

# KIC 004139351

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004139351-01	OBS	No	1.617618	131.758437	24.6	5.067	11.9	11.7	2.58	7027	1.76	15050.44
004139351-02	OBS	No	1.617457	132.792667	7.7	7.220	10.2	5.2	2.58	7027	0.75	15052.44
004139351-03	OBS	No	33.348582	156.166187	151.0	3.824	9.3	9.3	2.58	7027	3.70	266.24
004139351-04	OBS	No	23.702619	144.250944	140.8	1.388	8.2	8.0	2.58	7027	3.10	419.75
004139351-05	OBS	No	17.992676	143.020549	94.1	3.360	8.5	7.8	2.58	7027	2.87	606.16
004139351-06	OBS	No	26.531520	151.986211	145.8	3.530	7.9	7.6	2.58	7027	3.63	361.16

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004139351-01	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
004139351-02	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD
004139351-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
004139351-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
004139351-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_ZUMA—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_FEW_MEAS
004139351-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT—CENT_FEW_DIFFS

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

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

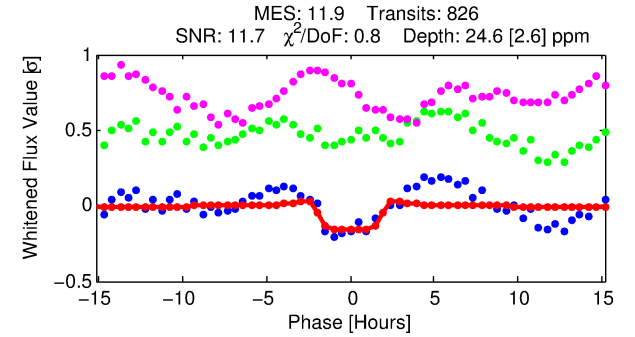
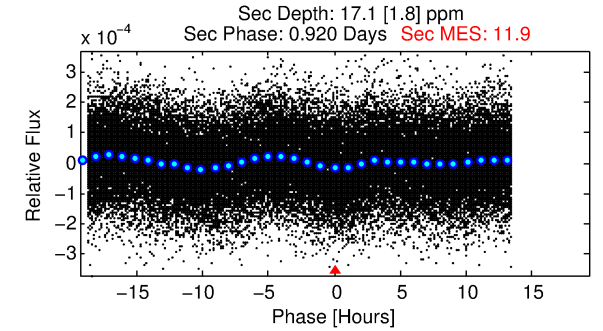
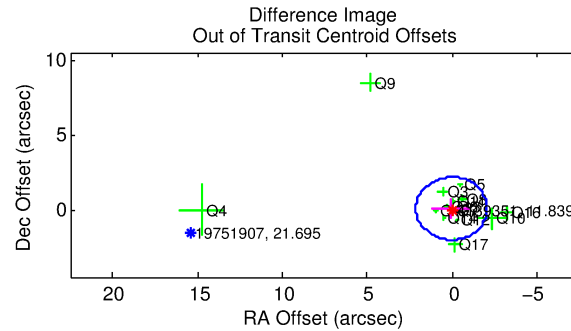
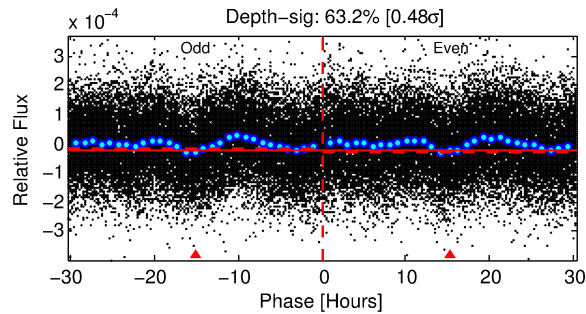
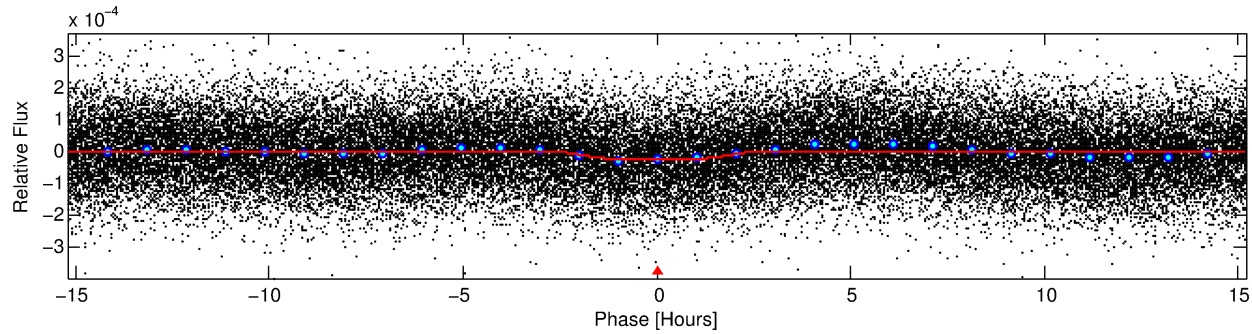
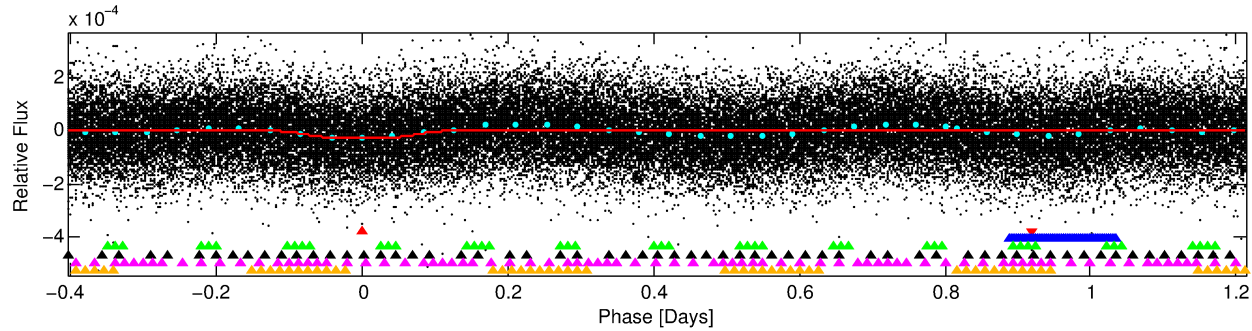
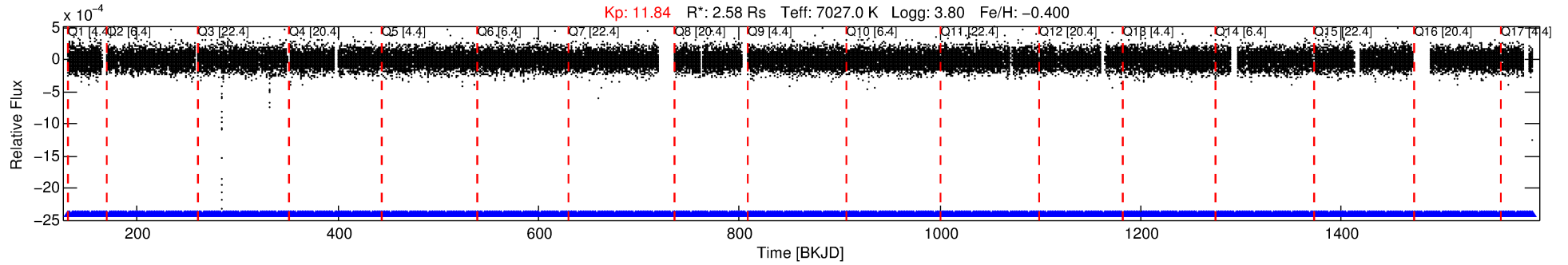
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 004139351-01

No Significant Match Found

# DV One-Page Summary

KIC: 4139351 Candidate: 1 of 6 Period: 1.618 d



## DV Fit Results:

Period = 1.61762 [0.00001] d  
Epoch = 131.7584 [0.0049] BKJD  
Rp/R\* = 0.0063 [0.0004]  
a/R\* = 1.08 [0.02]  
b = 0.99 [0.00]  
Seff = 15050.44 [7804.25]  
Teq = 2824 [366] K  
Rp = 1.77 [0.61] Re  
a = 0.0310 [0.0099] AU  
Ag = 2.90 [1.53] [1.24 $\sigma$ ]  
Teffp = 5699 [290] K [6.15 $\sigma$ ]

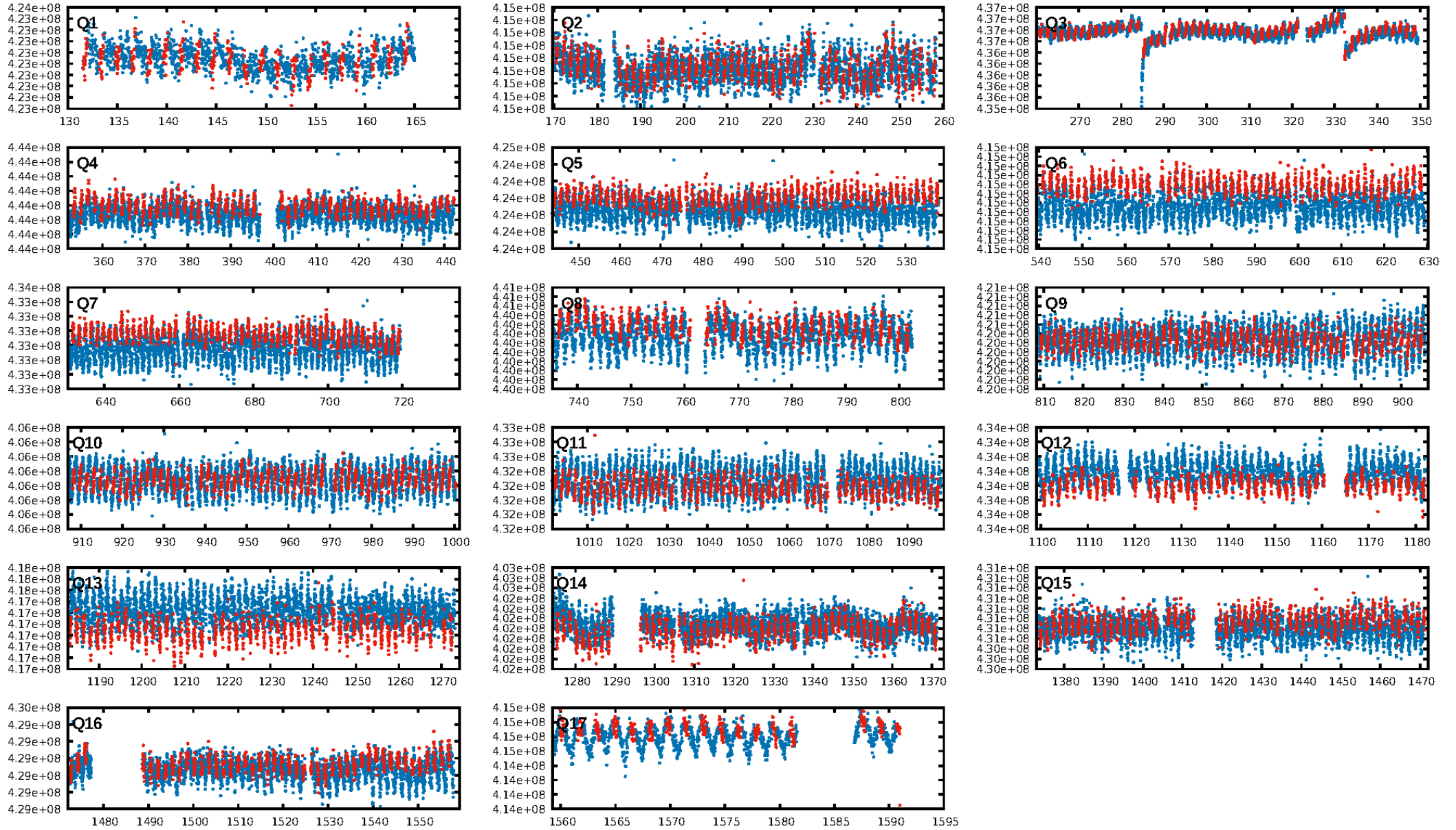
## DV Diagnostic Results:

ShortPeriod-sig: 0.0% [0.00 $\sigma$ ]  
LongPeriod-sig: 100.0% [64.64 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGoF-sig: N/A  
Bootstrap-pfa: 4.61e-14  
RollingBand-fgt: 1.00 [788/788]  
GhostDiagnostic-chr: 3.098  
Centroid-sig: 1.2%  
Centroid-so: 0.820 arcsec [1.48 $\sigma$ ]  
OotOffset-rm: 0.073 arcsec [0.10 $\sigma$ ]  
KicOffset-rm: 0.097 arcsec [0.17 $\sigma$ ]  
OotOffset-st: 3/3/4/5 [15]  
KicOffset-st: 3/3/4/5 [15]  
DiffImageQuality-fgm: 0.47 [7/15]  
DiffImageOverlap-fno: 0.94 [16/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 02-Feb-2016 09:19:15 Z

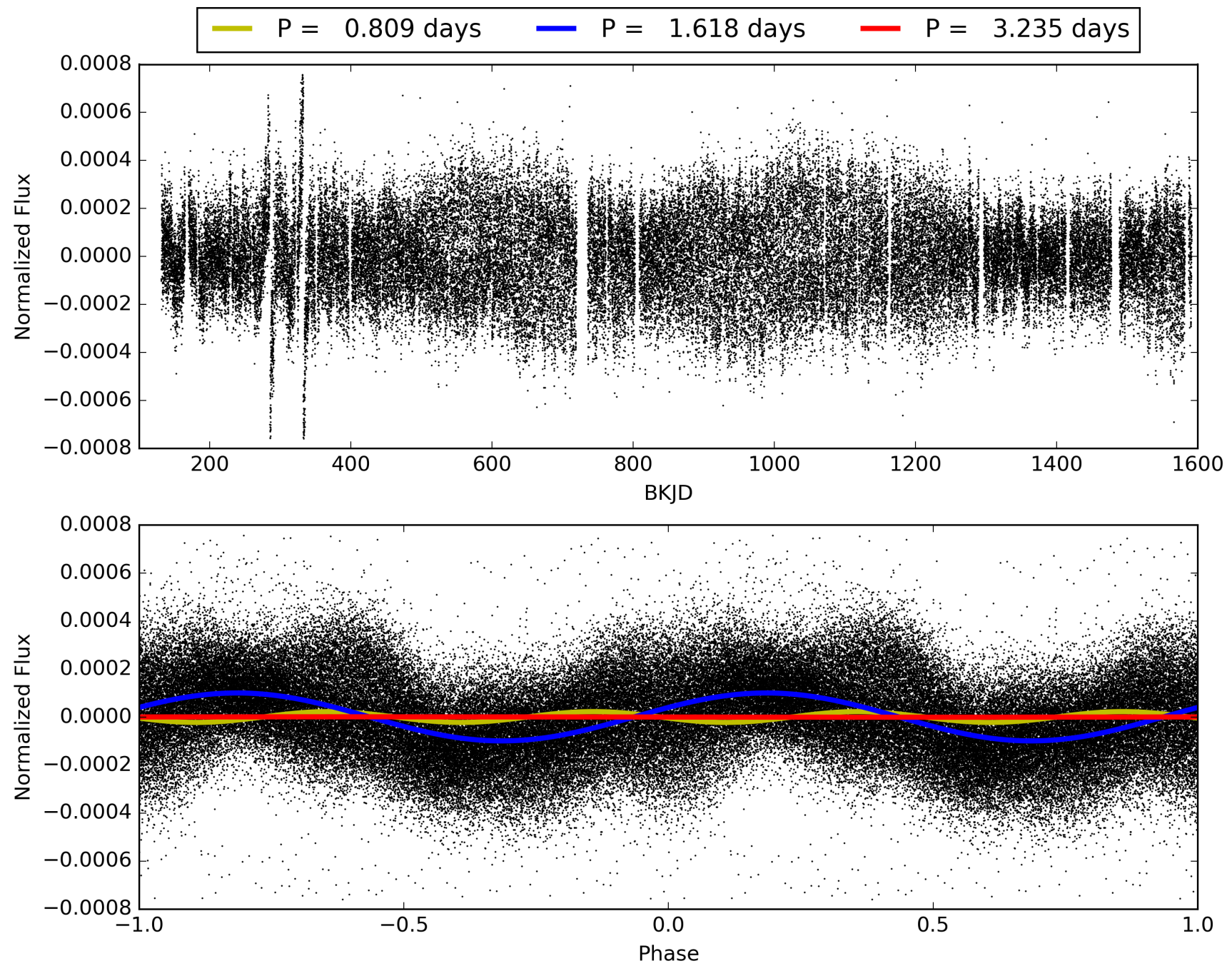
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 004139351-01, PDC Light Curves





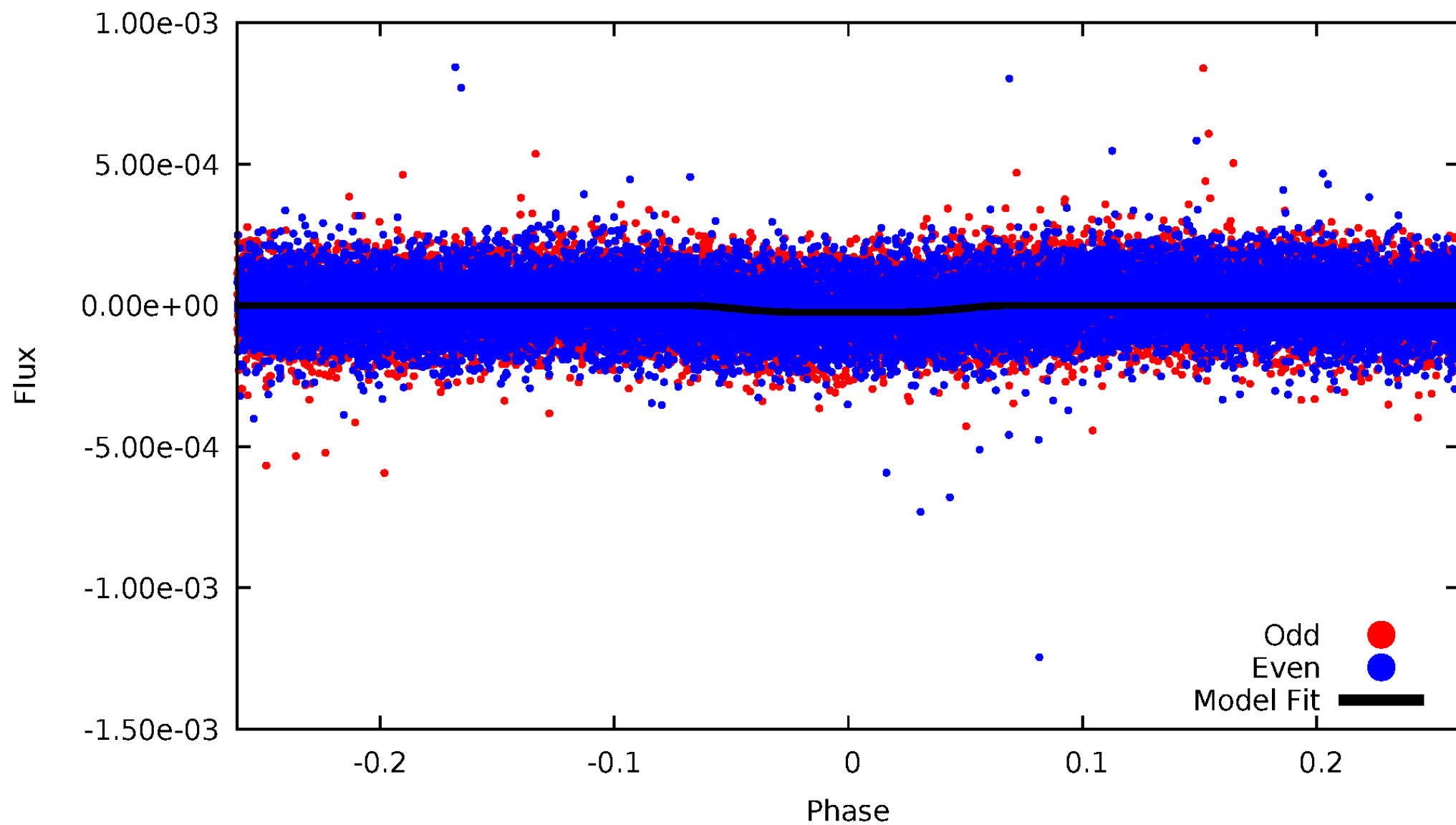
TCE 004139351-01





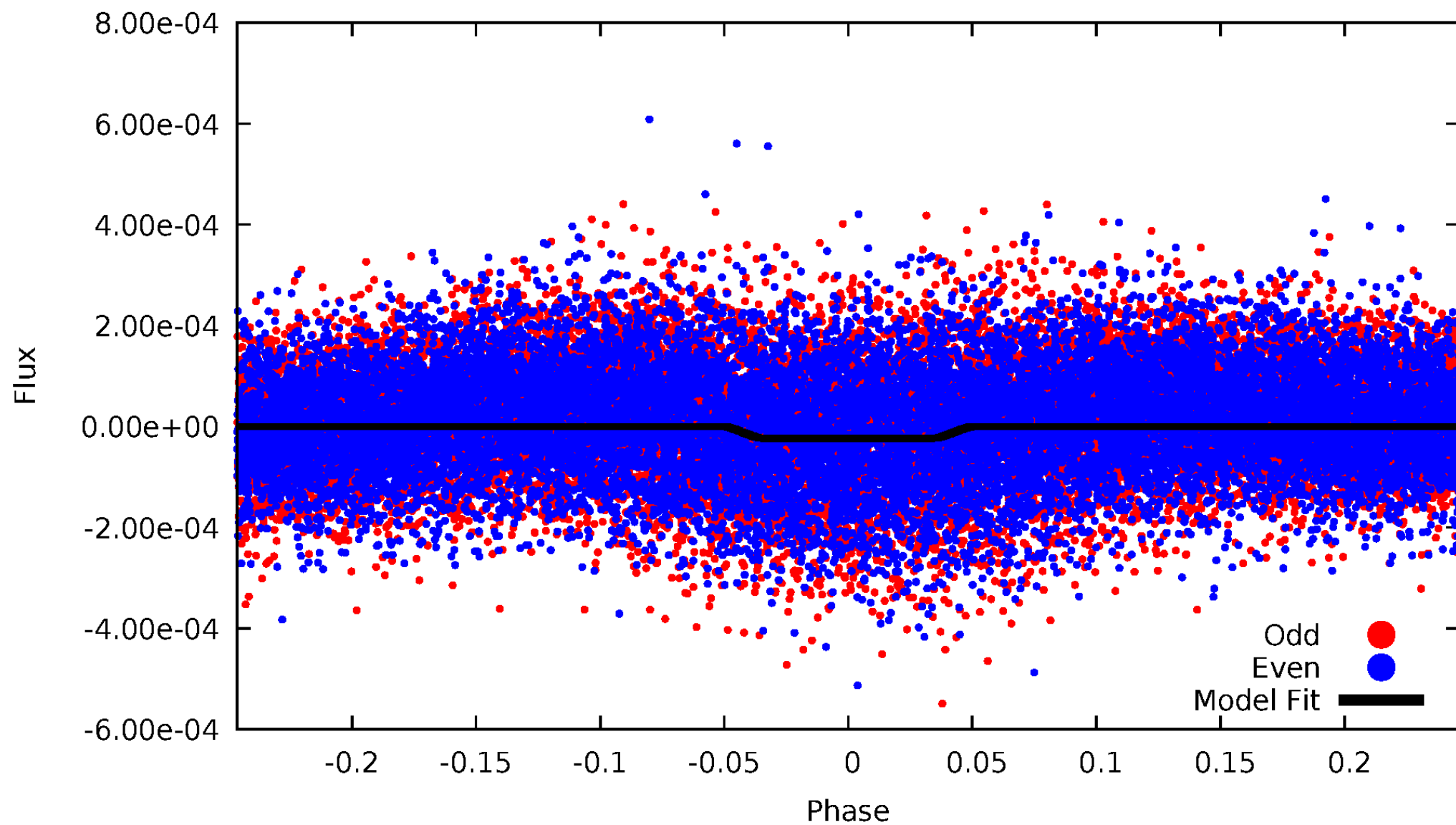
# DV Odd/Even

TCE 004139351-01

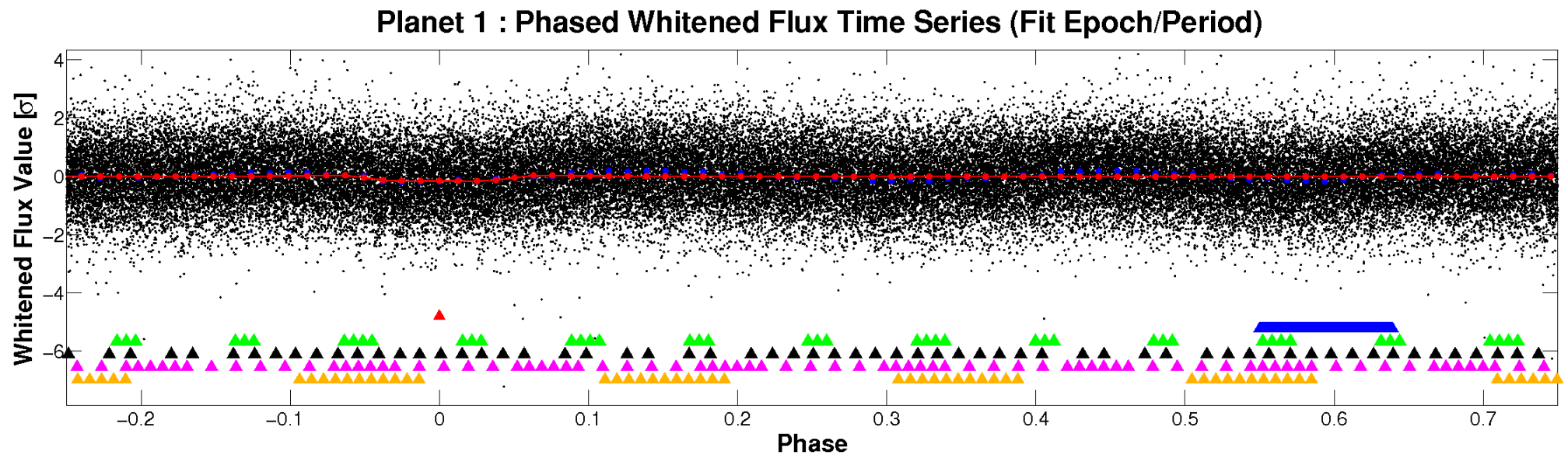
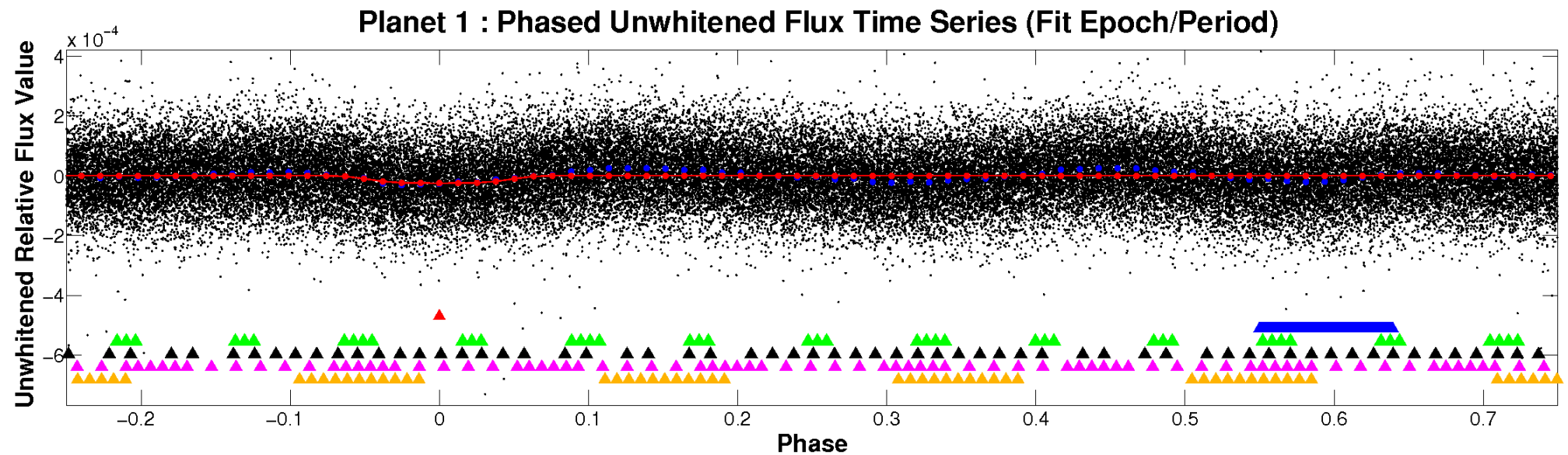


# ALT Odd/Even

TCE 004139351-01



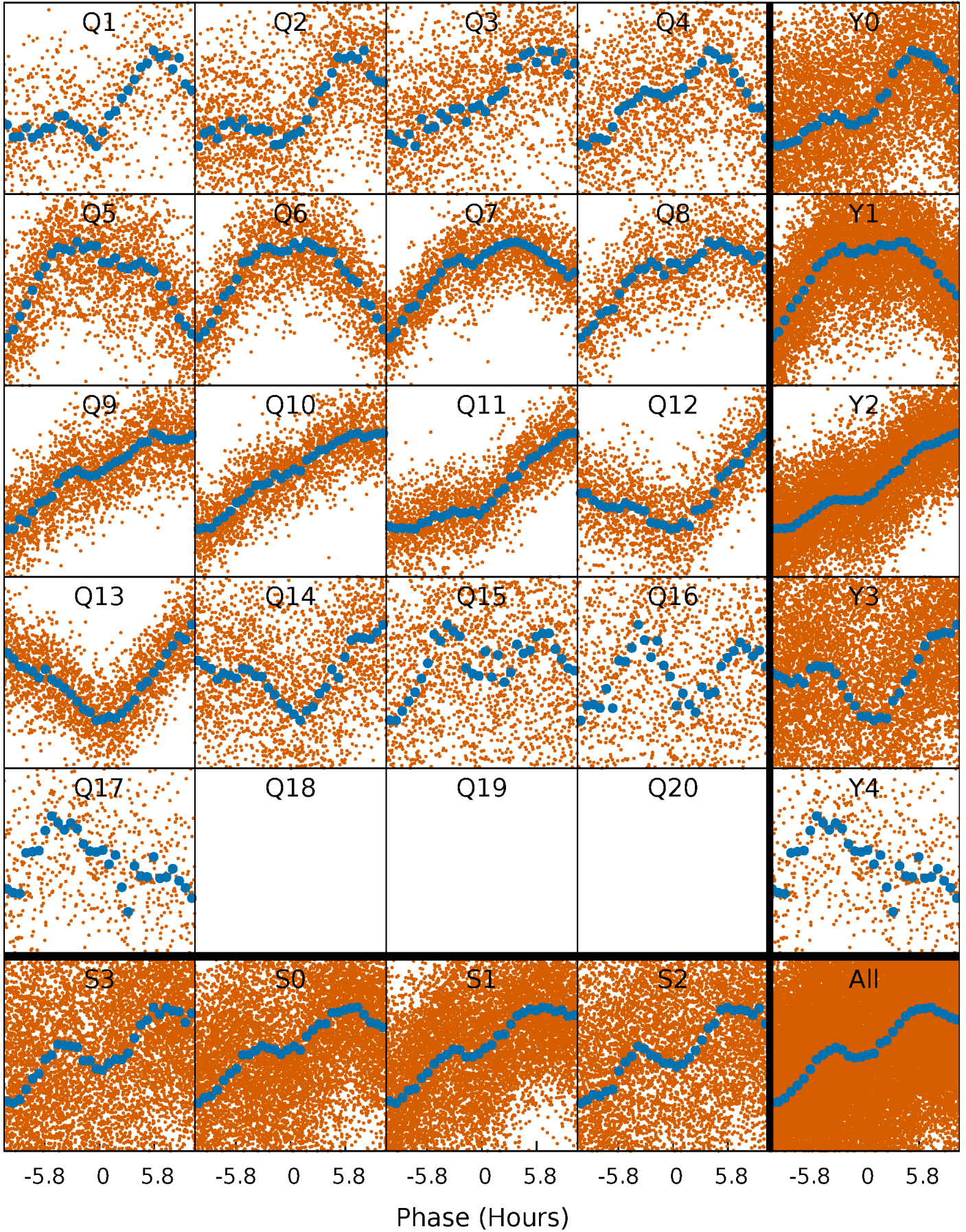
# Non-Whitened Vs. Whitened Light Curve





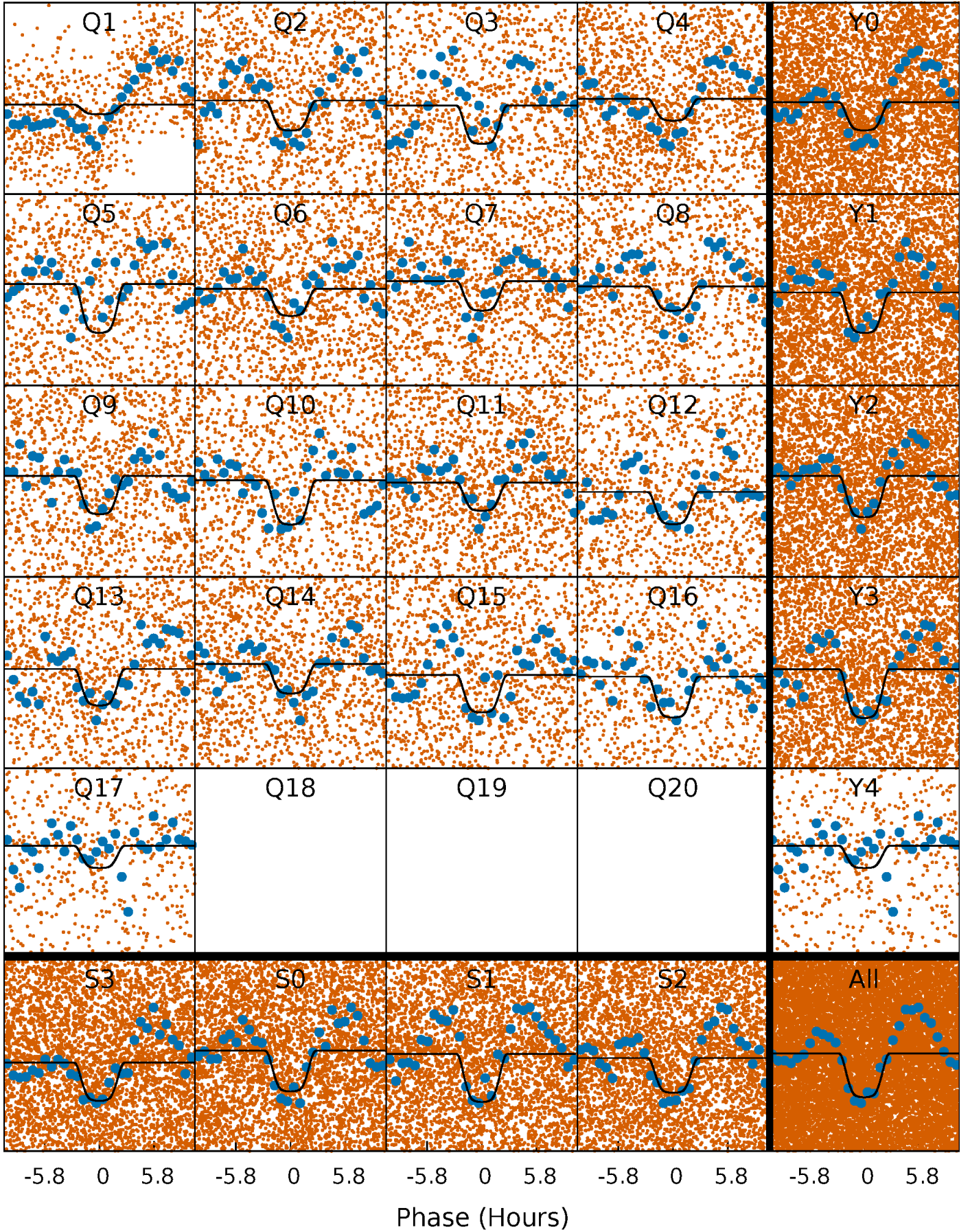
# PDC Quarter-Phased Transit Curves

TCE 004139351-01   P= 1.617618 Days    $T_0=131.758437$  (BKJD)



# DV Quarter-Phased Transit Curves

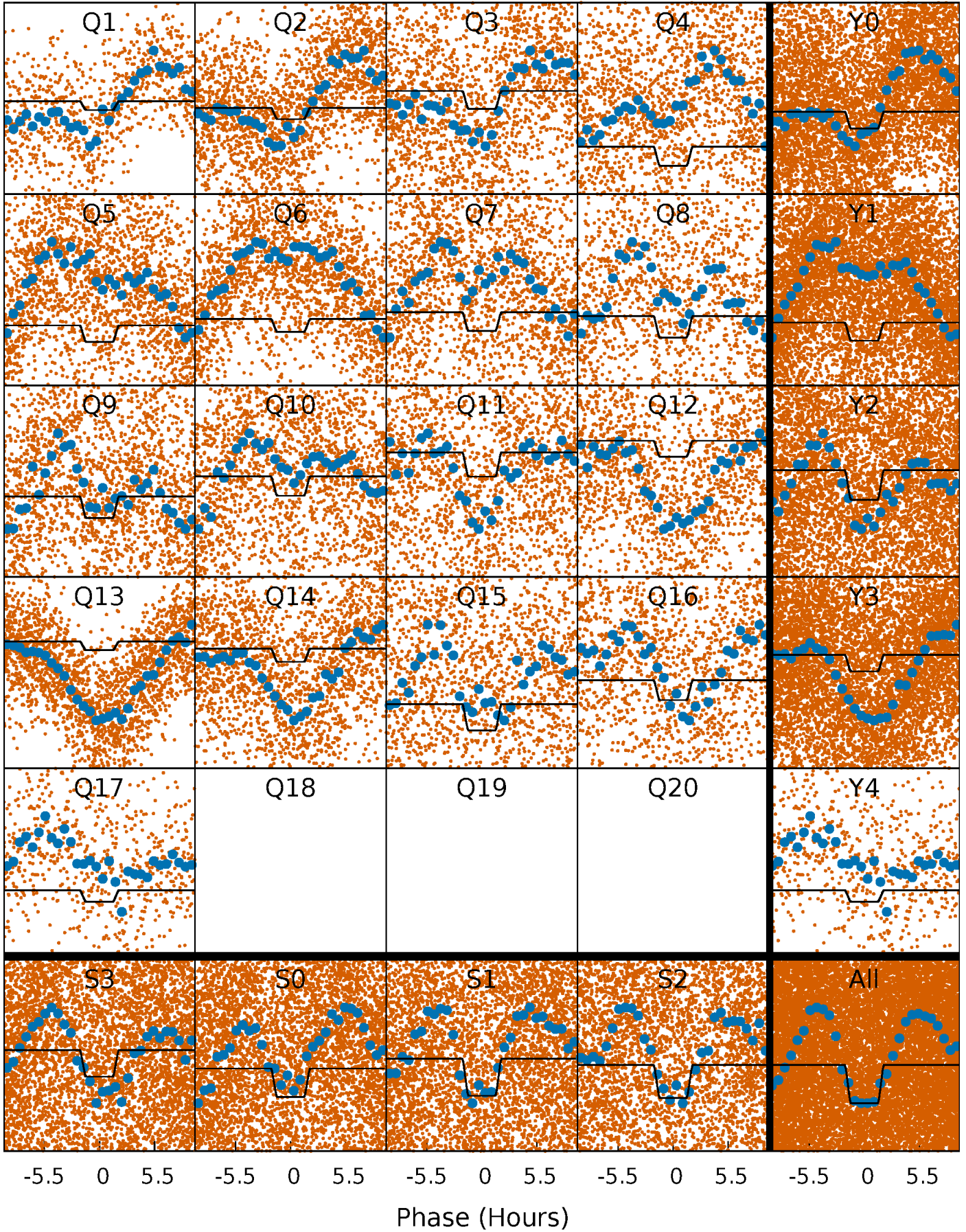
TCE 004139351-01 P= 1.617618 Days  $T_0=131.758437$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

TCE 004139351-01 P= 1.617617 Days  $T_0=131.778832$  (BKJD)

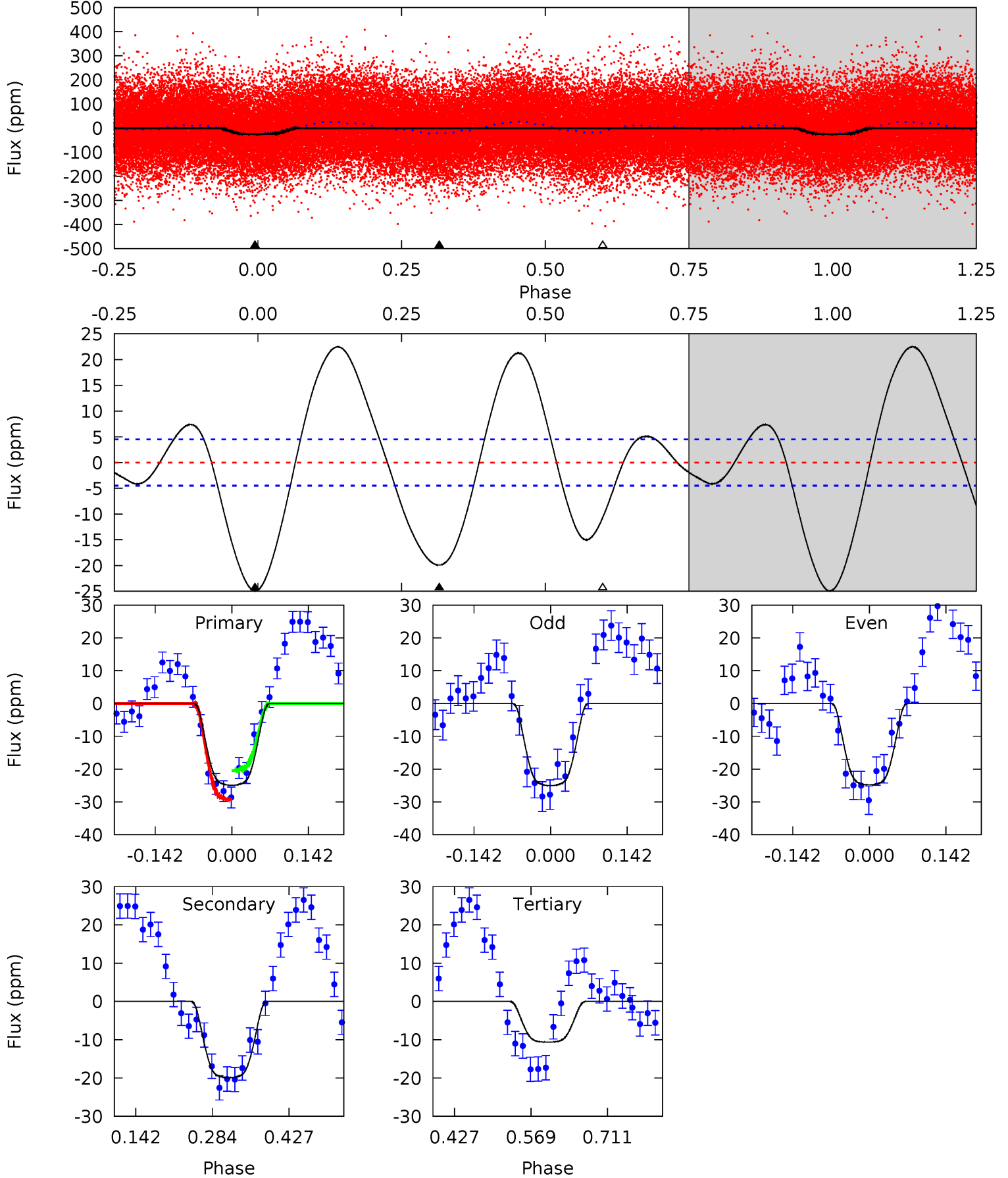




# DV Model-Shift Uniqueness Test

004139351-01, P = 1.617618 Days, E = 130.140819 Days

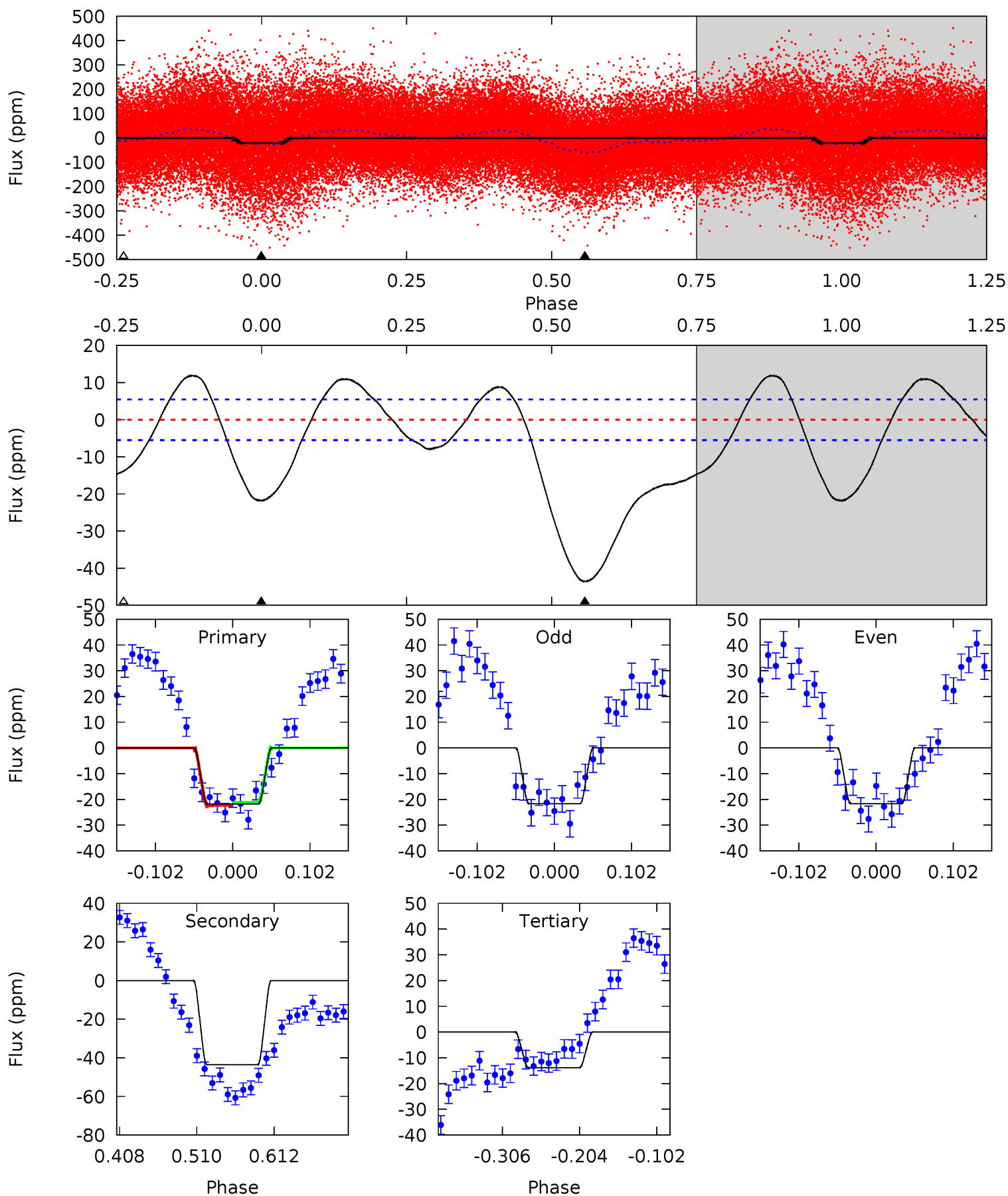
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
24.9	19.9	10.6	0	4.49	1.47	9.82	14.3	24.9	9.27	19.9	0.13	1.09	0.47	4.41



# Alt Model-Shift Uniqueness Test

004139351-01, P = 1.617617 Days, E = 130.161215 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
18.1	36.2	11.5	0	4.56	1.63	8.07	6.62	18.1	24.7	36.2	0.00	1.32	0.21	0.47



### Stellar Parameters For KIC 004139351

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$7027^{+183}_{-224}$	$3.799^{+0.292}_{-0.097}$	$-0.400^{+0.300}_{-0.250}$	$2.577^{+0.406}_{-0.879}$	$1.524^{+0.205}_{-0.308}$	$0.126^{+0.248}_{-0.038}$
	+3%/-3%	+8%/-3%	+75%/-62%	+16%/-34%	+13%/-20%	+197%/-30%
Source	PHO1	FLK73	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 004139351-01 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-20 \pm 1$	$1.72^{+0.24}_{-0.34}$	$3887^{+244}_{-343}$	$5769^{+229}_{-245}$	$3.586^{+1.696}_{-0.793}$
Alt.	$-44 \pm 1$	$1.32^{+0.19}_{-0.25}$	$3890^{+220}_{-338}$	$8399^{+562}_{-481}$	$13^{+6}_{-3}$

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



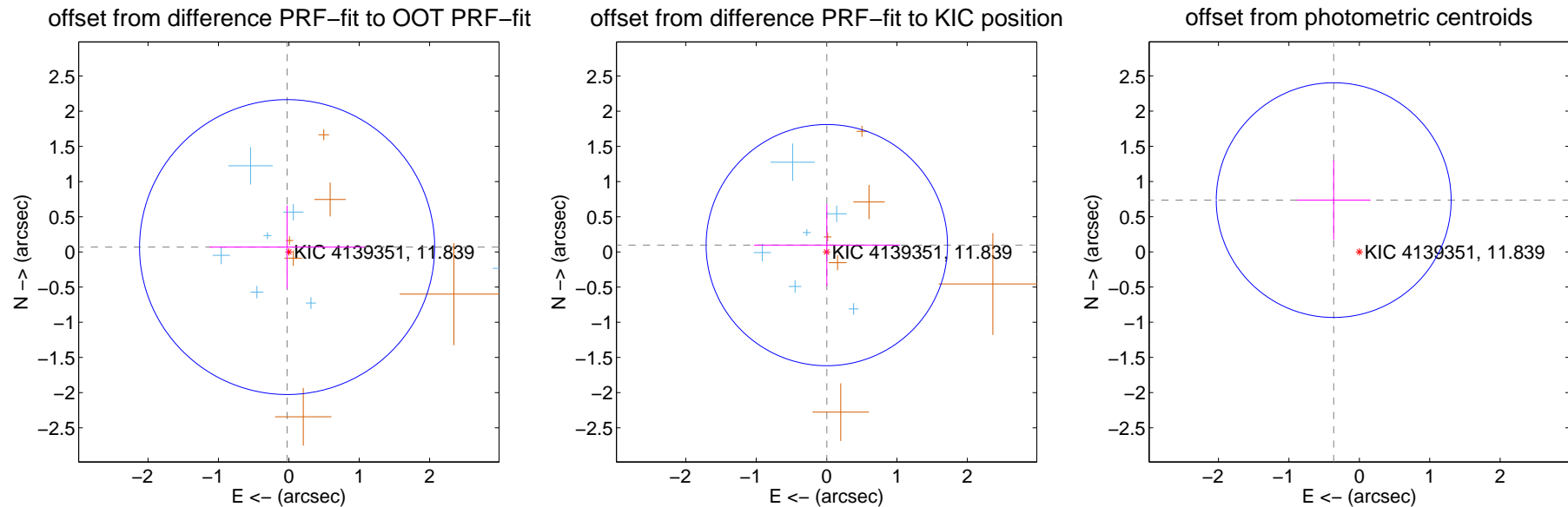
## DV Centroid Data

Supplemental centroid analysis for 004139351-01. **Kepler magnitude: 11.84.** Transit SNR 11.67

There are 7 quarters with good PRF difference image offsets

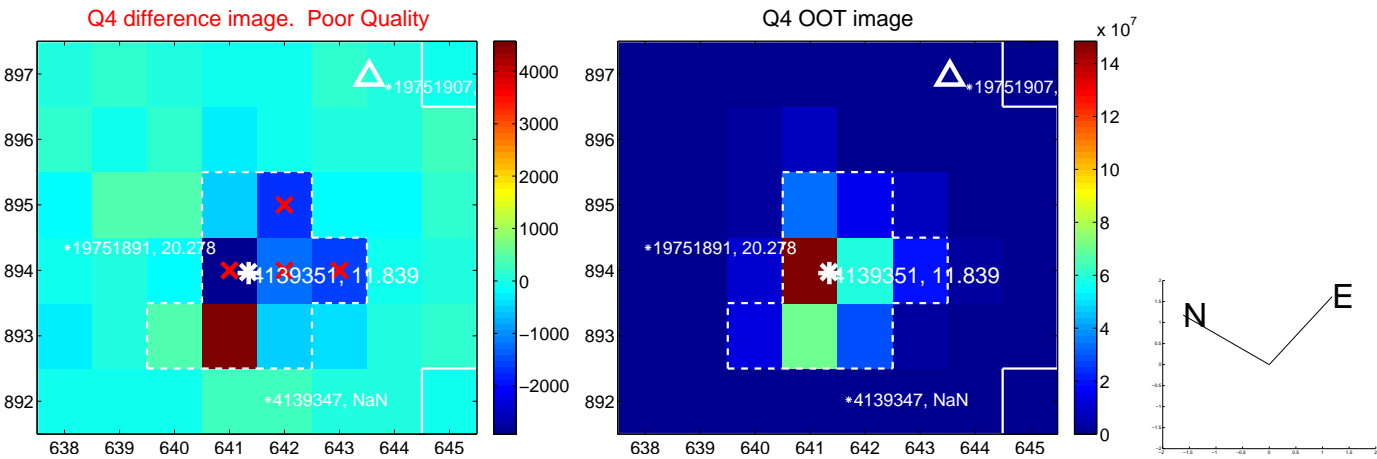
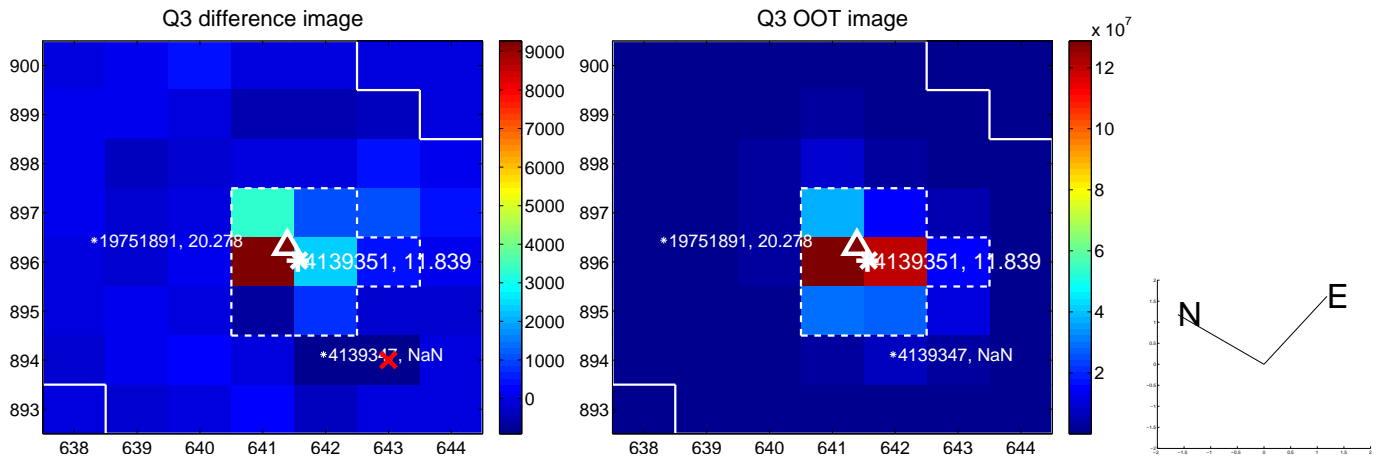
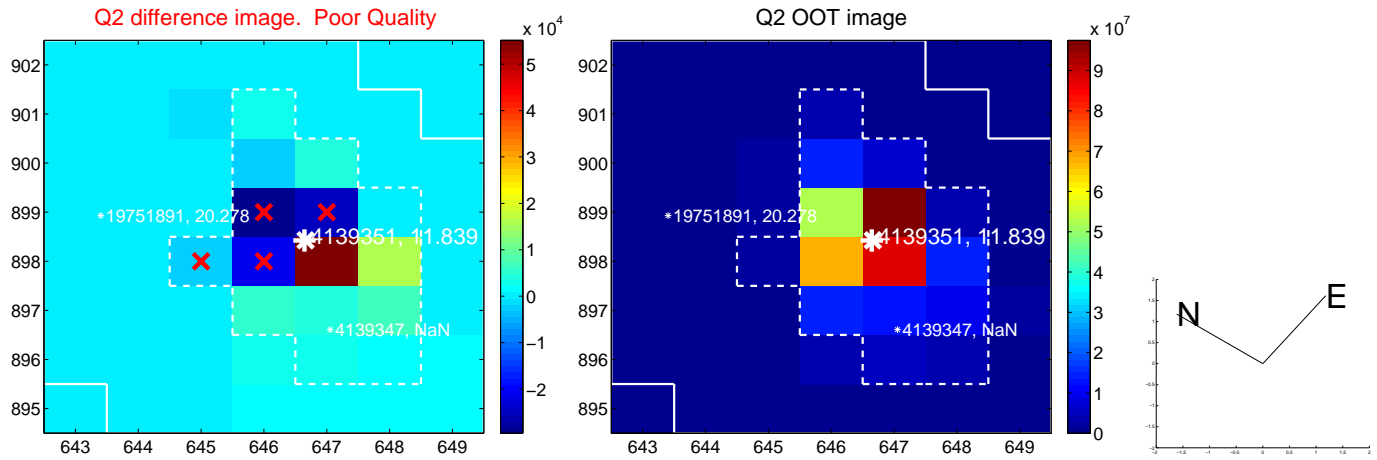
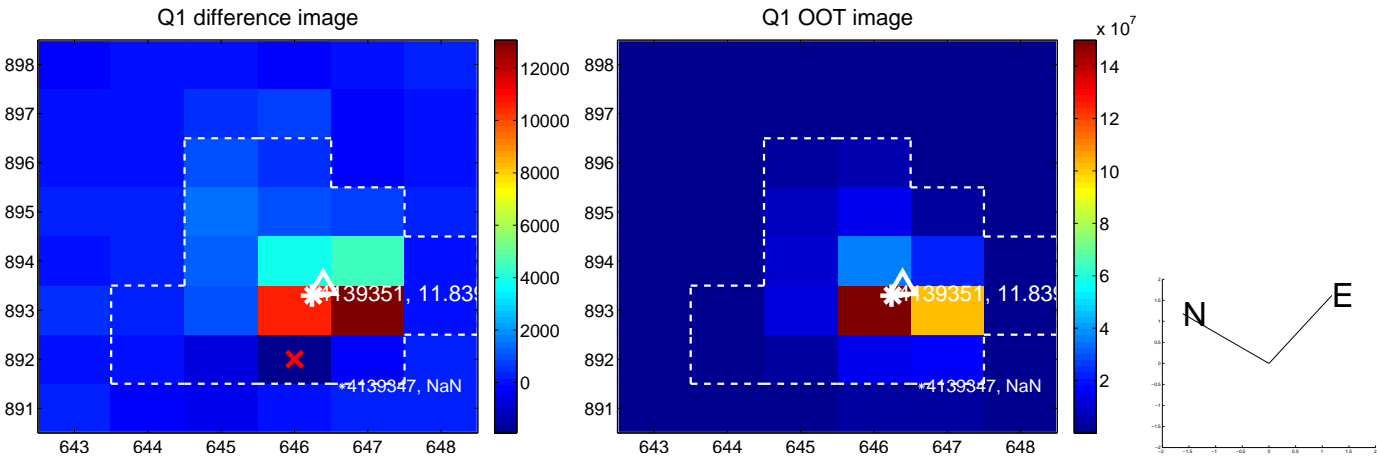
The direct PRF centroid is offset from the target star catalog position by about 0.07 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.073 \pm 0.699$	0.10	$0.024 \pm 1.102$	$0.069 \pm 0.591$
PRF-fit source offset from KIC position	$0.097 \pm 0.571$	0.17	$-0.003 \pm 1.036$	$0.097 \pm 0.580$
photometric centroid source offset	$0.82 \pm 0.56$	1.48	$0.36 \pm 0.52$	$0.74 \pm 0.56$



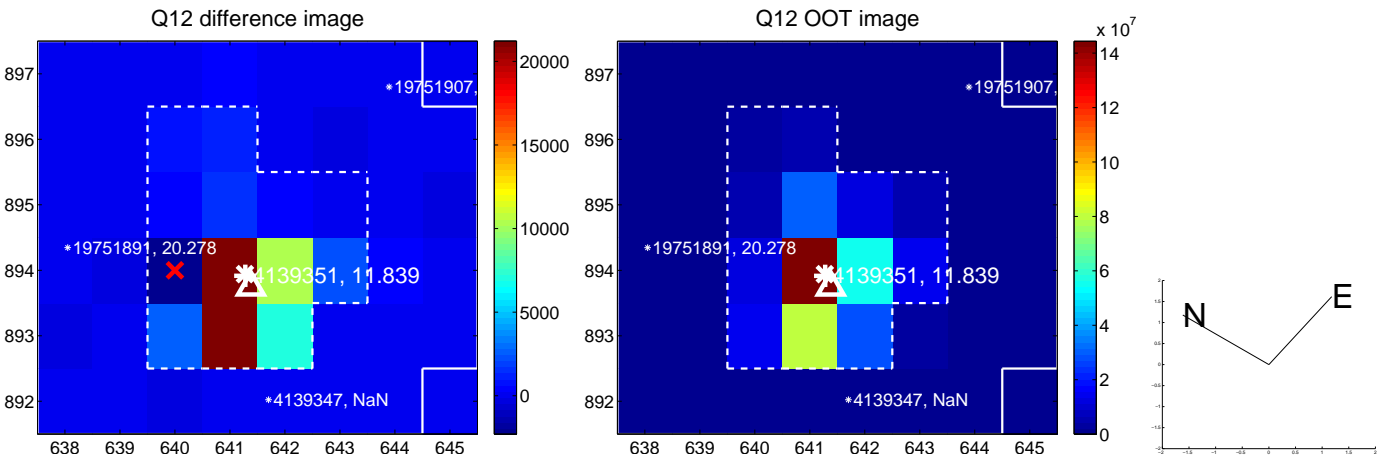
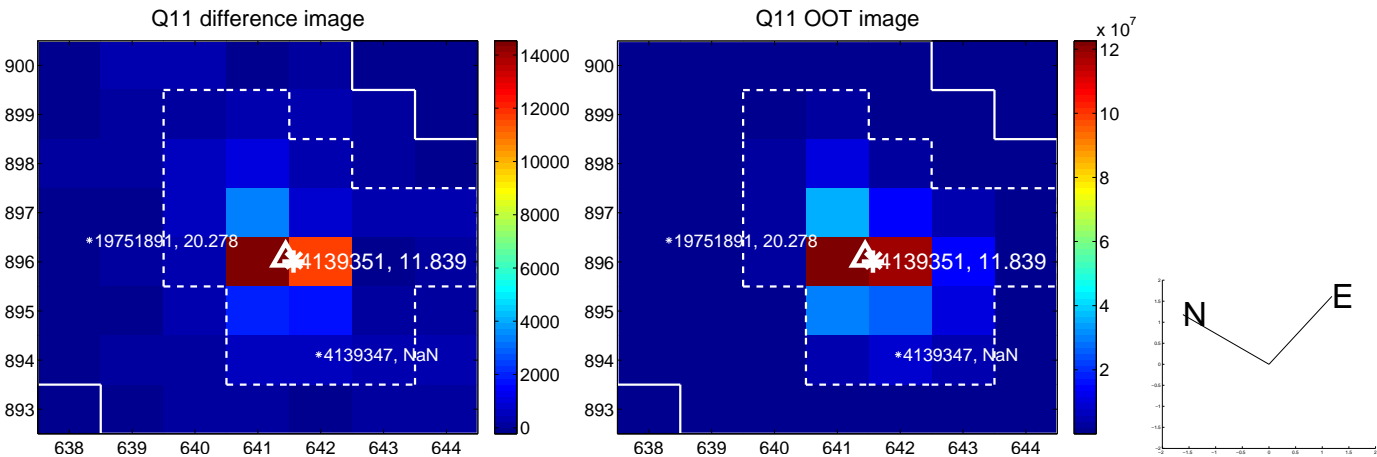
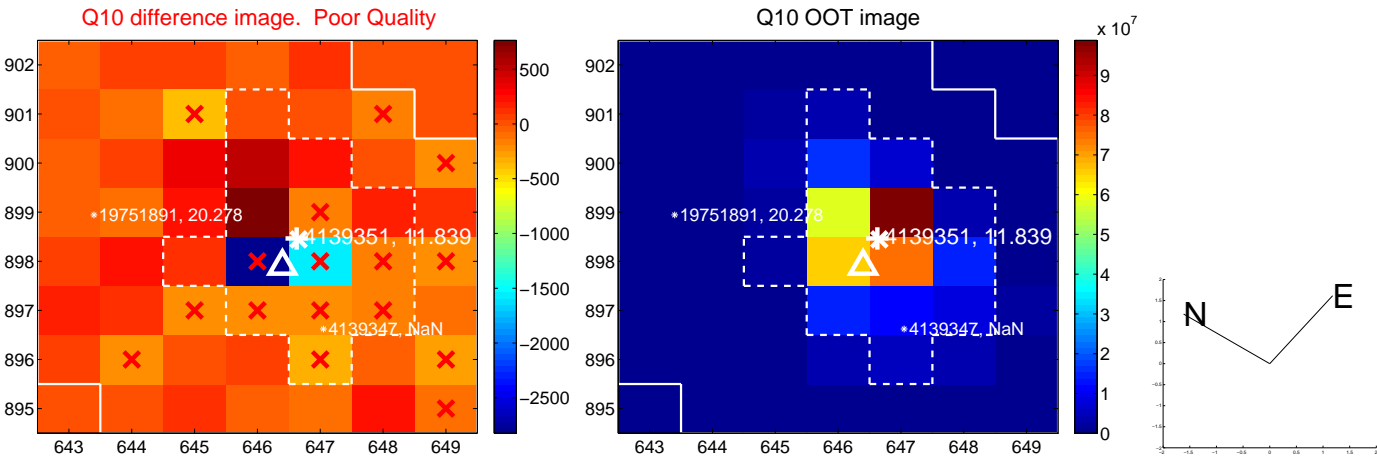
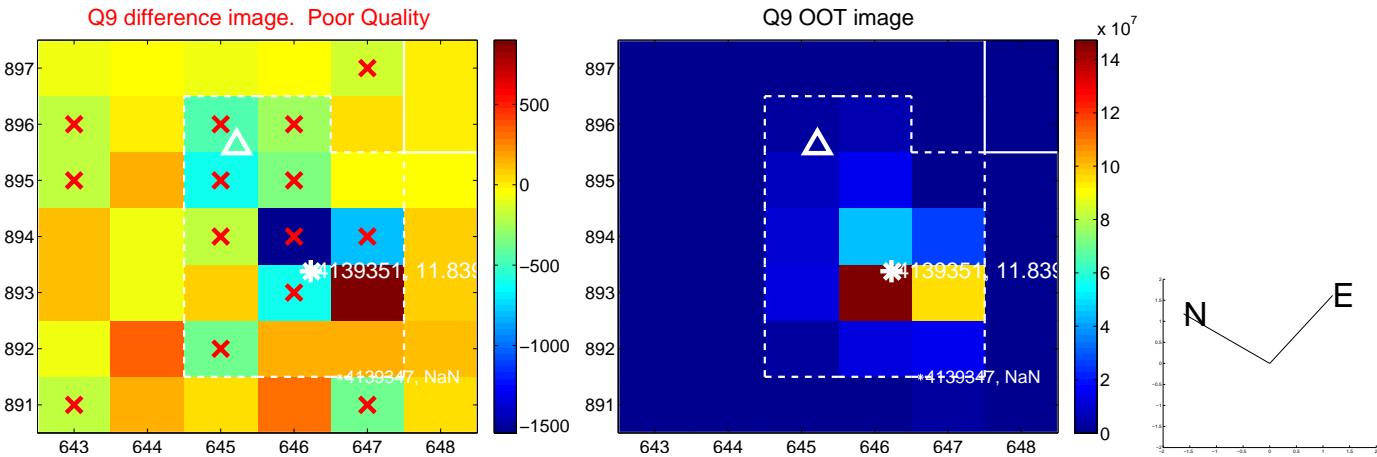
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

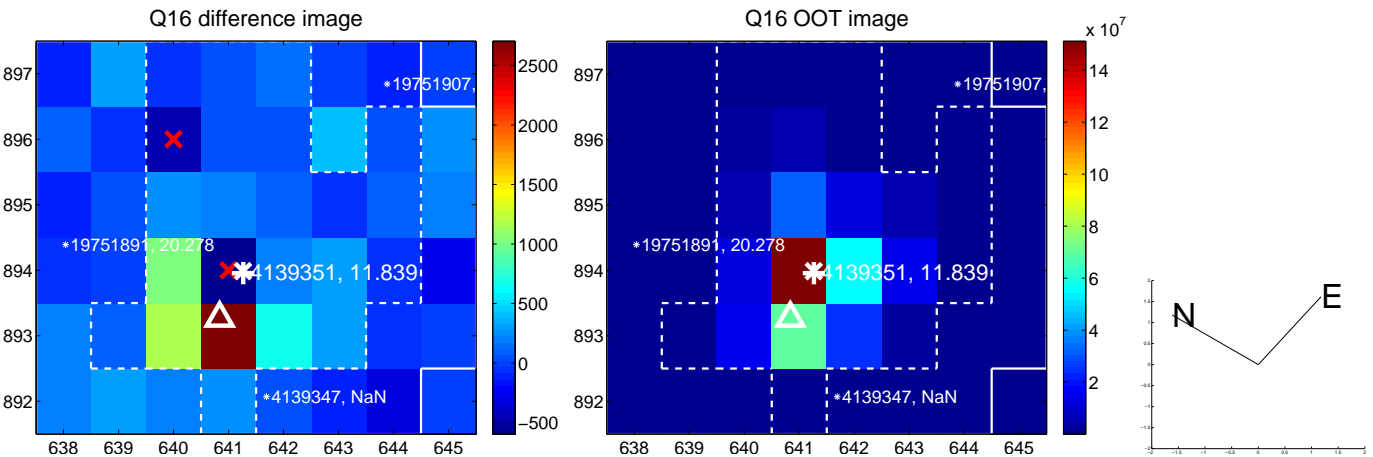
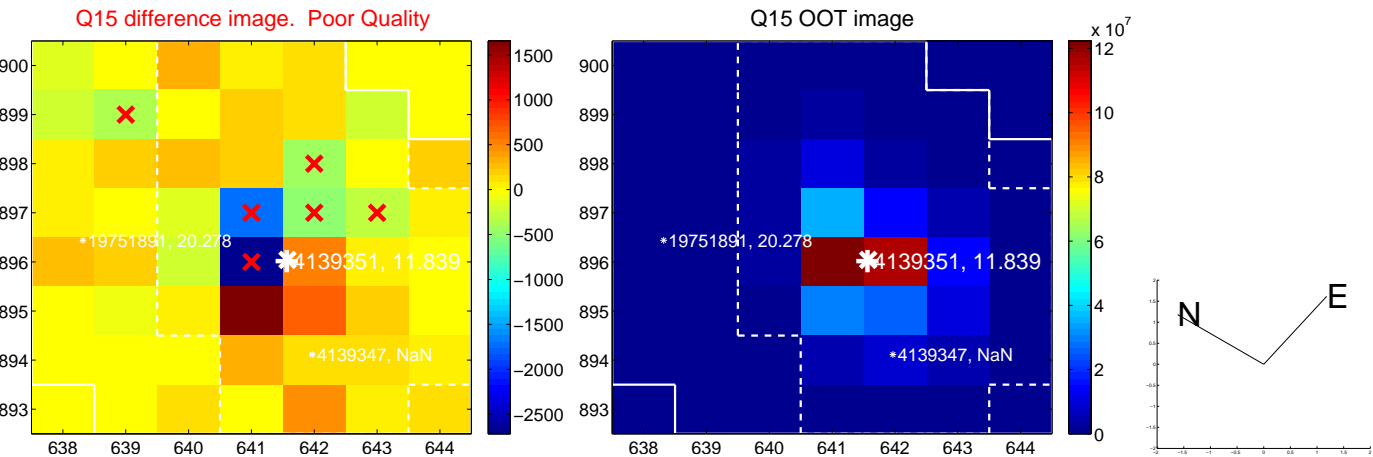
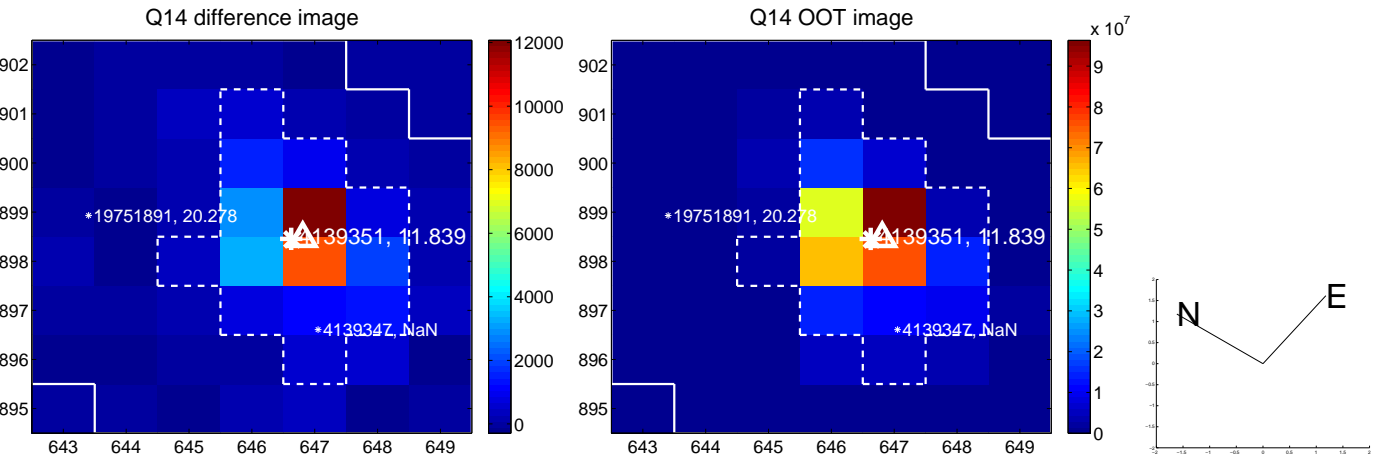
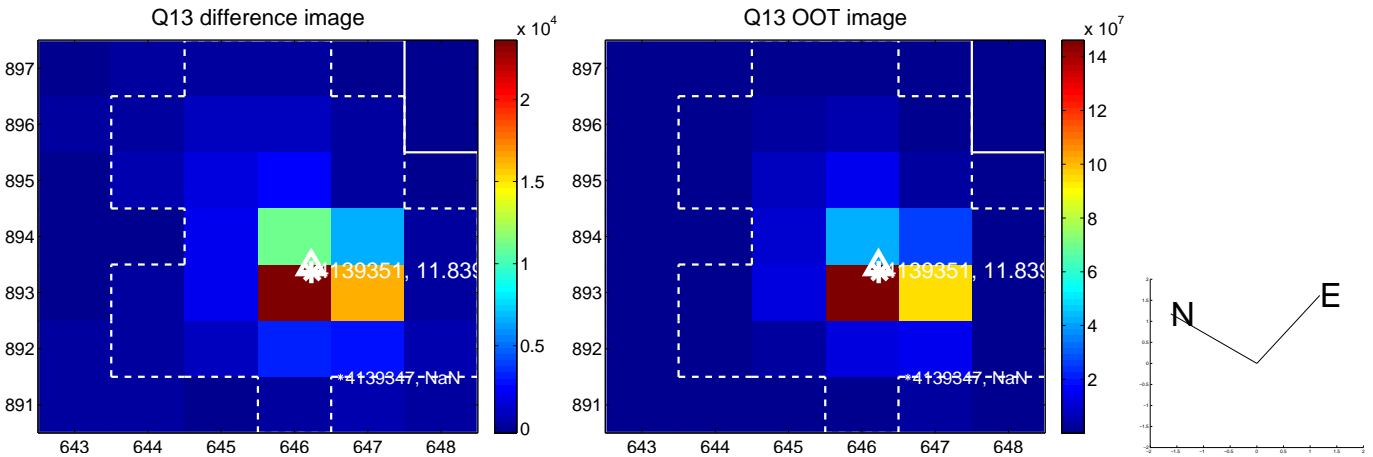




white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



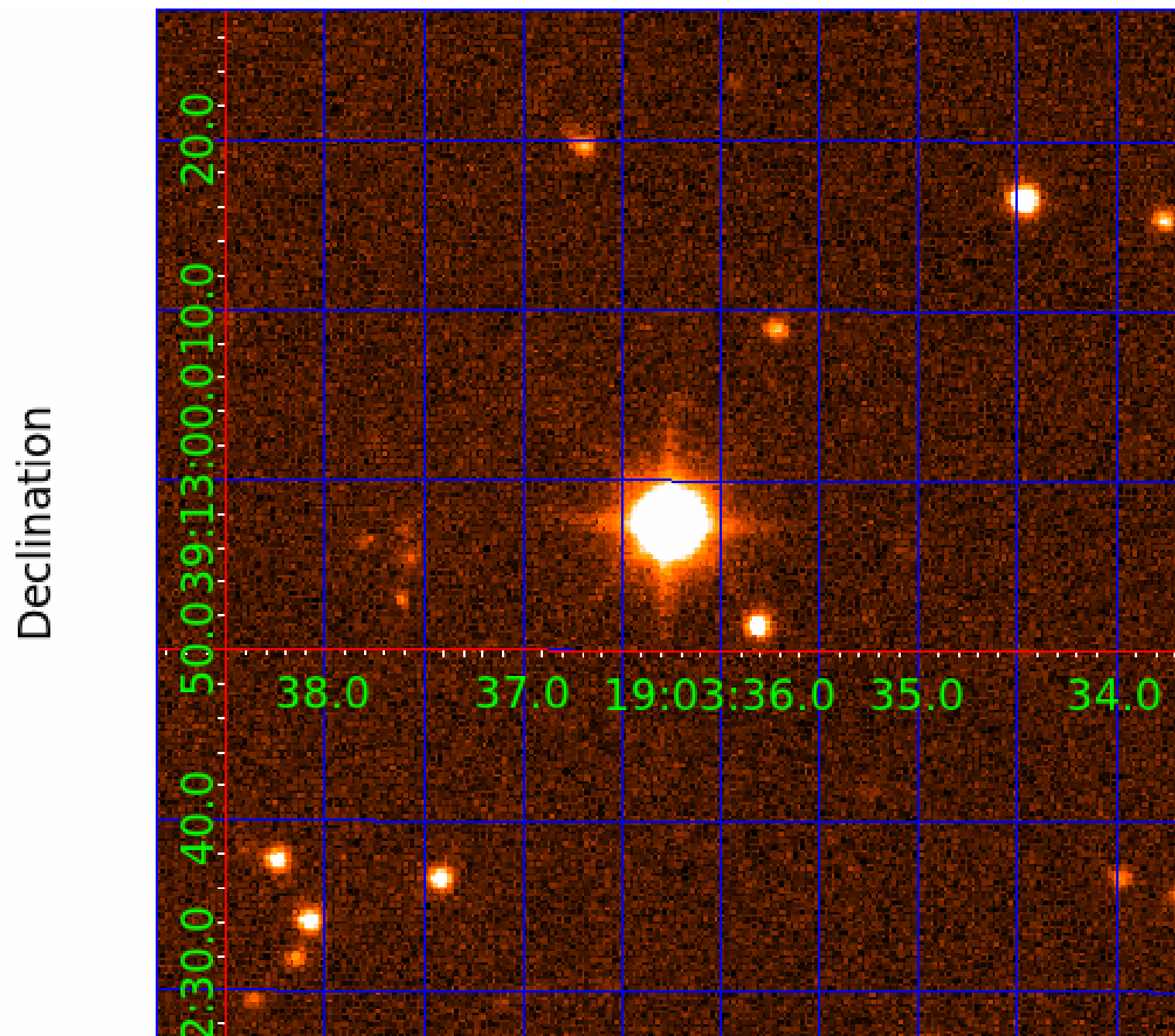
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.







UKIRT Image



# KIC 004139351

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004139351-01	OBS	No	1.617618	131.758437	24.6	5.067	11.9	11.7	2.58	7027	1.76	15050.44
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004139351-04	OBS	No	23.702619	144.250944	140.8	1.388	8.2	8.0	2.58	7027	3.10	419.75
004139351-05	OBS	No	17.992676	143.020549	94.1	3.360	8.5	7.8	2.58	7027	2.87	606.16
004139351-06	OBS	No	26.531520	151.986211	145.8	3.530	7.9	7.6	2.58	7027	3.63	361.16

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004139351-01	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
004139351-02	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD
004139351-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
004139351-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
004139351-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_ZUMA—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_FEW_MEAS
004139351-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT—CENT_FEW_DIFFS

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

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

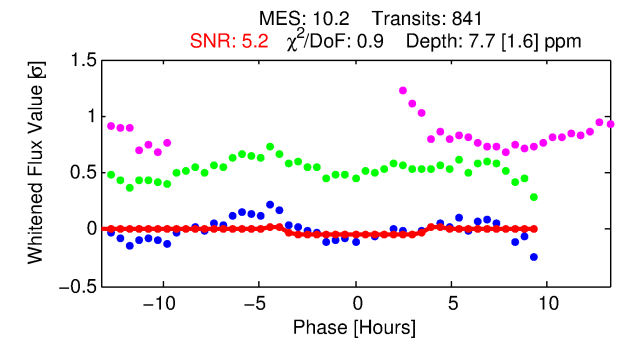
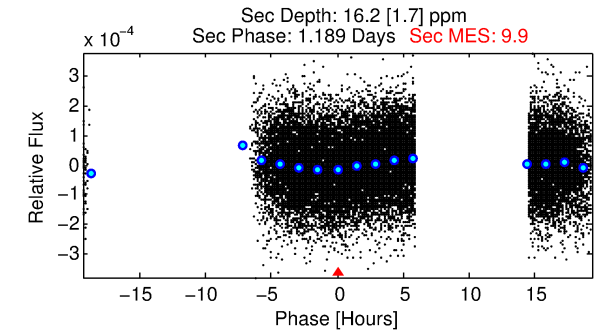
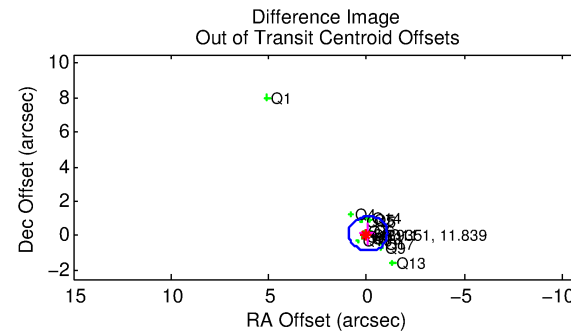
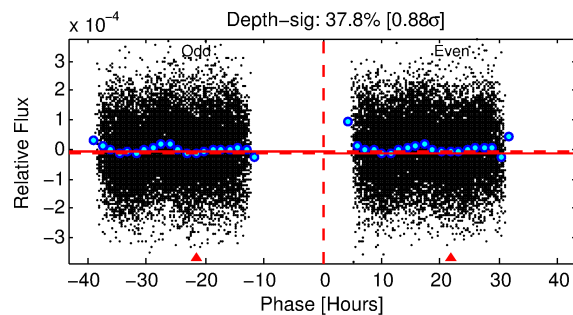
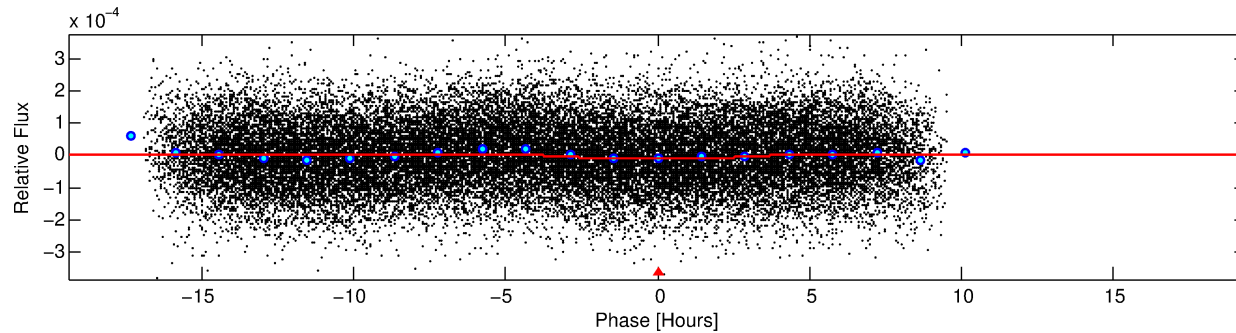
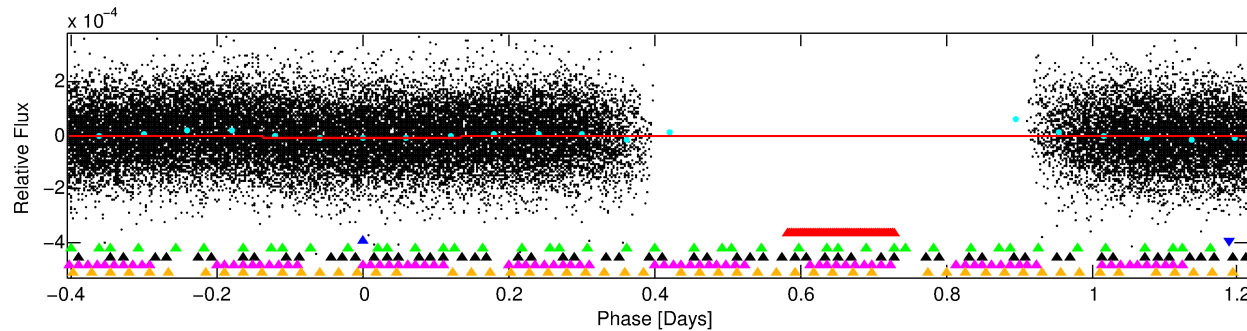
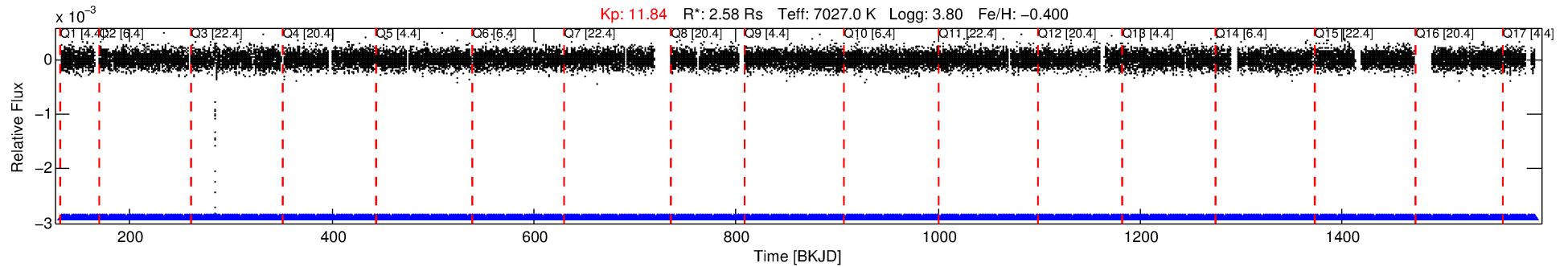
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 004139351-02

No Significant Match Found

# DV One-Page Summary

KIC: 4139351 Candidate: 2 of 6 Period: 1.617 d



## DV Fit Results:

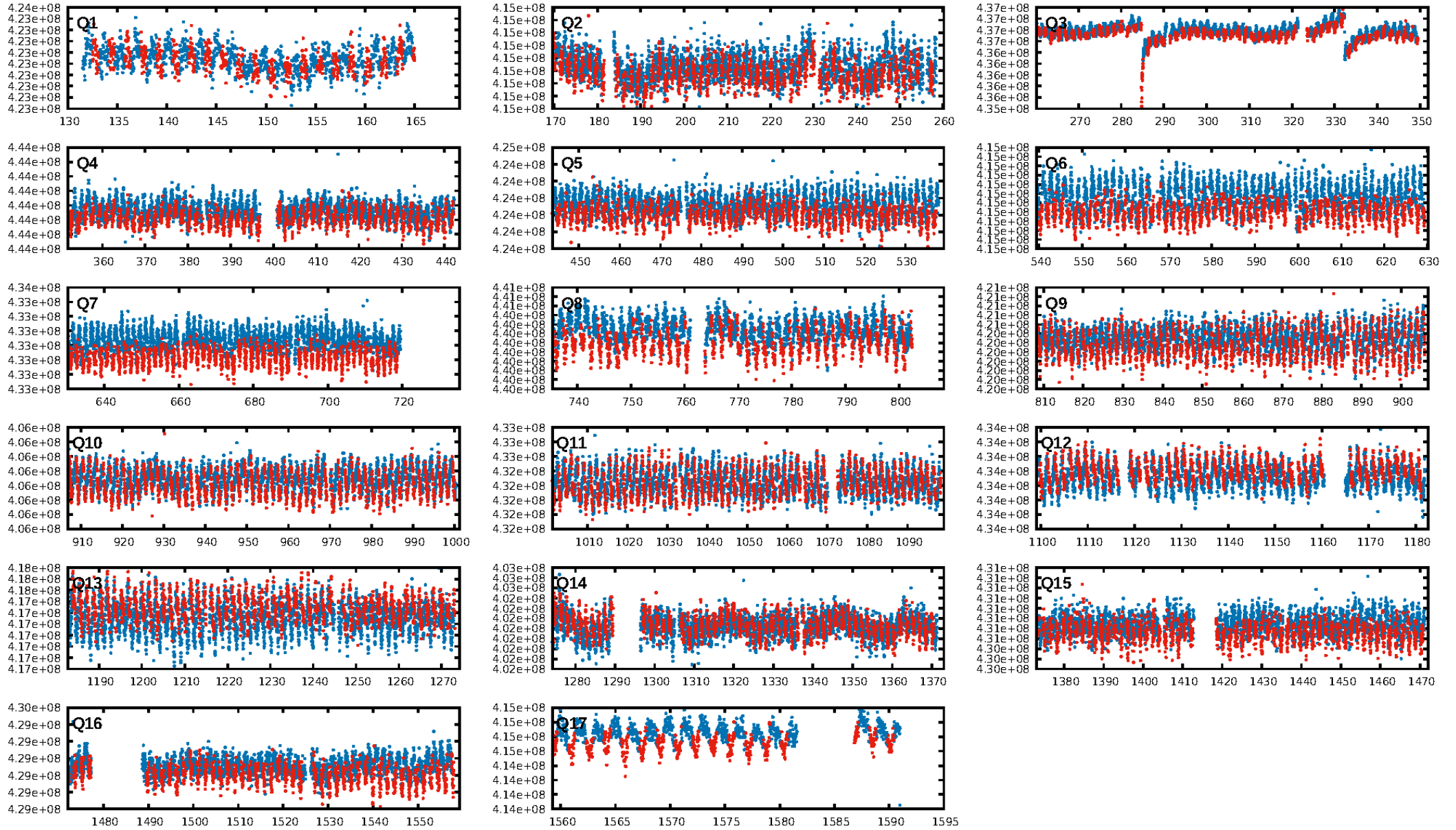
Period = 1.61746 [0.00004] d  
Epoch = 132.7927 [0.0091] BKJD  
Rp/R\* = 0.0027 [0.0006]  
a/R\* = 1.56 [1.10]  
b = 0.62 [1.21]  
Seff = 15052.44 [7805.29]  
Teq = 2824 [366] K  
Rp = 0.75 [0.31] Re  
a = 0.0310 [0.0099] AU  
Ag = 15.10 [10.46] [1.35 $\sigma$ ]  
Teffp = 8609 [1062] K [5.15 $\sigma$ ]

## DV Diagnostic Results:

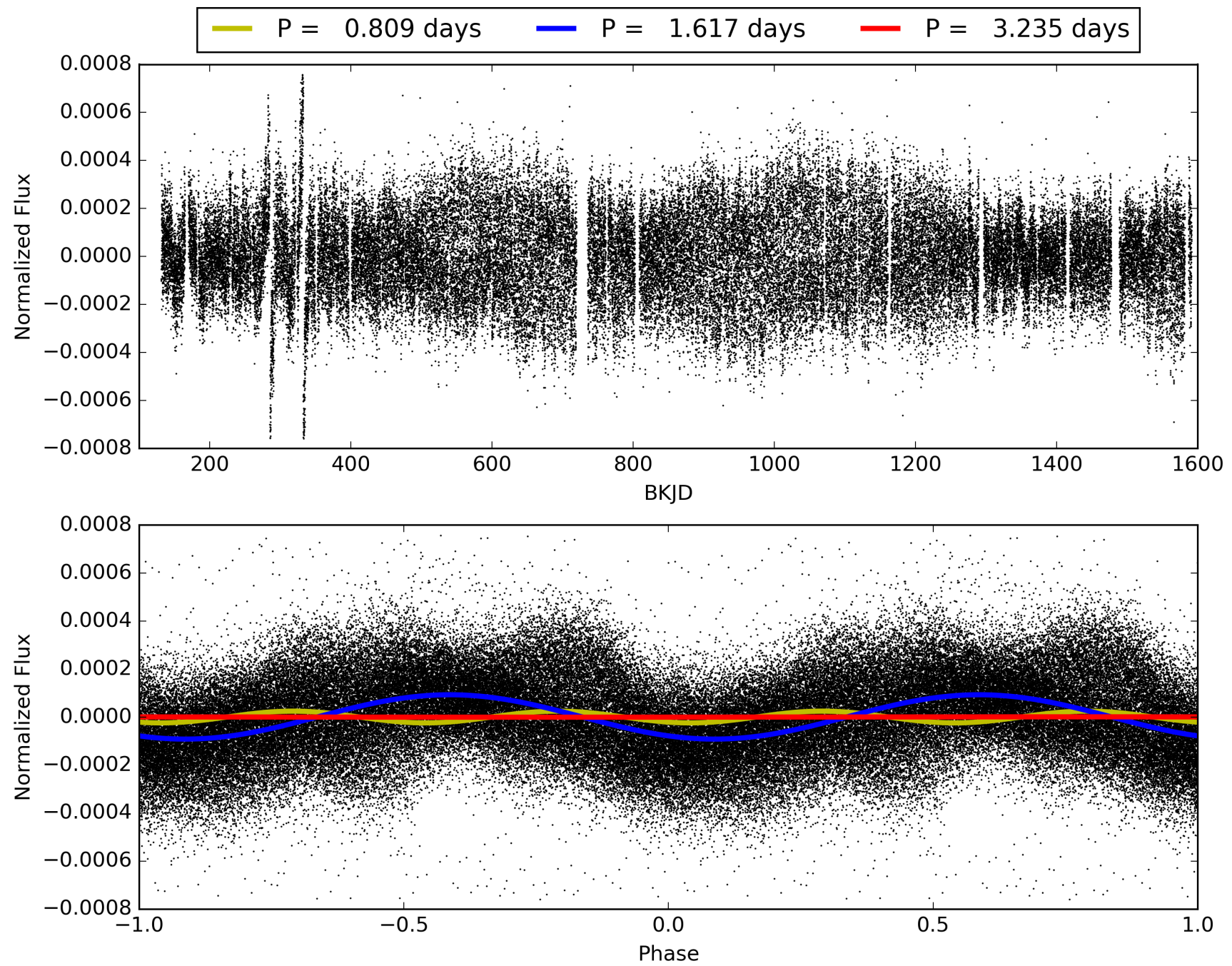
ShortPeriod-sig: N/A  
LongPeriod-sig: 0.0% [0.00 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 5.34e-10  
RollingBand-fgt: 1.00 [803/803]  
GhostDiagnostic-chr: 1.331  
Centroid-sig: 7.5%  
Centroid-so: 2.040 arcsec [1.50 $\sigma$ ]  
OotOffset-rm: 0.137 arcsec [0.41 $\sigma$ ]  
KicOffset-rm: 0.171 arcsec [0.67 $\sigma$ ]  
OotOffset-st: 3/4/3/5 [15]  
KicOffset-st: 3/4/3/5 [15]  
DiffImageQuality-fgm: 0.93 [14/15]  
DiffImageOverlap-fno: 0.35 [6/17]



# TCE 004139351-02, PDC Light Curves

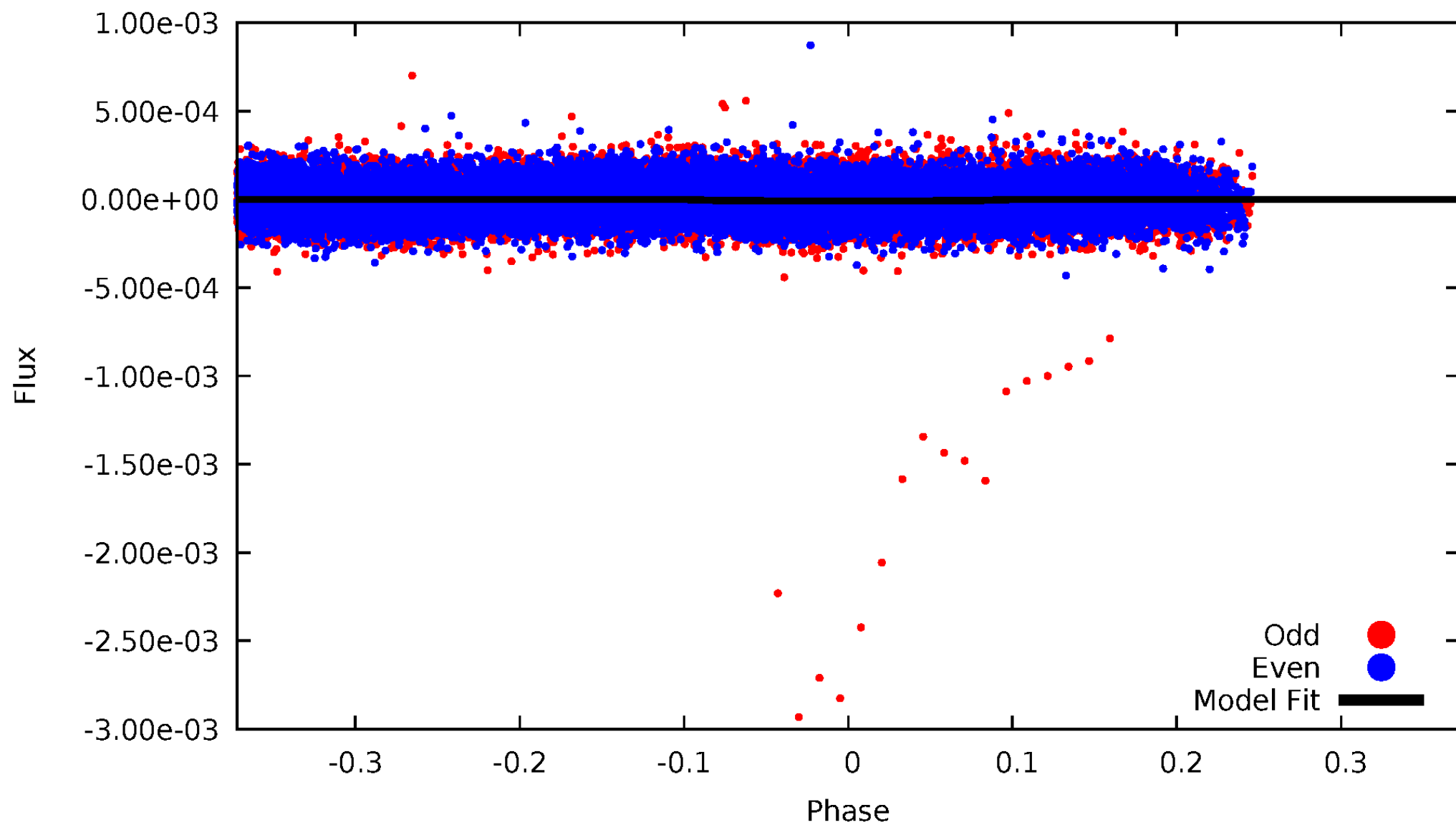


TCE 004139351-02



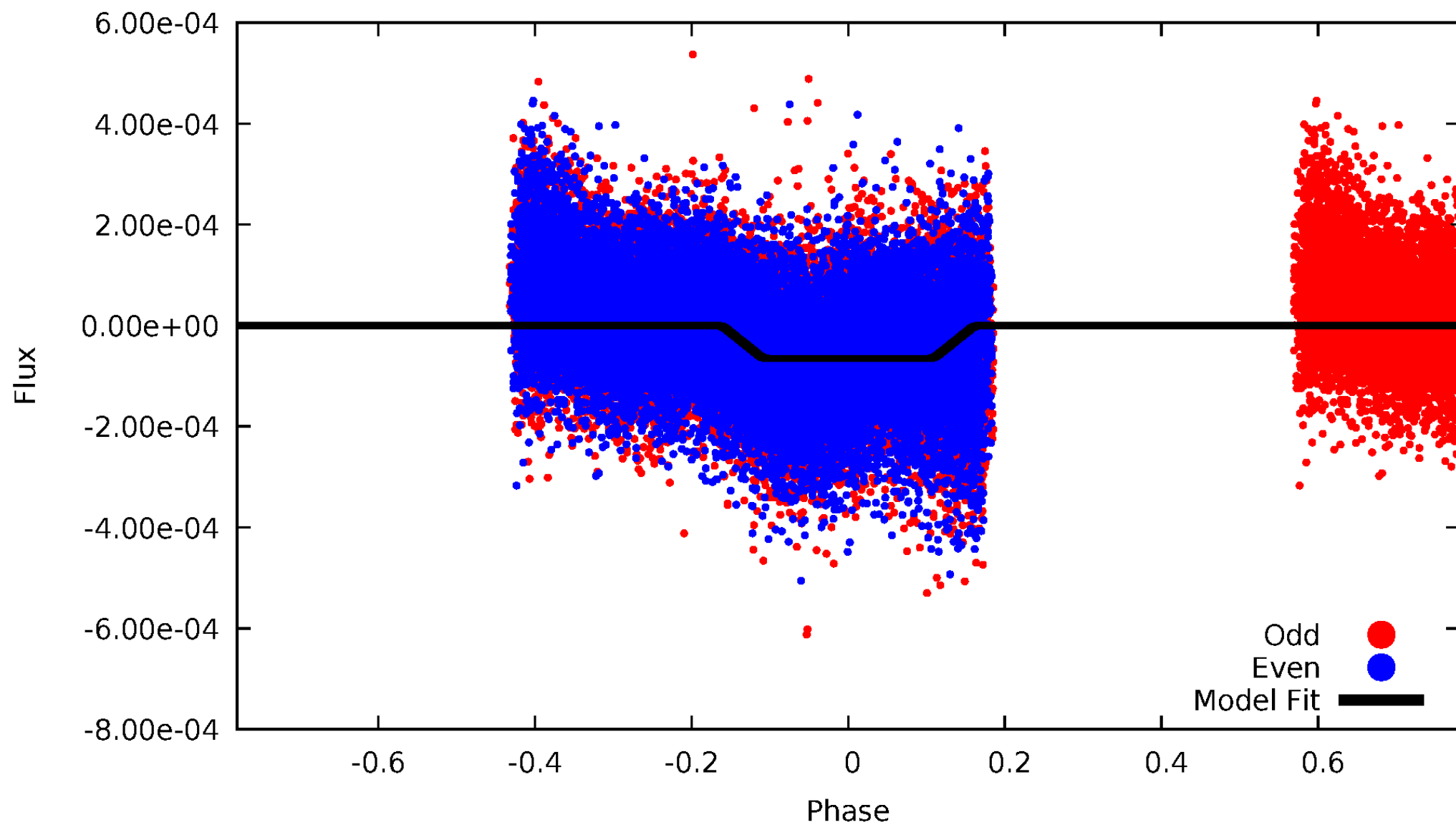
# DV Odd/Even

TCE 004139351-02



# ALT Odd/Even

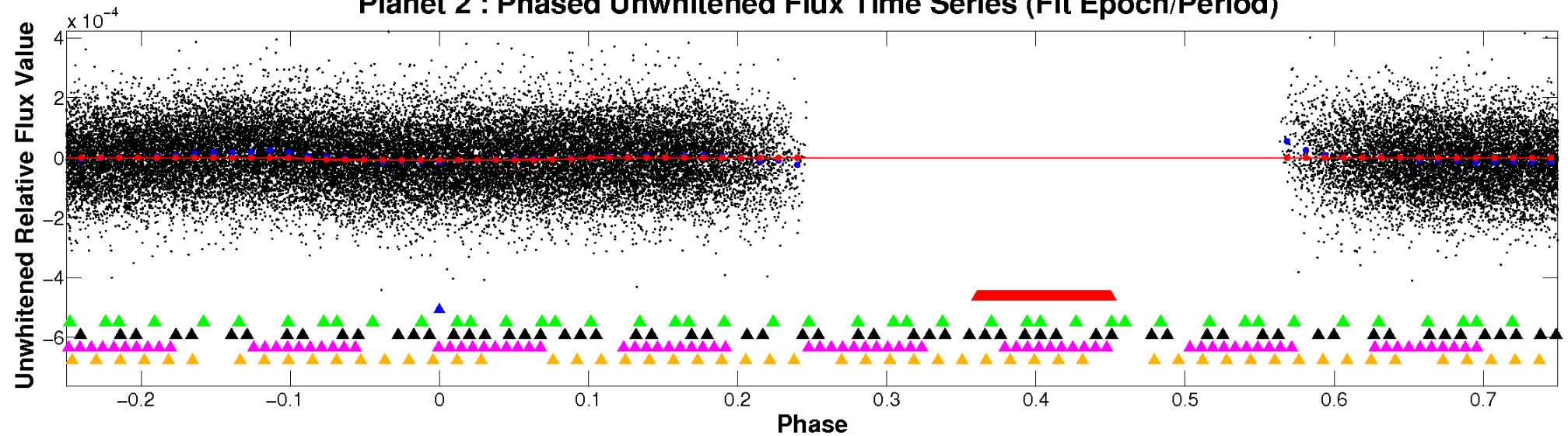
TCE 004139351-02



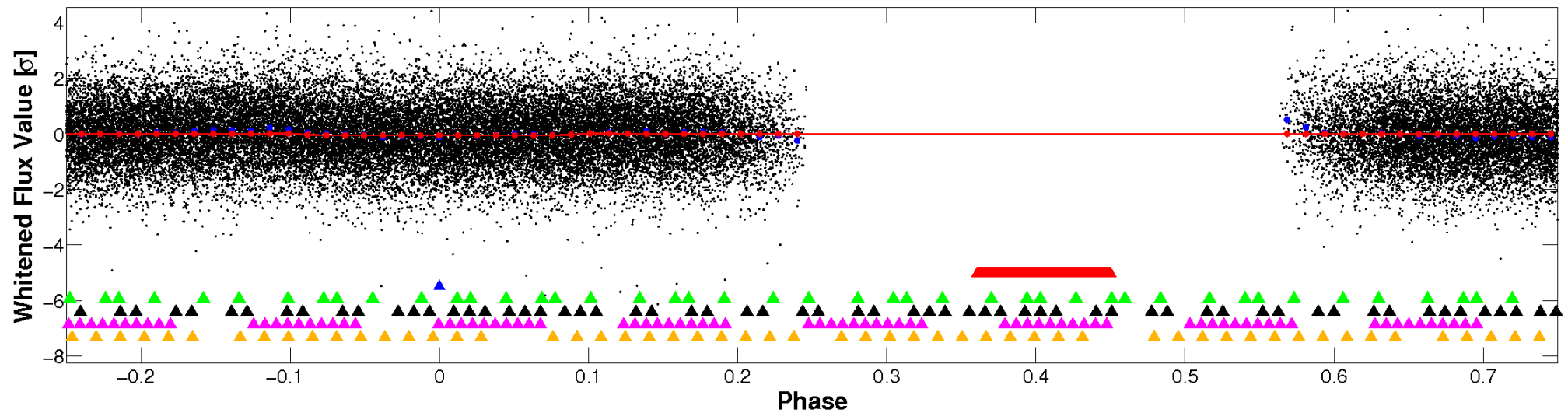


# Non-Whitened Vs. Whitened Light Curve

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

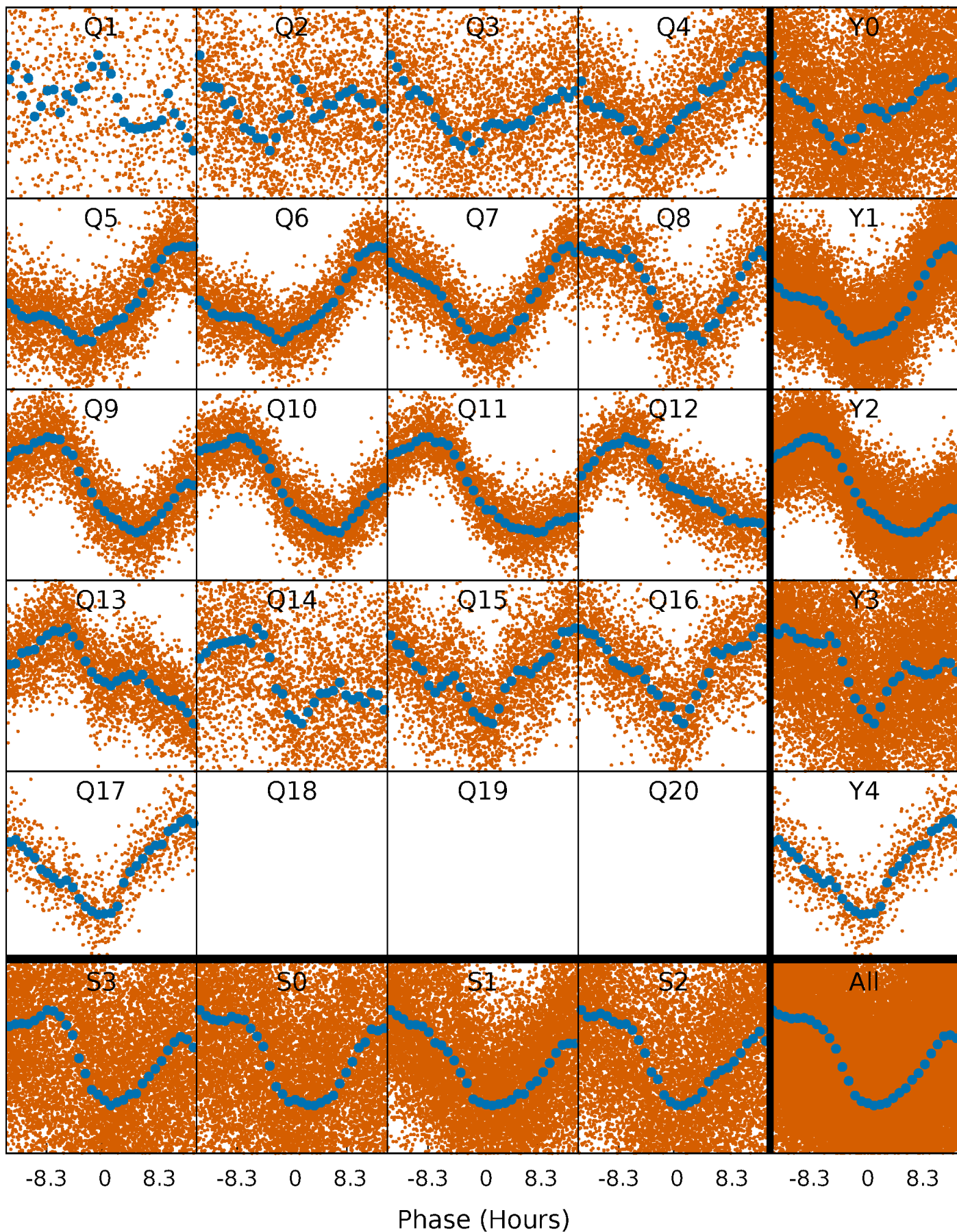


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



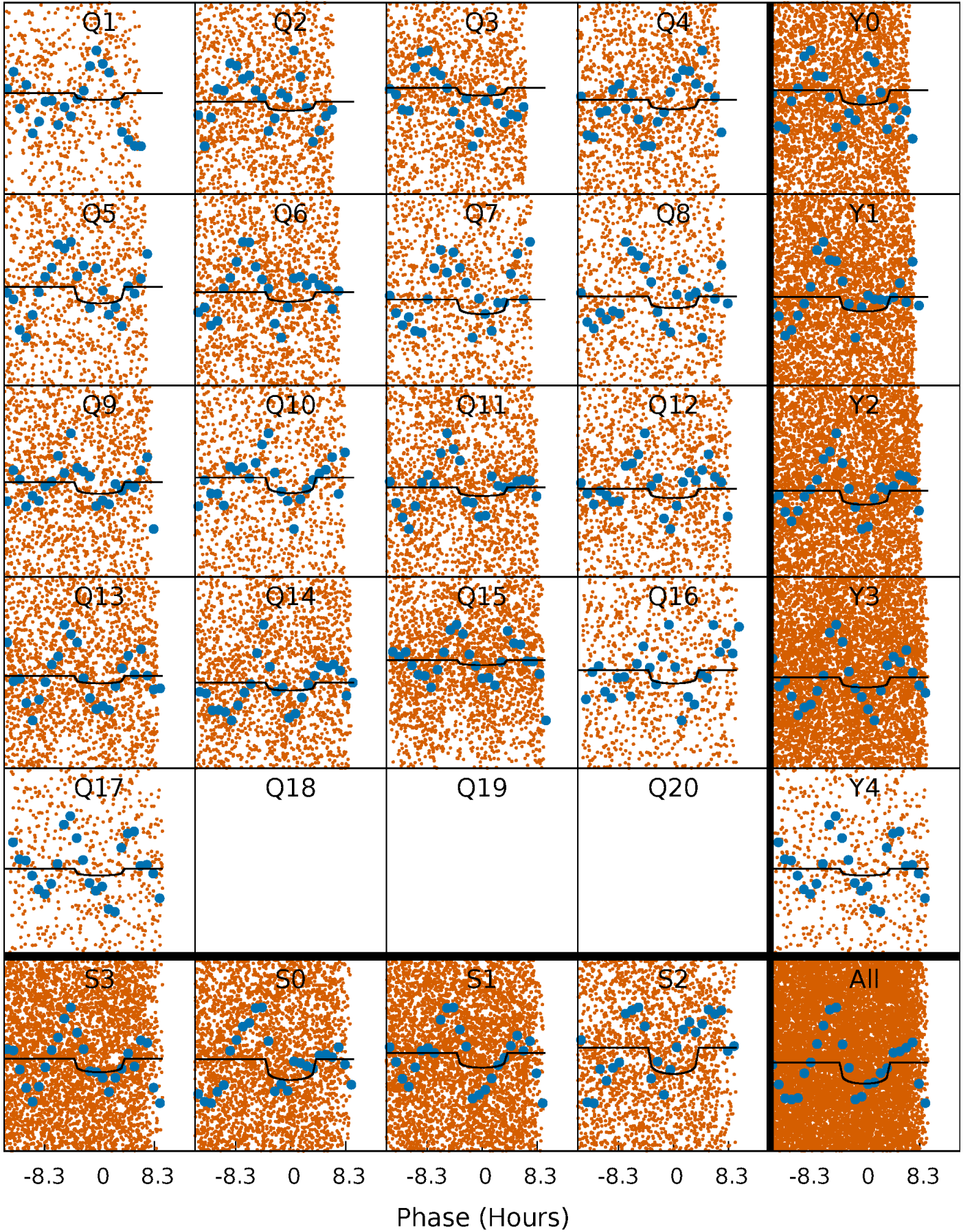
# PDC Quarter-Phased Transit Curves

TCE 004139351-02 P= 1.617457 Days  $T_0=132.792667$  (BKJD)



# DV Quarter-Phased Transit Curves

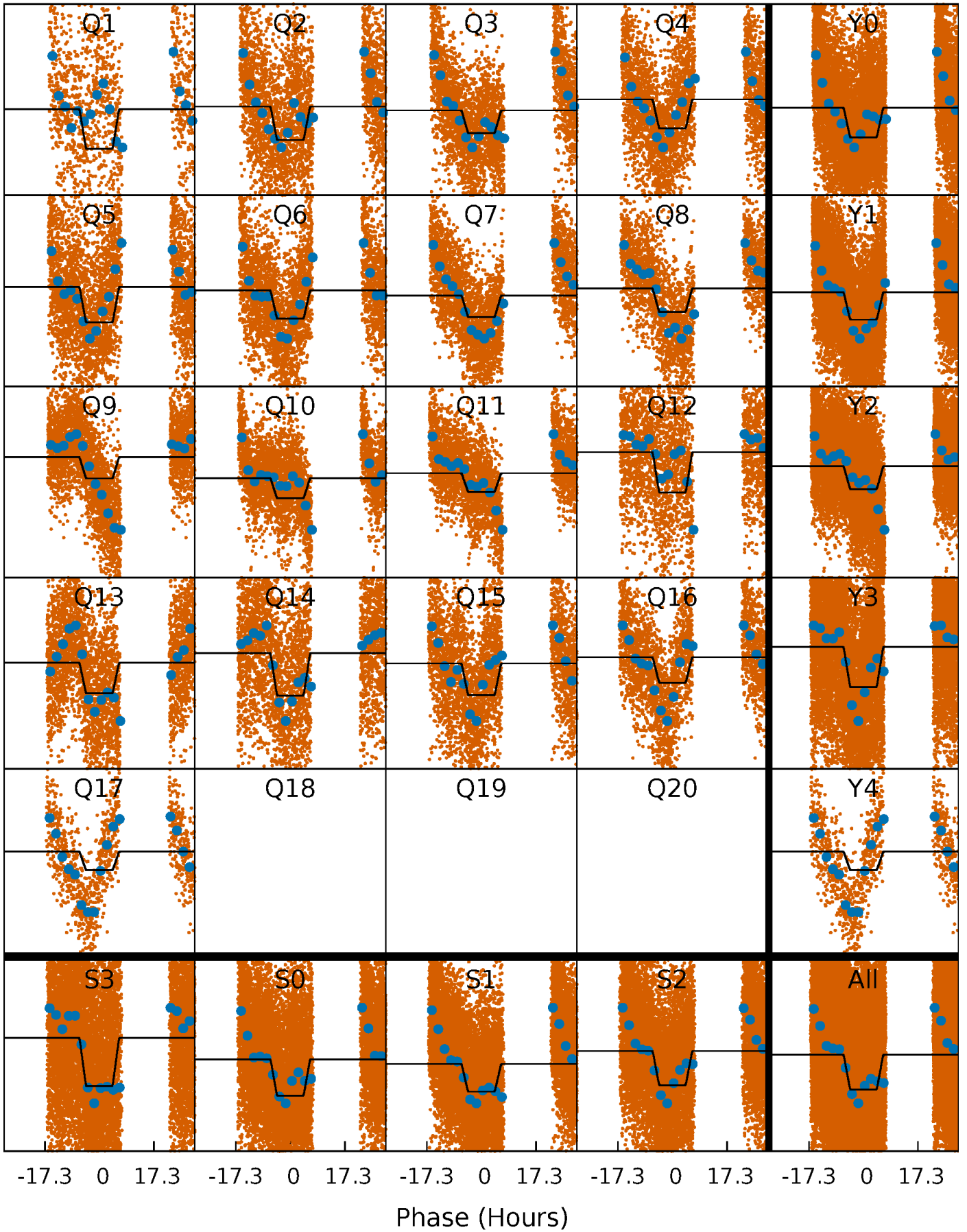
TCE 004139351-02   P= 1.617457 Days    $T_0=132.792667$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

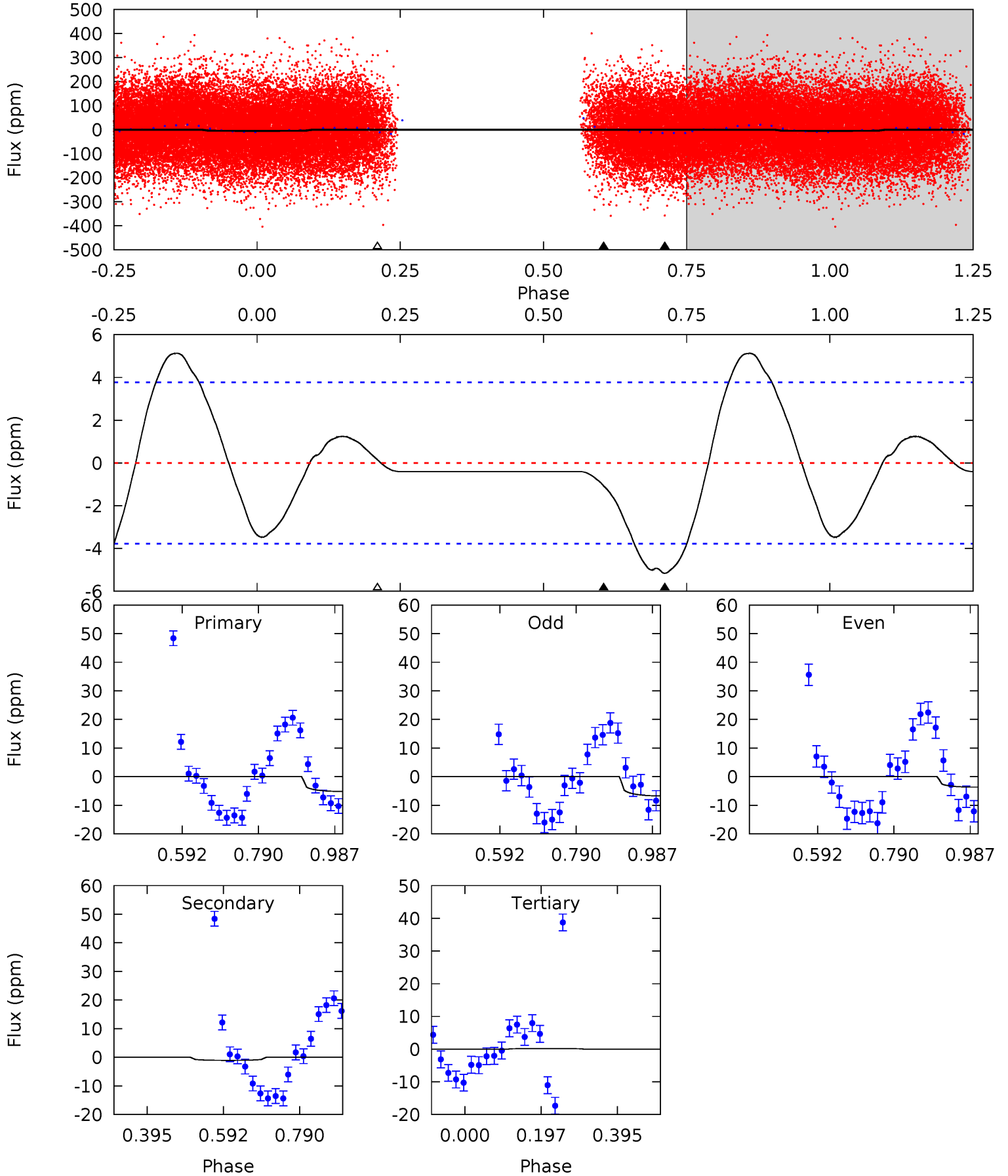
TCE 004139351-02     $P = 1.617660$  Days     $T_0 = 132.747423$  (BKJD)



# DV Model-Shift Uniqueness Test

004139351-02, P = 1.617457 Days, E = 131.175210 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
6.04	1.26	-0.18	0	4.42	1.29	2.10	6.22	6.04	1.43	1.26	1.78	1.32	0.50	1.28

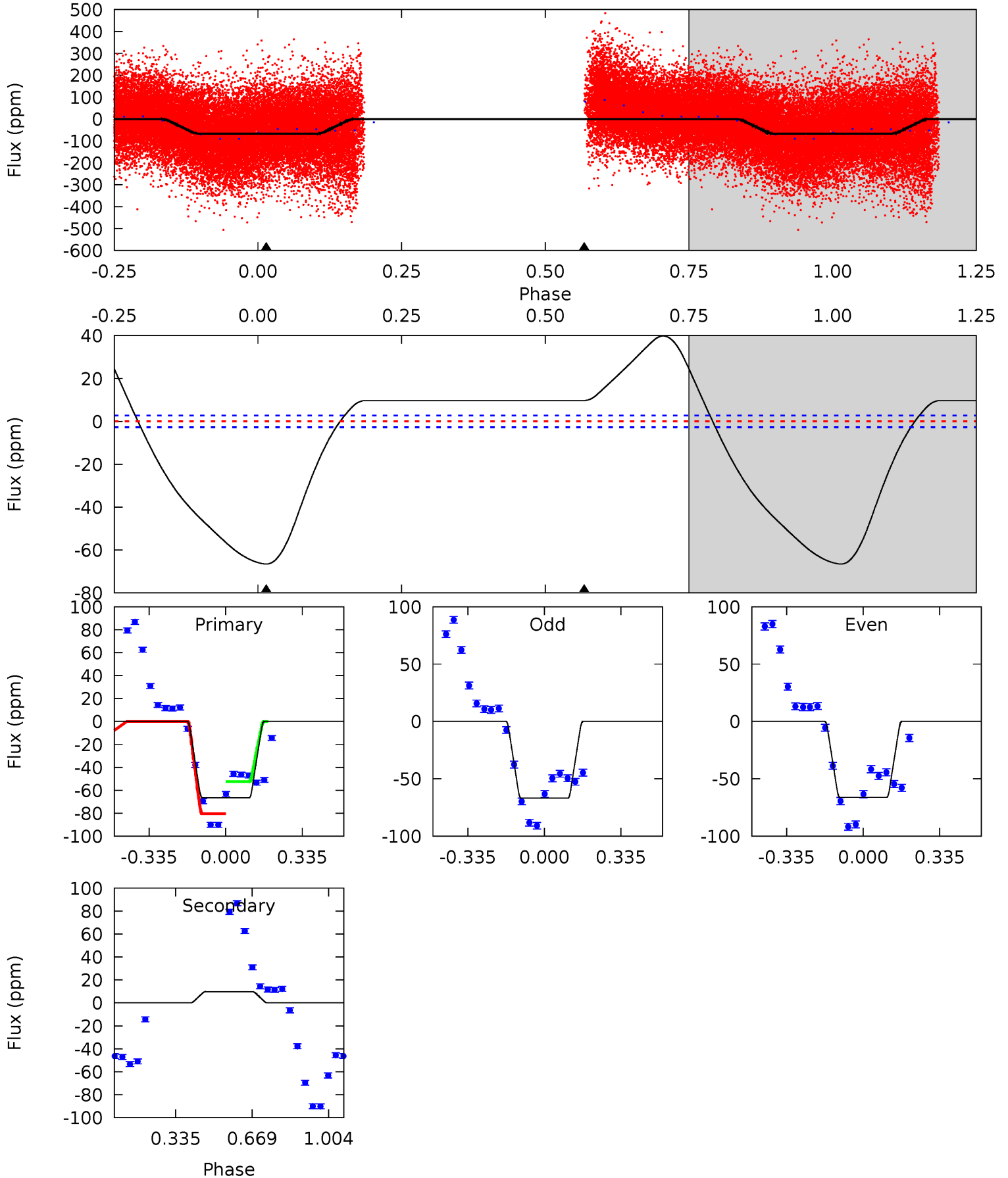




# Alt Model-Shift Uniqueness Test

004139351-02, P = 1.617660 Days, E = 131.129763 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
104.5	-15.2	0	0	4.30	0.96	16.0	104.5	104.5	-15.2	-15.2	0.58	1.01	0.37	17.6



### Stellar Parameters For KIC 004139351

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$7027^{+183}_{-224}$	$3.799^{+0.292}_{-0.097}$	$-0.400^{+0.300}_{-0.250}$	$2.577^{+0.406}_{-0.879}$	$1.524^{+0.205}_{-0.308}$	$0.126^{+0.248}_{-0.038}$
	+3%/-3%	+8%/-3%	+75%/-62%	+16%/-34%	+13%/-20%	+197%/-30%
Source	PHO1	FLK73	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 004139351-02 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-1\pm1$	$0.71^{+0.21}_{-0.20}$	$3871^{+217}_{-346}$	$4214^{+1030}_{-7442}$	$1.079^{+1.600}_{-0.919}$
Alt.	$10\pm1$	$2.17^{+0.34}_{-0.42}$	$3856^{+246}_{-353}$	$-4738^{+169}_{-178}$	$-1.102^{+0.272}_{-0.548}$

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

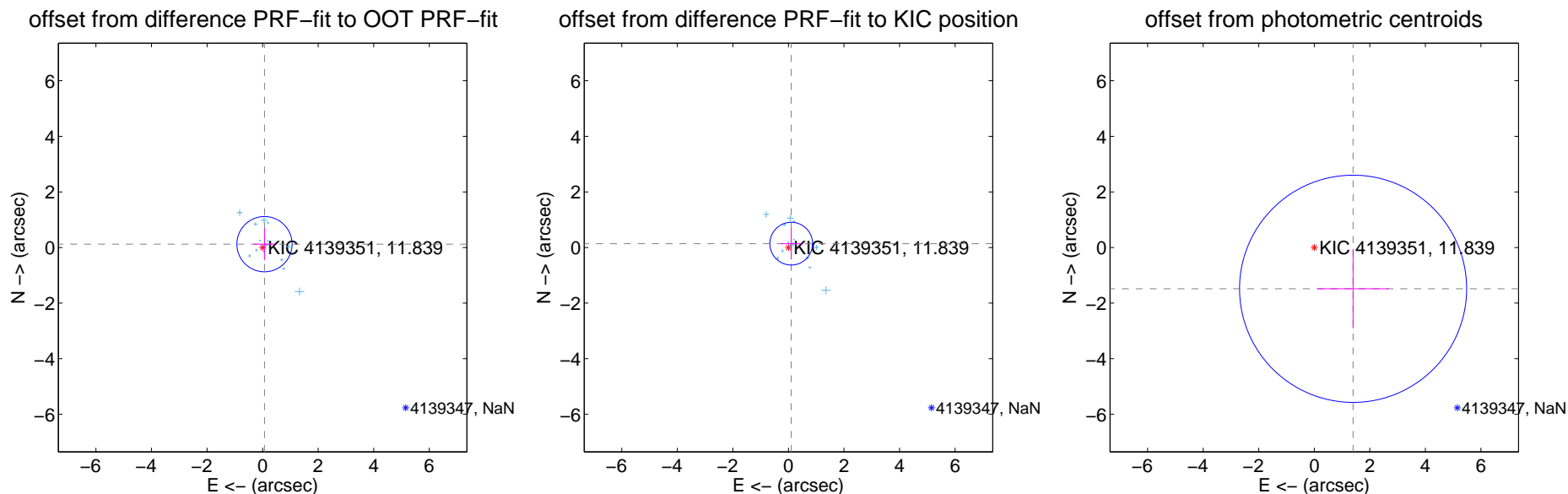
## DV Centroid Data

Supplemental centroid analysis for 004139351-02. **Kepler magnitude: 11.84.** Transit SNR 5.19

There are 14 quarters with good PRF difference image offsets

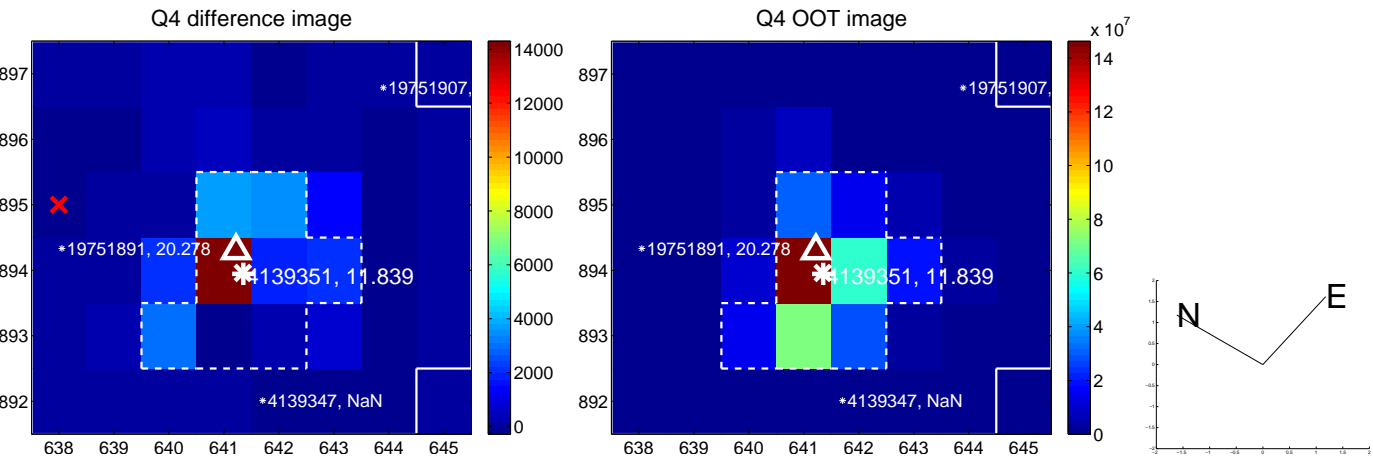
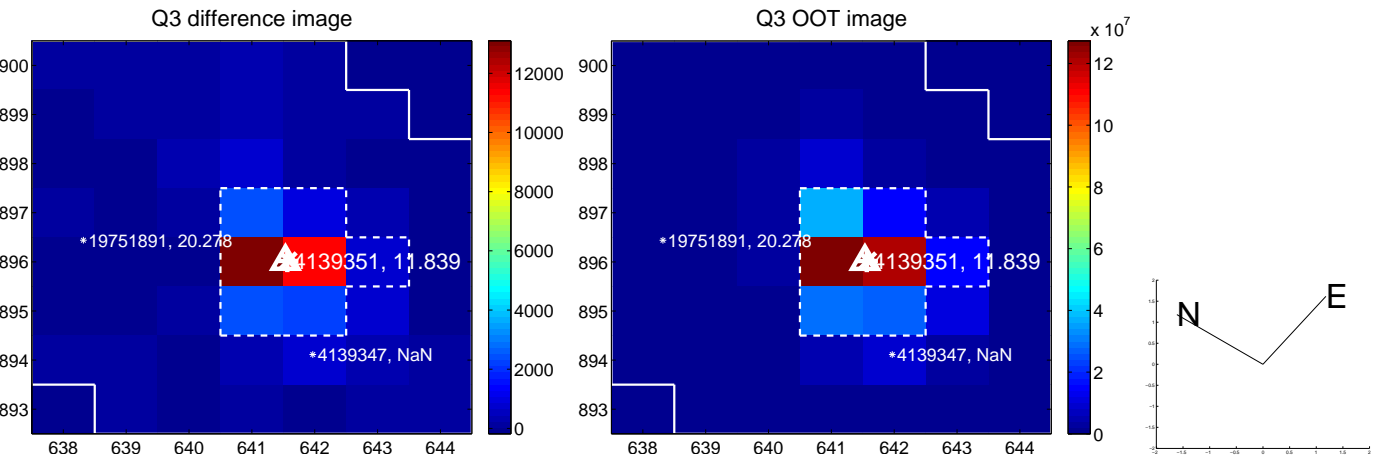
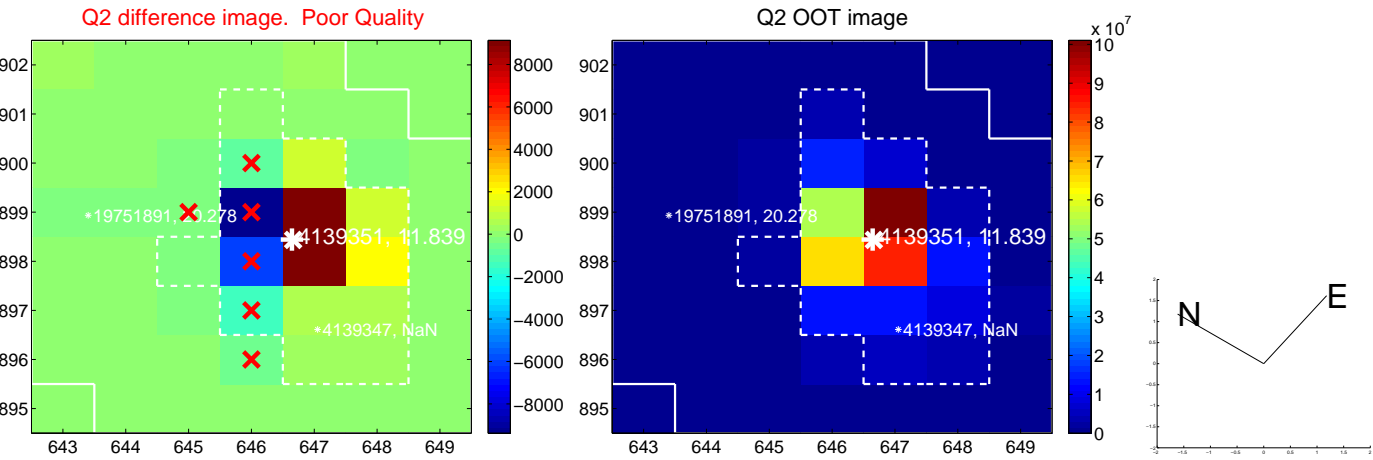
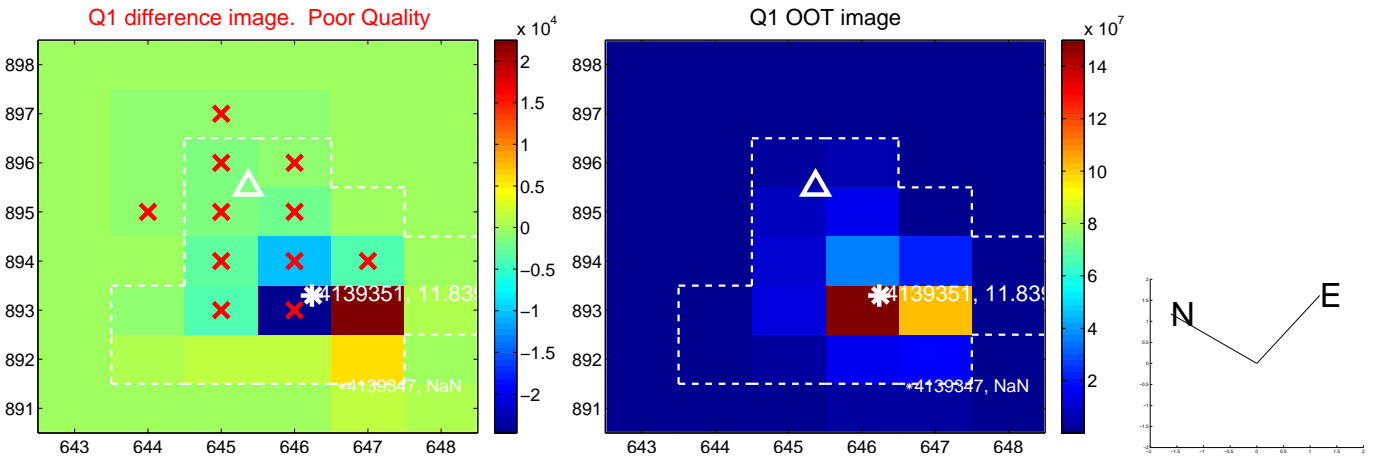
The direct PRF centroid is offset from the target star catalog position by about 0.07 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.137 \pm 0.331$	0.41	$-0.067 \pm 0.380$	$0.120 \pm 0.573$
PRF-fit source offset from KIC position	$0.171 \pm 0.256$	0.67	$-0.101 \pm 0.387$	$0.138 \pm 0.569$
photometric centroid source offset	$2.04 \pm 1.36$	1.50	$-1.40 \pm 1.29$	$-1.49 \pm 1.42$

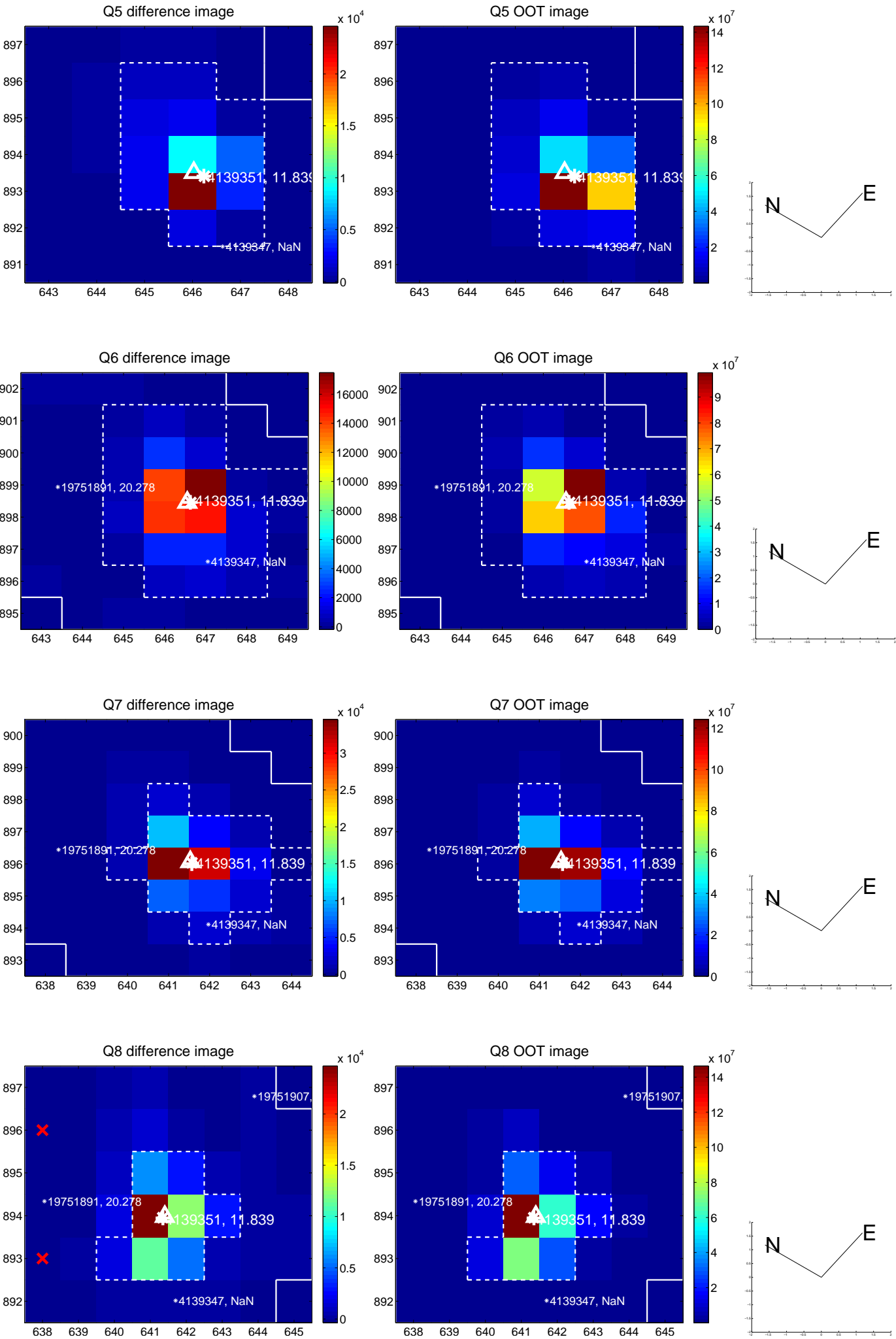


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

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

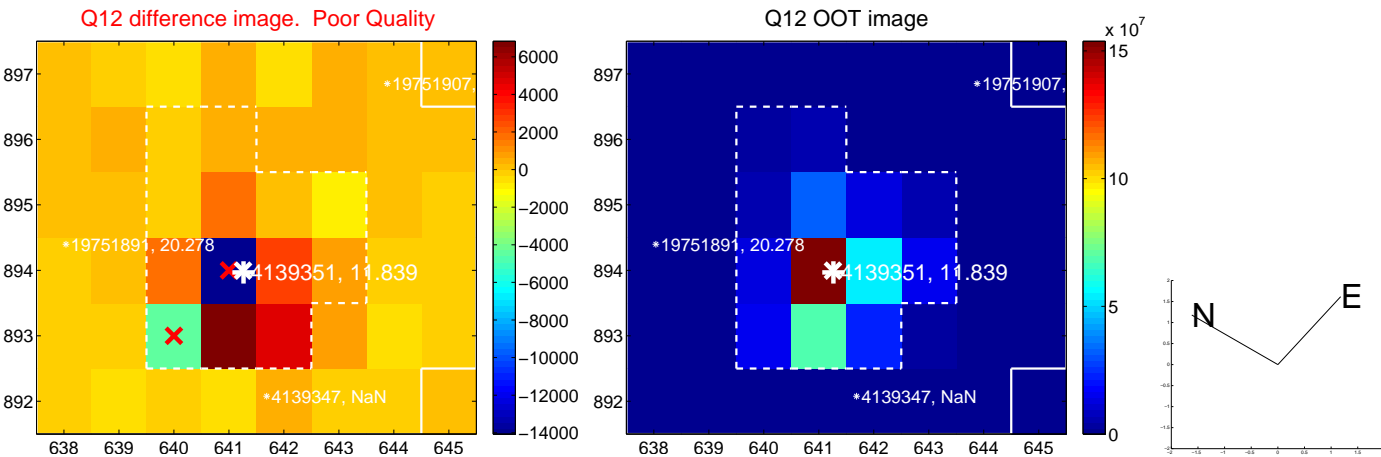
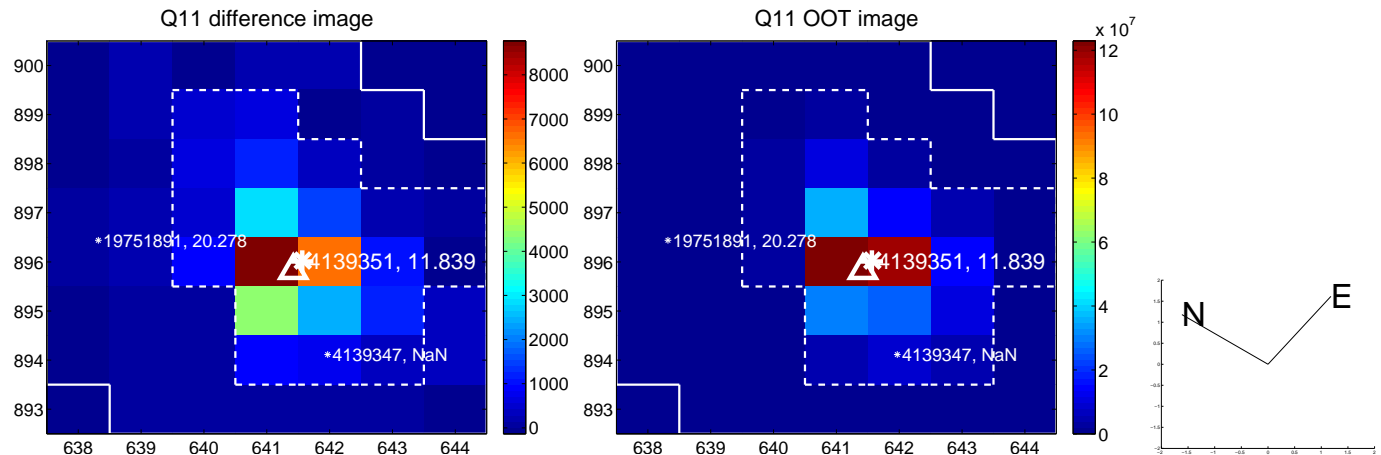
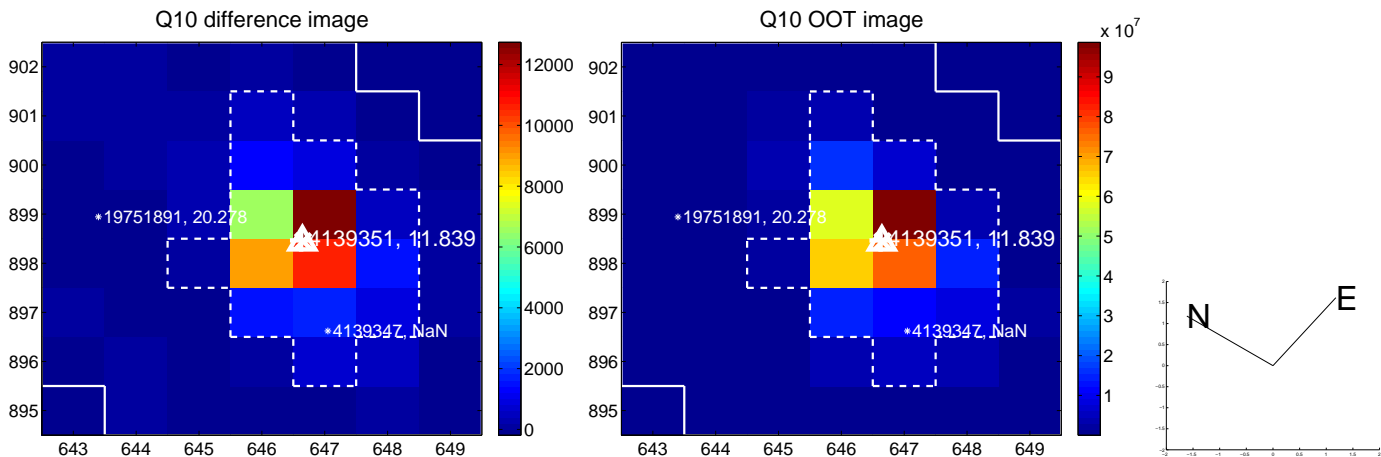
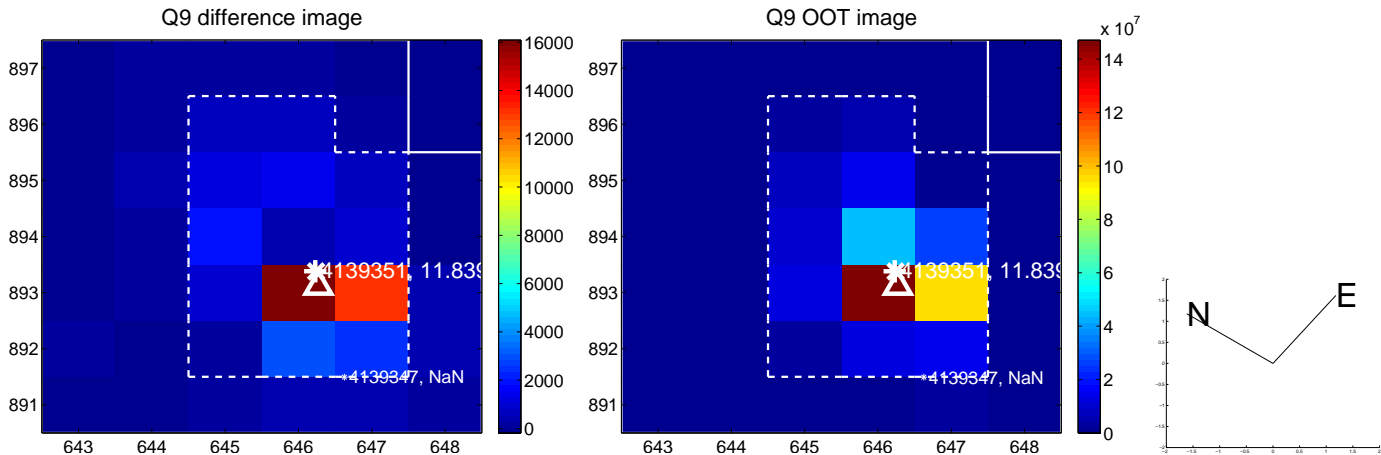


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



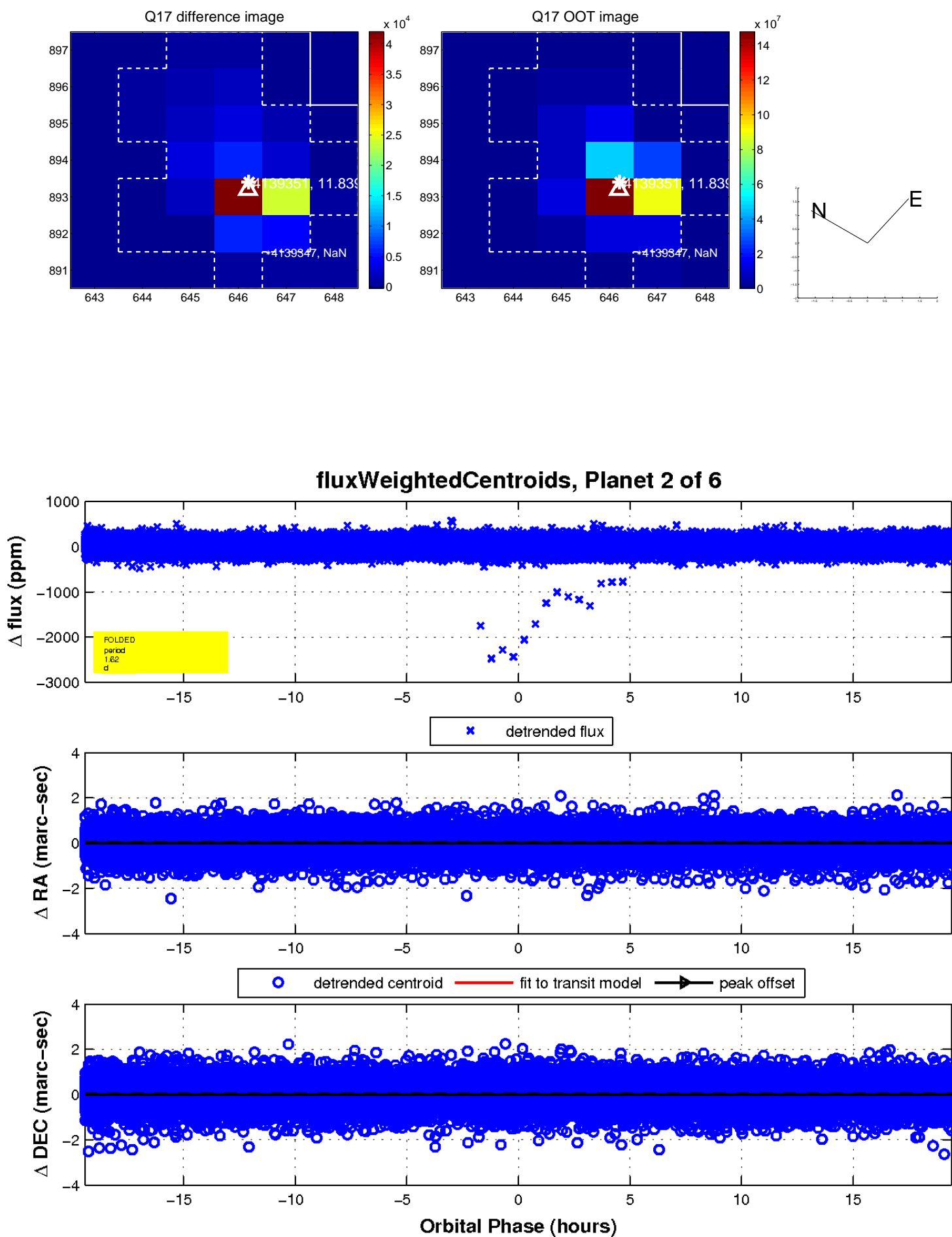


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



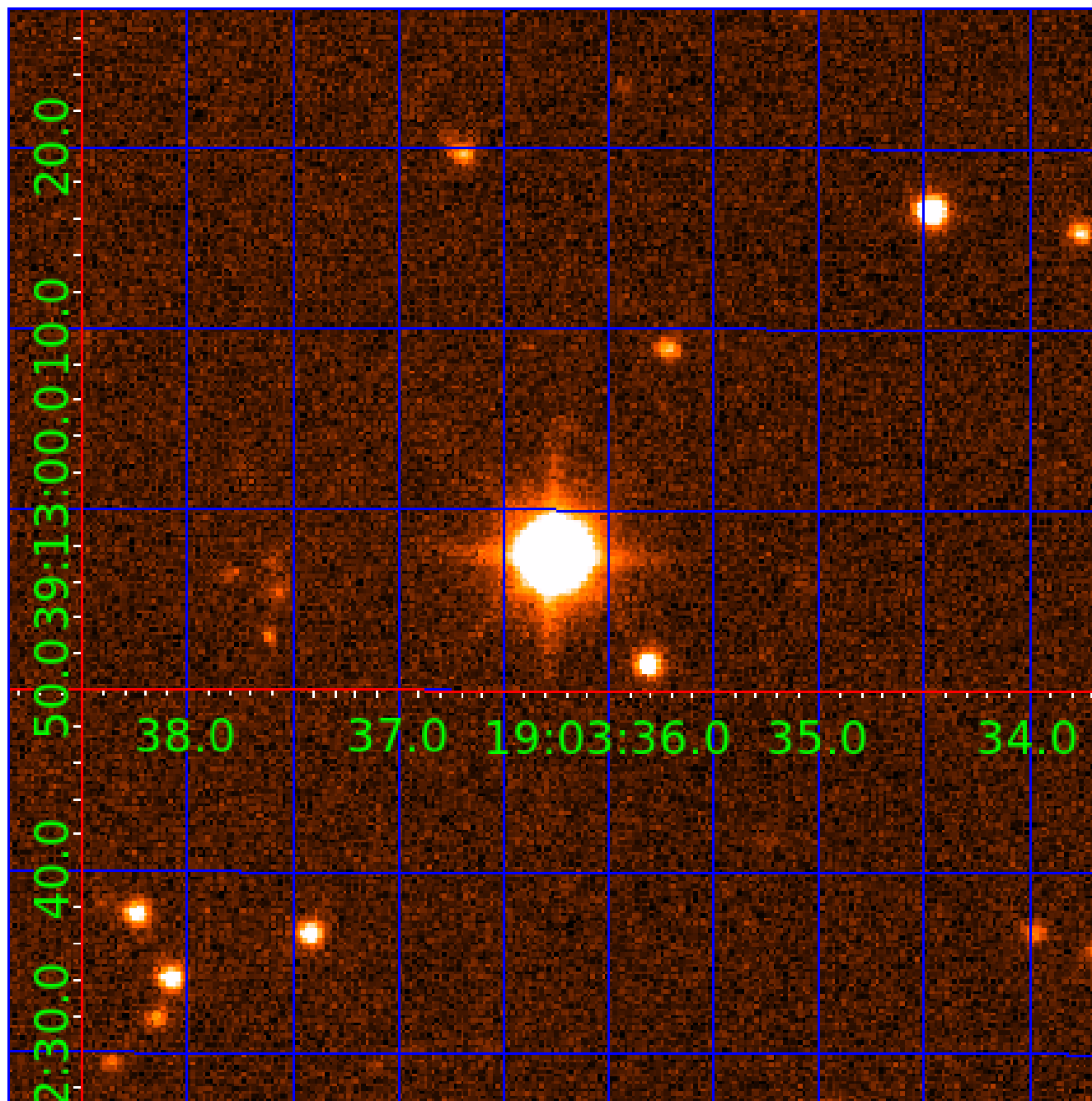


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



# UKIRT Image

Declination



# KIC 004139351

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004139351-01	OBS	No	1.617618	131.758437	24.6	5.067	11.9	11.7	2.58	7027	1.76	15050.44
004139351-02	OBS	No	1.617457	132.792667	7.7	7.220	10.2	5.2	2.58	7027	0.75	15052.44
004139351-03	OBS	No	33.348582	156.166187	151.0	3.824	9.3	9.3	2.58	7027	3.70	266.24
004139351-04	OBS	No	23.702619	144.250944	140.8	1.388	8.2	8.0	2.58	7027	3.10	419.75
004139351-05	OBS	No	17.992676	143.020549	94.1	3.360	8.5	7.8	2.58	7027	2.87	606.16
004139351-06	OBS	No	26.531520	151.986211	145.8	3.530	7.9	7.6	2.58	7027	3.63	361.16

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004139351-01	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
004139351-02	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD
004139351-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
004139351-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
004139351-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_ZUMA—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_FEW_MEAS
004139351-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT—CENT_FEW_DIFFS

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

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

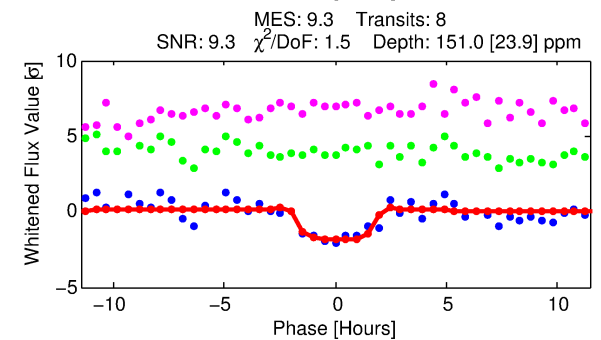
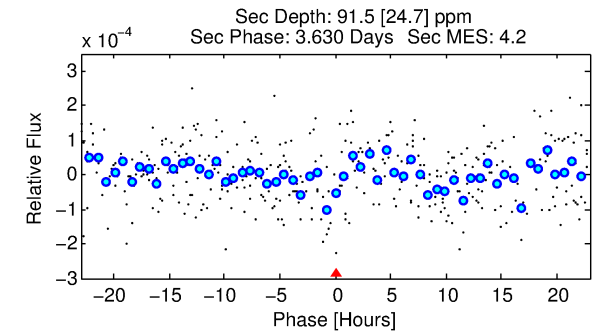
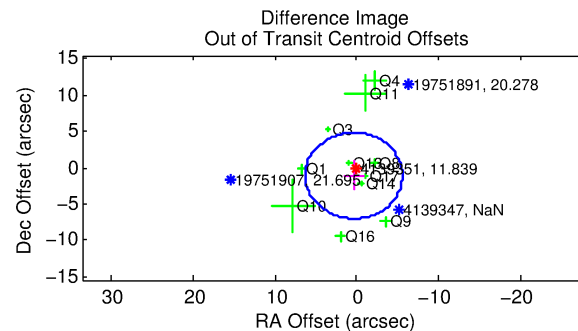
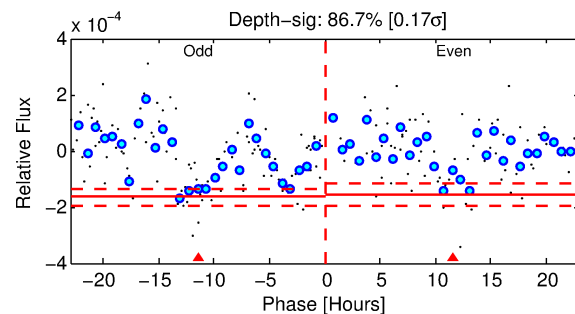
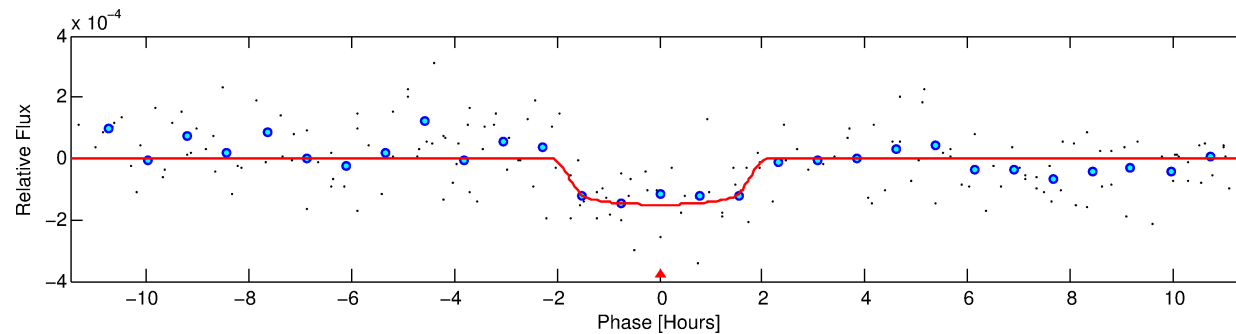
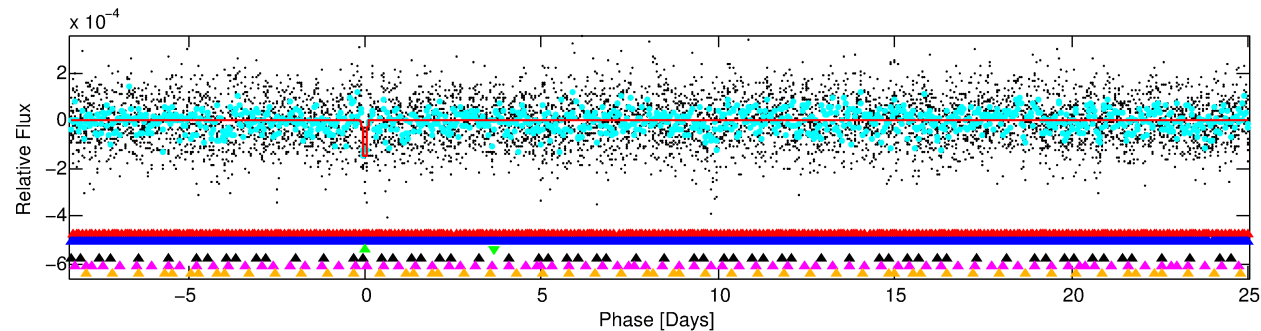
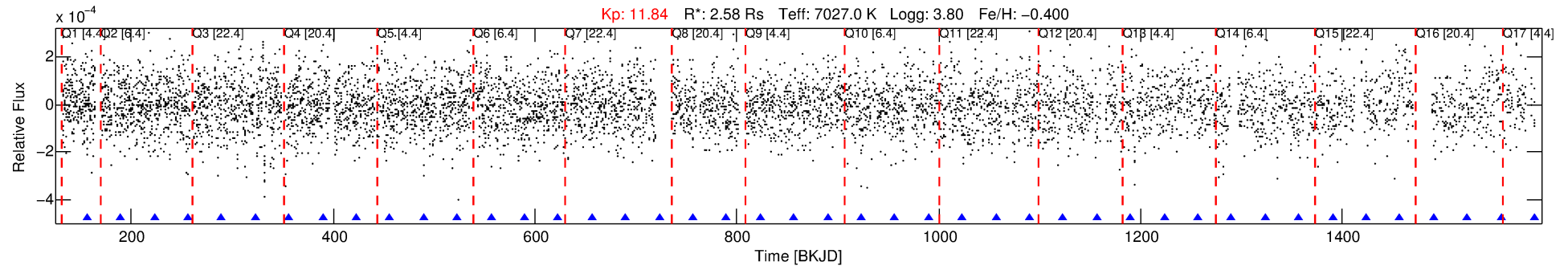
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 004139351-03

No Significant Match Found



KIC: 4139351    Candidate: 3 of 6    Period: 33.349 d



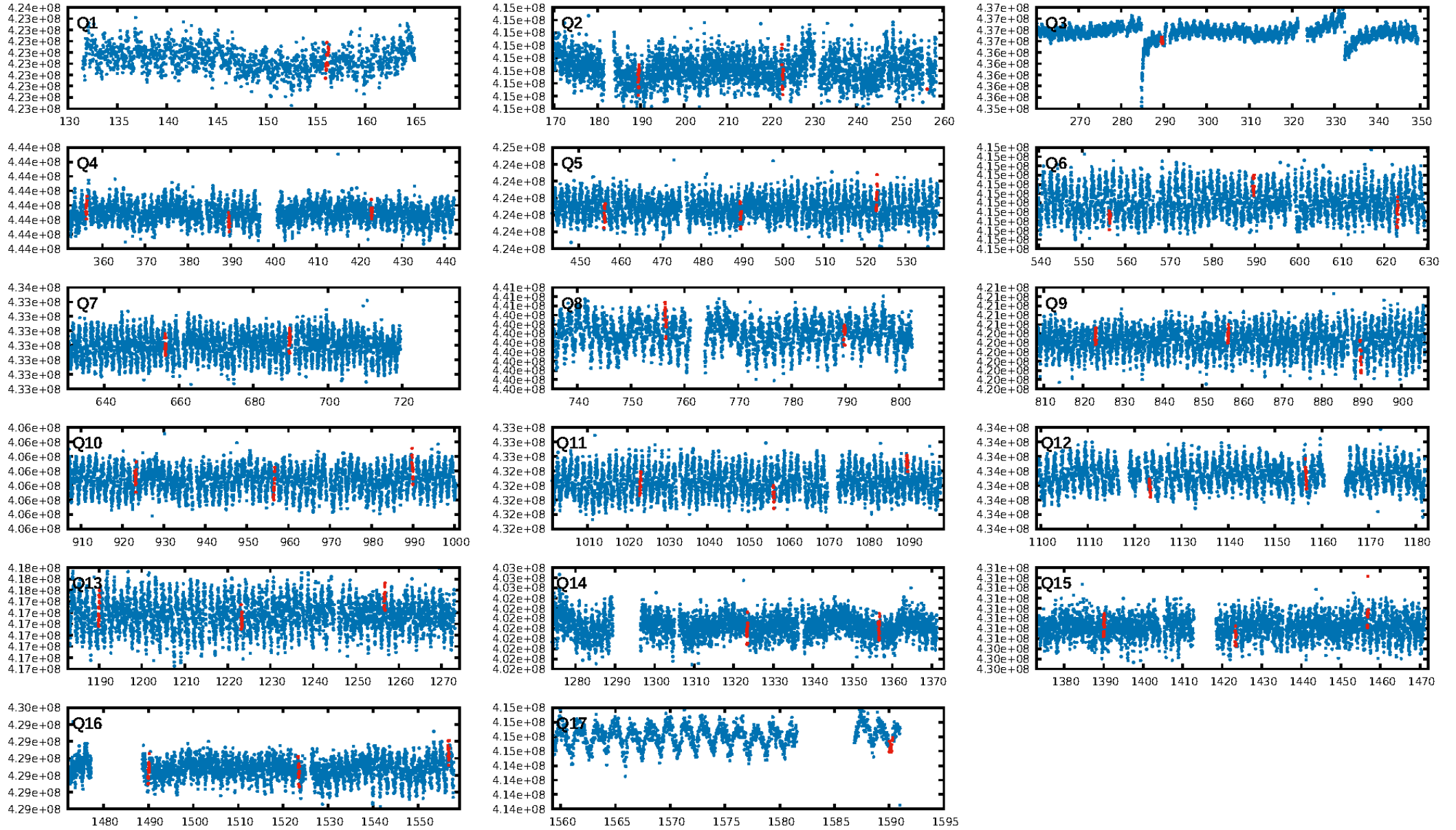
DV Fit Results:

Period = 33.34858 [0.00054] d  
Epoch = 156.1662 [0.0121] BKJD  
Rp/R\* = 0.0132 [0.0058]  
a/R\* = 30.10 [77.66]  
b = 0.91 [0.51]  
Seff = 266.24 [138.06]  
Teq = 1030 [134] K  
Rp = 3.70 [2.07] Re  
a = 0.2334 [0.0745] AU  
Ag = 199.95 [210.53] [0.95σ]  
Teffp = 5988 [1398] K [3.53σ]

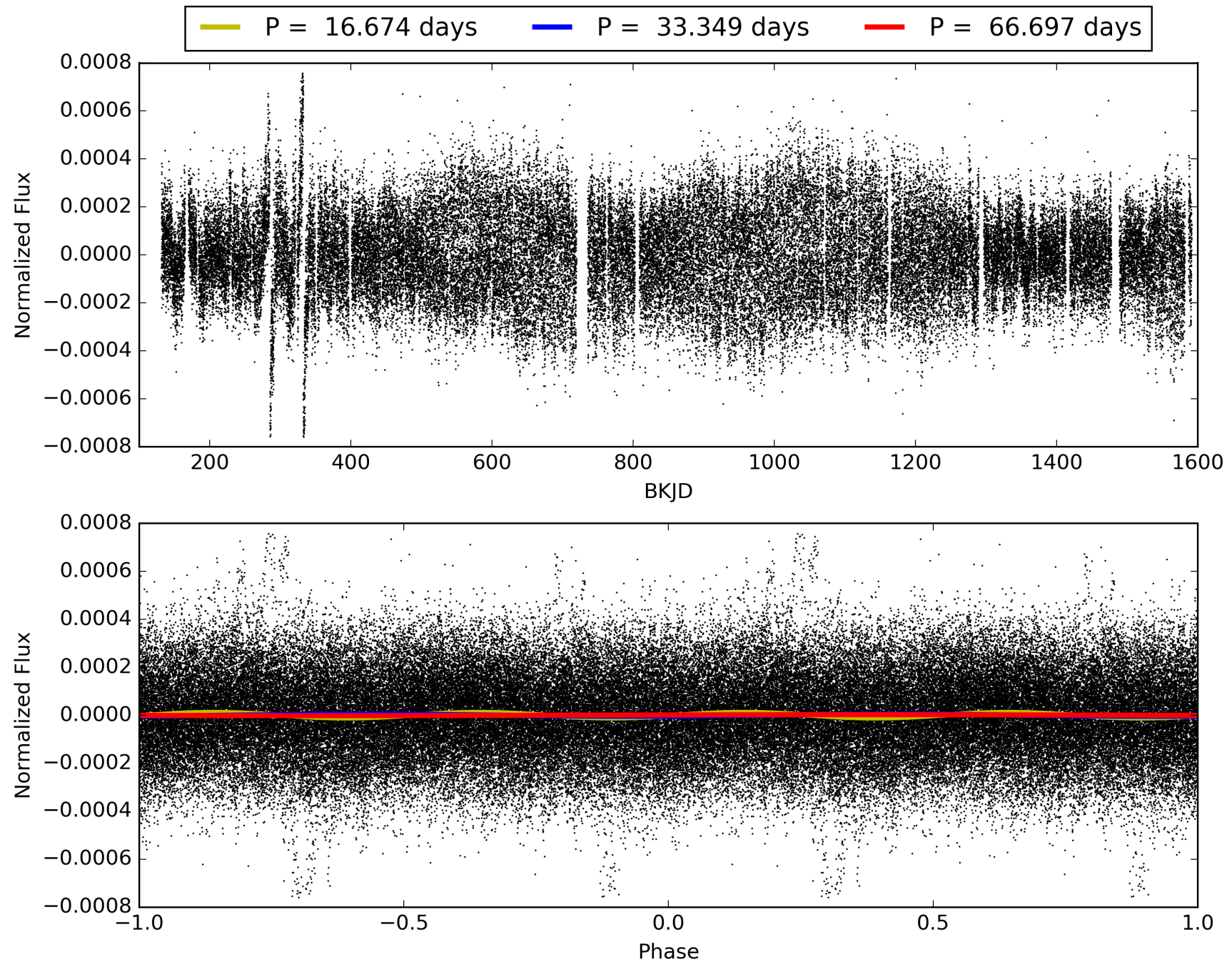
DV Diagnostic Results:

ShortPeriod-sig: 100.0% [31.44σ]  
 LongPeriod-sig: N/A  
 ModelChiSquare2-sig: 17.4%  
 ModelChiSquareGof-sig: 100.0%  
 Bootstrap-pfa: 6.35e-13  
 RollingBand-fgt: 1.00 [8/8]  
 GhostDiagnostic-chr: 1.911  
 Centroid-sig: 72.3%  
 Centroid-so: 0.321 arcsec [0.80σ]  
 OotOffset-rm: 1.185 arcsec [0.60σ]  
 KicOffset-rm: 1.121 arcsec [0.65σ]  
 OotOffset-st: 2/2/3/4 [11]  
 KicOffset-st: 2/2/3/4 [11]  
 DiffImageQuality-fgm: 0.18 [2/11]  
 DiffImageOverlap-fno: 0.00 [0/17]

# TCE 004139351-03, PDC Light Curves

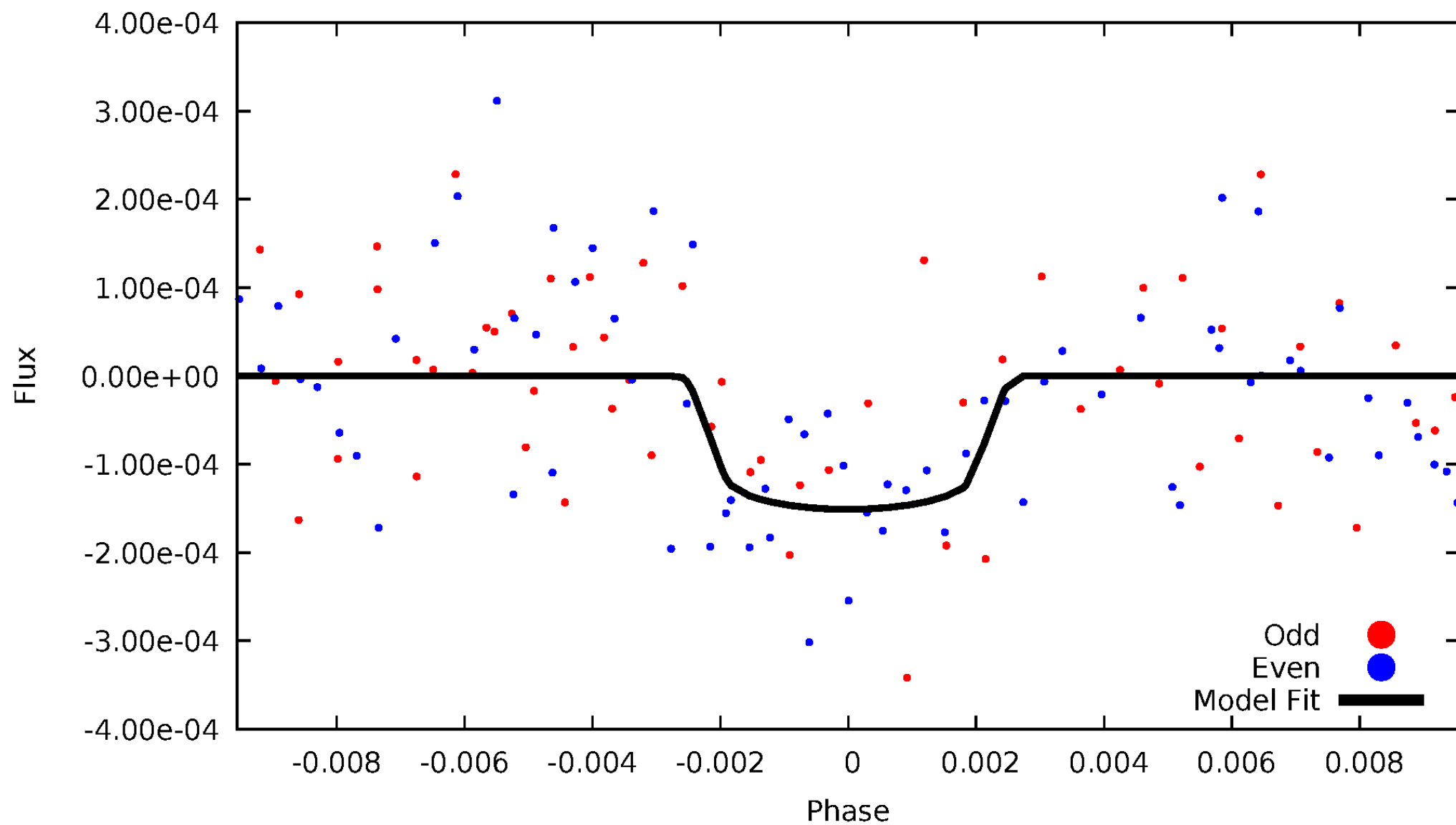


TCE 004139351-03



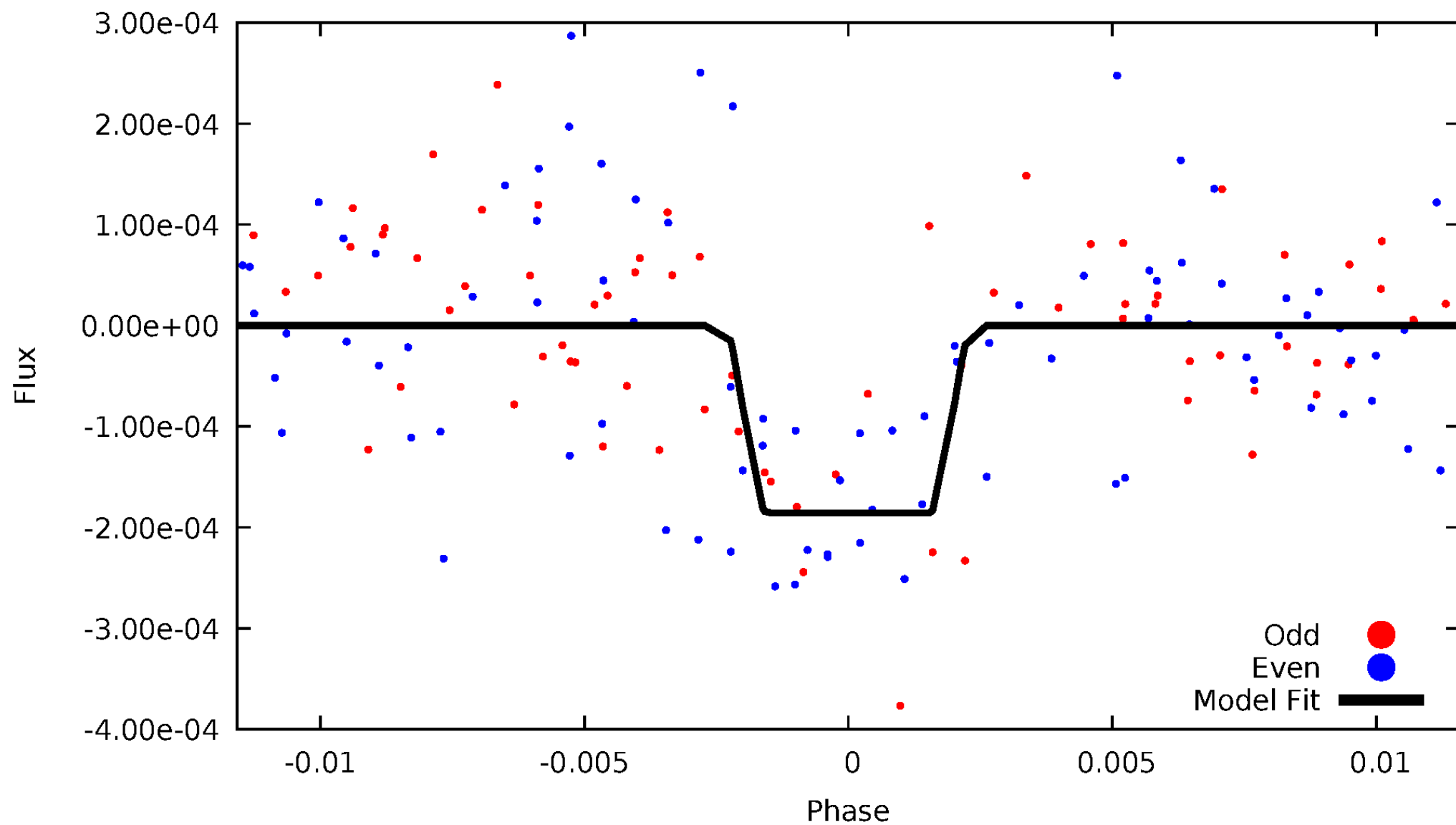
# DV Odd/Even

TCE 004139351-03



# ALT Odd/Even

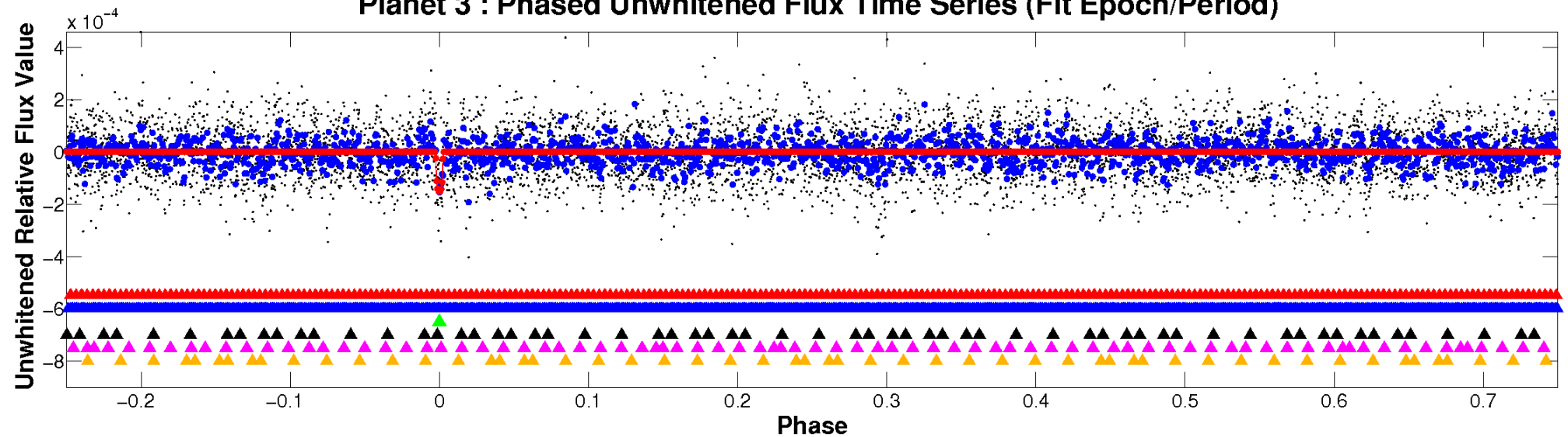
TCE 004139351-03



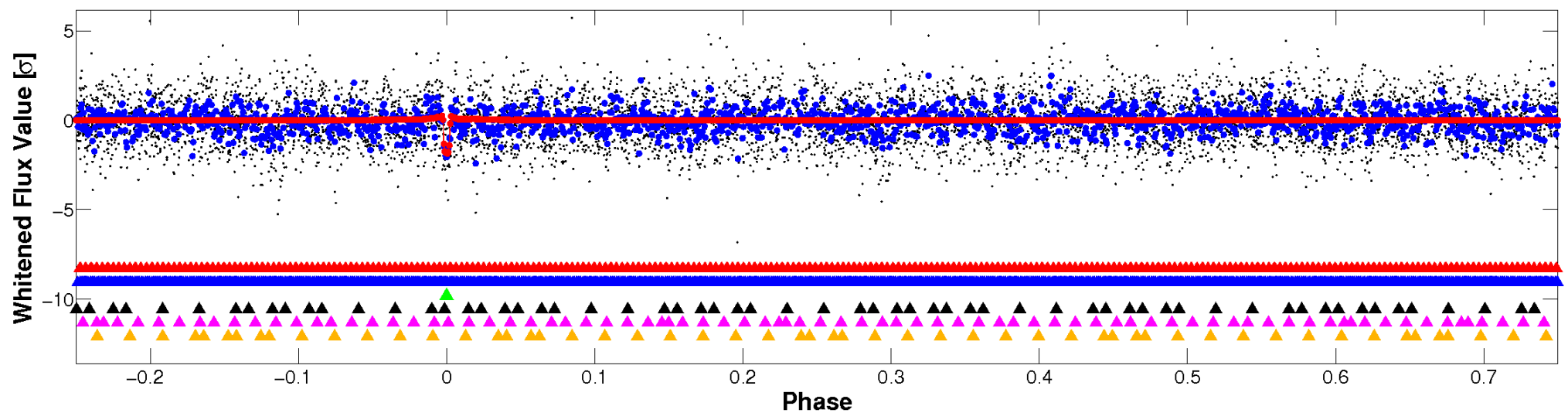


# Non-Whitened Vs. Whitened Light Curve

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

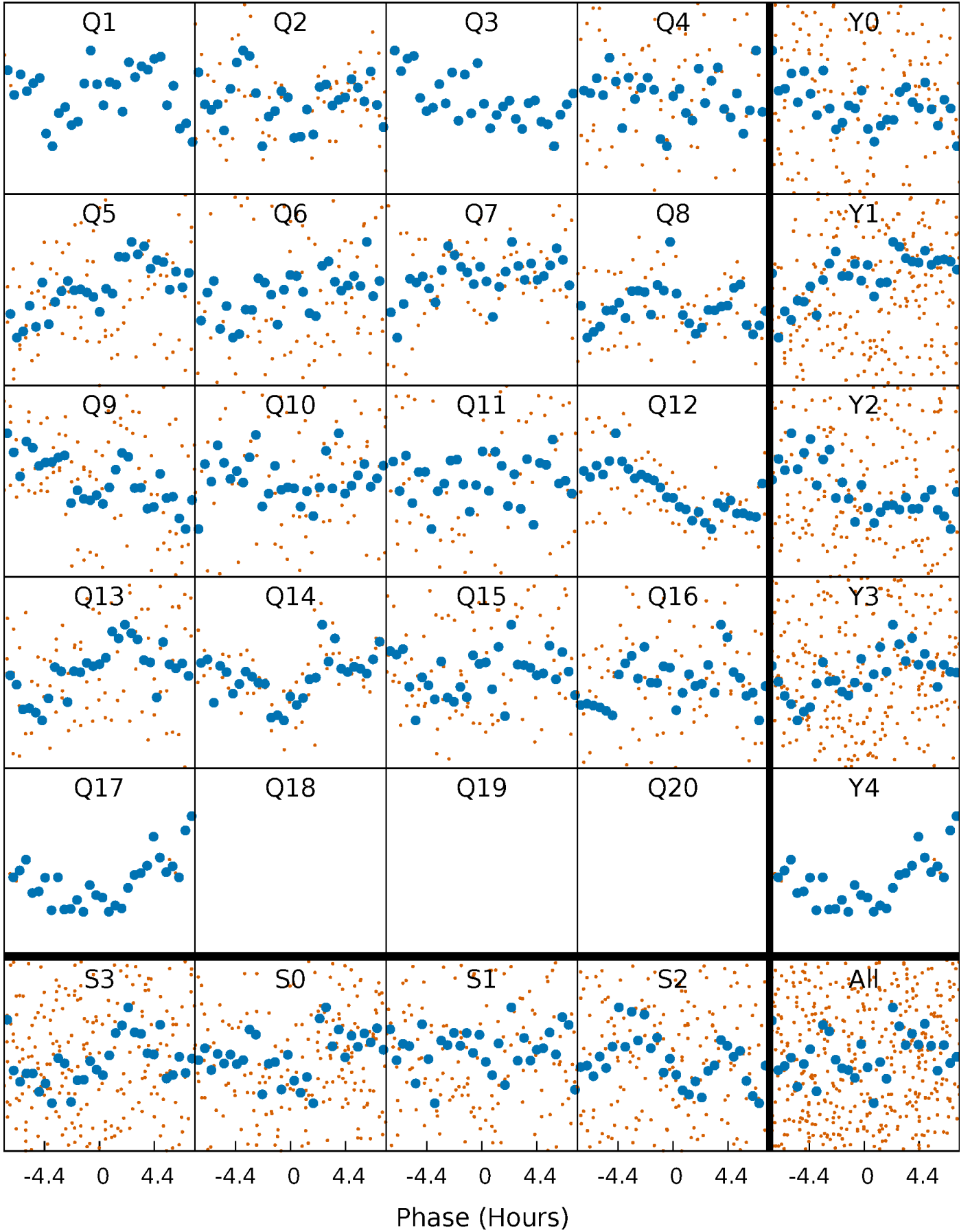


## Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



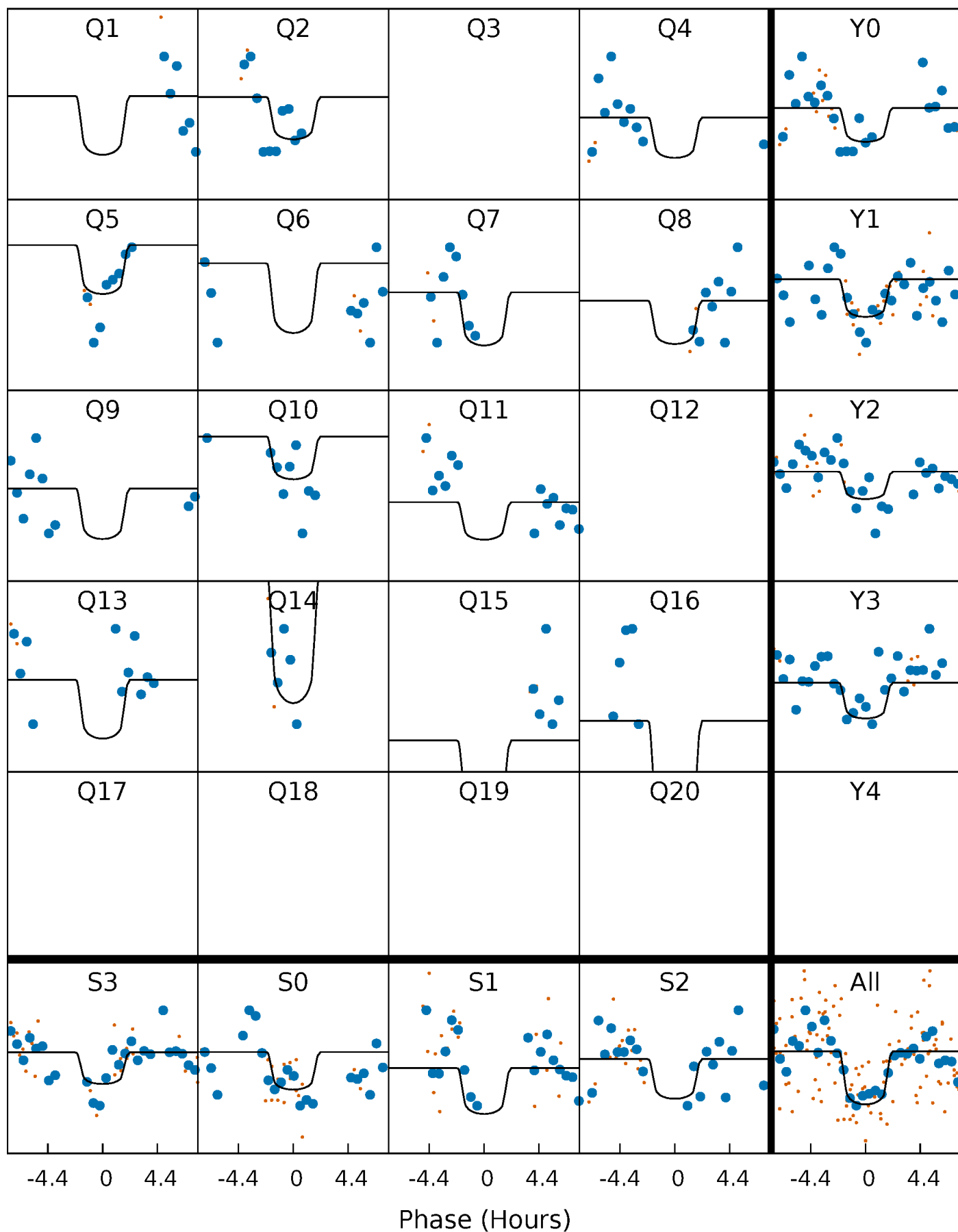
# PDC Quarter-Phased Transit Curves

TCE 004139351-03 P= 33.348582 Days  $T_0=156.166187$  (BKJD)



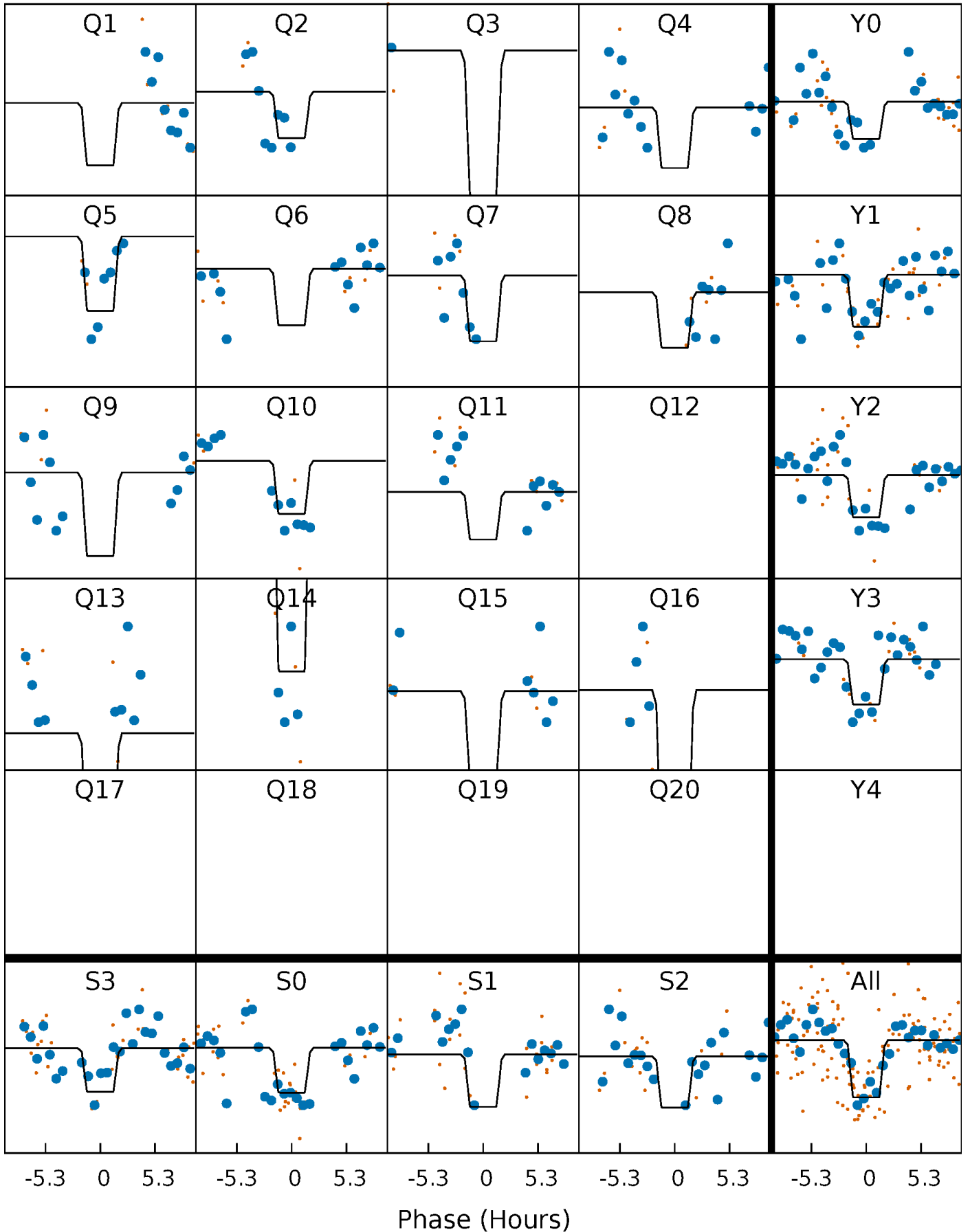
# DV Quarter-Phased Transit Curves

TCE 004139351-03 P= 33.348582 Days  $T_0=156.166187$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

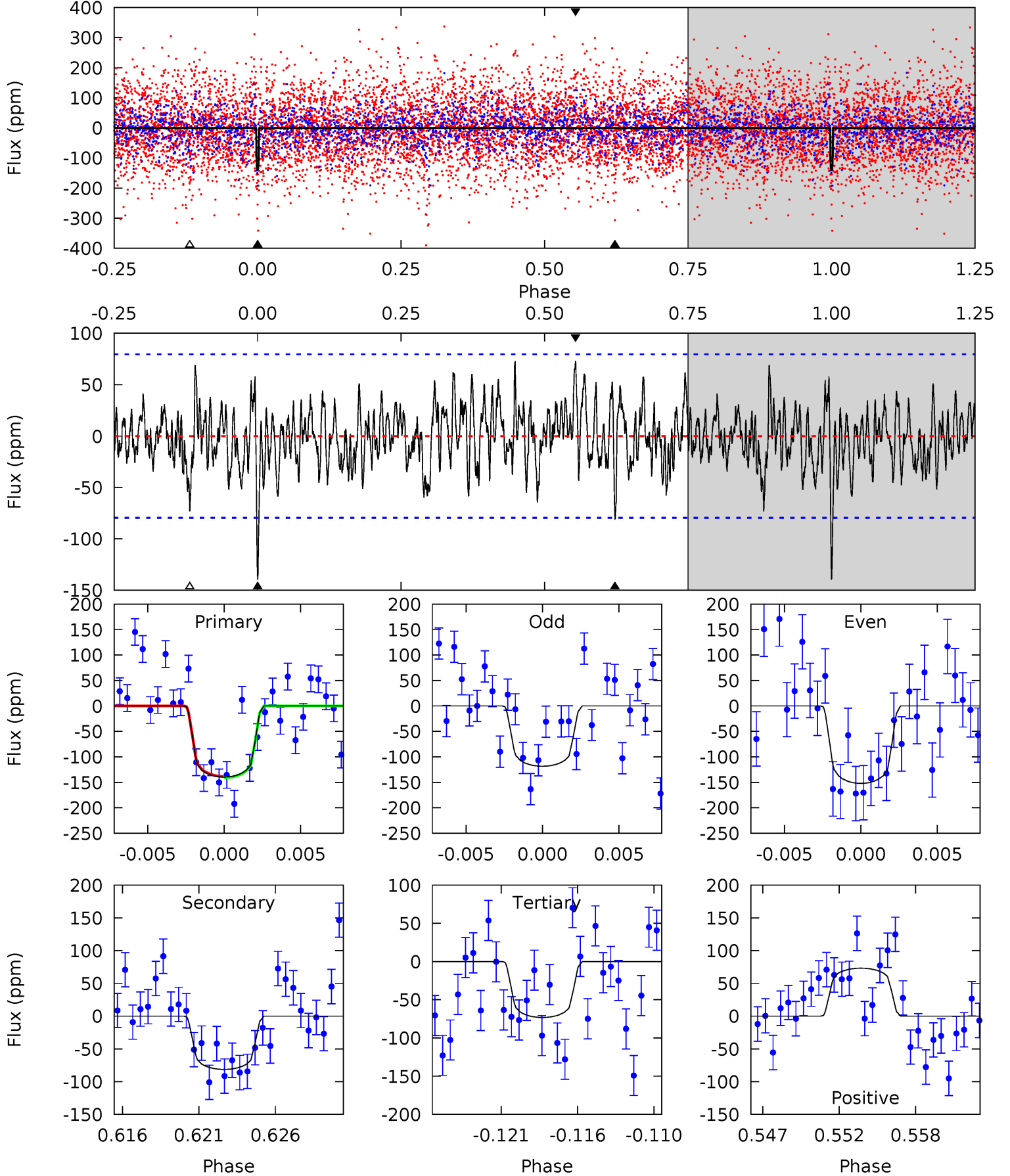
TCE 004139351-03 P= 33.347397 Days  $T_0=156.191267$  (BKJD)



# DV Model-Shift Uniqueness Test

004139351-03, P = 33.348582 Days, E = 122.817605 Days

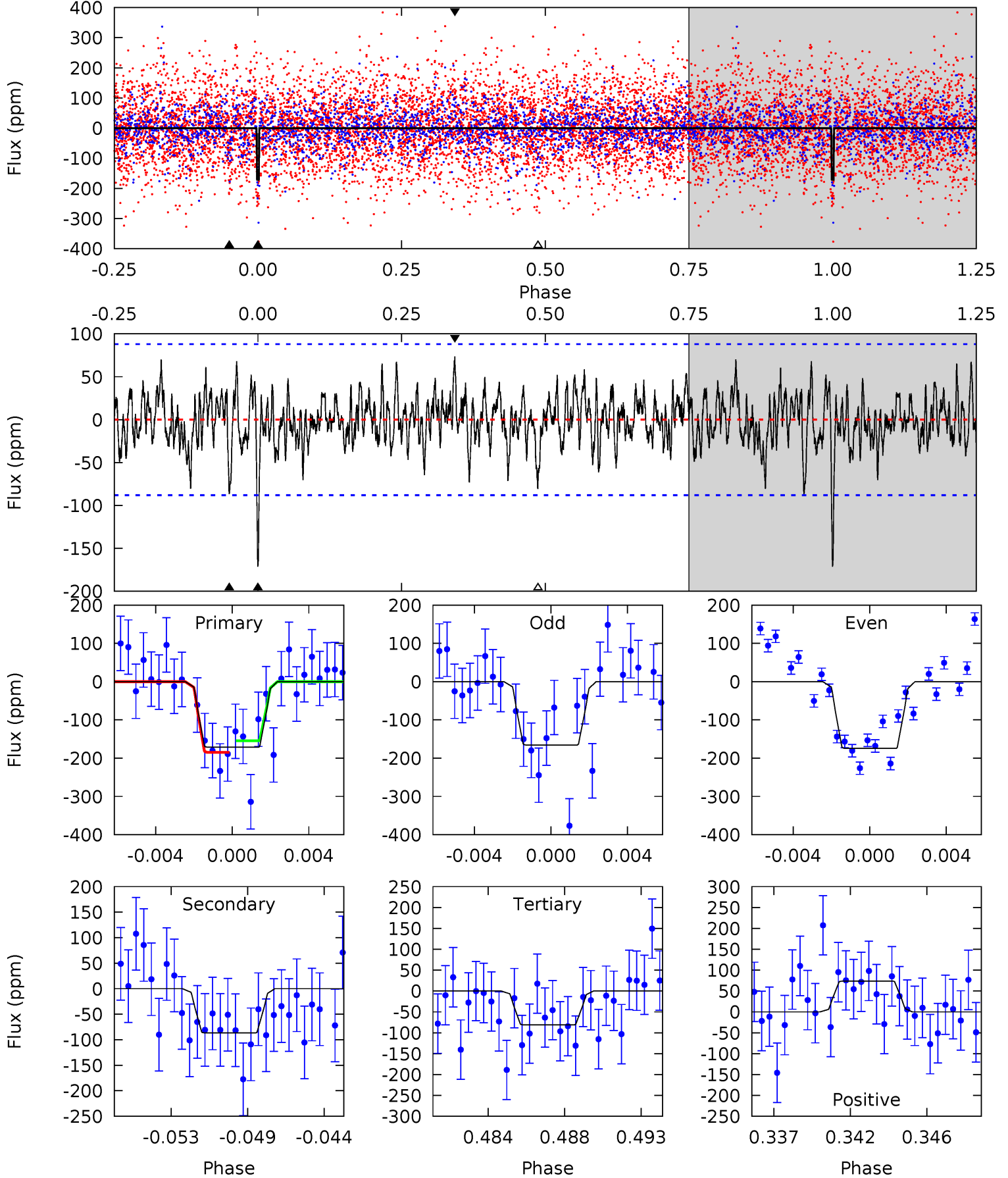
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
9.03	5.26	4.74	4.73	5.15	2.79	1.60	4.30	4.30	0.53	0.53	1.08	0.89	0.34	0.08



# Alt Model-Shift Uniqueness Test

004139351-03,  $P = 33.347397$  Days,  $E = 122.843870$  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
10.1	5.09	4.76	4.33	5.18	2.85	1.41	5.32	5.75	0.34	0.76	0.25	0.85	0.30	0.88





### Stellar Parameters For KIC 004139351

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$7027^{+183}_{-224}$	$3.799^{+0.292}_{-0.097}$	$-0.400^{+0.300}_{-0.250}$	$2.577^{+0.406}_{-0.879}$	$1.524^{+0.205}_{-0.308}$	$0.126^{+0.248}_{-0.038}$
	+3%/-3%	+8%/-3%	+75%/-62%	+16%/-34%	+13%/-20%	+197%/-30%
Source	PHO1	FLK73	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 004139351-03 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-81 \pm 15$	$3.46^{+1.88}_{-1.59}$	$1409^{+86}_{-120}$	$5745^{+1985}_{-913}$	$201^{+443}_{-116}$
Alt.	$-87 \pm 17$	$3.61^{+1.79}_{-1.55}$	$1416^{+81}_{-123}$	$5740^{+1895}_{-846}$	$204^{+376}_{-118}$

$T_{max}$  = 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

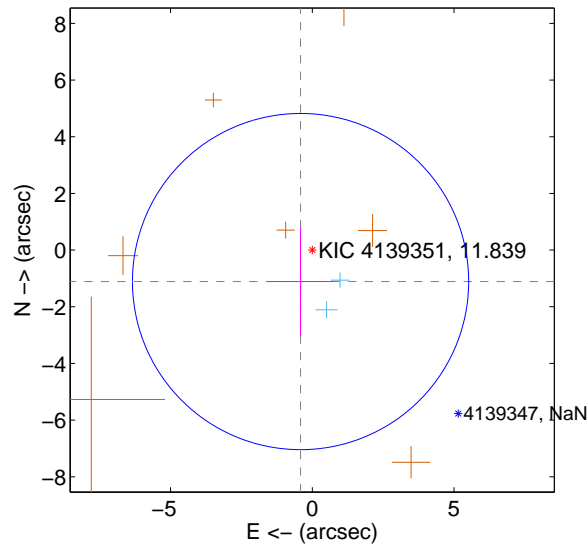
Supplemental centroid analysis for 004139351-03. **Kepler magnitude: 11.84.** Transit SNR 9.35

**There are 2 quarters with good PRF difference image offsets**

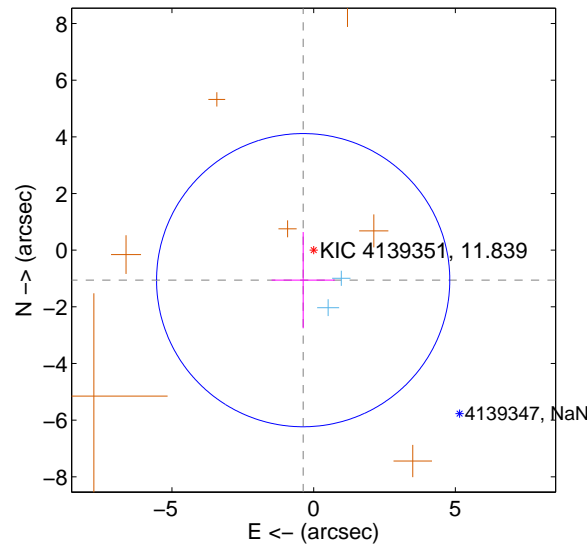
The direct PRF centroid is offset from the target star catalog position by about 0.07 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.185 \pm 1.977$	0.60	$0.413 \pm 1.156$	$-1.110 \pm 1.926$
PRF-fit source offset from KIC position	$1.121 \pm 1.725$	0.65	$0.370 \pm 1.116$	$-1.059 \pm 1.698$
photometric centroid source offset	$0.32 \pm 0.40$	0.80	$-0.32 \pm 0.40$	$0.03 \pm 0.42$

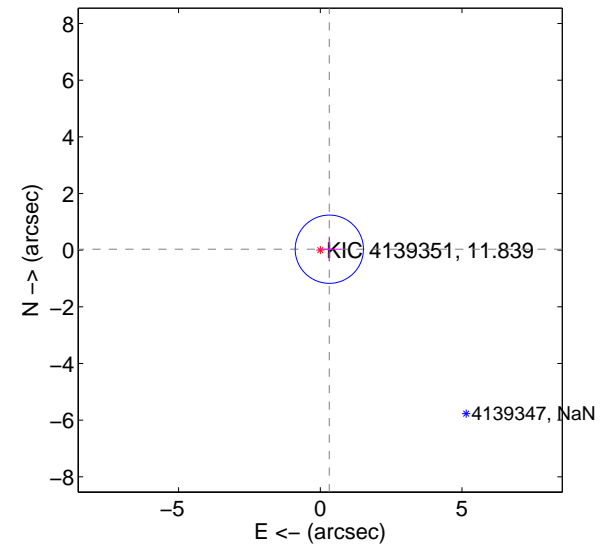
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

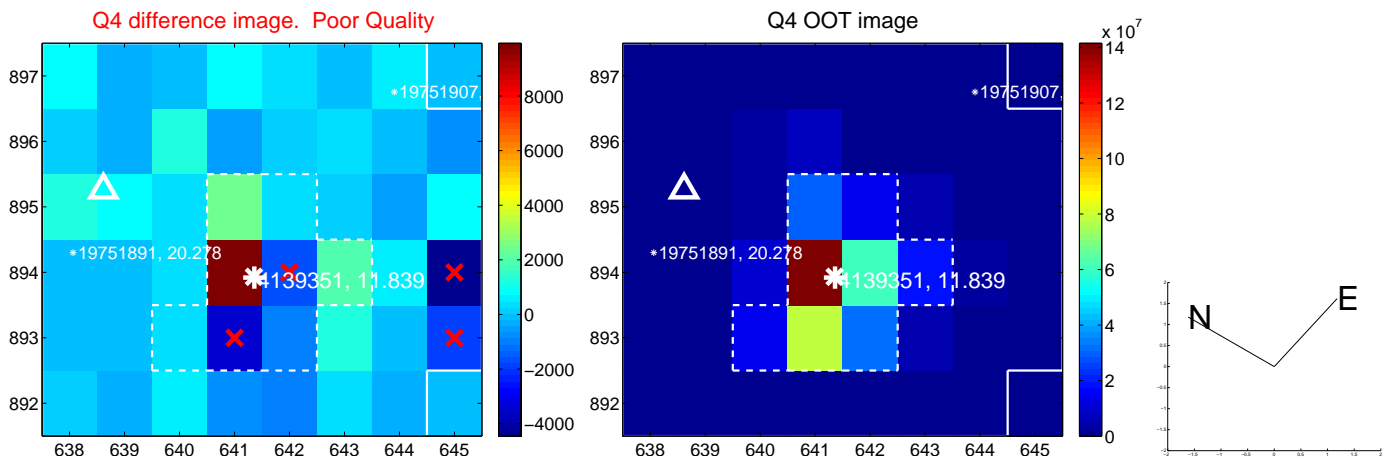
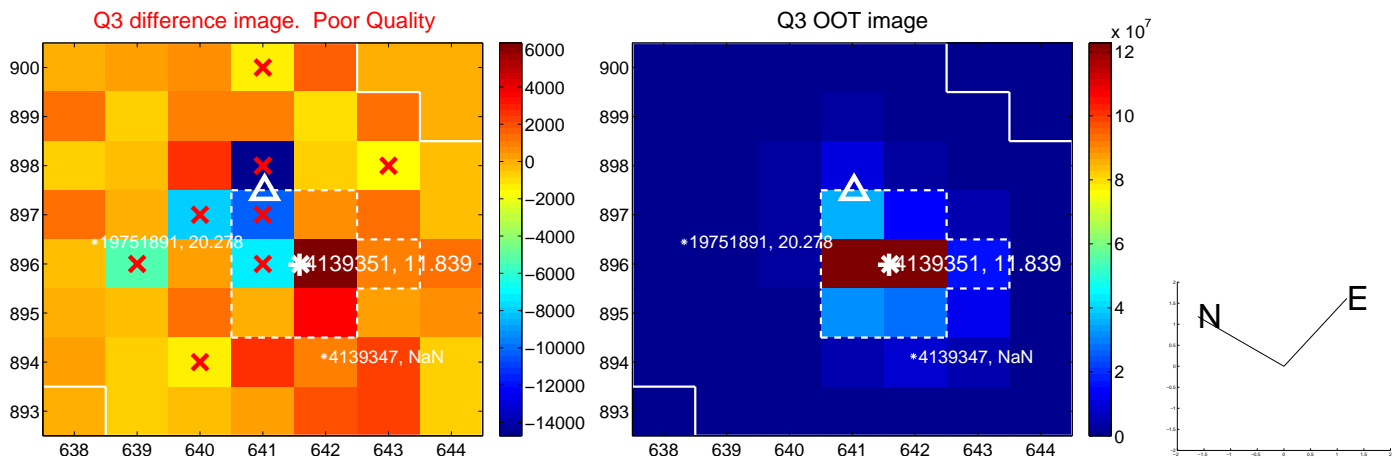
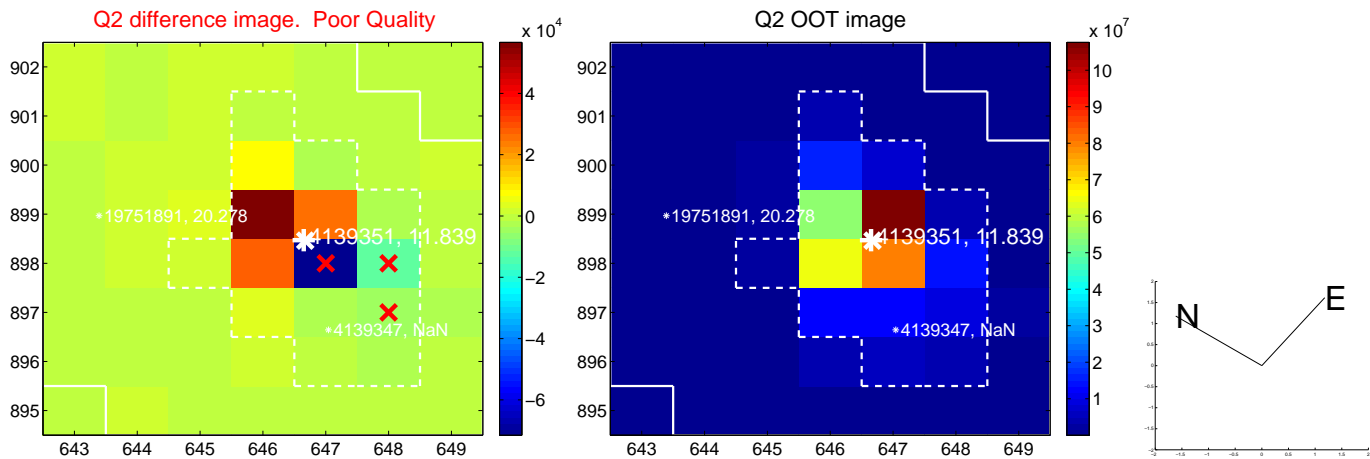
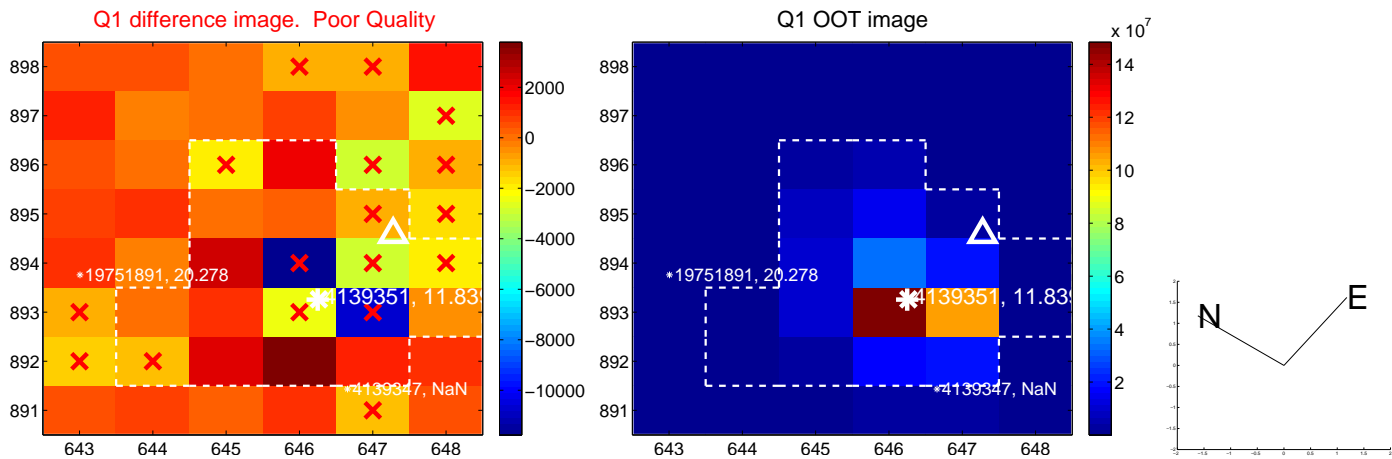


offset from photometric centroids

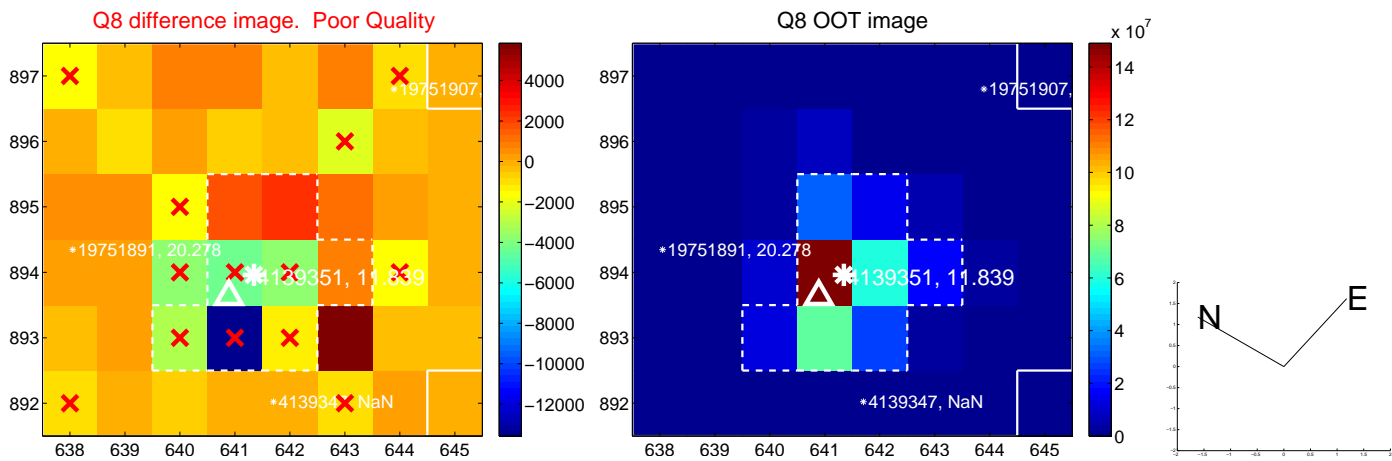
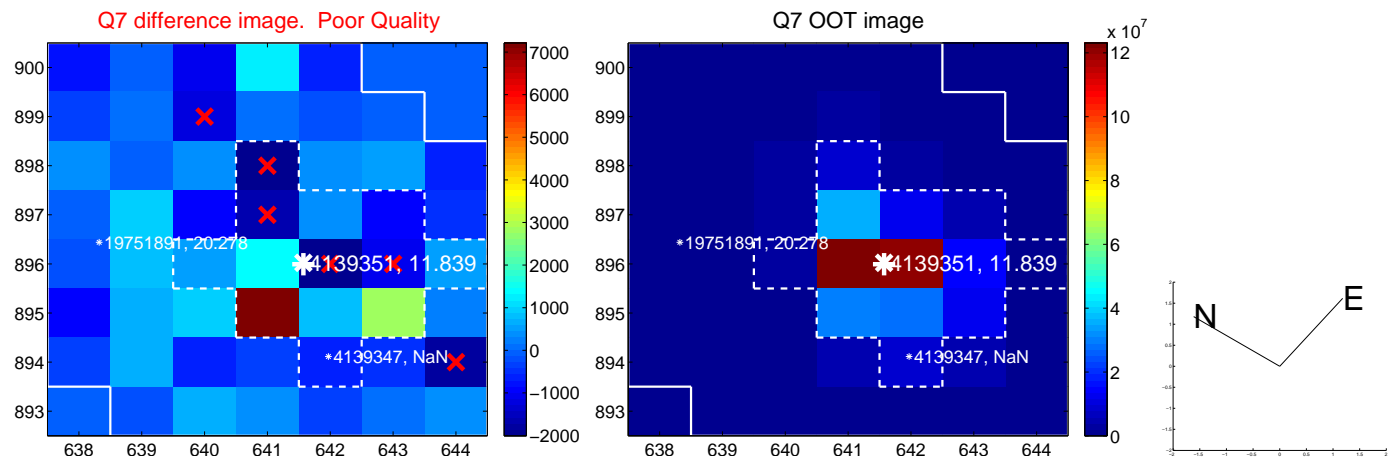
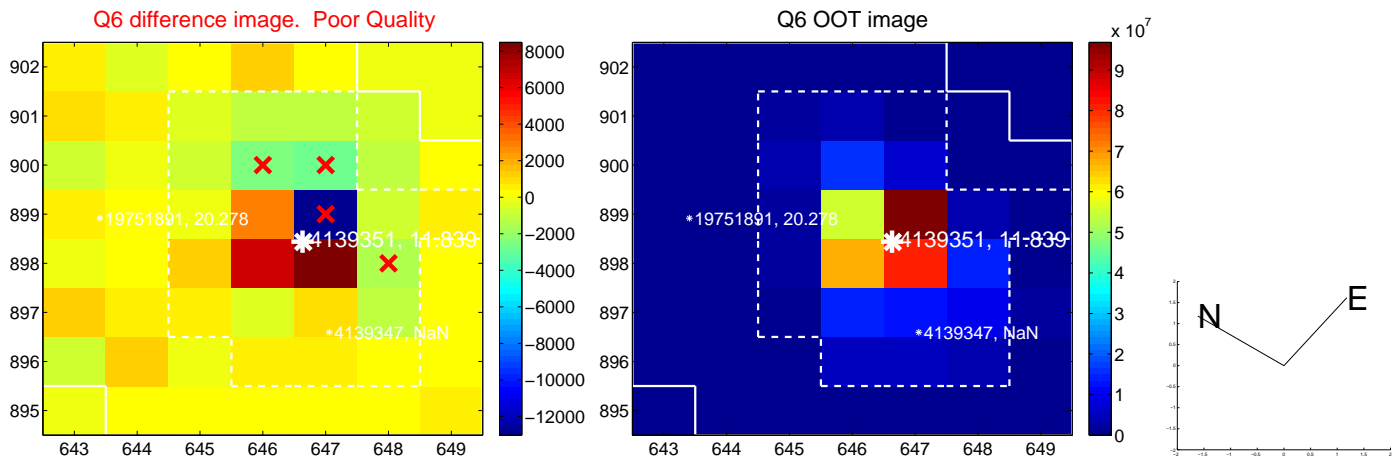
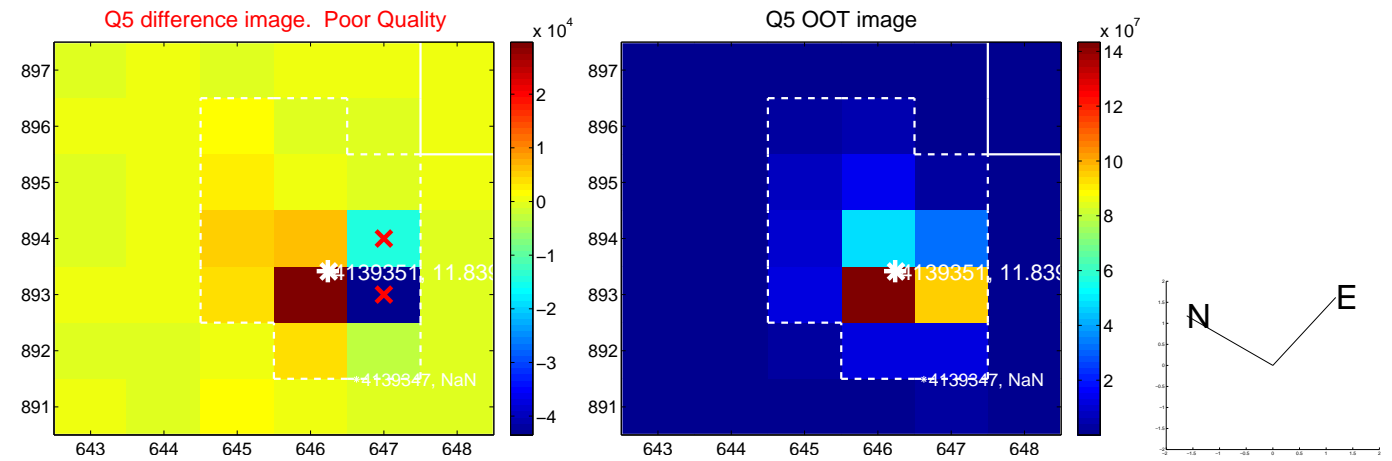


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

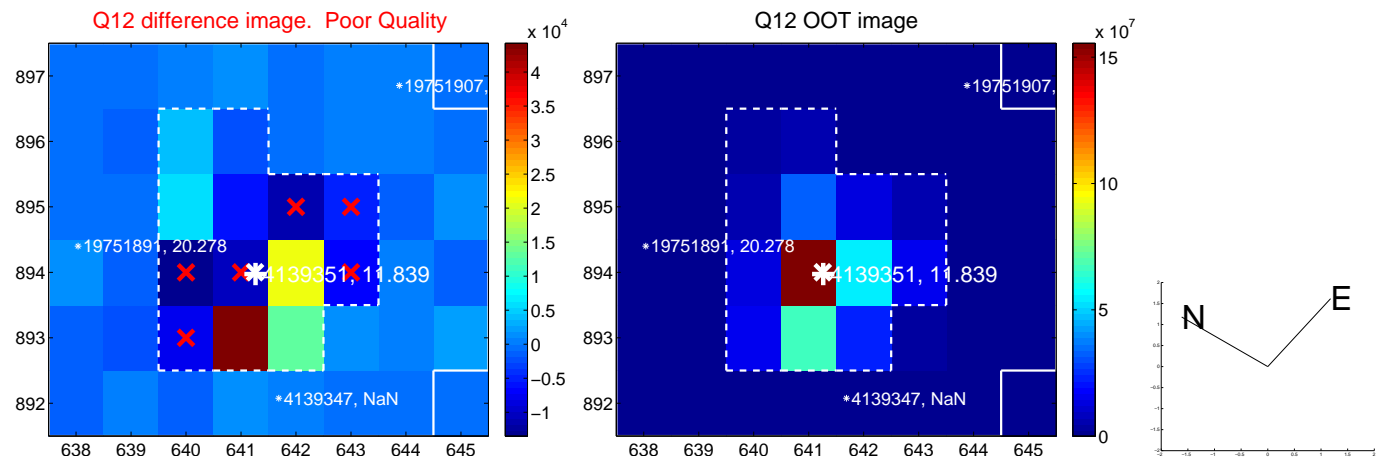
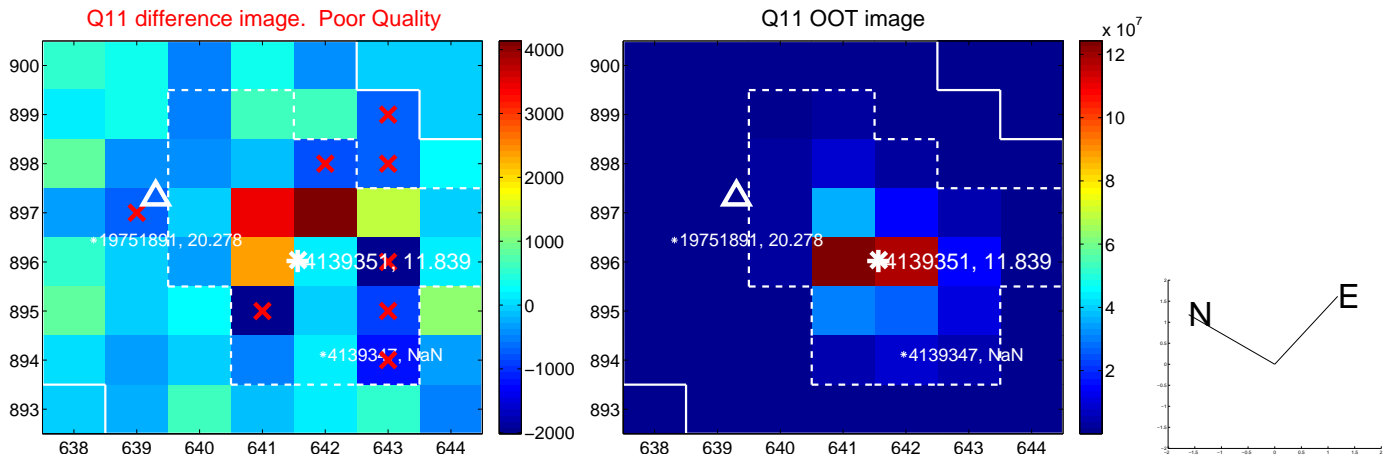
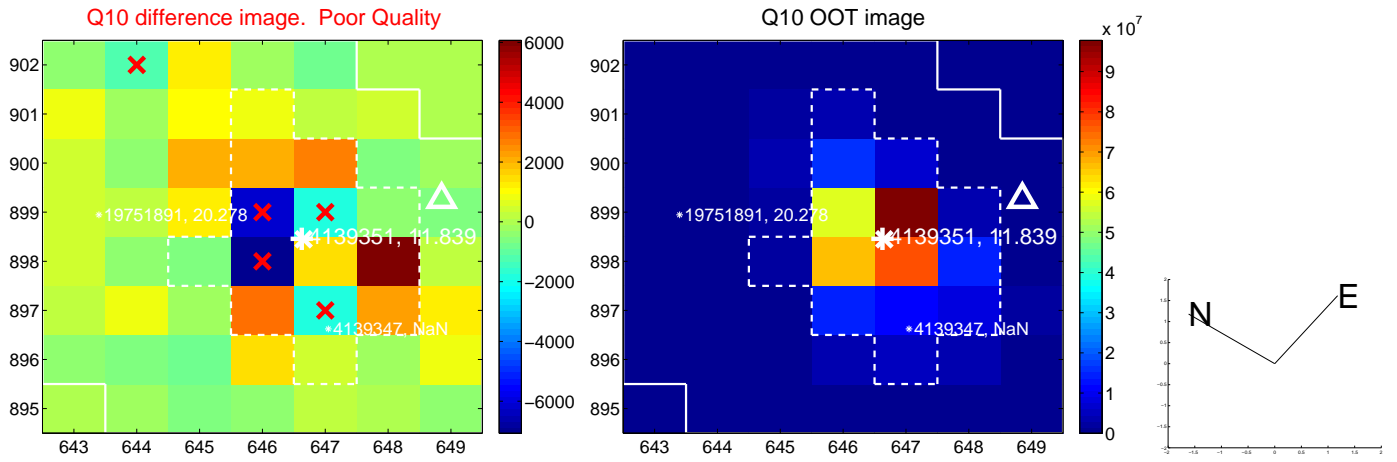
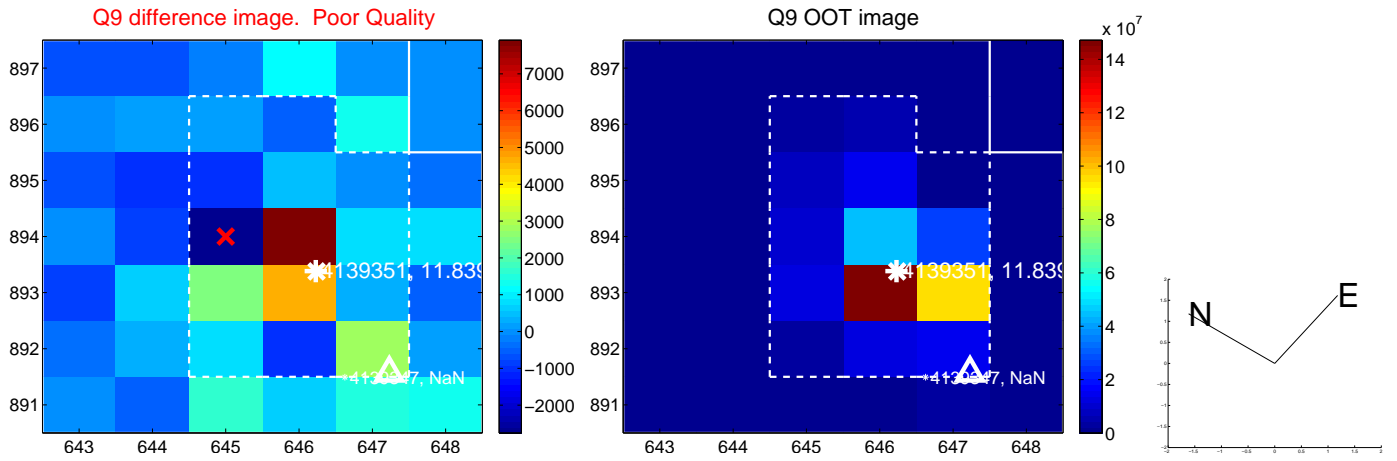
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

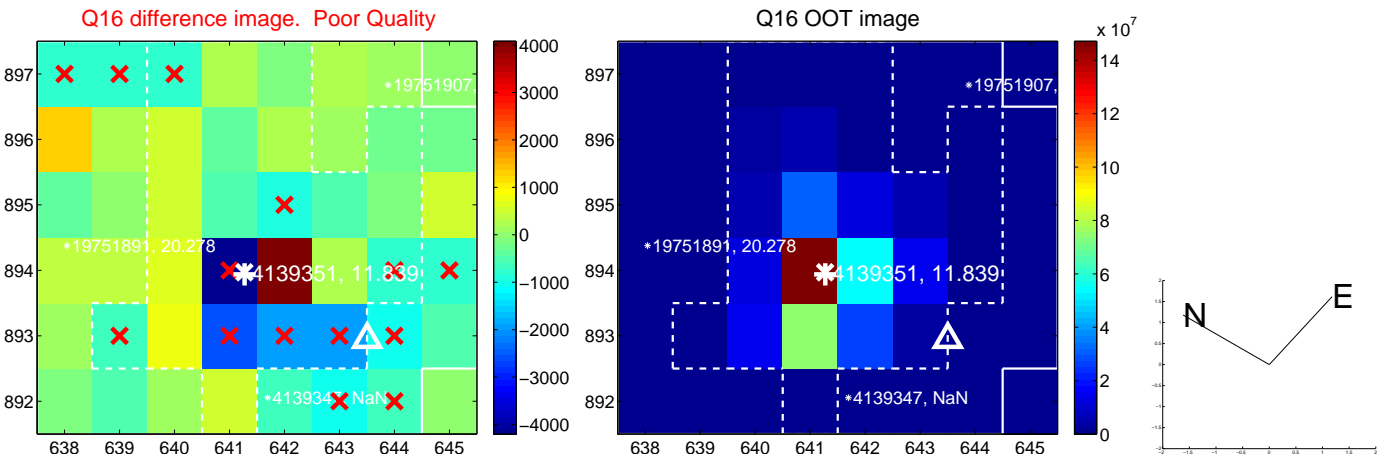
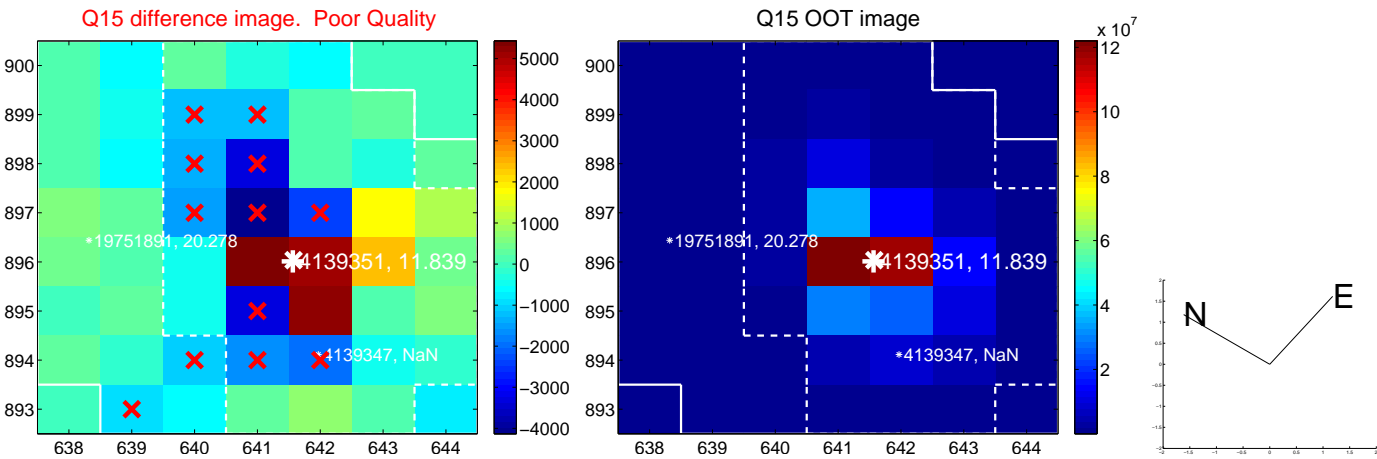
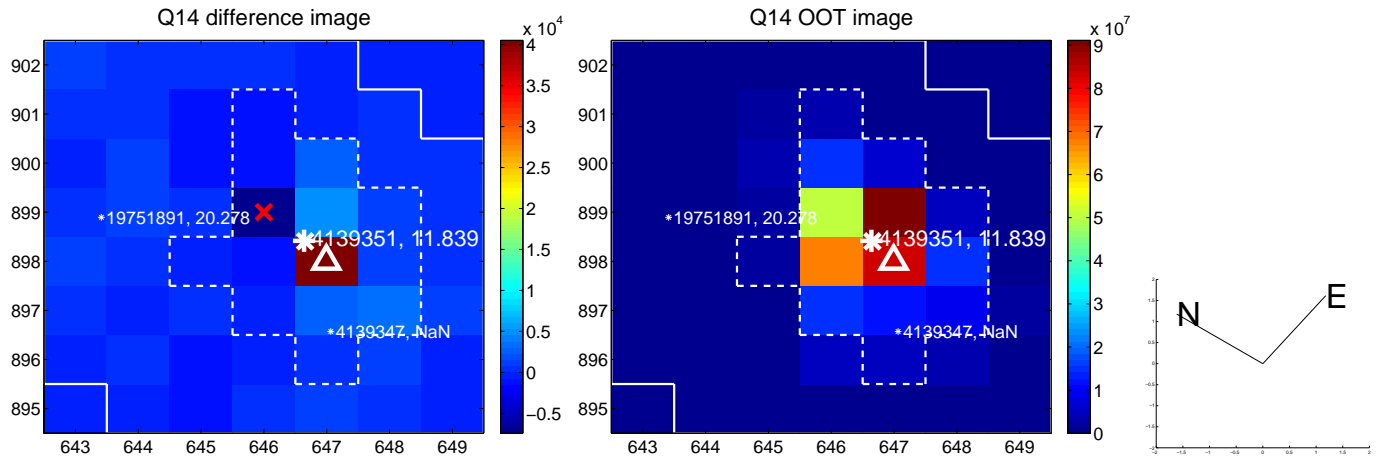
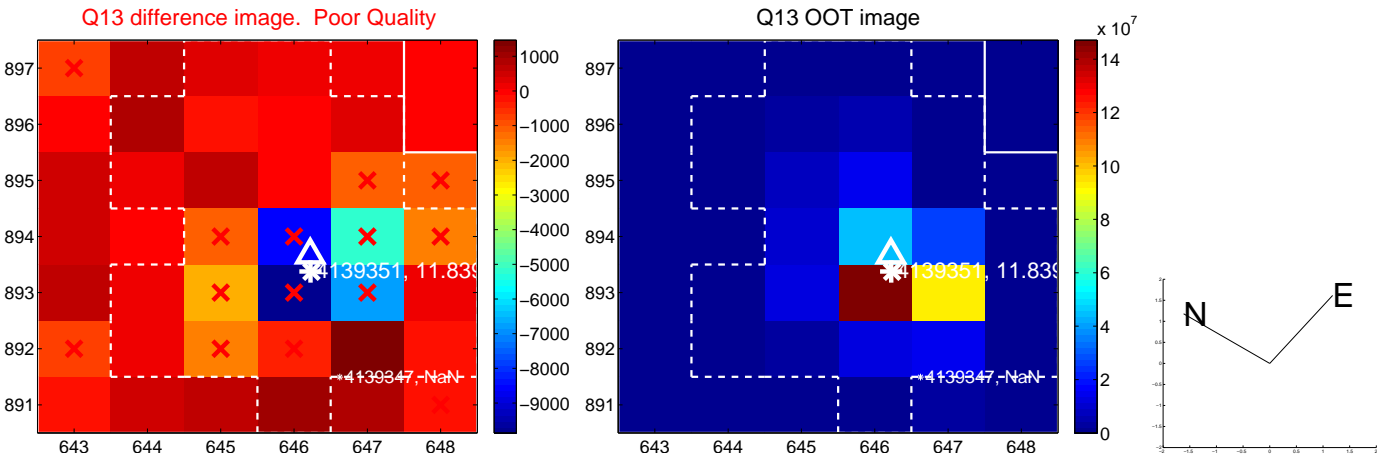


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

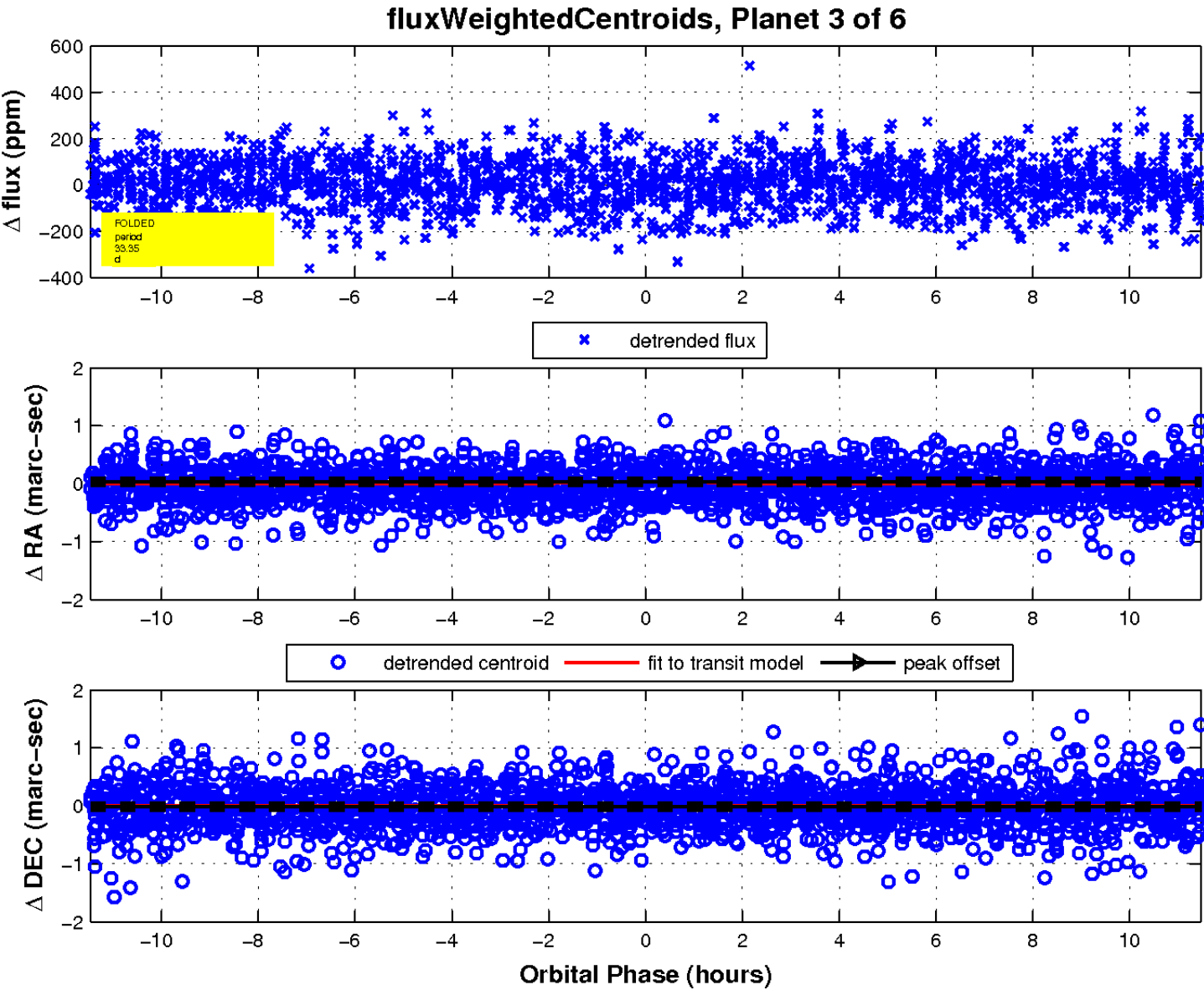
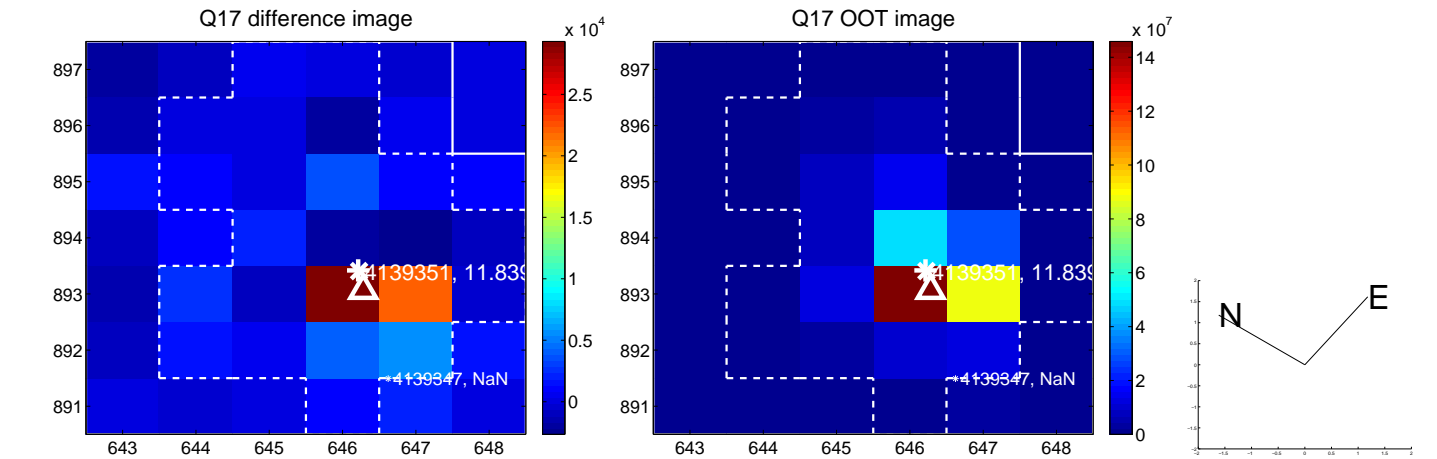




white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

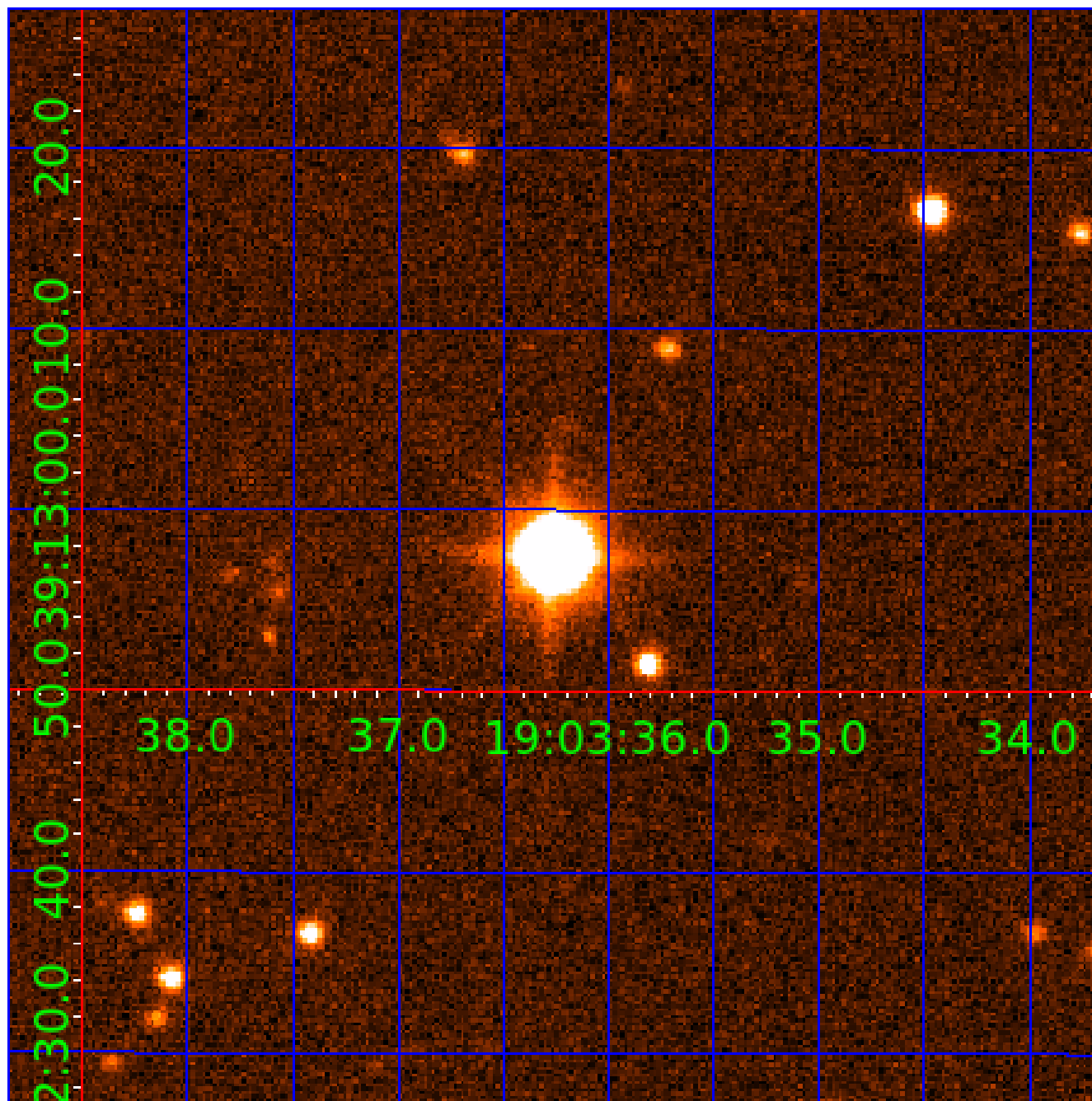


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



# UKIRT Image

Declination



# KIC 004139351

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004139351-01	OBS	No	1.617618	131.758437	24.6	5.067	11.9	11.7	2.58	7027	1.76	15050.44
004139351-02	OBS	No	1.617457	132.792667	7.7	7.220	10.2	5.2	2.58	7027	0.75	15052.44
004139351-03	OBS	No	33.348582	156.166187	151.0	3.824	9.3	9.3	2.58	7027	3.70	266.24
004139351-04	OBS	No	23.702619	144.250944	140.8	1.388	8.2	8.0	2.58	7027	3.10	419.75
004139351-05	OBS	No	17.992676	143.020549	94.1	3.360	8.5	7.8	2.58	7027	2.87	606.16
004139351-06	OBS	No	26.531520	151.986211	145.8	3.530	7.9	7.6	2.58	7027	3.63	361.16

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004139351-01	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
004139351-02	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD
004139351-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
004139351-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
004139351-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_ZUMA—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_FEW_MEAS
004139351-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT—CENT_FEW_DIFFS

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

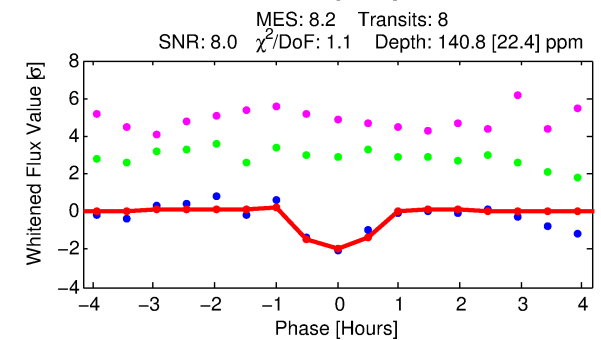
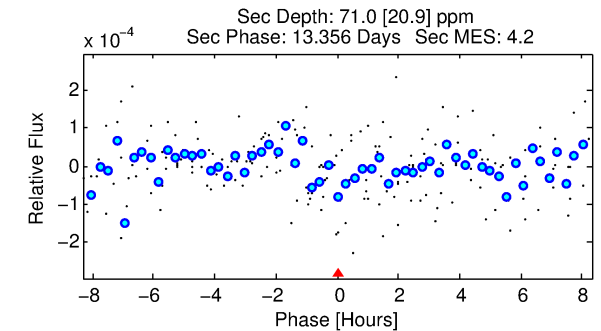
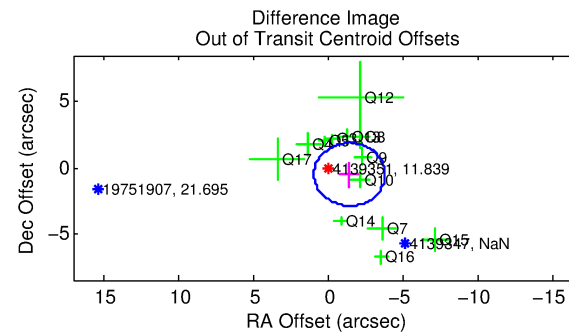
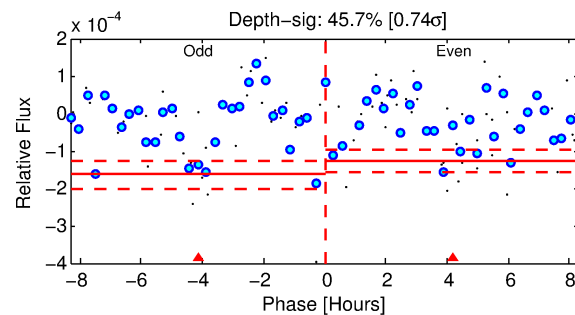
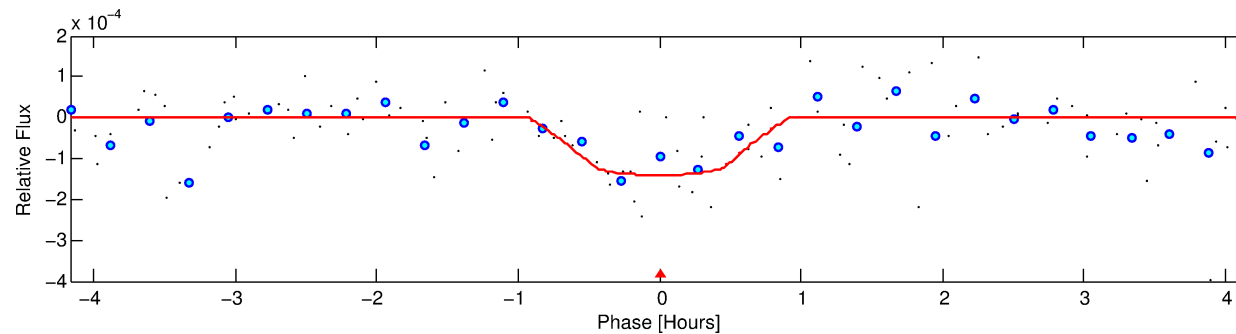
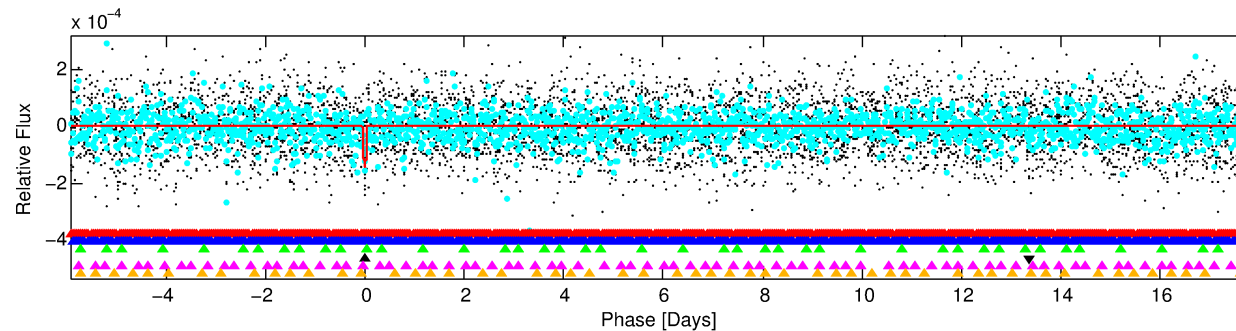
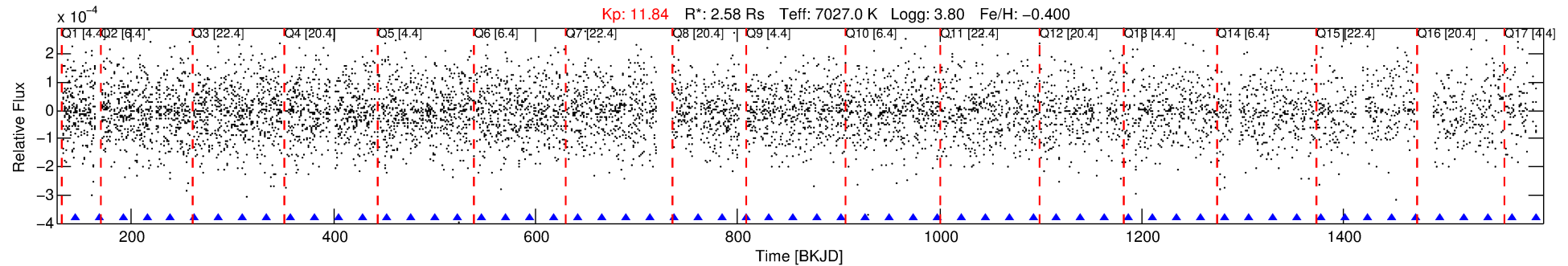
N = Not Transit-Like. S = Stellar Eclipse. C = Centroid Offset. E = Ephemeris Match.

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

## Ephemeris Match Information For 004139351-04

No Significant Match Found

KIC: 4139351    Candidate: 4 of 6    Period: 23.703 d



DV Fit Results:

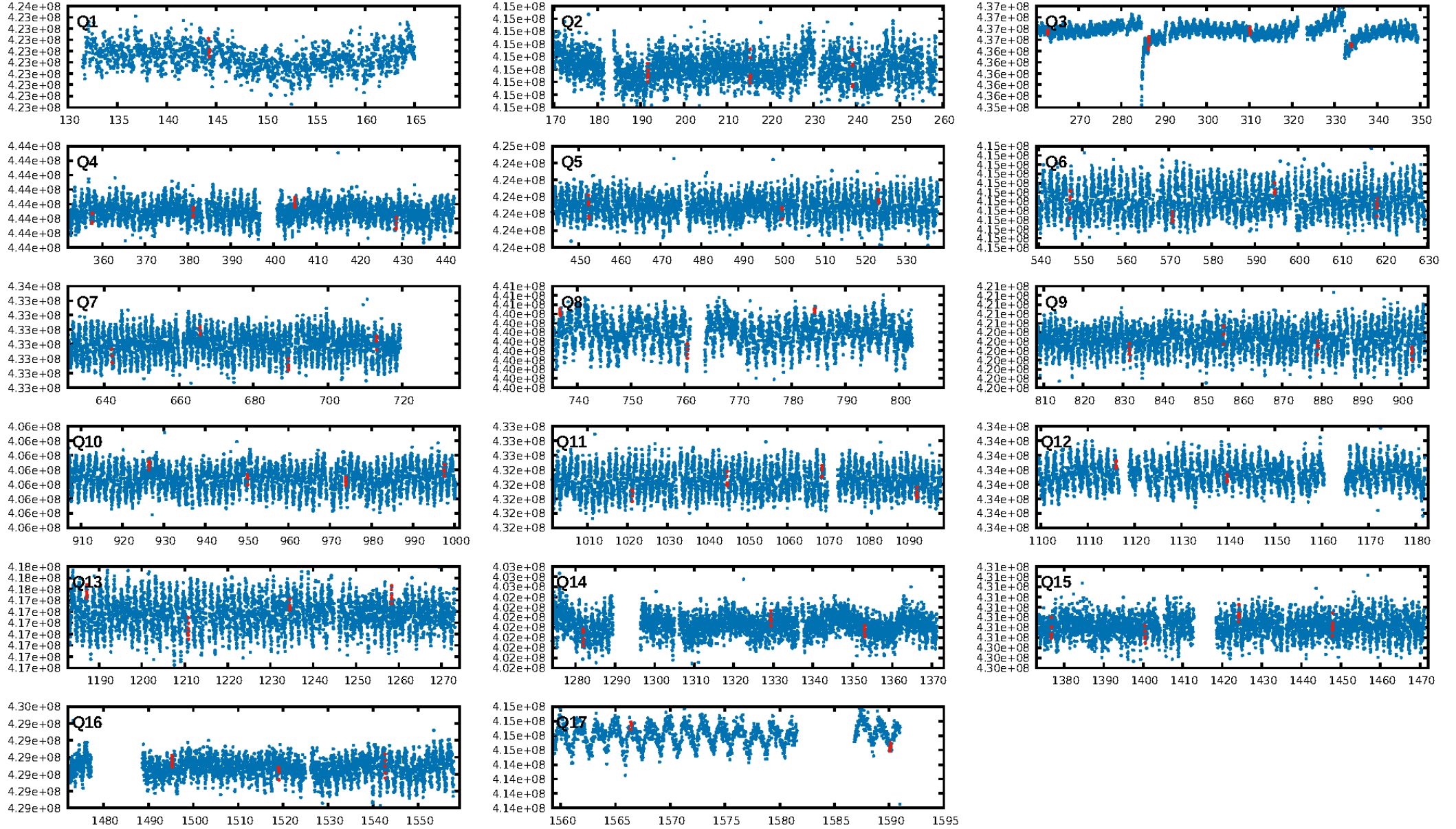
Period = 23.70262 [0.00017] d  
 Epoch = 144.2509 [0.0053] BKJD  
 Rp/R\* = 0.0110 [0.0184]  
 a/R\* = 131.67 [1214.59]  
 b = 0.06 [147.18]  
 Seff = 419.75 [217.66]  
 Teq = 1154 [150] K  
 Rp = 3.10 [5.27] Re  
 a = 0.1859 [0.0594] AU  
 Ag = 140.68 [475.98] [0.29σ]  
 Teffp = 6146 [5144] K [0.97σ]

DV Diagnostic Results:

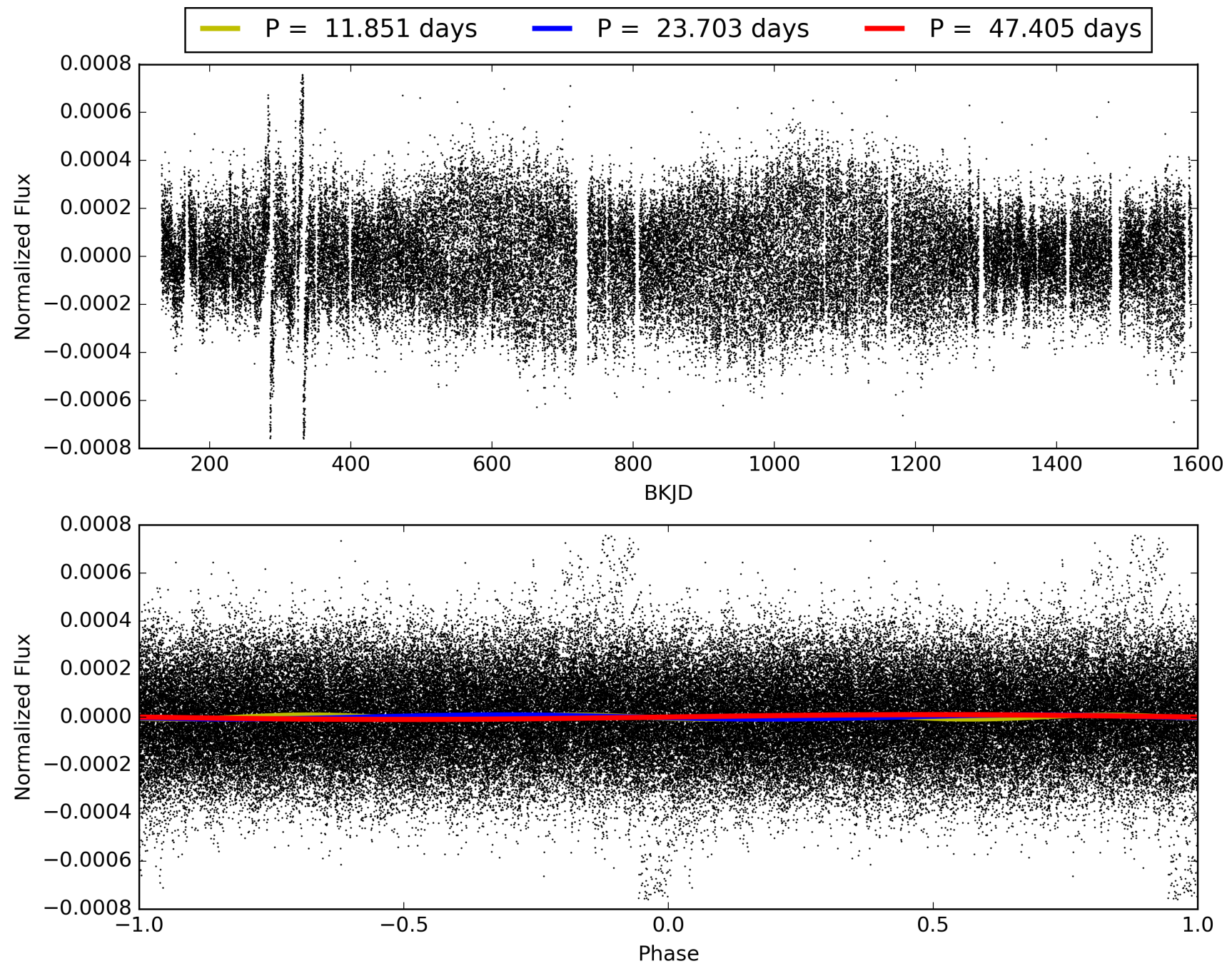
ShortPeriod-sig: 100.0% [37.70σ]  
LongPeriod-sig: 100.0% [17.90σ]  
ModelChiSquare2-sig: 49.3%  
ModelChiSquareGof-sig: 93.5%  
**Bootstrap-pfa: 1.85e-09**  
RollingBand-fgt: 1.00 [8/8]  
GhostDiagnostic-chr: -1.145  
  
Centroid-sig: 0.5%  
Centroid-so: 1.316 arcsec [2.45σ]  
OotOffset-rm: 1.546 arcsec [1.95σ]  
KicOffset-rm: 1.564 arcsec [1.82σ]  
OotOffset-st: 2/3/4/4 [13]  
KicOffset-st: 2/3/4/4 [13]  
DiffImageQuality-fgm: 0.31 [4/13]  
DiffImageOverlap-fno: 0.53 [9/17]



# TCE 004139351-04, PDC Light Curves

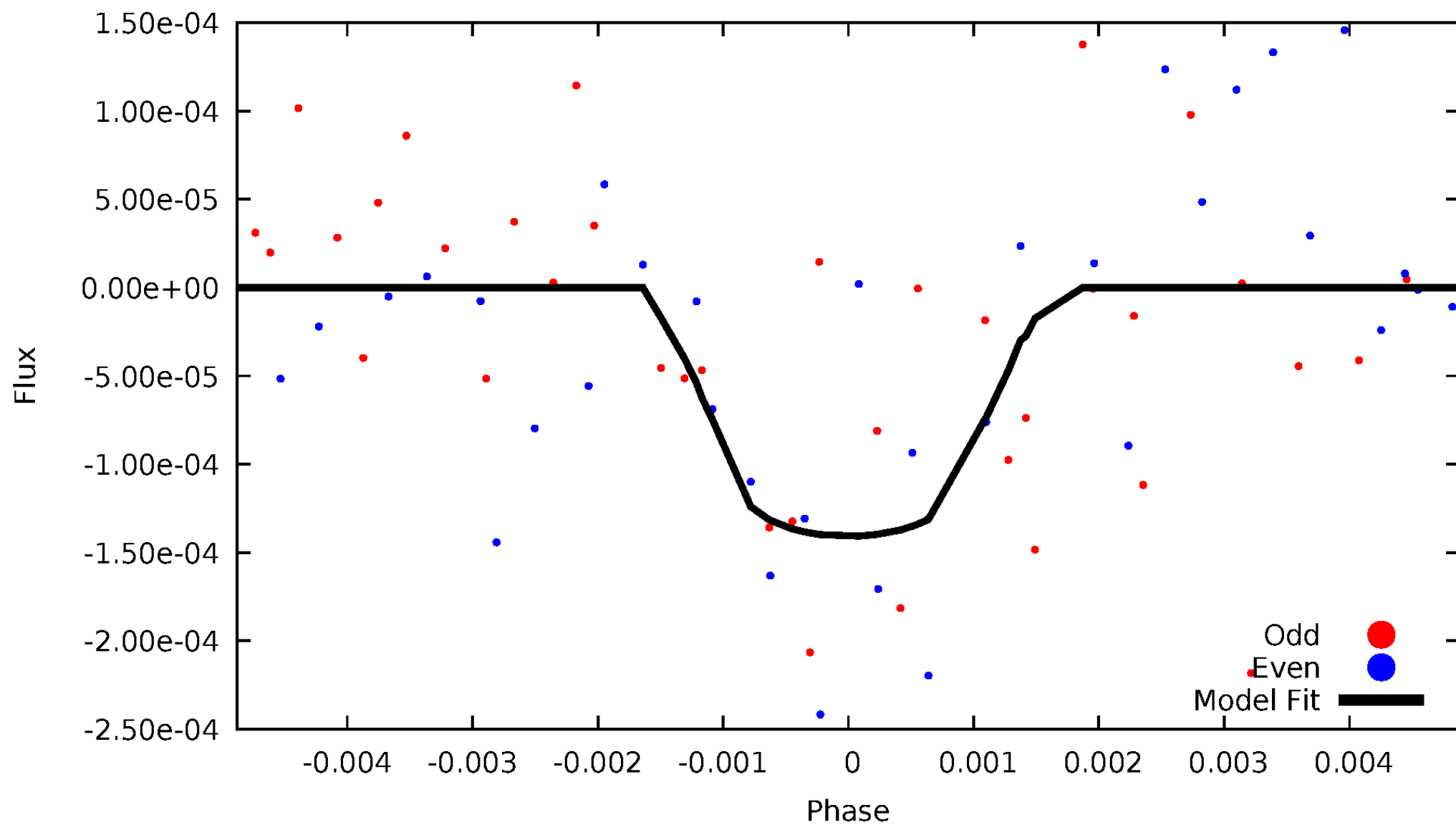


TCE 004139351-04



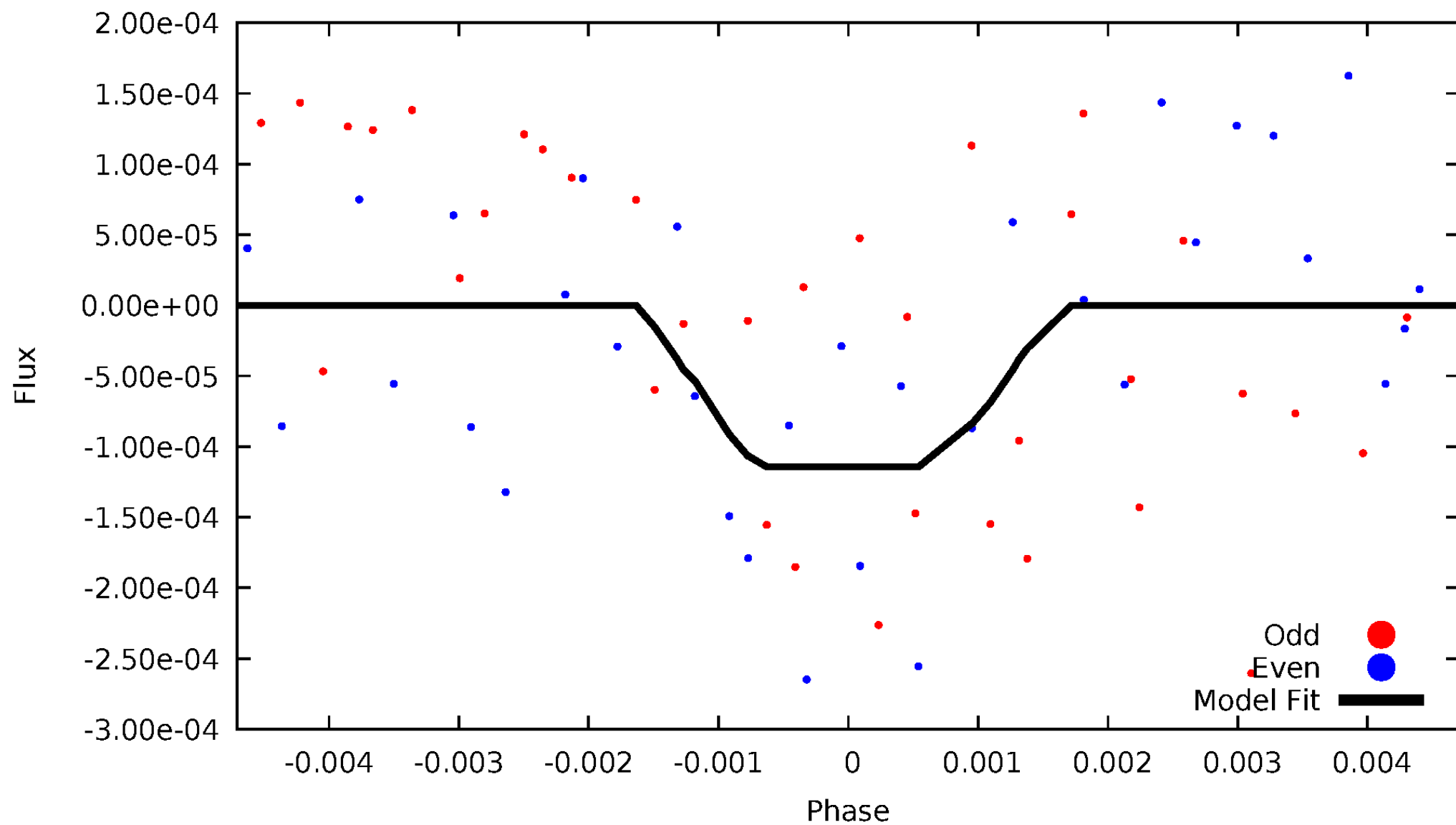
# DV Odd/Even

TCE 004139351-04



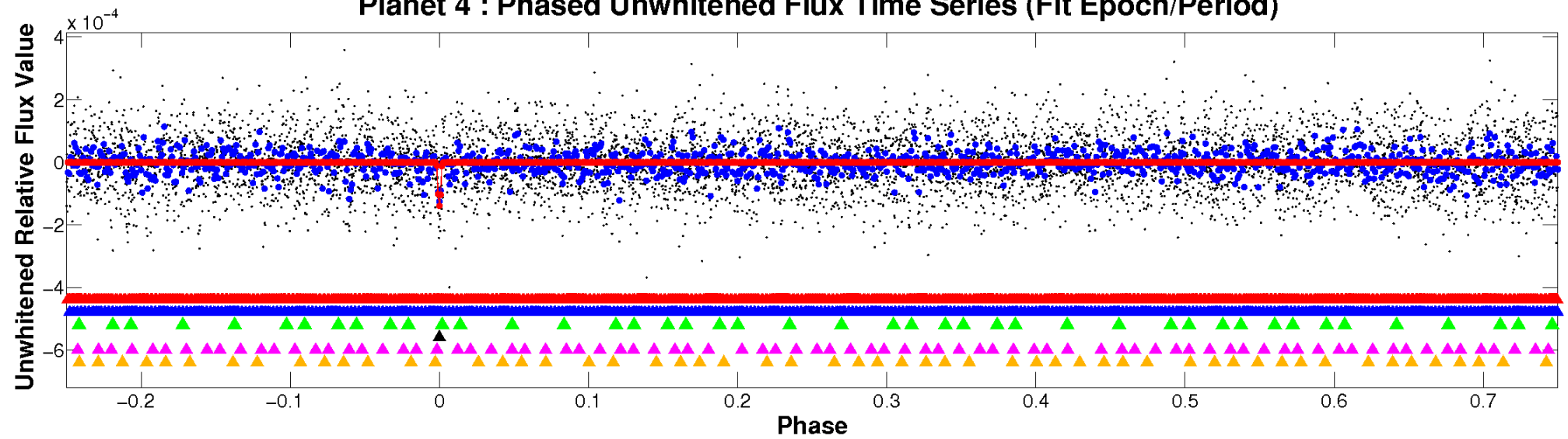
# ALT Odd/Even

TCE 004139351-04

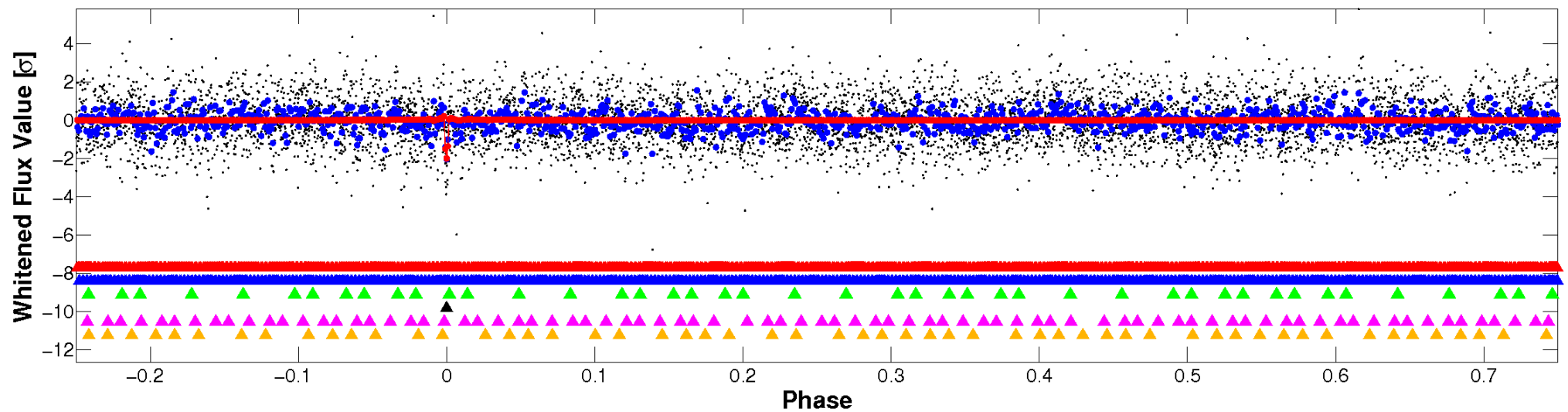


# Non-Whitened Vs. Whitened Light Curve

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



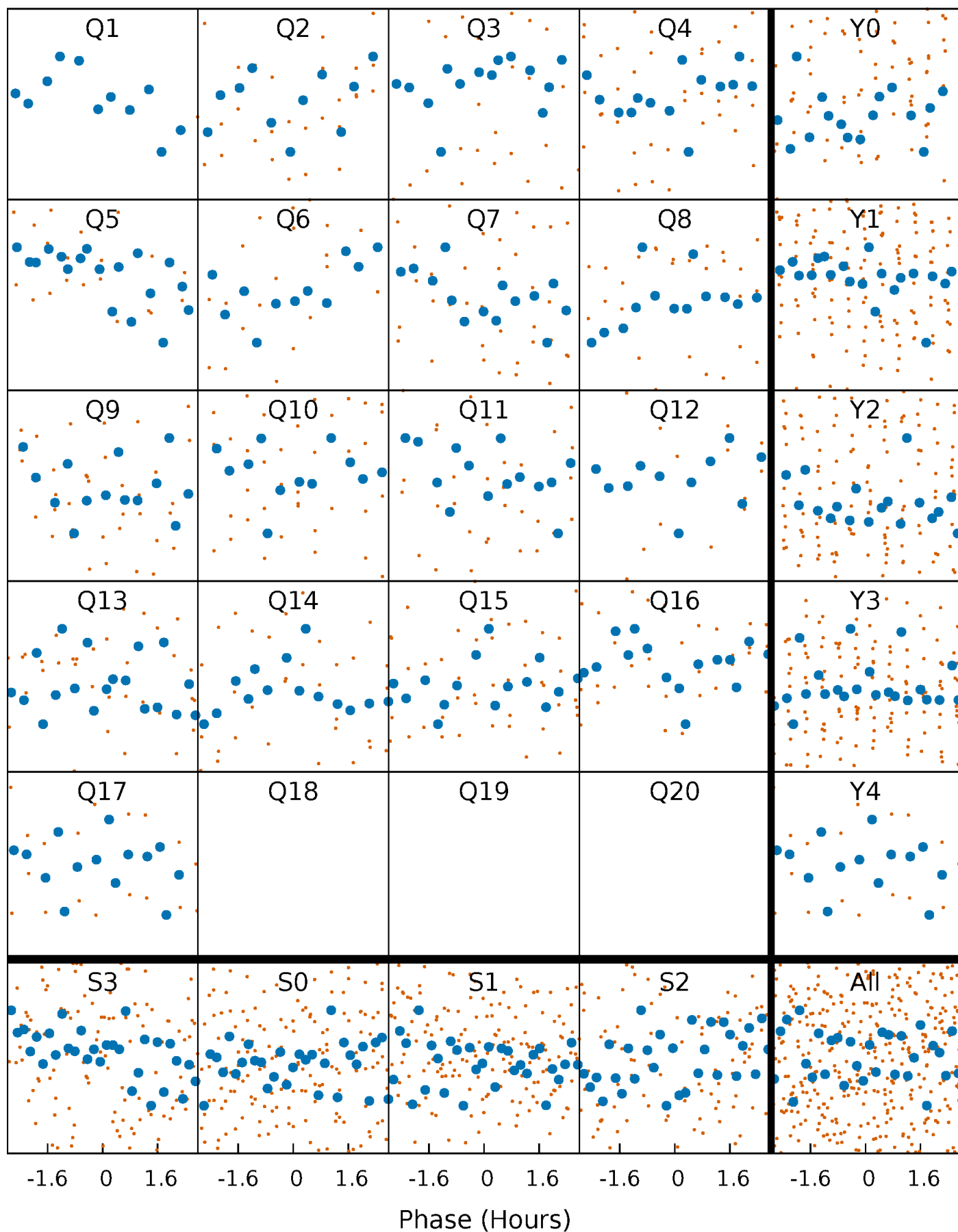
## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)





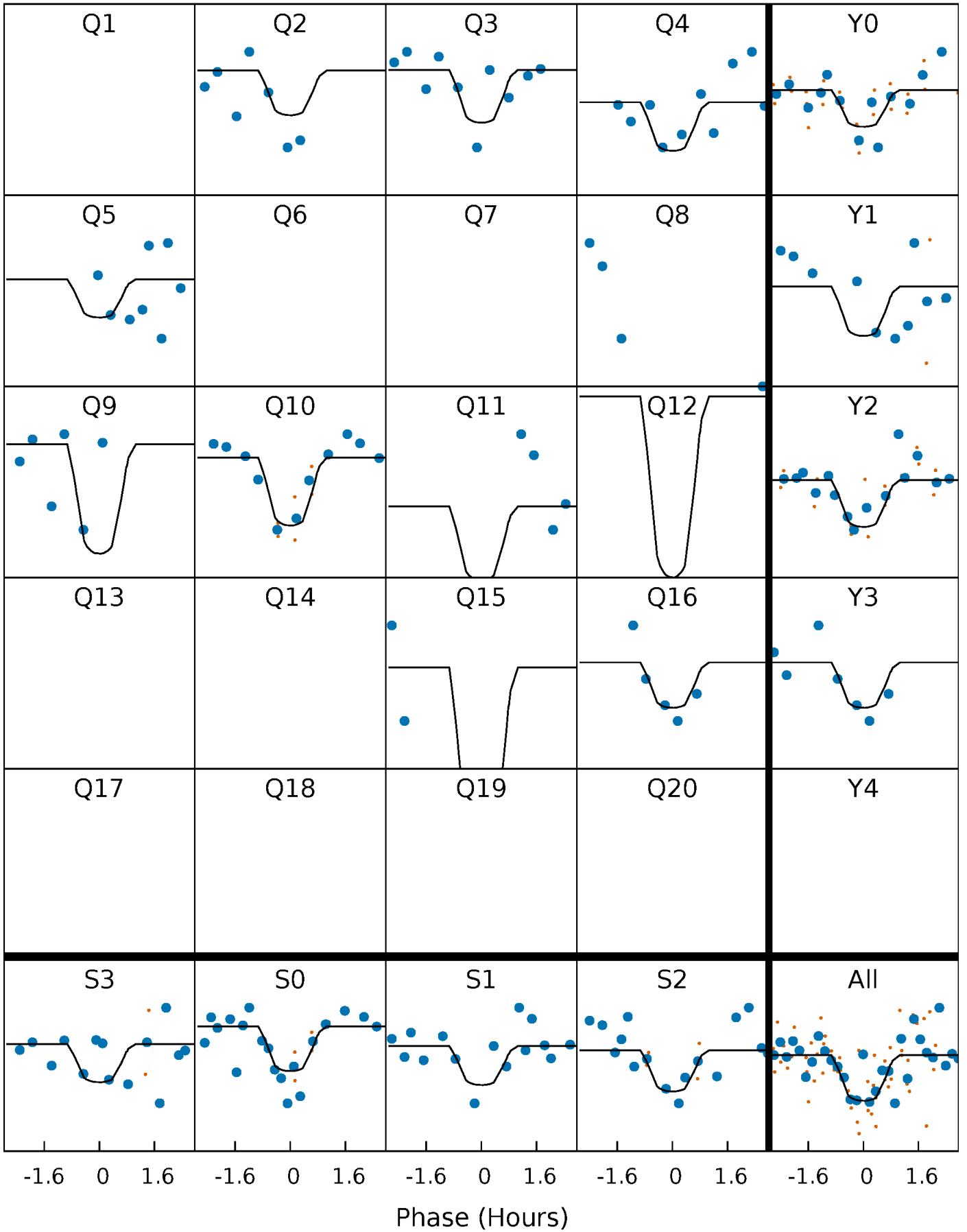
# PDC Quarter-Phased Transit Curves

TCE 004139351-04 P= 23.702619 Days  $T_0=144.250944$  (BKJD)



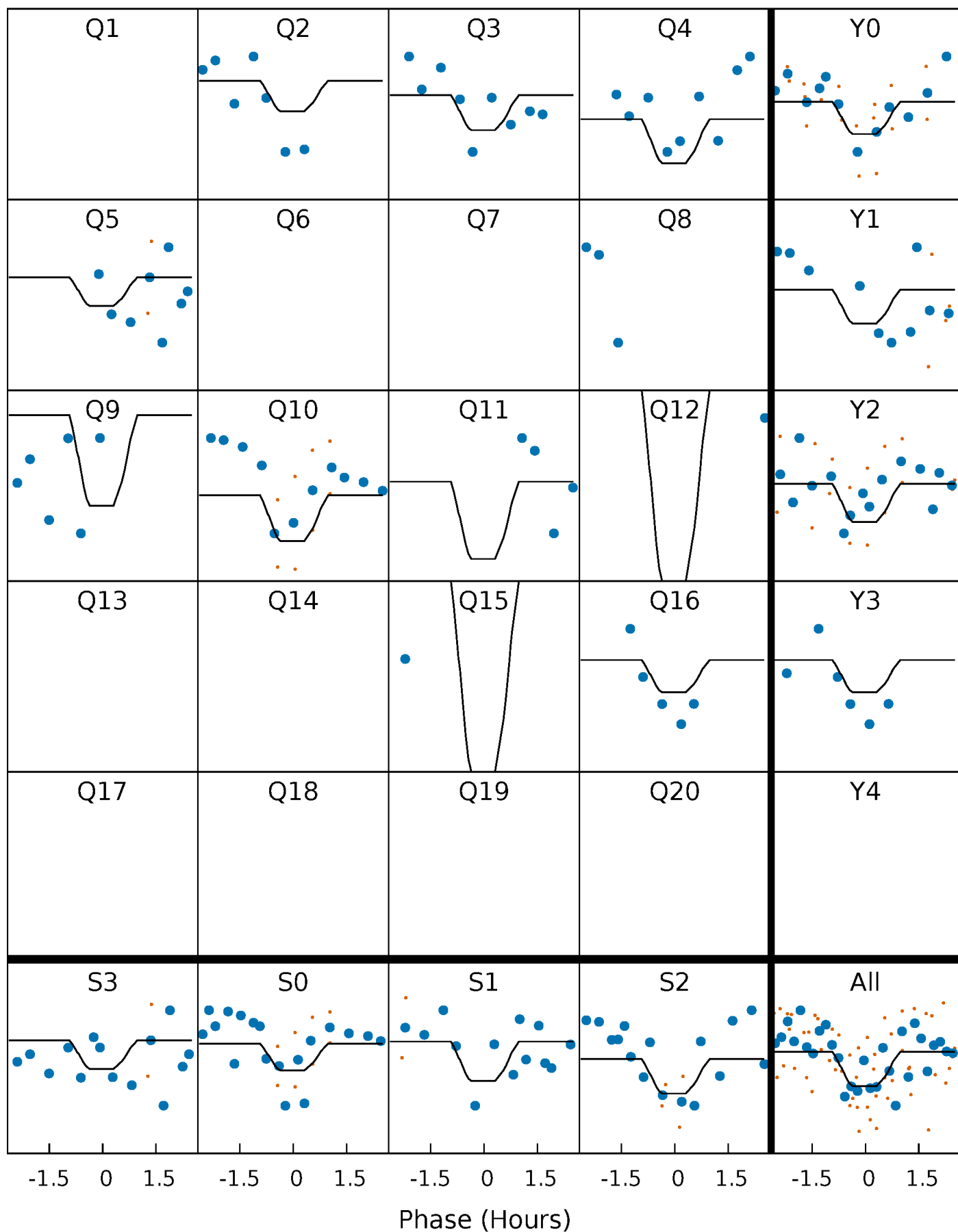
# DV Quarter-Phased Transit Curves

TCE 004139351-04 P= 23.702619 Days  $T_0=144.250944$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

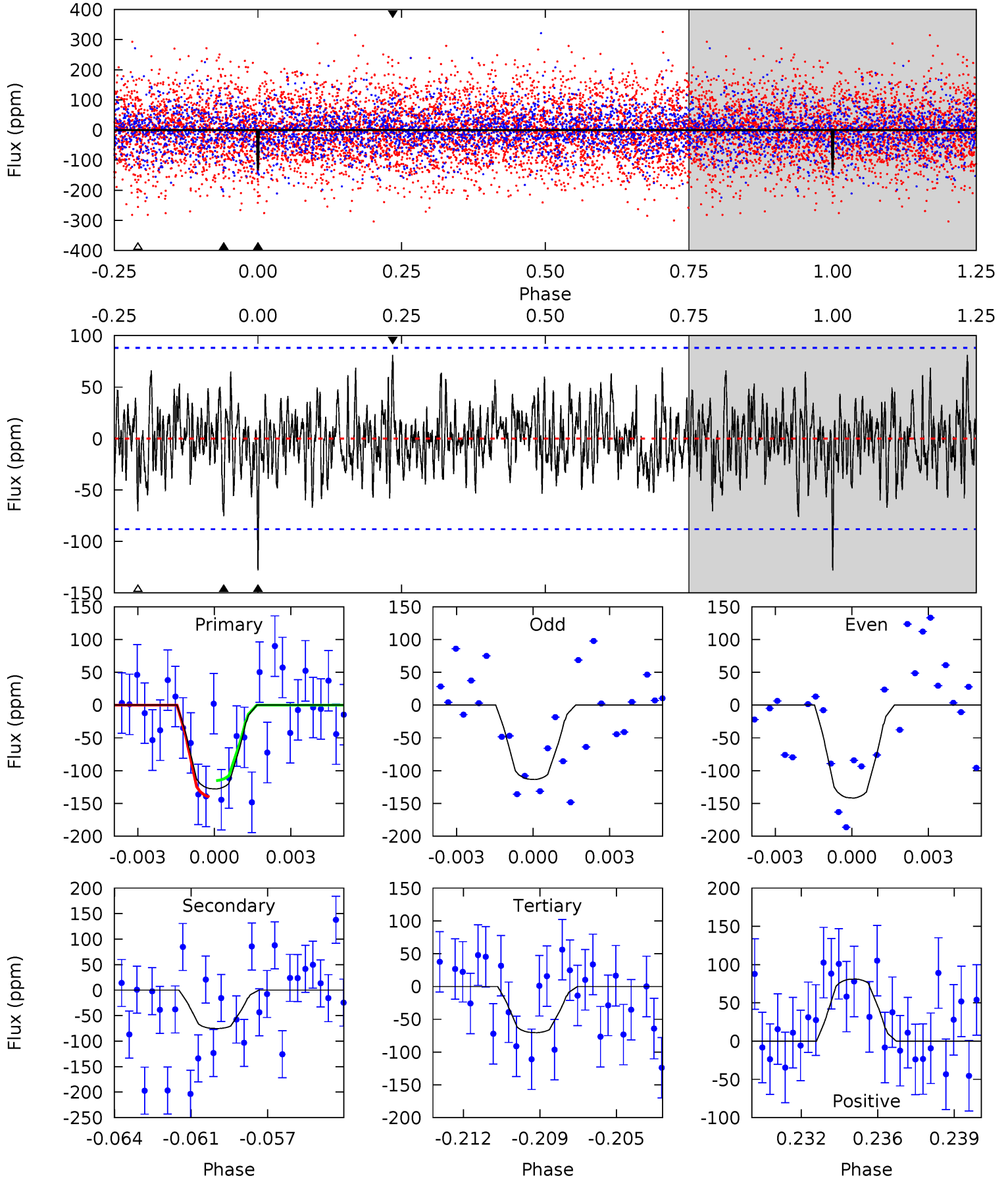
TCE 004139351-04     $P = 23.702655$  Days     $T_0 = 144.253116$  (BKJD)



# DV Model-Shift Uniqueness Test

004139351-04, P = 23.702619 Days, E = 120.548325 Days

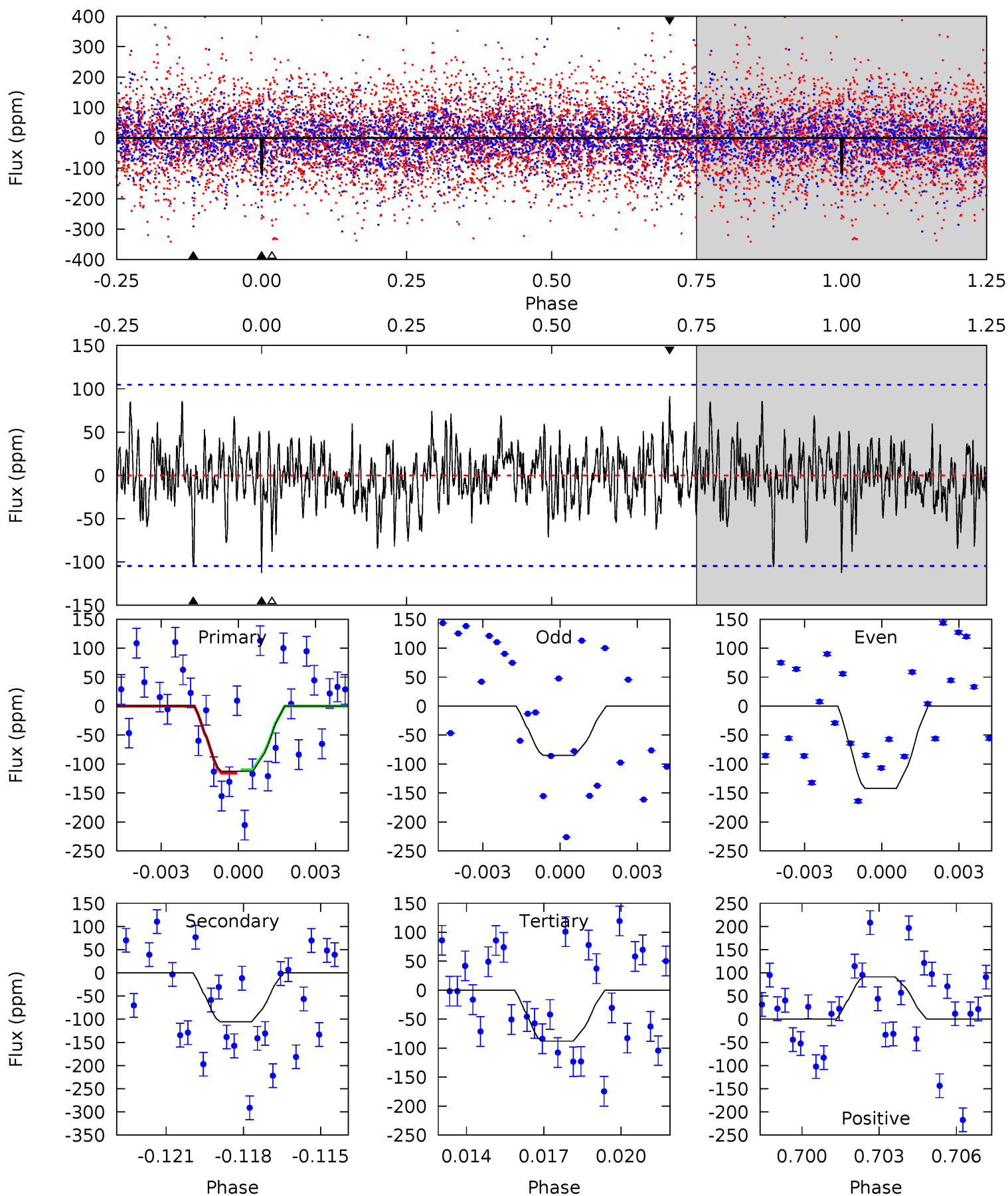
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
7.61	4.48	4.19	4.83	5.23	2.93	1.42	3.42	2.78	0.30	-0.35	0.84	1.16	0.39	0.73



# Alt Model-Shift Uniqueness Test

004139351-04, P = 23.702655 Days, E = 120.550461 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
5.66	5.30	4.42	4.58	5.26	2.98	1.36	1.24	1.07	0.89	0.72	1.43	1.17	0.45	0.15



### Stellar Parameters For KIC 004139351

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$\rho_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$7027^{+183}_{-224}$	$3.799^{+0.292}_{-0.097}$	$-0.400^{+0.300}_{-0.250}$	$2.577^{+0.406}_{-0.879}$	$1.524^{+0.205}_{-0.308}$	$0.126^{+0.248}_{-0.038}$
	+3%/-3%	+8%/-3%	+75%/-62%	+16%/-34%	+13%/-20%	+197%/-30%
Source	PHO1	FLK73	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 004139351-04 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-75 \pm 17$	$4.49^{+4.35}_{-2.76}$	$1581^{+96}_{-135}$	$5026^{+3263}_{-1167}$	$69^{+381}_{-51}$
Alt.	$-106 \pm 20$	$4.50^{+4.43}_{-3.16}$	$1589^{+89}_{-146}$	$5418^{+5336}_{-1314}$	$100^{+952}_{-75}$

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



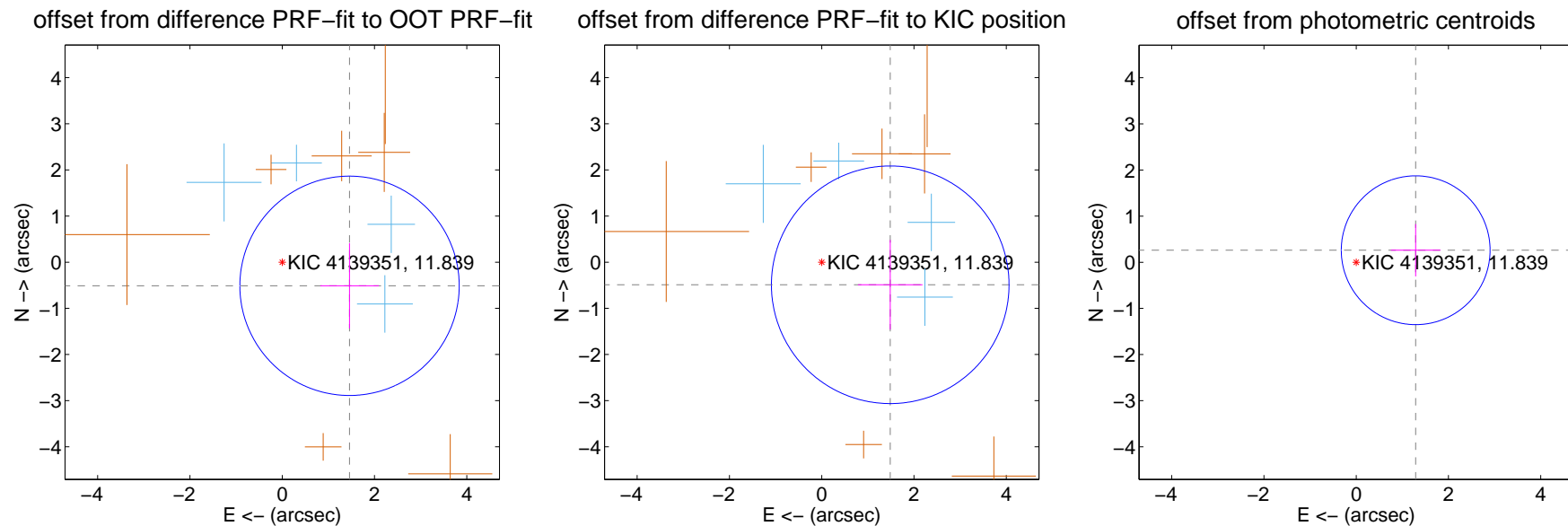
## DV Centroid Data

Supplemental centroid analysis for 004139351-04. **Kepler magnitude: 11.84.** Transit SNR 7.97

There are 4 quarters with good PRF difference image offsets

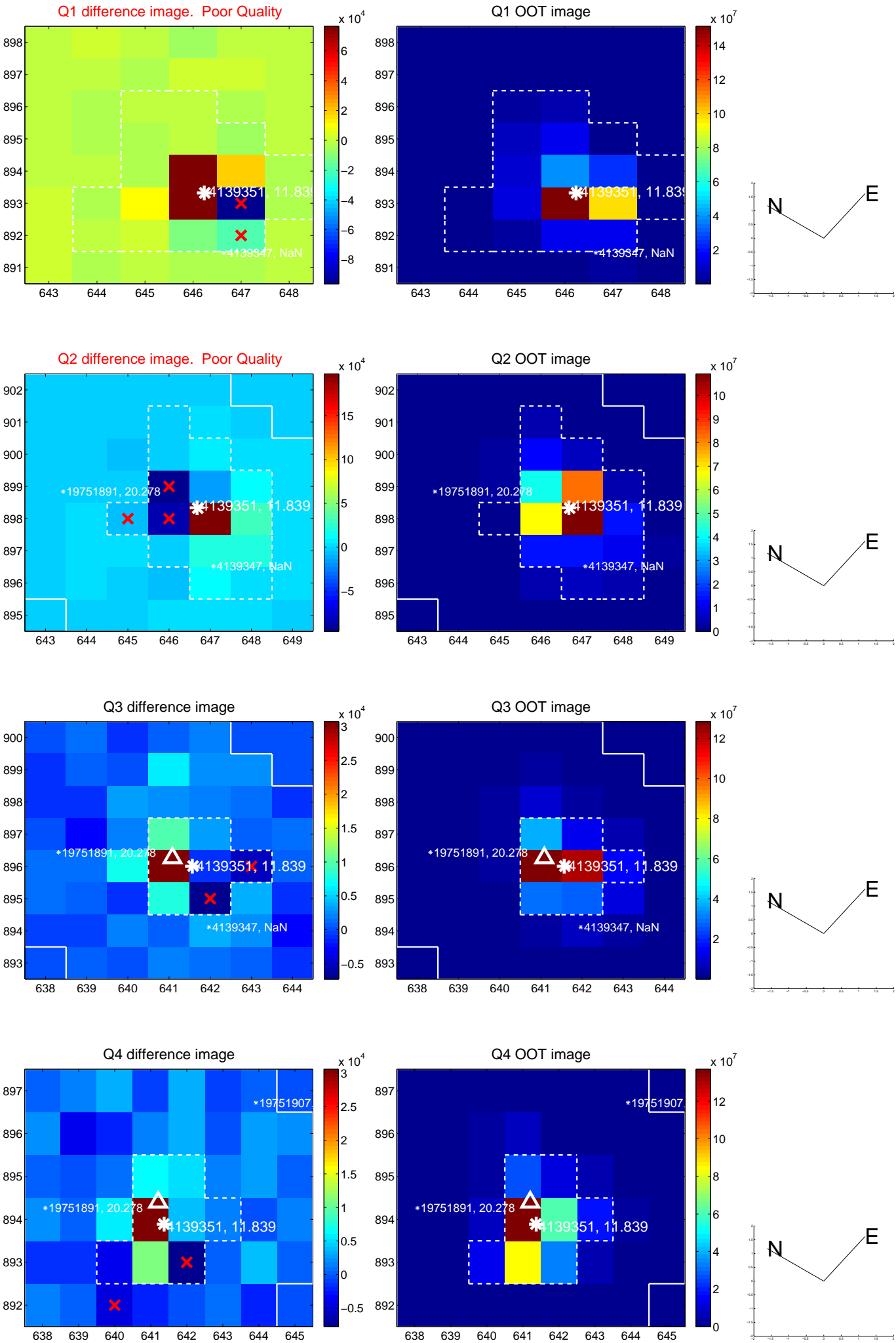
The direct PRF centroid is offset from the target star catalog position by about 0.07 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.546 \pm 0.792$	1.95	$-1.459 \pm 0.633$	$-0.512 \pm 0.925$
PRF-fit source offset from KIC position	$1.564 \pm 0.858$	1.82	$-1.485 \pm 0.700$	$-0.489 \pm 0.972$
photometric centroid source offset	$1.32 \pm 0.54$	2.45	$-1.29 \pm 0.54$	$0.26 \pm 0.57$

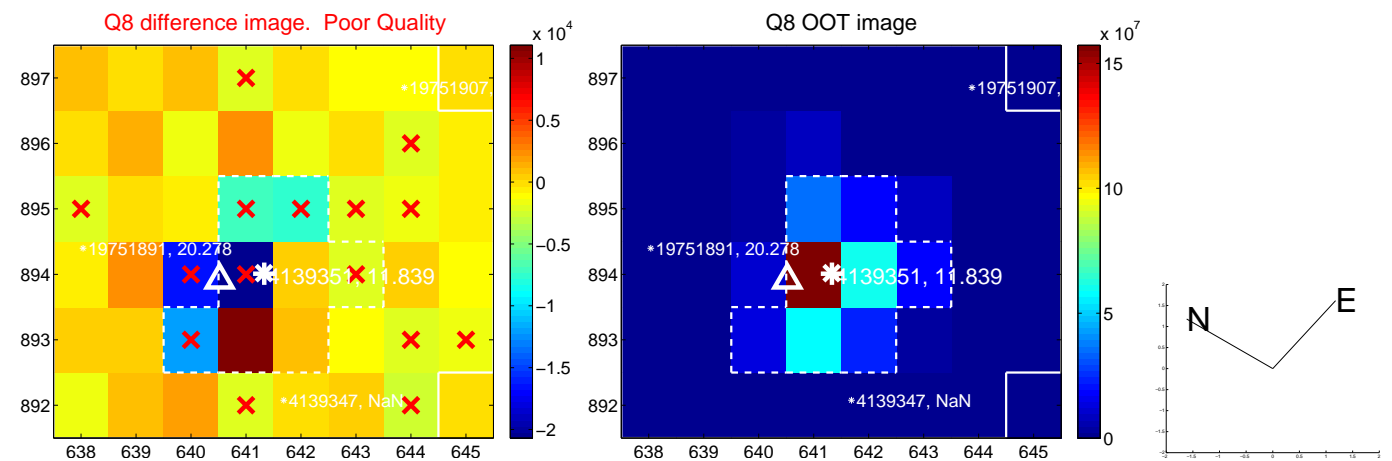
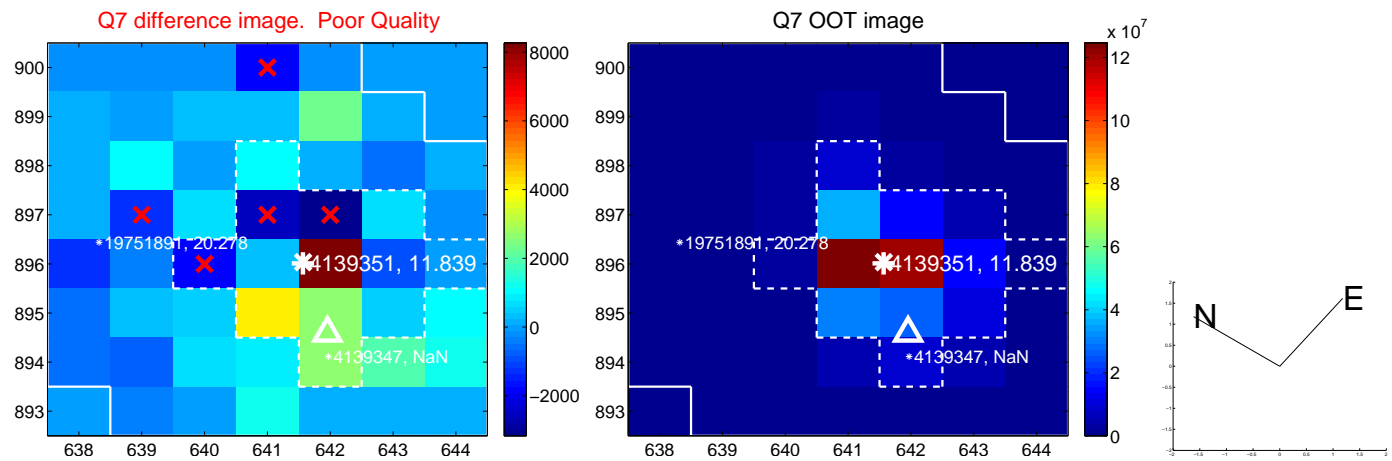
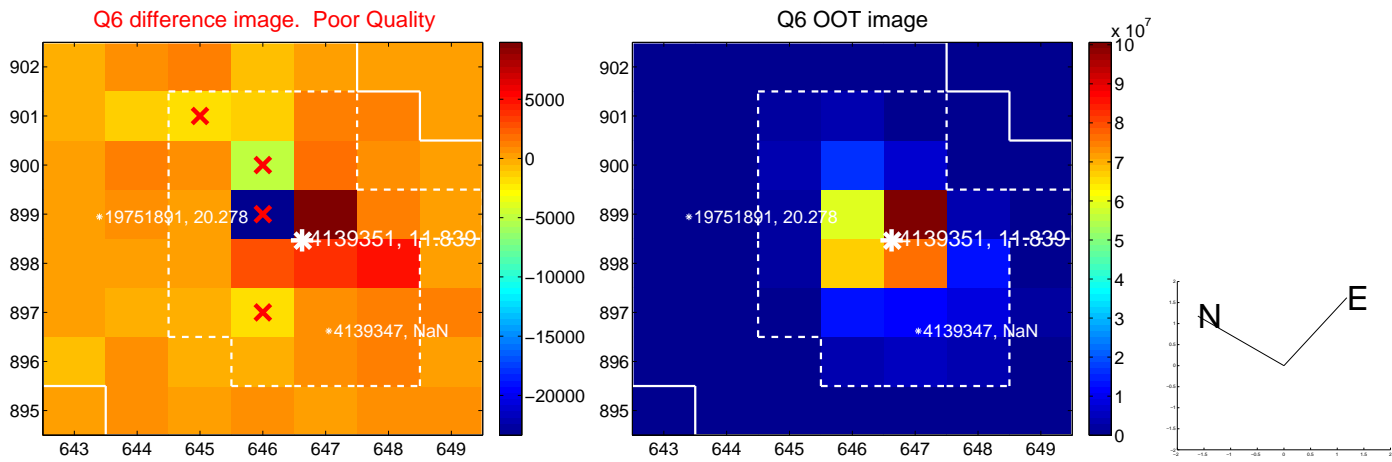
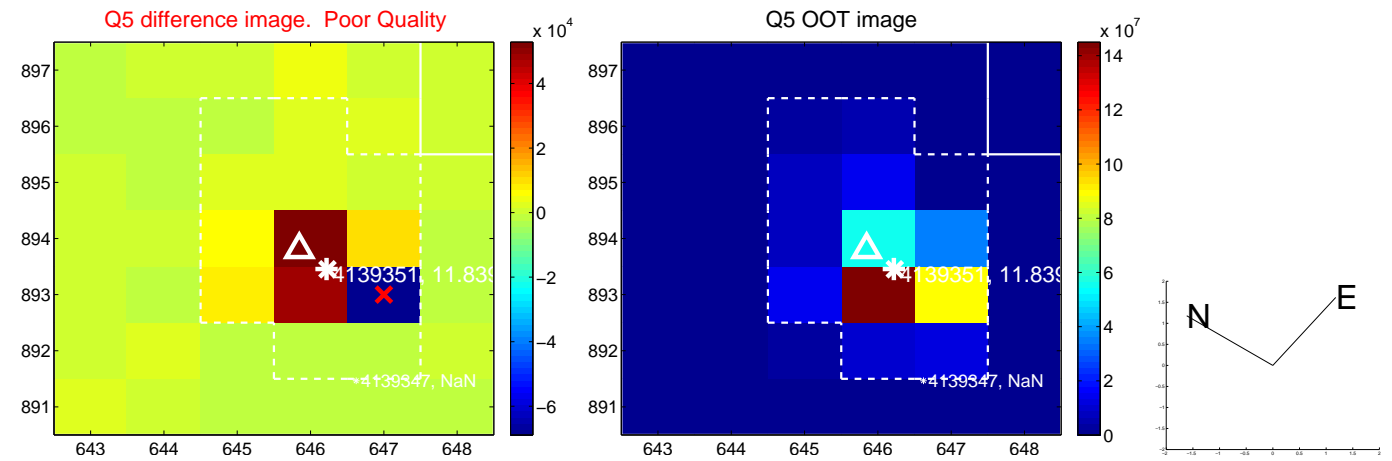


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

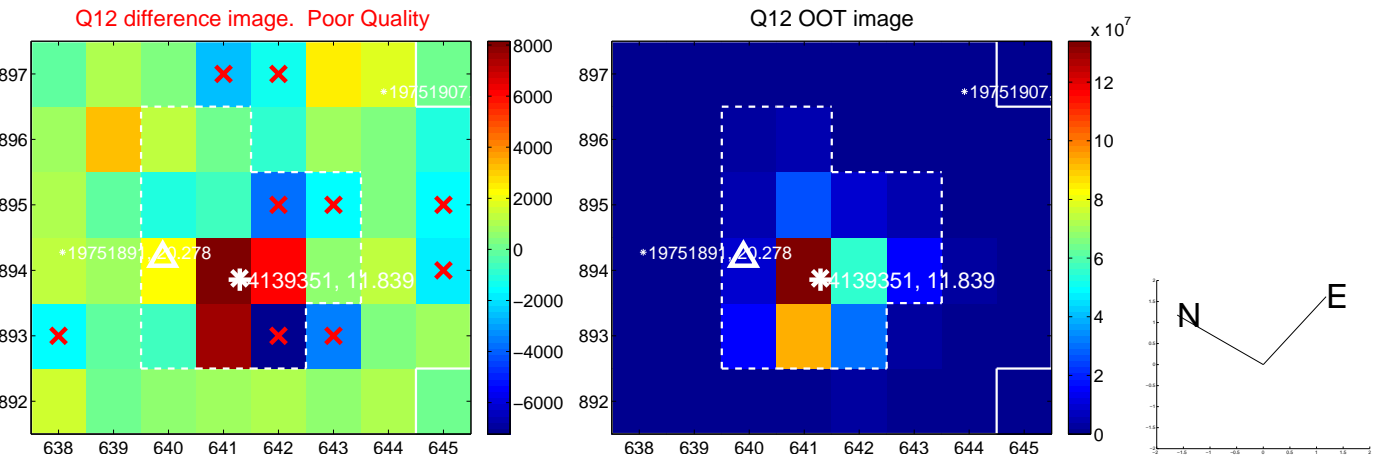
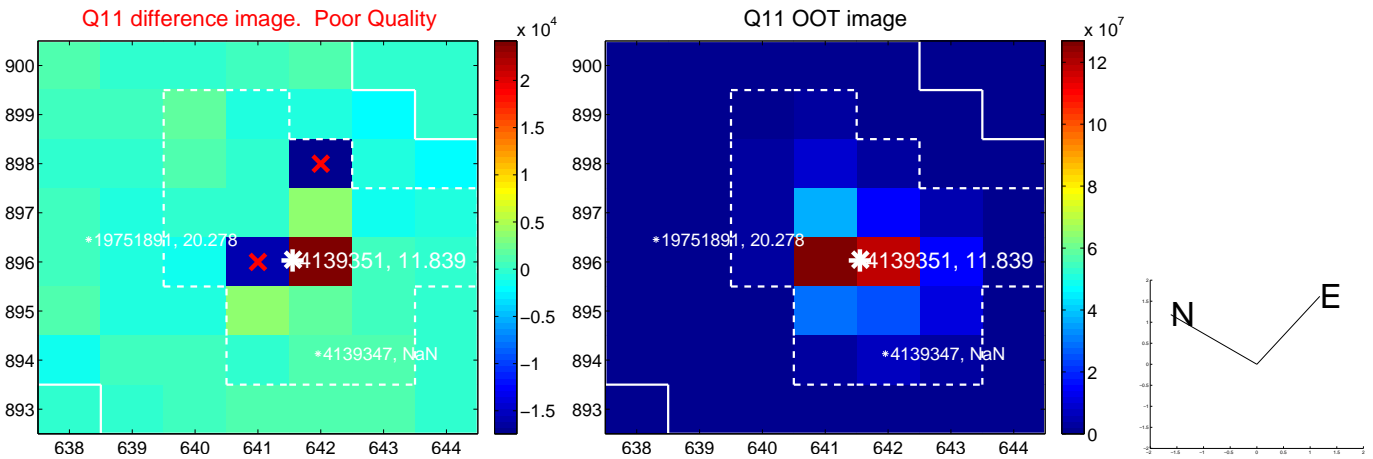
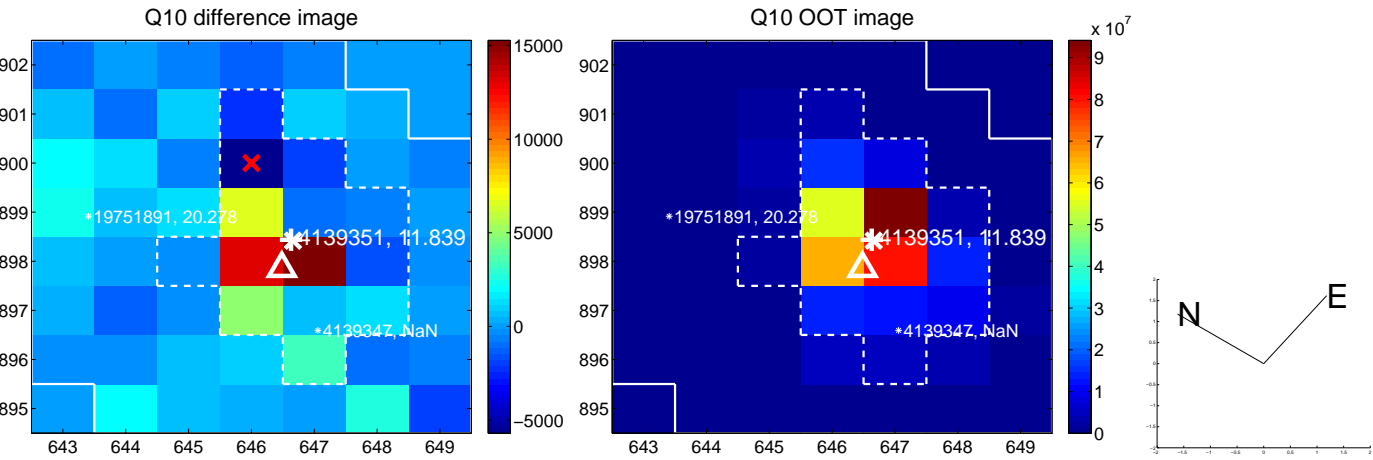
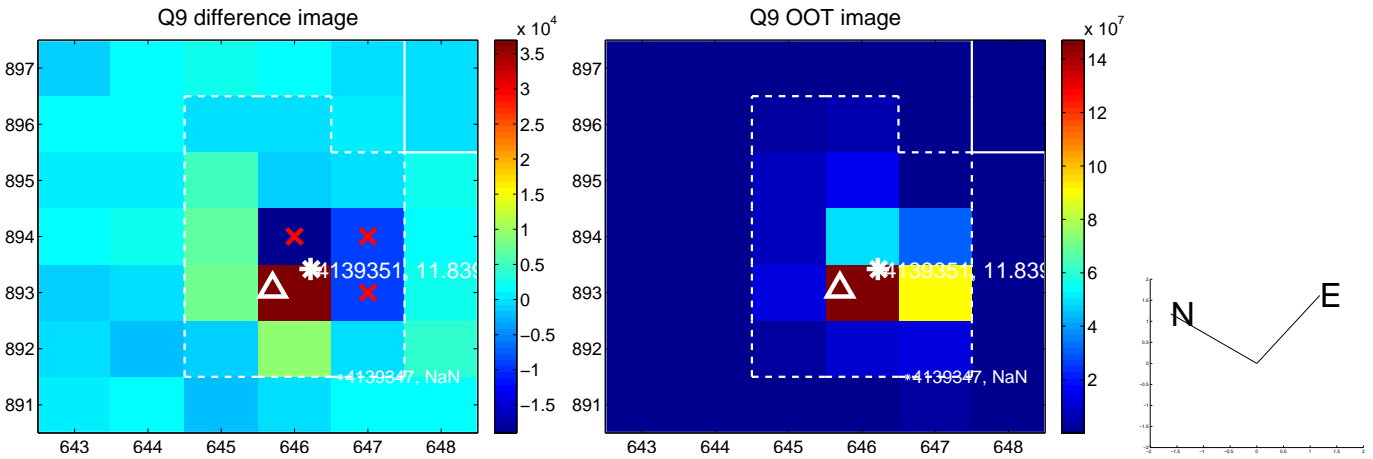
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



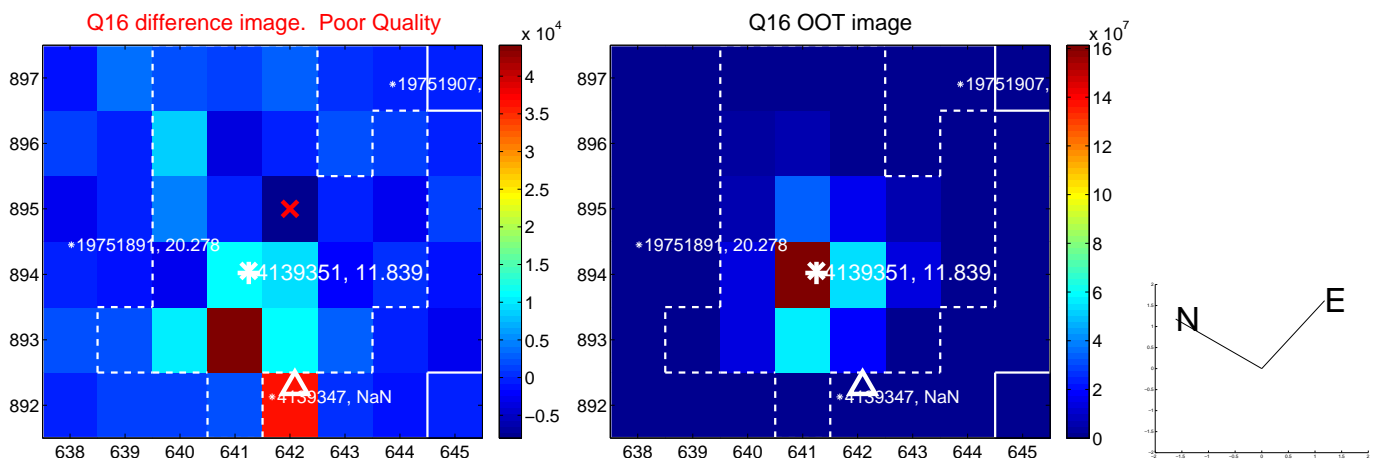
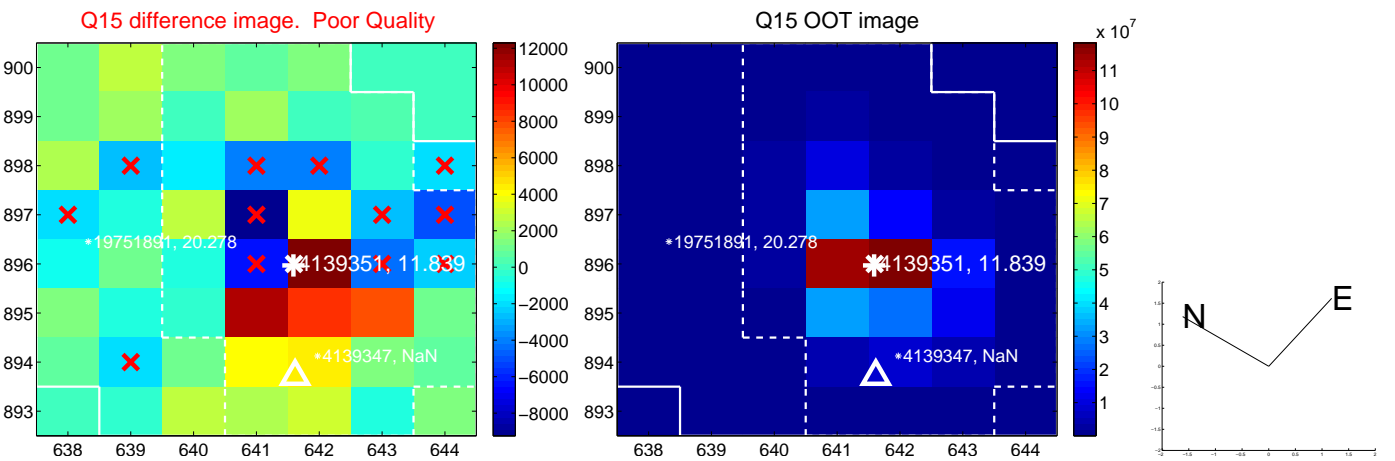
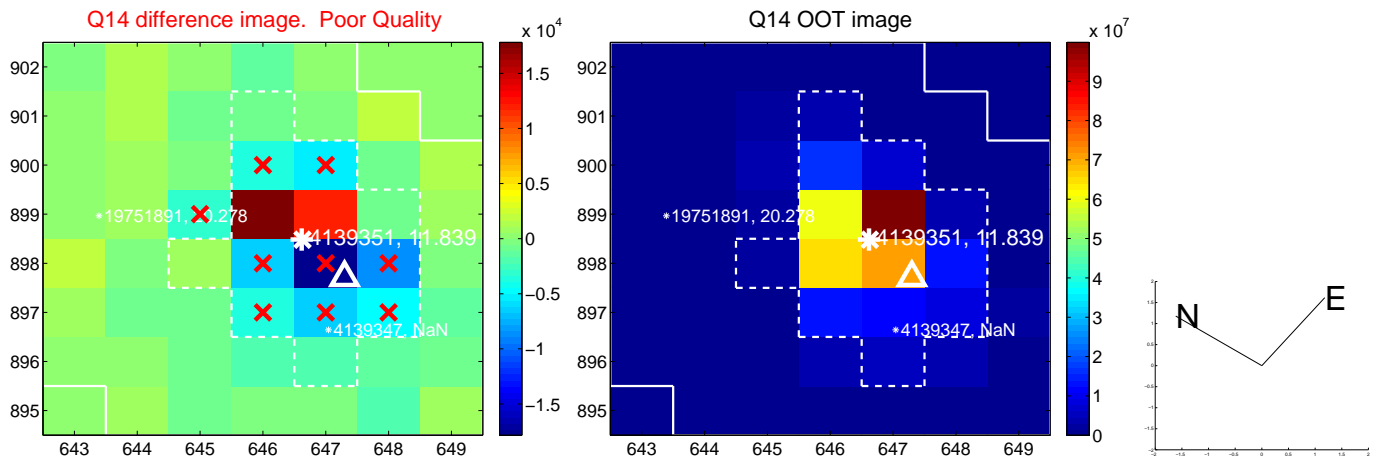
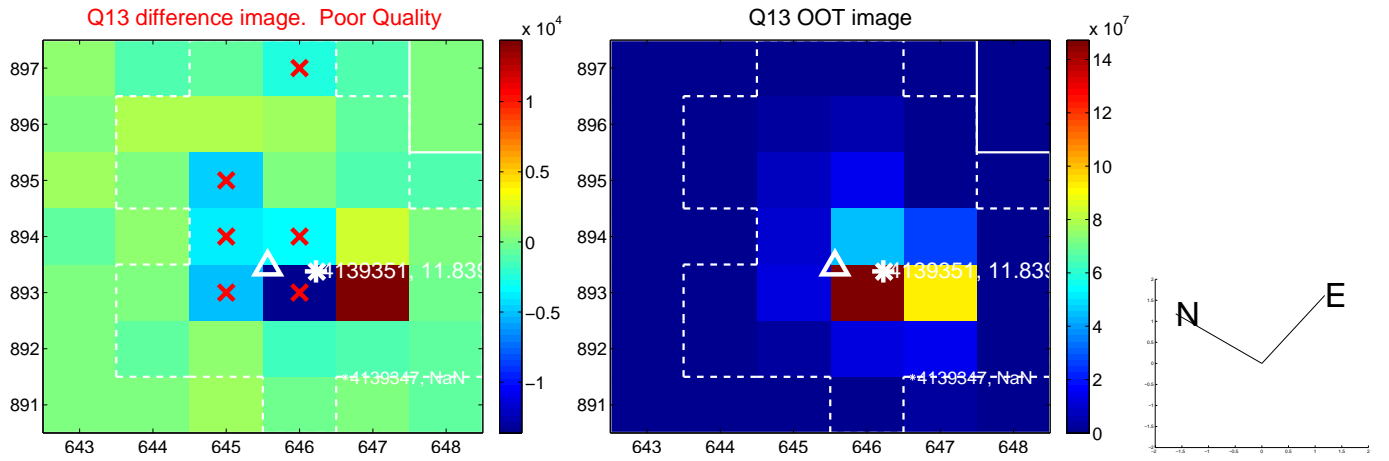
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



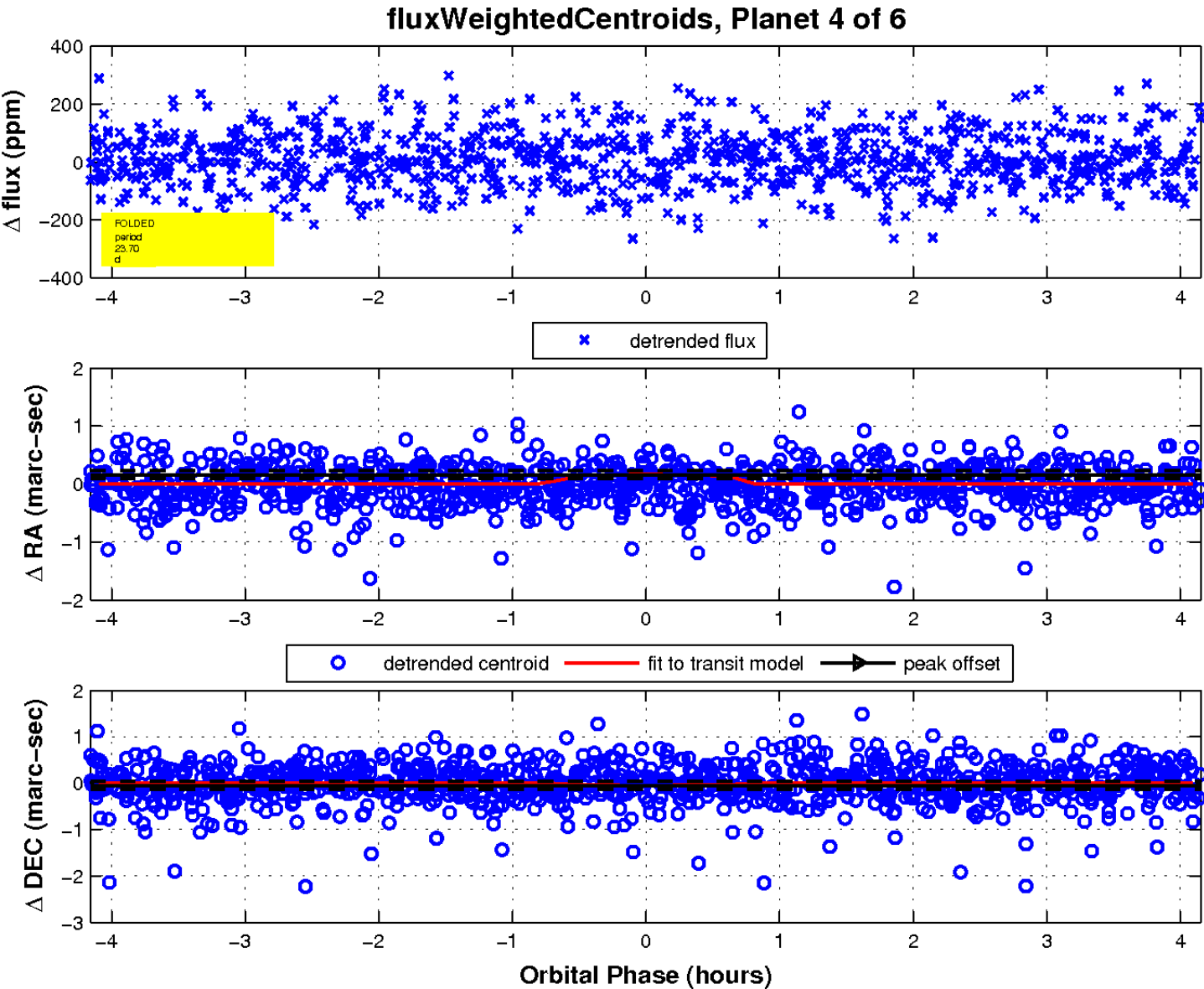
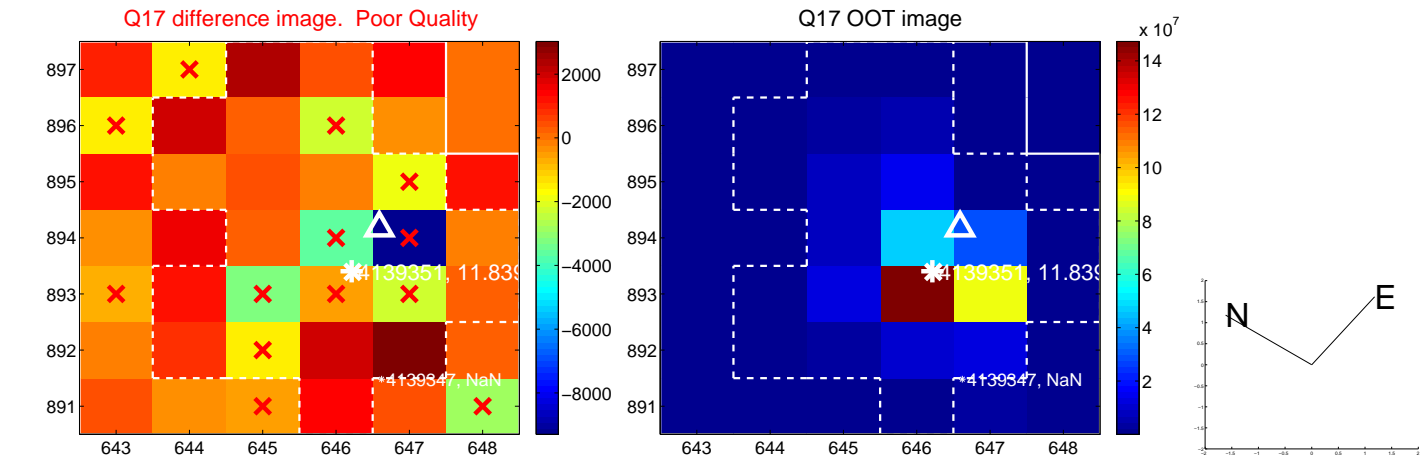
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



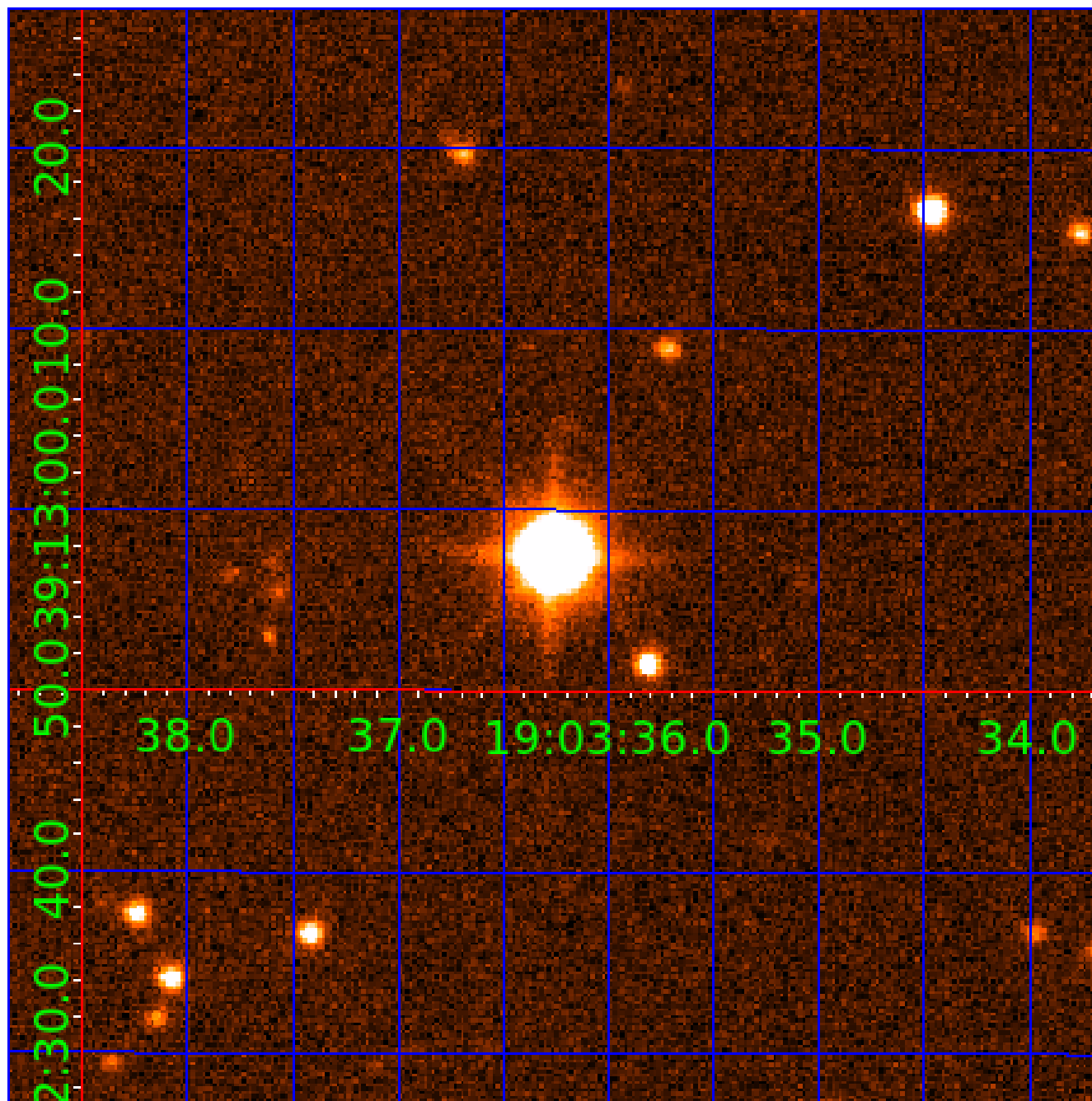
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.





# UKIRT Image

Declination



# KIC 004139351

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004139351-01	OBS	No	1.617618	131.758437	24.6	5.067	11.9	11.7	2.58	7027	1.76	15050.44
004139351-02	OBS	No	1.617457	132.792667	7.7	7.220	10.2	5.2	2.58	7027	0.75	15052.44
004139351-03	OBS	No	33.348582	156.166187	151.0	3.824	9.3	9.3	2.58	7027	3.70	266.24
004139351-04	OBS	No	23.702619	144.250944	140.8	1.388	8.2	8.0	2.58	7027	3.10	419.75
004139351-05	OBS	No	17.992676	143.020549	94.1	3.360	8.5	7.8	2.58	7027	2.87	606.16
004139351-06	OBS	No	26.531520	151.986211	145.8	3.530	7.9	7.6	2.58	7027	3.63	361.16

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004139351-01	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
004139351-02	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD
004139351-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
004139351-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
004139351-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_ZUMA—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_FEW_MEAS
004139351-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT—CENT_FEW_DIFFS

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

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

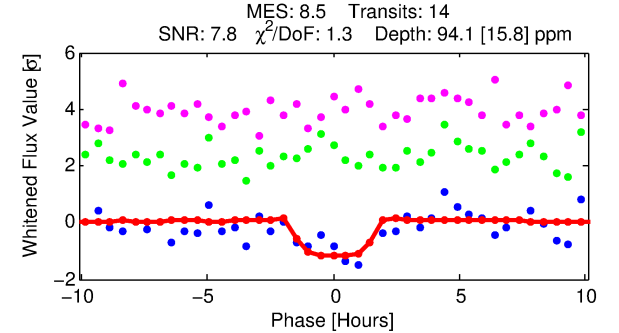
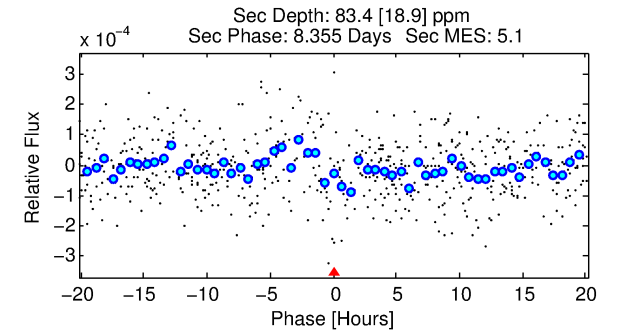
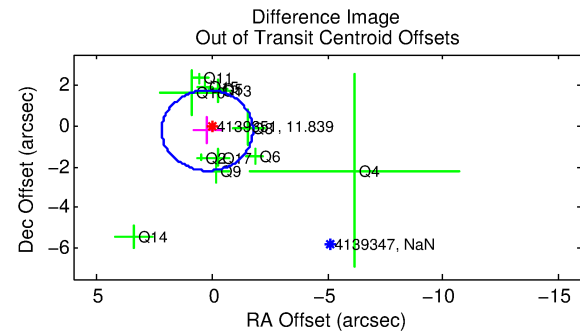
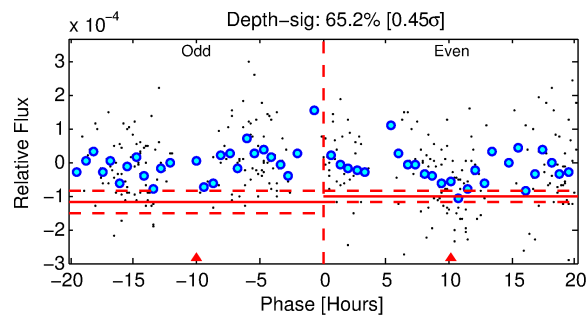
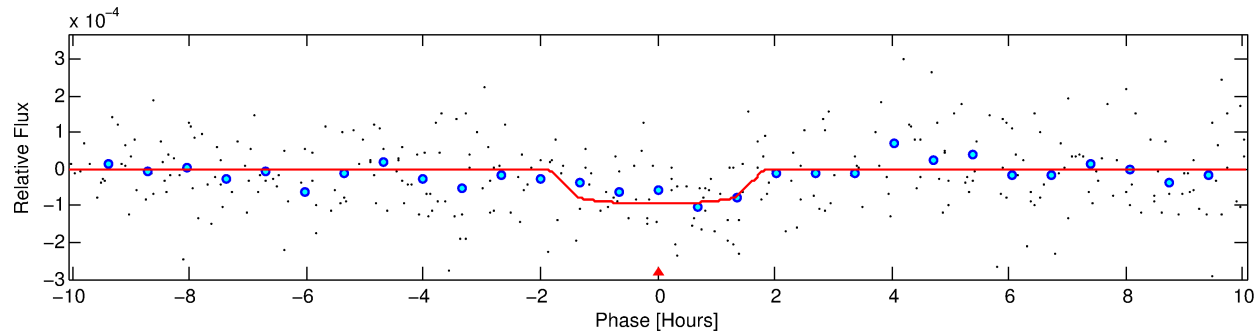
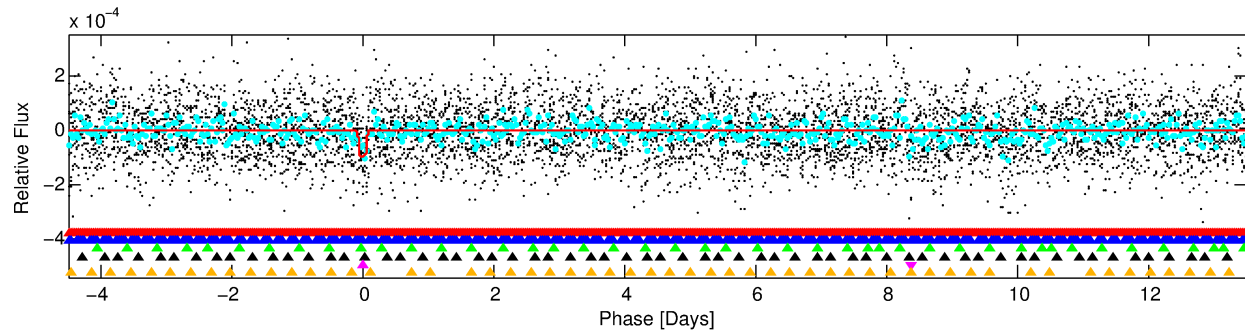
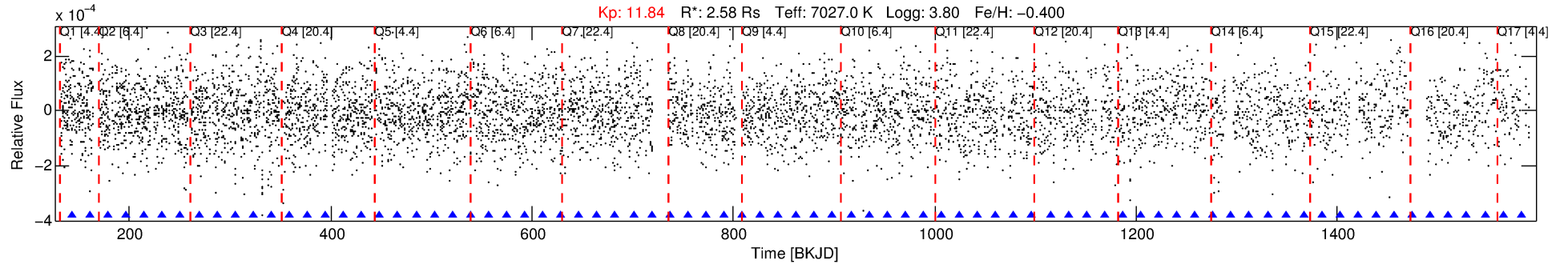
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 004139351-05

No Significant Match Found

# DV One-Page Summary

KIC: 4139351 Candidate: 5 of 6 Period: 17.993 d



## DV Fit Results:

Period = 17.99268 [0.00034] d  
Epoch = 143.0205 [0.0131] BKJD  
 $R_p/R^* = 0.0102$  [0.0086]  
 $a/R^* = 20.18$  [102.46]  
 $b = 0.88$  [1.30]  
 $\text{Seff} = 606.16$  [314.32]  
 $T_{\text{eq}} = 1265$  [164] K  
 $R_p = 2.87$  [2.61]  $R_{\text{e}}$   
 $a = 0.1547$  [0.0494] AU  
 $A_g = 133.17$  [235.87] [0.56 $\sigma$ ]  
 $T_{\text{eff}} = 6645$  [2829] K [1.90 $\sigma$ ]

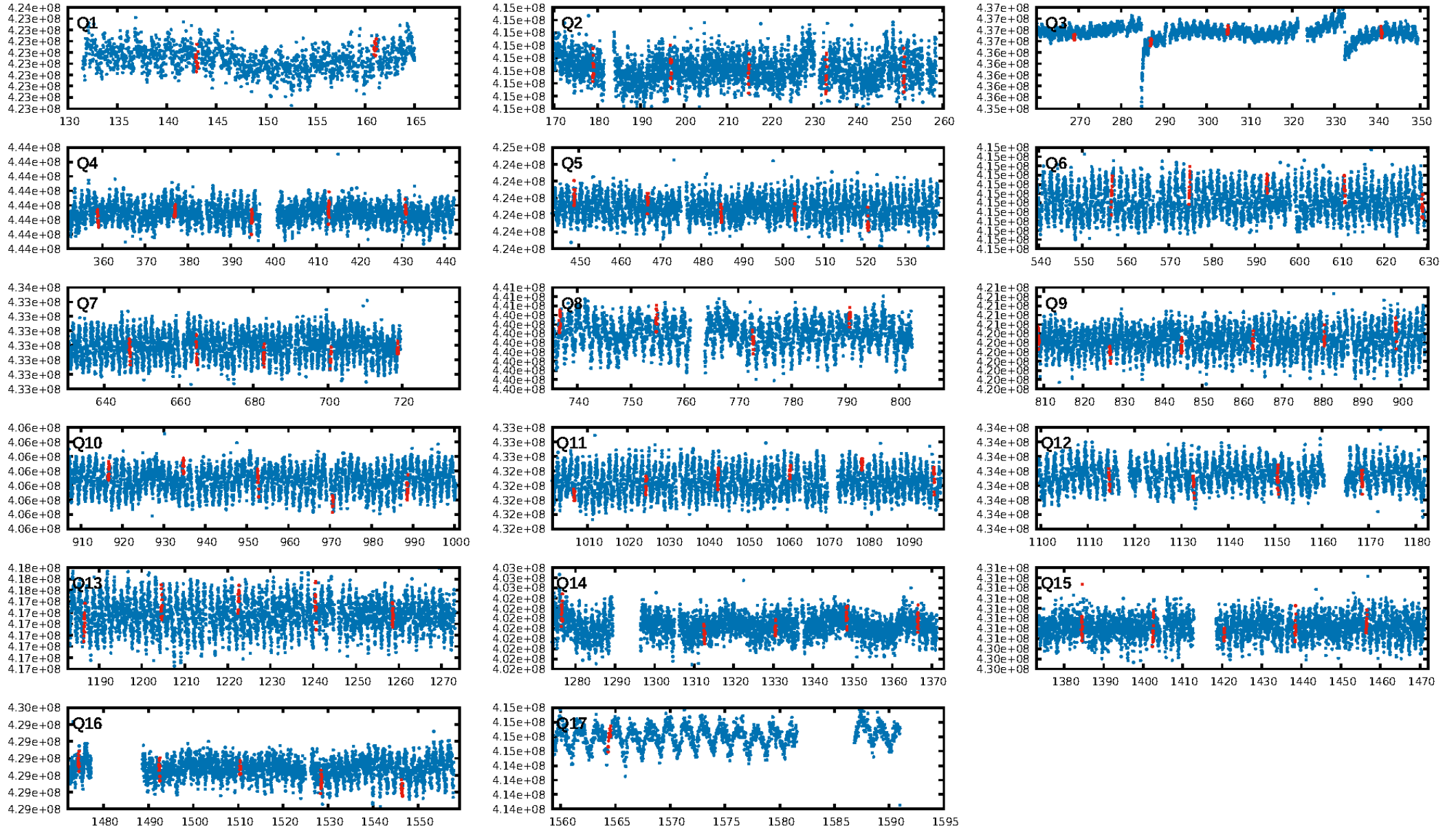
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [64.64 $\sigma$ ]  
LongPeriod-sig: 100.0% [37.70 $\sigma$ ]  
ModelChiSquare2-sig: 30.2%  
ModelChiSquareGof-sig: 100.0%  
**Bootstrap-pfa: 9.78e-10**  
RollingBand-fgt: 1.00 [14/14]  
**GhostDiagnostic-chr: -1.291**  
Centroid-sig: 9.4%  
Centroid-so: 0.512 arcsec [1.02 $\sigma$ ]  
OotOffset-rm: 0.299 arcsec [0.45 $\sigma$ ]  
KicOffset-rm: 0.264 arcsec [0.40 $\sigma$ ]  
OotOffset-st: 4/2/2/4 [12]  
KicOffset-st: 4/2/2/4 [12]  
DiffImageQuality-fgm: 0.33 [4/12]  
DiffImageOverlap-fno: 0.18 [3/17]

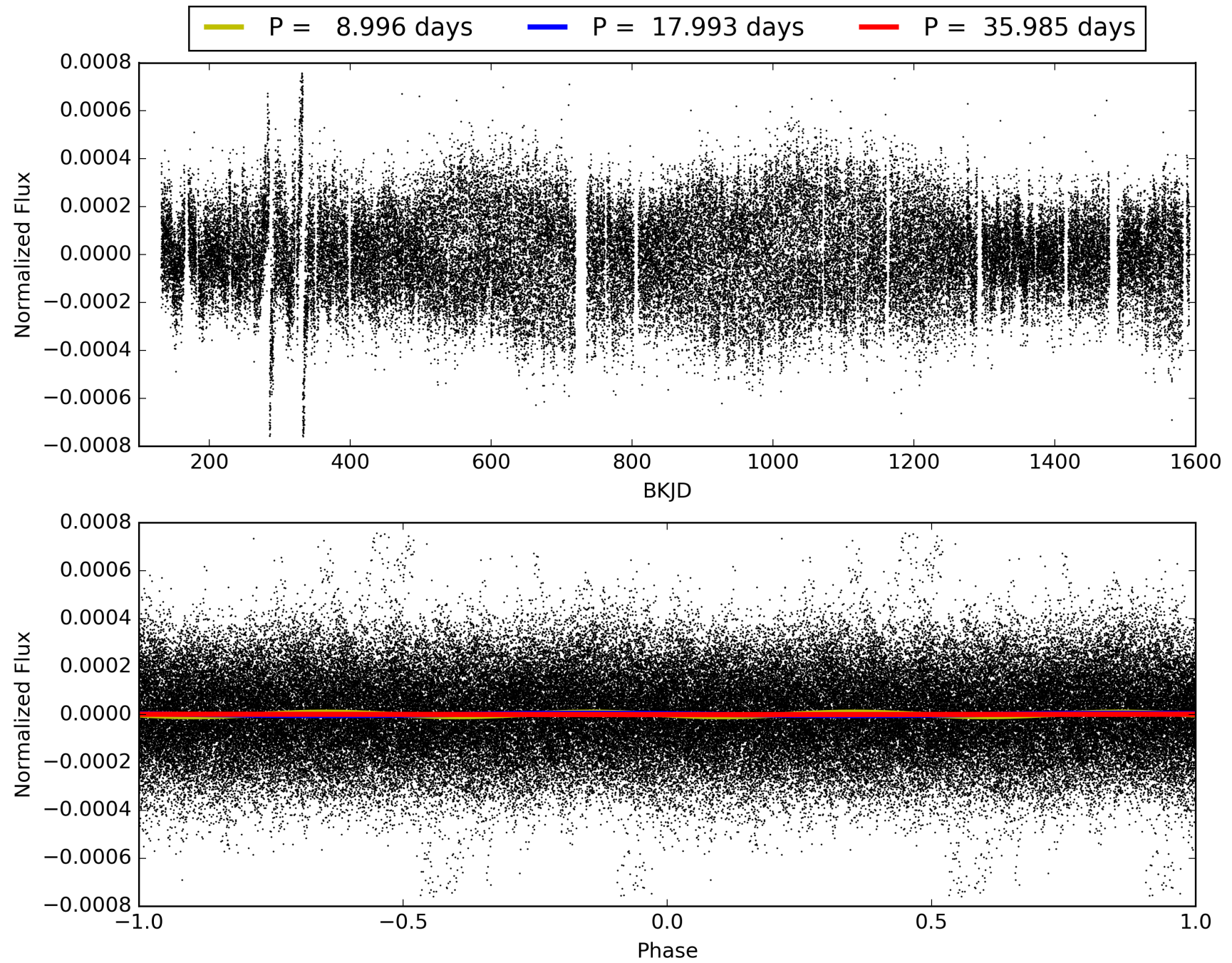
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 02-Feb-2016 09:19:41 Z

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

# TCE 004139351-05, PDC Light Curves



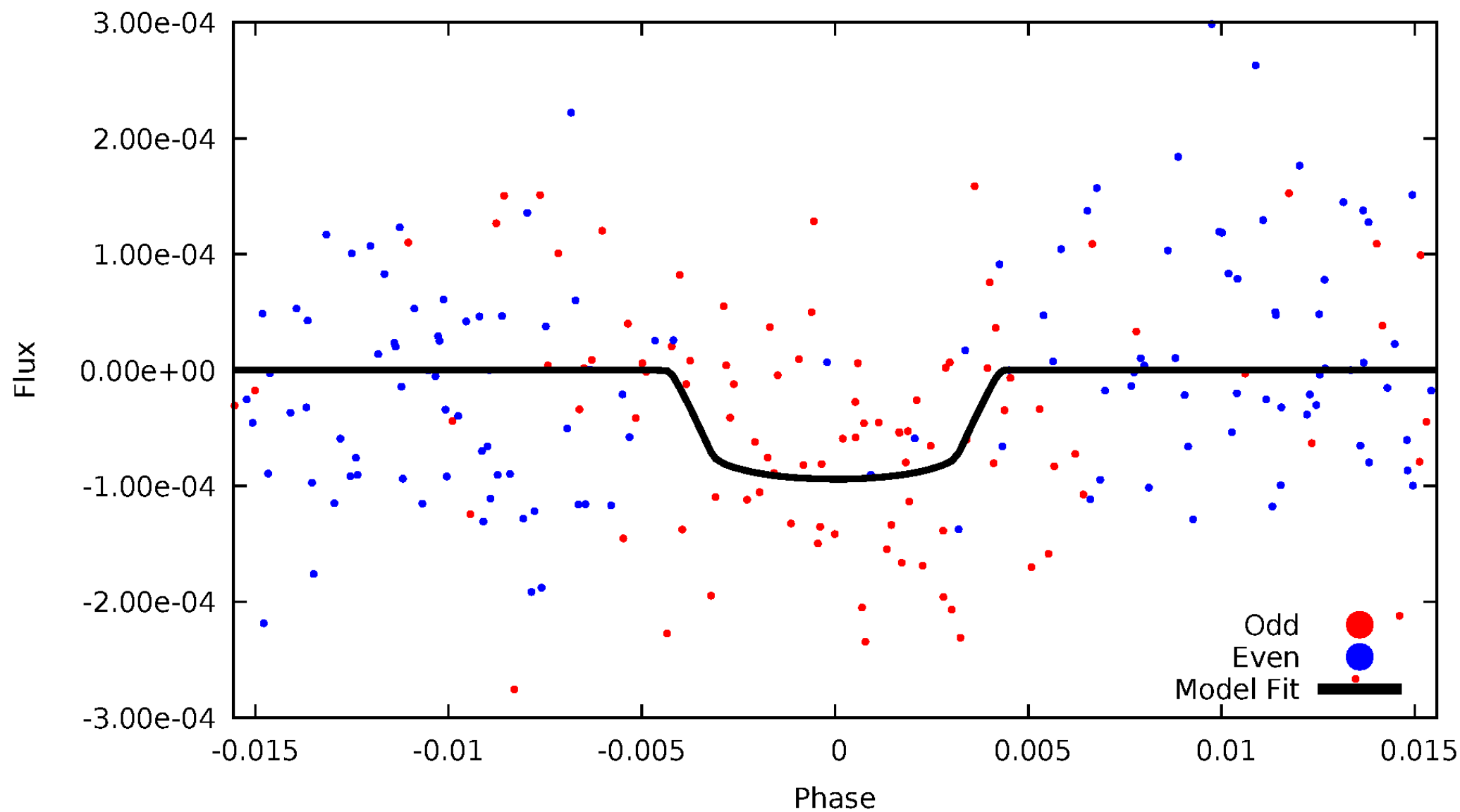
TCE 004139351-05





# DV Odd/Even

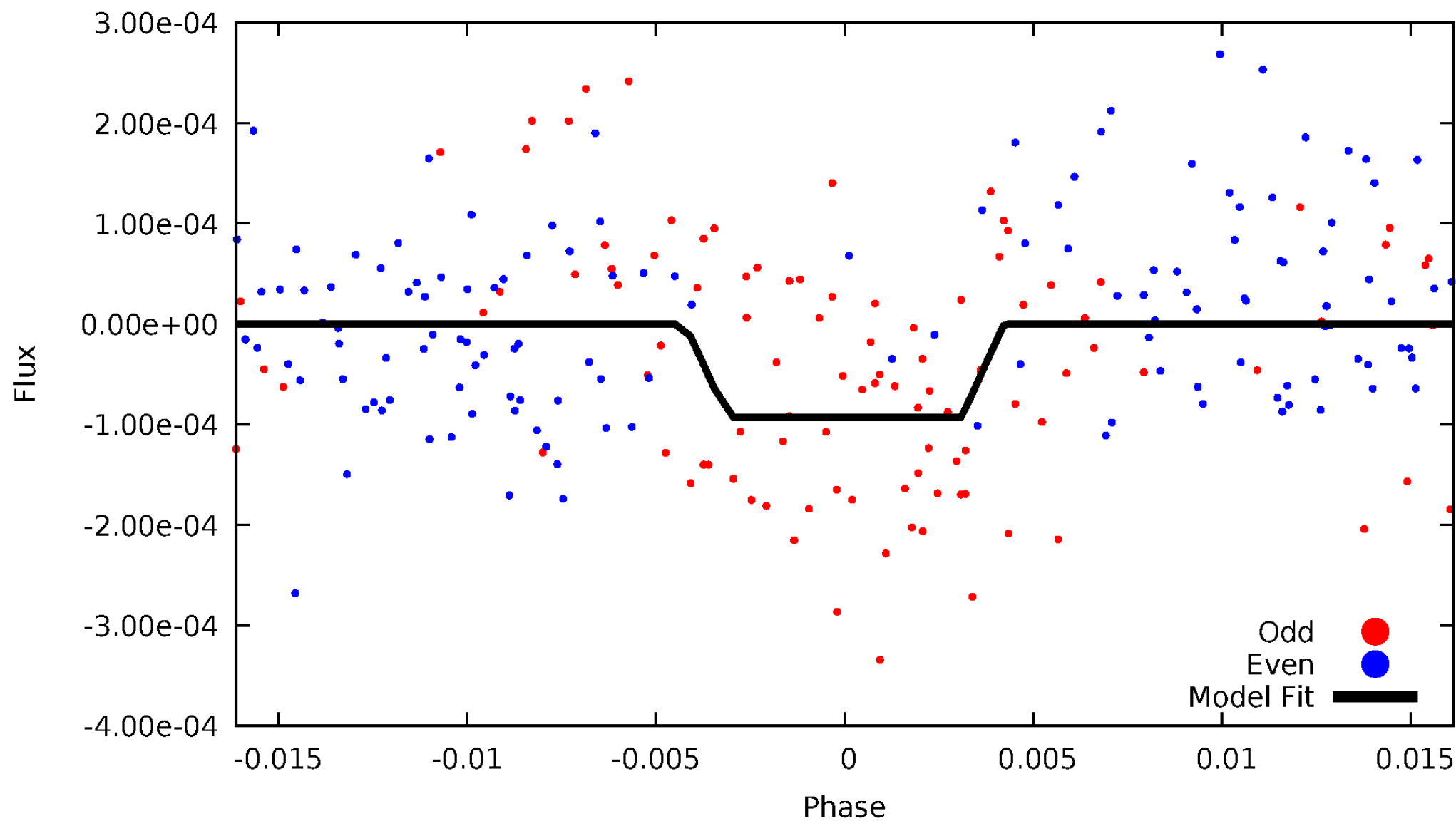
TCE 004139351-05





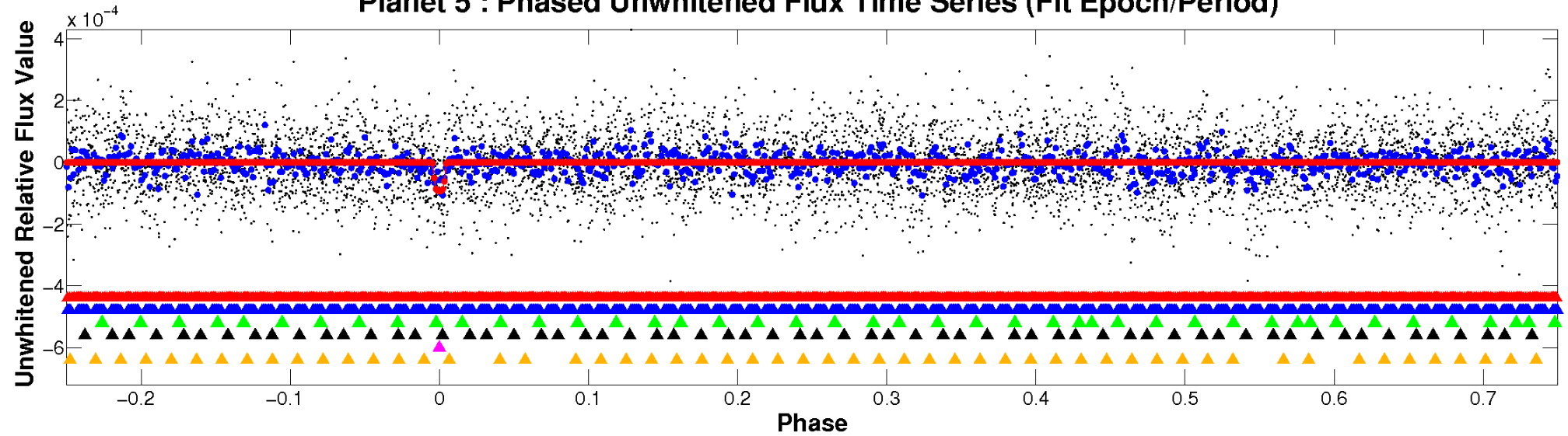
# ALT Odd/Even

TCE 004139351-05

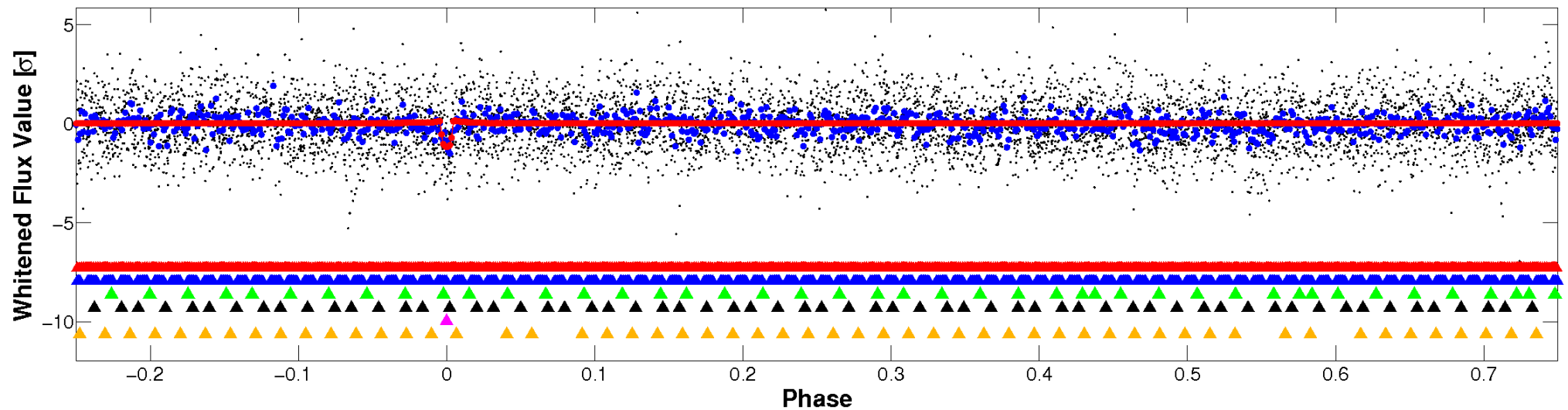


### Non-Whitened Vs. Whitened Light Curve

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

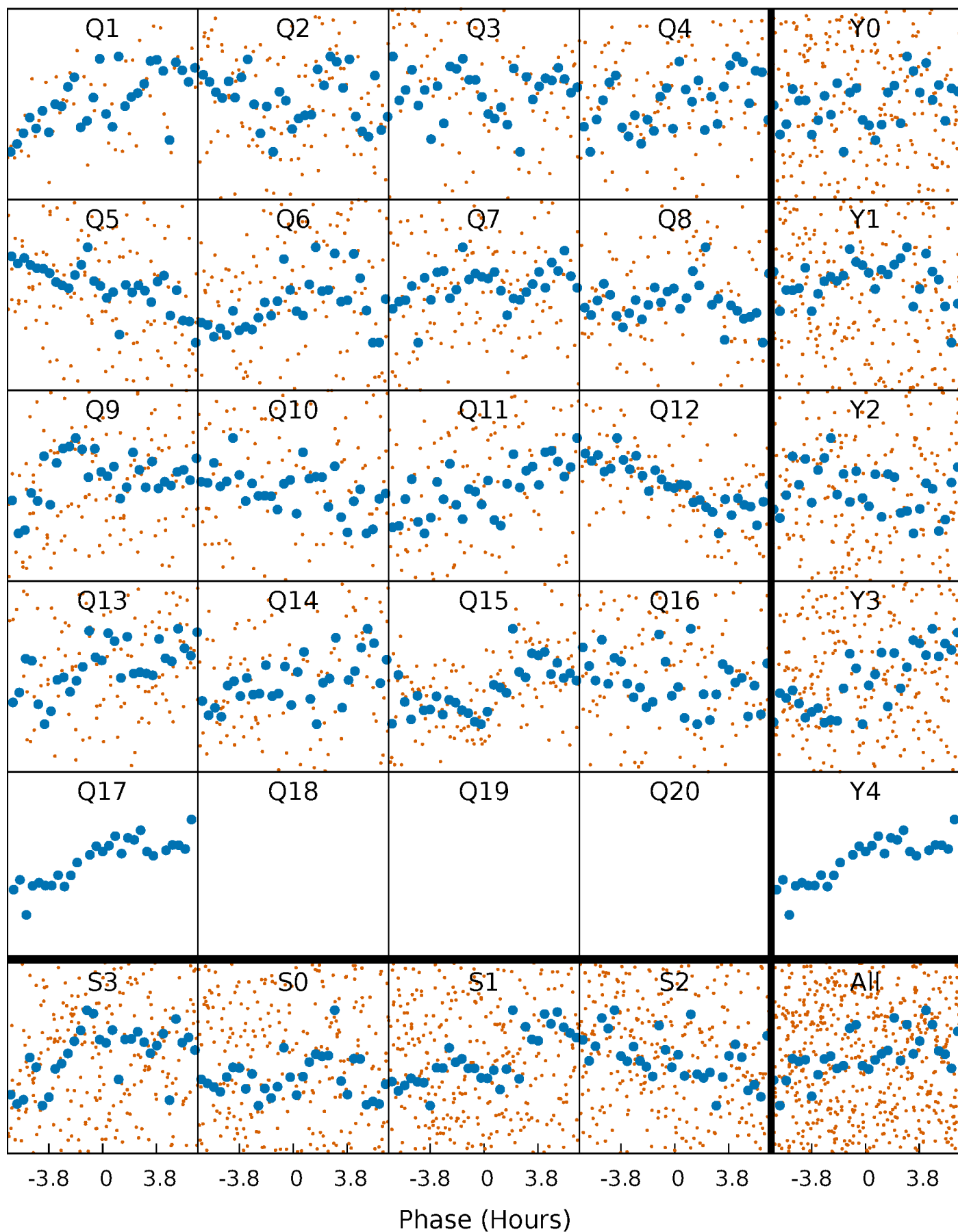


### Planet 5 : Phased Whitened Flux Time Series (Fit Epoch/Period)



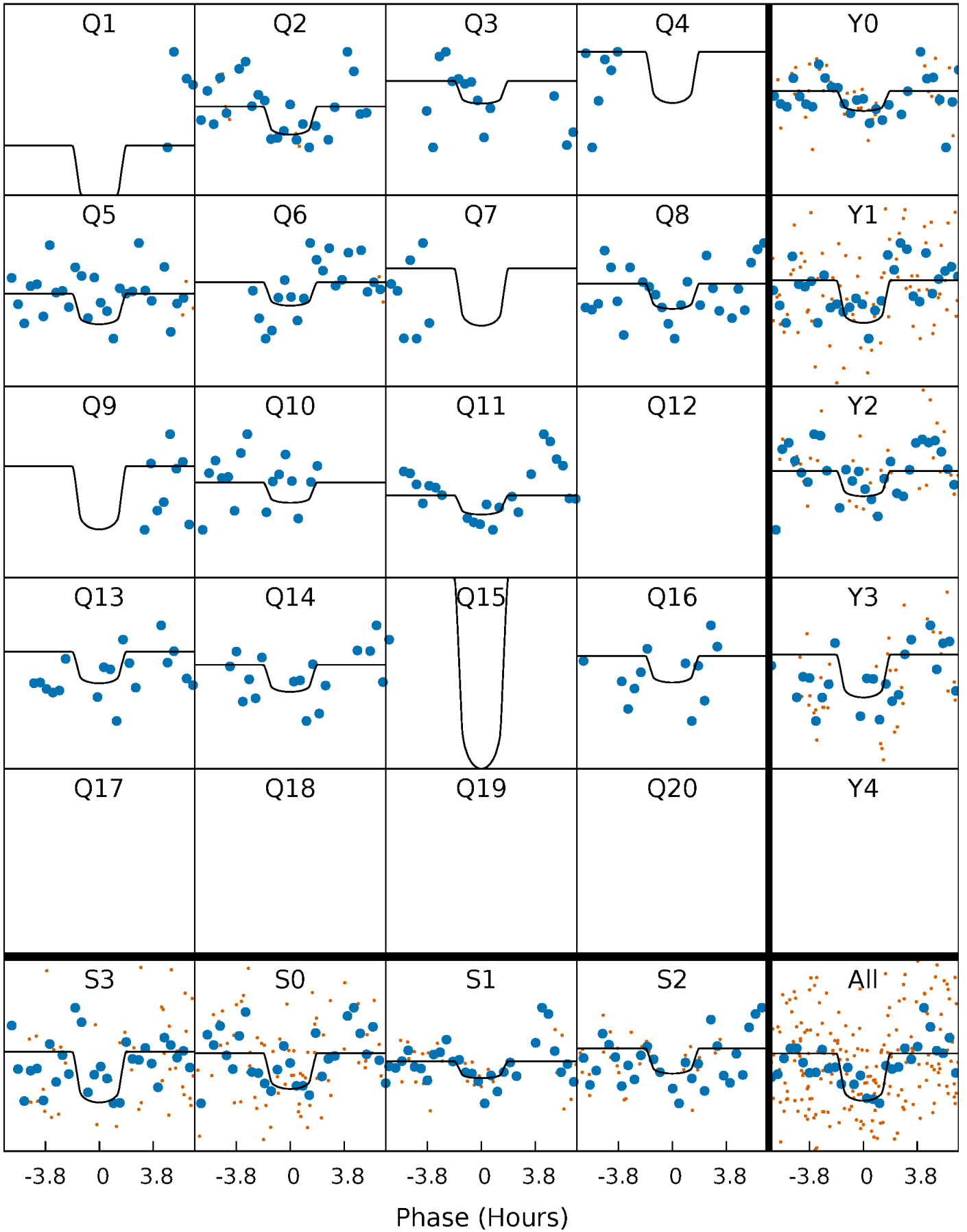
# PDC Quarter-Phased Transit Curves

TCE 004139351-05 P= 17.992676 Days  $T_0=143.020549$  (BKJD)



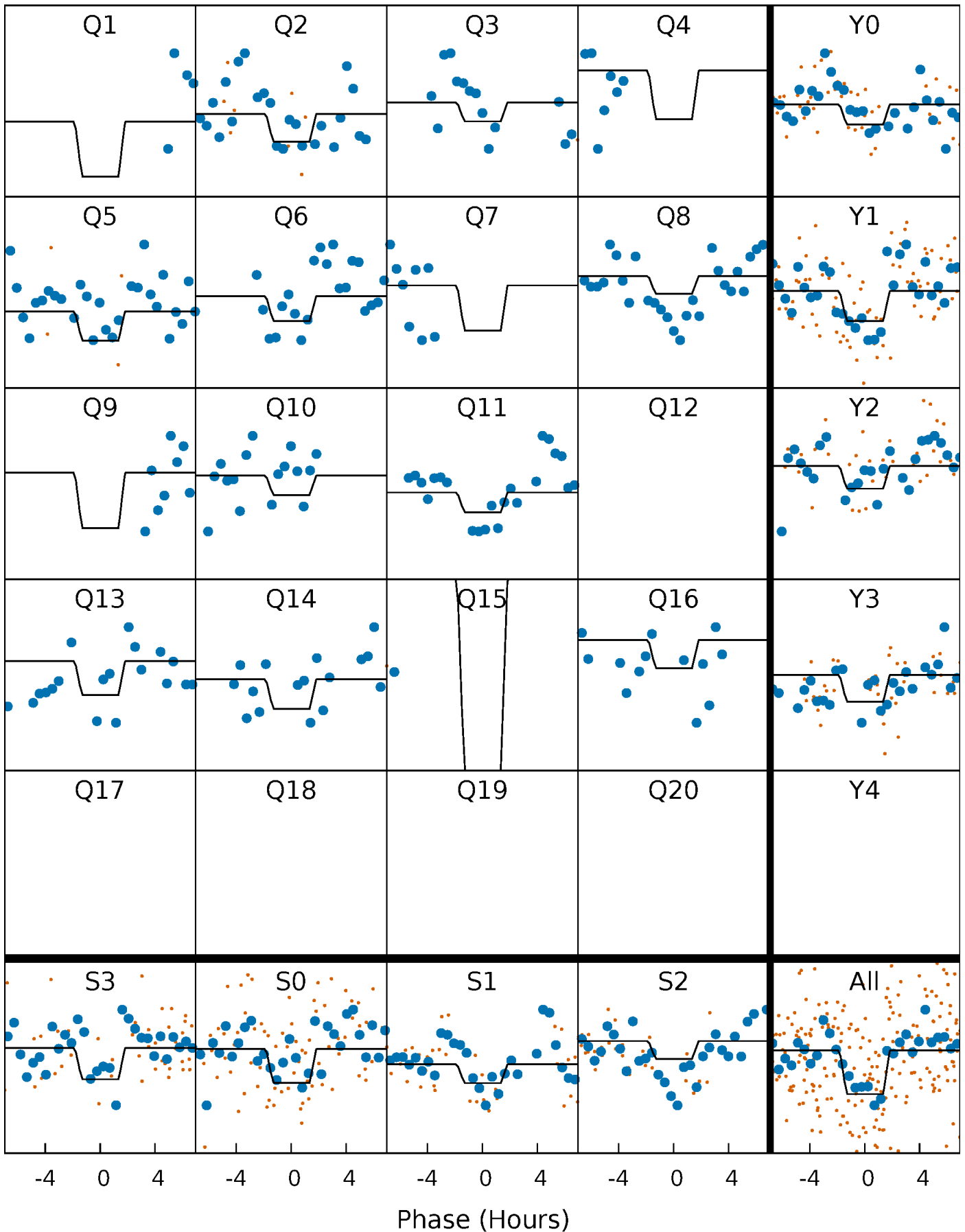
# DV Quarter-Phased Transit Curves

TCE 004139351-05   P= 17.992676 Days    $T_0=143.020549$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

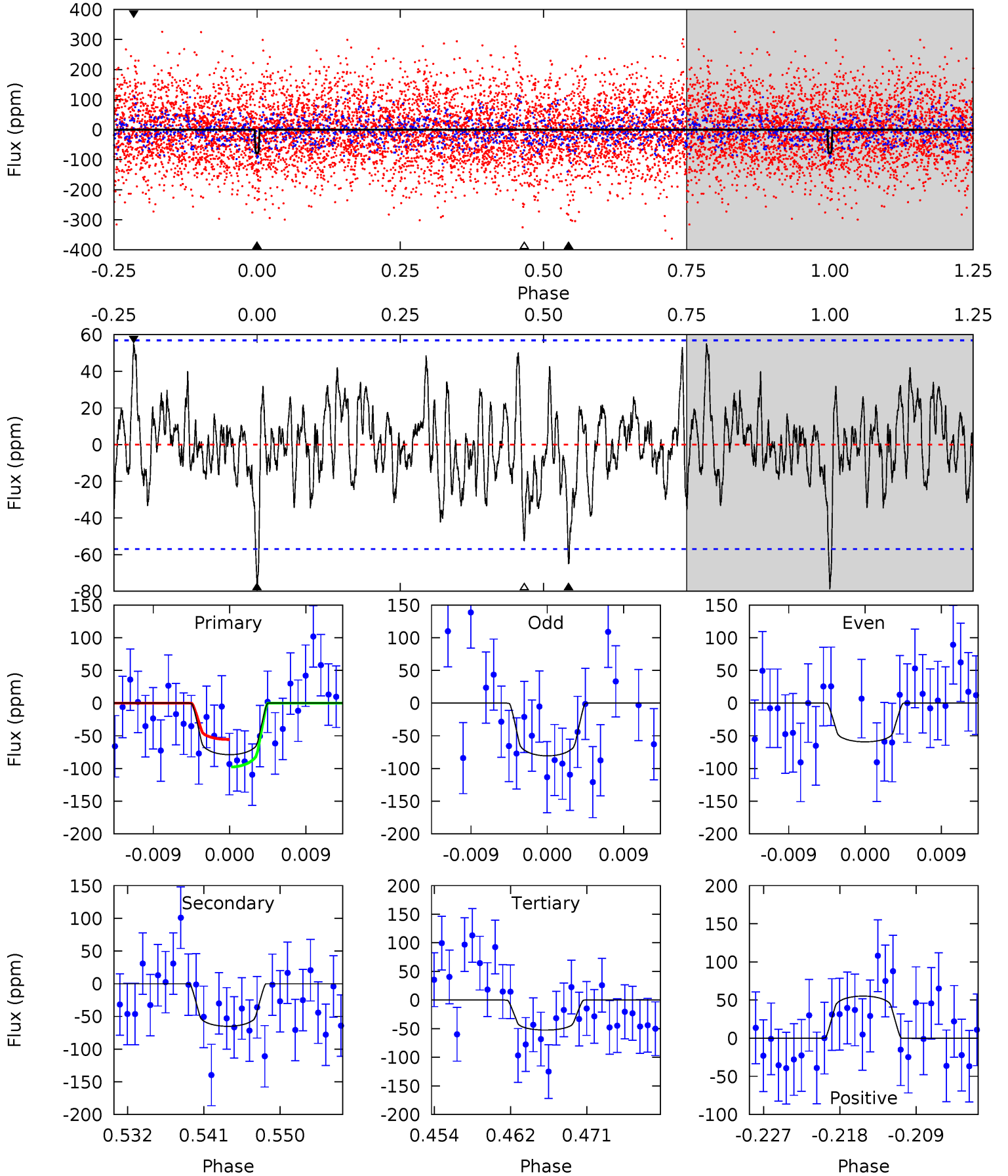
TCE 004139351-05     $P = 17.992723$  Days     $T_0 = 143.014567$  (BKJD)



# DV Model-Shift Uniqueness Test

004139351-05,  $P = 17.992676$  Days,  $E = 125.027873$  Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
7.00	5.78	4.66	4.90	5.05	2.62	1.55	2.35	2.10	1.12	0.88	0.62	0.84	0.41	1.87

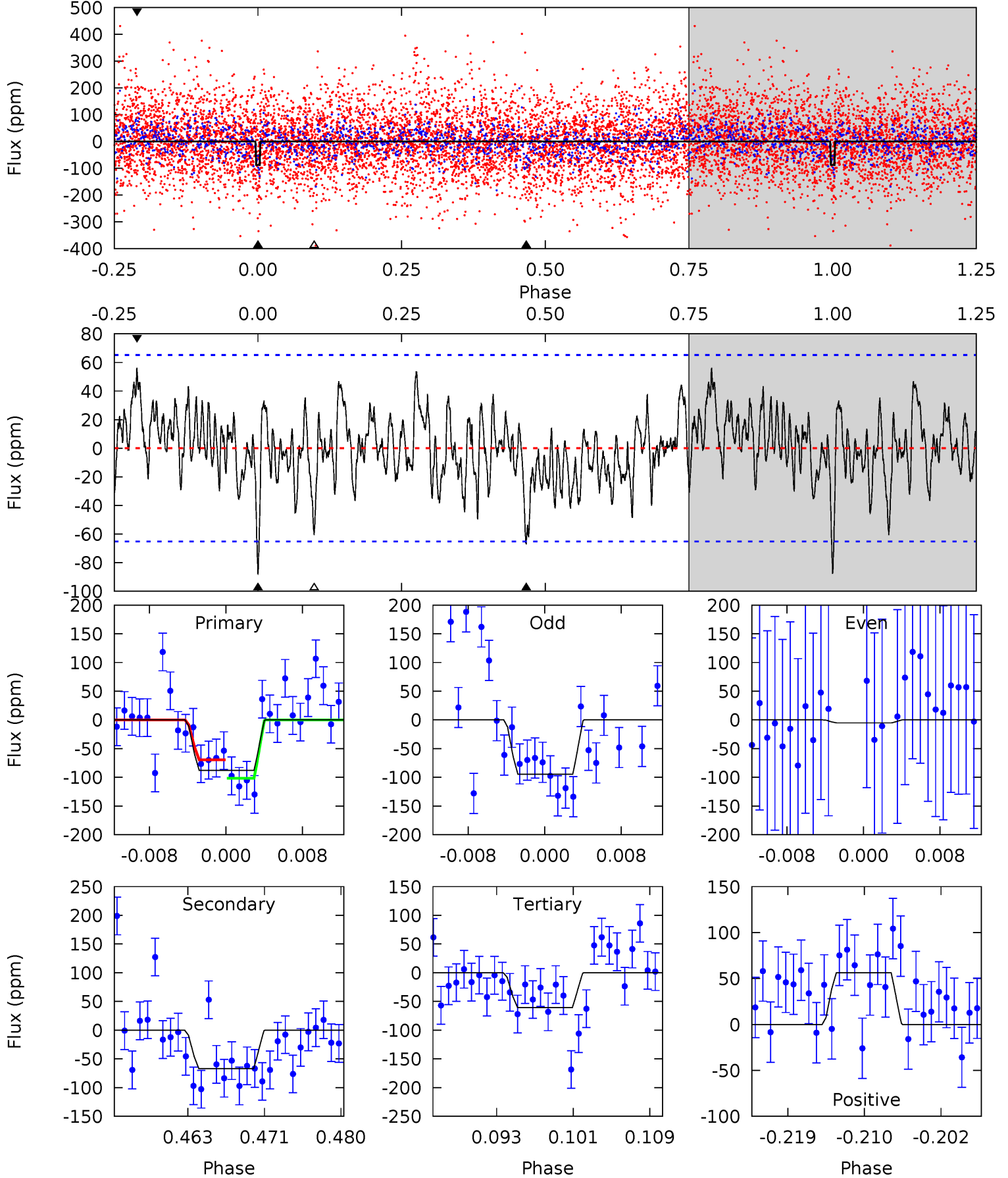




# Alt Model-Shift Uniqueness Test

004139351-05,  $P = 17.992723$  Days,  $E = 125.021844$  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
6.81	5.21	4.71	4.37	5.06	2.64	1.55	2.10	2.45	0.50	0.84	2.02	1.17	0.39	1.24



### Stellar Parameters For KIC 004139351

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$7027^{+183}_{-224}$	$3.799^{+0.292}_{-0.097}$	$-0.400^{+0.300}_{-0.250}$	$2.577^{+0.406}_{-0.879}$	$1.524^{+0.205}_{-0.308}$	$0.126^{+0.248}_{-0.038}$
	+3%/-3%	+8%/-3%	+75%/-62%	+16%/-34%	+13%/-20%	+197%/-30%
Source	PHO1	FLK73	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 004139351-05 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-65 \pm 11$	$3.09^{+2.23}_{-1.94}$	$1733^{+104}_{-153}$	$5783^{+4350}_{-1197}$	$94^{+551}_{-64}$
Alt.	$-67 \pm 13$	$3.02^{+1.84}_{-1.81}$	$1735^{+106}_{-145}$	$5955^{+3979}_{-1227}$	$97^{+489}_{-62}$

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

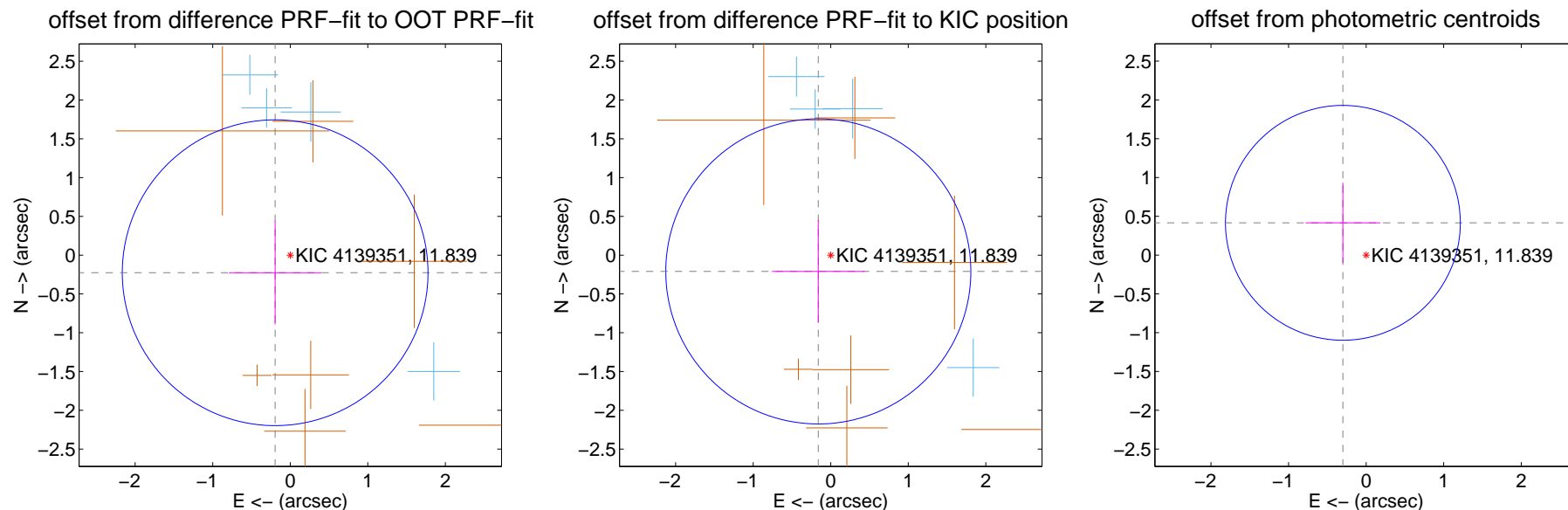
## DV Centroid Data

Supplemental centroid analysis for 004139351-05. **Kepler magnitude: 11.84.** Transit SNR 7.82

There are 4 quarters with good PRF difference image offsets

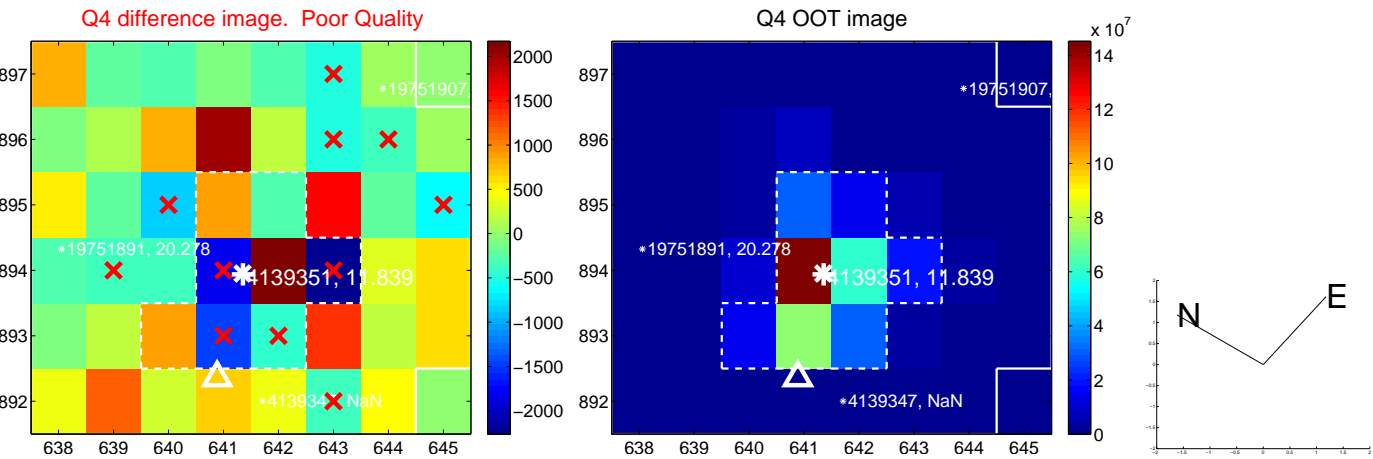
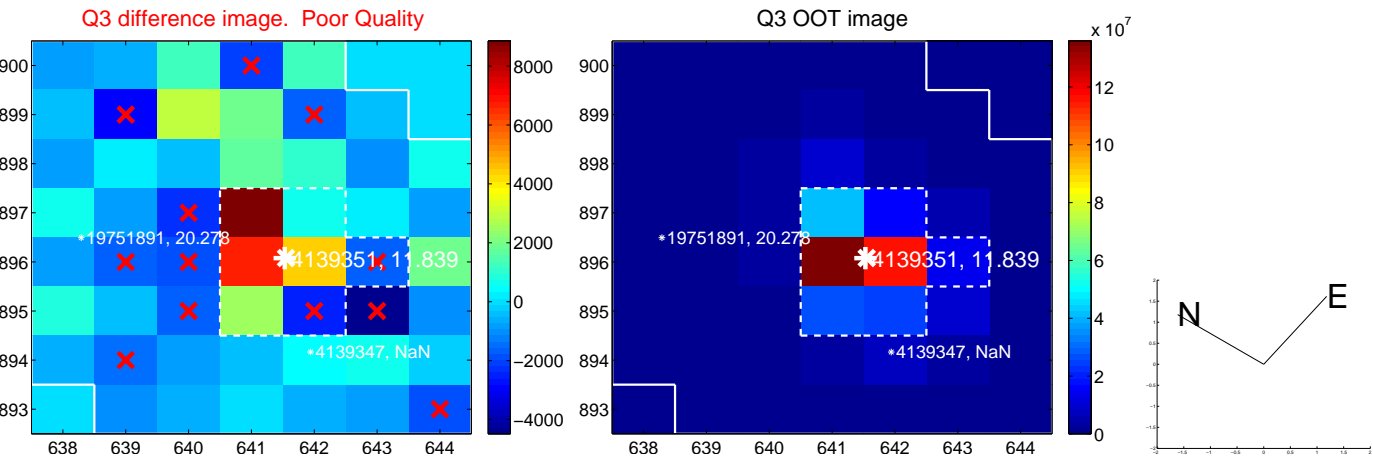
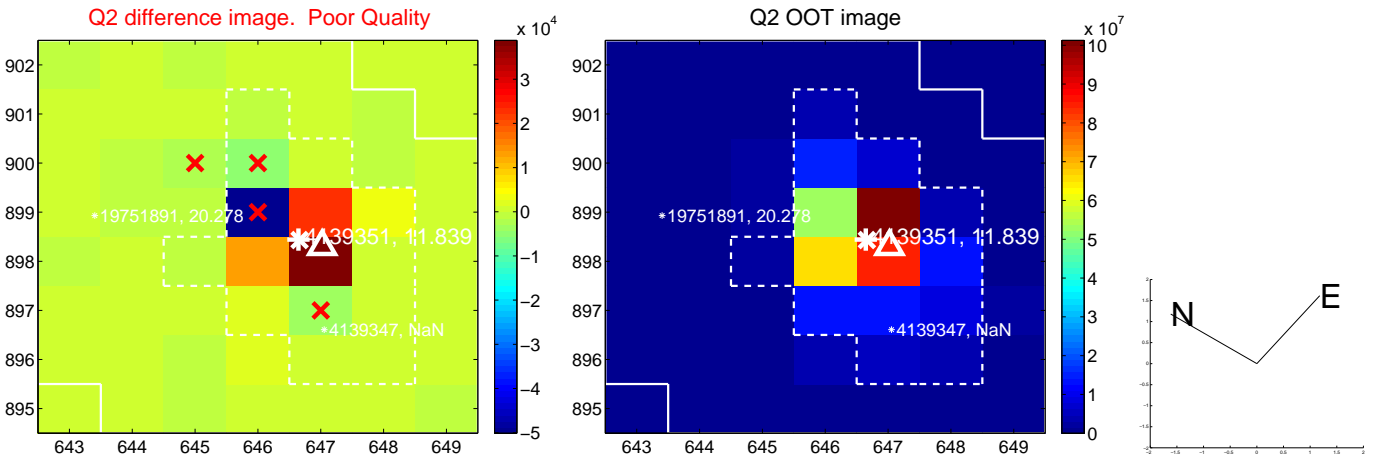
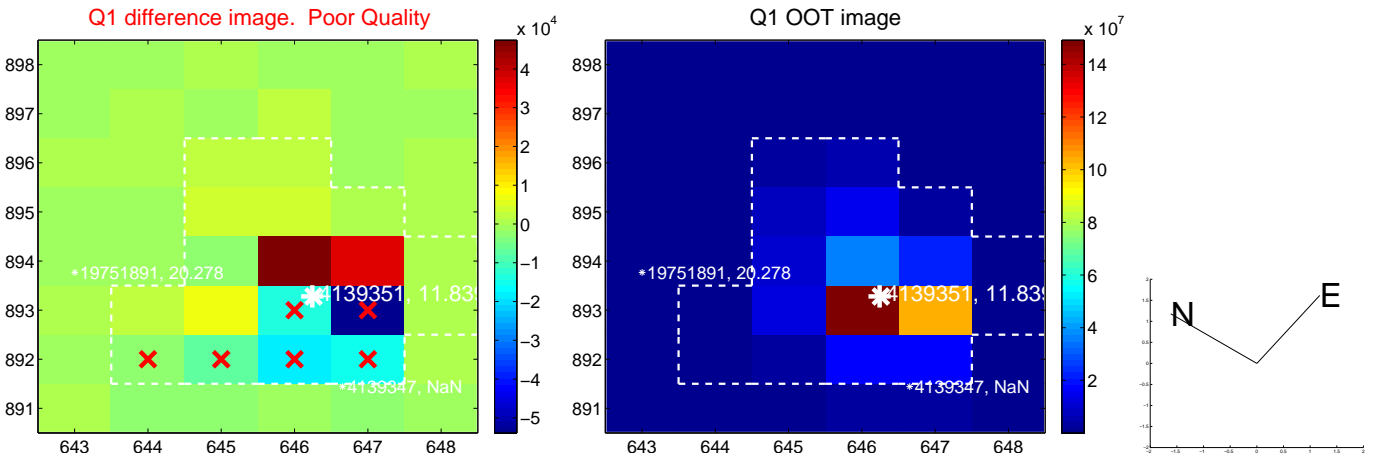
The direct PRF centroid is offset from the target star catalog position by about 0.07 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.299 \pm 0.657$	0.45	$0.195 \pm 0.596$	$-0.227 \pm 0.666$
PRF-fit source offset from KIC position	$0.264 \pm 0.656$	0.40	$0.160 \pm 0.598$	$-0.209 \pm 0.662$
photometric centroid source offset	$0.51 \pm 0.50$	1.02	$0.30 \pm 0.48$	$0.42 \pm 0.52$

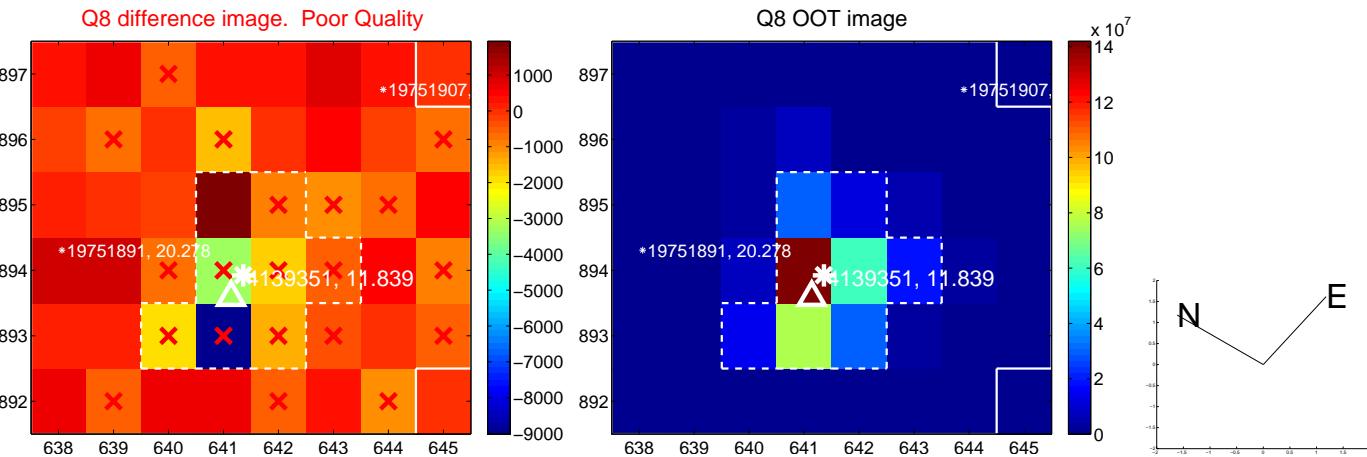
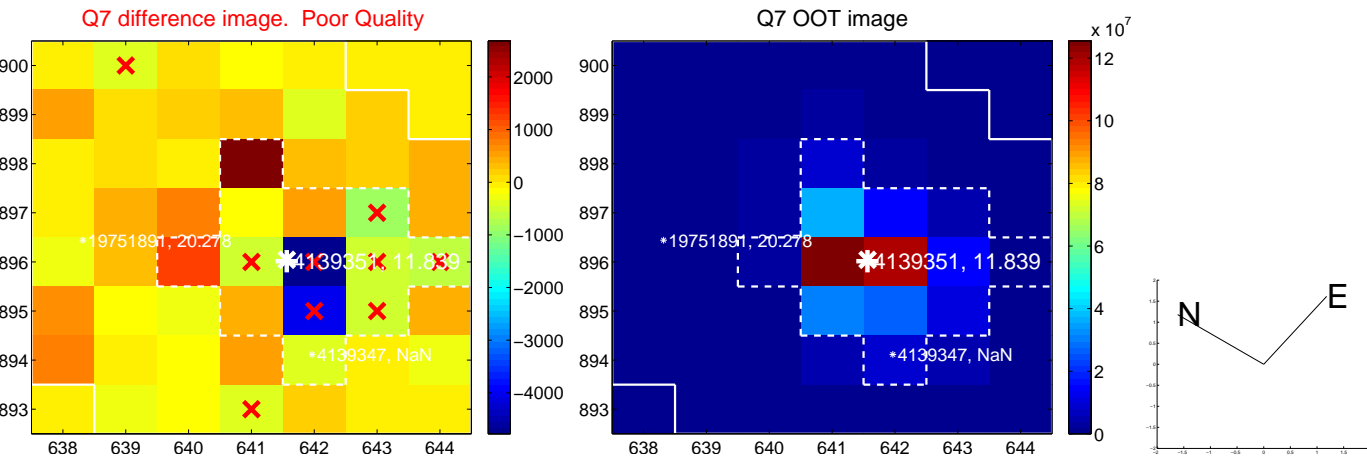
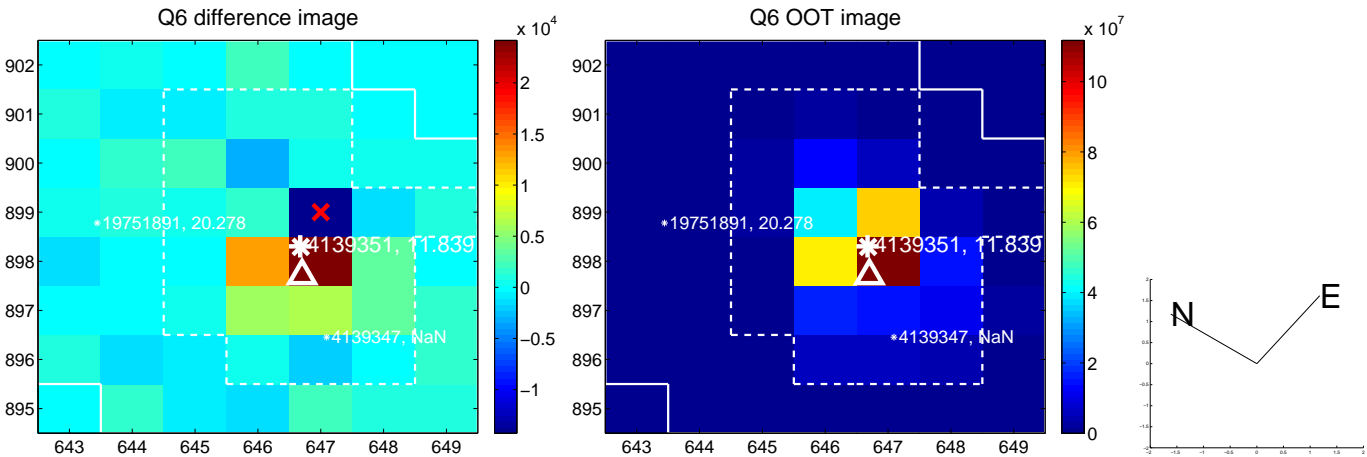
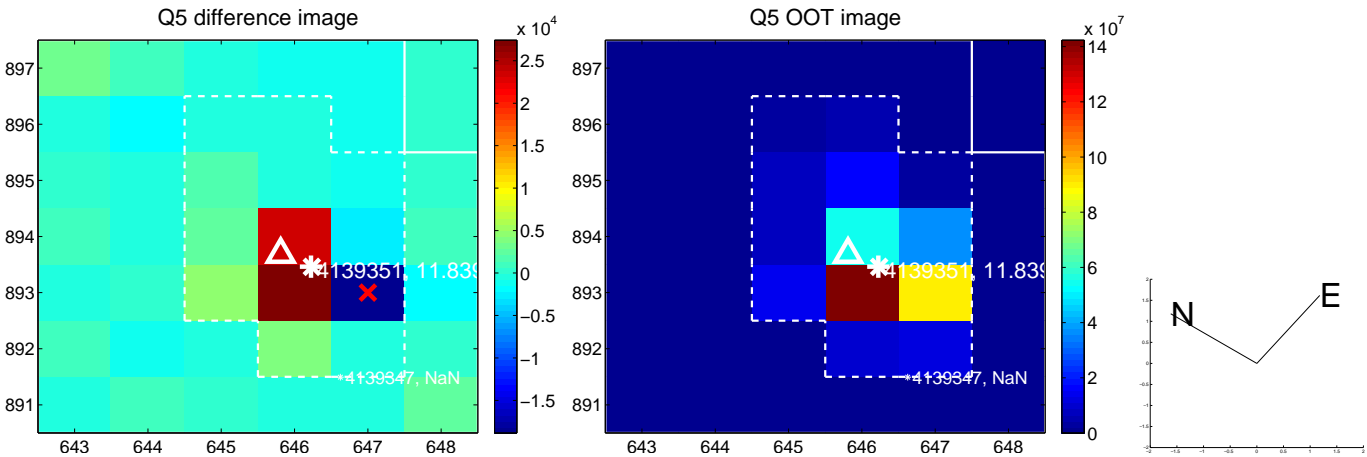


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

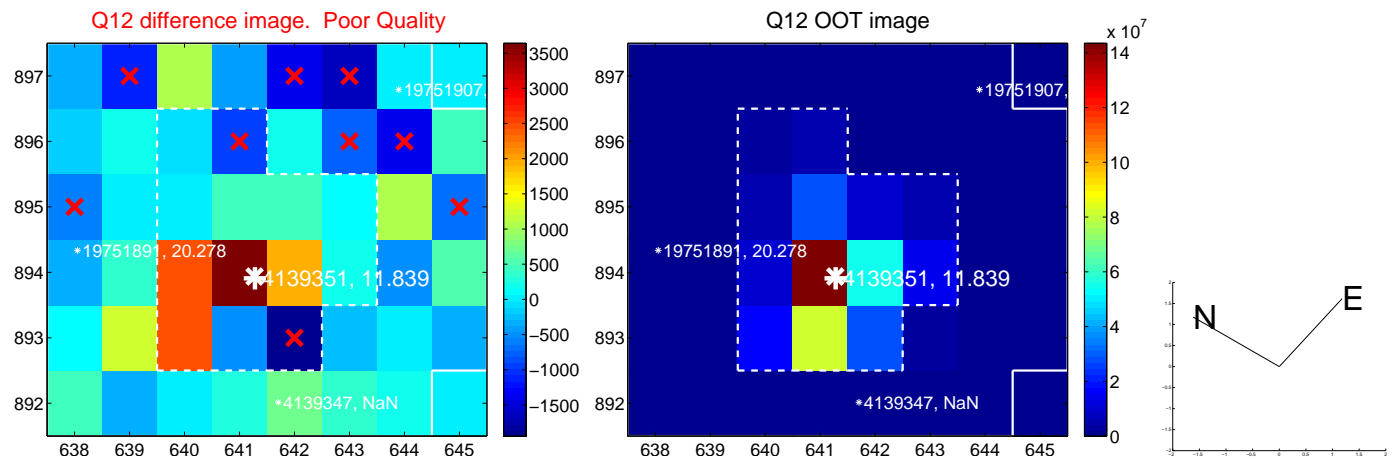
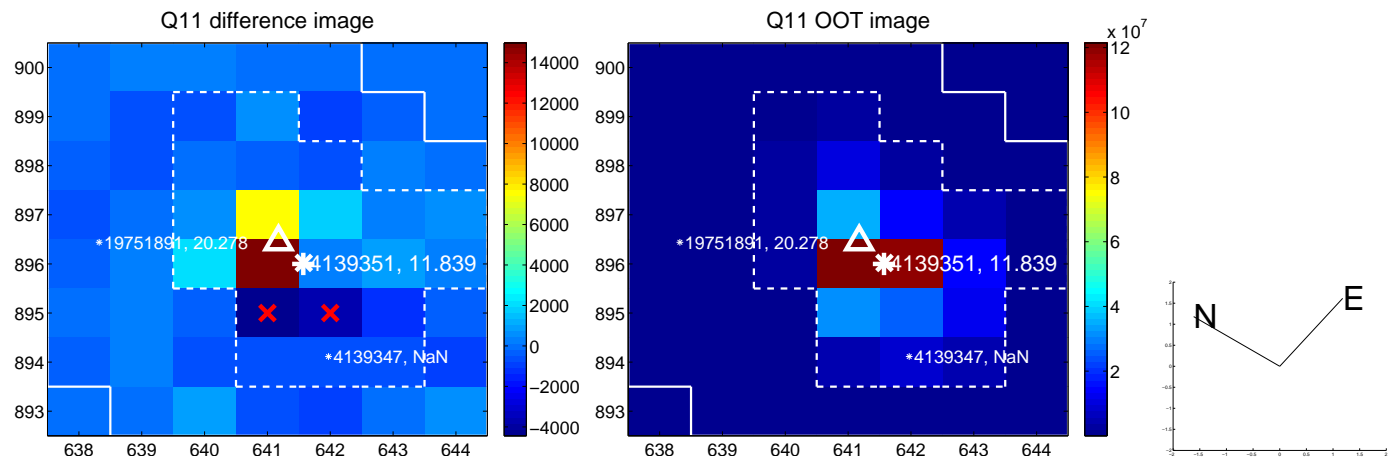
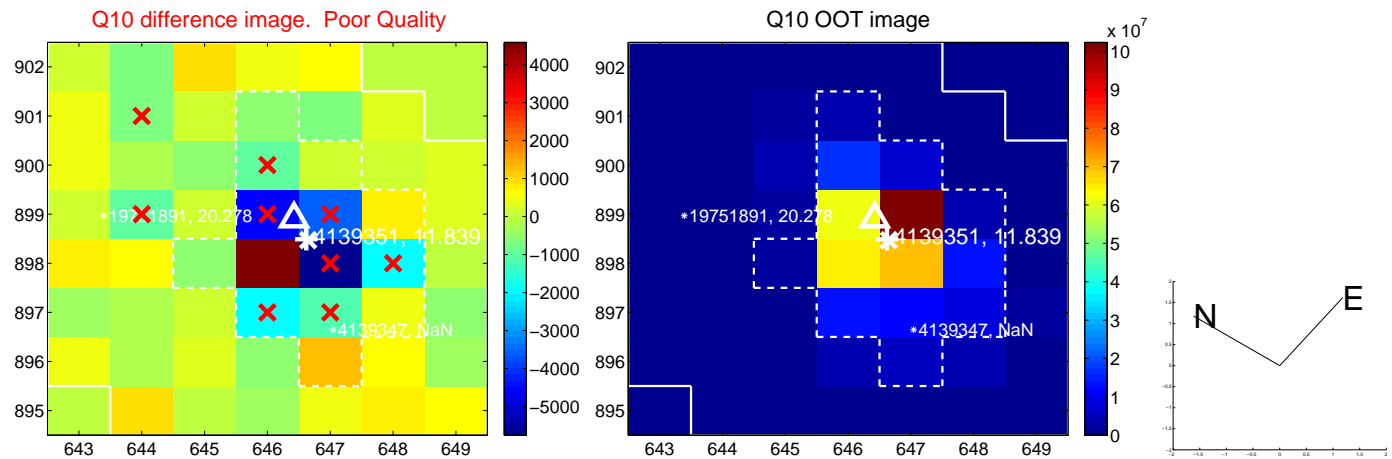
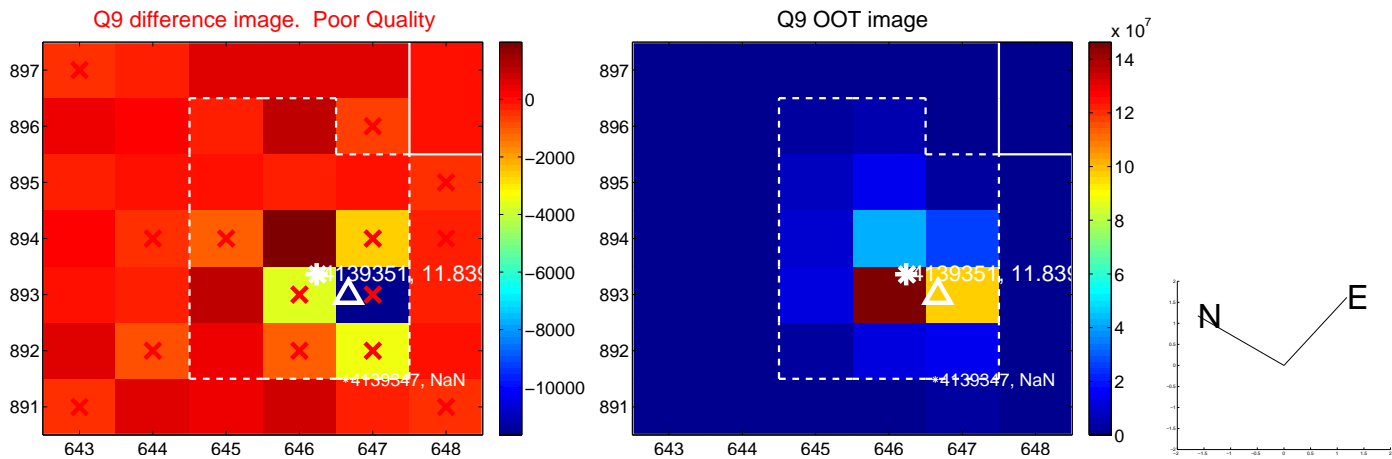
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

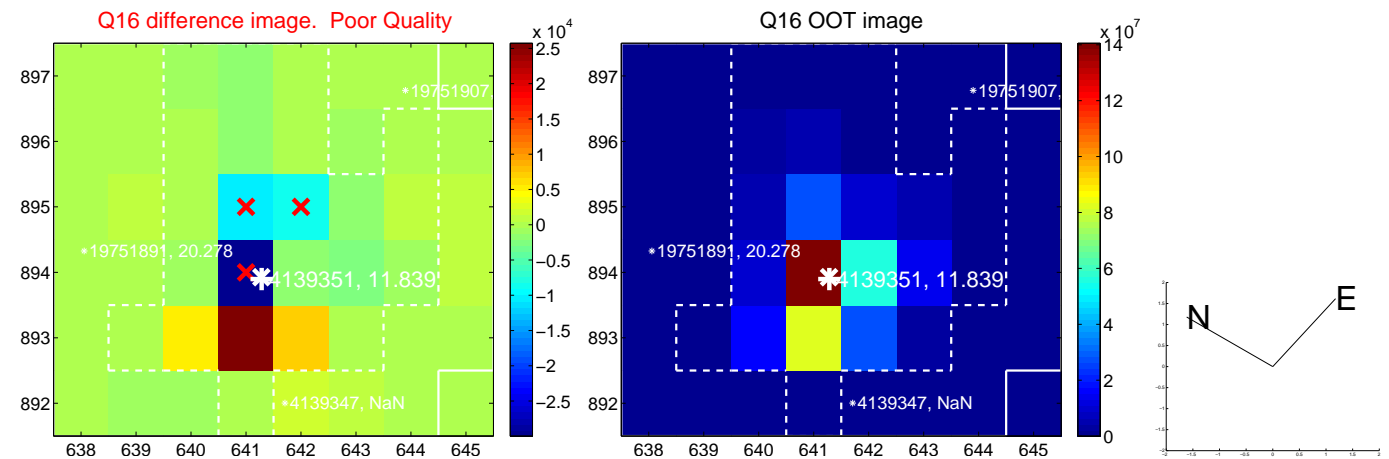
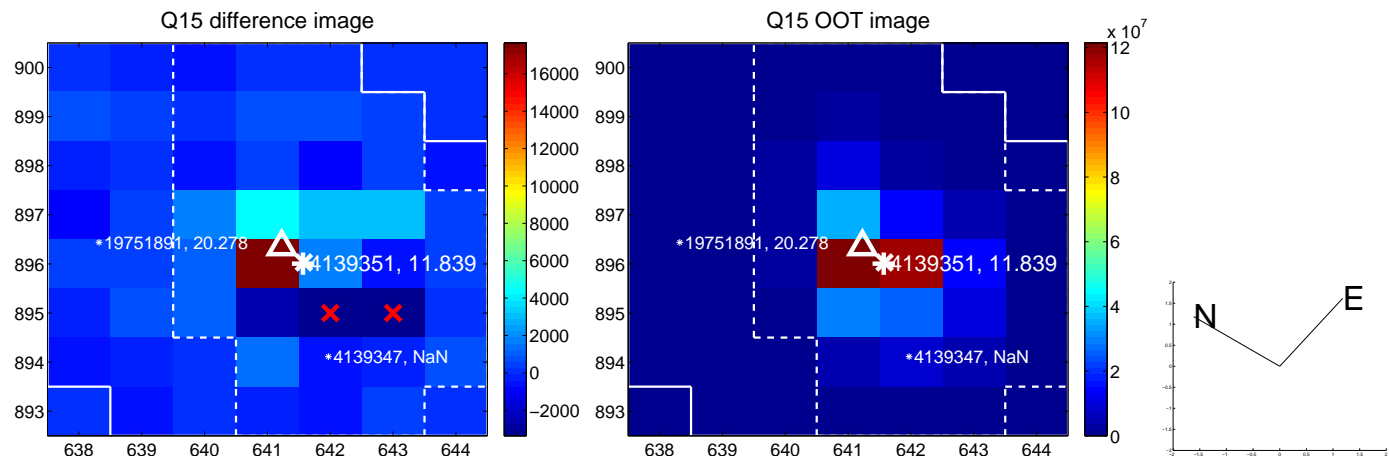
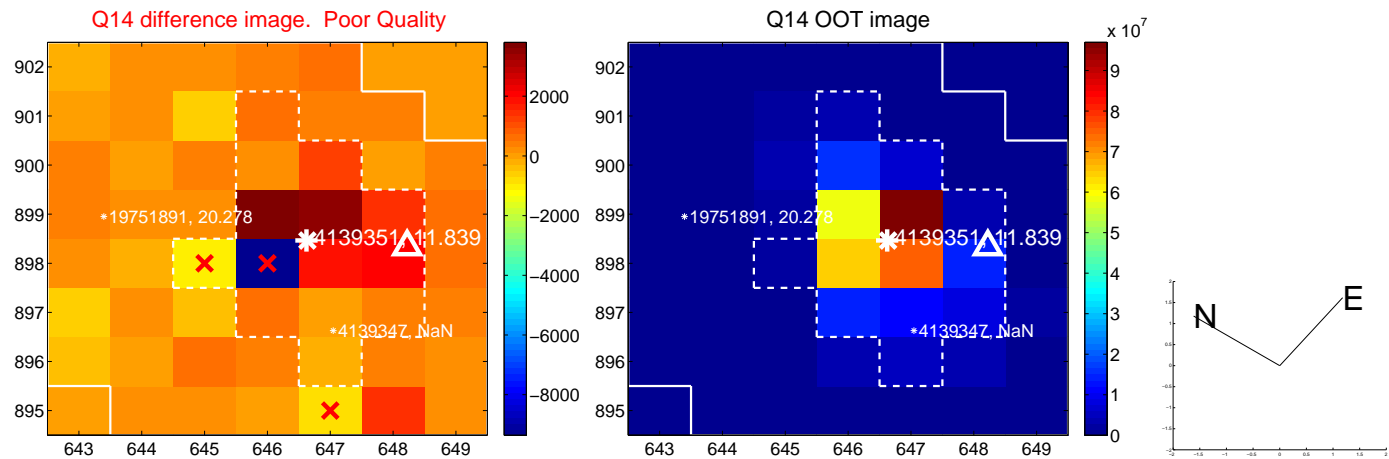
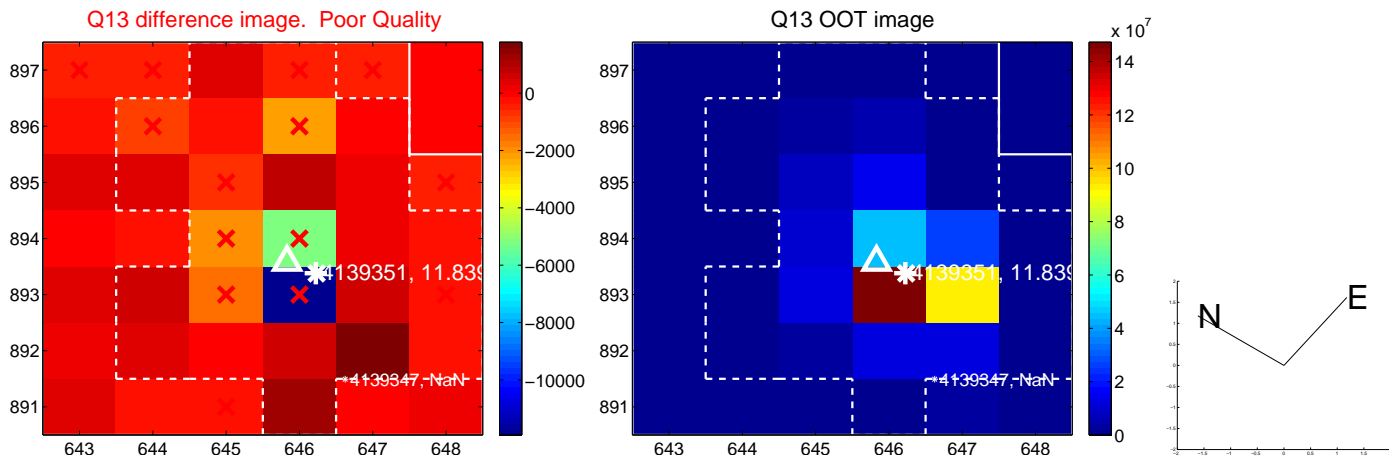


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

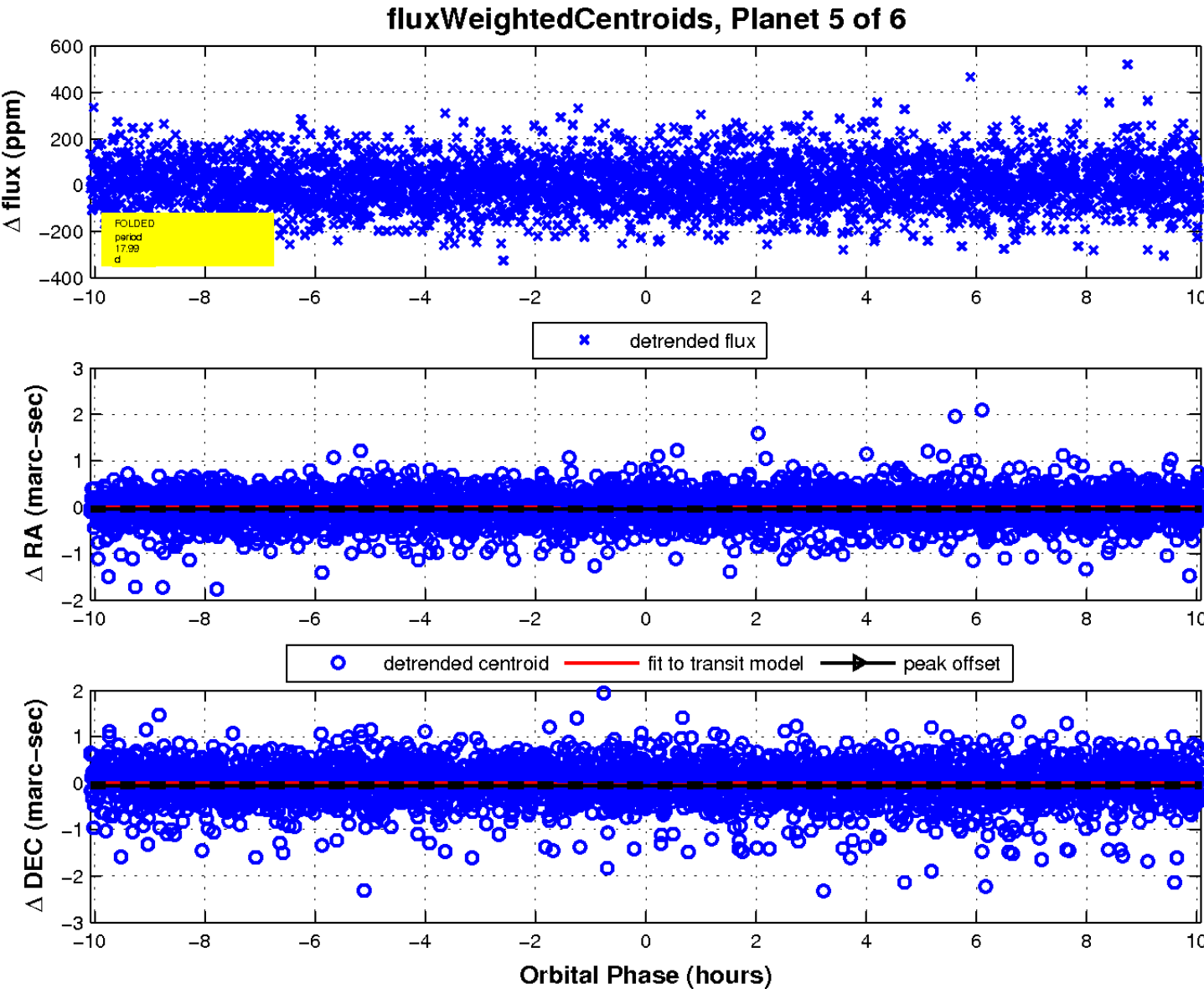
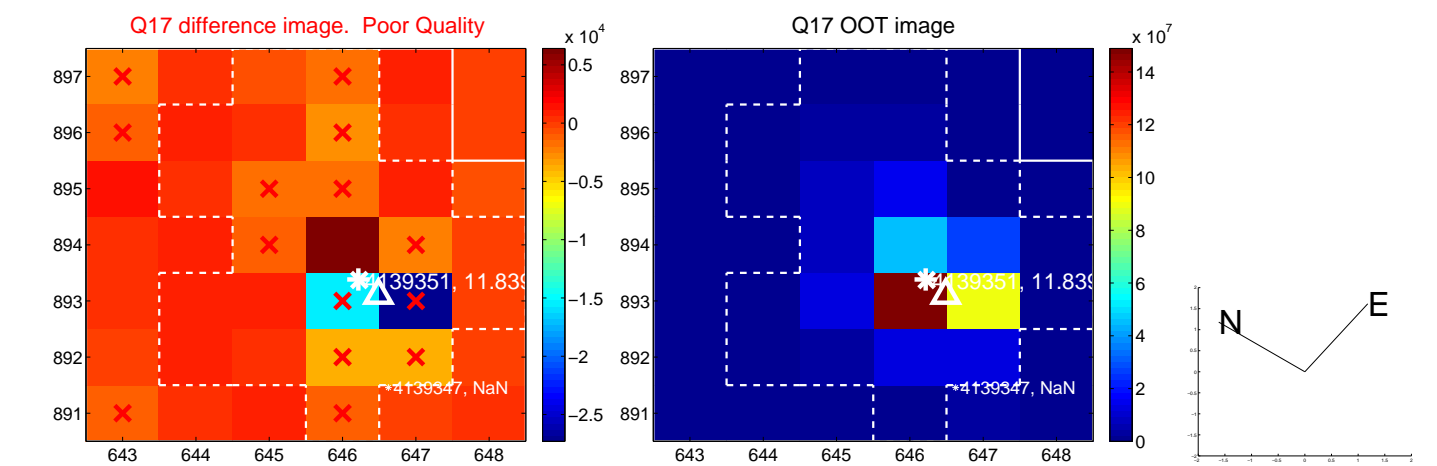




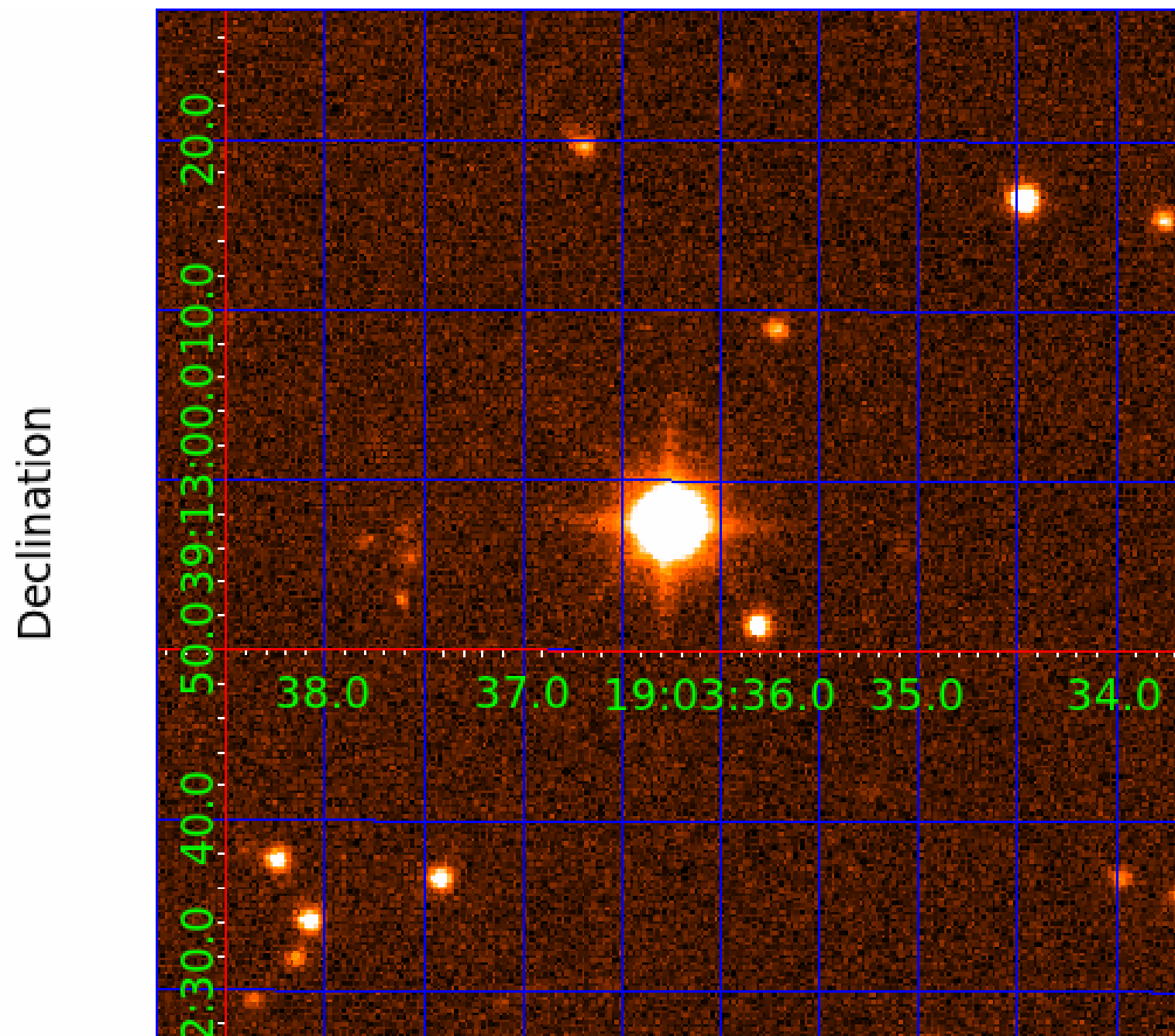
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



UKIRT Image



# KIC 004139351

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004139351-01	OBS	No	1.617618	131.758437	24.6	5.067	11.9	11.7	2.58	7027	1.76	15050.44
004139351-02	OBS	No	1.617457	132.792667	7.7	7.220	10.2	5.2	2.58	7027	0.75	15052.44
004139351-03	OBS	No	33.348582	156.166187	151.0	3.824	9.3	9.3	2.58	7027	3.70	266.24
004139351-04	OBS	No	23.702619	144.250944	140.8	1.388	8.2	8.0	2.58	7027	3.10	419.75
004139351-05	OBS	No	17.992676	143.020549	94.1	3.360	8.5	7.8	2.58	7027	2.87	606.16
004139351-06	OBS	No	26.531520	151.986211	145.8	3.530	7.9	7.6	2.58	7027	3.63	361.16

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004139351-01	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
004139351-02	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD
004139351-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
004139351-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
004139351-05	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_ZUMA—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_FEW_MEAS
004139351-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_POS_ALT—CENT_FEW_DIFFS

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

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

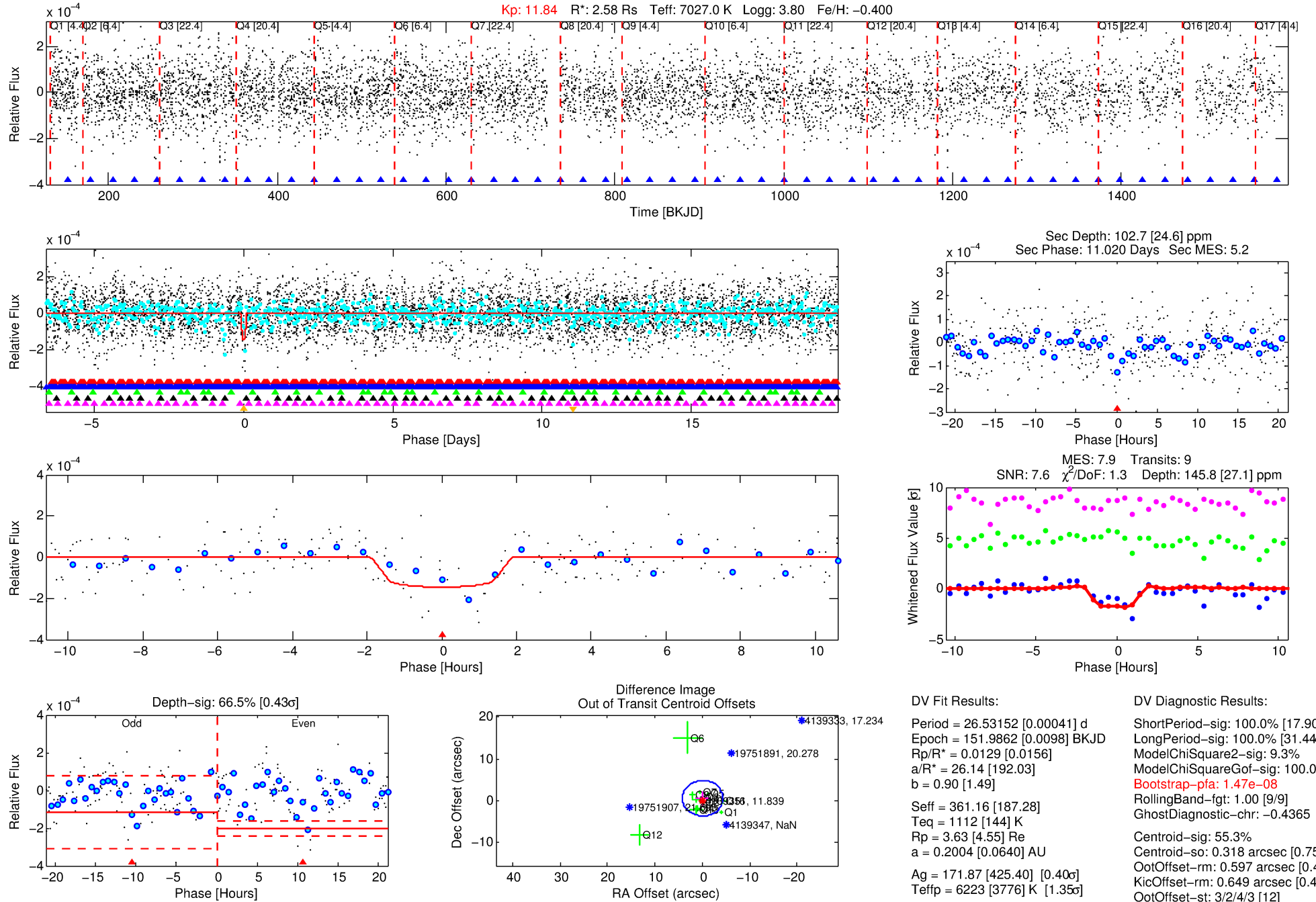
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 004139351-06

No Significant Match Found

# DV One-Page Summary

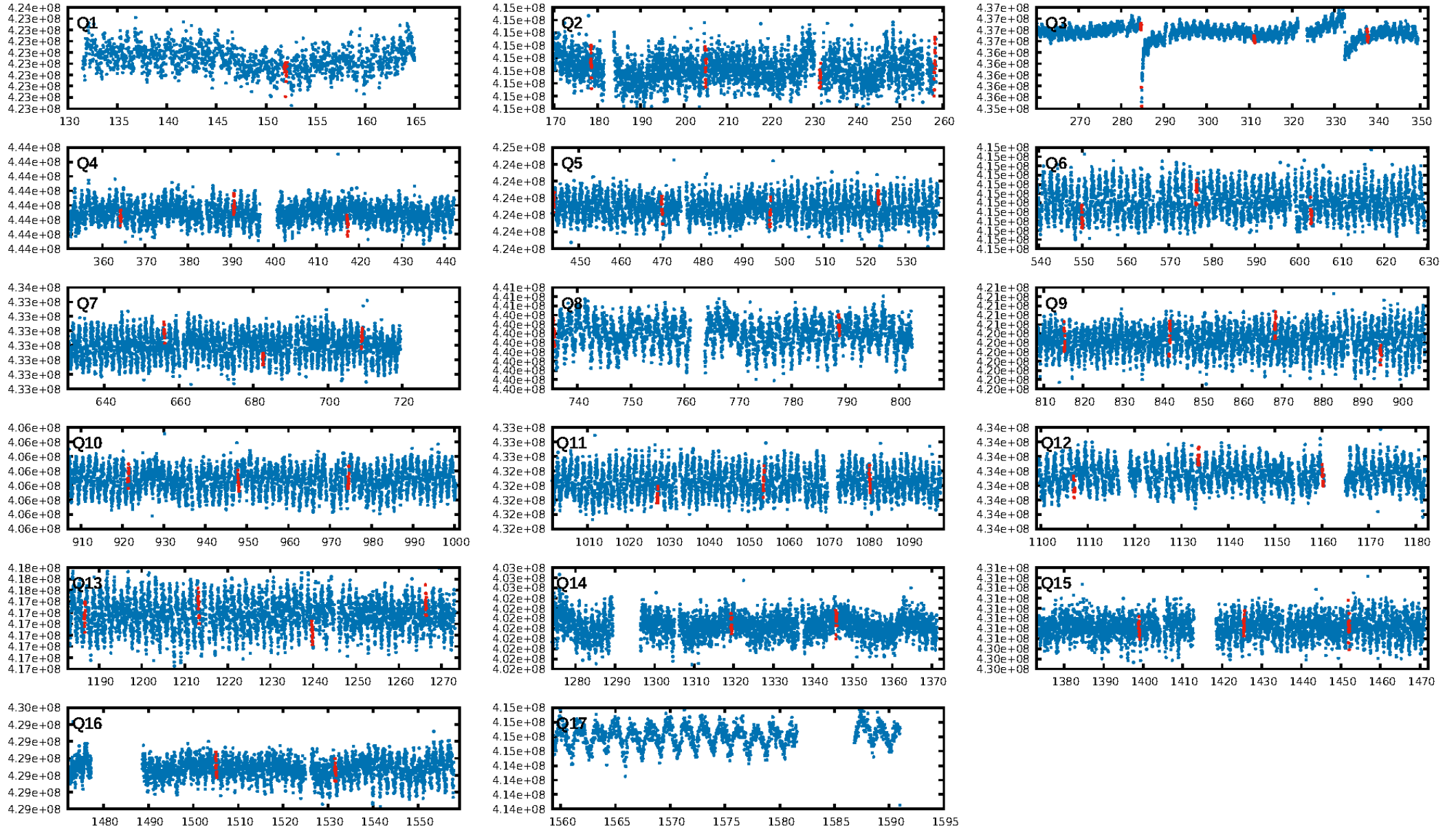
KIC: 4139351 Candidate: 6 of 6 Period: 26.532 d



Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 02-Feb-2016 09:19:44 Z

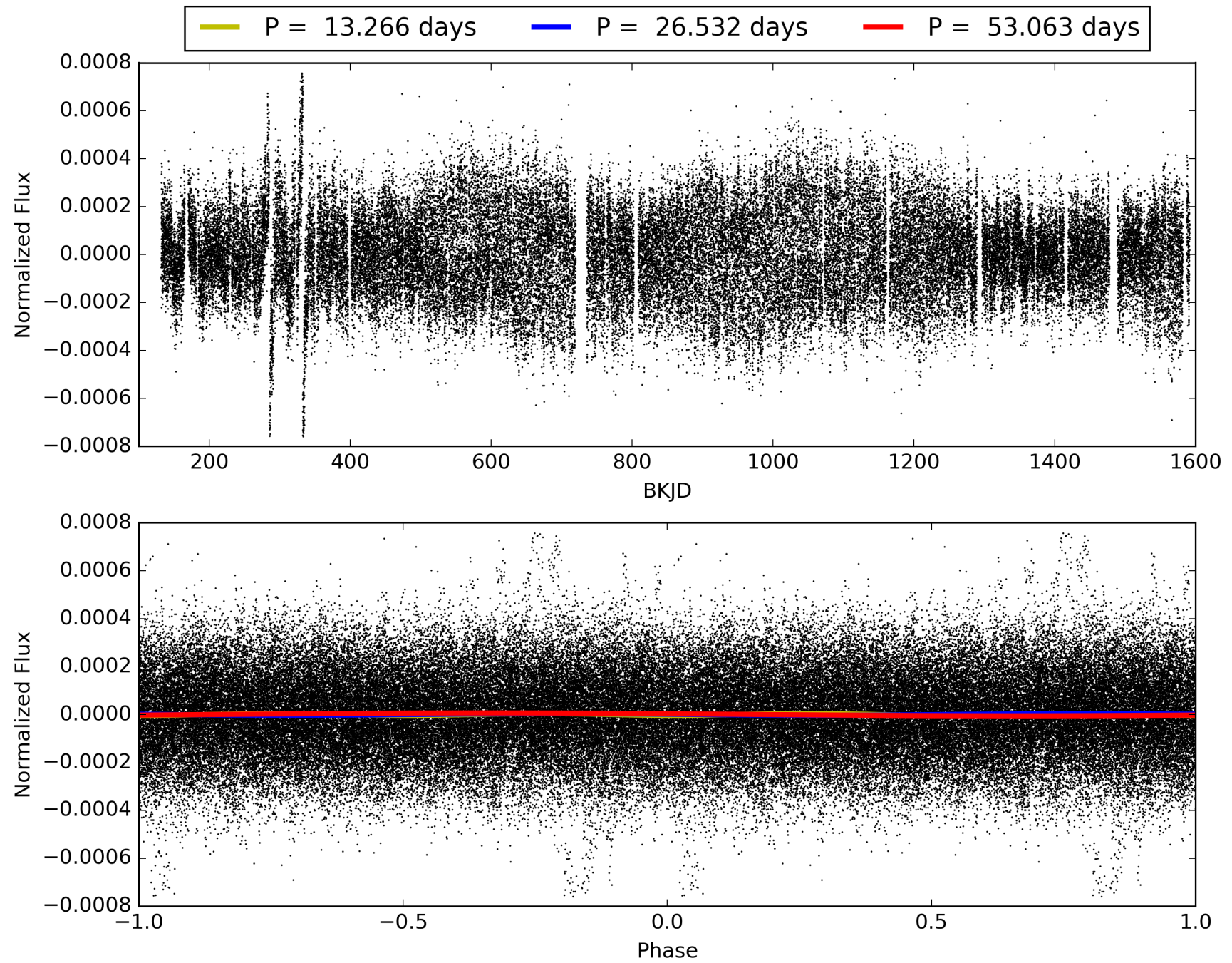
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 004139351-06, PDC Light Curves



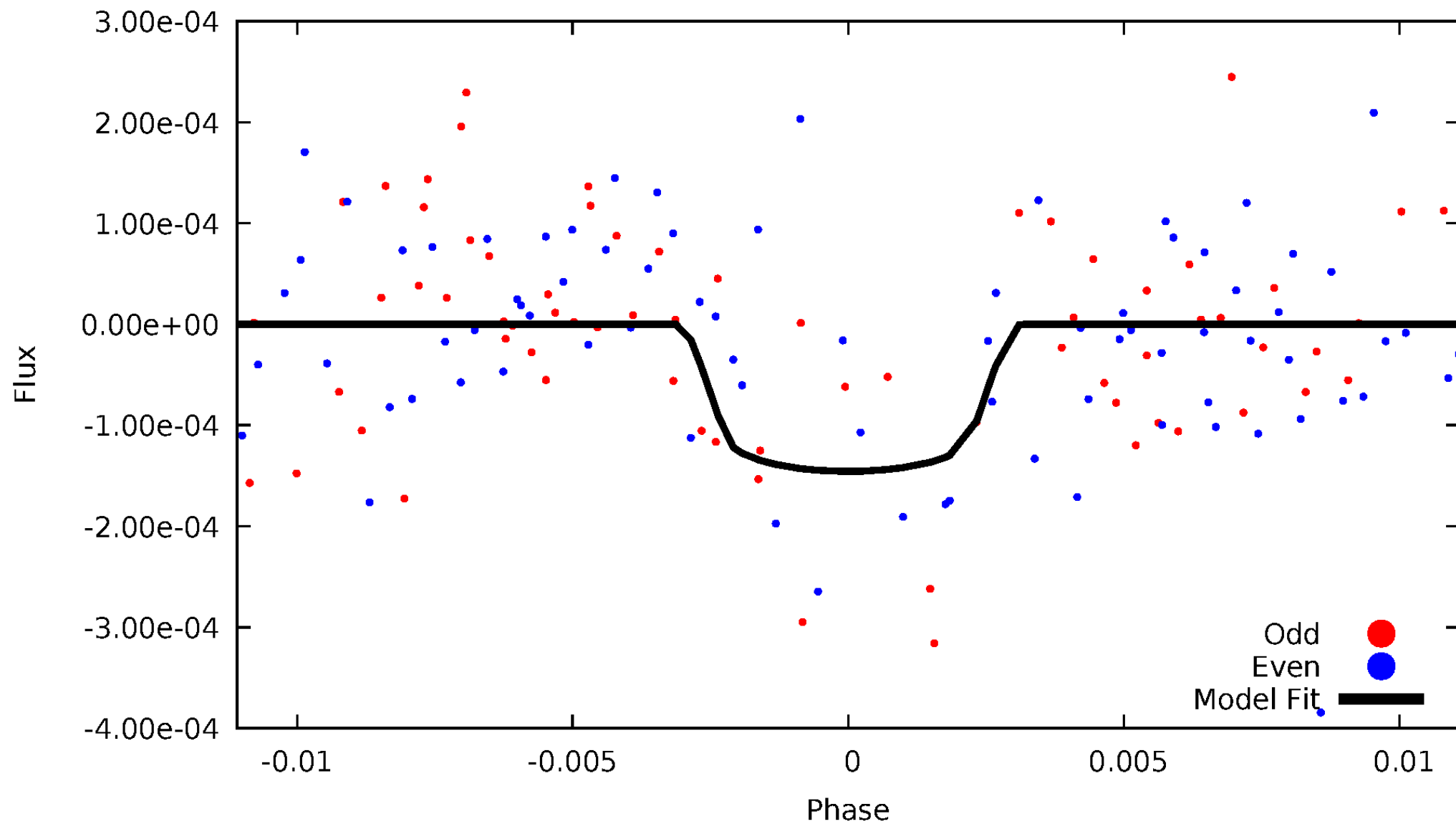


# TCE 004139351-06



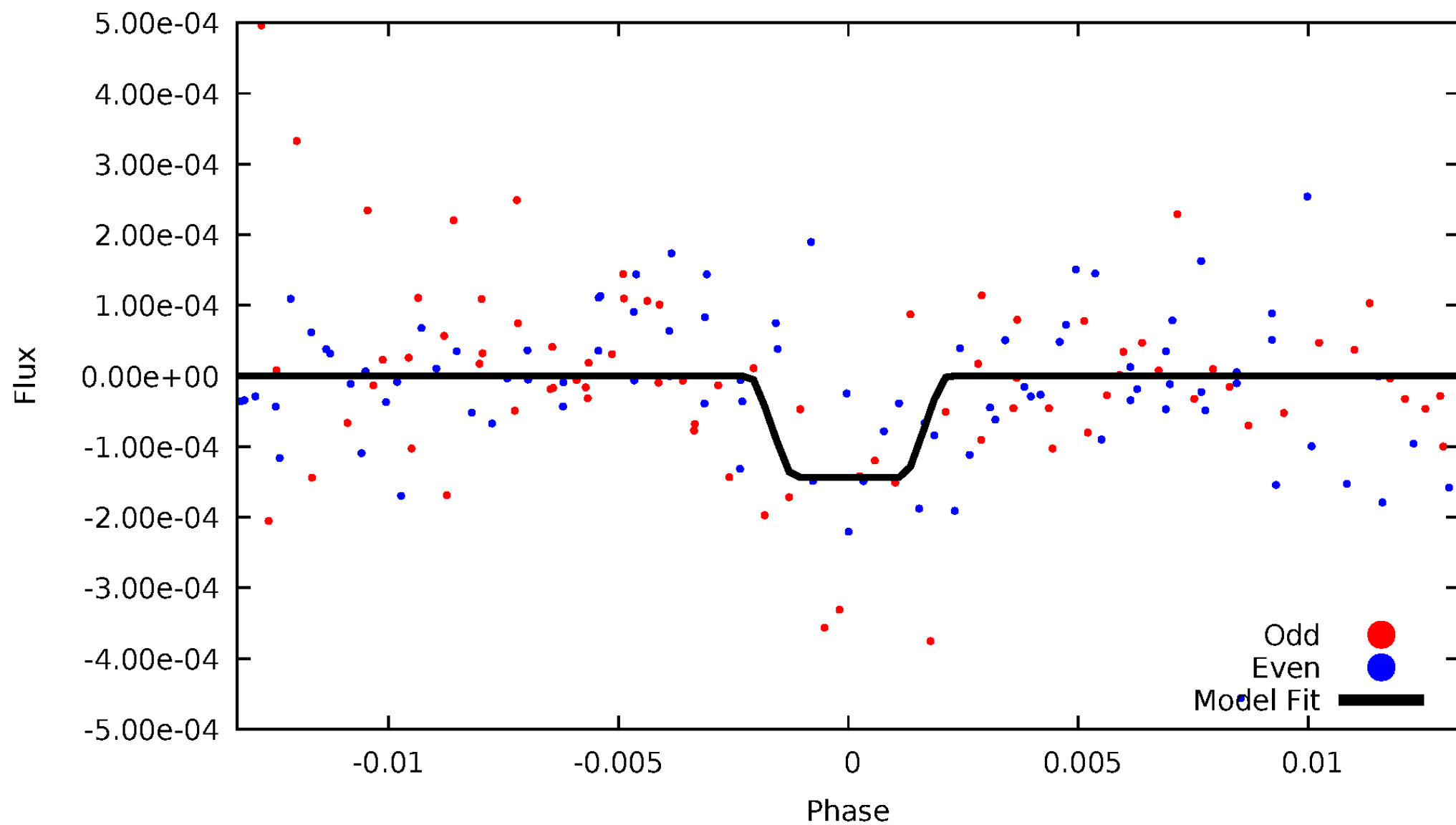
# DV Odd/Even

TCE 004139351-06



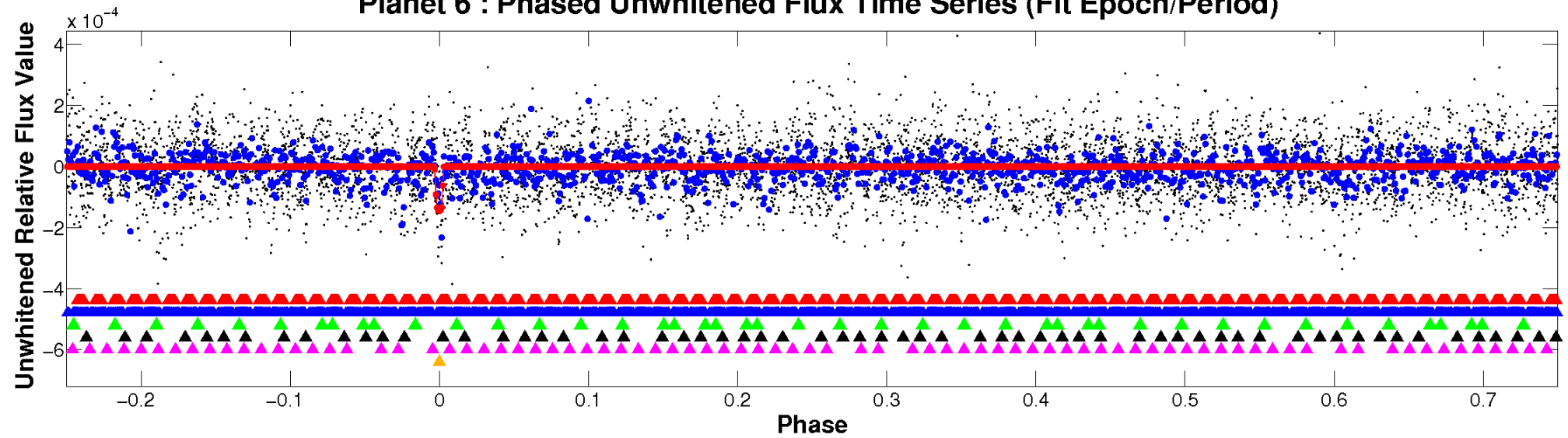
# ALT Odd/Even

TCE 004139351-06

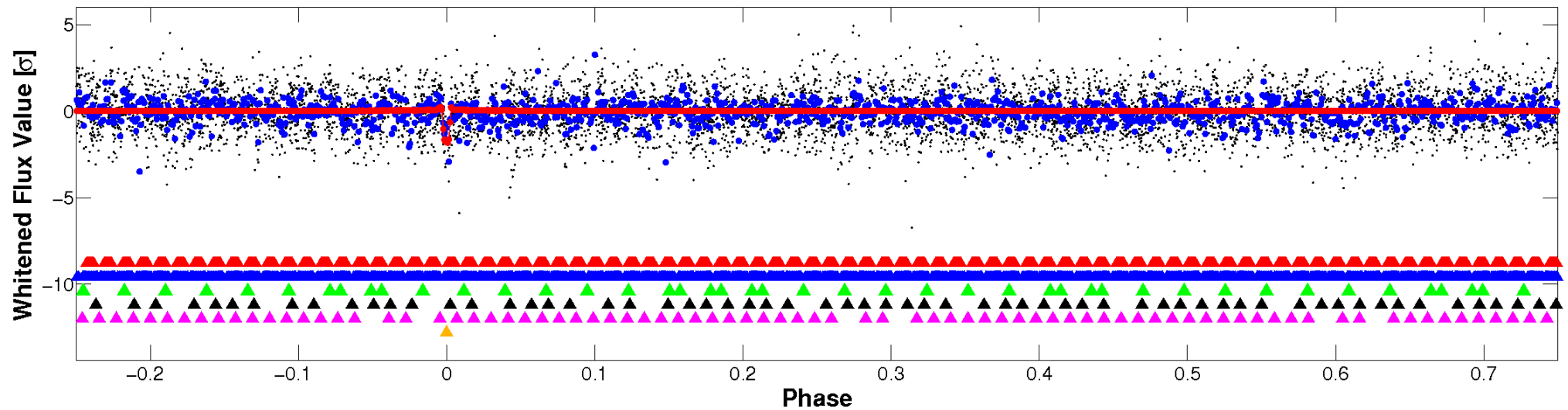


# Non-Whitened Vs. Whitened Light Curve

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

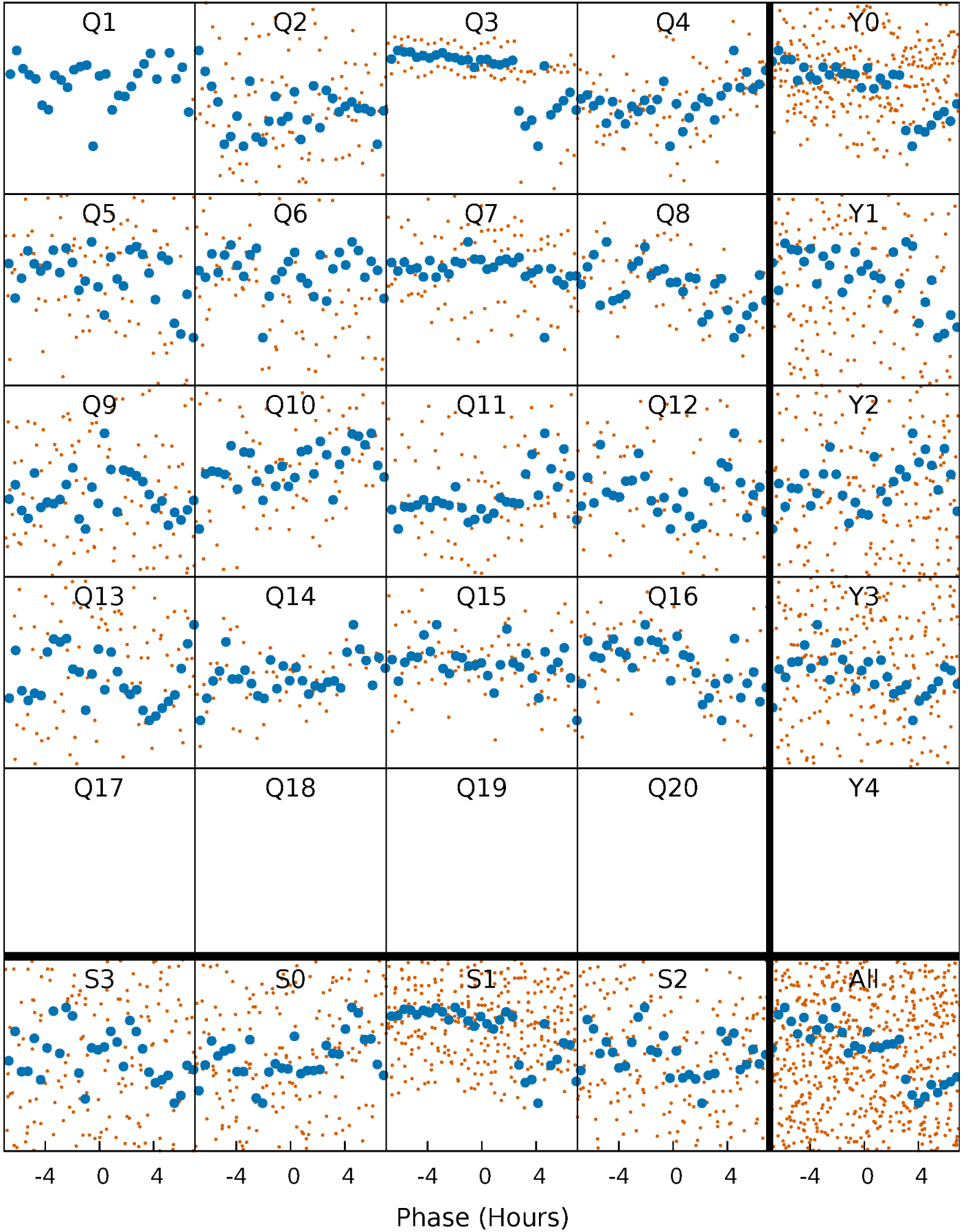


## Planet 6 : Phased Whitened Flux Time Series (Fit Epoch/Period)



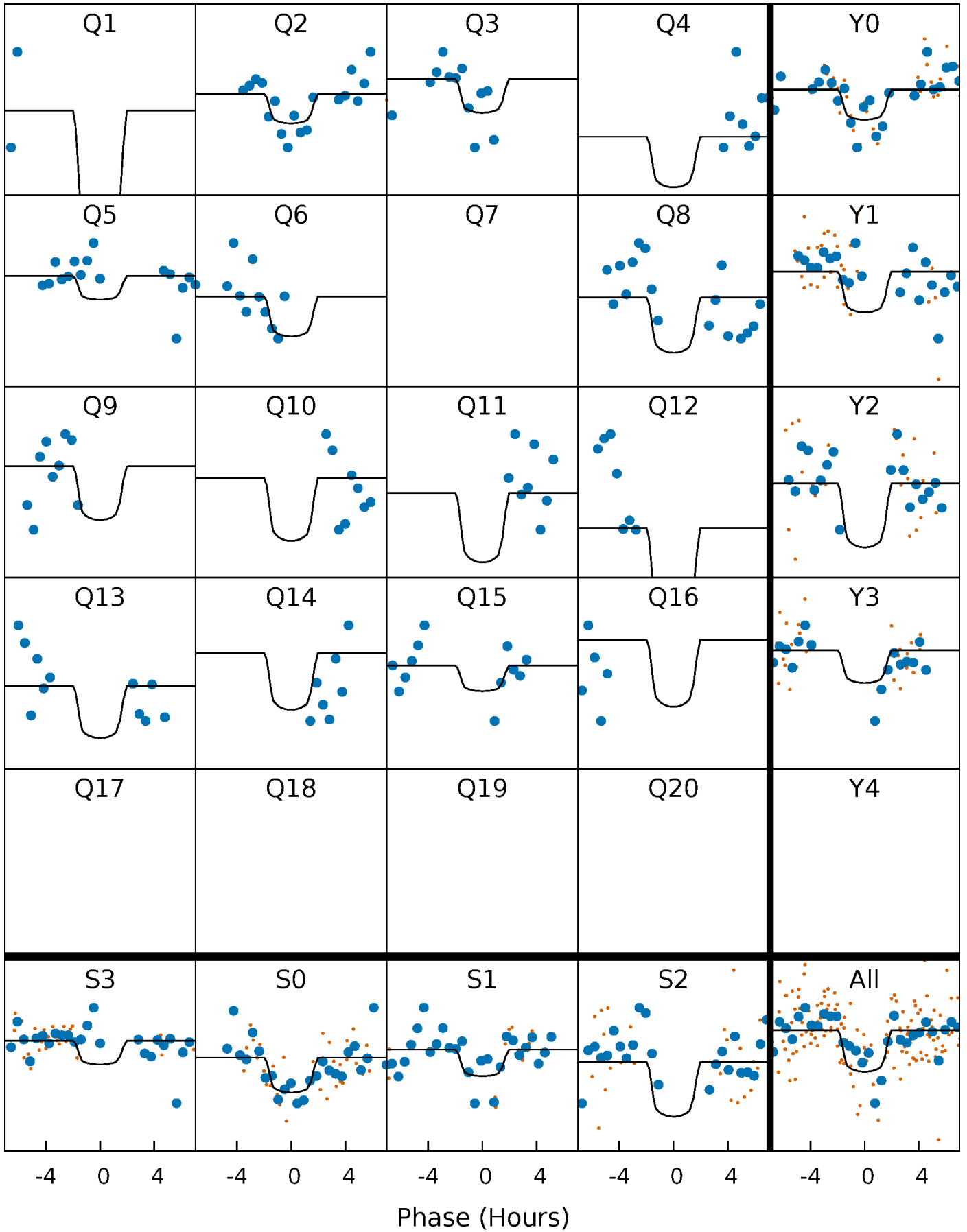
# PDC Quarter-Phased Transit Curves

TCE 004139351-06 P= 26.531520 Days  $T_0=151.986211$  (BKJD)



# DV Quarter-Phased Transit Curves

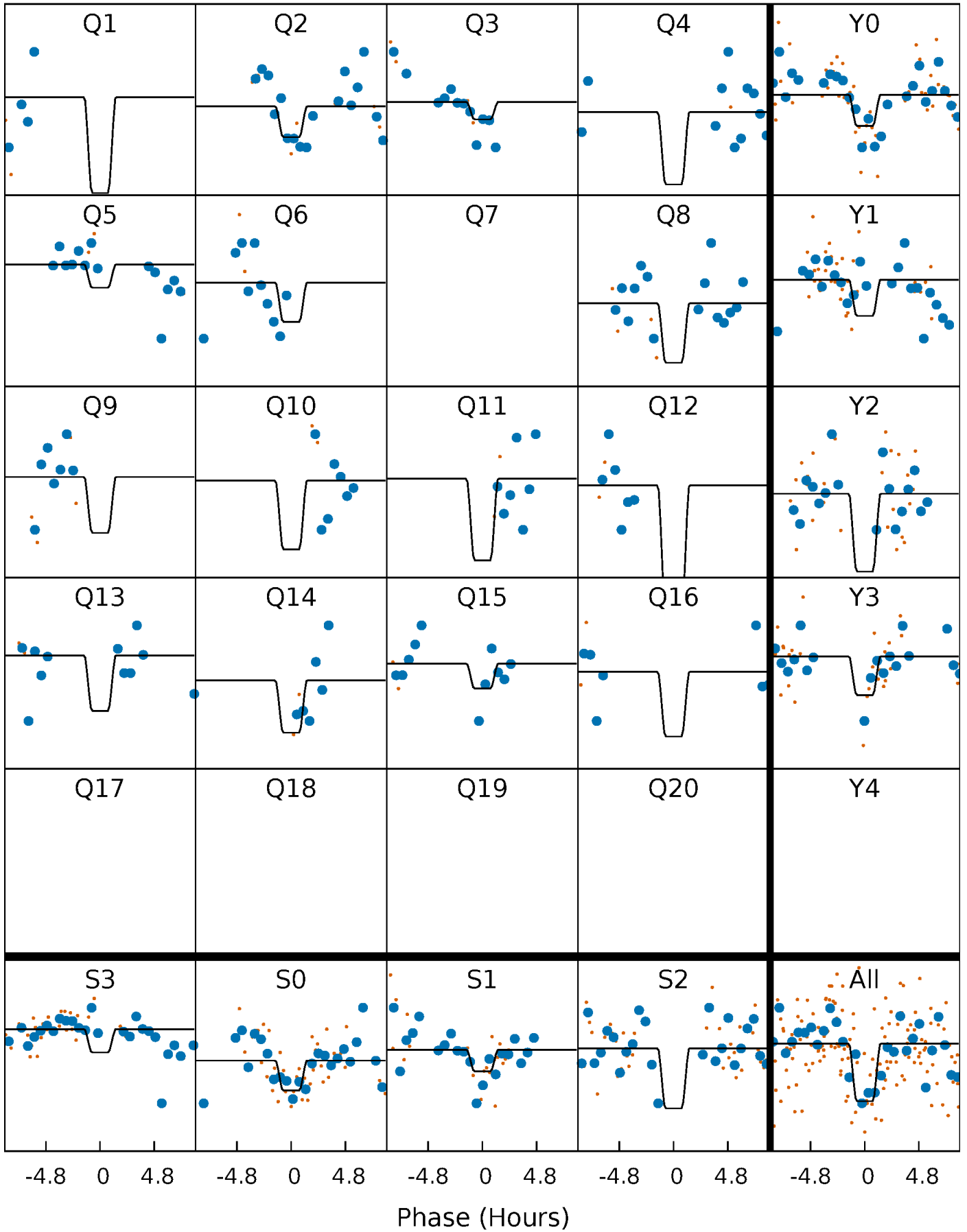
TCE 004139351-06 P= 26.531520 Days  $T_0=151.986211$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

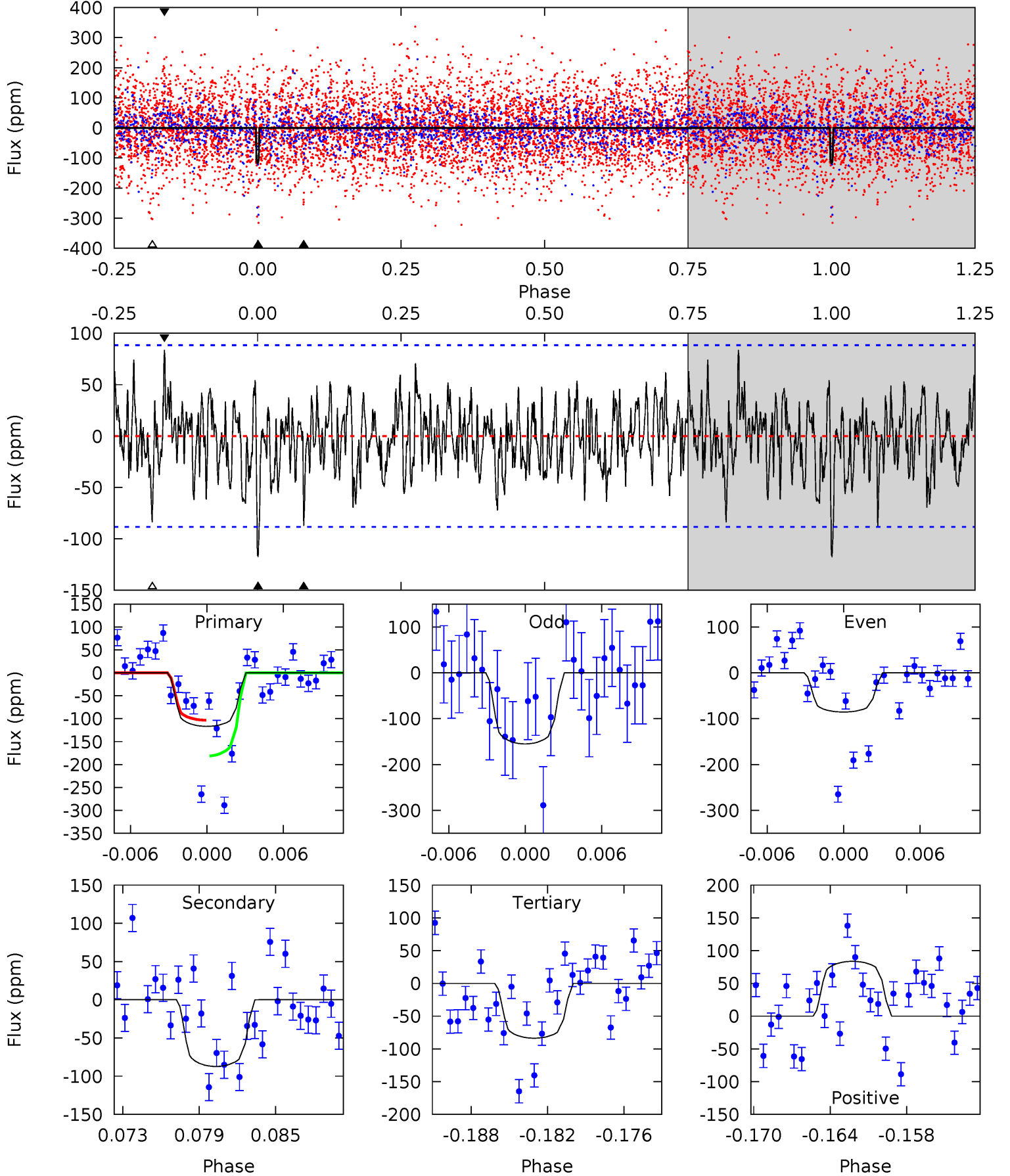
TCE 004139351-06 P= 26.532822 Days  $T_0=151.968984$  (BKJD)



# DV Model-Shift Uniqueness Test

004139351-06, P = 26.531520 Days, E = 125.454691 Days

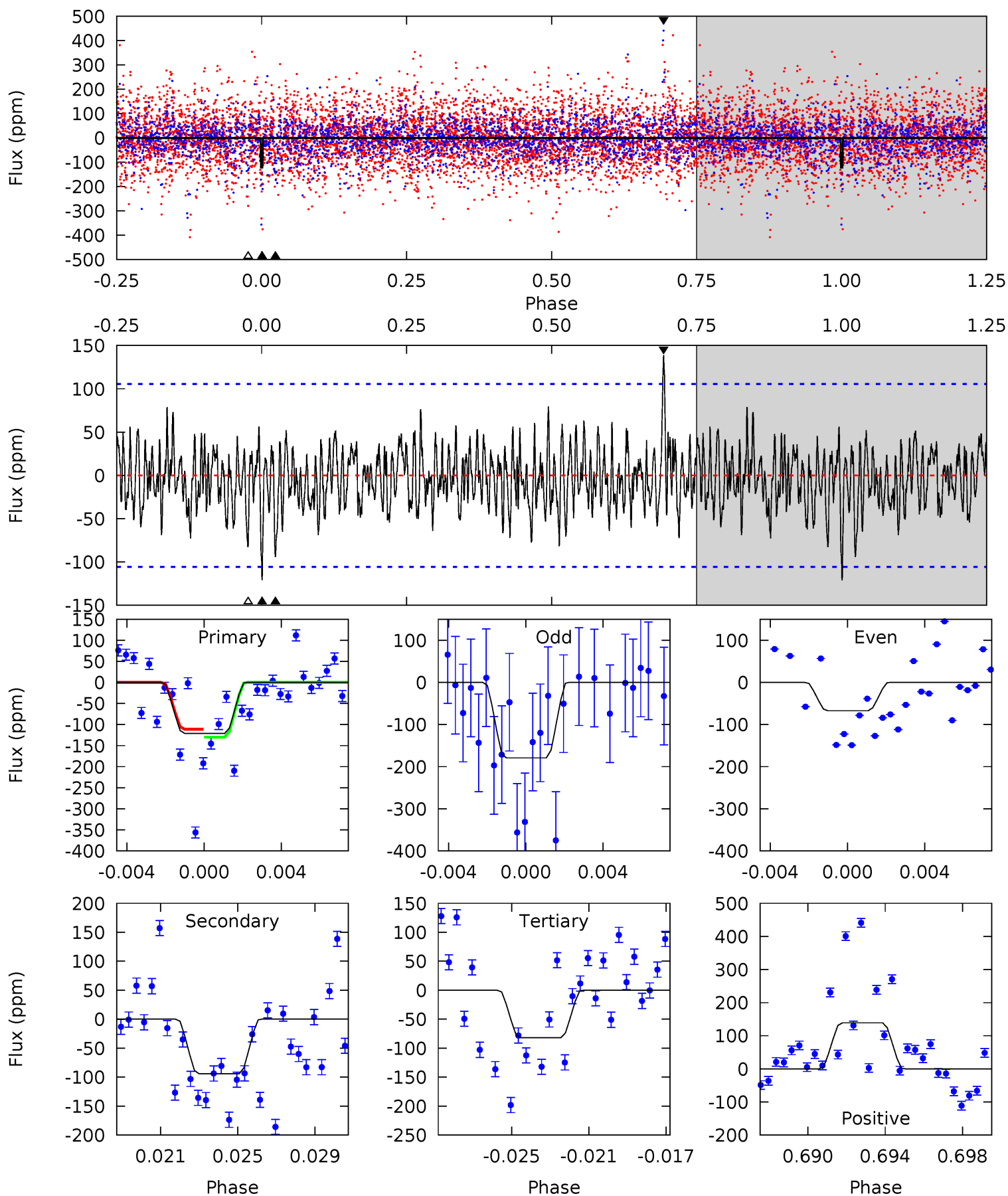
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
6.77	5.06	4.85	4.85	5.12	2.74	1.53	1.92	1.92	0.21	0.21	2.01	0.84	0.42	2.21



# Alt Model-Shift Uniqueness Test

004139351-06, P = 26.532822 Days, E = 125.436162 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
5.95	4.62	4.04	6.83	5.19	2.87	1.45	1.91	-0.88	0.58	-2.21	2.63	0.88	0.53	0.45



### Stellar Parameters For KIC 004139351

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$7027^{+183}_{-224}$	$3.799^{+0.292}_{-0.097}$	$-0.400^{+0.300}_{-0.250}$	$2.577^{+0.406}_{-0.879}$	$1.524^{+0.205}_{-0.308}$	$0.126^{+0.248}_{-0.038}$
	+3%/-3%	+8%/-3%	+75%/-62%	+16%/-34%	+13%/-20%	+197%/-30%
Source	PHO1	FLK73	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 004139351-06 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-87 \pm 17$	$4.41^{+3.75}_{-2.91}$	$1520^{+98}_{-137}$	$5272^{+4119}_{-1170}$	$100^{+730}_{-72}$
Alt.	$-94 \pm 20$	$4.33^{+3.91}_{-2.90}$	$1530^{+94}_{-133}$	$5335^{+4568}_{-1157}$	$110^{+915}_{-79}$

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

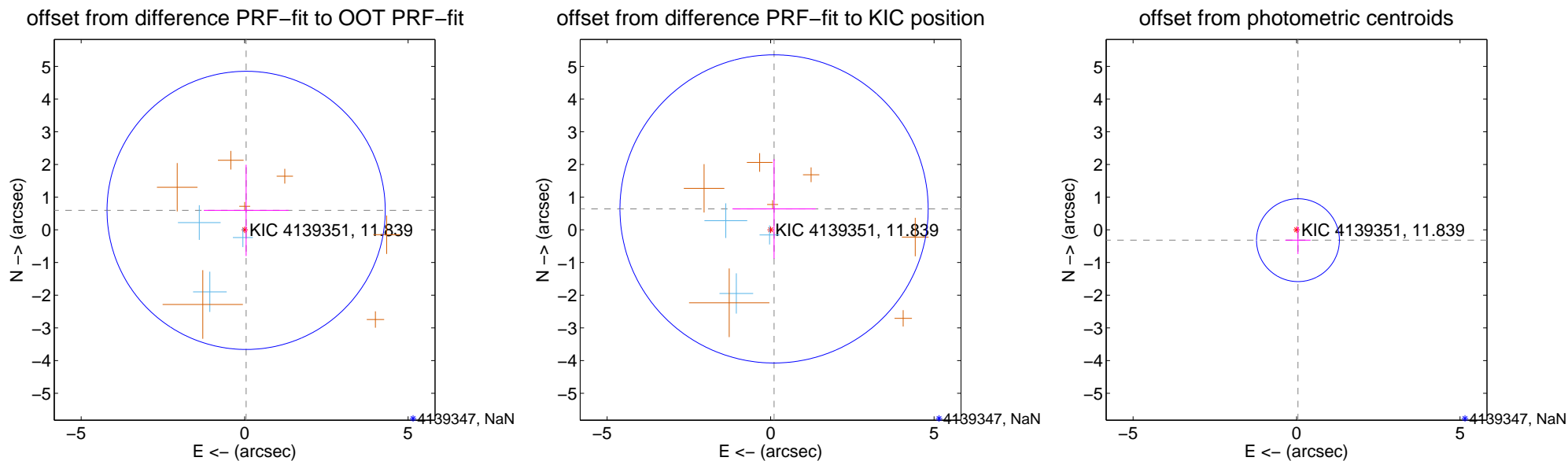
## DV Centroid Data

Supplemental centroid analysis for 004139351-06. **Kepler magnitude: 11.84.** Transit SNR 7.58

**There are 3 quarters with good PRF difference image offsets**

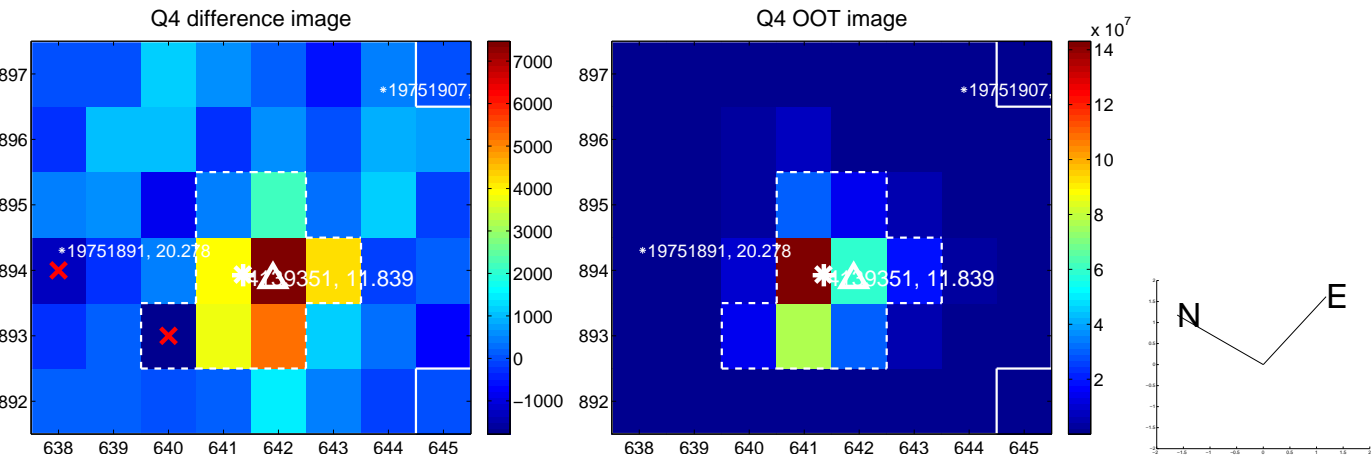
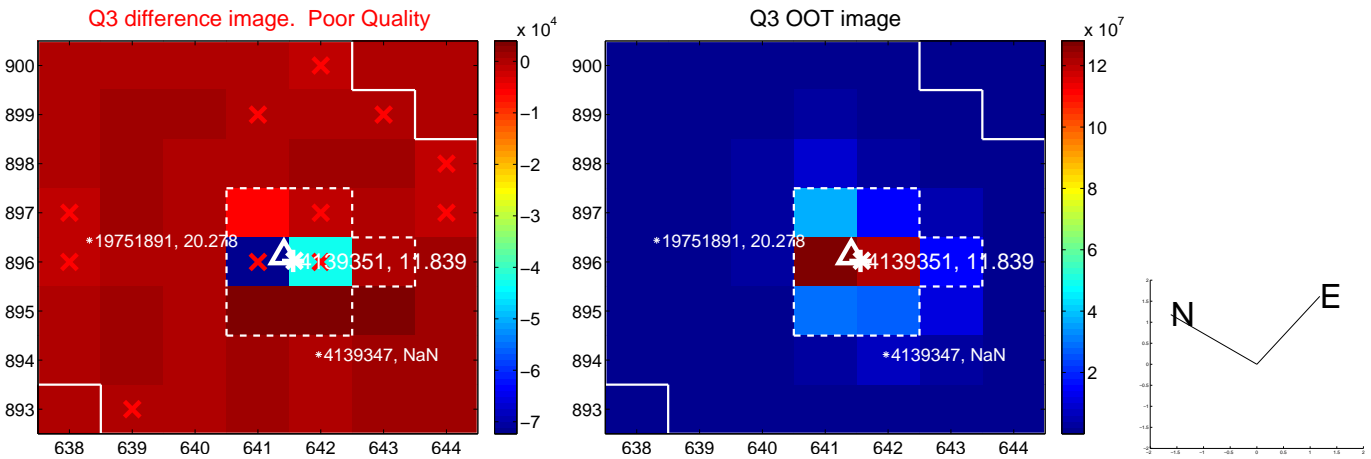
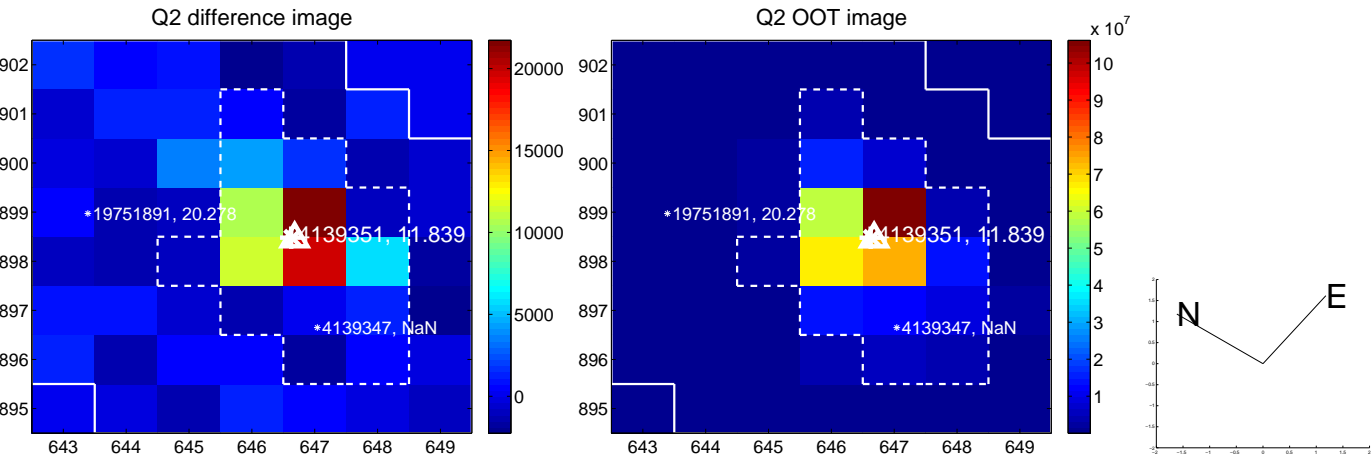
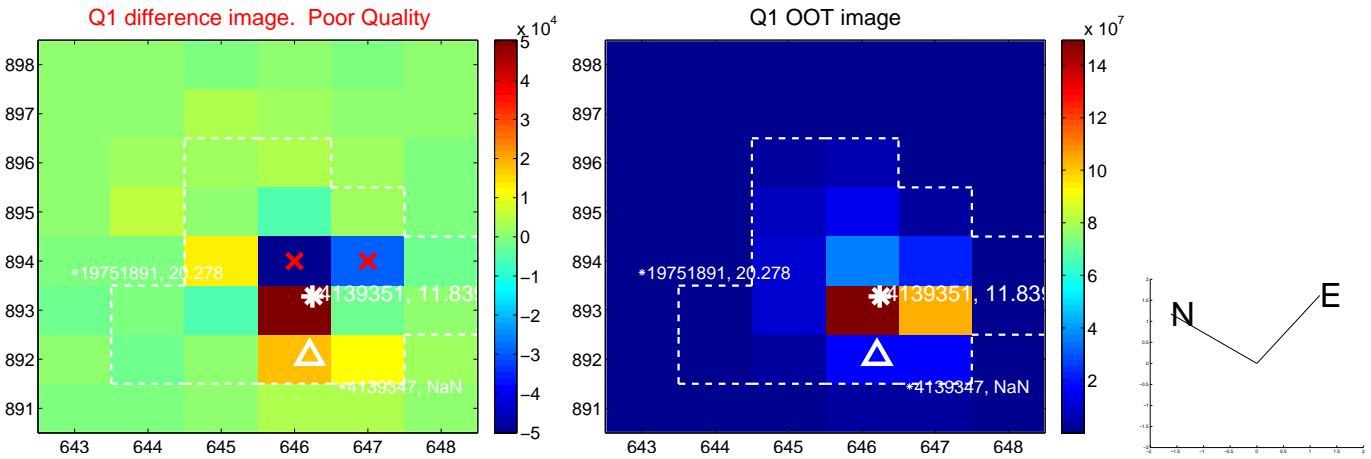
The direct PRF centroid is offset from the target star catalog position by about 0.11 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.597 \pm 1.418$	0.42	$-0.046 \pm 1.296$	$0.596 \pm 1.396$
PRF-fit source offset from KIC position	$0.649 \pm 1.571$	0.41	$-0.106 \pm 1.273$	$0.640 \pm 1.521$
photometric centroid source offset	$0.32 \pm 0.42$	0.75	$-0.04 \pm 0.39$	$-0.32 \pm 0.42$

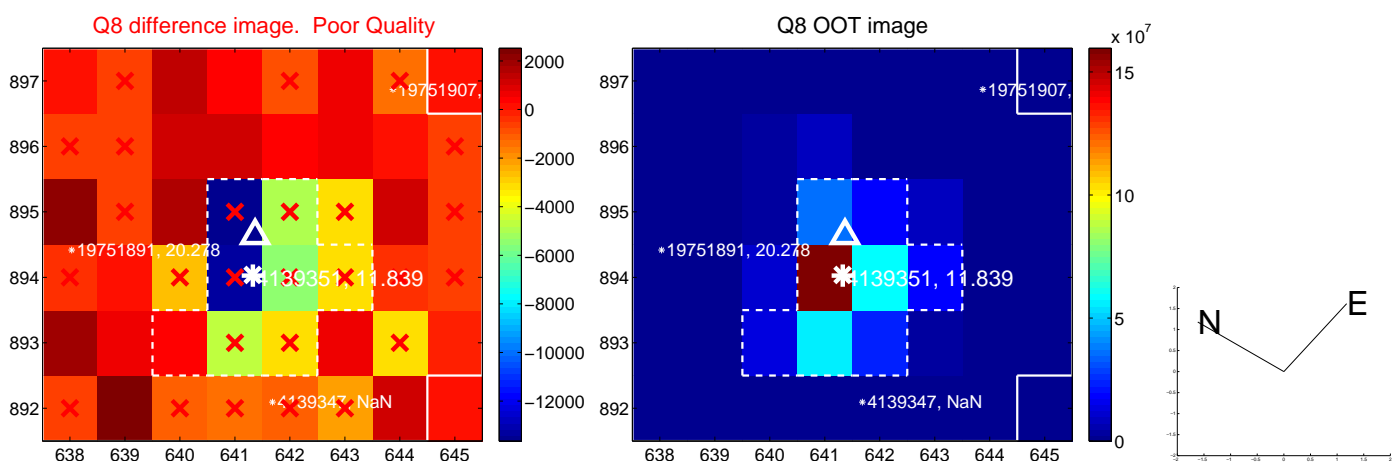
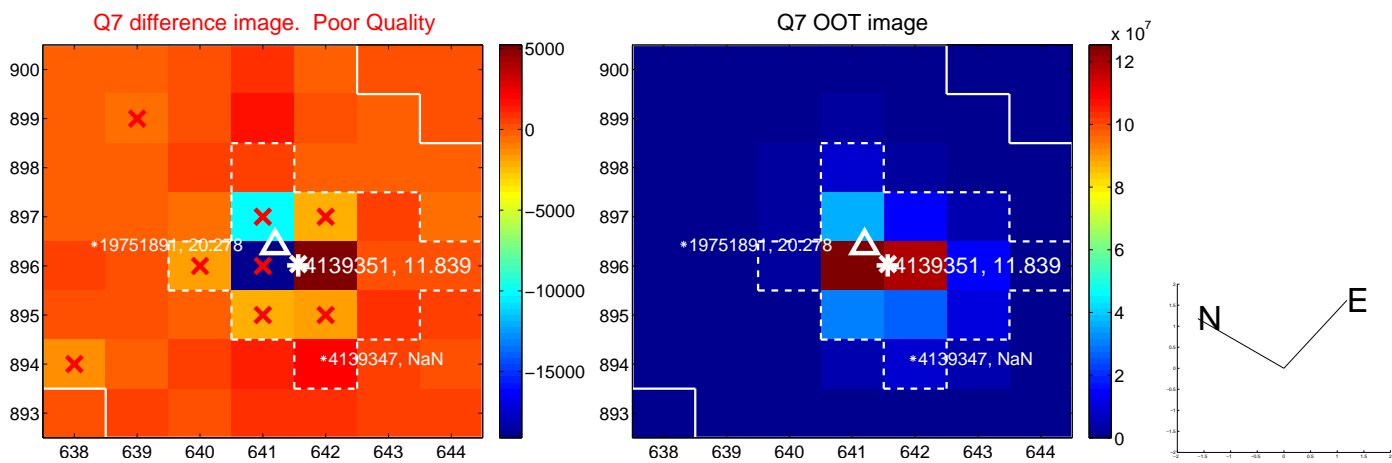
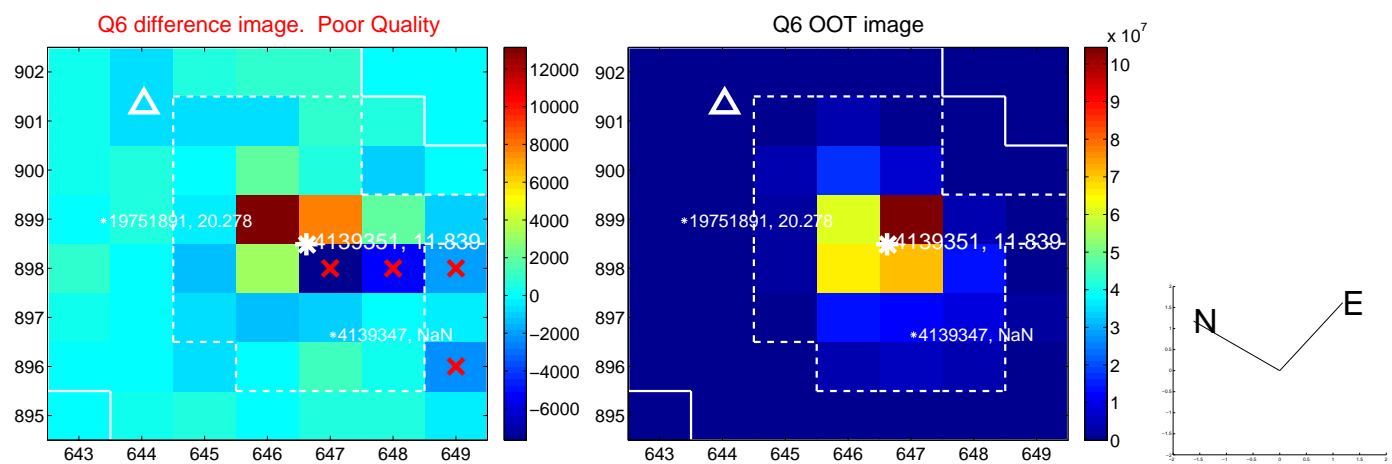
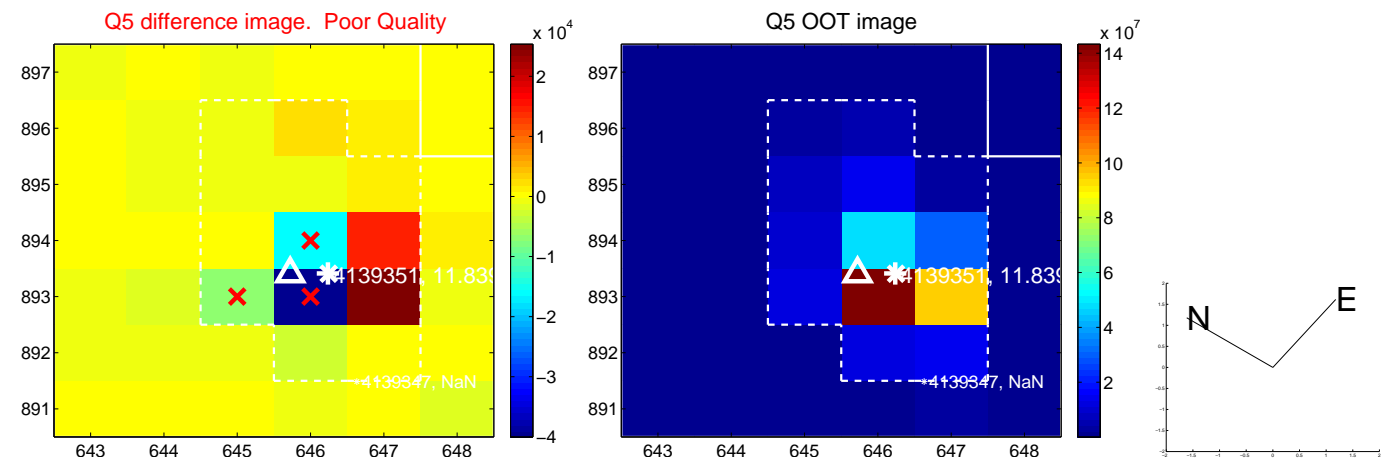


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

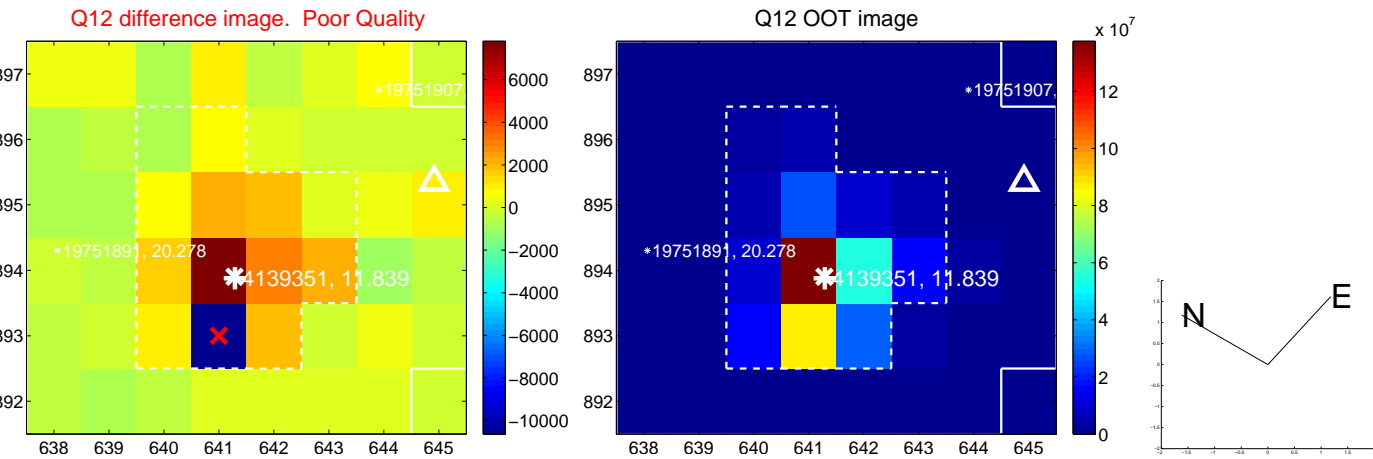
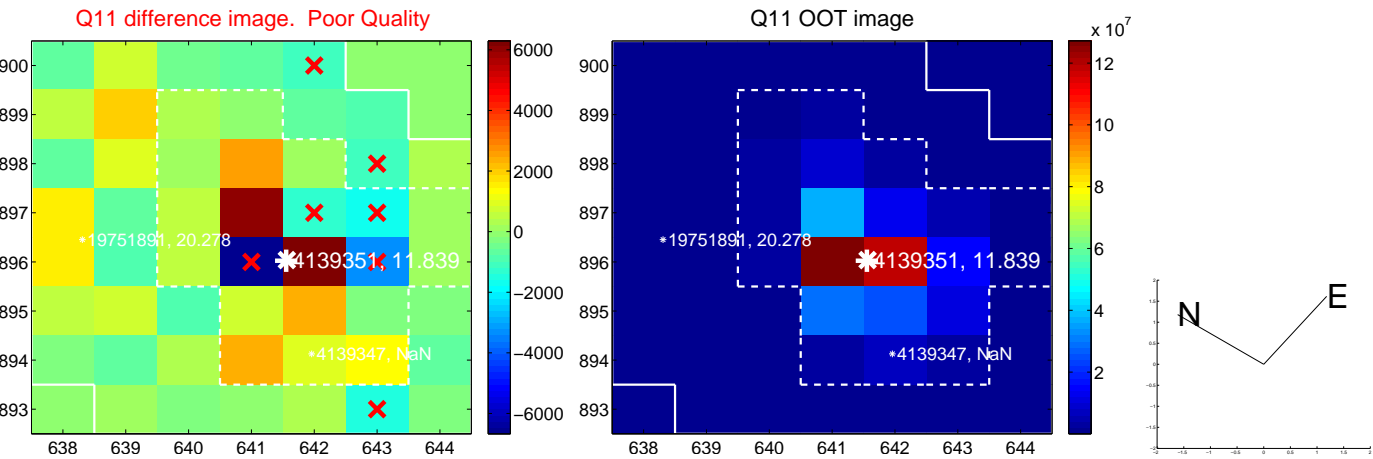
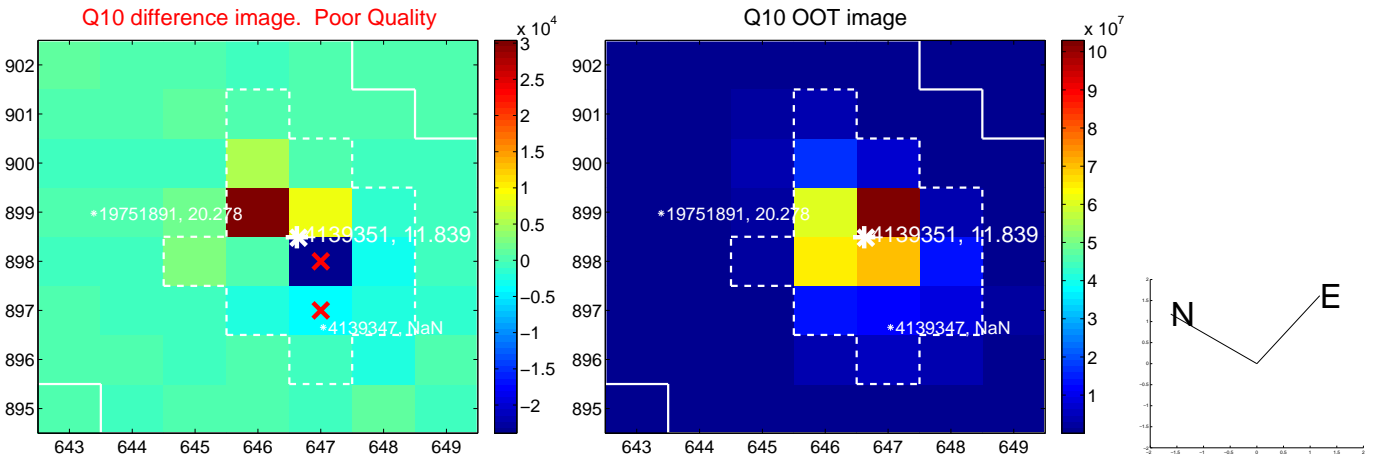
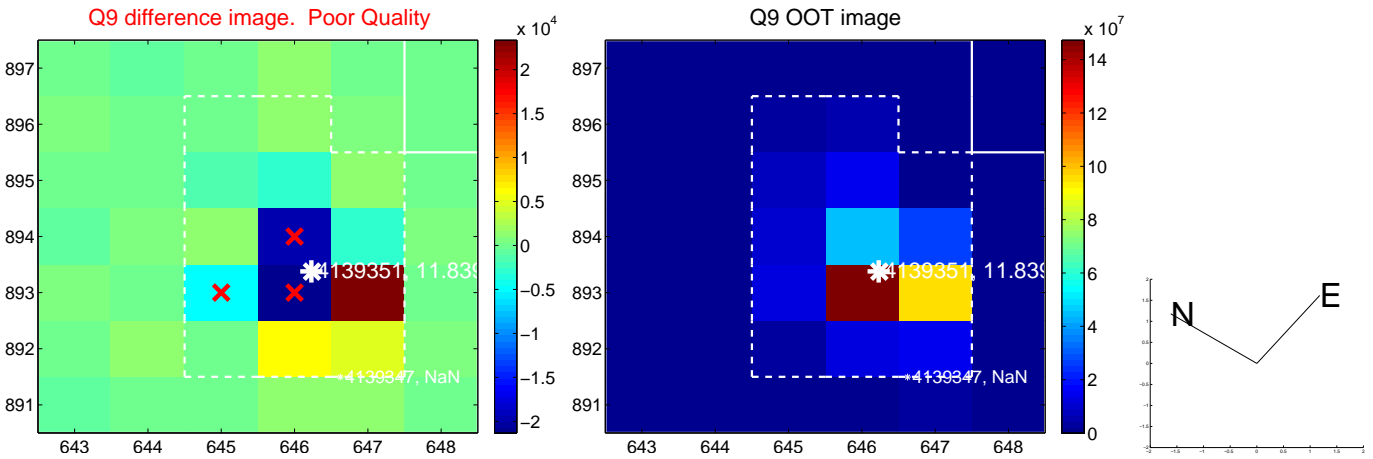


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

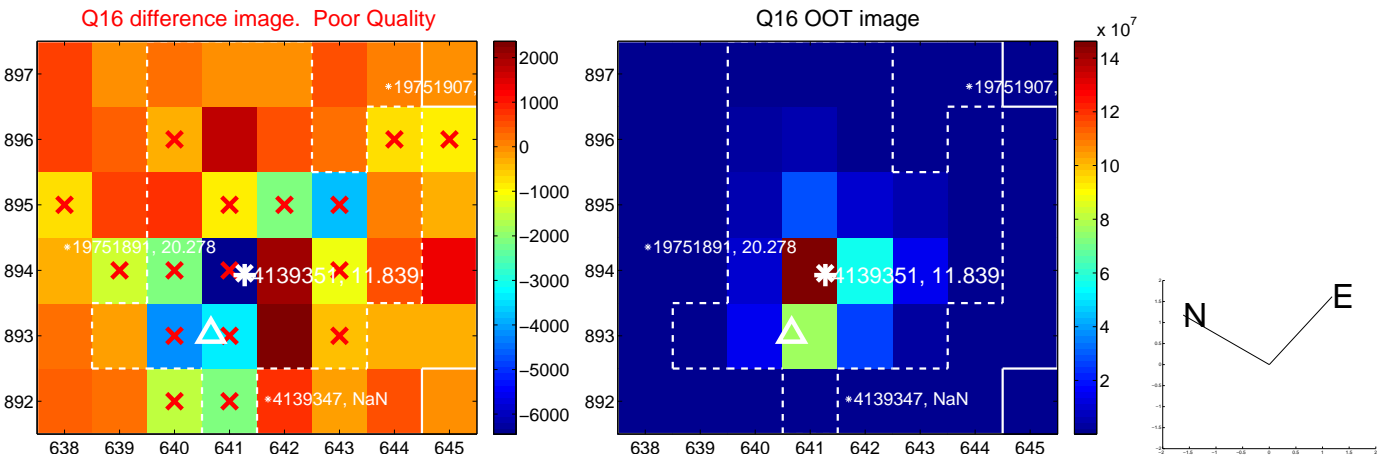
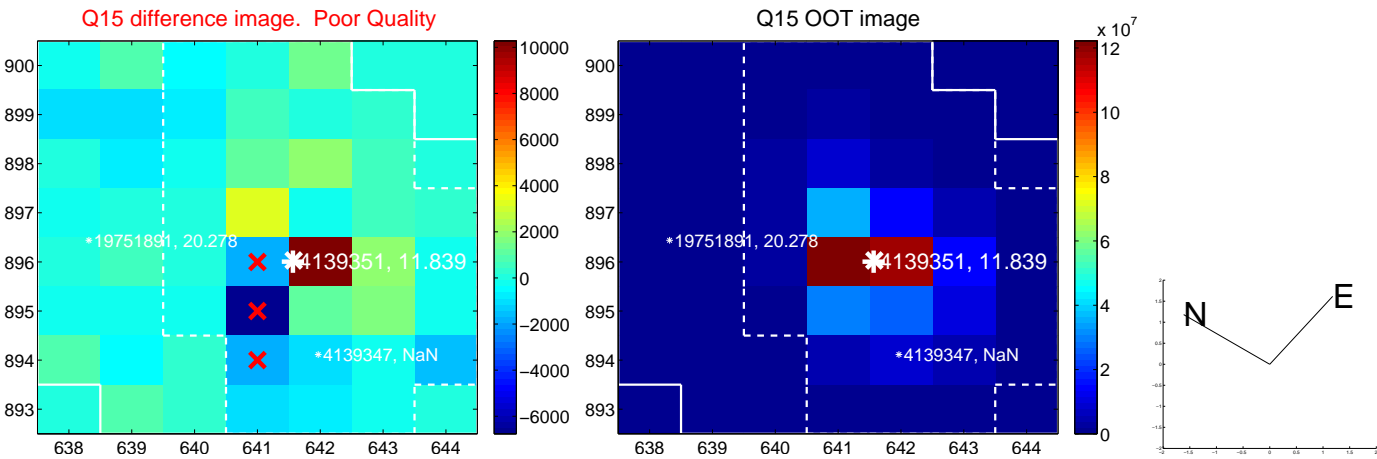
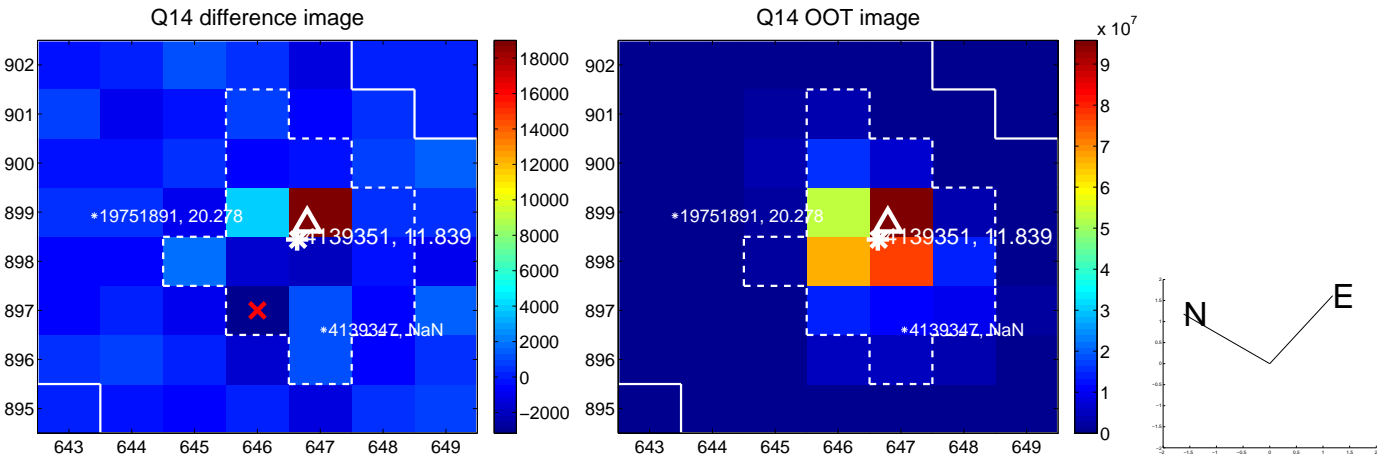
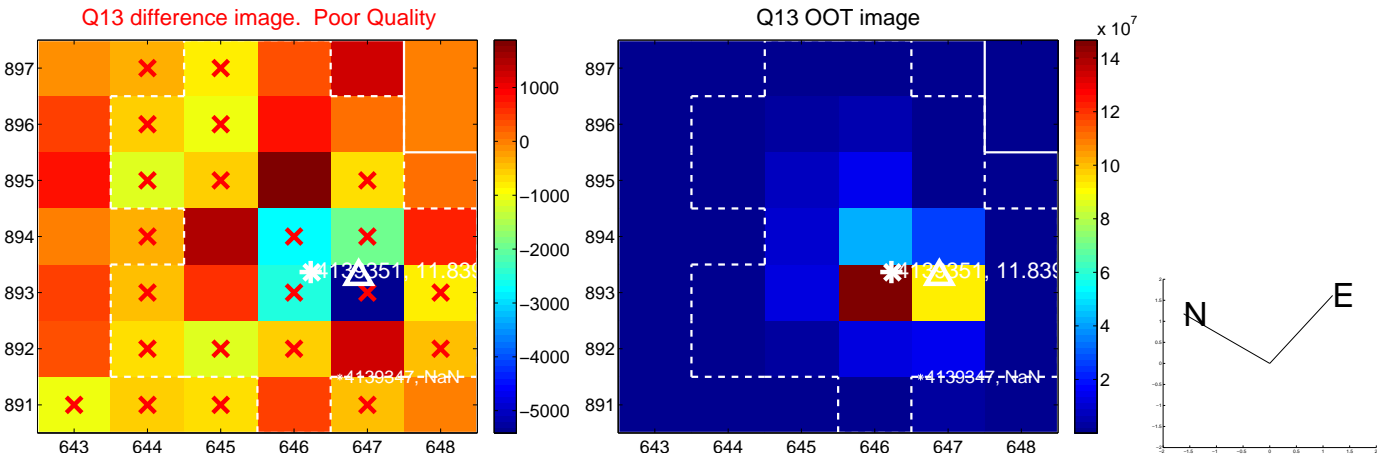




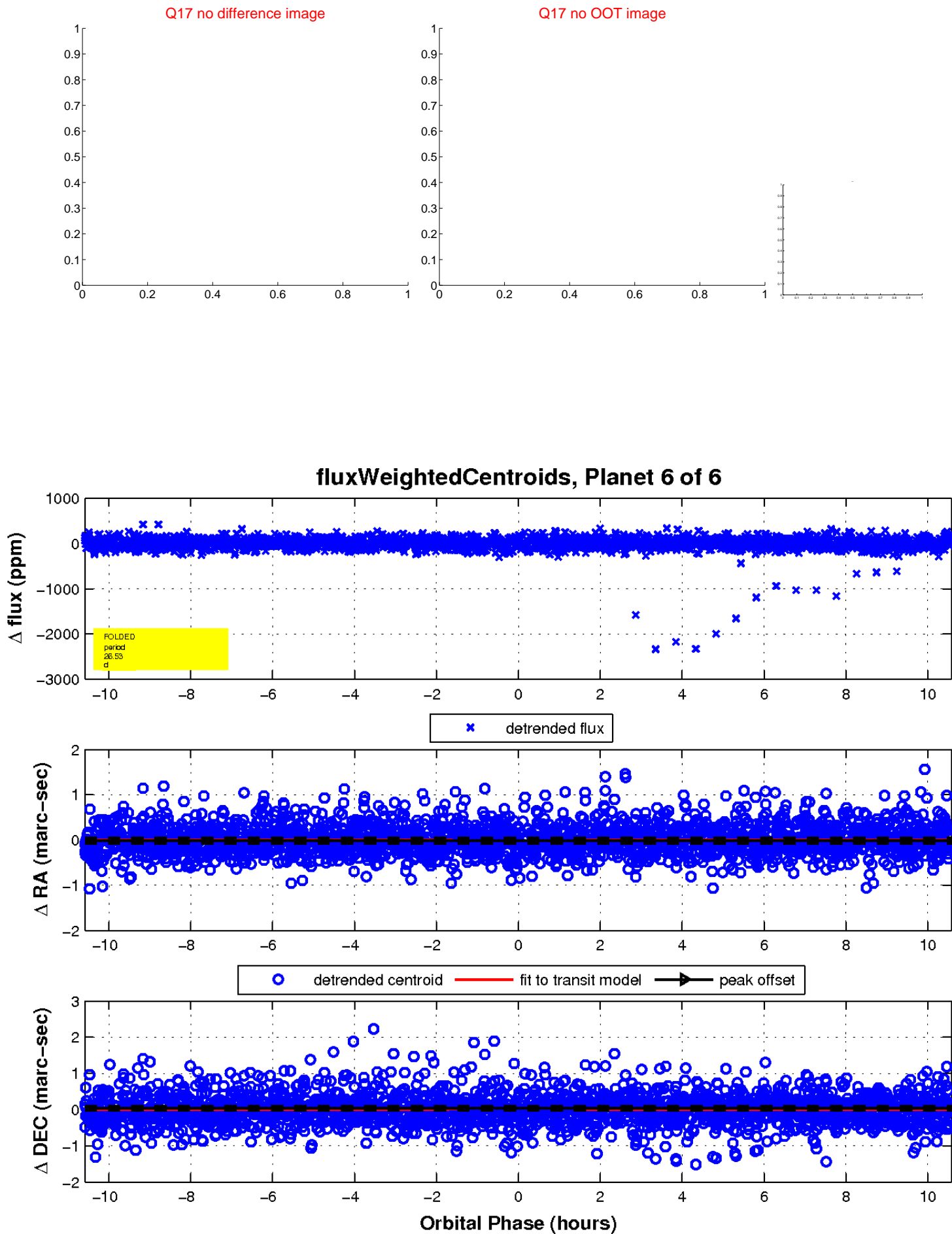
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

