

# KIC 009172981

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009172981-01	OBS	No	1.091576	132.554100	61.9	1.452	10.1	8.3	2.37	7659	2.19	27797.74
009172981-02	OBS	No	0.664760	132.110819	33.4	4.615	9.2	7.1	2.37	7659	1.40	53851.20

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009172981-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
009172981-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV

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

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

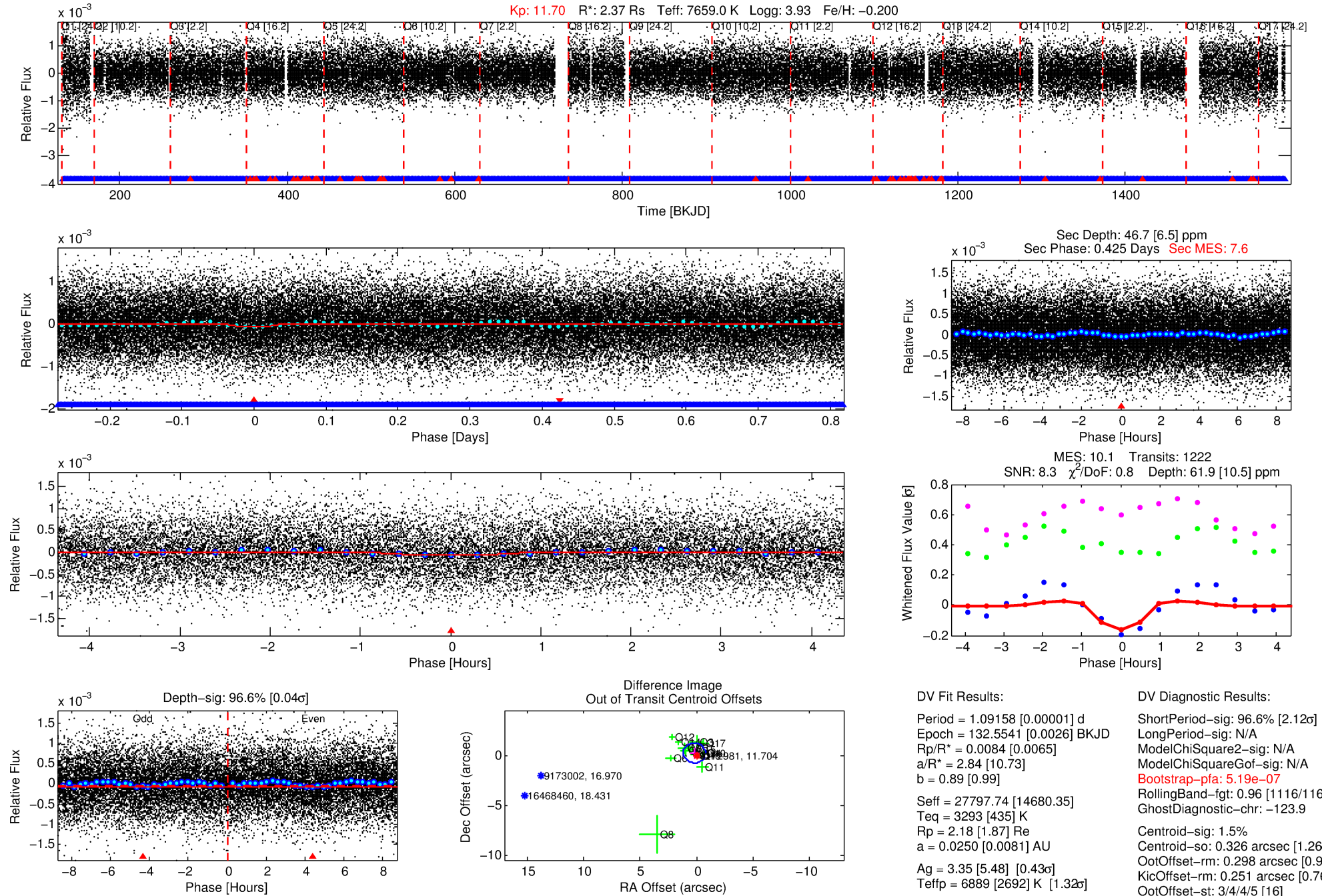
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009172981-01

No Significant Match Found

# DV One-Page Summary

KIC: 9172981 Candidate: 1 of 2 Period: 1.092 d



## DV Fit Results:

Period = 1.09158 [0.00001] d  
Epoch = 132.5541 [0.0026] BKJD  
Rp/R\* = 0.0084 [0.0065]  
a/R\* = 2.84 [10.73]  
b = 0.89 [0.99]  
Seff = 27797.74 [14680.35]  
Teq = 3293 [435] K  
Rp = 2.18 [1.87] Re  
a = 0.0250 [0.0081] AU  
Ag = 3.35 [5.48] [0.43σ]  
Teffp = 6889 [2692] K [1.32σ]

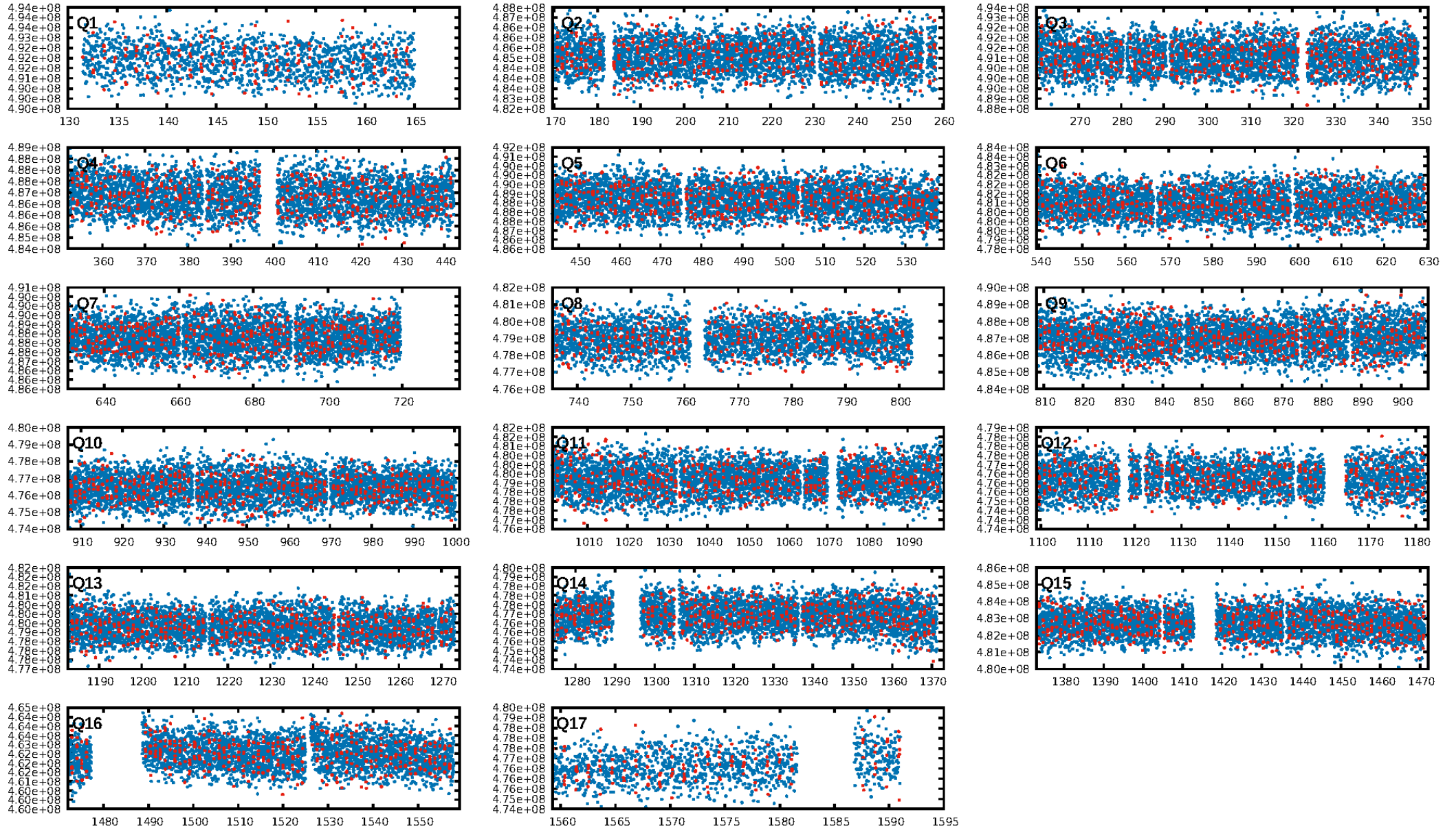
## DV Diagnostic Results:

ShortPeriod-sig: 96.6% [2.12σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
**Bootstrap-pfa: 5.19e-07**  
RollingBand-fgt: 0.96 [1116/1167]  
GhostDiagnostic-chr: -123.9  
Centroid-sig: 1.5%  
Centroid-so: 0.326 arcsec [1.26σ]  
OotOffset-rm: 0.298 arcsec [0.91σ]  
KicOffset-rm: 0.251 arcsec [0.76σ]  
OotOffset-st: 3/4/4/5 [16]  
KicOffset-st: 3/4/4/5 [16]  
DiffImageQuality-fgm: 0.94 [15/16]  
DiffImageOverlap-fno: 0.94 [16/17]

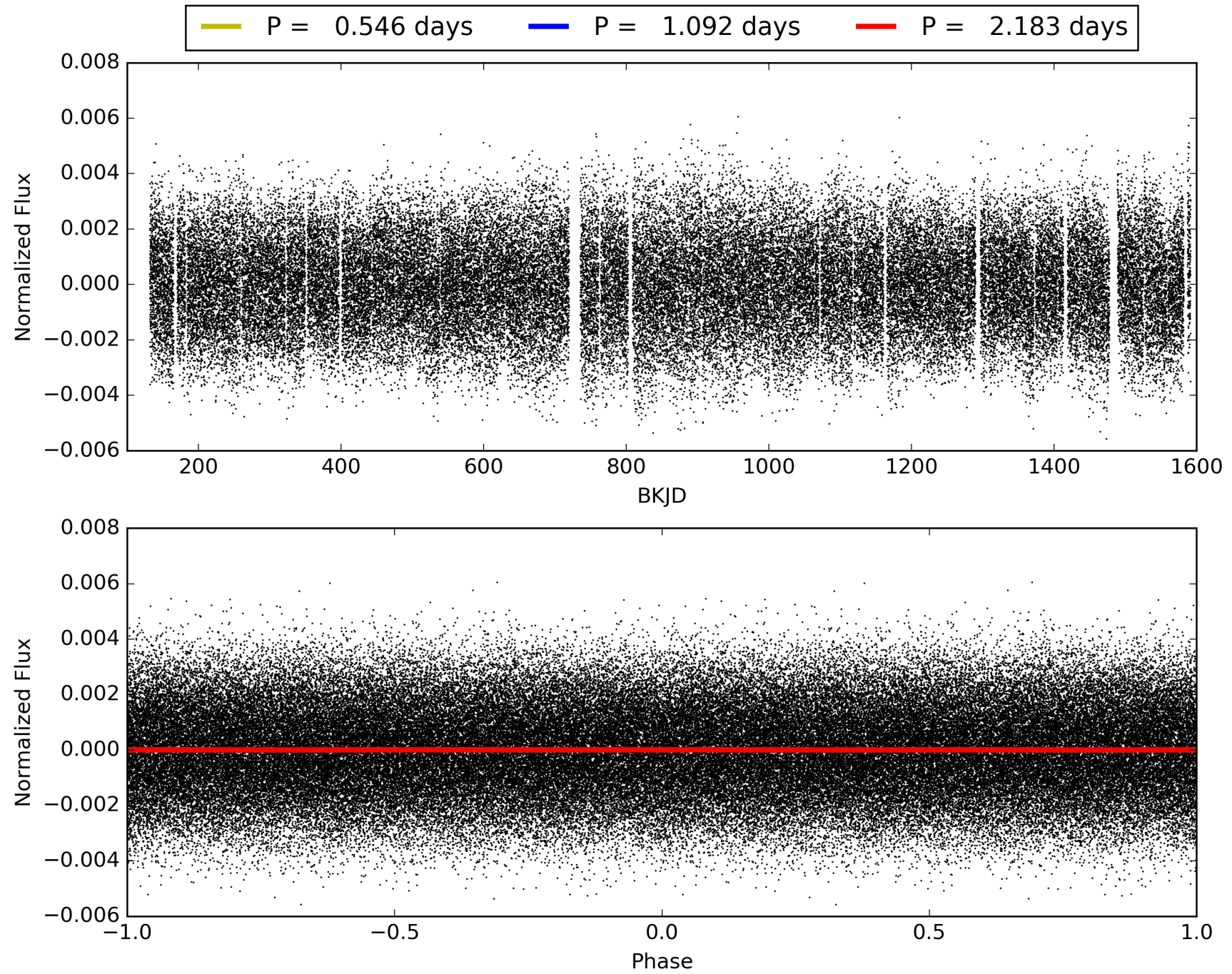
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 08:06:52 Z

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

# TCE 009172981-01, PDC Light Curves

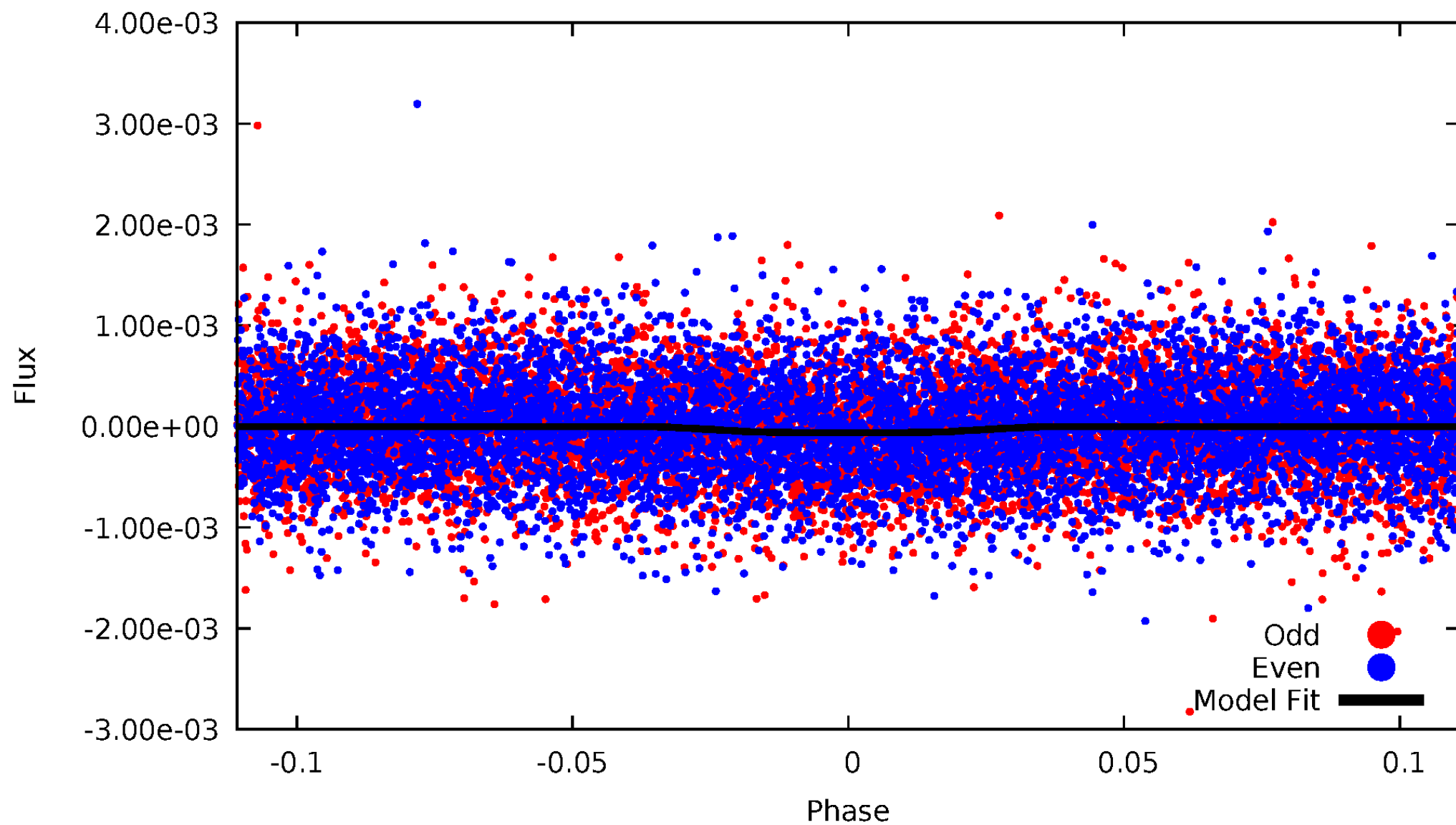


TCE 009172981-01



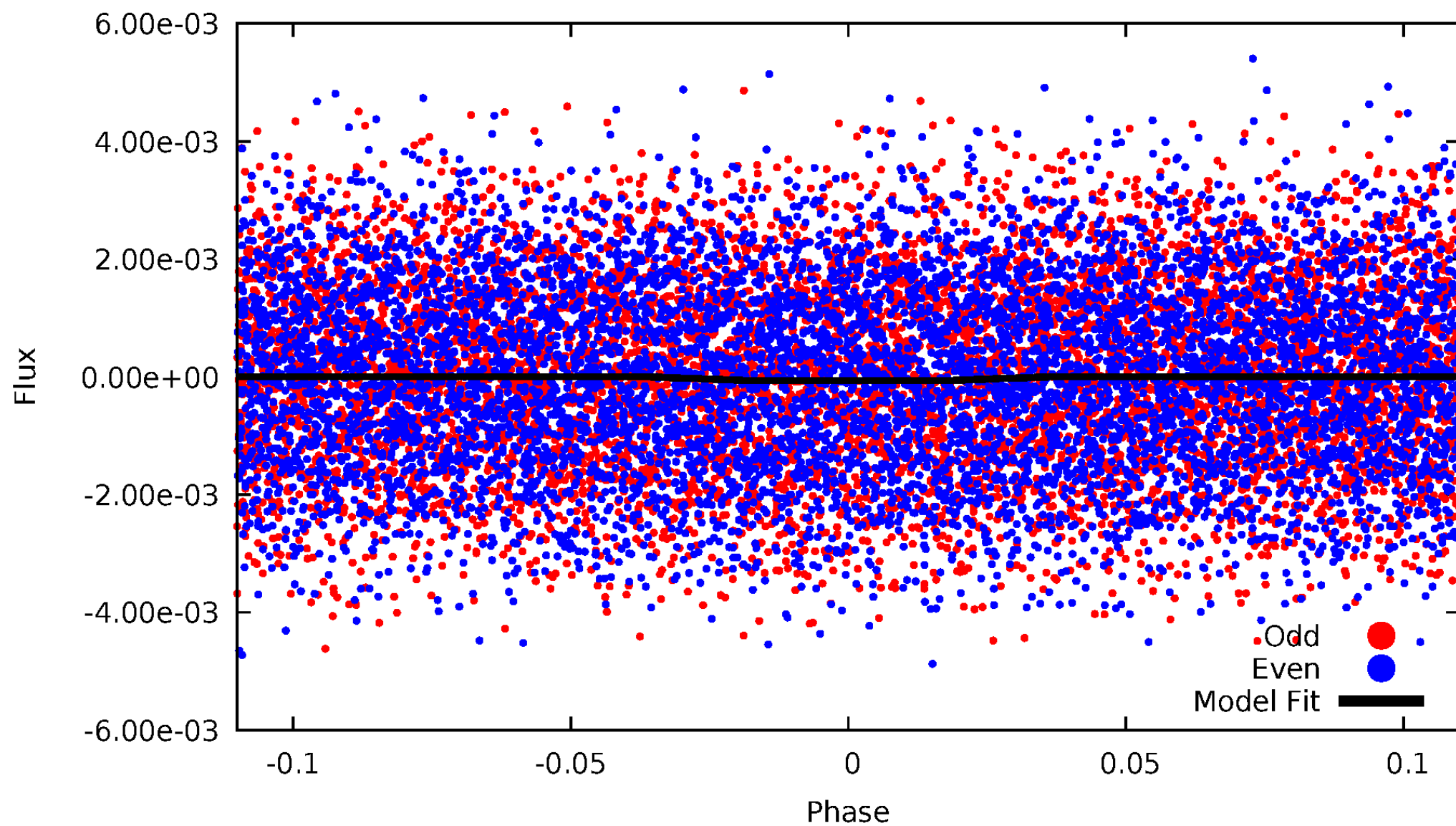
# DV Odd/Even

TCE 009172981-01

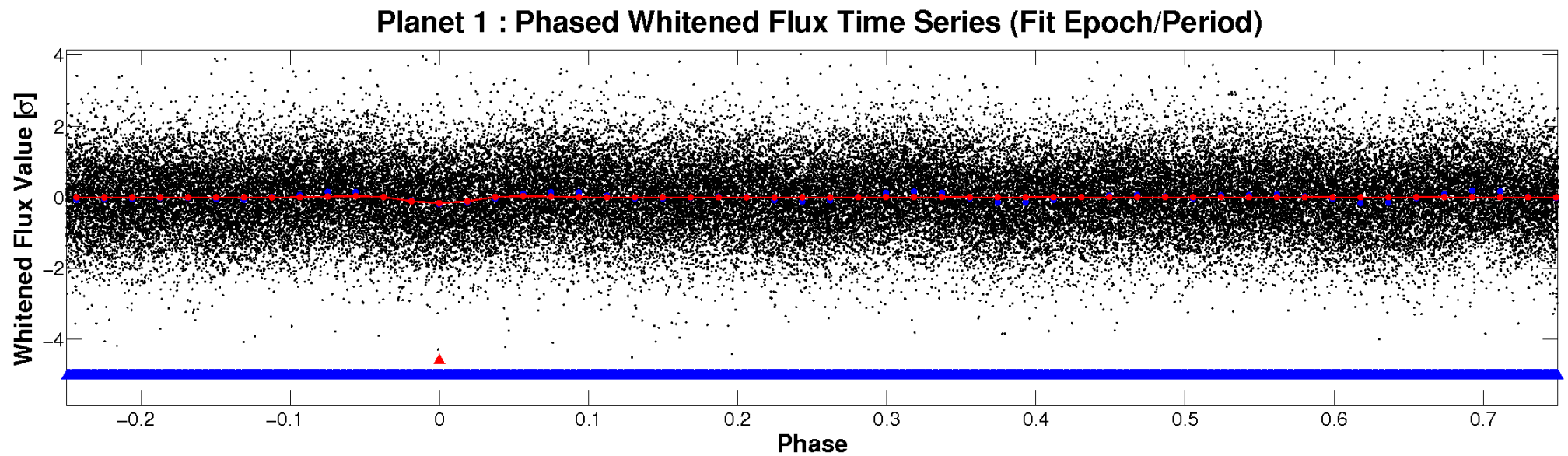
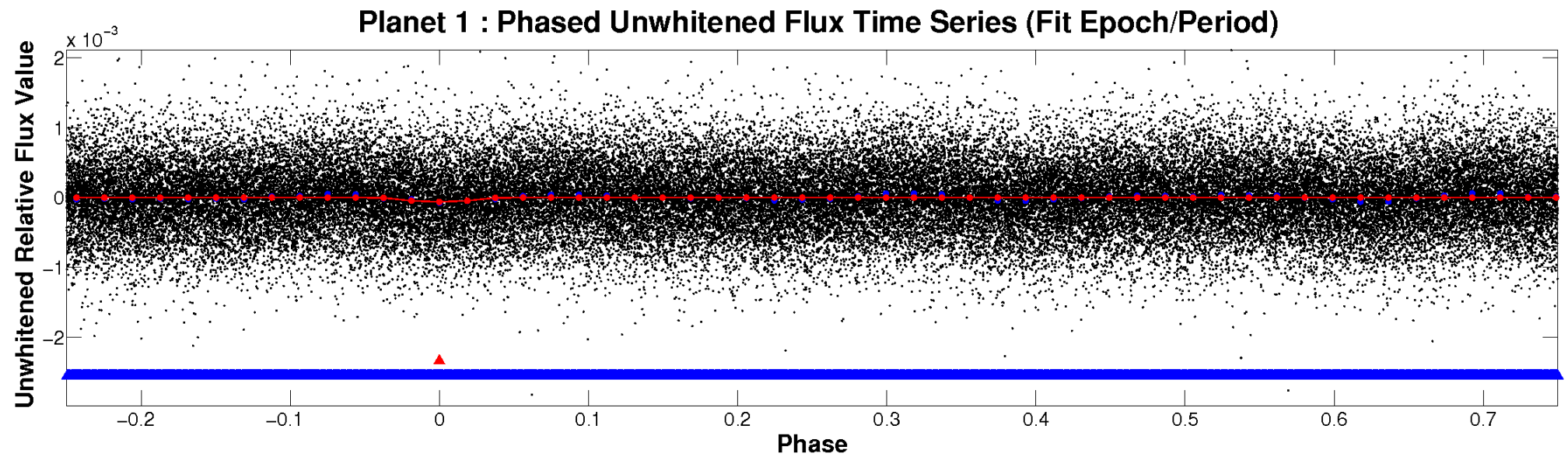


# ALT Odd/Even

TCE 009172981-01

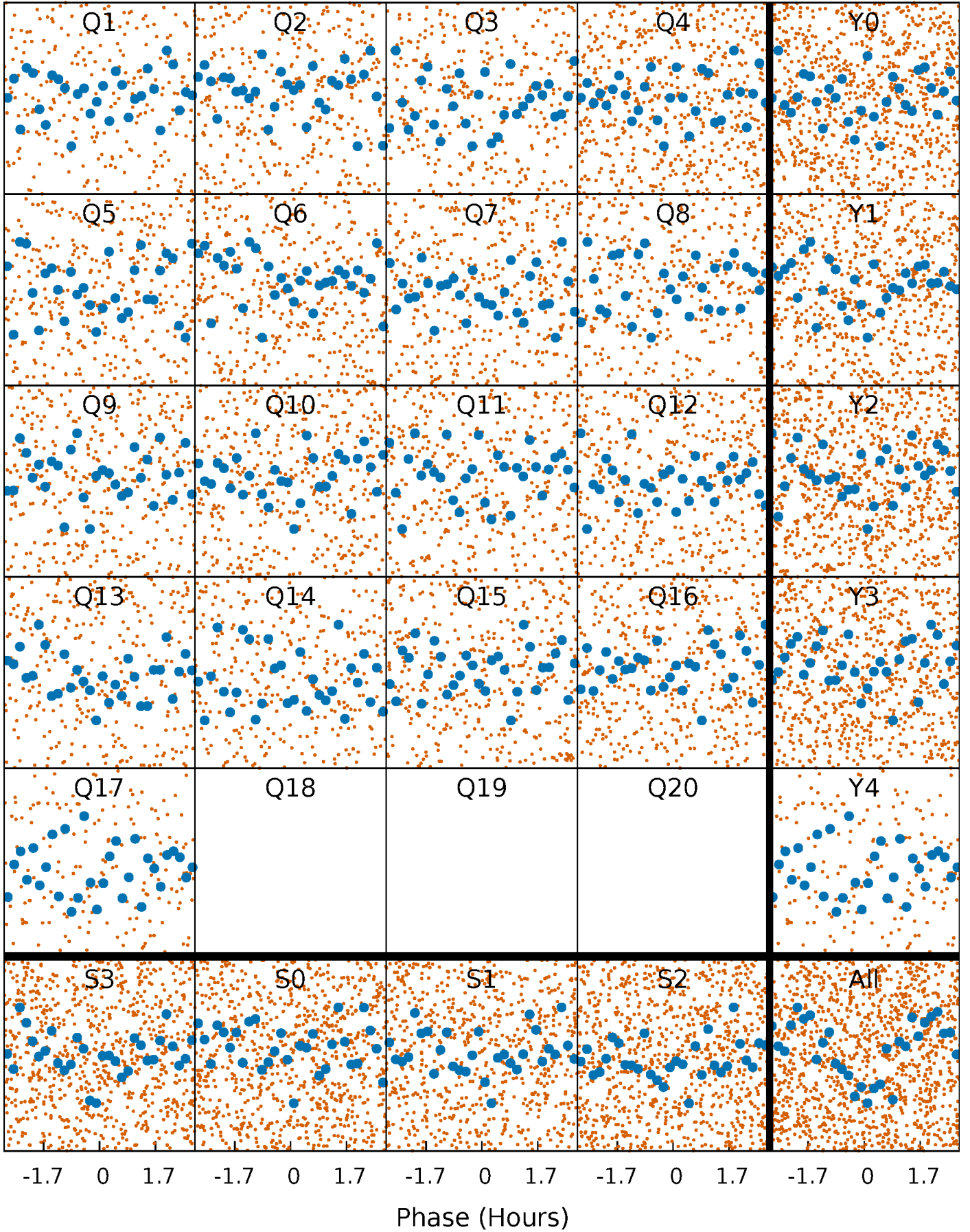


# Non-Whitened Vs. Whitened Light Curve



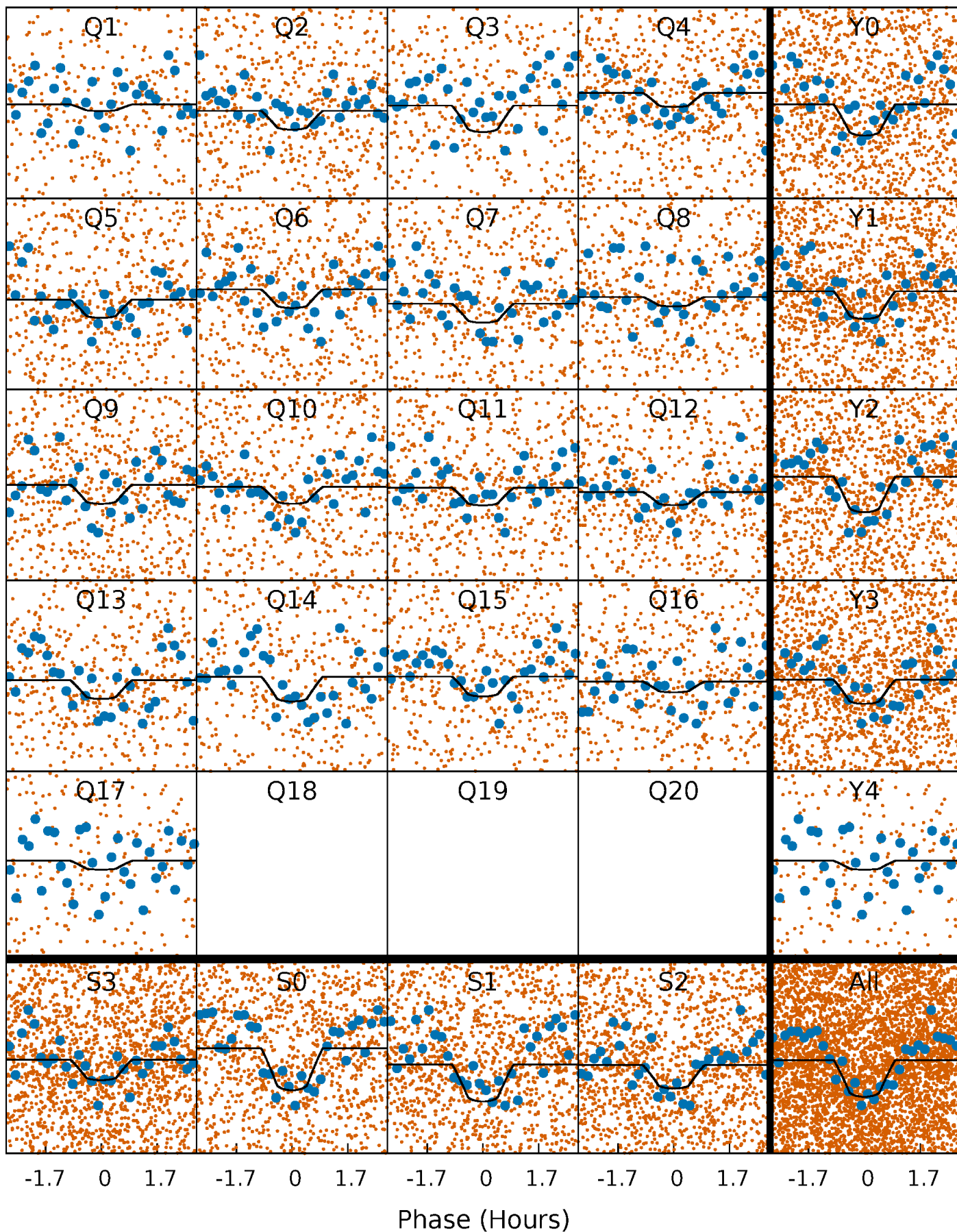
# PDC Quarter-Phased Transit Curves

TCE 009172981-01   P= 1.091576 Days    $T_0=132.554100$  (BKJD)



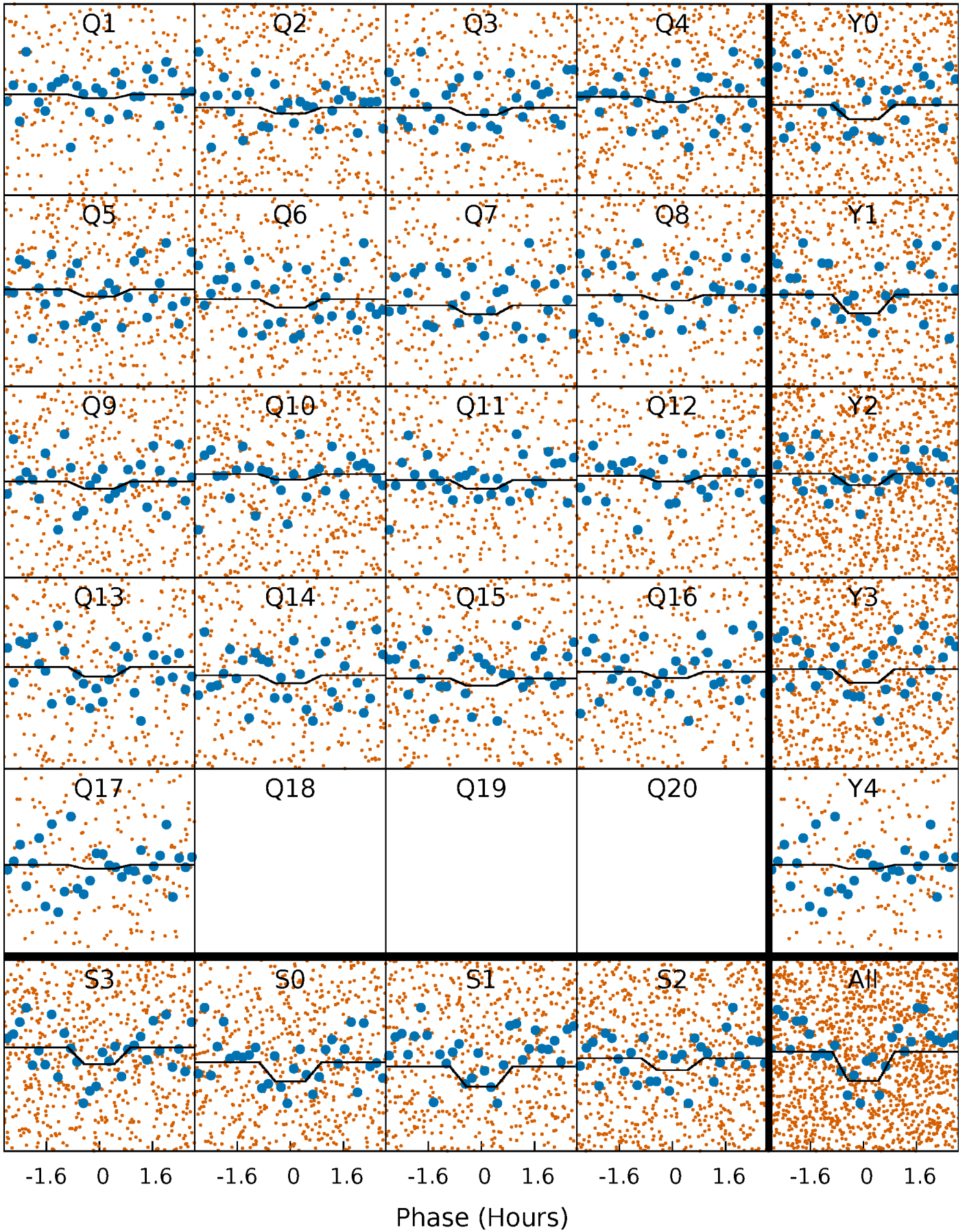
# DV Quarter-Phased Transit Curves

TCE 009172981-01   P= 1.091576 Days    $T_0=132.554100$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

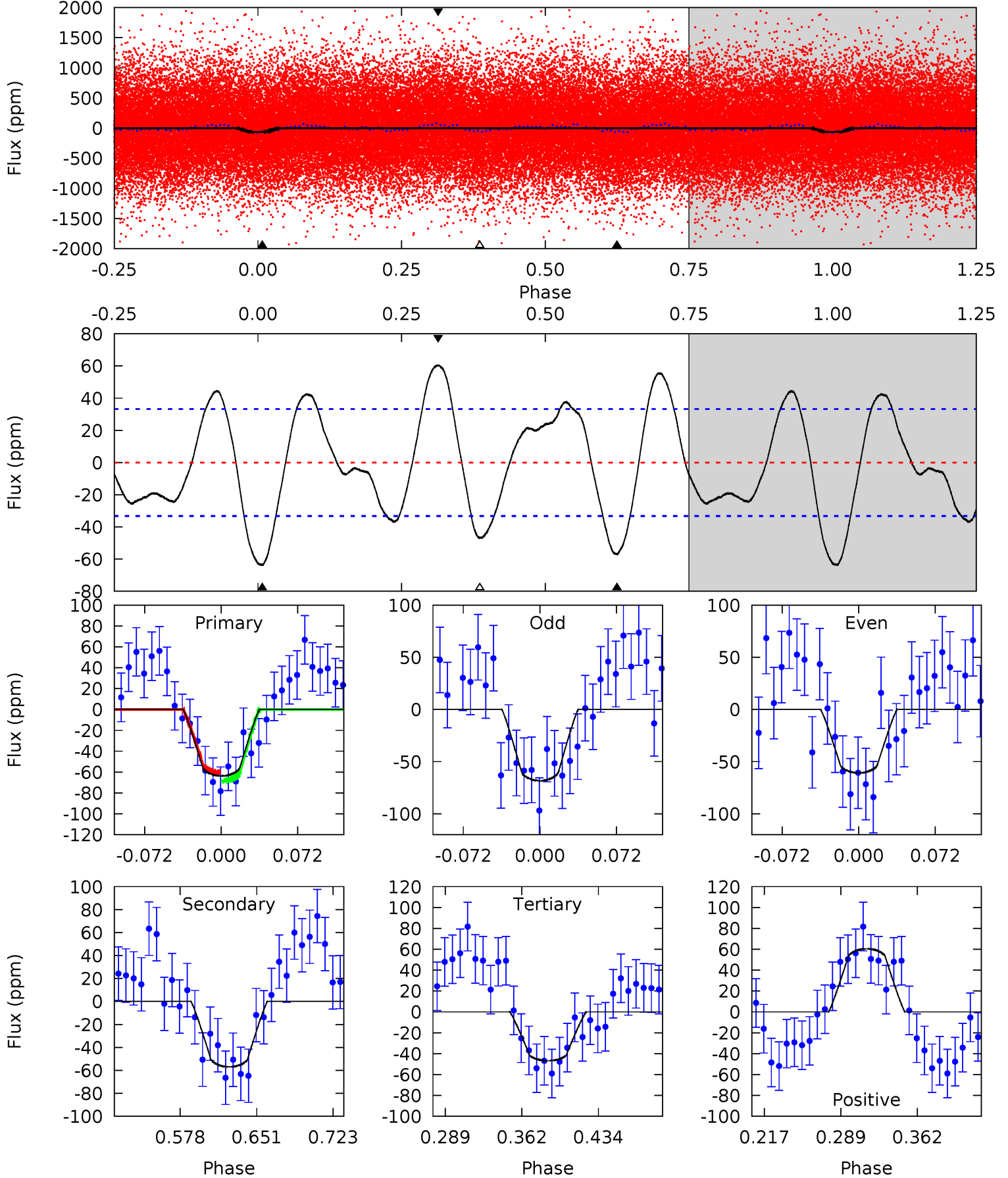
TCE 009172981-01   P= 1.091588 Days    $T_0=132.554797$  (BKJD)



# DV Model-Shift Uniqueness Test

009172981-01, P = 1.091576 Days, E = 131.462524 Days

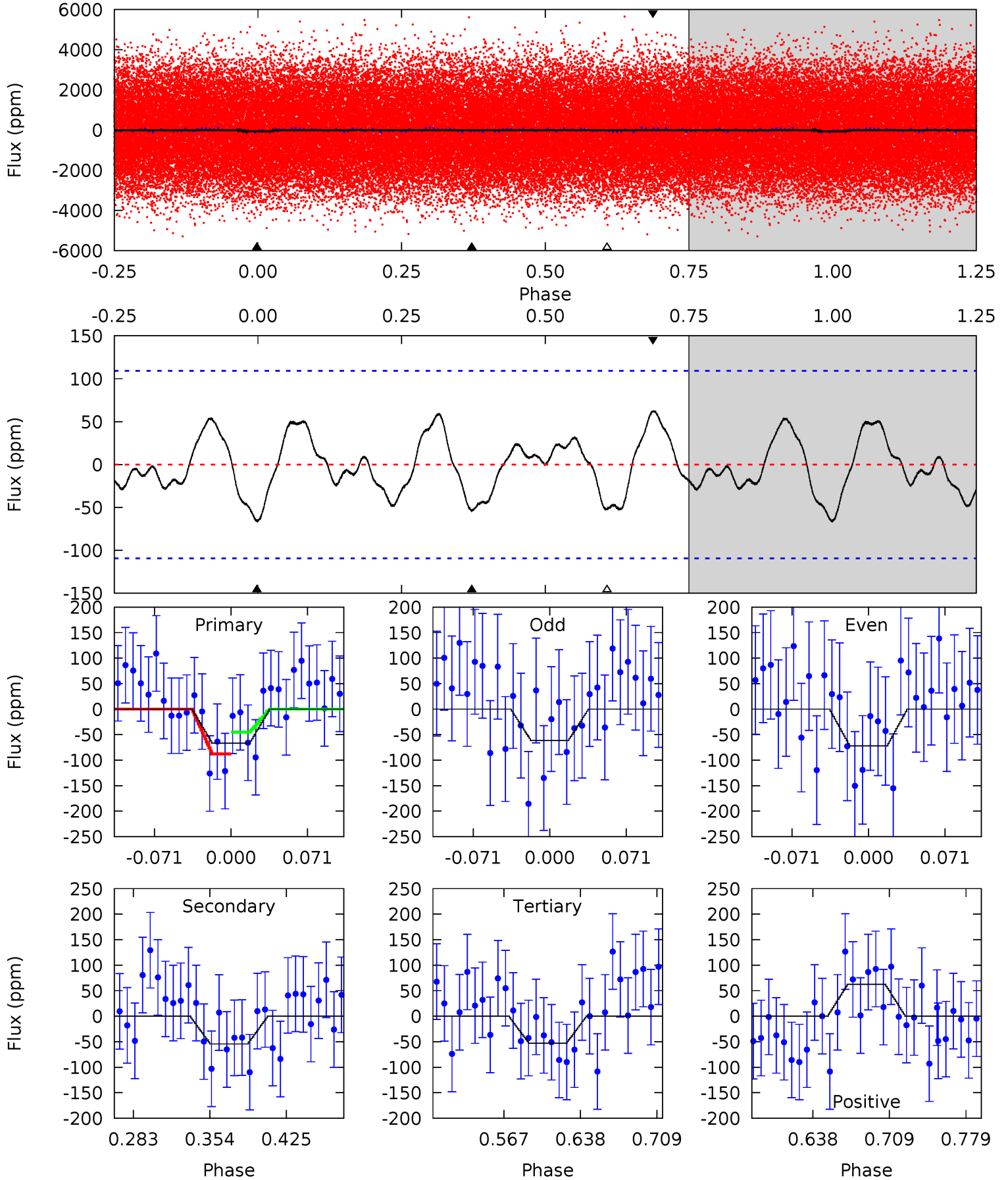
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
8.87	7.94	6.53	8.43	4.63	1.80	4.00	2.35	0.45	1.42	-0.48	0.52	0.84	0.49	0.57



# Alt Model-Shift Uniqueness Test

009172981-01, P = 1.091588 Days, E = 131.463209 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
2.83	2.30	2.25	2.66	4.64	1.81	1.20	0.58	0.17	0.06	-0.35	0.23	1.03	0.48	0.90



### Stellar Parameters For KIC 009172981

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$\rho_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7659^{+211}_{-316}$	$3.929^{+0.287}_{-0.123}$	$-0.200^{+0.200}_{-0.350}$	$2.370^{+0.459}_{-0.853}$	$1.740^{+0.166}_{-0.388}$	$0.184^{+0.357}_{-0.068}$
	+3%/-4%	+7%/-3%	+100%/-175%	+19%/-36%	+10%/-22%	+194%/-37%
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 009172981-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-57 \pm 7$	$2.27^{+1.61}_{-1.33}$	$4517^{+321}_{-433}$	$6584^{+5402}_{-1587}$	$3.792^{+18.523}_{-2.516}$
Alt.	$-54 \pm 24$	$2.21^{+1.67}_{-1.37}$	$4510^{+319}_{-405}$	$6478^{+5815}_{-1877}$	$3.504^{+20.138}_{-2.543}$

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

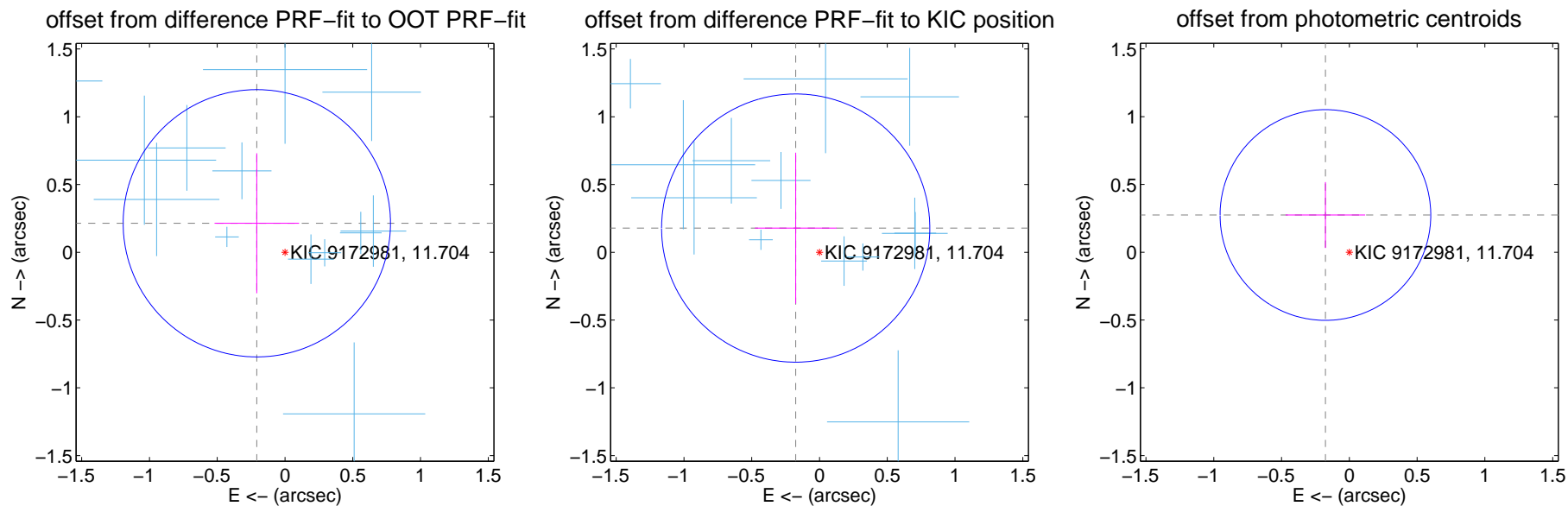
## DV Centroid Data

Supplemental centroid analysis for 009172981-01. **Kepler magnitude: 11.70.** Transit SNR 8.26

There are 15 quarters with good PRF difference image offsets

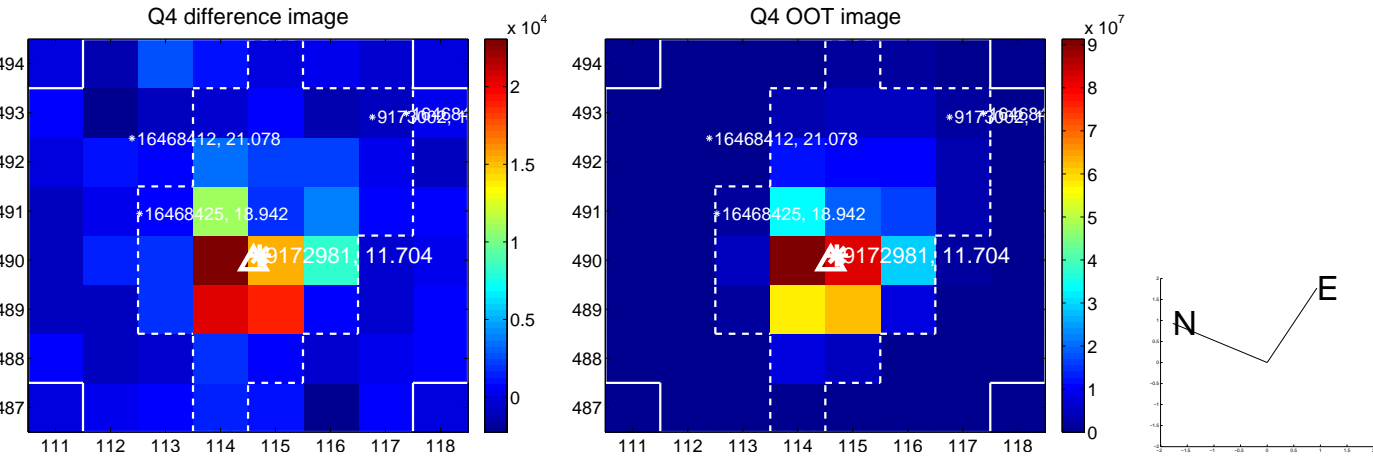
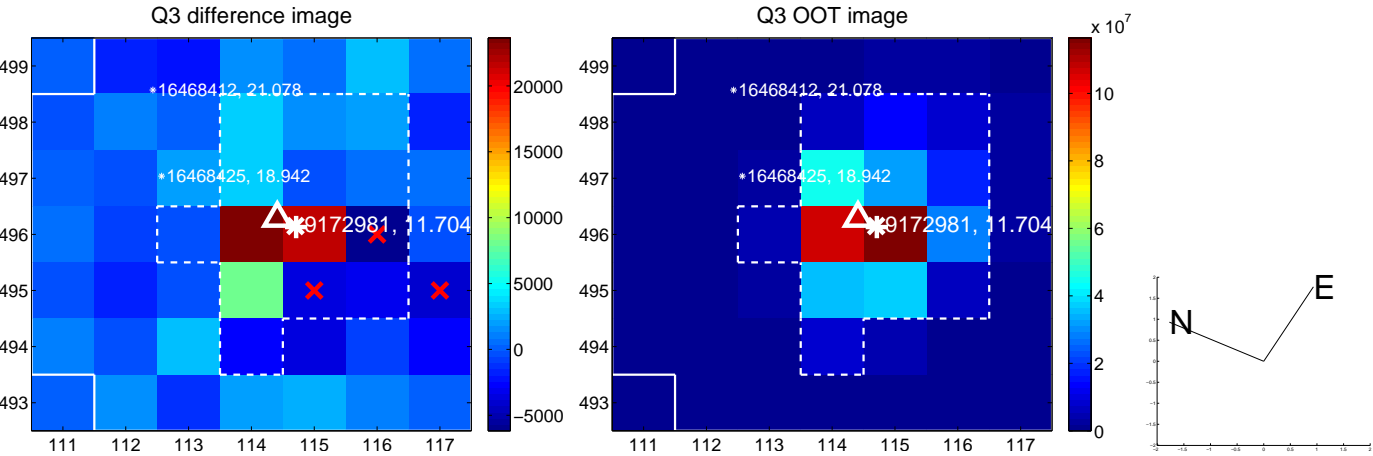
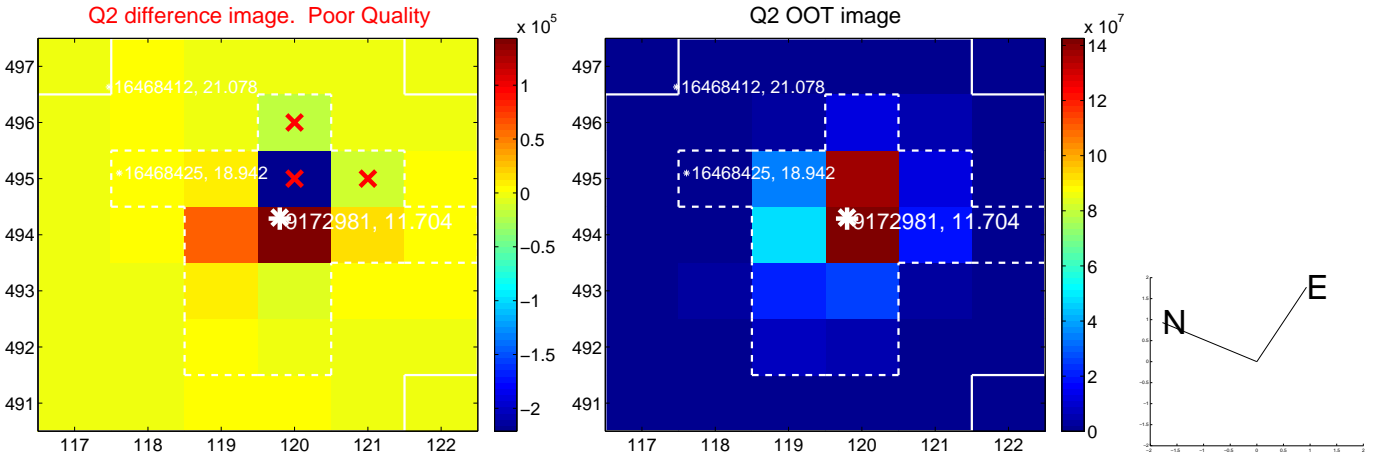
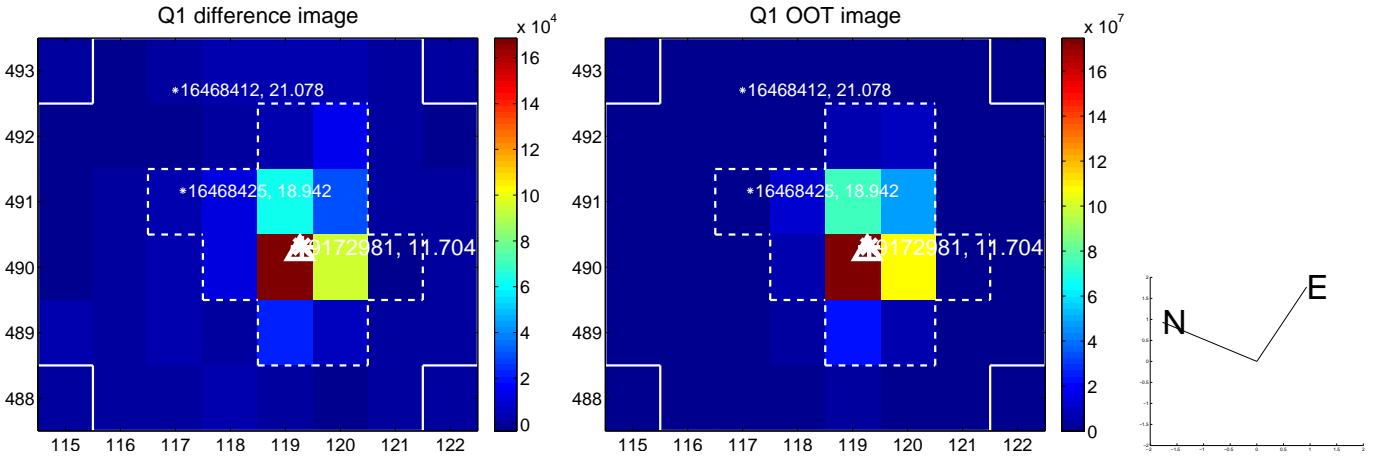
The direct PRF centroid is offset from the target star catalog position by about 0.04 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.298 \pm 0.329$	0.91	$0.208 \pm 0.312$	$0.214 \pm 0.516$
PRF-fit source offset from KIC position	$0.251 \pm 0.330$	0.76	$0.176 \pm 0.301$	$0.179 \pm 0.557$
photometric centroid source offset	$0.33 \pm 0.26$	1.26	$0.18 \pm 0.29$	$0.27 \pm 0.24$

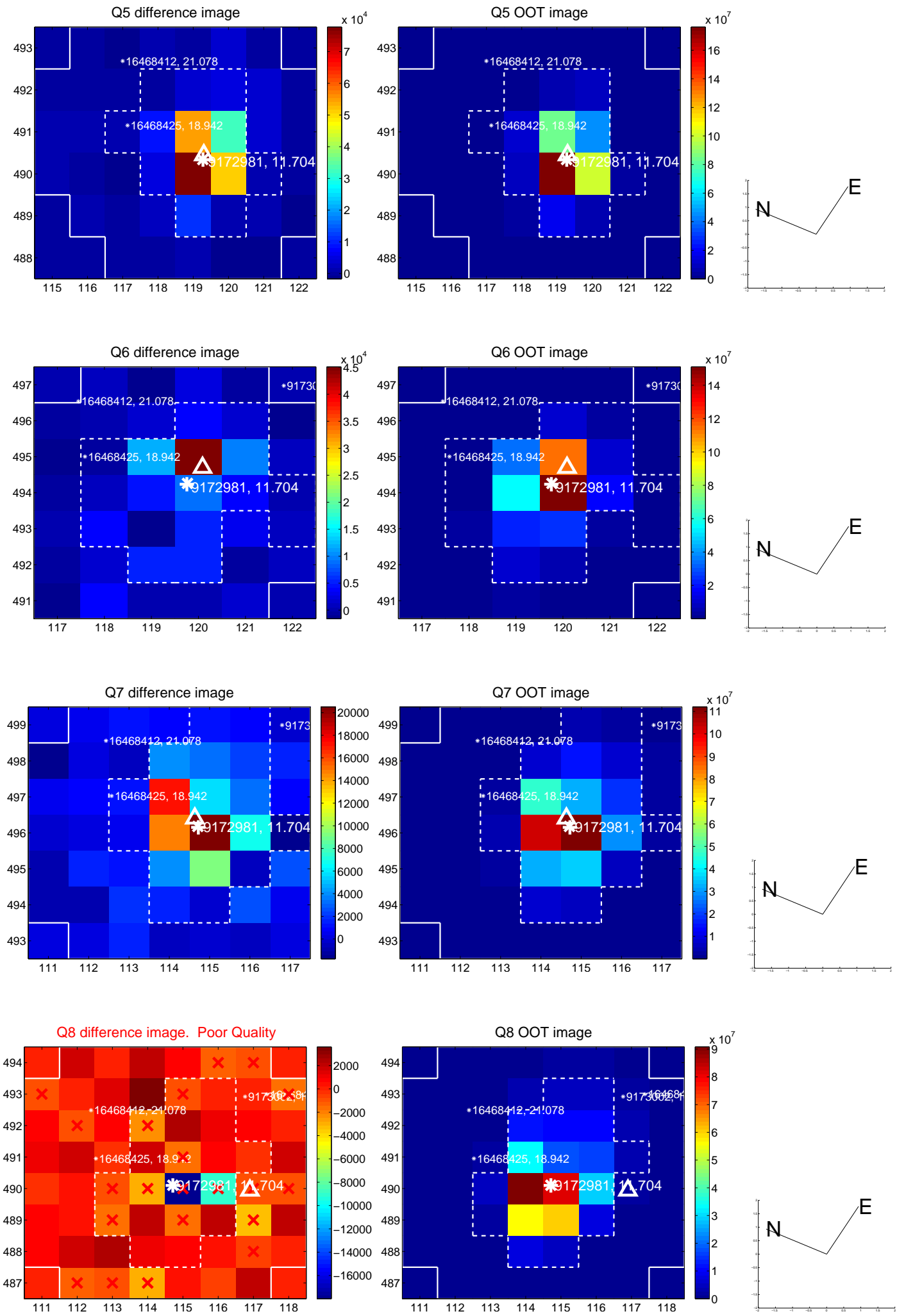


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

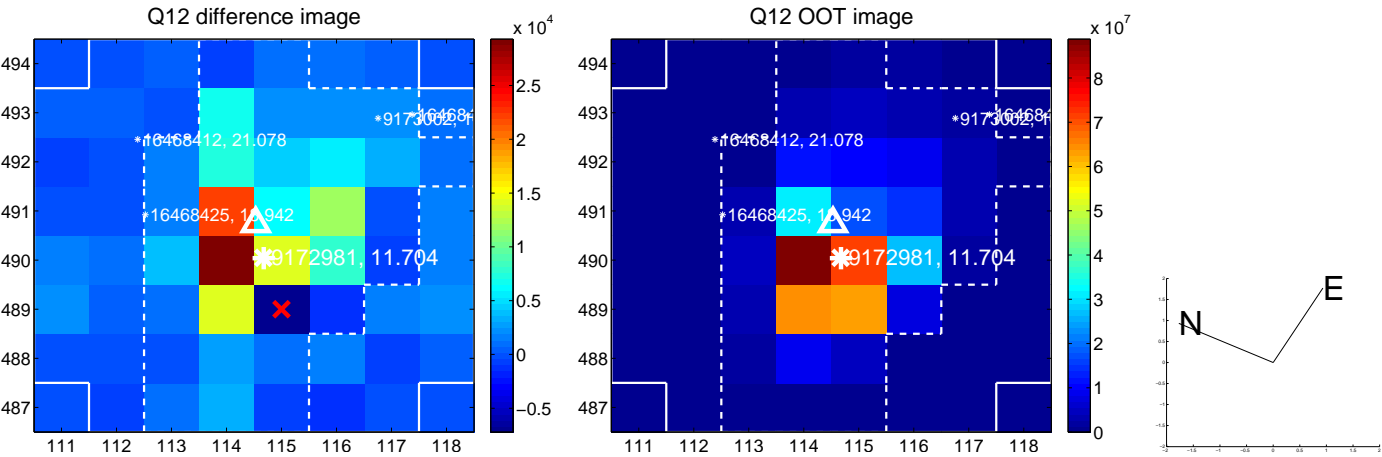
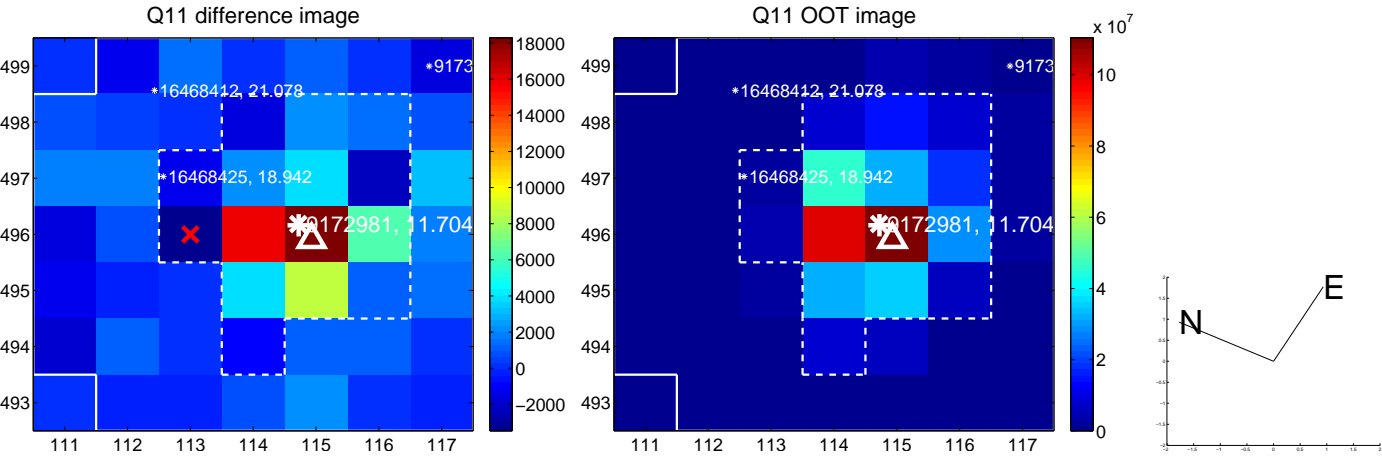
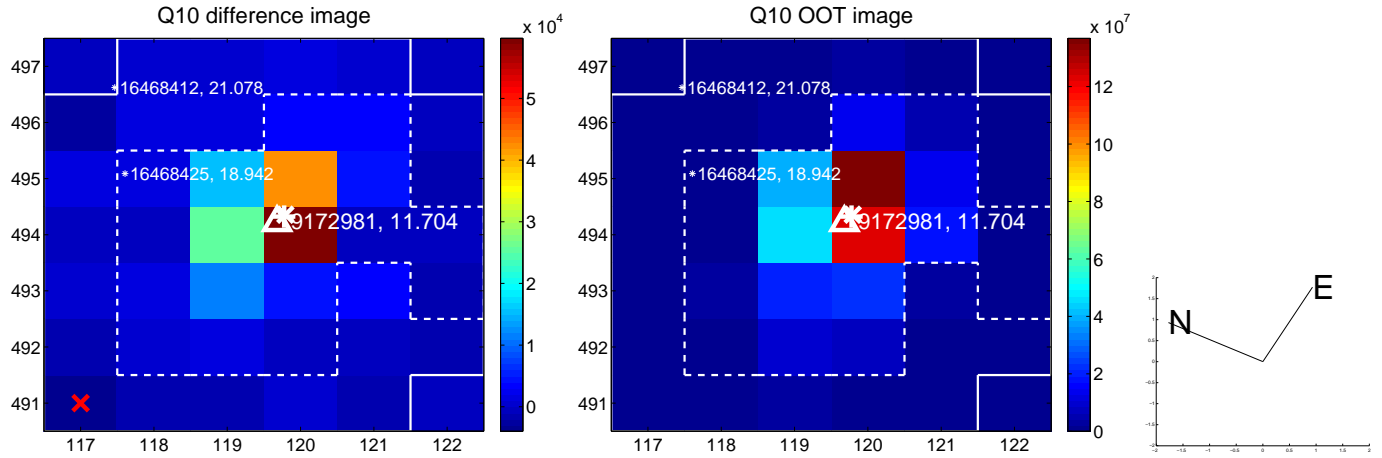
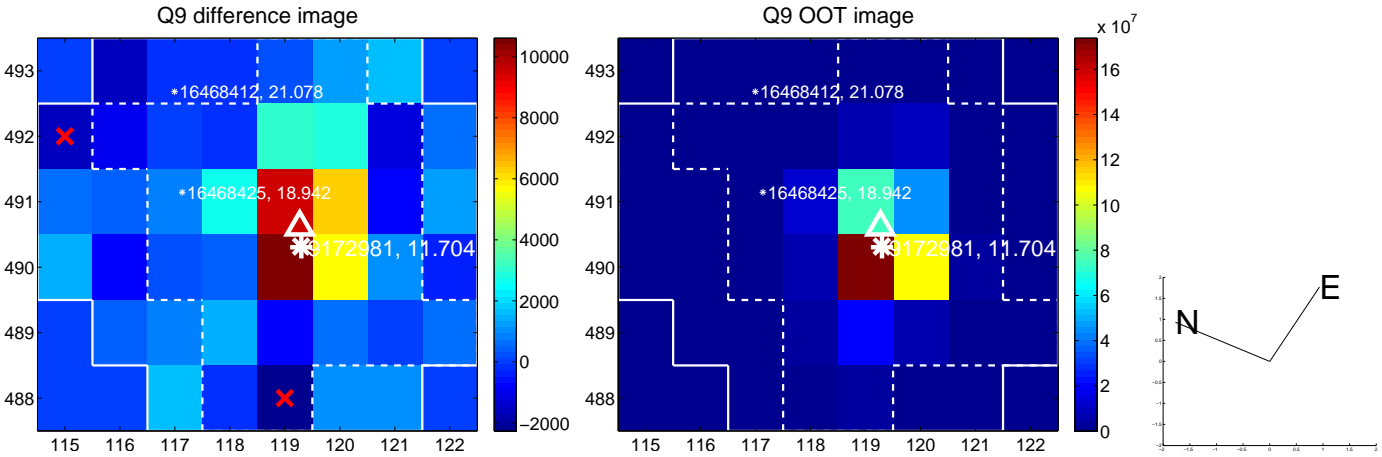
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



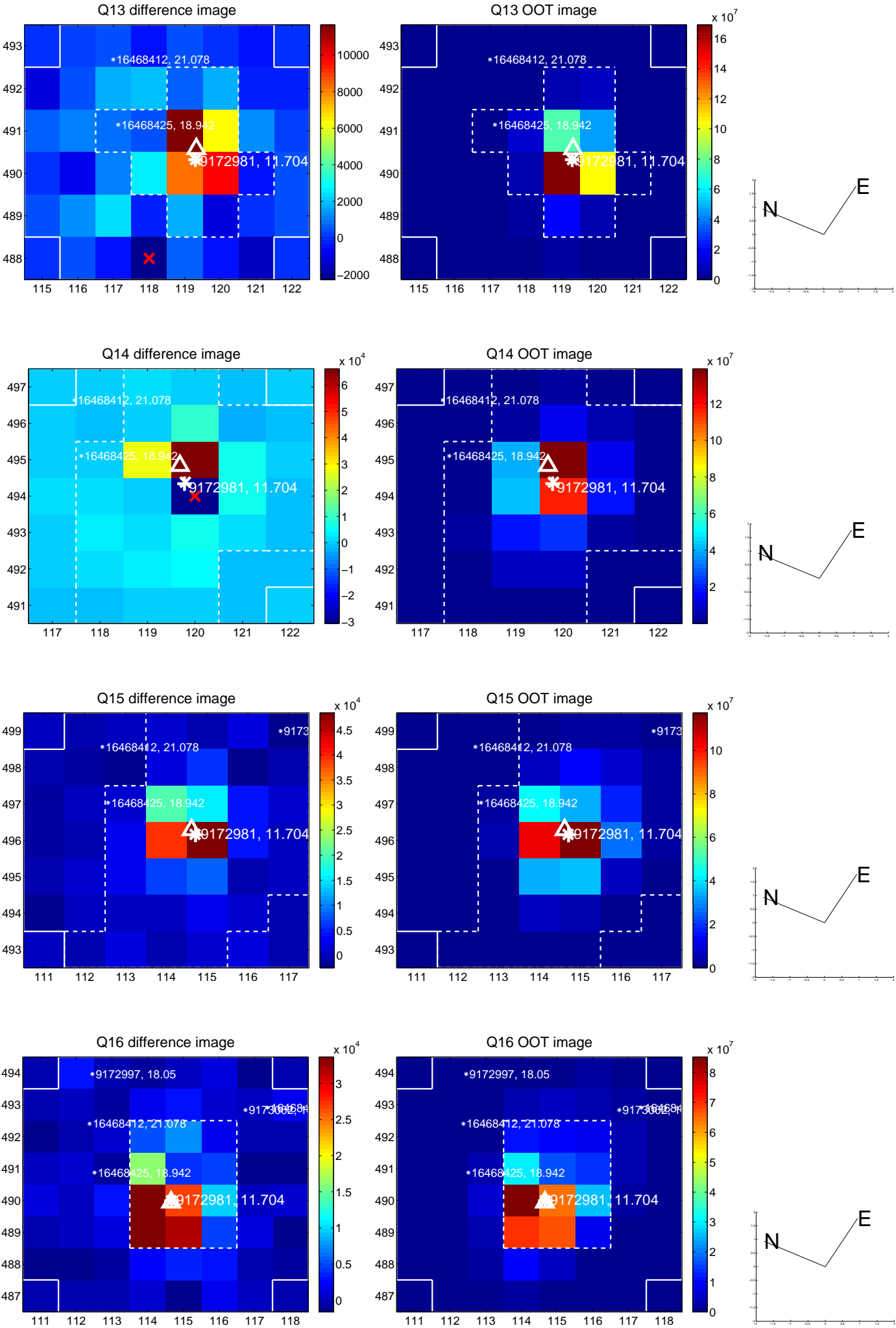
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



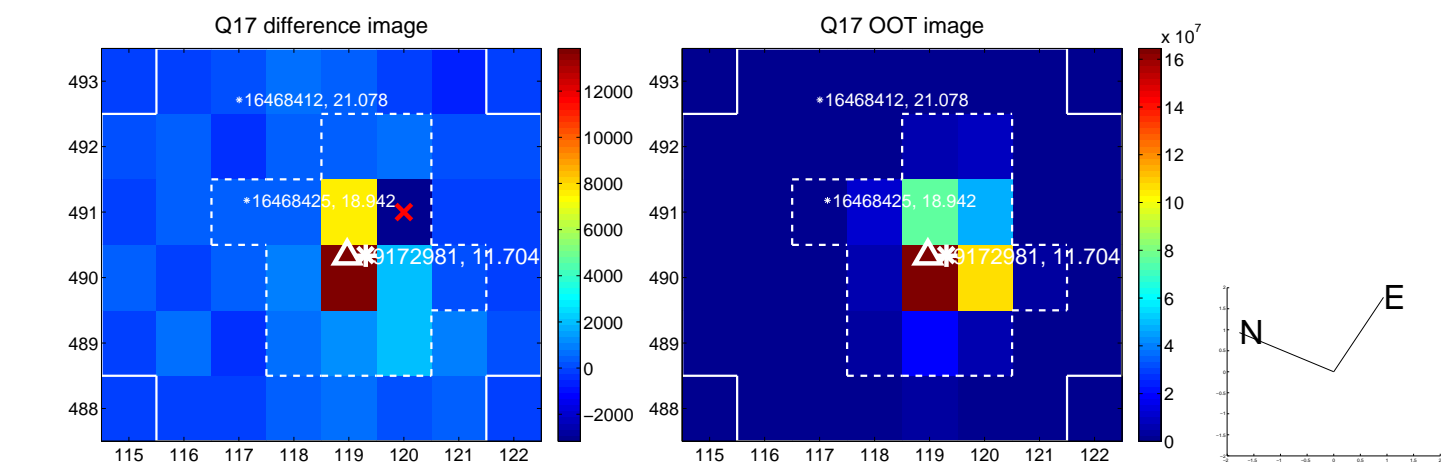
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



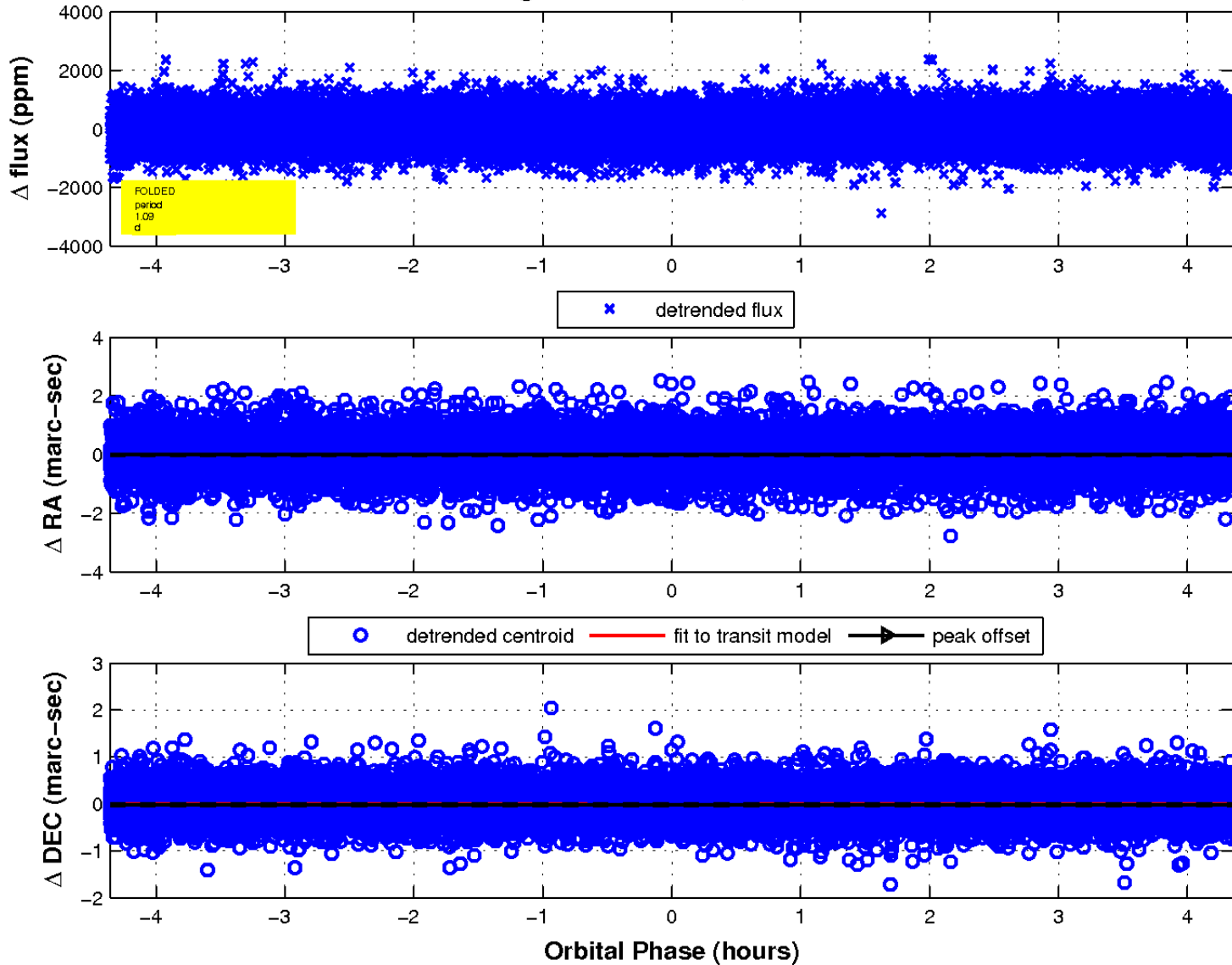
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

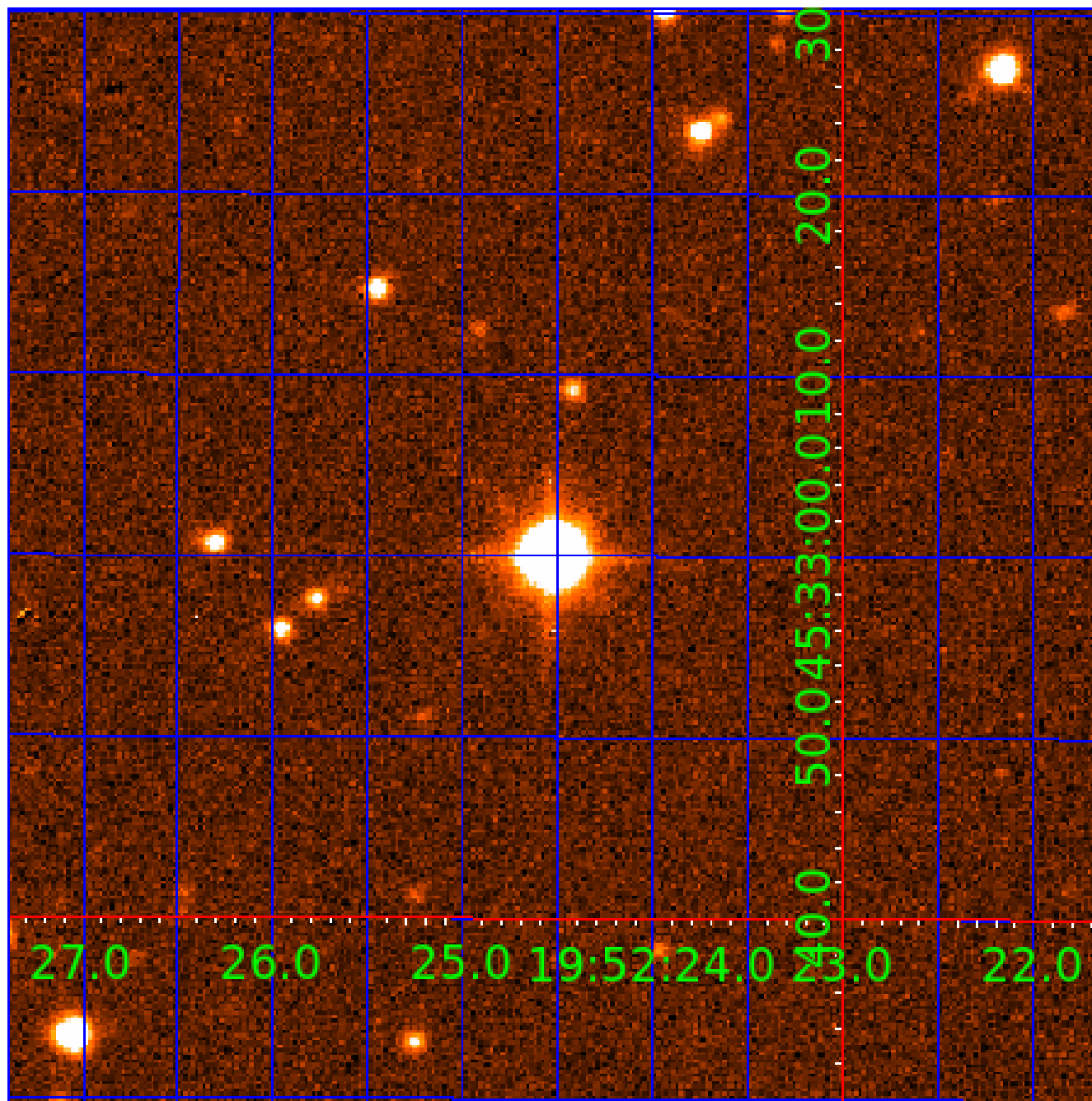


### fluxWeightedCentroids, Planet 1 of 2



UKIRT Image

Declination



# KIC 009172981

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009172981-01	OBS	No	1.091576	132.554100	61.9	1.452	10.1	8.3	2.37	7659	2.19	27797.74
009172981-02	OBS	No	0.664760	132.110819	33.4	4.615	9.2	7.1	2.37	7659	1.40	53851.20

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009172981-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT
009172981-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV

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

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

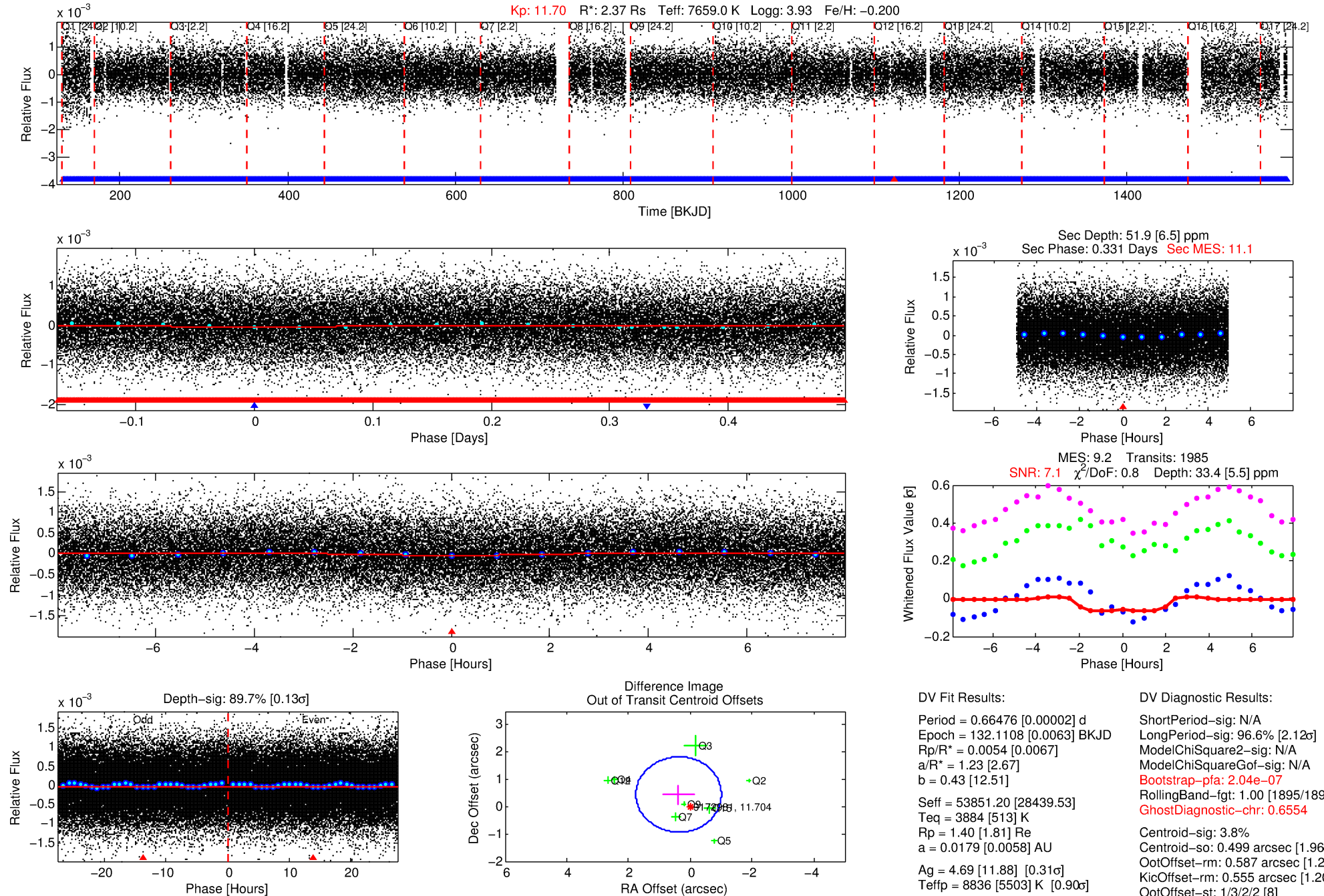
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009172981-02

No Significant Match Found

# DV One-Page Summary

KIC: 9172981 Candidate: 2 of 2 Period: 0.665 d



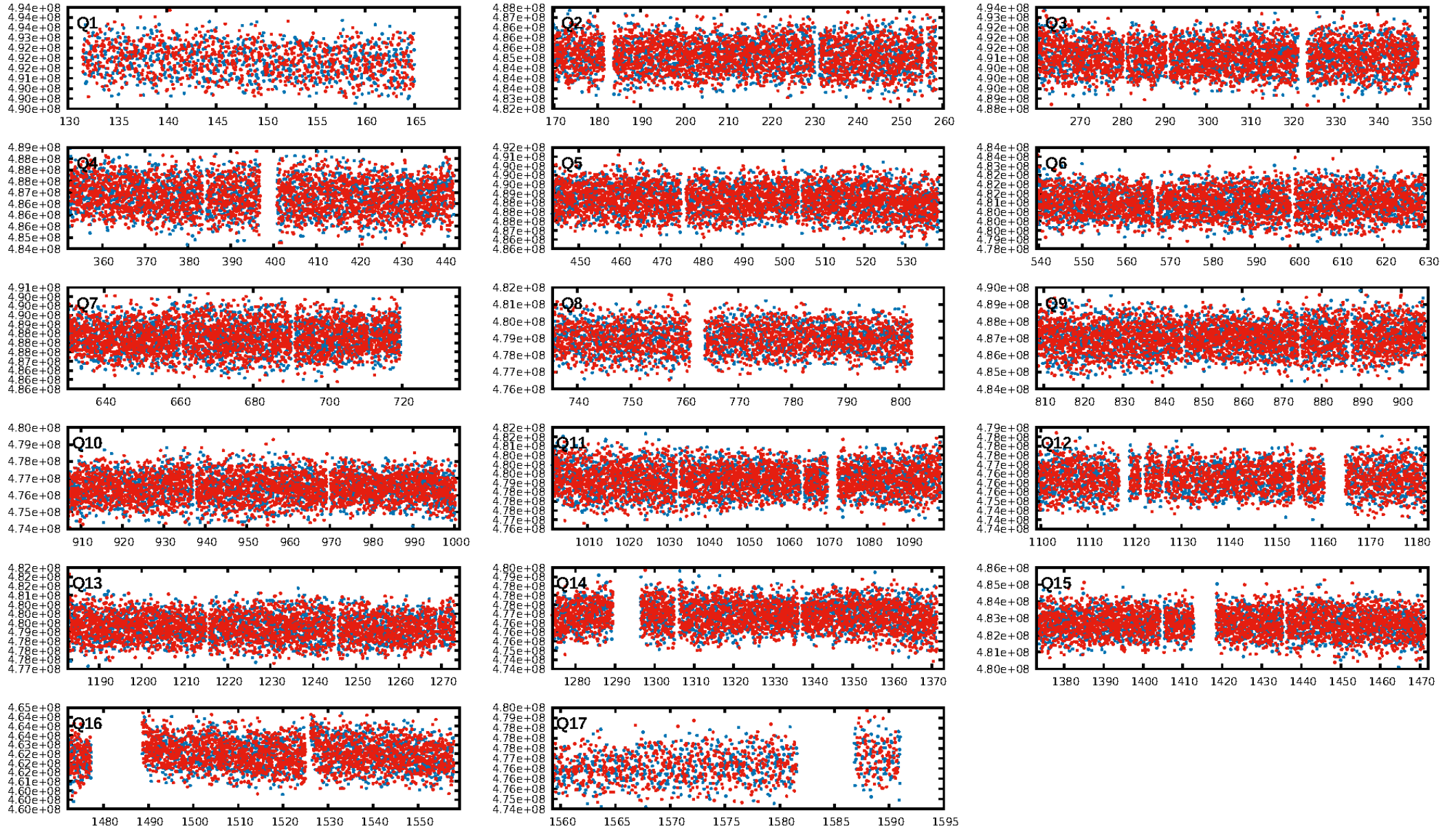
## DV Fit Results:

Period = 0.66476 [0.00002] d  
Epoch = 132.1108 [0.0063] BKJD  
Rp/R\* = 0.0054 [0.0067]  
a/R\* = 1.23 [2.67]  
b = 0.43 [12.51]  
Seff = 53851.20 [28439.53]  
Teq = 3884 [513] K  
Rp = 1.40 [1.81] Re  
a = 0.0179 [0.0058] AU  
Ag = 4.69 [11.88] [0.31σ]  
Teffp = 8836 [5503] K [0.90σ]

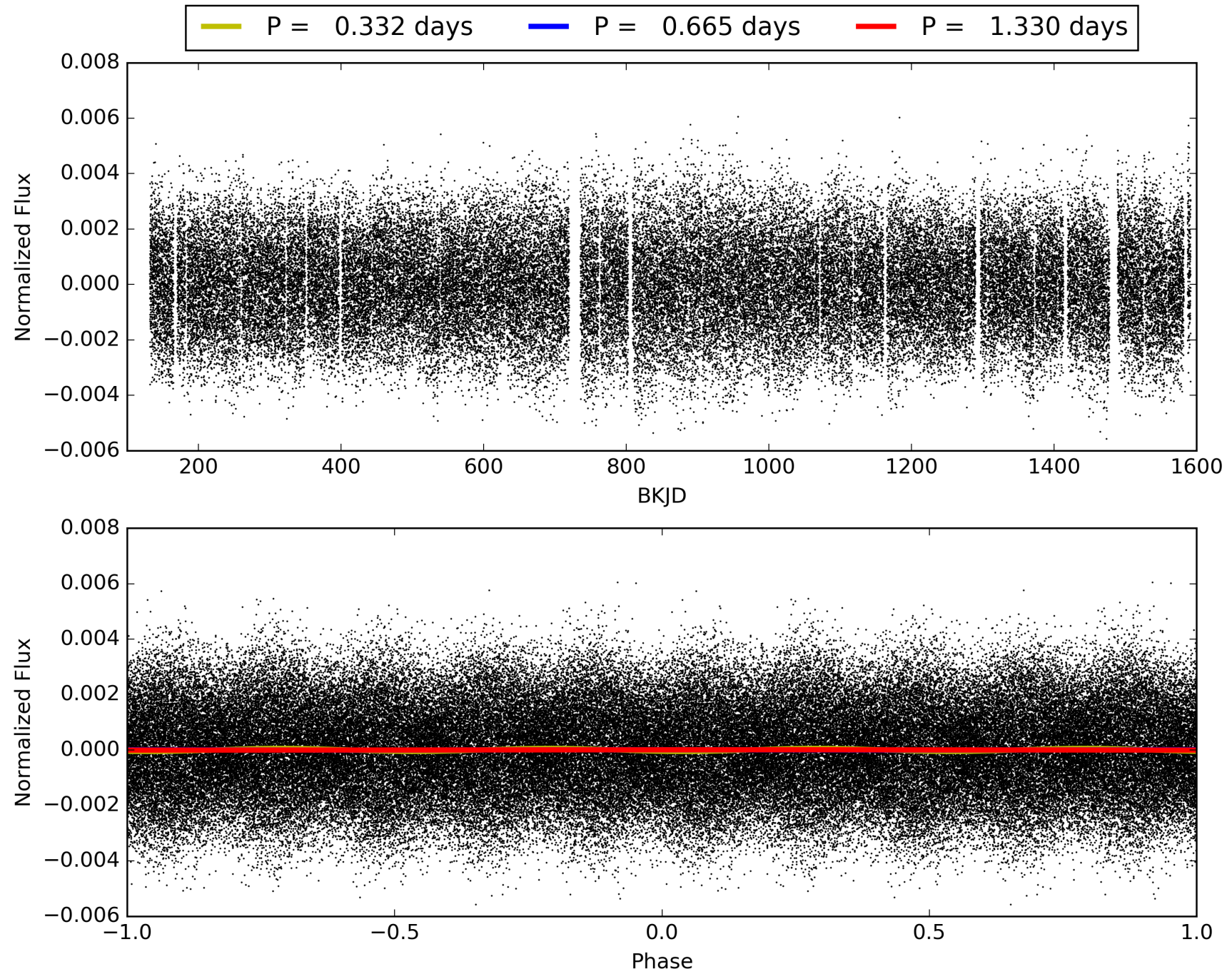
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 96.6% [2.12σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 2.04e-07  
RollingBand-fgt: 1.00 [1895/1896]  
GhostDiagnostic-chr: 0.6554  
Centroid-sig: 3.8%  
Centroid-so: 0.499 arcsec [1.96σ]  
OotOffset-rm: 0.587 arcsec [1.27σ]  
KicOffset-rm: 0.555 arcsec [1.20σ]  
OotOffset-st: 1/3/2/2 [8]  
KicOffset-st: 1/3/2/2 [8]  
DiffImageQuality-fgm: 0.38 [3/8]  
DiffImageOverlap-fno: 1.00 [17/17]

# TCE 009172981-02, PDC Light Curves

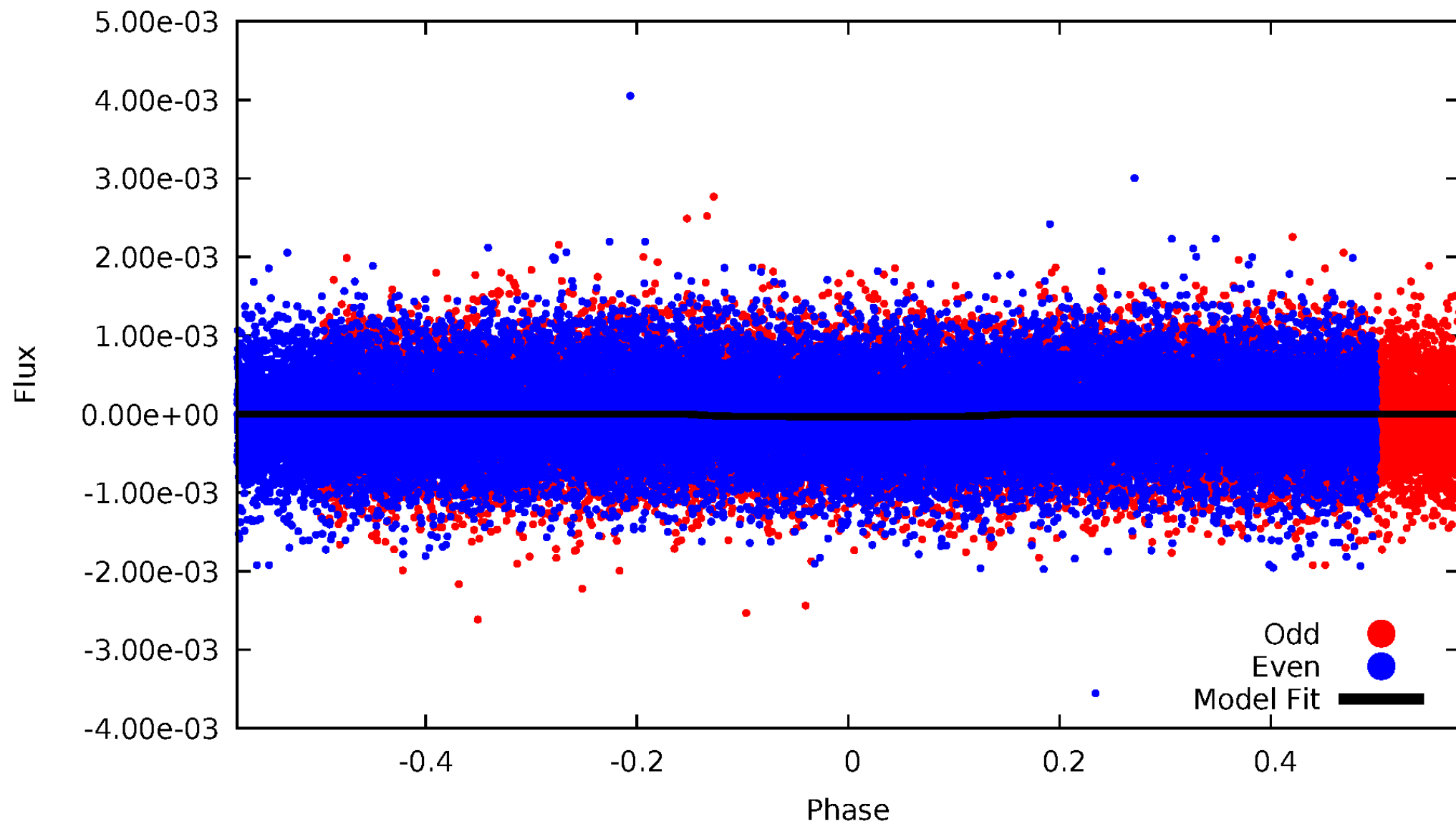


TCE 009172981-02



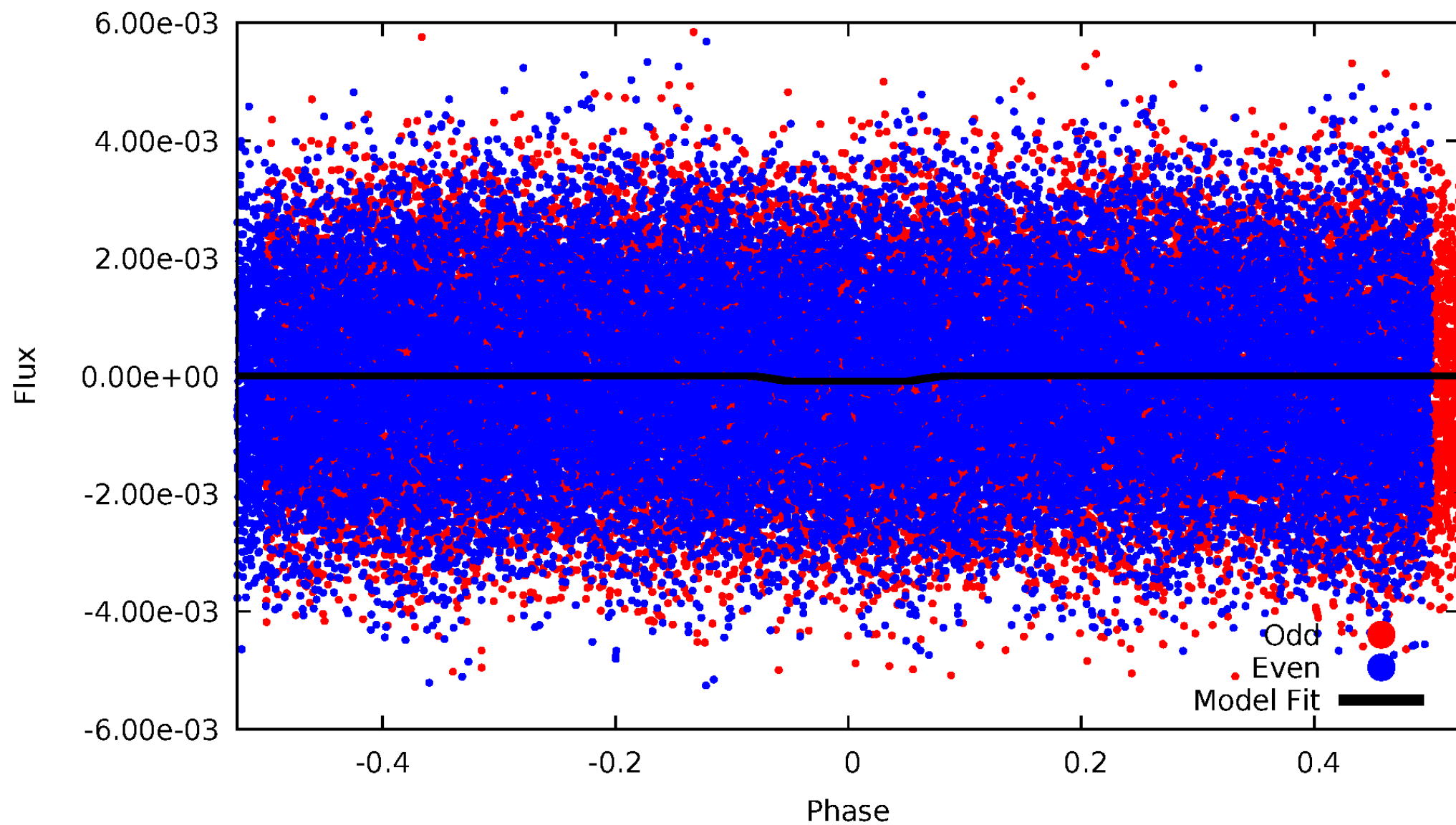
# DV Odd/Even

TCE 009172981-02



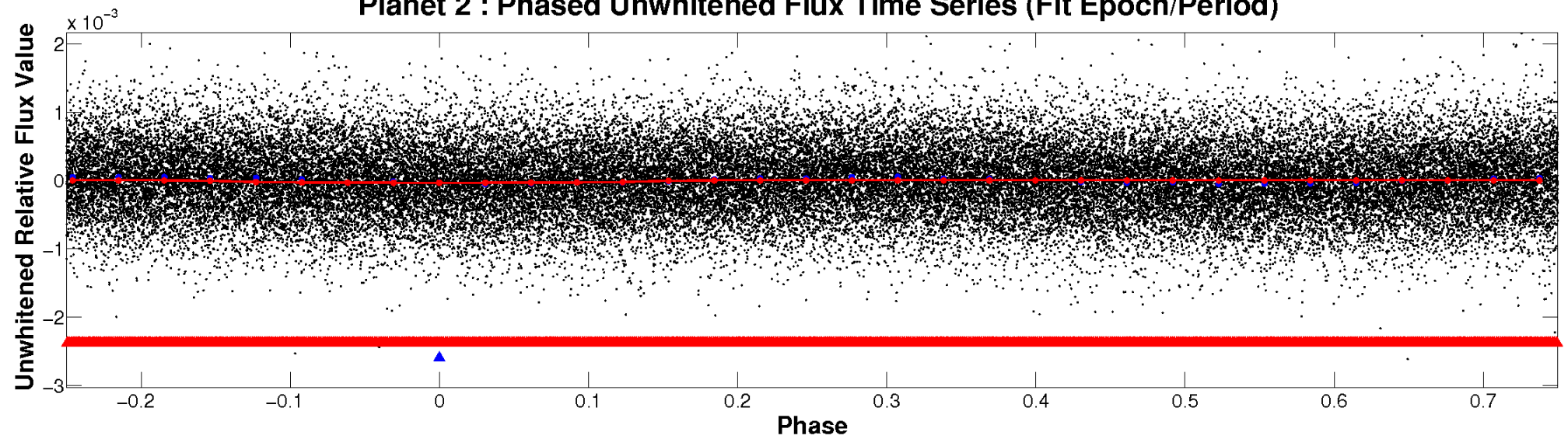
# ALT Odd/Even

TCE 009172981-02

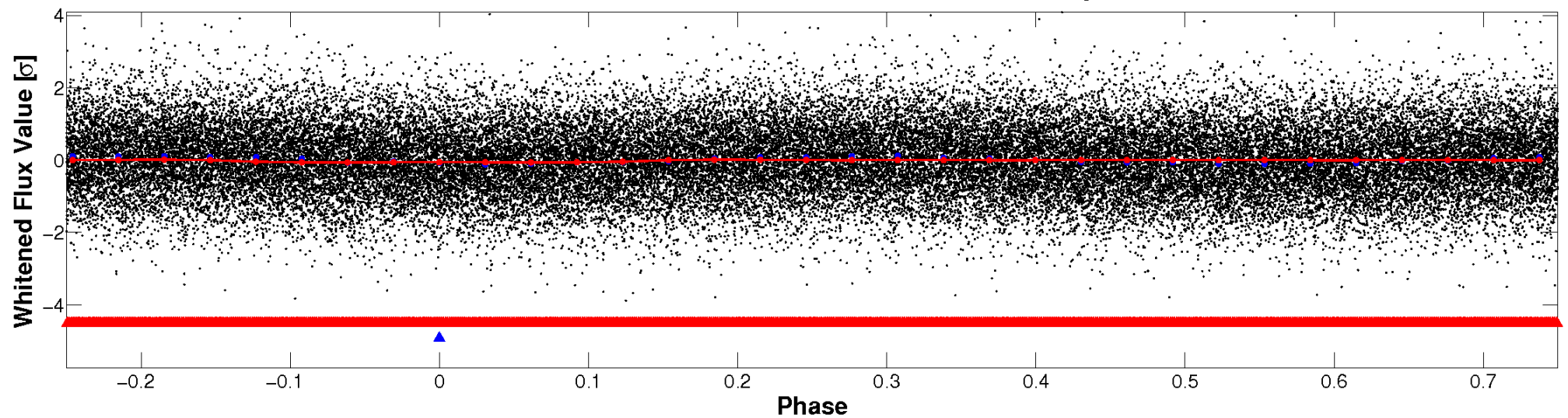


# Non-Whitened Vs. Whitened Light Curve

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

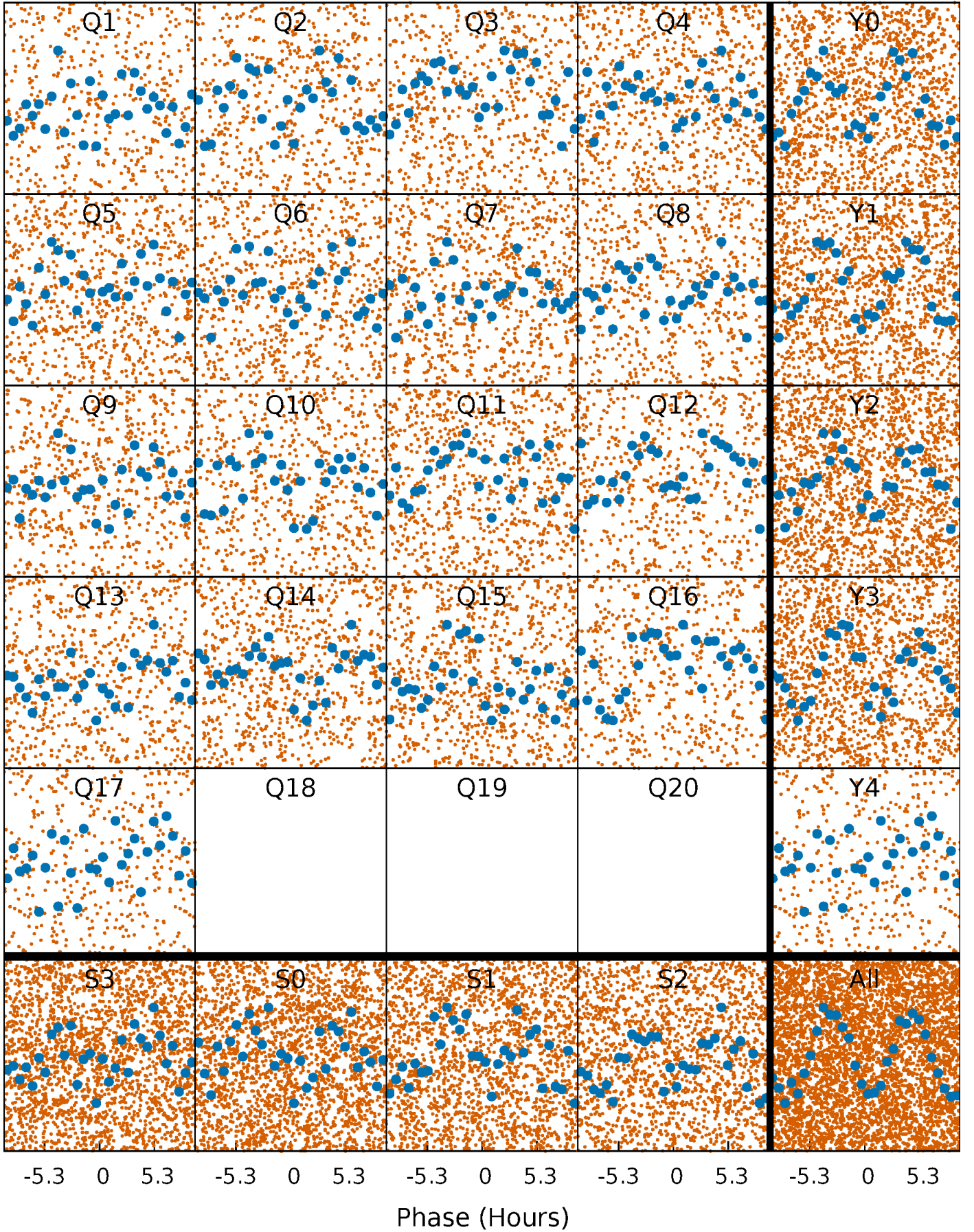


**Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



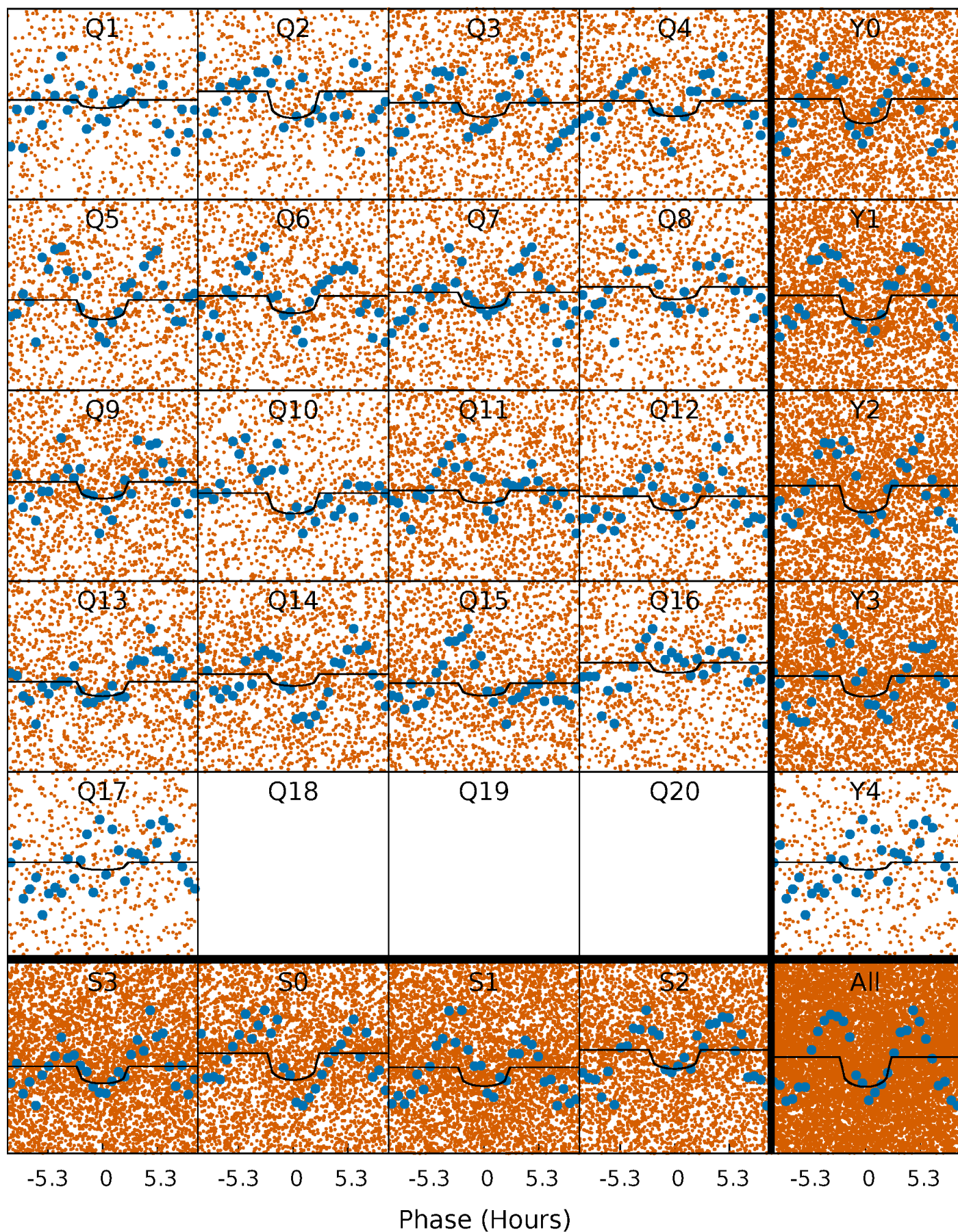
# PDC Quarter-Phased Transit Curves

TCE 009172981-02 P= 0.664760 Days  $T_0=132.110819$  (BKJD)



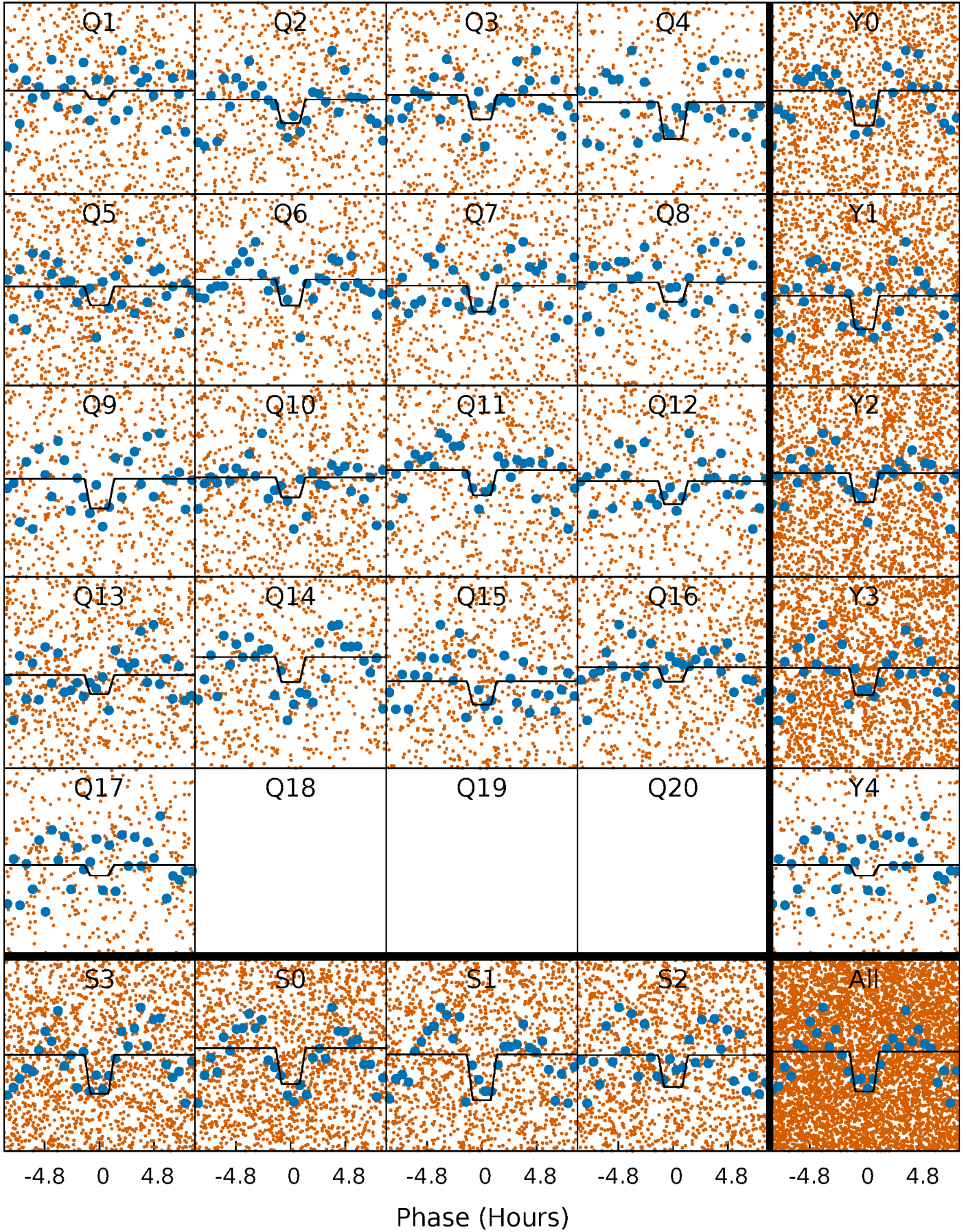
# DV Quarter-Phased Transit Curves

TCE 009172981-02   P= 0.664760 Days    $T_0=132.110819$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

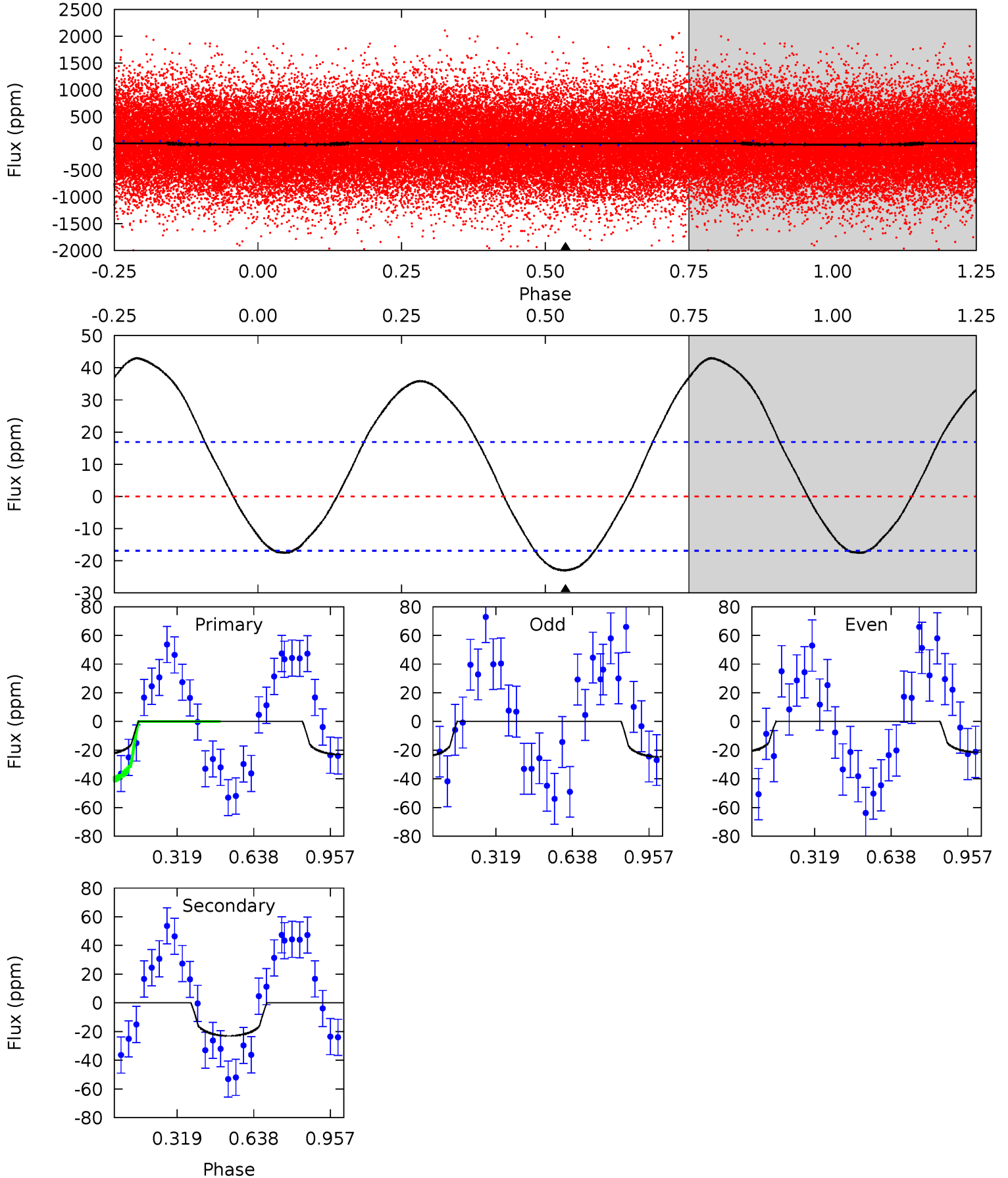
TCE 009172981-02   P= 0.664806 Days    $T_0=132.086569$  (BKJD)



# DV Model-Shift Uniqueness Test

009172981-02, P = 0.664760 Days, E = 131.446059 Days

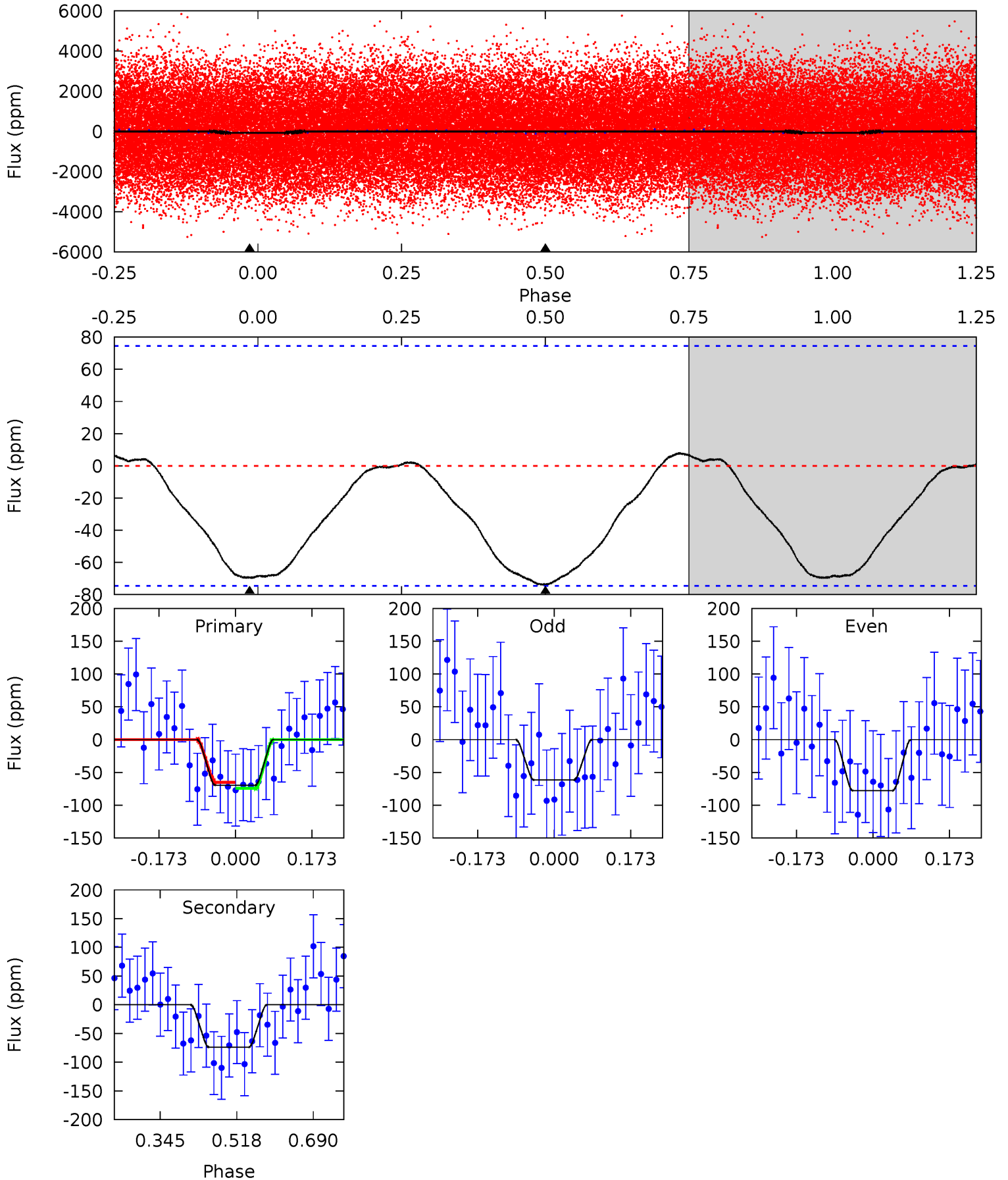
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
5.88	5.88	0	0	4.32	1.00	4.02	5.88	5.88	5.88	5.88	0.41	0.98	0.65	4.88



# Alt Model-Shift Uniqueness Test

009172981-02, P = 0.664806 Days, E = 131.421763 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
4.16	4.41	0	0	4.45	1.36	0.36	4.16	4.16	4.41	4.41	0.48	0.88	0.10	0.27



### Stellar Parameters For KIC 009172981

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7659^{+211}_{-316}$	$3.929^{+0.287}_{-0.123}$	$-0.200^{+0.200}_{-0.350}$	$2.370^{+0.459}_{-0.853}$	$1.740^{+0.166}_{-0.388}$	$0.184^{+0.357}_{-0.068}$
	+3%/-4%	+7%/-3%	+100%/-175%	+19%/-36%	+10%/-22%	+194%/-37%
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 009172981-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-23 \pm 4$	$1.65^{+1.58}_{-1.09}$	$5344^{+358}_{-520}$	$5875^{+6642}_{-2241}$	$1.462^{+11.060}_{-1.072}$
Alt.	$-74 \pm 17$	$2.51^{+1.60}_{-1.30}$	$5323^{+378}_{-462}$	$6487^{+4063}_{-1678}$	$1.986^{+6.873}_{-1.248}$

$T_{\text{max}}$  = 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

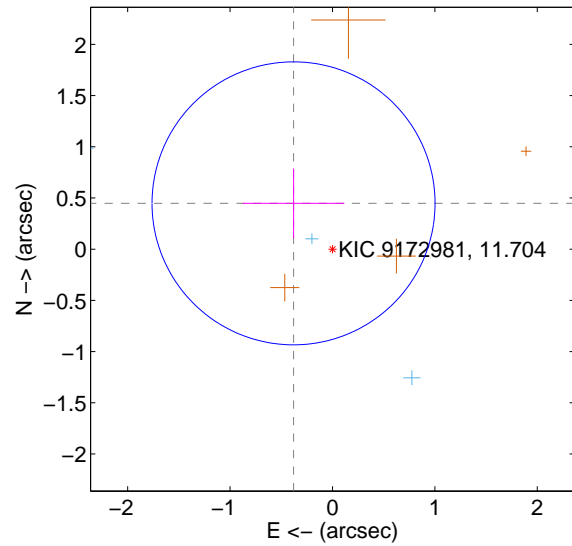
Supplemental centroid analysis for 009172981-02. **Kepler magnitude: 11.70.** Transit SNR 7.08

**There are 3 quarters with good PRF difference image offsets**

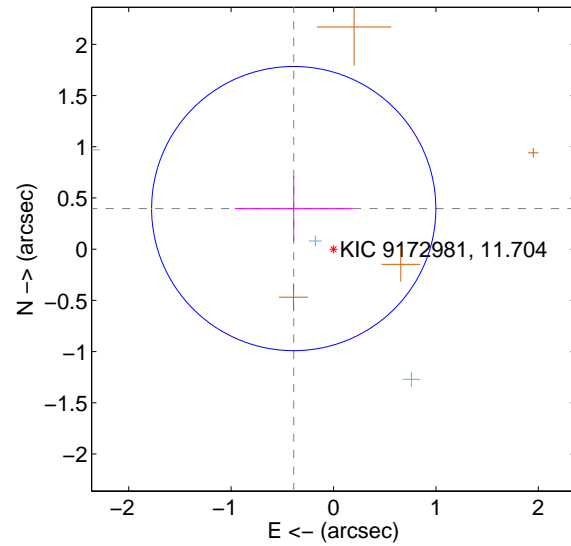
The direct PRF centroid is offset from the target star catalog position by about 0.09 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.587 \pm 0.461$	1.27	$0.380 \pm 0.496$	$0.448 \pm 0.340$
PRF-fit source offset from KIC position	$0.555 \pm 0.463$	1.20	$0.389 \pm 0.576$	$0.397 \pm 0.317$
photometric centroid source offset	$0.50 \pm 0.25$	1.96	$-0.50 \pm 0.25$	$-0.01 \pm 0.21$

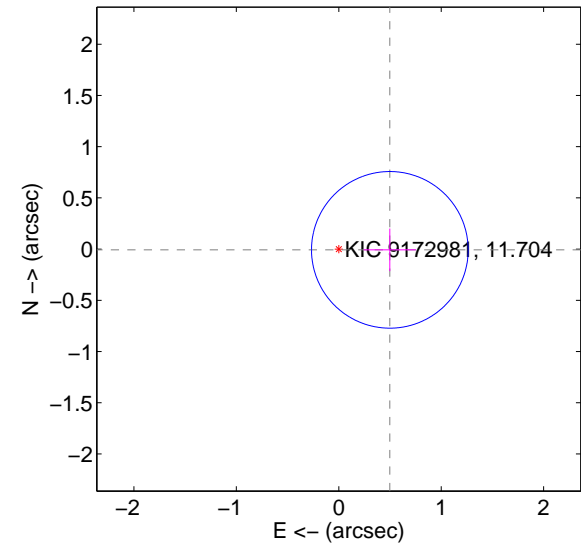
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

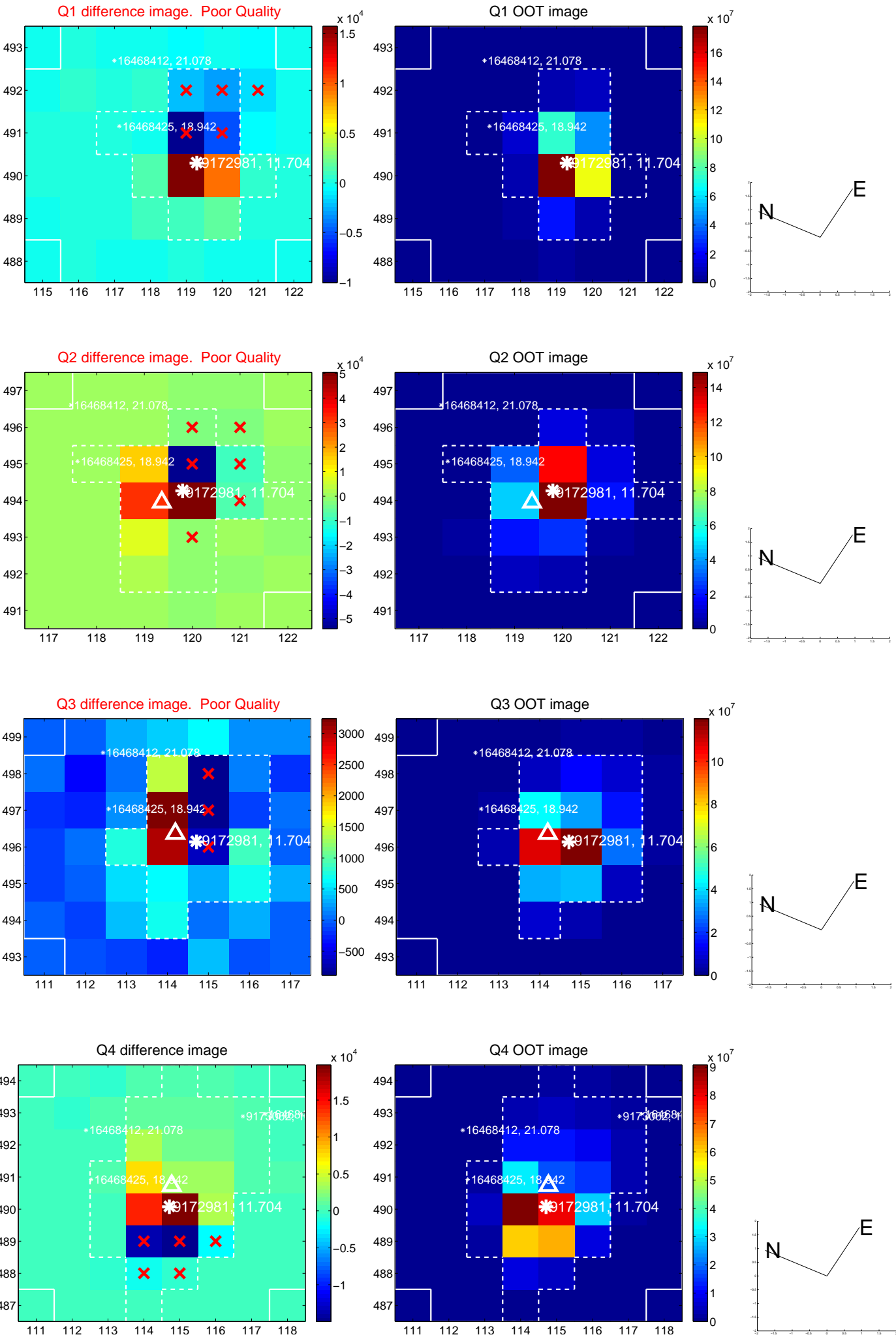


offset from photometric centroids

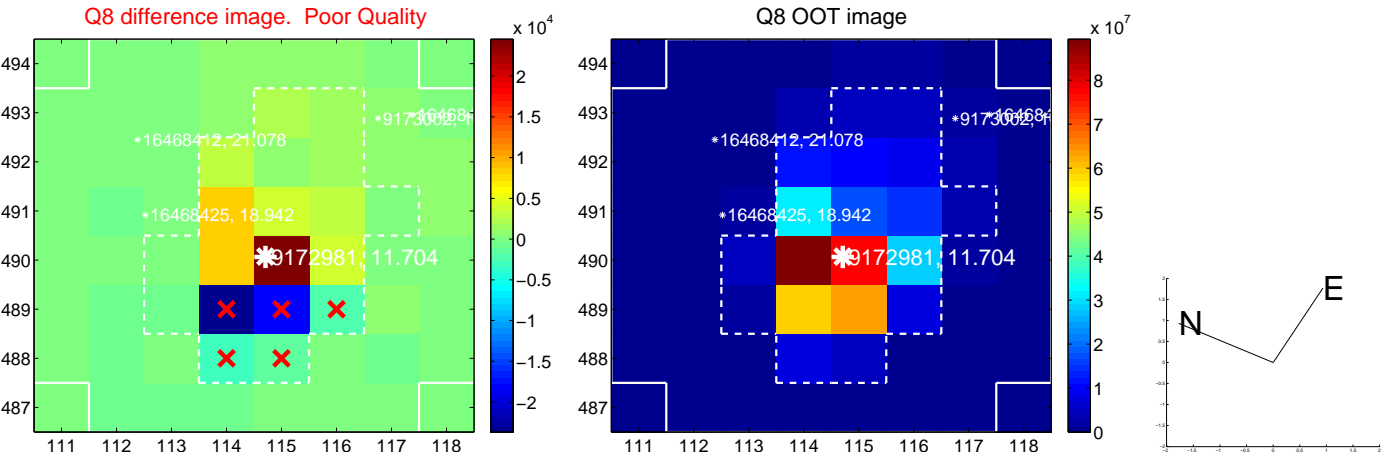
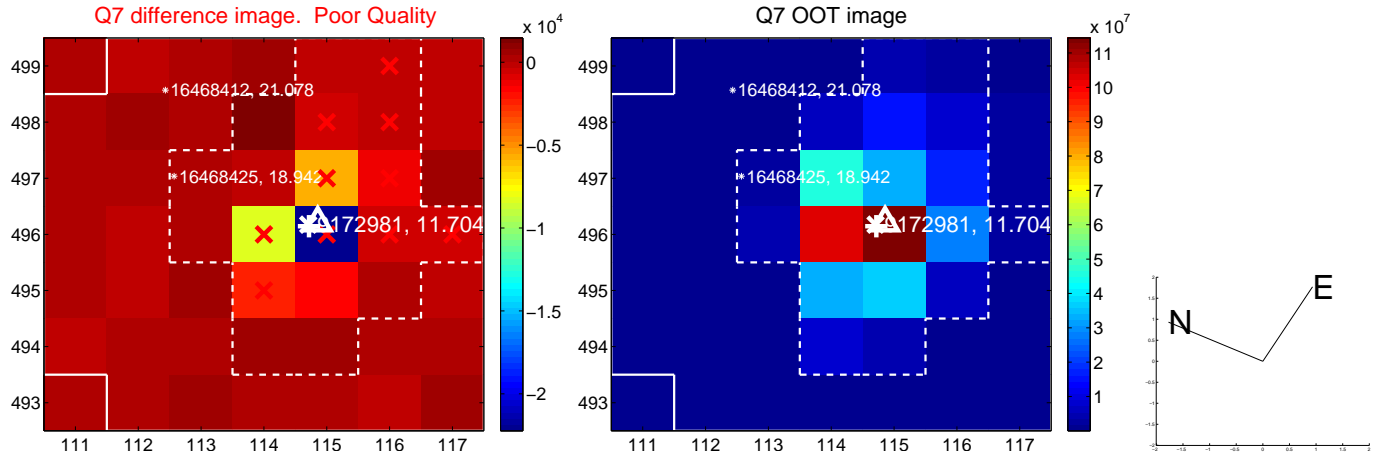
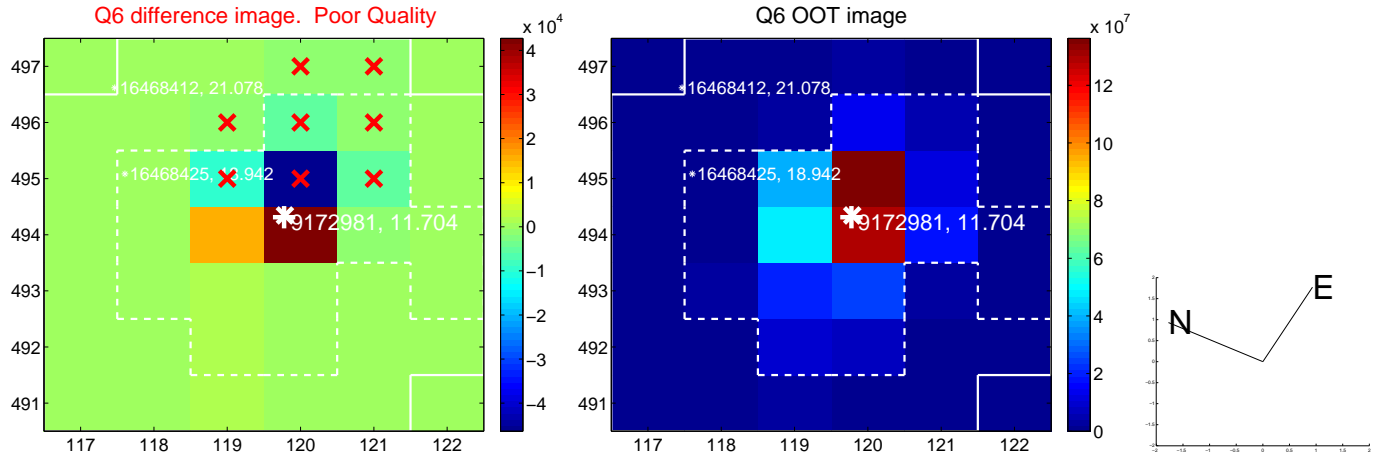
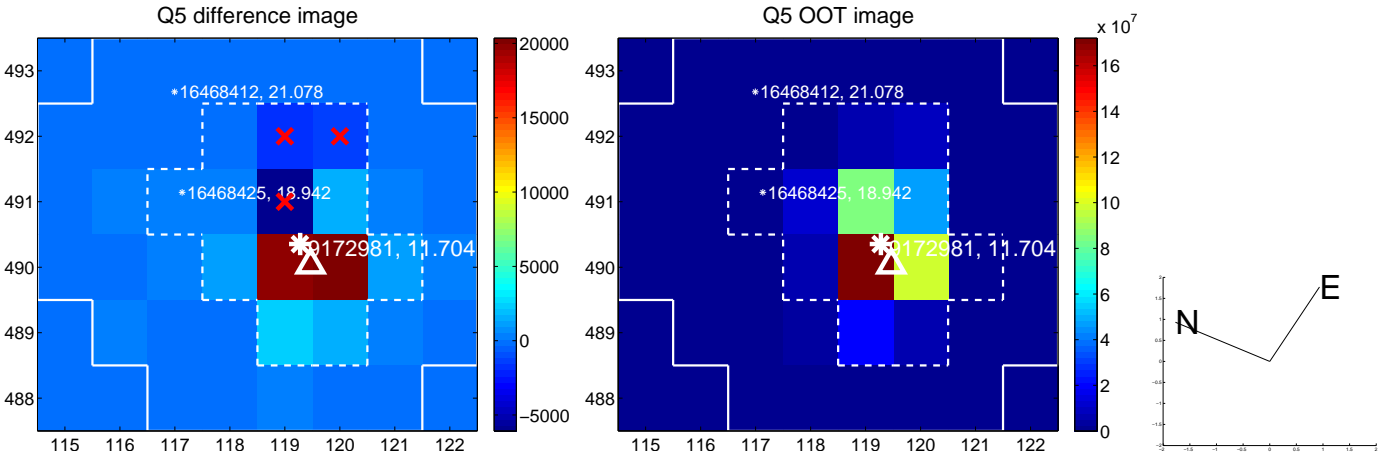


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

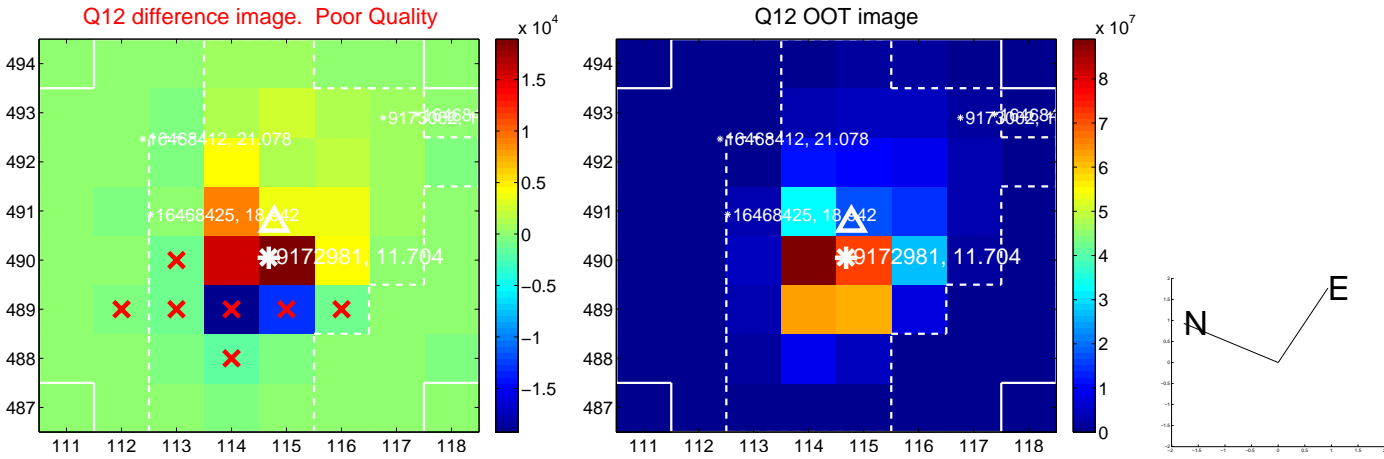
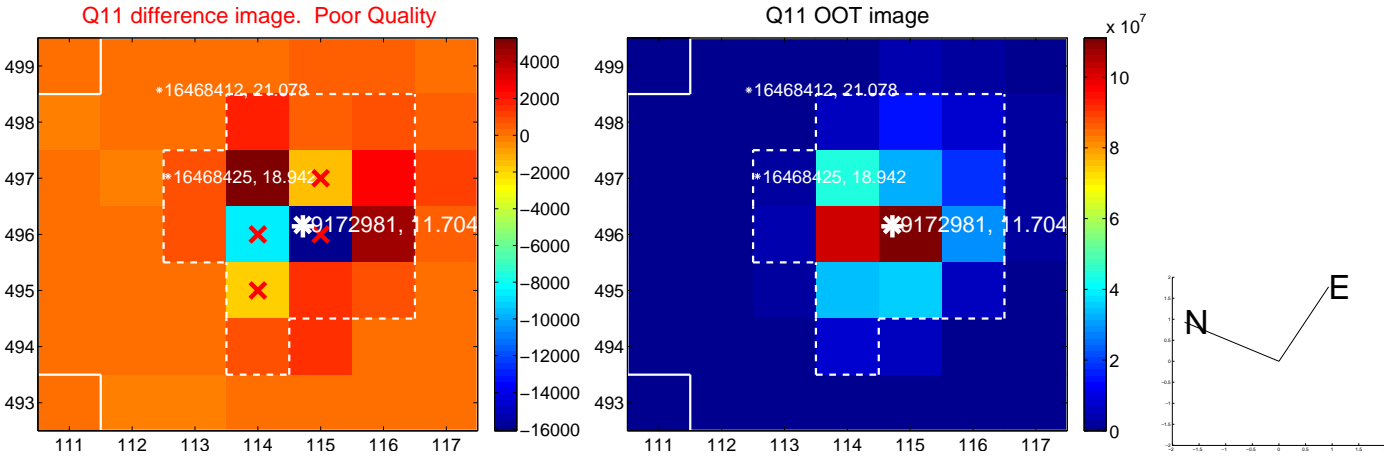
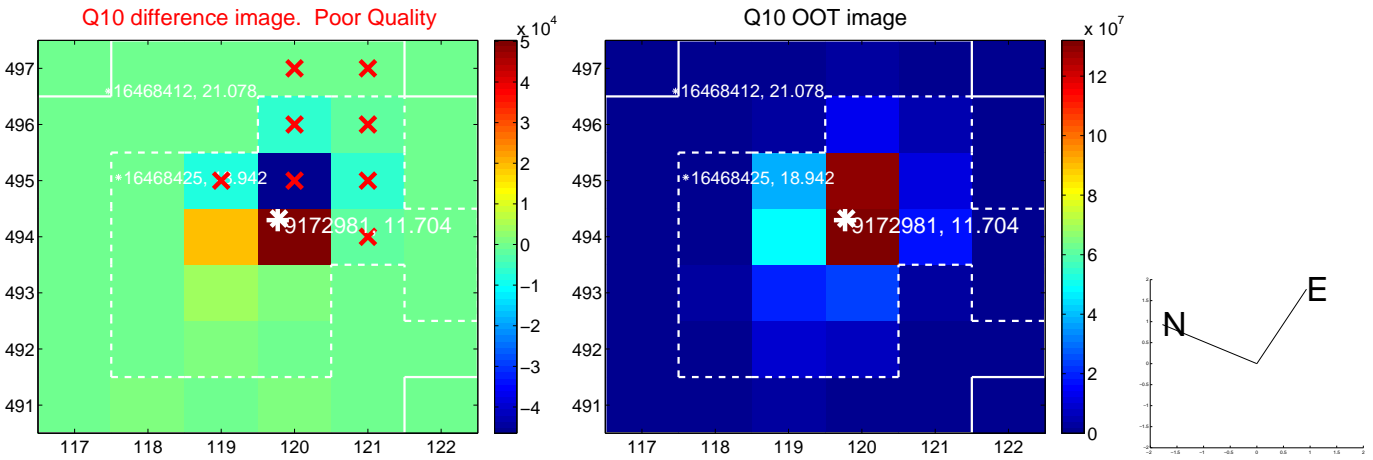
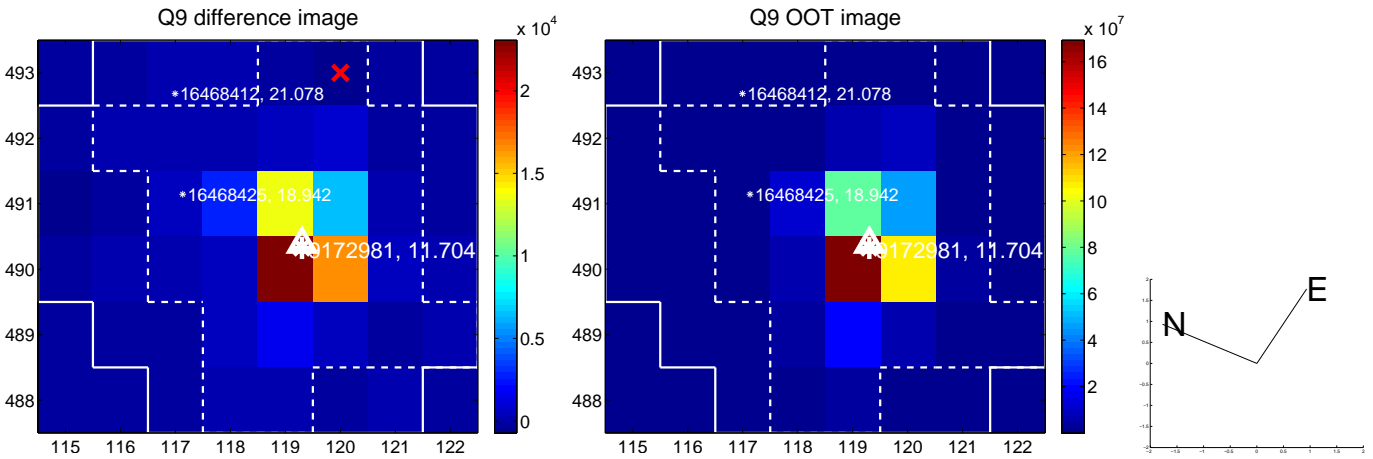
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



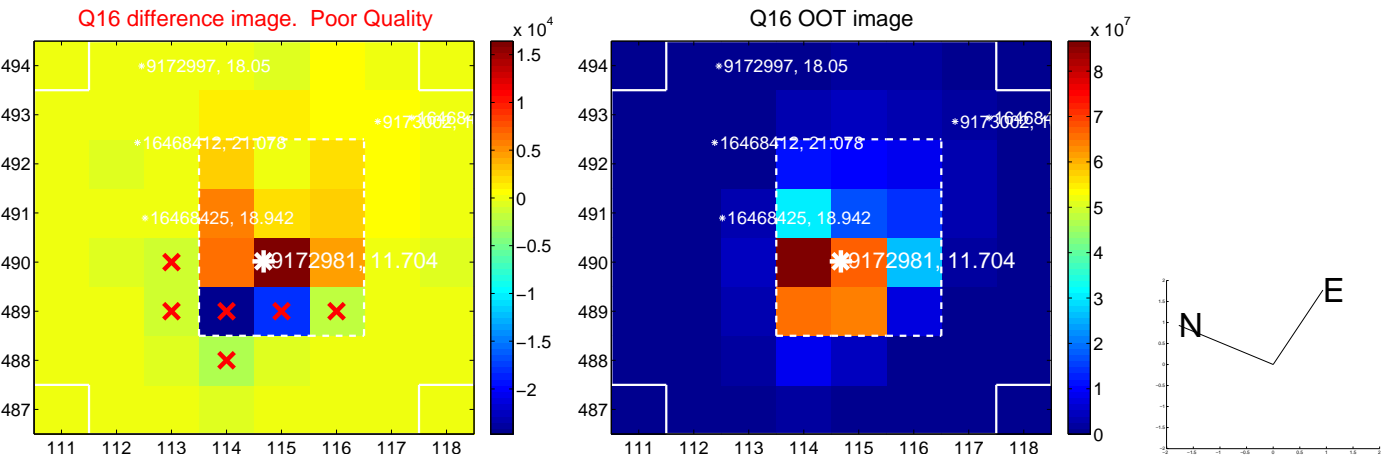
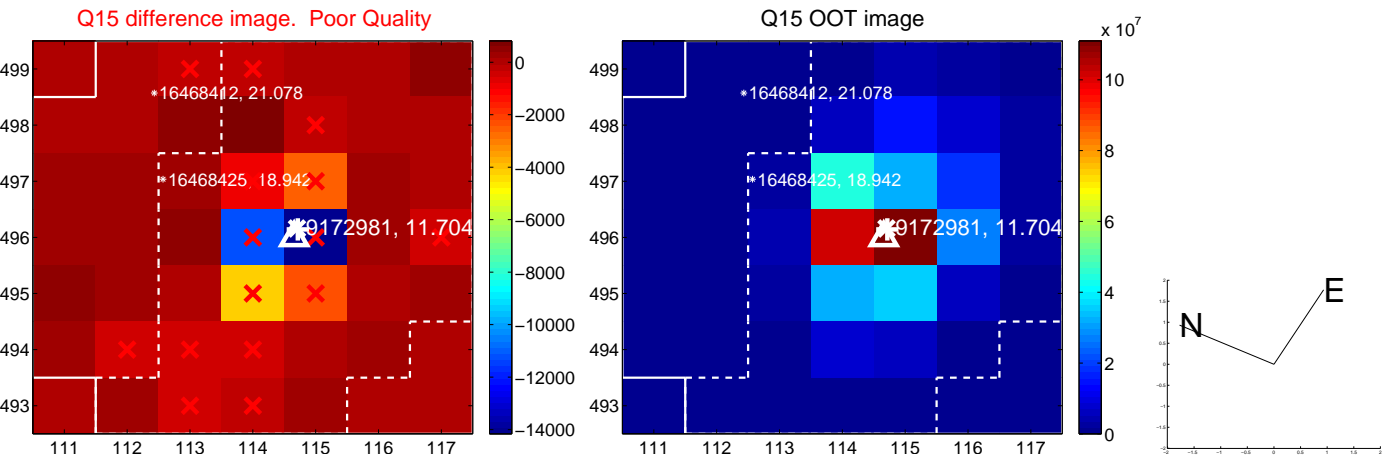
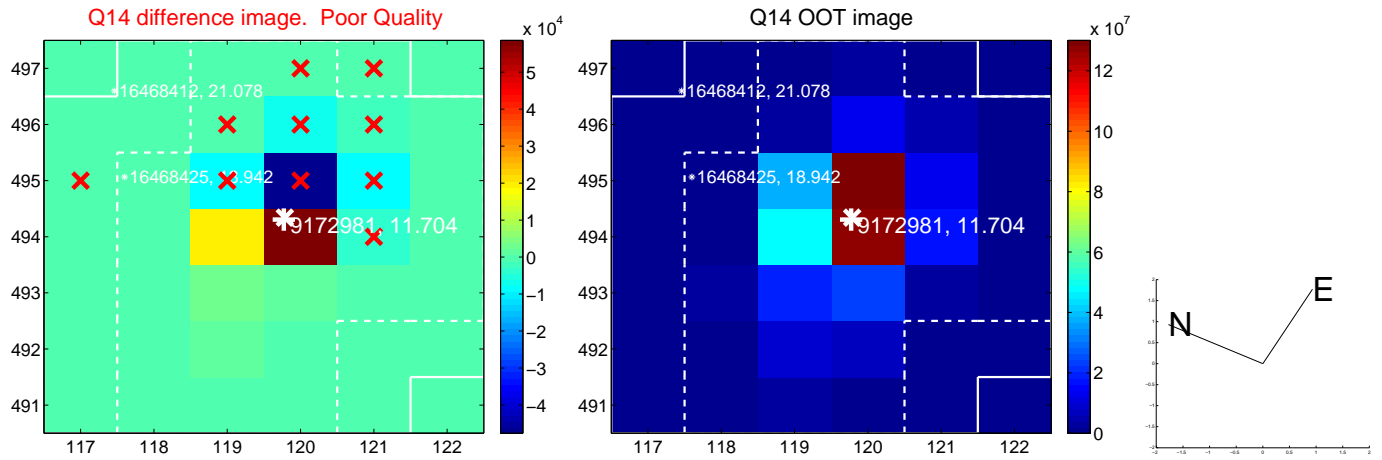
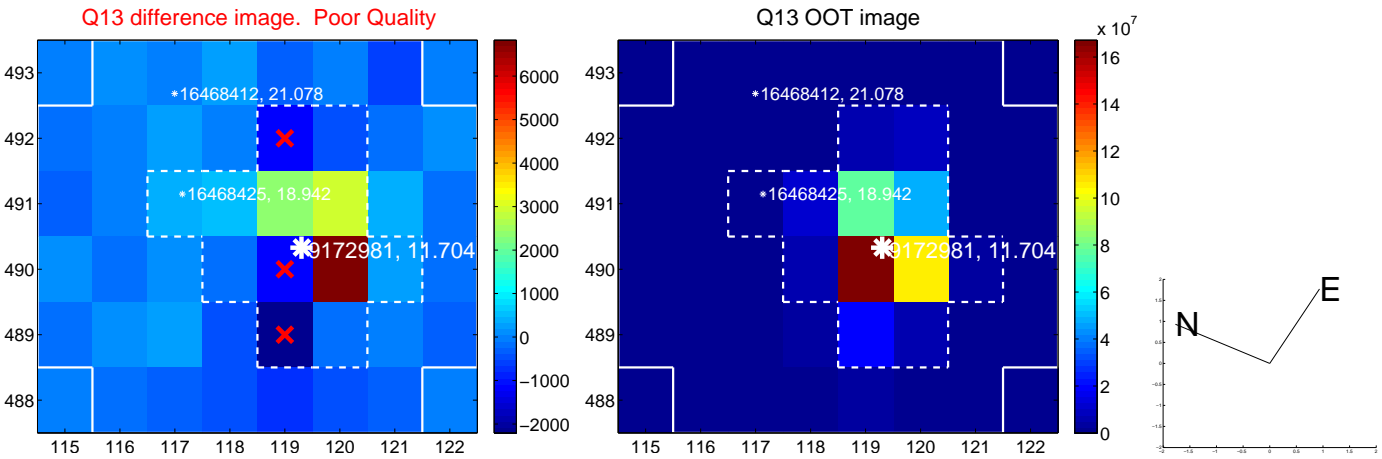
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



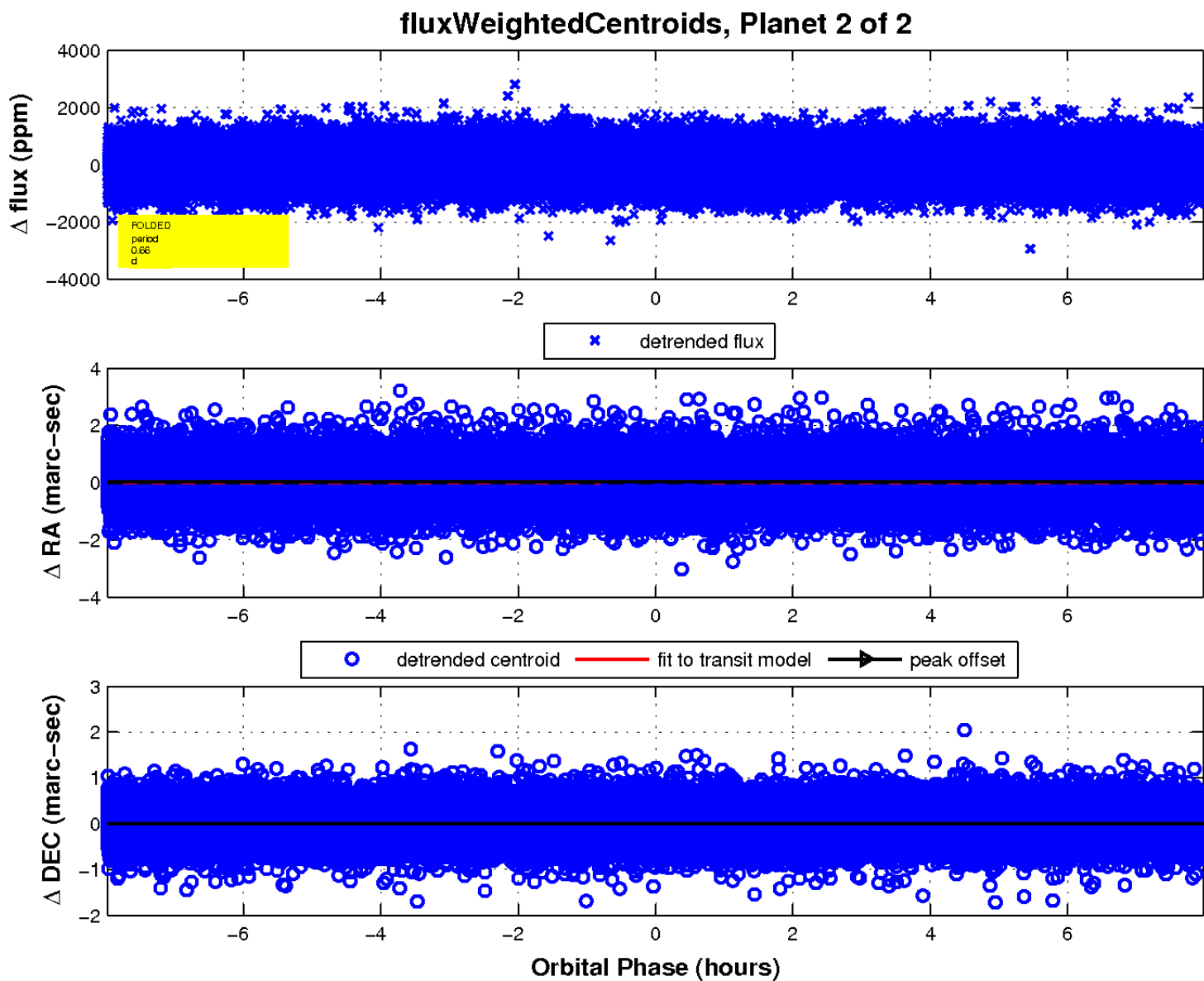
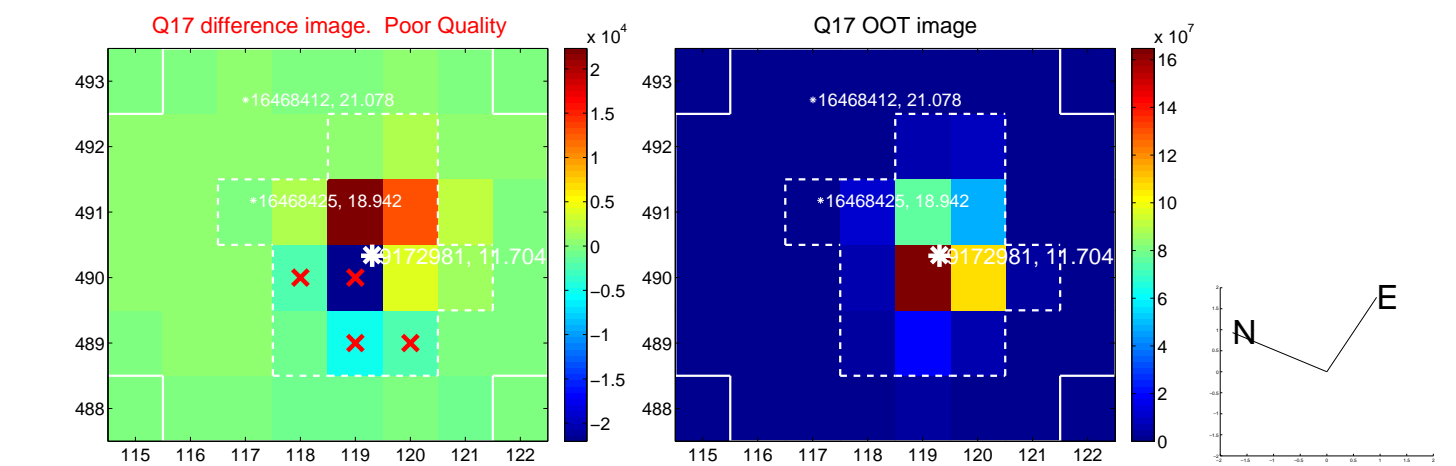
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white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination

