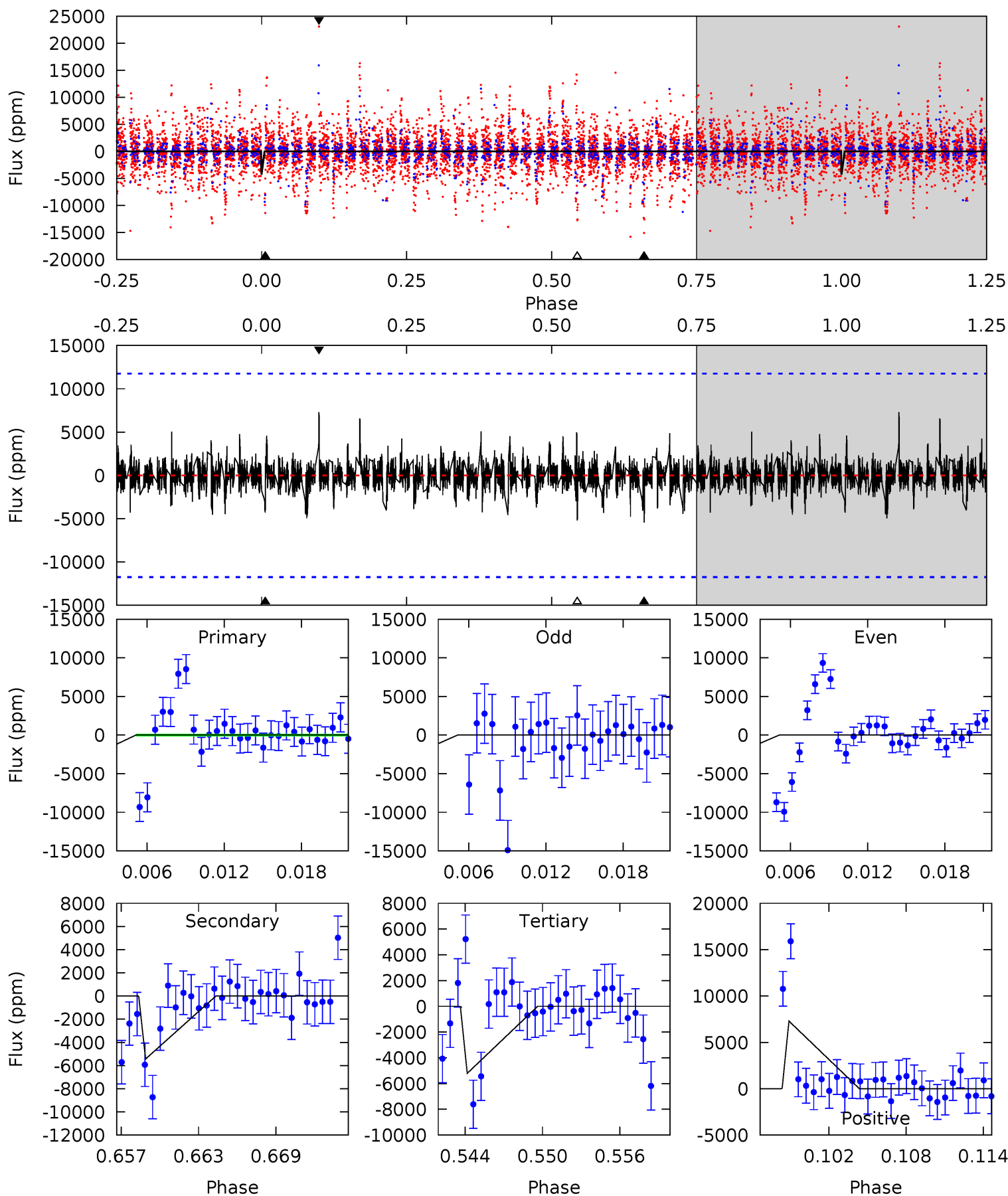
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
2.43	2.91	2.80	5.77	5.54	3.43	0.48	-0.36	-3.33	0.12	-2.86	0.14	1.00	0.66	0.89



# Alt Model-Shift Uniqueness Test

009226540-02, P = 38.432900 Days, E = 112.785454 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
1.87	2.37	2.27	3.18	5.12	2.75	0.47	-0.40	-1.31	0.10	-0.81	0.03	0	0.57	0



### Stellar Parameters For KIC 009226540

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7550^{+211}_{-316}$	$4.115^{+0.120}_{-0.180}$	$0.070^{+0.150}_{-0.350}$	$1.883^{+0.549}_{-0.366}$	$1.685^{+0.204}_{-0.272}$	$0.355^{+0.212}_{-0.179}$
	+3%/-4%	+3%/-4%	+214%/-500%	+29%/-19%	+12%/-16%	+60%/-50%
Source	KIC0	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 009226540-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-2290 \pm 786$	$42.33^{+49.72}_{-29.60}$	$1249^{+92}_{-75}$	$3900^{+2681}_{-907}$	$48^{+484}_{-39}$
Alt.	$-5437 \pm 2293$	$48.23^{+46.92}_{-34.36}$	$1245^{+91}_{-81}$	$4341^{+3576}_{-991}$	$87^{+974}_{-68}$

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

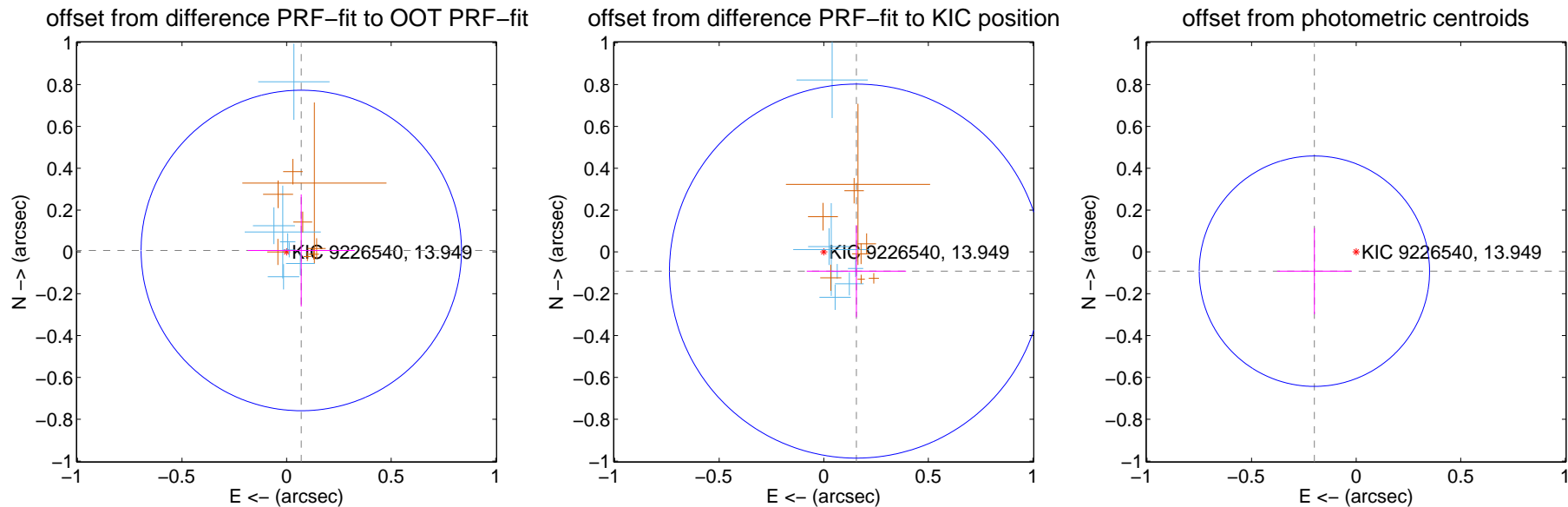
## DV Centroid Data

Supplemental centroid analysis for 009226540-02. Kepler magnitude: 13.95. Transit SNR 1.84

There are 7 quarters with good PRF difference image offsets

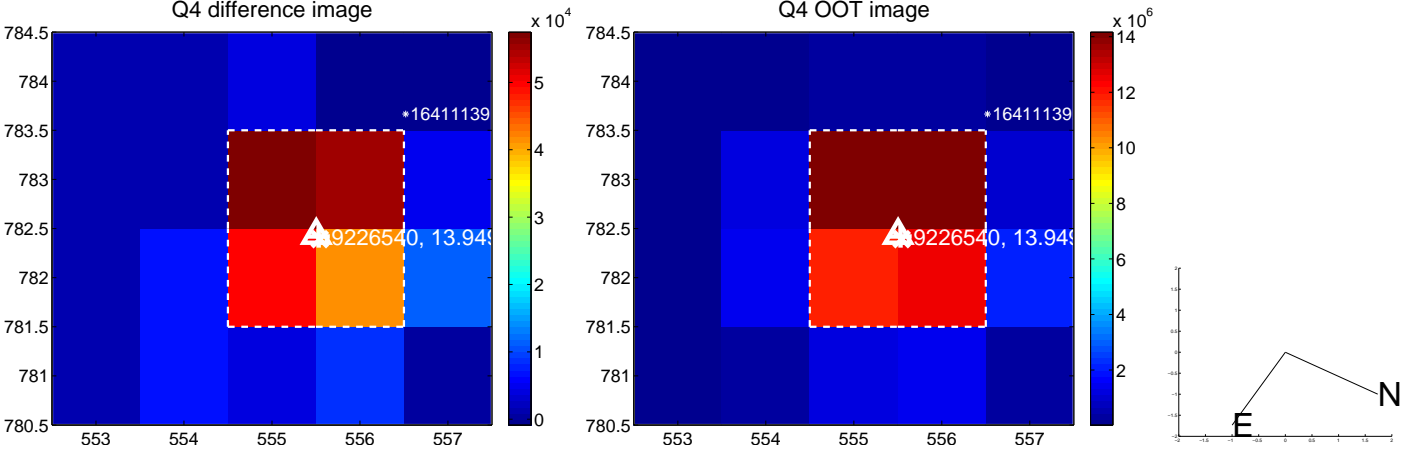
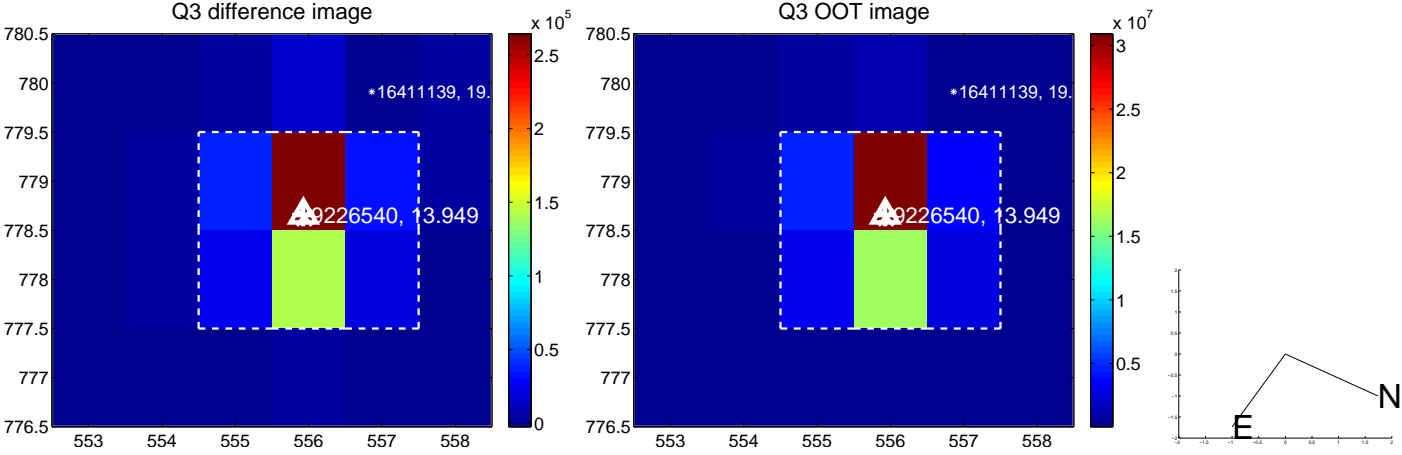
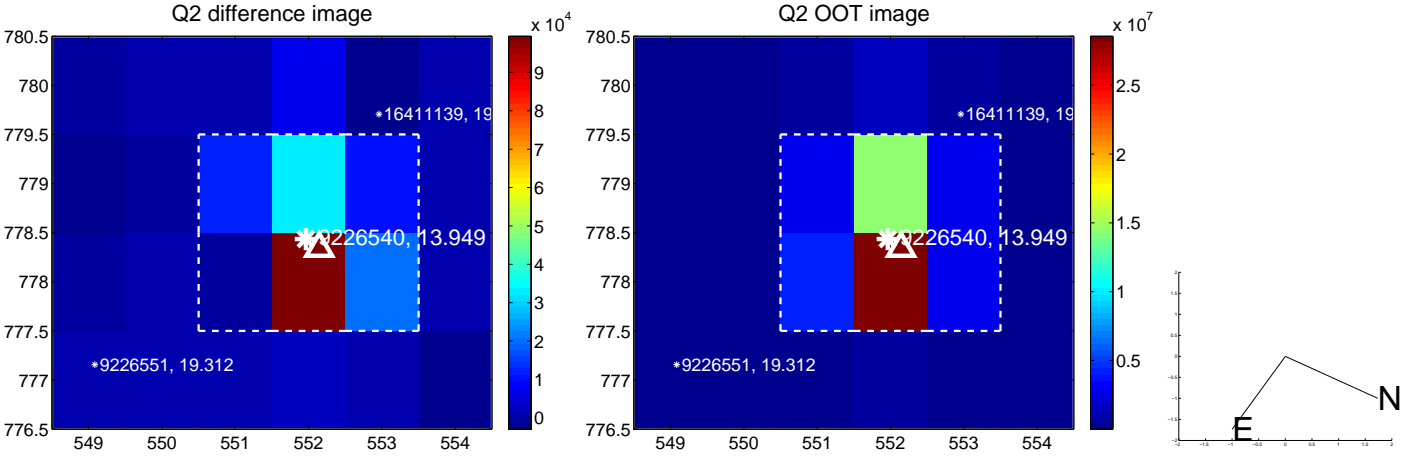
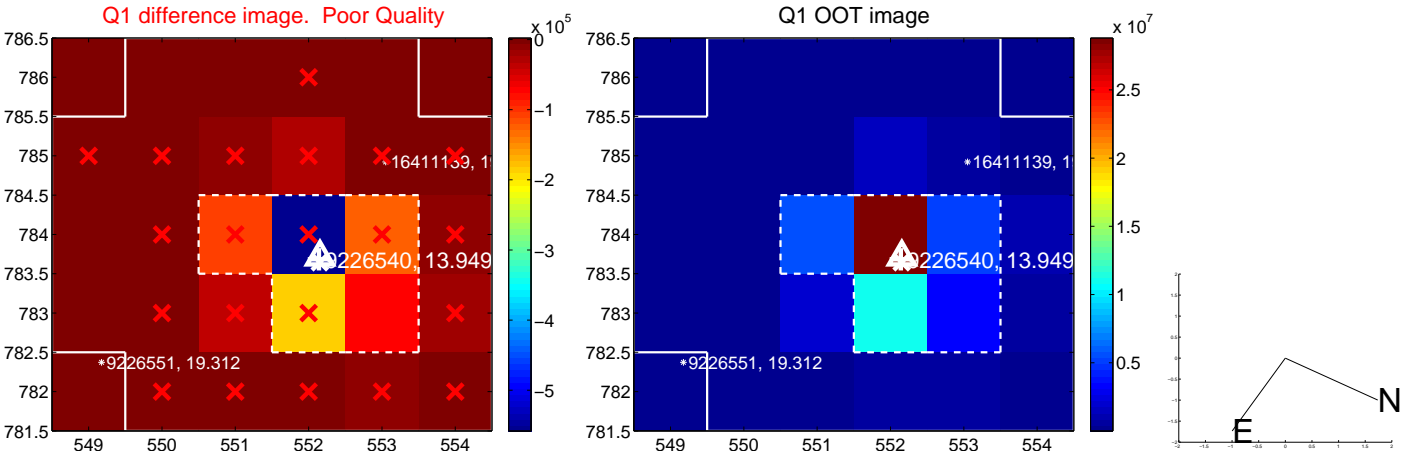
The direct PRF centroid is offset from the target star catalog position by about 0.16 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.071 \pm 0.255$	0.28	$-0.070 \pm 0.255$	$0.007 \pm 0.268$
PRF-fit source offset from KIC position	$0.181 \pm 0.298$	0.61	$-0.156 \pm 0.237$	$-0.092 \pm 0.220$
photometric centroid source offset	$0.22 \pm 0.18$	1.20	$0.20 \pm 0.18$	$-0.09 \pm 0.21$



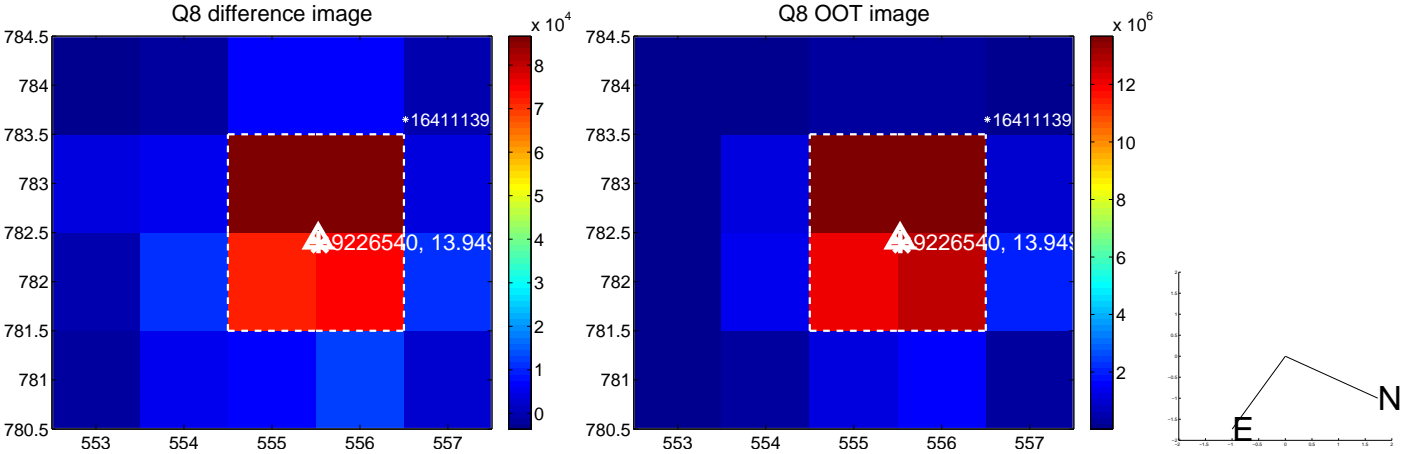
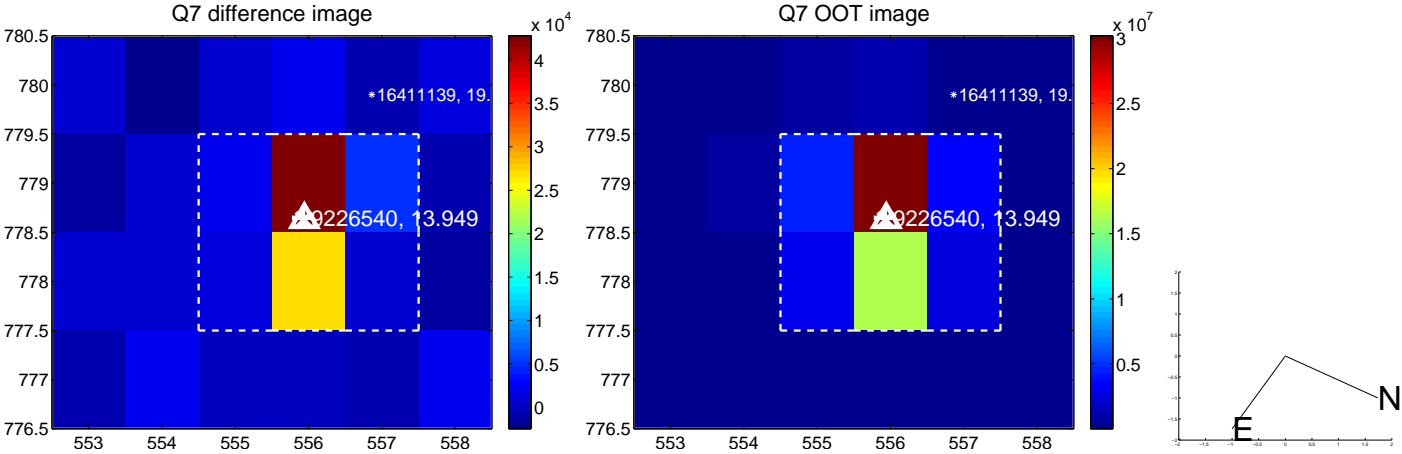
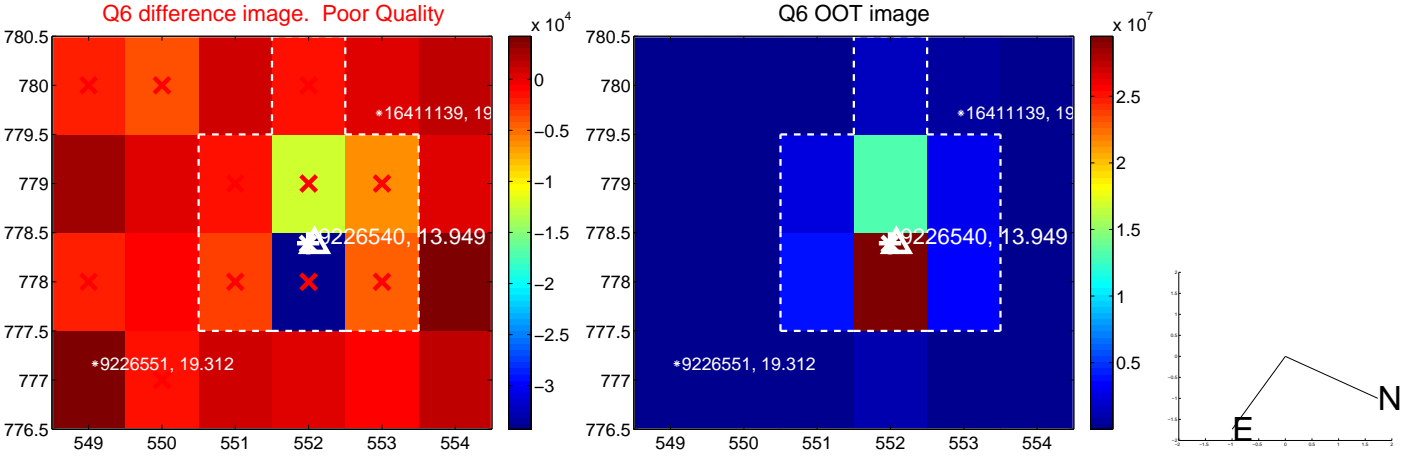
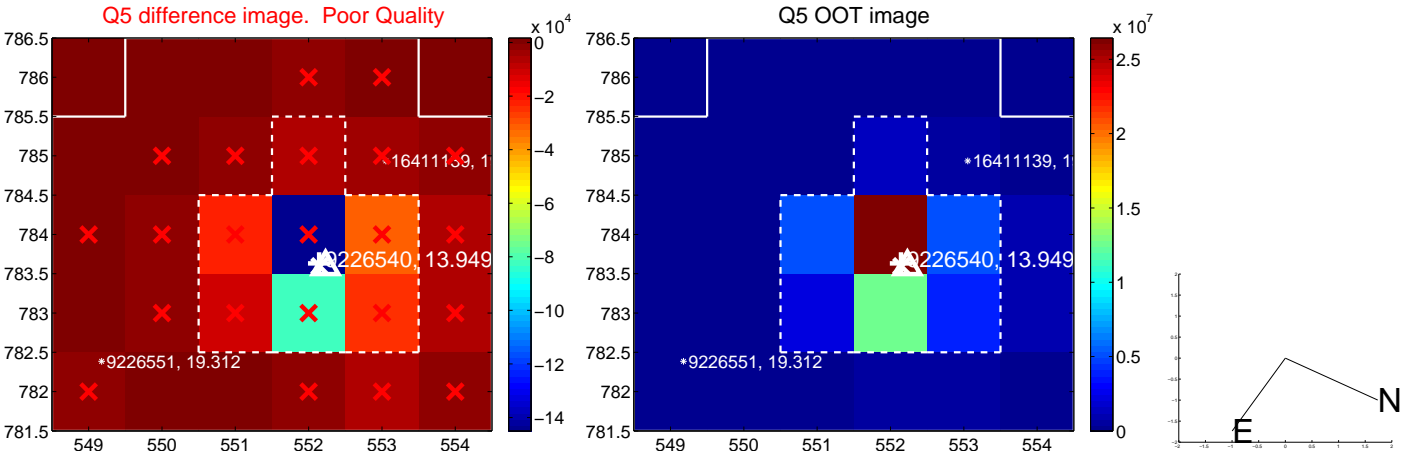
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

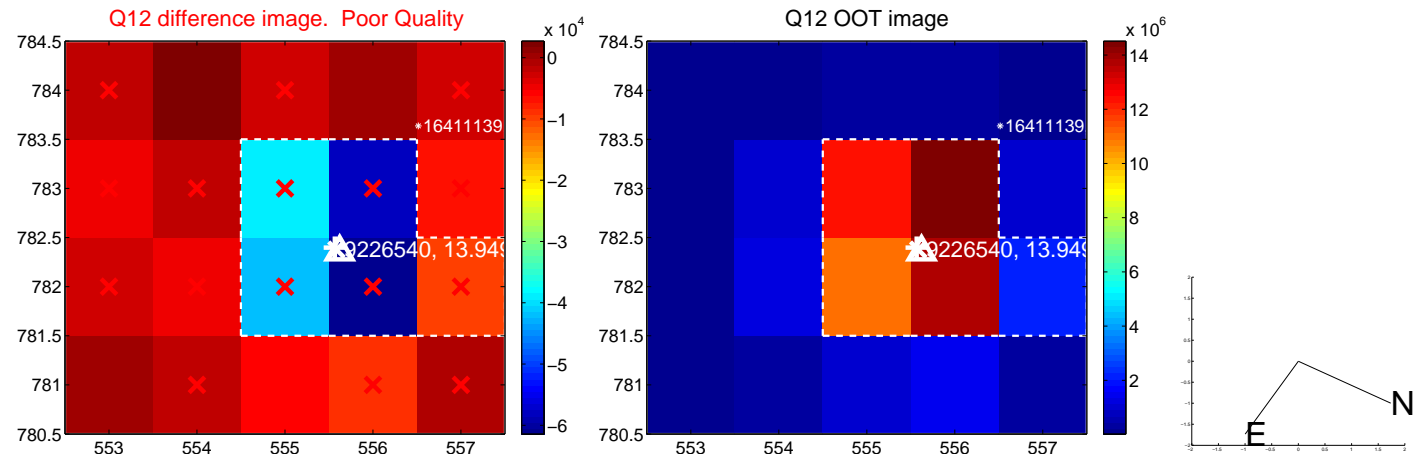
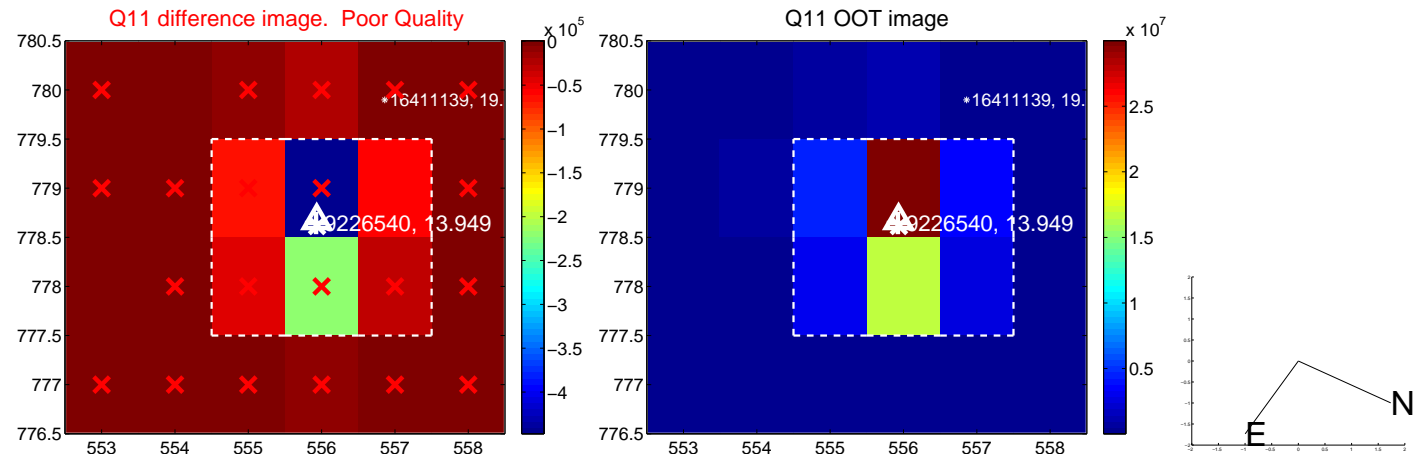
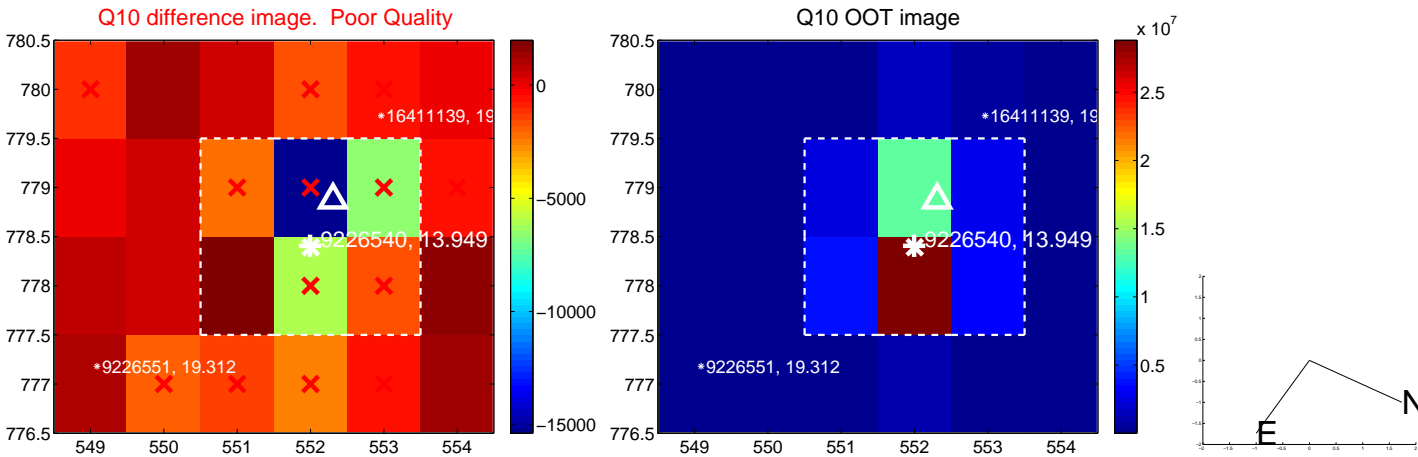
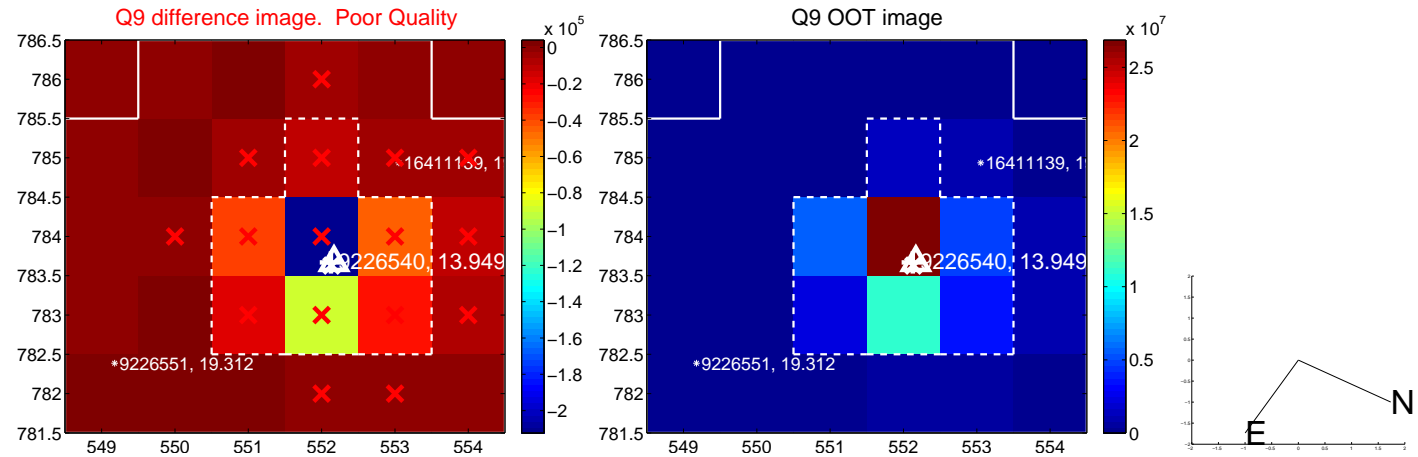




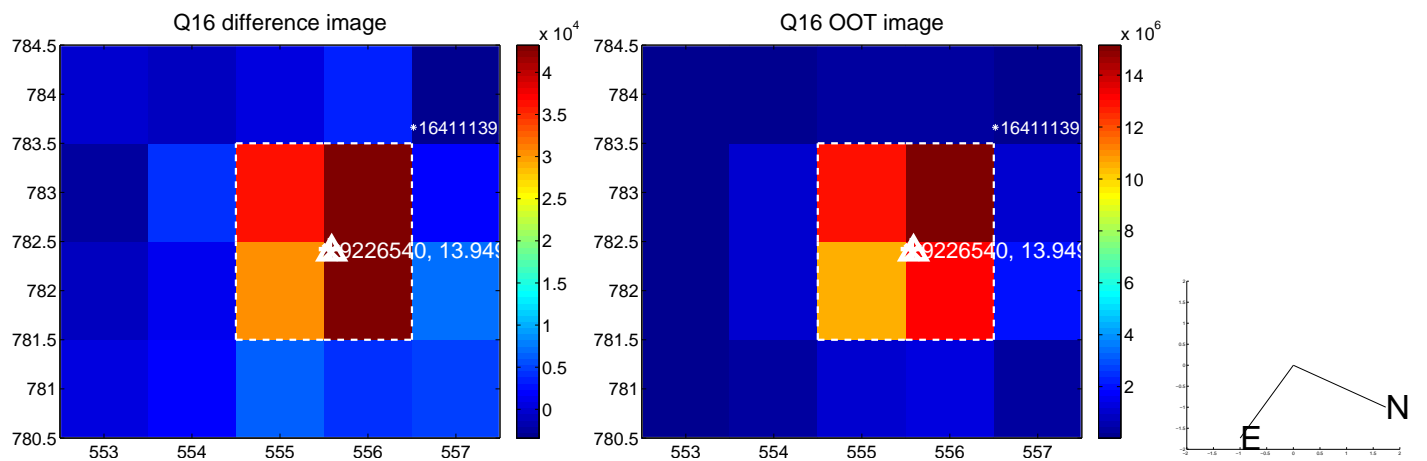
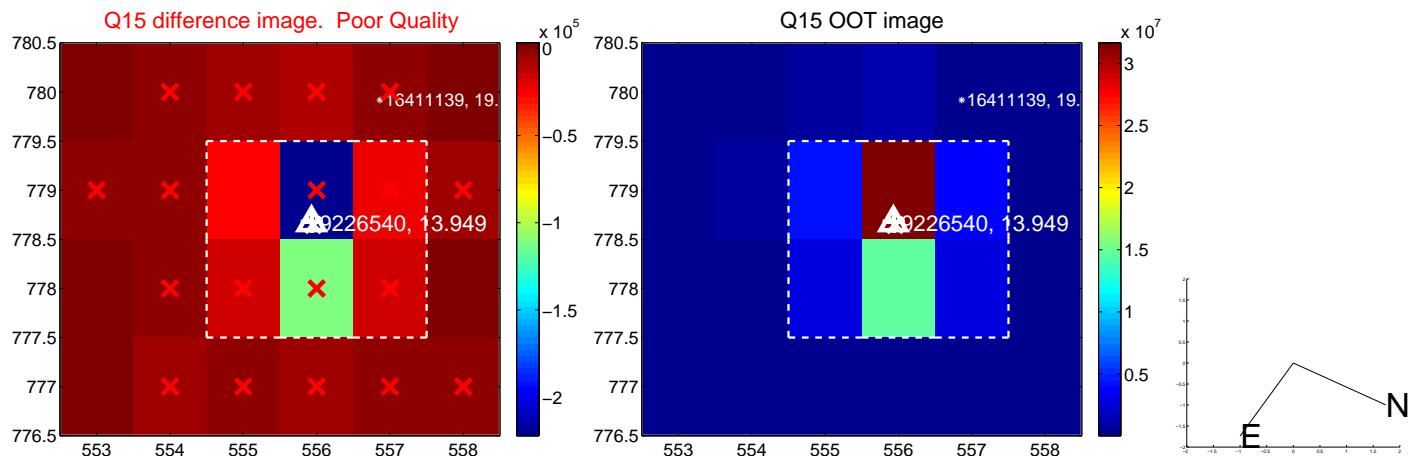
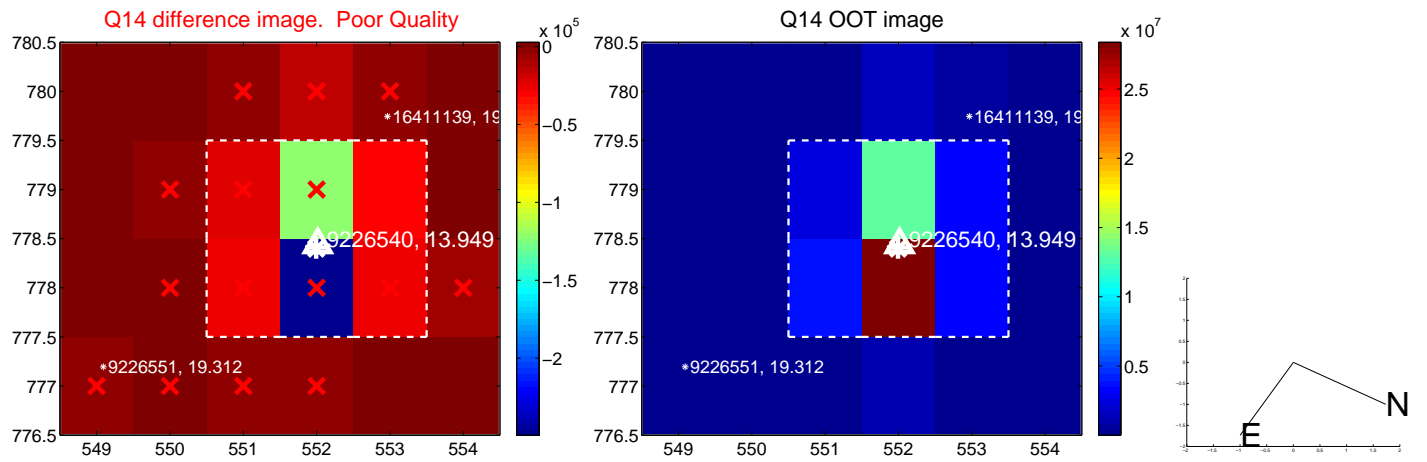
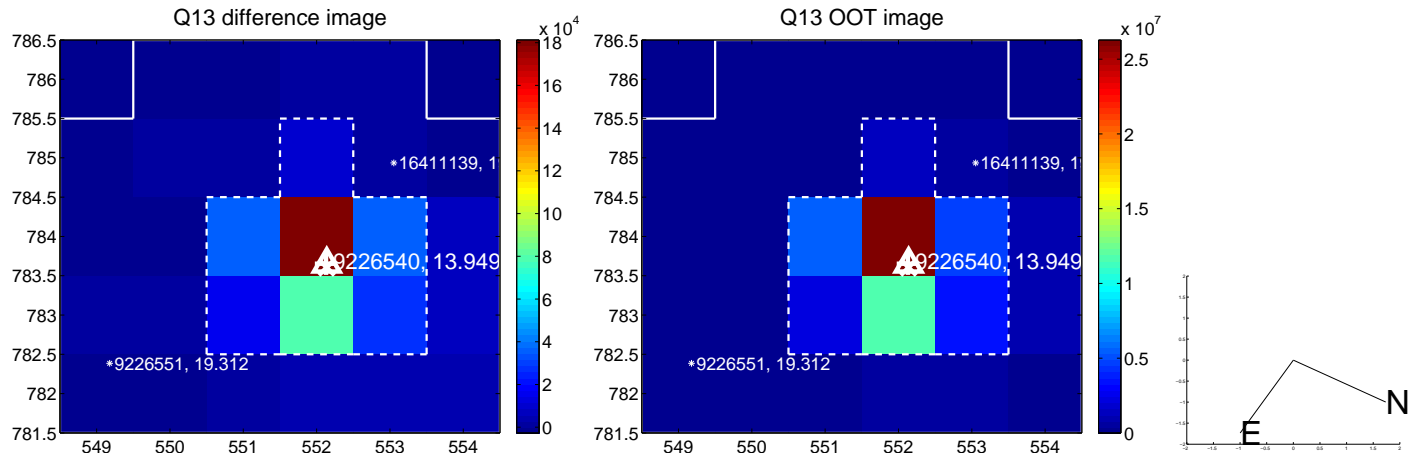
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



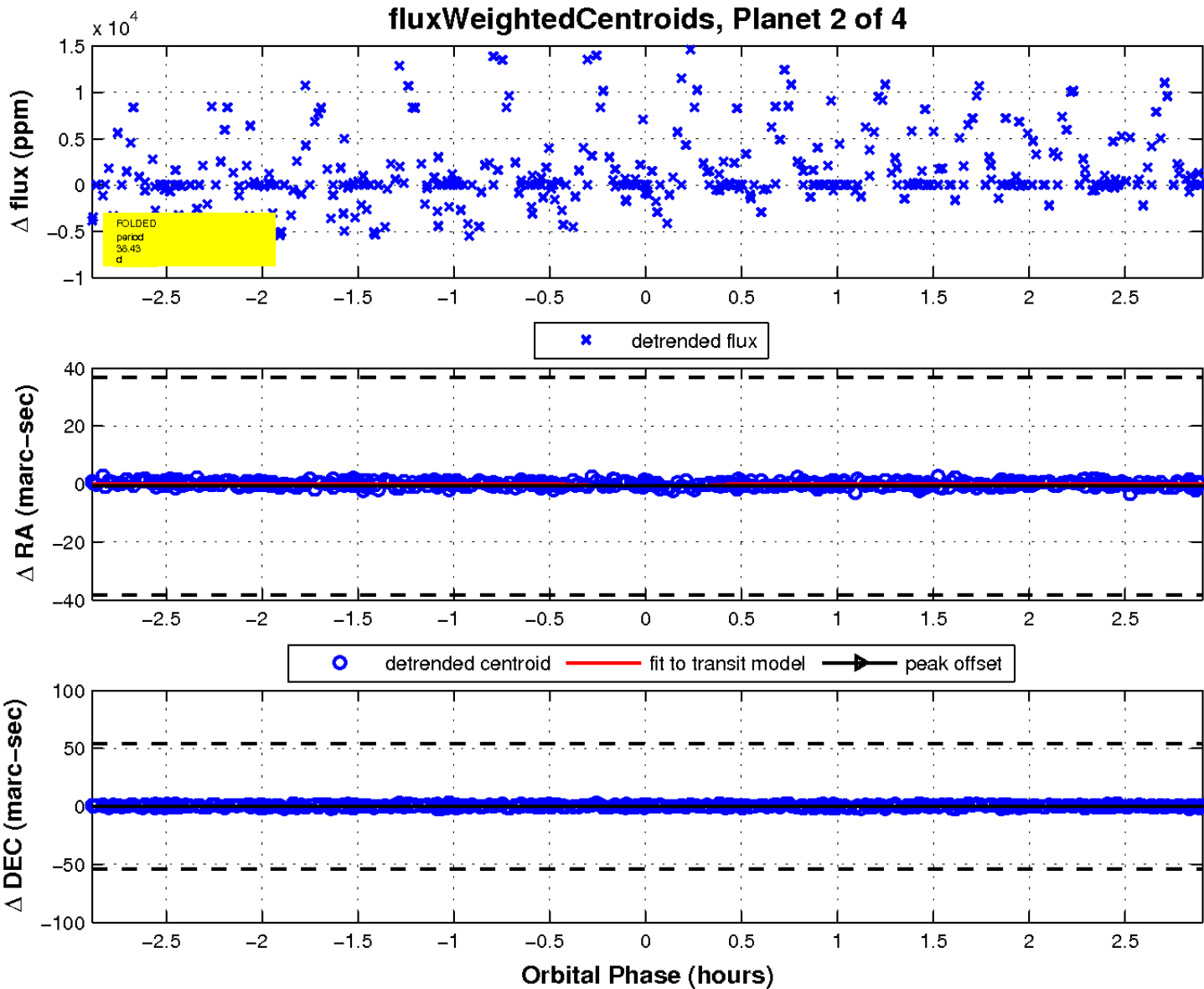
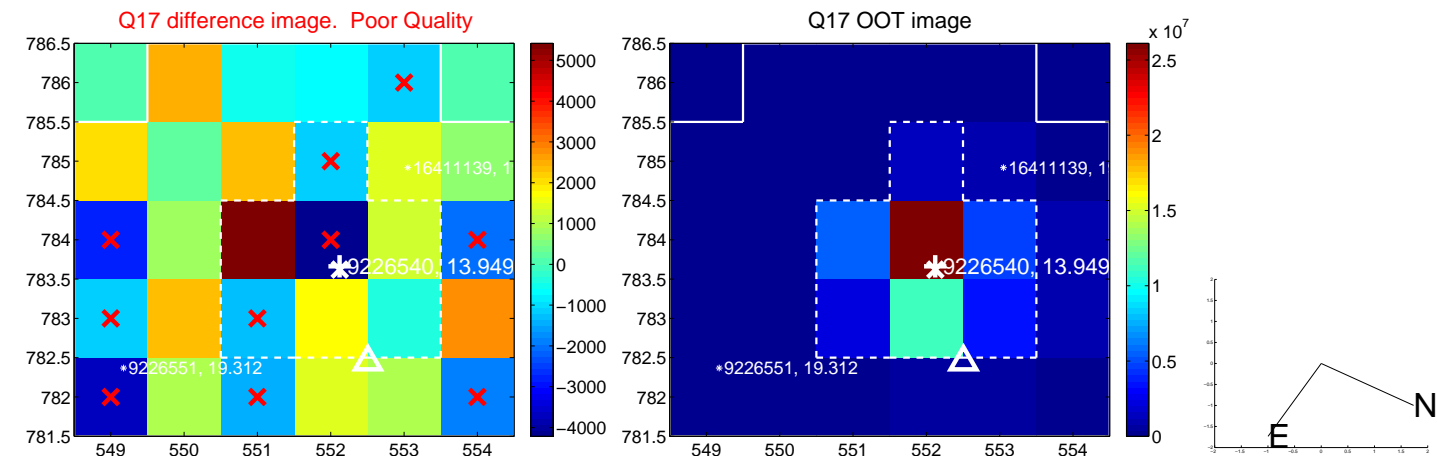
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

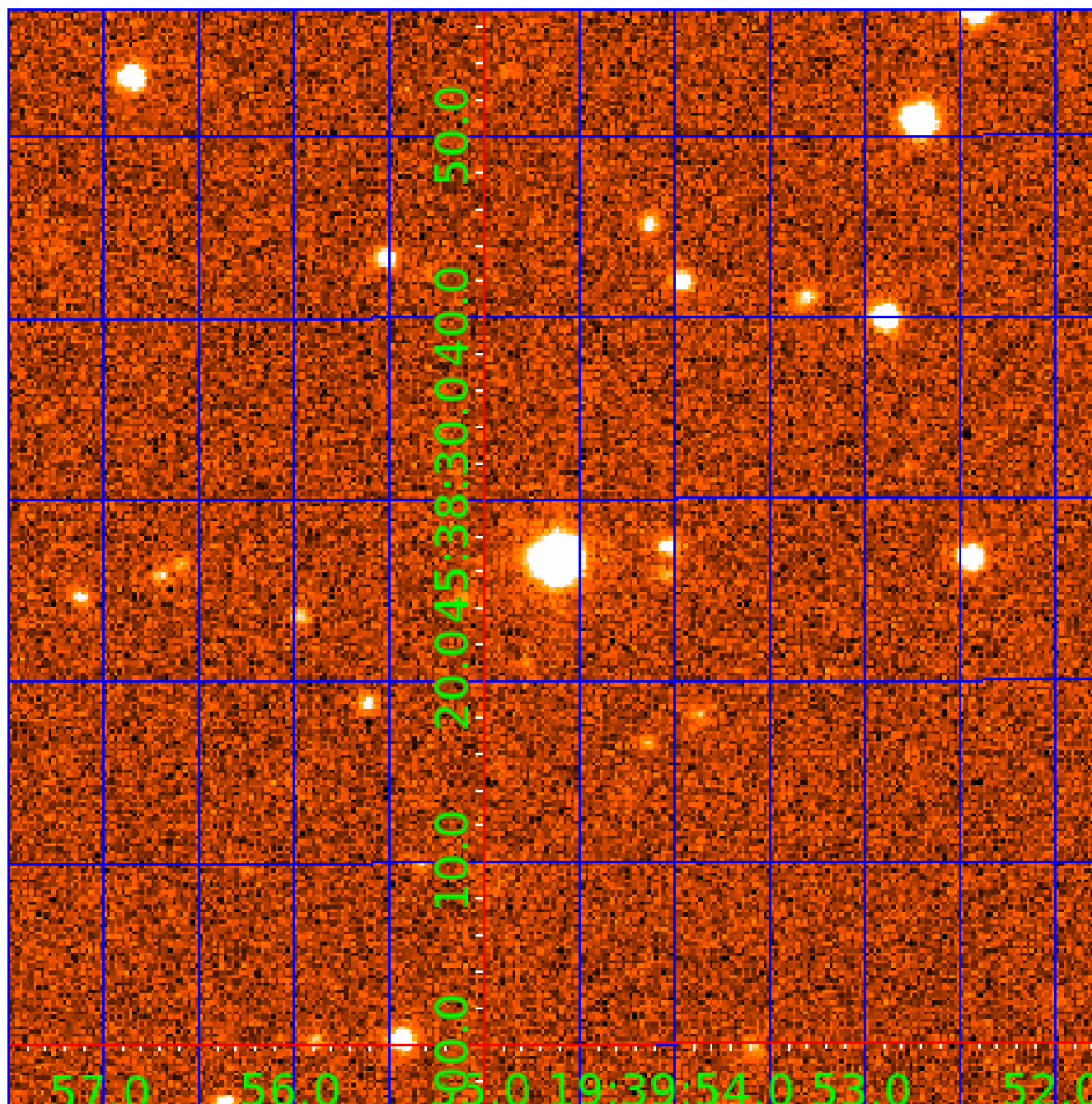


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



# UKIRT Image

Declination





# KIC 009226540

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009226540-01	OBS	No	0.894169	132.237372	29.1	6.218	11.1	2.2	1.88	7550	1.09	22081.21
009226540-02	OBS	No	38.433322	151.183296	2192.5	0.970	15.0	1.8	1.88	7550	10.43	146.66
009226540-03	OBS	No	38.428952	151.481393	952.2	4.500	13.9	-1.0	1.88	7550	5.90	146.68
009226540-04	OBS	No	8.046167	133.530511	538.1	6.000	14.1	-1.0	1.88	7550	4.44	1179.77

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009226540-01	OBS	FP	0.00	1	0	0	0	LPP_DV—MOD_NONUNIQ_DV
009226540-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
009226540-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—SAME_NTL_PERIOD—CENT_NOFITS
009226540-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_ZUMA—TRANS_GAPPED—LPP_DV—LPP_ALT—CENT_NOFITS

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

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

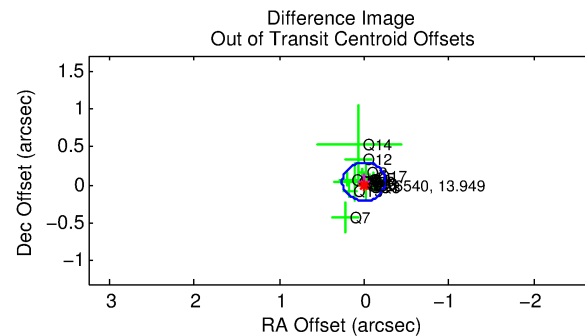
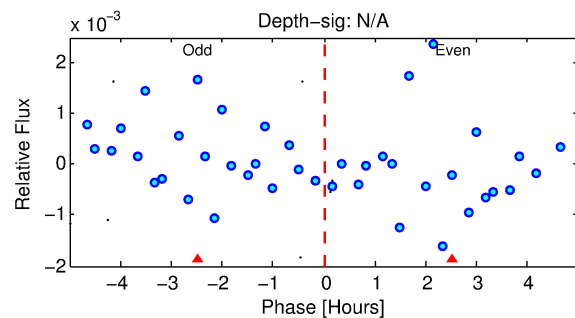
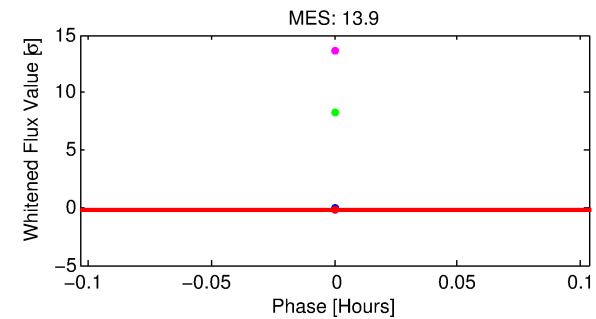
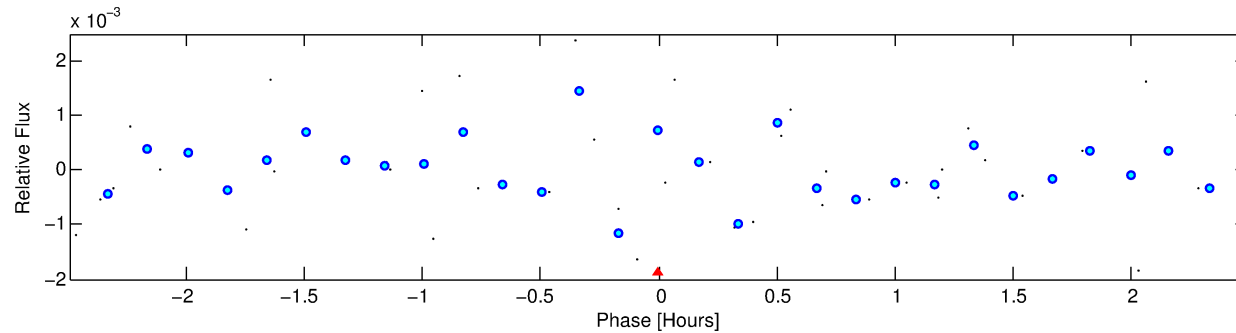
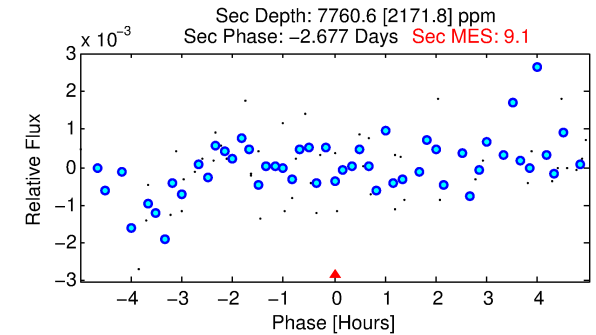
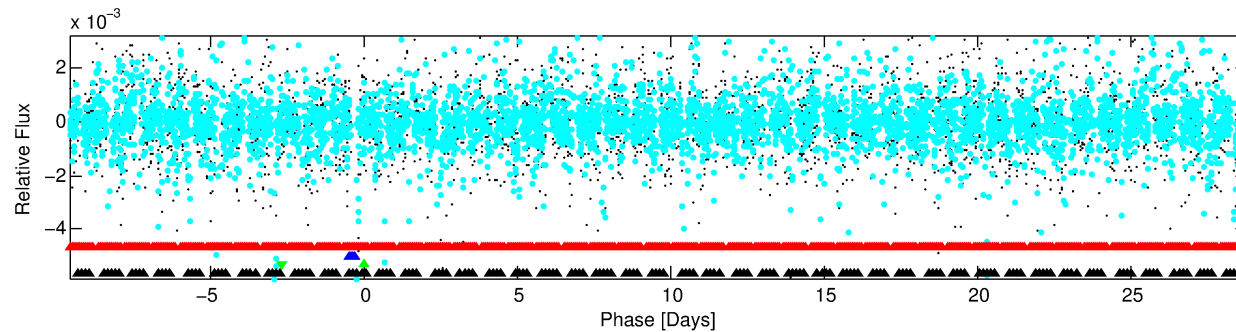
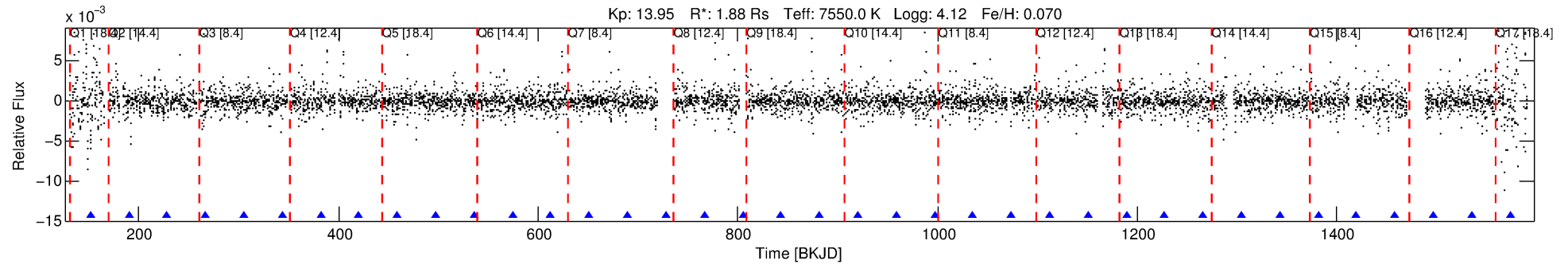
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009226540-03

No Significant Match Found

# DV One-Page Summary

KIC: 9226540 Candidate: 3 of 4 Period: 38.429 d



## TPS TCE Results:

Period = 38.42895 d  
Epoch = 151.4814 BKJD

DV fit results are unavailable

## DV Diagnostic Results:

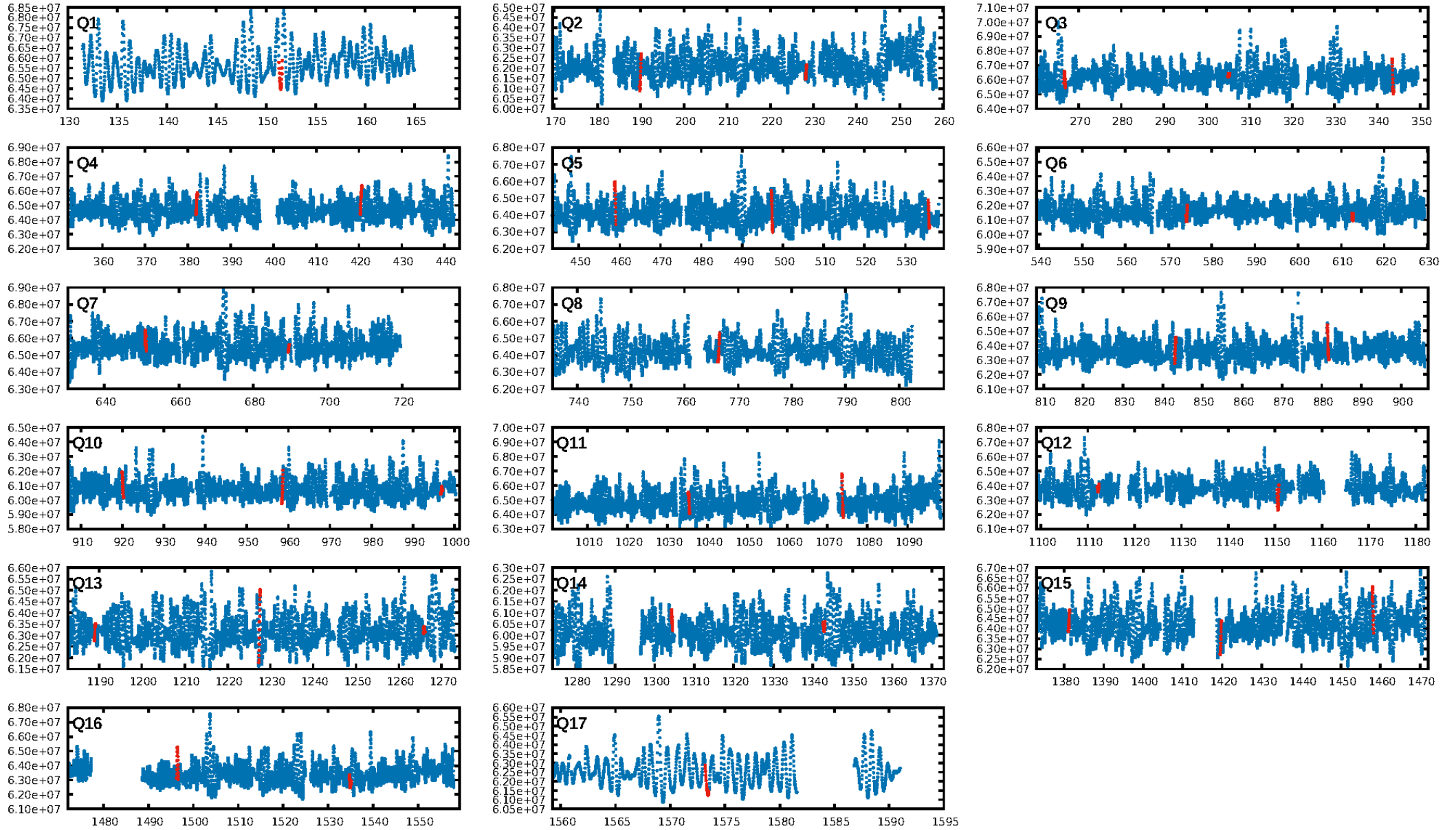
ShortPeriod-sig: 100.0% [97.22 $\sigma$ ]  
LongPeriod-sig: 1.8% [0.02 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [7/7]  
GhostDiagnostic-chr: -1.385

Centroid-sig: 9.3%  
Centroid-so: 0.388 arcsec [1.80 $\sigma$ ]  
OotOffset-rm: 0.045 arcsec [0.53 $\sigma$ ]  
KicOffset-rm: 0.101 arcsec [1.29 $\sigma$ ]  
OotOffset-st: 4/4/4/4 [16]  
KicOffset-st: 4/4/4/4 [16]  
DiffImageQuality-fgm: 0.50 [8/16]  
DiffImageOverlap-fno: 0.25 [4/16]

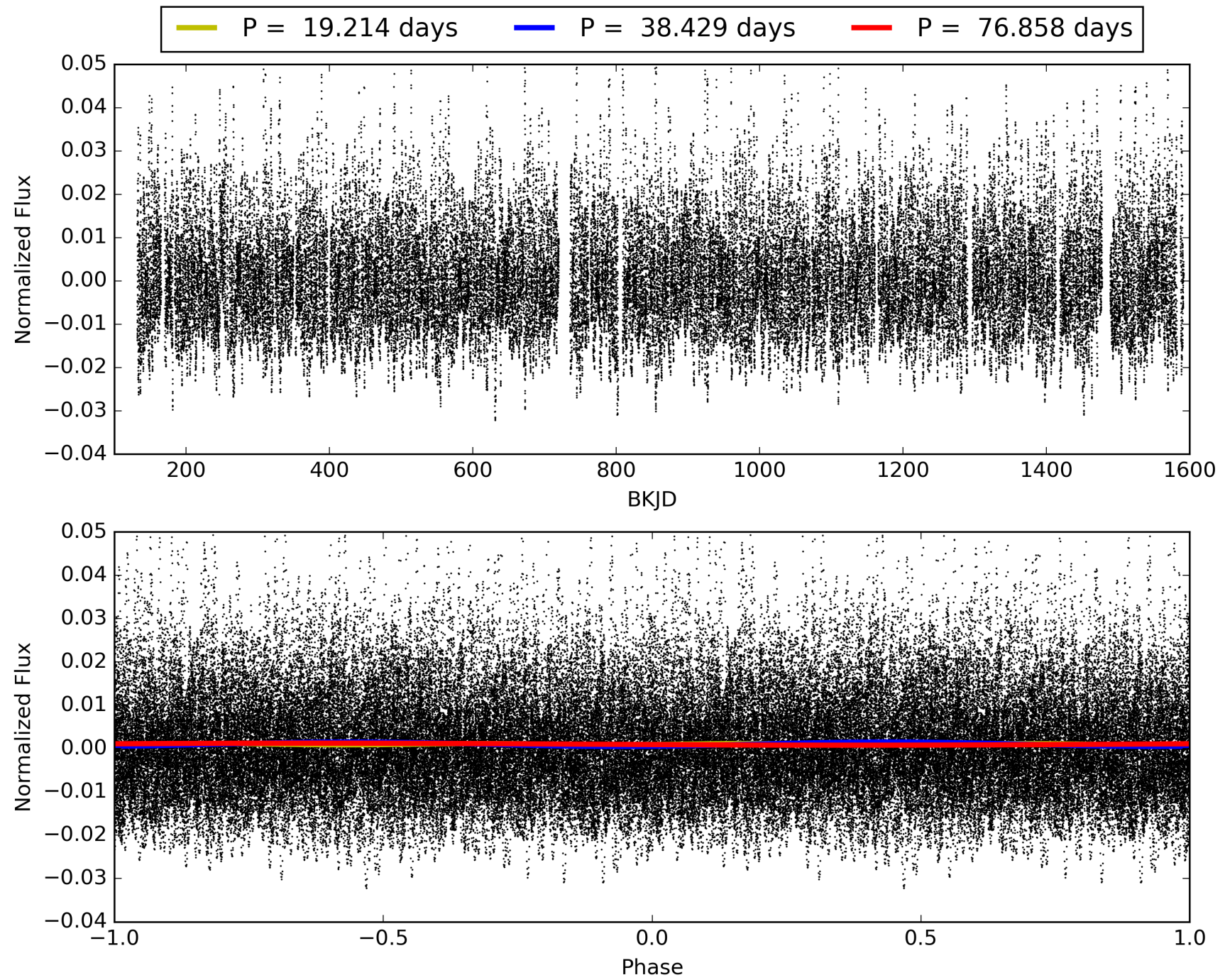
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 03-Feb-2016 08:14:31 Z

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

# TCE 009226540-03, PDC Light Curves

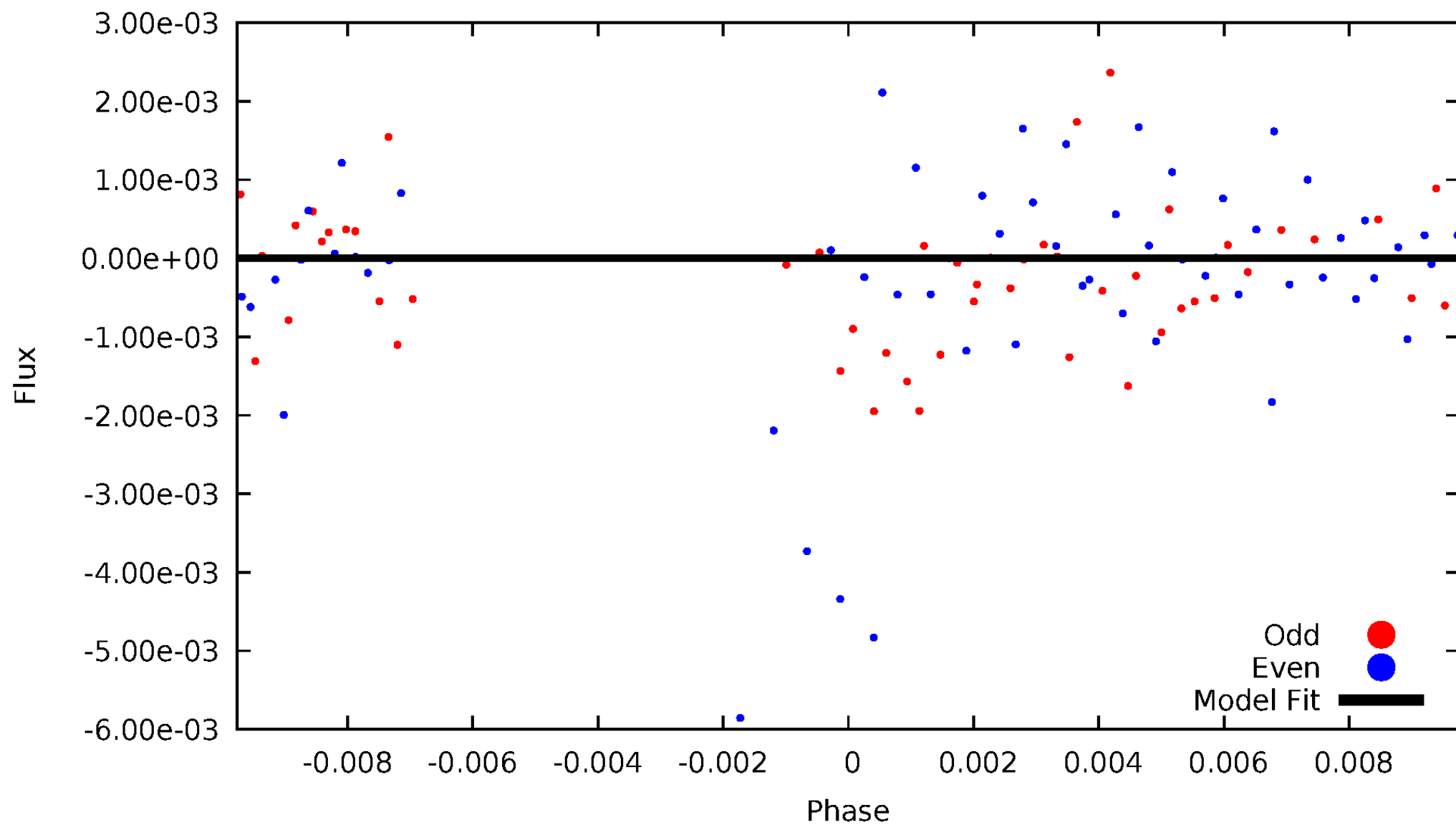


TCE 009226540-03



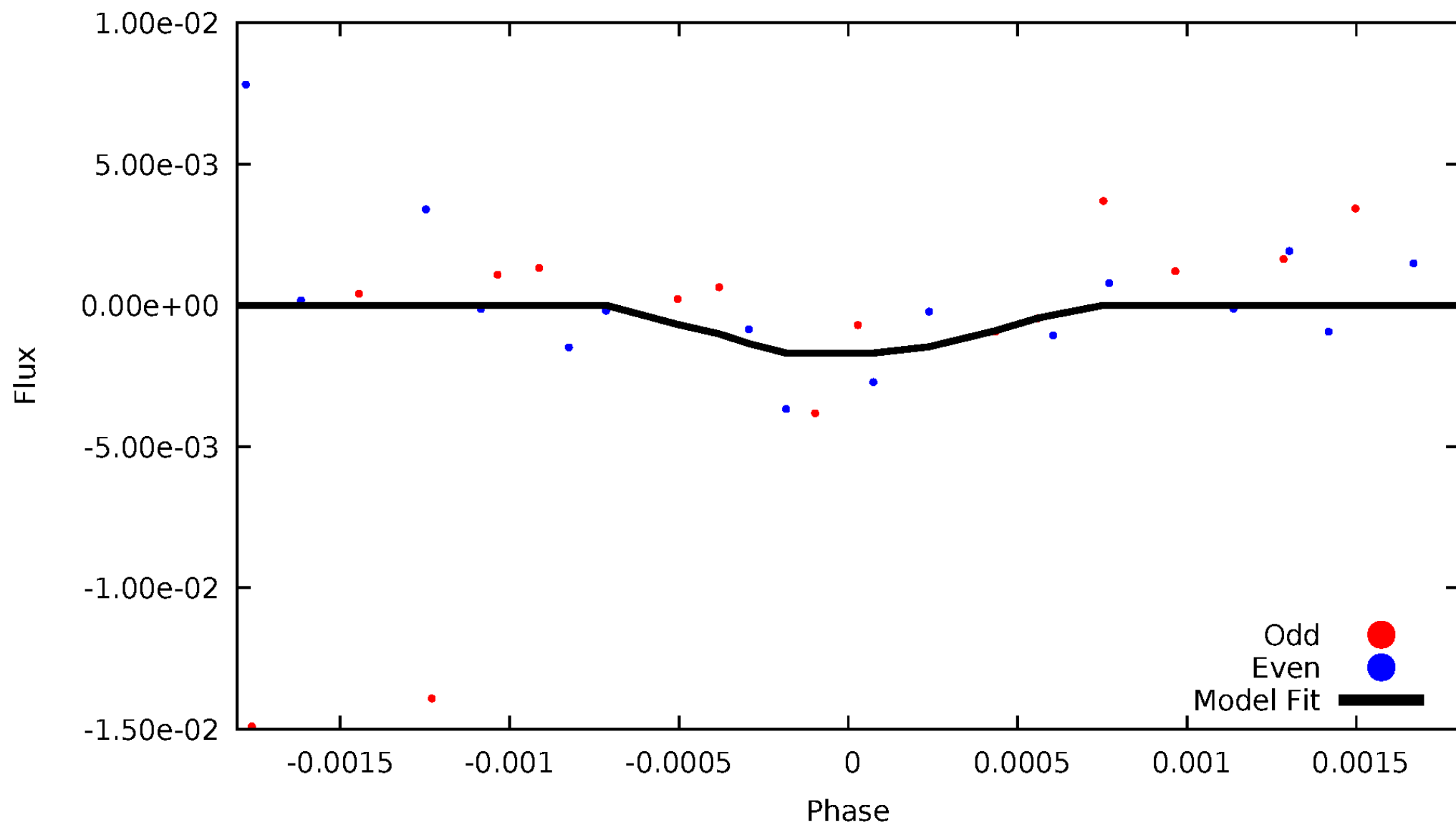
# DV Odd/Even

TCE 009226540-03



# ALT Odd/Even

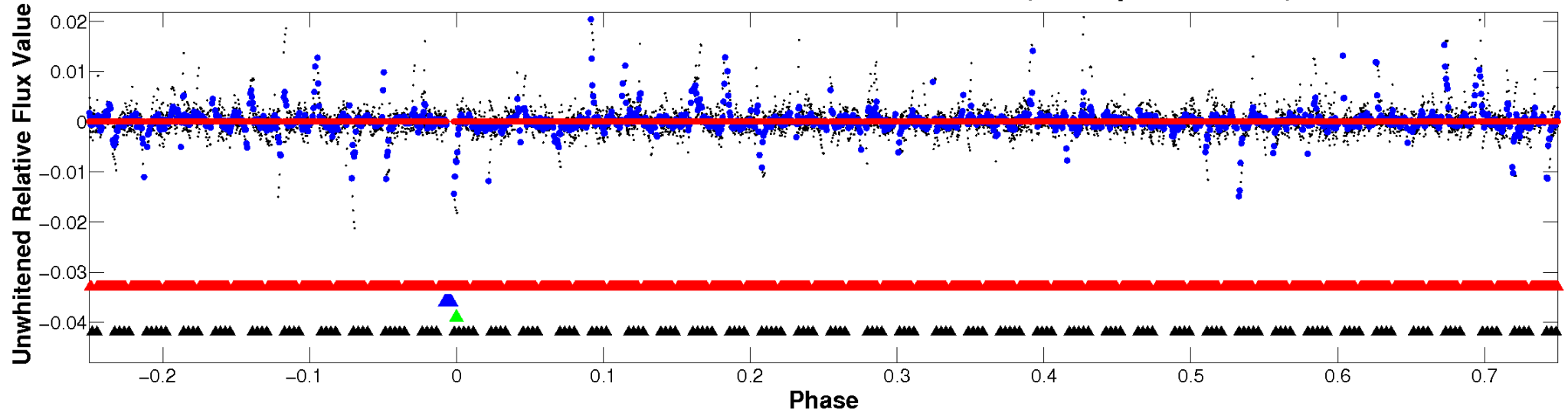
TCE 009226540-03



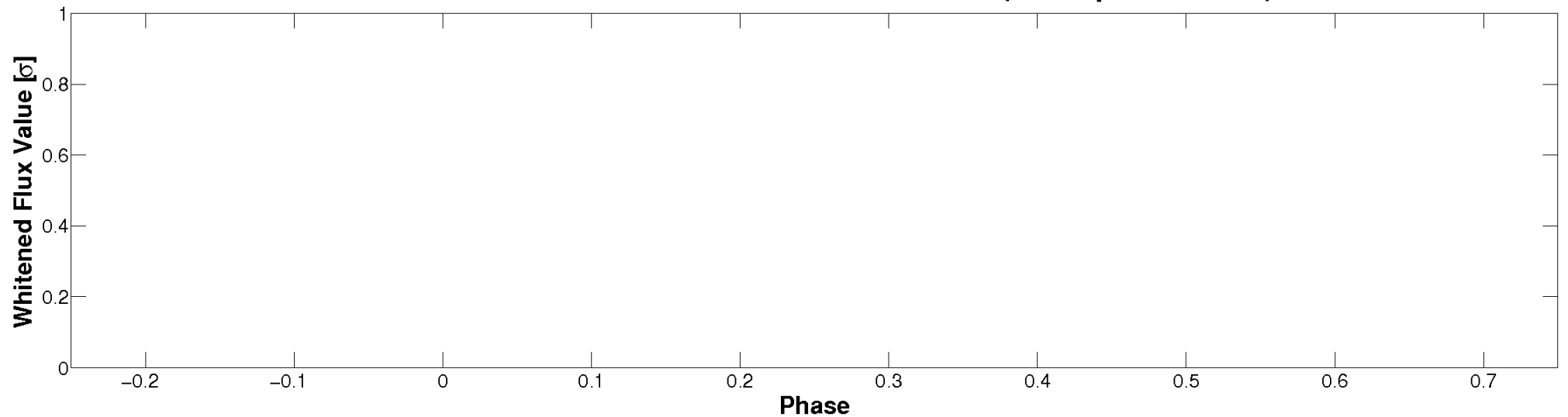


# Non-Whitened Vs. Whitened Light Curve

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

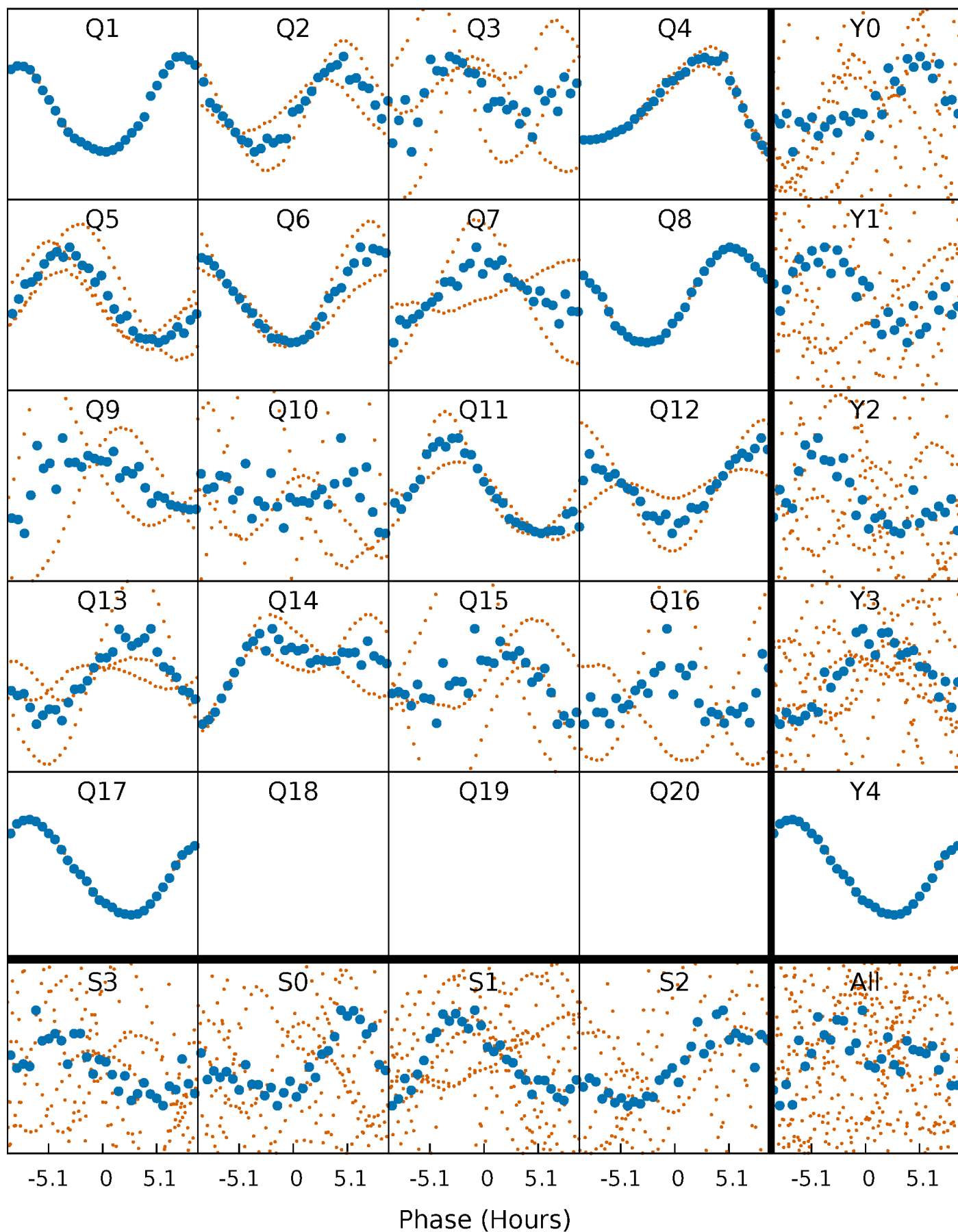


**Planet 3 : Phased Whitened Flux Time Series (TPS Epoch/Period)**



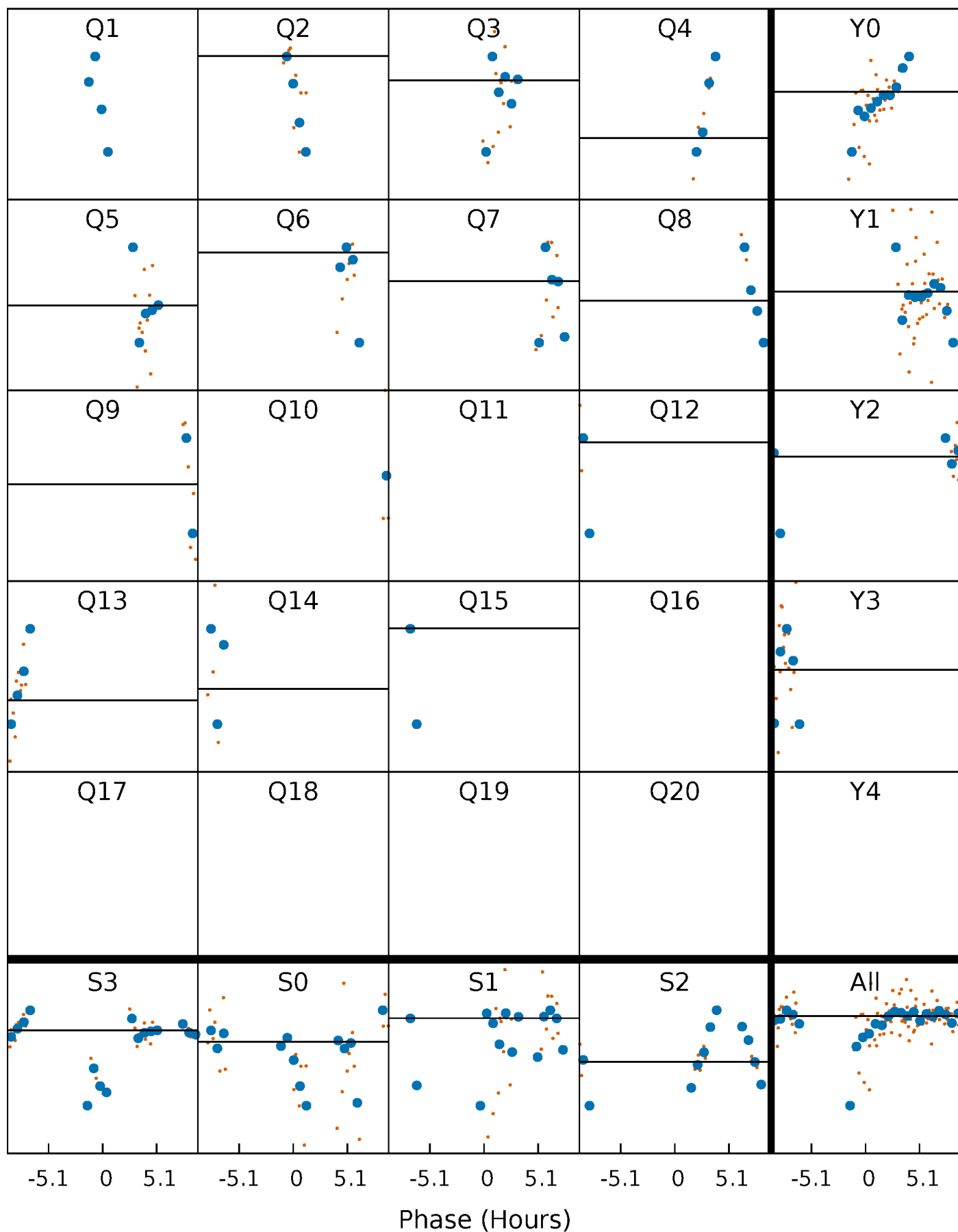
# PDC Quarter-Phased Transit Curves

TCE 009226540-03 P= 38.428952 Days  $T_0=151.481393$  (BKJD)



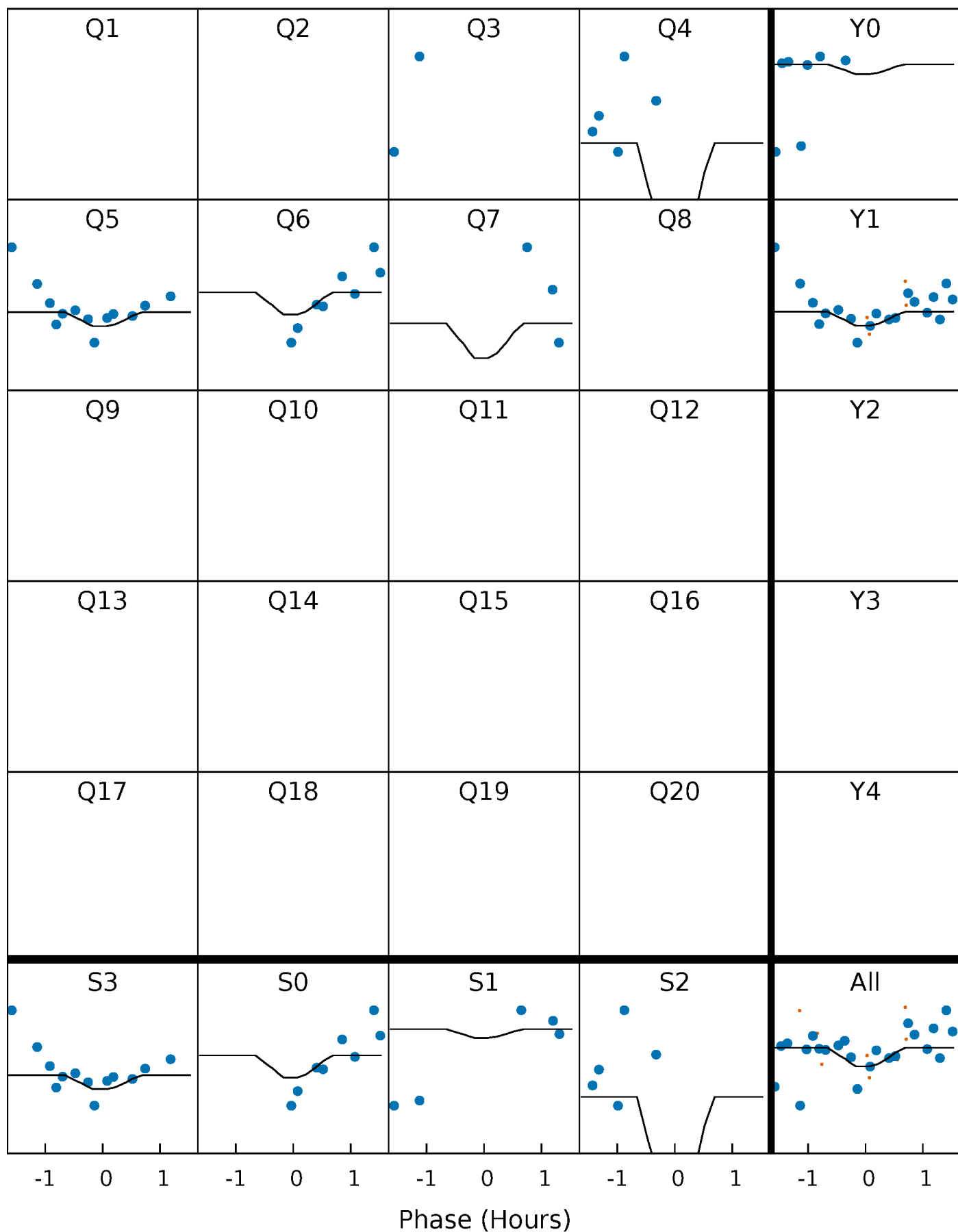
# DV Quarter-Phased Transit Curves

TCE 009226540-03     $P = 38.428952$  Days     $T_0 = 151.481393$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

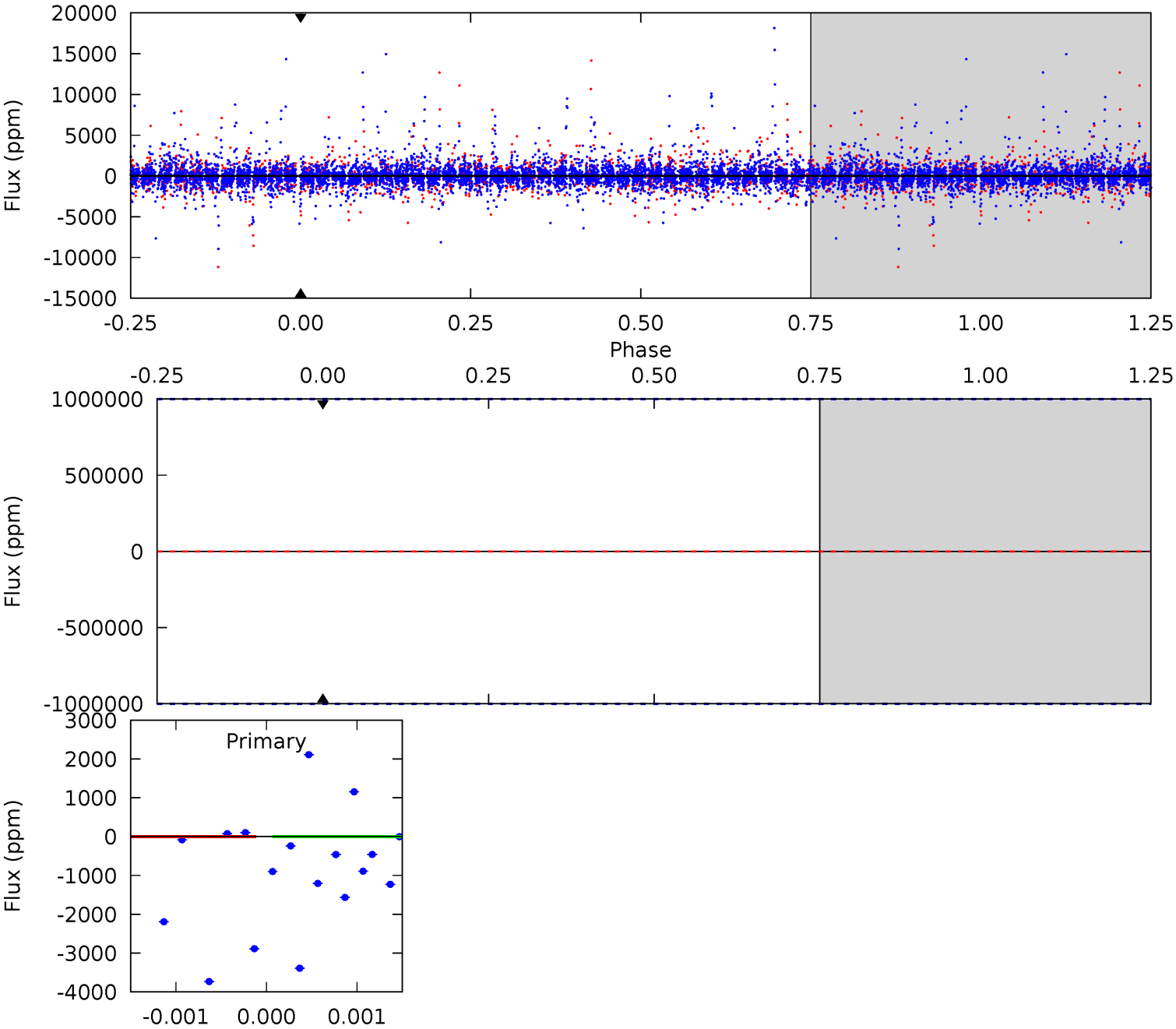
TCE 009226540-03 P= 38.428952 Days  $T_0=151.656813$  (BKJD)



# DV Model-Shift Uniqueness Test

009226540-03, P = 38.428952 Days, E = 113.052441 Days

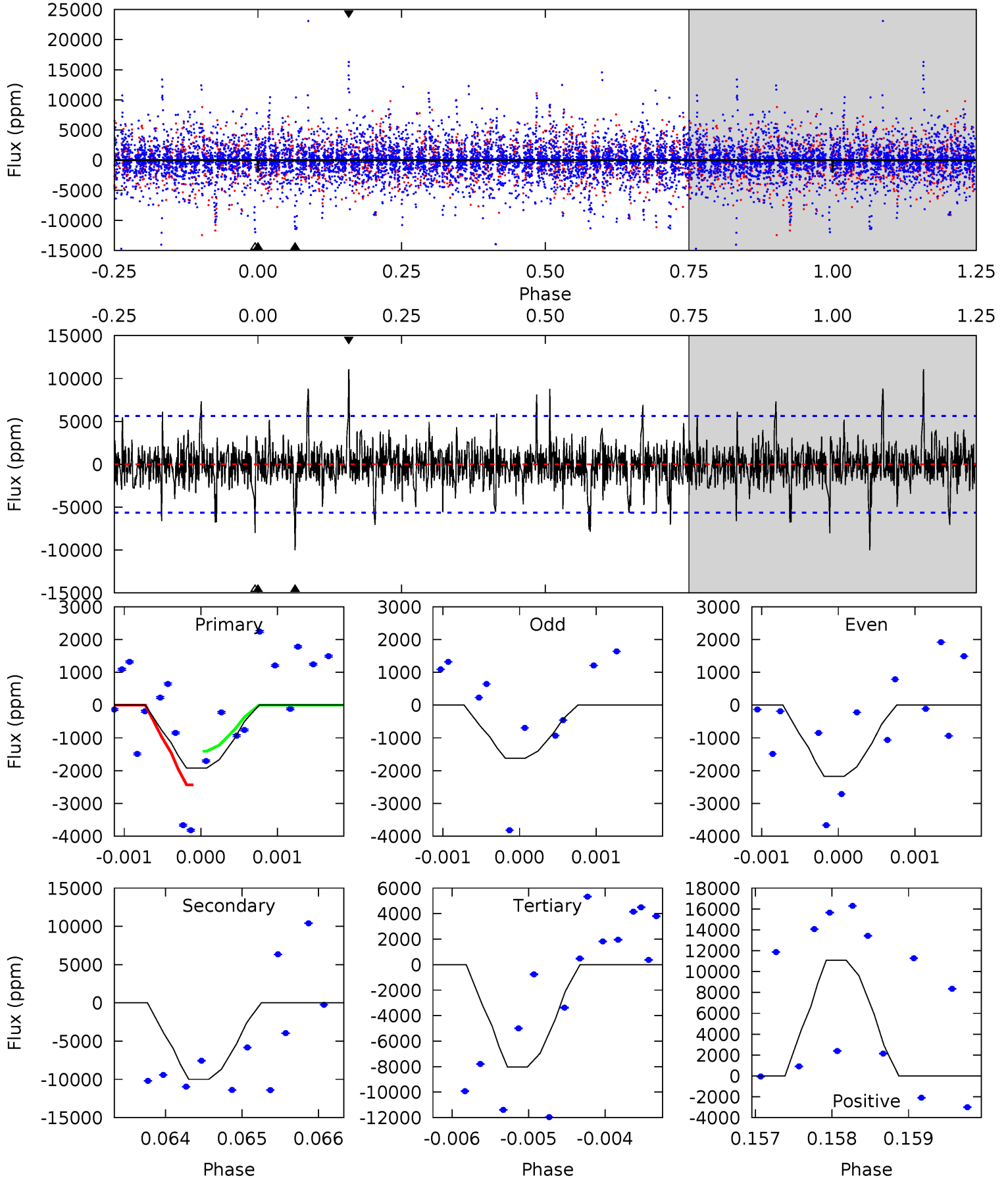
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
0	0	0	0	1.00	1.00	1.00	0	0	0	0	0	0	0	0



# Alt Model-Shift Uniqueness Test

009226540-03, P = 38.428952 Days, E = 113.227861 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
1.86	9.68	7.76	10.7	5.45	3.29	1.67	-5.90	-8.87	1.92	-1.05	0.24	1.07	0.53	0.48





### Stellar Parameters For KIC 009226540

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7550^{+211}_{-316}$	$4.115^{+0.120}_{-0.180}$	$0.070^{+0.150}_{-0.350}$	$1.883^{+0.549}_{-0.366}$	$1.685^{+0.204}_{-0.272}$	$0.355^{+0.212}_{-0.179}$
	+3%/-4%	+3%/-4%	+214%/-500%	+29%/-19%	+12%/-16%	+60%/-50%
Source	KIC0	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 009226540-03 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$0 \pm 1000000$	$16.54^{+17.01}_{-11.64}$	$1245^{+95}_{-77}$	$3721^{+34803}_{-40689}$	$37^{+28368}_{-23194}$
Alt.	$-10002 \pm 1033$	$18.21^{+17.05}_{-12.63}$	$1246^{+93}_{-79}$	$8114^{+16574}_{-2365}$	$1135^{+11379}_{-822}$

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

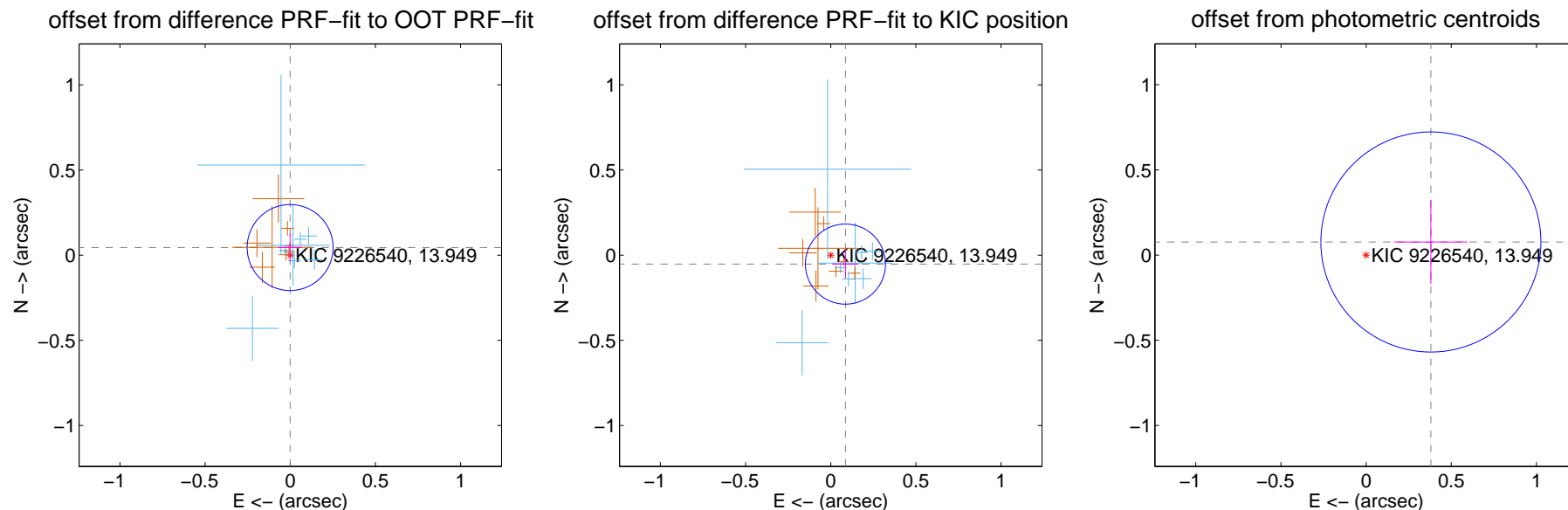
## DV Centroid Data

Supplemental centroid analysis for 009226540-03. Kepler magnitude: 13.95. Transit SNR -1.00

There are 8 quarters with good PRF difference image offsets

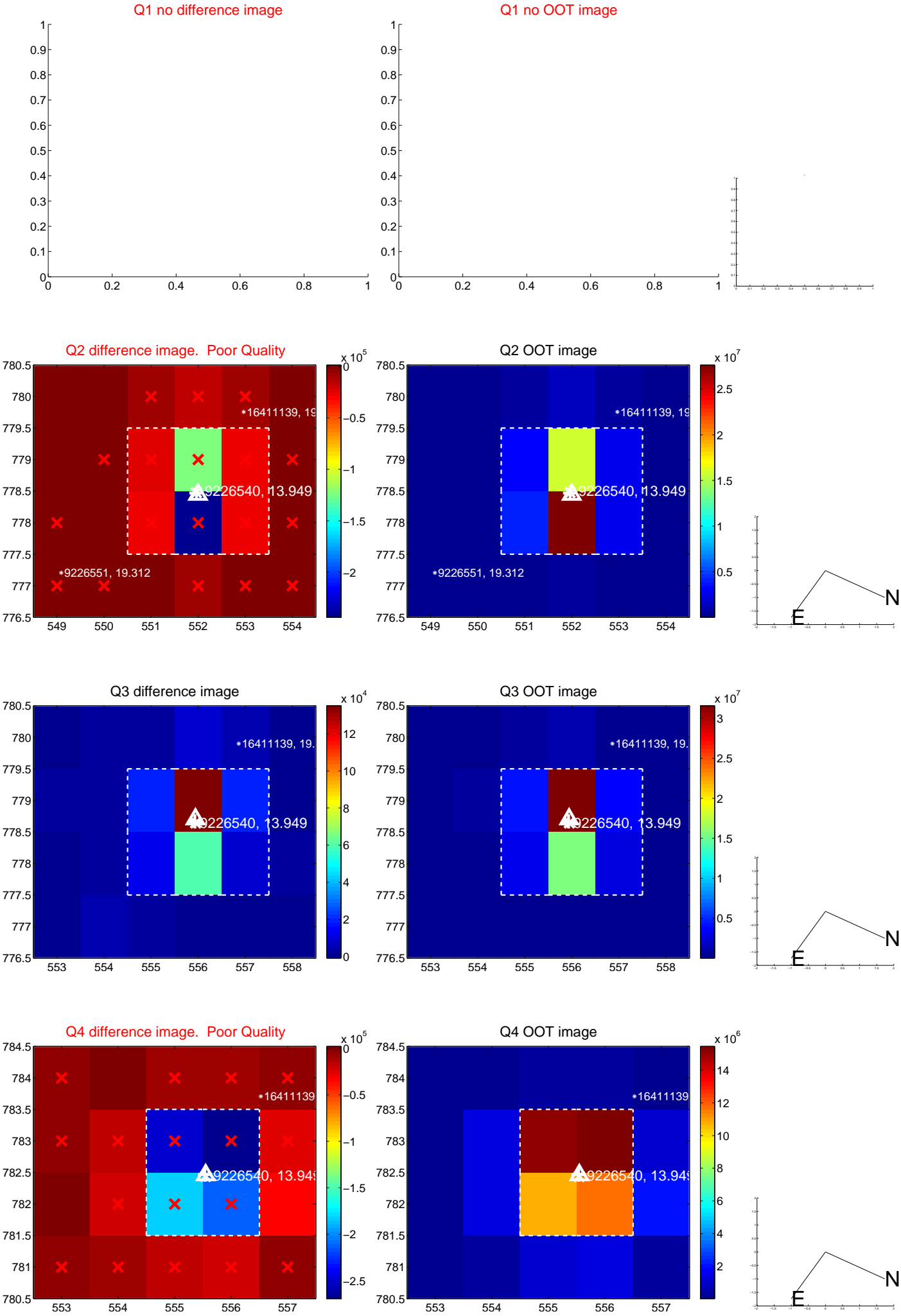
The direct PRF centroid is offset from the target star catalog position by about 0.16 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.045 \pm 0.084$	0.53	$0.001 \pm 0.071$	$0.045 \pm 0.084$
PRF-fit source offset from KIC position	$0.101 \pm 0.078$	1.29	$-0.086 \pm 0.078$	$-0.053 \pm 0.080$
photometric centroid source offset	$0.39 \pm 0.22$	1.80	$-0.38 \pm 0.21$	$0.08 \pm 0.25$

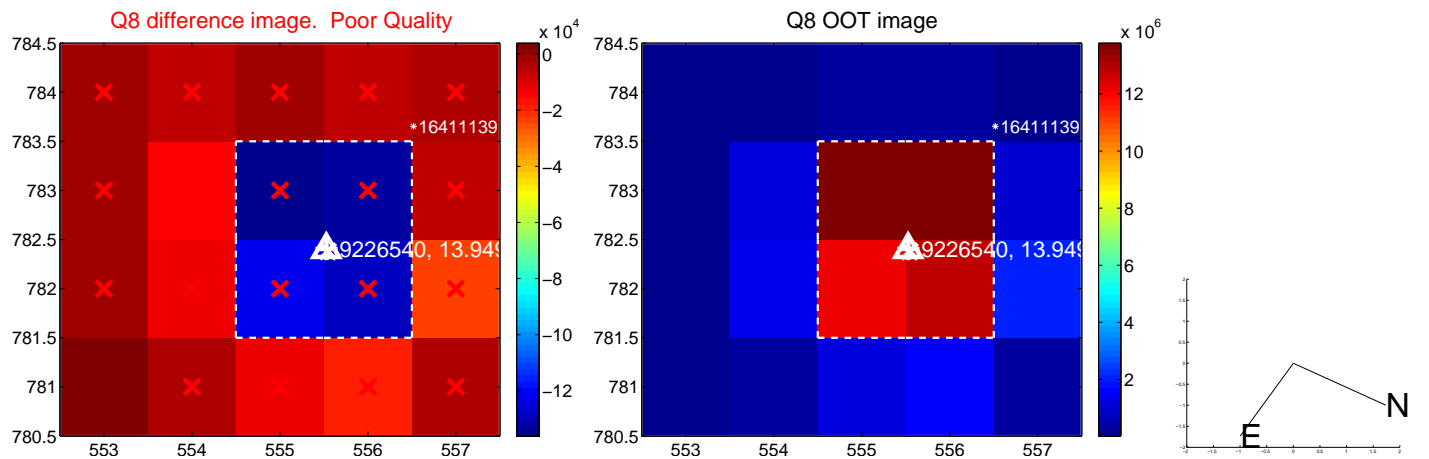
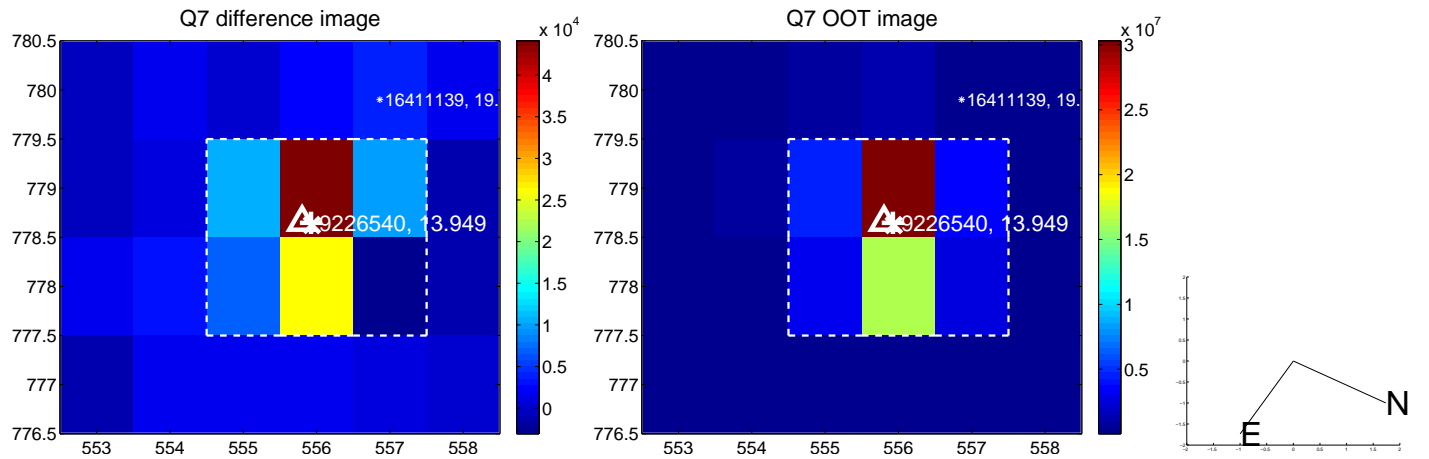
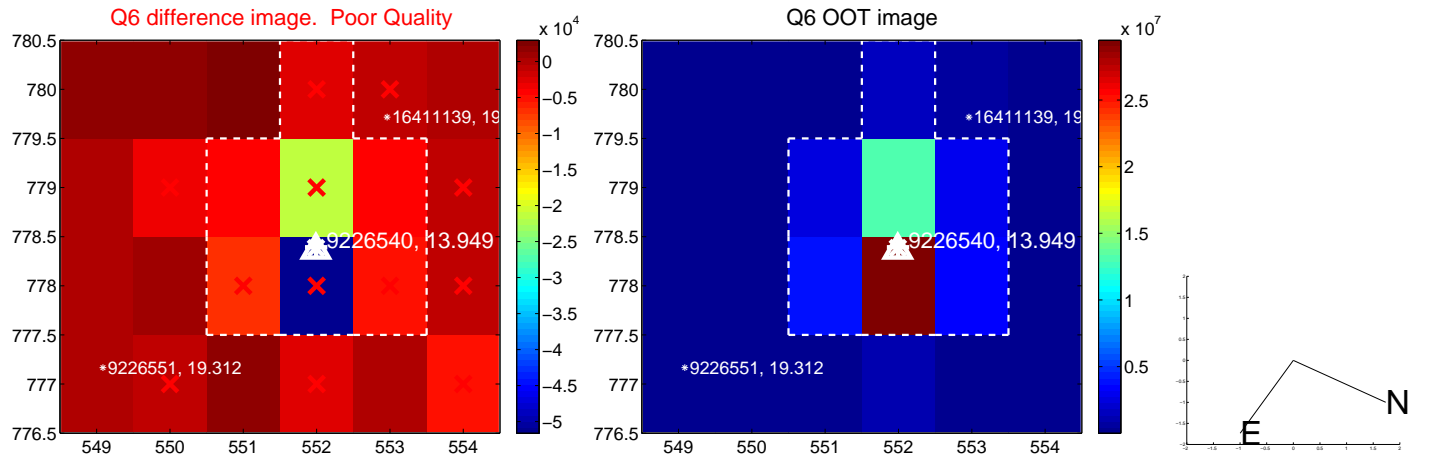
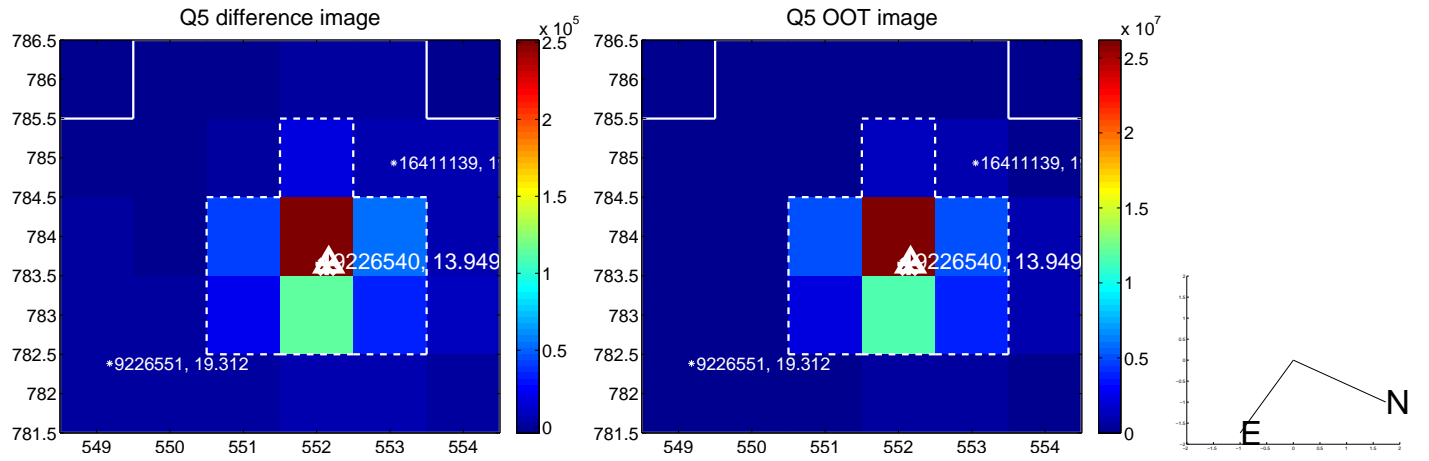


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

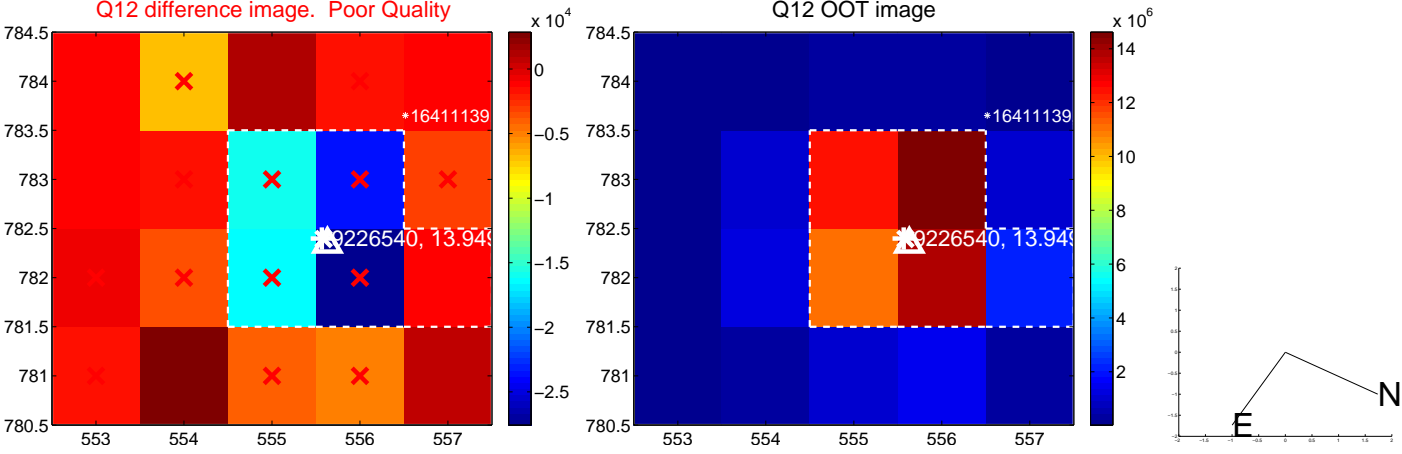
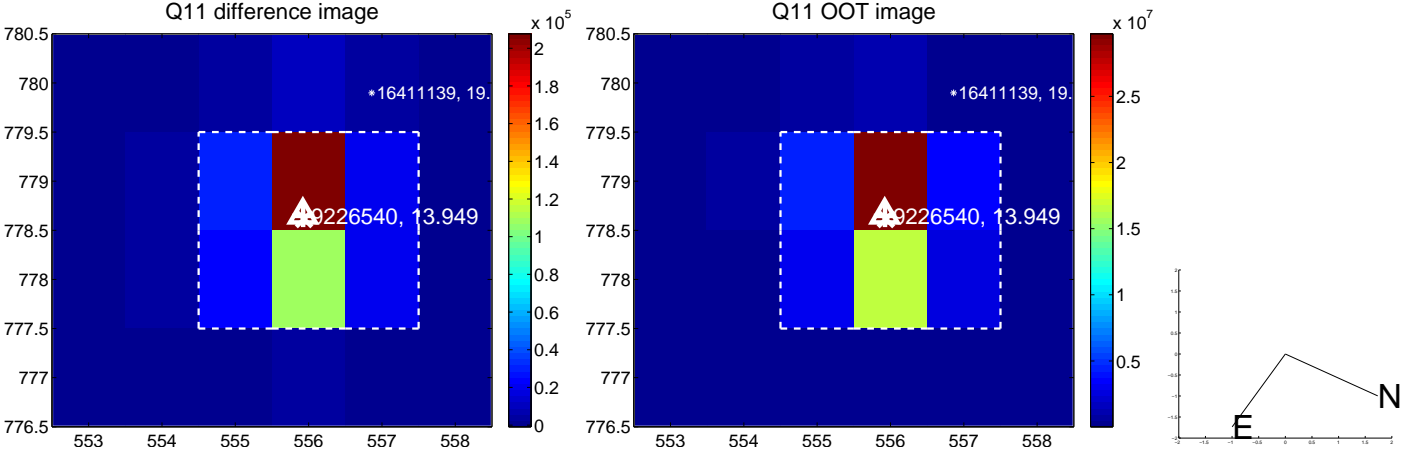
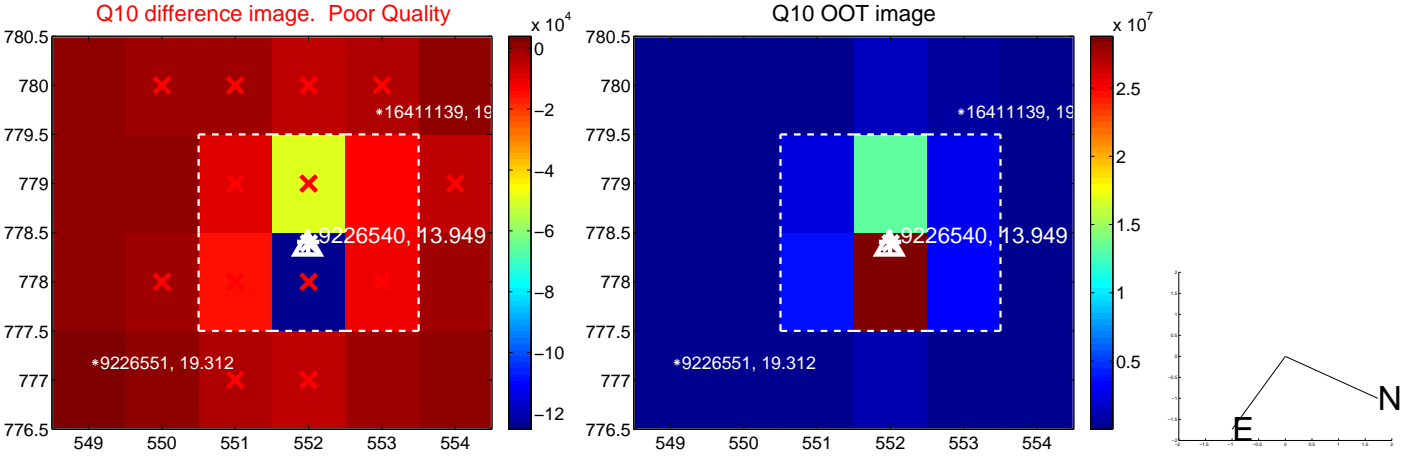
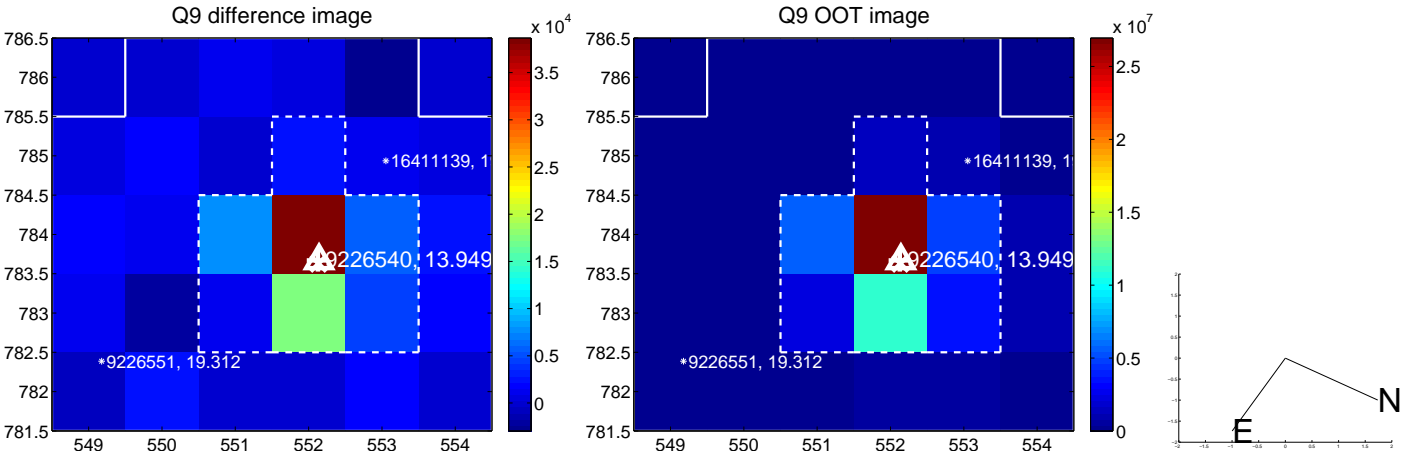
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



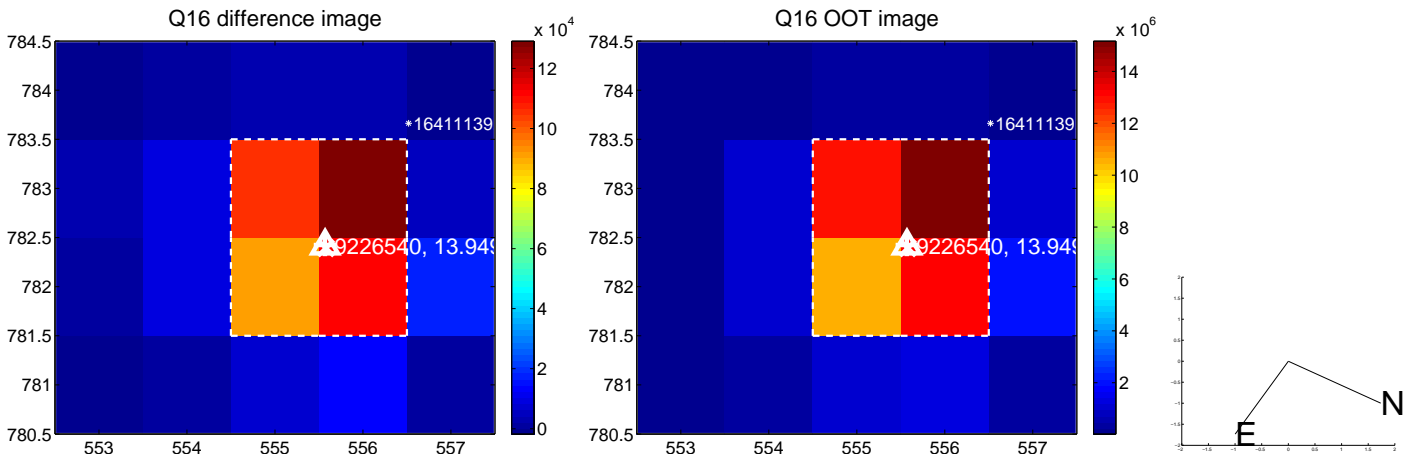
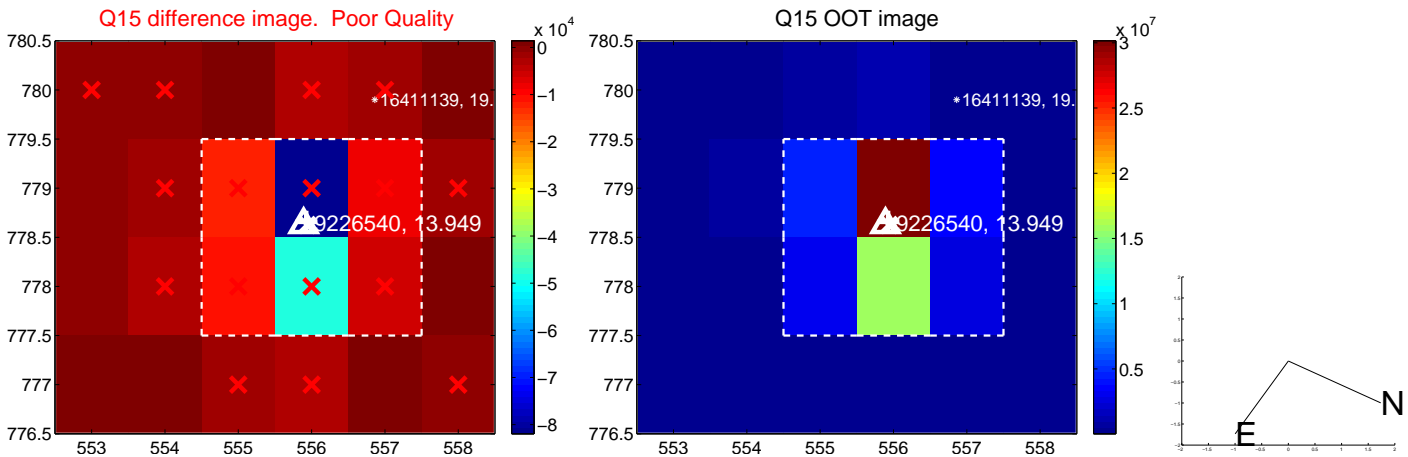
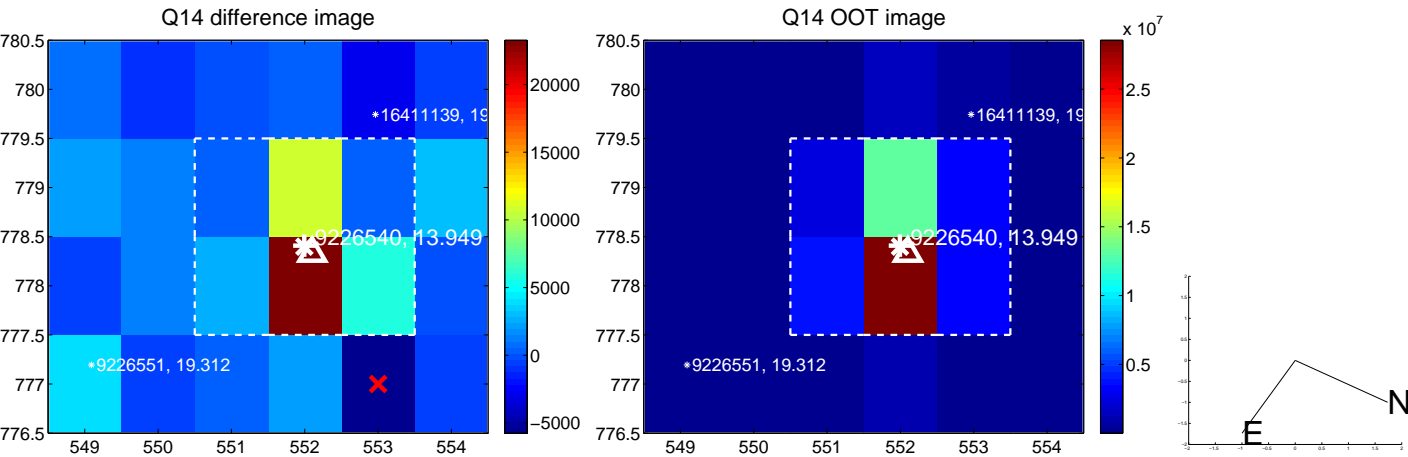
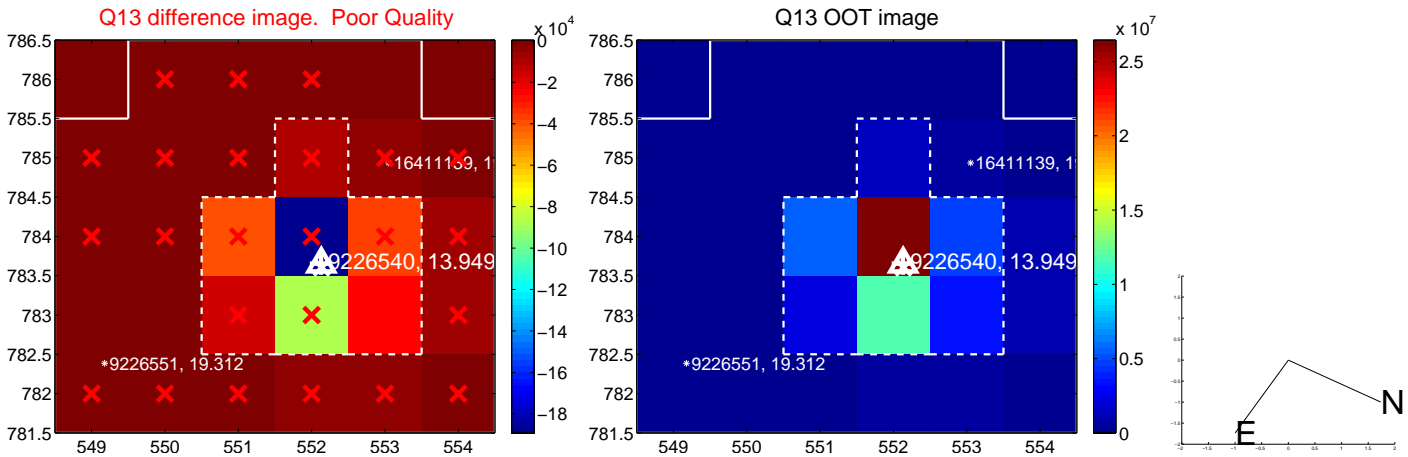
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



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

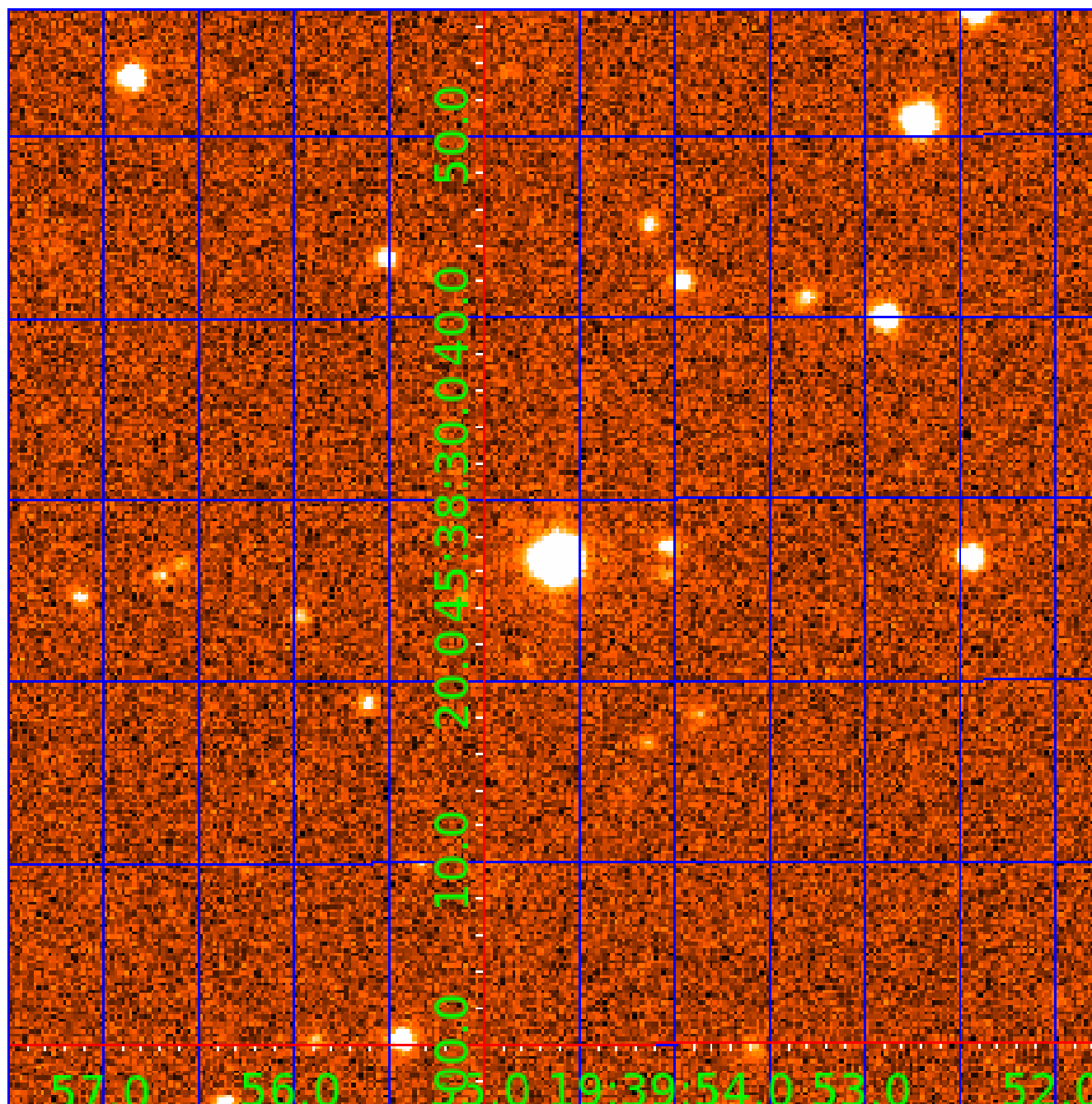






UKIRT Image

Declination



# KIC 009226540

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009226540-01	OBS	No	0.894169	132.237372	29.1	6.218	11.1	2.2	1.88	7550	1.09	22081.21
009226540-02	OBS	No	38.433322	151.183296	2192.5	0.970	15.0	1.8	1.88	7550	10.43	146.66
009226540-03	OBS	No	38.428952	151.481393	952.2	4.500	13.9	-1.0	1.88	7550	5.90	146.68
009226540-04	OBS	No	8.046167	133.530511	538.1	6.000	14.1	-1.0	1.88	7550	4.44	1179.77

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009226540-01	OBS	FP	0.00	1	0	0	0	LPP_DV—MOD_NONUNIQ_DV
009226540-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_TRACKER—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_TER_DV—MOD_POS_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
009226540-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—SAME_NTL_PERIOD—CENT_NOFITS
009226540-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_ZUMA—TRANS_GAPPED—LPP_DV—LPP_ALT—CENT_NOFITS

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

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

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

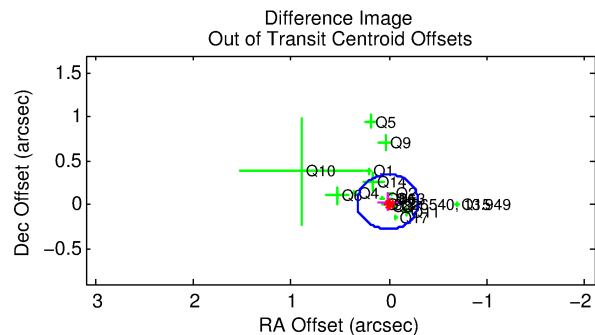
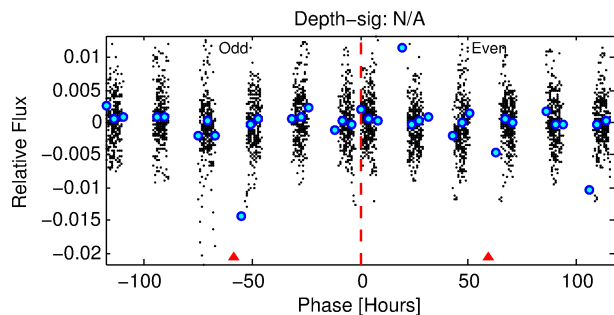
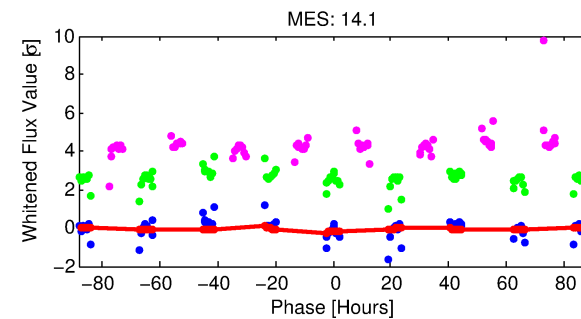
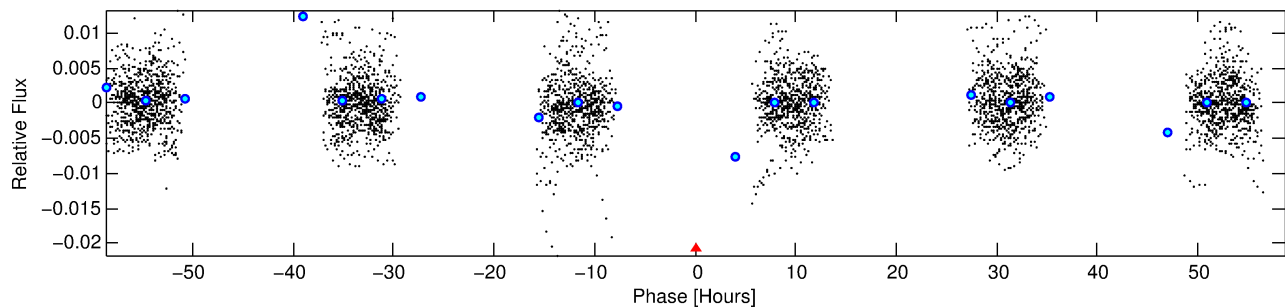
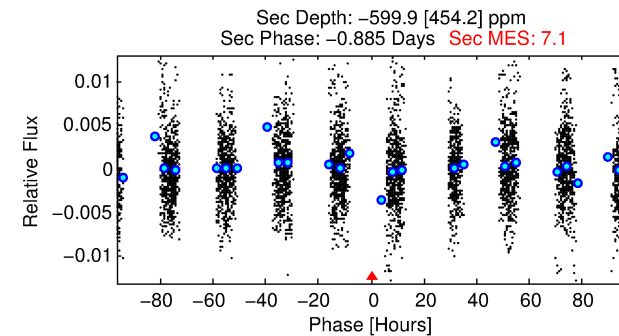
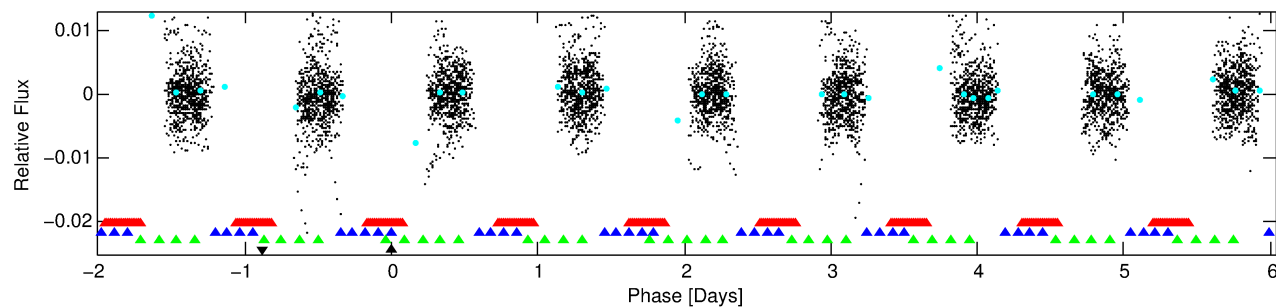
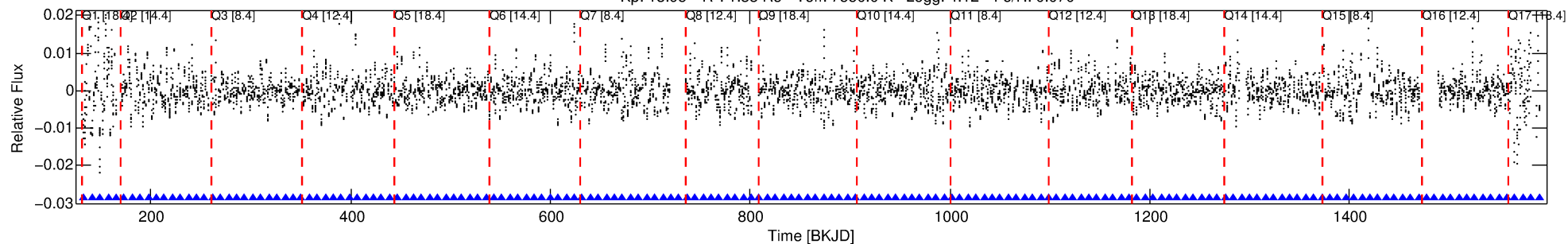
Ephemeris Match Information For 009226540-04

No Significant Match Found

# DV One-Page Summary

KIC: 9226540 Candidate: 4 of 4 Period: 8.046 d

Kp: 13.95 R\*: 1.88 Rs Teff: 7550.0 K Logg: 4.12 Fe/H: 0.070



## TPS TCE Results:

Period = 8.04617 d  
Epoch = 133.5305 BKJD

**DV fit results are unavailable**

## DV Diagnostic Results:

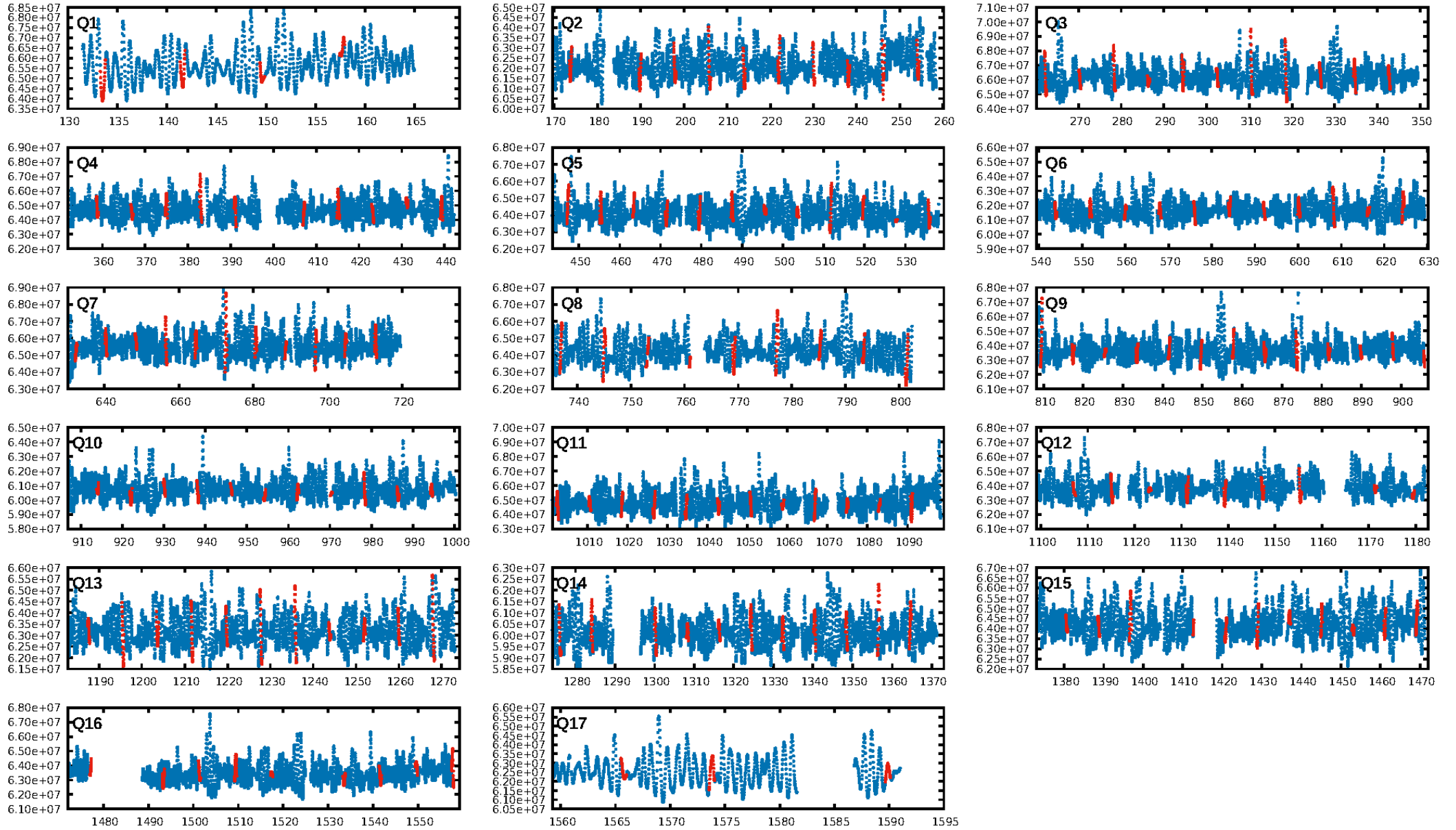
ShortPeriod-sig: 100.0% [19.87σ]  
LongPeriod-sig: 100.0% [97.22σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGoF-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [158/158]  
GhostDiagnostic-chr: 0.5985

Centroid-sig: 74.7%  
**Centroid-so: 0.189 arcsec [29.16σ]**  
OotOffset-rm: 0.038 arcsec [0.36σ]  
KicOffset-rm: 0.071 arcsec [0.64σ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 0.41 [7/17]  
DiffImageOverlap-fno: 0.00 [0/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 03-Feb-2016 08:14:36 Z

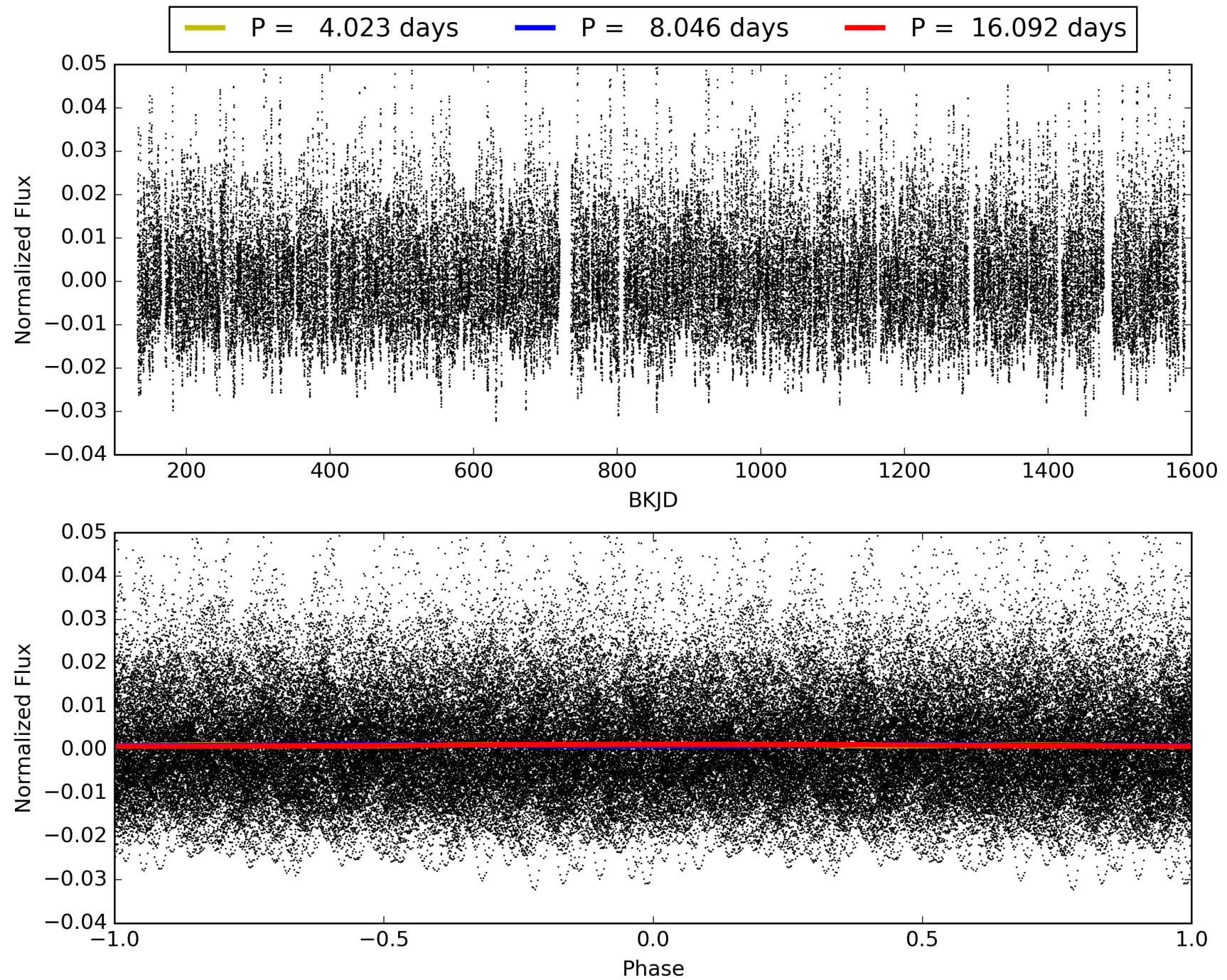
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 009226540-04, PDC Light Curves





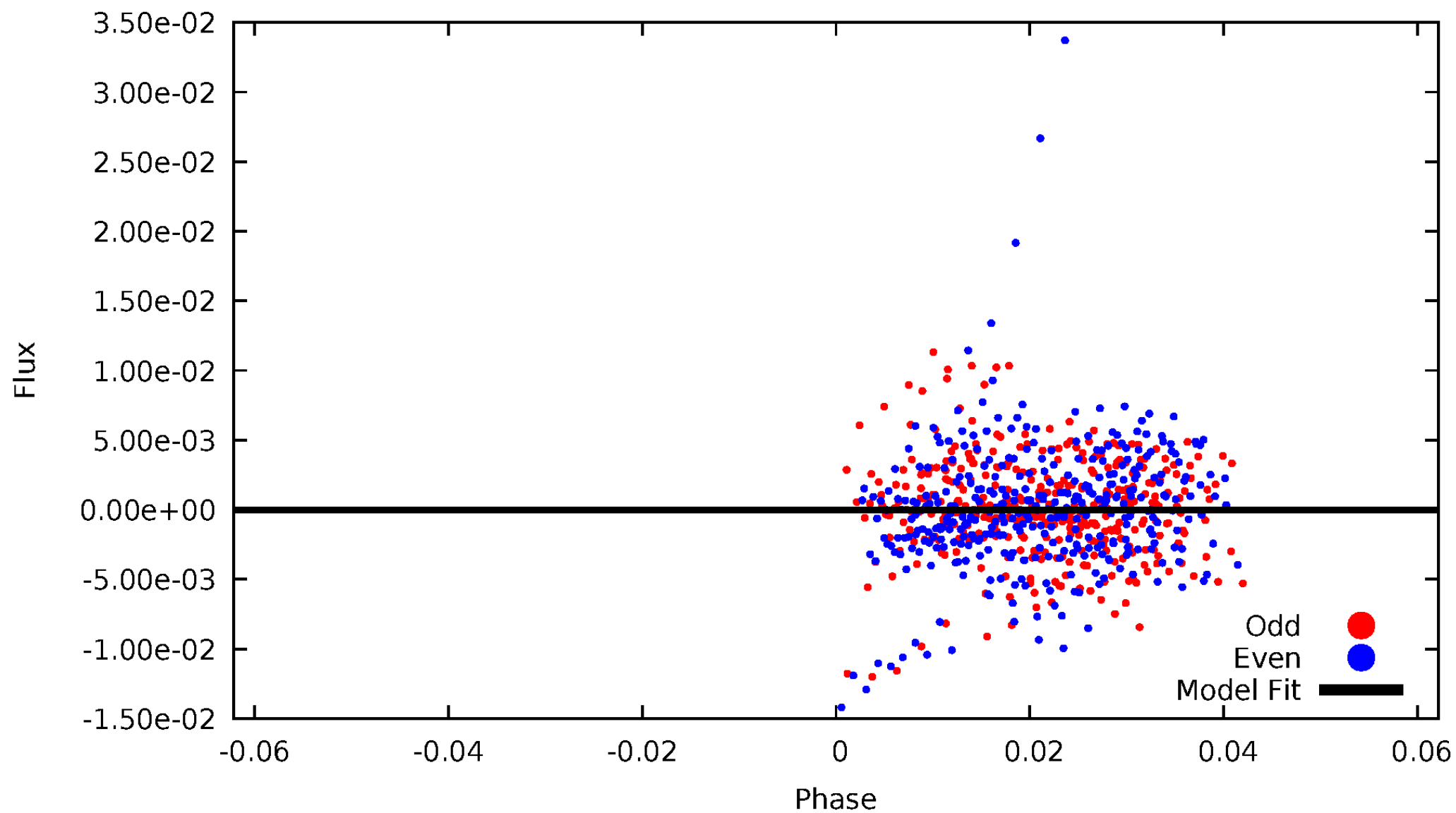
TCE 009226540-04





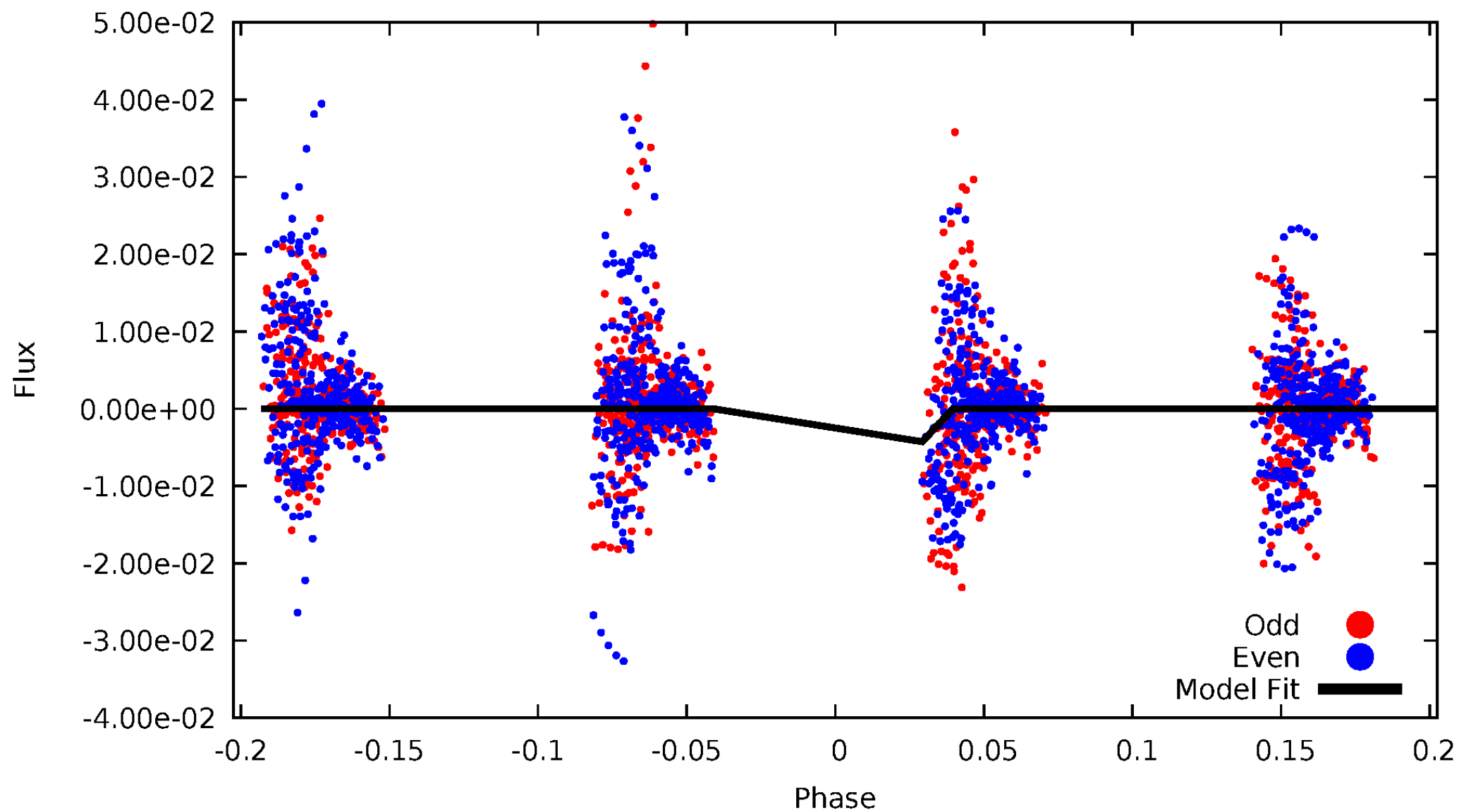
# DV Odd/Even

TCE 009226540-04



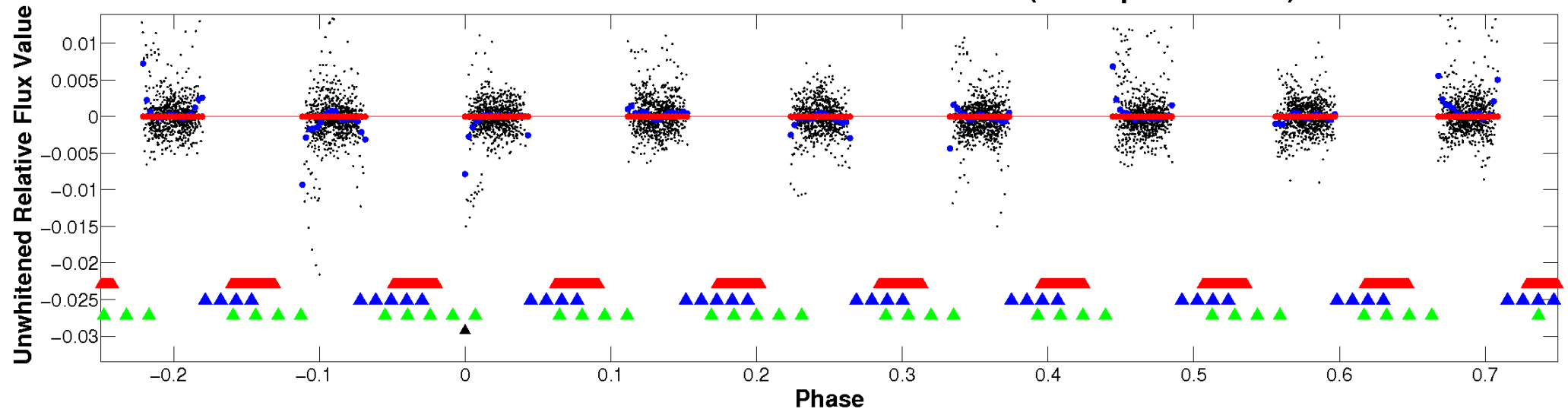
# ALT Odd/Even

TCE 009226540-04



# Non-Whitened Vs. Whitened Light Curve

**Planet 4 : Phased Unwhitened Flux Time Series (TPS Epoch/Period)**

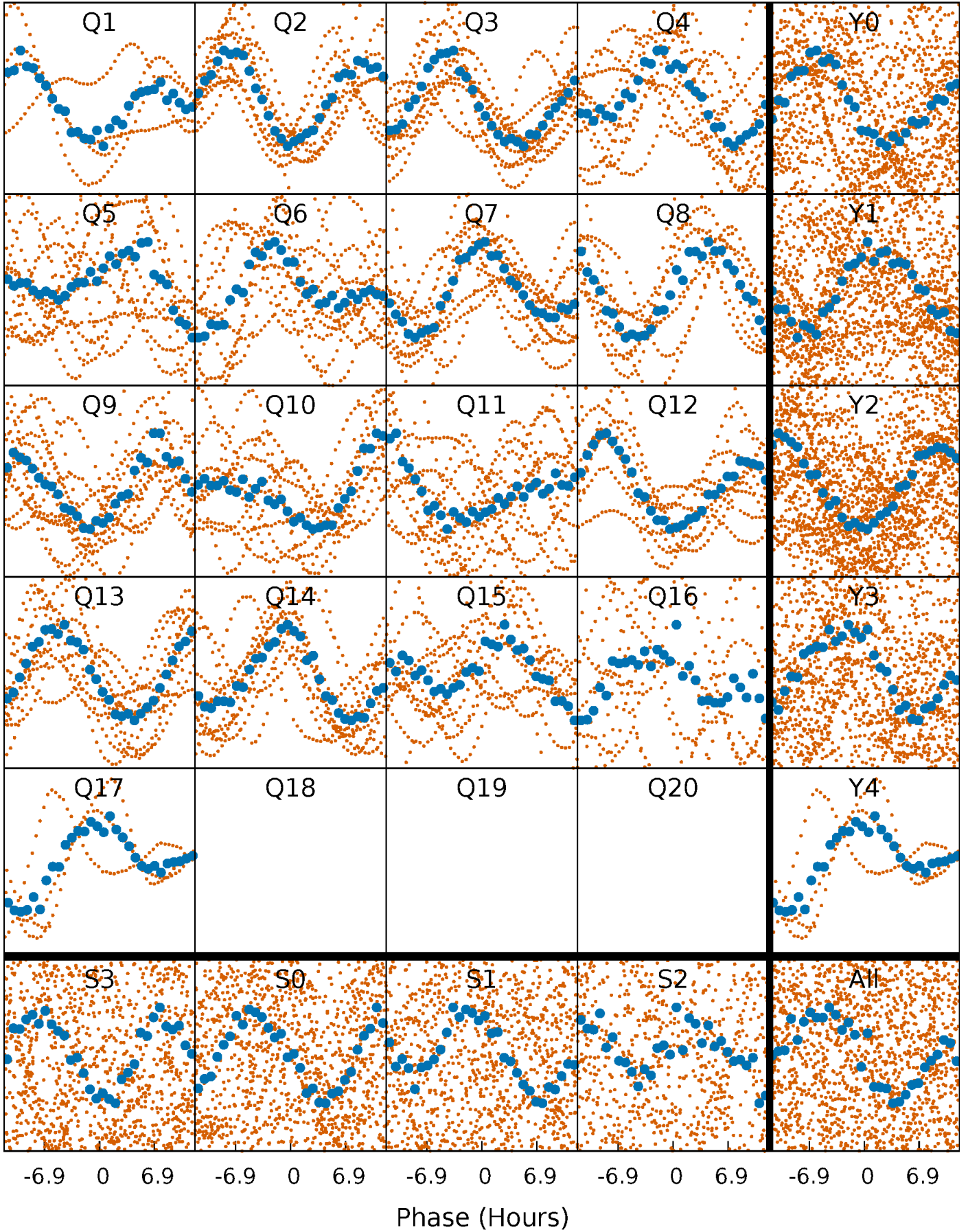


**Planet 4 : Phased Whitened Flux Time Series (TPS Epoch/Period)**



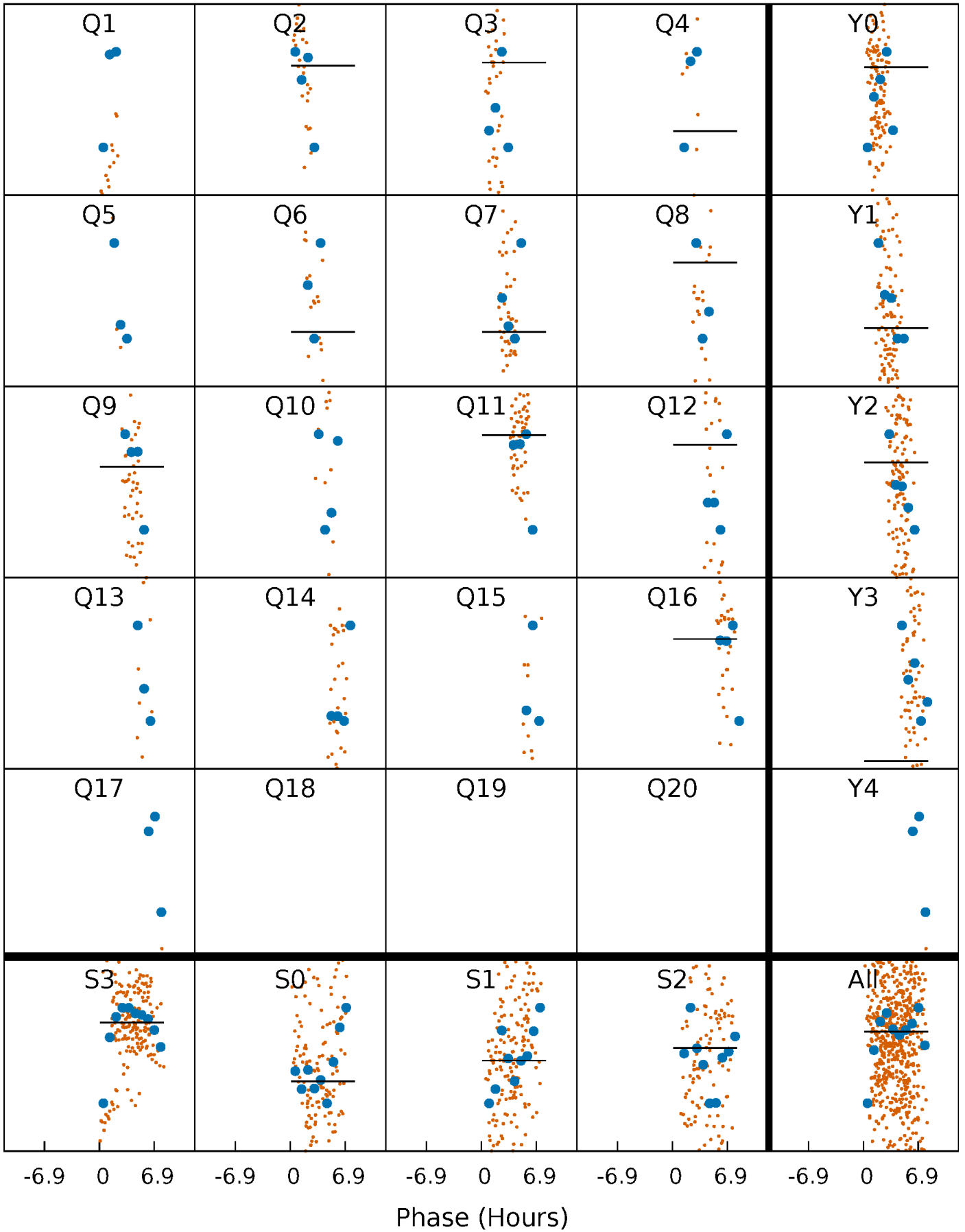
# PDC Quarter-Phased Transit Curves

TCE 009226540-04   P= 8.046167 Days    $T_0=133.530511$  (BKJD)



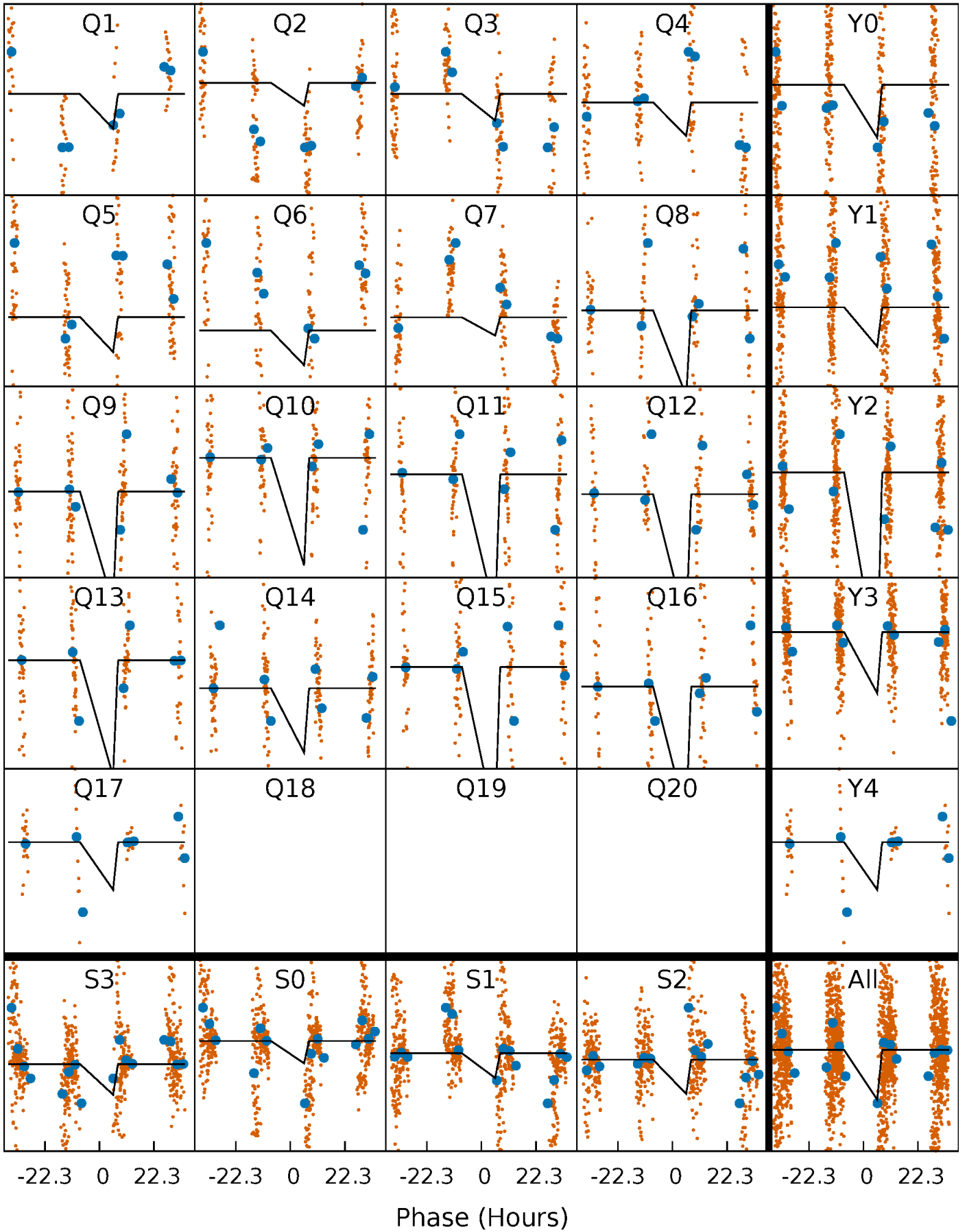
# DV Quarter-Phased Transit Curves

TCE 009226540-04     $P = 8.046167$  Days     $T_0 = 133.530511$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

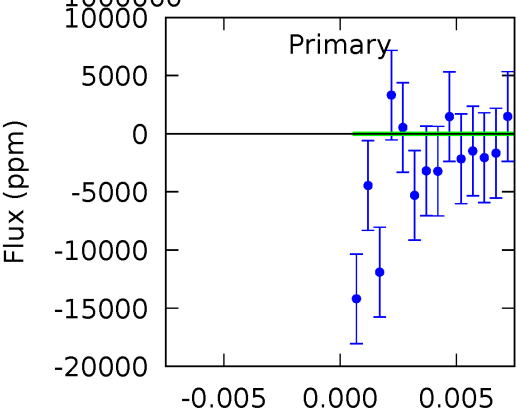
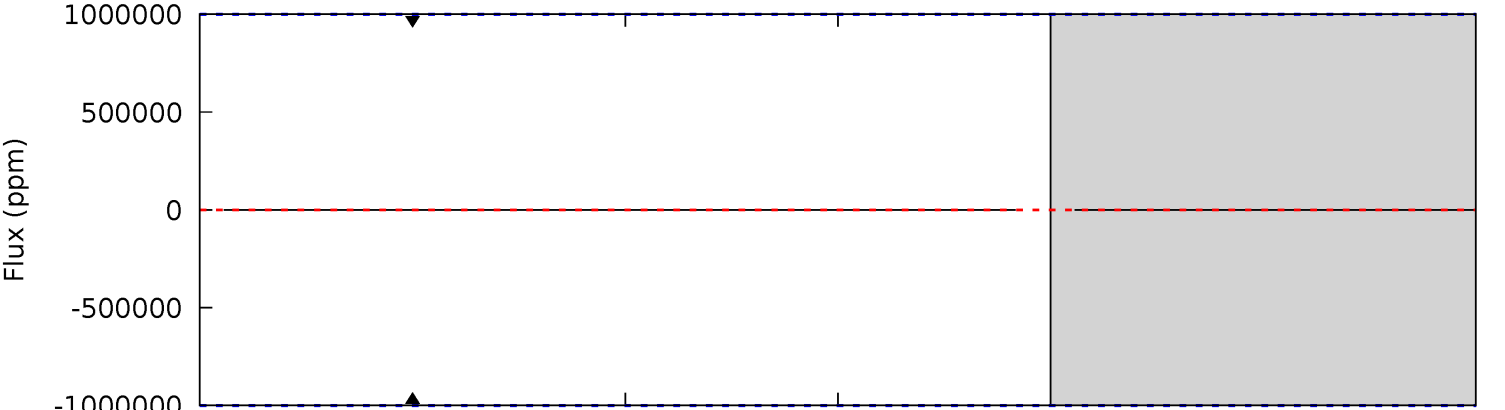
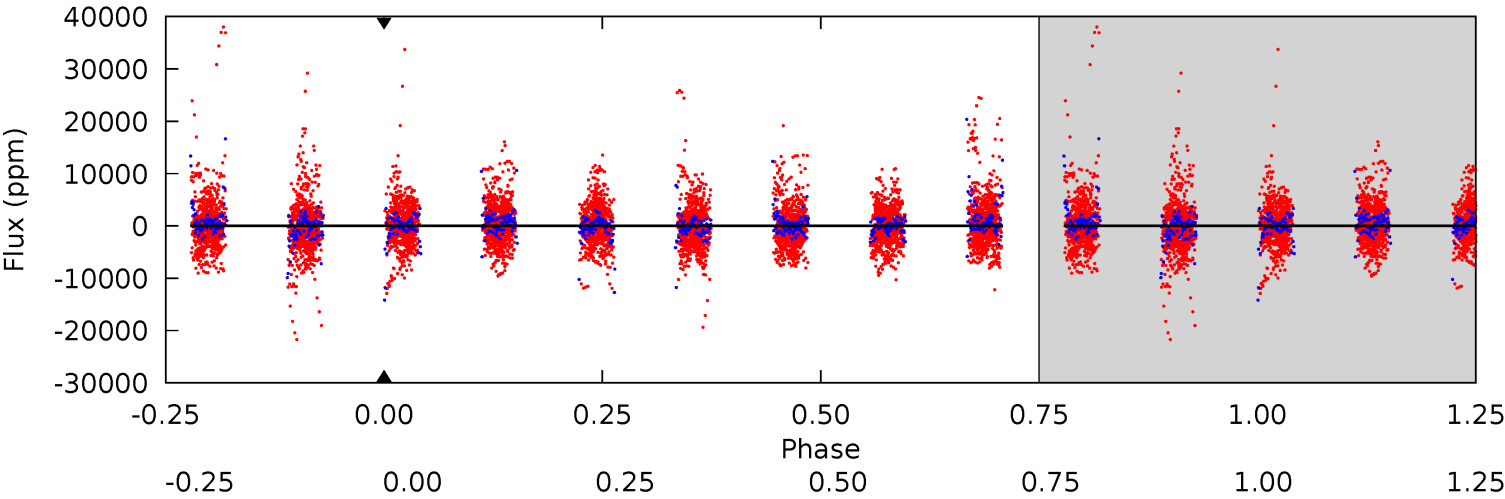
TCE 009226540-04   P= 8.046167 Days    $T_0=133.299571$  (BKJD)



DV Model-Shift Uniqueness Test

009226540-04, P = 8.046167 Days, E = 125.484344 Days

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

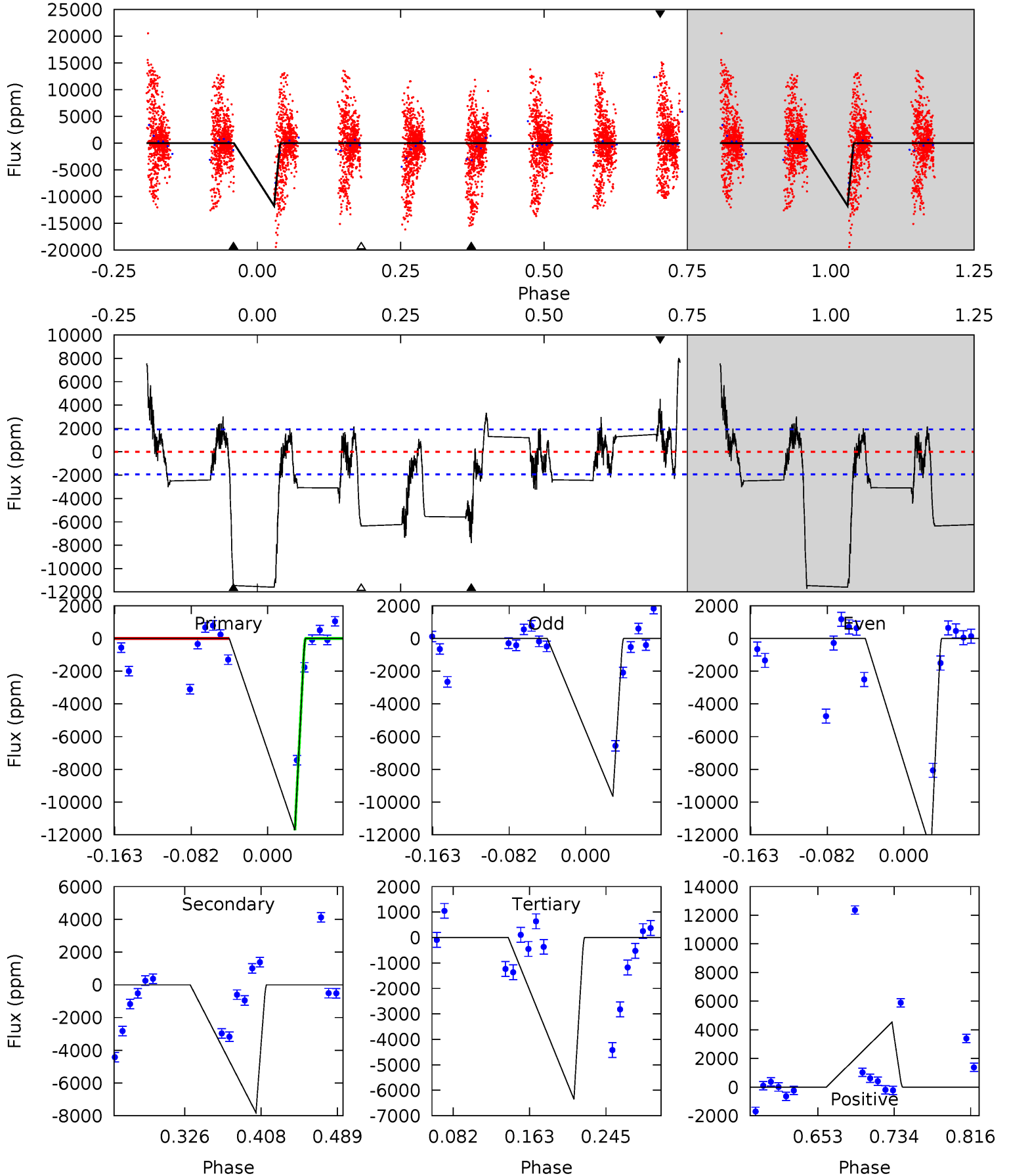




# Alt Model-Shift Uniqueness Test

009226540-04, P = 8.046167 Days, E = 125.253404 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
28.0	18.7	15.2	10.9	4.61	1.74	4.38	12.8	17.2	3.50	7.83	3.93	-0.88	0.41	0



### Stellar Parameters For KIC 009226540

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7550^{+211}_{-316}$	$4.115^{+0.120}_{-0.180}$	$0.070^{+0.150}_{-0.350}$	$1.883^{+0.549}_{-0.366}$	$1.685^{+0.204}_{-0.272}$	$0.355^{+0.212}_{-0.179}$
	+3%/-4%	+3%/-4%	+214%/-500%	+29%/-19%	+12%/-16%	+60%/-50%
Source	KIC0	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 009226540-04 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$0 \pm 1000000$	$16.02^{+18.00}_{-10.92}$	$2108^{+150}_{-127}$	$4718^{+34719}_{-40118}$	$15^{+3660}_{-2774}$
Alt.	$-7814 \pm 418$	$25.44^{+18.90}_{-16.30}$	$2103^{+164}_{-143}$	$6363^{+5648}_{-1475}$	$58^{+360}_{-40}$

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

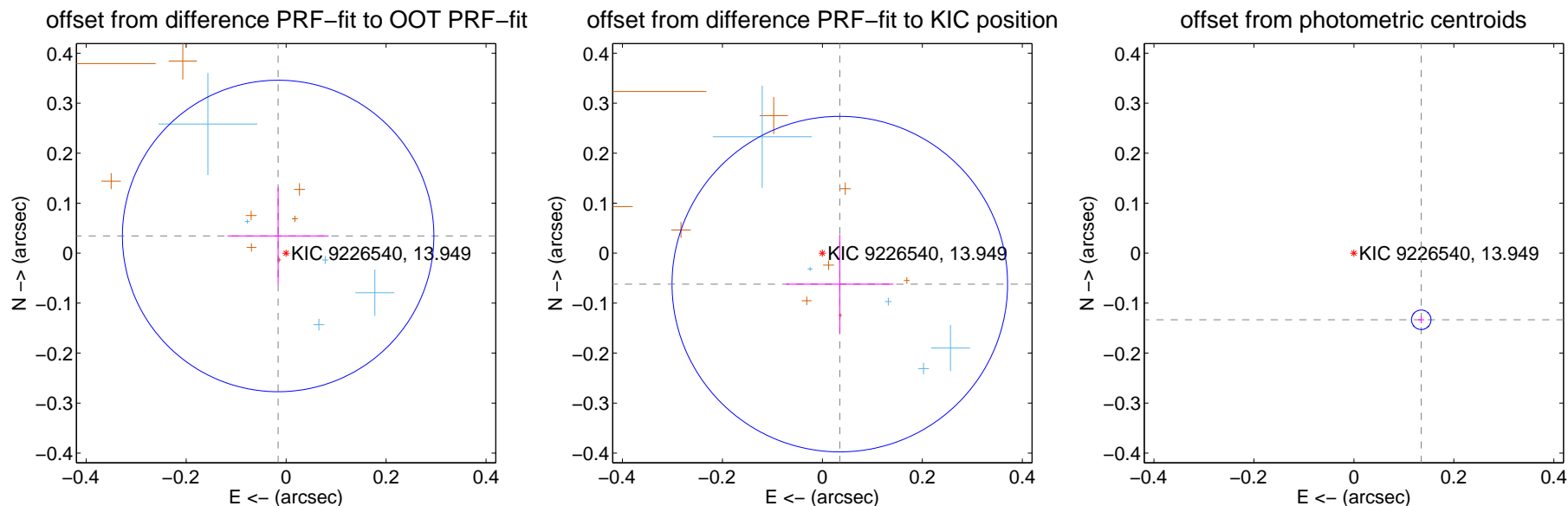
## DV Centroid Data

Supplemental centroid analysis for 009226540-04. Kepler magnitude: 13.95. Transit SNR -1.00

There are 7 quarters with good PRF difference image offsets

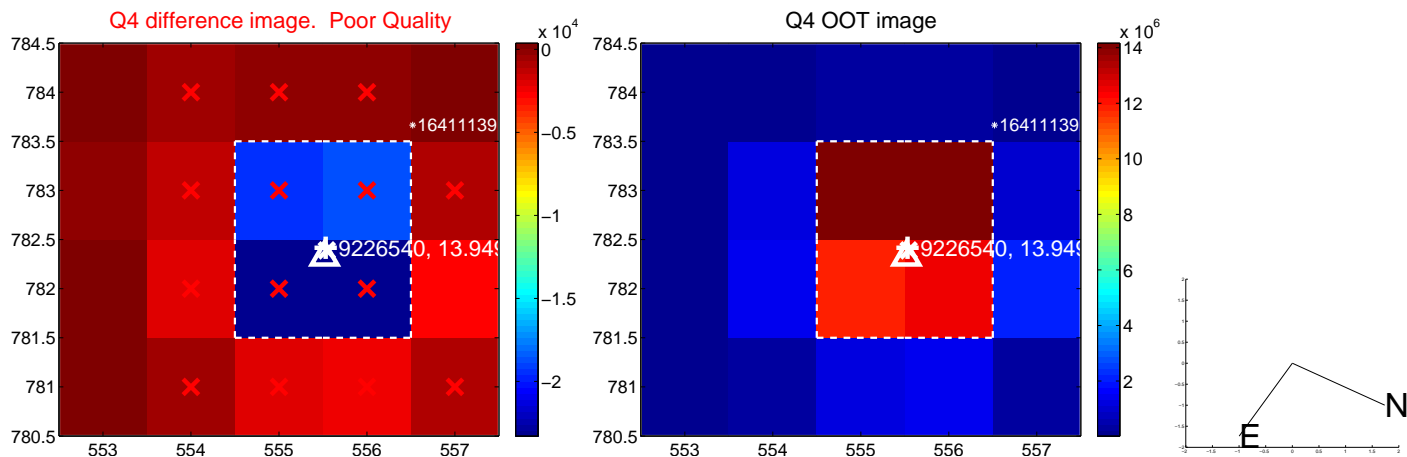
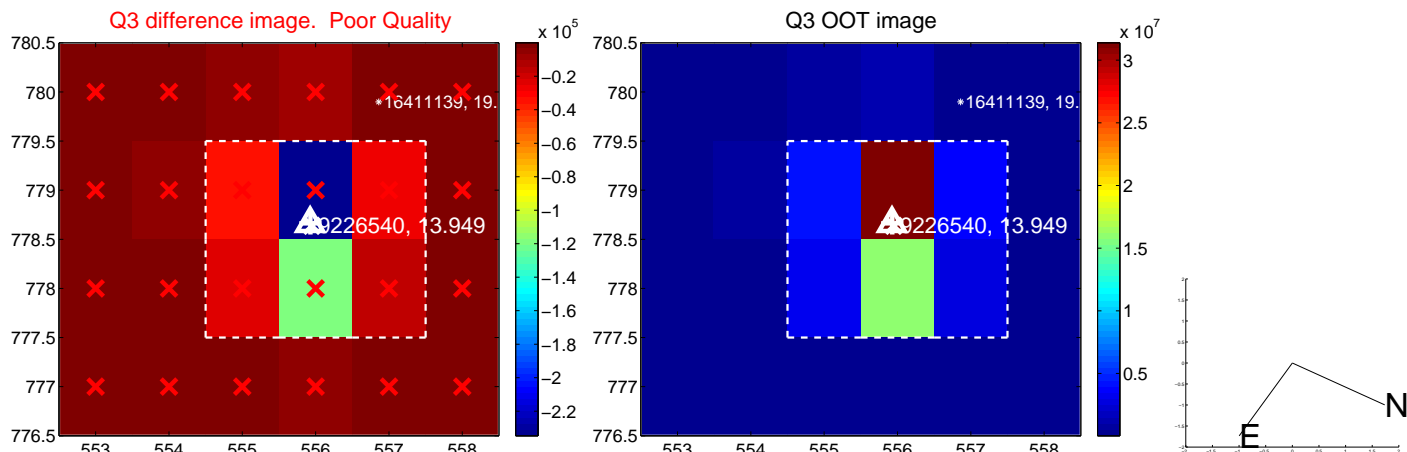
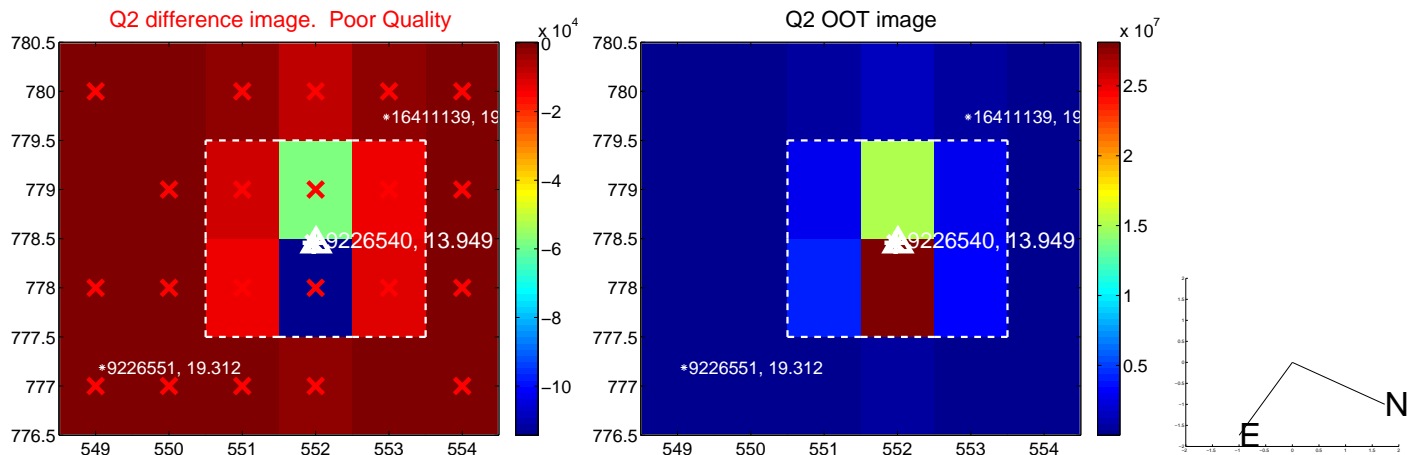
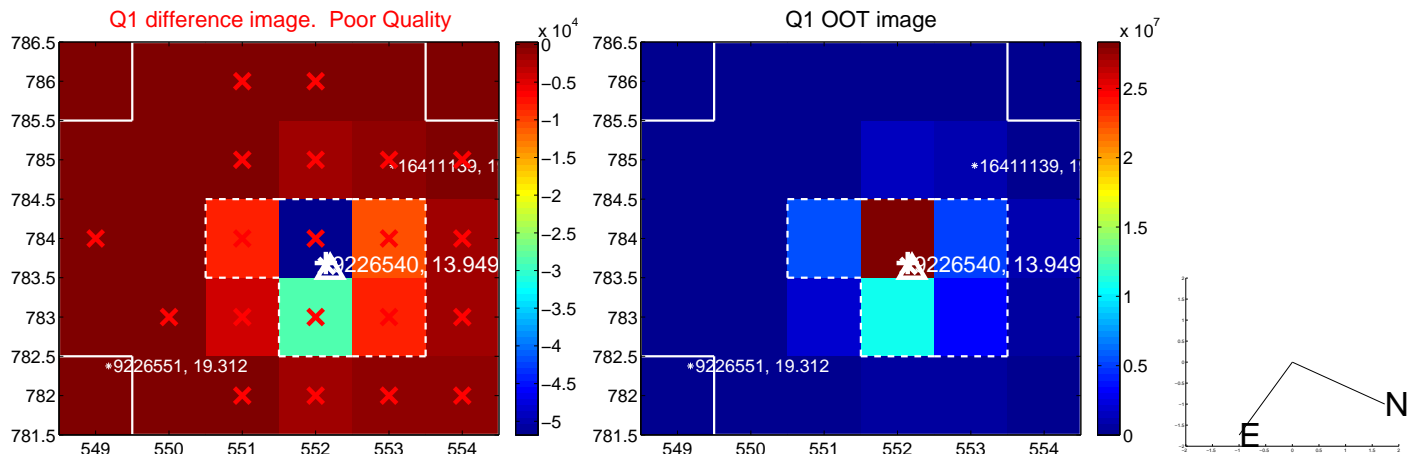
The direct PRF centroid is offset from the target star catalog position by about 0.16 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.038 \pm 0.104$	0.36	$0.016 \pm 0.101$	$0.034 \pm 0.097$
PRF-fit source offset from KIC position	$0.071 \pm 0.112$	0.64	$-0.035 \pm 0.107$	$-0.062 \pm 0.099$
photometric centroid source offset	$0.19 \pm 0.01$	29.16	$-0.13 \pm 0.01$	$-0.13 \pm 0.01$

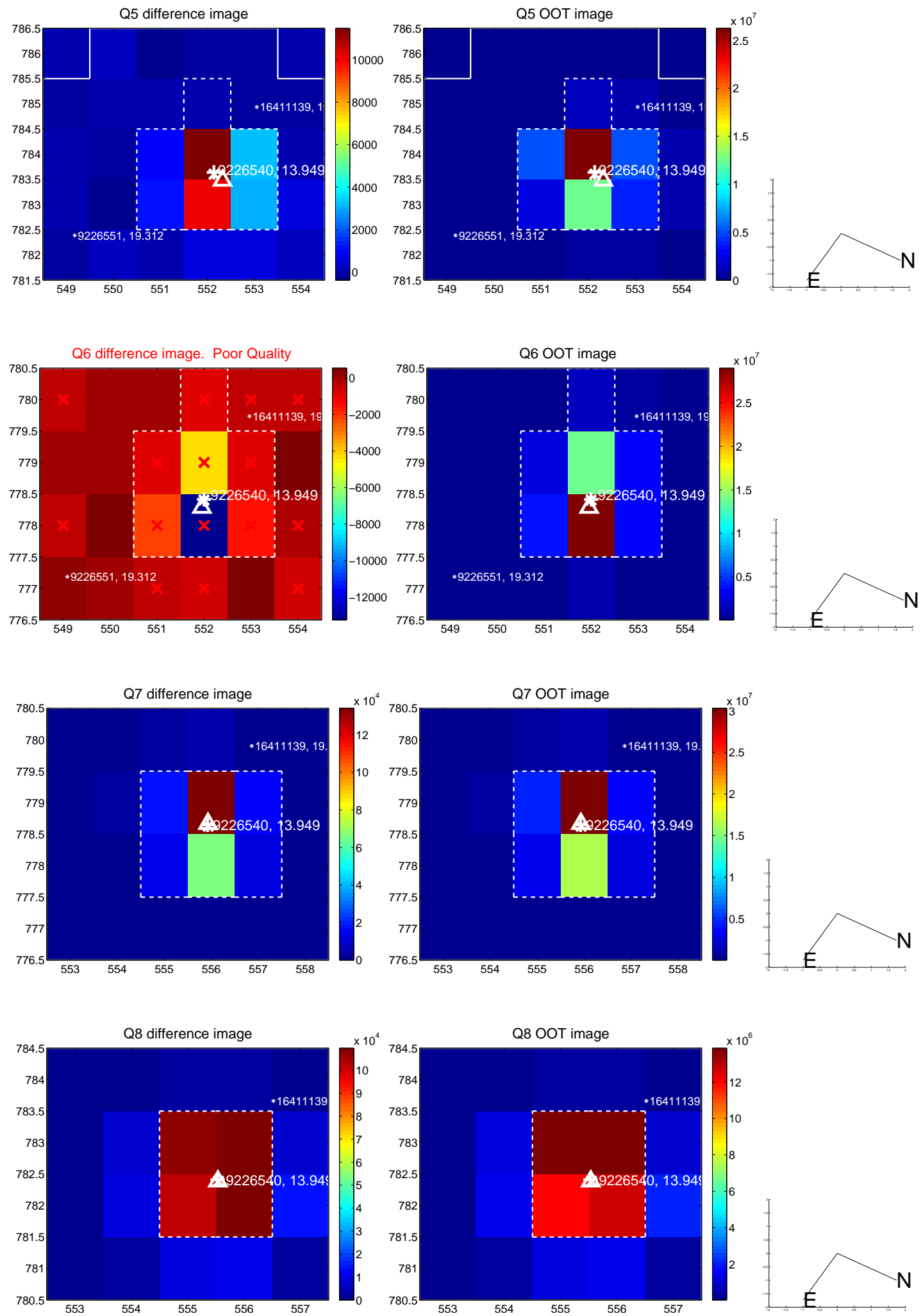


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

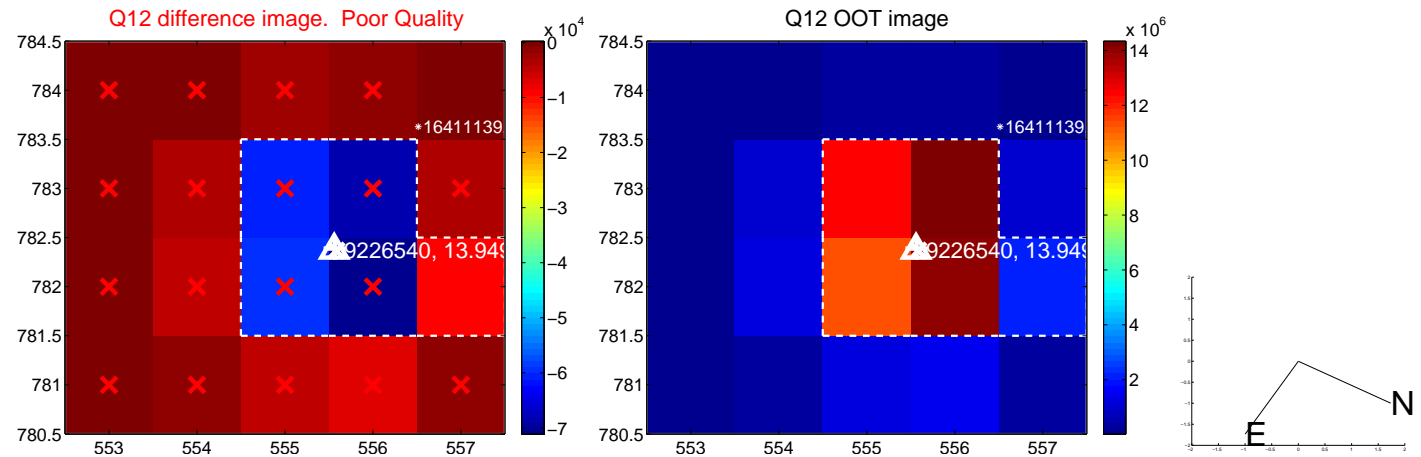
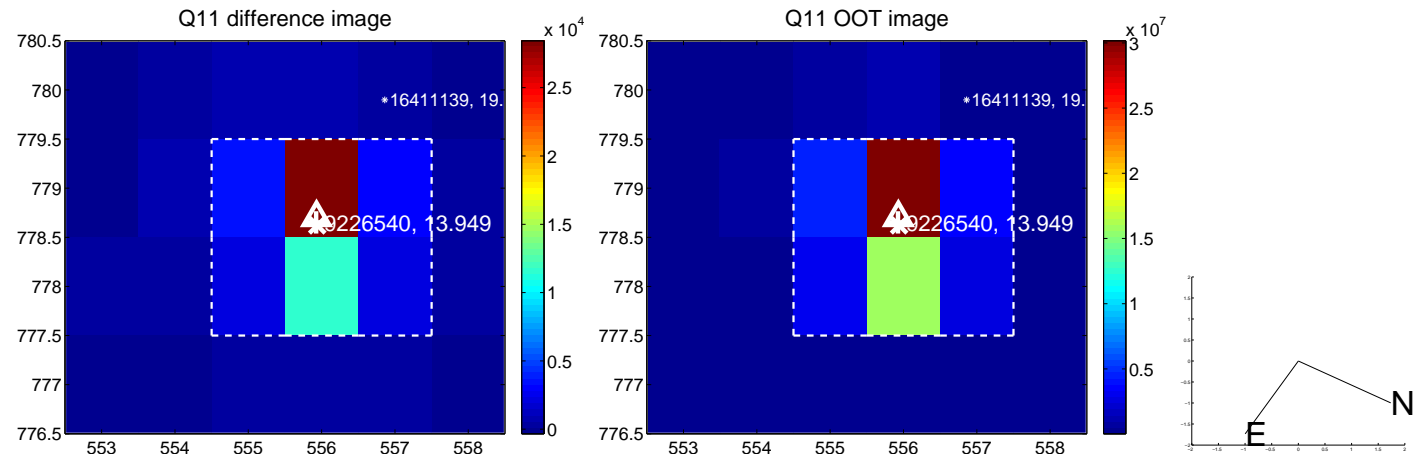
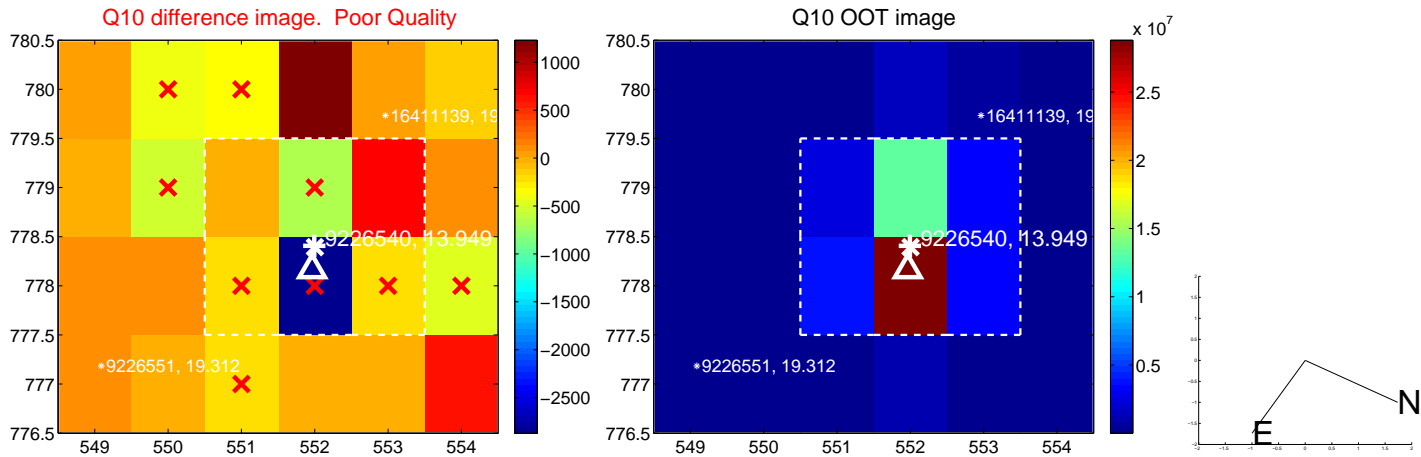
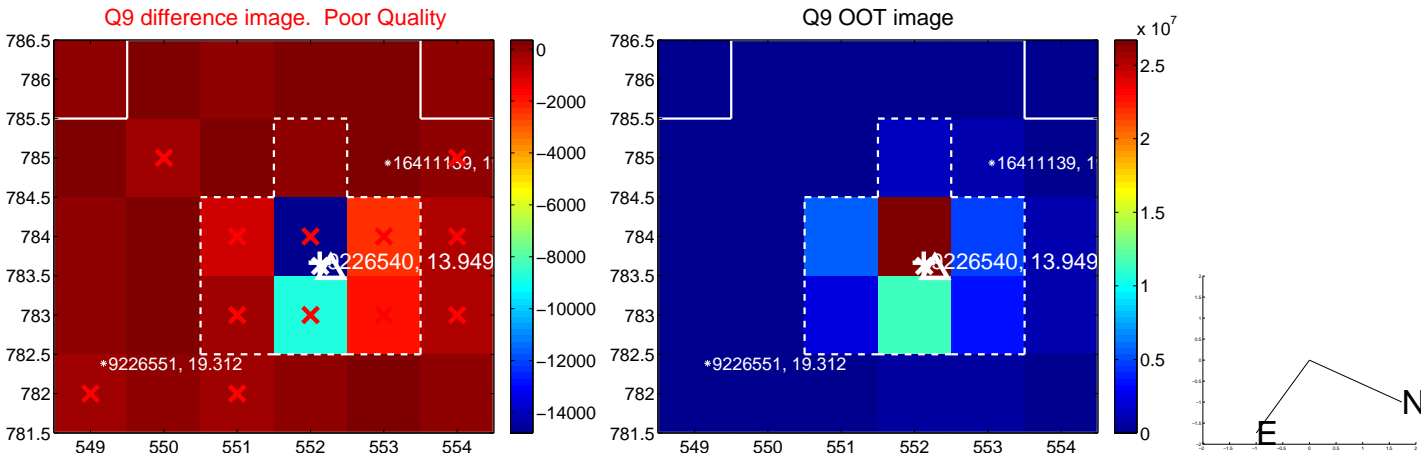
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



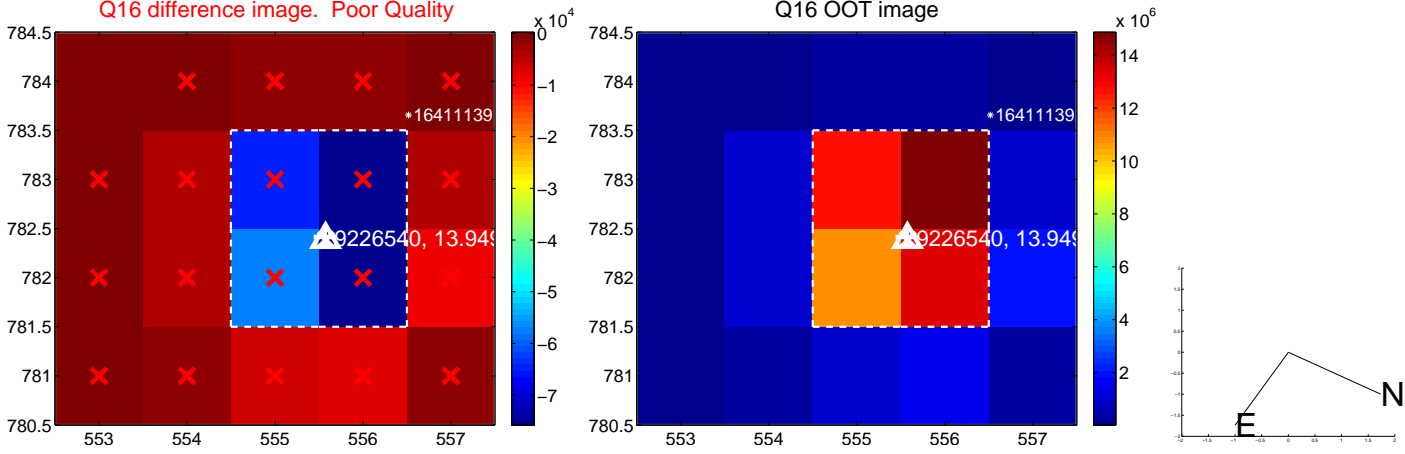
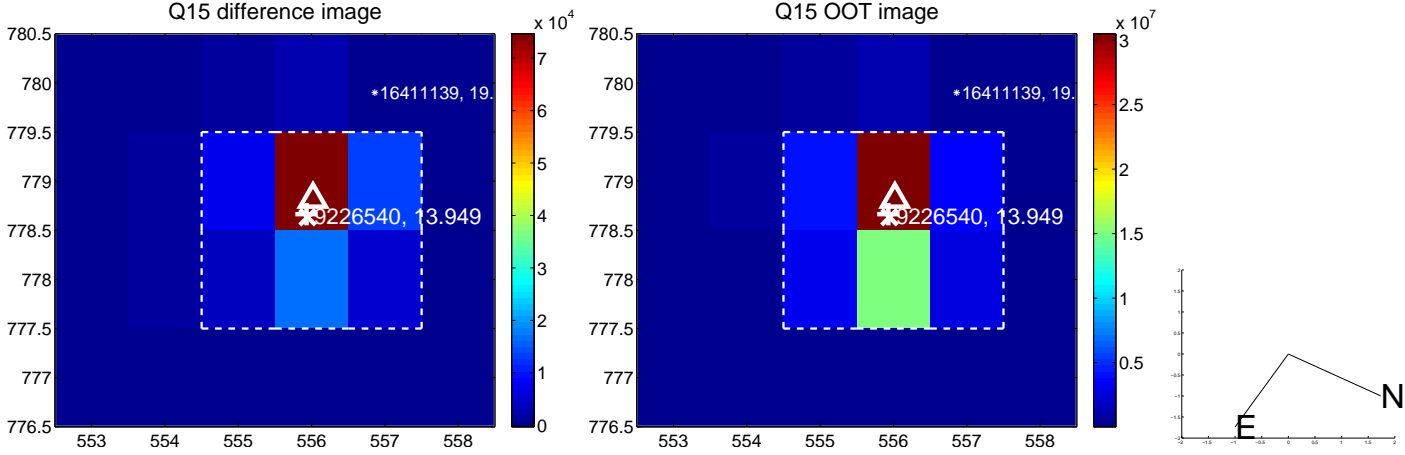
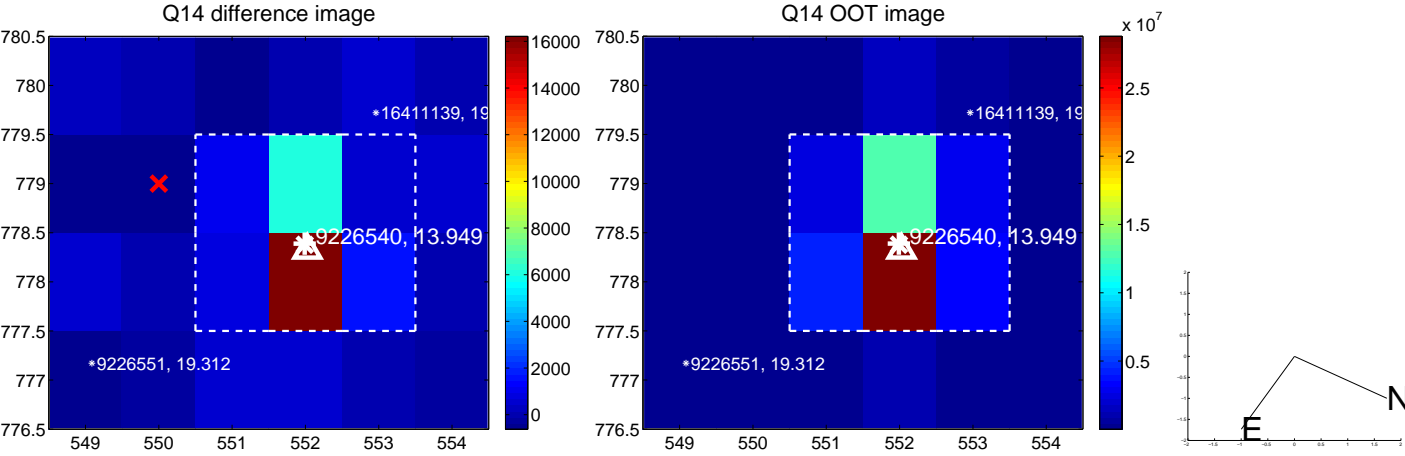
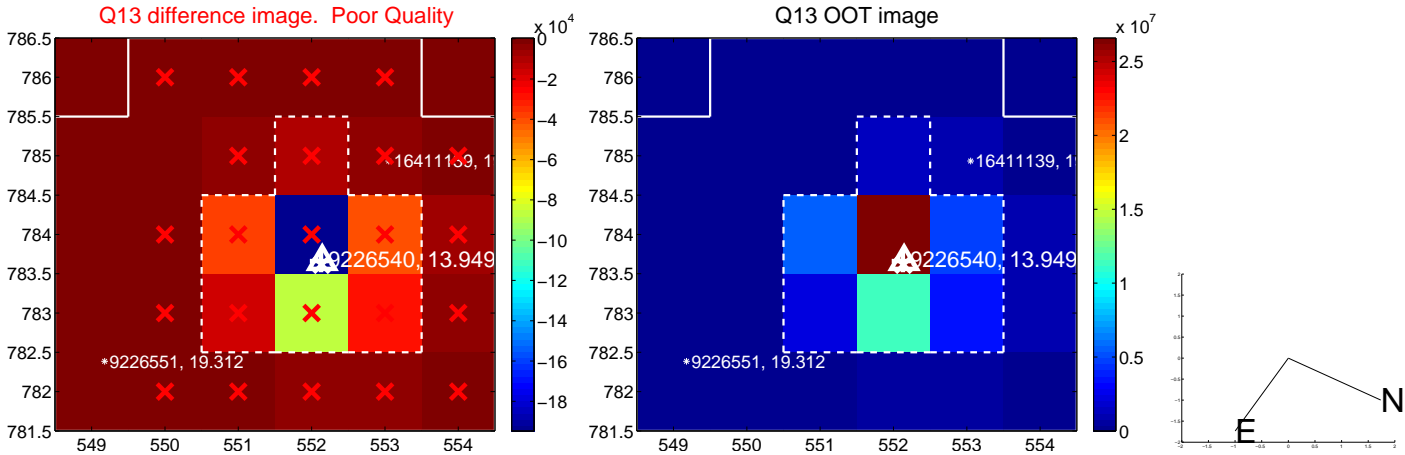
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

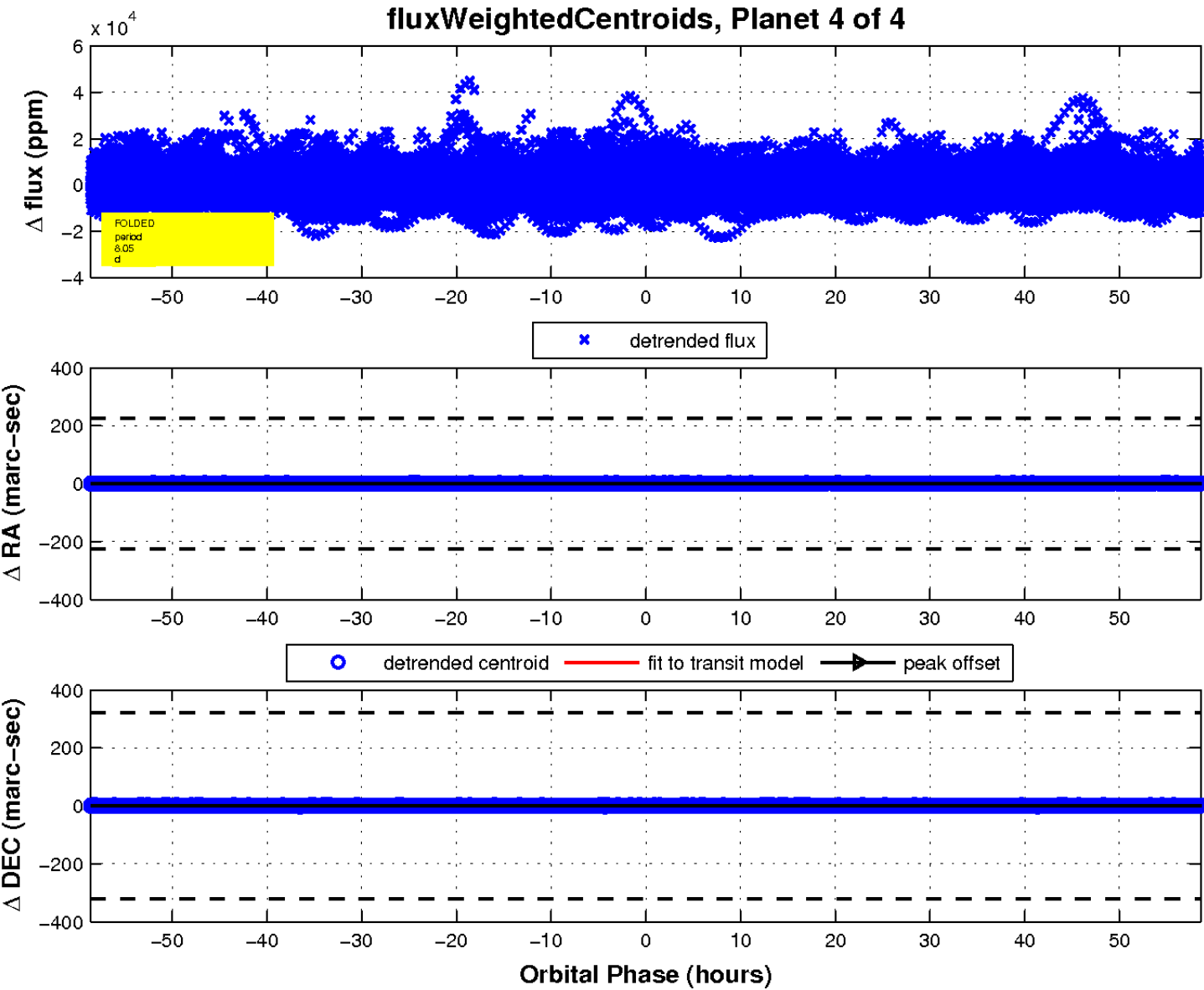
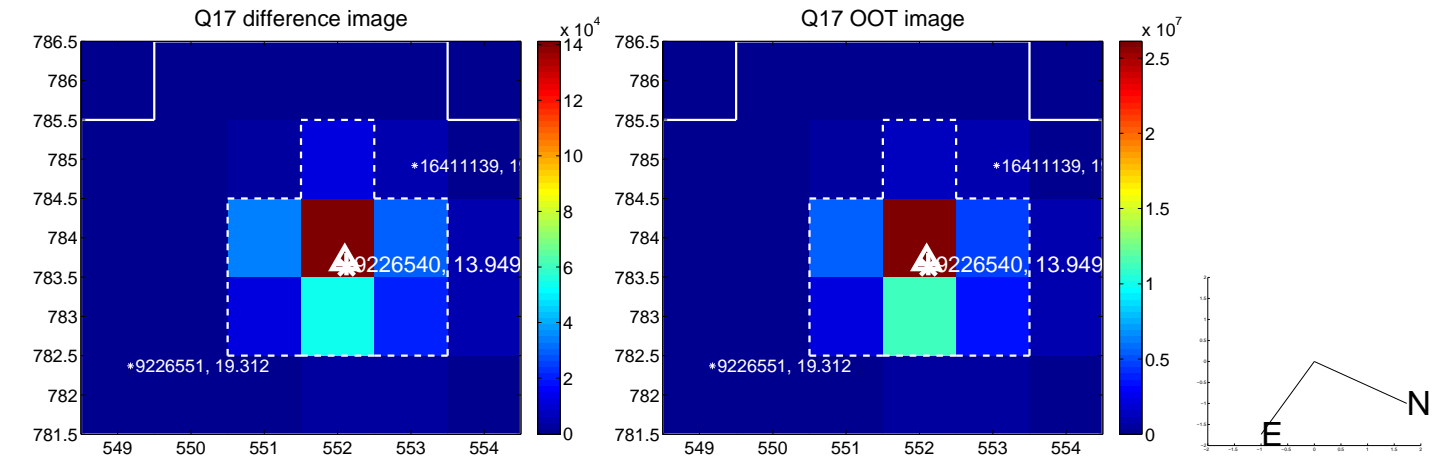


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





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



UKIRT Image

Declination

