

# KIC 009301506

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009301506-01	OBS	3047.01	0.605224	131.754469	214.2	0.942	14.6	19.2	0.76	5089	1.44	2113.16
009301506-02	OBS	No	0.605216	132.067058	122.0	1.005	10.9	11.9	0.76	5089	1.02	2113.20

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009301506-01	OBS	FP	0.00	0	1	1	0	MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE—CENT_RESOLVED_OFFSET—HALO_GHOST
009301506-02	OBS	FP	0.00	1	1	0	0	IS_SEC_TCE—CENT_KIC_POS

**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.

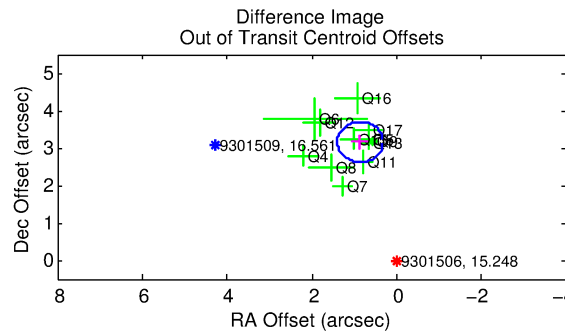
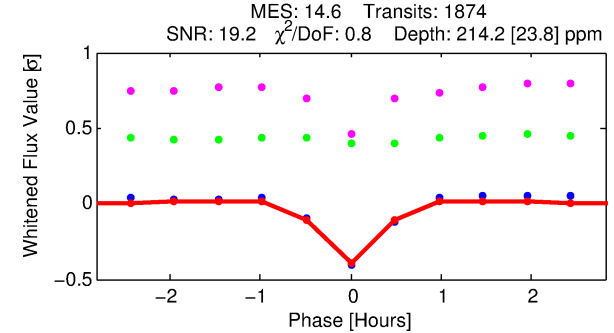
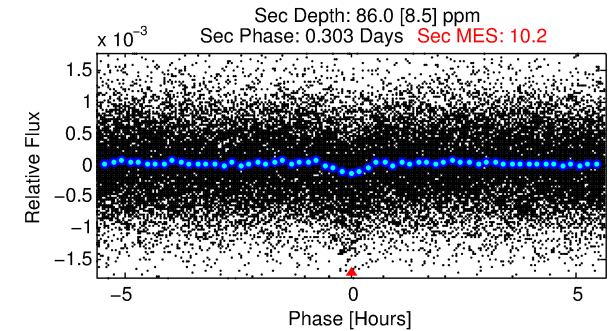
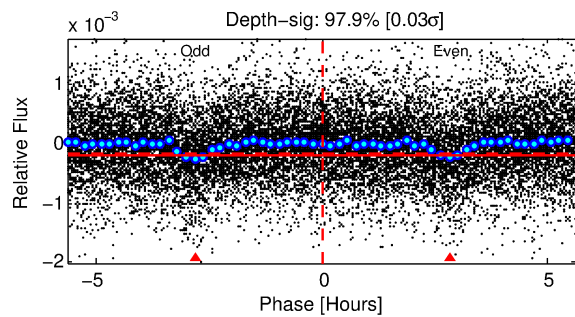
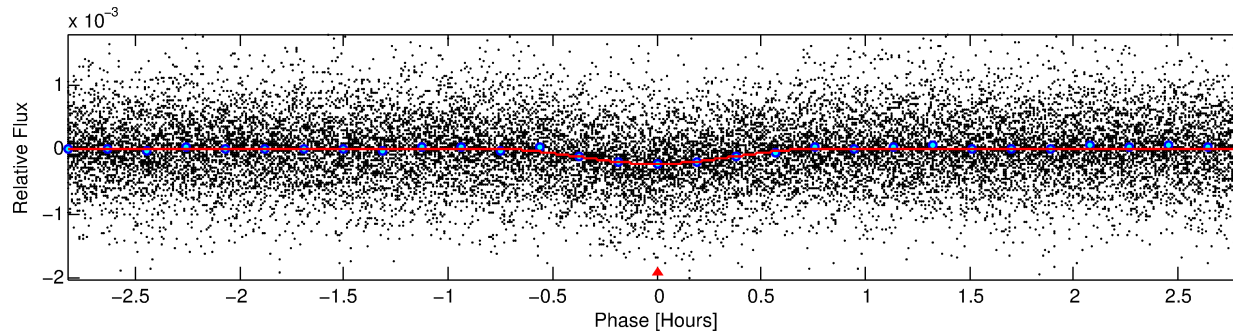
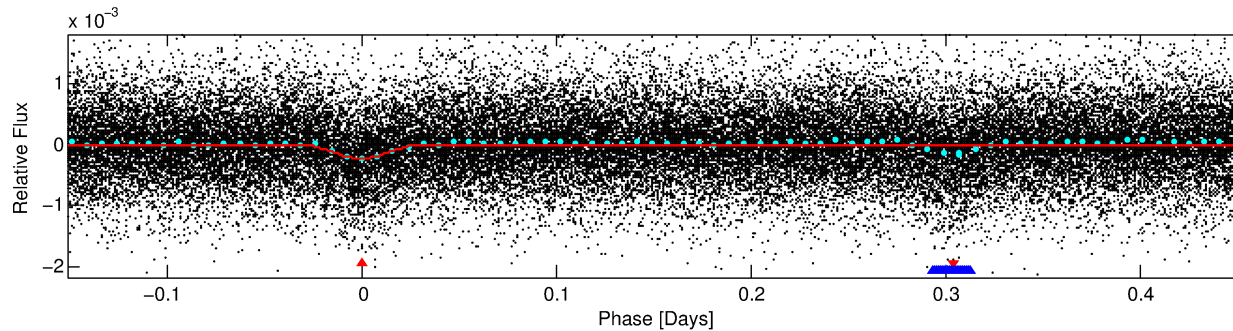
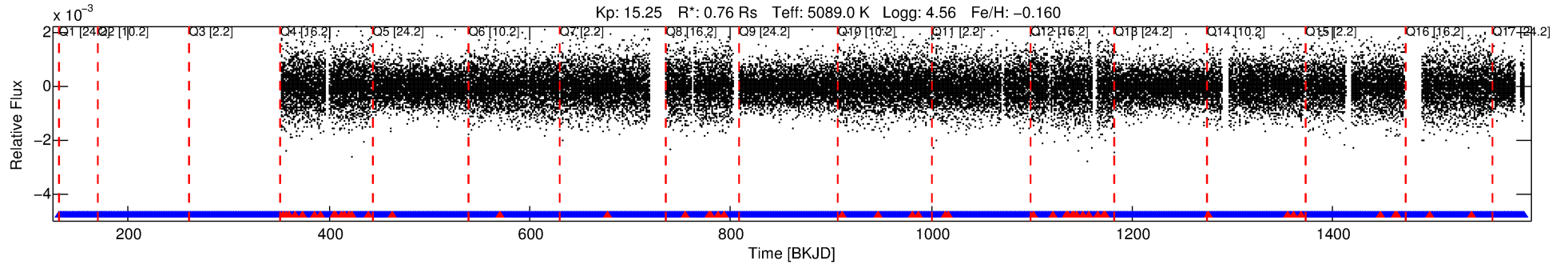
## Ephemeris Match Information For 009301506-01

No Significant Match Found

# DV One-Page Summary

KIC: 9301506 Candidate: 1 of 2 Period: 0.605 d  
KOI: K03047 Corr: No Ephemeris Match

Kp: 15.25 R\*: 0.76 Rs Teff: 5089.0 K Logg: 4.56 Fe/H: -0.160



## DV Fit Results:

Period = 0.60522 [0.00001] d  
Epoch = 131.7545 [0.0008] BKJD  
Rp/R\* = 0.0174 [0.0070]  
a/R\* = 2.16 [2.91]  
b = 0.94 [0.23]  
Seff = 2113.16 [392.06]  
Teq = 1729 [80] K  
Rp = 1.44 [0.60] Re  
a = 0.0128 [0.0012] AU  
Ag = 3.74 [3.08] [0.89σ]  
Teffp = 3718 [768] K [2.58σ]

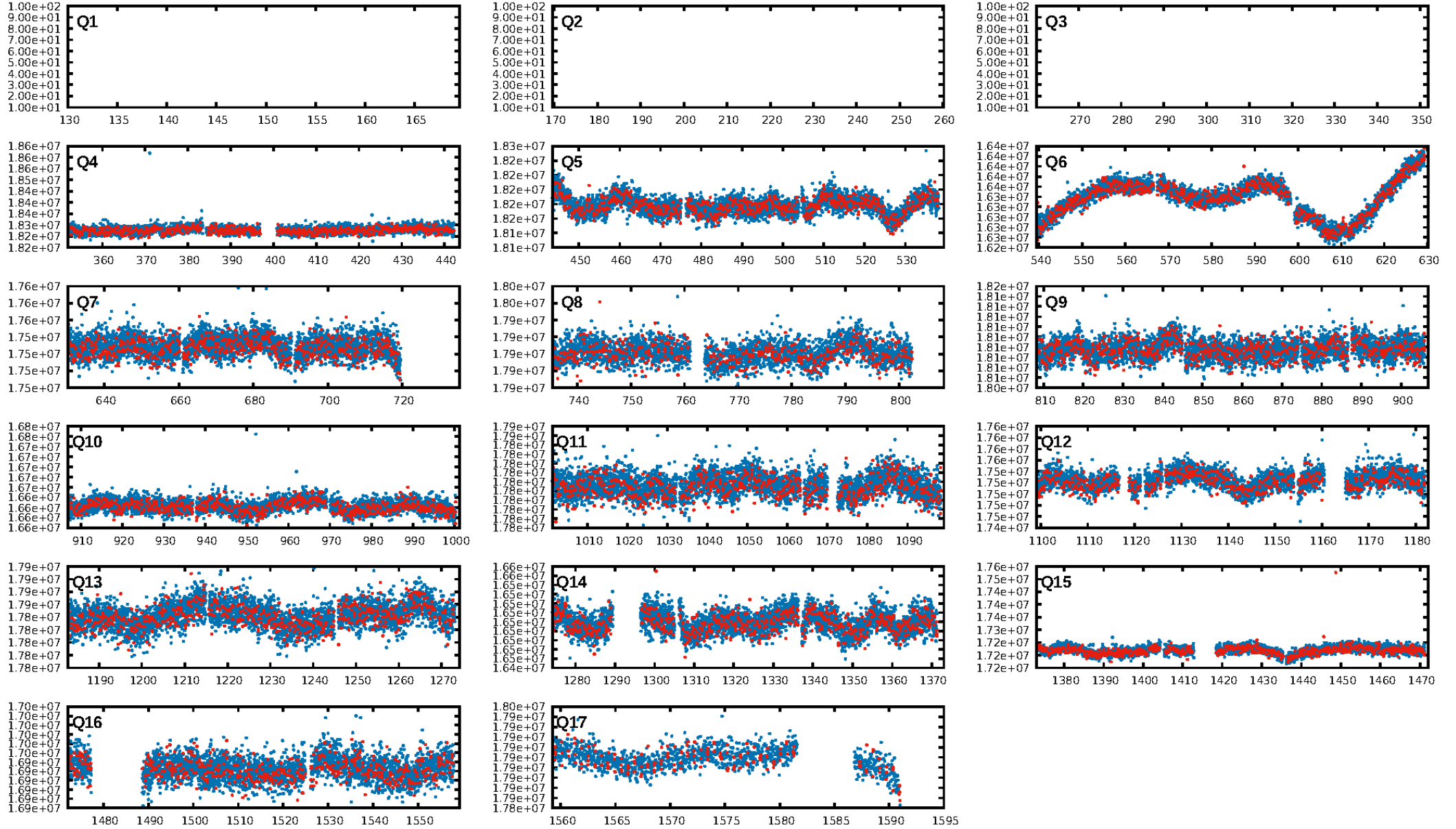
## DV Diagnostic Results:

ShortPeriod-sig: 0.0% [0.00σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 5.50e-54  
RollingBand-fgt: 0.97 [1779/1830]  
GhostDiagnostic-chr: 0.1802  
Centroid-sig: 0.0%  
Centroid-so: 4.959 arcsec [9.31σ]  
OotOffset-rm: 3.275 arcsec [18.20σ]  
KicOffset-rm: 4.335 arcsec [29.60σ]  
OotOffset-st: 1/3/4/4 [12]  
KicOffset-st: 1/3/4/4 [12]  
DiffImageQuality-fgm: 1.00 [12/12]  
DiffImageOverlap-fno: 1.00 [14/14]

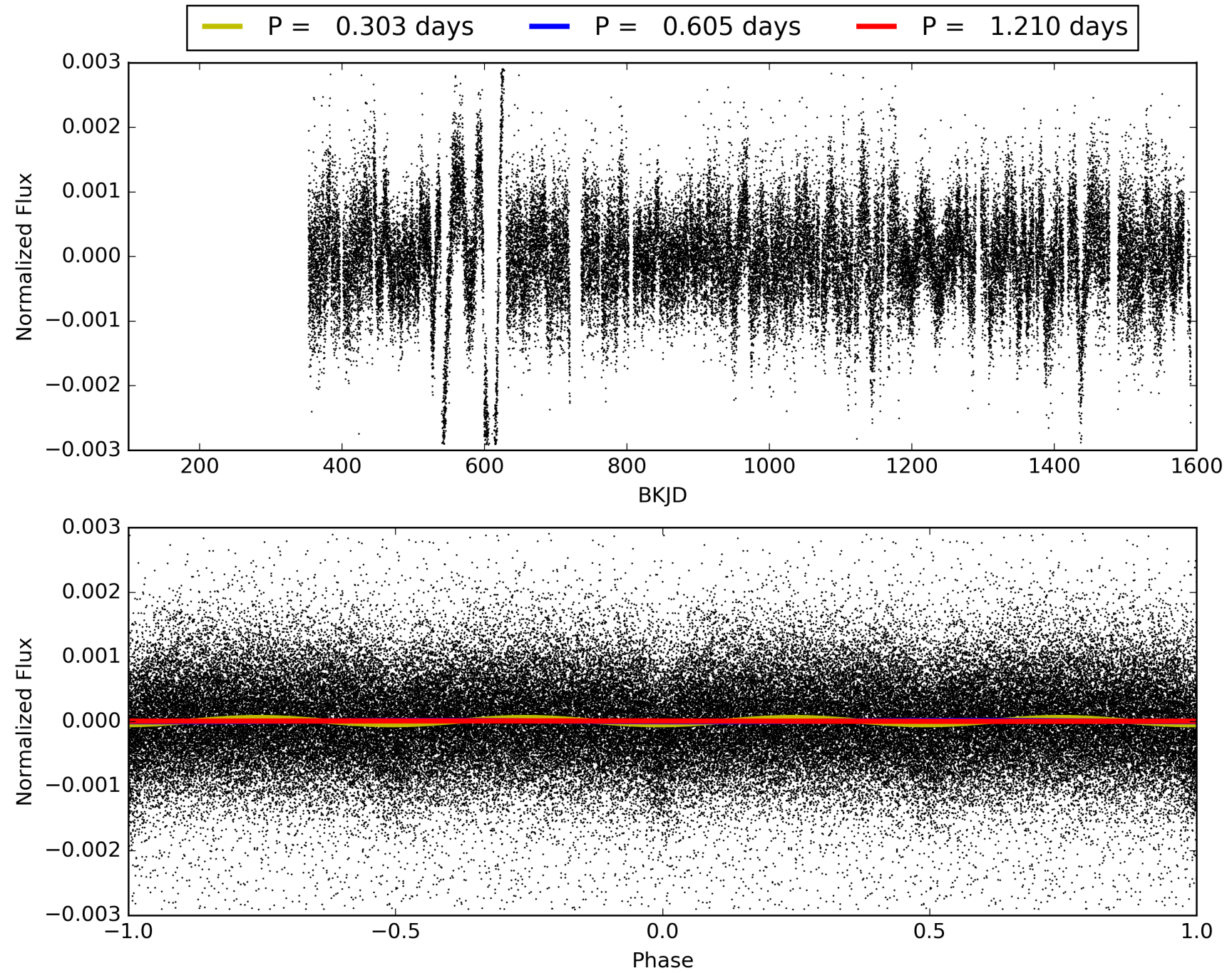
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 09:45:06 Z

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

# TCE 009301506-01, PDC Light Curves



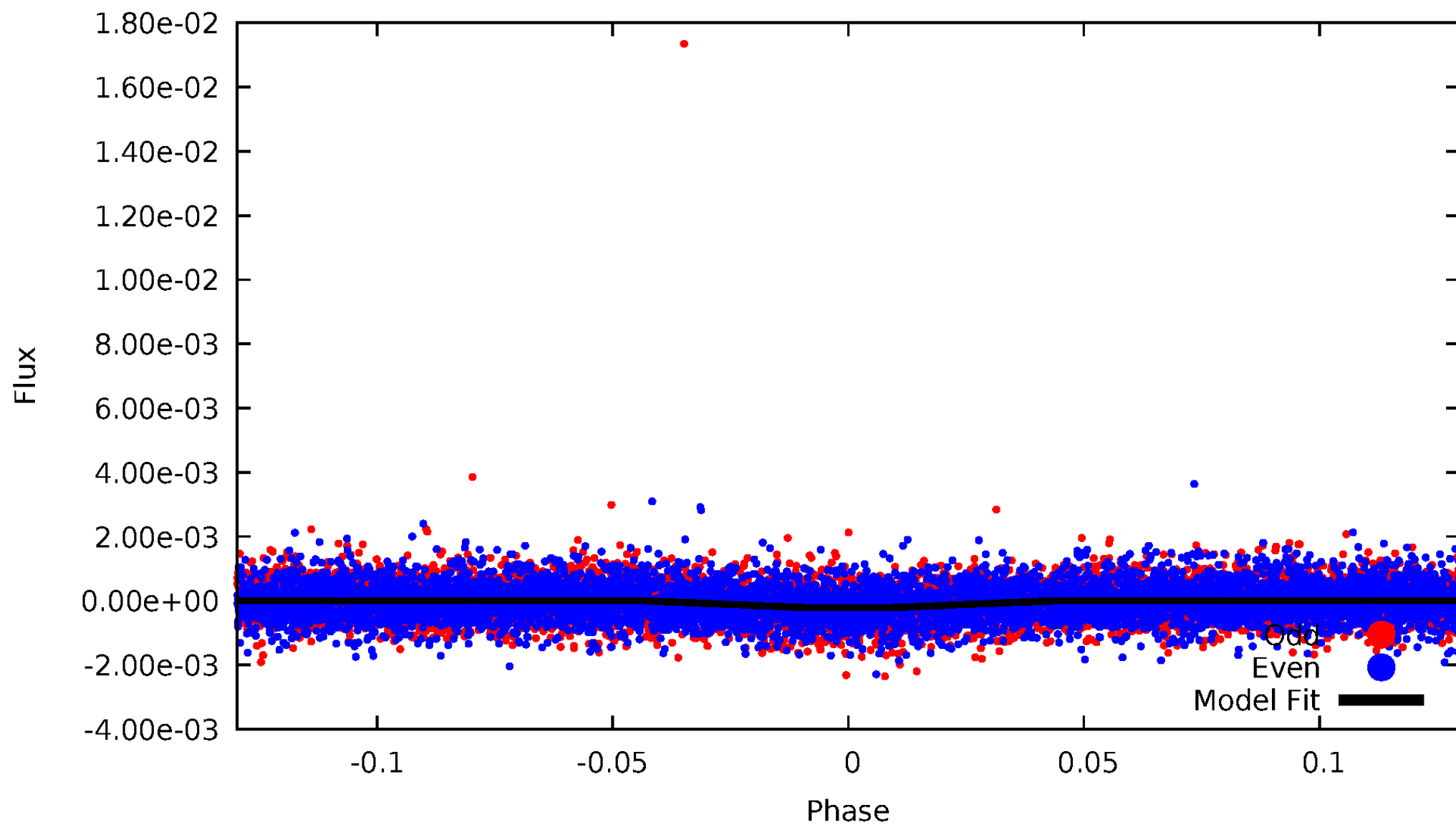
TCE 009301506-01





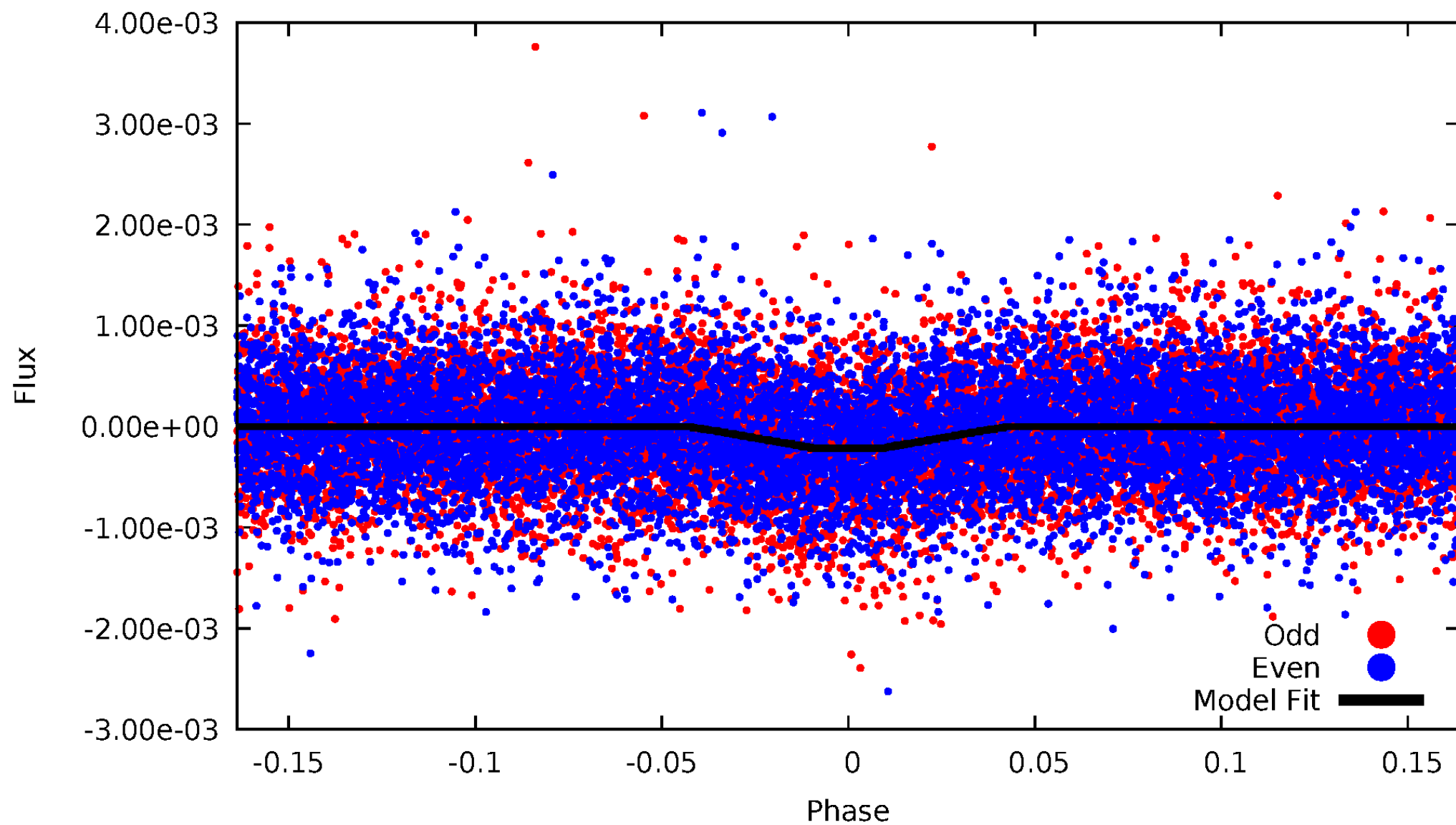
# DV Odd/Even

TCE 009301506-01

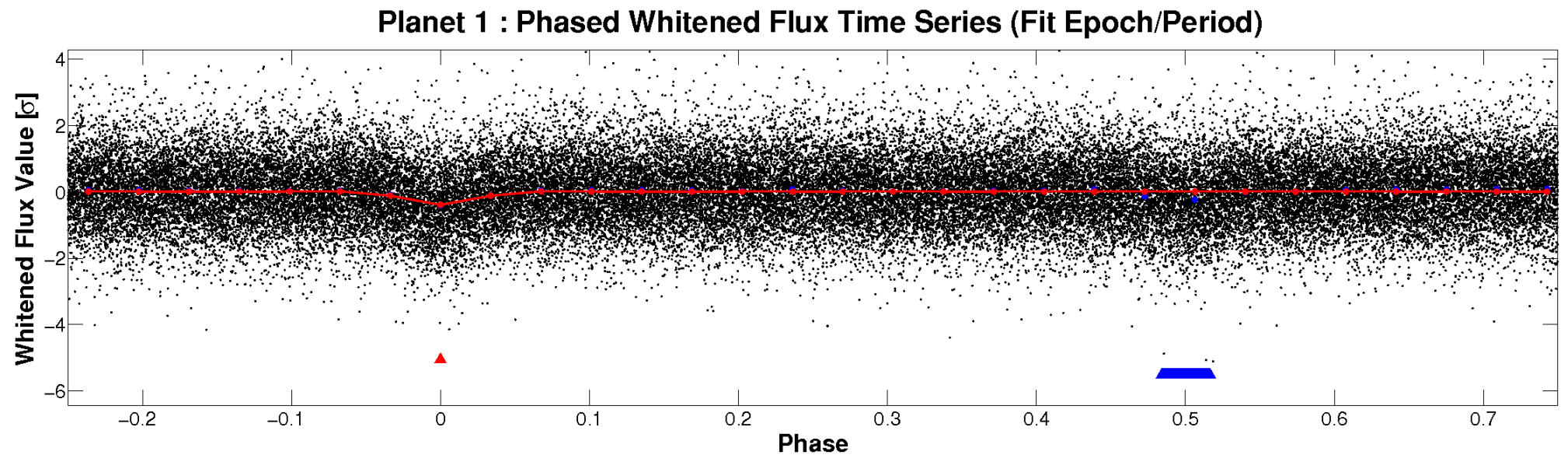
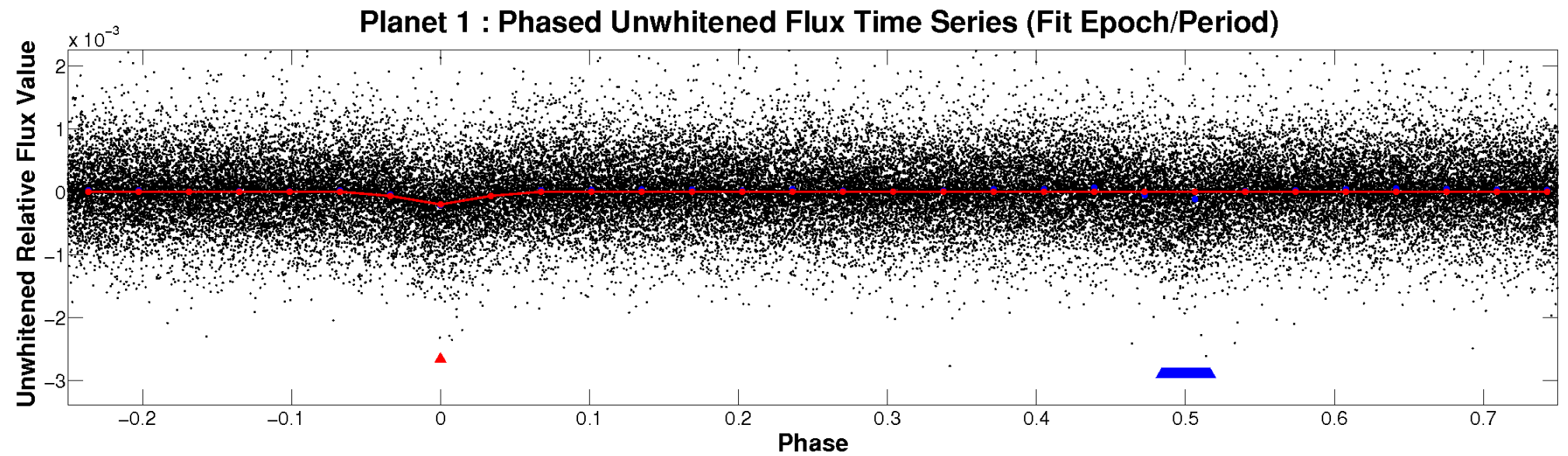


# ALT Odd/Even

TCE 009301506-01

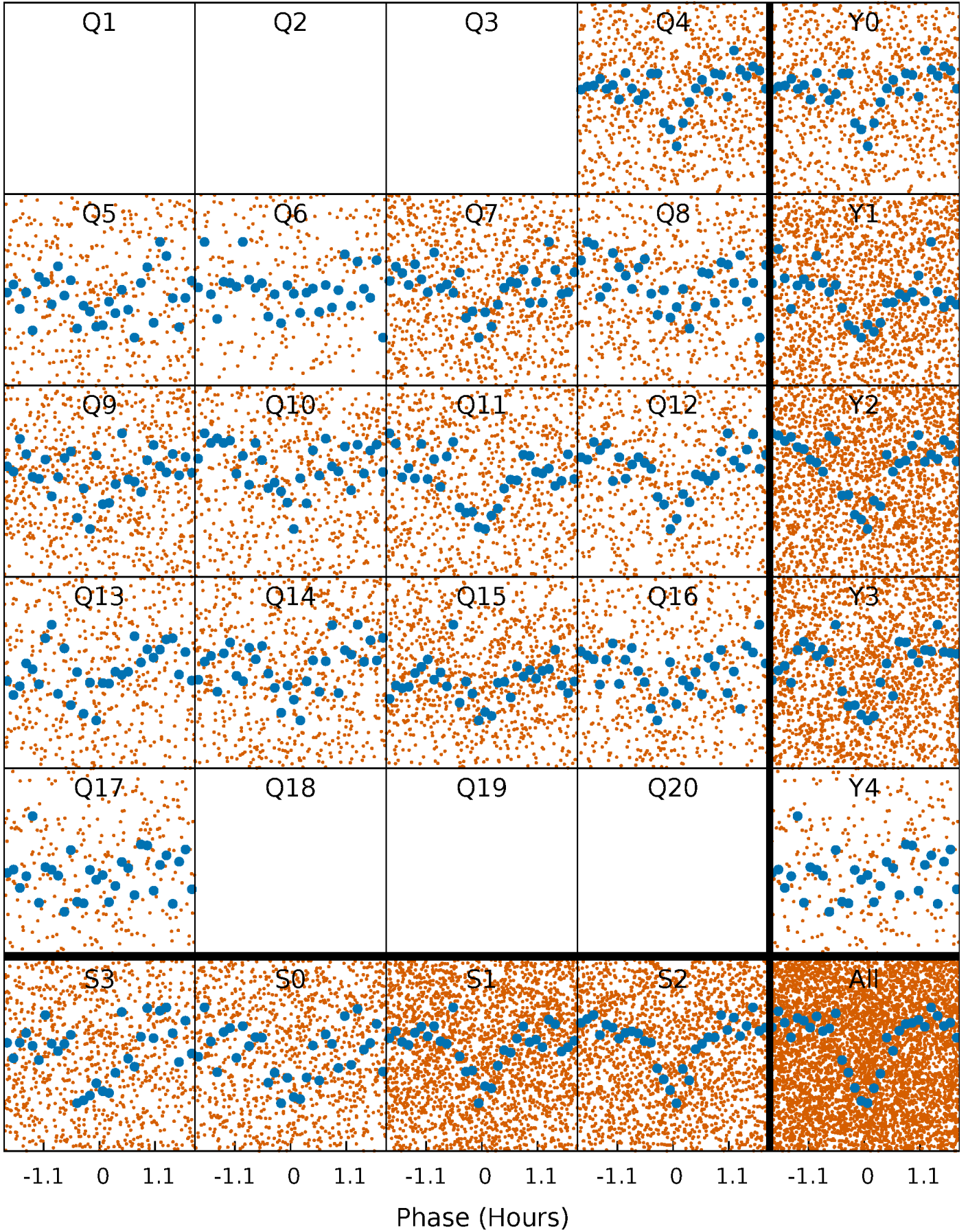


# Non-Whitened Vs. Whitened Light Curve



# PDC Quarter-Phased Transit Curves

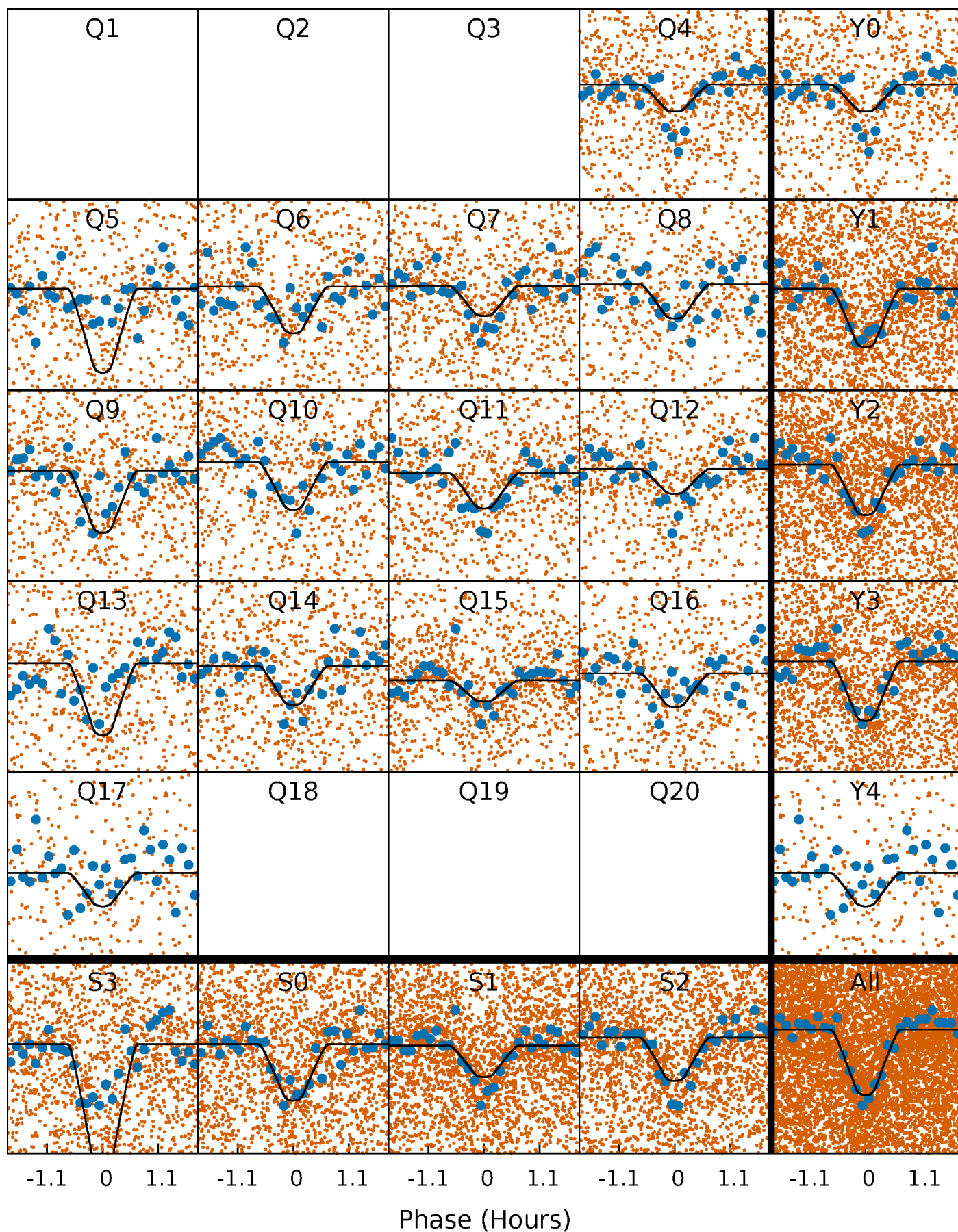
TCE 009301506-01   P= 0.605224 Days    $T_0=131.754469$  (BKJD)





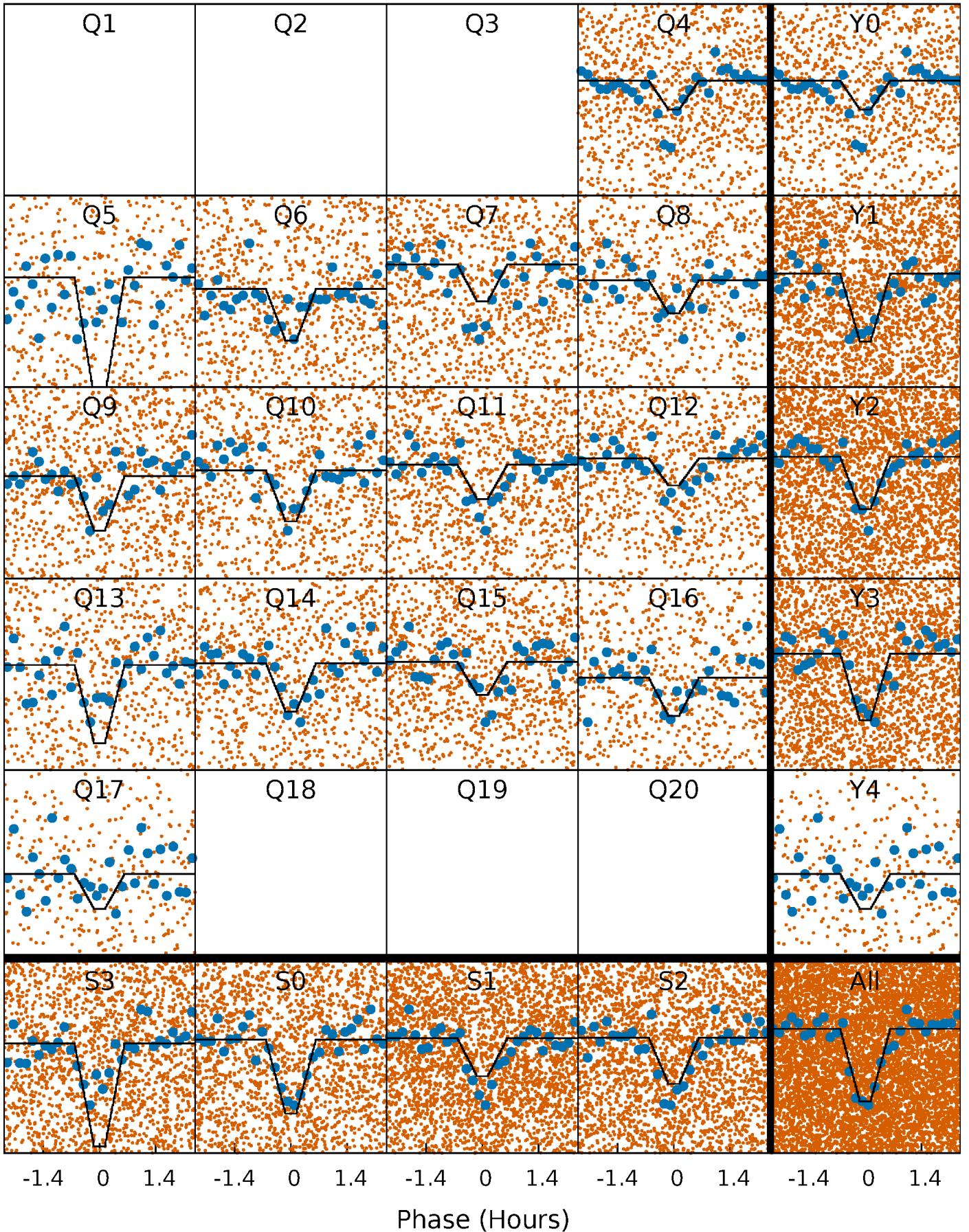
# DV Quarter-Phased Transit Curves

TCE 009301506-01   P= 0.605224 Days    $T_0=131.754469$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

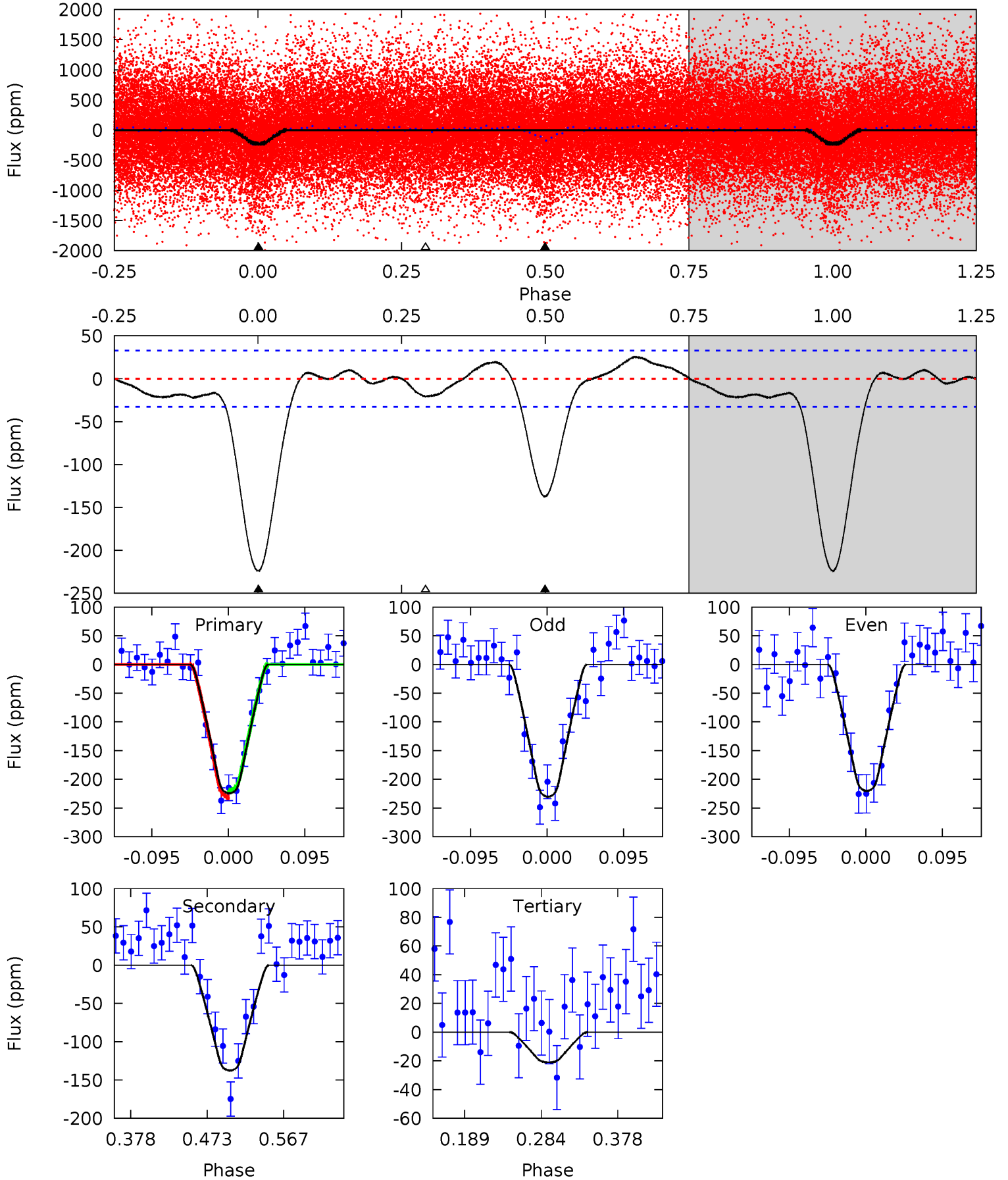
TCE 009301506-01 P= 0.605216 Days  $T_0=131.765378$  (BKJD)



# DV Model-Shift Uniqueness Test

009301506-01, P = 0.605224 Days, E = 131.754469 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
31.3	19.2	2.94	0	4.58	1.67	1.91	28.4	31.3	16.3	19.2	0.72	0.98	0.10	0.84

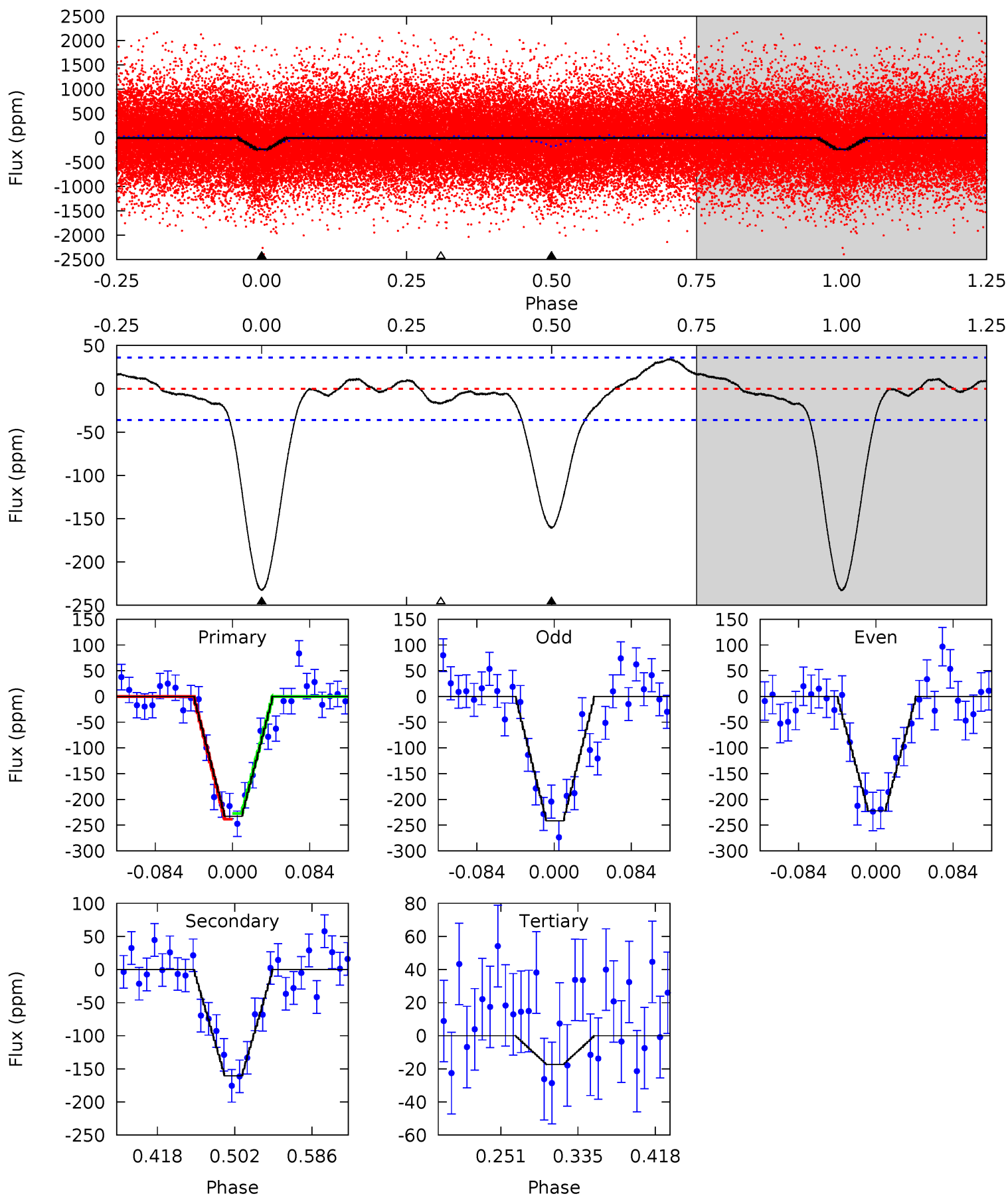




# Alt Model-Shift Uniqueness Test

009301506-01, P = 0.605216 Days, E = 131.765378 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
29.7	20.5	2.20	0	4.60	1.73	1.64	27.5	29.7	18.3	20.5	1.24	1.08	0.13	0.72





### Stellar Parameters For KIC 009301506

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5089^{+179}_{-179}$	$4.559^{+0.060}_{-0.060}$	$-0.160^{+0.300}_{-0.300}$	$0.757^{+0.089}_{-0.073}$	$0.757^{+0.090}_{-0.065}$	$2.461^{+0.675}_{-0.530}$
	+4%/-4%	+1%/-1%	+188%/-188%	+12%/-10%	+12%/-9%	+27%/-22%
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 009301506-01 / KOI 3047.01

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-138 \pm 7$	$1.38^{+0.63}_{-0.57}$	$2419^{+101}_{-111}$	$4356^{+1131}_{-578}$	$6.476^{+12.184}_{-3.480}$
Alt.	$-161 \pm 8$	$1.20^{+0.61}_{-0.54}$	$2415^{+105}_{-102}$	$4777^{+1439}_{-721}$	$9.829^{+21.803}_{-5.331}$

$T_{max}$  = 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

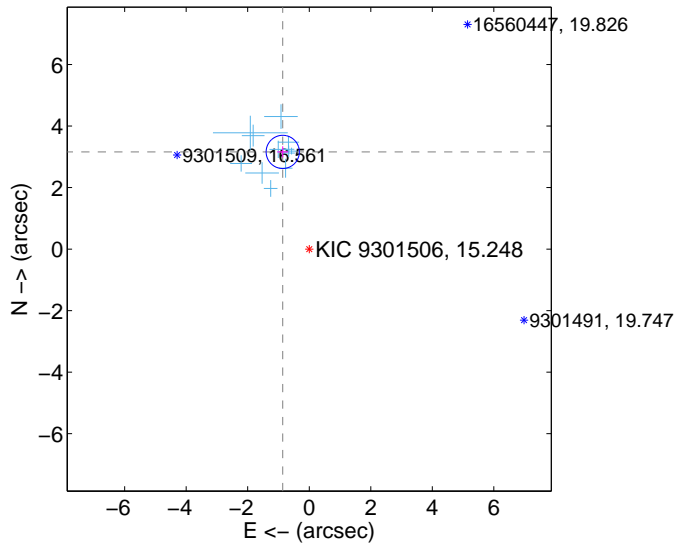
Supplemental centroid analysis for 009301506-01. Kepler magnitude: 15.25. Transit SNR 19.17

There are 12 quarters with good PRF difference image offsets

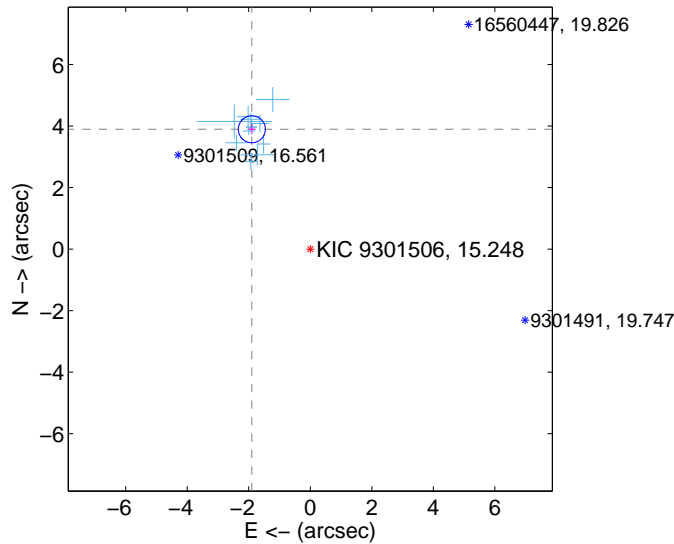
The direct PRF centroid is offset from the target star catalog position by about 1.46 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$3.275 \pm 0.180$	18.20	$0.861 \pm 0.182$	$3.160 \pm 0.181$
PRF-fit source offset from KIC position	$4.335 \pm 0.146$	29.60	$1.900 \pm 0.114$	$3.897 \pm 0.160$
photometric centroid source offset	$4.96 \pm 0.53$	9.31	$1.97 \pm 0.49$	$4.55 \pm 0.54$

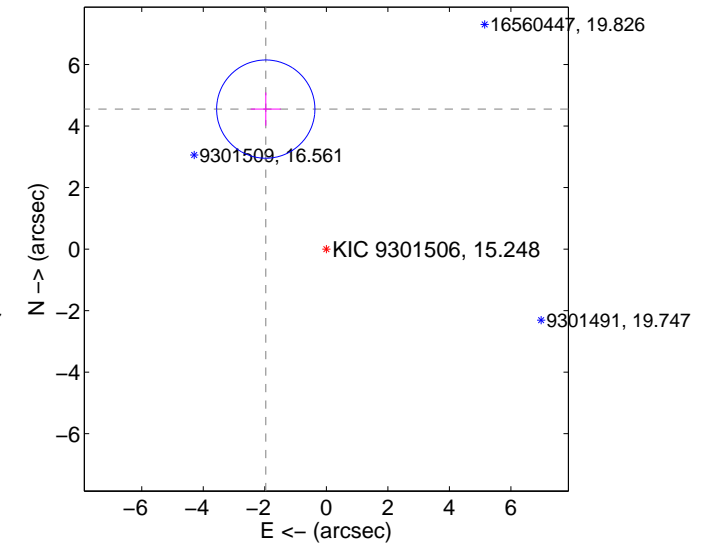
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

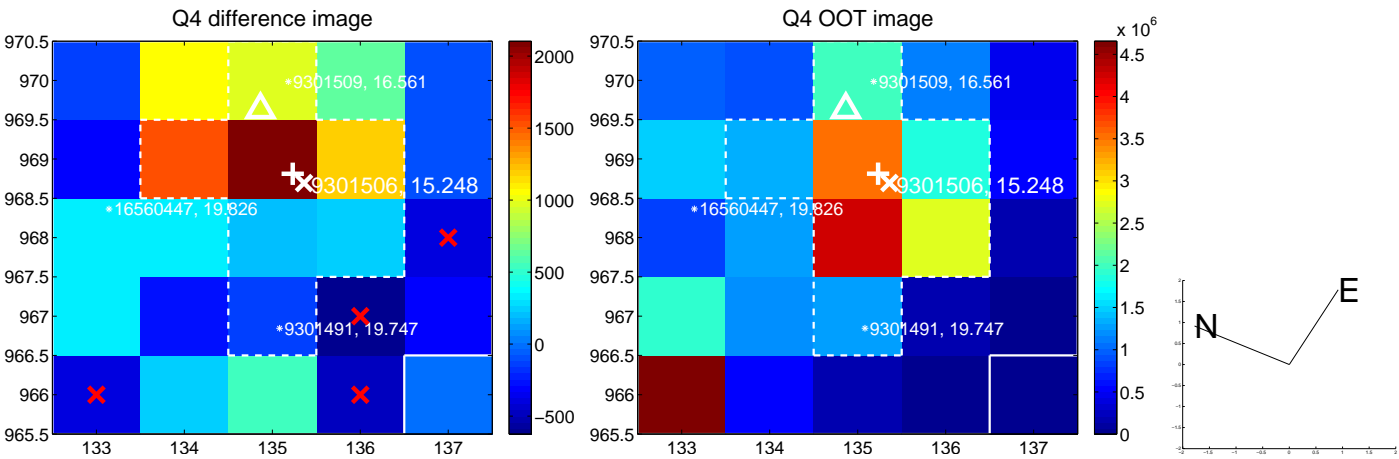
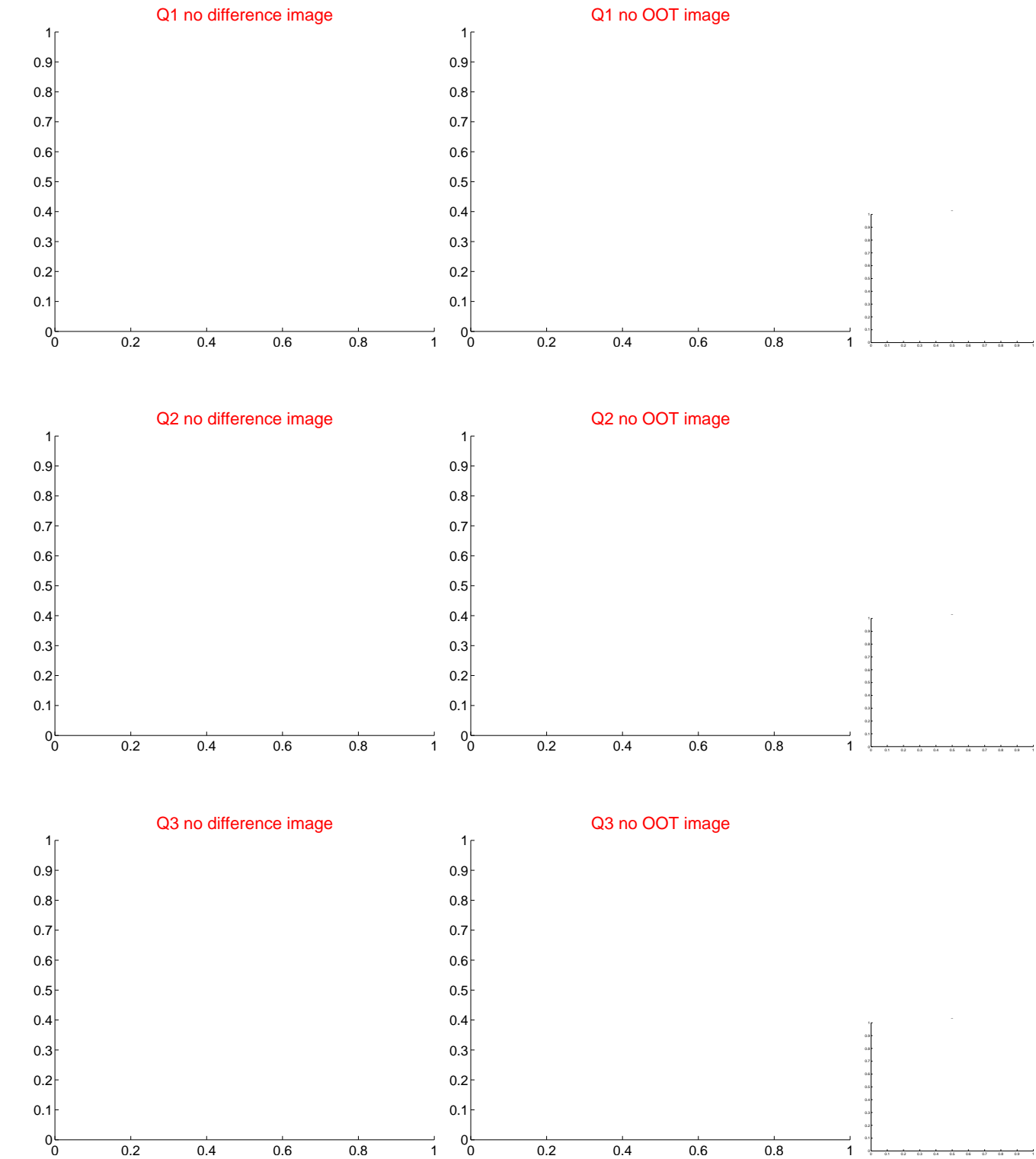


offset from photometric centroids

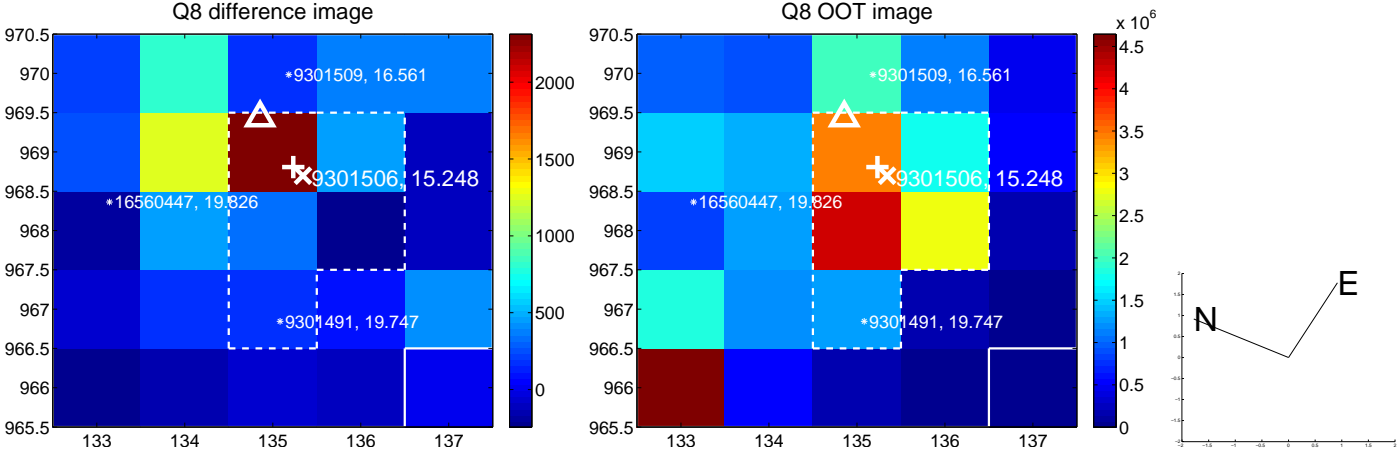
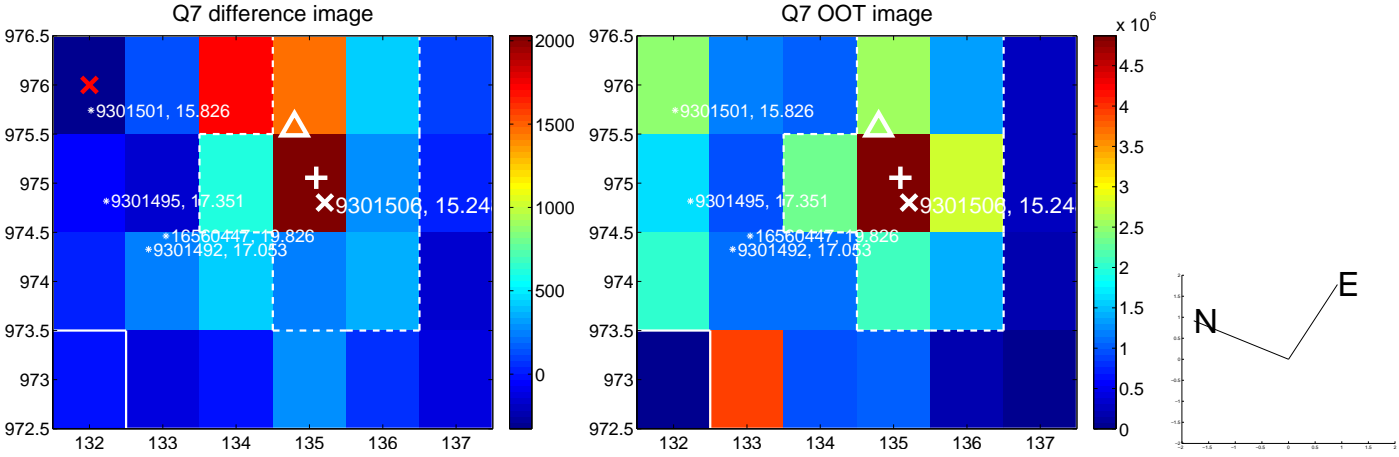
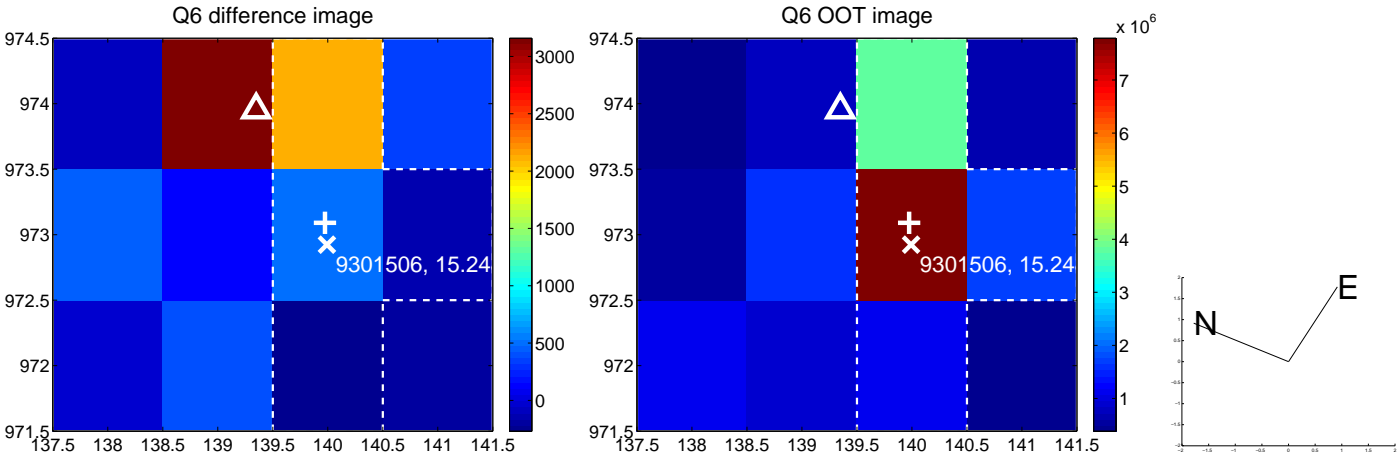
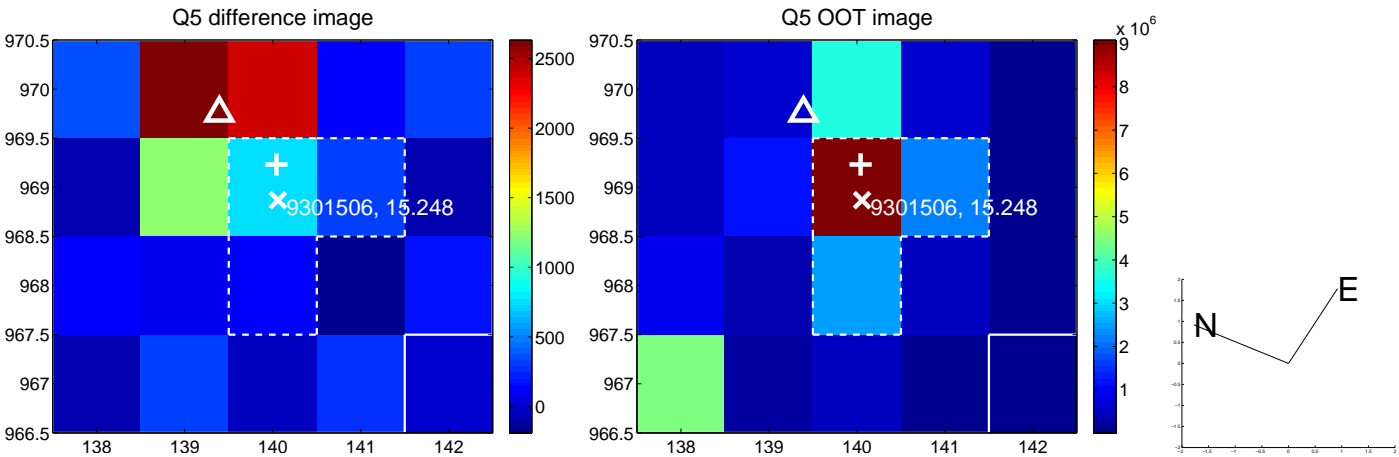


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets**; **Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

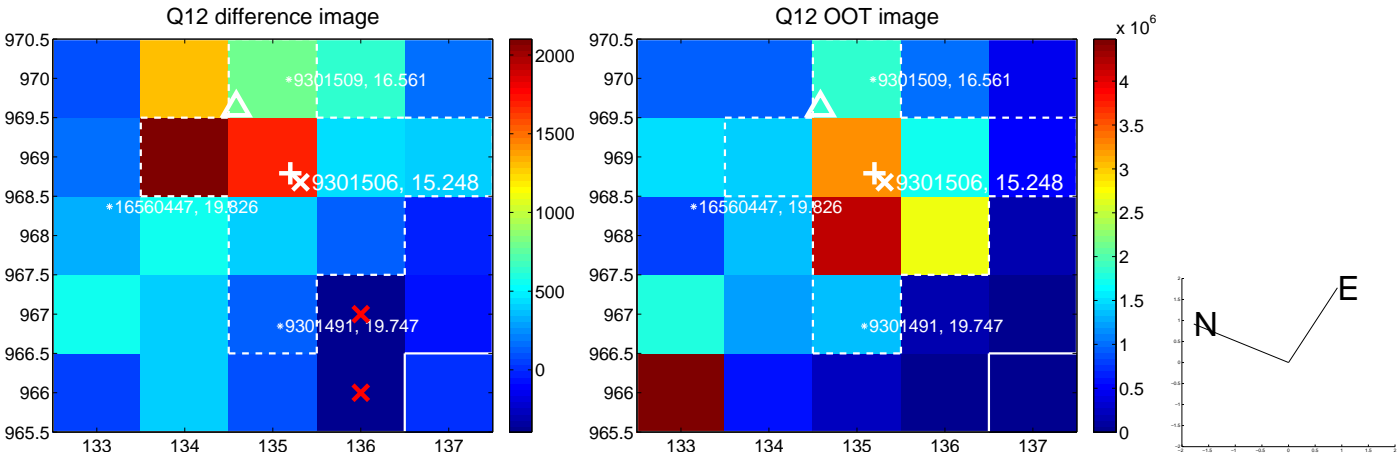
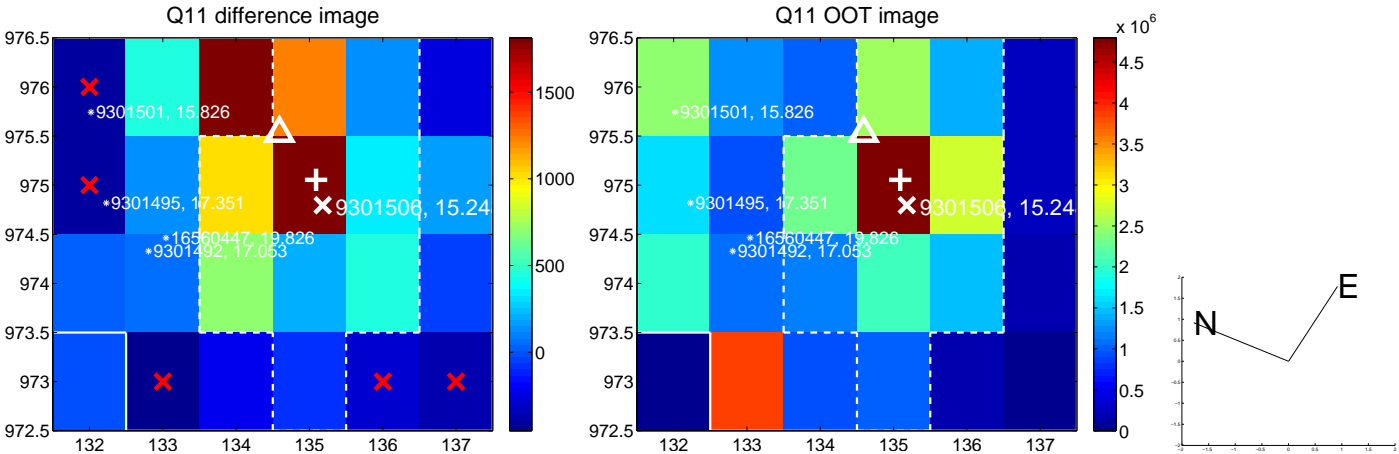
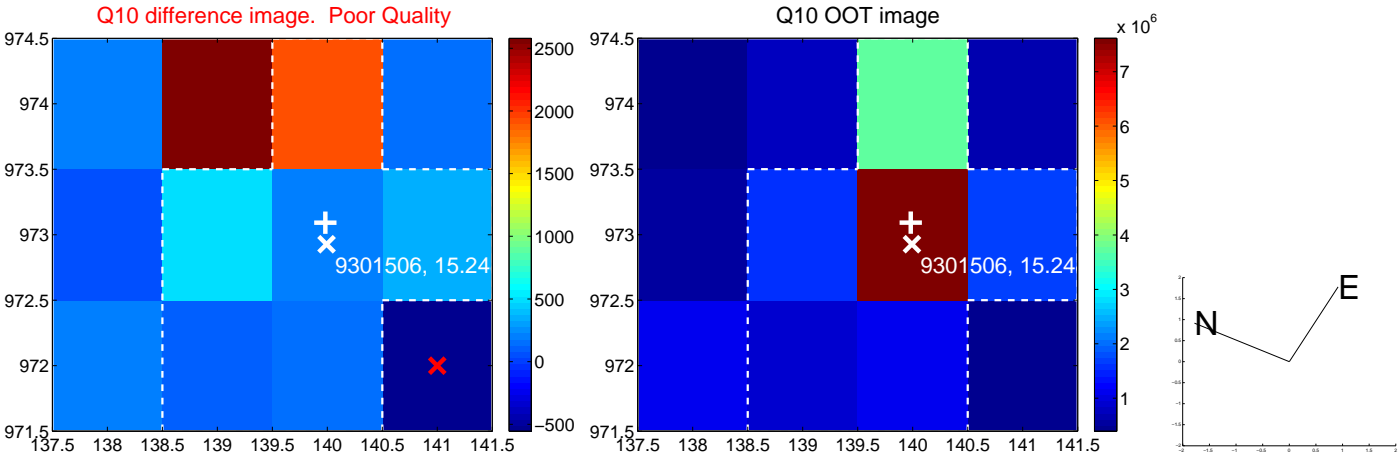
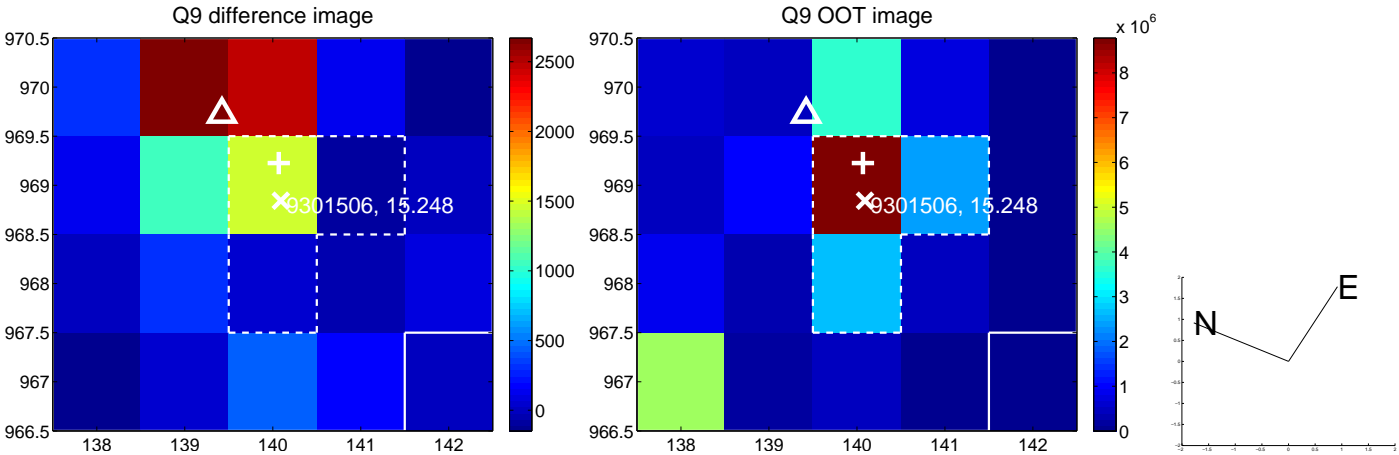


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

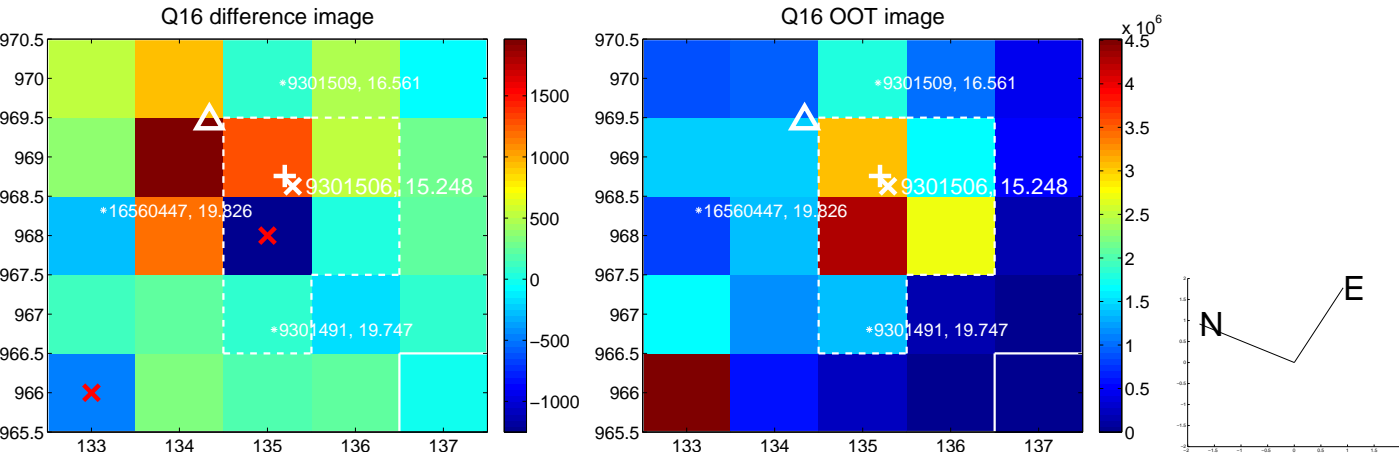
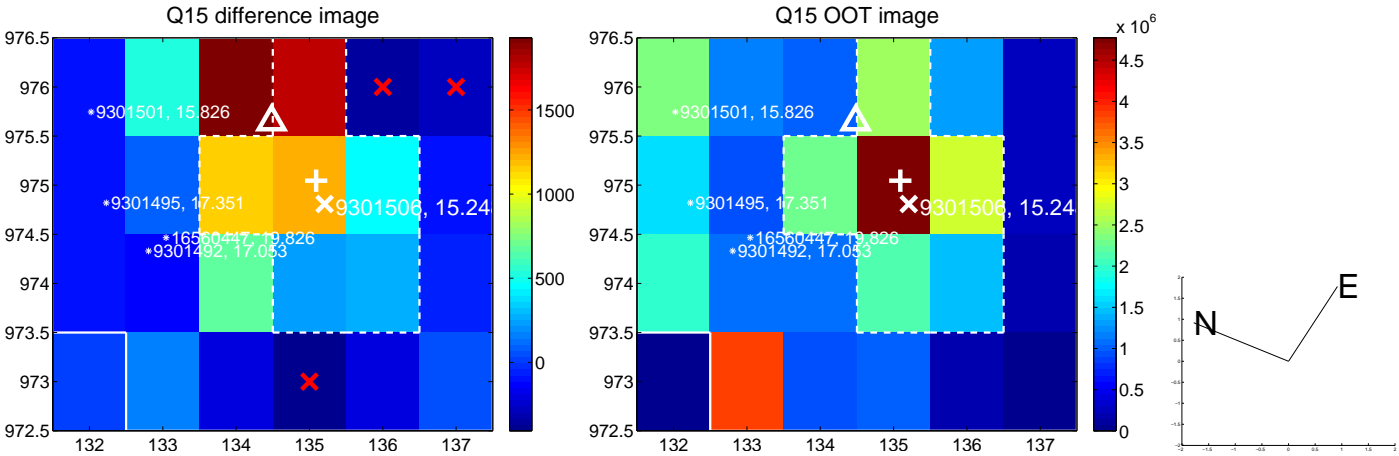
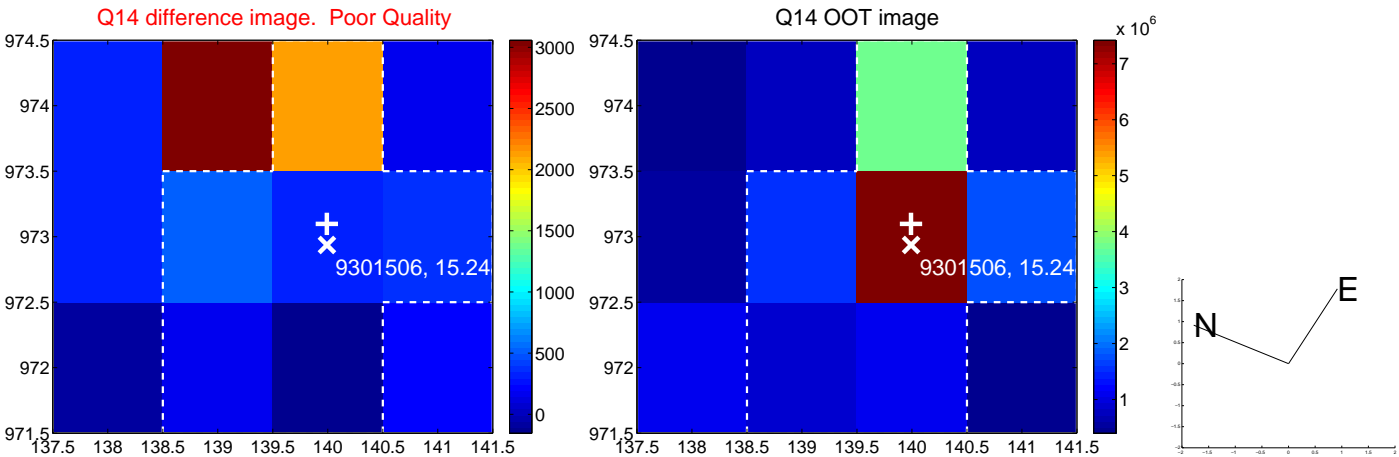
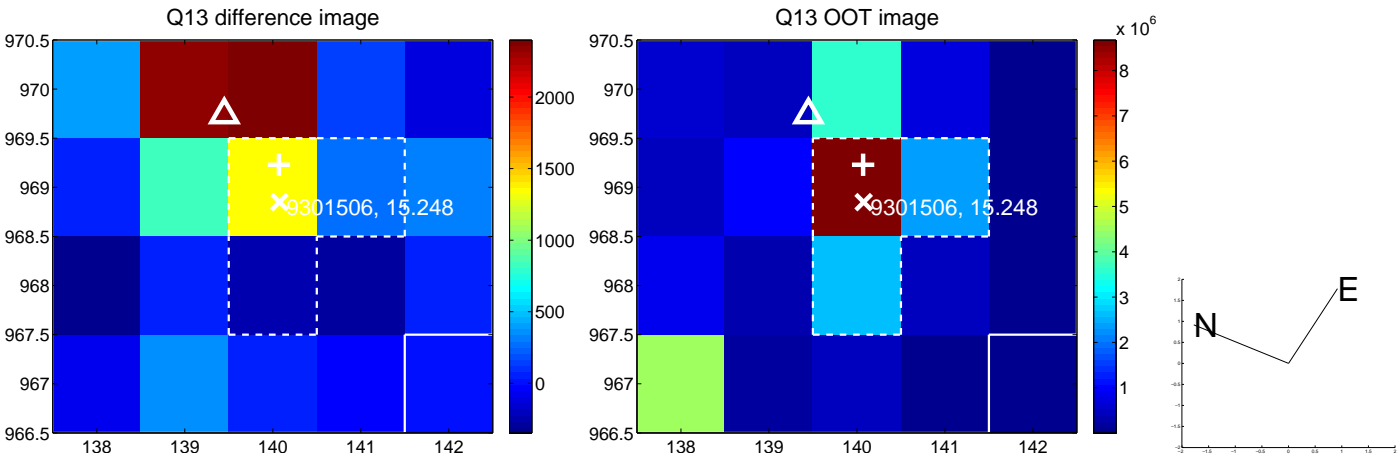




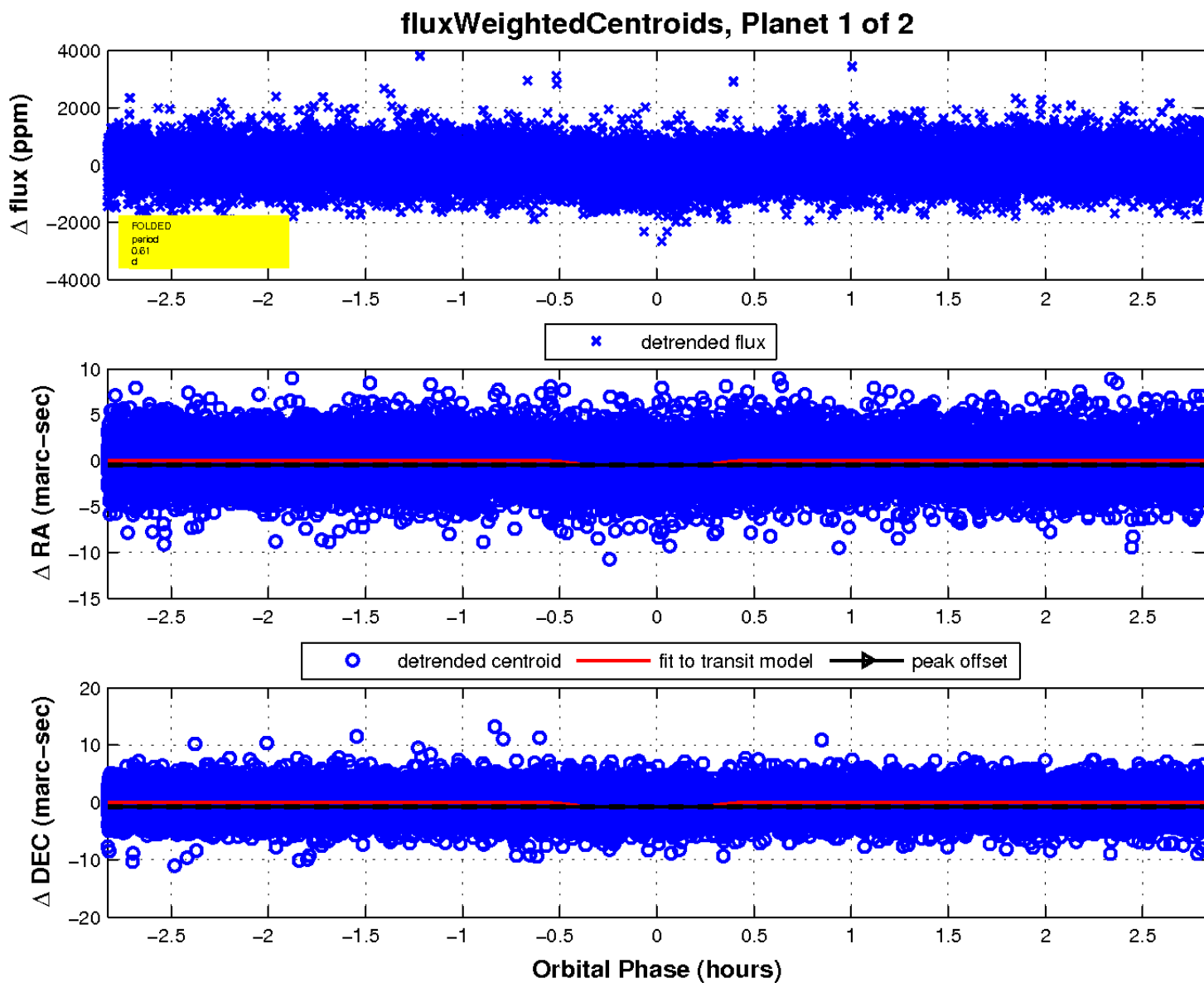
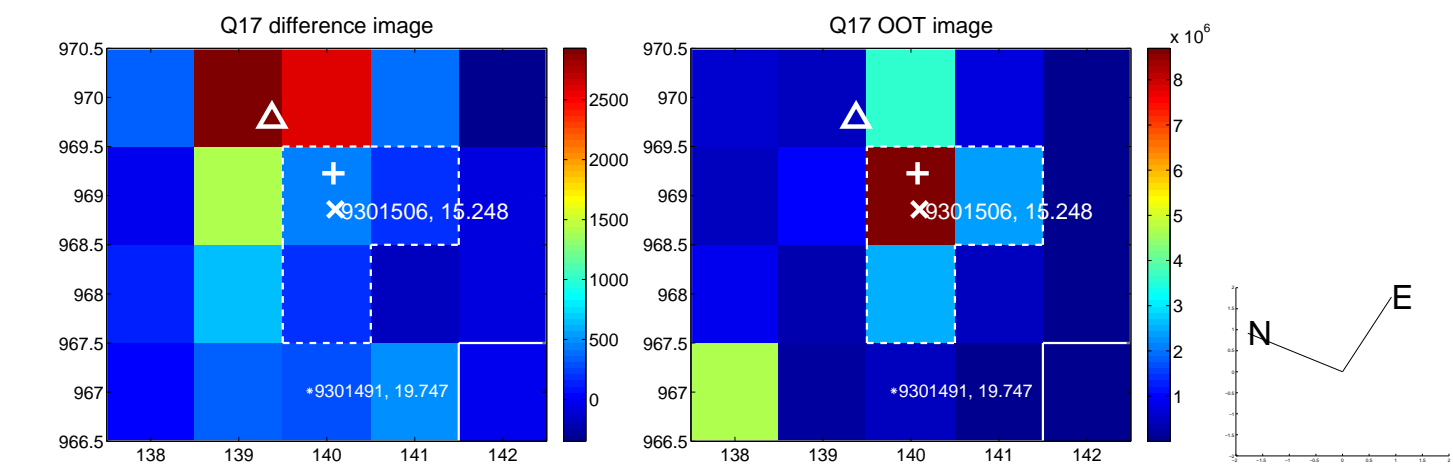
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



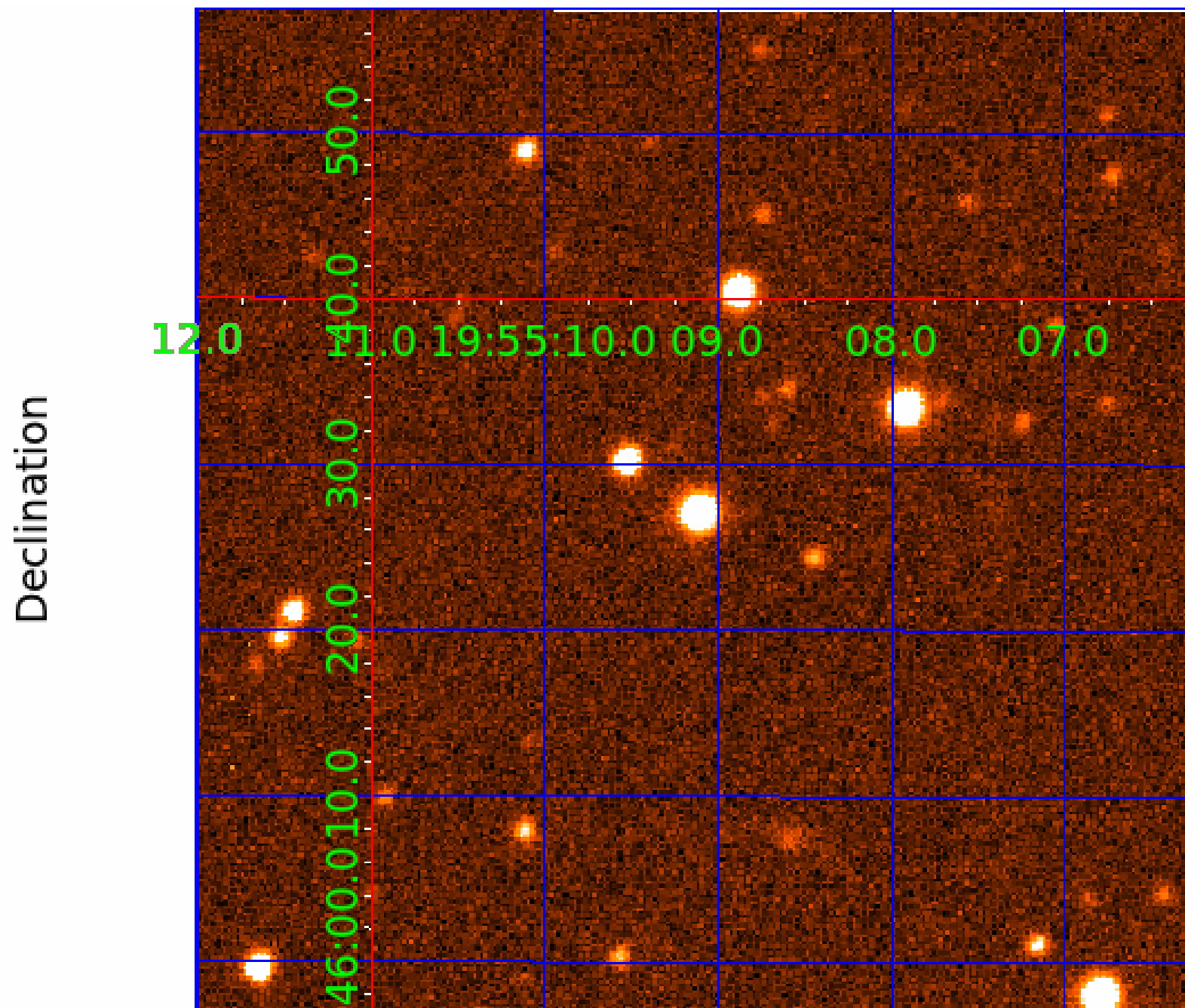
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



UKIRT Image





# KIC 009301506

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009301506-01	OBS	3047.01	0.605224	131.754469	214.2	0.942	14.6	19.2	0.76	5089	1.44	2113.16
009301506-02	OBS	No	0.605216	132.067058	122.0	1.005	10.9	11.9	0.76	5089	1.02	2113.20

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009301506-01	OBS	FP	0.00	0	1	1	0	MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE—CENT_RESOLVED_OFFSET—HALO_GHOST
009301506-02	OBS	FP	0.00	1	1	0	0	IS_SEC_TCE—CENT_KIC_POS

**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 009301506-02

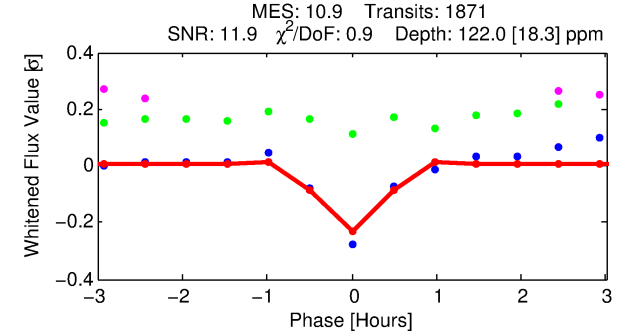
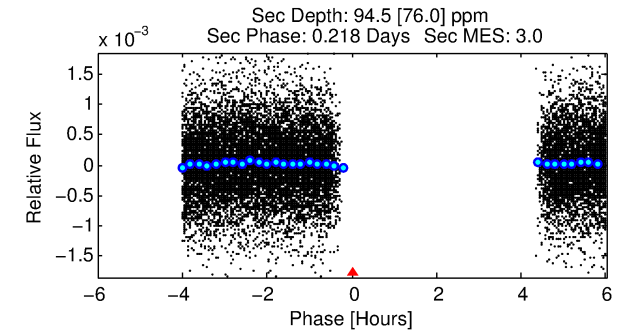
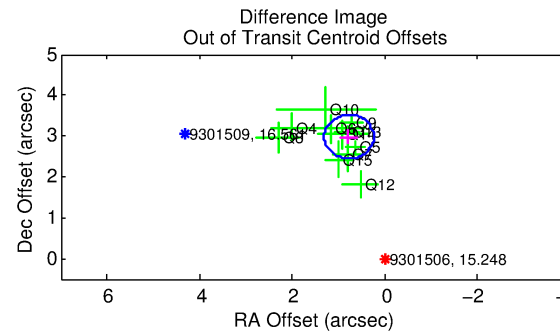
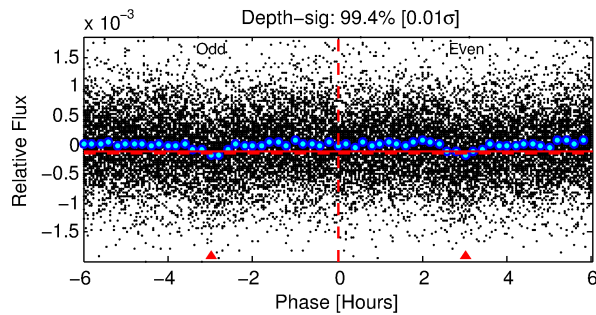
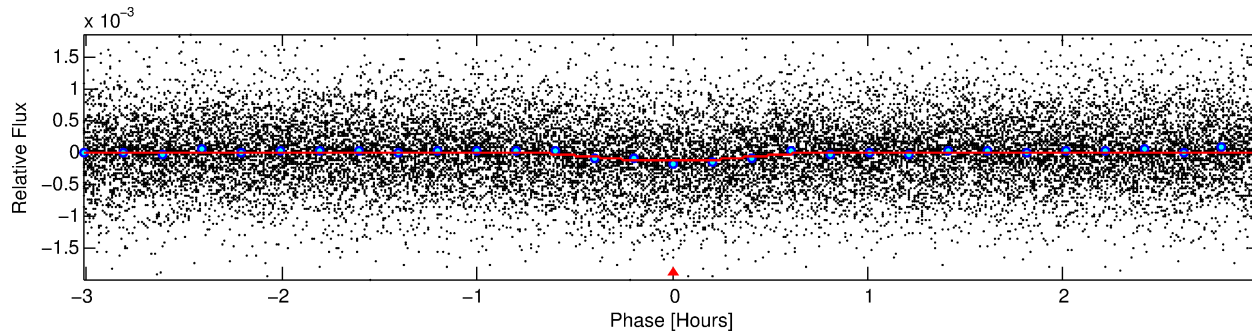
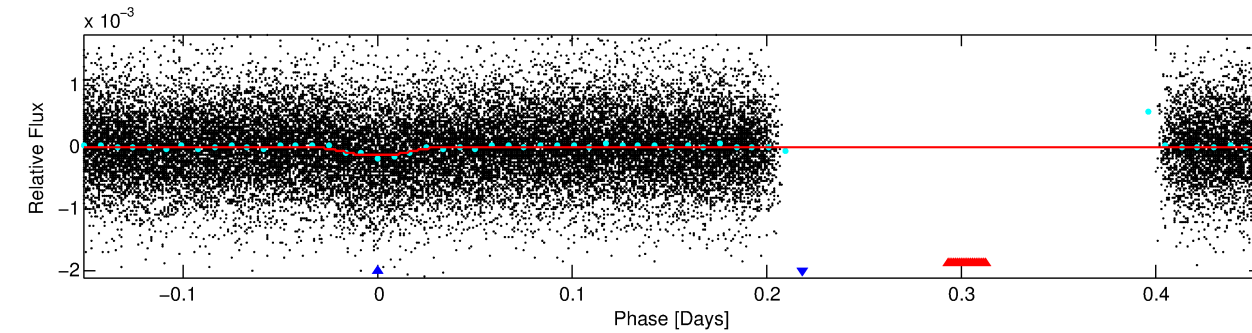
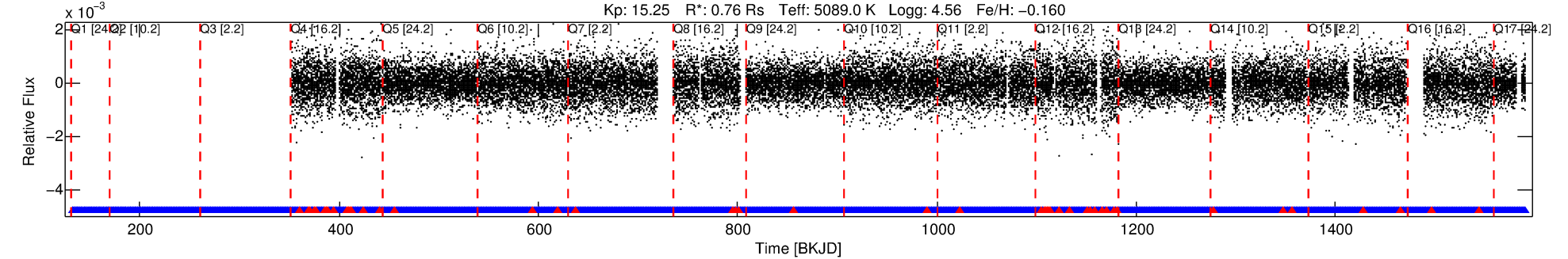
No Significant Match Found

# DV One-Page Summary

KIC: 9301506 Candidate: 2 of 2 Period: 0.605 d

KOI: K03047 Corr: No Ephemeris Match

Kp: 15.25 R\*: 0.76 Rs Teff: 5089.0 K Logg: 4.56 Fe/H: -0.160



## DV Fit Results:

Period = 0.60522 [0.00001] d  
Epoch = 132.0671 [0.0015] BKJD  
Rp/R\* = 0.0124 [0.0112]  
a/R\* = 2.33 [7.00]  
b = 0.90 [0.80]  
Seff = 2113.20 [392.06]  
Teq = 1729 [80] K  
Rp = 1.02 [0.93] Re  
a = 0.0128 [0.0012] AU  
Ag = 8.07 [15.93] [0.44σ]  
Teffp = 4505 [2224] K [1.25σ]

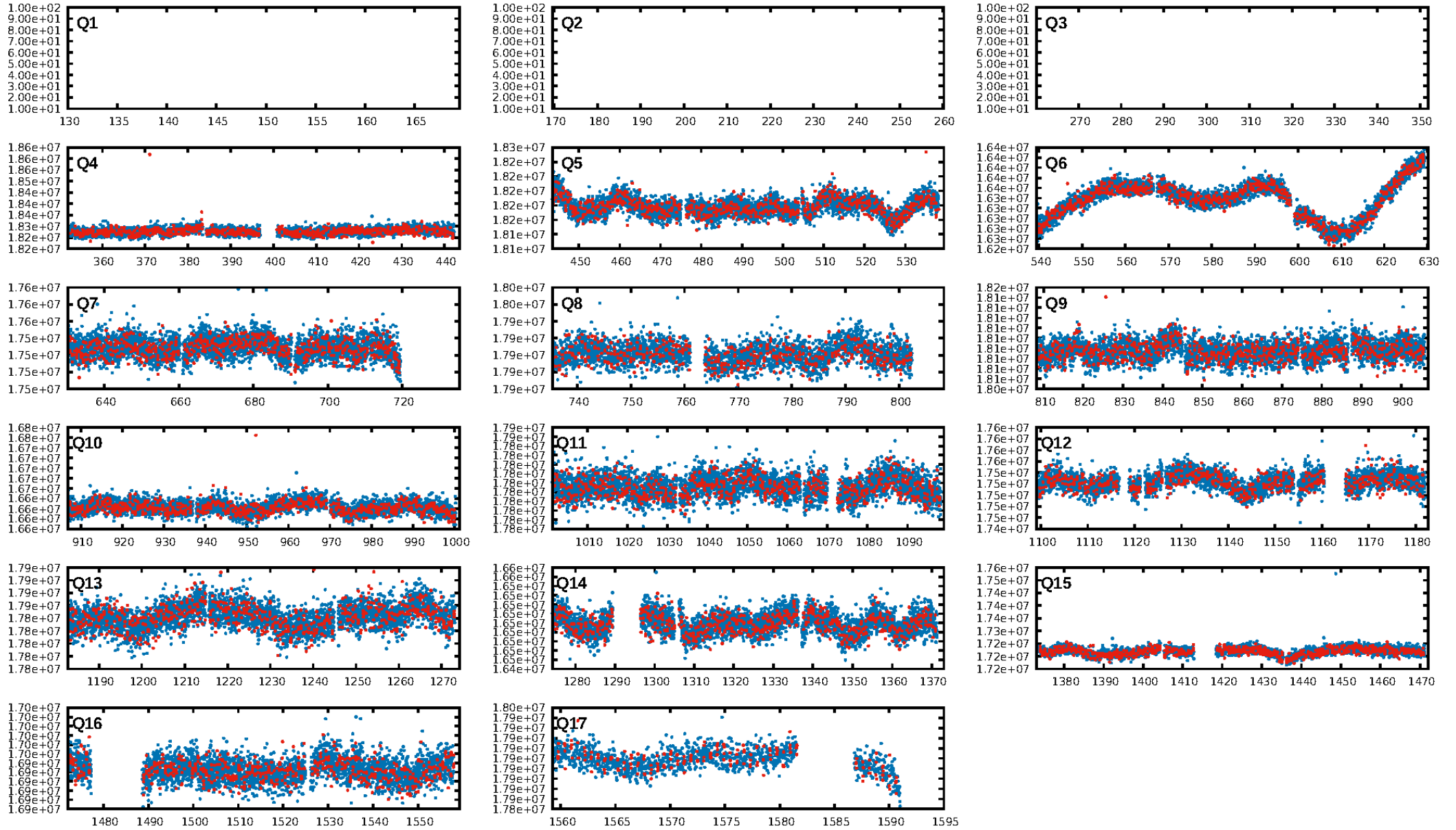
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.0% [0.00σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 8.80e-34  
RollingBand-fgt: 0.97 [1777/1827]  
GhostDiagnostic-chr: 0.608  
Centroid-sig: 0.0%  
Centroid-so: 3.949 arcsec [4.60σ]  
OotOffset-rm: 3.080 arcsec [17.24σ]  
KicOffset-rm: 4.087 arcsec [22.91σ]  
OotOffset-st: 3/2/3/3 [11]  
KicOffset-st: 3/2/3/3 [11]  
DiffImageQuality-fgm: 1.00 [11/11]  
DiffImageOverlap-fno: 1.00 [14/14]

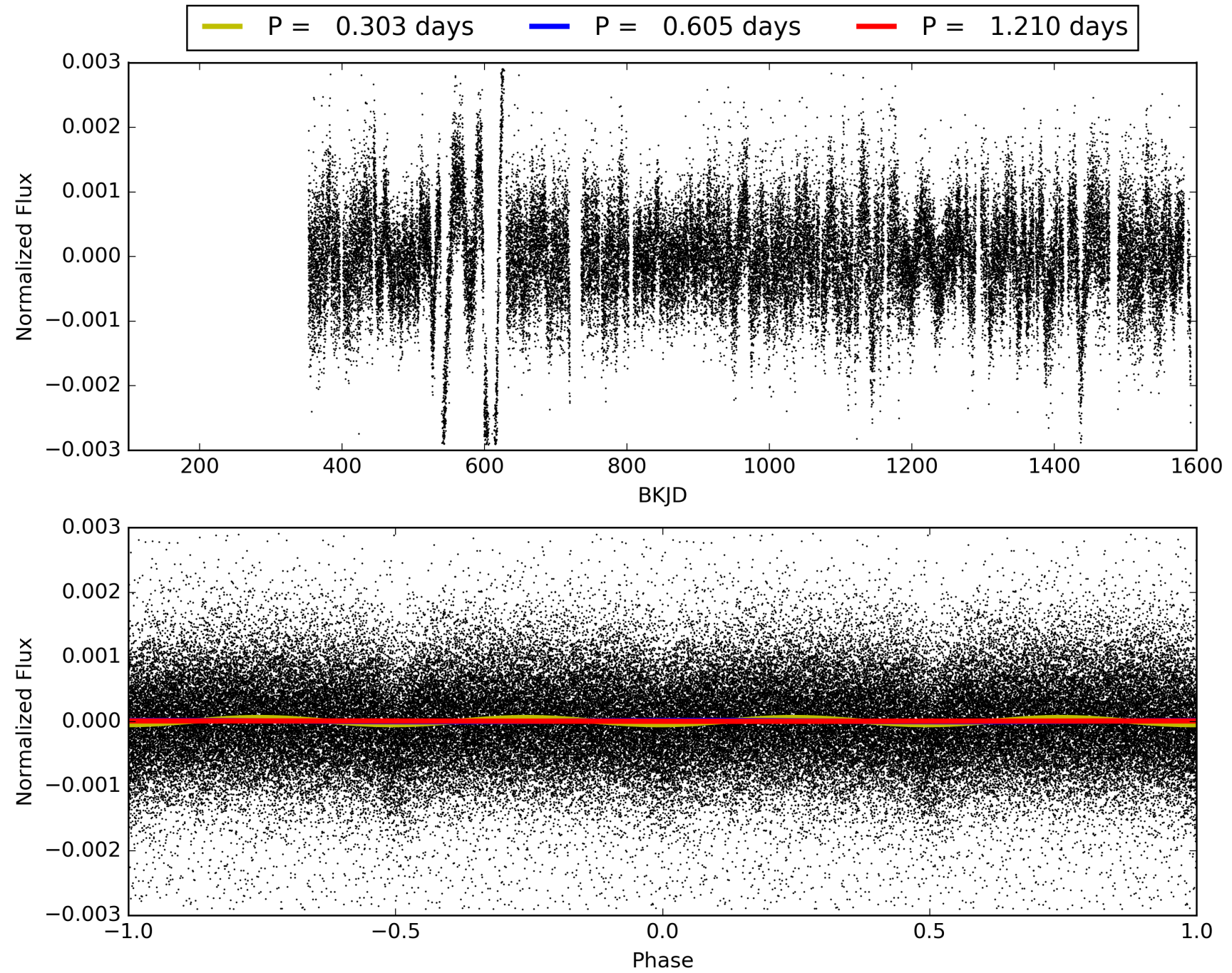
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 09:45:15 Z

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

# TCE 009301506-02, PDC Light Curves



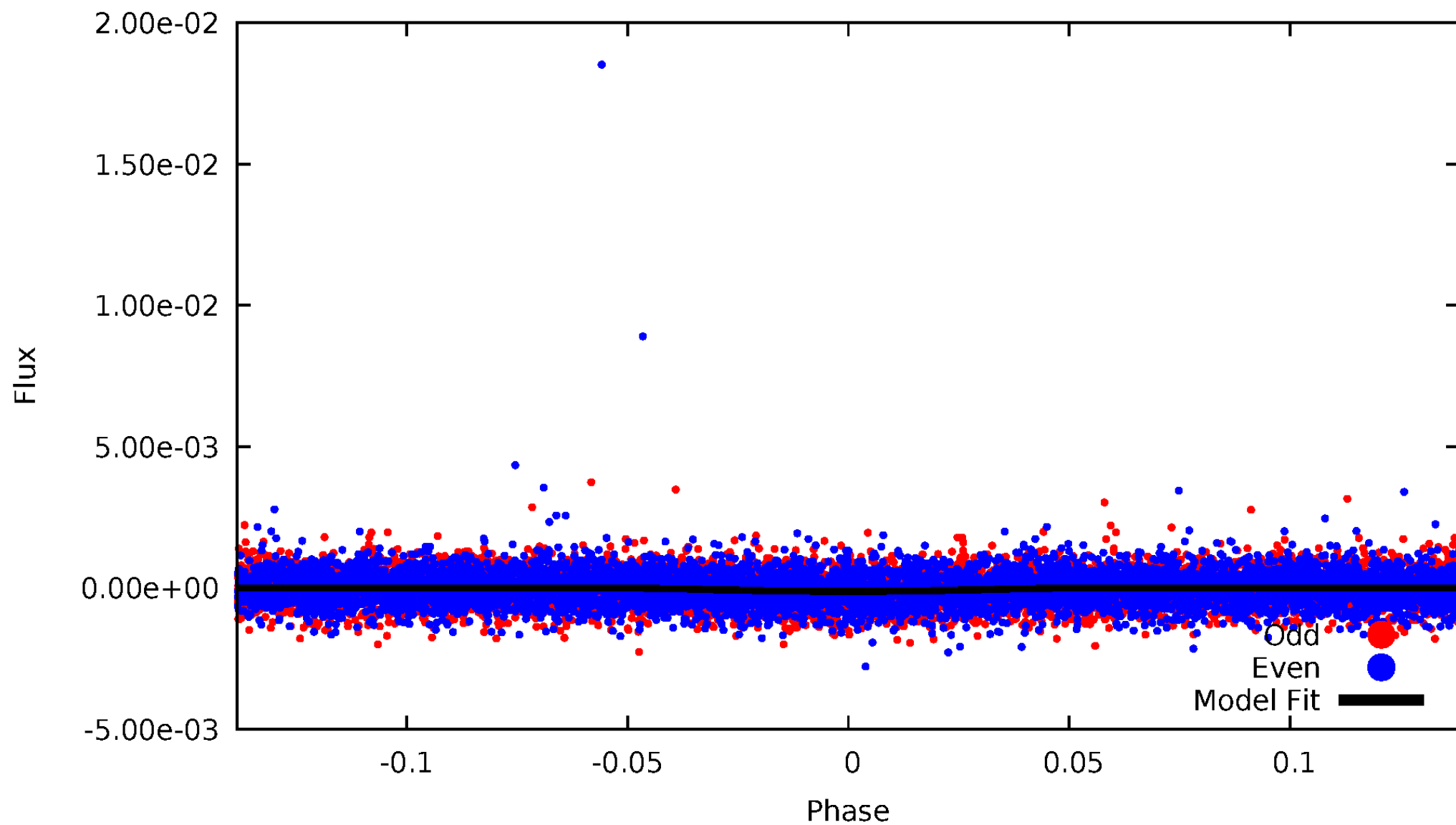
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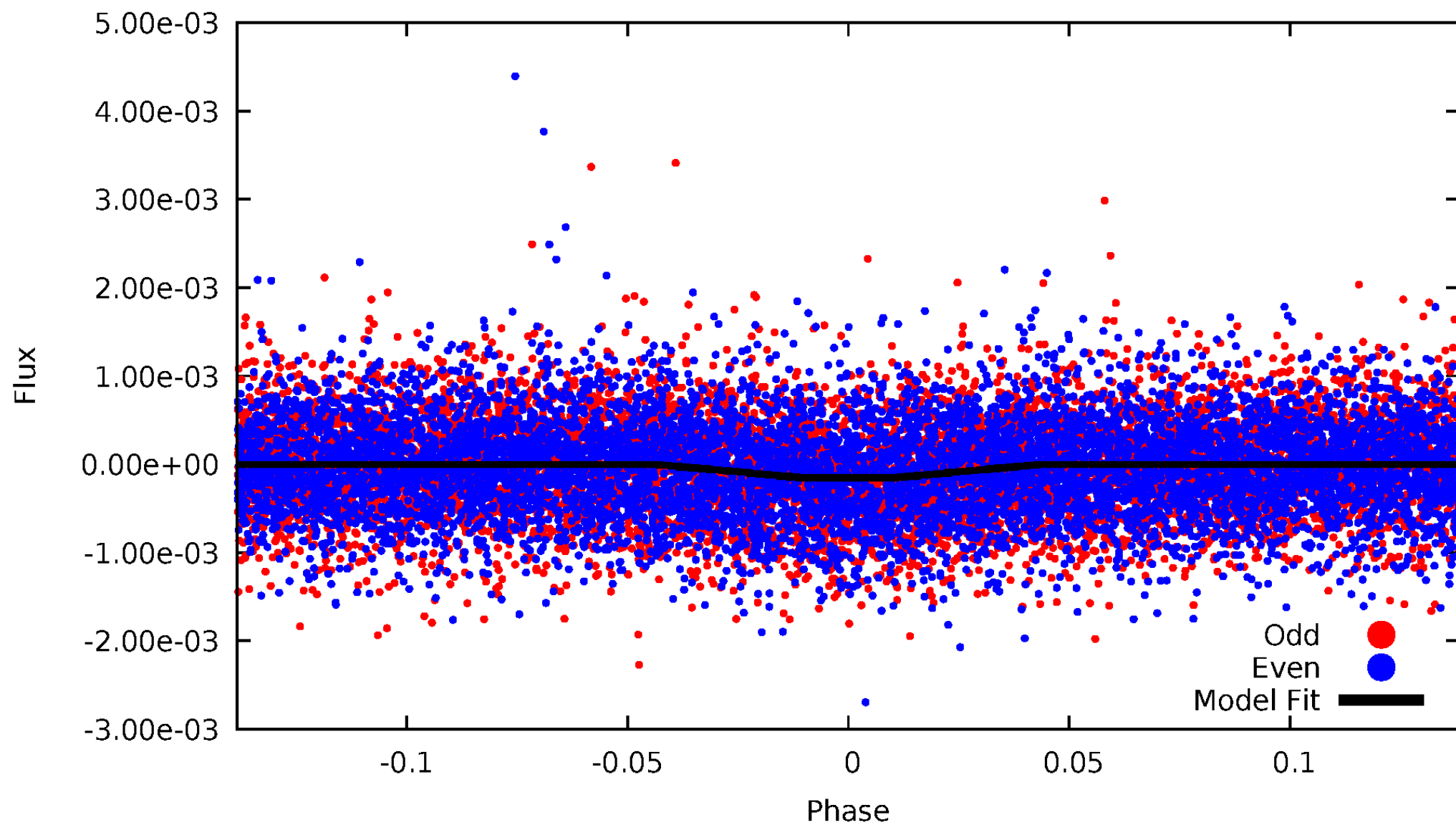
# DV Odd/Even

TCE 009301506-02



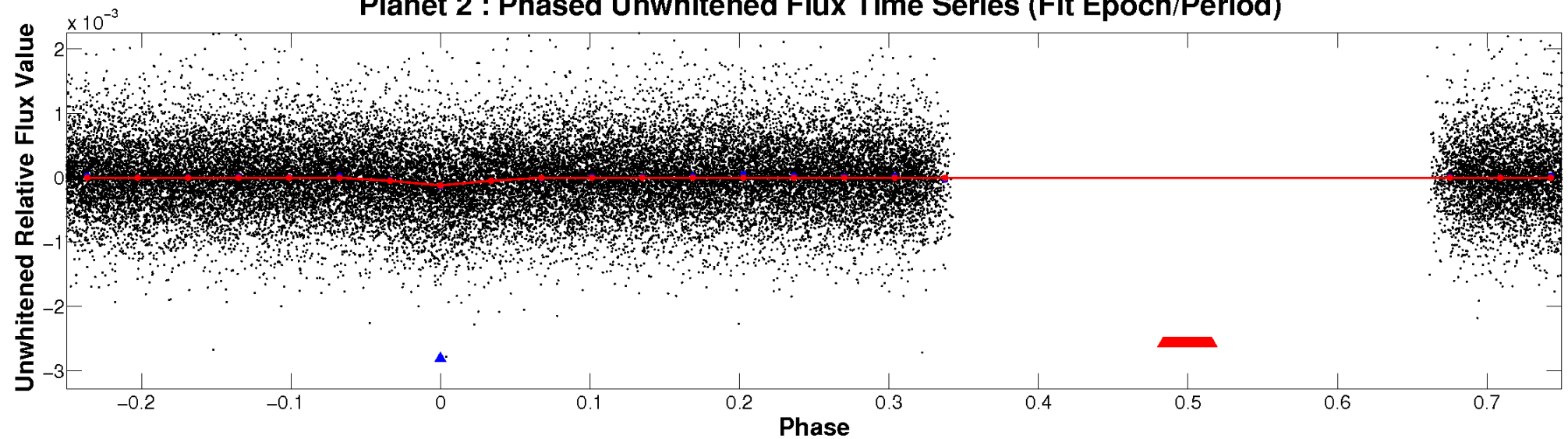
# ALT Odd/Even

TCE 009301506-02

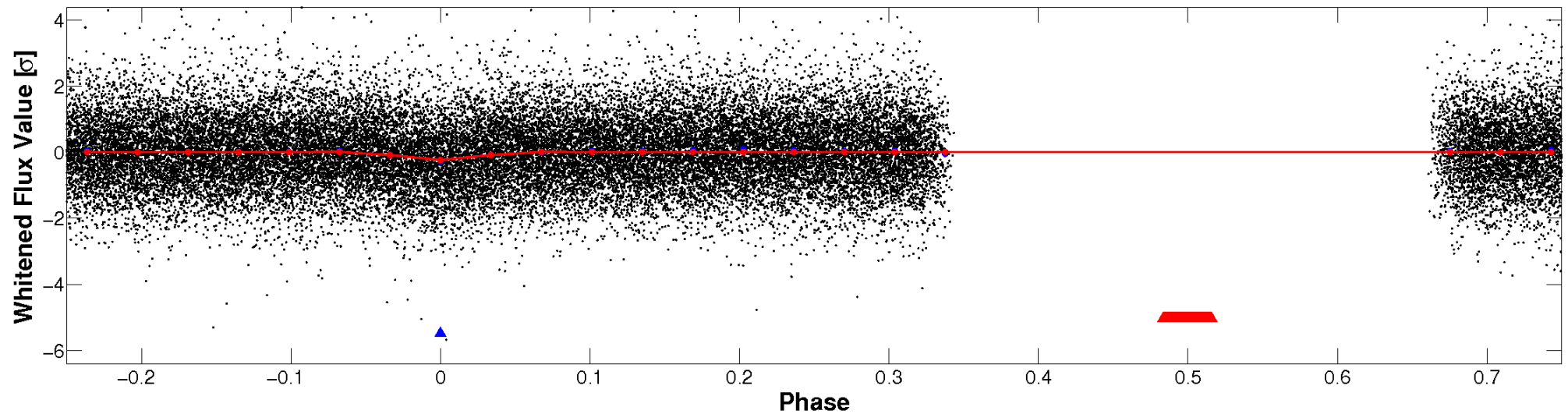


# Non-Whitened Vs. Whitened Light Curve

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

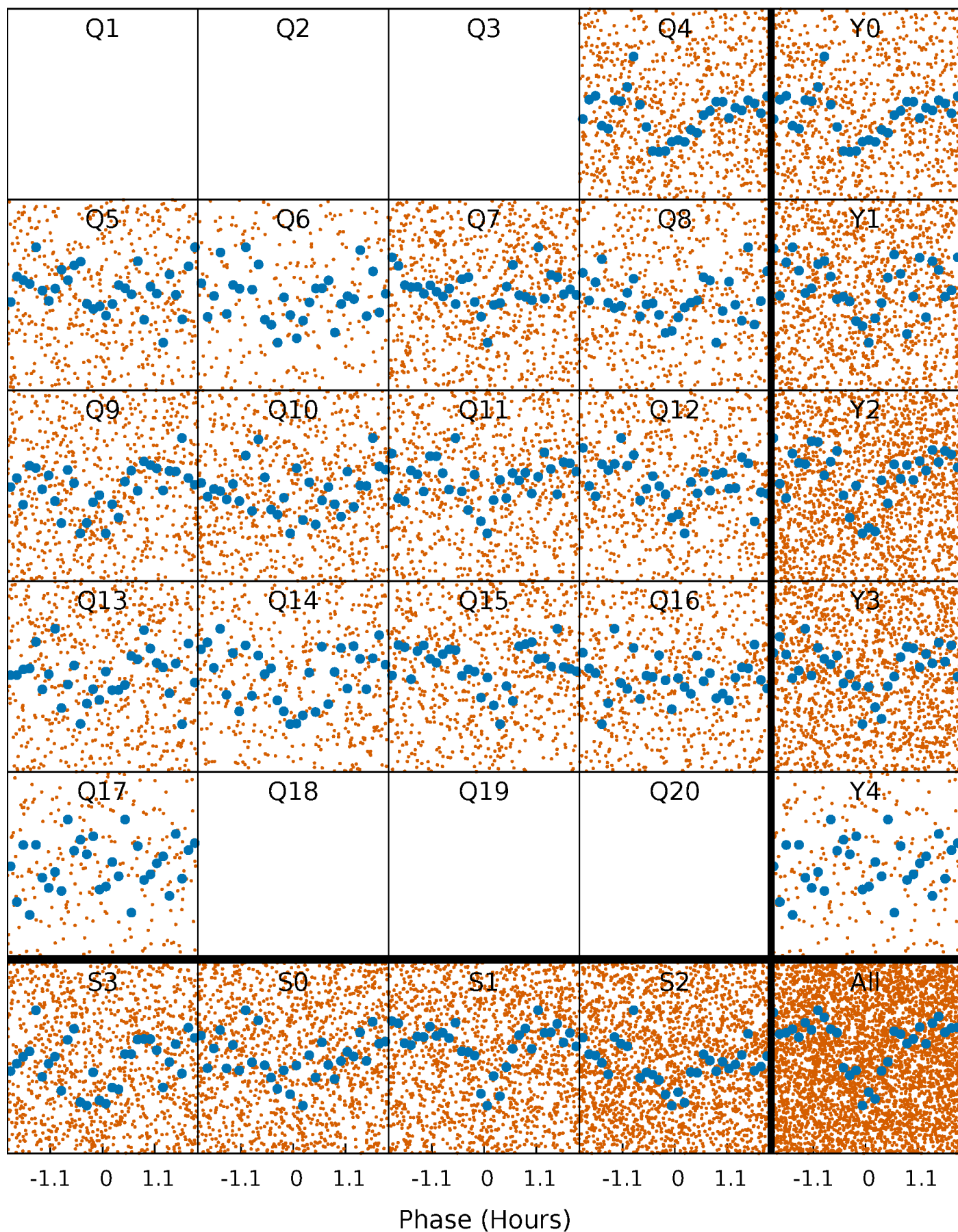


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

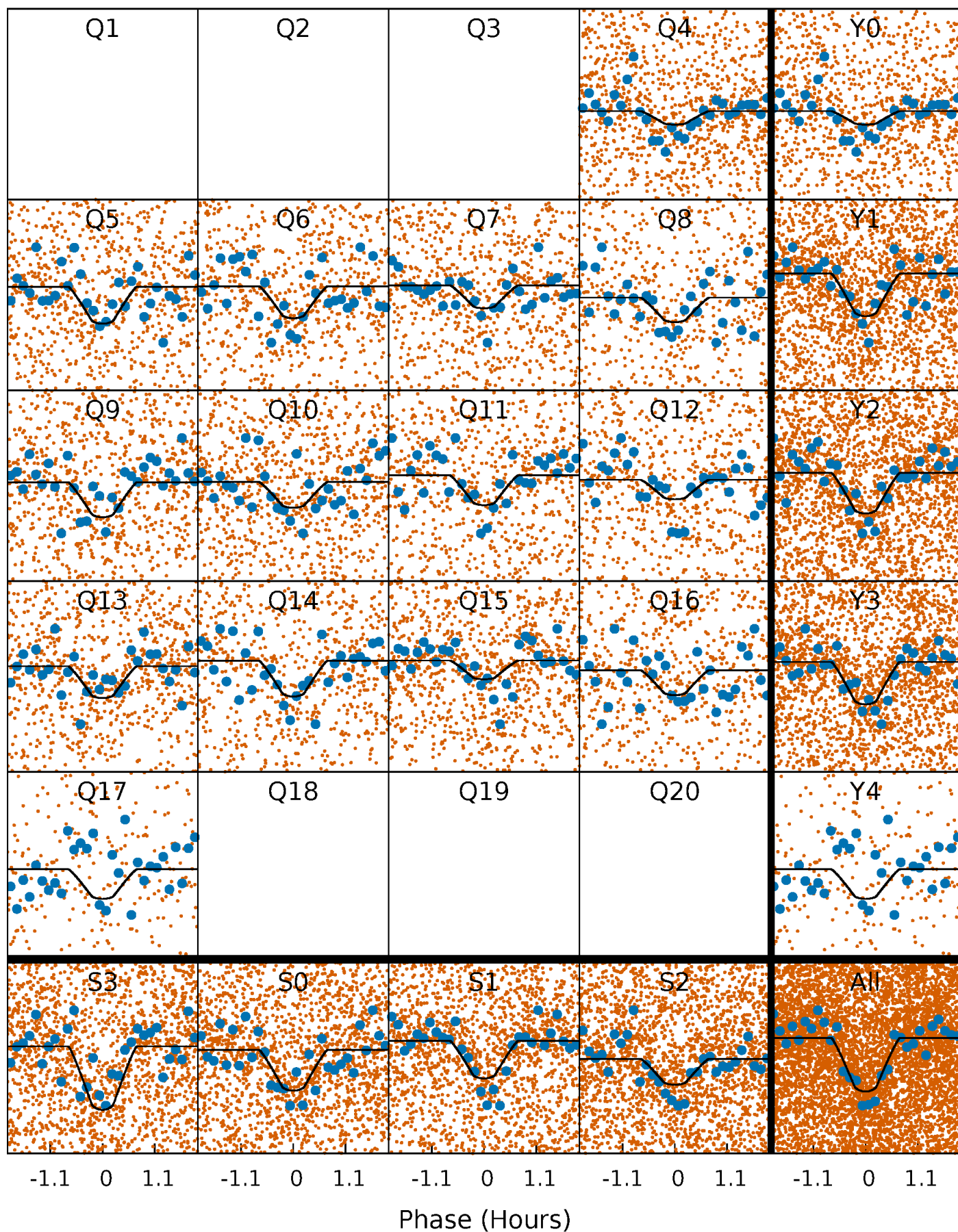
TCE 009301506-02 P= 0.605216 Days  $T_0=132.067058$  (BKJD)





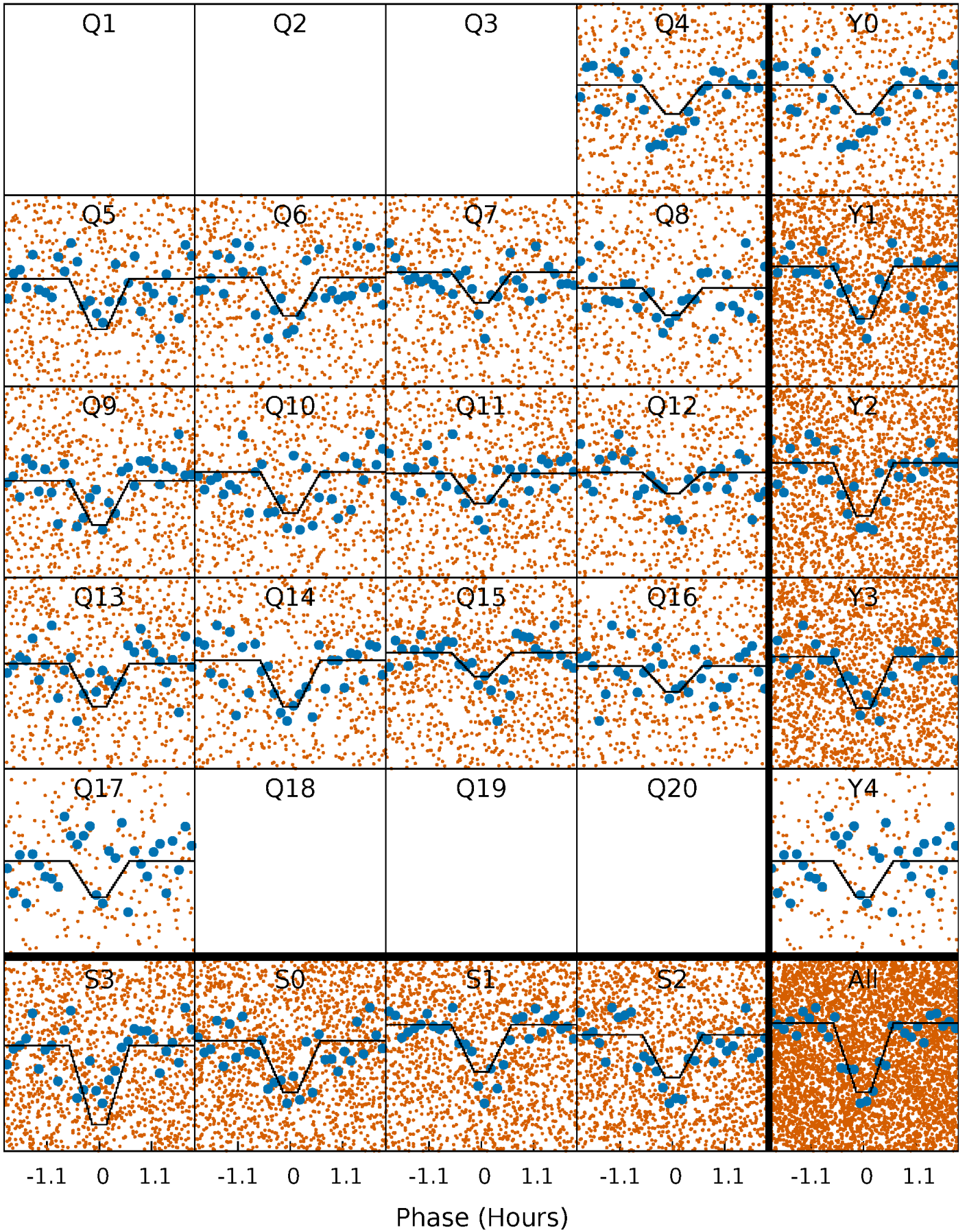
# DV Quarter-Phased Transit Curves

TCE 009301506-02     $P = 0.605216$  Days     $T_0 = 132.067058$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 009301506-02 P= 0.605216 Days  $T_0=132.067058$  (BKJD)

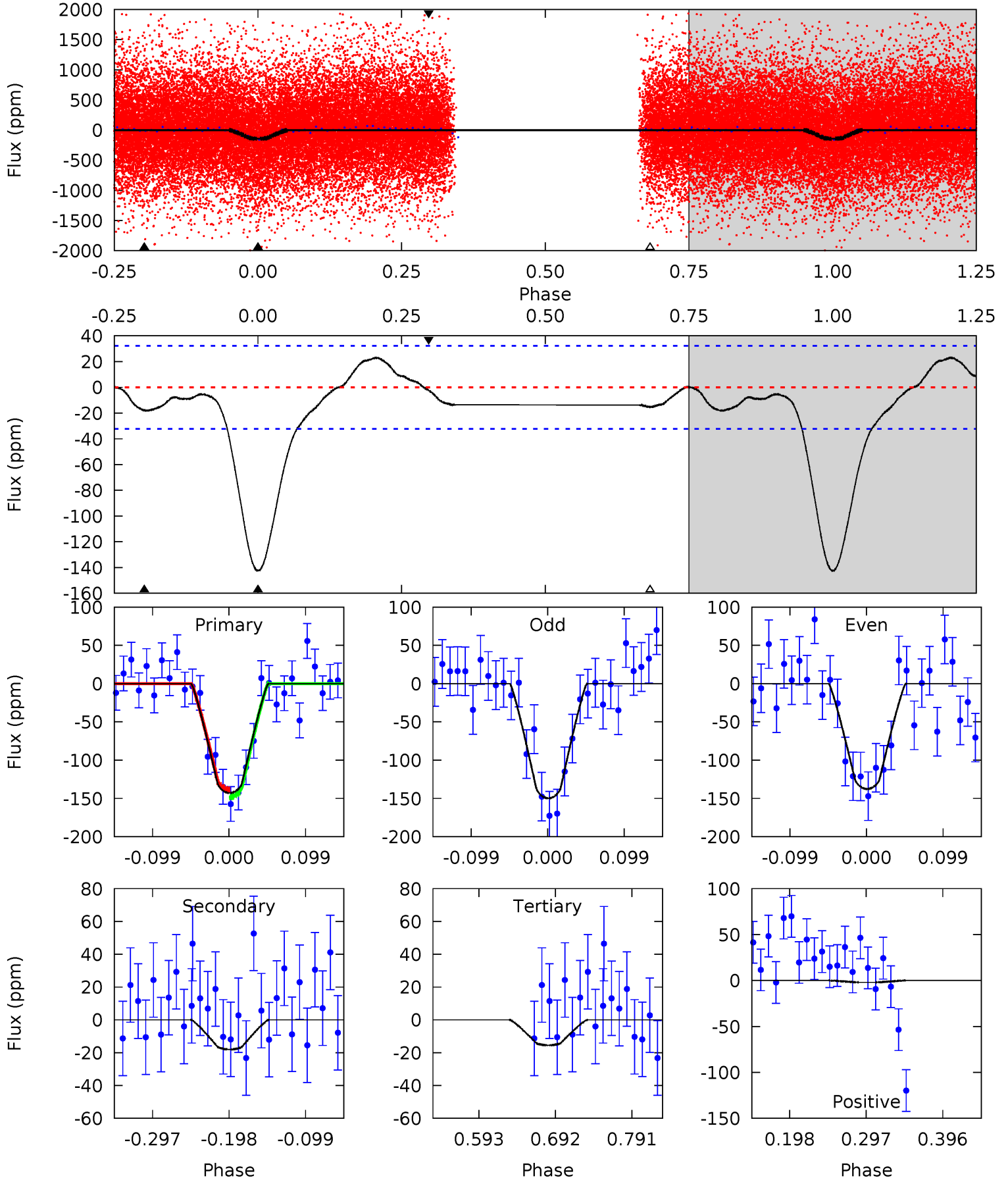




# DV Model-Shift Uniqueness Test

009301506-02, P = 0.605216 Days, E = 132.067058 Days

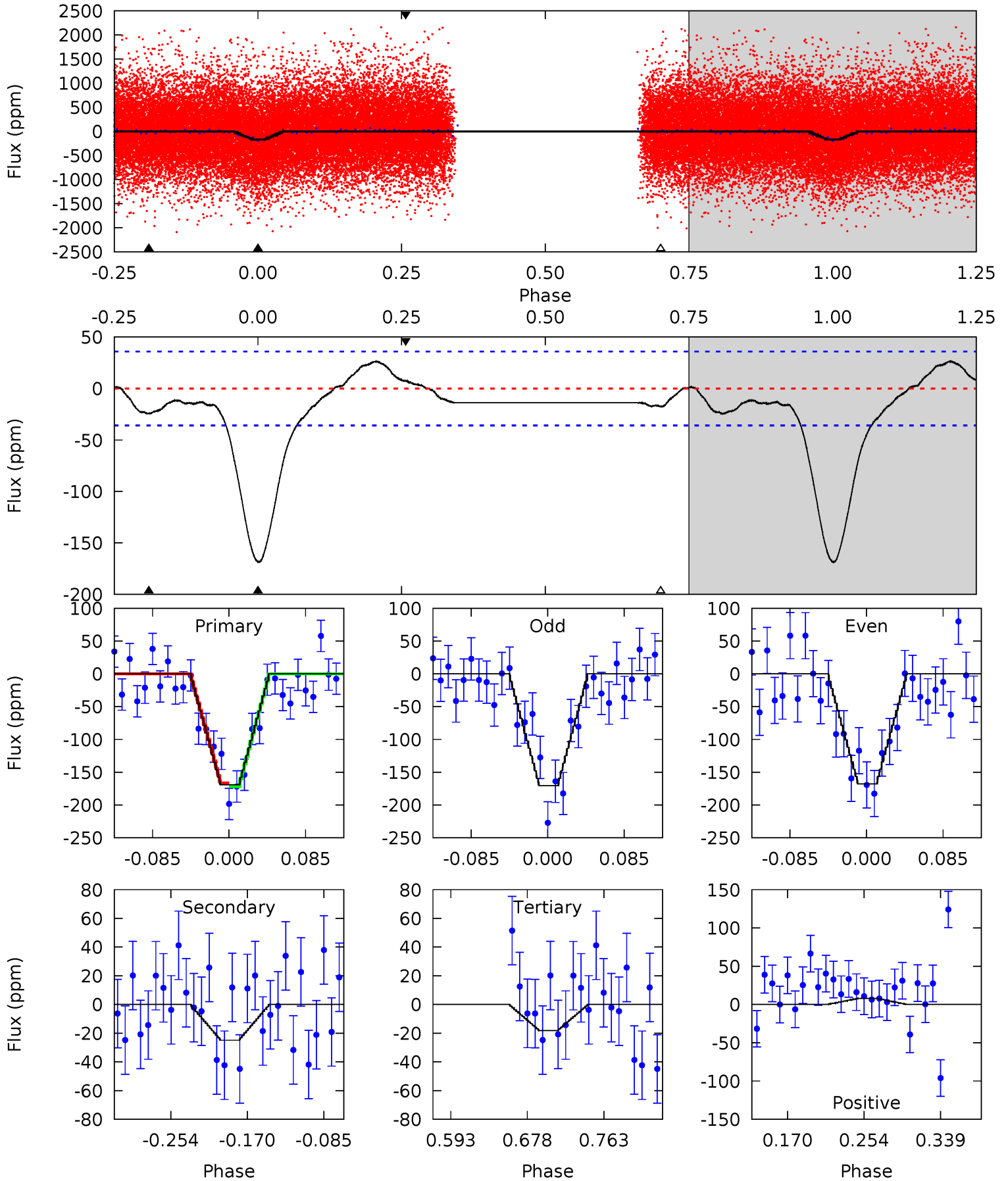
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
20.2	2.55	2.19	-0.30	4.57	1.65	1.68	18.0	20.5	0.36	2.85	0.86	1.10	0.14	0.69



# Alt Model-Shift Uniqueness Test

009301506-02, P = 0.605216 Days, E = 132.067058 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
21.7	3.19	2.32	1.03	4.60	1.72	1.75	19.3	20.6	0.86	2.16	0.17	0.99	0.14	0.37



### Stellar Parameters For KIC 009301506

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5089^{+179}_{-179}$	$4.559^{+0.060}_{-0.060}$	$-0.160^{+0.300}_{-0.300}$	$0.757^{+0.089}_{-0.073}$	$0.757^{+0.090}_{-0.065}$	$2.461^{+0.675}_{-0.530}$
	+4%/-4%	+1%/-1%	+188%/-188%	+12%/-10%	+12%/-9%	+27%/-22%
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 009301506-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-18 \pm 7$	$1.19^{+0.86}_{-0.74}$	$2412^{+109}_{-104}$	$3102^{+1423}_{-990}$	$1.079^{+7.121}_{-0.739}$
Alt.	$-25 \pm 8$	$1.25^{+0.79}_{-0.77}$	$2419^{+109}_{-106}$	$3268^{+1387}_{-695}$	$1.419^{+7.929}_{-0.928}$

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

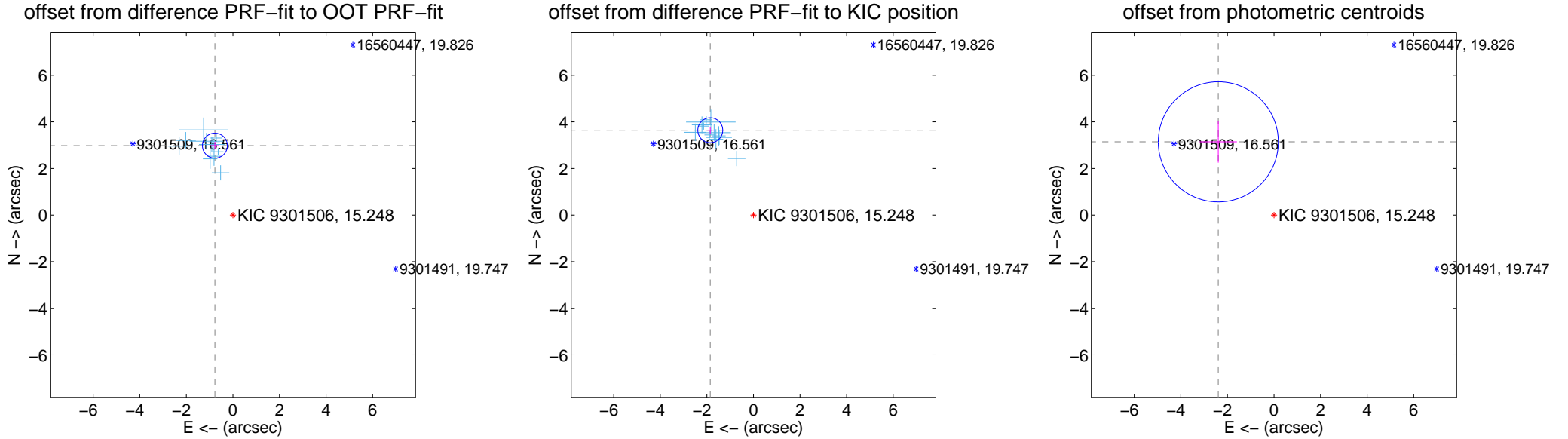
## DV Centroid Data

Supplemental centroid analysis for 009301506-02. Kepler magnitude: 15.25. Transit SNR 11.89

There are 11 quarters with good PRF difference image offsets

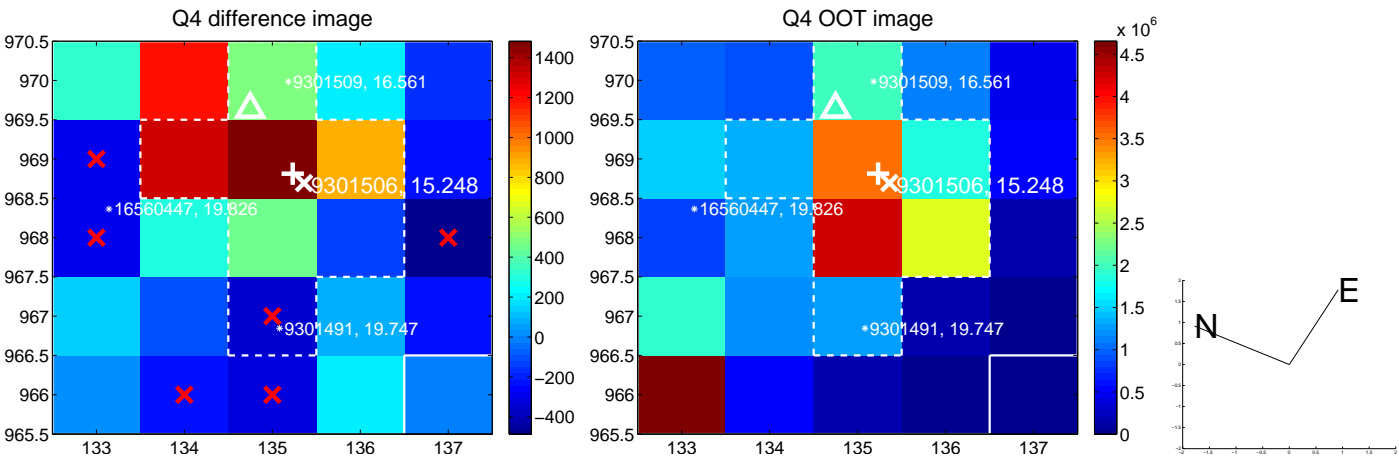
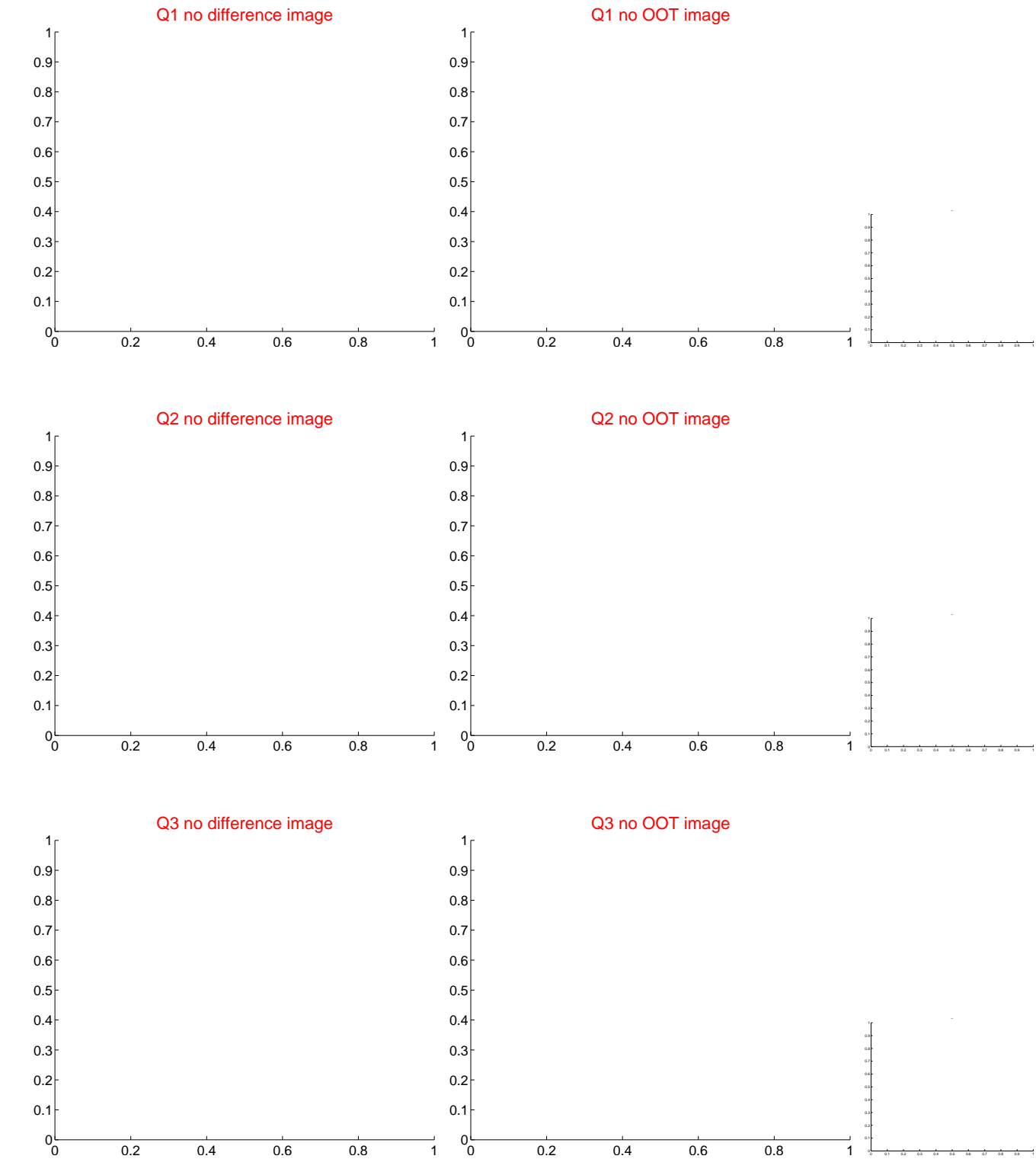
The direct PRF centroid is offset from the target star catalog position by about 1.05 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$3.080 \pm 0.179$	17.24	$0.773 \pm 0.179$	$2.981 \pm 0.164$
PRF-fit source offset from KIC position	$4.087 \pm 0.178$	22.91	$1.854 \pm 0.143$	$3.642 \pm 0.146$
photometric centroid source offset	$3.95 \pm 0.86$	4.60	$2.39 \pm 0.80$	$3.14 \pm 0.89$

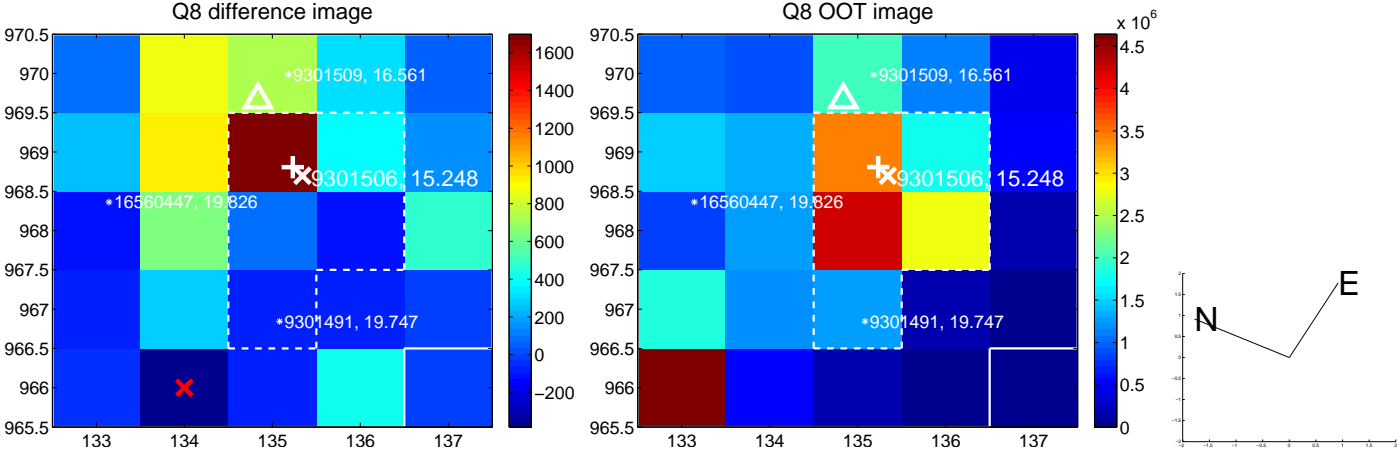
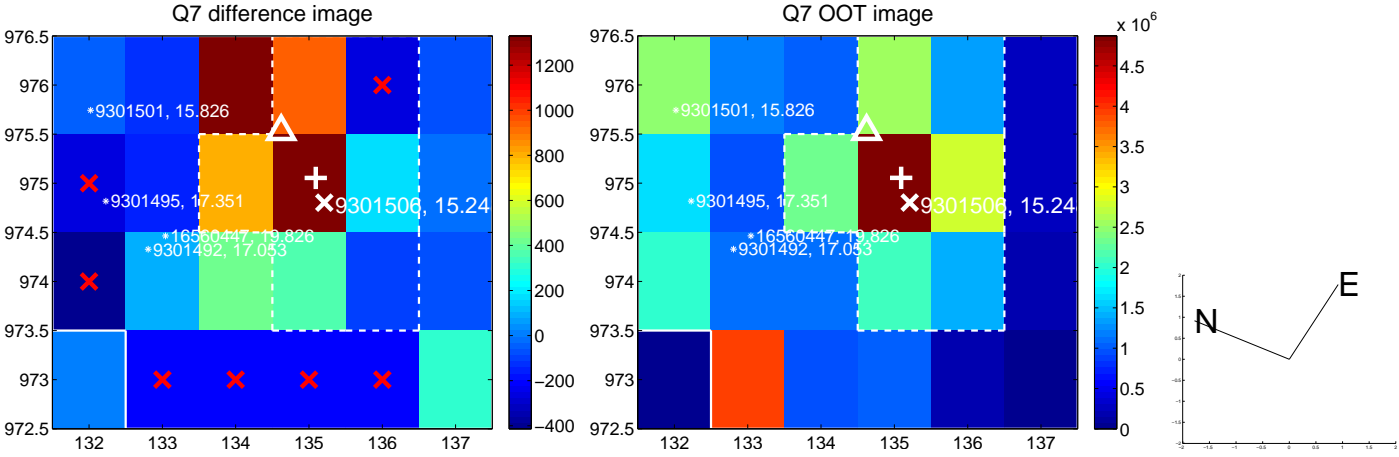
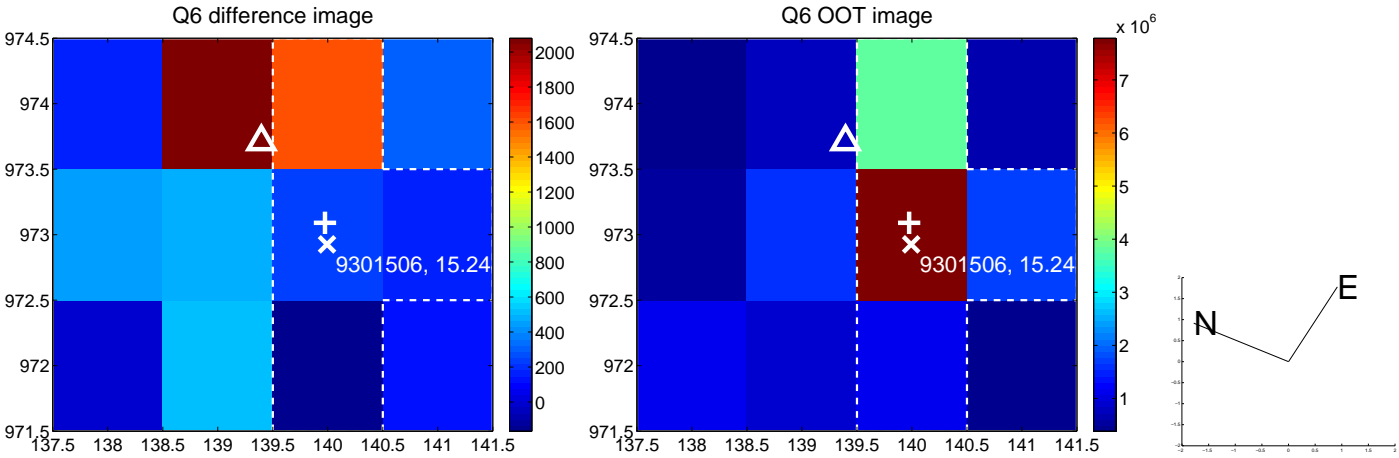
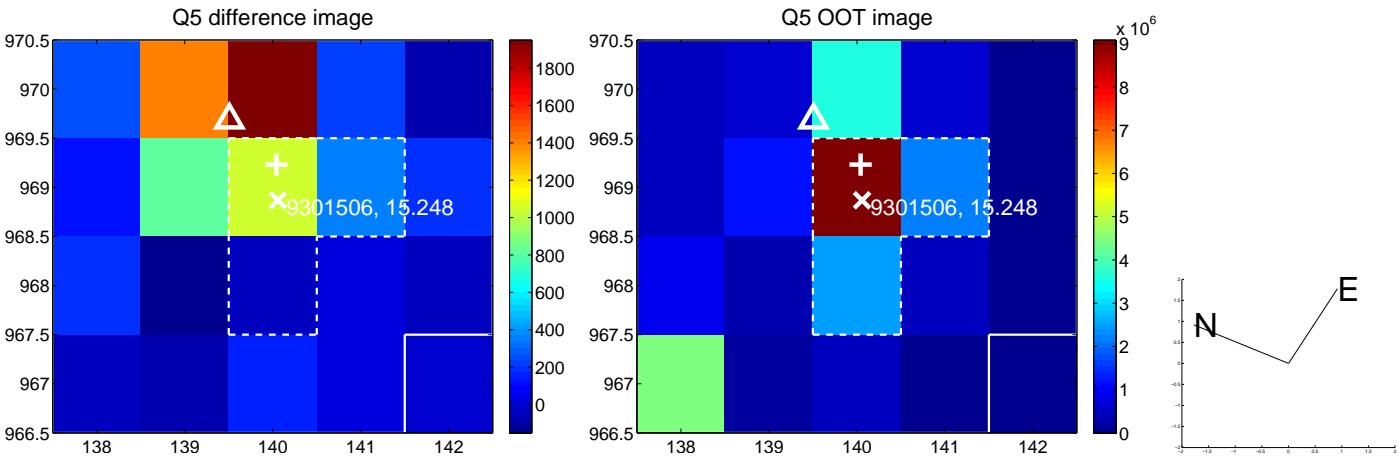


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

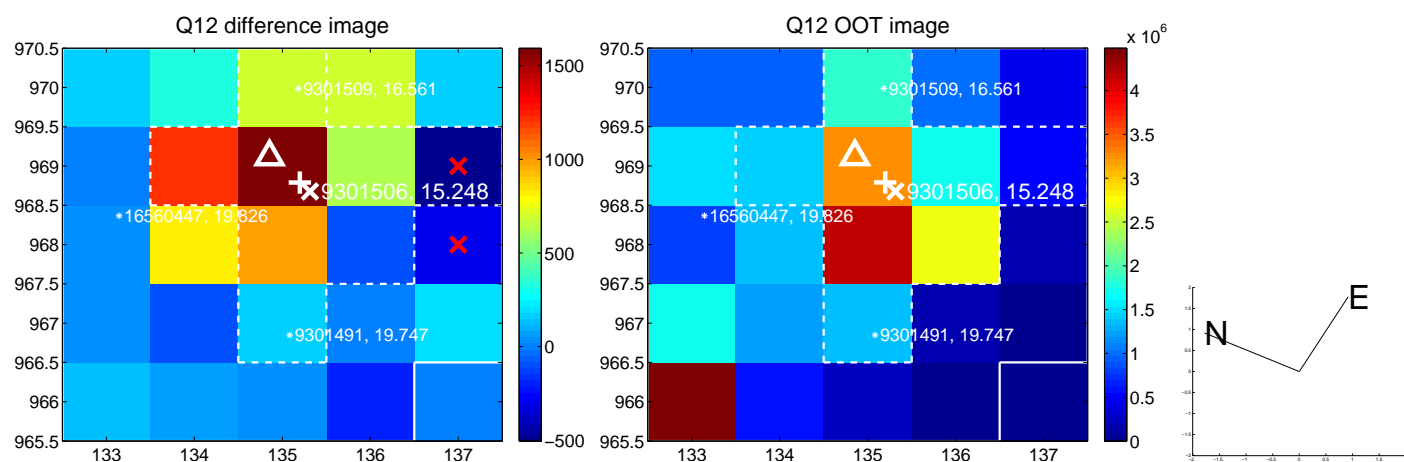
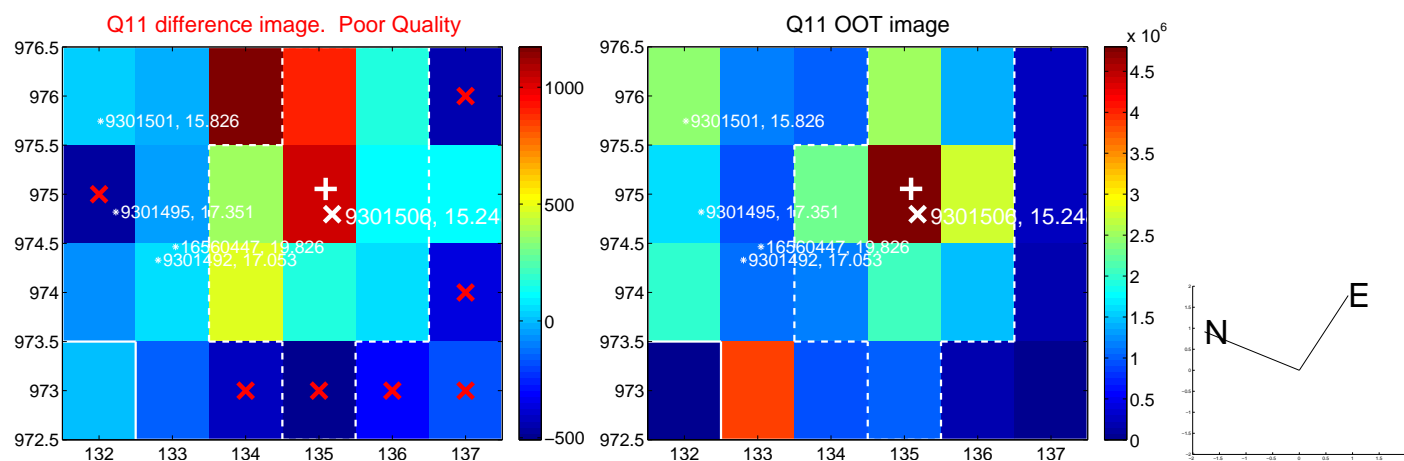
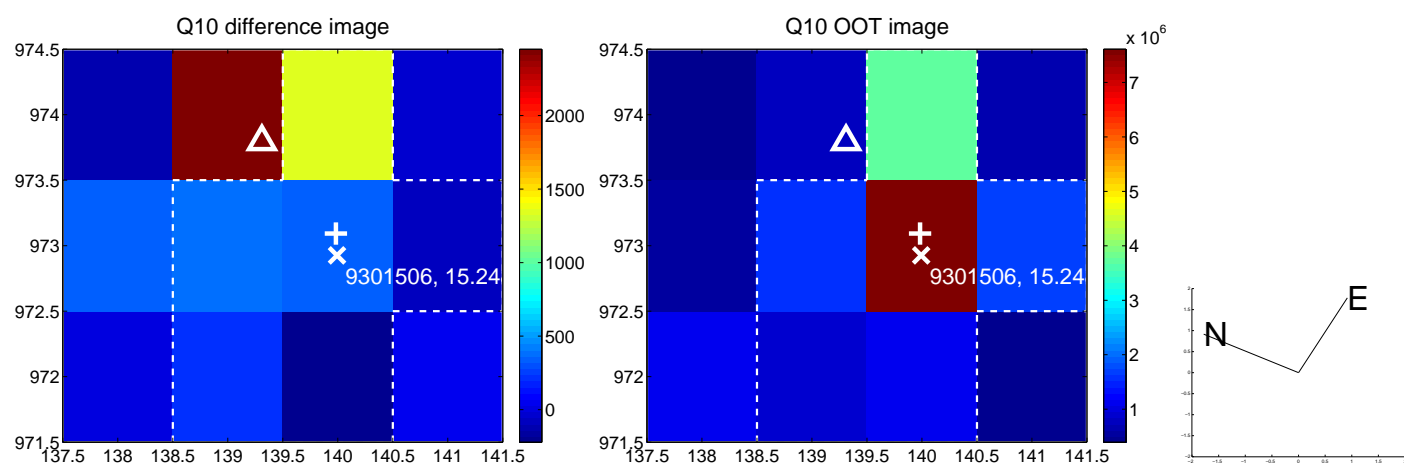
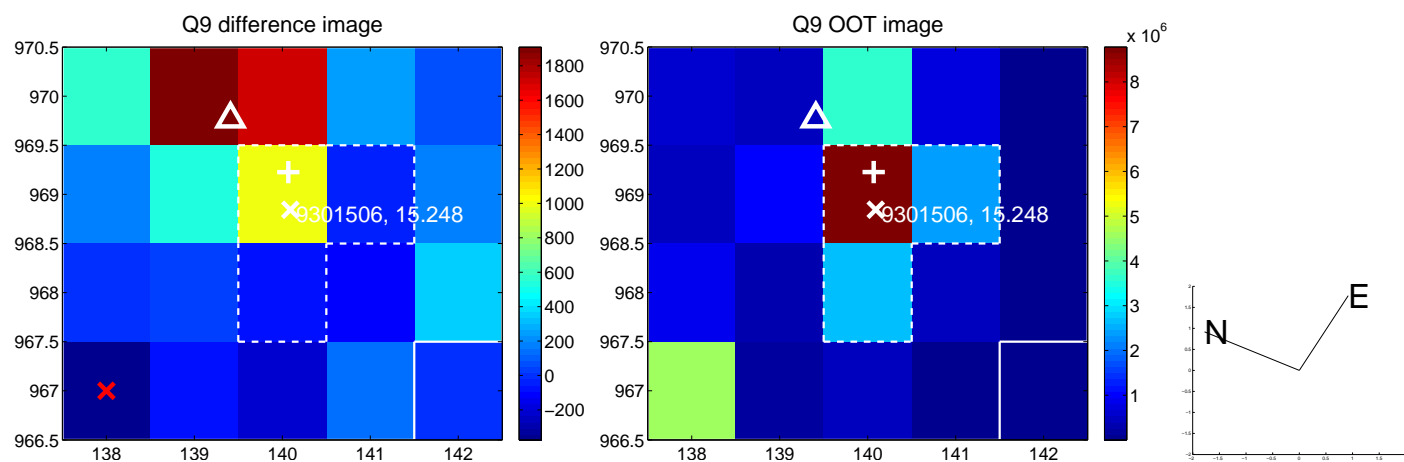


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

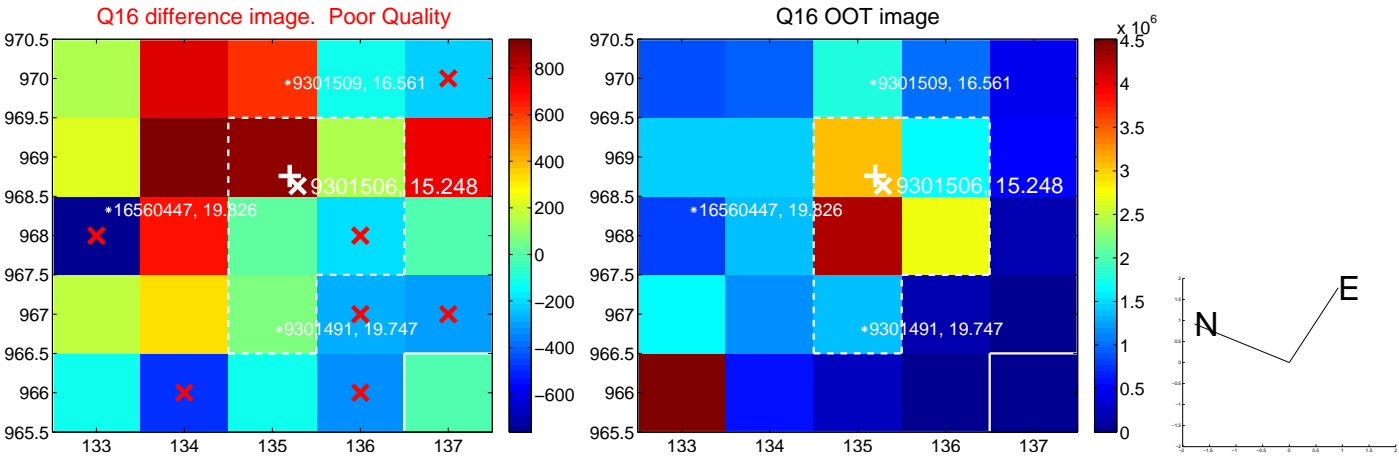
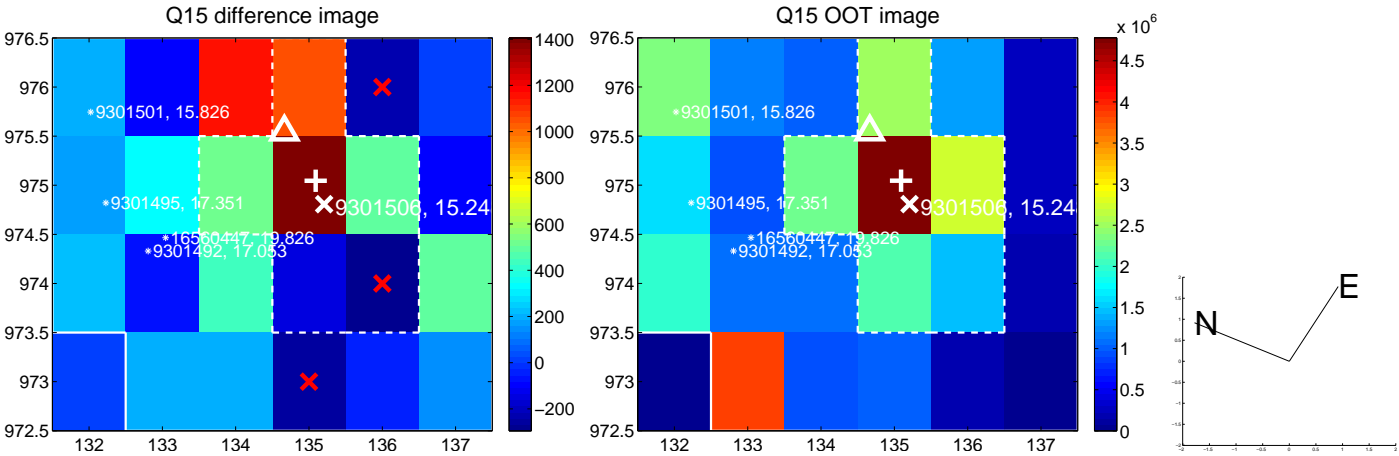
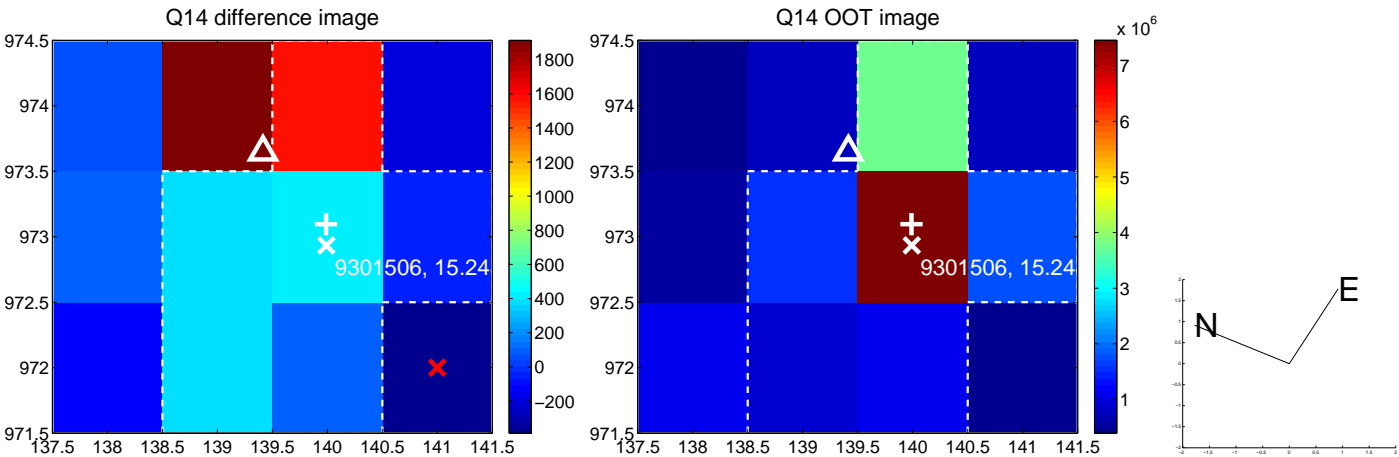
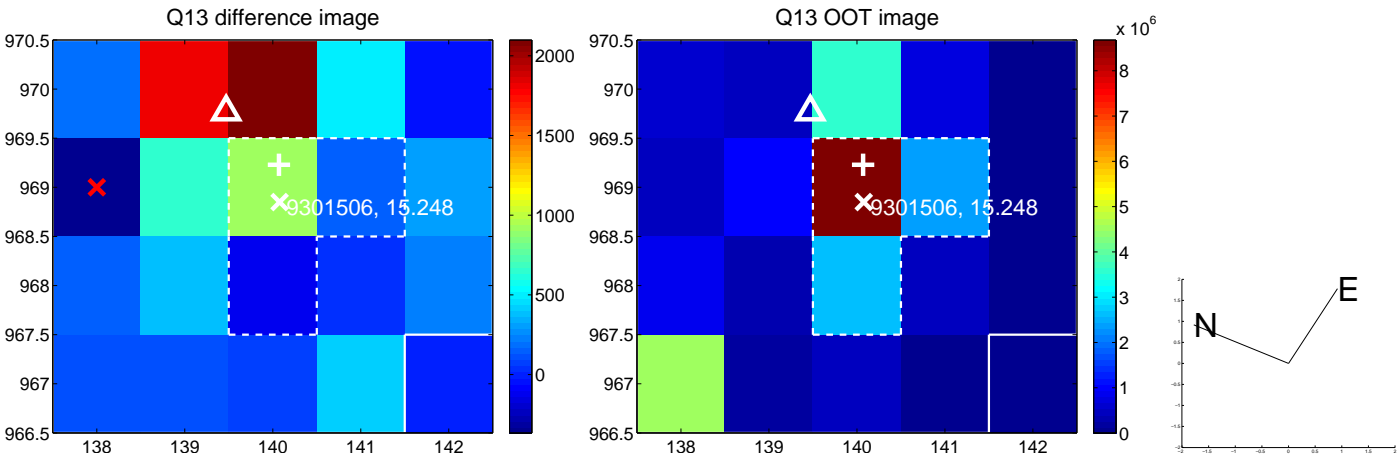




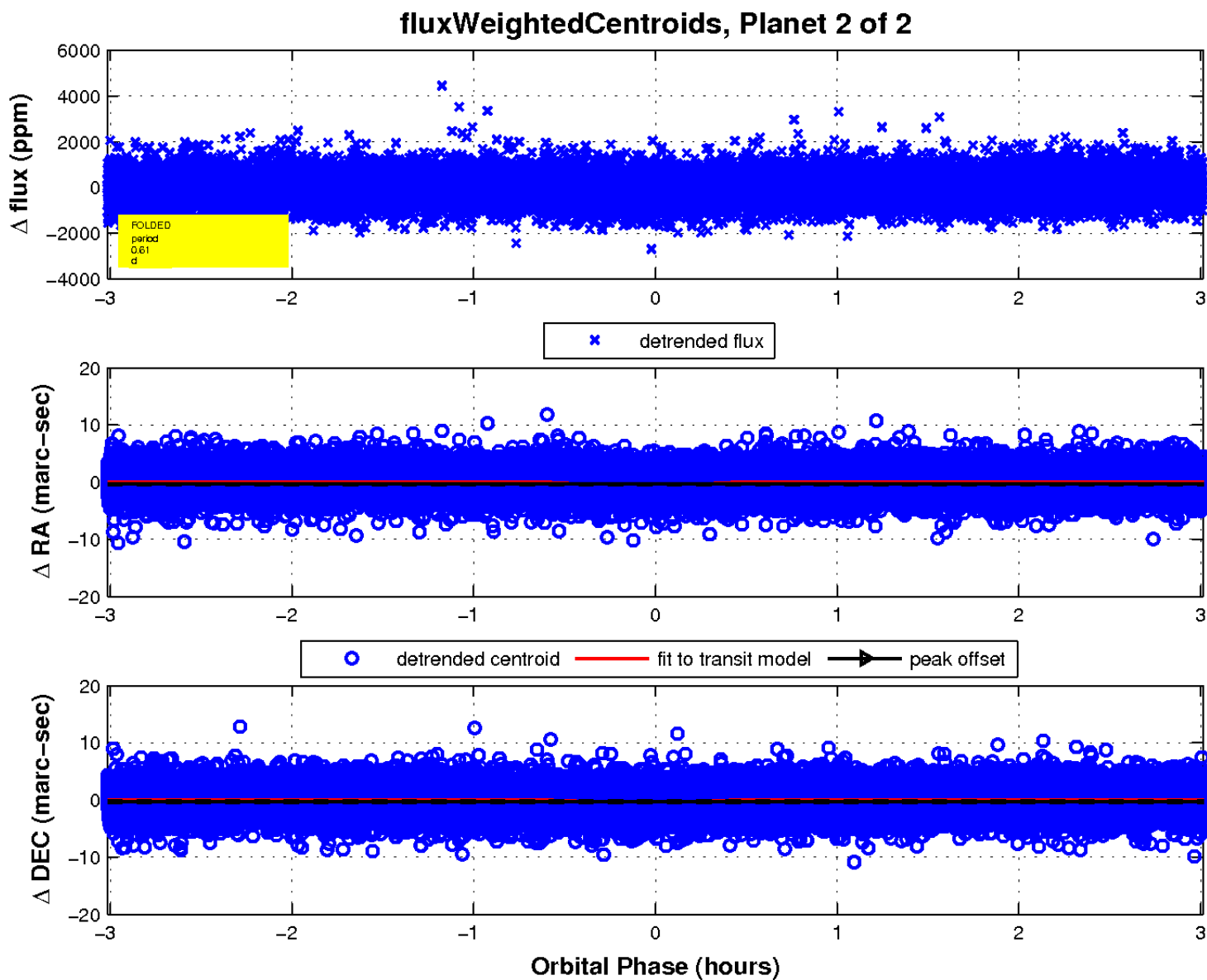
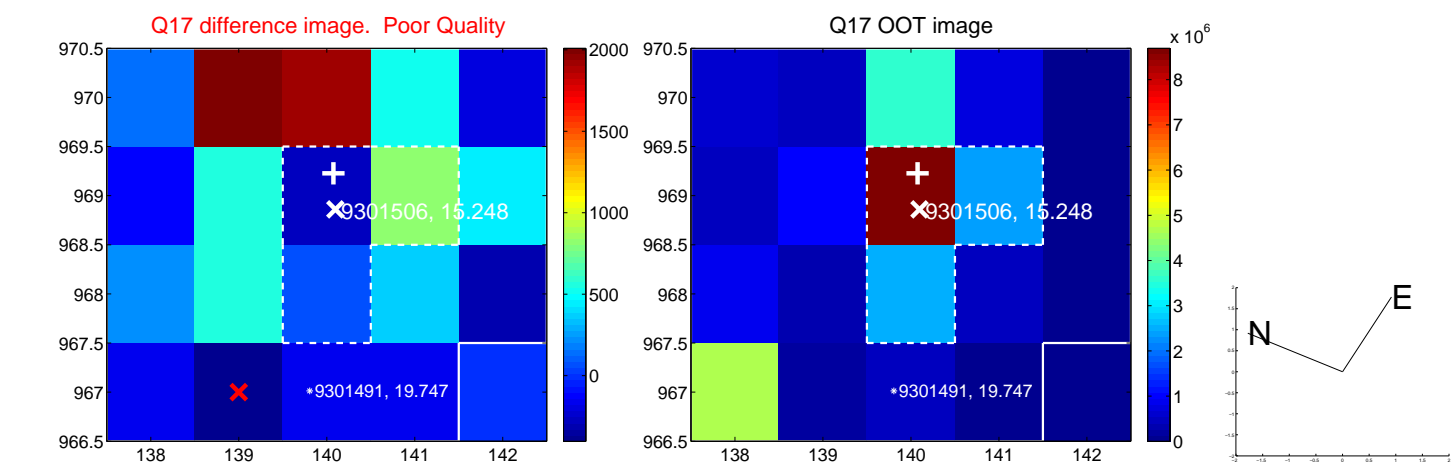
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UKIRT Image

