

# KIC 009334289

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009334289-01	OBS	0934.01	5.826650	132.225495	1541.0	3.054	61.9	69.3	1.06	5561	4.54	249.16
009334289-02	OBS	0934.03	18.746494	147.132156	764.2	4.111	19.5	21.1	1.06	5561	3.33	52.46
009334289-03	OBS	0934.02	12.412081	142.545384	605.3	4.028	18.3	20.3	1.06	5561	3.18	90.90

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009334289-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009334289-02	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009334289-03	OBS	PC	1.00	0	0	0	0	NO_COMMENT

**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.

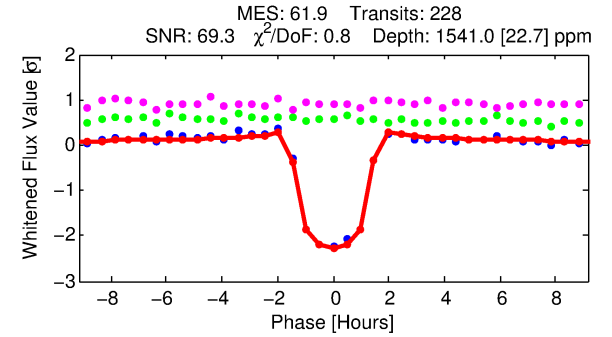
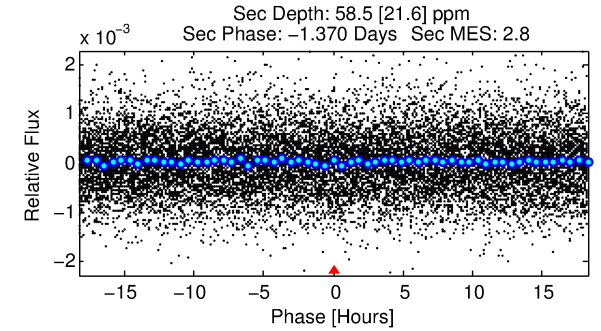
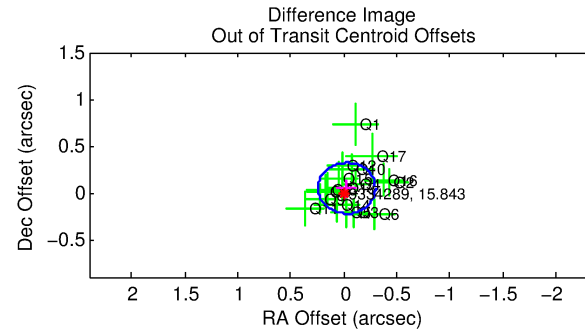
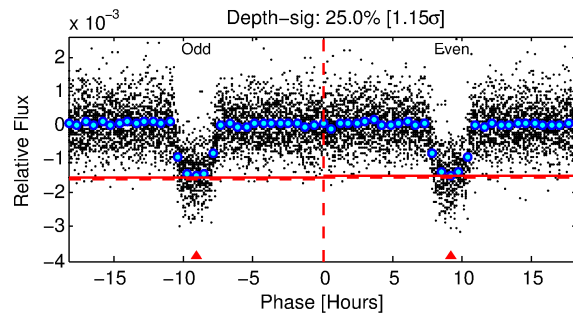
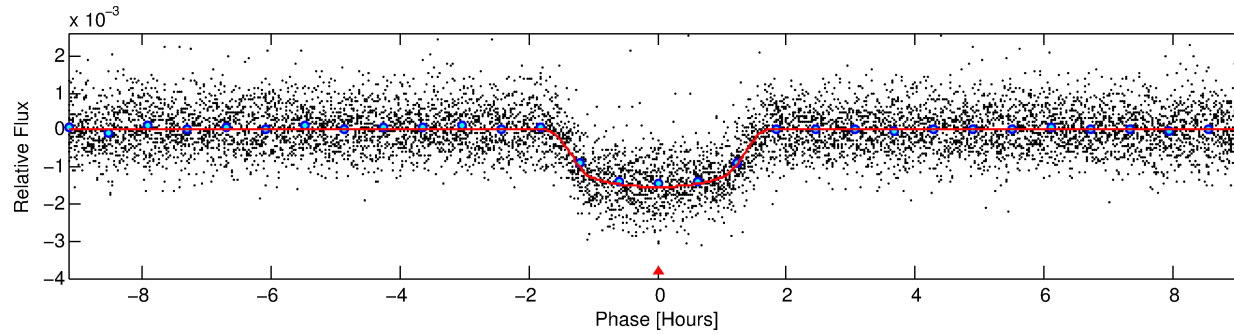
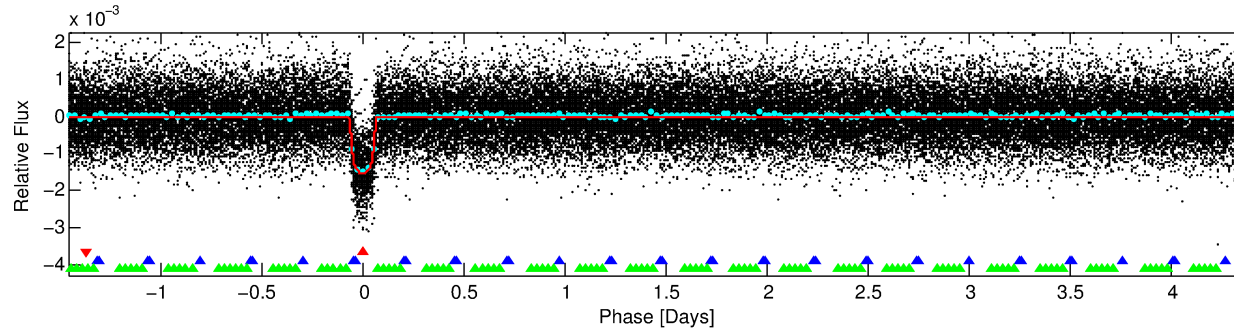
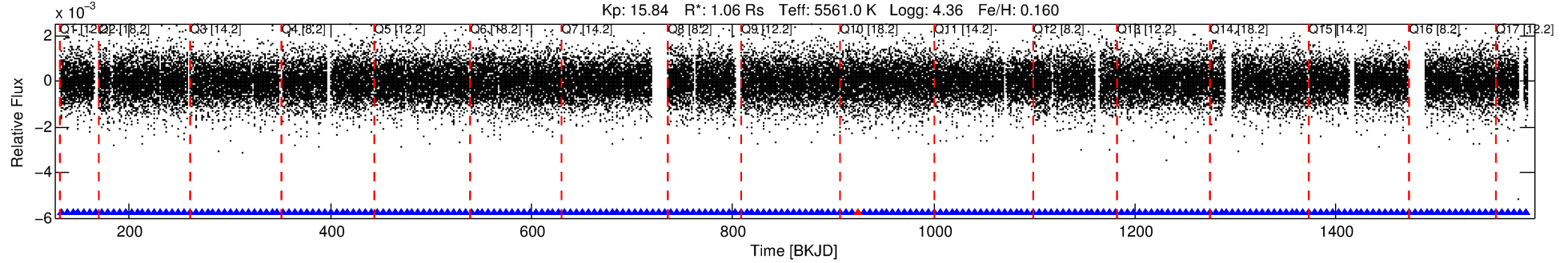
Ephemeris Match Information For 009334289-01

No Significant Match Found

# DV One-Page Summary

KIC: 9334289 Candidate: 1 of 3 Period: 5.827 d  
KOI: K00934.01 Name: Kepler-254b Corr: 0.977

Kp: 15.84 R\*: 1.06 Rs Teff: 5561.0 K Logg: 4.36 Fe/H: 0.160



## DV Fit Results:

Period = 5.82665 [0.00001] d  
Epoch = 132.2255 [0.0008] BKJD  
Rp/R\* = 0.0392 [0.0037]  
a/R\* = 10.46 [3.85]  
b = 0.75 [0.22]  
Seff = 249.16 [56.05]  
Teq = 1013 [57] K  
Rp = 4.54 [0.79] Re  
a = 0.0622 [0.0086] AU  
Ag = 6.04 [2.82] [1.79σ]  
Teffp = 2456 [256] K [5.50σ]

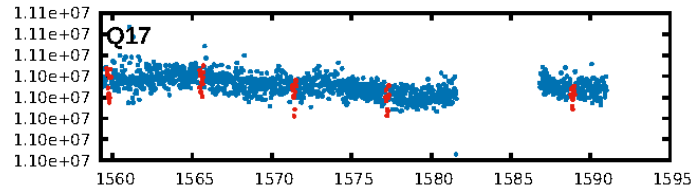
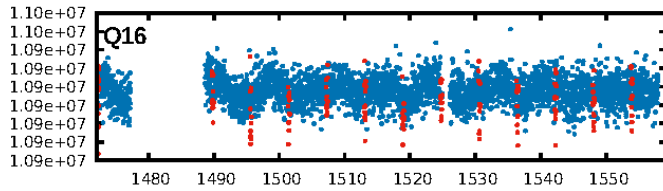
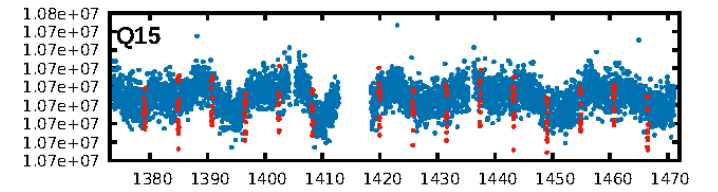
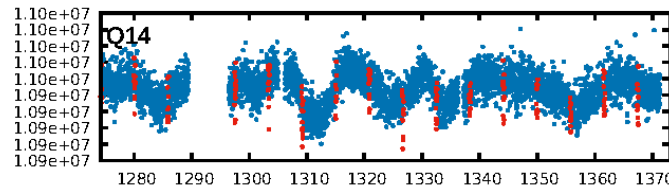
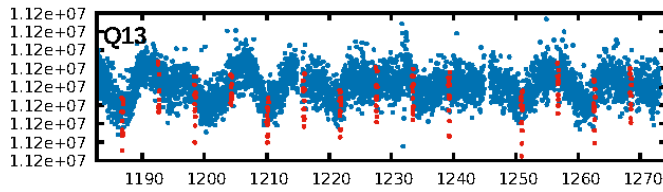
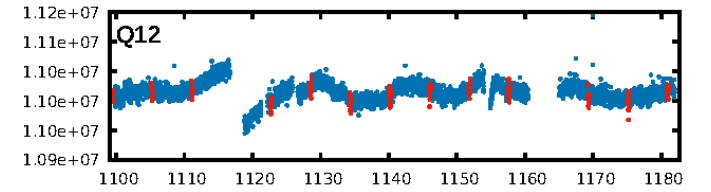
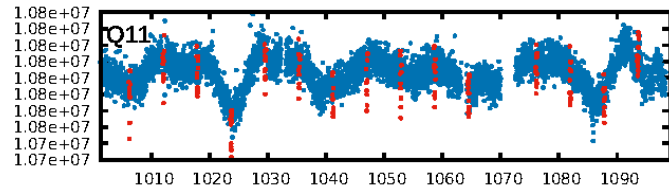
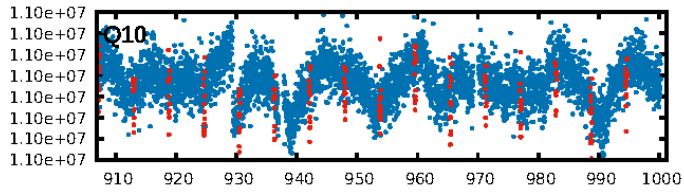
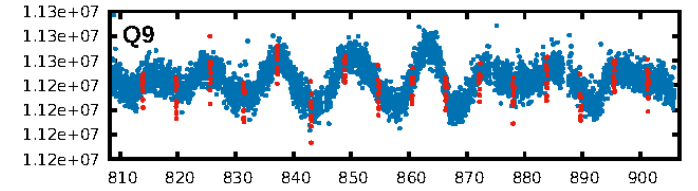
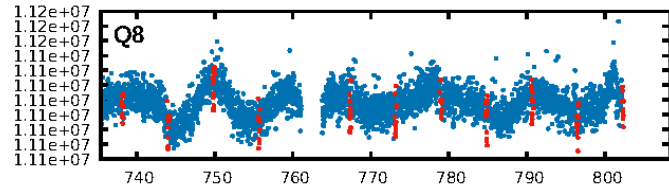
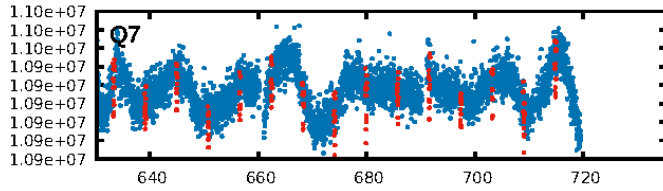
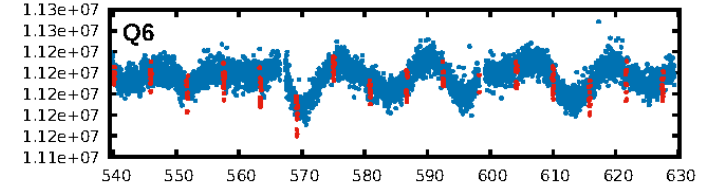
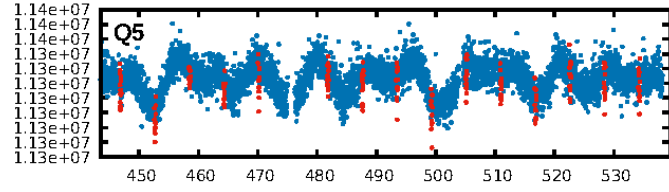
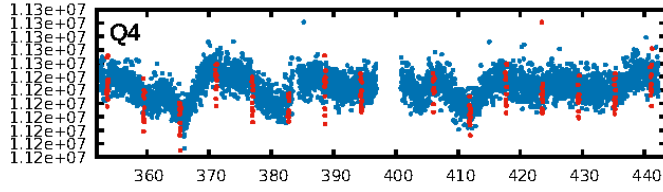
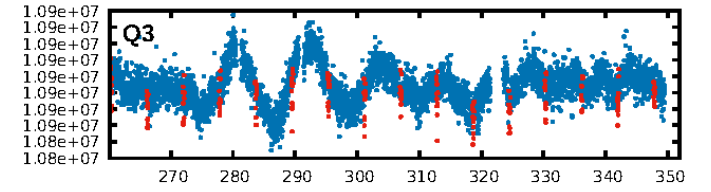
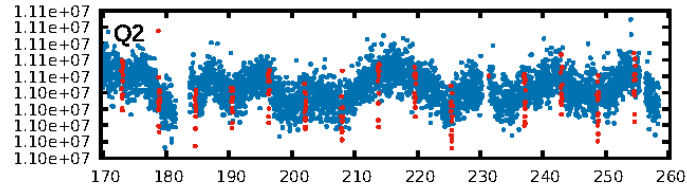
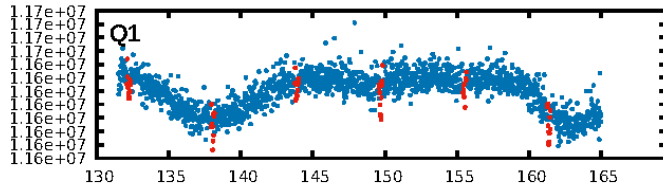
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [31.27σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 0.00e+00  
RollingBand-fgt: 1.00 [216/217]  
GhostDiagnostic-chr: 4.285  
Centroid-sig: 7.8%  
Centroid-so: 0.326 arcsec [2.00σ]  
OotOffset-rm: 0.056 arcsec [0.62σ]  
KicOffset-rm: 0.176 arcsec [2.07σ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 1.00 [17/17]  
DiffImageOverlap-fno: 1.00 [17/17]

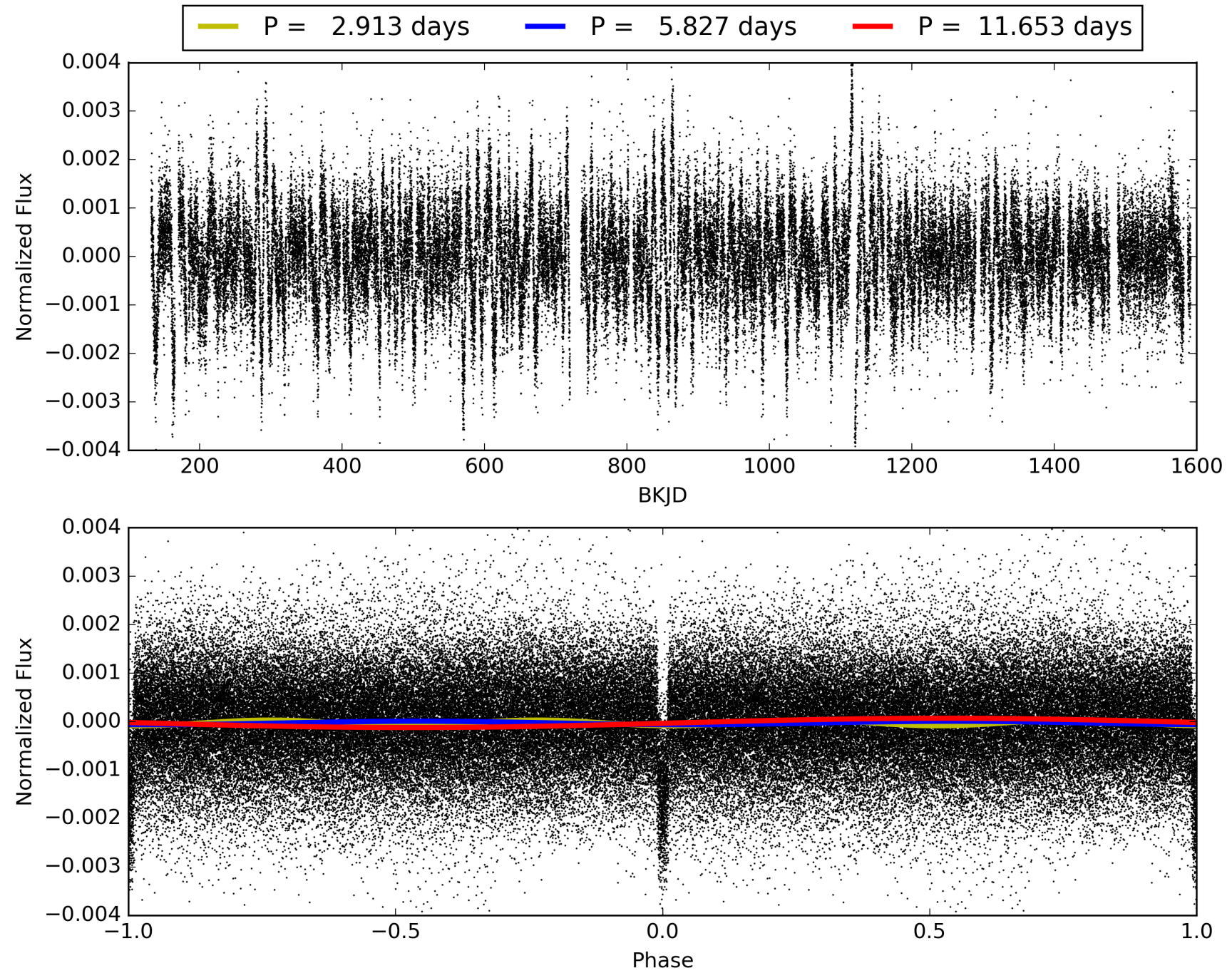
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 29-Jan-2016 05:45:19 Z

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

# TCE 009334289-01, PDC Light Curves

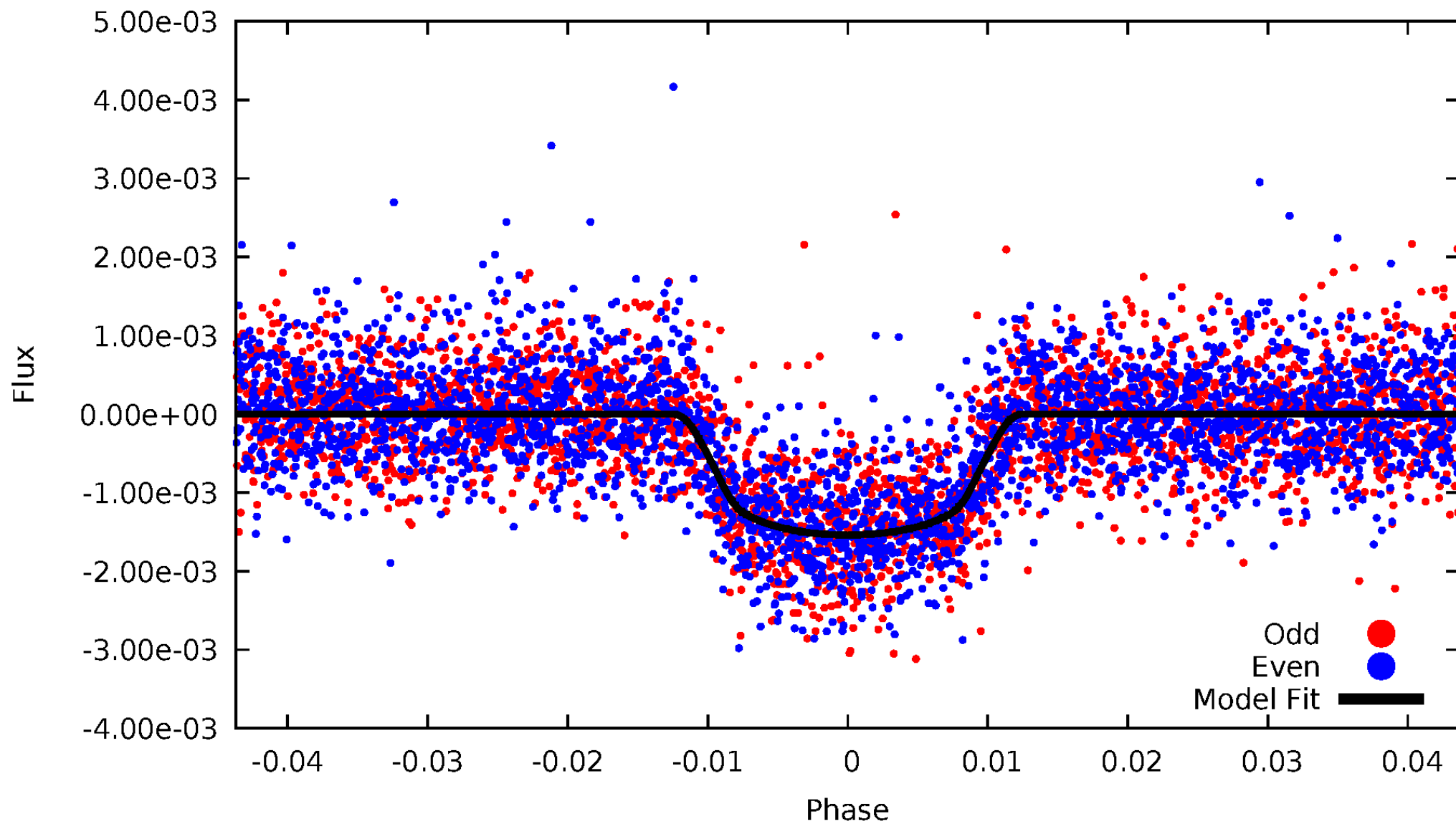


TCE 009334289-01



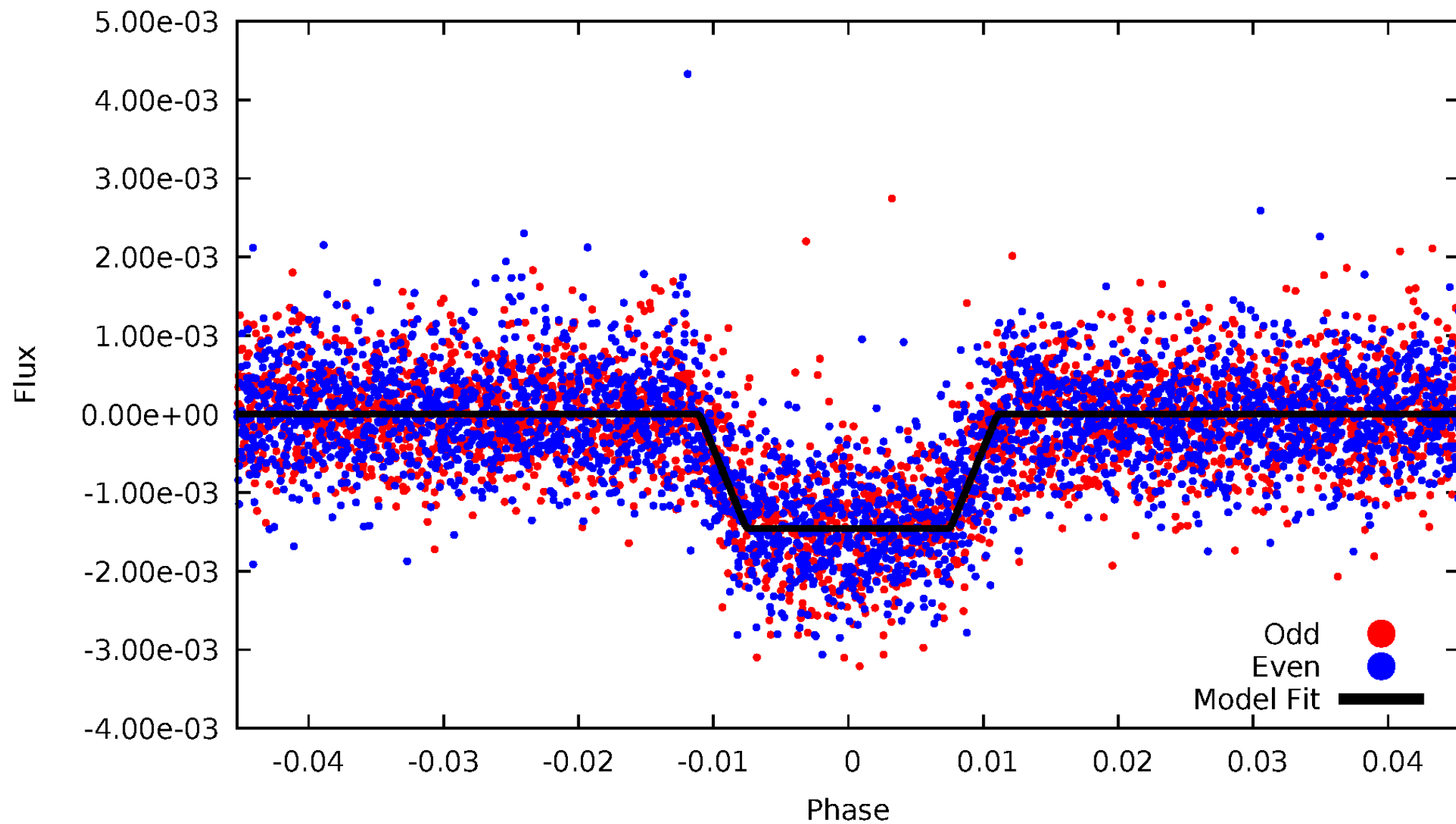
# DV Odd/Even

TCE 009334289-01



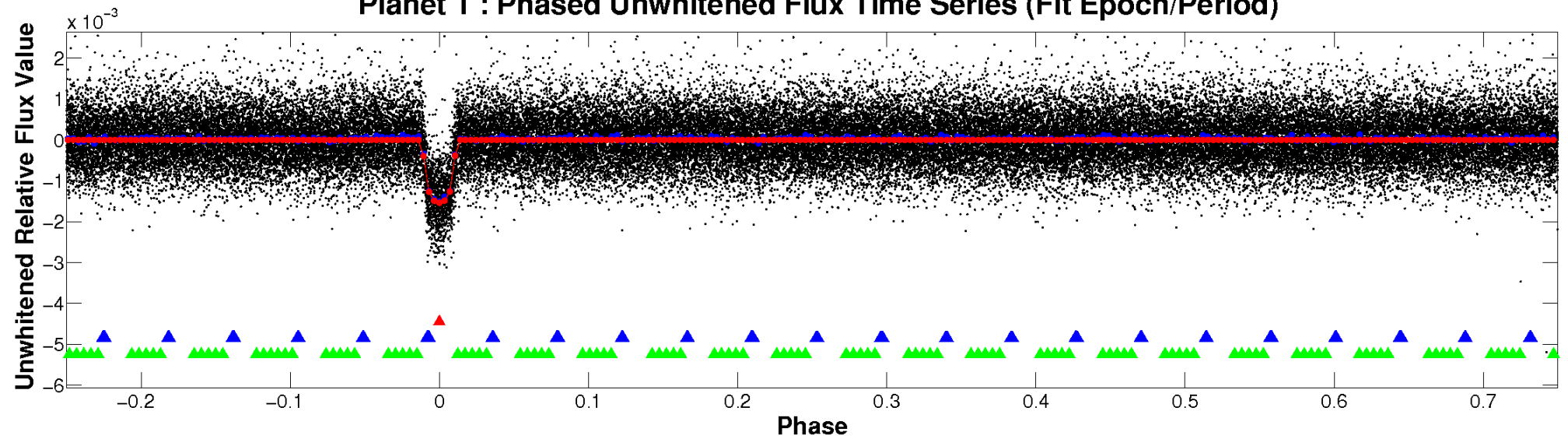
# ALT Odd/Even

TCE 009334289-01

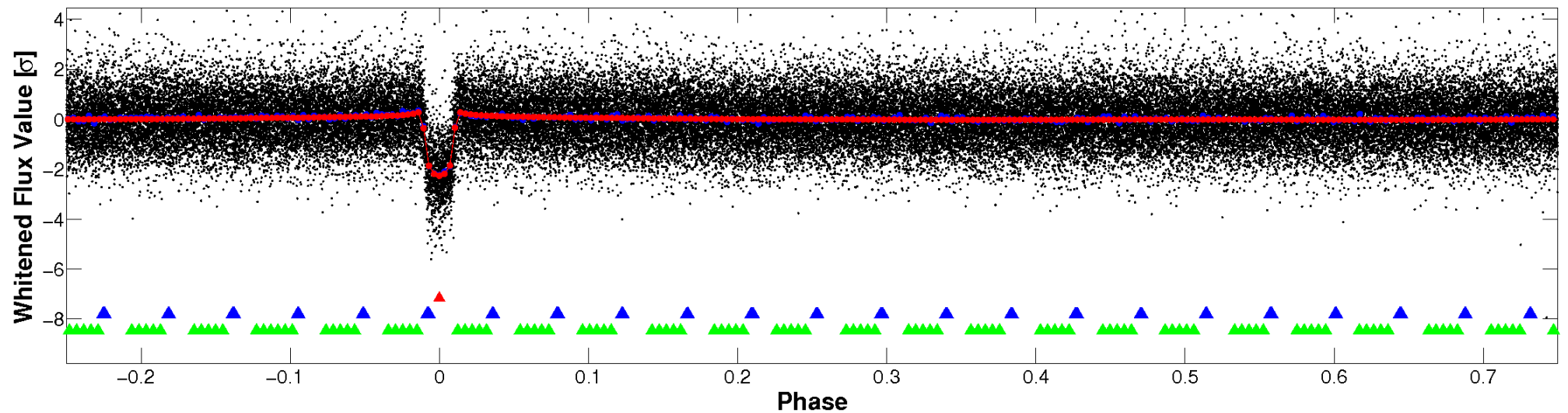


# Non-Whitened Vs. Whitened Light Curve

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

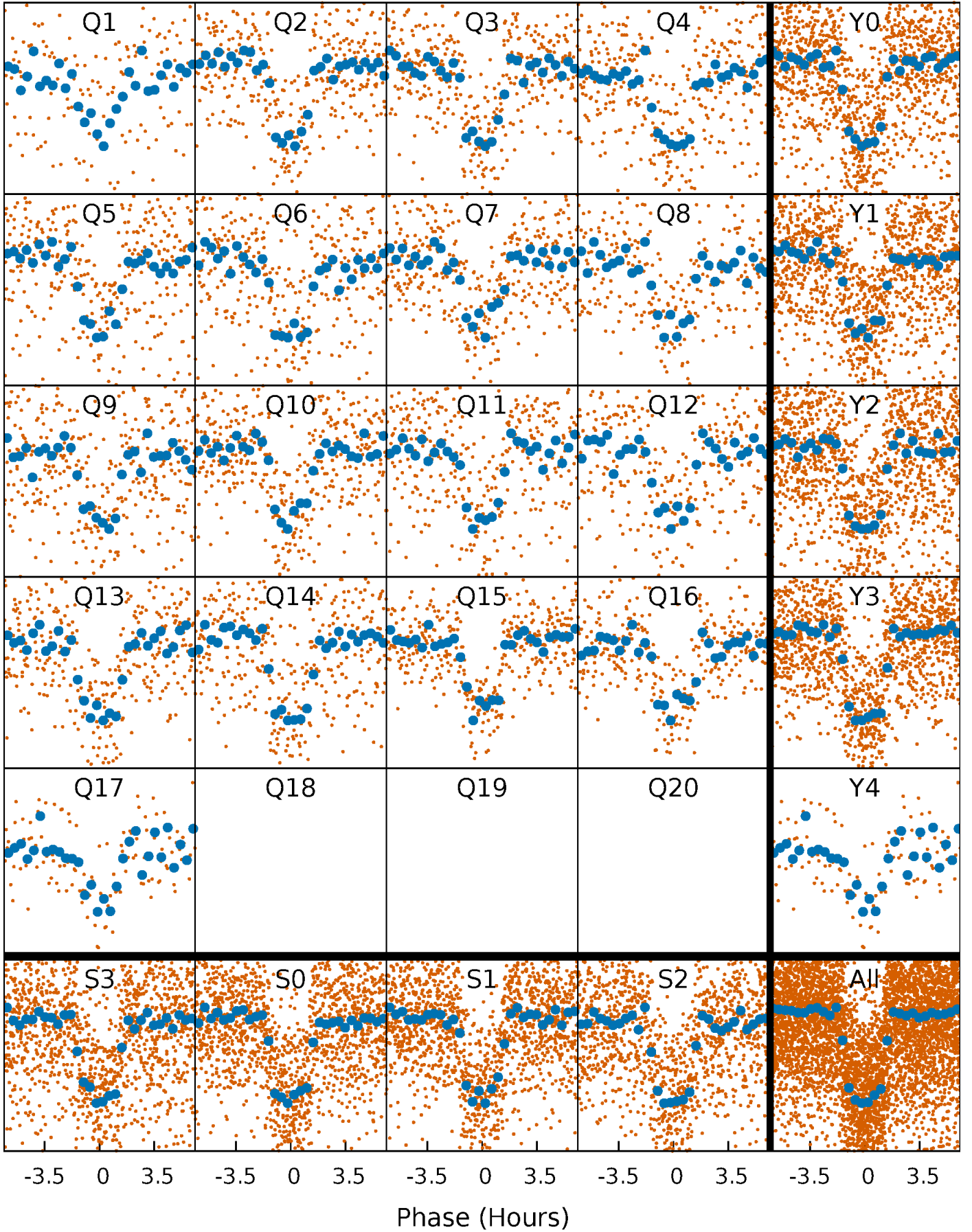


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



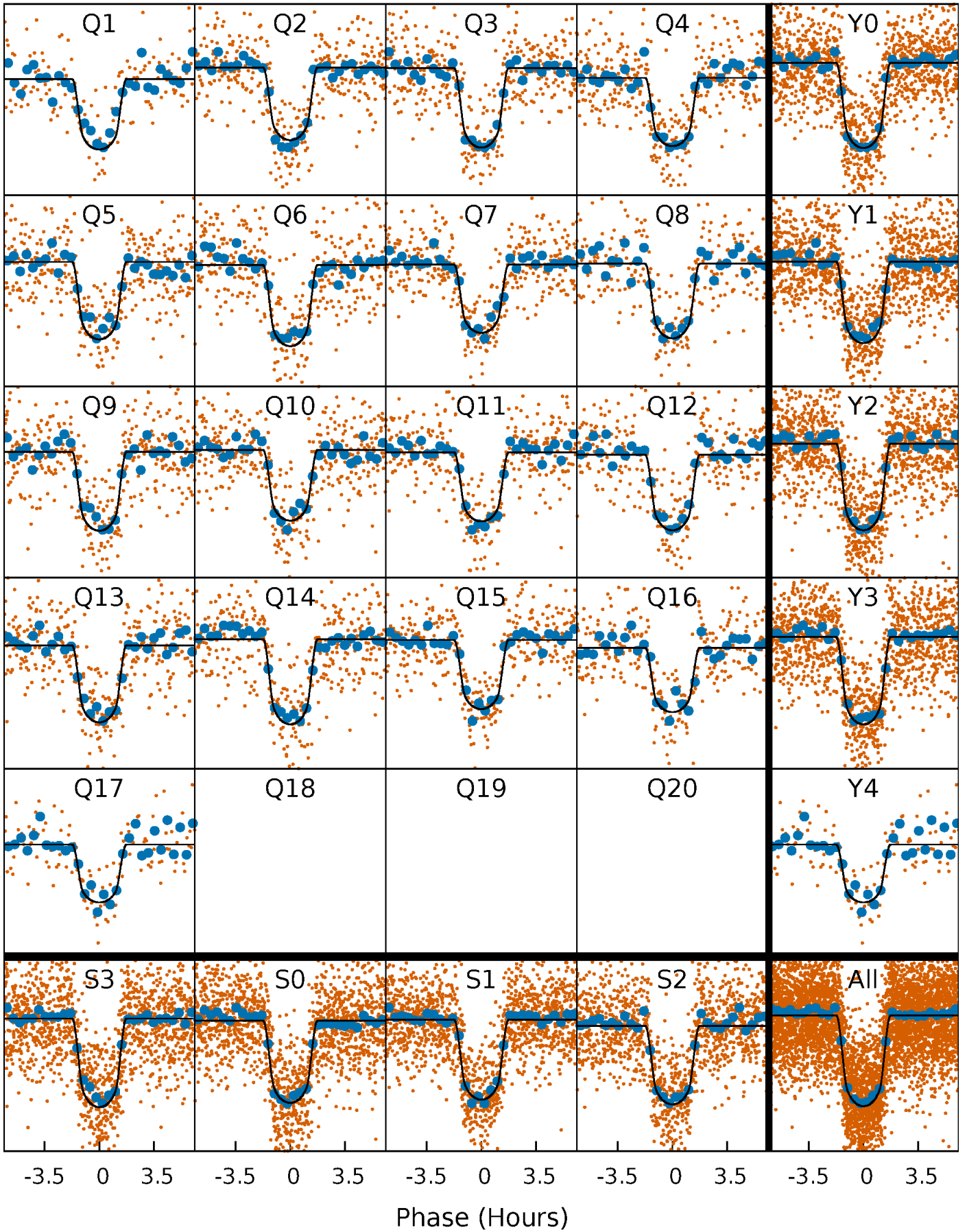
# PDC Quarter-Phased Transit Curves

TCE 009334289-01   P= 5.826650 Days    $T_0=132.225495$  (BKJD)



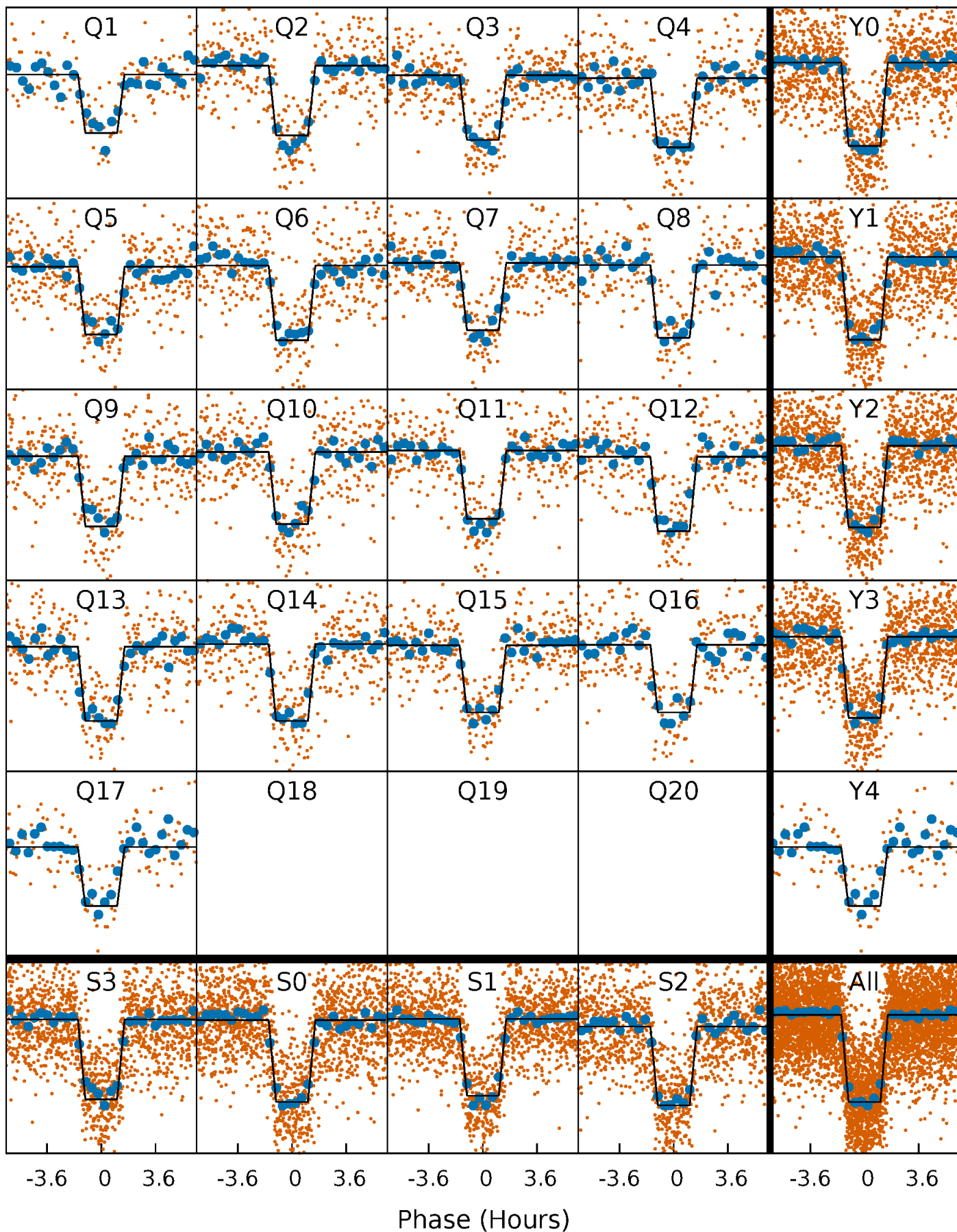
# DV Quarter-Phased Transit Curves

TCE 009334289-01   P= 5.826650 Days    $T_0=132.225495$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

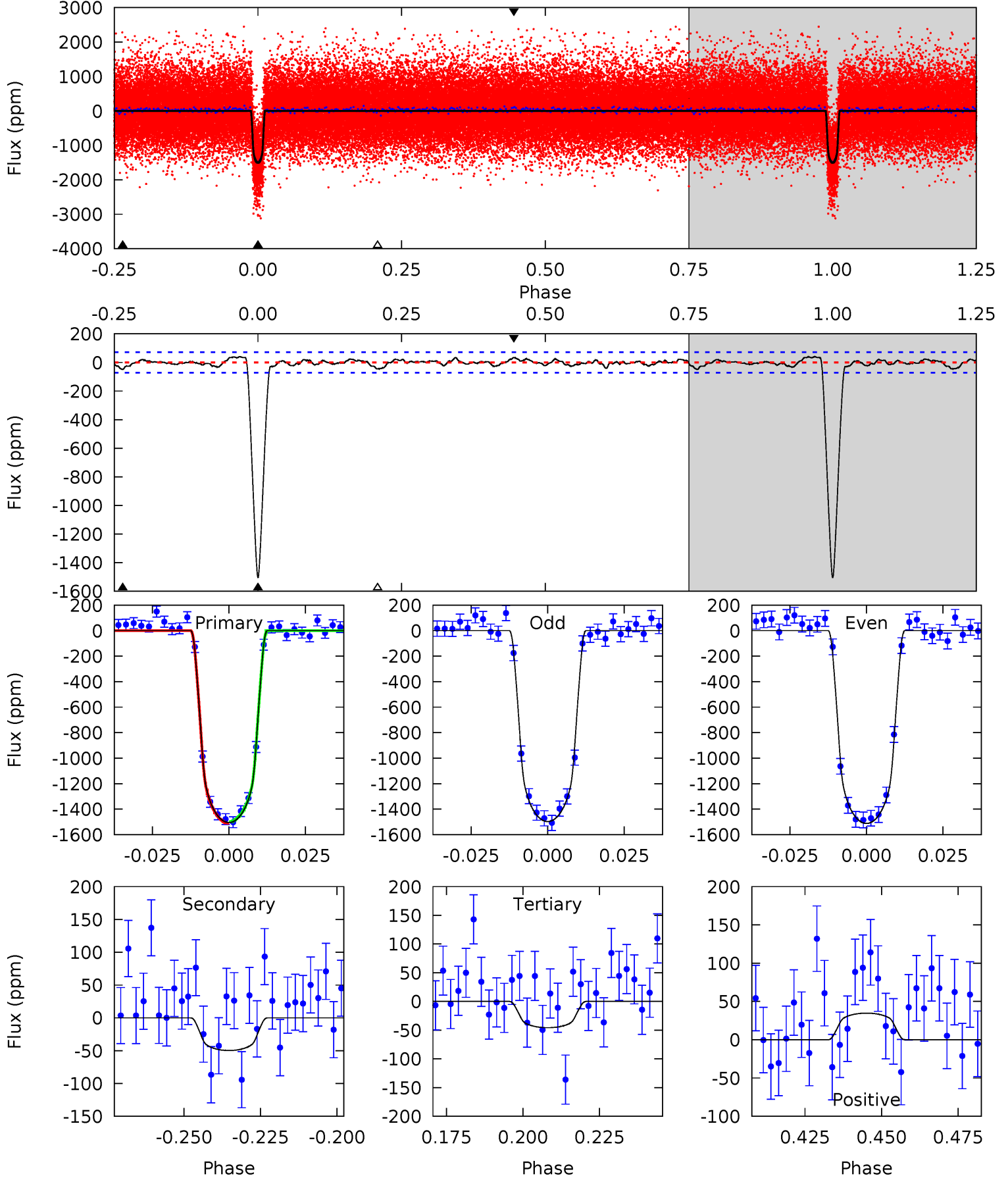
TCE 009334289-01 P= 5.826696 Days  $T_0=132.220065$  (BKJD)



# DV Model-Shift Uniqueness Test

009334289-01, P = 5.826650 Days, E = 126.398845 Days

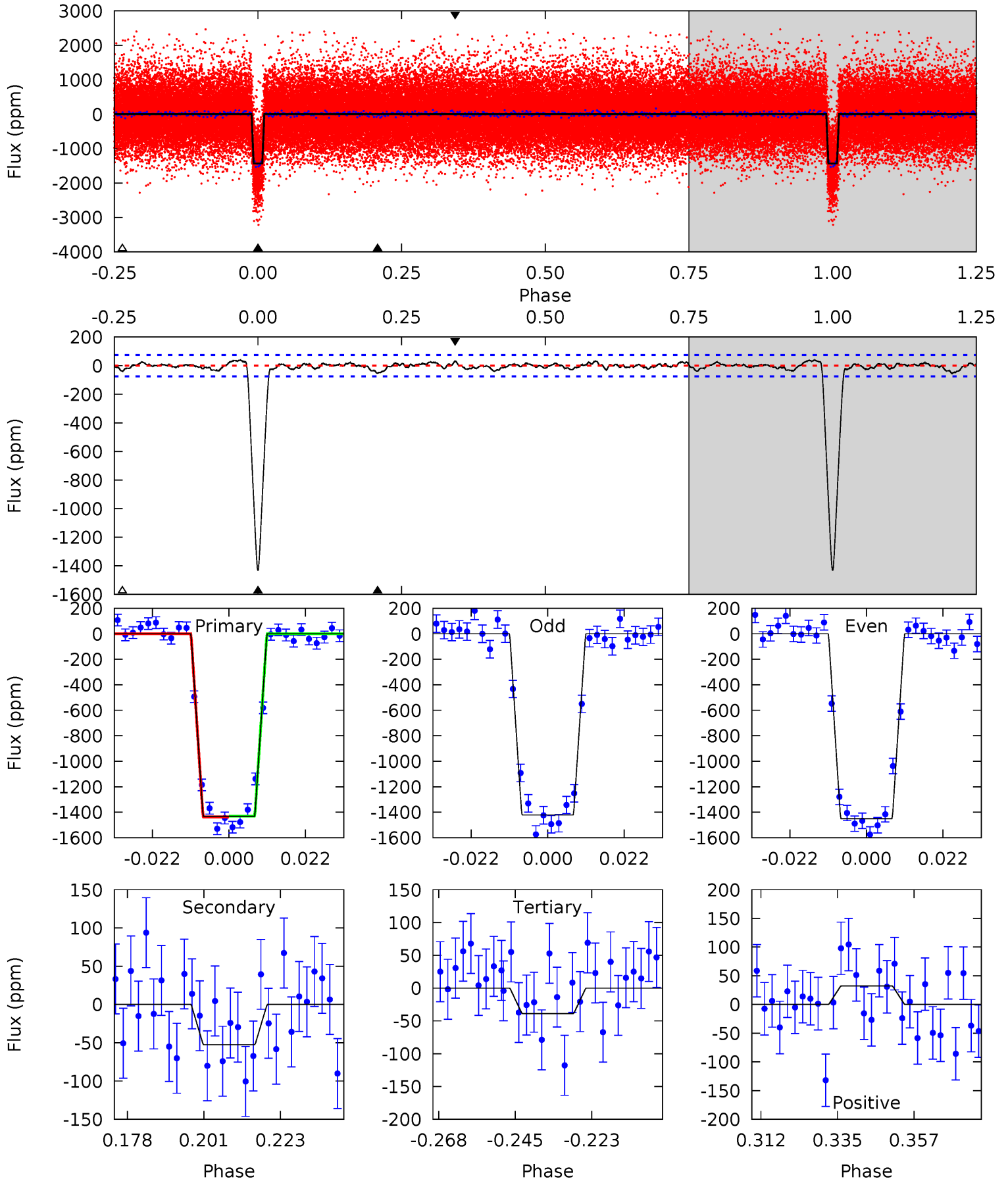
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
102.2	3.38	3.10	2.36	4.85	2.24	1.05	99.0	99.8	0.28	1.02	0.51	0.97	0.03	0.37



# Alt Model-Shift Uniqueness Test

009334289-01, P = 5.826696 Days, E = 126.393369 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
92.6	3.40	2.50	2.09	4.87	2.29	0.97	90.1	90.5	0.89	1.31	0.93	0.99	0.03	0.23



### Stellar Parameters For KIC 009334289

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5561^{+75}_{-83}$	$4.362^{+0.126}_{-0.103}$	$0.160^{+0.150}_{-0.150}$	$1.060^{+0.156}_{-0.127}$	$0.943^{+0.062}_{-0.048}$	$1.115^{+0.522}_{-0.357}$
	+1%/-1%	+3%/-2%	+94%/-94%	+15%/-12%	+7%/-5%	+47%/-32%
Source	SPE90	SPE90	SPE90	DSEP		

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

### Secondary Eclipse Parameters for KIC 009334289-01 / KOI 0934.01

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-50 \pm 15$	$4.52^{+0.59}_{-0.53}$	$1411^{+57}_{-53}$	$2991^{+150}_{-176}$	$5.159^{+2.279}_{-1.793}$
Alt.	$-53 \pm 15$	$4.42^{+0.57}_{-0.54}$	$1410^{+64}_{-55}$	$3030^{+164}_{-161}$	$5.673^{+2.754}_{-1.986}$

$T_{max}$  = 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

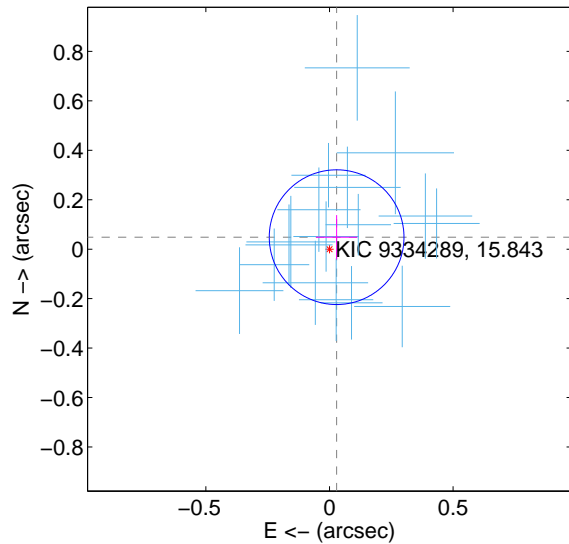
Supplemental centroid analysis for 009334289-01. Kepler magnitude: 15.84. Transit SNR 69.30

There are 17 quarters with good PRF difference image offsets

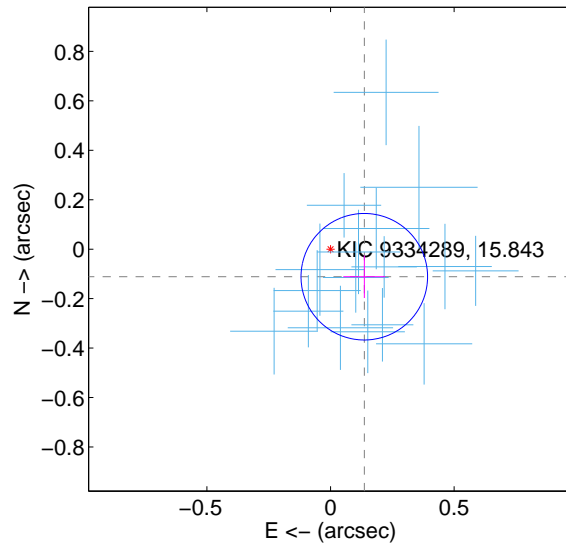
The direct PRF centroid is offset from the target star catalog position by about 0.17 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.056 \pm 0.091$	0.62	$-0.029 \pm 0.084$	$0.049 \pm 0.089$
PRF-fit source offset from KIC position	$0.176 \pm 0.085$	2.07	$-0.137 \pm 0.085$	$-0.111 \pm 0.086$
photometric centroid source offset	$0.33 \pm 0.16$	2.00	$0.04 \pm 0.19$	$-0.32 \pm 0.16$

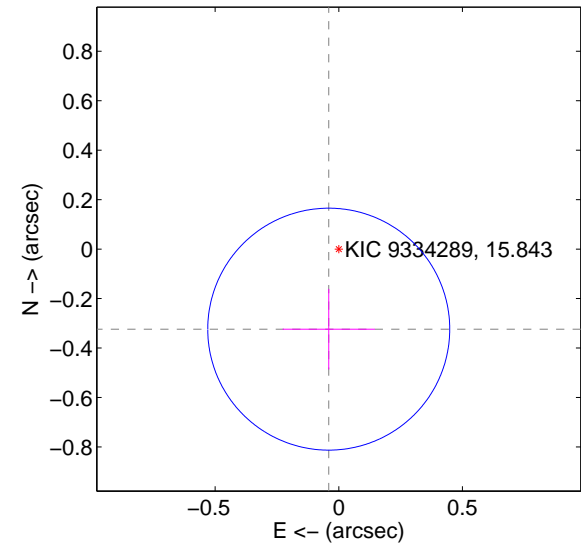
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

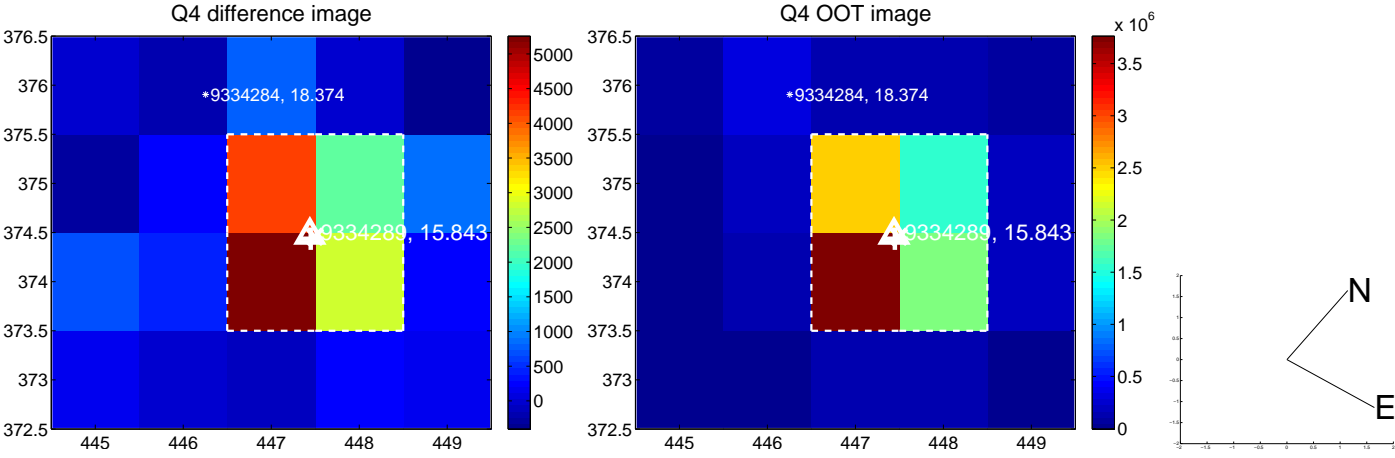
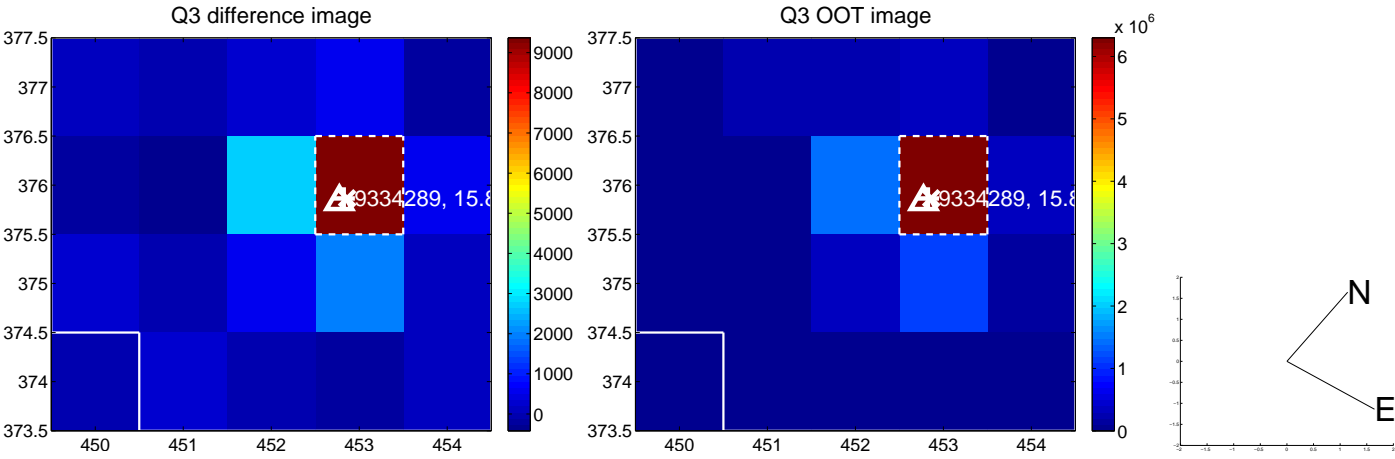
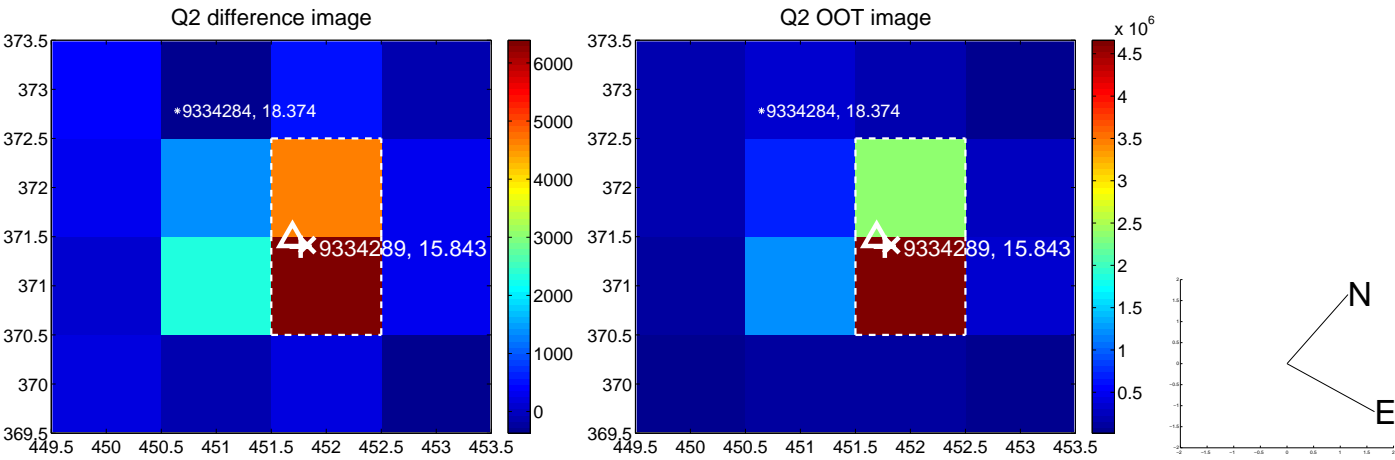
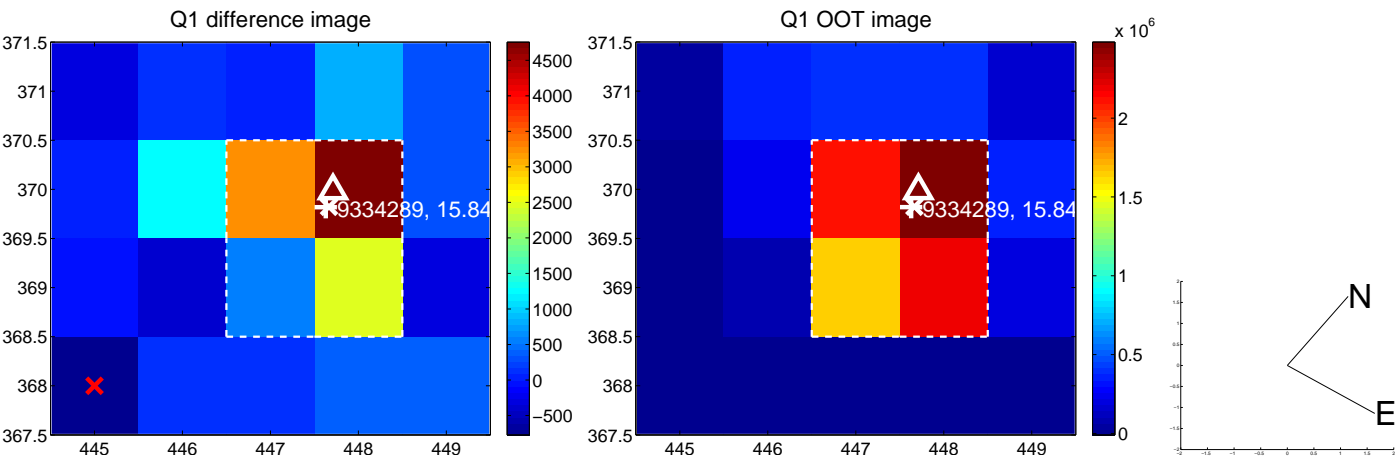


offset from photometric centroids

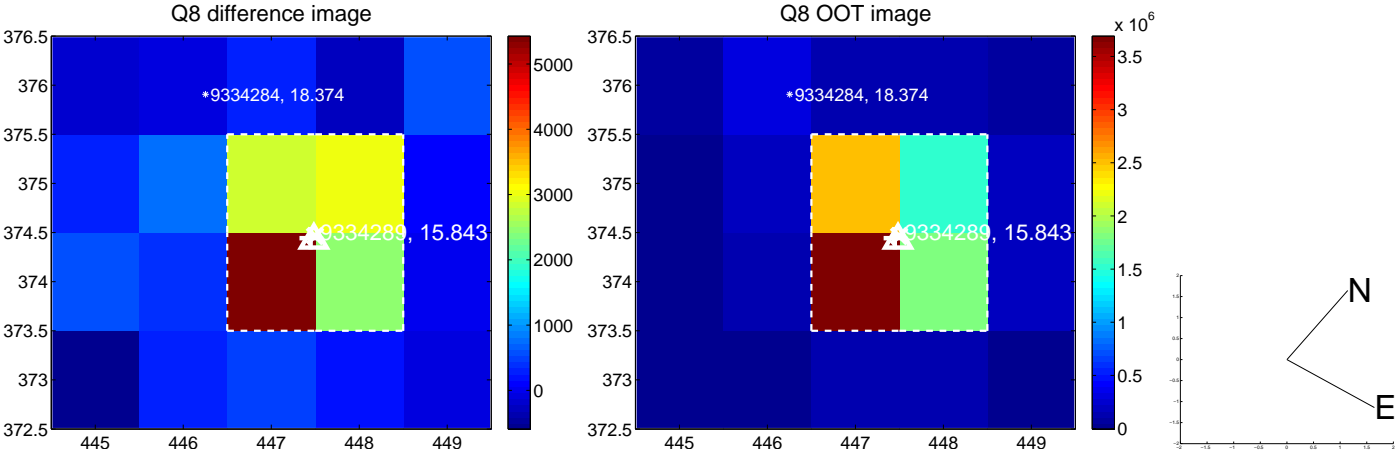
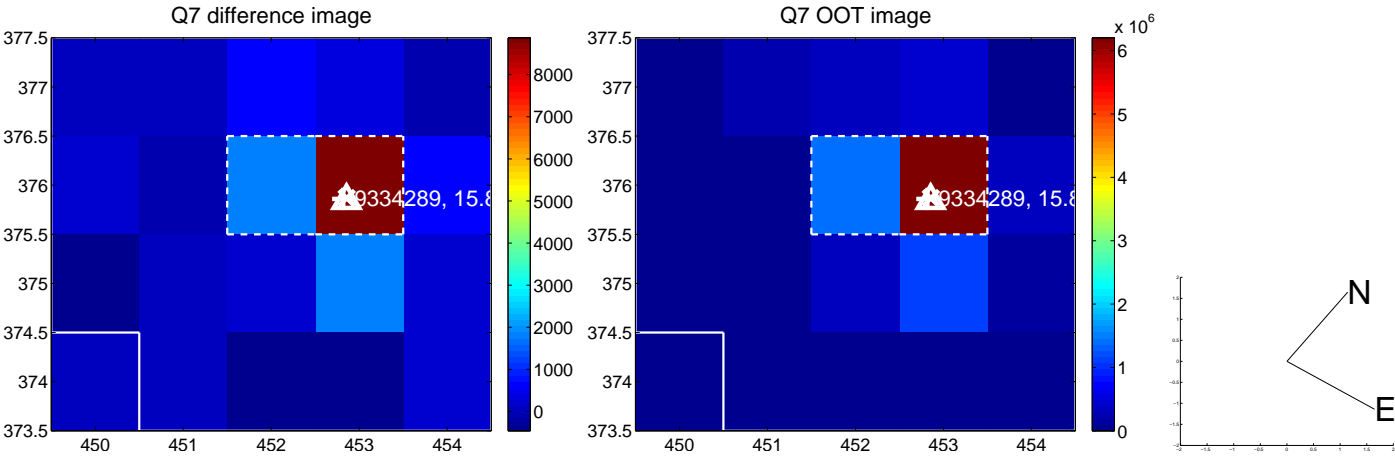
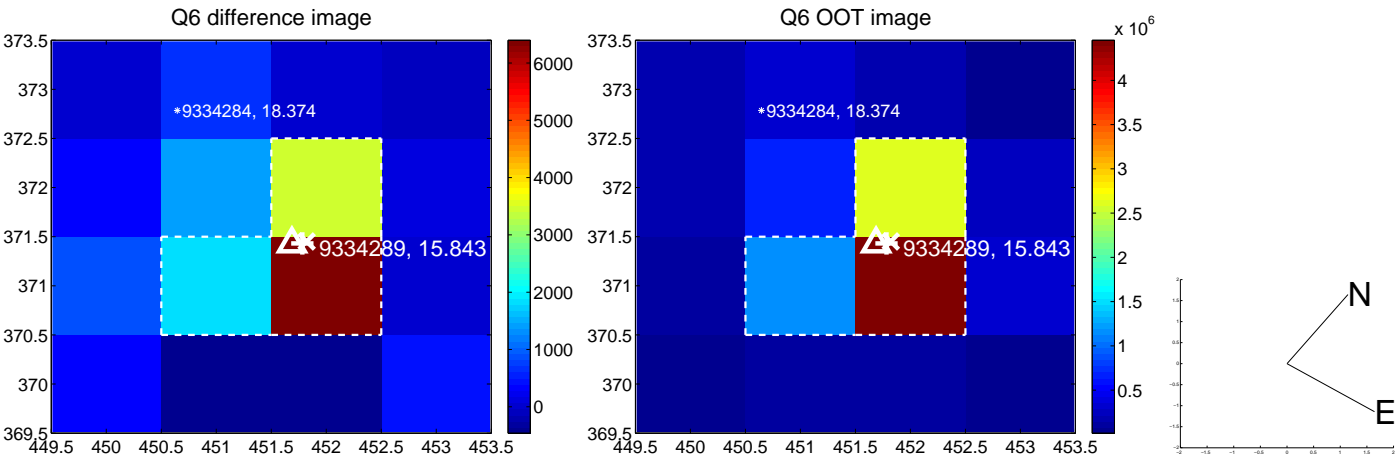
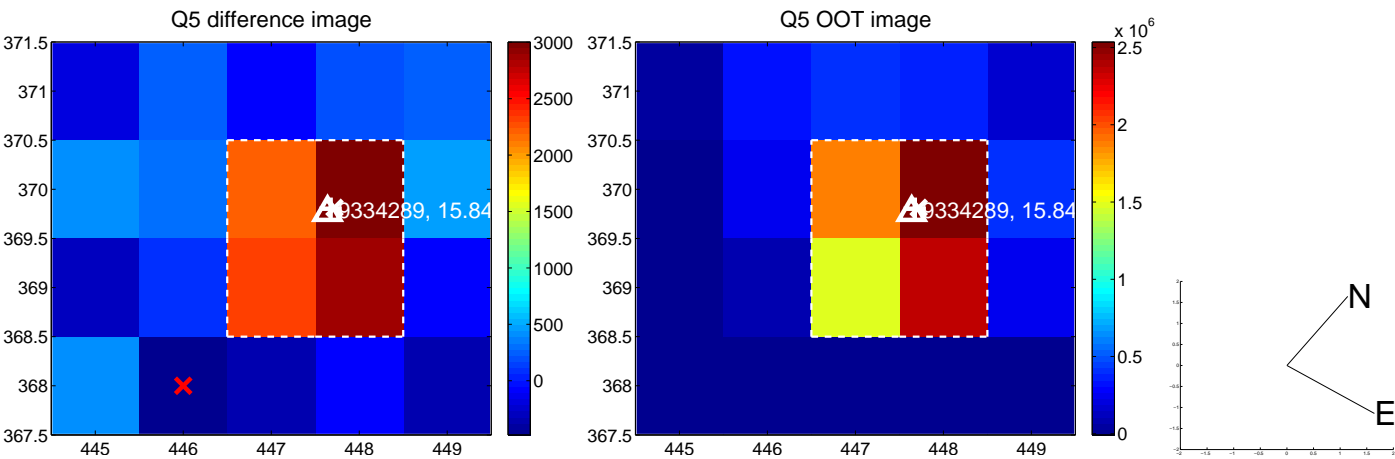


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

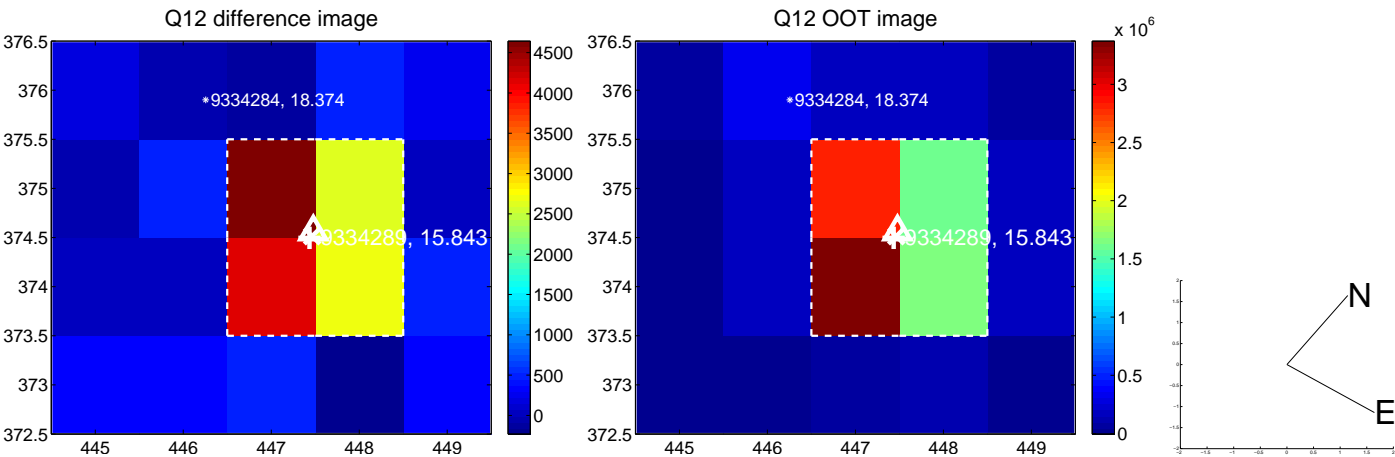
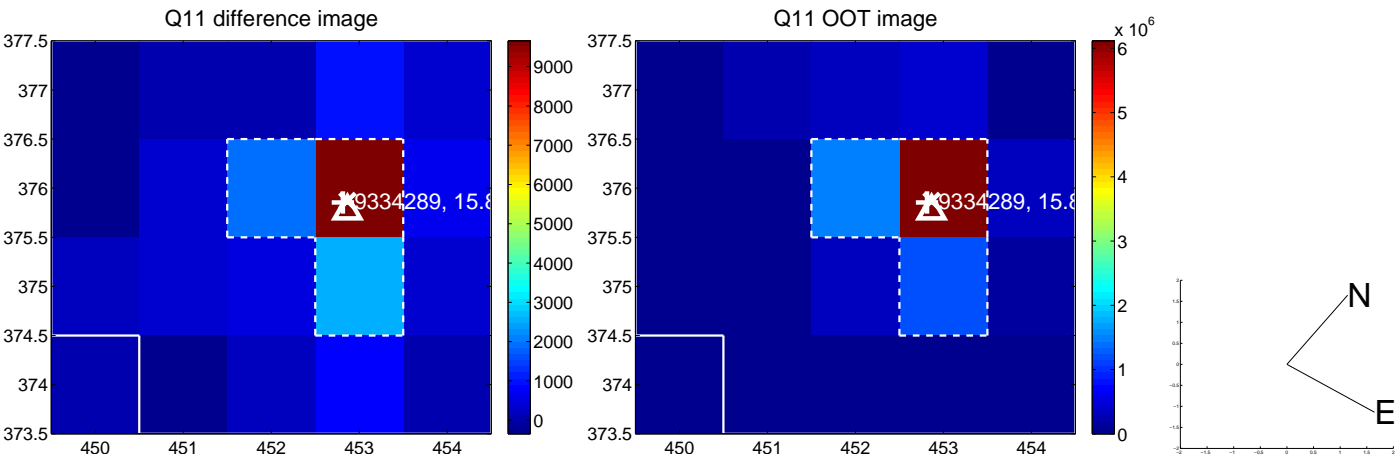
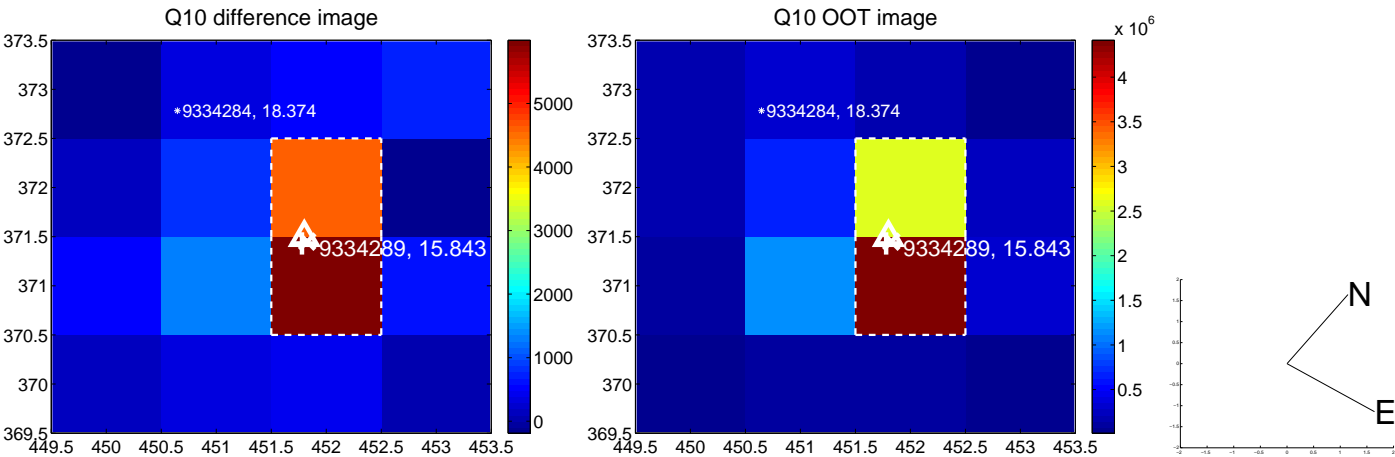
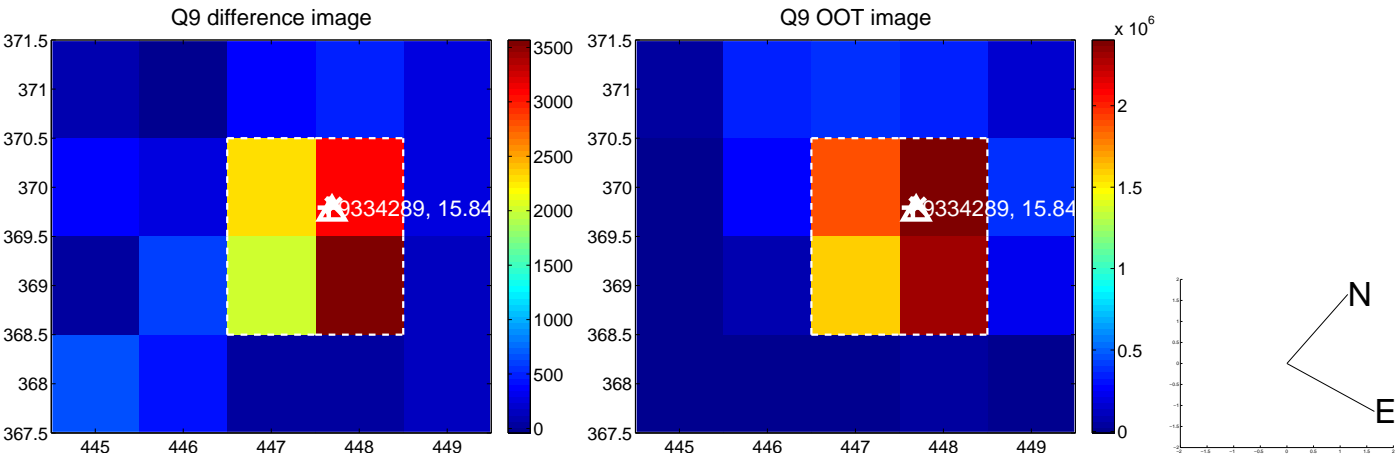
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



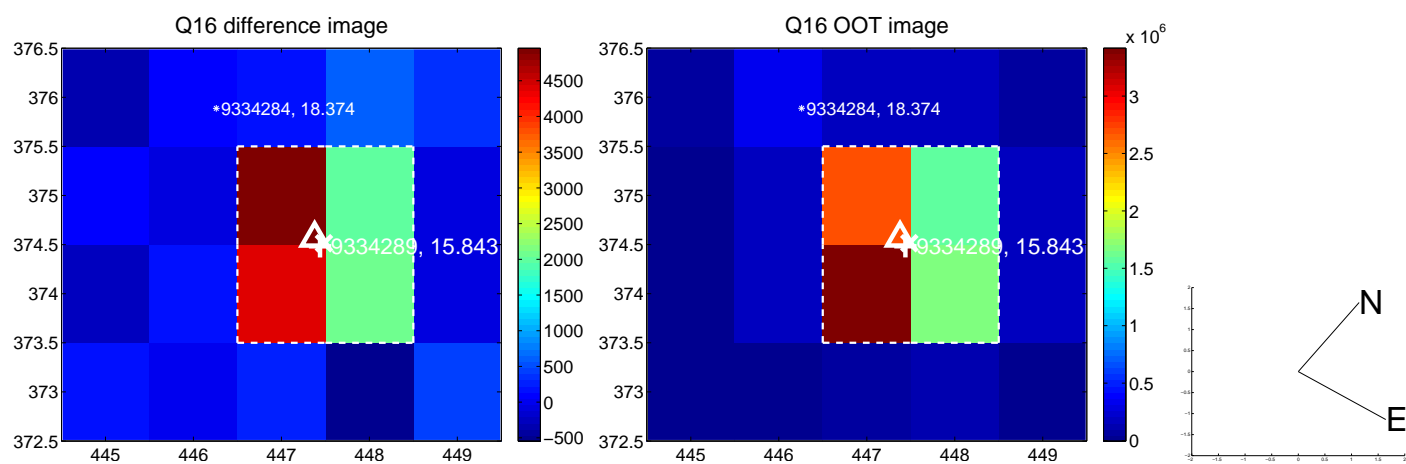
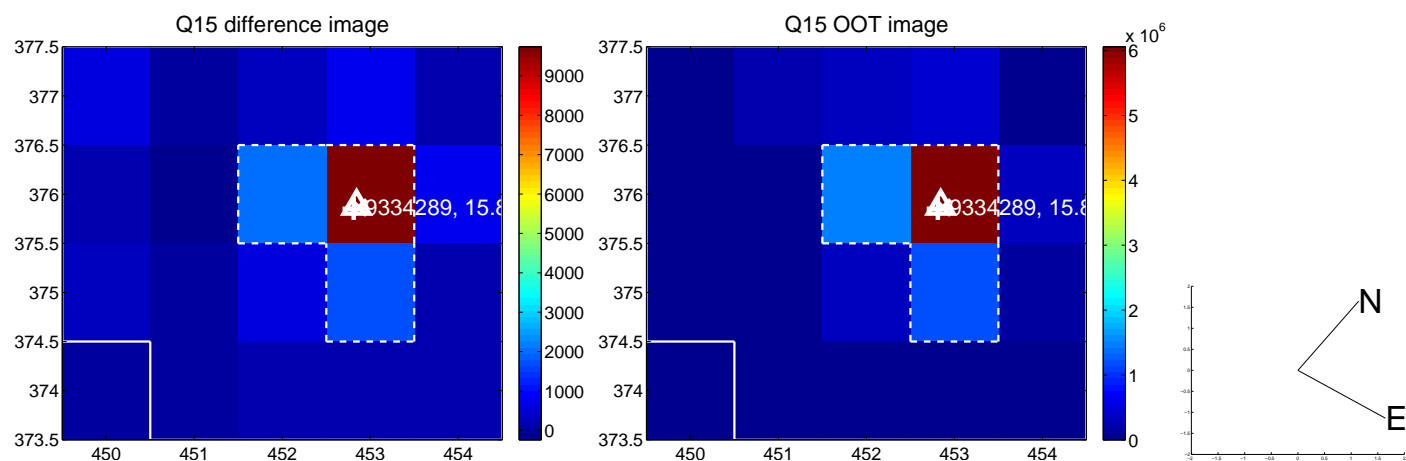
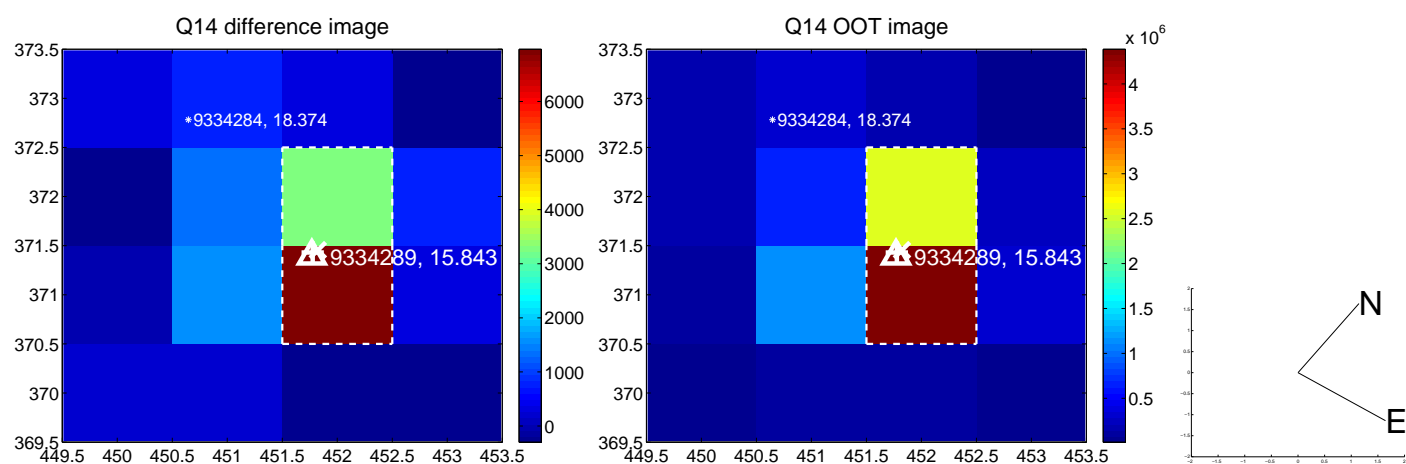
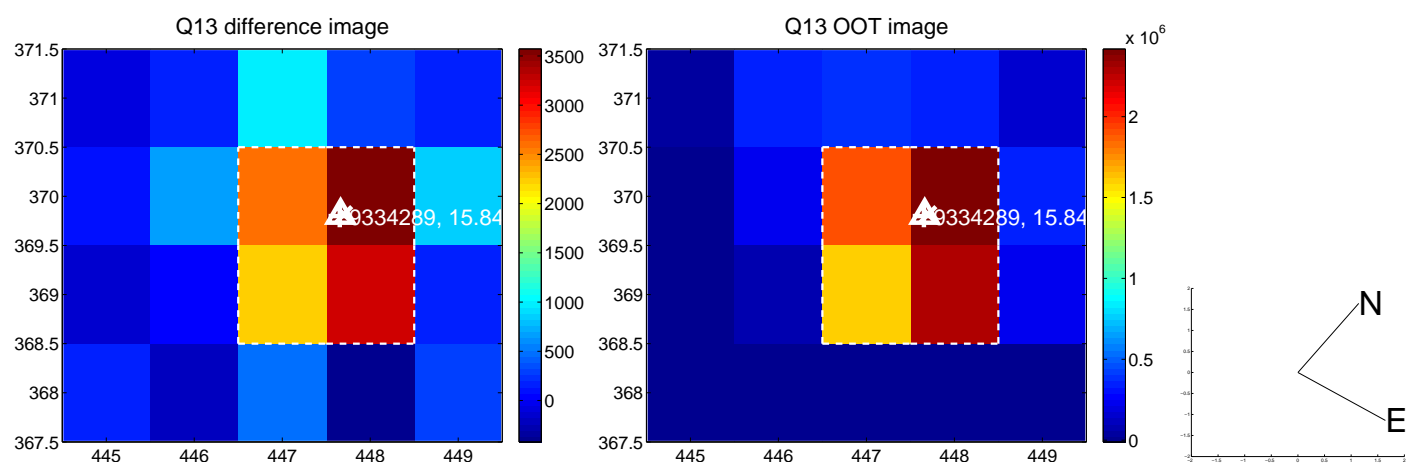
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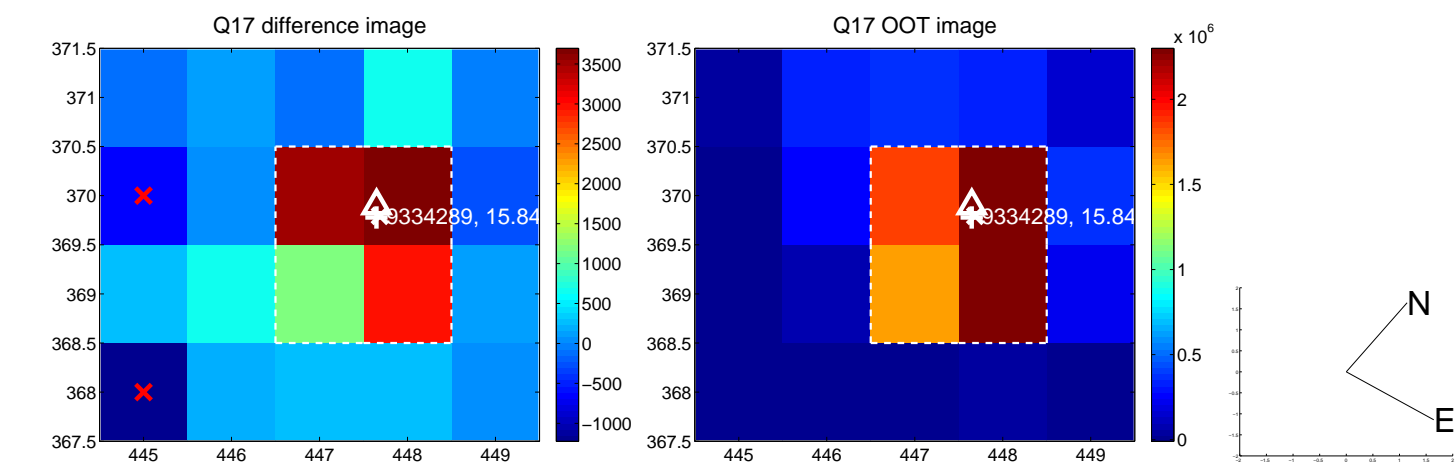
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



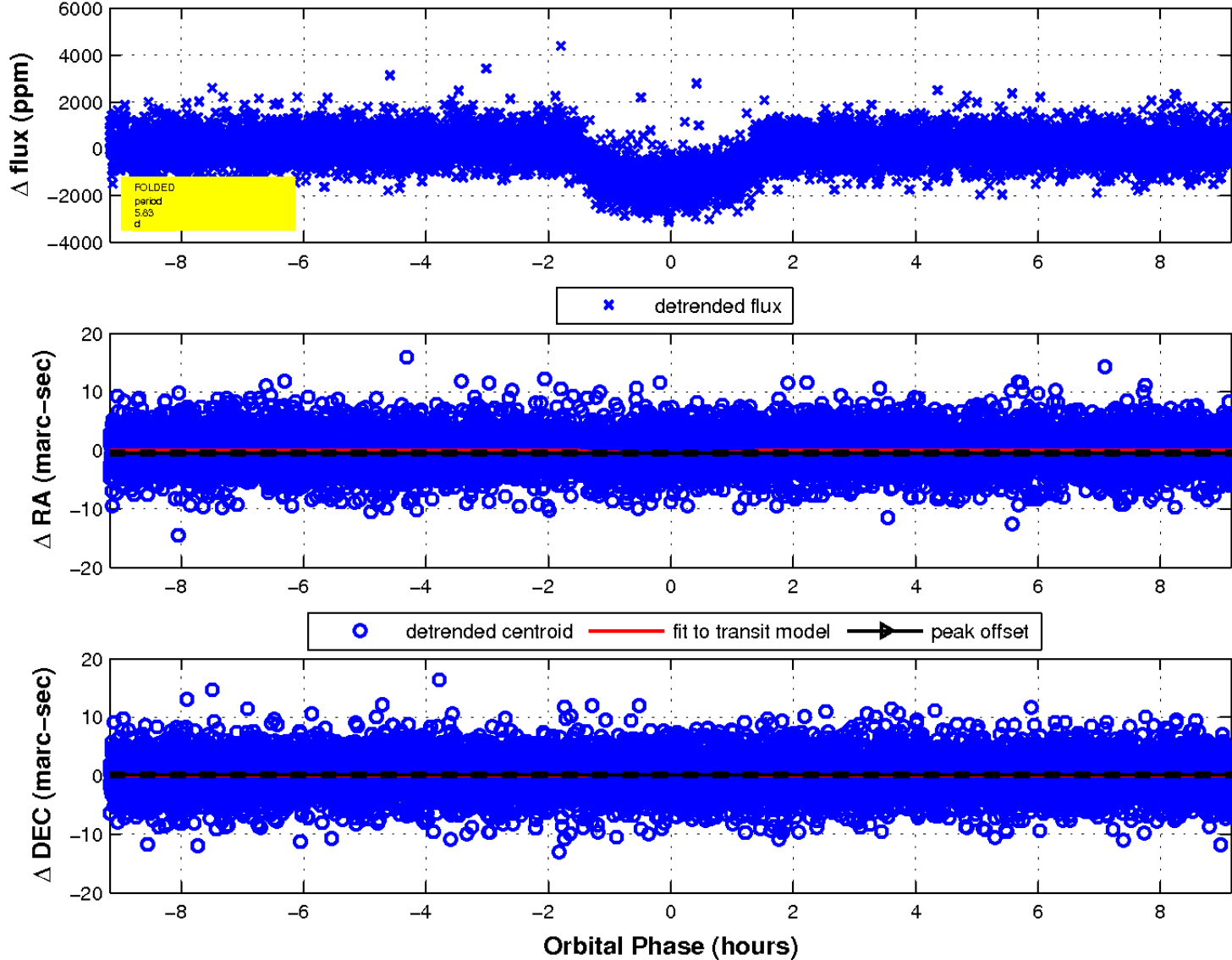
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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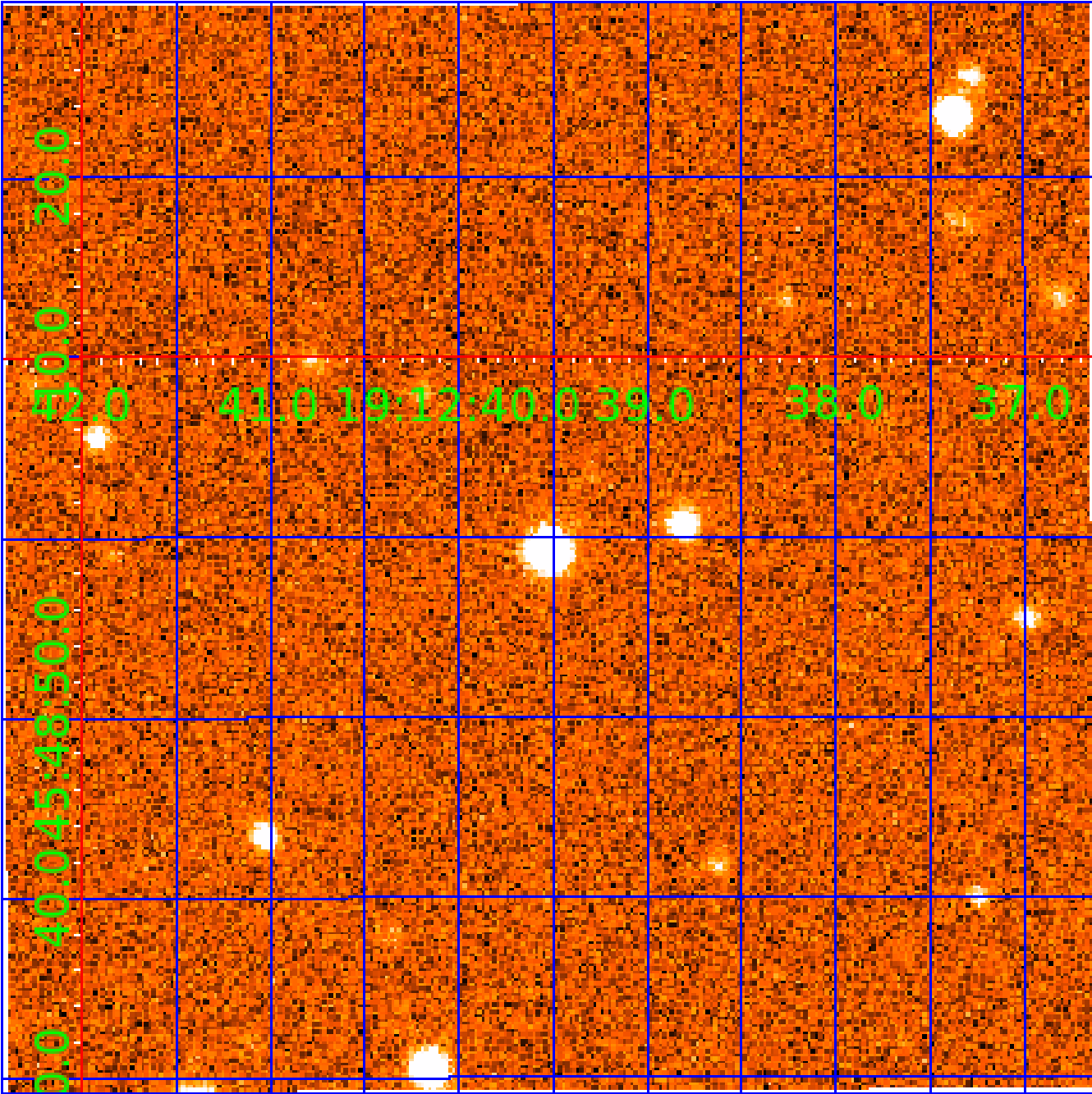


fluxWeightedCentroids, Planet 1 of 3



UKIRT Image

Declination



# KIC 009334289

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
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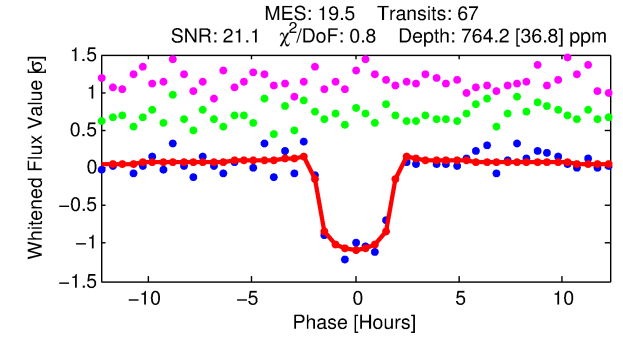
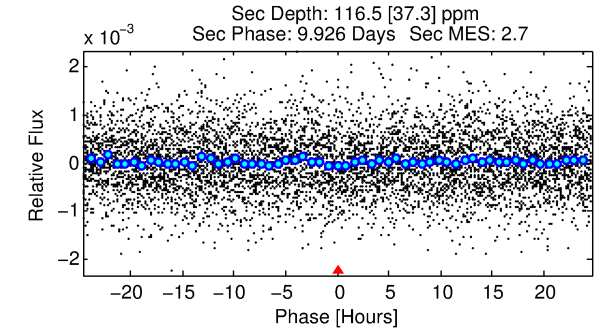
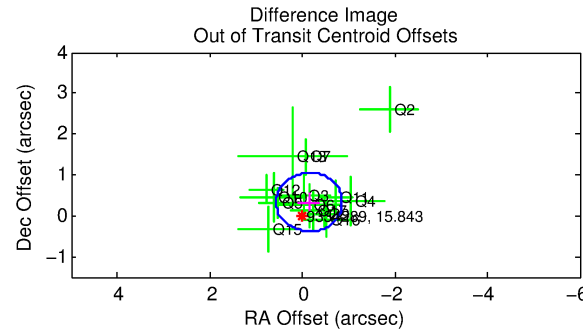
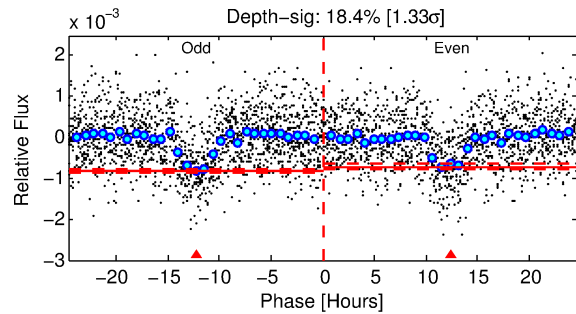
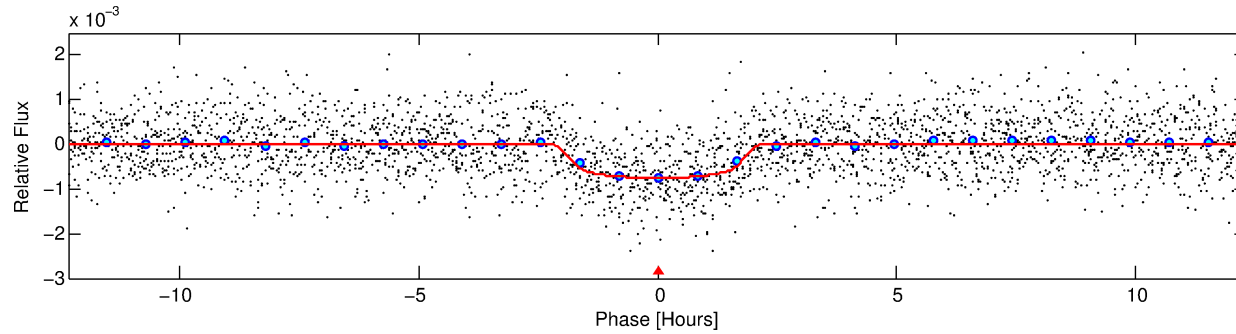
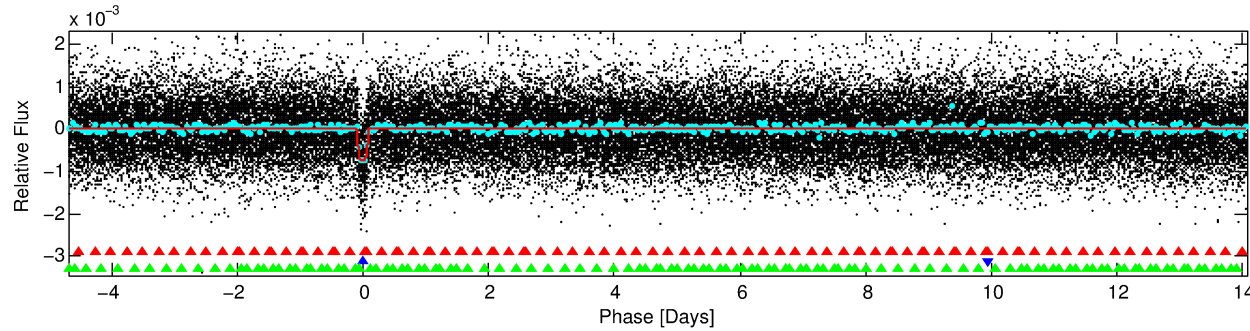
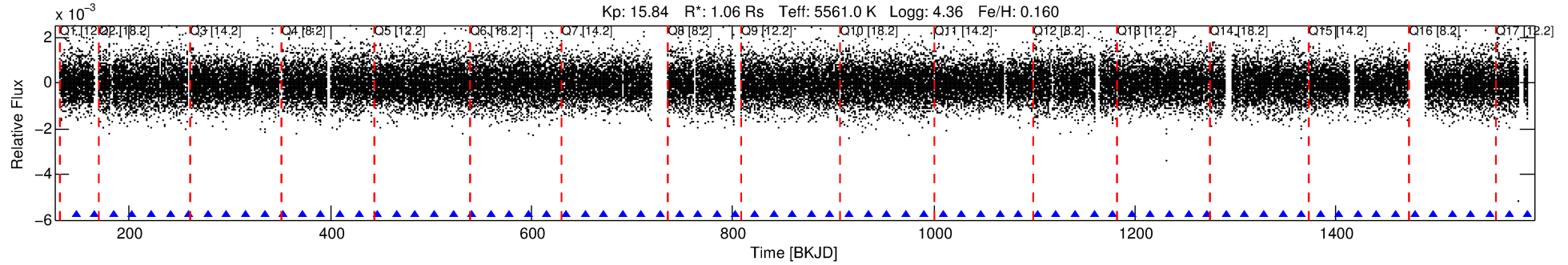
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 009334289-02

No Significant Match Found

# DV One-Page Summary

KIC: 9334289 Candidate: 2 of 3 Period: 18.746 d  
KOI: K00934.03 Name: Kepler-254d Corr: 0.978



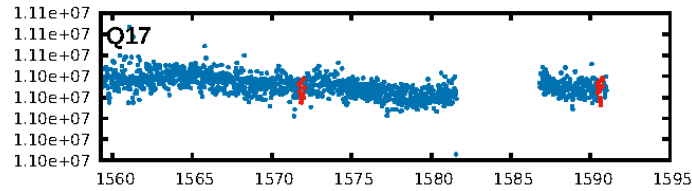
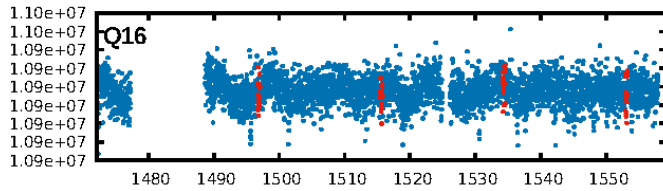
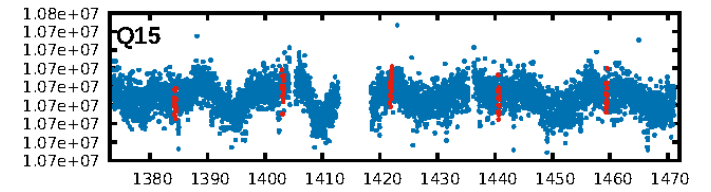
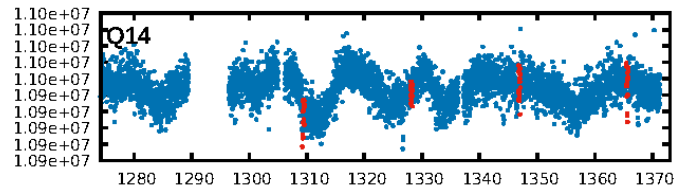
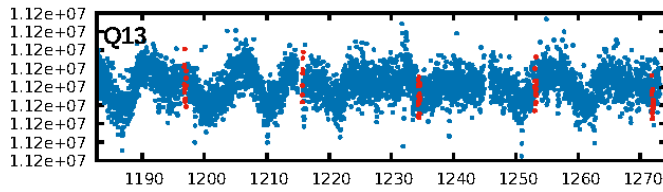
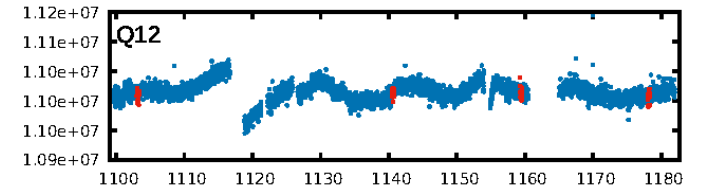
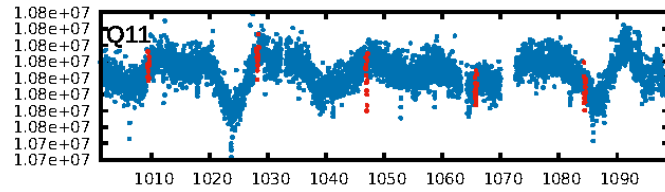
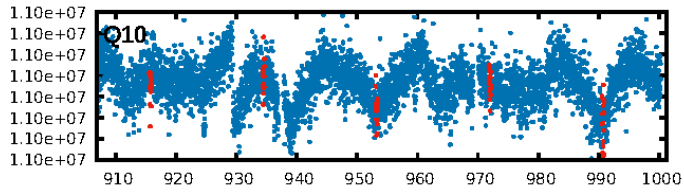
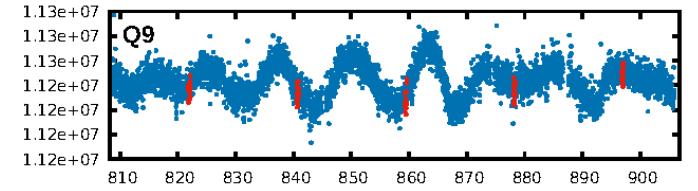
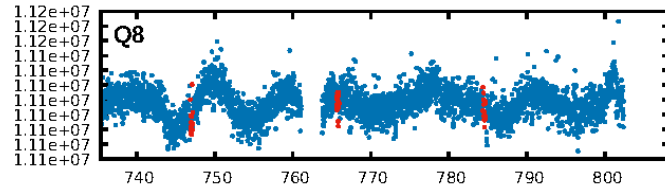
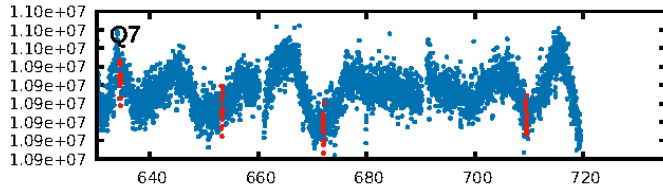
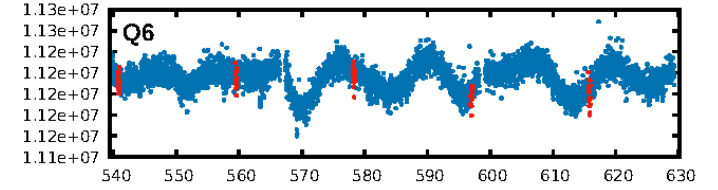
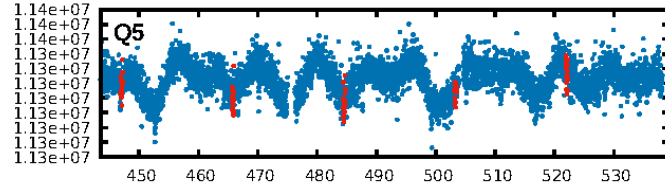
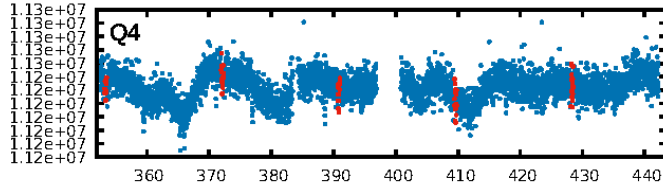
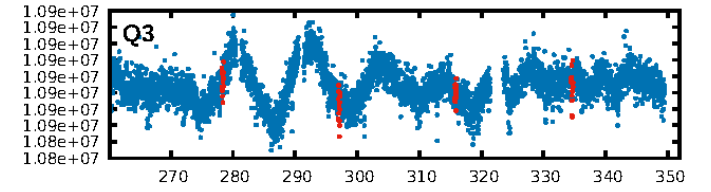
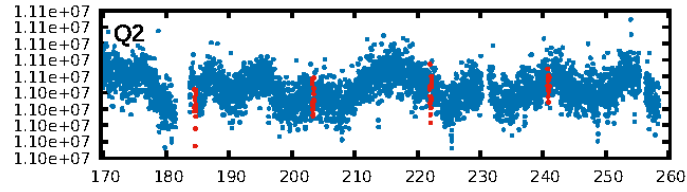
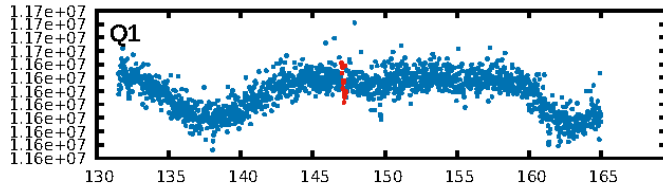
## DV Fit Results:

Period = 18.74649 [0.00009] d  
Epoch = 147.1322 [0.0041] BKJD  
Rp/R\* = 0.0288 [0.0058]  
a/R\* = 21.08 [17.43]  
b = 0.83 [0.31]  
Seff = 52.46 [11.80]  
Teq = 686 [39] K  
Rp = 3.33 [0.83] Re  
a = 0.1355 [0.0187] AU  
Ag = 106.31 [59.42] [1.77 $\sigma$ ]  
Teffp = 3407 [442] K [6.14 $\sigma$ ]

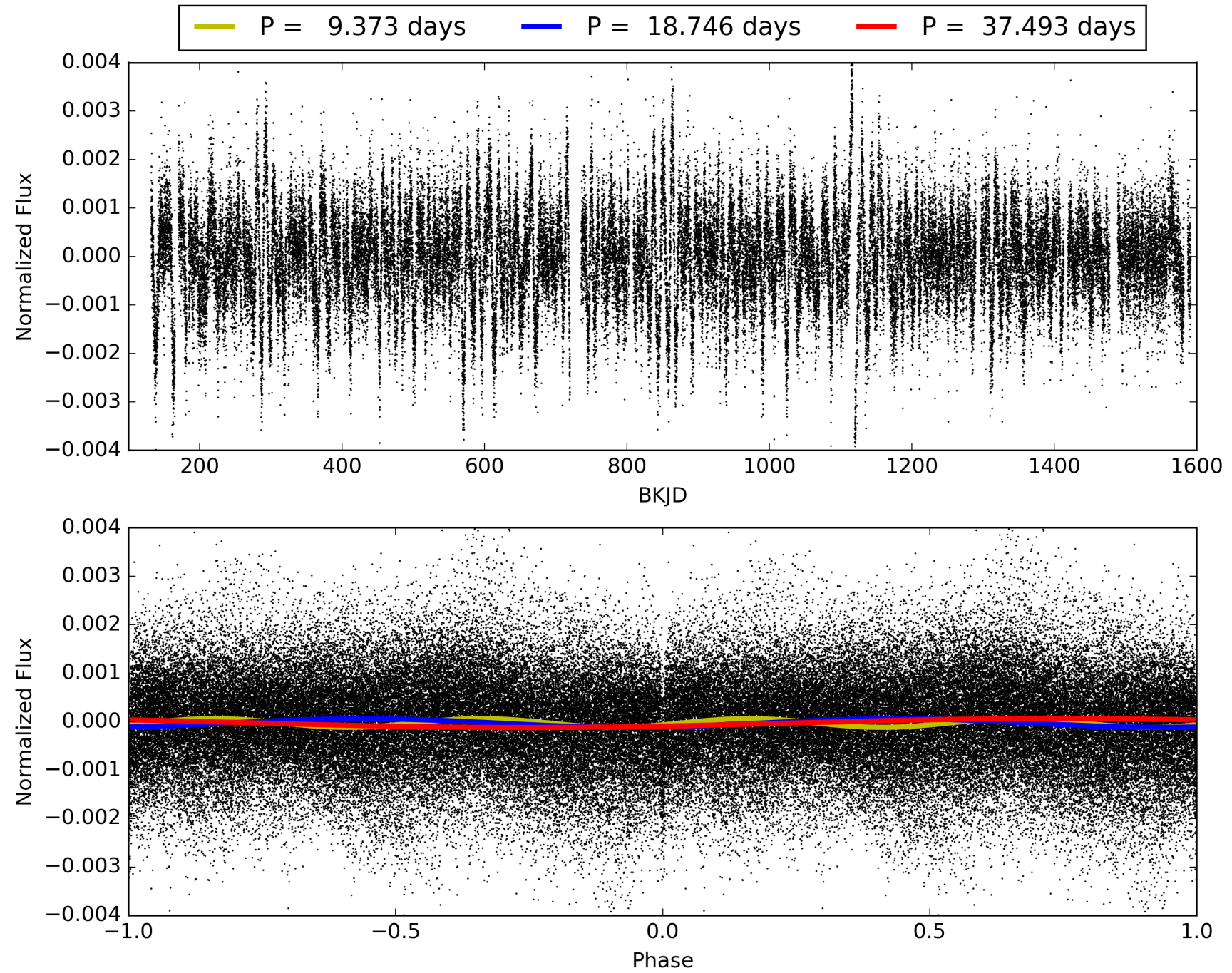
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [26.42 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 99.0%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 5.76e-82  
RollingBand-fgt: 1.00 [64/64]  
GhostDiagnostic-chr: 3.447  
Centroid-sig: 52.7%  
Centroid-so: 0.782 arcsec [1.35 $\sigma$ ]  
OotOffset-rm: 0.362 arcsec [1.52 $\sigma$ ]  
KicOffset-rm: 0.319 arcsec [1.37 $\sigma$ ]  
OotOffset-st: 3/4/3/4 [14]  
KicOffset-st: 3/4/3/4 [14]  
DiffImageQuality-fgm: 1.00 [14/14]  
DiffImageOverlap-fno: 1.00 [17/17]

# TCE 009334289-02, PDC Light Curves

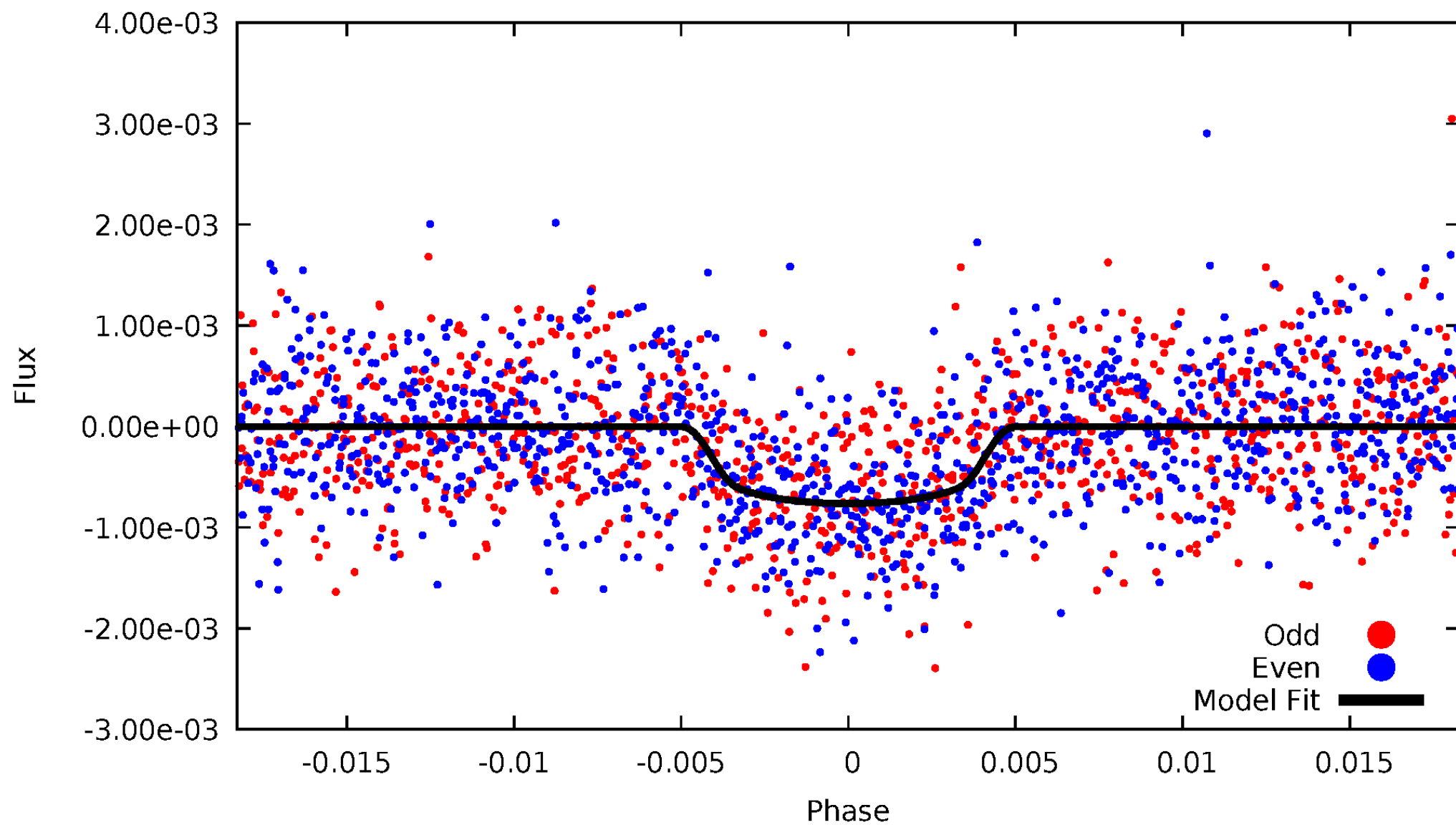


TCE 009334289-02



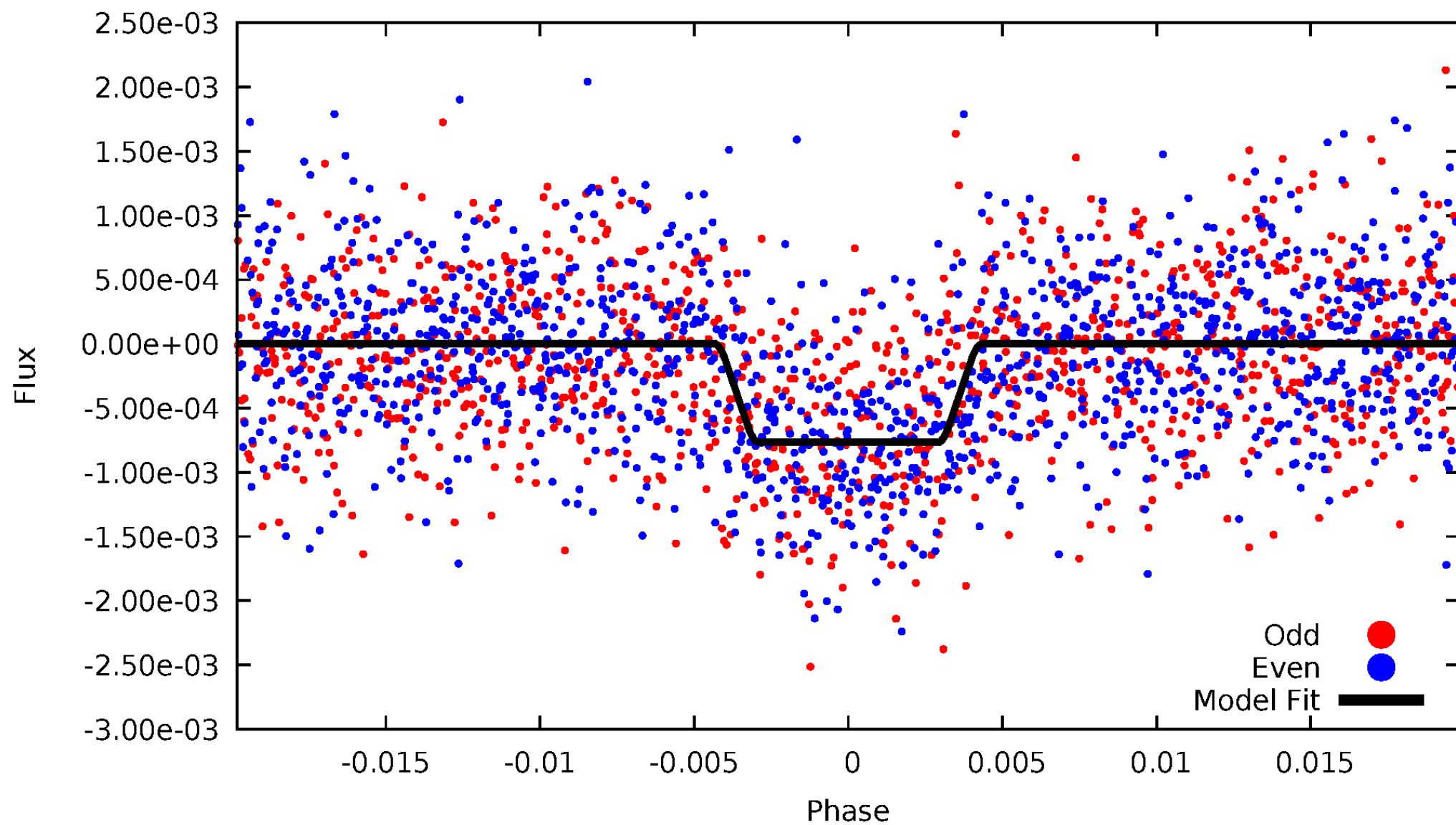
# DV Odd/Even

TCE 009334289-02



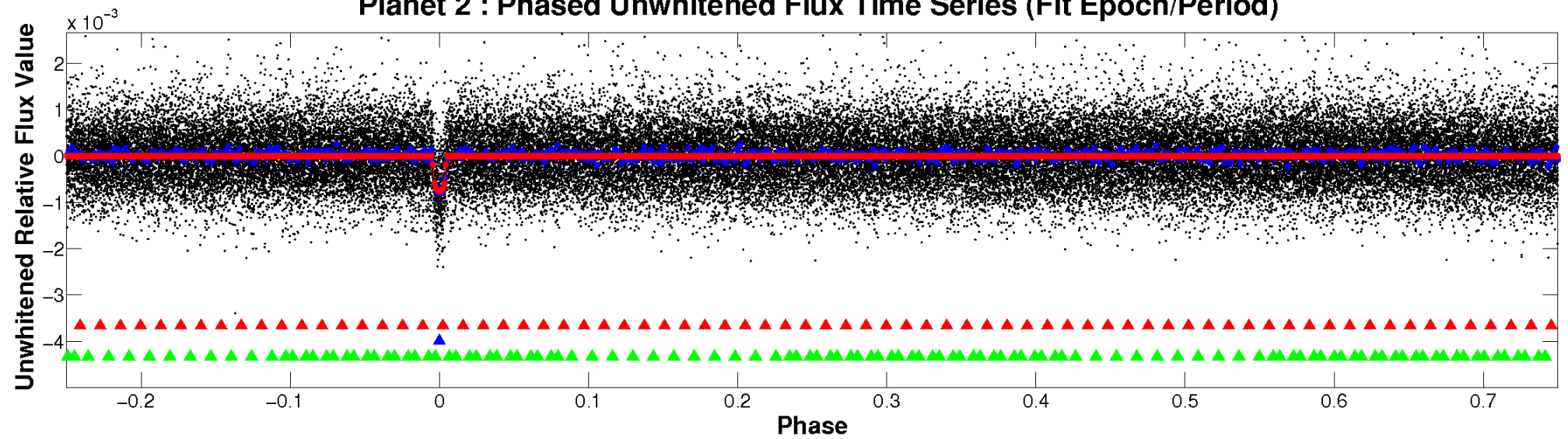
# ALT Odd/Even

TCE 009334289-02

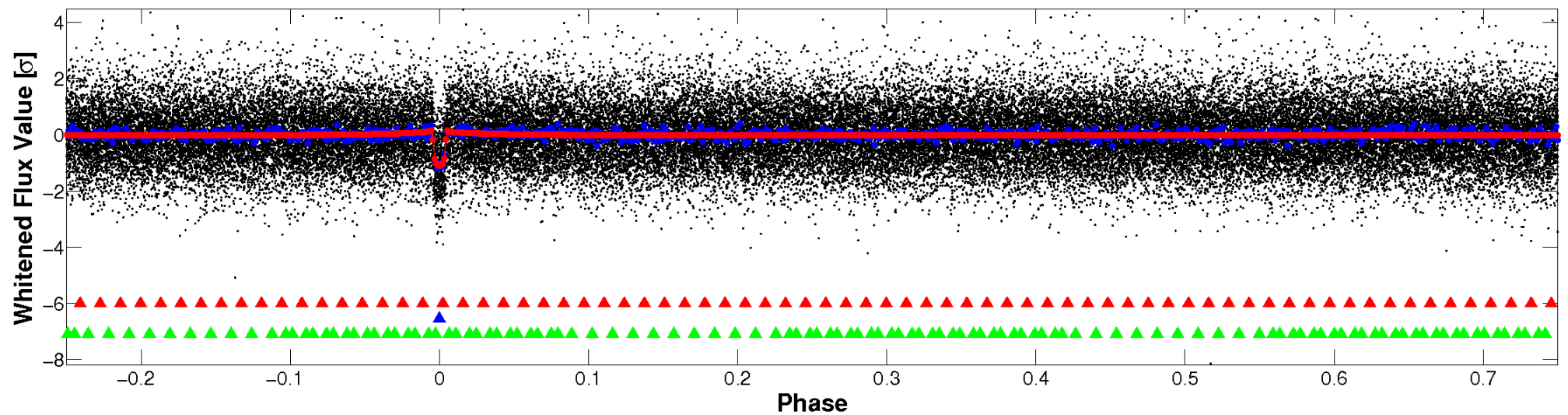


# Non-Whitened Vs. Whitened Light Curve

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

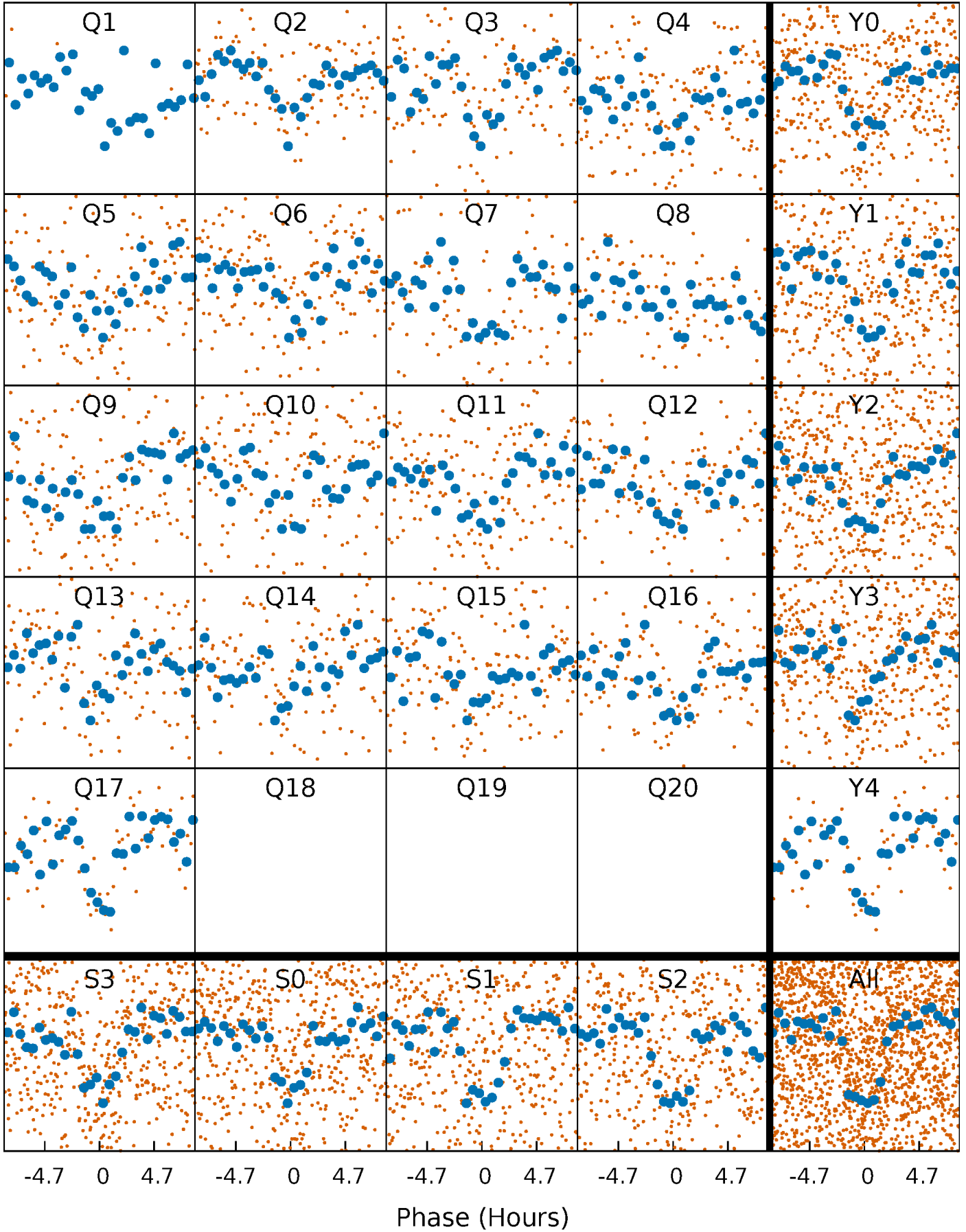


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



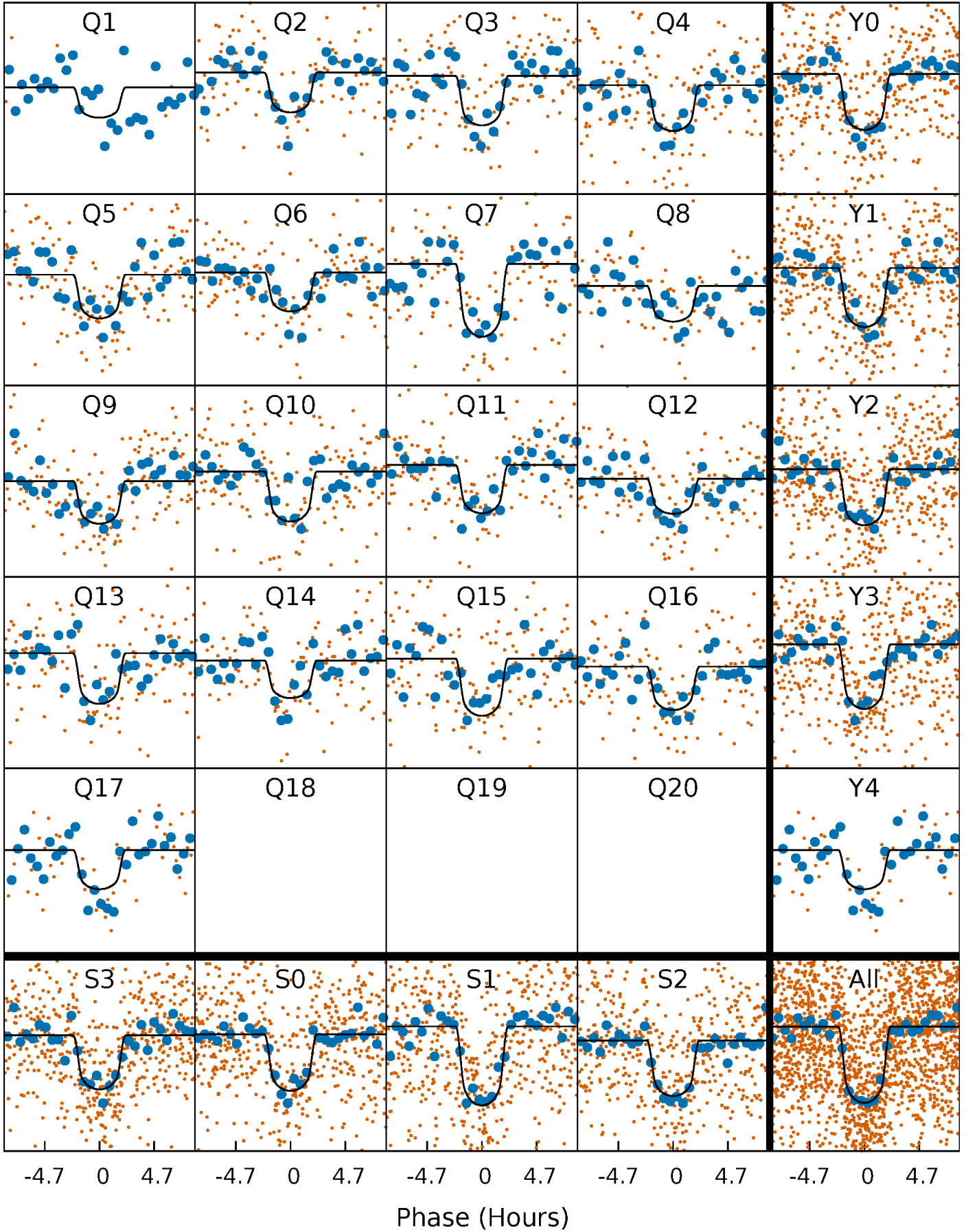
# PDC Quarter-Phased Transit Curves

TCE 009334289-02   P= 18.746494 Days    $T_0=147.132156$  (BKJD)



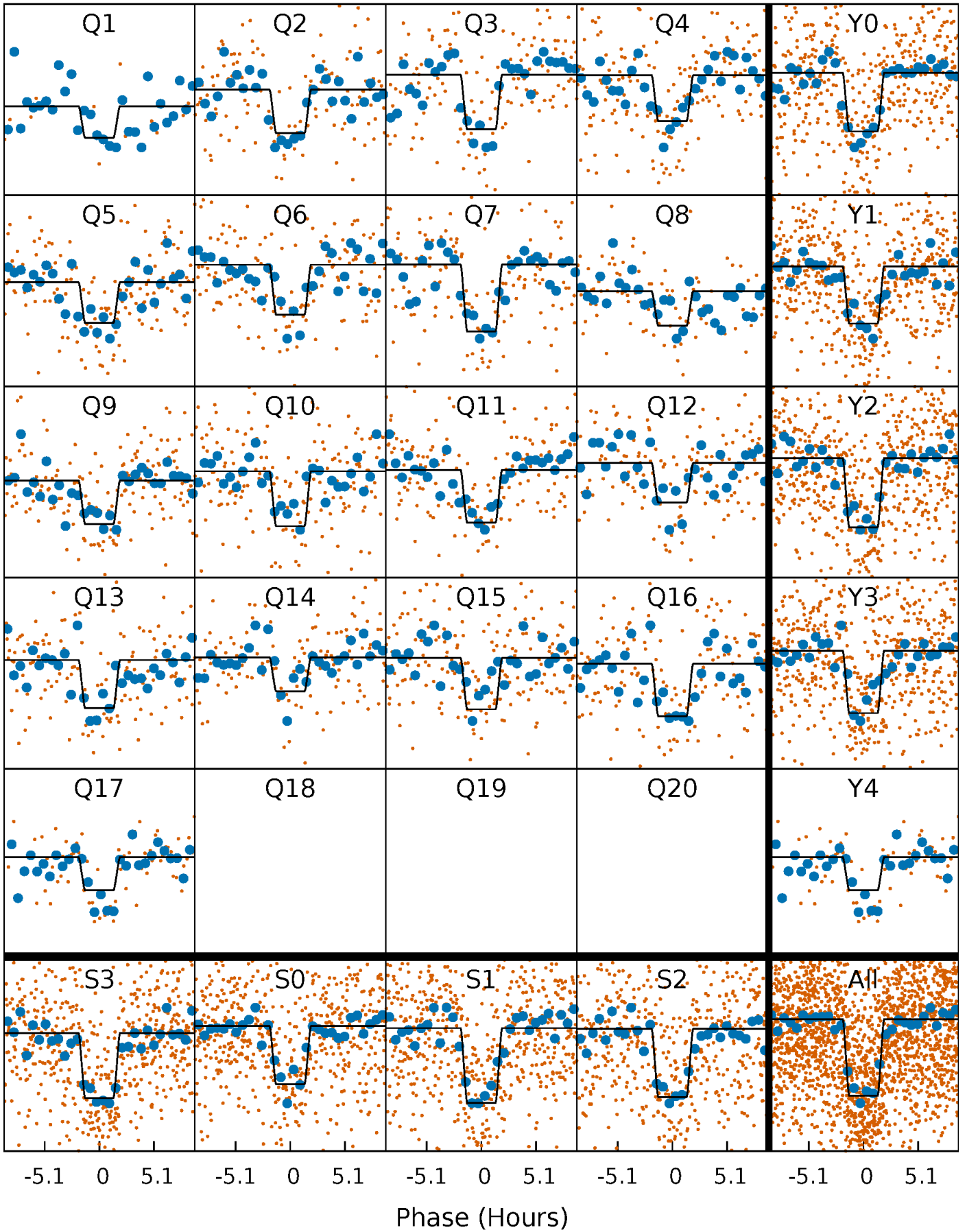
# DV Quarter-Phased Transit Curves

TCE 009334289-02   P= 18.746494 Days    $T_0=147.132156$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

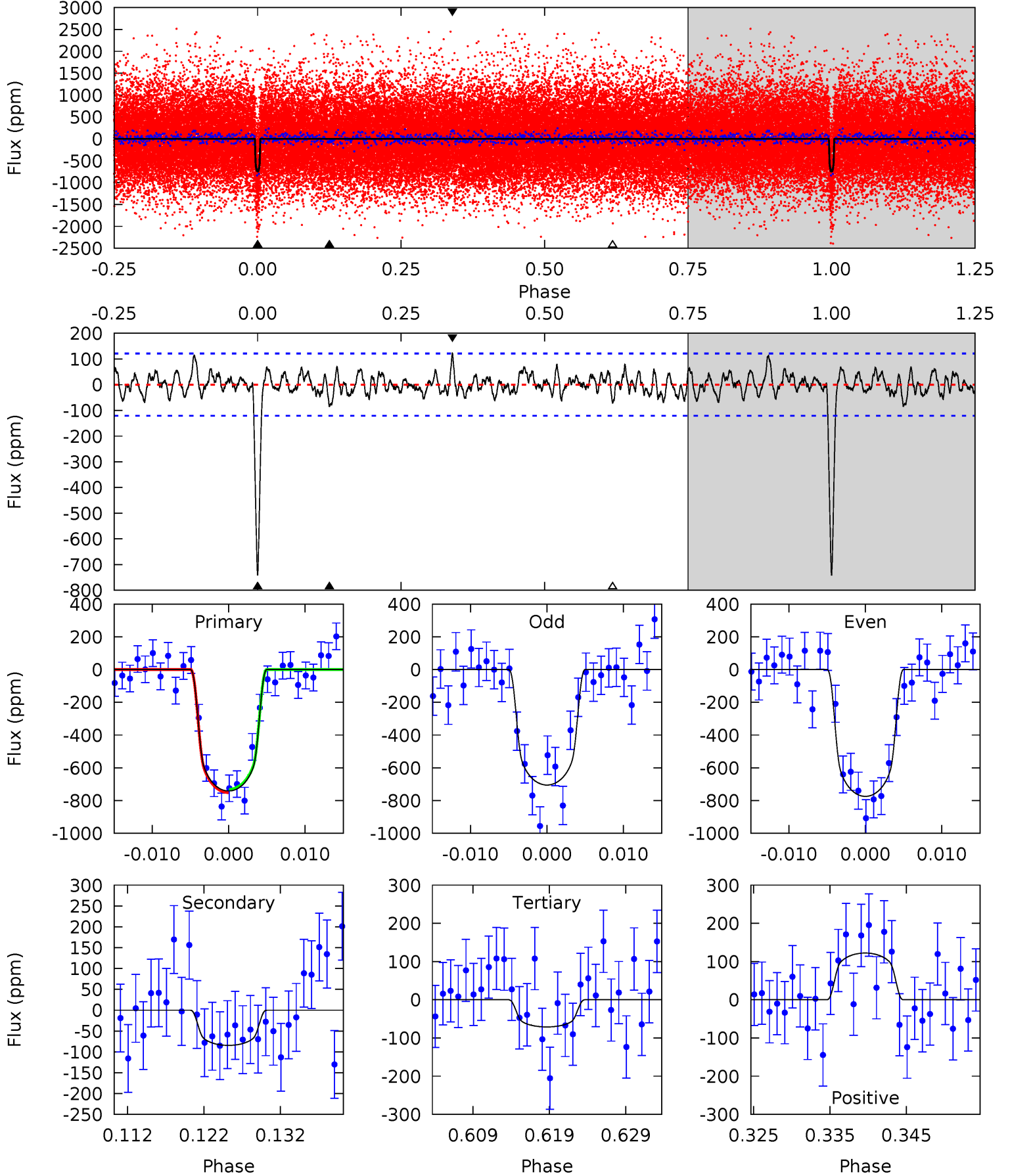
TCE 009334289-02   P= 18.746156 Days    $T_0=147.145002$  (BKJD)



# DV Model-Shift Uniqueness Test

009334289-02, P = 18.746494 Days, E = 128.385662 Days

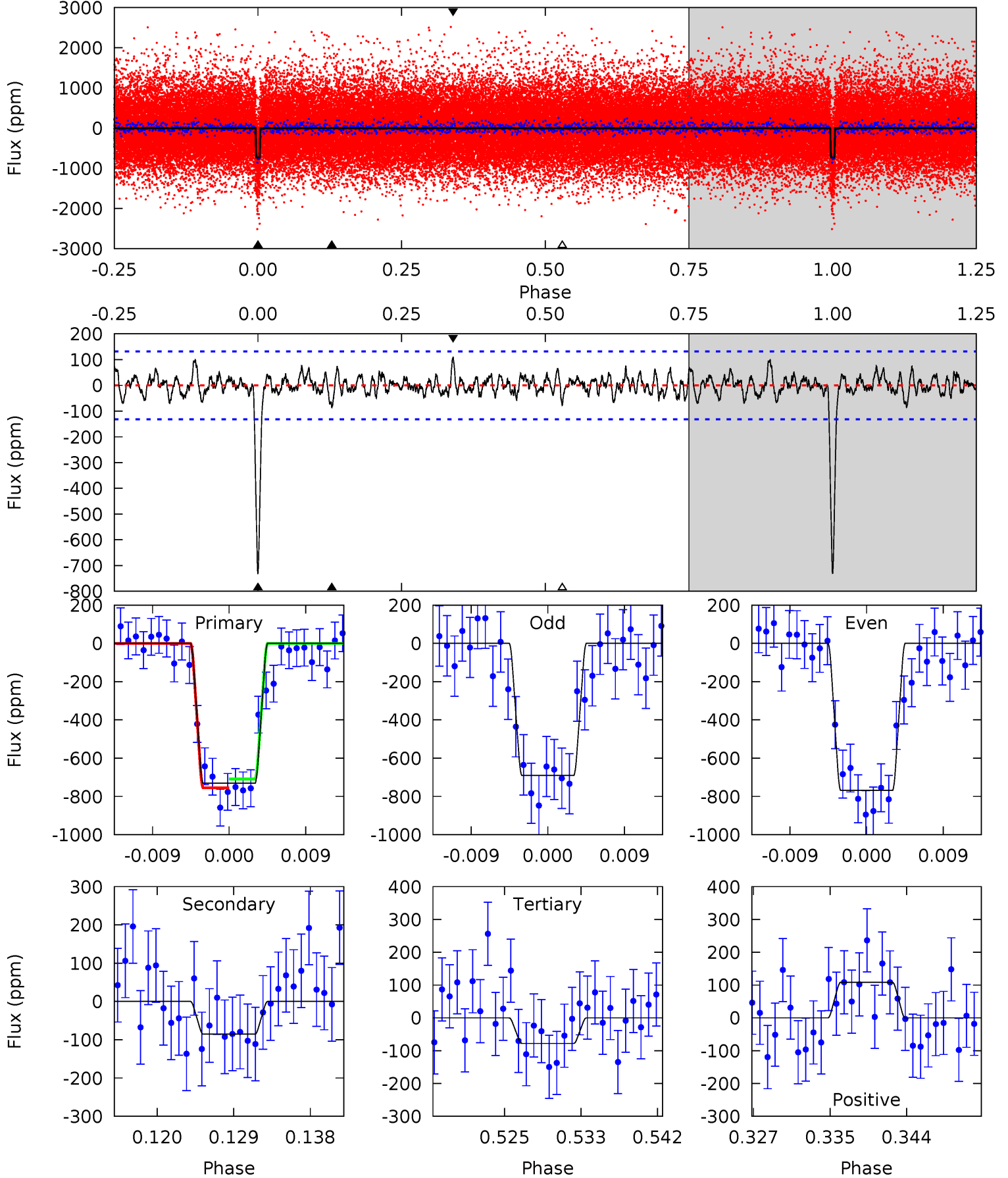
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
30.7	3.50	2.95	5.06	5.02	2.57	1.32	27.8	25.7	0.55	-1.57	1.43	0.98	0.14	0.40



# Alt Model-Shift Uniqueness Test

009334289-02,  $P = 18.746156$  Days,  $E = 128.398846$  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
28.0	3.28	2.99	4.15	5.06	2.63	1.12	25.1	23.9	0.29	-0.87	1.50	1.03	0.13	0.88



### Stellar Parameters For KIC 009334289

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5561^{+75}_{-83}$	$4.362^{+0.126}_{-0.103}$	$0.160^{+0.150}_{-0.150}$	$1.060^{+0.156}_{-0.127}$	$0.943^{+0.062}_{-0.048}$	$1.115^{+0.522}_{-0.357}$
	+1%/-1%	+3%/-2%	+94%/-94%	+15%/-12%	+7%/-5%	+47%/-32%
Source	SPE90	SPE90	SPE90	DSEP		

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

### Secondary Eclipse Parameters for KIC 009334289-02 / KOI 0934.03

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-84 \pm 24$	$3.30^{+0.79}_{-0.76}$	$952^{+40}_{-38}$	$3580^{+334}_{-265}$	$79^{+56}_{-33}$
Alt.	$-85 \pm 26$	$3.17^{+0.73}_{-0.71}$	$956^{+39}_{-38}$	$3613^{+366}_{-281}$	$84^{+63}_{-36}$

$T_{\text{max}}$  = 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

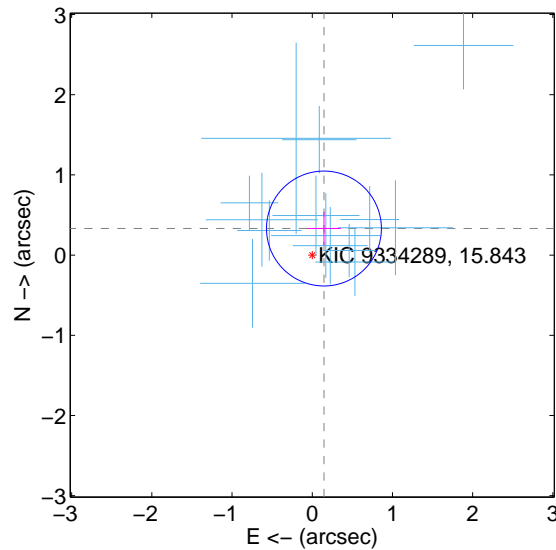
Supplemental centroid analysis for 009334289-02. Kepler magnitude: 15.84. Transit SNR 21.07

There are 14 quarters with good PRF difference image offsets

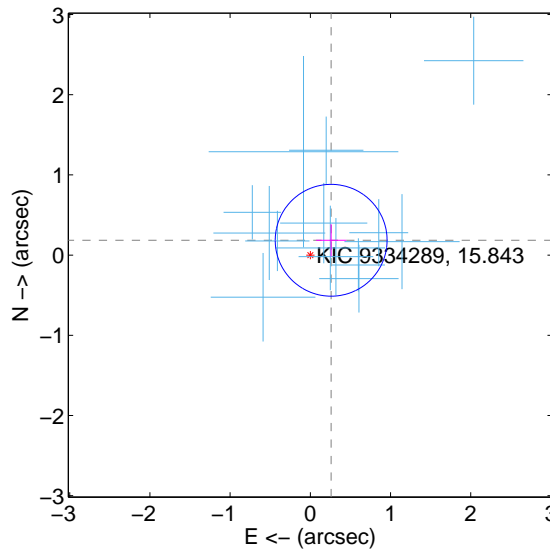
The direct PRF centroid is offset from the target star catalog position by about 0.17 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.362 \pm 0.239$	1.52	$-0.146 \pm 0.212$	$0.331 \pm 0.206$
PRF-fit source offset from KIC position	$0.319 \pm 0.232$	1.37	$-0.260 \pm 0.188$	$0.185 \pm 0.201$
photometric centroid source offset	$0.78 \pm 0.58$	1.35	$-0.71 \pm 0.59$	$-0.34 \pm 0.52$

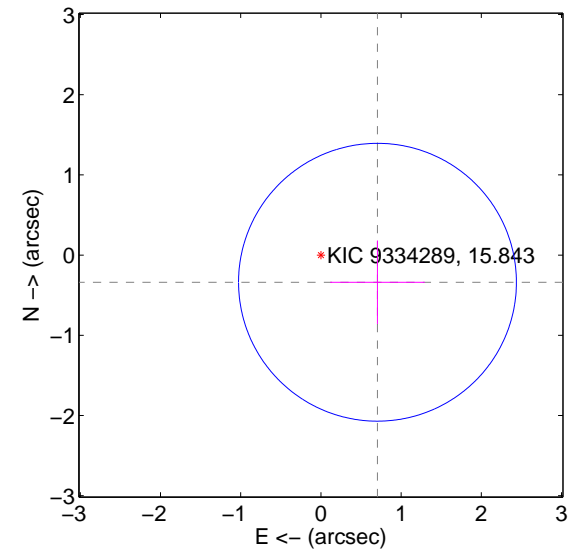
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

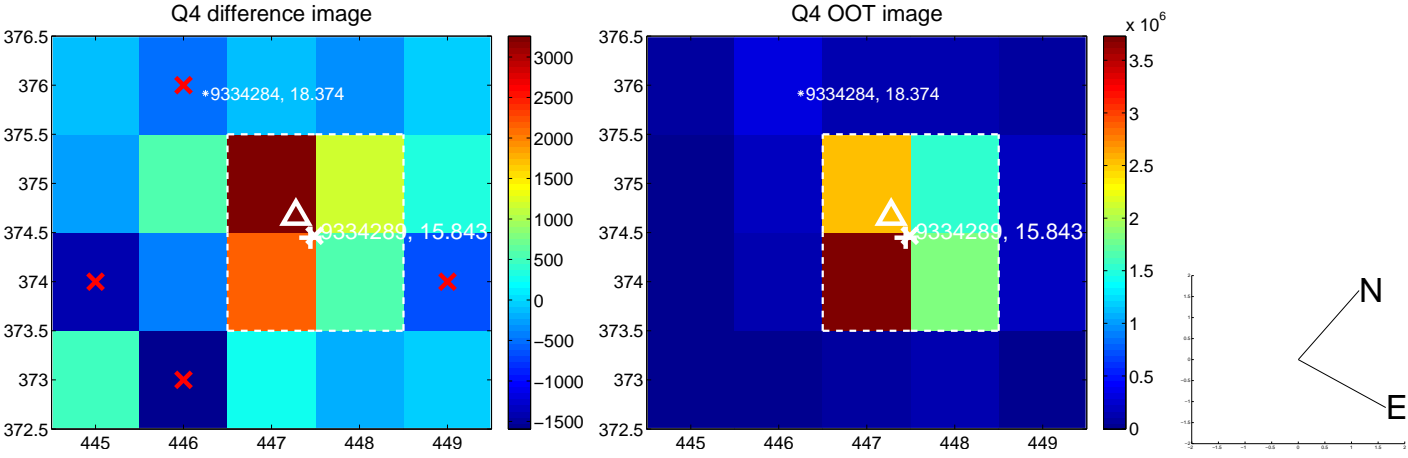
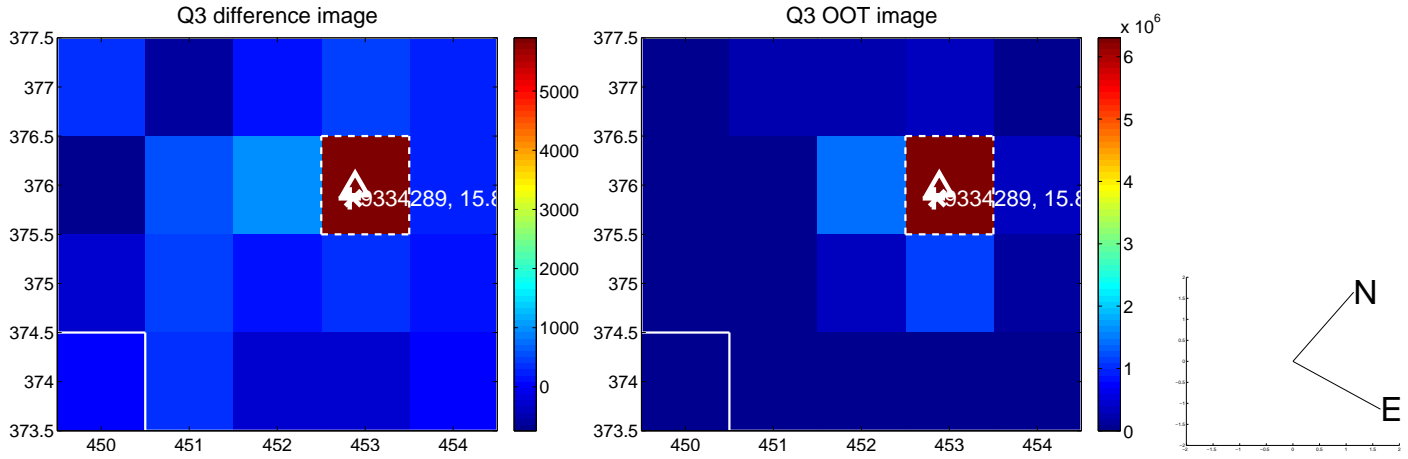
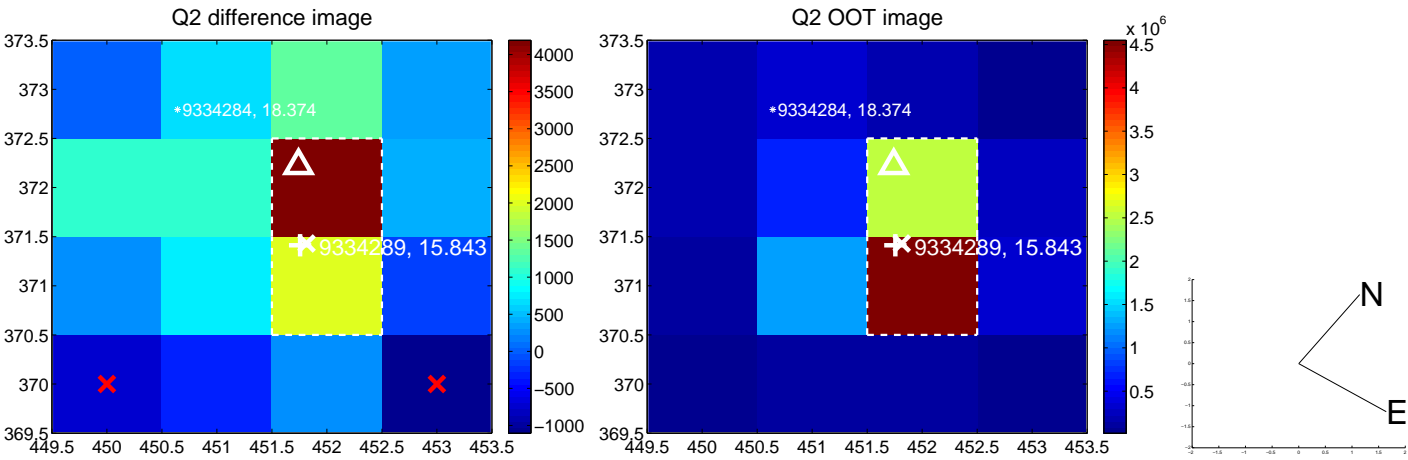
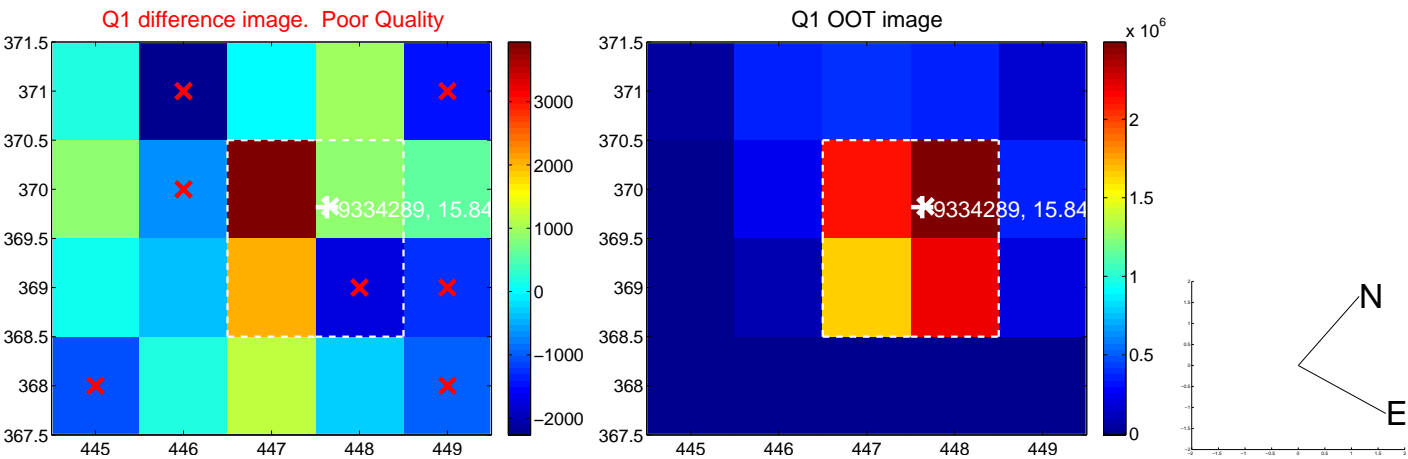


offset from photometric centroids

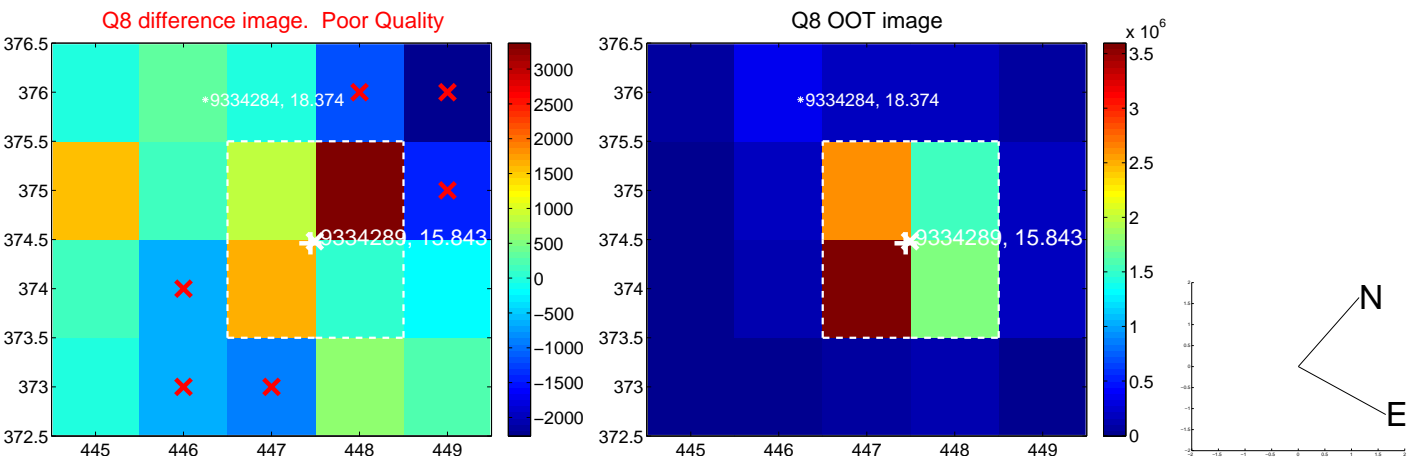
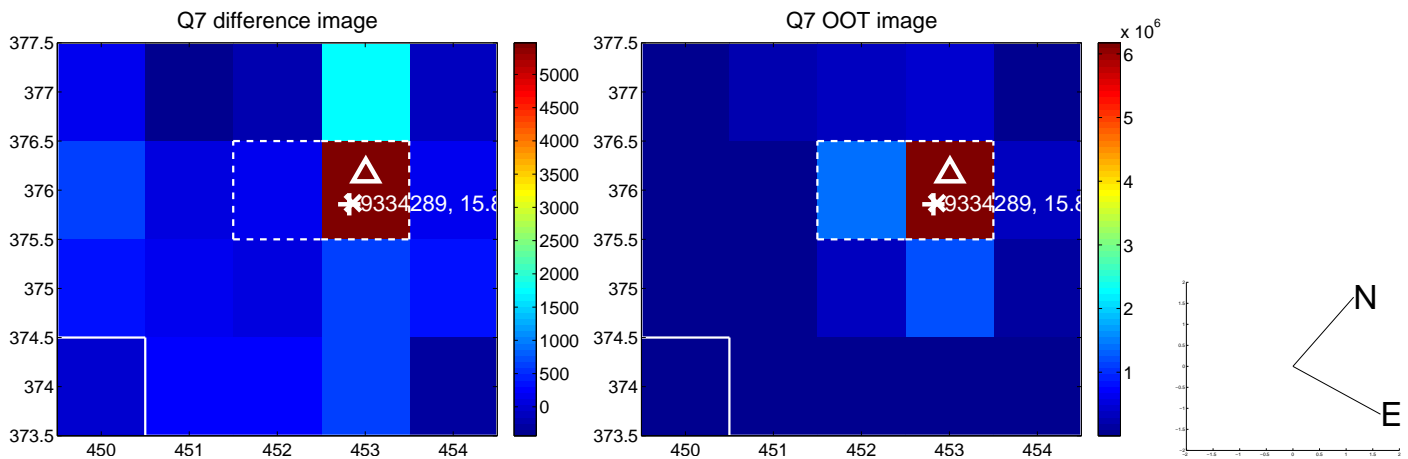
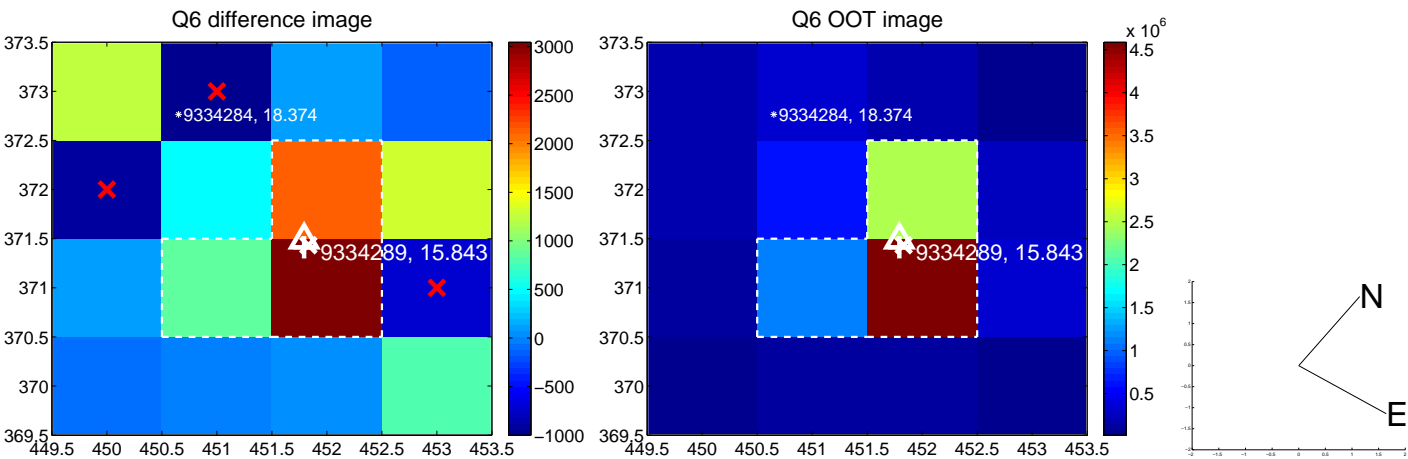
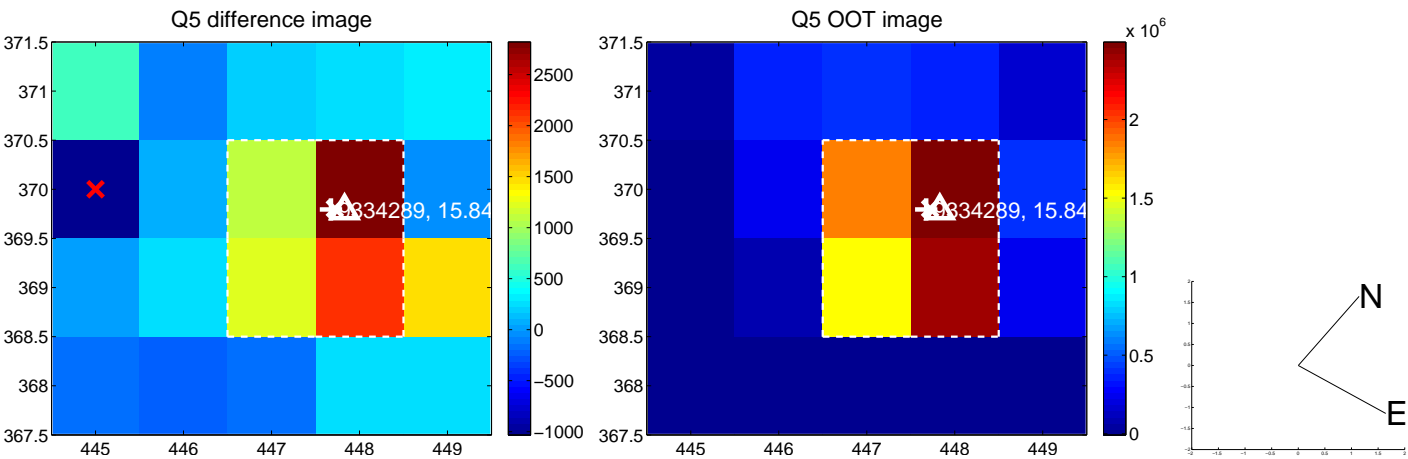


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

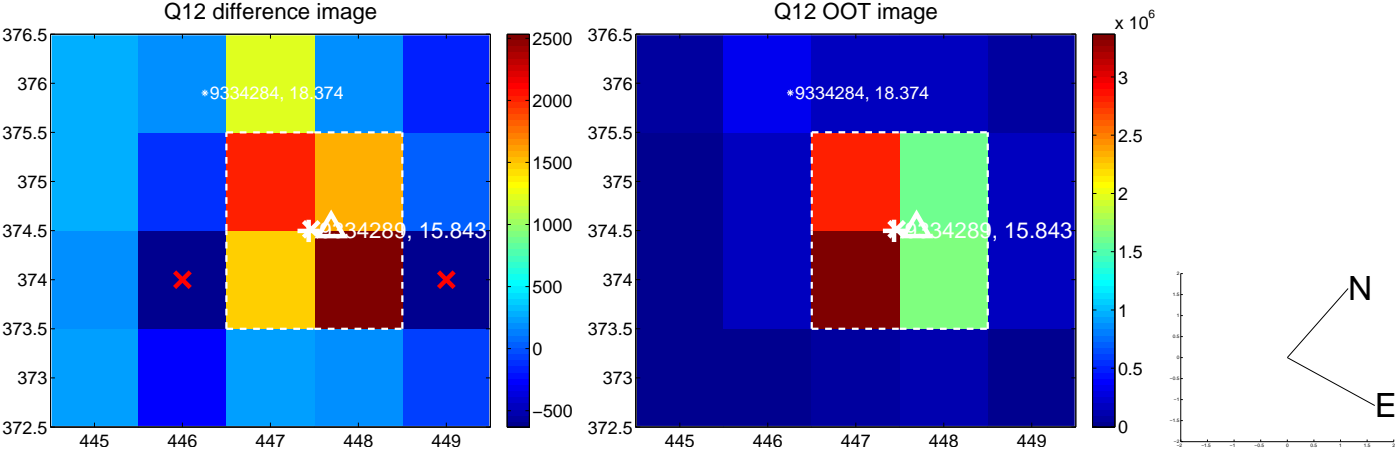
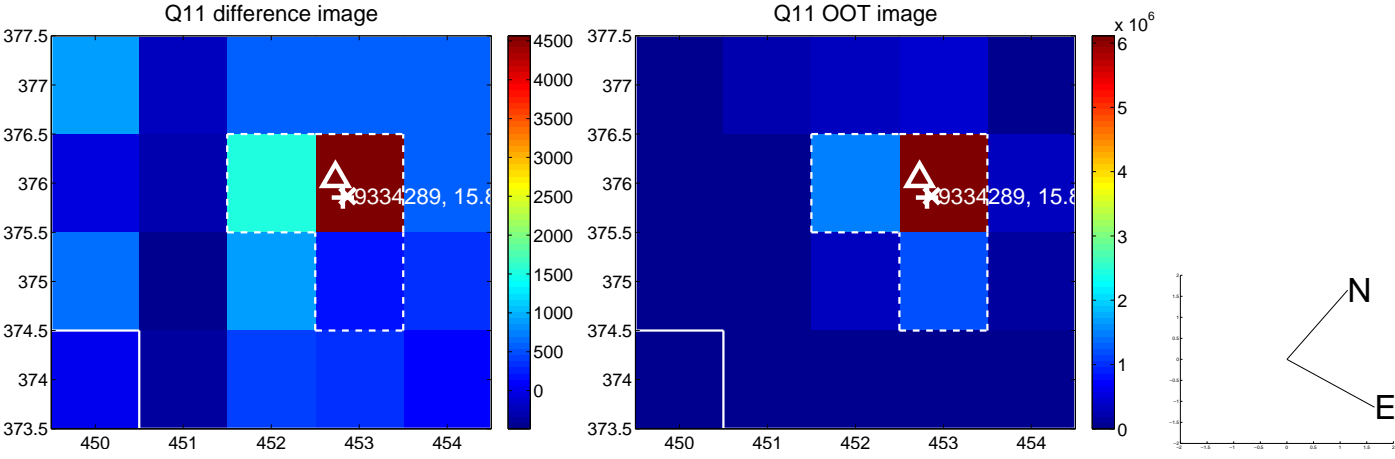
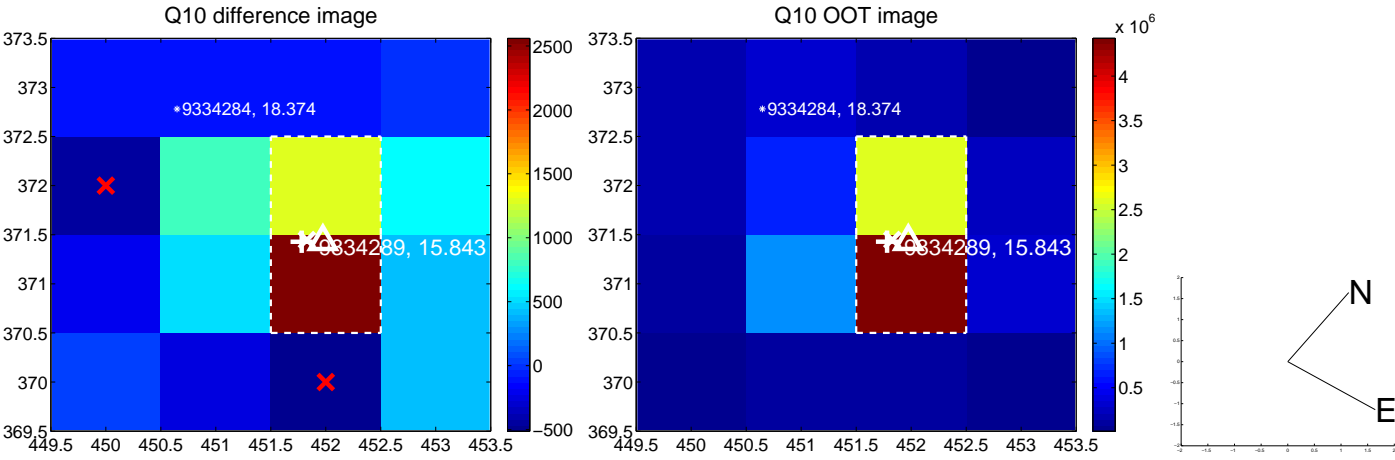
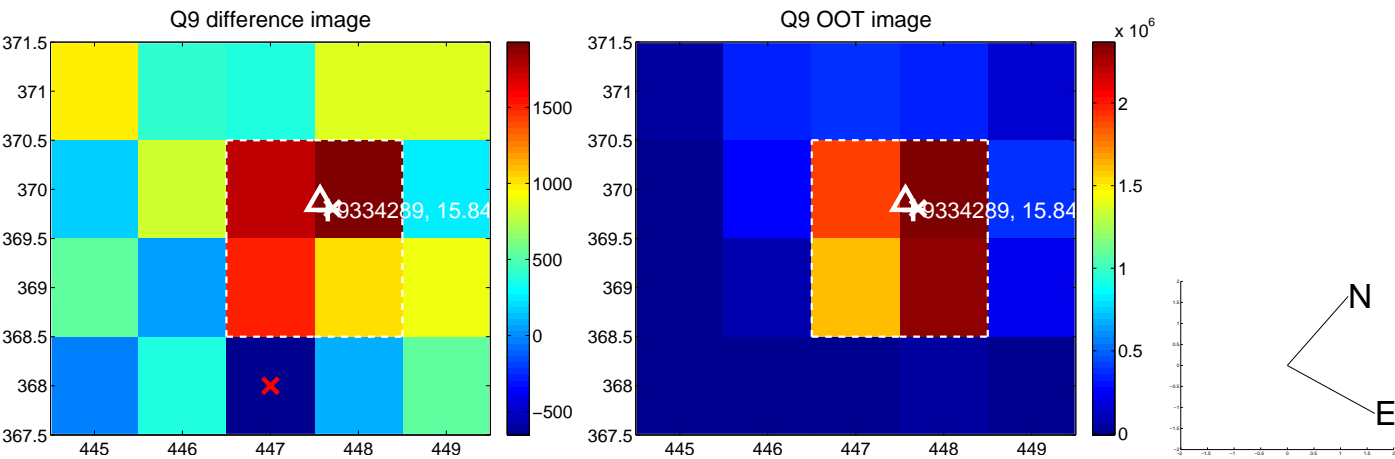
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



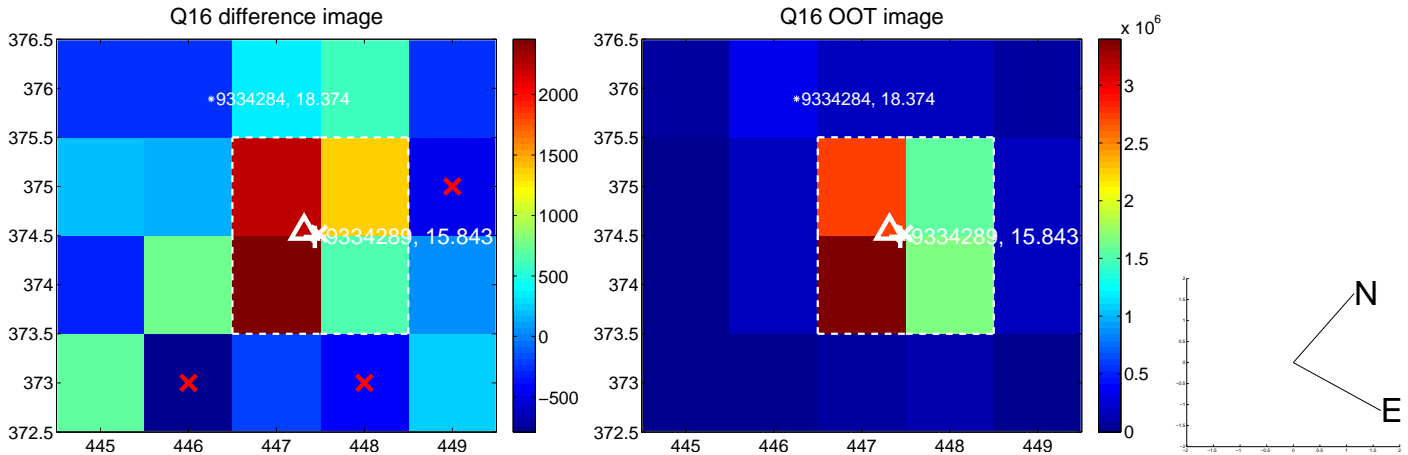
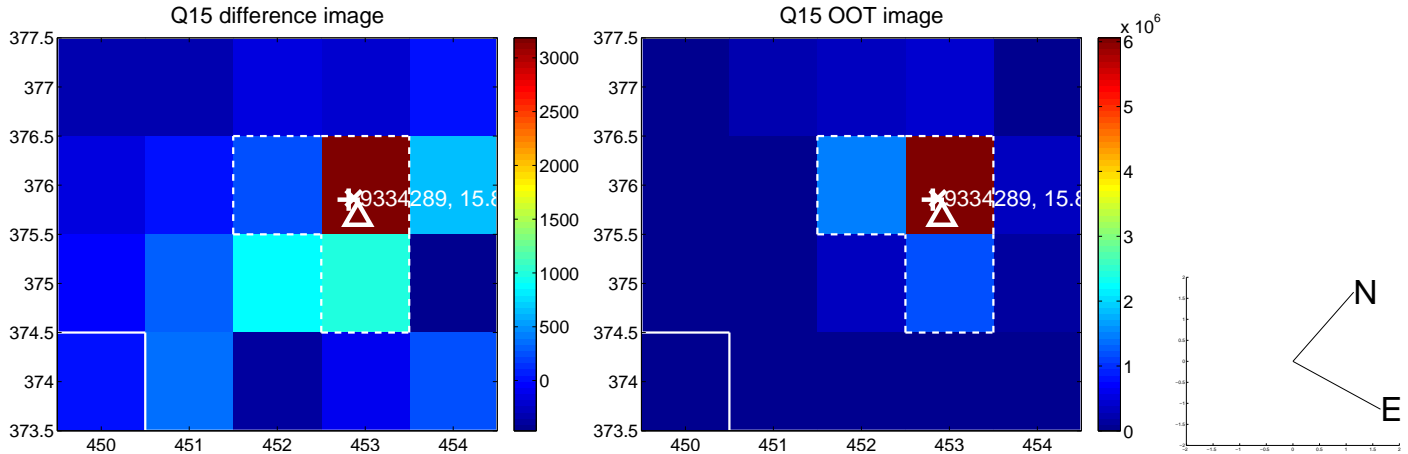
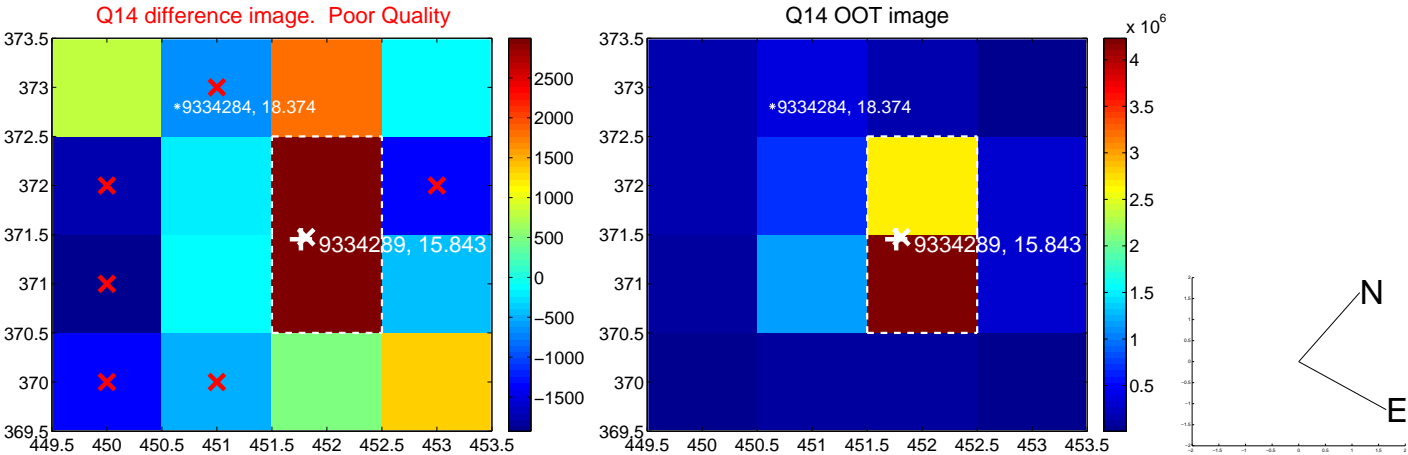
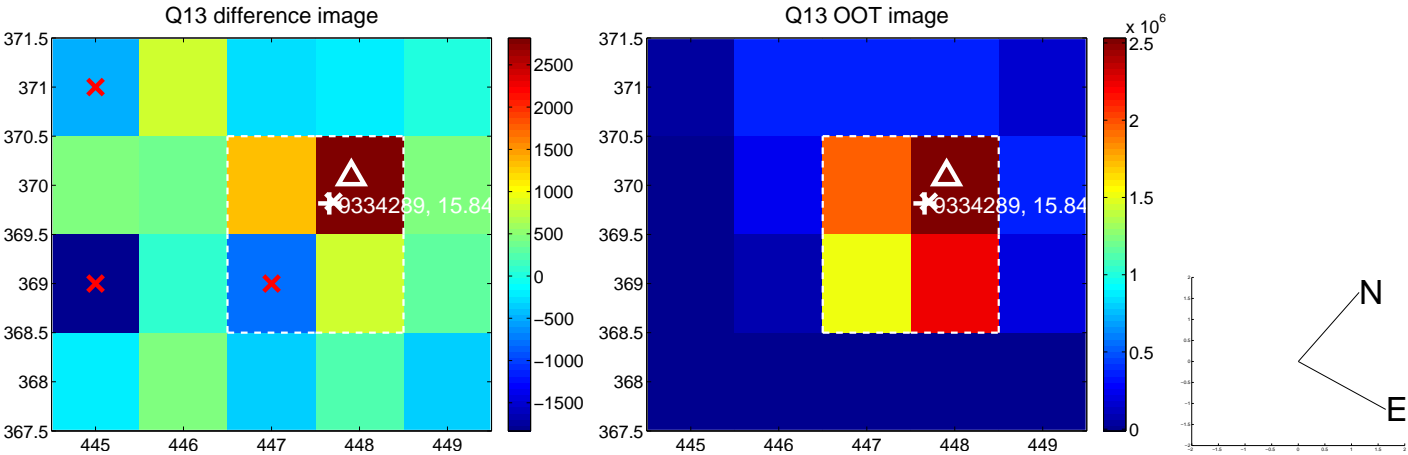
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



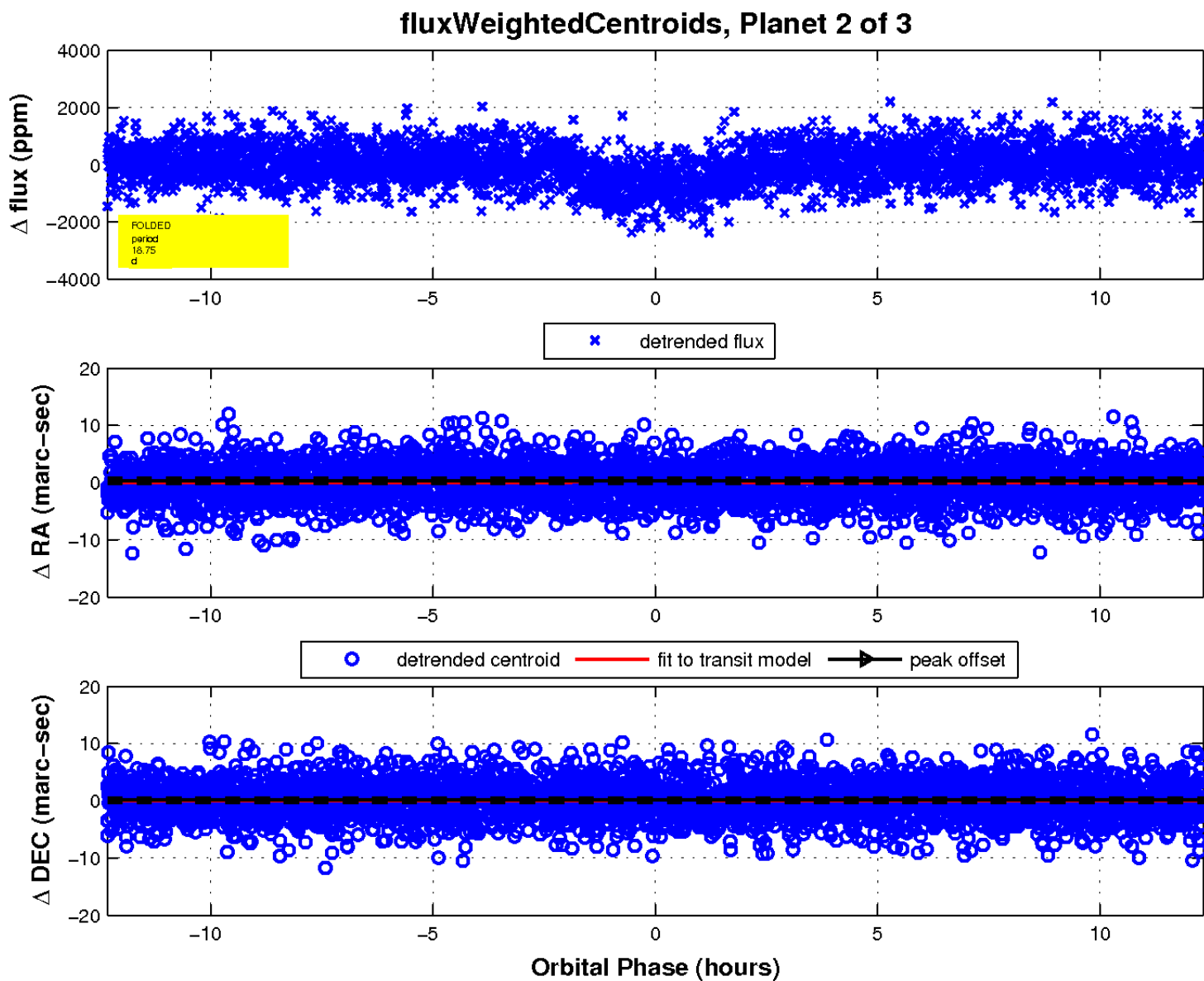
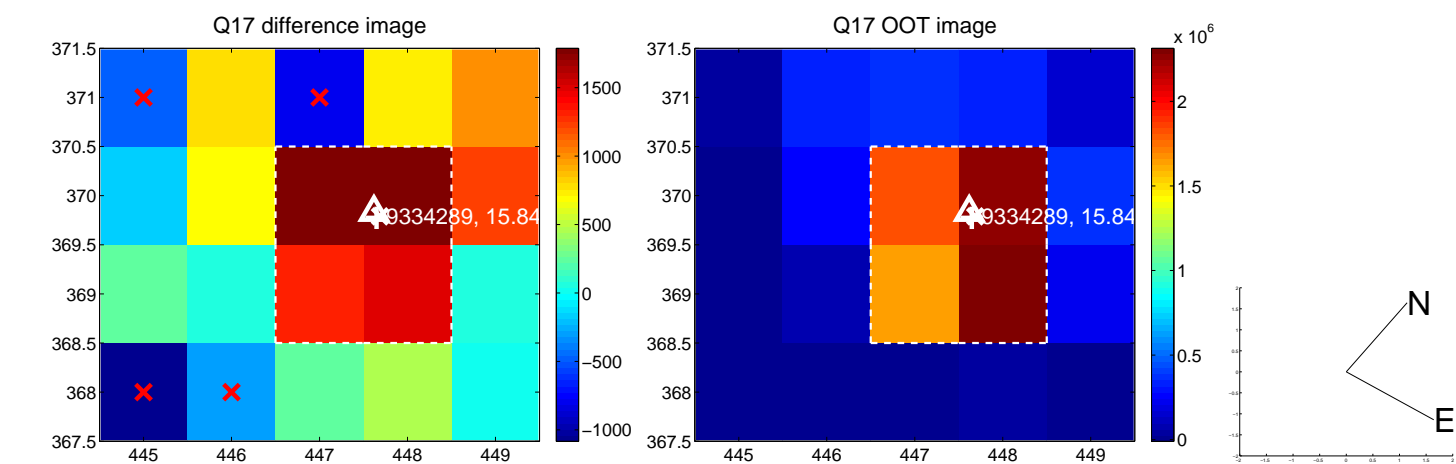
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

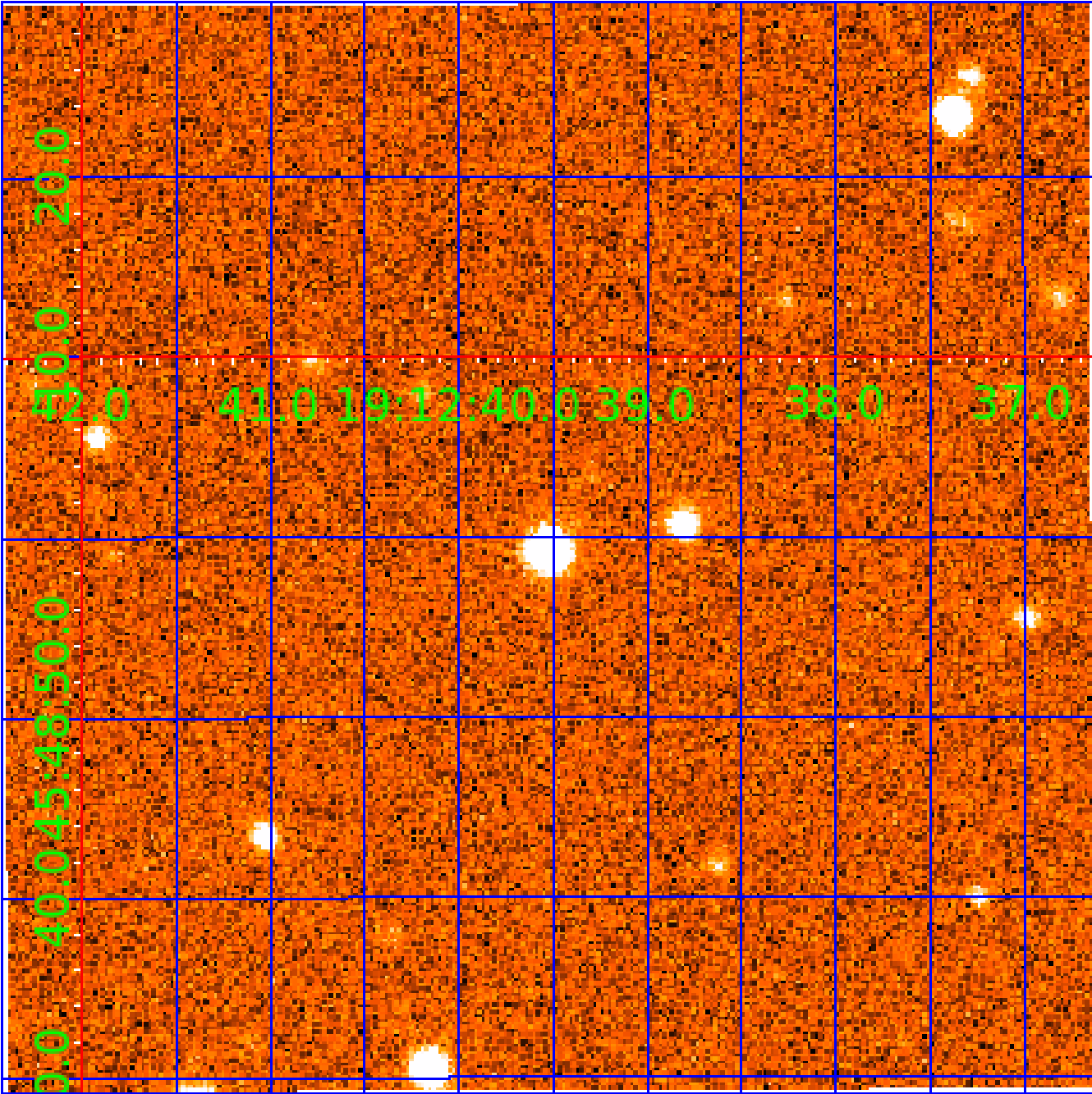


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 009334289

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009334289-01	OBS	0934.01	5.826650	132.225495	1541.0	3.054	61.9	69.3	1.06	5561	4.54	249.16
009334289-02	OBS	0934.03	18.746494	147.132156	764.2	4.111	19.5	21.1	1.06	5561	3.33	52.46
009334289-03	OBS	0934.02	12.412081	142.545384	605.3	4.028	18.3	20.3	1.06	5561	3.18	90.90

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009334289-01	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009334289-02	OBS	PC	1.00	0	0	0	0	NO_COMMENT
009334289-03	OBS	PC	1.00	0	0	0	0	NO_COMMENT

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

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

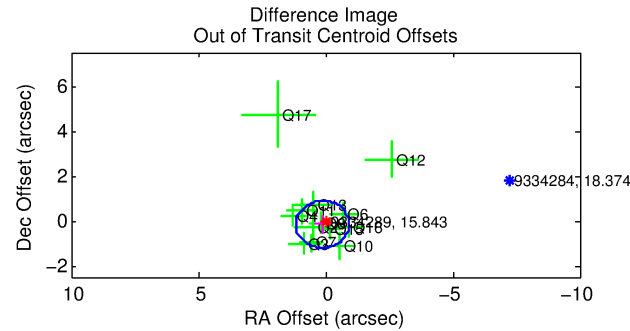
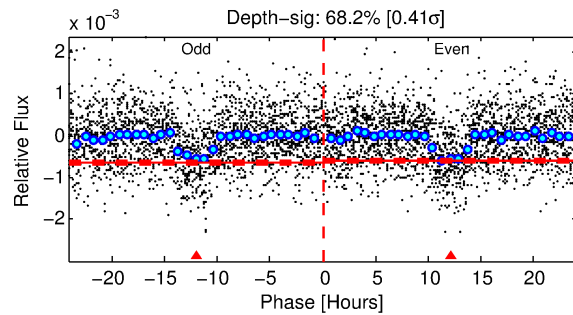
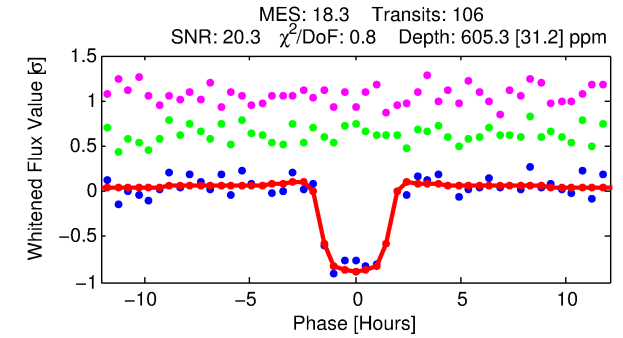
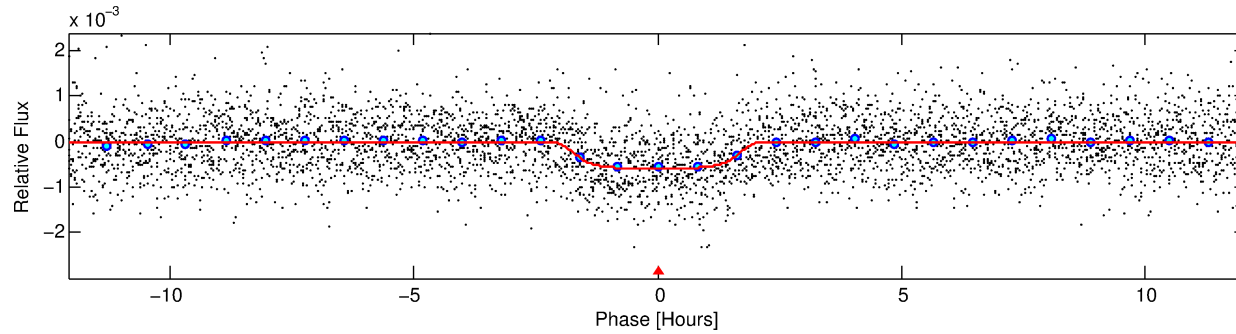
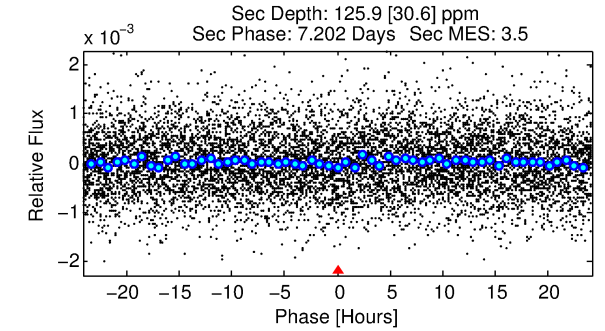
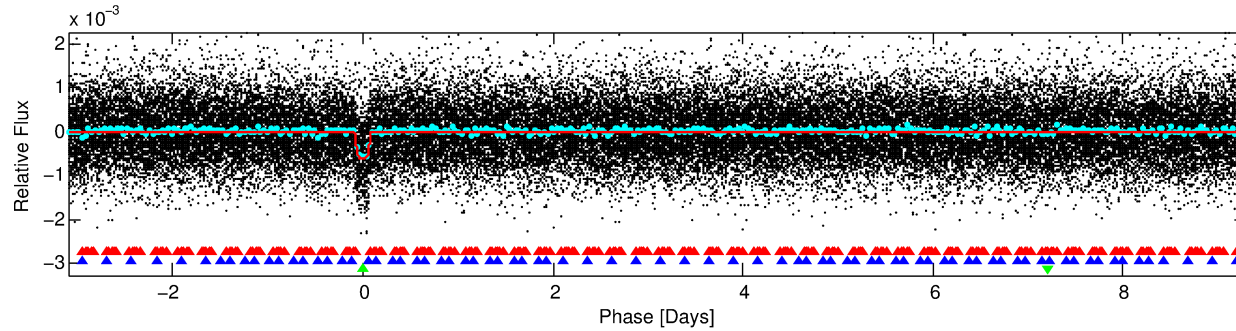
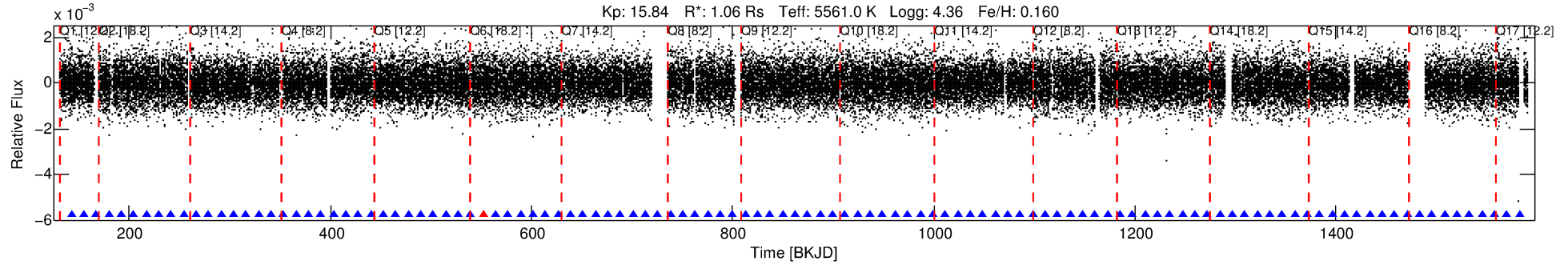
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009334289-03

No Significant Match Found

# DV One-Page Summary

KIC: 9334289 Candidate: 3 of 3 Period: 12.412 d  
KOI: K00934.02 Name: Kepler-254c Corr: 0.934



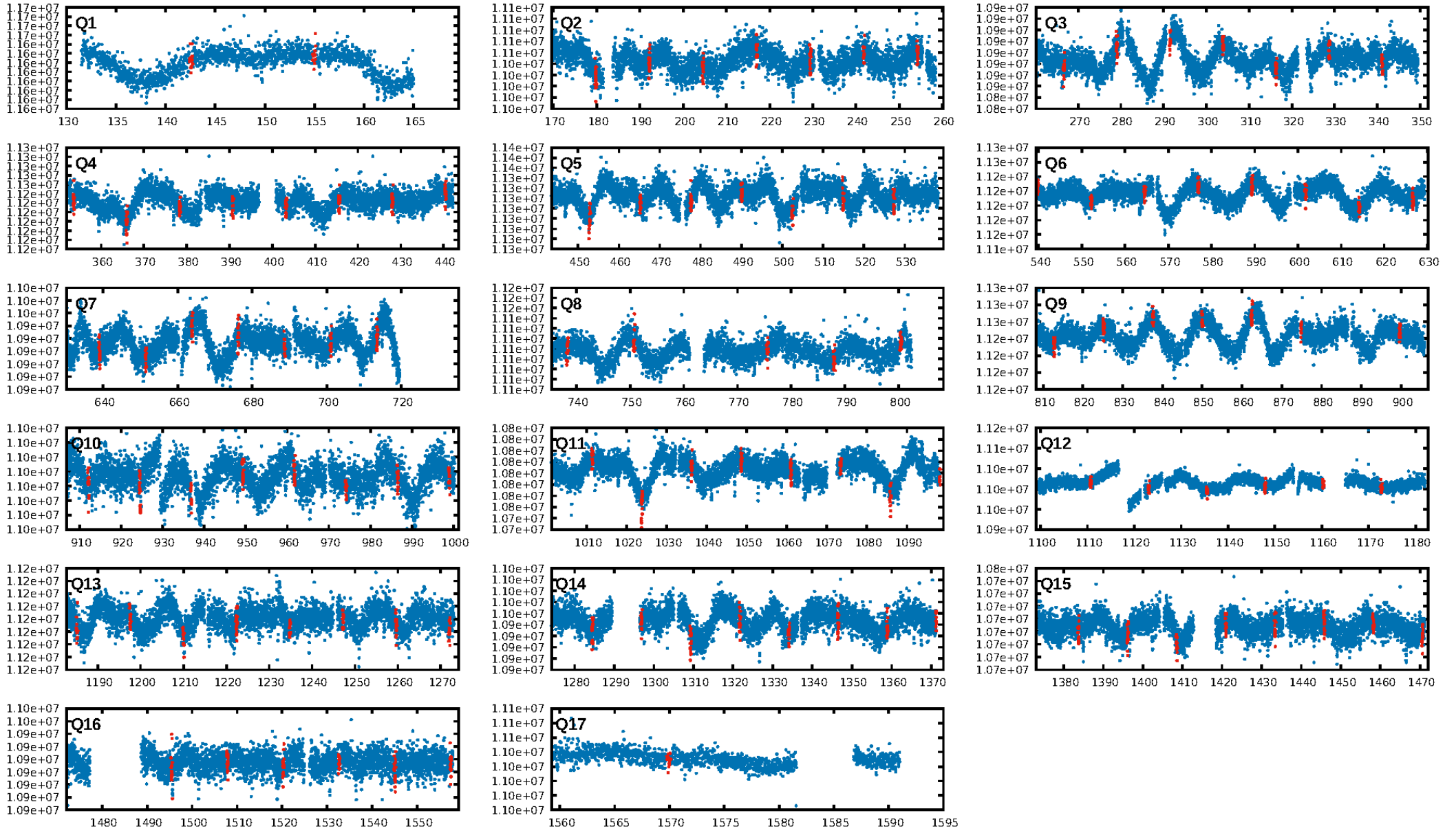
## DV Fit Results:

Period = 12.41208 [0.00006] d  
Epoch = 142.5454 [0.0040] BKJD  
Rp/R\* = 0.0275 [0.0023]  
a/R\* = 11.12 [3.73]  
b = 0.91 [0.06]  
Seff = 90.90 [20.45]  
Teq = 787 [44] K  
Rp = 3.18 [0.54] Re  
a = 0.1029 [0.0142] AU  
Ag = 72.75 [26.70] [2.69σ]  
Teffp = 3555 [268] K [10.17σ]

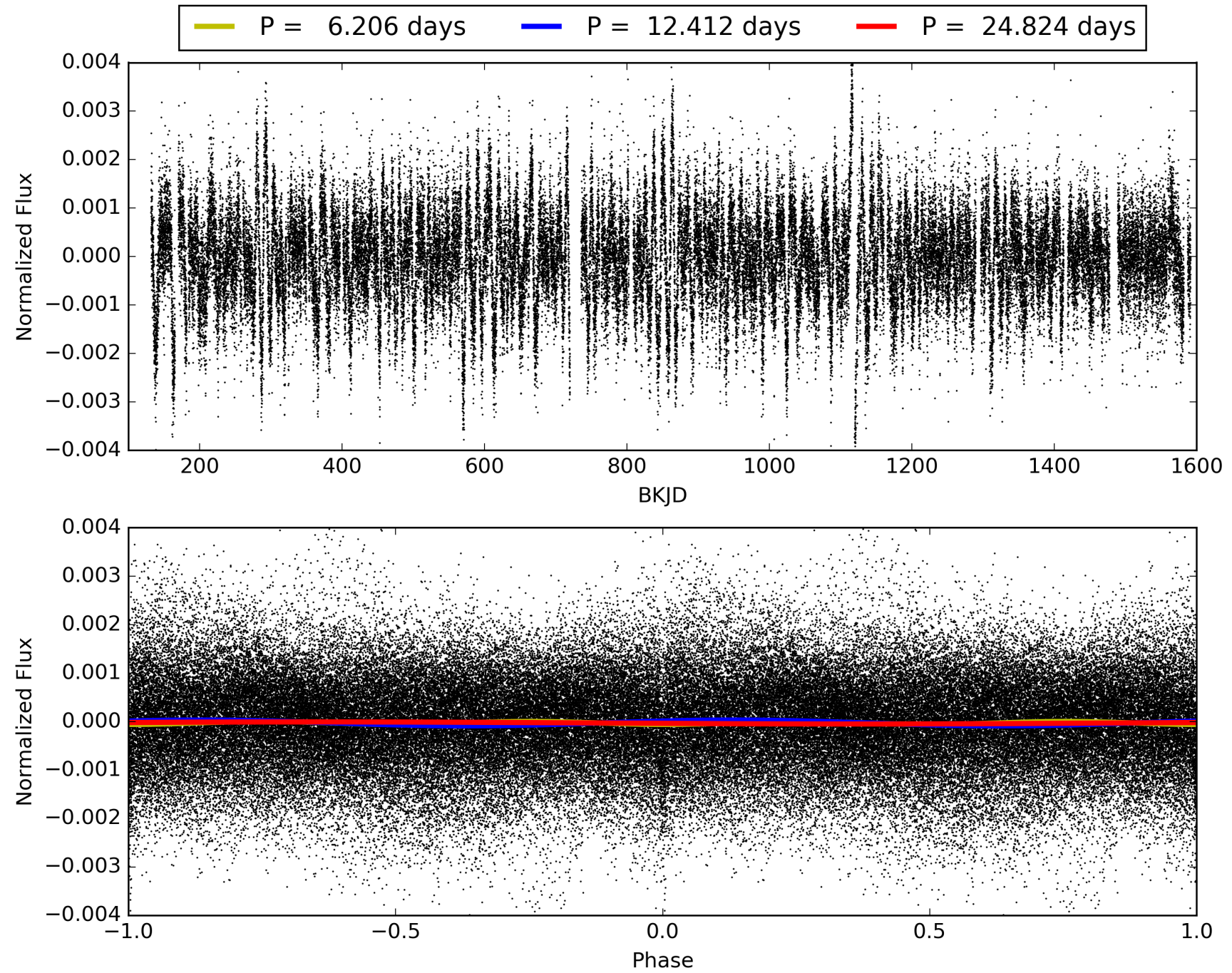
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [31.27σ]  
LongPeriod-sig: 100.0% [26.42σ]  
ModelChiSquare2-sig: 99.5%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 2.04e-72  
RollingBand-fgt: 0.99 [102/103]  
GhostDiagnostic-chr: 3.427  
Centroid-sig: 59.9%  
Centroid-so: 0.106 arcsec [0.18σ]  
OotOffset-rm: 0.201 arcsec [0.58σ]  
KicOffset-rm: 0.319 arcsec [0.84σ]  
OotOffset-st: 3/4/4/3 [14]  
KicOffset-st: 3/4/4/3 [14]  
DiffImageQuality-fgm: 0.86 [12/14]  
DiffImageOverlap-fno: 1.00 [17/17]

# TCE 009334289-03, PDC Light Curves

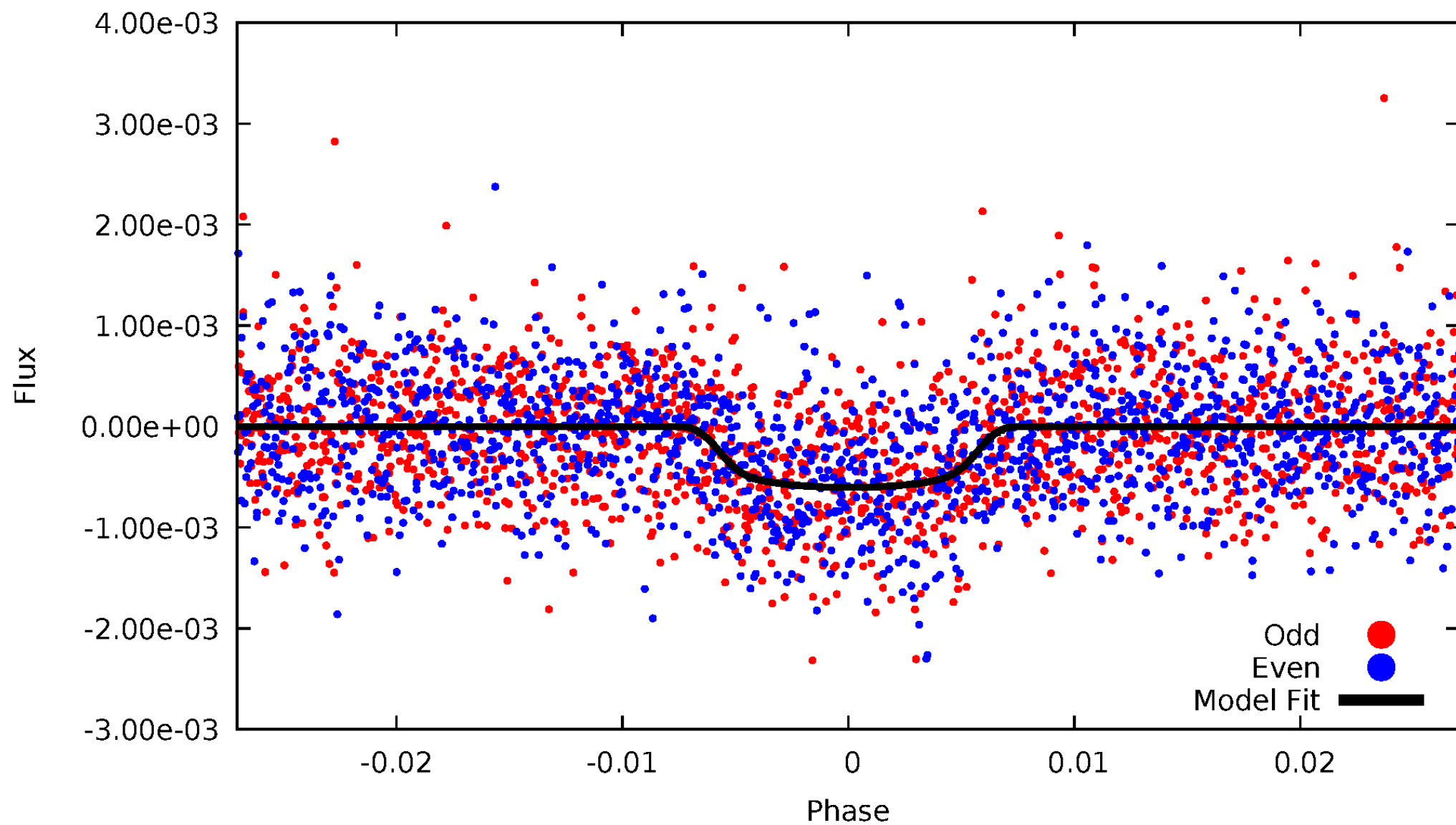


TCE 009334289-03



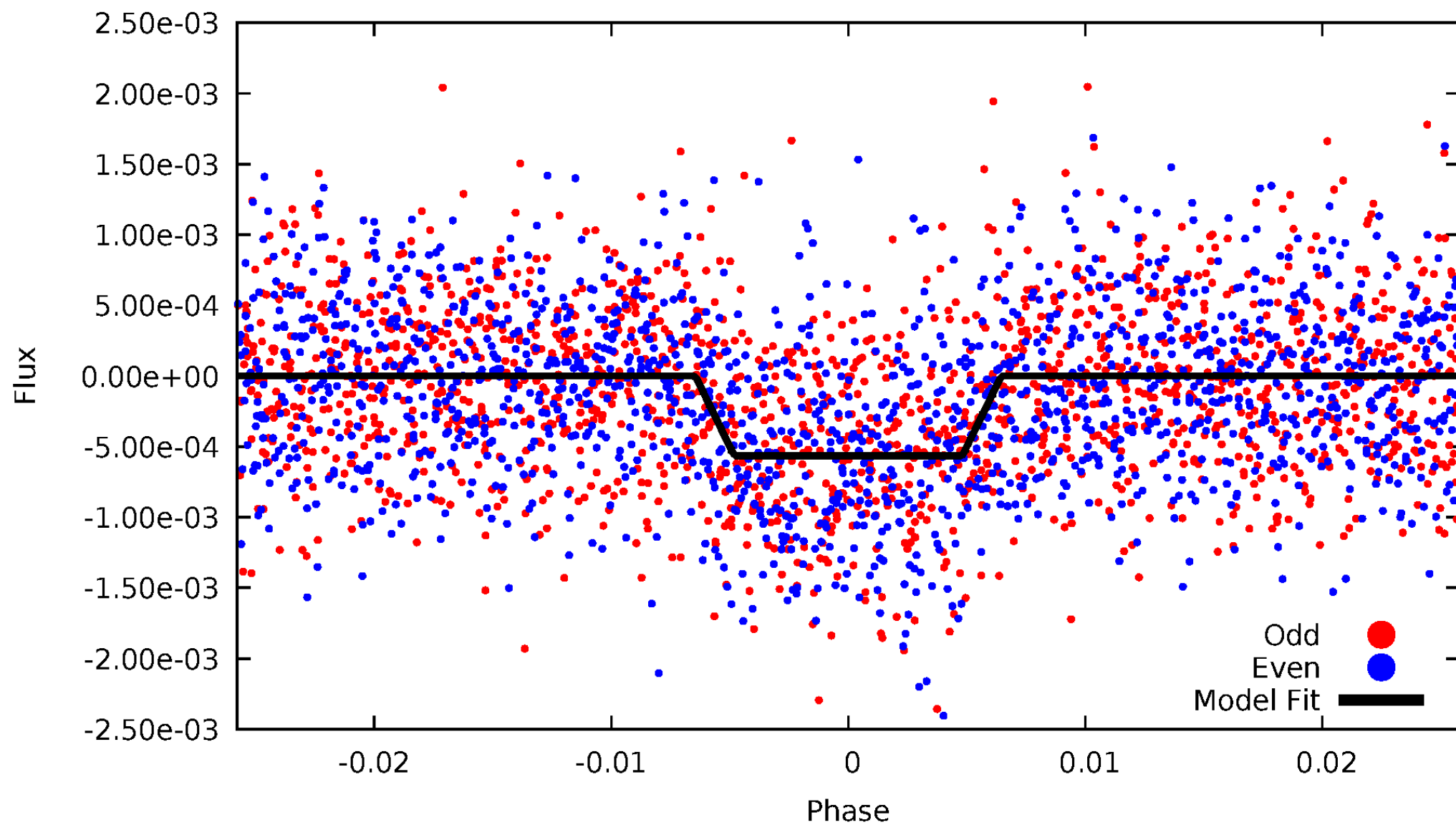
# DV Odd/Even

TCE 009334289-03



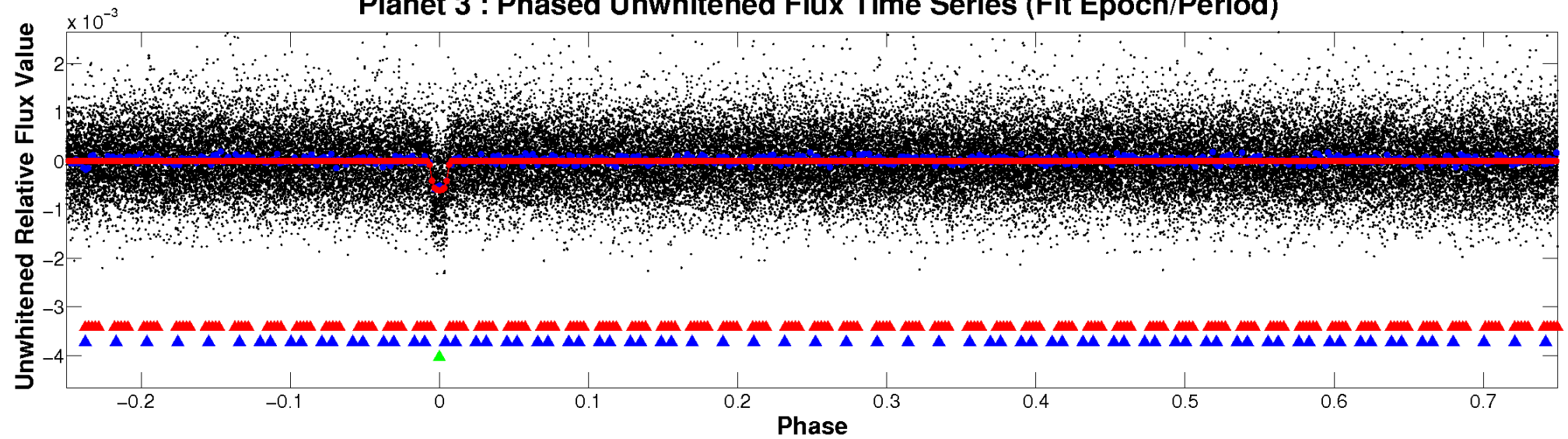
# ALT Odd/Even

TCE 009334289-03

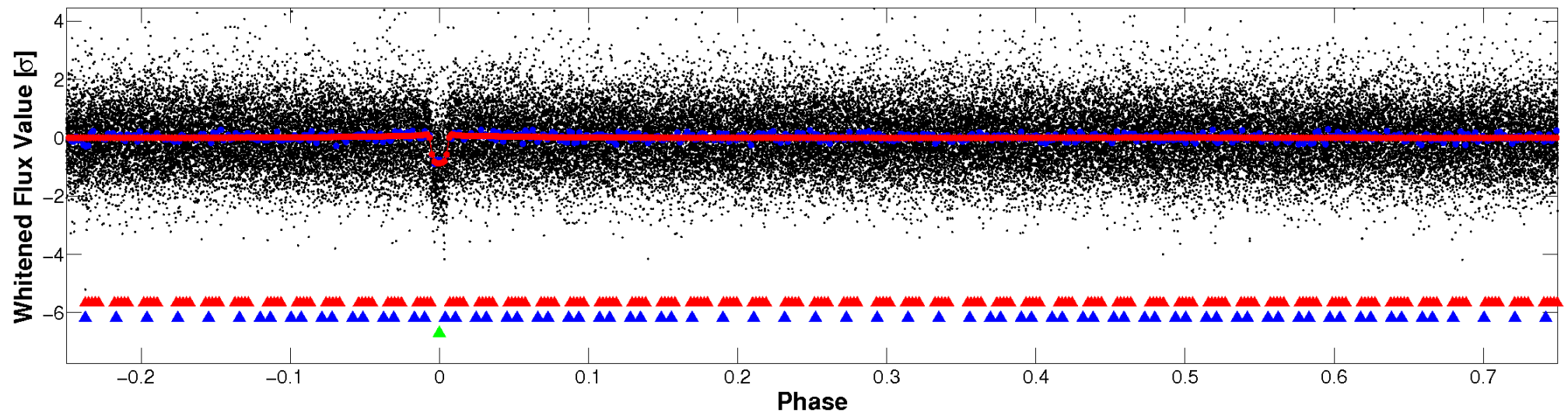


# Non-Whitened Vs. Whitened Light Curve

Planet 3 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

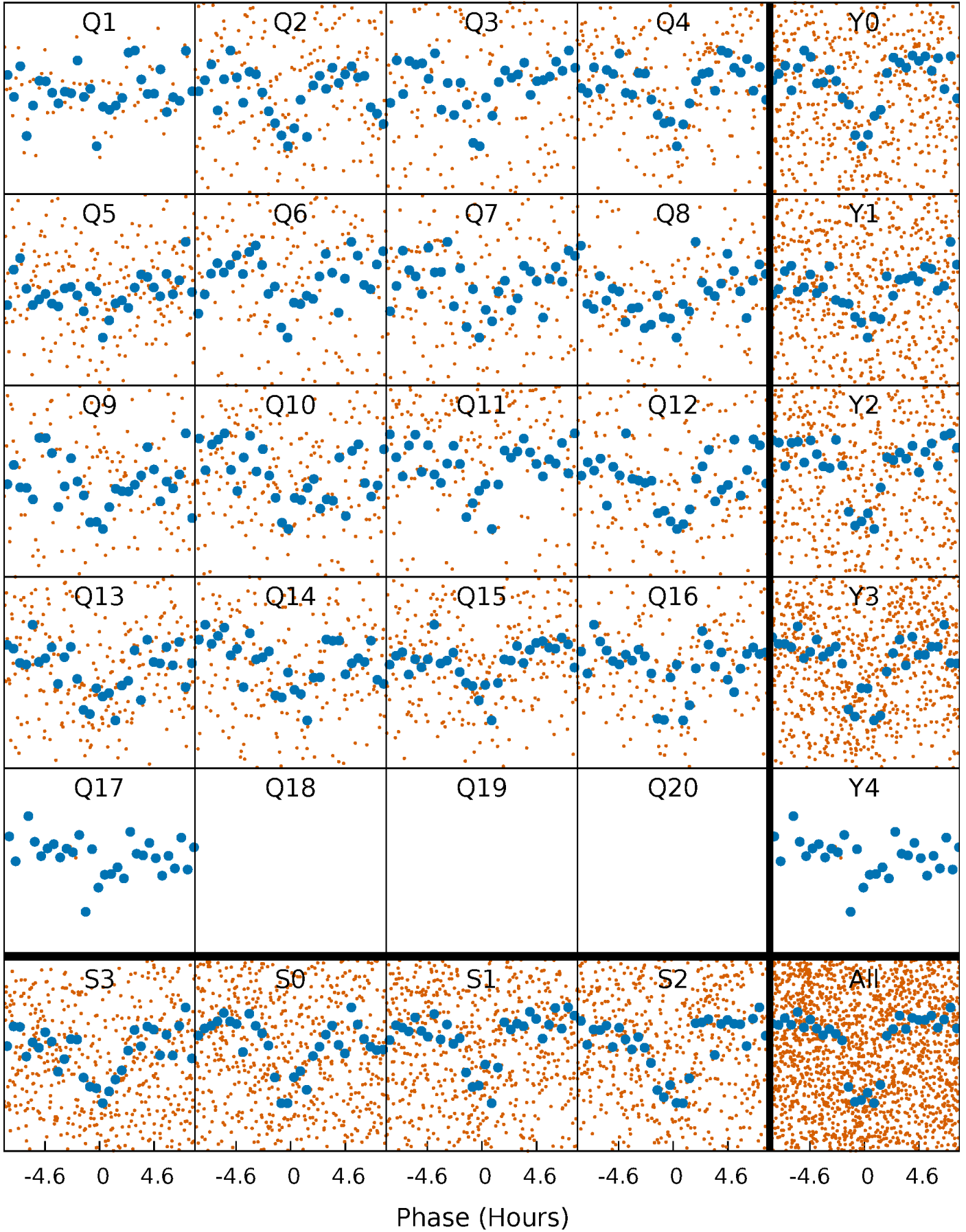


Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



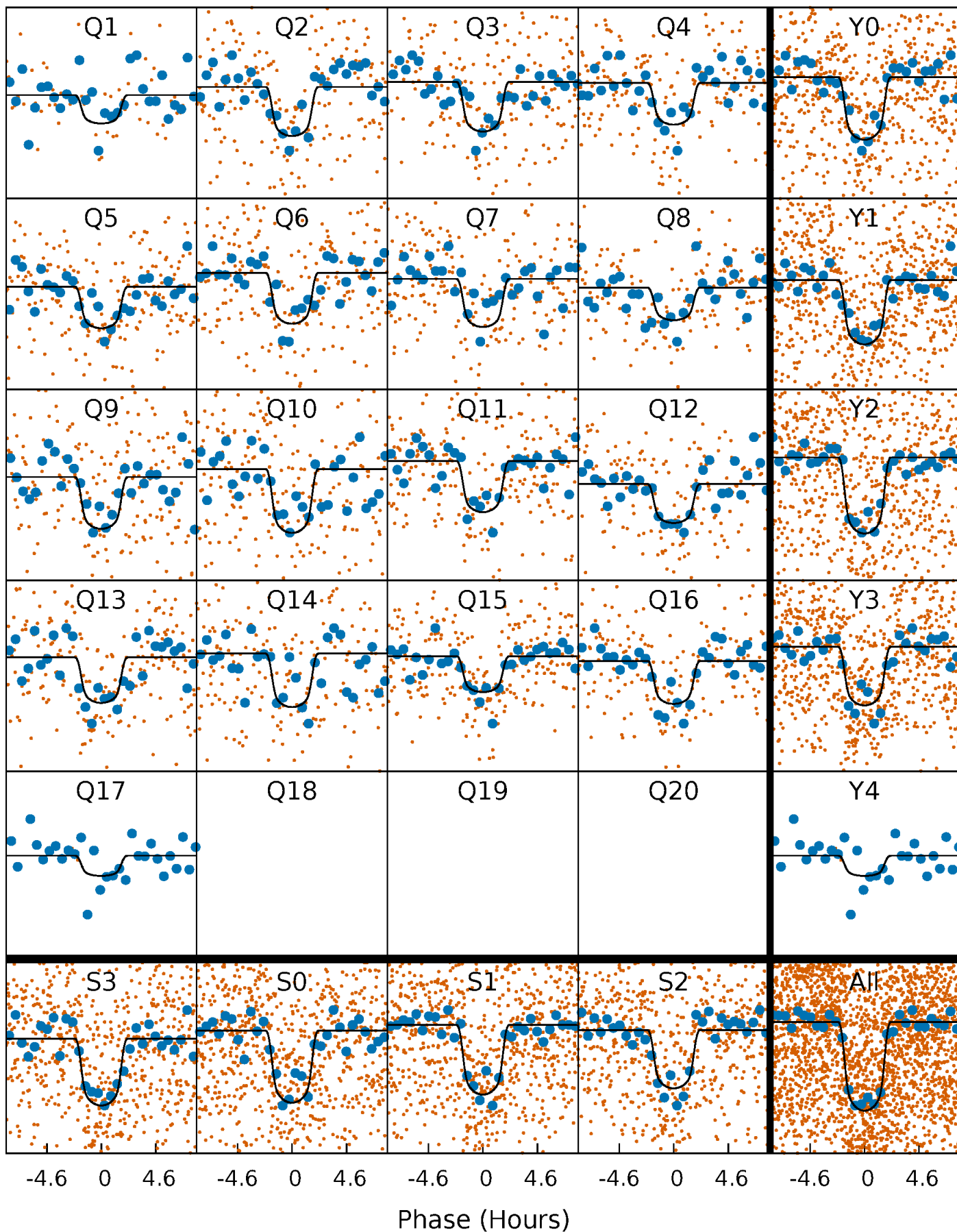
# PDC Quarter-Phased Transit Curves

TCE 009334289-03 P= 12.412081 Days  $T_0=142.545384$  (BKJD)



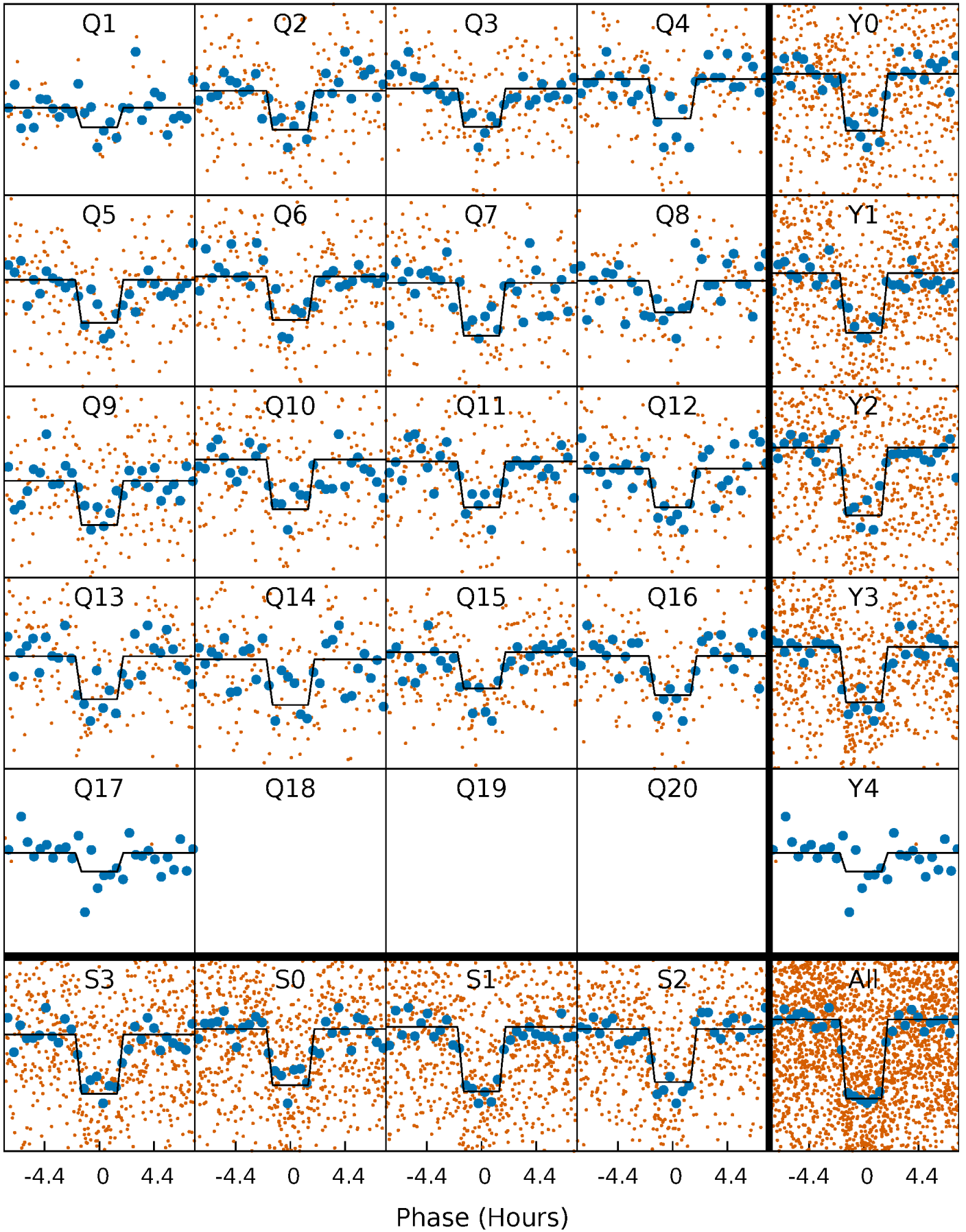
# DV Quarter-Phased Transit Curves

TCE 009334289-03   P= 12.412081 Days    $T_0=142.545384$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

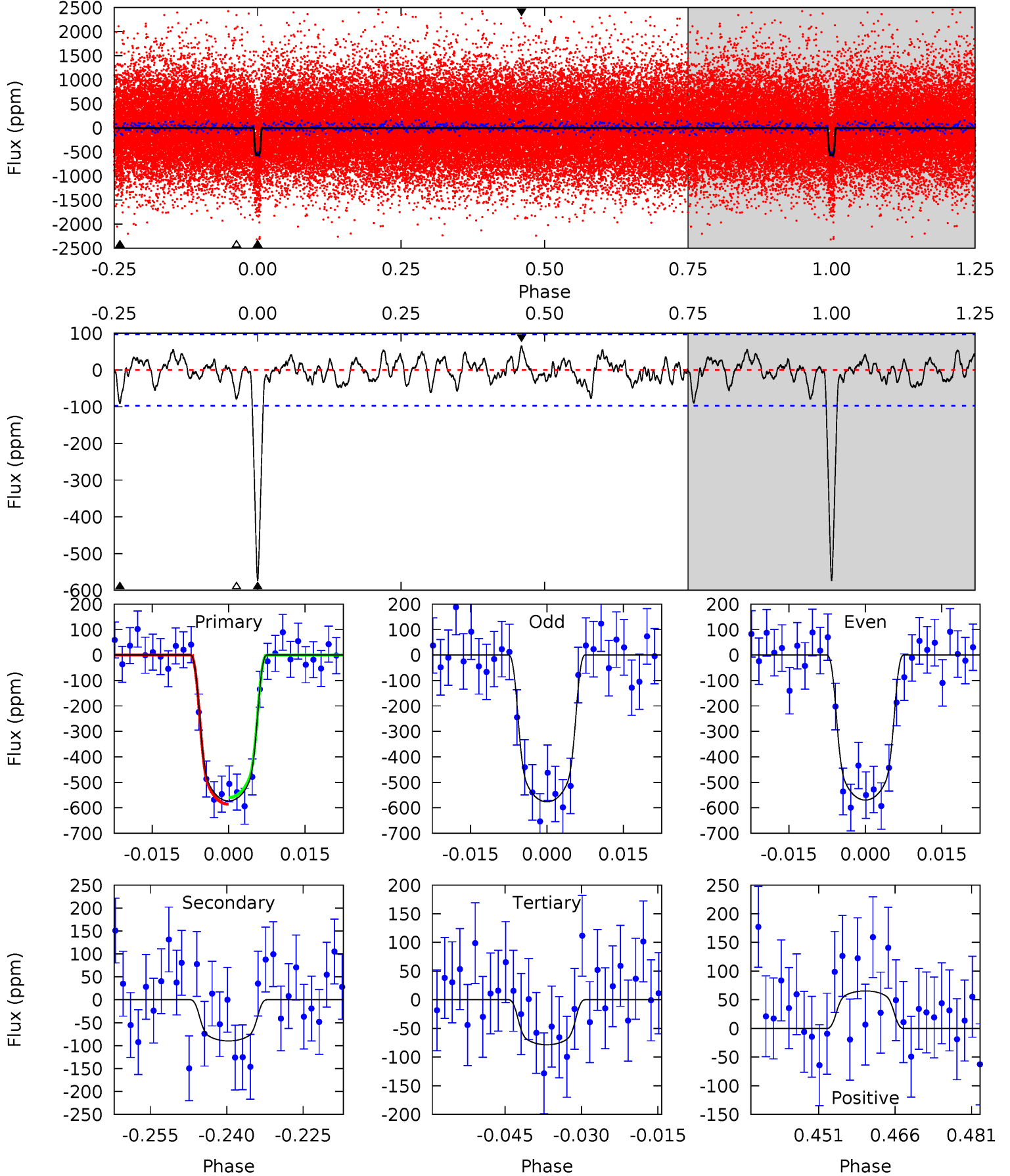
TCE 009334289-03 P= 12.412233 Days  $T_0=142.535625$  (BKJD)



# DV Model-Shift Uniqueness Test

009334289-03, P = 12.412081 Days, E = 130.133303 Days

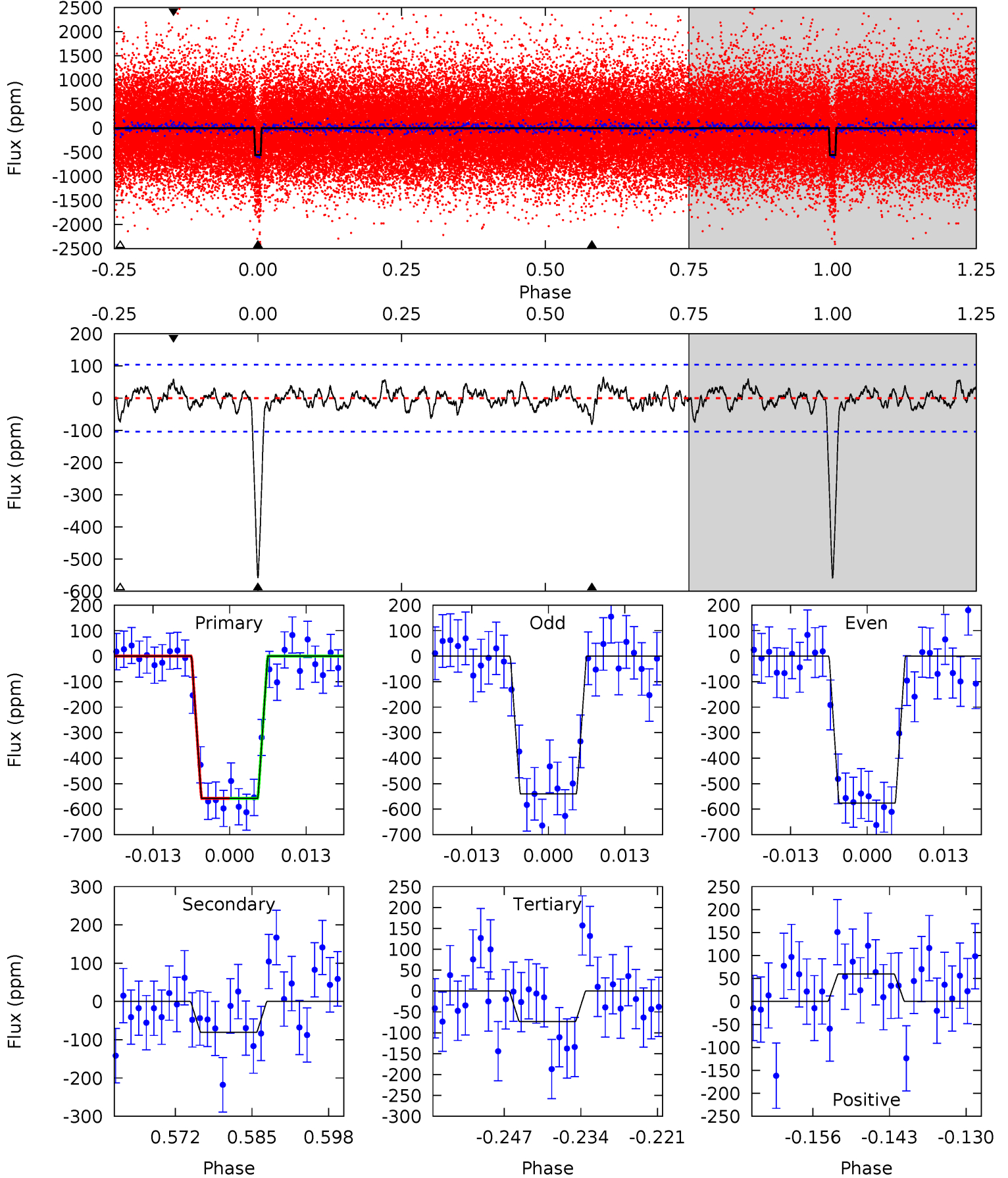
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
29.2	4.58	4.00	3.34	4.95	2.43	1.31	25.2	25.9	0.57	1.24	0.18	0.97	0.10	0.67



# Alt Model-Shift Uniqueness Test

009334289-03, P = 12.412233 Days, E = 130.123392 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
26.7	3.85	3.50	2.86	4.98	2.48	1.08	23.2	23.8	0.34	0.99	0.87	0.96	0.10	0.01



### Stellar Parameters For KIC 009334289

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5561^{+75}_{-83}$	$4.362^{+0.126}_{-0.103}$	$0.160^{+0.150}_{-0.150}$	$1.060^{+0.156}_{-0.127}$	$0.943^{+0.062}_{-0.048}$	$1.115^{+0.522}_{-0.357}$
	+1%/-1%	+3%/-2%	+94%/-94%	+15%/-12%	+7%/-5%	+47%/-32%
Source	SPE90	SPE90	SPE90	DSEP		

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

### Secondary Eclipse Parameters for KIC 009334289-03 / KOI 0934.02

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-90 \pm 20$	$3.15^{+0.39}_{-0.35}$	$1095^{+48}_{-45}$	$3671^{+176}_{-178}$	$53^{+19}_{-15}$
Alt.	$-80 \pm 21$	$2.72^{+0.39}_{-0.32}$	$1094^{+46}_{-42}$	$3780^{+201}_{-220}$	$63^{+26}_{-20}$

$T_{max}$  = 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

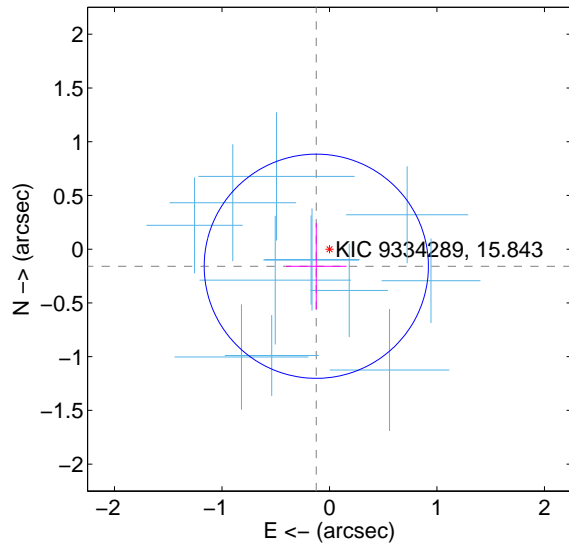
Supplemental centroid analysis for 009334289-03. Kepler magnitude: 15.84. Transit SNR 20.27

There are 12 quarters with good PRF difference image offsets

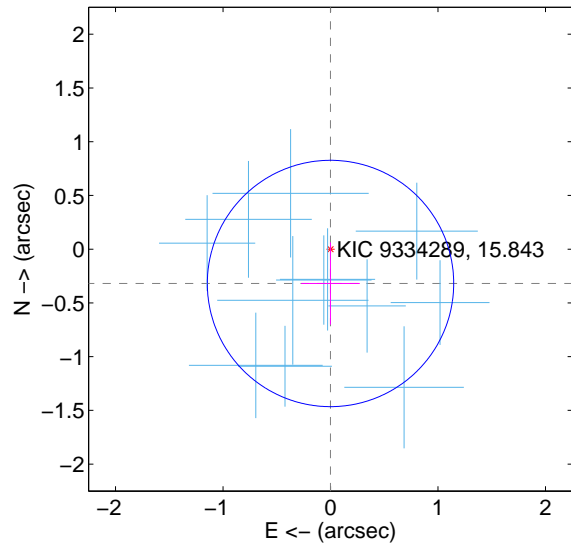
The direct PRF centroid is offset from the target star catalog position by about 0.16 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.201 \pm 0.348$	0.58	$0.123 \pm 0.281$	$-0.159 \pm 0.401$
PRF-fit source offset from KIC position	$0.319 \pm 0.382$	0.84	$0.000 \pm 0.272$	$-0.319 \pm 0.382$
photometric centroid source offset	$0.11 \pm 0.59$	0.18	$-0.09 \pm 0.61$	$0.06 \pm 0.53$

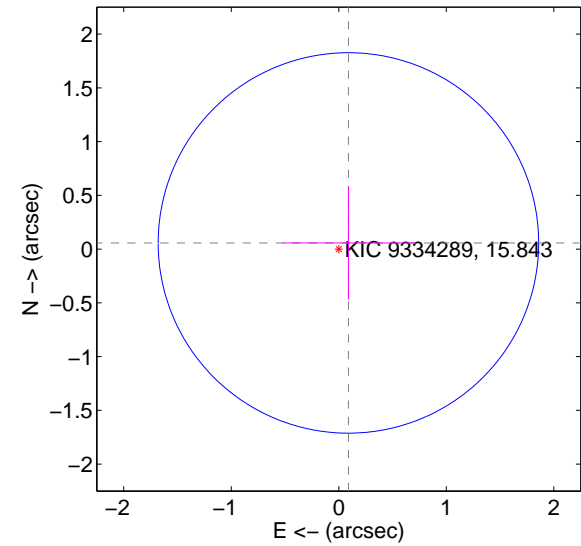
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

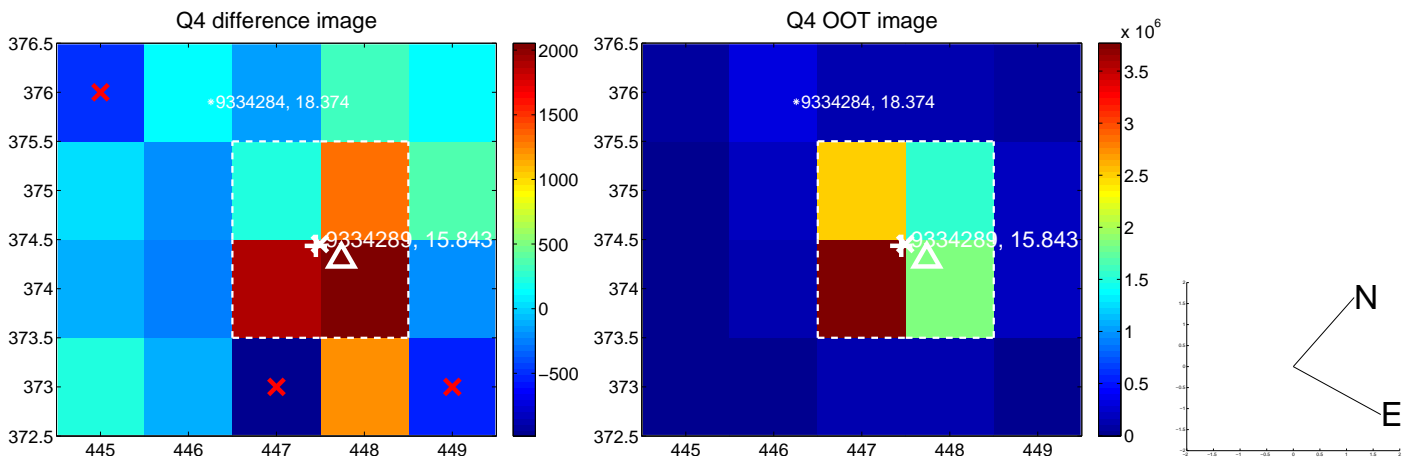
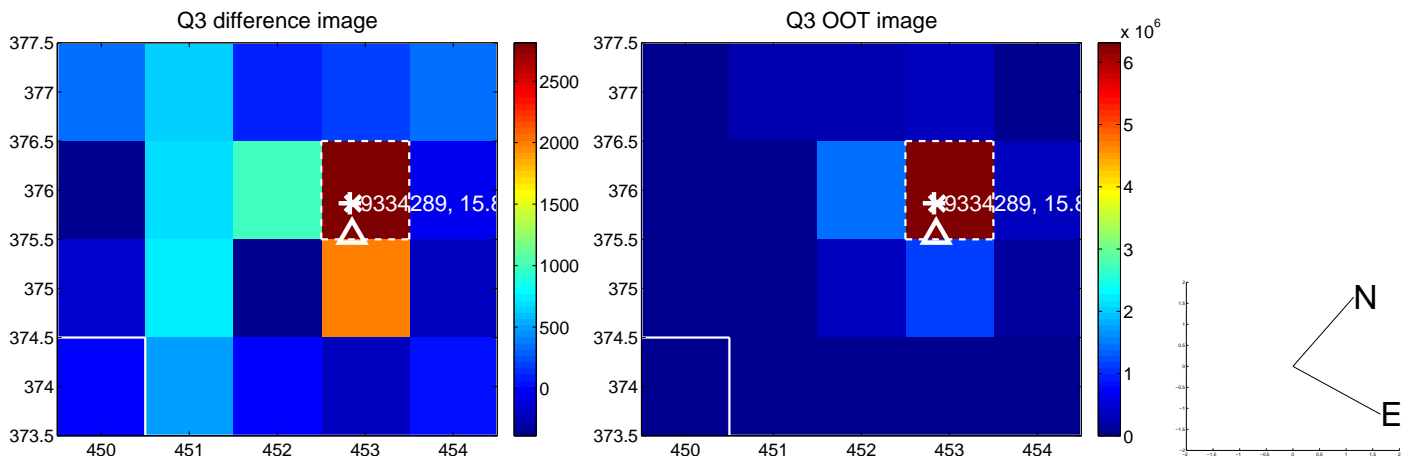
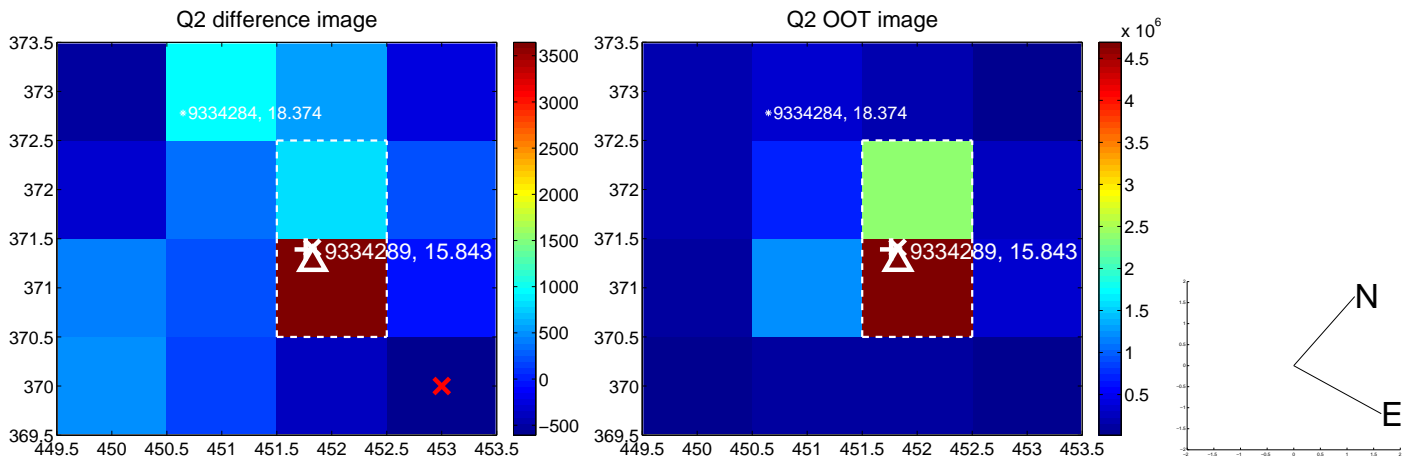
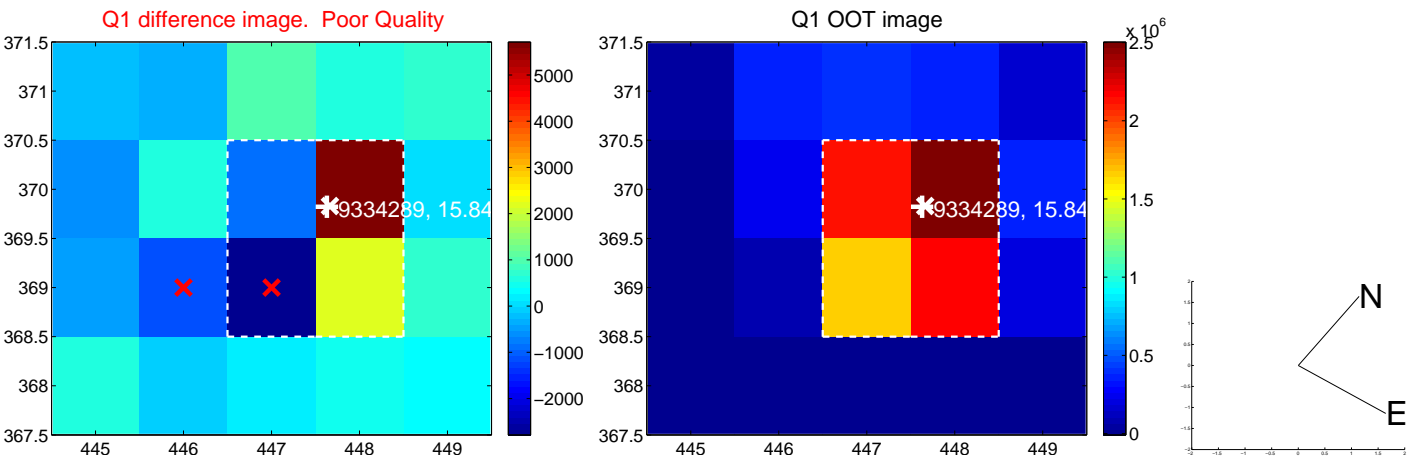


offset from photometric centroids

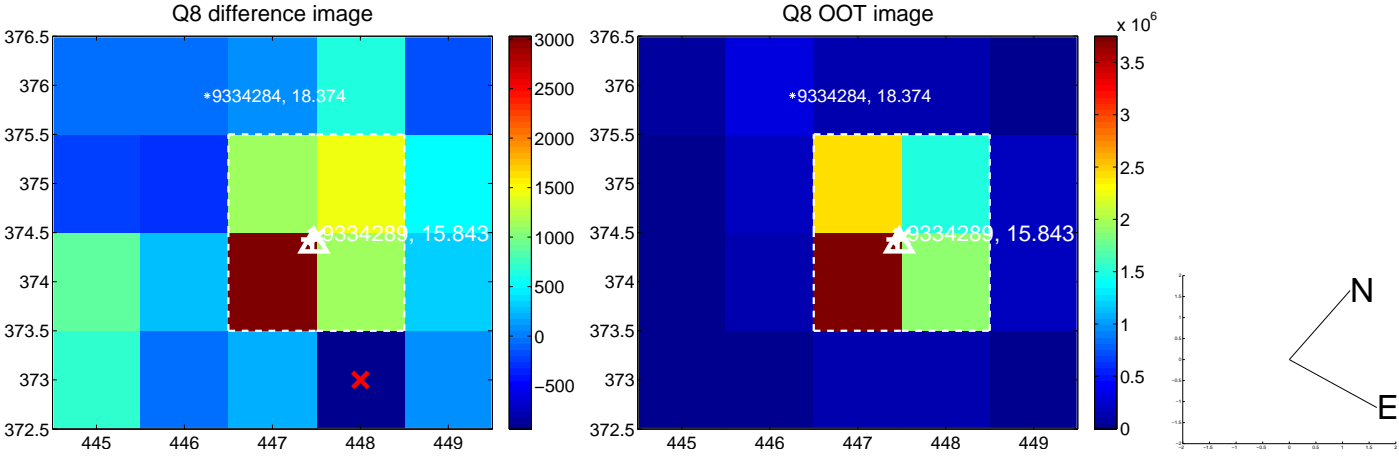
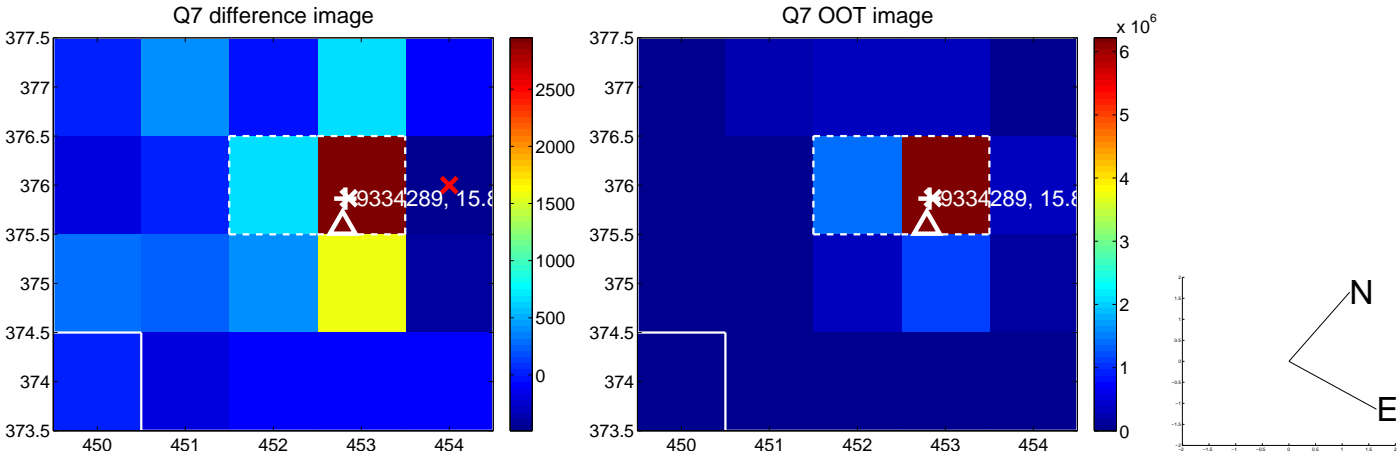
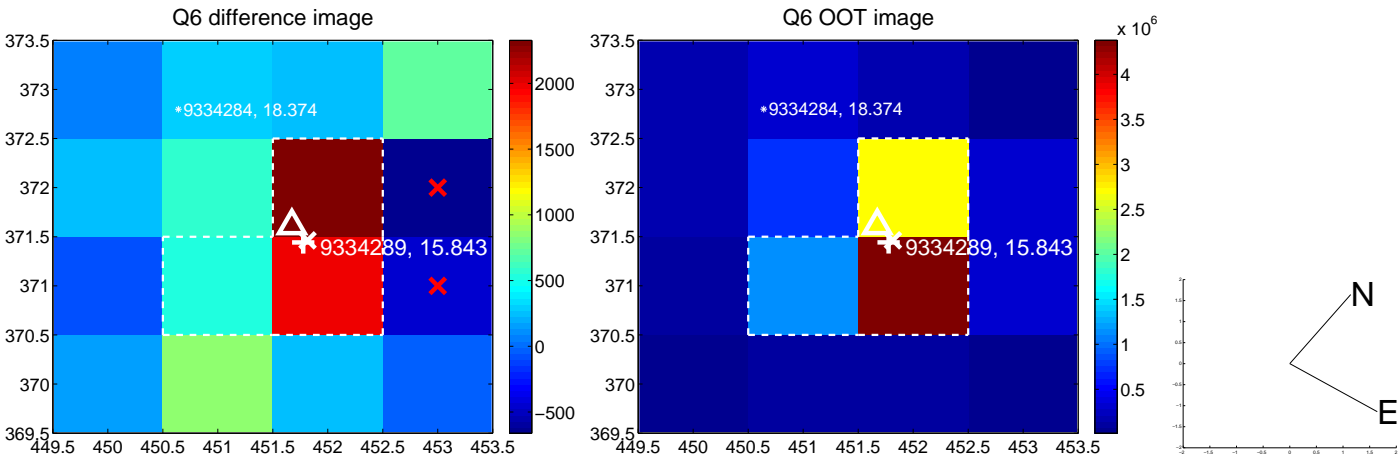
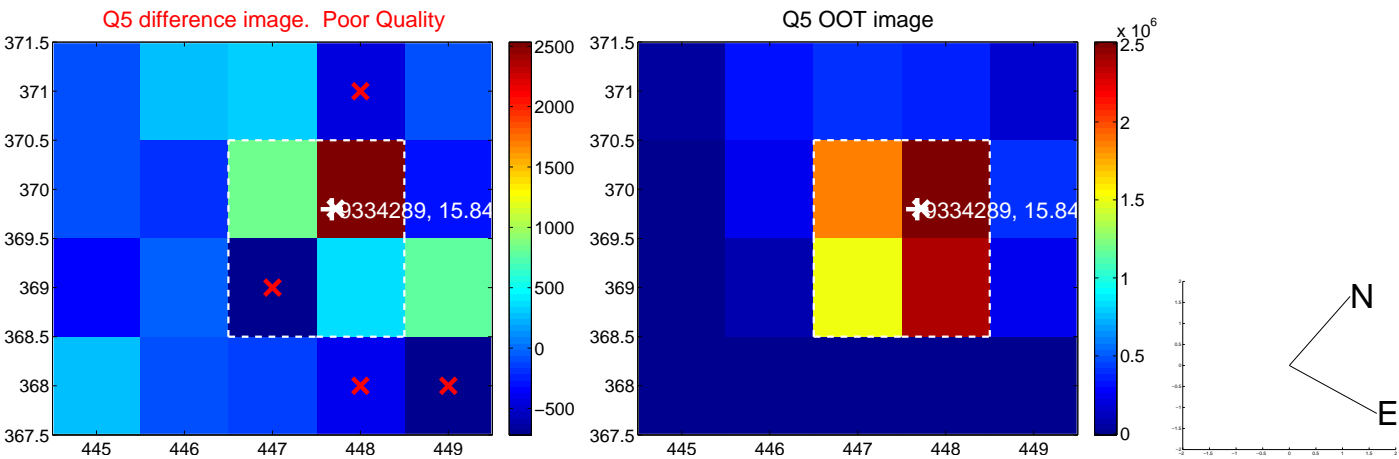


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

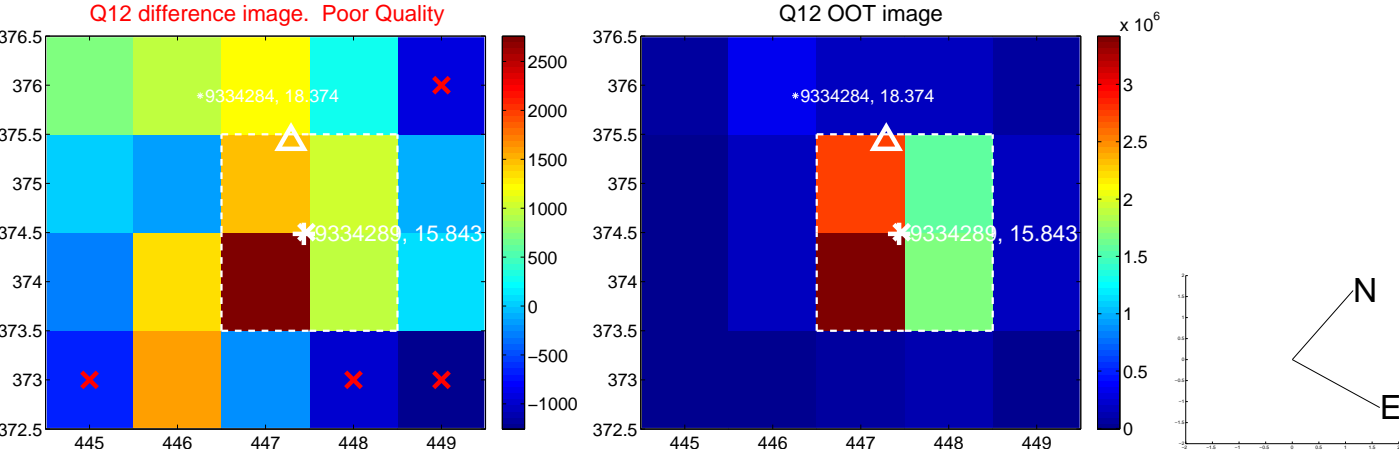
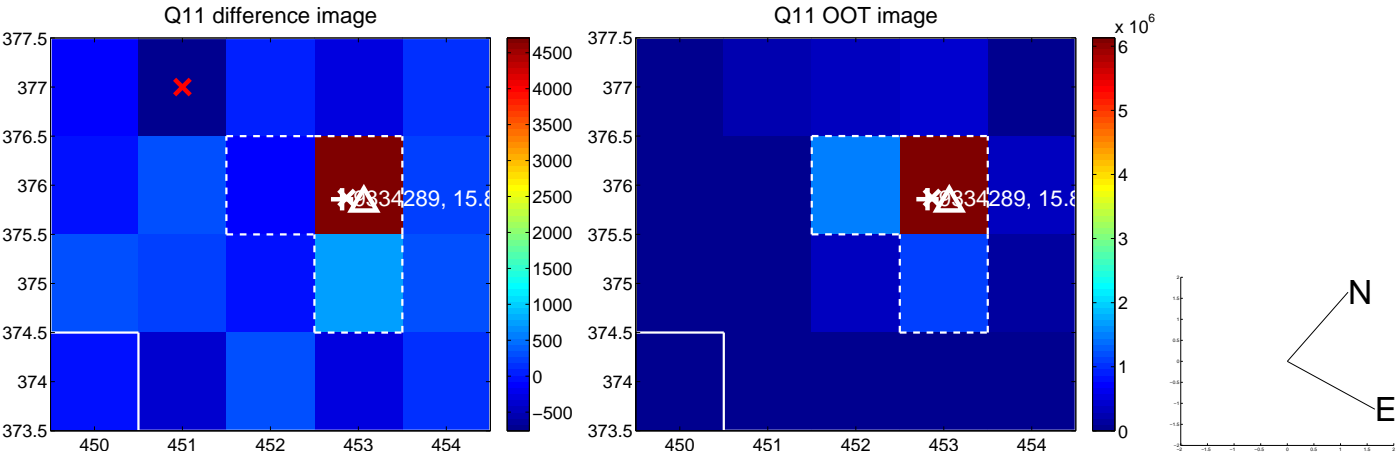
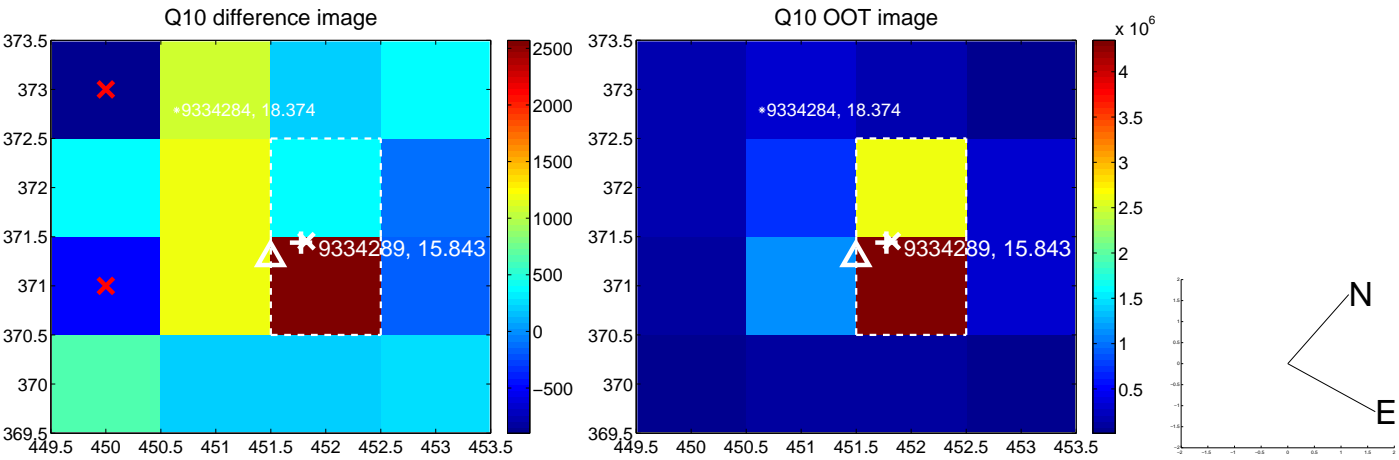
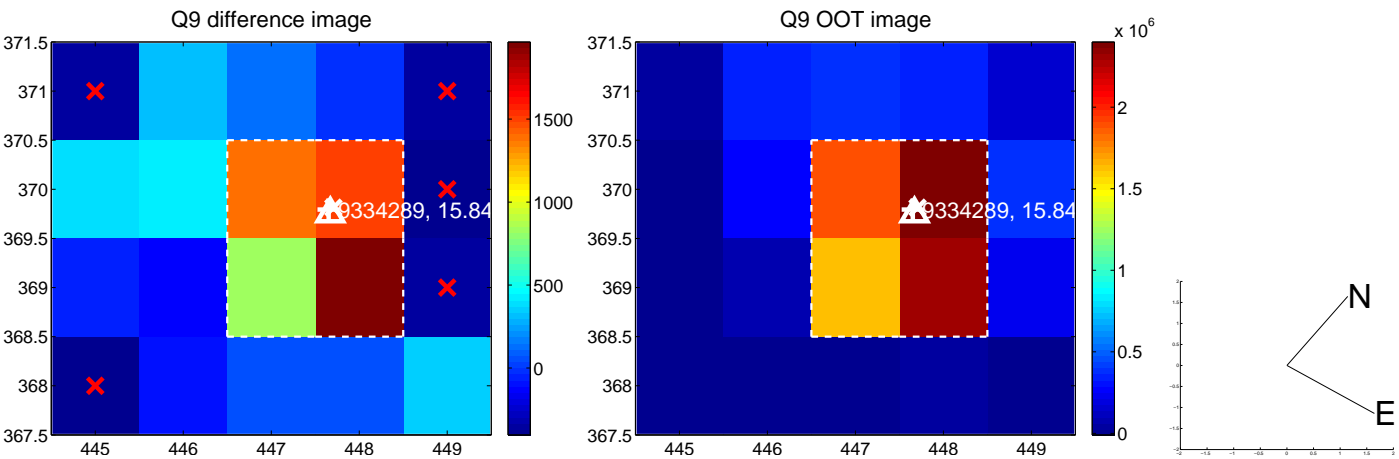
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



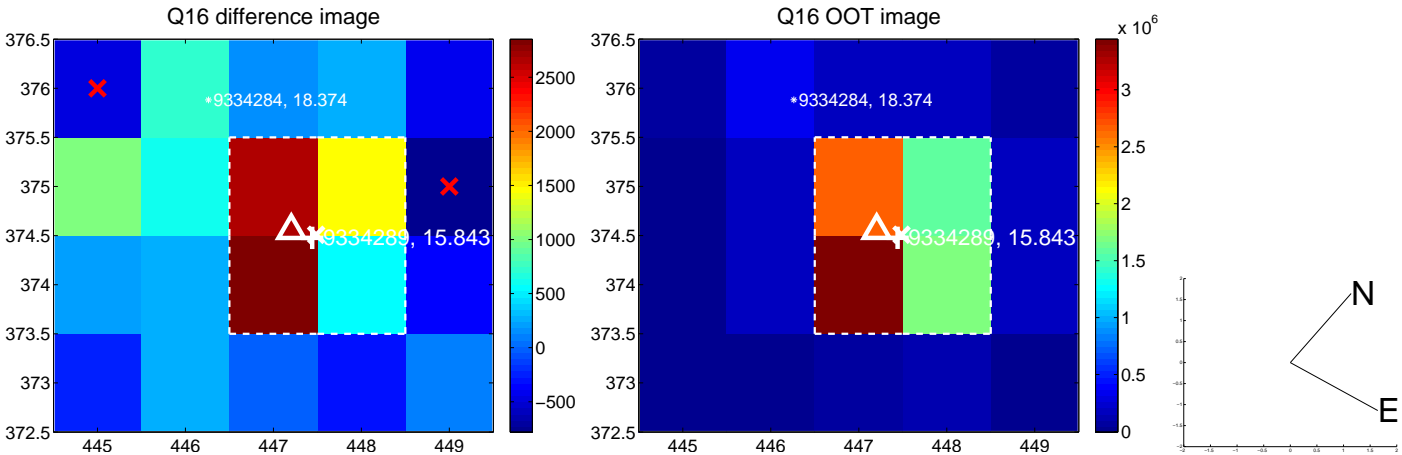
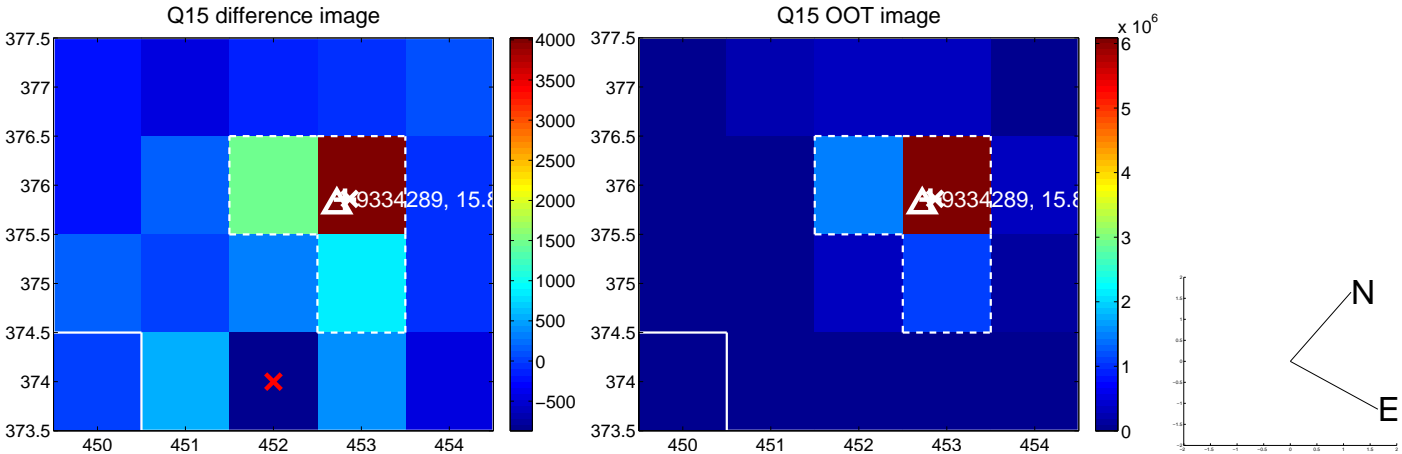
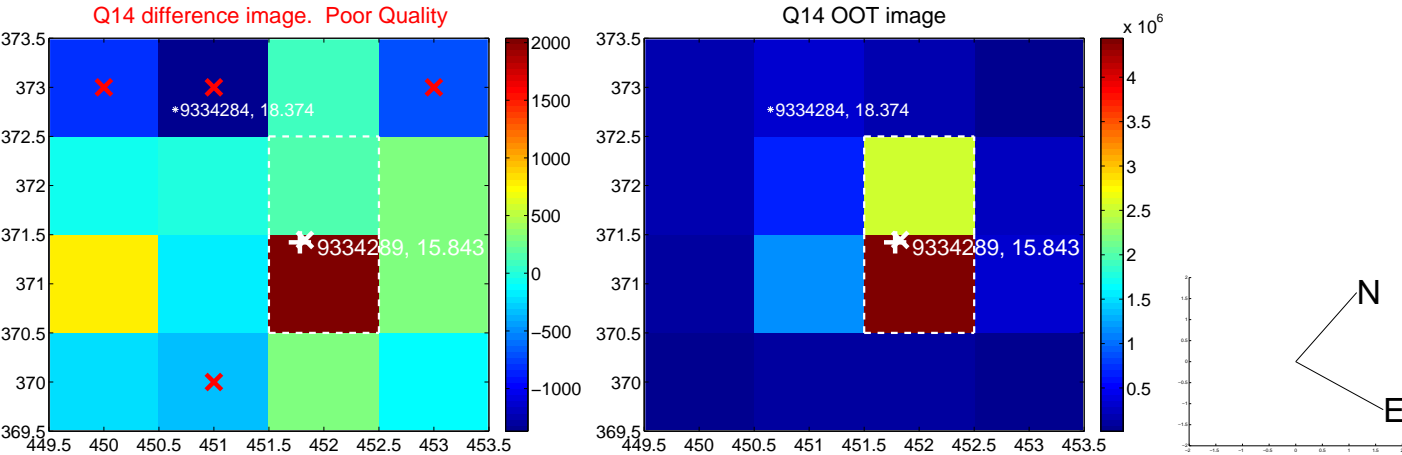
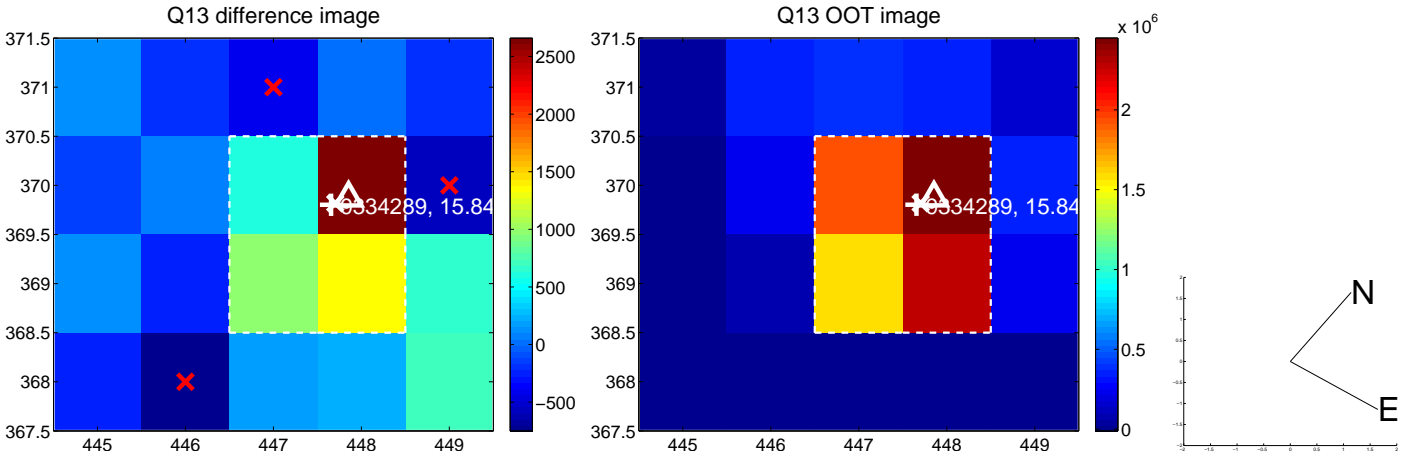
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



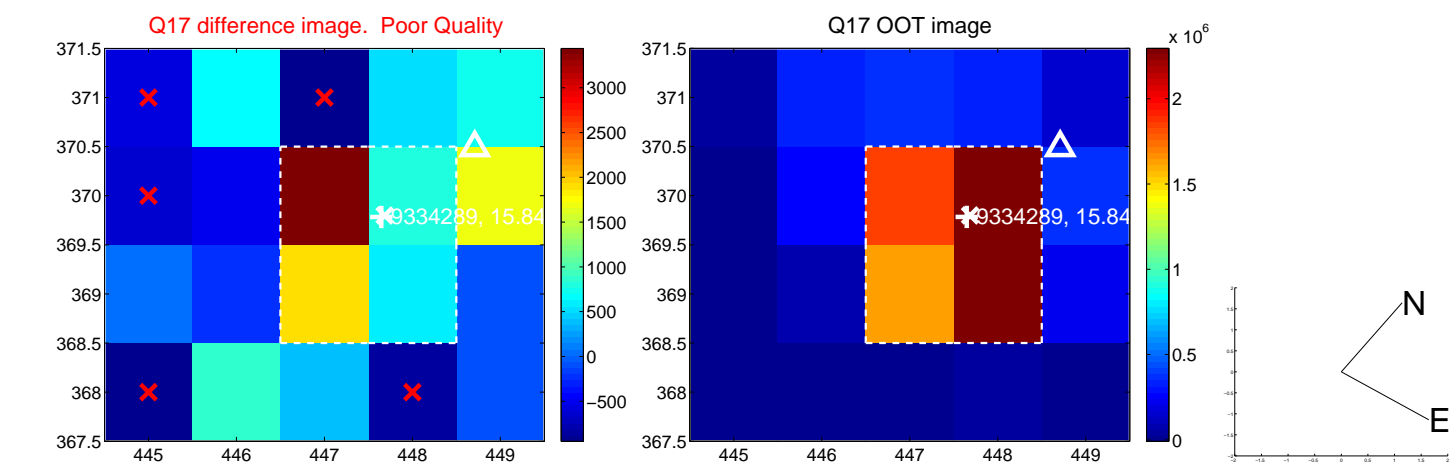
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



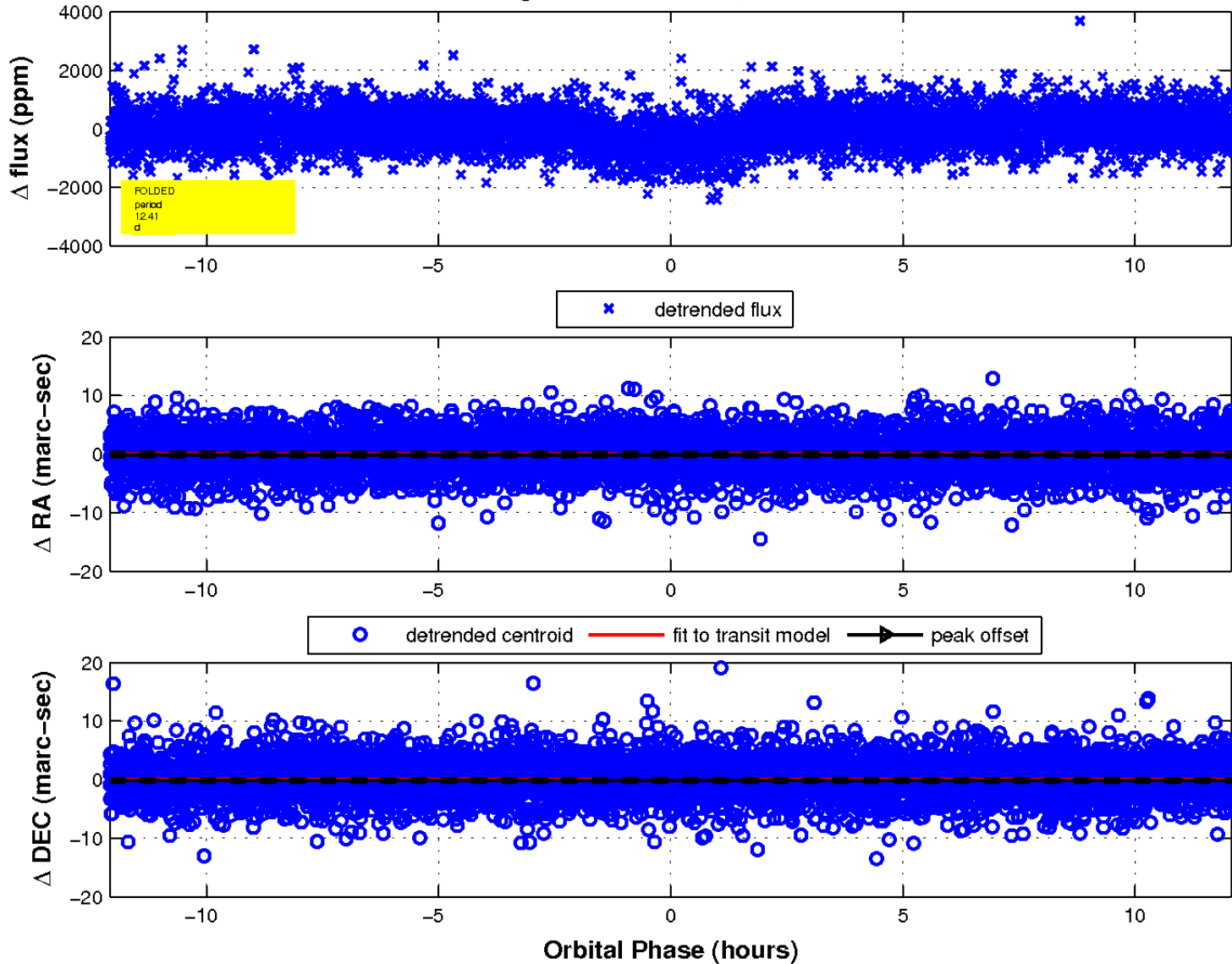
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



fluxWeightedCentroids, Planet 3 of 3



UKIRT Image

Declination

