

# KIC 006509328

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
006509328-01	OBS	No	1.408270	132.198995	5.6	4.151	11.1	4.2	1.90	7638	0.55	12800.29
006509328-02	OBS	No	1.408101	131.879878	12.1	4.719	10.4	9.9	1.90	7638	0.76	12802.34

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
006509328-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_SKYE_ZUMA_TRACKER—SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
006509328-02	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD

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

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

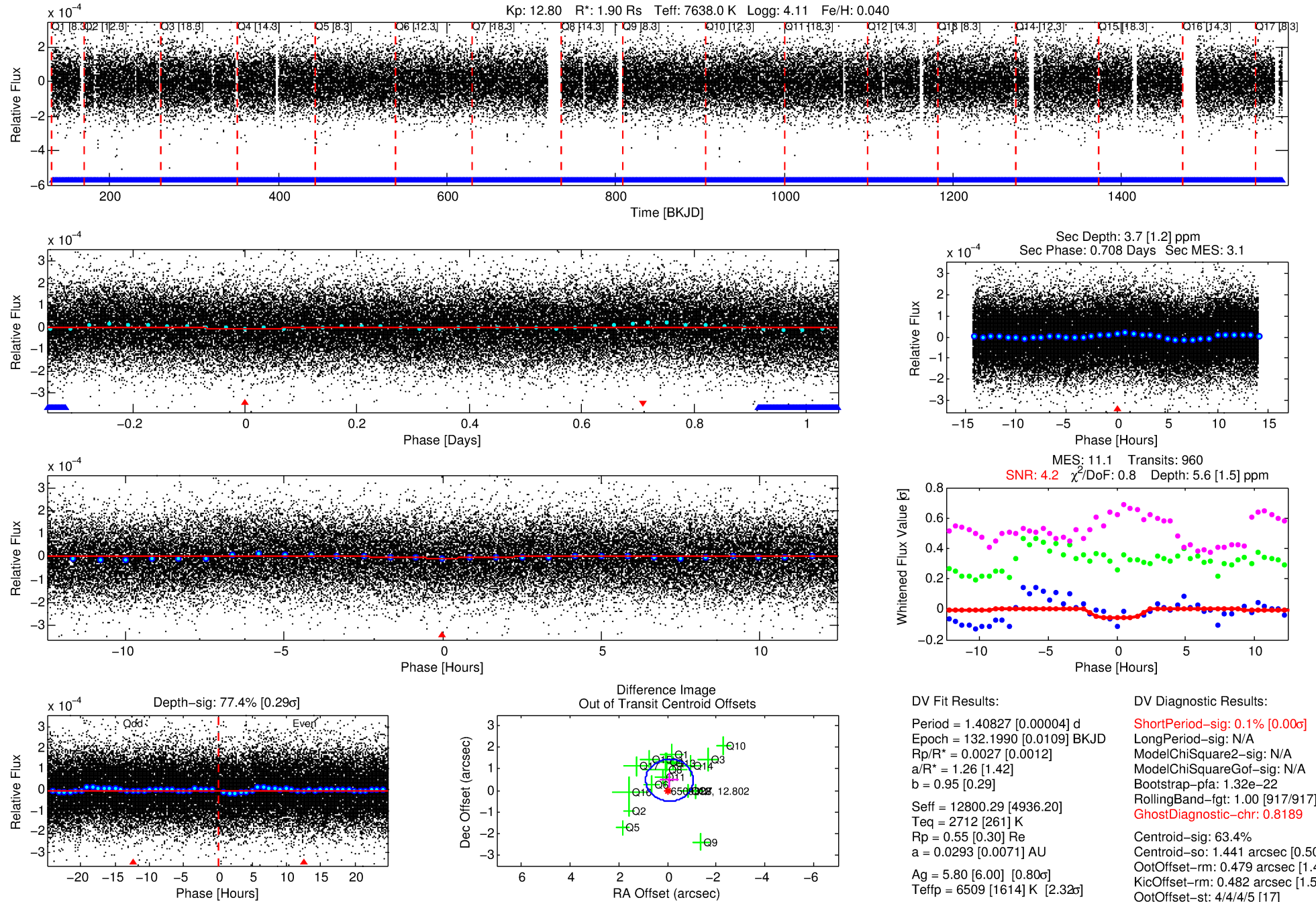
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 006509328-01

No Significant Match Found

# DV One-Page Summary

KIC: 6509328 Candidate: 1 of 2 Period: 1.408 d



## DV Fit Results:

Period = 1.40827 [0.00004] d  
Epoch = 132.990 [0.0109] BKJD  
Rp/R\* = 0.0027 [0.0012]  
a/R\* = 1.26 [1.42]  
b = 0.95 [0.29]  
Seff = 12800.29 [4936.20]  
Teq = 2712 [261] K  
Rp = 0.55 [0.30] Re  
a = 0.0293 [0.0071] AU  
Ag = 5.80 [6.00] [0.80 $\sigma$ ]  
Teffp = 6509 [1614] K [2.32 $\sigma$ ]

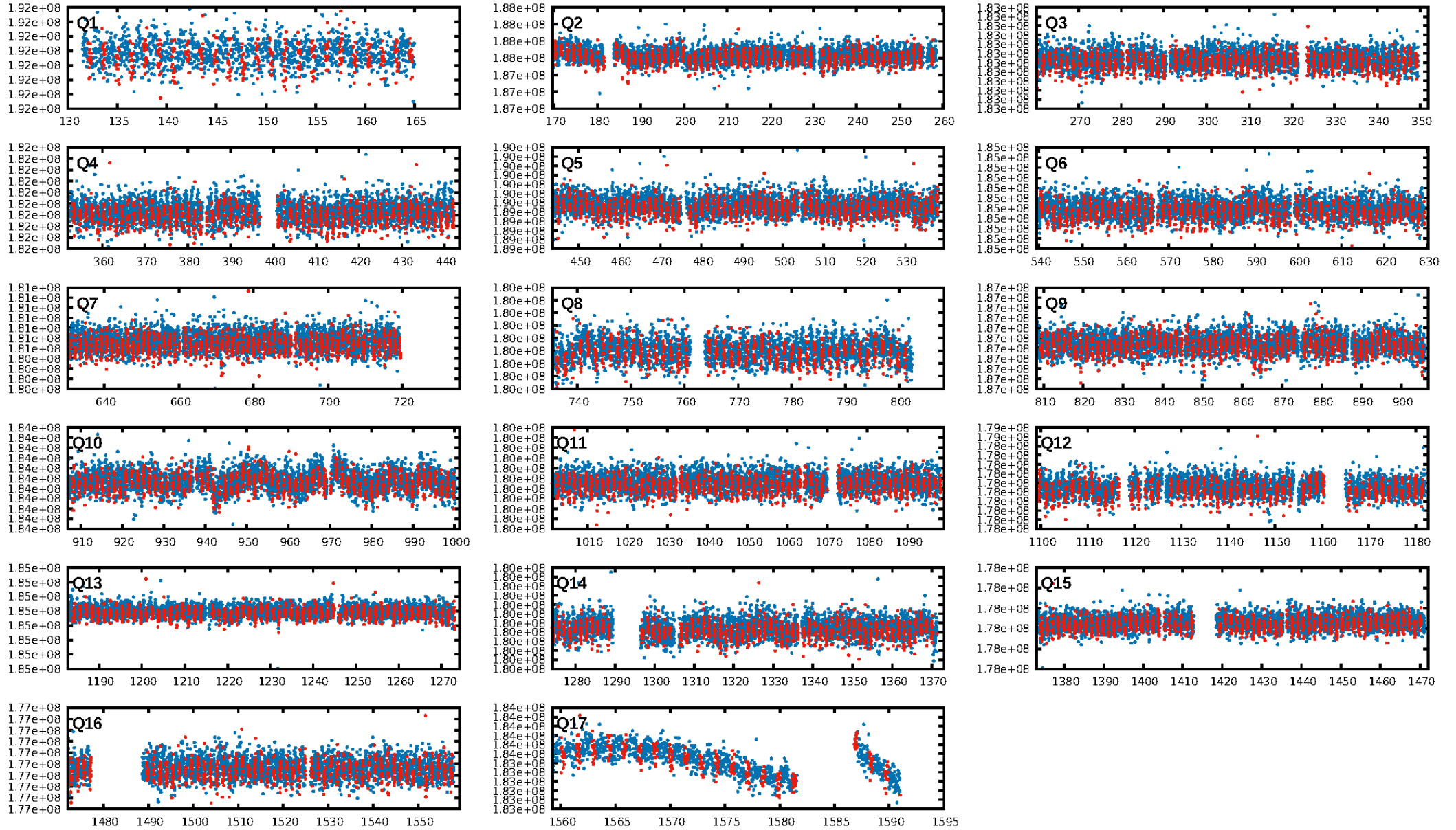
## DV Diagnostic Results:

ShortPeriod-sig: 0.1% [0.00 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 1.32e-22  
RollingBand-fgt: 1.00 [917/917]  
GhostDiagnostic-chr: 0.8189  
Centroid-sig: 63.4%  
Centroid-so: 1.441 arcsec [0.50 $\sigma$ ]  
OotOffset-rm: 0.479 arcsec [1.48 $\sigma$ ]  
KicOffset-rm: 0.482 arcsec [1.51 $\sigma$ ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 1.00 [17/17]  
DiffImageOverlap-fno: 0.12 [2/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 02:23:57 Z

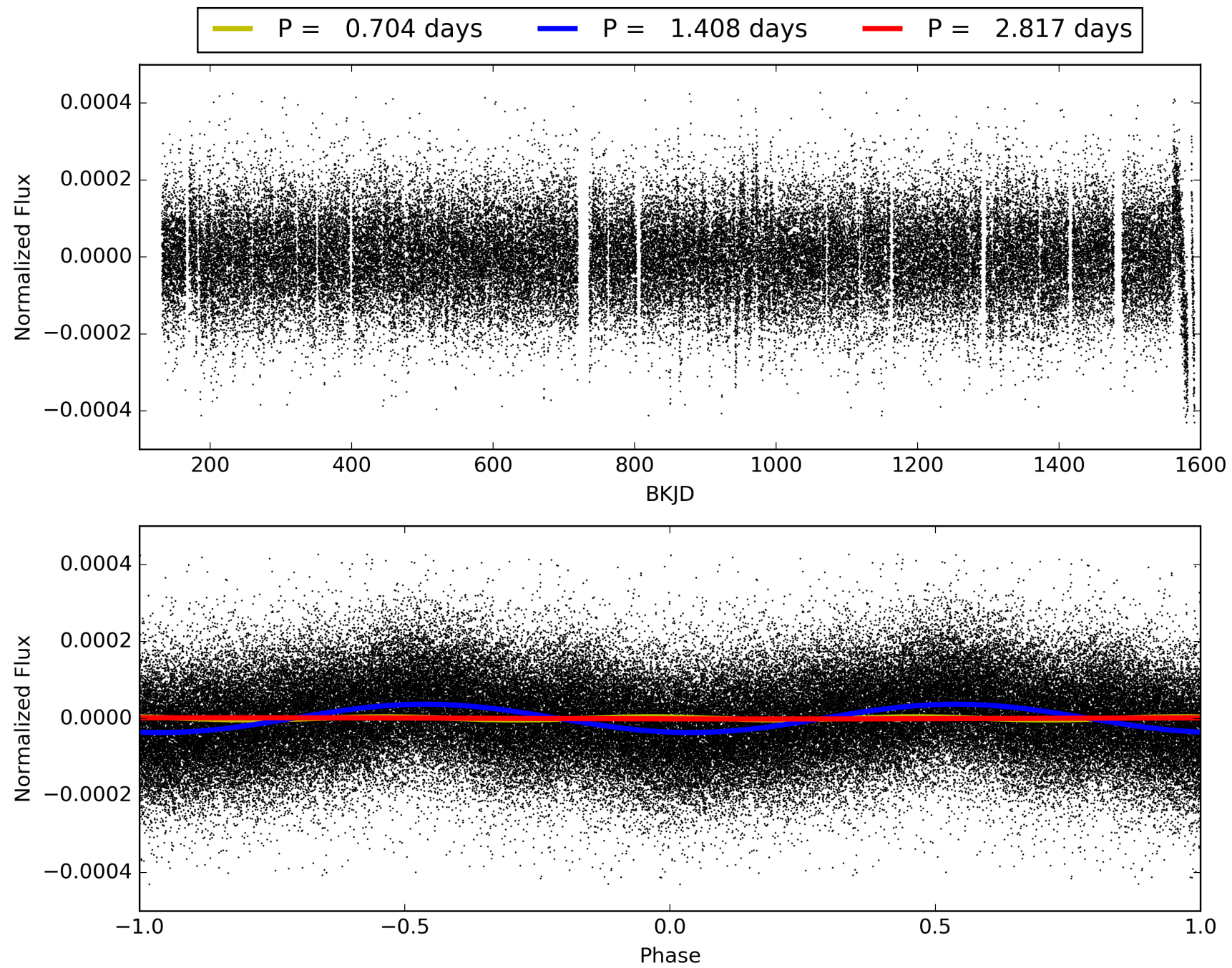
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 006509328-01, PDC Light Curves



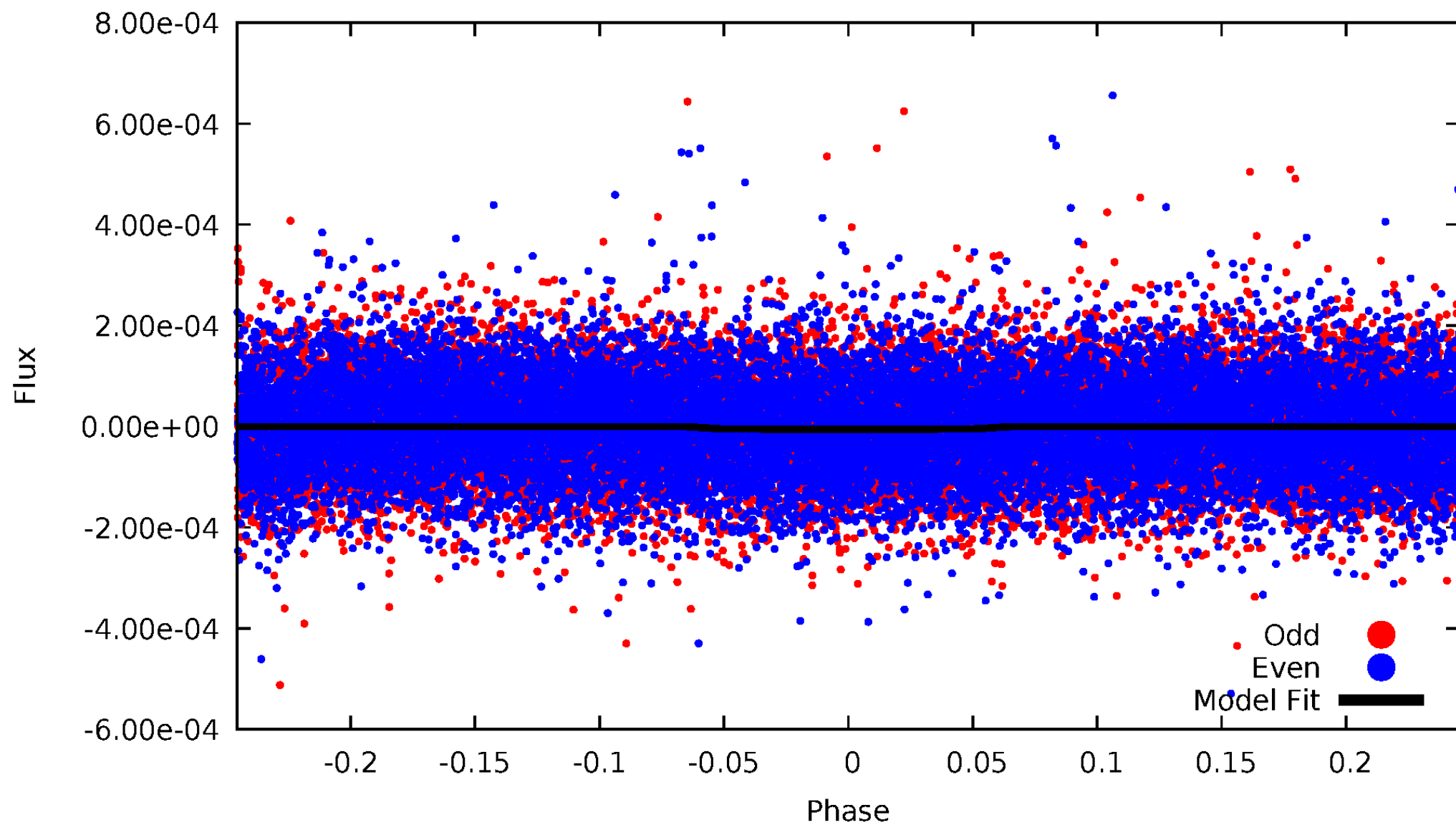


TCE 006509328-01



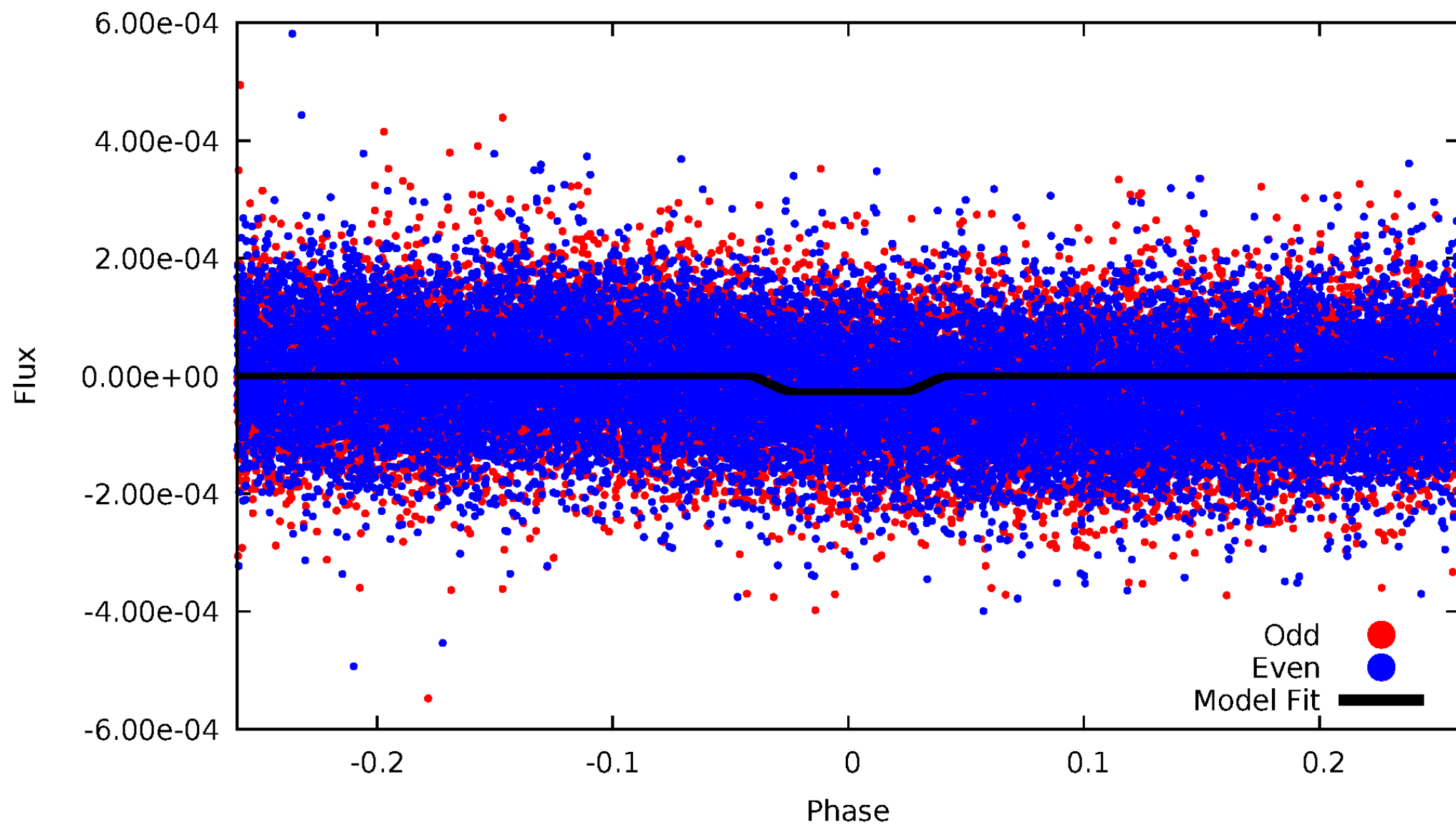
# DV Odd/Even

TCE 006509328-01



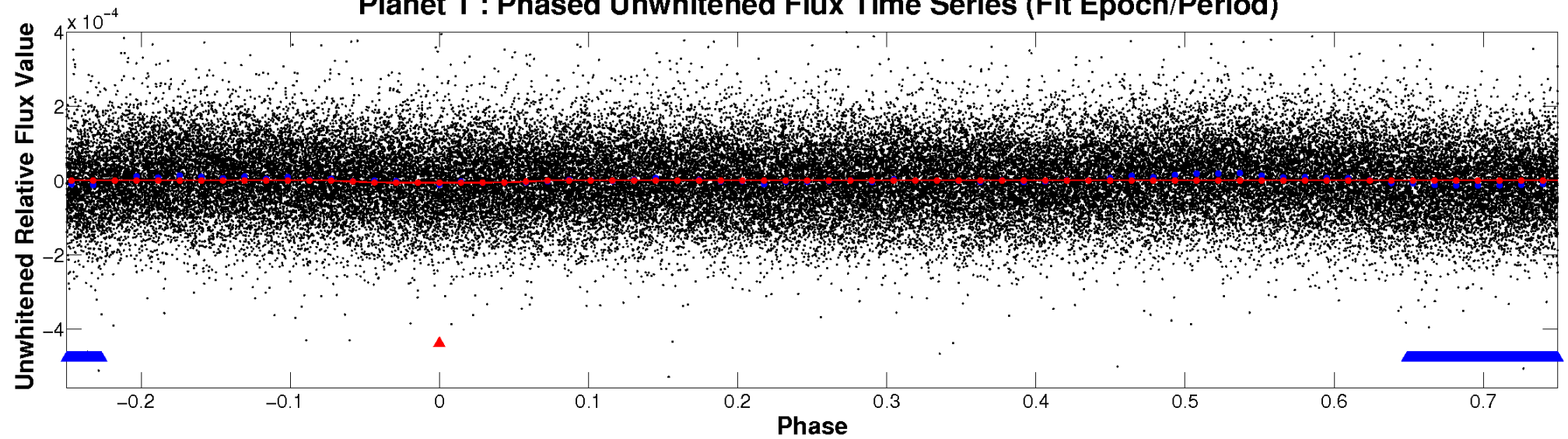
# ALT Odd/Even

TCE 006509328-01

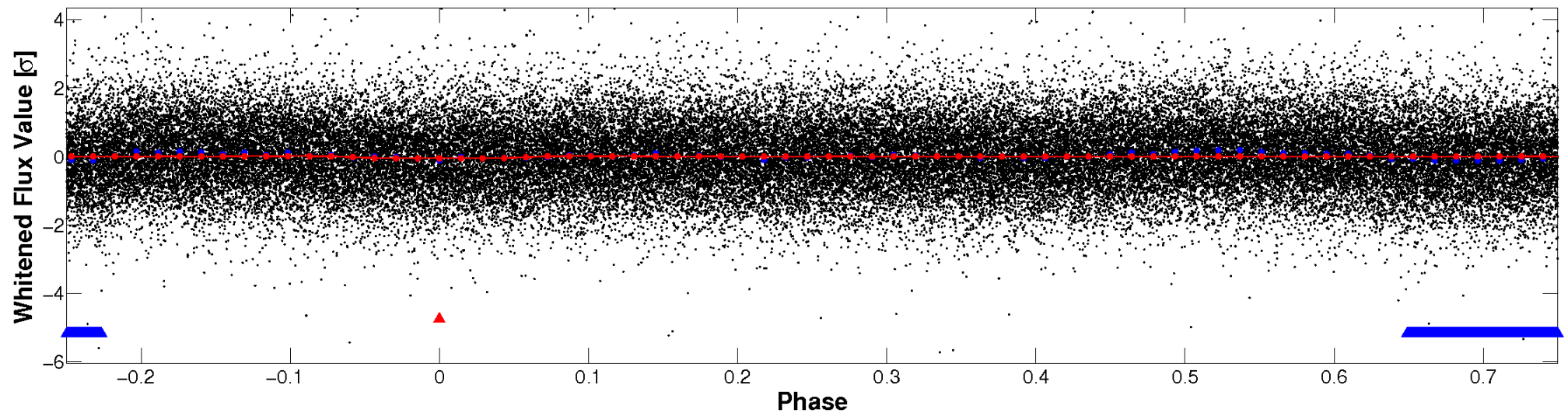


# Non-Whitened Vs. Whitened Light Curve

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



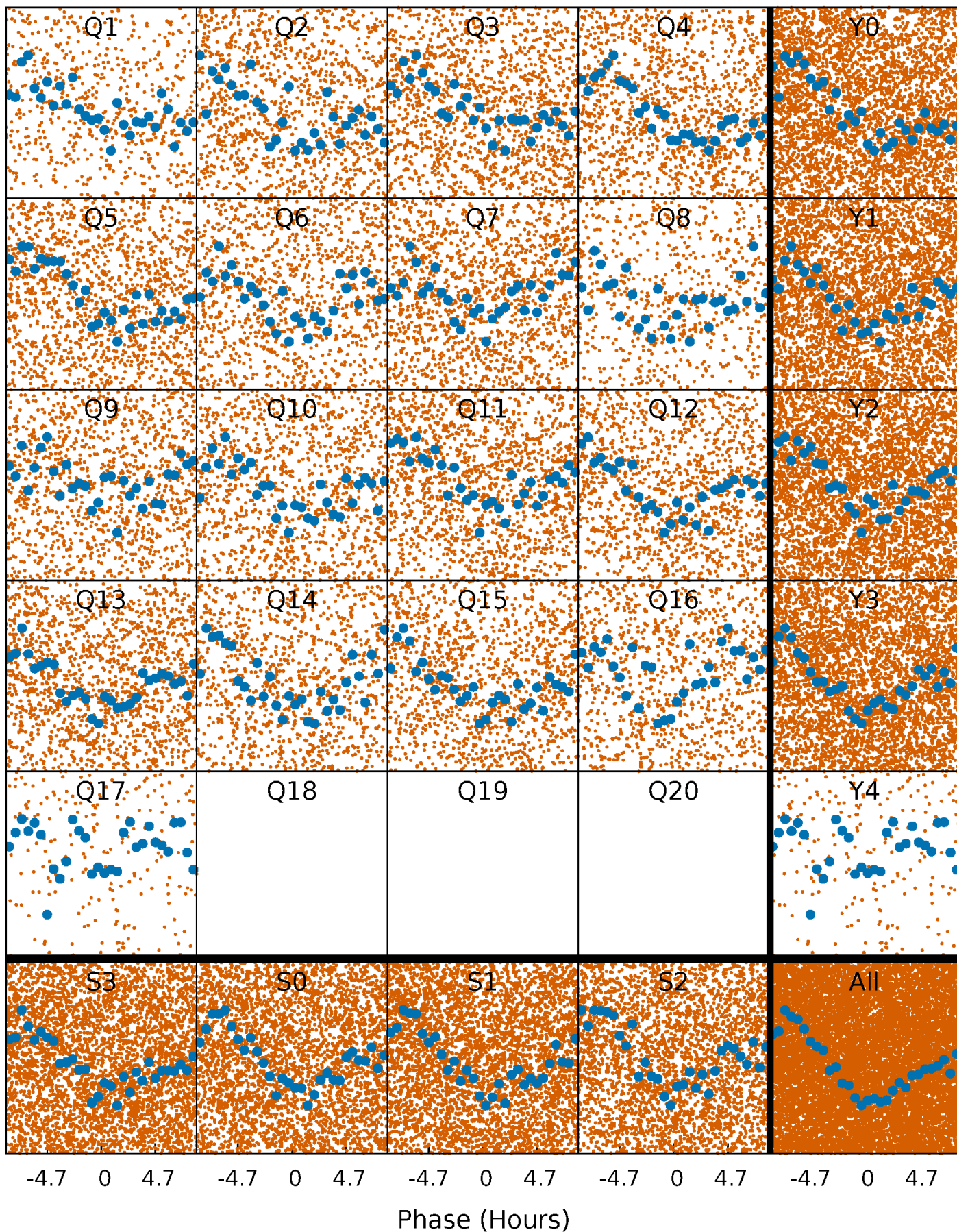
Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)





# PDC Quarter-Phased Transit Curves

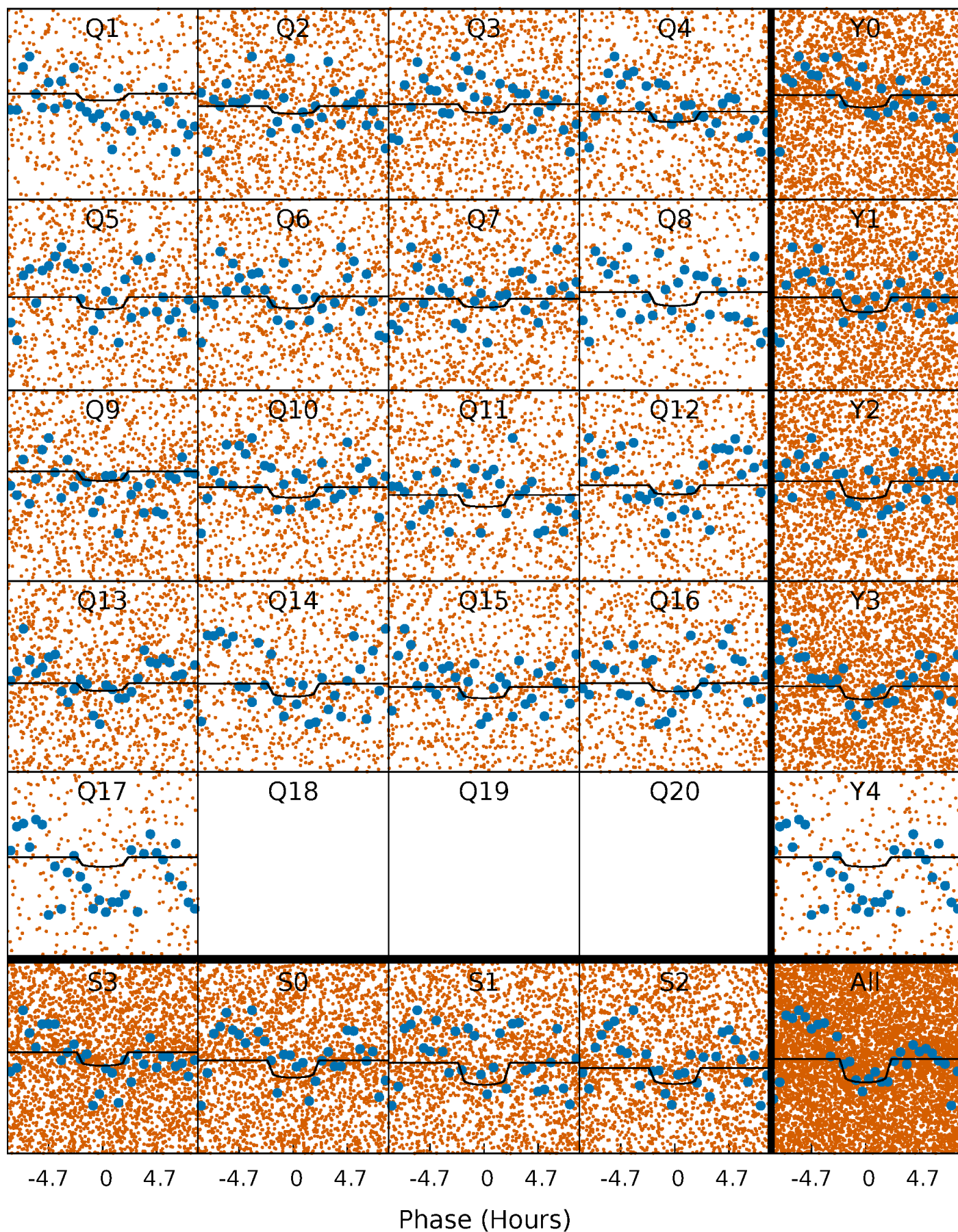
TCE 006509328-01 P= 1.408270 Days  $T_0=132.198995$  (BKJD)





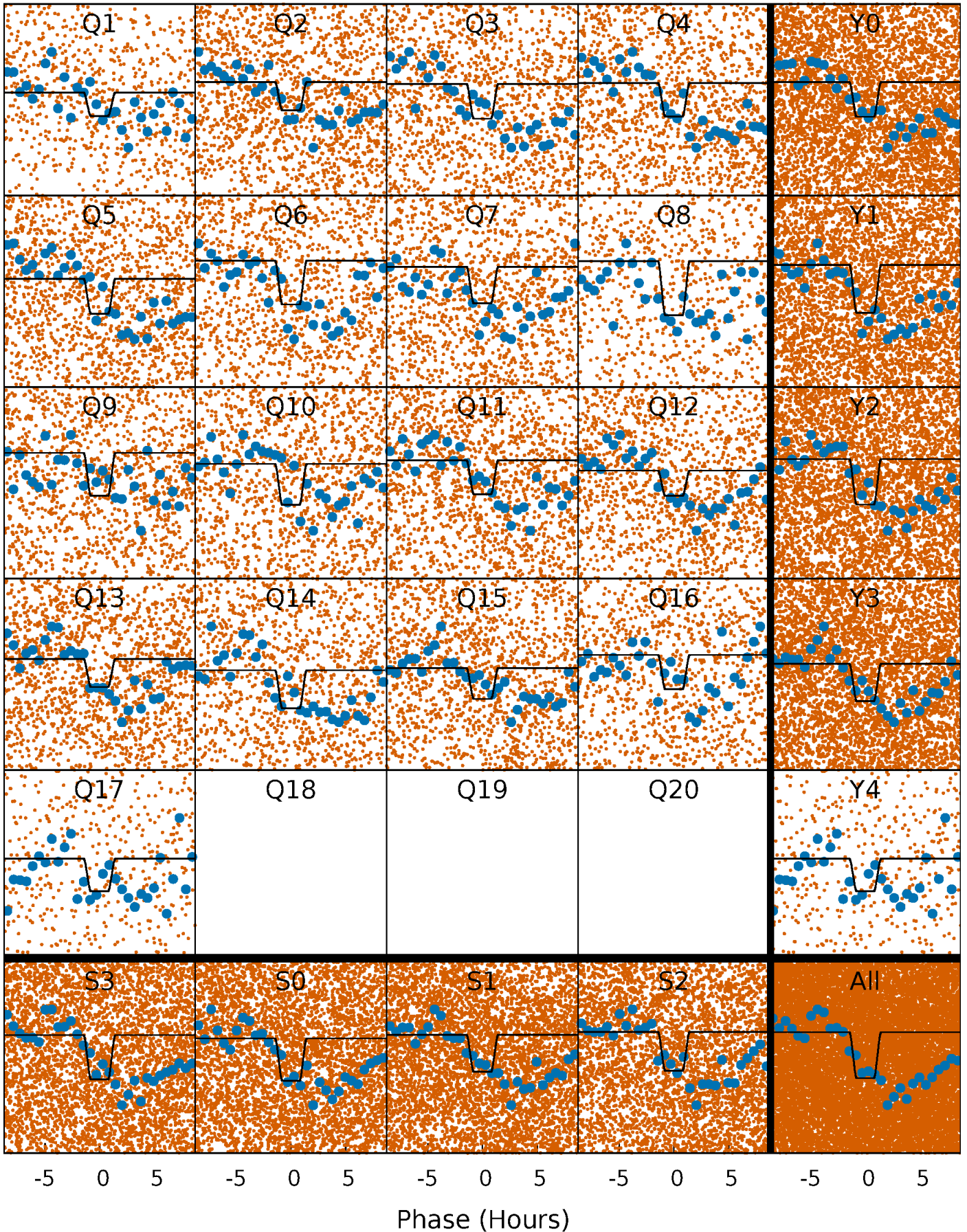
# DV Quarter-Phased Transit Curves

TCE 006509328-01 P= 1.408270 Days  $T_0=132.198995$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 006509328-01 P= 1.408214 Days  $T_0=132.131698$  (BKJD)

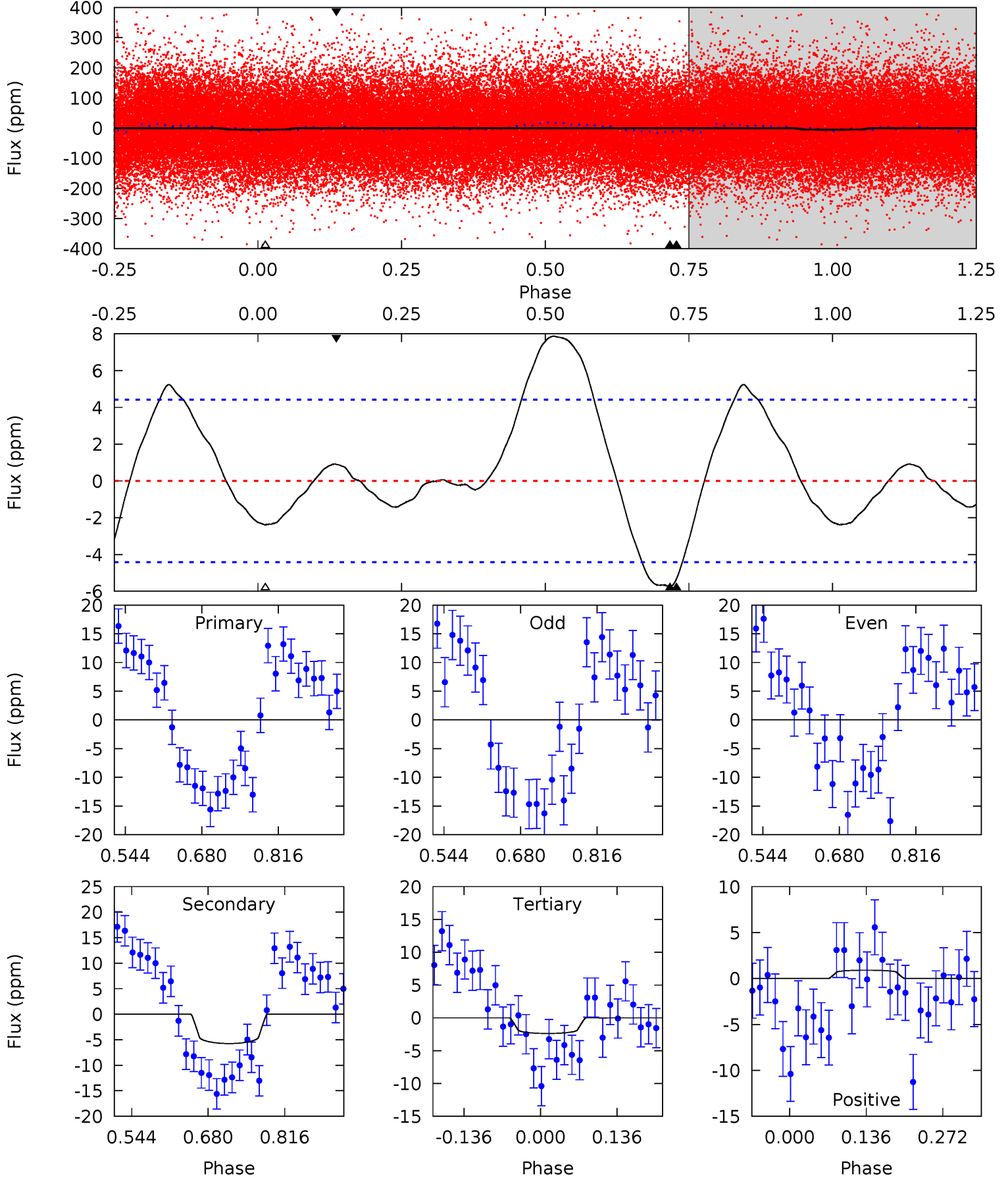




# DV Model-Shift Uniqueness Test

006509328-01, P = 1.408270 Days, E = 130.790725 Days

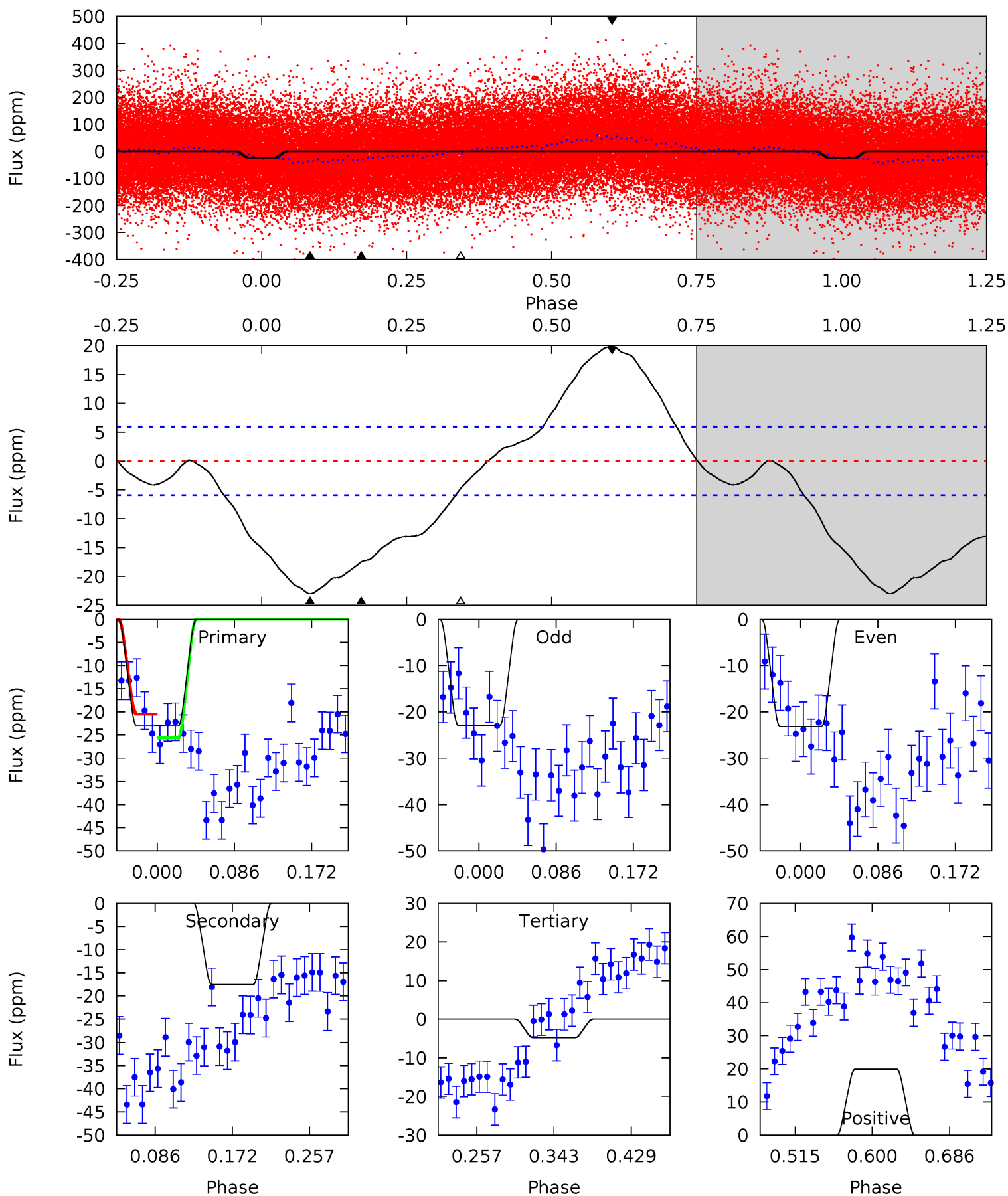
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
5.43	5.86	2.43	0.92	4.50	1.49	3.03	3.00	4.51	3.43	4.94	0.33	0.98	0.58	0.32



# Alt Model-Shift Uniqueness Test

006509328-01, P = 1.408214 Days, E = 130.723484 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
17.8	13.5	3.69	15.4	4.60	1.72	7.39	14.1	2.43	9.83	-1.84	0.10	1.06	0.46	2.00





### Stellar Parameters For KIC 006509328

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7638^{+211}_{-343}$	$4.110^{+0.120}_{-0.180}$	$0.040^{+0.200}_{-0.350}$	$1.901^{+0.571}_{-0.381}$	$1.698^{+0.210}_{-0.280}$	$0.348^{+0.212}_{-0.179}$
	+3%/-4%	+3%/-4%	+500%/-875%	+30%/-20%	+12%/-16%	+61%/-51%
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 006509328-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-6 \pm 1$	$0.55^{+0.30}_{-0.26}$	$3803^{+294}_{-220}$	$7175^{+3425}_{-1473}$	$8.971^{+22.019}_{-5.281}$
Alt.	$-18 \pm 1$	$1.10^{+0.29}_{-0.29}$	$3800^{+285}_{-243}$	$6623^{+1159}_{-724}$	$6.679^{+5.477}_{-2.504}$

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

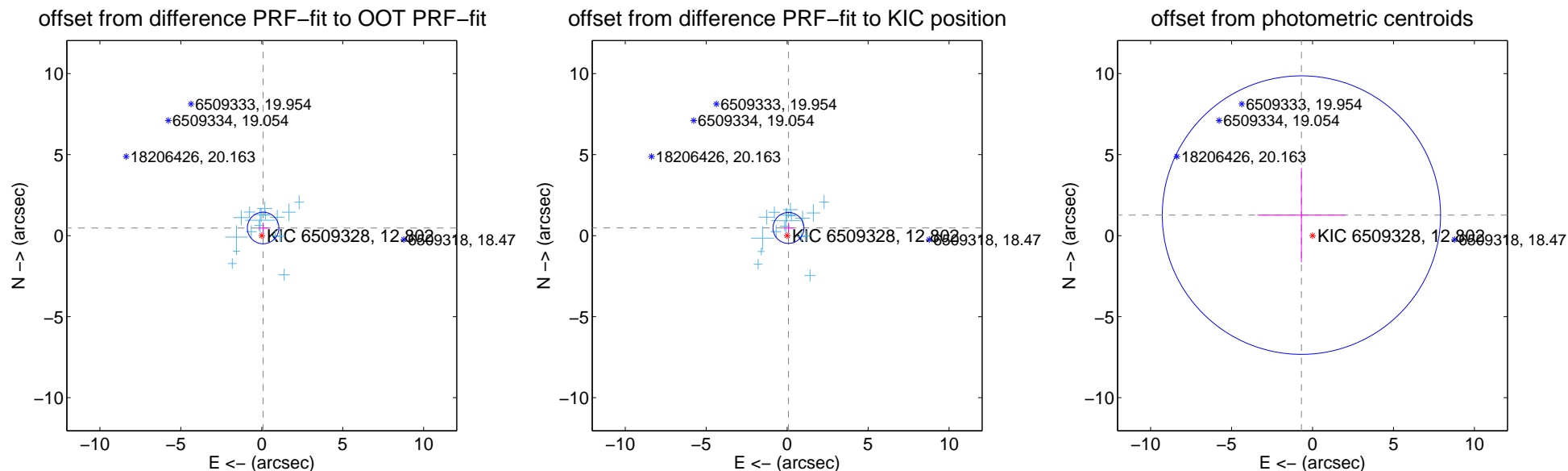
## DV Centroid Data

Supplemental centroid analysis for 006509328-01. Kepler magnitude: 12.80. Transit SNR 4.20

There are 17 quarters with good PRF difference image offsets

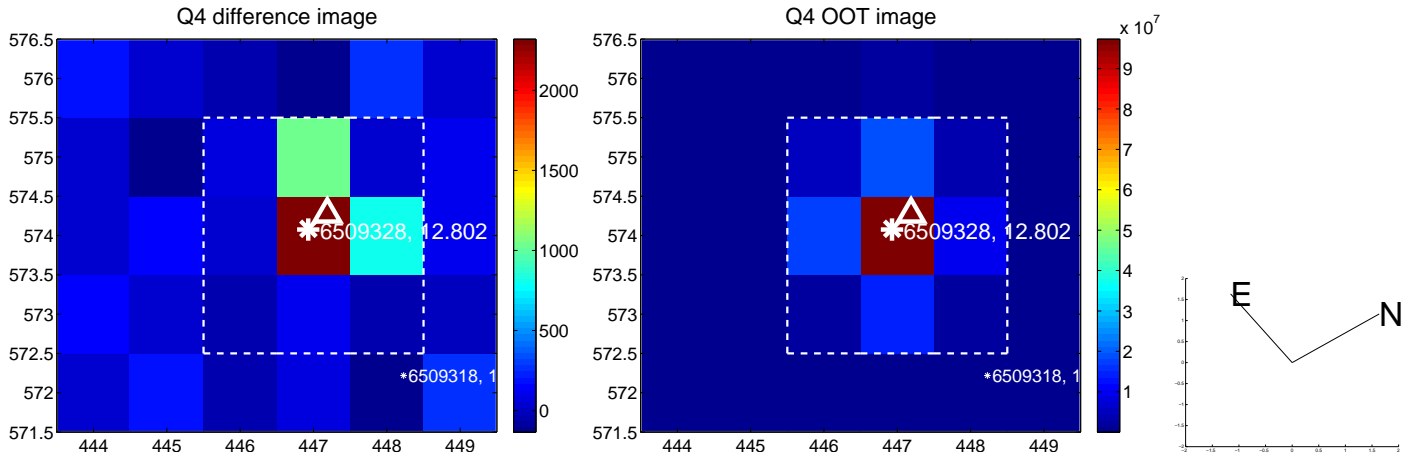
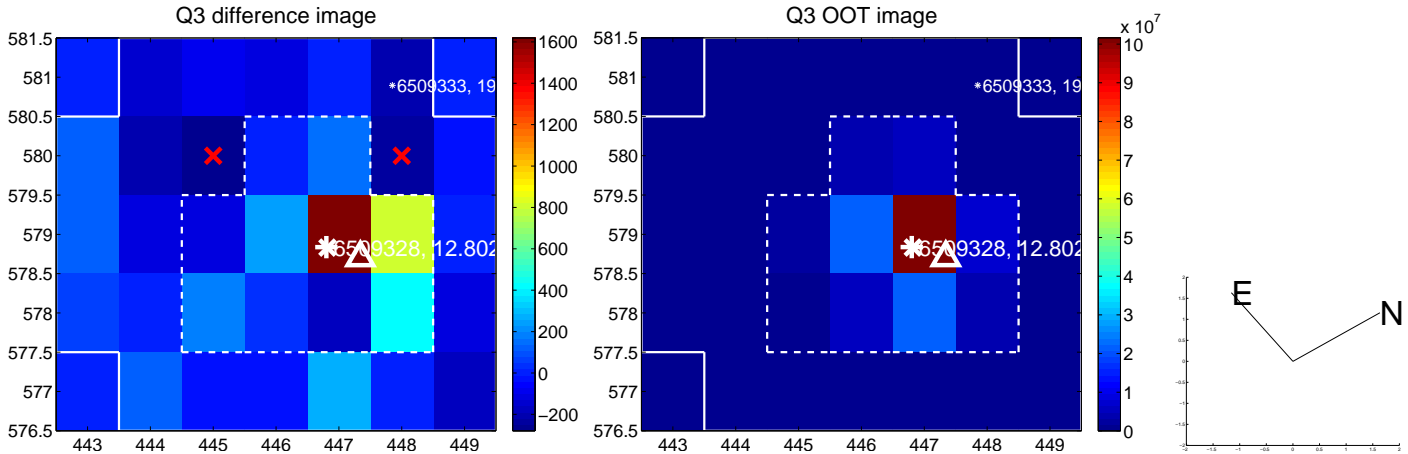
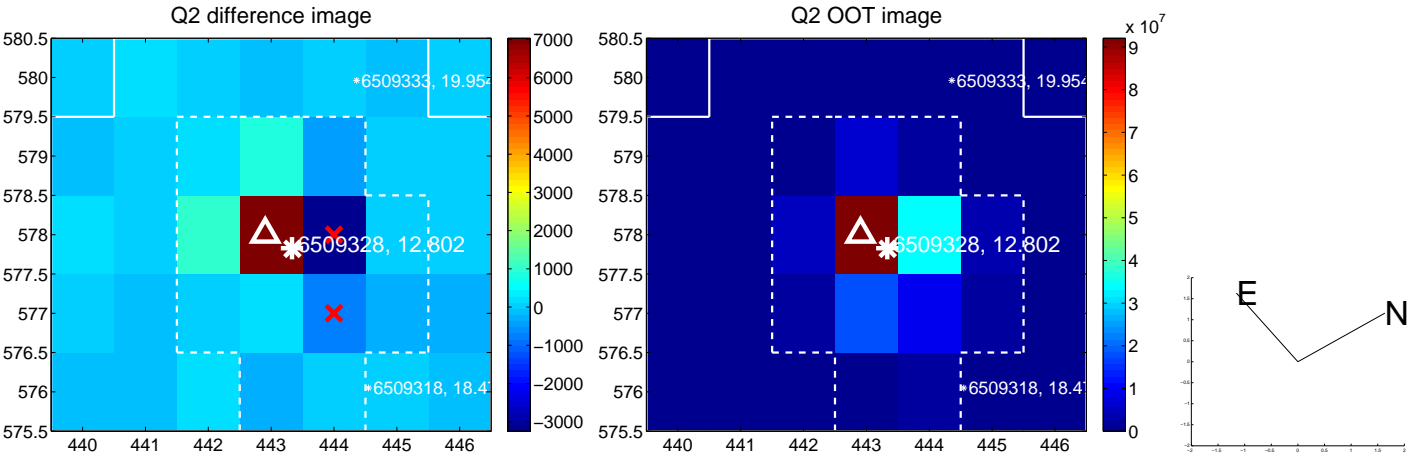
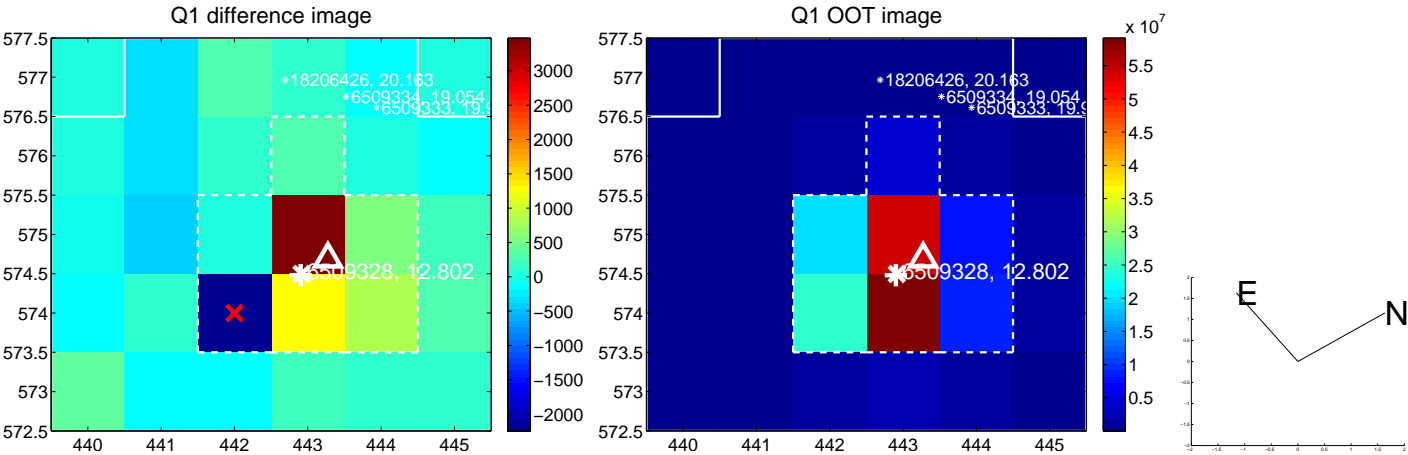
The direct PRF centroid is offset from the target star catalog position by about 0.02 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.479 \pm 0.325$	1.48	$-0.084 \pm 0.345$	$0.472 \pm 0.324$
PRF-fit source offset from KIC position	$0.482 \pm 0.318$	1.51	$-0.082 \pm 0.345$	$0.475 \pm 0.318$
photometric centroid source offset	$1.44 \pm 2.87$	0.50	$0.69 \pm 2.71$	$1.27 \pm 2.91$

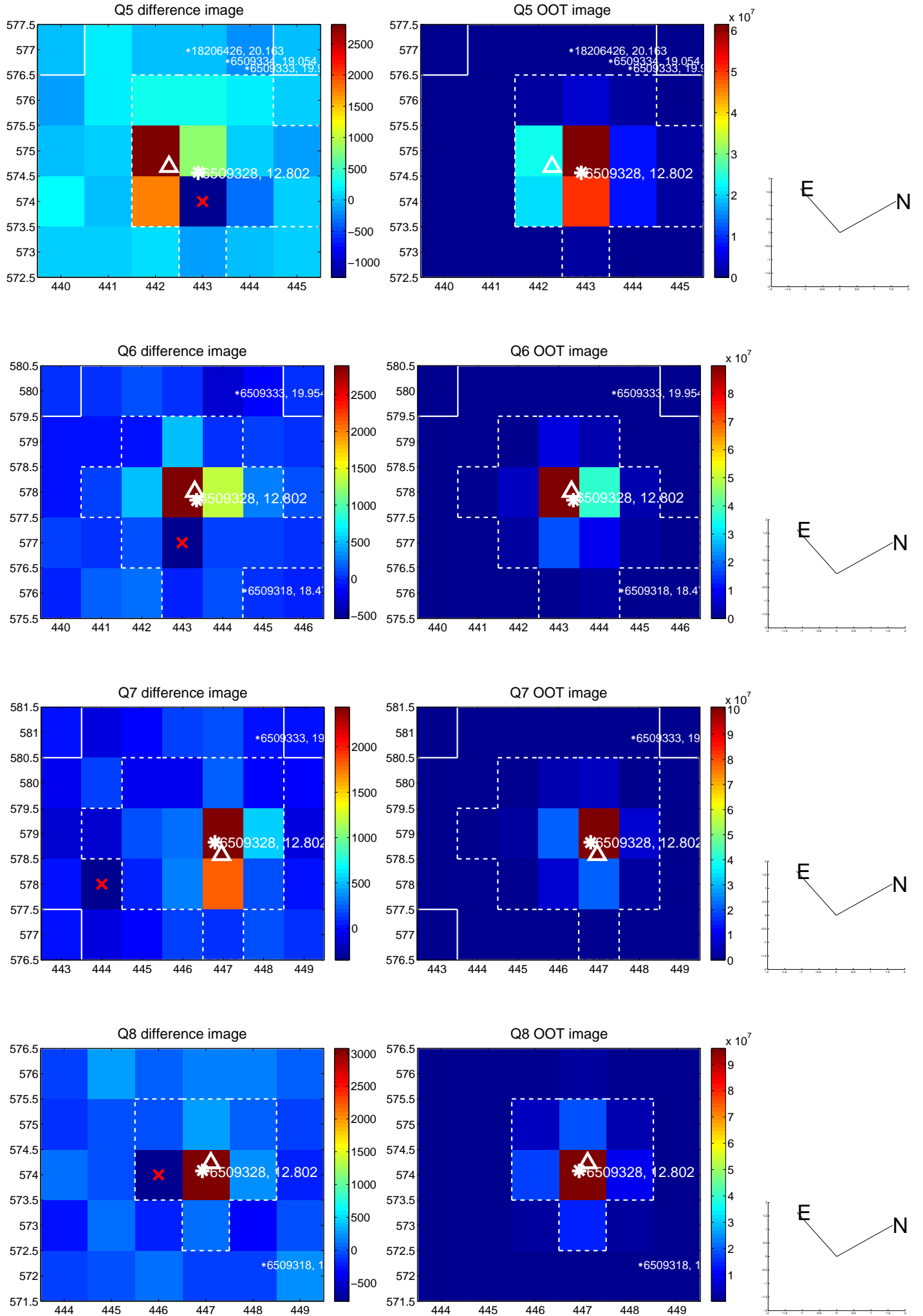


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets**; **Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



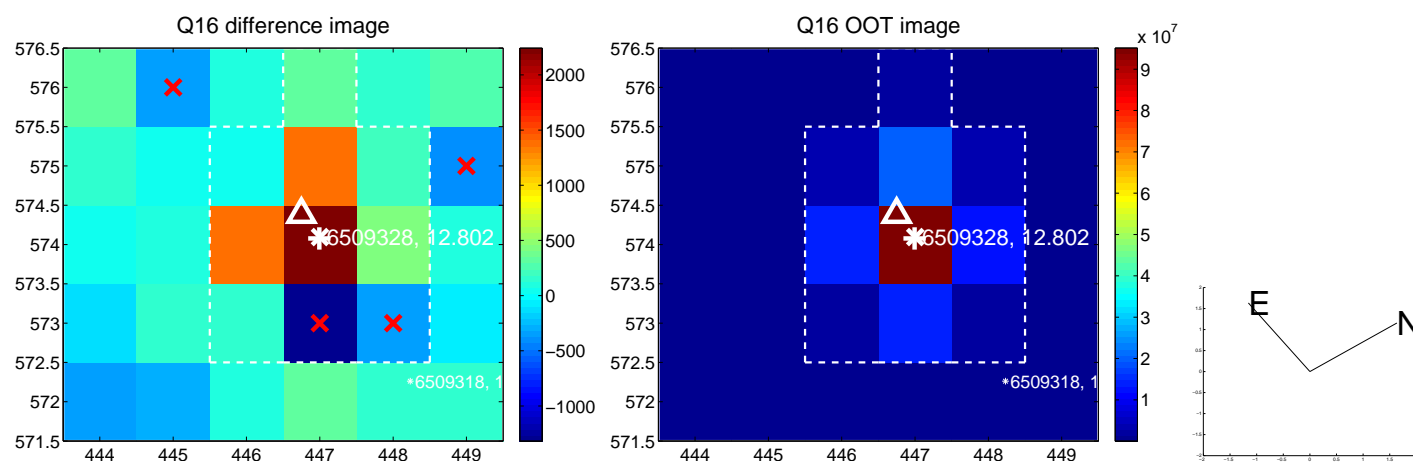
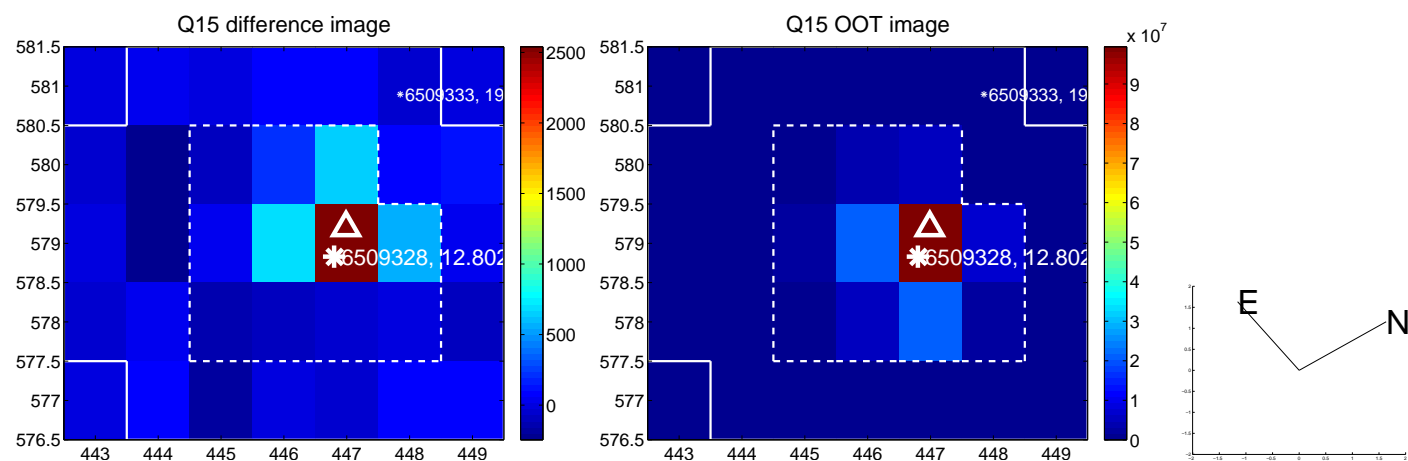
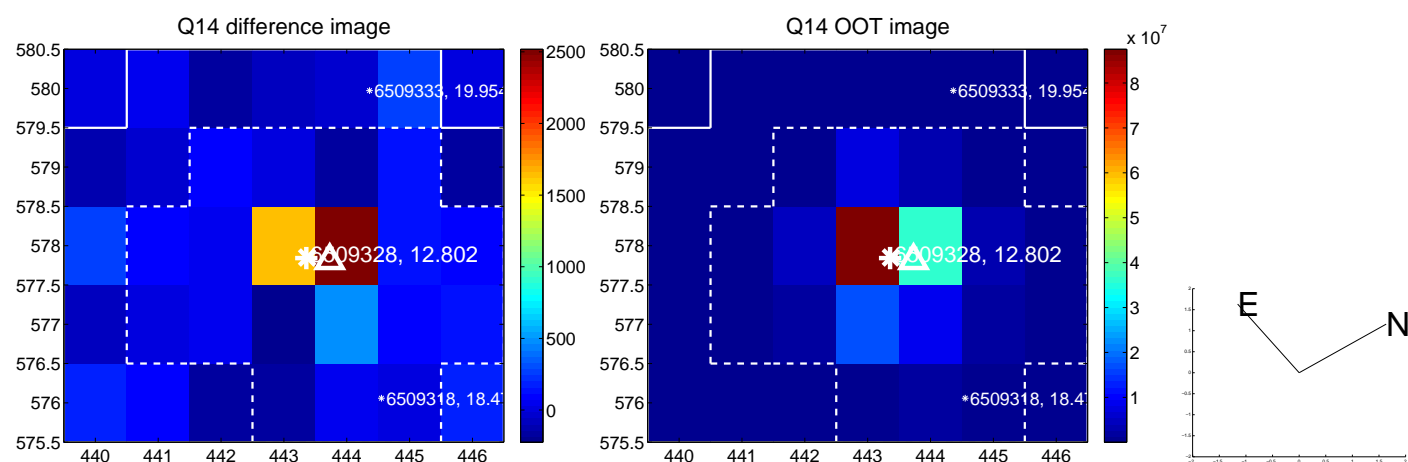
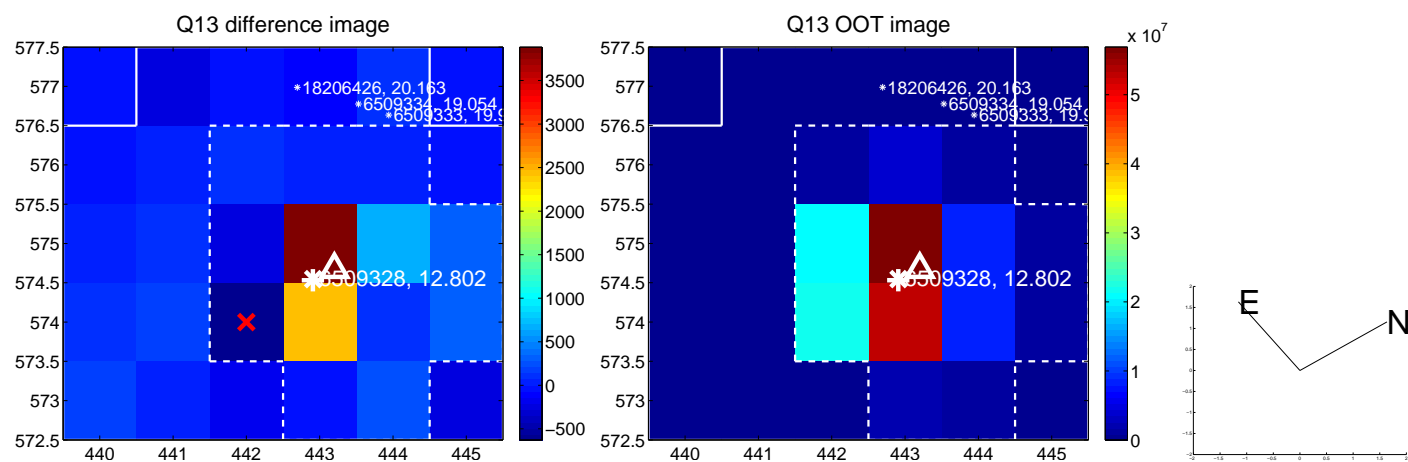
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



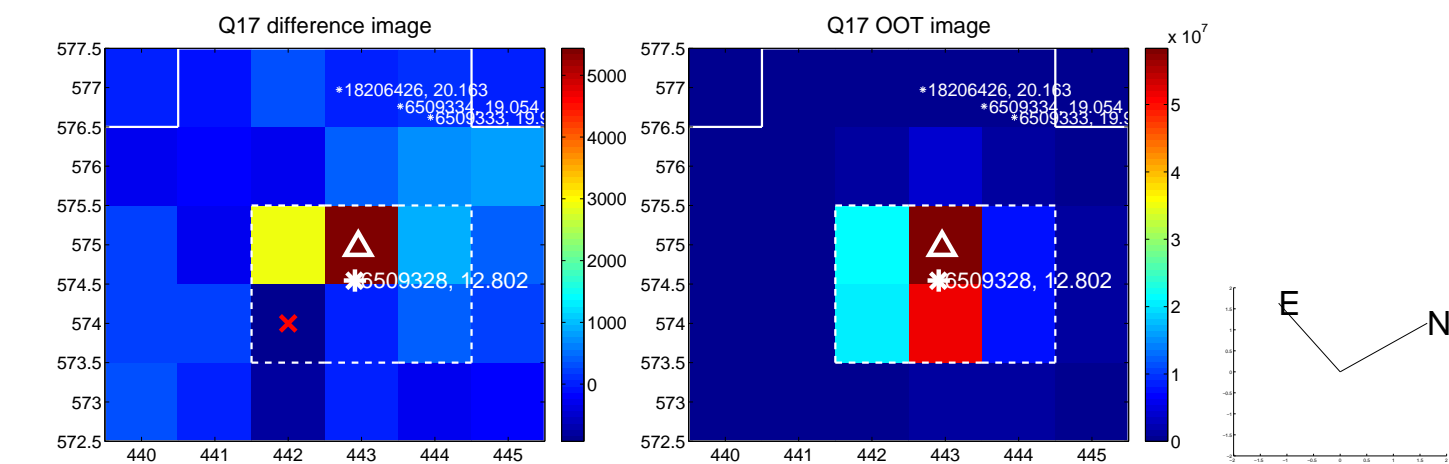




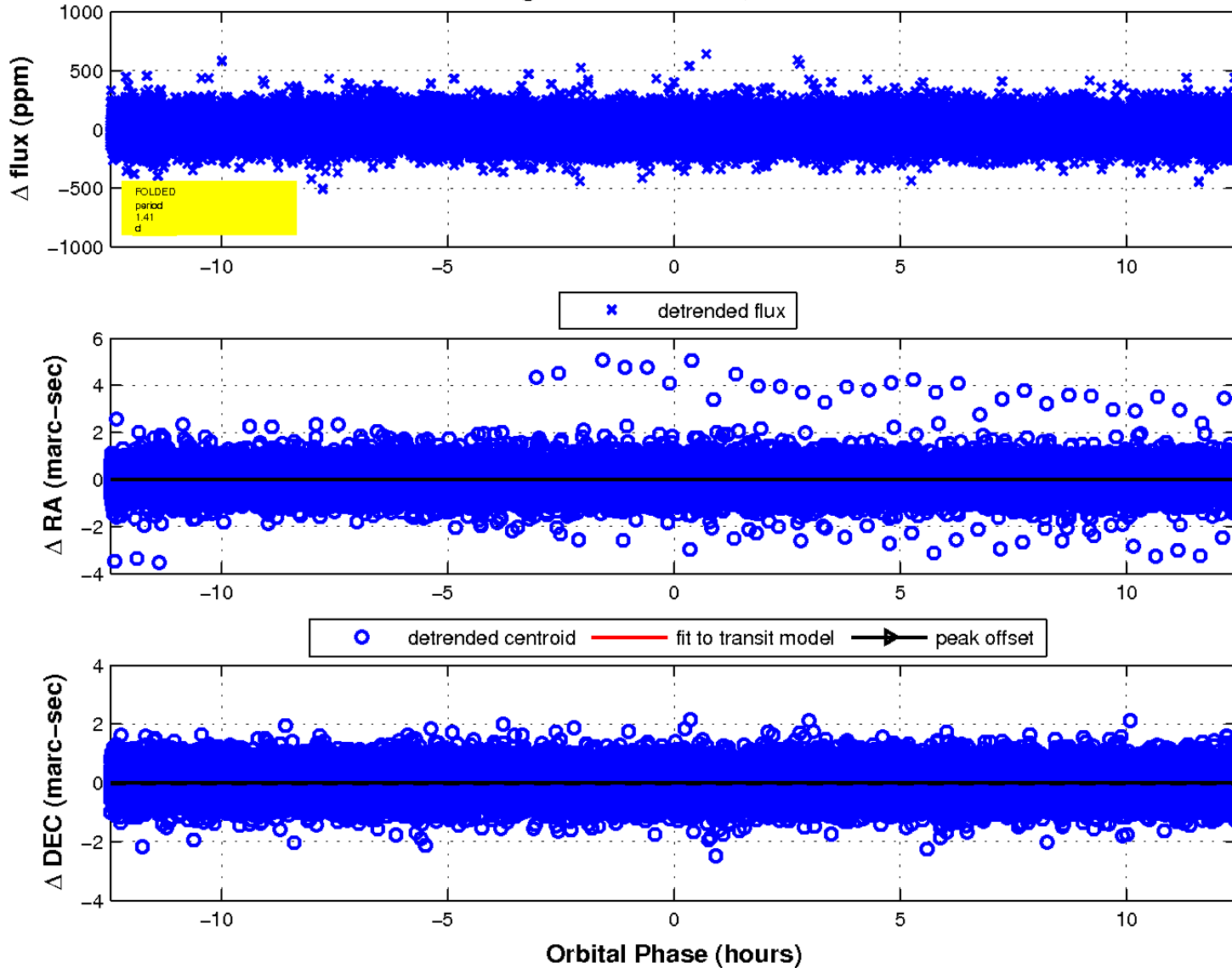
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



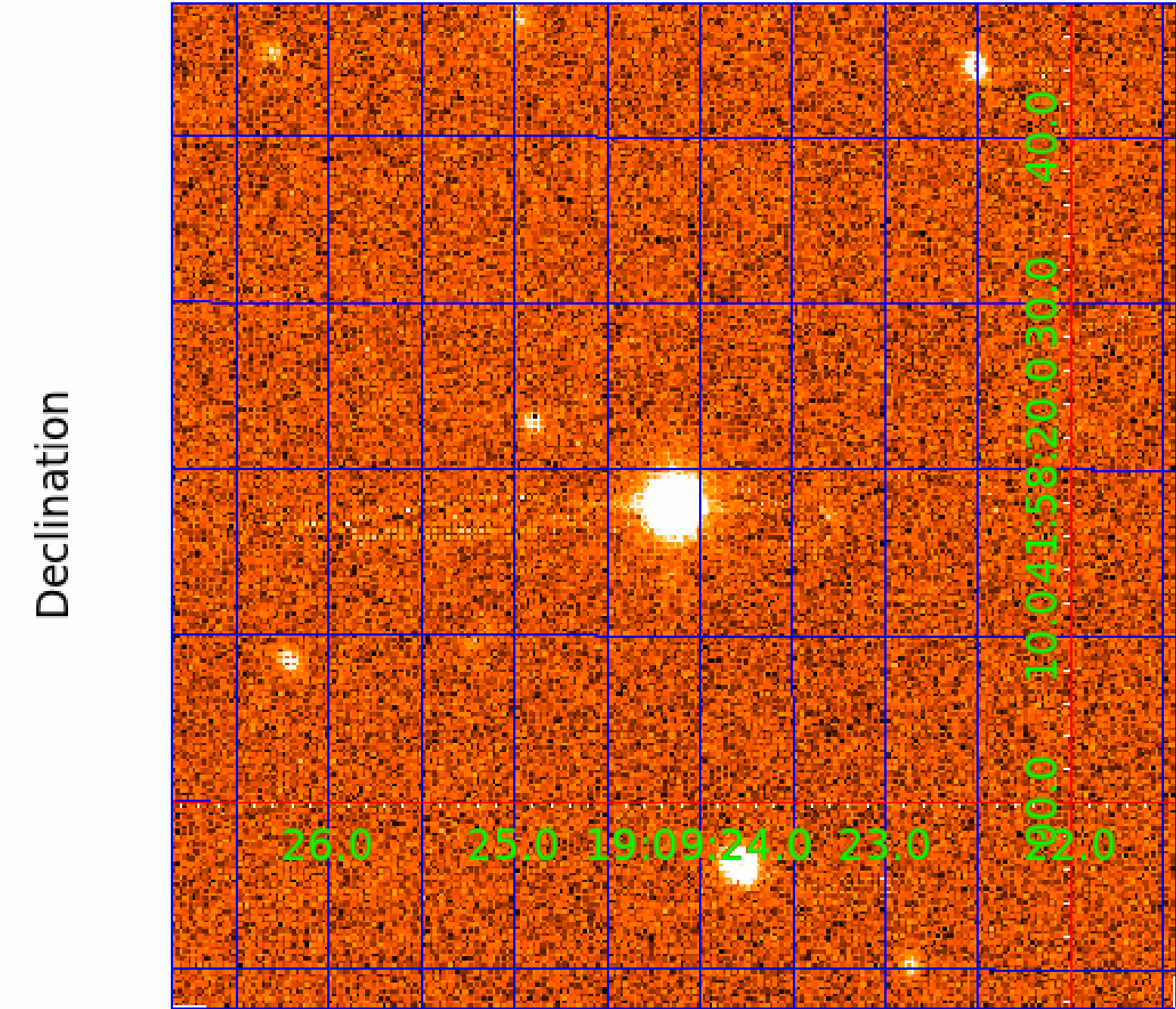
white  $\times$ : KIC target position; +: OOT centroid;  $\Delta$ : difference centroid. red  $\times$ : large negative pixel value.



fluxWeightedCentroids, Planet 1 of 2



UKIRT Image





# KIC 006509328

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
006509328-01	OBS	No	1.408270	132.198995	5.6	4.151	11.1	4.2	1.90	7638	0.55	12800.29
006509328-02	OBS	No	1.408101	131.879878	12.1	4.719	10.4	9.9	1.90	7638	0.76	12802.34

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
006509328-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_SKYE_ZUMA_TRACKER—SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT
006509328-02	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD

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

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

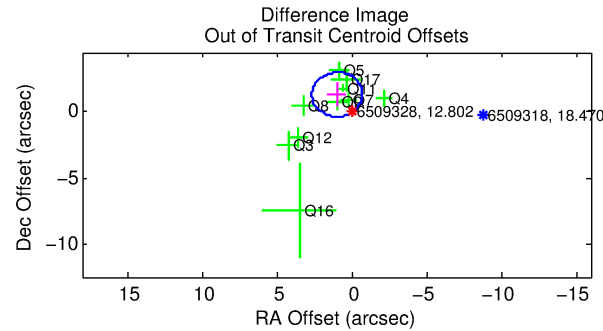
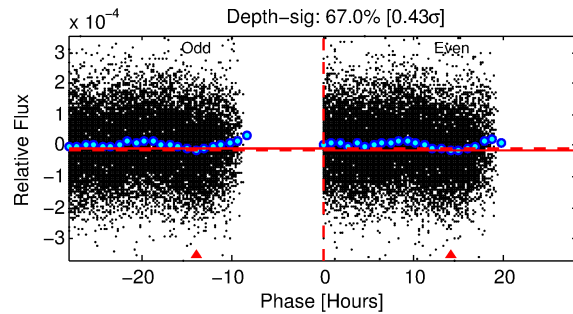
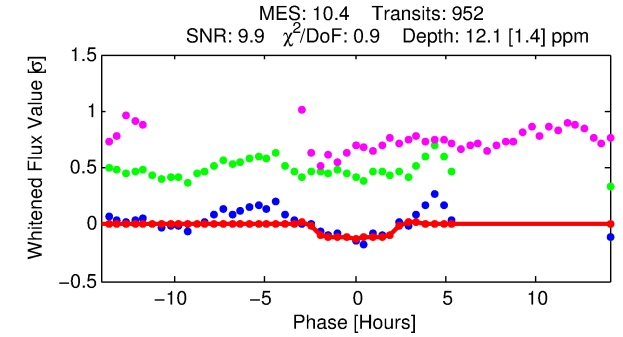
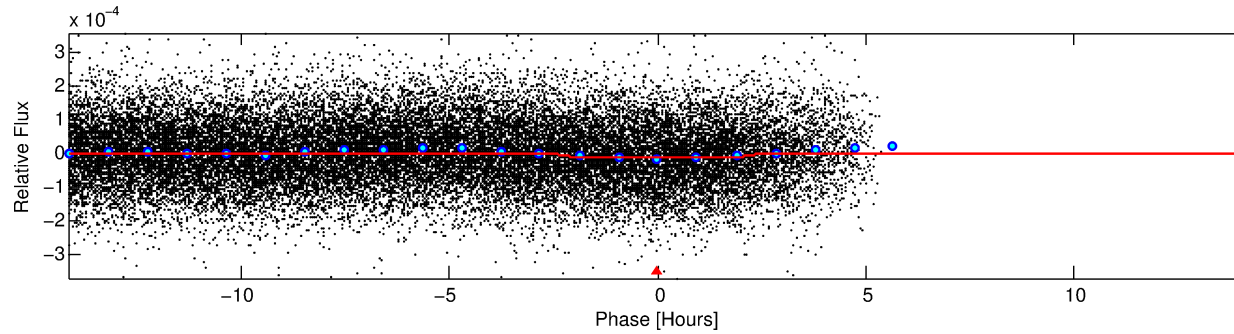
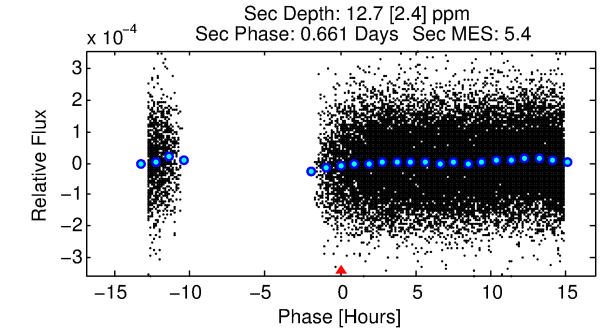
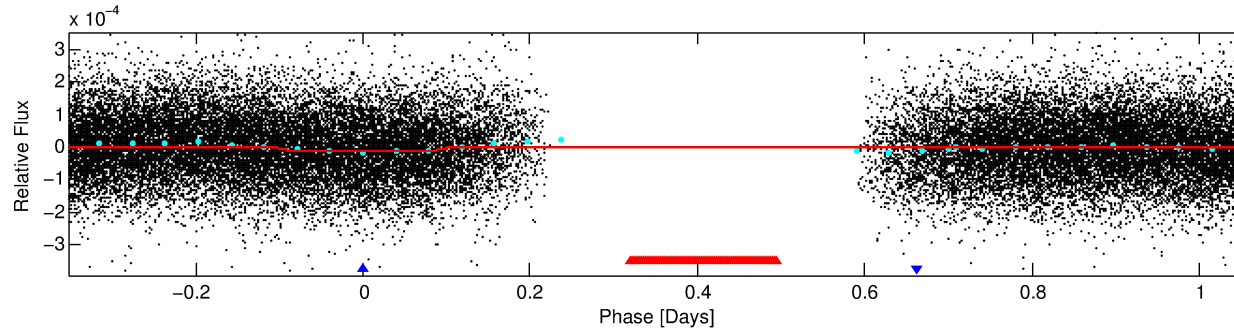
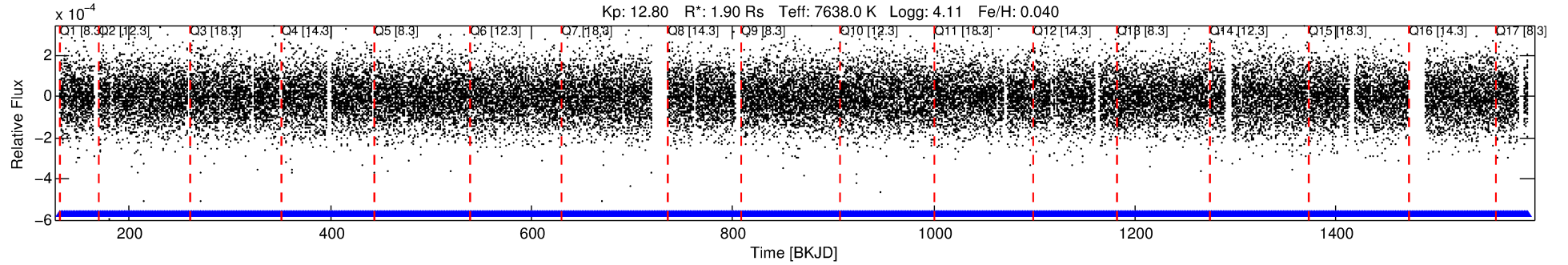
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 006509328-02

No Significant Match Found

# DV One-Page Summary

KIC: 6509328 Candidate: 2 of 2 Period: 1.408 d



## DV Fit Results:

Period = 1.40810 [0.00002] d  
Epoch = 131.8799 [0.0057] BKJD  
Rp/R\* = 0.0037 [0.0008]  
a/R\* = 1.42 [0.96]  
b = 0.89 [0.33]  
Seff = 12802.34 [4936.99]  
Teq = 2712 [261] K  
Rp = 0.76 [0.28] Re  
a = 0.0293 [0.0071] AU  
Ag = 10.46 [6.02] [1.57σ]  
Teffp = 7542 [937] K [4.97σ]

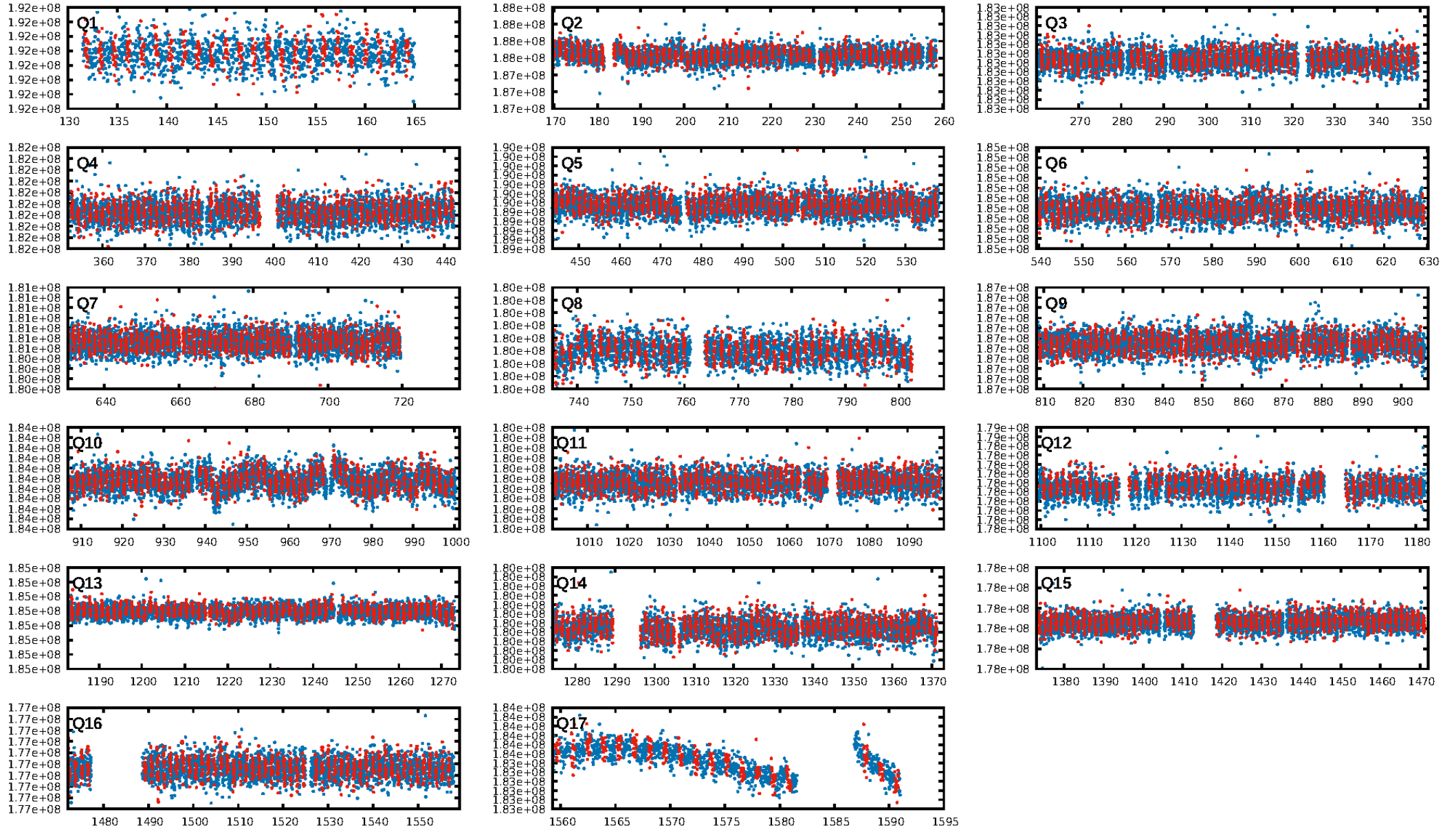
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.1% [0.00σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 3.05e-19  
RollingBand-fgt: 1.00 [909/909]  
GhostDiagnostic-chr: 8.804  
Centroid-sig: 0.0%  
Centroid-so: 2.551 arcsec [2.02σ]  
OotOffset-rm: 1.624 arcsec [2.91σ]  
KicOffset-rm: 1.598 arcsec [2.73σ]  
OotOffset-st: 0/3/4/3 [10]  
KicOffset-st: 0/3/4/3 [10]  
DiffImageQuality-fgm: 0.70 [7/10]  
DiffImageOverlap-fno: 0.00 [0/17]

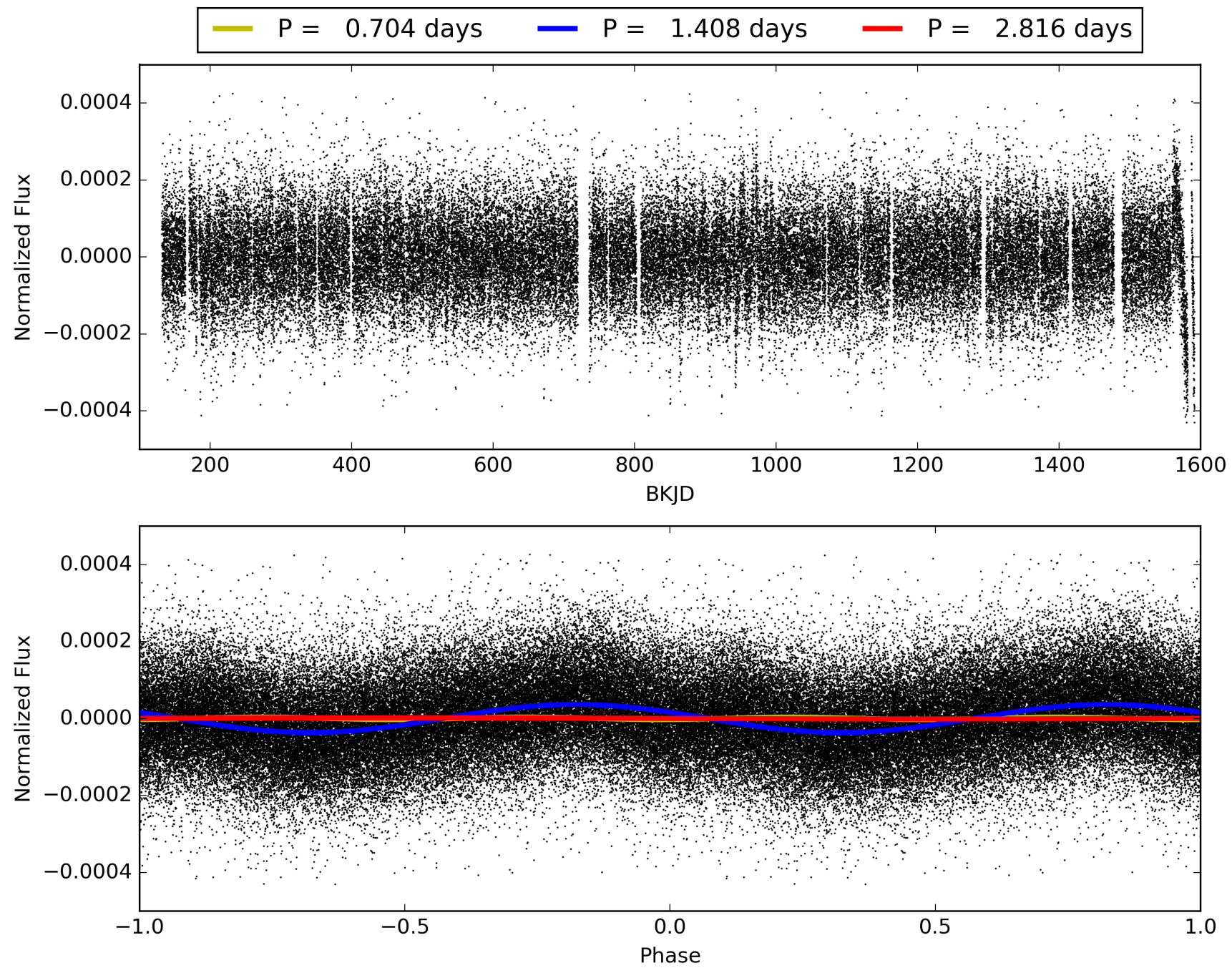
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 02:24:09 Z

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

# TCE 006509328-02, PDC Light Curves



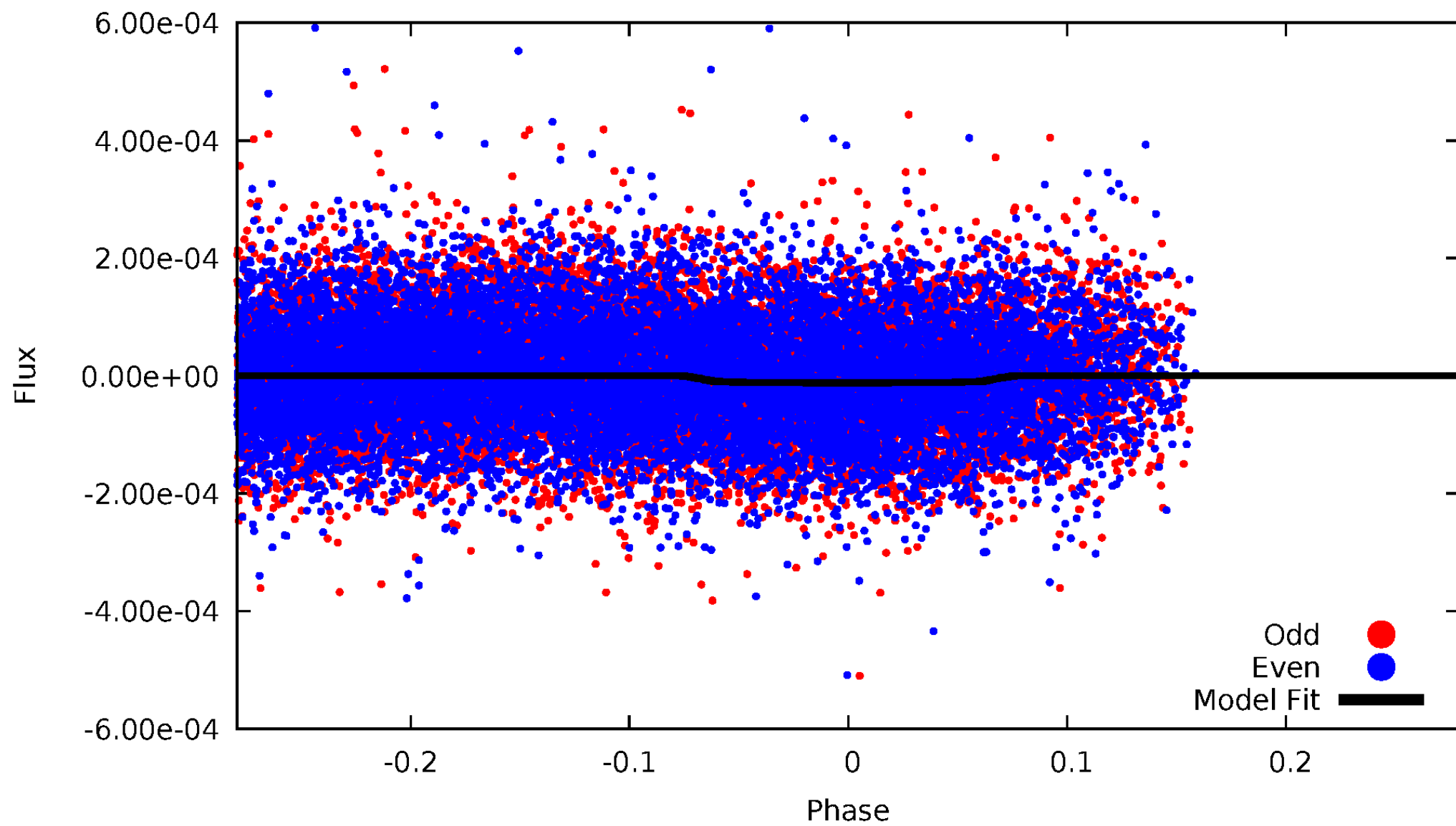
TCE 006509328-02





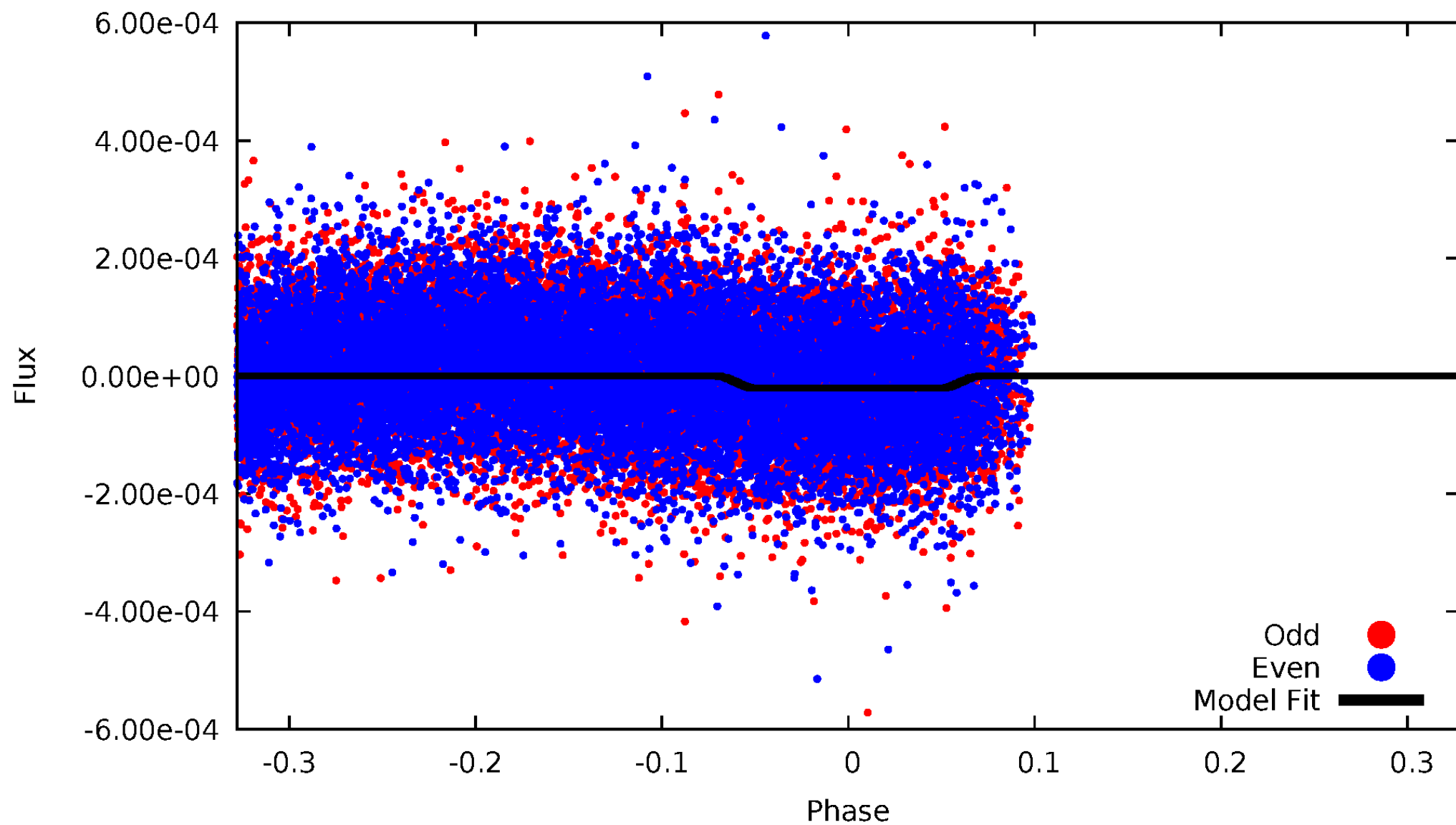
DV Odd/Even

TCE 006509328-02



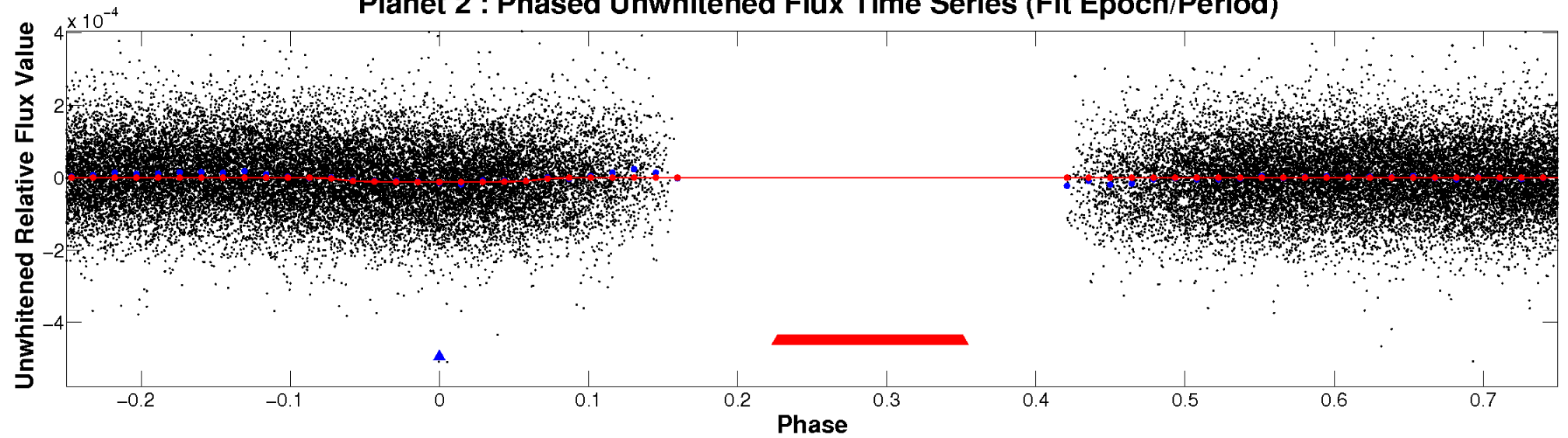
# ALT Odd/Even

TCE 006509328-02

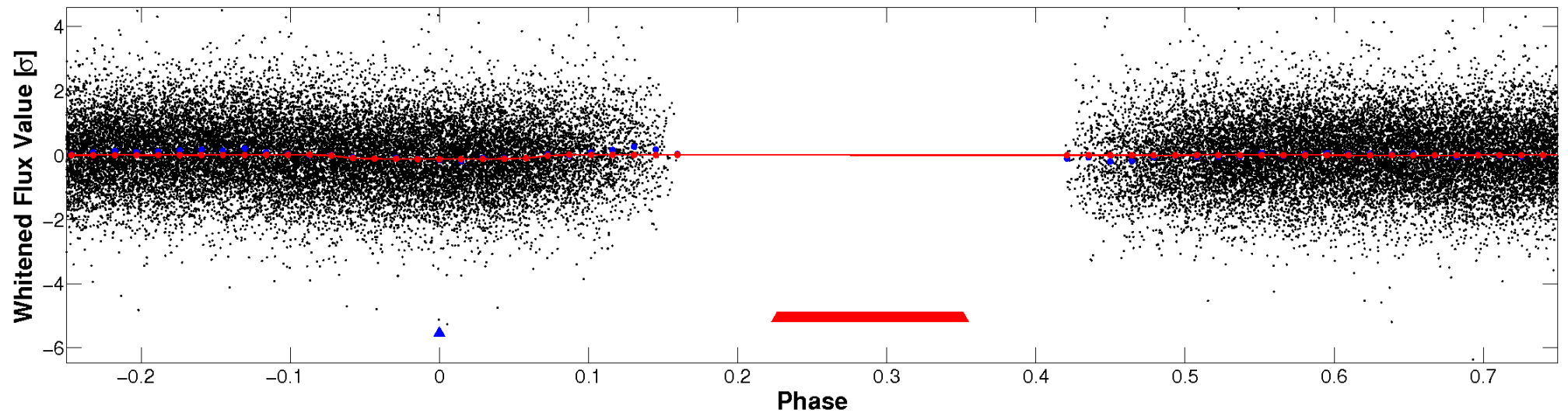


# Non-Whitened Vs. Whitened Light Curve

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

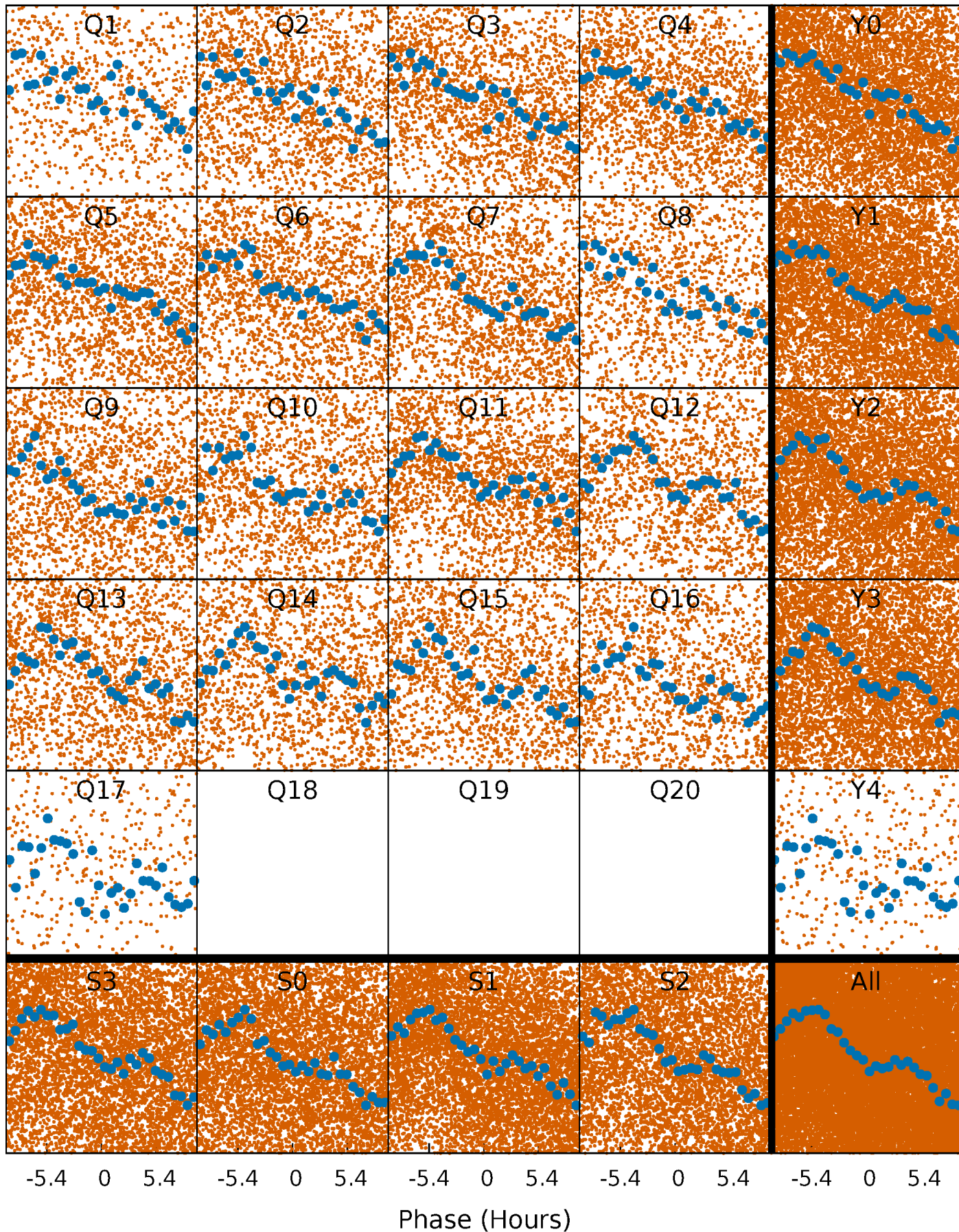


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

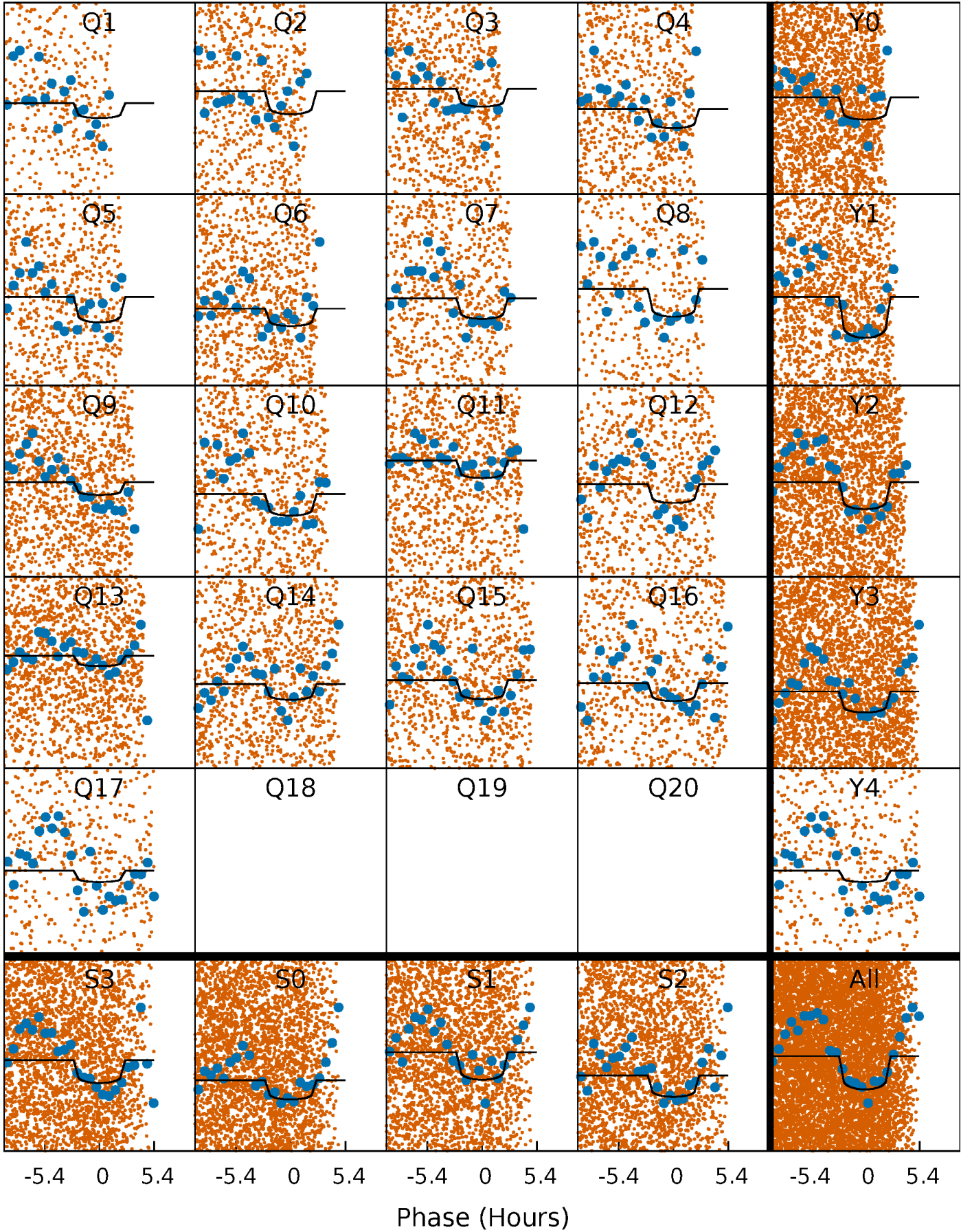
TCE 006509328-02 P= 1.408101 Days  $T_0=131.879878$  (BKJD)





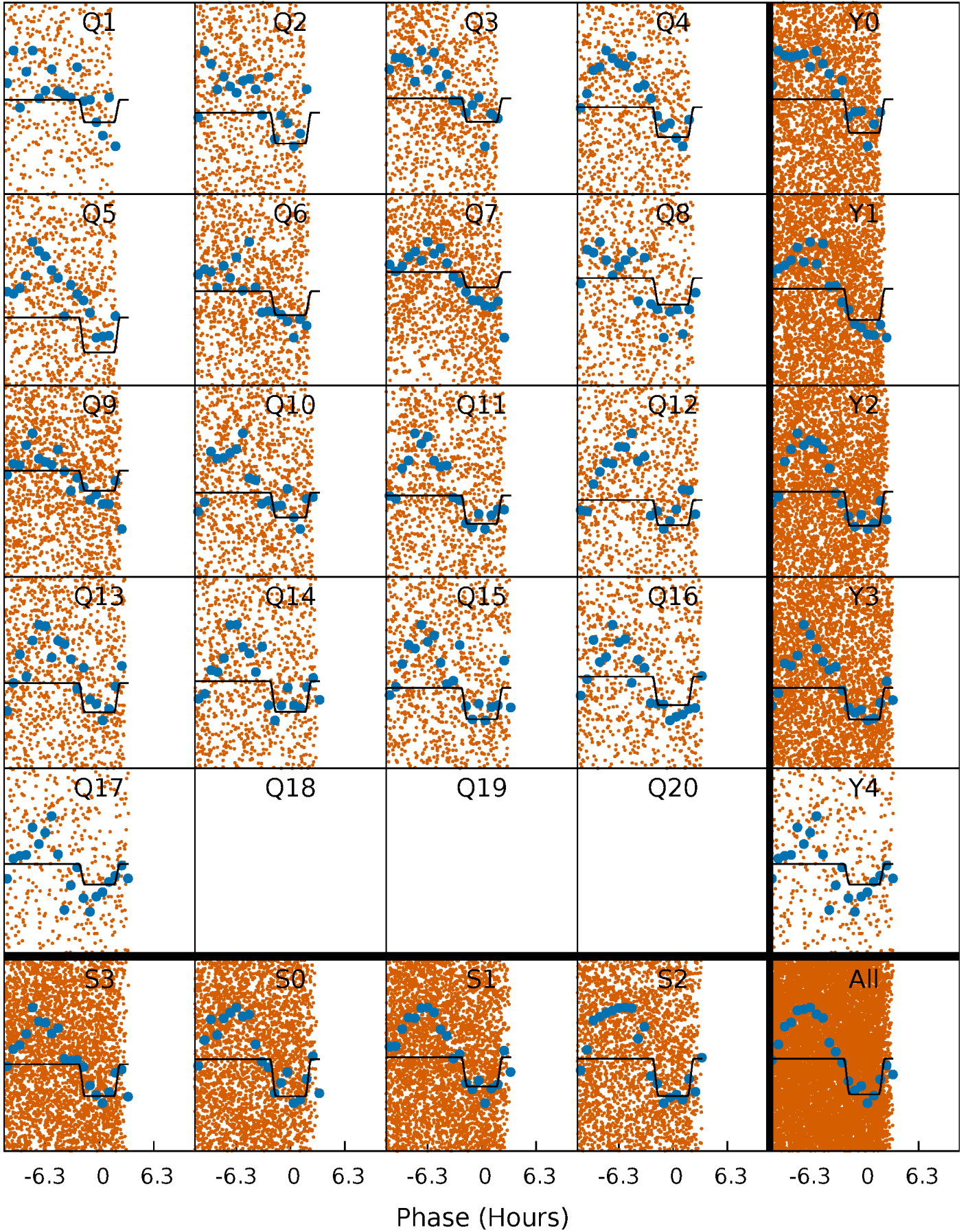
# DV Quarter-Phased Transit Curves

TCE 006509328-02 P= 1.408101 Days  $T_0=131.879878$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 006509328-02   P= 1.408194 Days    $T_0=131.866945$  (BKJD)

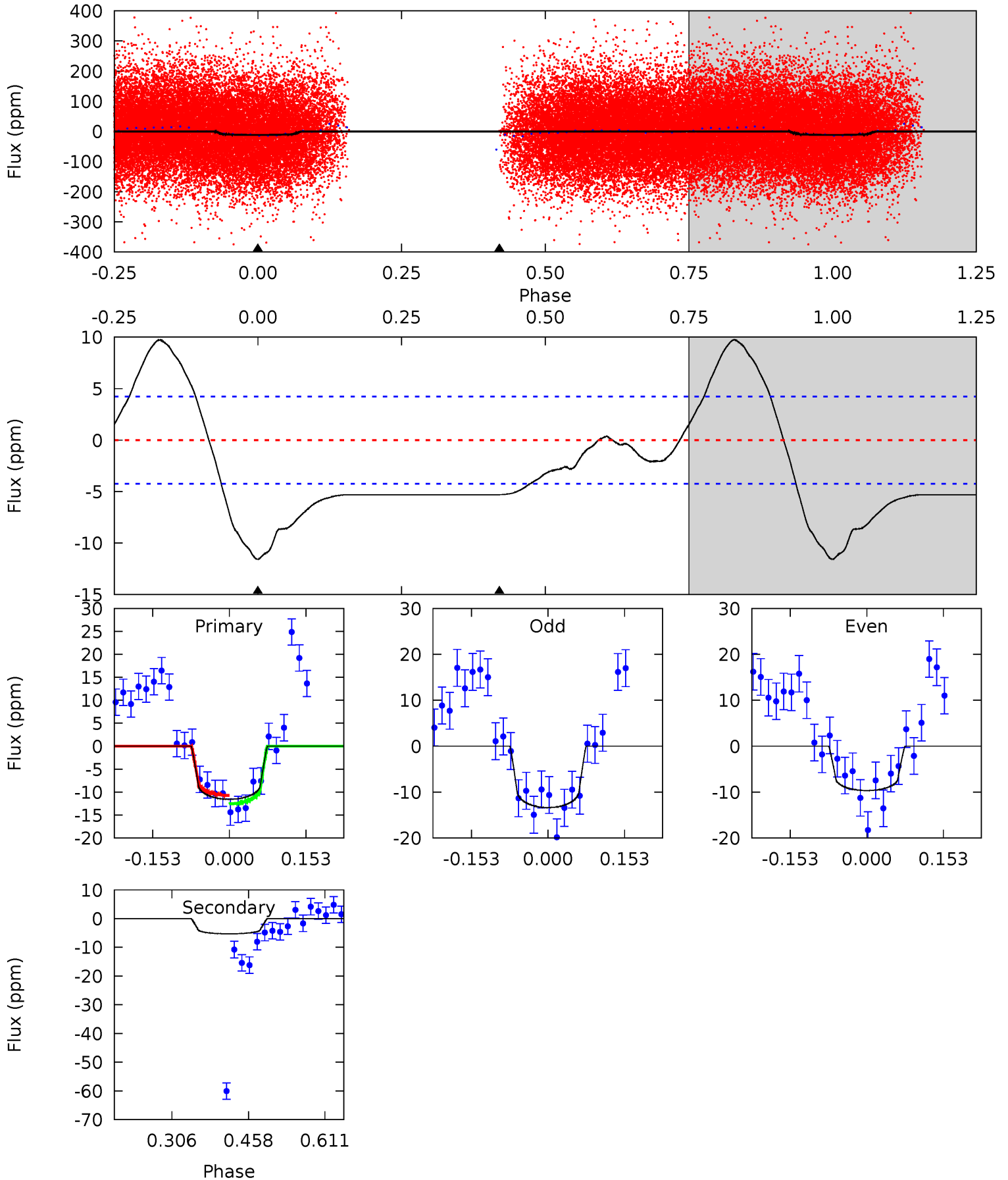




# DV Model-Shift Uniqueness Test

006509328-02, P = 1.408101 Days, E = 130.471777 Days

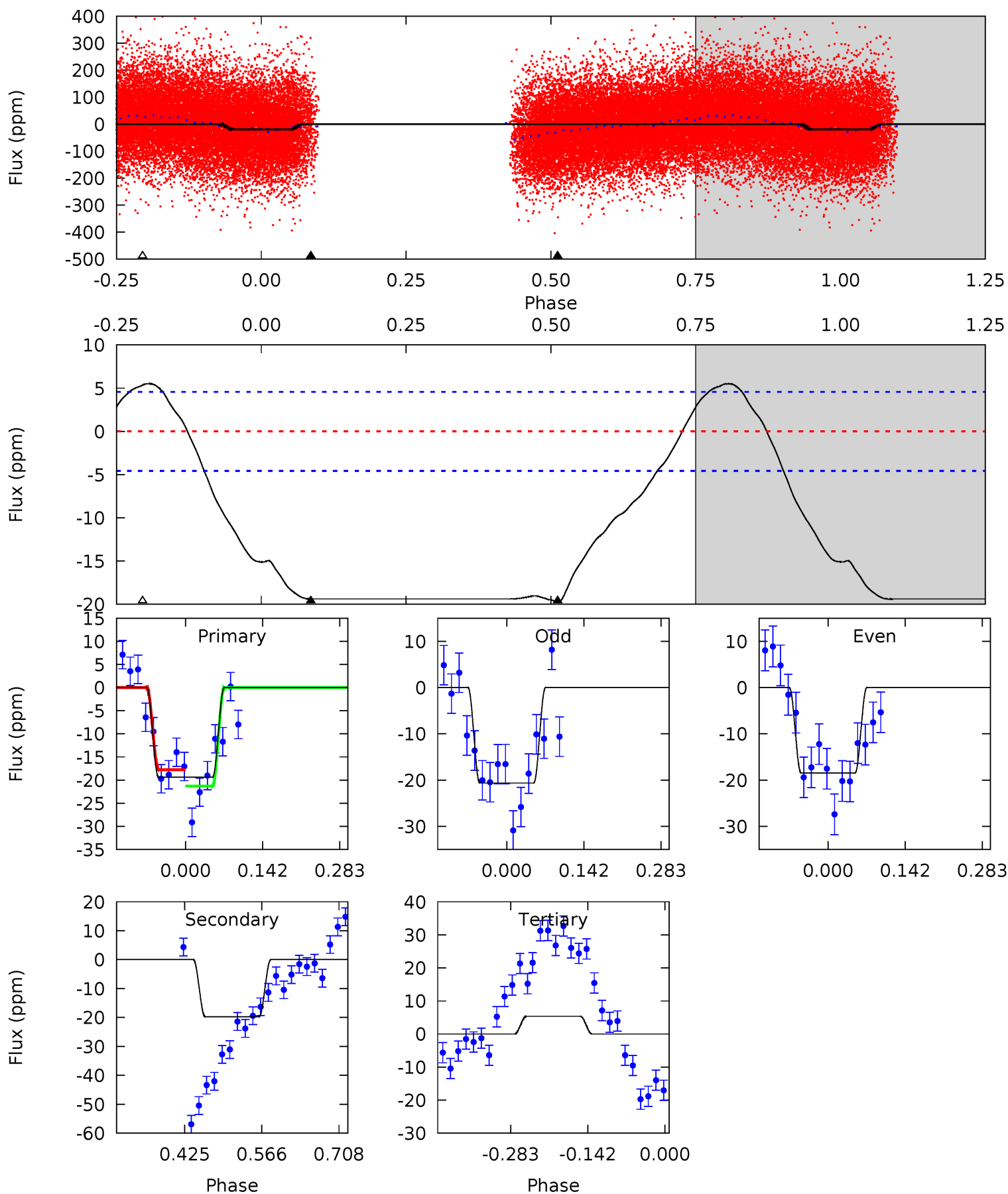
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
12.2	5.60	0	0	4.48	1.43	4.17	12.2	12.2	5.60	5.60	1.97	0.81	0.46	0.92



# Alt Model-Shift Uniqueness Test

006509328-02, P = 1.408194 Days, E = 130.458751 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
19.1	19.4	-5.26	0	4.49	1.47	4.68	24.3	19.1	24.7	19.4	1.07	1.01	0.22	1.73



### Stellar Parameters For KIC 006509328

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7638^{+211}_{-343}$	$4.110^{+0.120}_{-0.180}$	$0.040^{+0.200}_{-0.350}$	$1.901^{+0.571}_{-0.381}$	$1.698^{+0.210}_{-0.280}$	$0.348^{+0.212}_{-0.179}$
	+3%/-4%	+3%/-4%	+500%/-875%	+30%/-20%	+12%/-16%	+61%/-51%
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 006509328-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-5 \pm 1$	$0.78^{+0.20}_{-0.19}$	$3804^{+289}_{-235}$	$5814^{+801}_{-636}$	$4.105^{+3.082}_{-1.619}$
Alt.	$-20 \pm 1$	$0.95^{+0.22}_{-0.19}$	$3797^{+304}_{-243}$	$7419^{+931}_{-730}$	$10^{+6}_{-3}$

$T_{\text{max}}$  = Theoretical Maximum Planetary Temperature  
 $T_{\text{obs}}$  = Observed Planetary Temperature (Assuming A=0.3)  
 $A_{\text{obs}}$  = Observed Albedo (Assuming T=0)

If a secondary eclipse is present, the system is likely an EB if  $T_{\text{obs}} \gg T_{\text{max}}$  AND  $A_{\text{obs}} \gg 1.0$

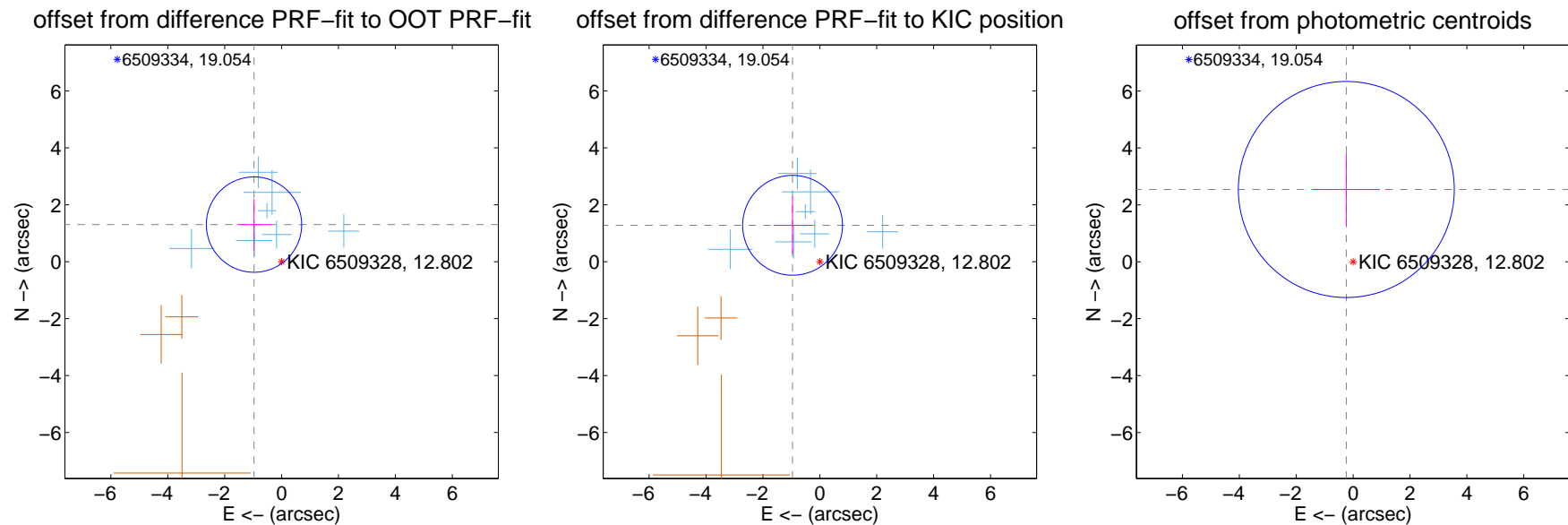
## DV Centroid Data

Supplemental centroid analysis for 006509328-02. Kepler magnitude: 12.80. Transit SNR 9.91

There are 7 quarters with good PRF difference image offsets

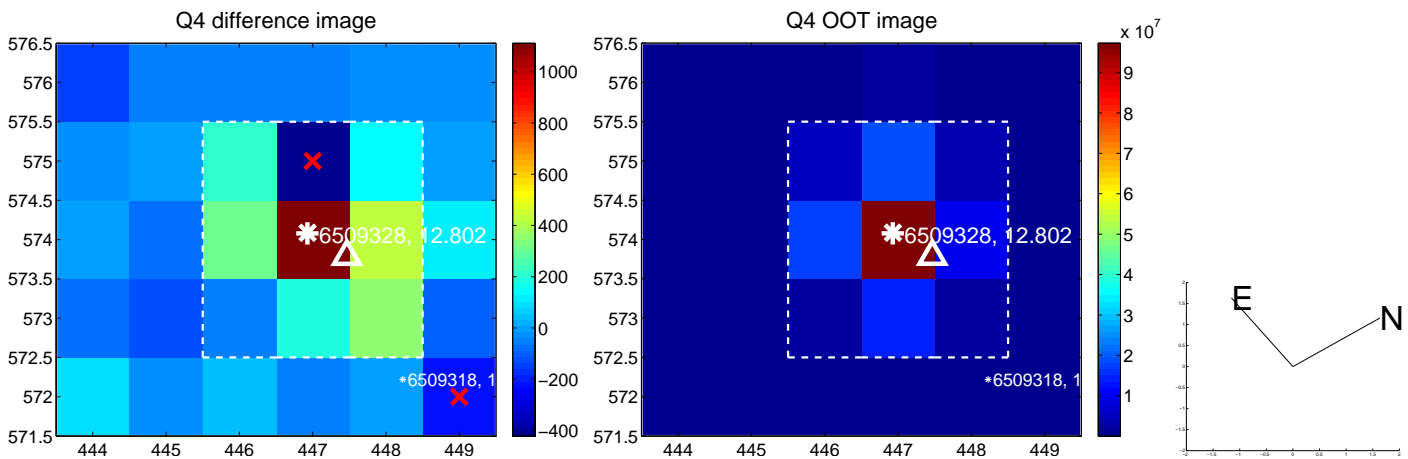
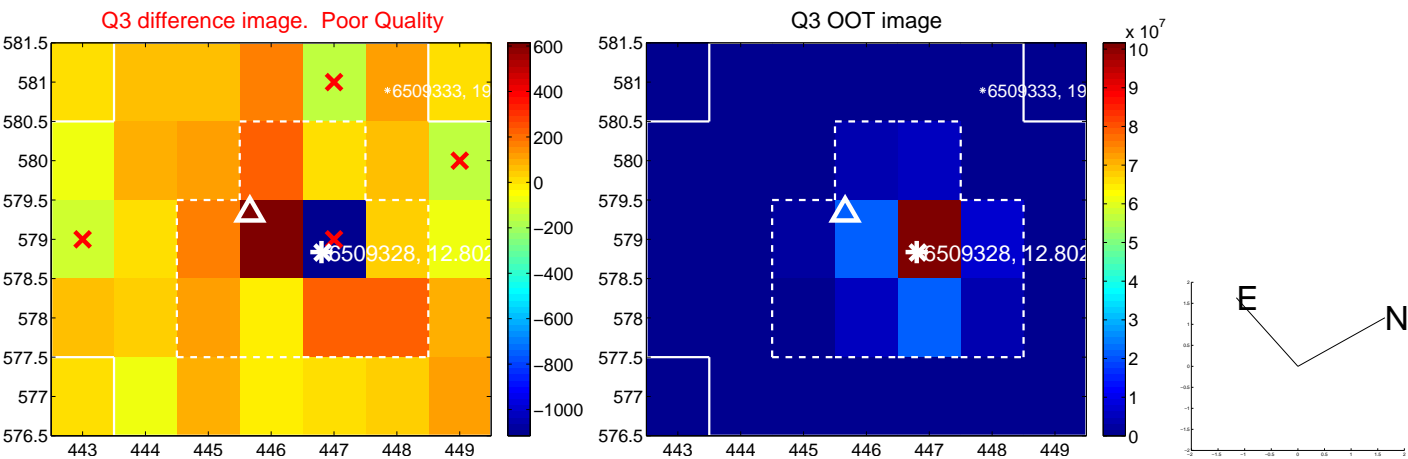
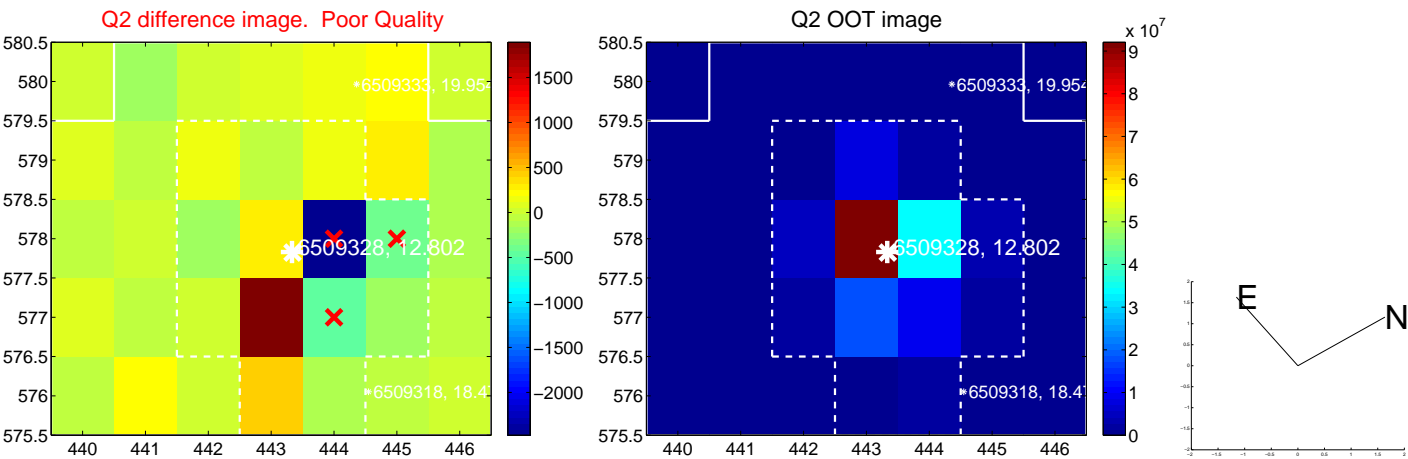
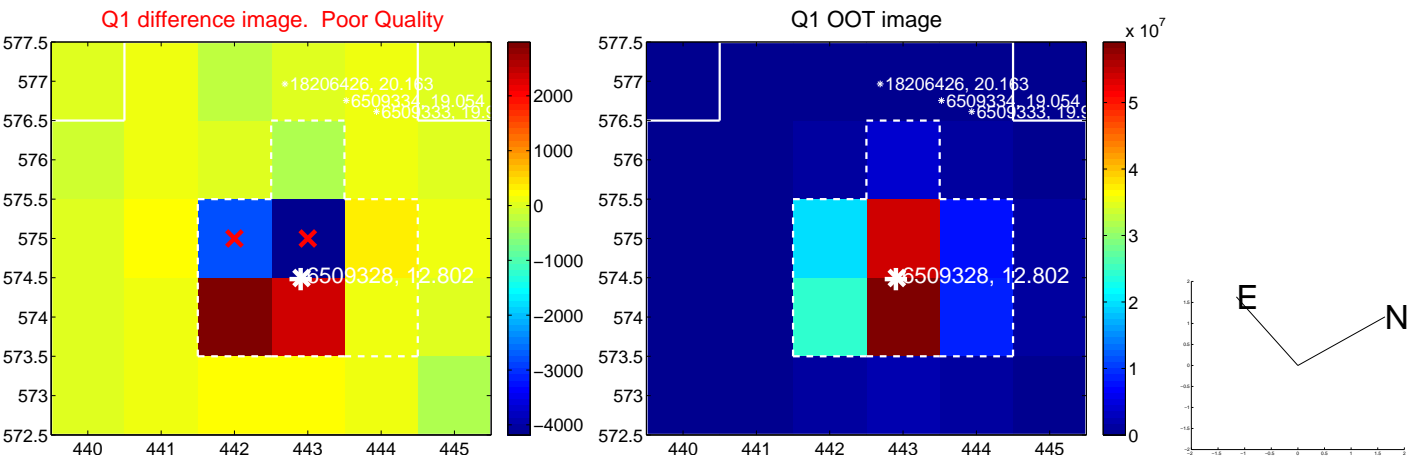
The direct PRF centroid is offset from the target star catalog position by about 0.02 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$1.624 \pm 0.558$	2.91	$0.969 \pm 0.589$	$1.303 \pm 0.903$
PRF-fit source offset from KIC position	$1.598 \pm 0.585$	2.73	$0.959 \pm 0.667$	$1.279 \pm 0.999$
photometric centroid source offset	$2.55 \pm 1.27$	2.02	$0.24 \pm 1.18$	$2.54 \pm 1.27$

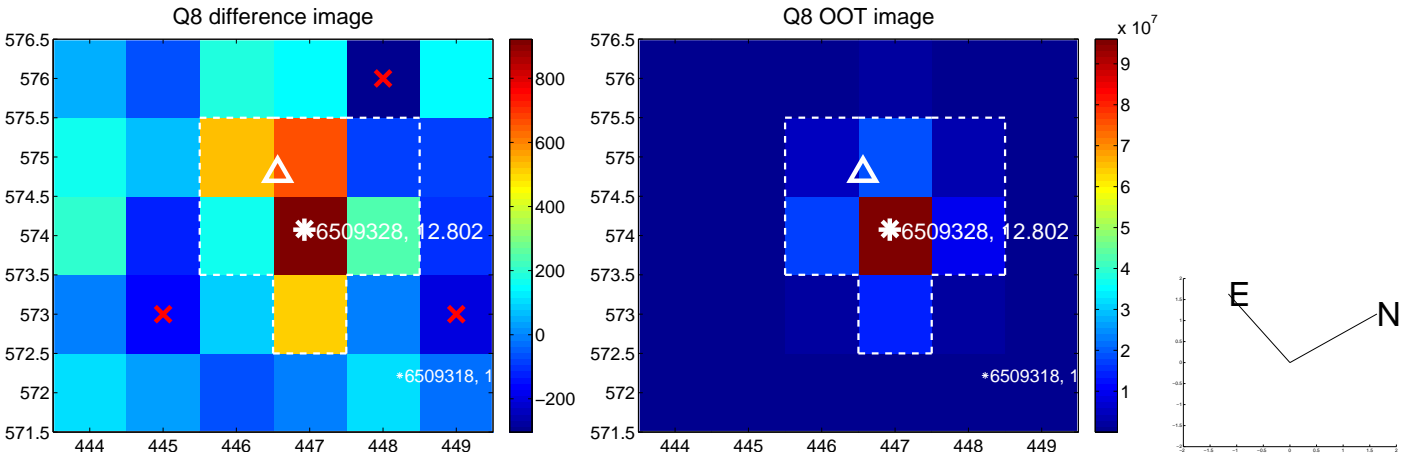
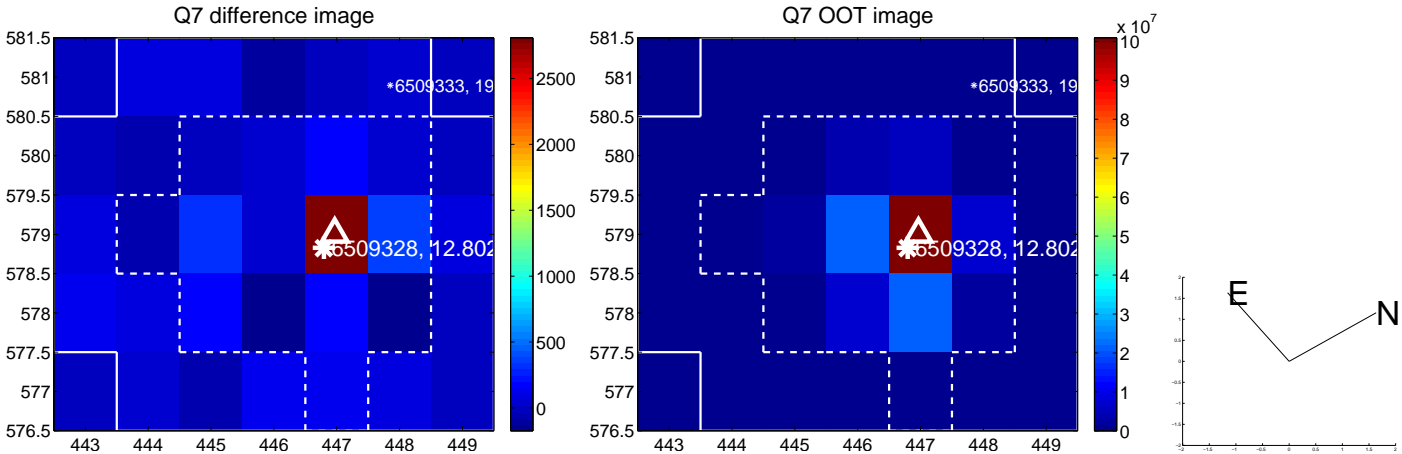
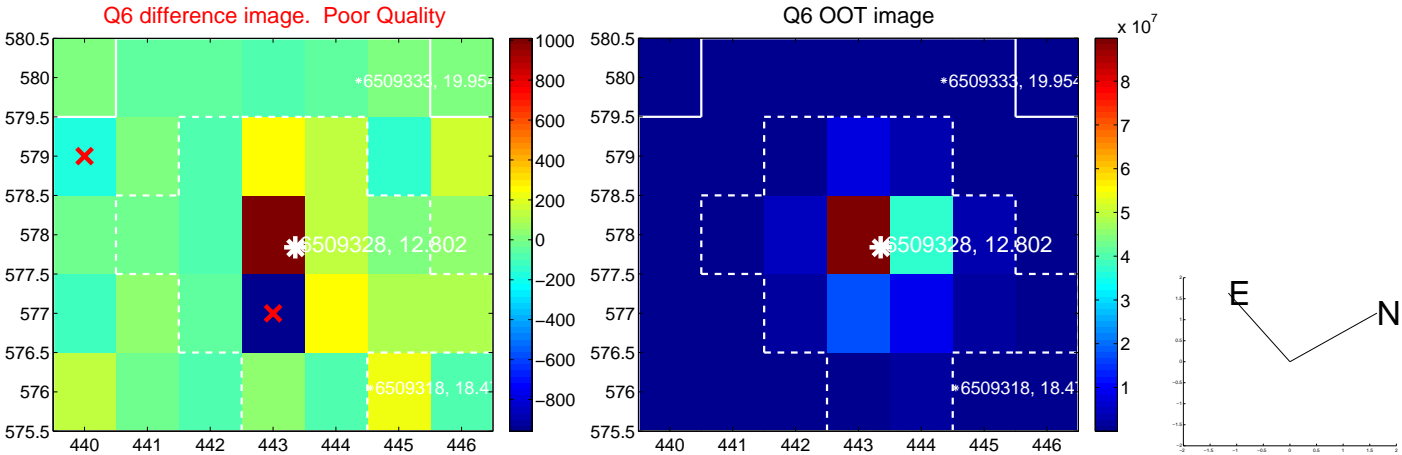
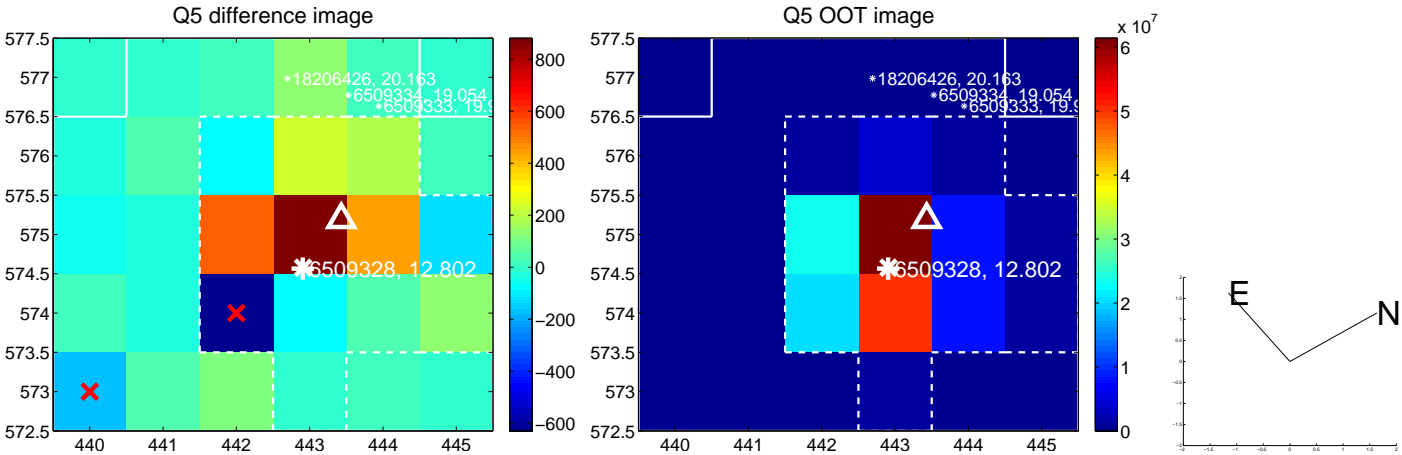


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

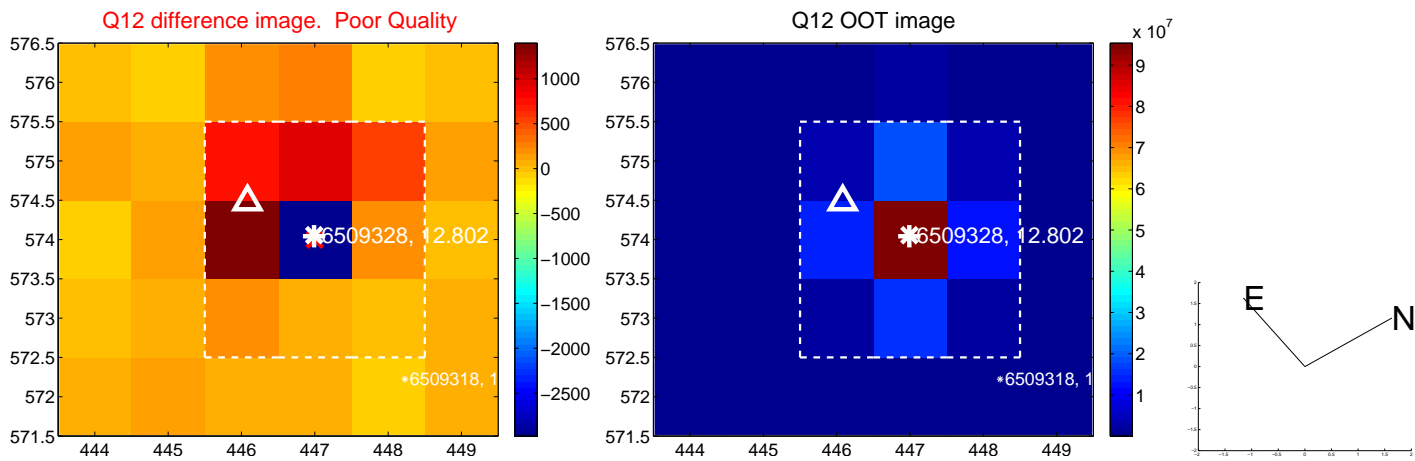
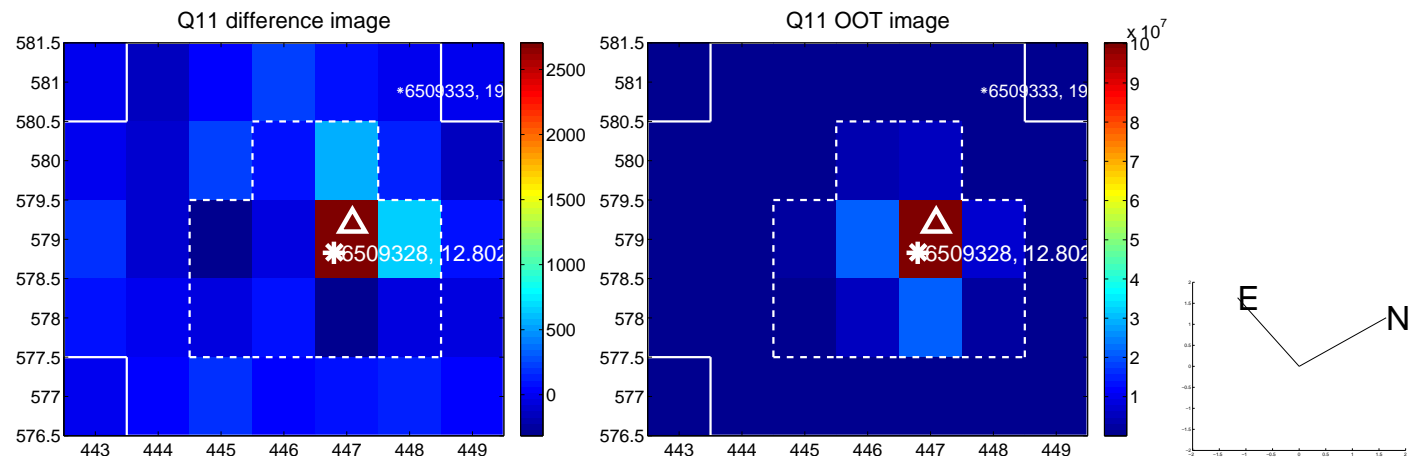
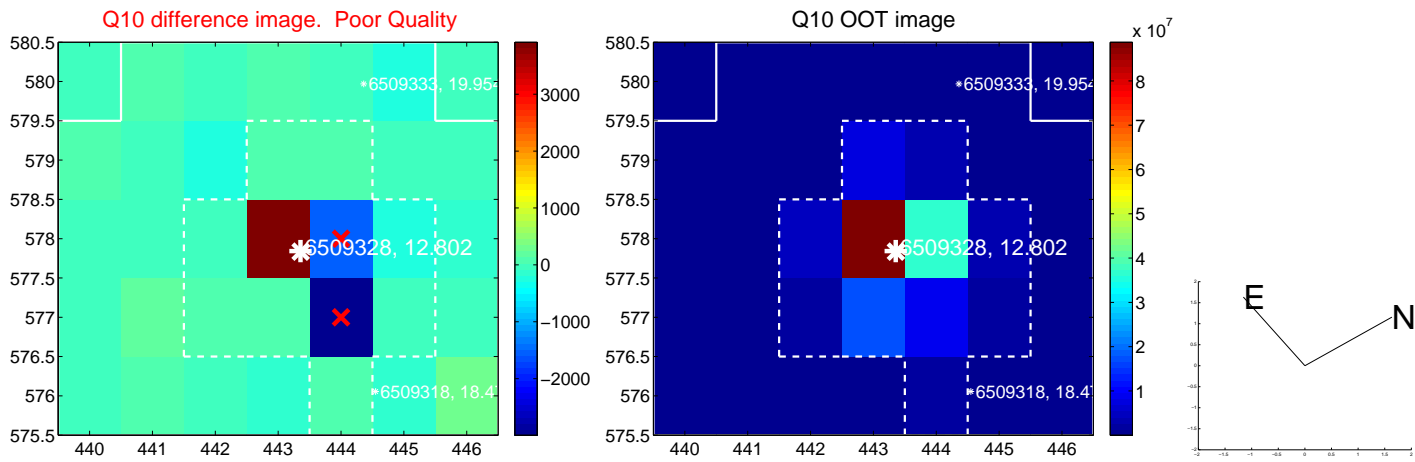
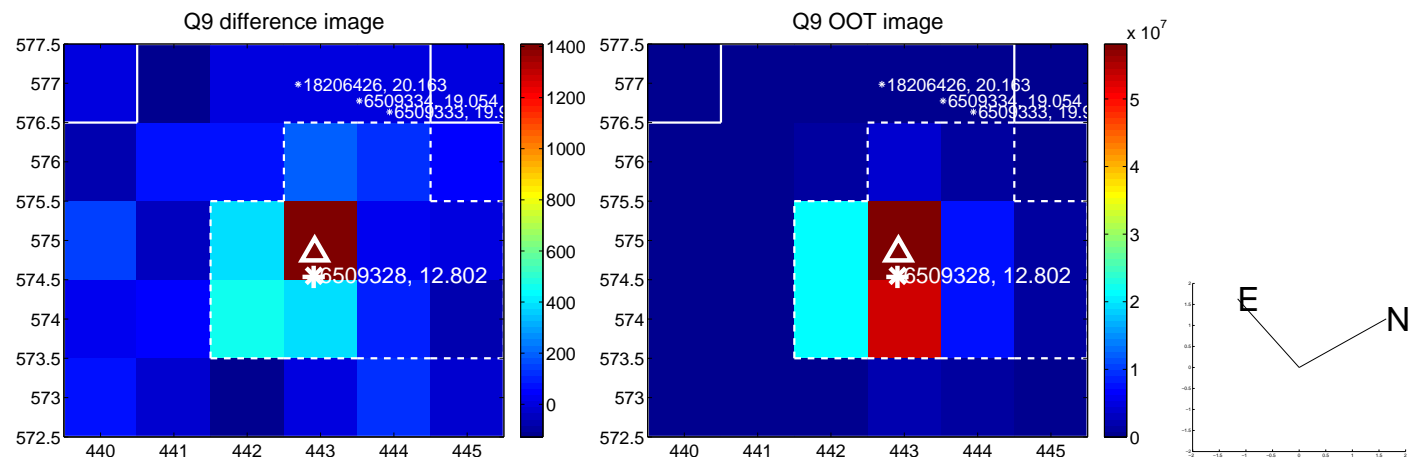


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

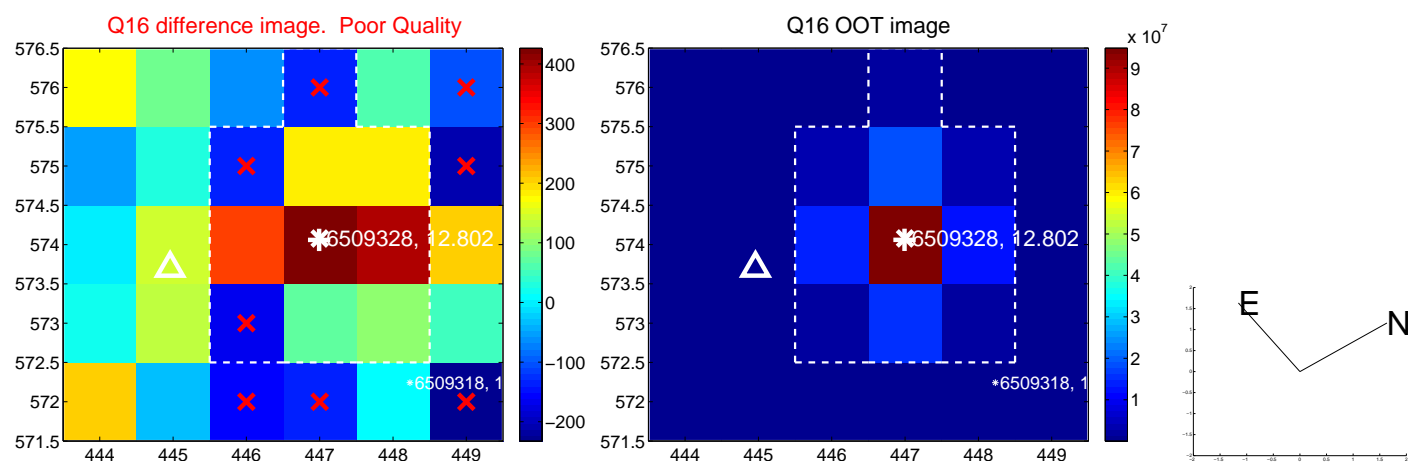
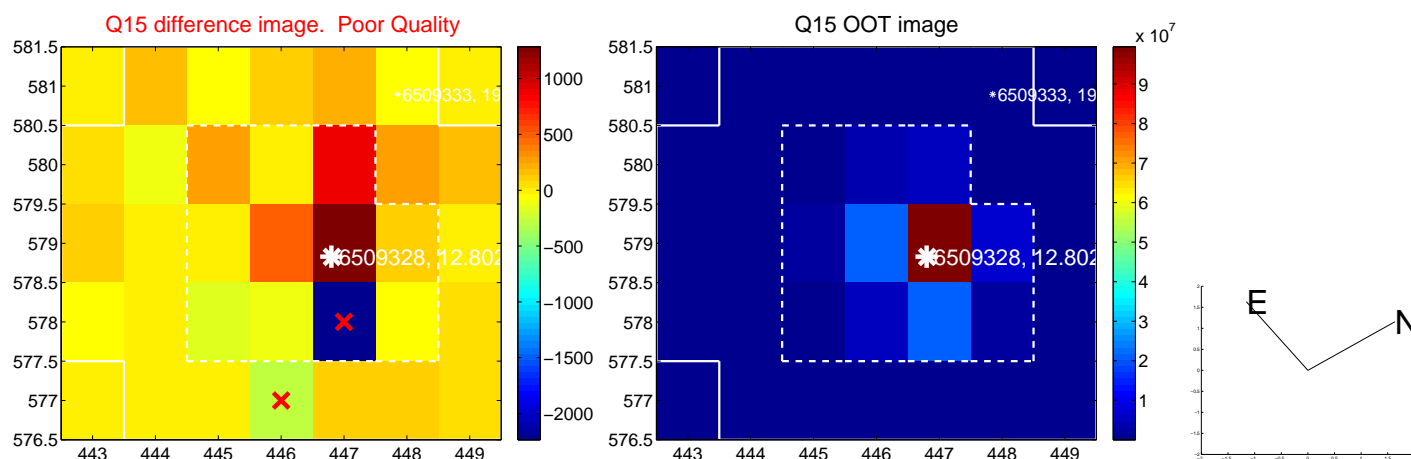
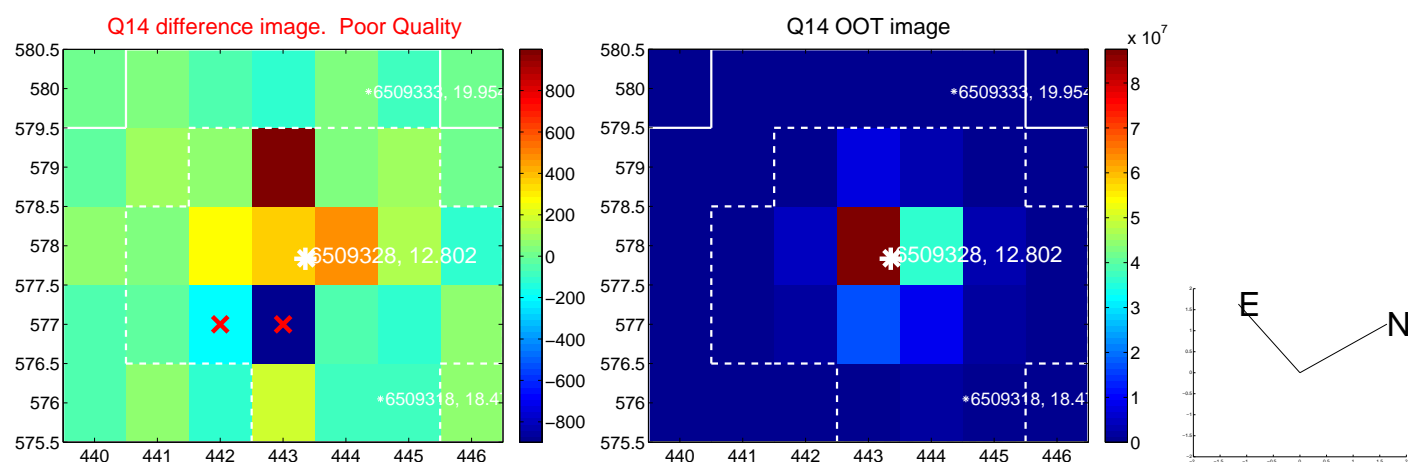
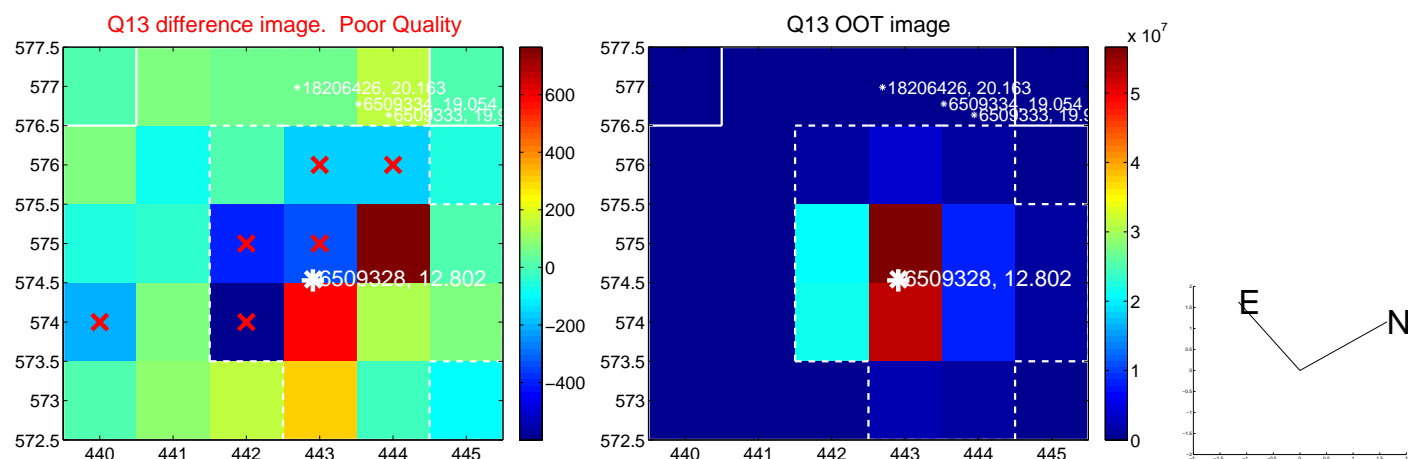




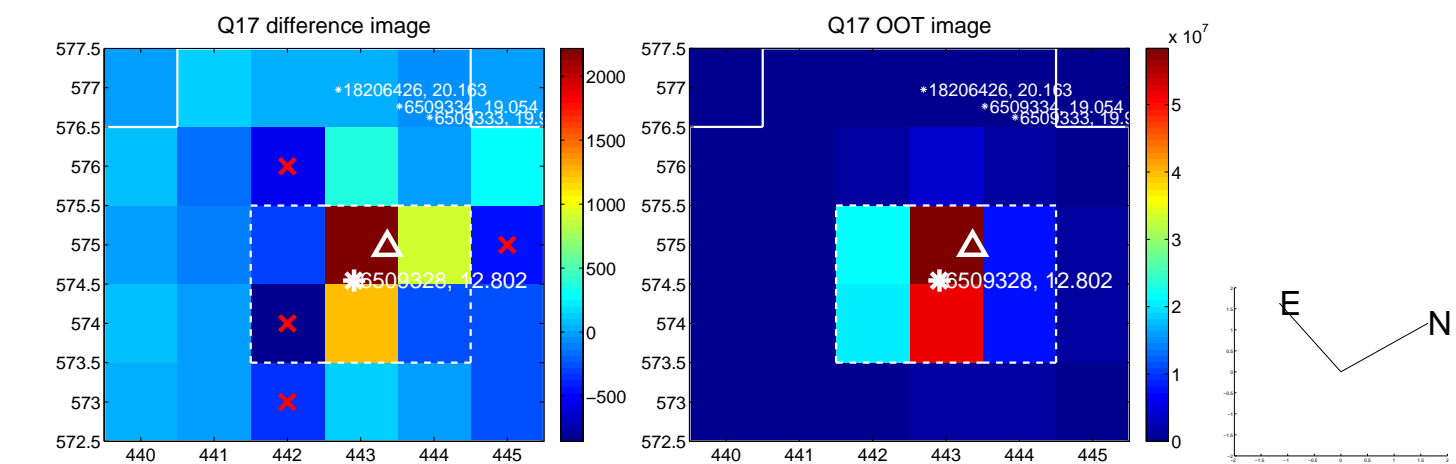
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



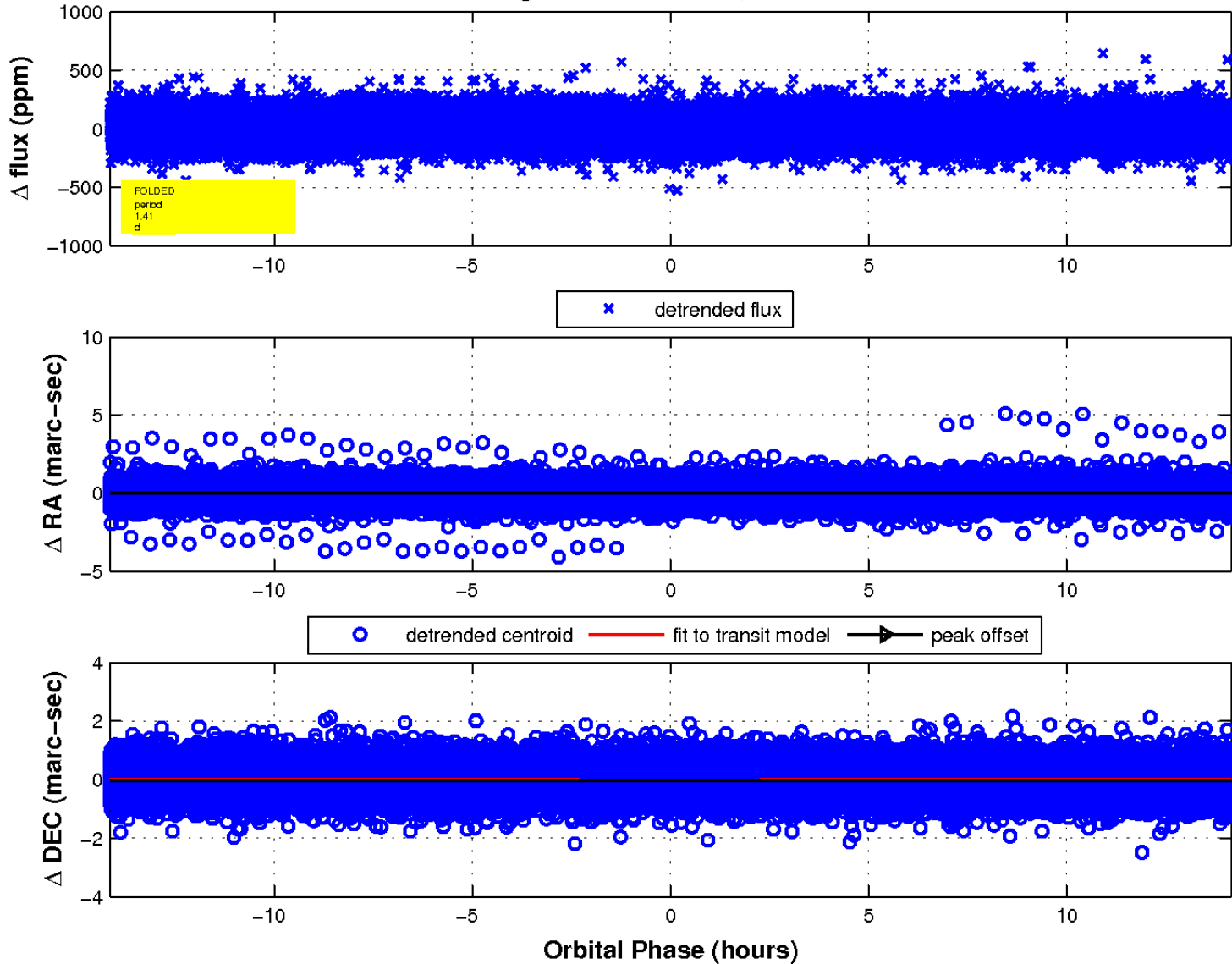
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



fluxWeightedCentroids, Planet 2 of 2



UKIRT Image

