

# KIC 009047103

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009047103-01	OBS	No	0.588906	131.794446	172.3	1.132	11.0	12.7	1.77	6790	2.36	27783.76
009047103-02	OBS	No	0.588903	132.032546	47.0	1.083	10.1	3.5	1.77	6790	1.26	27783.93

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009047103-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT
009047103-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD

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

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

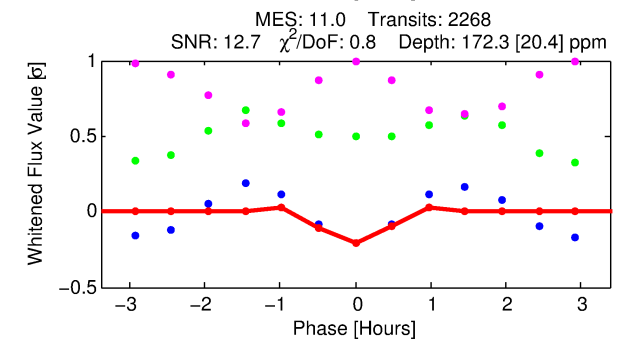
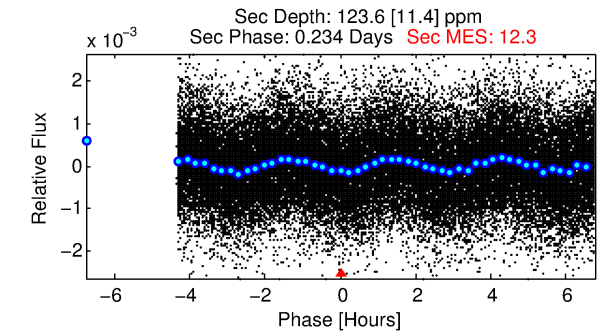
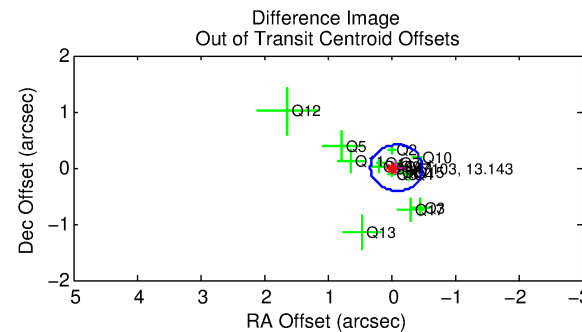
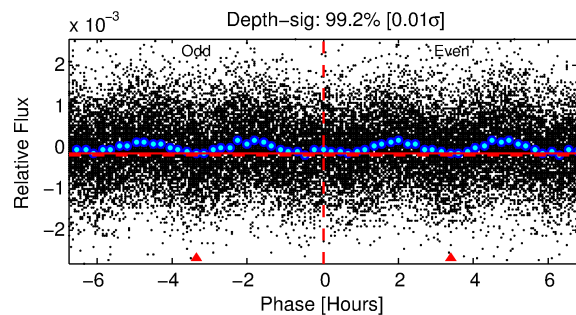
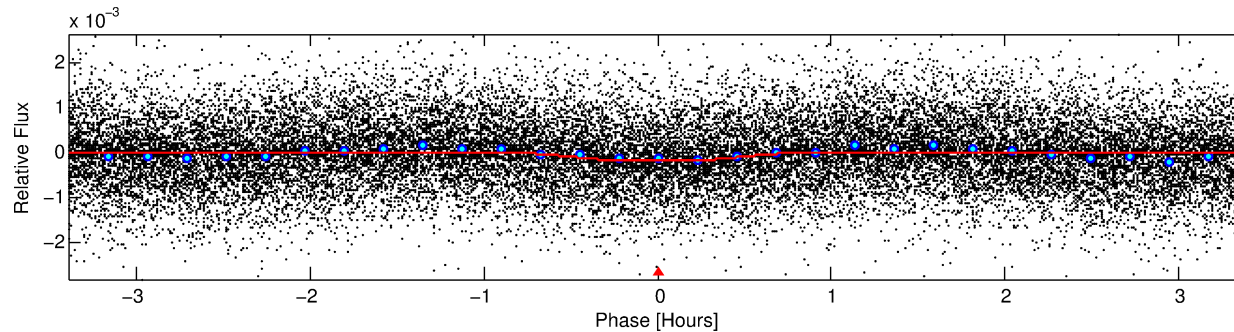
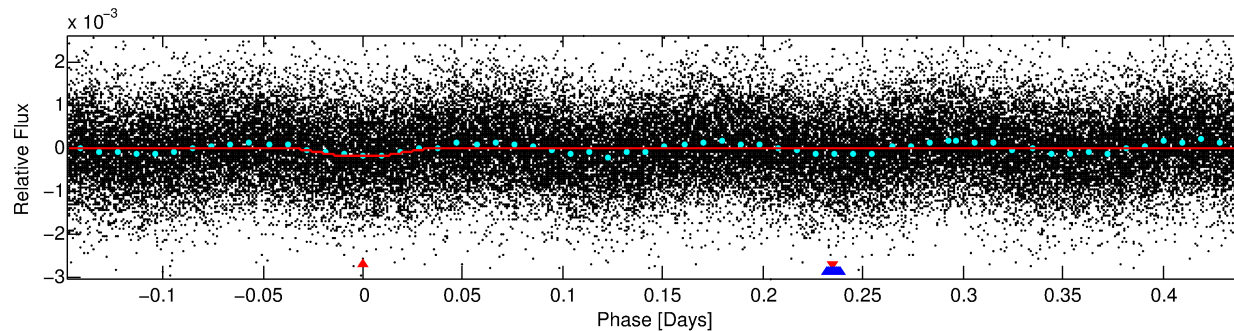
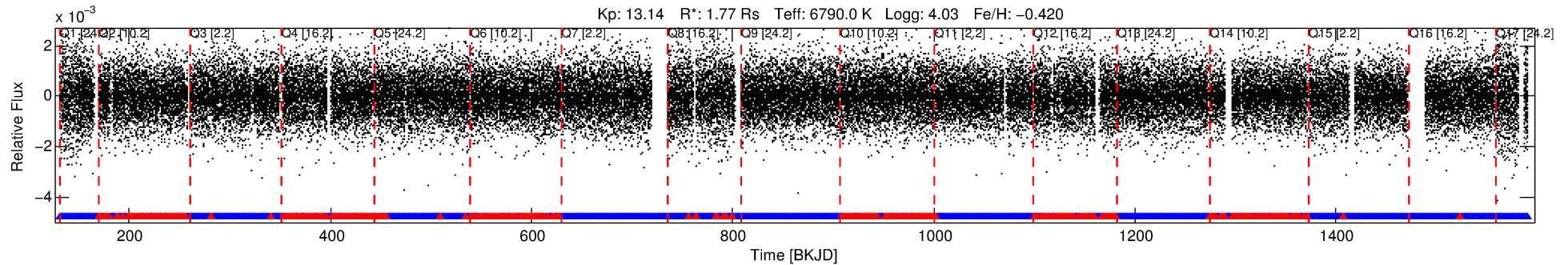
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009047103-01

No Significant Match Found

# DV One-Page Summary

KIC: 9047103 Candidate: 1 of 2 Period: 0.589 d



## DV Fit Results:

Period = 0.58891 [0.00001] d  
Epoch = 131.7944 [0.0013] BKJD  
Rp/R\* = 0.0122 [0.0091]  
a/R\* = 4.03 [15.42]  
b = 0.14 [29.10]  
Seff = 27783.76 [15523.36]  
Teq = 3292 [460] K  
Rp = 2.36 [1.93] Re  
a = 0.0147 [0.0048] AU  
Ag = 2.62 [4.15] [0.39σ]  
Teffp = 6475 [2433] K [1.29σ]

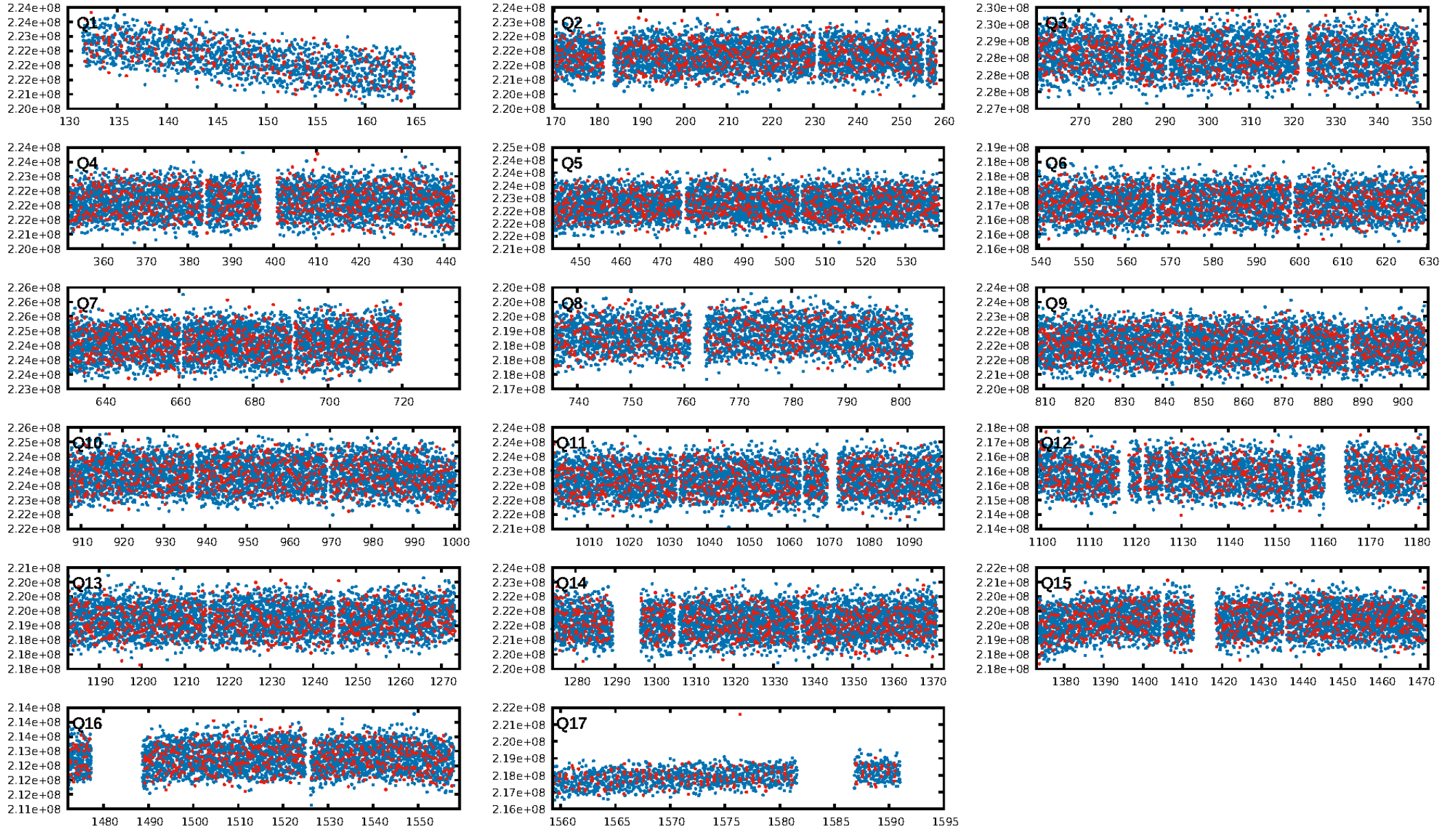
## DV Diagnostic Results:

ShortPeriod-sig: 0.0% [0.00σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 9.20e-22  
RollingBand-fgt: 0.78 [1696/2166]  
GhostDiagnostic-chr: 2.702  
Centroid-sig: 1.6%  
Centroid-so: 0.538 arcsec [4.10σ]  
OotOffset-rm: 0.082 arcsec [0.60σ]  
KicOffset-rm: 0.215 arcsec [1.64σ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 0.65 [11/17]  
DiffImageOverlap-fno: 0.00 [0/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 09:10:04 Z

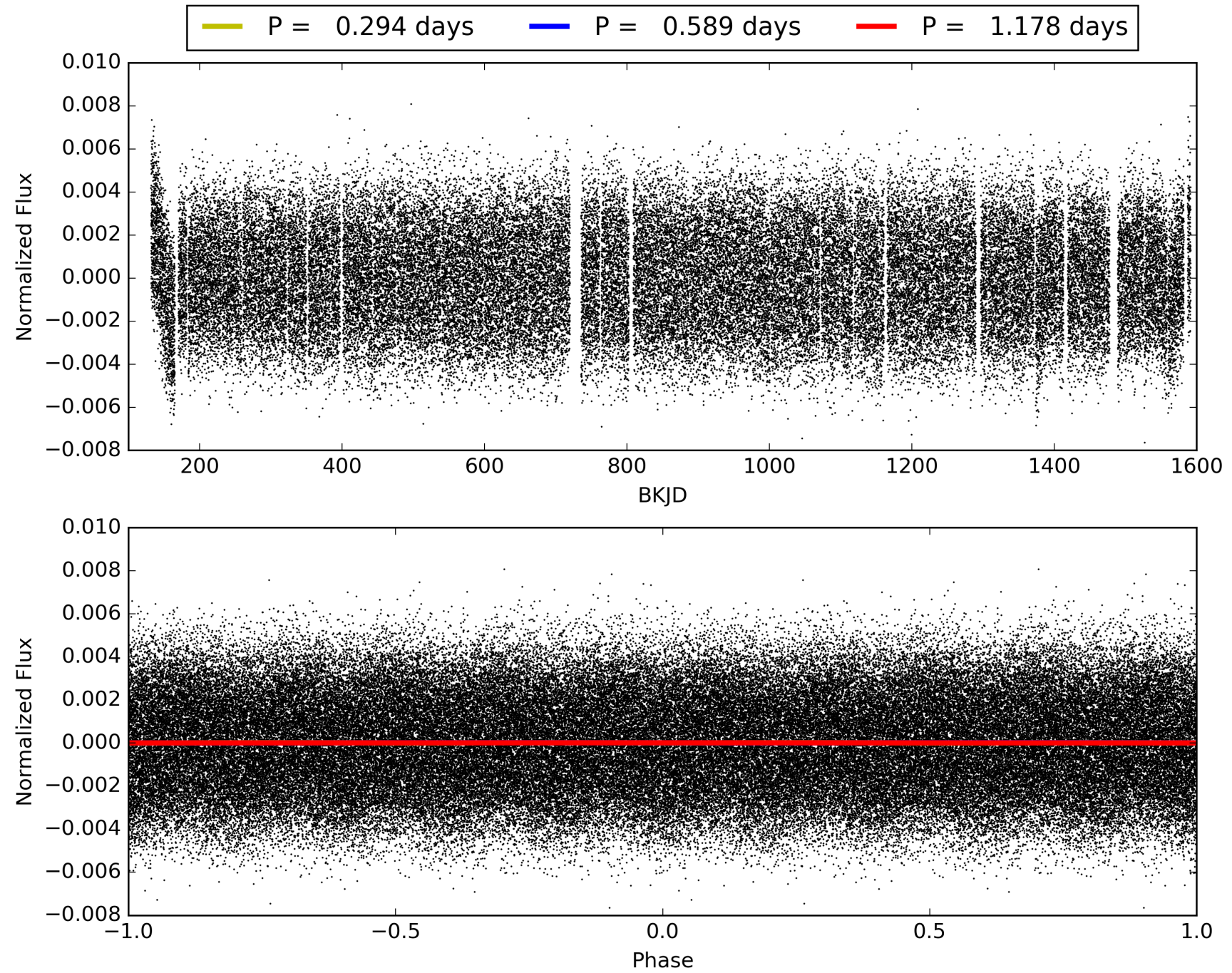
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 009047103-01, PDC Light Curves



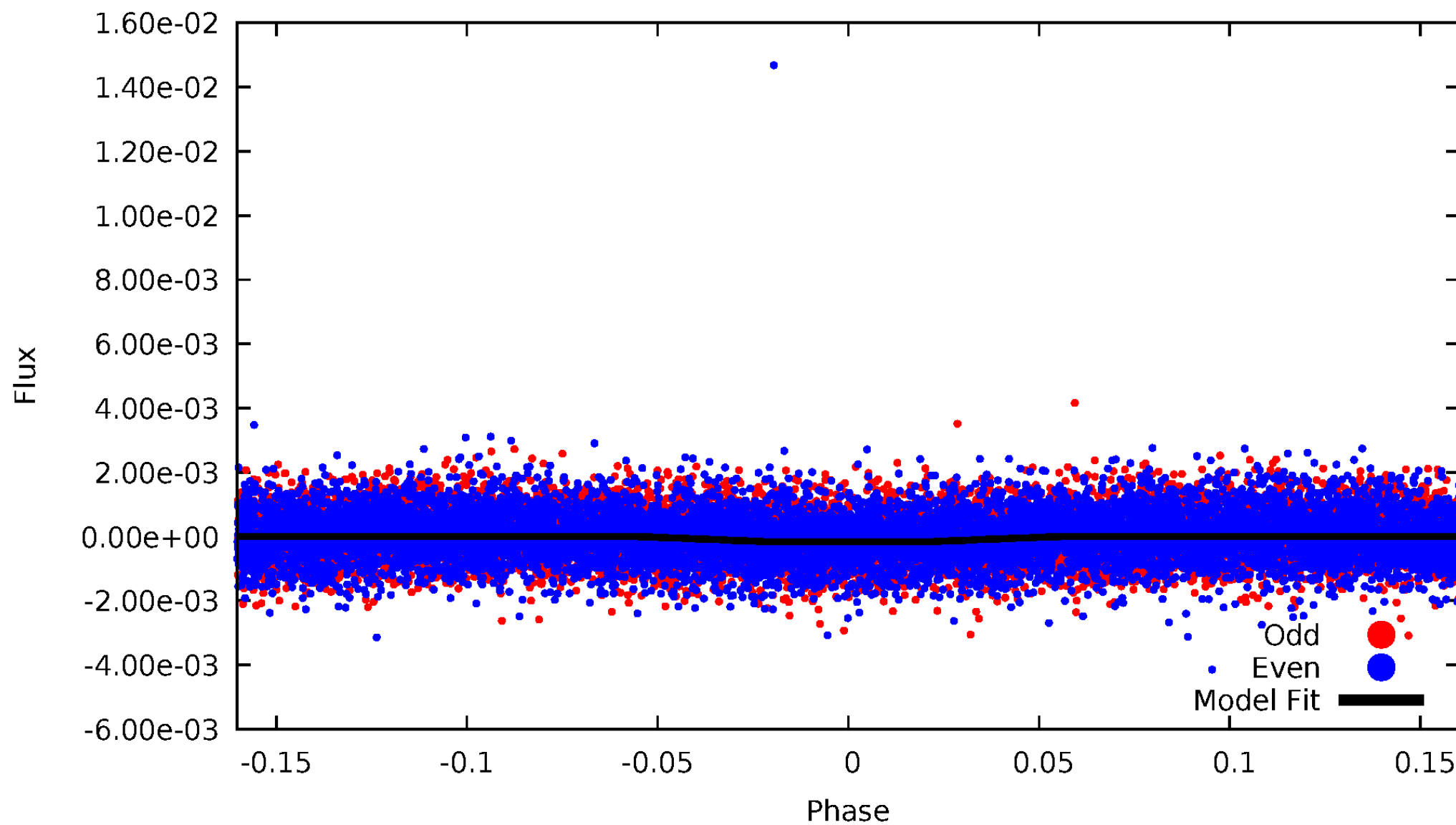


TCE 009047103-01



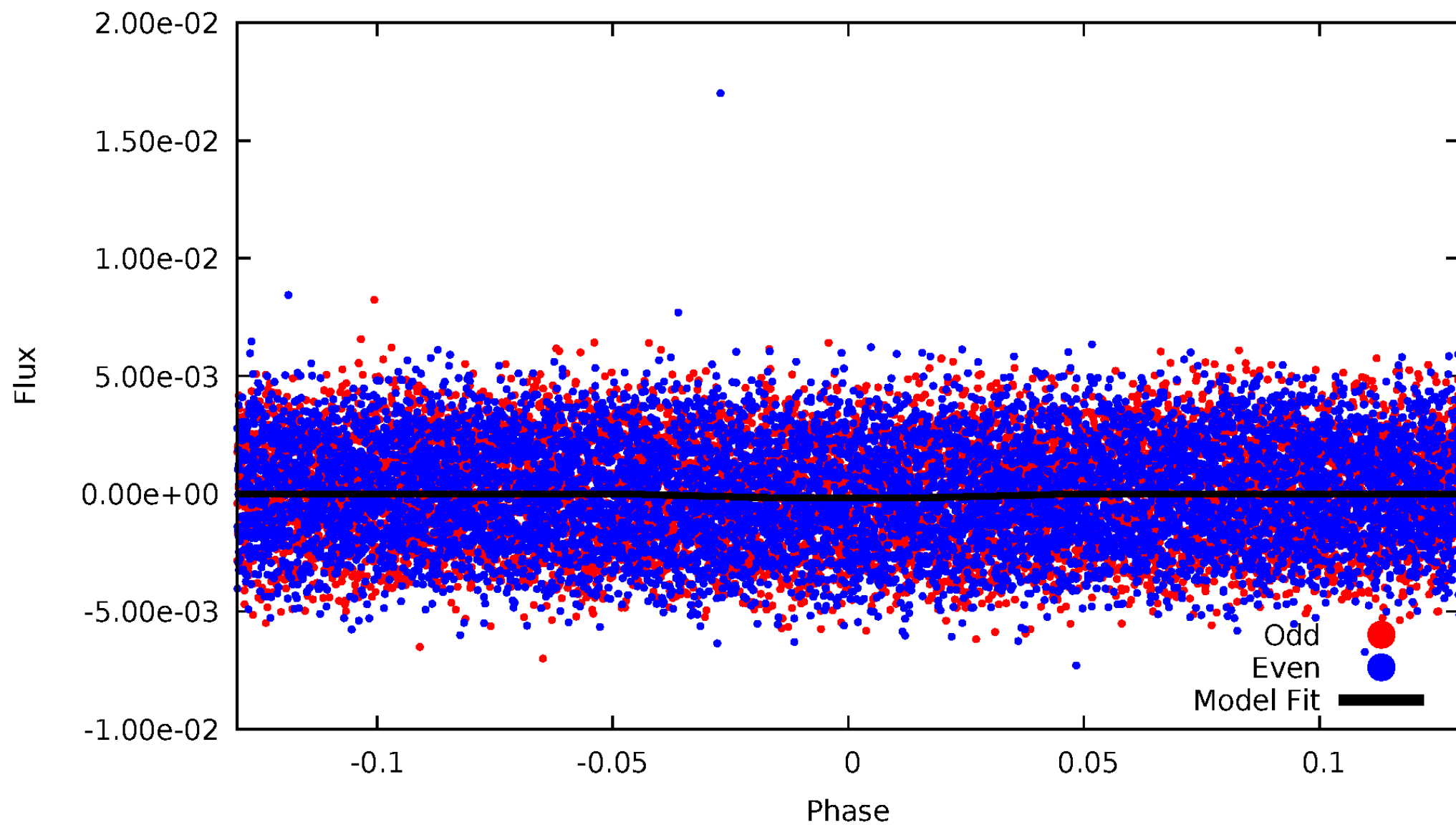
# DV Odd/Even

TCE 009047103-01

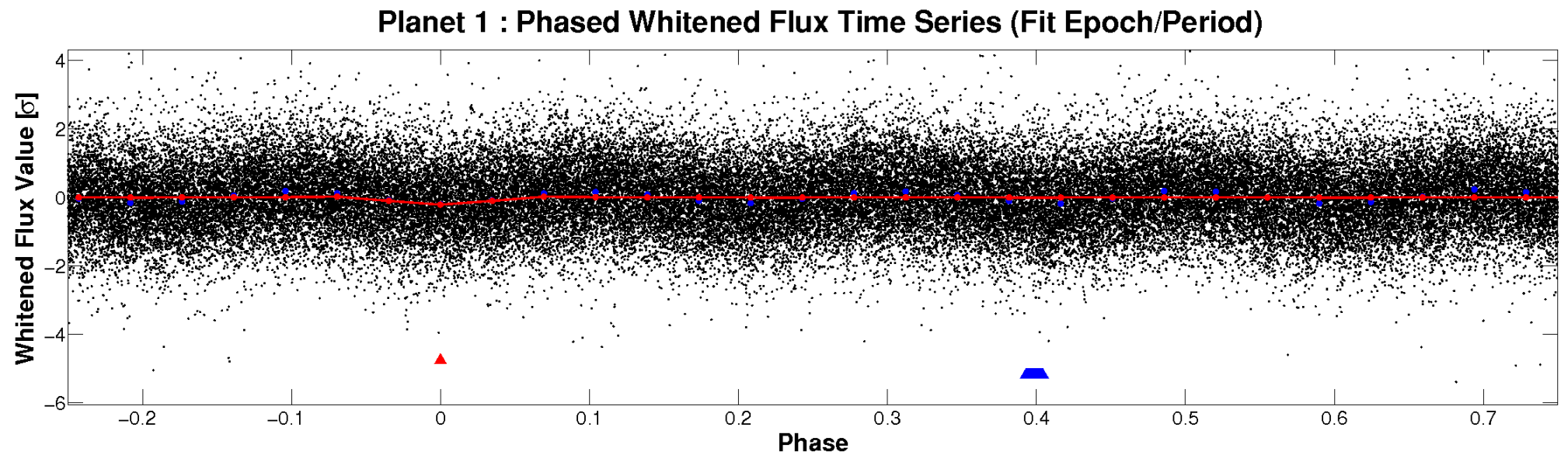
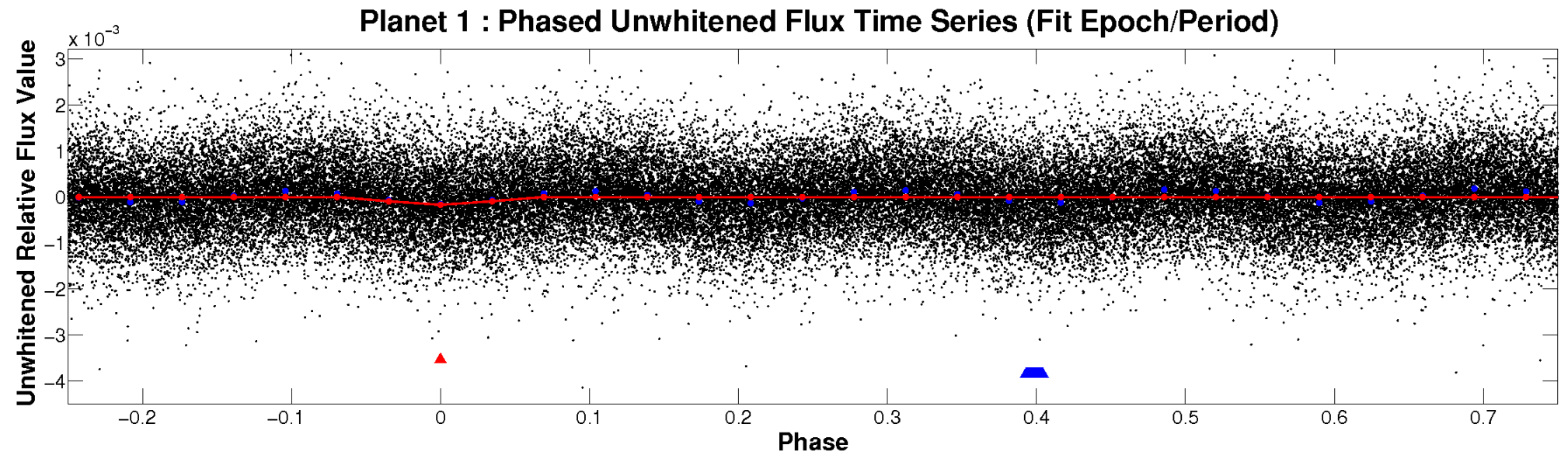


# ALT Odd/Even

TCE 009047103-01



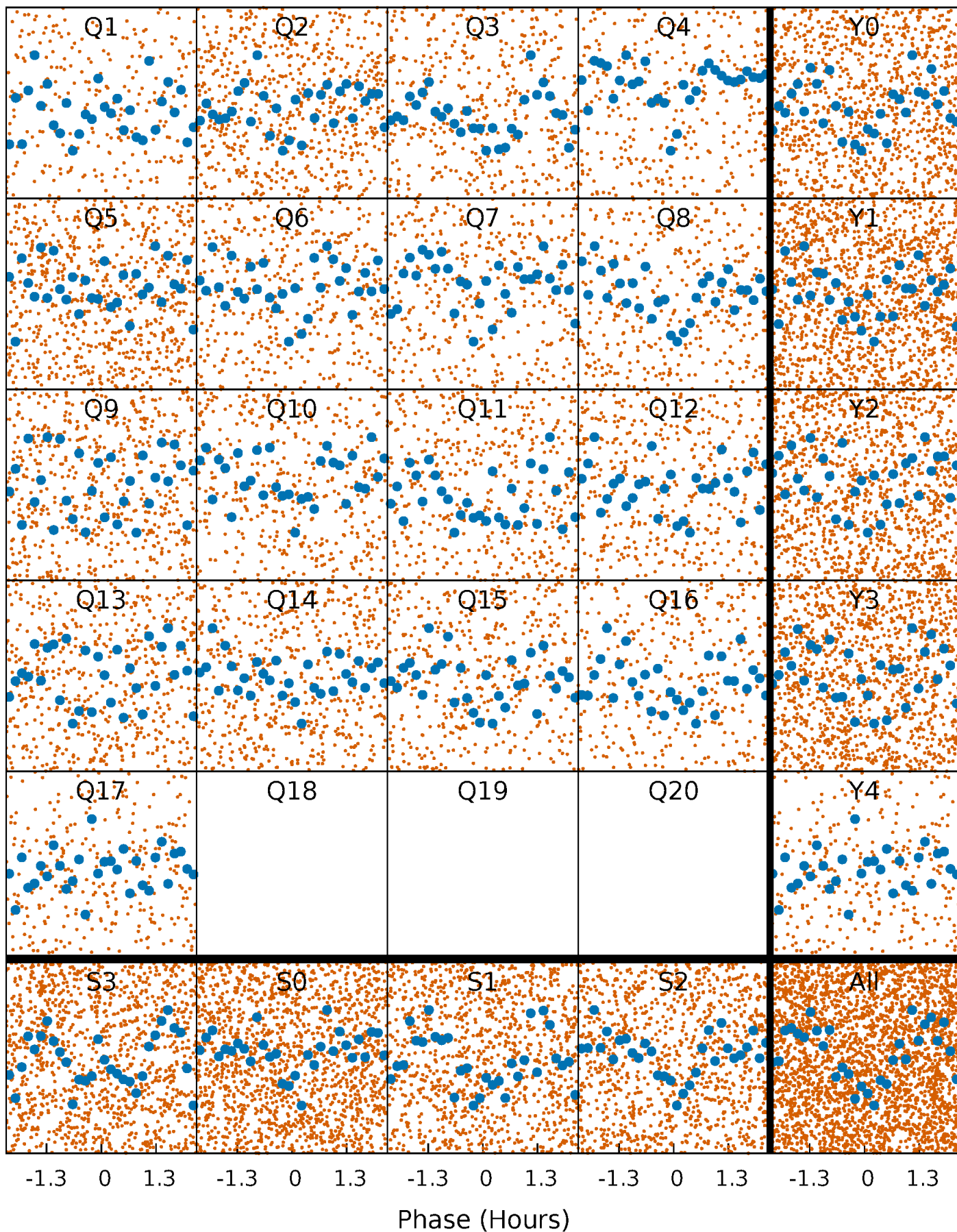
# Non-Whitened Vs. Whitened Light Curve





# PDC Quarter-Phased Transit Curves

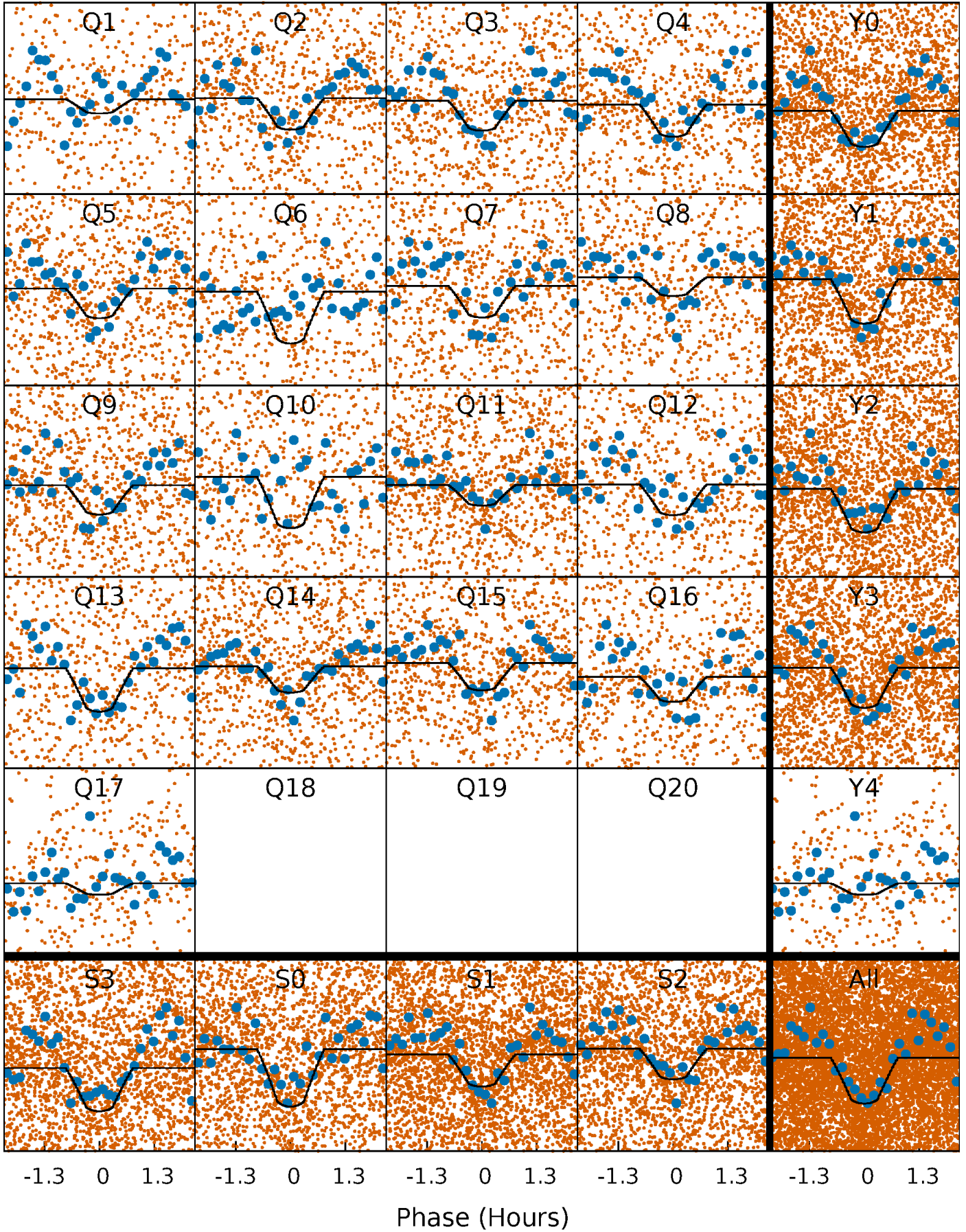
TCE 009047103-01 P= 0.588906 Days  $T_0=131.794446$  (BKJD)





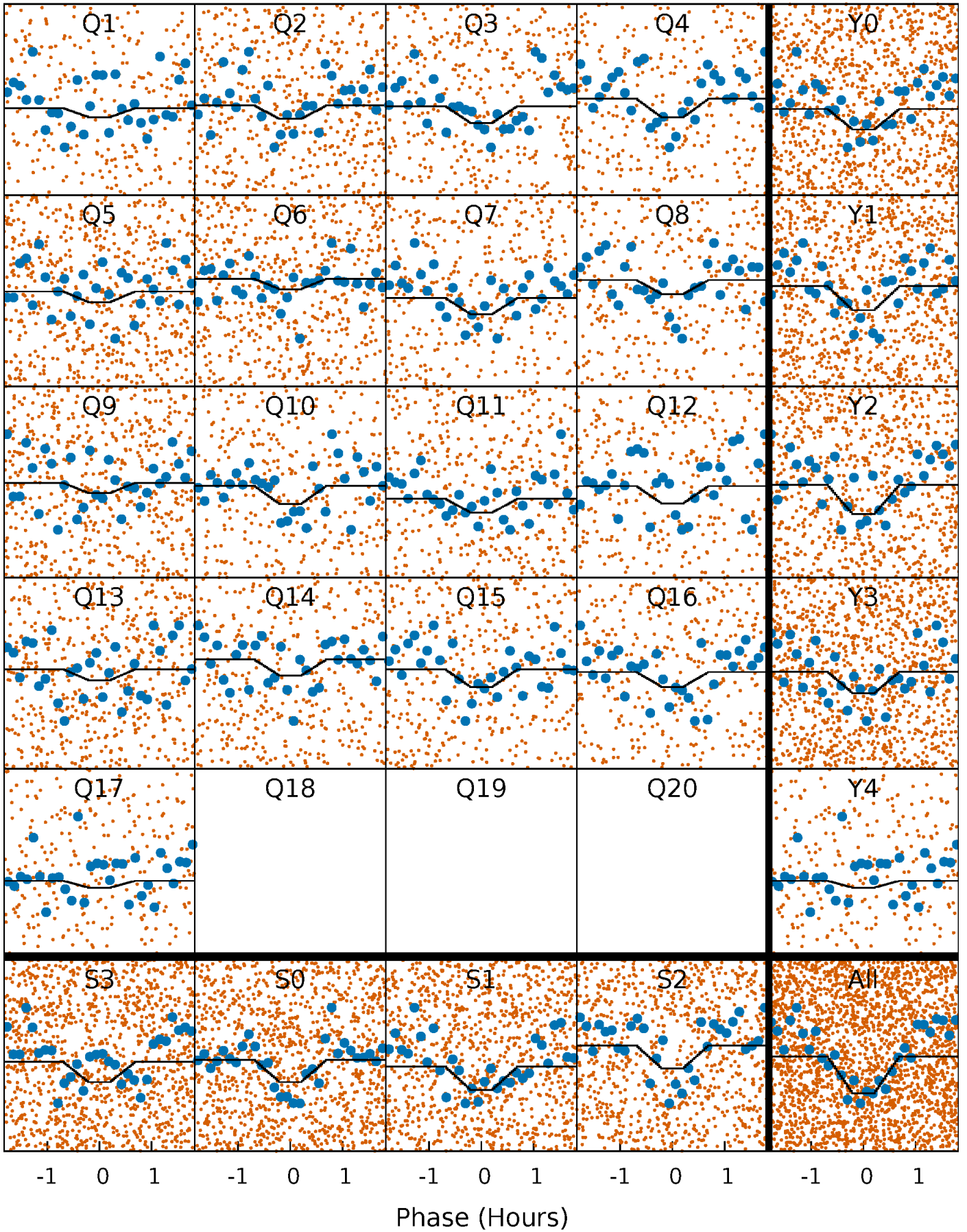
# DV Quarter-Phased Transit Curves

TCE 009047103-01 P= 0.588906 Days  $T_0=131.794446$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

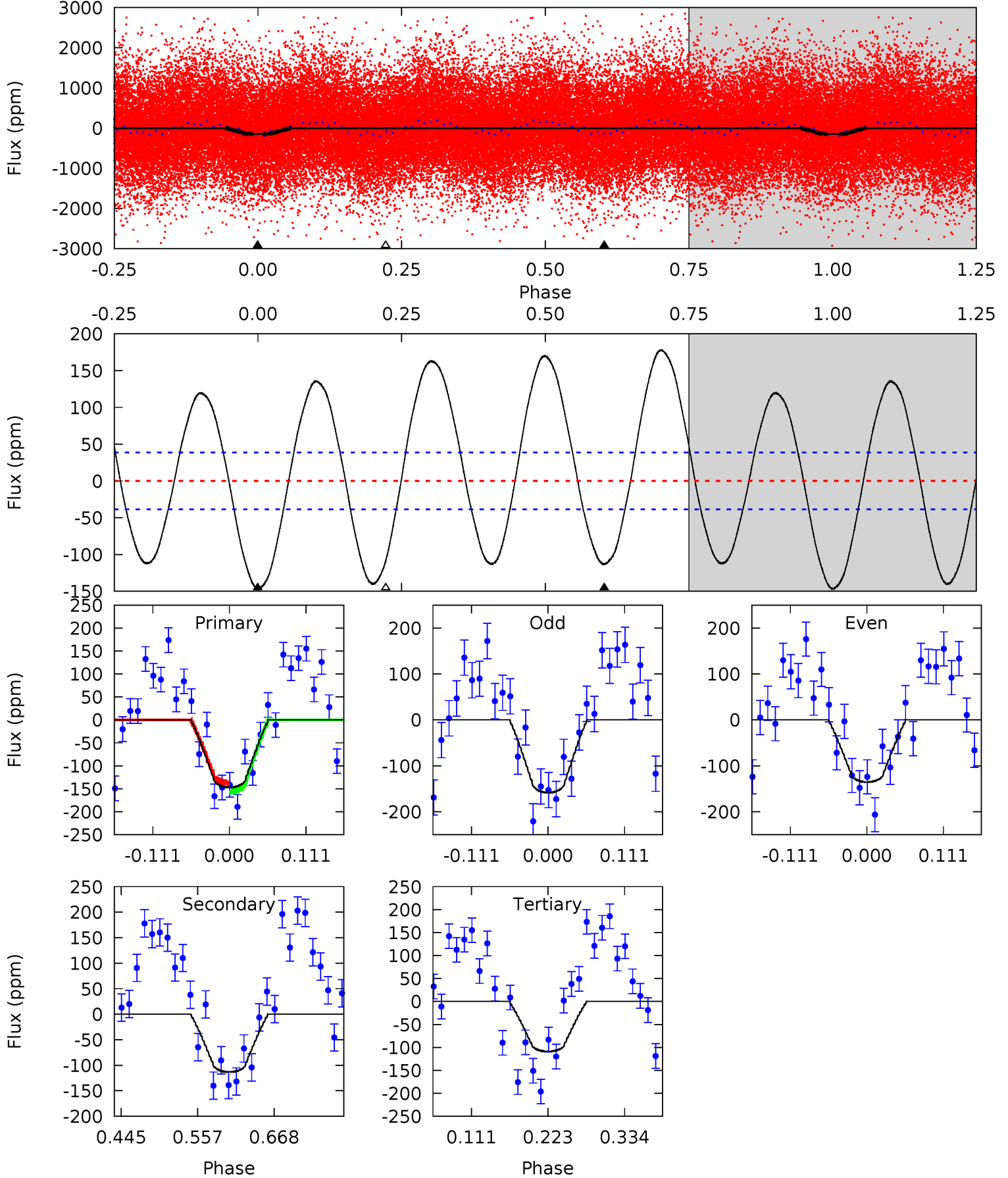
TCE 009047103-01   P= 0.588909 Days    $T_0=131.793170$  (BKJD)



# DV Model-Shift Uniqueness Test

009047103-01, P = 0.588906 Days, E = 131.205540 Days

Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
17.3	13.3	12.8	0	4.54	1.59	11.2	4.48	17.3	0.52	13.3	1.37	0.95	0.55	1.09

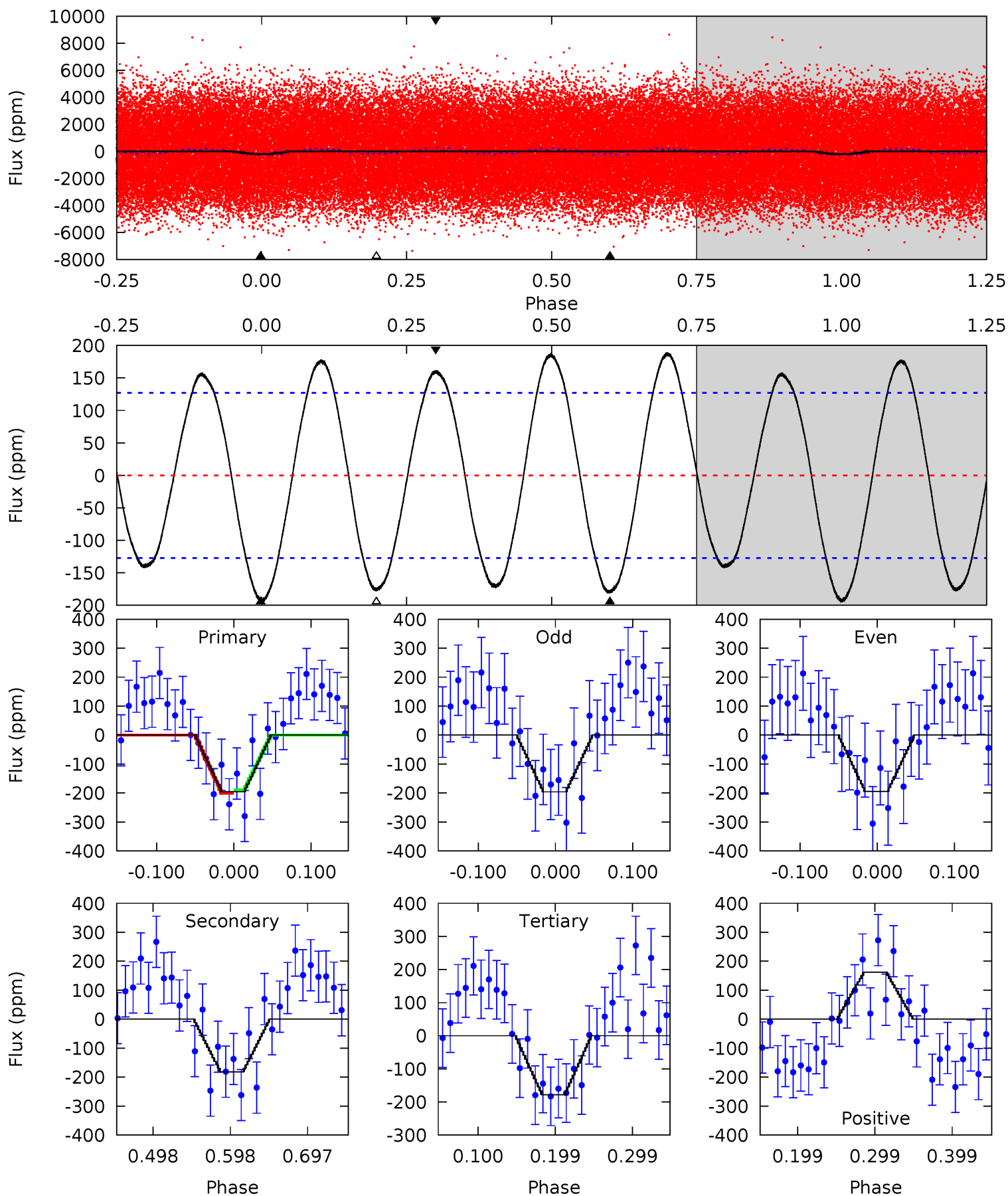




# Alt Model-Shift Uniqueness Test

009047103-01, P = 0.588909 Days, E = 131.204261 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
7.01	6.53	6.40	5.80	4.57	1.65	4.26	0.61	1.21	0.12	0.72	0.02	0.97	0.49	0.23





### Stellar Parameters For KIC 009047103

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$6790^{+214}_{-285}$	$4.025^{+0.315}_{-0.158}$	$-0.420^{+0.250}_{-0.300}$	$1.771^{+0.487}_{-0.595}$	$1.213^{+0.189}_{-0.189}$	$0.308^{+0.596}_{-0.134}$
	+3%/-4%	+8%/-4%	+60%/-71%	+27%/-34%	+16%/-16%	+194%/-43%
Source	PHO54	PHO54	PHO54	DSEP		

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

### Secondary Eclipse Parameters for KIC 009047103-01 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-113 \pm 9$	$2.34^{+1.79}_{-1.39}$	$4524^{+359}_{-416}$	$5814^{+4838}_{-1437}$	$2.366^{+12.556}_{-1.593}$
Alt.	$-182 \pm 28$	$2.64^{+1.65}_{-1.49}$	$4496^{+409}_{-449}$	$6361^{+4199}_{-1461}$	$3.224^{+11.999}_{-2.014}$

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

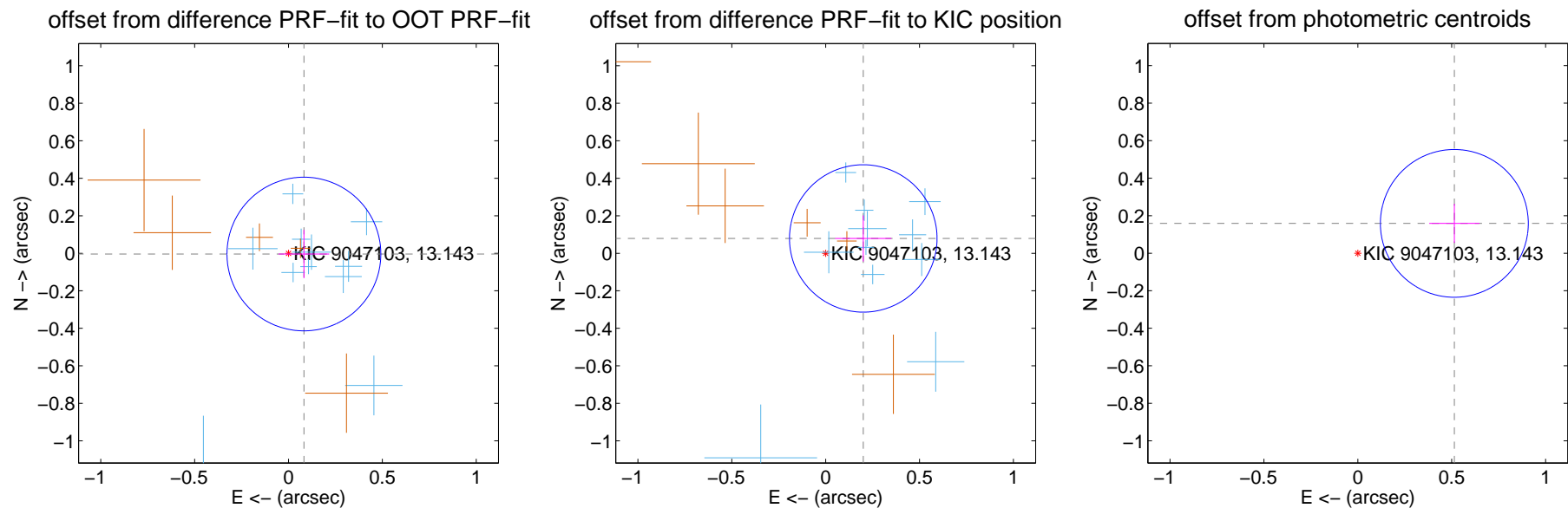
## DV Centroid Data

Supplemental centroid analysis for 009047103-01. Kepler magnitude: 13.14. Transit SNR 12.73

There are 11 quarters with good PRF difference image offsets

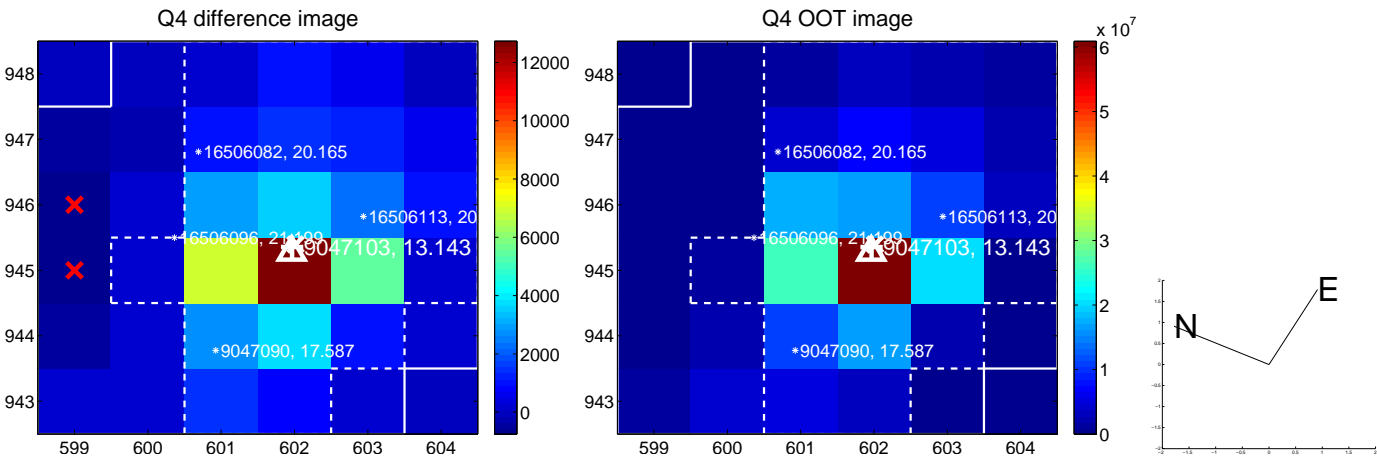
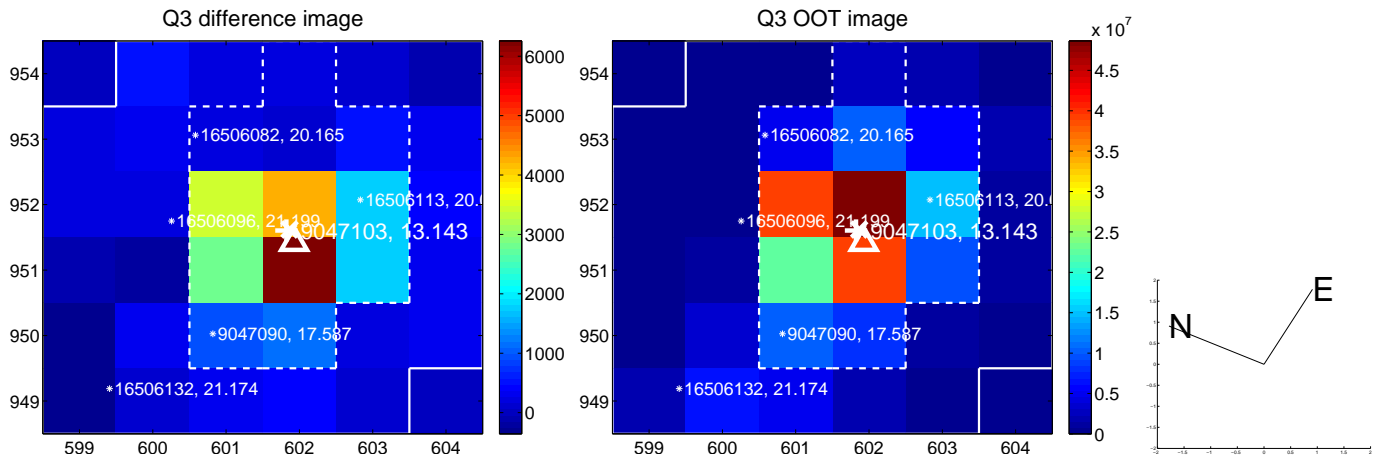
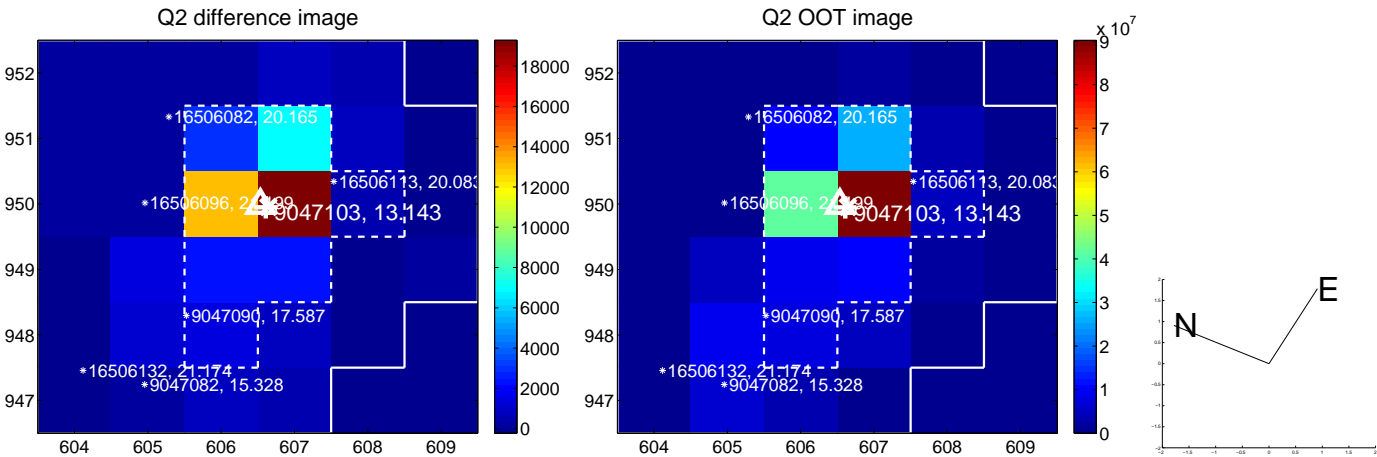
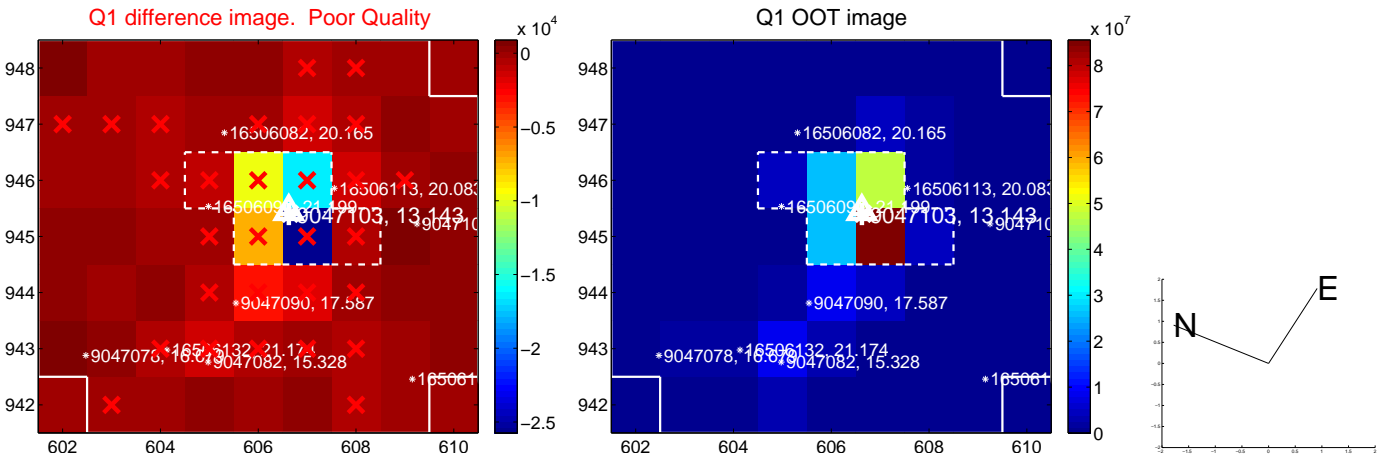
The direct PRF centroid is offset from the target star catalog position by about 0.11 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.082 \pm 0.137$	0.60	$-0.082 \pm 0.135$	$-0.004 \pm 0.129$
PRF-fit source offset from KIC position	$0.215 \pm 0.131$	1.64	$-0.200 \pm 0.150$	$0.079 \pm 0.123$
photometric centroid source offset	$0.54 \pm 0.13$	4.10	$-0.51 \pm 0.13$	$0.16 \pm 0.10$

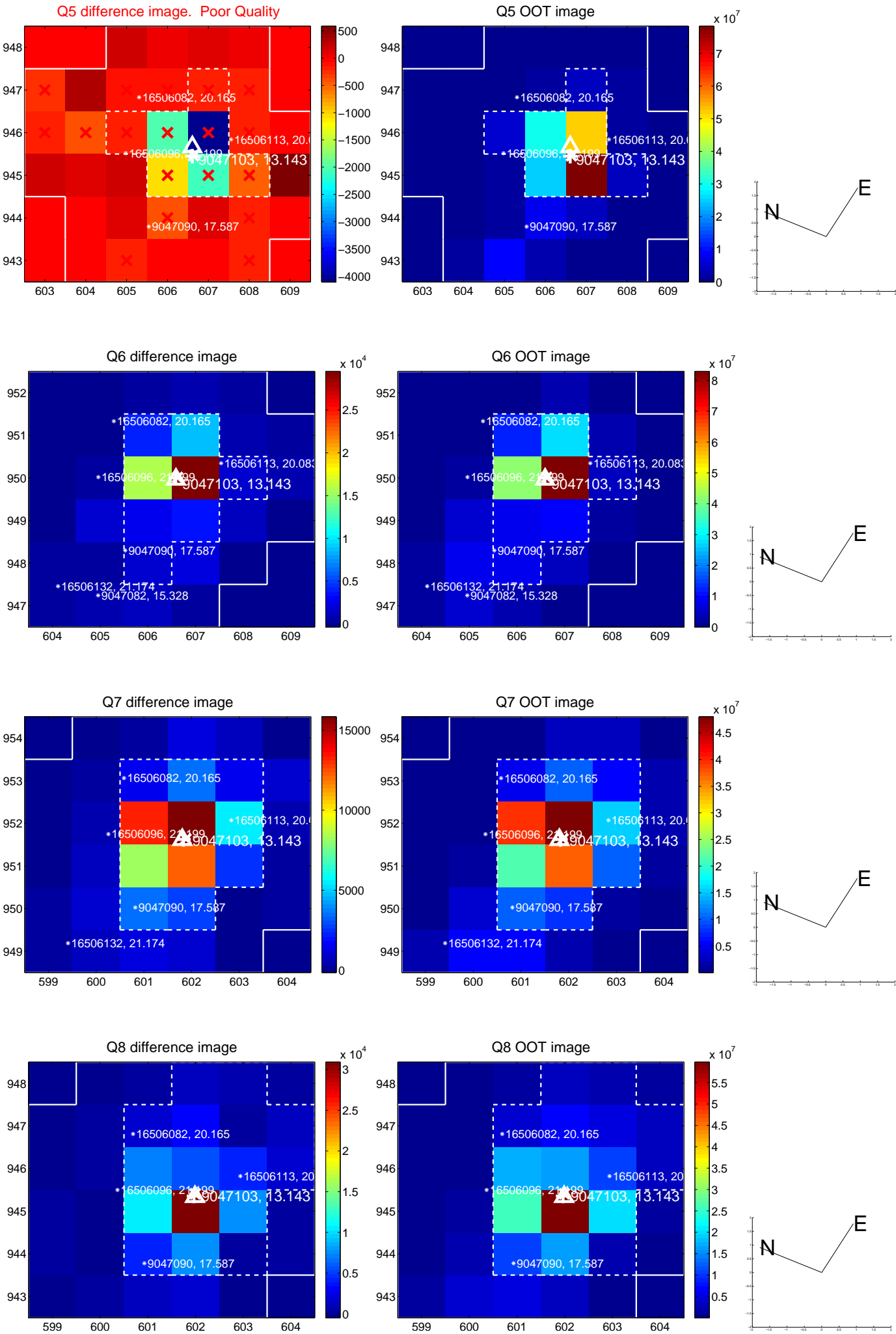


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

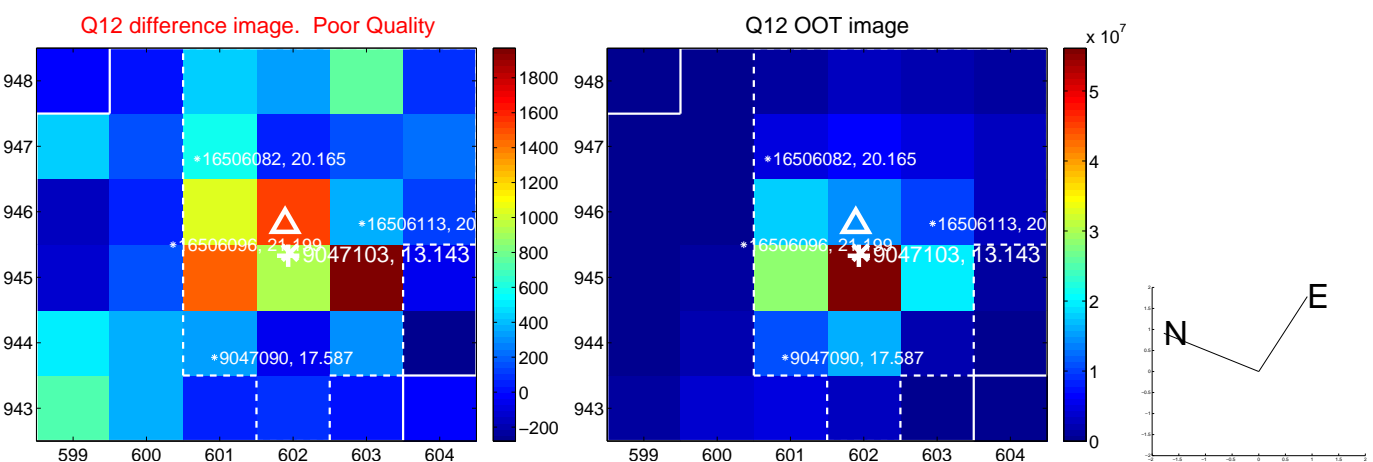
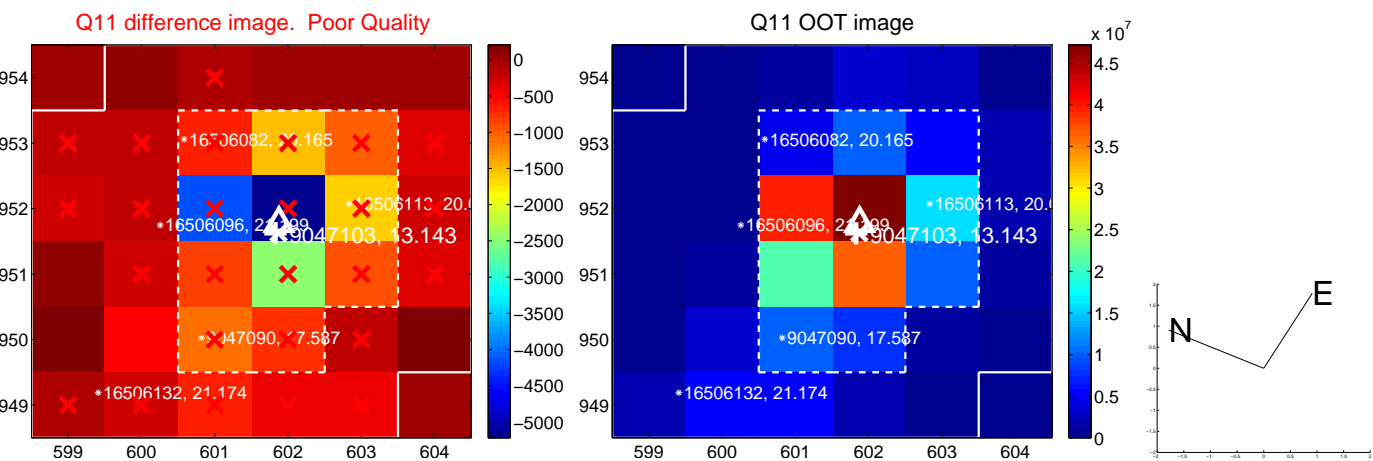
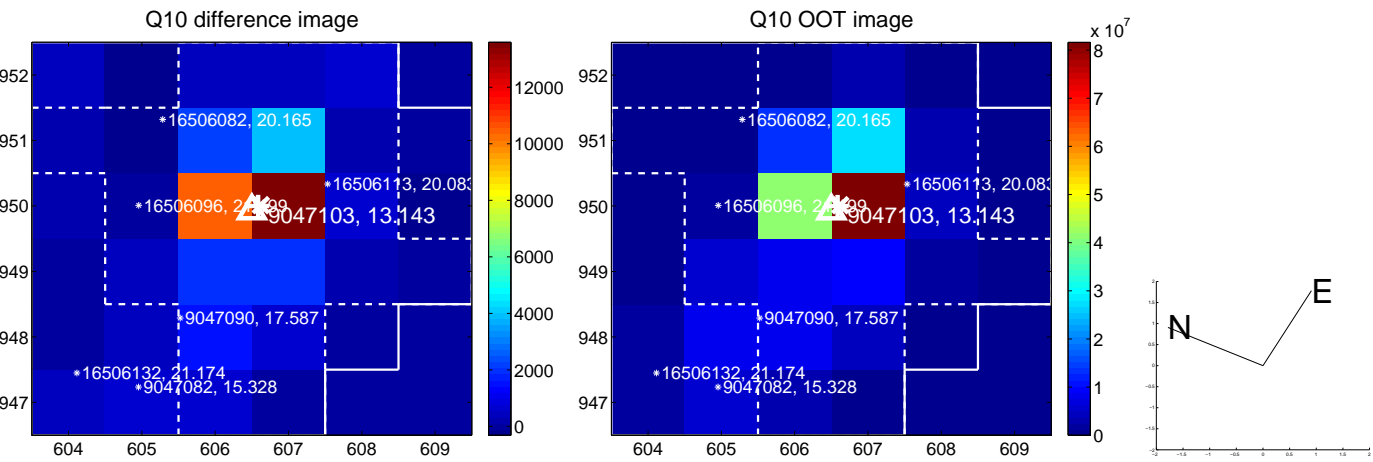
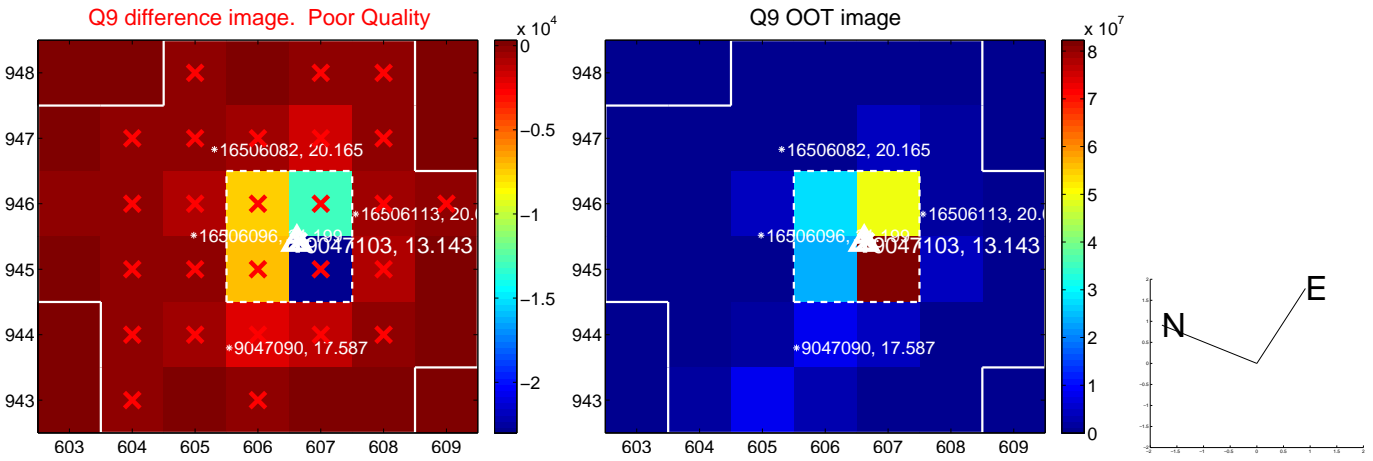


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

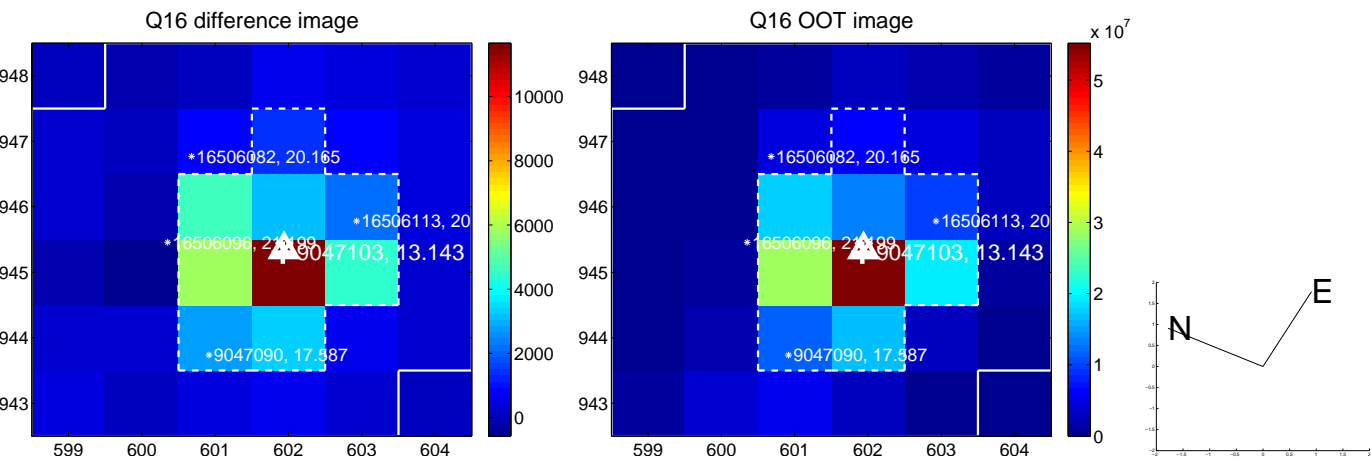
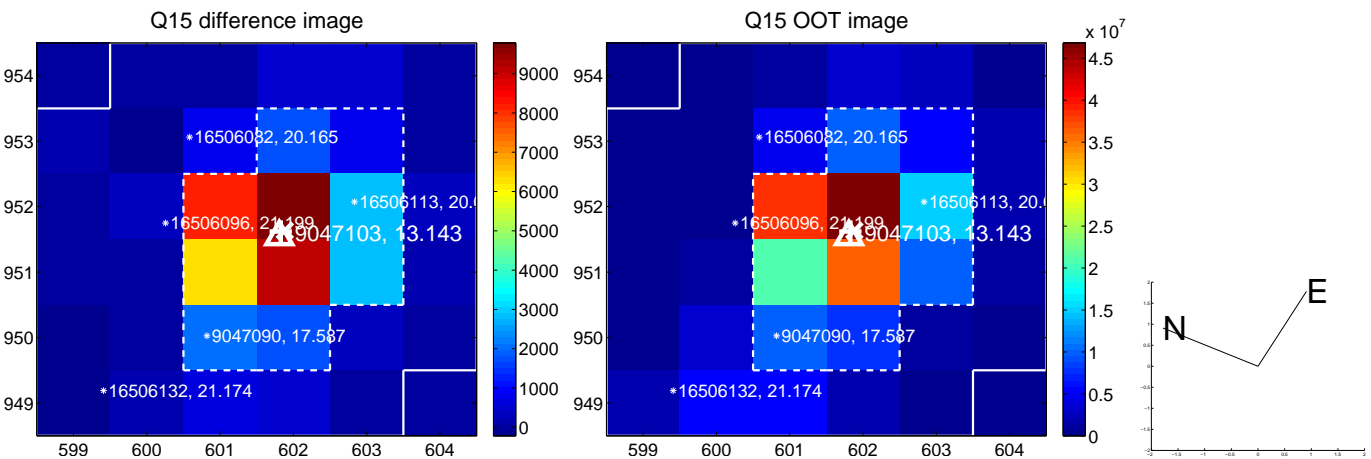
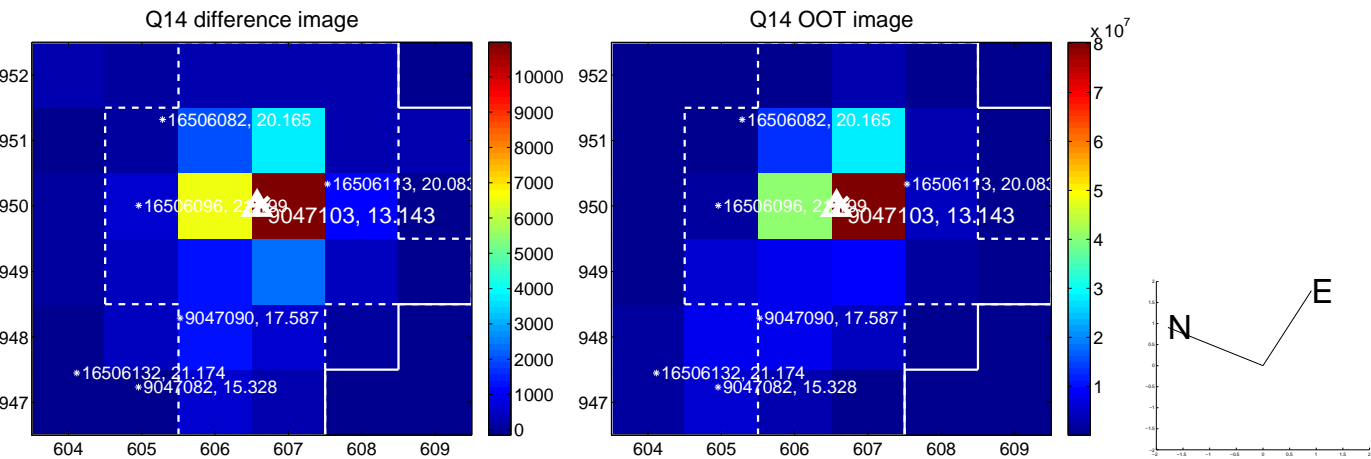
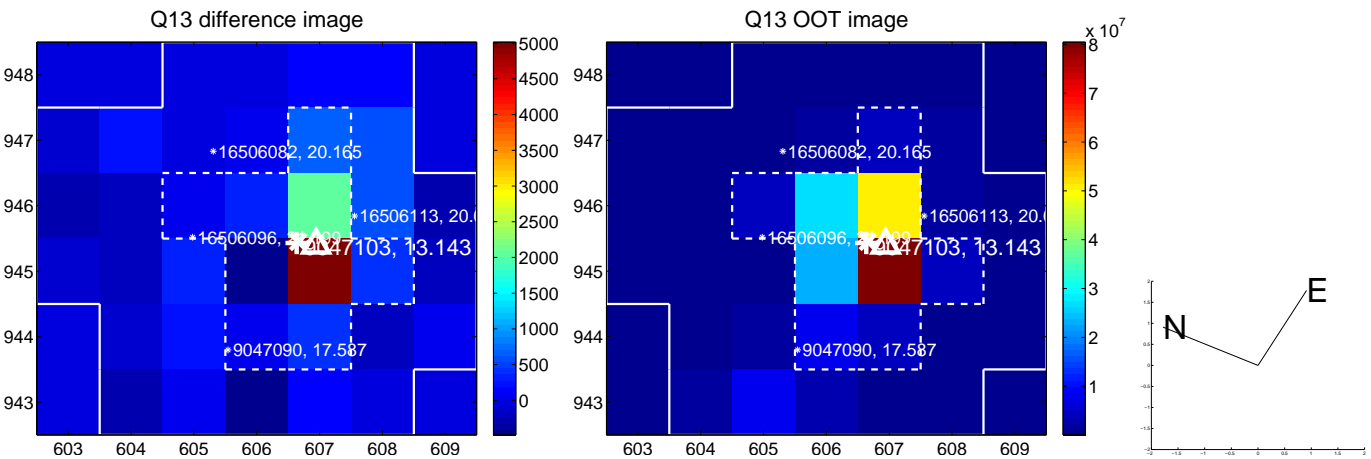




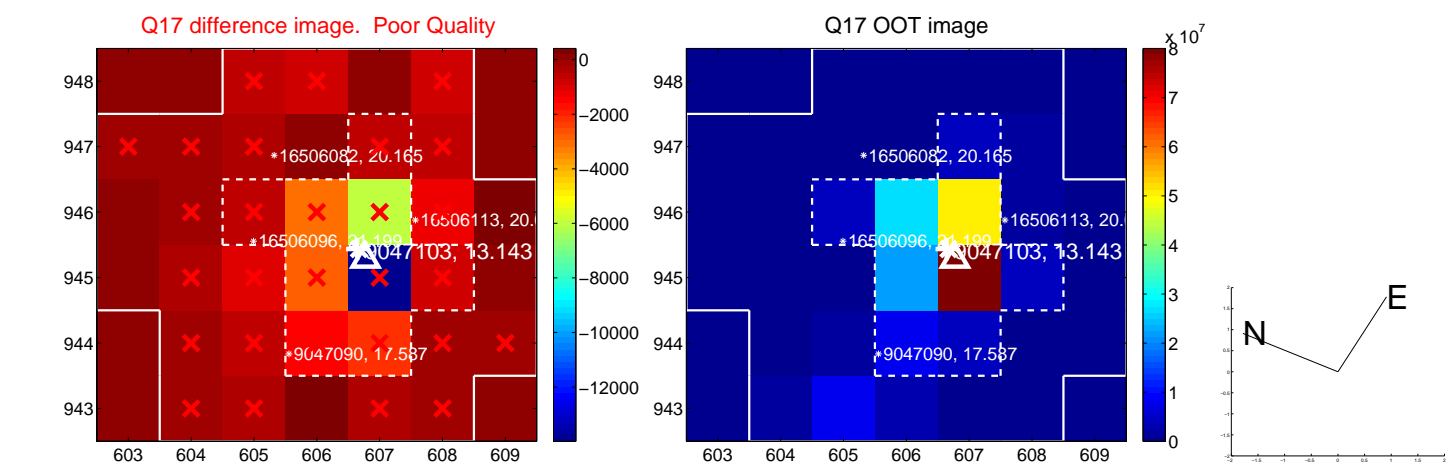
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



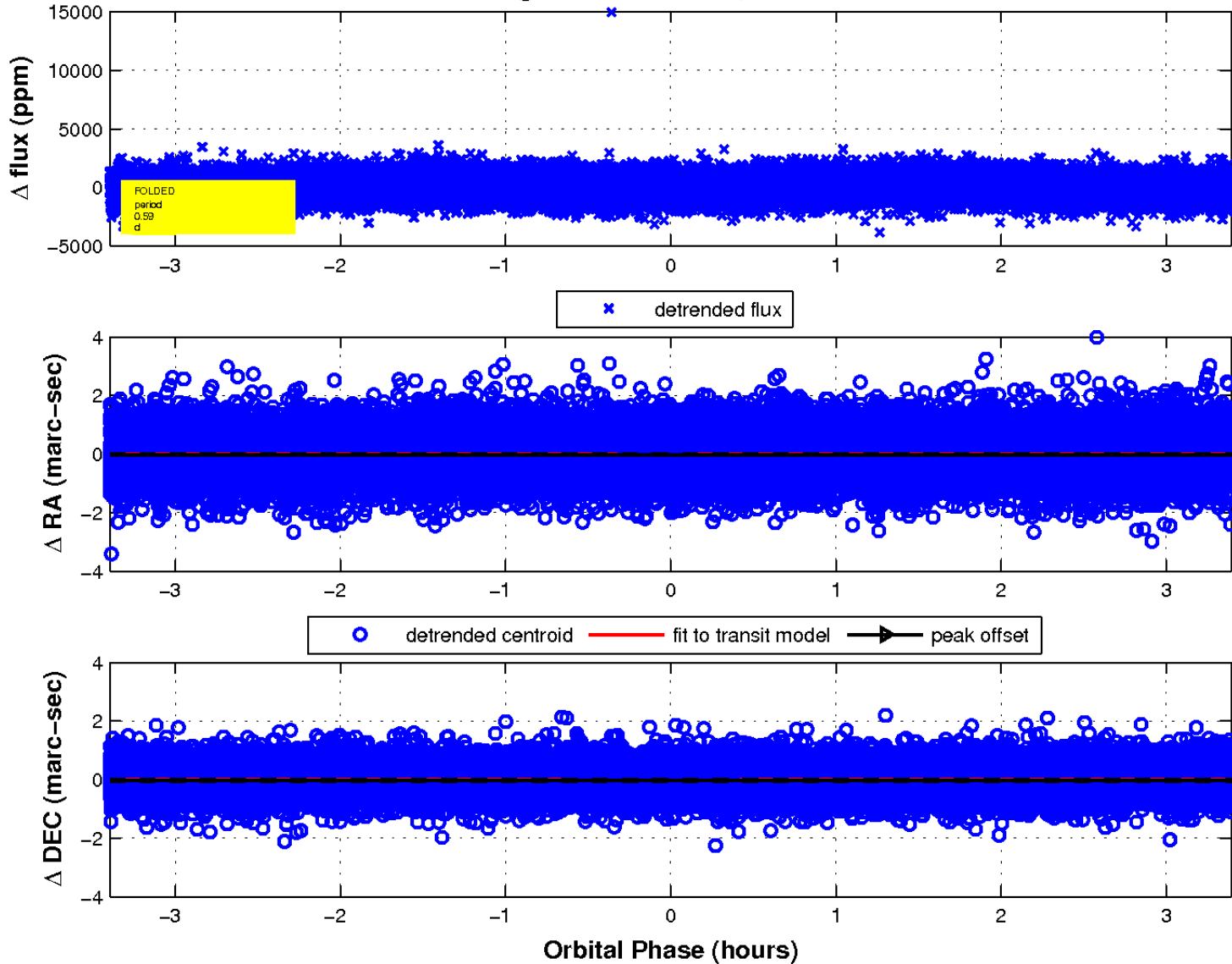
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

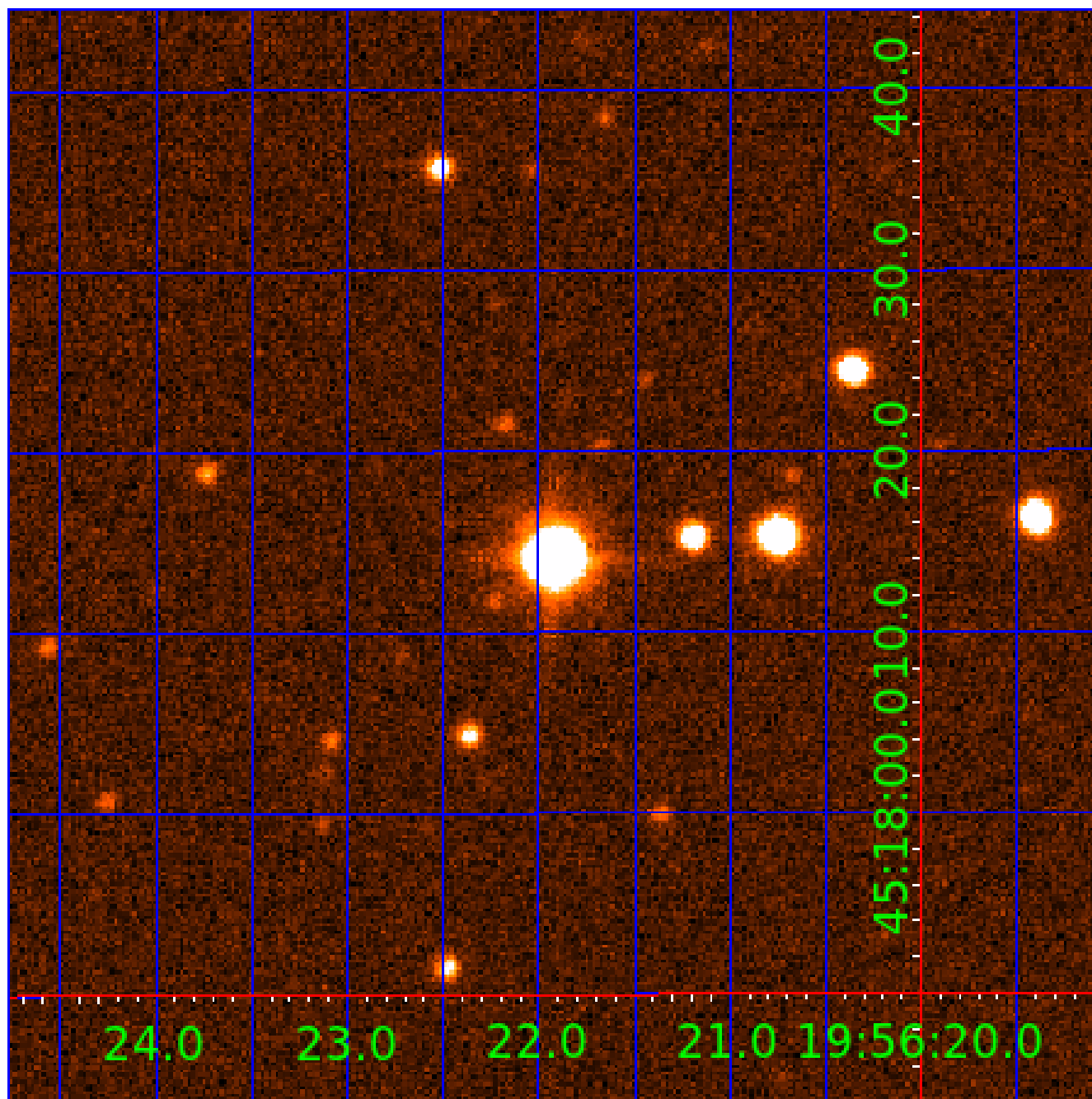


fluxWeightedCentroids, Planet 1 of 2



UKIRT Image

Declination





# KIC 009047103

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009047103-01	OBS	No	0.588906	131.794446	172.3	1.132	11.0	12.7	1.77	6790	2.36	27783.76
009047103-02	OBS	No	0.588903	132.032546	47.0	1.083	10.1	3.5	1.77	6790	1.26	27783.93

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009047103-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT
009047103-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—SAME_NTL_PERIOD

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

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

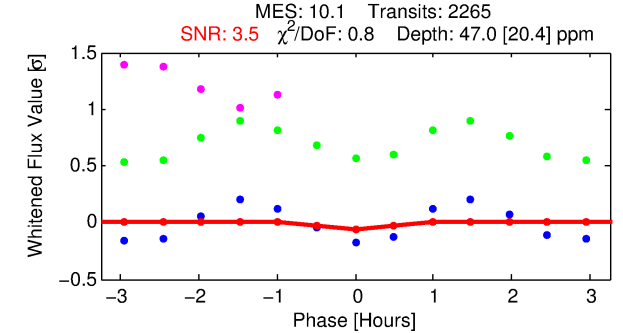
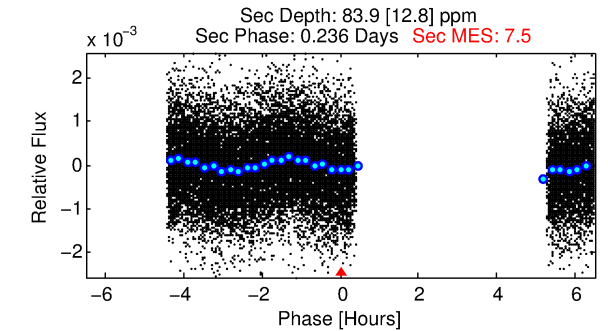
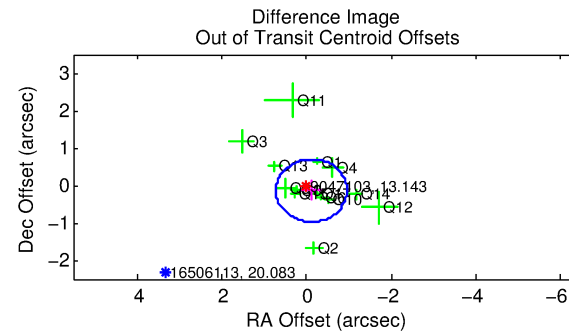
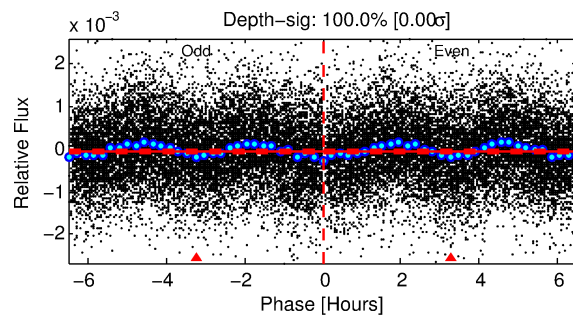
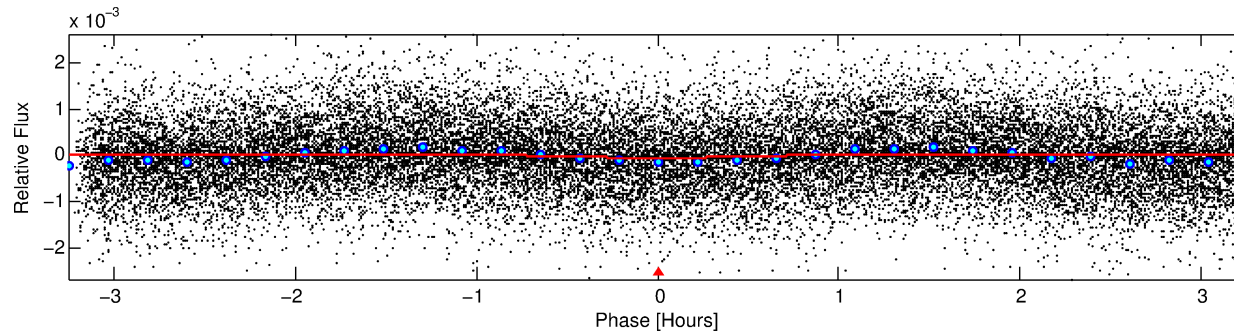
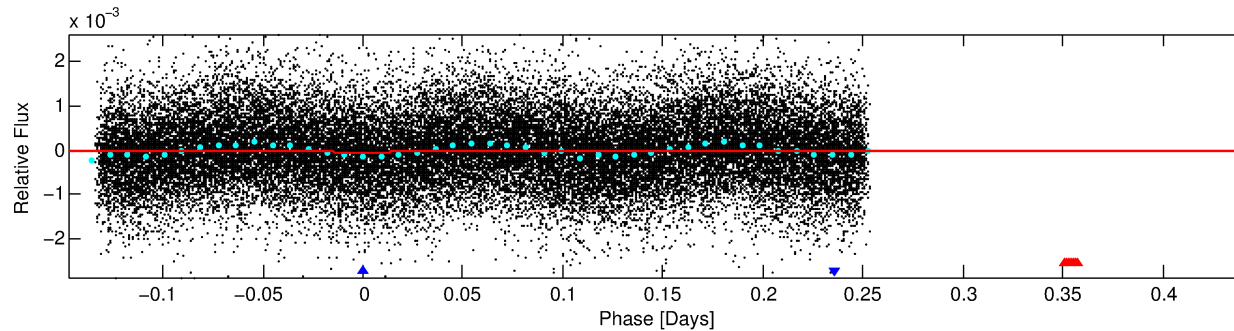
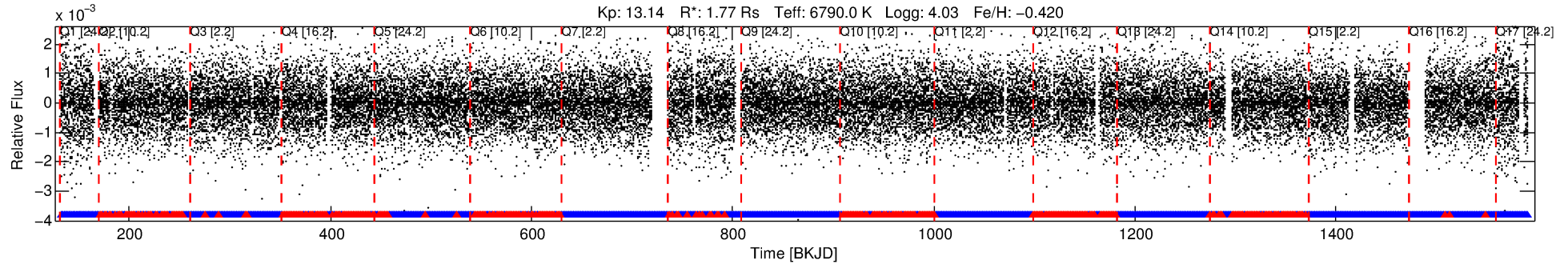
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009047103-02

No Significant Match Found

# DV One-Page Summary

KIC: 9047103 Candidate: 2 of 2 Period: 0.589 d



## DV Fit Results:

Period = 0.58890 [0.00003] d  
Epoch = 132.0325 [0.0049] BKJD  
Rp/R\* = 0.0065 [0.0067]  
a/R\* = 3.70 [19.33]  
b = 0.50 [8.50]  
Seff = 27783.93 [15523.45]  
Teq = 3292 [460] K  
Rp = 1.26 [1.36] Re  
a = 0.0147 [0.0048] AU  
Ag = 6.20 [13.09] [0.40σ]  
Teffp = 8033 [4115] K [1.15σ]

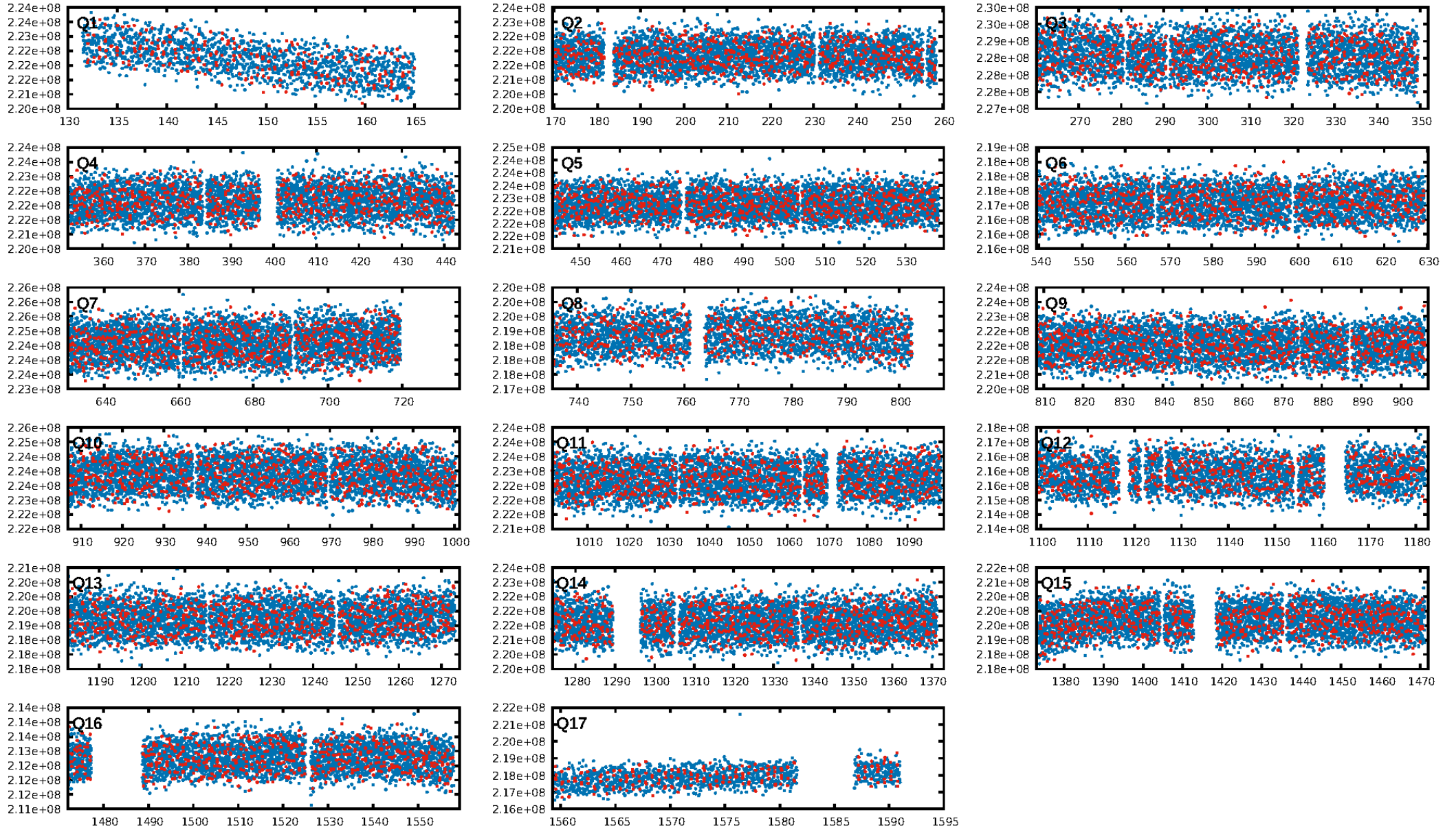
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.0% [0.00σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 7.94e-19  
RollingBand-fgt: 0.79 [1698/2163]  
GhostDiagnostic-chr: 0.3301  
Centroid-sig: 1.7%  
Centroid-so: 0.410 arcsec [1.01σ]  
OotOffset-rm: 0.181 arcsec [0.65σ]  
KicOffset-rm: 0.239 arcsec [0.96σ]  
OotOffset-st: 4/3/3/4 [14]  
KicOffset-st: 4/3/3/4 [14]  
DiffImageQuality-fgm: 0.64 [9/14]  
DiffImageOverlap-fno: 0.00 [0/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 09:10:15 Z

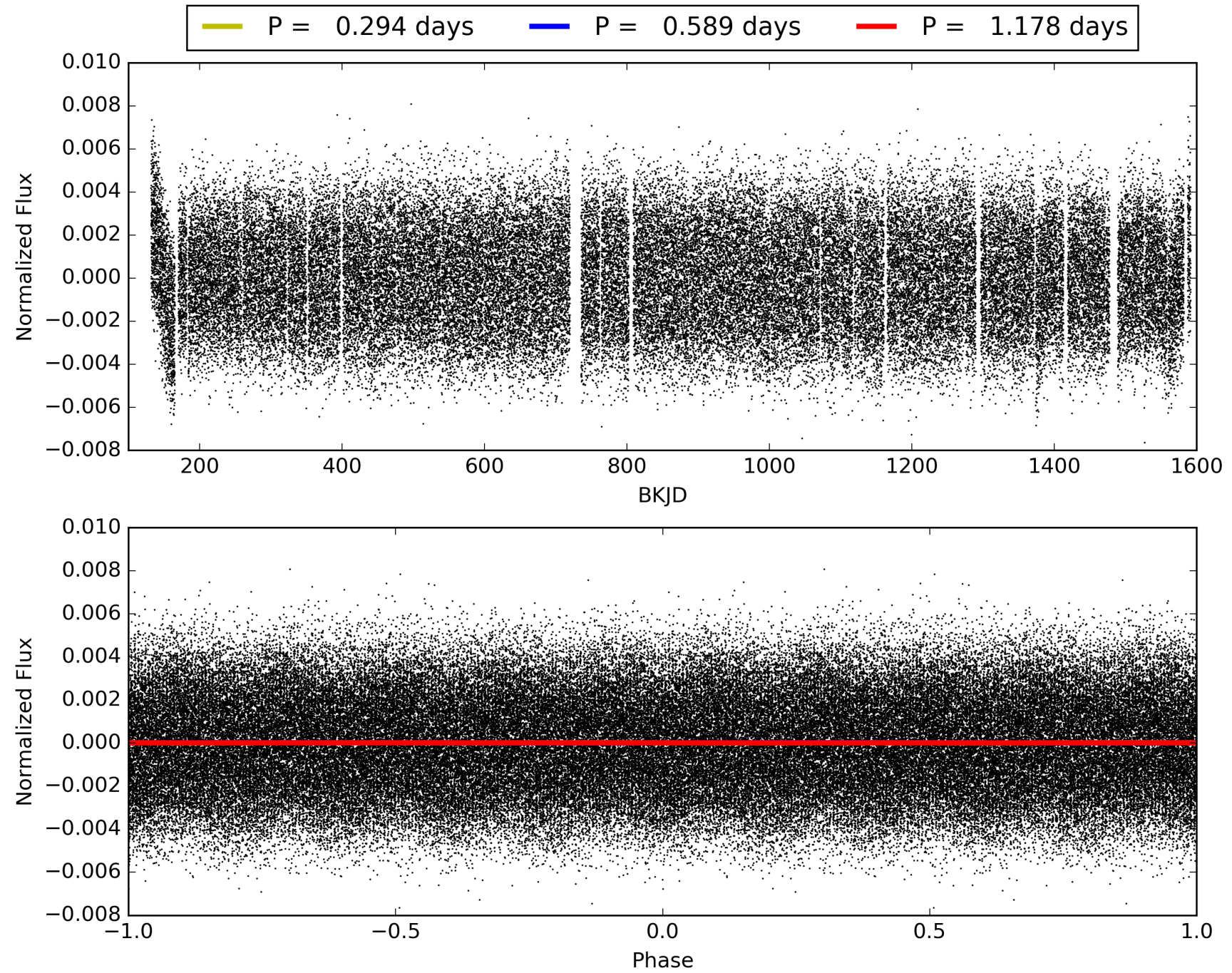
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 009047103-02, PDC Light Curves





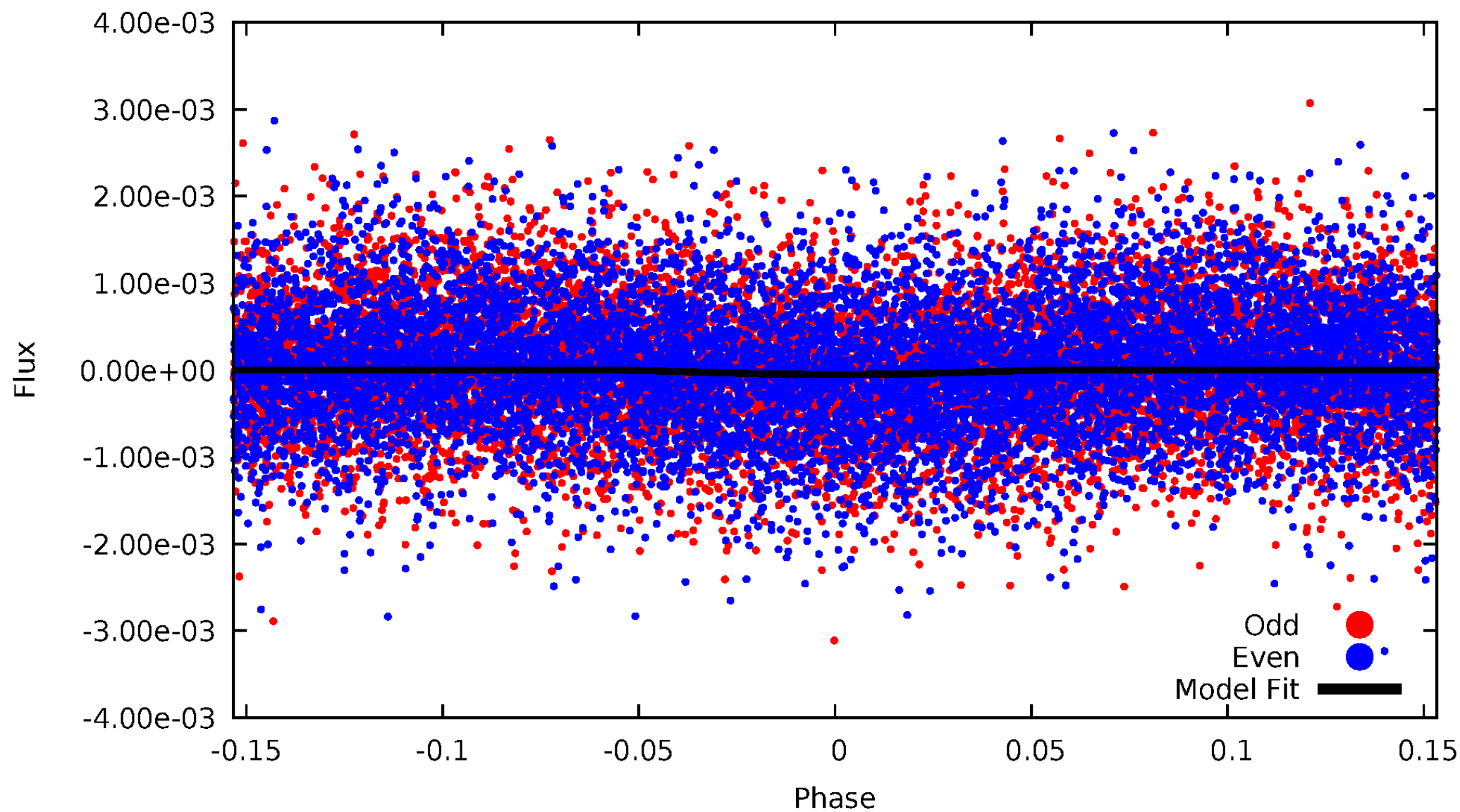
TCE 009047103-02





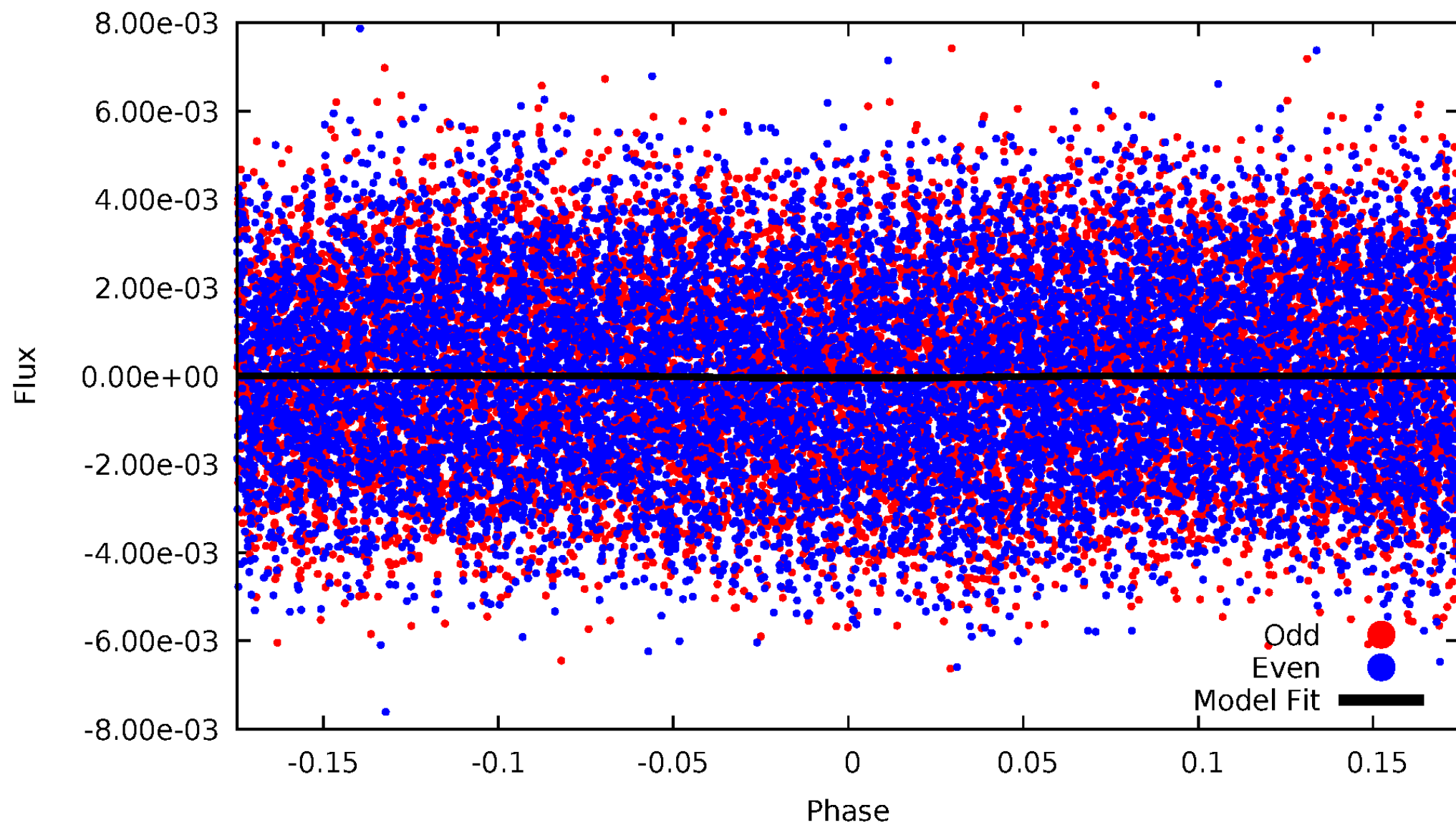
DV Odd/Even

TCE 009047103-02



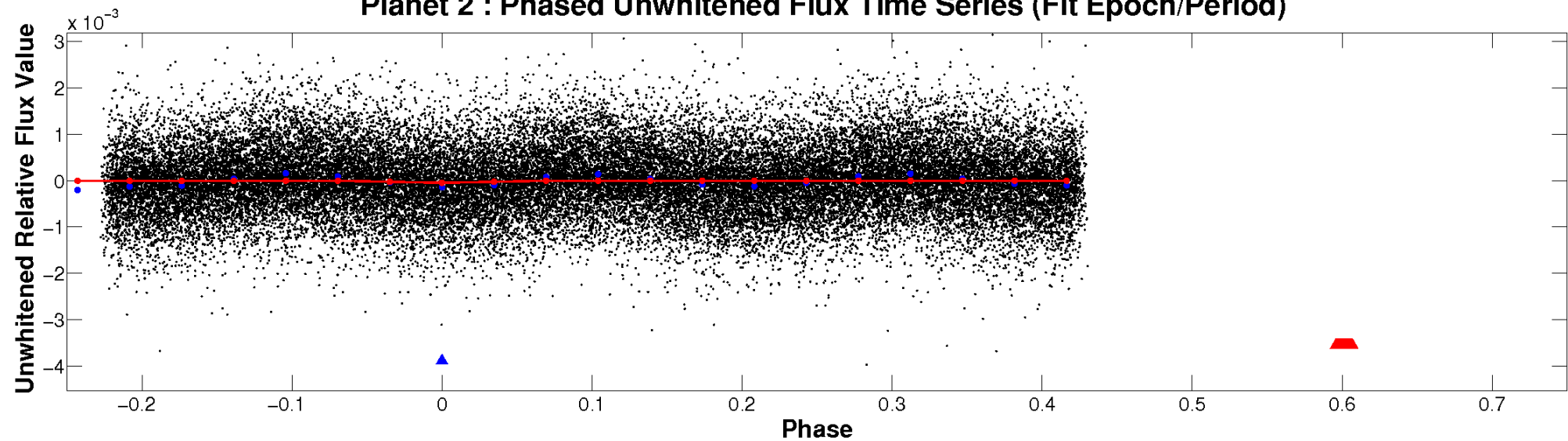
# ALT Odd/Even

TCE 009047103-02

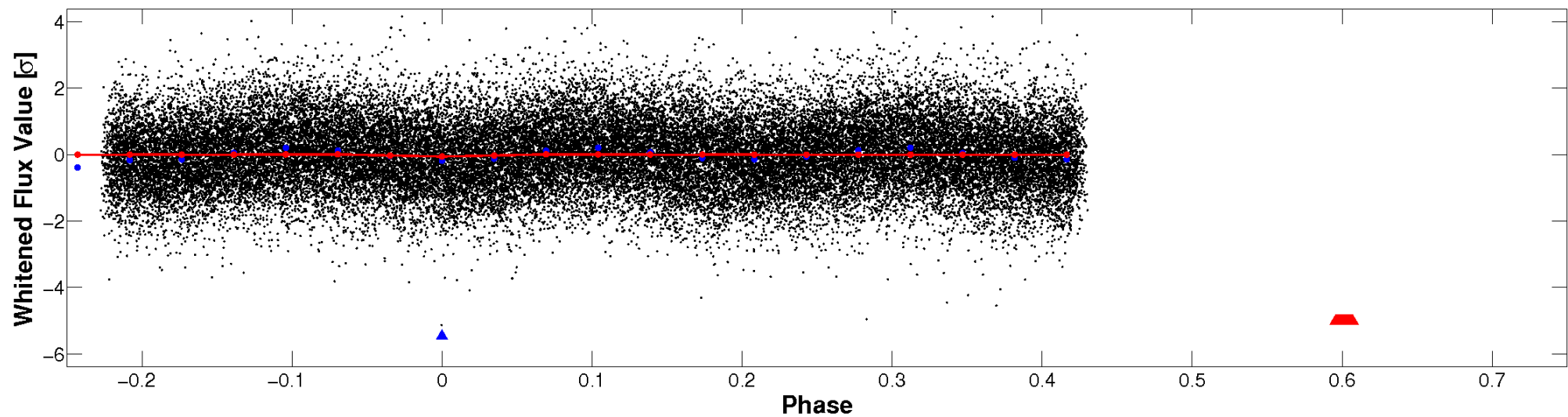


# Non-Whitened Vs. Whitened Light Curve

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

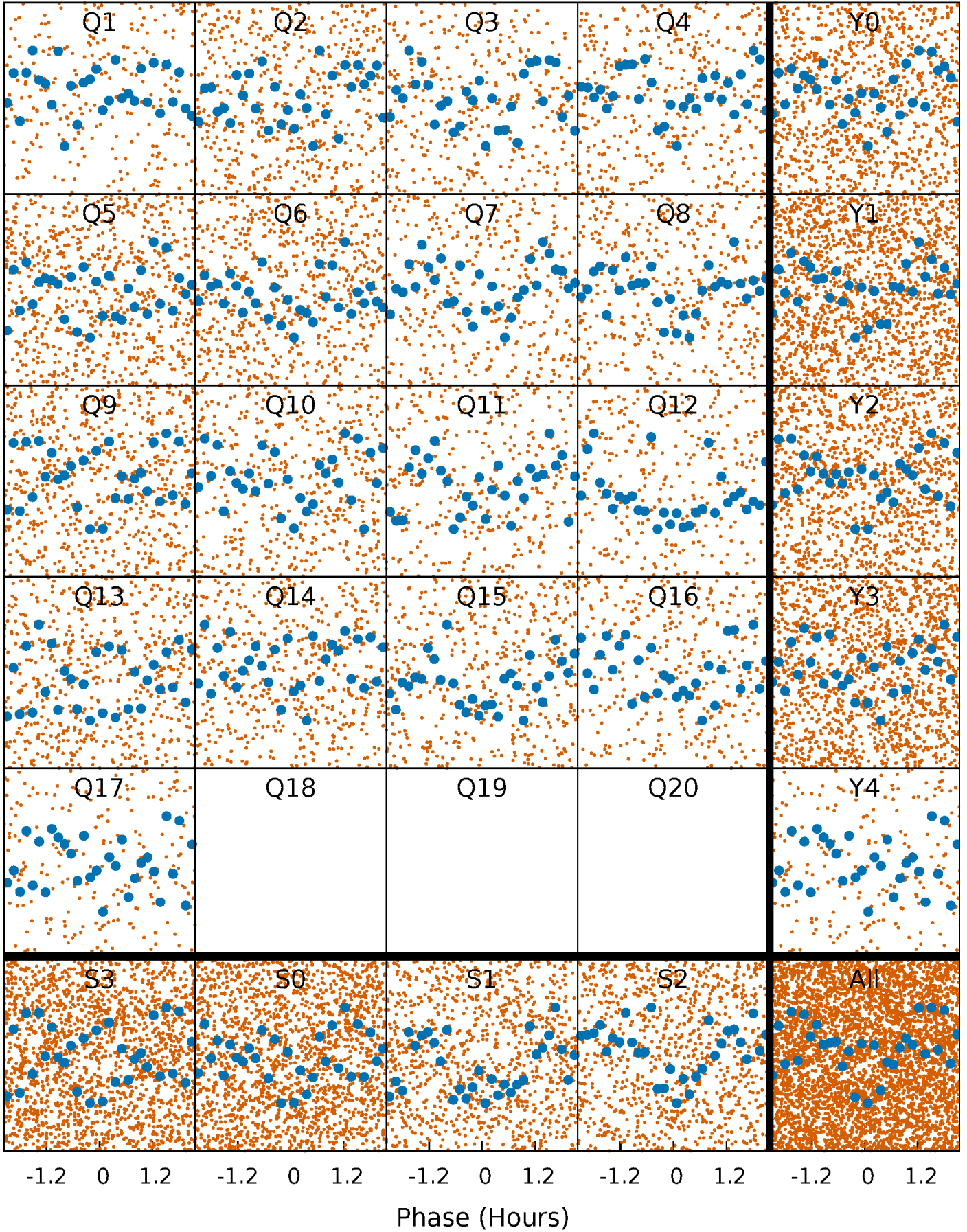


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

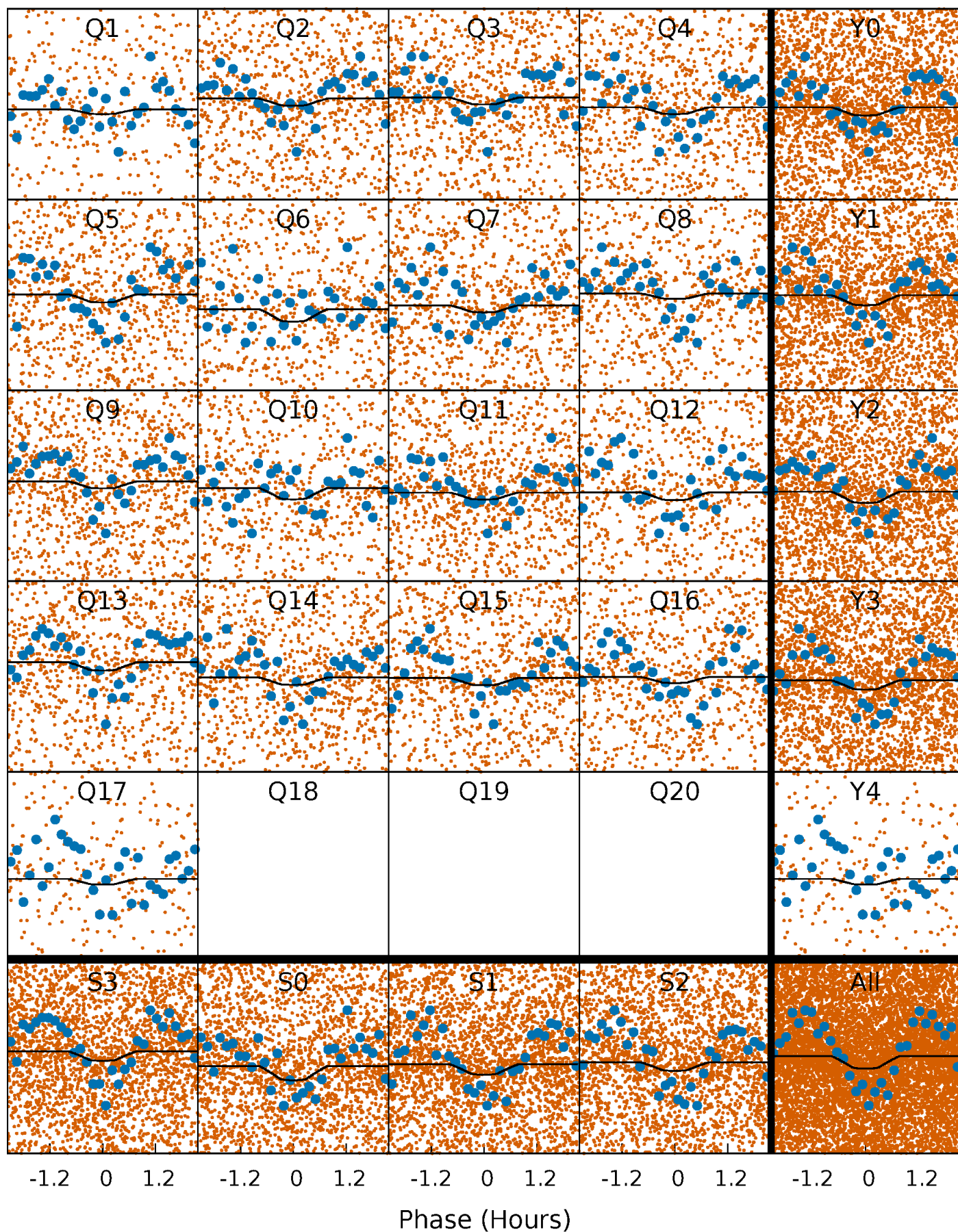
TCE 009047103-02 P= 0.588903 Days  $T_0=132.032546$  (BKJD)





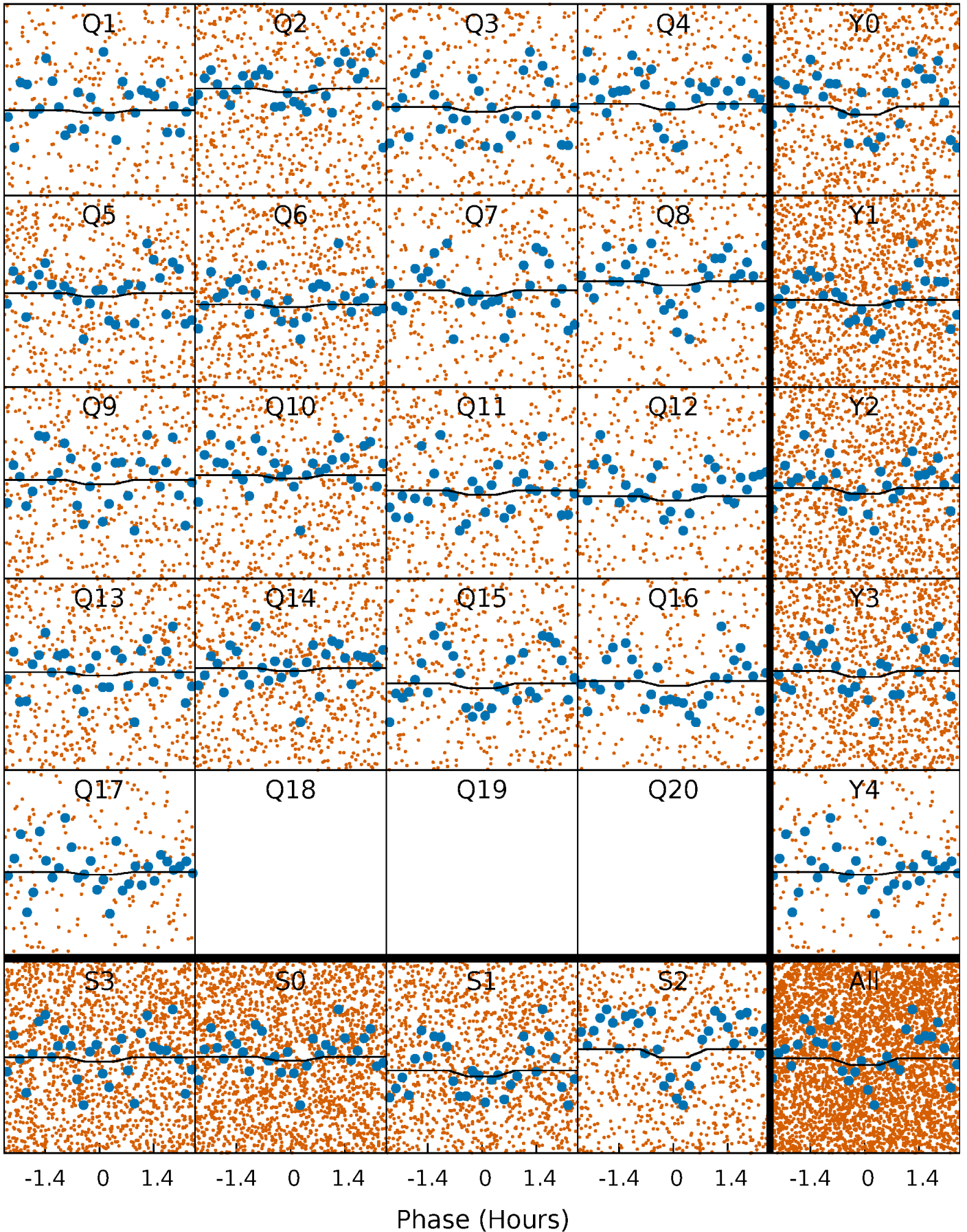
# DV Quarter-Phased Transit Curves

TCE 009047103-02   P= 0.588903 Days    $T_0=132.032546$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 009047103-02 P= 0.588903 Days  $T_0=132.032546$  (BKJD)



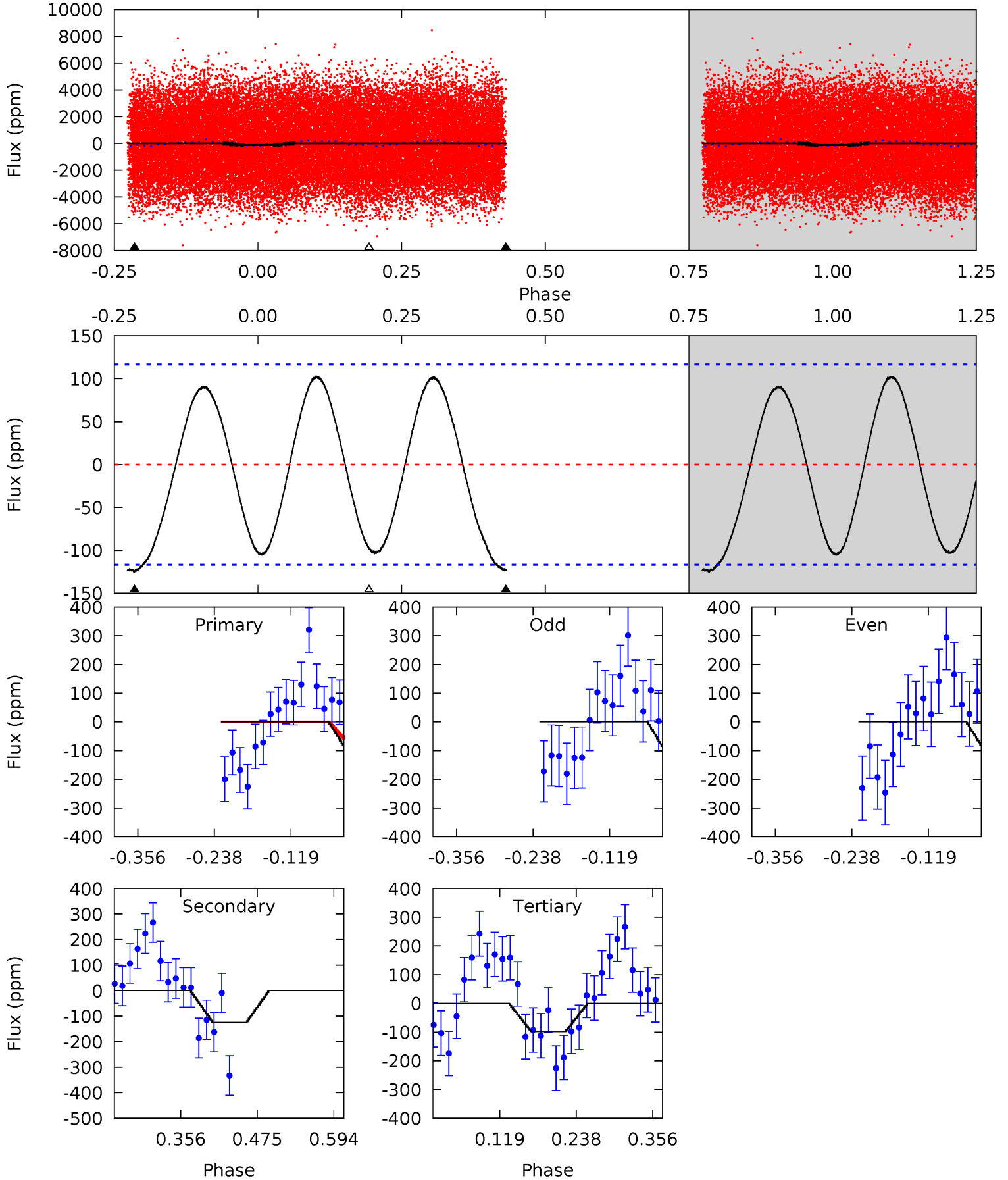




# Alt Model-Shift Uniqueness Test

009047103-02, P = 0.588903 Days, E = 131.443643 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
4.88	4.80	3.82	0	4.53	1.56	2.78	1.05	4.88	0.98	4.80	0.12	0.77	0.45	1.54



### Stellar Parameters For KIC 009047103

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$\rho_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$6790^{+214}_{-285}$	$4.025^{+0.315}_{-0.158}$	$-0.420^{+0.250}_{-0.300}$	$1.771^{+0.487}_{-0.595}$	$1.213^{+0.189}_{-0.189}$	$0.308^{+0.596}_{-0.134}$
	+3%/-4%	+8%/-4%	+60%/-71%	+27%/-34%	+16%/-16%	+194%/-43%
Source	PHO54	PHO54	PHO54	DSEP		

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

### Secondary Eclipse Parameters for KIC 009047103-02 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-135 \pm 9$	$1.45^{+1.11}_{-0.92}$	$4517^{+373}_{-422}$	$8400^{+11577}_{-2385}$	$7.787^{+48.857}_{-5.382}$
Alt.	$-124 \pm 26$	$1.41^{+1.19}_{-0.85}$	$4503^{+380}_{-422}$	$8159^{+9236}_{-2337}$	$7.256^{+40.552}_{-5.065}$

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

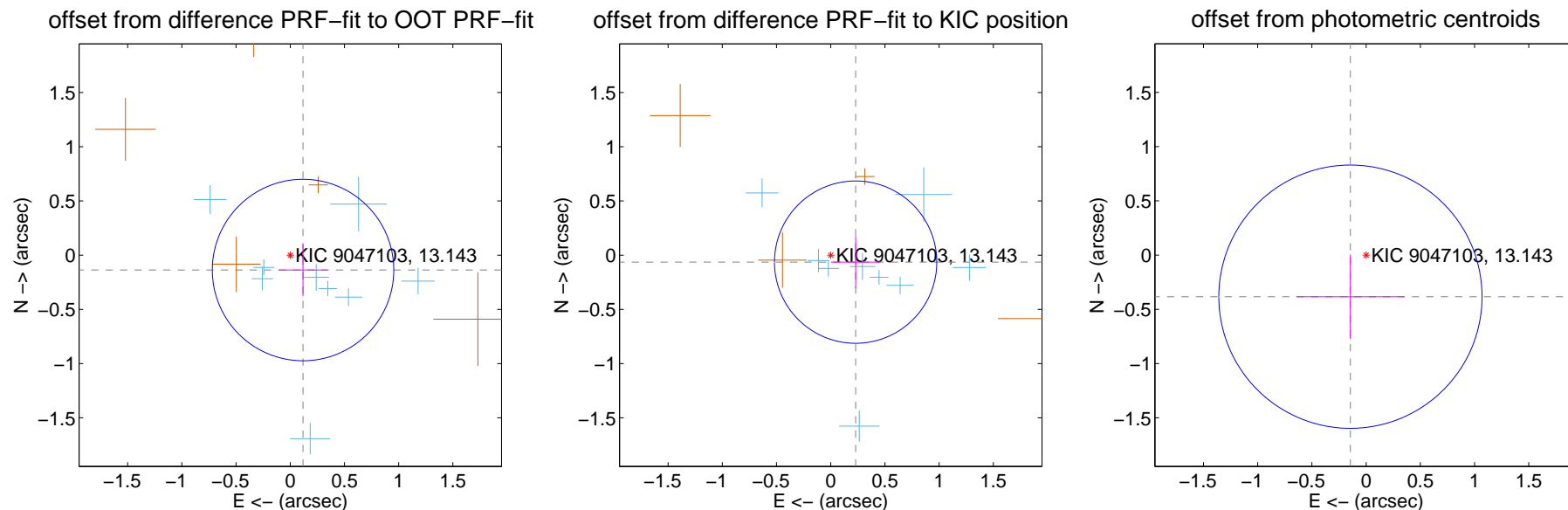
## DV Centroid Data

Supplemental centroid analysis for 009047103-02. Kepler magnitude: 13.14. Transit SNR 3.50

There are 9 quarters with good PRF difference image offsets

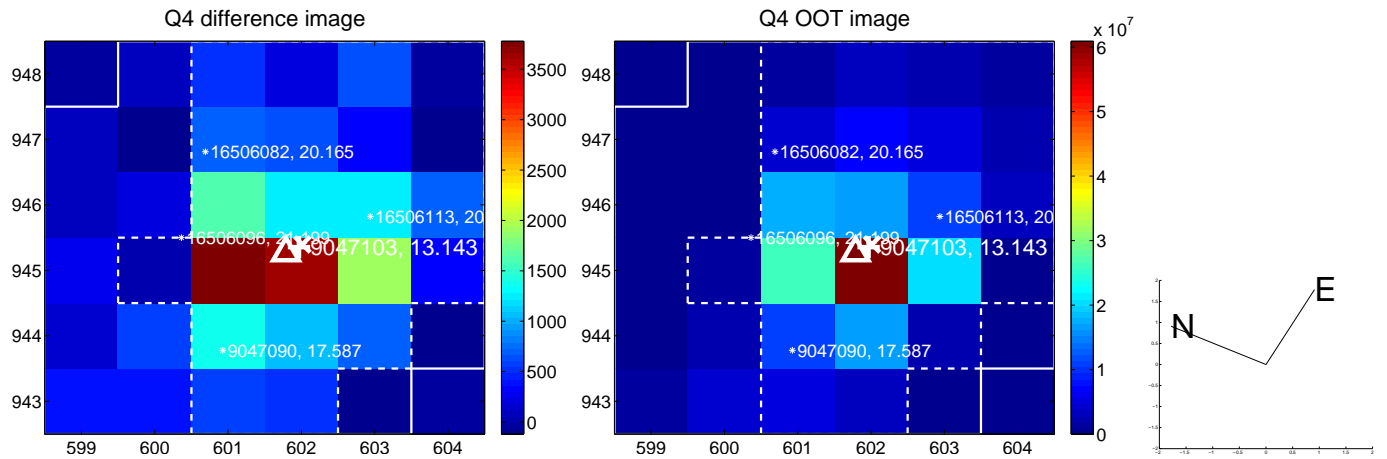
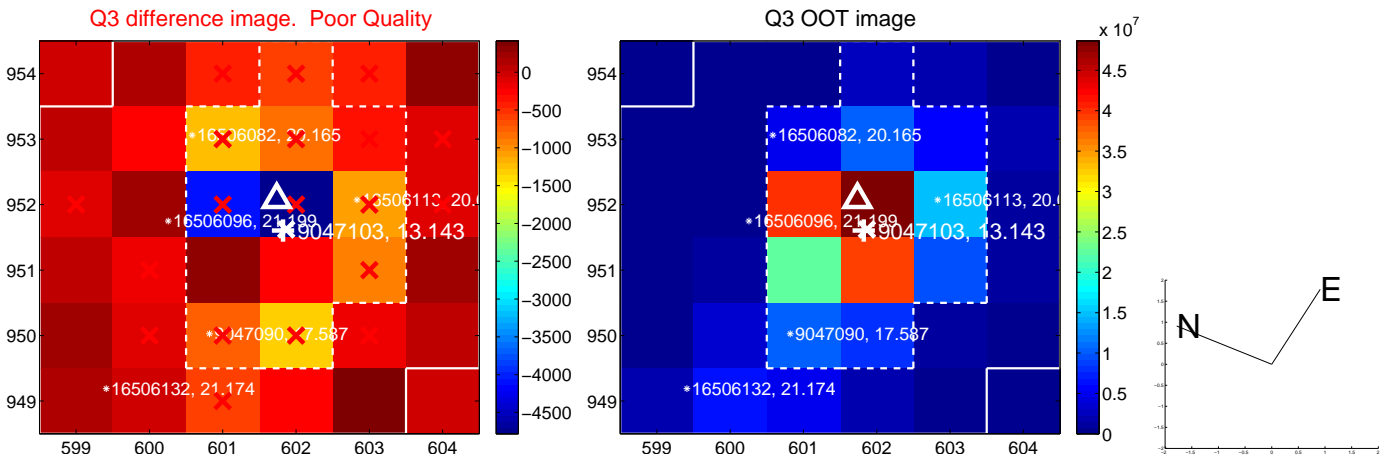
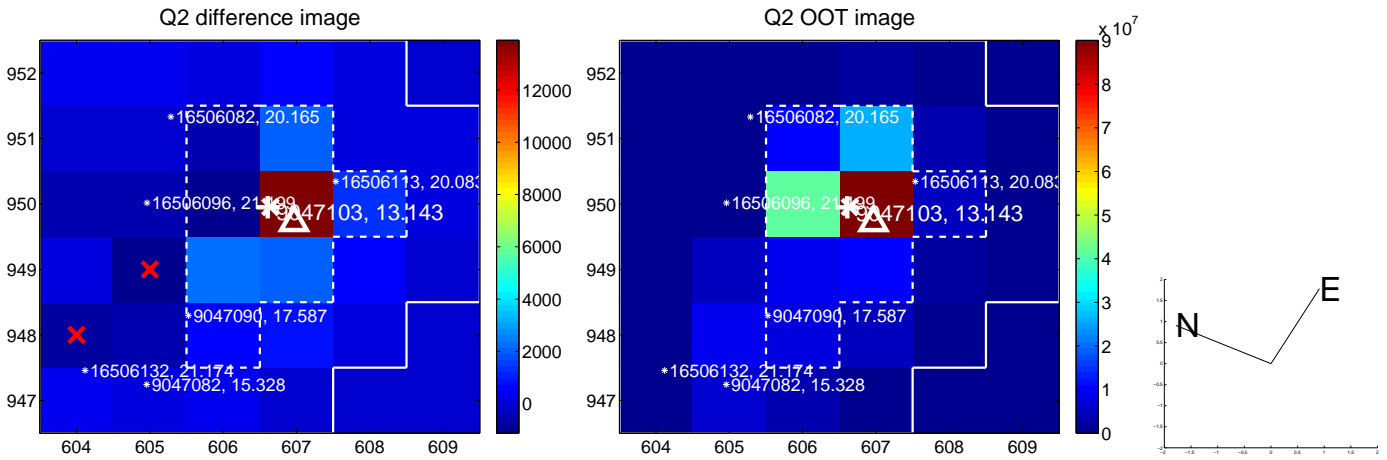
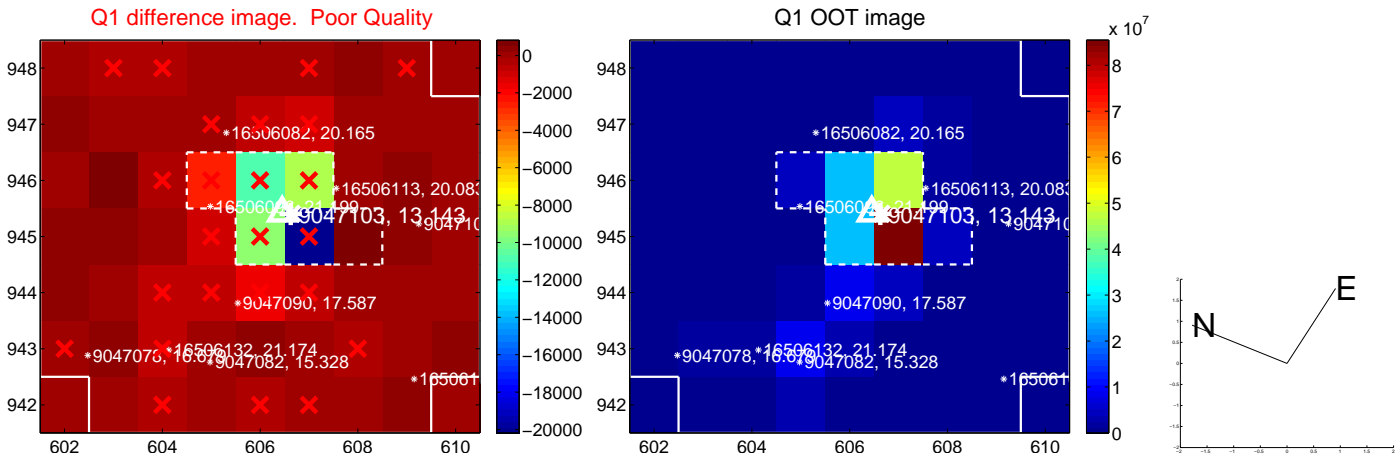
The direct PRF centroid is offset from the target star catalog position by about 0.11 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.181 \pm 0.279$	0.65	$-0.118 \pm 0.226$	$-0.137 \pm 0.241$
PRF-fit source offset from KIC position	$0.239 \pm 0.250$	0.96	$-0.230 \pm 0.225$	$-0.064 \pm 0.239$
photometric centroid source offset	$0.41 \pm 0.40$	1.01	$0.14 \pm 0.50$	$-0.38 \pm 0.39$

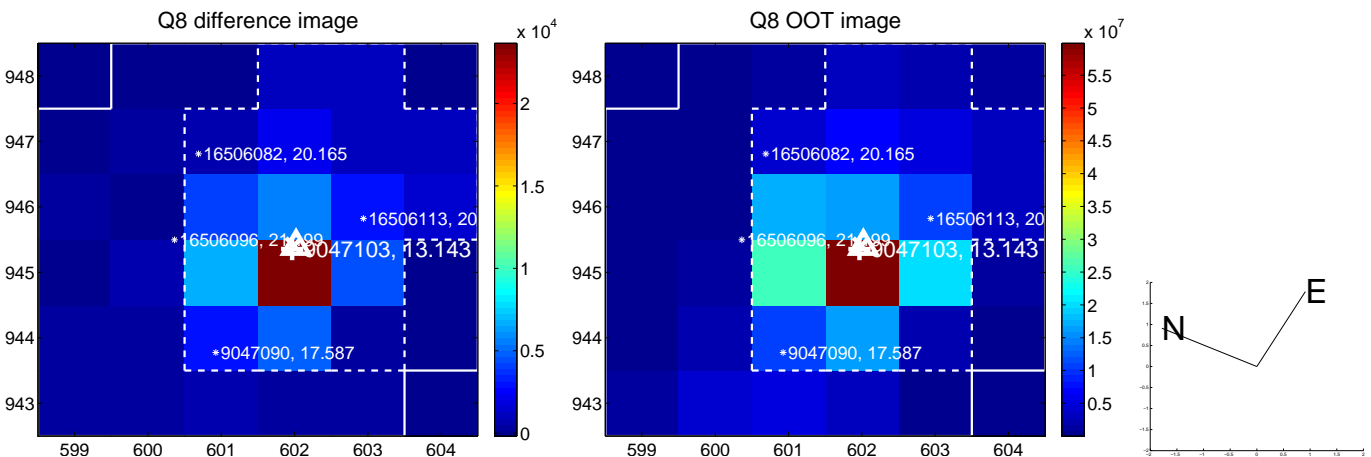
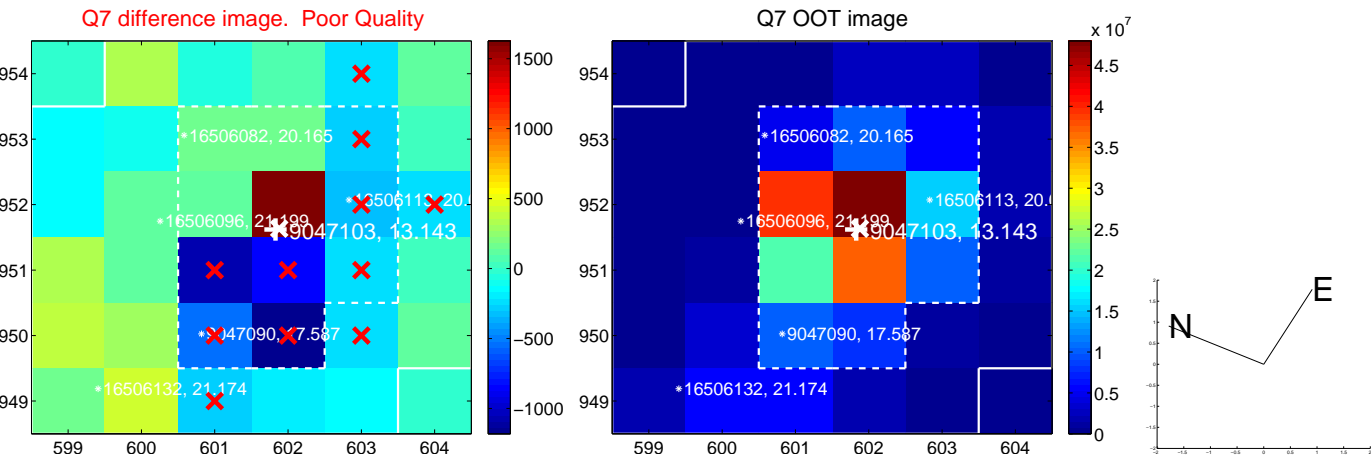
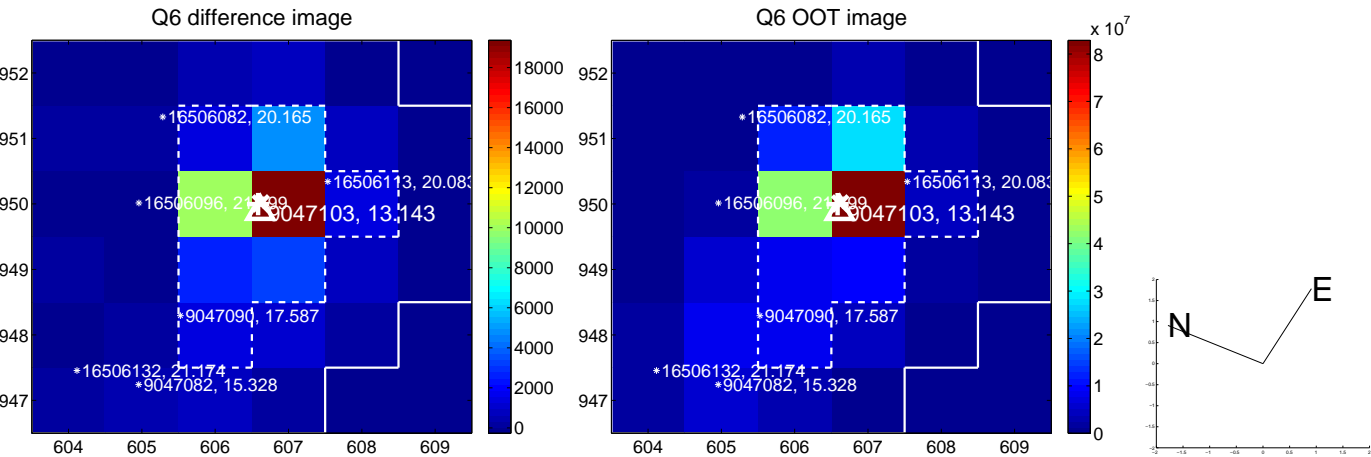
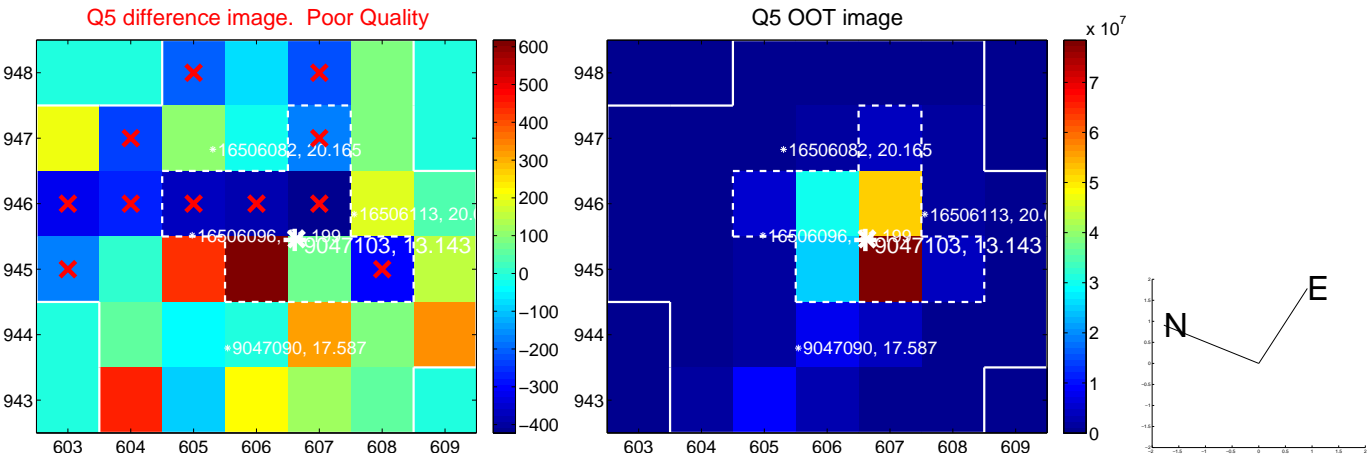


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets**; **Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

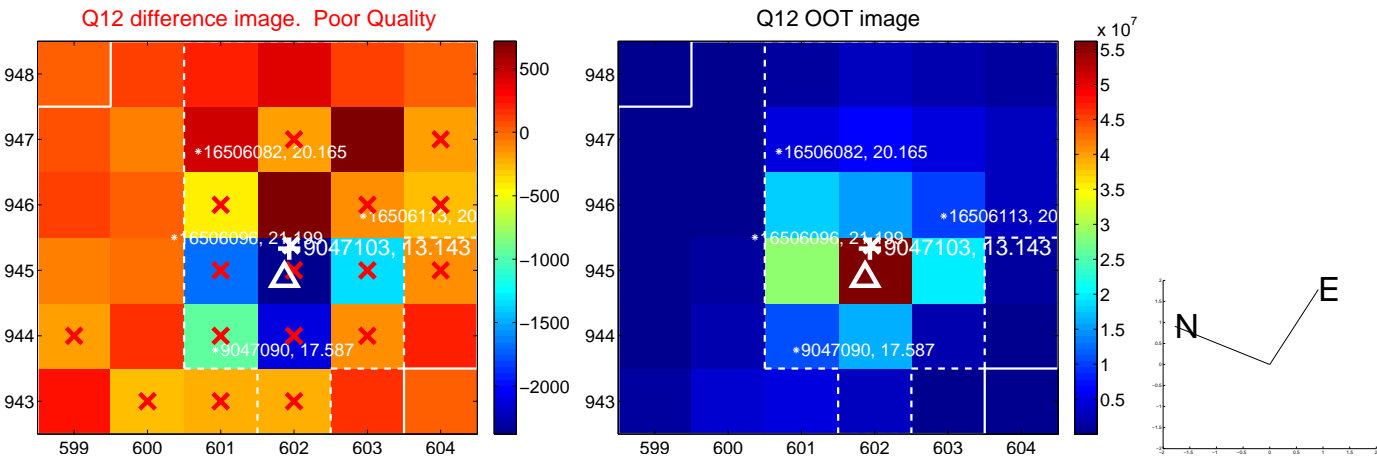
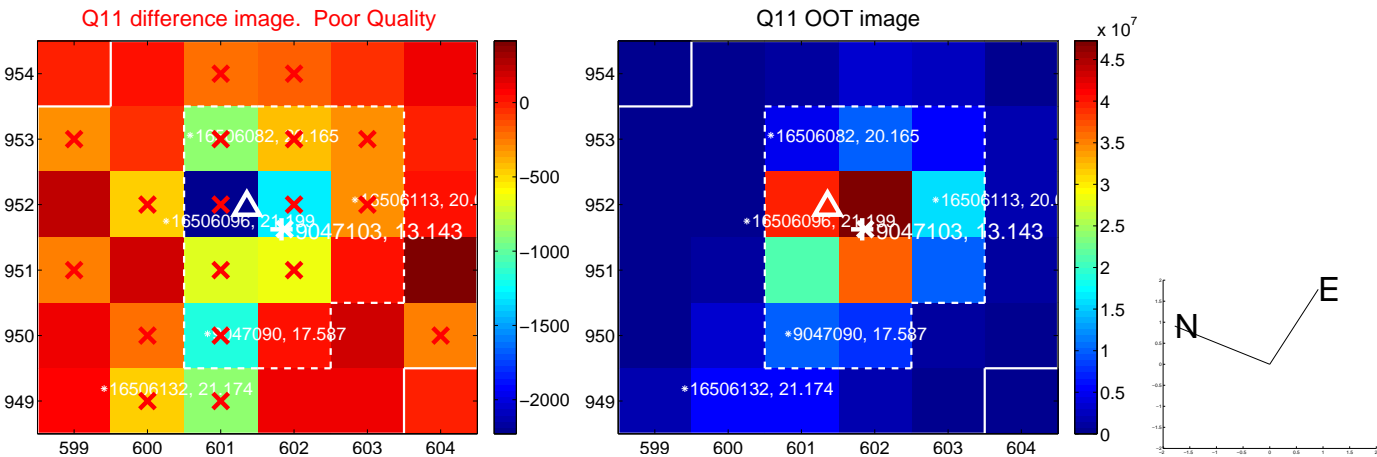
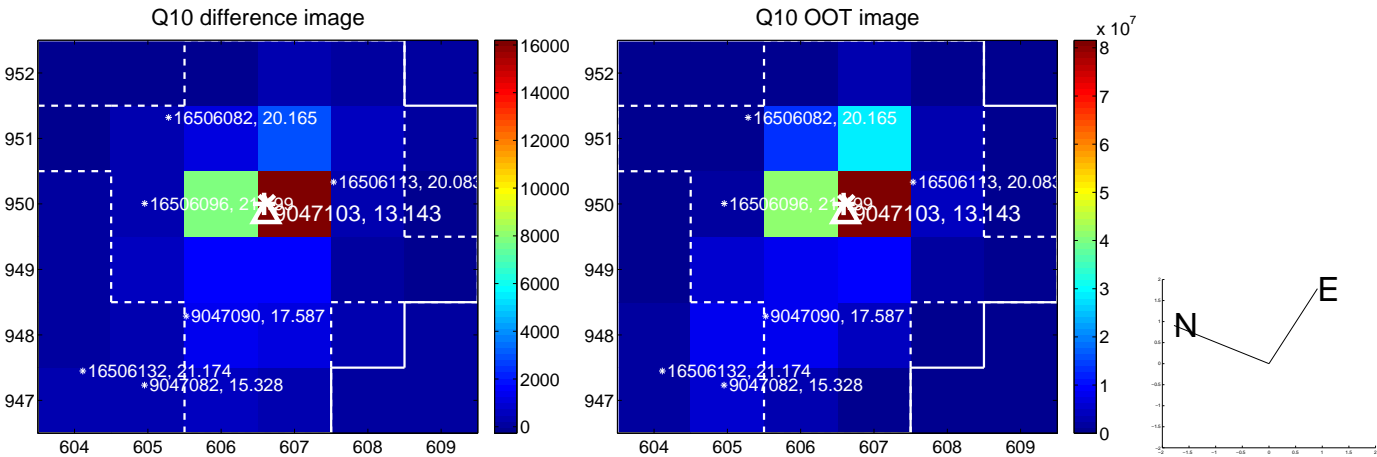
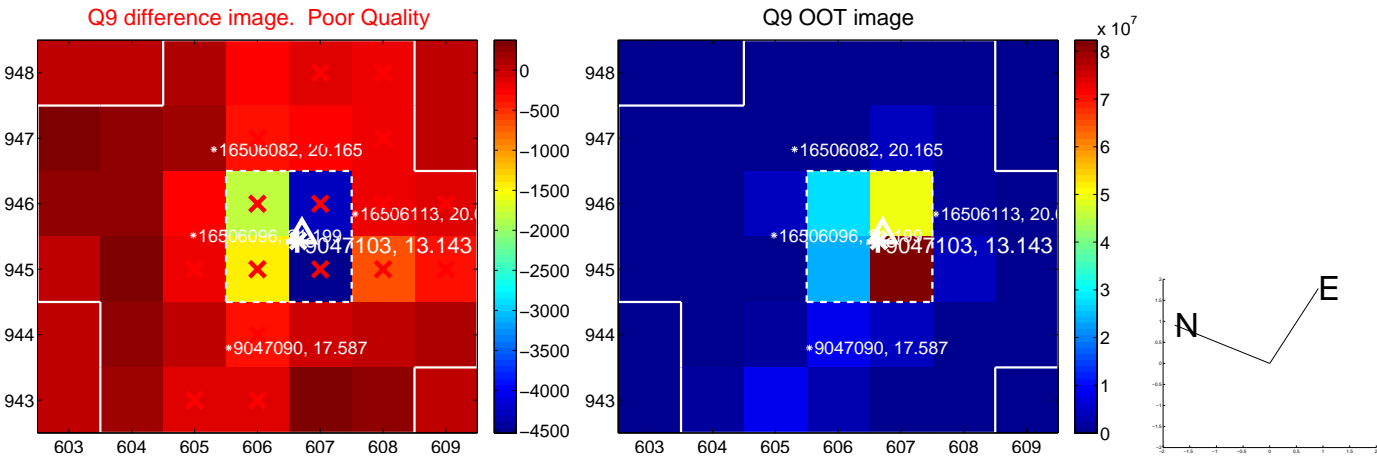


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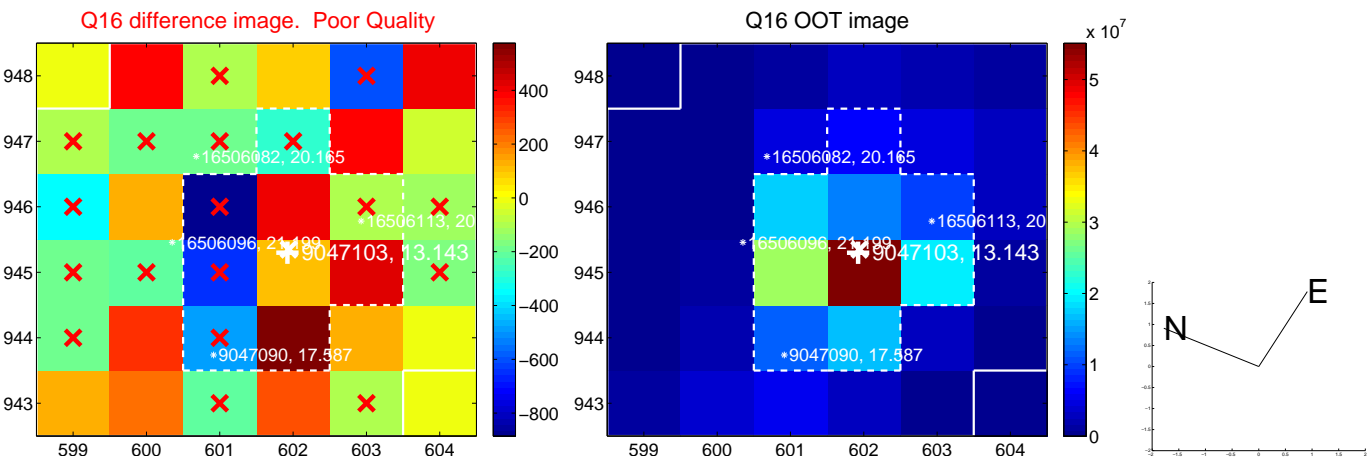
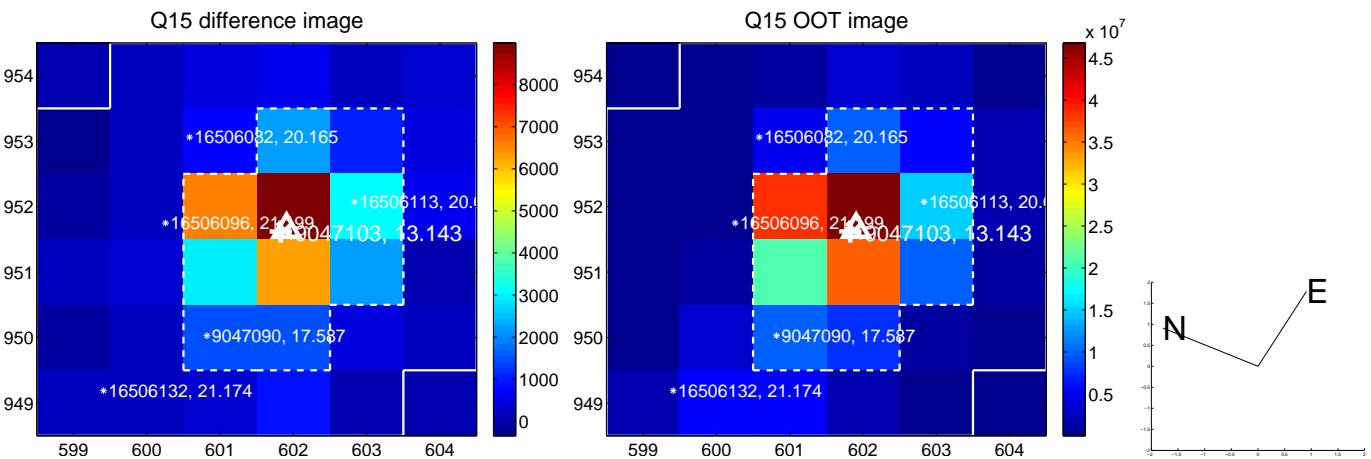
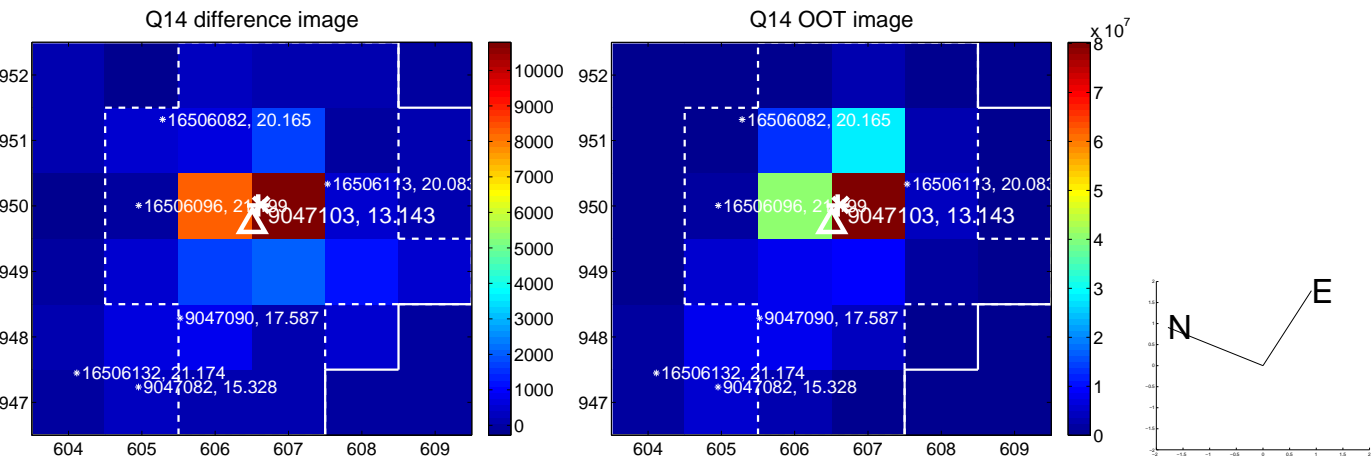
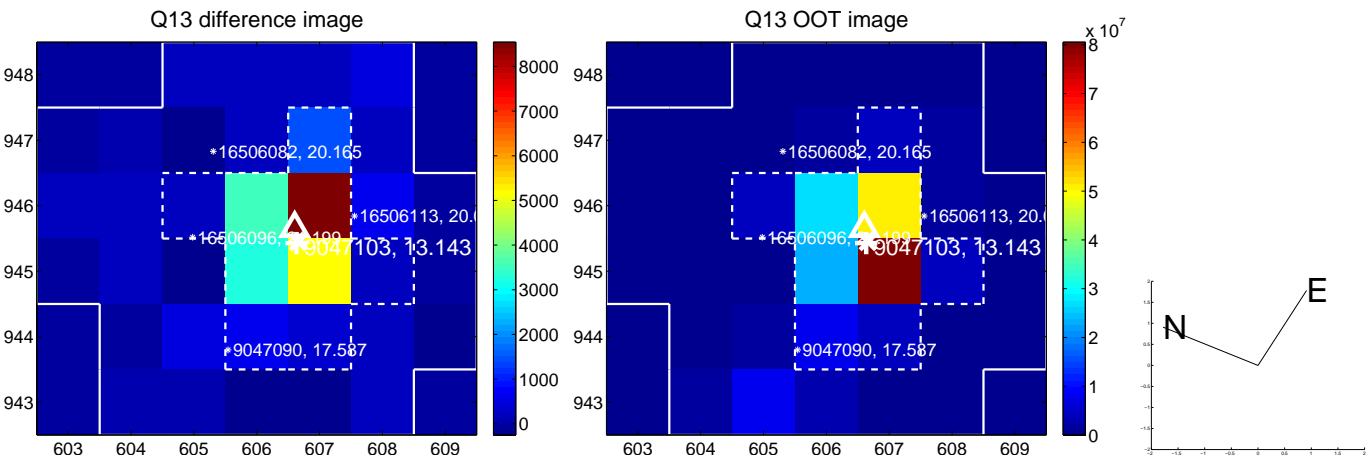




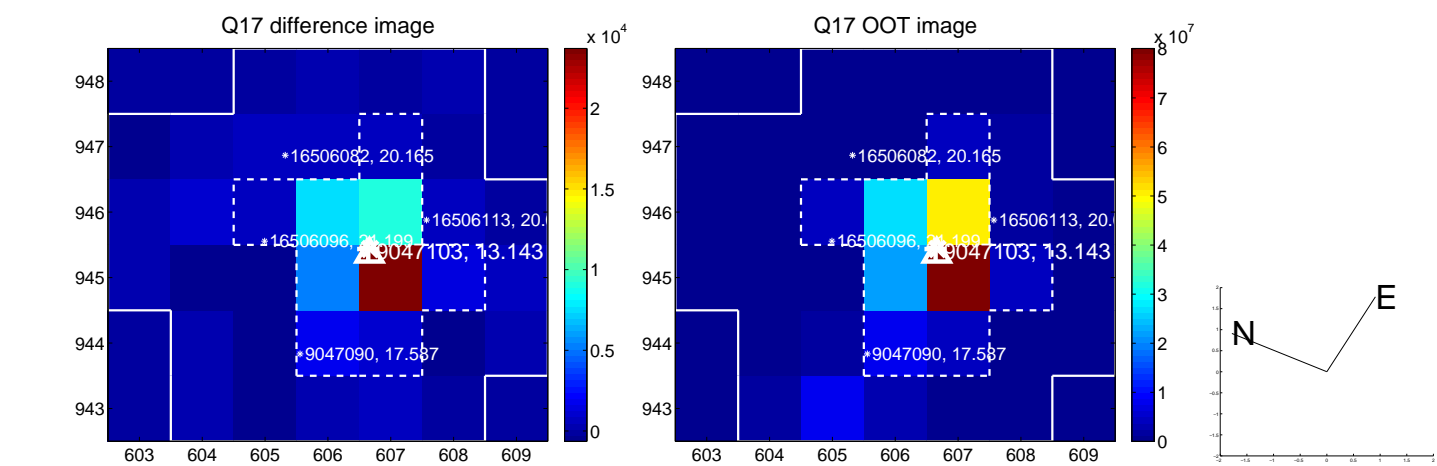
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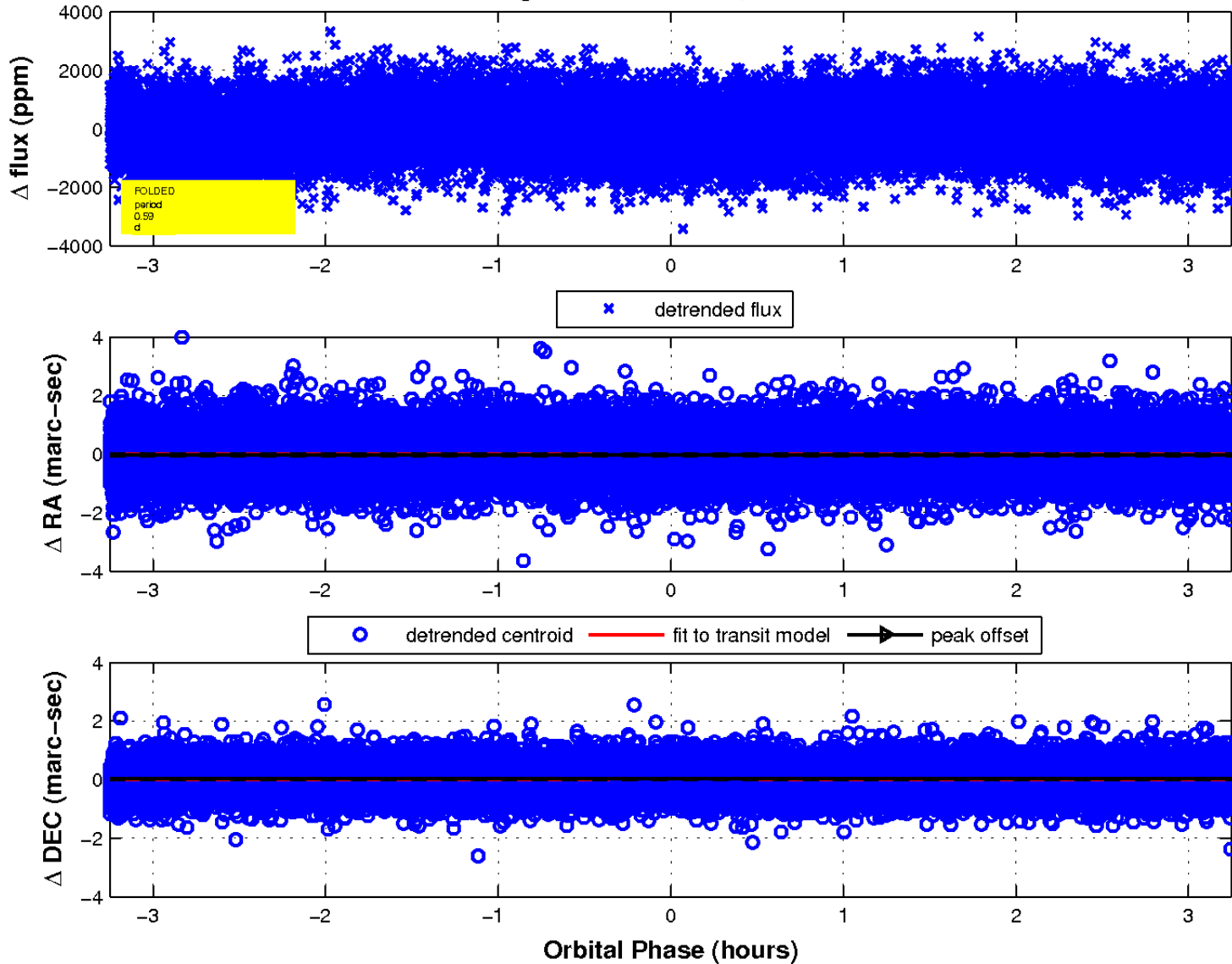
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fluxWeightedCentroids, Planet 2 of 2



UKIRT Image

Declination

