

# KIC 010098844

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010098844-01	OBS	2964.01	47.449561	173.460187	206.6	11.066	13.8	13.8	1.13	6007	1.92	21.86
010098844-02	OBS	2964.02	35.082183	164.445050	84.9	13.614	7.5	7.3	1.13	6007	1.14	32.69

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010098844-01	OBS	PC	0.98	0	0	0	0	NO_COMMENT
010098844-02	OBS	FP	0.19	1	0	0	0	LPP_DV—CENT_FEW_DIFFS

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

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

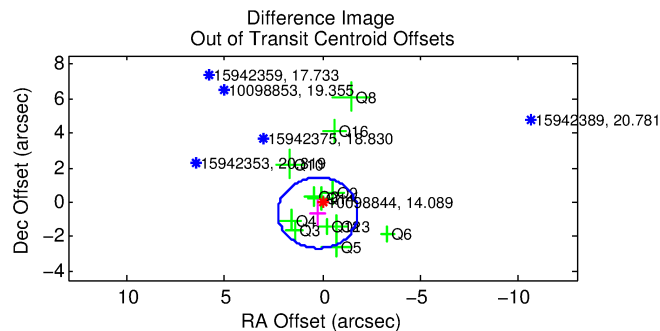
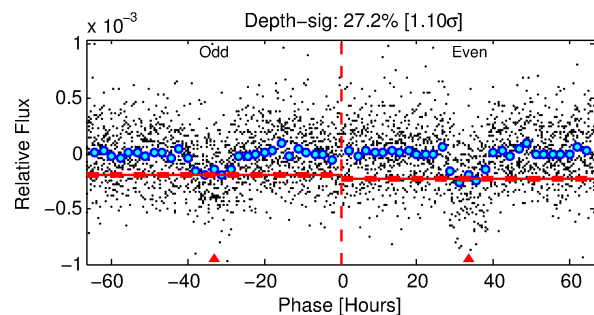
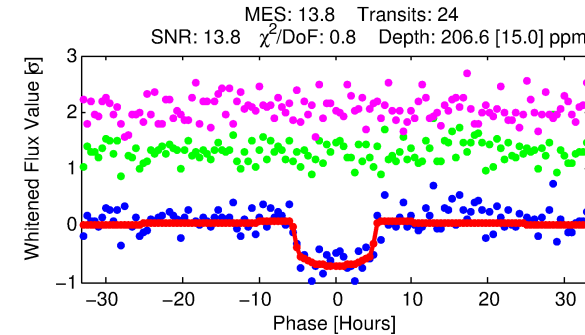
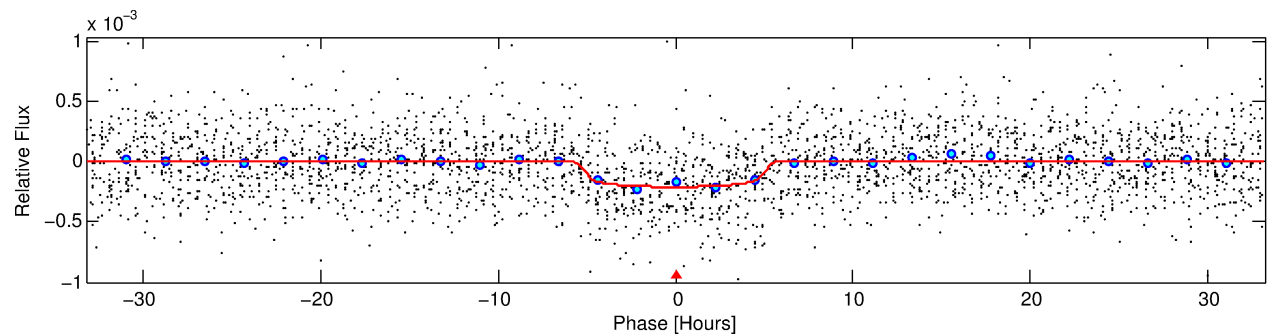
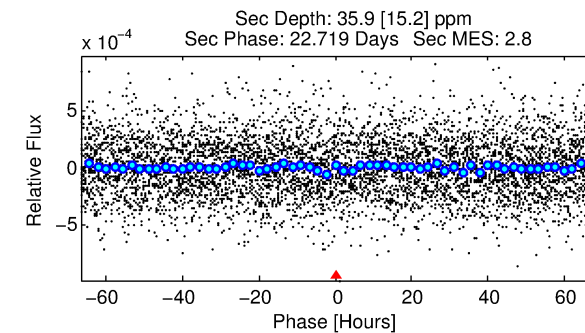
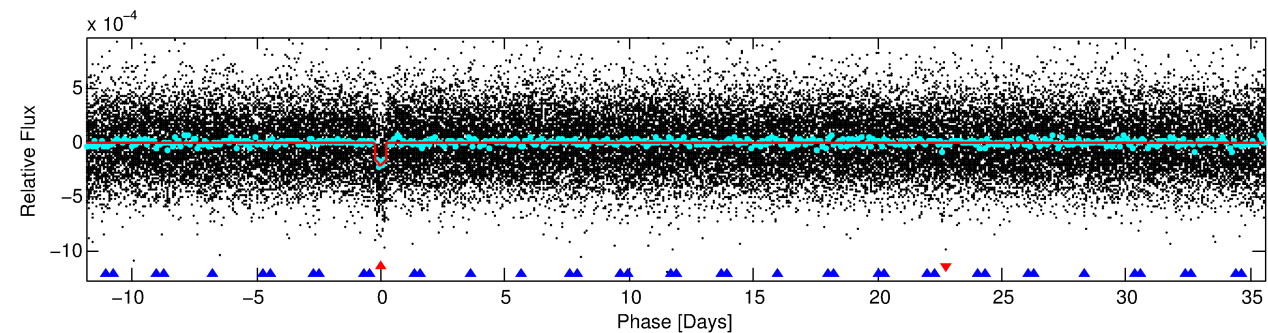
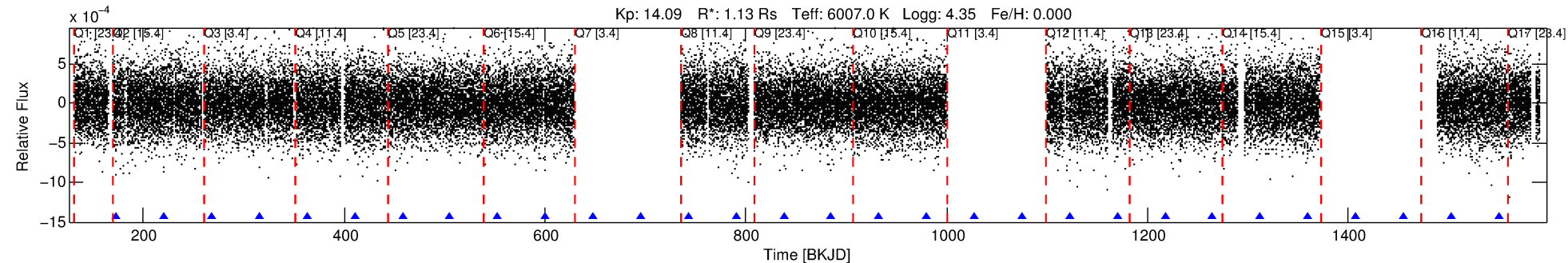
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 010098844-01

No Significant Match Found

# DV One-Page Summary

KIC: 10098844 Candidate: 1 of 2 Period: 47.450 d  
KOI: K02964.01 Corr: 0.986



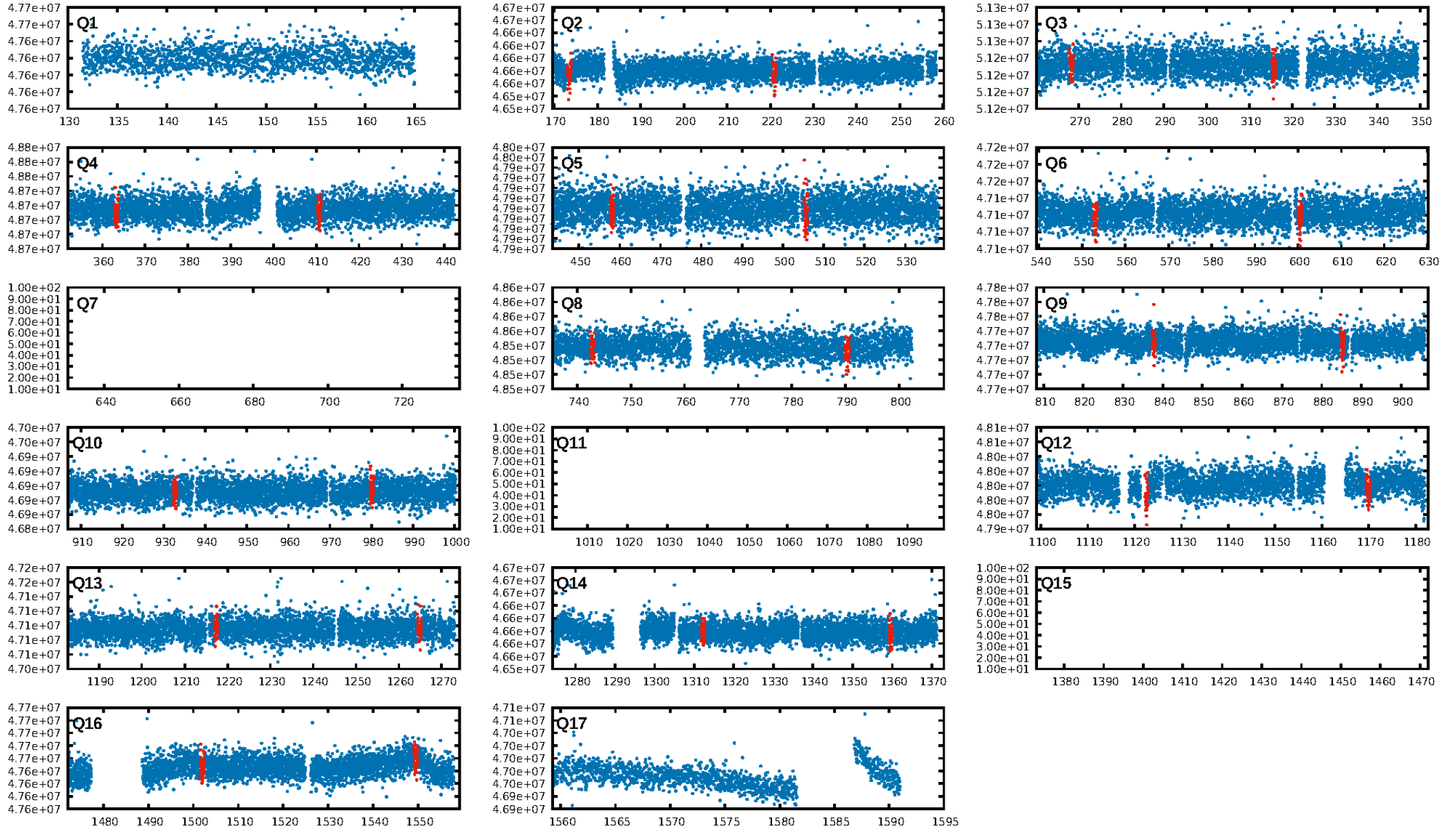
## DV Fit Results:

Period = 47.44956 [0.00078] d  
Epoch = 173.4602 [0.0121] BKJD  
Rp/R\* = 0.0156 [0.0016]  
a/R\* = 15.29 [7.30]  
b = 0.90 [0.10]  
Seff = 21.86 [5.28]  
Teff = 551 [33] K  
Rp = 1.92 [0.38] Re  
a = 0.2601 [0.0389] AU  
Ag = 364.54 [189.58] [1.92σ]  
Teffp = 3725 [444] K [7.12σ]

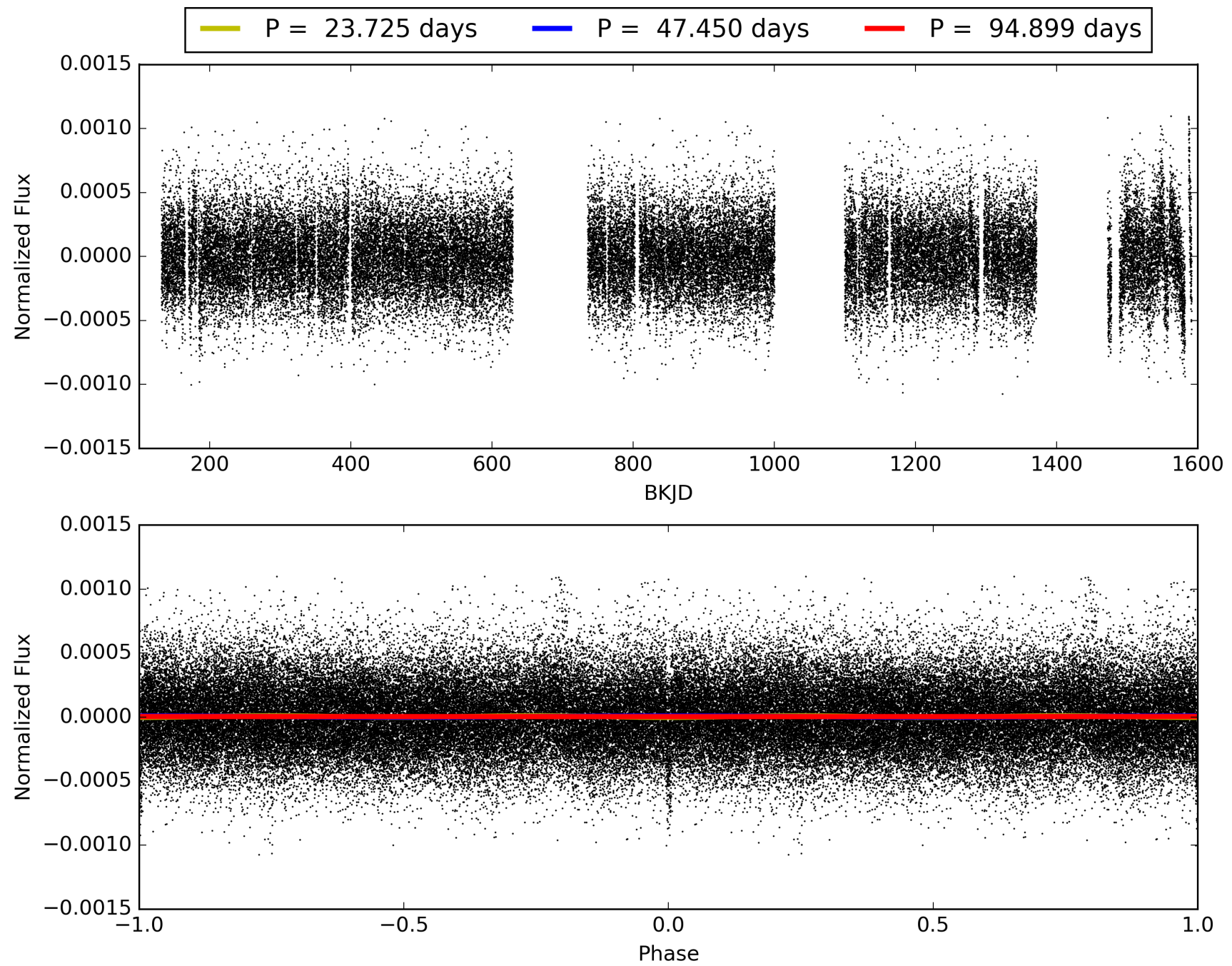
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [16.92σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 4.6%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 5.43e-40  
RollingBand-fgt: 1.00 [24/24]  
GhostDiagnostic-chr: 1.868  
Centroid-sig: 30.1%  
Centroid-so: 0.445 arcsec [0.45σ]  
OotOffset-rm: 0.665 arcsec [0.98σ]  
KicOffset-rm: 0.572 arcsec [0.90σ]  
OotOffset-st: 4/1/4/3 [12]  
KicOffset-st: 4/1/4/3 [12]  
DiffImageQuality-fgm: 0.75 [9/12]  
DiffImageOverlap-fno: 1.00 [12/12]

# TCE 010098844-01, PDC Light Curves

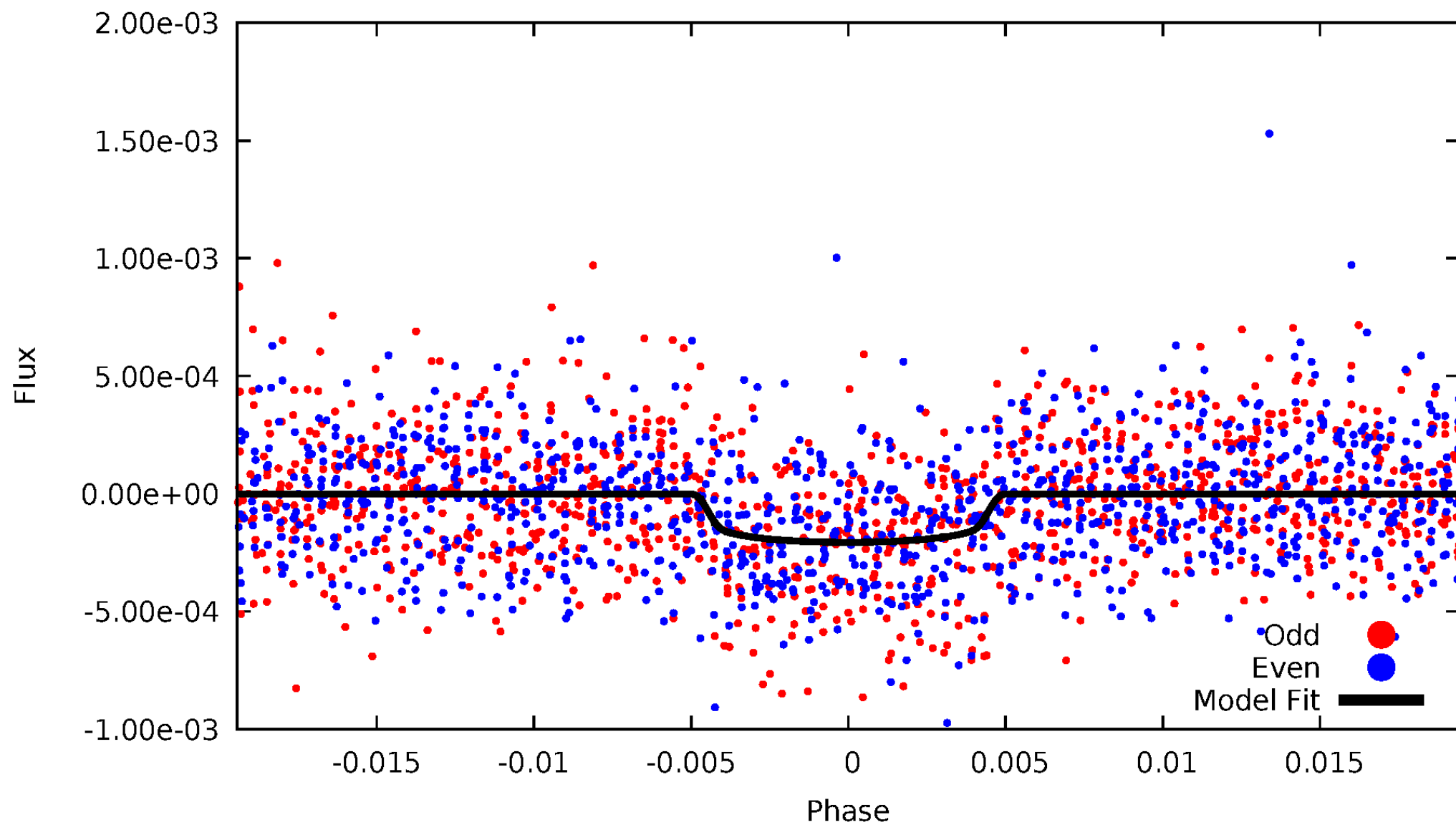


TCE 010098844-01



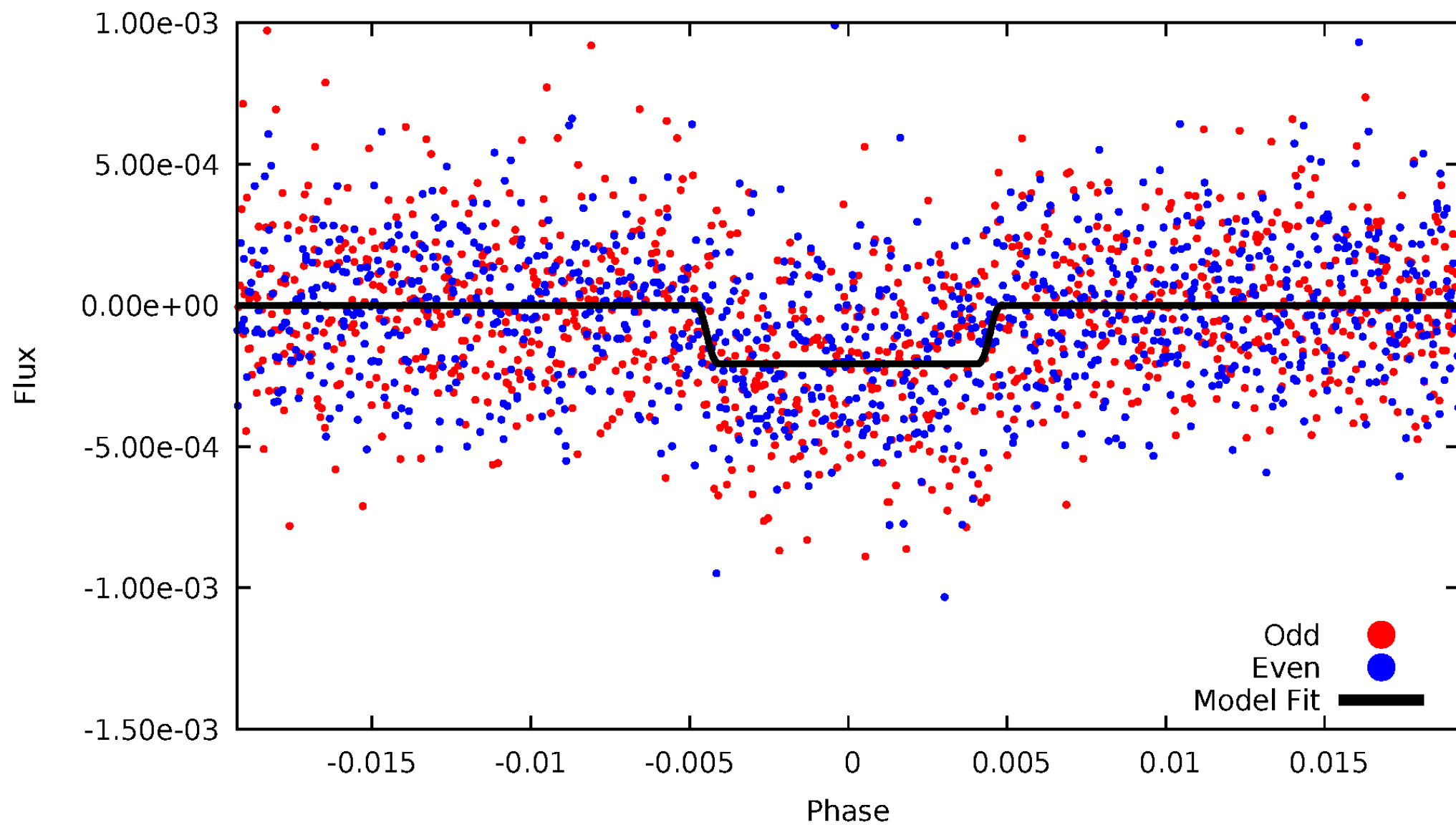
# DV Odd/Even

TCE 010098844-01



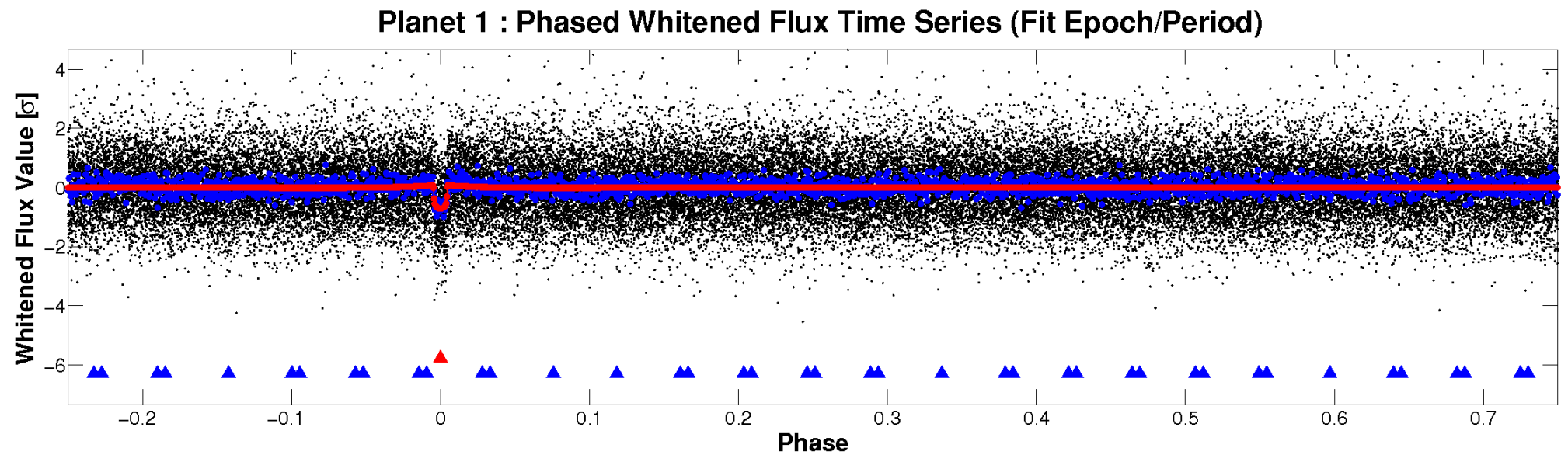
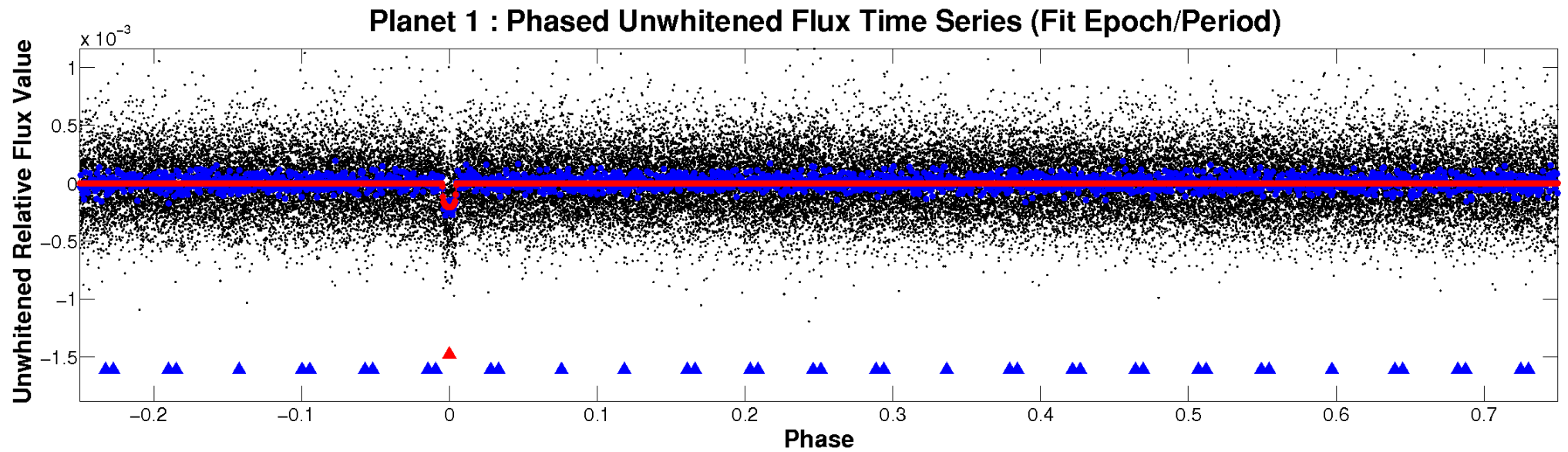
# ALT Odd/Even

TCE 010098844-01



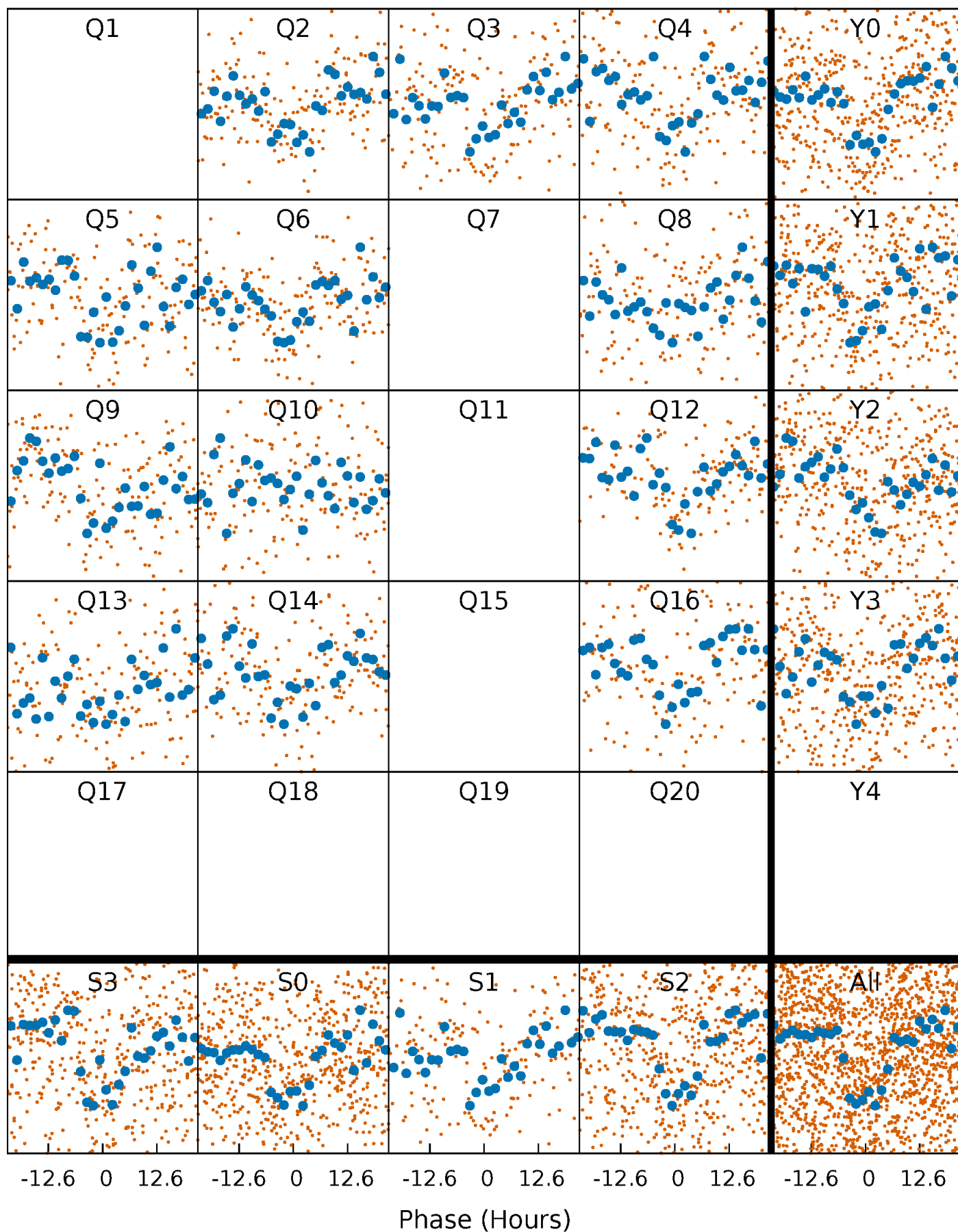


# Non-Whitened Vs. Whitened Light Curve



# PDC Quarter-Phased Transit Curves

TCE 010098844-01 P= 47.449561 Days  $T_0=173.460187$  (BKJD)





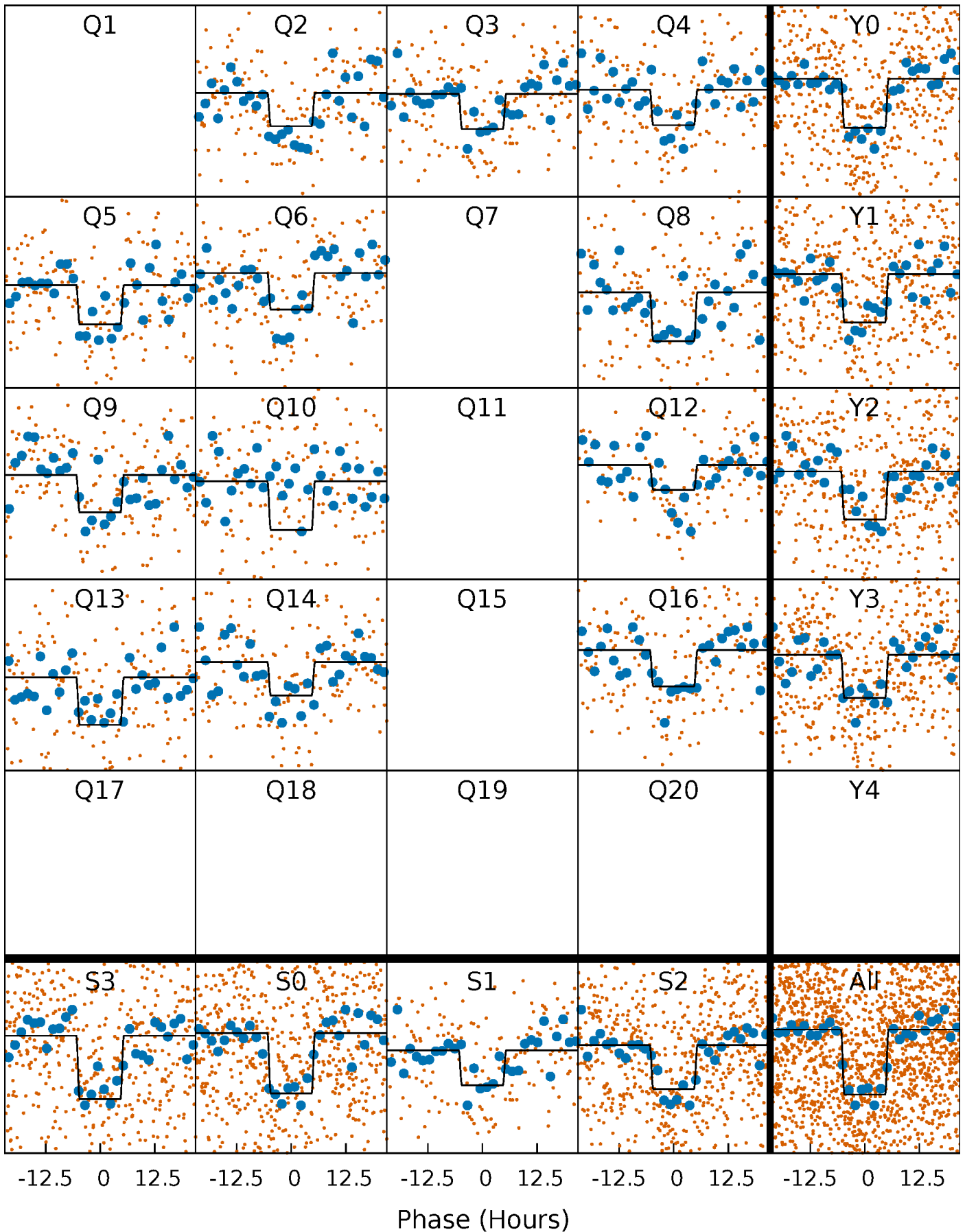
# DV Quarter-Phased Transit Curves

TCE 010098844-01 P= 47.449561 Days  $T_0=173.460187$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

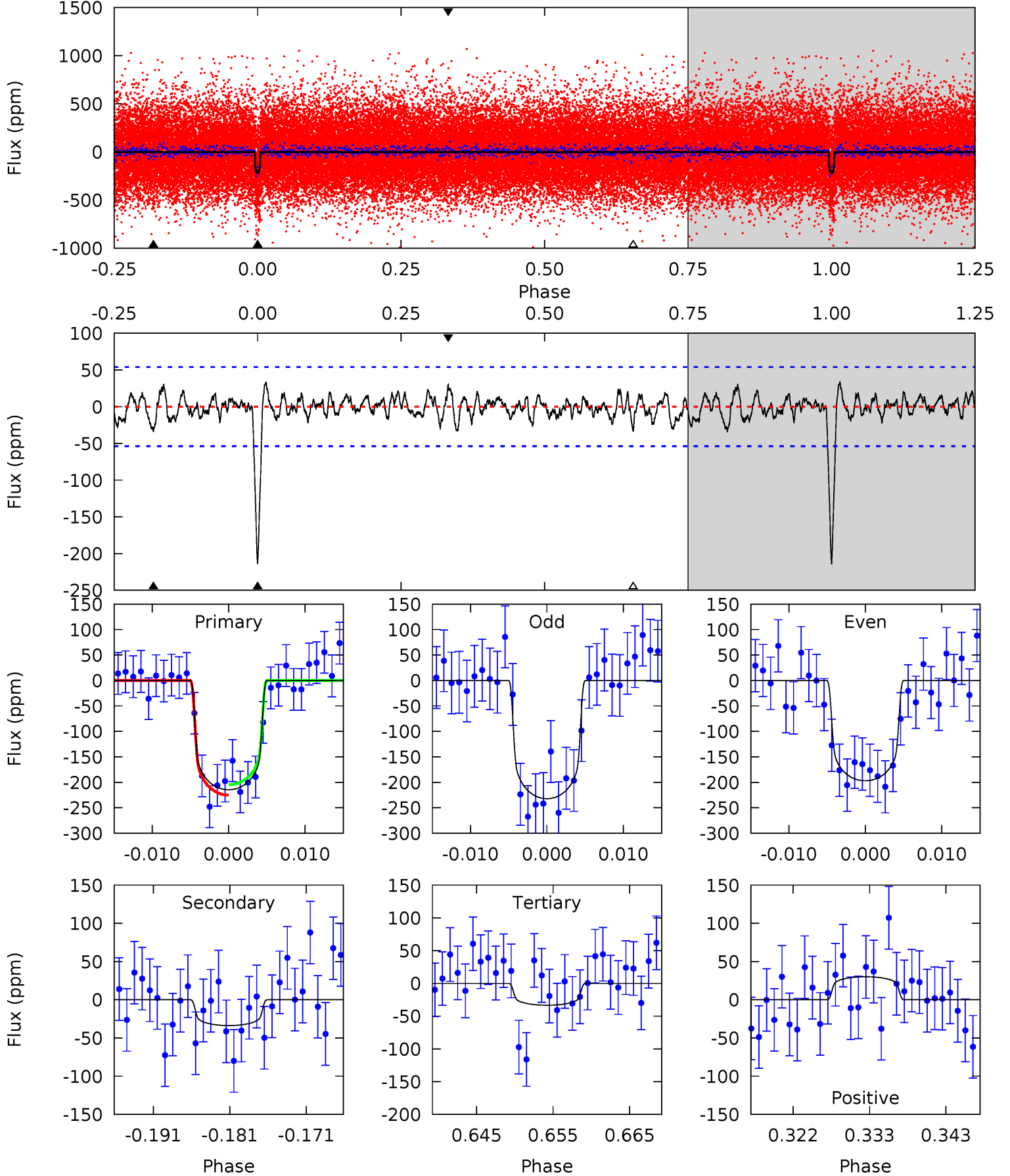
TCE 010098844-01 P= 47.450015 Days  $T_0=173.456202$  (BKJD)



# DV Model-Shift Uniqueness Test

010098844-01, P = 47.449561 Days, E = 126.010626 Days

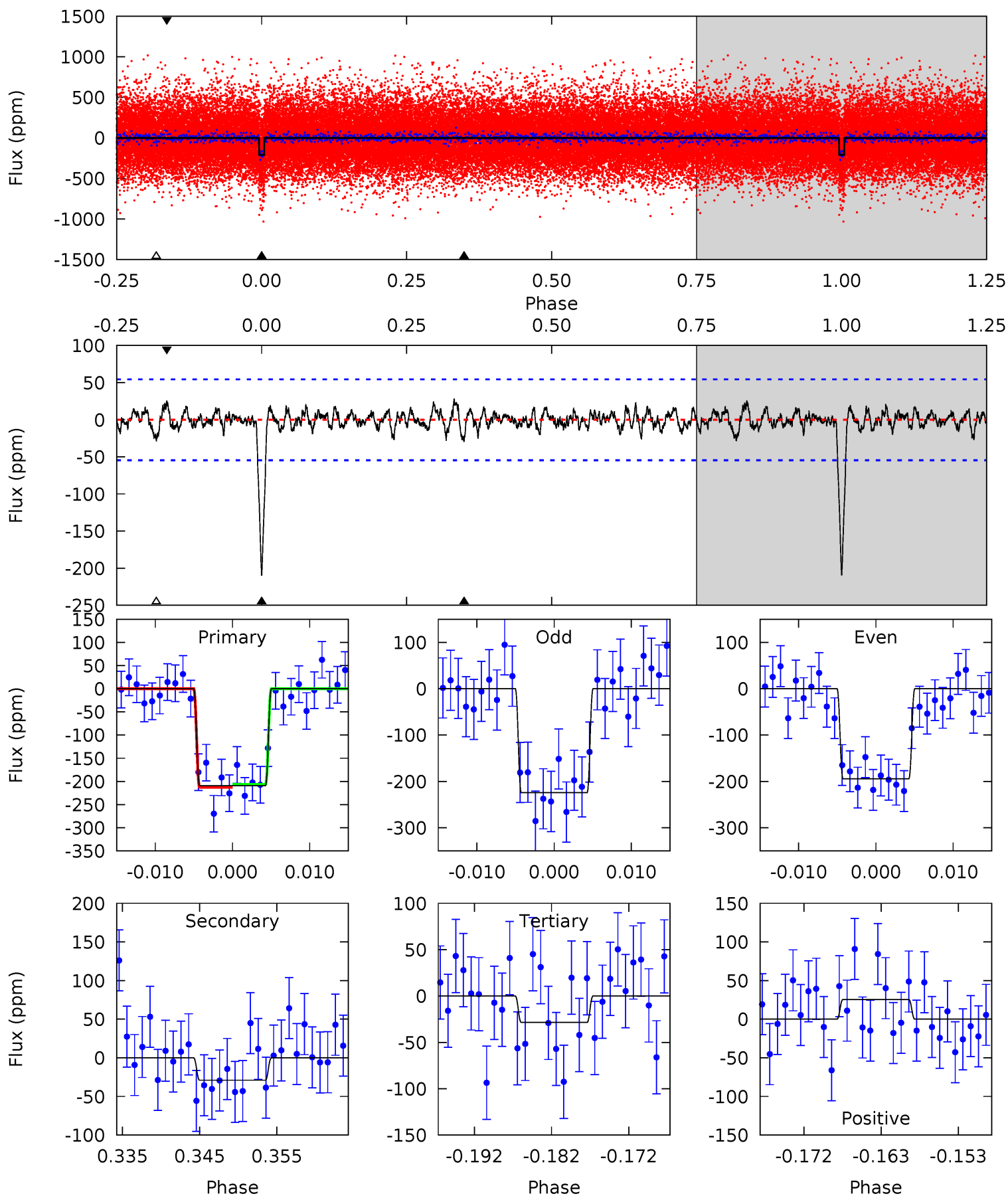
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
20.0	3.15	3.11	2.80	5.02	2.57	1.08	16.9	17.2	0.04	0.34	1.64	0.91	0.14	0.96



# Alt Model-Shift Uniqueness Test

010098844-01,  $P = 47.450015$  Days,  $E = 126.006187$  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
19.3	2.67	2.63	2.35	5.03	2.59	0.84	16.7	17.0	0.04	0.32	1.38	0.86	0.12	0.28



### Stellar Parameters For KIC 010098844

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6007^{+108}_{-133}$	$4.353^{+0.084}_{-0.126}$	$0.000^{+0.150}_{-0.150}$	$1.126^{+0.193}_{-0.128}$	$1.042^{+0.086}_{-0.070}$	$1.028^{+0.368}_{-0.354}$
	+2%/-2%	+2%/-3%	+inf%/-inf%	+17%/-11%	+8%/-7%	+36%/-34%
Source	SPE57	SPE57	SPE57	DSEP		

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

### Secondary Eclipse Parameters for KIC 010098844-01 / KOI 2964.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-34 \pm 11$	$1.93^{+0.27}_{-0.24}$	$772^{+36}_{-30}$	$3982^{+270}_{-263}$	$331^{+162}_{-116}$
Alt.	$-29 \pm 11$	$1.78^{+0.25}_{-0.25}$	$772^{+35}_{-29}$	$3986^{+311}_{-319}$	$333^{+180}_{-133}$

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



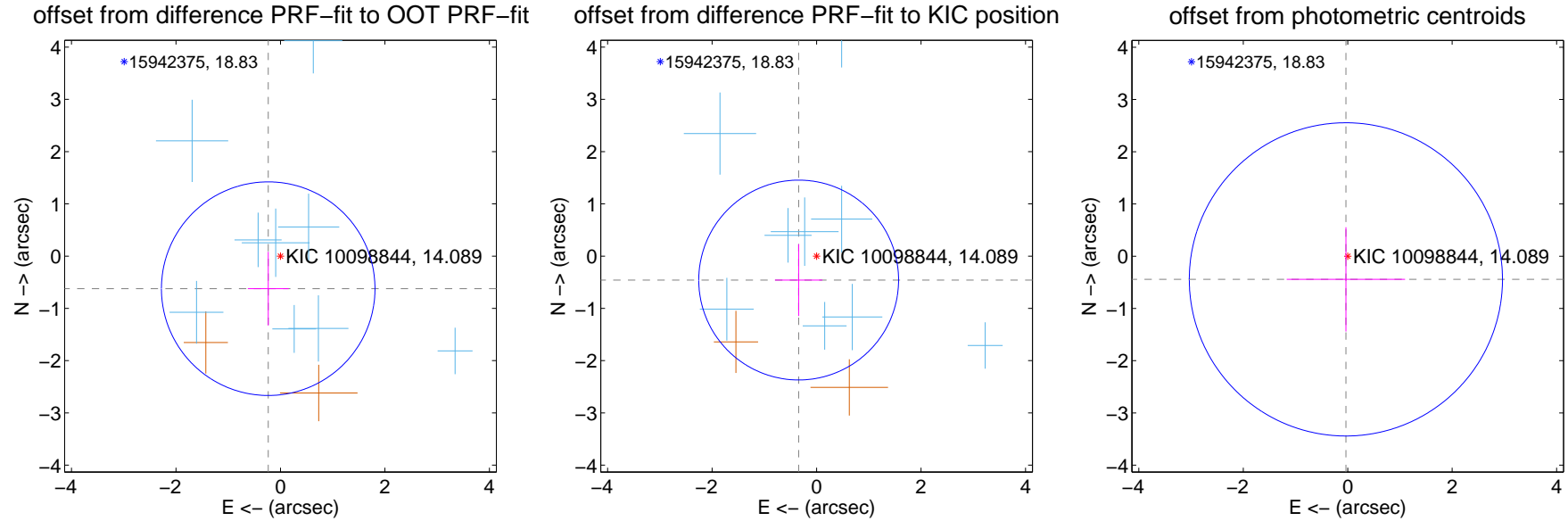
## DV Centroid Data

Supplemental centroid analysis for 010098844-01. Kepler magnitude: 14.09. Transit SNR 13.80

There are 9 quarters with good PRF difference image offsets

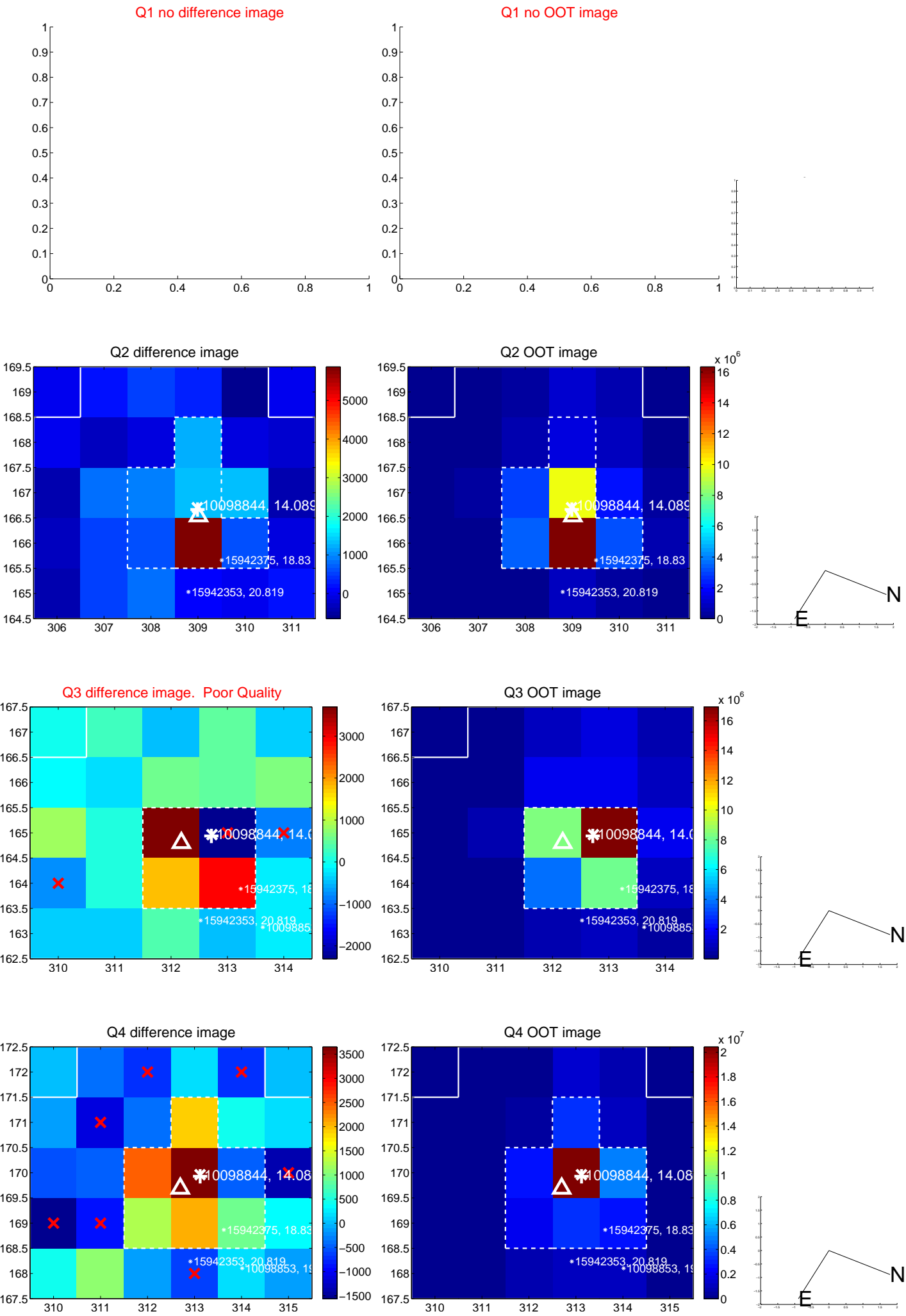
The direct PRF centroid is offset from the target star catalog position by about 0.19 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.665 \pm 0.681$	0.98	$0.234 \pm 0.391$	$-0.623 \pm 0.706$
PRF-fit source offset from KIC position	$0.572 \pm 0.637$	0.90	$0.343 \pm 0.454$	$-0.458 \pm 0.688$
photometric centroid source offset	$0.45 \pm 1.00$	0.45	$0.04 \pm 1.13$	$-0.44 \pm 1.00$

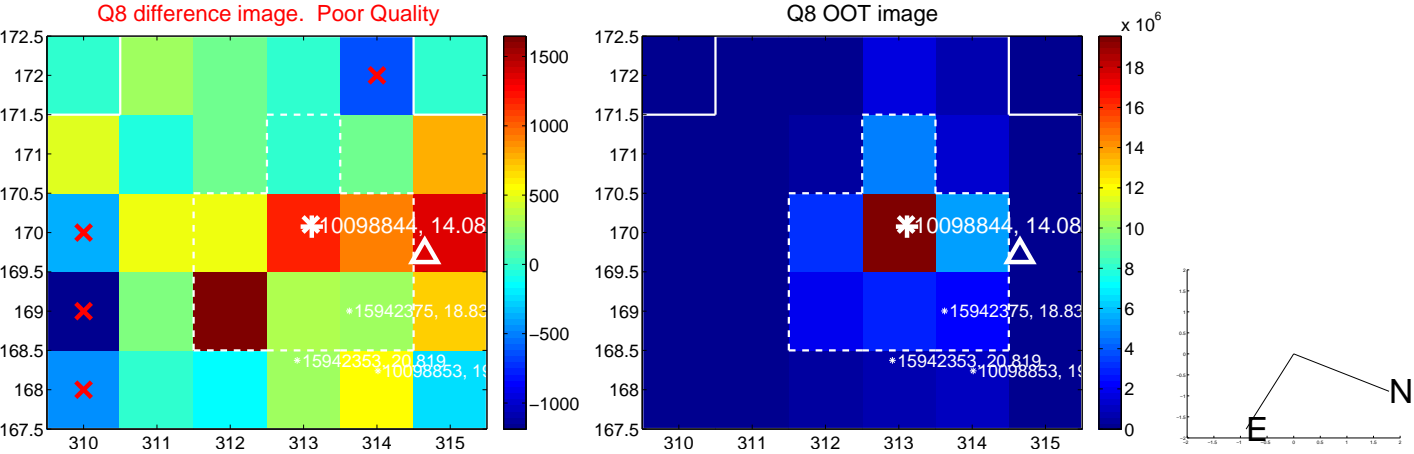
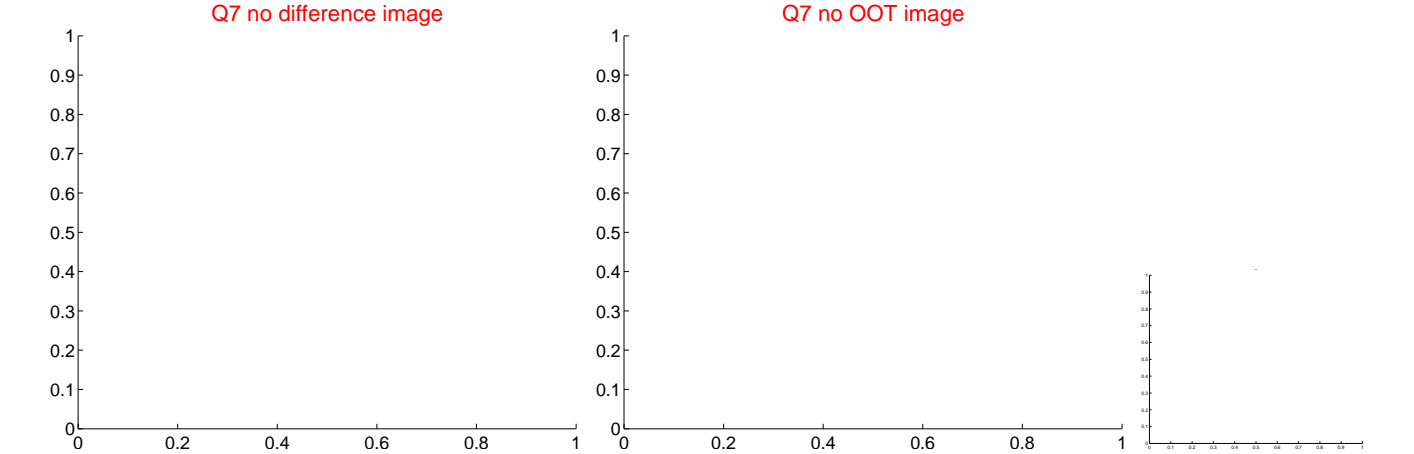
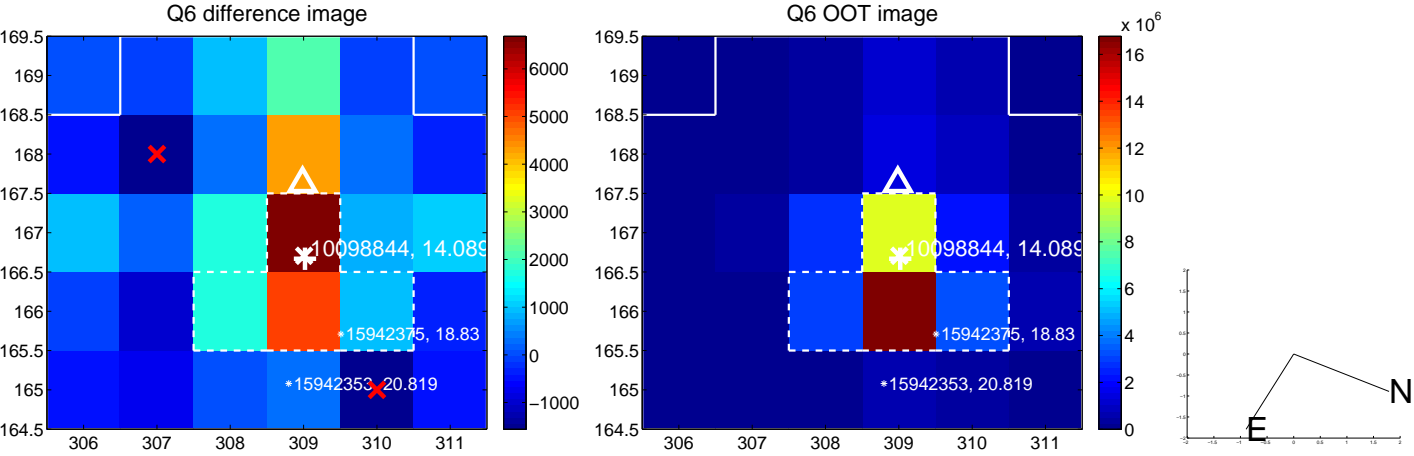
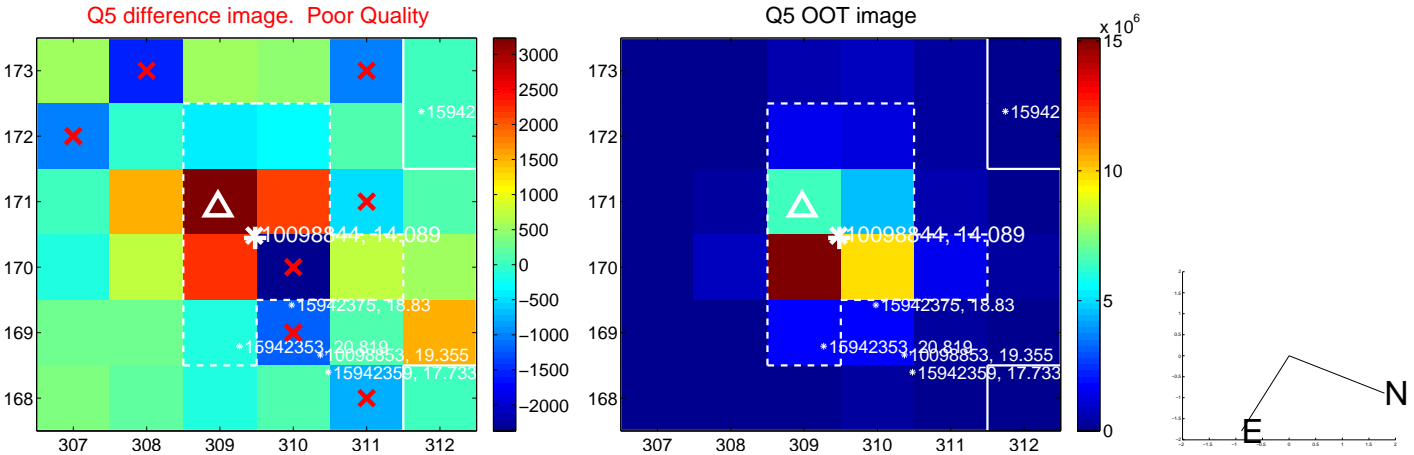


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets**; **Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

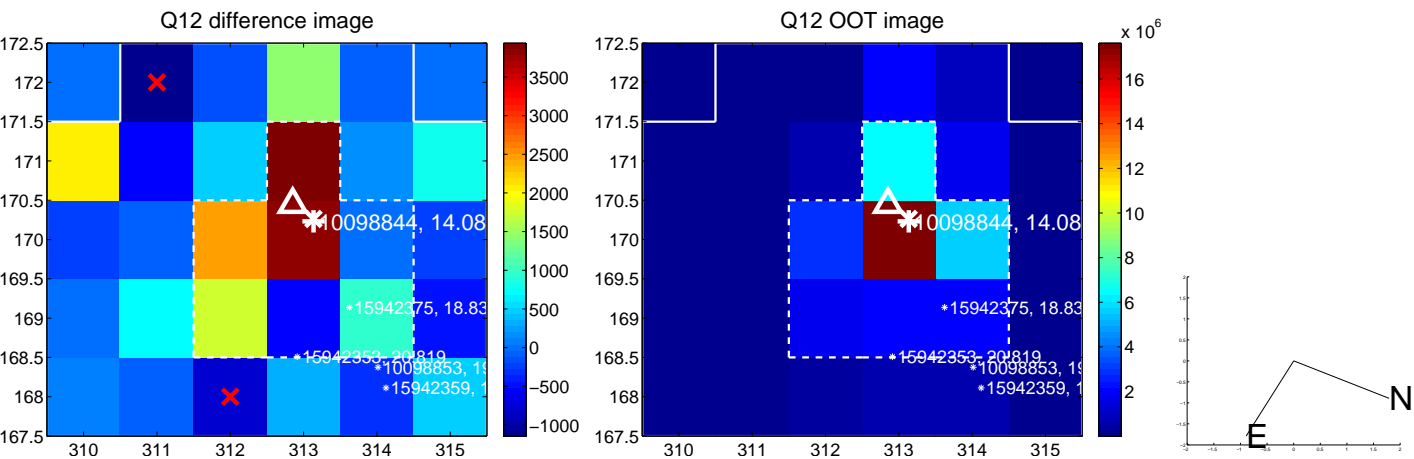
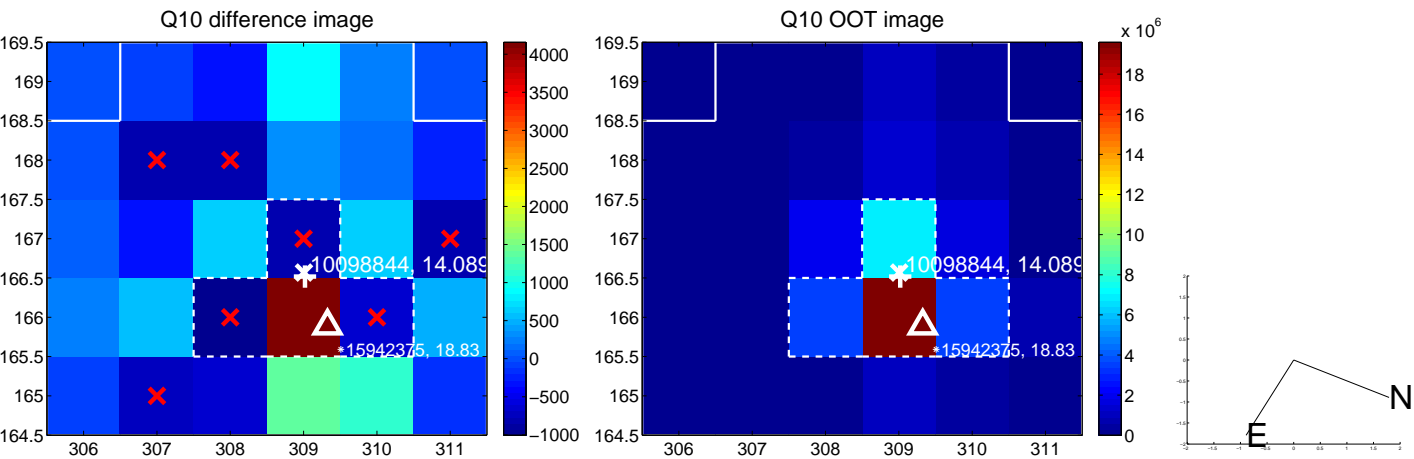
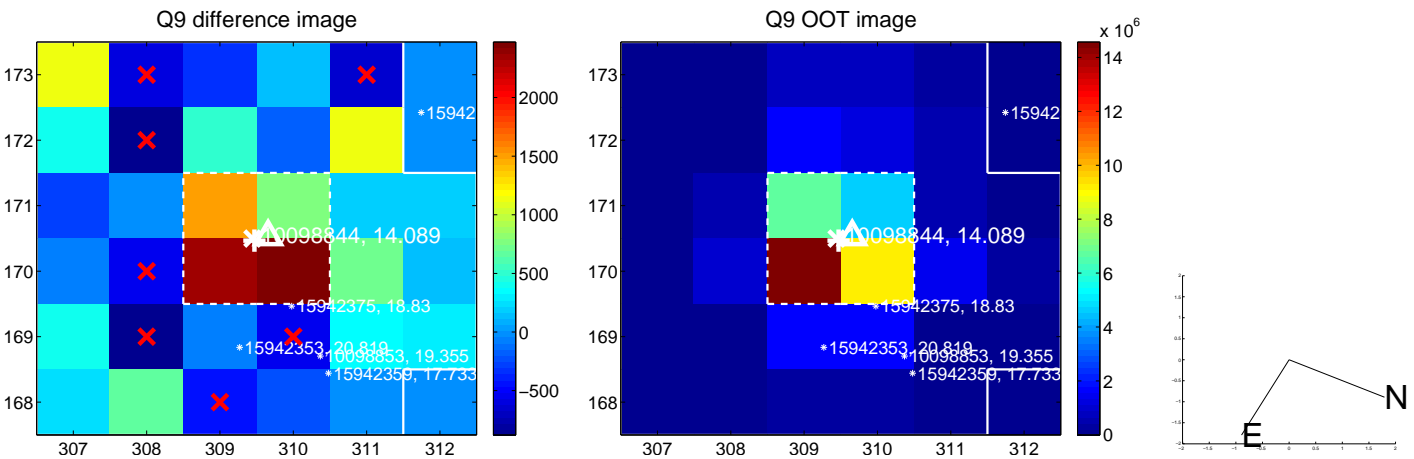
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



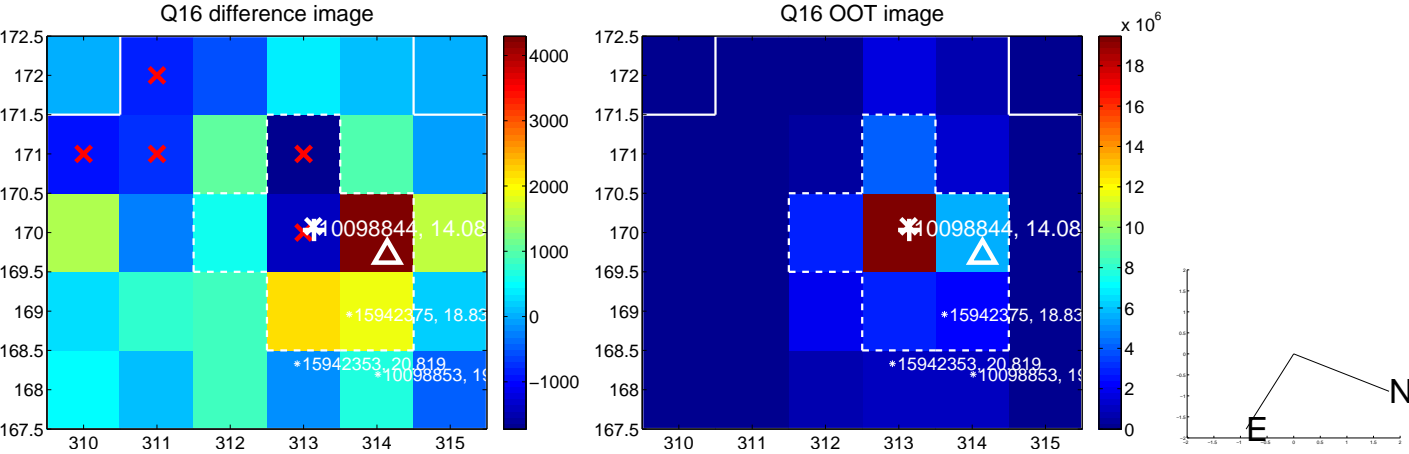
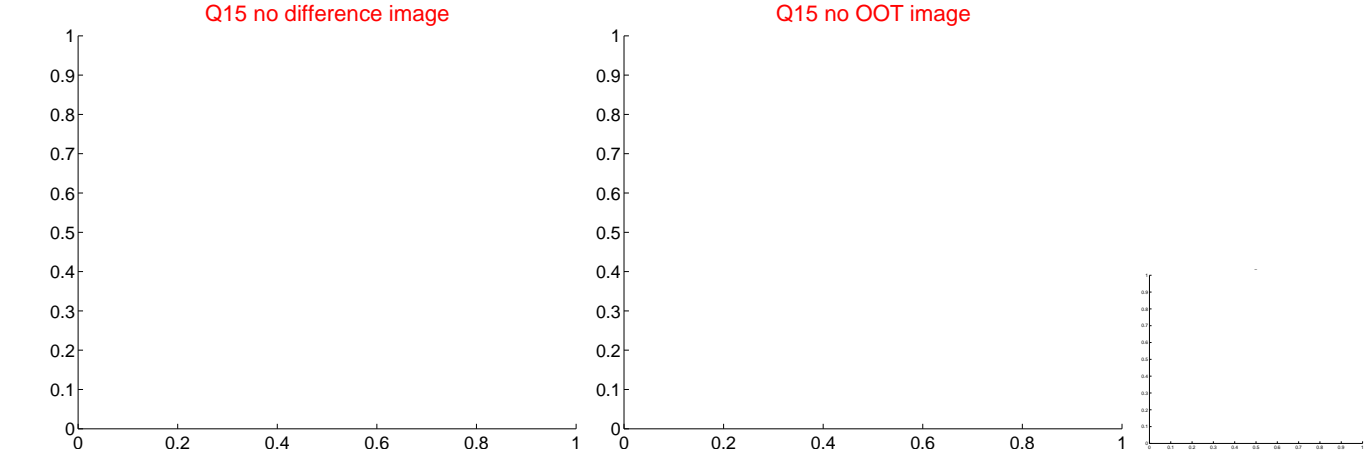
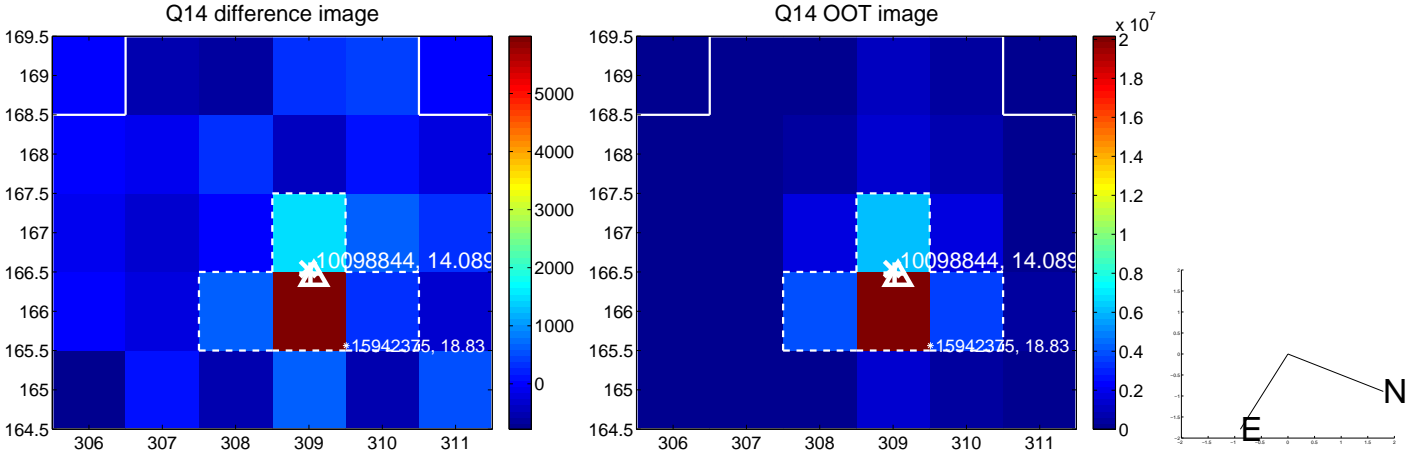
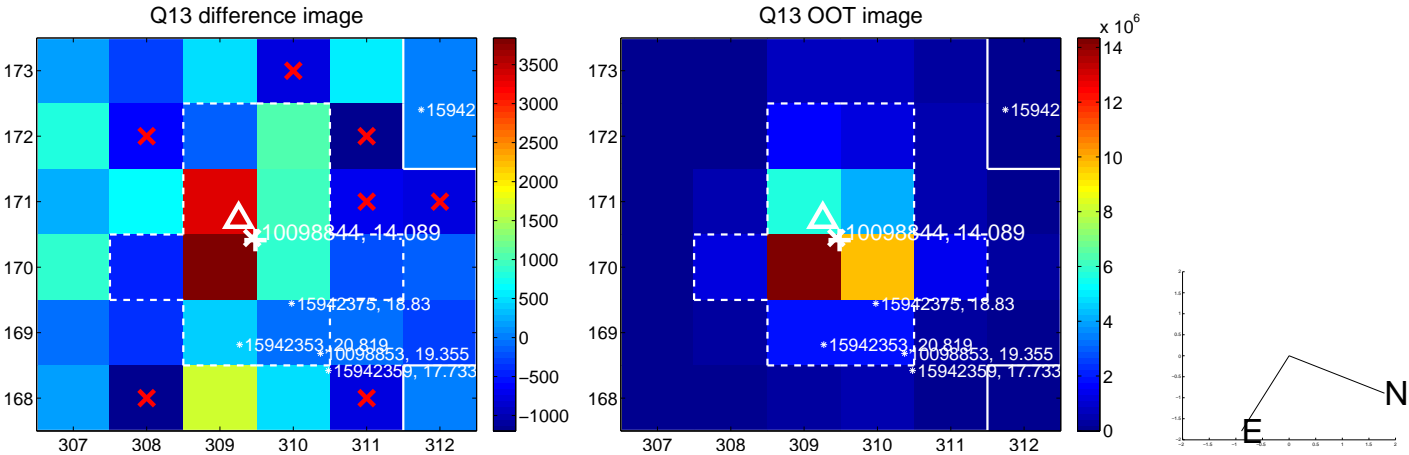
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

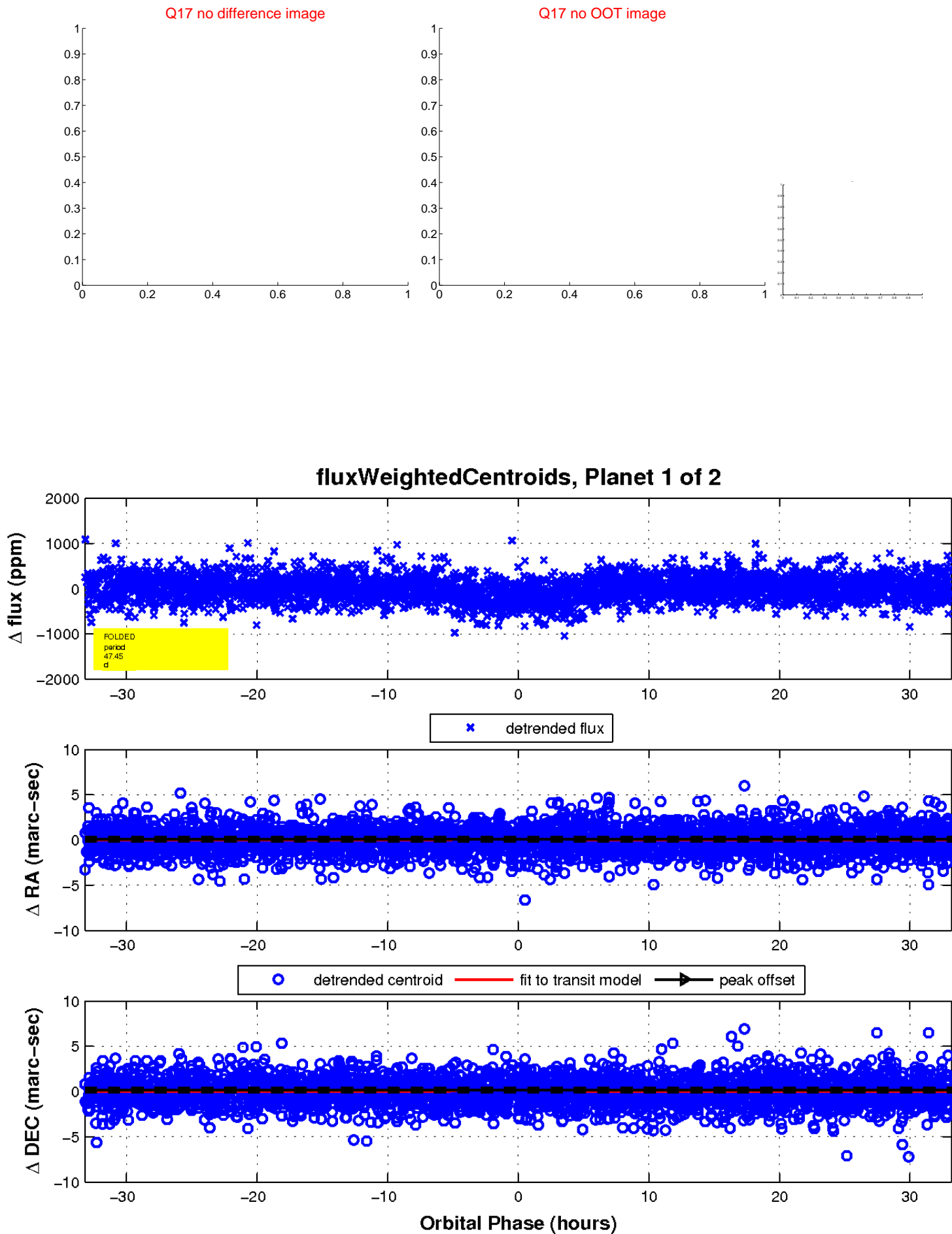


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

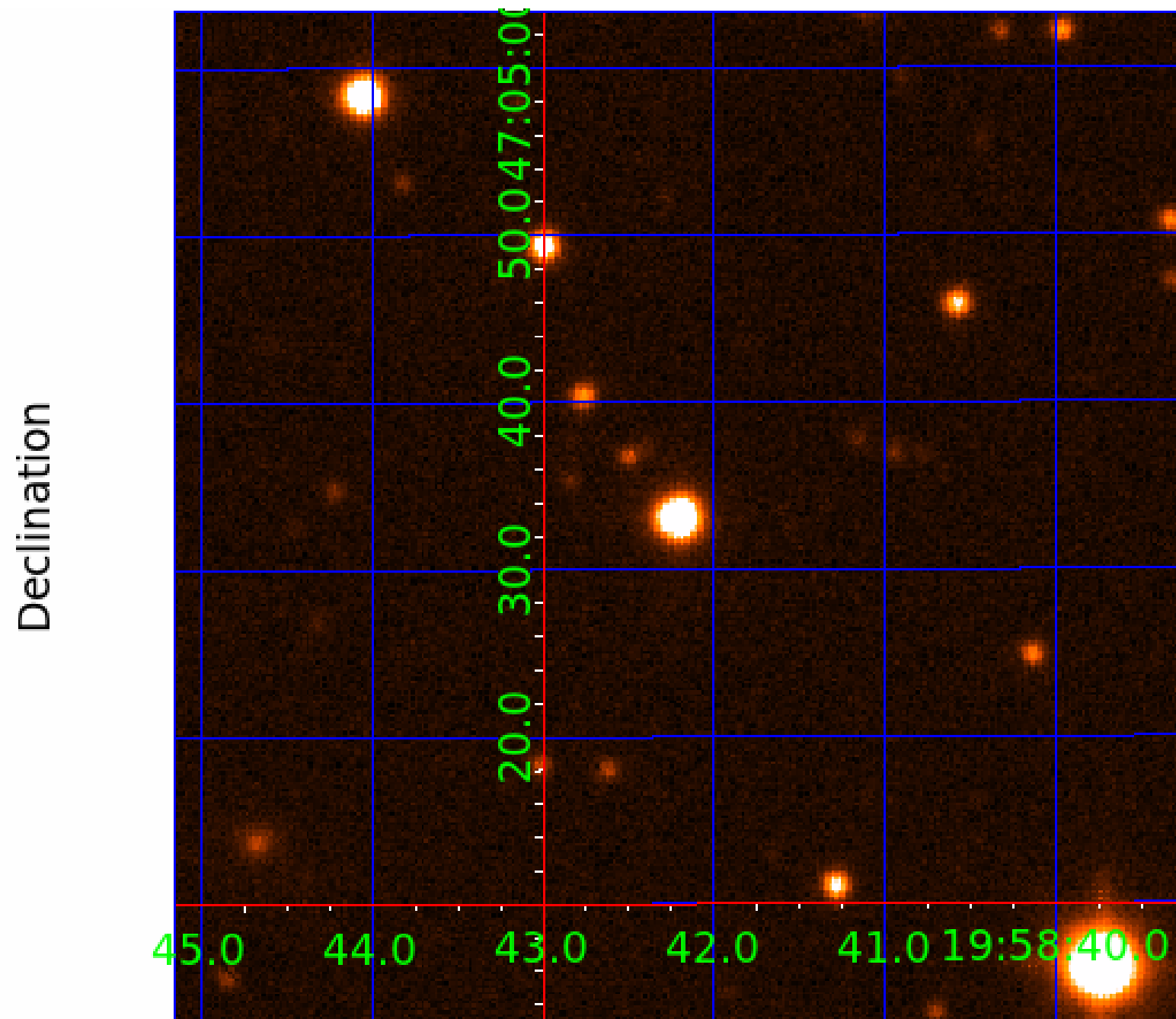




white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image



# KIC 010098844

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010098844-01	OBS	2964.01	47.449561	173.460187	206.6	11.066	13.8	13.8	1.13	6007	1.92	21.86
010098844-02	OBS	2964.02	35.082183	164.445050	84.9	13.614	7.5	7.3	1.13	6007	1.14	32.69

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010098844-01	OBS	PC	0.98	0	0	0	0	NO_COMMENT
010098844-02	OBS	FP	0.19	1	0	0	0	LPP_DV—CENT_FEW_DIFFS

**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.

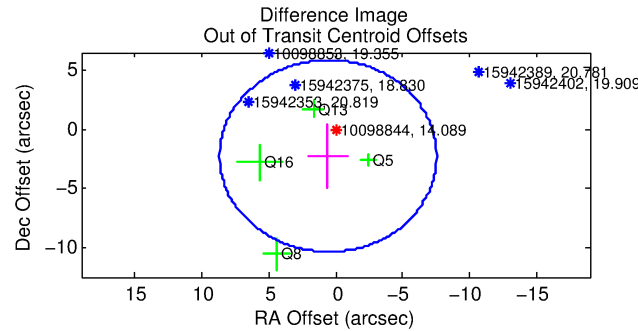
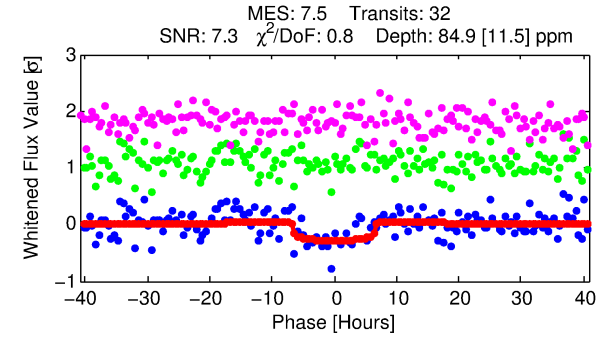
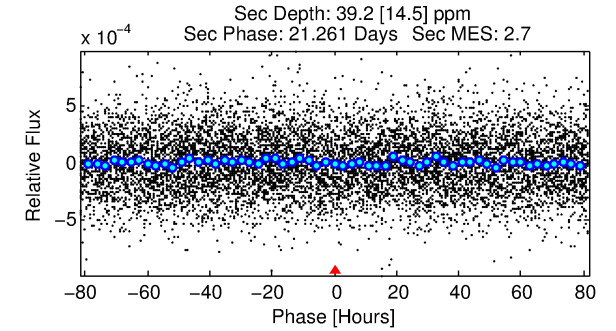
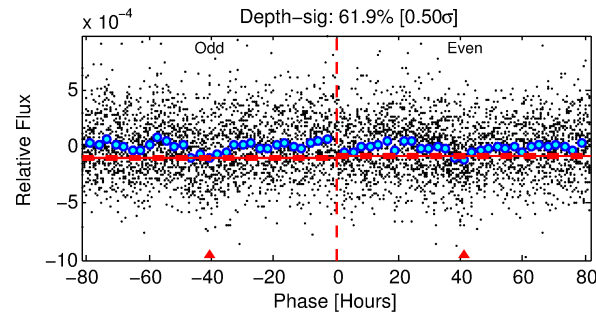
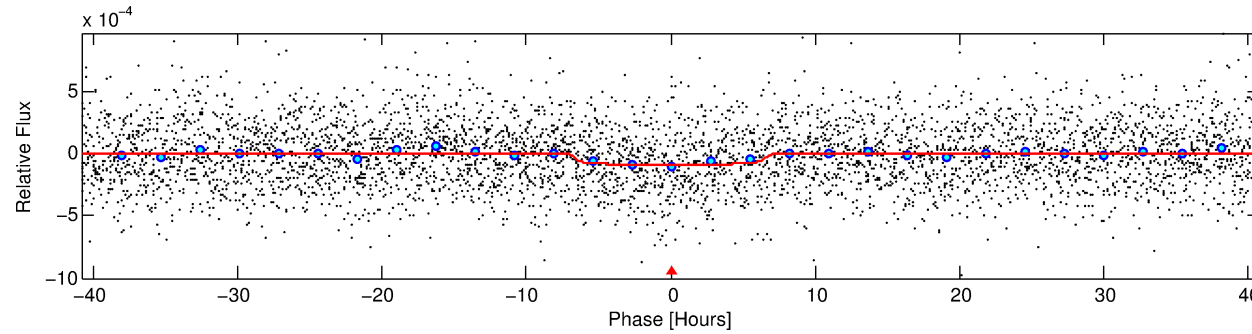
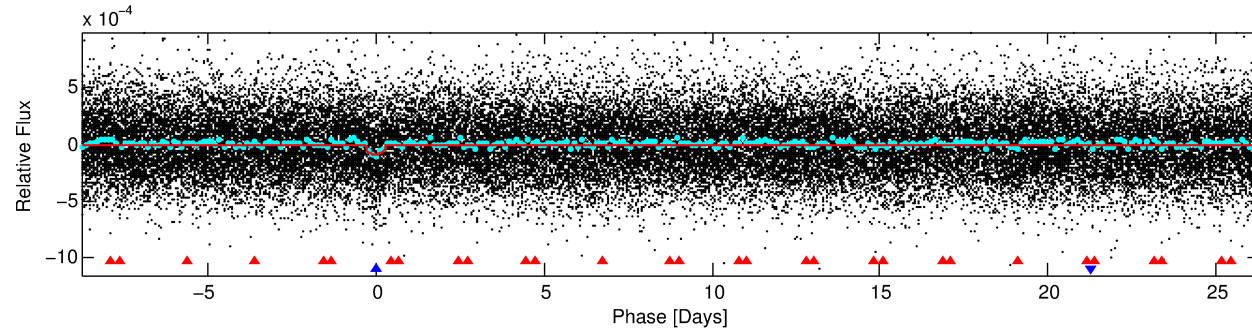
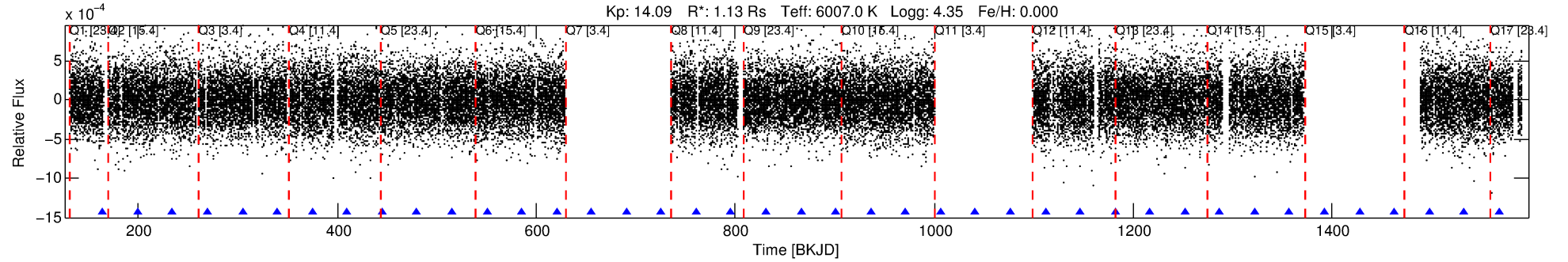
## Ephemeris Match Information For 010098844-02

No Significant Match Found

# DV One-Page Summary

KIC: 10098844 Candidate: 2 of 2 Period: 35.082 d

KOI: K02964 Corr: No Ephemeris Match



## DV Fit Results:

Period = 35.08218 [0.00103] d  
Epoch = 164.4450 [0.0229] BKJD  
Rp/R\* = 0.0092 [0.0049]  
a/R\* = 12.80 [32.71]  
b = 0.77 [1.35]  
Seff = 32.69 [7.89]  
Teq = 610 [37] K  
Rp = 1.14 [0.64] Re  
a = 0.2127 [0.0318] AU  
Ag = 756.36 [873.63] [0.86 $\sigma$ ]  
Teff = 4944 [1405] K [3.08 $\sigma$ ]

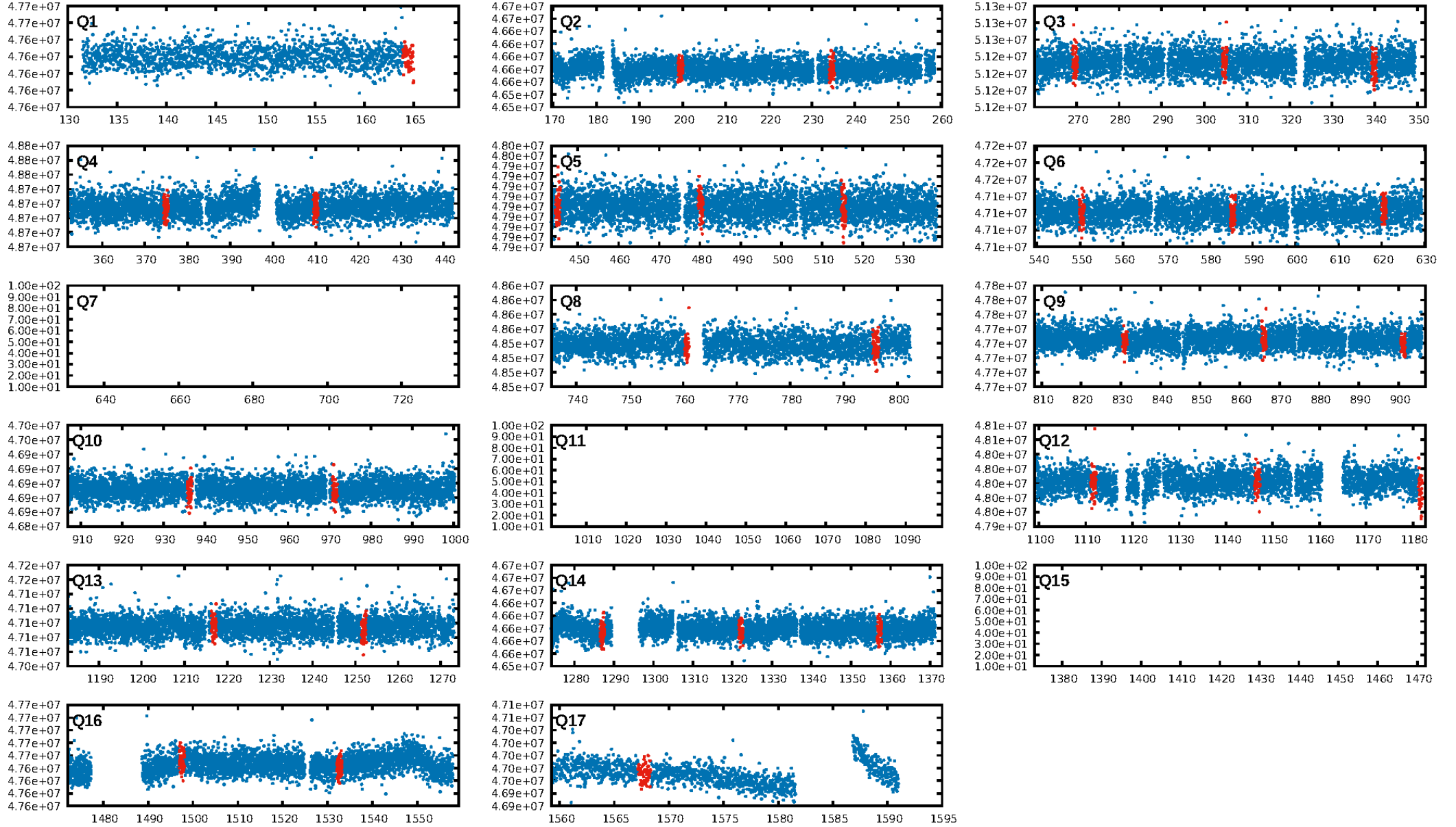
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [16.92 $\sigma$ ]  
ModelChiSquare2-sig: 92.2%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 3.01e-13  
RollingBand-fgt: 1.00 [30/30]  
GhostDiagnostic-chr: -70.22  
Centroid-sig: 44.2%  
Centroid-so: 2.388 arcsec [1.15 $\sigma$ ]  
OotOffset-rm: 2.329 arcsec [0.86 $\sigma$ ]  
KicOffset-rm: 2.194 arcsec [1.01 $\sigma$ ]  
OotOffset-st: 0/0/2/2 [4]  
KicOffset-st: 0/0/2/2 [4]  
DiffImageQuality-fgm: 0.00 [0/4]  
DiffImageOverlap-fno: 1.00 [12/12]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 10:08:06 Z

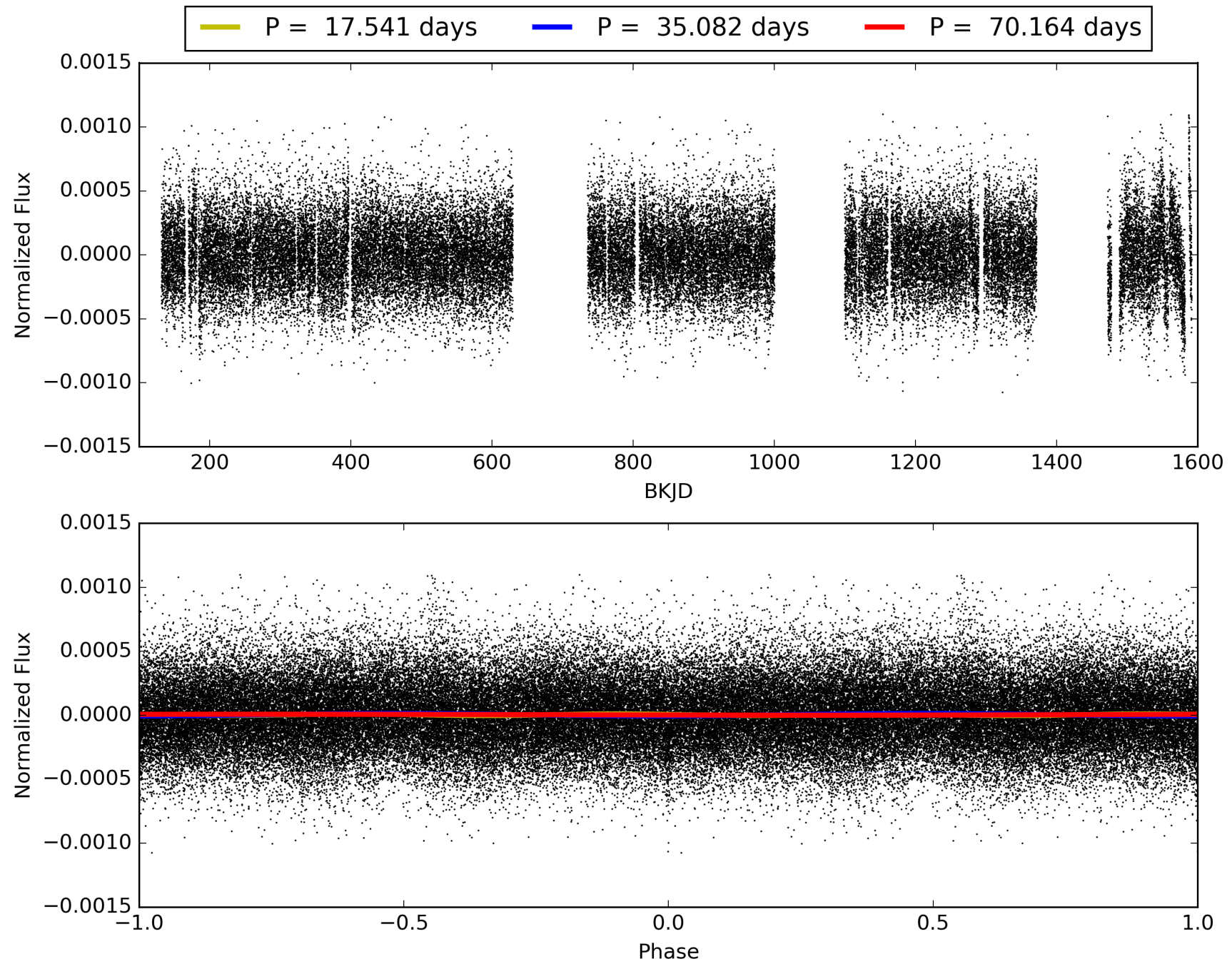
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 010098844-02, PDC Light Curves



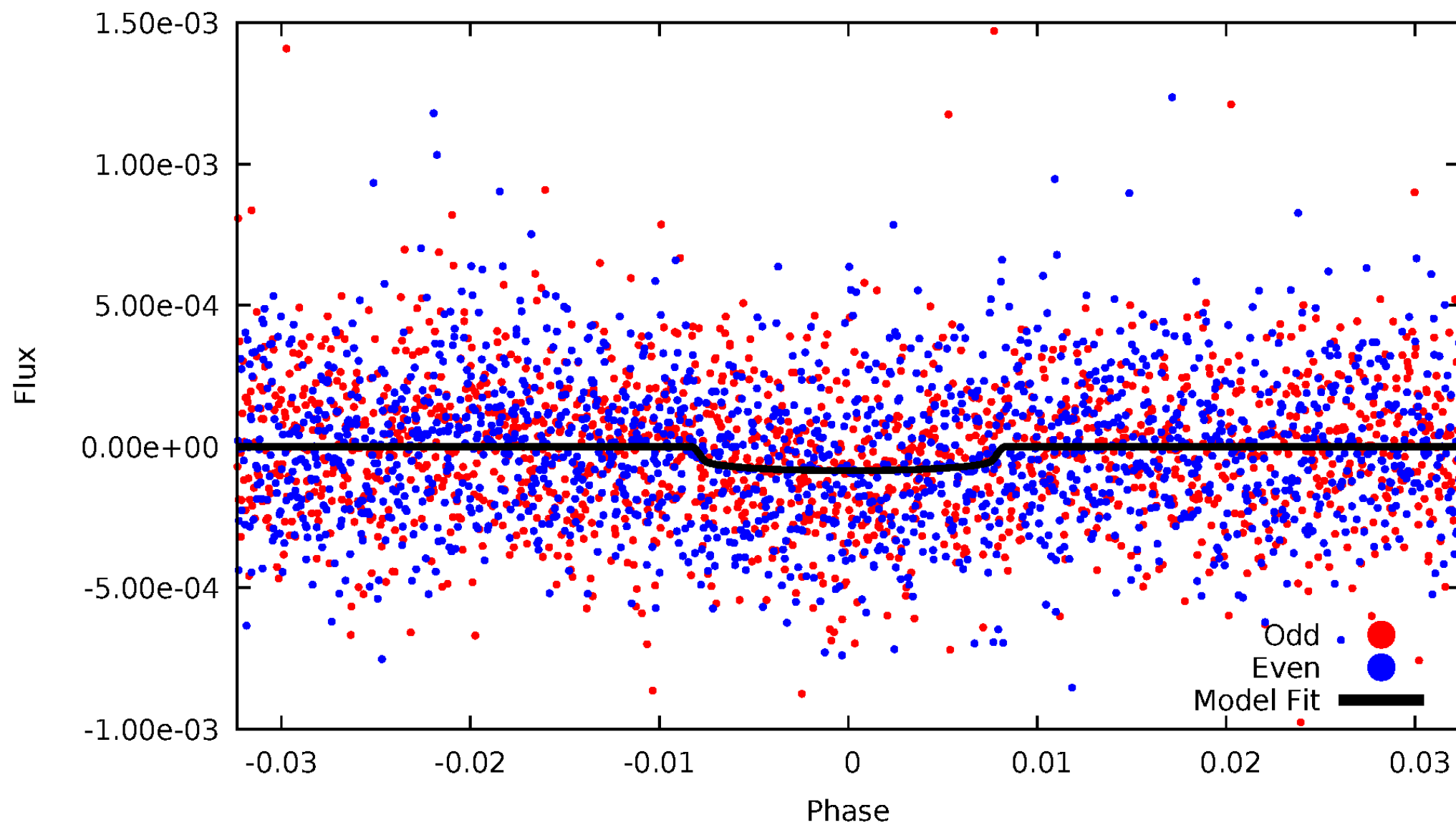


TCE 010098844-02



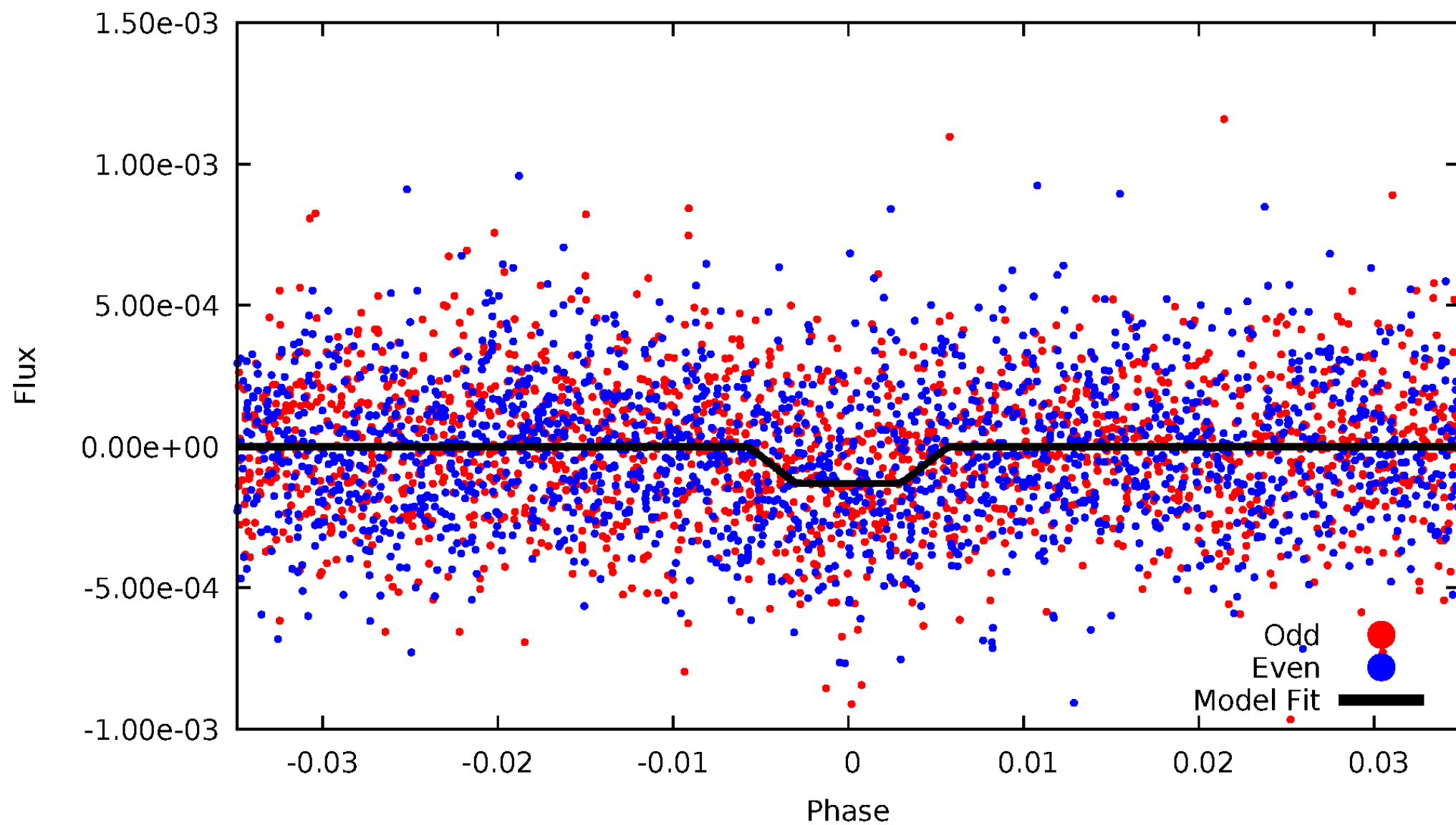
# DV Odd/Even

TCE 010098844-02



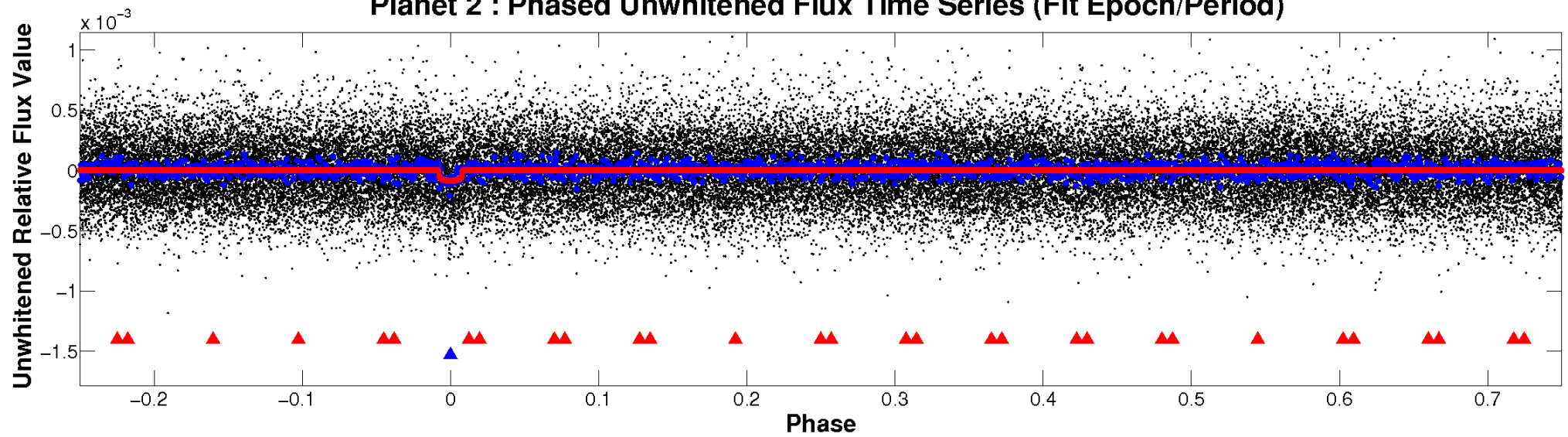
# ALT Odd/Even

TCE 010098844-02

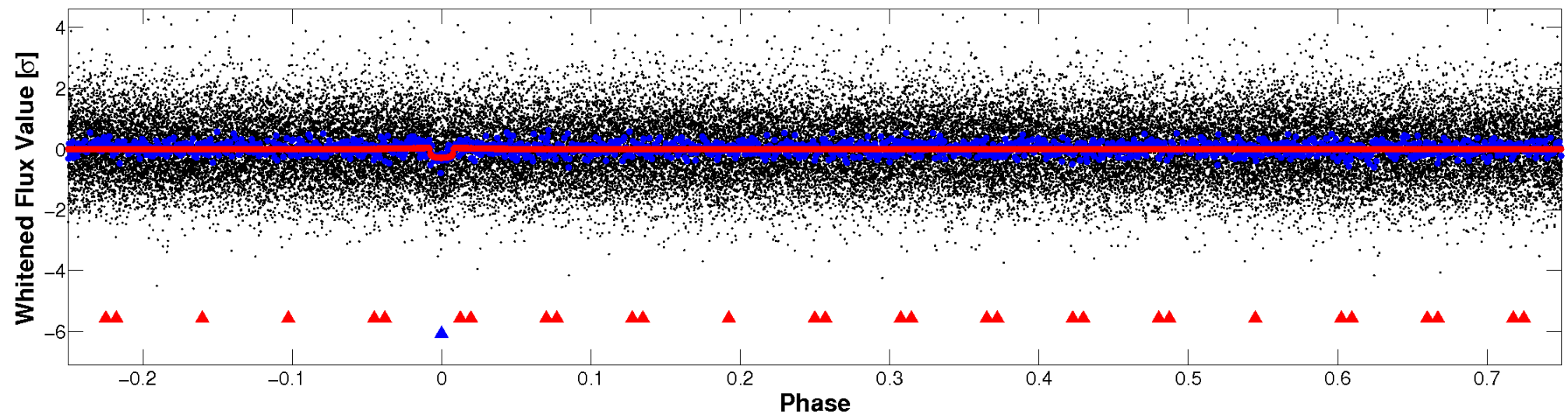


# Non-Whitened Vs. Whitened Light Curve

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

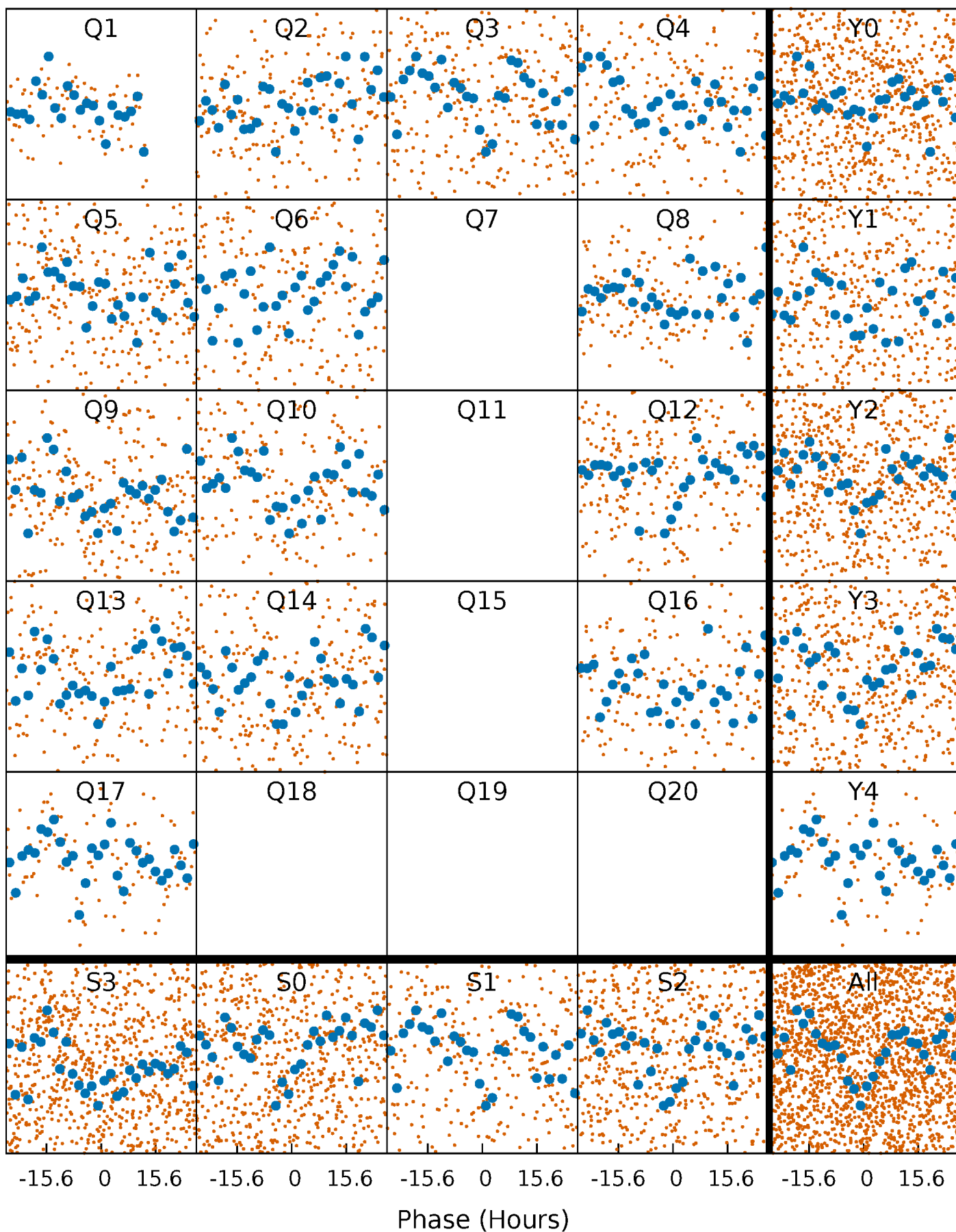


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

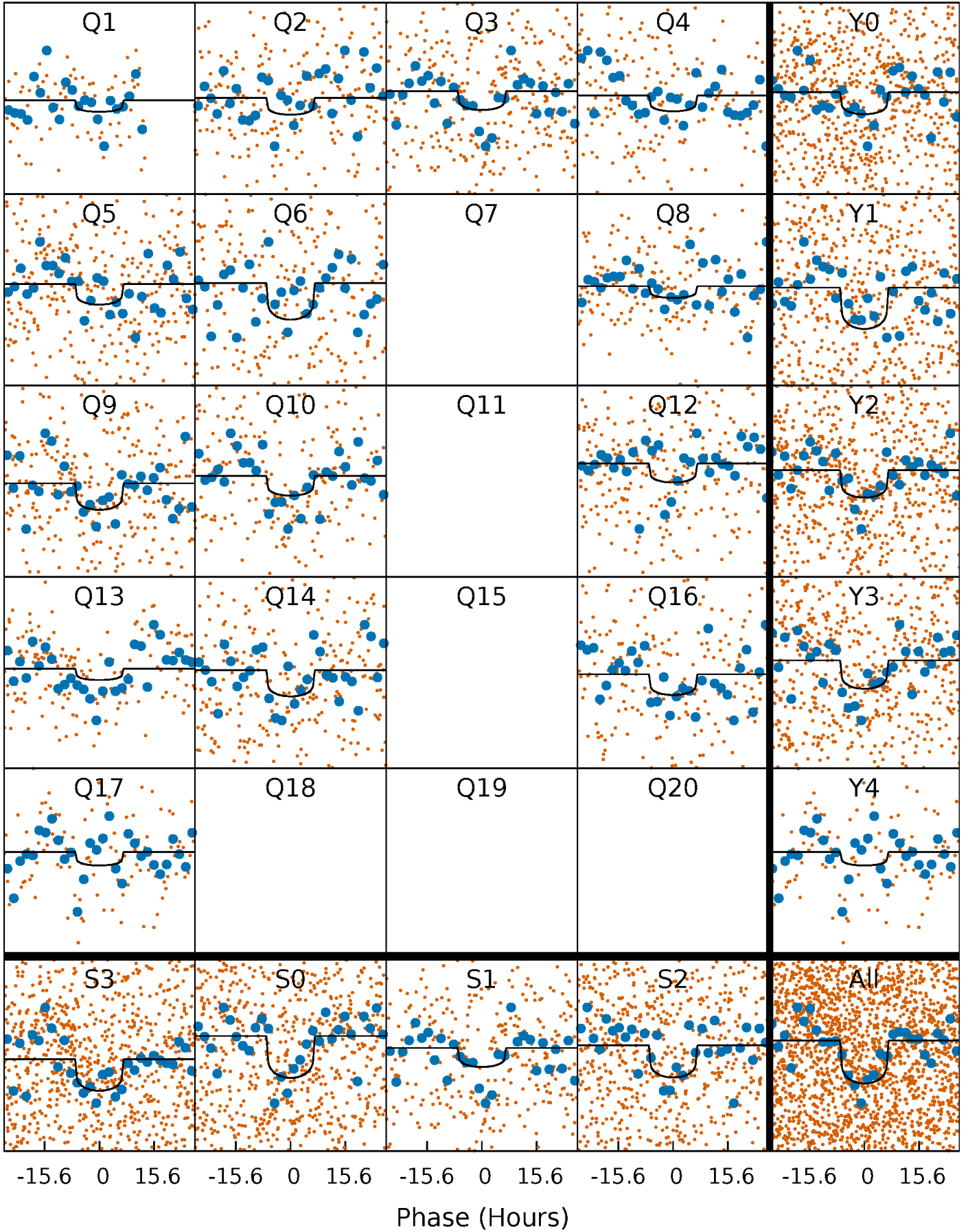
TCE 010098844-02 P= 35.082183 Days  $T_0=164.445050$  (BKJD)





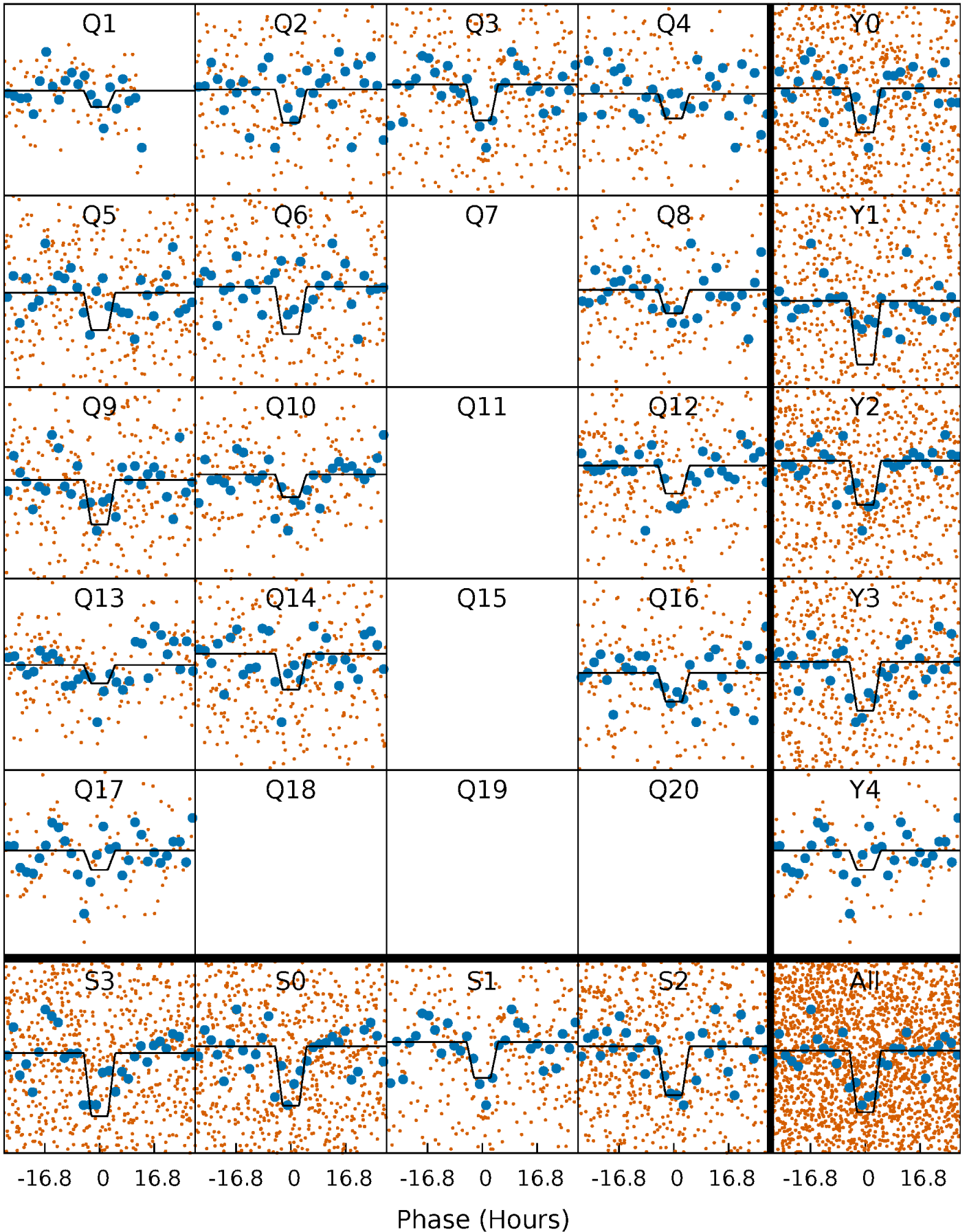
# DV Quarter-Phased Transit Curves

TCE 010098844-02   P= 35.082183 Days    $T_0=164.445050$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

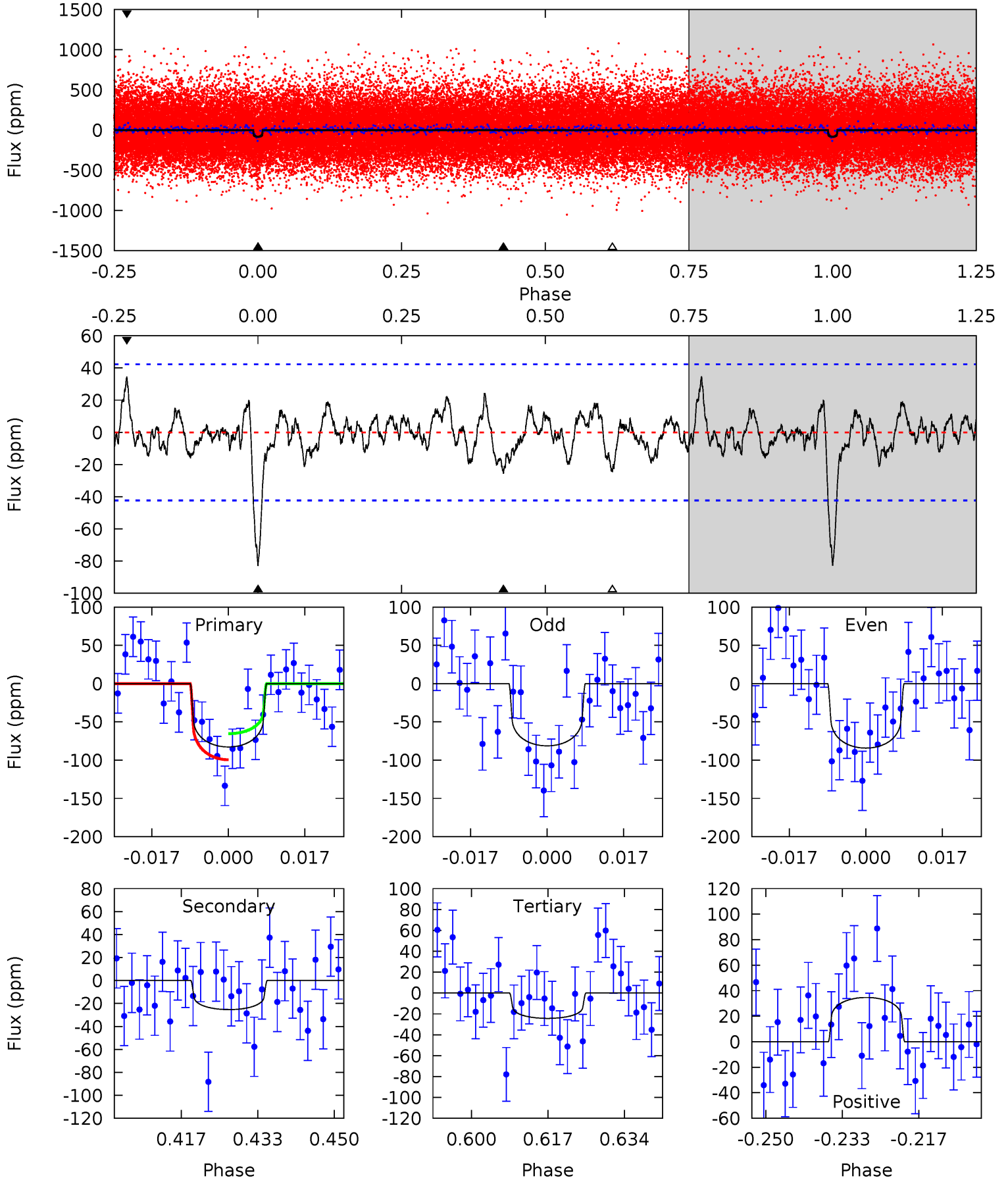
TCE 010098844-02   P= 35.080458 Days    $T_0=164.457130$  (BKJD)



# DV Model-Shift Uniqueness Test

010098844-02, P = 35.082183 Days, E = 129.362867 Days

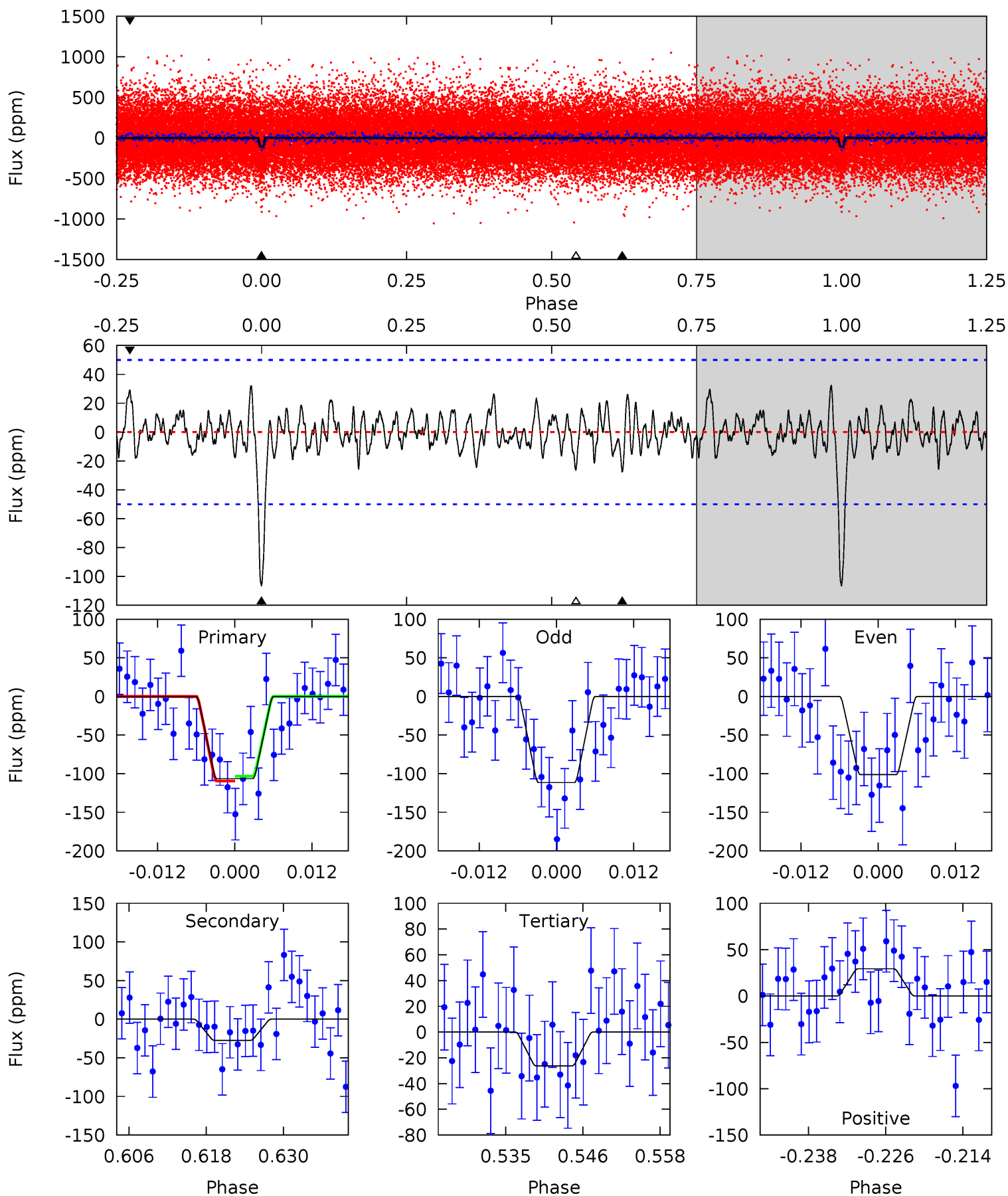
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
9.64	2.95	2.83	4.04	4.93	2.39	1.08	6.80	5.60	0.12	-1.09	0.17	0.92	0.30	1.98



# Alt Model-Shift Uniqueness Test

010098844-02, P = 35.080458 Days, E = 129.376672 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
10.6	2.75	2.63	2.93	4.99	2.52	0.99	8.00	7.70	0.12	-0.18	0.52	0.98	0.23	0.31



### Stellar Parameters For KIC 010098844

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6007^{+108}_{-133}$	$4.353^{+0.084}_{-0.126}$	$0.000^{+0.150}_{-0.150}$	$1.126^{+0.193}_{-0.128}$	$1.042^{+0.086}_{-0.070}$	$1.028^{+0.368}_{-0.354}$
	+2%/-2%	+2%/-3%	+inf%/-inf%	+17%/-11%	+8%/-7%	+36%/-34%
Source	SPE57	SPE57	SPE57	DSEP		

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

### Secondary Eclipse Parameters for KIC 010098844-02 / KOI 2964.02

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-25 \pm 9$	$1.15^{+0.62}_{-0.58}$	$855^{+40}_{-34}$	$4535^{+1810}_{-685}$	$452^{+1652}_{-268}$
Alt.	$-27 \pm 10$	$1.42^{+0.60}_{-0.59}$	$856^{+40}_{-34}$	$4329^{+1020}_{-639}$	$331^{+674}_{-192}$

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

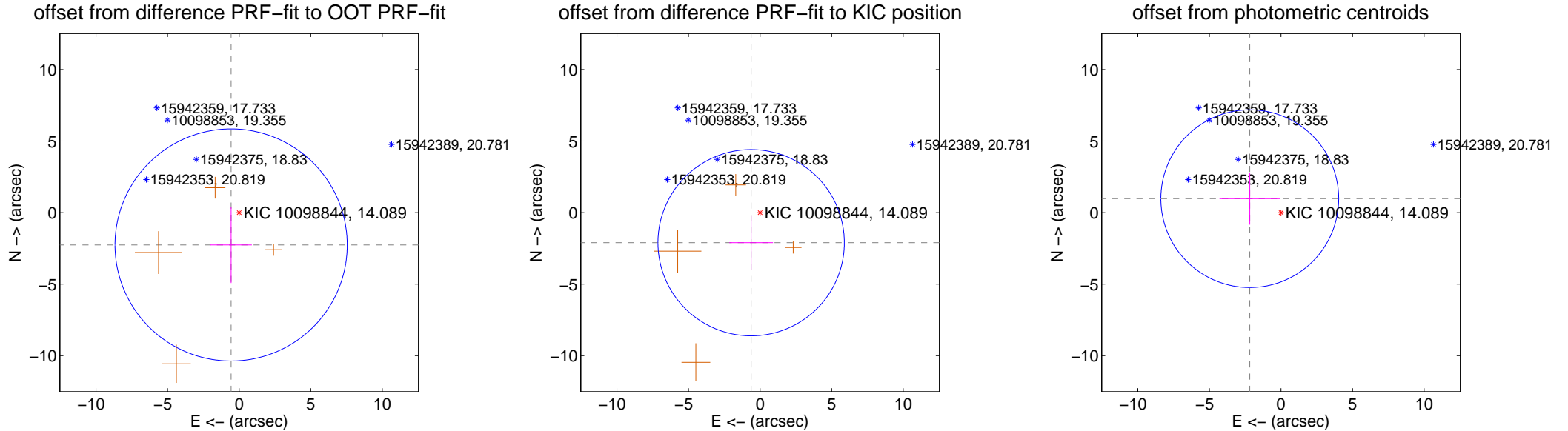
## DV Centroid Data

Supplemental centroid analysis for 010098844-02. Kepler magnitude: 14.09. Transit SNR 7.26

There are 0 quarters with good PRF difference image offsets

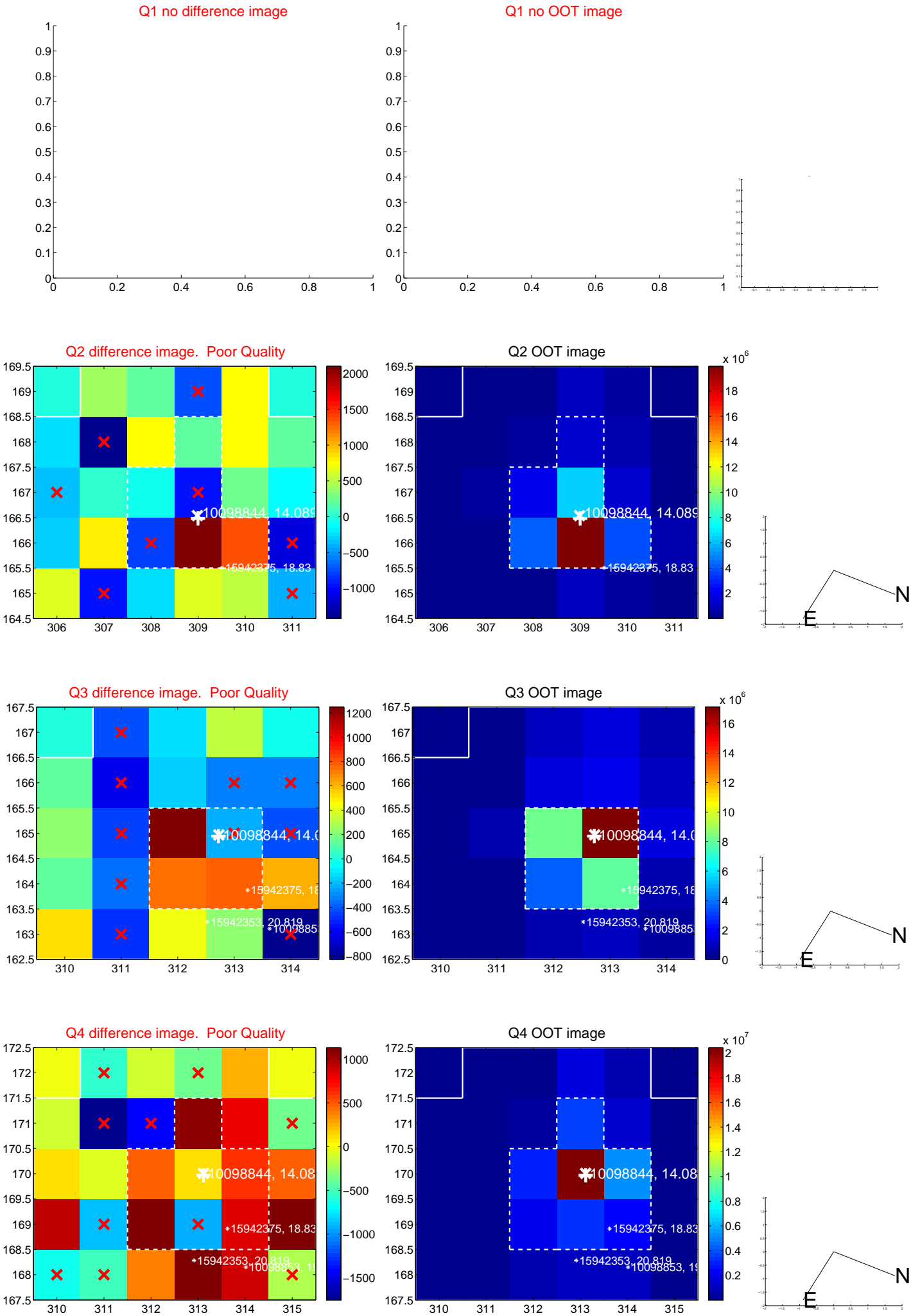
The direct PRF centroid is offset from the target star catalog position by about 0.16 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$2.329 \pm 2.704$	0.86	$0.560 \pm 1.445$	$-2.261 \pm 2.663$
PRF-fit source offset from KIC position	$2.194 \pm 2.170$	1.01	$0.624 \pm 1.525$	$-2.104 \pm 1.906$
photometric centroid source offset	$2.39 \pm 2.07$	1.15	$2.18 \pm 2.12$	$0.97 \pm 1.82$



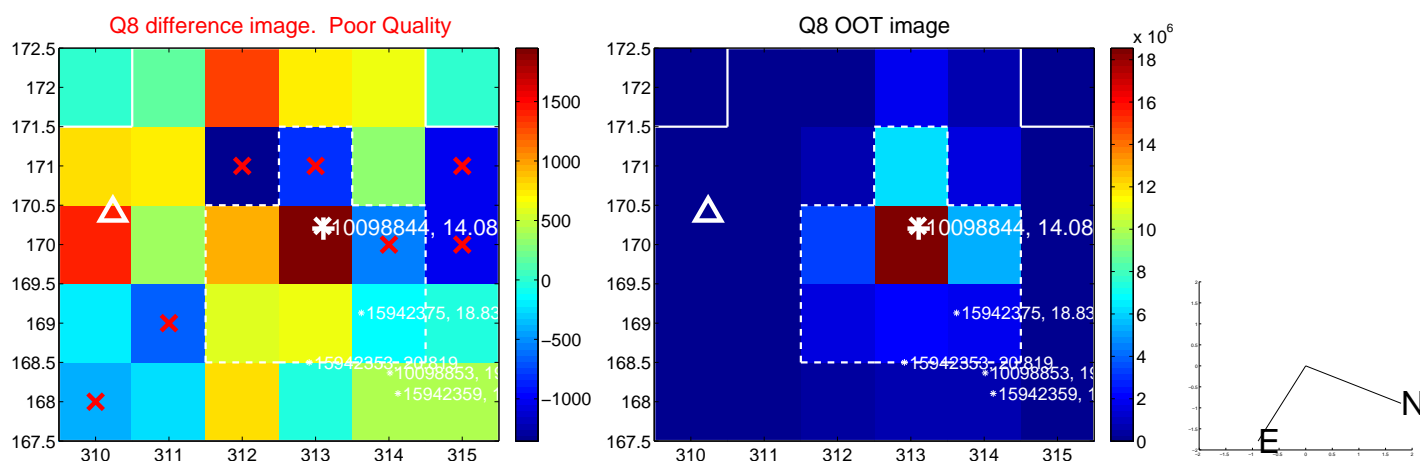
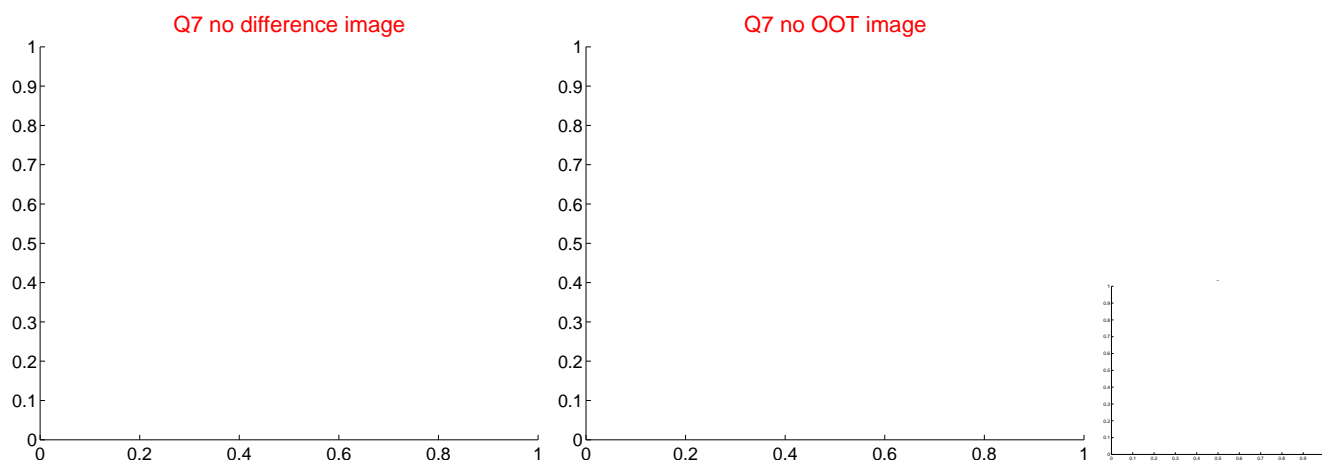
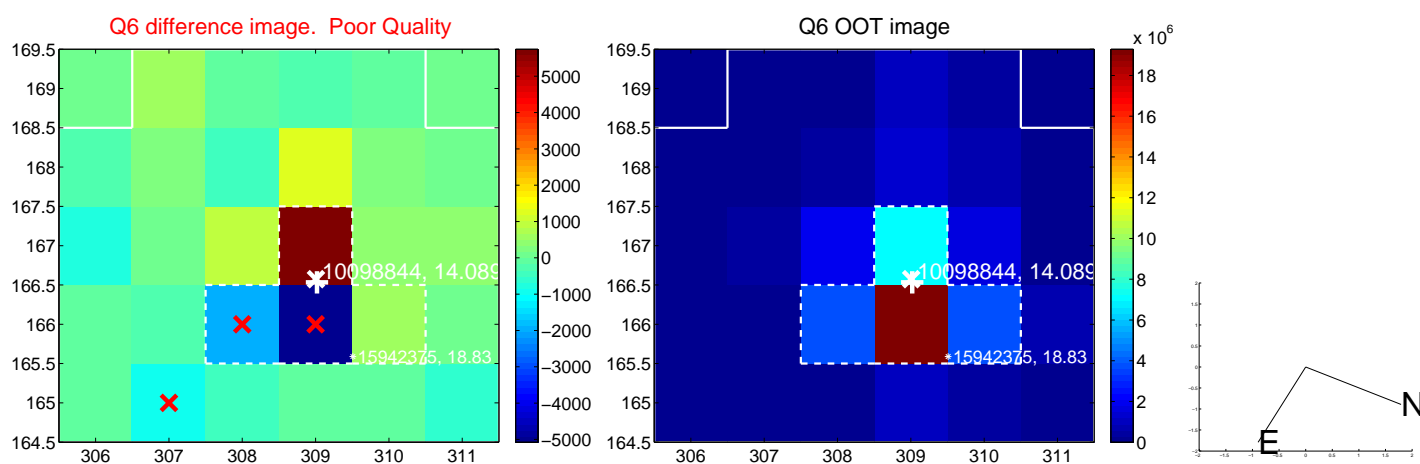
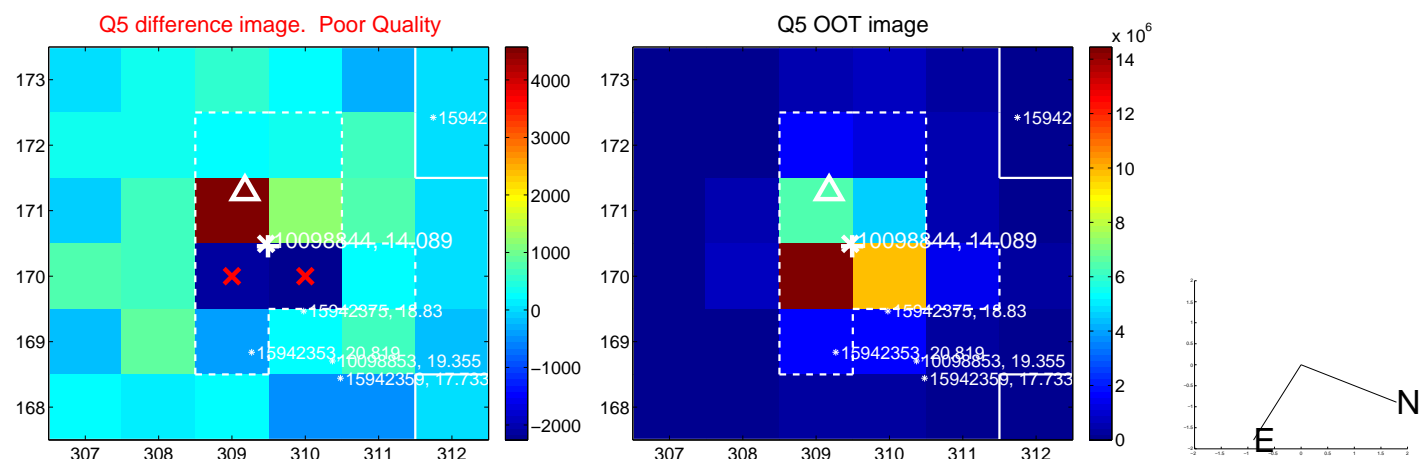
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

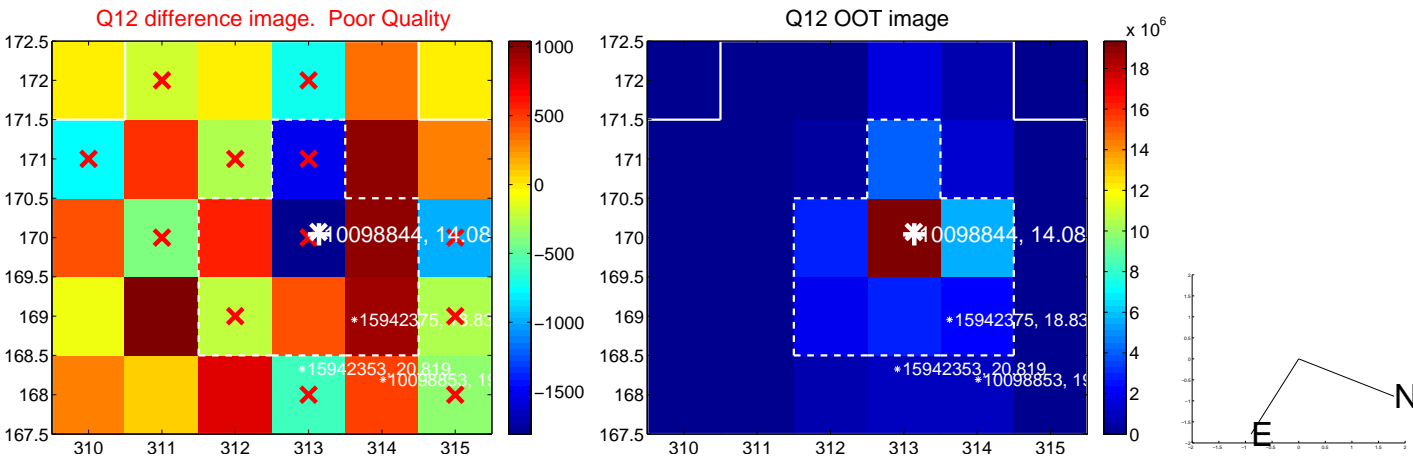
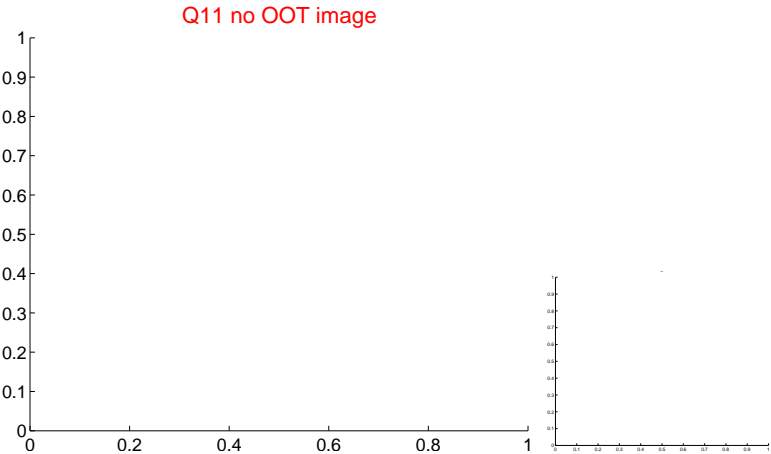
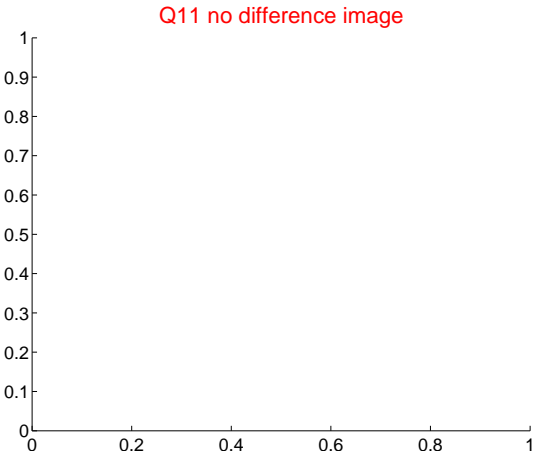
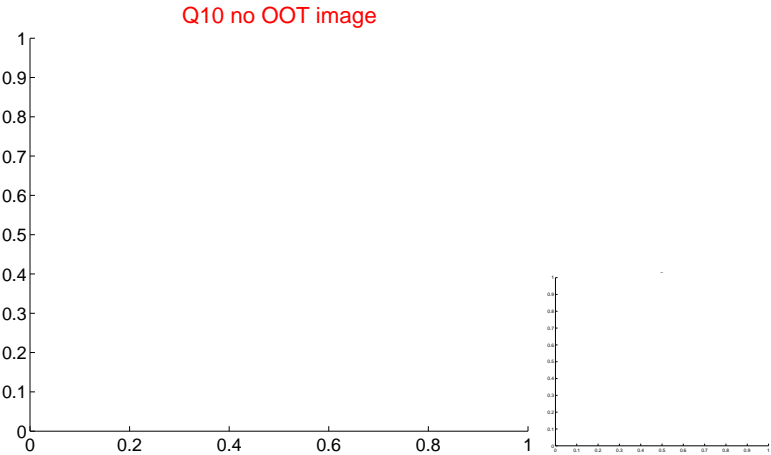
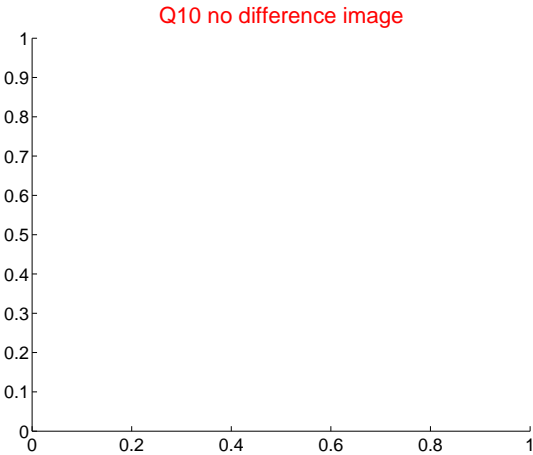
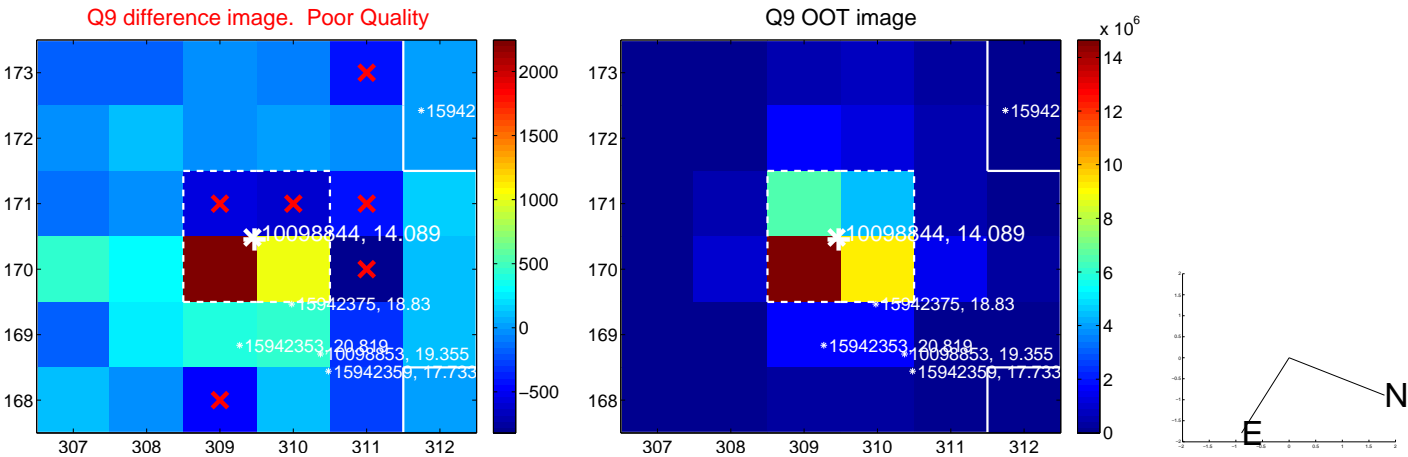




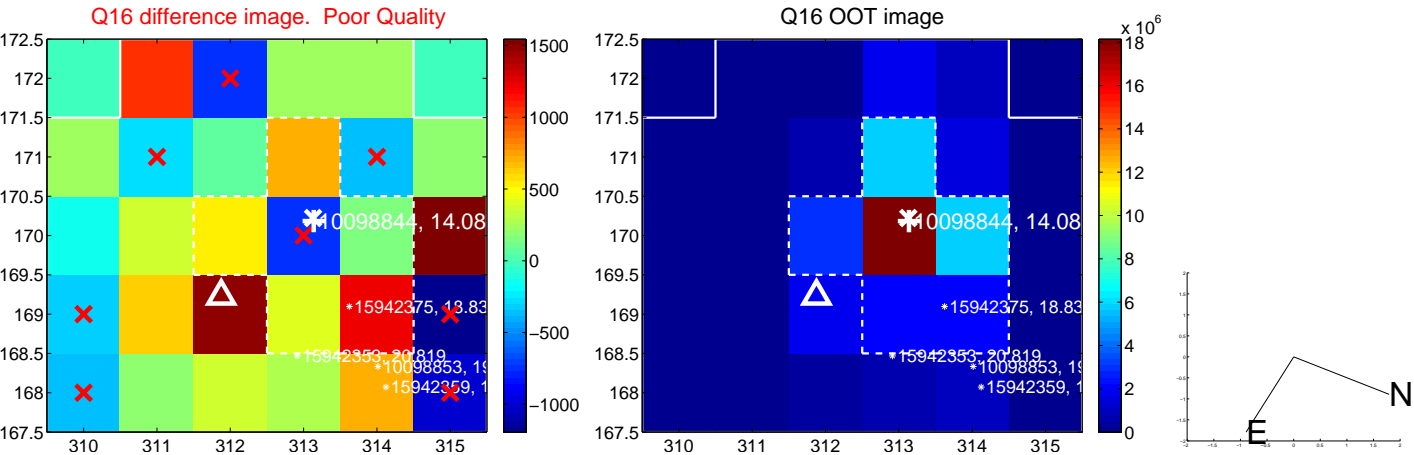
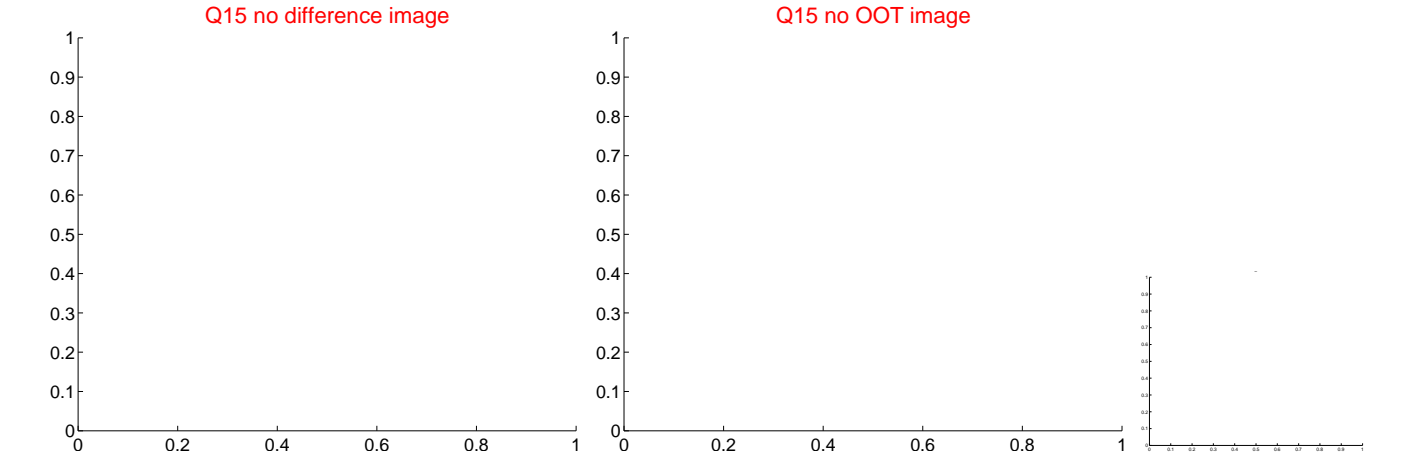
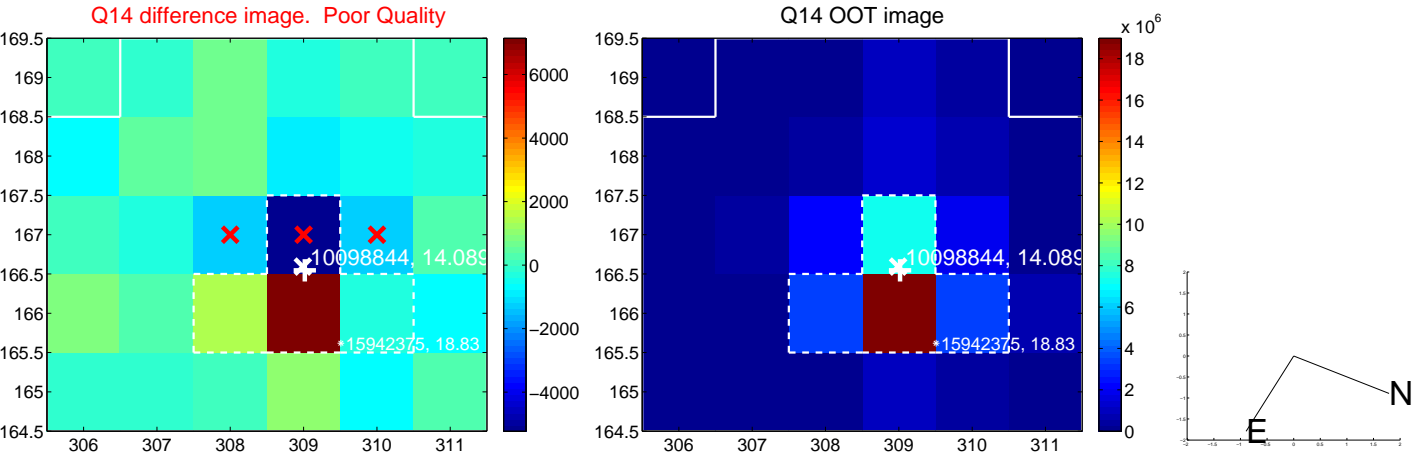
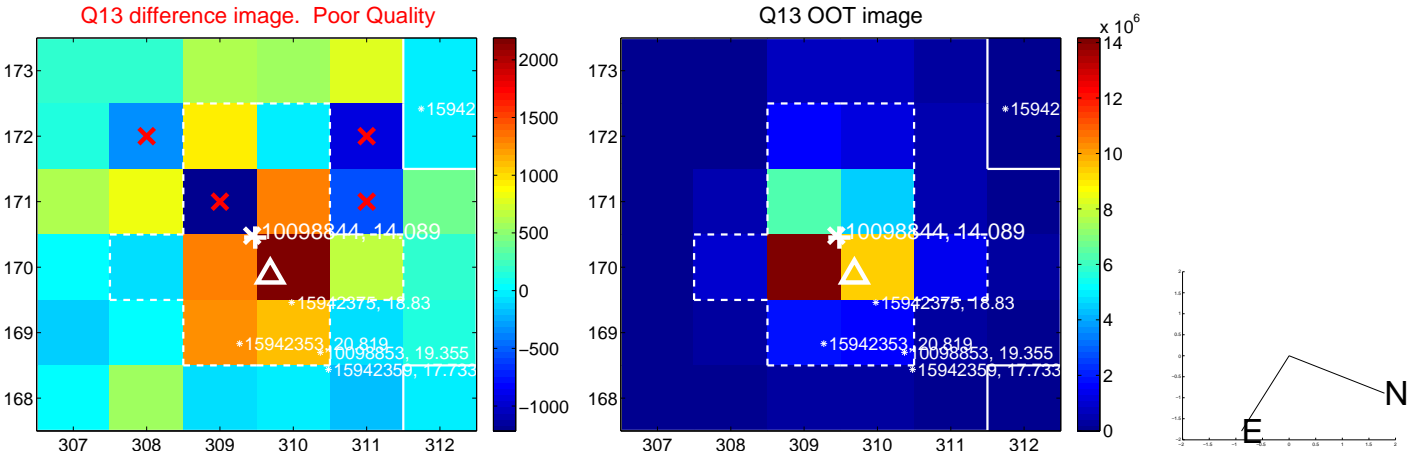
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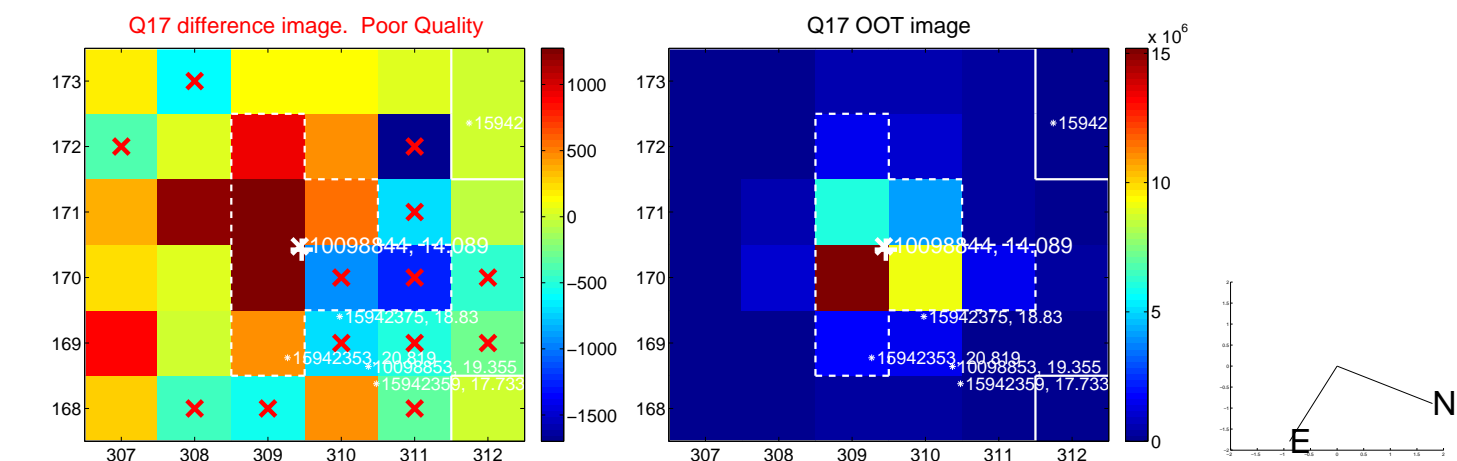
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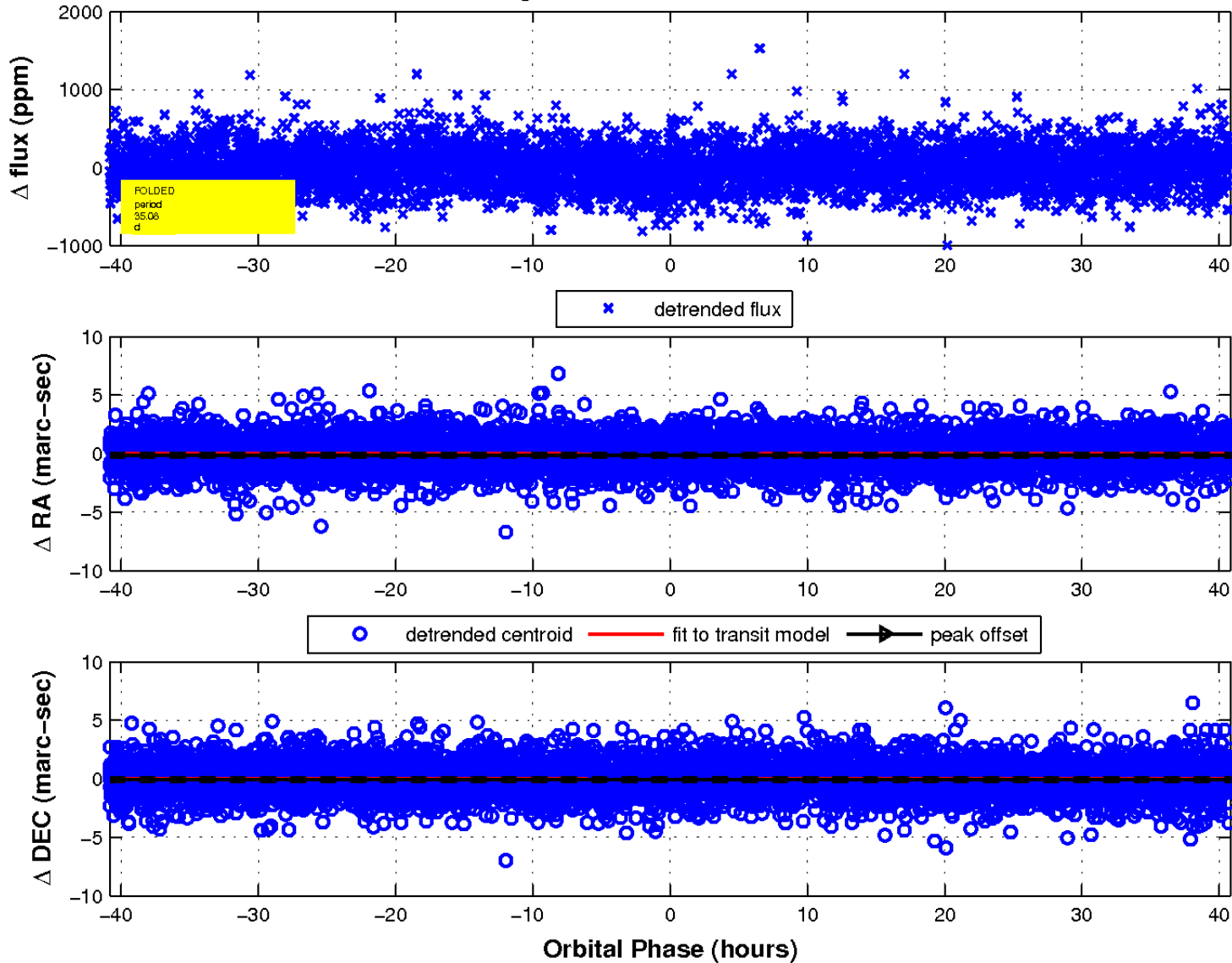
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fluxWeightedCentroids, Planet 2 of 2



UKIRT Image

