

# KIC 009886221

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009886221-01	OBS	0591.01	2.992647	131.895154	102.3	1.859	13.6	15.4	0.86	5718	1.05	443.07

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009886221-01	OBS	FP	0.00	0	0	1	1	CENT_RESOLVED_OFFSET—HALO_GHOST—EPHEM_MATCH

**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.

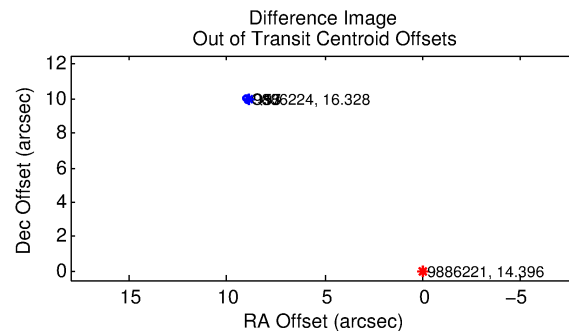
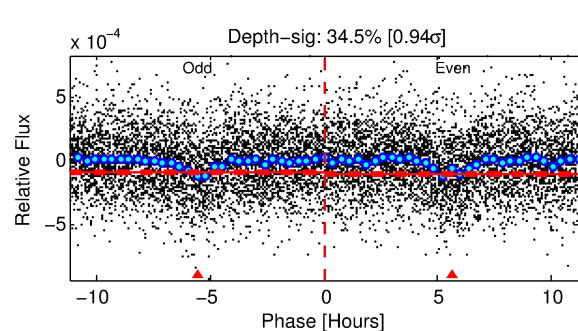
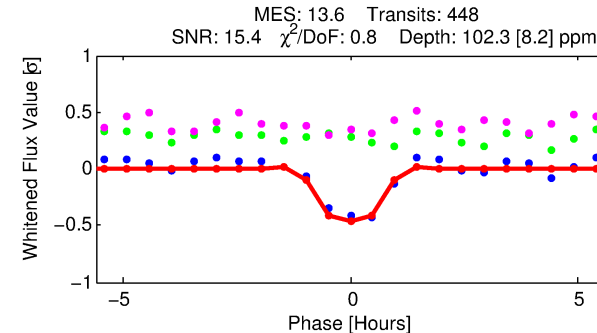
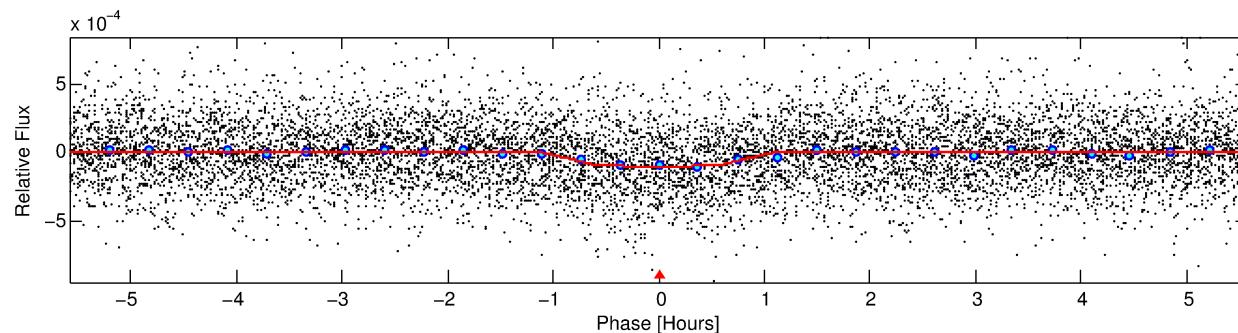
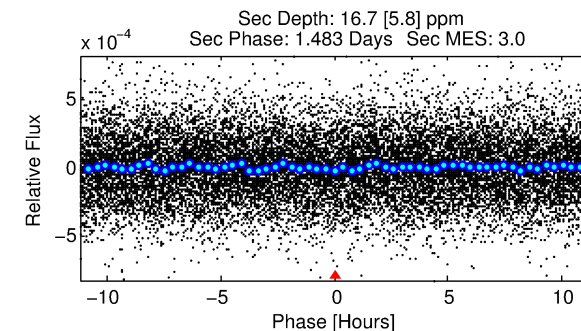
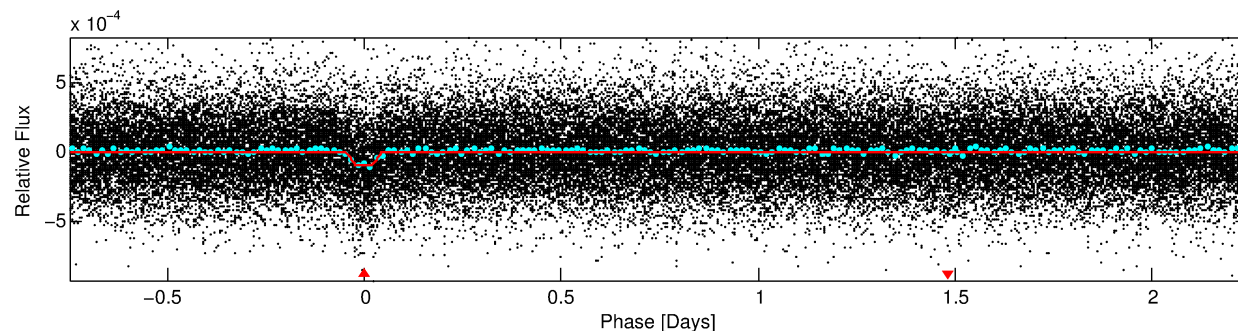
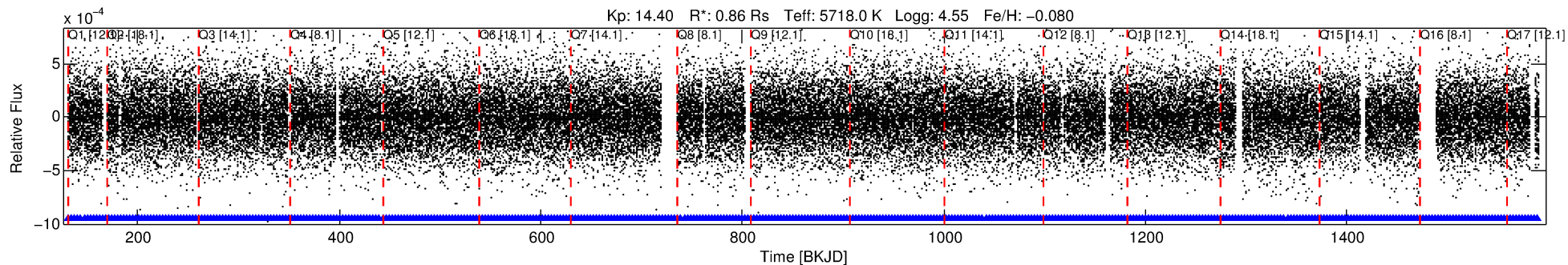
## Ephemeris Match Information For 009886221-01

TCE (1)	KIC	Parent (2)	Parent KIC	$P_1:P_2$	Dist ( $''$ )	$\Delta$ Row	$\Delta$ Col	$m_2$	$m_1$	$D_2/D_1$	Mechanism	Flag	$\sigma_P$	$\sigma_T$
009886221-01	9886221	3614.01	9886224	1:1	13.4	-1	3	16.33	14.40	1222.60	Direct-PRF	0	0.33	0.10

**Notes:**  $P_1:P_2$  is the period ratio. Dist is the distance in arcseconds.  $\Delta$ Row and  $\Delta$ Col are the number of pixels apart in row and column.  $m_2$  and  $m_1$  are the magnitudes of the parent and child.  $D_2/D_1$  is the parent's transit depth divided by the child's.  $\sigma_P$  and  $\sigma_T$  are the significance of the match in period and epoch. For a match to be considered significant  $\sigma_P < 5.0$  and  $\sigma_T < 5.0$ . Matches which have  $\sigma_P$  and  $\sigma_T$  very close to this cutoff should receive extra scrutiny, especially if the period ratio is very large.

# DV One-Page Summary

KIC: 9886221 Candidate: 1 of 1 Period: 2.993 d  
KOI: K00591.01 Corr: 0.984



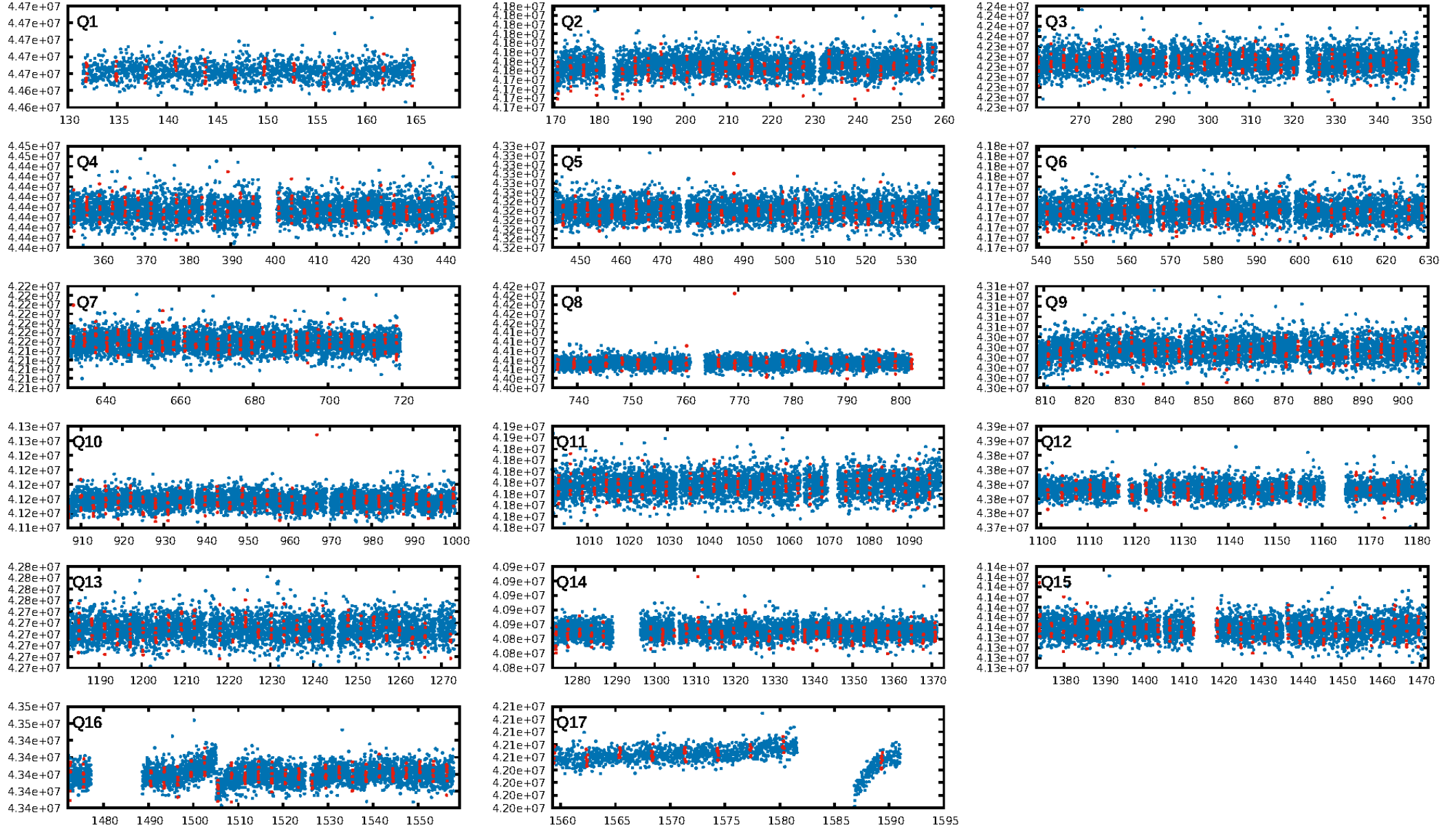
## DV Fit Results:

Period = 2.99265 [0.00001] d  
Epoch = 131.8952 [0.0022] BKJD  
Rp/R\* = 0.0111 [0.0064]  
a/R\* = 5.62 [15.13]  
b = 0.91 [0.57]  
Seff = 443.07 [146.81]  
Teq = 1170 [97] K  
Rp = 1.05 [0.66] Re  
a = 0.0401 [0.0086] AU  
Ag = 13.50 [16.77] [0.75σ]  
Teff = 3467 [1048] K [2.18σ]

## DV Diagnostic Results:

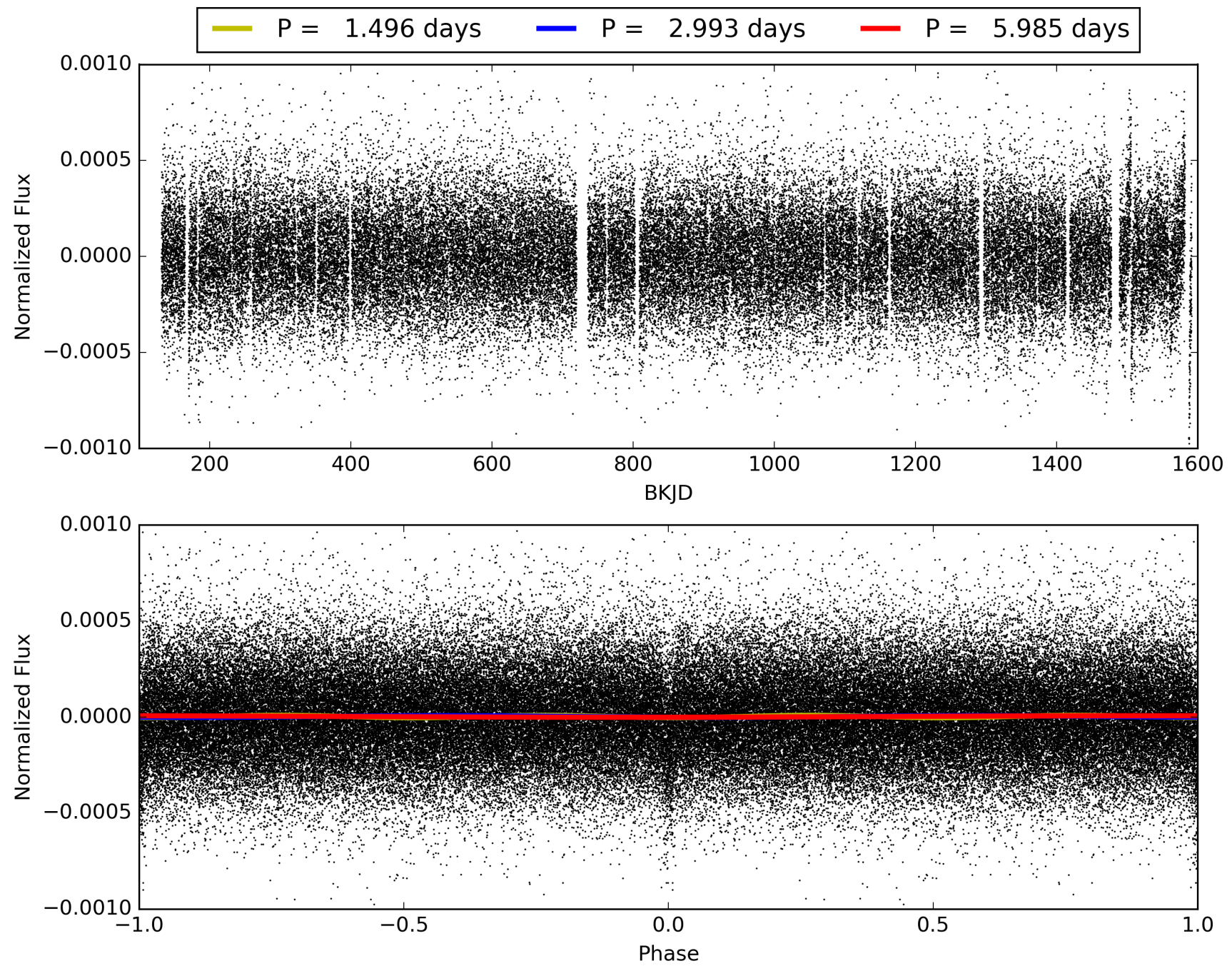
ShortPeriod-sig: N/A  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 4.05e-41  
RollingBand-fgt: 1.00 [427/427]  
GhostDiagnostic-chr: -0.07935  
Centroid-sig: N/A  
Centroid-so: N/A  
OotOffset-rm: 13.424 arcsec [200.11σ]  
KicOffset-rm: 13.417 arcsec [196.25σ]  
OotOffset-st: 0/0/0/5 [5]  
KicOffset-st: 0/0/0/5 [5]  
DiffImageQuality-fgm: 1.00 [5/5]  
DiffImageOverlap-fno: 1.00 [17/17]

# TCE 009886221-01, PDC Light Curves



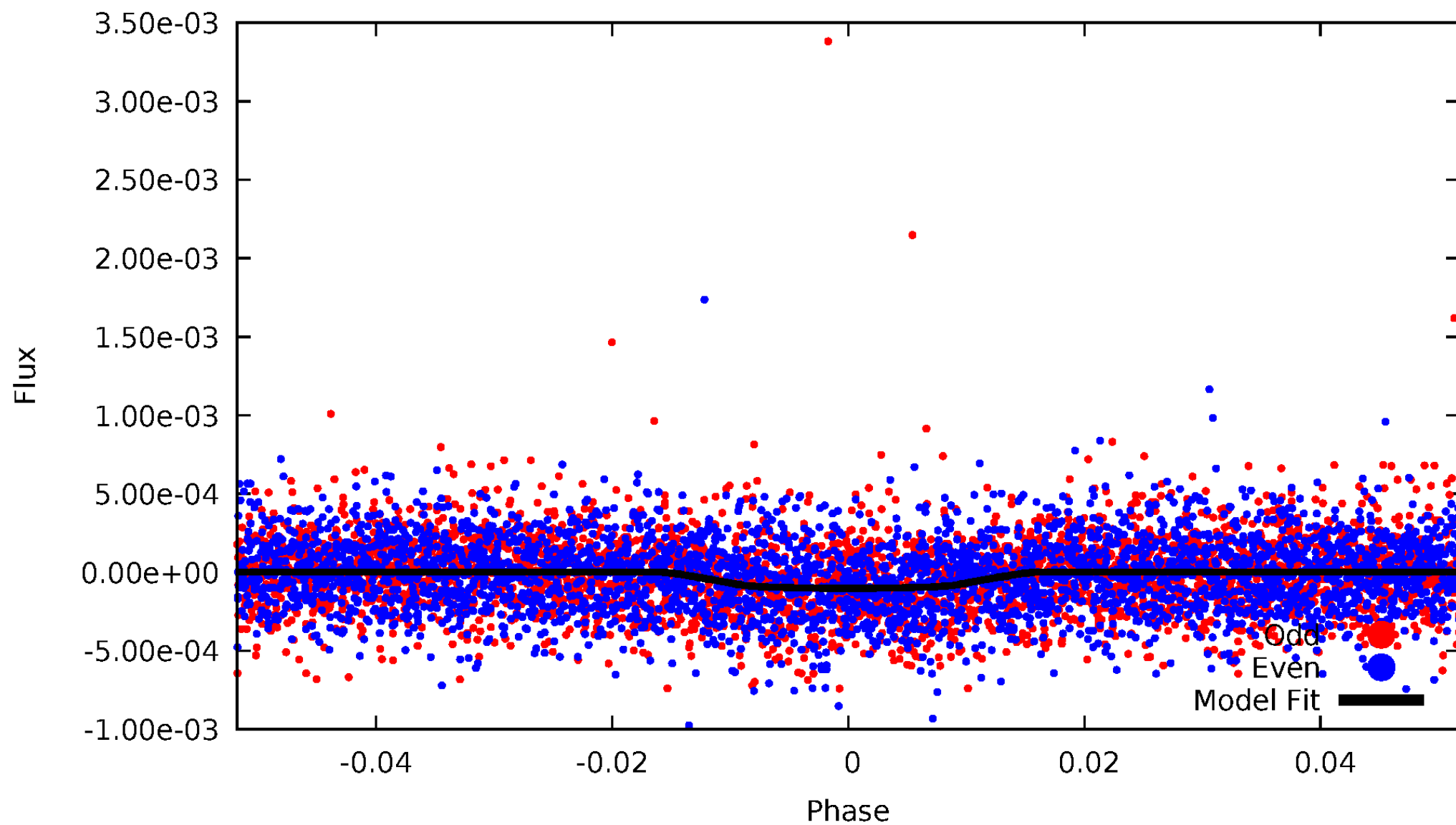


TCE 009886221-01



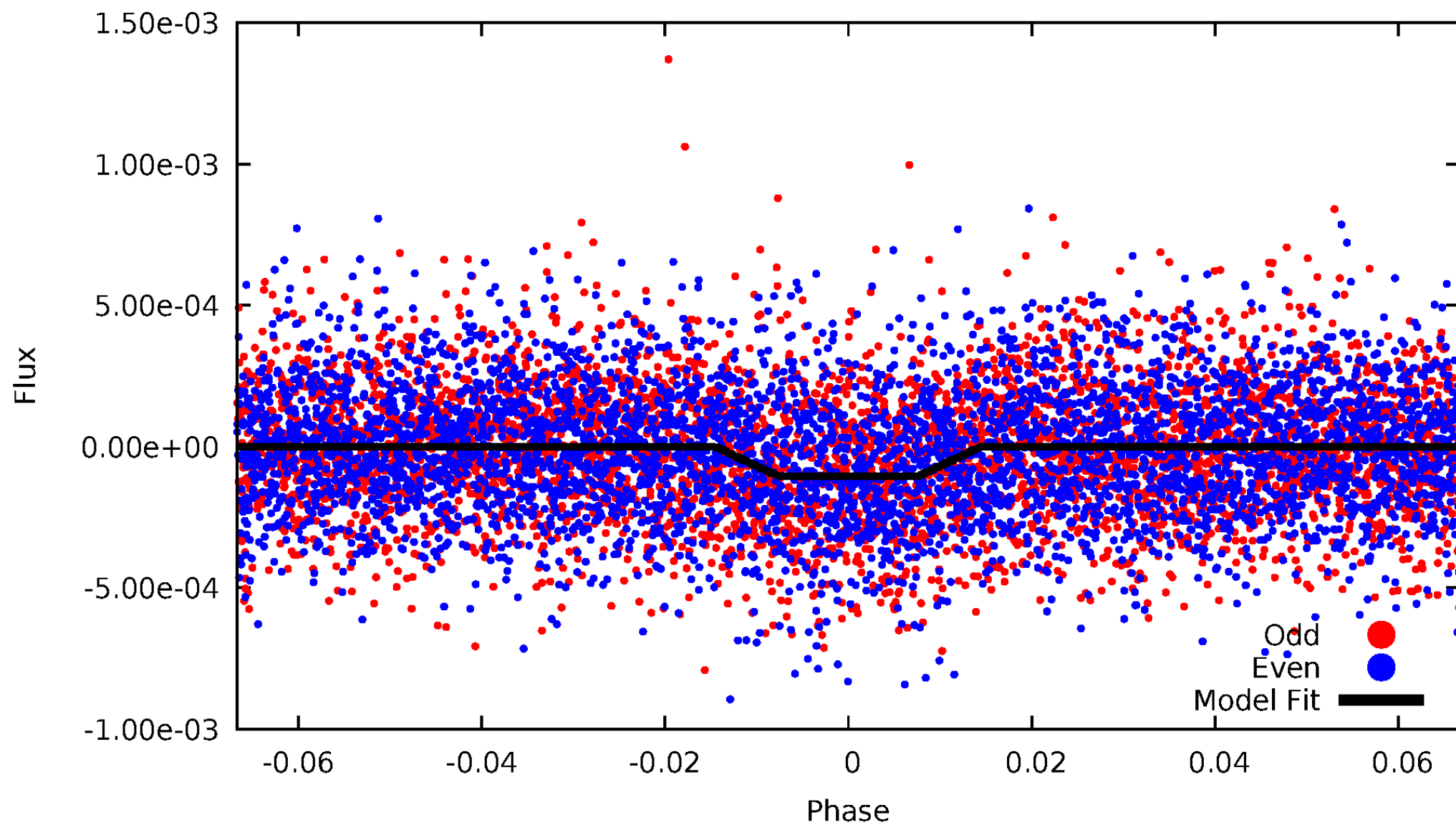
# DV Odd/Even

TCE 009886221-01



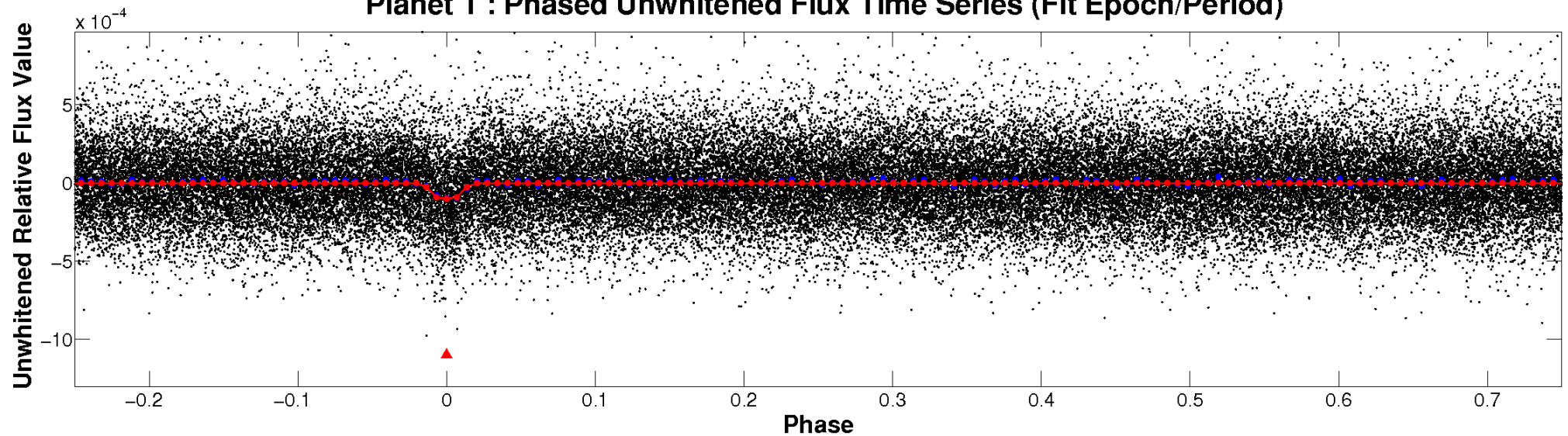
# ALT Odd/Even

TCE 009886221-01

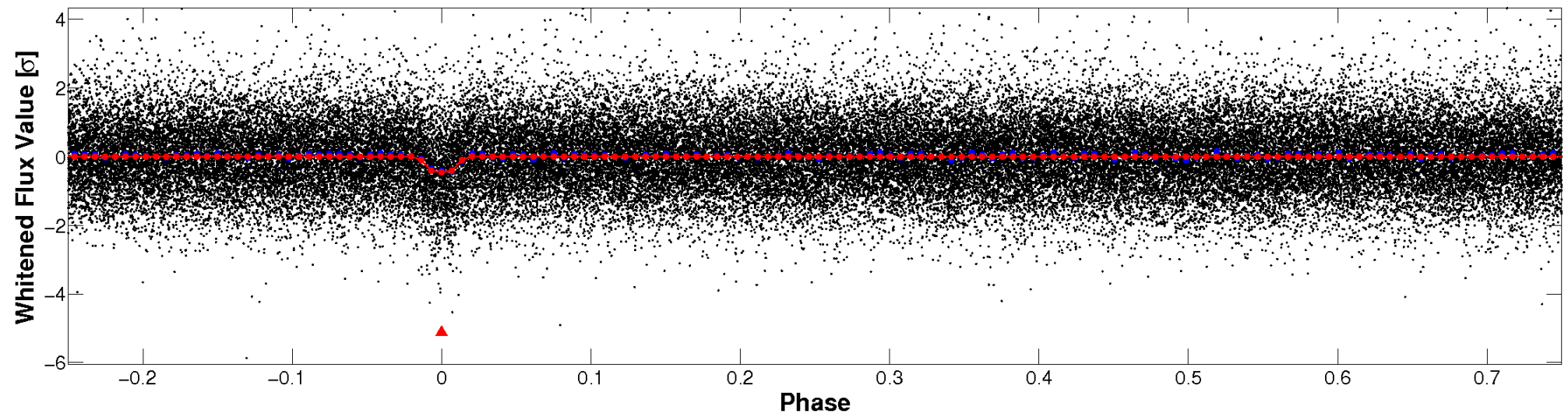


# Non-Whitened Vs. Whitened Light Curve

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



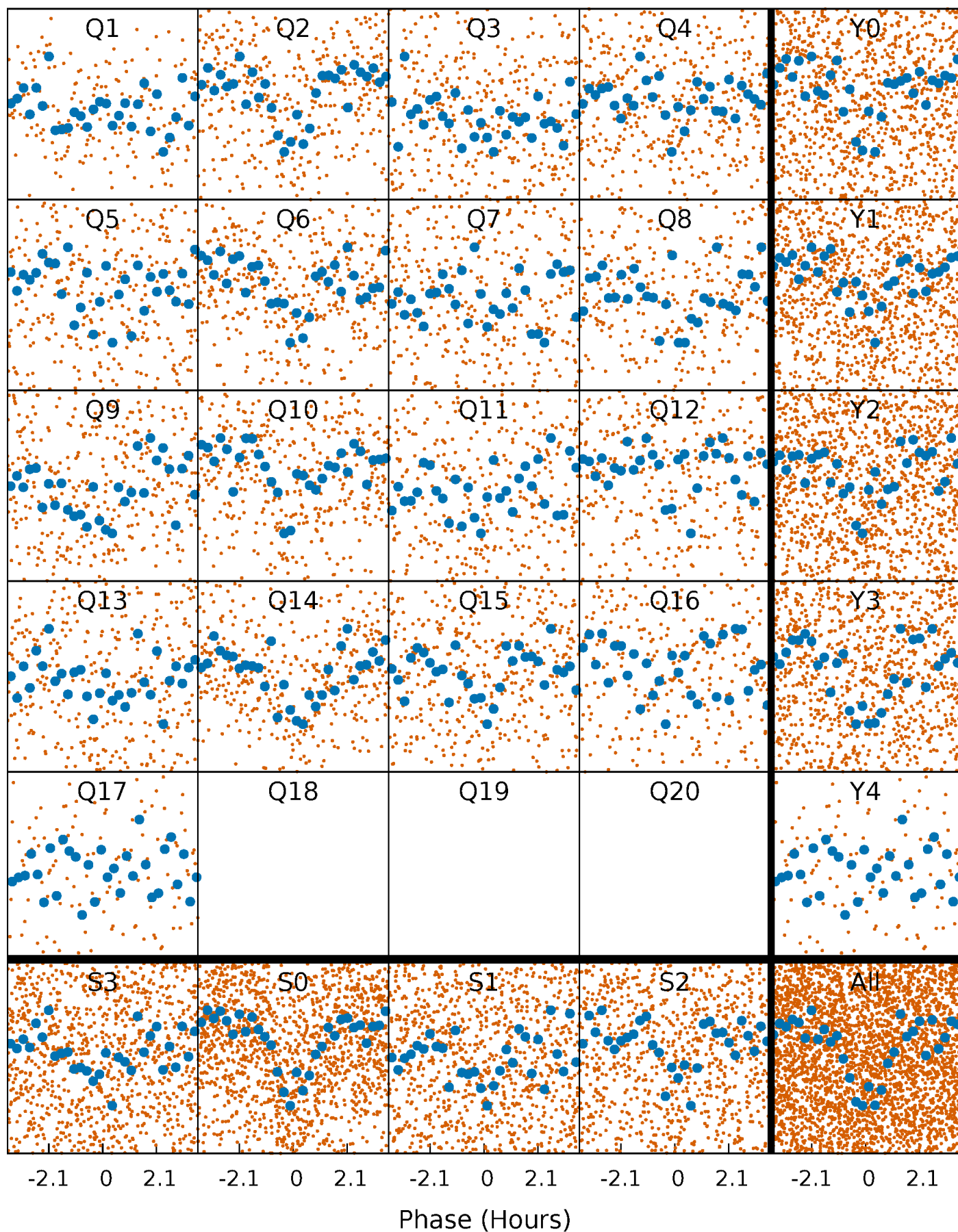
**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**





# PDC Quarter-Phased Transit Curves

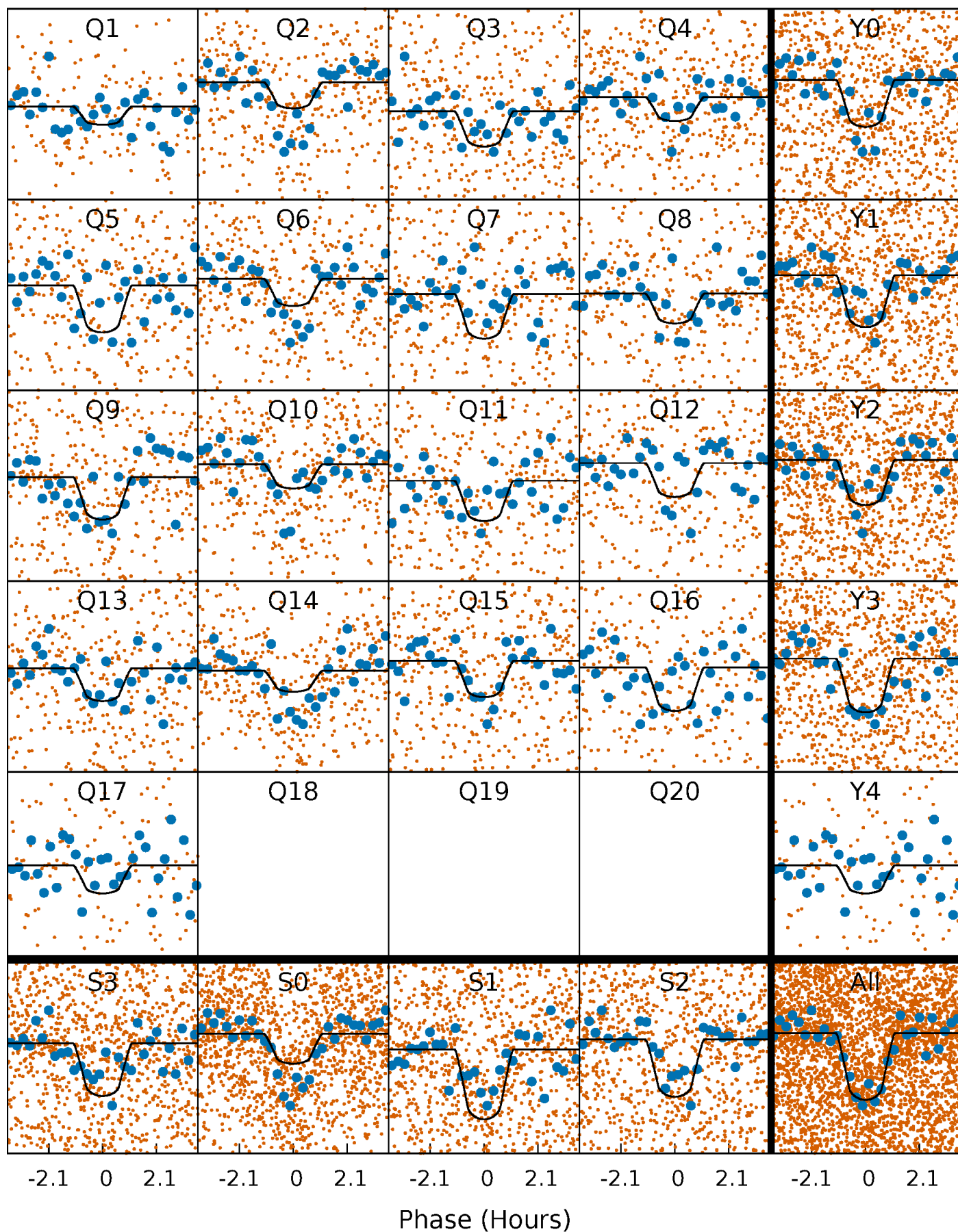
TCE 009886221-01 P= 2.992647 Days  $T_0=131.895154$  (BKJD)





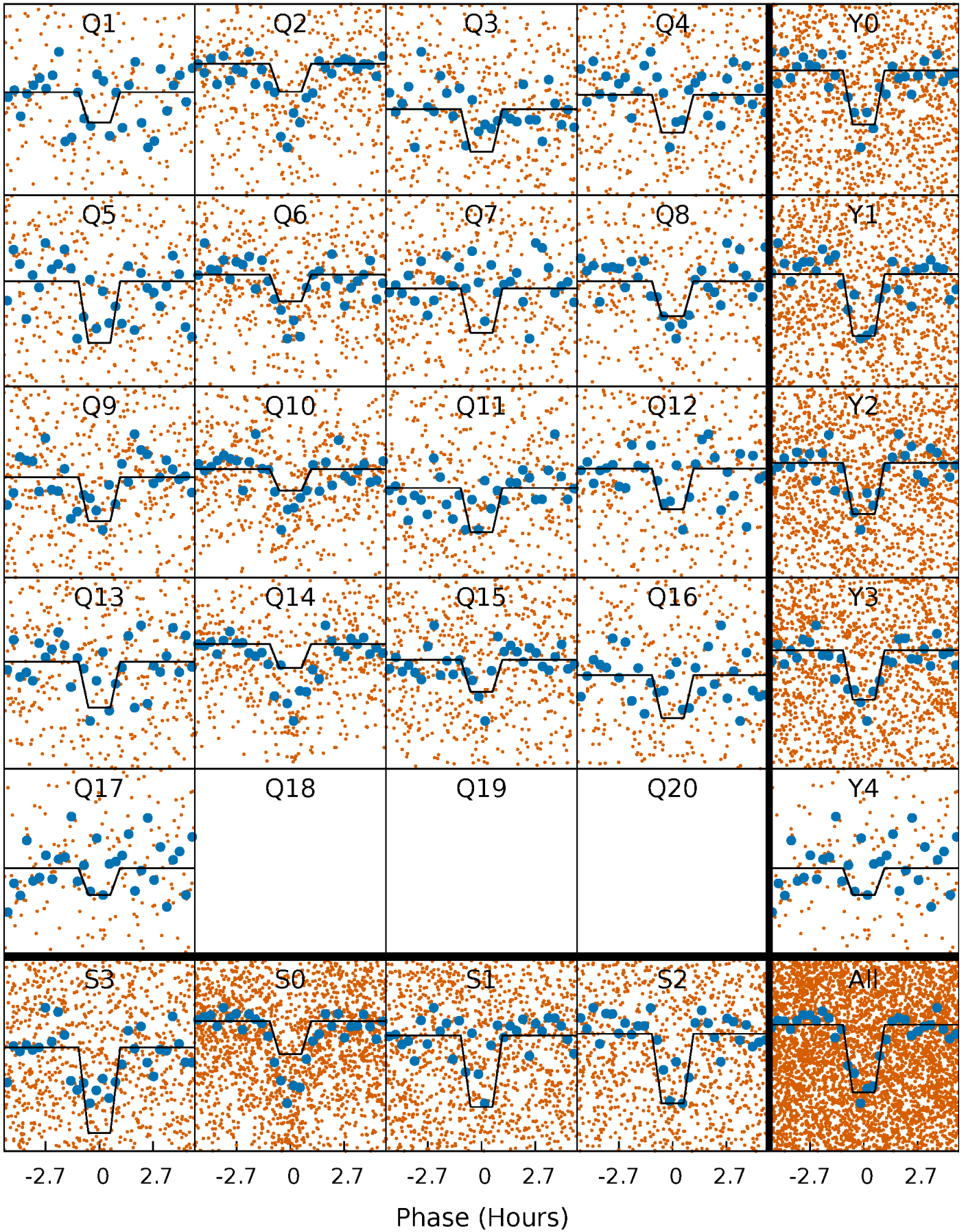
# DV Quarter-Phased Transit Curves

TCE 009886221-01 P= 2.992647 Days  $T_0=131.895154$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

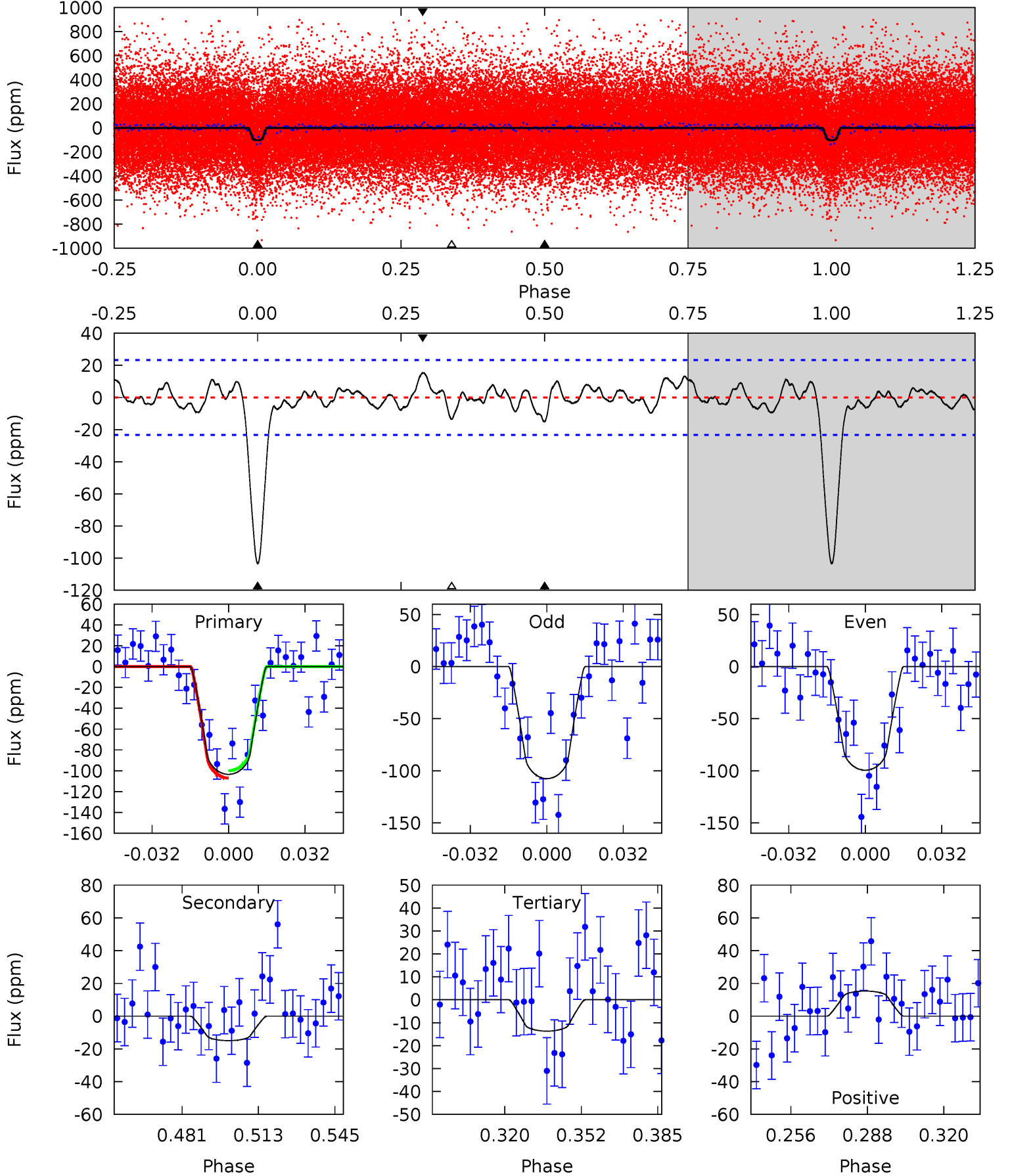
TCE 009886221-01 P= 2.992664 Days  $T_0=131.892225$  (BKJD)



# DV Model-Shift Uniqueness Test

009886221-01, P = 2.992647 Days, E = 128.902507 Days

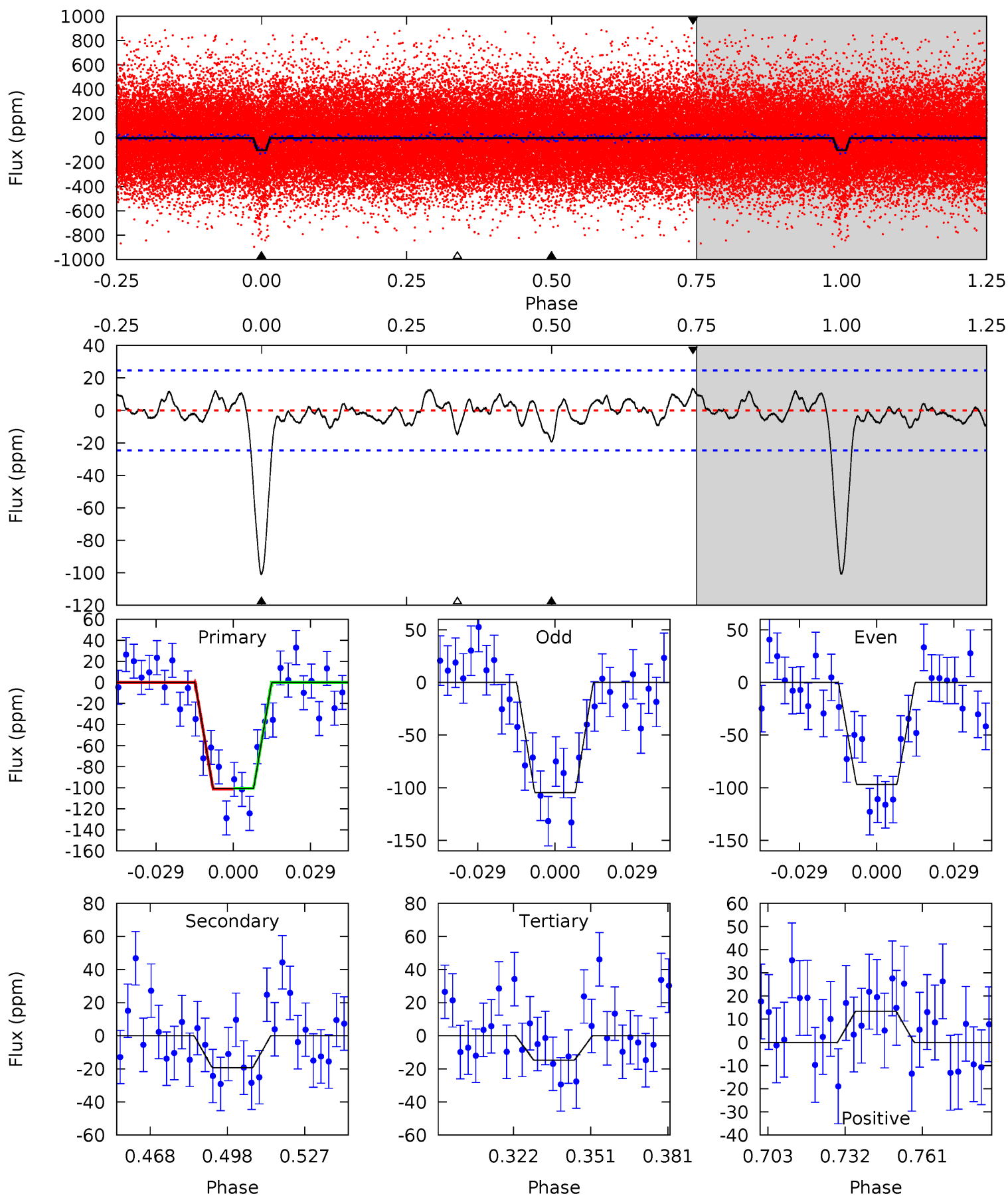
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
21.3	3.08	2.82	3.15	4.80	2.14	1.14	18.5	18.2	0.27	-0.07	0.83	1.06	0.13	0.73



# Alt Model-Shift Uniqueness Test

009886221-01, P = 2.992664 Days, E = 128.899561 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
19.8	3.78	2.91	2.64	4.82	2.18	1.10	16.9	17.1	0.88	1.15	0.76	1.08	0.12	0.07





### Stellar Parameters For KIC 009886221

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5718^{+136}_{-170}$	$4.549^{+0.042}_{-0.168}$	$-0.080^{+0.300}_{-0.300}$	$0.863^{+0.221}_{-0.074}$	$0.960^{+0.095}_{-0.116}$	$2.107^{+0.461}_{-0.937}$
	+2%/-3%	+1%/-4%	+375%/-375%	+26%/-9%	+10%/-12%	+22%/-44%
Source	PHO1	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 009886221-01 / KOI 0591.01

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-15 \pm 5$	$1.16^{+0.59}_{-0.57}$	$1664^{+87}_{-71}$	$3663^{+986}_{-503}$	$9.540^{+27.581}_{-5.675}$
Alt.	$-19 \pm 5$	$1.04^{+0.66}_{-0.57}$	$1663^{+94}_{-68}$	$3959^{+1560}_{-581}$	$15^{+66}_{-10}$

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

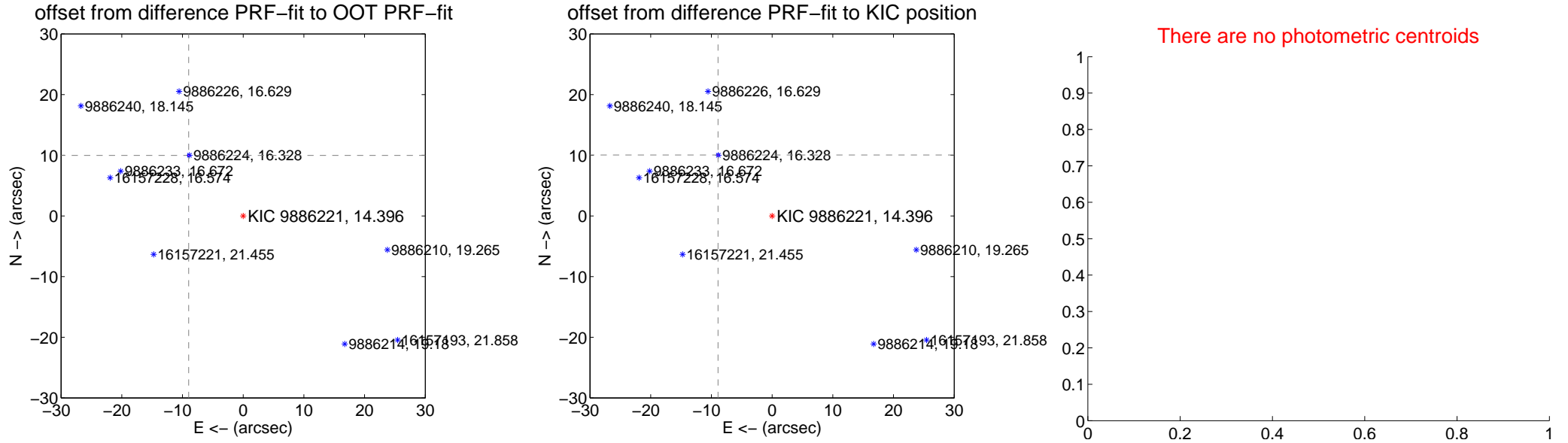
## DV Centroid Data

Supplemental centroid analysis for 009886221-01. Kepler magnitude: 14.40. Transit SNR 15.43

There are 5 quarters with good PRF difference image offsets

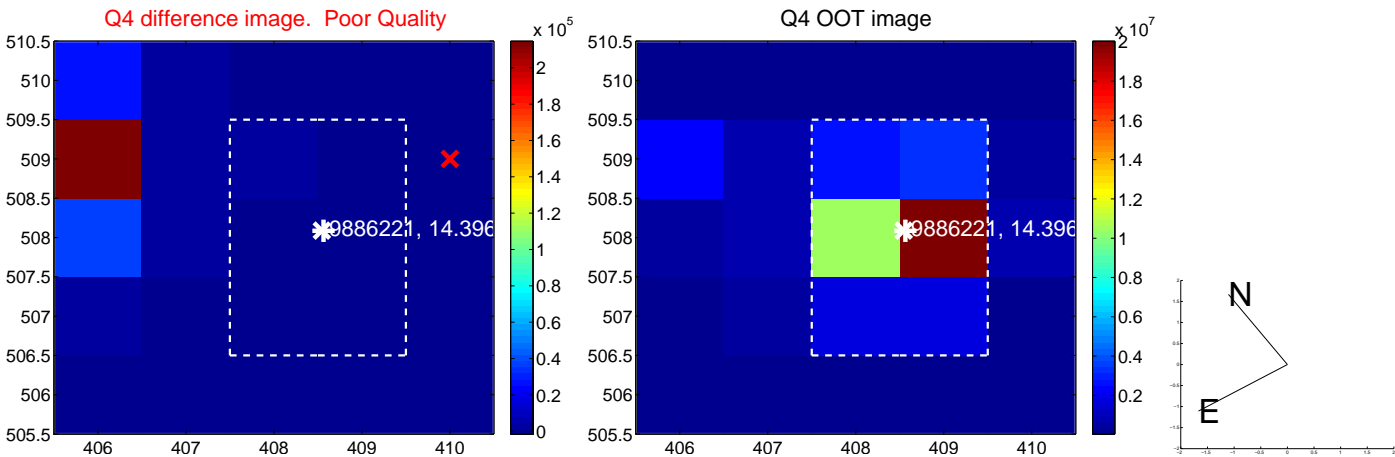
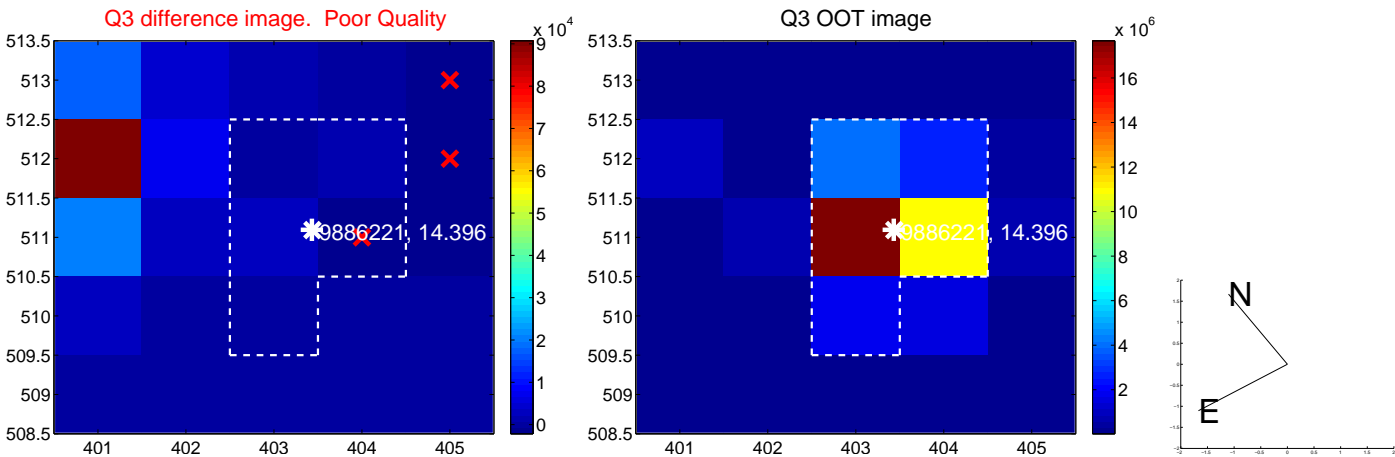
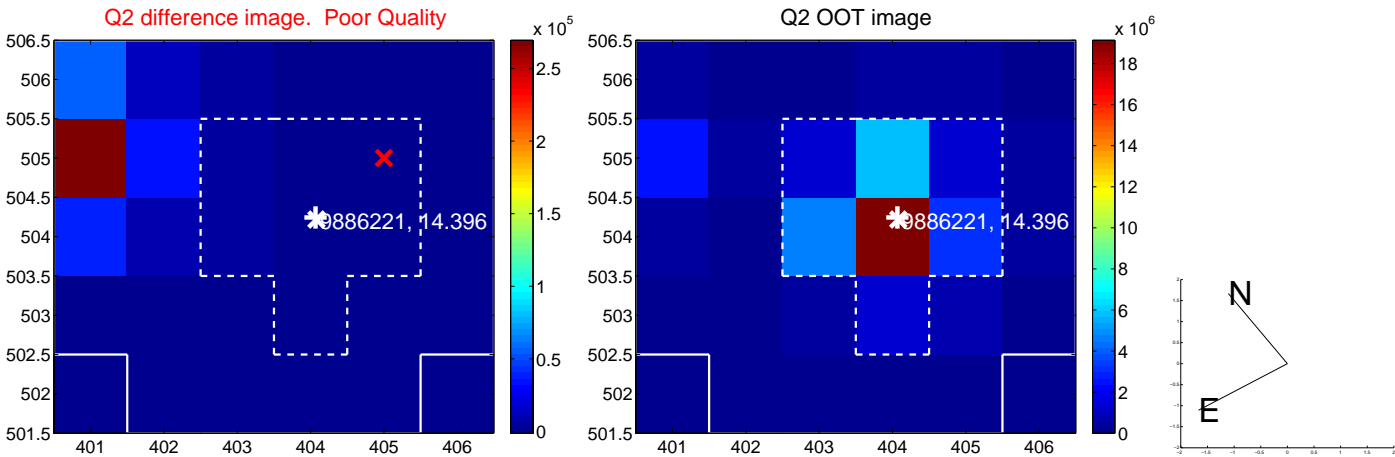
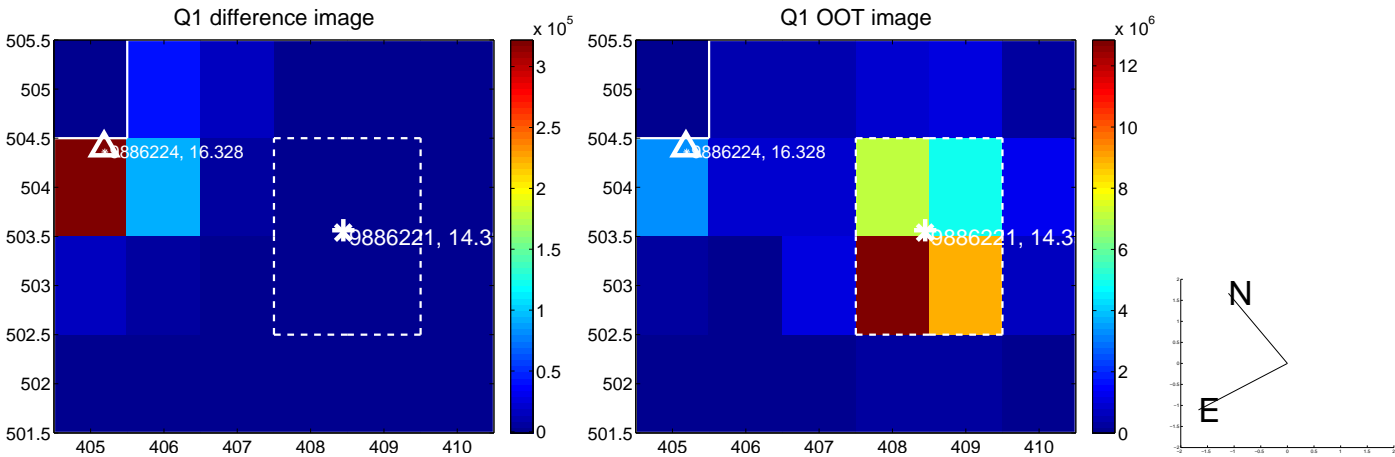
The direct PRF centroid is offset from the target star catalog position by about 0.11 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$13.424 \pm 0.067$	200.11	$8.977 \pm 0.067$	$9.981 \pm 0.067$
PRF-fit source offset from KIC position	$13.417 \pm 0.068$	196.25	$8.902 \pm 0.070$	$10.039 \pm 0.067$
photometric centroid source offset	—	—	—	—

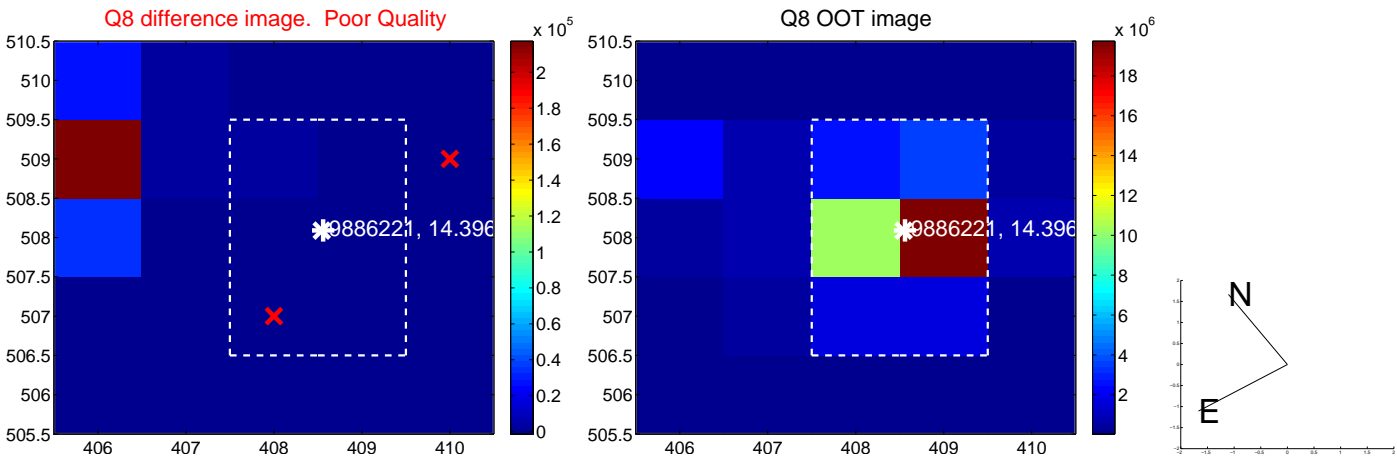
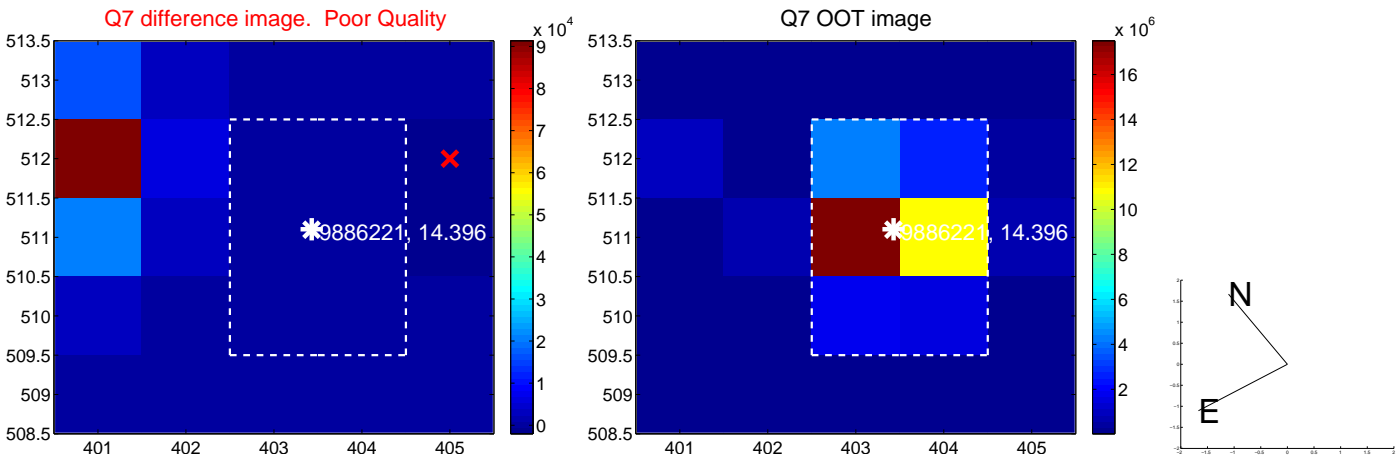
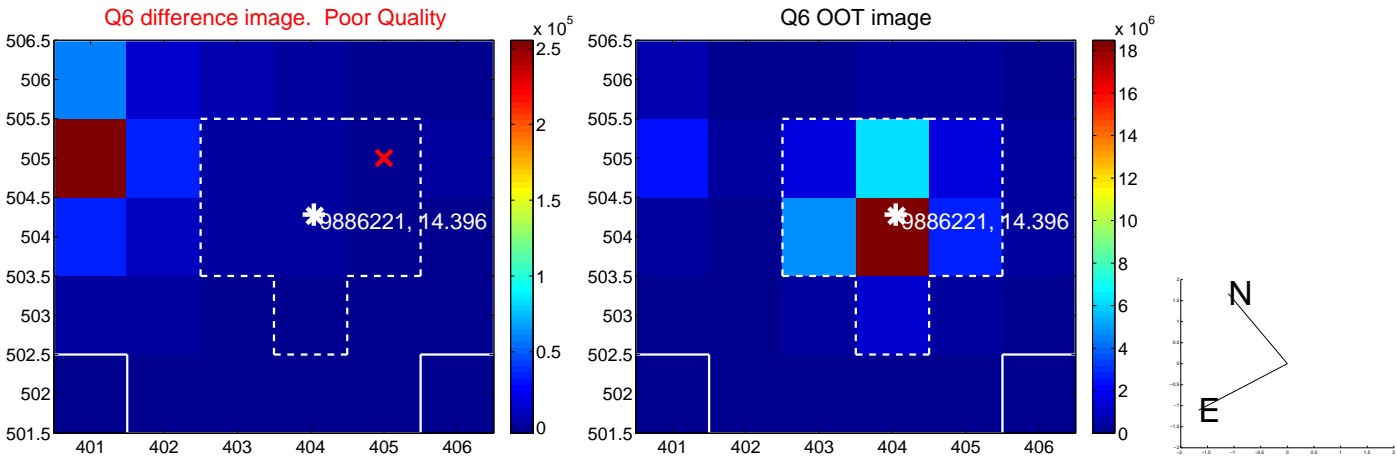
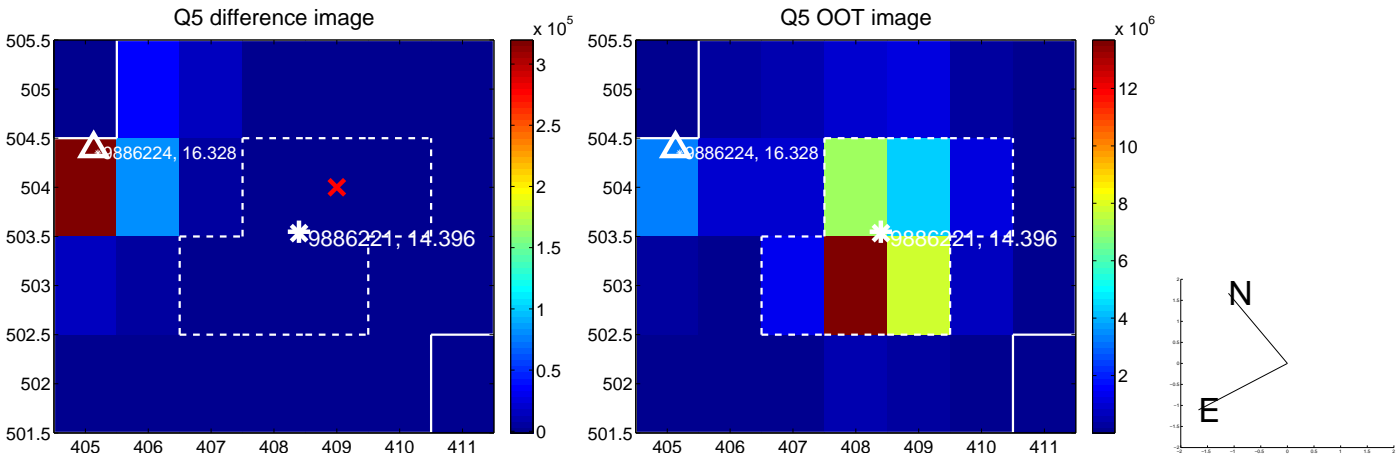


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

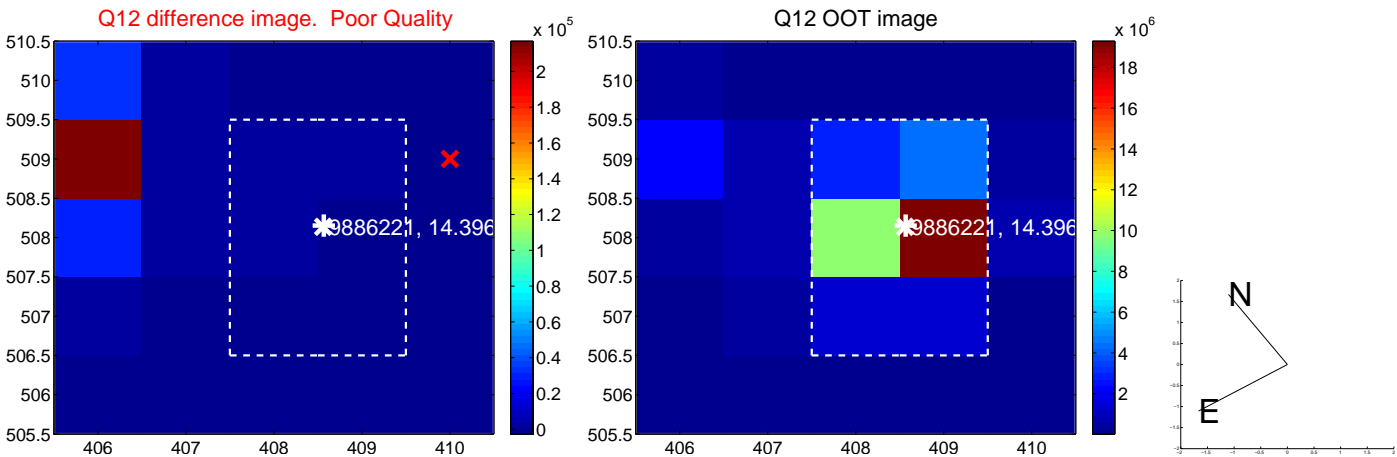
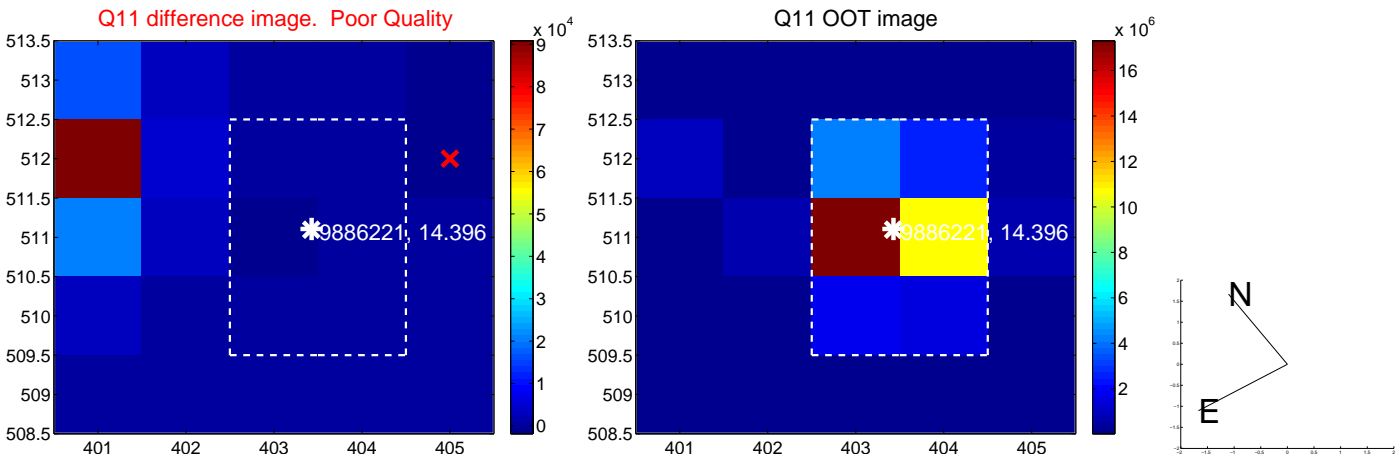
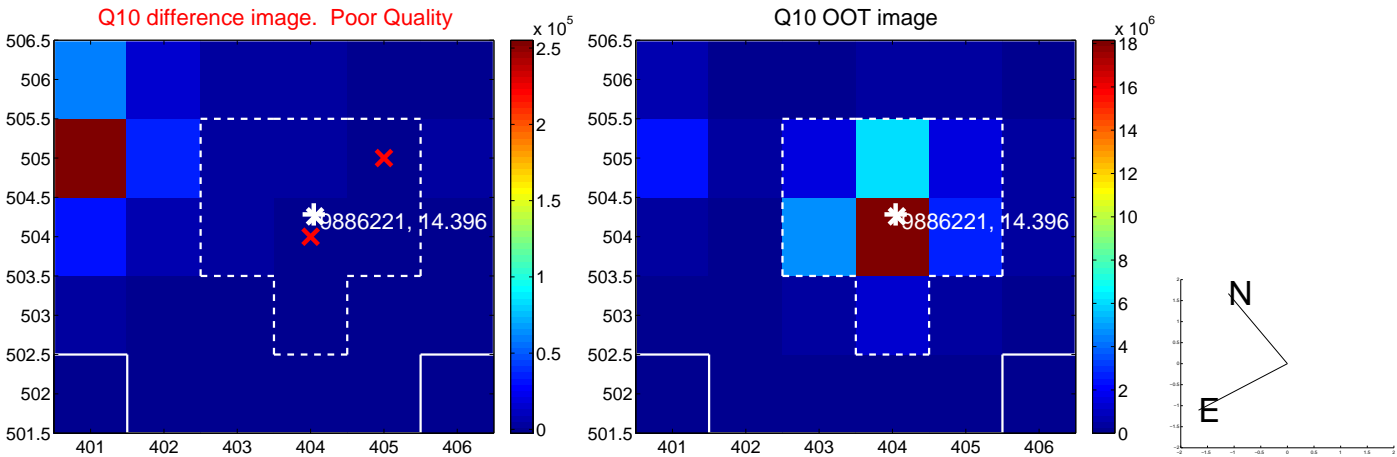
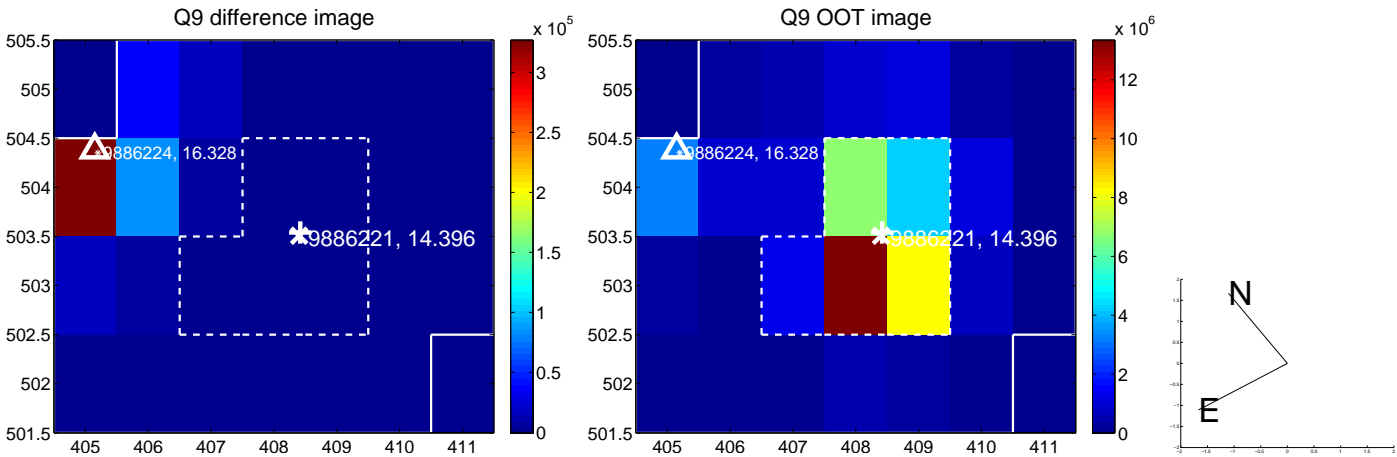


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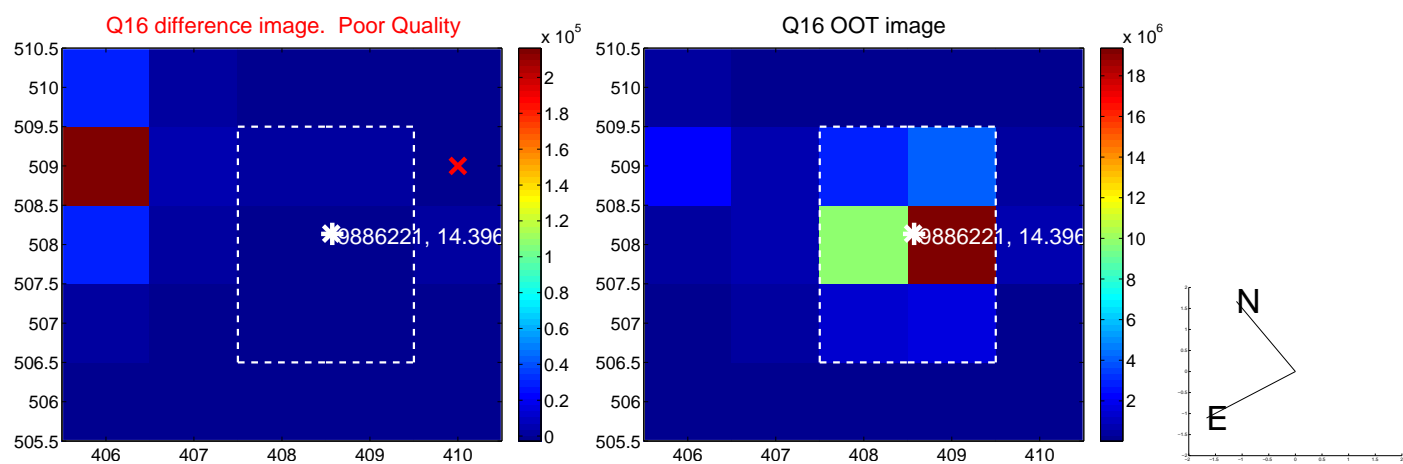
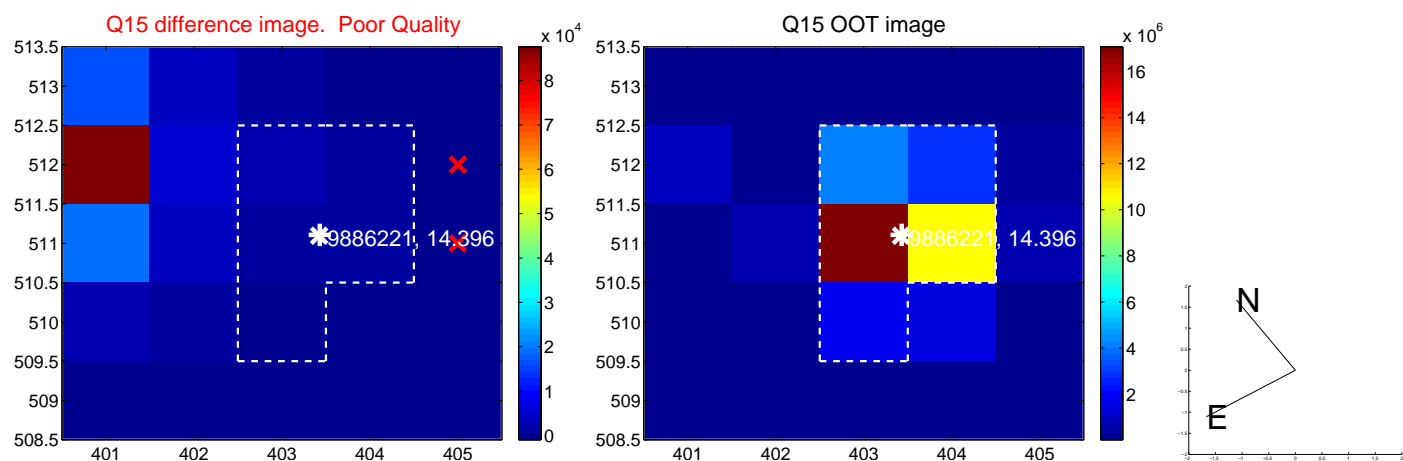
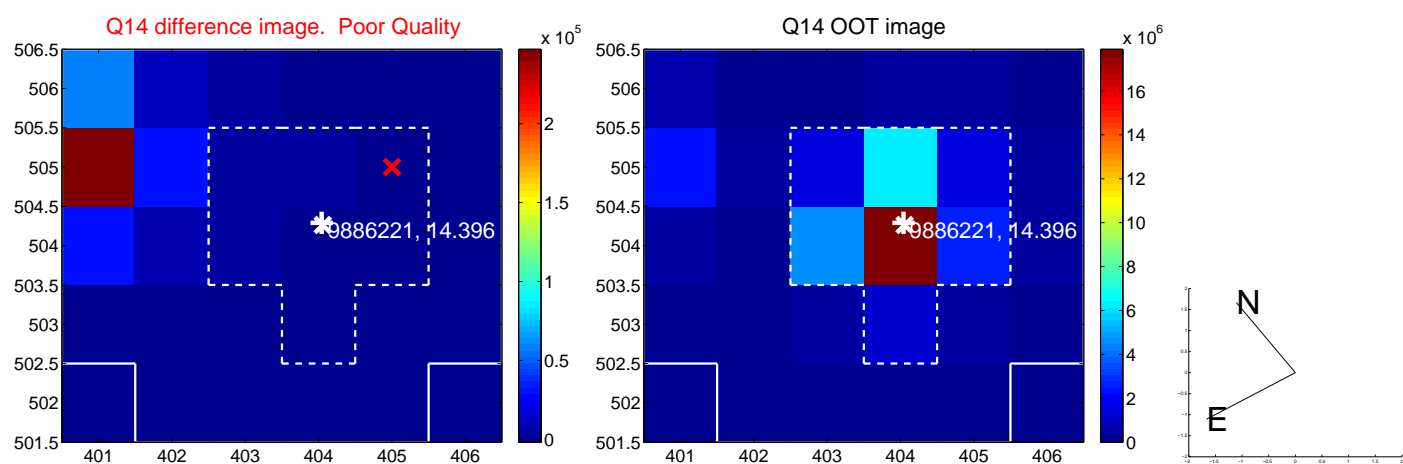
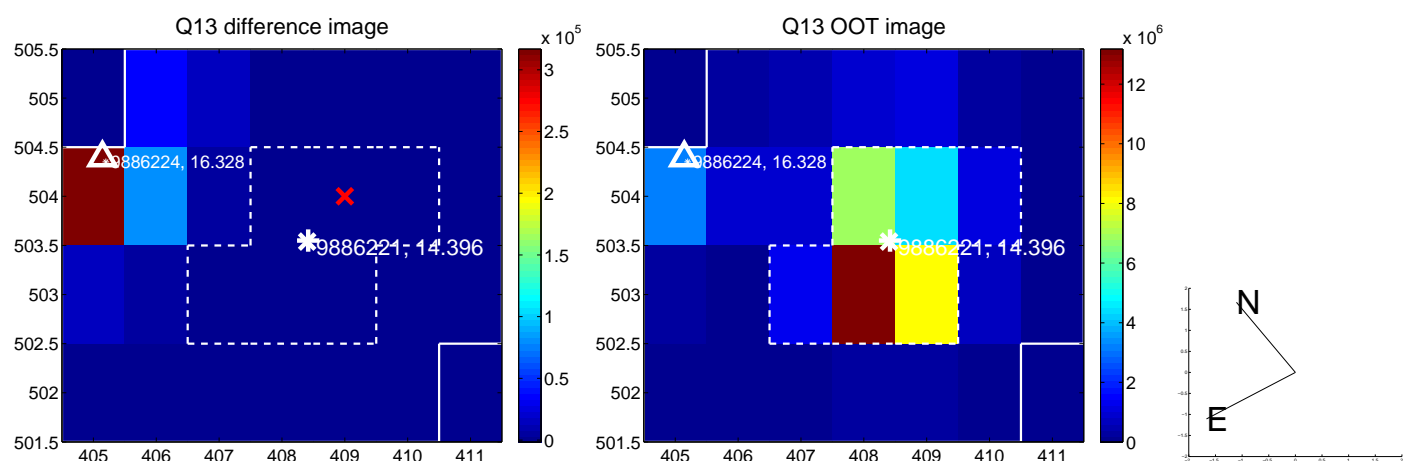




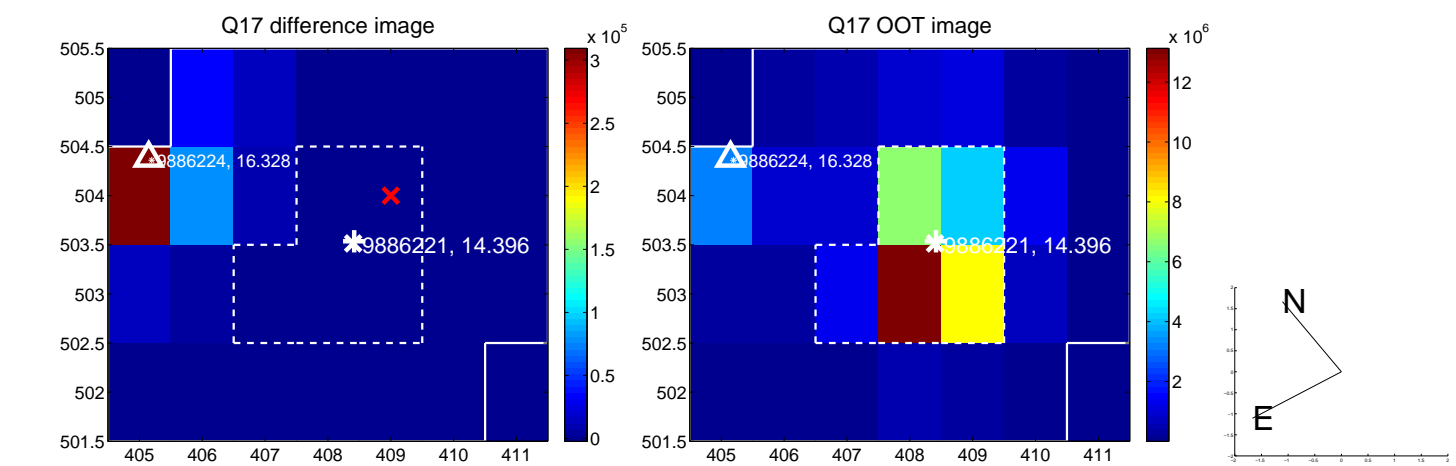
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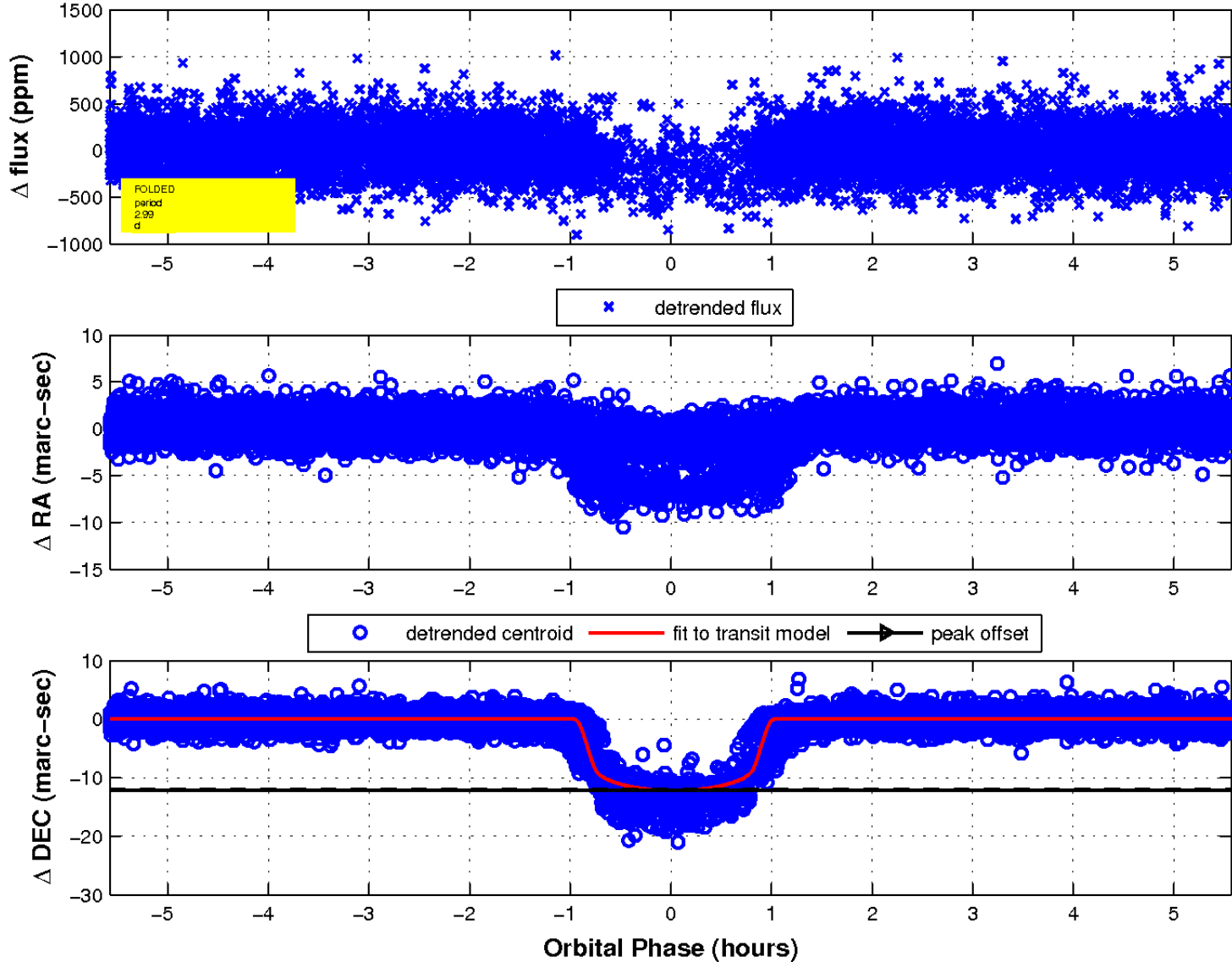
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



fluxWeightedCentroids, Planet 1 of 1



UKIRT Image

Declination

