

# KIC 011031512

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
011031512-01	OBS	No	0.672191	131.549377	22.6	2.083	11.1	11.8	3.84	7643	2.14	127652.58
011031512-02	OBS	No	0.672196	131.885669	20.9	2.190	10.0	11.8	3.84	7643	1.97	127651.21
011031512-03	OBS	No	54.989719	140.822953	305.7	1.768	8.4	8.4	3.84	7643	6.76	359.45
011031512-04	OBS	No	48.759807	164.170128	247.0	1.465	7.7	6.5	3.84	7643	6.72	421.96

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
011031512-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
011031512-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—SAME_NTL_PERIOD
011031512-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_DV
011031512-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT

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

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

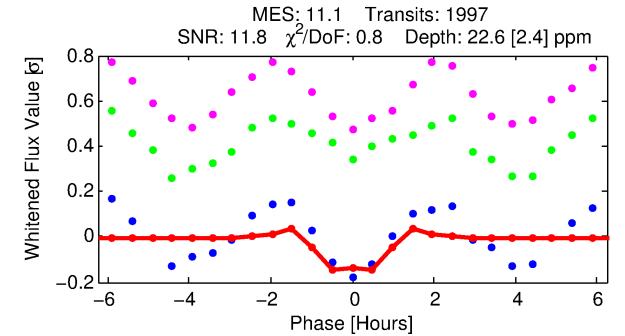
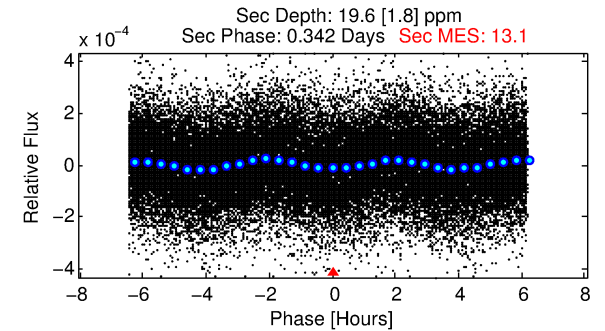
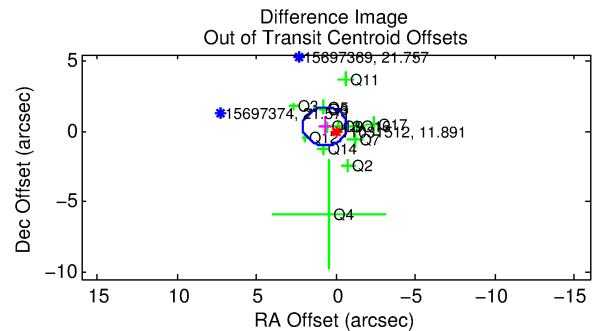
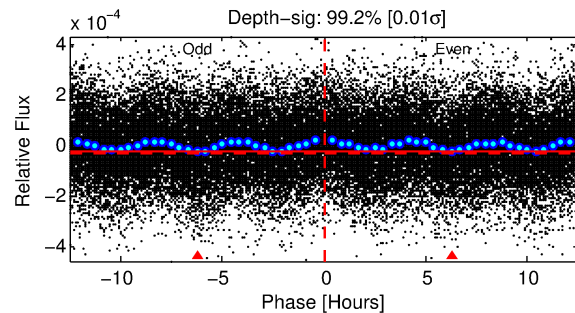
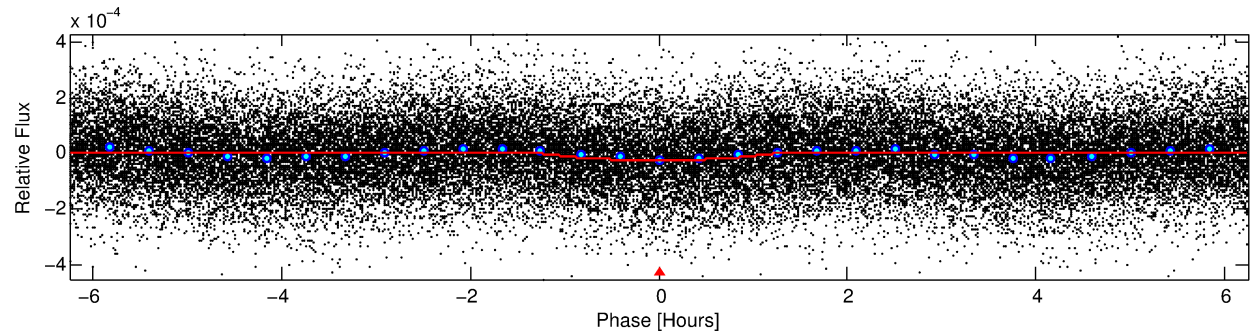
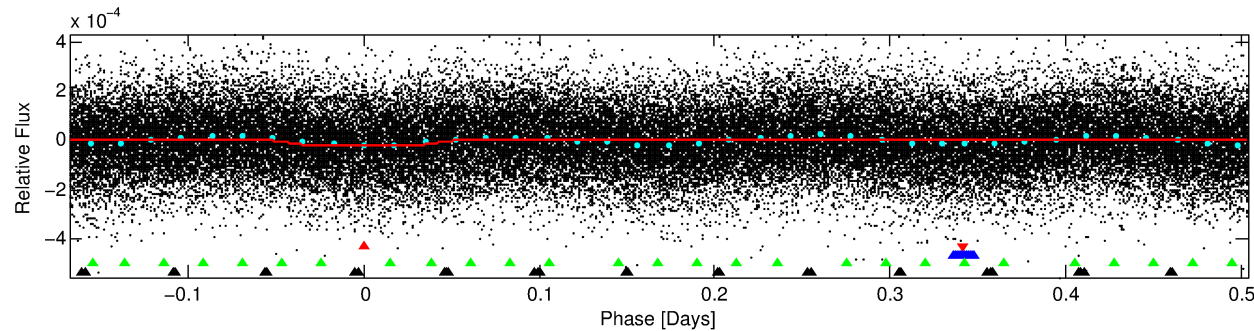
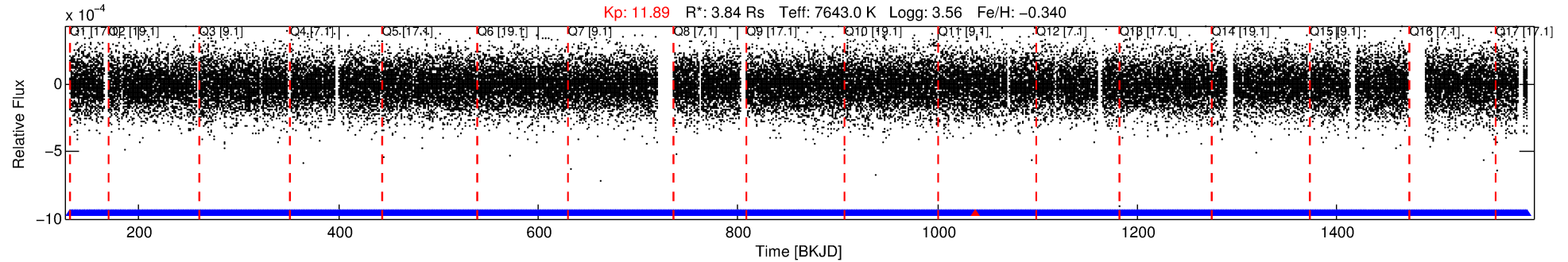
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 011031512-01

No Significant Match Found

# DV One-Page Summary

KIC: 11031512 Candidate: 1 of 4 Period: 0.672 d



## DV Fit Results:

Period = 0.67219 [0.00001] d  
Epoch = 131.5494 [0.0016] BKJD  
Rp/R\* = 0.0051 [0.0011]  
a/R\* = 1.45 [0.93]  
b = 0.90 [0.26]  
Seff = 127652.58 [128307.15]  
Teq = 4820 [1211] K  
Rp = 2.14 [1.33] Re  
a = 0.0188 [0.0113] AU  
Ag = 0.83 [0.90] [-0.19σ]  
Teffp = 7110 [846] K [1.55σ]

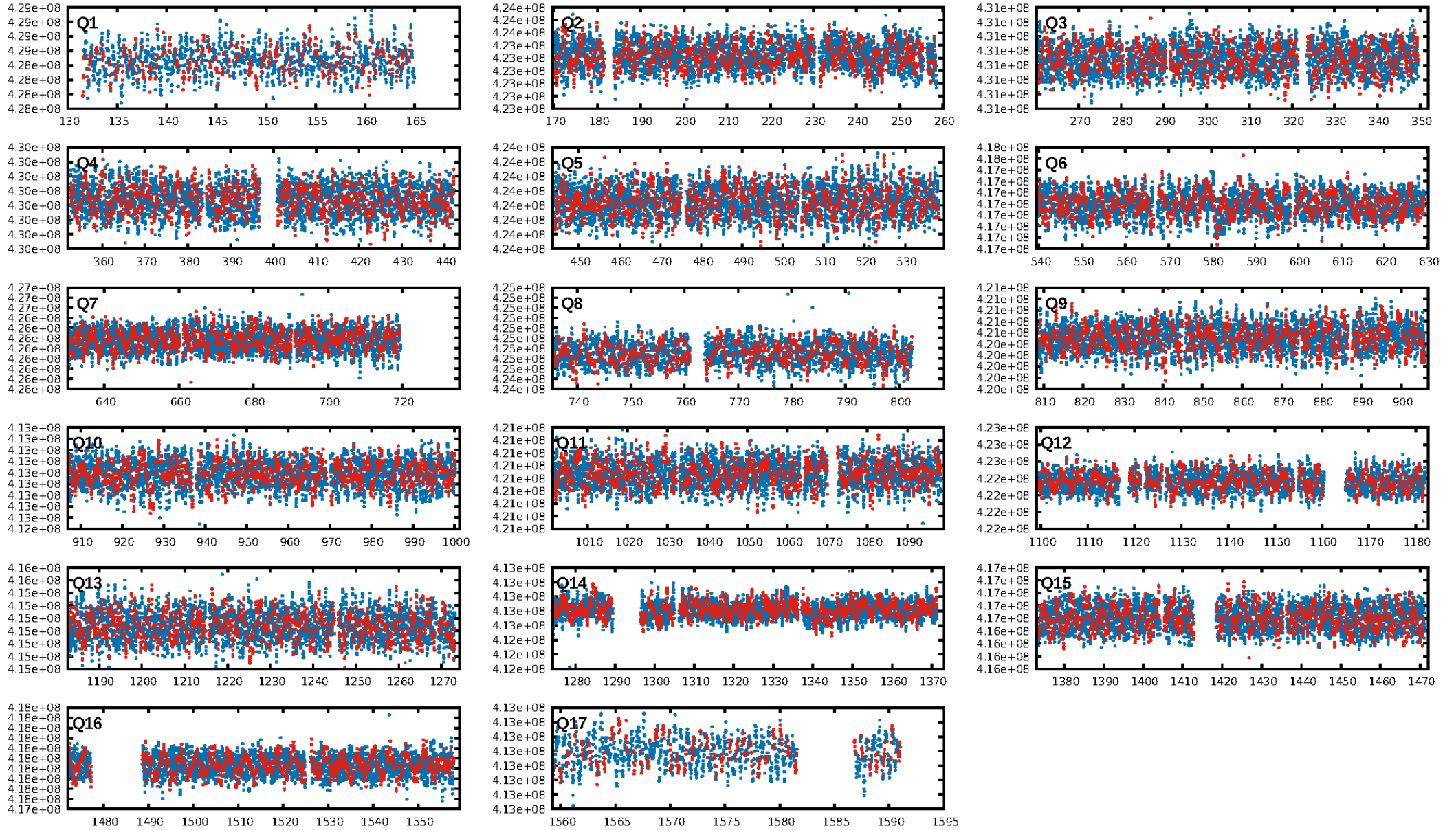
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.0% [0.00σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 1.79e-08  
RollingBand-fgt: 1.00 [1905/1906]  
GhostDiagnostic-chr: 2.63  
Centroid-sig: 10.9%  
Centroid-so: 0.688 arcsec [1.97σ]  
OotOffset-rm: 0.781 arcsec [1.71σ]  
OotOffset-st: 3/3/3/4 [13]  
KicOffset-rm: 0.217 arcsec [0.38σ]  
KicOffset-st: 3/3/3/4 [13]  
DiffImageQuality-fgm: 0.38 [5/13]  
DiffImageOverlap-fno: 1.00 [17/17]

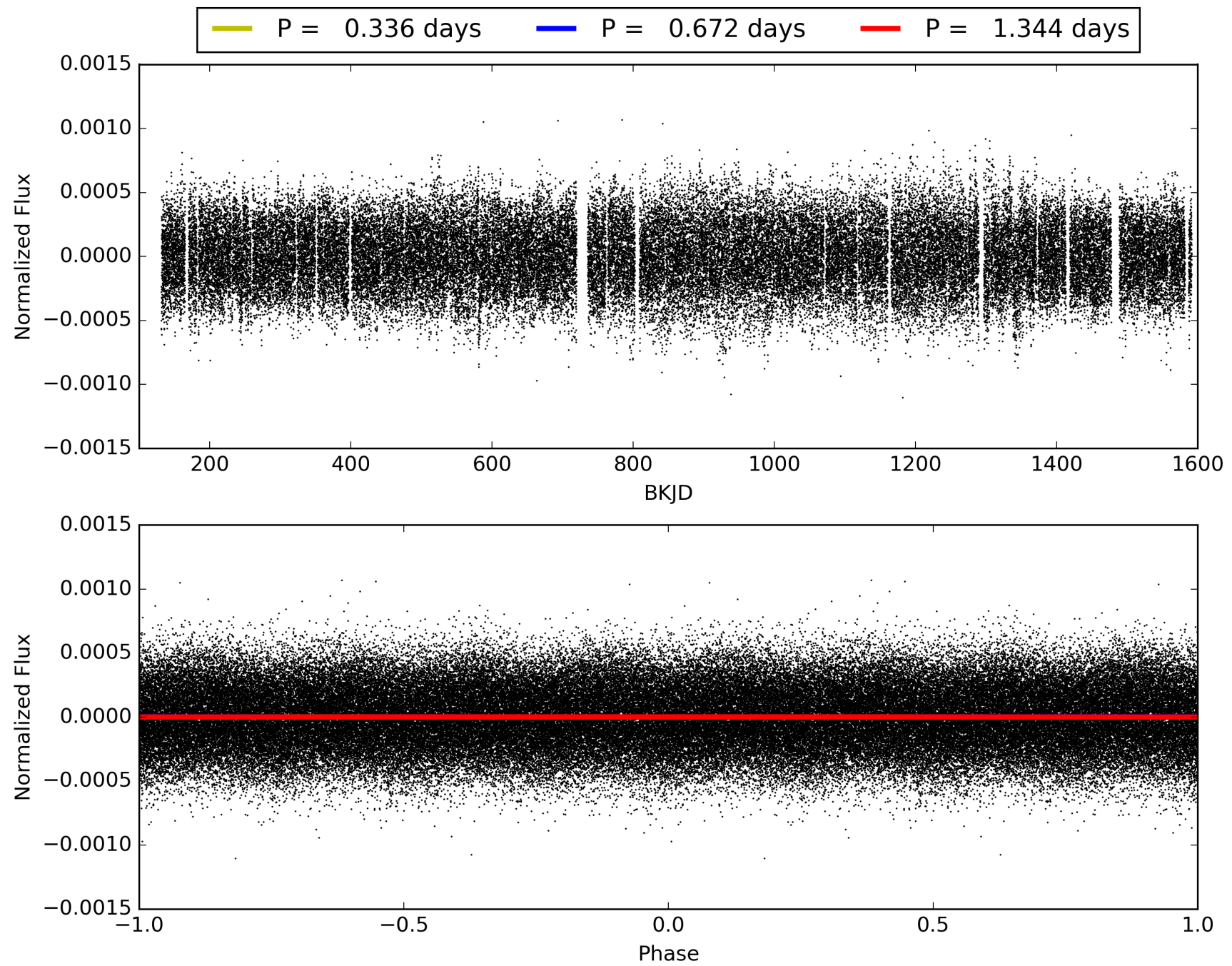
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 15:07:38 Z

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

# TCE 011031512-01, PDC Light Curves



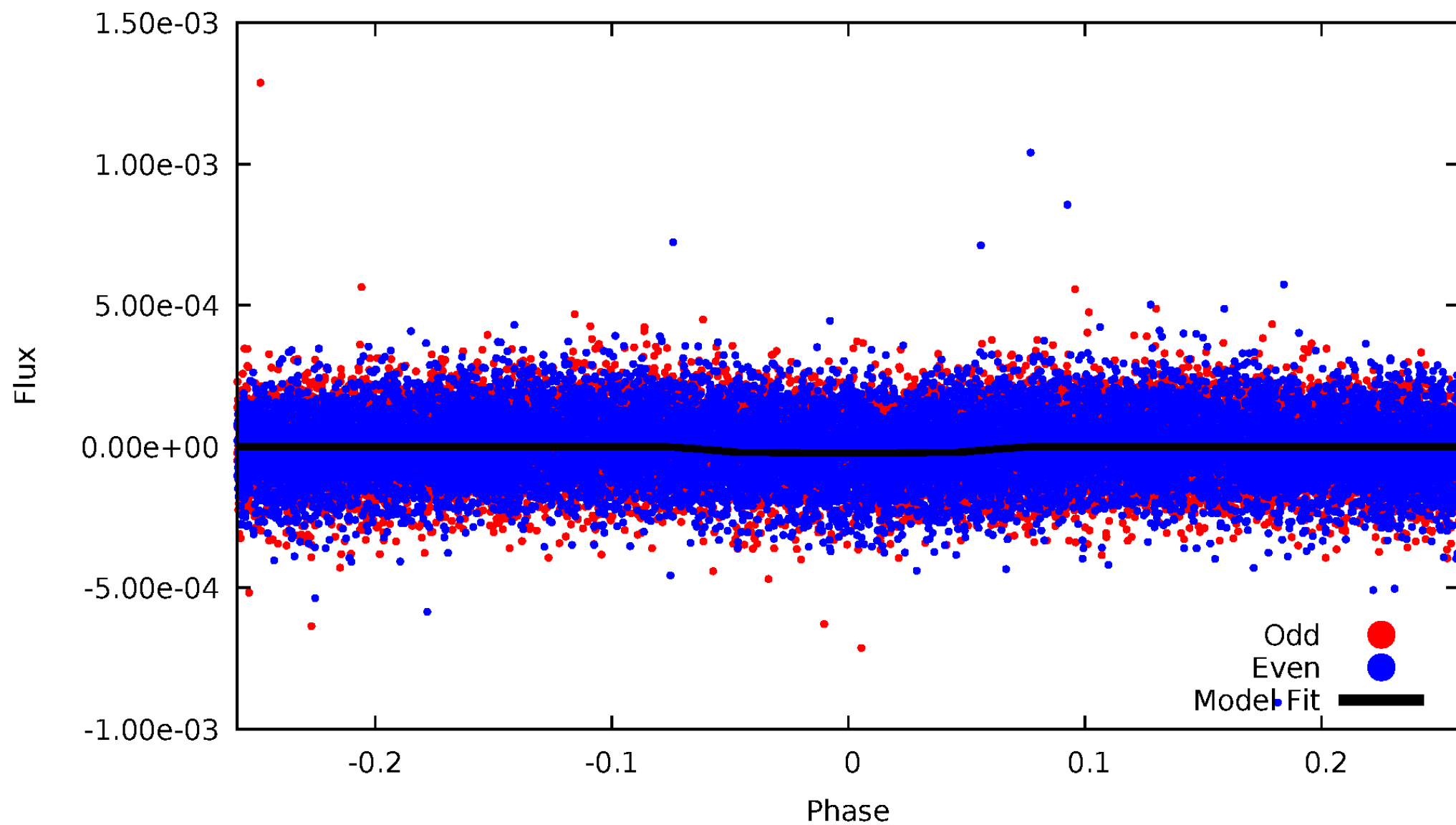
TCE 011031512-01





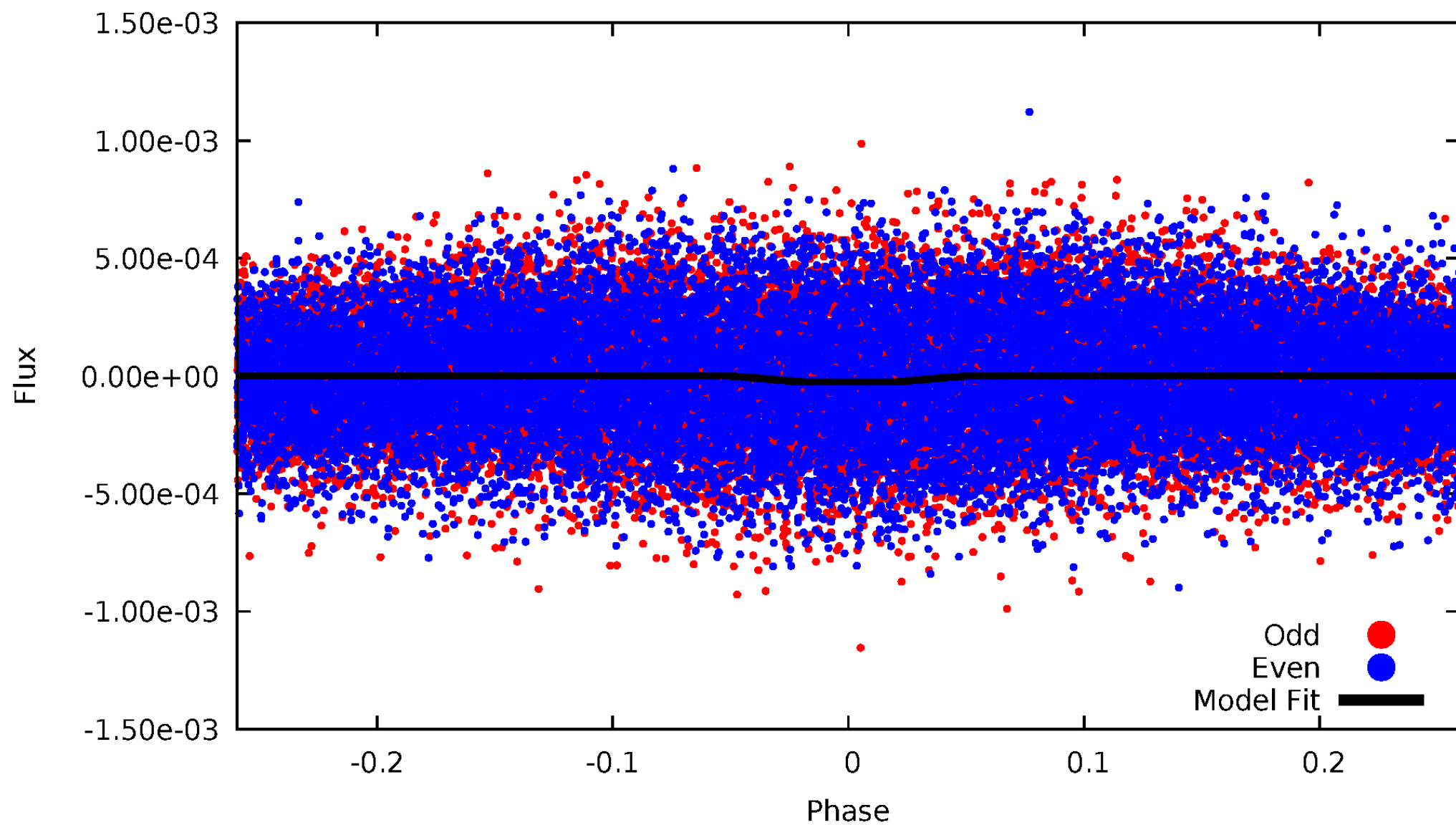
# DV Odd/Even

TCE 011031512-01

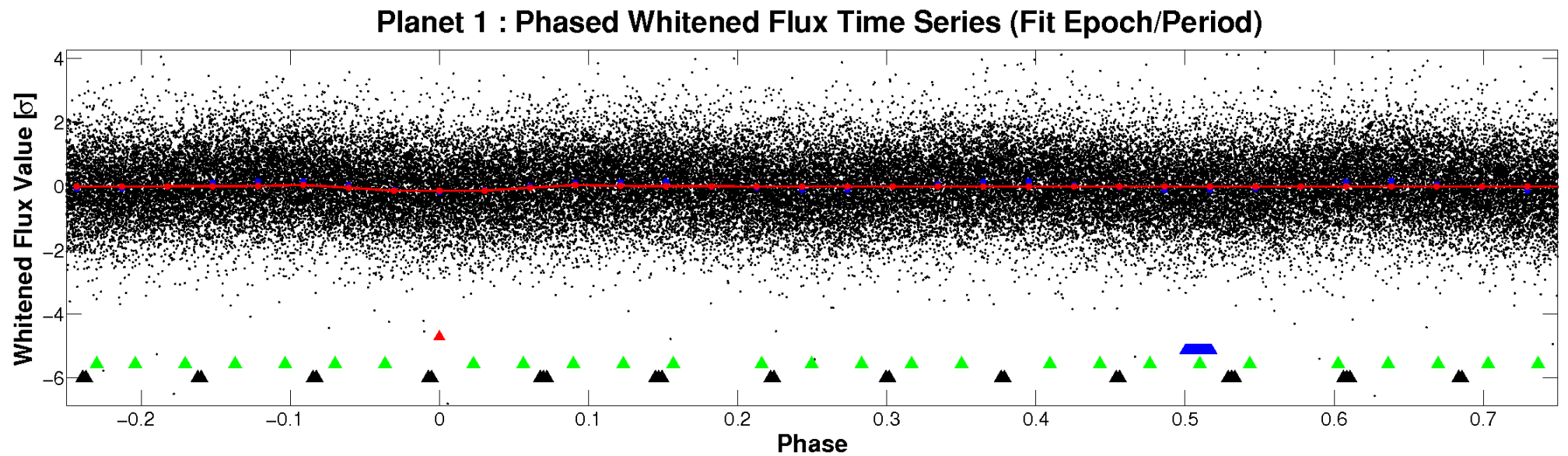
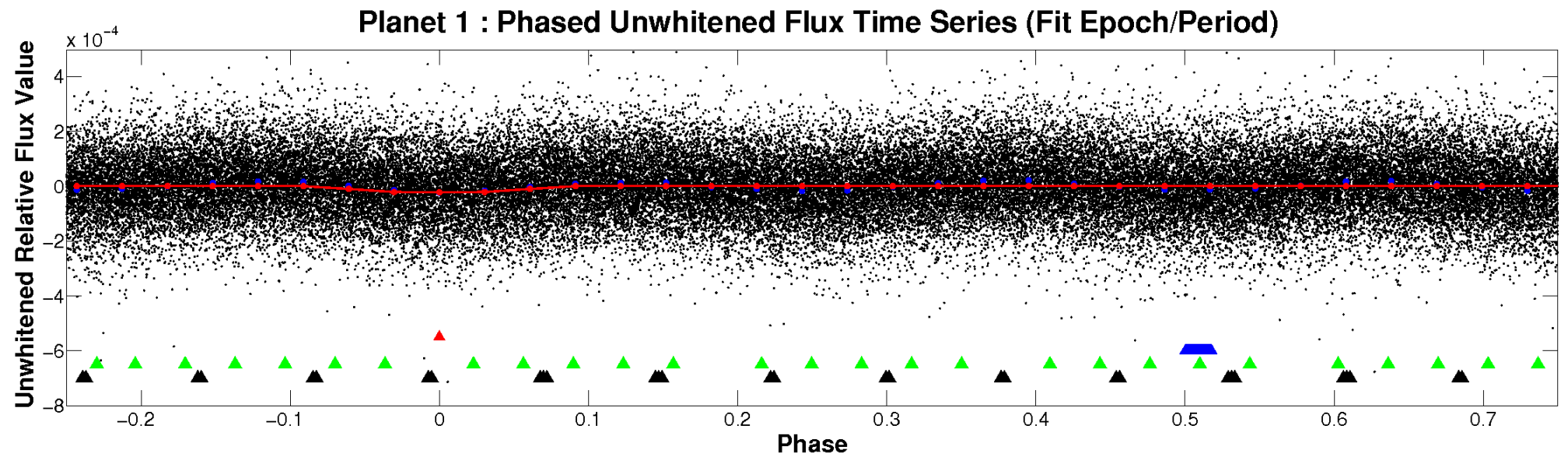


# ALT Odd/Even

TCE 011031512-01

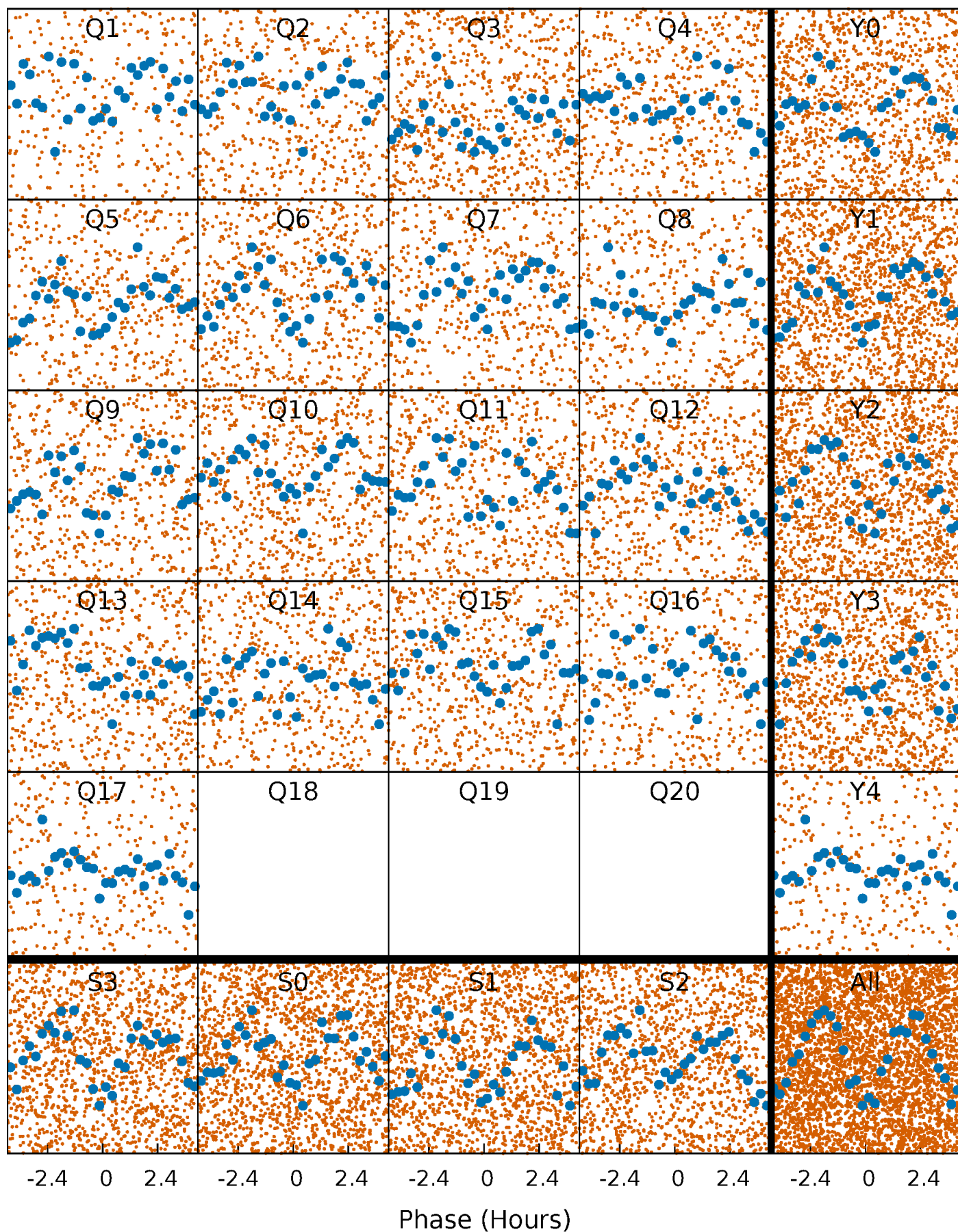


# Non-Whitened Vs. Whitened Light Curve



# PDC Quarter-Phased Transit Curves

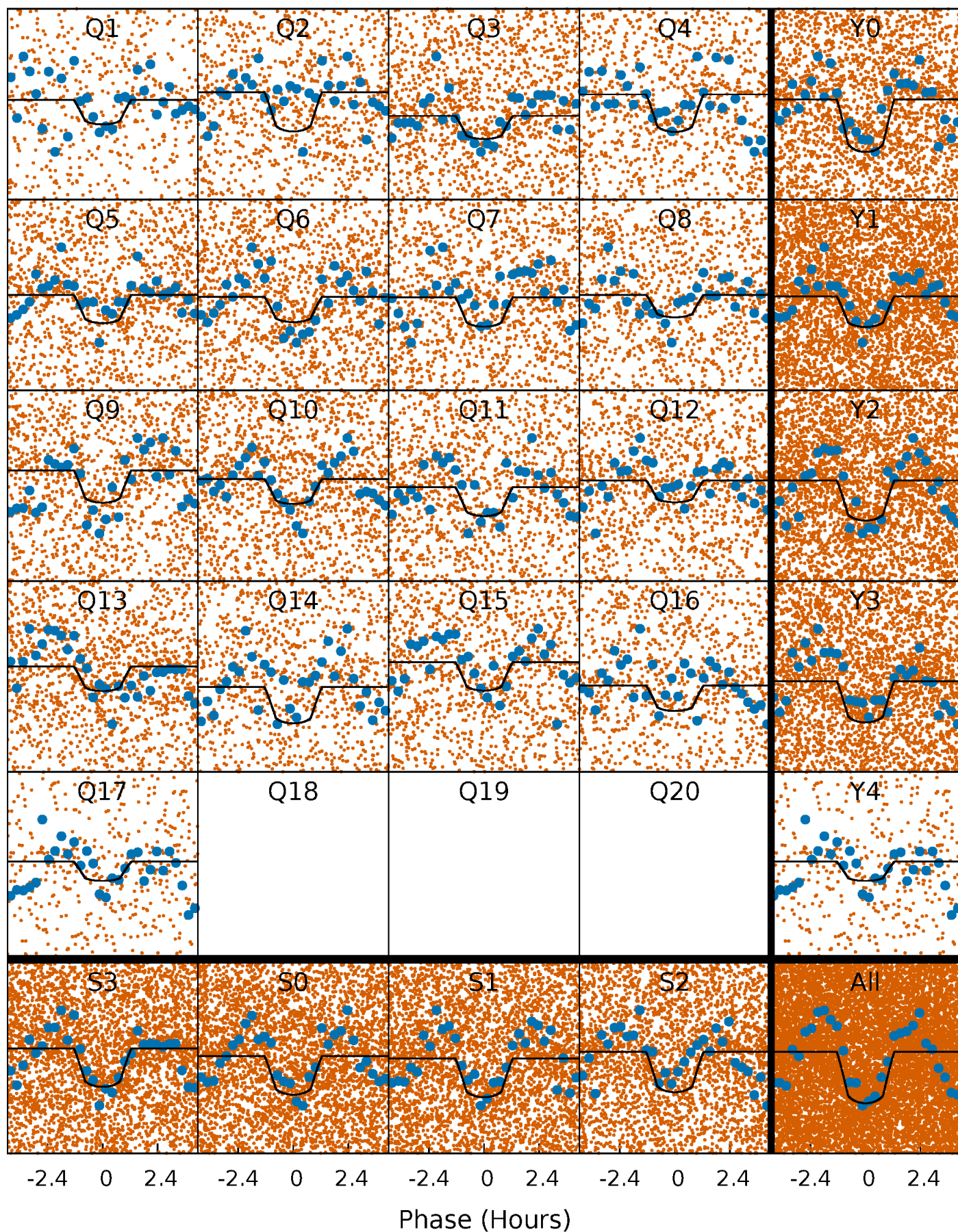
TCE 011031512-01 P= 0.672191 Days  $T_0=131.549377$  (BKJD)





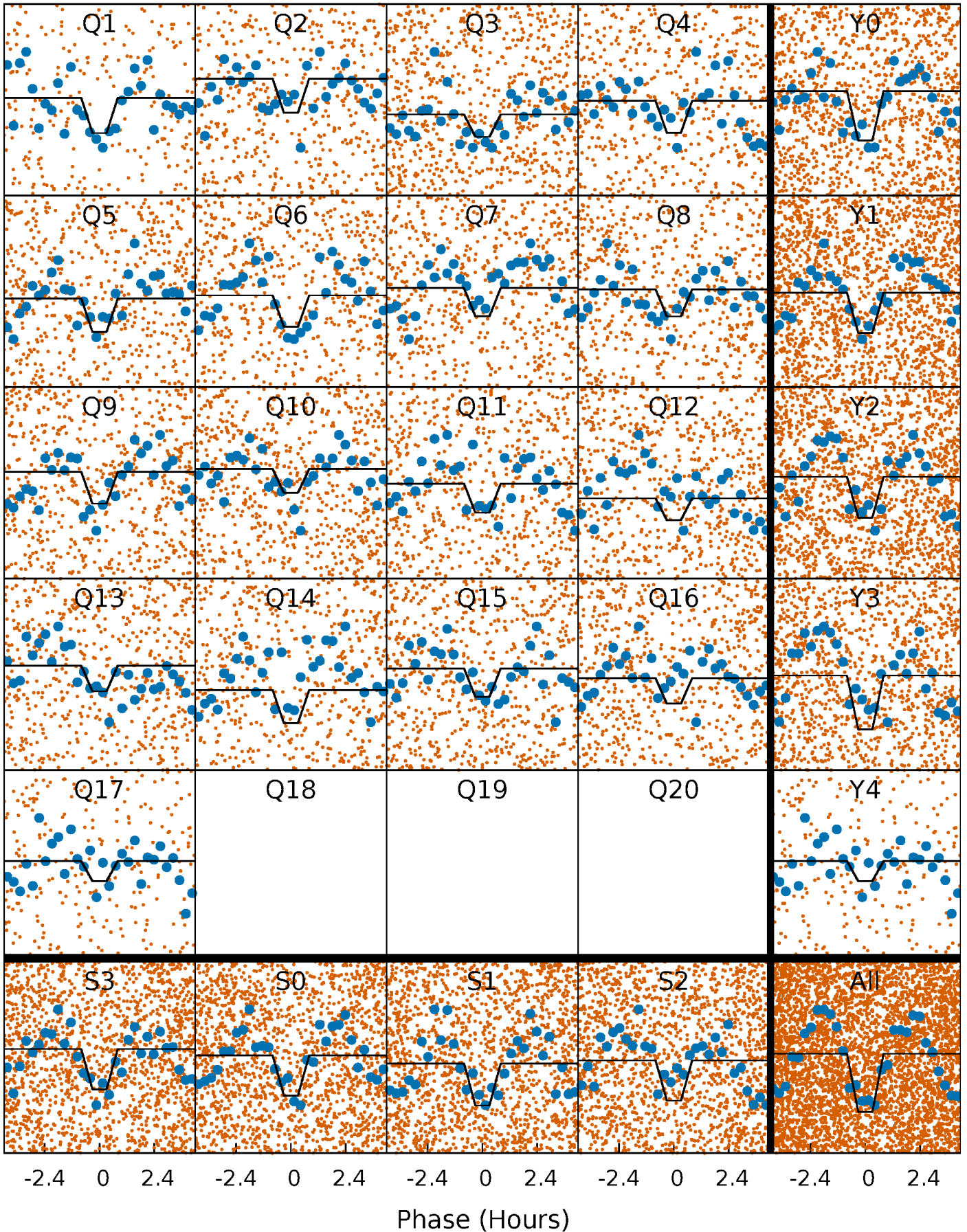
# DV Quarter-Phased Transit Curves

TCE 011031512-01 P= 0.672191 Days  $T_0=131.549377$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

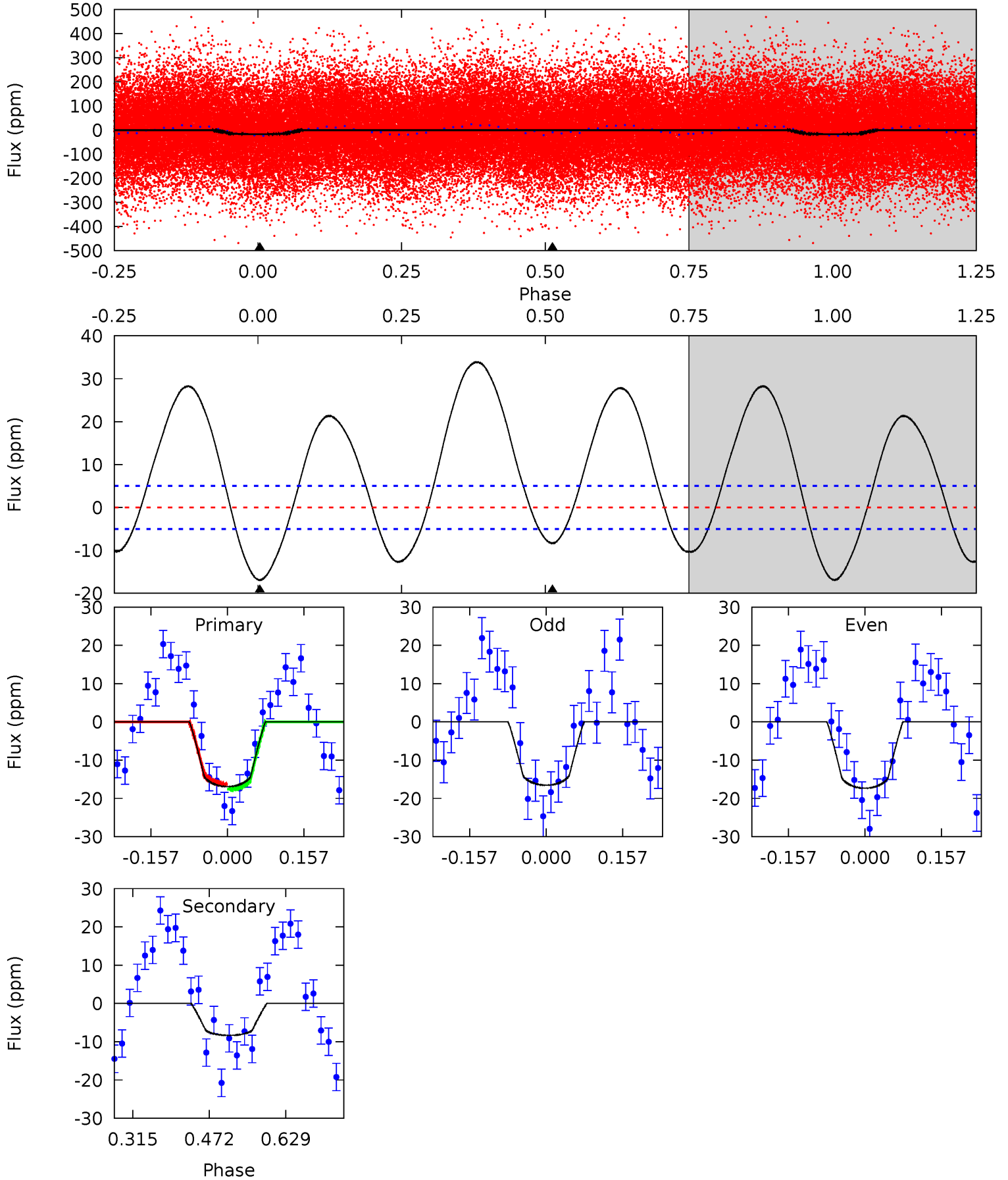
TCE 011031512-01 P= 0.672191 Days  $T_0=131.549372$  (BKJD)



# DV Model-Shift Uniqueness Test

011031512-01, P = 0.672191 Days, E = 130.877186 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
15.1	7.43	0	0	4.47	1.41	10.0	15.1	15.1	7.43	7.43	0.34	0.95	0.67	0.56

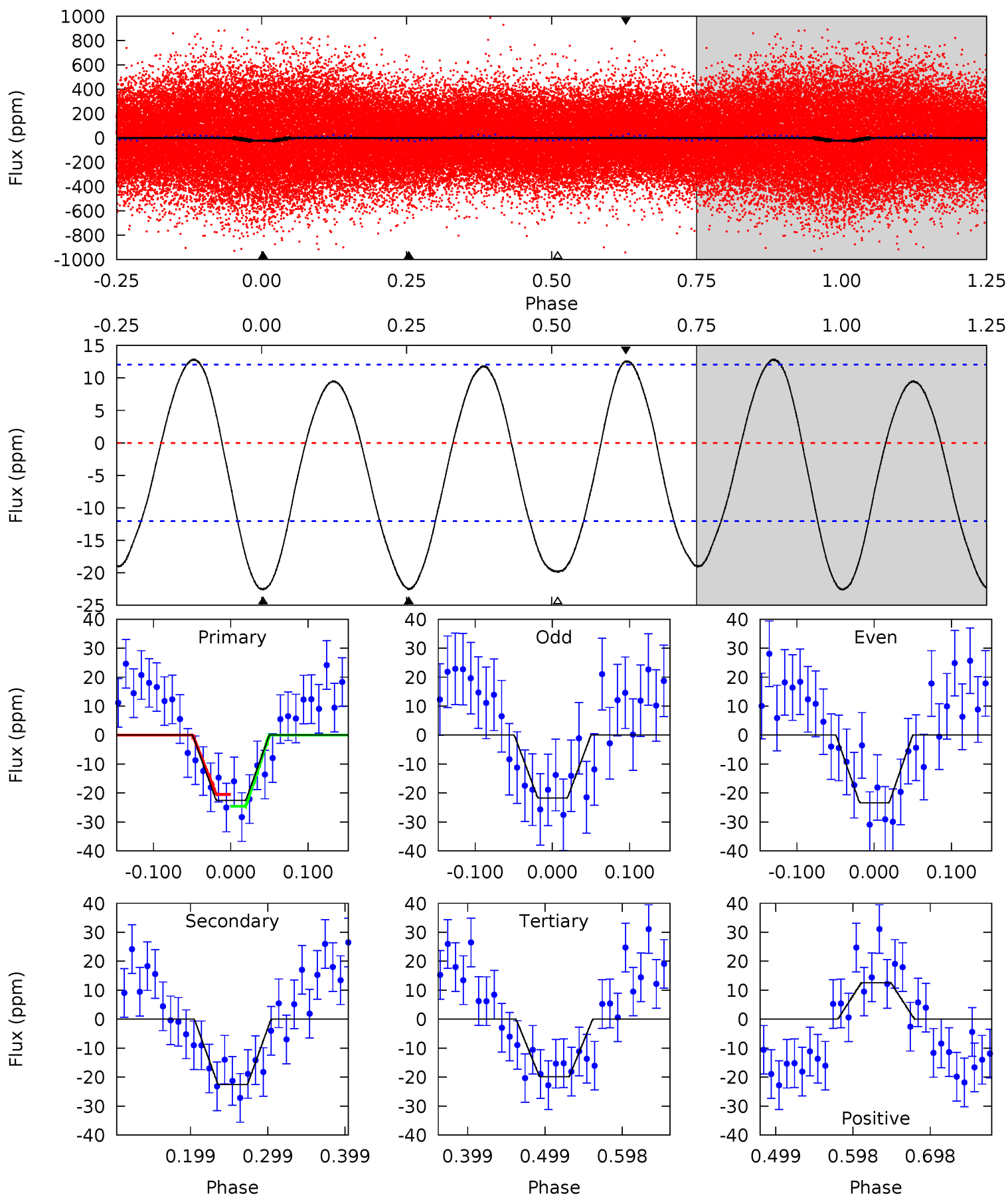




# Alt Model-Shift Uniqueness Test

011031512-01, P = 0.672191 Days, E = 130.877181 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
8.56	8.55	7.53	4.77	4.57	1.65	4.38	1.03	3.79	1.02	3.78	0.31	0.75	0.36	0.77





### Stellar Parameters For KIC 011031512

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7643^{+239}_{-319}$	$3.561^{+0.594}_{-0.066}$	$-0.340^{+0.250}_{-0.300}$	$3.838^{+0.395}_{-2.237}$	$1.958^{+0.062}_{-0.561}$	$0.049^{+0.413}_{-0.011}$
	+3%/-4%	+17%/-2%	+74%/-88%	+10%/-58%	+3%/-29%	+847%/-23%
Source	KIC0	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 011031512-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-8 \pm 1$	$1.87^{+0.60}_{-0.60}$	$6439^{+494}_{-935}$	$4405^{+1245}_{-8148}$	$0.443^{+0.490}_{-0.188}$
Alt.	$-23 \pm 3$	$1.87^{+0.59}_{-0.60}$	$6476^{+457}_{-928}$	$6734^{+1420}_{-1000}$	$1.211^{+1.340}_{-0.495}$

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

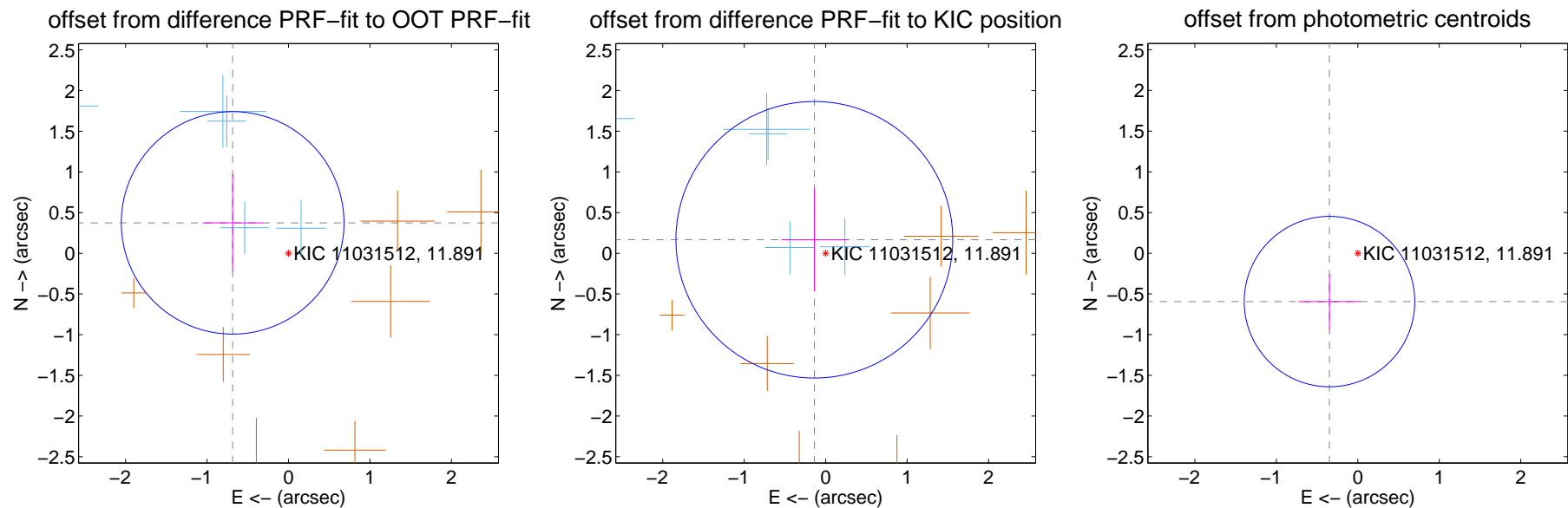
## DV Centroid Data

Supplemental centroid analysis for 011031512-01. **Kepler magnitude: 11.89.** Transit SNR 11.80

There are 5 quarters with good PRF difference image offsets

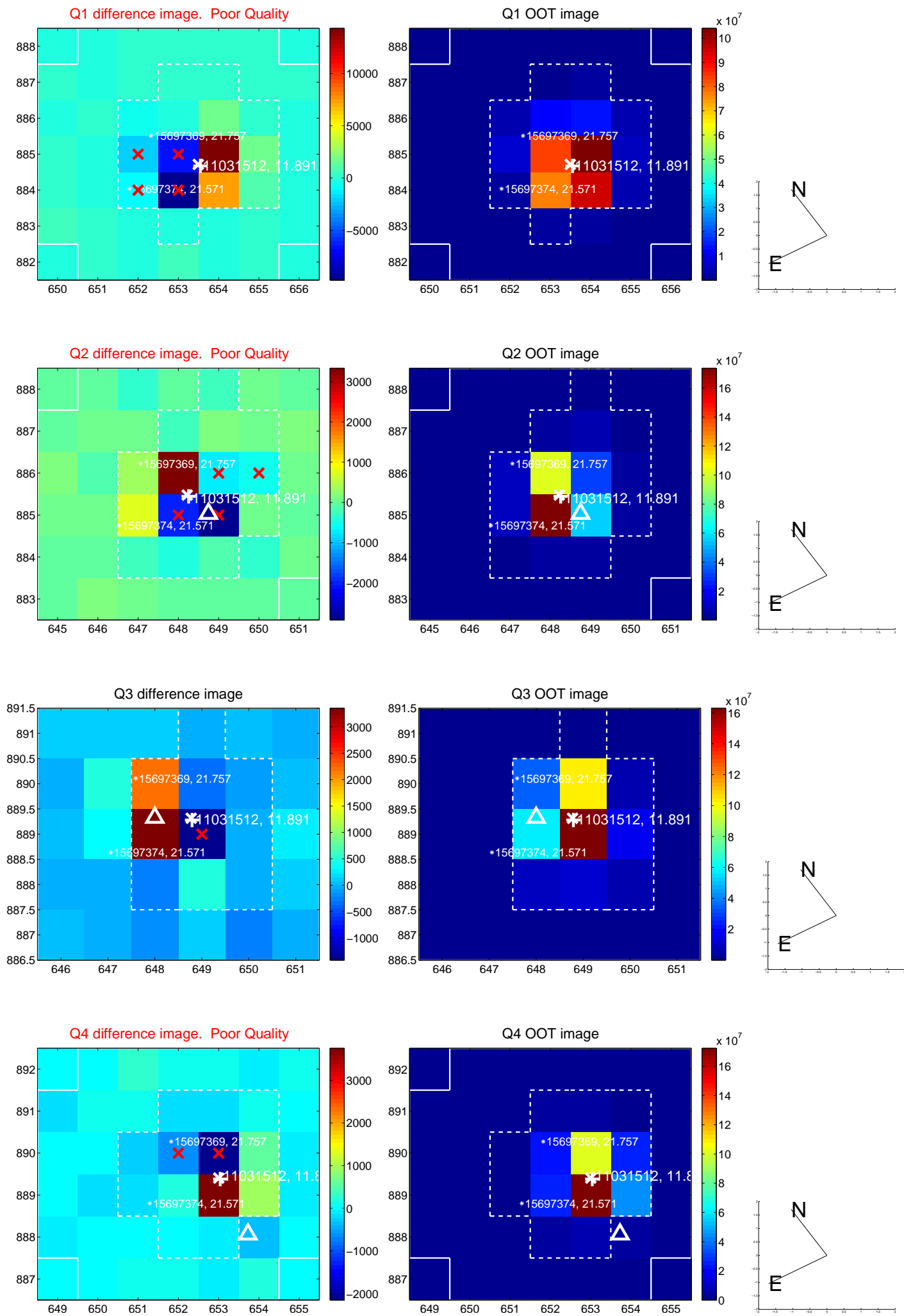
The direct PRF centroid is offset from the target star catalog position by about 0.27 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.781 \pm 0.456$	1.71	$0.686 \pm 0.369$	$0.374 \pm 0.595$
PRF-fit source offset from KIC position	$0.217 \pm 0.566$	0.38	$0.139 \pm 0.406$	$0.166 \pm 0.633$
photometric centroid source offset	$0.69 \pm 0.35$	1.97	$0.35 \pm 0.38$	$-0.59 \pm 0.34$

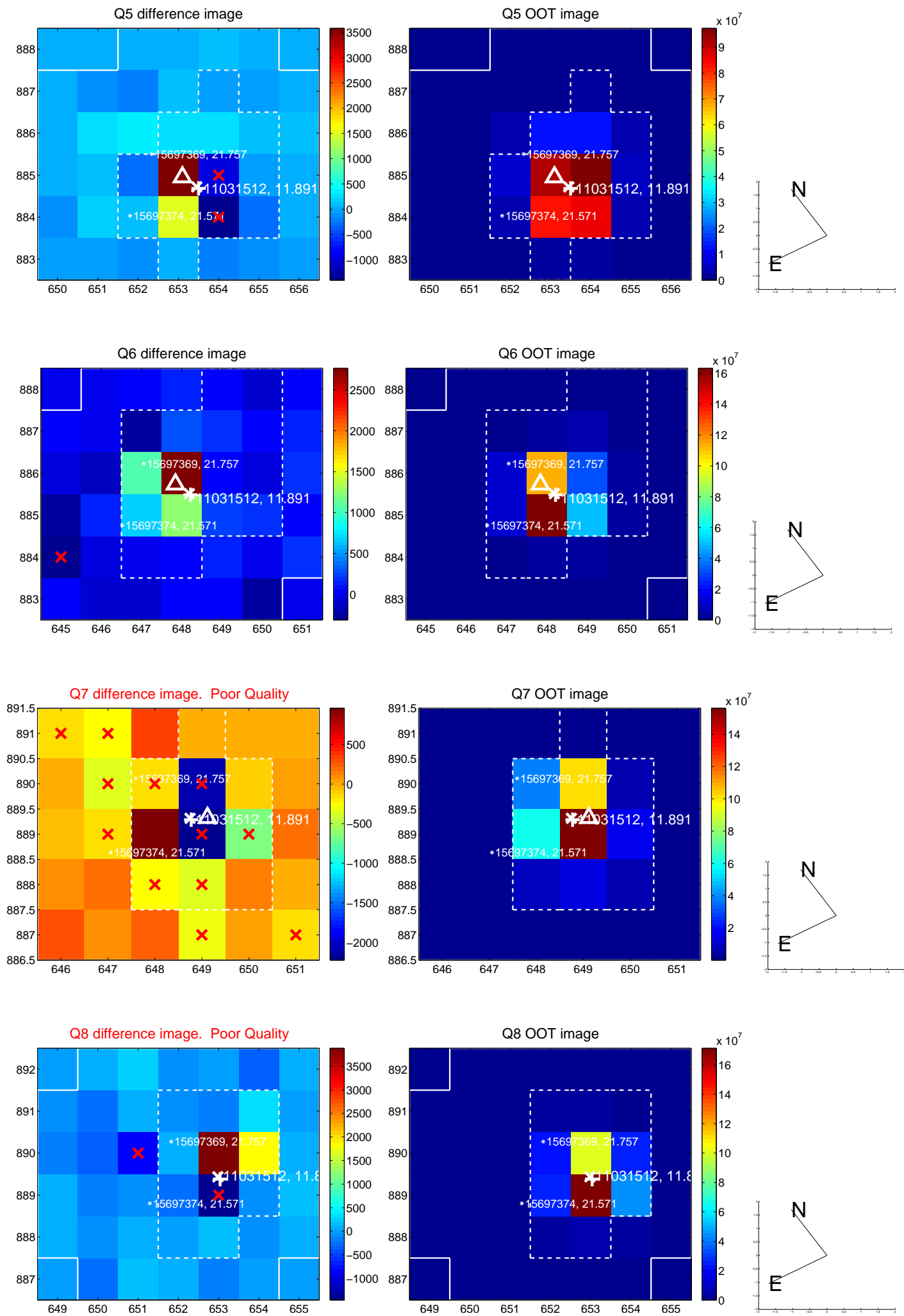


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

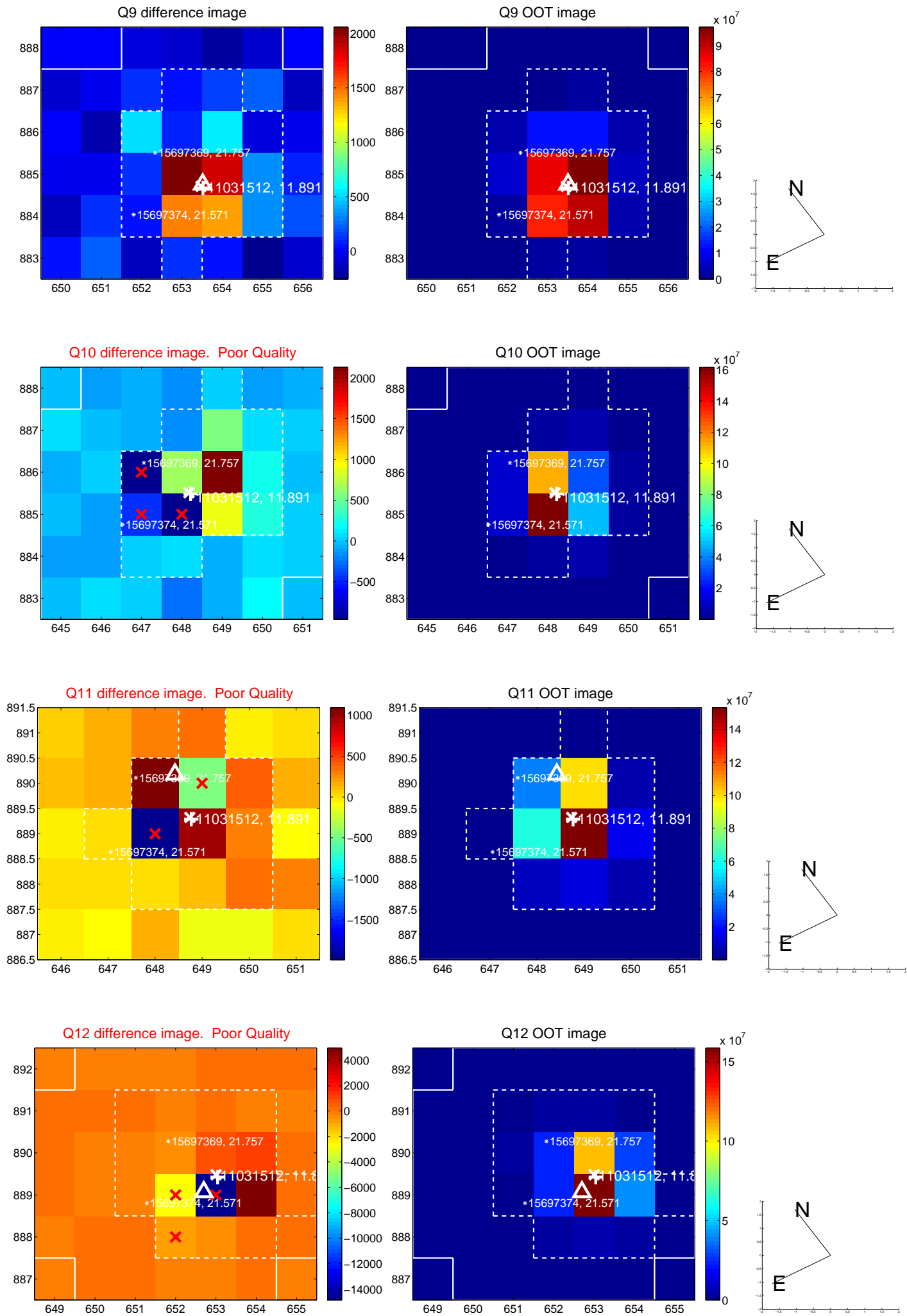


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

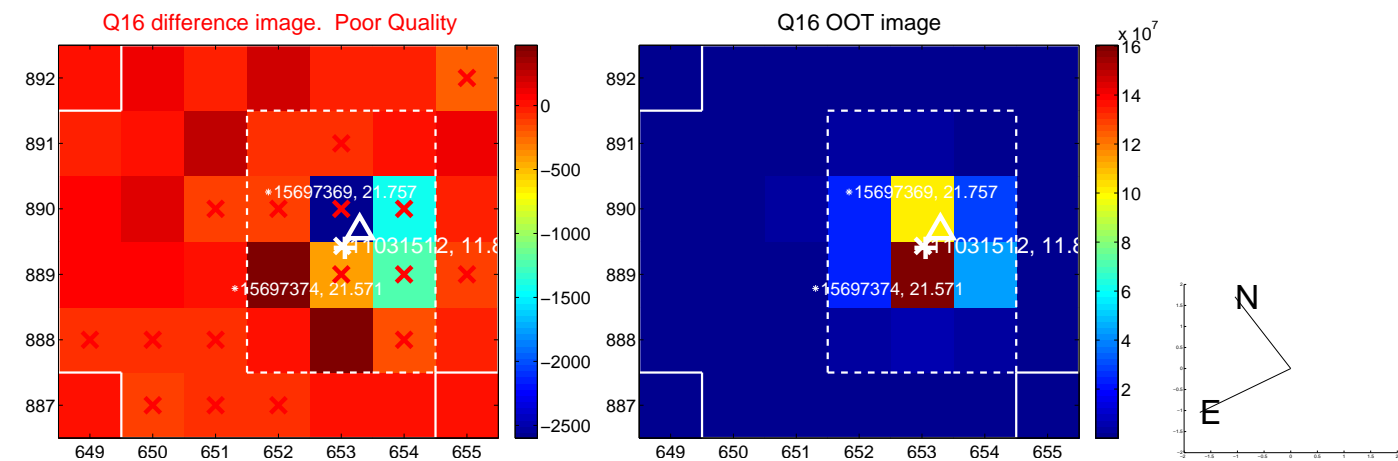
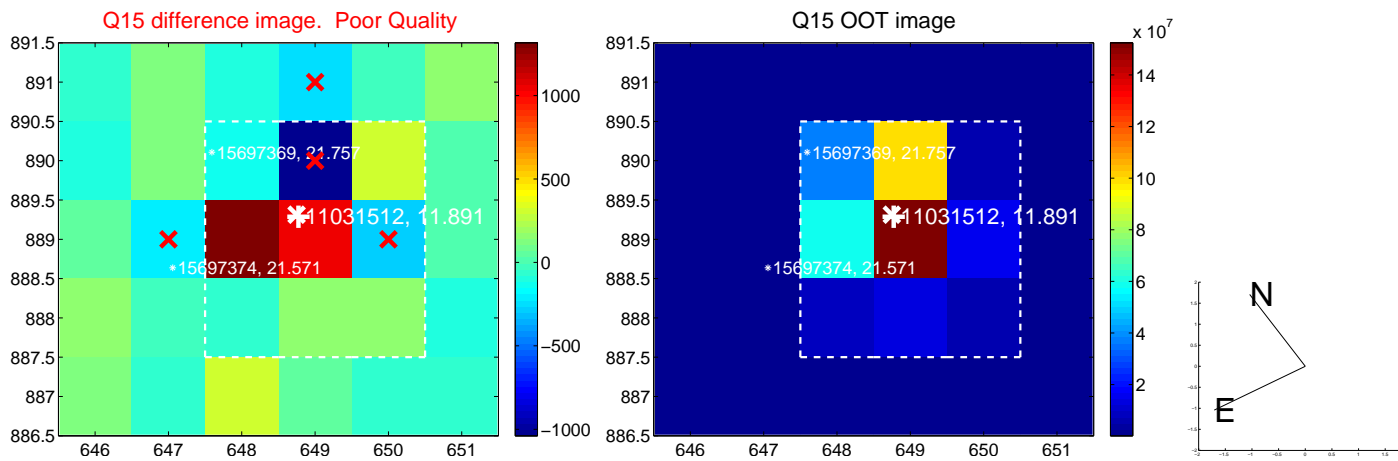
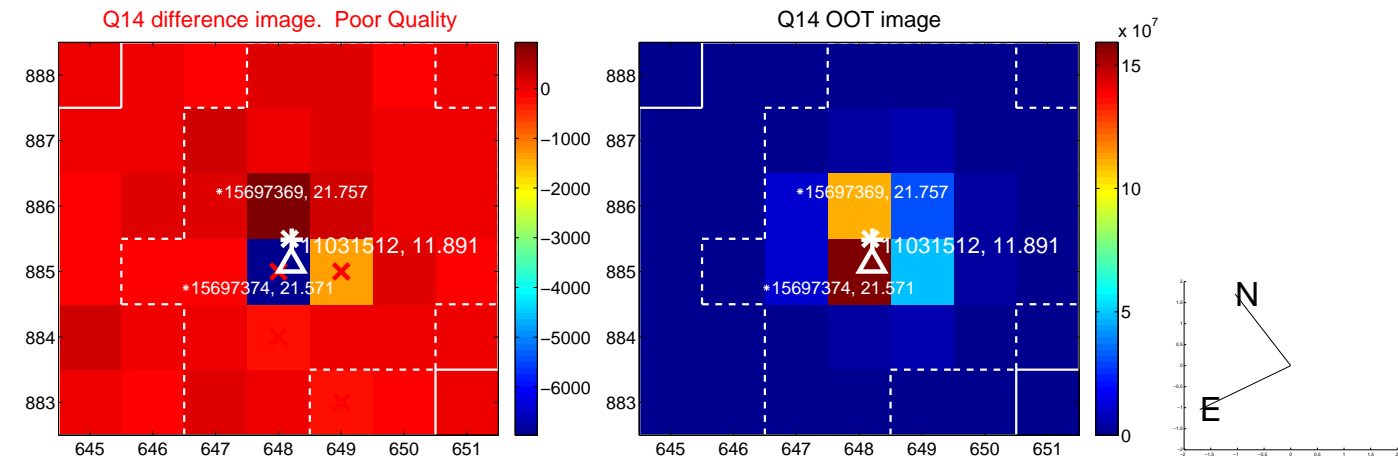
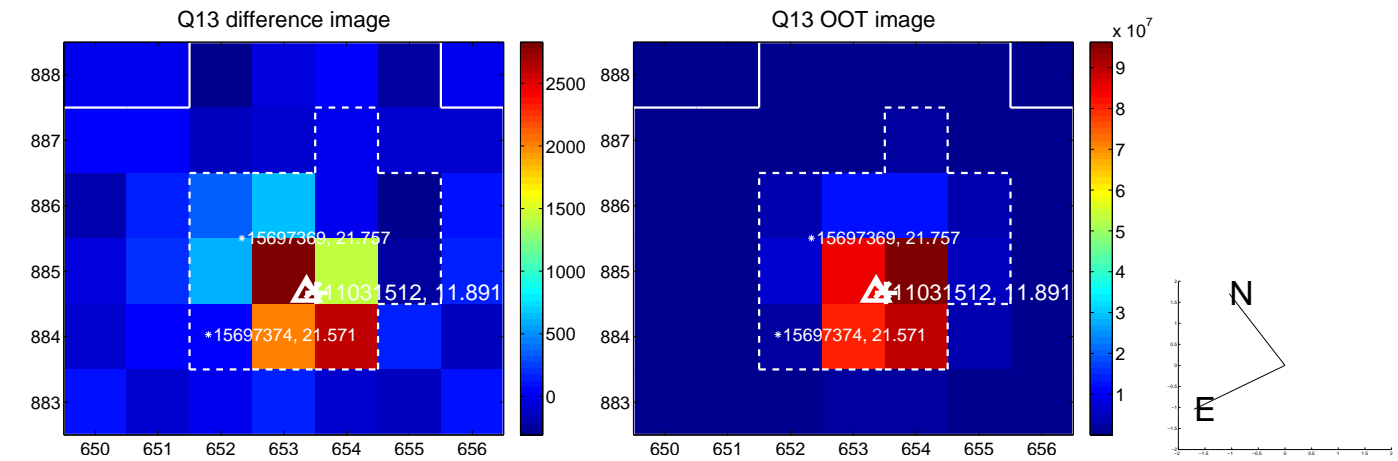




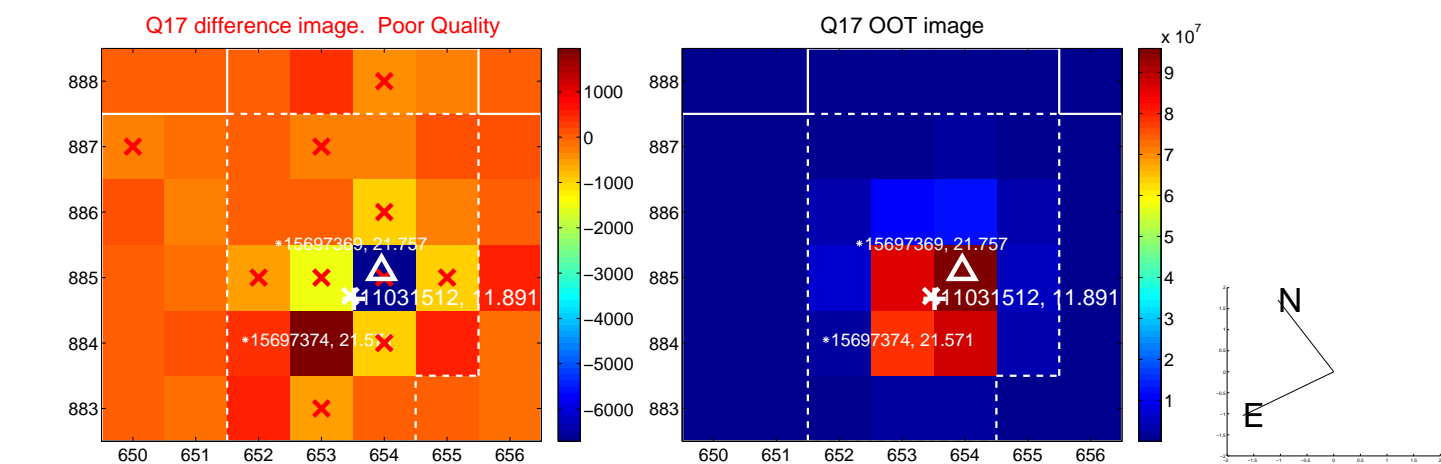
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



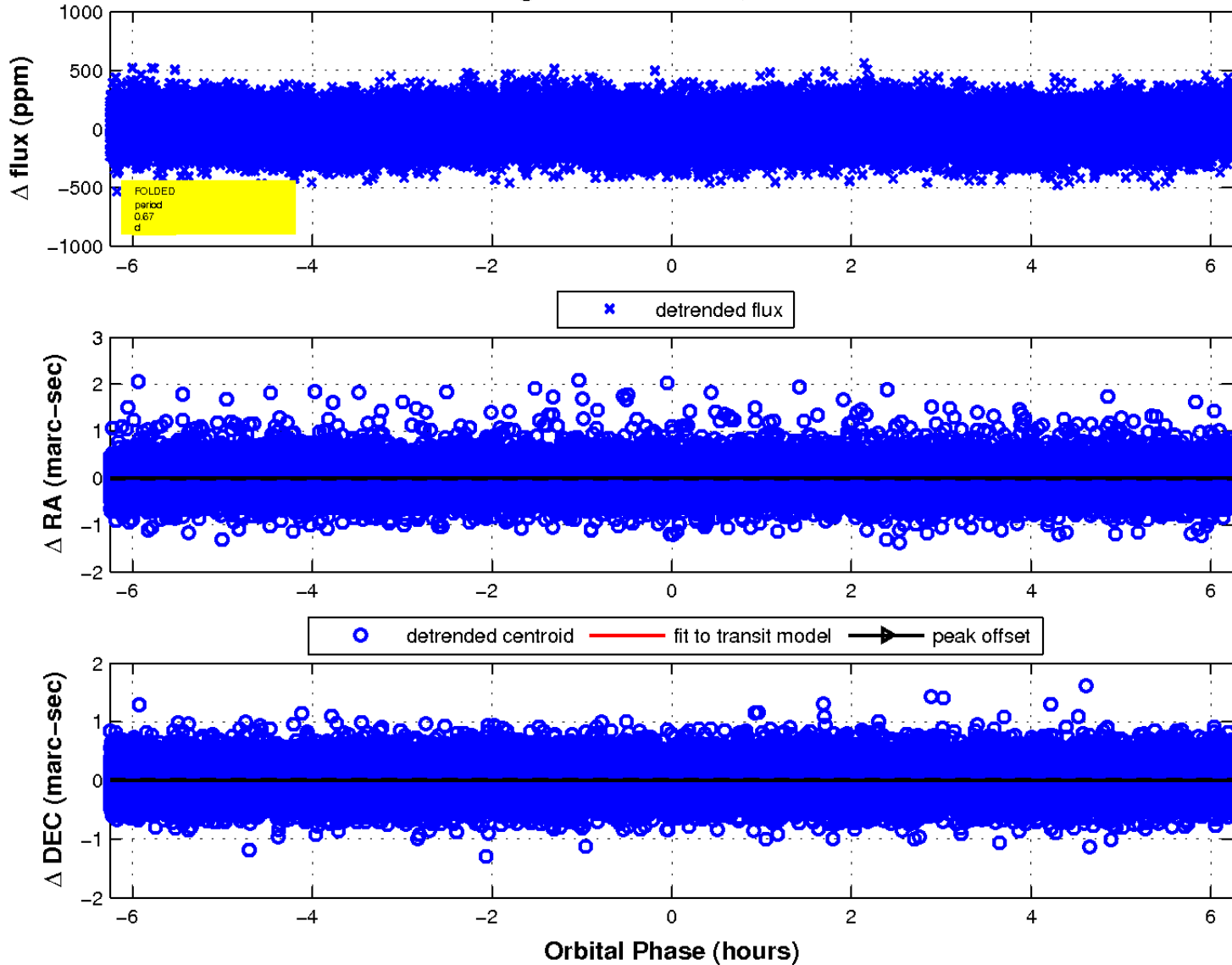
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

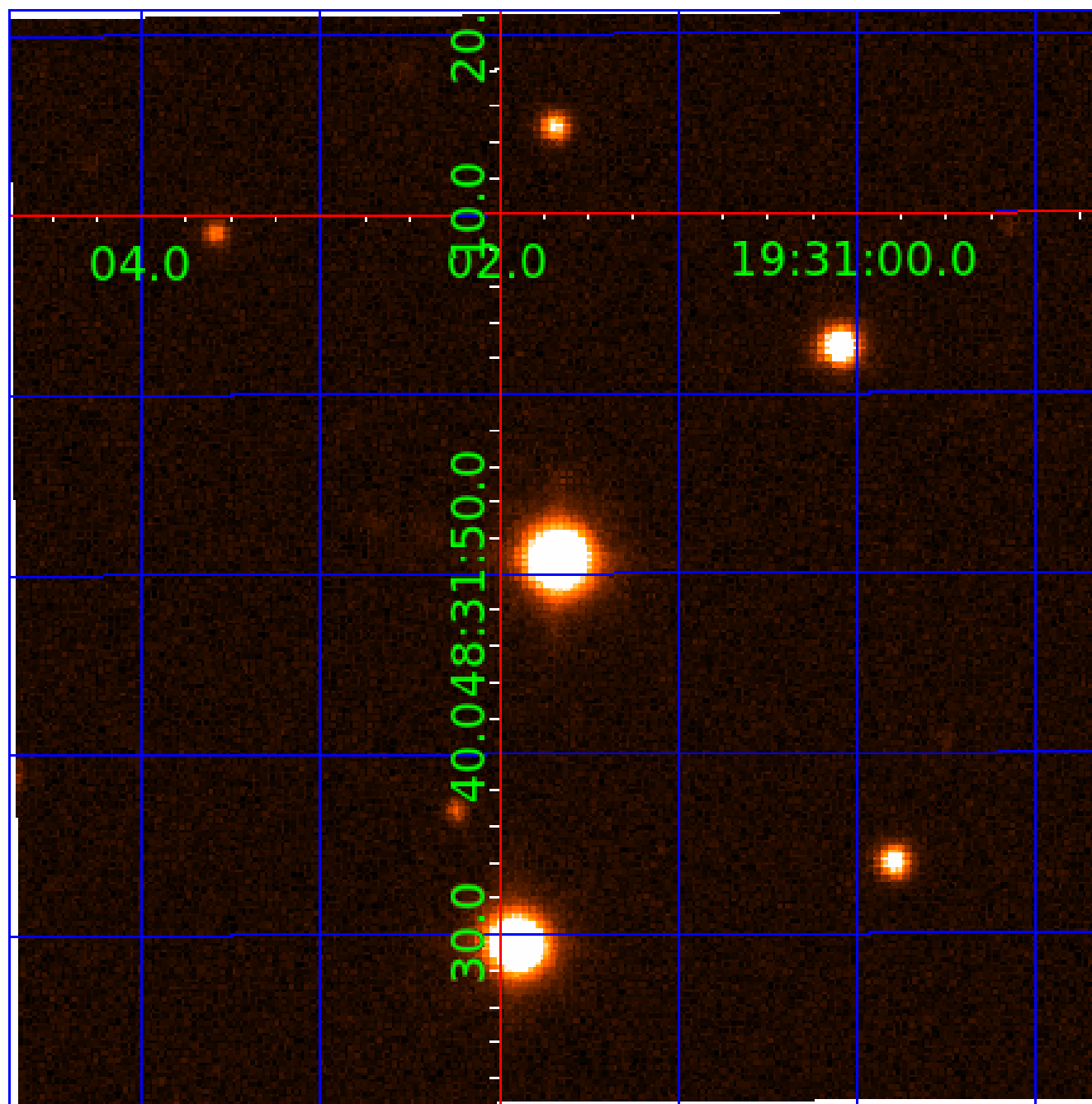


fluxWeightedCentroids, Planet 1 of 4



UKIRT Image

Declination





# KIC 011031512

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
011031512-01	OBS	No	0.672191	131.549377	22.6	2.083	11.1	11.8	3.84	7643	2.14	127652.58
011031512-02	OBS	No	0.672196	131.885669	20.9	2.190	10.0	11.8	3.84	7643	1.97	127651.21
011031512-03	OBS	No	54.989719	140.822953	305.7	1.768	8.4	8.4	3.84	7643	6.76	359.45
011031512-04	OBS	No	48.759807	164.170128	247.0	1.465	7.7	6.5	3.84	7643	6.72	421.96

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
011031512-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
011031512-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—SAME_NTL_PERIOD
011031512-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_DV
011031512-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT

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

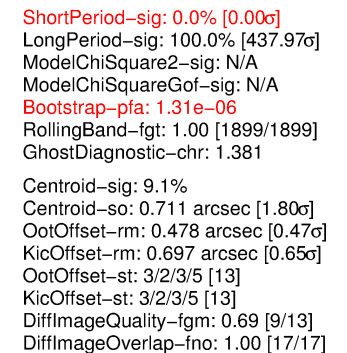
N = Not Transit-Like. S = Stellar Eclipse. C = Centroid Offset. E = Ephemeris Match.

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 011031512-02

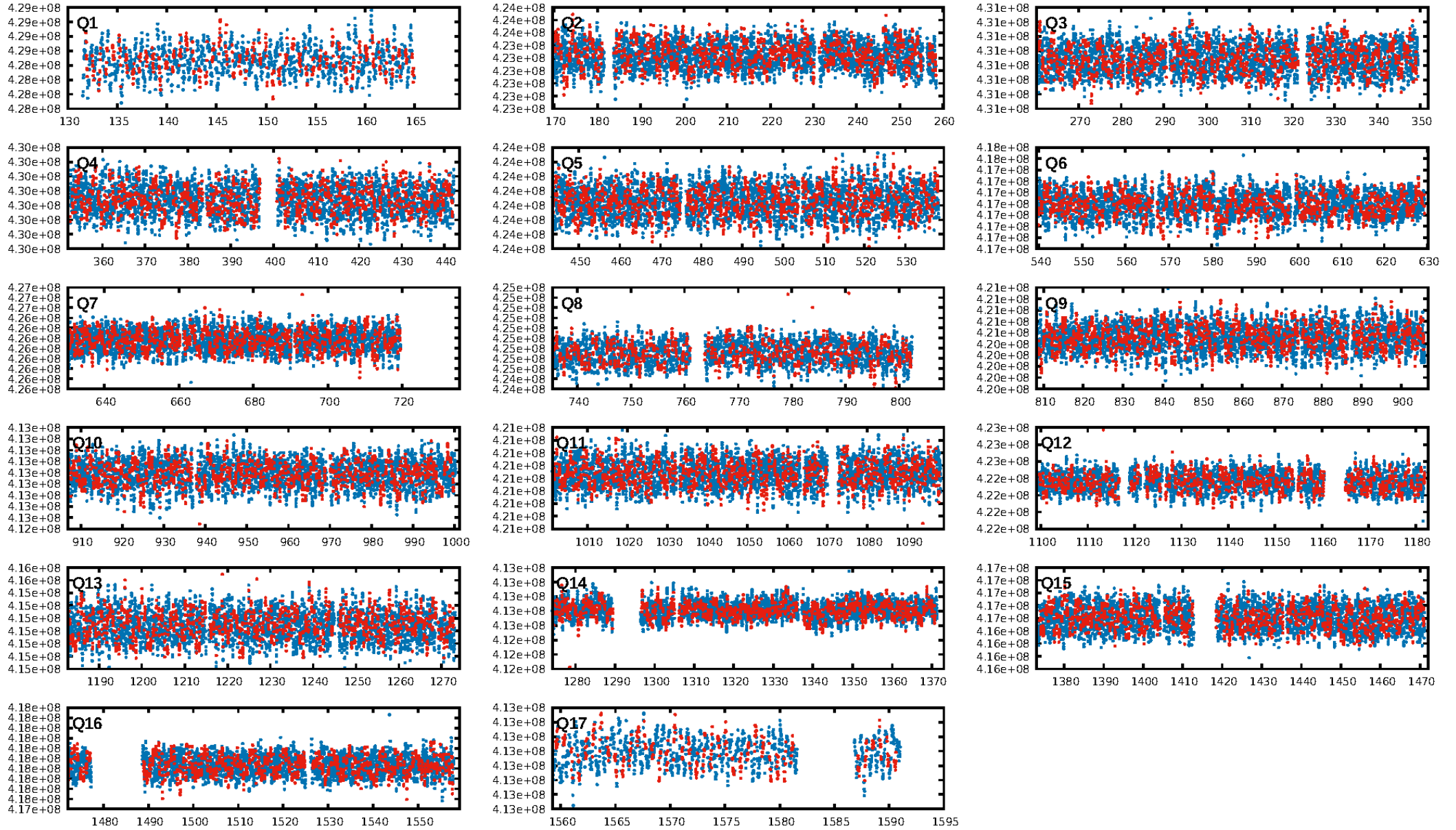
No Significant Match Found

## KIC: 11031512    Candidate: 2 of 4    Period: 0.672 d

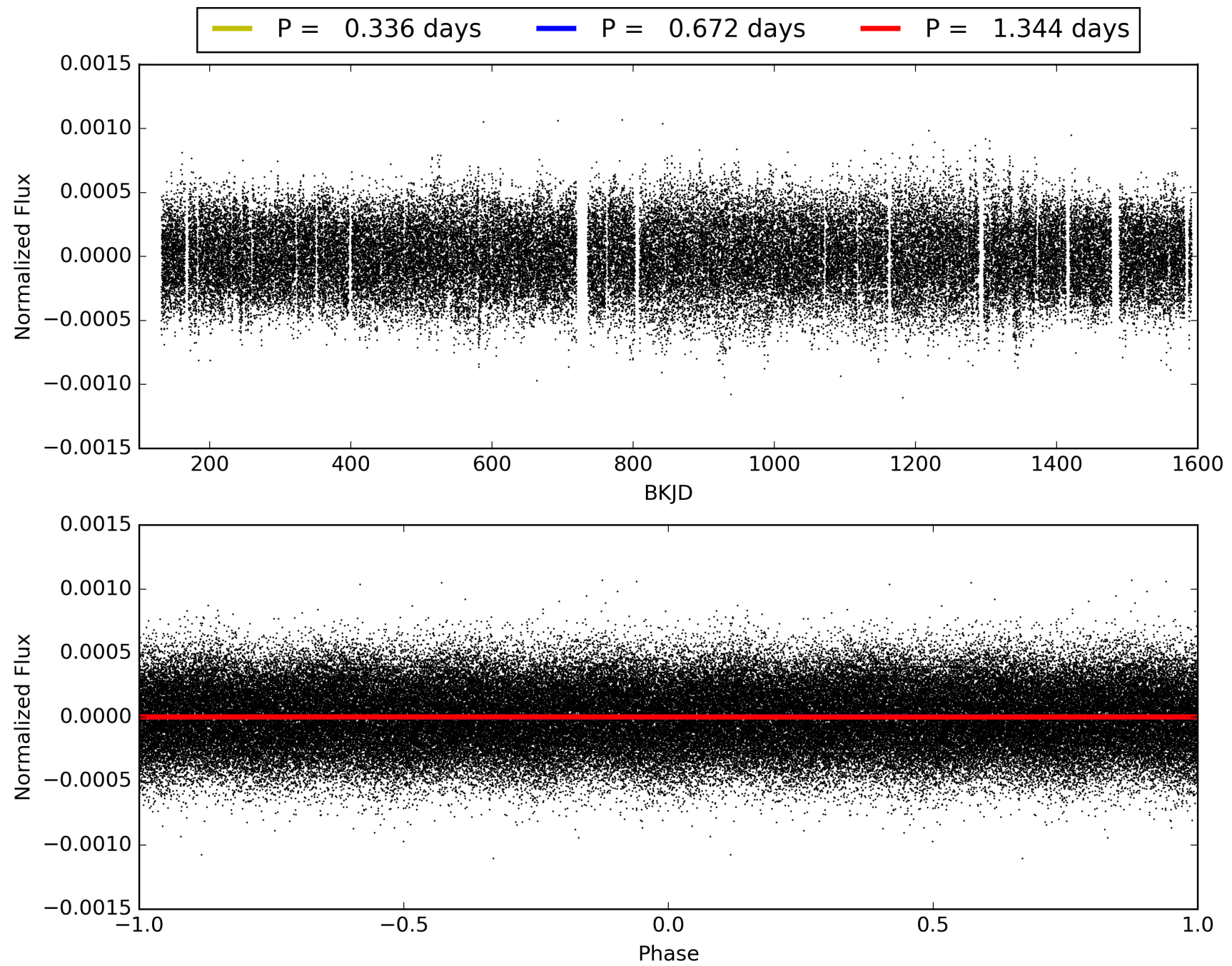


**This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center**

# TCE 011031512-02, PDC Light Curves

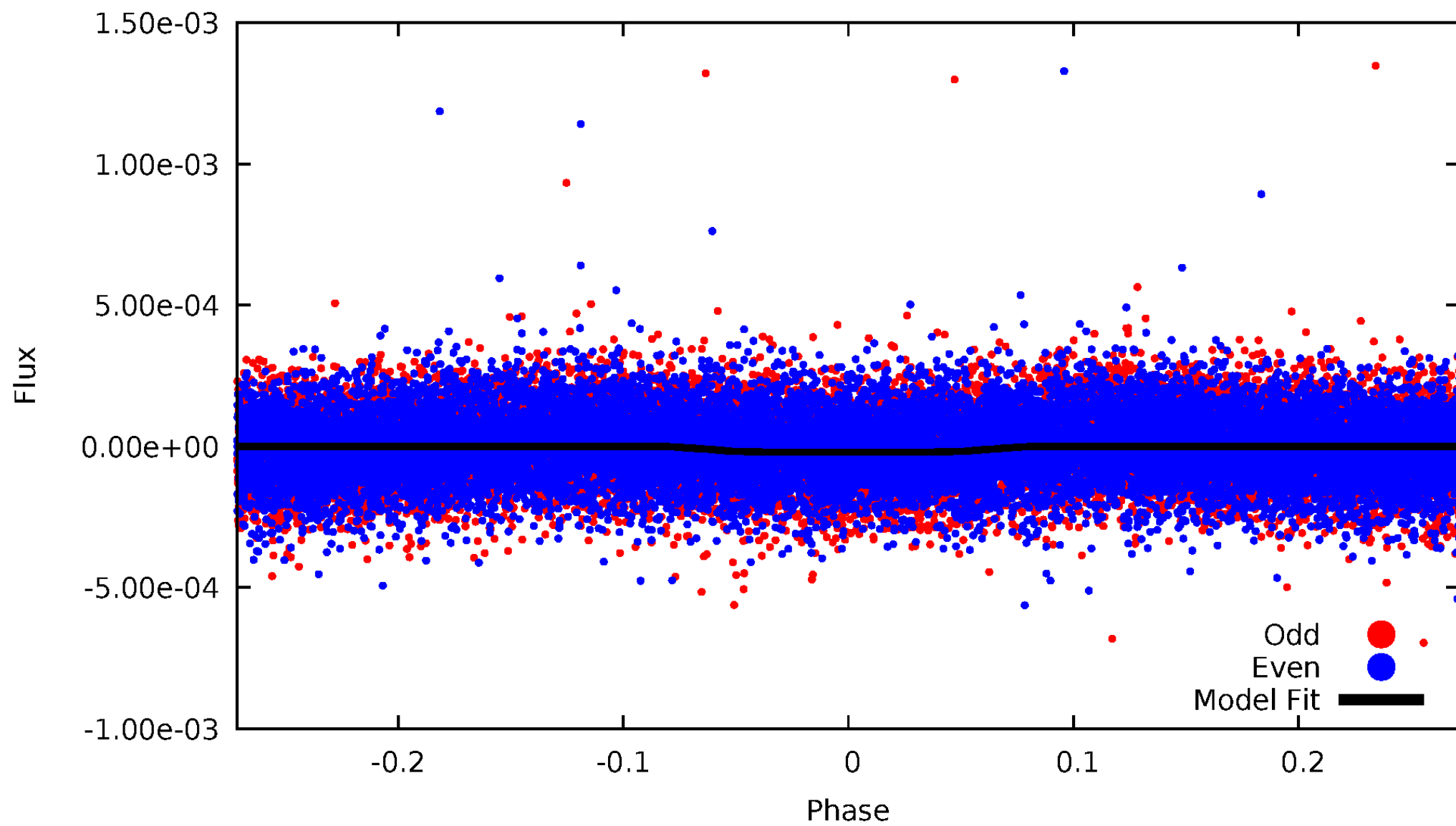


TCE 011031512-02



# DV Odd/Even

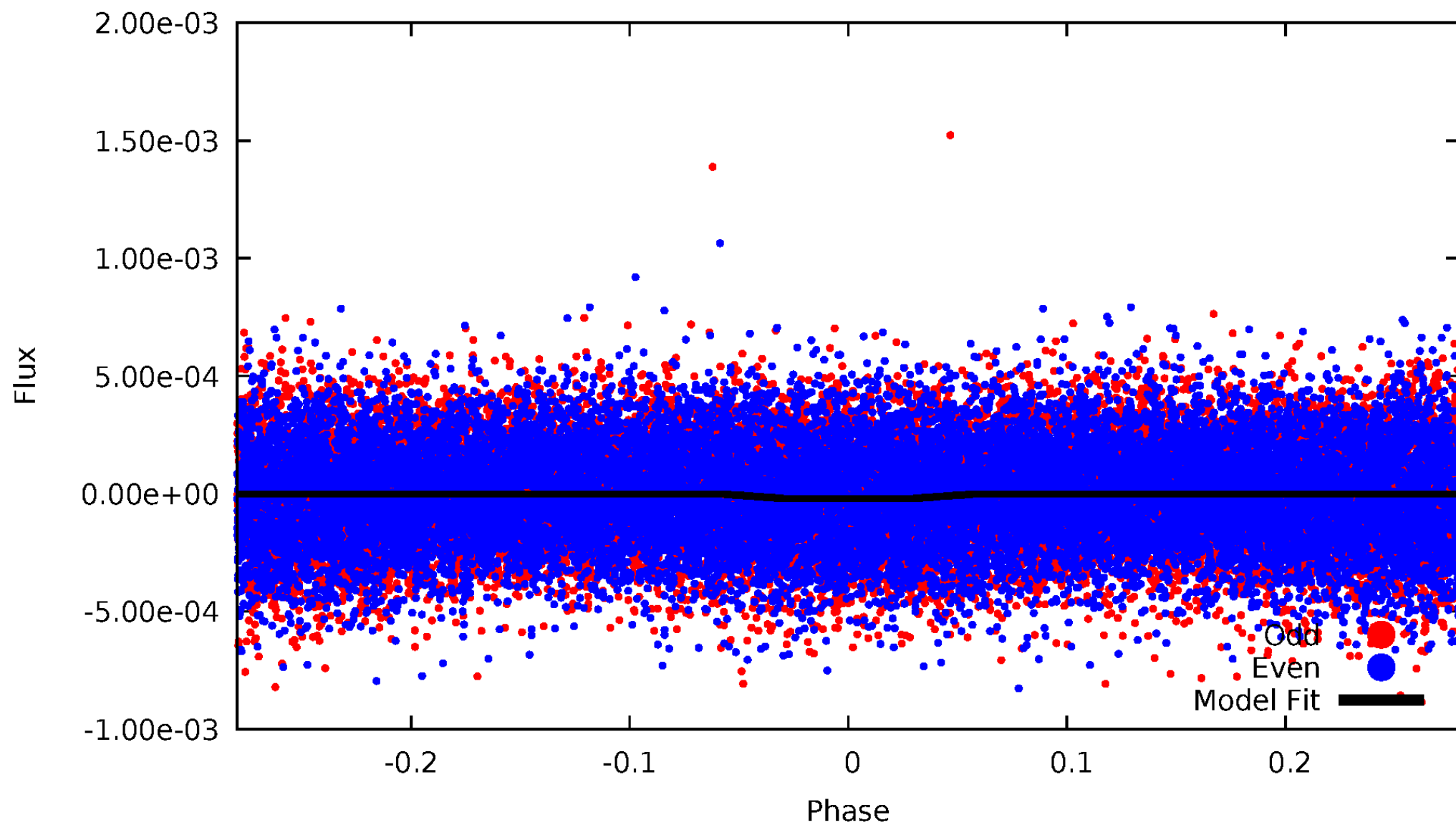
TCE 011031512-02





# ALT Odd/Even

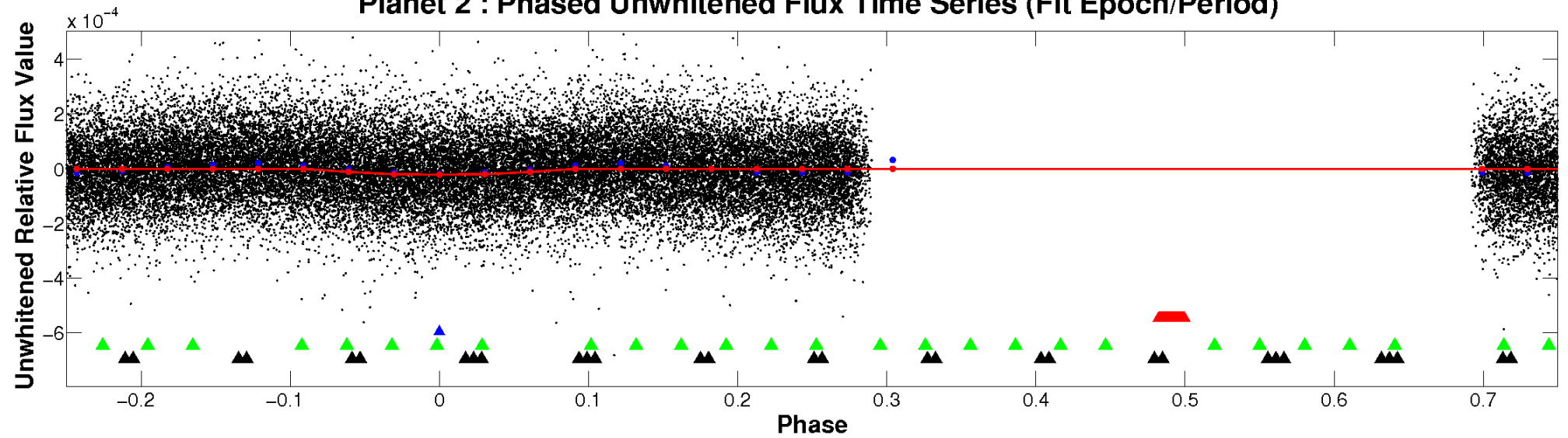
TCE 011031512-02



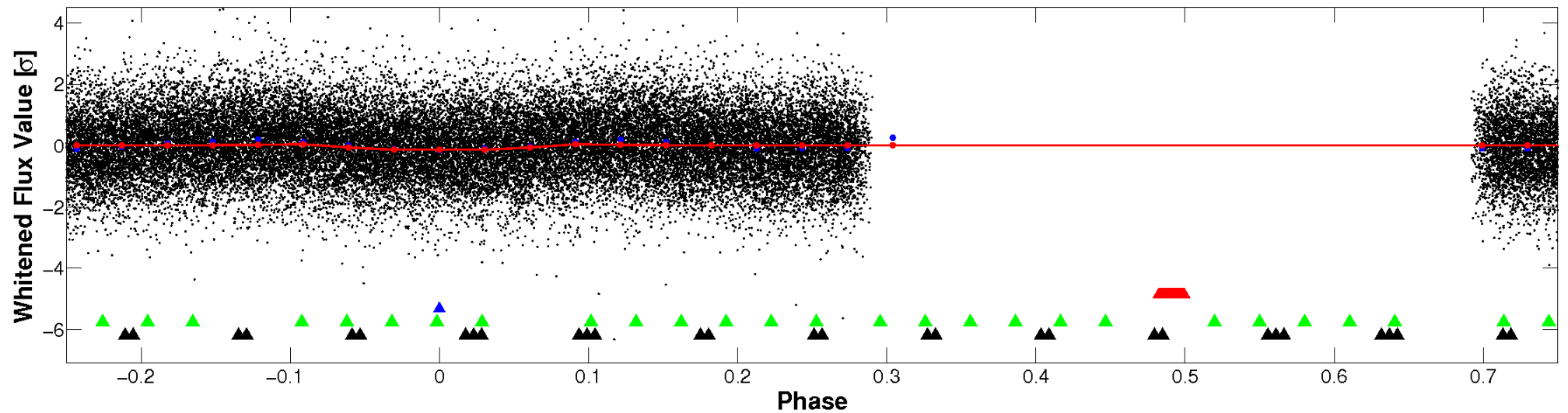


# Non-Whitened Vs. Whitened Light Curve

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

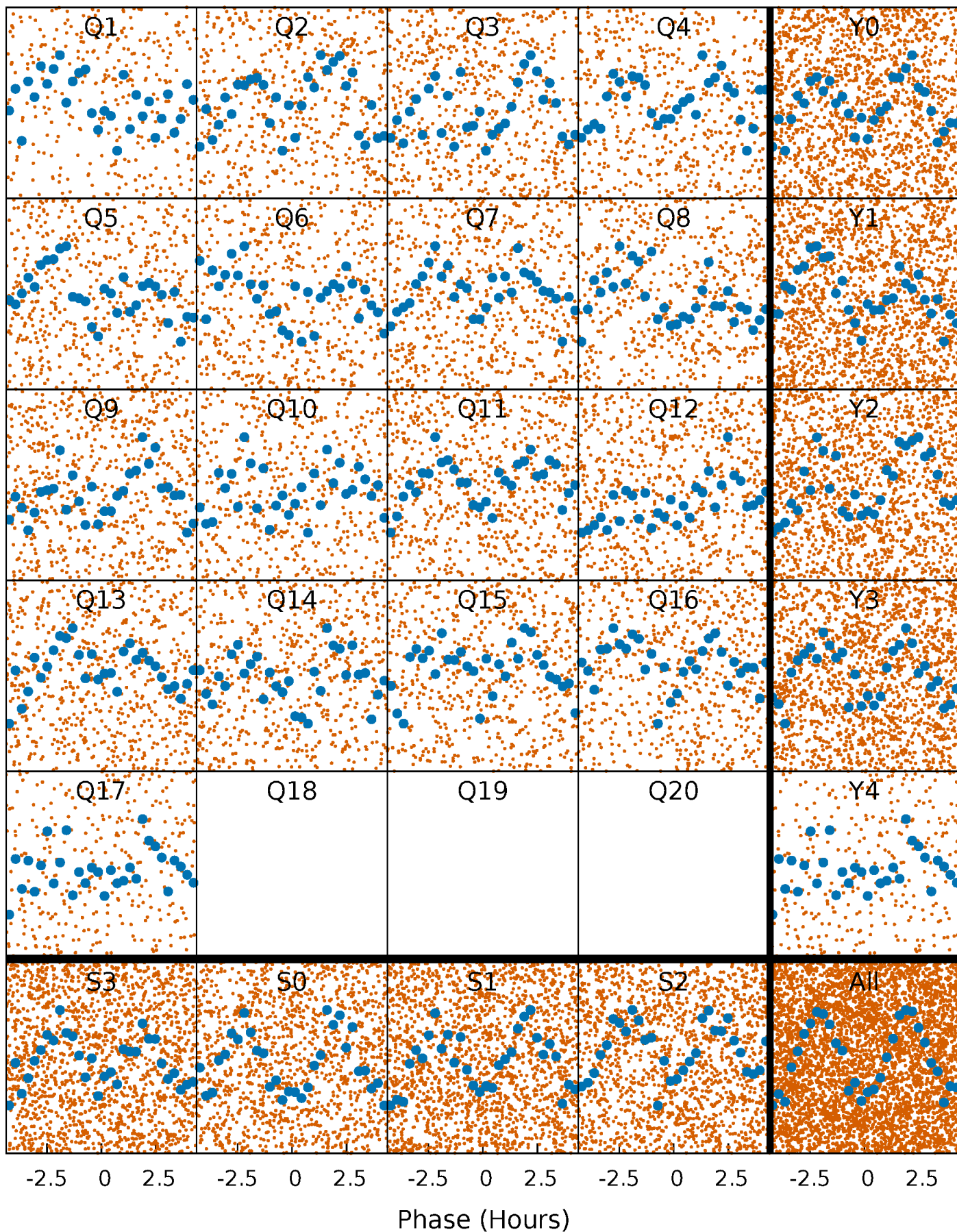


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

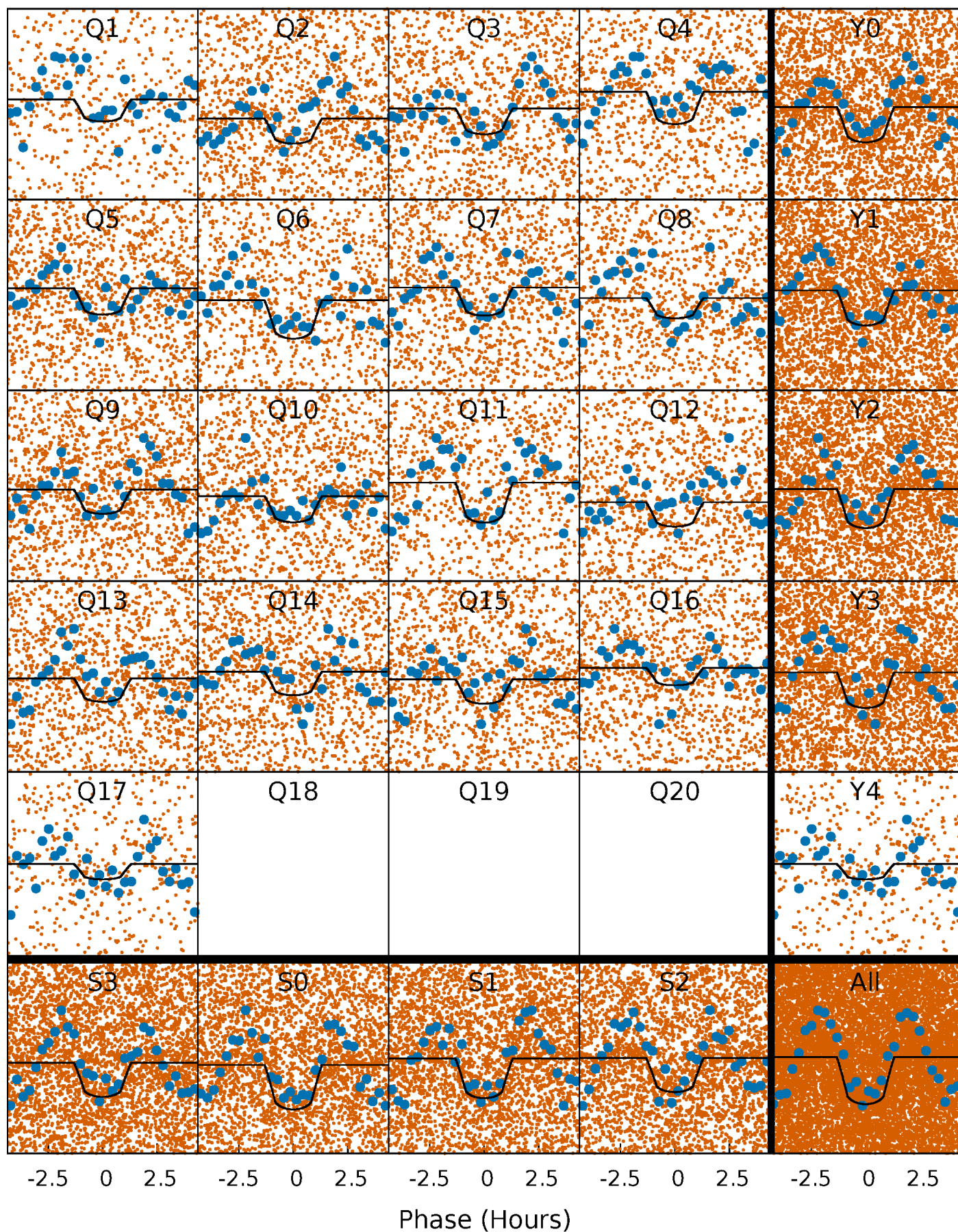
TCE 011031512-02 P= 0.672196 Days  $T_0=131.885669$  (BKJD)





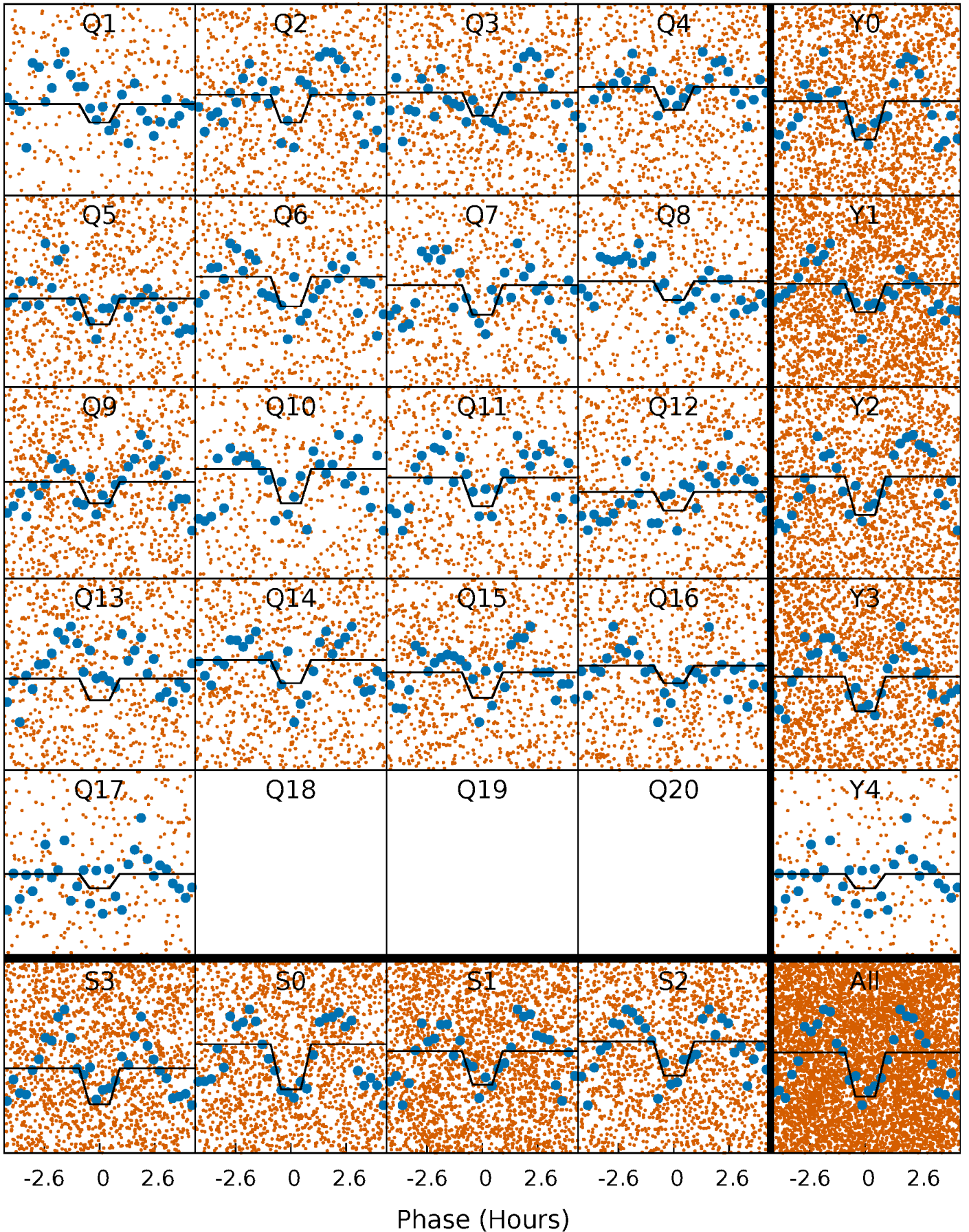
# DV Quarter-Phased Transit Curves

TCE 011031512-02   P= 0.672196 Days    $T_0=131.885669$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 011031512-02 P= 0.672199 Days  $T_0=131.882288$  (BKJD)

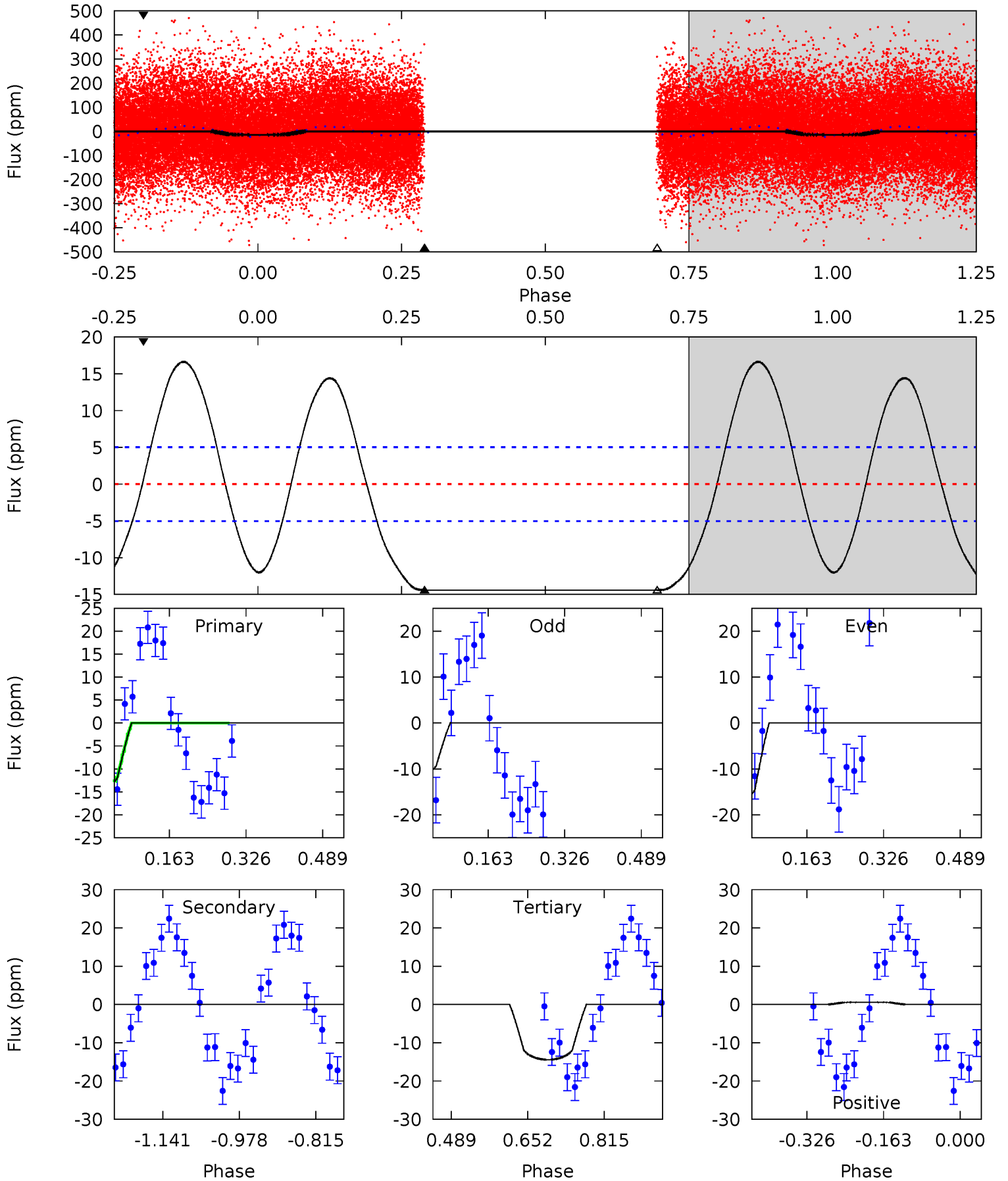




# DV Model-Shift Uniqueness Test

011031512-02, P = 0.672196 Days, E = 131.213473 Days

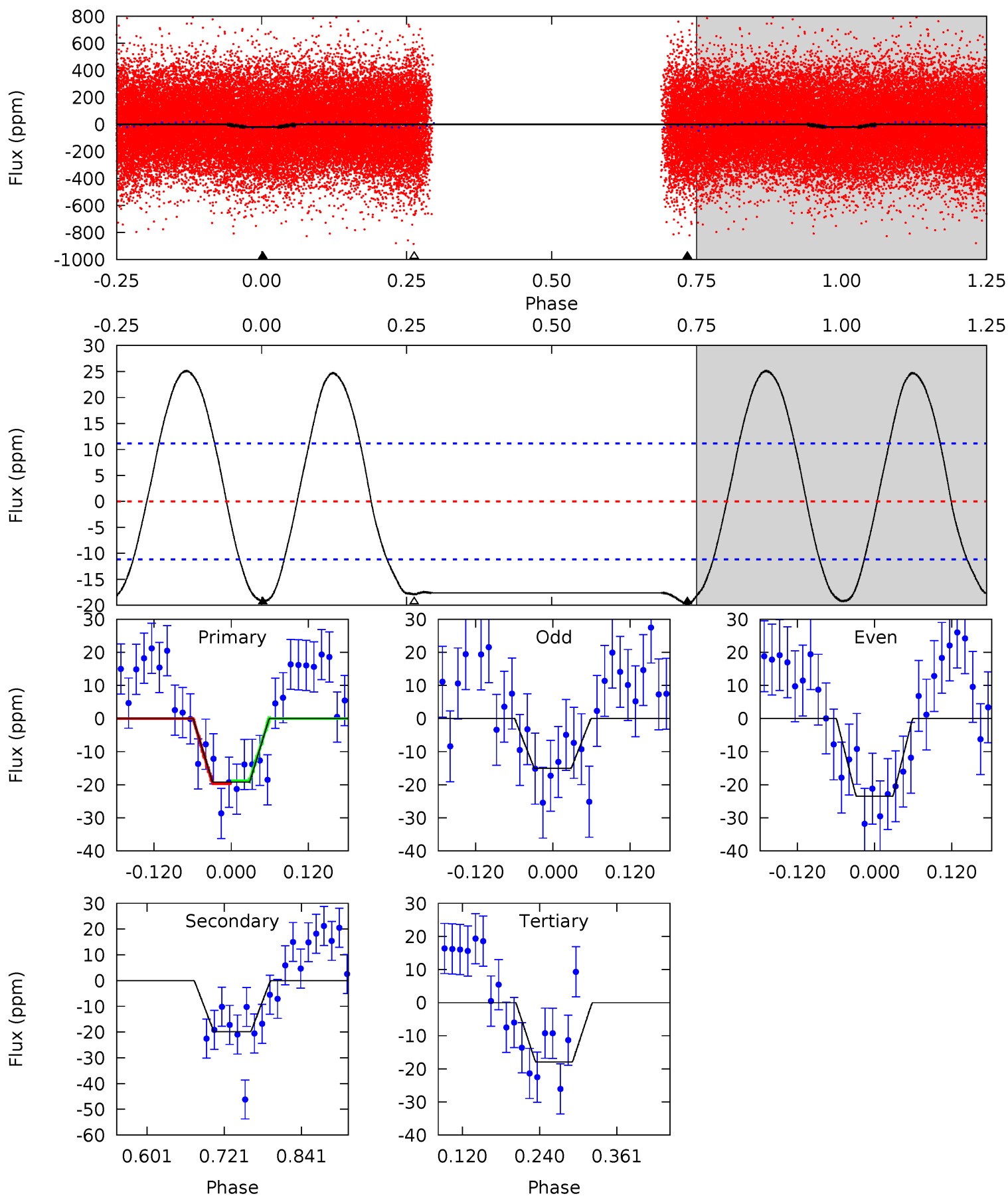
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
12.8	0	12.8	0.54	4.46	1.40	9.25	0.00	12.3	-12.8	-0.54	2.73	0.96	0.54	0.13



# Alt Model-Shift Uniqueness Test

011031512-02, P = 0.672199 Days, E = 131.210089 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
7.80	8.05	7.27	0	4.53	1.55	6.97	0.53	7.80	0.78	8.05	1.73	1.42	0.56	0.19





### Stellar Parameters For KIC 011031512

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7643^{+239}_{-319}$	$3.561^{+0.594}_{-0.066}$	$-0.340^{+0.250}_{-0.300}$	$3.838^{+0.395}_{-2.237}$	$1.958^{+0.062}_{-0.561}$	$0.049^{+0.413}_{-0.011}$
	+3%/-4%	+17%/-2%	+74%/-88%	+10%/-58%	+3%/-29%	+847%/-23%
Source	KIC0	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 011031512-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$0\pm1$	$1.75^{+0.41}_{-0.54}$	$6433^{+501}_{-899}$	$-5199^{+736}_{-463}$	$0.004^{+0.083}_{-0.080}$
Alt.	$-20\pm2$	$1.71^{+0.40}_{-0.51}$	$6453^{+499}_{-986}$	$6952^{+894}_{-767}$	$1.307^{+1.145}_{-0.453}$

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

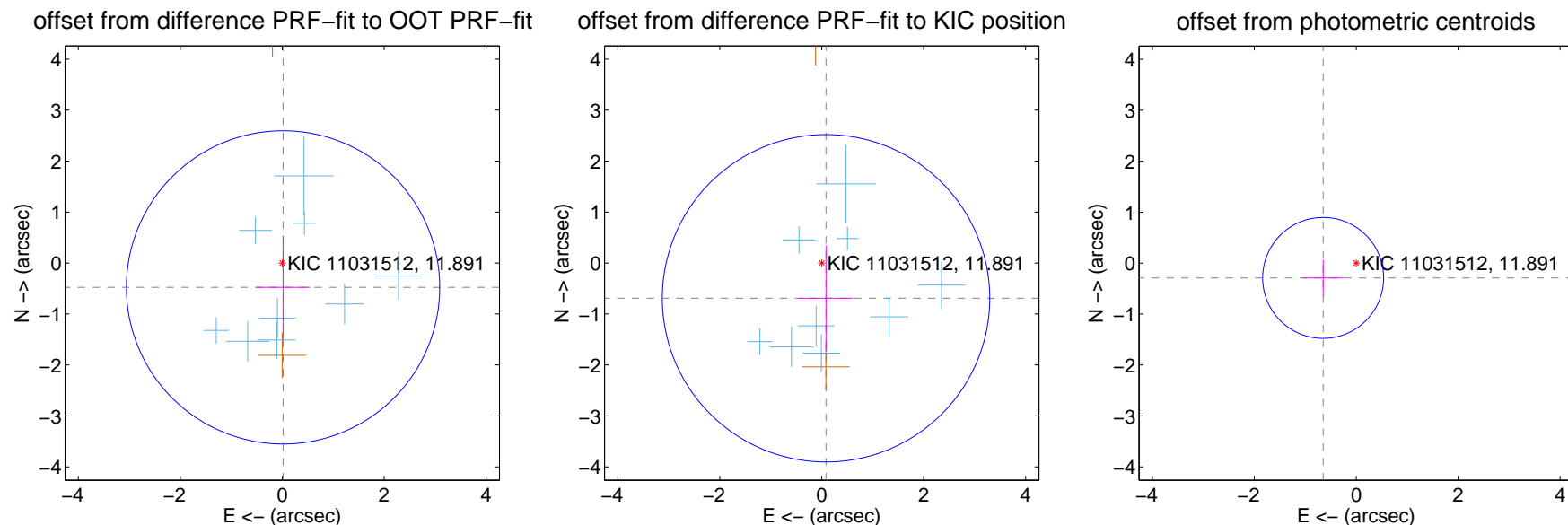
## DV Centroid Data

Supplemental centroid analysis for 011031512-02. **Kepler magnitude: 11.89.** Transit SNR 11.82

There are 9 quarters with good PRF difference image offsets

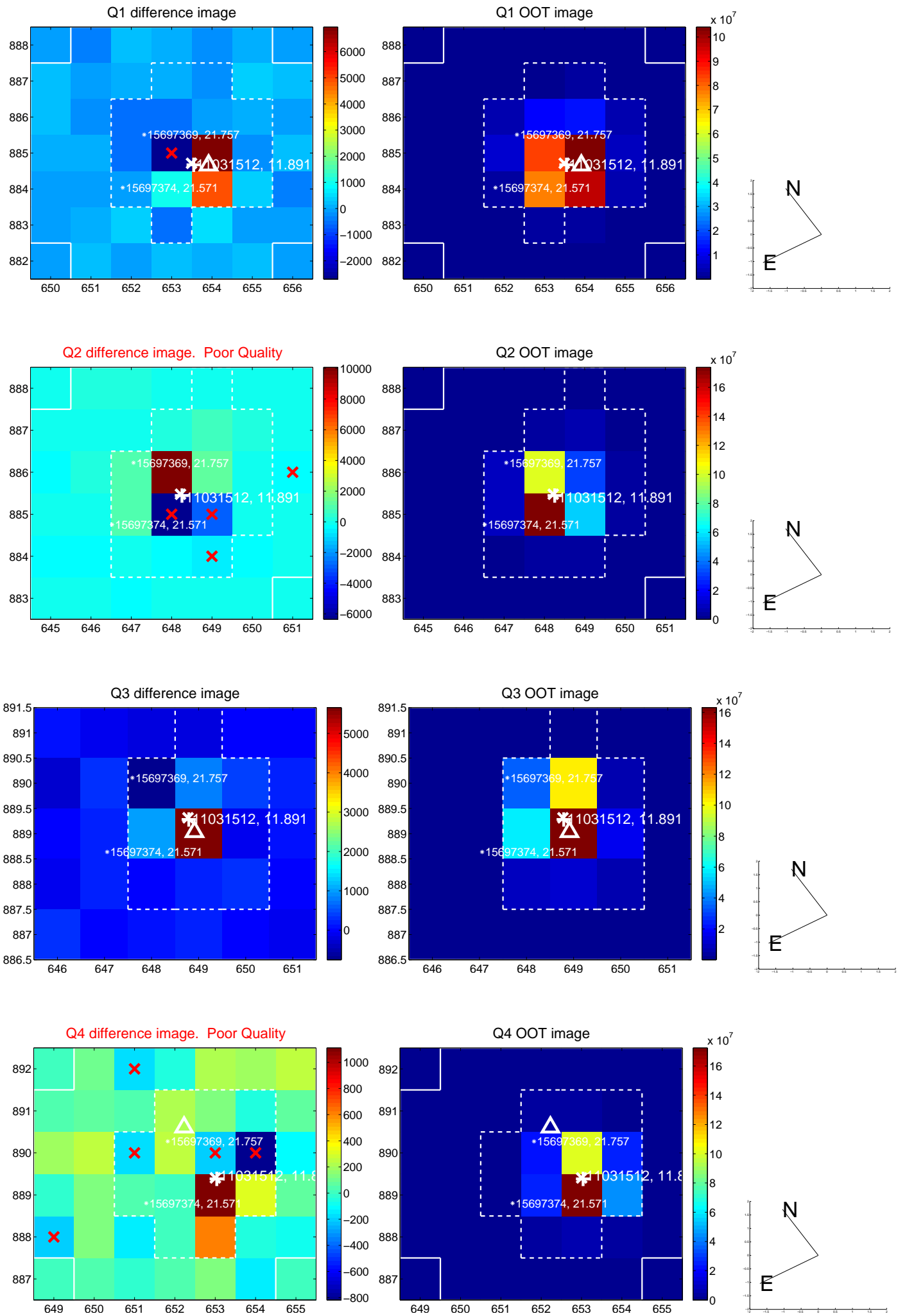
The direct PRF centroid is offset from the target star catalog position by about 0.27 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.478 \pm 1.024$	0.47	$-0.016 \pm 0.527$	$-0.478 \pm 1.013$
PRF-fit source offset from KIC position	$0.697 \pm 1.071$	0.65	$-0.085 \pm 0.531$	$-0.691 \pm 1.038$
photometric centroid source offset	$0.71 \pm 0.40$	1.80	$0.65 \pm 0.40$	$-0.29 \pm 0.36$

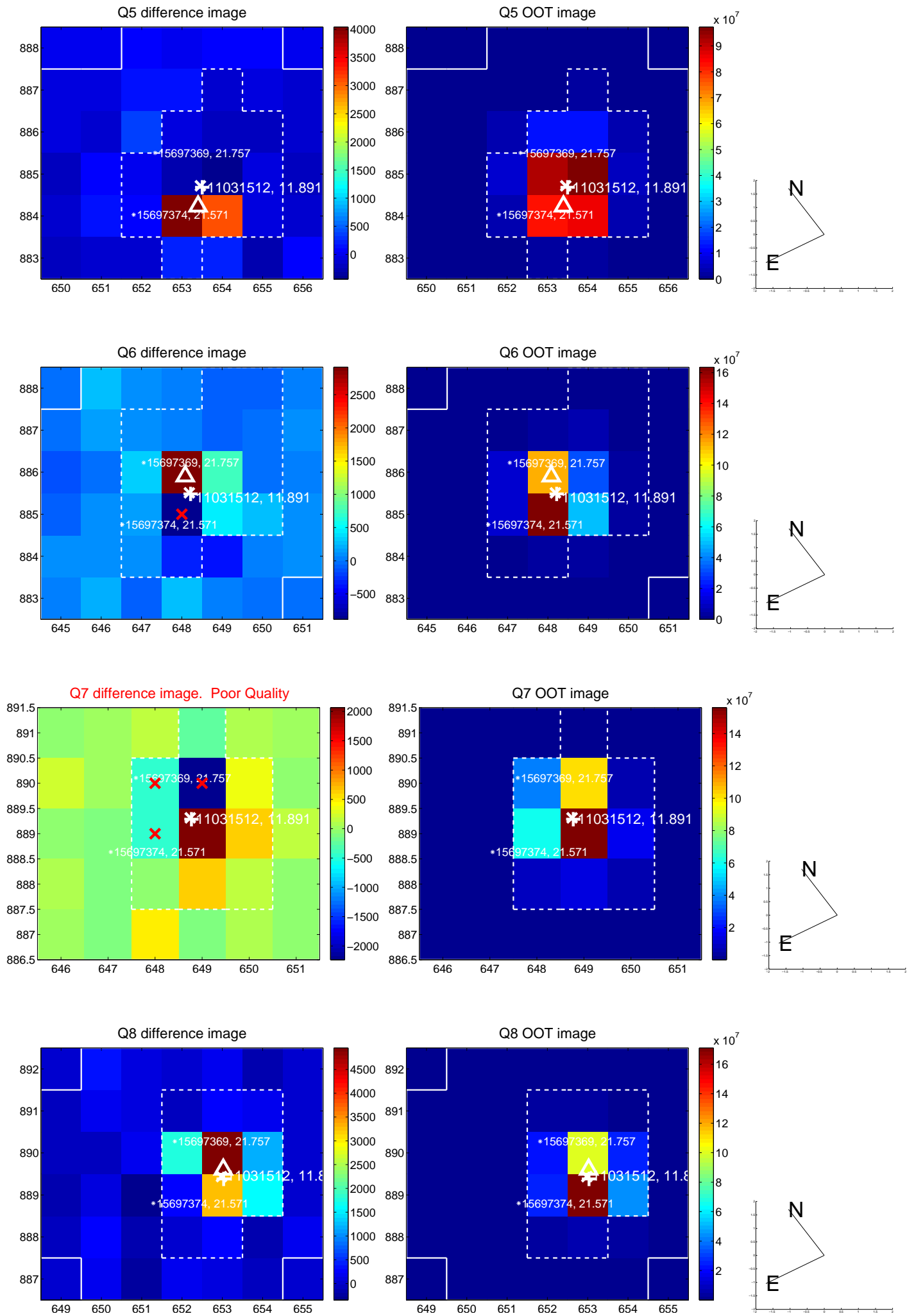


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

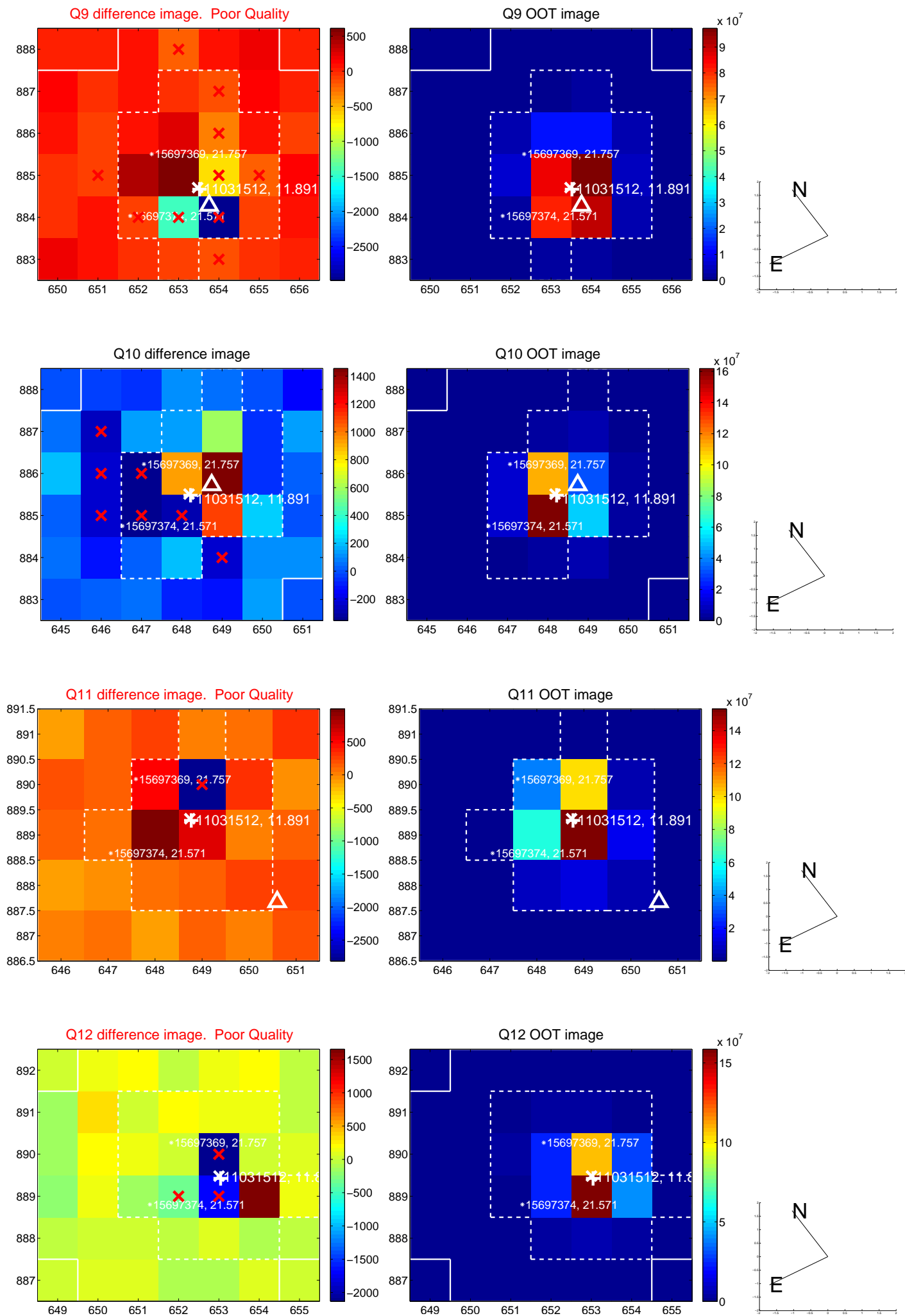
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

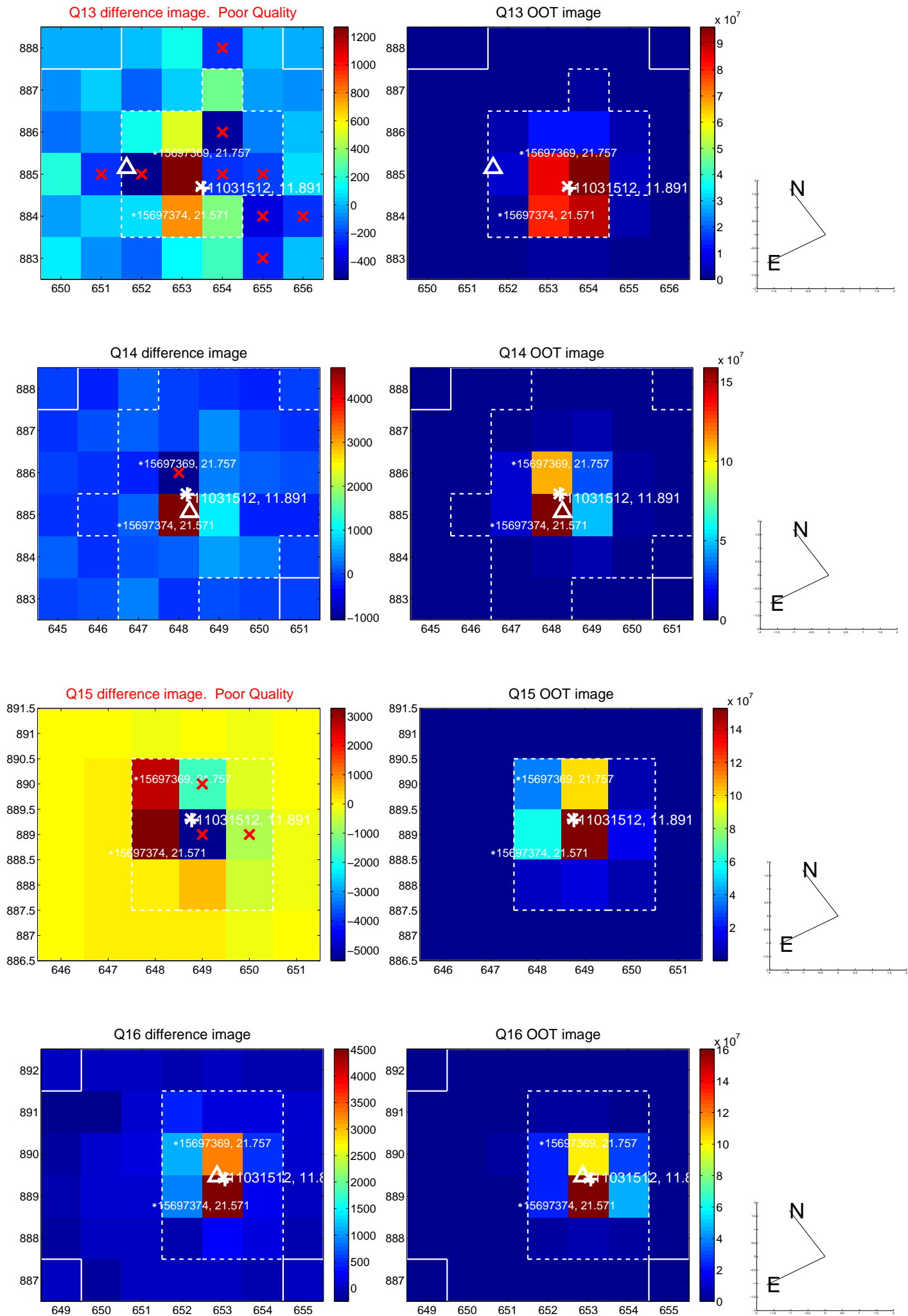


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

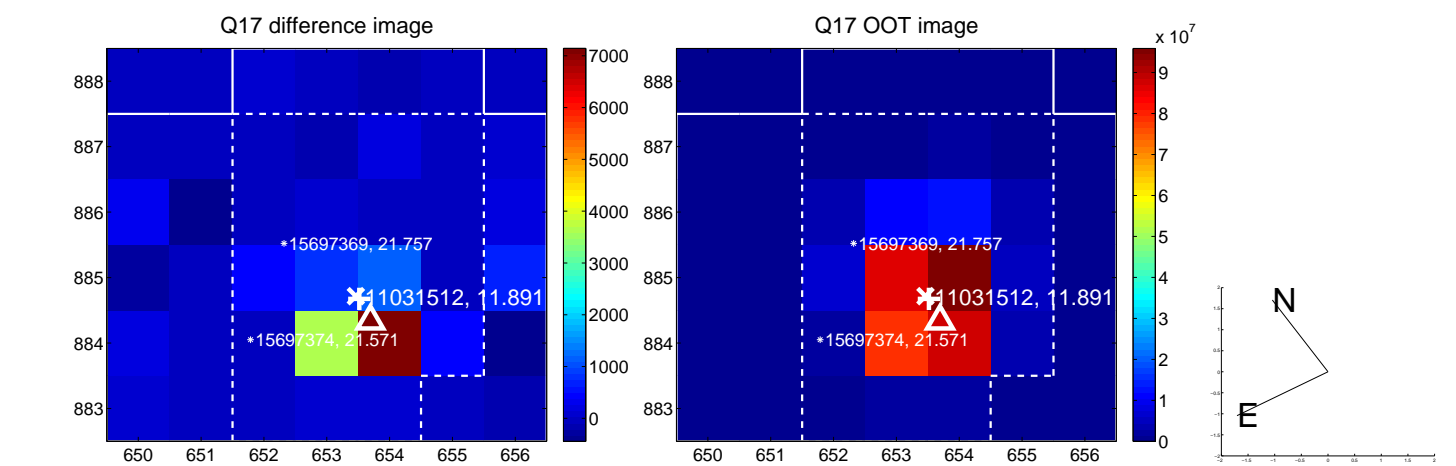




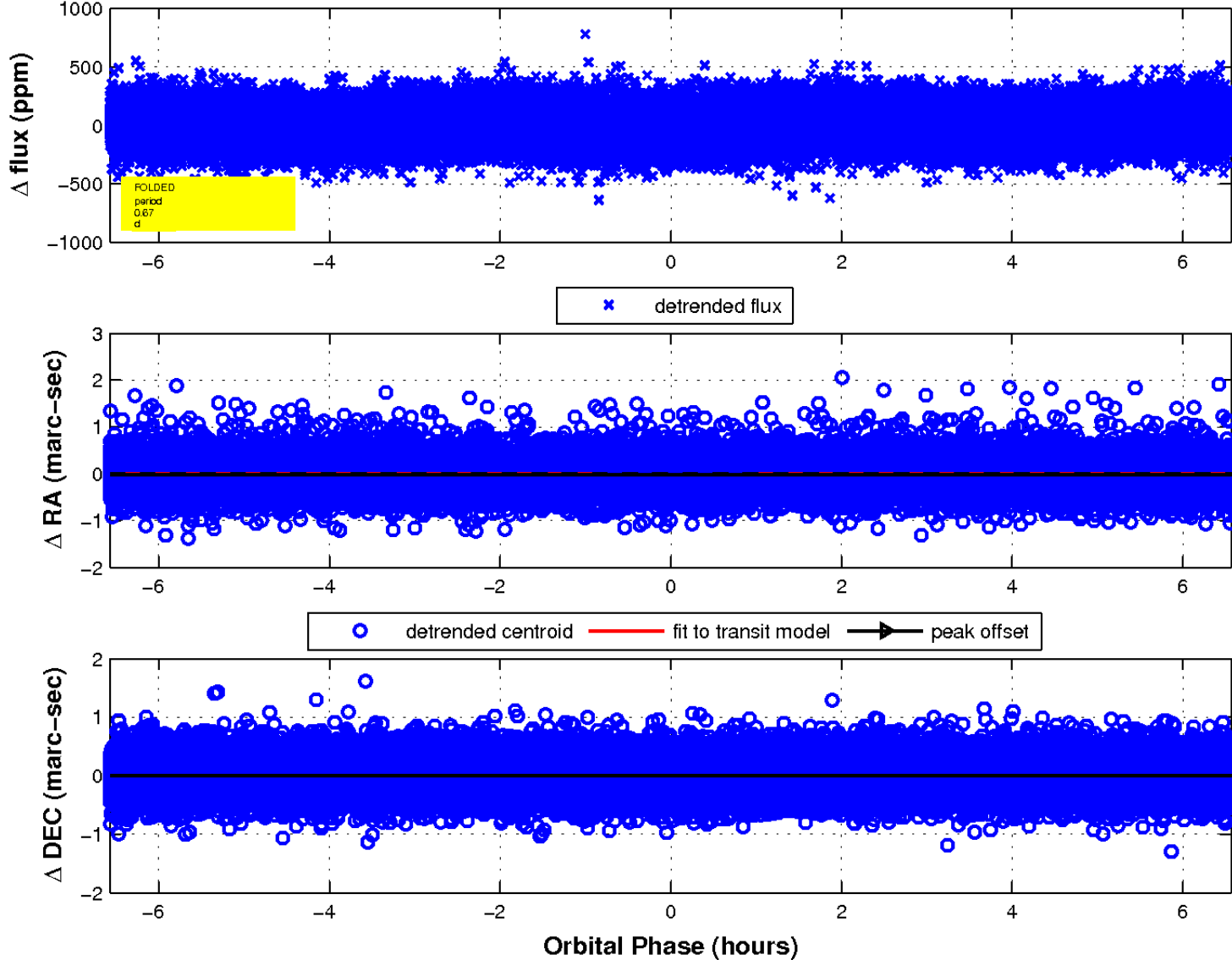
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

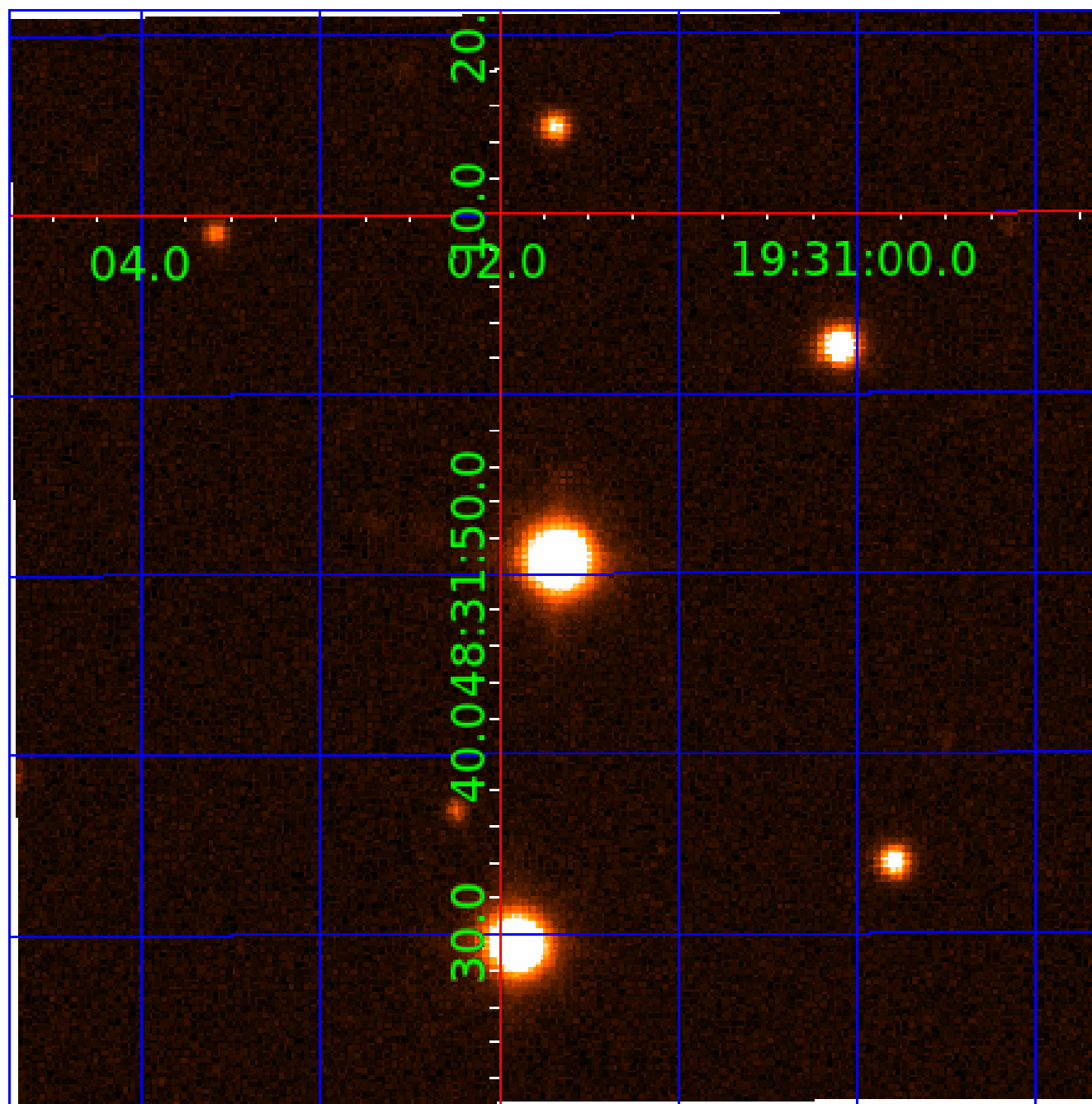


fluxWeightedCentroids, Planet 2 of 4



UKIRT Image

Declination



# KIC 011031512

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
011031512-01	OBS	No	0.672191	131.549377	22.6	2.083	11.1	11.8	3.84	7643	2.14	127652.58
011031512-02	OBS	No	0.672196	131.885669	20.9	2.190	10.0	11.8	3.84	7643	1.97	127651.21
011031512-03	OBS	No	54.989719	140.822953	305.7	1.768	8.4	8.4	3.84	7643	6.76	359.45
011031512-04	OBS	No	48.759807	164.170128	247.0	1.465	7.7	6.5	3.84	7643	6.72	421.96

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
011031512-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
011031512-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—SAME_NTL_PERIOD
011031512-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_DV
011031512-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT

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

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

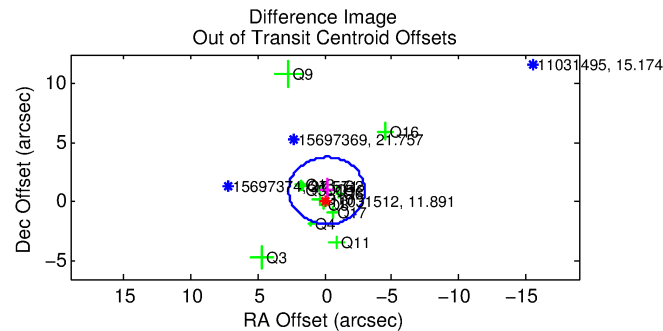
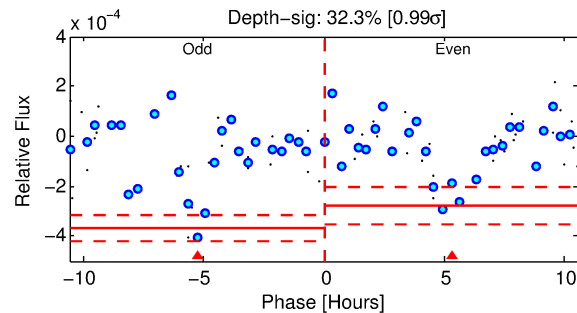
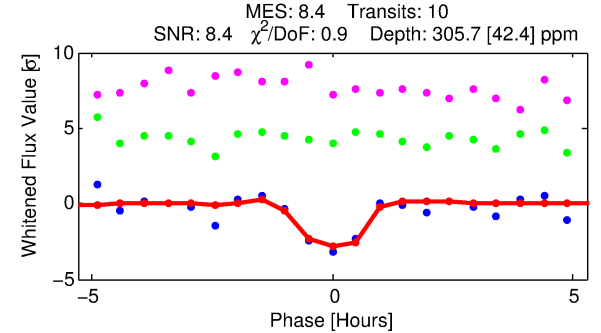
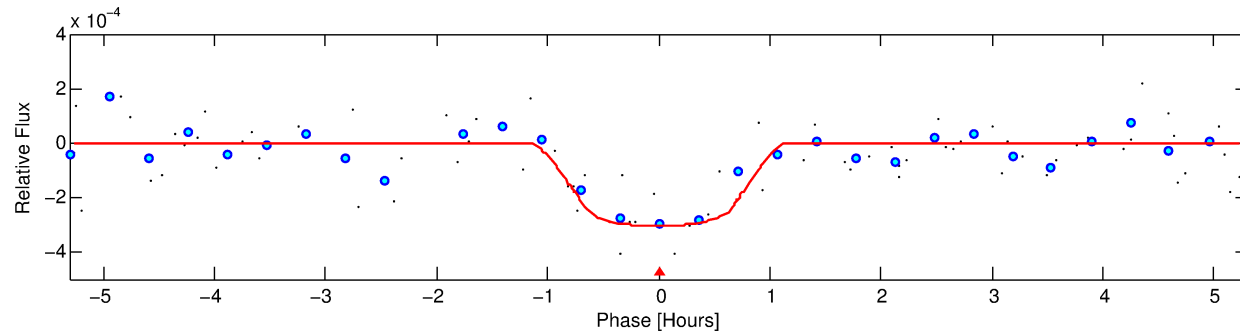
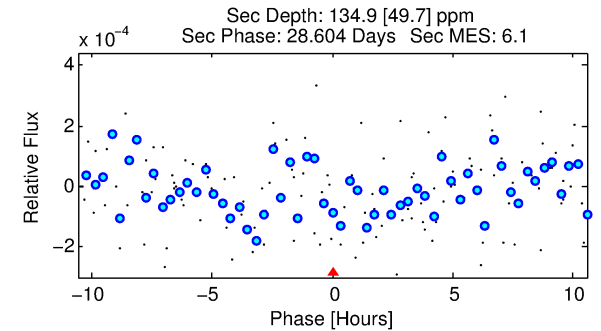
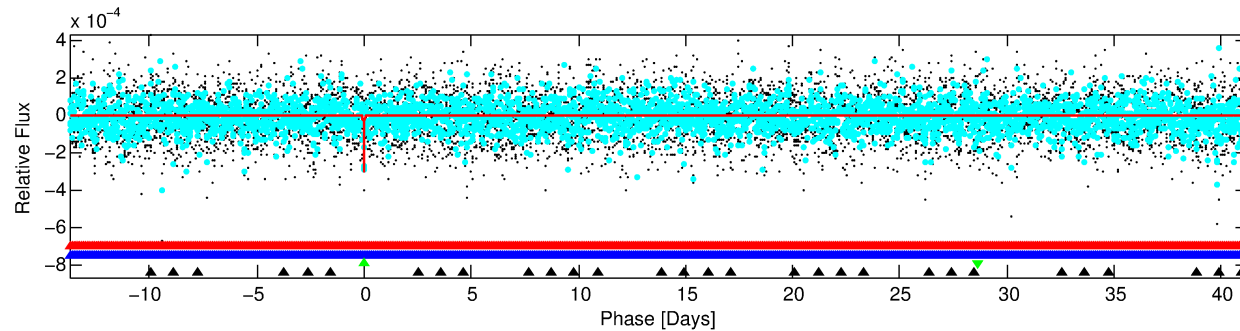
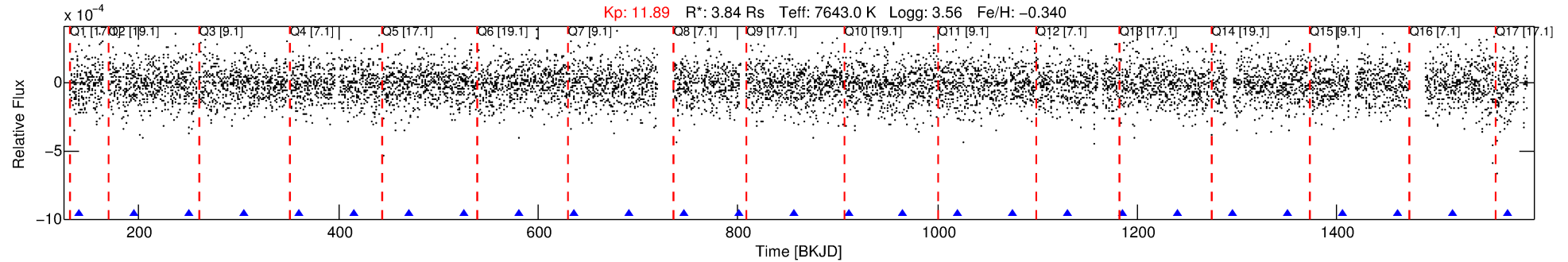
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 011031512-03

No Significant Match Found

# DV One-Page Summary

KIC: 11031512 Candidate: 3 of 4 Period: 54.990 d



## DV Fit Results:

Period = 54.98972 [0.00043] d  
Epoch = 140.8230 [0.0058] BKJD  
Rp/R\* = 0.0161 [0.0355]  
a/R\* = 239.74 [2794.22]  
b = 0.12 [97.54]  
Seff = 359.45 [361.30]  
Teq = 1110 [279] K  
Rp = 6.76 [15.38] Re  
a = 0.3540 [0.2120] AU  
Ag = 203.43 [919.93] [0.22σ]  
Teffp = 6483 [7156] K [0.75σ]

## DV Diagnostic Results:

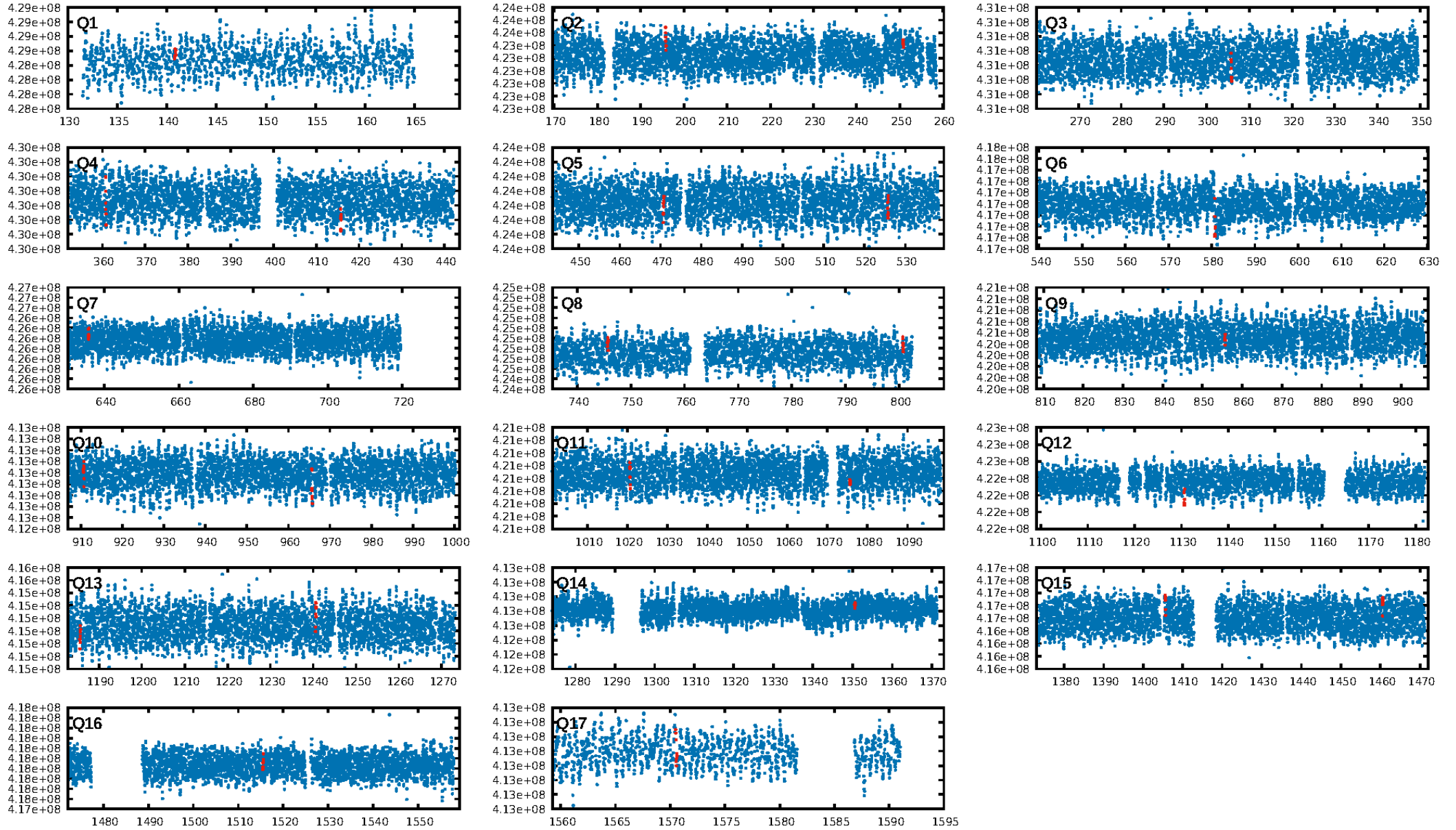
ShortPeriod-sig: 100.0% [65.10σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 41.1%  
ModelChiSquareGof-sig: 100.0%  
**Bootstrap-pfa: 1.67e-09**  
RollingBand-fgt: 1.00 [8/8]  
GhostDiagnostic-chr: 1.737  
Centroid-sig: 16.2%  
Centroid-so: 0.489 arcsec [1.71σ]  
OotOffset-rm: 0.977 arcsec [1.03σ]  
OotOffset-st: 3/4/4/4 [15]  
KicOffset-rm: 0.648 arcsec [0.68σ]  
KicOffset-st: 3/4/4/4 [15]  
DiffImageQuality-fgm: 0.47 [7/15]  
DiffImageOverlap-fno: 0.00 [0/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 15:07:57 Z

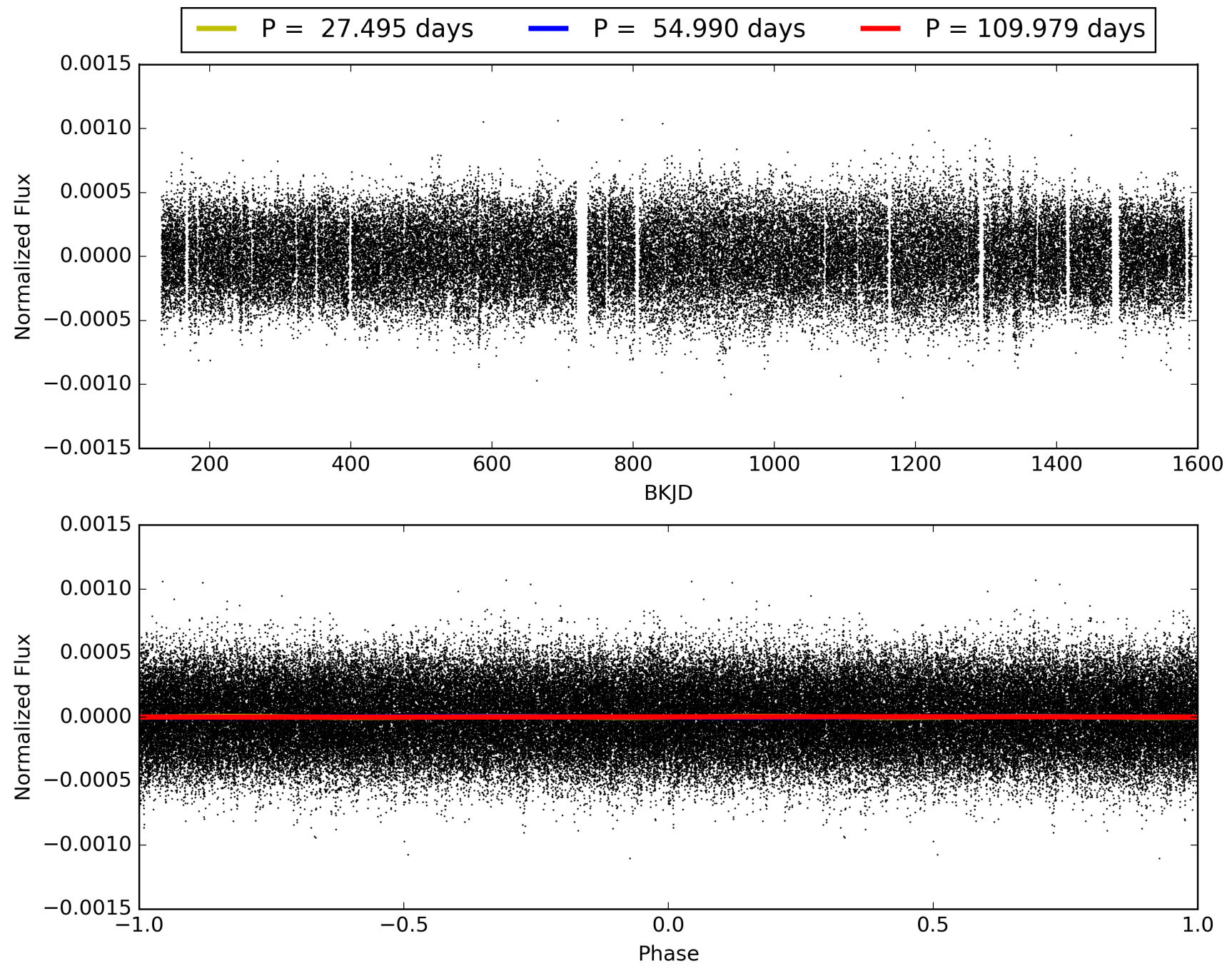
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center



# TCE 011031512-03, PDC Light Curves

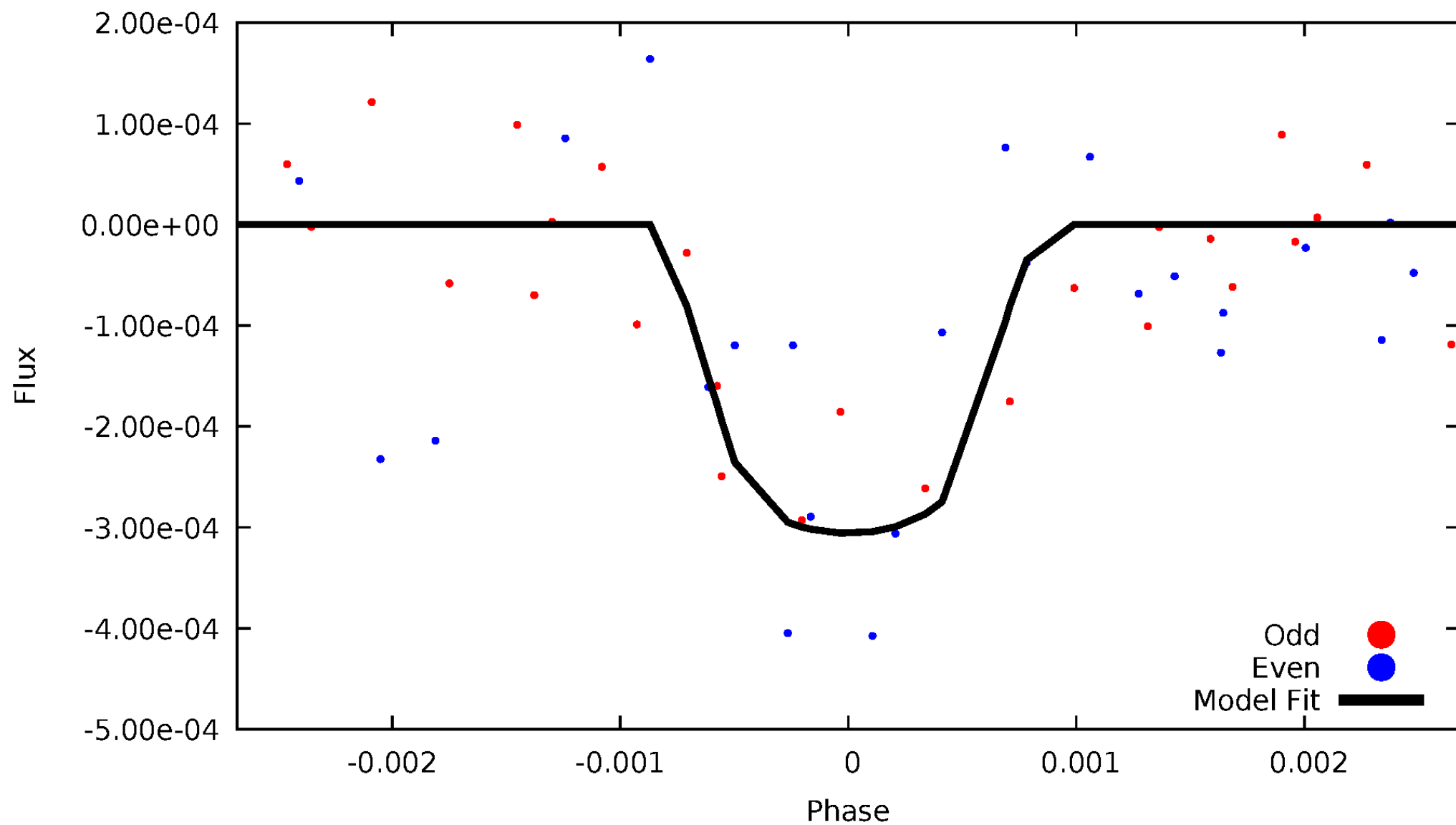


TCE 011031512-03



# DV Odd/Even

TCE 011031512-03



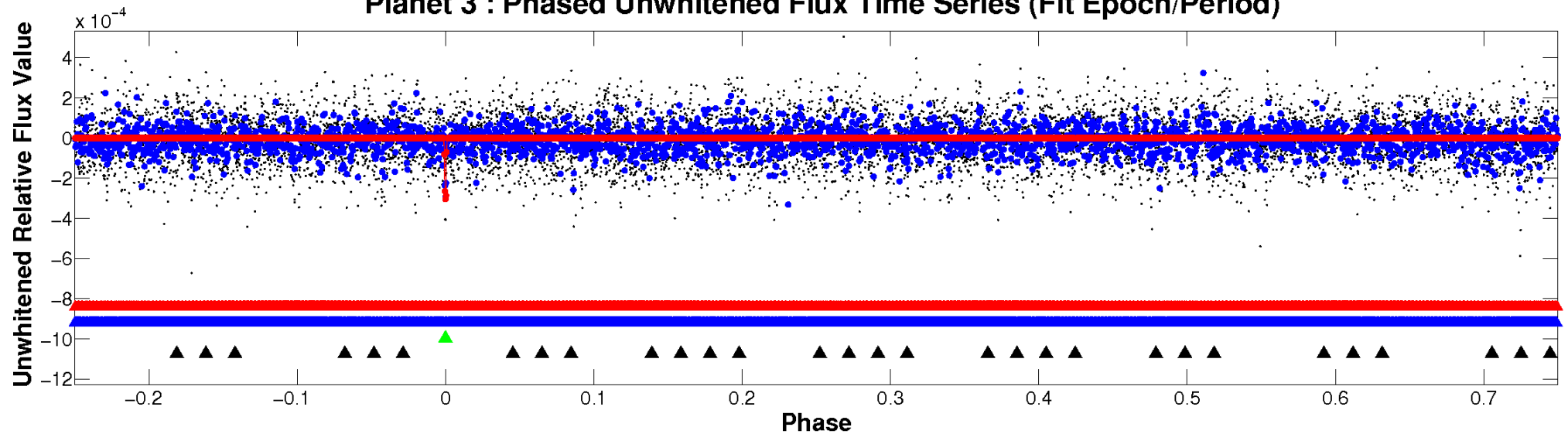


ALT Odd/Even

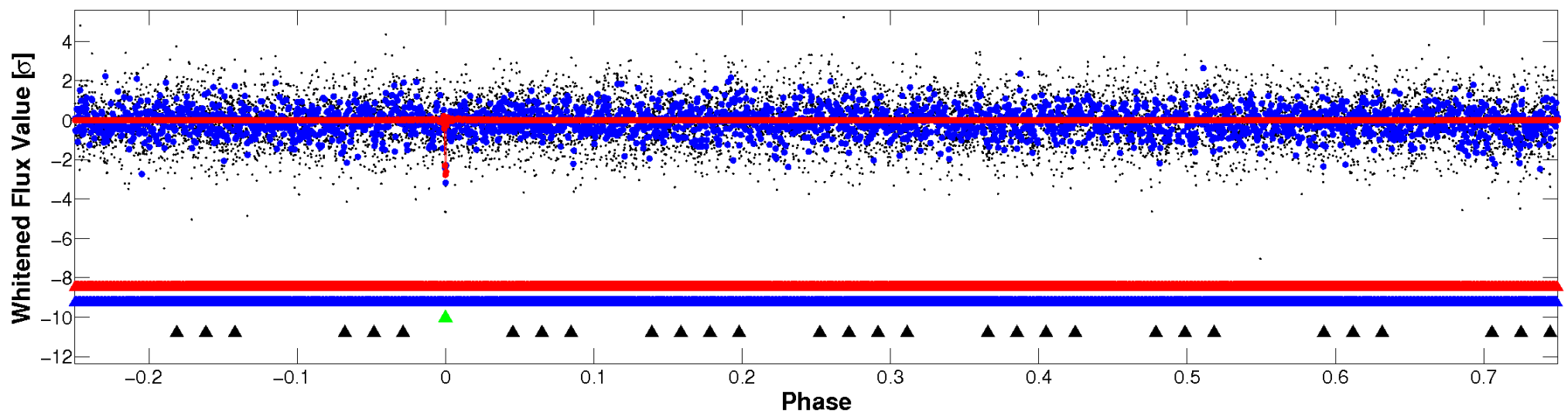
This plot does not exist for this TCE.

# Non-Whitened Vs. Whitened Light Curve

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



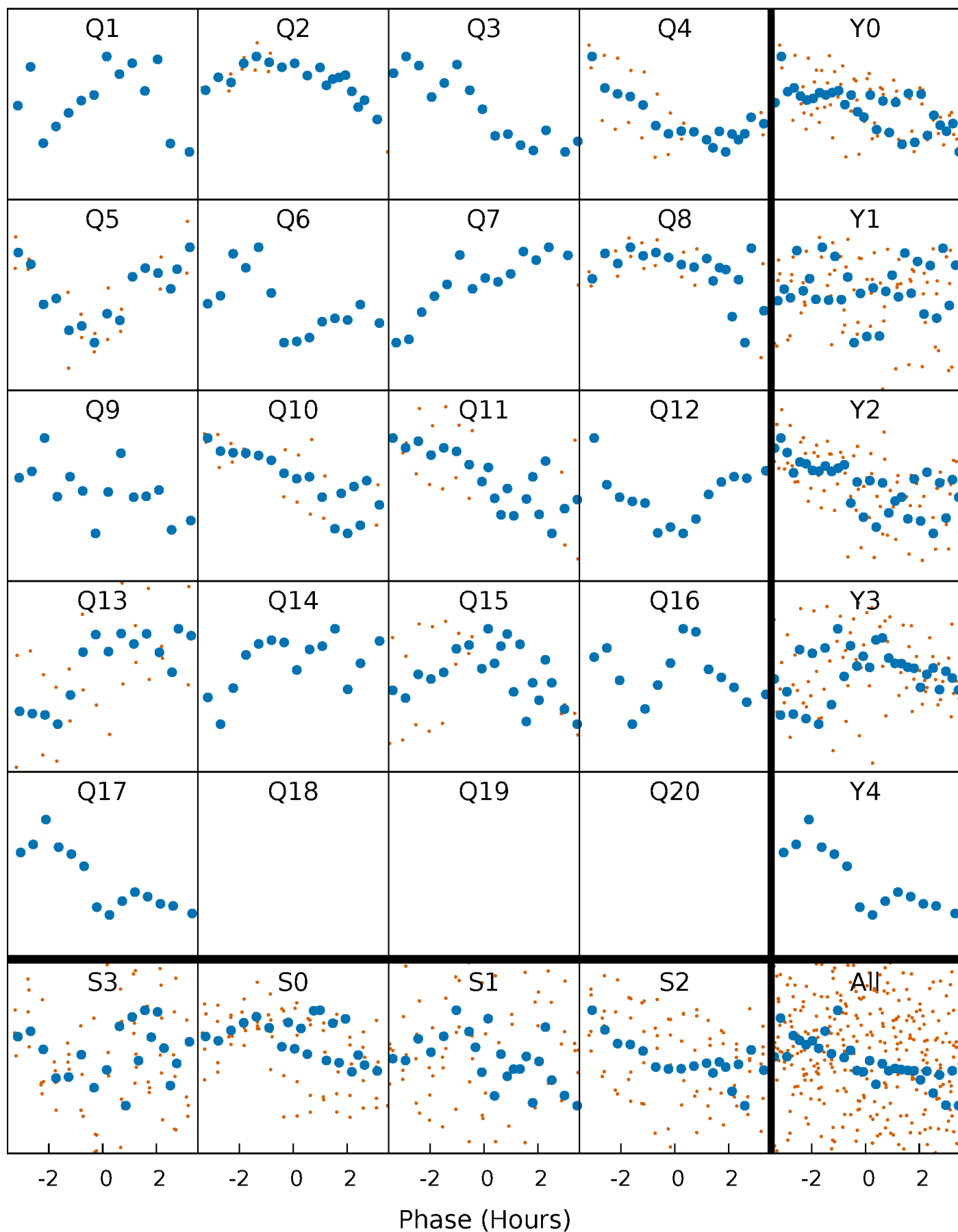
Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)





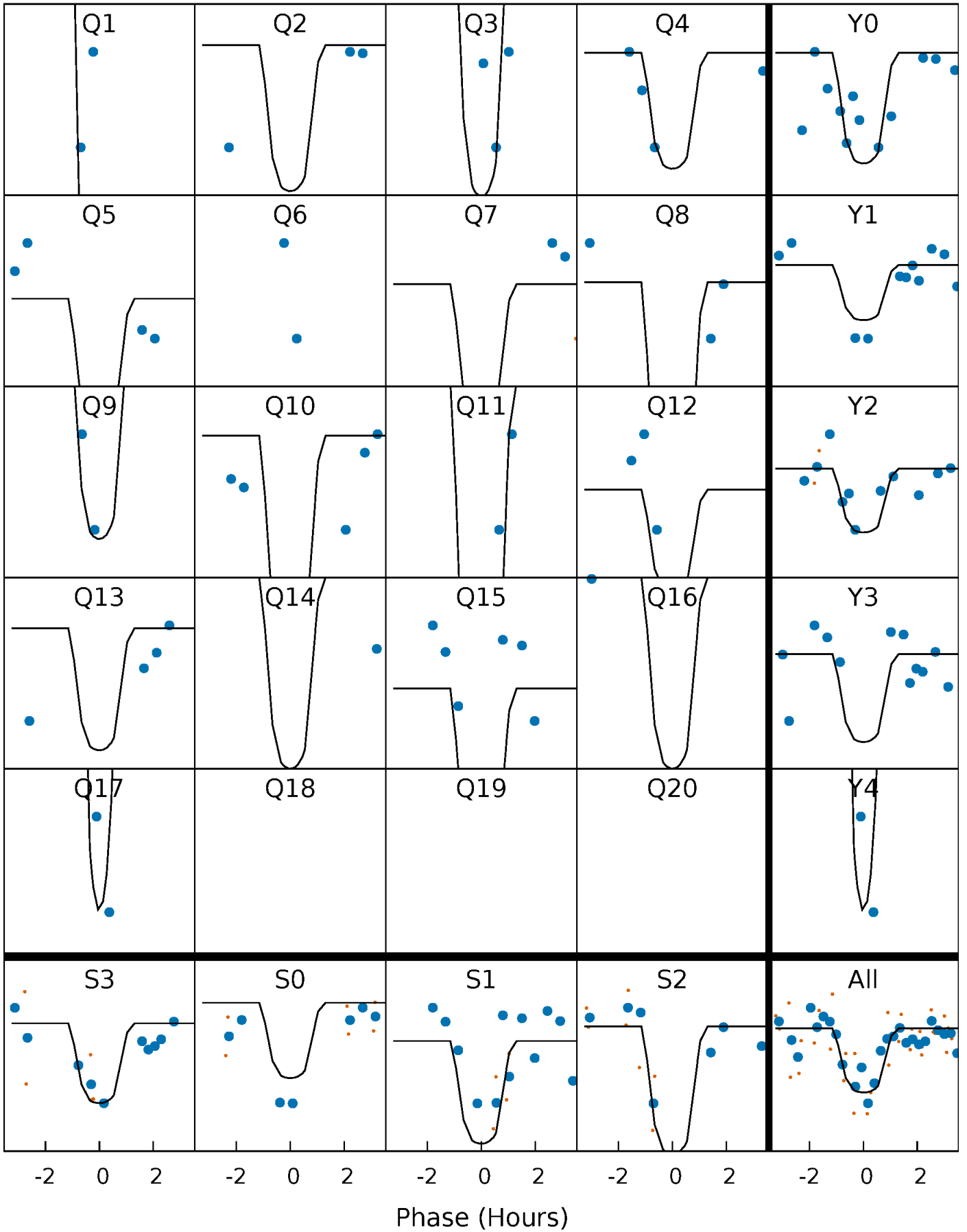
# PDC Quarter-Phased Transit Curves

TCE 011031512-03 P= 54.989719 Days  $T_0=140.822953$  (BKJD)



# DV Quarter-Phased Transit Curves

TCE 011031512-03 P= 54.989719 Days  $T_0=140.822953$  (BKJD)

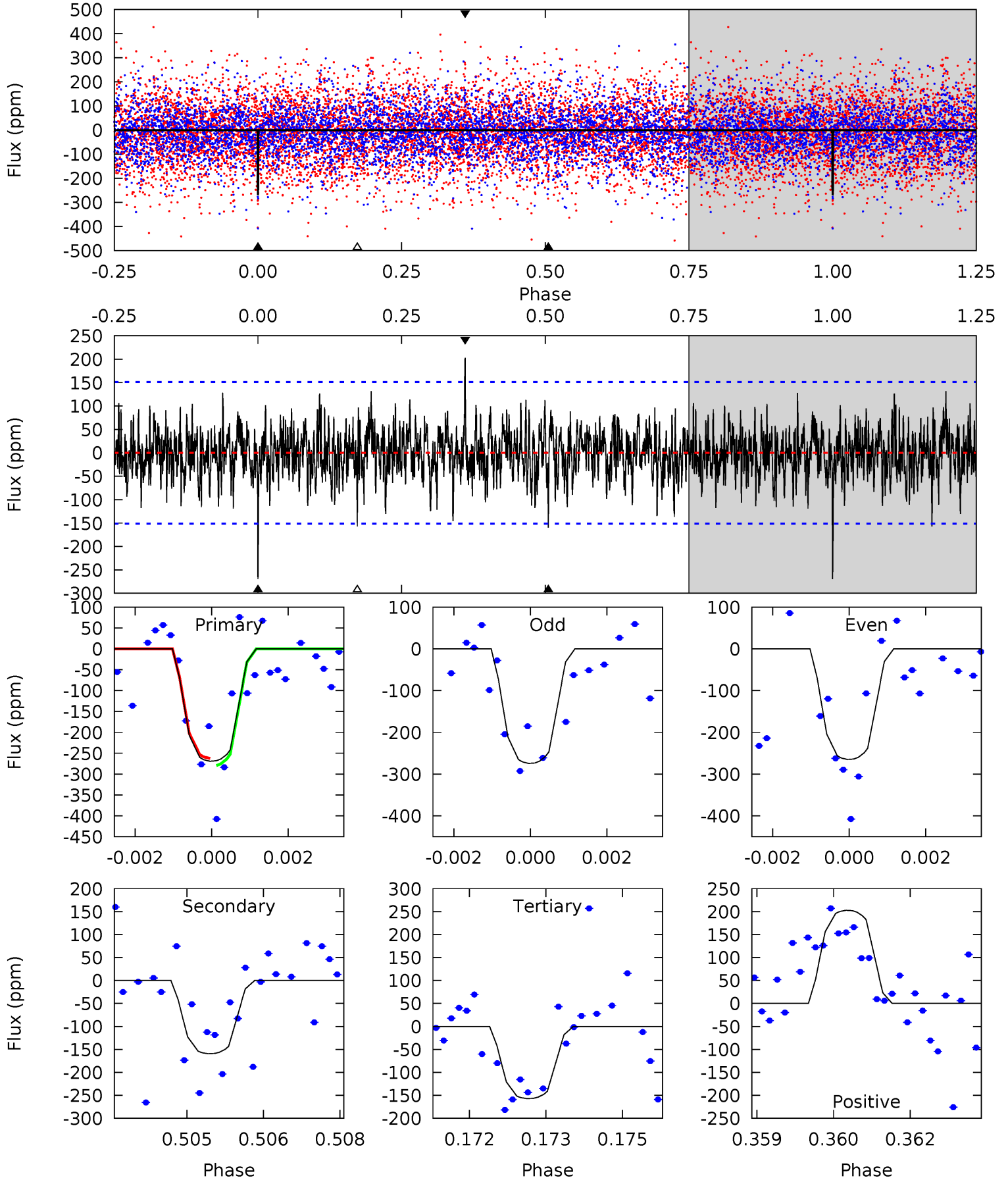


This plot does not exist for this TCE.

# DV Model-Shift Uniqueness Test

011031512-03, P = 54.989719 Days, E = 85.833234 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
9.53	5.64	5.56	7.18	5.36	3.14	1.55	3.97	2.35	0.08	-1.54	0.16	0.96	0.43	0.30



## Alt Model-Shift Uniqueness Test

This plot does not exist for this TCE.

### Stellar Parameters For KIC 011031512

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7643^{+239}_{-319}$	$3.561^{+0.594}_{-0.066}$	$-0.340^{+0.250}_{-0.300}$	$3.838^{+0.395}_{-2.237}$	$1.958^{+0.062}_{-0.561}$	$0.049^{+0.413}_{-0.011}$
	+3%/-4%	+17%/-2%	+74%/-88%	+10%/-58%	+3%/-29%	+847%/-23%
Source	KIC0	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 011031512-03 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-160 \pm 28$	$10.78^{+12.34}_{-7.46}$	$1493^{+107}_{-216}$	$4862^{+4234}_{-1086}$	$89^{+851}_{-70}$
Alt.	N/A	N/A	N/A	N/A	N/A

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



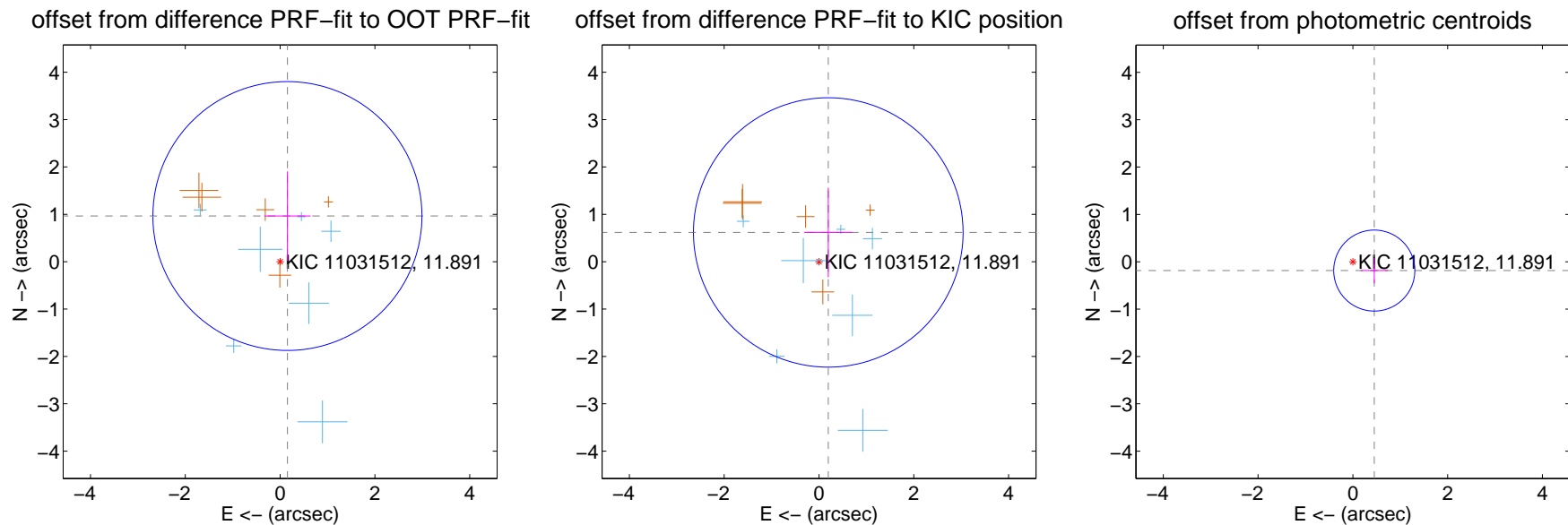
## DV Centroid Data

Supplemental centroid analysis for 011031512-03. **Kepler magnitude: 11.89.** Transit SNR 8.40

There are 7 quarters with good PRF difference image offsets

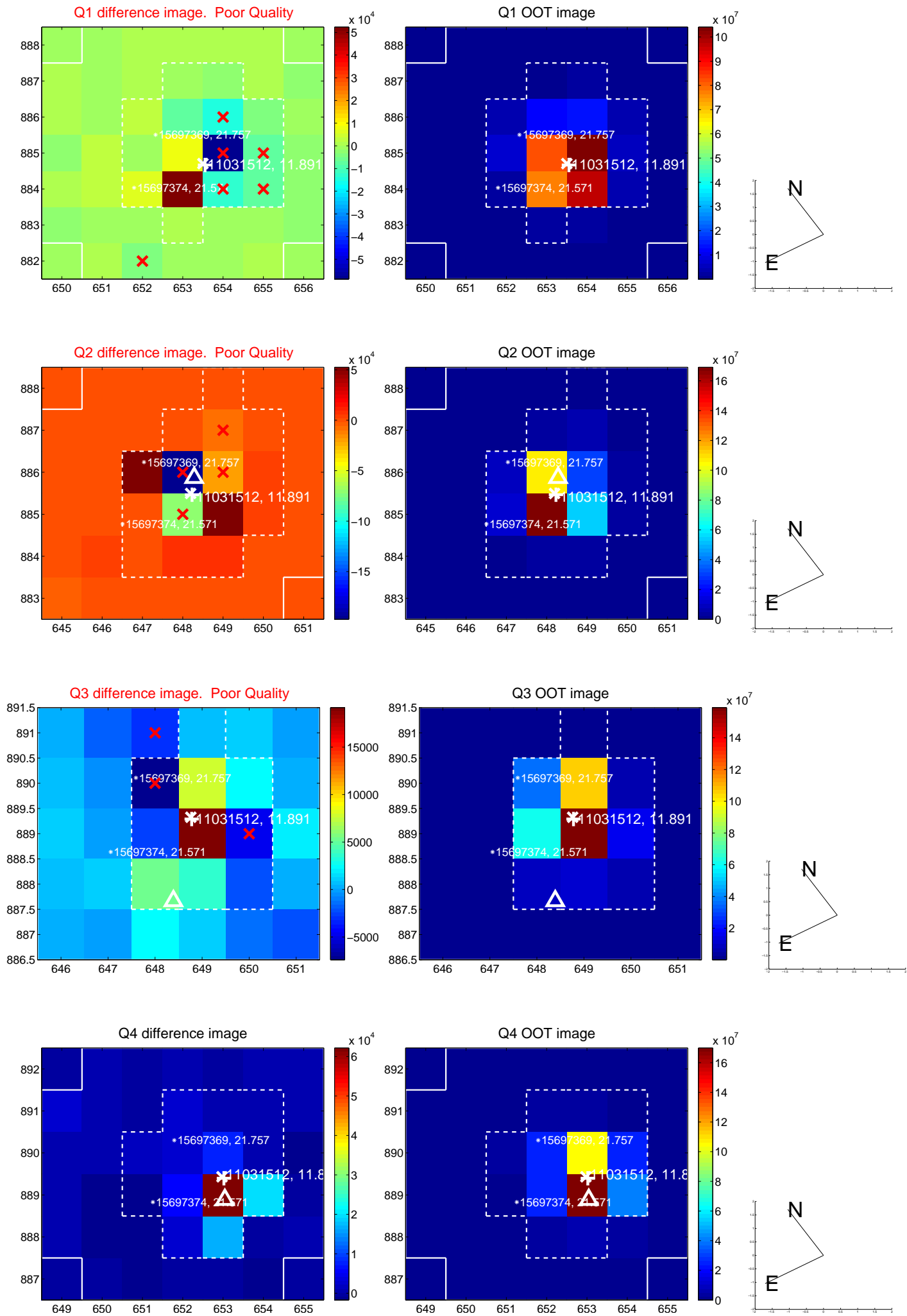
The direct PRF centroid is offset from the target star catalog position by about 0.27 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.977 \pm 0.946$	1.03	$-0.154 \pm 0.488$	$0.964 \pm 0.943$
PRF-fit source offset from KIC position	$0.648 \pm 0.948$	0.68	$-0.196 \pm 0.509$	$0.618 \pm 0.946$
photometric centroid source offset	$0.49 \pm 0.29$	1.71	$-0.45 \pm 0.29$	$-0.19 \pm 0.27$

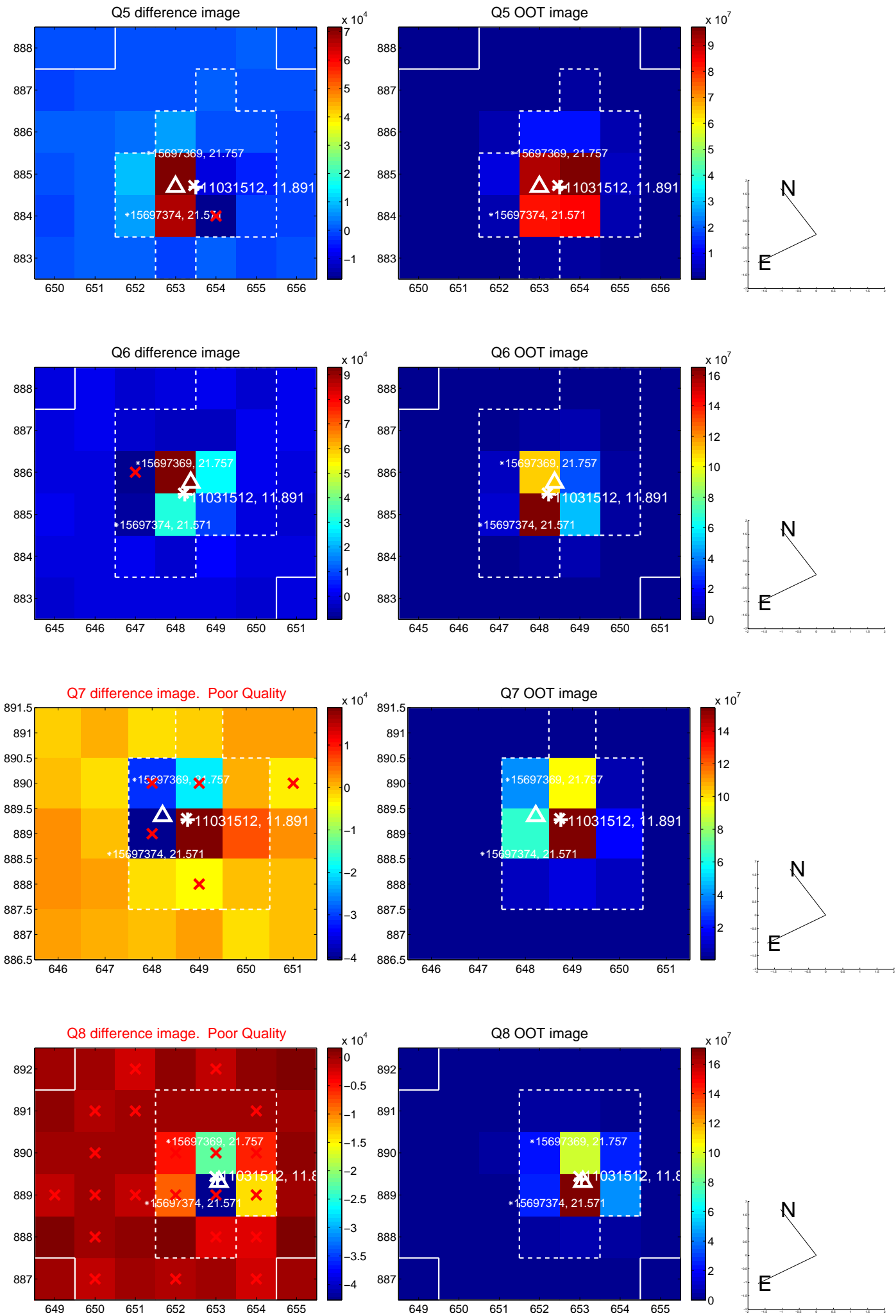


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

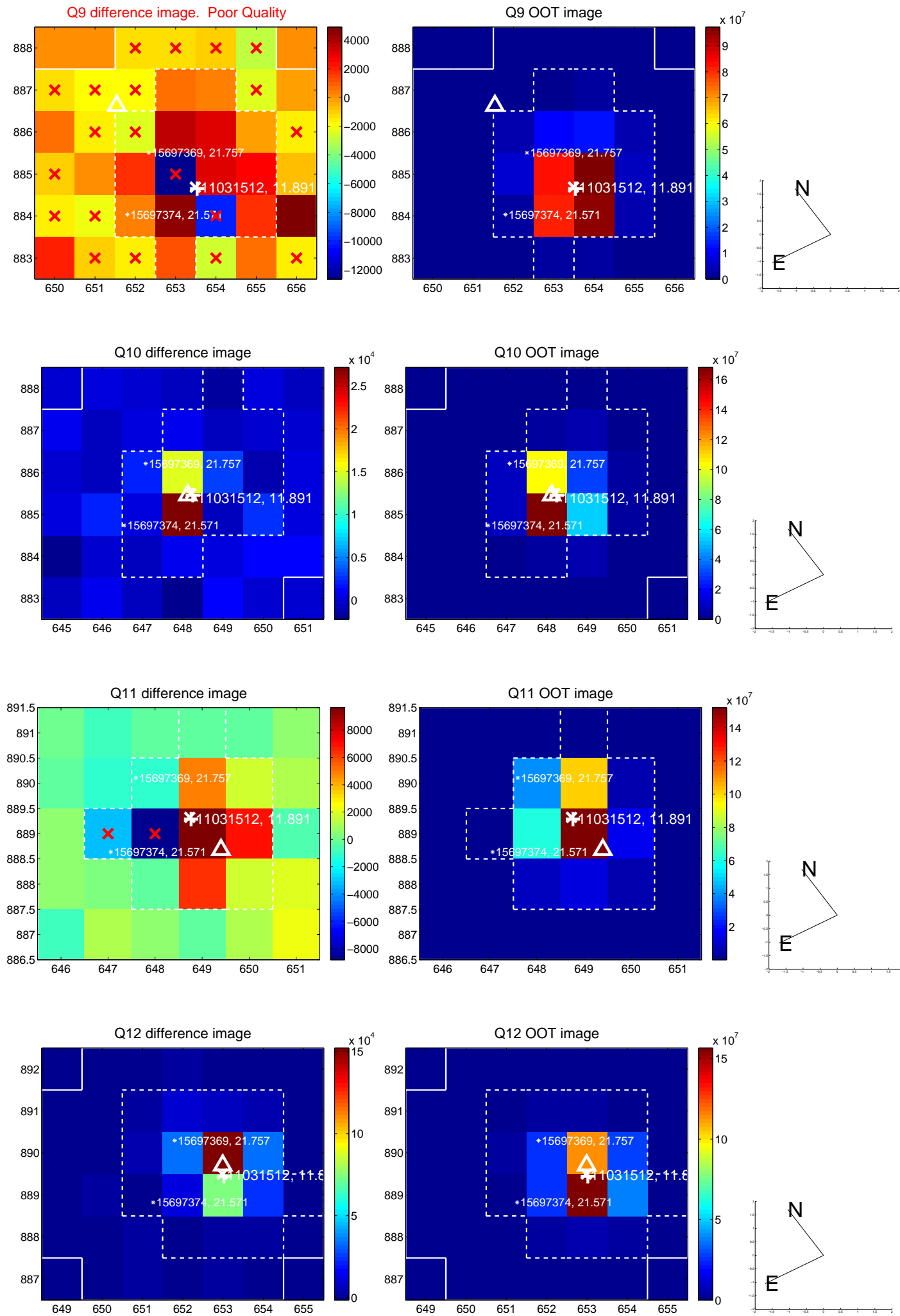
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



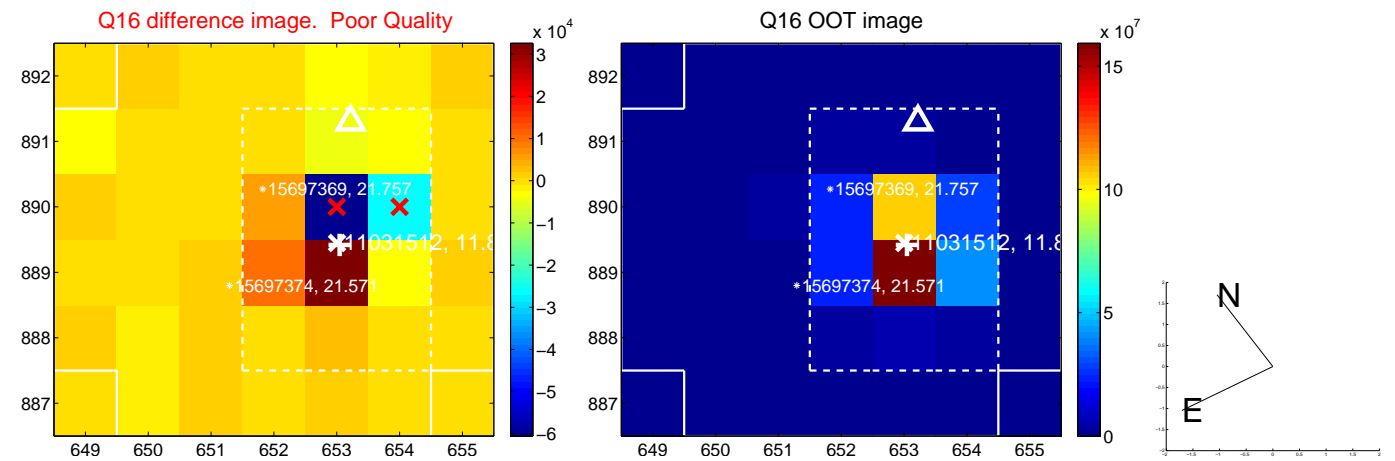
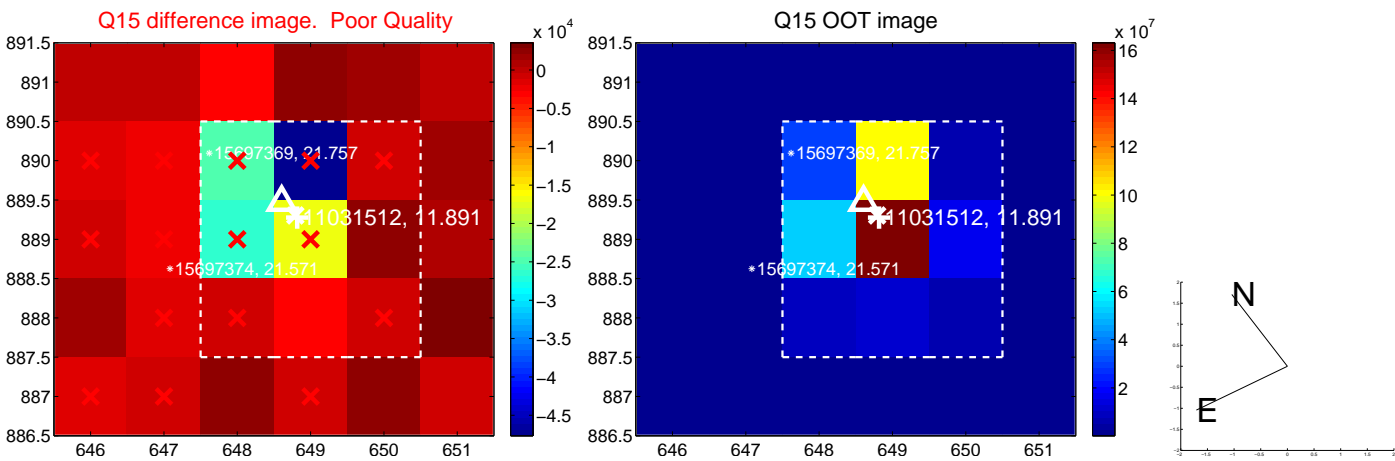
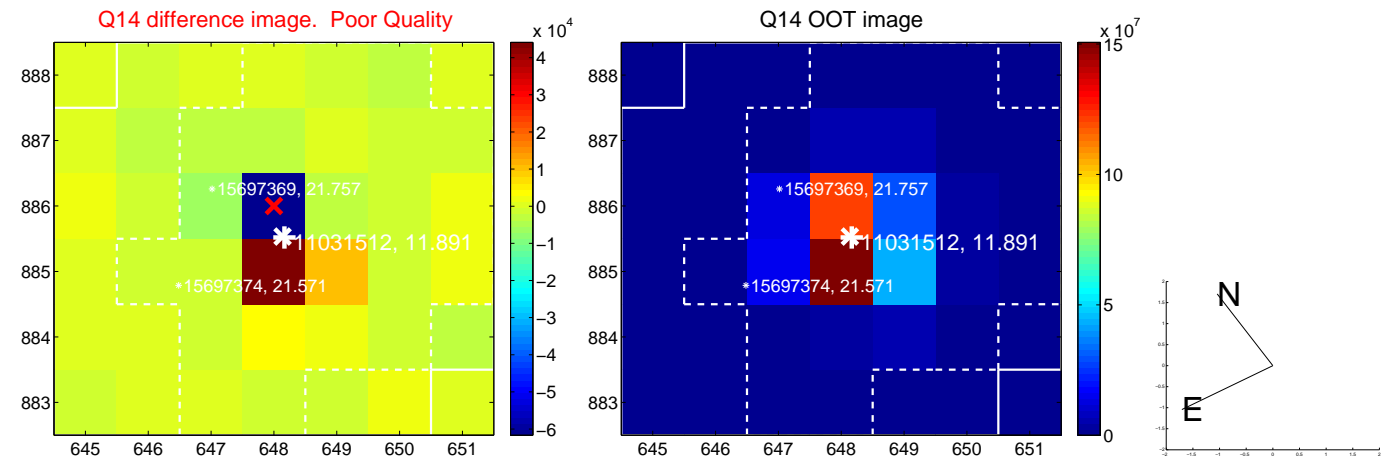
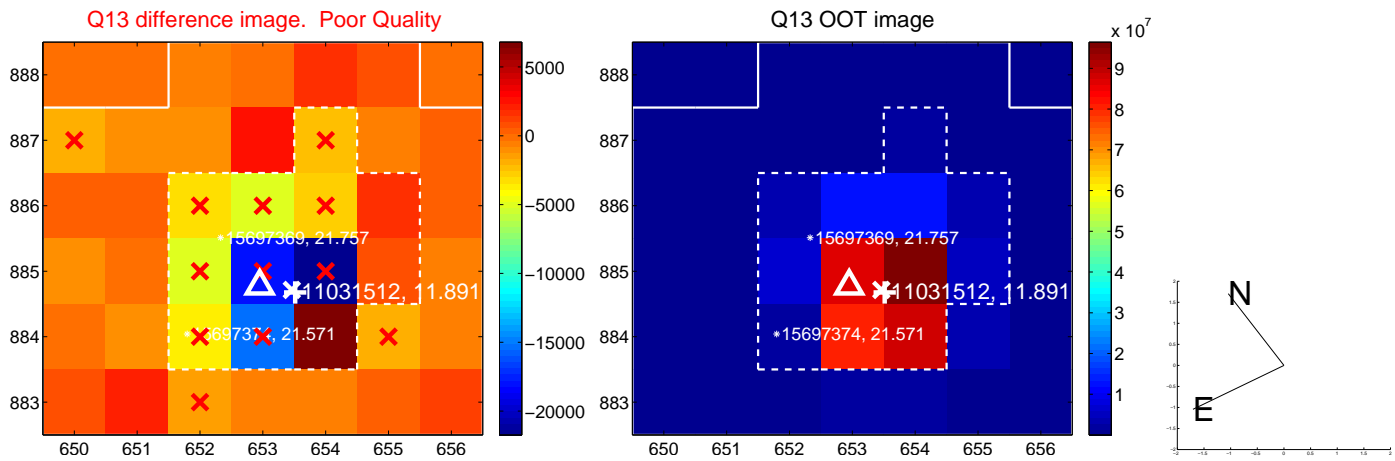
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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.

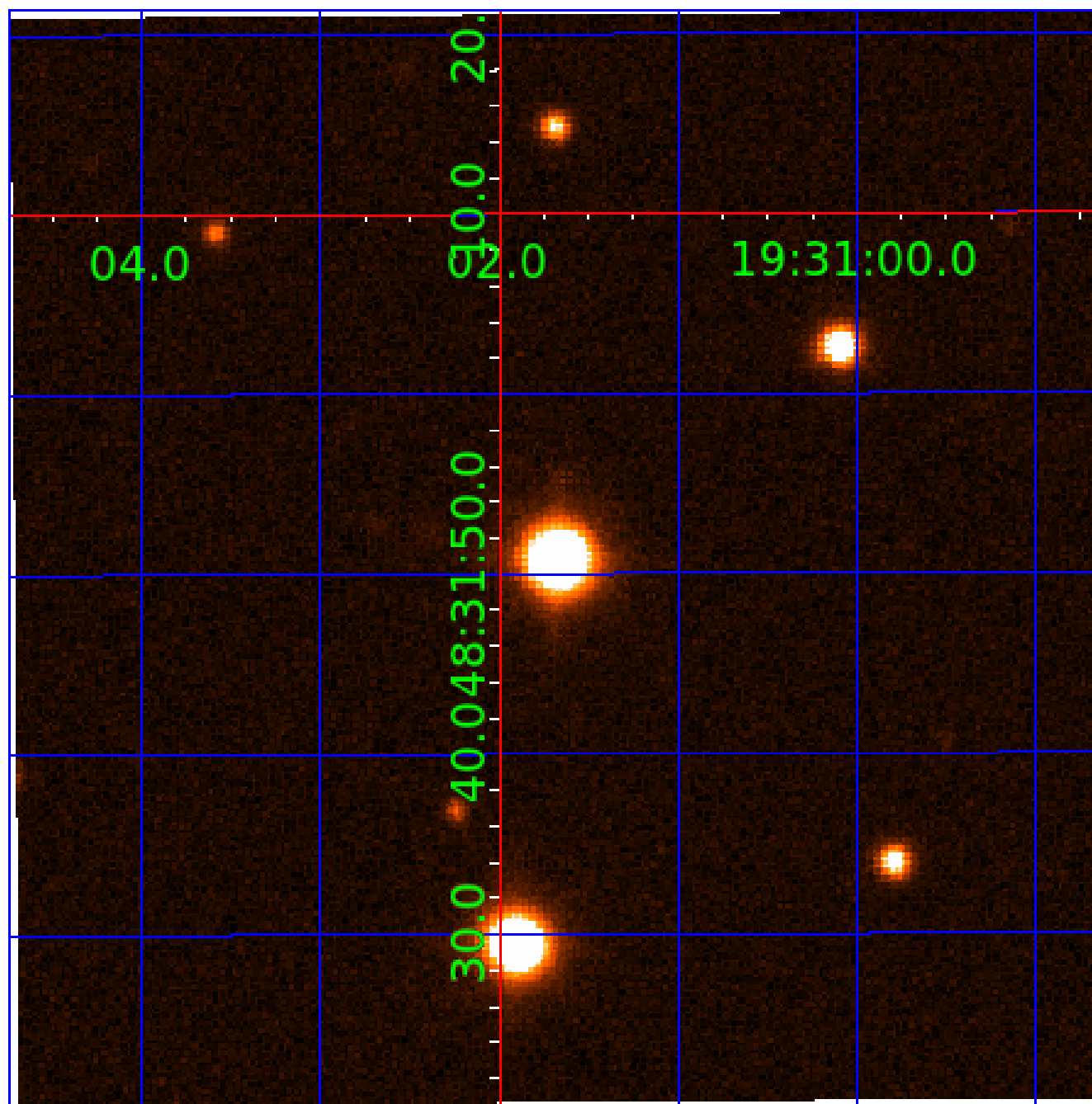






UKIRT Image

Declination



# KIC 011031512

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
011031512-01	OBS	No	0.672191	131.549377	22.6	2.083	11.1	11.8	3.84	7643	2.14	127652.58
011031512-02	OBS	No	0.672196	131.885669	20.9	2.190	10.0	11.8	3.84	7643	1.97	127651.21
011031512-03	OBS	No	54.989719	140.822953	305.7	1.768	8.4	8.4	3.84	7643	6.76	359.45
011031512-04	OBS	No	48.759807	164.170128	247.0	1.465	7.7	6.5	3.84	7643	6.72	421.96

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
011031512-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
011031512-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—SAME_NTL_PERIOD
011031512-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—MOD_NONUNIQ_DV
011031512-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE—TRANS_GAPPED—LPP_DV—ALL_TRANS_CHASES—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT

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

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

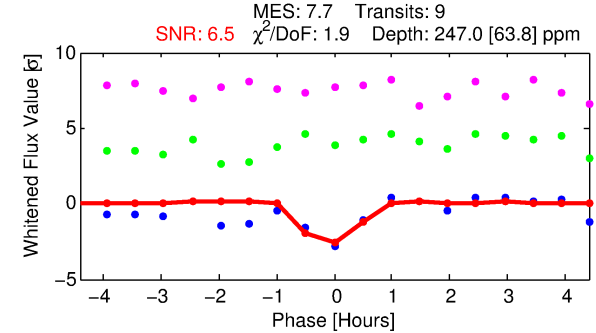
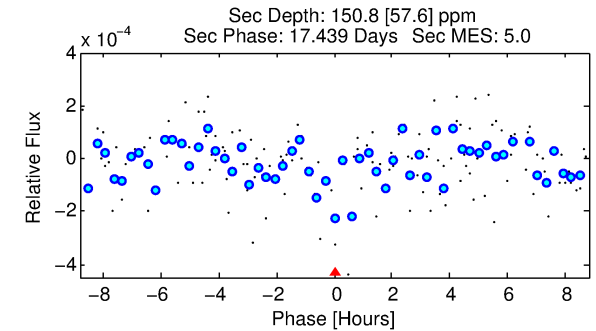
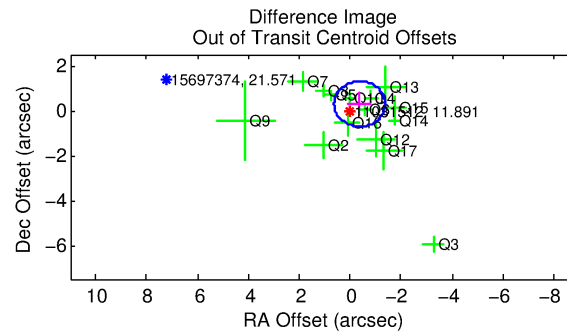
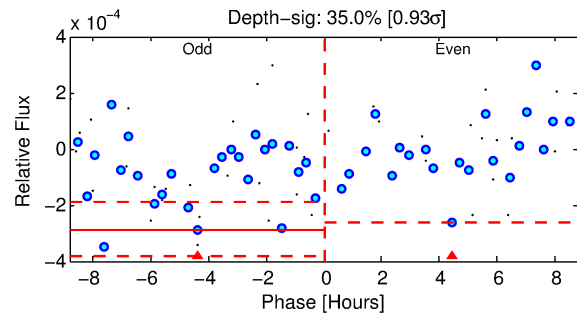
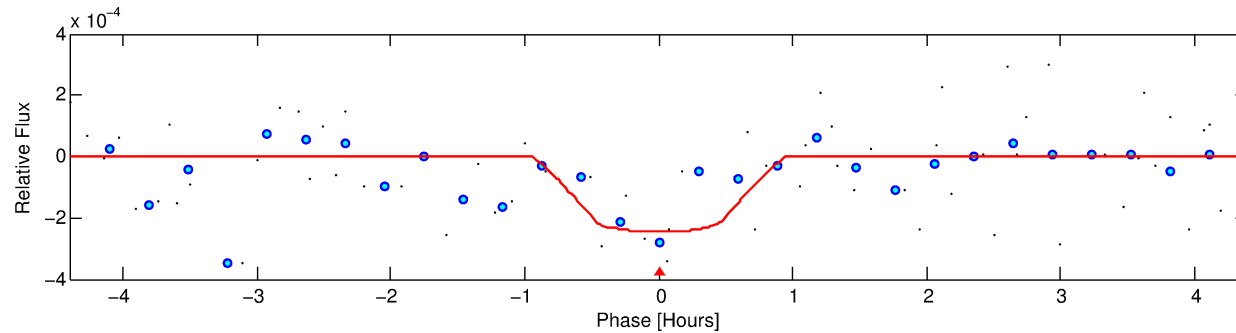
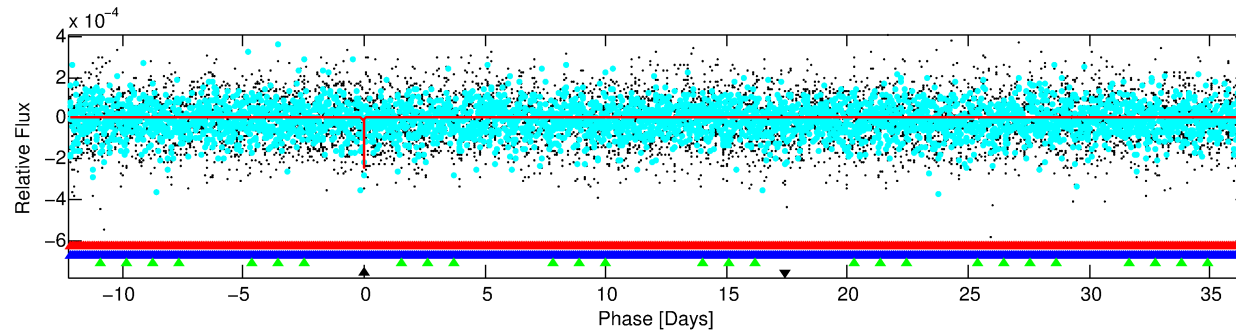
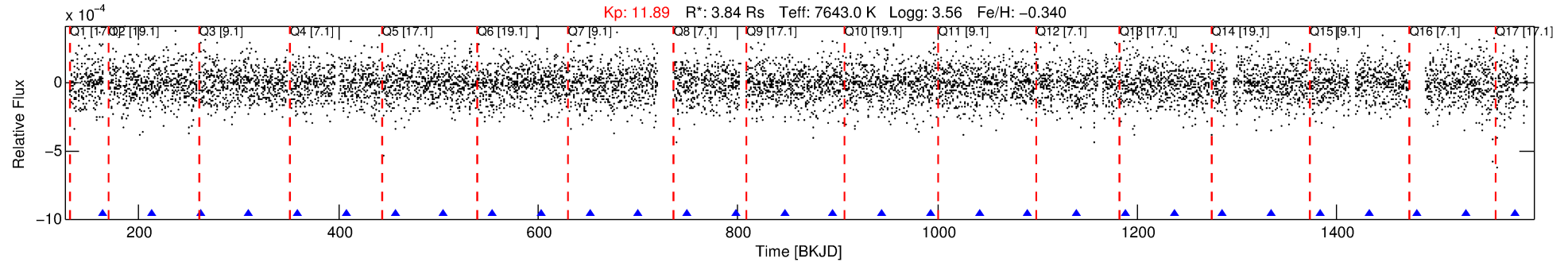
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 011031512-04

No Significant Match Found

# DV One-Page Summary

KIC: 11031512 Candidate: 4 of 4 Period: 48.760 d



## DV Fit Results:

Period = 48.75981 [0.00069] d  
Epoch = 164.1701 [0.0108] BKJD  
 $R_p/R^*$  = 0.0160 [0.0518]  
 $a/R^*$  = 156.94 [2709.32]  
 $b$  = 0.81 [7.56]  
 $S_{\text{eff}}$  = 421.96 [424.12]  
 $T_{\text{eq}}$  = 1156 [290] K  
 $R_p$  = 6.72 [22.06]  $R_e$   
 $a$  = 0.3267 [0.1957] AU  
 $A_g$  = 196.30 [1286.01] [0.15 $\sigma$ ]  
 $T_{\text{eff}}$  = 6688 [10832] K [0.51 $\sigma$ ]

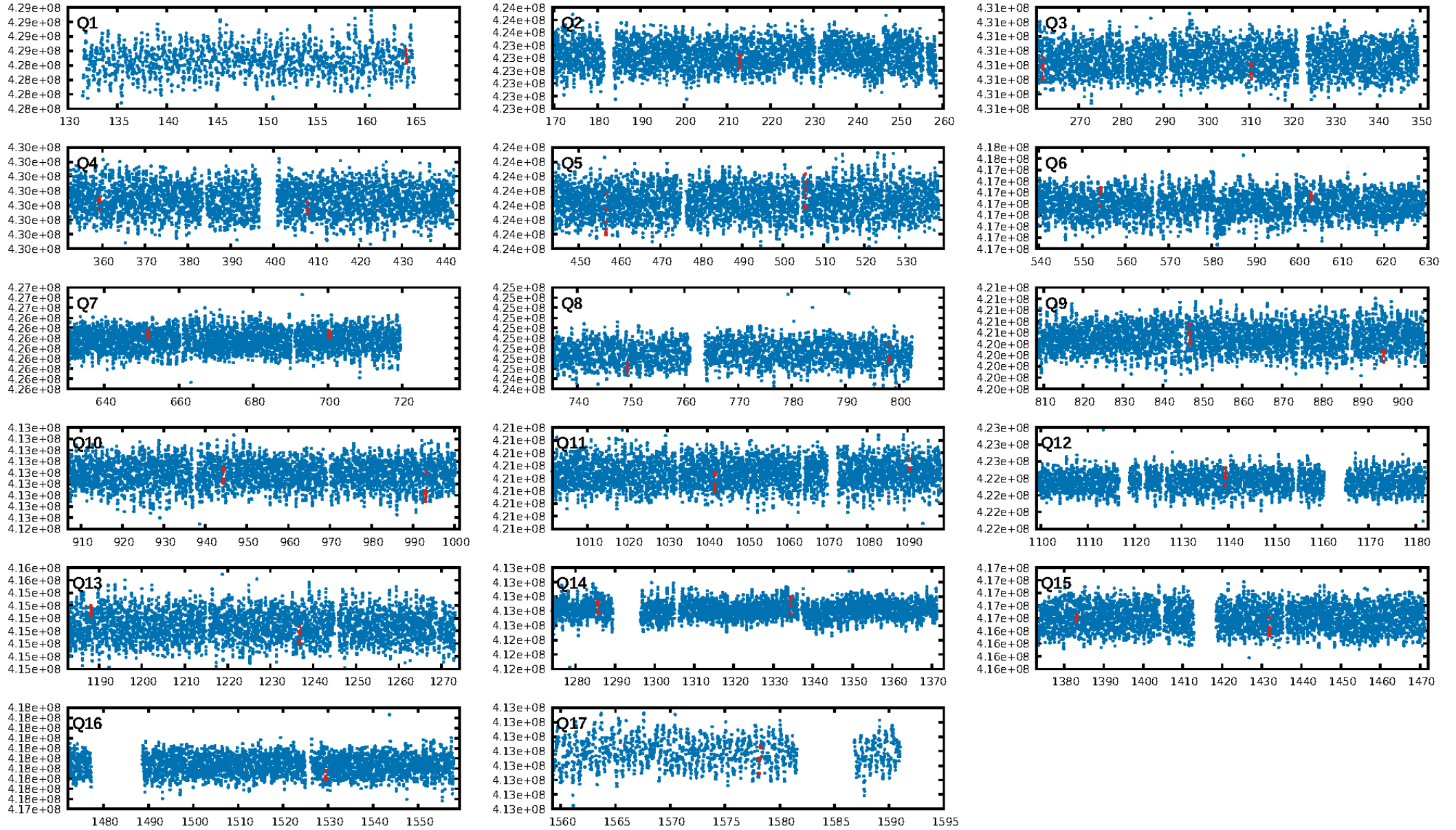
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [437.97 $\sigma$ ]  
LongPeriod-sig: 100.0% [65.10 $\sigma$ ]  
ModelChiSquare2-sig: 33.7%  
ModelChiSquareGof-sig: 100.0%  
**Bootstrap-pfa: 2.92e-08**  
RollingBand-fgt: 1.00 [9/9]  
GhostDiagnostic-chr: -0.6935  
Centroid-sig: 0.8%  
Centroid-so: 0.274 arcsec [0.85 $\sigma$ ]  
OotOffset-rm: 0.469 arcsec [1.40 $\sigma$ ]  
KicOffset-rm: 0.439 arcsec [1.06 $\sigma$ ]  
OotOffset-st: 4/3/4/4 [15]  
KicOffset-st: 4/3/4/4 [15]  
DiffImageQuality-fgm: 0.47 [7/15]  
DiffImageOverlap-fno: 0.00 [0/17]

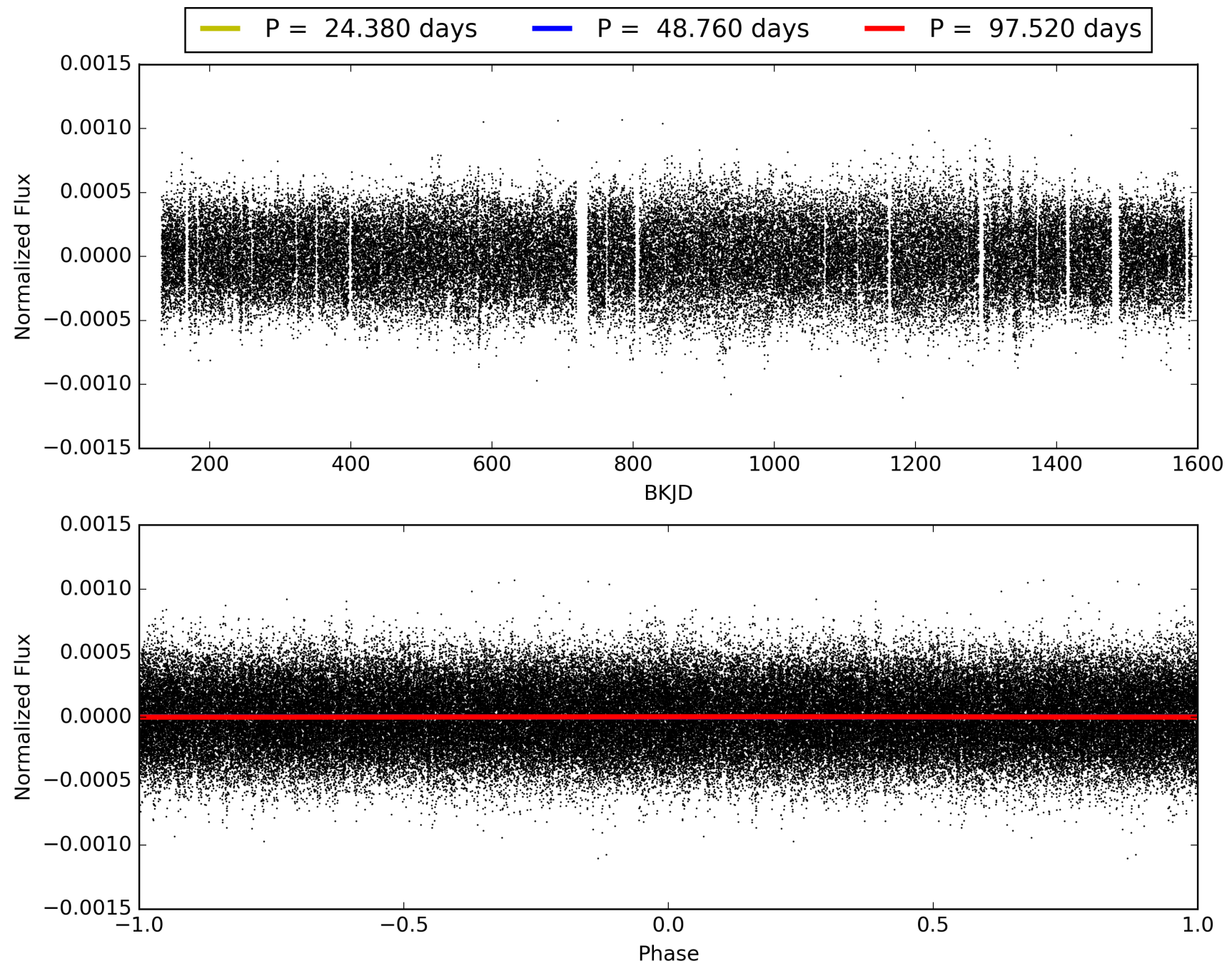
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 15:08:01 Z

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

# TCE 011031512-04, PDC Light Curves

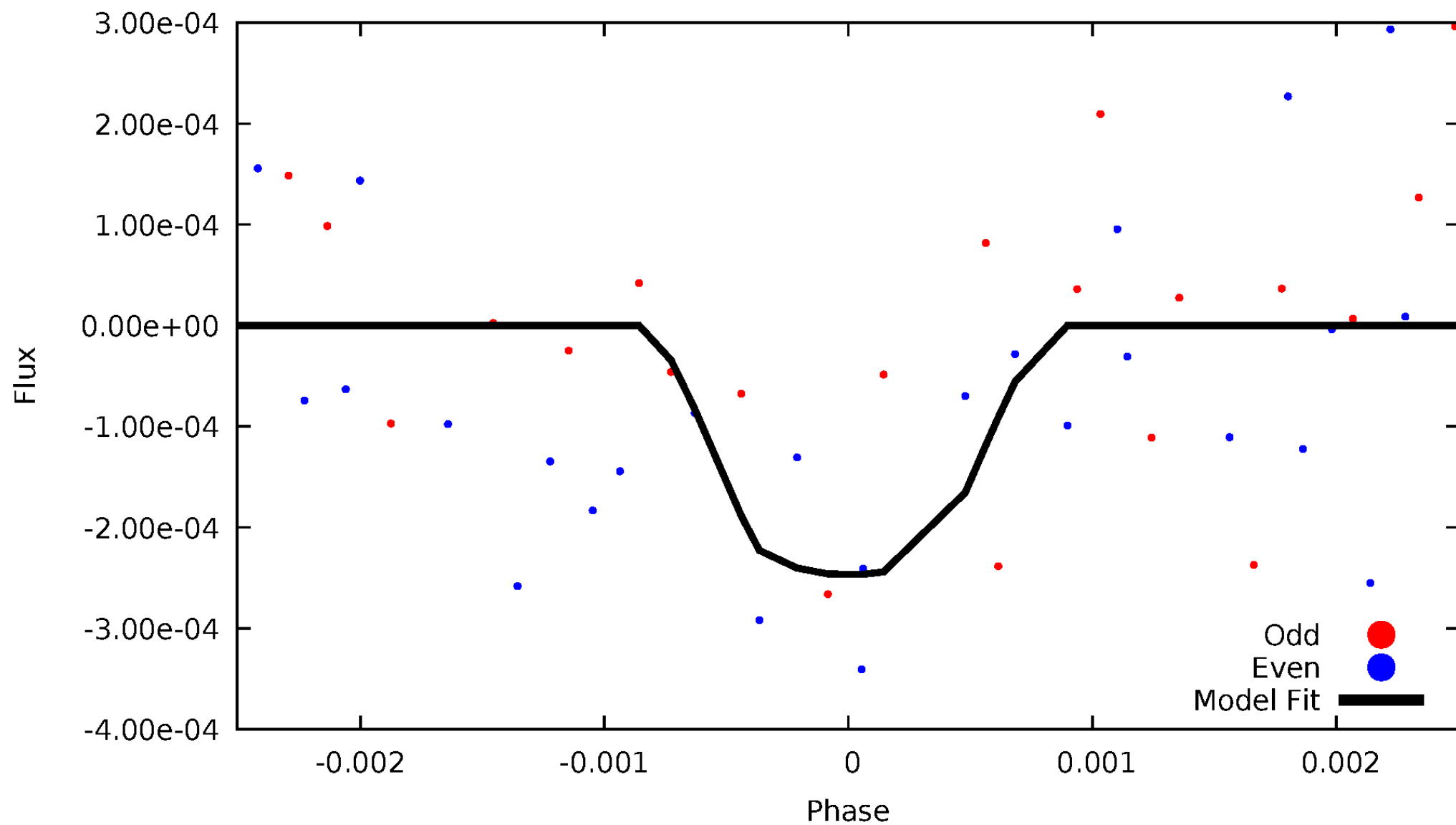


TCE 011031512-04



# DV Odd/Even

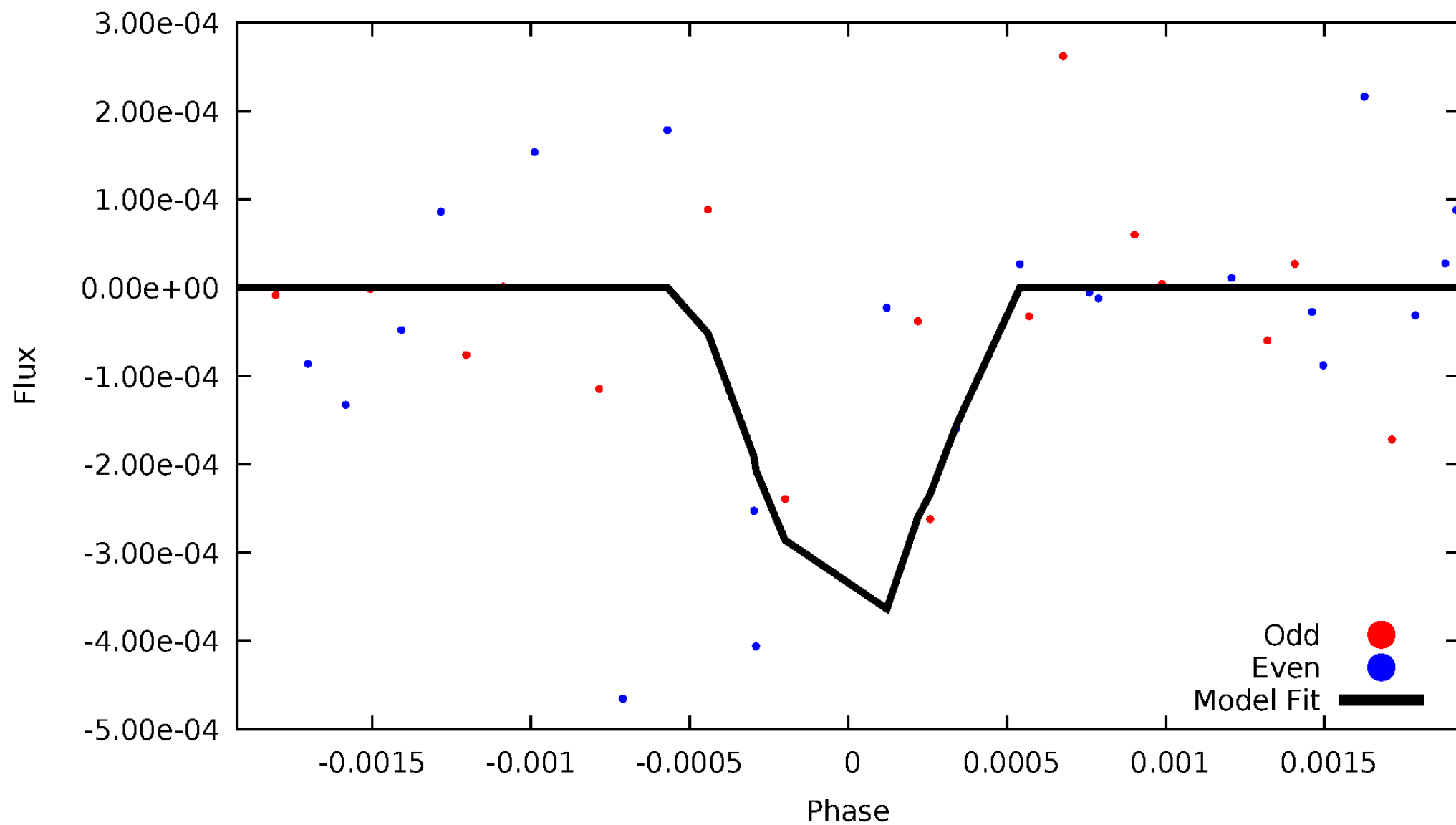
TCE 011031512-04





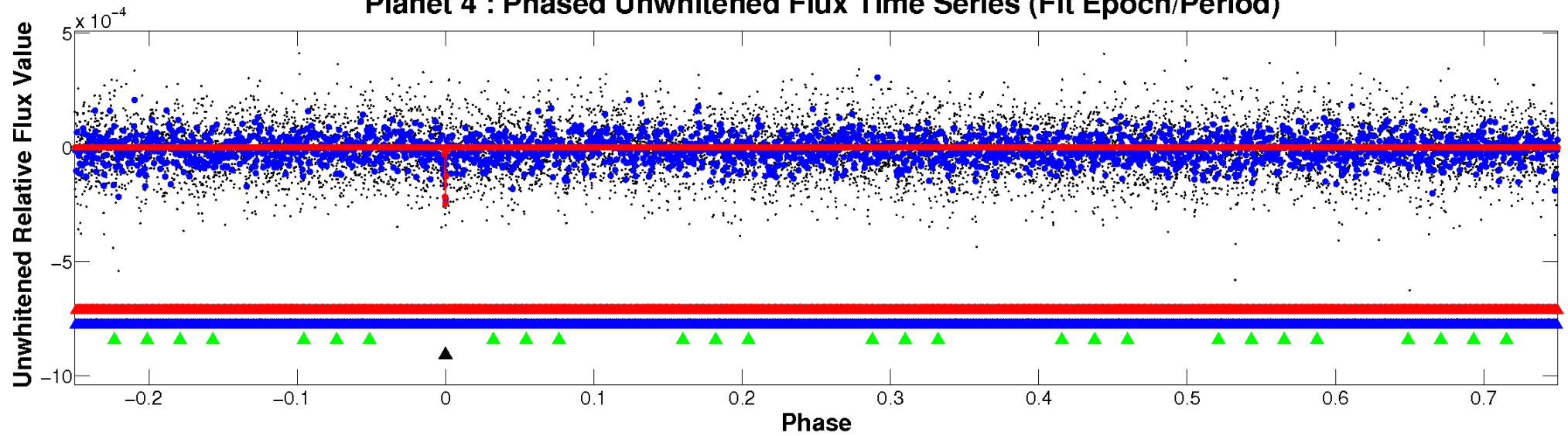
# ALT Odd/Even

TCE 011031512-04

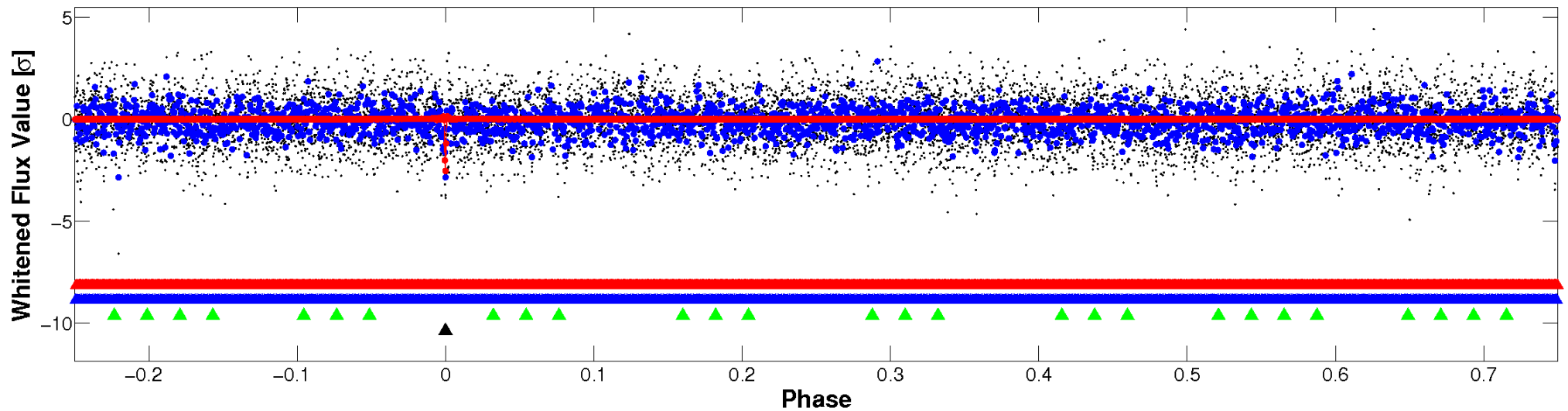


# Non-Whitened Vs. Whitened Light Curve

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

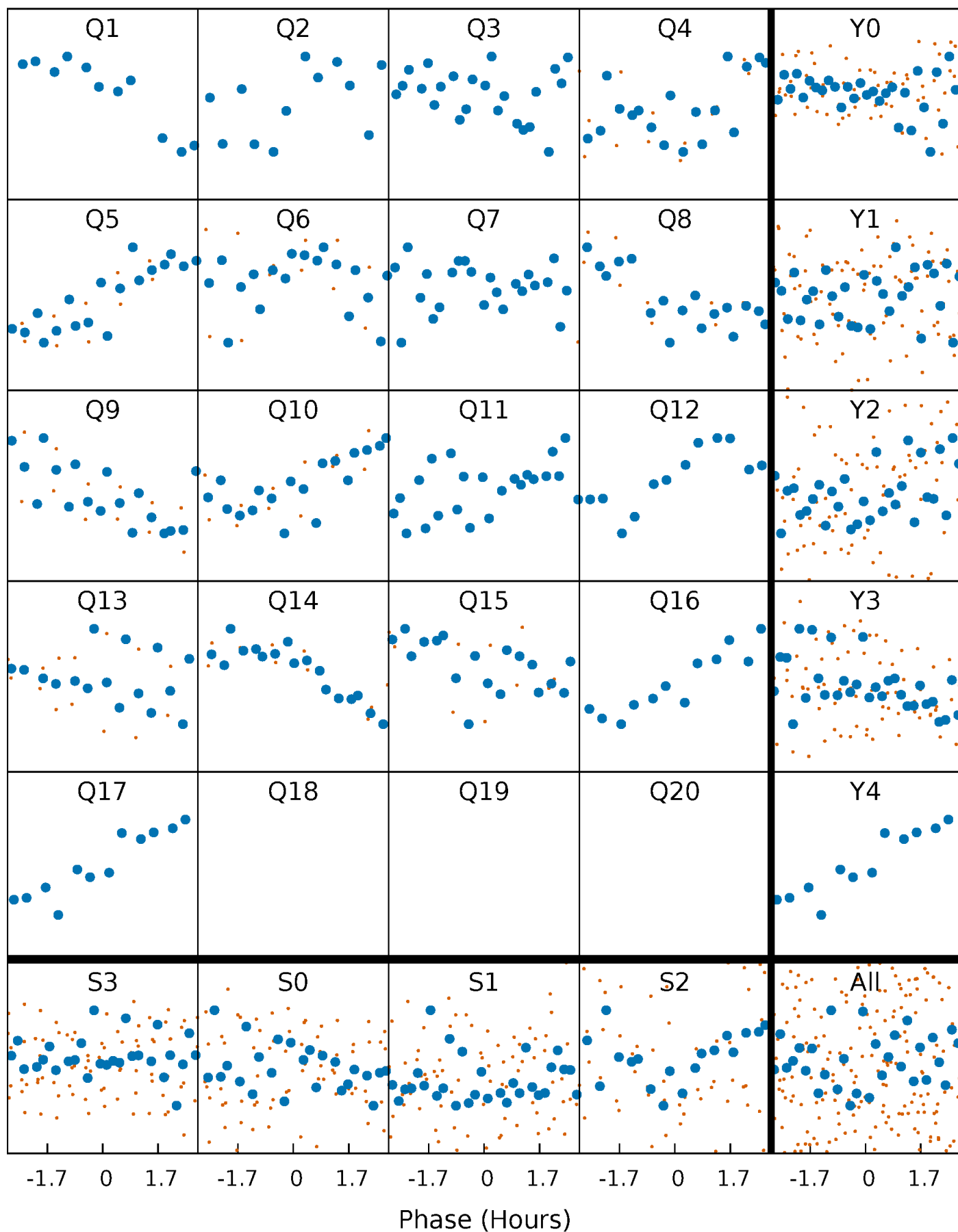


## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



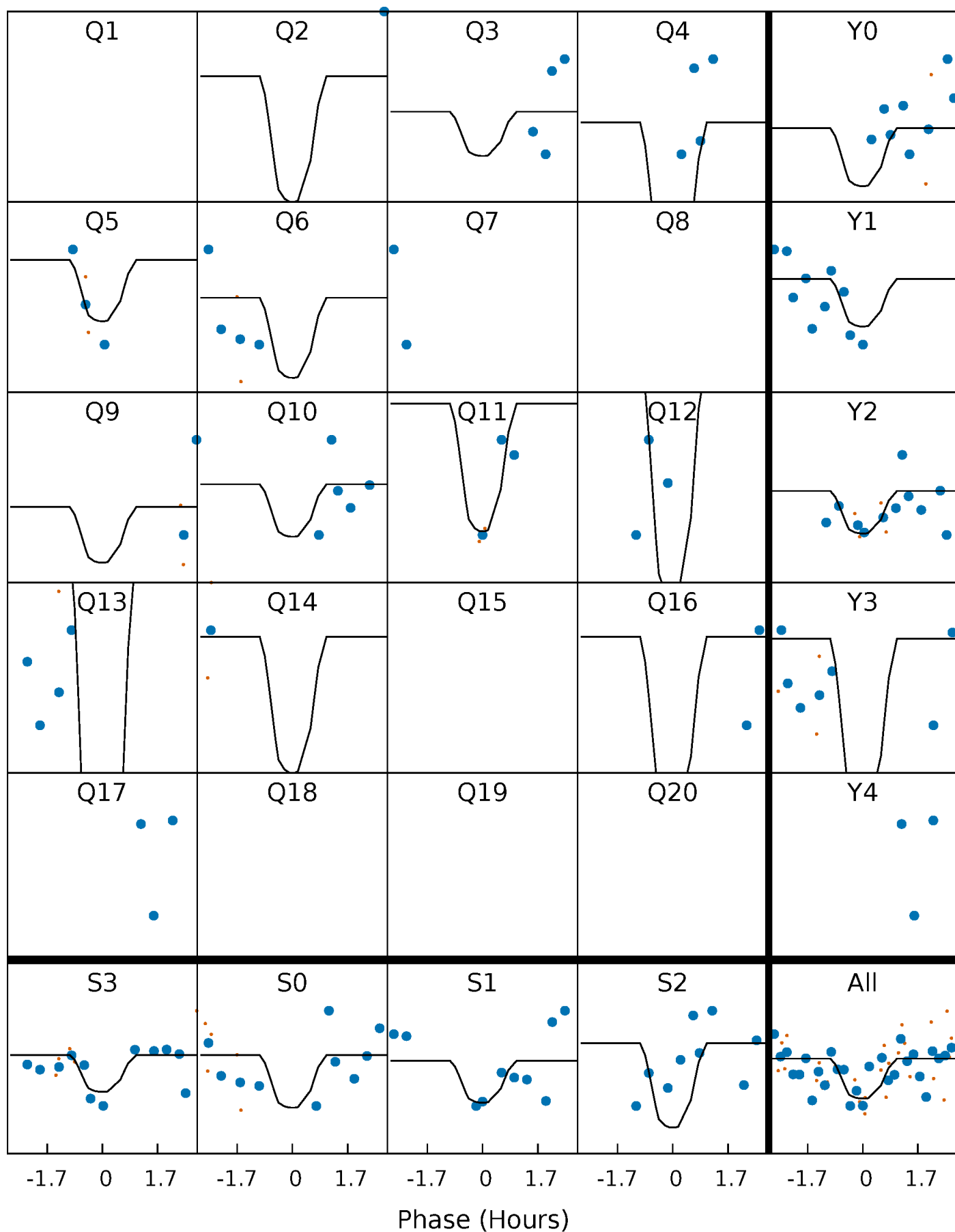
# PDC Quarter-Phased Transit Curves

TCE 011031512-04 P= 48.759807 Days  $T_0=164.170128$  (BKJD)



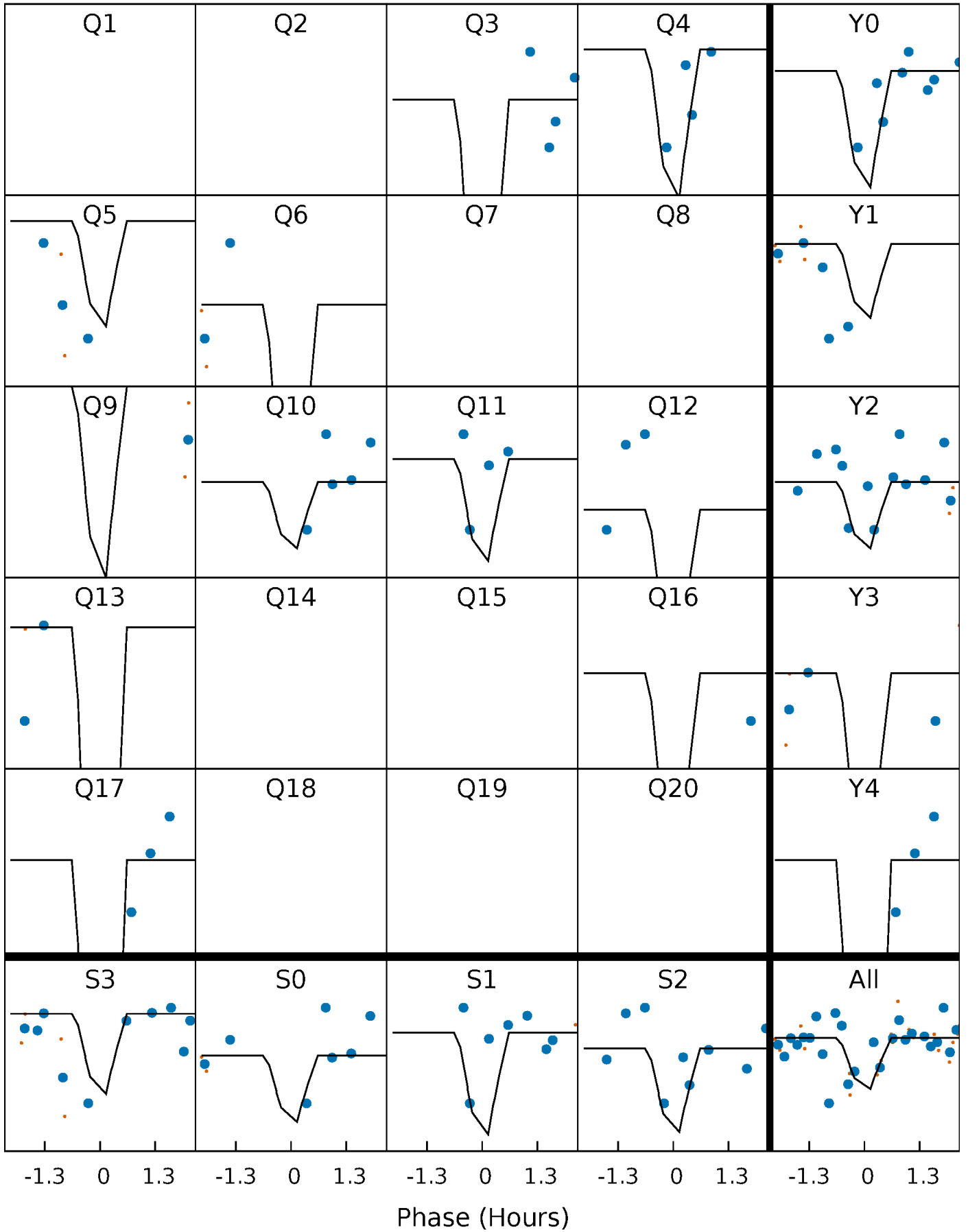
# DV Quarter-Phased Transit Curves

TCE 011031512-04 P= 48.759807 Days  $T_0=164.170128$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

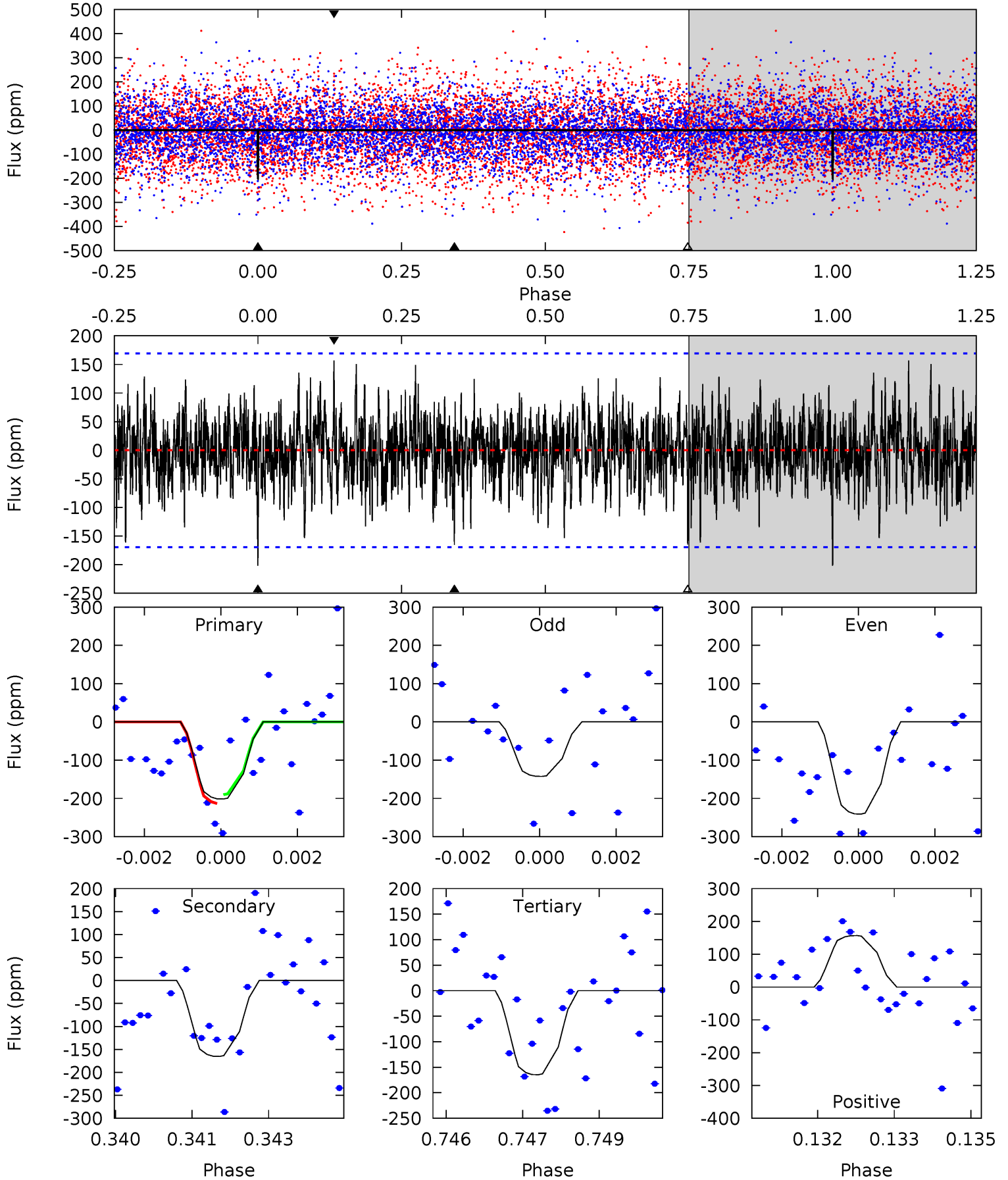
TCE 011031512-04   P= 48.759856 Days    $T_0=164.186668$  (BKJD)



# DV Model-Shift Uniqueness Test

011031512-04, P = 48.759807 Days, E = 115.410321 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
6.38	5.24	5.22	4.97	5.36	3.15	1.49	1.16	1.41	0.02	0.27	1.55	0.99	0.44	0.36

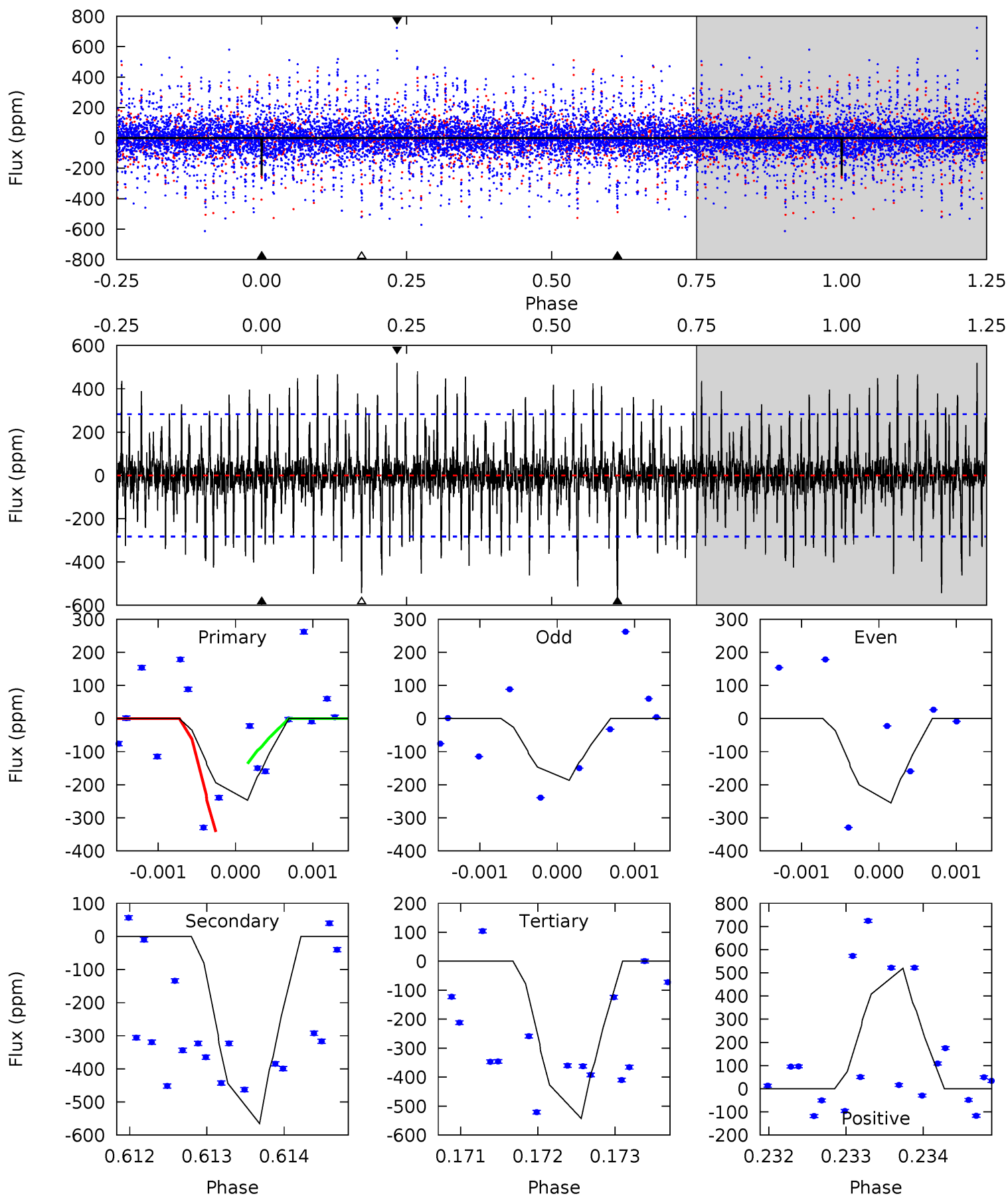




# Alt Model-Shift Uniqueness Test

011031512-04, P = 48.759856 Days, E = 115.426812 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
4.80	11.0	10.6	10.1	5.49	3.36	2.20	-5.76	-5.31	0.44	0.89	0.64	1.00	0.48	2.03



### Stellar Parameters For KIC 011031512

	$T_{\text{eff}}(K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7643^{+239}_{-319}$	$3.561^{+0.594}_{-0.066}$	$-0.340^{+0.250}_{-0.300}$	$3.838^{+0.395}_{-2.237}$	$1.958^{+0.062}_{-0.561}$	$0.049^{+0.413}_{-0.011}$
	+3%/-4%	+17%/-2%	+74%/-88%	+10%/-58%	+3%/-29%	+847%/-23%
Source	KIC0	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 011031512-04 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-165 \pm 32$	$14.96^{+15.10}_{-9.96}$	$1551^{+117}_{-225}$	$4343^{+2803}_{-922}$	$42^{+306}_{-32}$
Alt.	$-565 \pm 51$	$14.95^{+17.29}_{-10.88}$	$1541^{+123}_{-230}$	$5542^{+6359}_{-1351}$	$139^{+1838}_{-107}$

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

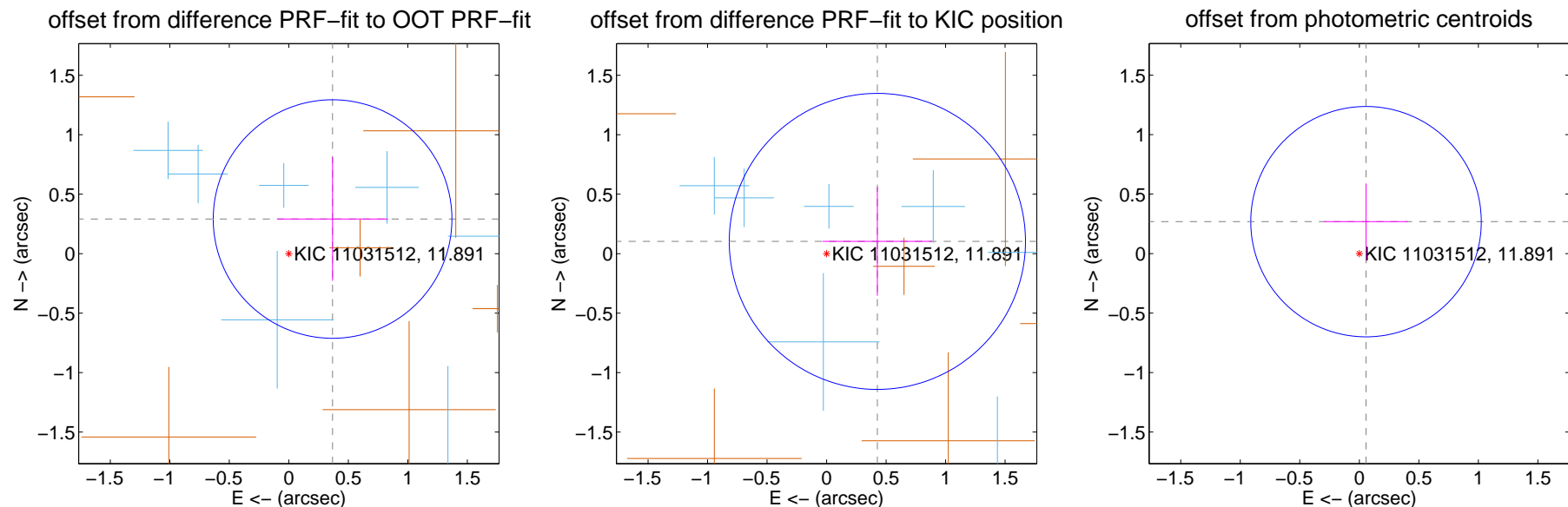
## DV Centroid Data

Supplemental centroid analysis for 011031512-04. **Kepler magnitude: 11.89**. Transit SNR 6.52

There are 7 quarters with good PRF difference image offsets

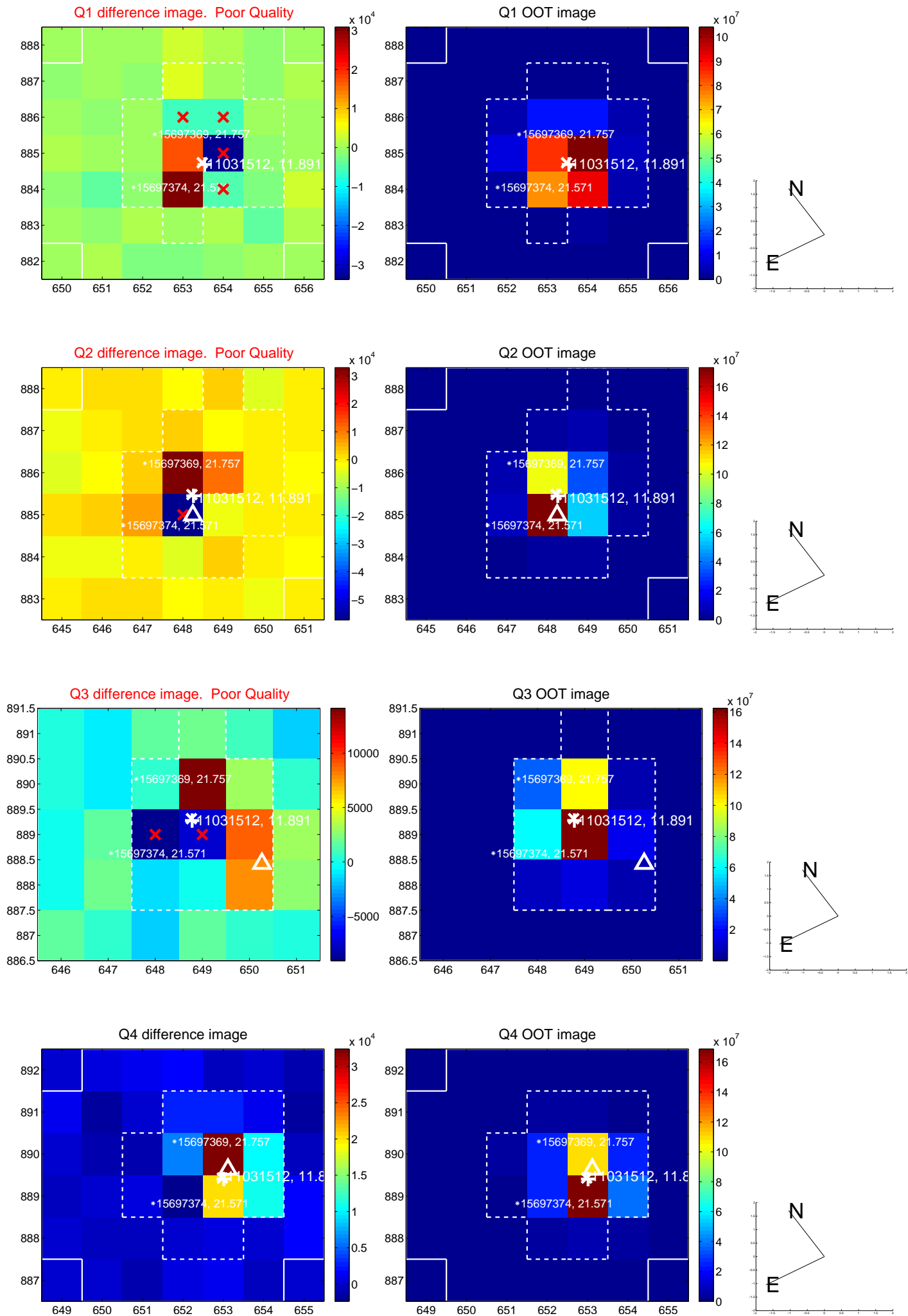
The direct PRF centroid is offset from the target star catalog position by about 0.27 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.469 \pm 0.334$	1.40	$-0.368 \pm 0.466$	$0.291 \pm 0.520$
PRF-fit source offset from KIC position	$0.439 \pm 0.415$	1.06	$-0.427 \pm 0.461$	$0.103 \pm 0.457$
photometric centroid source offset	$0.27 \pm 0.32$	0.85	$-0.06 \pm 0.35$	$0.27 \pm 0.32$

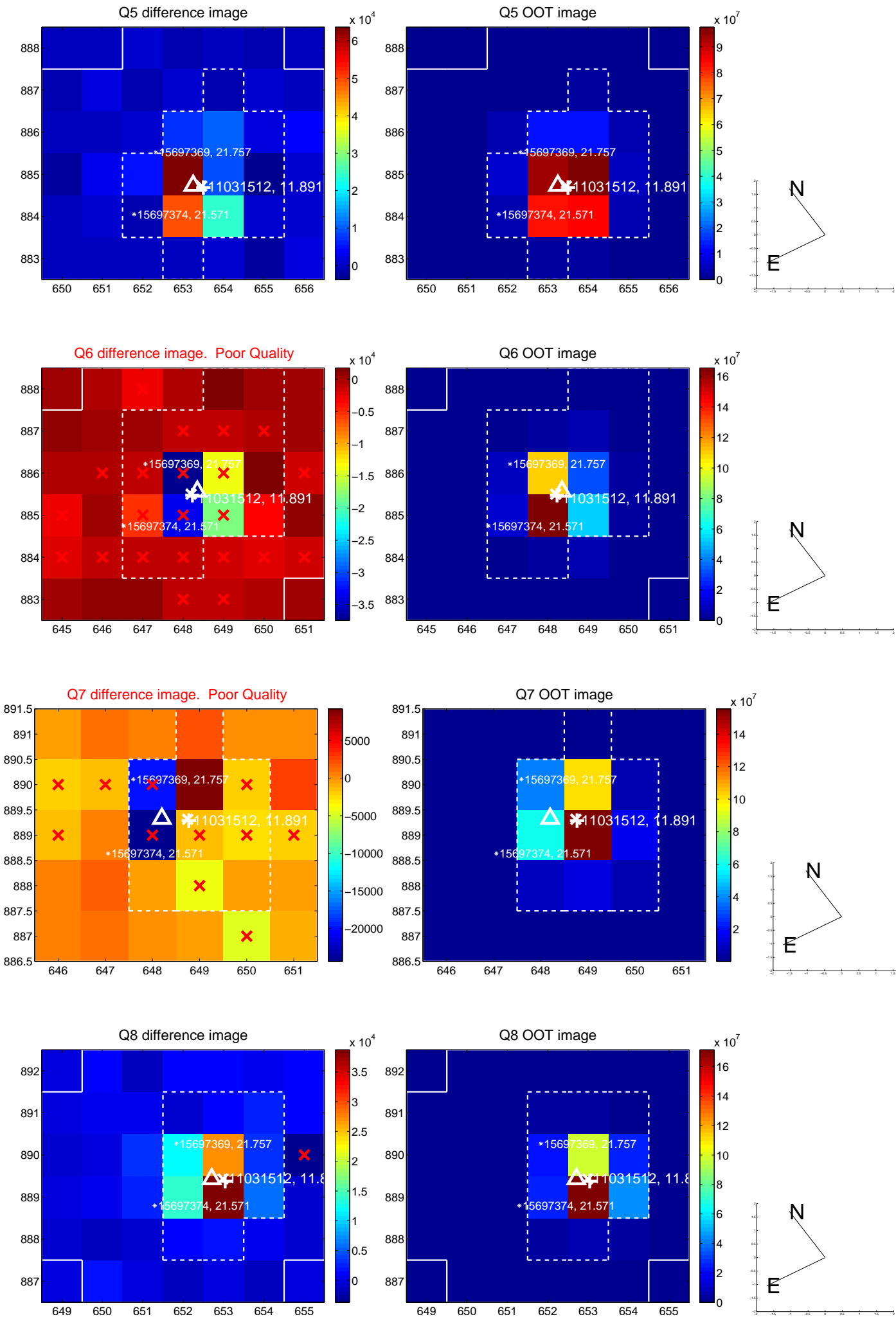


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

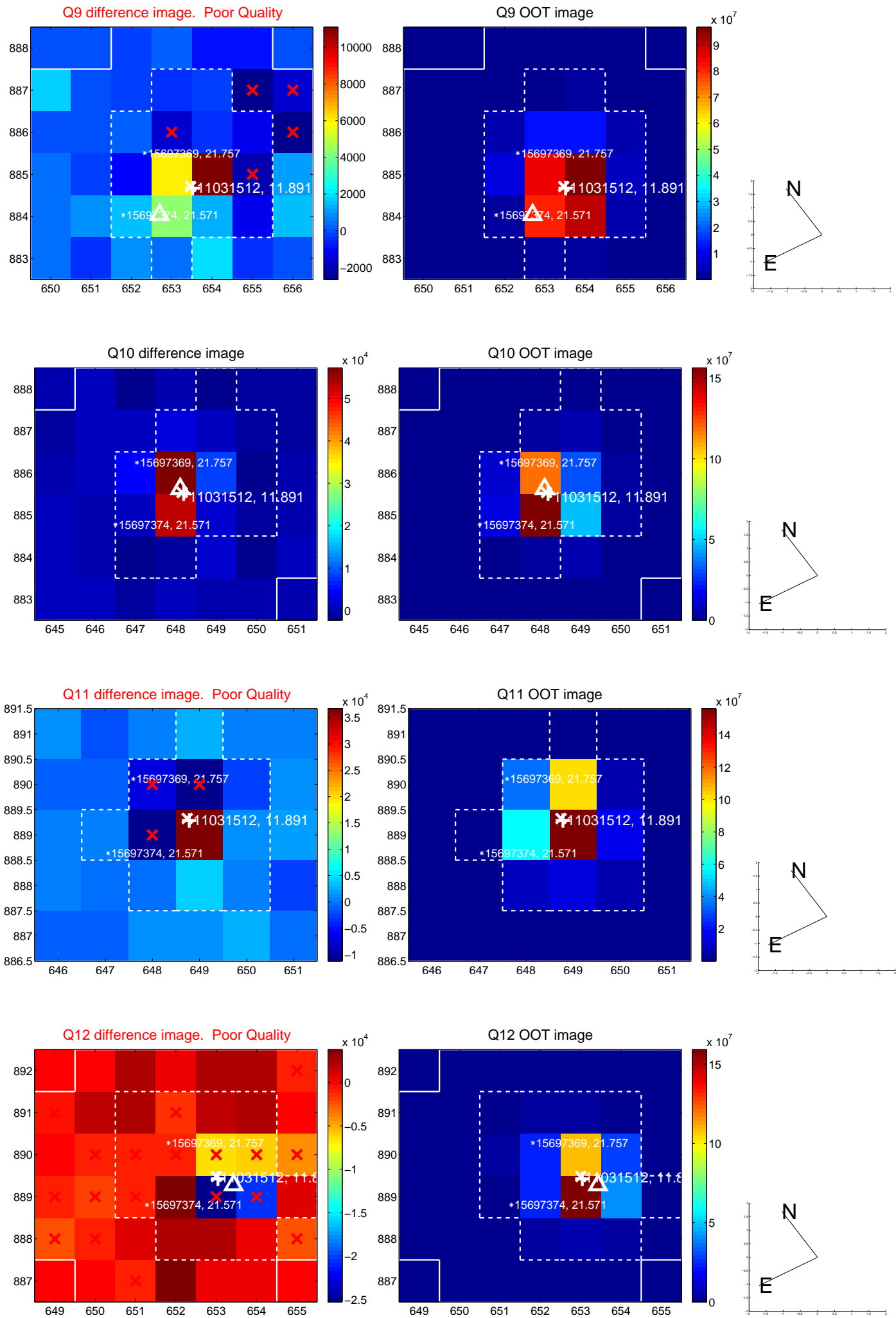
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

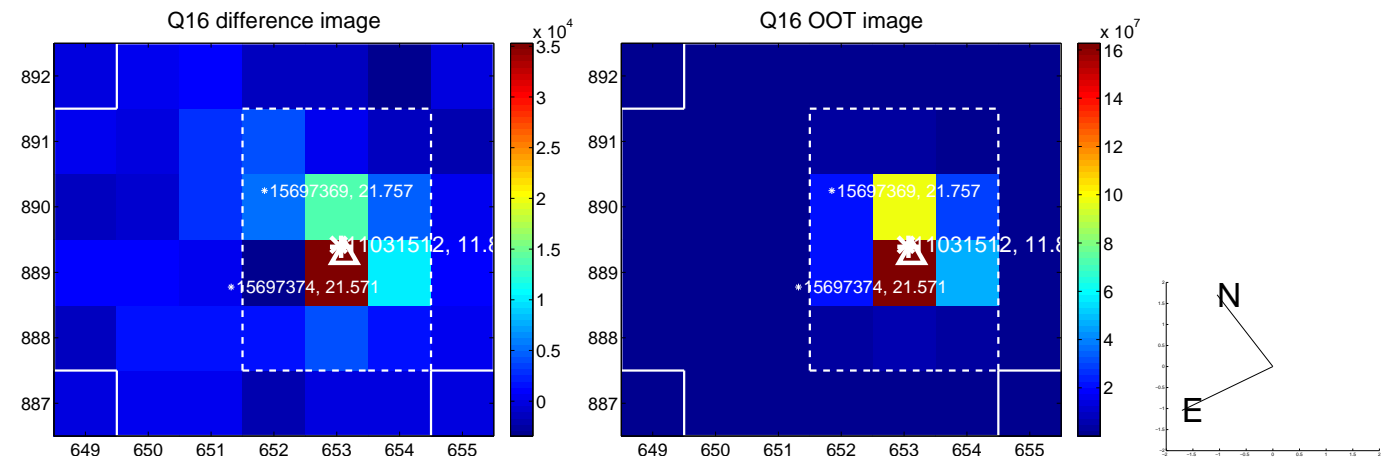
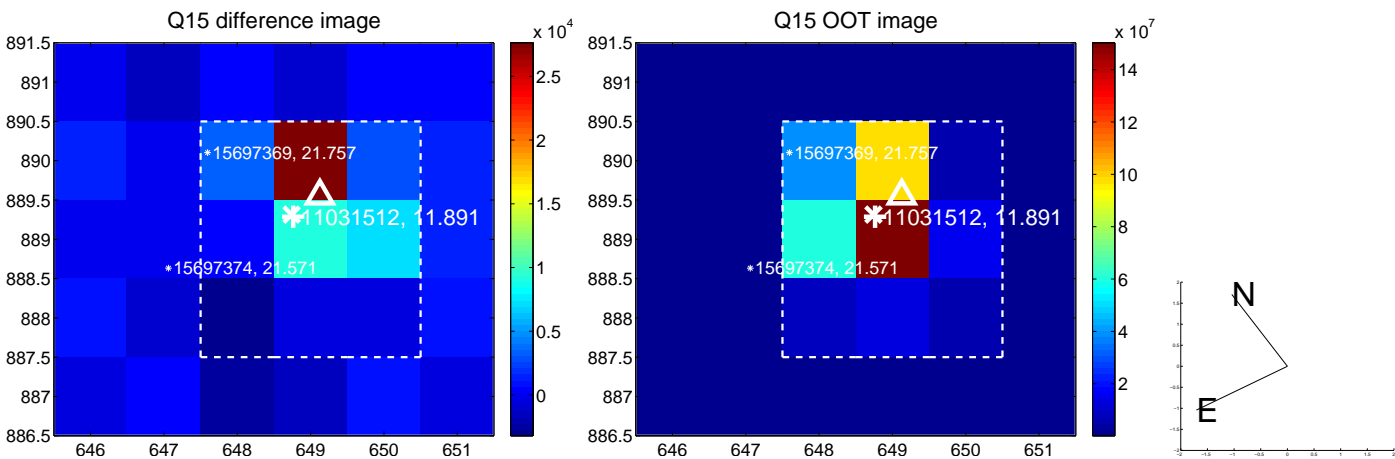
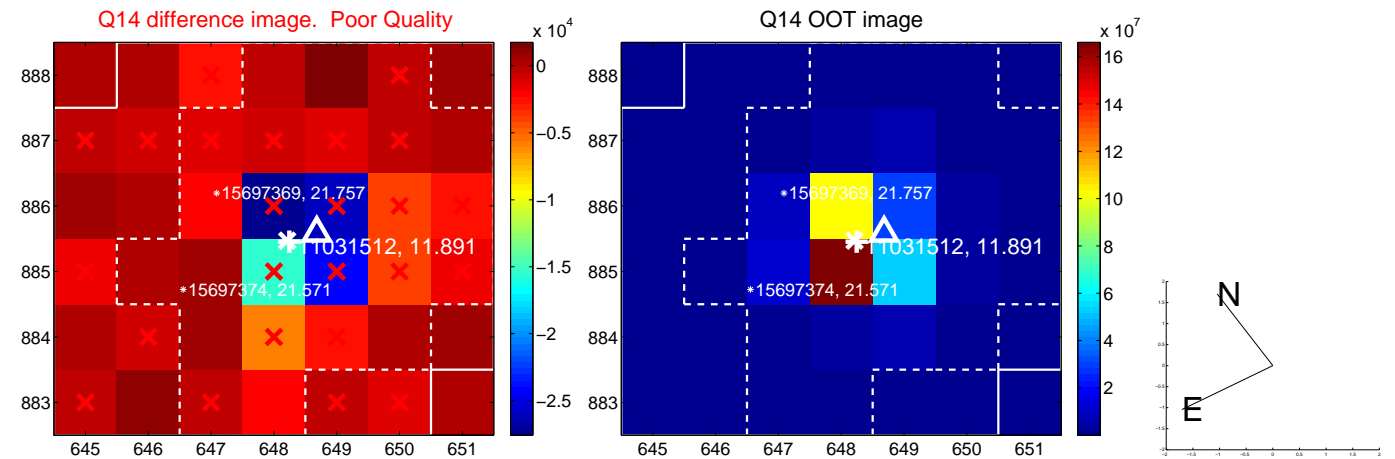
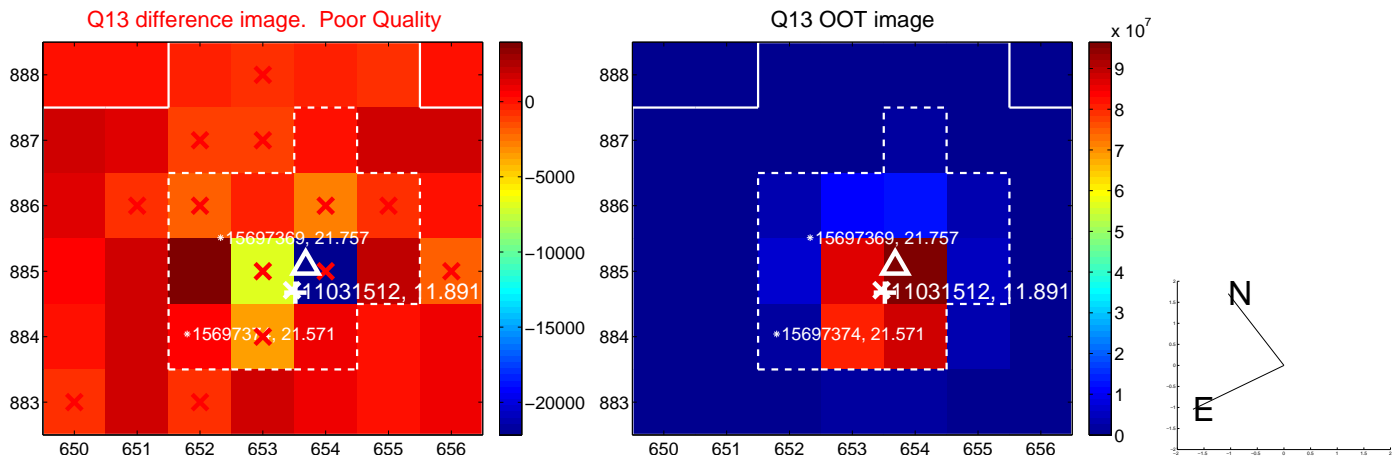


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

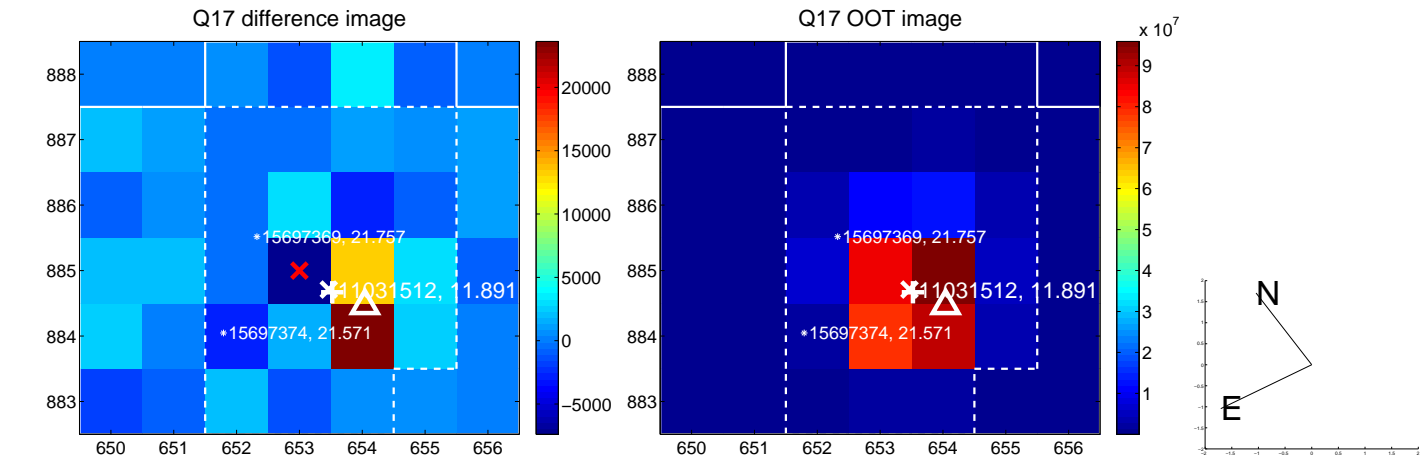




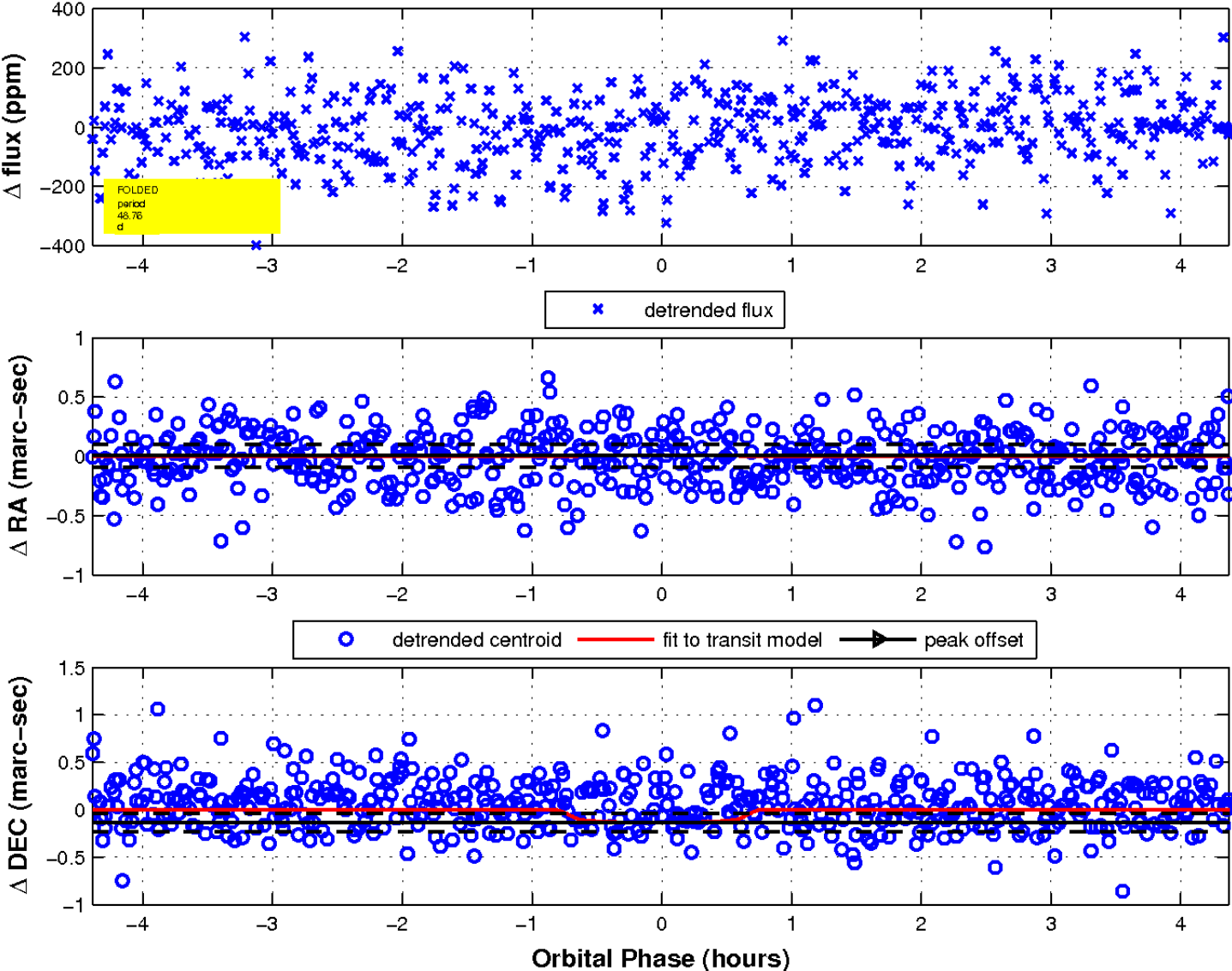
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



fluxWeightedCentroids, Planet 4 of 4



UKIRT Image

Declination

