

# KIC 007458309

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
007458309-01	OBS	3957.01	0.660630	131.895666	25.5	4.784	19.0	13.0	0.85	6024	0.43	4040.43
007458309-02	OBS	No	31.683274	160.042939	1644.2	1.723	17.2	12.7	0.85	6024	3.45	23.19
007458309-03	OBS	No	15.870817	143.336192	219.8	3.686	17.6	3.9	0.85	6024	1.44	58.29
007458309-04	OBS	No	15.201166	132.825777	664.0	2.000	11.4	-1.0	0.85	6024	2.19	61.74

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
007458309-01	OBS	FP	0.00	1	0	1	1	LPP_DV—CENT_RESOLVED_OFFSET—HALO_GHOST—EPHEM_MATCH
007458309-02	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—CENT_RESOLVED_OFFSET
007458309-03	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_RESOLVED_OFFSET
007458309-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—CENT_NOFITS

**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 007458309-01

TCE (1)	KIC	Parent (2)	Parent KIC	$P_1:P_2$	Dist ( $''$ )	$\Delta$ Row	$\Delta$ Col	$m_2$	$m_1$	$D_2/D_1$	Mechanism	Flag	$\sigma_P$	$\sigma_T$
007458309-01	7458309	007458285-pri	7458285	1:1	18.4	3	-3	13.52	13.87	13884.00	Direct-PRF	0	0.45	2.71

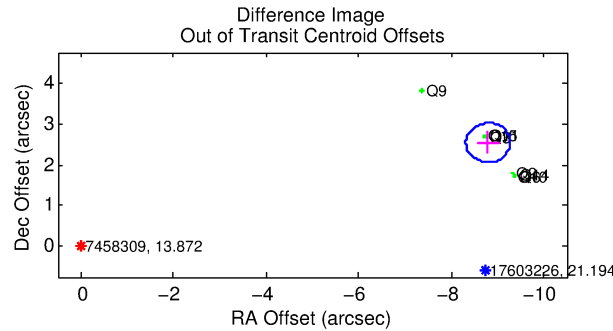
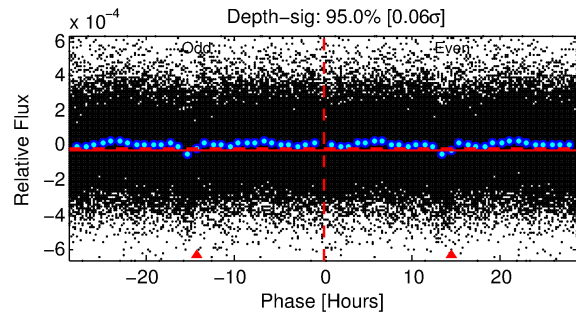
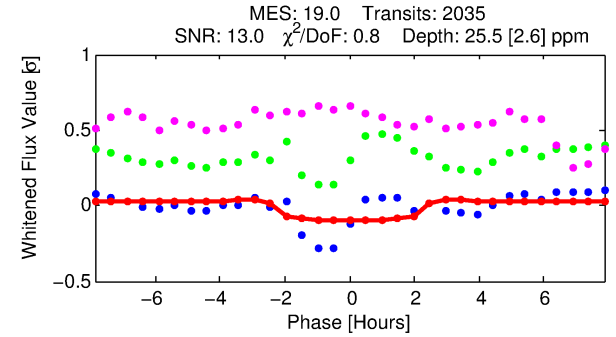
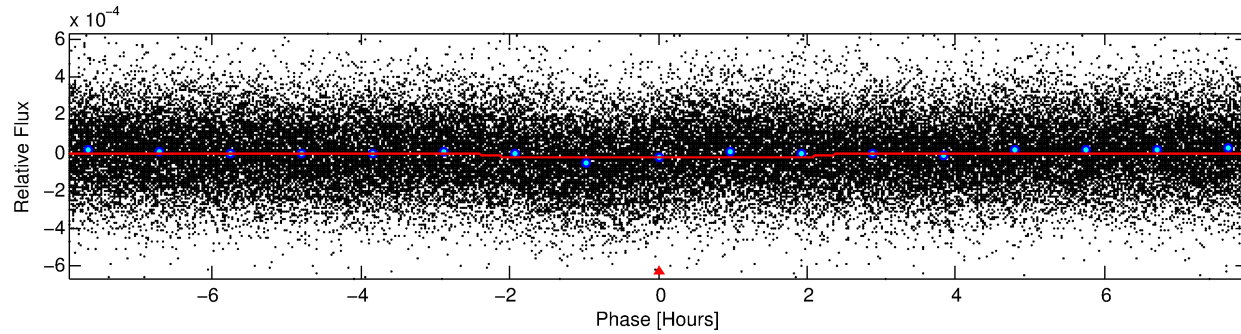
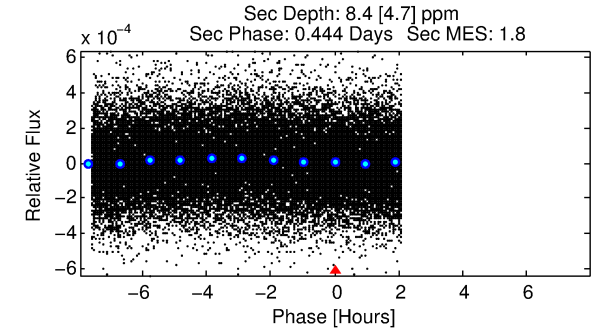
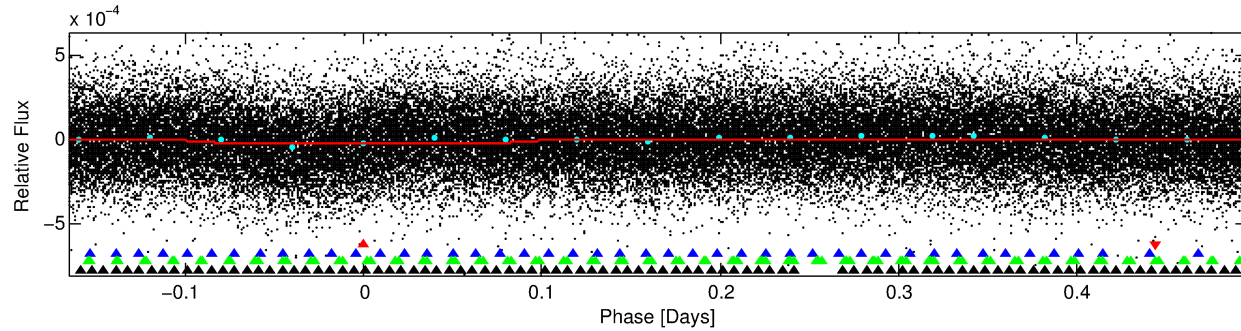
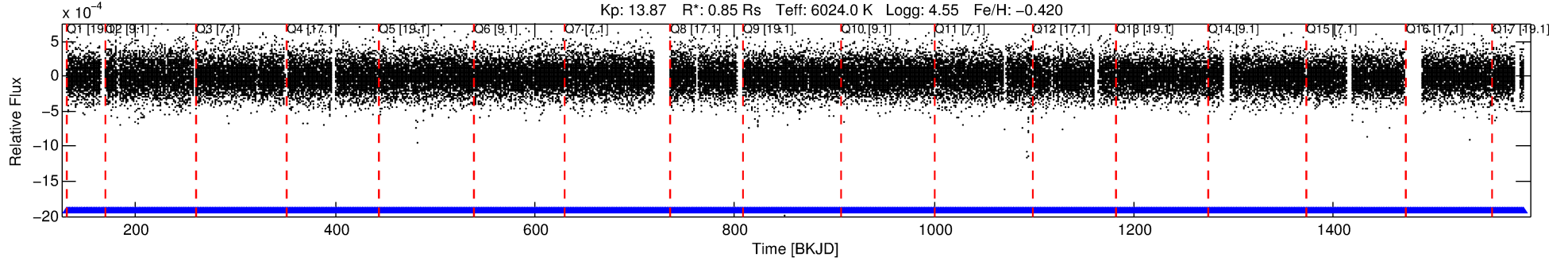
**Notes:**  $P_1:P_2$  is the period ratio. Dist is the distance in arcseconds.  $\Delta$ Row and  $\Delta$ Col are the number of pixels apart in row and column.  $m_2$  and  $m_1$  are the magnitudes of the parent and child.  $D_2/D_1$  is the parent's transit depth divided by the child's.  $\sigma_P$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

# DV One-Page Summary

KIC: 7458309 Candidate: 1 of 4 Period: 0.661 d

KOI: K03957.01 Corr: 0.839

Kp: 13.87 R\*: 0.85 Rs Teff: 6024.0 K Logg: 4.55 Fe/H: -0.420



## DV Fit Results:

Period = 0.66063 [0.00001] d  
Epoch = 131.8957 [0.0031] BKJD  
Rp/R\* = 0.0047 [0.0031]  
a/R\* = 1.21 [1.26]  
b = 0.36 [7.99]  
Seff = 4040.43 [1509.51]  
Teq = 2033 [190] K  
Rp = 0.43 [0.31] Re  
a = 0.0145 [0.0035] AU  
Ag = 5.12 [7.56] [0.55σ]  
Teffp = 4729 [1698] K [1.58σ]

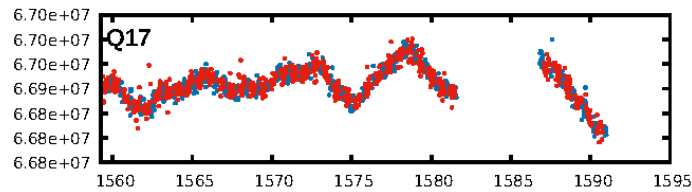
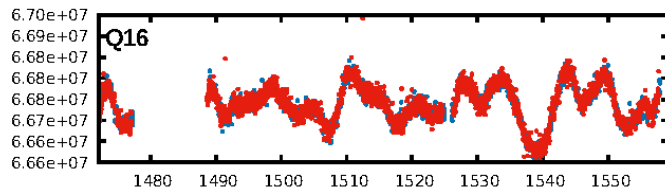
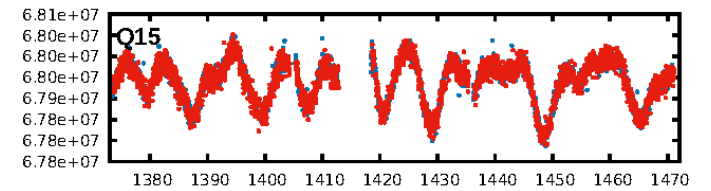
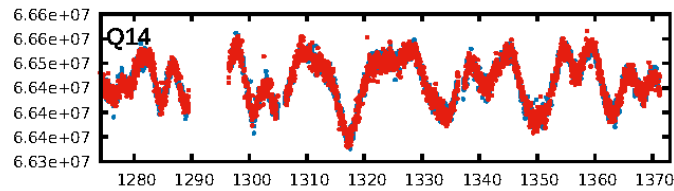
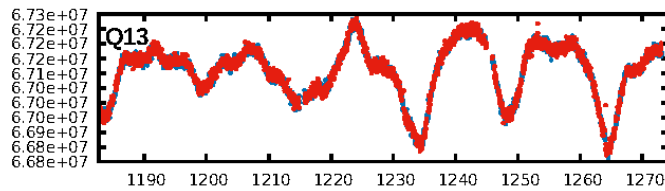
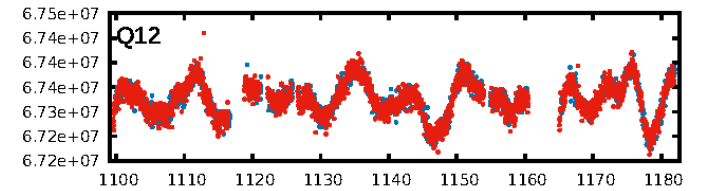
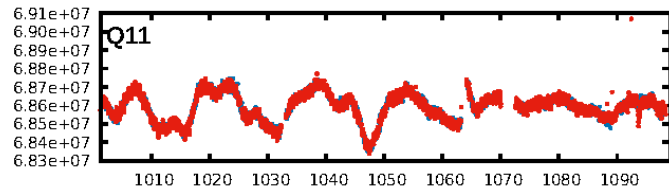
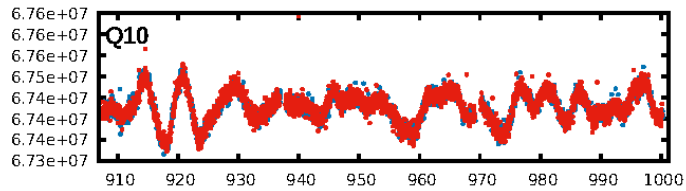
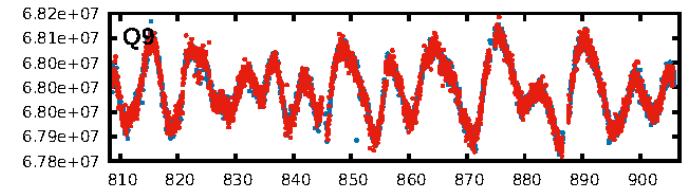
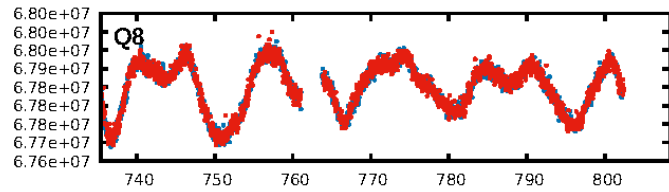
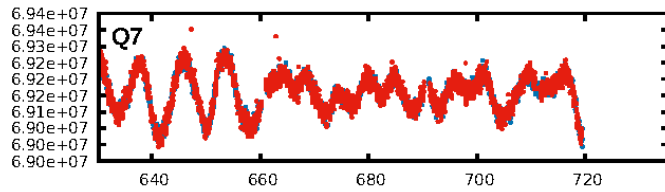
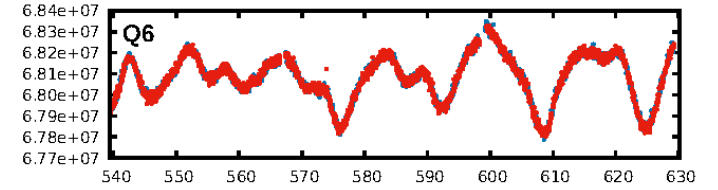
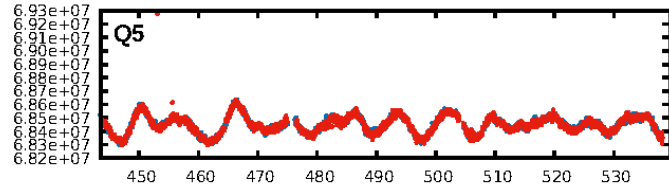
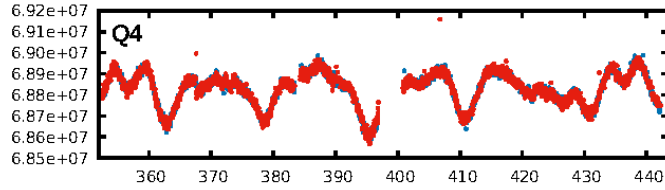
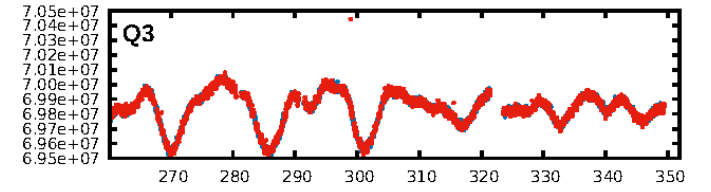
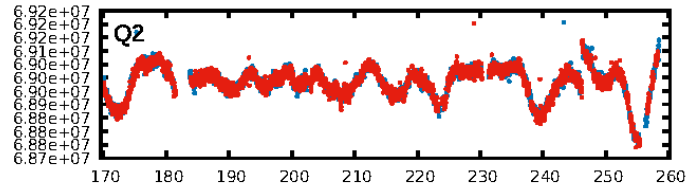
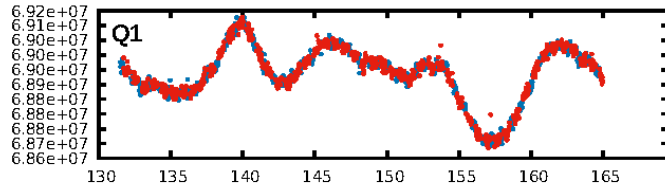
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [67.30σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [1944/1944]  
GhostDiagnostic-chr: -0.07913  
Centroid-sig: N/A  
Centroid-so: 11.618 arcsec [14.20σ]  
OotOffset-rm: 9.151 arcsec [57.19σ]  
KicOffset-rm: 9.253 arcsec [51.62σ]  
OotOffset-st: 4/4/0/1 [9]  
KicOffset-st: 4/4/0/1 [9]  
DiffImageQuality-fgm: 1.00 [9/9]  
DiffImageOverlap-fno: 1.00 [17/17]

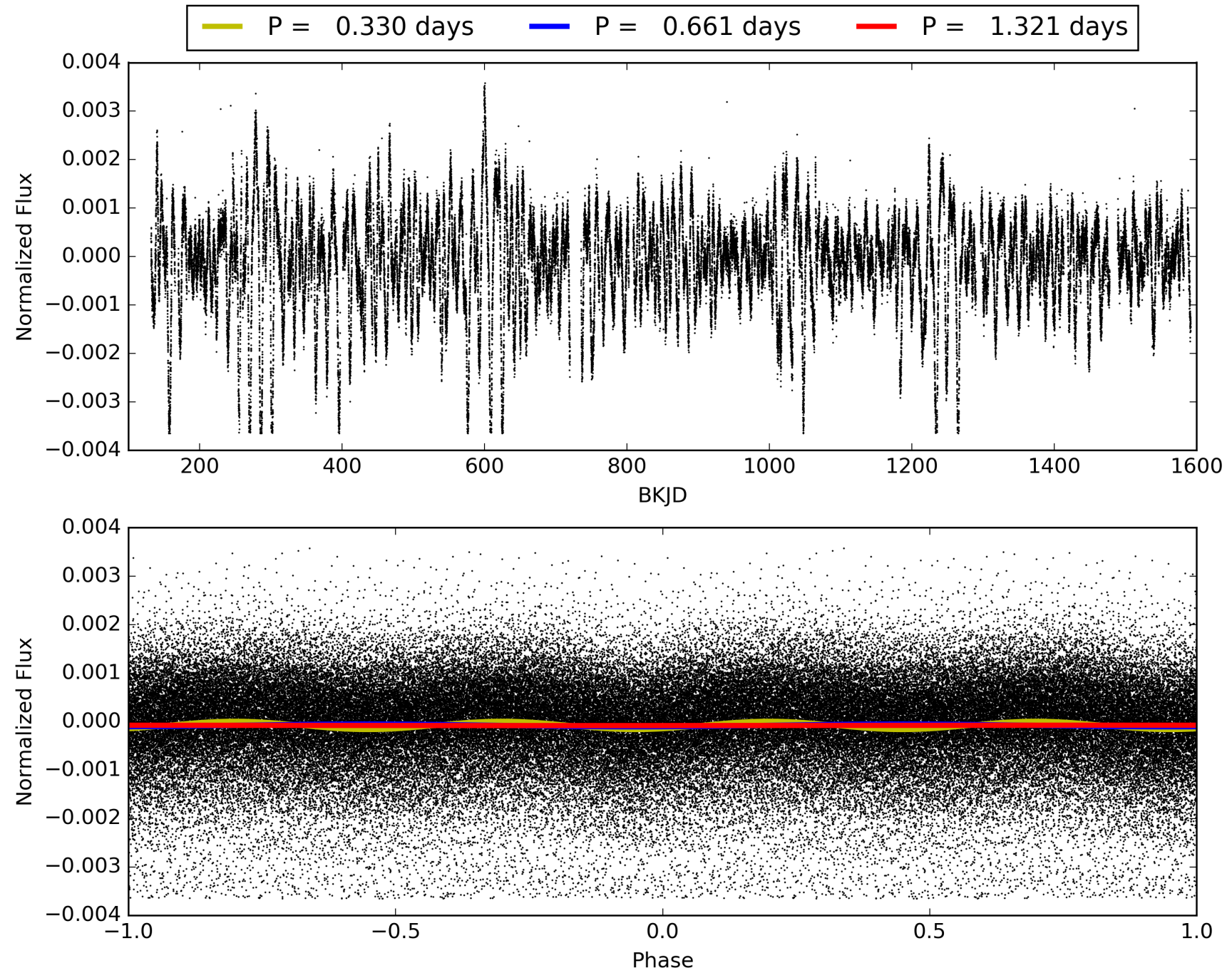
Software Revision: svn-ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 03-Feb-2016 09:08:29 Z

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

# TCE 007458309-01, PDC Light Curves



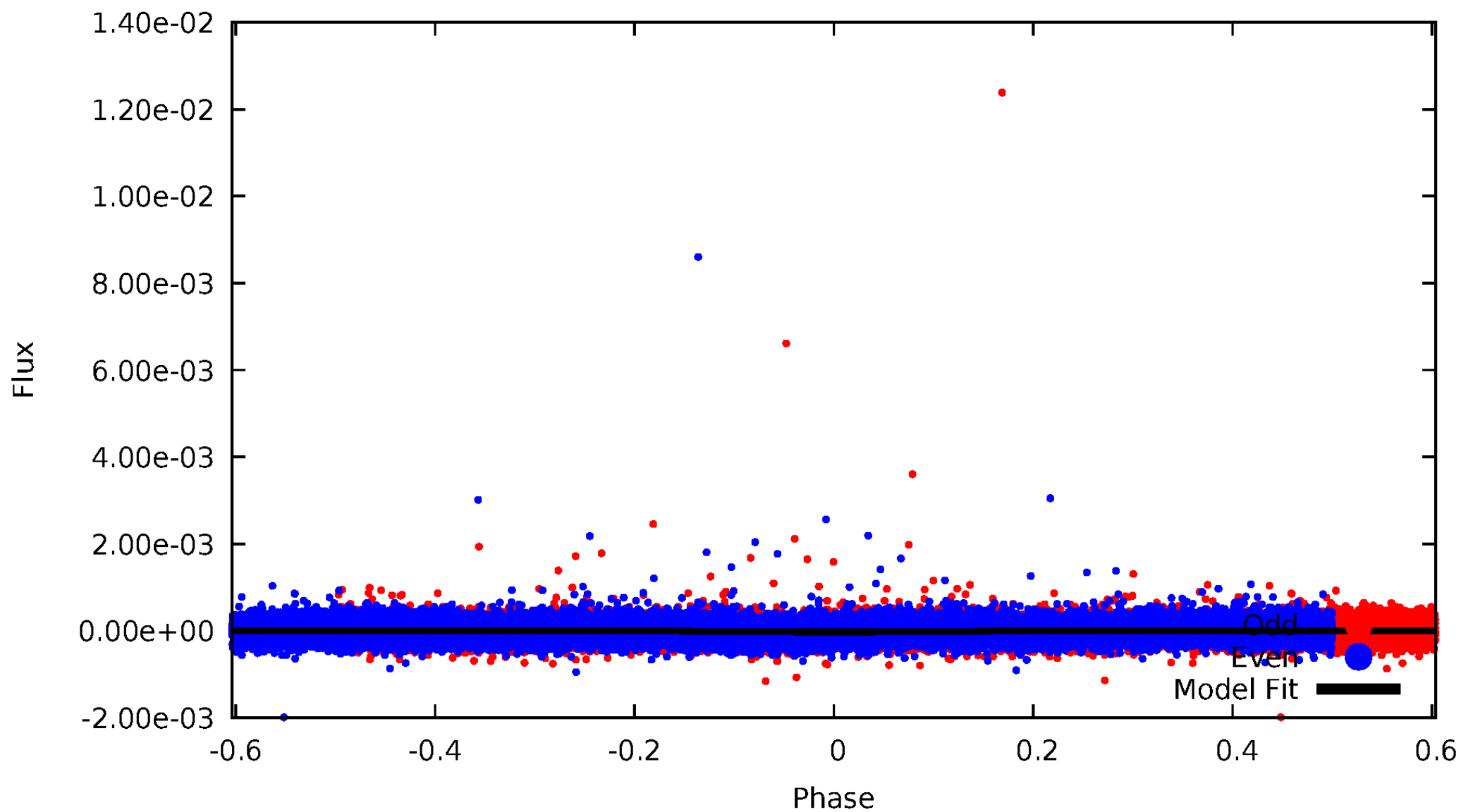
TCE 007458309-01





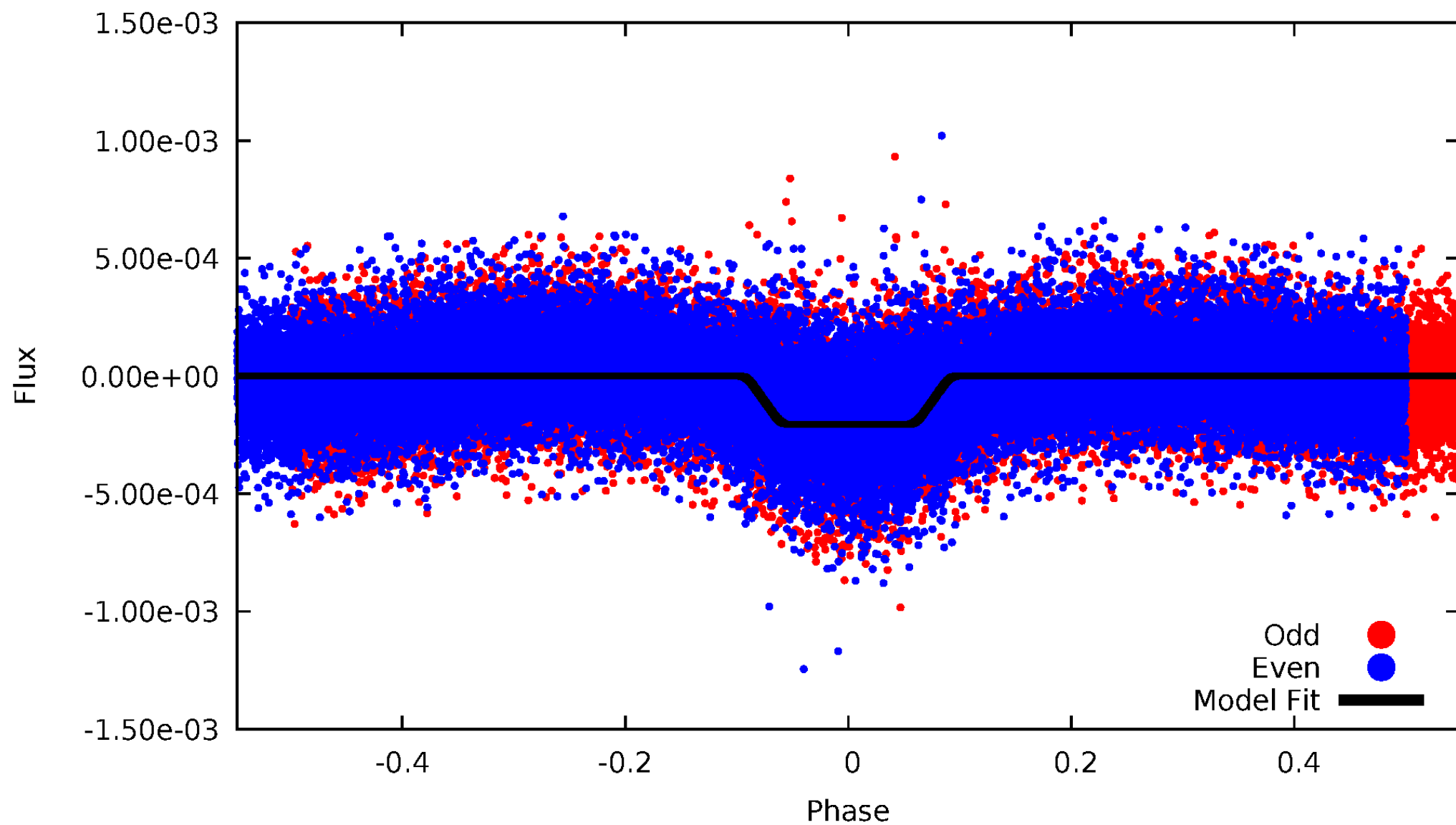
# DV Odd/Even

TCE 007458309-01

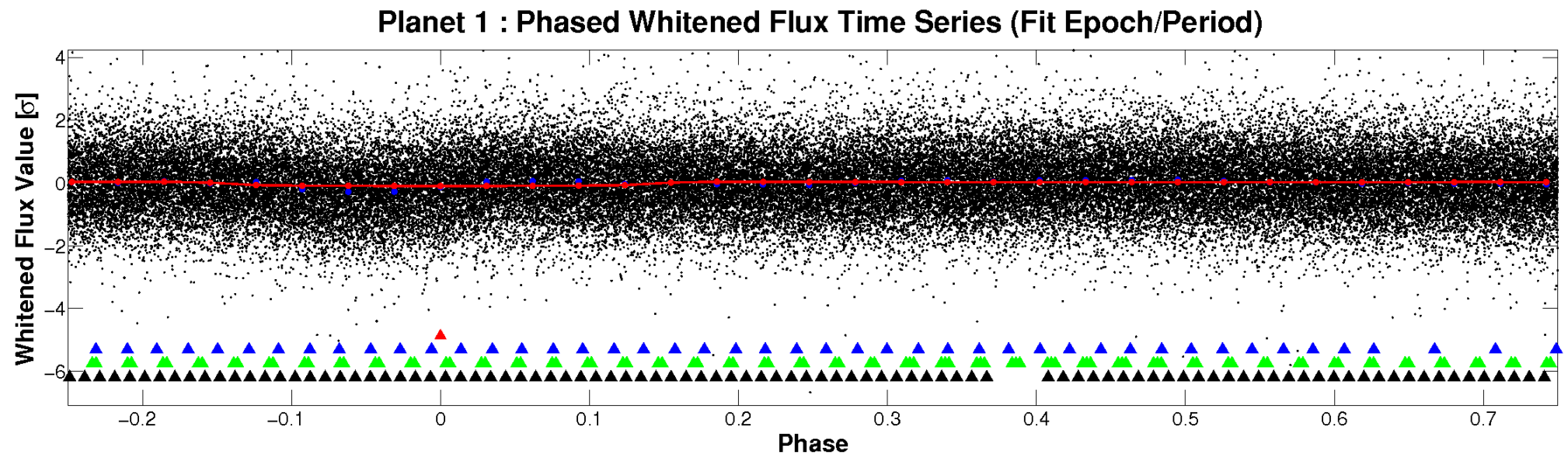
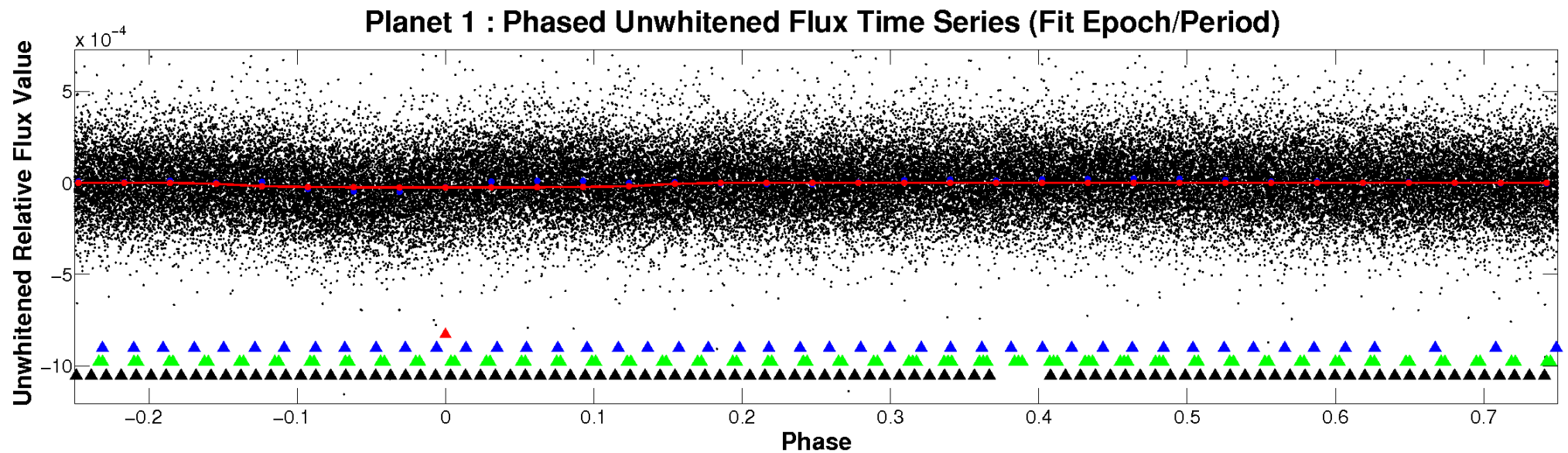


# ALT Odd/Even

TCE 007458309-01

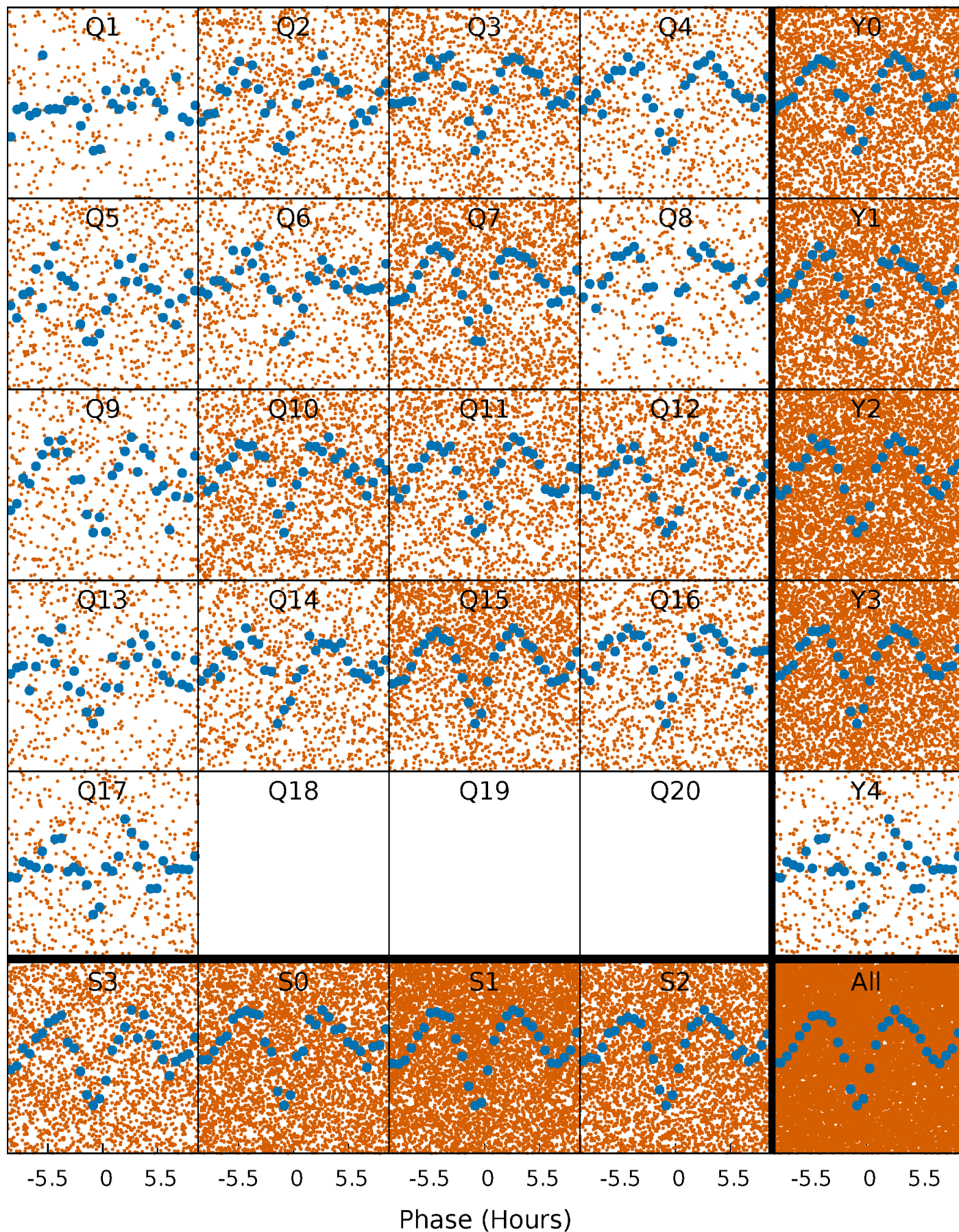


# Non-Whitened Vs. Whitened Light Curve



# PDC Quarter-Phased Transit Curves

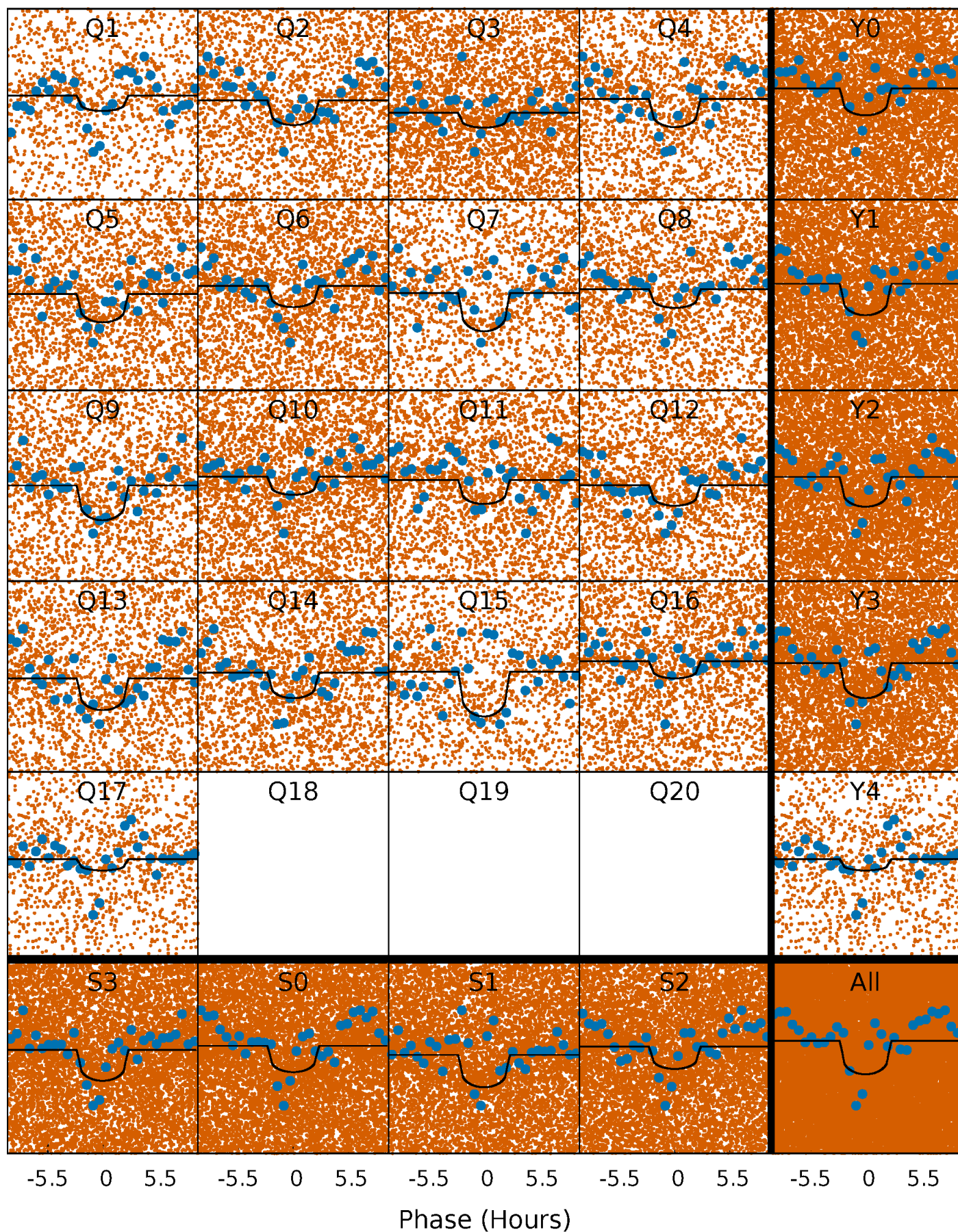
TCE 007458309-01 P= 0.660630 Days  $T_0=131.895666$  (BKJD)





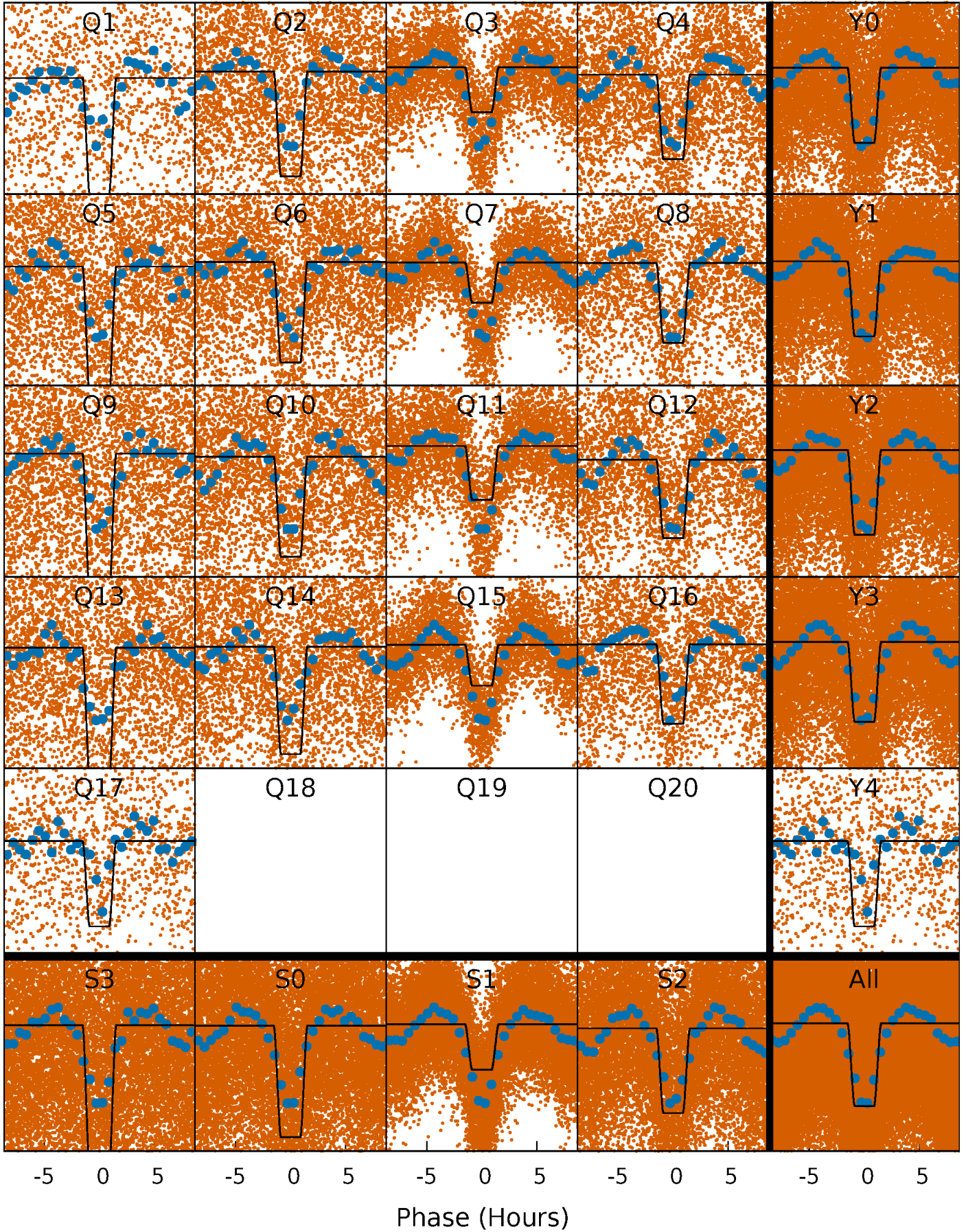
# DV Quarter-Phased Transit Curves

TCE 007458309-01 P= 0.660630 Days  $T_0=131.895666$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 007458309-01   P= 0.660627 Days    $T_0=131.864243$  (BKJD)

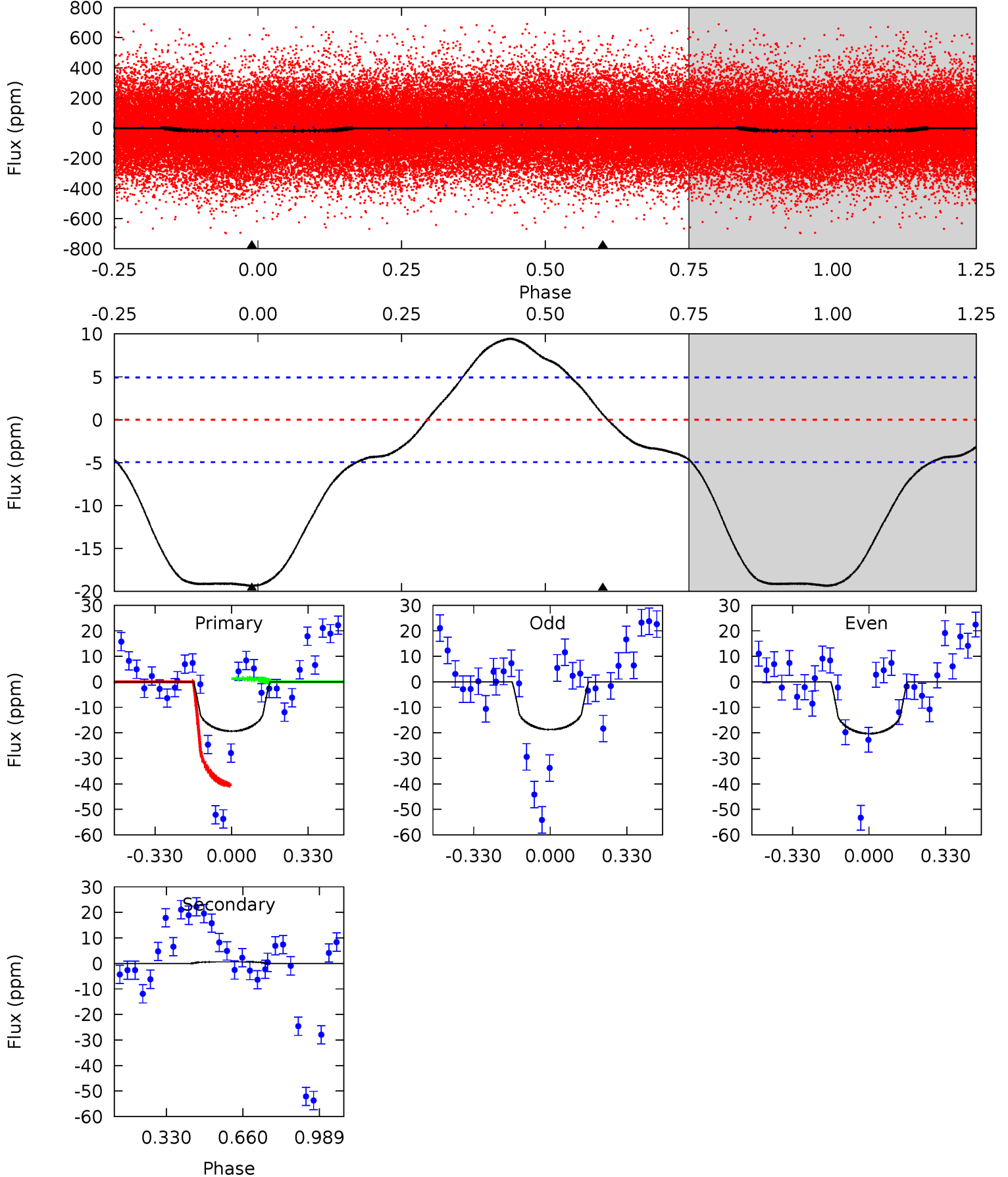




# DV Model-Shift Uniqueness Test

007458309-01,  $P = 0.660630$  Days,  $E = 131.235036$  Days

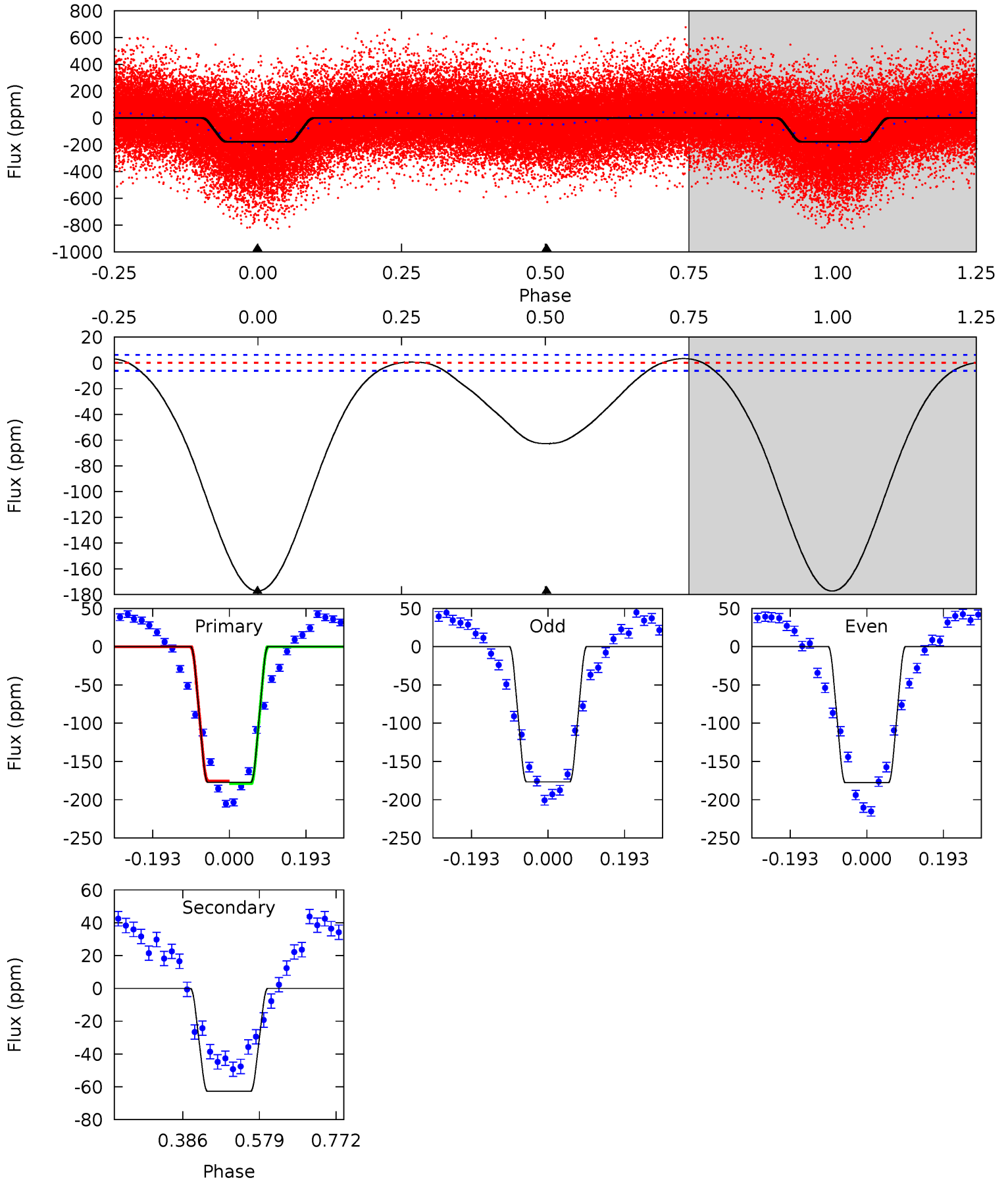
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
16.9	-0.55	0	0	4.31	0.97	1.98	16.9	16.9	-0.55	-0.55	0.69	0.80	0.33	16.9



# Alt Model-Shift Uniqueness Test

007458309-01, P = 0.660627 Days, E = 131.203616 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
126.4	44.8	0	0	4.42	1.30	2.62	126.4	126.4	44.8	44.8	0.39	1.07	0.02	1.20





### Stellar Parameters For KIC 007458309

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6024^{+161}_{-179}$	$4.550^{+0.046}_{-0.196}$	$-0.420^{+0.300}_{-0.300}$	$0.849^{+0.238}_{-0.074}$	$0.934^{+0.098}_{-0.109}$	$2.150^{+0.398}_{-1.059}$
	+3%/-3%	+1%/-4%	+71%/-71%	+28%/-9%	+10%/-12%	+19%/-49%
Source	PHO1	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 007458309-01 / KOI 3957.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$1\pm1$	$0.47^{+0.31}_{-0.24}$	$2908^{+182}_{-141}$	$-3338^{+853}_{-798}$	$-0.254^{+0.487}_{-1.345}$
Alt.	$-63\pm1$	$1.38^{+0.35}_{-0.31}$	$2898^{+170}_{-133}$	$4527^{+551}_{-355}$	$3.720^{+2.542}_{-1.308}$

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

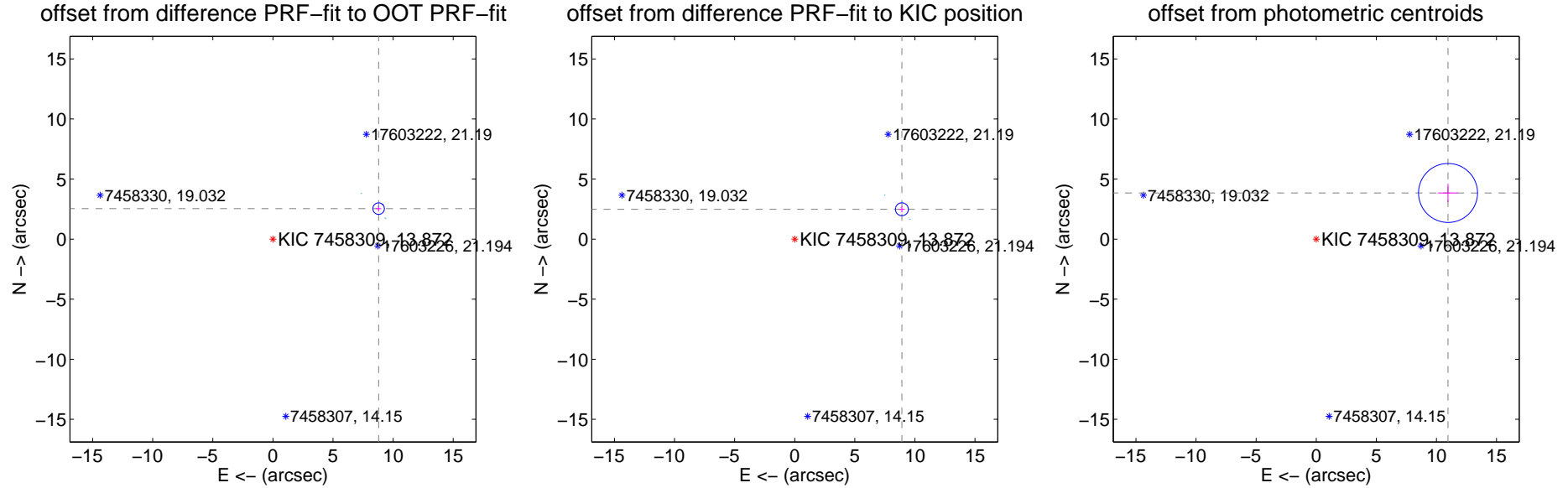
## DV Centroid Data

Supplemental centroid analysis for 007458309-01. Kepler magnitude: 13.87. Transit SNR 13.03

There are 9 quarters with good PRF difference image offsets

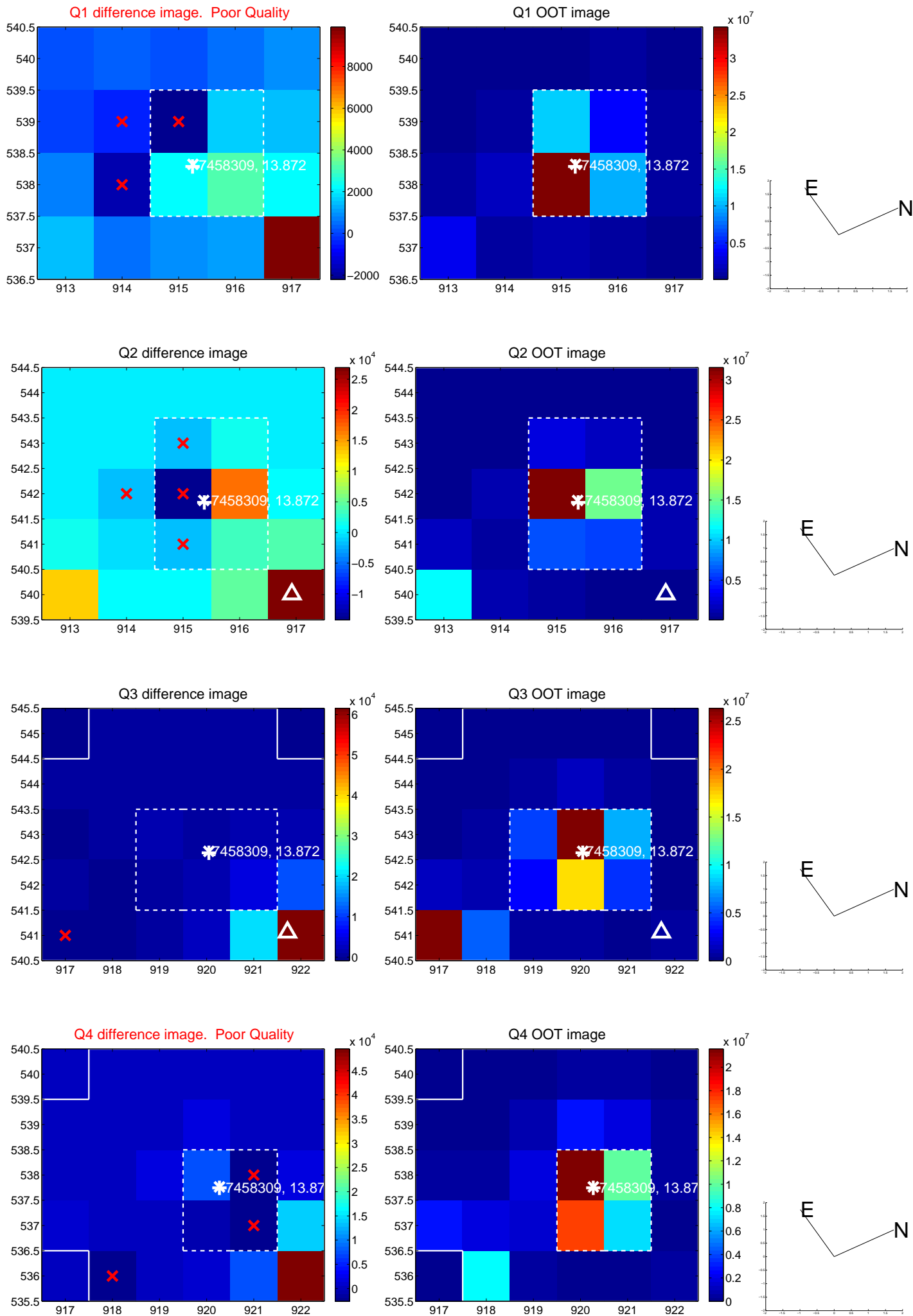
The direct PRF centroid is offset from the target star catalog position by about 0.13 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	<b>9.151 <math>\pm</math> 0.160</b>	<b>57.19</b>	-8.792 $\pm$ 0.228	2.539 $\pm$ 0.247
PRF-fit source offset from KIC position	<b>9.253 <math>\pm</math> 0.179</b>	<b>51.62</b>	-8.913 $\pm$ 0.250	2.484 $\pm$ 0.258
photometric centroid source offset	<b>11.62 <math>\pm</math> 0.82</b>	<b>14.20</b>	-10.96 $\pm$ 0.82	3.84 $\pm$ 0.76

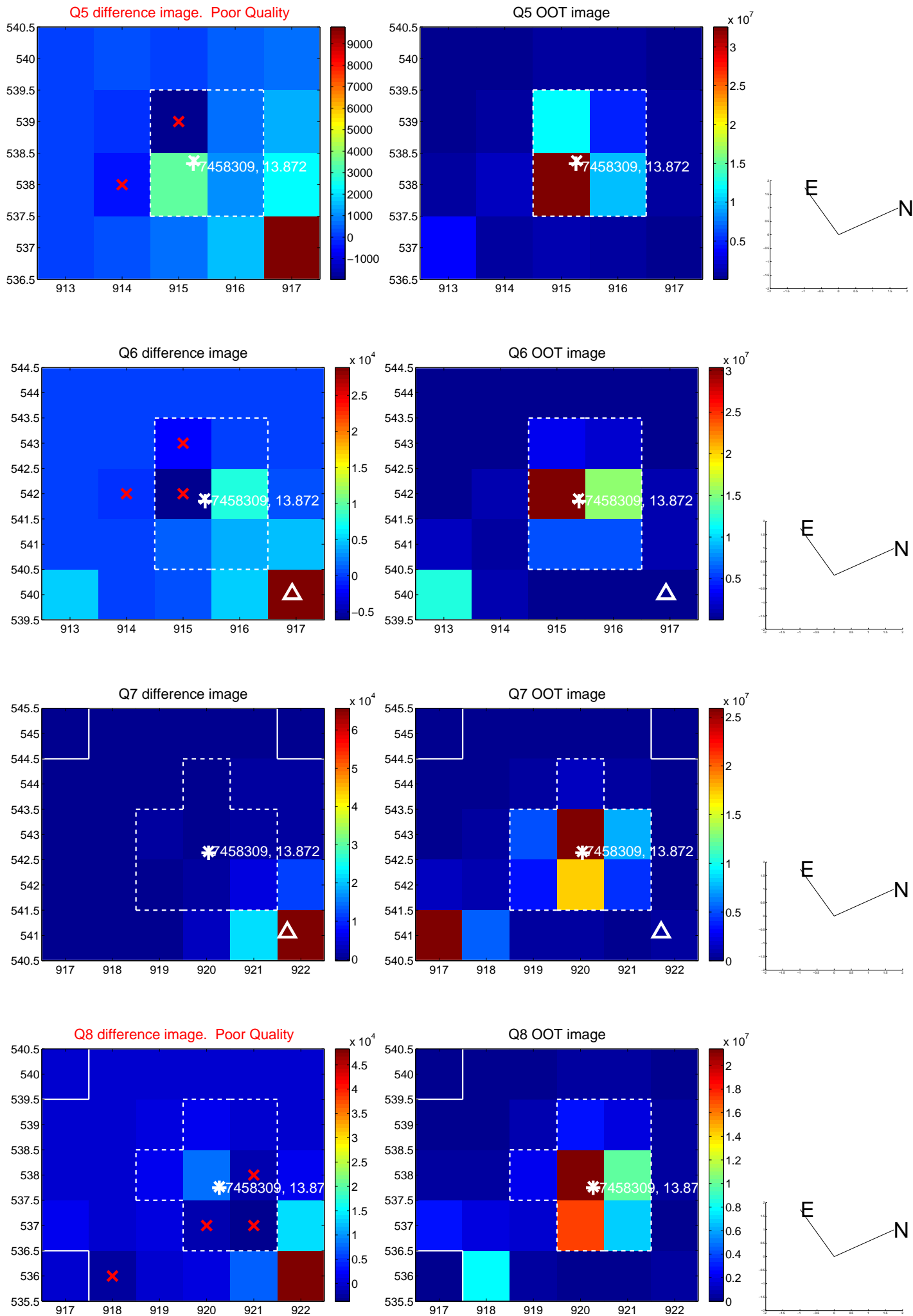


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

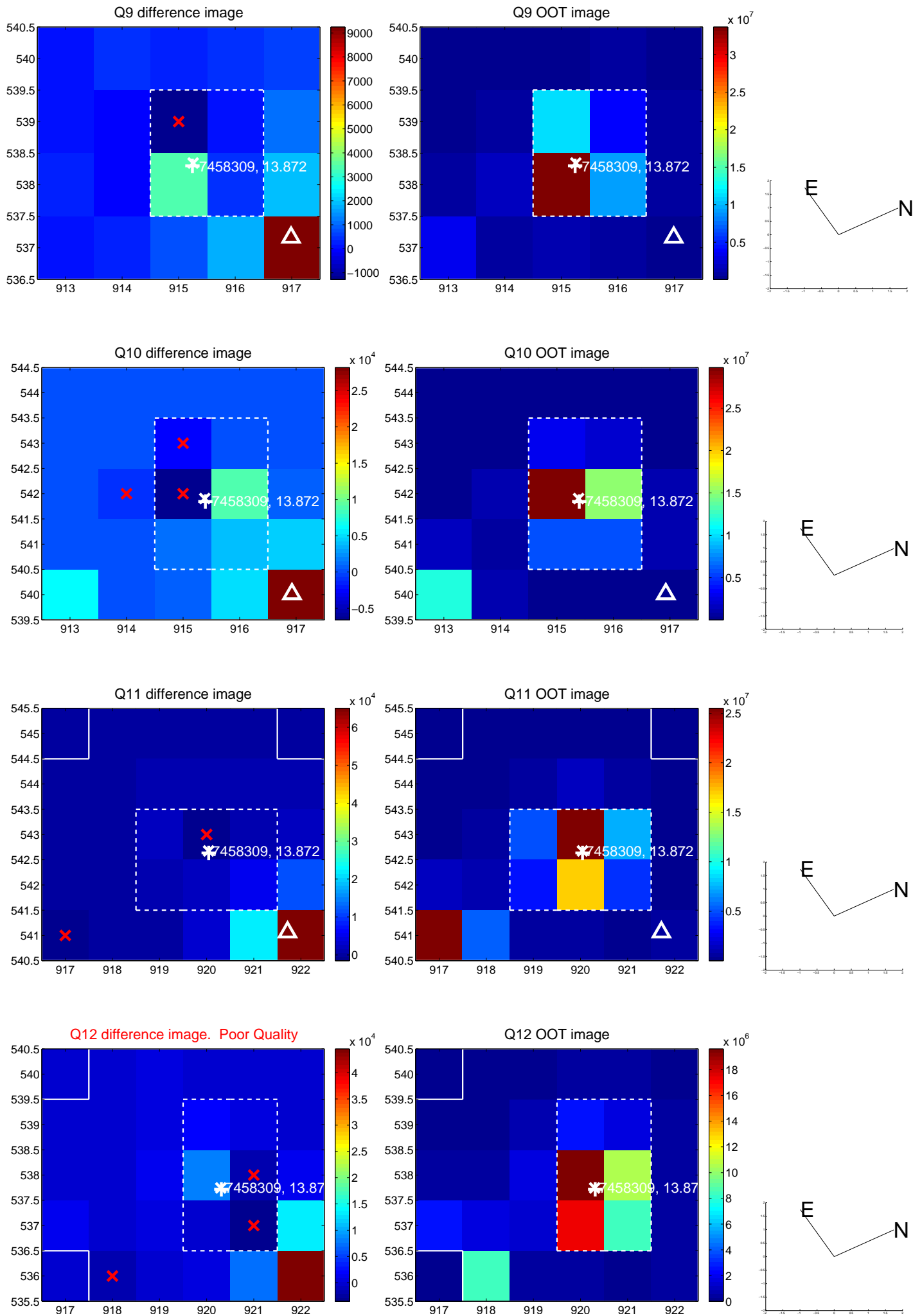


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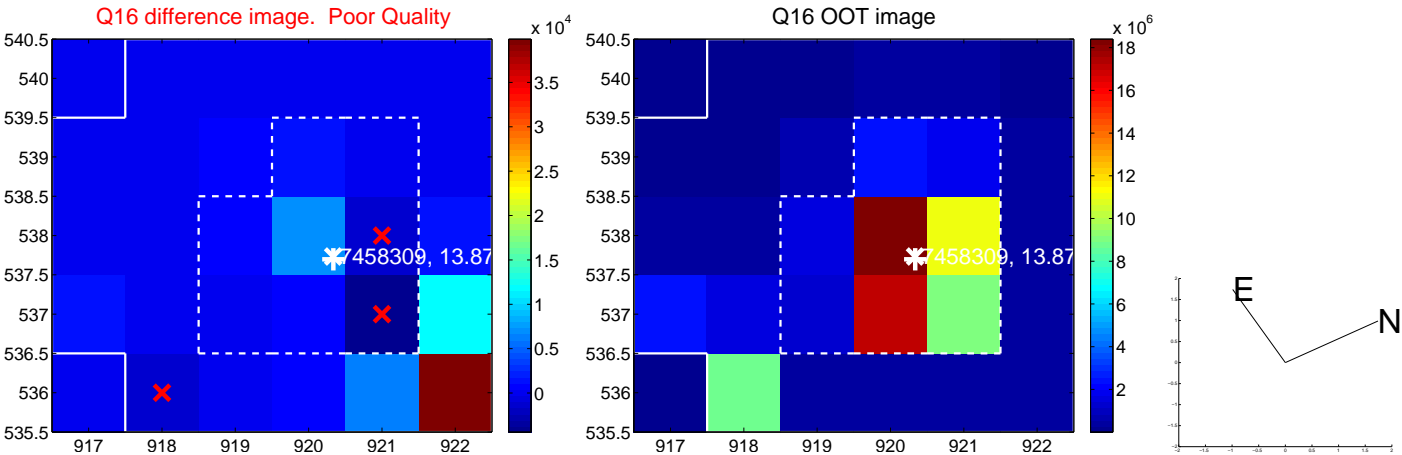
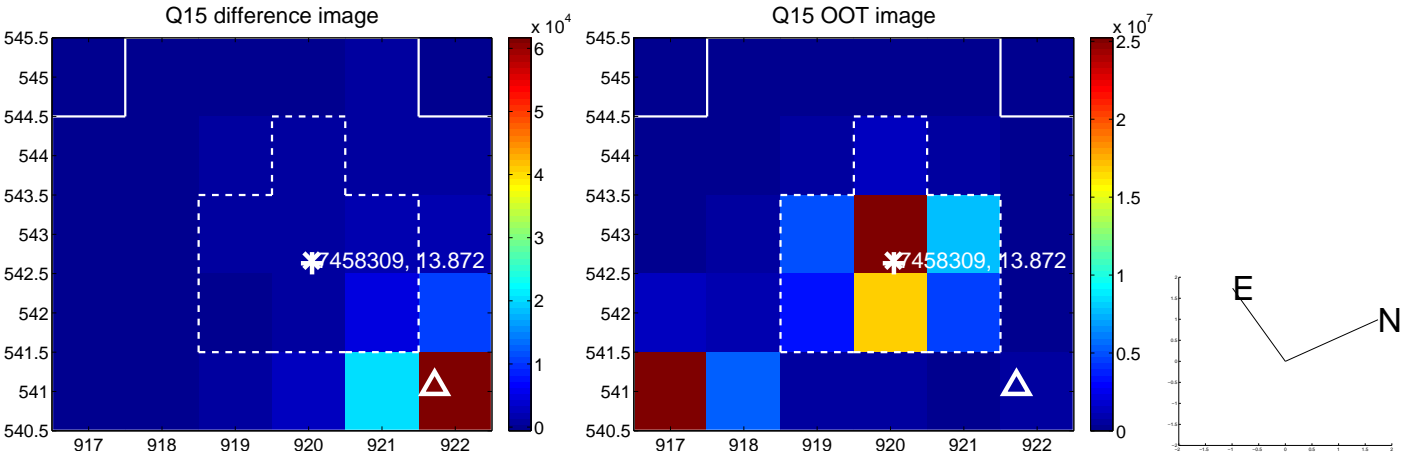
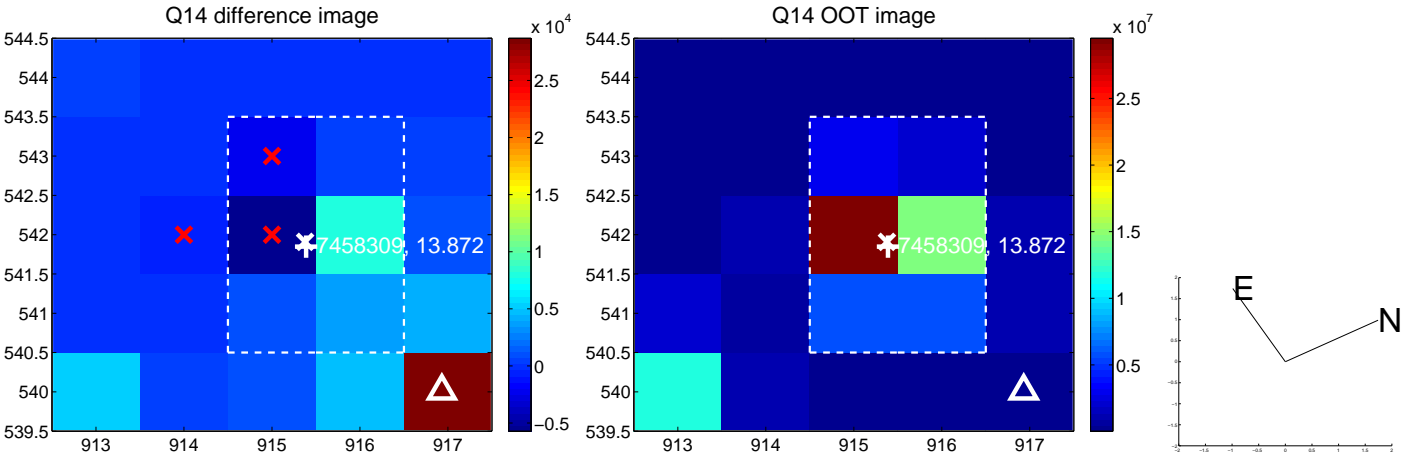
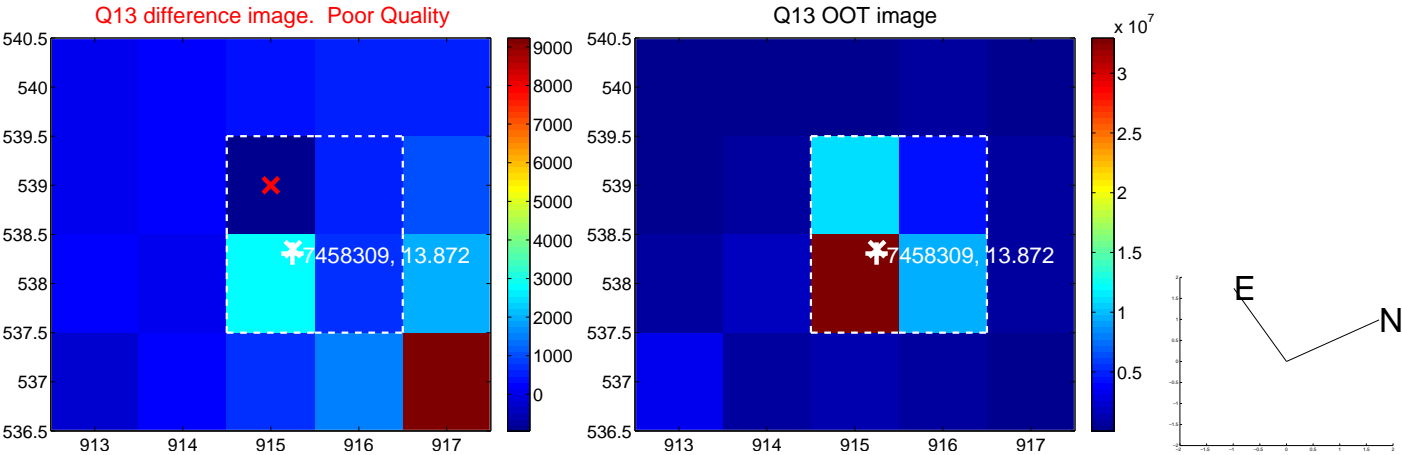




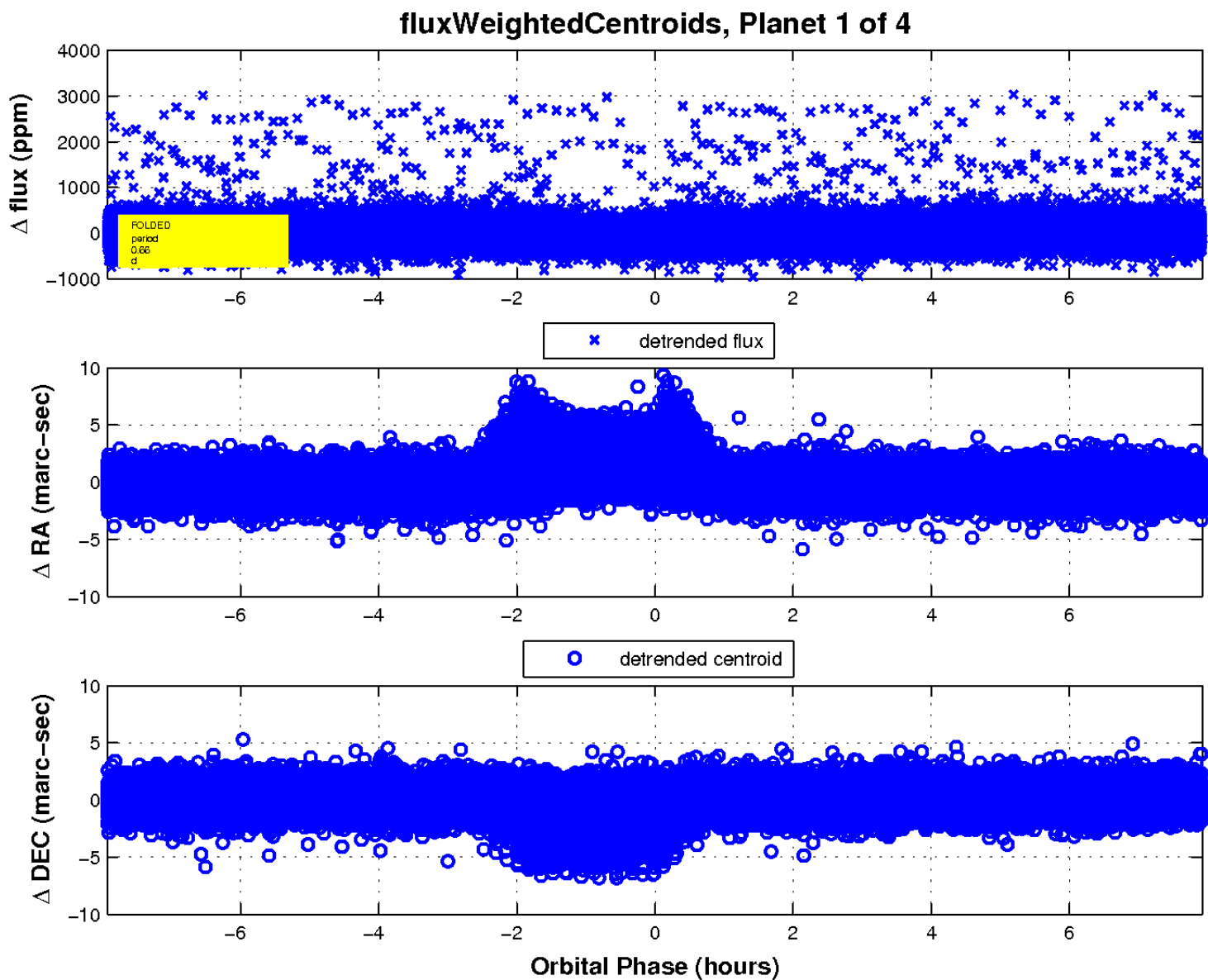
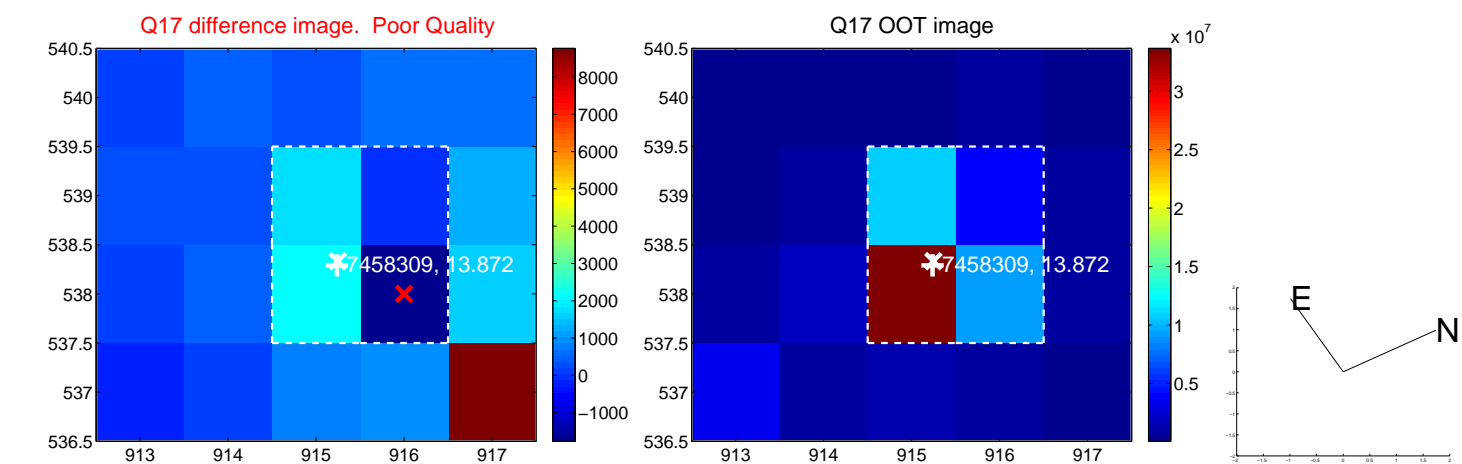
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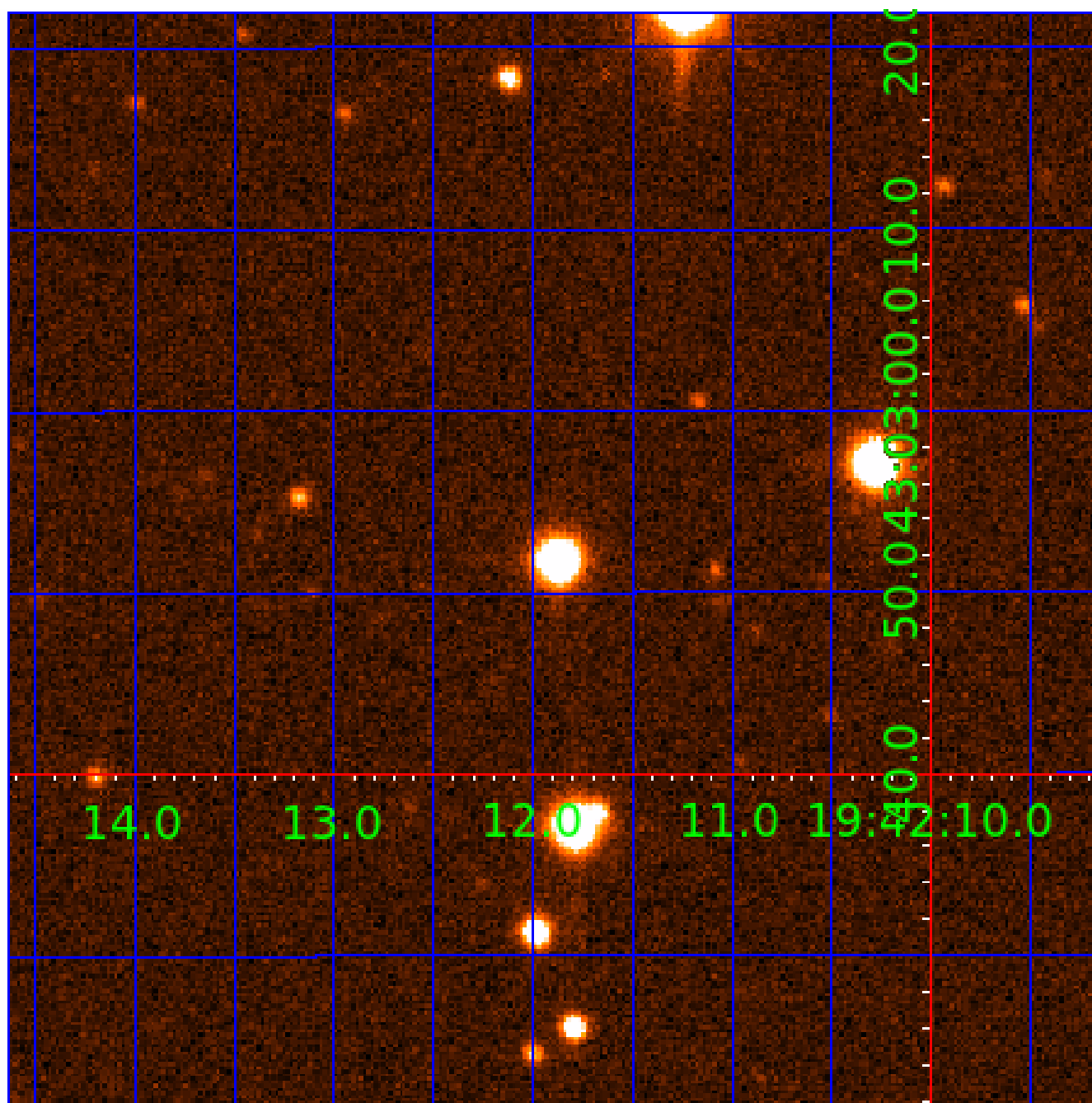


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UKIRT Image

Declination





# KIC 007458309

## Q1-17 DR25 TCE Parameters

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007458309-03	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_RESOLVED_OFFSET
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**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.

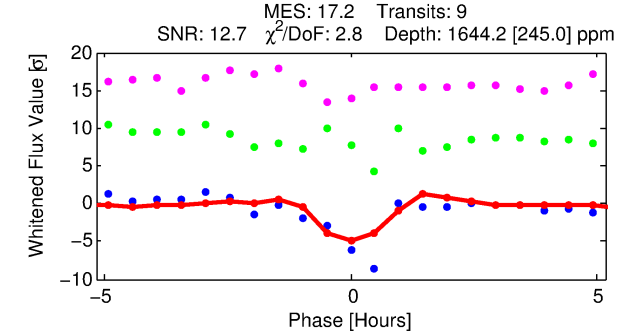
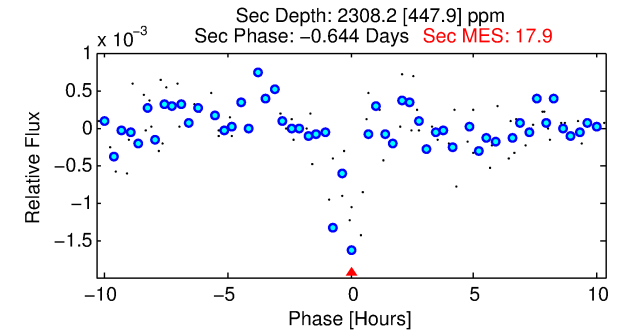
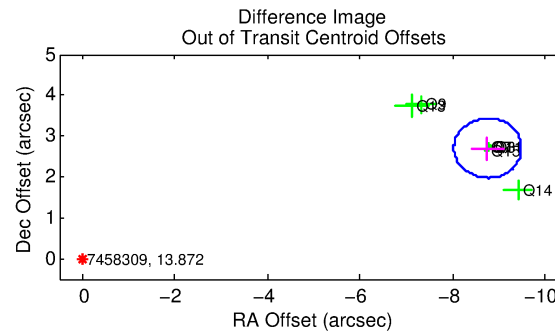
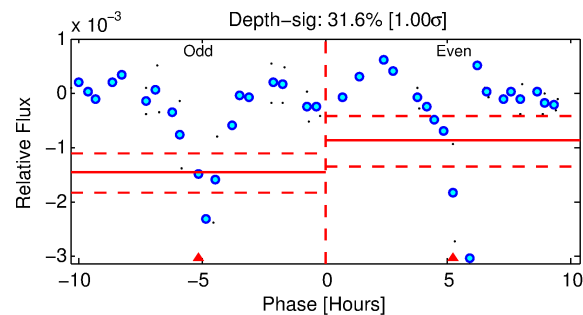
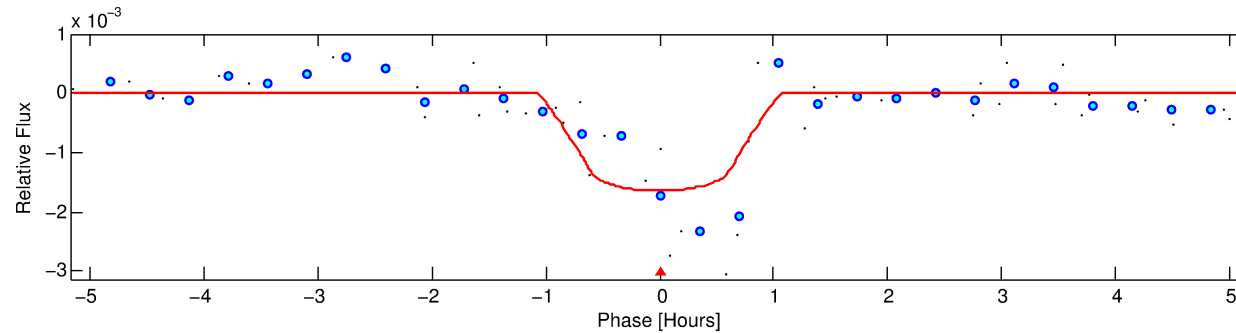
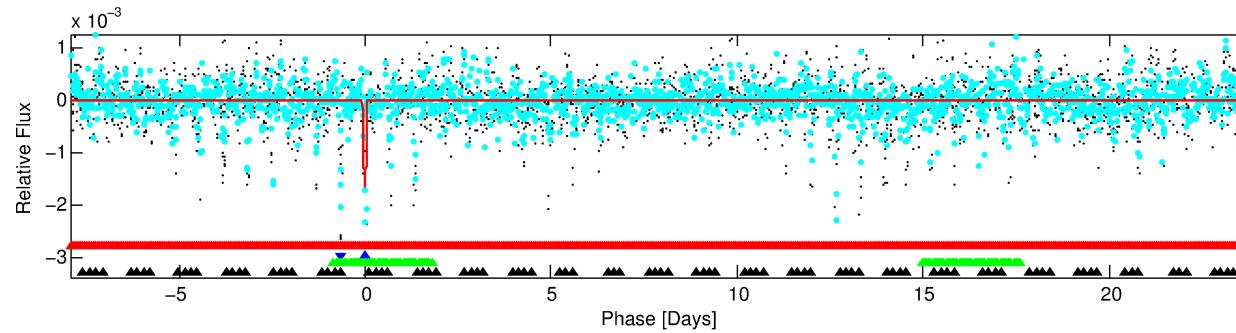
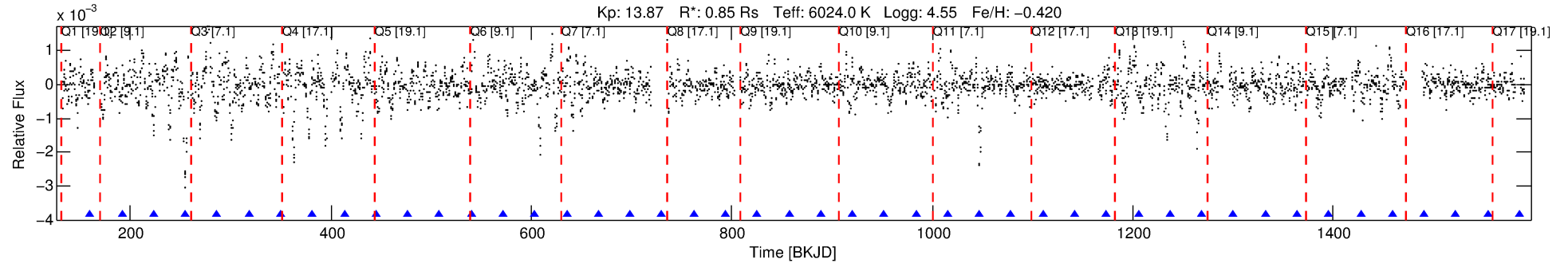
Ephemeris Match Information For 007458309-02

No Significant Match Found

# DV One-Page Summary

KIC: 7458309 Candidate: 2 of 4 Period: 31.683 d  
KOI: K03957 Corr: No Ephemeris Match

Kp: 13.87 R\*: 0.85 Rs Teff: 6024.0 K Logg: 4.55 Fe/H: -0.420



## DV Fit Results:

Period = 31.68327 [0.00031] d  
Epoch = 160.0429 [0.0079] BKJD  
Rp/R\* = 0.0373 [0.0763]  
a/R\* = 145.67 [1468.25]  
b = 0.01 [1160.29]  
Seff = 23.19 [8.66]  
Teq = 560 [52] K  
Rp = 3.45 [7.13] Re  
a = 0.1915 [0.0459] AU  
Ag = 3909.46 [16089.92] [0.24σ]  
Teff = 6841 [7015] K [0.90σ]

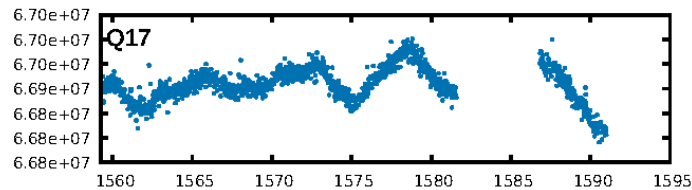
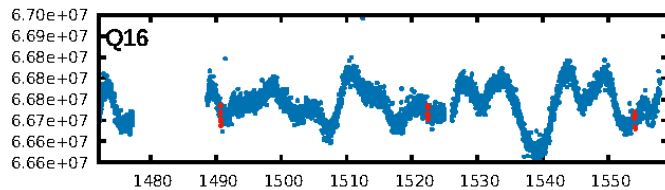
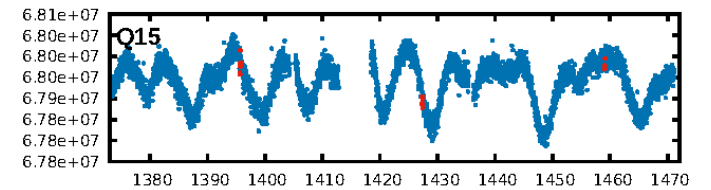
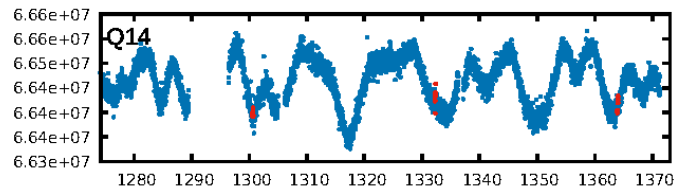
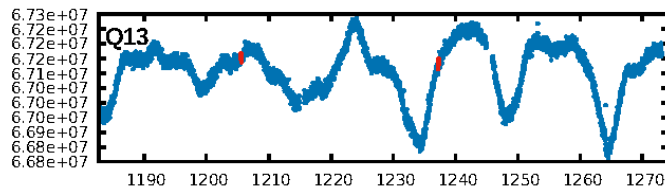
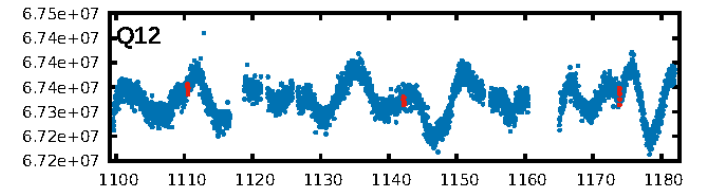
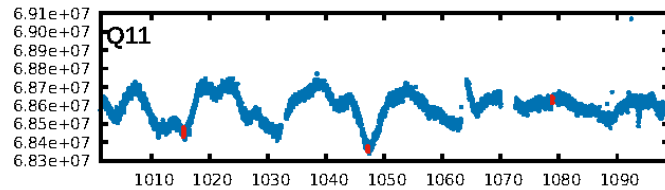
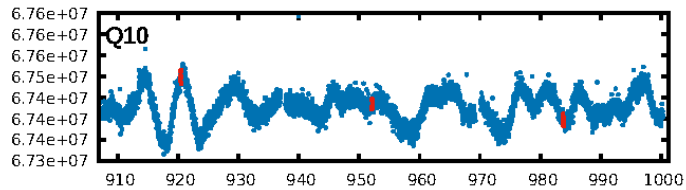
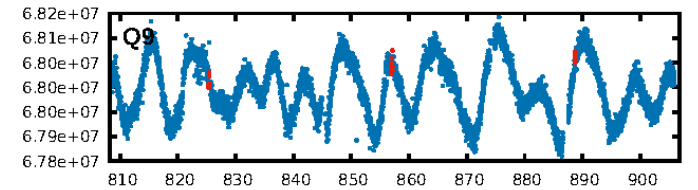
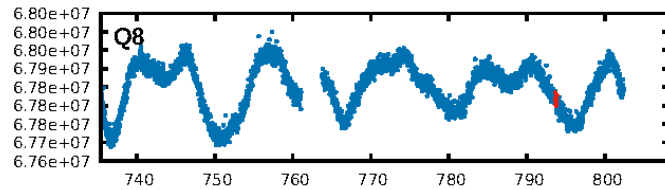
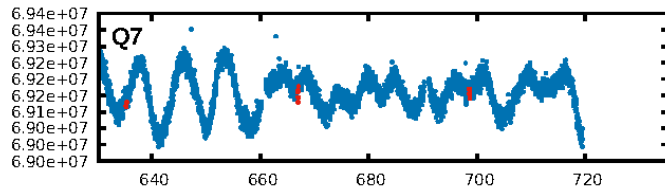
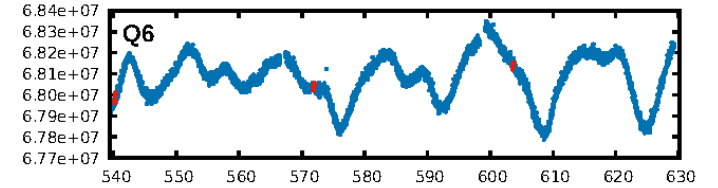
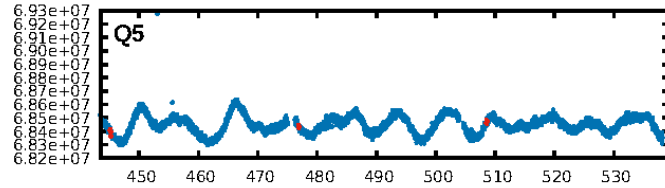
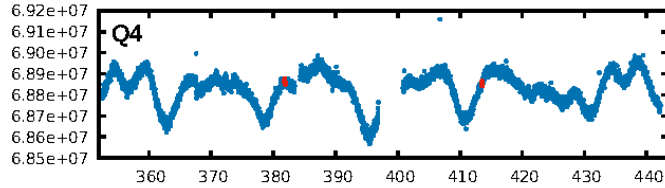
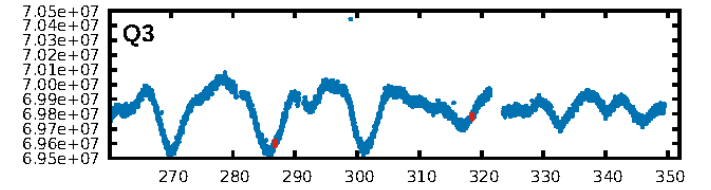
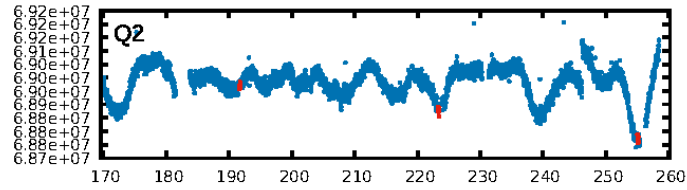
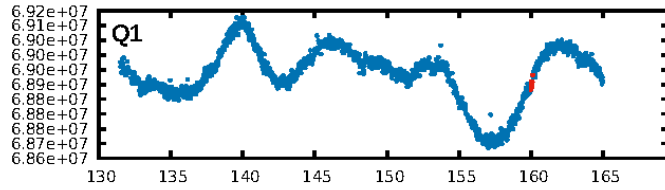
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [93.27σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGoF-sig: 92.0%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [9/9]  
GhostDiagnostic-chr: 2.917  
Centroid-sig: N/A  
Centroid-so: 0.180 arcsec [1.32σ]  
OotOffset-rm: 9.165 arcsec [37.72σ]  
KicOffset-rm: 9.253 arcsec [40.93σ]  
OotOffset-st: 1/4/0/2 [7]  
KicOffset-st: 1/4/0/2 [7]  
DiffImageQuality-fgm: 0.57 [4/7]  
DiffImageOverlap-fno: 0.00 [0/16]

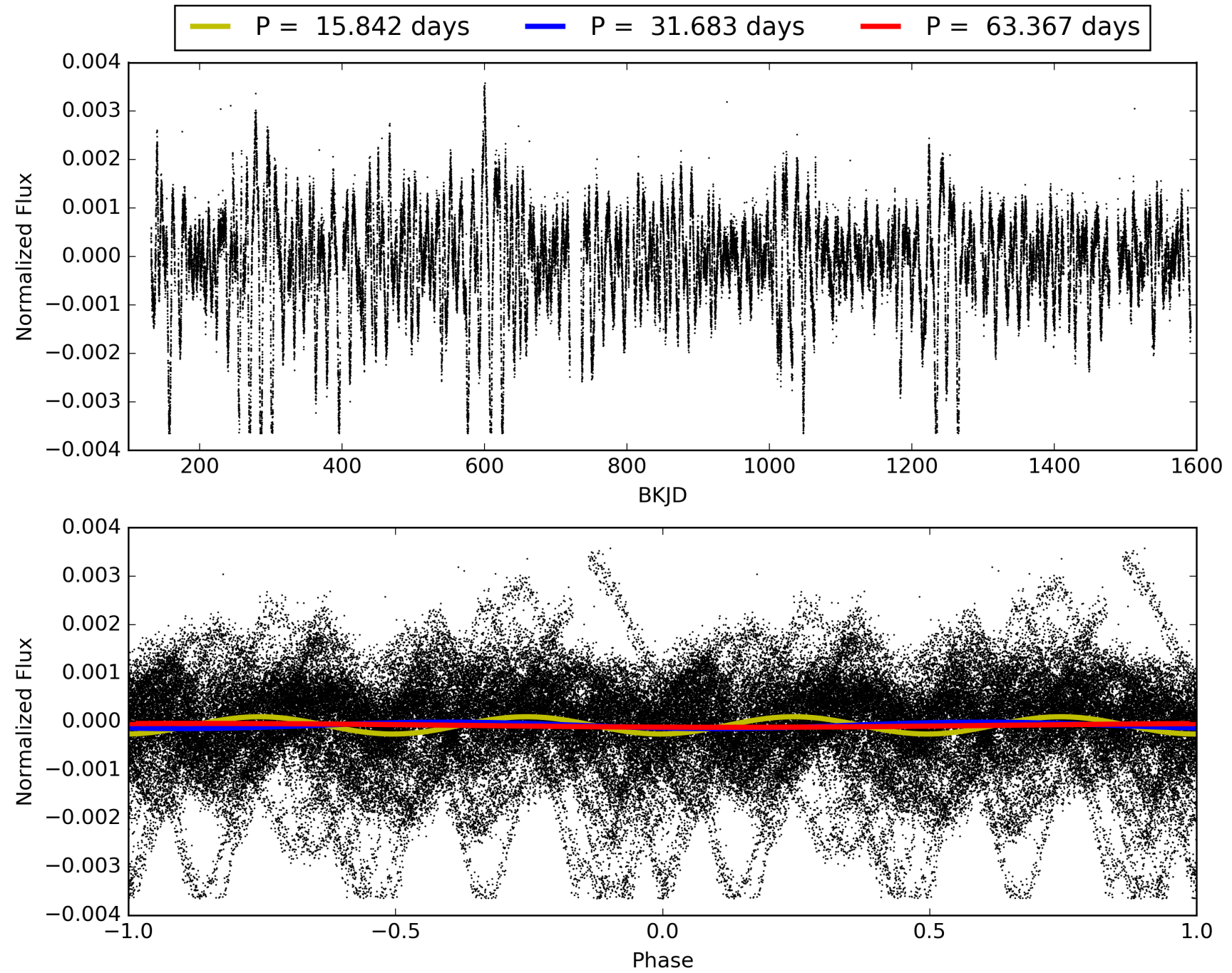
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 03-Feb-2016 09:08:40 Z

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

# TCE 007458309-02, PDC Light Curves

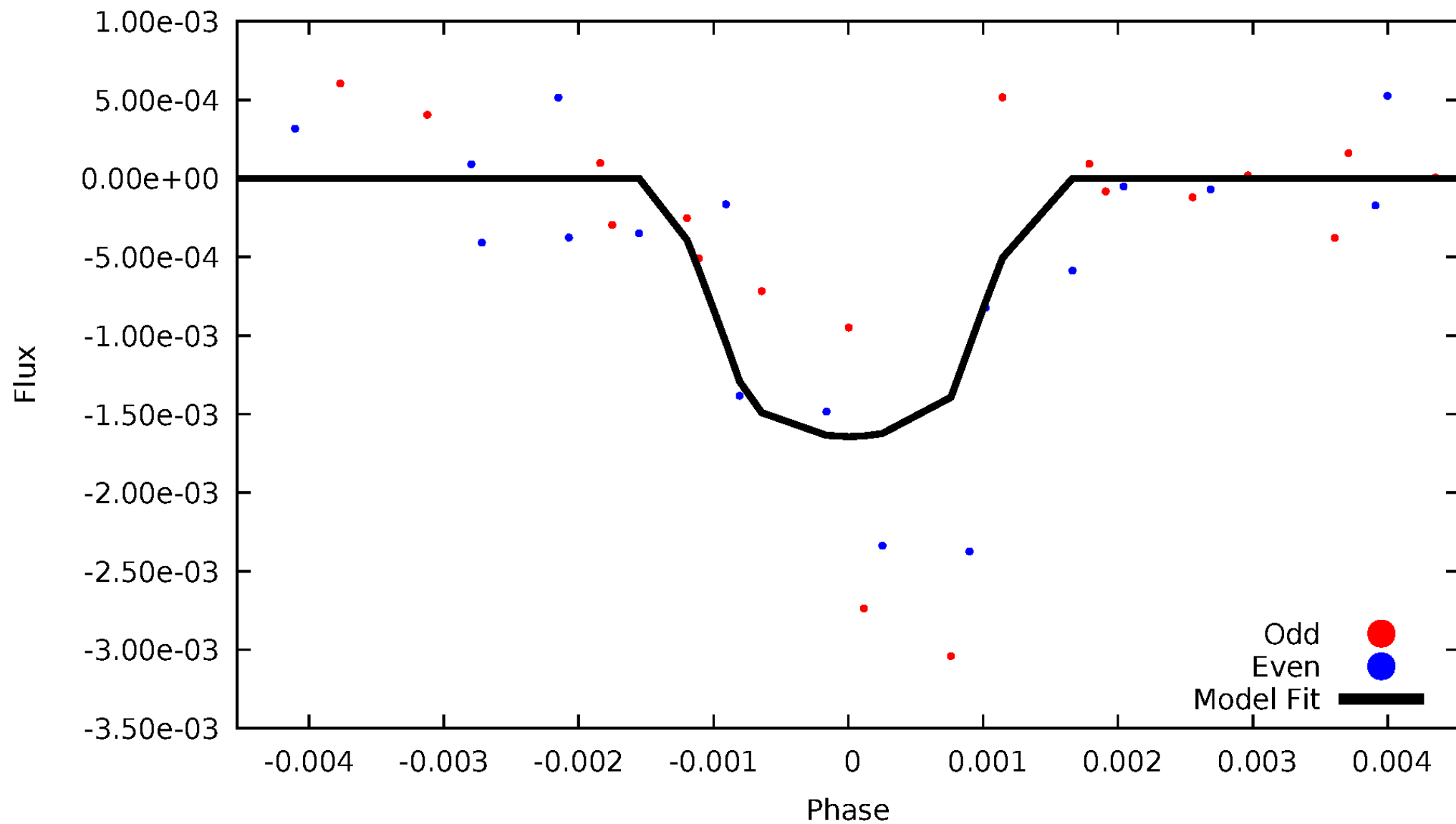


TCE 007458309-02



# DV Odd/Even

TCE 007458309-02





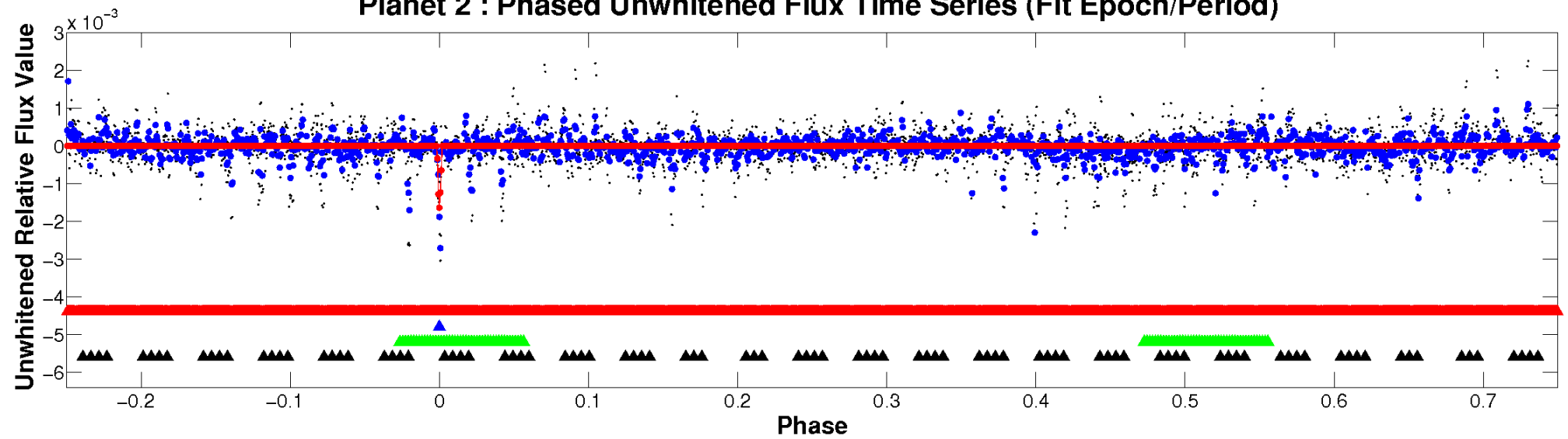


ALT Odd/Even

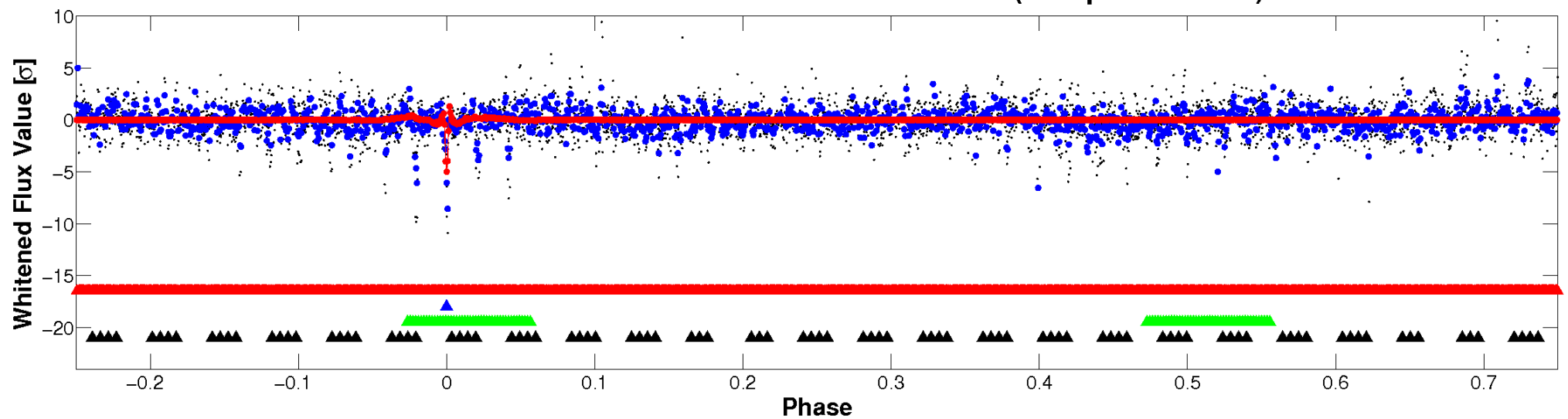
This plot does not exist for this TCE.

# Non-Whitened Vs. Whitened Light Curve

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

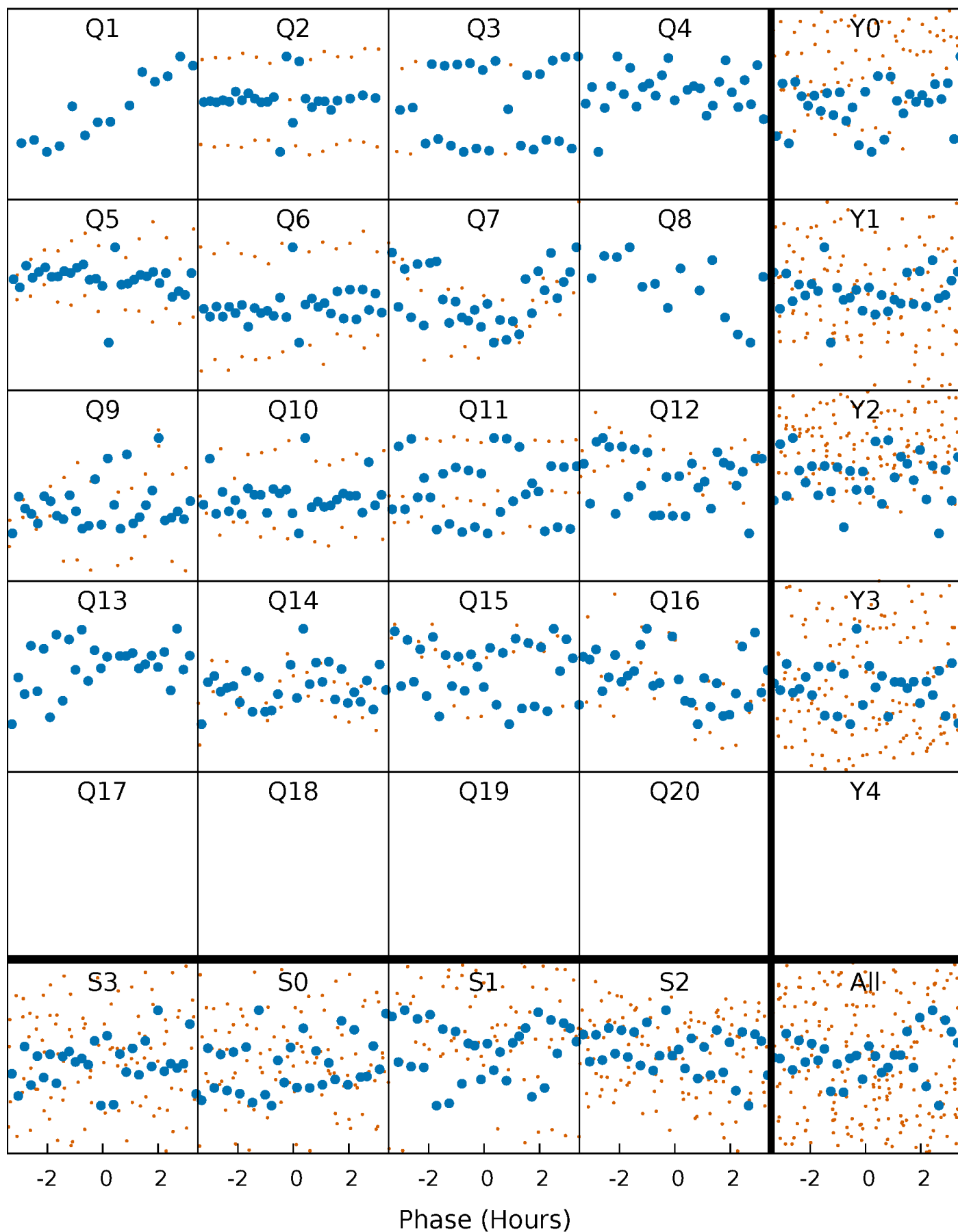


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



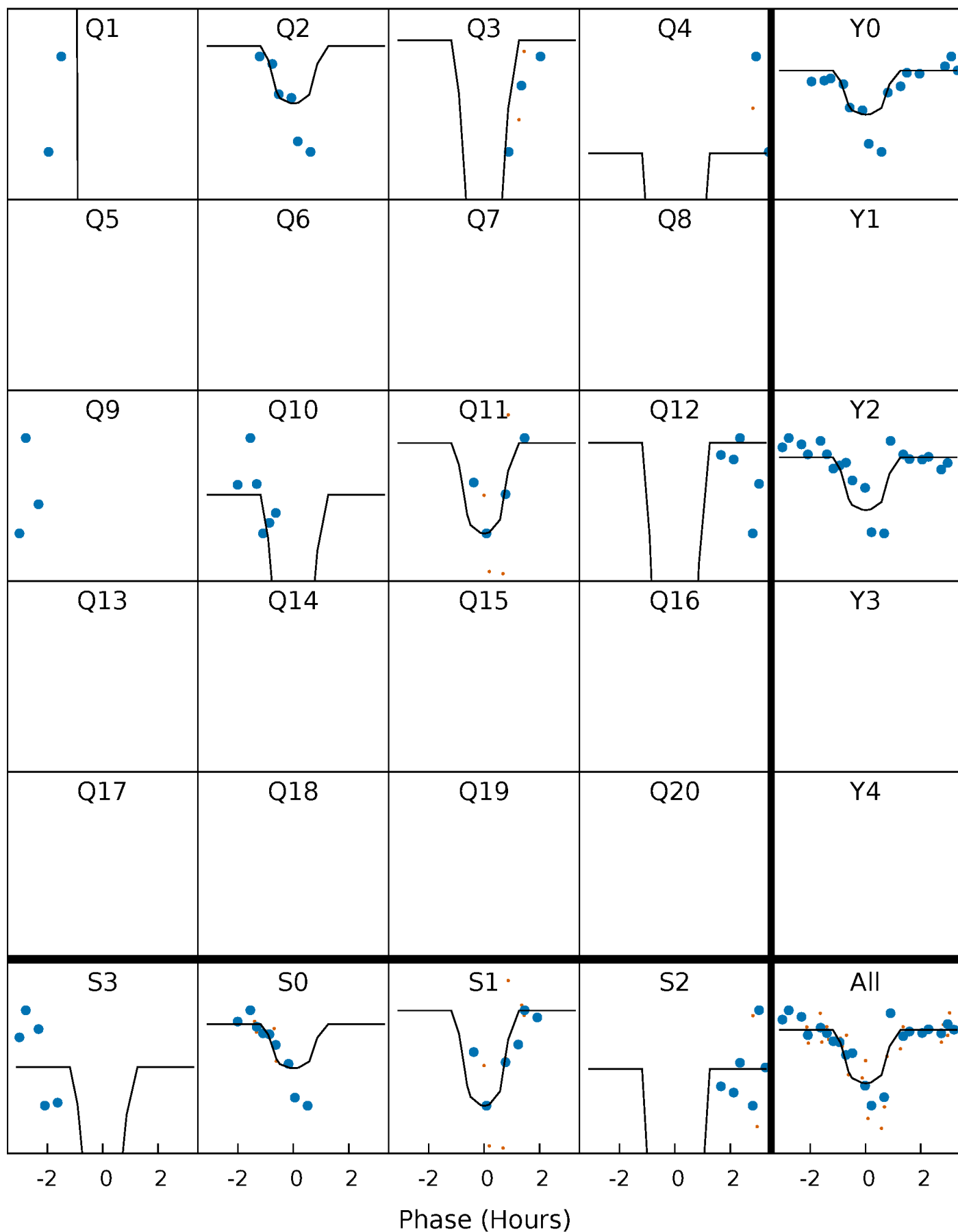
# PDC Quarter-Phased Transit Curves

TCE 007458309-02   P= 31.683274 Days    $T_0=160.042939$  (BKJD)



# DV Quarter-Phased Transit Curves

TCE 007458309-02   P= 31.683274 Days    $T_0=160.042939$  (BKJD)

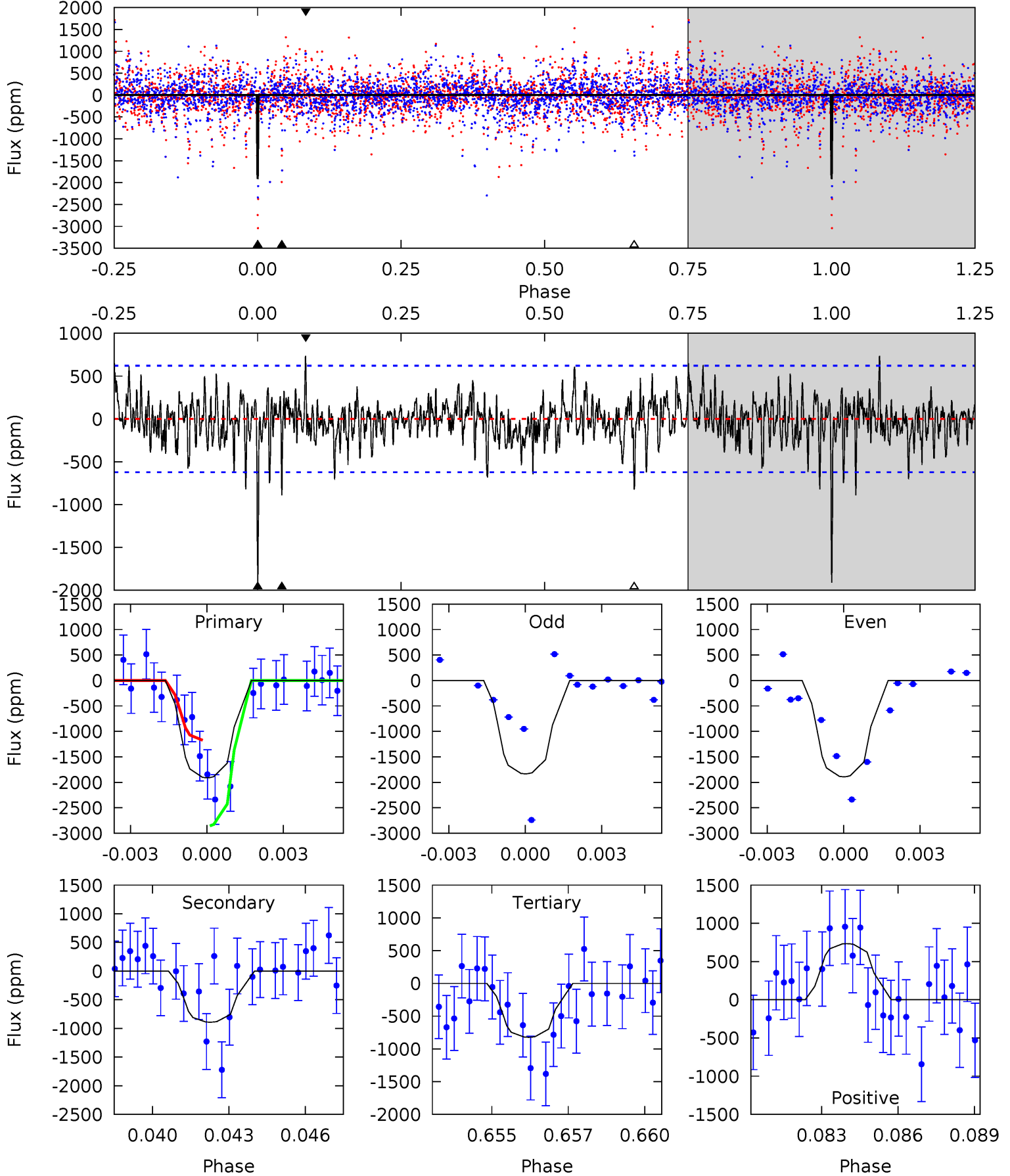


This plot does not exist for this TCE.

# DV Model-Shift Uniqueness Test

007458309-02,  $P = 31.683274$  Days,  $E = 128.359665$  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
16.2	7.55	6.97	6.22	5.26	2.98	1.71	9.22	9.97	0.58	1.33	0.24	0.96	0.28	6.80





## Alt Model-Shift Uniqueness Test

This plot does not exist for this TCE.

### Stellar Parameters For KIC 007458309

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$6024^{+161}_{-179}$	$4.550^{+0.046}_{-0.196}$	$-0.420^{+0.300}_{-0.300}$	$0.849^{+0.238}_{-0.074}$	$0.934^{+0.098}_{-0.109}$	$2.150^{+0.398}_{-1.059}$
	+3%/-3%	+1%/-4%	+71%/-71%	+28%/-9%	+10%/-12%	+19%/-49%
Source	PHO1	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 007458309-02 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-892 \pm 118$	$6.65^{+5.92}_{-4.58}$	$800^{+51}_{-37}$	$4257^{+2918}_{-847}$	$418^{+3568}_{-308}$
Alt.	N/A	N/A	N/A	N/A	N/A

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

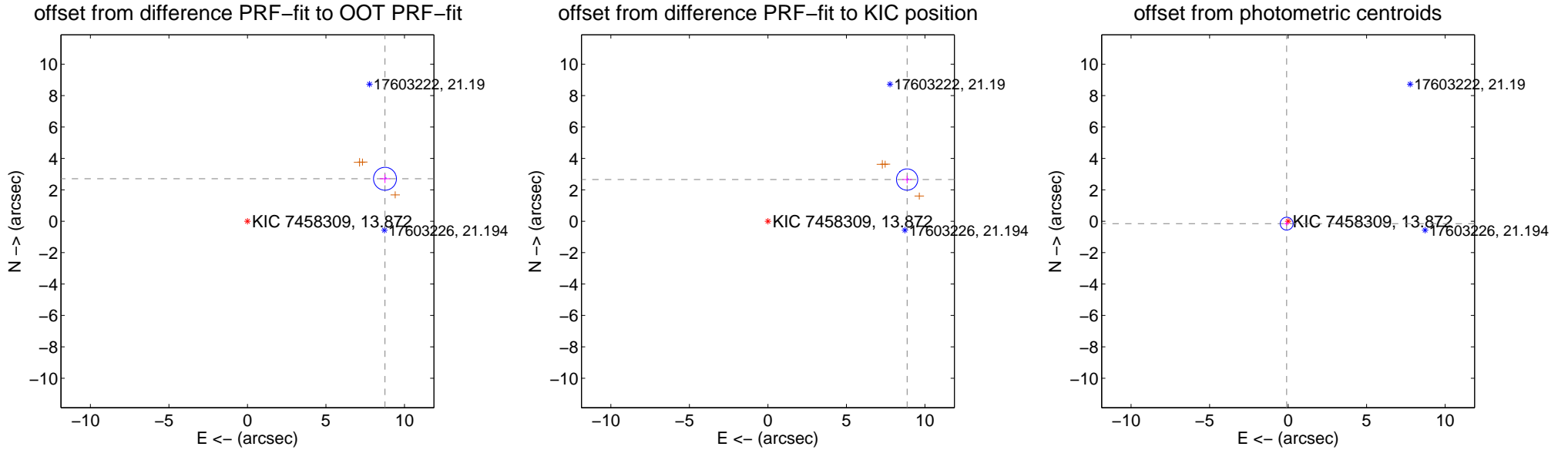
## DV Centroid Data

Supplemental centroid analysis for 007458309-02. Kepler magnitude: 13.87. Transit SNR 12.71

There are 4 quarters with good PRF difference image offsets

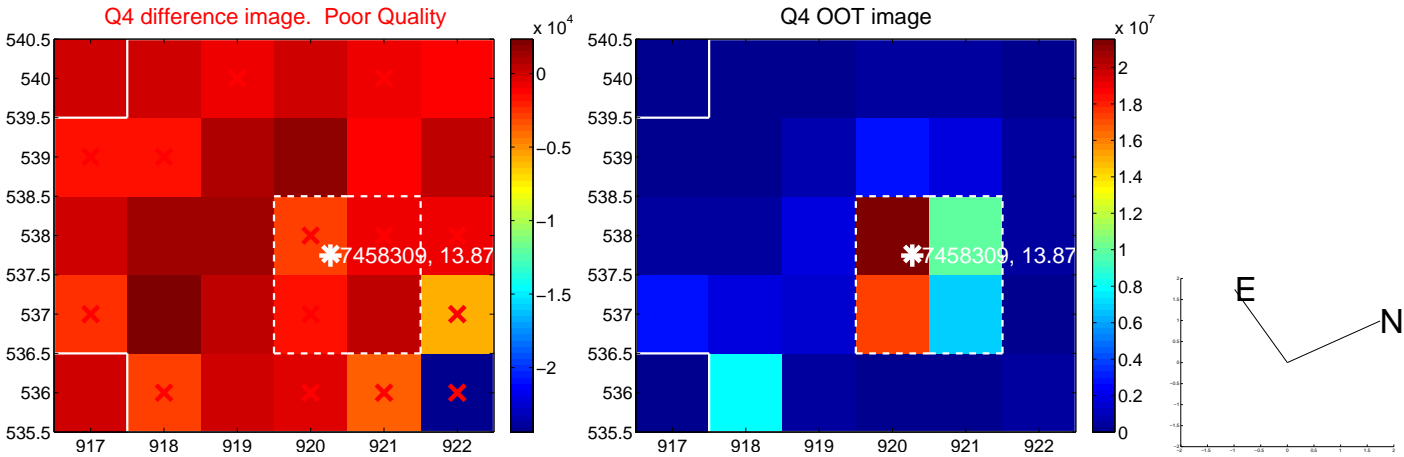
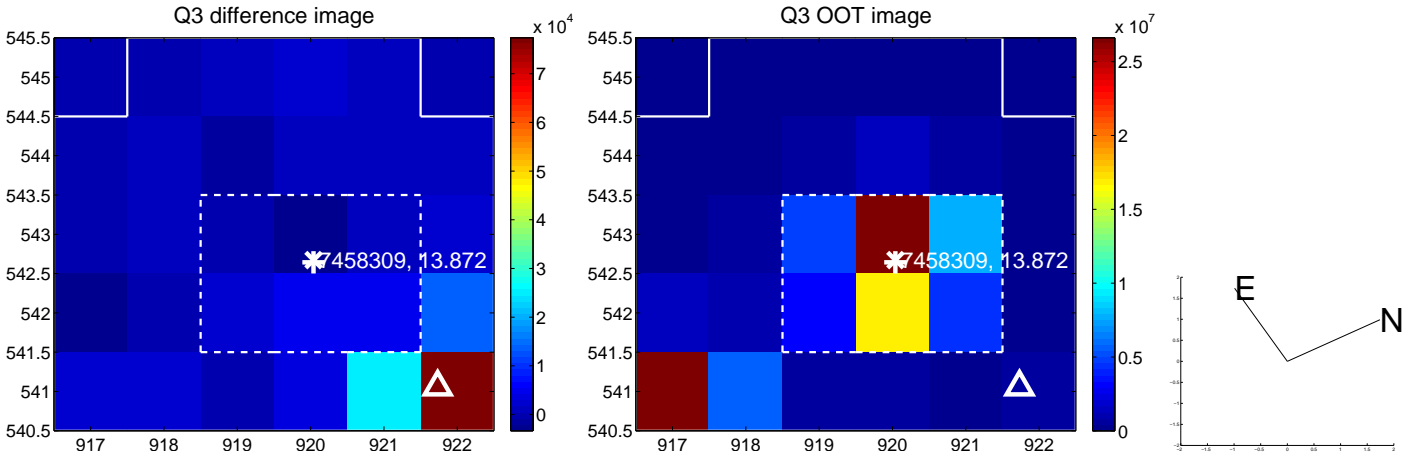
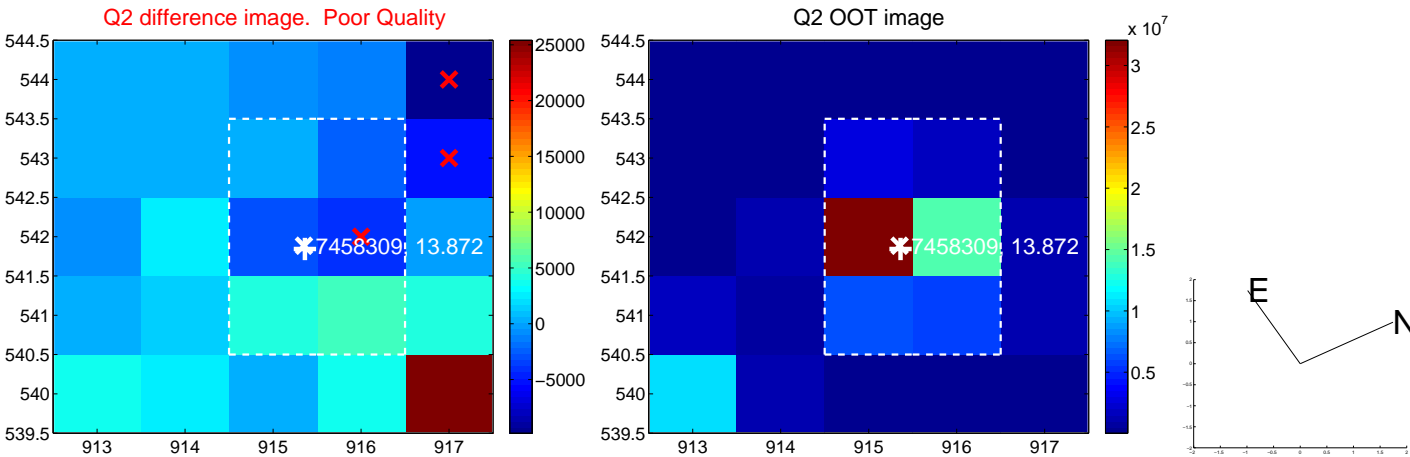
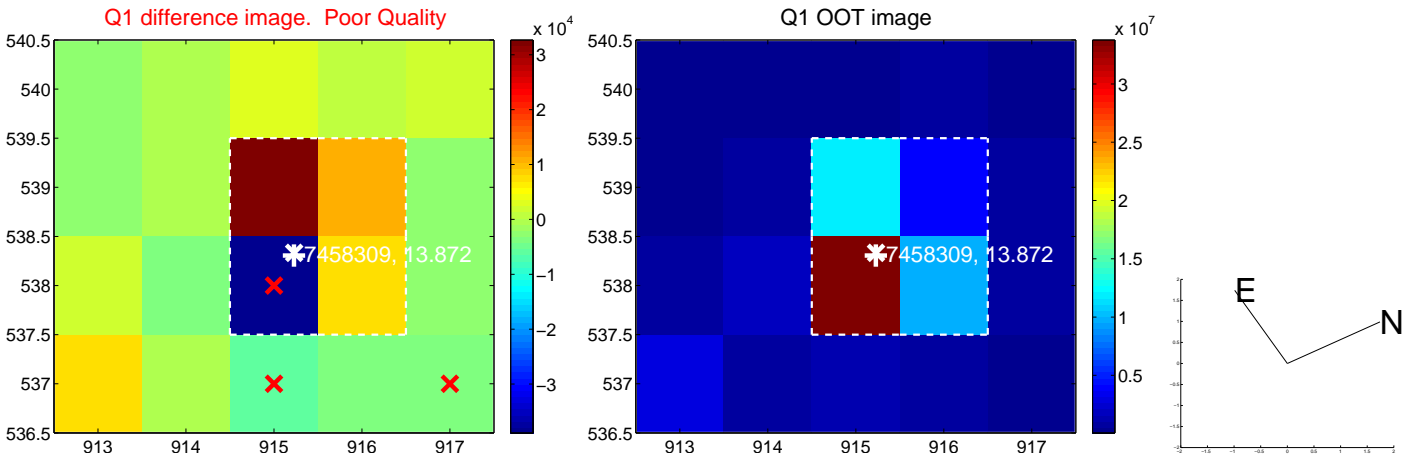
The direct PRF centroid is offset from the target star catalog position by about 0.12 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	<b>9.165 <math>\pm</math> 0.243</b>	<b>37.72</b>	-8.758 $\pm$ 0.330	2.703 $\pm$ 0.276
PRF-fit source offset from KIC position	<b>9.253 <math>\pm</math> 0.226</b>	<b>40.93</b>	-8.864 $\pm$ 0.300	2.654 $\pm$ 0.247
photometric centroid source offset	0.18 $\pm$ 0.14	1.32	0.09 $\pm$ 0.14	-0.16 $\pm$ 0.13

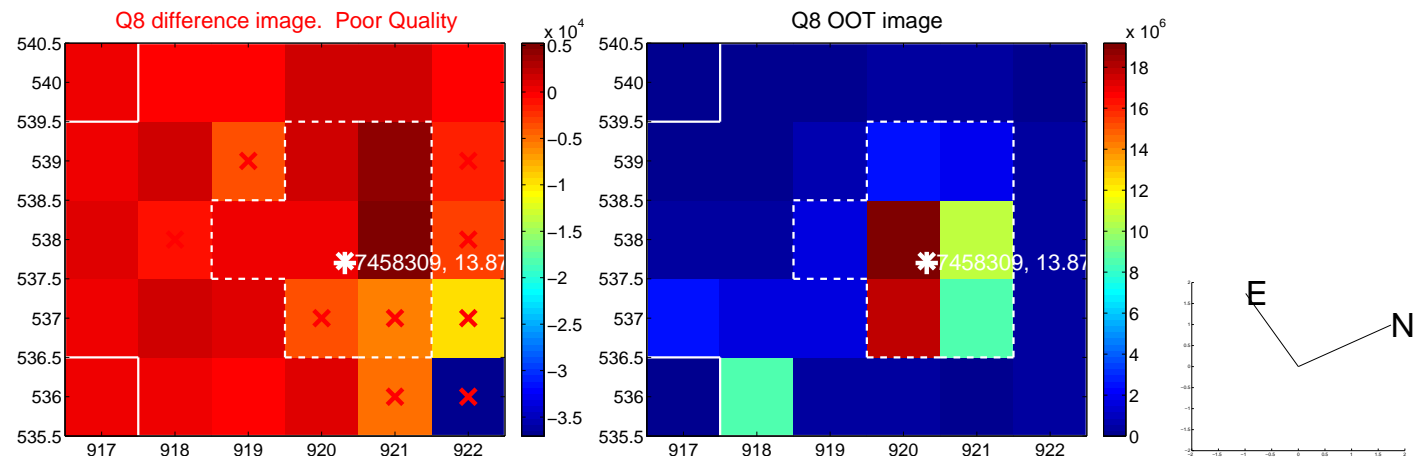
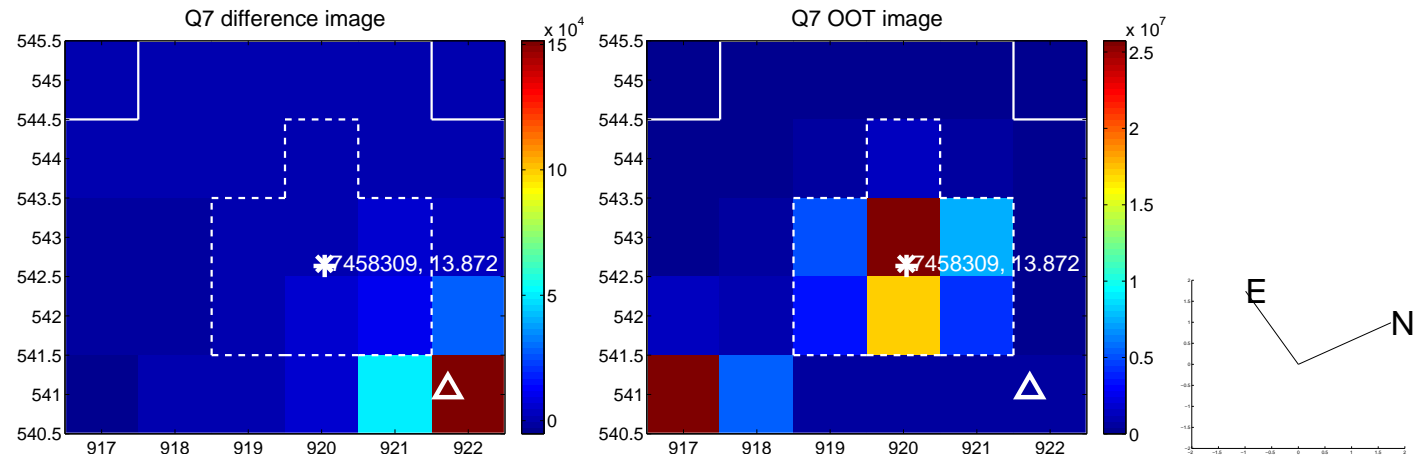
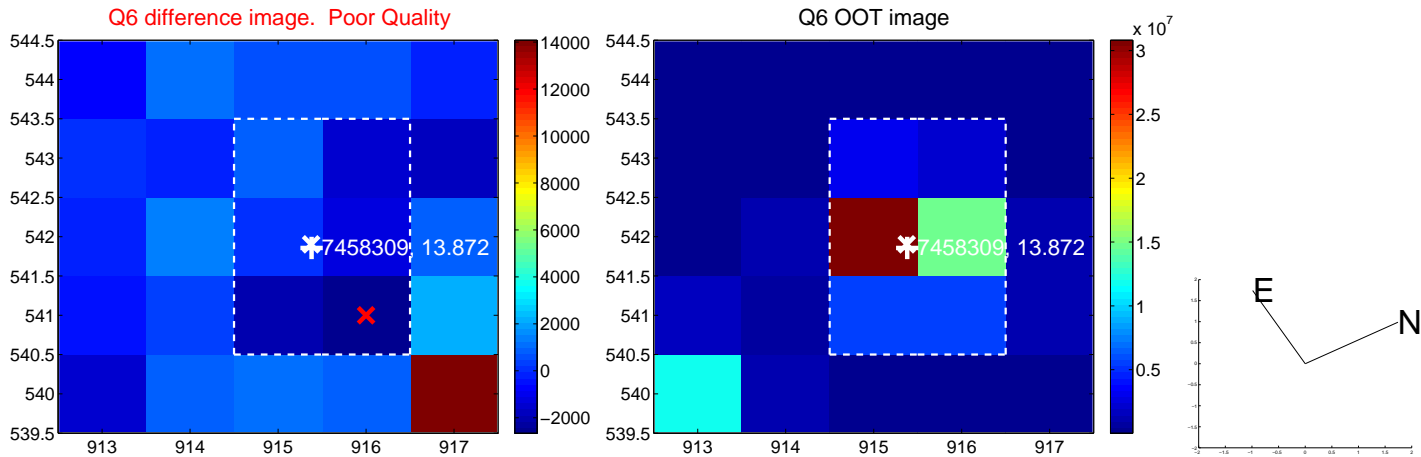
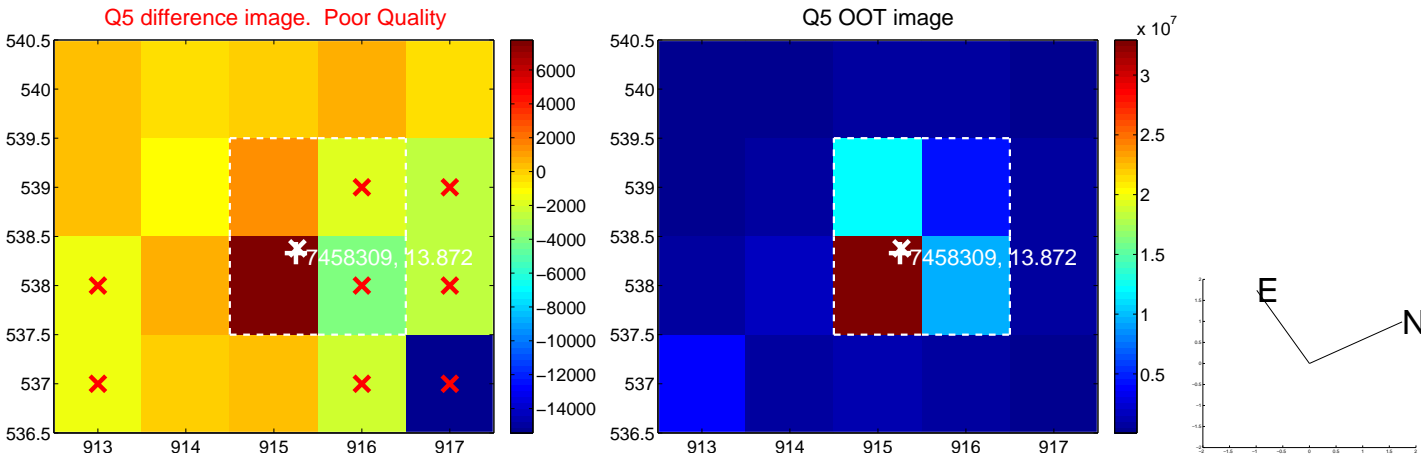


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

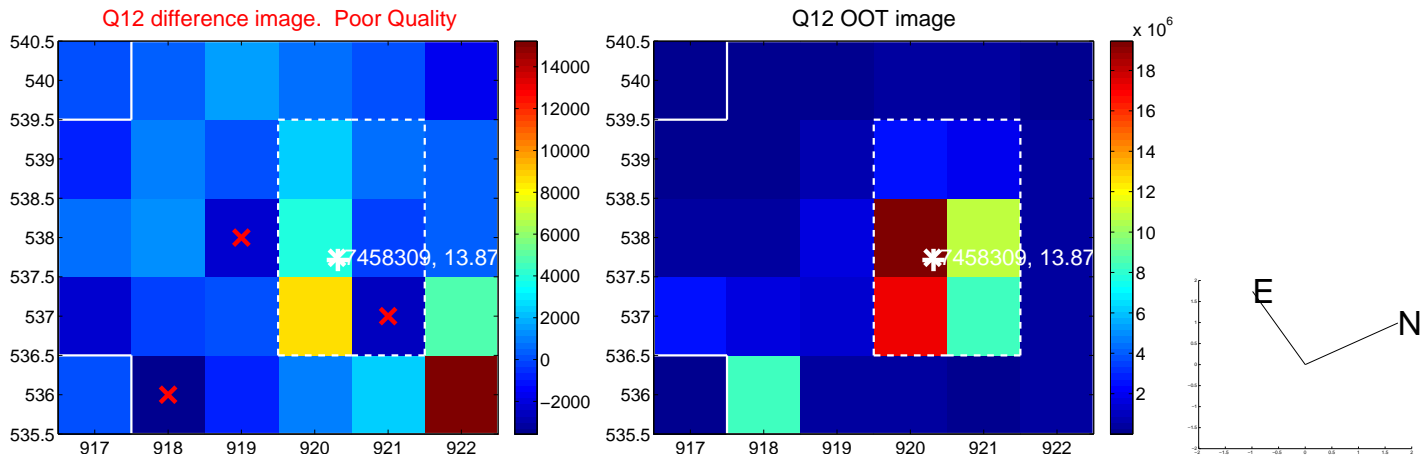
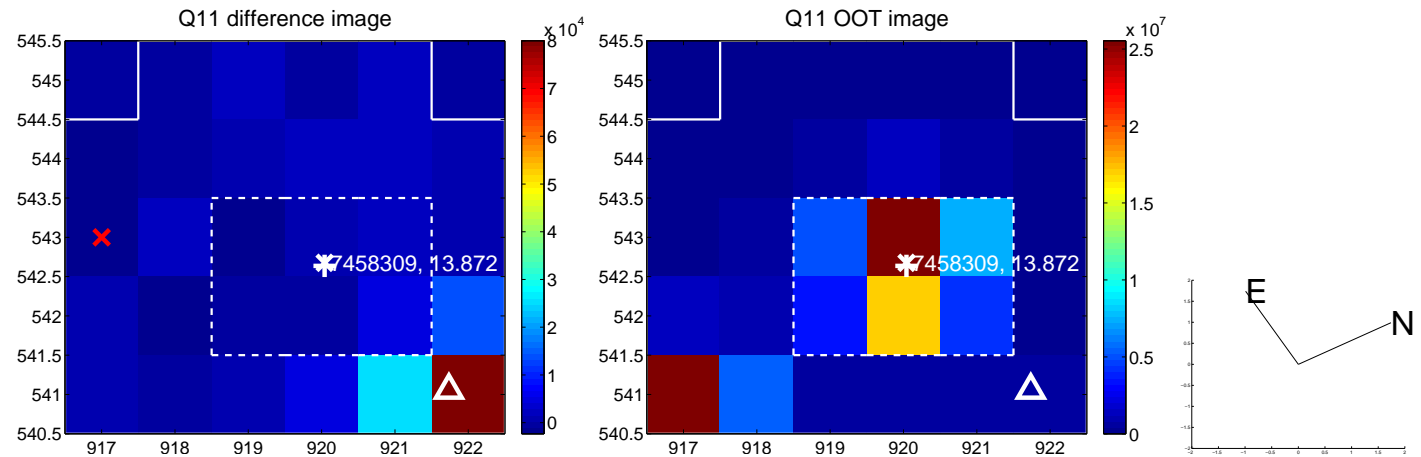
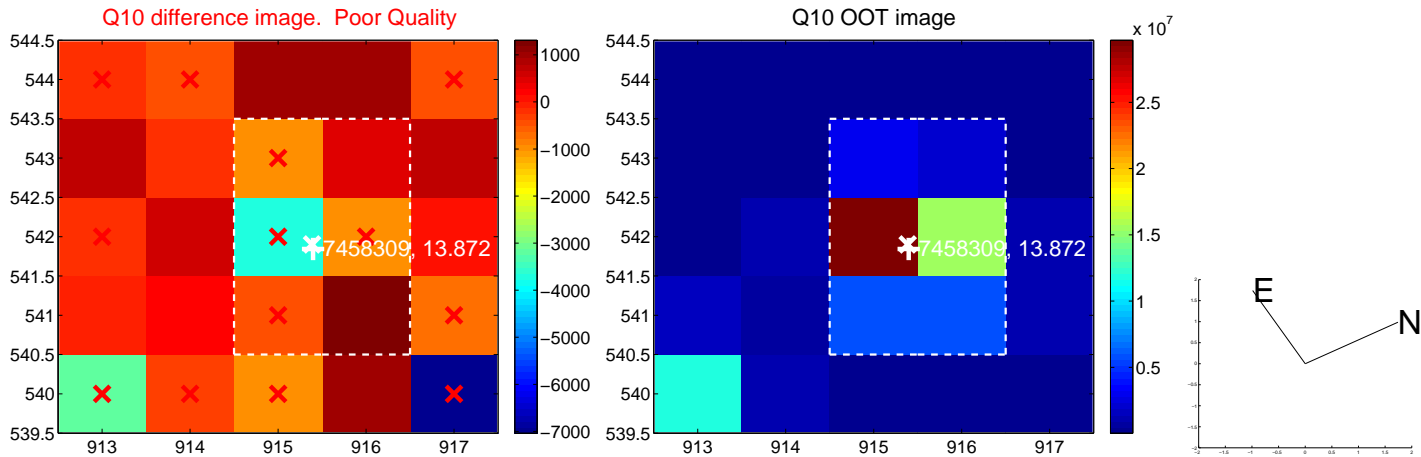
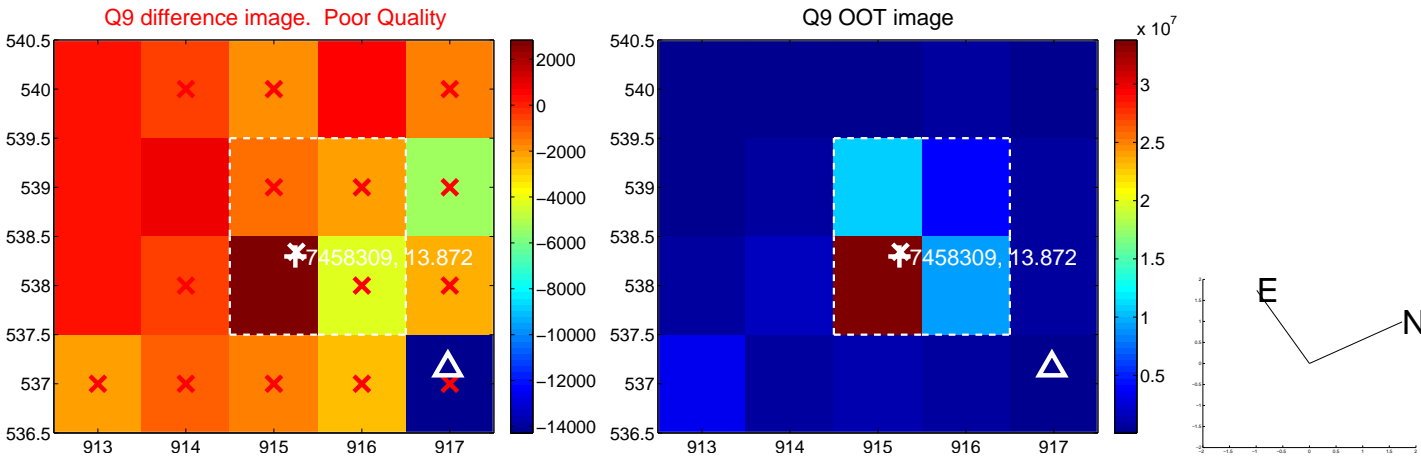


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

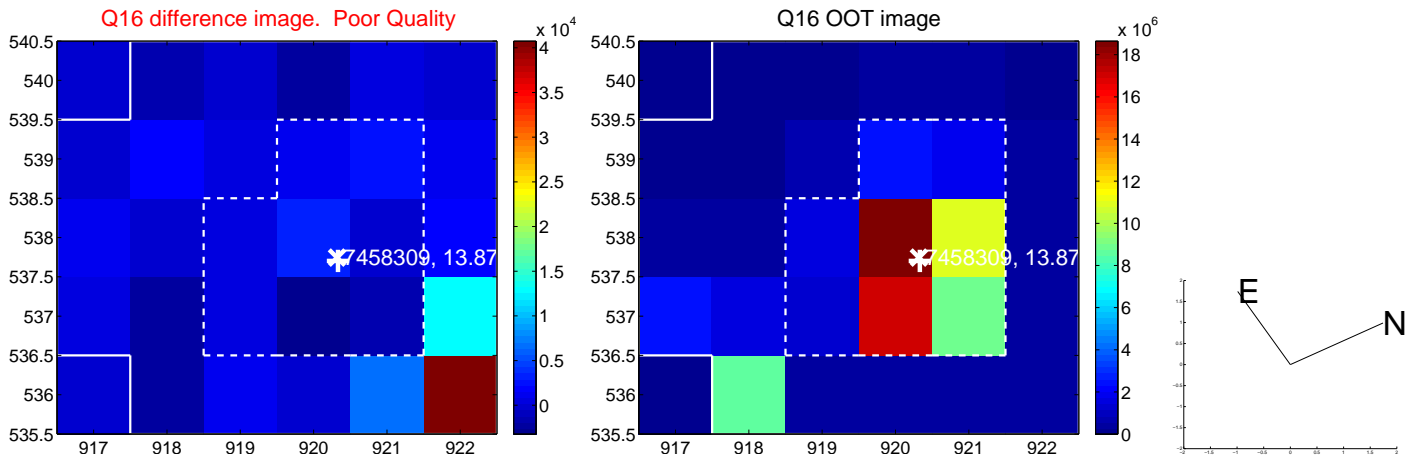
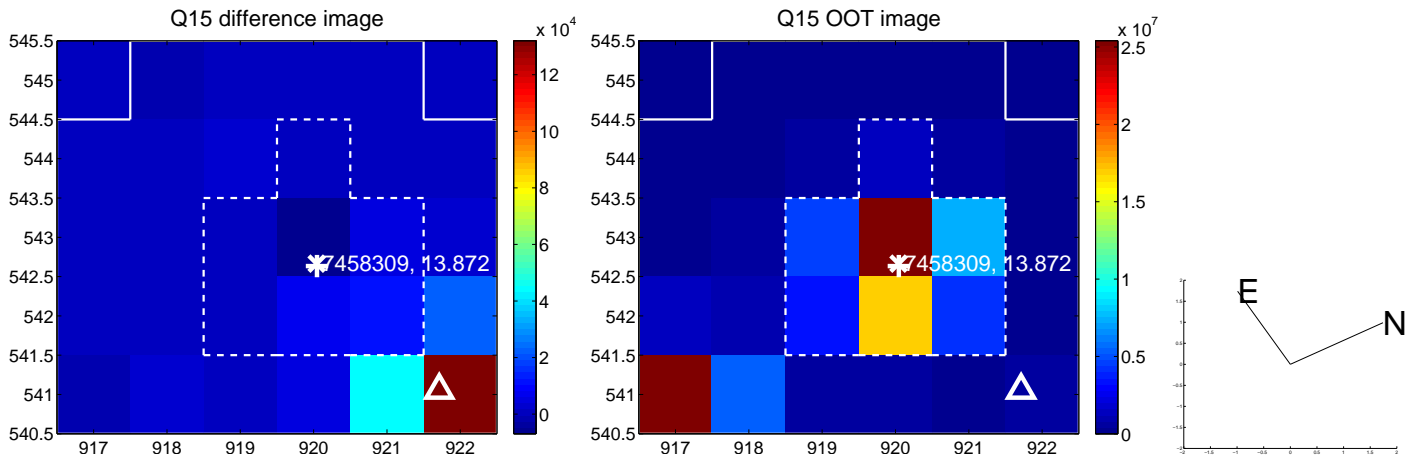
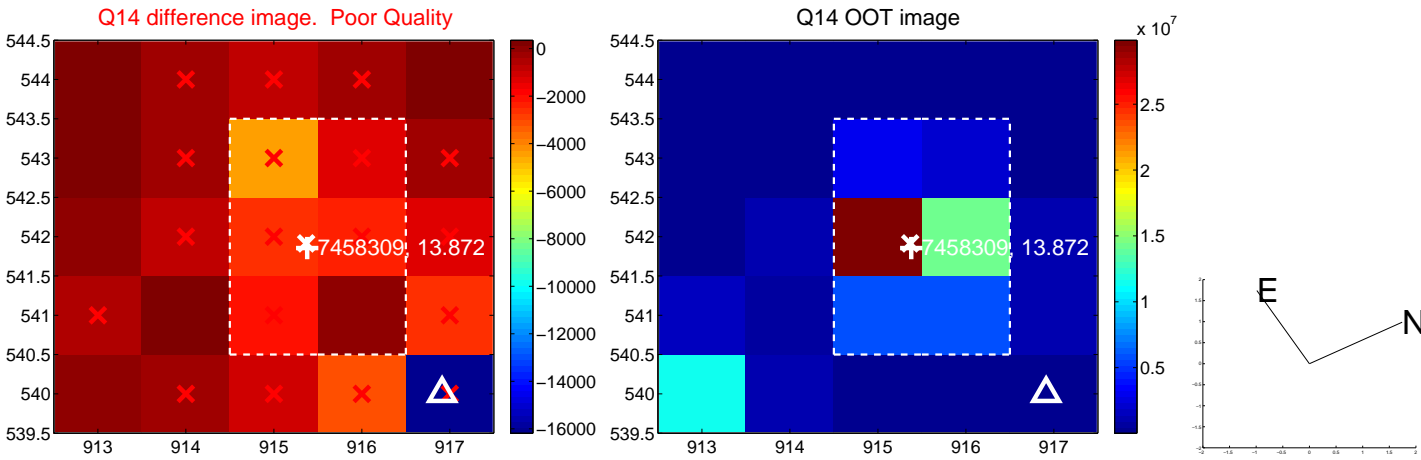
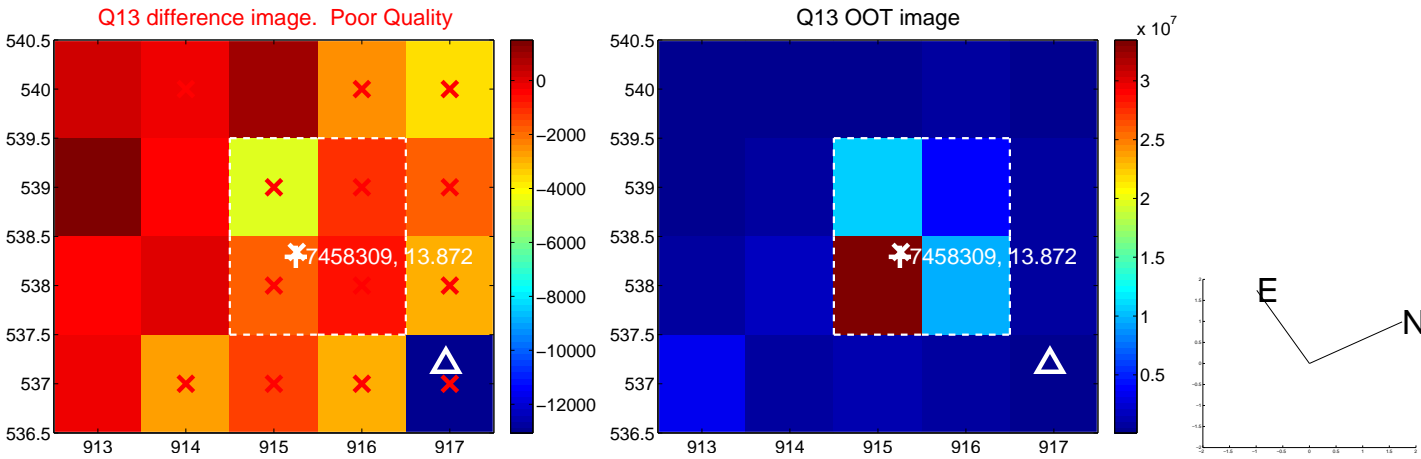




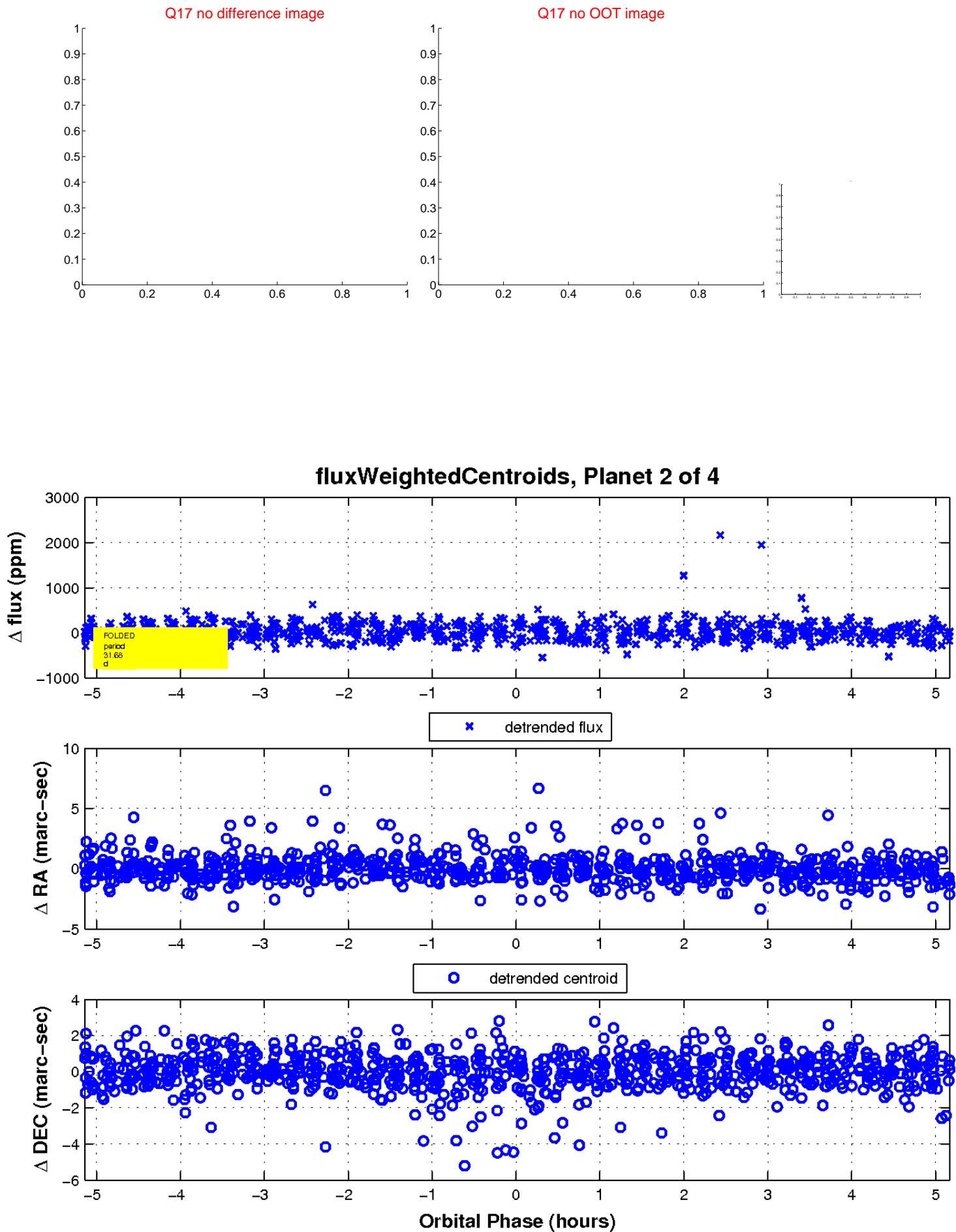
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

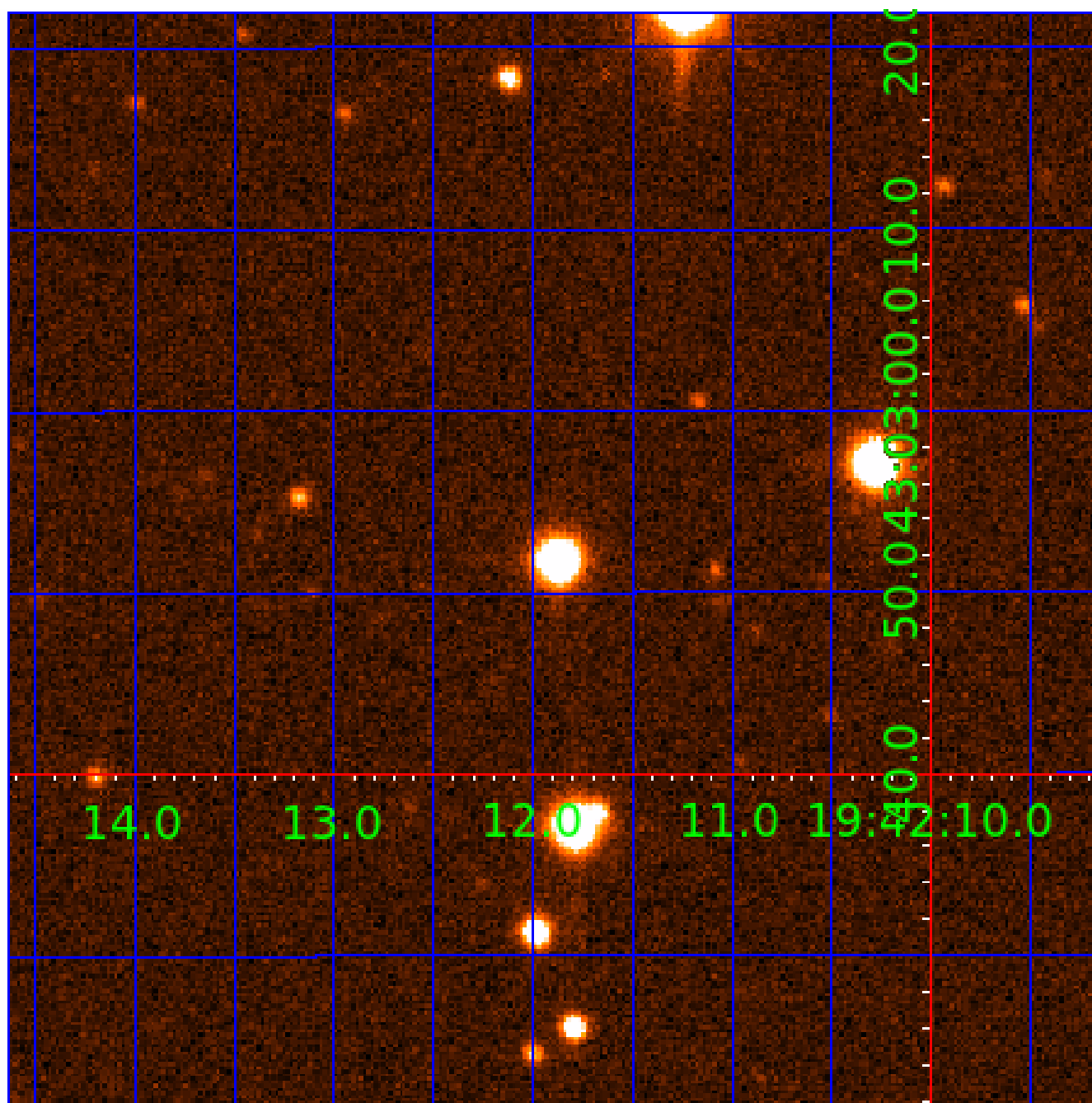


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 007458309

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
007458309-01	OBS	3957.01	0.660630	131.895666	25.5	4.784	19.0	13.0	0.85	6024	0.43	4040.43
007458309-02	OBS	No	31.683274	160.042939	1644.2	1.723	17.2	12.7	0.85	6024	3.45	23.19
007458309-03	OBS	No	15.870817	143.336192	219.8	3.686	17.6	3.9	0.85	6024	1.44	58.29
007458309-04	OBS	No	15.201166	132.825777	664.0	2.000	11.4	-1.0	0.85	6024	2.19	61.74

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
007458309-01	OBS	FP	0.00	1	0	1	1	LPP_DV—CENT_RESOLVED_OFFSET—HALO_GHOST—EPHEM_MATCH
007458309-02	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—CENT_RESOLVED_OFFSET
007458309-03	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_RESOLVED_OFFSET
007458309-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—CENT_NOFITS

**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 007458309-03

No Significant Match Found

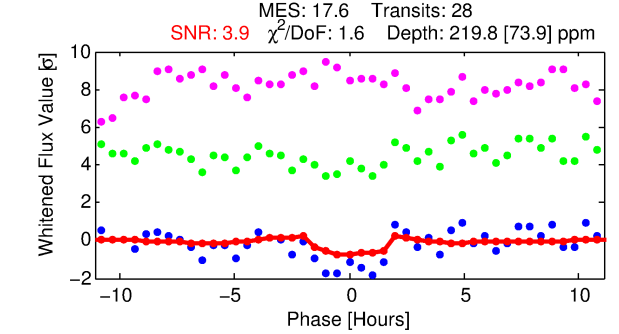
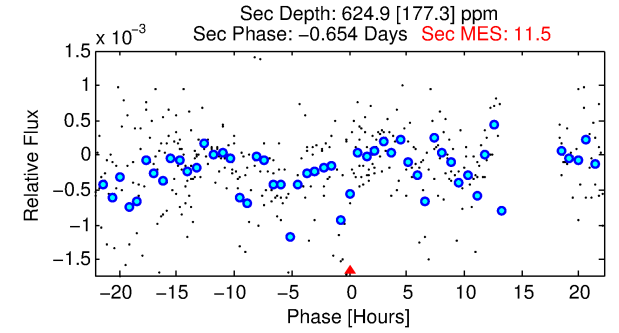
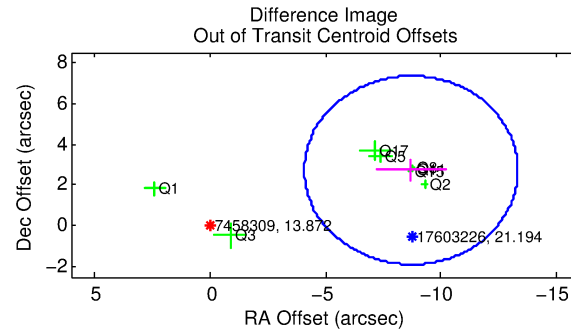
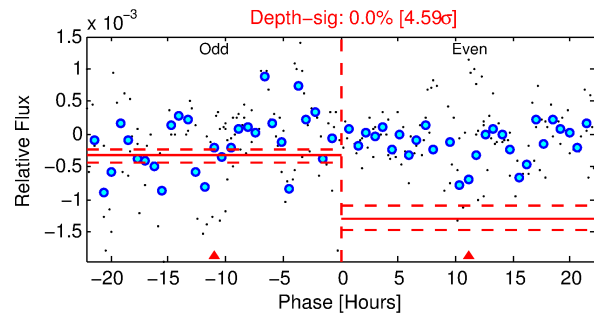
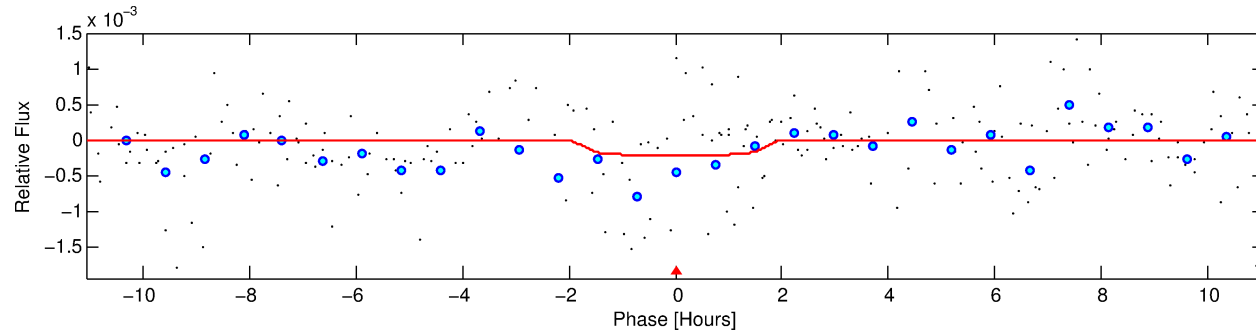
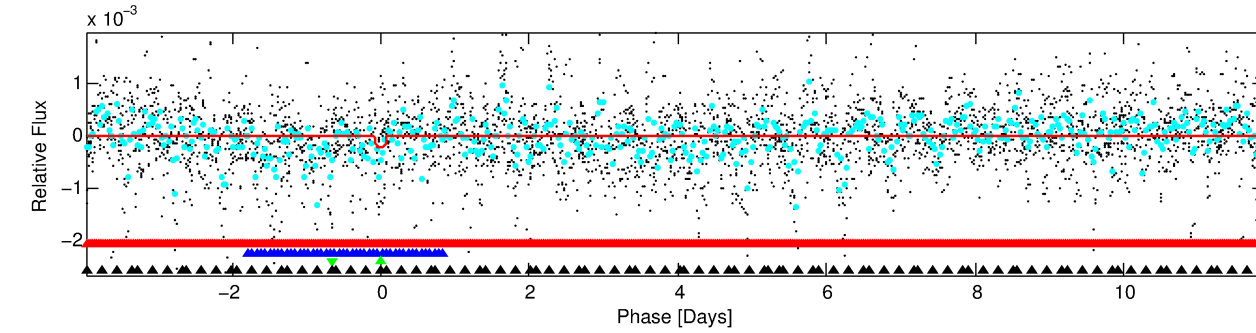
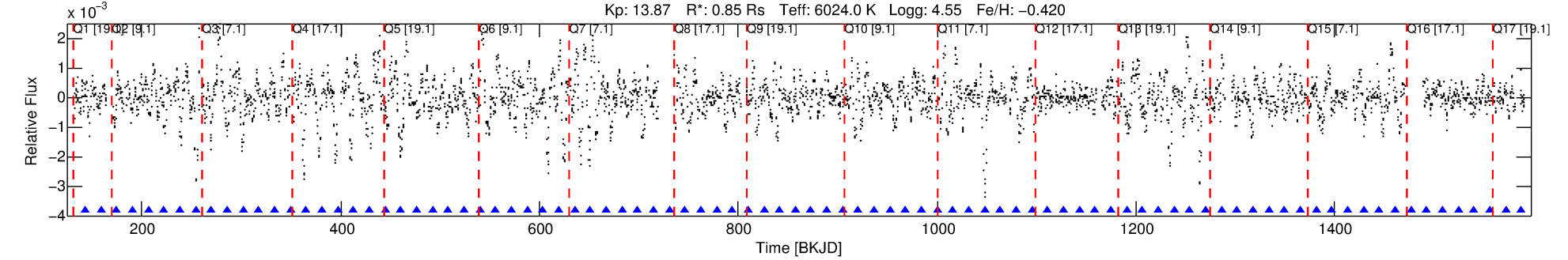


# DV One-Page Summary

KIC: 7458309 Candidate: 3 of 4 Period: 15.871 d

KOI: K03957 Corr: No Ephemeris Match

Kp: 13.87 R\*: 0.85 Rs Teff: 6024.0 K Logg: 4.55 Fe/H: -0.420



## DV Fit Results:

Period = 15.87082 [0.00026] d  
Epoch = 143.3362 [0.0158] BKJD  
Rp/R\* = 0.0155 [0.0153]  
a/R\* = 17.66 [89.56]  
b = 0.86 [1.52]  
Seff = 58.29 [21.78]  
Teq = 705 [66] K  
Rp = 1.44 [1.47] Re  
a = 0.1208 [0.0290] AU  
Ag = 2424.13 [4901.17] [0.49σ]  
Teffp = 7644 [3811] K [1.82σ]

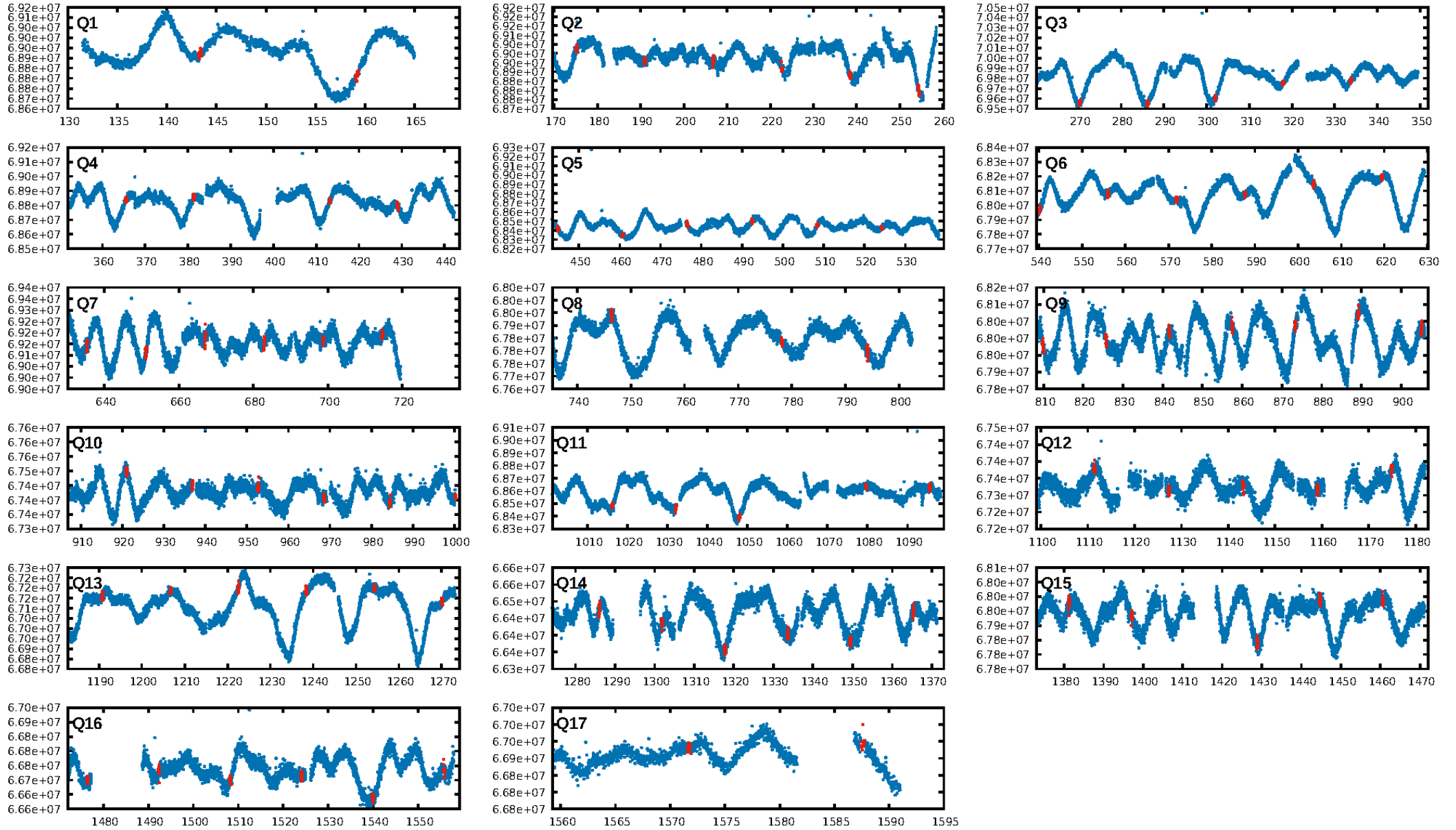
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [3.83σ]  
LongPeriod-sig: 100.0% [93.27σ]  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [26/26]  
GhostDiagnostic-chr: -0.9774  
Centroid-sig: N/A  
Centroid-so: 0.441 arcsec [0.85σ]  
OotOffset-rm: 9.121 arcsec [5.93σ]  
KicOffset-rm: 9.216 arcsec [5.73σ]  
OotOffset-st: 1/3/1/3 [8]  
KicOffset-st: 1/3/1/3 [8]  
DiffImageQuality-fgm: 0.50 [4/8]  
DiffImageOverlap-fno: 0.00 [0/17]

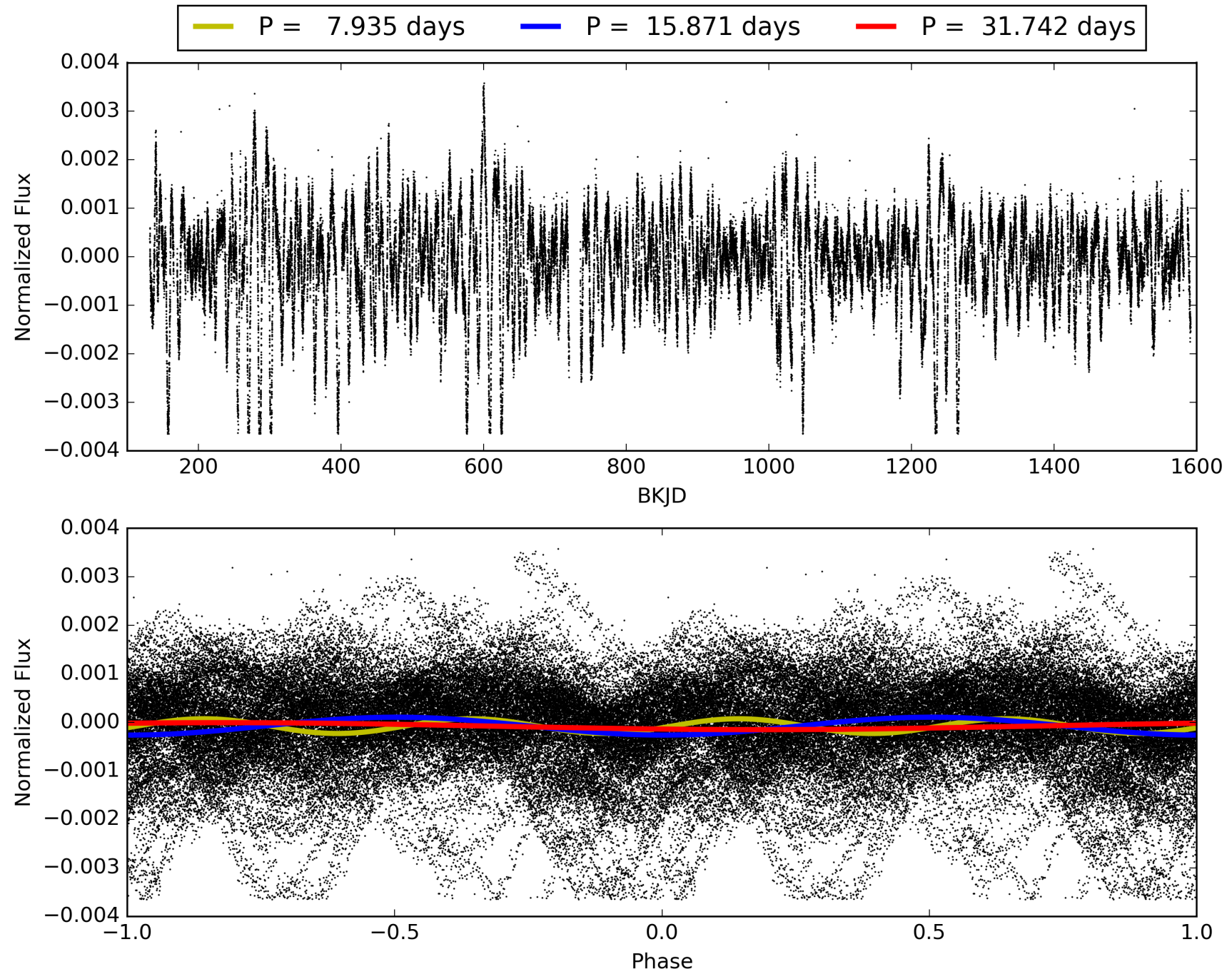
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 03-Feb-2016 09:08:43 Z

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

# TCE 007458309-03, PDC Light Curves

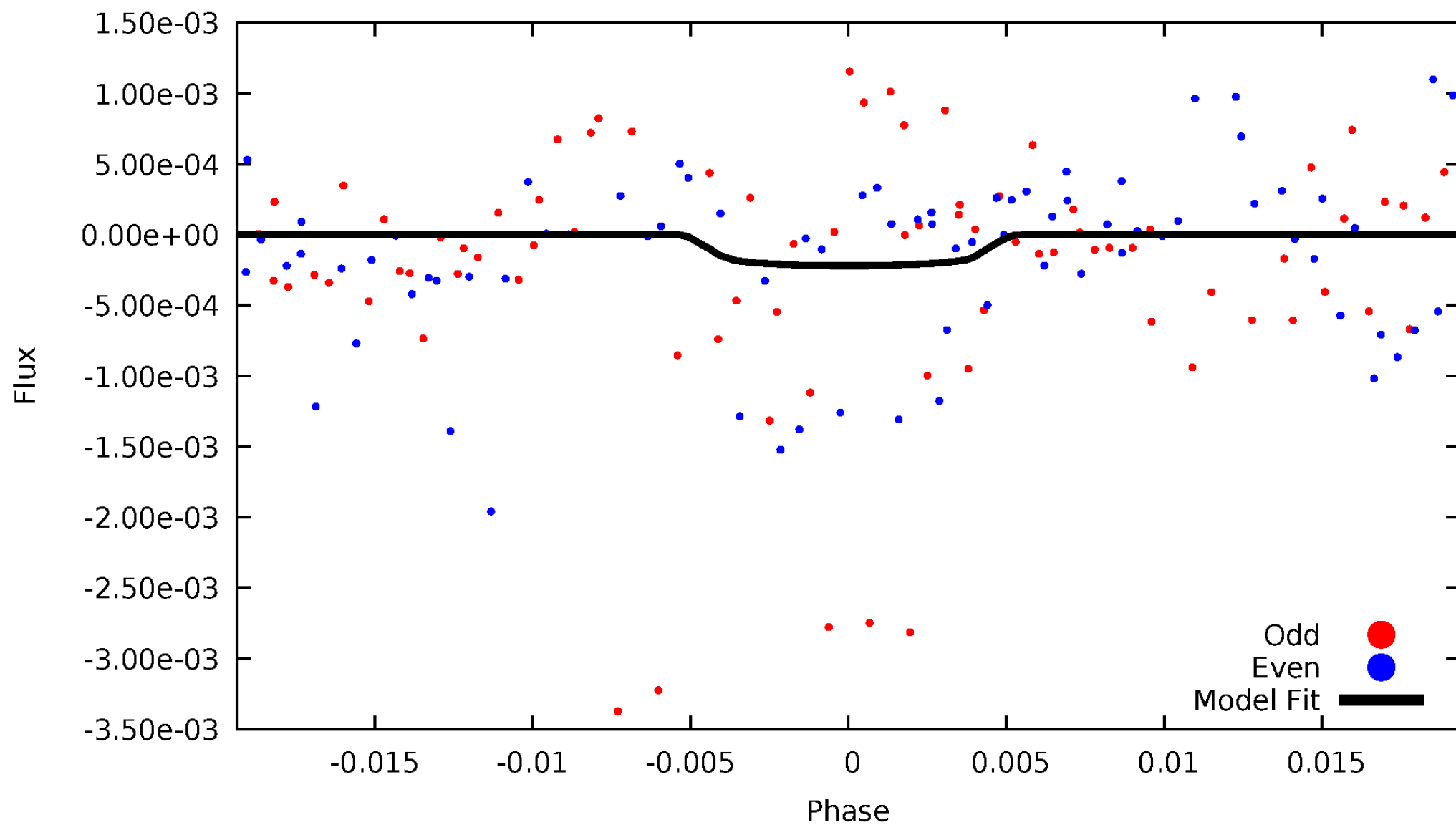


TCE 007458309-03



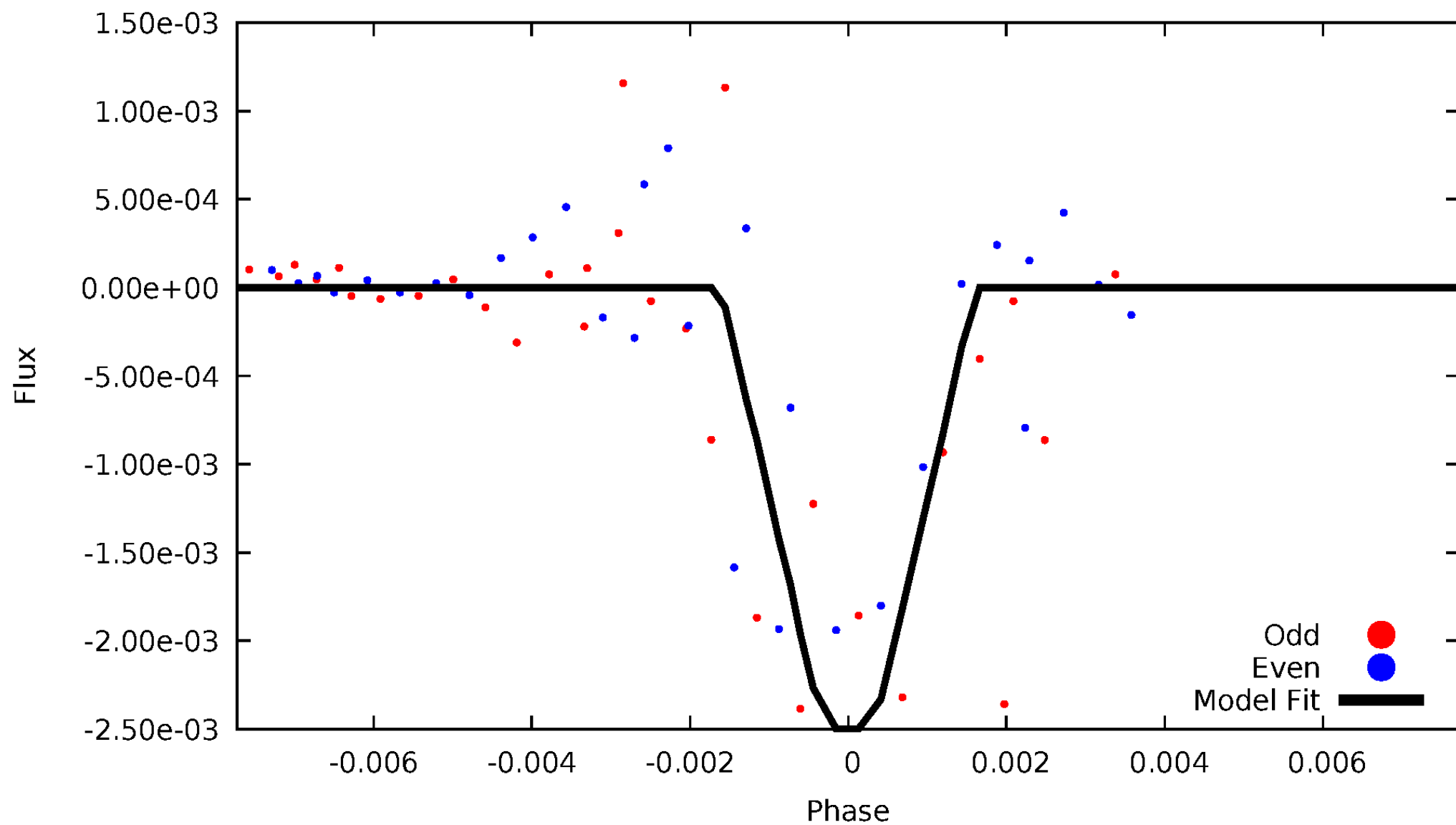
# DV Odd/Even

TCE 007458309-03



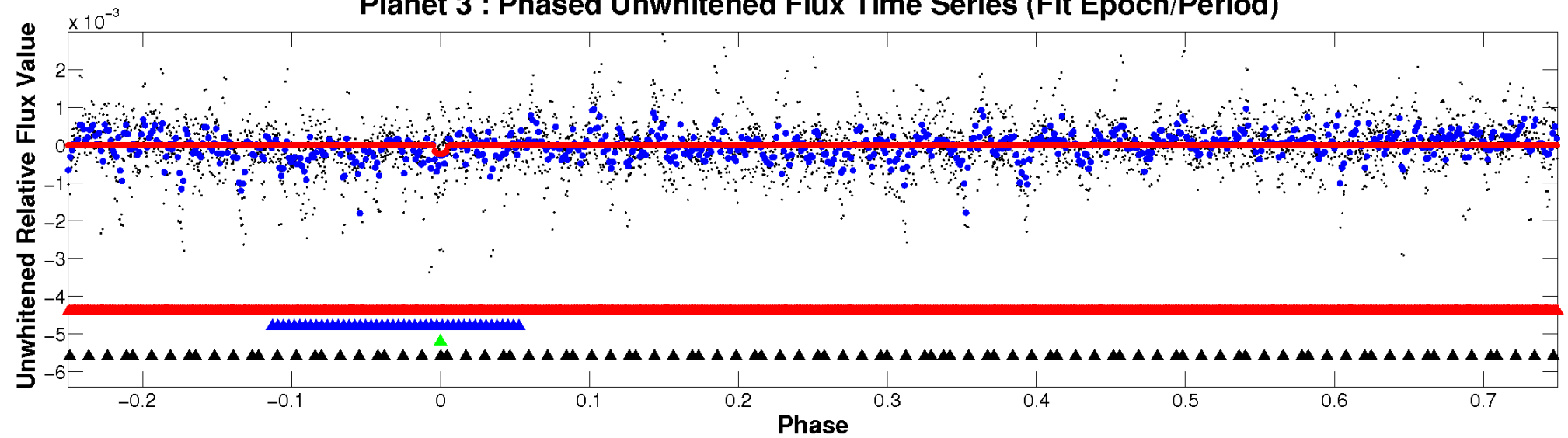
# ALT Odd/Even

TCE 007458309-03

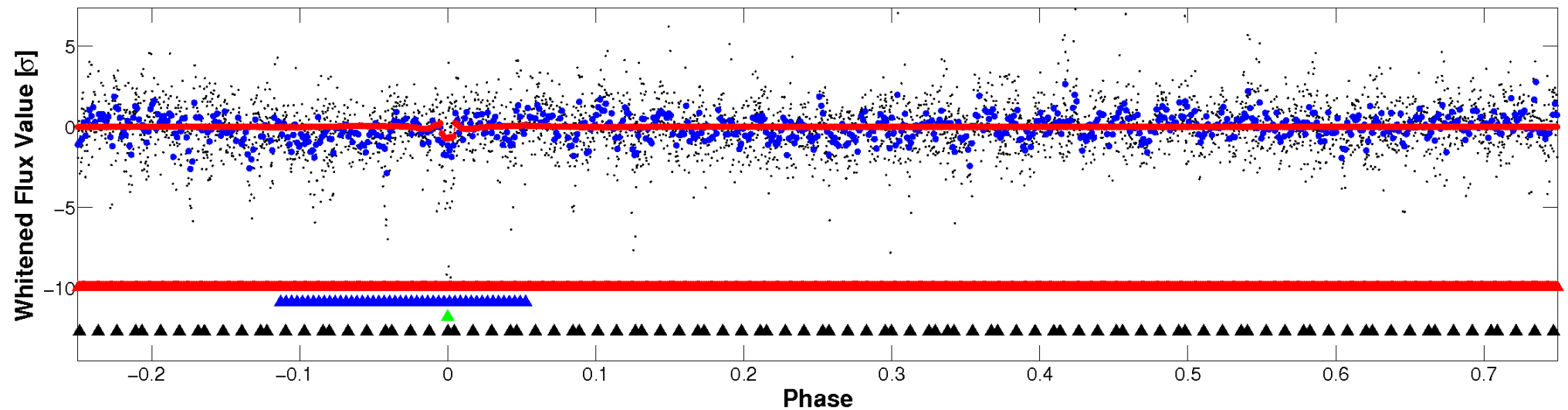


# Non-Whitened Vs. Whitened Light Curve

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



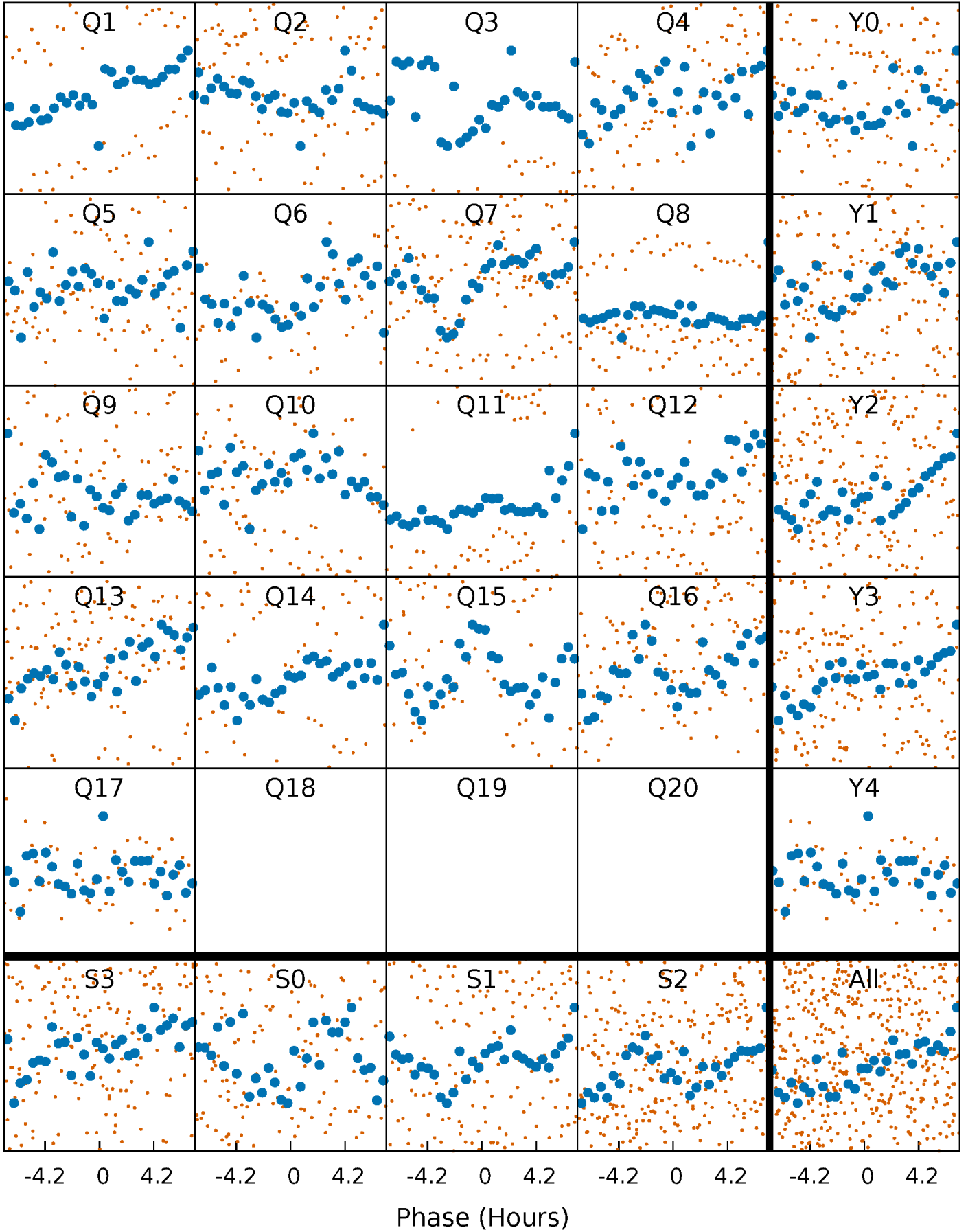
## Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)





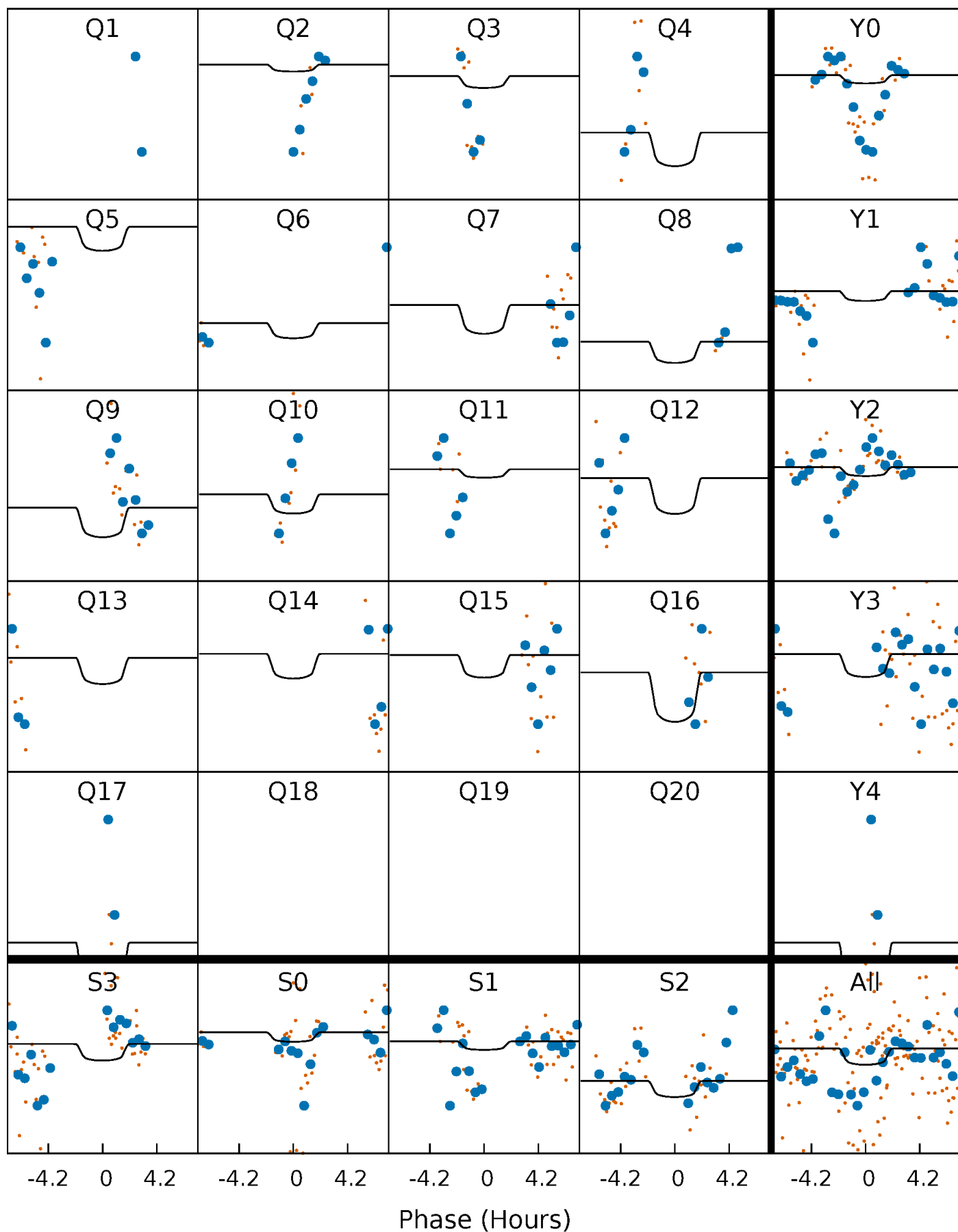
# PDC Quarter-Phased Transit Curves

TCE 007458309-03 P= 15.870817 Days  $T_0=143.336193$  (BKJD)



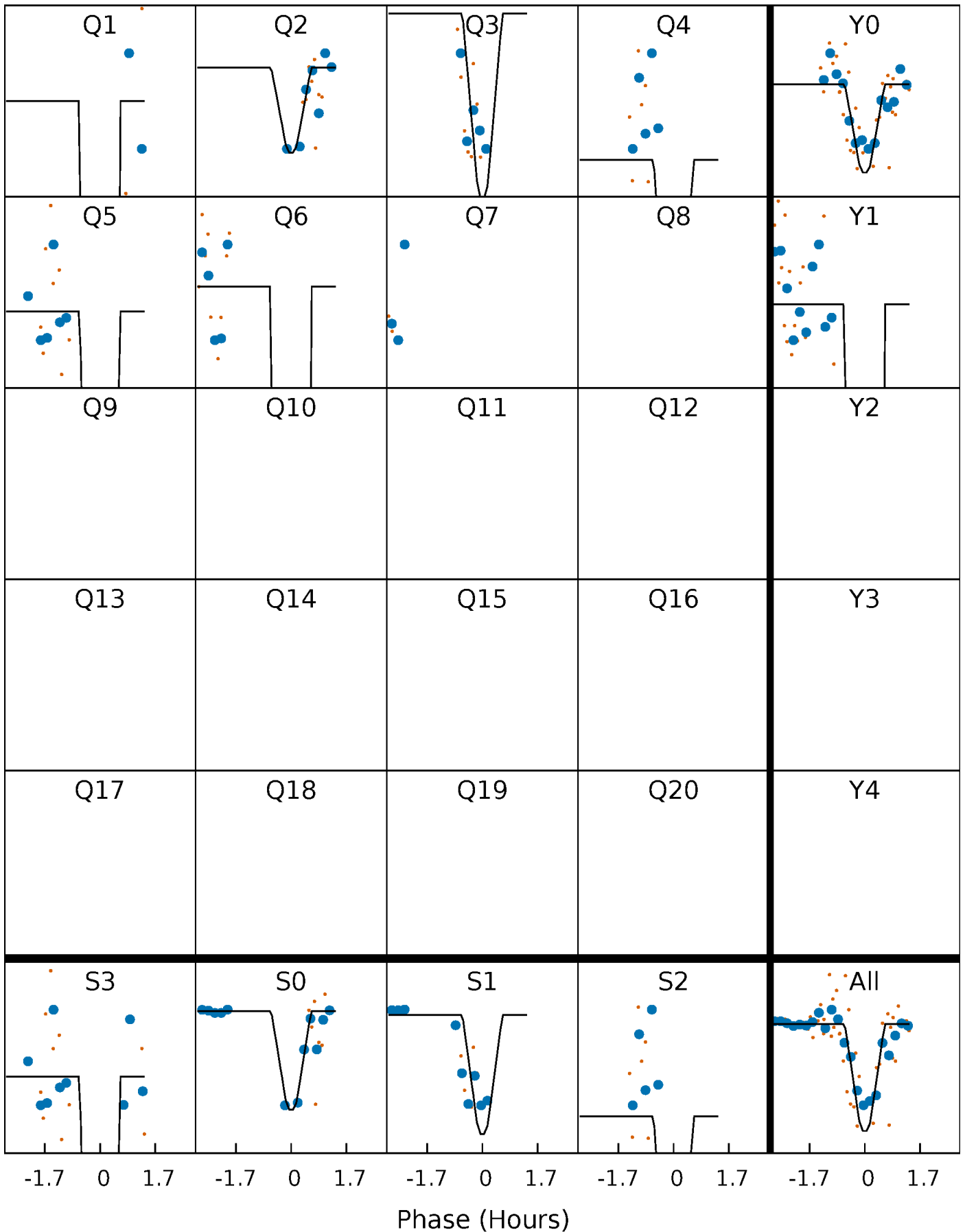
# DV Quarter-Phased Transit Curves

TCE 007458309-03 P= 15.870817 Days  $T_0=143.336193$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

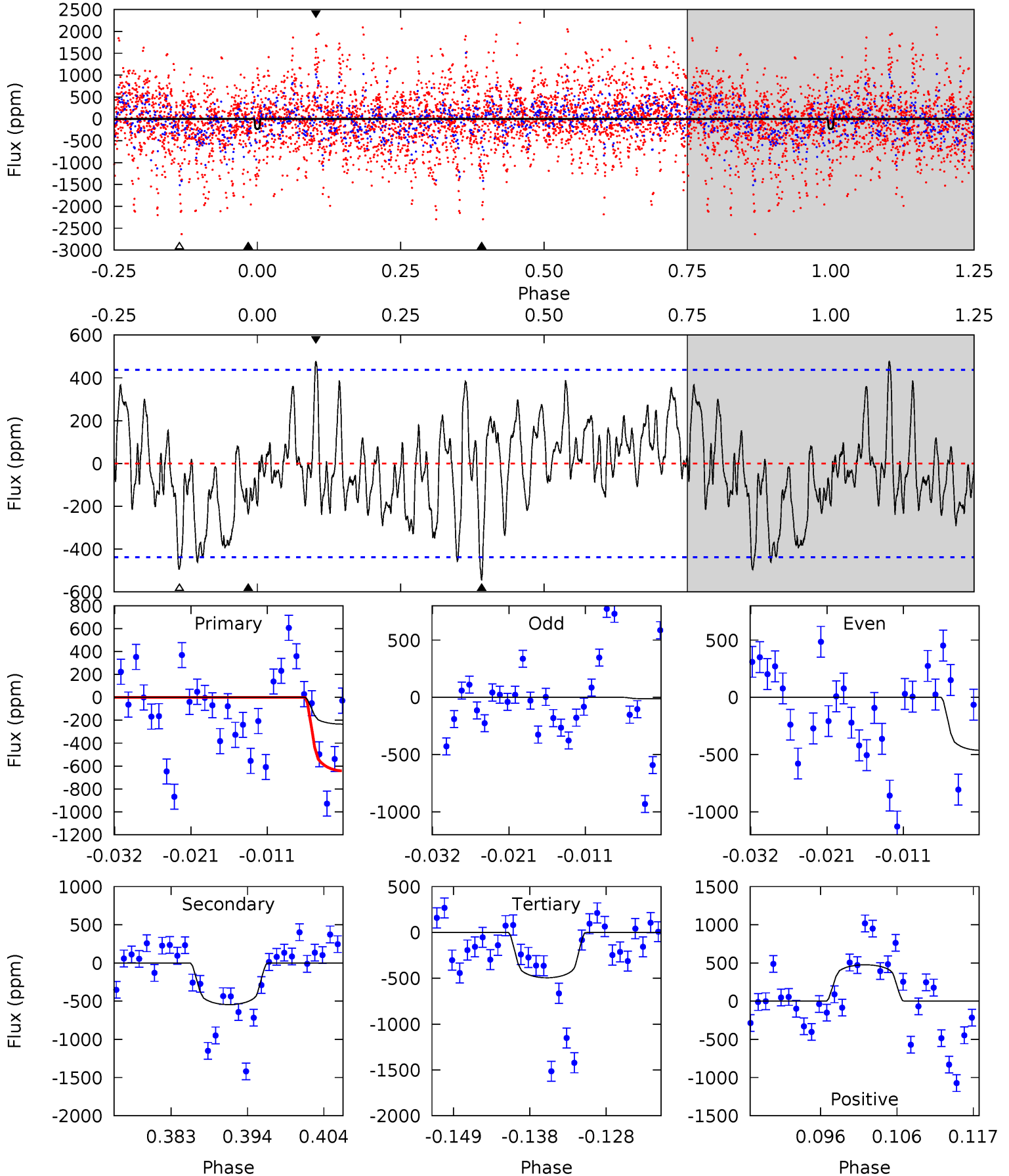
TCE 007458309-03   P= 15.860316 Days    $T_0=143.409513$  (BKJD)



# DV Model-Shift Uniqueness Test

007458309-03, P = 15.870817 Days, E = 127.465376 Days

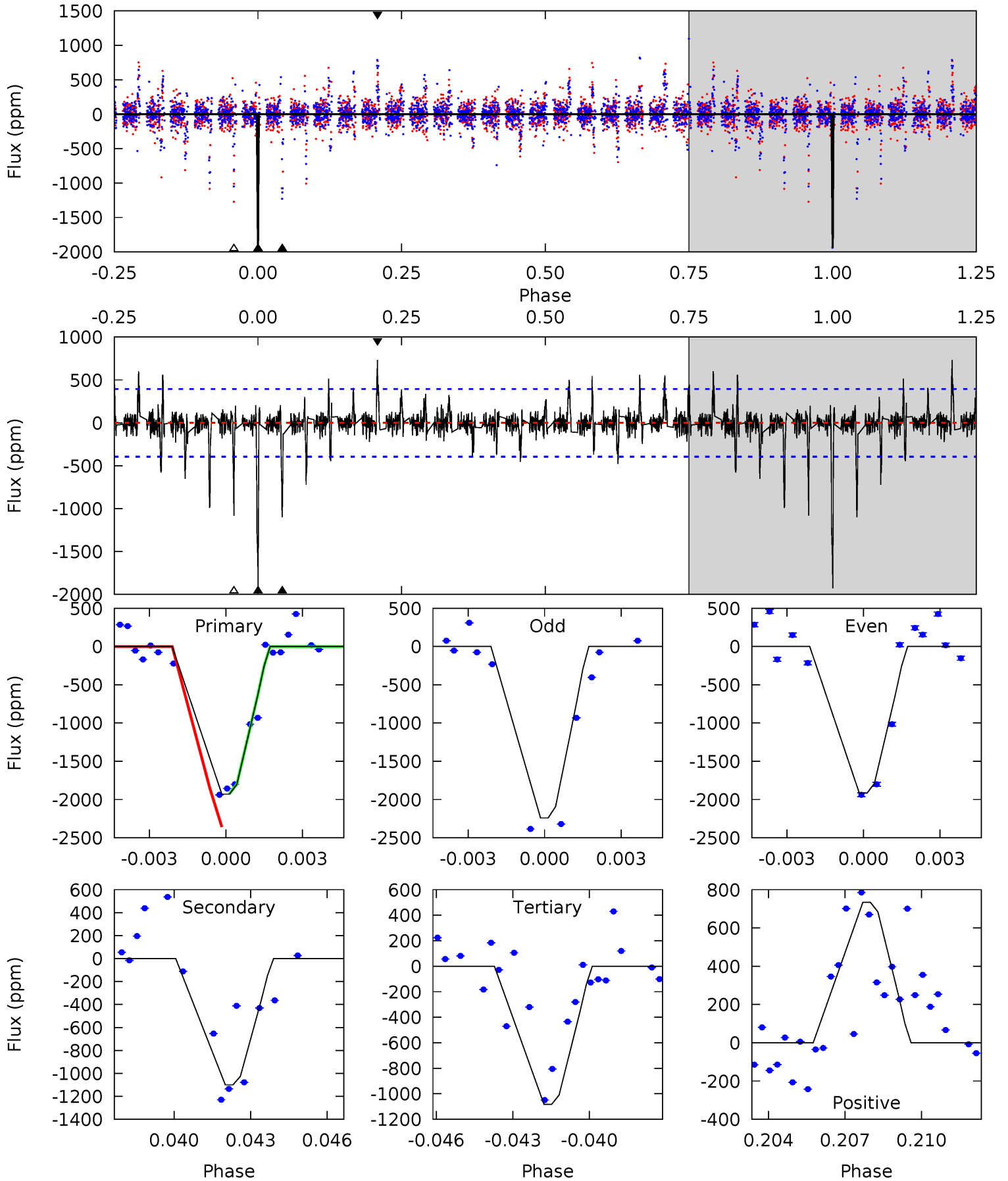
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
2.68	6.24	5.67	5.46	5.01	2.55	2.04	-2.99	-2.77	0.57	0.79	2.55	-17.5	0.47	3.37



# Alt Model-Shift Uniqueness Test

007458309-03, P = 15.860316 Days, E = 127.549197 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
25.7	14.7	14.4	9.78	5.26	2.98	1.69	11.3	15.9	0.23	4.88	2.18	1.07	0.28	2.96



### Stellar Parameters For KIC 007458309

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6024^{+161}_{-179}$	$4.550^{+0.046}_{-0.196}$	$-0.420^{+0.300}_{-0.300}$	$0.849^{+0.238}_{-0.074}$	$0.934^{+0.098}_{-0.109}$	$2.150^{+0.398}_{-1.059}$
	+3%/-3%	+1%/-4%	+71%/-71%	+28%/-9%	+10%/-12%	+19%/-49%
Source	PHO1	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 007458309-03 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-545 \pm 87$	$1.78^{+1.31}_{-1.09}$	$1005^{+66}_{-47}$	$6769^{+6538}_{-1527}$	$1321^{+8316}_{-871}$
Alt.	$-1100 \pm 75$	$4.91^{+1.62}_{-1.65}$	$1003^{+69}_{-45}$	$4946^{+960}_{-494}$	$363^{+434}_{-154}$

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

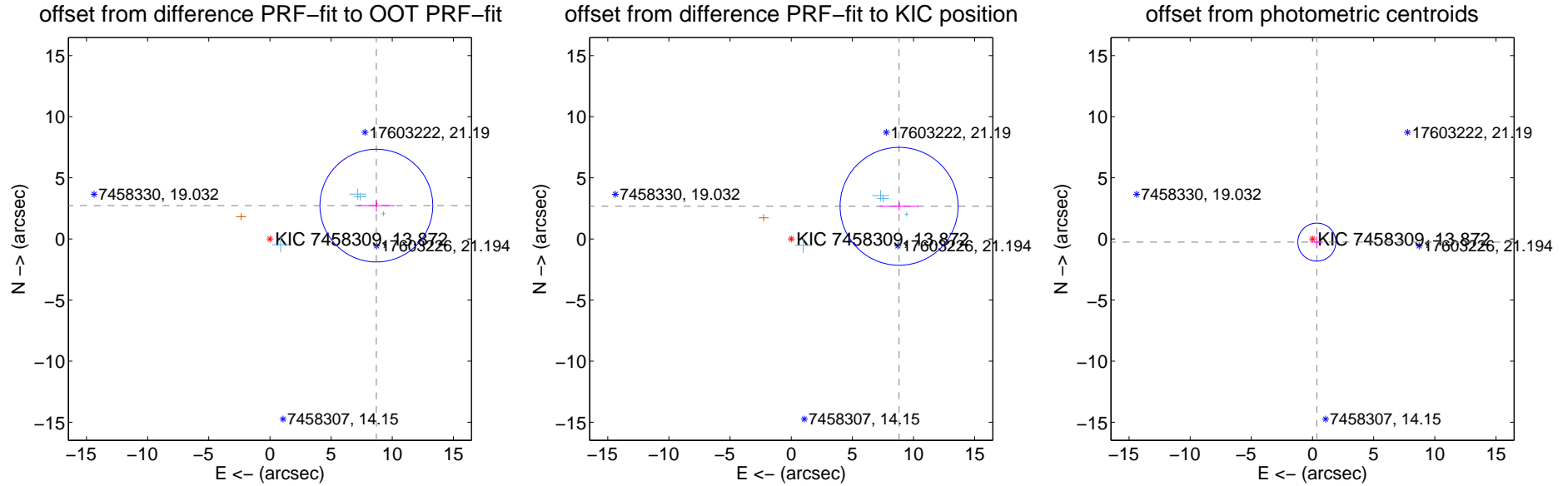
## DV Centroid Data

Supplemental centroid analysis for 007458309-03. Kepler magnitude: 13.87. Transit SNR 3.92

There are 4 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.18 arcsec

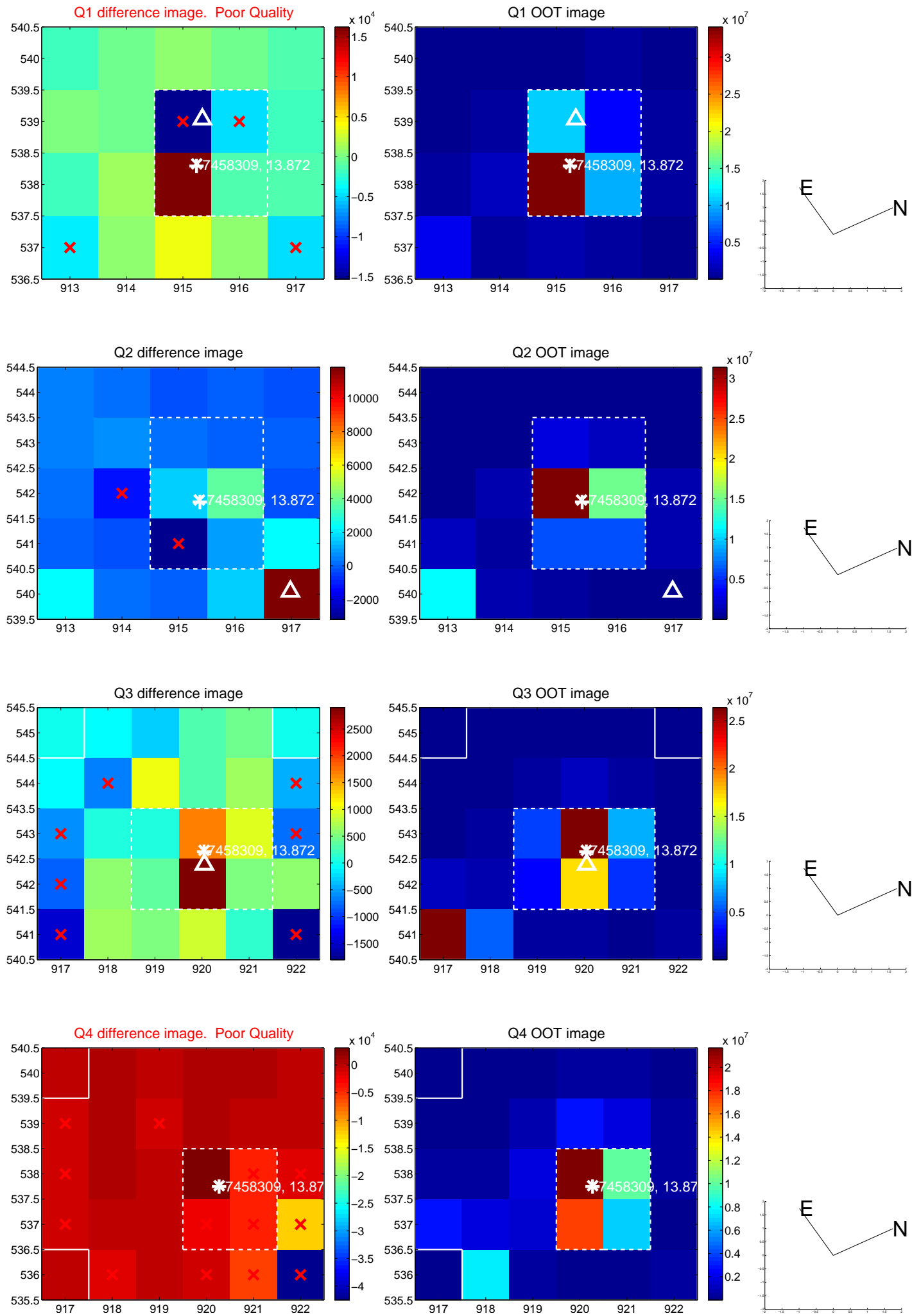
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	<b>9.121 <math>\pm</math> 1.538</b>	<b>5.93</b>	-8.704 $\pm$ 1.500	2.726 $\pm$ 0.491
PRF-fit source offset from KIC position	<b>9.216 <math>\pm</math> 1.608</b>	<b>5.73</b>	-8.821 $\pm$ 1.614	2.669 $\pm$ 0.346
photometric centroid source offset	0.44 $\pm$ 0.52	0.85	-0.36 $\pm$ 0.53	-0.26 $\pm$ 0.50



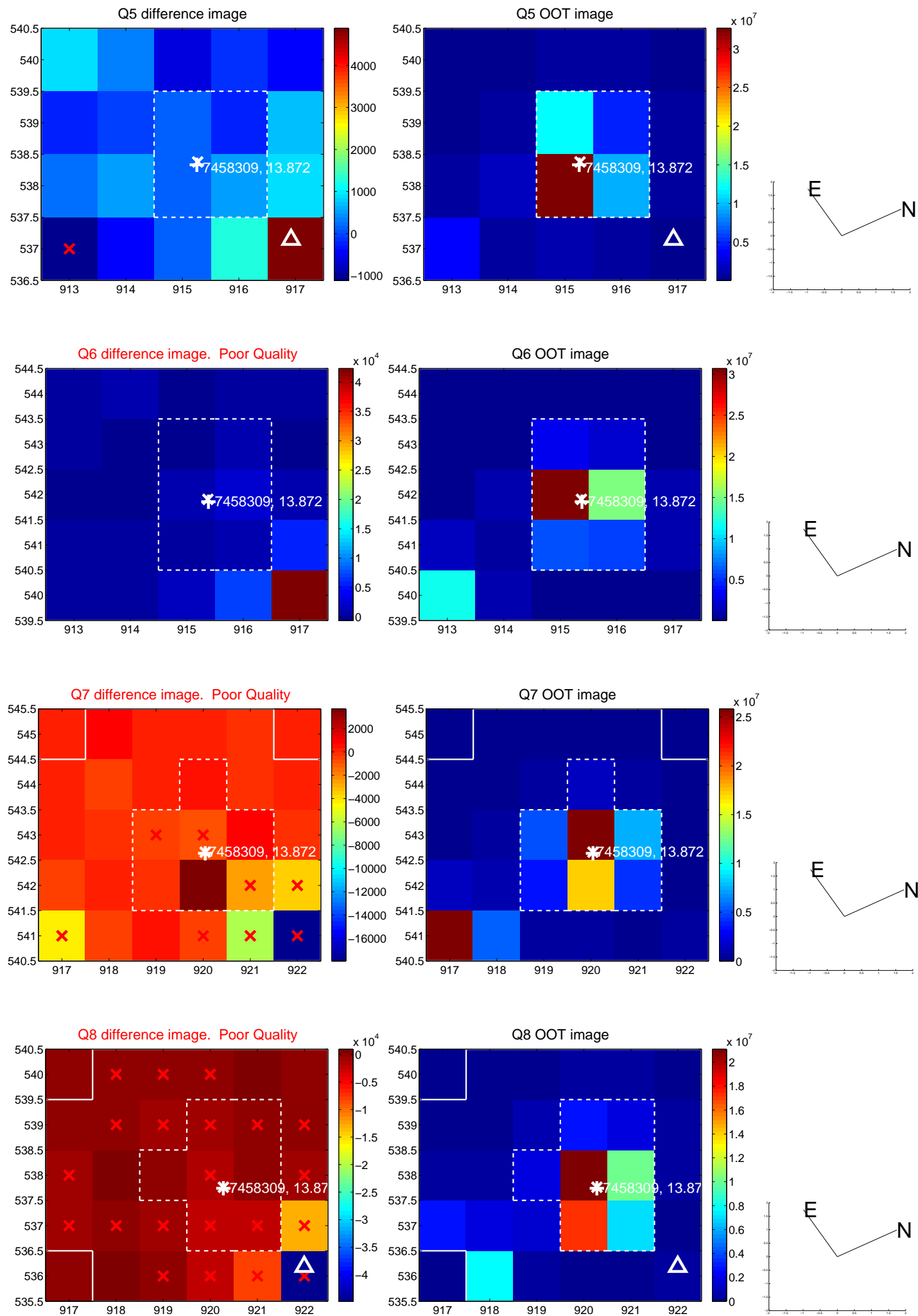
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



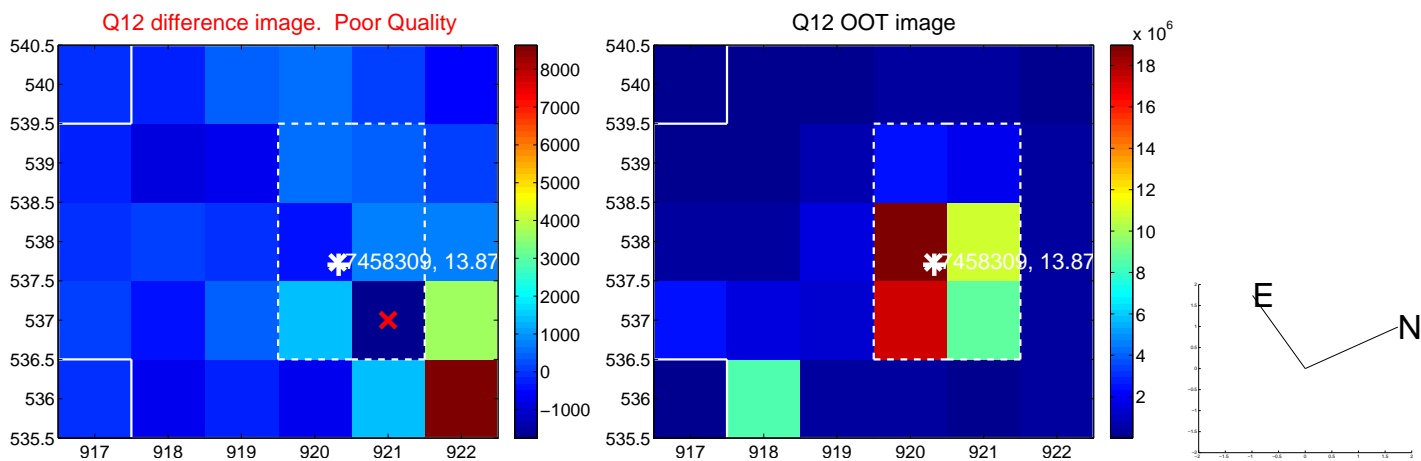
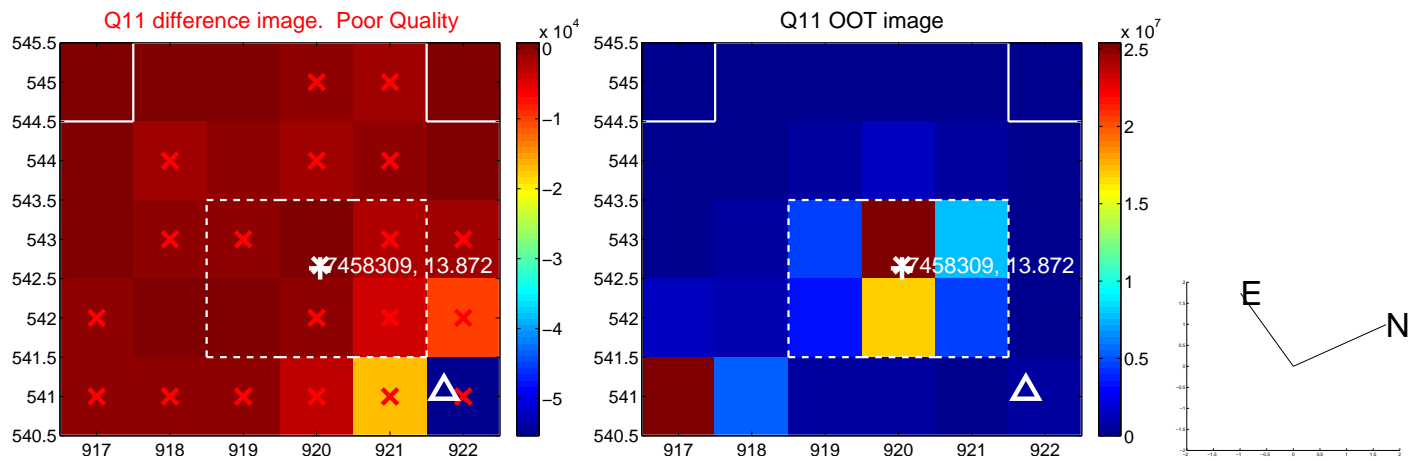
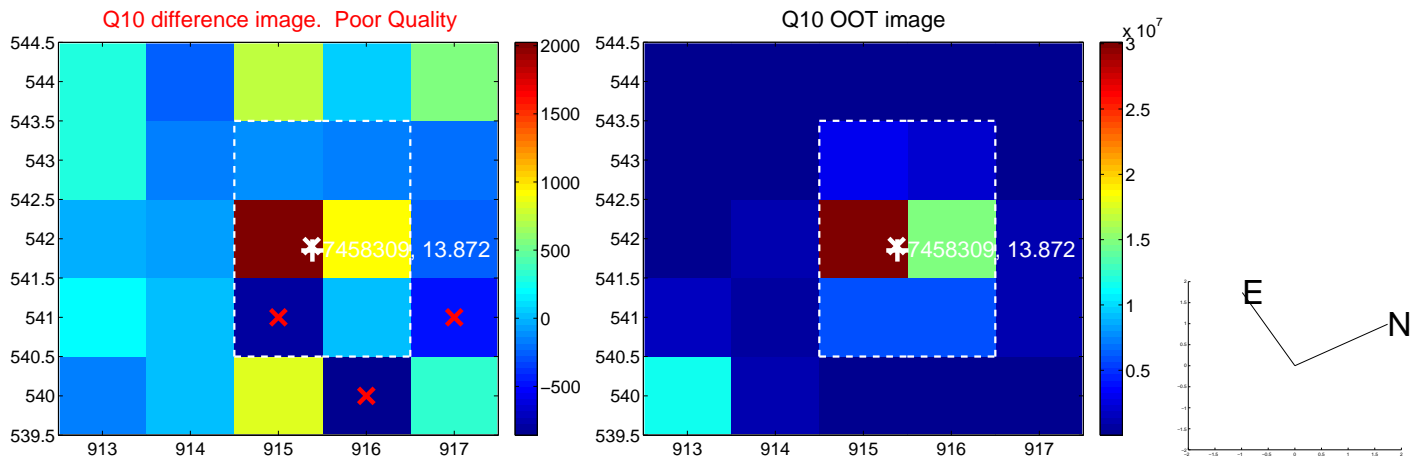
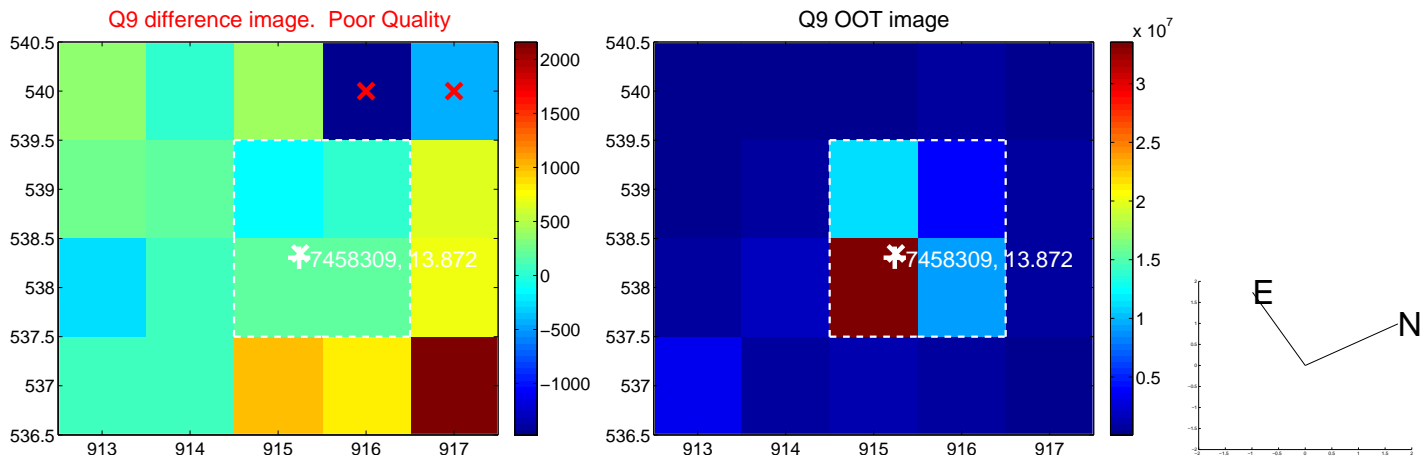
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



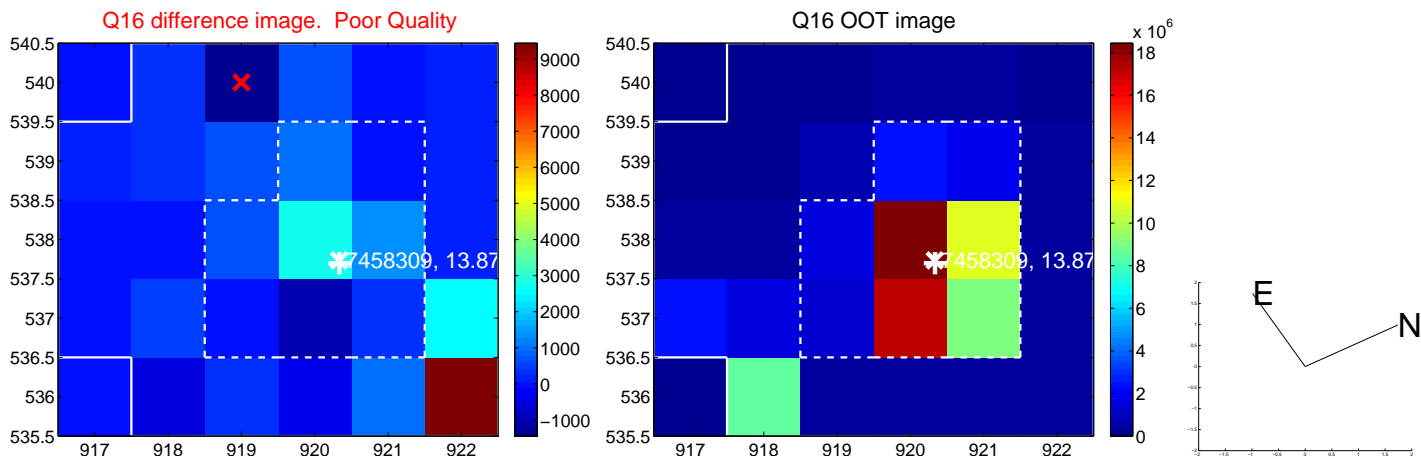
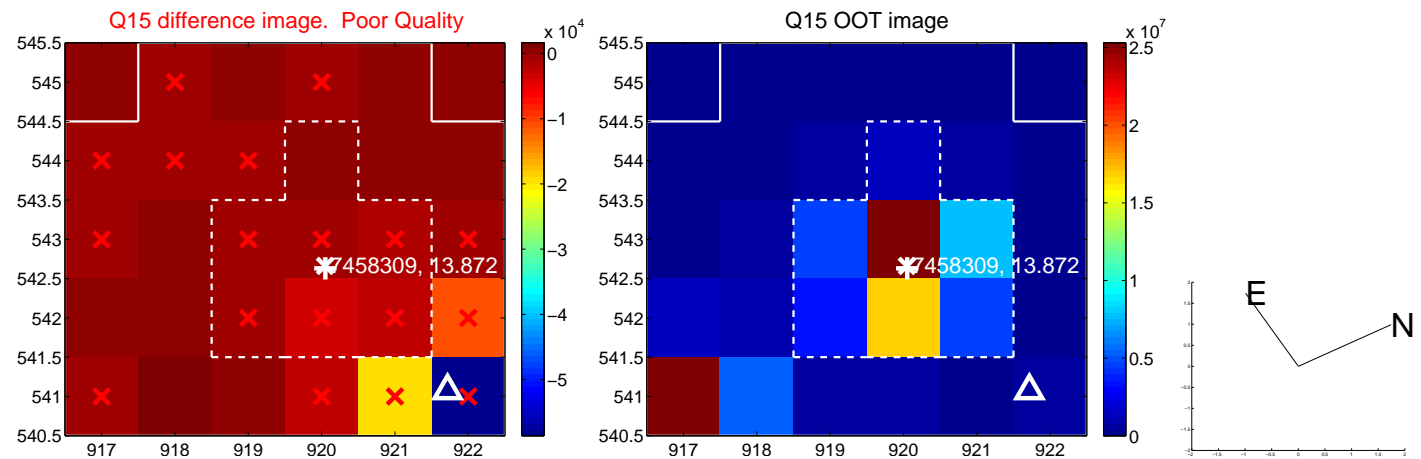
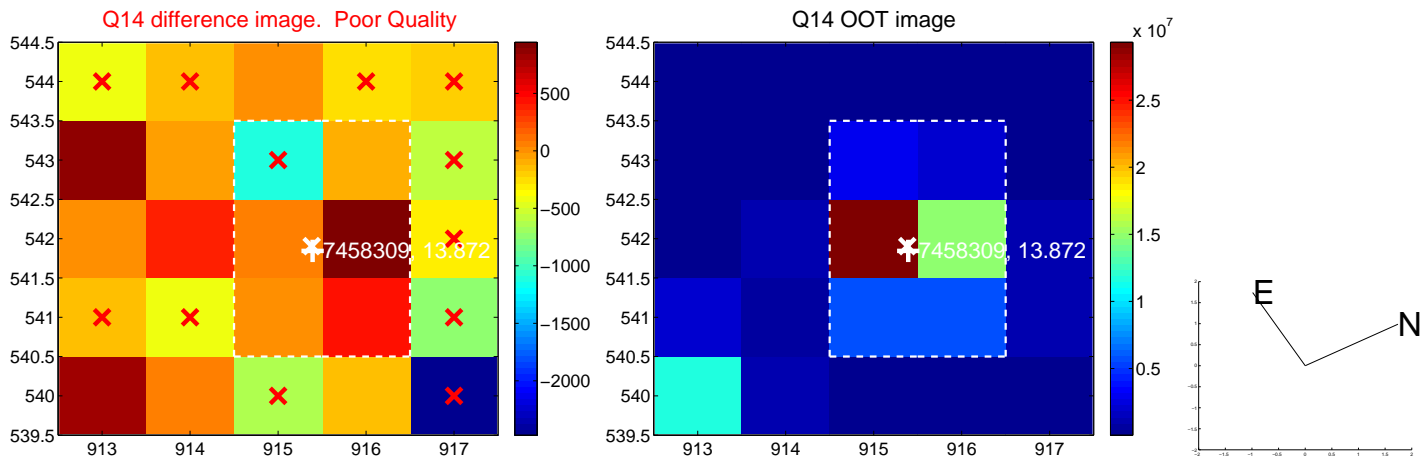
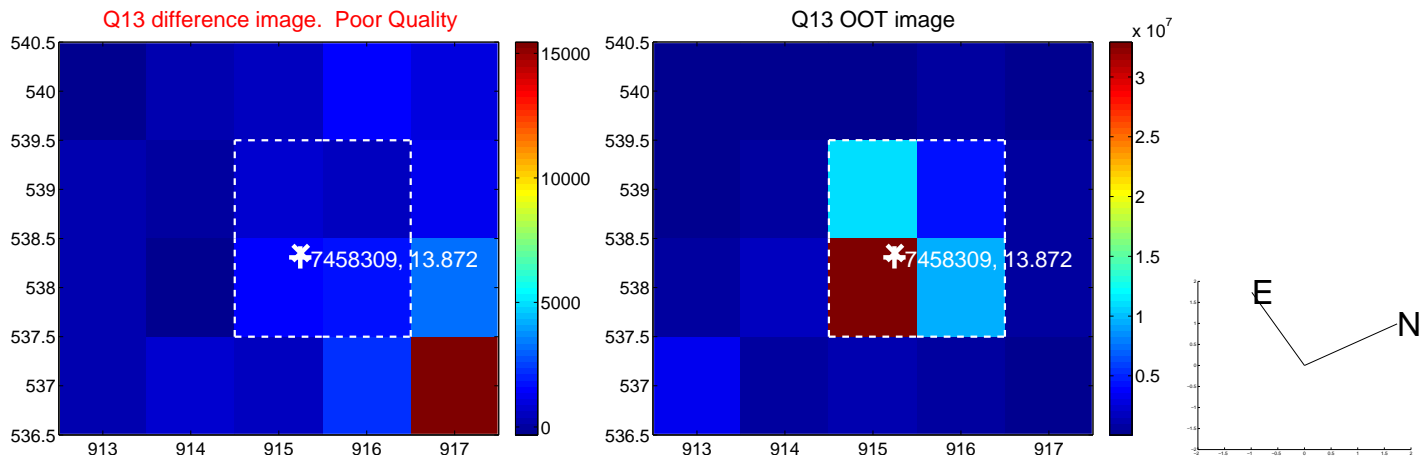
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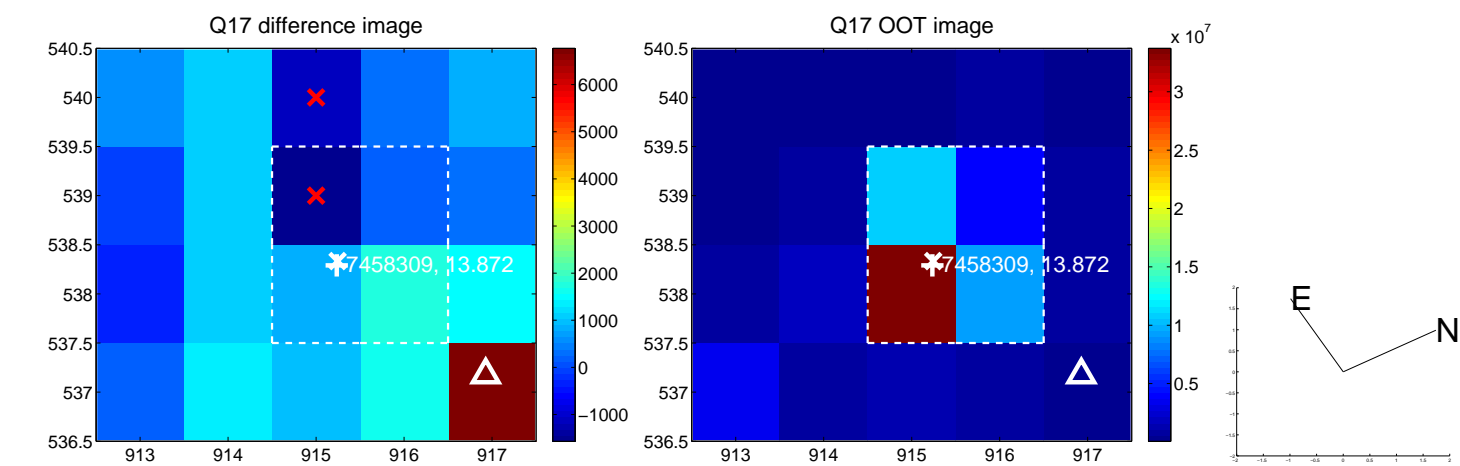
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



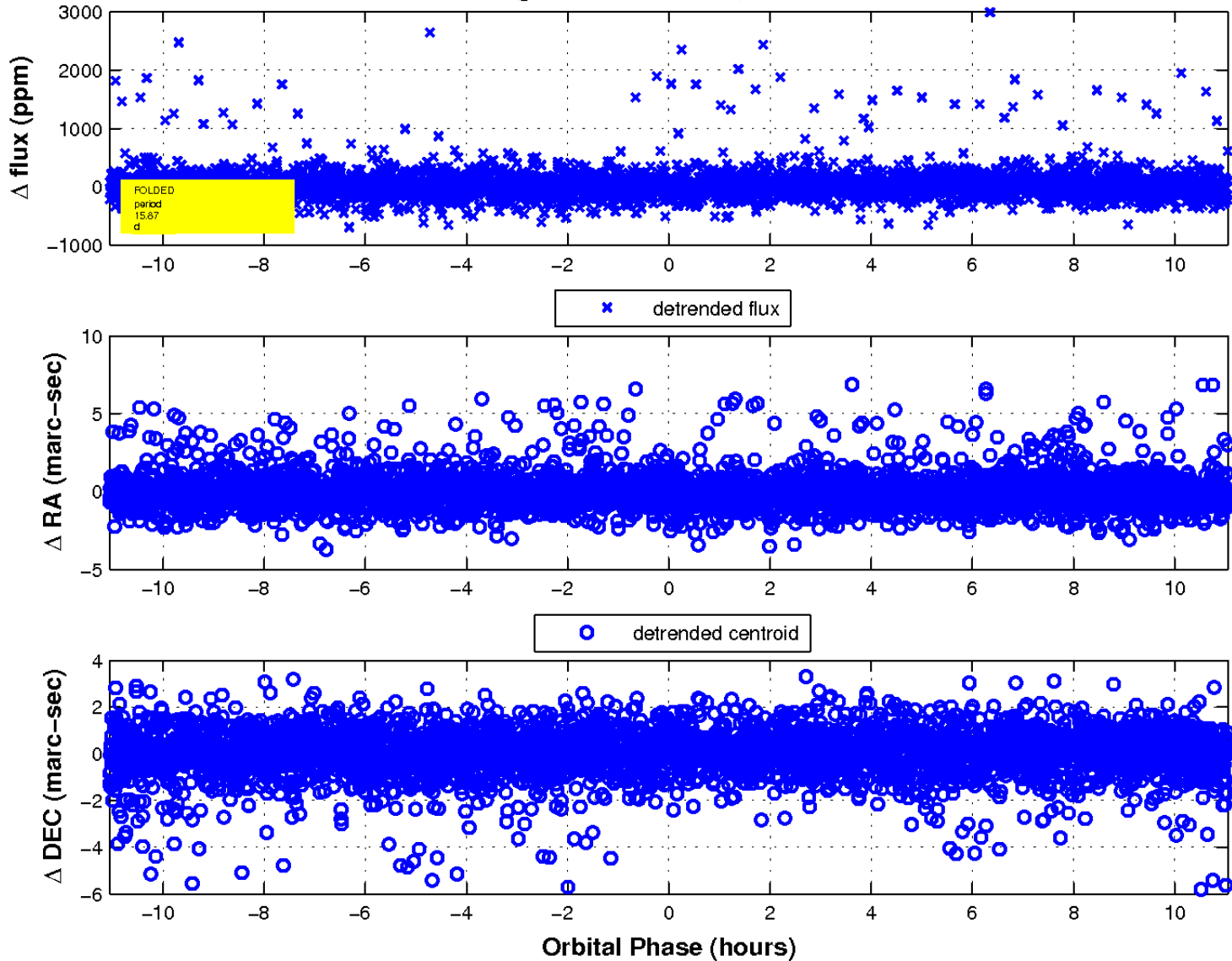
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

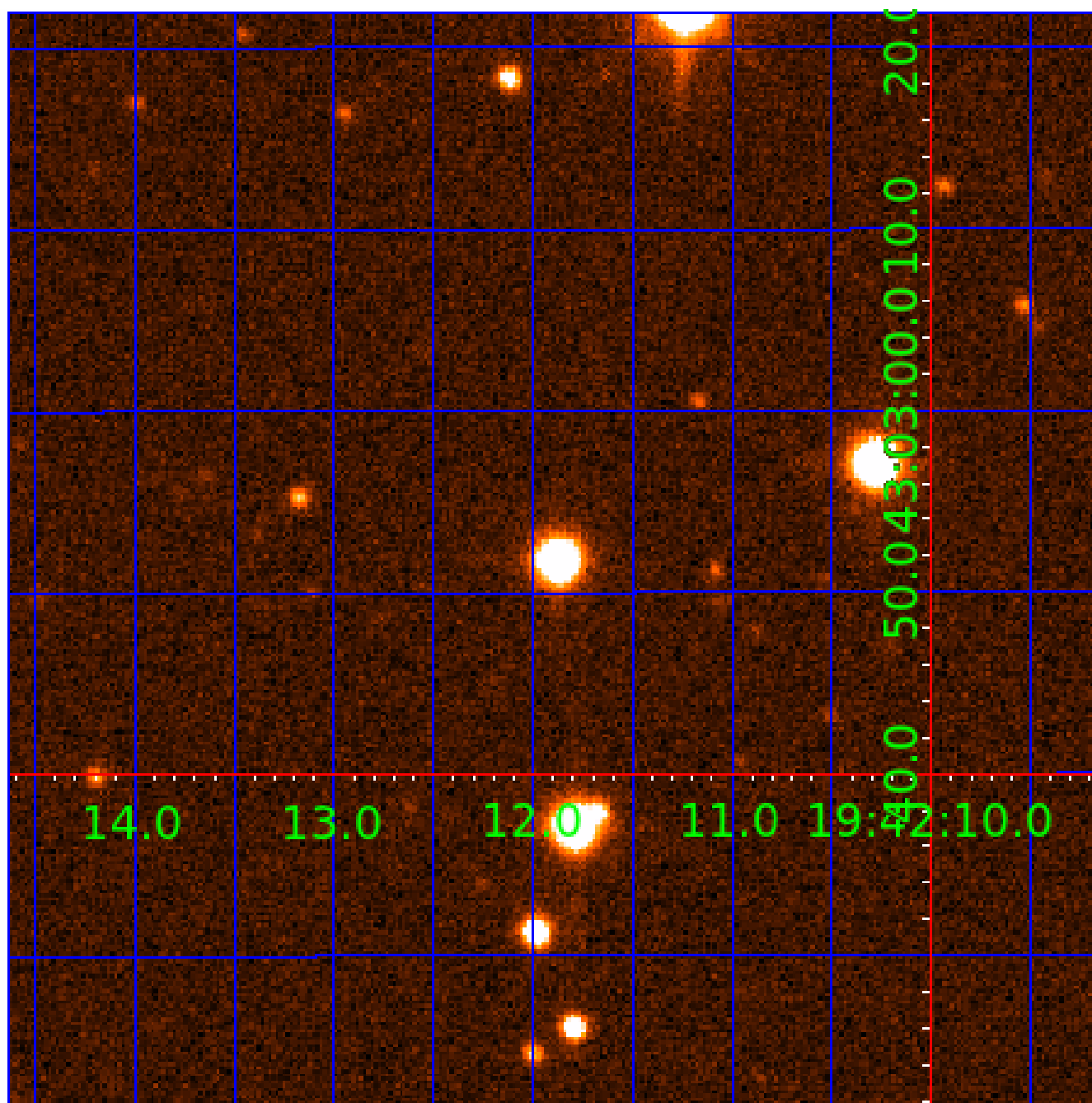


fluxWeightedCentroids, Planet 3 of 4



UKIRT Image

Declination



# KIC 007458309

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
007458309-01	OBS	3957.01	0.660630	131.895666	25.5	4.784	19.0	13.0	0.85	6024	0.43	4040.43
007458309-02	OBS	No	31.683274	160.042939	1644.2	1.723	17.2	12.7	0.85	6024	3.45	23.19
007458309-03	OBS	No	15.870817	143.336192	219.8	3.686	17.6	3.9	0.85	6024	1.44	58.29
007458309-04	OBS	No	15.201166	132.825777	664.0	2.000	11.4	-1.0	0.85	6024	2.19	61.74

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
007458309-01	OBS	FP	0.00	1	0	1	1	LPP_DV—CENT_RESOLVED_OFFSET—HALO_GHOST—EPHEM_MATCH
007458309-02	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—CENT_RESOLVED_OFFSET
007458309-03	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_RESOLVED_OFFSET
007458309-04	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—CENT_NOFITS

**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 007458309-04

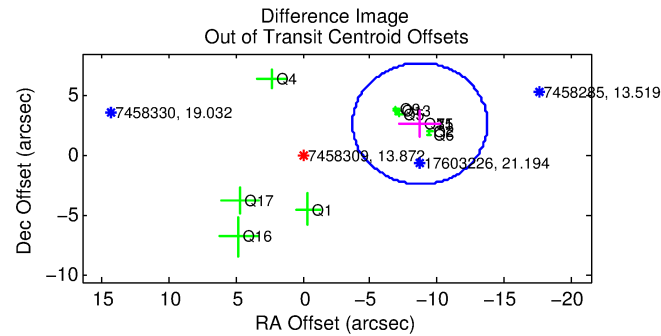
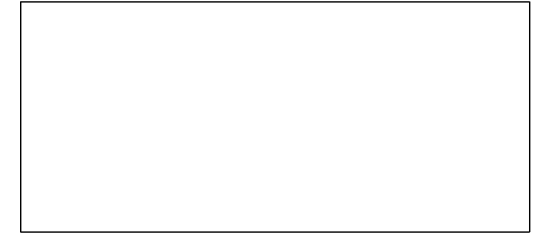
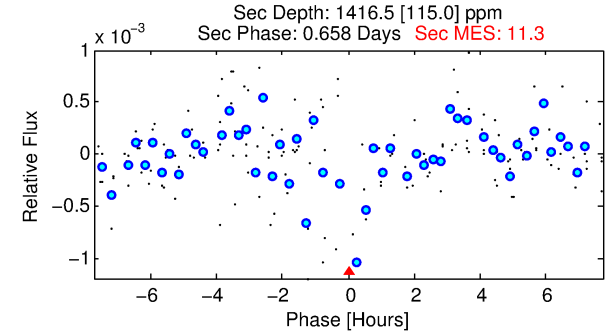
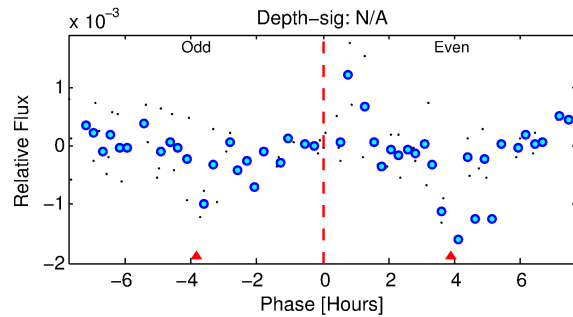
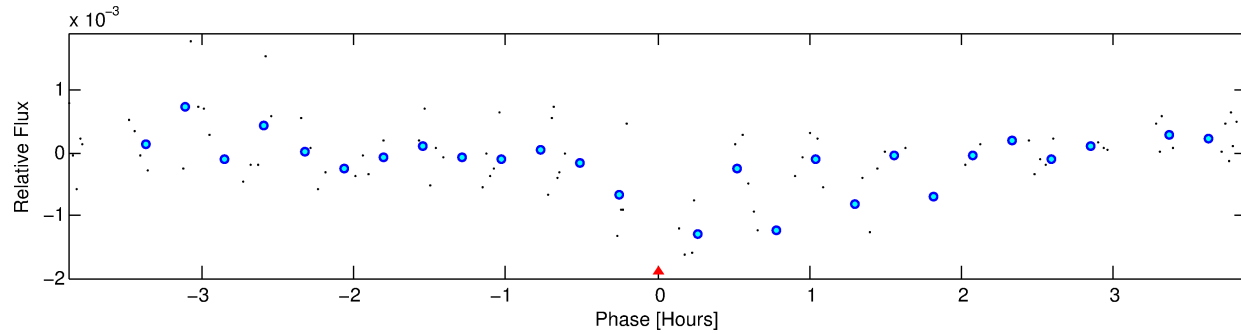
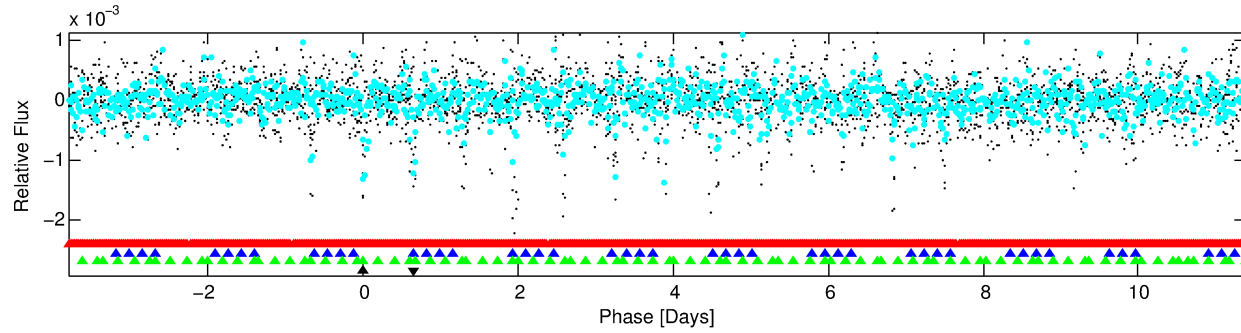
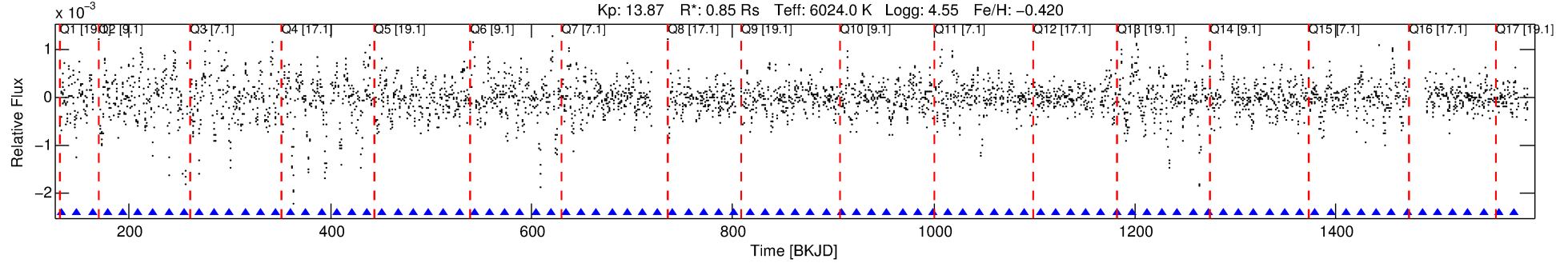
No Significant Match Found



# DV One-Page Summary

KIC: 7458309 Candidate: 4 of 4 Period: 15.201 d  
KOI: K03957 Corr: No Ephemeris Match

Kp: 13.87 R\*: 0.85 Rs Teff: 6024.0 K Logg: 4.55 Fe/H: -0.420



TPS TCE Results:

Period = 15.20117 d  
Epoch = 132.8258 BKJD

DV fit results are unavailable

DV Diagnostic Results:

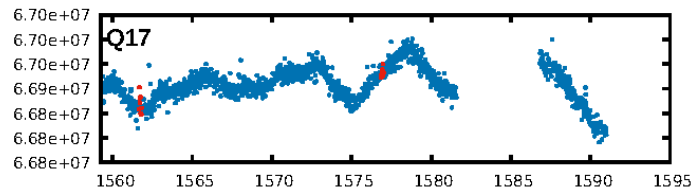
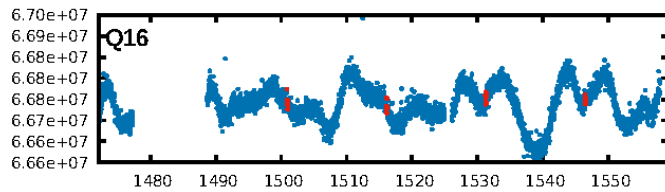
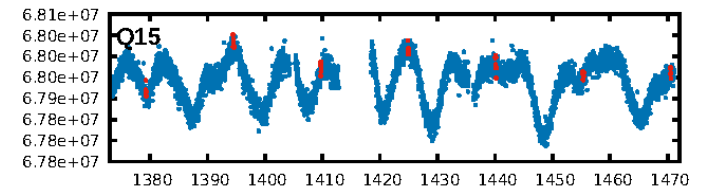
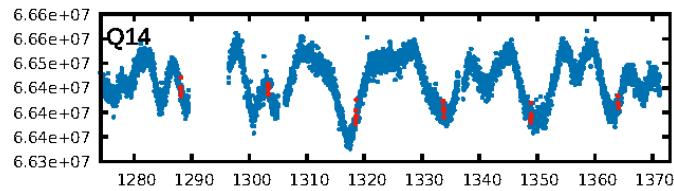
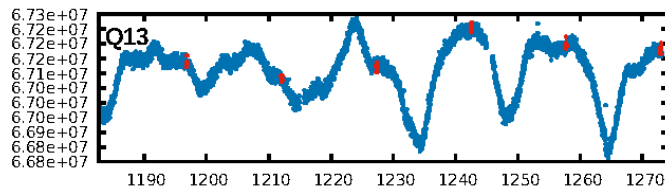
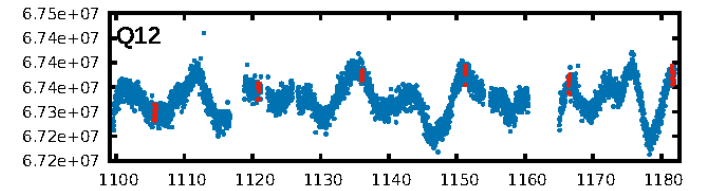
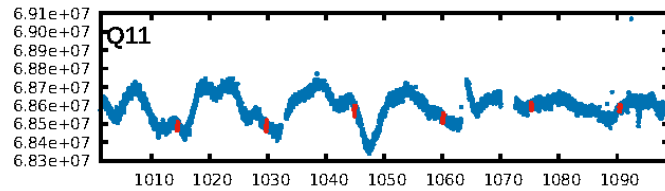
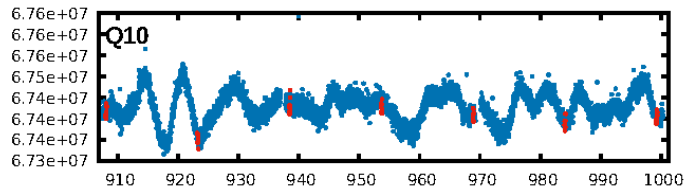
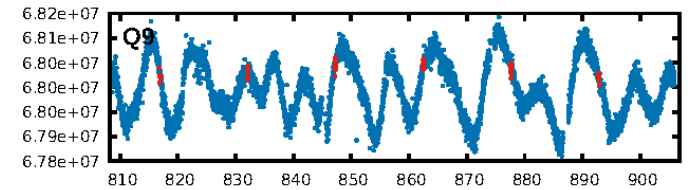
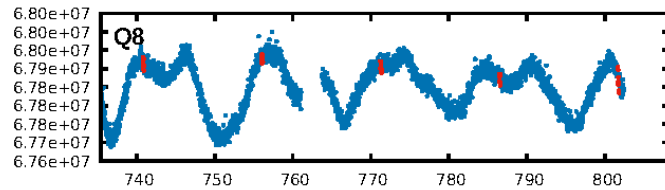
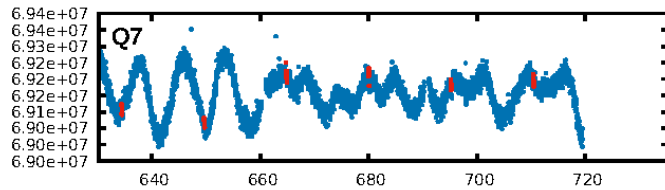
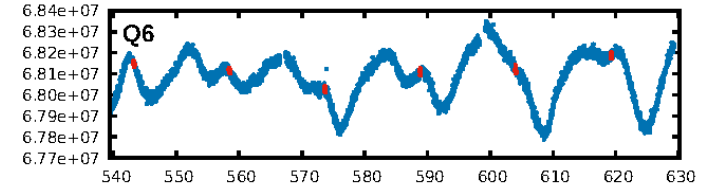
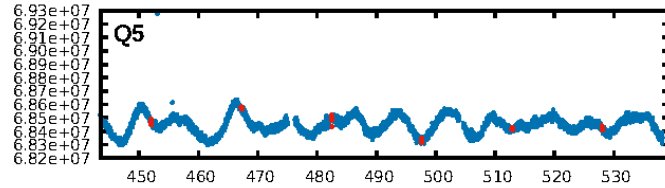
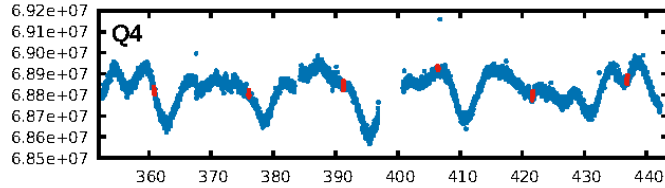
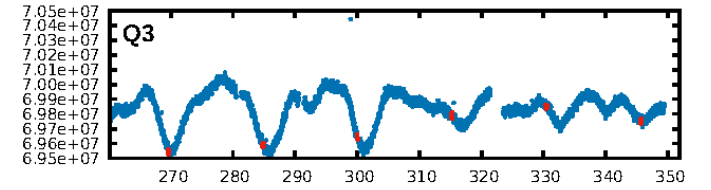
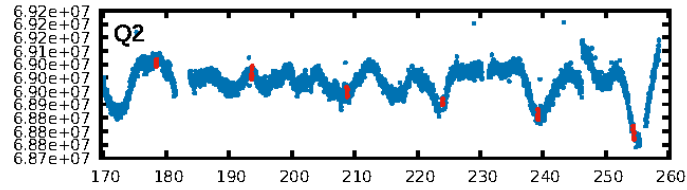
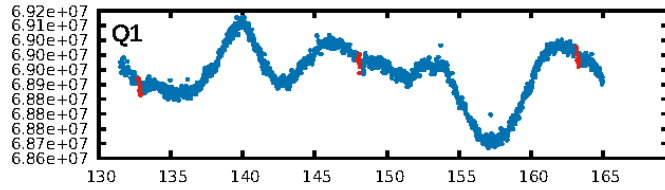
ShortPeriod-sig: 100.0% [67.30σ]  
LongPeriod-sig: 100.0% [3.83σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [13/13]  
GhostDiagnostic-chr: -0.4907

Centroid-sig: N/A  
Centroid-so: 0.563 arcsec [7.52σ]  
OotOffset-rm: 9.134 arcsec [5.44σ]  
KicOffset-rm: 9.232 arcsec [5.66σ]  
OotOffset-st: 2/4/2/5 [13]  
KicOffset-st: 2/4/2/5 [13]  
DiffImageQuality-fgm: 0.31 [4/13]  
DiffImageOverlap-fno: 0.06 [1/17]

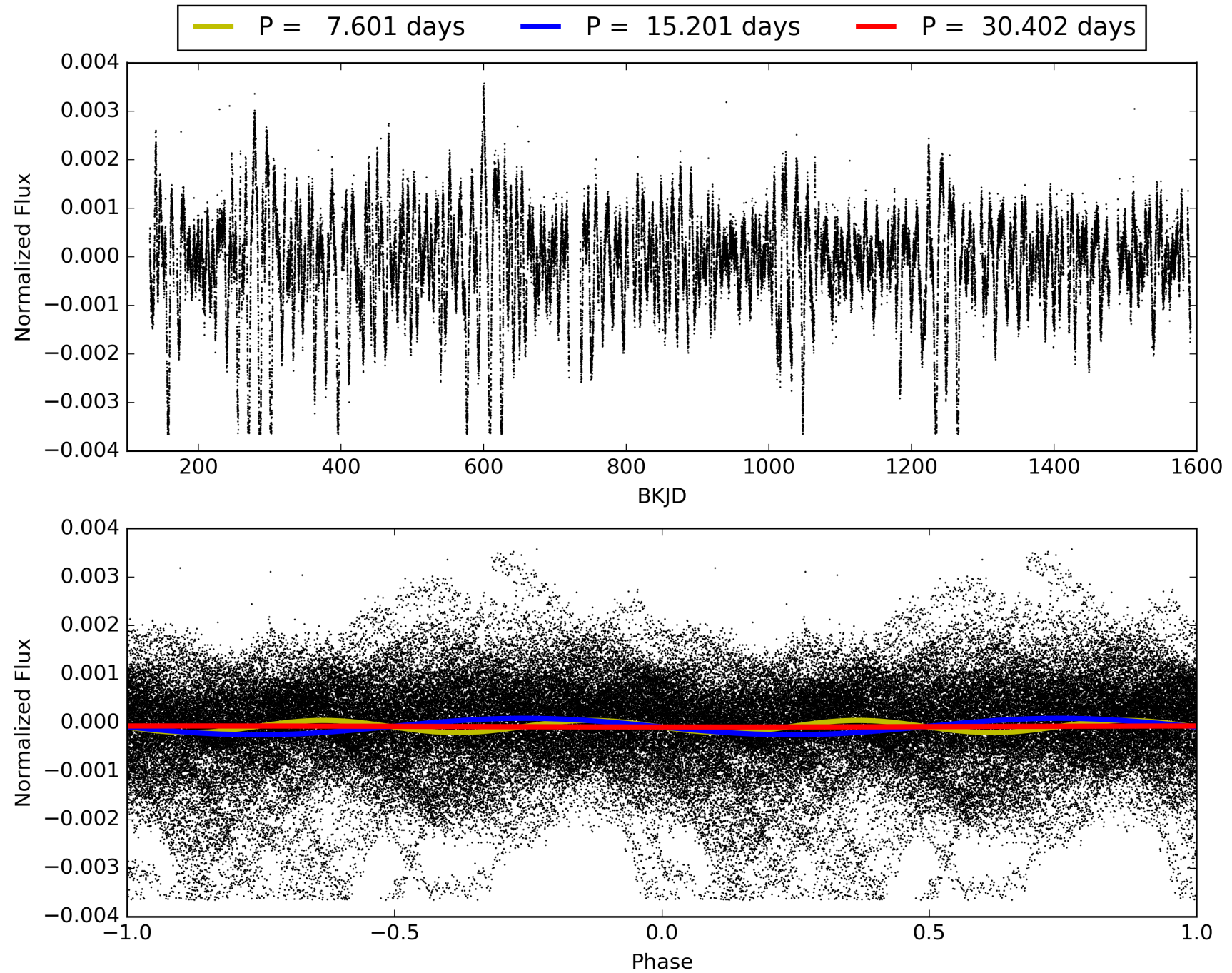
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 03-Feb-2016 09:08:46 Z

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

# TCE 007458309-04, PDC Light Curves

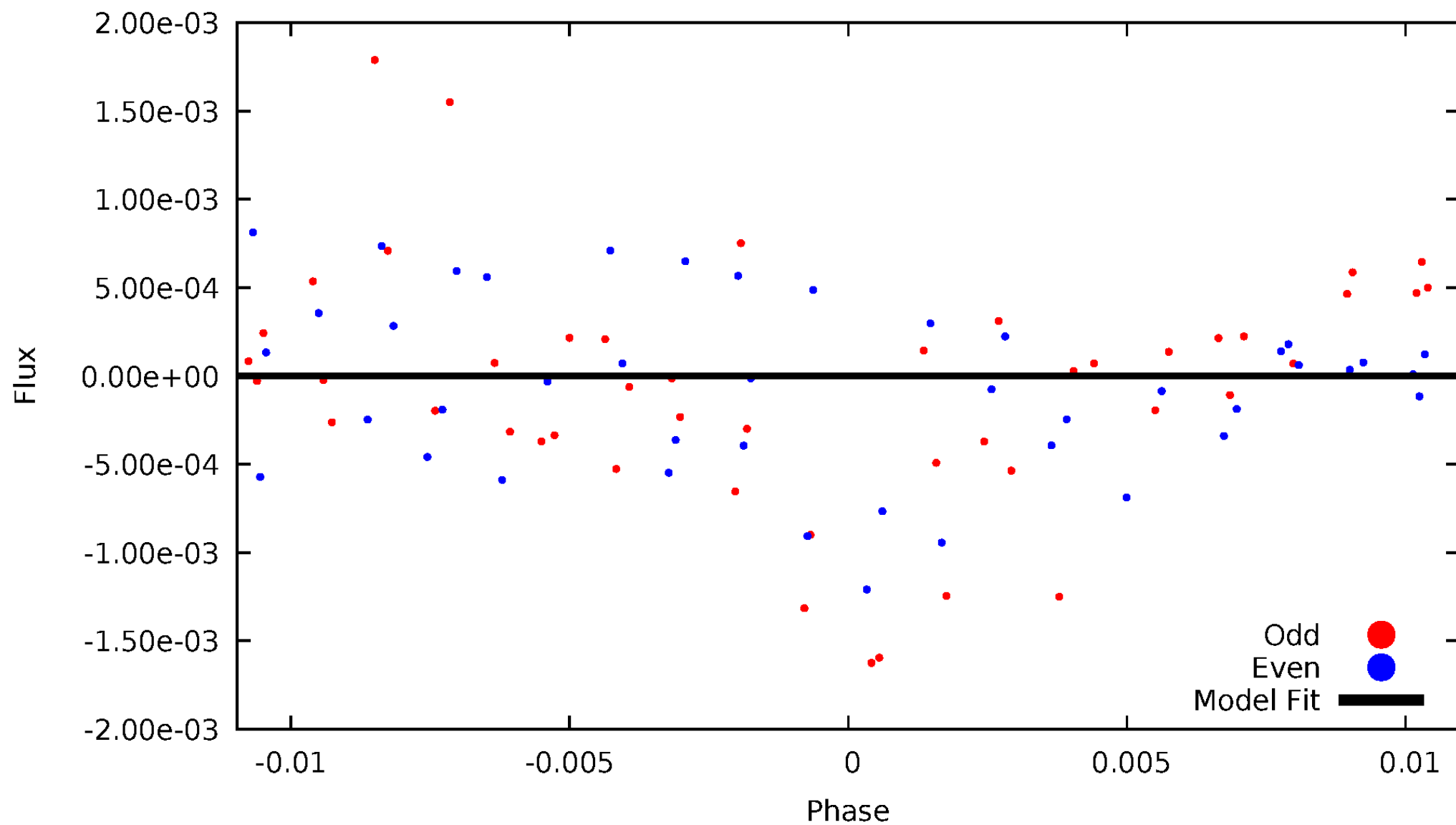


TCE 007458309-04



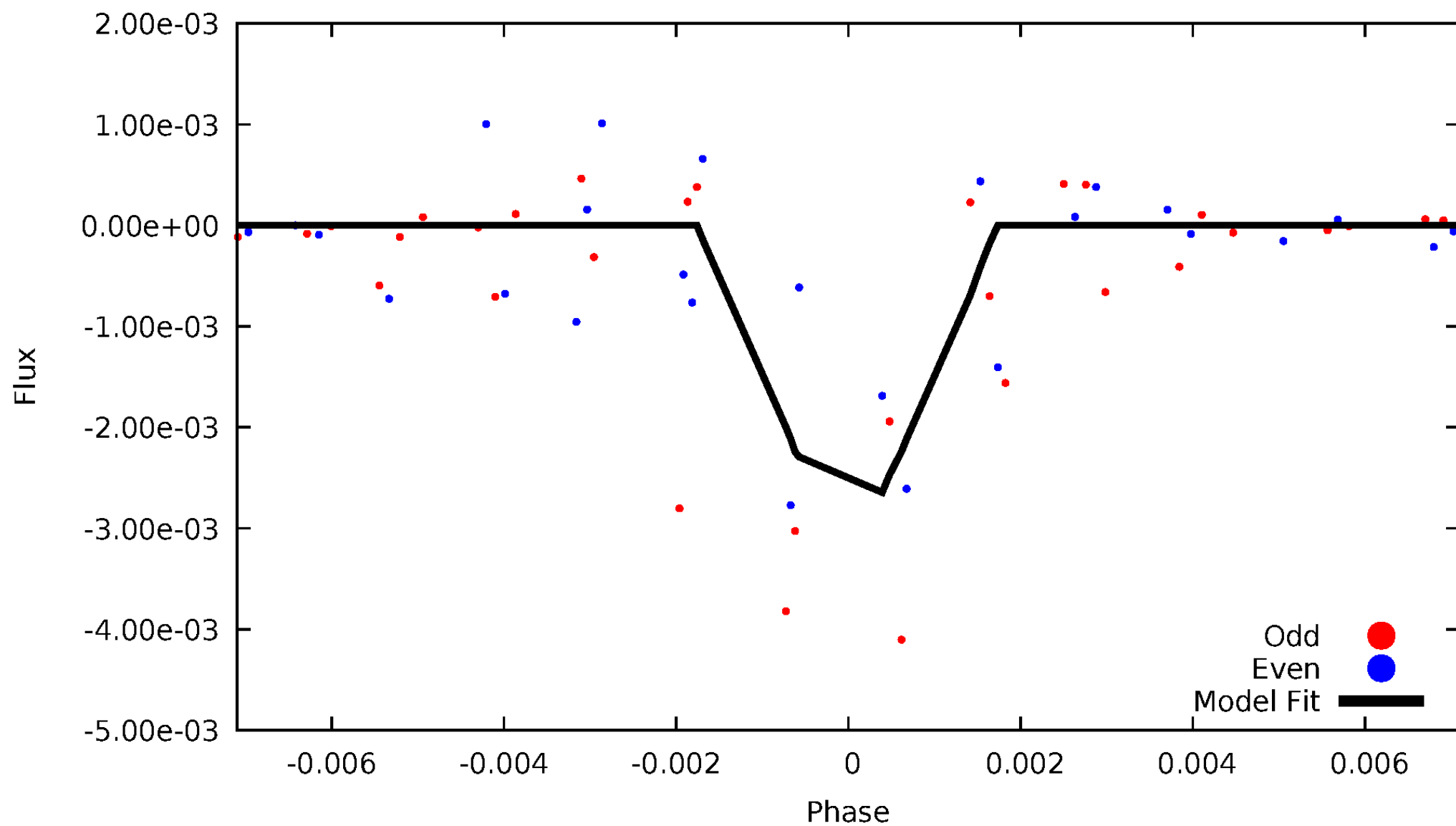
# DV Odd/Even

TCE 007458309-04



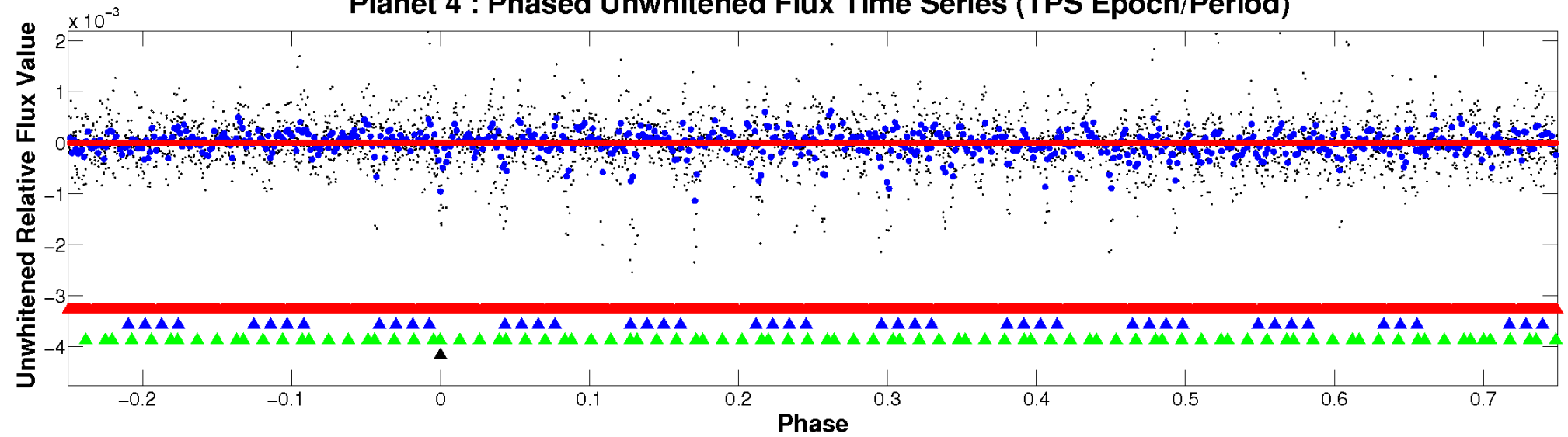
# ALT Odd/Even

TCE 007458309-04

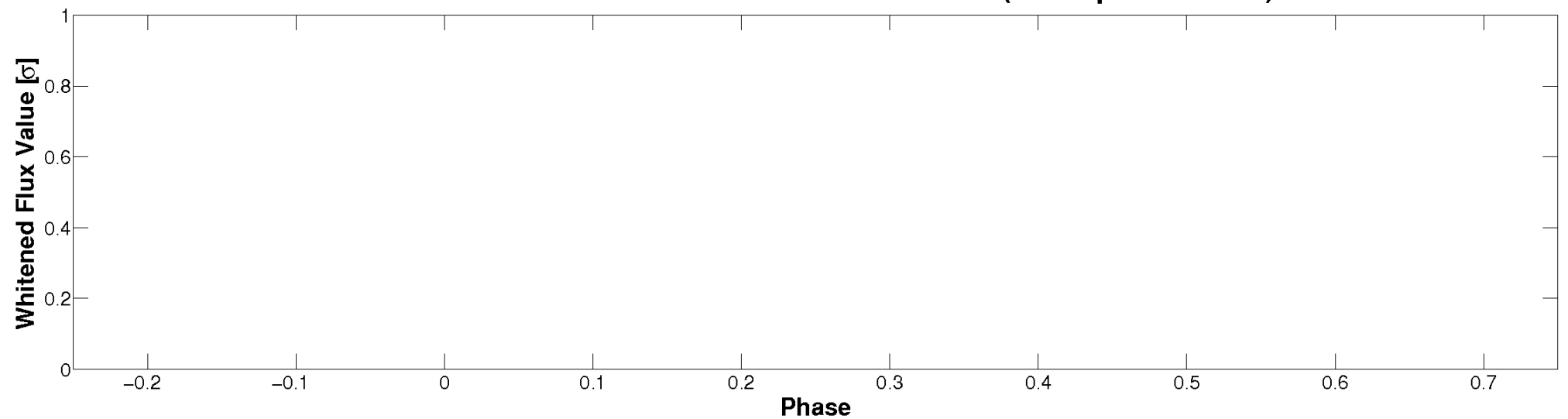


# Non-Whitened Vs. Whitened Light Curve

**Planet 4 : Phased Unwhitened Flux Time Series (TPS Epoch/Period)**

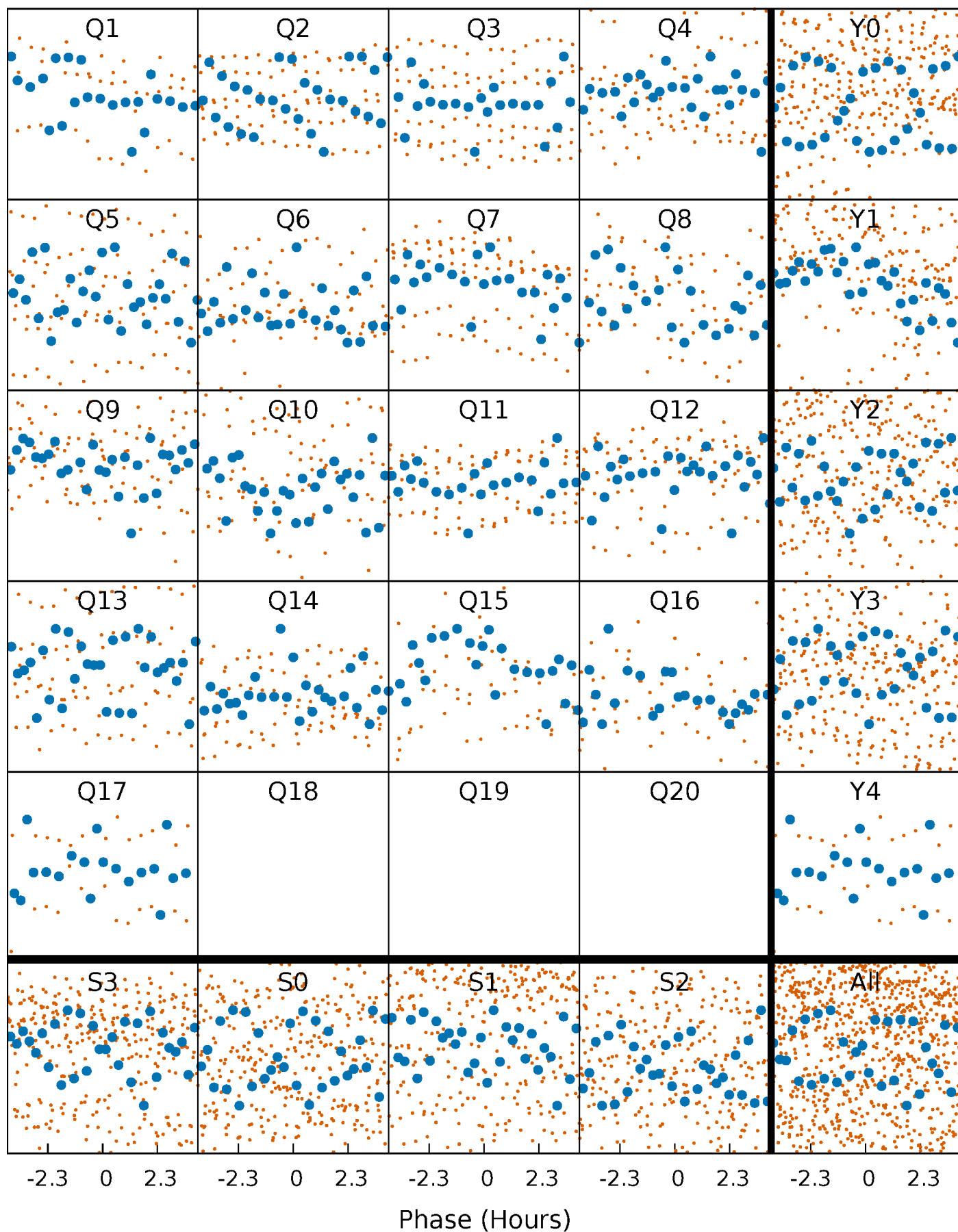


**Planet 4 : Phased Whitened Flux Time Series (TPS Epoch/Period)**



# PDC Quarter-Phased Transit Curves

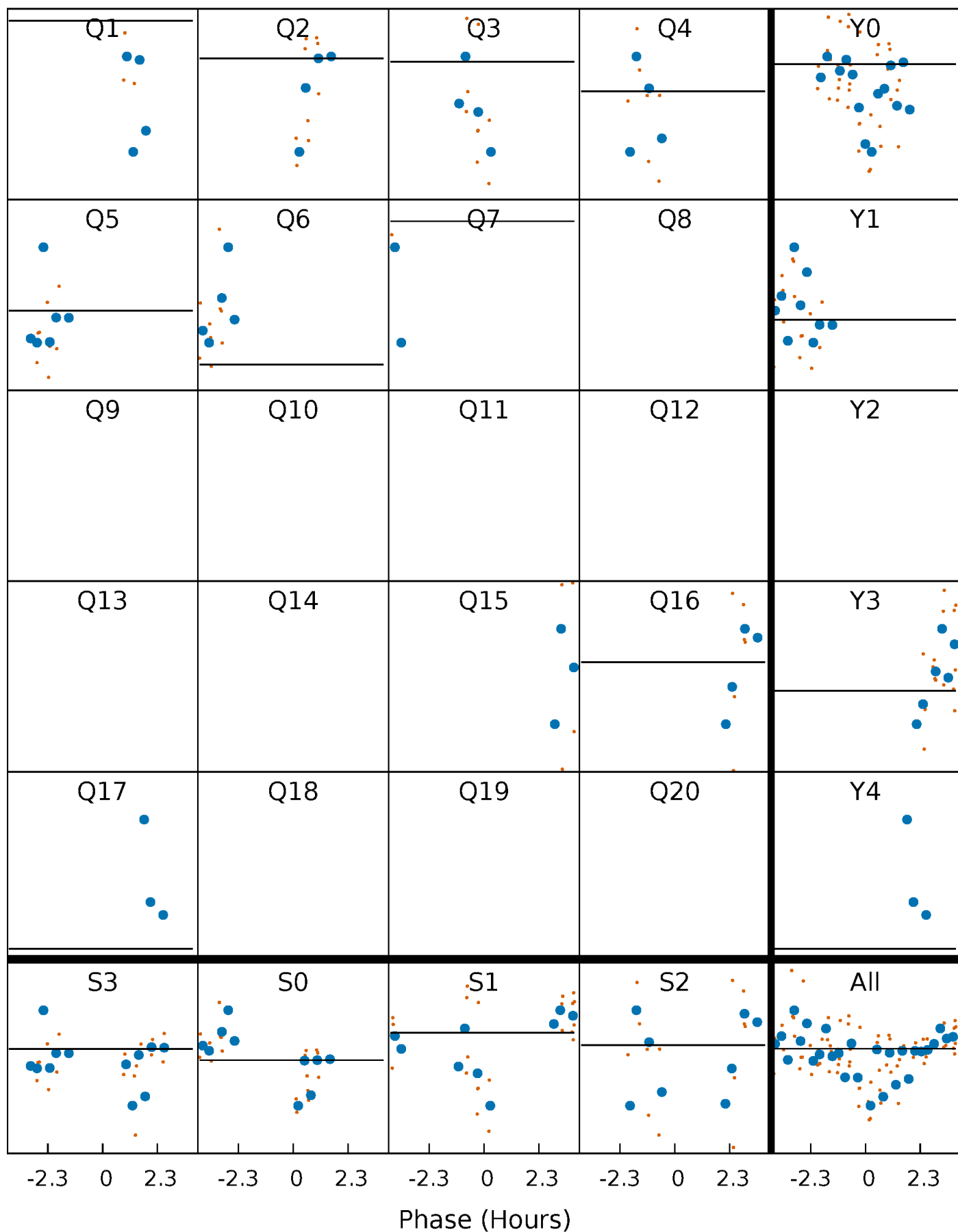
TCE 007458309-04 P= 15.201166 Days  $T_0=132.825777$  (BKJD)





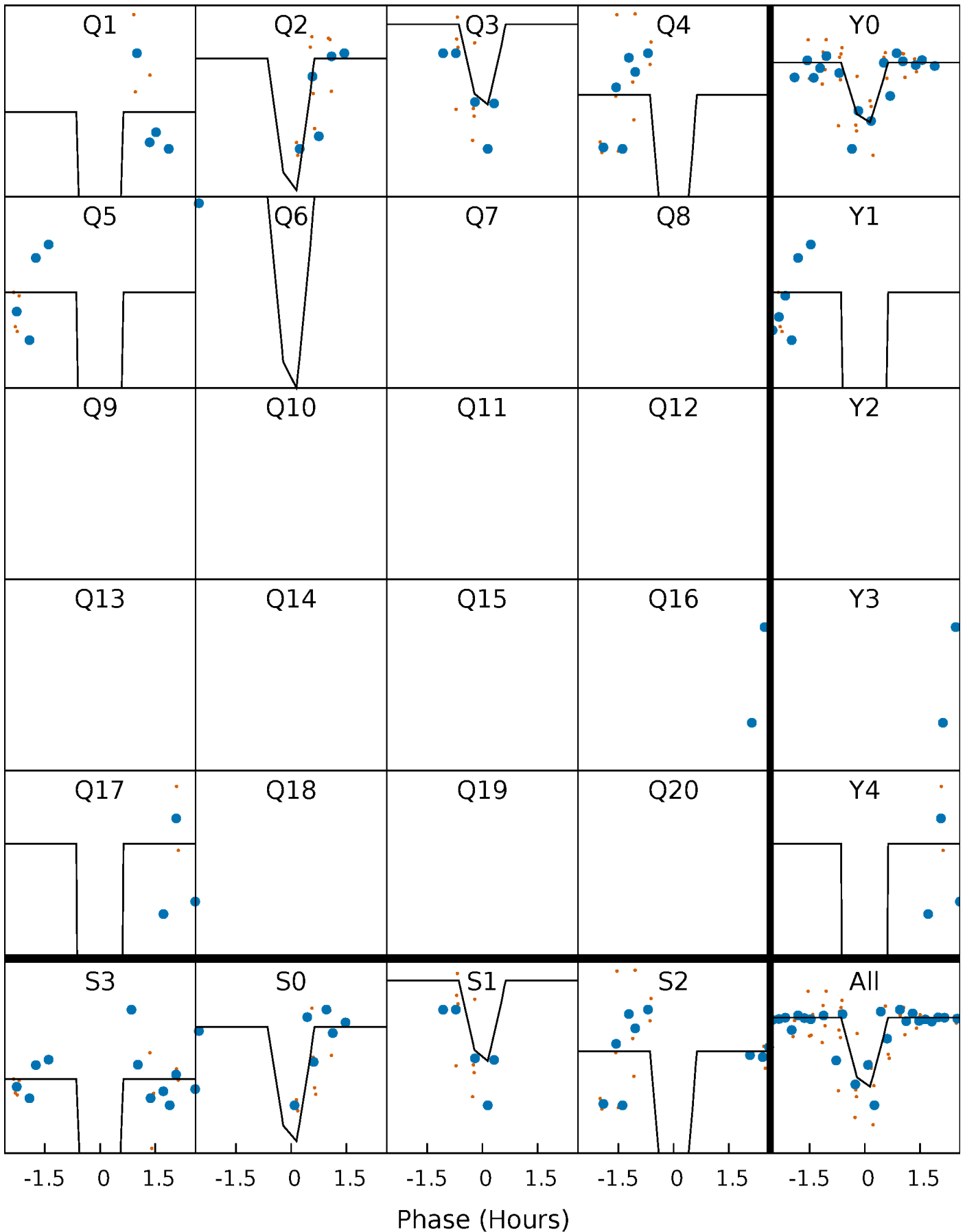
# DV Quarter-Phased Transit Curves

TCE 007458309-04   P= 15.201166 Days    $T_0=132.825777$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

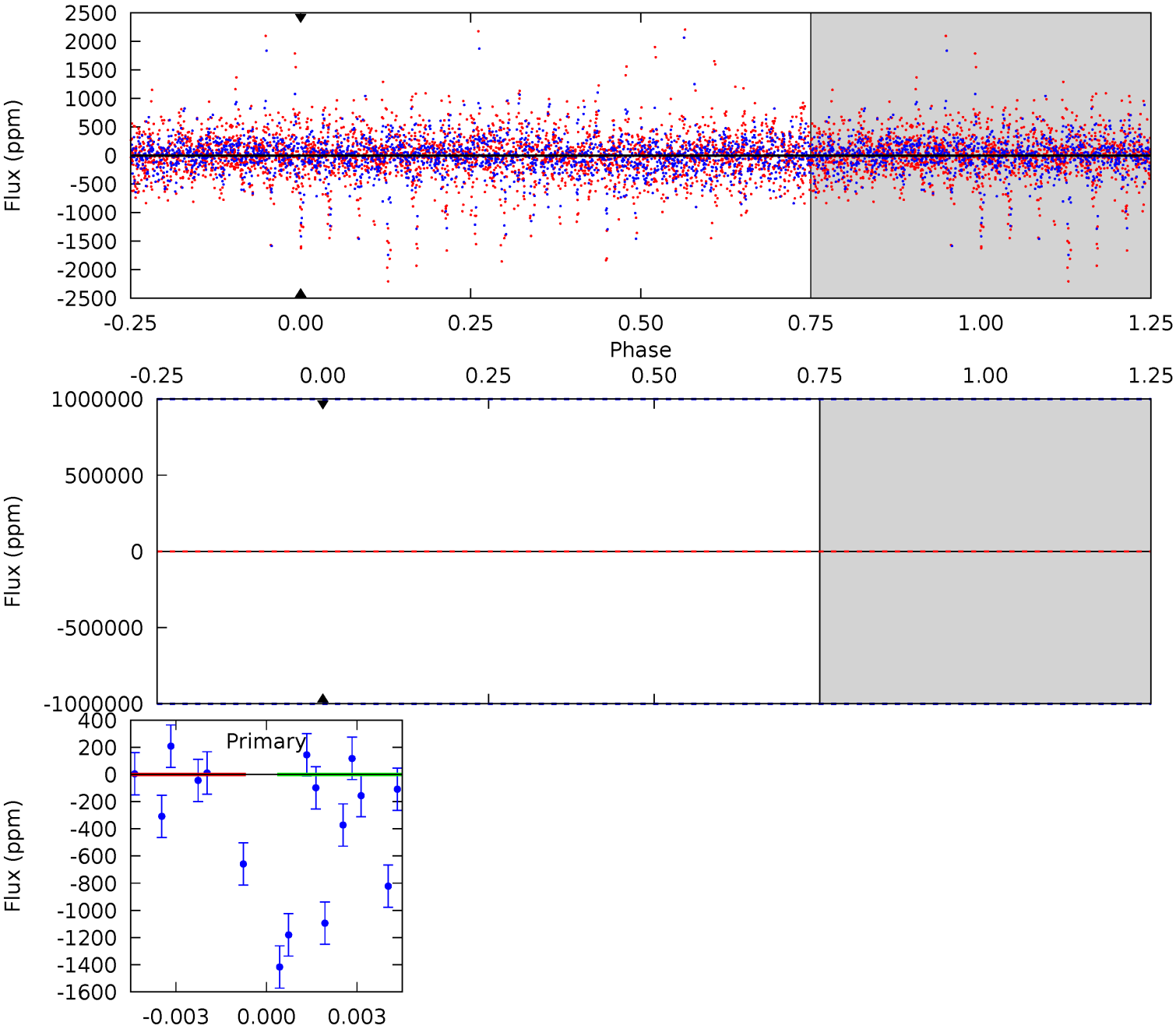
TCE 007458309-04   P= 15.201166 Days    $T_0=132.824827$  (BKJD)



# DV Model-Shift Uniqueness Test

007458309-04, P = 15.201166 Days, E = 117.624611 Days

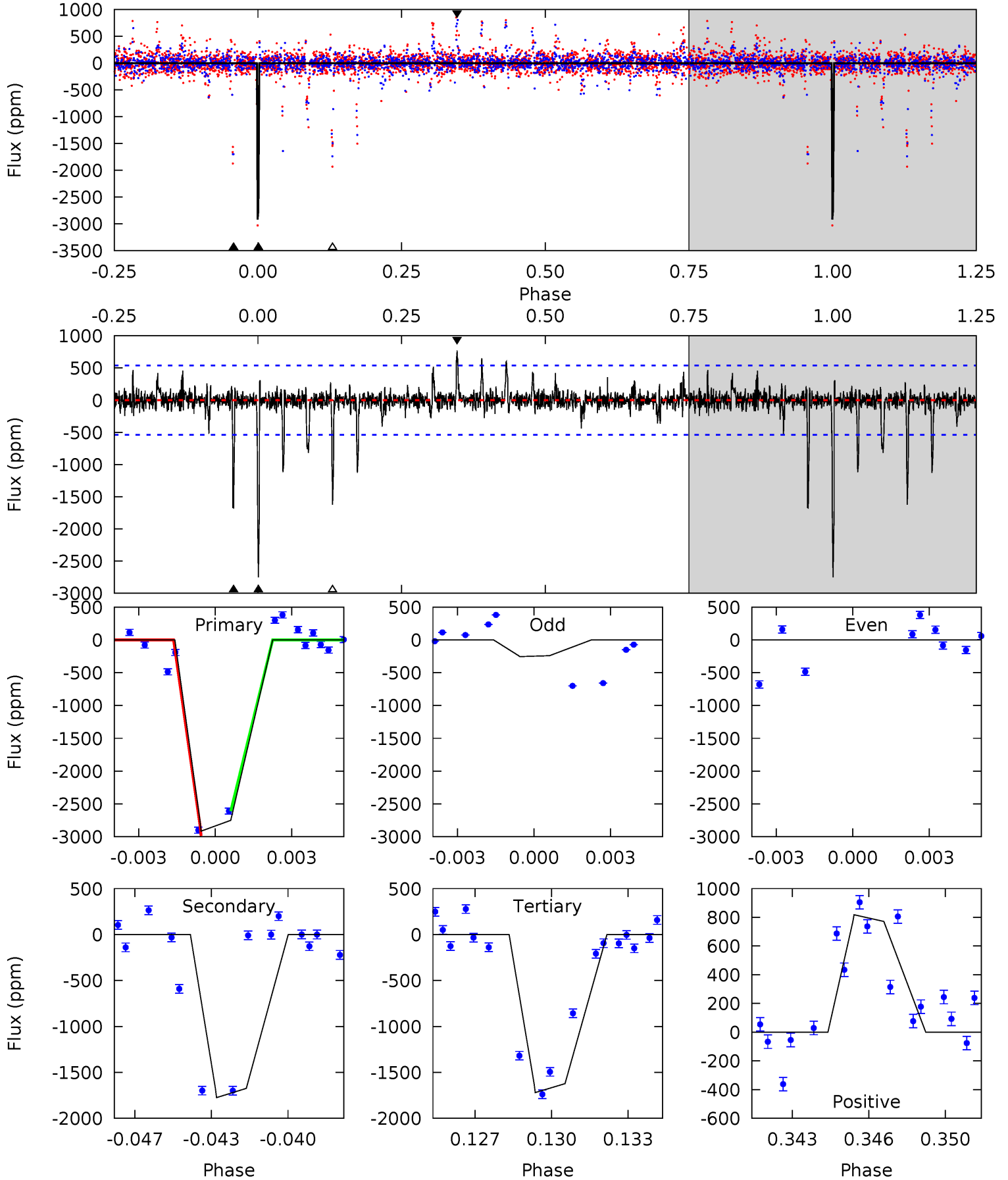
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
0	0	0	0	1.00	1.00	1.00	0	0	0	0	0	0	0	0



# Alt Model-Shift Uniqueness Test

007458309-04, P = 15.201166 Days, E = 117.623661 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	16.3	15.8	7.50	5.23	2.94	1.25	11.0	19.2	0.50	8.77	0	1.00	0.22	0



### Stellar Parameters For KIC 007458309

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6024^{+161}_{-179}$	$4.550^{+0.046}_{-0.196}$	$-0.420^{+0.300}_{-0.300}$	$0.849^{+0.238}_{-0.074}$	$0.934^{+0.098}_{-0.109}$	$2.150^{+0.398}_{-1.059}$
	+3%/-3%	+1%/-4%	+71%/-71%	+28%/-9%	+10%/-12%	+19%/-49%
Source	PHO1	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 007458309-04 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$0 \pm 1000000$	$7.38^{+7.49}_{-5.14}$	$1019^{+71}_{-45}$	$-4343^{+28473}_{-15493}$	$-162.986^{+27115.550}_{-19222.284}$
Alt.	$-1674 \pm 103$	$9.15^{+7.71}_{-6.05}$	$1017^{+70}_{-46}$	$4250^{+2645}_{-833}$	$148^{+1185}_{-104}$

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

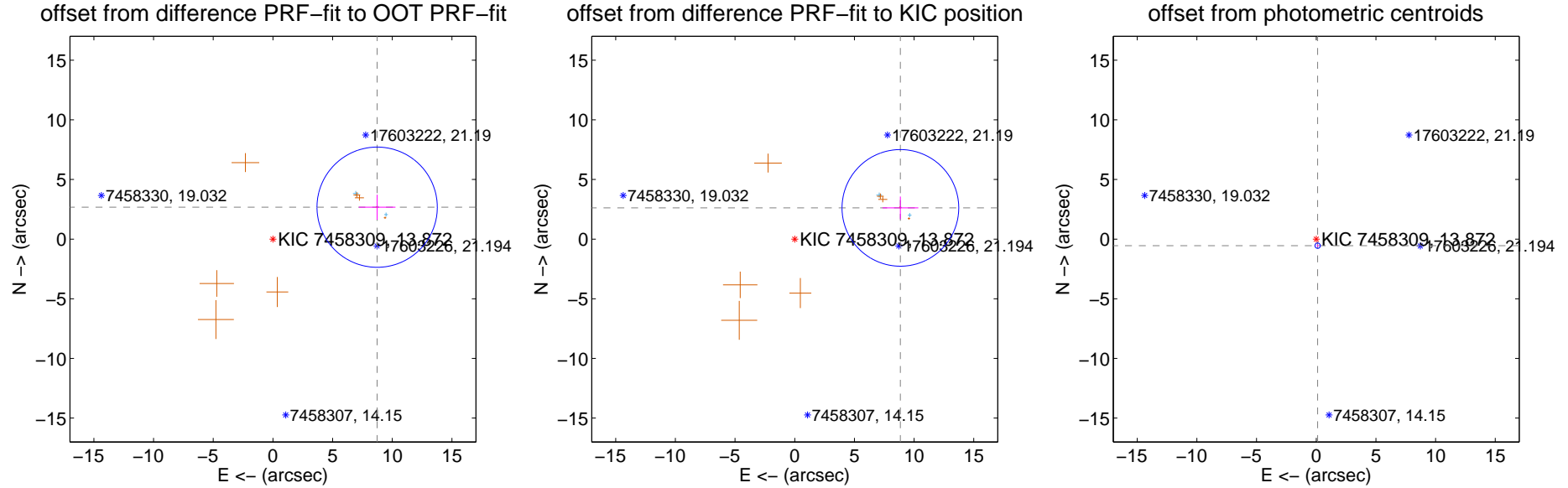
## DV Centroid Data

Supplemental centroid analysis for 007458309-04. Kepler magnitude: 13.87. Transit SNR -1.00

There are 4 quarters with good PRF difference image offsets

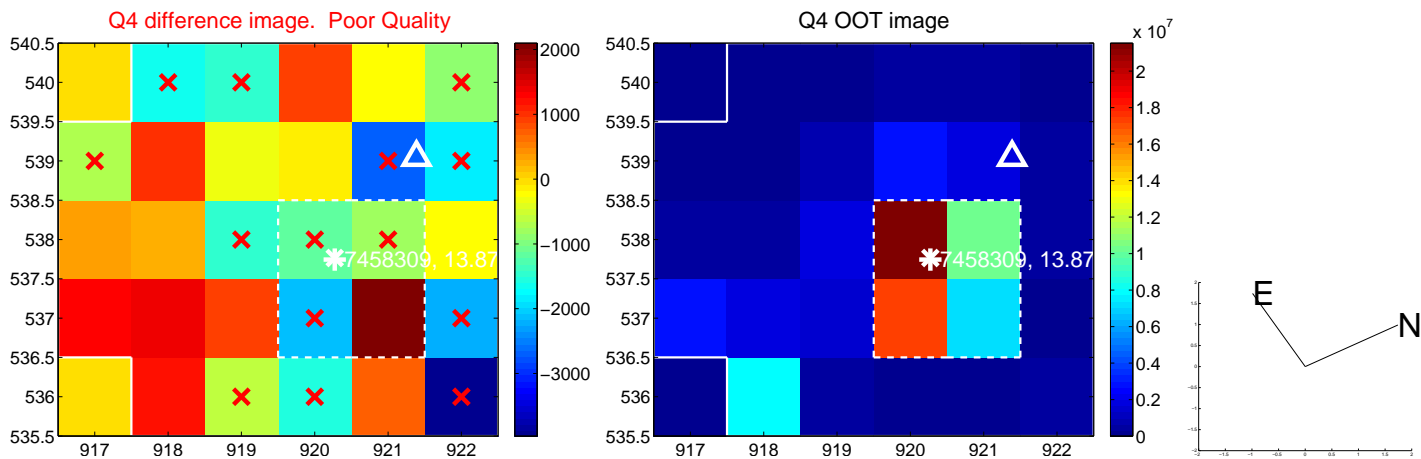
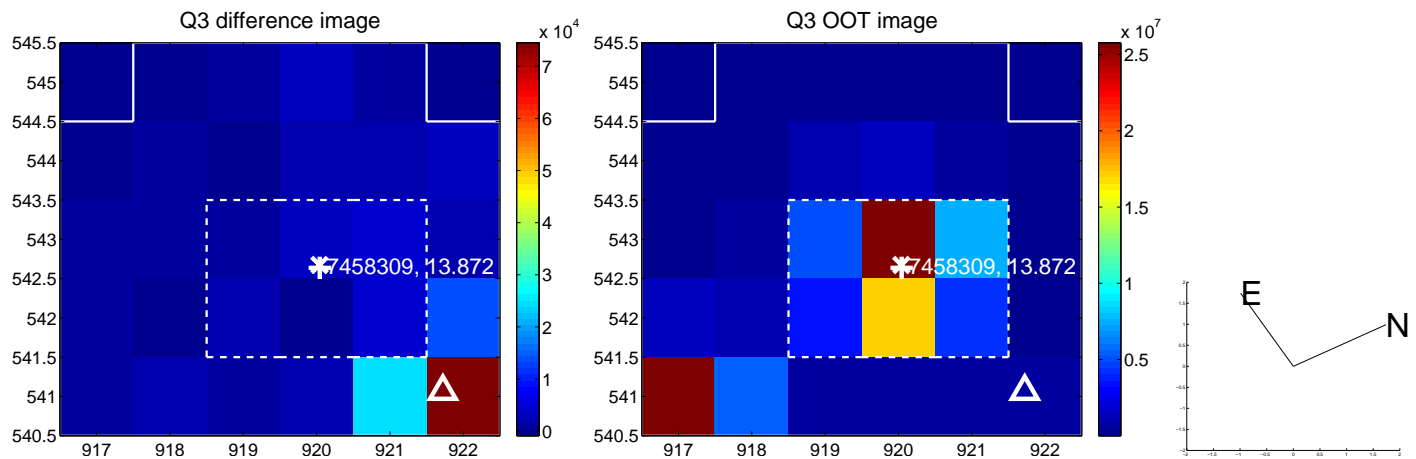
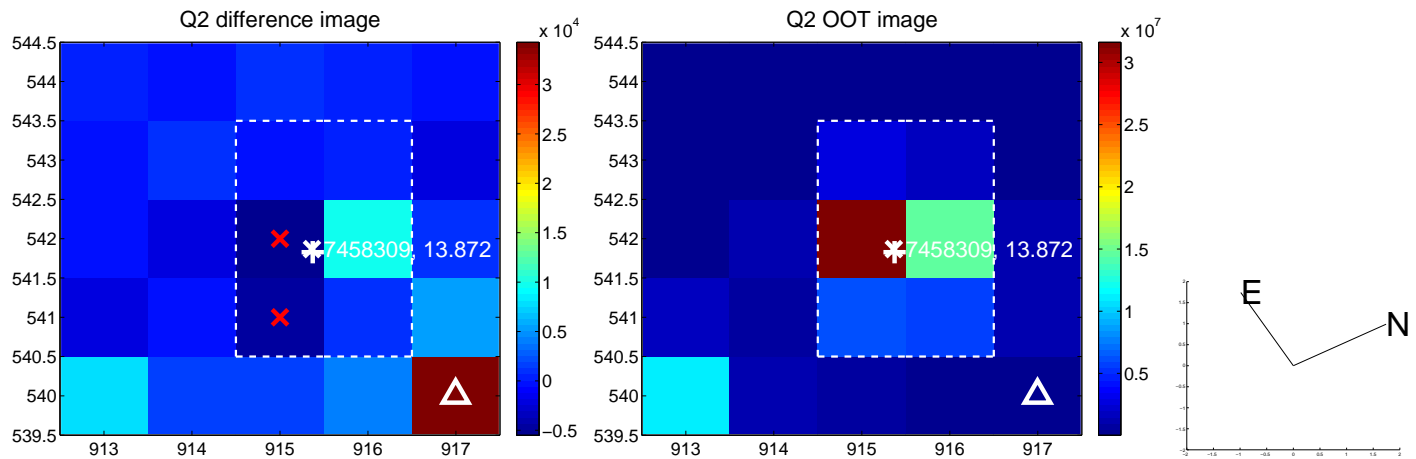
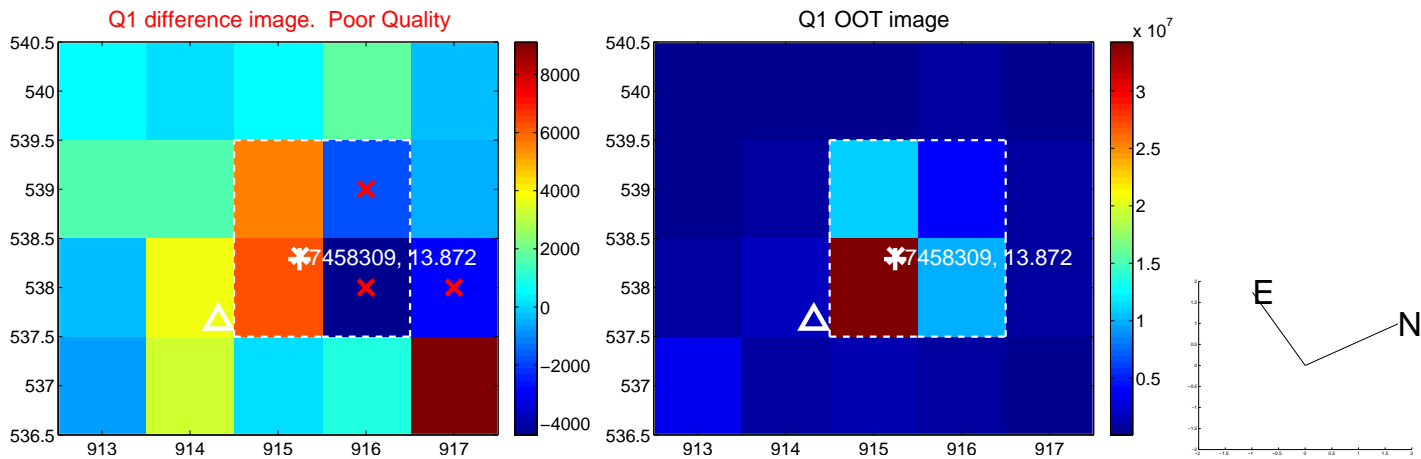
The direct PRF centroid is offset from the target star catalog position by about 0.18 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$9.134 \pm 1.680$	5.44	$-8.733 \pm 1.532$	$2.676 \pm 1.050$
PRF-fit source offset from KIC position	$9.232 \pm 1.630$	5.66	$-8.853 \pm 1.501$	$2.618 \pm 0.950$
photometric centroid source offset	$0.56 \pm 0.07$	7.52	$-0.12 \pm 0.08$	$-0.55 \pm 0.07$

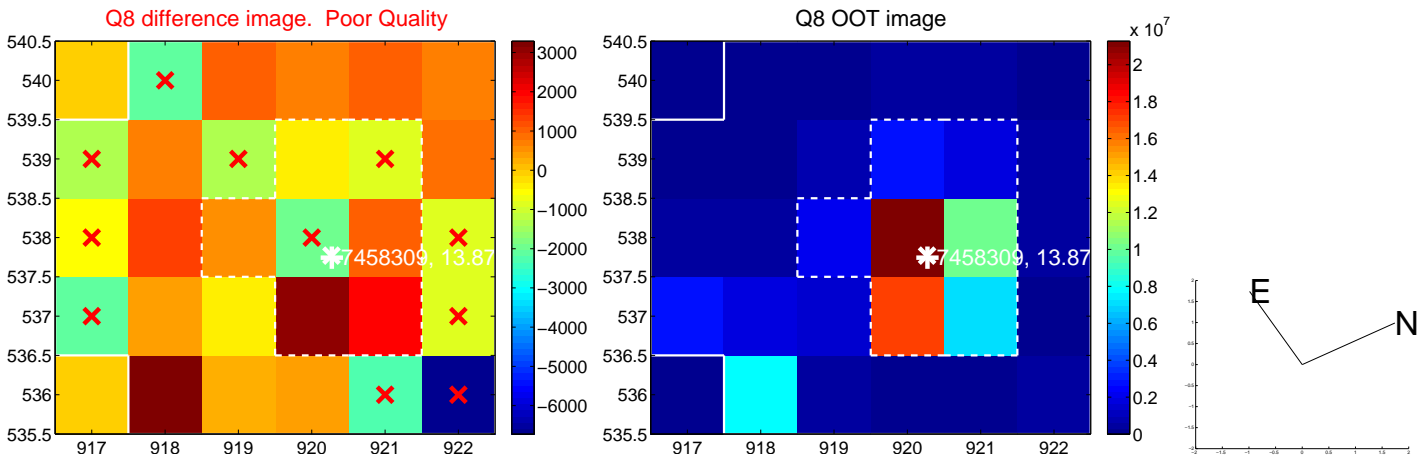
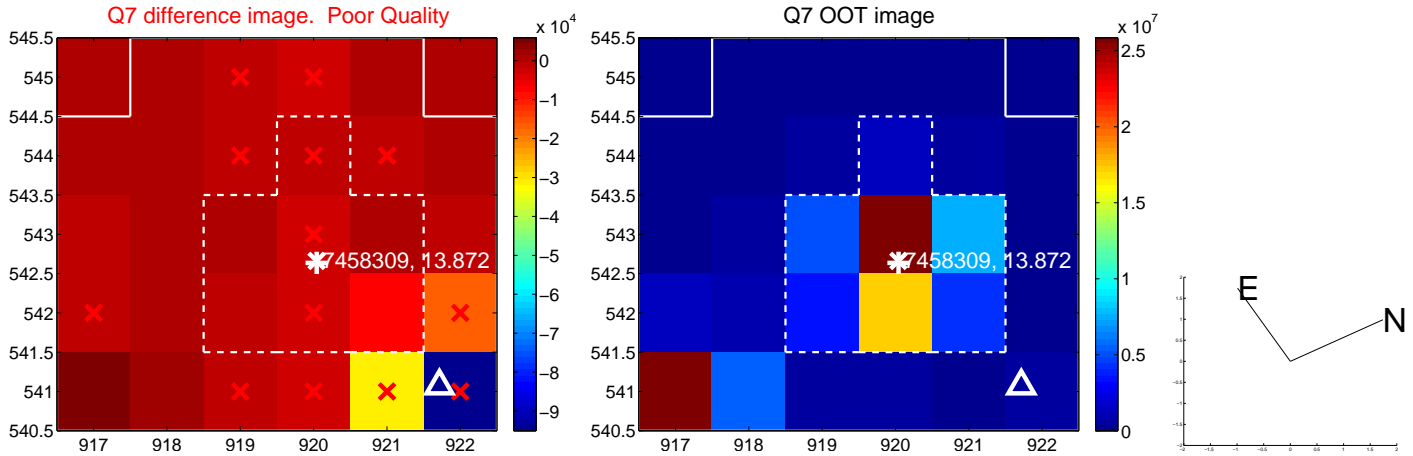
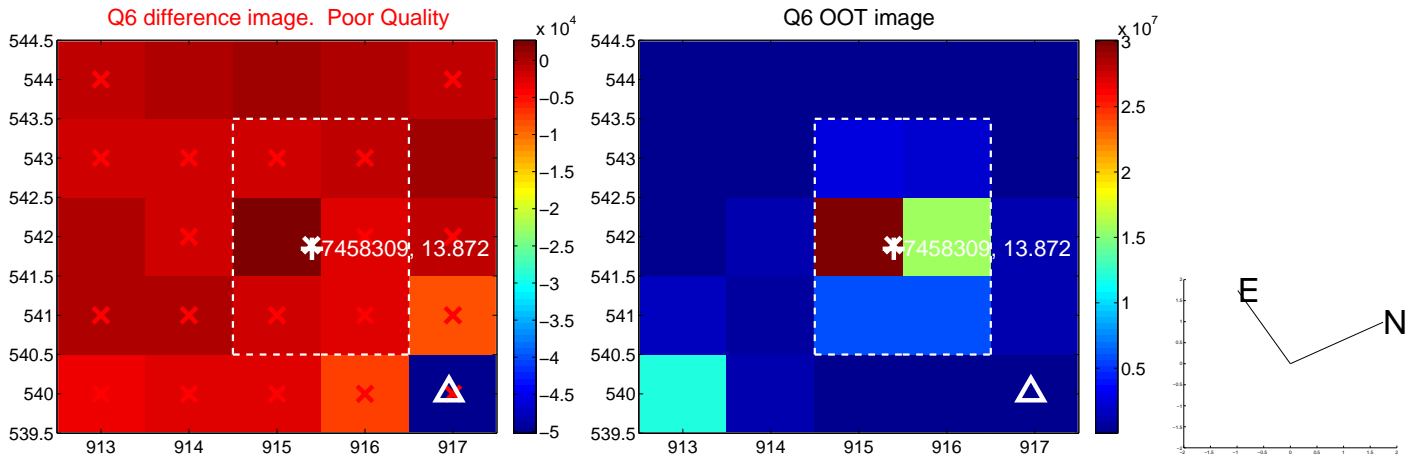
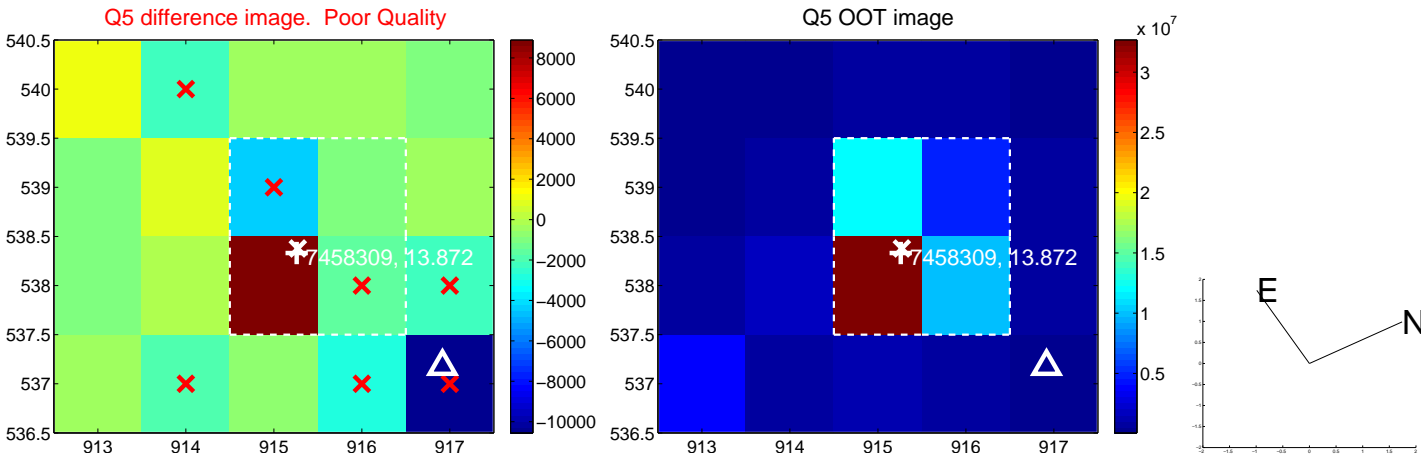


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets**; **Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

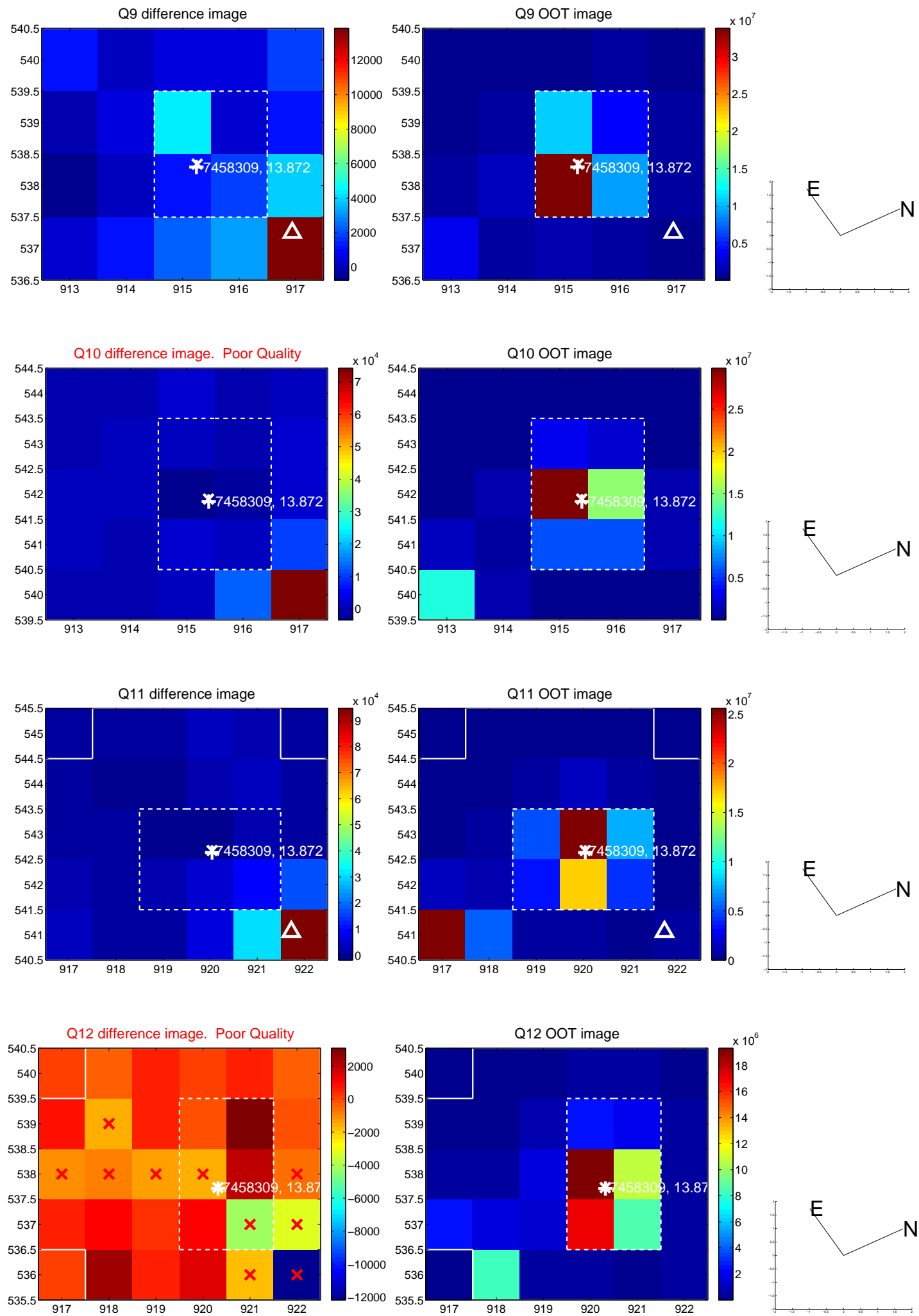


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

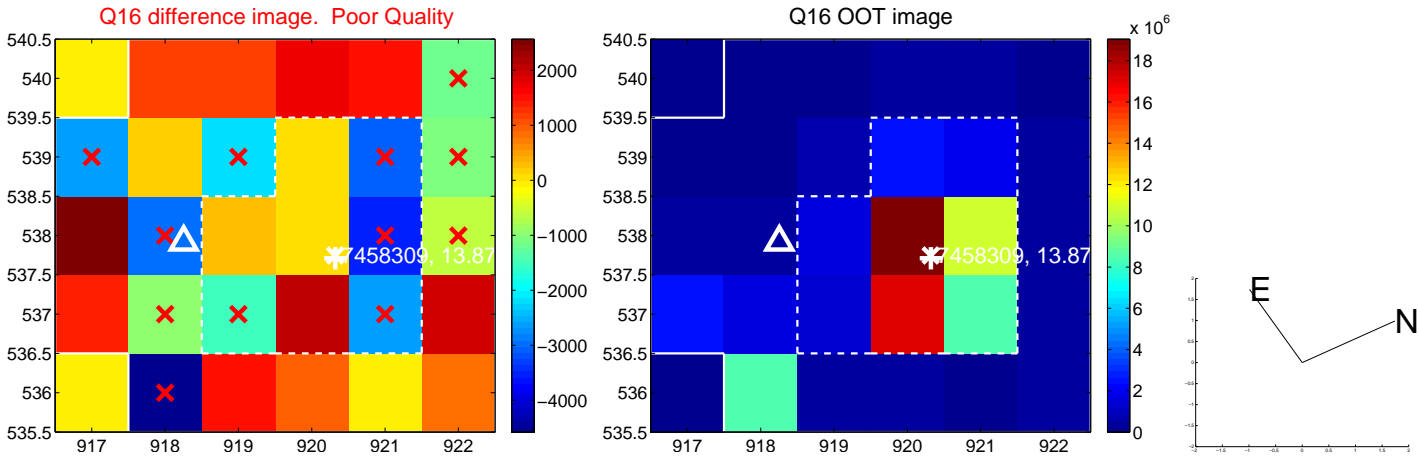
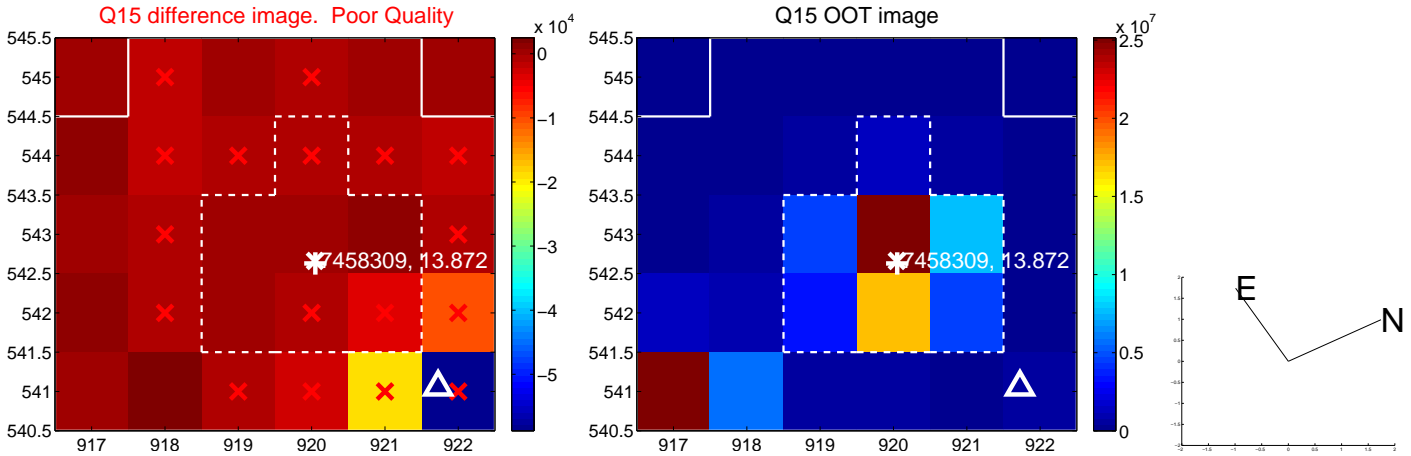
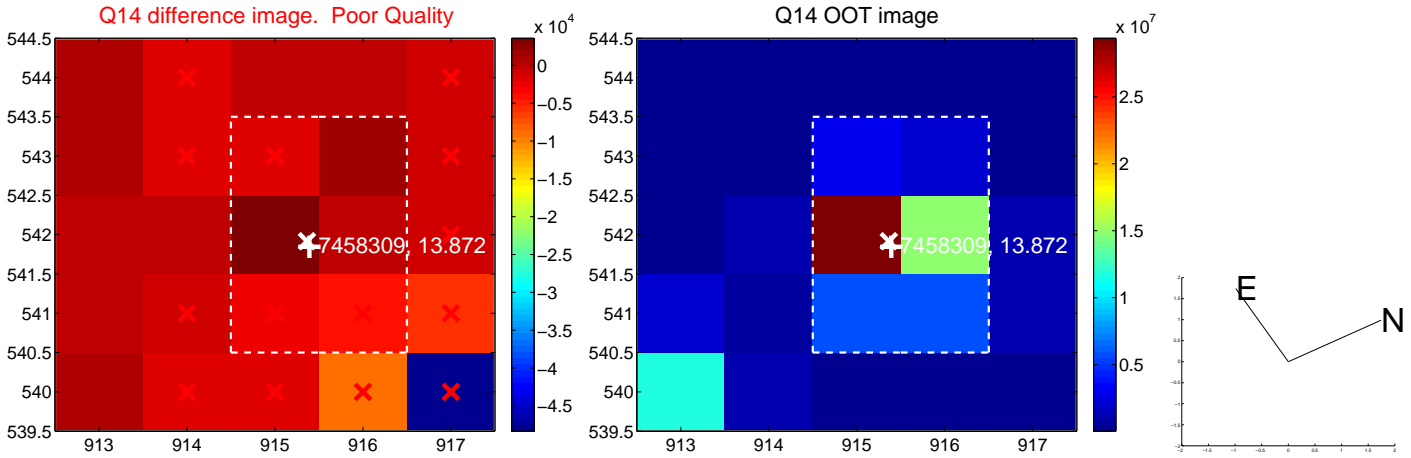
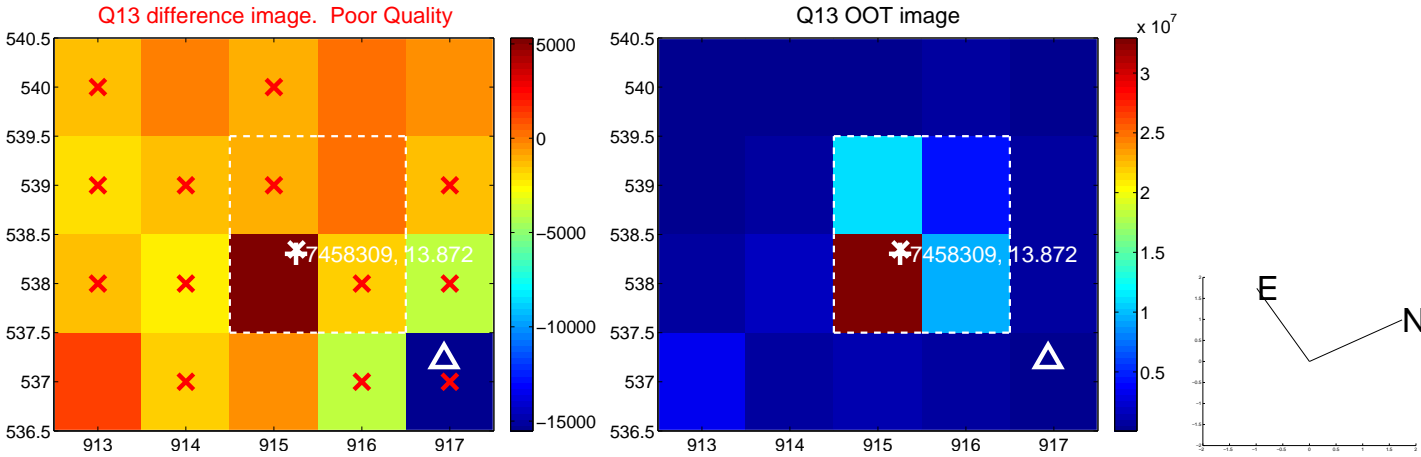




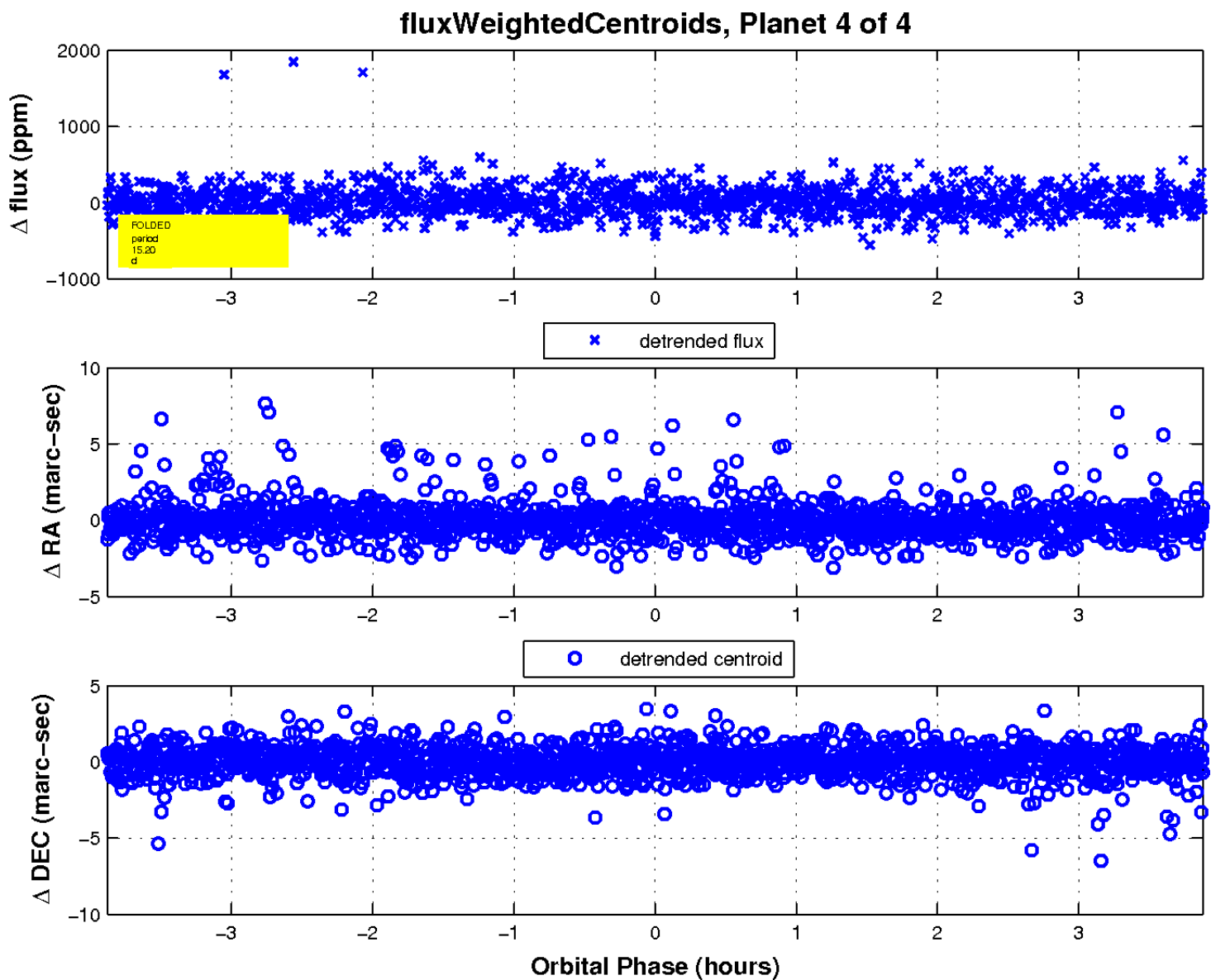
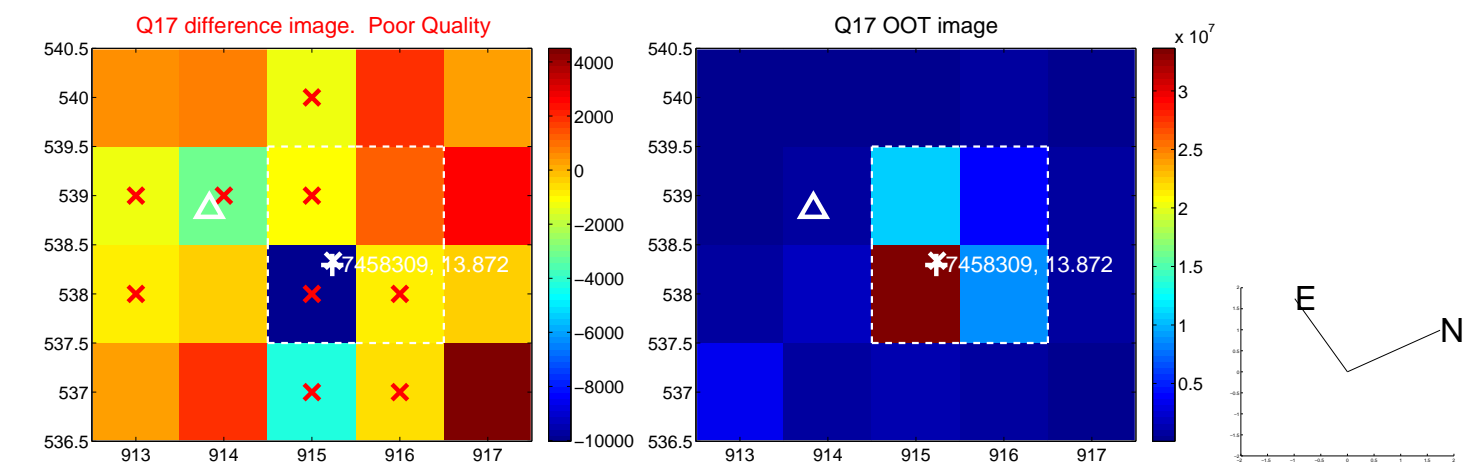
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white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination

