

# KIC 009331207

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009331207-01	OBS	No	1.416333	132.311718	12.5	7.870	7.6	8.3	1.91	6854	0.68	8943.40
009331207-02	OBS	No	90.772496	161.637332	127.8	16.110	10.6	7.4	1.91	6854	2.30	34.87

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009331207-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—CENT_SATURATED
009331207-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT— INCONSISTENT_TRANS—CENT_SATURATED

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

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

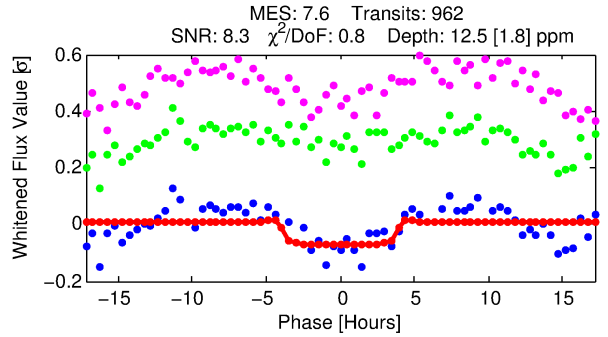
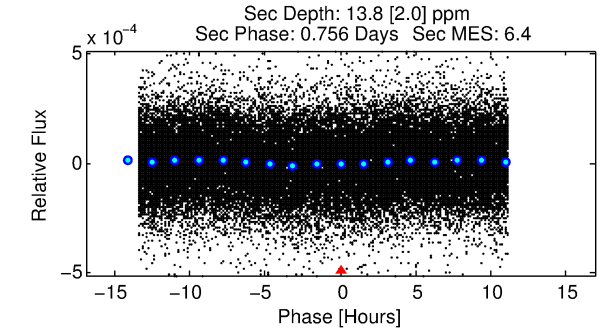
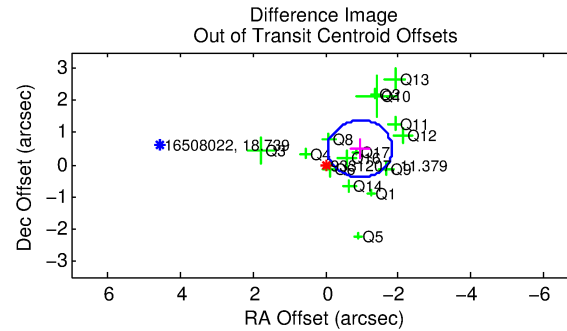
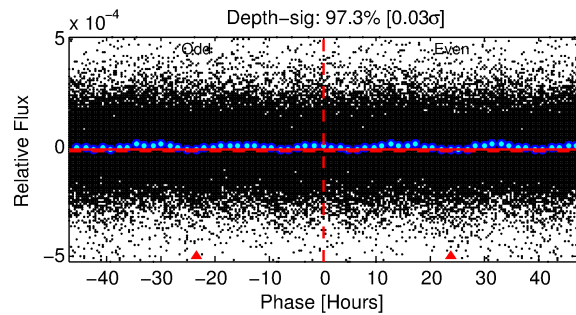
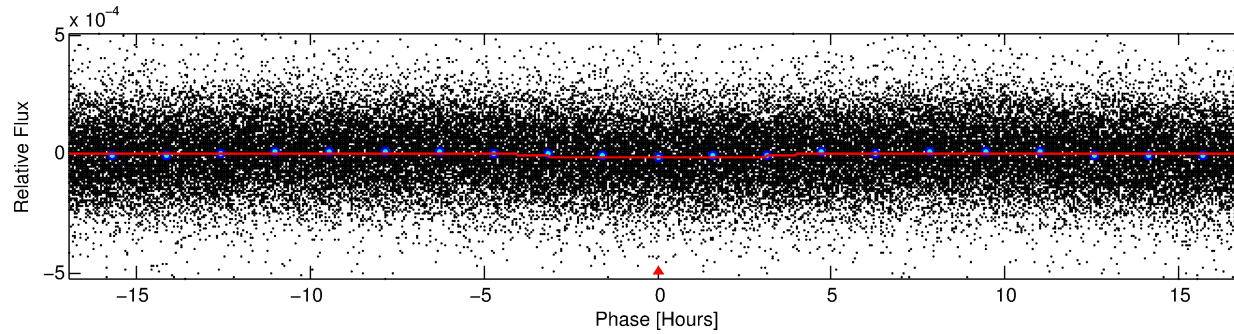
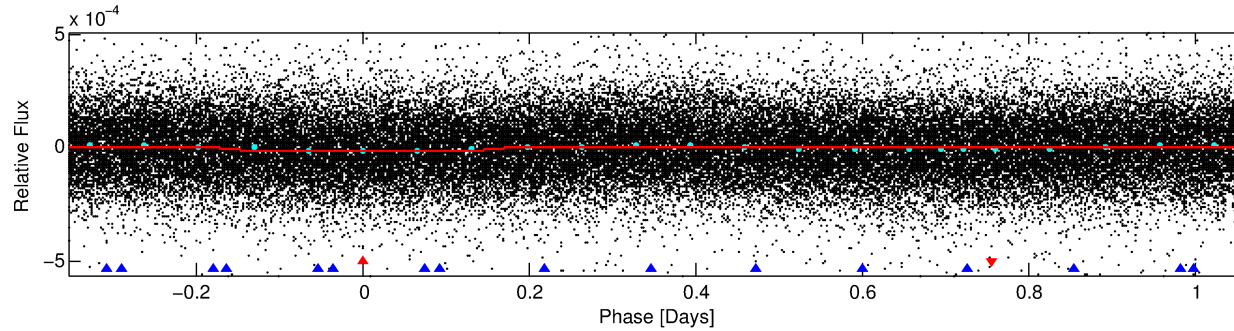
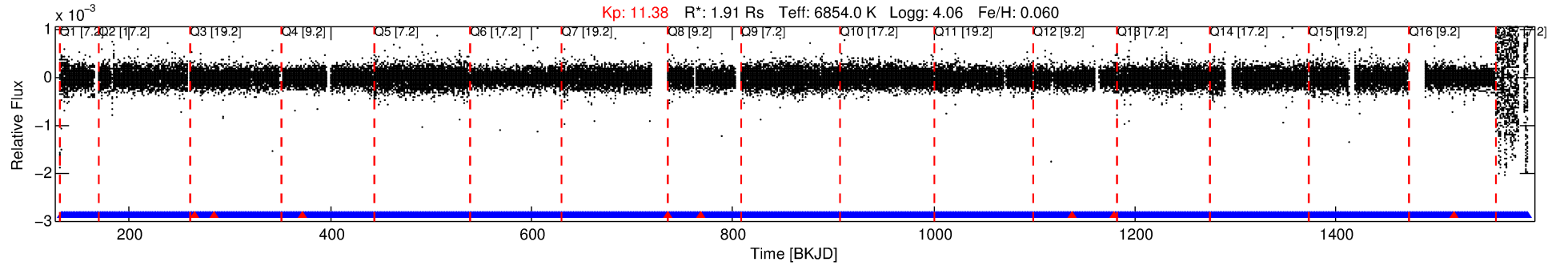
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009331207-01

No Significant Match Found

# DV One-Page Summary

KIC: 9331207 Candidate: 1 of 2 Period: 1.416 d



## DV Fit Results:

Period = 1.41633 [0.00002] d  
Epoch = 132.3117 [0.0077] BKJD  
Rp/R\* = 0.0033 [0.0040]  
a/R\* = 1.50 [5.75]  
b = 0.11 [59.84]  
Seff = 8943.40 [3480.64]  
Teq = 2480 [241] K  
Rp = 0.68 [0.87] Re  
a = 0.0284 [0.0069] AU  
Ag = 13.24 [33.18] [0.37 $\sigma$ ]  
Teffp = 7314 [4546] K [1.06 $\sigma$ ]

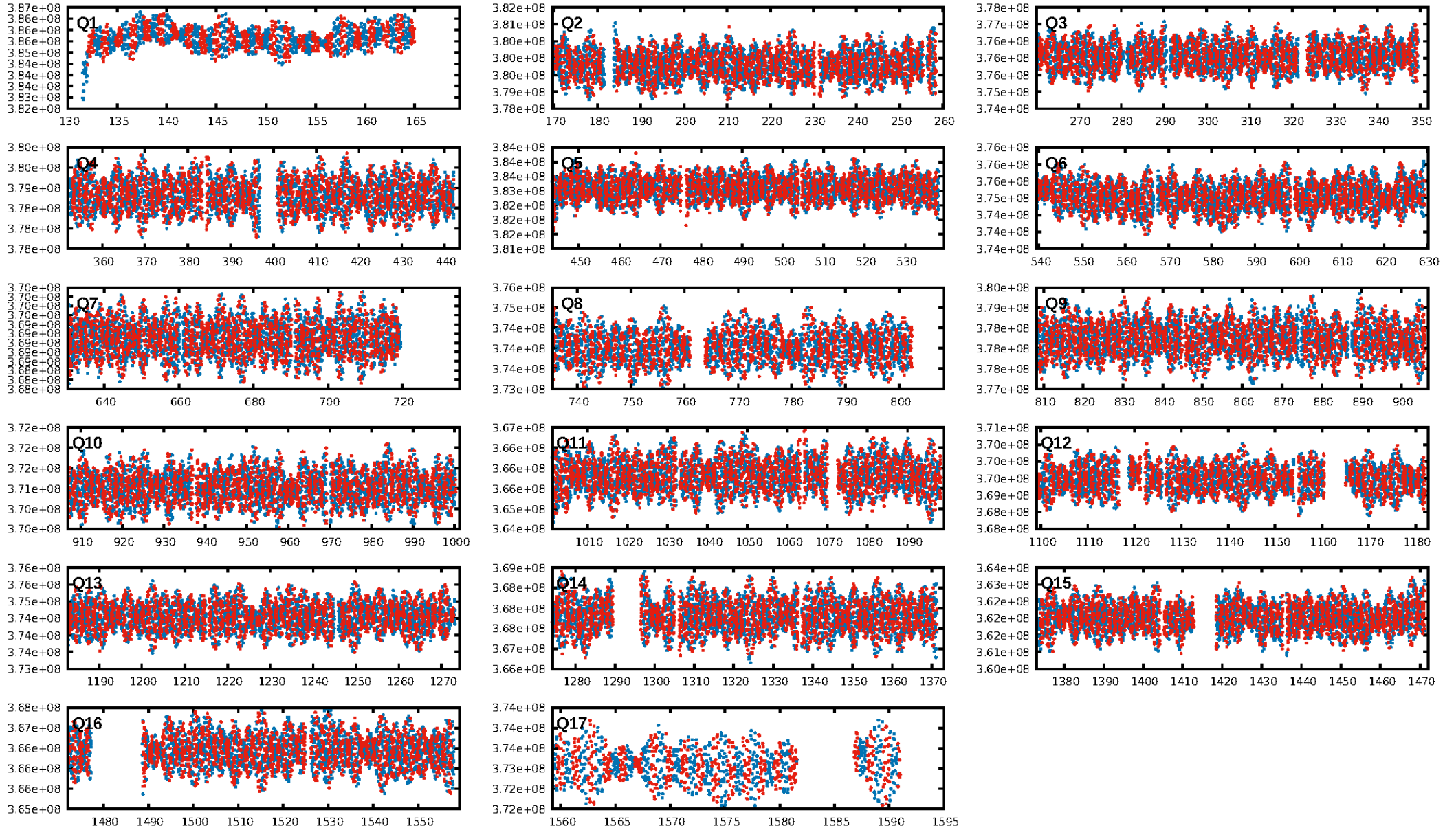
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [119.61 $\sigma$ ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 1.86e-08  
RollingBand-fgt: 0.99 [909/918]  
GhostDiagnostic-chr: 3.481  
Centroid-sig: 0.0%  
Centroid-so: 1.591 arcsec [2.14 $\sigma$ ]  
OotOffset-rm: 1.067 arcsec [3.61 $\sigma$ ]  
KicOffset-rm: 1.040 arcsec [3.23 $\sigma$ ]  
OotOffset-st: 4/2/4/5 [15]  
KicOffset-st: 4/2/4/5 [15]  
DiffImageQuality-fgm: 0.67 [10/15]  
DiffImageOverlap-fno: 1.00 [17/17]

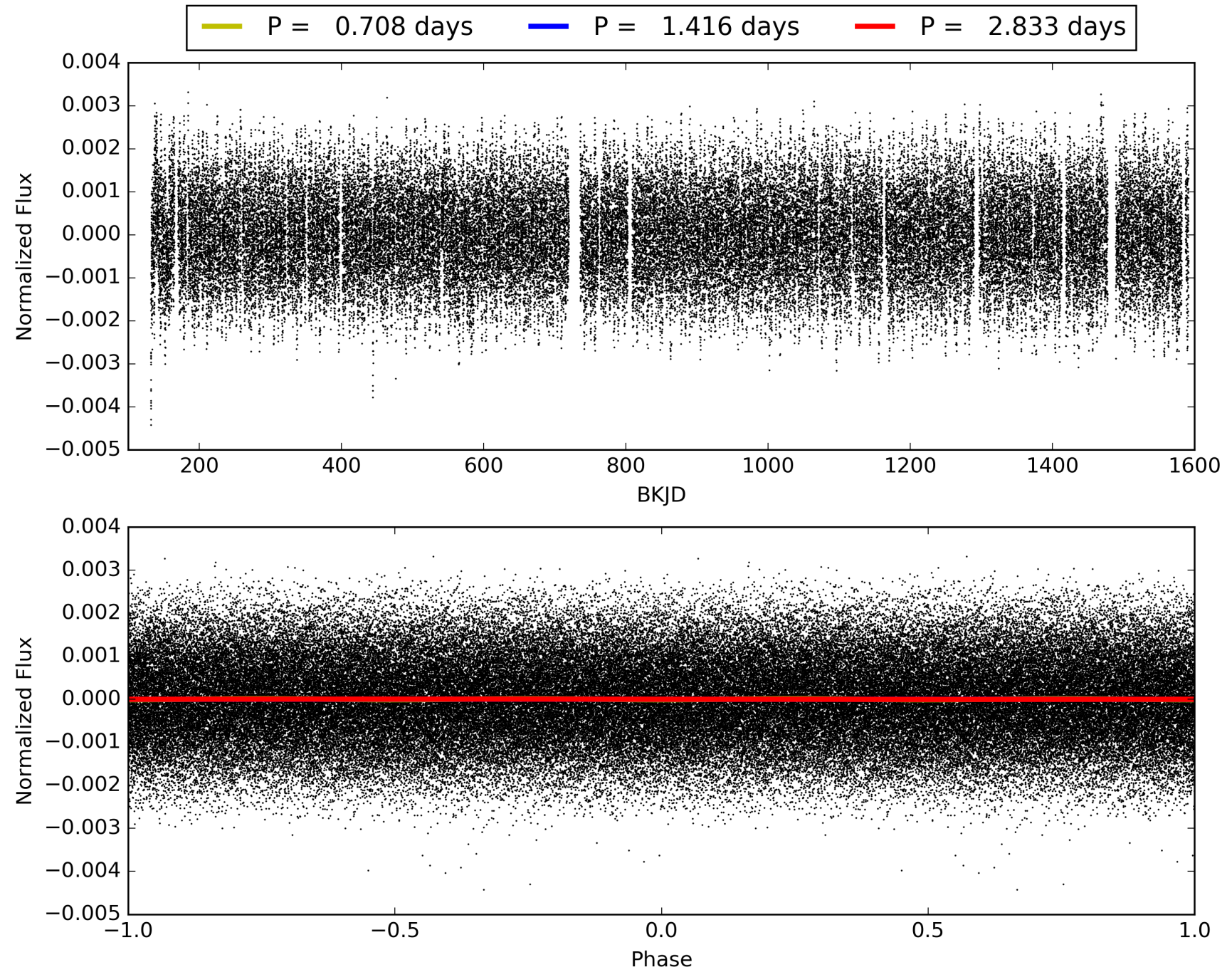
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 06:01:58 Z

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

# TCE 009331207-01, PDC Light Curves

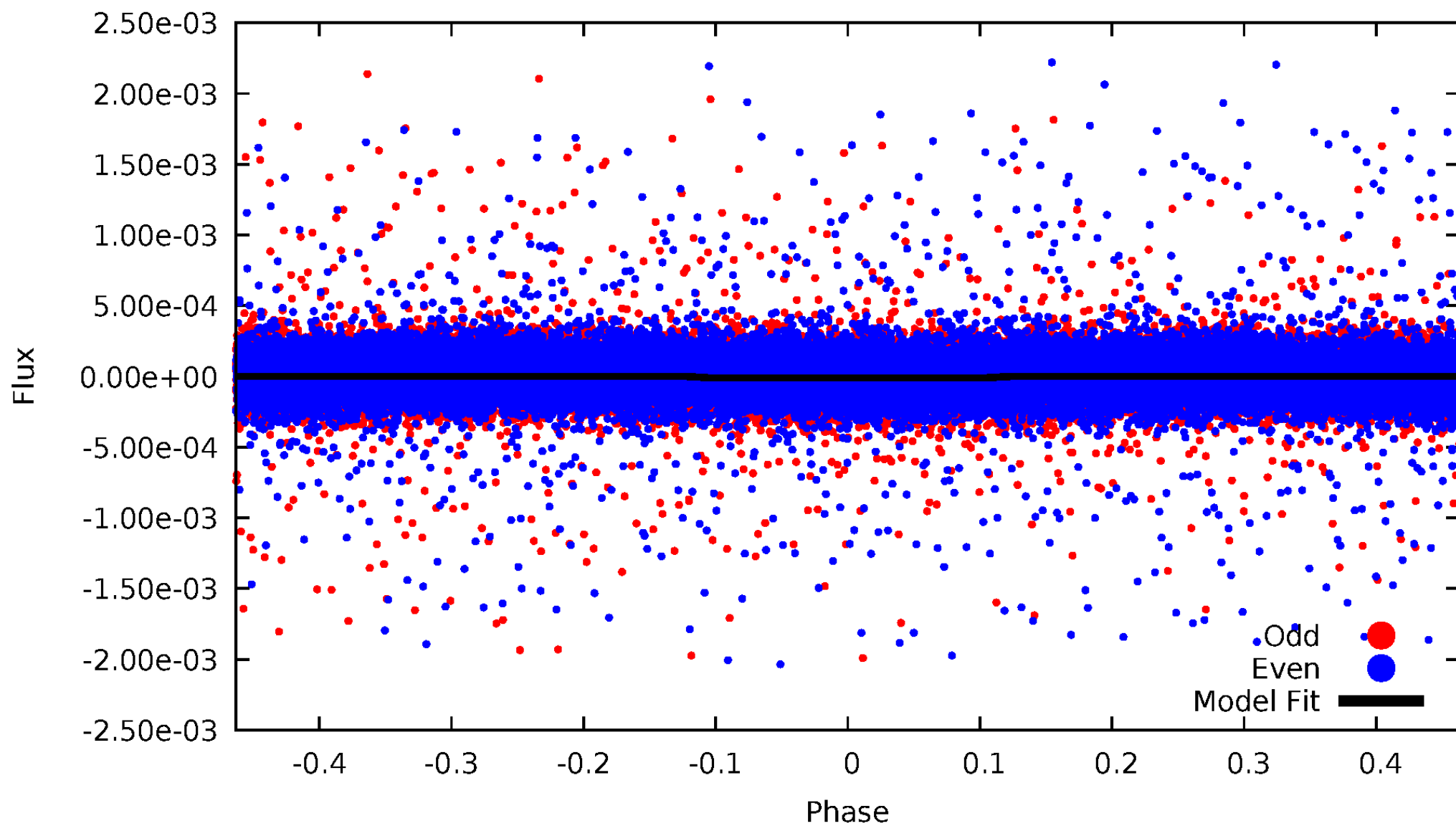


# TCE 009331207-01



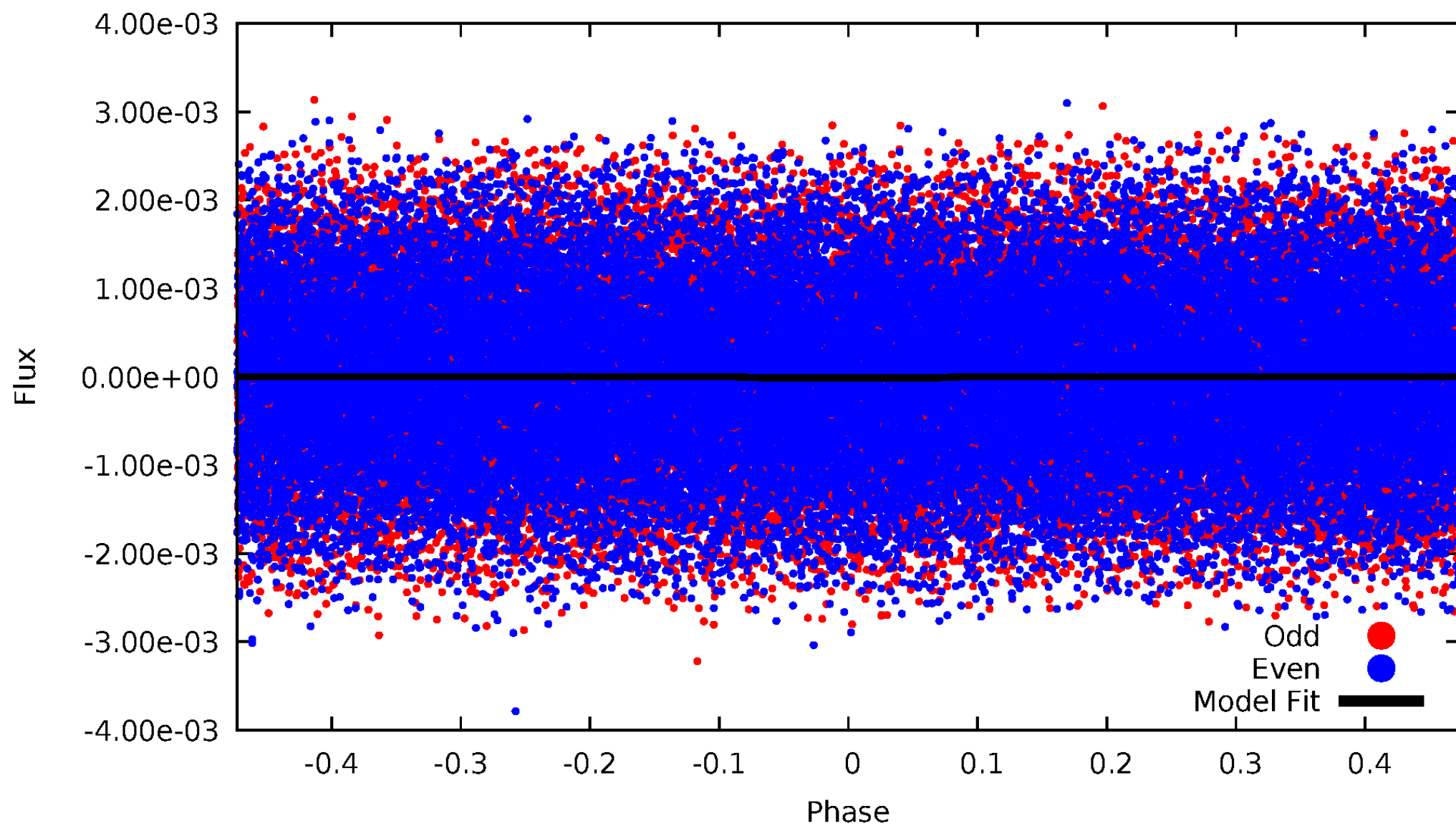
# DV Odd/Even

TCE 009331207-01



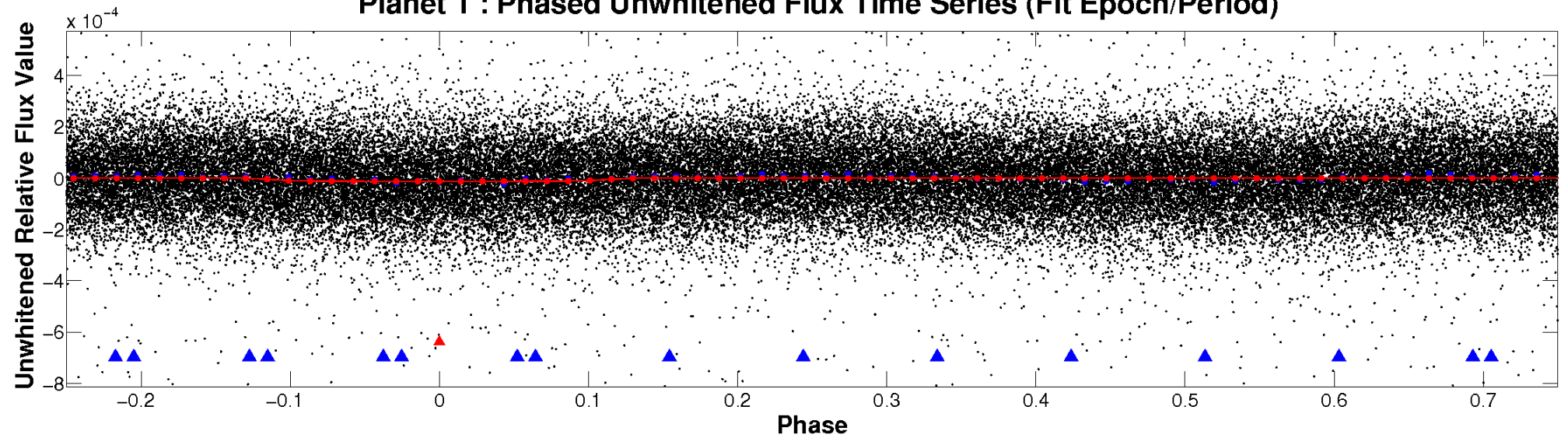
# ALT Odd/Even

TCE 009331207-01

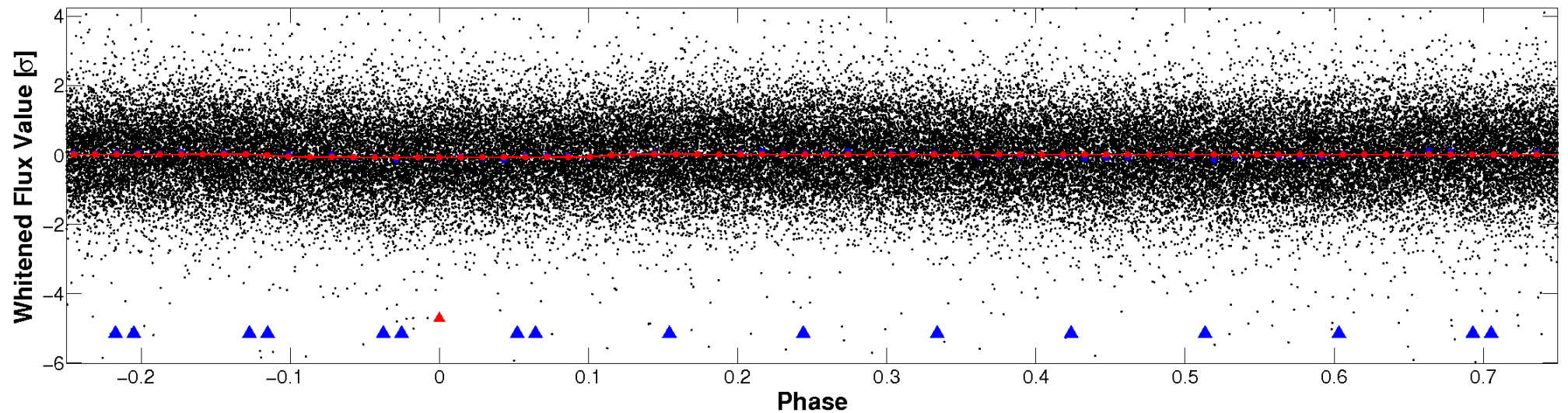


# Non-Whitened Vs. Whitened Light Curve

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

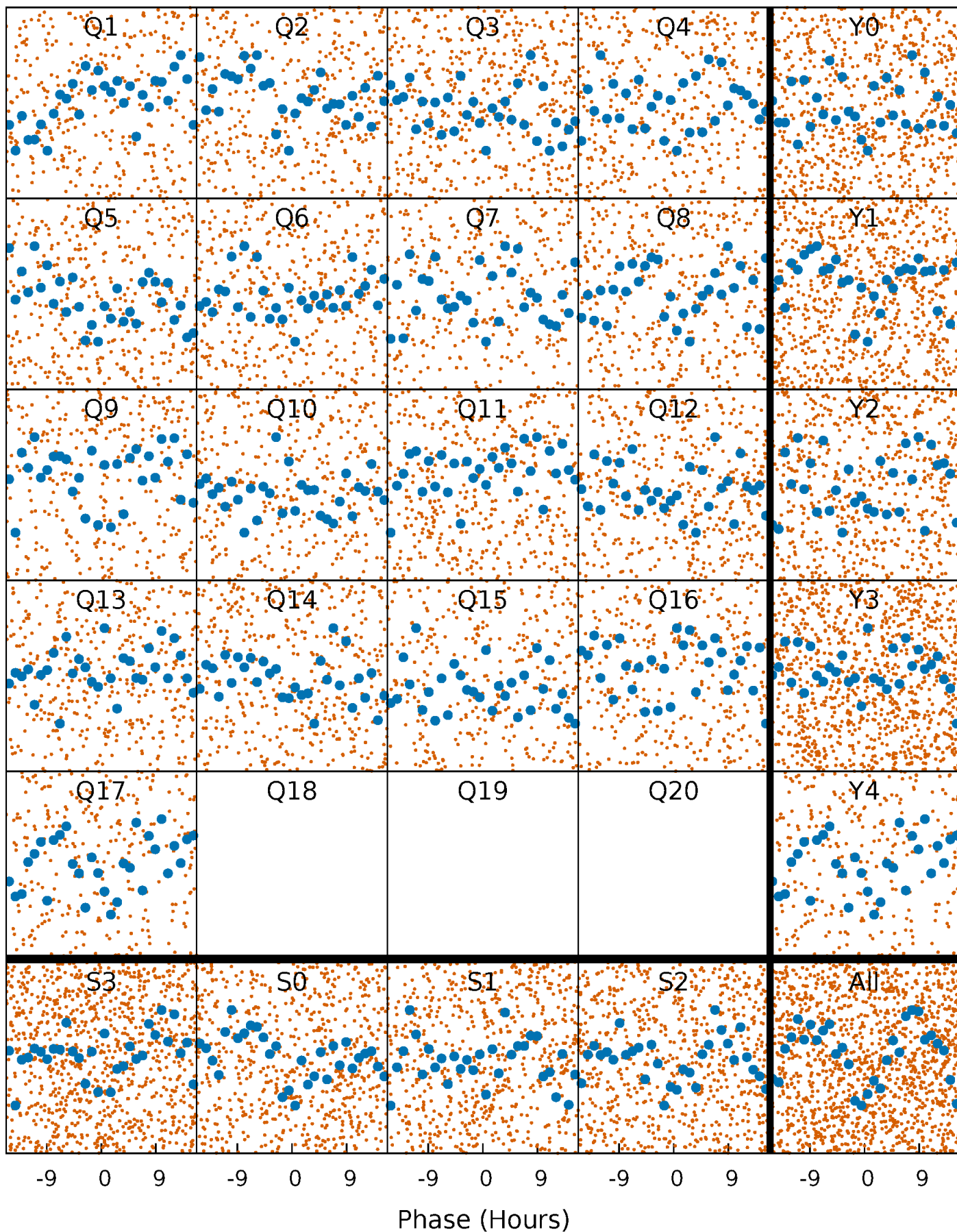


**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



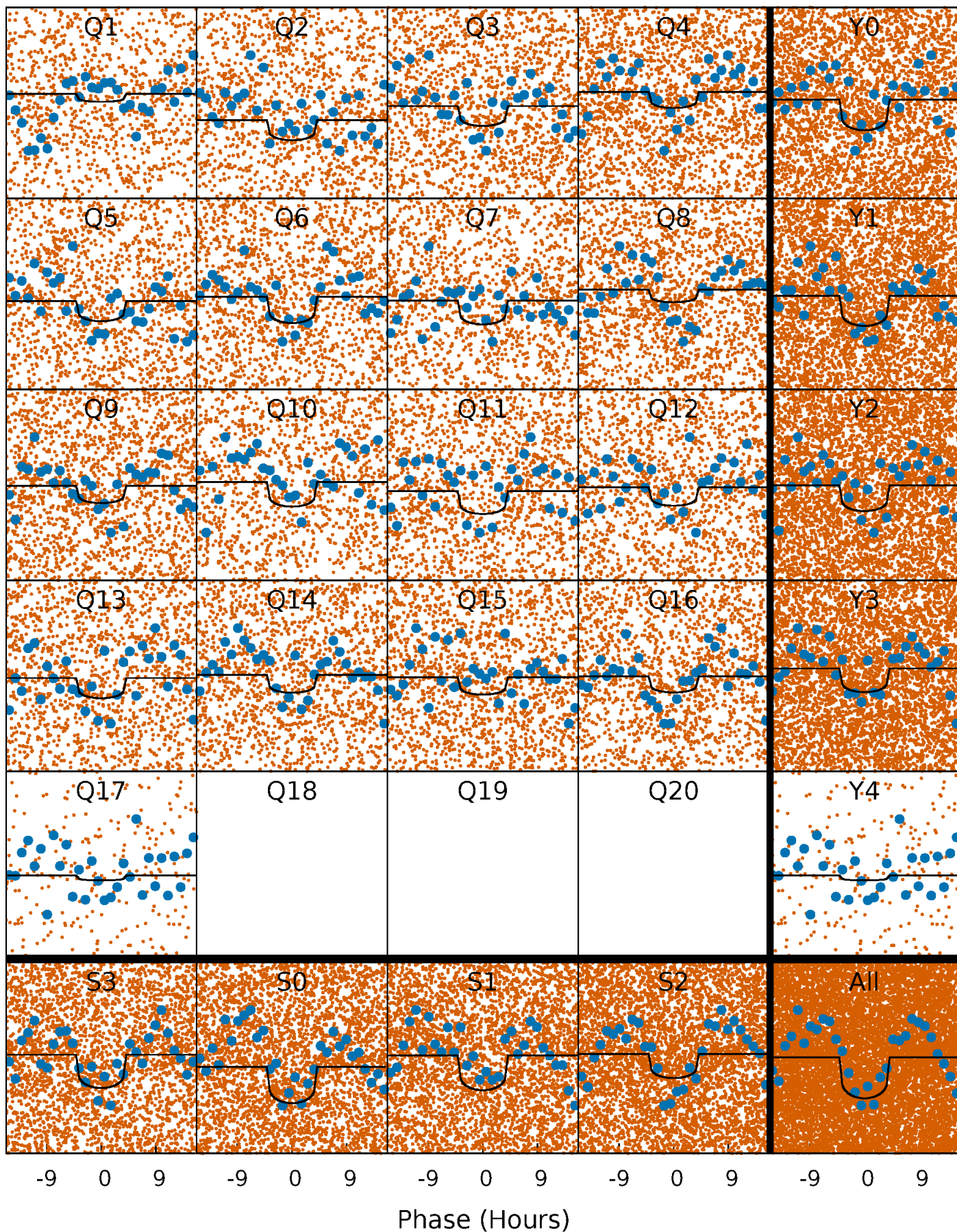
# PDC Quarter-Phased Transit Curves

TCE 009331207-01 P= 1.416333 Days  $T_0=132.311717$  (BKJD)



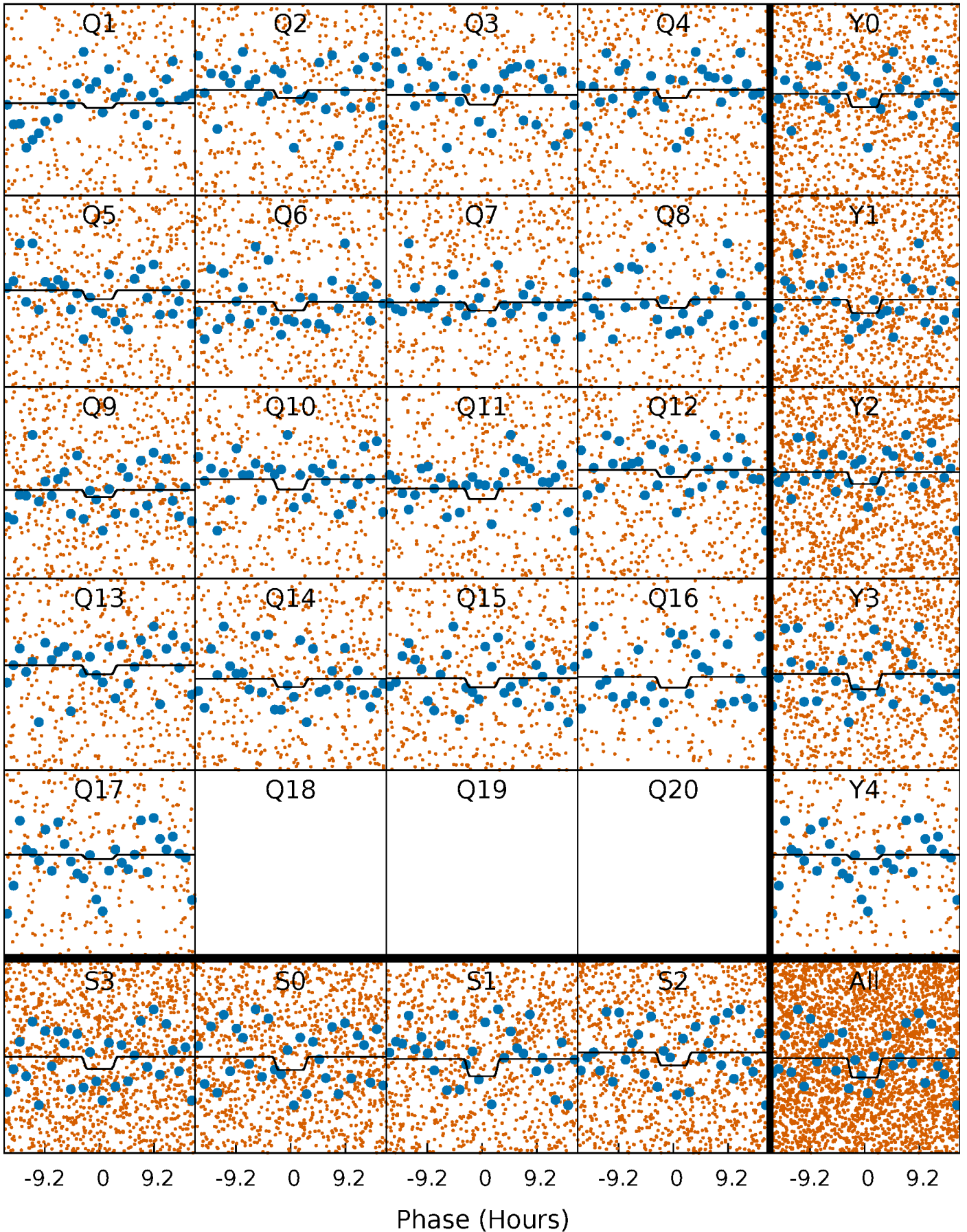
# DV Quarter-Phased Transit Curves

TCE 009331207-01 P= 1.416333 Days  $T_0=132.311717$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

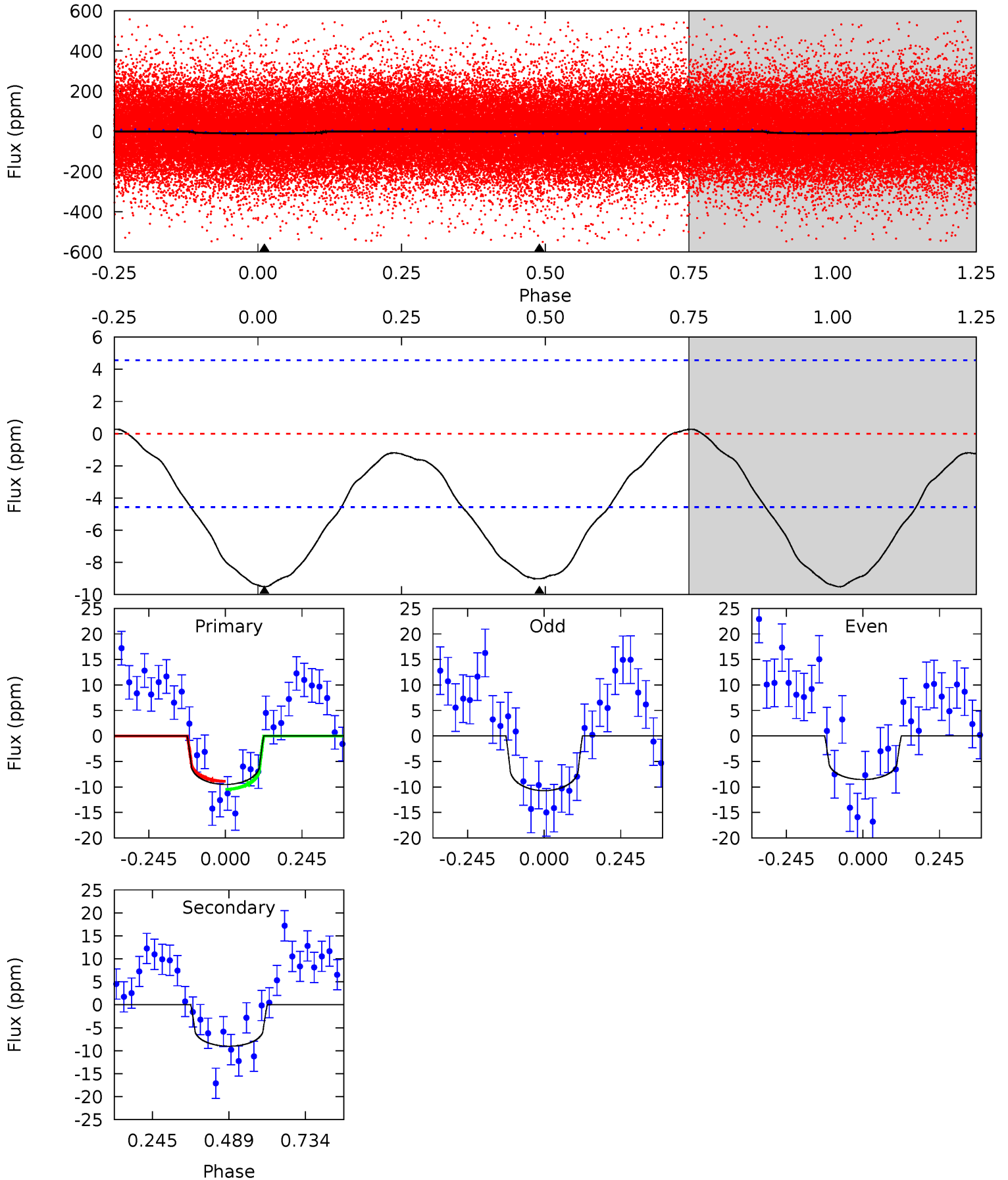
TCE 009331207-01 P= 1.416399 Days  $T_0=132.288526$  (BKJD)



# DV Model-Shift Uniqueness Test

009331207-01, P = 1.416333 Days, E = 130.895384 Days

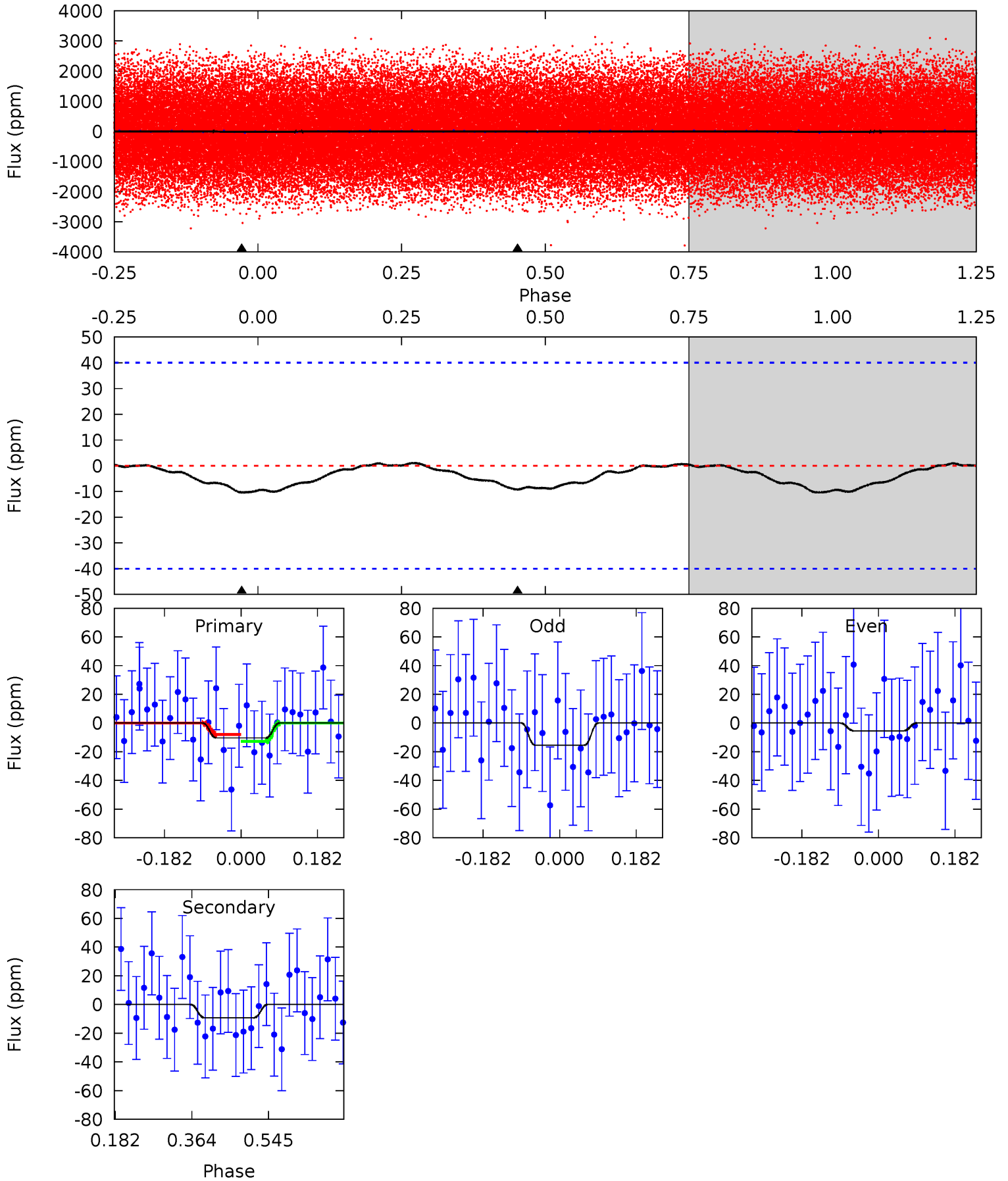
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
9.11	8.64	0	0	4.37	1.16	0.61	9.11	9.11	8.64	8.64	1.06	1.01	0.03	0.75



# Alt Model-Shift Uniqueness Test

009331207-01, P = 1.416399 Days, E = 130.872127 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
1.15	1.03	0	0	4.44	1.34	0.08	1.15	1.15	1.03	1.03	0.55	1.12	0.10	0.26



### Stellar Parameters For KIC 009331207

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$\rho_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6854^{+192}_{-288}$	$4.058^{+0.190}_{-0.190}$	$0.060^{+0.200}_{-0.350}$	$1.908^{+0.559}_{-0.503}$	$1.517^{+0.208}_{-0.277}$	$0.308^{+0.334}_{-0.162}$
	+3%/-4%	+5%/-5%	+333%/-583%	+29%/-26%	+14%/-18%	+108%/-53%
Source	PHO54	PHO54	PHO54	DSEP		

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

### Secondary Eclipse Parameters for KIC 009331207-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-9 \pm 1$	$0.87^{+0.81}_{-0.53}$	$3445^{+289}_{-262}$	$5623^{+4052}_{-1433}$	$5.107^{+26.920}_{-3.693}$
Alt.	$-9 \pm 9$	$0.95^{+0.85}_{-0.62}$	$3467^{+292}_{-252}$	$5178^{+4377}_{-8696}$	$3.268^{+27.452}_{-3.340}$

$T_{max}$  = 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

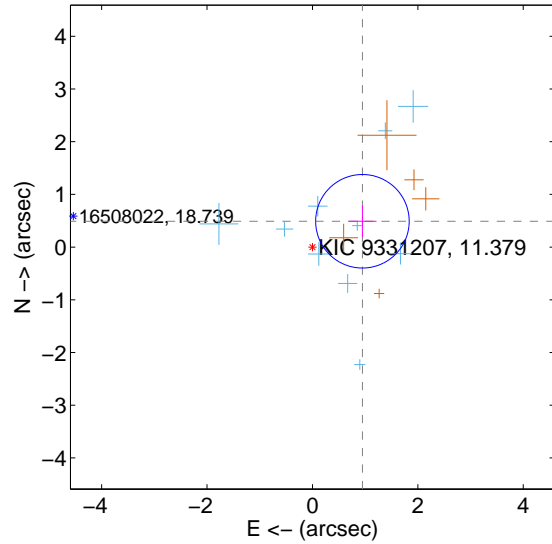
Supplemental centroid analysis for 009331207-01. **Kepler magnitude: 11.38.** Transit SNR 8.25

There are 10 quarters with good PRF difference image offsets

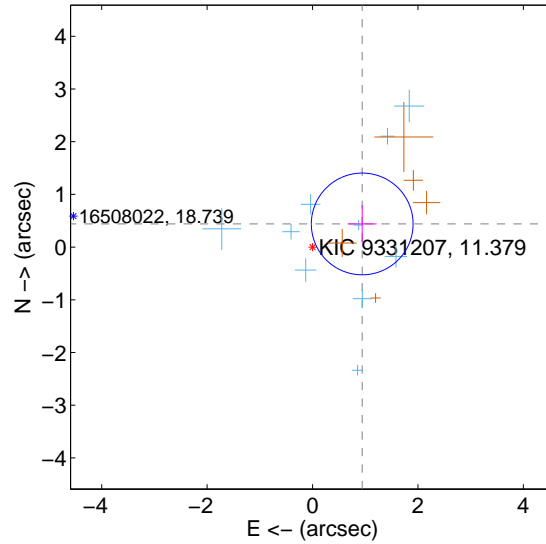
The direct PRF centroid is offset from the target star catalog position by about 0.03 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	<b><math>1.067 \pm 0.296</math></b>	<b>3.61</b>	$-0.948 \pm 0.267$	$0.490 \pm 0.301$
PRF-fit source offset from KIC position	<b><math>1.040 \pm 0.322</math></b>	<b>3.23</b>	$-0.943 \pm 0.274$	$0.439 \pm 0.356$
photometric centroid source offset	$1.59 \pm 0.74$	2.14	$0.14 \pm 0.72$	$-1.59 \pm 0.75$

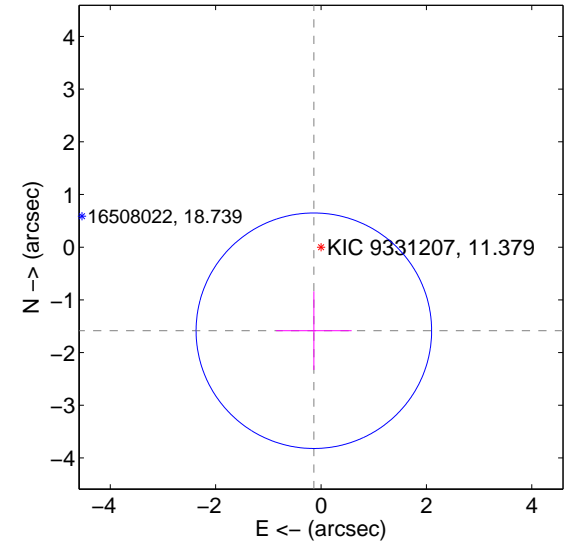
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

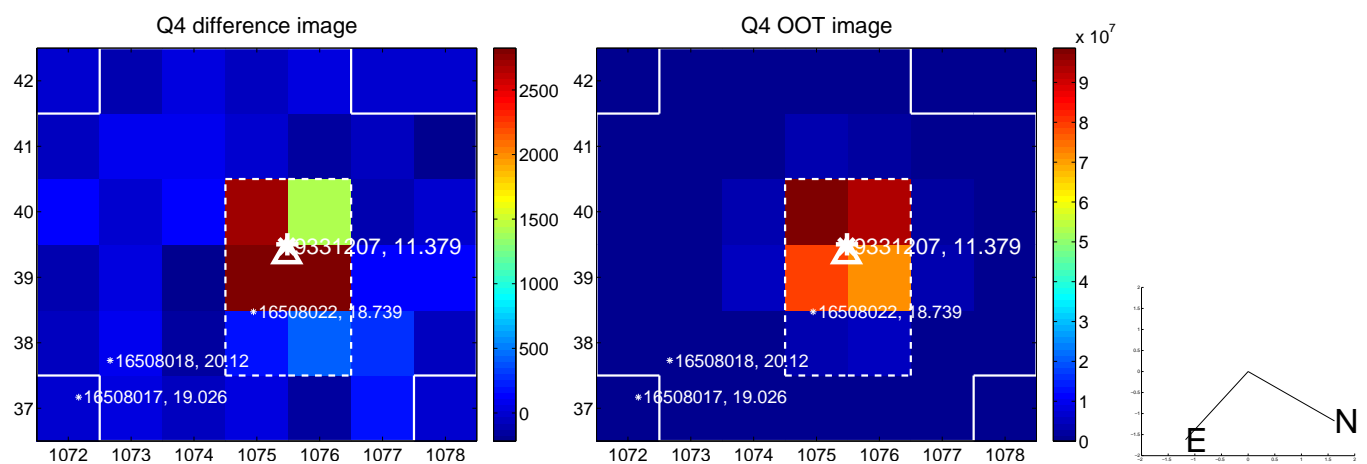
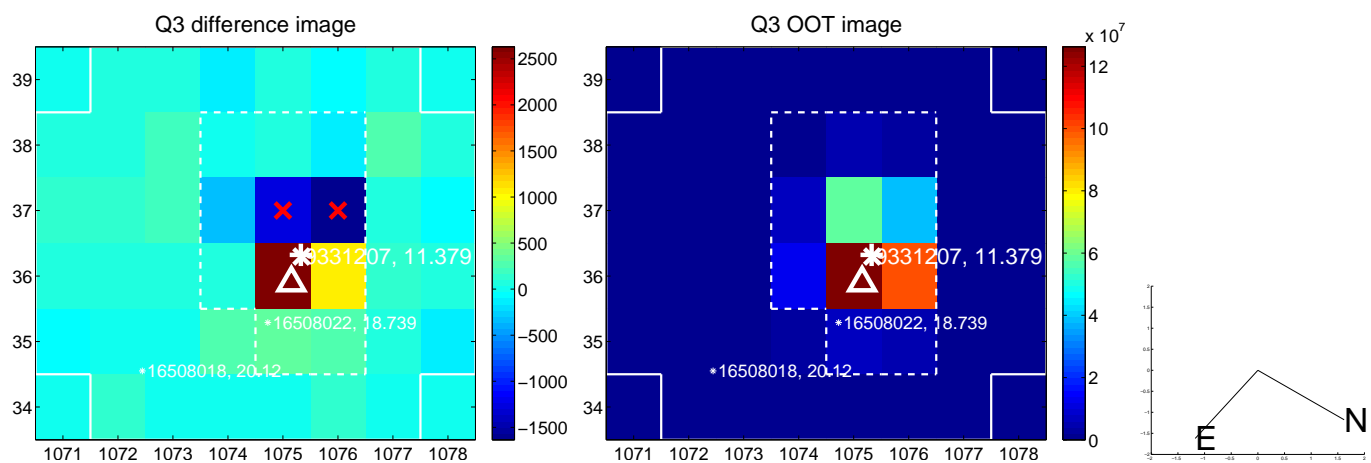
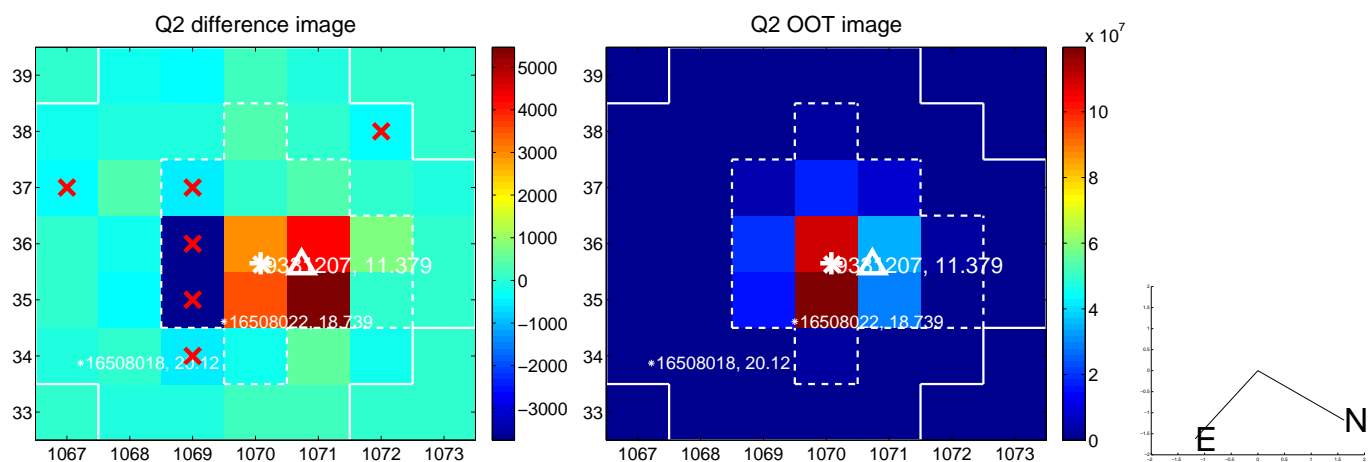
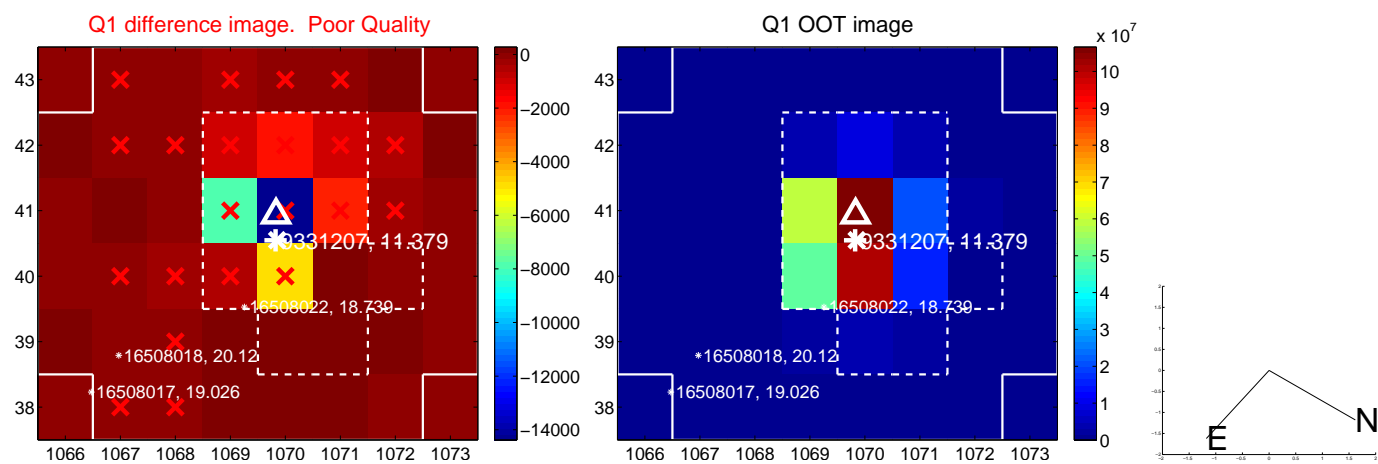


offset from photometric centroids

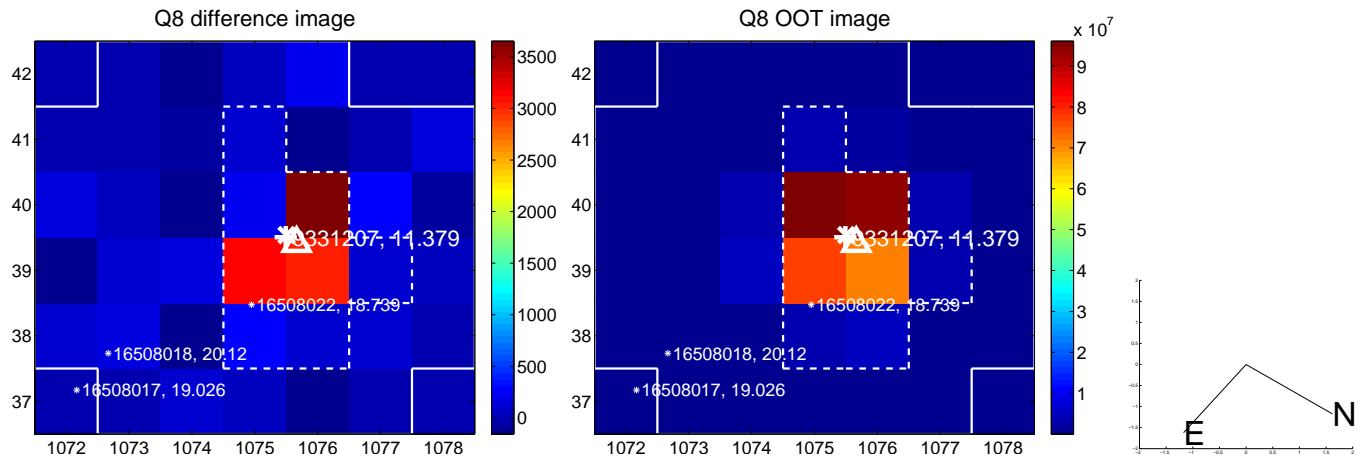
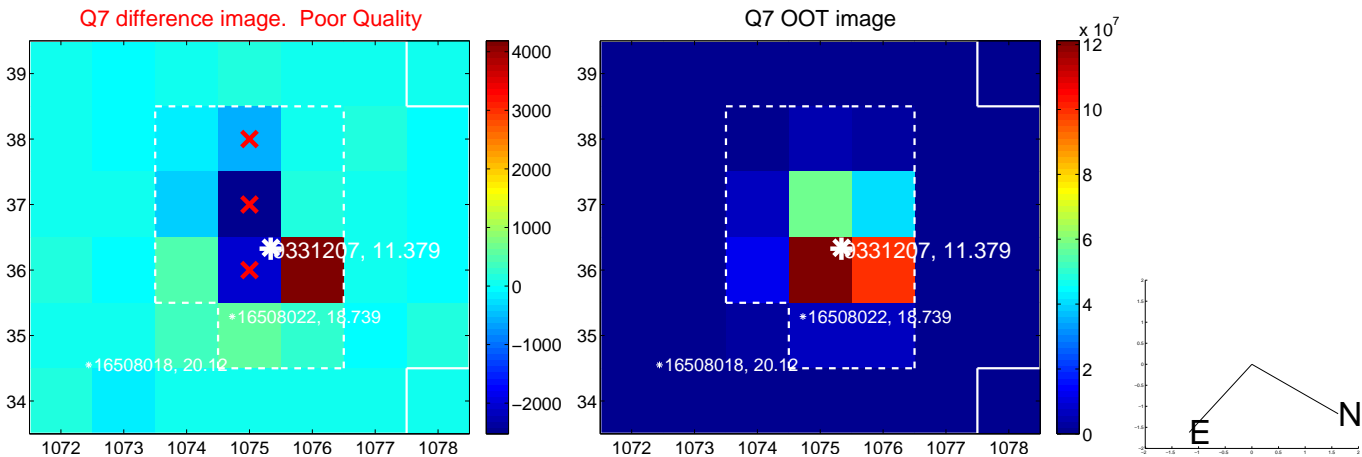
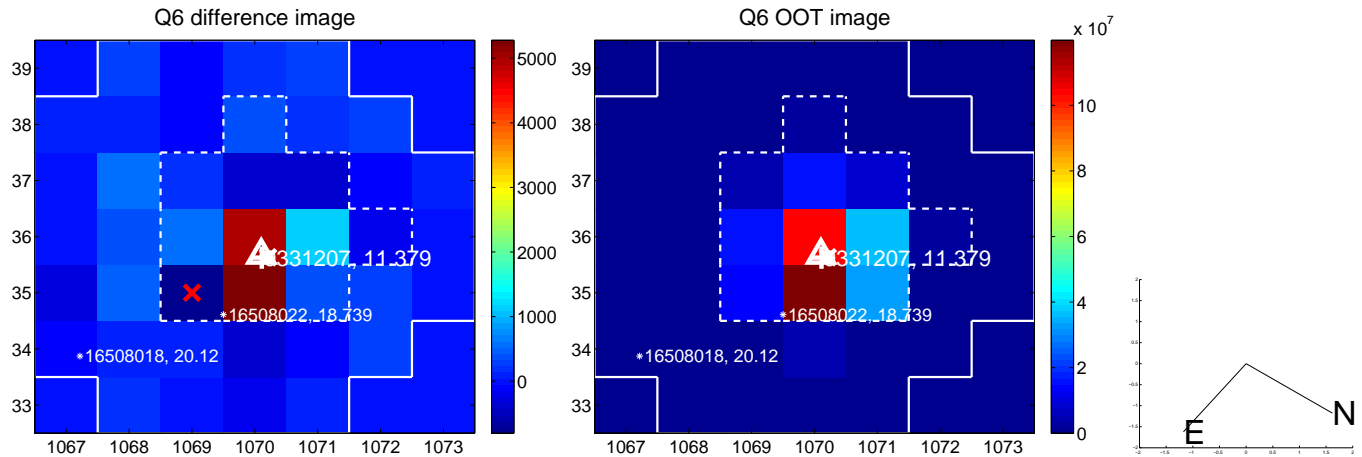
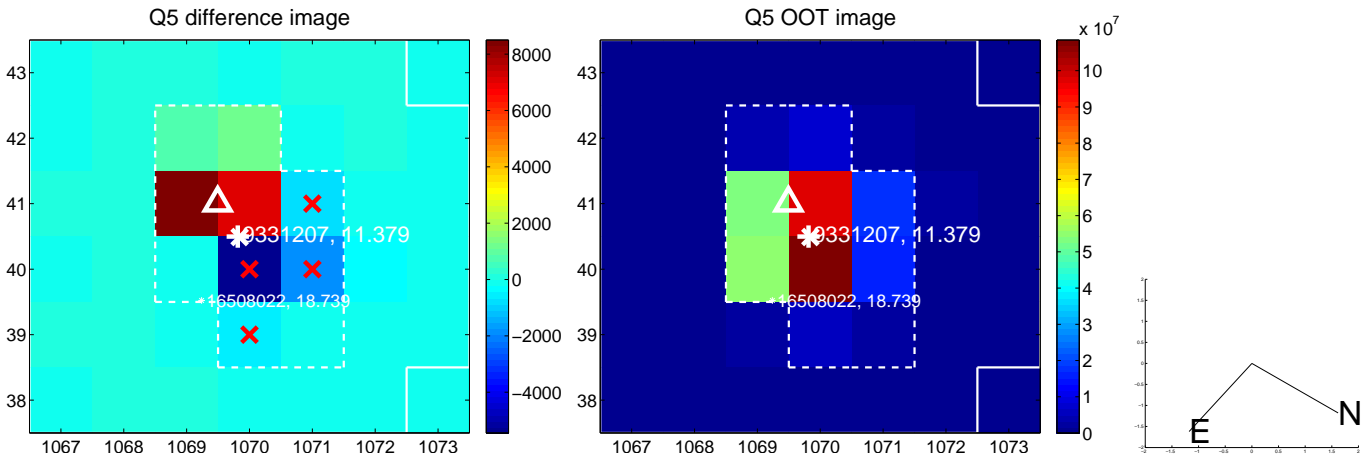


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

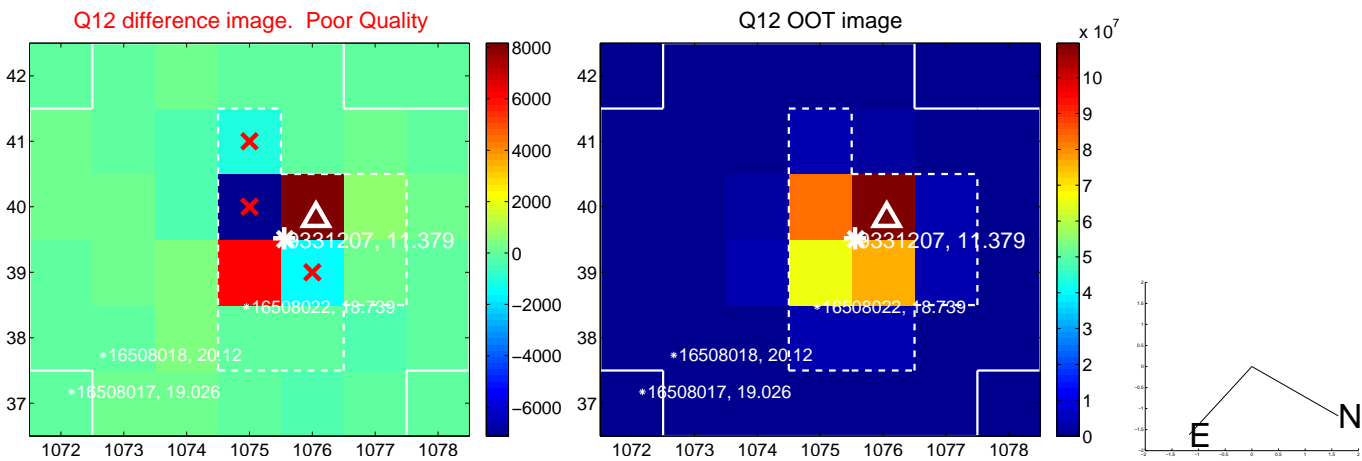
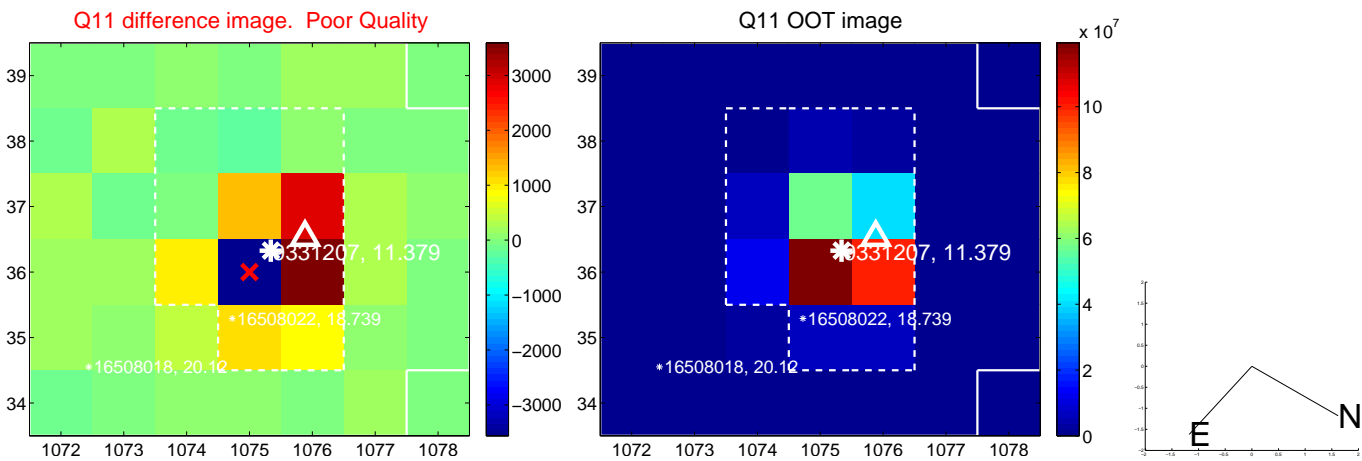
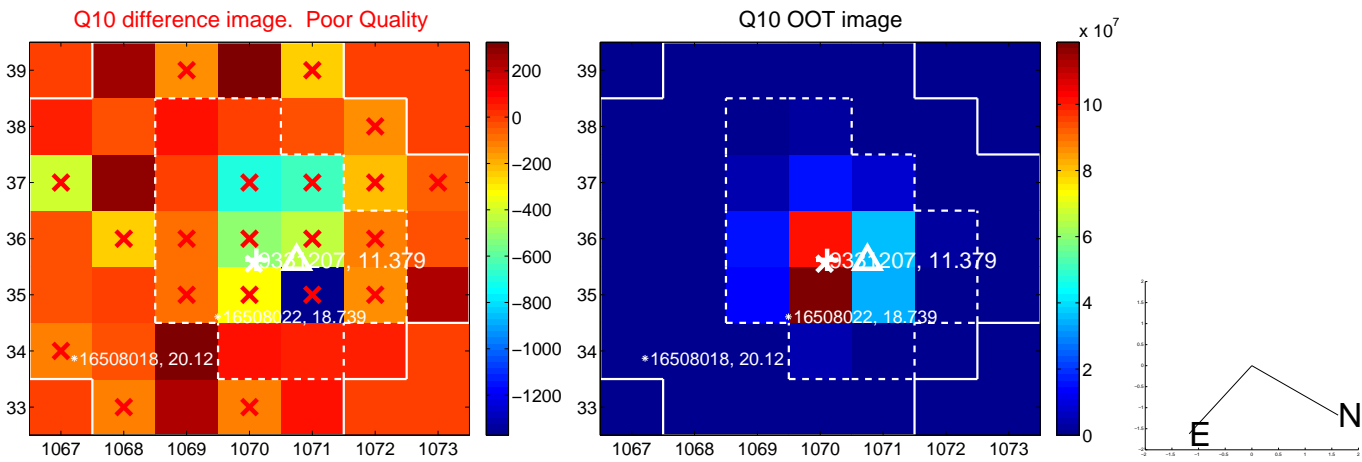
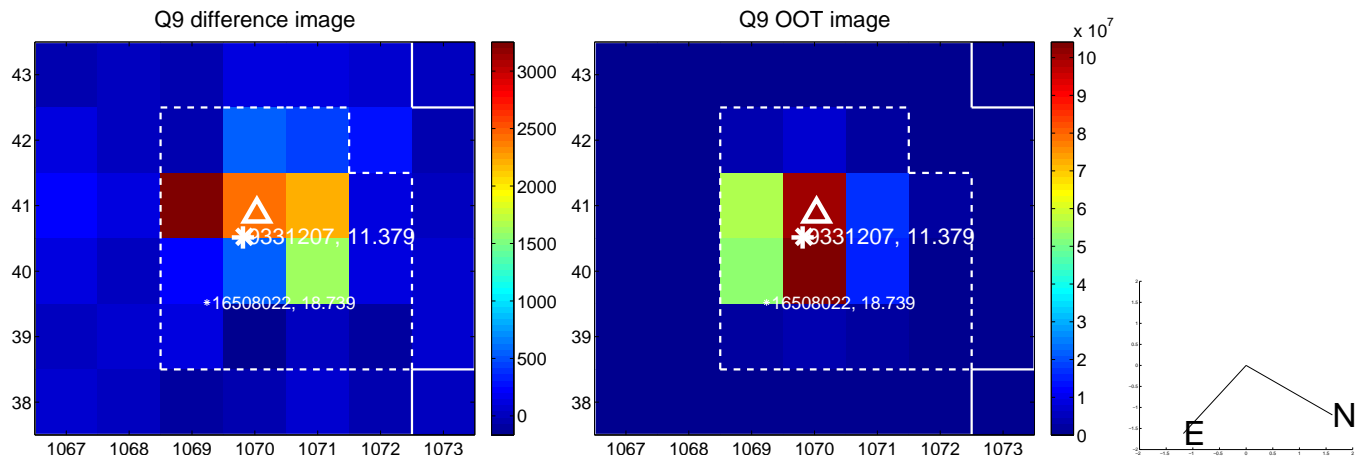
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



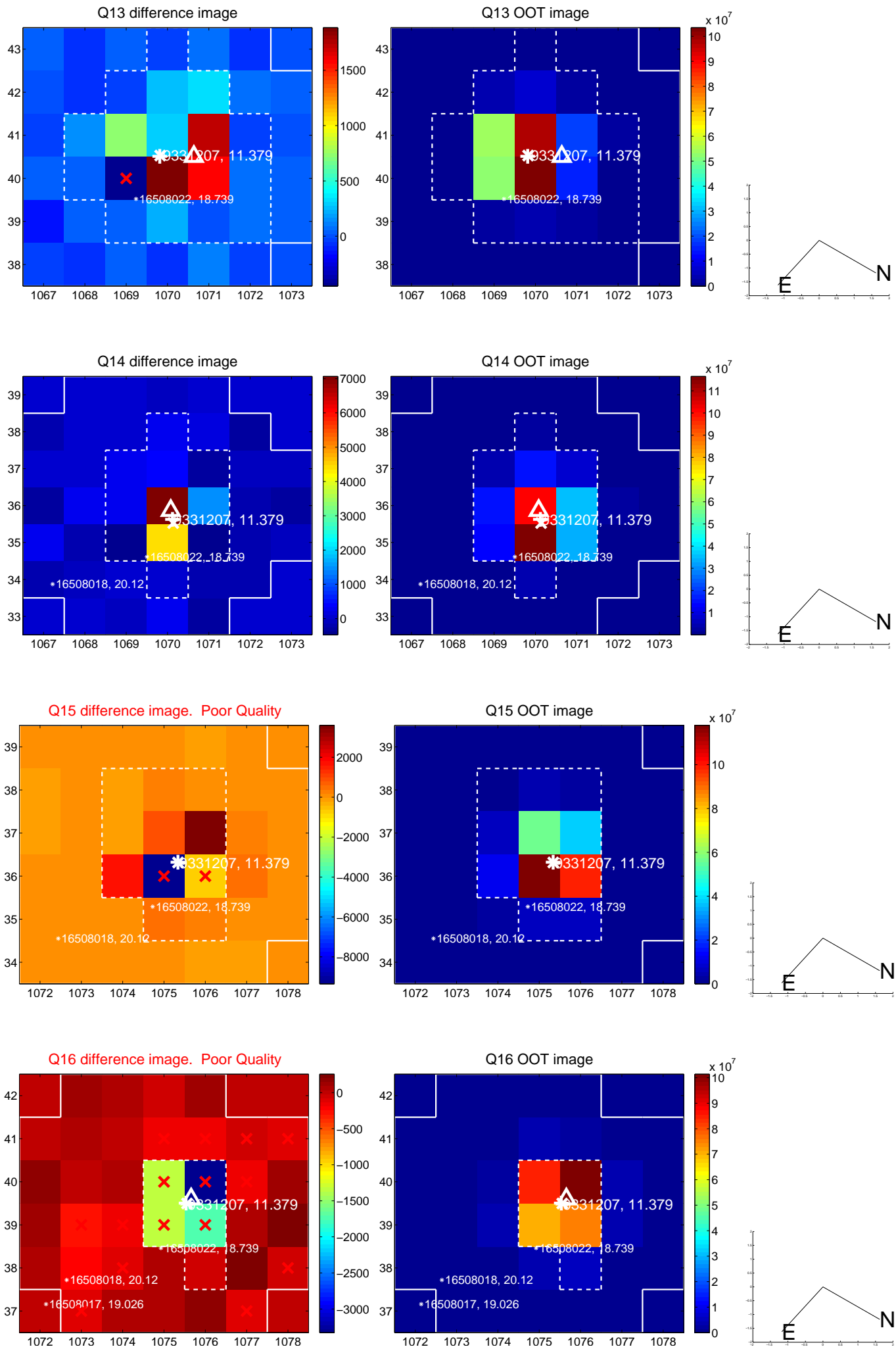
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



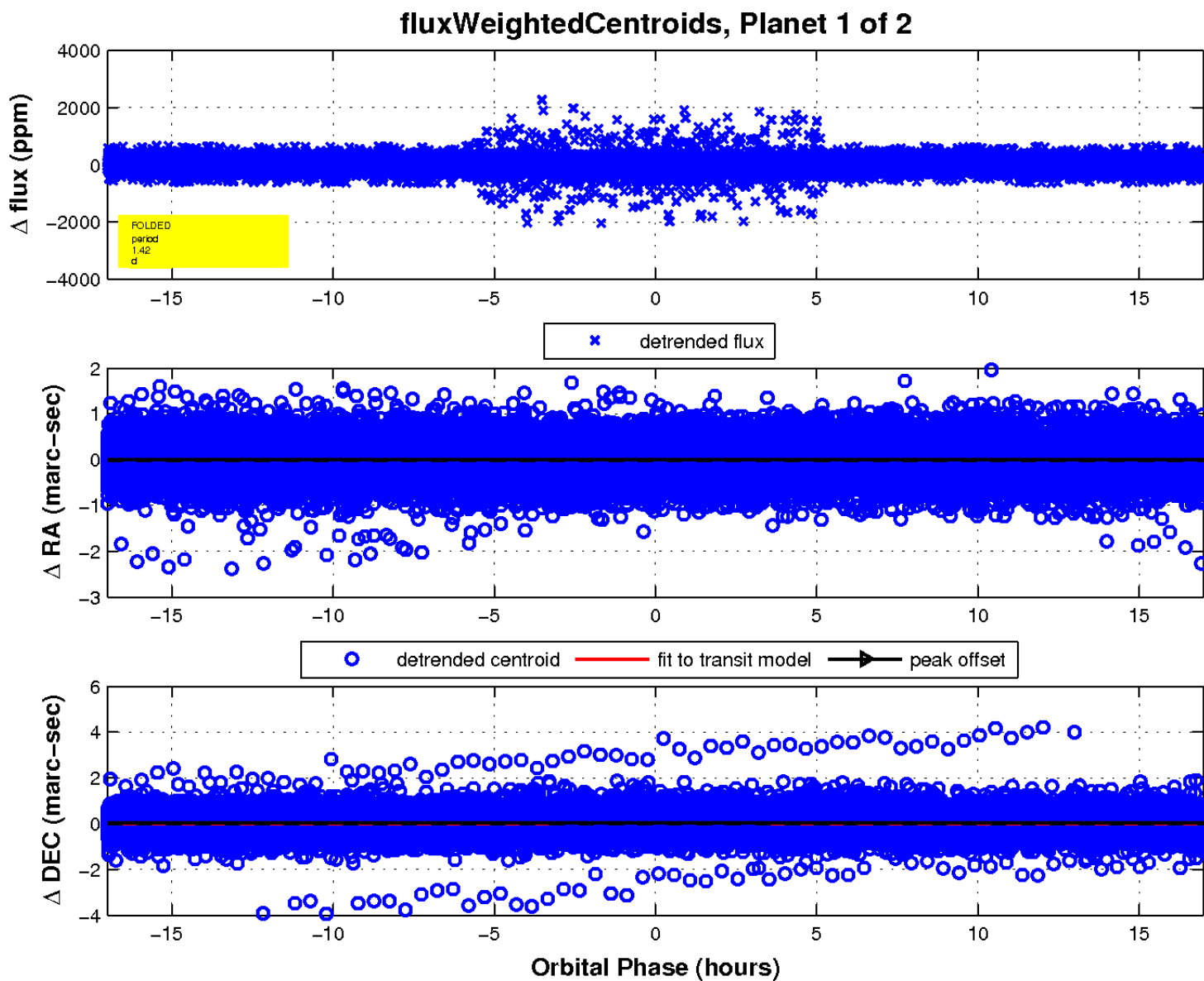
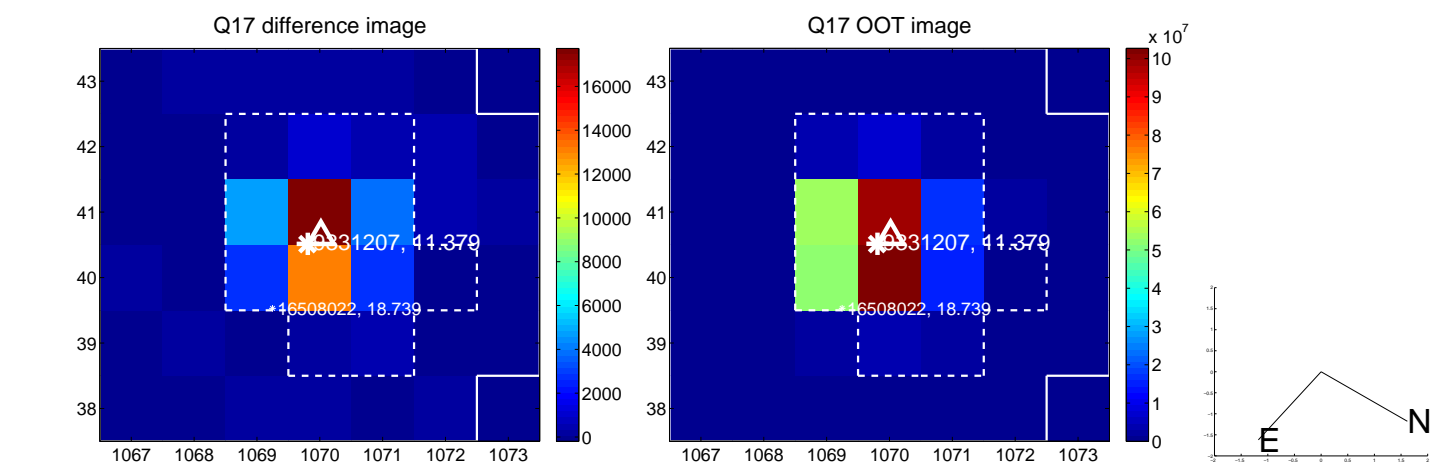
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



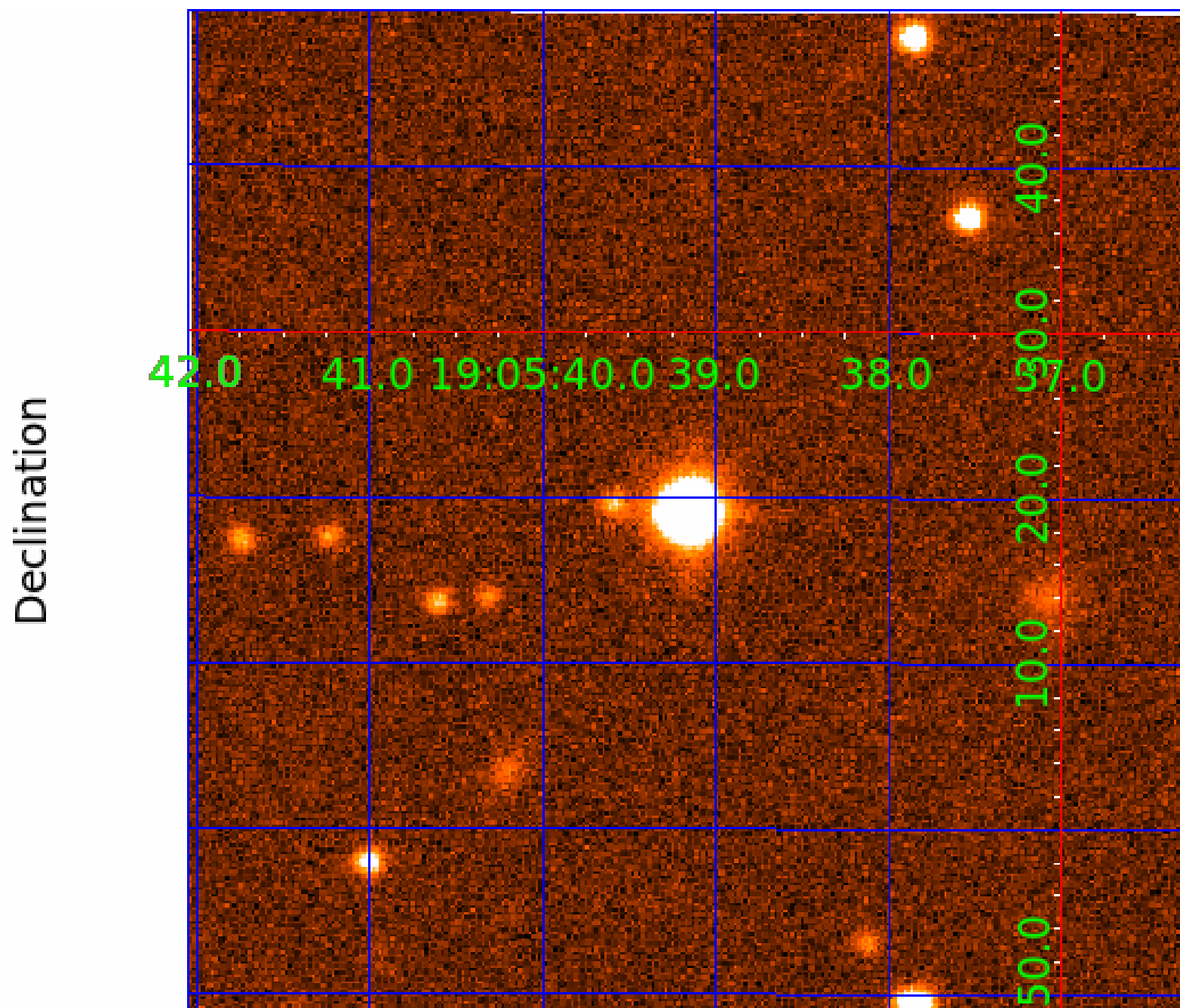
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



UKIRT Image



# KIC 009331207

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009331207-01	OBS	No	1.416333	132.311718	12.5	7.870	7.6	8.3	1.91	6854	0.68	8943.40
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## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009331207-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—CENT_SATURATED
009331207-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT— INCONSISTENT_TRANS—CENT_SATURATED

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

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

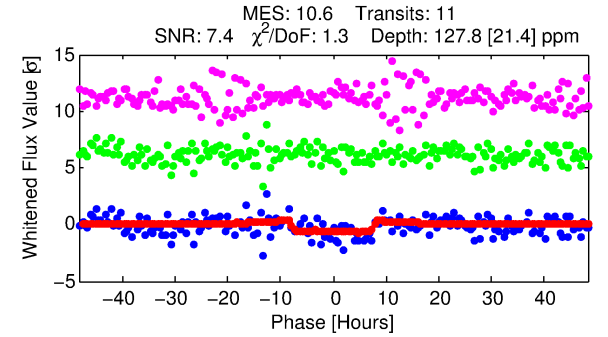
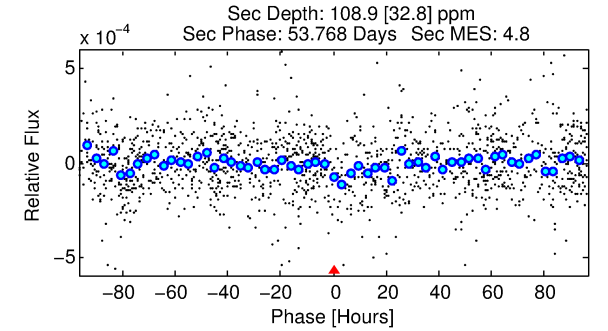
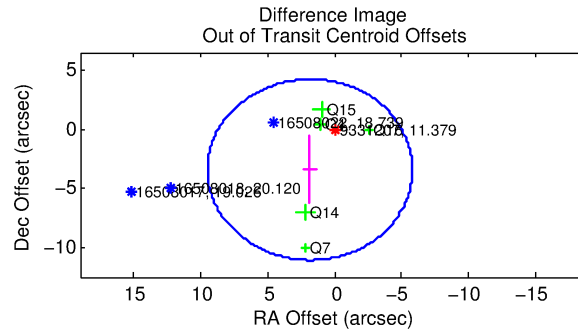
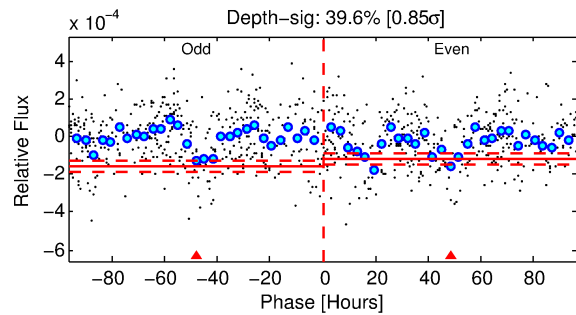
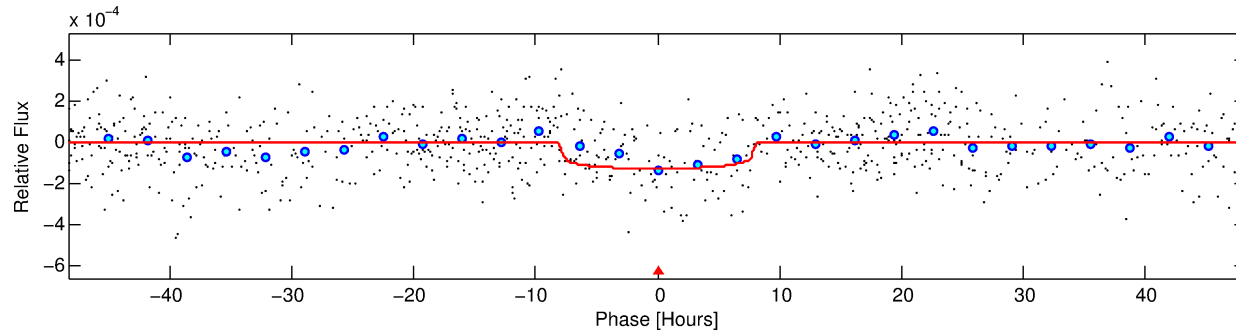
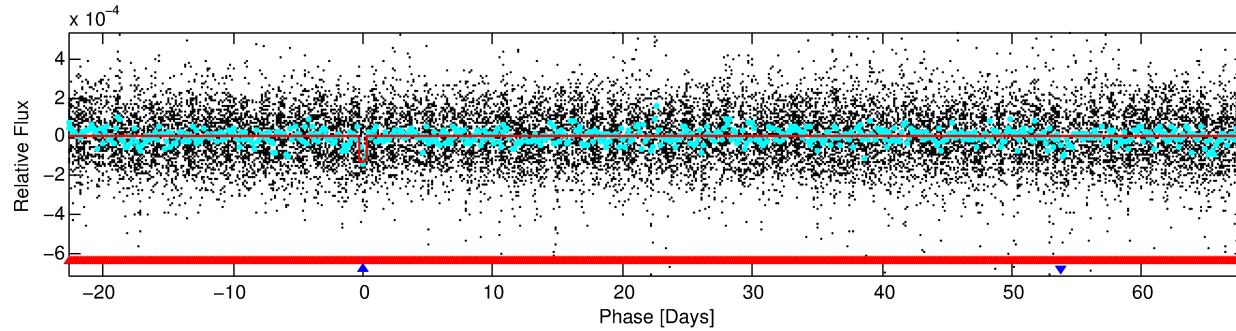
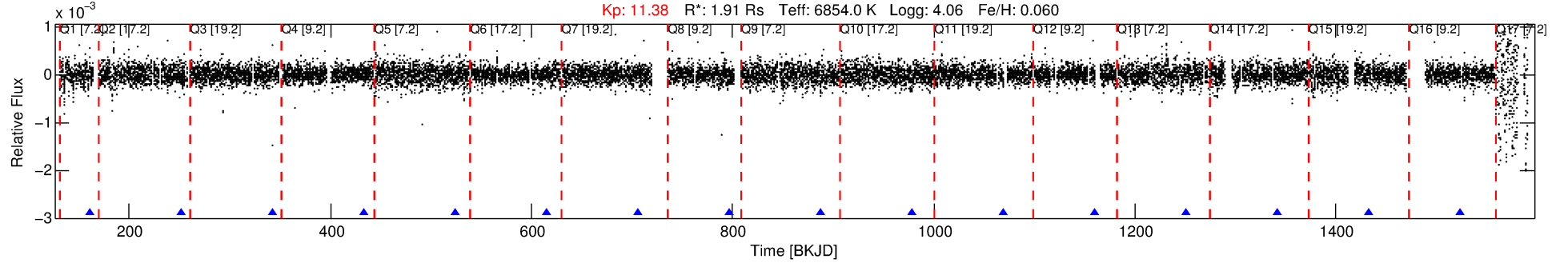
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009331207-02

No Significant Match Found

# DV One-Page Summary

KIC: 9331207 Candidate: 2 of 2 Period: 90.772 d



## DV Fit Results:

Period = 90.77250 [0.00287] d  
Epoch = 161.6373 [0.0232] BKJD  
Rp/R\* = 0.0111 [0.0045]  
a/R\* = 31.77 [71.58]  
b = 0.69 [1.71]  
Seff = 34.87 [13.57]  
Teq = 620 [60] K  
Rp = 2.30 [1.15] Re  
a = 0.4543 [0.1107] AU  
Ag = 2329.52 [2168.92] [1.07 $\sigma$ ]  
Teffp = 6656 [1462] K [4.13 $\sigma$ ]

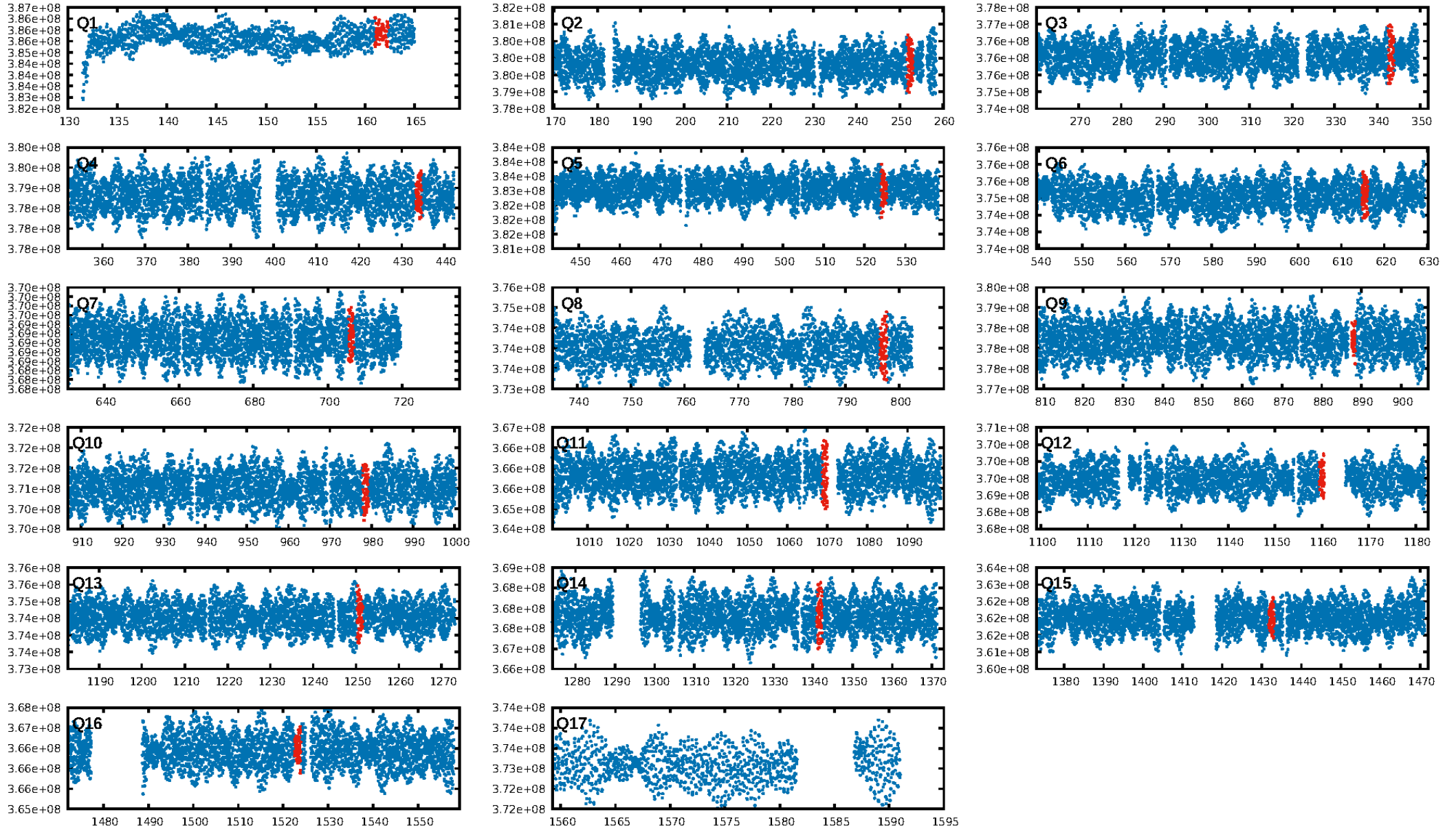
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [119.61 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 0.3%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 1.58e-20  
RollingBand-fgt: 1.00 [10/10]  
GhostDiagnostic-chr: 0.3524  
Centroid-sig: 22.4%  
Centroid-so: 0.531 arcsec [1.09 $\sigma$ ]  
OotOffset-rm: 3.889 arcsec [1.52 $\sigma$ ]  
KicOffset-rm: 3.987 arcsec [1.55 $\sigma$ ]  
OotOffset-st: 1/2/2/0 [5]  
KicOffset-st: 1/2/2/0 [5]  
DiffImageQuality-fgm: 0.20 [1/5]  
DiffImageOverlap-fno: 0.00 [0/13]

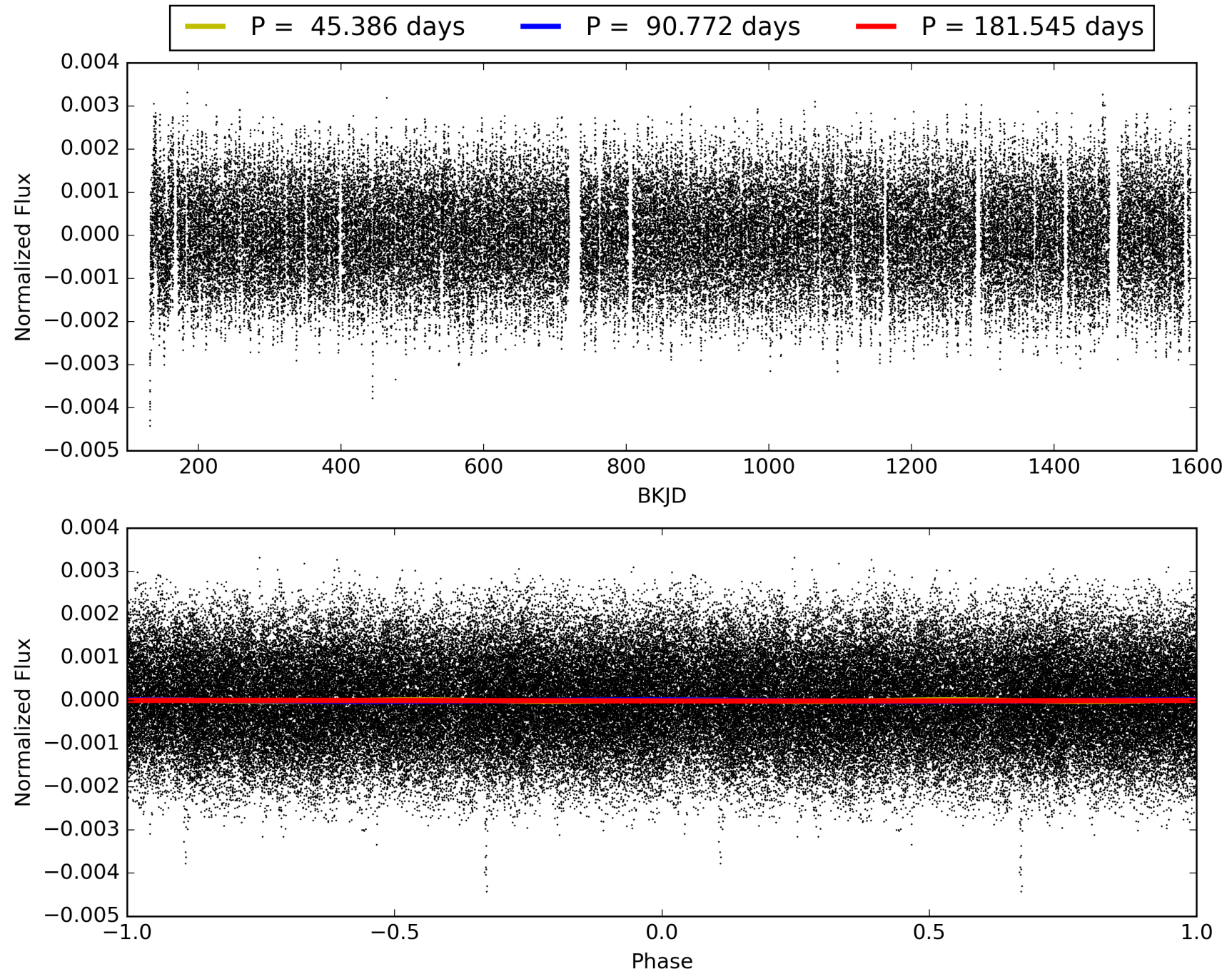
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 06:02:09 Z

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

# TCE 009331207-02, PDC Light Curves

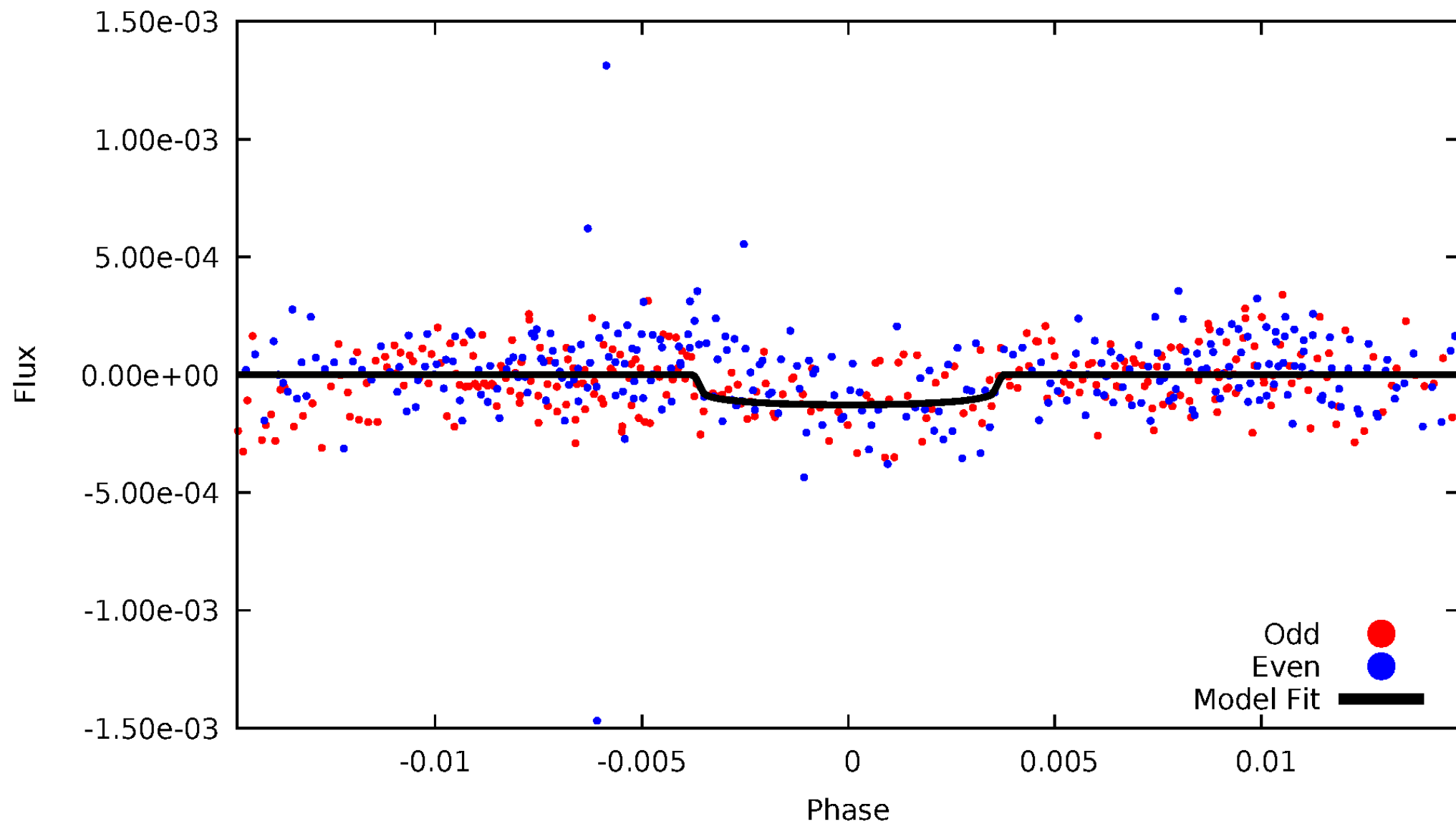


TCE 009331207-02



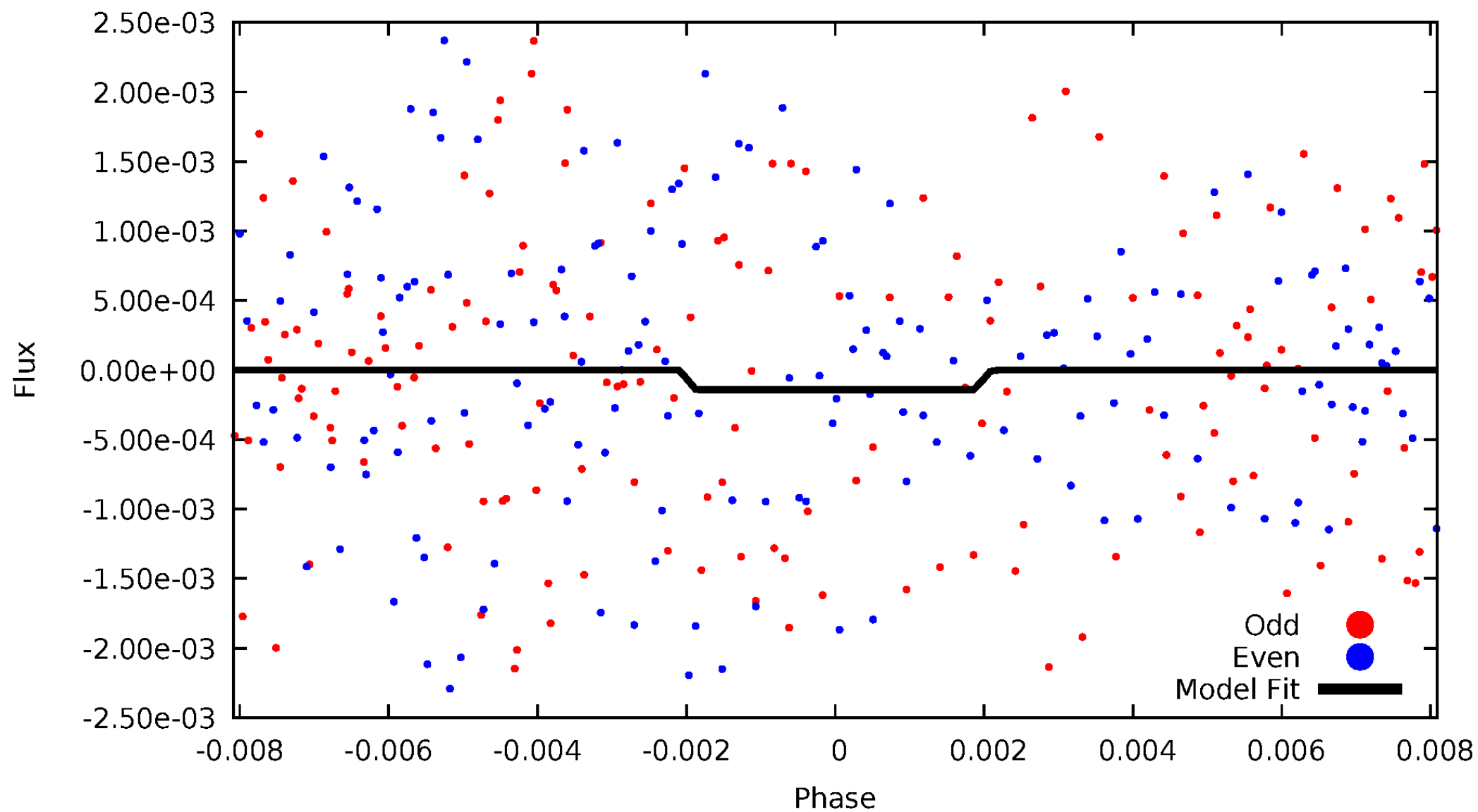
# DV Odd/Even

TCE 009331207-02



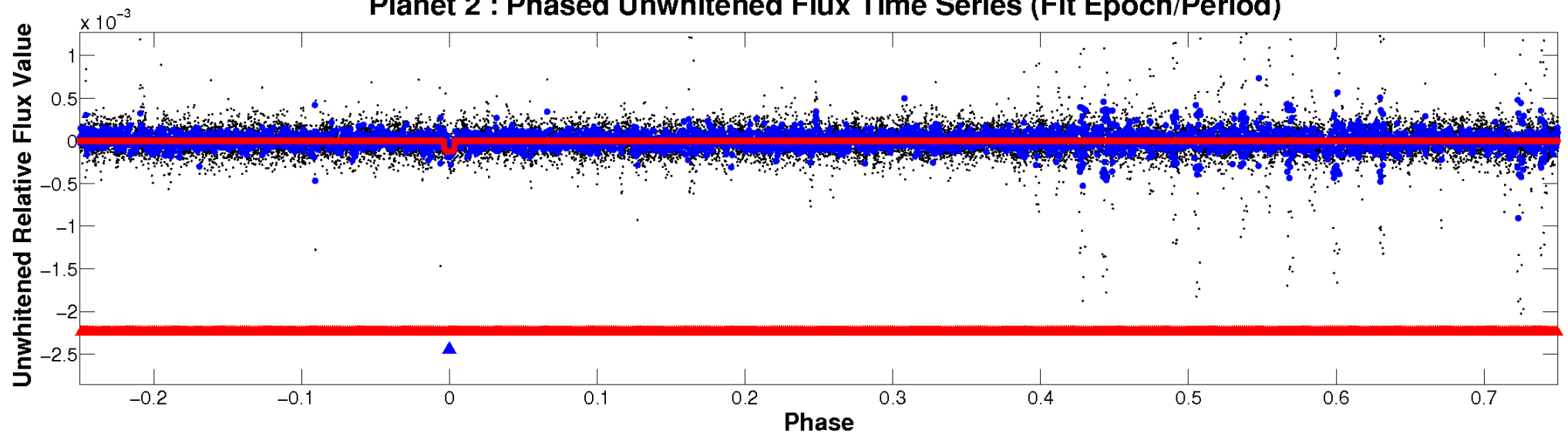
# ALT Odd/Even

TCE 009331207-02

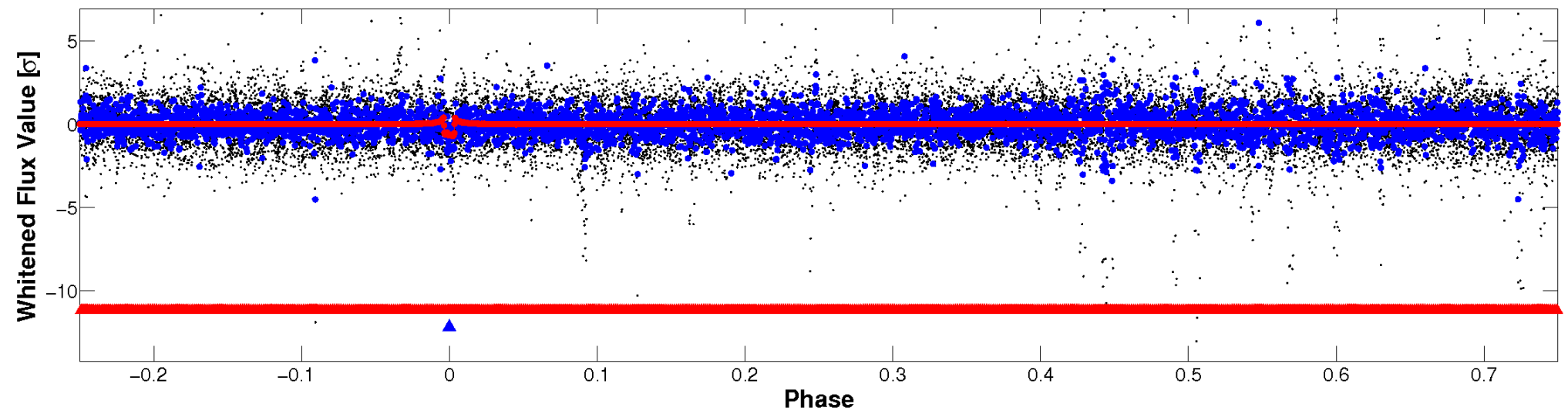


# Non-Whitened Vs. Whitened Light Curve

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

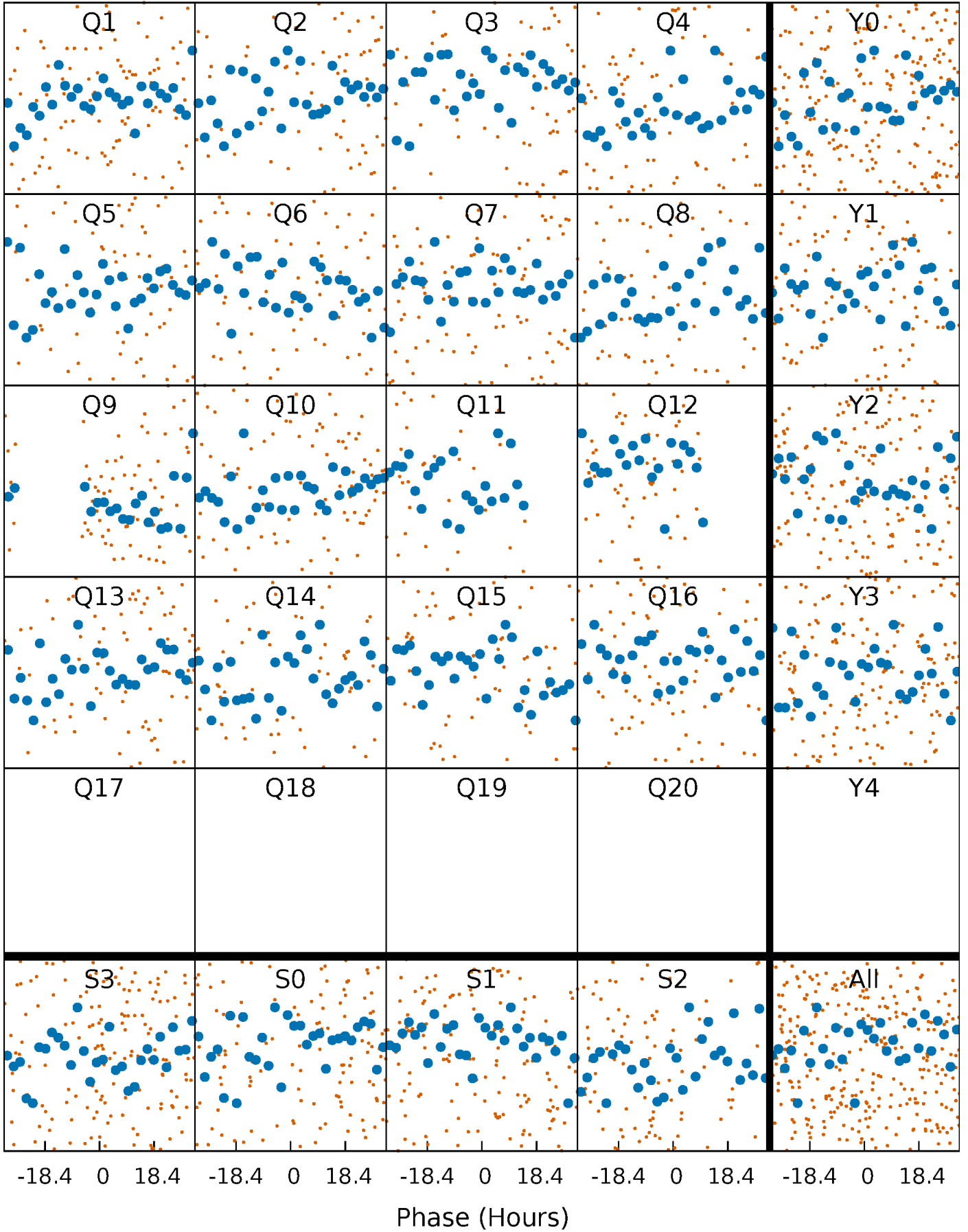


Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



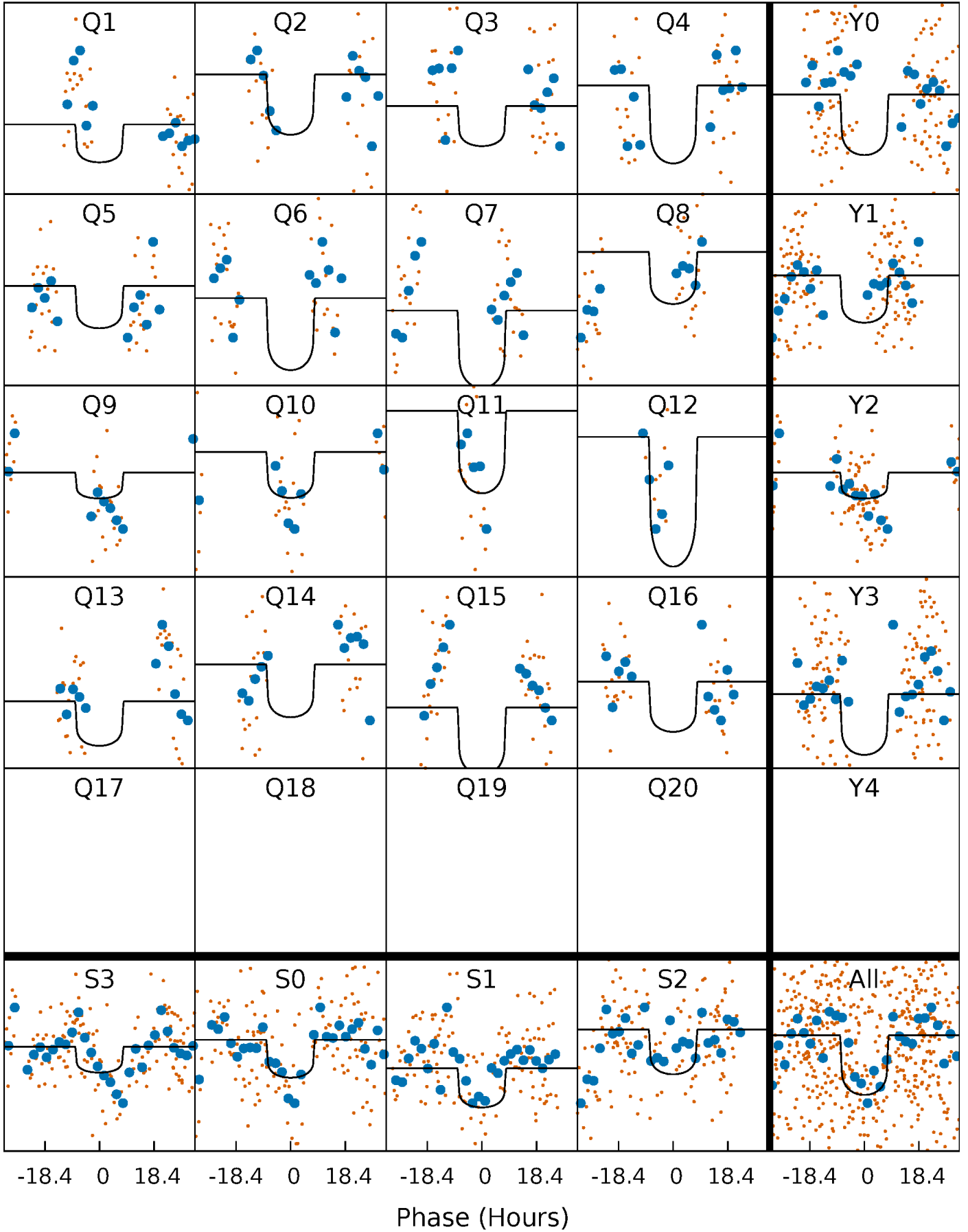
# PDC Quarter-Phased Transit Curves

TCE 009331207-02     $P = 90.772496$  Days     $T_0 = 161.637332$  (BKJD)



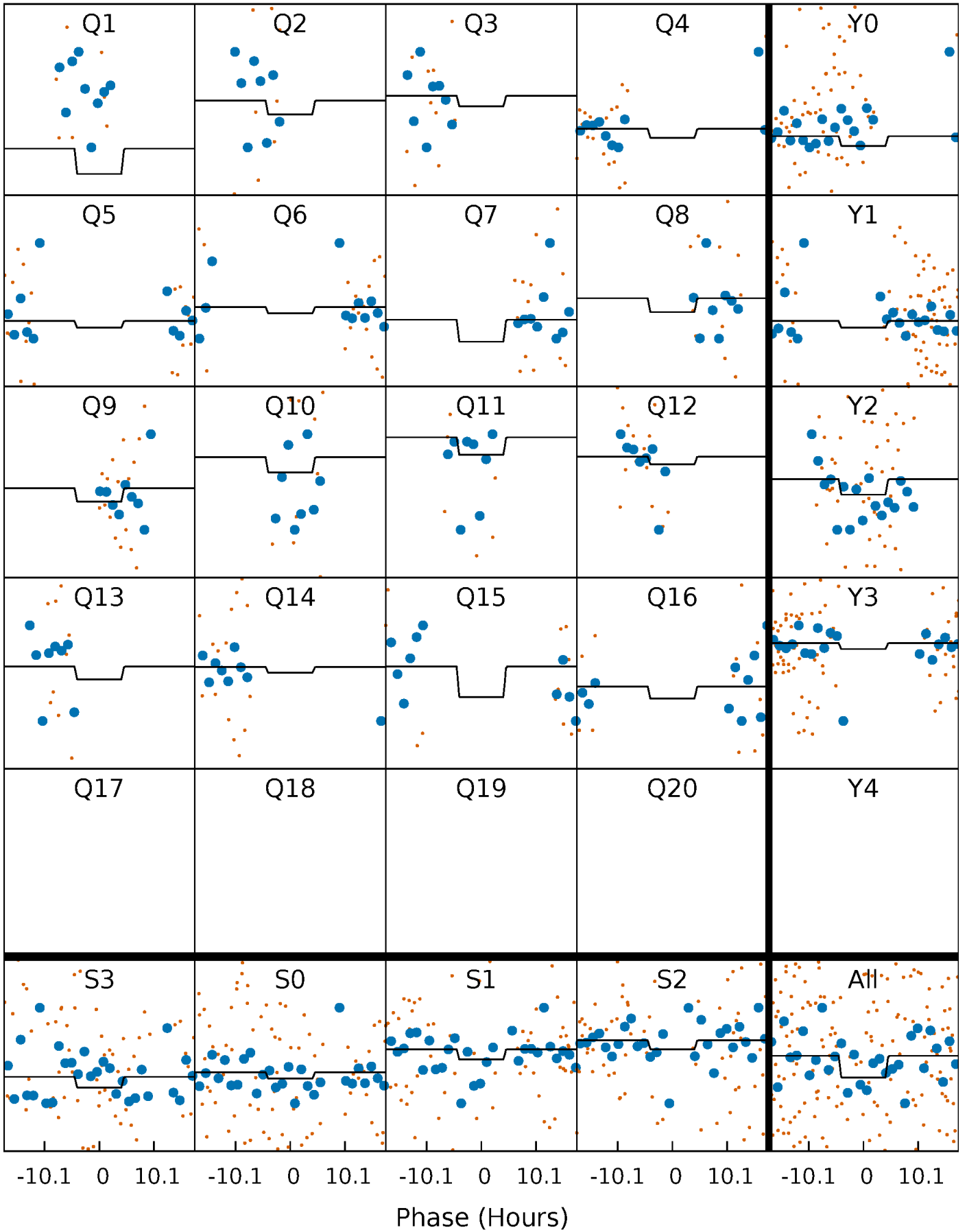
# DV Quarter-Phased Transit Curves

TCE 009331207-02   P= 90.772496 Days    $T_0=161.637332$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

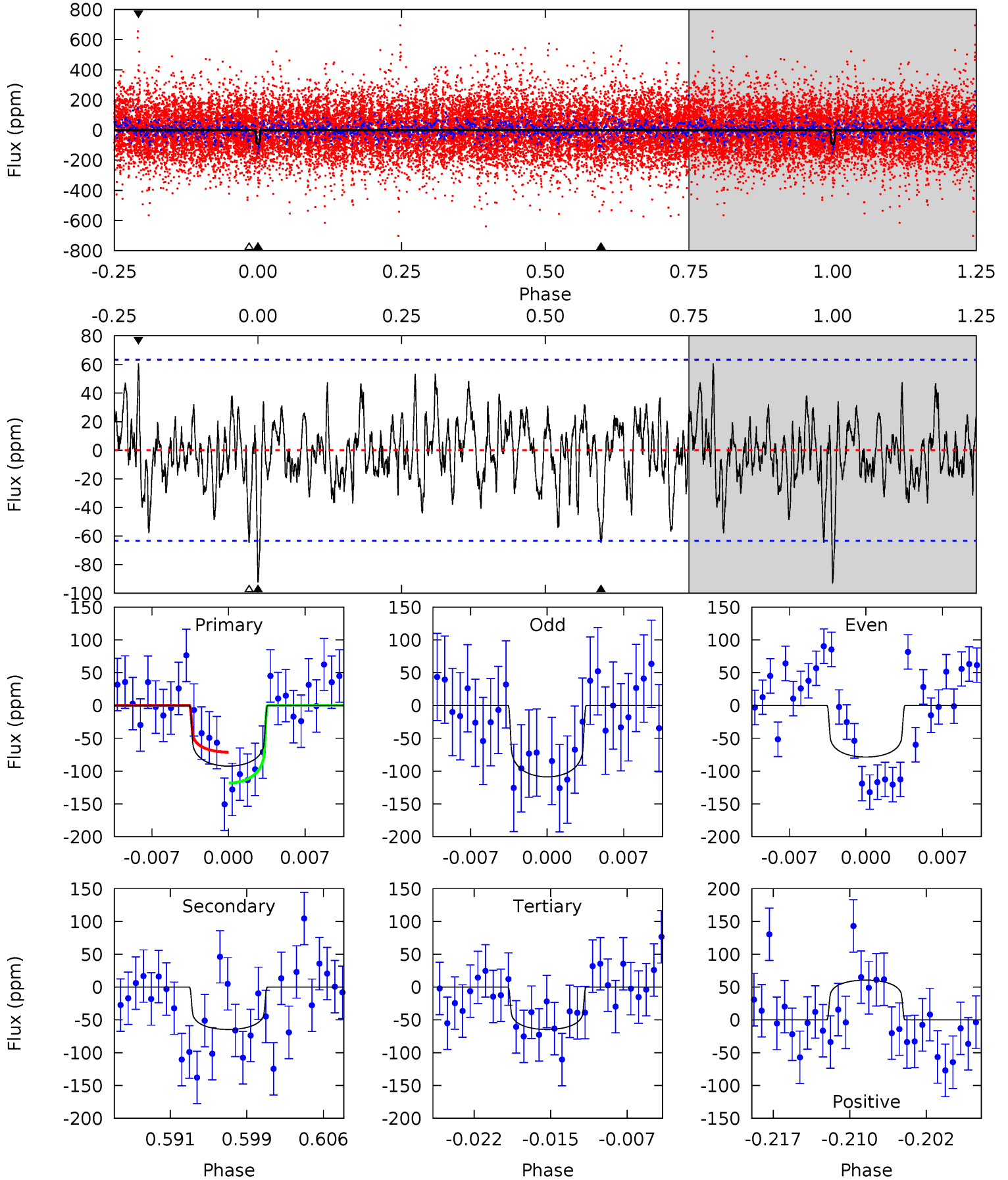
TCE 009331207-02     $P = 90.783345$  Days     $T_0 = 161.472116$  (BKJD)



# DV Model-Shift Uniqueness Test

009331207-02, P = 90.772496 Days, E = 70.864836 Days

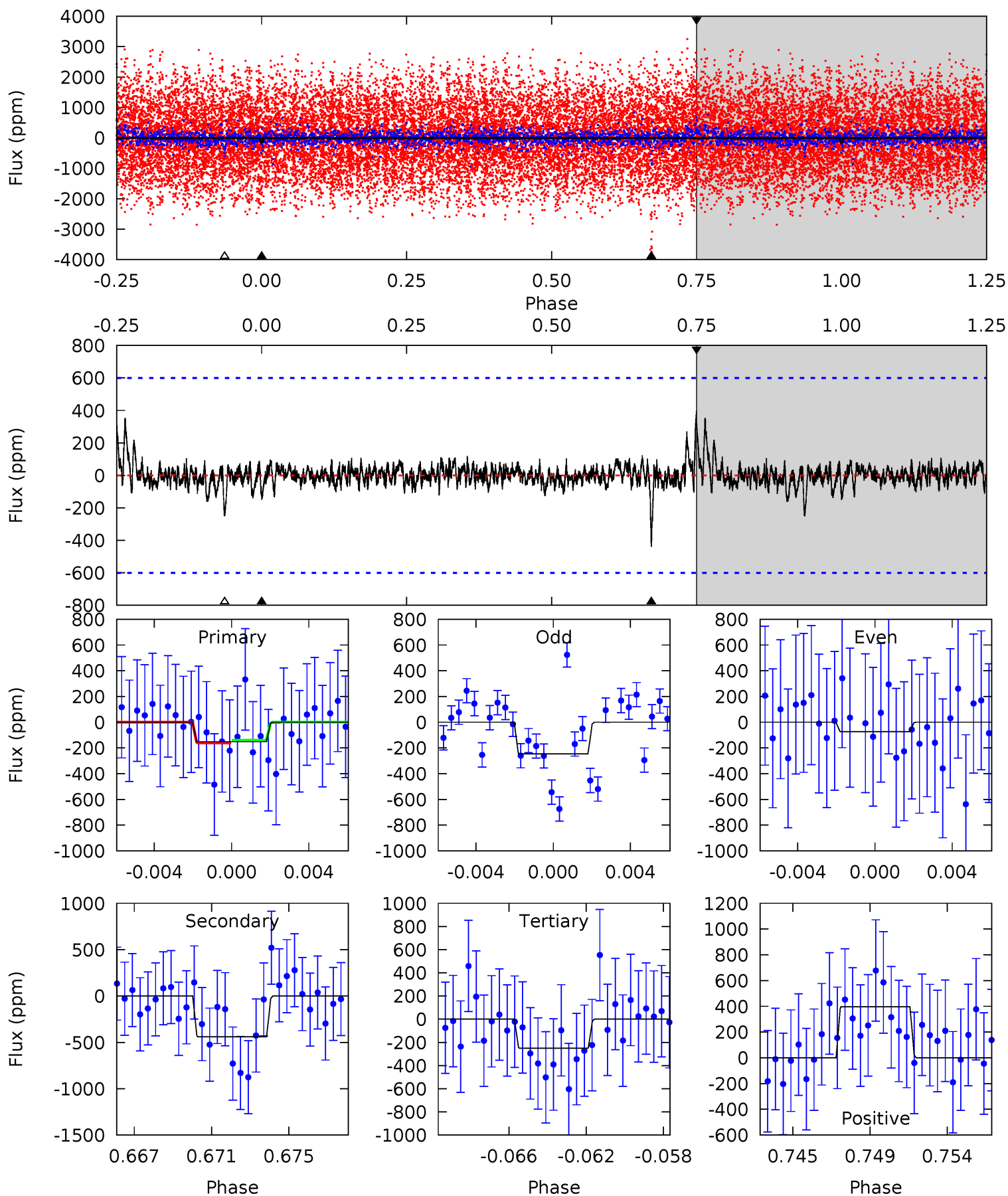
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
7.42	5.19	5.19	4.86	5.08	2.67	1.58	2.23	2.56	0.00	0.33	1.21	0.65	0.40	1.89



# Alt Model-Shift Uniqueness Test

009331207-02, P = 90.783345 Days, E = 70.688771 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
1.31	3.81	2.17	3.43	5.19	2.87	0.49	-0.86	-2.12	1.64	0.38	0.75	0.62	0.47	0.08



### Stellar Parameters For KIC 009331207

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$\rho_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6854^{+192}_{-288}$	$4.058^{+0.190}_{-0.190}$	$0.060^{+0.200}_{-0.350}$	$1.908^{+0.559}_{-0.503}$	$1.517^{+0.208}_{-0.277}$	$0.308^{+0.334}_{-0.162}$
	+3%/-4%	+5%/-5%	+333%/-583%	+29%/-26%	+14%/-18%	+108%/-53%
Source	PHO54	PHO54	PHO54	DSEP		

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

### Secondary Eclipse Parameters for KIC 009331207-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-65 \pm 12$	$2.30^{+1.01}_{-0.89}$	$865^{+62}_{-62}$	$5784^{+1672}_{-851}$	$1375^{+2245}_{-730}$
Alt.	$-440 \pm 116$	$2.51^{+1.07}_{-0.90}$	$865^{+71}_{-66}$	$9630^{+4161}_{-2056}$	$7918^{+13536}_{-4229}$

$T_{\text{max}}$  = 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

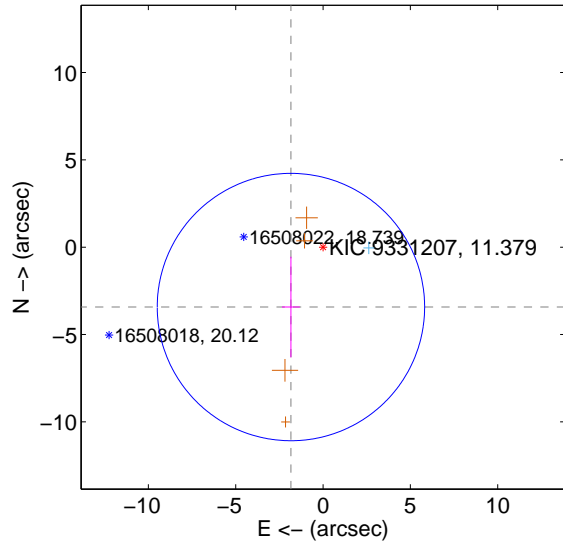
Supplemental centroid analysis for 009331207-02. **Kepler magnitude: 11.38.** Transit SNR 7.44

**There are 1 quarters with good PRF difference image offsets**

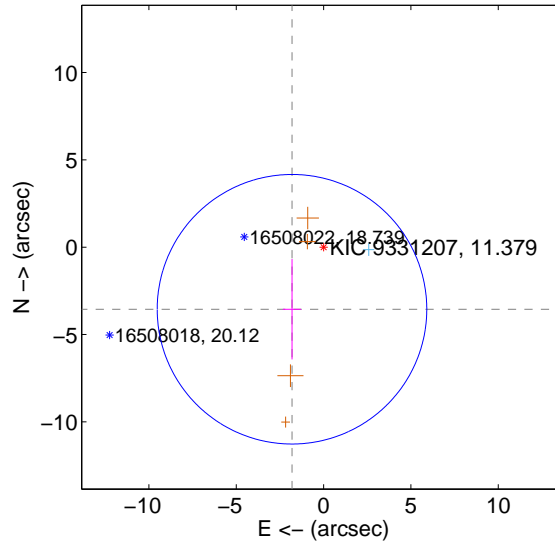
The direct PRF centroid is offset from the target star catalog position by about 0.11 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$3.889 \pm 2.551$	1.52	$1.838 \pm 0.510$	$-3.427 \pm 2.881$
PRF-fit source offset from KIC position	$3.987 \pm 2.572$	1.55	$1.809 \pm 0.519$	$-3.553 \pm 2.873$
photometric centroid source offset	$0.53 \pm 0.49$	1.09	$-0.49 \pm 0.48$	$0.20 \pm 0.50$

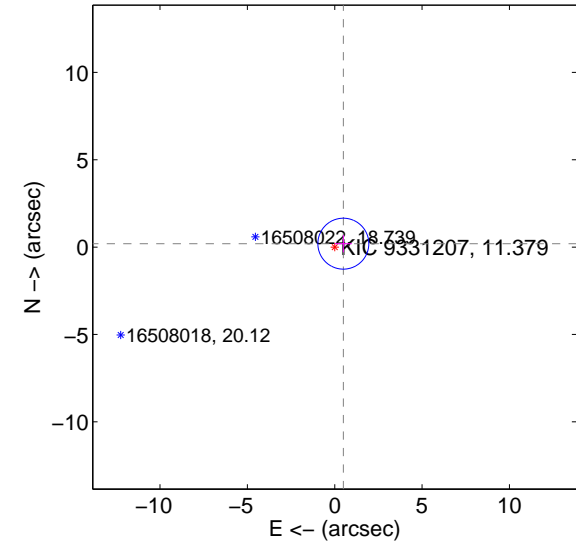
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

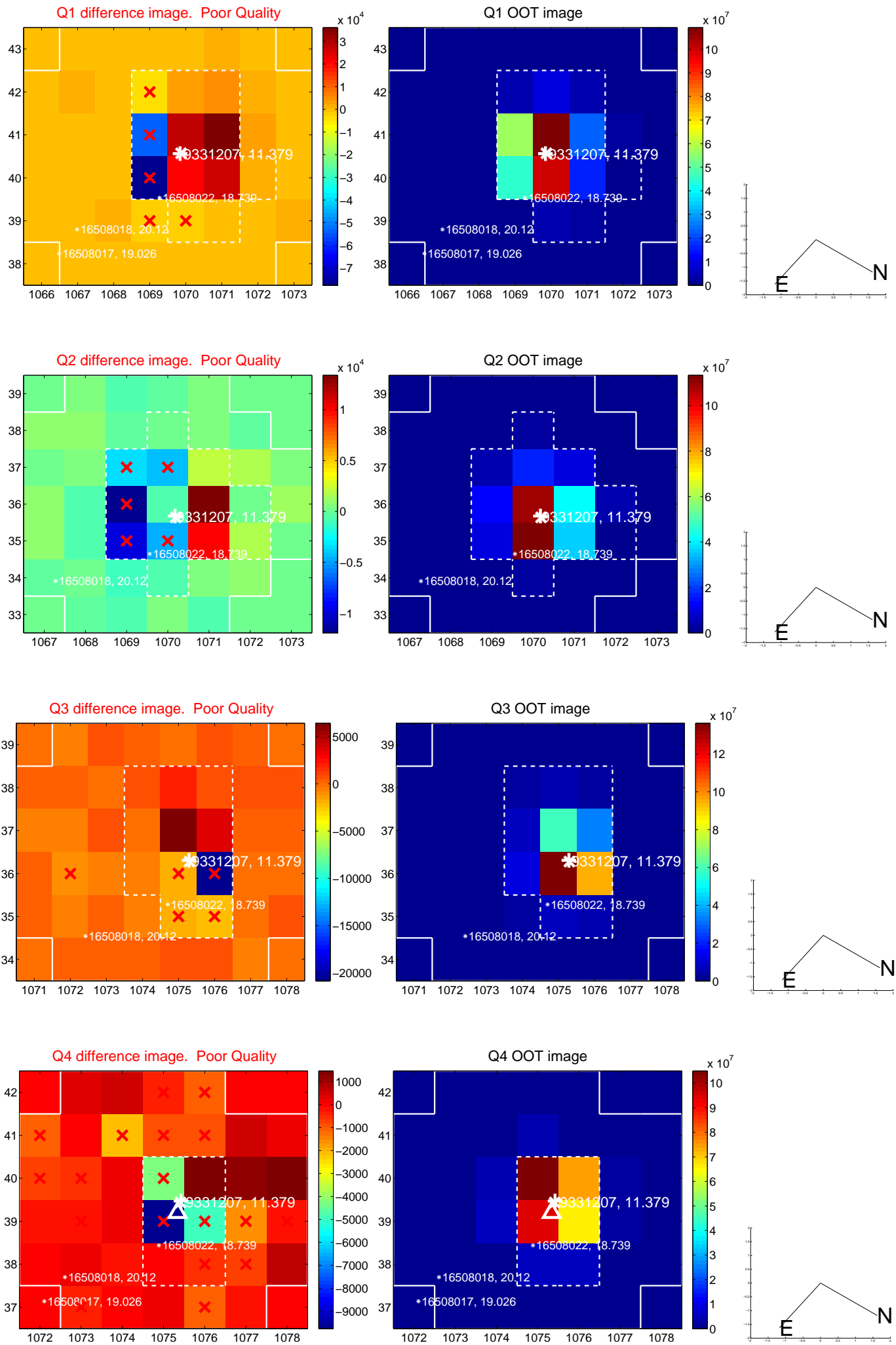


offset from photometric centroids

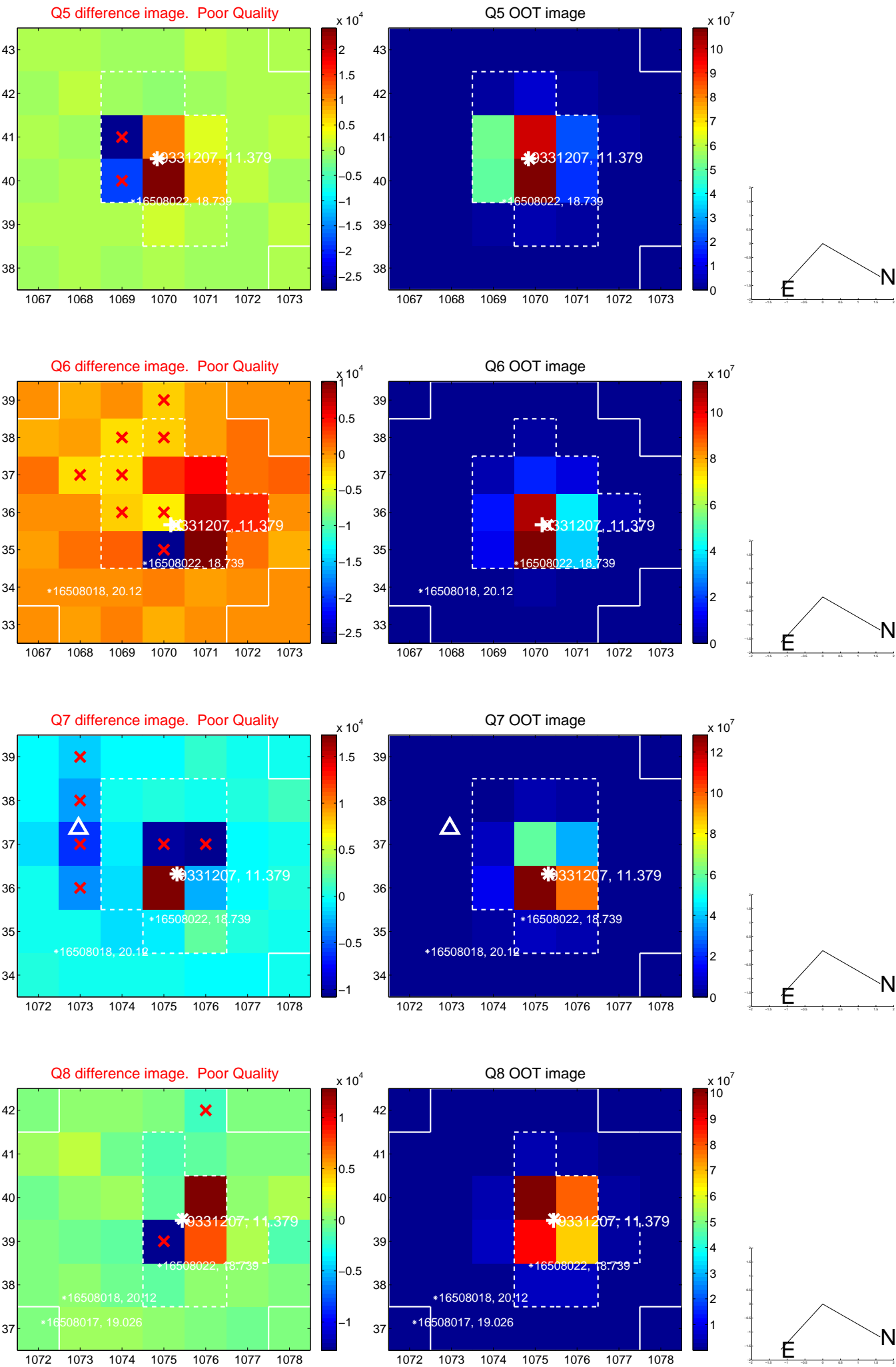


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

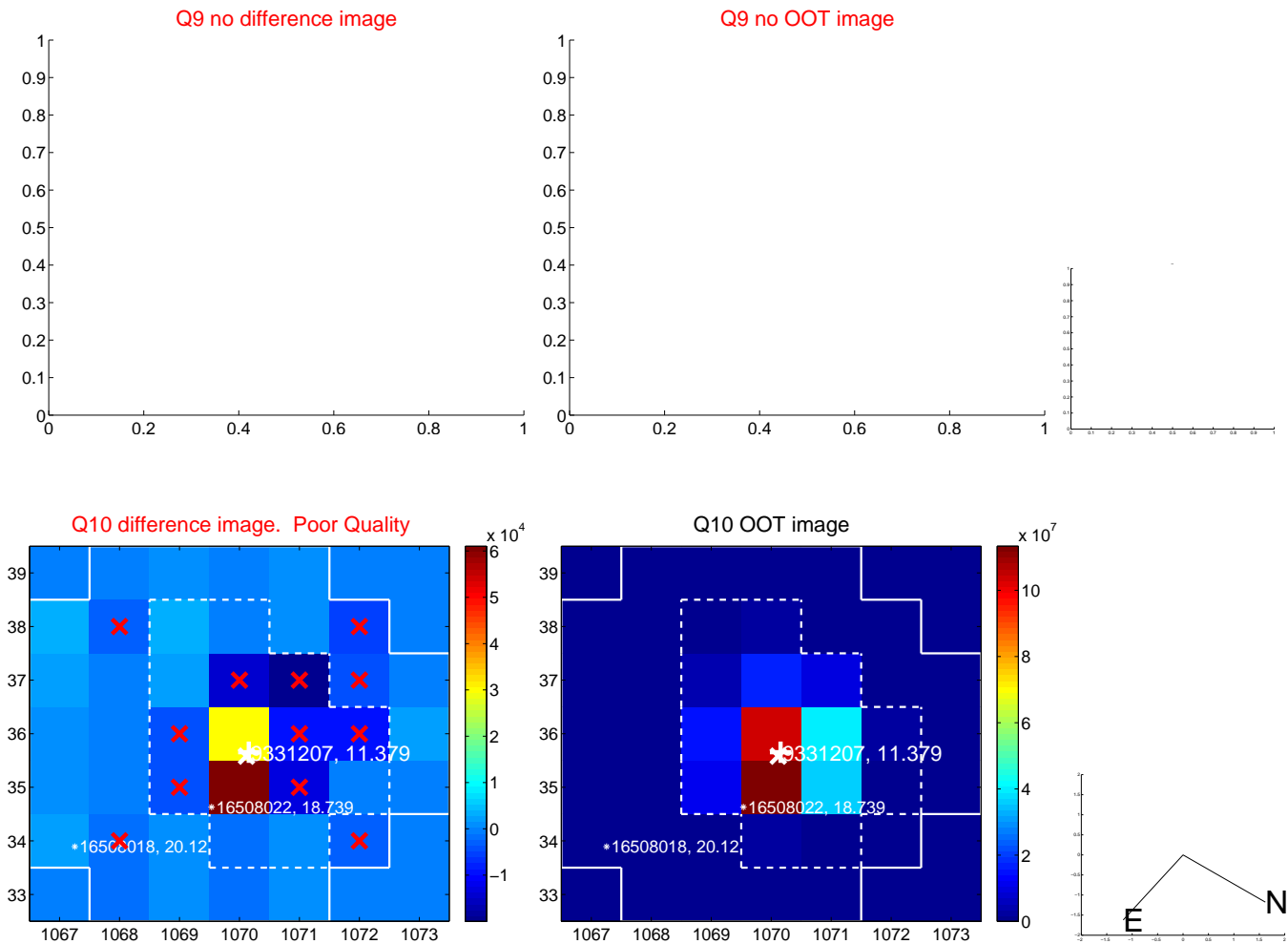
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



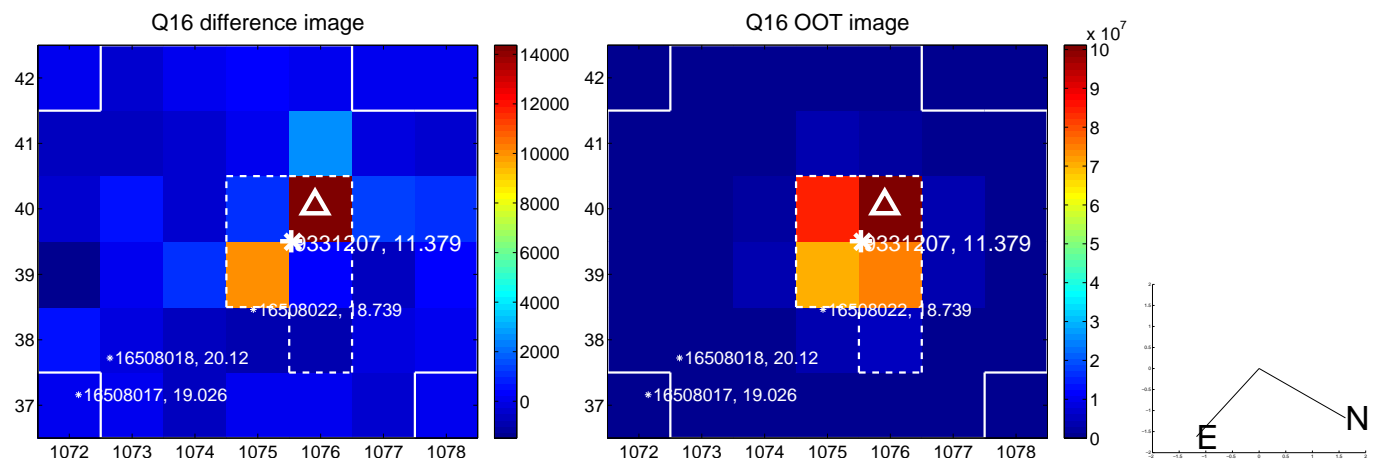
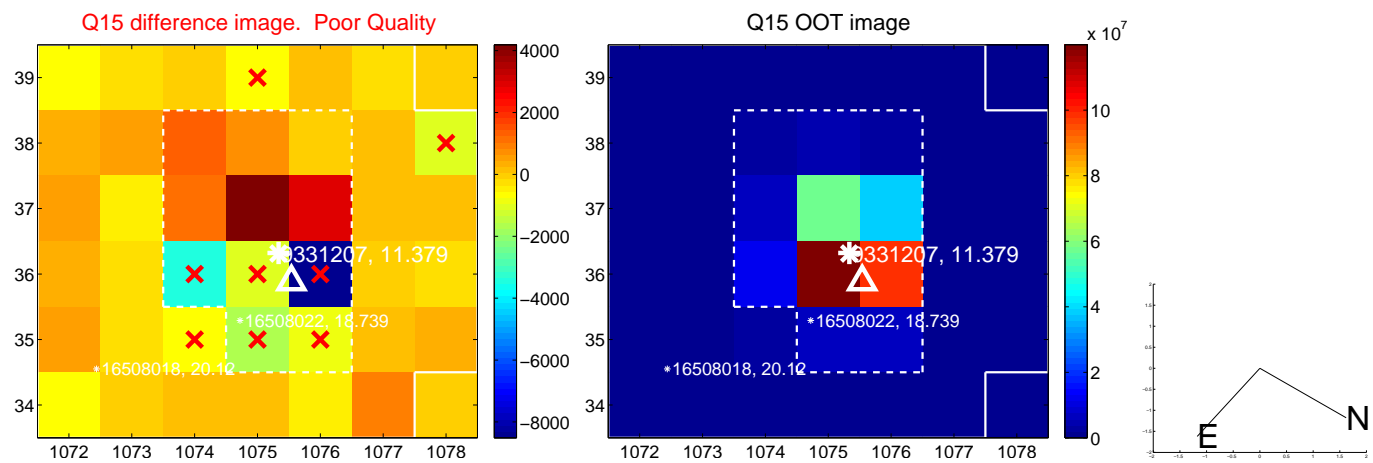
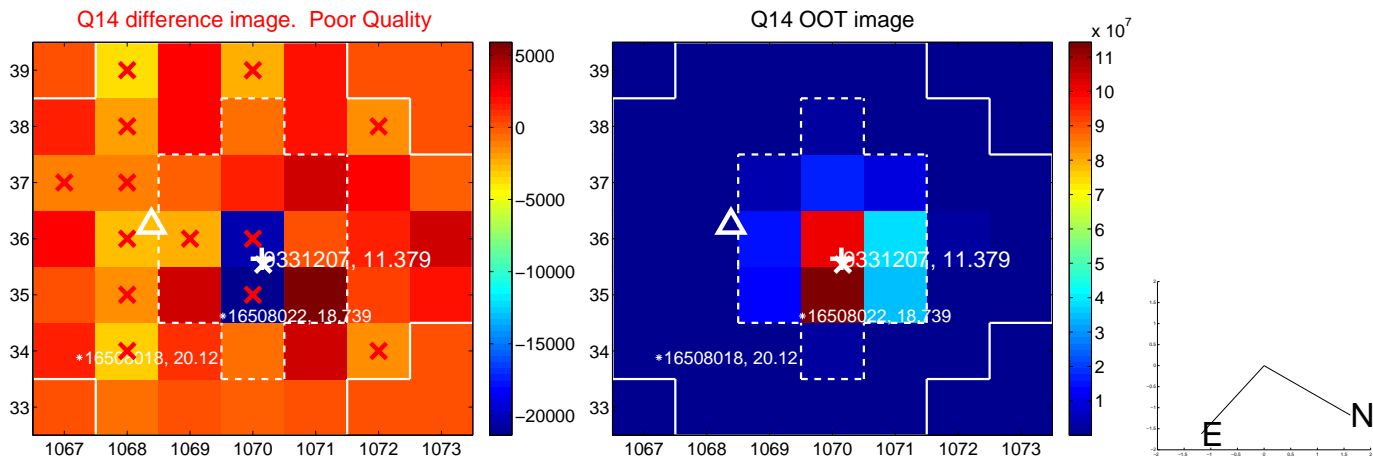
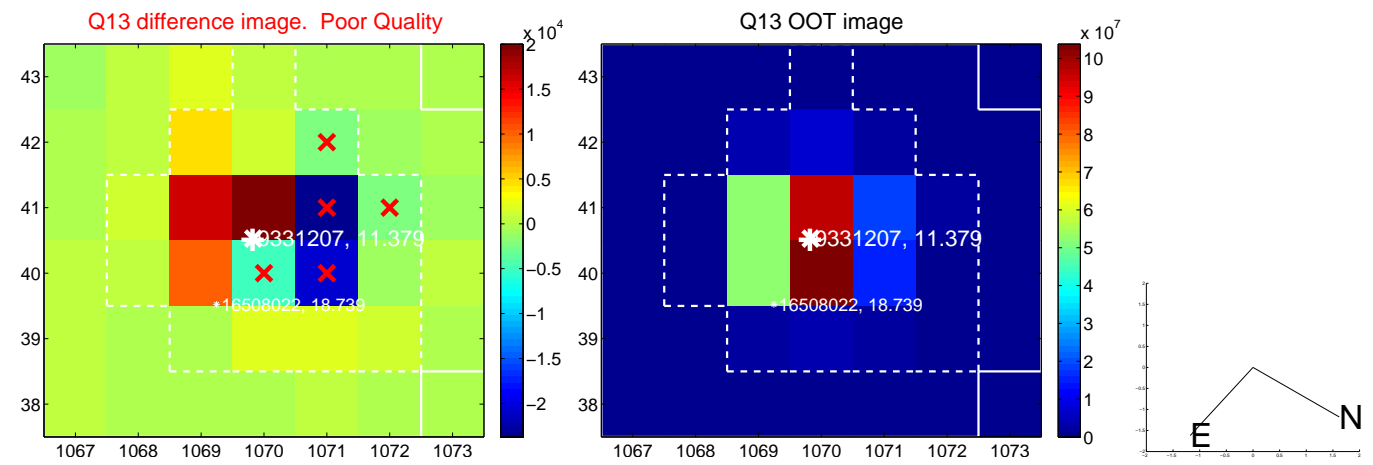
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



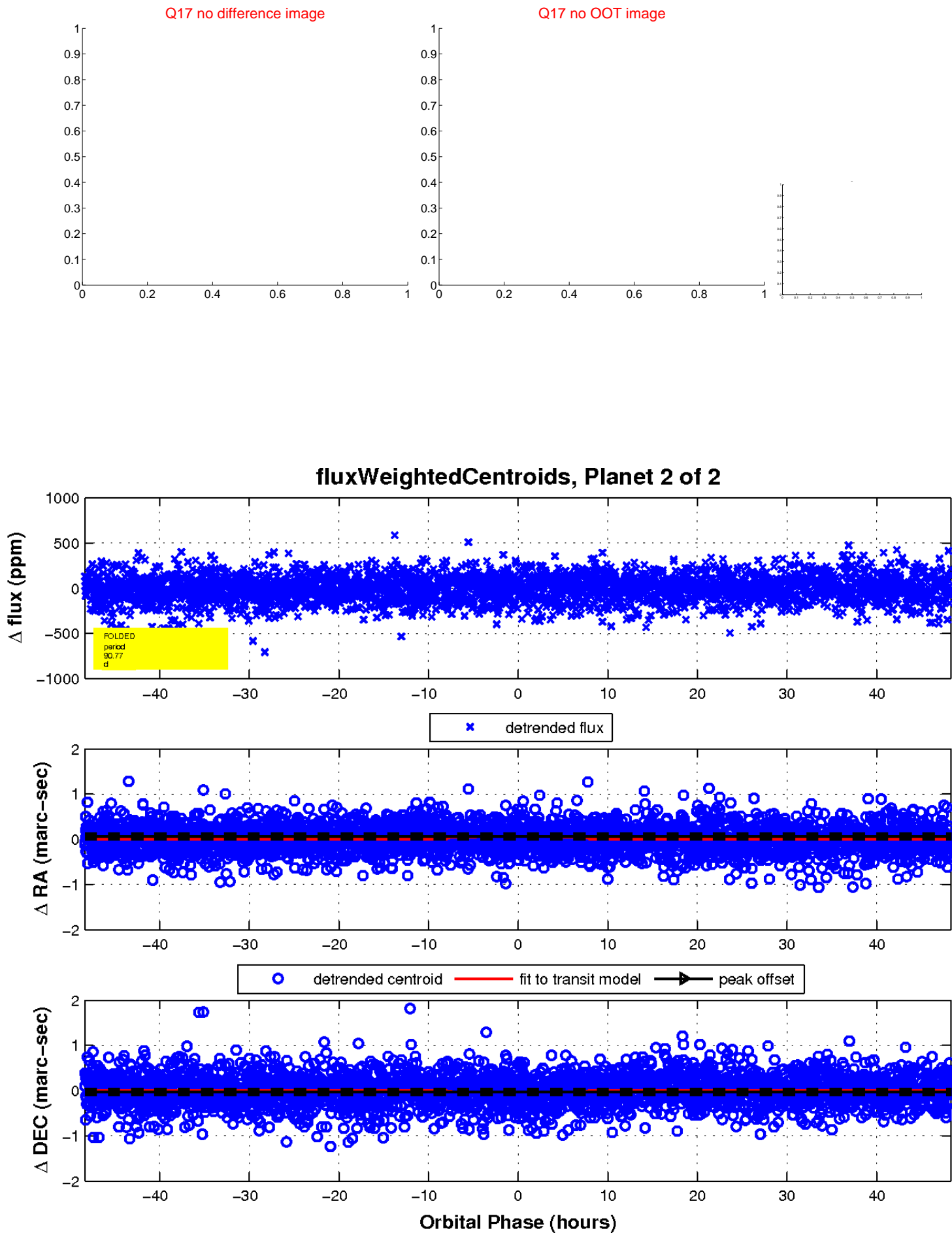
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

