

# KIC 004390912

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004390912-01	OBS	7695.01	0.687503	131.866326	77.0	1.102	12.6	16.8	7.91	4643	8.59	0.00
004390912-02	OBS	No	0.687502	131.514369	60.1	1.293	11.5	12.5	7.91	4643	7.65	0.00
004390912-03	OBS	No	228.268812	153.650474	1198.9	3.272	8.4	7.8	7.91	4643	36.88	52.34
004390912-04	OBS	No	151.520908	192.382705	1061.1	2.943	8.2	6.4	7.91	4643	26.75	90.39
004390912-05	OBS	No	213.056315	278.688706	1487.4	3.436	9.2	7.1	7.91	4643	29.26	57.38
004390912-06	OBS	No	240.589536	221.748142	1651.7	7.777	7.7	8.0	7.91	4643	65.02	48.79

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004390912-01	OBS	FP	0.00	1	0	1	0	MOD_NONUNIQ_ALT—CENT_RESOLVED_OFFSET
004390912-02	OBS	FP	0.00	1	0	1	0	MOD_NONUNIQ_ALT—SAME_NTL_PERIOD—CENT_RESOLVED_OFFSET
004390912-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—INCONSISTENT_TRANS
004390912-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—ALL_TRANS_CHASES—INCONSISTENT_TRANS
004390912-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_MARSHALL—TRANS_GAPPED—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_POS_ALT—INCONSISTENT_TRANS
004390912-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT

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

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

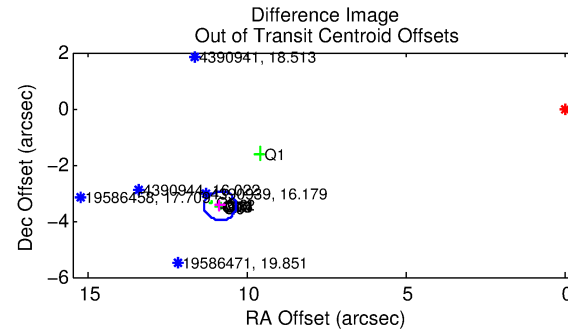
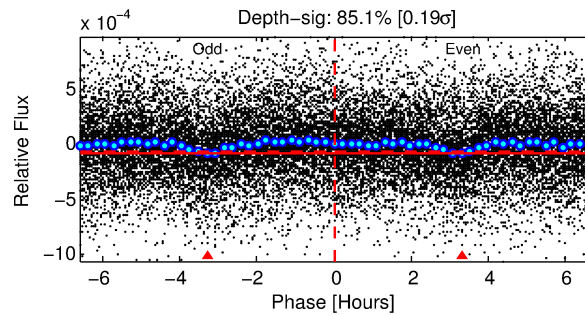
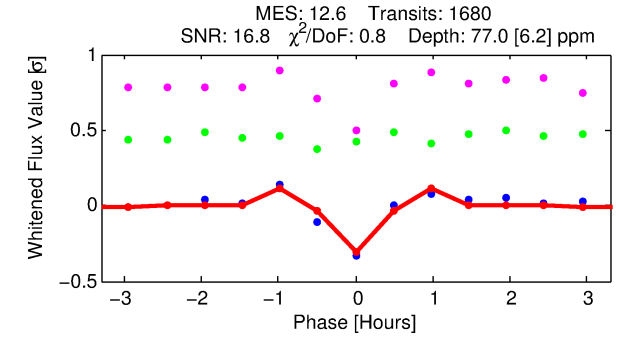
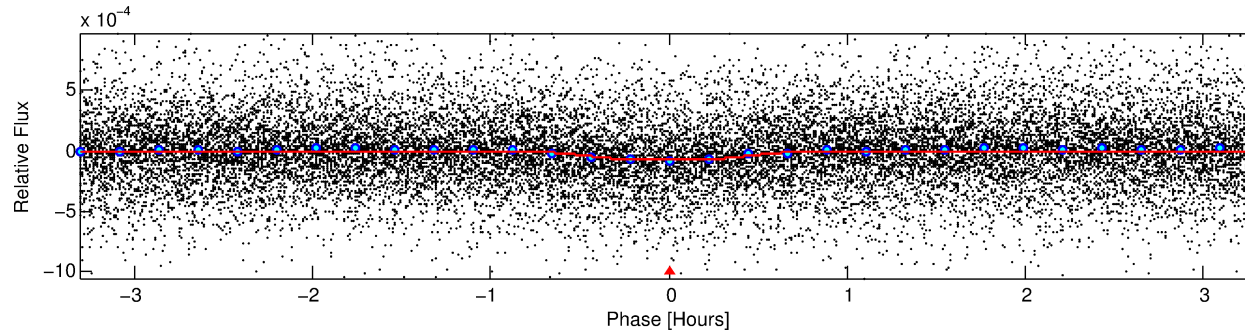
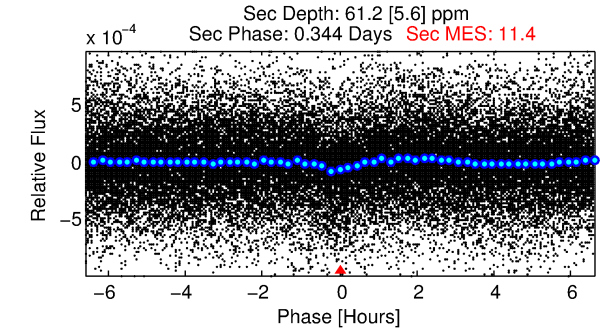
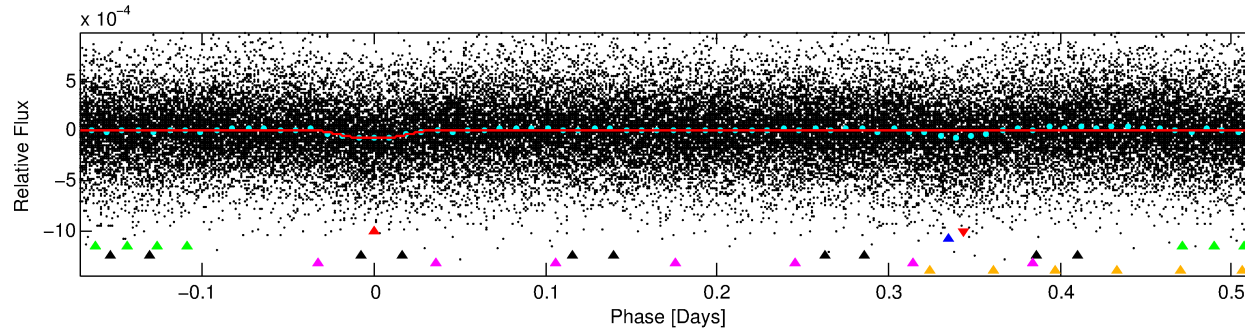
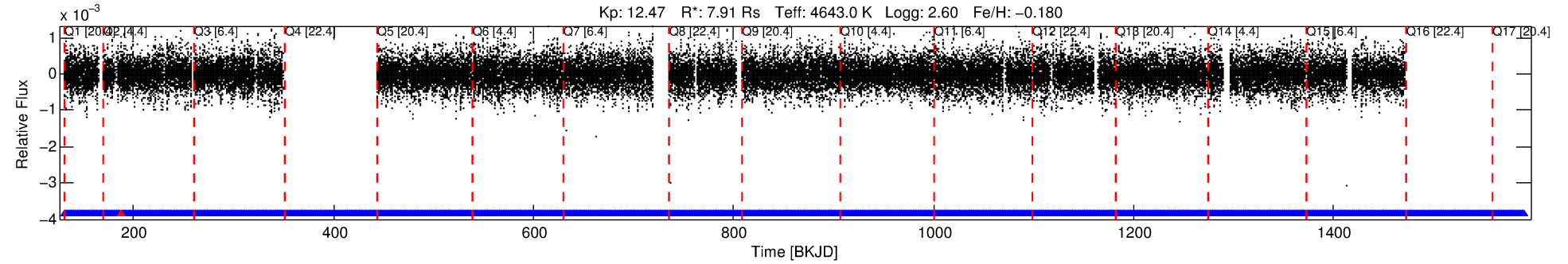
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 004390912-01

No Significant Match Found

# DV One-Page Summary

KIC: 4390912 Candidate: 1 of 6 Period: 0.688 d



## DV Fit Results:

Period = 0.68750 [0.00001] d  
Epoch = 131.8663 [0.0007] BKJD  
Rp/R\* = 0.0100 [0.0028]  
a/R\* = 2.38 [2.10]  
b = 0.90 [0.24]  
Seff = N/A  
Teq = N/A  
Rp = 8.59 [2.85] Re  
a = N/A  
Ag = N/A  
Teff = N/A

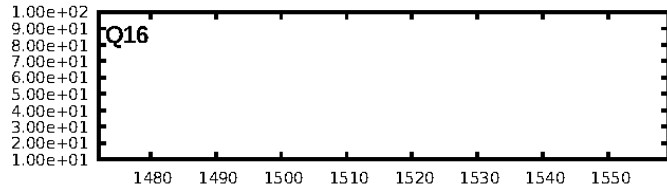
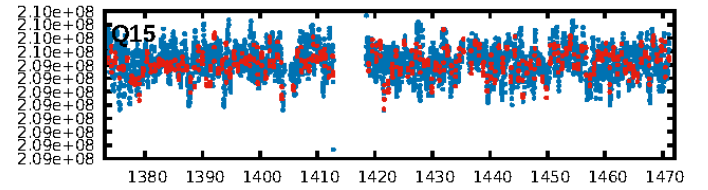
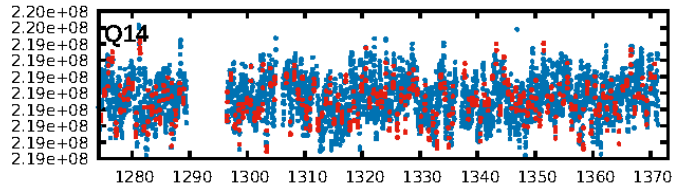
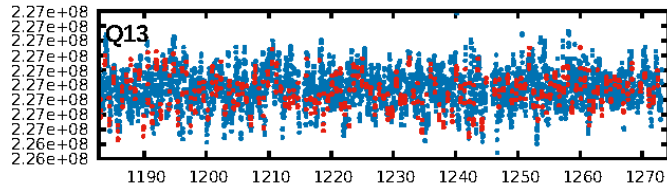
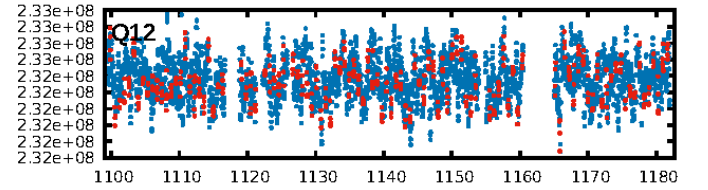
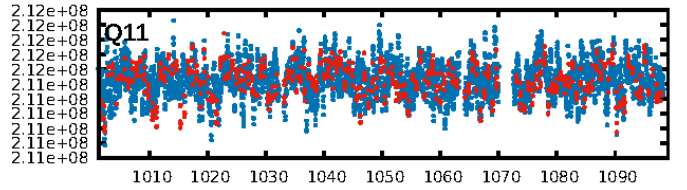
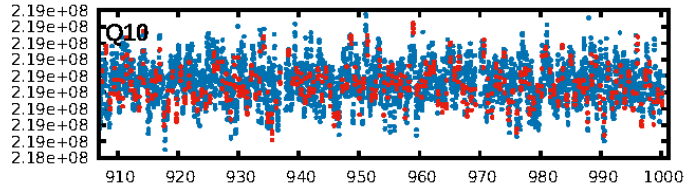
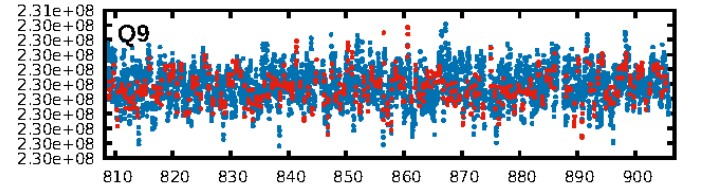
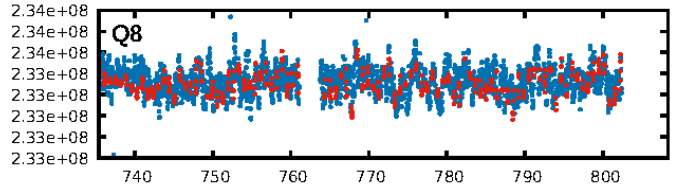
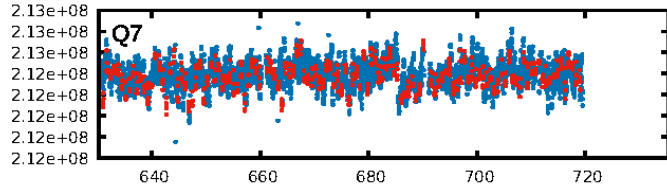
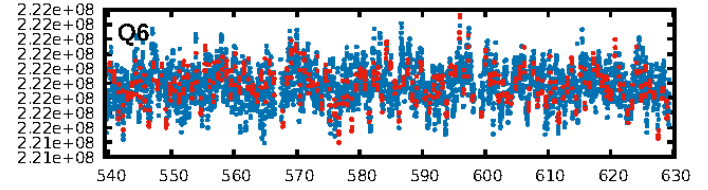
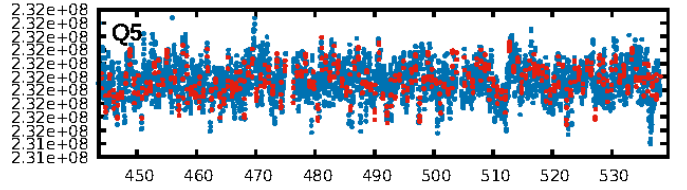
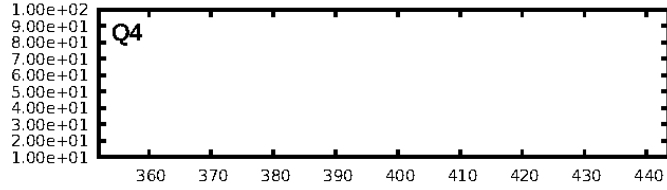
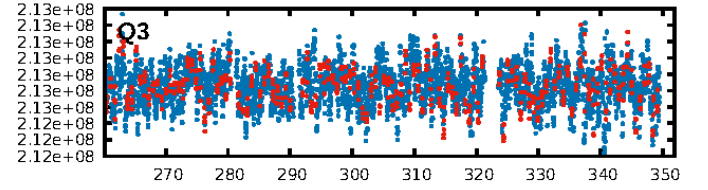
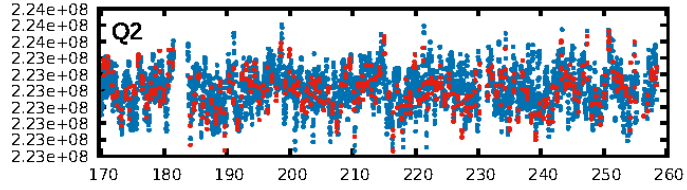
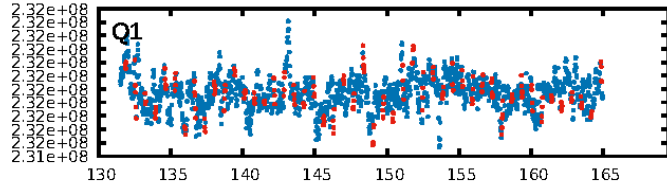
## DV Diagnostic Results:

ShortPeriod-sig: 0.0% [0.00σ]  
LongPeriod-sig: 100.0% [1151.85σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGoF-sig: N/A  
Bootstrap-pfa: 3.65e-33  
RollingBand-fgt: 1.00 [1630/1631]  
GhostDiagnostic-chr: -0.9375  
Centroid-sig: 0.0%  
Centroid-so: 0.807 arcsec [1.70σ]  
OotOffset-rm: 11.396 arcsec [67.09σ]  
KicOffset-rm: 11.635 arcsec [59.93σ]  
OotOffset-st: 4/4/2/1 [11]  
KicOffset-st: 4/4/2/1 [11]  
DiffImageQuality-fgm: 0.91 [10/11]  
DiffImageOverlap-fno: 1.00 [14/14]

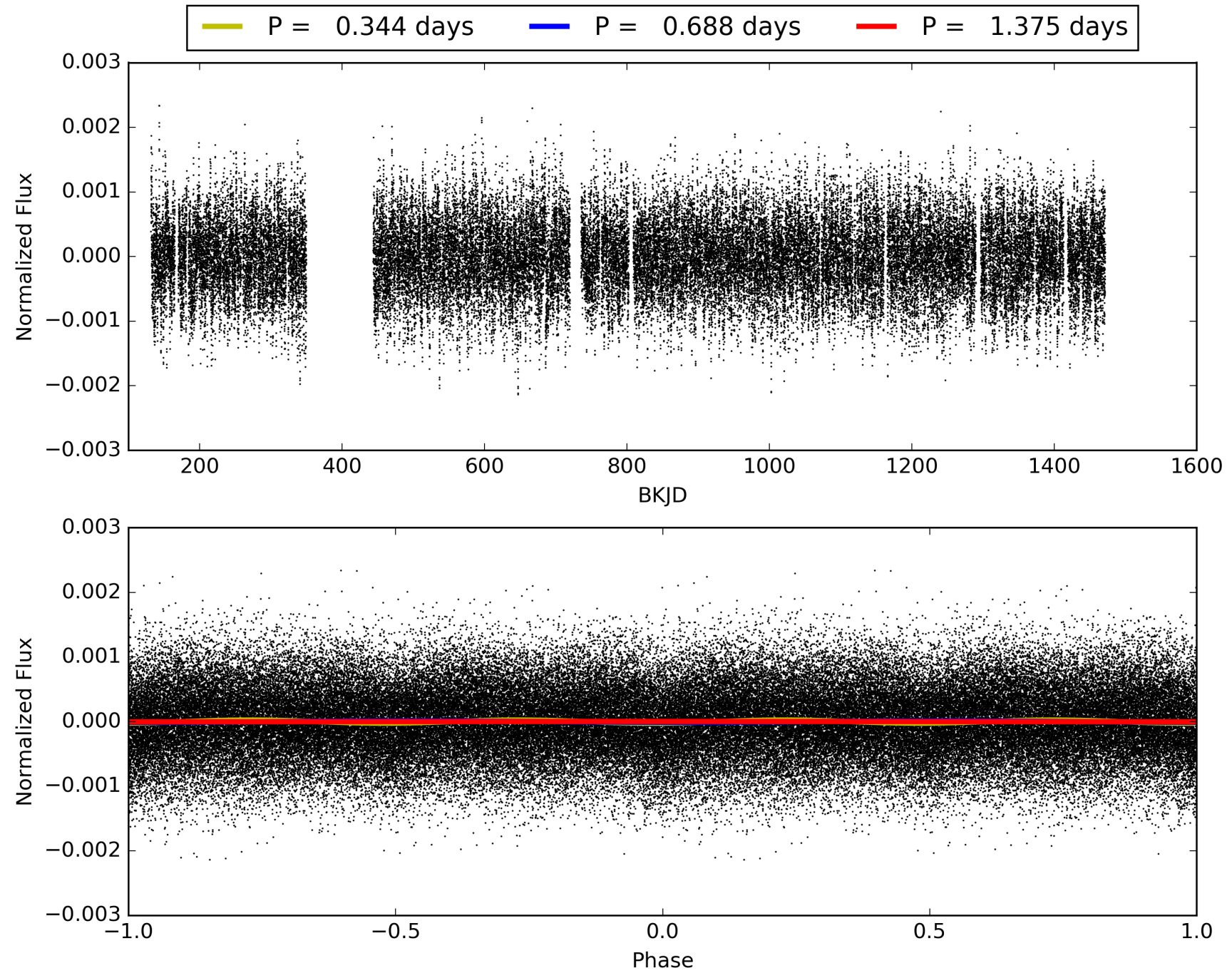
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 16:09:15 Z

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

## TCE 004390912-01, PDC Light Curves



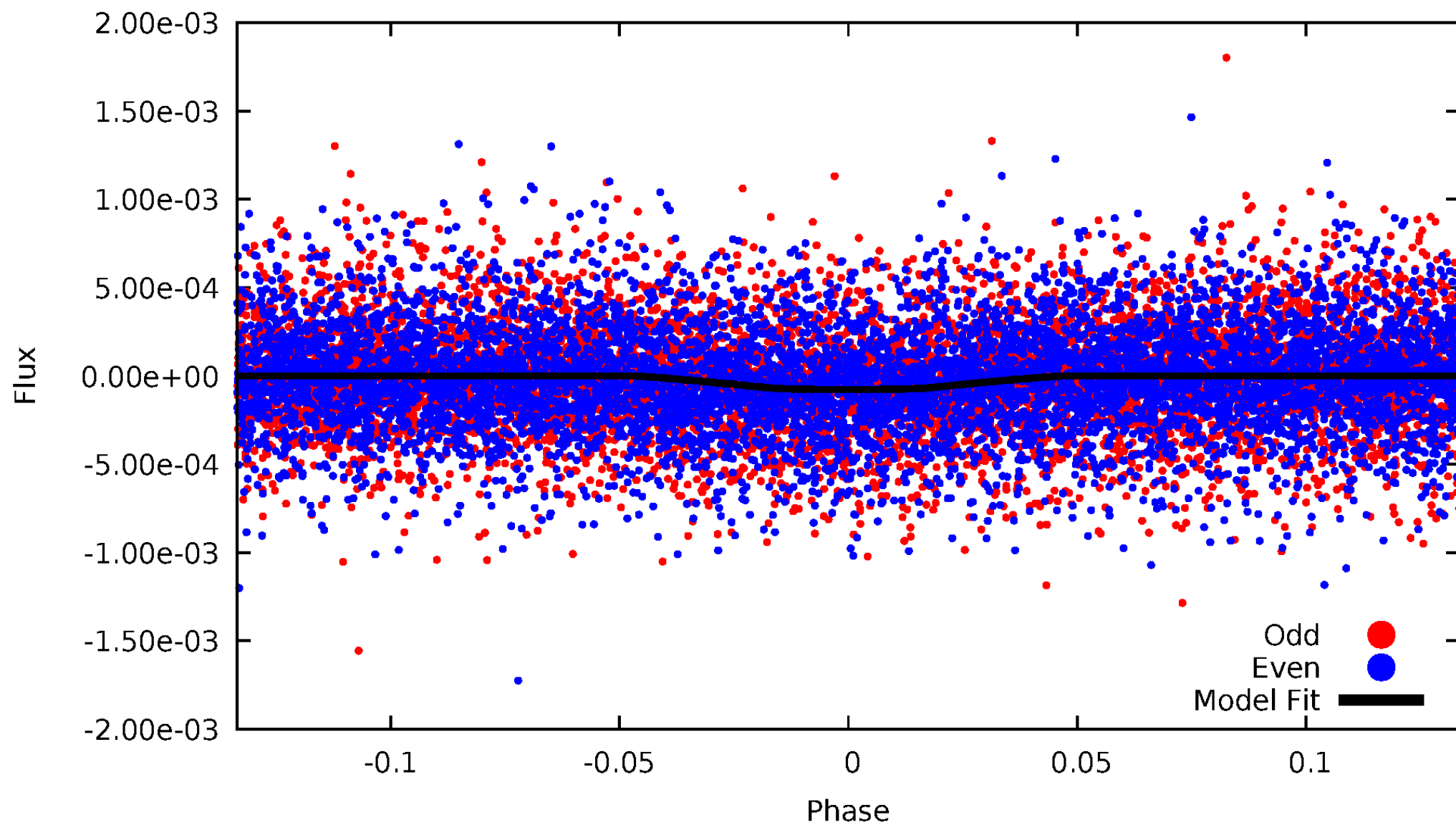
TCE 004390912-01





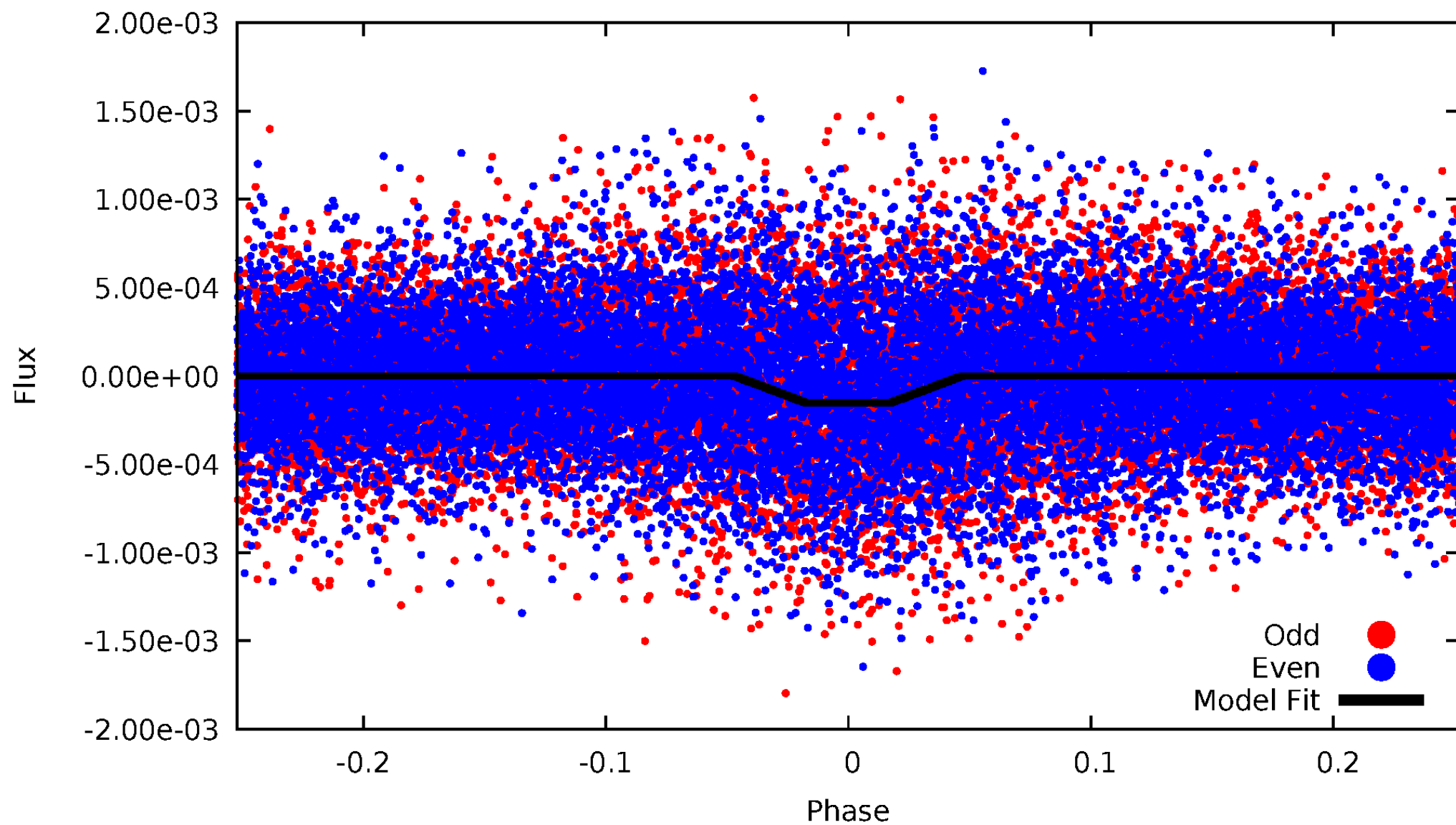
# DV Odd/Even

TCE 004390912-01

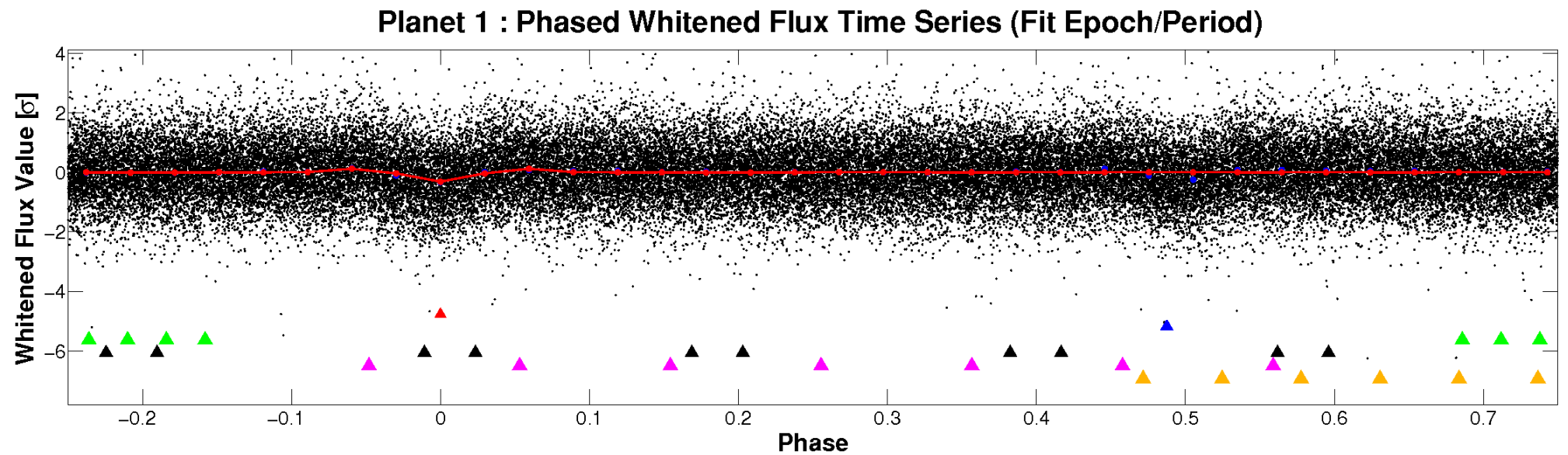
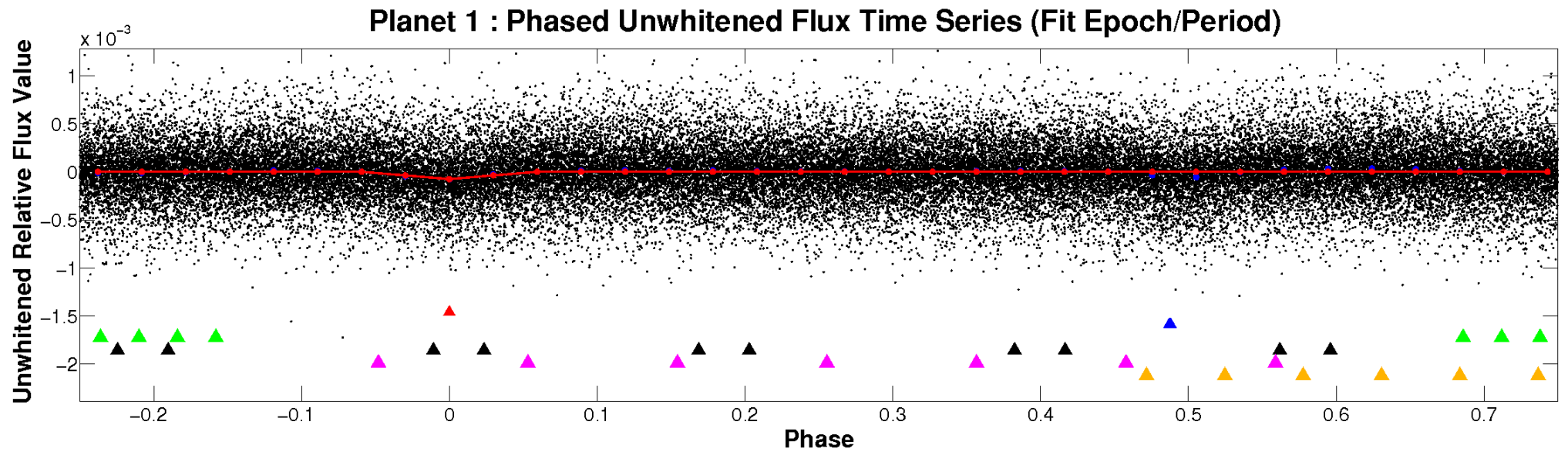


# ALT Odd/Even

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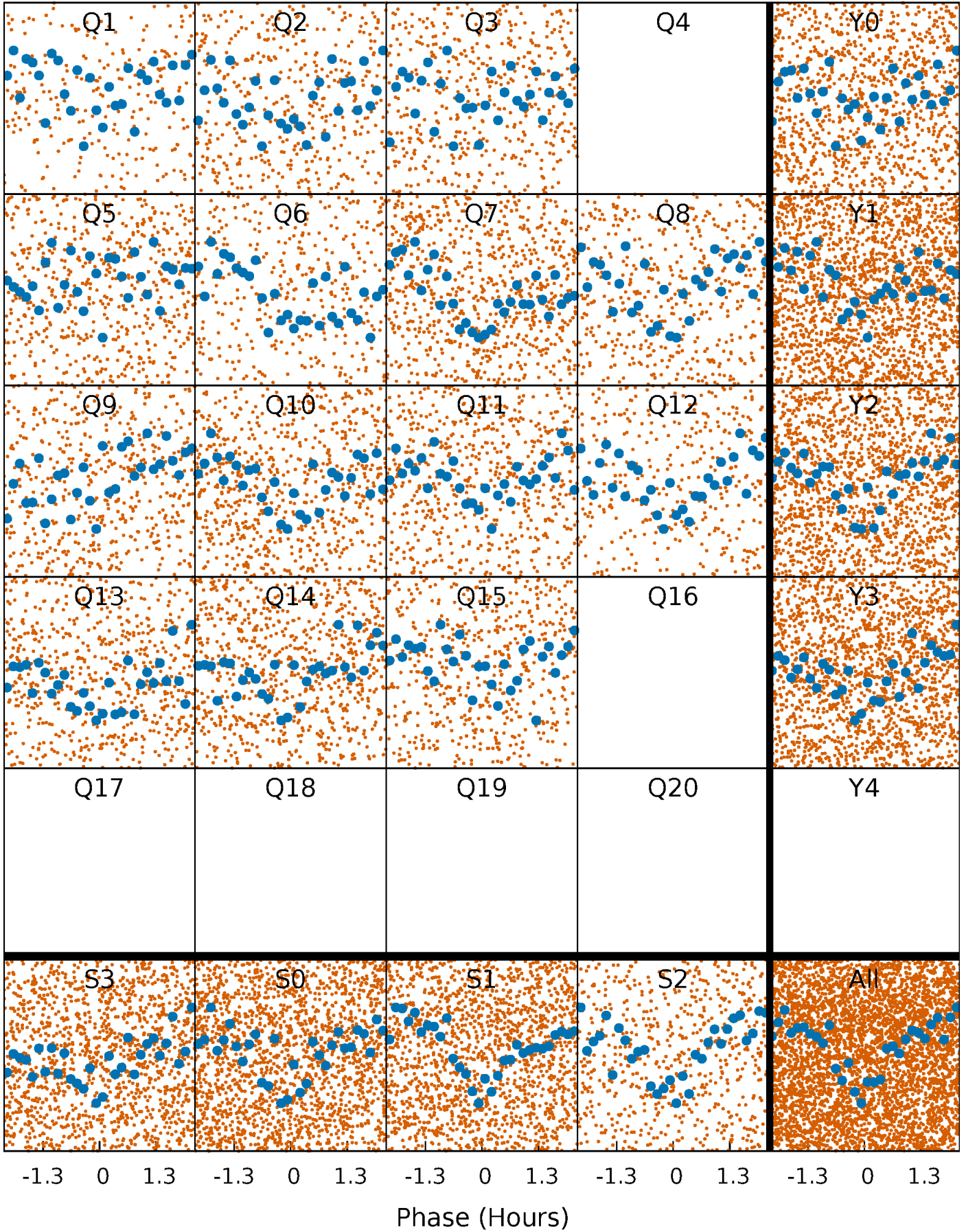


# Non-Whitened Vs. Whitened Light Curve



# PDC Quarter-Phased Transit Curves

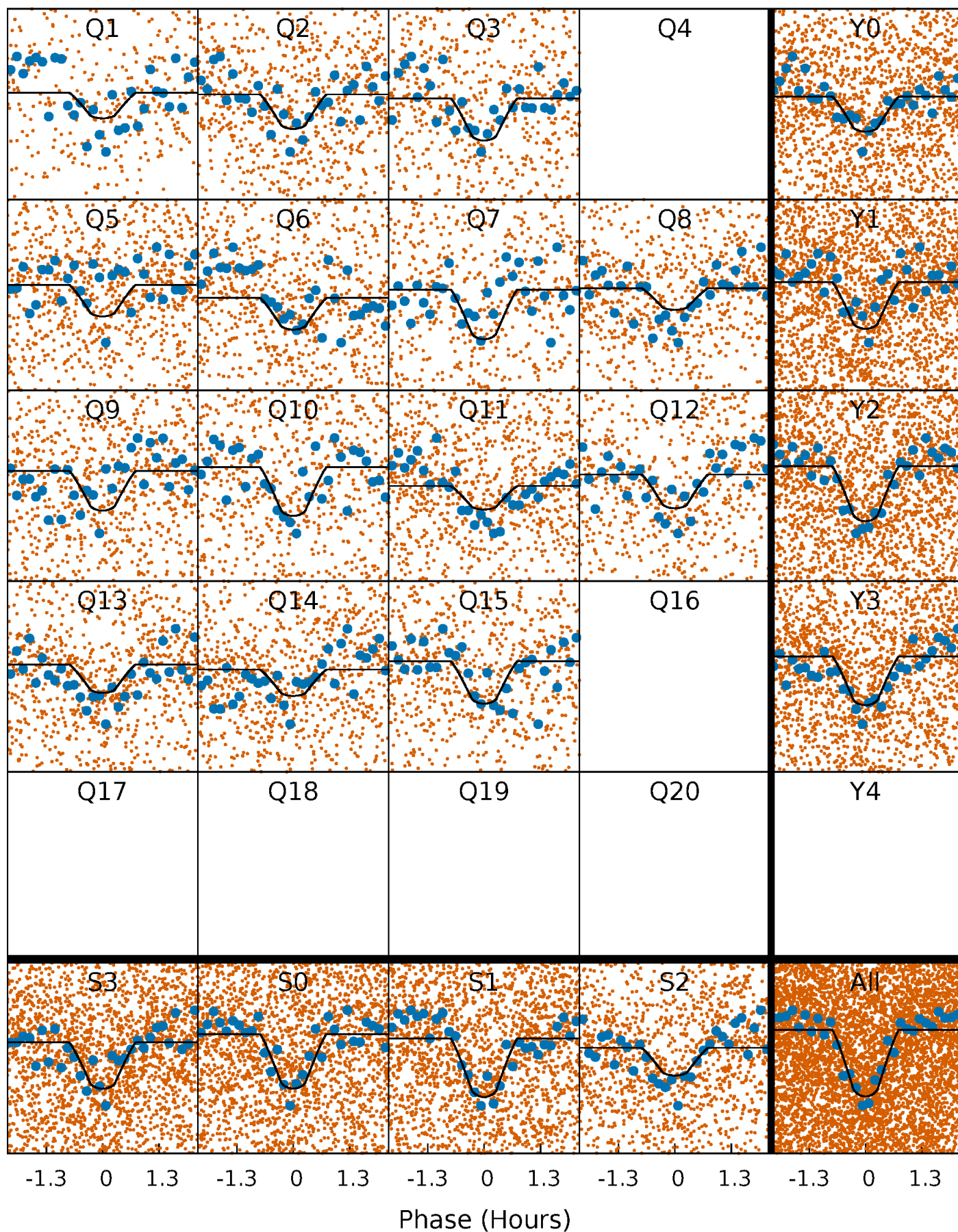
TCE 004390912-01   P= 0.687503 Days    $T_0=131.866326$  (BKJD)





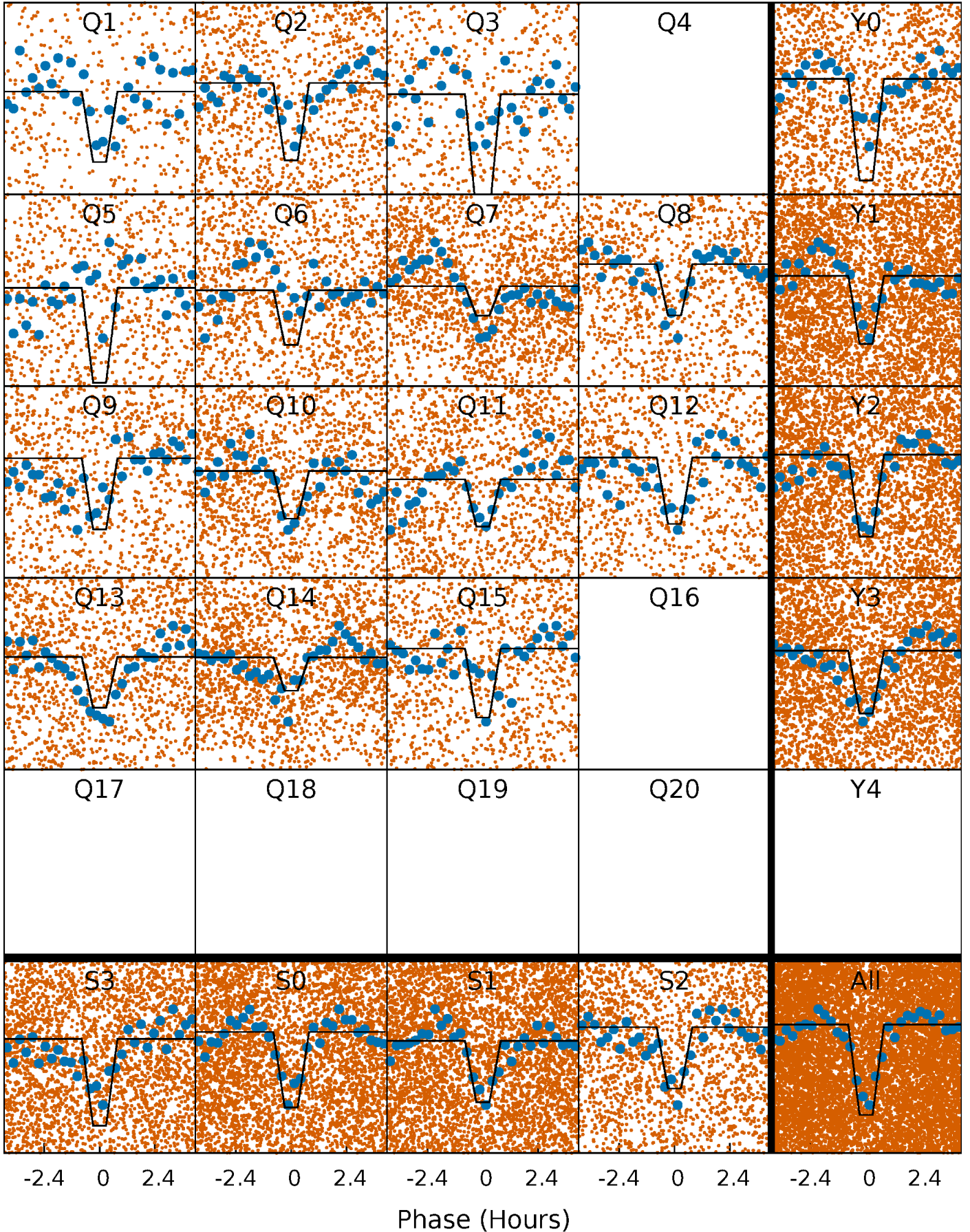
# DV Quarter-Phased Transit Curves

TCE 004390912-01 P= 0.687503 Days  $T_0=131.866326$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

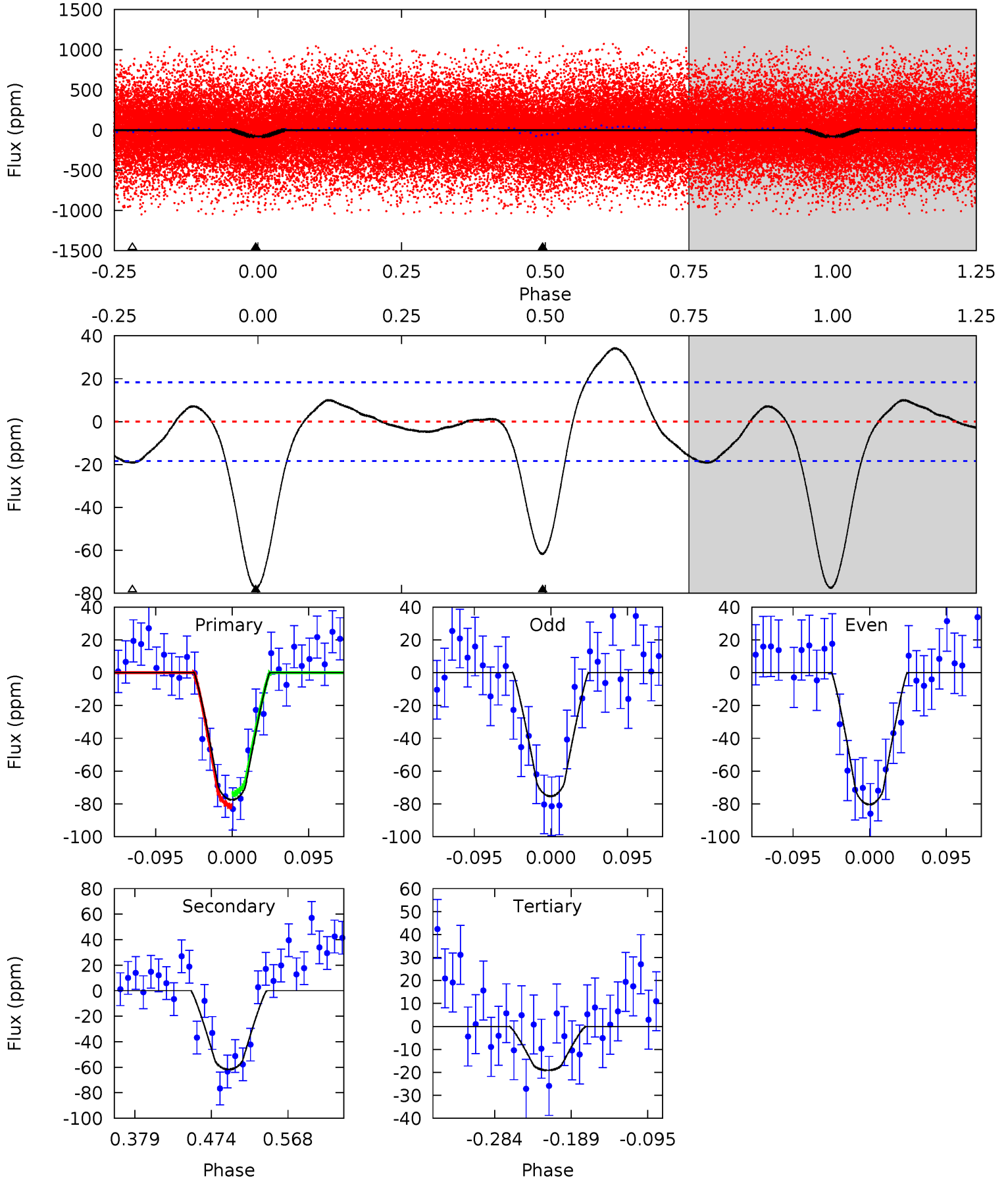
TCE 004390912-01   P= 0.687509 Days    $T_0=131.857464$  (BKJD)



# DV Model-Shift Uniqueness Test

004390912-01, P = 0.687503 Days, E = 131.178823 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
19.3	15.4	4.77	0	4.58	1.67	3.22	14.6	19.3	10.6	15.4	0.62	0.96	0.31	0.93

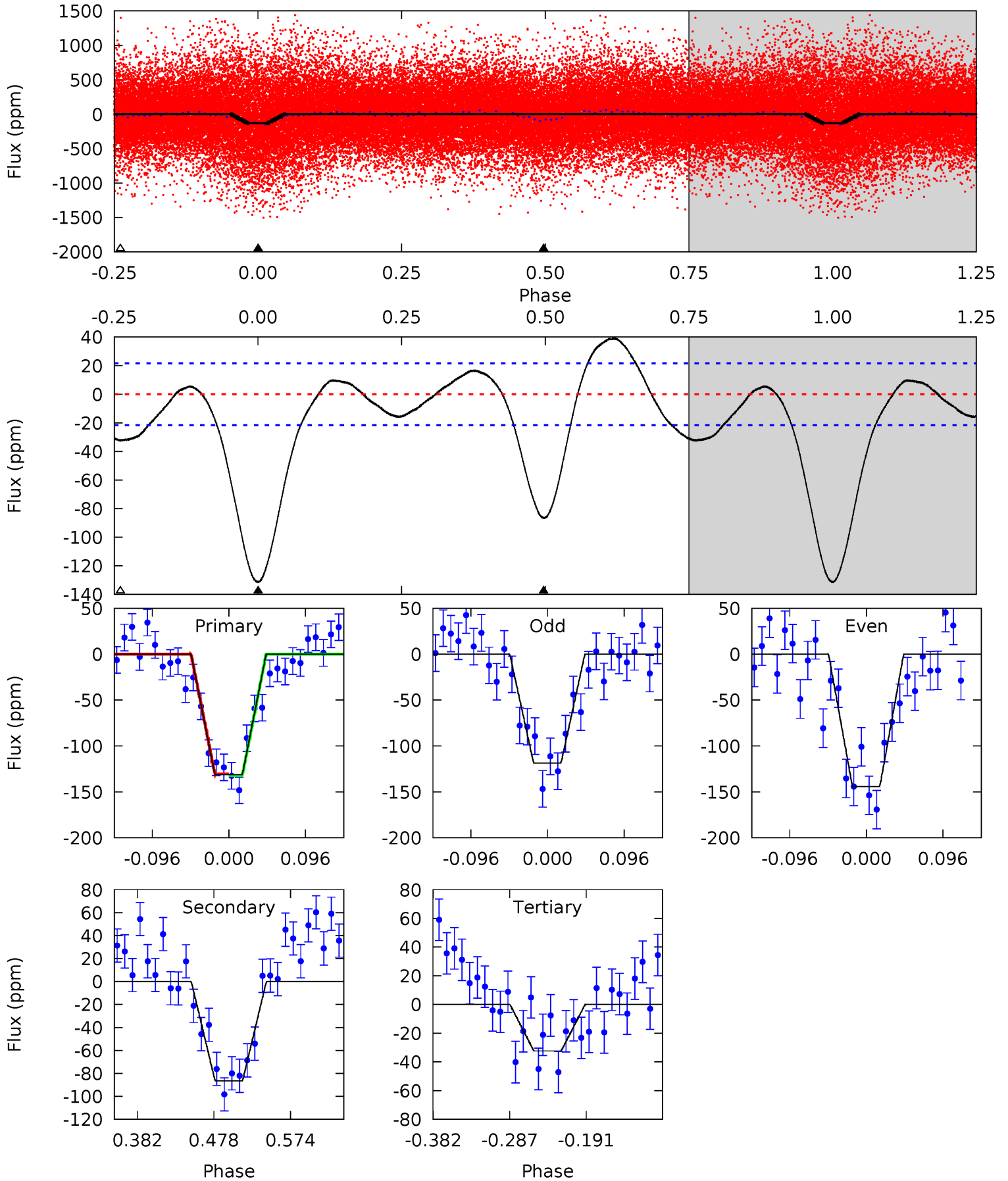




# Alt Model-Shift Uniqueness Test

004390912-01, P = 0.687509 Days, E = 131.169955 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
27.8	18.3	6.84	0	4.57	1.67	3.82	20.9	27.8	11.5	18.3	2.69	0.94	0.23	0.18





### Stellar Parameters For KIC 004390912

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$4643^{+55}_{-55}$	$2.595^{+0.024}_{-0.033}$	$-0.180^{+0.150}_{-0.100}$	$7.906^{+1.325}_{-0.221}$	$0.898^{+0.268}_{-0.015}$	$0.003^{+0.000}_{-0.000}$
	+1%/-1%	+1%/-1%	+83%/-56%	+17%/-3%	+30%/-2%	+7%/-19%
Source	SPE68	AST9	SPE68	DSEP		

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

### Secondary Eclipse Parameters for KIC 004390912-01 / KOI 7695.01

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-62 \pm 4$	$8.78^{+2.48}_{-2.53}$	$6645^{+111}_{-107}$	$-4862^{+513}_{-222}$	$0.097^{+0.090}_{-0.038}$
Alt.	$-87 \pm 5$	$10.88^{+2.47}_{-2.50}$	$6635^{+130}_{-103}$	$-4908^{+338}_{-186}$	$0.088^{+0.063}_{-0.030}$

$T_{\text{max}}$  = 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

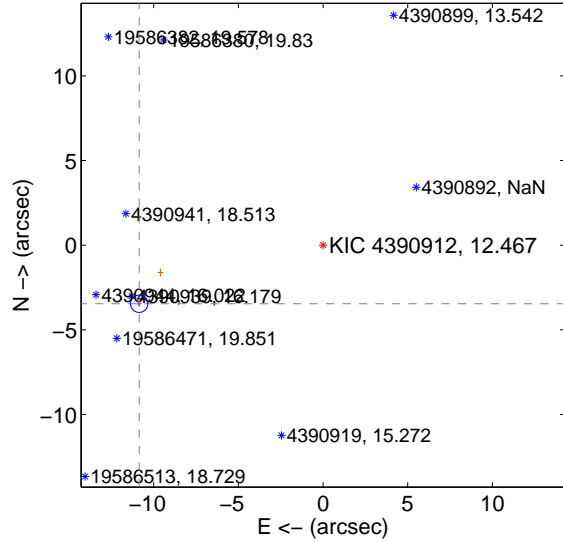
Supplemental centroid analysis for 004390912-01. Kepler magnitude: 12.47. Transit SNR 16.81

There are 10 quarters with good PRF difference image offsets

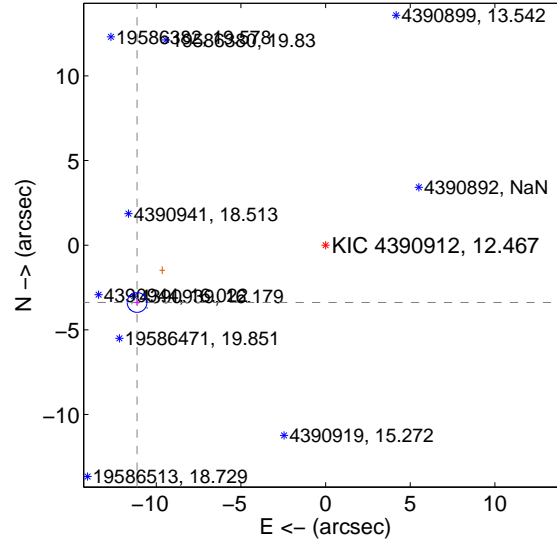
The direct PRF centroid is offset from the target star catalog position by about 0.73 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	<b>11.396 <math>\pm</math> 0.170</b>	<b>67.09</b>	10.858 $\pm$ 0.132	-3.461 $\pm$ 0.177
PRF-fit source offset from KIC position	<b>11.635 <math>\pm</math> 0.194</b>	<b>59.93</b>	11.132 $\pm$ 0.171	-3.385 $\pm$ 0.179
photometric centroid source offset	0.81 $\pm$ 0.48	1.70	0.51 $\pm$ 0.41	-0.63 $\pm$ 0.52

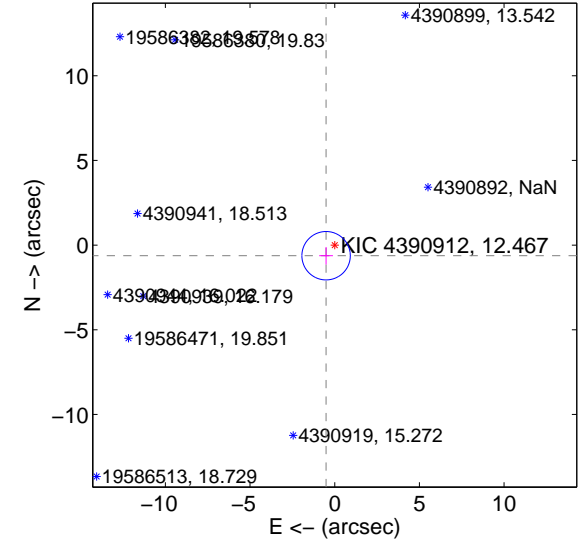
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

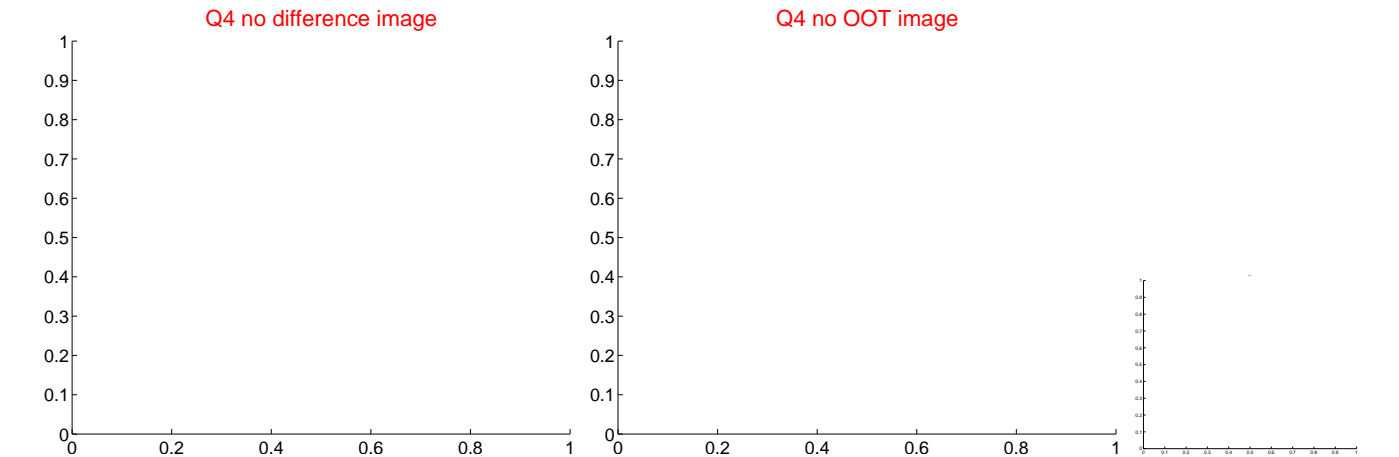
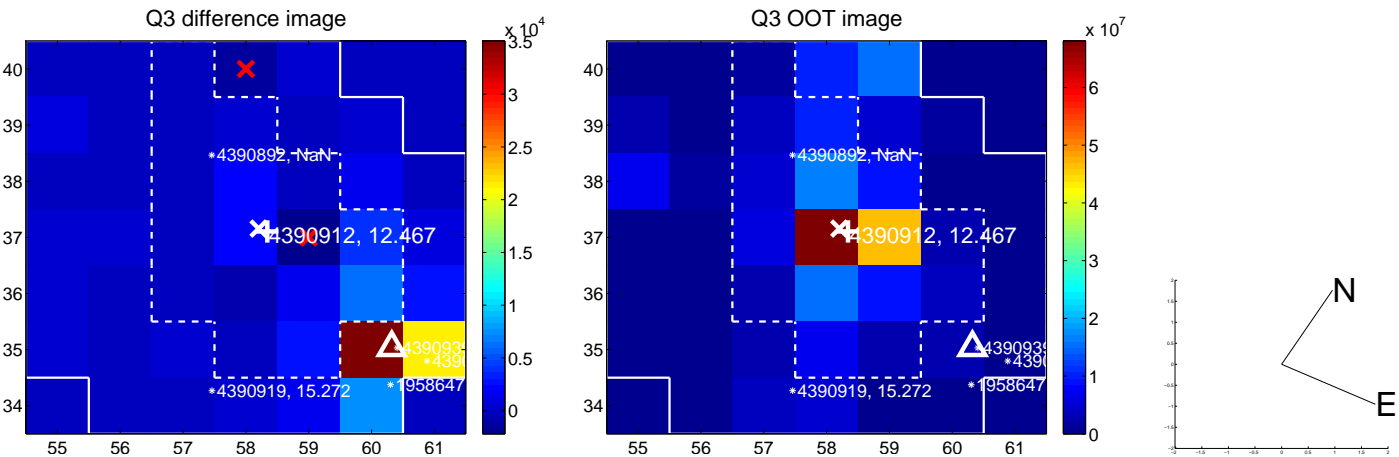
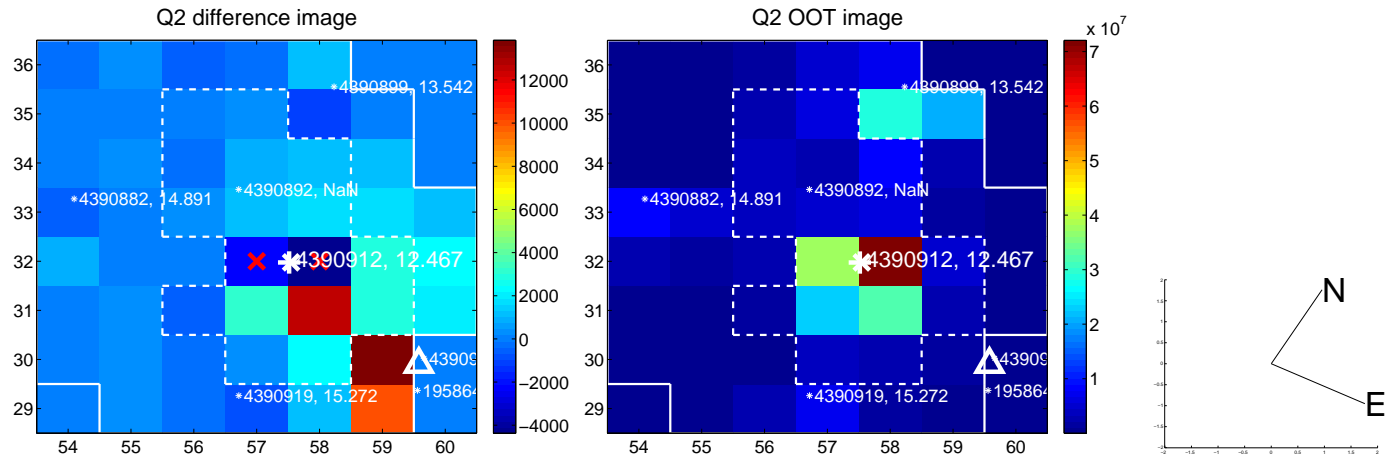
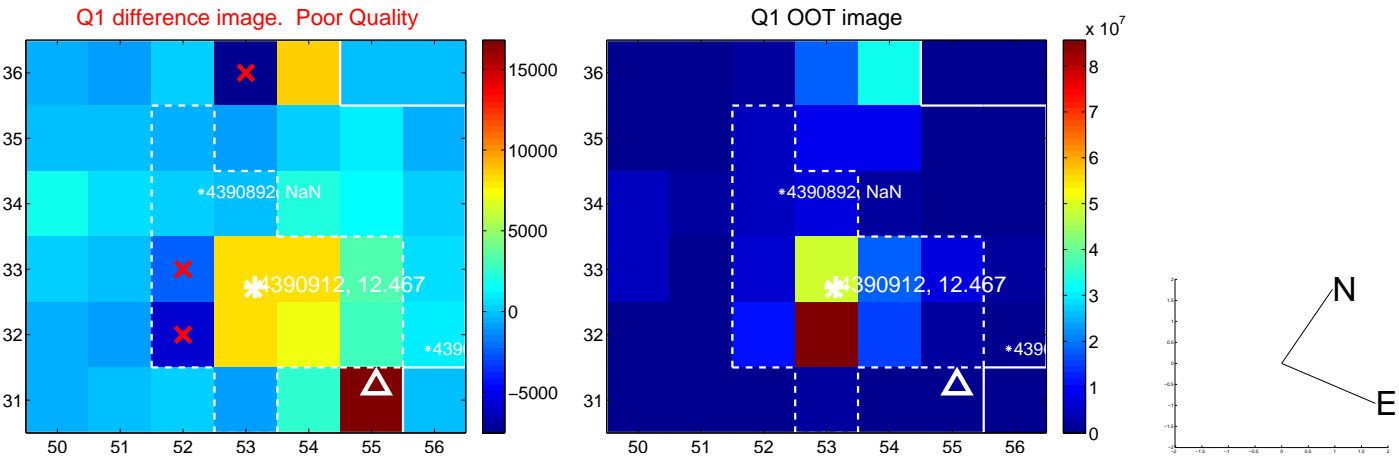


offset from photometric centroids

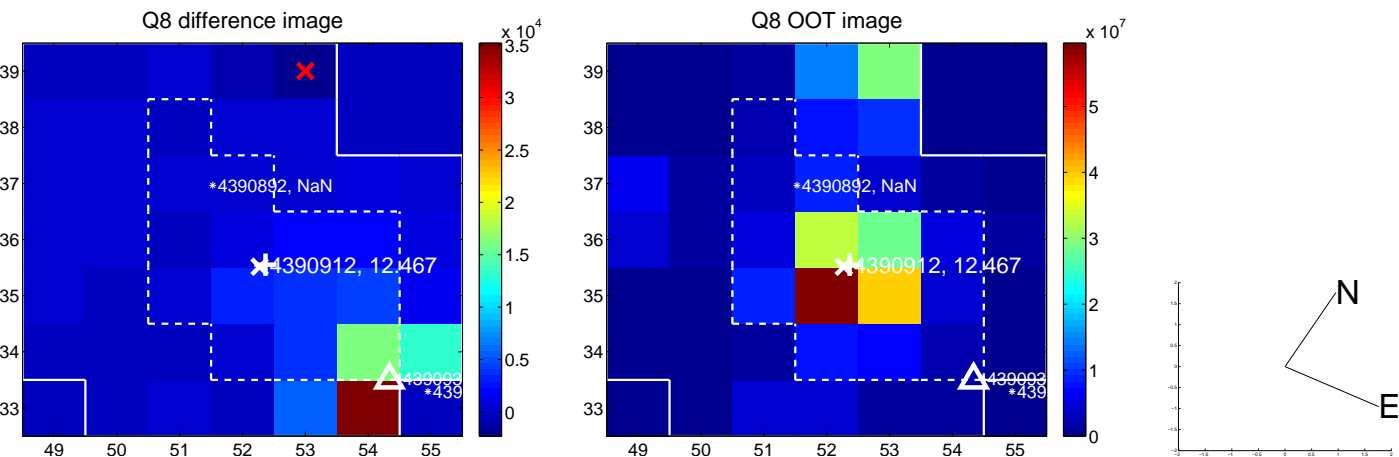
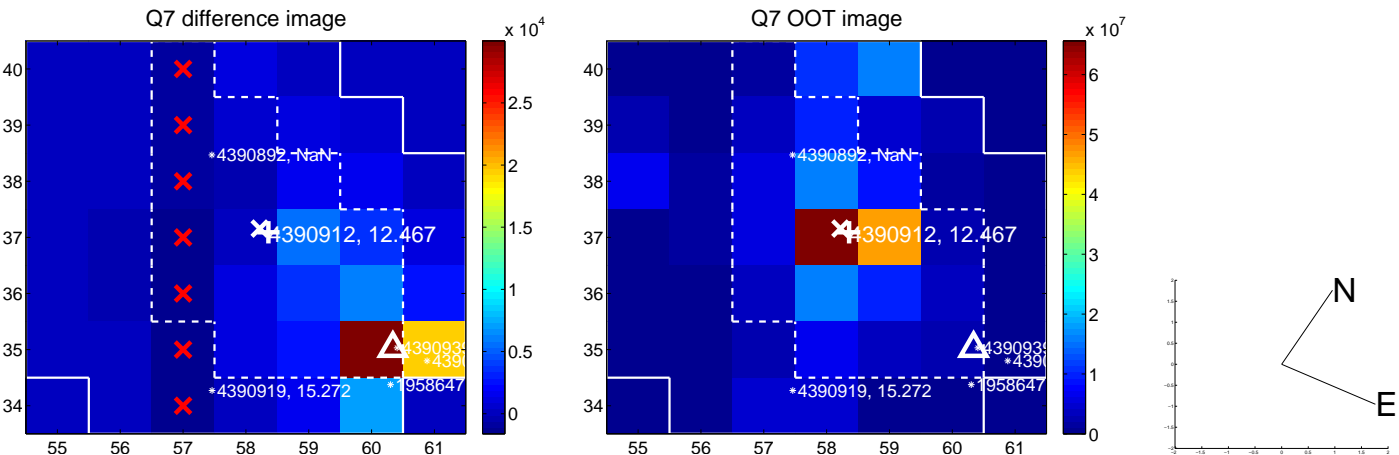
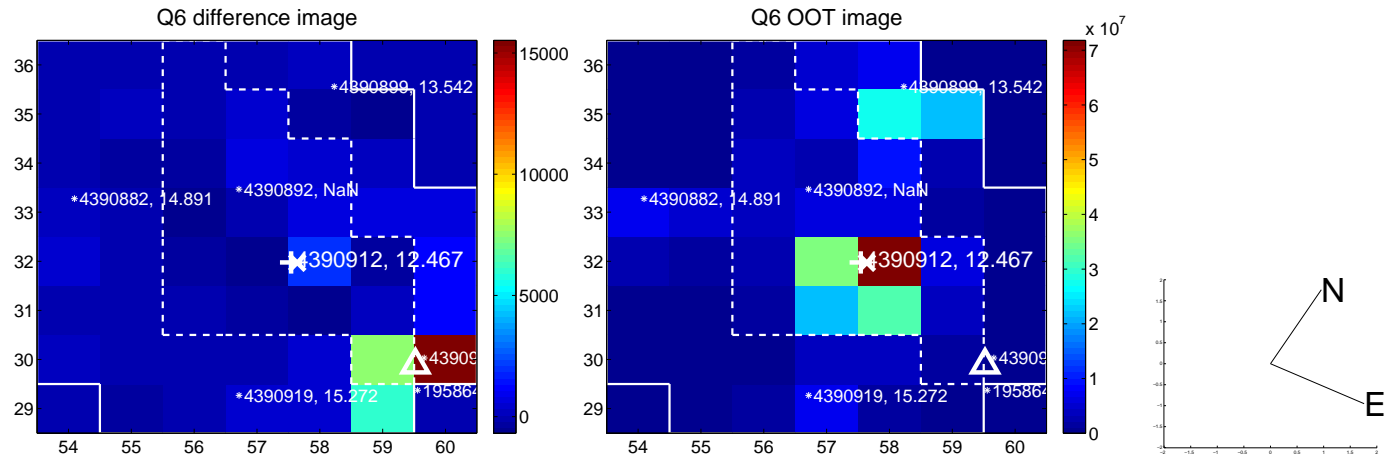
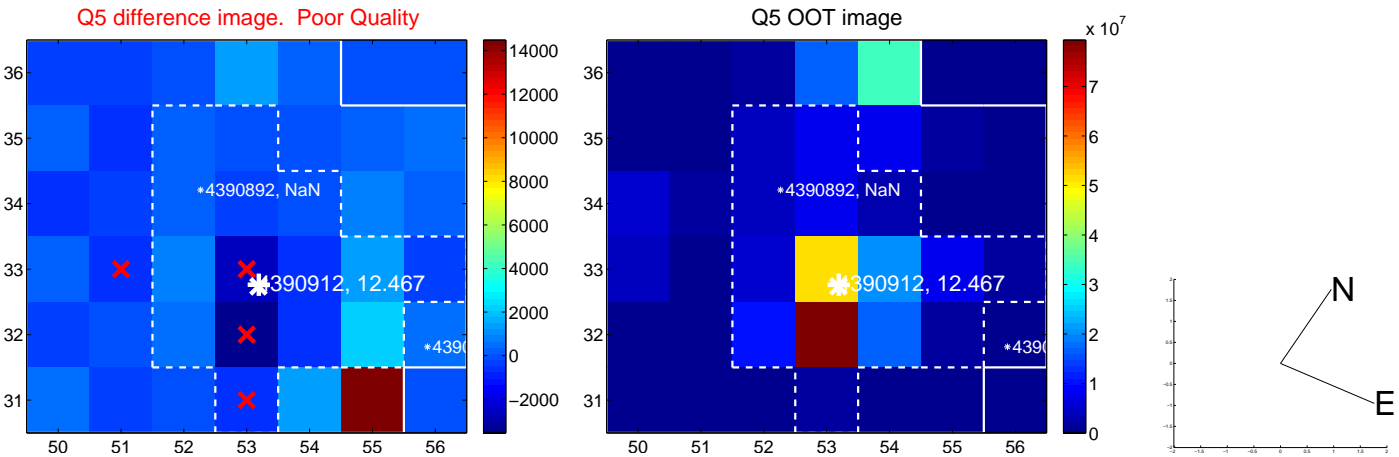


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets**; **Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

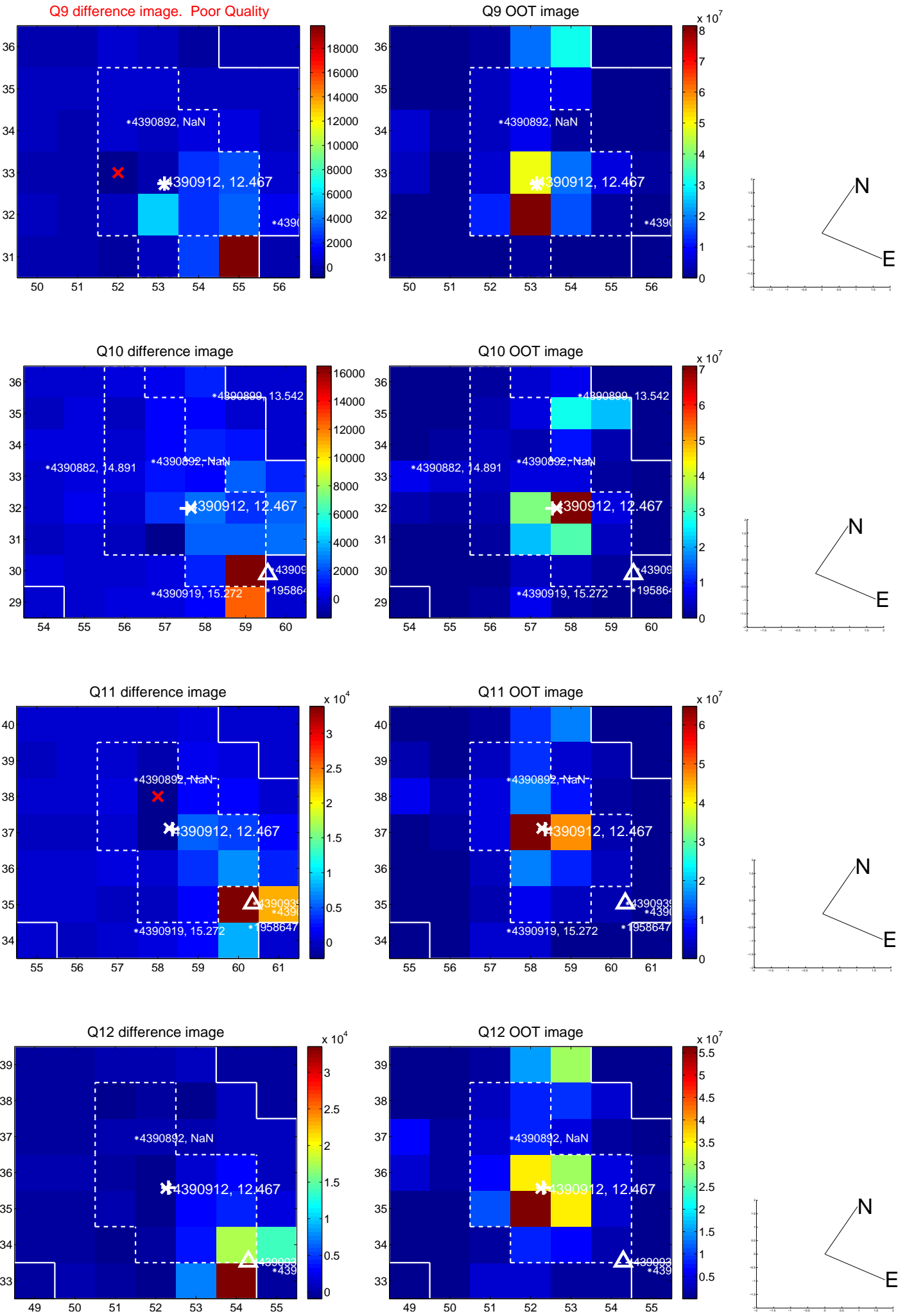


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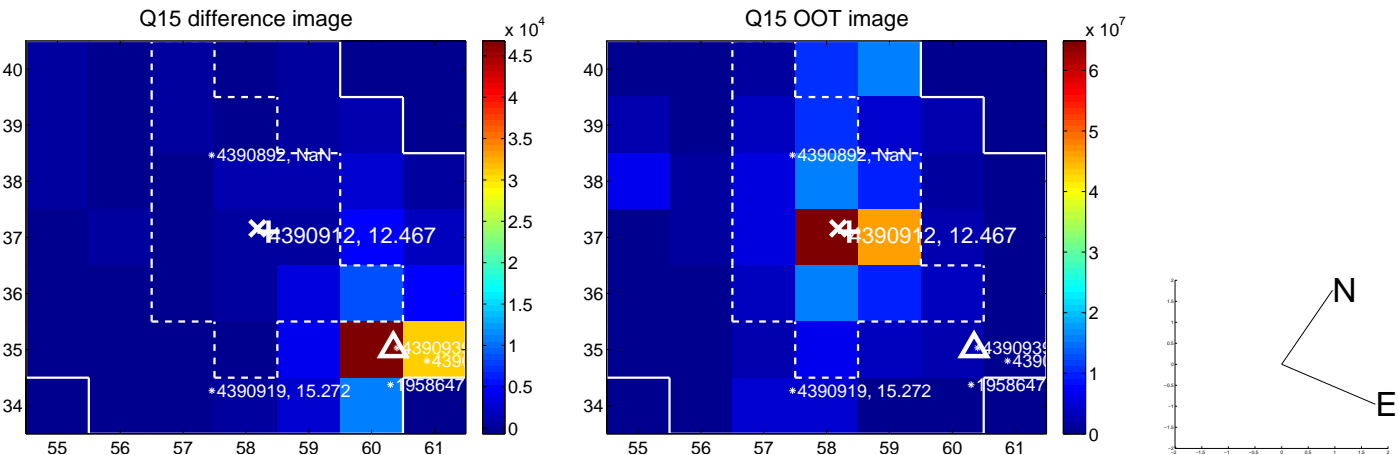
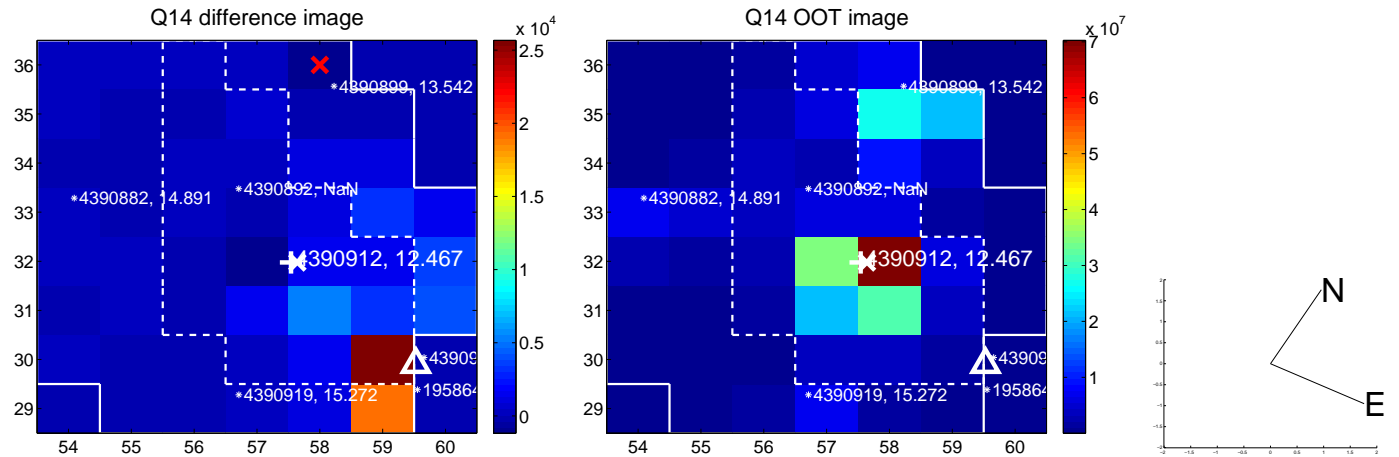
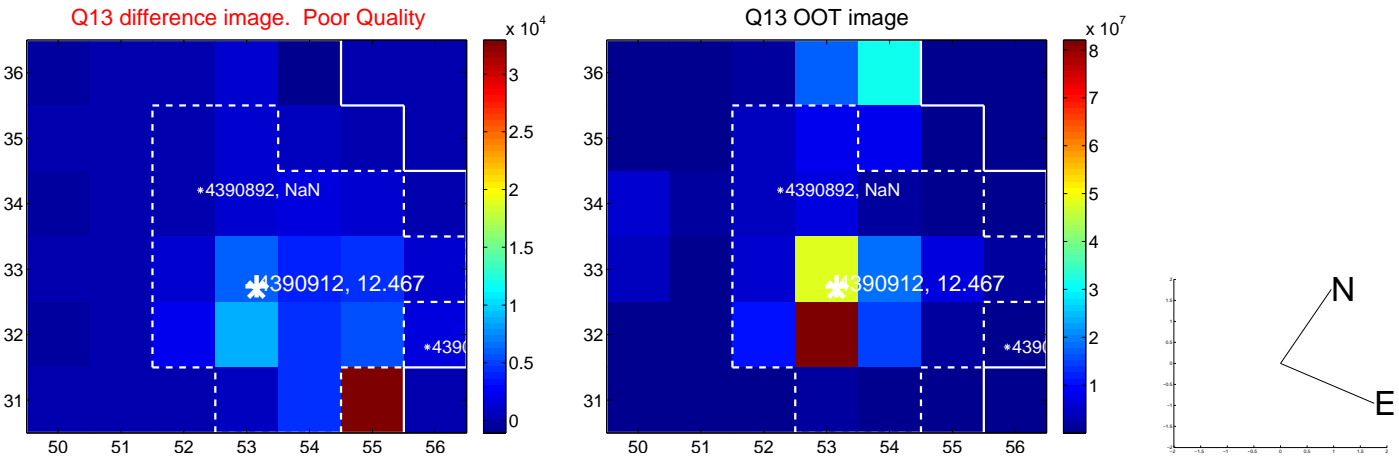




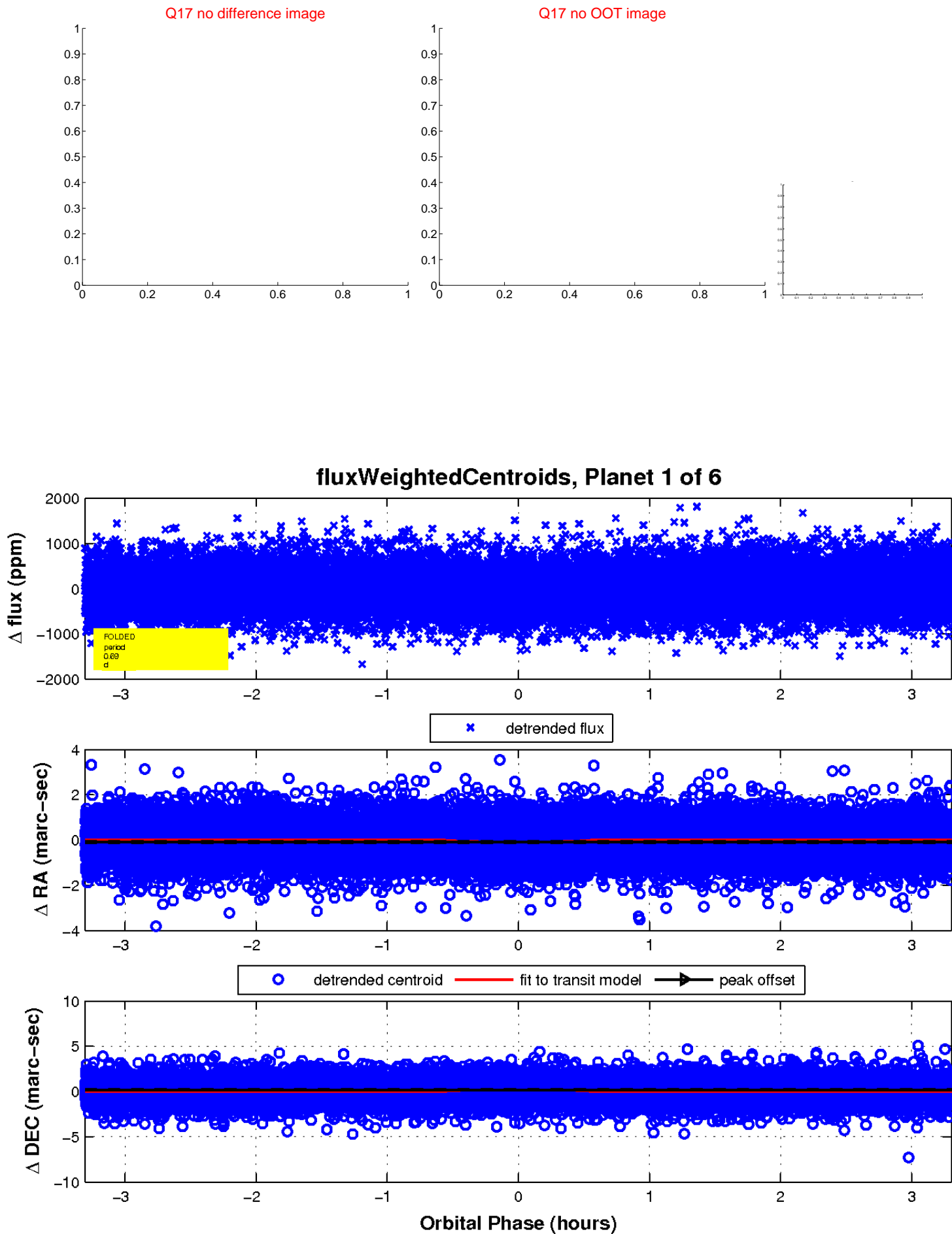
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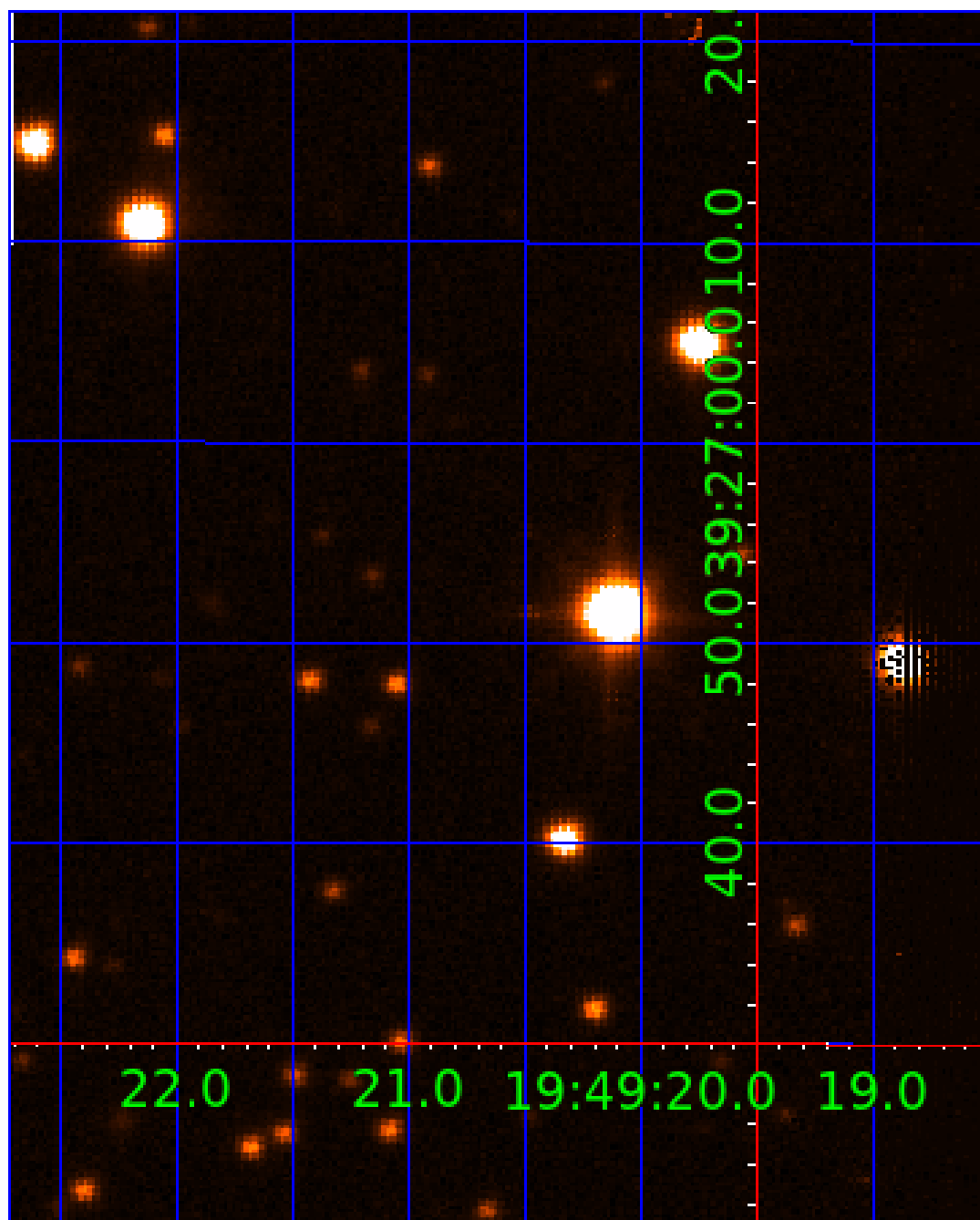


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UKIRT Image

Declination





# KIC 004390912

## Q1-17 DR25 TCE Parameters

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004390912-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—ALL_TRANS_CHASES—INCONSISTENT_TRANS
004390912-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_MARSHALL—TRANS_GAPPED—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_POS_ALT—INCONSISTENT_TRANS
004390912-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT

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

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

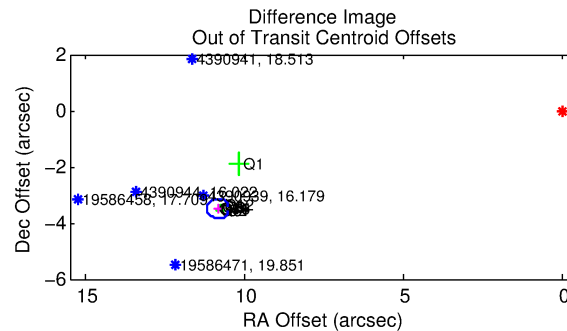
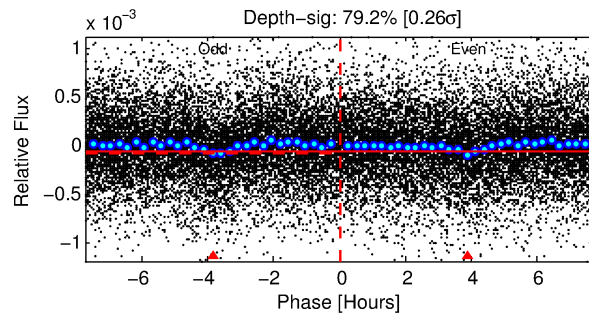
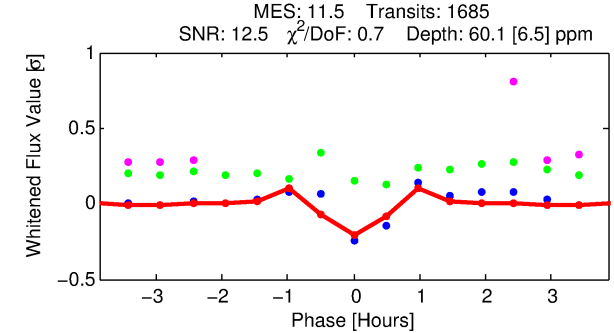
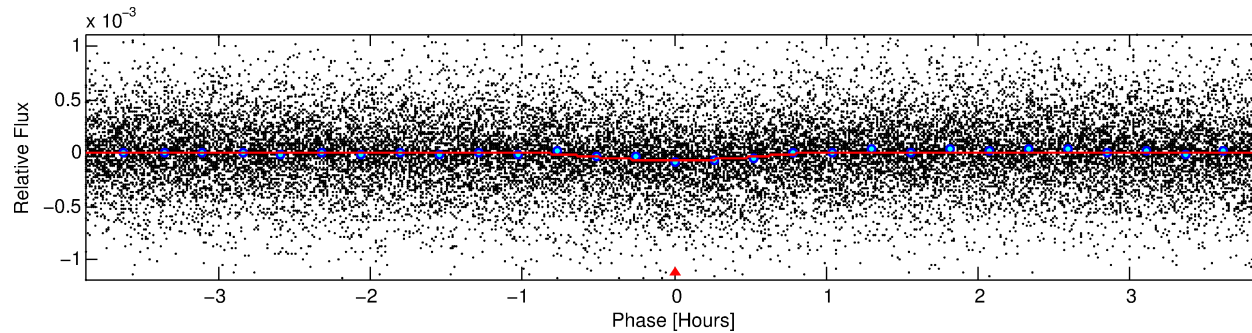
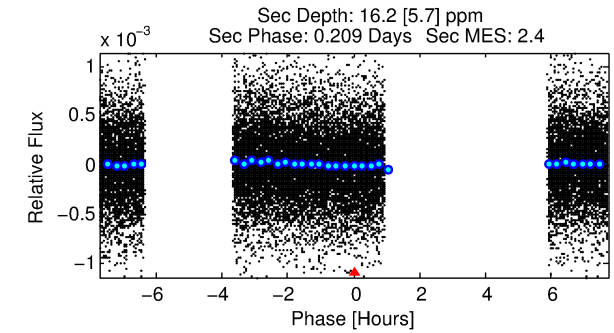
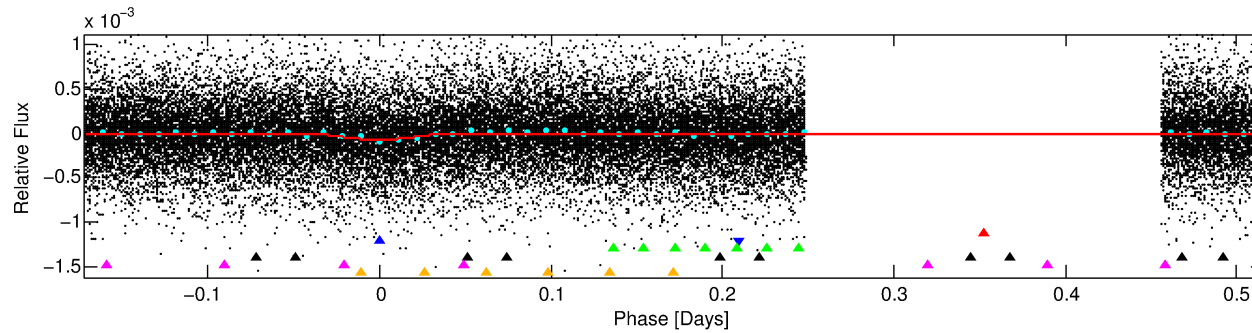
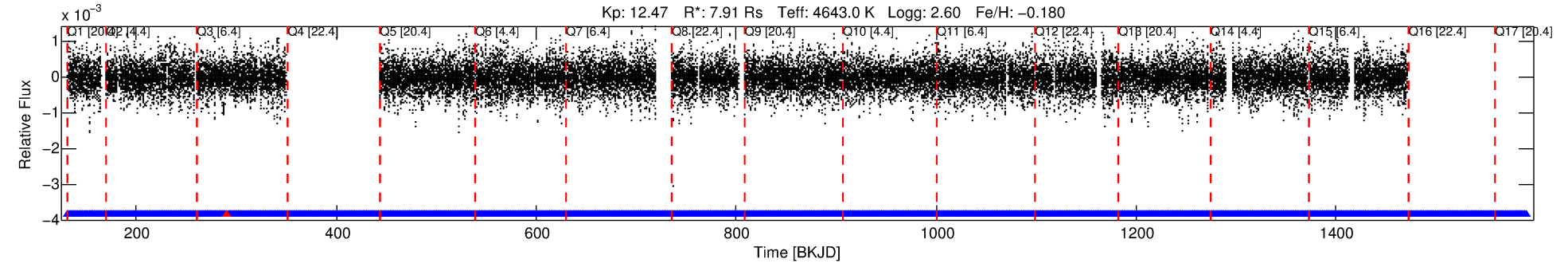
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 004390912-02

No Significant Match Found

# DV One-Page Summary

KIC: 4390912 Candidate: 2 of 6 Period: 0.688 d



## DV Fit Results:

Period = 0.68750 [0.00001] d  
Epoch = 131.5144 [0.0009] BKJD  
Rp/R\* = 0.0089 [0.0034]  
a/R\* = 2.02 [2.21]  
b = 0.91 [0.29]  
Seff = N/A  
Teq = N/A  
Rp = 7.65 [3.18] Re  
a = N/A  
Ag = N/A  
Teffp = N/A

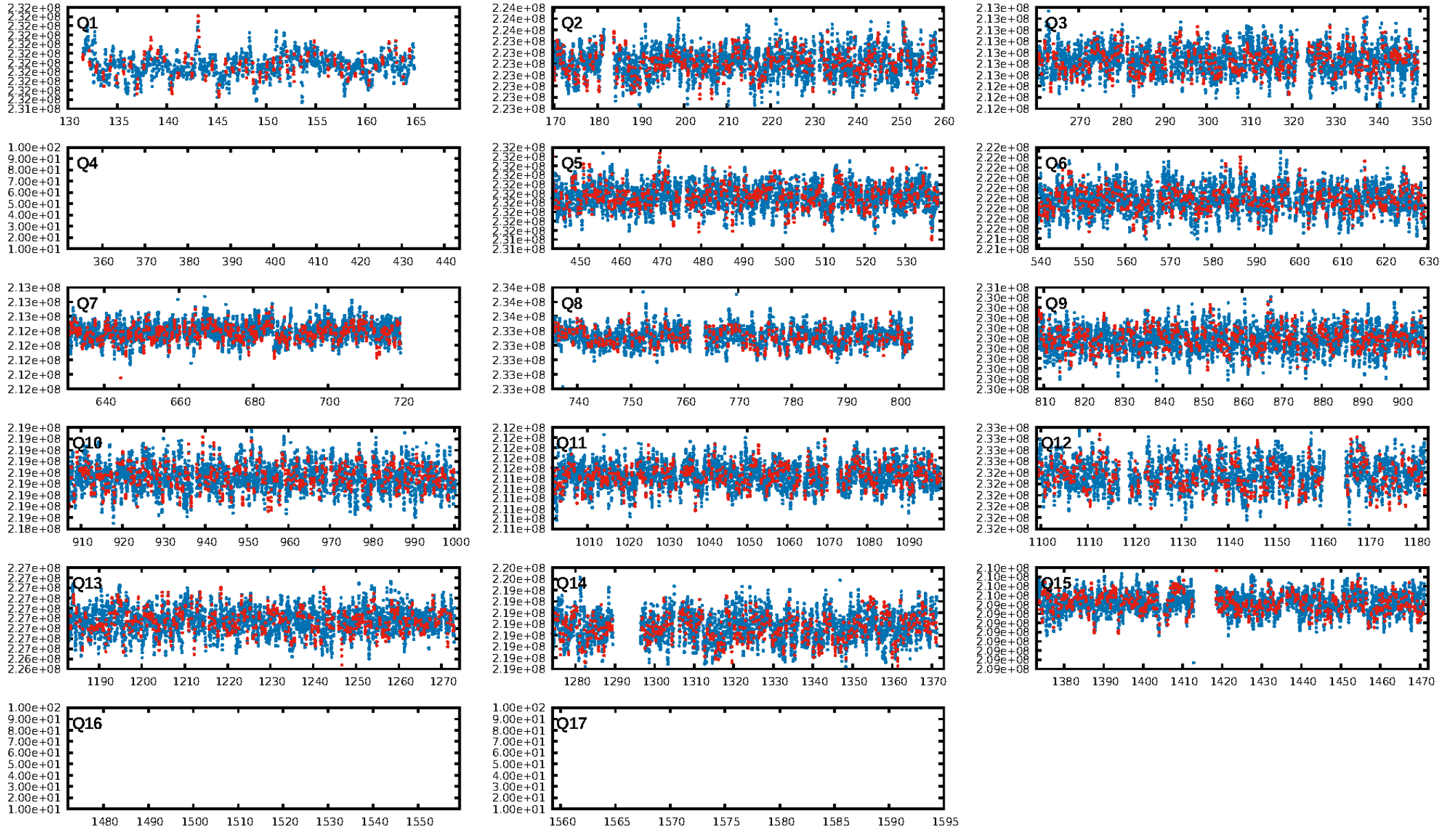
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.0% [0.00σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 3.38e-28  
RollingBand-fgt: 1.00 [1635/1636]  
GhostDiagnostic-chr: -0.4756  
Centroid-sig: 0.0%  
Centroid-so: 1.376 arcsec [2.78σ]  
OotOffset-rm: 11.394 arcsec [97.30σ]  
KicOffset-rm: 11.619 arcsec [68.92σ]  
OotOffset-st: 4/4/2/1 [11]  
KicOffset-st: 4/4/2/1 [11]  
DiffImageQuality-fgm: 1.00 [11/11]  
DiffImageOverlap-fno: 1.00 [14/14]

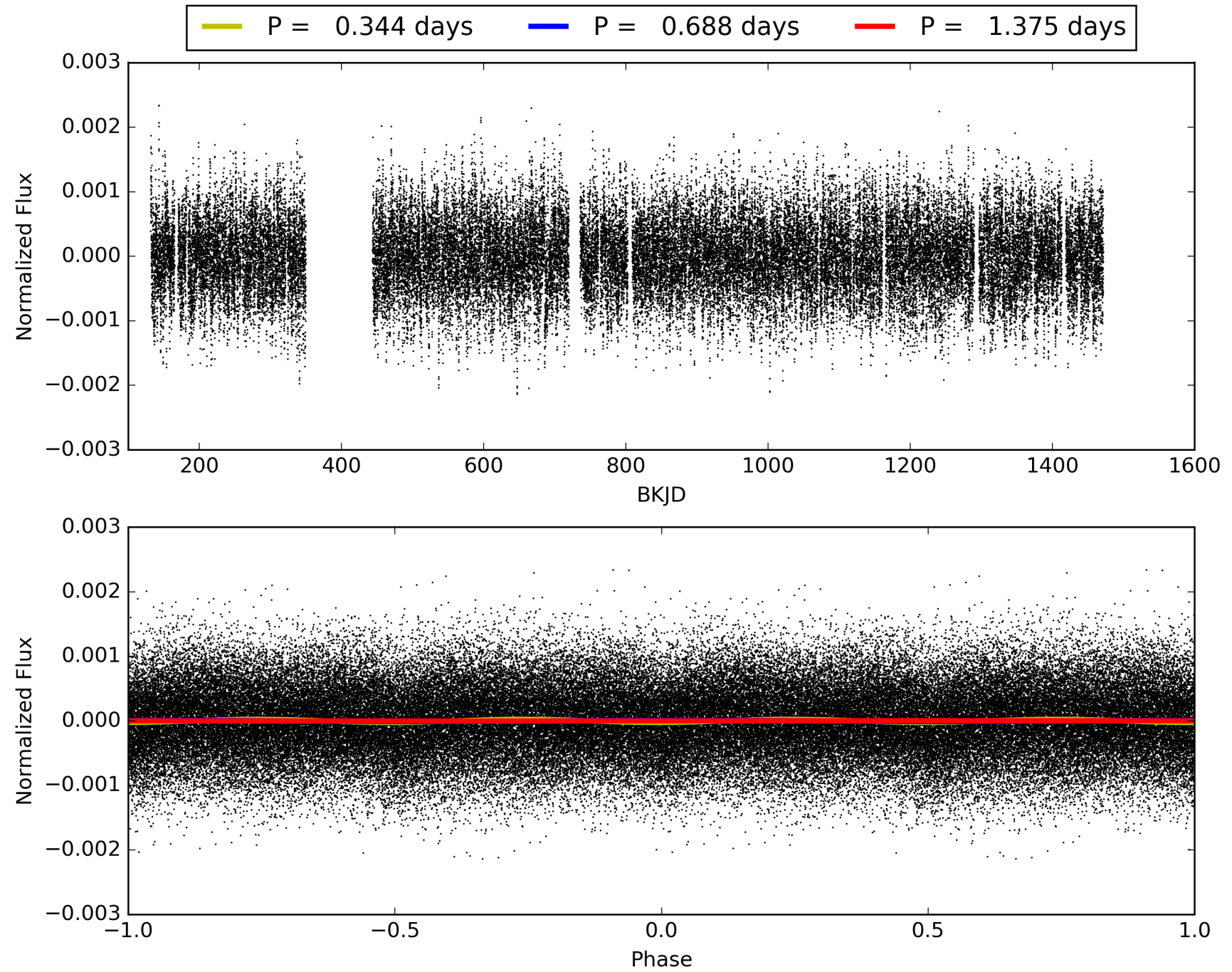
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 16:09:24 Z

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

# TCE 004390912-02, PDC Light Curves



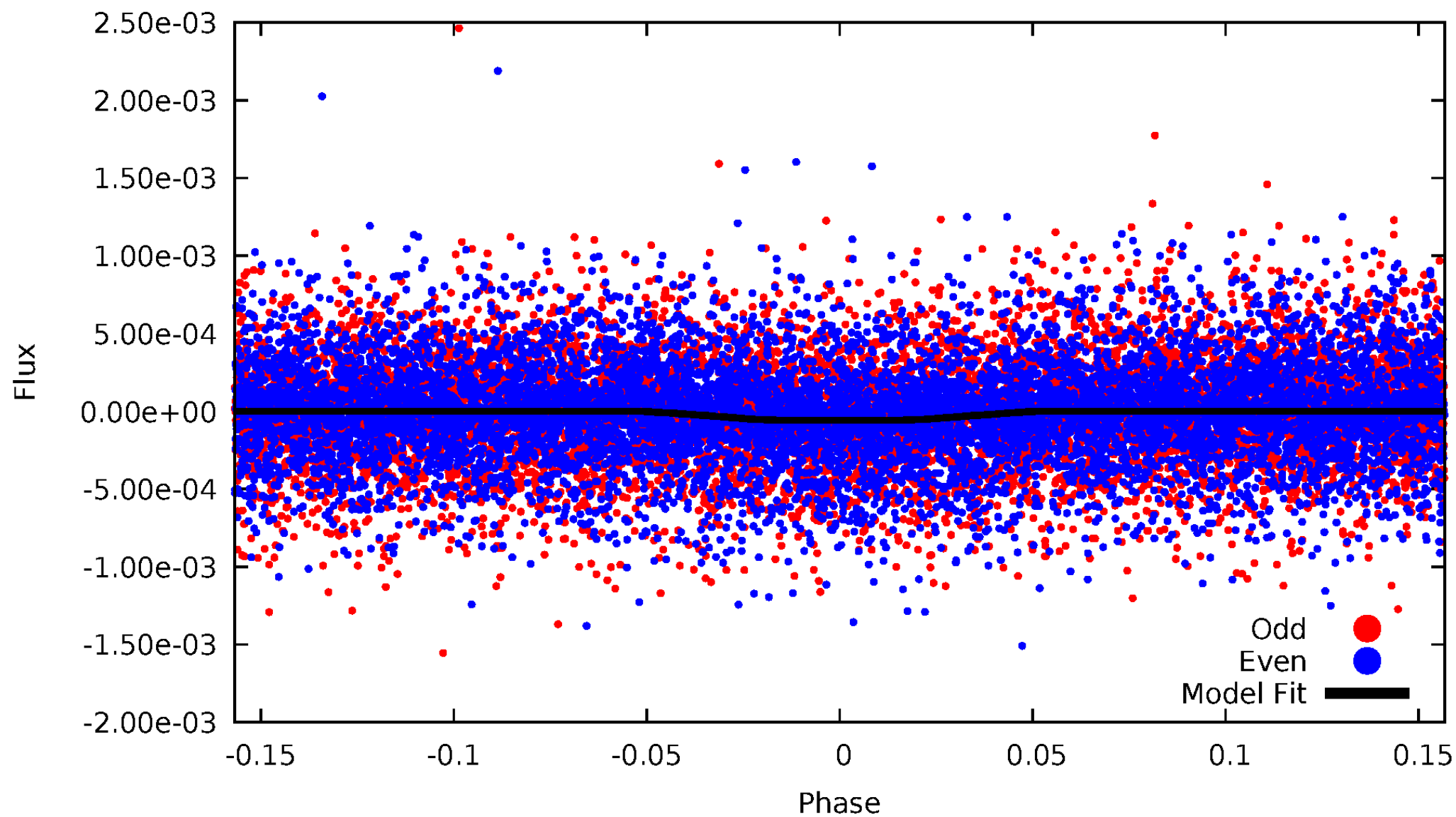
# TCE 004390912-02





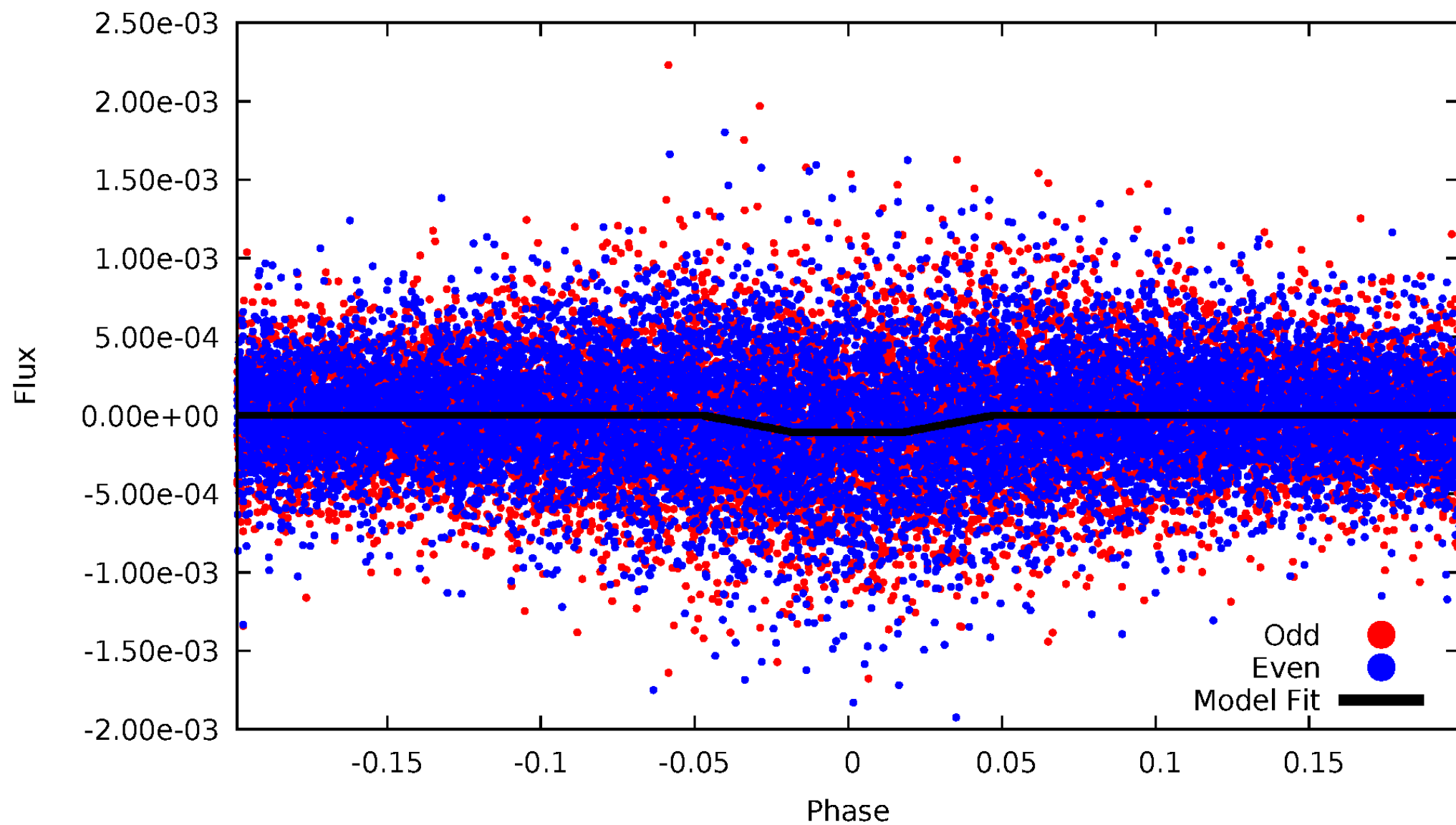
# DV Odd/Even

TCE 004390912-02



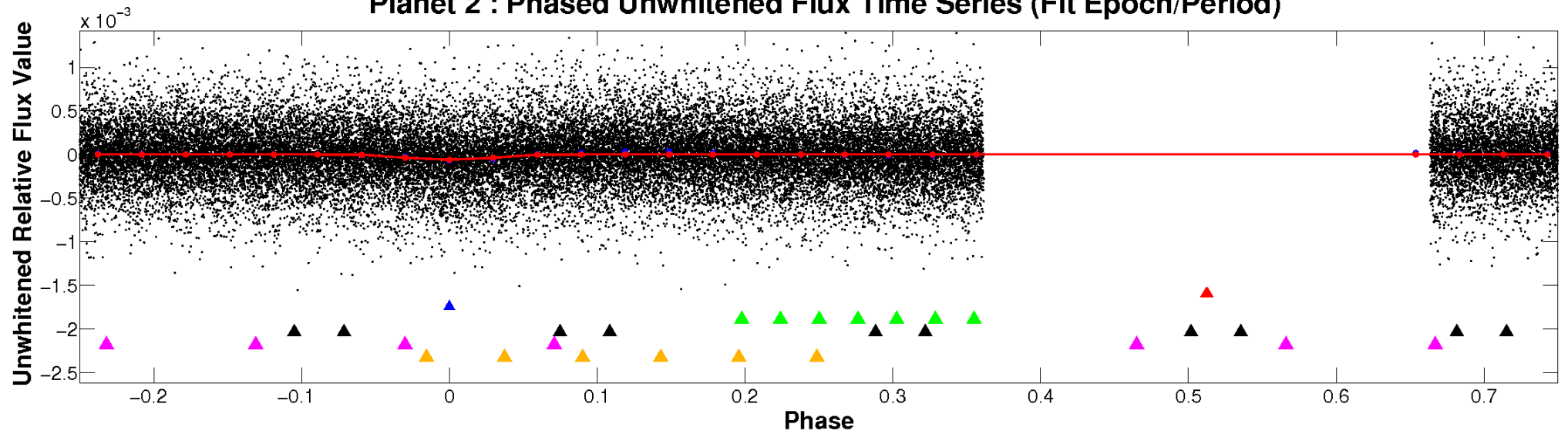
# ALT Odd/Even

TCE 004390912-02

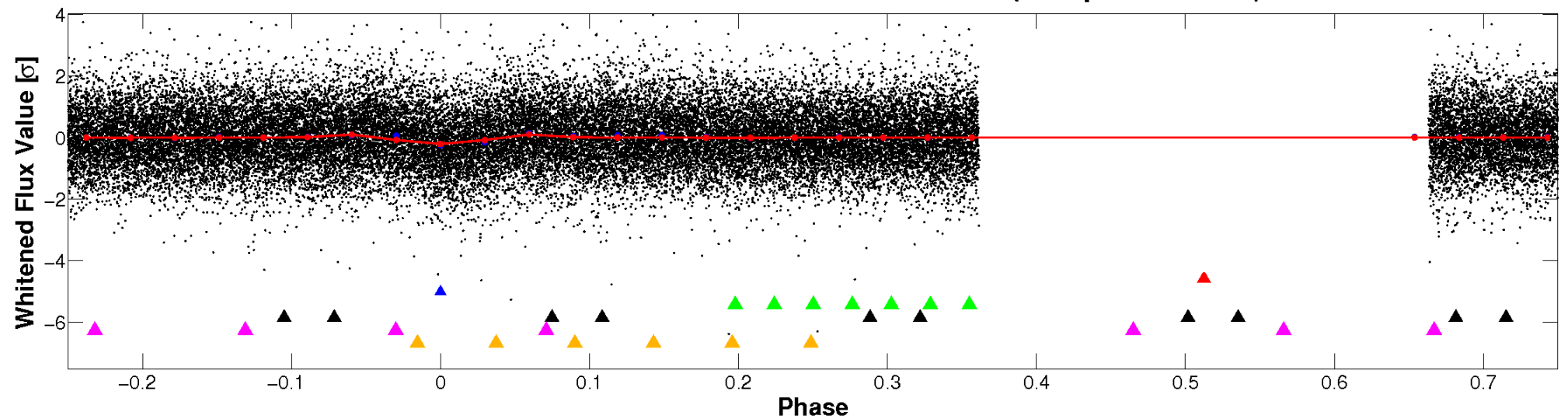


# Non-Whitened Vs. Whitened Light Curve

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



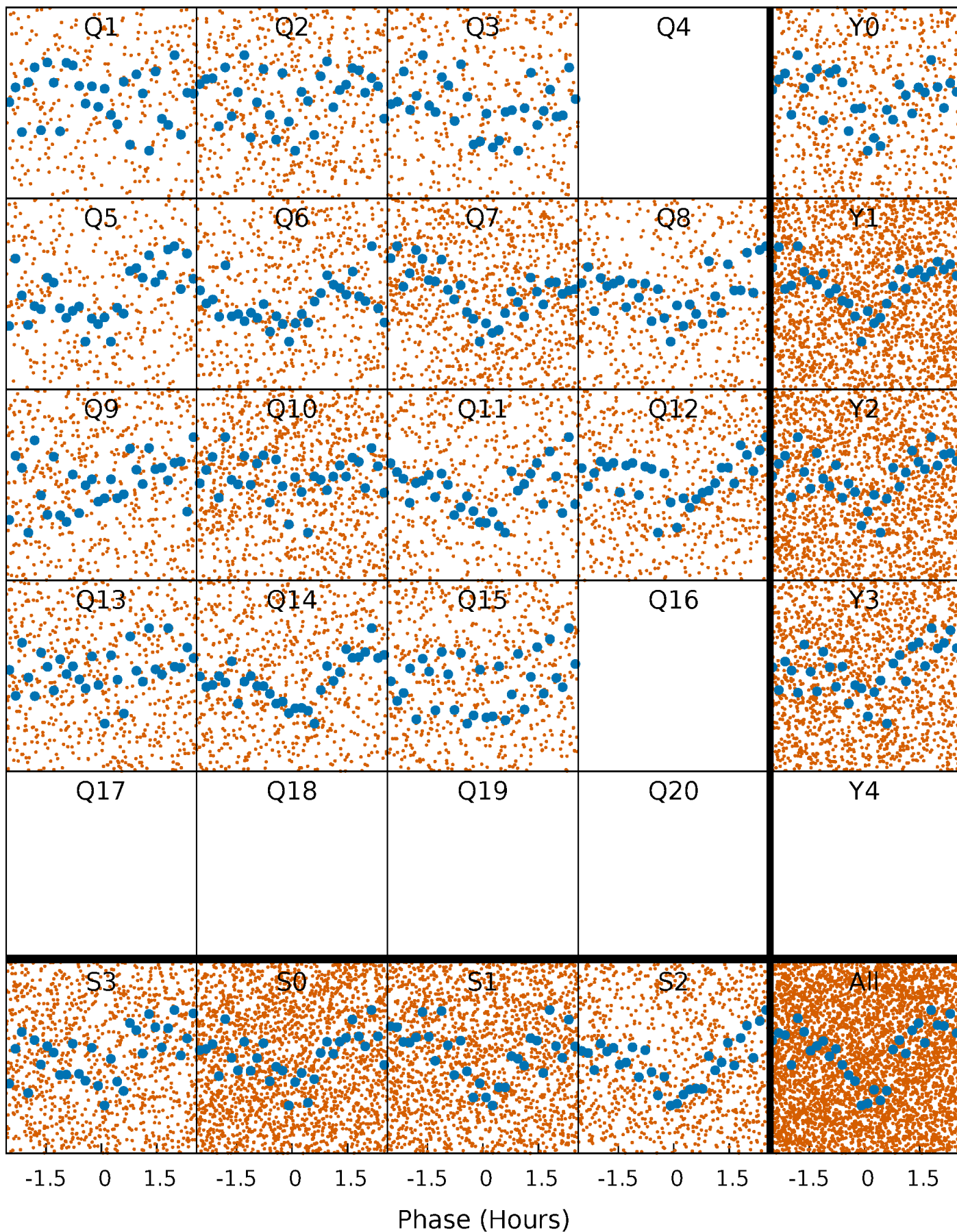
## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)





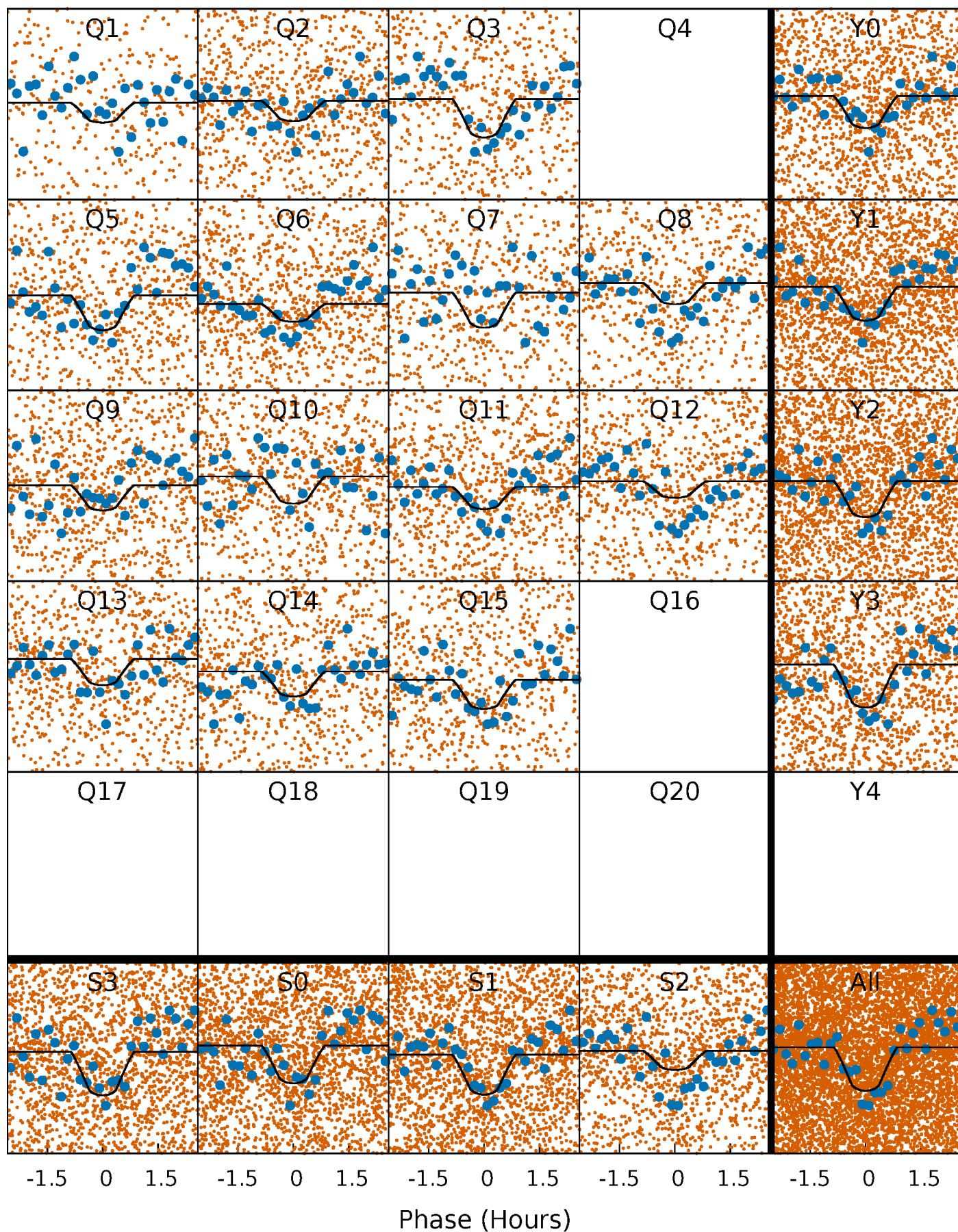
# PDC Quarter-Phased Transit Curves

TCE 004390912-02    P= 0.687502 Days     $T_0=131.514369$  (BKJD)



# DV Quarter-Phased Transit Curves

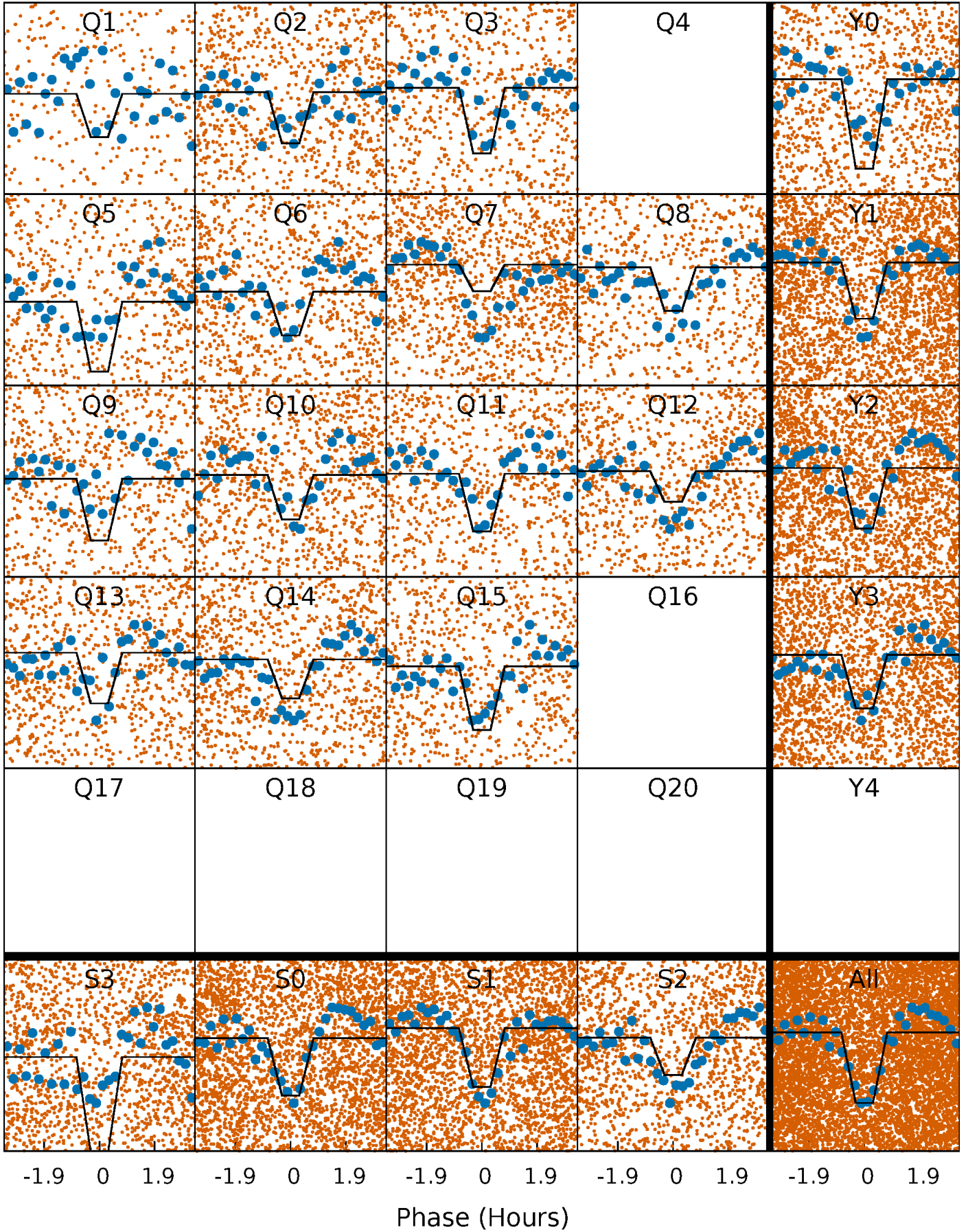
TCE 004390912-02     $P = 0.687502$  Days     $T_0 = 131.514369$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

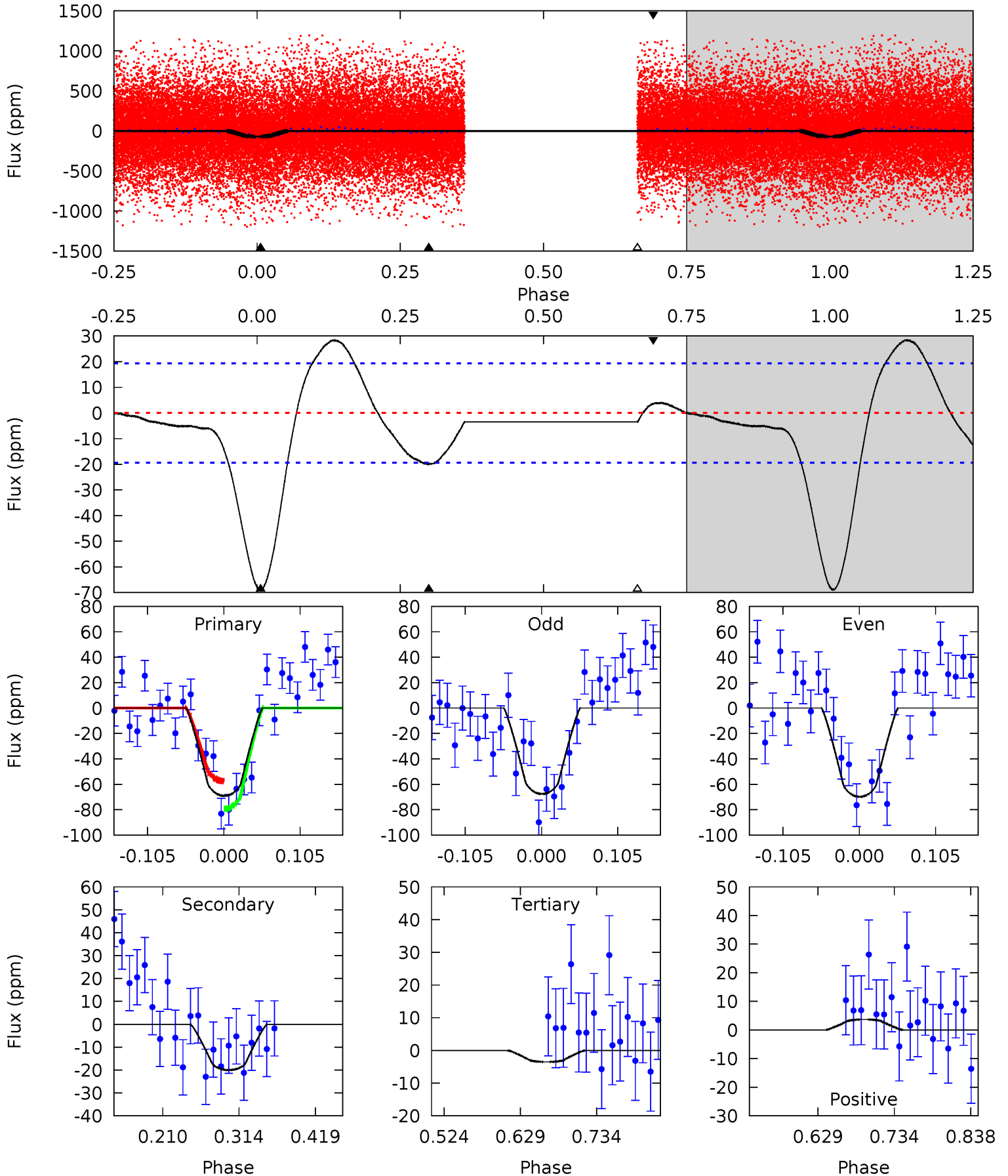
TCE 004390912-02   P= 0.687509 Days    $T_0=131.512462$  (BKJD)



# DV Model-Shift Uniqueness Test

004390912-02, P = 0.687502 Days, E = 130.826867 Days

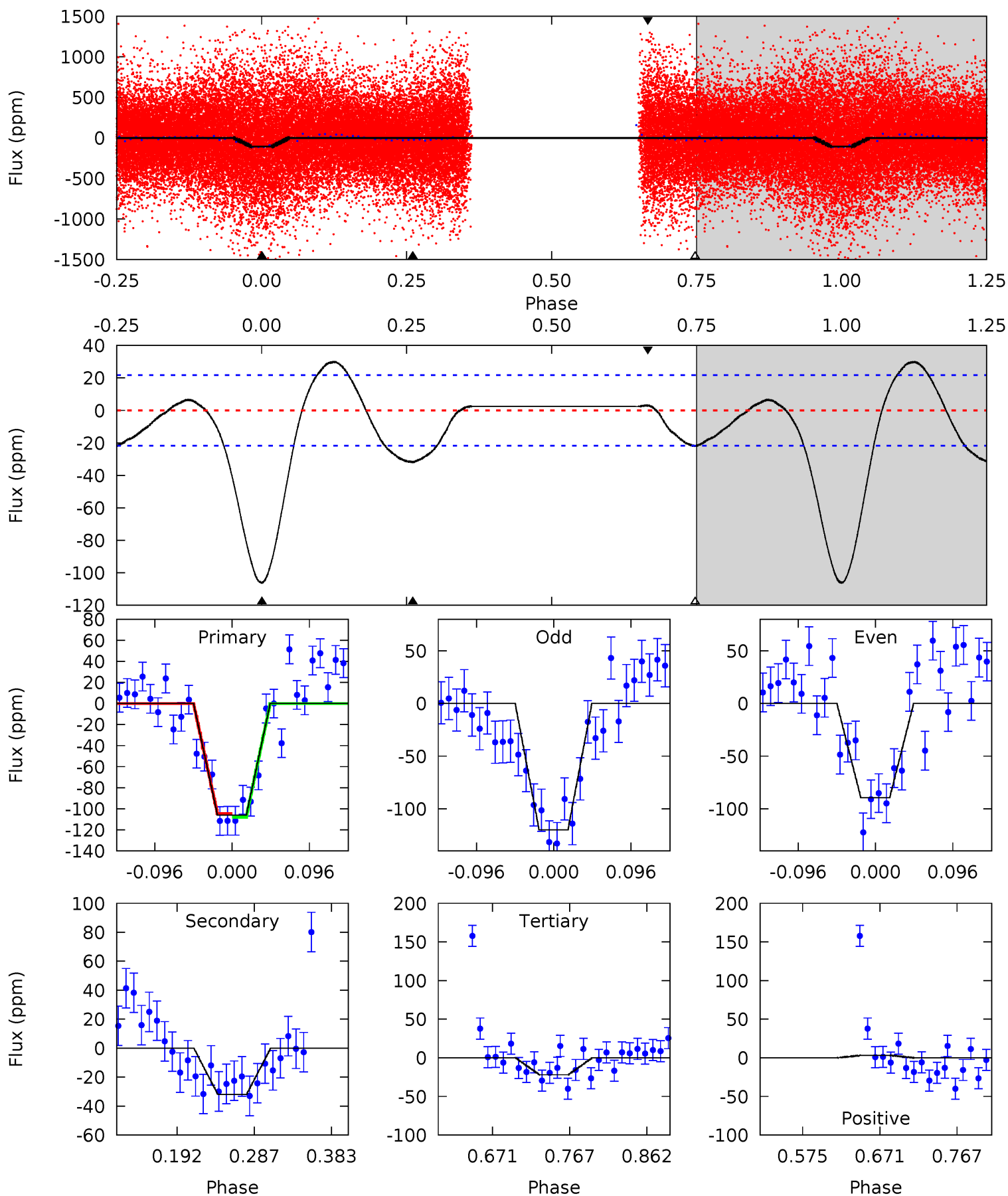
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
16.3	4.71	0.83	0.87	4.55	1.62	2.63	15.4	15.4	3.88	3.85	0.26	1.22	0.29	2.57



# Alt Model-Shift Uniqueness Test

004390912-02, P = 0.687509 Days, E = 130.824953 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
22.4	6.72	4.63	0.67	4.57	1.67	3.31	17.7	21.7	2.09	6.05	3.21	1.10	0.22	0.40



### Stellar Parameters For KIC 004390912

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$4643^{+55}_{-55}$	$2.595^{+0.024}_{-0.033}$	$-0.180^{+0.150}_{-0.100}$	$7.906^{+1.325}_{-0.221}$	$0.898^{+0.268}_{-0.015}$	$0.003^{+0.000}_{-0.000}$
	+1%/-1%	+1%/-1%	+83%/-56%	+17%/-3%	+30%/-2%	+7%/-19%
Source	SPE68	AST9	SPE68	DSEP		

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

### Secondary Eclipse Parameters for KIC 004390912-02 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-20 \pm 4$	$7.82^{+3.03}_{-3.08}$	$6638^{+120}_{-103}$	$-5122^{+325}_{-138}$	$0.040^{+0.068}_{-0.020}$
Alt.	$-32 \pm 5$	$9.00^{+3.04}_{-2.84}$	$6639^{+129}_{-102}$	$-5082^{+237}_{-158}$	$0.048^{+0.053}_{-0.021}$

$T_{max}$  = 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

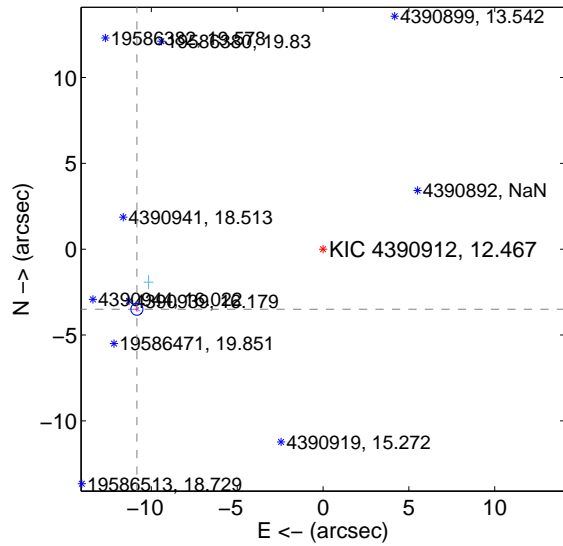
Supplemental centroid analysis for 004390912-02. Kepler magnitude: 12.47. Transit SNR 12.50

There are 11 quarters with good PRF difference image offsets

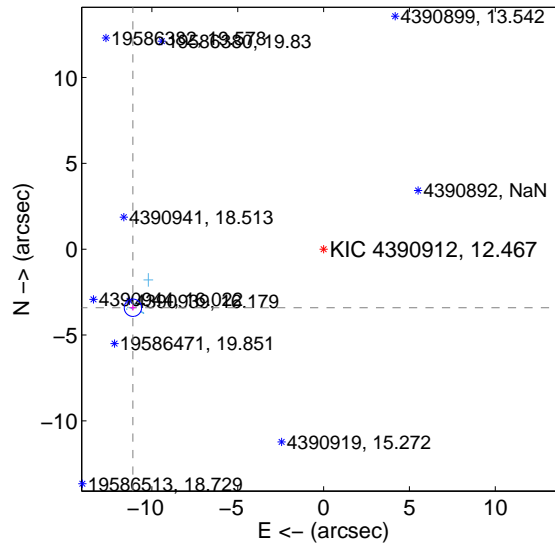
The direct PRF centroid is offset from the target star catalog position by about 0.73 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	<b>11.394 <math>\pm</math> 0.117</b>	<b>97.30</b>	10.843 $\pm$ 0.089	-3.498 $\pm$ 0.150
PRF-fit source offset from KIC position	<b>11.619 <math>\pm</math> 0.169</b>	<b>68.92</b>	11.107 $\pm$ 0.158	-3.413 $\pm$ 0.166
photometric centroid source offset	1.38 $\pm$ 0.50	2.78	1.34 $\pm$ 0.49	-0.30 $\pm$ 0.63

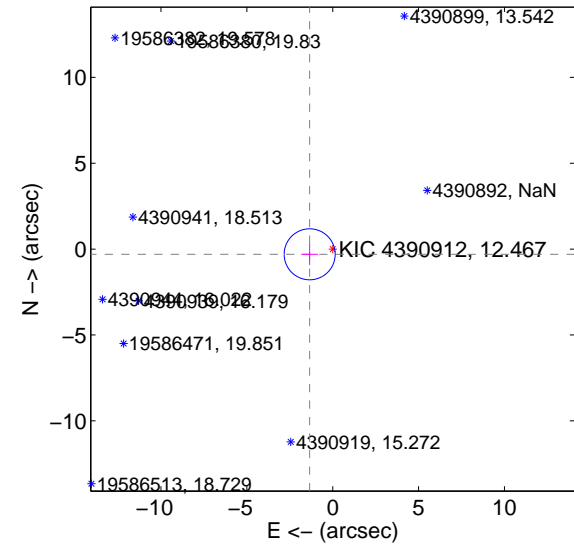
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

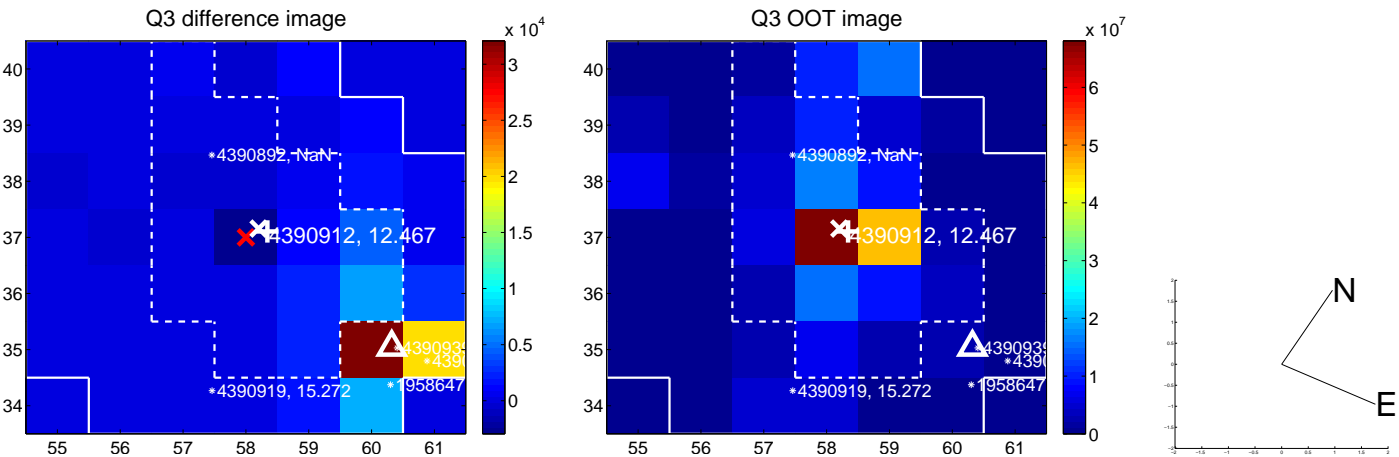
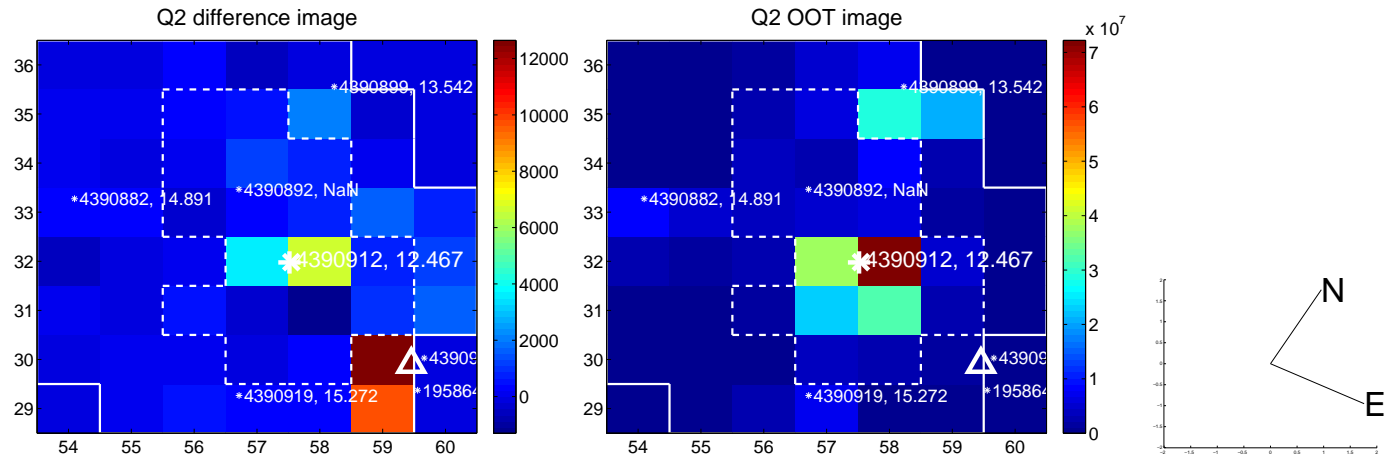
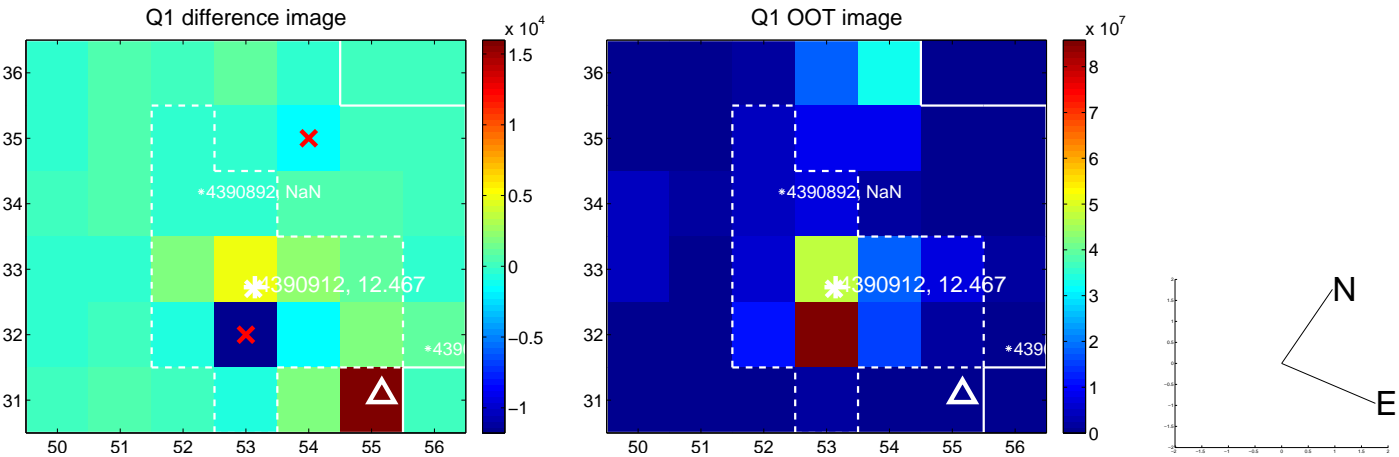


offset from photometric centroids

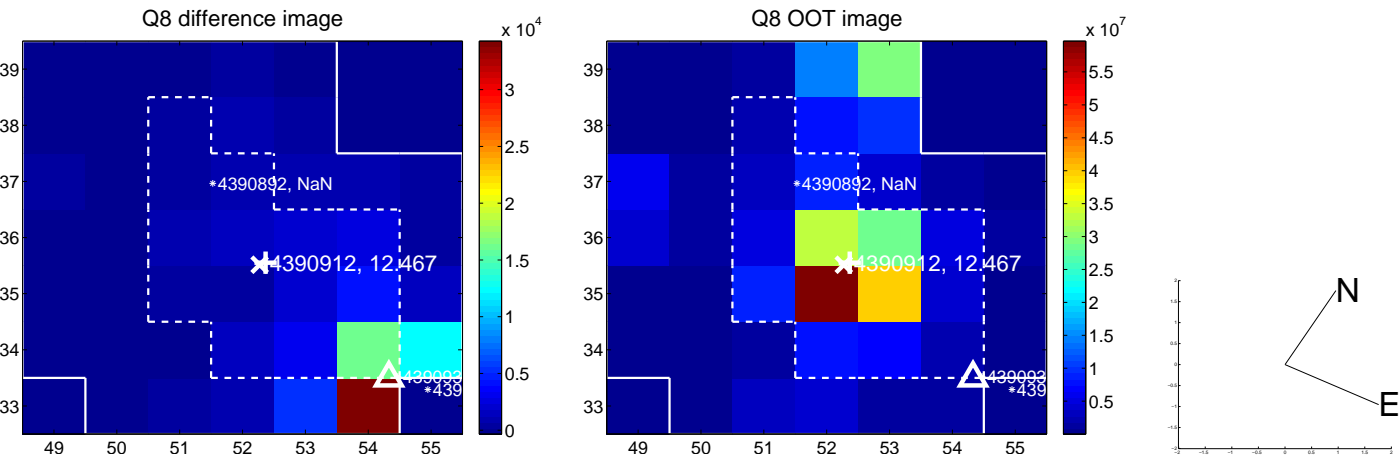
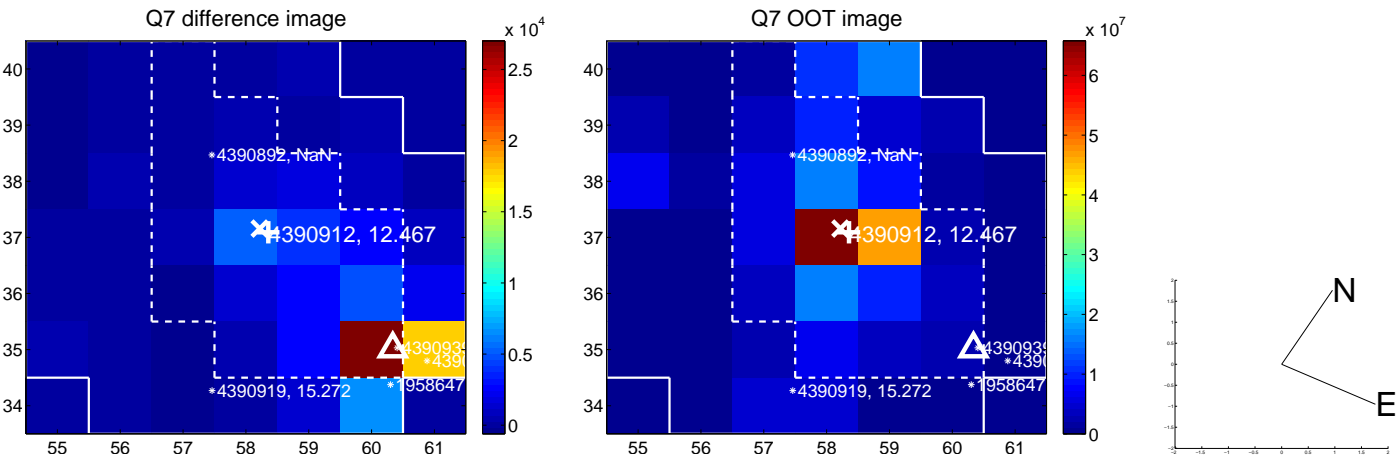
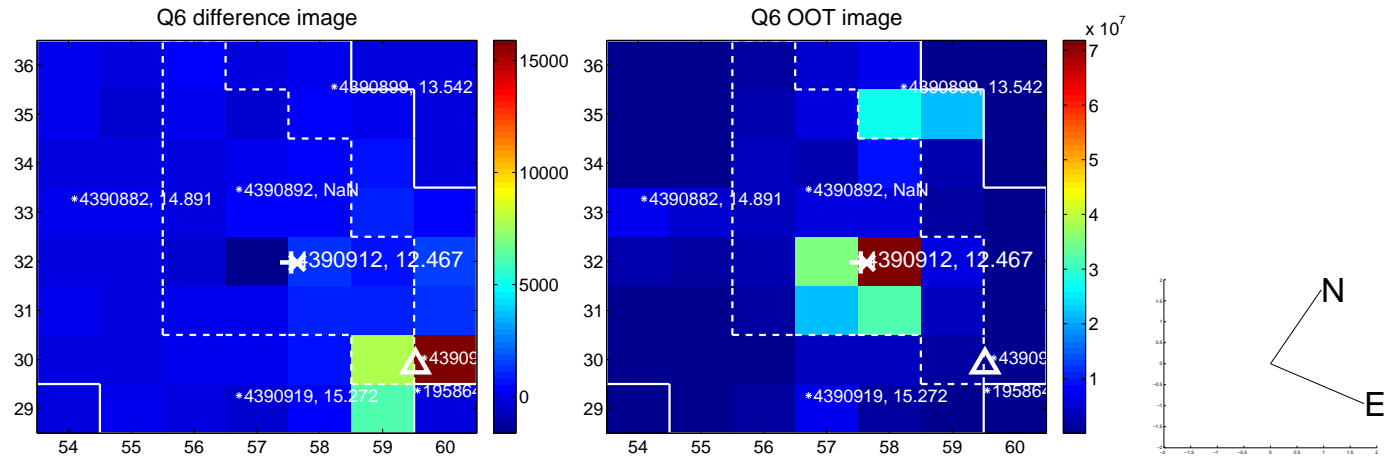
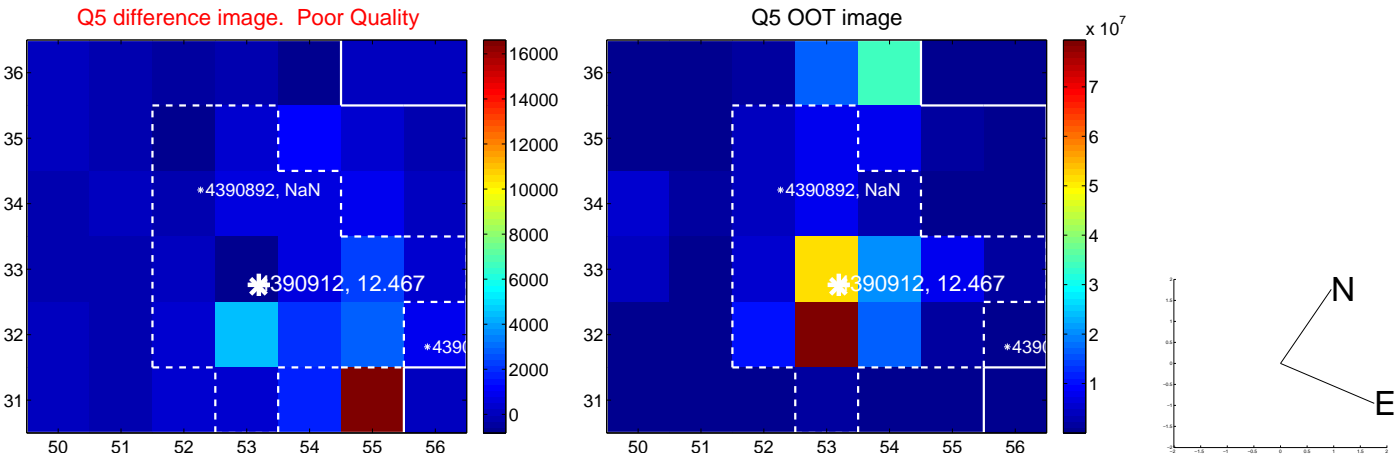


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets**; **Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

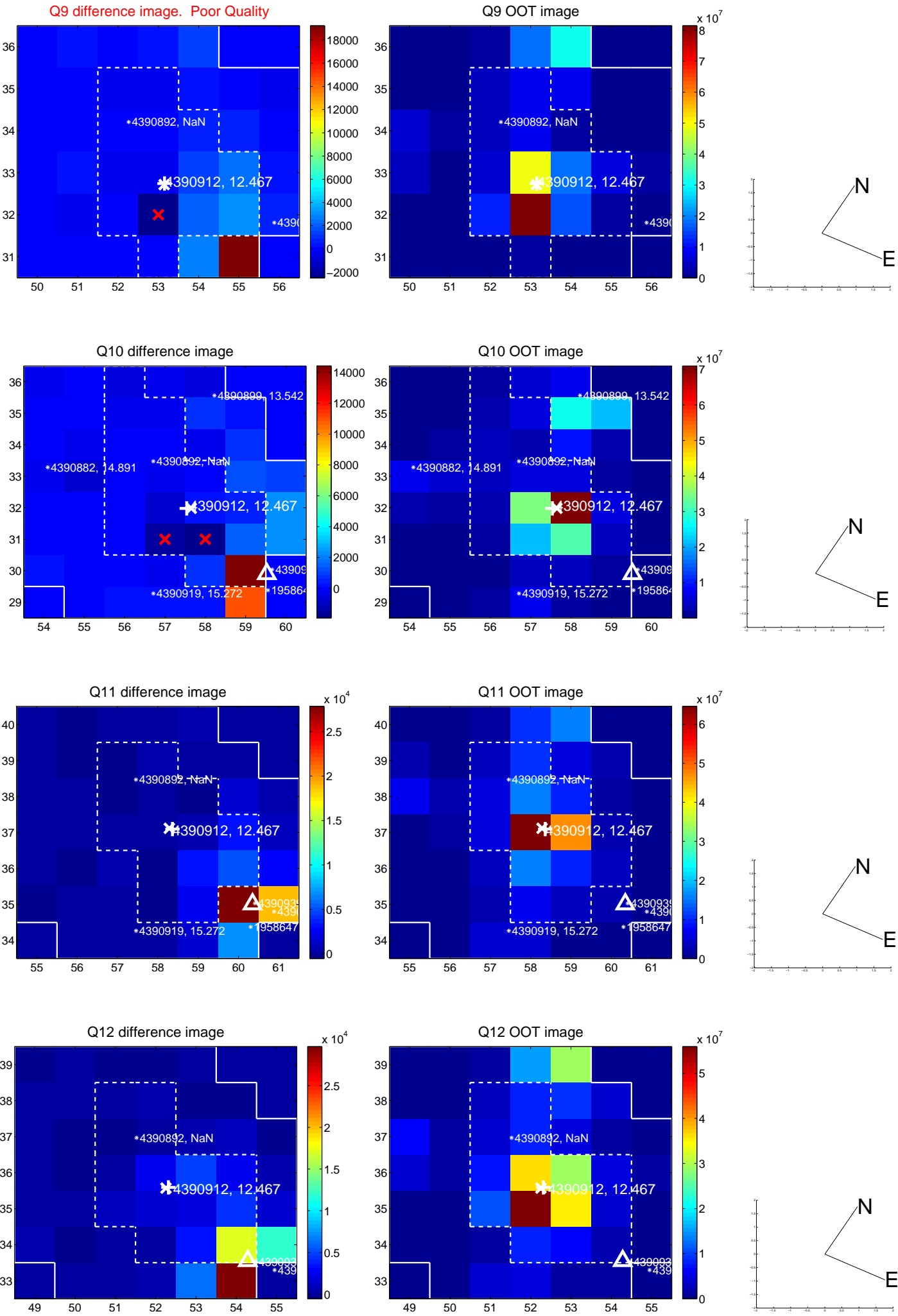
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



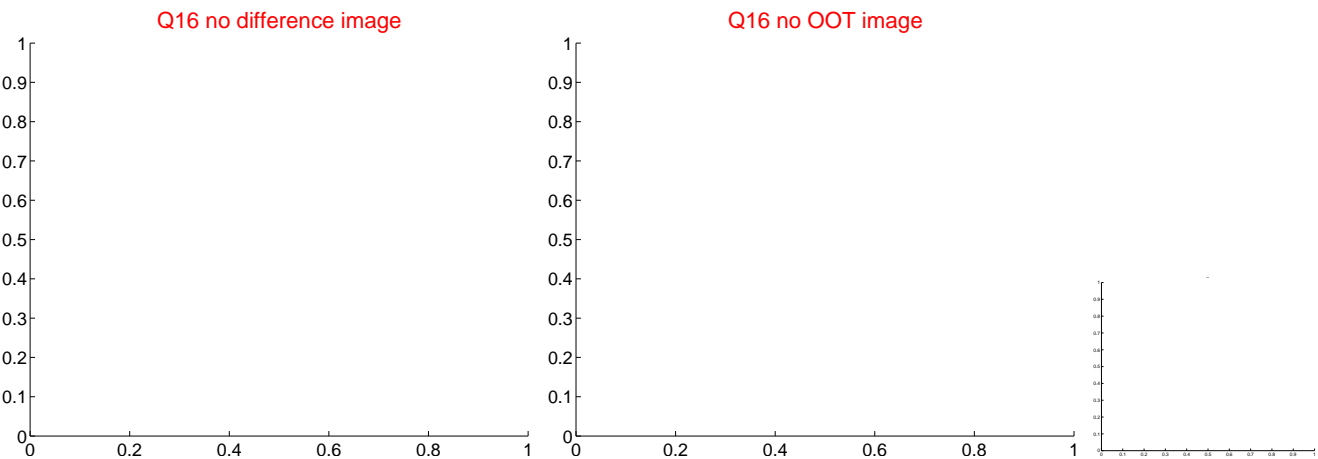
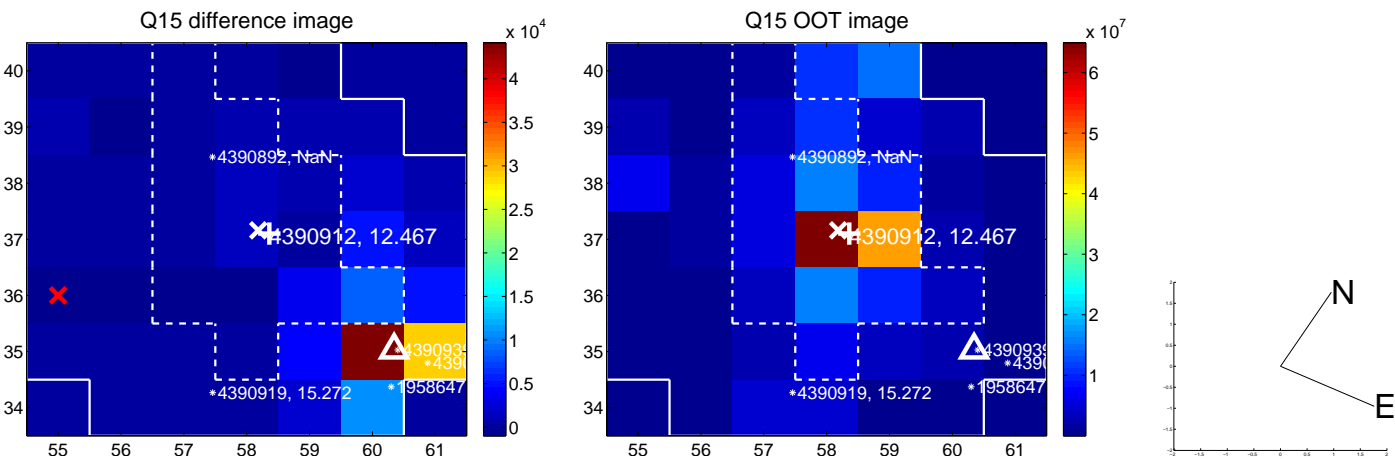
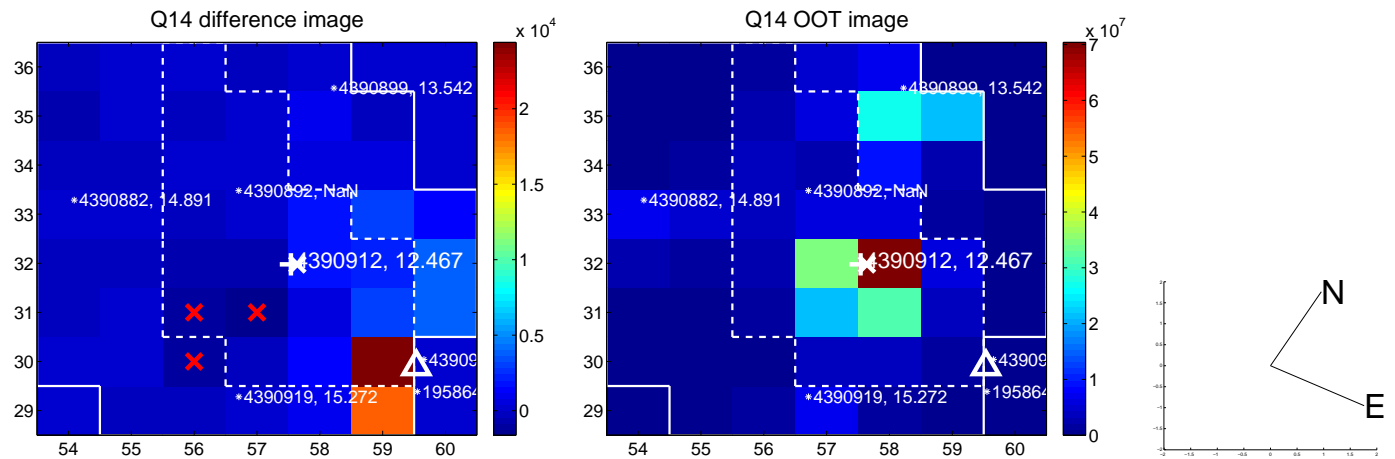
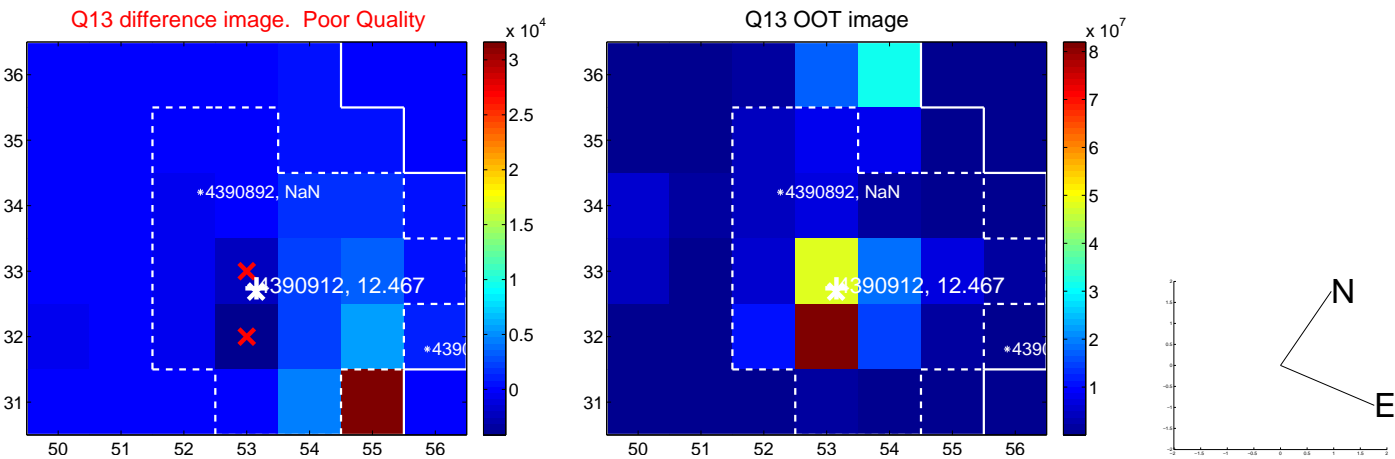
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

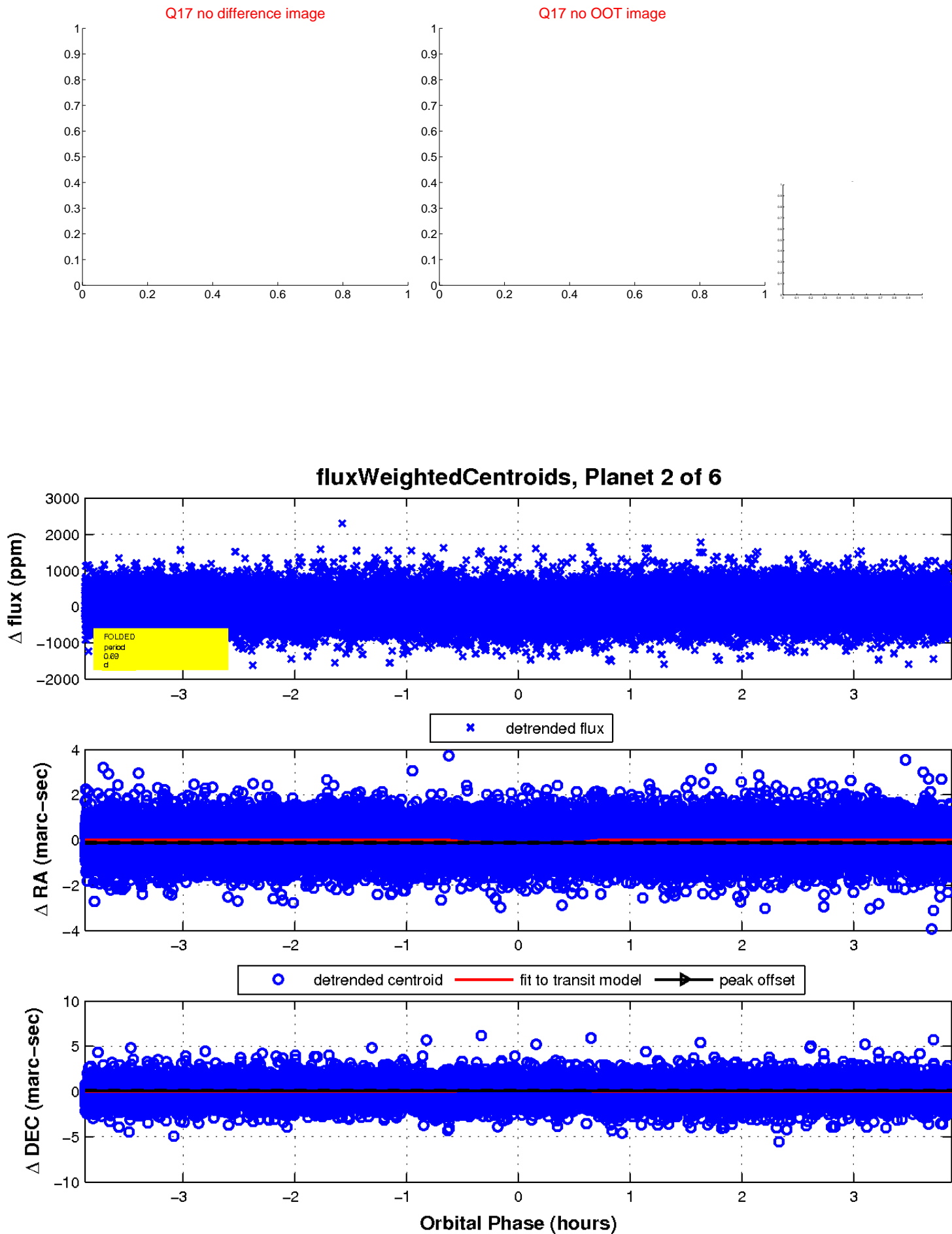


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



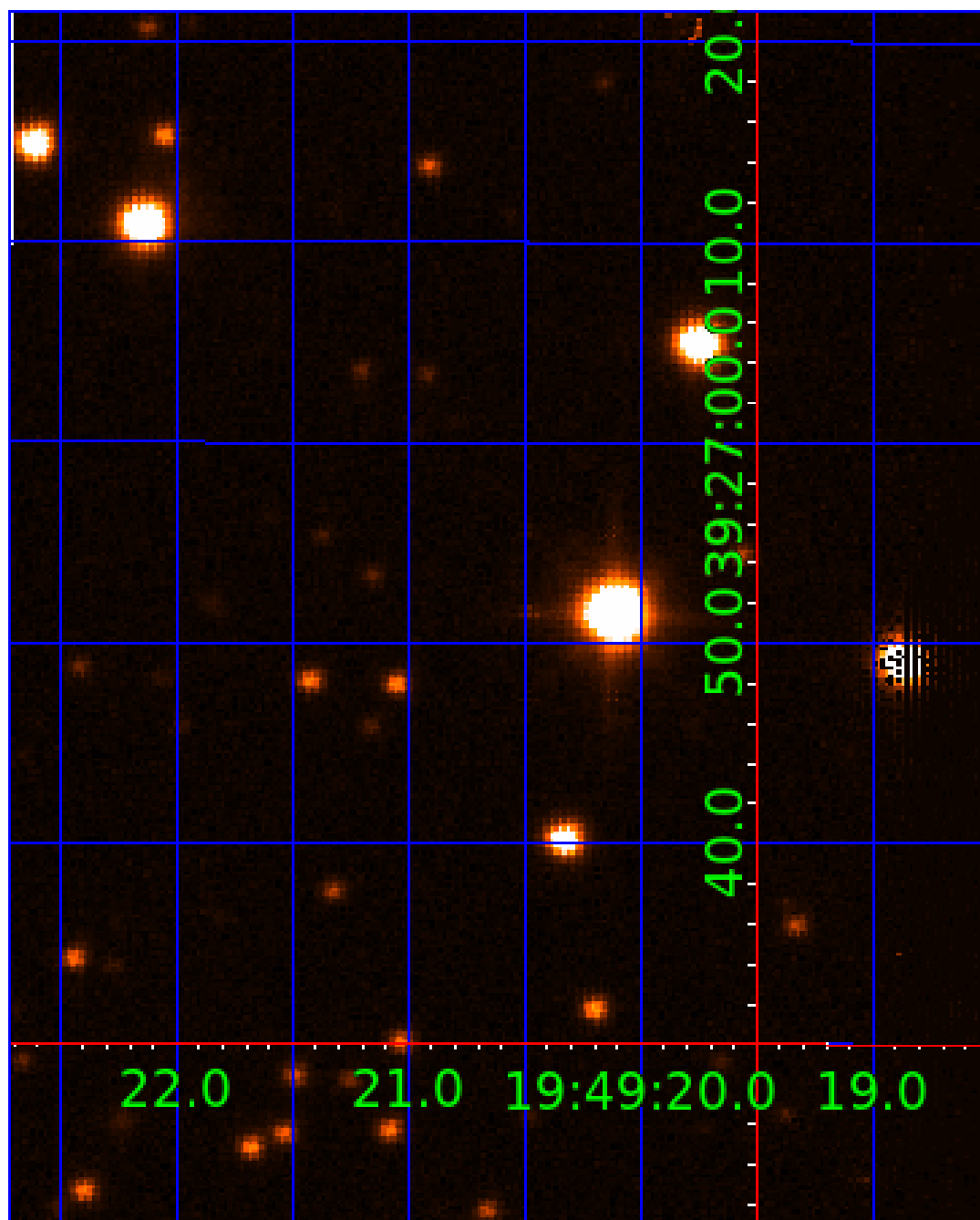


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 004390912

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004390912-01	OBS	7695.01	0.687503	131.866326	77.0	1.102	12.6	16.8	7.91	4643	8.59	0.00
004390912-02	OBS	No	0.687502	131.514369	60.1	1.293	11.5	12.5	7.91	4643	7.65	0.00
004390912-03	OBS	No	228.268812	153.650474	1198.9	3.272	8.4	7.8	7.91	4643	36.88	52.34
004390912-04	OBS	No	151.520908	192.382705	1061.1	2.943	8.2	6.4	7.91	4643	26.75	90.39
004390912-05	OBS	No	213.056315	278.688706	1487.4	3.436	9.2	7.1	7.91	4643	29.26	57.38
004390912-06	OBS	No	240.589536	221.748142	1651.7	7.777	7.7	8.0	7.91	4643	65.02	48.79

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004390912-01	OBS	FP	0.00	1	0	1	0	MOD_NONUNIQ_ALT—CENT_RESOLVED_OFFSET
004390912-02	OBS	FP	0.00	1	0	1	0	MOD_NONUNIQ_ALT—SAME_NTL_PERIOD—CENT_RESOLVED_OFFSET
004390912-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—INCONSISTENT_TRANS
004390912-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—ALL_TRANS_CHASES—INCONSISTENT_TRANS
004390912-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_MARSHALL—TRANS_GAPPED—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_POS_ALT—INCONSISTENT_TRANS
004390912-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT

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

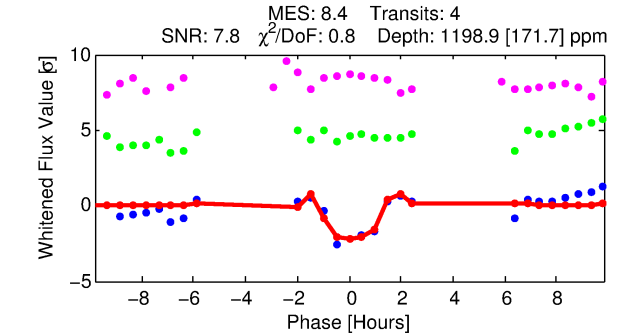
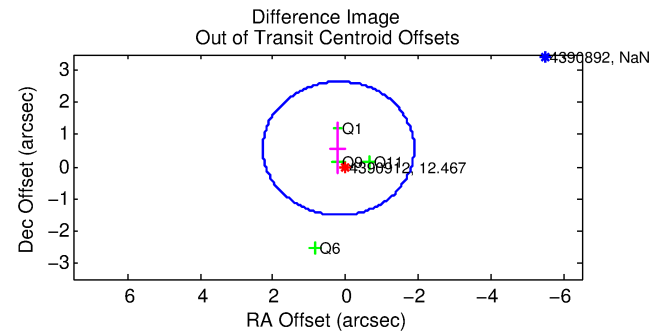
N = Not Transit-Like. S = Stellar Eclipse. C = Centroid Offset. E = Ephemeris Match.

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 004390912-03

No Significant Match Found

KIC: 4390912    Candidate: 3 of 6    Period: 228.269 d

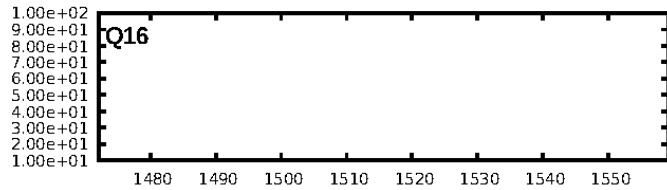
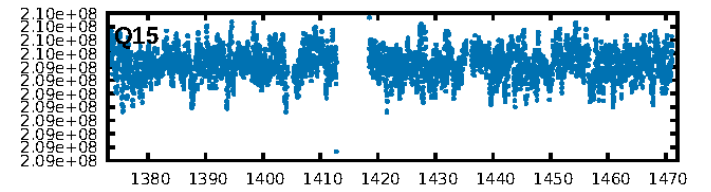
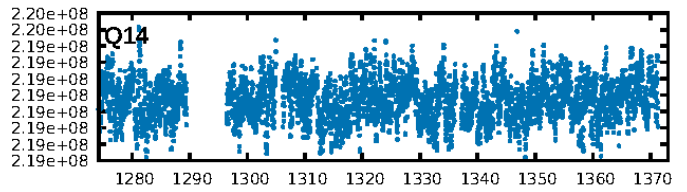
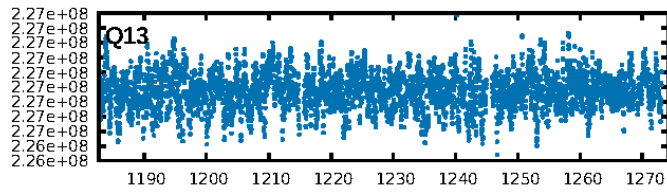
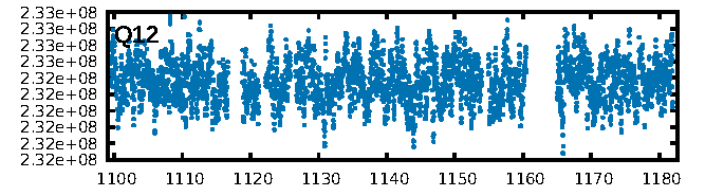
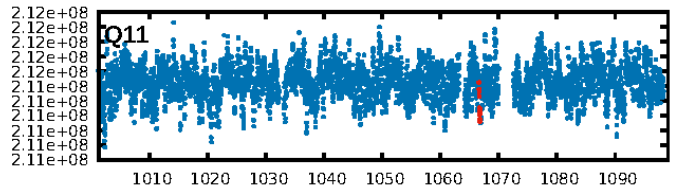
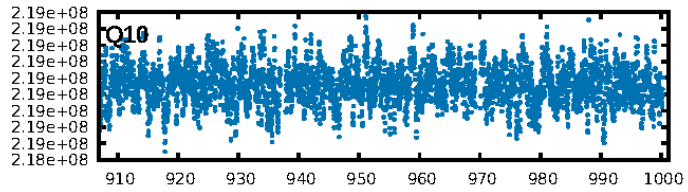
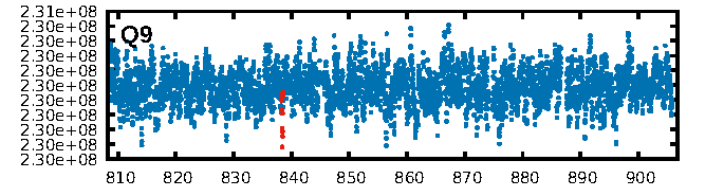
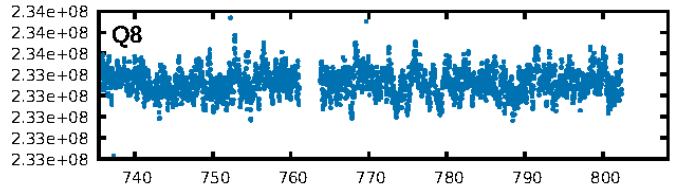
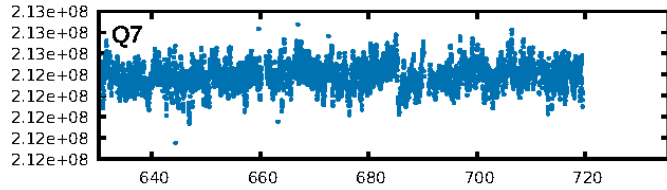
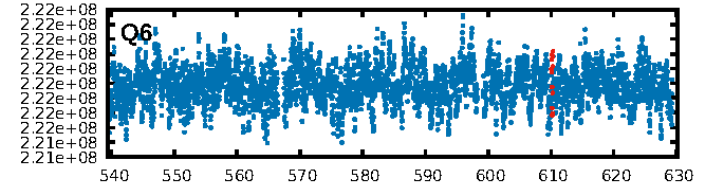
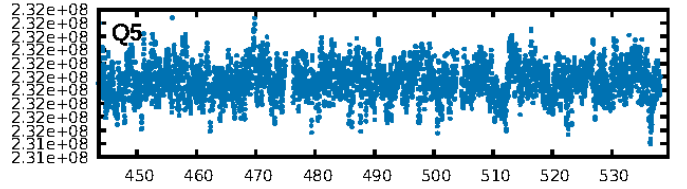
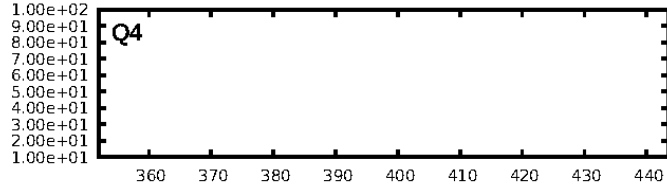
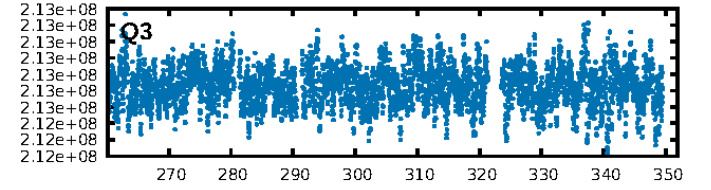
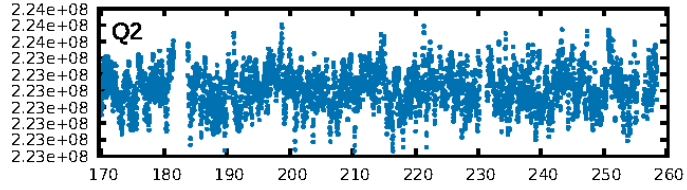
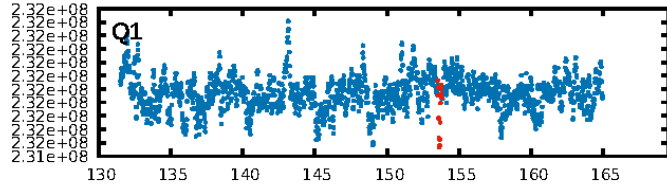


ShortPeriod-sig: 100.0% [76.96σ]  
LongPeriod-sig: 100.0% [35.05σ]  
ModelChiSquare2-sig: 7.4%  
ModelChiSquareGof-sig: 99.4%  
**Bootstrap-pfa: 2.82e-11**  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: 2.883

**Centroid-sig: 0.0%**  
Centroid-so: 0.509 arcsec [1.16σ]  
OotOffset-rm: 0.599 arcsec [0.86σ]  
KicOffset-rm: 0.716 arcsec [1.03σ]  
OotOffset-st: 1/1/0/2 [4]  
KicOffset-st: 1/1/0/2 [4]  
DiffImageQuality-fgm: 1.00 [4/4]  
DiffImageOverlap-fno: 0.00 [0/4]

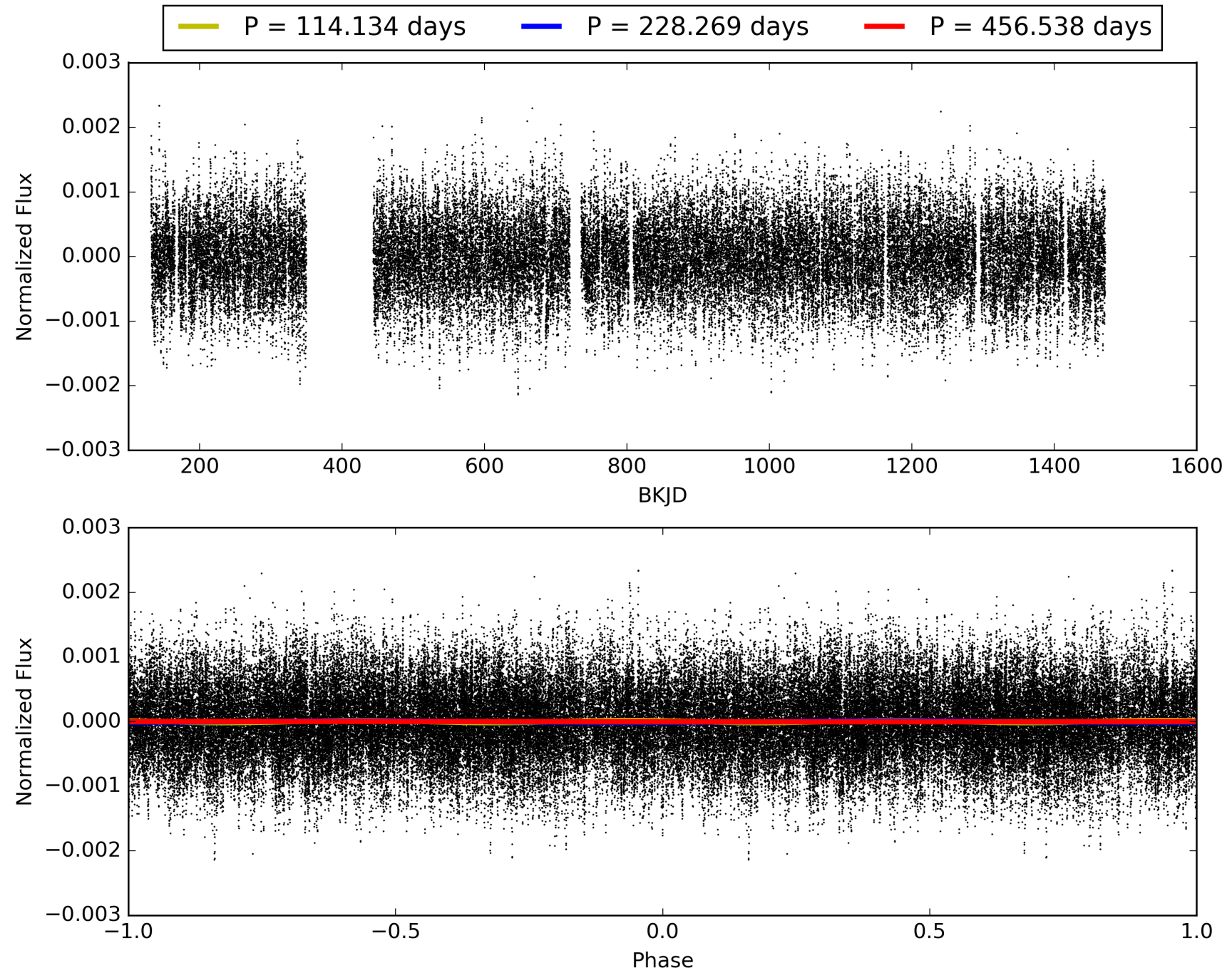
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

## TCE 004390912-03, PDC Light Curves



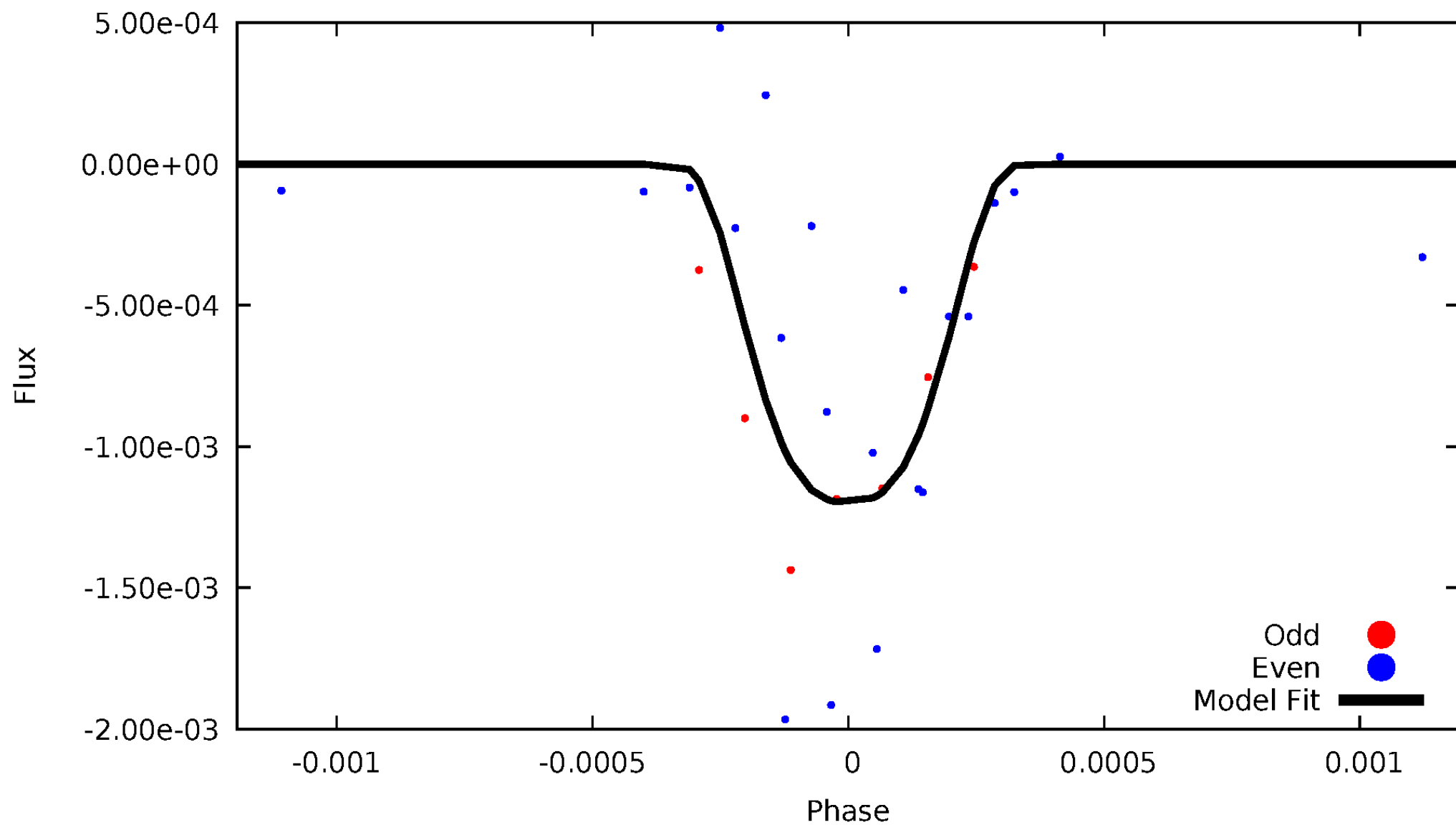


TCE 004390912-03



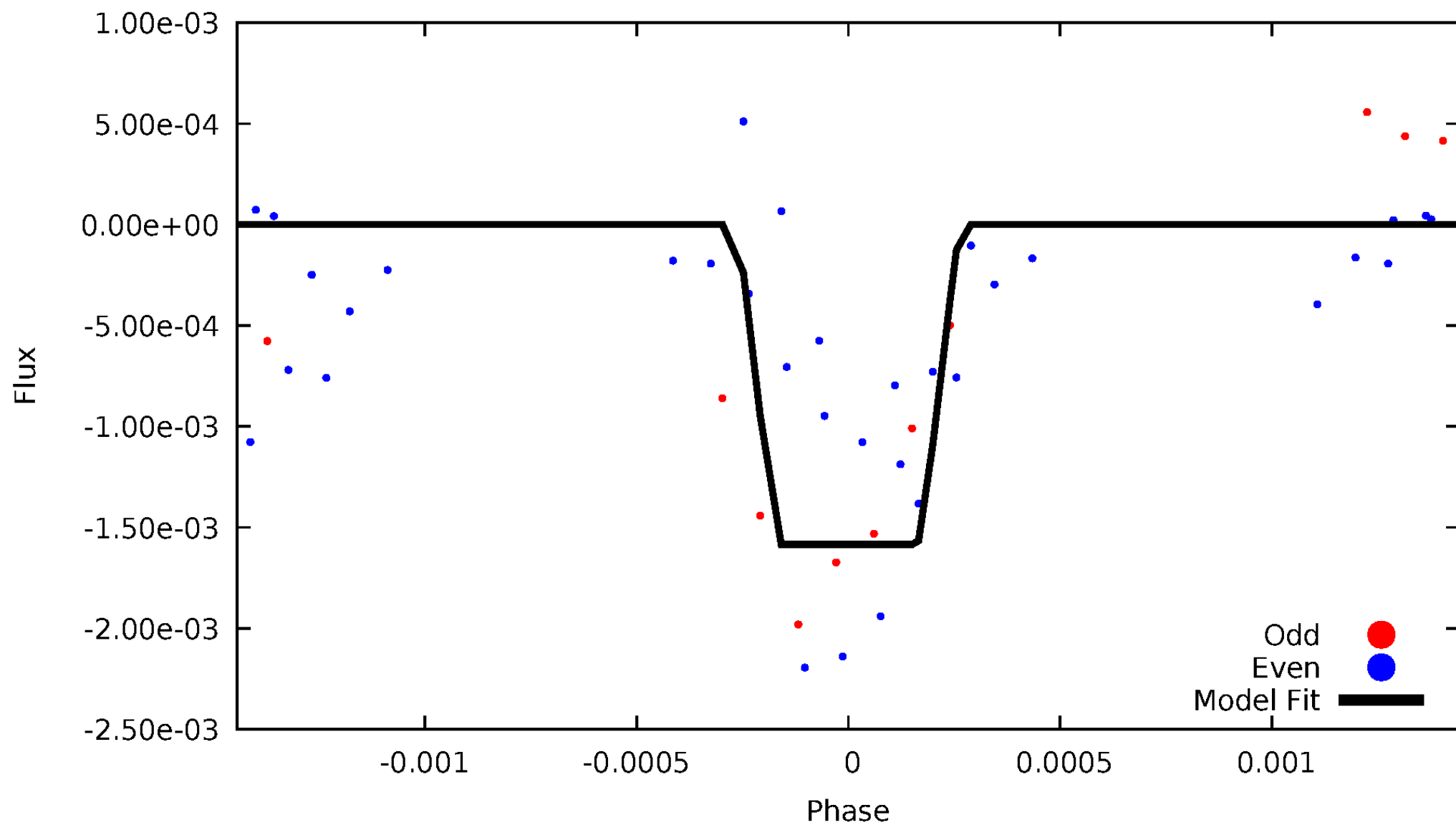
# DV Odd/Even

TCE 004390912-03



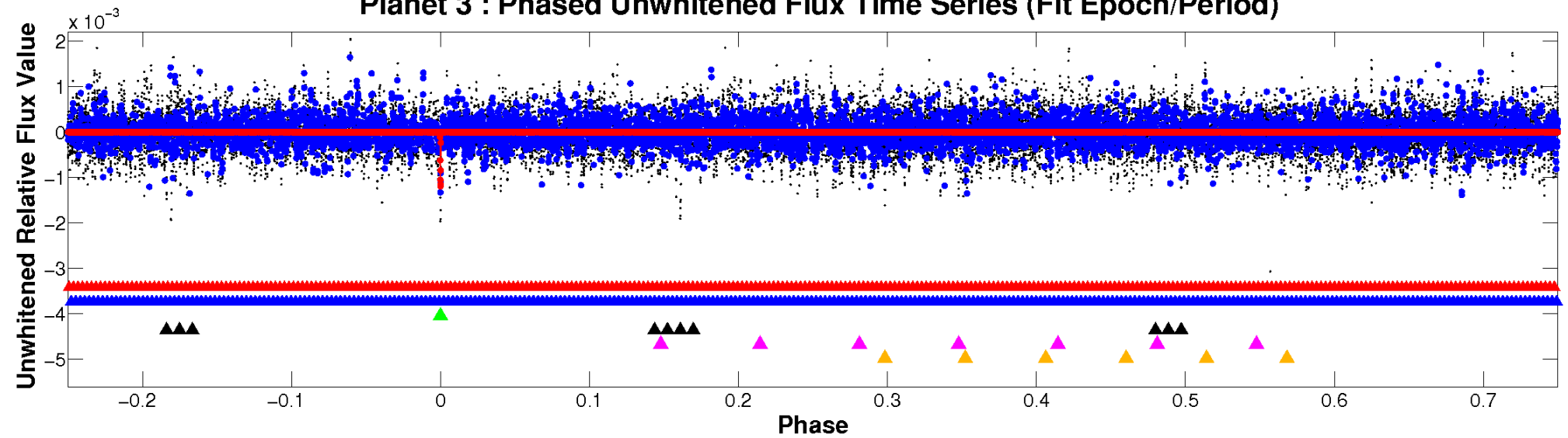
# ALT Odd/Even

TCE 004390912-03

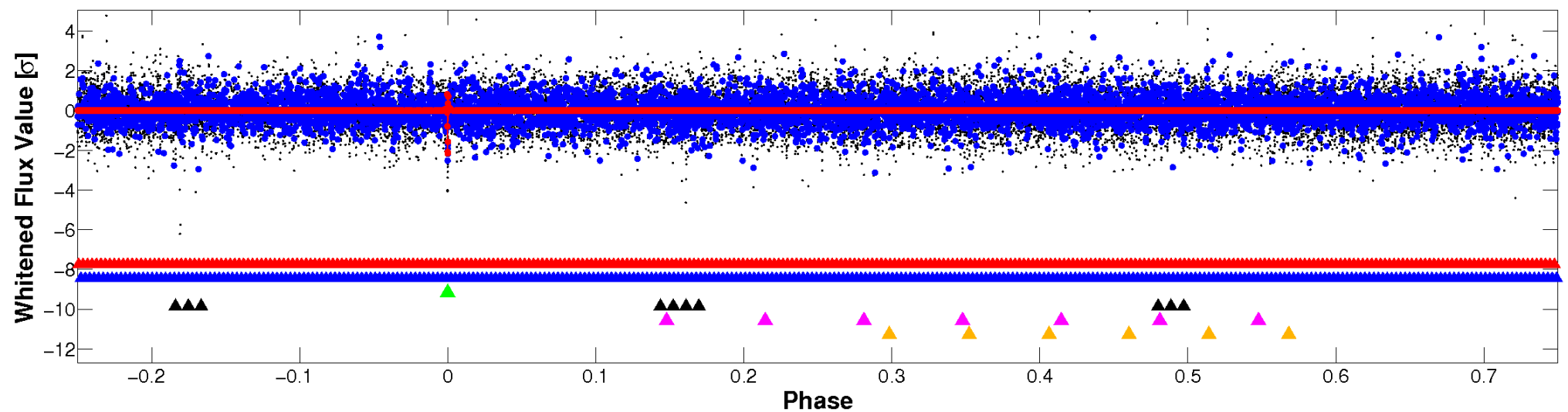


# Non-Whitened Vs. Whitened Light Curve

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

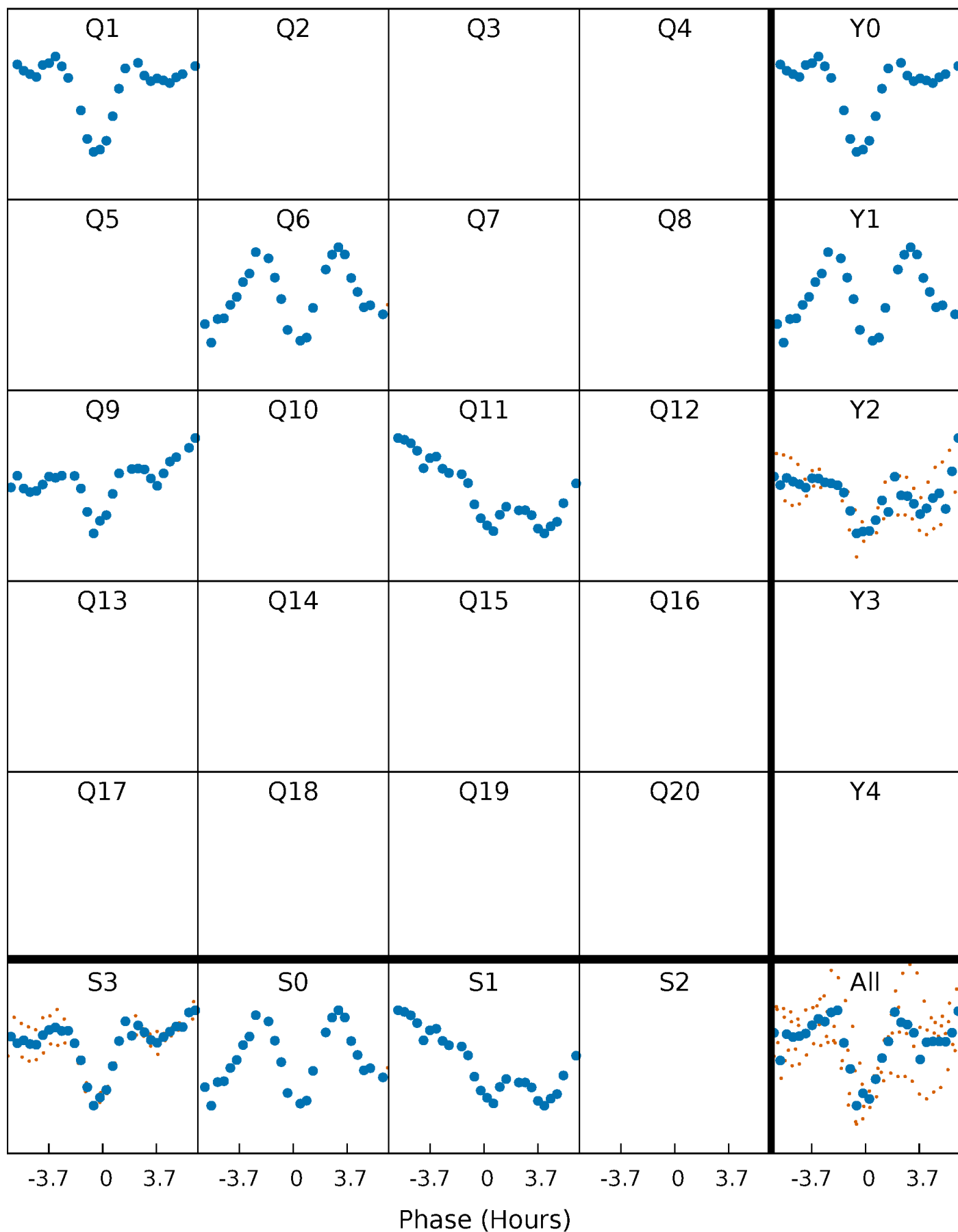


## Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



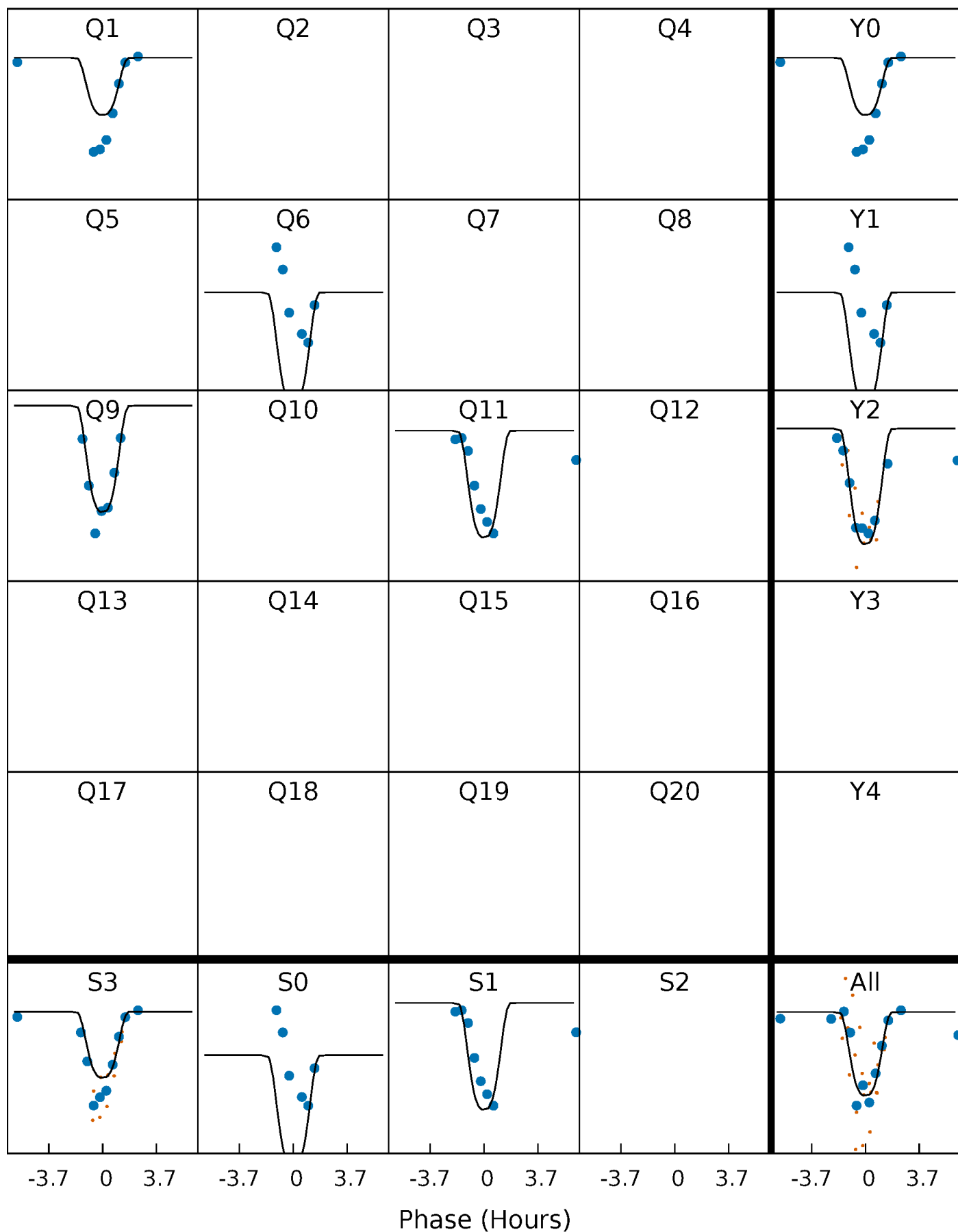
# PDC Quarter-Phased Transit Curves

TCE 004390912-03     $P=228.268812$  Days     $T_0=153.650474$  (BKJD)



# DV Quarter-Phased Transit Curves

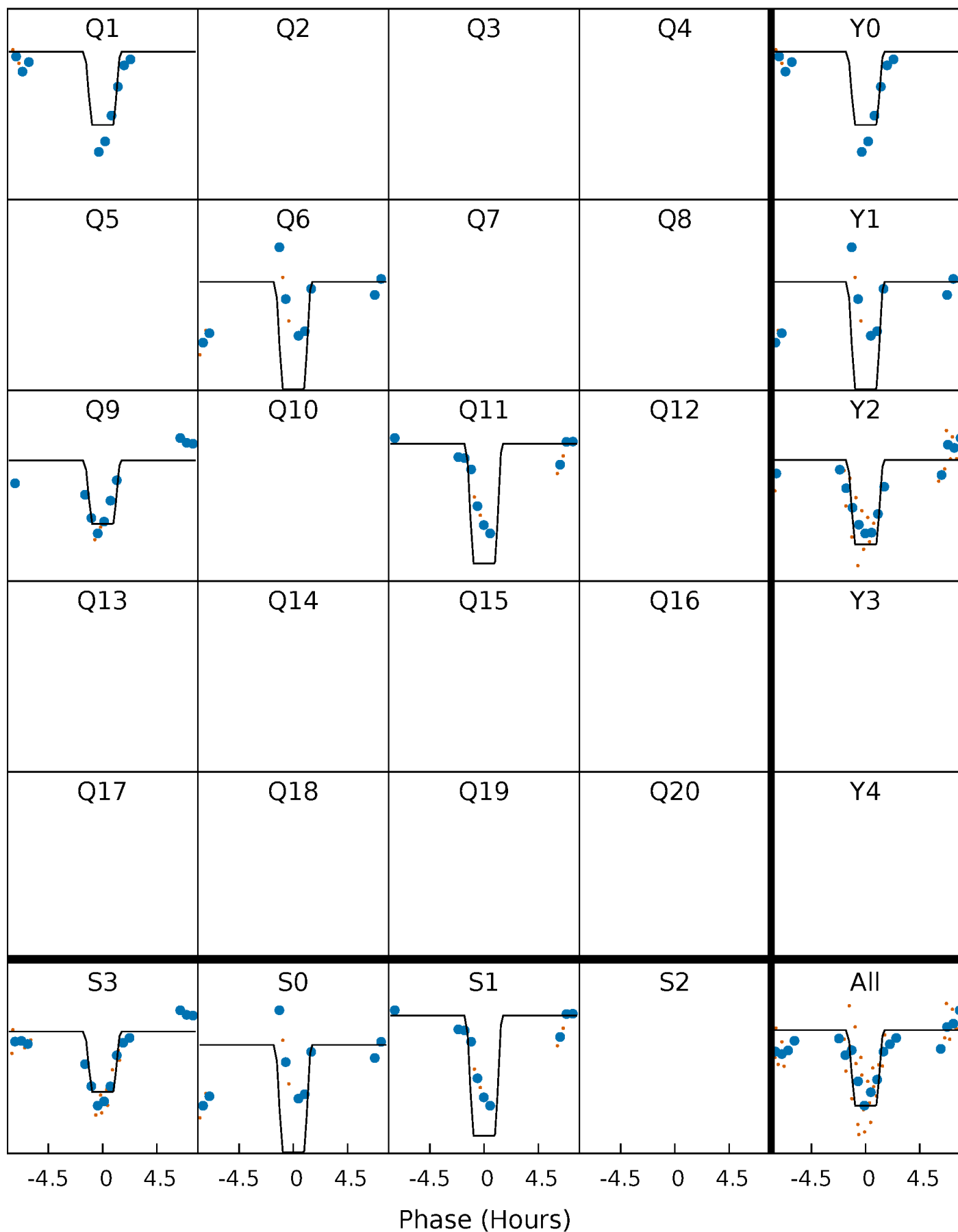
TCE 004390912-03 P=228.268812 Days  $T_0=153.650474$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

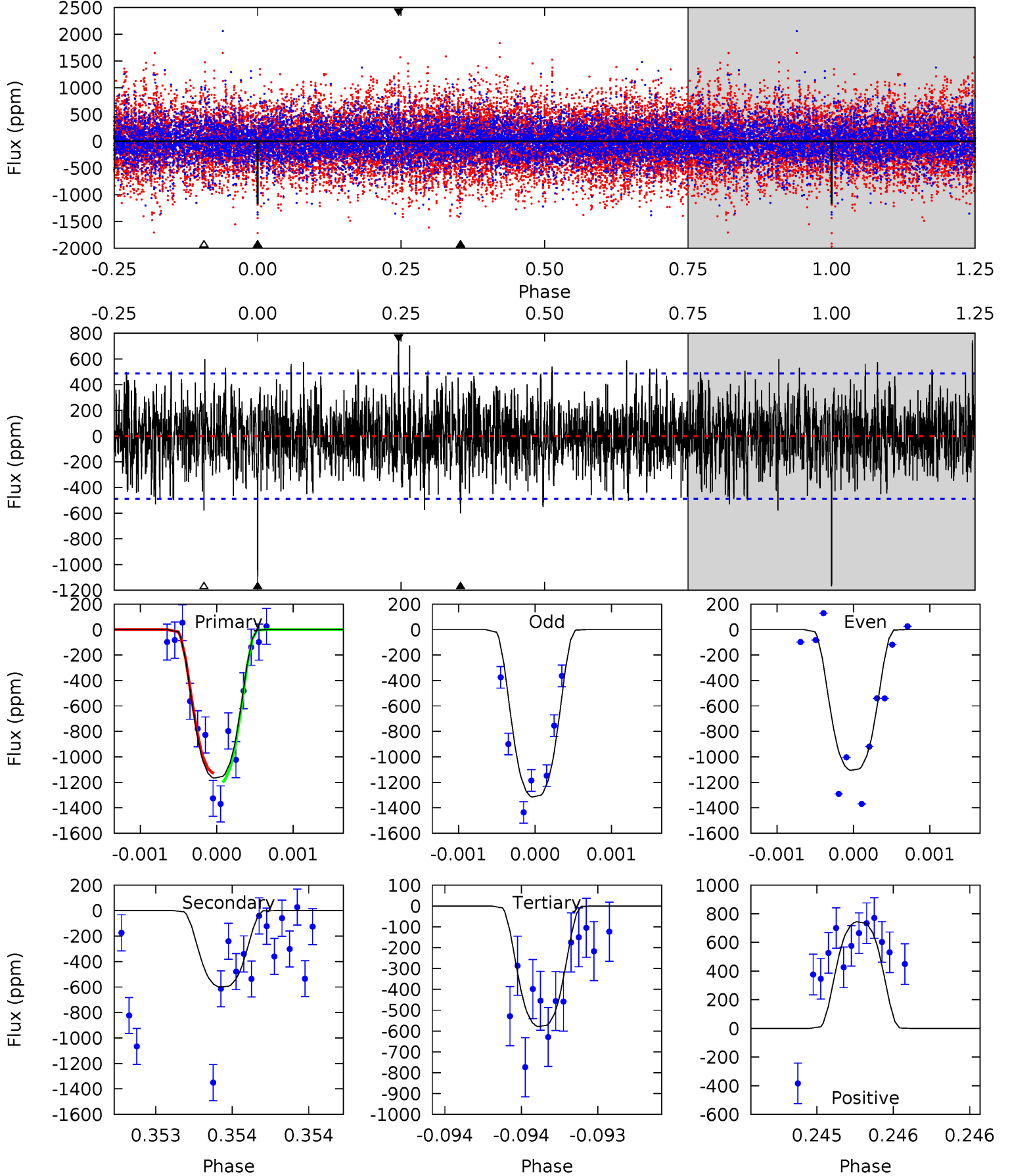
TCE 004390912-03 P=228.270793 Days  $T_0=153.645817$  (BKJD)



# DV Model-Shift Uniqueness Test

004390912-03, P = 228.268812 Days, E = 153.650474 Days

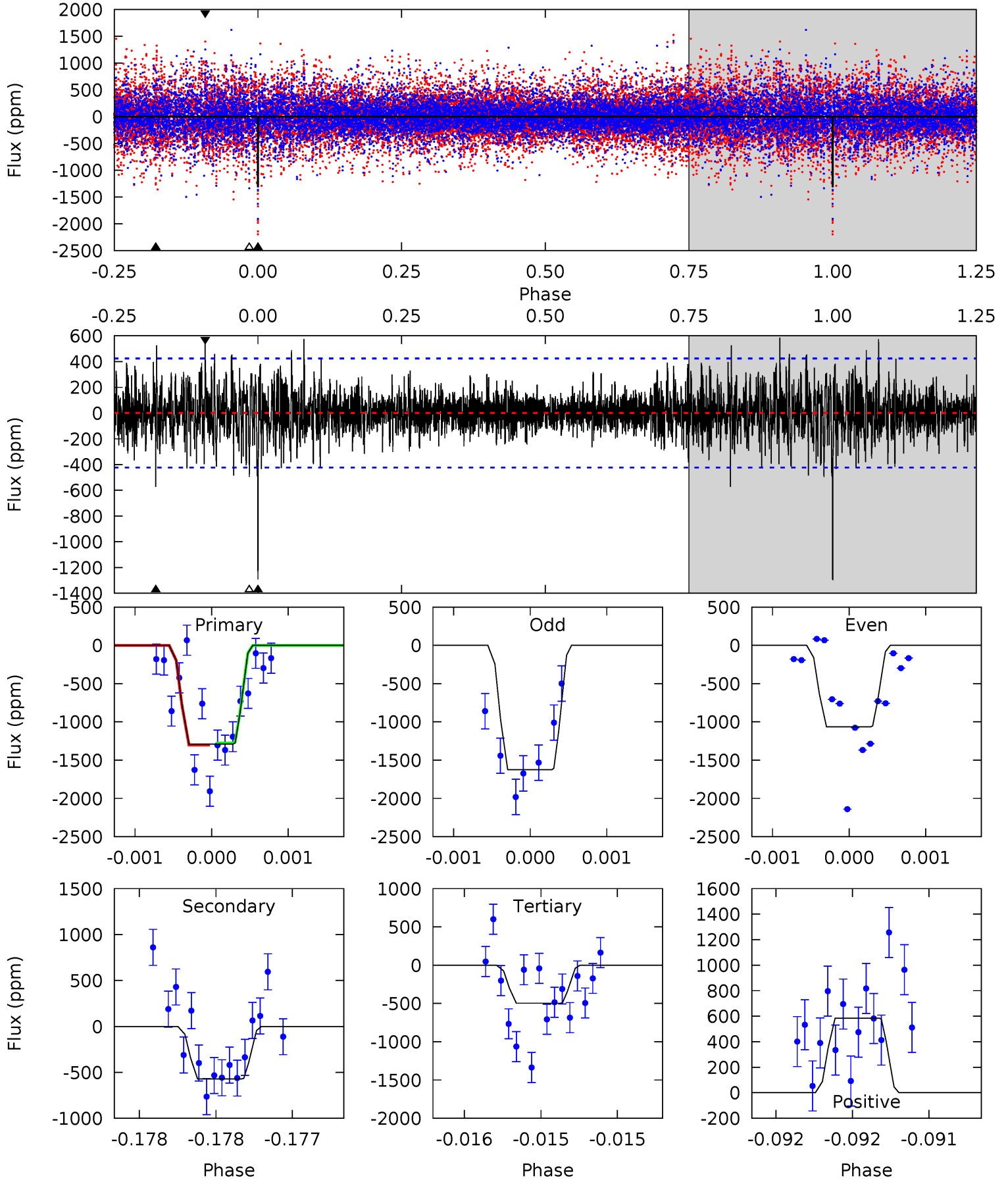
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
13.3	6.82	6.57	8.45	5.54	3.42	2.11	6.68	4.80	0.25	-1.63	1.06	0.96	0.39	0.40



# Alt Model-Shift Uniqueness Test

004390912-03, P = 228.270793 Days, E = 153.645817 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
17.0	7.51	6.53	7.69	5.56	3.46	1.65	10.4	9.28	0.99	-0.17	3.38	0.97	0.31	0.18



### Stellar Parameters For KIC 004390912

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$4643^{+55}_{-55}$	$2.595^{+0.024}_{-0.033}$	$-0.180^{+0.150}_{-0.100}$	$7.906^{+1.325}_{-0.221}$	$0.898^{+0.268}_{-0.015}$	$0.003^{+0.000}_{-0.000}$
	+1%/-1%	+1%/-1%	+83%/-56%	+17%/-3%	+30%/-2%	+7%/-19%
Source	SPE68	AST9	SPE68	DSEP		

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

### Secondary Eclipse Parameters for KIC 004390912-03 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-600 \pm 88$	$37.17^{+3.85}_{-3.62}$	$958^{+16}_{-15}$	$3775^{+159}_{-149}$	$120^{+31}_{-25}$
Alt.	$-572 \pm 76$	$34.70^{+3.78}_{-3.65}$	$958^{+20}_{-14}$	$3842^{+185}_{-145}$	$132^{+40}_{-28}$

$T_{\text{max}}$  = 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

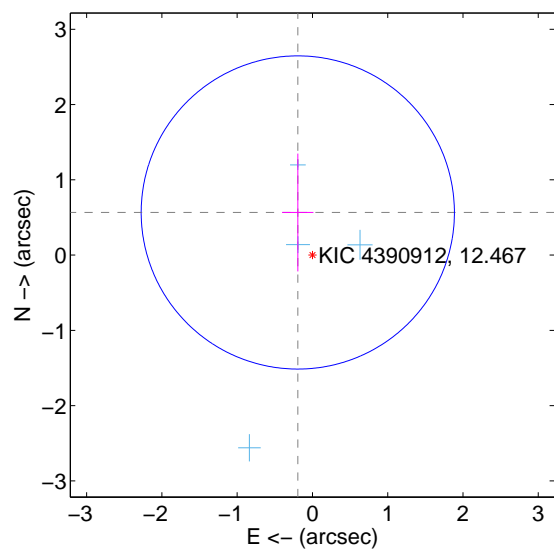
Supplemental centroid analysis for 004390912-03. Kepler magnitude: 12.47. Transit SNR 7.84

There are 4 quarters with good PRF difference image offsets

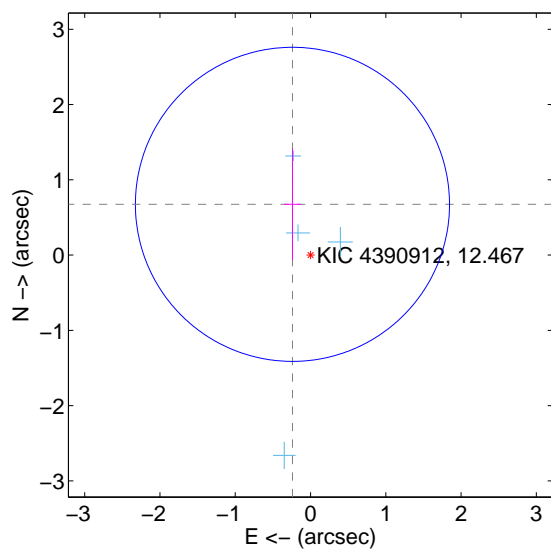
The direct PRF centroid is offset from the target star catalog position by about 0.24 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.599 \pm 0.694$	0.86	$0.195 \pm 0.208$	$0.566 \pm 0.783$
PRF-fit source offset from KIC position	$0.716 \pm 0.696$	1.03	$0.240 \pm 0.113$	$0.674 \pm 0.737$
photometric centroid source offset	$0.51 \pm 0.44$	1.16	$0.51 \pm 0.44$	$0.05 \pm 0.63$

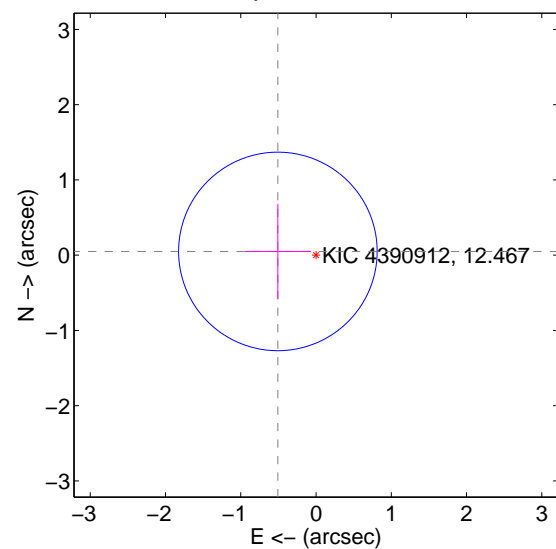
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position



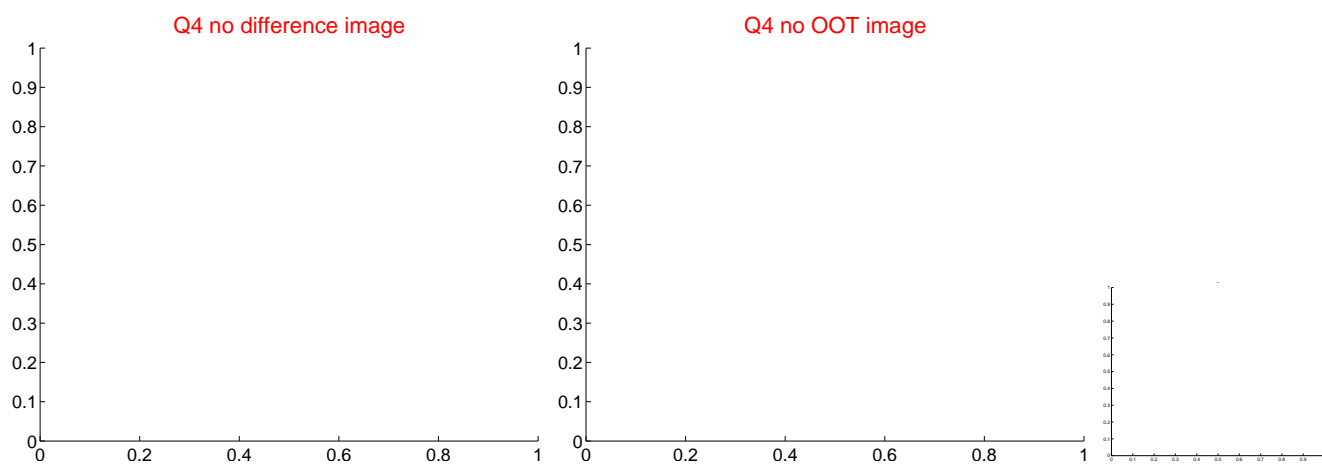
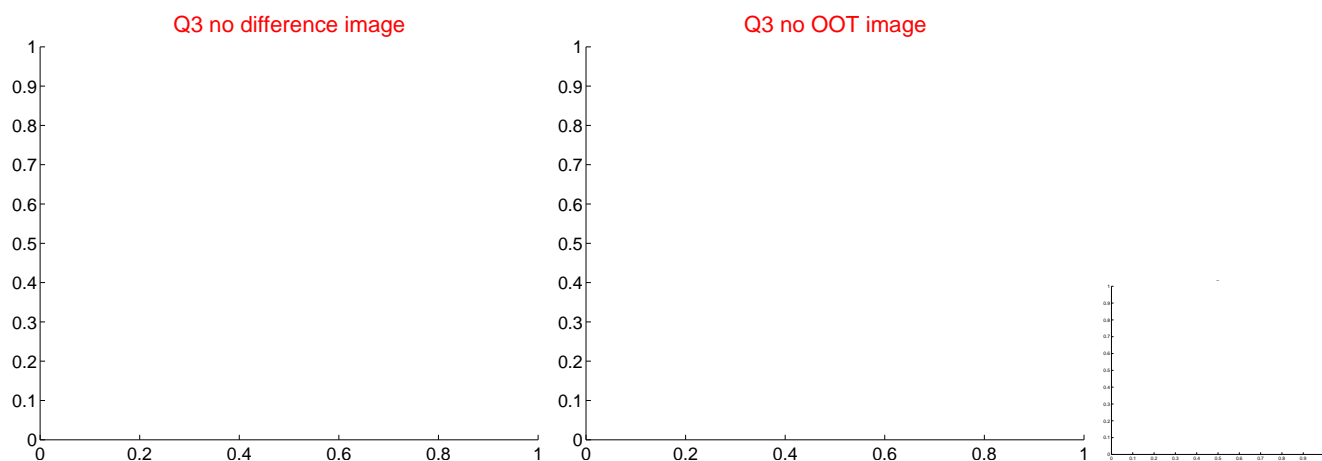
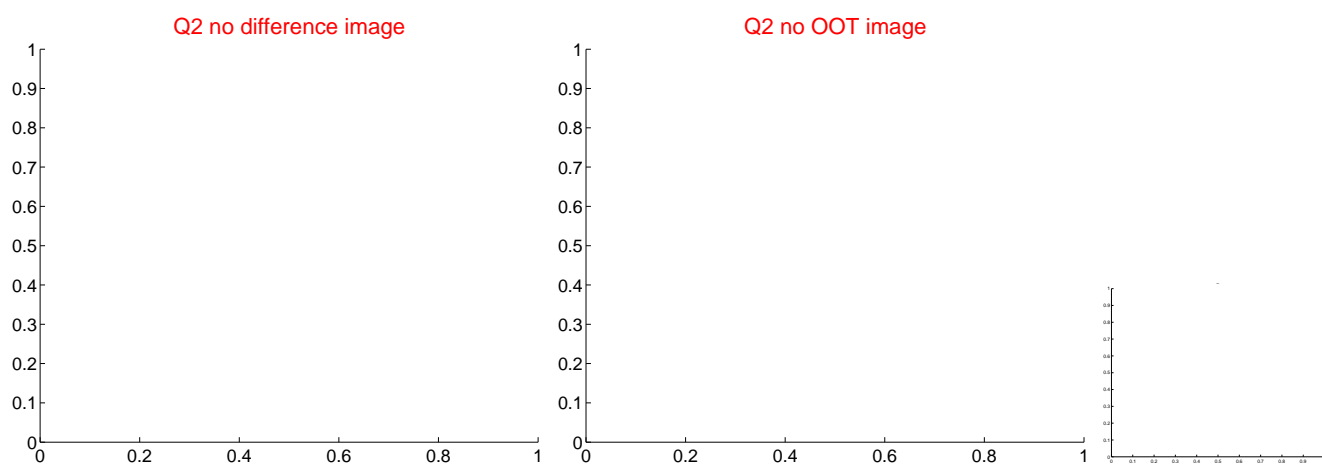
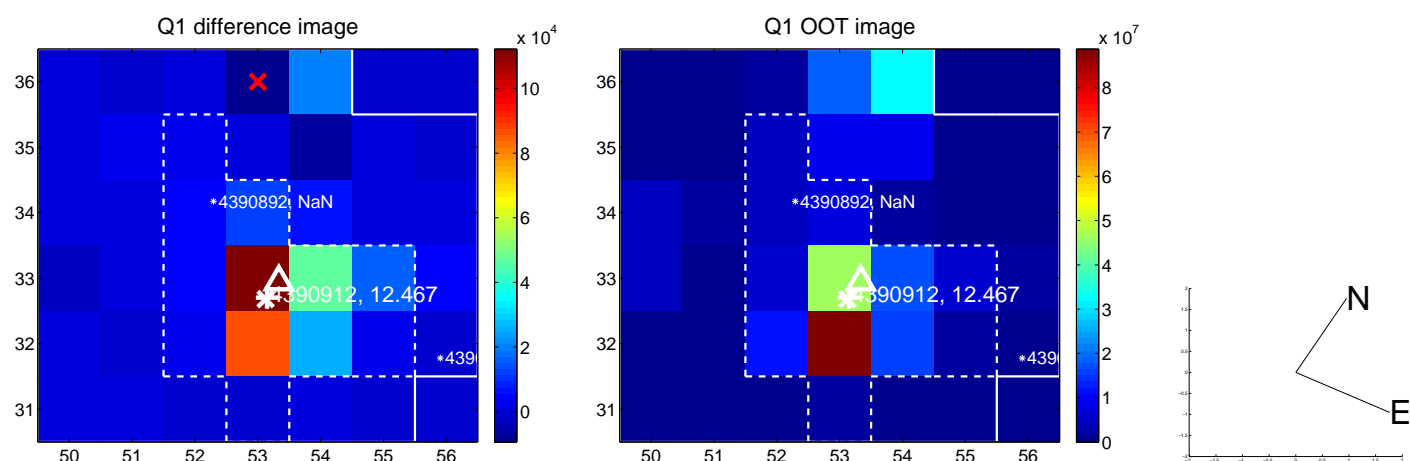
offset from photometric centroids



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.

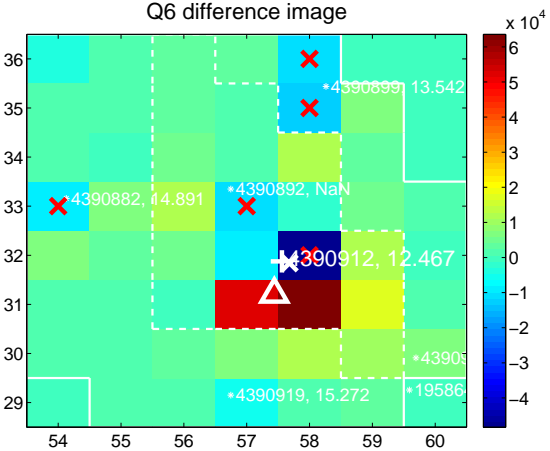
Q5 no difference image



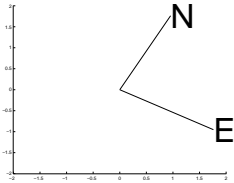
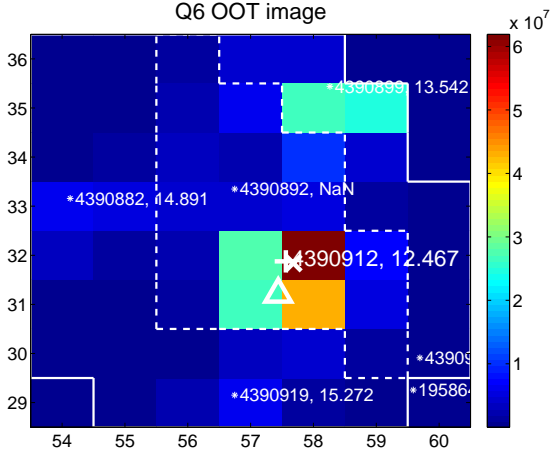
Q5 no OOT image



Q6 difference image



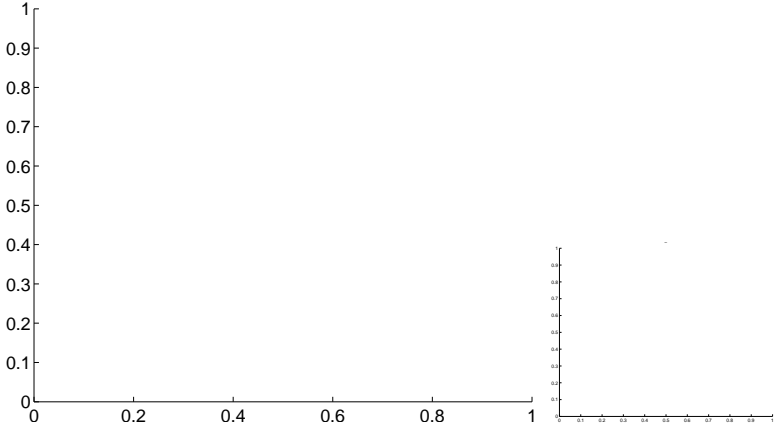
Q6 OOT image



Q7 no difference image



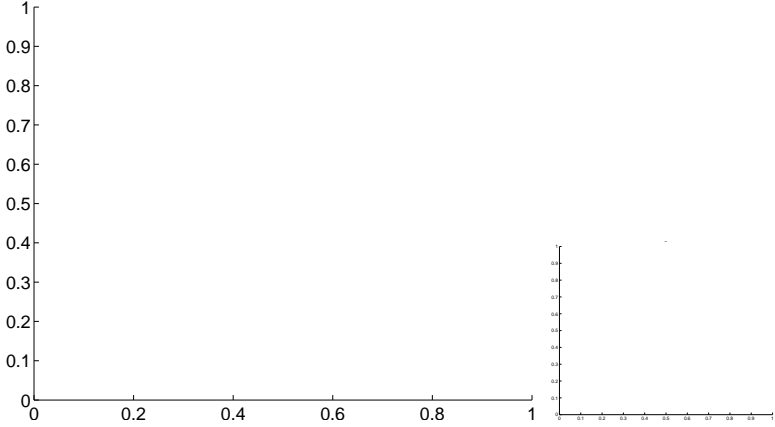
Q7 no OOT image



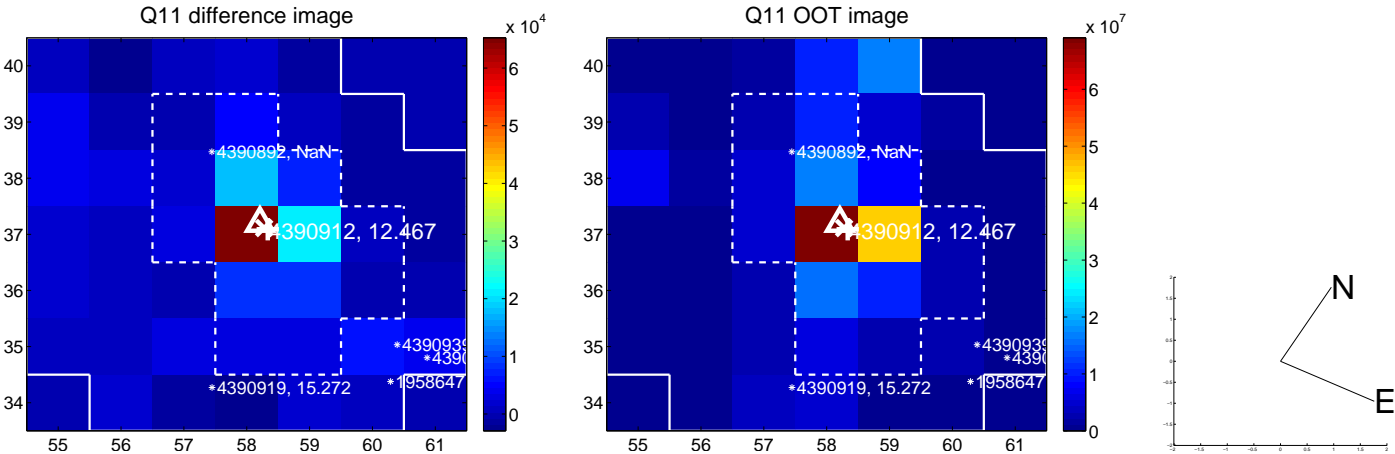
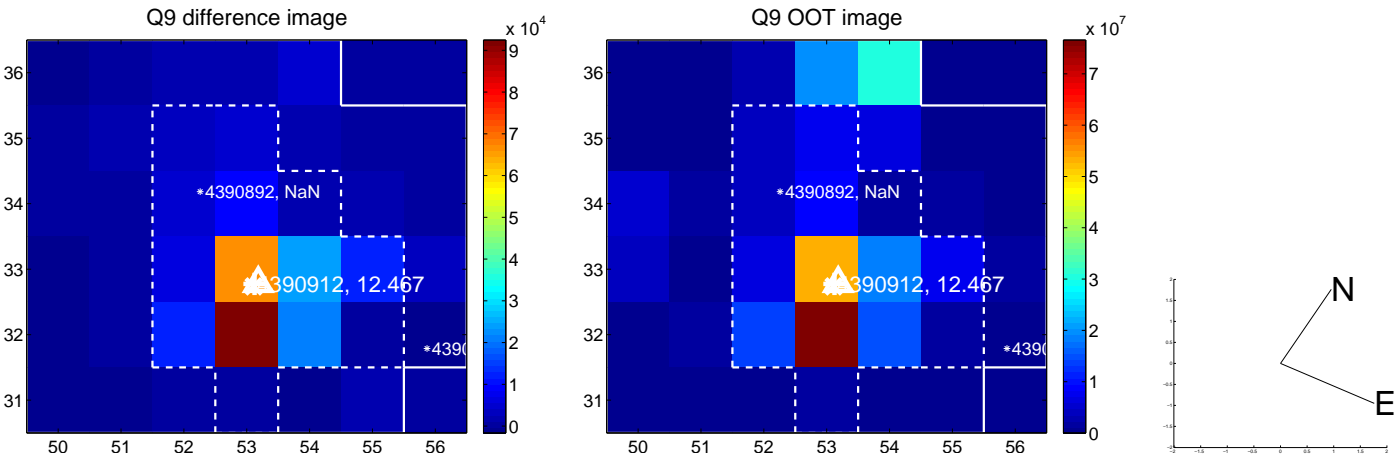
Q8 no difference image



Q8 no OOT image



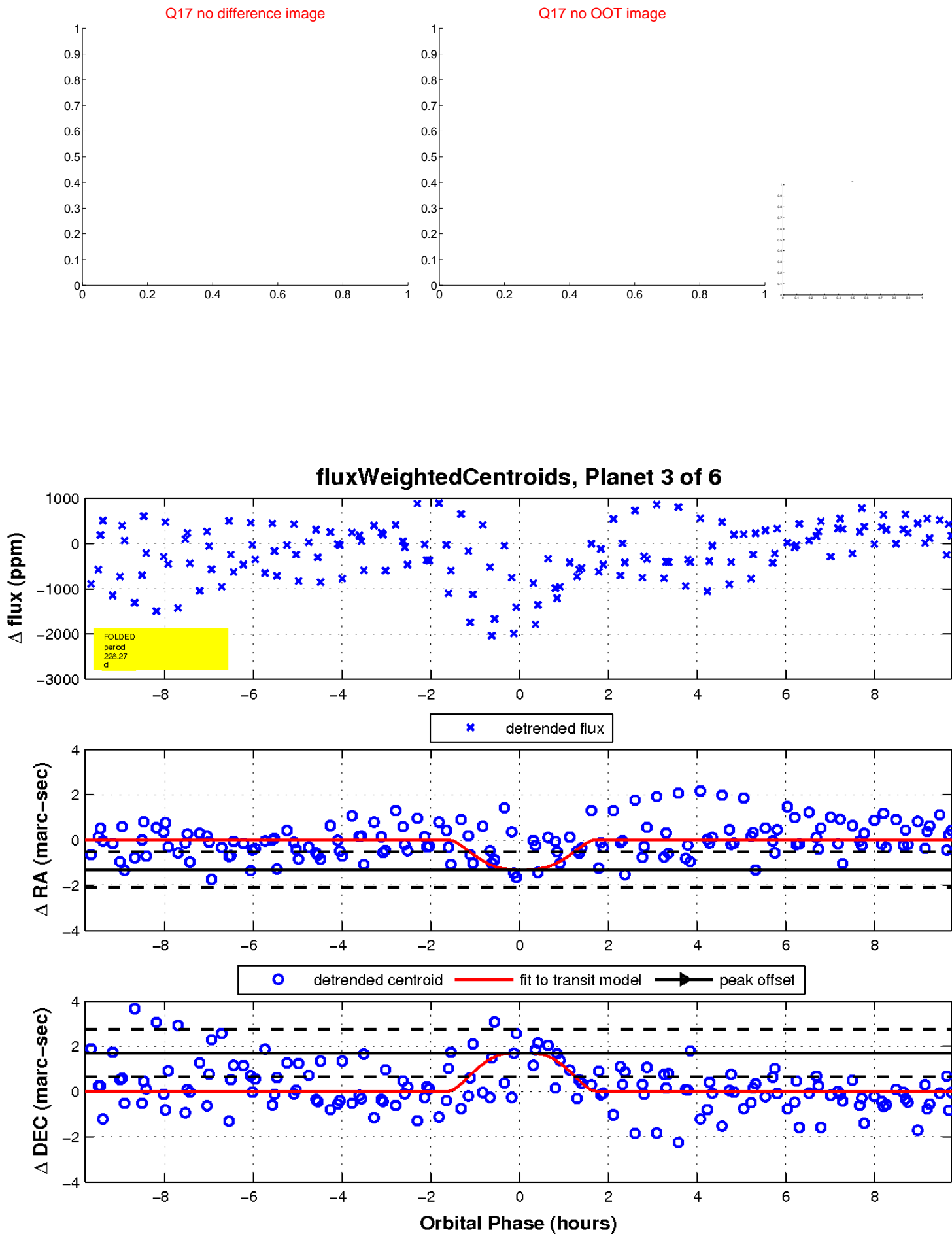
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



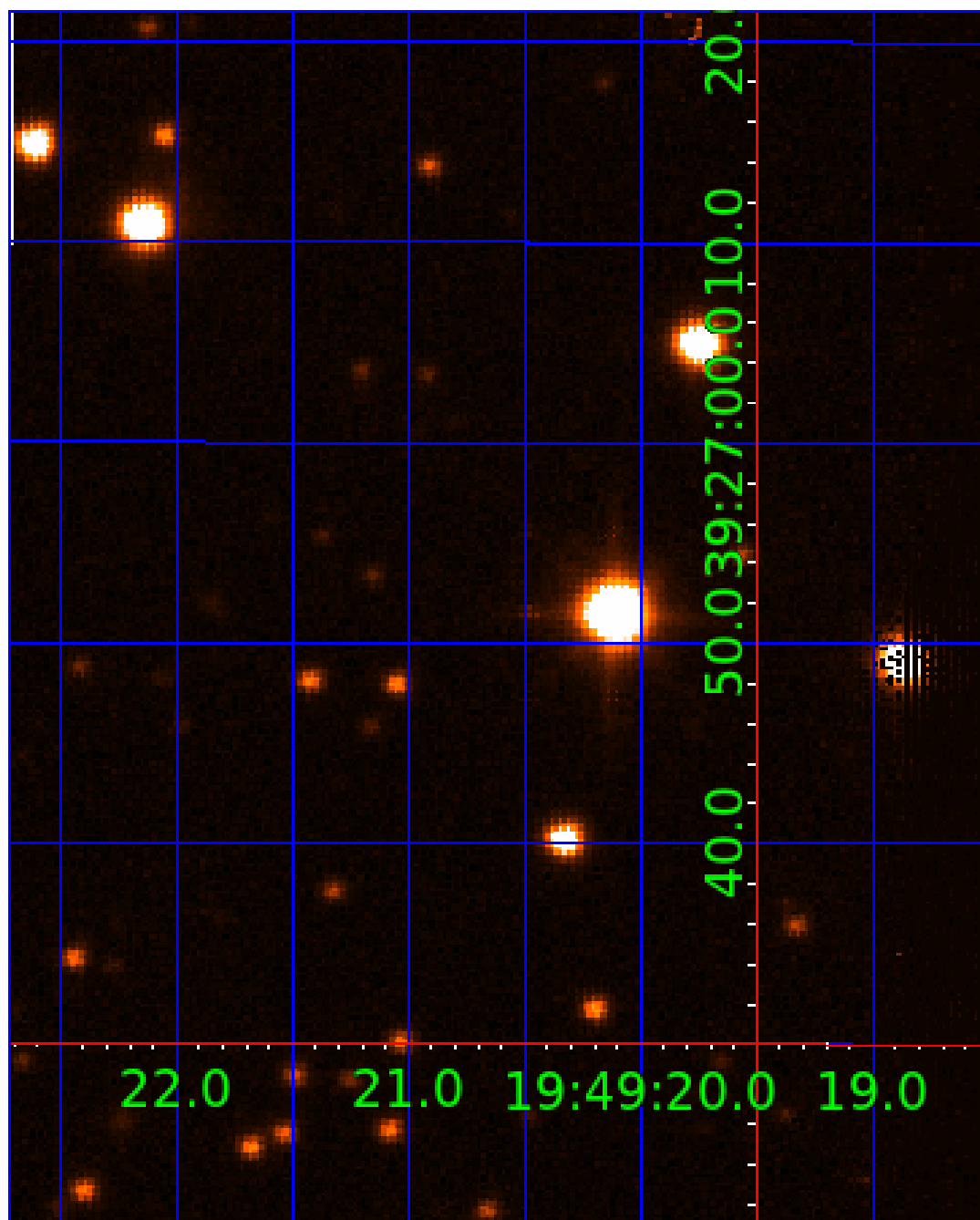
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





UKIRT Image

Declination



# KIC 004390912

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004390912-01	OBS	7695.01	0.687503	131.866326	77.0	1.102	12.6	16.8	7.91	4643	8.59	0.00
004390912-02	OBS	No	0.687502	131.514369	60.1	1.293	11.5	12.5	7.91	4643	7.65	0.00
004390912-03	OBS	No	228.268812	153.650474	1198.9	3.272	8.4	7.8	7.91	4643	36.88	52.34
004390912-04	OBS	No	151.520908	192.382705	1061.1	2.943	8.2	6.4	7.91	4643	26.75	90.39
004390912-05	OBS	No	213.056315	278.688706	1487.4	3.436	9.2	7.1	7.91	4643	29.26	57.38
004390912-06	OBS	No	240.589536	221.748142	1651.7	7.777	7.7	8.0	7.91	4643	65.02	48.79

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004390912-01	OBS	FP	0.00	1	0	1	0	MOD_NONUNIQ_ALT—CENT_RESOLVED_OFFSET
004390912-02	OBS	FP	0.00	1	0	1	0	MOD_NONUNIQ_ALT—SAME_NTL_PERIOD—CENT_RESOLVED_OFFSET
004390912-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—INCONSISTENT_TRANS
004390912-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—ALL_TRANS_CHASES—INCONSISTENT_TRANS
004390912-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_MARSHALL—TRANS_GAPPED—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_POS_ALT—INCONSISTENT_TRANS
004390912-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT

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

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

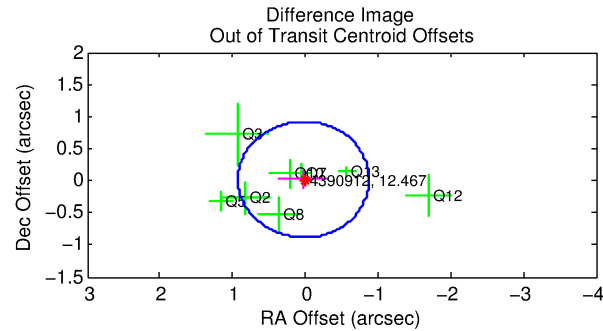
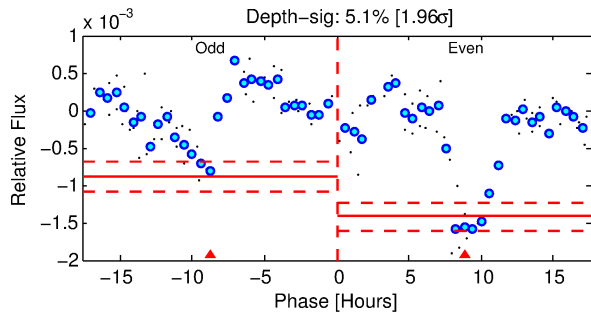
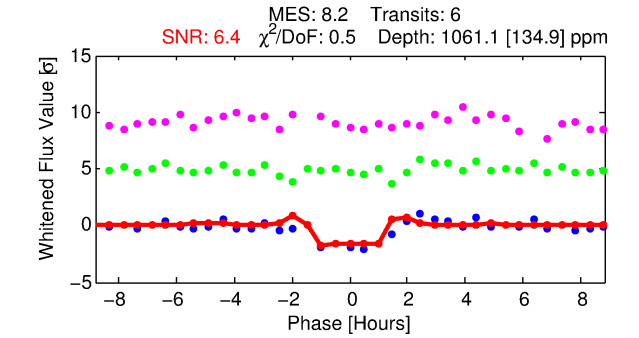
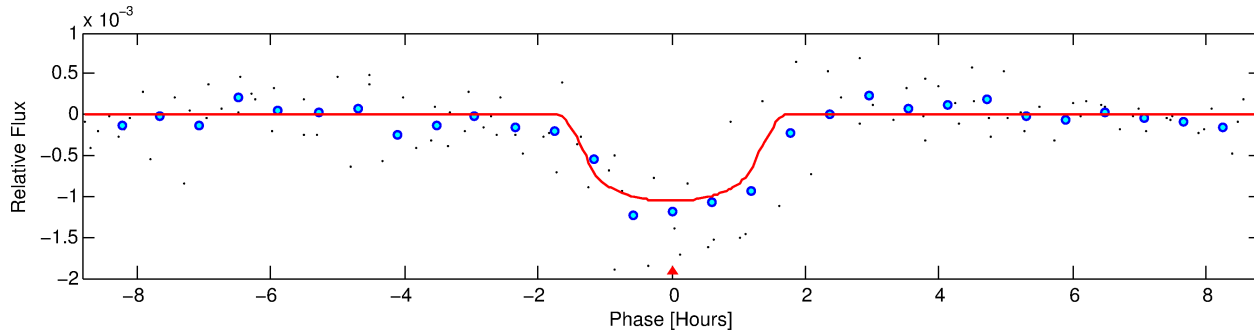
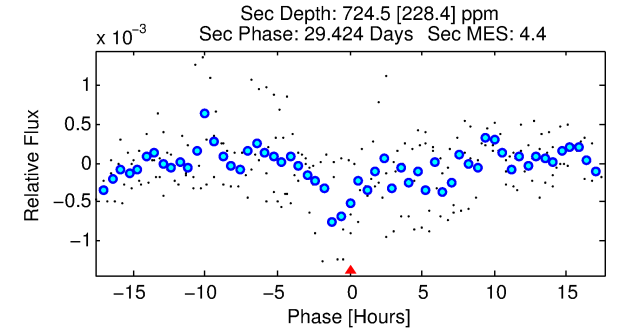
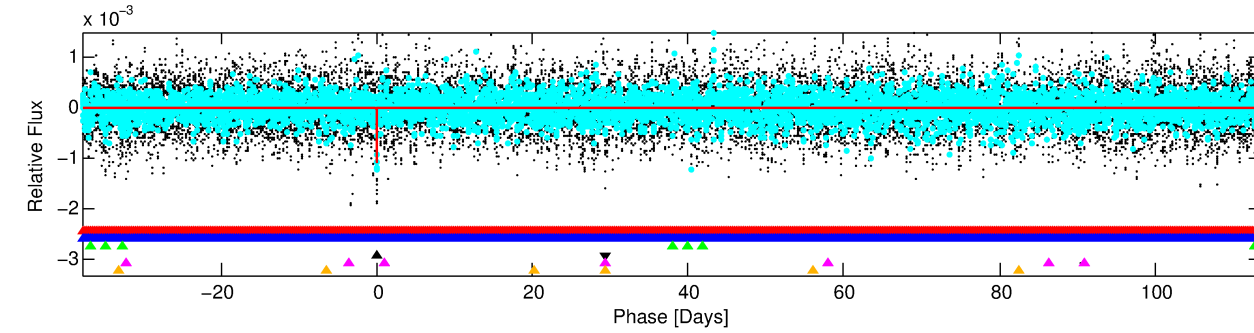
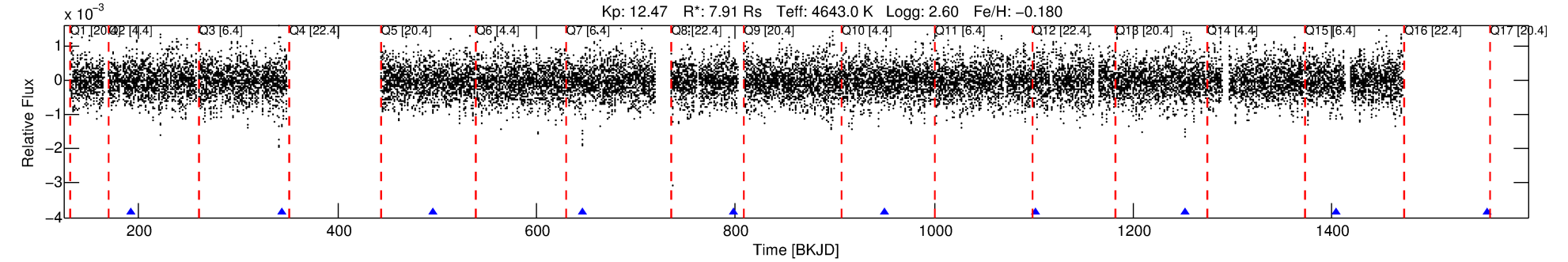
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 004390912-04

No Significant Match Found

# DV One-Page Summary

KIC: 4390912 Candidate: 4 of 6 Period: 151.521 d



## DV Fit Results:

Period = 151.52091 [0.00125] d  
Epoch = 192.3827 [0.0053] BKJD  
Rp/R\* = 0.0310 [0.0315]  
a/R\* = 322.64 [1033.78]  
b = 0.62 [3.24]  
Seff = 90.39 [11.89]  
Teq = 786 [26] K  
Rp = 26.75 [27.53] Re  
a = 0.5366 [0.0615] AU  
Ag = 160.43 [330.35] [0.48σ]  
Teffp = 4326 [2224] K [1.59σ]

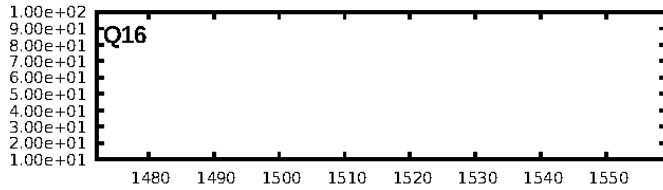
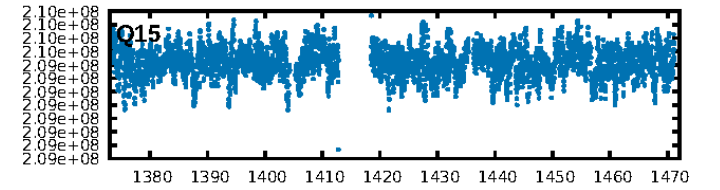
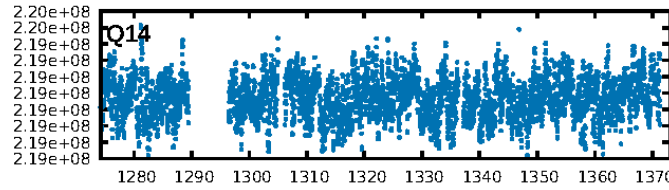
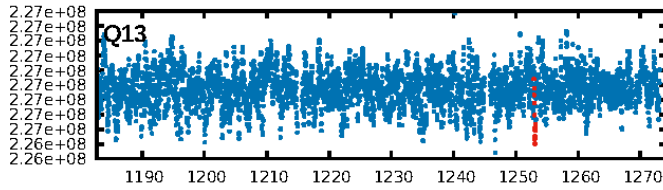
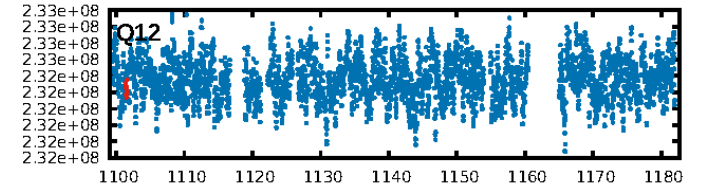
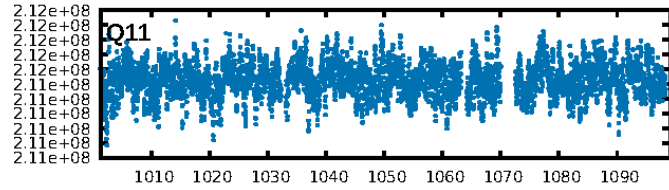
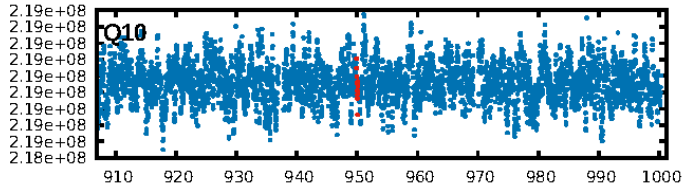
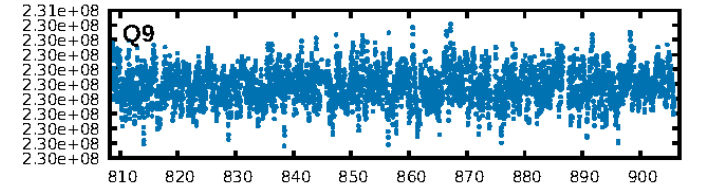
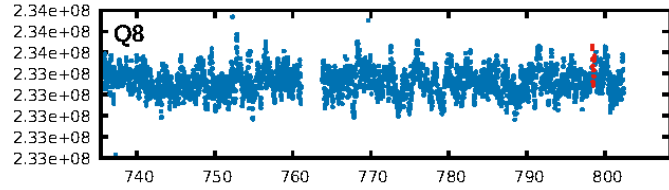
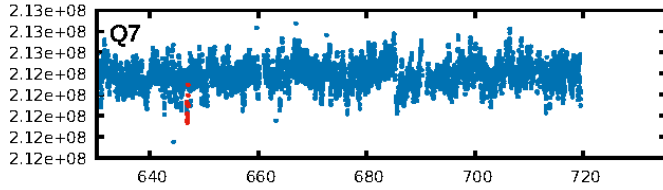
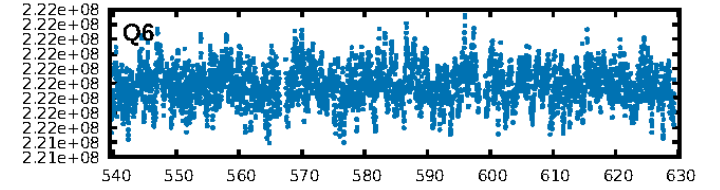
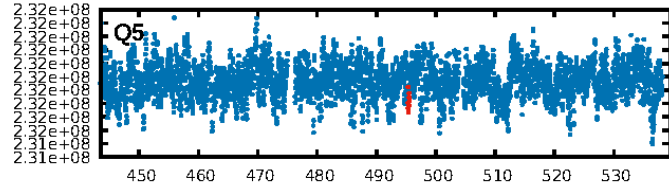
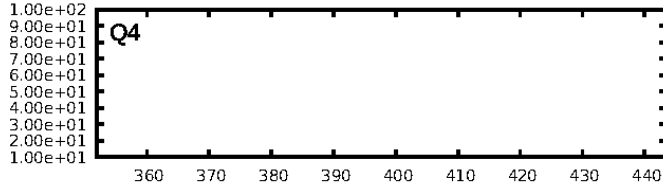
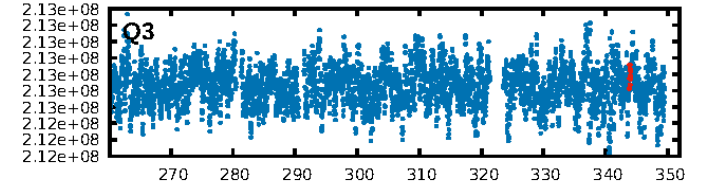
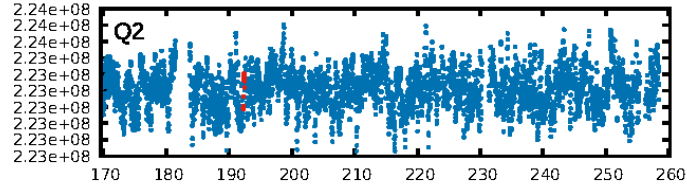
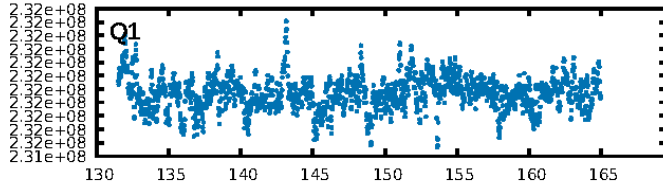
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [1151.85σ]  
LongPeriod-sig: 100.0% [326.45σ]  
ModelChiSquare2-sig: 60.5%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 5.76e-11  
RollingBand-fgt: 1.00 [6/6]  
GhostDiagnostic-chr: 1.885  
Centroid-sig: 38.3%  
Centroid-so: 1.772 arcsec [4.06σ]  
OotOffset-rm: 0.031 arcsec [0.10σ]  
KicOffset-rm: 0.376 arcsec [1.12σ]  
OotOffset-st: 2/2/2 [8]  
KicOffset-st: 2/2/2 [8]  
DiffImageQuality-fgm: 0.75 [6/8]  
DiffImageOverlap-fno: 0.00 [0/8]

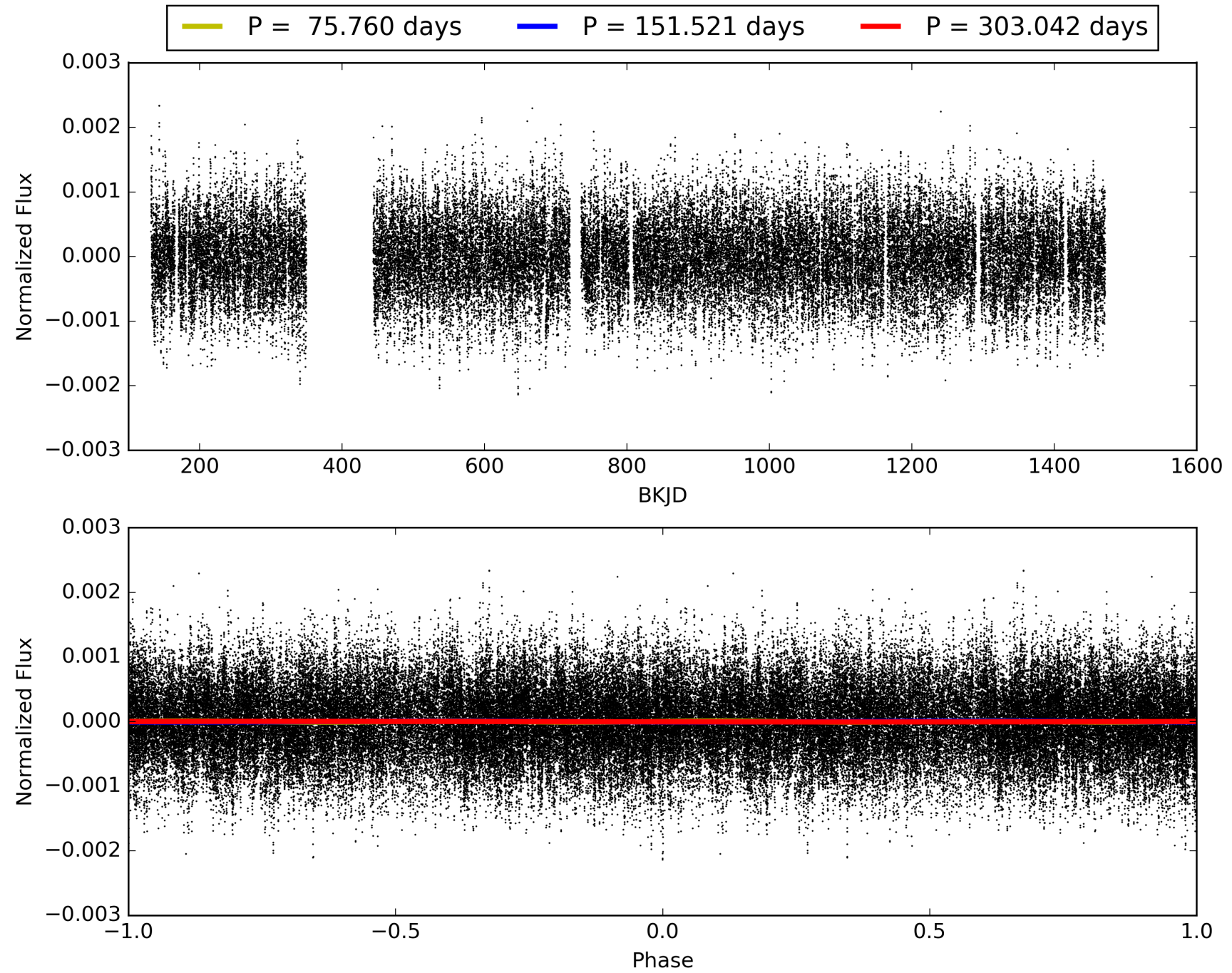
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 16:09:40 Z

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

# TCE 004390912-04, PDC Light Curves



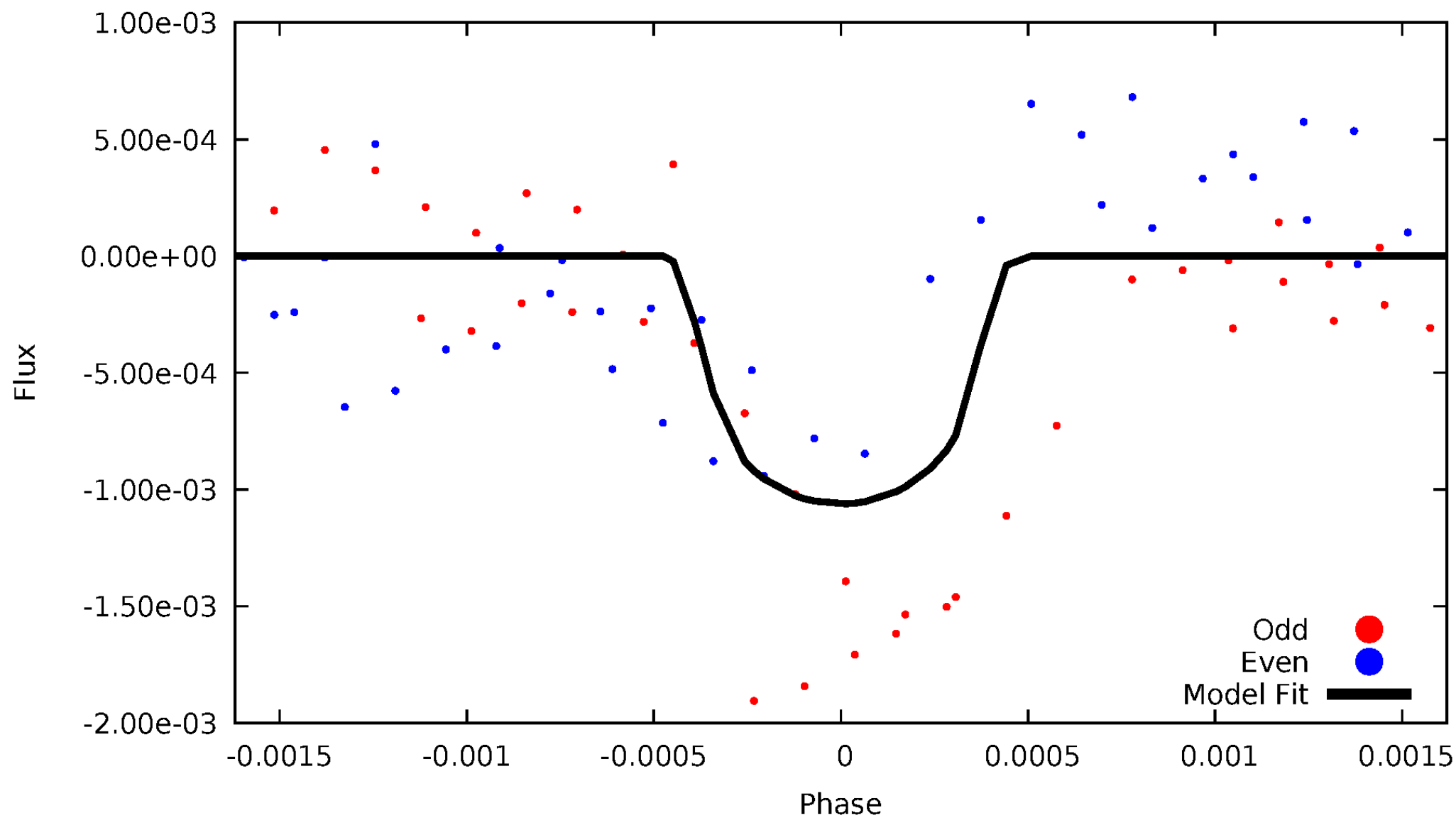
TCE 004390912-04





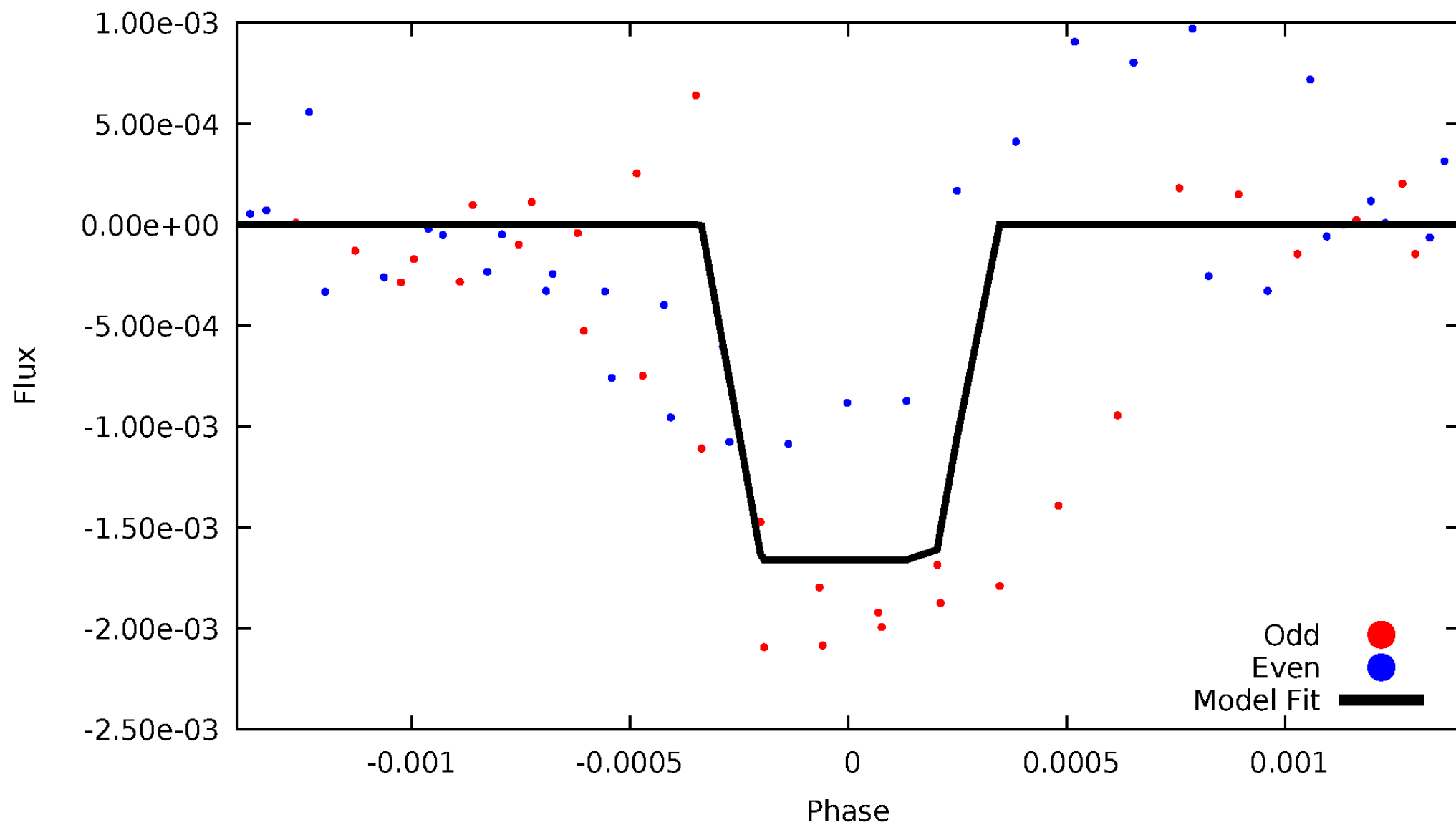
# DV Odd/Even

TCE 004390912-04



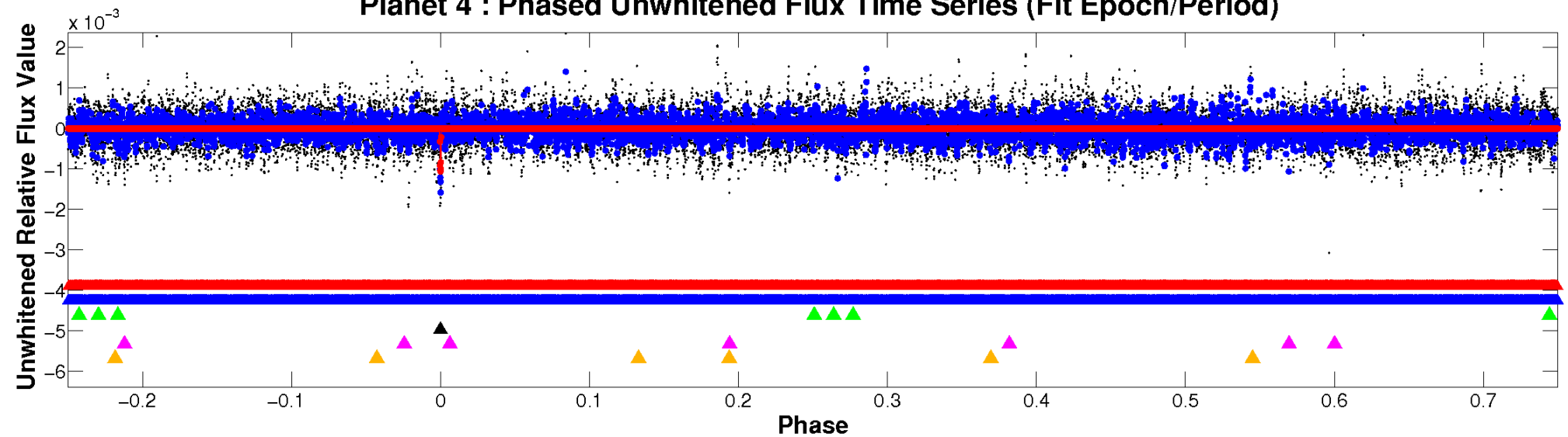
# ALT Odd/Even

TCE 004390912-04

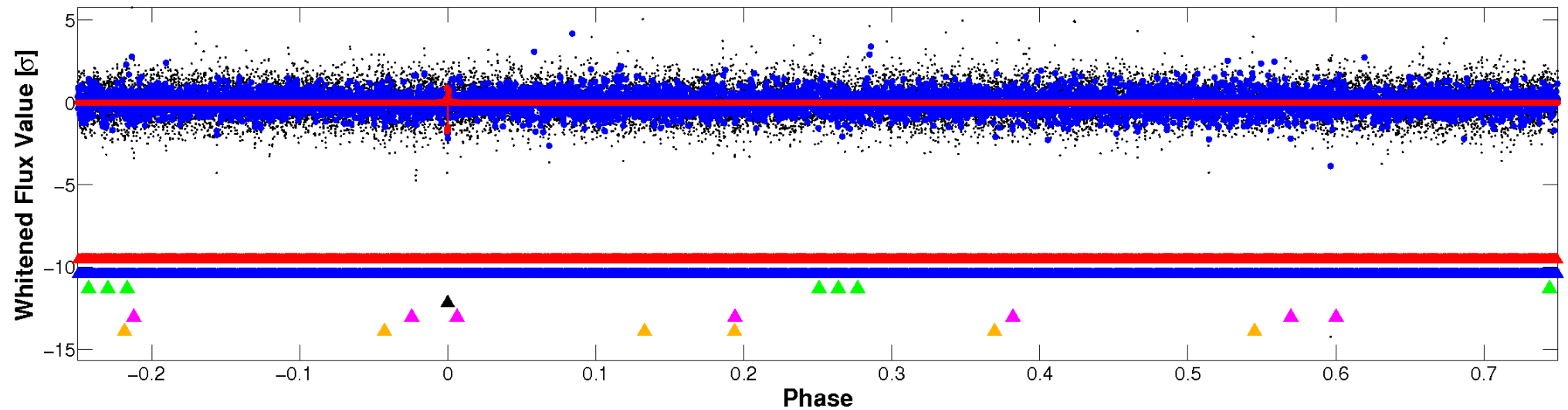


# Non-Whitened Vs. Whitened Light Curve

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

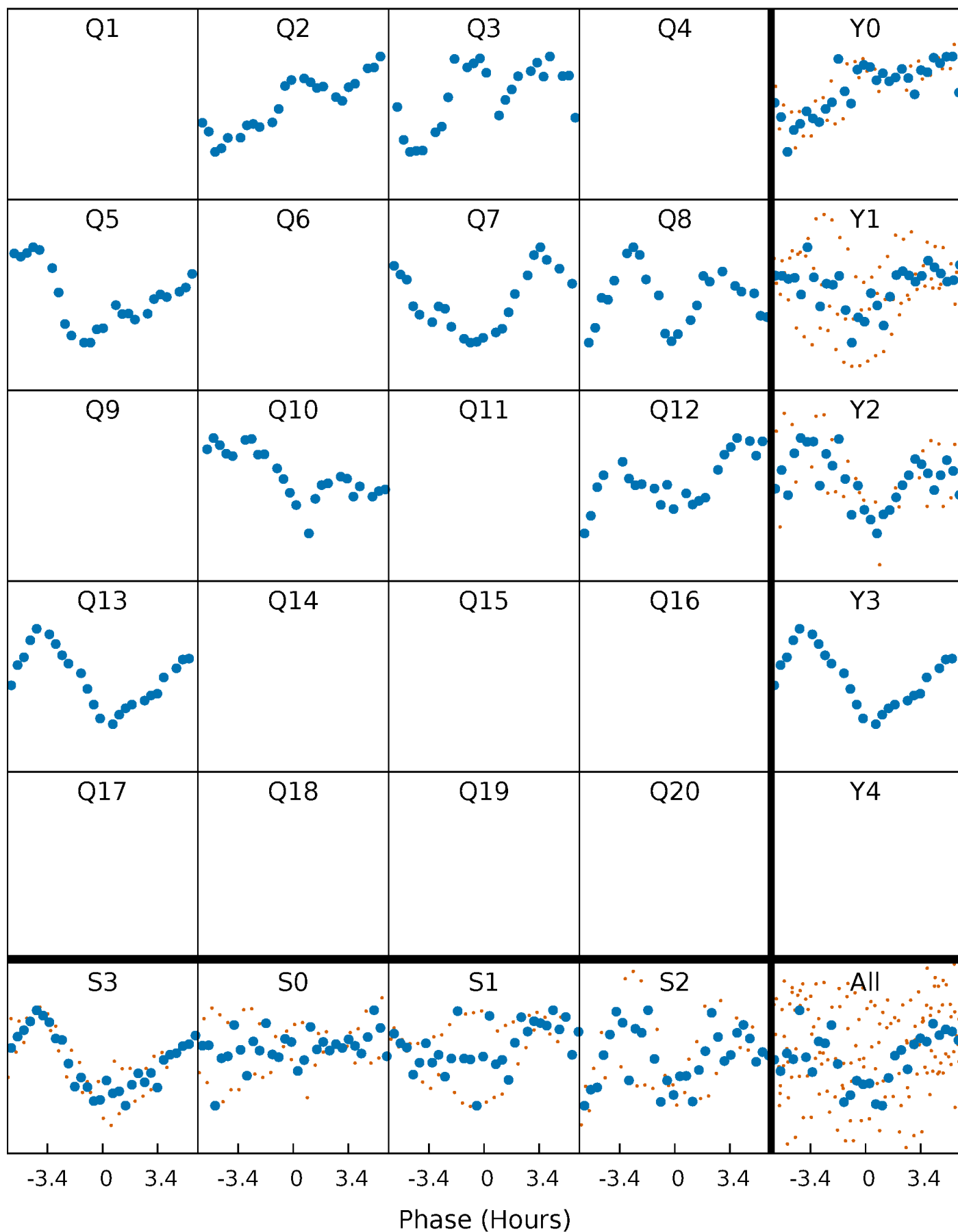


## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



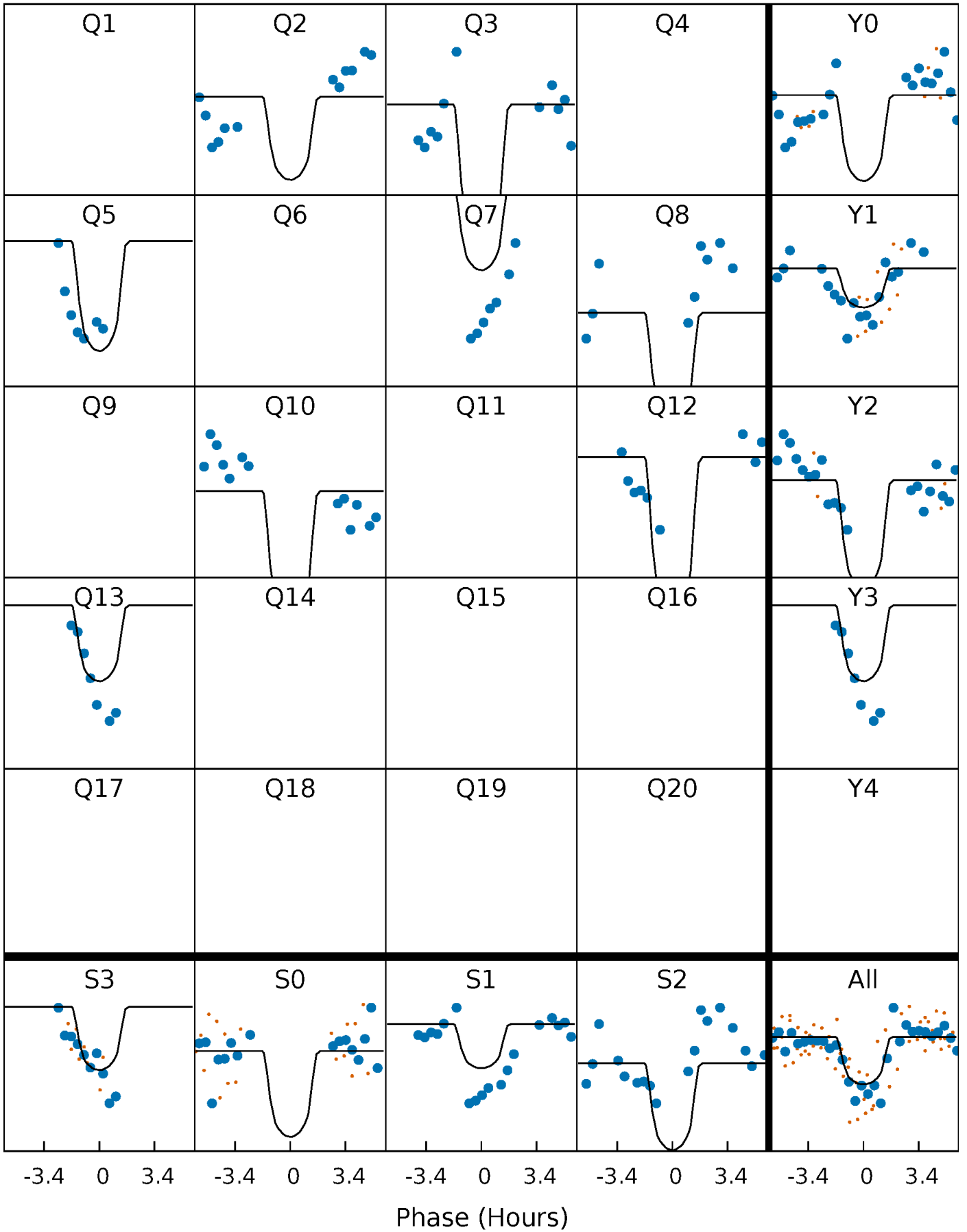
# PDC Quarter-Phased Transit Curves

TCE 004390912-04 P=151.520908 Days  $T_0=192.382705$  (BKJD)



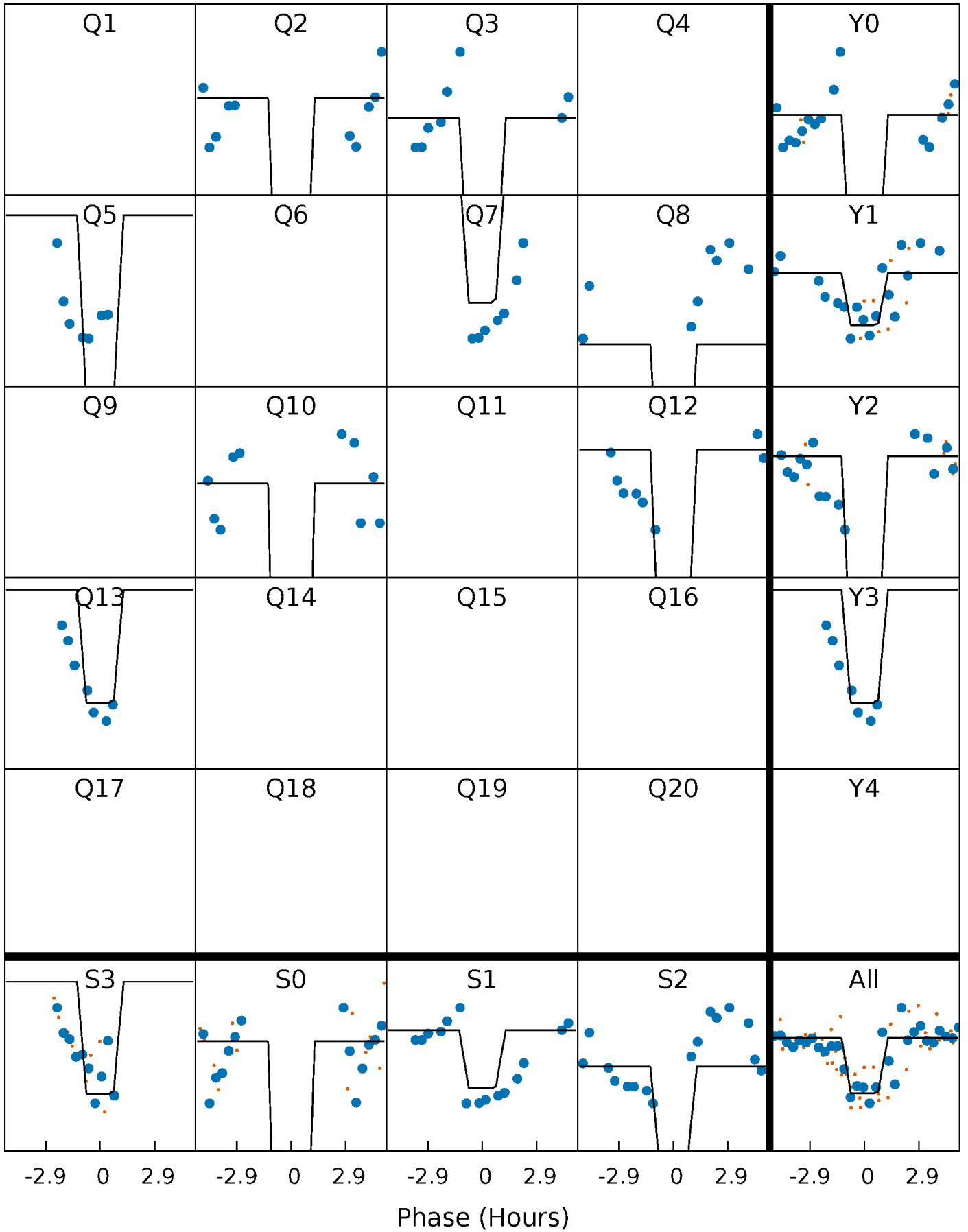
# DV Quarter-Phased Transit Curves

TCE 004390912-04 P=151.520908 Days  $T_0=192.382705$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 004390912-04 P=151.525383 Days  $T_0=192.363333$  (BKJD)

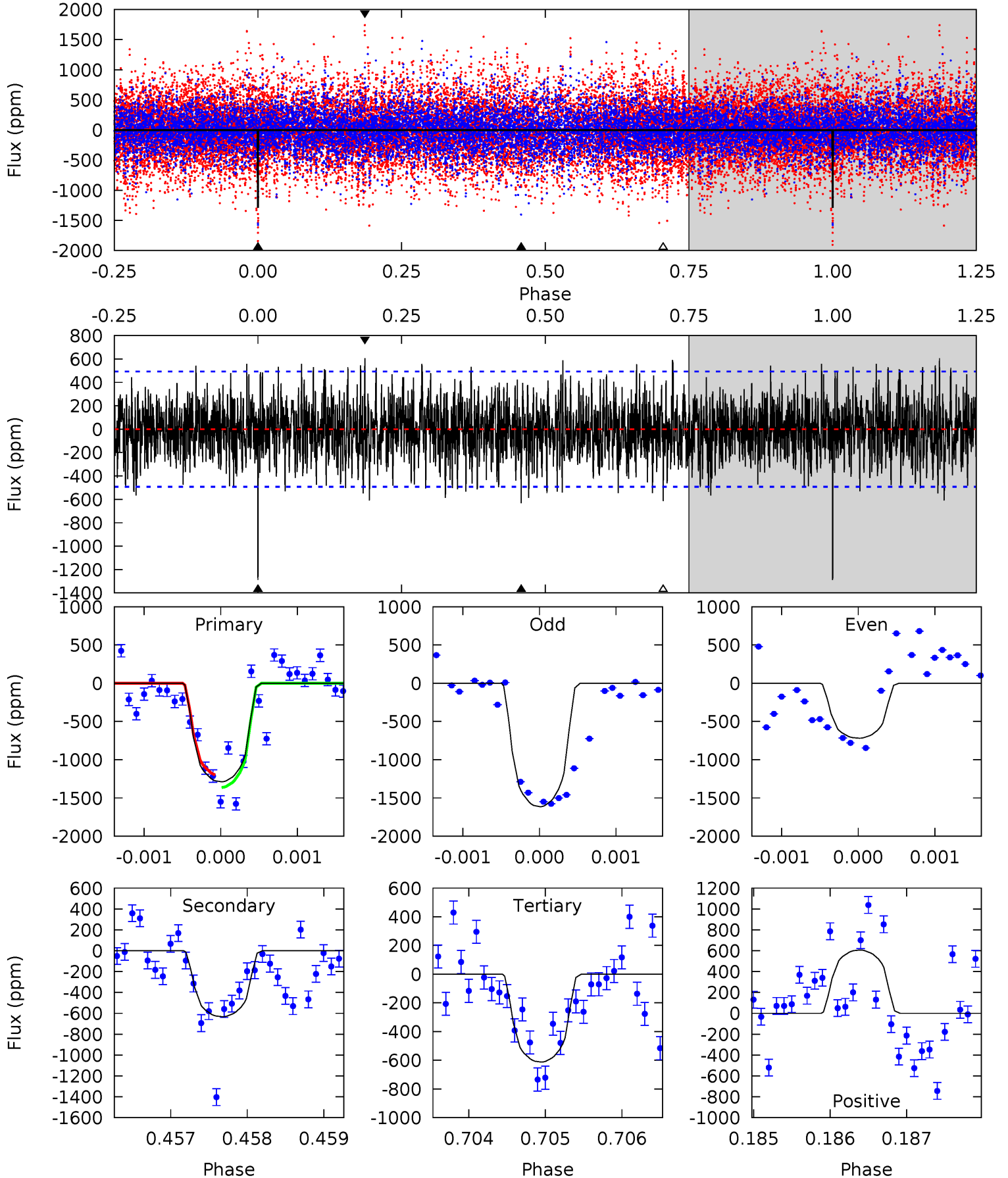




# DV Model-Shift Uniqueness Test

004390912-04,  $P = 151.520908$  Days,  $E = 40.861797$  Days

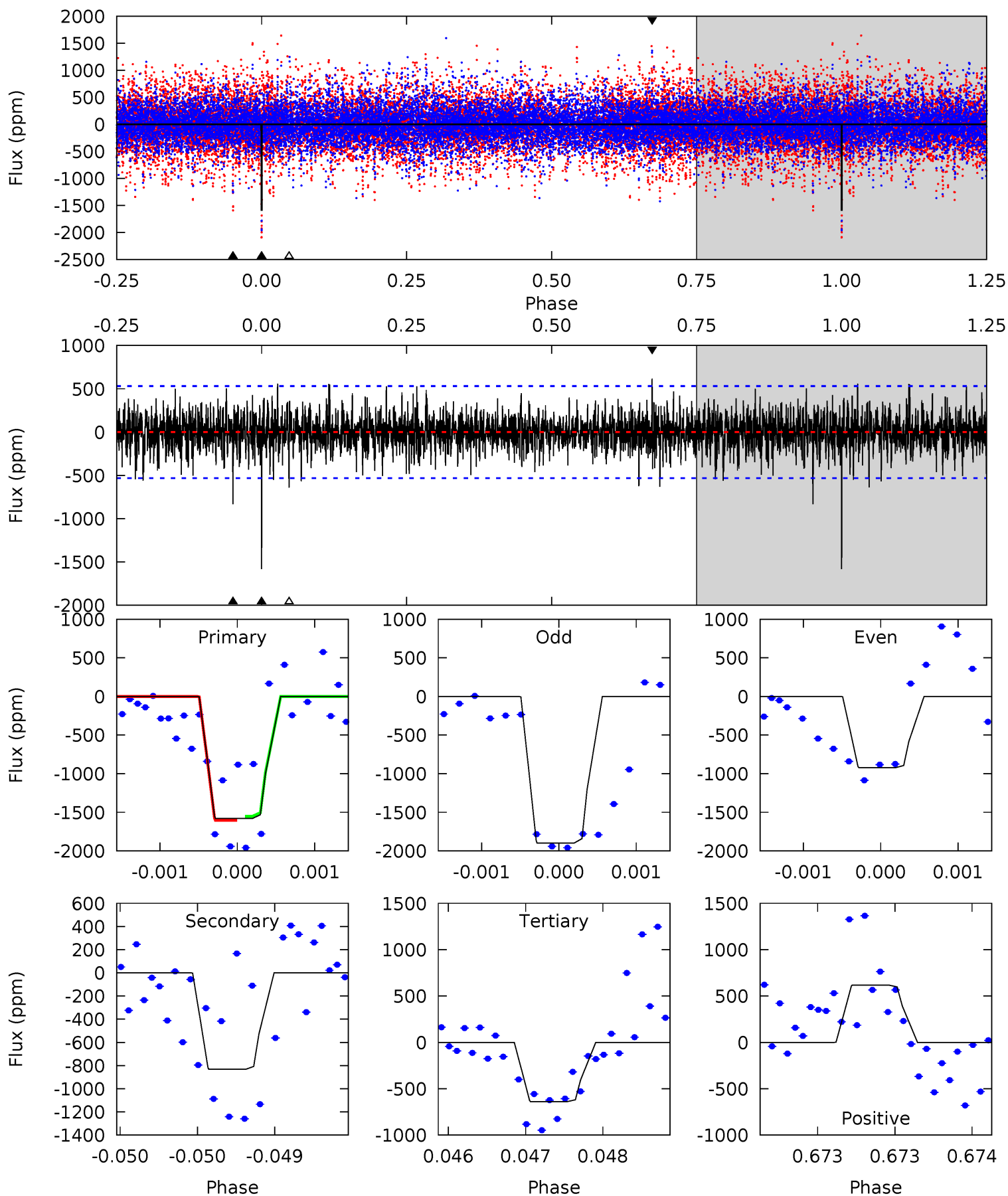
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
14.3	7.01	6.79	6.72	5.46	3.30	2.11	7.49	7.56	0.22	0.29	4.85	1.01	0.32	0.91



# Alt Model-Shift Uniqueness Test

004390912-04, P = 151.525383 Days, E = 40.837950 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
16.4	8.64	6.63	6.41	5.52	3.40	1.59	9.77	10.00	2.01	2.24	4.97	0.93	0.28	0.26



### Stellar Parameters For KIC 004390912

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$4643^{+55}_{-55}$	$2.595^{+0.024}_{-0.033}$	$-0.180^{+0.150}_{-0.100}$	$7.906^{+1.325}_{-0.221}$	$0.898^{+0.268}_{-0.015}$	$0.003^{+0.000}_{-0.000}$
	+1%/-1%	+1%/-1%	+83%/-56%	+17%/-3%	+30%/-2%	+7%/-19%
Source	SPE68	AST9	SPE68	DSEP		

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

### Secondary Eclipse Parameters for KIC 004390912-04 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-633 \pm 90$	$32.07^{+24.40}_{-21.16}$	$1098^{+21}_{-18}$	$4050^{+2261}_{-718}$	$105^{+700}_{-73}$
Alt.	$-833 \pm 96$	$37.86^{+26.71}_{-23.22}$	$1099^{+20}_{-18}$	$3968^{+1854}_{-629}$	$92^{+515}_{-60}$

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

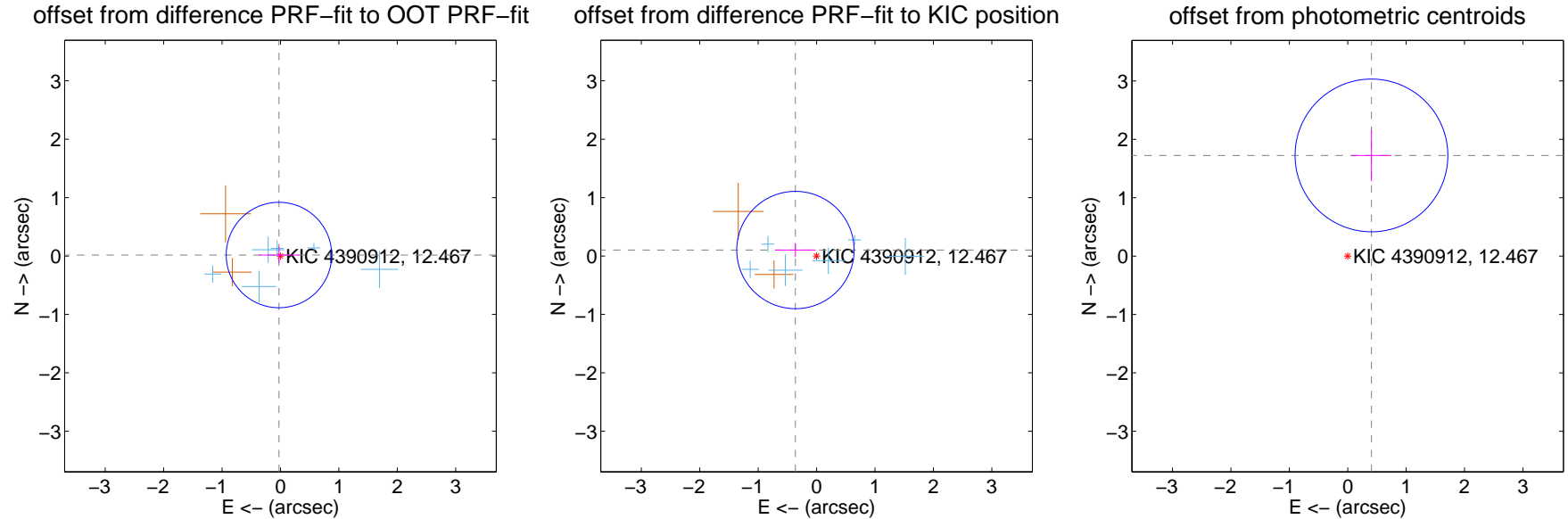
## DV Centroid Data

Supplemental centroid analysis for 004390912-04. Kepler magnitude: 12.47. Transit SNR 6.38

There are 6 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	$0.031 \pm 0.301$	0.10	$0.026 \pm 0.339$	$0.017 \pm 0.143$
PRF-fit source offset from KIC position	$0.376 \pm 0.335$	1.12	$0.362 \pm 0.346$	$0.103 \pm 0.120$
photometric centroid source offset	$1.77 \pm 0.44$	4.06	$-0.41 \pm 0.34$	$1.72 \pm 0.44$



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.

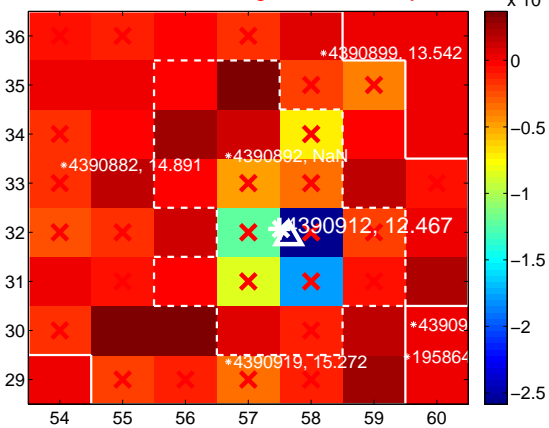
Q1 no difference image



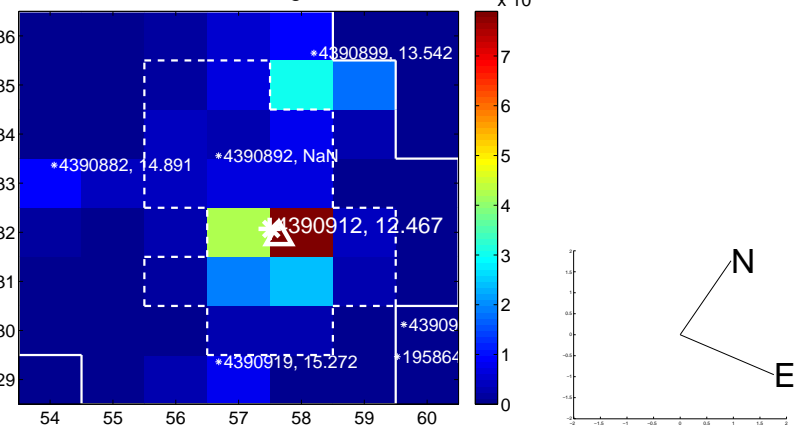
Q1 no OOT image



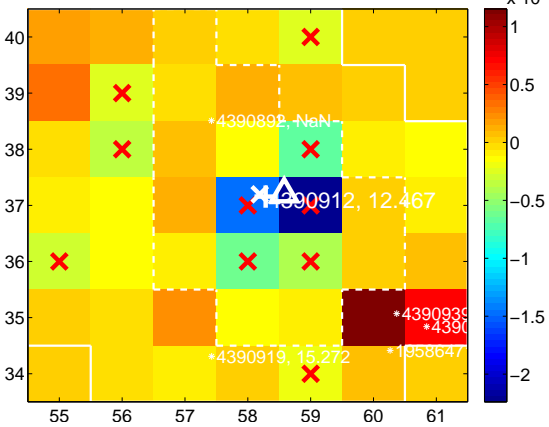
Q2 difference image. Poor Quality



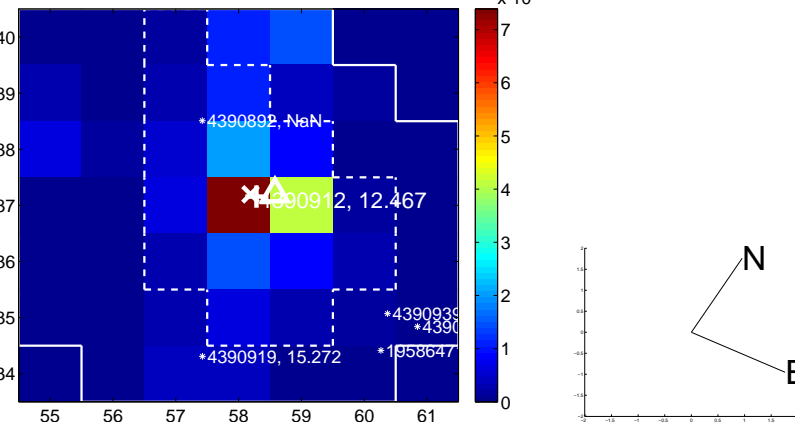
Q2 OOT image



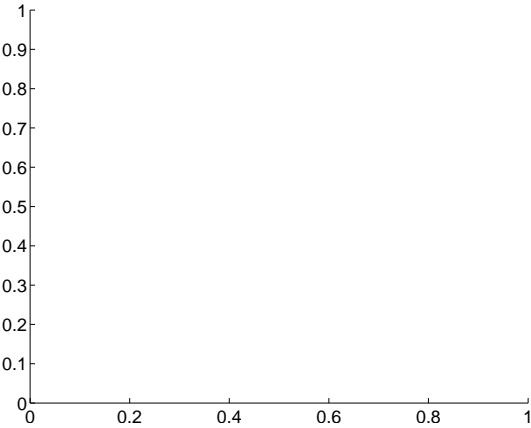
Q3 difference image. Poor Quality



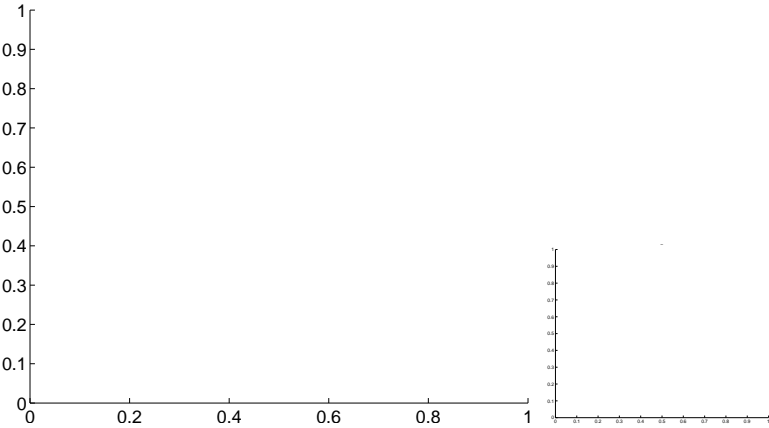
Q3 OOT image



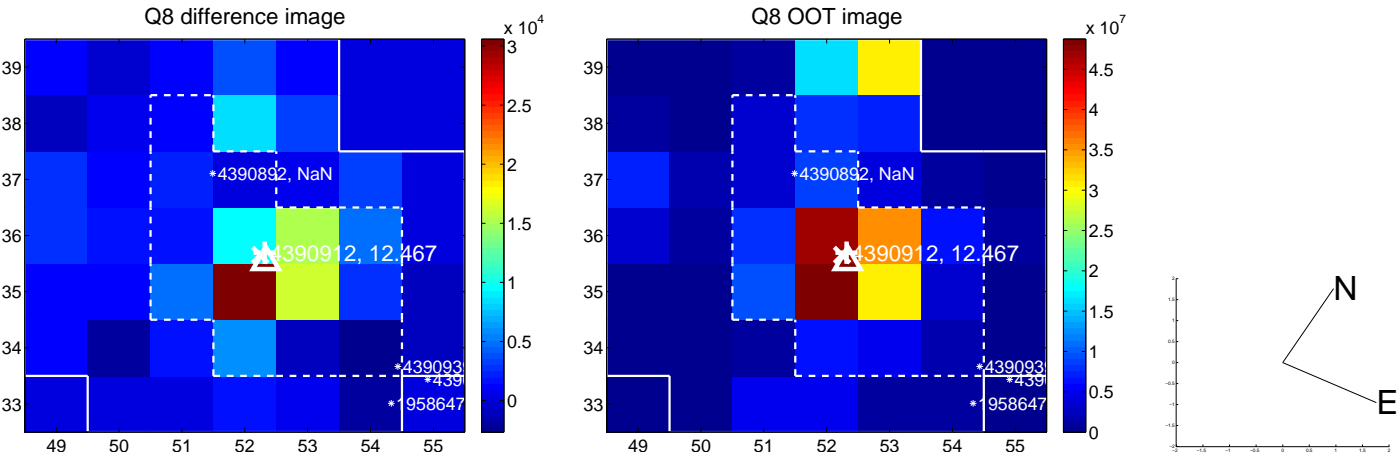
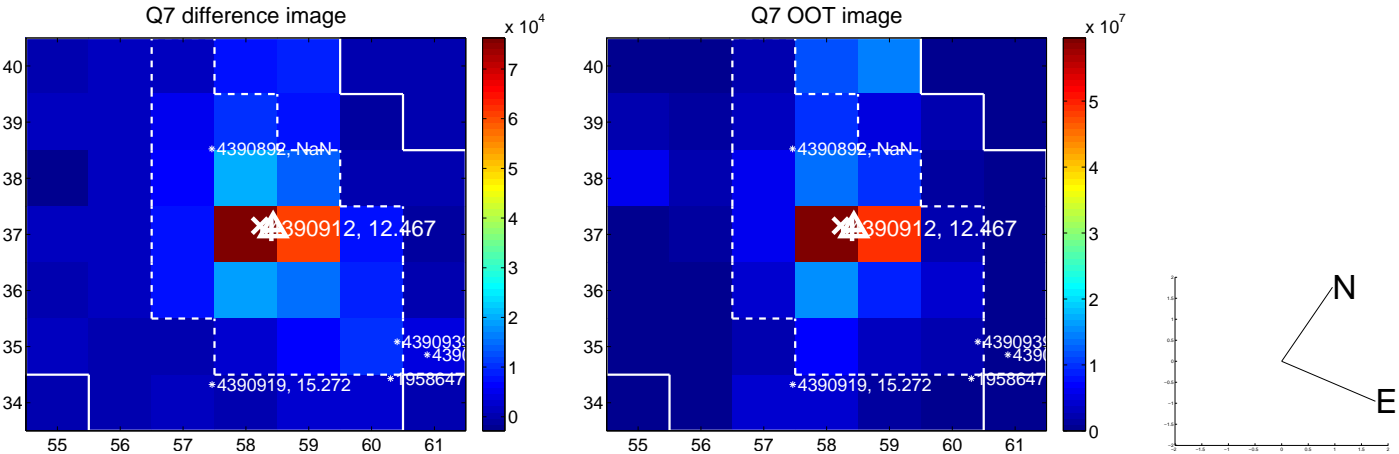
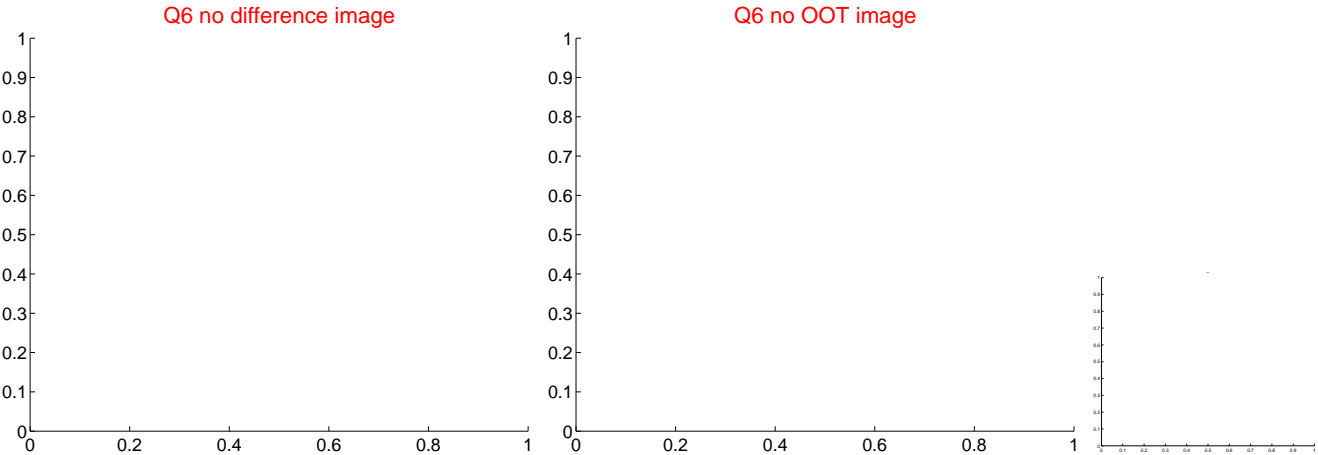
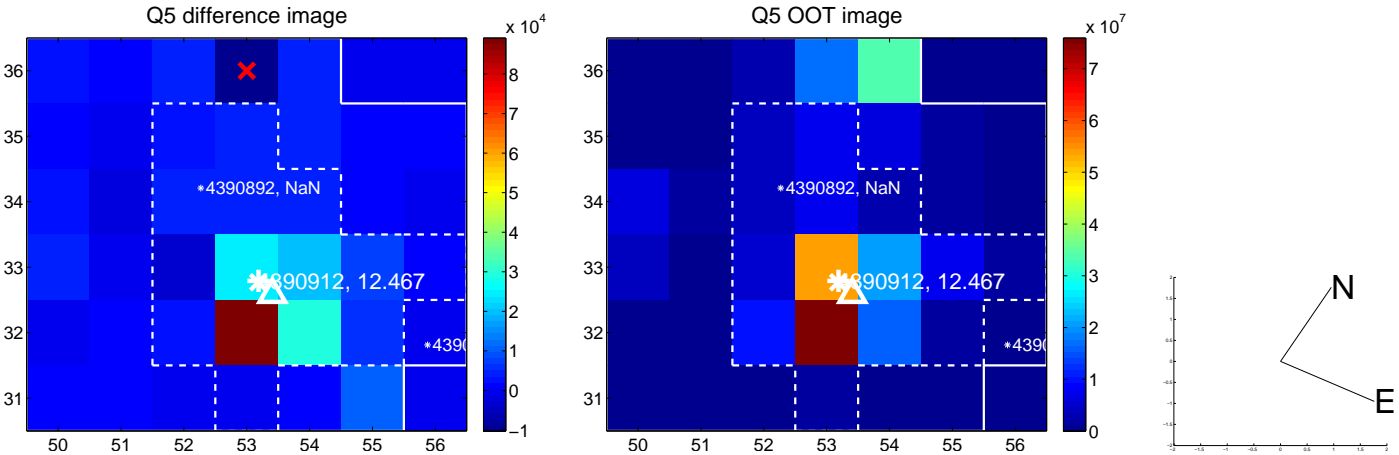
Q4 no difference image



Q4 no OOT image

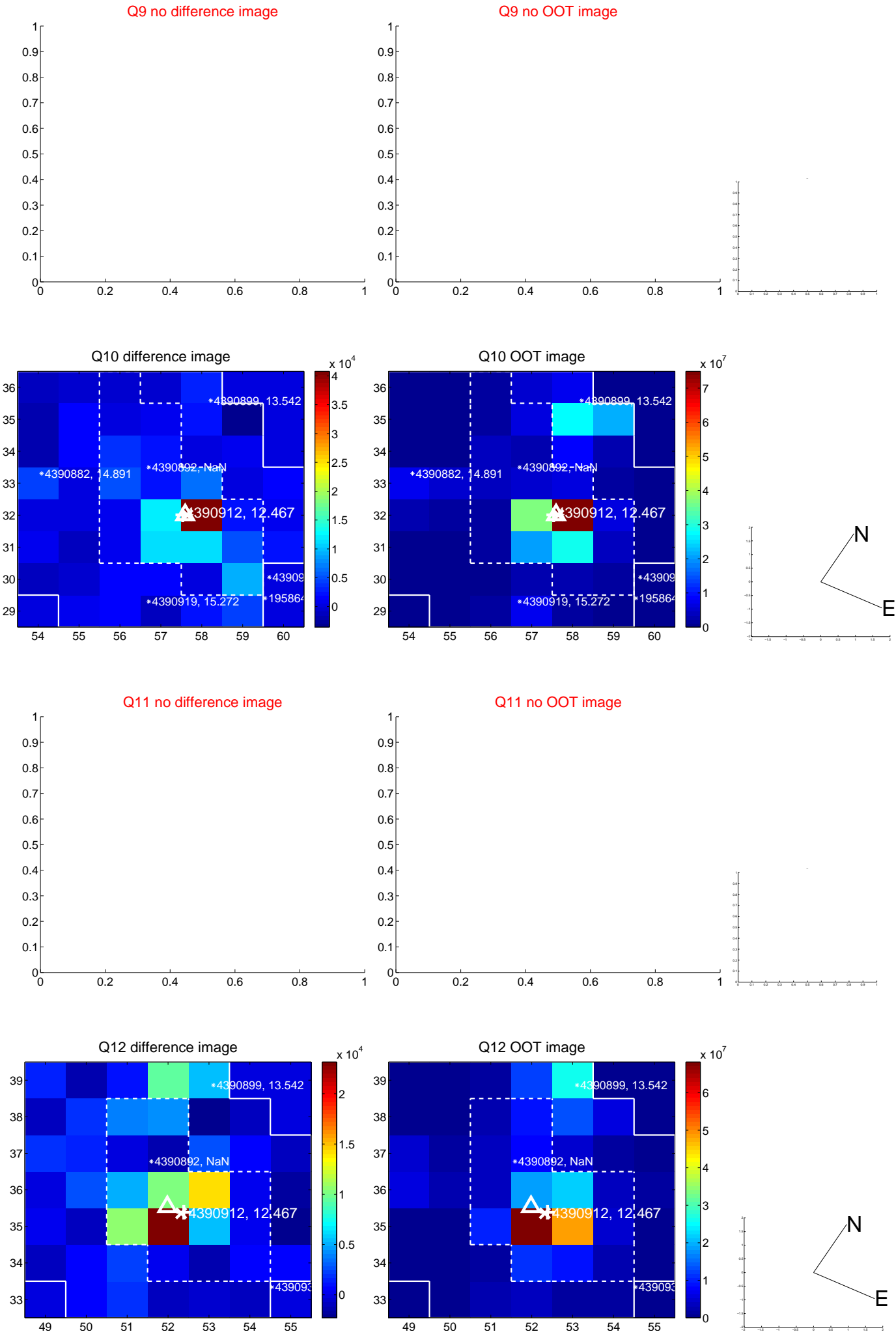


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

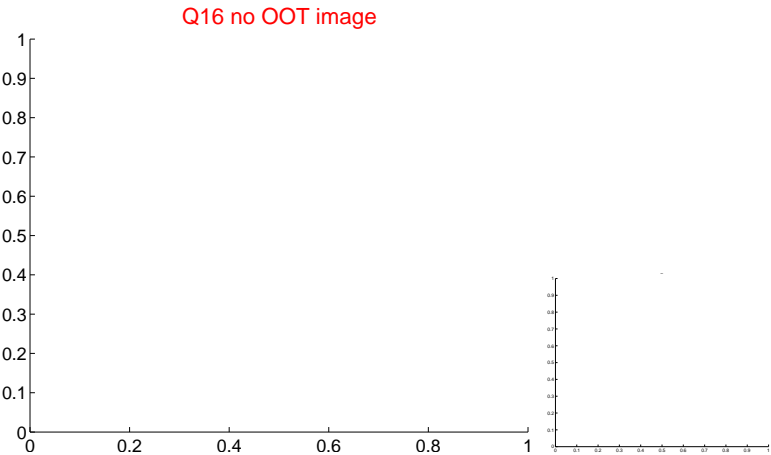
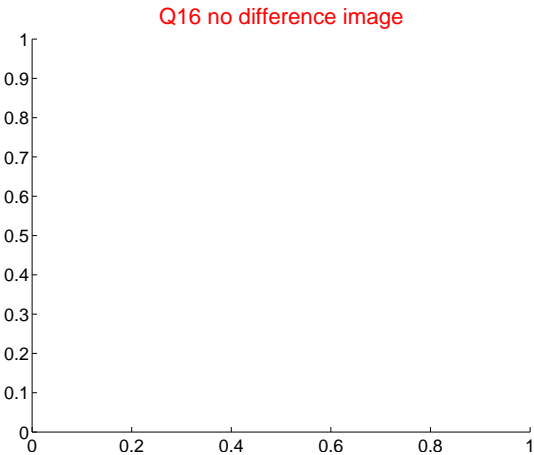
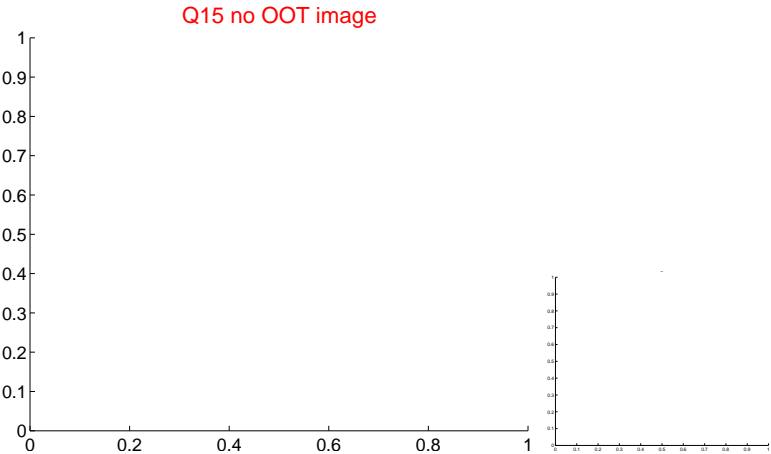
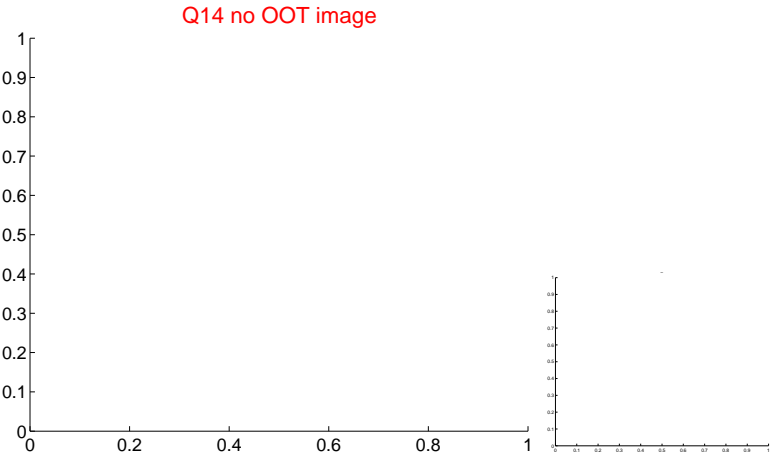
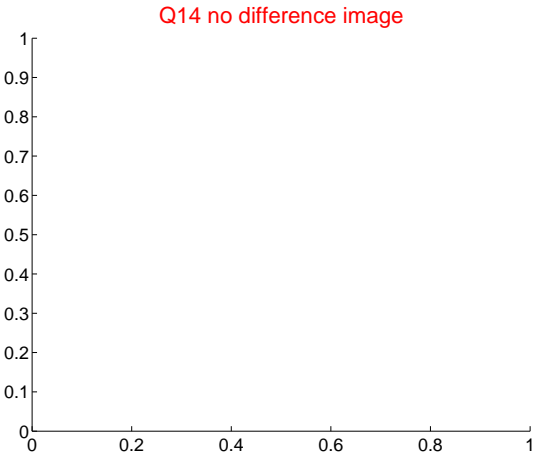
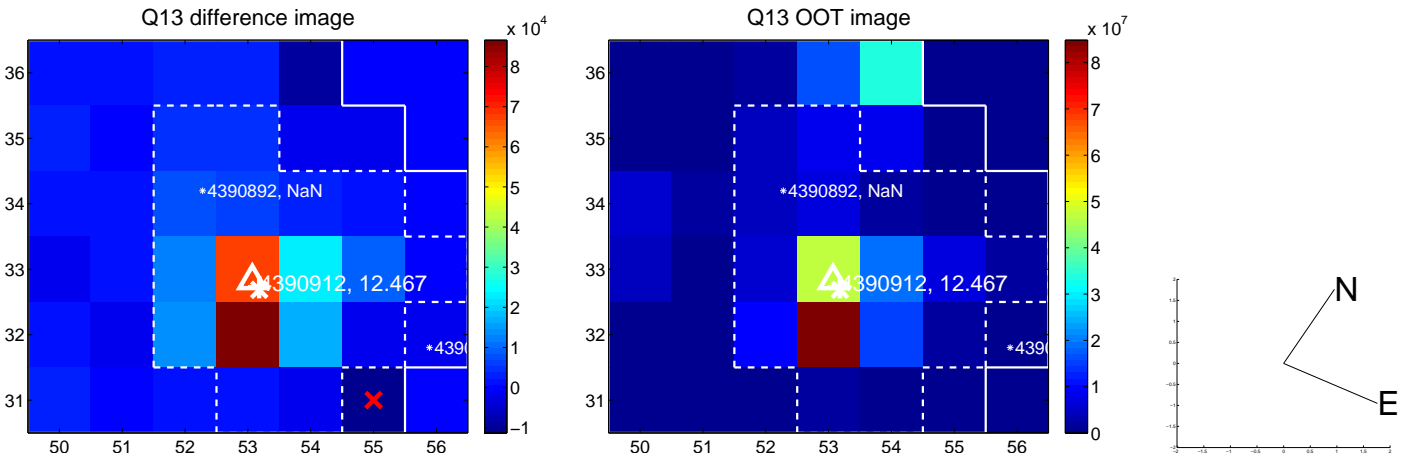




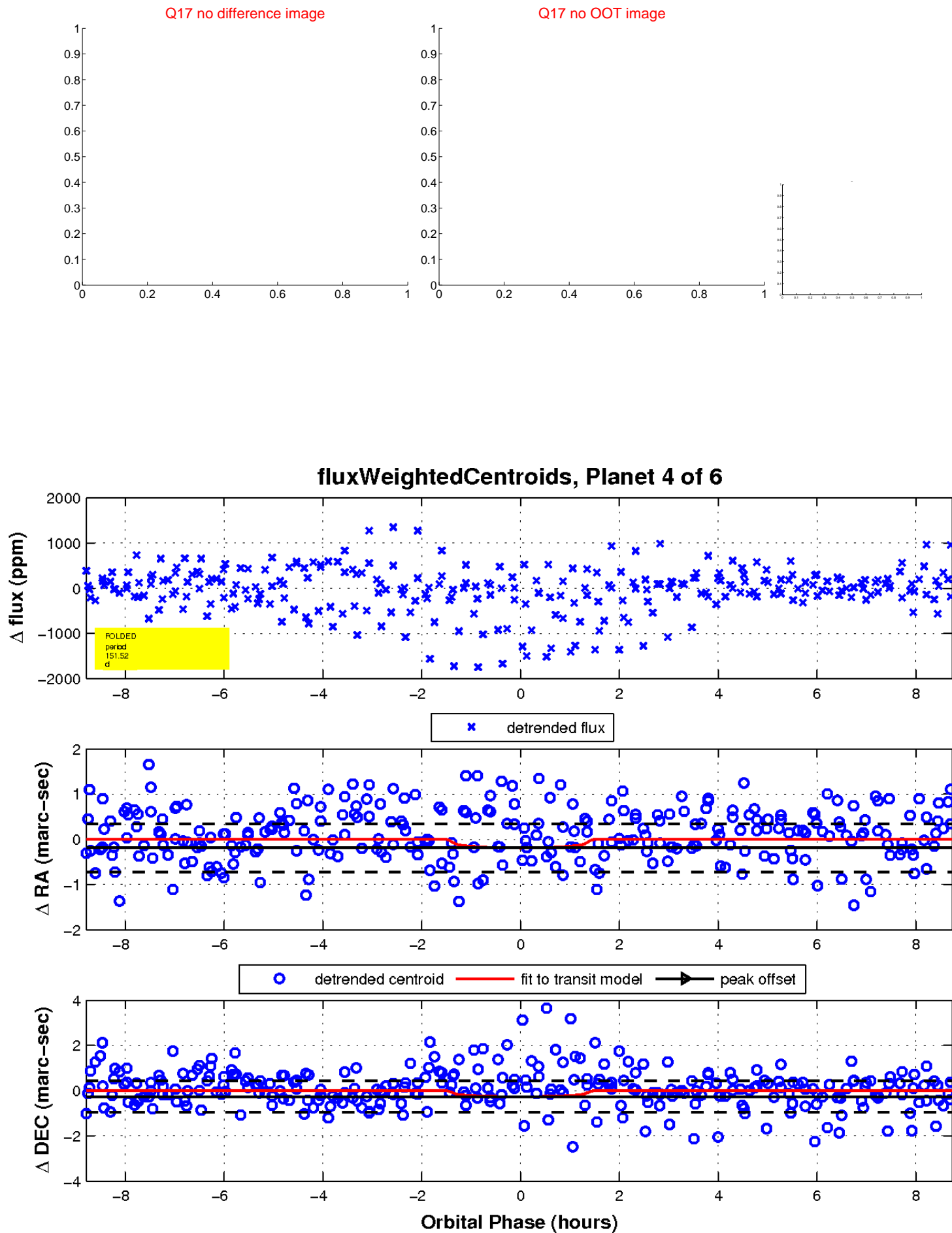
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

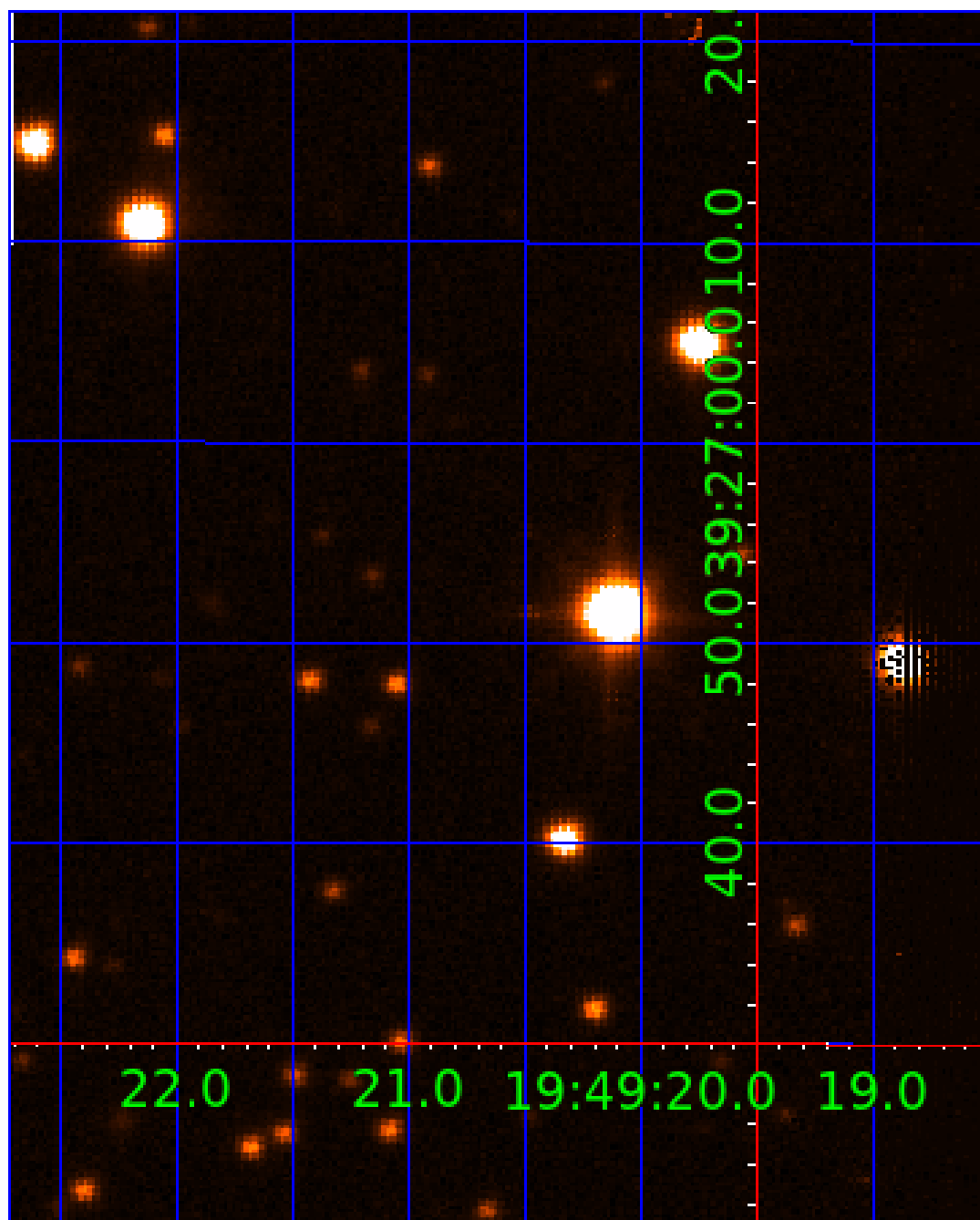


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 004390912

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004390912-01	OBS	7695.01	0.687503	131.866326	77.0	1.102	12.6	16.8	7.91	4643	8.59	0.00
004390912-02	OBS	No	0.687502	131.514369	60.1	1.293	11.5	12.5	7.91	4643	7.65	0.00
004390912-03	OBS	No	228.268812	153.650474	1198.9	3.272	8.4	7.8	7.91	4643	36.88	52.34
004390912-04	OBS	No	151.520908	192.382705	1061.1	2.943	8.2	6.4	7.91	4643	26.75	90.39
004390912-05	OBS	No	213.056315	278.688706	1487.4	3.436	9.2	7.1	7.91	4643	29.26	57.38
004390912-06	OBS	No	240.589536	221.748142	1651.7	7.777	7.7	8.0	7.91	4643	65.02	48.79

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004390912-01	OBS	FP	0.00	1	0	1	0	MOD_NONUNIQ_ALT—CENT_RESOLVED_OFFSET
004390912-02	OBS	FP	0.00	1	0	1	0	MOD_NONUNIQ_ALT—SAME_NTL_PERIOD—CENT_RESOLVED_OFFSET
004390912-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—INCONSISTENT_TRANS
004390912-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—ALL_TRANS_CHASES—INCONSISTENT_TRANS
004390912-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_MARSHALL—TRANS_GAPPED—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_POS_ALT—INCONSISTENT_TRANS
004390912-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT

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

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

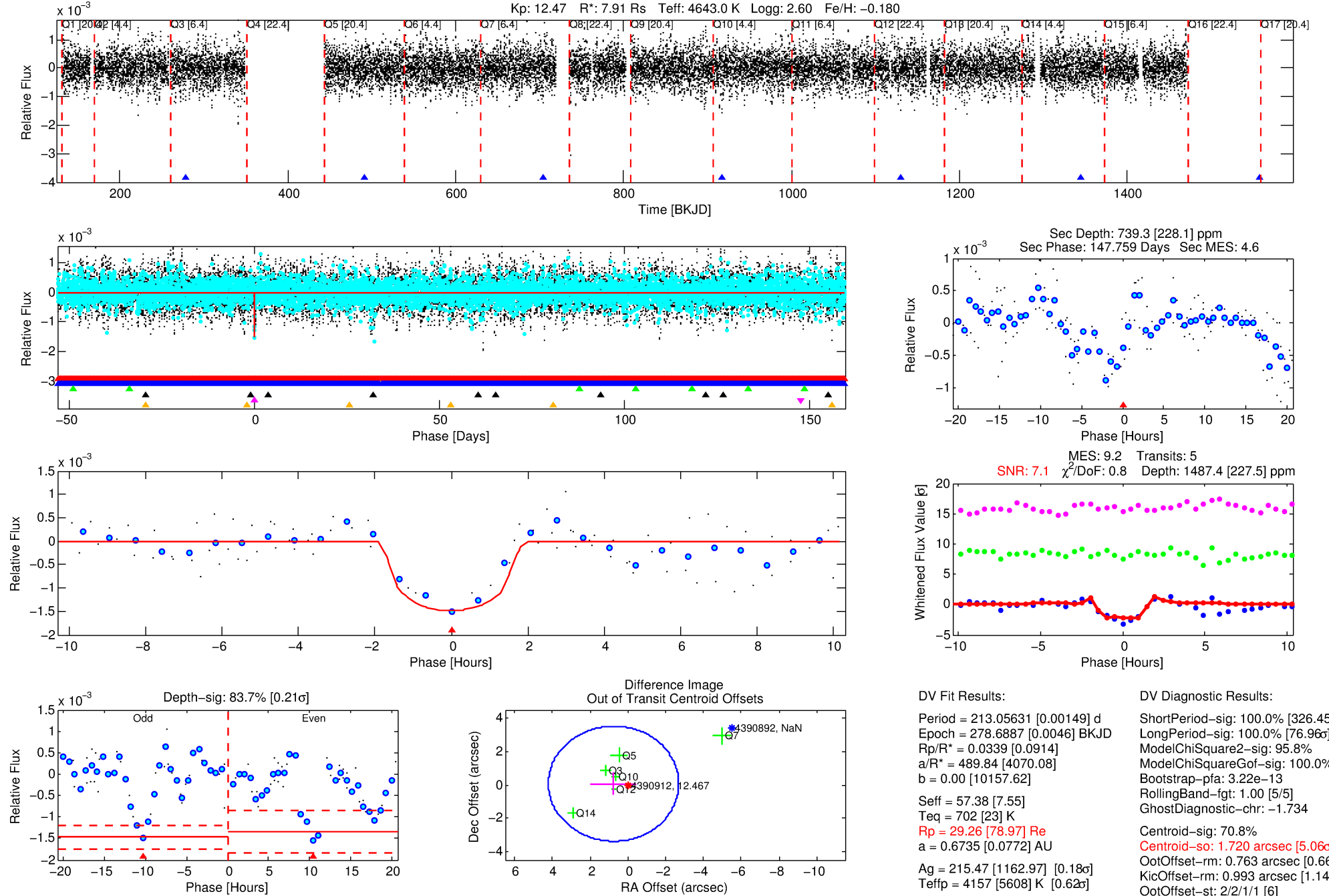
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 004390912-05

No Significant Match Found

# DV One-Page Summary

KIC: 4390912 Candidate: 5 of 6 Period: 213.056 d

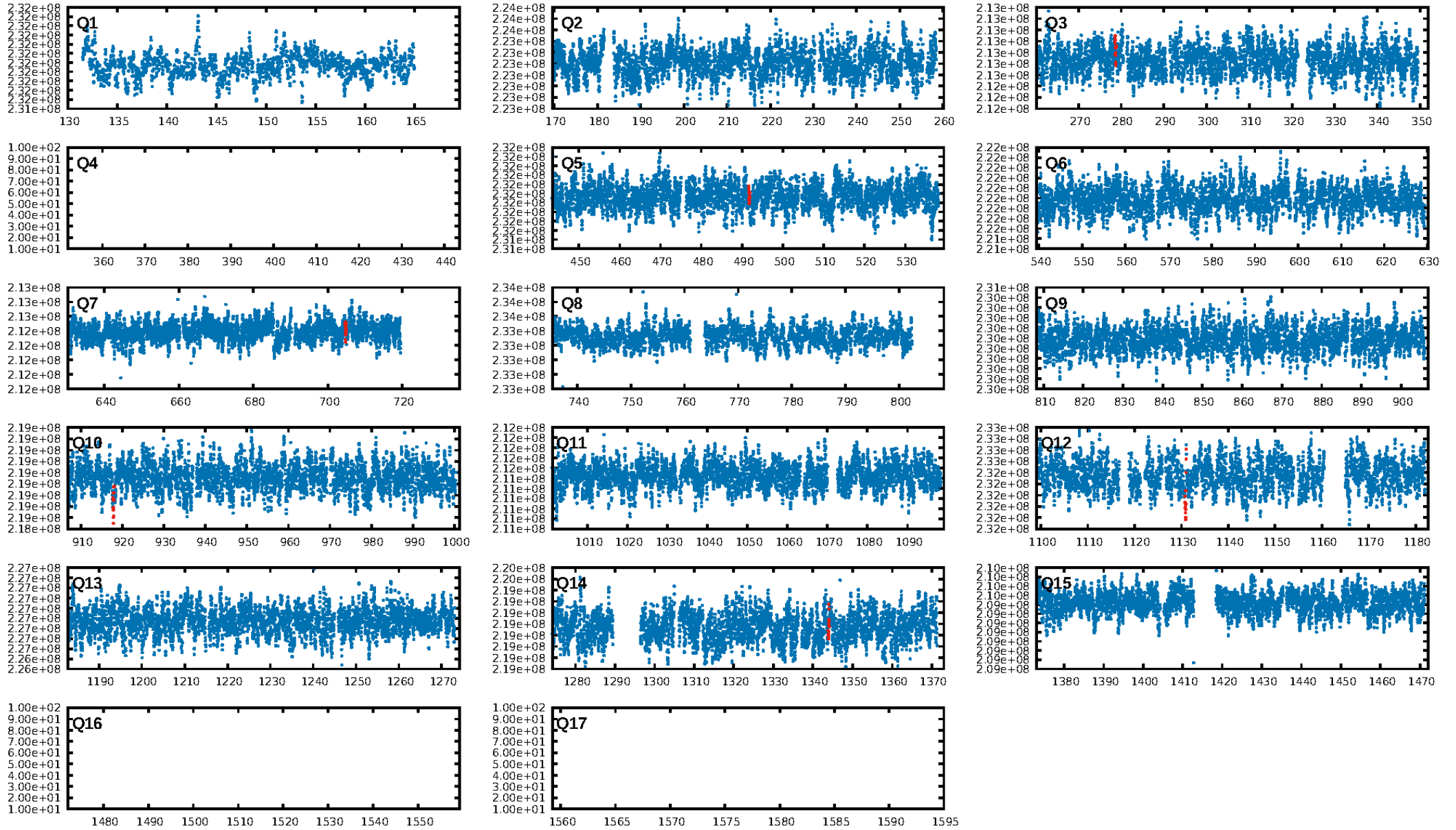


Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 16:09:46 Z

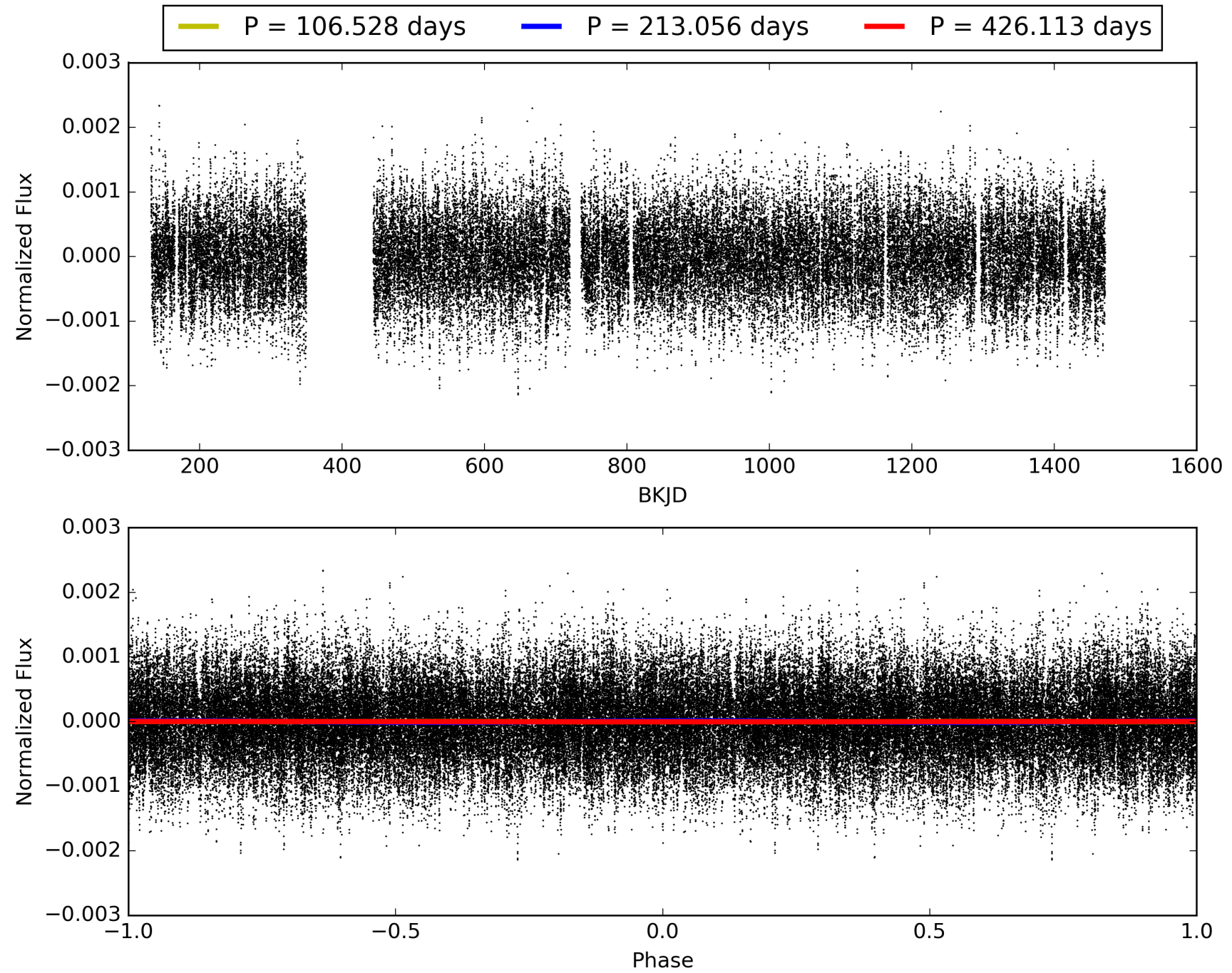
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center



# TCE 004390912-05, PDC Light Curves

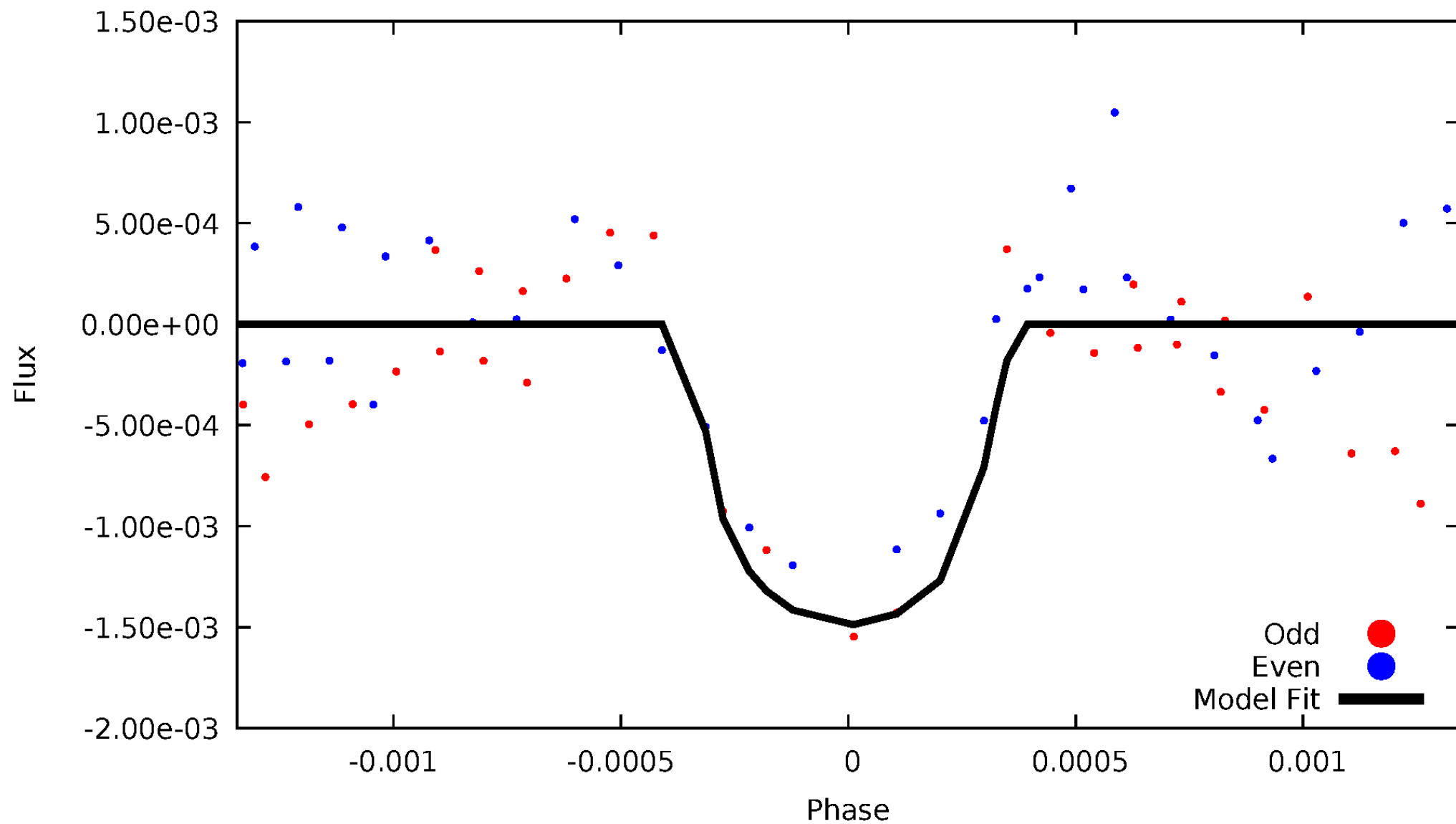


TCE 004390912-05



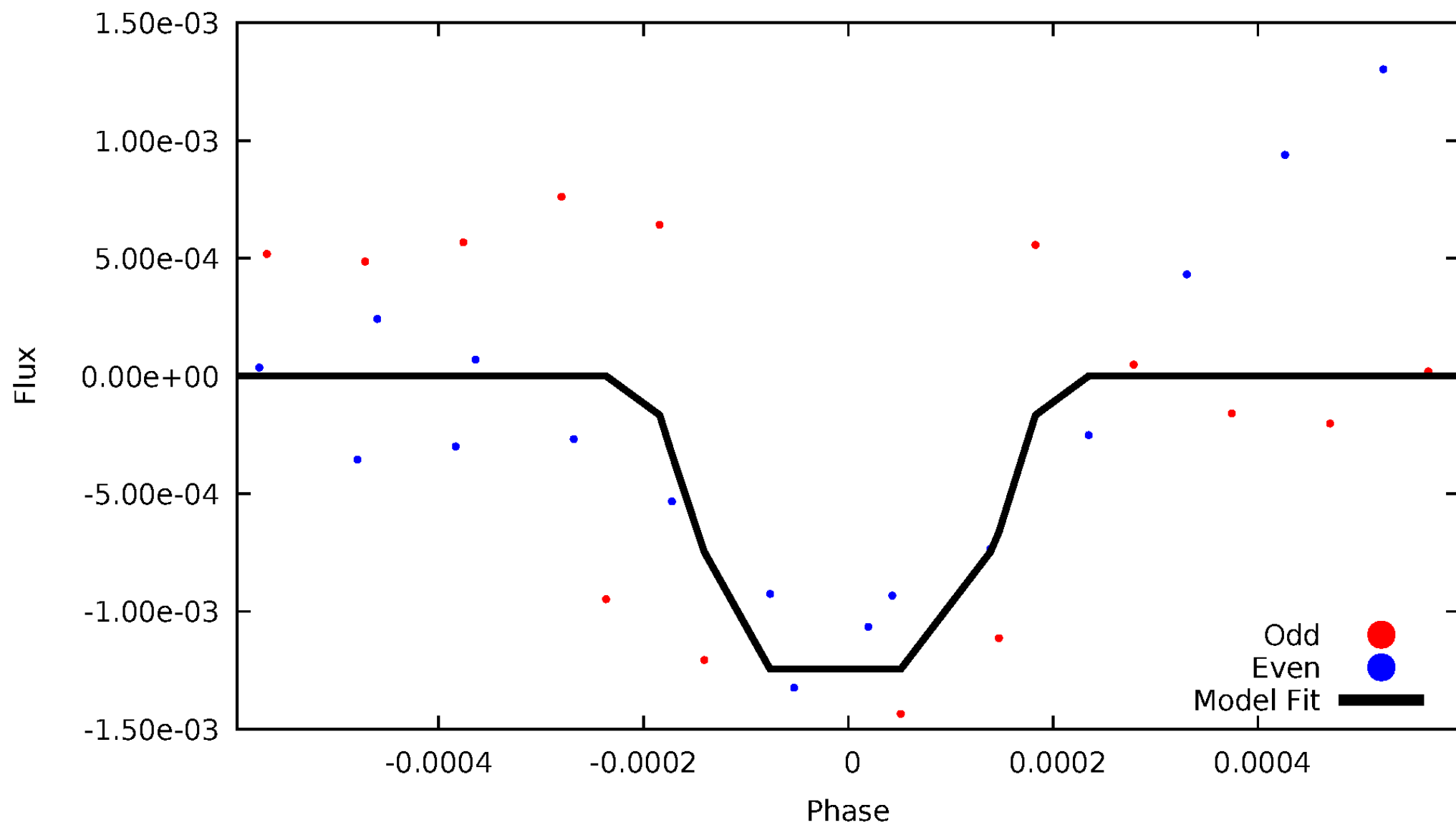
# DV Odd/Even

TCE 004390912-05



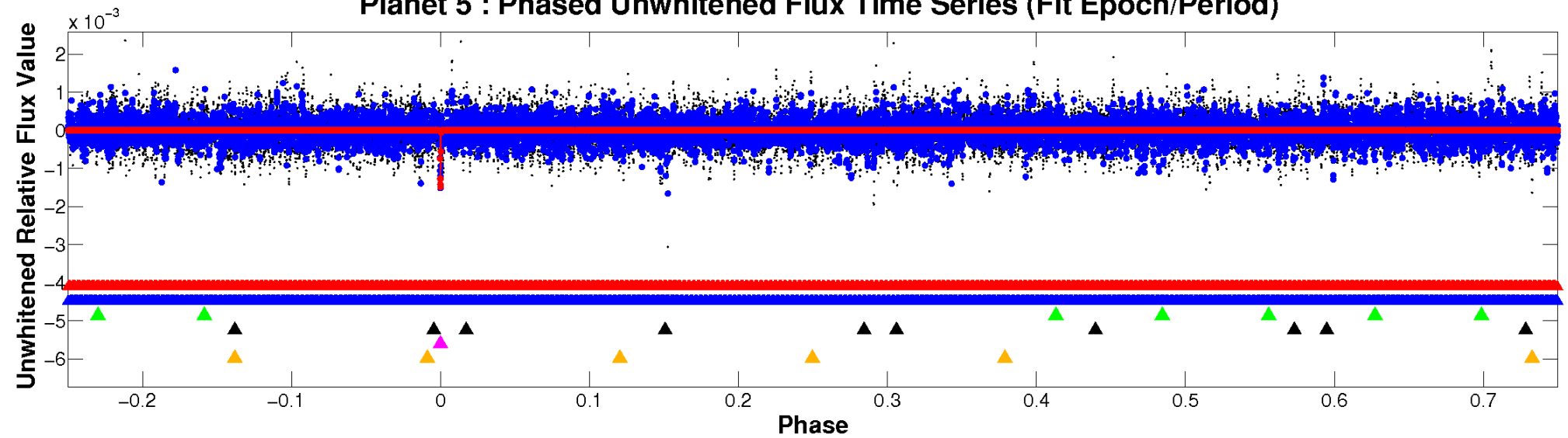
# ALT Odd/Even

TCE 004390912-05

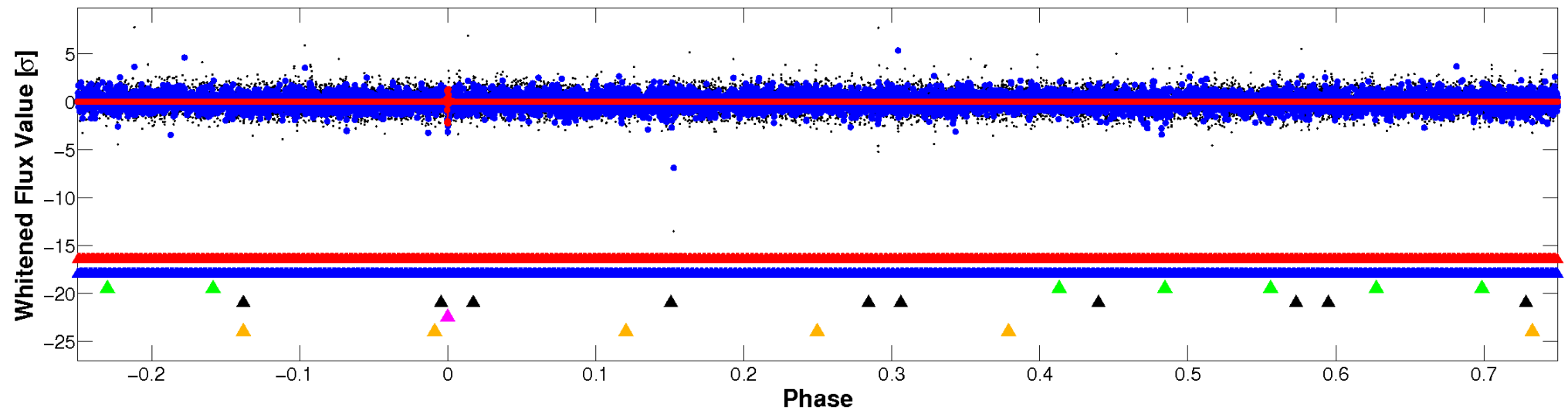


# Non-Whitened Vs. Whitened Light Curve

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

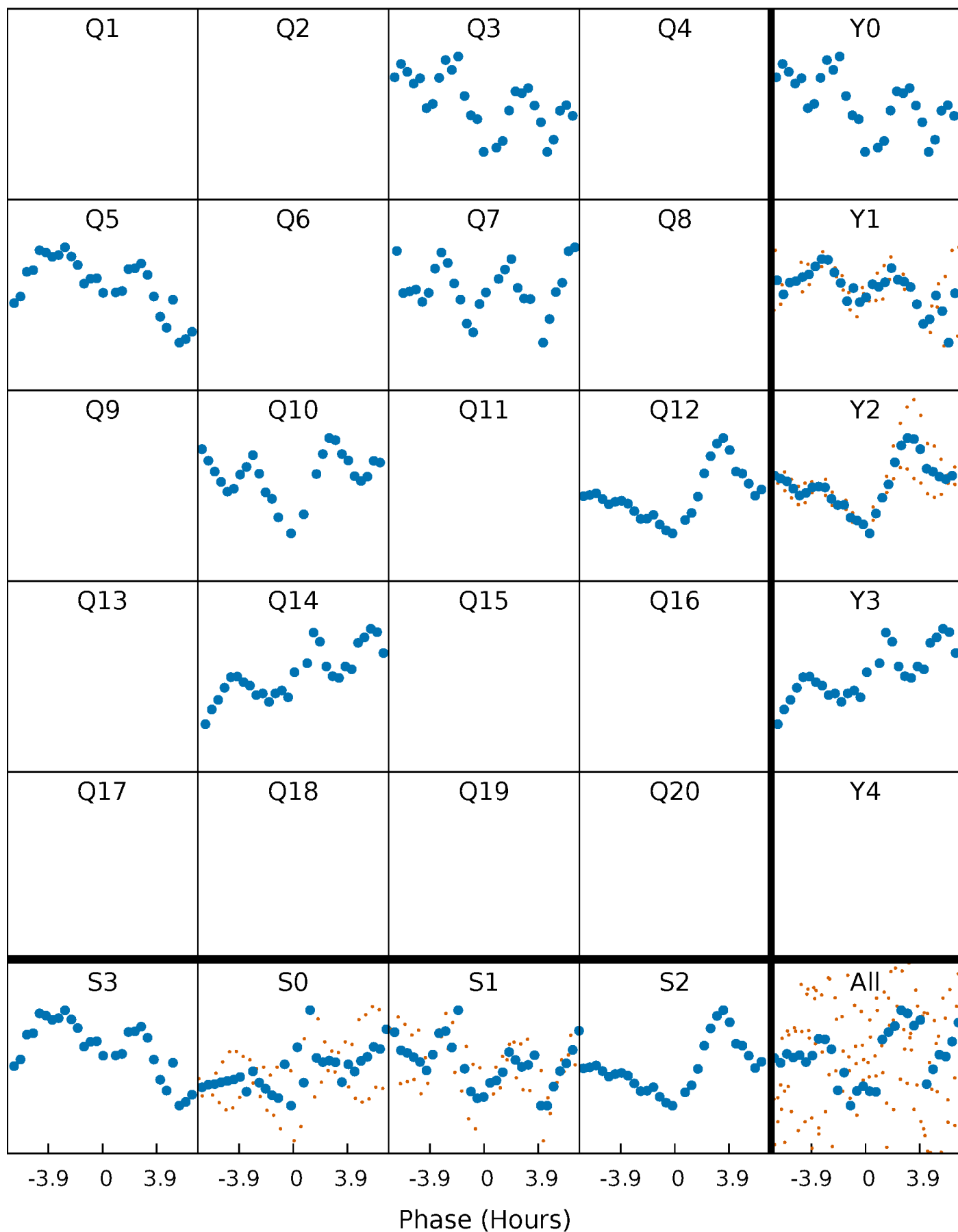


## Planet 5 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

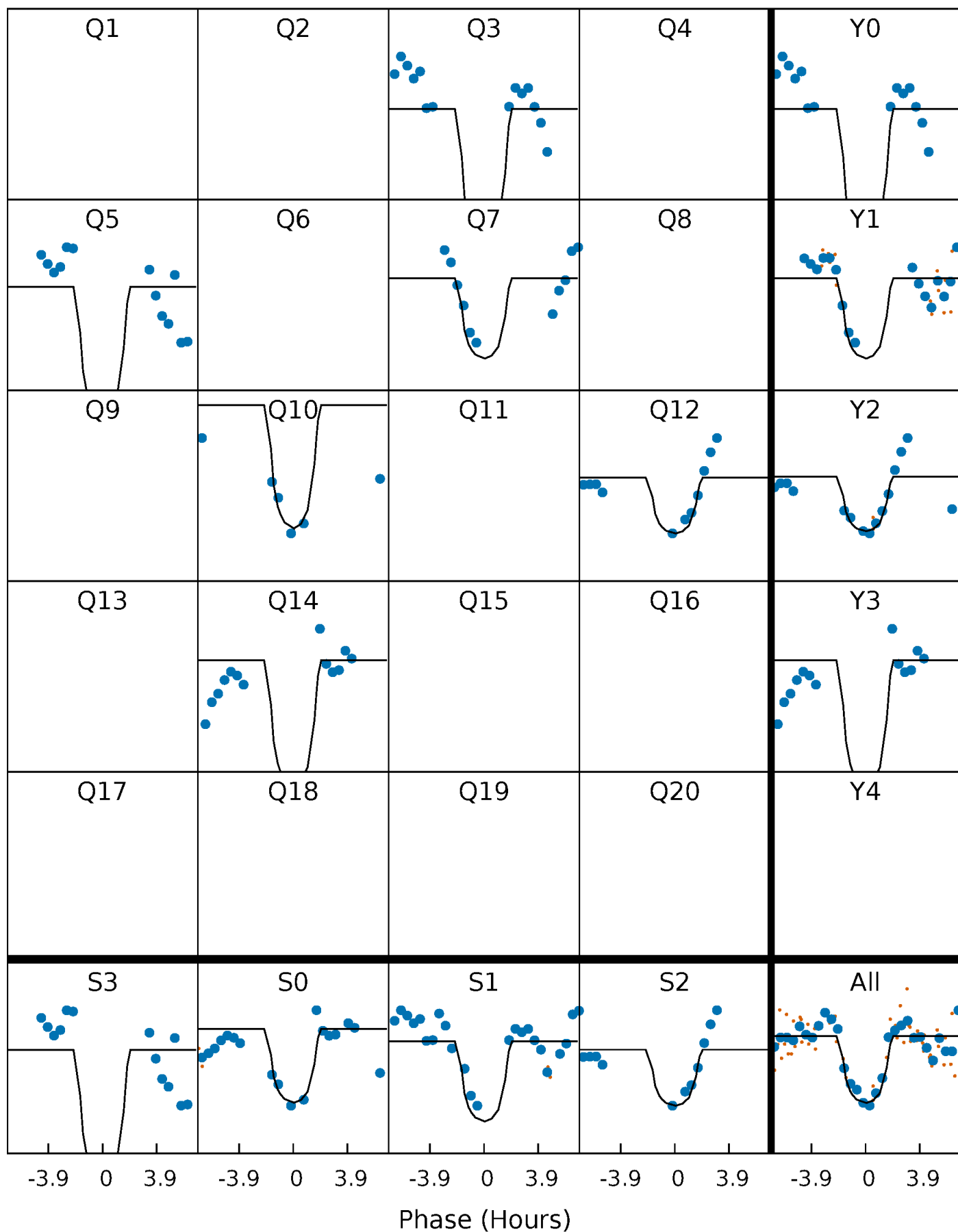
TCE 004390912-05     $P=213.056315$  Days     $T_0=278.688706$  (BKJD)





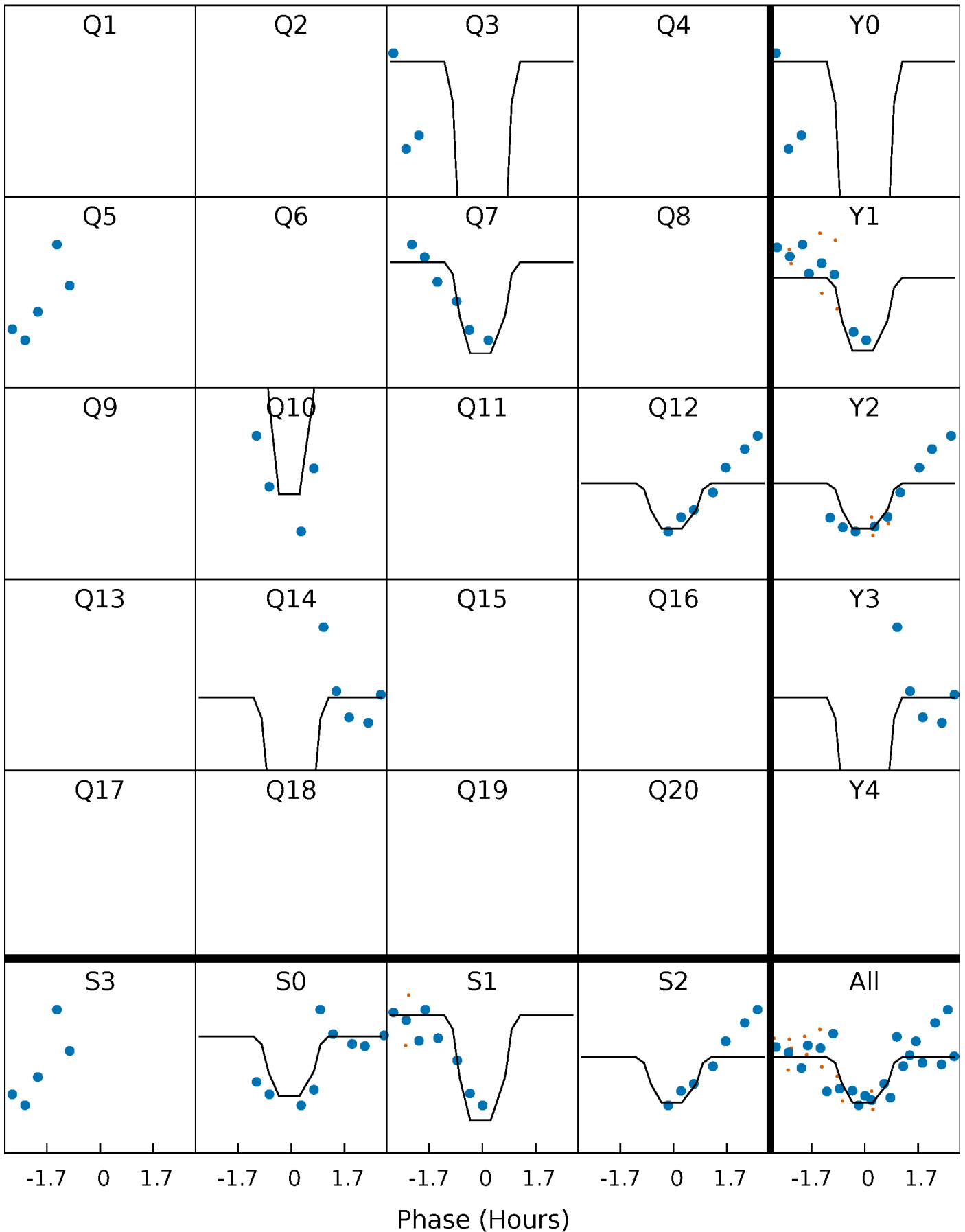
# DV Quarter-Phased Transit Curves

TCE 004390912-05     $P=213.056315$  Days     $T_0=278.688706$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

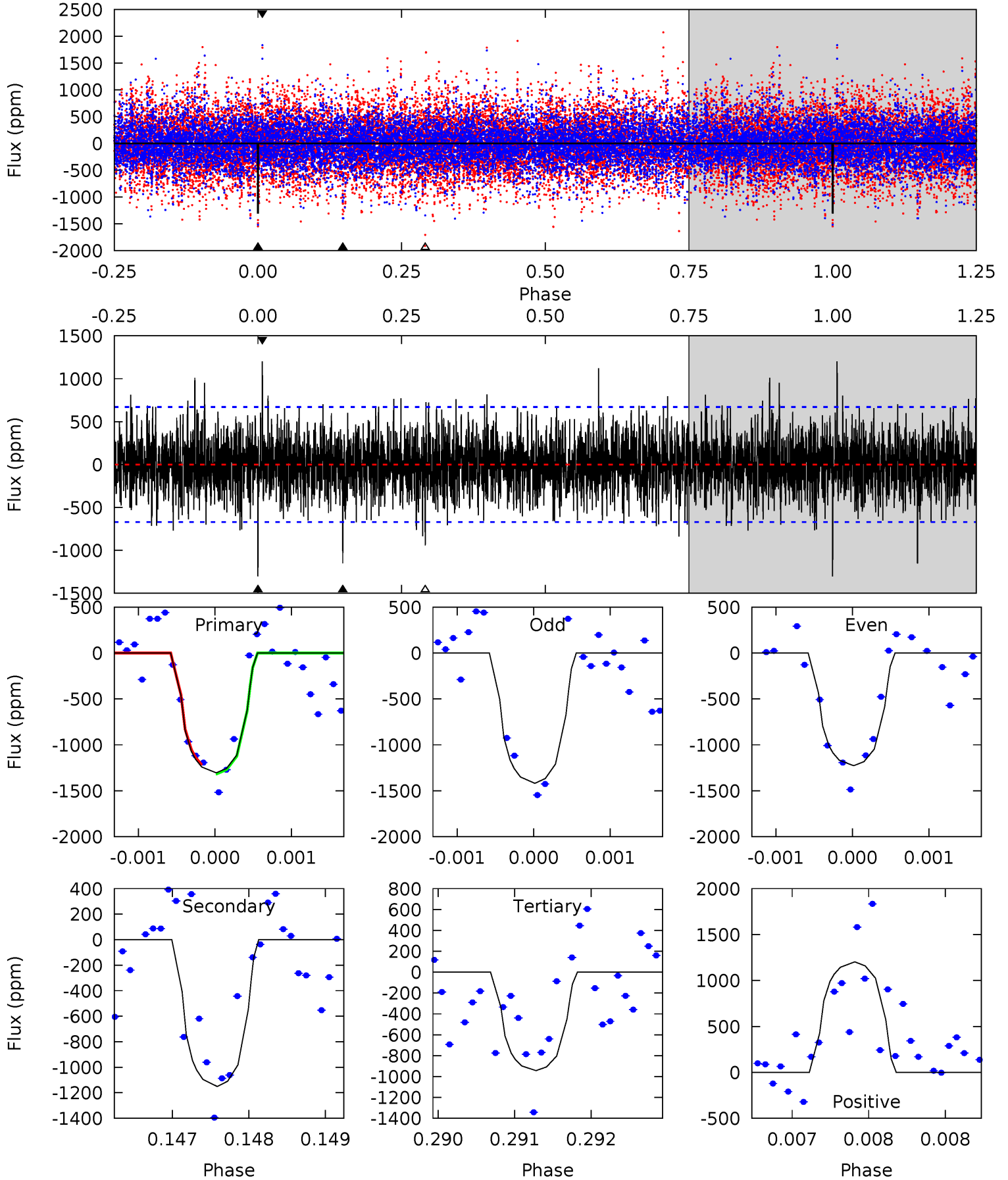
TCE 004390912-05     $P=213.078151$  Days     $T_0=278.614875$  (BKJD)



# DV Model-Shift Uniqueness Test

004390912-05, P = 213.056315 Days, E = 65.632391 Days

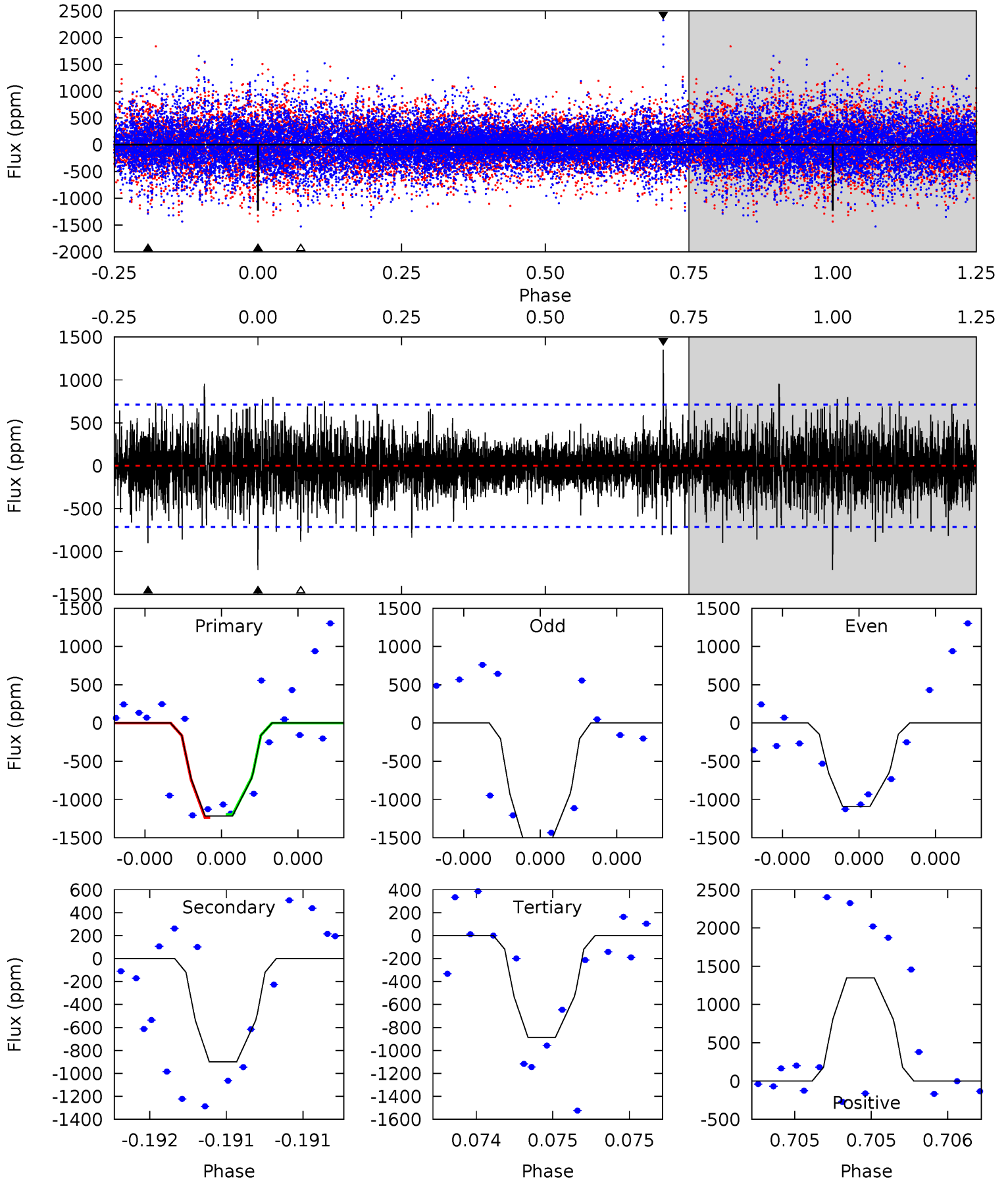
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
10.7	9.46	7.75	9.88	5.51	3.39	2.12	2.96	0.83	1.71	-0.42	0.78	1.05	0.48	0.38



# Alt Model-Shift Uniqueness Test

004390912-05, P = 213.078151 Days, E = 65.536724 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
9.59	7.10	6.99	10.7	5.63	3.57	1.67	2.60	-1.07	0.10	-3.56	1.71	1.12	0.53	0.14



### Stellar Parameters For KIC 004390912

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$4643^{+55}_{-55}$	$2.595^{+0.024}_{-0.033}$	$-0.180^{+0.150}_{-0.100}$	$7.906^{+1.325}_{-0.221}$	$0.898^{+0.268}_{-0.015}$	$0.003^{+0.000}_{-0.000}$
	+1%/-1%	+1%/-1%	+83%/-56%	+17%/-3%	+30%/-2%	+7%/-19%
Source	SPE68	AST9	SPE68	DSEP		

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

### Secondary Eclipse Parameters for KIC 004390912-05 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-1151 \pm 122$	$68.50^{+66.52}_{-48.93}$	$980^{+19}_{-15}$	$3442^{+2003}_{-613}$	$64^{+670}_{-48}$
Alt.	$-899 \pm 127$	$69.76^{+64.90}_{-48.82}$	$980^{+19}_{-14}$	$3308^{+1749}_{-573}$	$48^{+454}_{-36}$

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

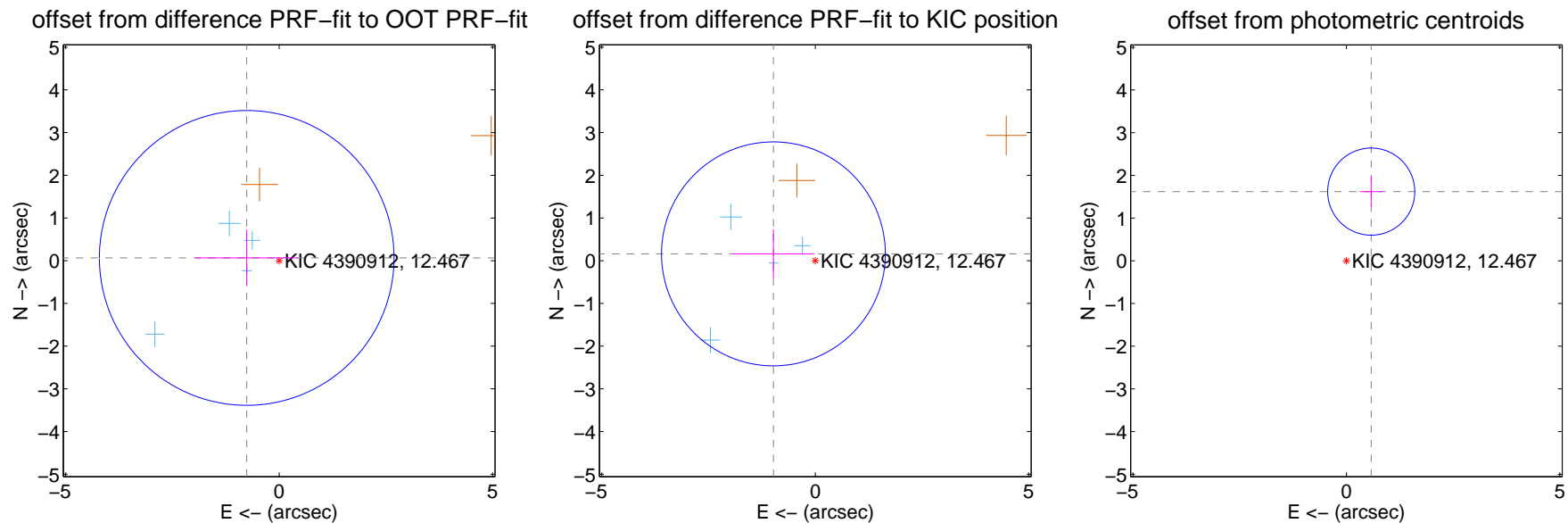
## DV Centroid Data

Supplemental centroid analysis for 004390912-05. Kepler magnitude: 12.47. Transit SNR 7.07

There are 4 quarters with good PRF difference image offsets

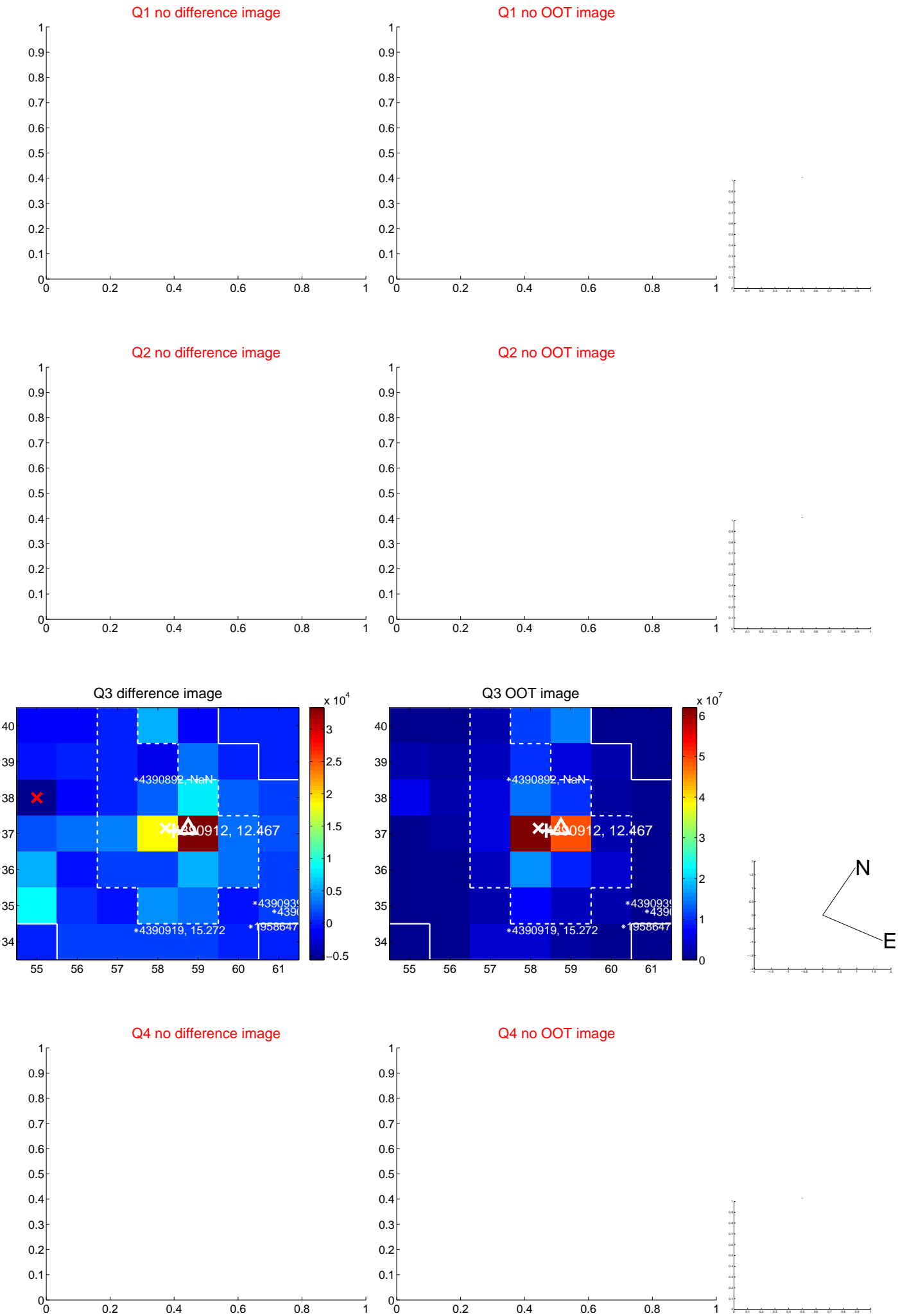
The direct PRF centroid is offset from the target star catalog position by about 0.47 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.763 \pm 1.150$	0.66	$0.760 \pm 1.203$	$0.065 \pm 0.663$
PRF-fit source offset from KIC position	$0.993 \pm 0.874$	1.14	$0.980 \pm 0.959$	$0.160 \pm 0.573$
photometric centroid source offset	$1.72 \pm 0.34$	5.06	$-0.58 \pm 0.26$	$1.62 \pm 0.35$



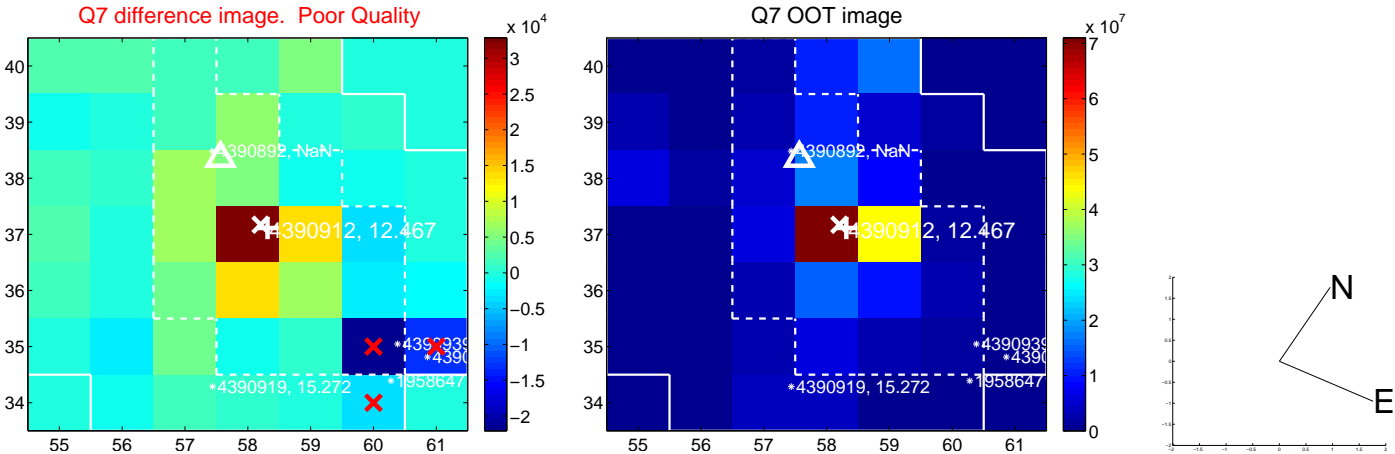
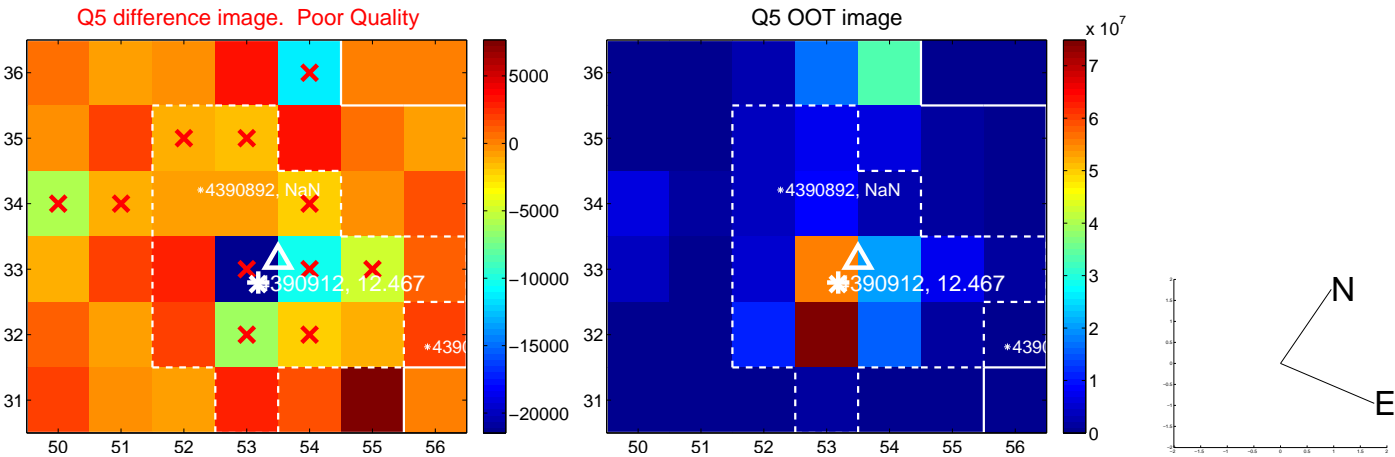
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

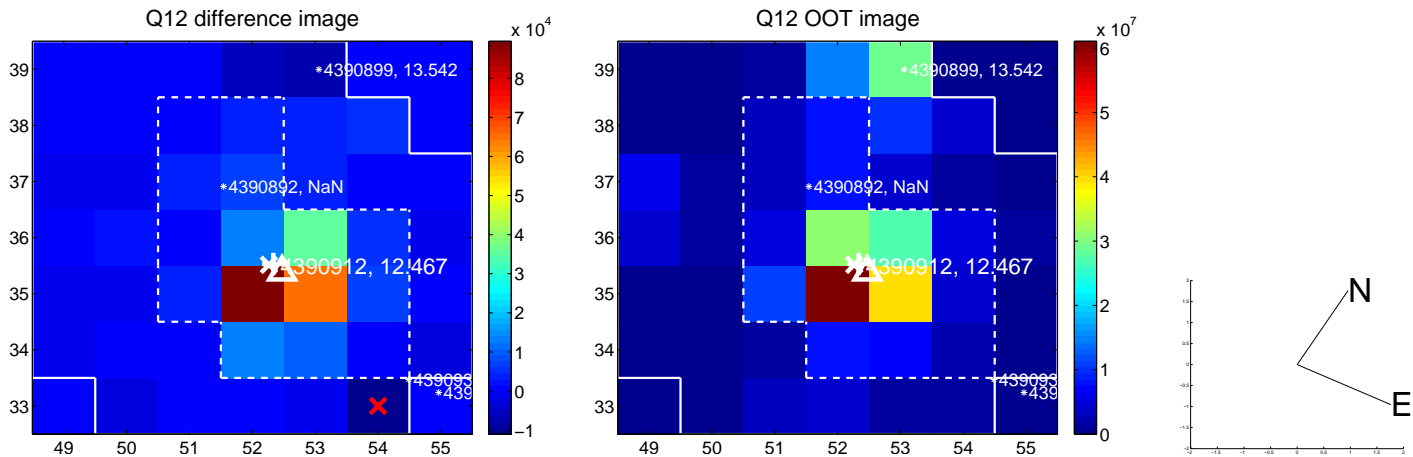
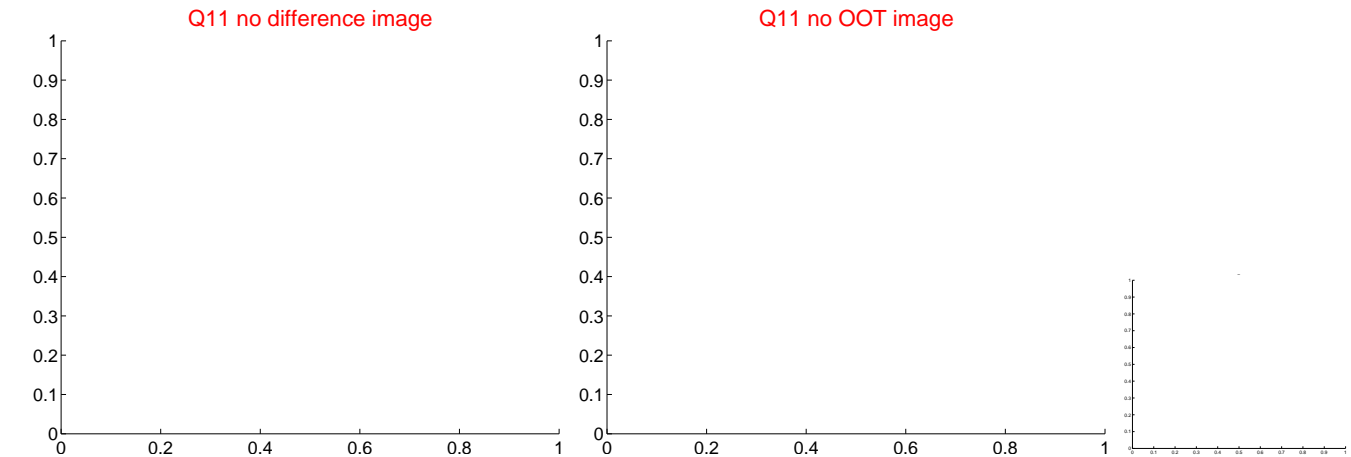
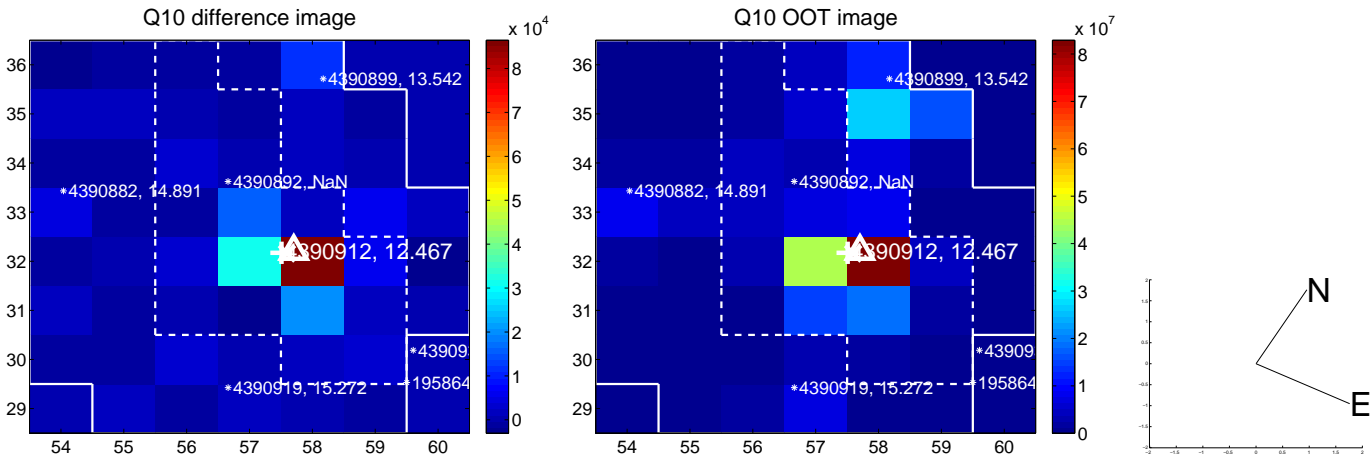
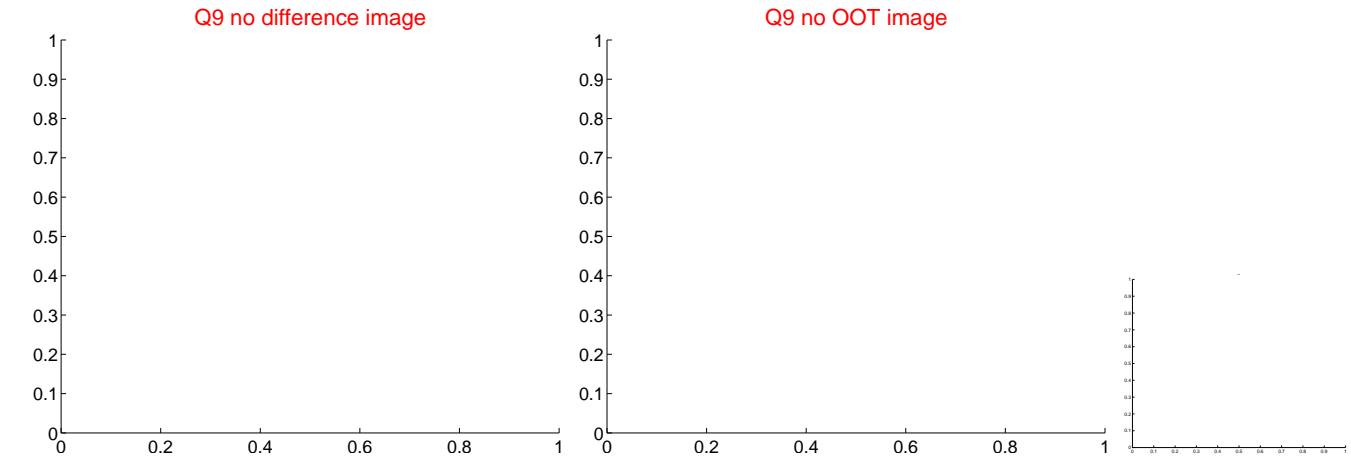




white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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.

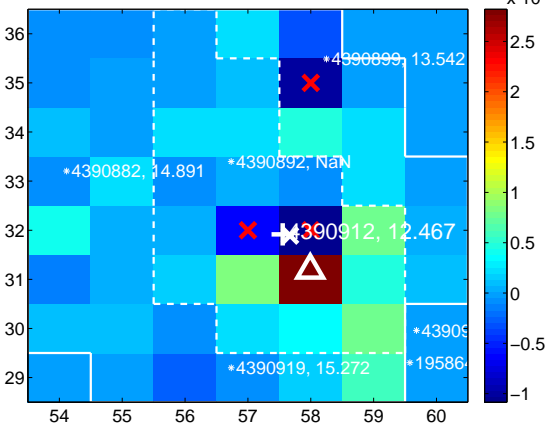
Q13 no difference image



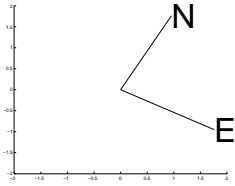
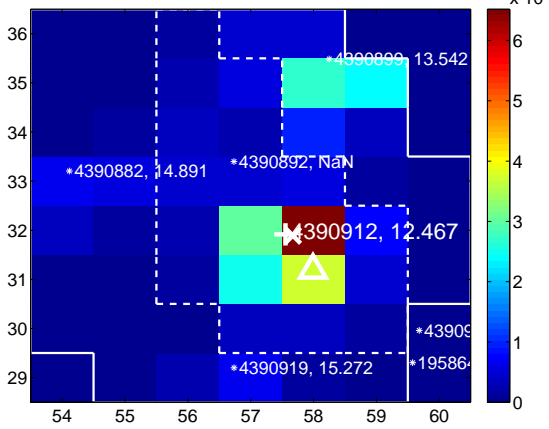
Q13 no OOT image



Q14 difference image



Q14 OOT image



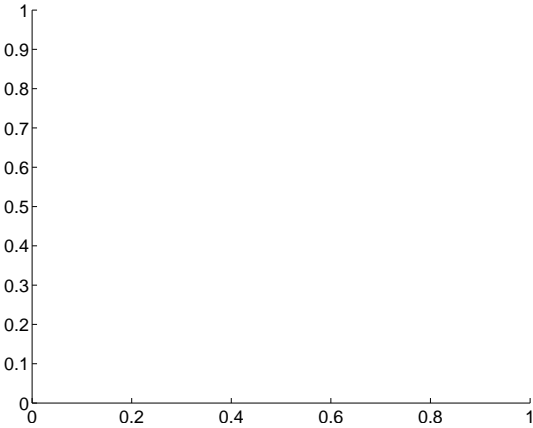
Q15 no difference image



Q15 no OOT image



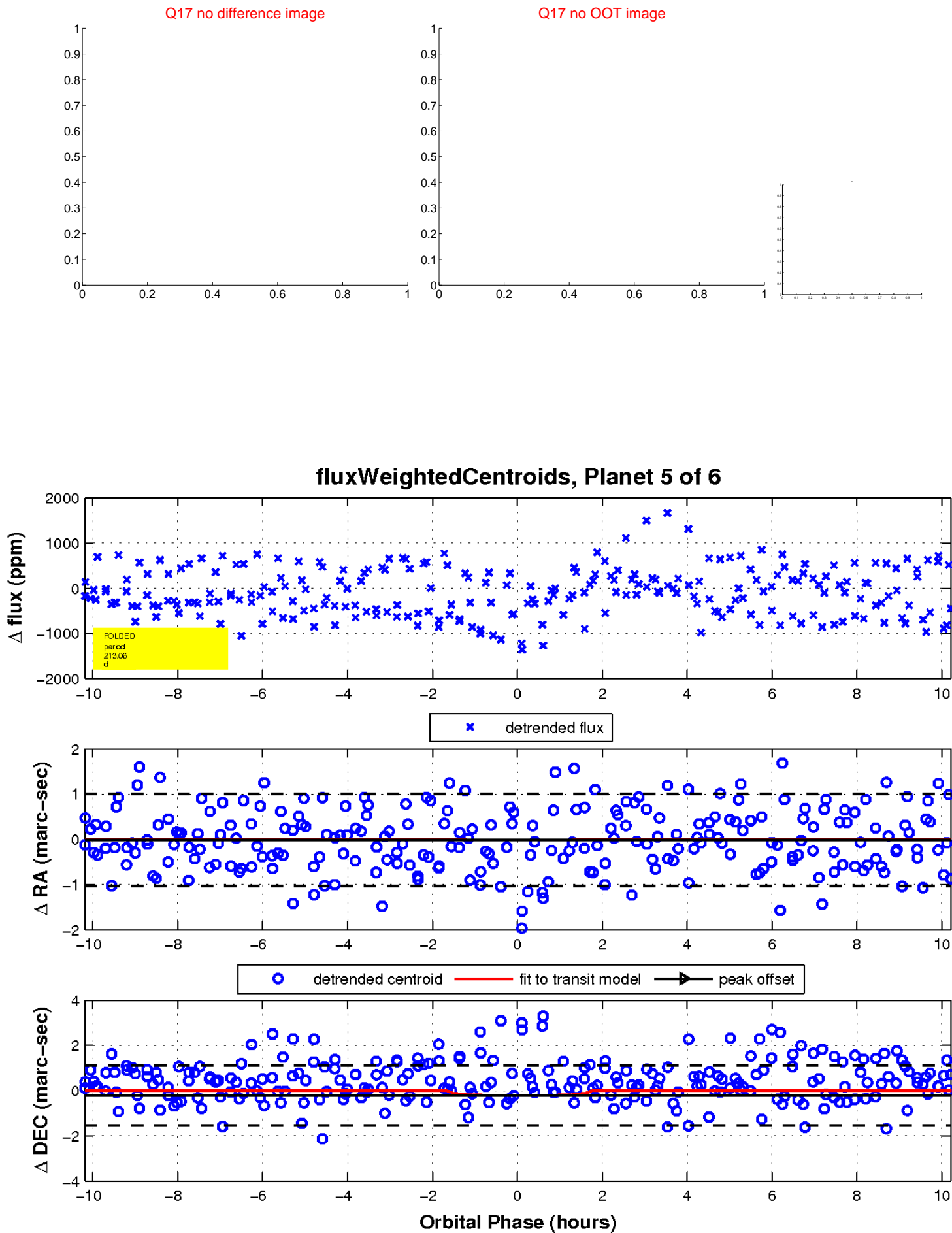
Q16 no difference image



Q16 no OOT image

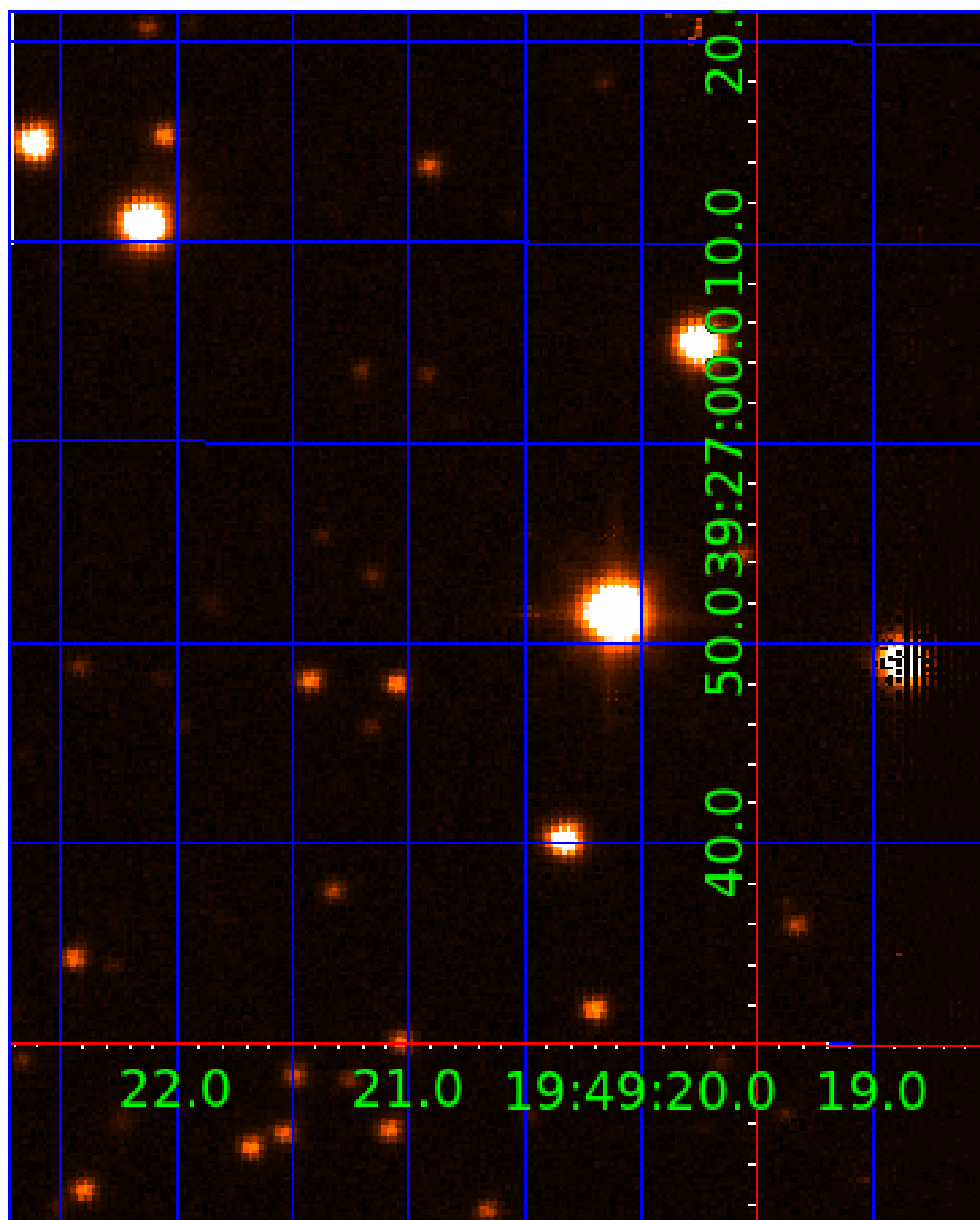


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 004390912

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004390912-01	OBS	7695.01	0.687503	131.866326	77.0	1.102	12.6	16.8	7.91	4643	8.59	0.00
004390912-02	OBS	No	0.687502	131.514369	60.1	1.293	11.5	12.5	7.91	4643	7.65	0.00
004390912-03	OBS	No	228.268812	153.650474	1198.9	3.272	8.4	7.8	7.91	4643	36.88	52.34
004390912-04	OBS	No	151.520908	192.382705	1061.1	2.943	8.2	6.4	7.91	4643	26.75	90.39
004390912-05	OBS	No	213.056315	278.688706	1487.4	3.436	9.2	7.1	7.91	4643	29.26	57.38
004390912-06	OBS	No	240.589536	221.748142	1651.7	7.777	7.7	8.0	7.91	4643	65.02	48.79

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004390912-01	OBS	FP	0.00	1	0	1	0	MOD_NONUNIQ_ALT—CENT_RESOLVED_OFFSET
004390912-02	OBS	FP	0.00	1	0	1	0	MOD_NONUNIQ_ALT—SAME_NTL_PERIOD—CENT_RESOLVED_OFFSET
004390912-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_MARSHALL—INCONSISTENT_TRANS
004390912-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—ALL_TRANS_CHASES—INCONSISTENT_TRANS
004390912-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_MARSHALL—TRANS_GAPPED—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT—MOD_POS_ALT—INCONSISTENT_TRANS
004390912-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_CHASES_MARSHALL_SKYE—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_ALT

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

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

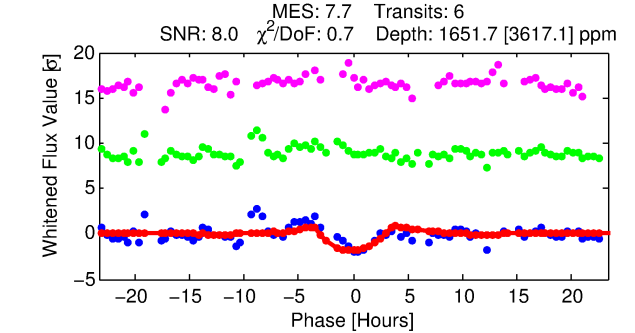
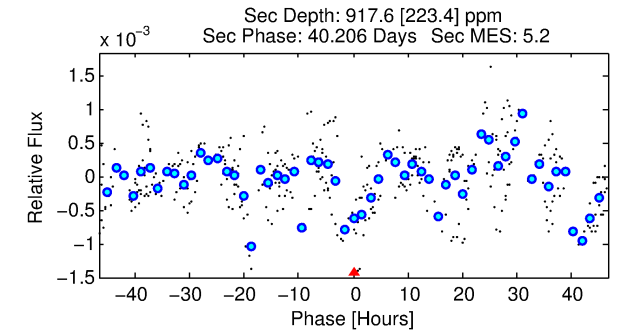
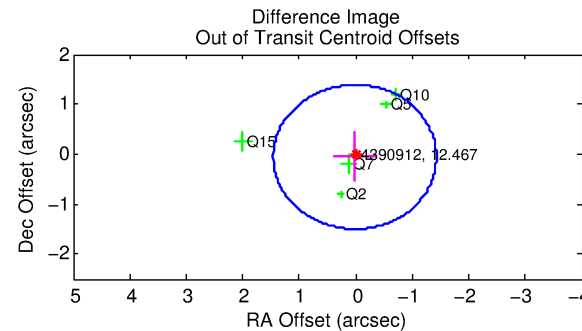
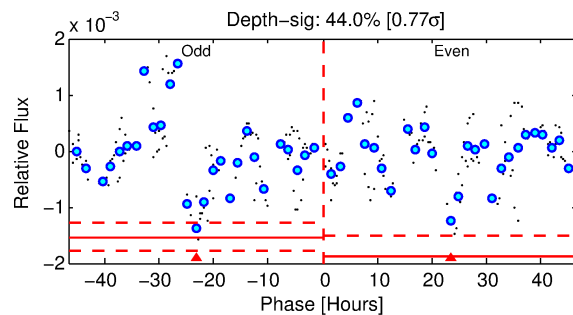
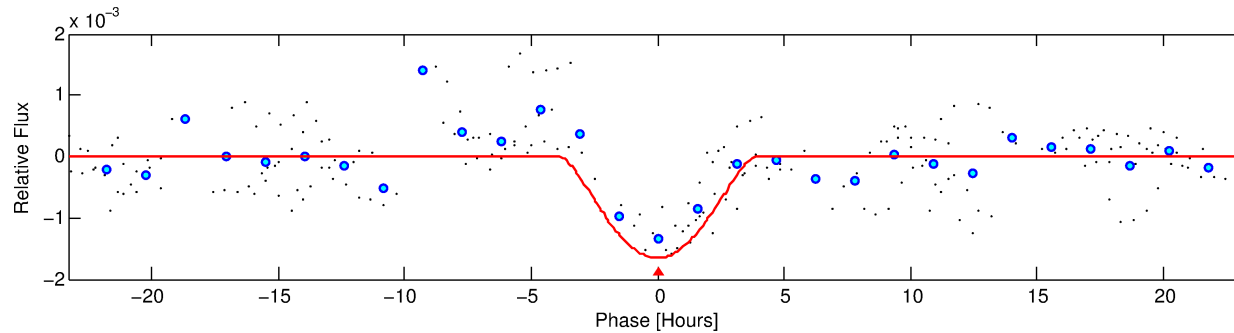
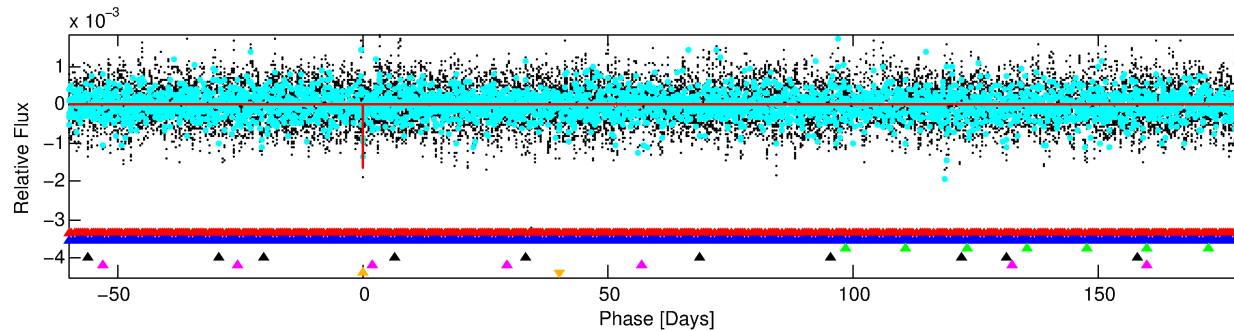
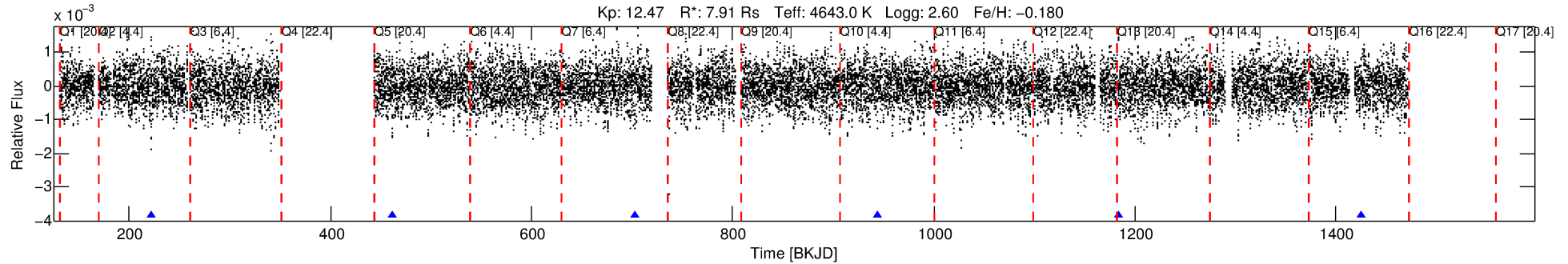
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 004390912-06

No Significant Match Found

# DV One-Page Summary

KIC: 4390912 Candidate: 6 of 6 Period: 240.590 d



## DV Fit Results:

Period = 240.58954 [0.00603] d  
Epoch = 221.7481 [0.0239] BKJD  
Rp/R\* = 0.0754 [0.1854]  
a/R\* = 93.48 [45.74]  
b = 1.00 [0.15]  
Seff = 48.79 [6.42]  
Teq = 674 [22] K  
**Rp = 65.02 [160.36] Re**  
a = 0.7303 [0.0837] AU  
Ag = 63.69 [313.89] [0.20 $\sigma$ ]  
Teffp = 2944 [3626] K [0.63 $\sigma$ ]

## DV Diagnostic Results:

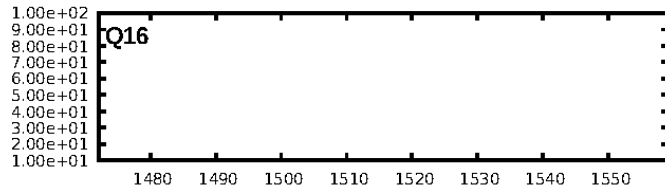
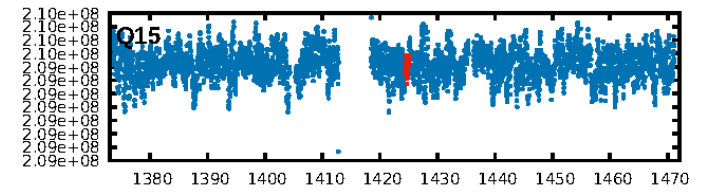
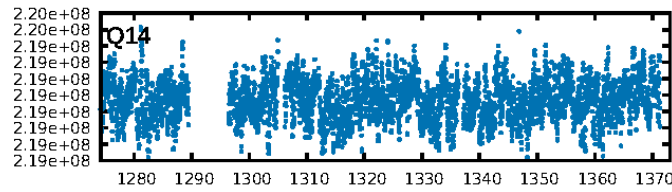
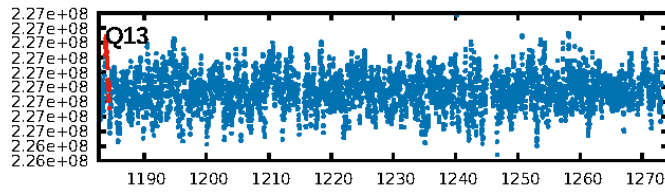
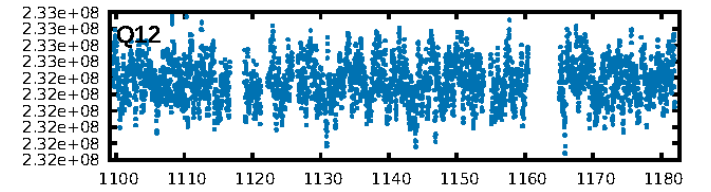
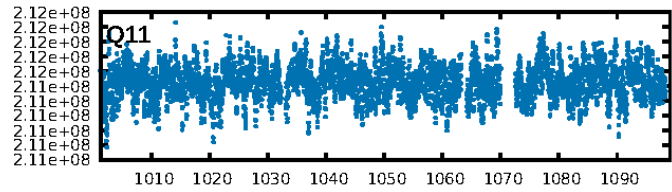
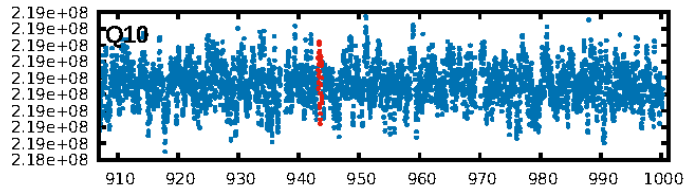
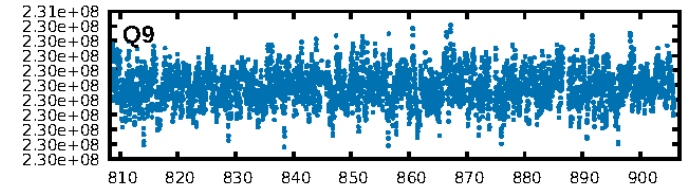
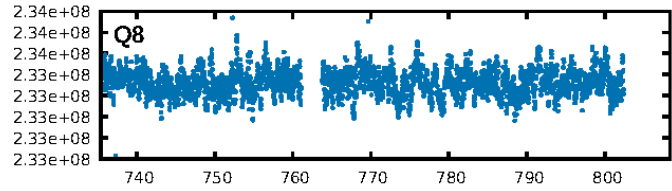
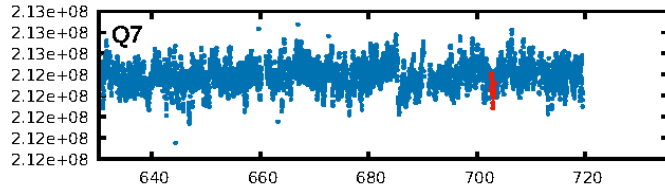
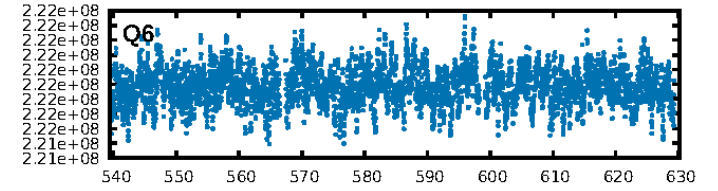
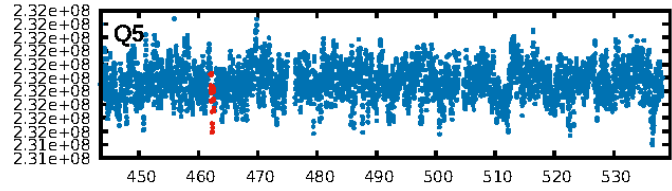
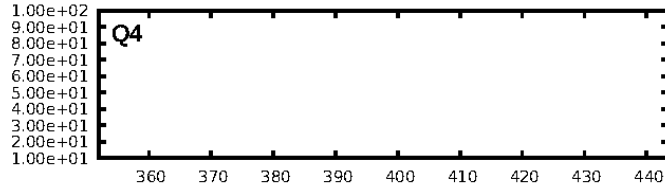
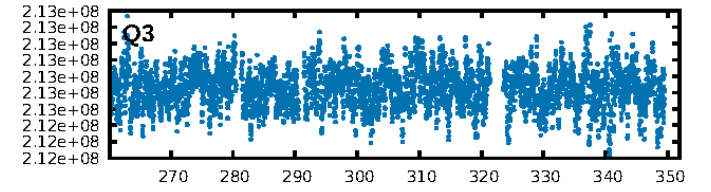
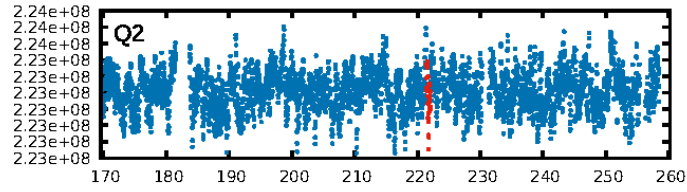
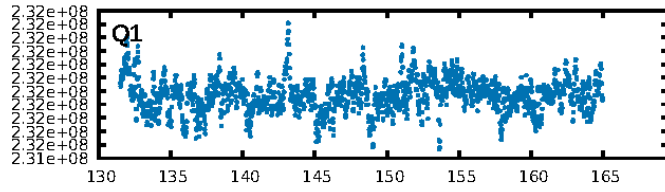
ShortPeriod-sig: 100.0% [35.05 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 77.8%  
ModelChiSquareGof-sig: 100.0%  
**Bootstrap-pfa: 1.02e-09**  
RollingBand-fgt: 1.00 [6/6]  
**GhostDiagnostic-chr: -1.706**  
Centroid-sig: 12.9%  
**Centroid-so: 1.424 arcsec [4.37 $\sigma$ ]**  
OotOffset-rm: 0.059 arcsec [0.12 $\sigma$ ]  
KicOffset-rm: 0.069 arcsec [0.11 $\sigma$ ]  
OotOffset-st: 2/2/0/1 [5]  
KicOffset-st: 2/2/0/1 [5]  
DiffImageQuality-fgm: 1.00 [5/5]  
DiffImageOverlap-fno: 0.00 [0/5]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 16:09:51 Z

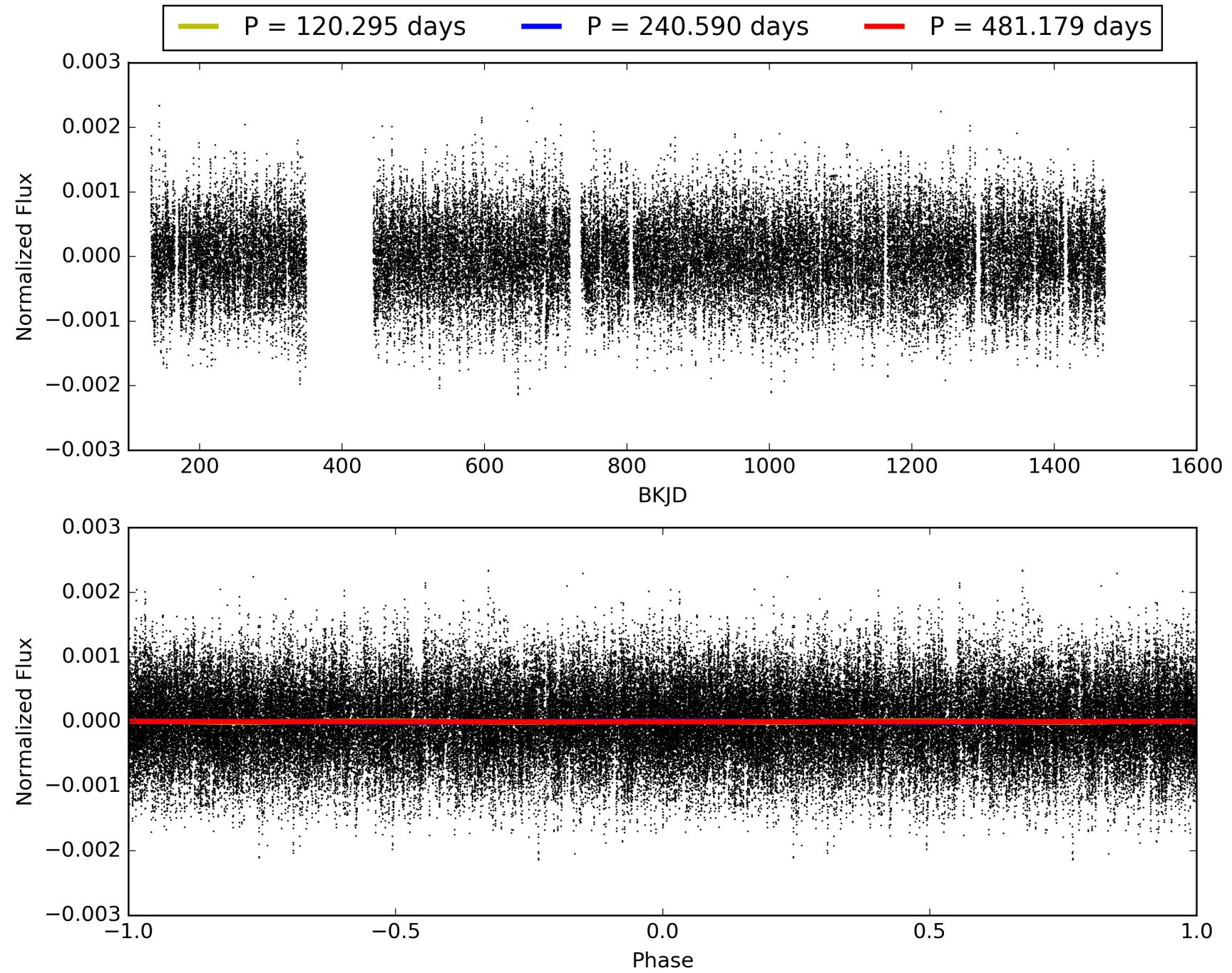
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center



# TCE 004390912-06, PDC Light Curves

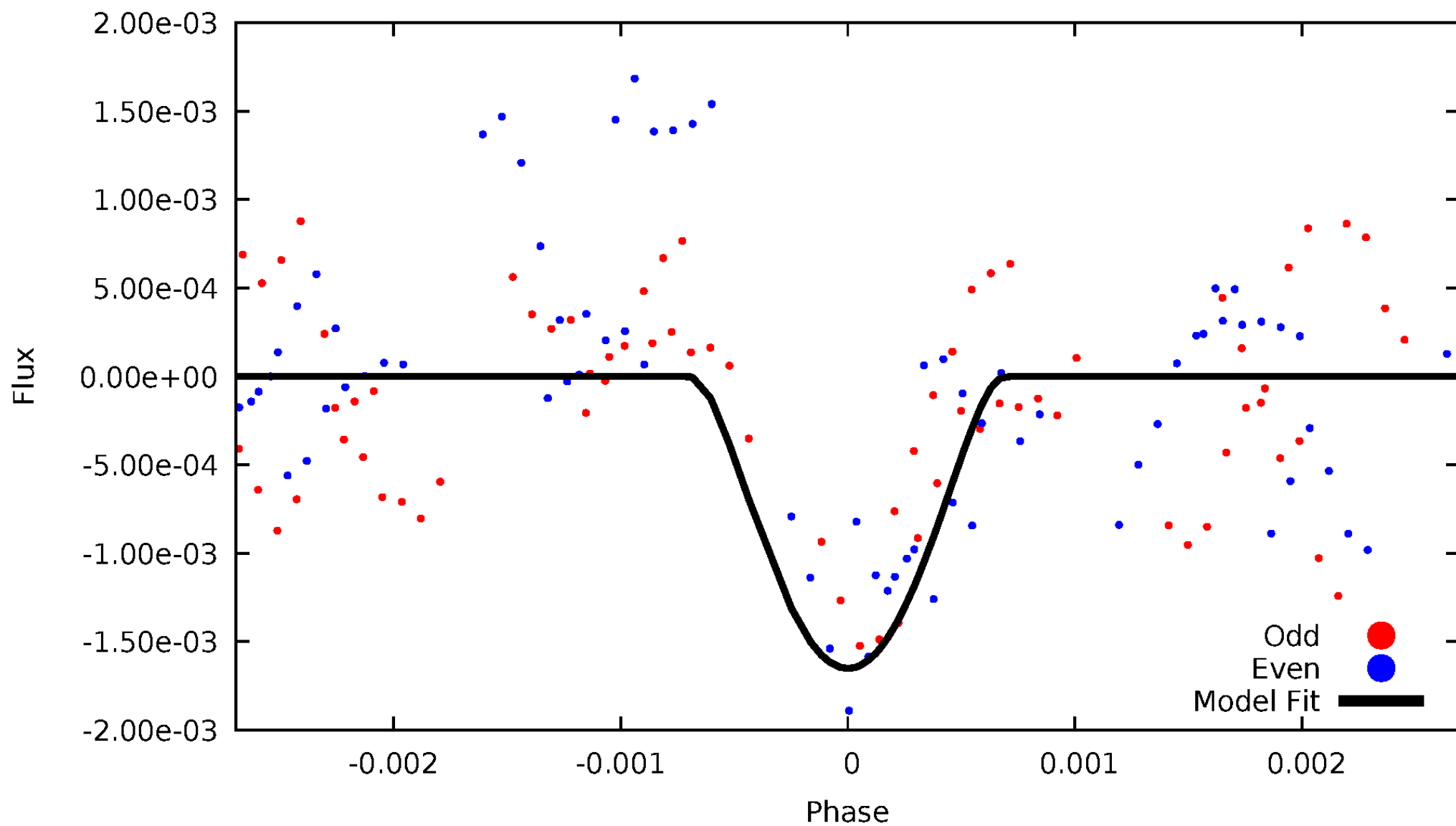


TCE 004390912-06



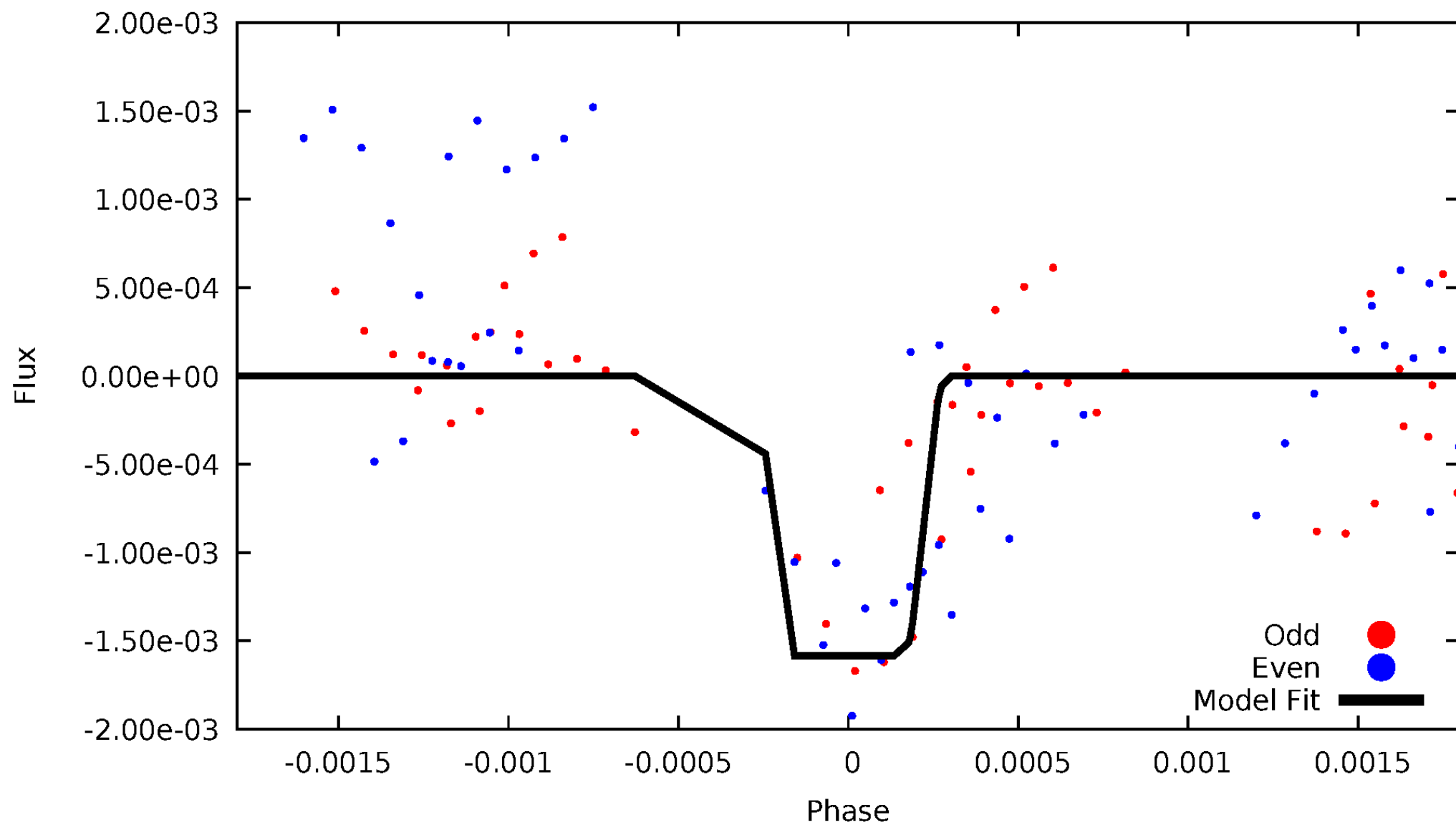
# DV Odd/Even

TCE 004390912-06



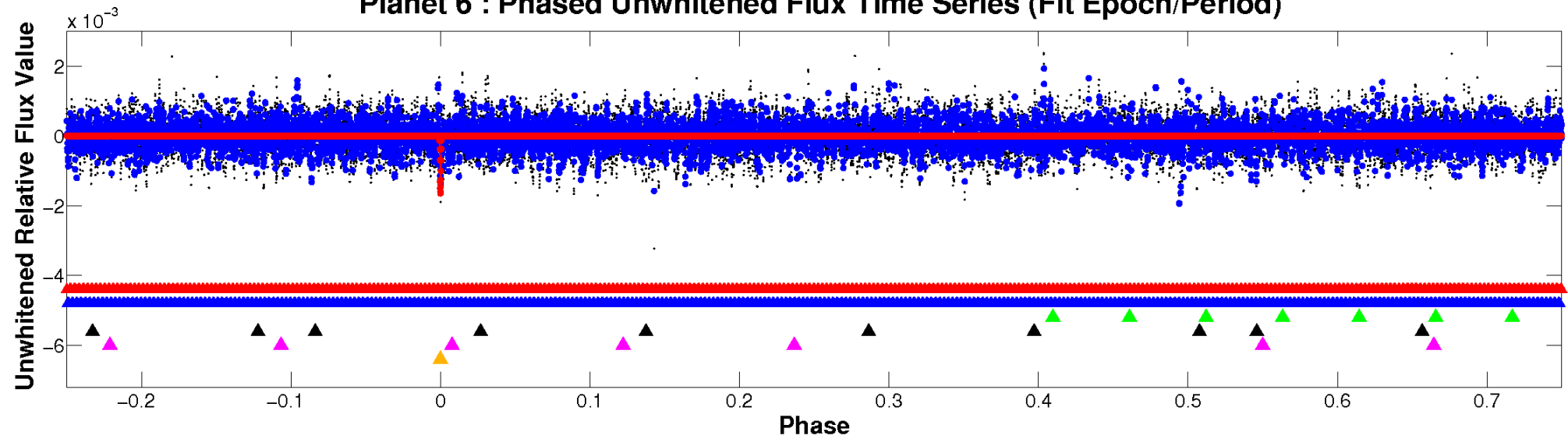
# ALT Odd/Even

TCE 004390912-06

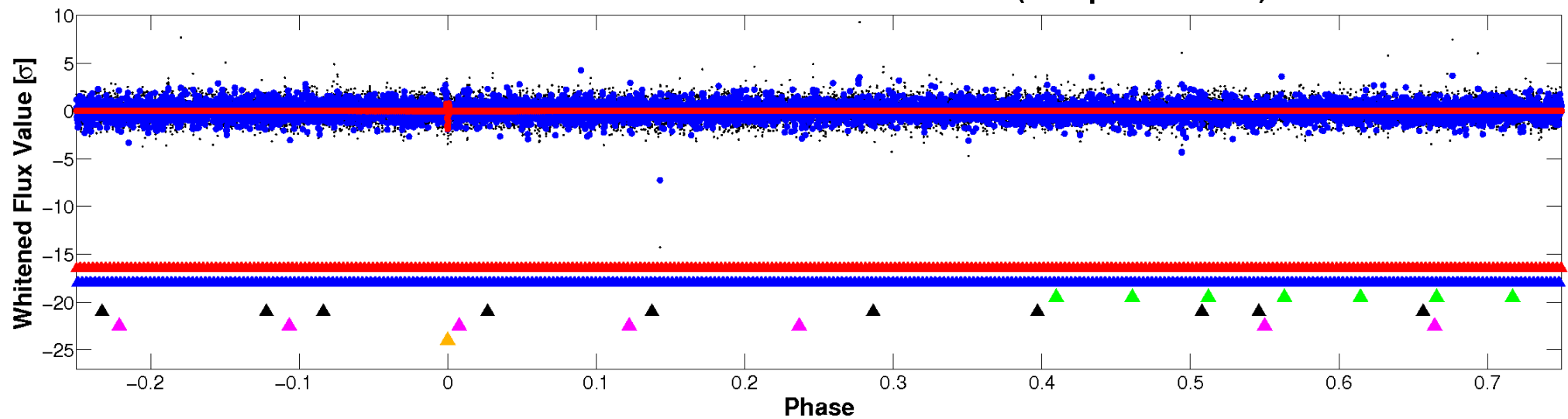


# Non-Whitened Vs. Whitened Light Curve

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

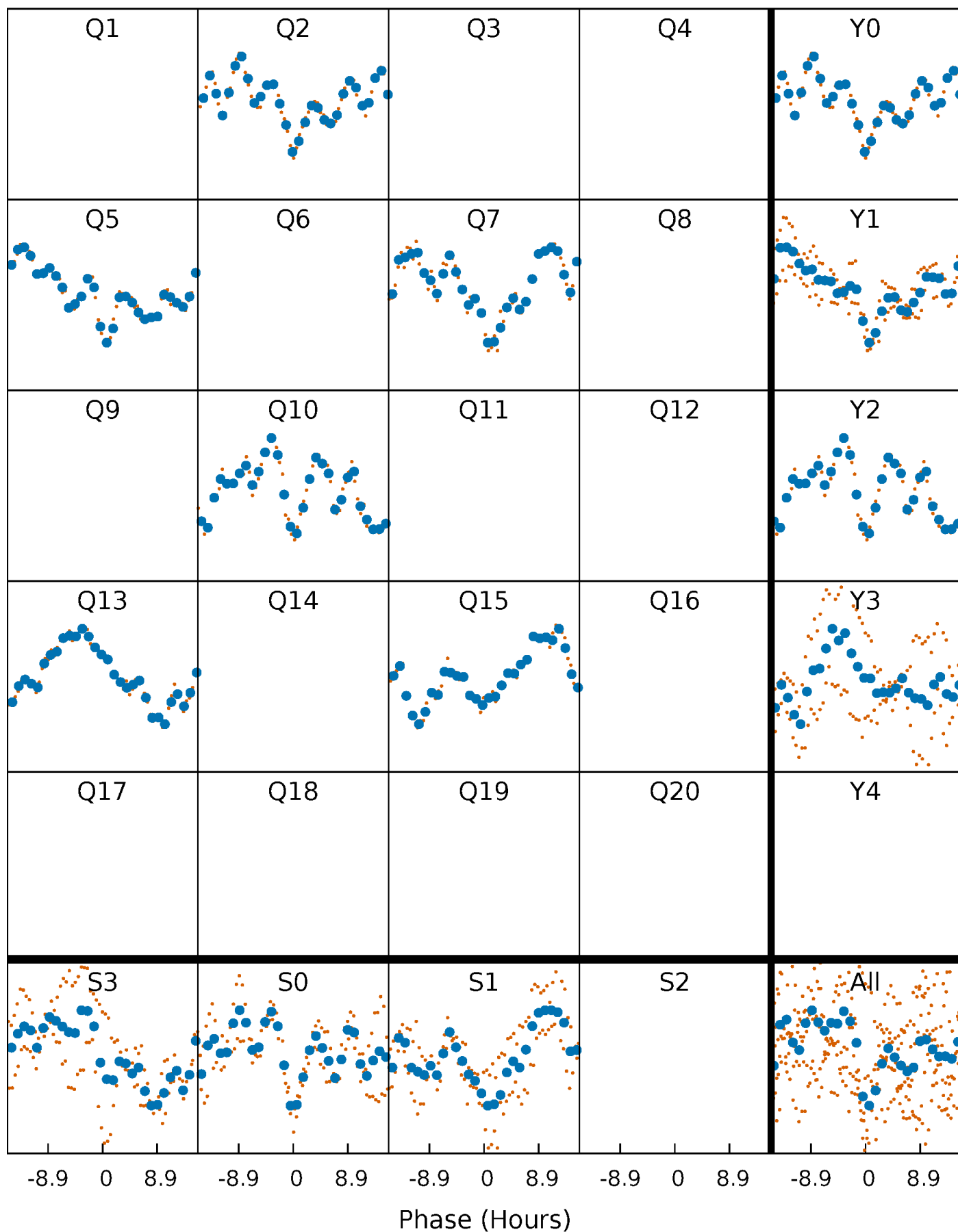


## Planet 6 : Phased Whitened Flux Time Series (Fit Epoch/Period)



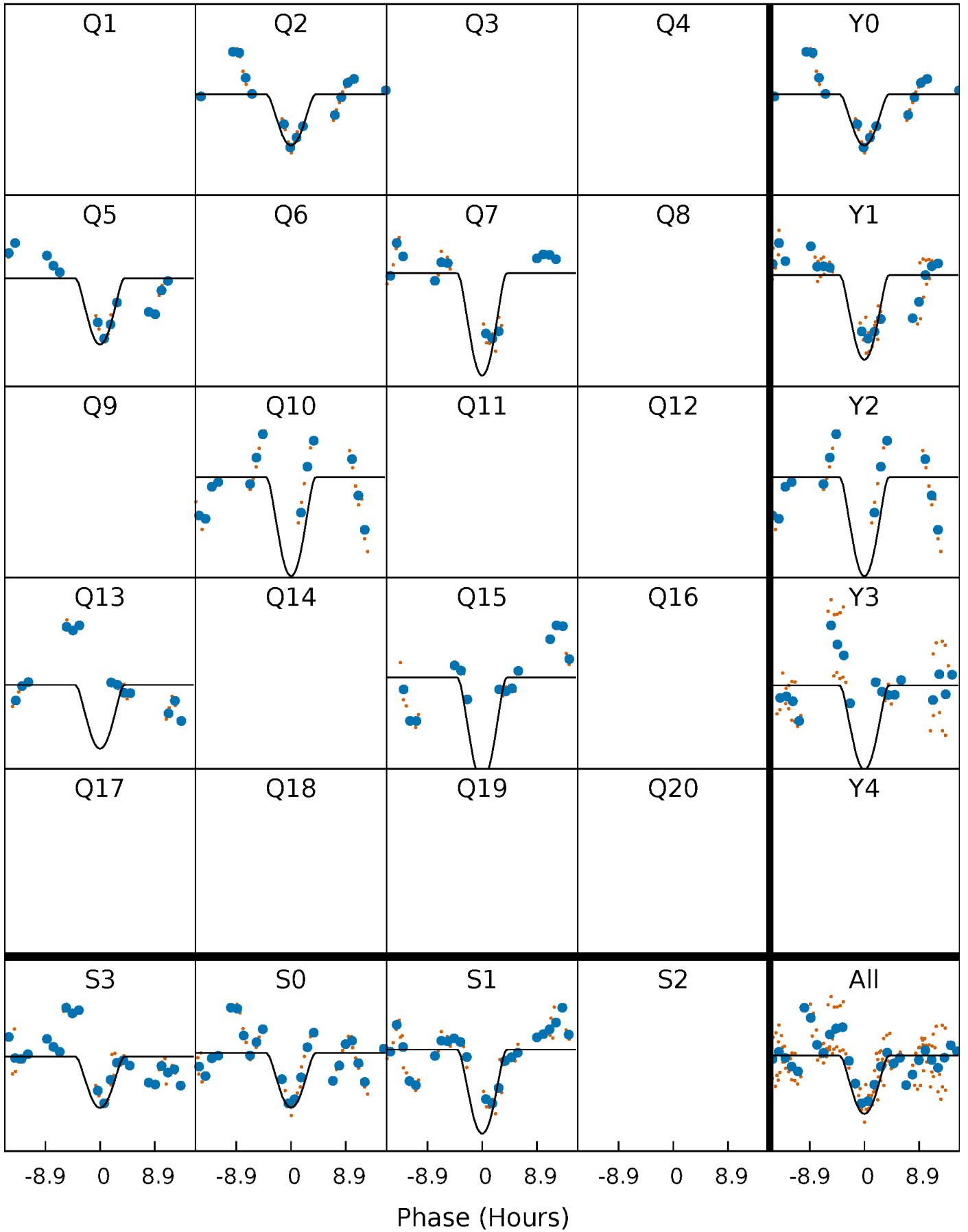
# PDC Quarter-Phased Transit Curves

TCE 004390912-06     $P=240.589536$  Days     $T_0=221.748142$  (BKJD)



# DV Quarter-Phased Transit Curves

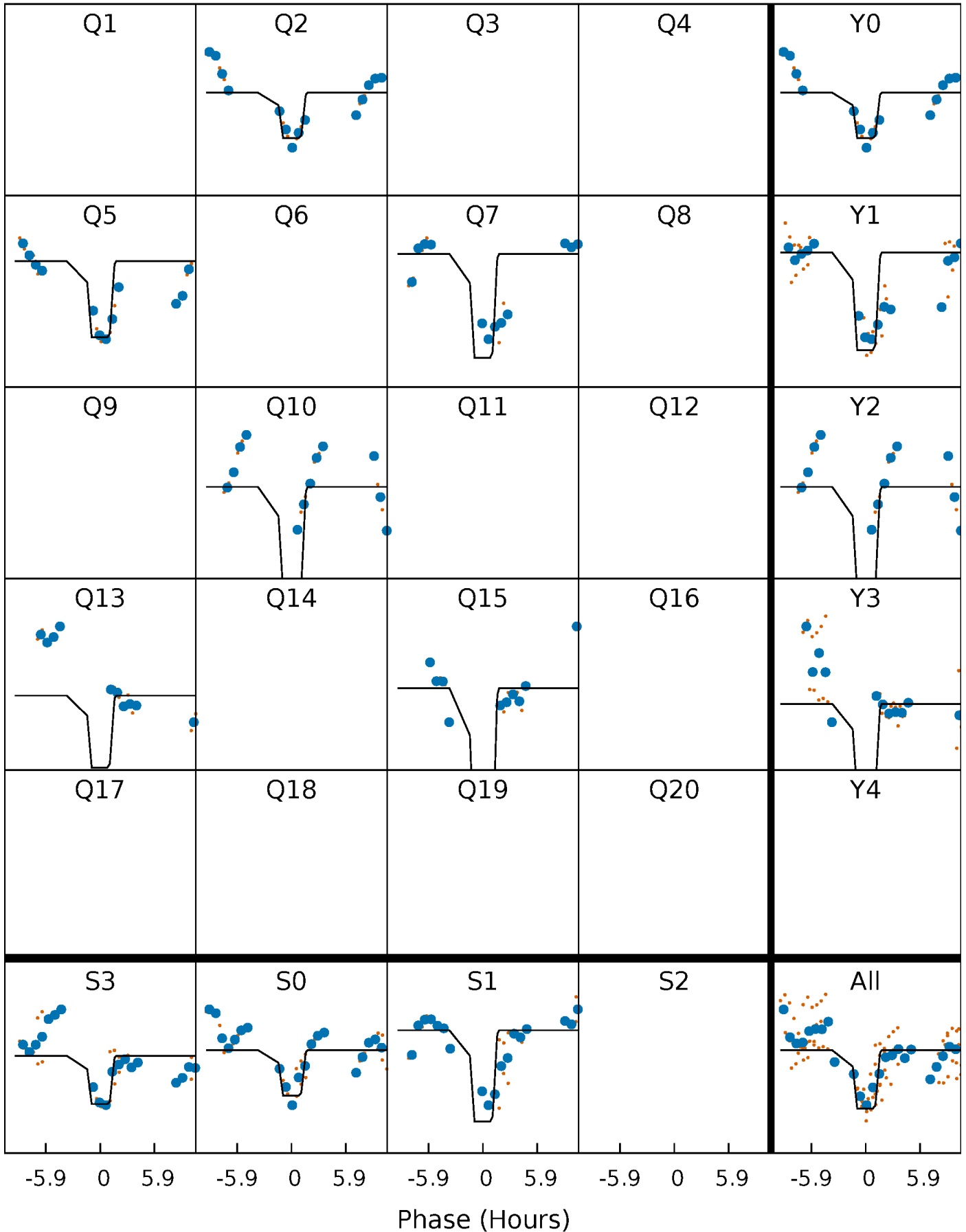
TCE 004390912-06     $P=240.589536$  Days     $T_0=221.748142$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

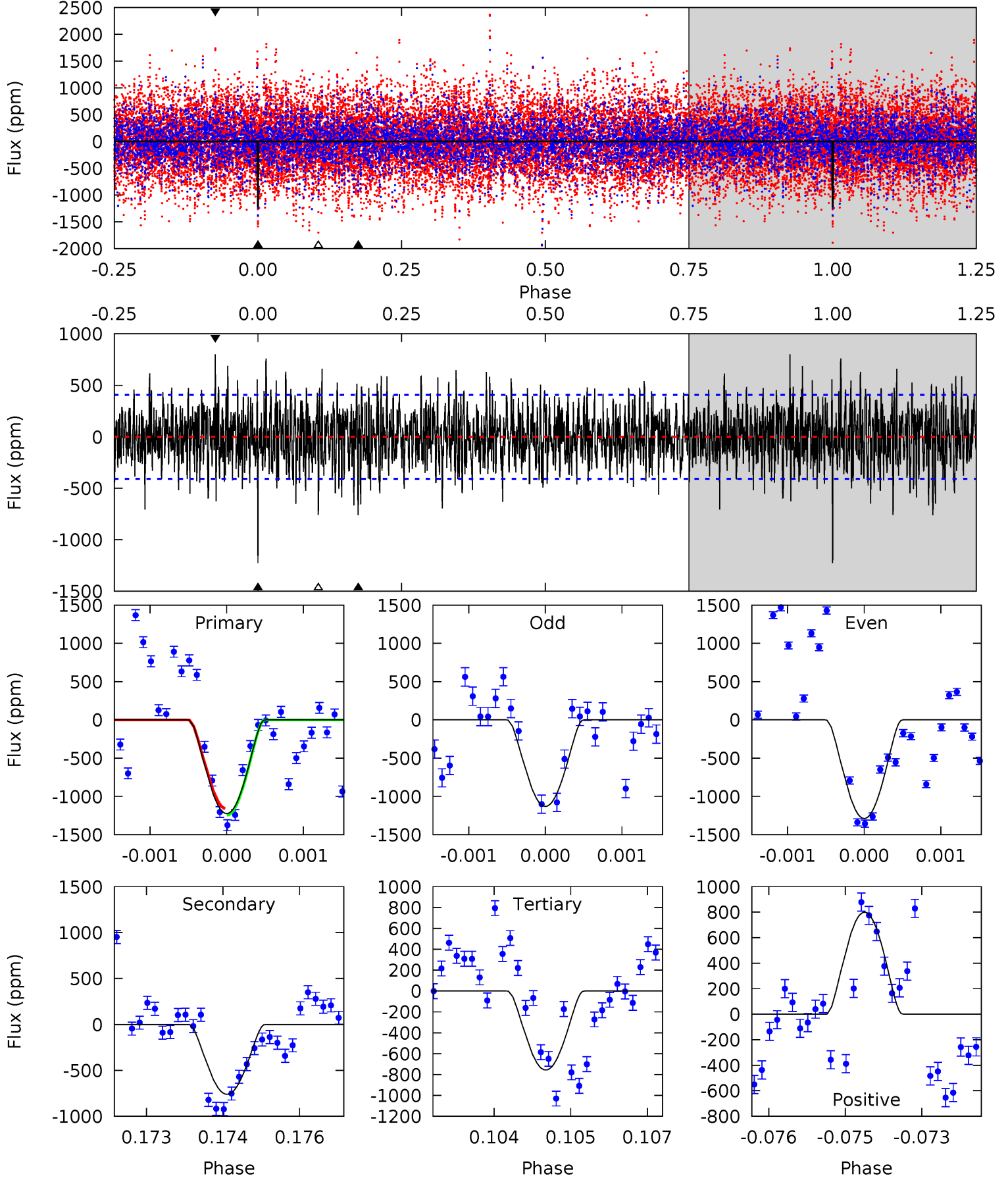
TCE 004390912-06 P=240.599051 Days  $T_0=221.746862$  (BKJD)



# DV Model-Shift Uniqueness Test

004390912-06, P = 240.589536 Days, E = 221.748142 Days

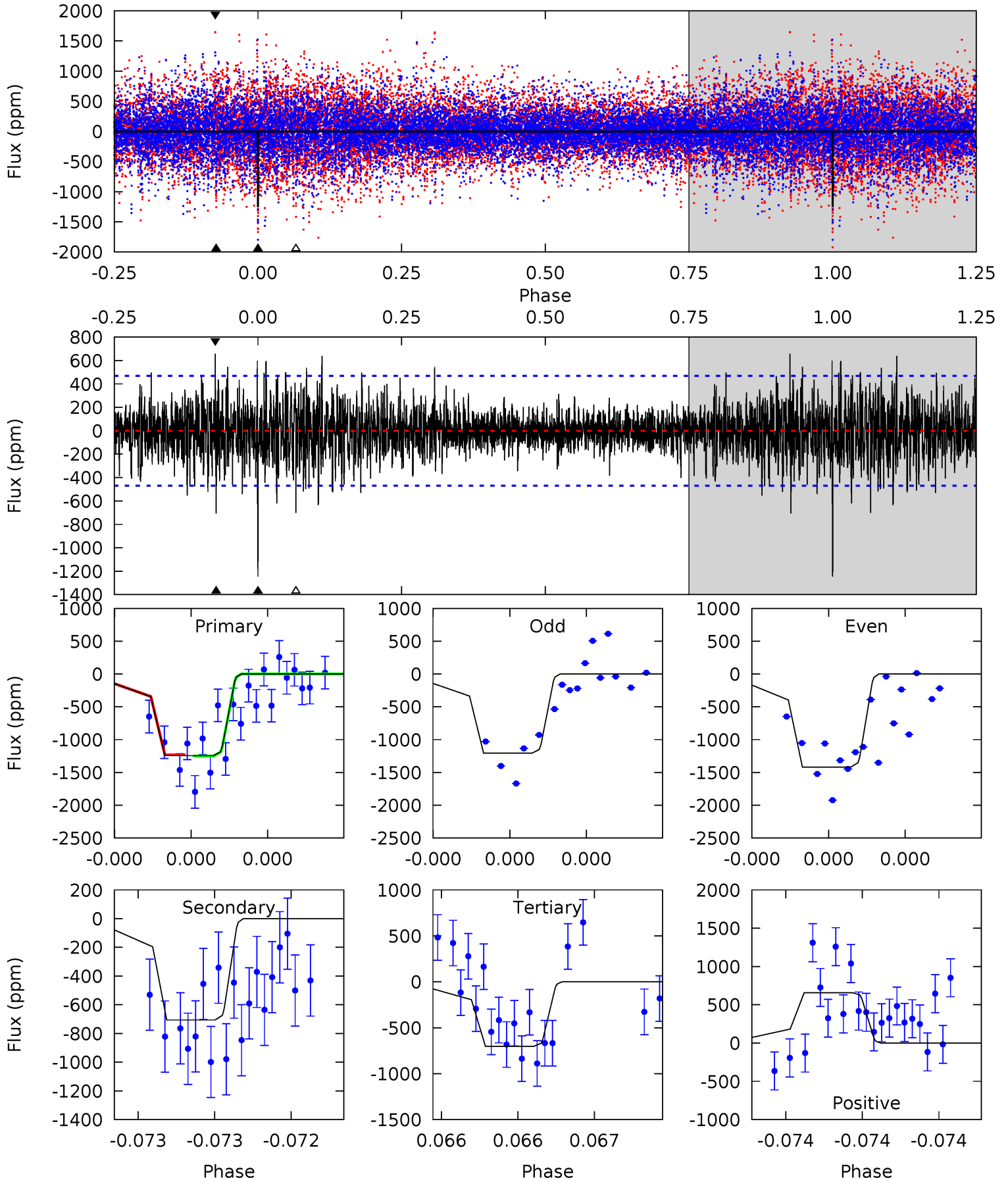
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
16.2	10.1	10.0	10.6	5.39	3.19	2.90	6.19	5.62	0.05	-0.52	1.05	0.87	0.40	0.49



# Alt Model-Shift Uniqueness Test

004390912-06, P = 240.599051 Days, E = 221.746862 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
14.8	8.40	8.35	7.82	5.59	3.50	1.84	6.46	6.98	0.05	0.58	1.23	0.72	0.35	0.10



### Stellar Parameters For KIC 004390912

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$4643^{+55}_{-55}$	$2.595^{+0.024}_{-0.033}$	$-0.180^{+0.150}_{-0.100}$	$7.906^{+1.325}_{-0.221}$	$0.898^{+0.268}_{-0.015}$	$0.003^{+0.000}_{-0.000}$
	+1%/-1%	+1%/-1%	+83%/-56%	+17%/-3%	+30%/-2%	+7%/-19%
Source	SPE68	AST9	SPE68	DSEP		

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

### Secondary Eclipse Parameters for KIC 004390912-06 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-761 \pm 76$	$148.59^{+124.44}_{-101.13}$	$942^{+17}_{-16}$	$2608^{+977}_{-353}$	$10^{+83}_{-7}$
Alt.	$-706 \pm 84$	$118.71^{+123.77}_{-77.49}$	$941^{+17}_{-15}$	$2757^{+1016}_{-477}$	$15^{+113}_{-12}$

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

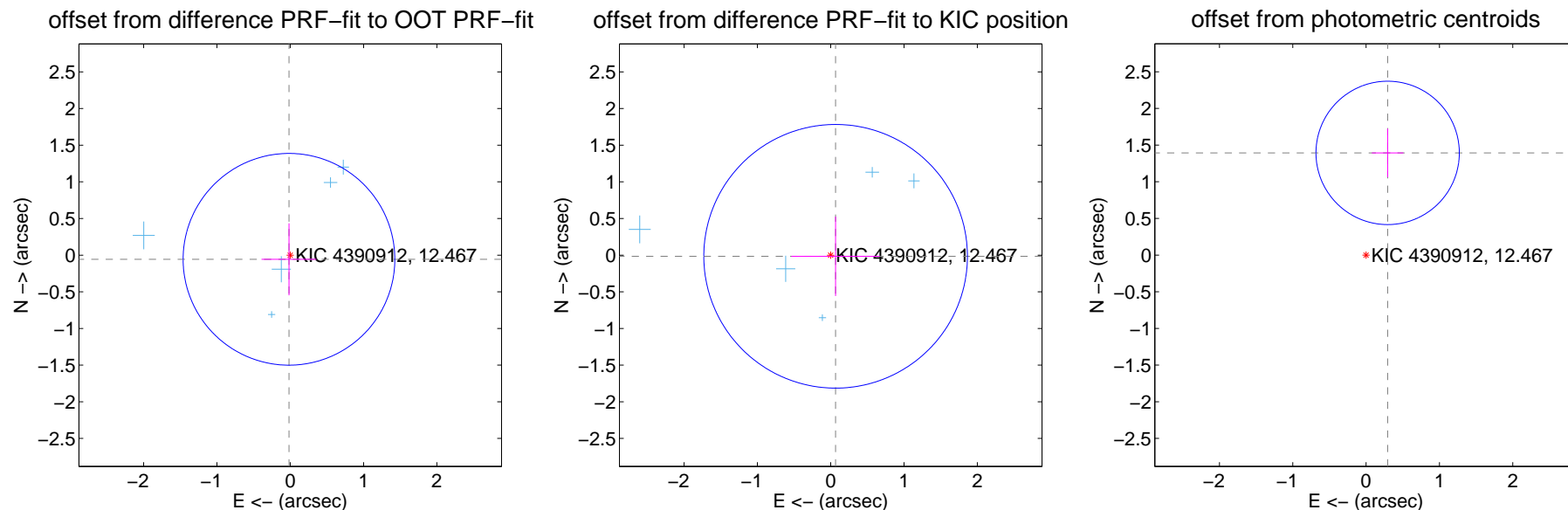
## DV Centroid Data

Supplemental centroid analysis for 004390912-06. Kepler magnitude: 12.47. Transit SNR 7.98

There are 5 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.61 arcsec

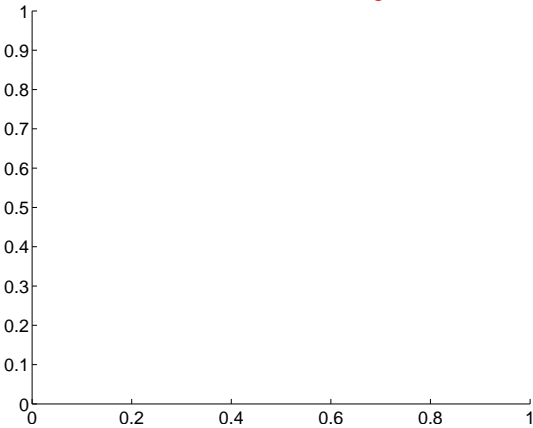
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.059 \pm 0.481$	0.12	$0.018 \pm 0.375$	$-0.057 \pm 0.491$
PRF-fit source offset from KIC position	$0.069 \pm 0.600$	0.11	$-0.067 \pm 0.603$	$-0.016 \pm 0.541$
photometric centroid source offset	$1.42 \pm 0.33$	4.37	$-0.29 \pm 0.21$	$1.39 \pm 0.33$



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.

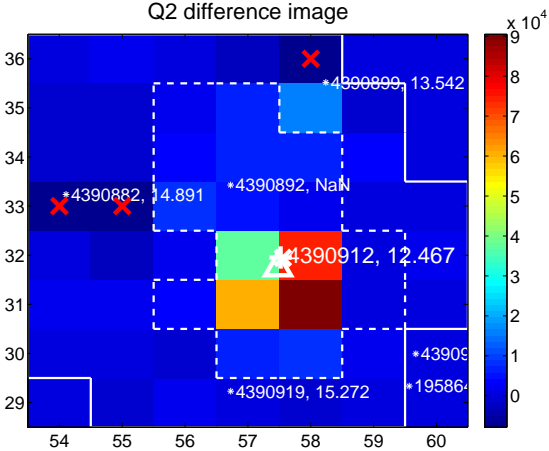
Q1 no difference image



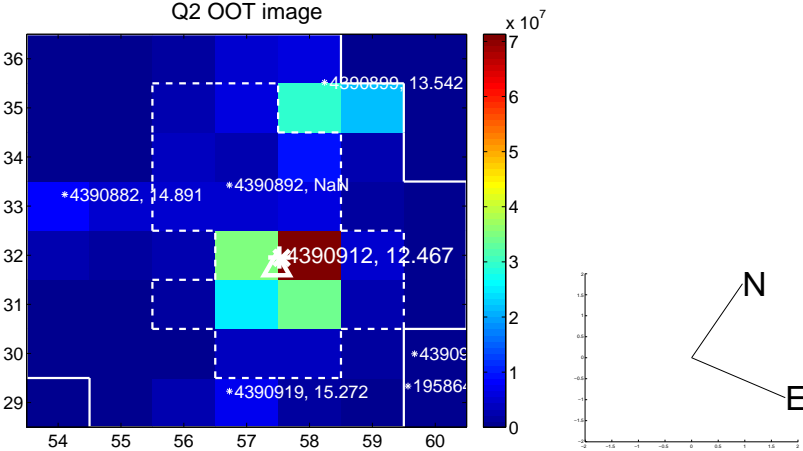
Q1 no OOT image



Q2 difference image



Q2 OOT image



Q3 no difference image



Q3 no OOT image



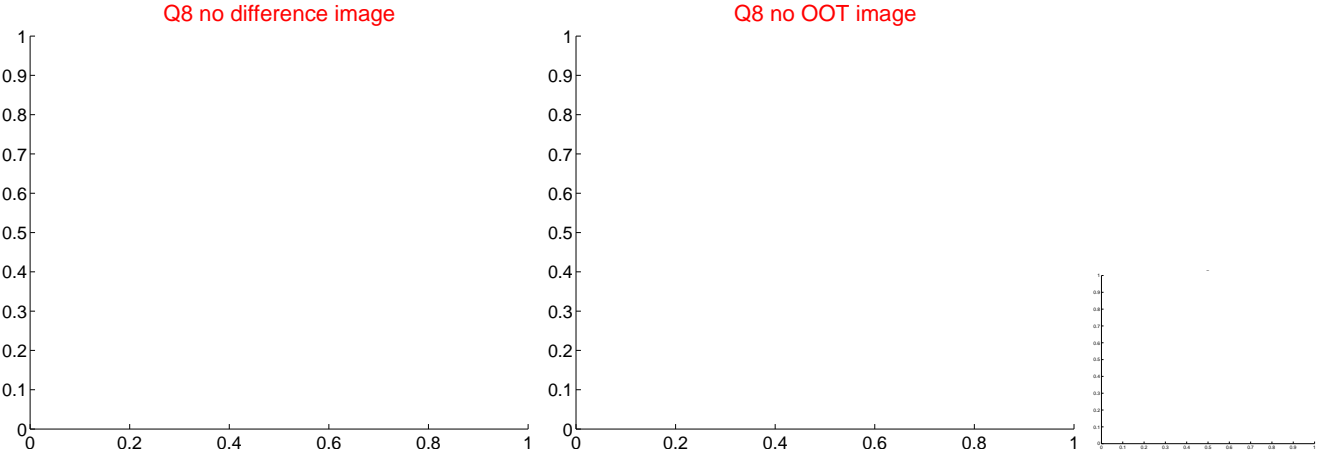
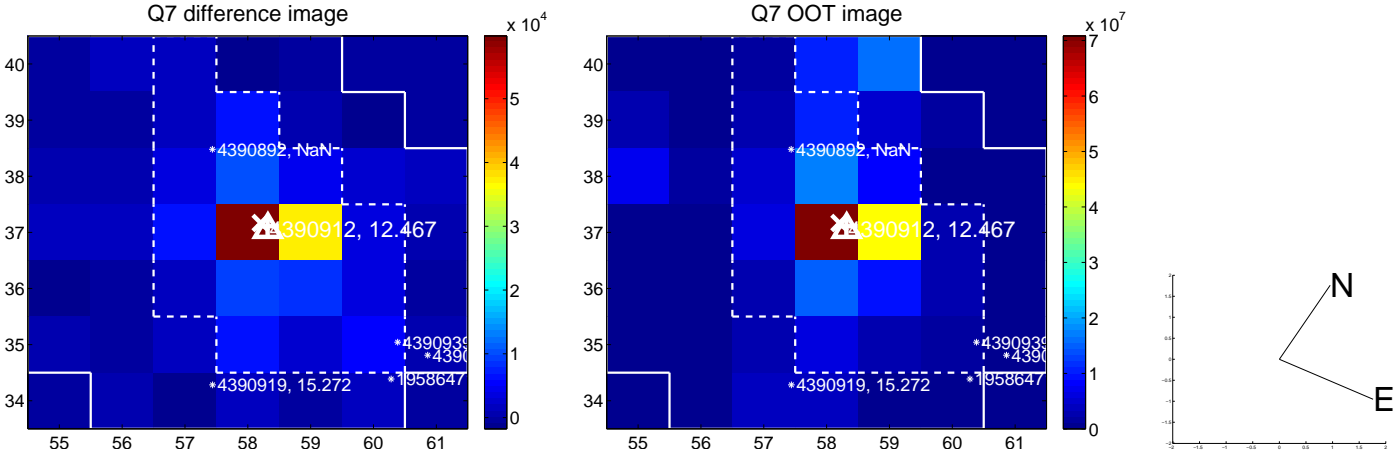
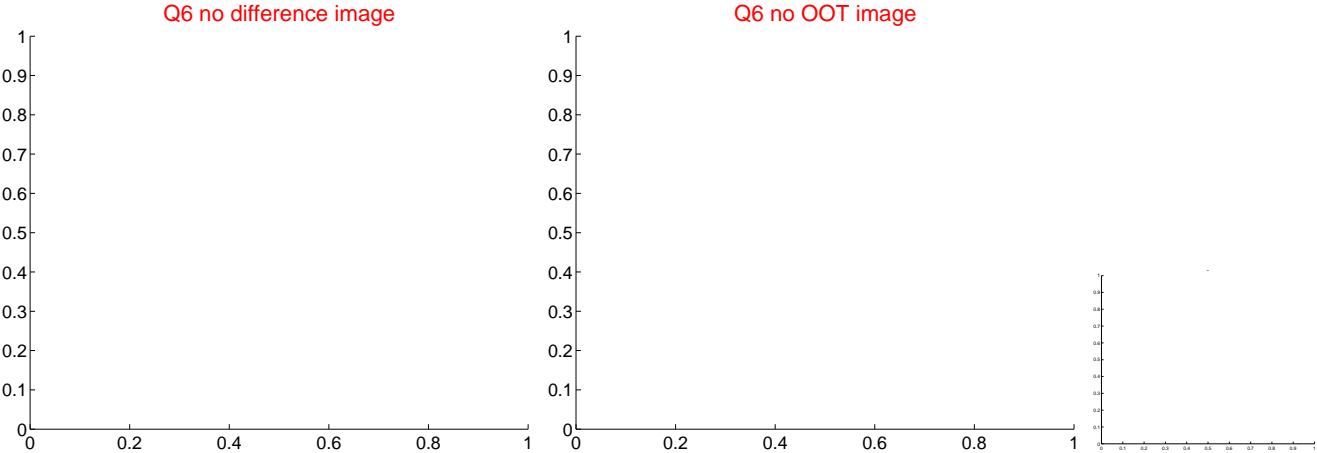
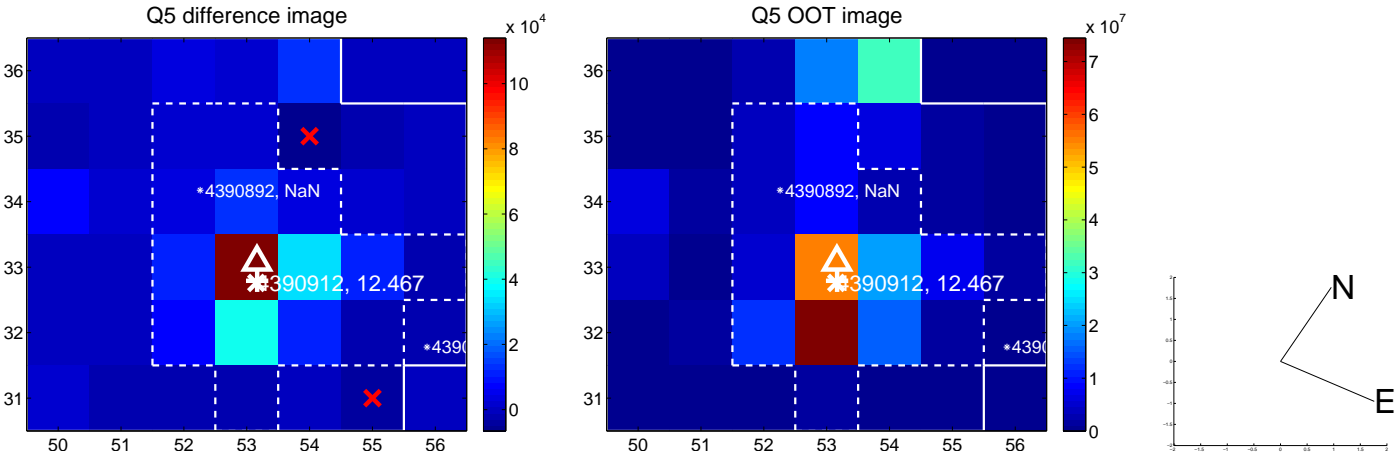
Q4 no difference image



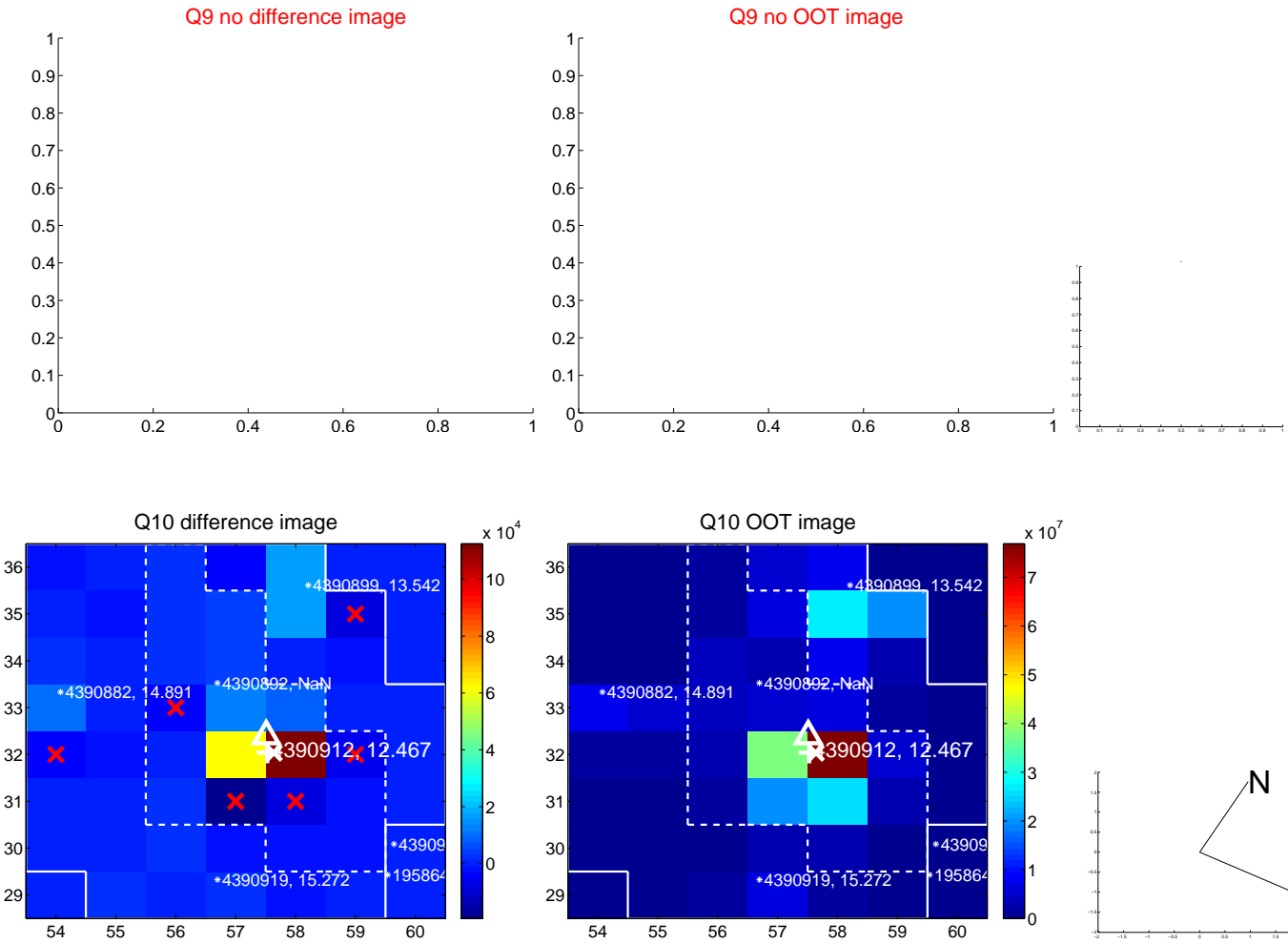
Q4 no OOT image



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

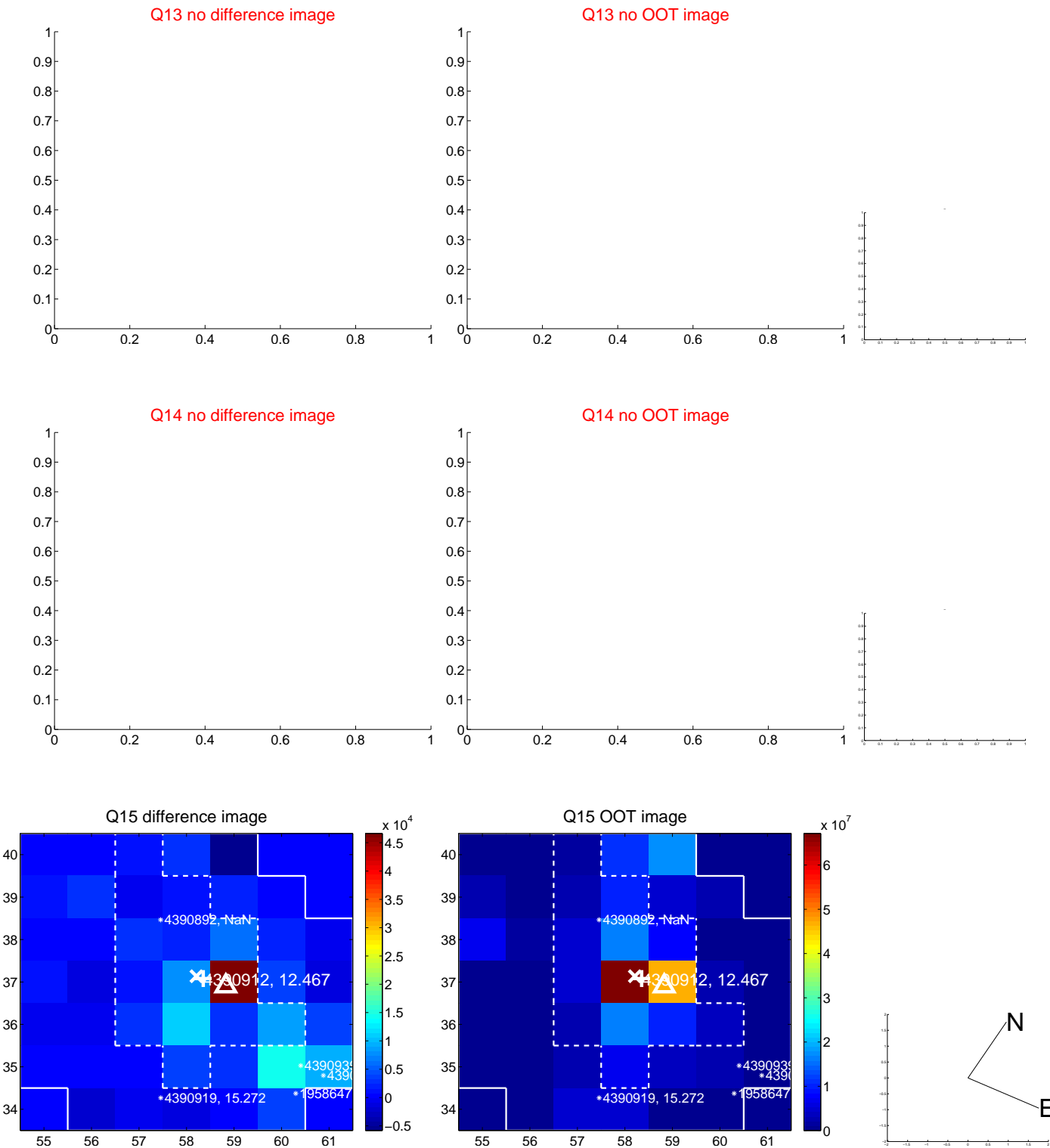


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

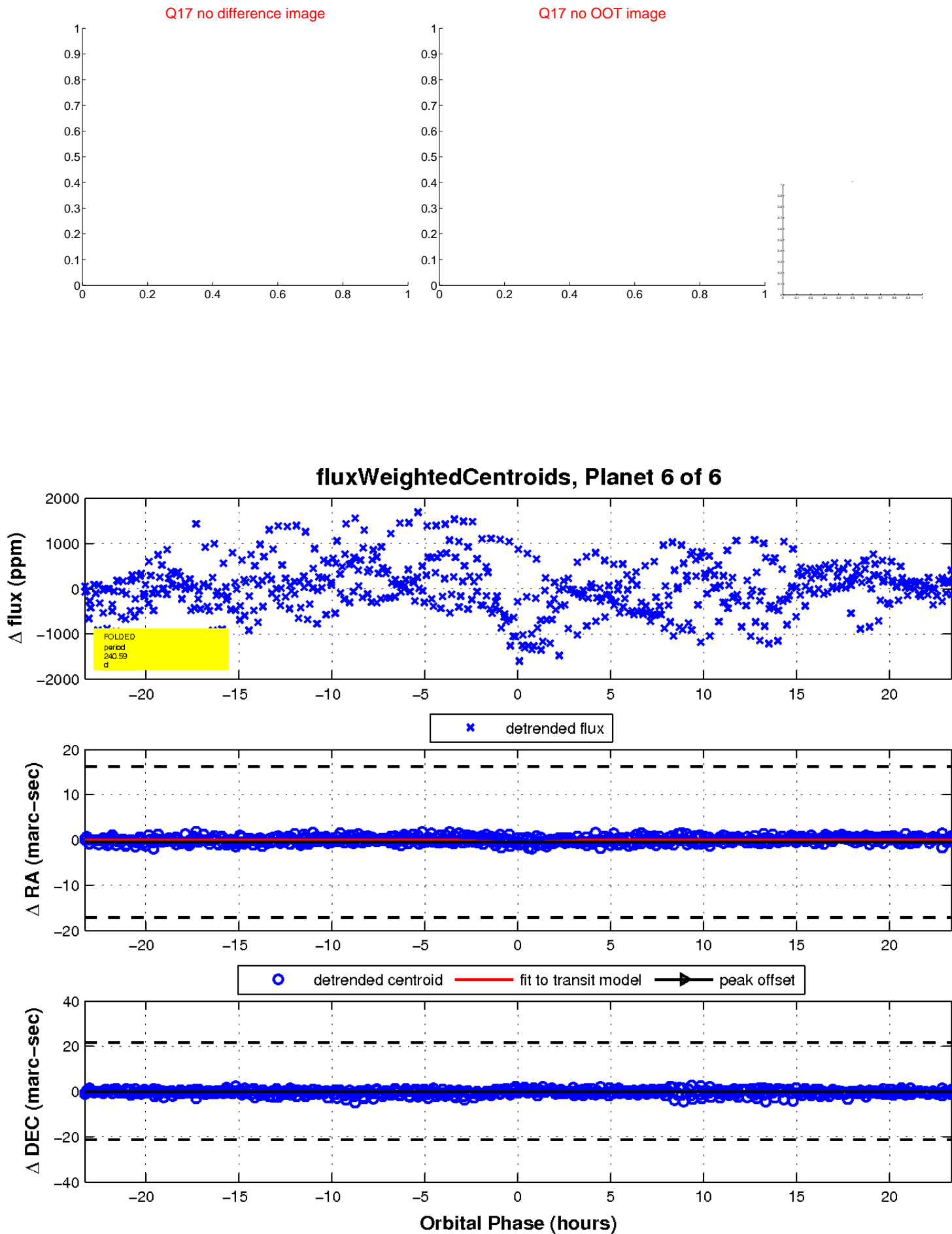




white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



UKIRT Image

Declination

