

# KIC 009471360

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009471360-01	OBS	No	6.349803	134.672450	49.4	16.556	8.9	8.3	2.76	7059	2.38	2508.76
009471360-02	OBS	No	3.174893	133.151036	49.1	11.941	11.4	11.4	2.76	7059	2.28	6321.71

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009471360-01	OBS	FP	0.00	1	0	0	0	LPP_DV—MOD_NONUNIQ_DV—CENT_SATURATED
009471360-02	OBS	FP	0.00	1	0	0	0	LPP_DV—SAME_NTL_PERIOD—CENT_SATURATED

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

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

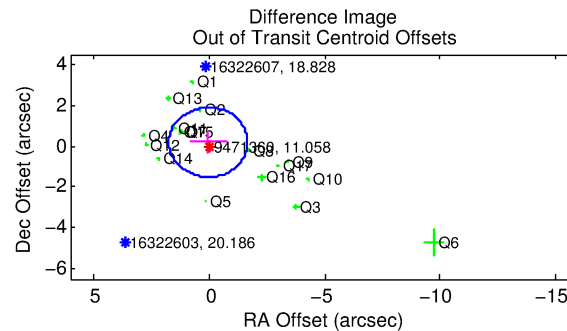
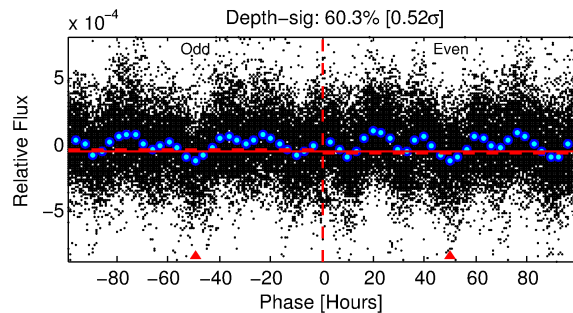
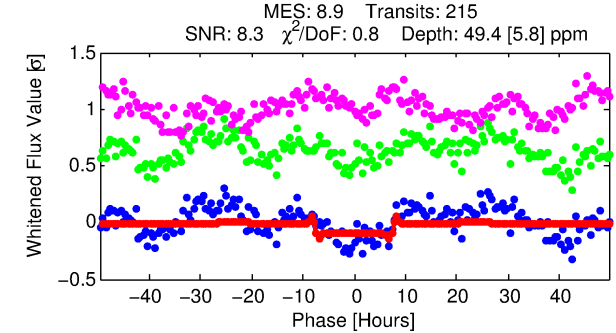
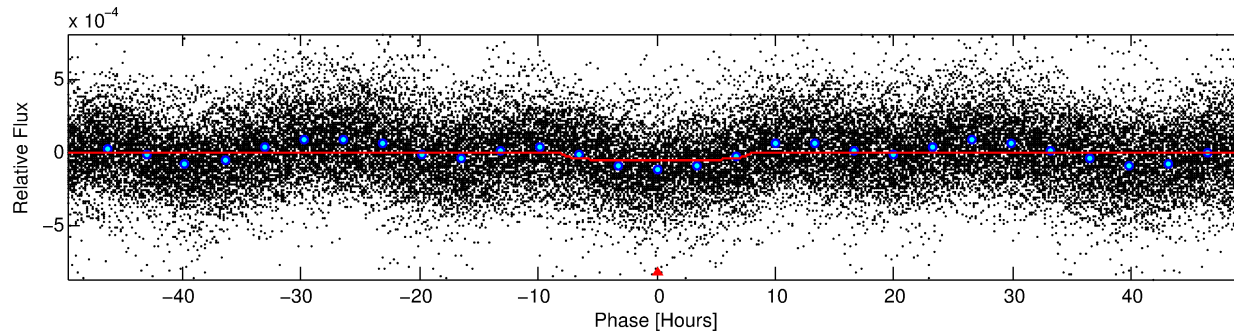
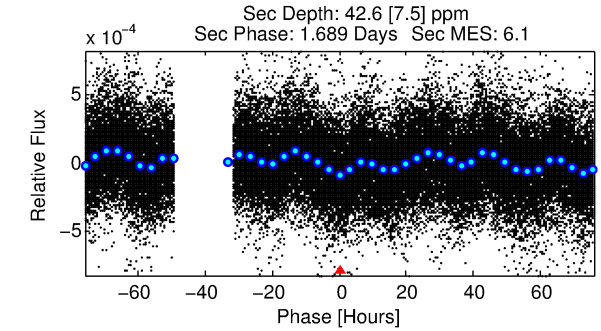
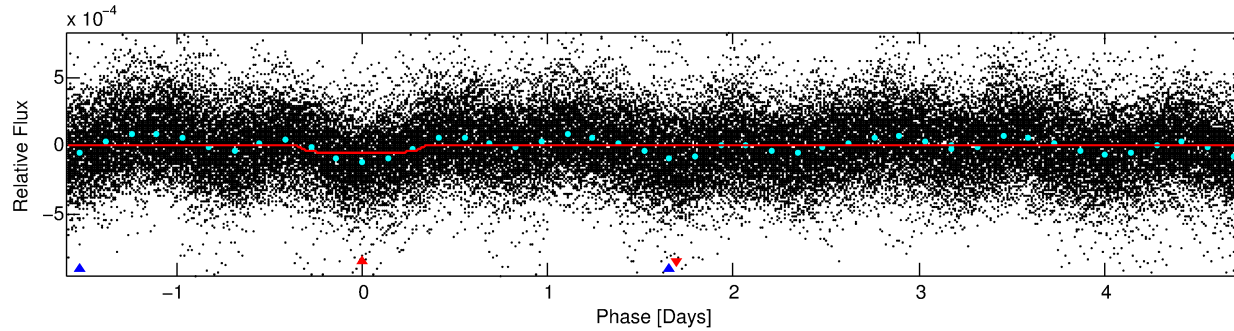
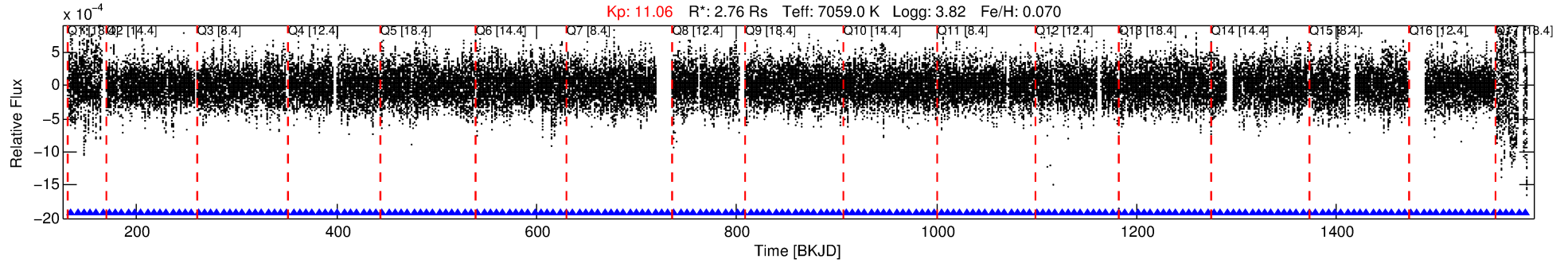
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009471360-01

No Significant Match Found

# DV One-Page Summary

KIC: 9471360 Candidate: 1 of 2 Period: 6.350 d



## DV Fit Results:

Period = 6.34980 [0.00010] d  
Epoch = 134.6725 [0.0111] BKJD  
Rp/R\* = 0.0079 [0.0005]  
a/R\* = 1.37 [0.10]  
b = 0.95 [0.01]  
Seff = 2508.76 [1581.91]  
Teq = 1805 [284] K  
Rp = 2.38 [0.97] Re  
a = 0.0822 [0.0313] AU  
Ag = 27.90 [17.93] [1.50σ]  
Teffp = 6413 [454] K [8.59σ]

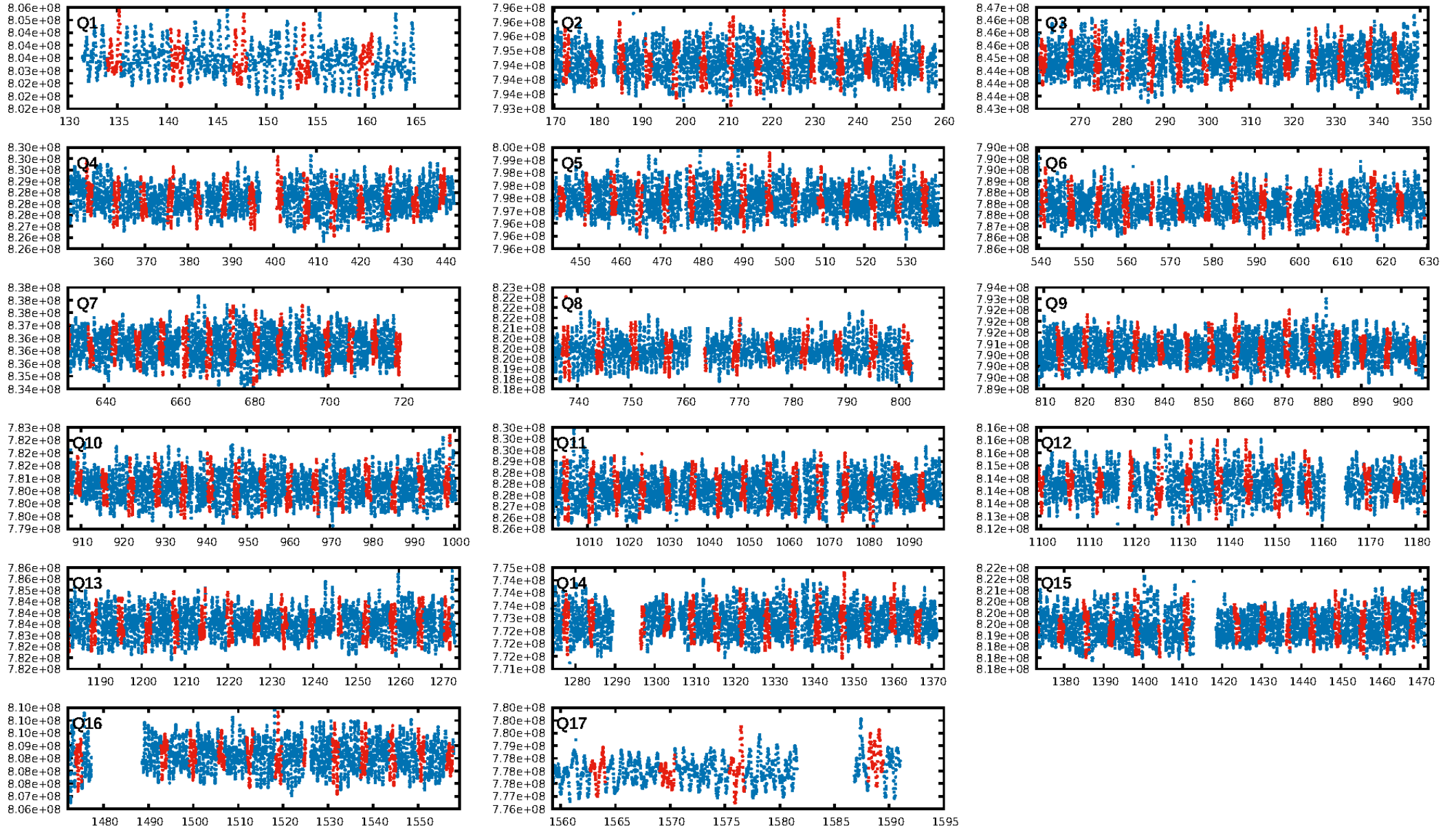
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [3.73σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
**Bootstrap-pfa: 1.05e-09**  
RollingBand-fgt: 1.00 [206/206]  
GhostDiagnostic-chr: 1.416  
**Centroid-sig: 0.1%**  
Centroid-so: 1.138 arcsec [2.50σ]  
OotOffset-rm: 0.198 arcsec [0.35σ]  
KicOffset-rm: 0.825 arcsec [0.90σ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 0.71 [12/17]  
DiffImageOverlap-fno: 1.00 [17/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 07:16:46 Z

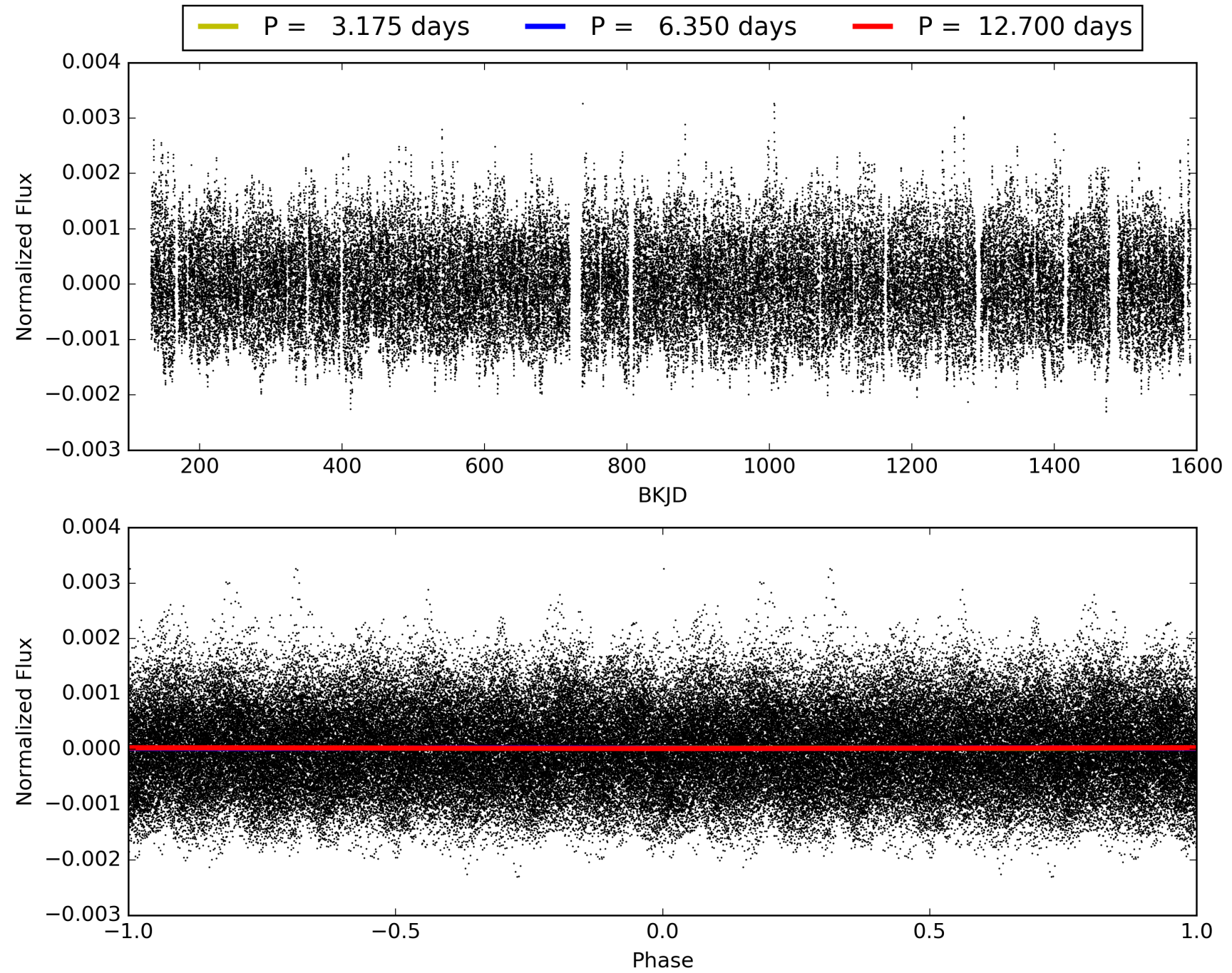
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 009471360-01, PDC Light Curves



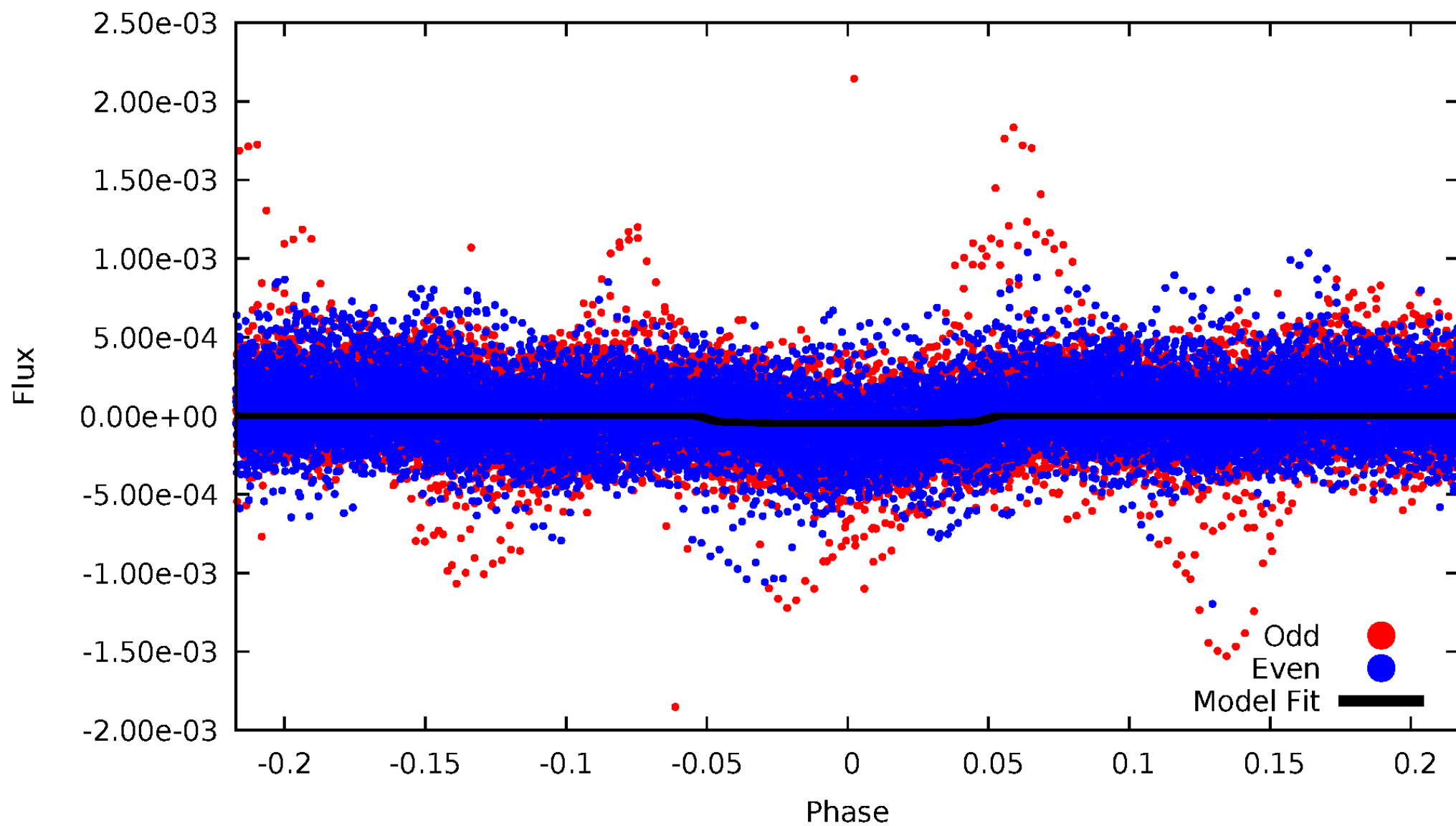


TCE 009471360-01



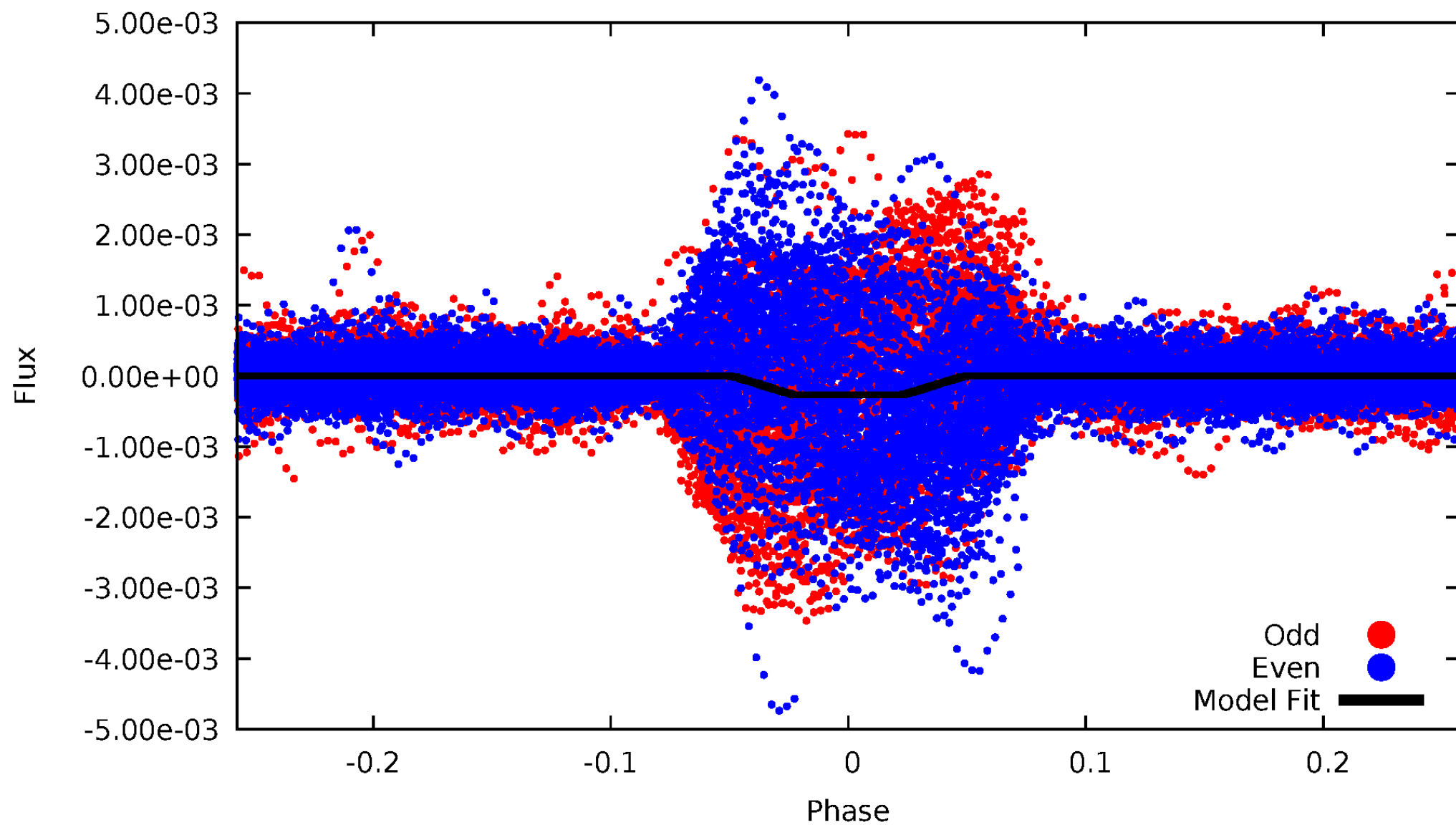
# DV Odd/Even

TCE 009471360-01

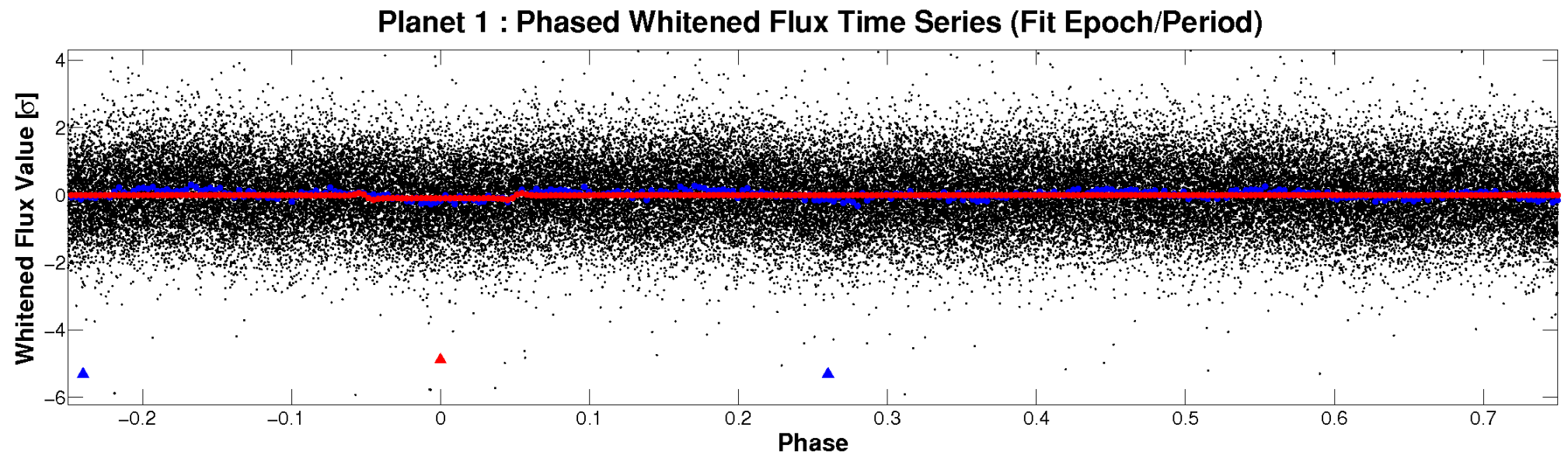
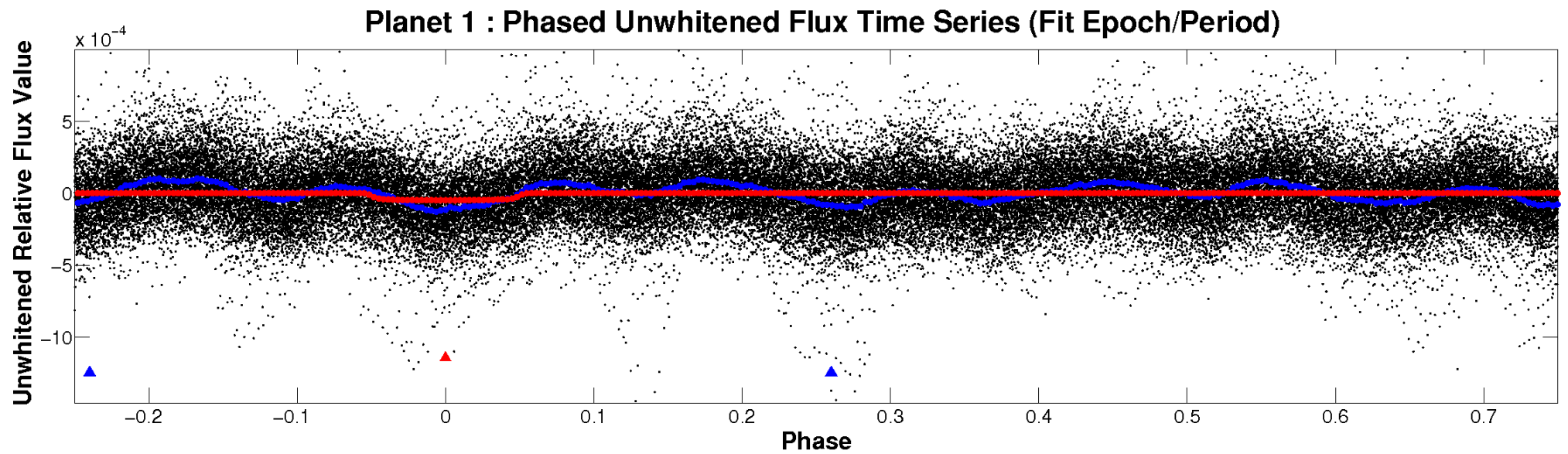


# ALT Odd/Even

TCE 009471360-01



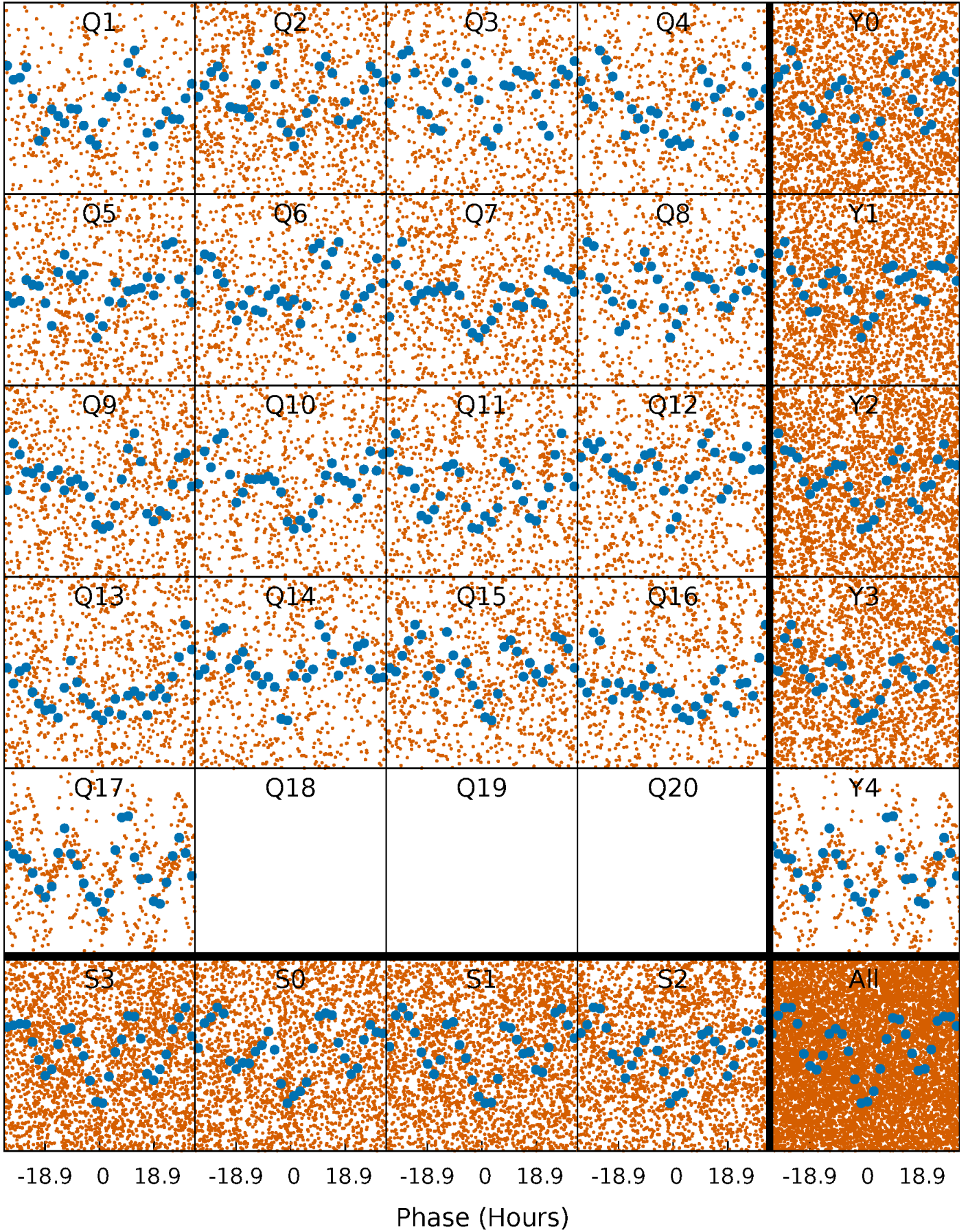
# Non-Whitened Vs. Whitened Light Curve





# PDC Quarter-Phased Transit Curves

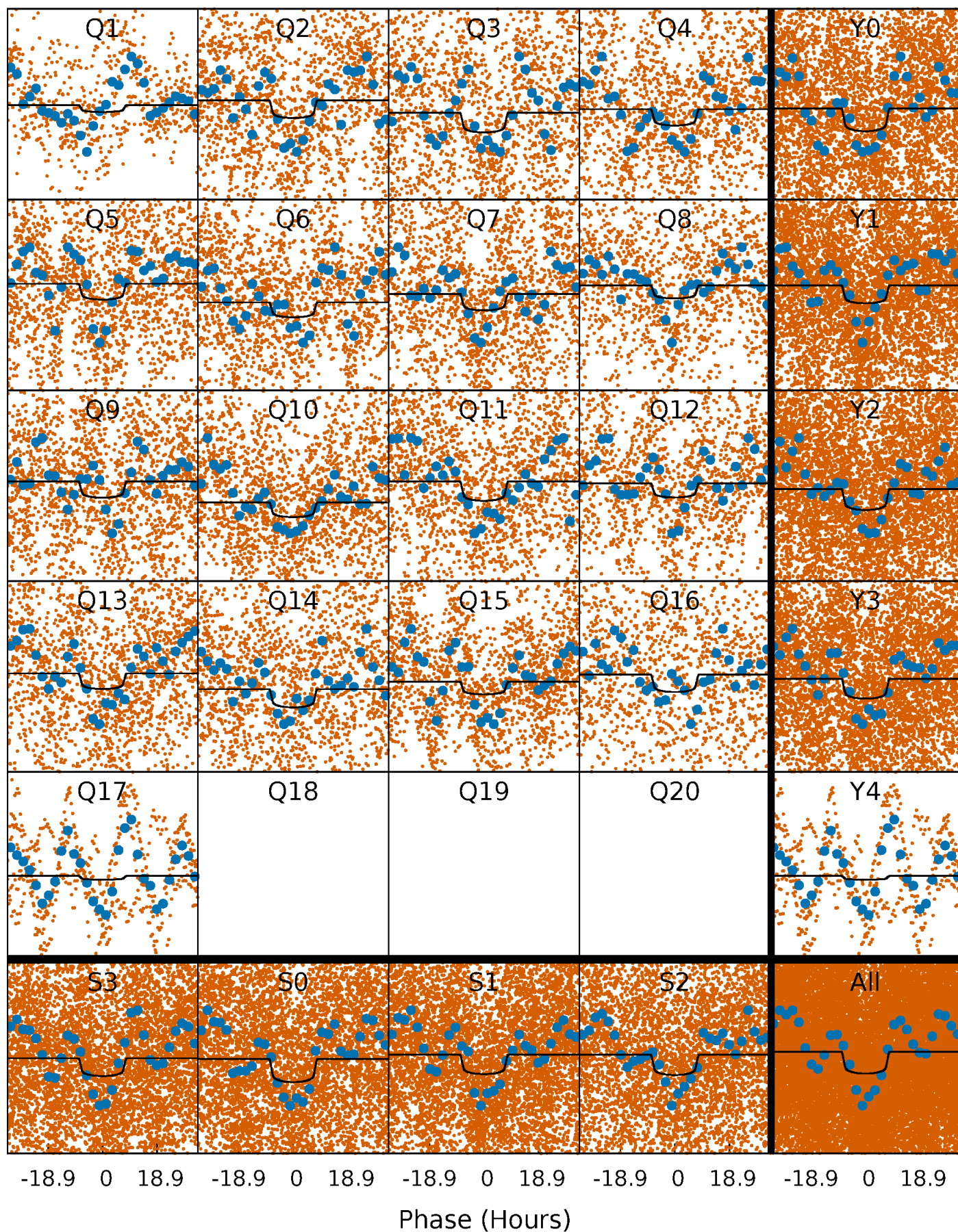
TCE 009471360-01 P= 6.349803 Days  $T_0=134.672450$  (BKJD)





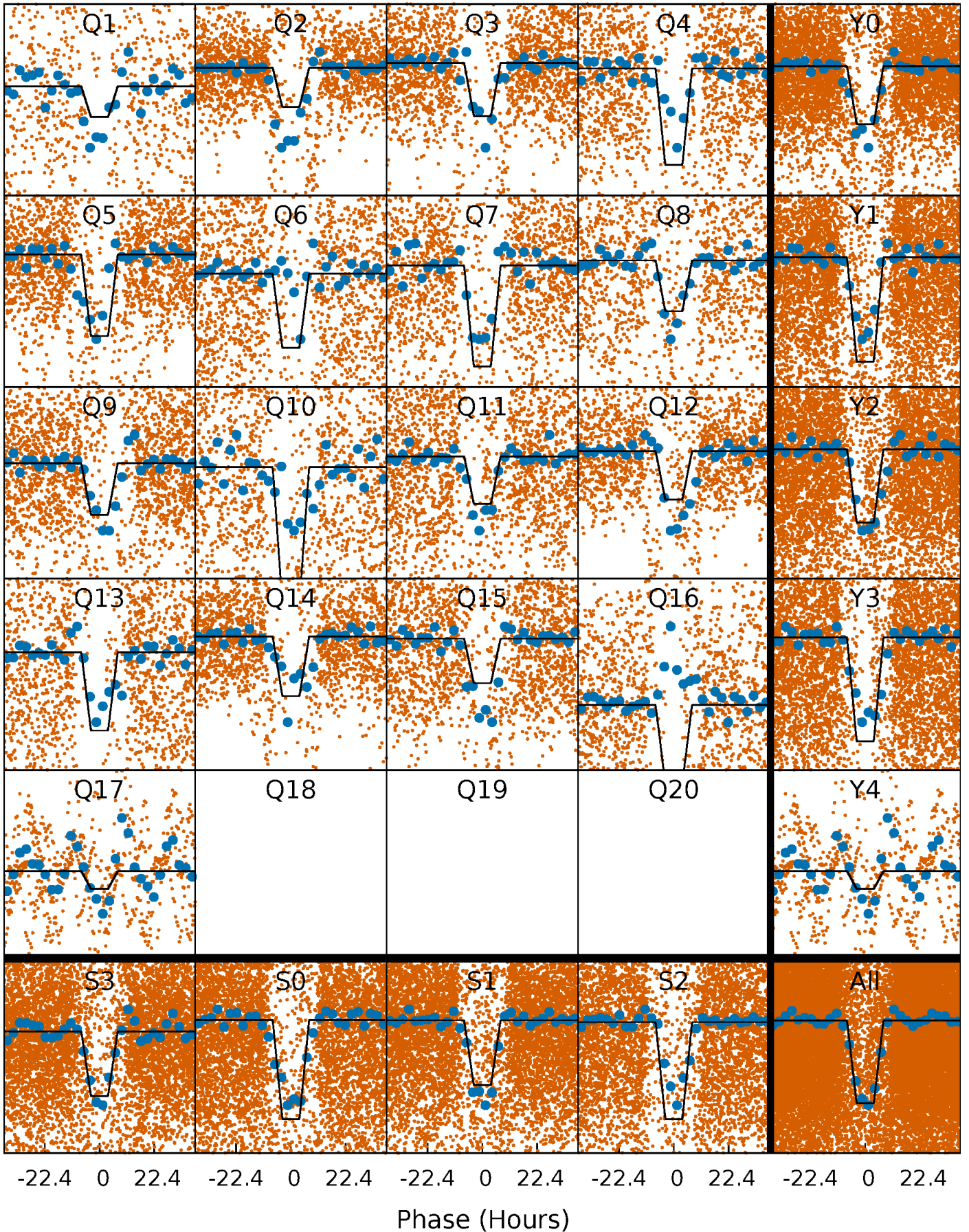
# DV Quarter-Phased Transit Curves

TCE 009471360-01 P= 6.349803 Days  $T_0=134.672450$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 009471360-01 P= 6.349372 Days  $T_0=134.718081$  (BKJD)

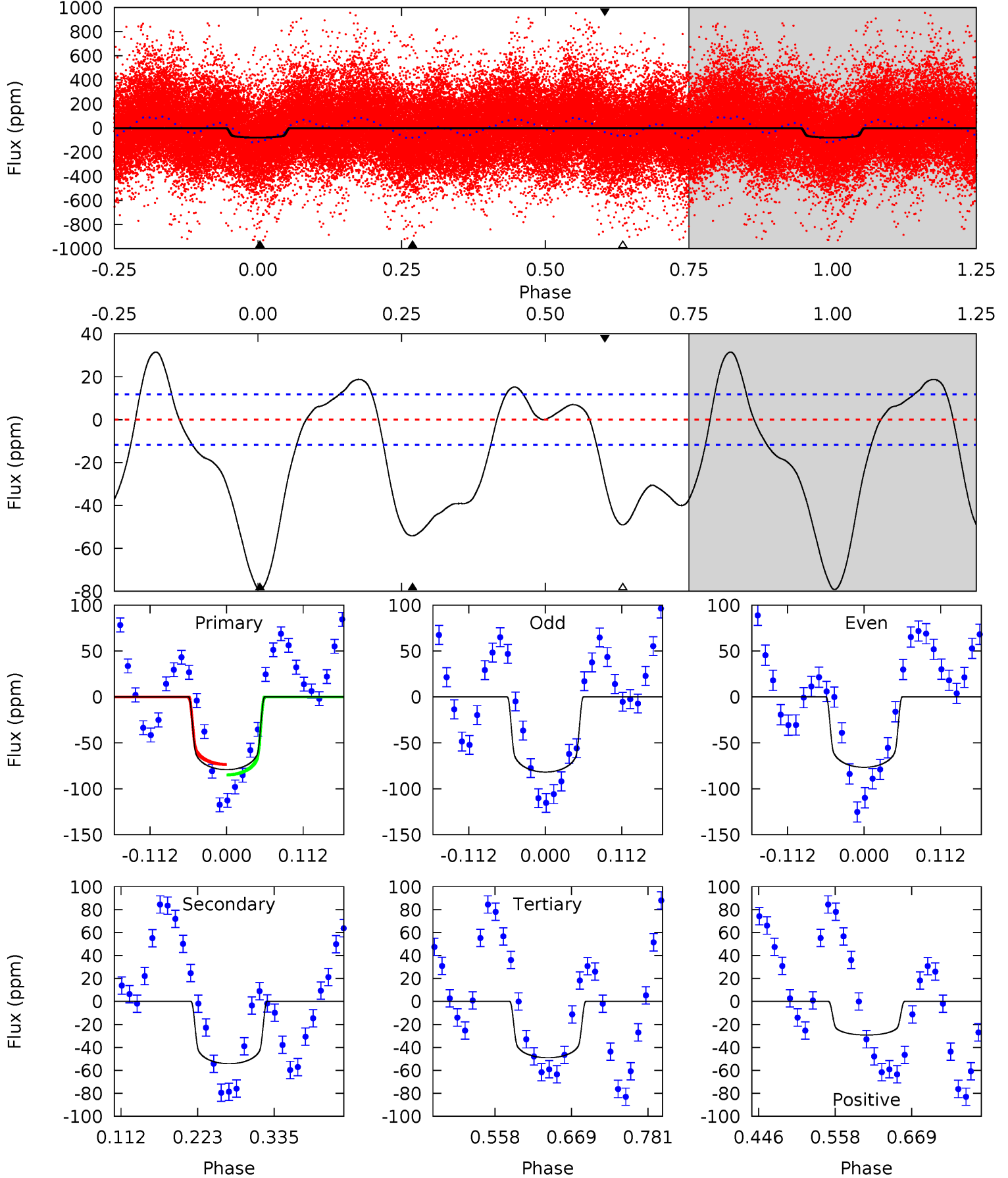




# DV Model-Shift Uniqueness Test

009471360-01, P = 6.349803 Days, E = 128.322647 Days

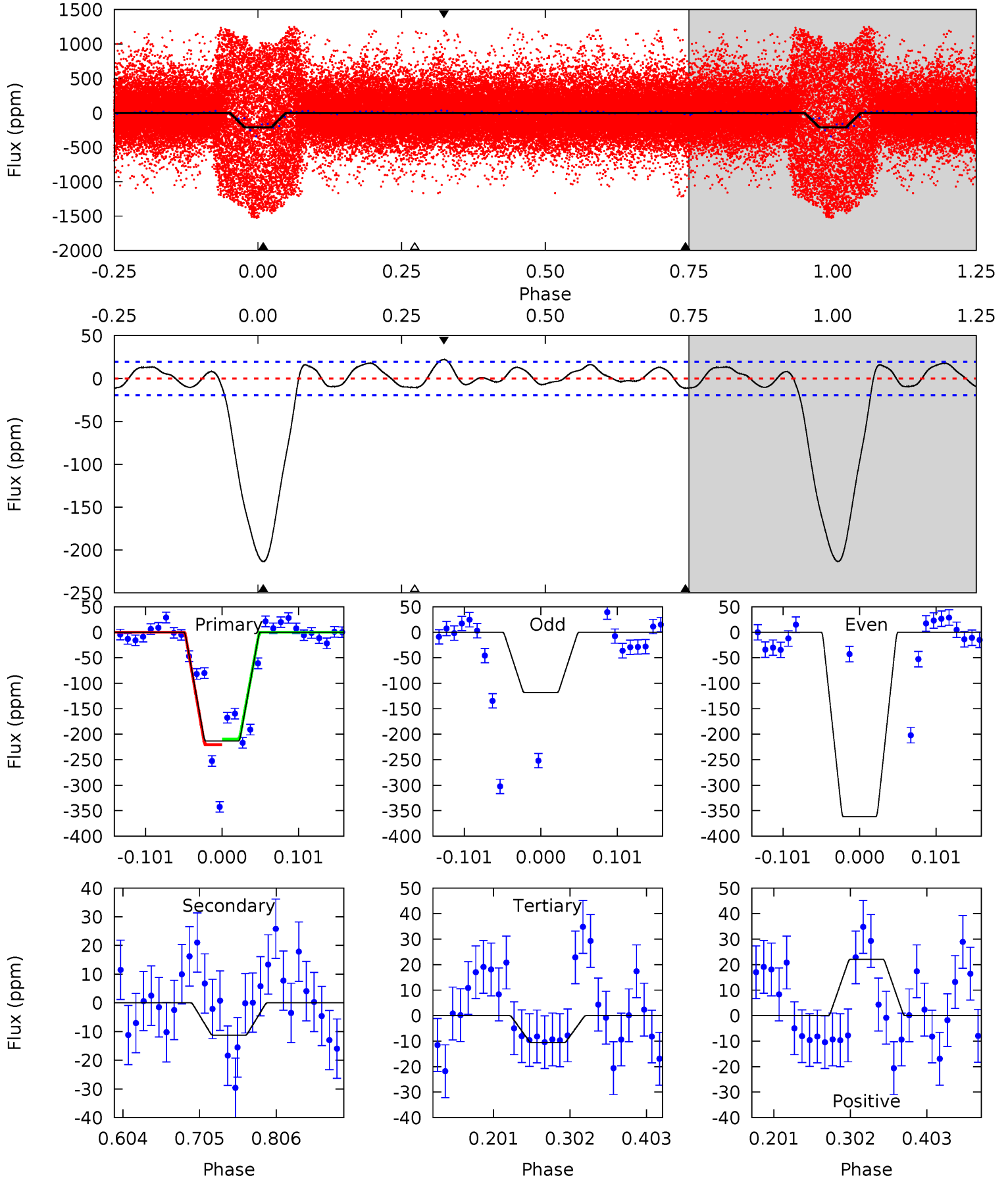
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
30.5	20.9	18.9	-11.3	4.54	1.59	8.67	11.6	41.8	1.99	32.2	1.00	1.07	0.28	2.23



# Alt Model-Shift Uniqueness Test

009471360-01, P = 6.349372 Days, E = 128.368709 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
50.3	2.65	2.50	5.20	4.56	1.64	2.08	47.8	45.1	0.15	-2.55	28.9	0.82	0.09	0





### Stellar Parameters For KIC 009471360

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$\rho_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7059^{+220}_{-318}$	$3.820^{+0.353}_{-0.118}$	$0.070^{+0.200}_{-0.350}$	$2.760^{+0.511}_{-1.107}$	$1.834^{+0.188}_{-0.439}$	$0.123^{+0.363}_{-0.046}$
	+3%/-5%	+9%/-3%	+286%/-500%	+19%/-40%	+10%/-24%	+296%/-38%
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 009471360-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-54 \pm 3$	$2.29^{+0.39}_{-0.46}$	$2467^{+188}_{-257}$	$6728^{+387}_{-346}$	$38^{+19}_{-9}$
Alt.	$-11 \pm 4$	$4.80^{+0.60}_{-0.97}$	$2473^{+180}_{-252}$	$3507^{+248}_{-328}$	$1.892^{+1.141}_{-0.755}$

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

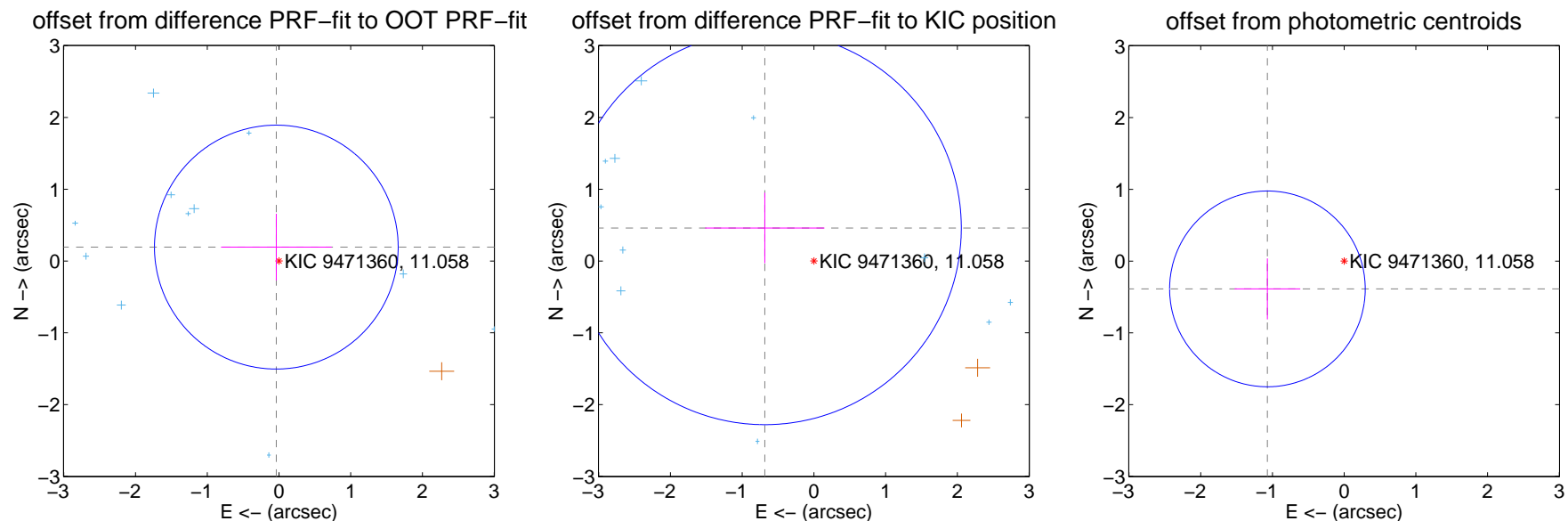
## DV Centroid Data

Supplemental centroid analysis for 009471360-01. **Kepler magnitude: 11.06.** Transit SNR 8.32

There are 12 quarters with good PRF difference image offsets

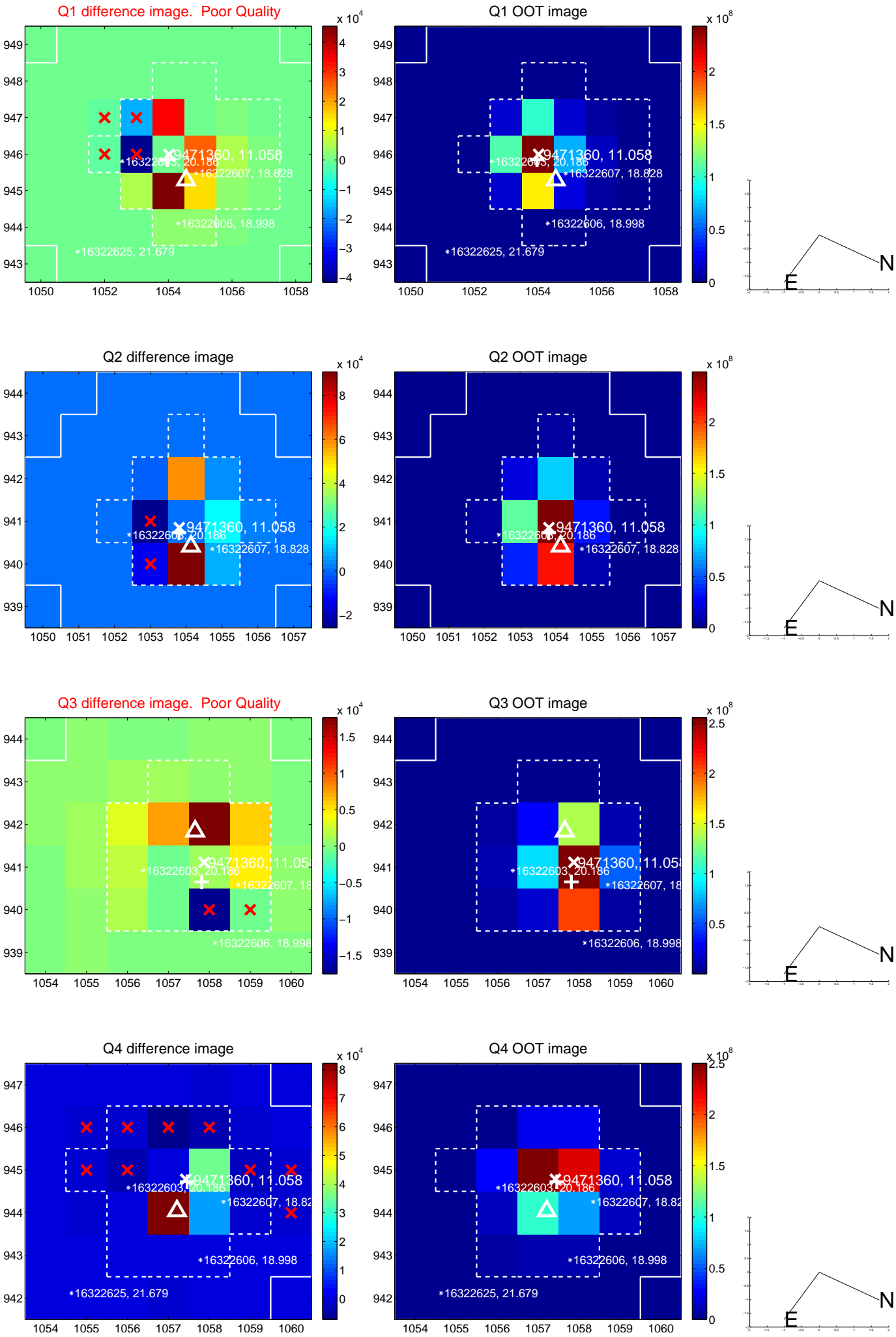
The direct PRF centroid is offset from the target star catalog position by about 0.57 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.198 \pm 0.566$	0.35	$0.037 \pm 0.771$	$0.194 \pm 0.465$
PRF-fit source offset from KIC position	$0.825 \pm 0.913$	0.90	$0.684 \pm 0.831$	$0.460 \pm 0.491$
photometric centroid source offset	$1.14 \pm 0.45$	2.50	$1.07 \pm 0.46$	$-0.39 \pm 0.42$

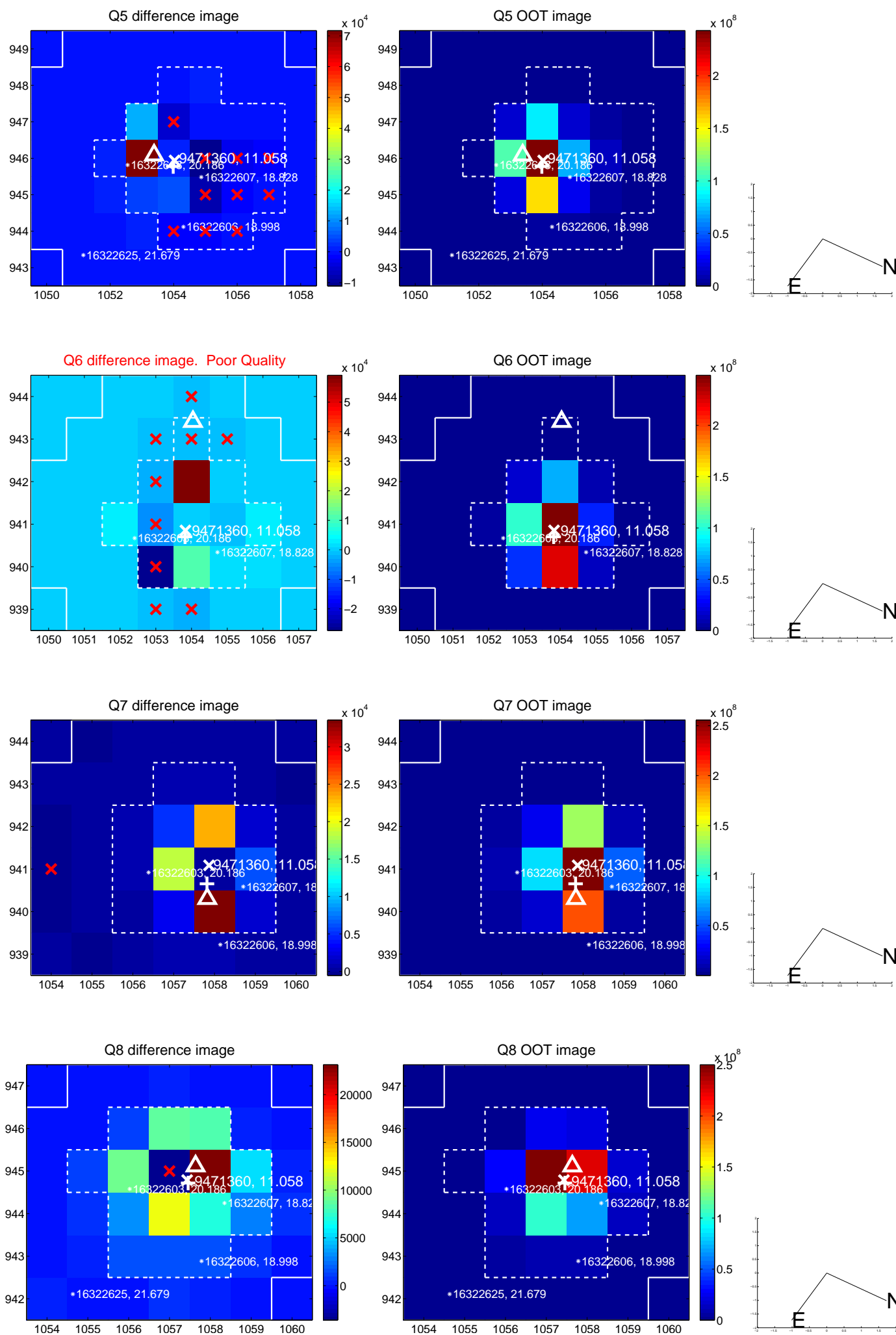


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

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

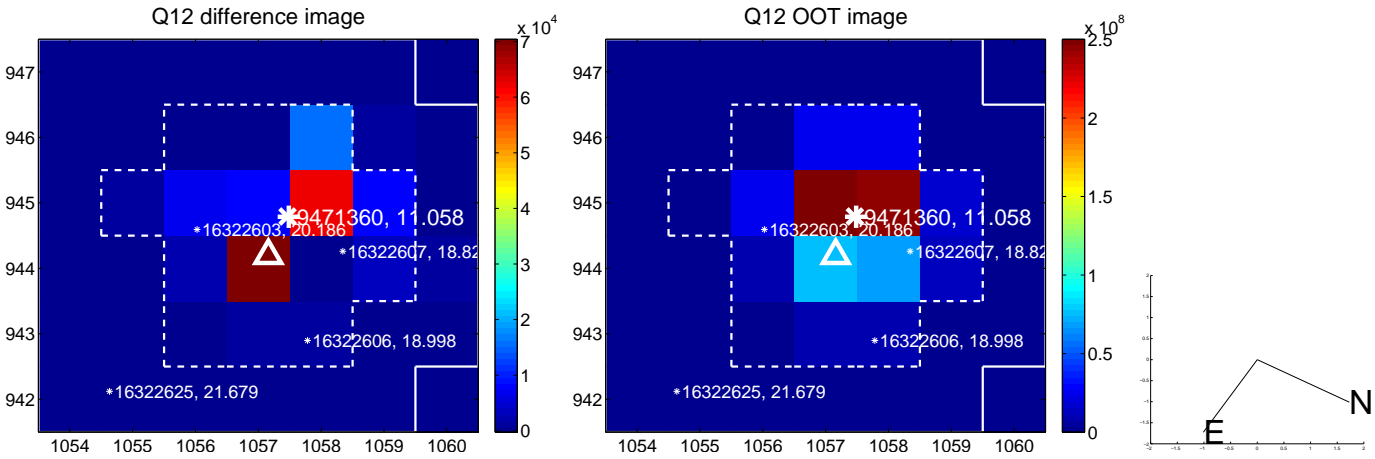
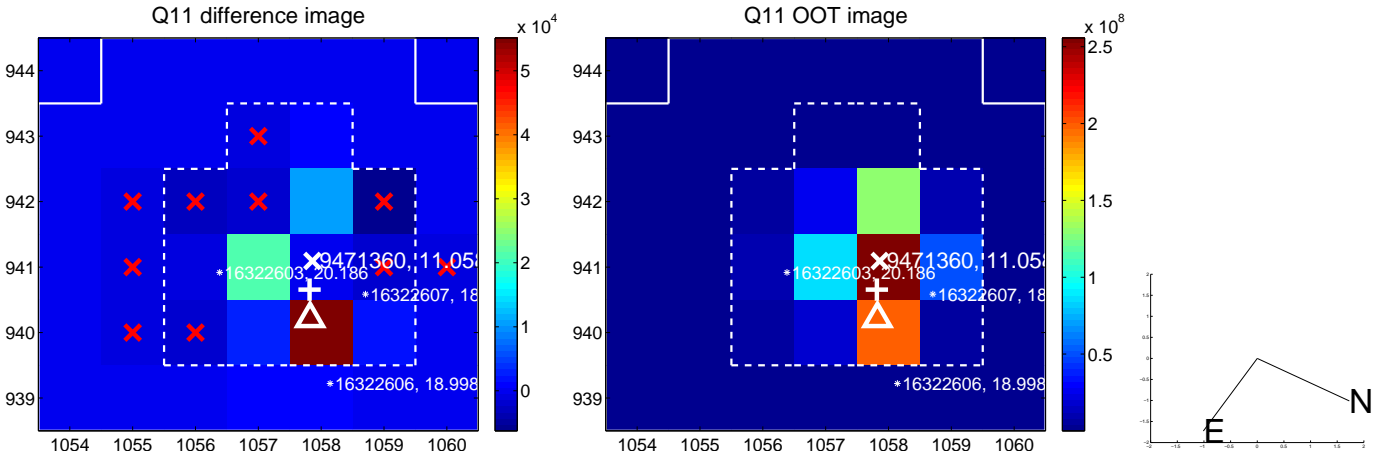
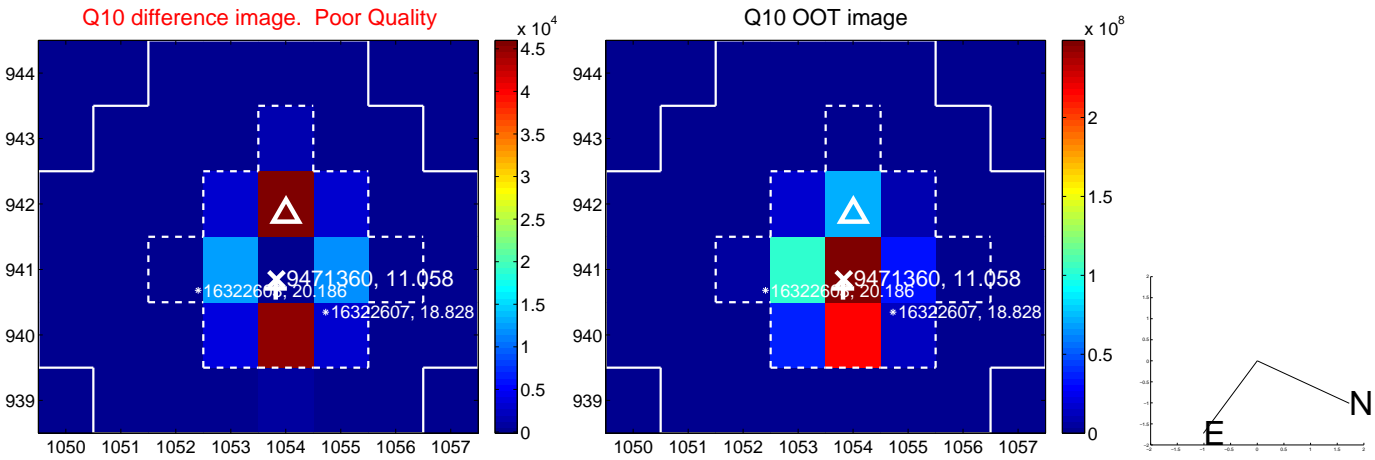
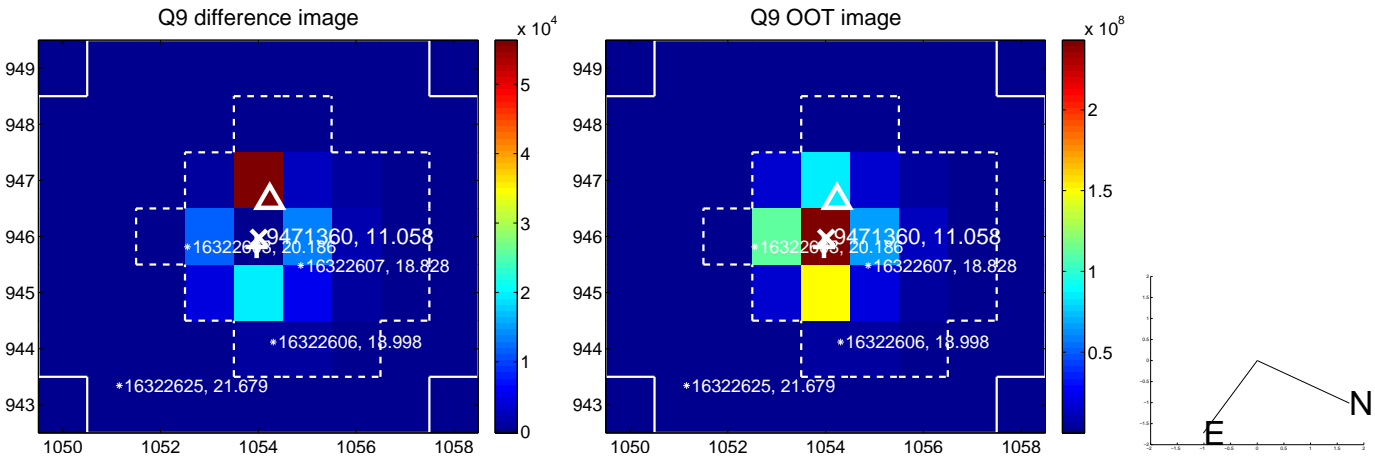


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

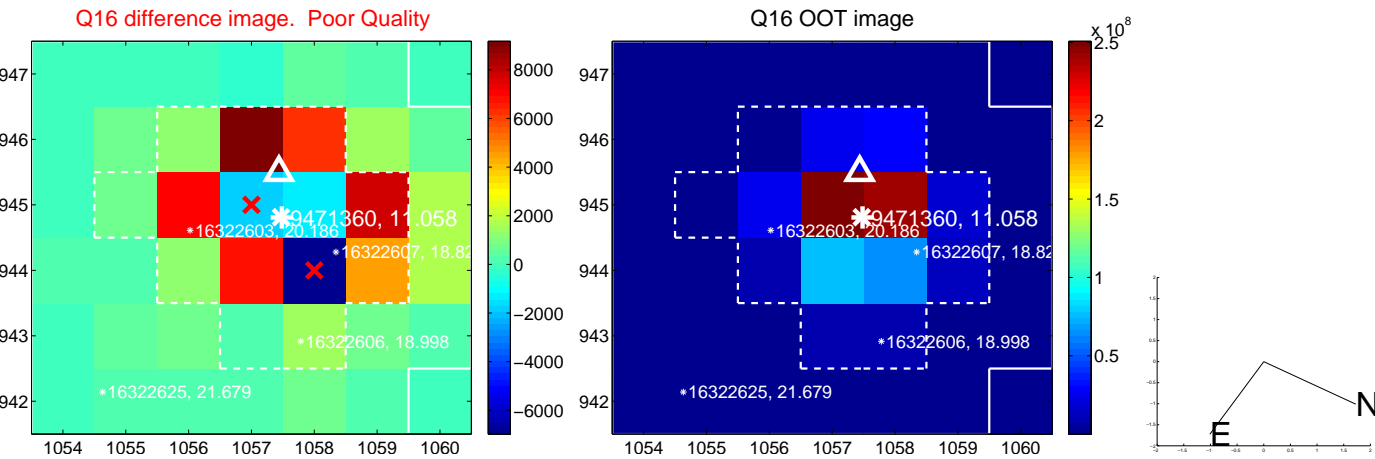
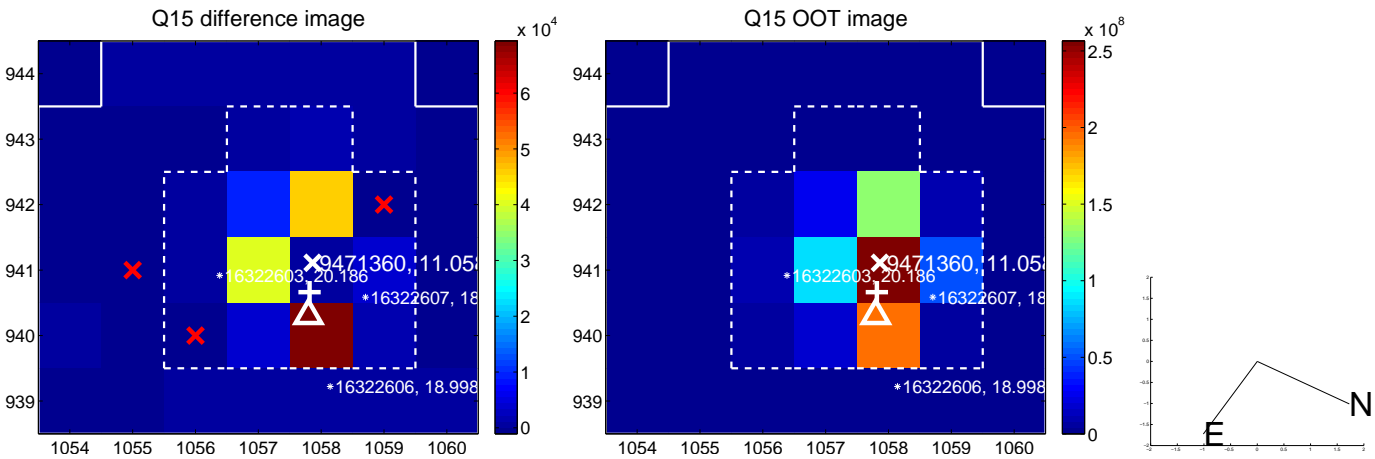
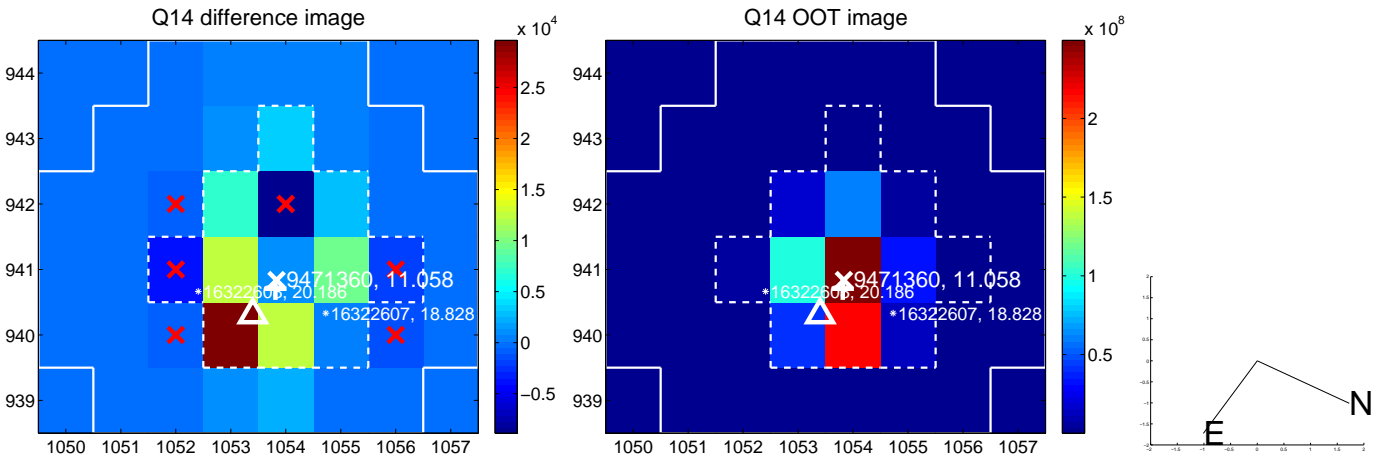
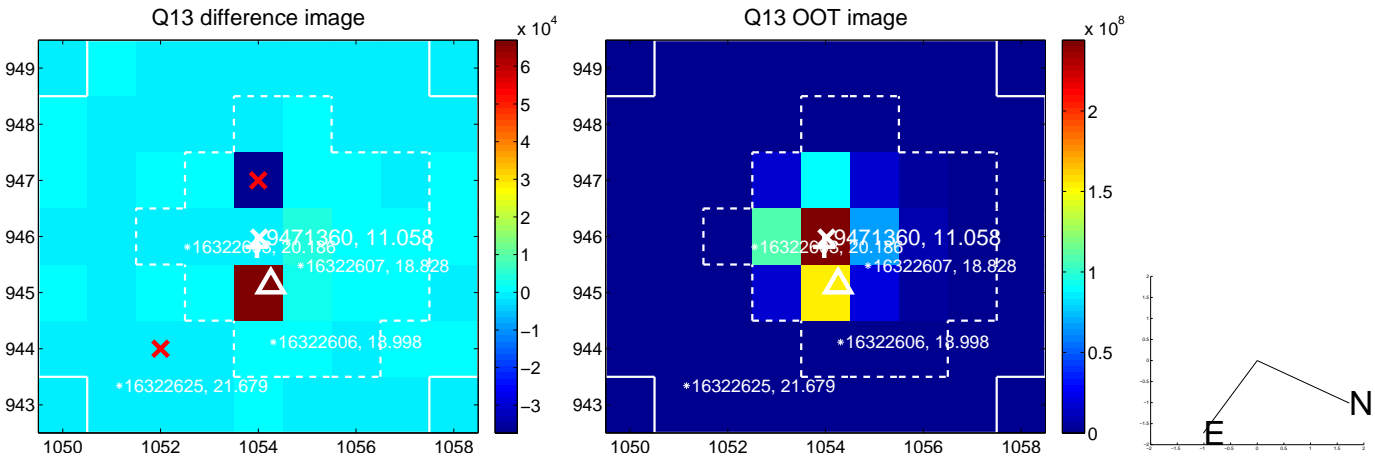




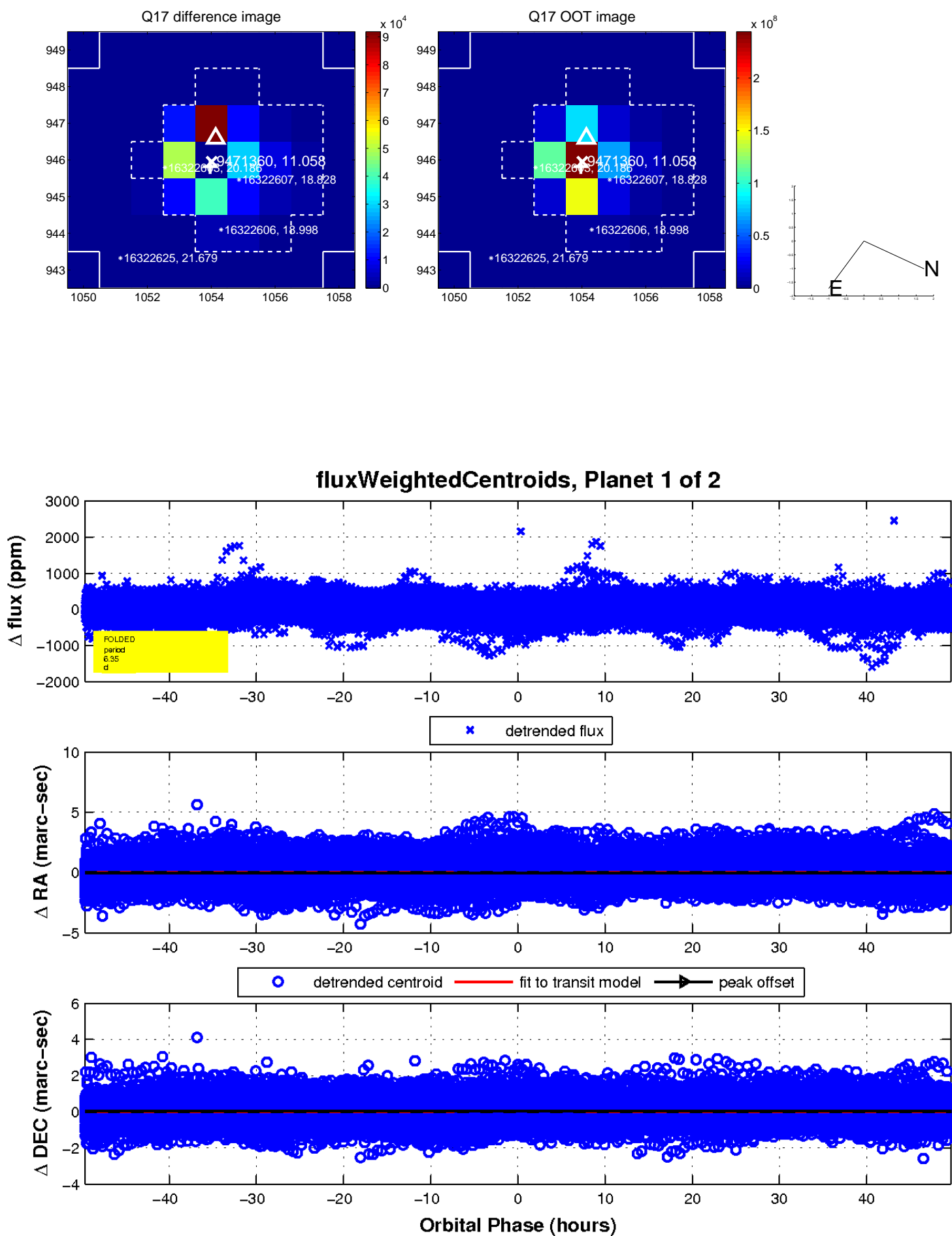
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

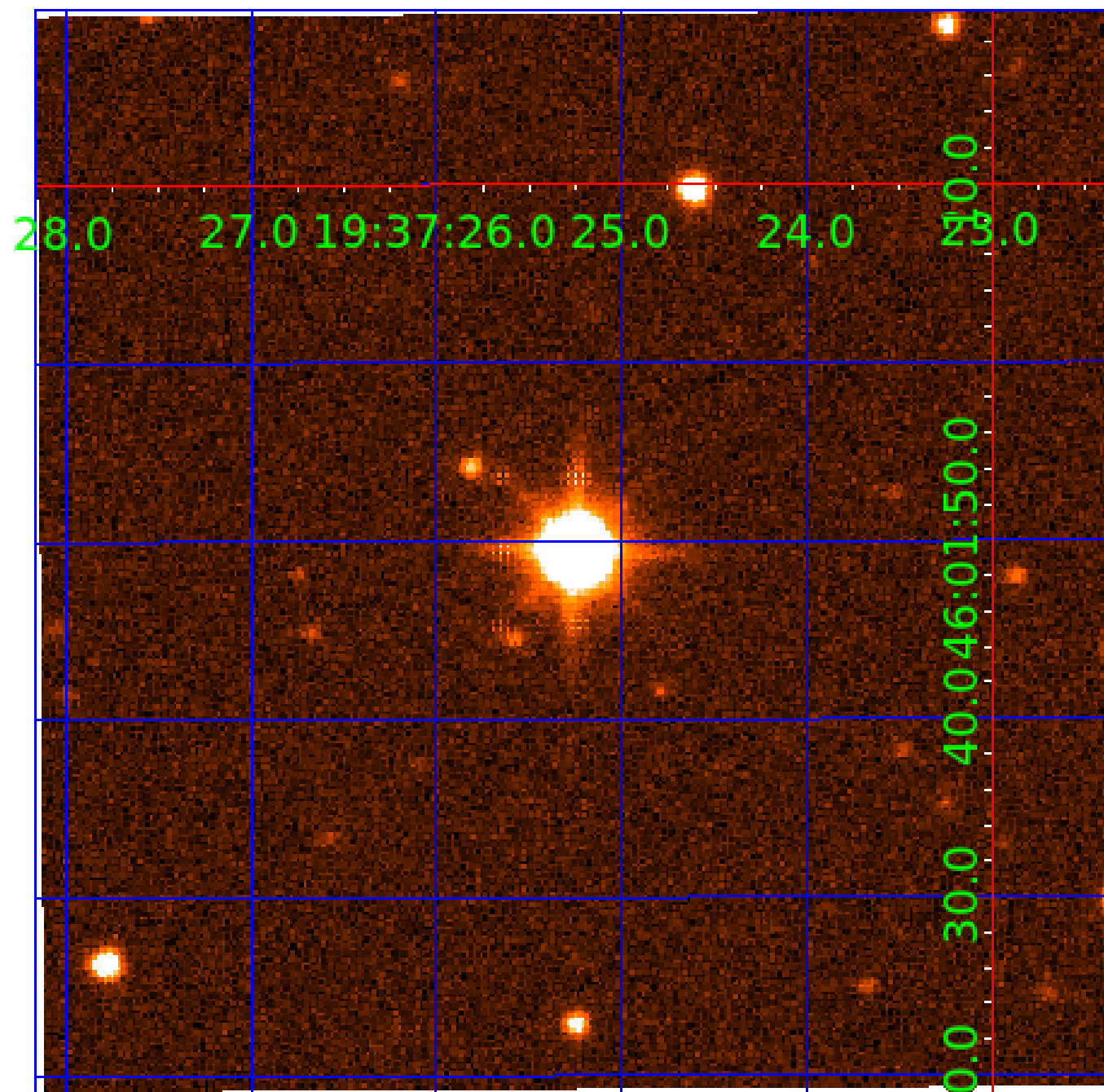


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 009471360

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009471360-01	OBS	No	6.349803	134.672450	49.4	16.556	8.9	8.3	2.76	7059	2.38	2508.76
009471360-02	OBS	No	3.174893	133.151036	49.1	11.941	11.4	11.4	2.76	7059	2.28	6321.71

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009471360-01	OBS	FP	0.00	1	0	0	0	LPP_DV—MOD_NONUNIQ_DV—CENT_SATURATED
009471360-02	OBS	FP	0.00	1	0	0	0	LPP_DV—SAME_NTL_PERIOD—CENT_SATURATED

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

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

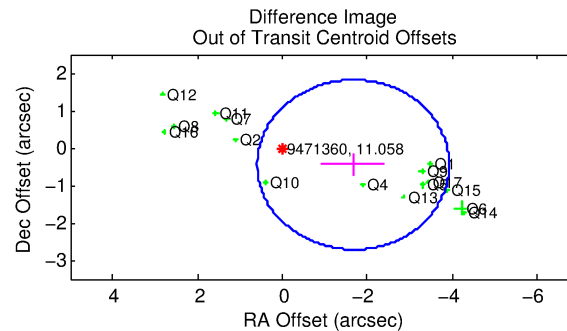
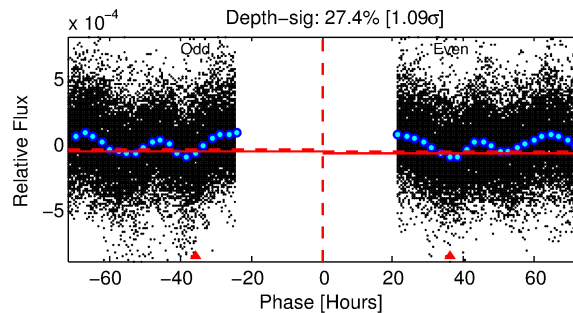
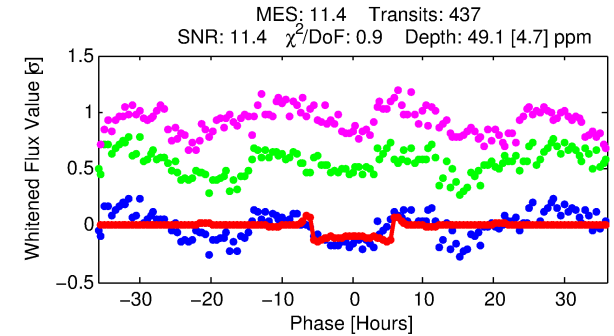
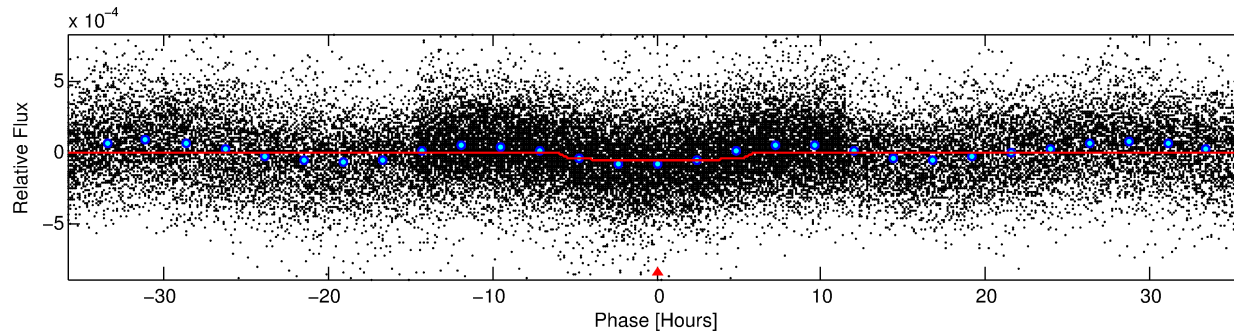
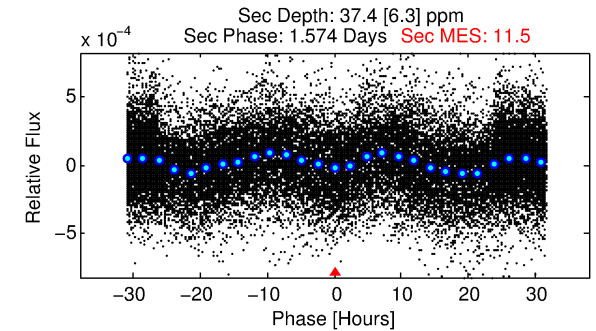
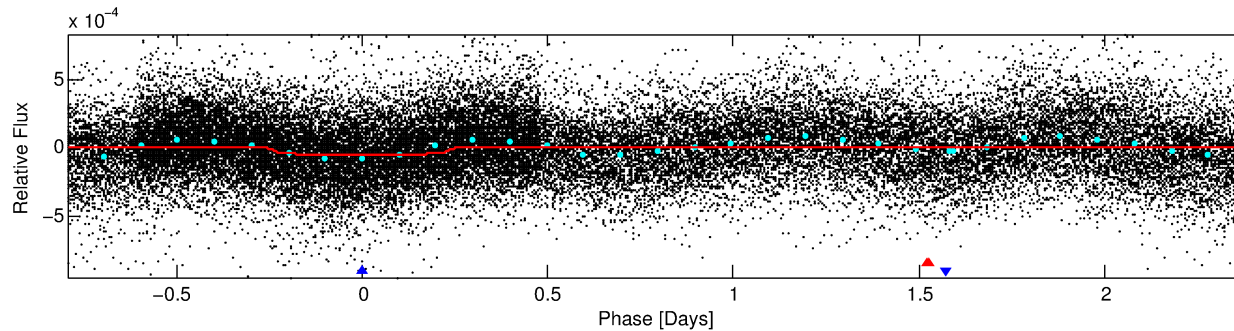
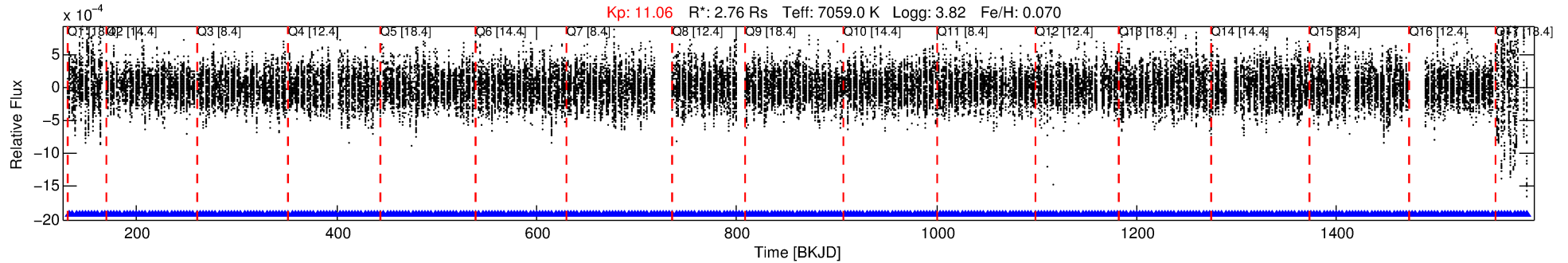
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009471360-02

No Significant Match Found

# DV One-Page Summary

KIC: 9471360 Candidate: 2 of 2 Period: 3.175 d



## DV Fit Results:

Period = 3.17489 [0.00002] d  
Epoch = 133.1510 [0.0032] BKJD  
Rp/R\* = 0.0076 [0.0005]  
a/R\* = 1.27 [0.11]  
b = 0.92 [0.04]  
Seff = 6321.71 [3986.17]  
Teq = 2274 [358] K  
Rp = 2.28 [0.93] Re  
a = 0.0518 [0.0197] AU  
Ag = 10.63 [6.80] [1.42σ]  
Teffp = 6348 [440] K [7.18σ]

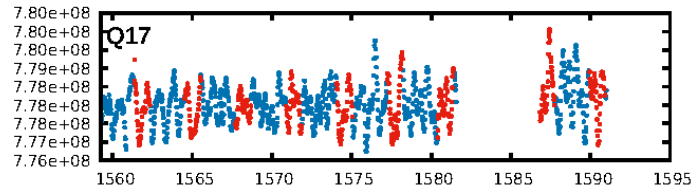
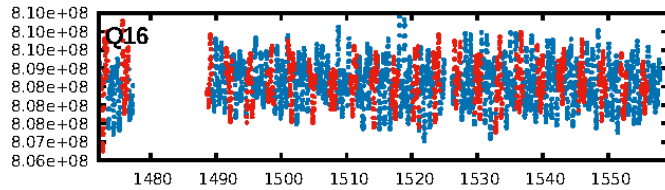
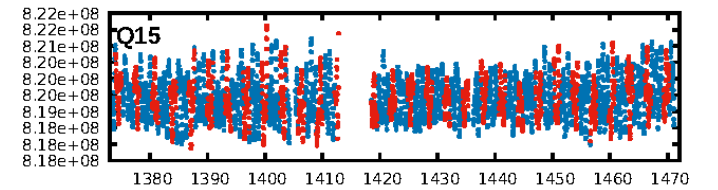
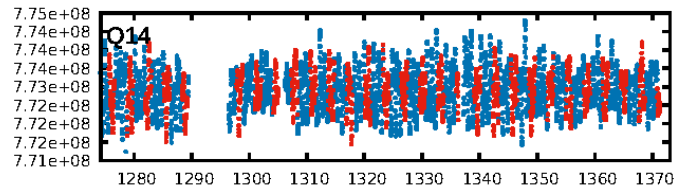
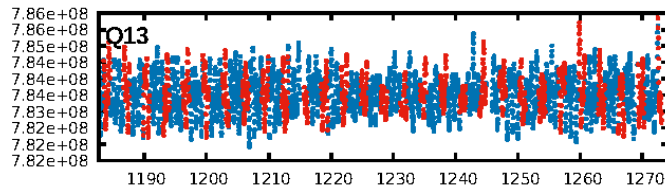
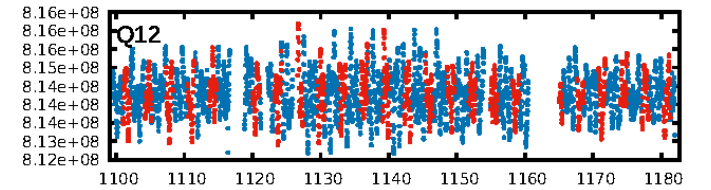
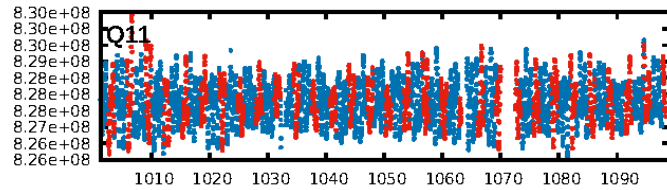
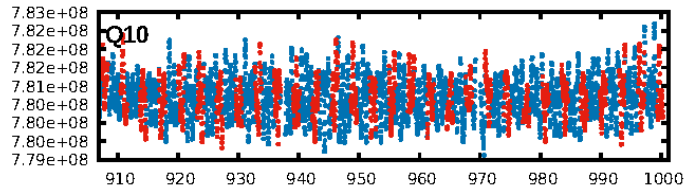
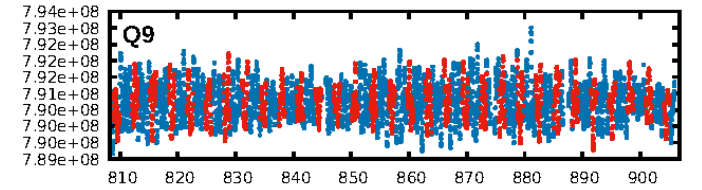
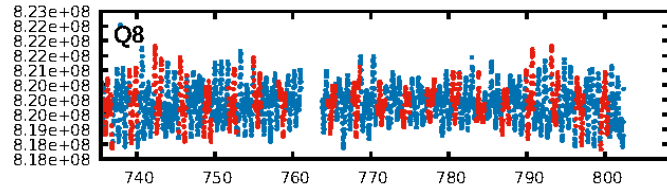
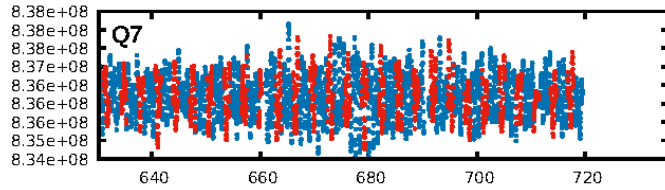
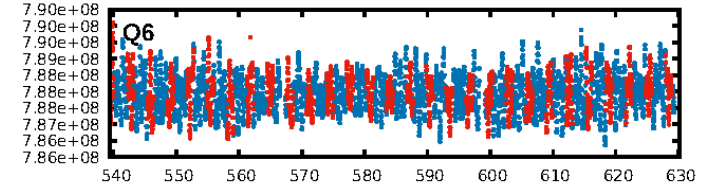
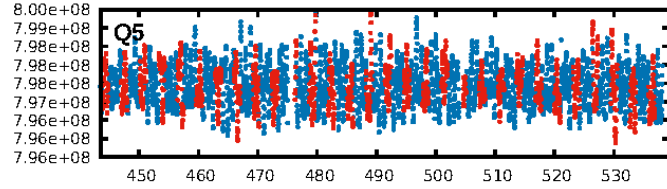
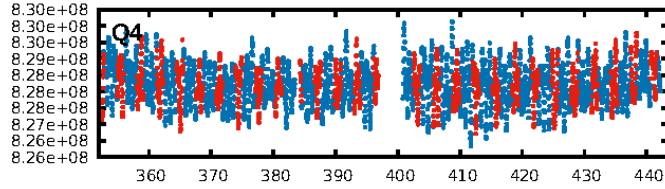
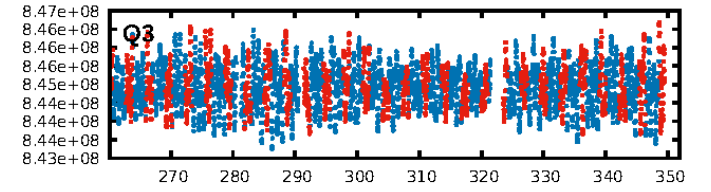
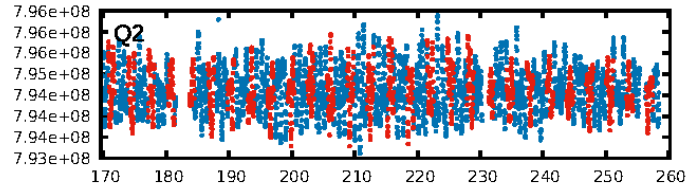
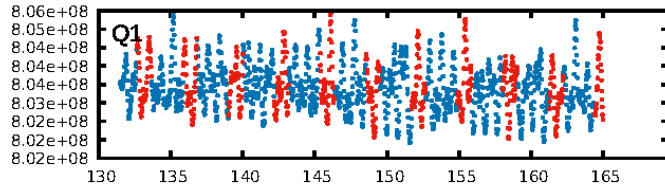
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [3.73σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 2.94e-10  
RollingBand-fgt: 1.00 [417/417]  
GhostDiagnostic-chr: 1.899  
Centroid-sig: 24.4%  
Centroid-so: 0.440 arcsec [1.45σ]  
OotOffset-rm: 1.733 arcsec [2.29σ]  
KicOffset-rm: 1.074 arcsec [1.52σ]  
OotOffset-st: 4/3/4/5 [16]  
KicOffset-st: 4/3/4/5 [16]  
DiffImageQuality-fgm: 0.62 [10/16]  
DiffImageOverlap-fno: 1.00 [17/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 07:16:57 Z

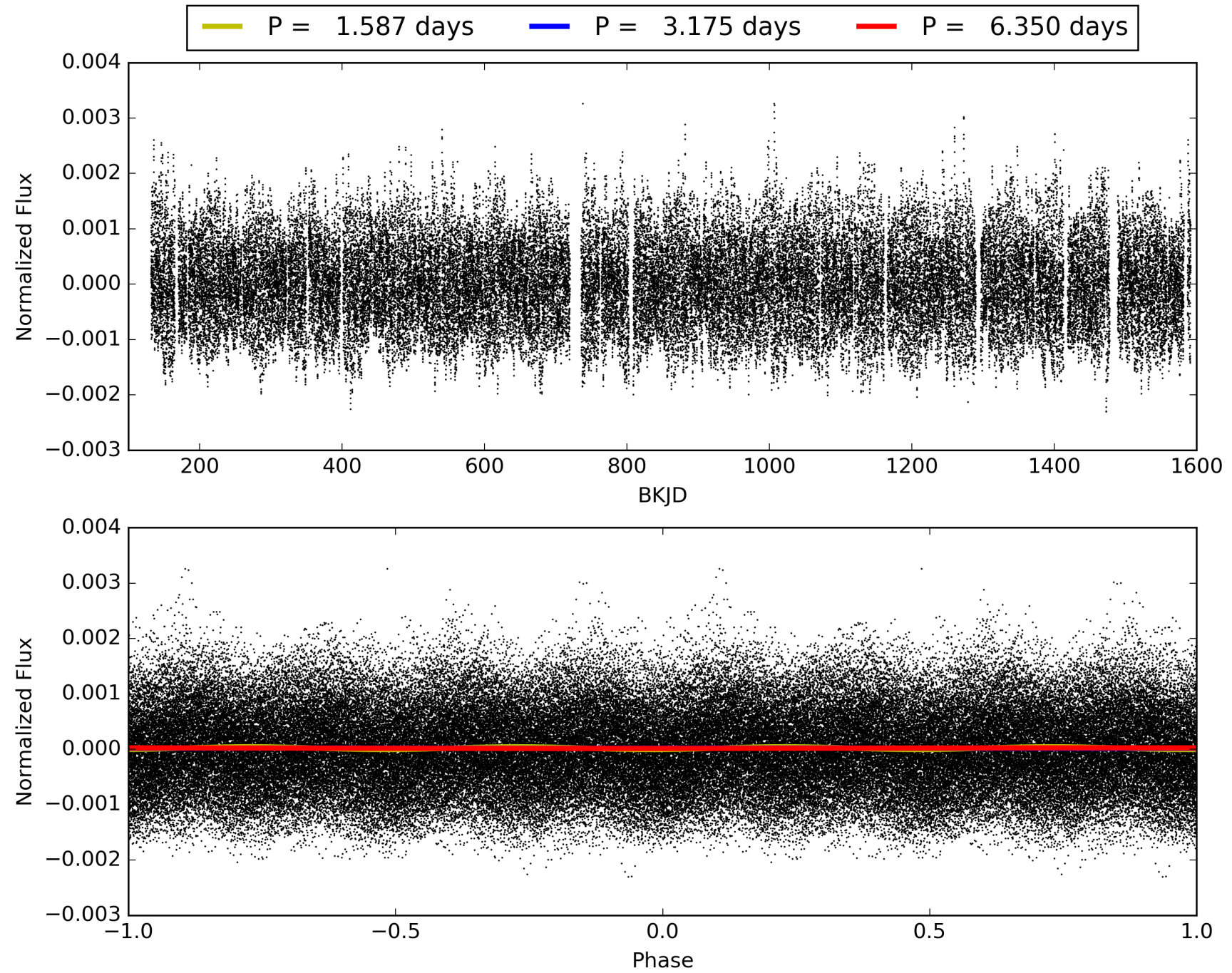
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 009471360-02, PDC Light Curves





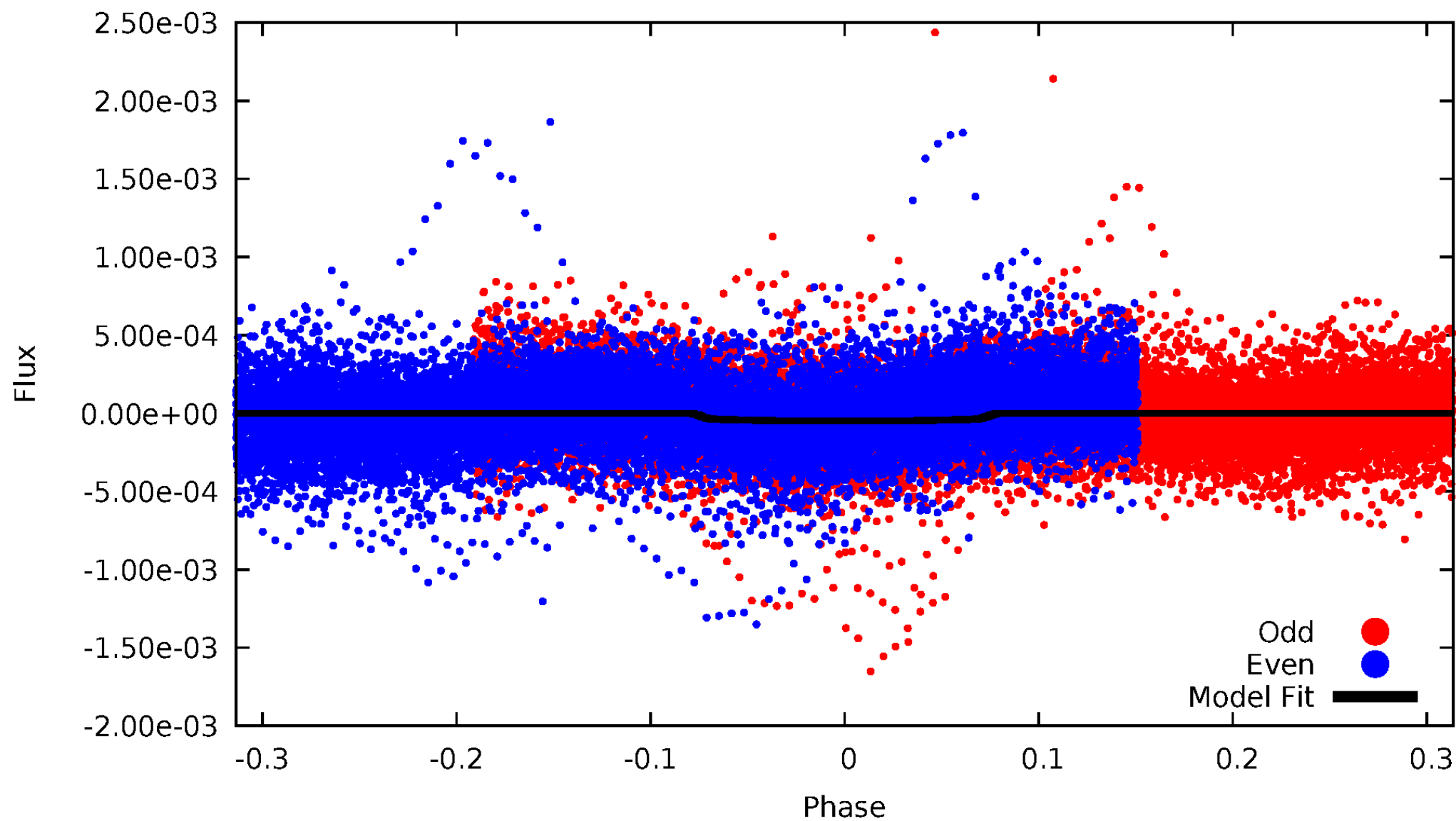
TCE 009471360-02





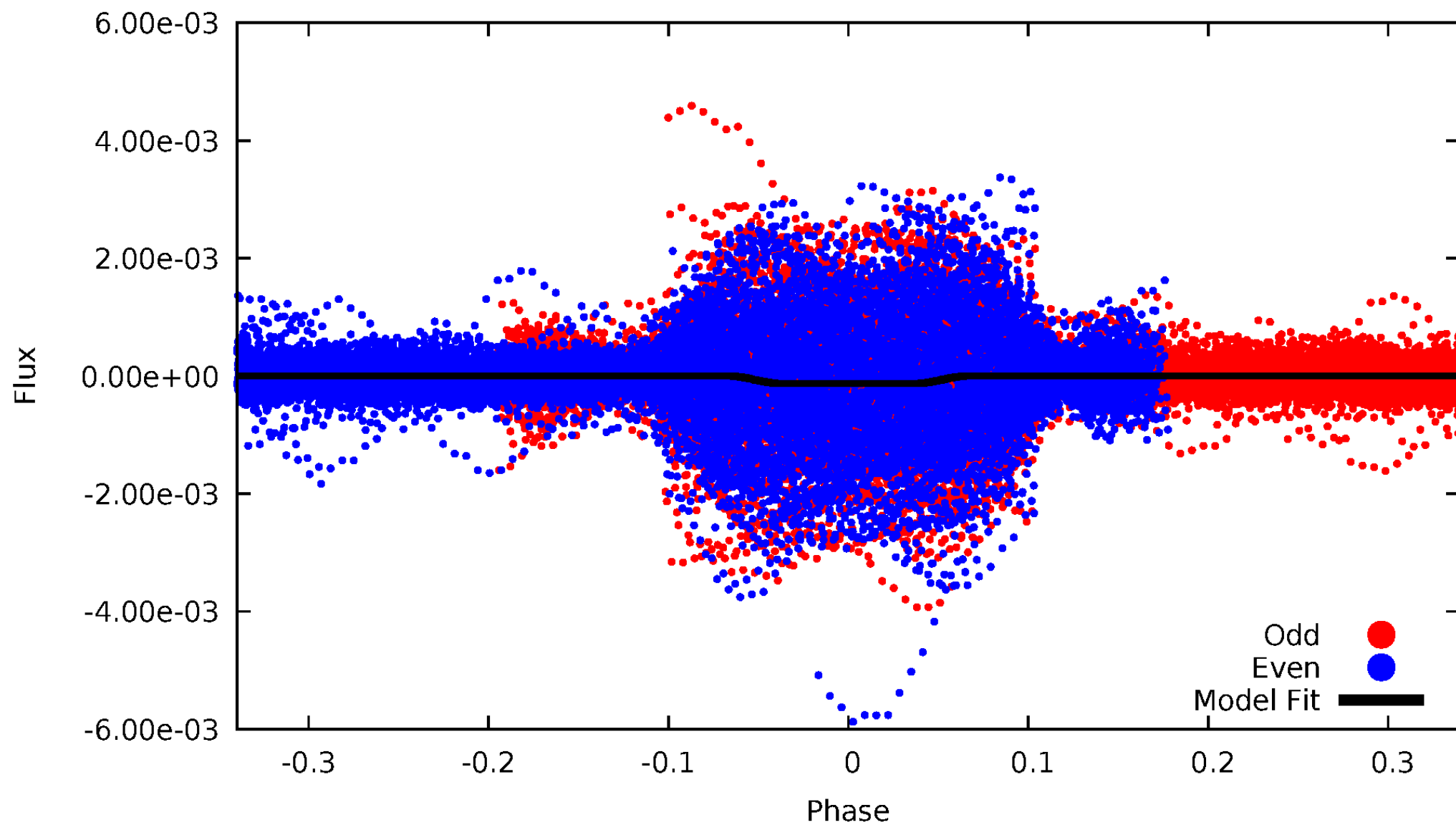
# DV Odd/Even

TCE 009471360-02



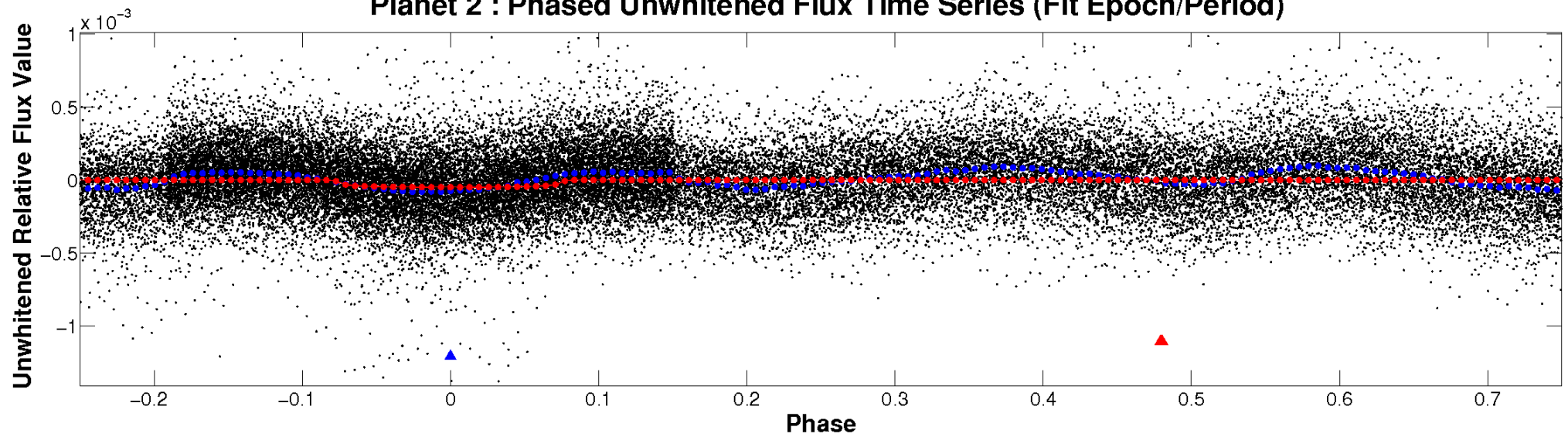
# ALT Odd/Even

TCE 009471360-02

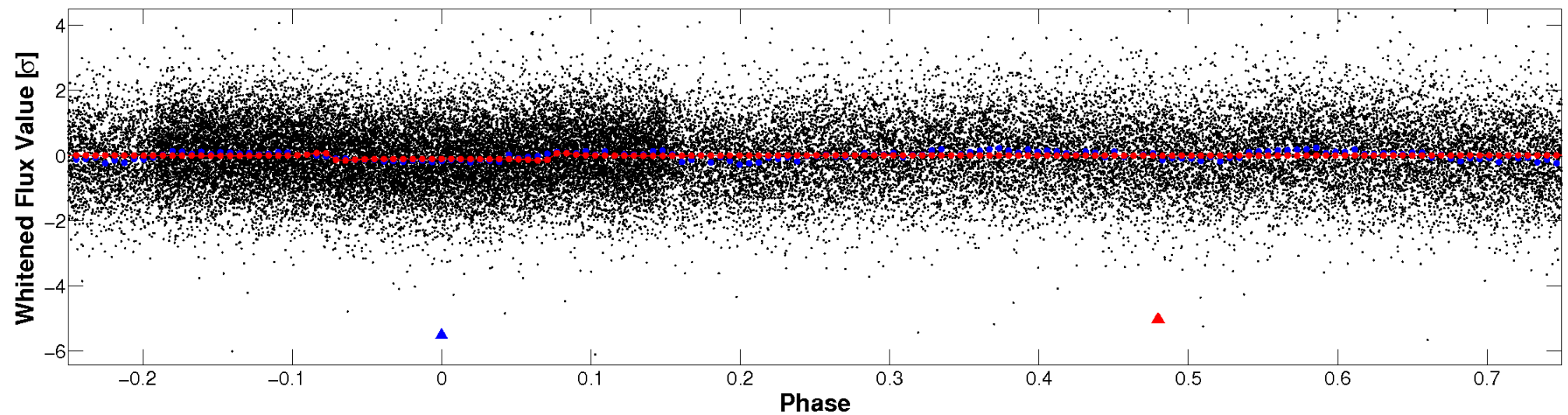


# Non-Whitened Vs. Whitened Light Curve

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

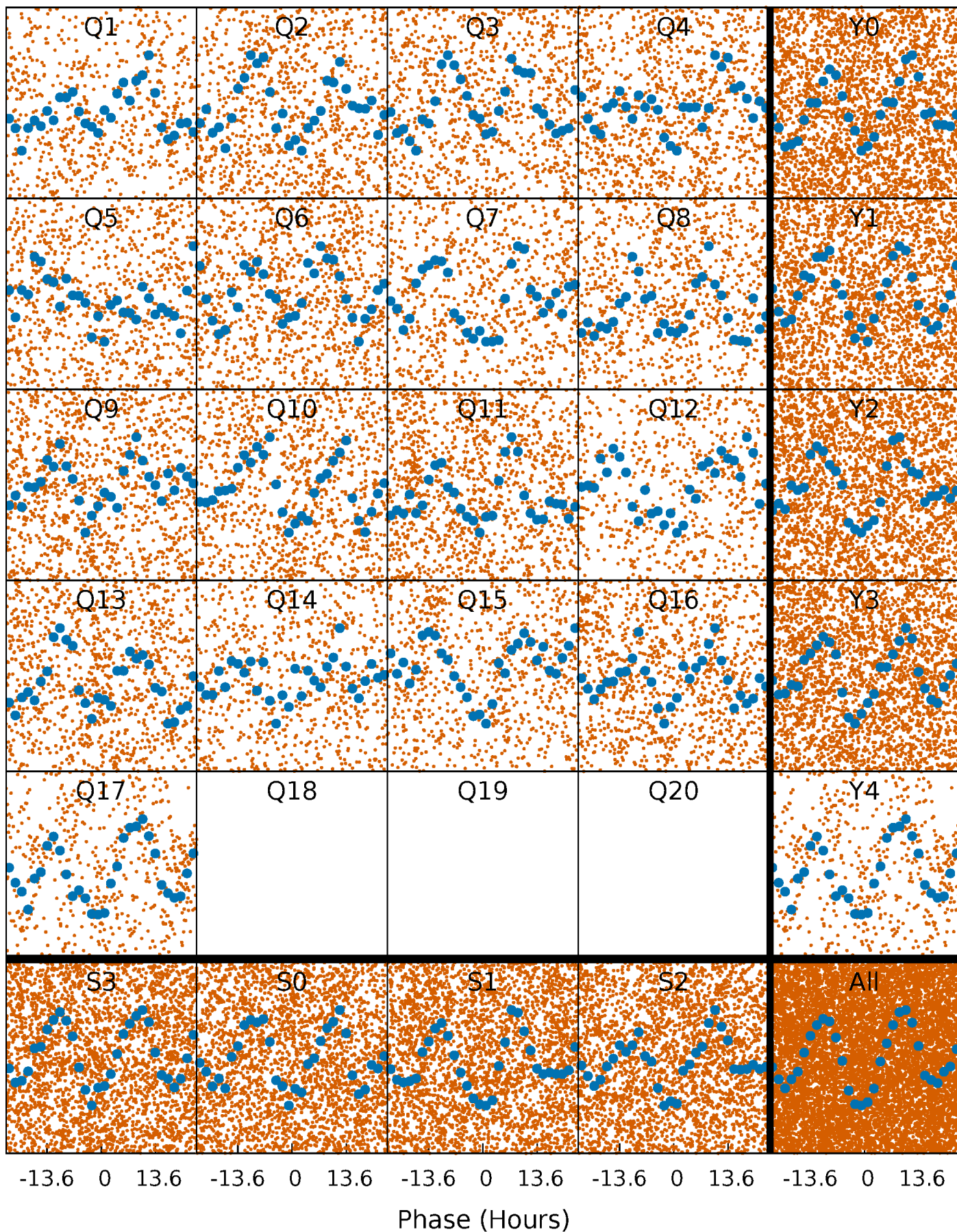


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

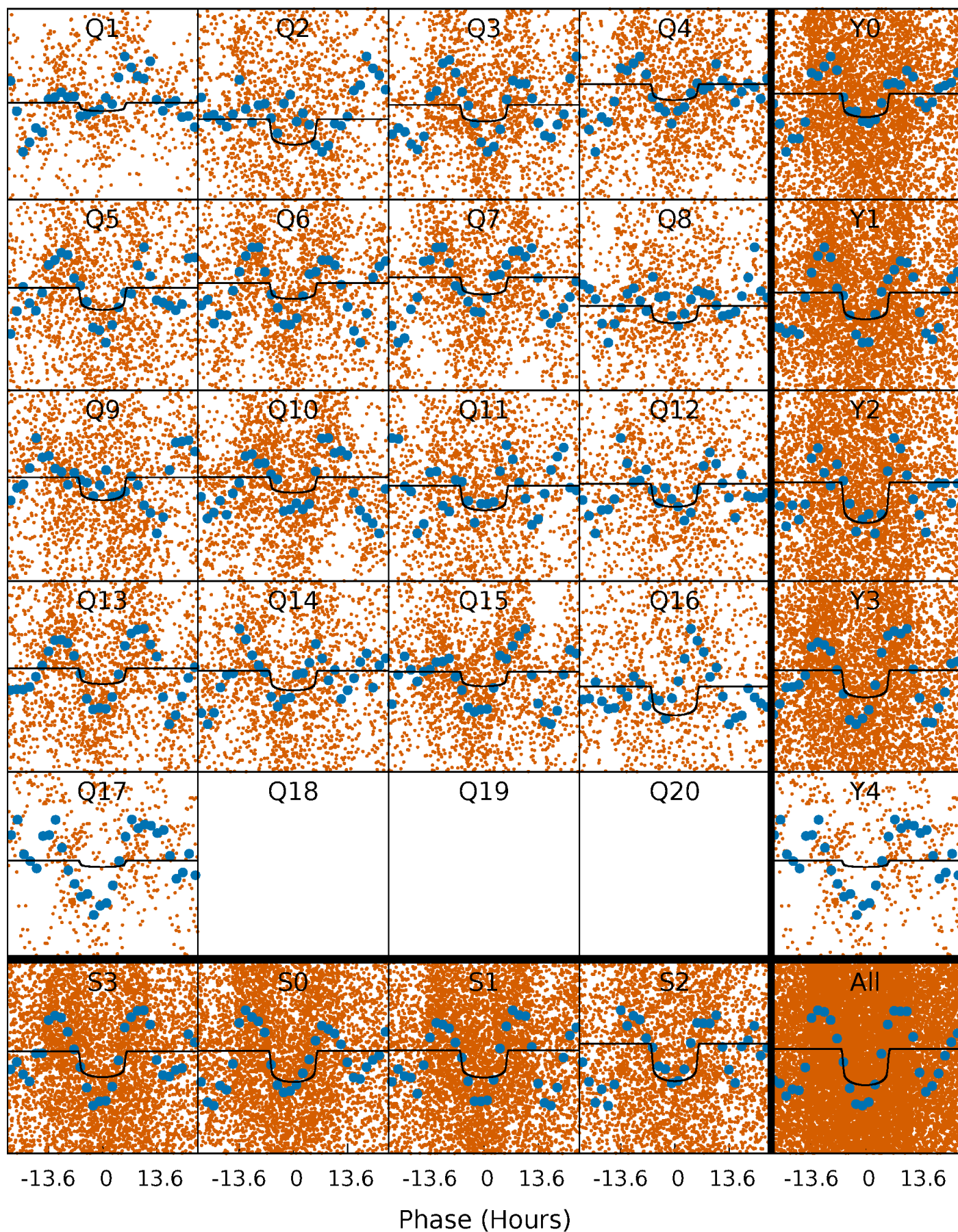
TCE 009471360-02 P= 3.174893 Days  $T_0=133.151036$  (BKJD)





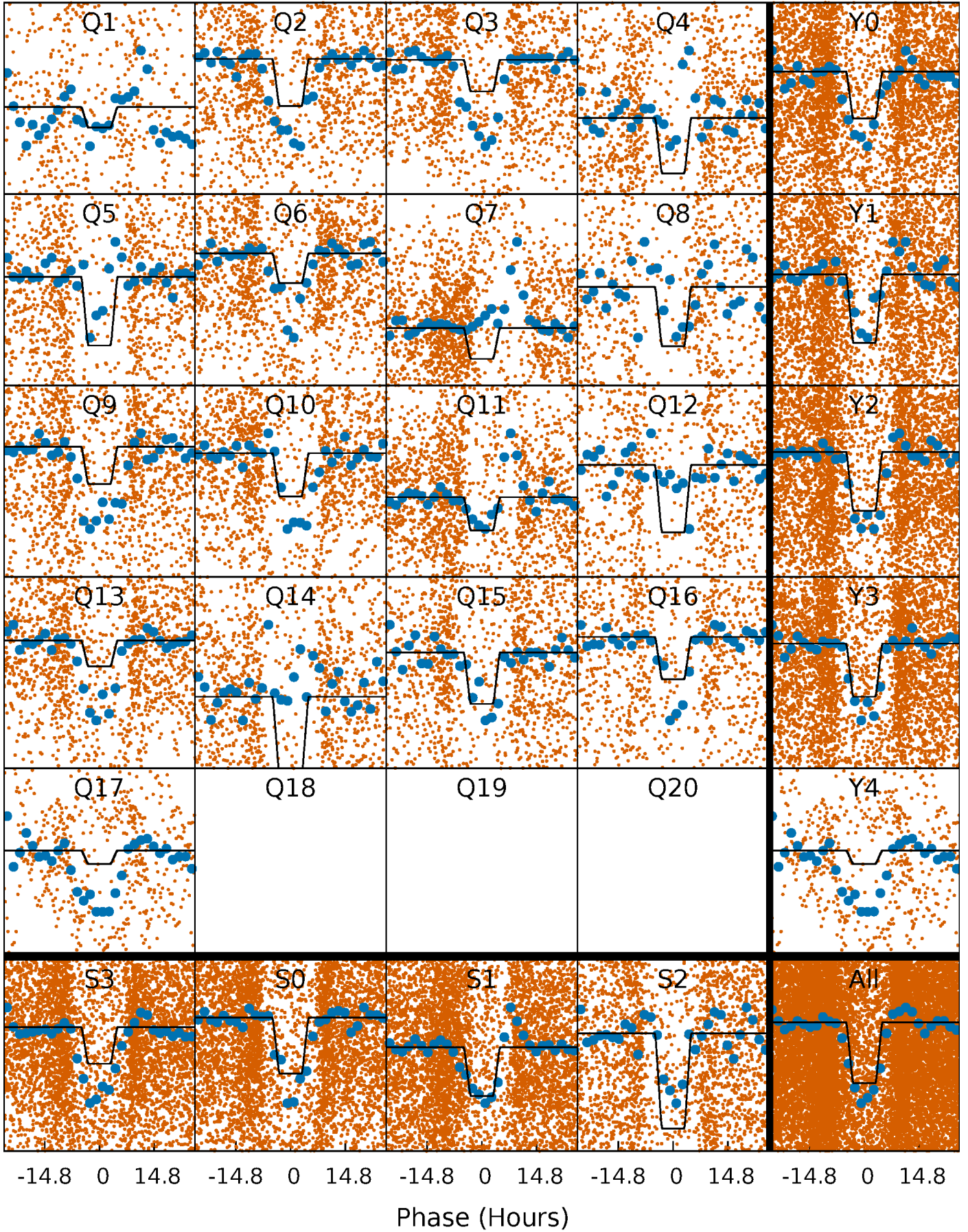
# DV Quarter-Phased Transit Curves

TCE 009471360-02   P= 3.174893 Days    $T_0=133.151036$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 009471360-02   P= 3.174682 Days    $T_0=133.163567$  (BKJD)

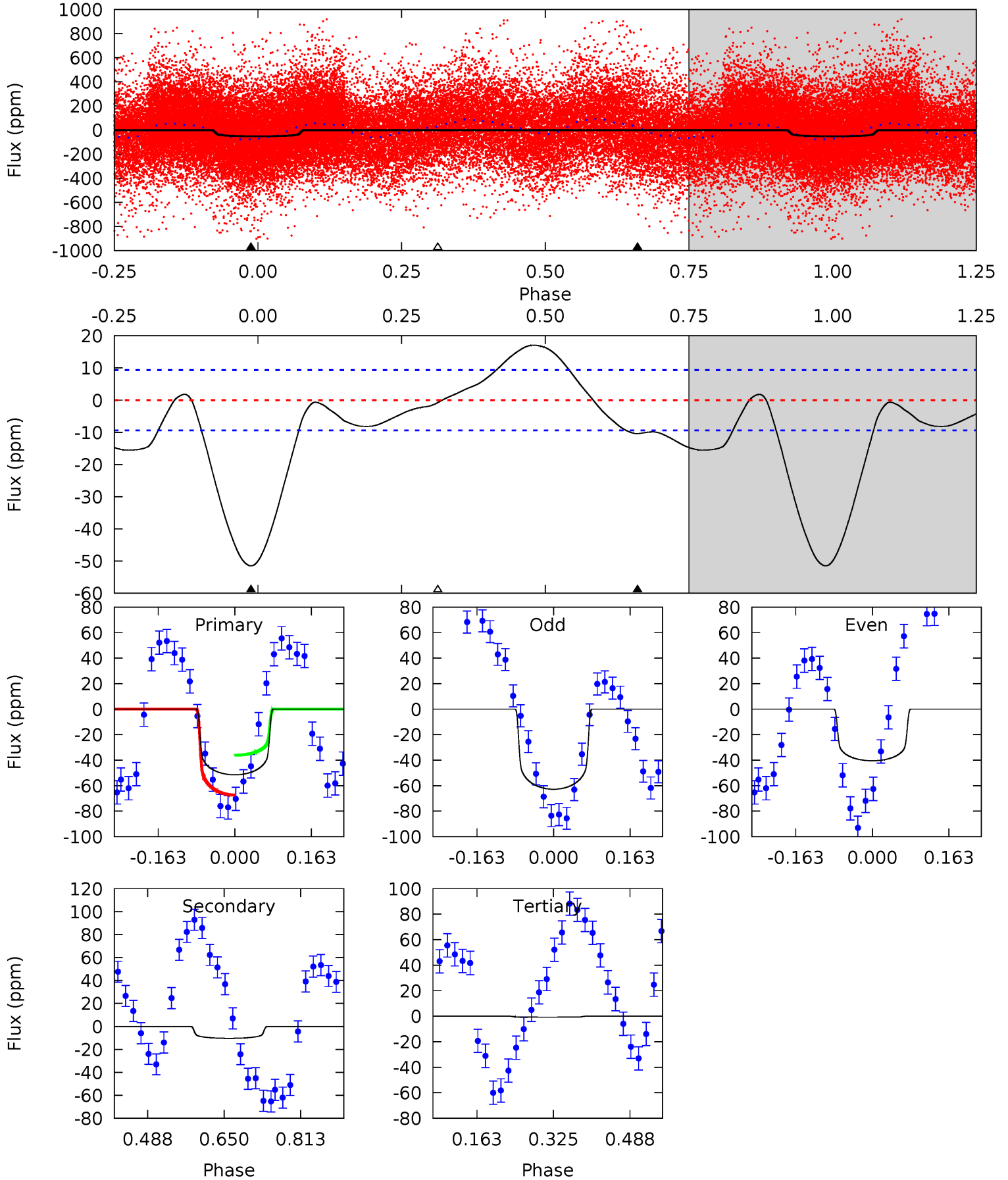




# DV Model-Shift Uniqueness Test

009471360-02, P = 3.174893 Days, E = 129.976143 Days

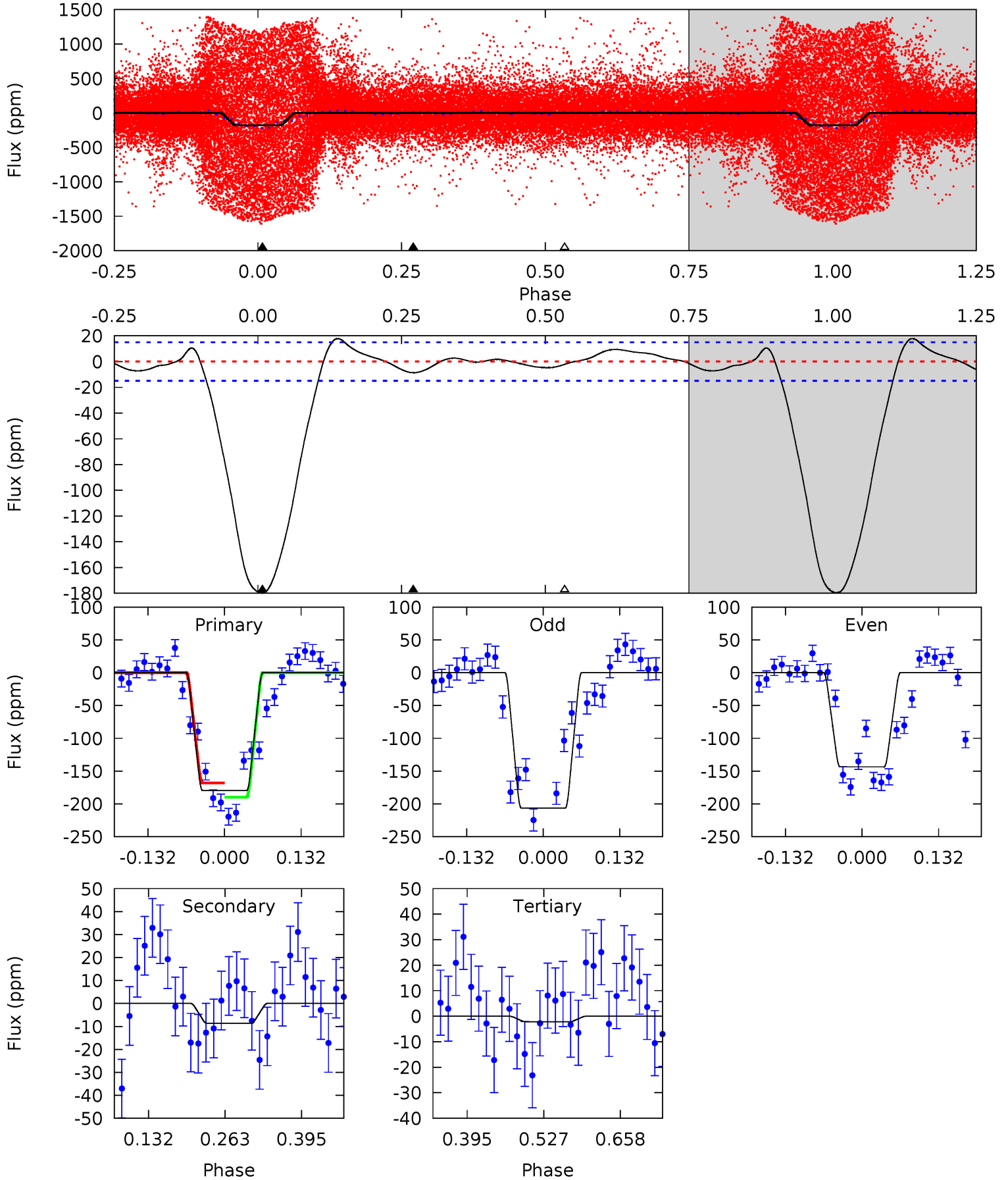
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
24.5	4.95	0.35	0	4.46	1.40	4.03	24.2	24.5	4.60	4.95	5.39	1.27	0.25	7.44



# Alt Model-Shift Uniqueness Test

009471360-02, P = 3.174682 Days, E = 129.988885 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
53.9	2.59	0.65	0	4.51	1.51	1.39	53.3	53.9	1.94	2.59	8.75	0.81	0.09	3.18



### Stellar Parameters For KIC 009471360

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7059^{+220}_{-318}$	$3.820^{+0.353}_{-0.118}$	$0.070^{+0.200}_{-0.350}$	$2.760^{+0.511}_{-1.107}$	$1.834^{+0.188}_{-0.439}$	$0.123^{+0.363}_{-0.046}$
	+3%/-5%	+9%/-3%	+286%/-500%	+19%/-40%	+10%/-24%	+296%/-38%
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 009471360-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-10 \pm 2$	$2.20^{+0.37}_{-0.46}$	$3112^{+241}_{-315}$	$4575^{+274}_{-276}$	$3.100^{+1.736}_{-0.897}$
Alt.	$-9 \pm 3$	$3.26^{+0.48}_{-0.66}$	$3093^{+249}_{-316}$	$3718^{+320}_{-433}$	$1.198^{+0.752}_{-0.497}$

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

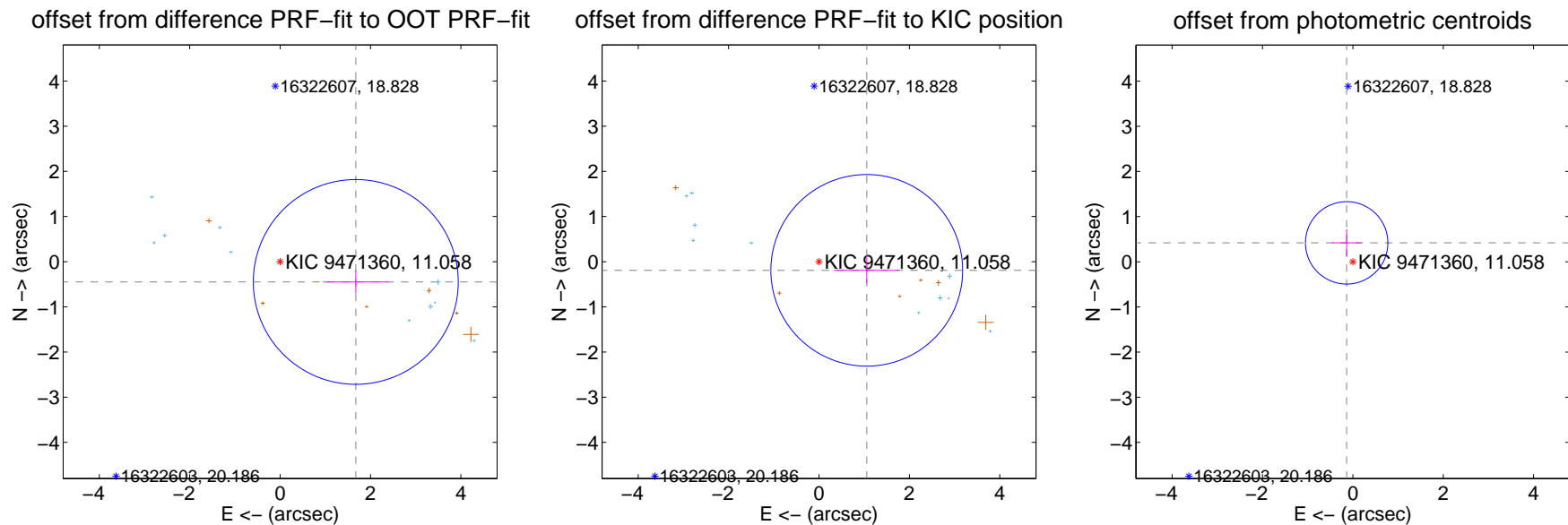
## DV Centroid Data

Supplemental centroid analysis for 009471360-02. **Kepler magnitude: 11.06.** Transit SNR 11.40

There are 10 quarters with good PRF difference image offsets

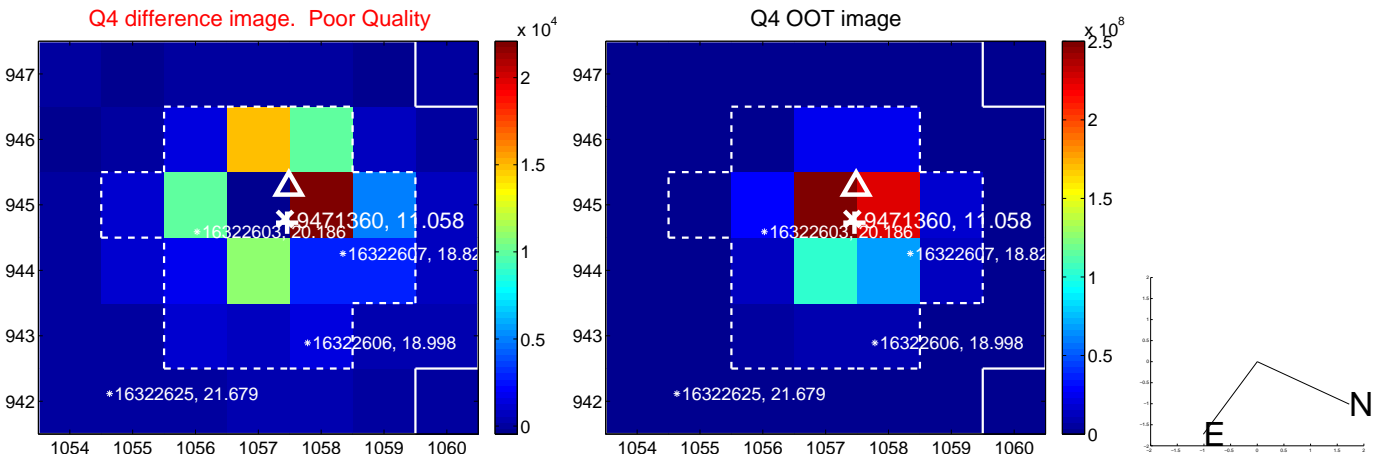
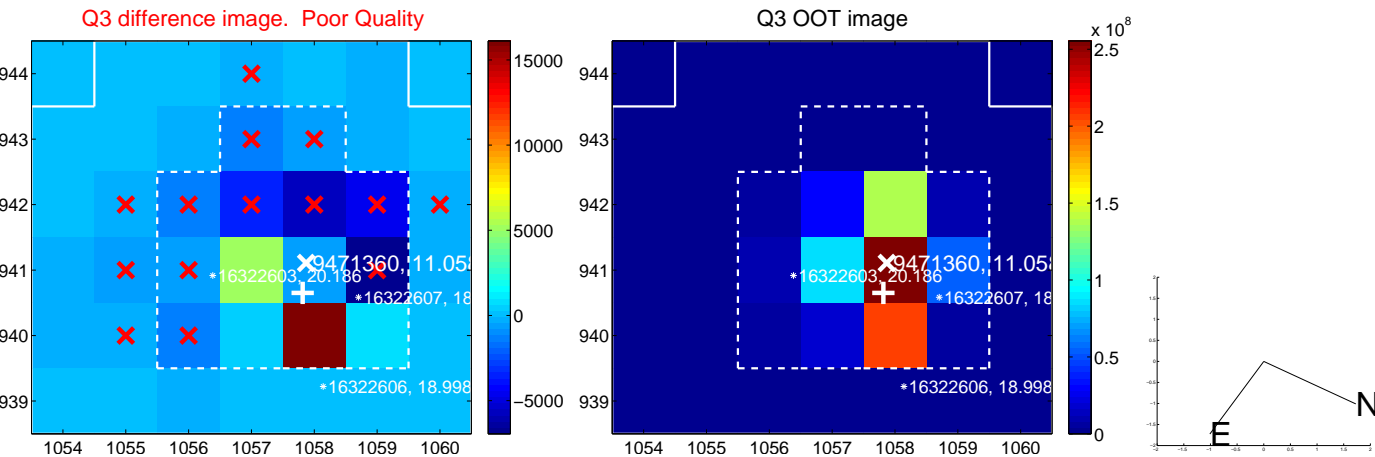
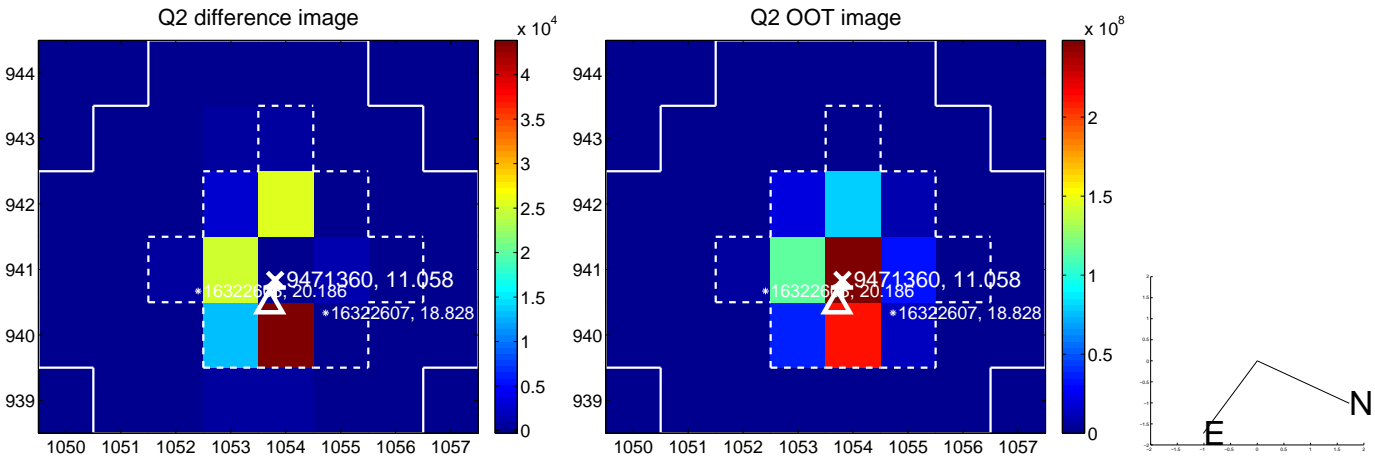
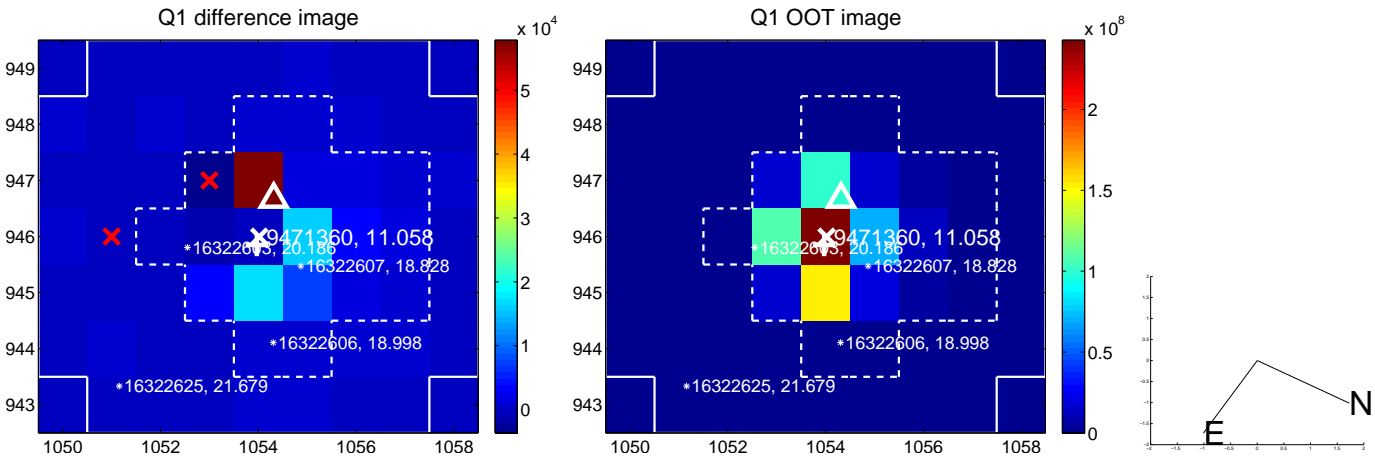
The direct PRF centroid is offset from the target star catalog position by about 0.57 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.733 \pm 0.756$	2.29	$-1.674 \pm 0.724$	$-0.448 \pm 0.253$
PRF-fit source offset from KIC position	$1.074 \pm 0.707$	1.52	$-1.057 \pm 0.717$	$-0.191 \pm 0.289$
photometric centroid source offset	$0.44 \pm 0.30$	1.45	$0.14 \pm 0.33$	$0.42 \pm 0.30$



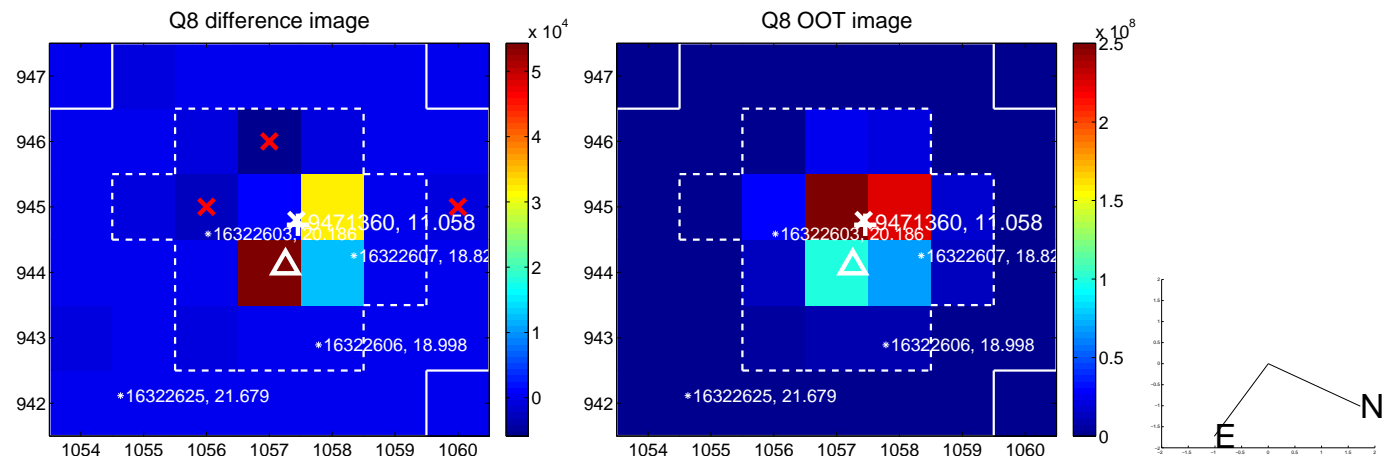
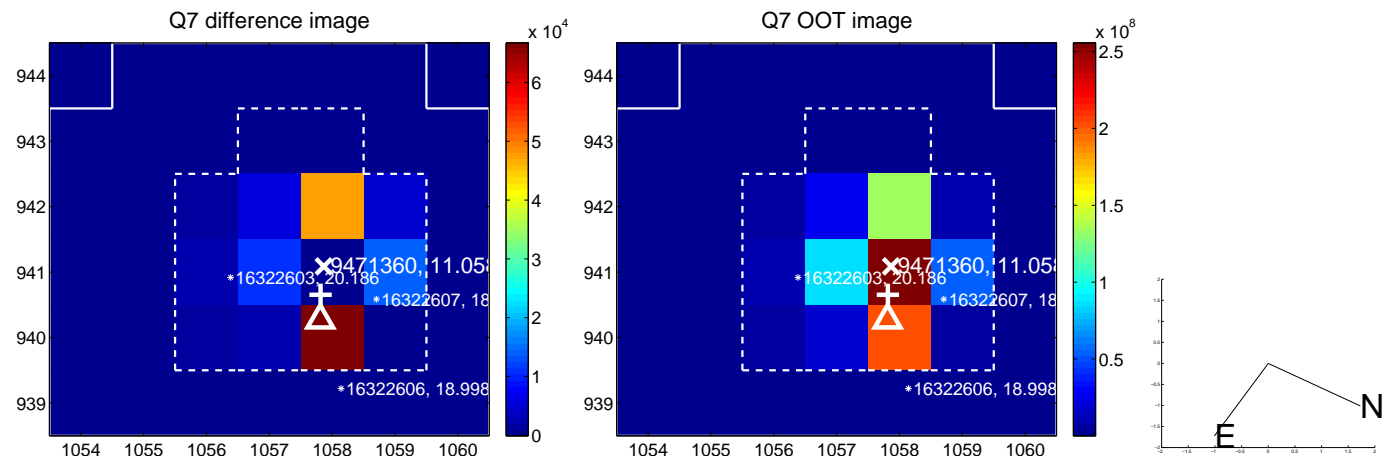
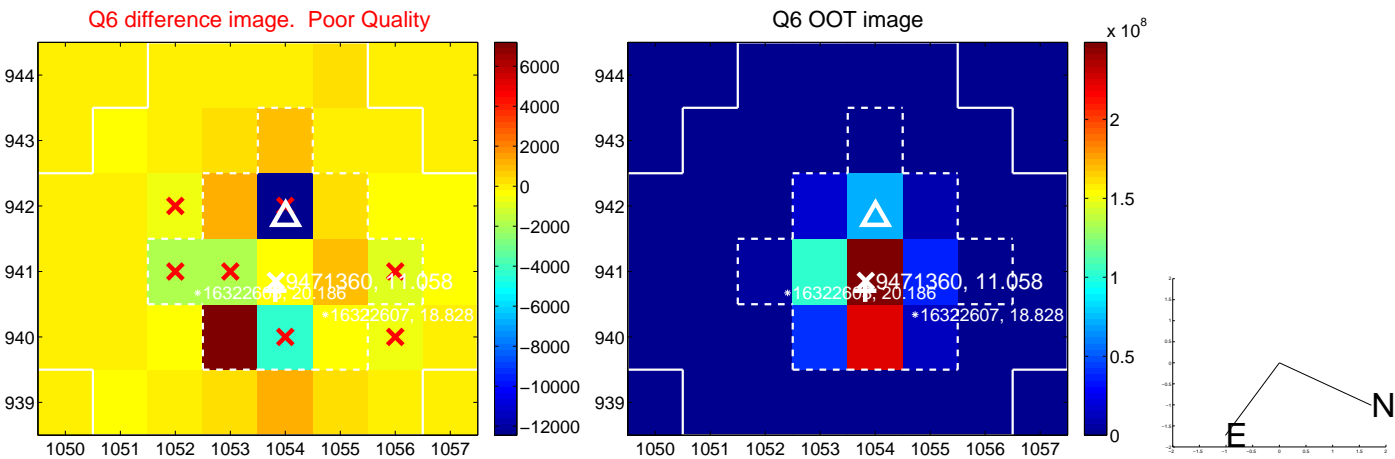
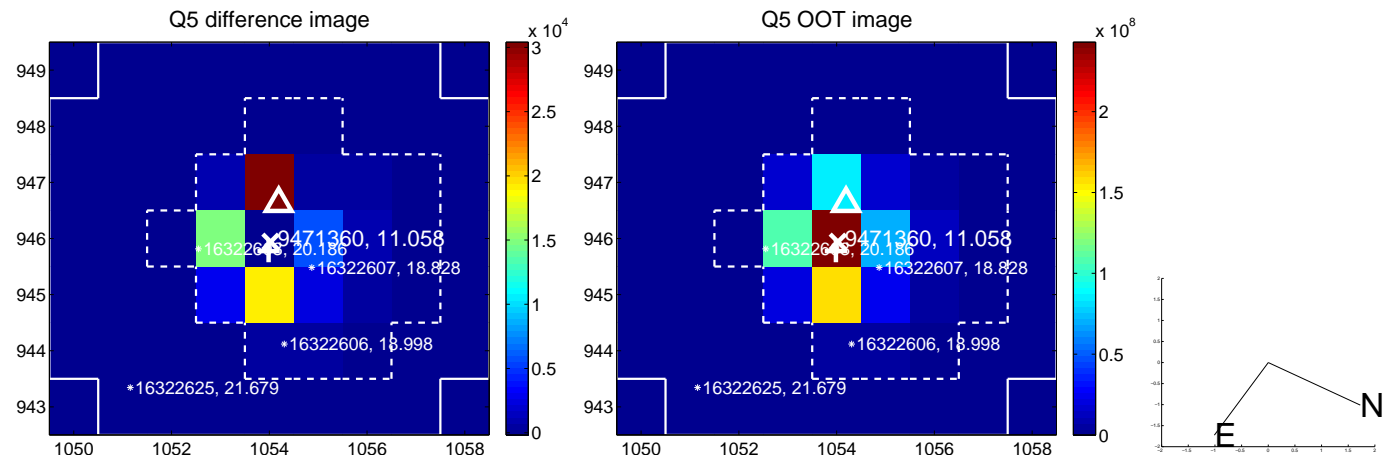
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

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

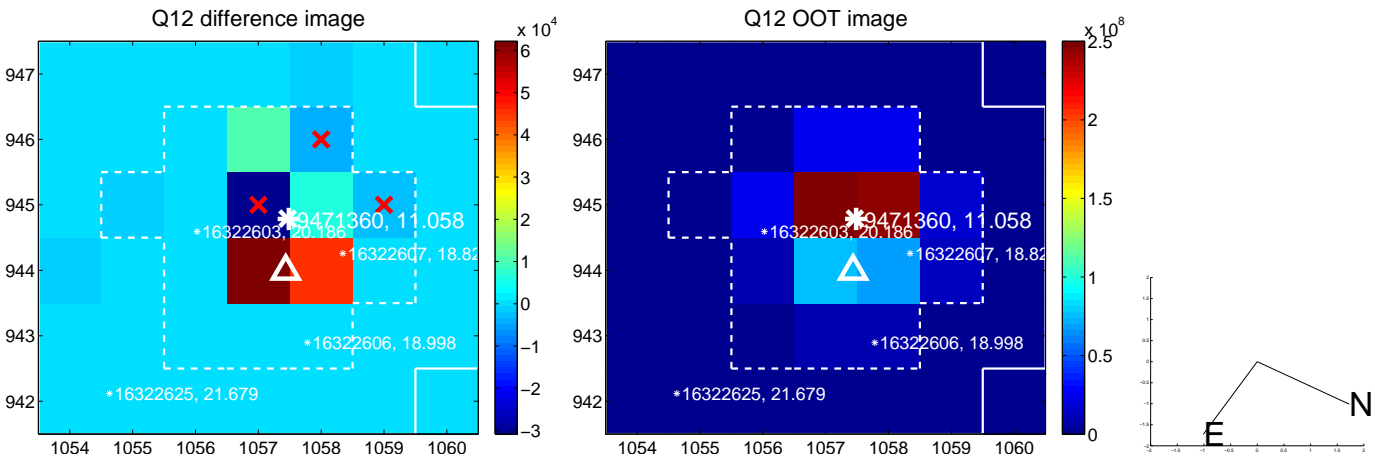
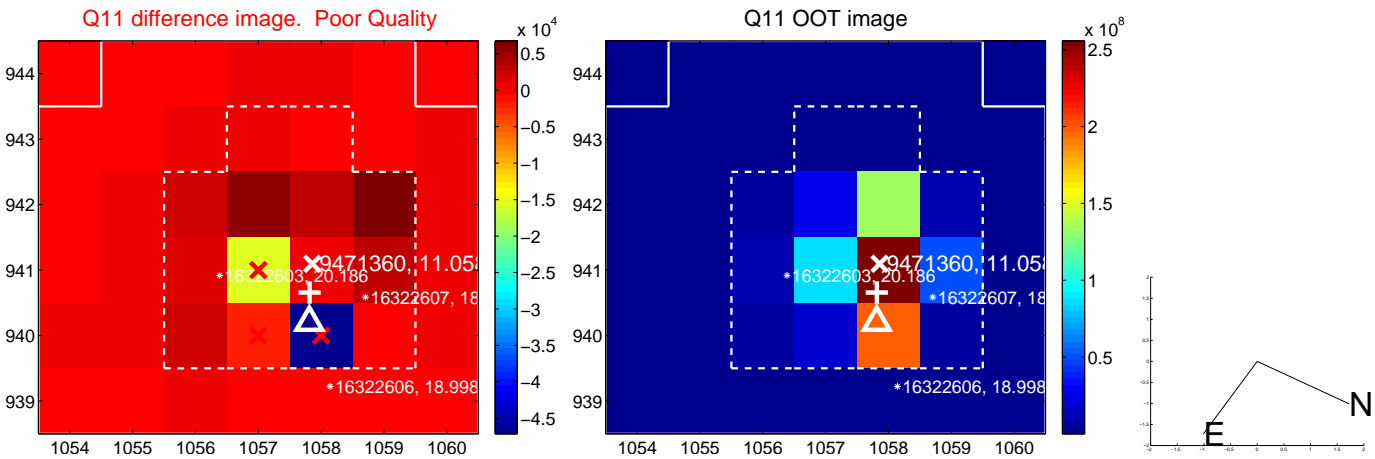
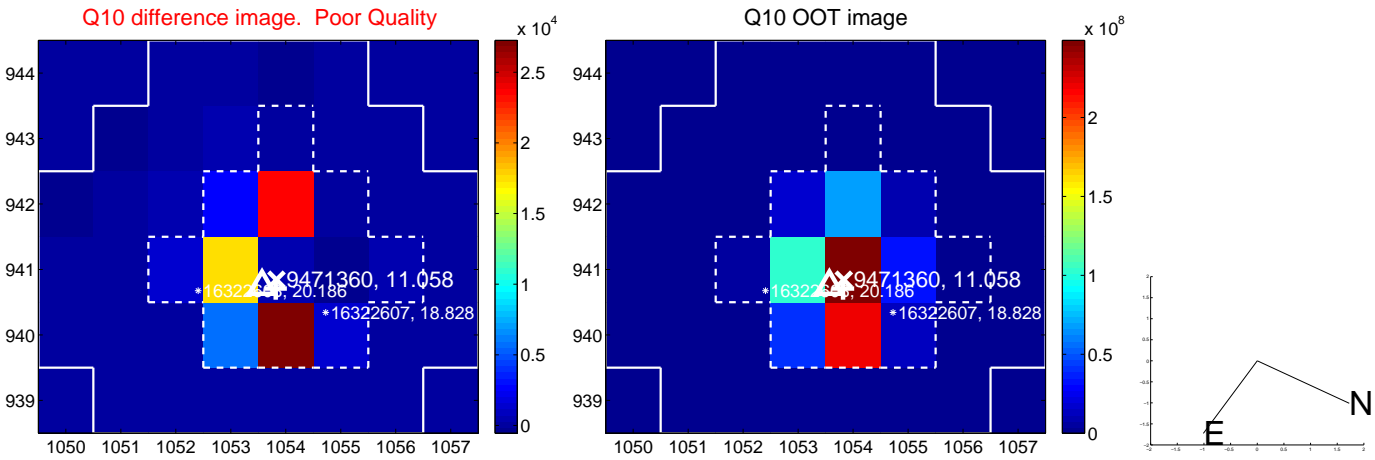
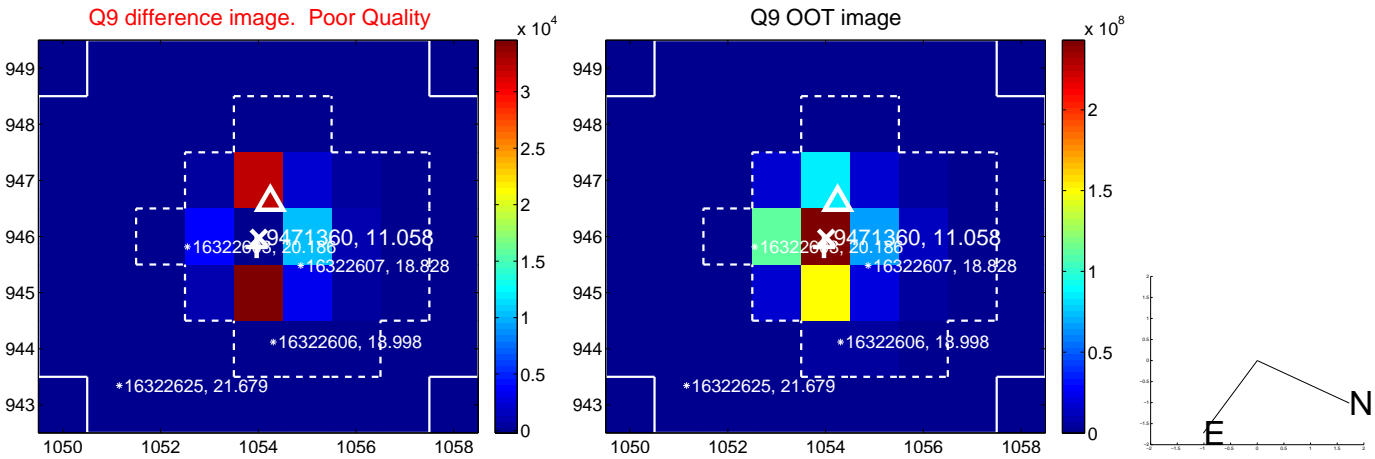




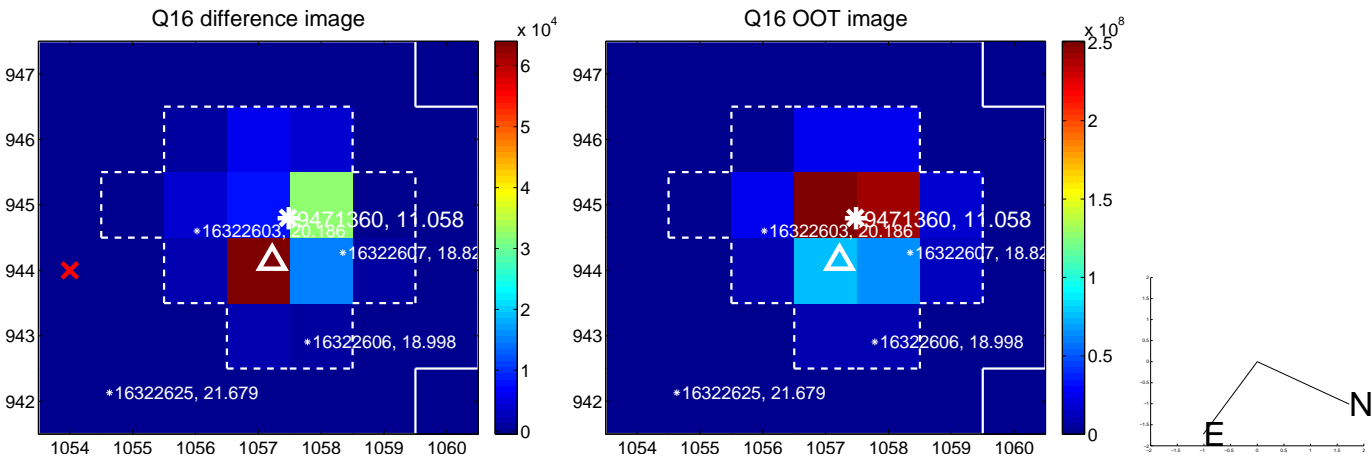
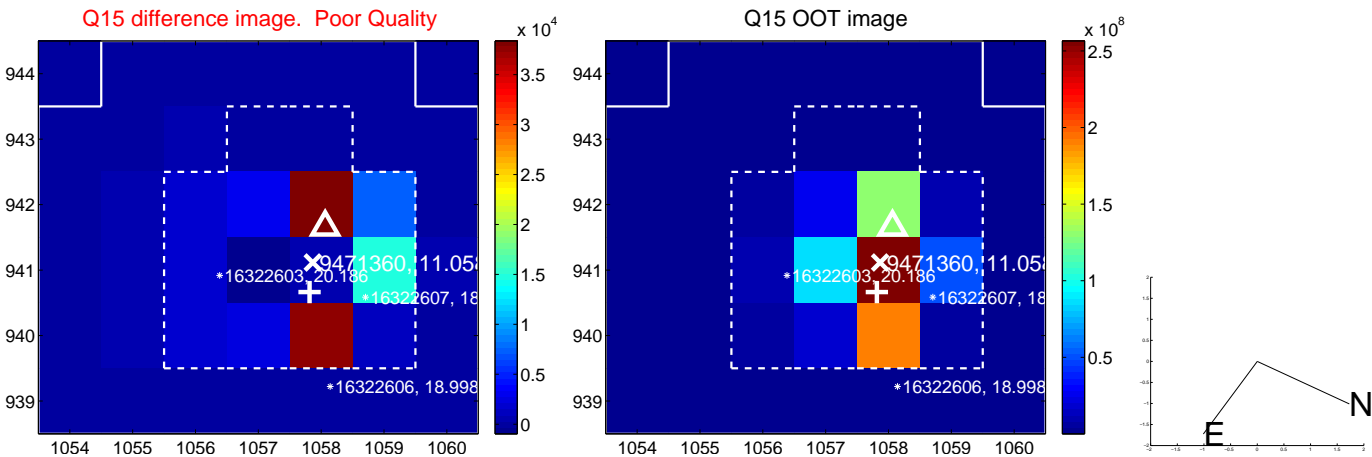
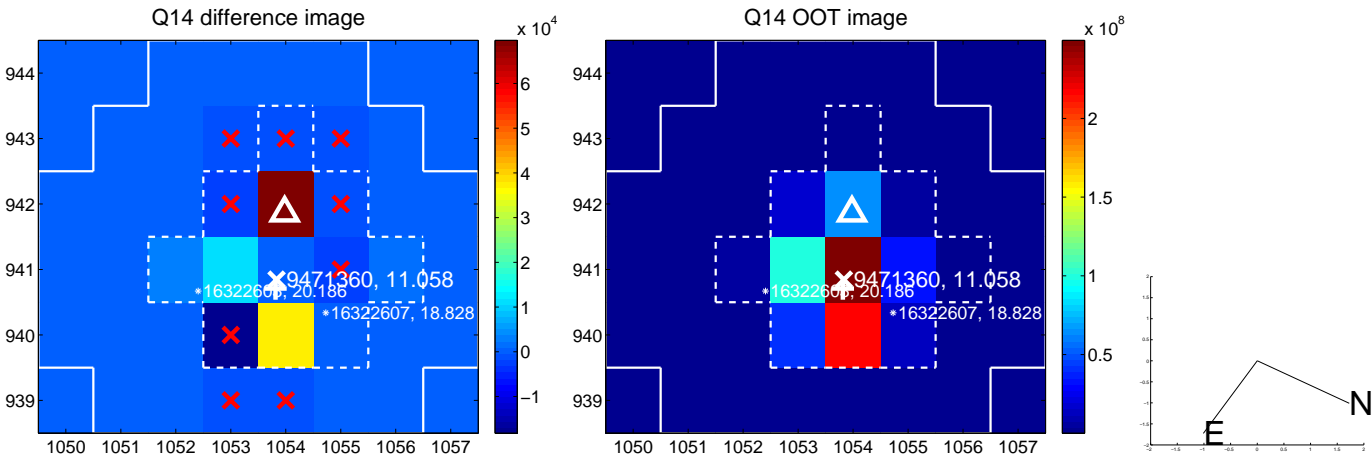
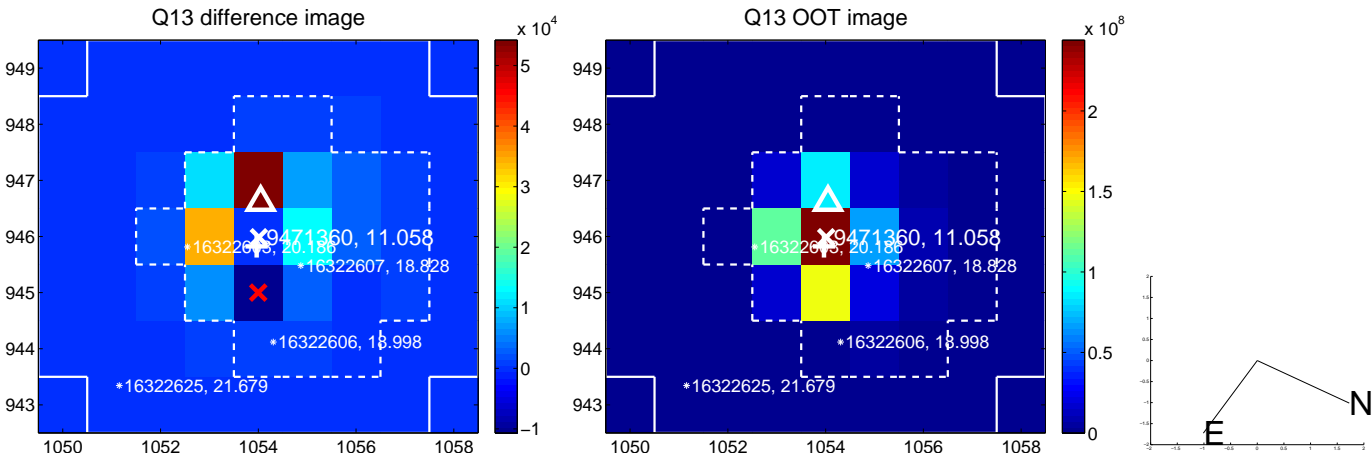
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



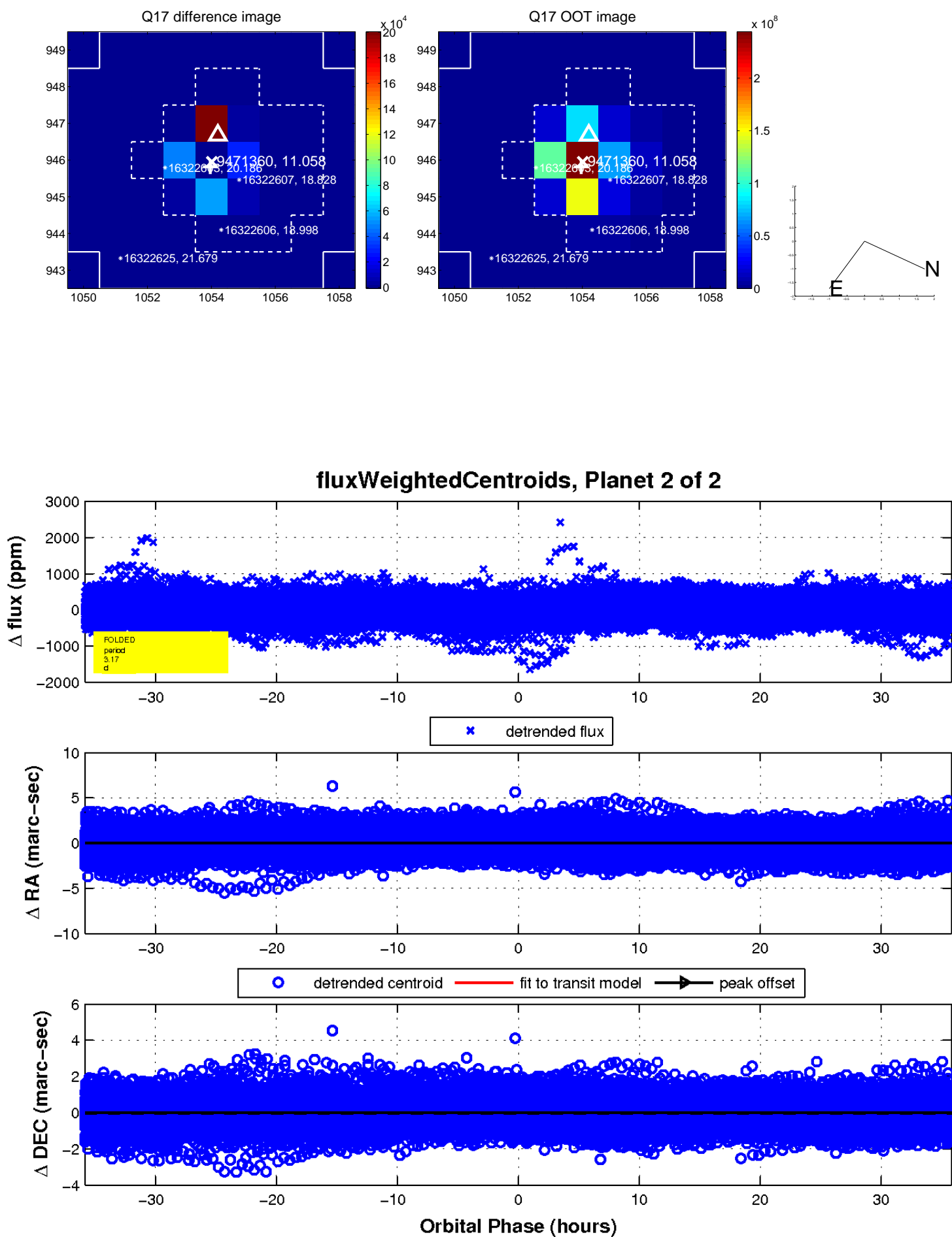
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



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



UKIRT Image

Declination

