

# KIC 005521300

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
005521300-01	OBS	2456.01	18.135647	138.313642	425.0	2.015	14.0	15.8	1.04	6184	3.09	72.45
005521300-02	OBS	No	18.135757	133.954978	268.1	3.752	12.3	12.9	1.04	6184	3.11	72.45

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
005521300-01	OBS	FP	0.00	0	1	1	0	MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE—CENT_RESOLVED_OFFSET
005521300-02	OBS	FP	0.00	1	1	1	0	IS_SEC_TCE—CENT_RESOLVED_OFFSET

**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.

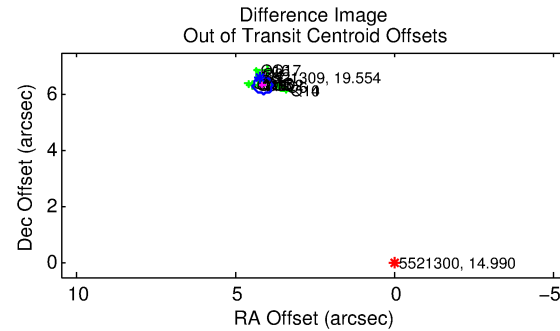
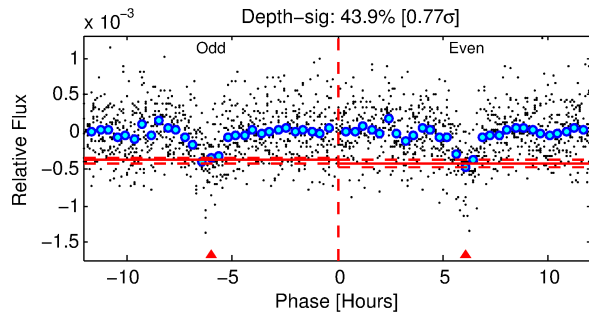
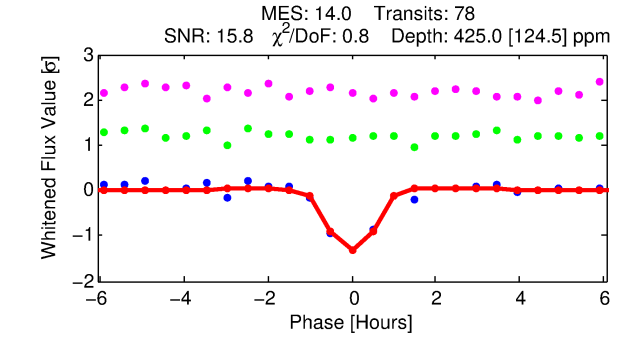
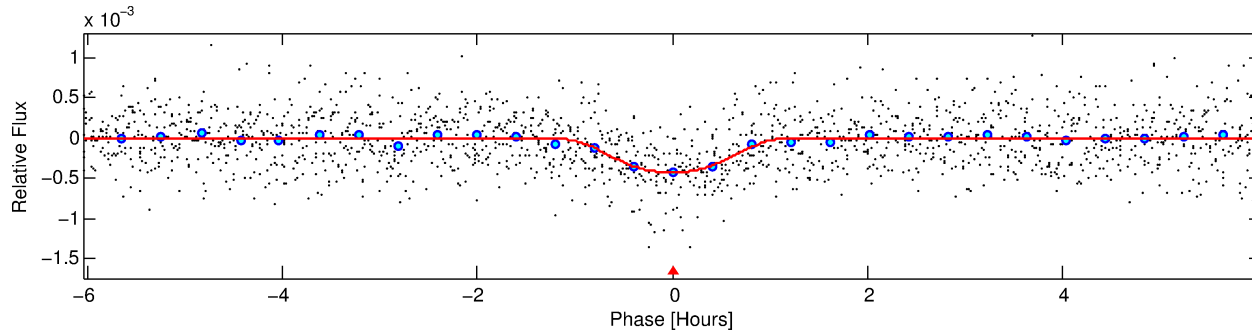
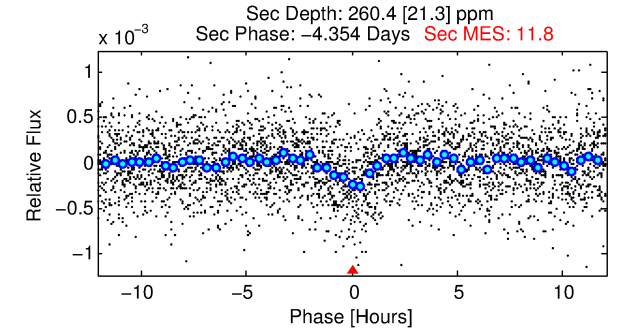
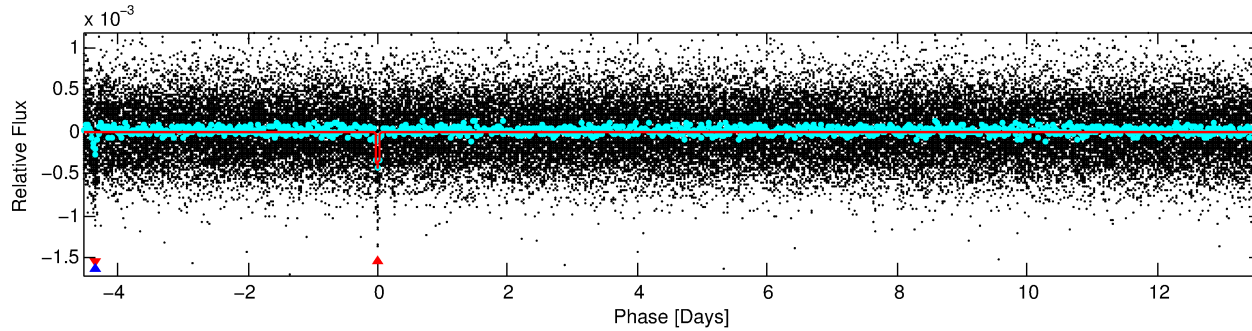
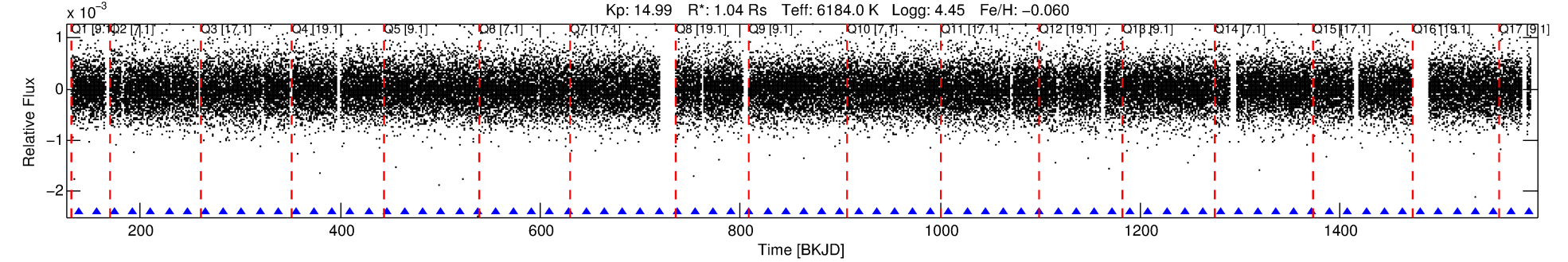
## Ephemeris Match Information For 005521300-01

No Significant Match Found

# DV One-Page Summary

KIC: 5521300 Candidate: 1 of 2 Period: 18.136 d  
KOI: K02456.01 Corr: 0.989

Kp: 14.99 R\*: 1.04 Rs Teff: 6184.0 K Logg: 4.45 Fe/H: -0.060



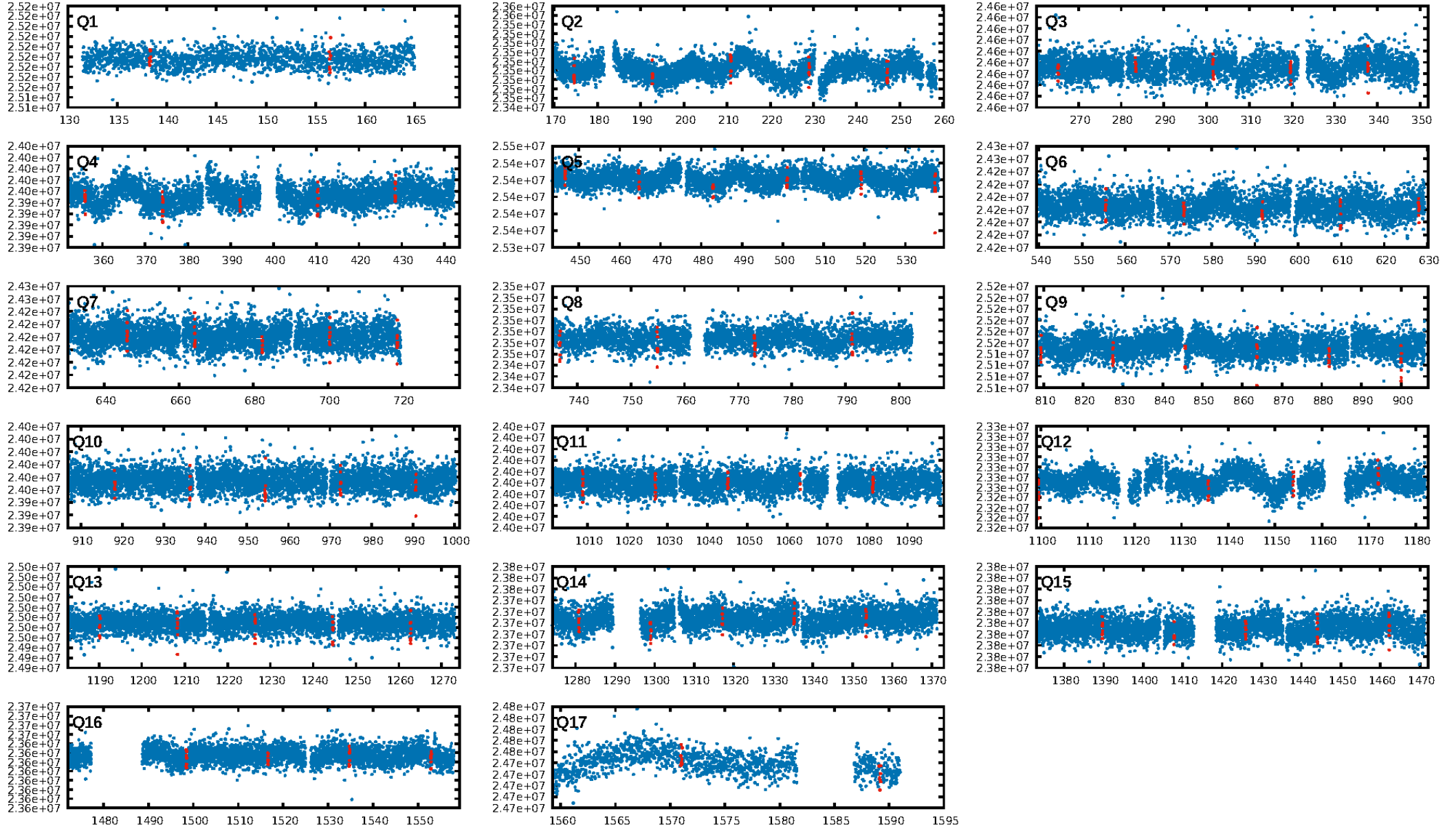
## DV Fit Results:

Period = 18.13565 [0.00007] d  
Epoch = 138.3136 [0.0034] BKJD  
Rp/R\* = 0.0273 [0.0193]  
a/R\* = 20.88 [8.71]  
b = 0.98 [0.05]  
Seff = 72.45 [29.08]  
Teq = 744 [75] K  
Rp = 3.09 [2.40] Re  
a = 0.1396 [0.0368] AU  
Ag = 291.94 [427.23] [0.68σ]  
Teffp = 4754 [1689] K [2.37σ]

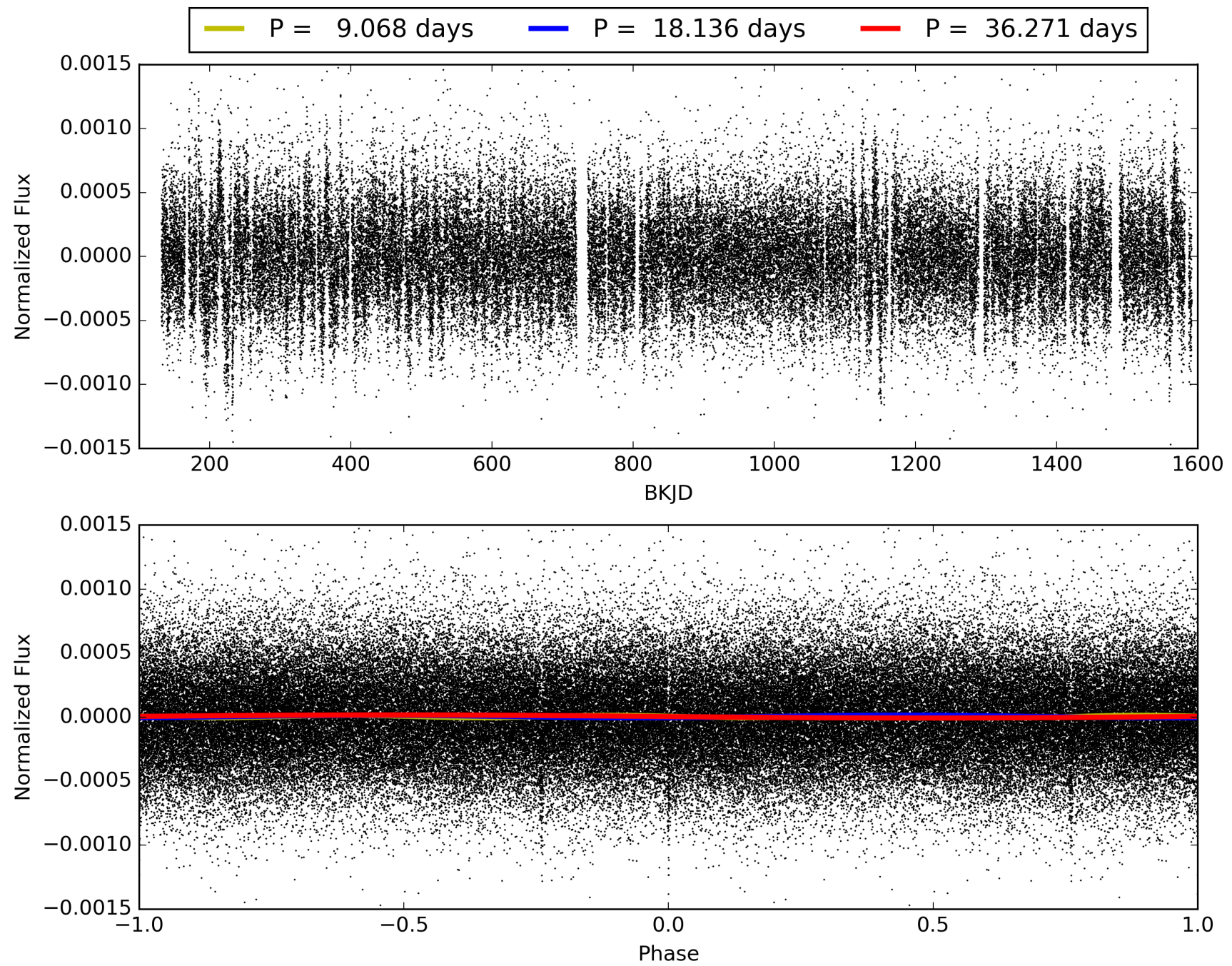
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.0% [0.00σ]  
ModelChiSquare2-sig: 97.4%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 2.15e-43  
RollingBand-fgt: 1.00 [74/74]  
GhostDiagnostic-chr: -0.3917  
Centroid-sig: 0.0%  
Centroid-so: 51.719 arcsec [54.70σ]  
OotOffset-rm: 7.566 arcsec [76.88σ]  
KicOffset-rm: 7.677 arcsec [77.16σ]  
OotOffset-st: 4/4/3/5 [16]  
KicOffset-st: 4/4/3/5 [16]  
DiffImageQuality-fgm: 1.00 [16/16]  
DiffImageOverlap-fno: 1.00 [17/17]

# TCE 005521300-01, PDC Light Curves

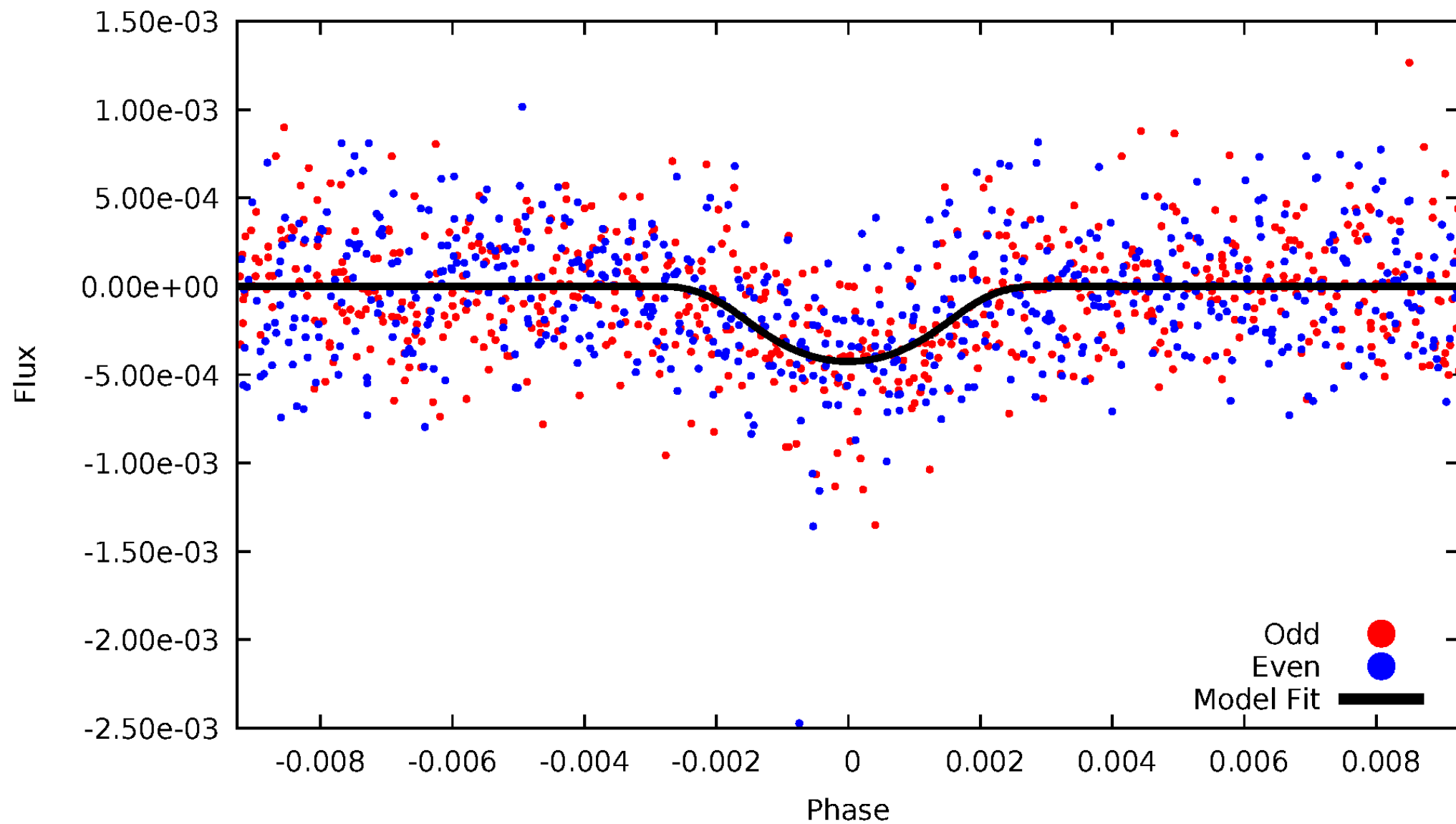


TCE 005521300-01



# DV Odd/Even

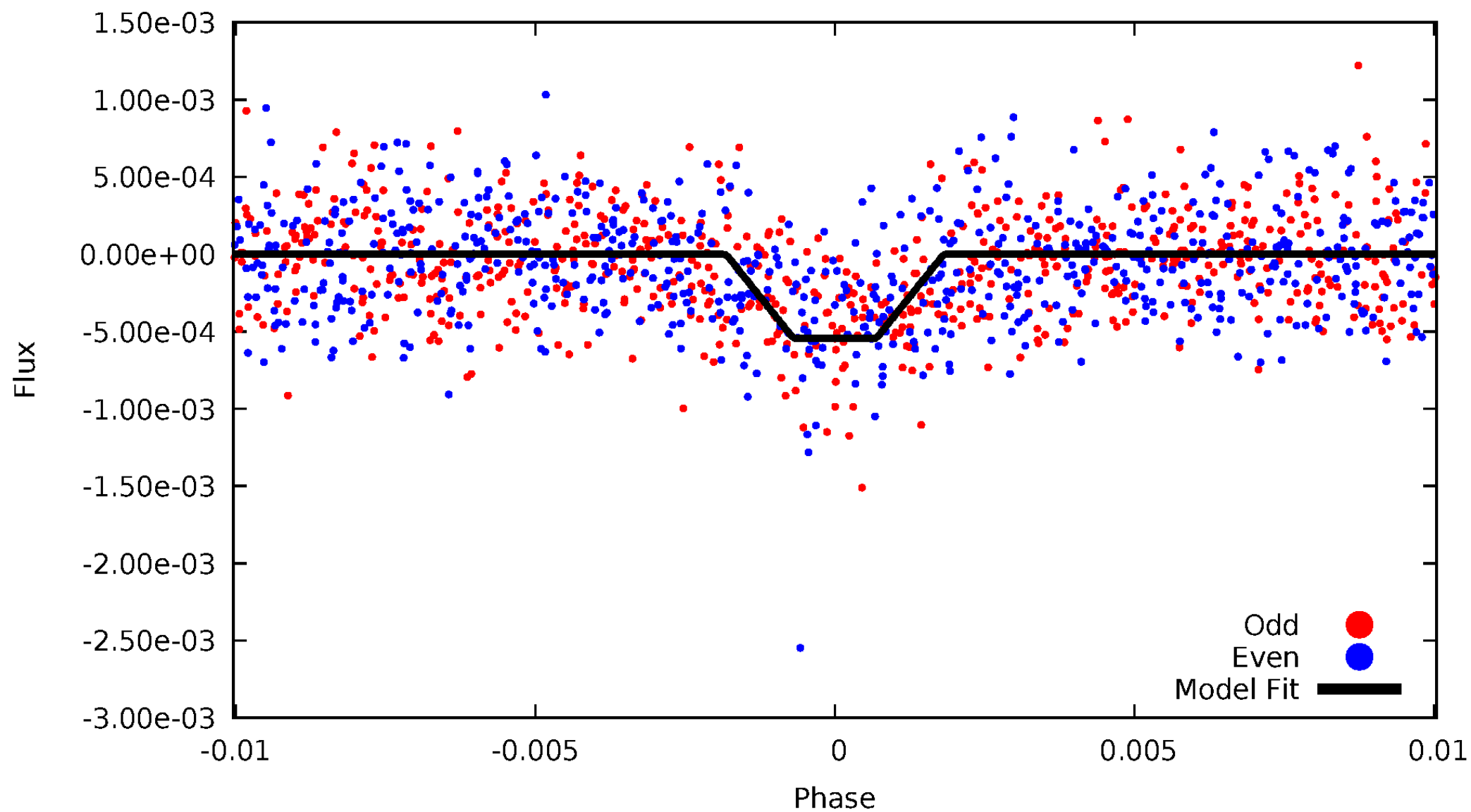
TCE 005521300-01





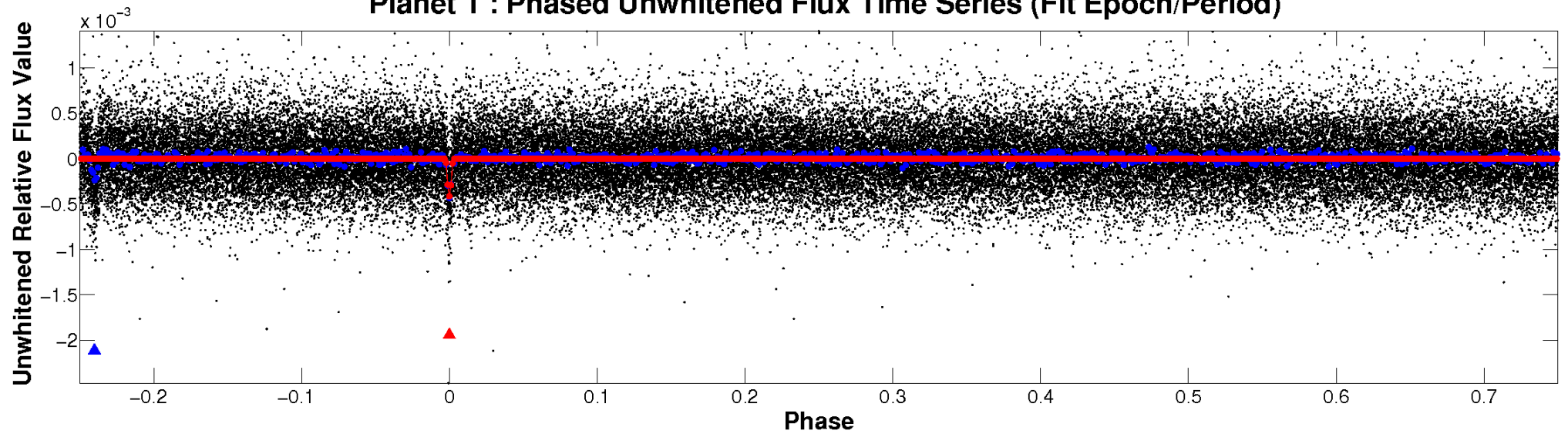
# ALT Odd/Even

TCE 005521300-01

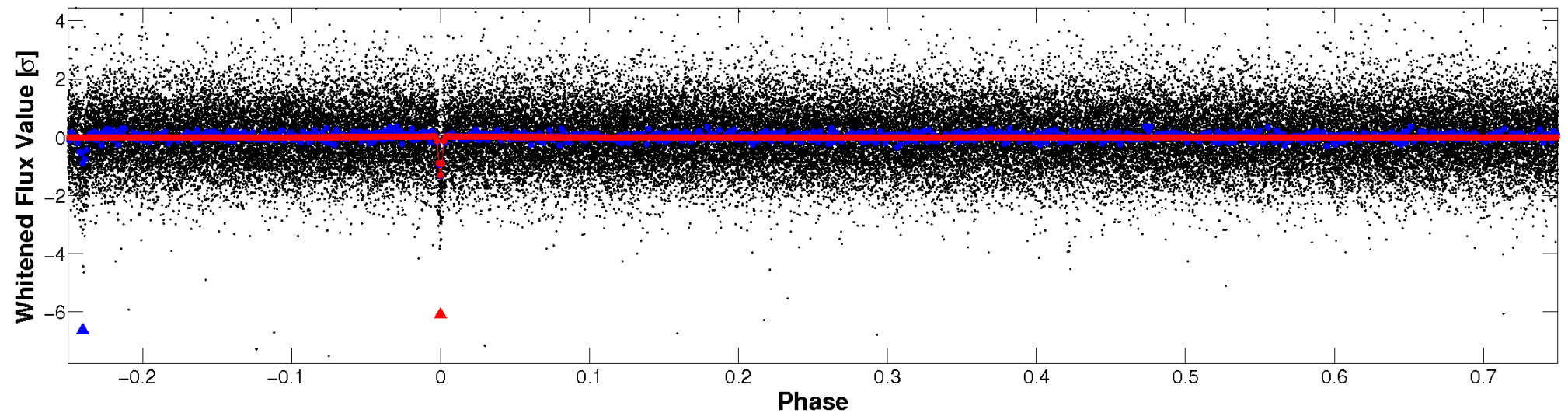


# Non-Whitened Vs. Whitened Light Curve

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

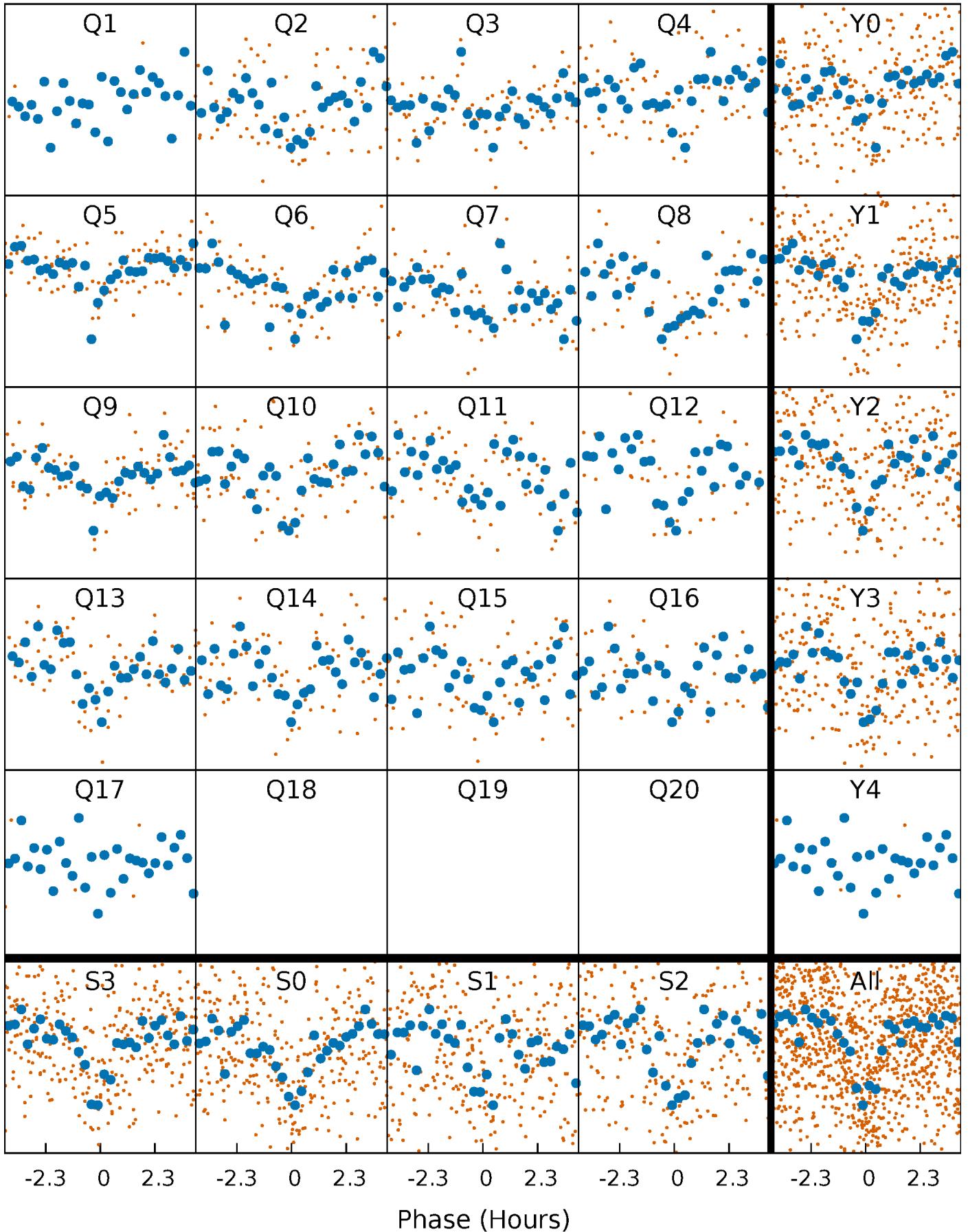


**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

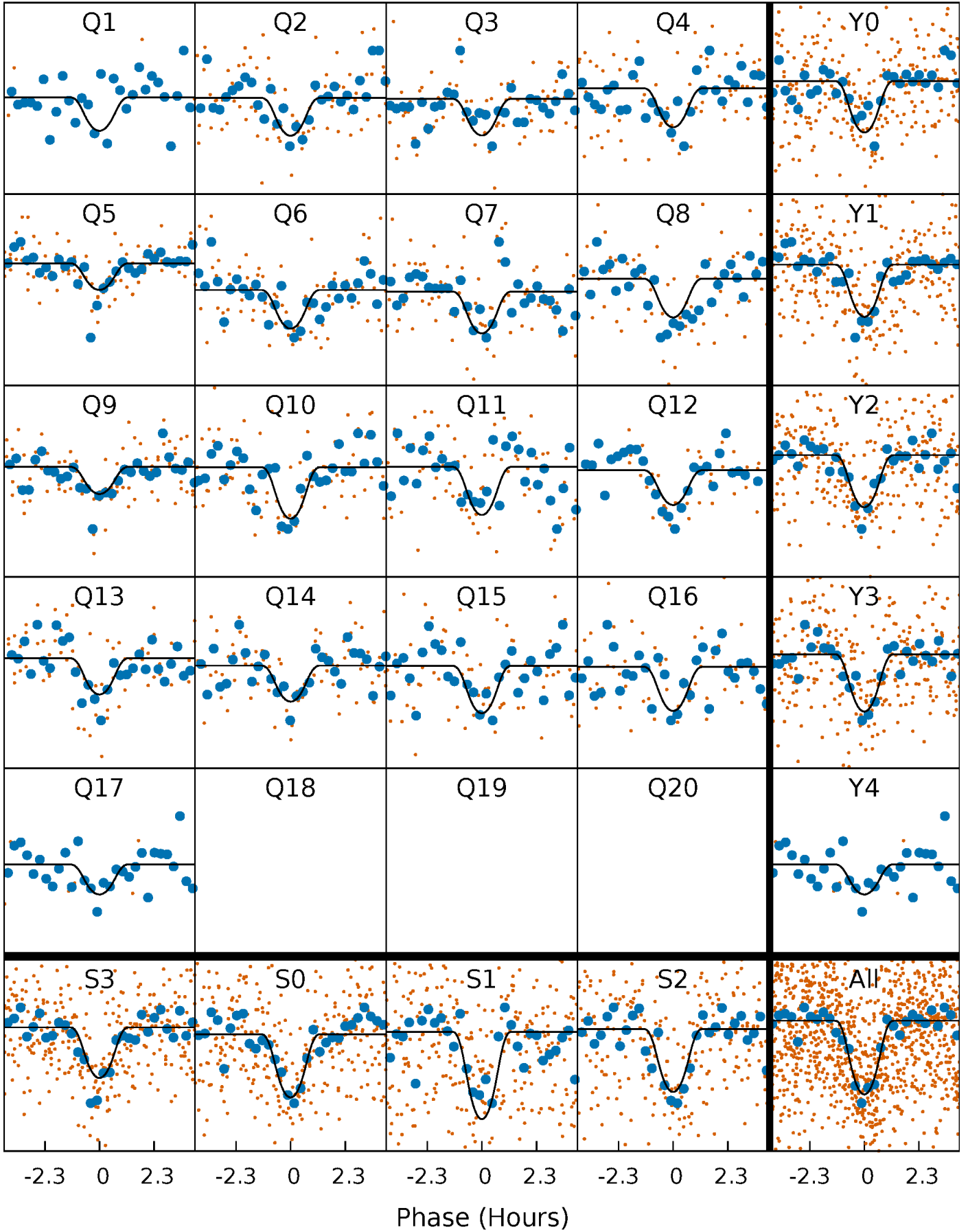
TCE 005521300-01 P= 18.135647 Days  $T_0=138.313642$  (BKJD)





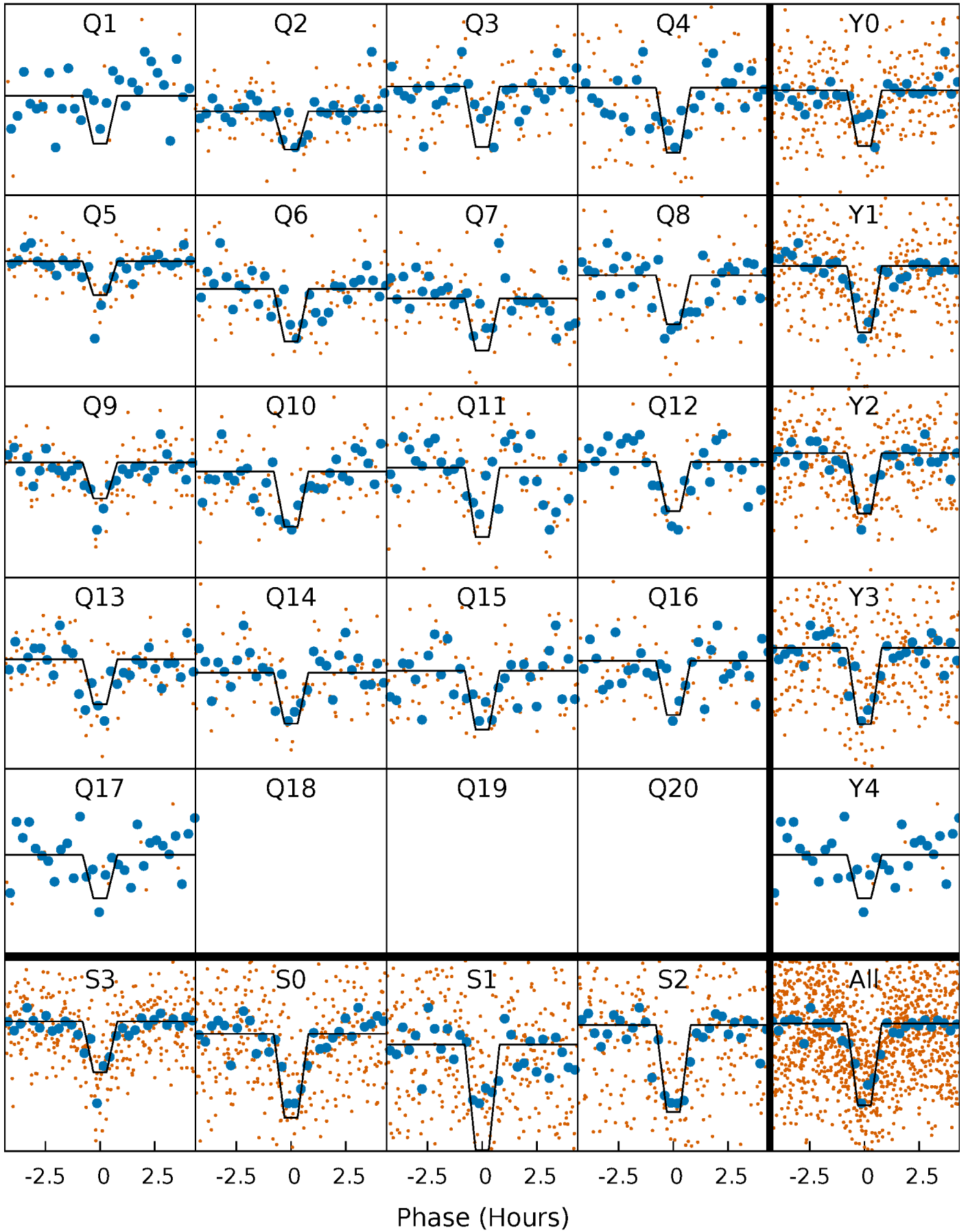
# DV Quarter-Phased Transit Curves

TCE 005521300-01   P= 18.135647 Days    $T_0=138.313642$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

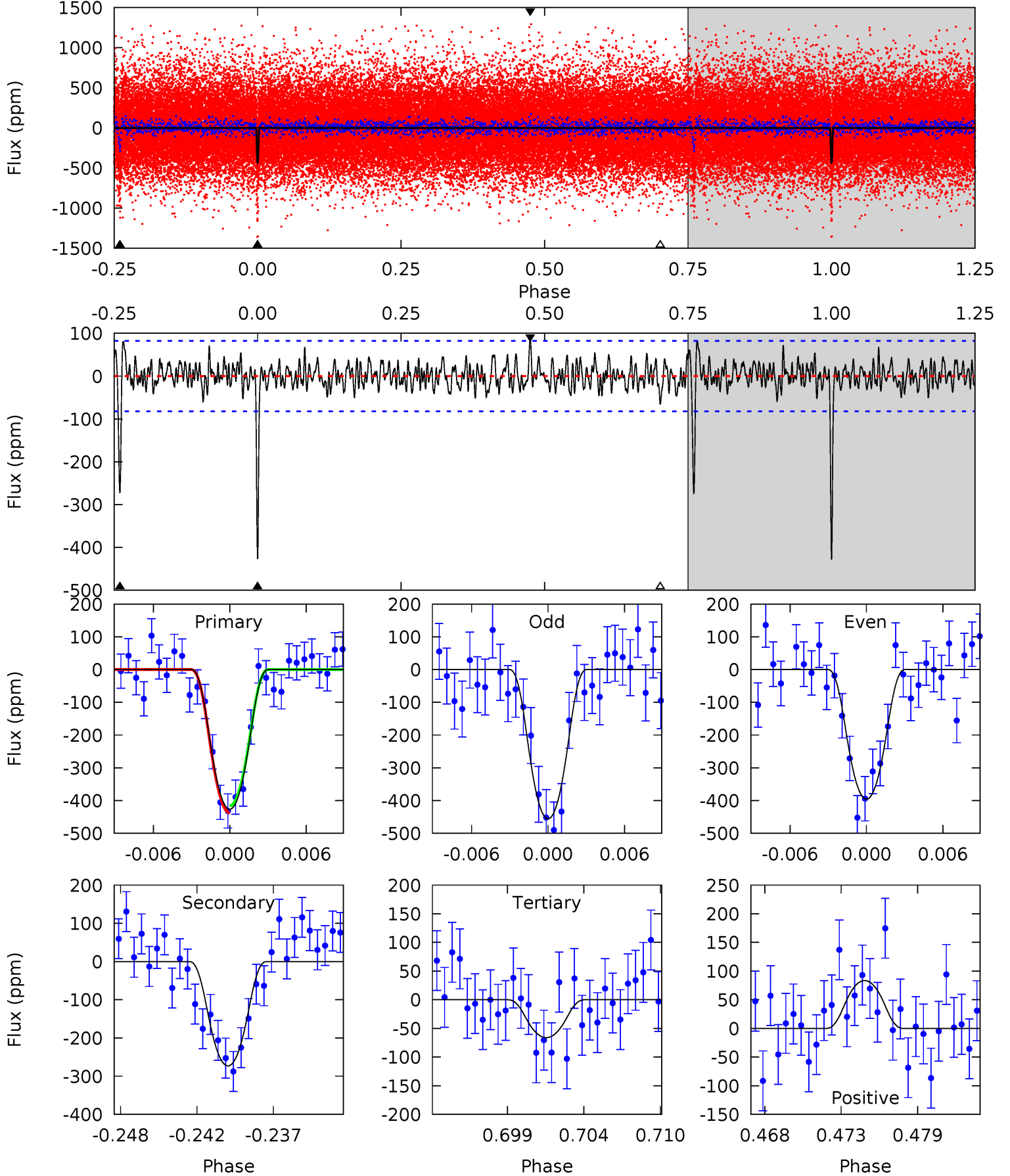
TCE 005521300-01 P= 18.135719 Days  $T_0=138.309054$  (BKJD)



# DV Model-Shift Uniqueness Test

005521300-01,  $P = 18.135647$  Days,  $E = 120.177995$  Days

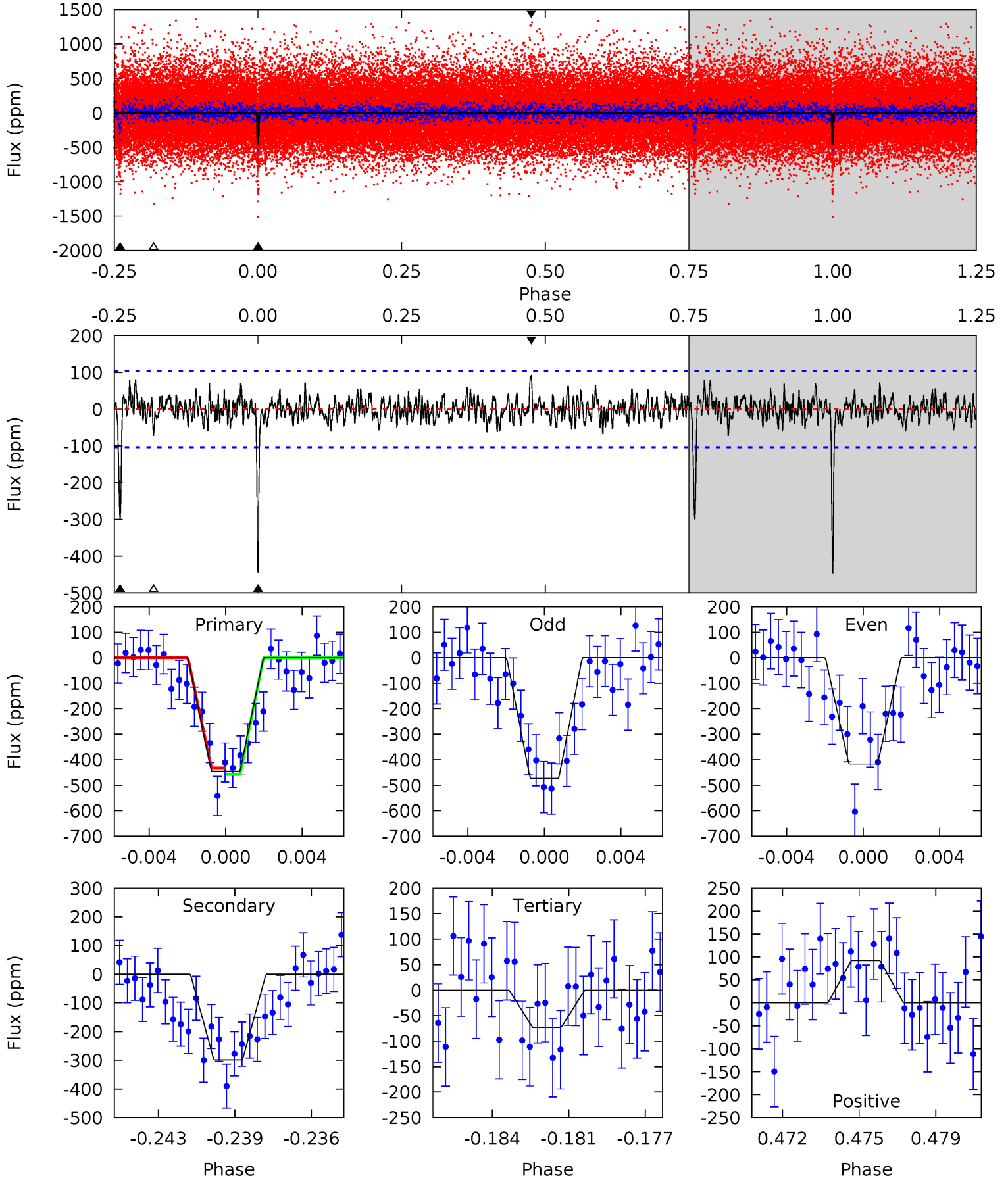
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
26.6	17.1	4.12	5.22	5.14	2.77	1.46	22.5	21.4	12.9	11.8	1.88	1.18	0.16	0.68



# Alt Model-Shift Uniqueness Test

005521300-01, P = 18.135719 Days, E = 120.173335 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
22.4	15.0	3.67	4.63	5.21	2.90	1.24	18.7	17.7	11.3	10.4	1.40	1.09	0.17	0.63



### Stellar Parameters For KIC 005521300

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6184^{+172}_{-216}$	$4.448^{+0.054}_{-0.202}$	$-0.060^{+0.250}_{-0.350}$	$1.038^{+0.332}_{-0.111}$	$1.100^{+0.141}_{-0.141}$	$1.387^{+0.397}_{-0.740}$
	+3%/-3%	+1%/-5%	+417%/-583%	+32%/-11%	+13%/-13%	+29%/-53%
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 005521300-01 / KOI 2456.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-273 \pm 16$	$3.67^{+2.15}_{-2.14}$	$1059^{+79}_{-50}$	$4638^{+2375}_{-711}$	$215^{+978}_{-130}$
Alt.	$-298 \pm 20$	$3.08^{+2.10}_{-1.73}$	$1057^{+78}_{-51}$	$5099^{+2675}_{-948}$	$333^{+1380}_{-216}$

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



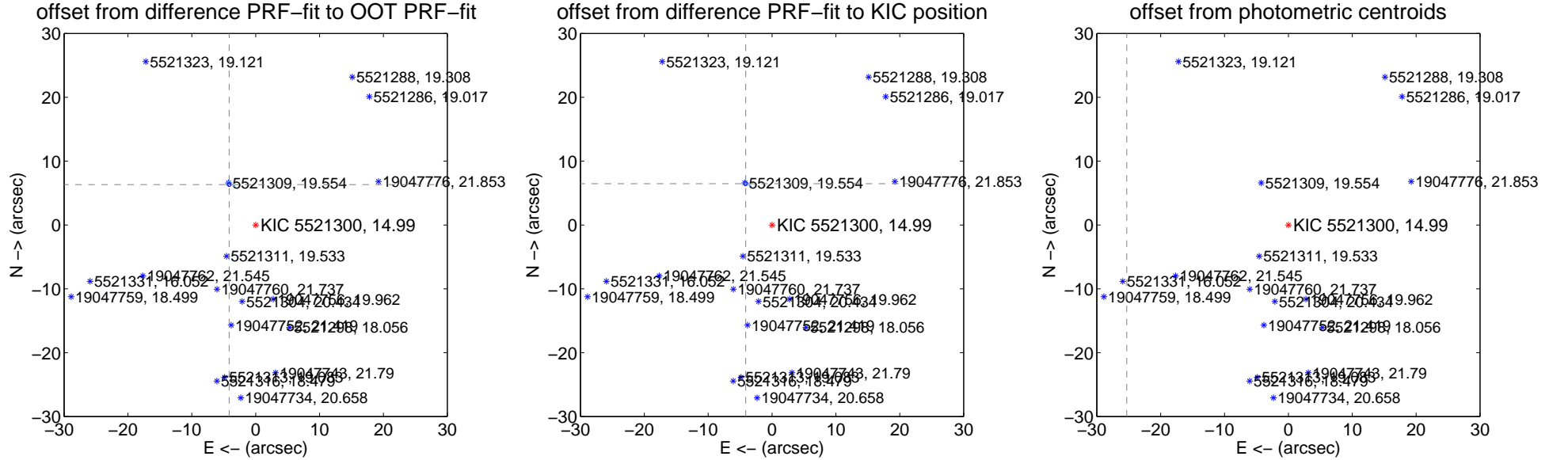
## DV Centroid Data

Supplemental centroid analysis for 005521300-01. Kepler magnitude: 14.99. Transit SNR 15.82

There are 16 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.06 arcsec

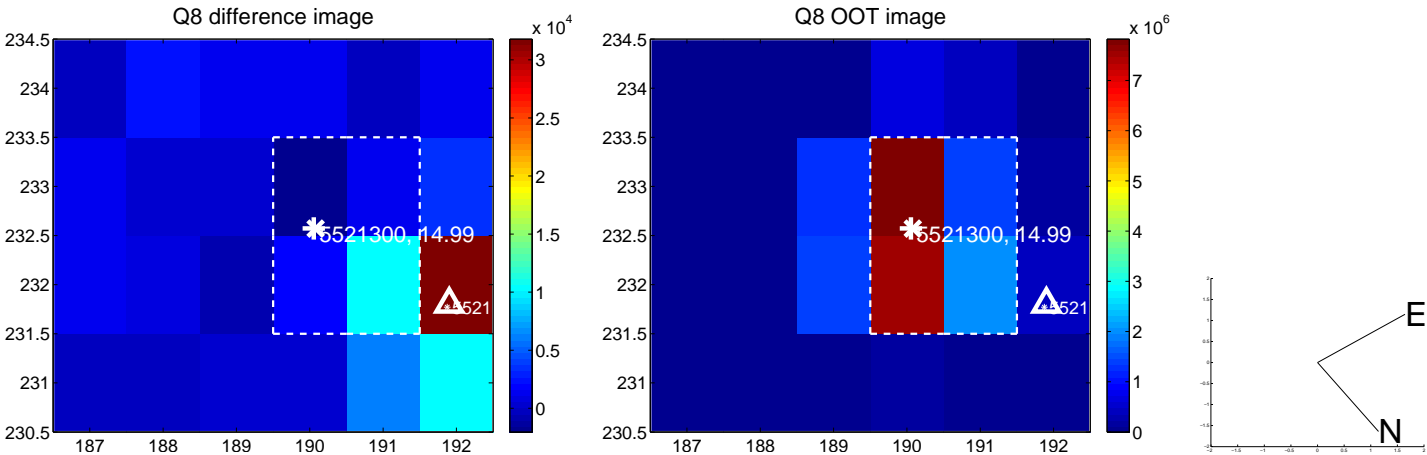
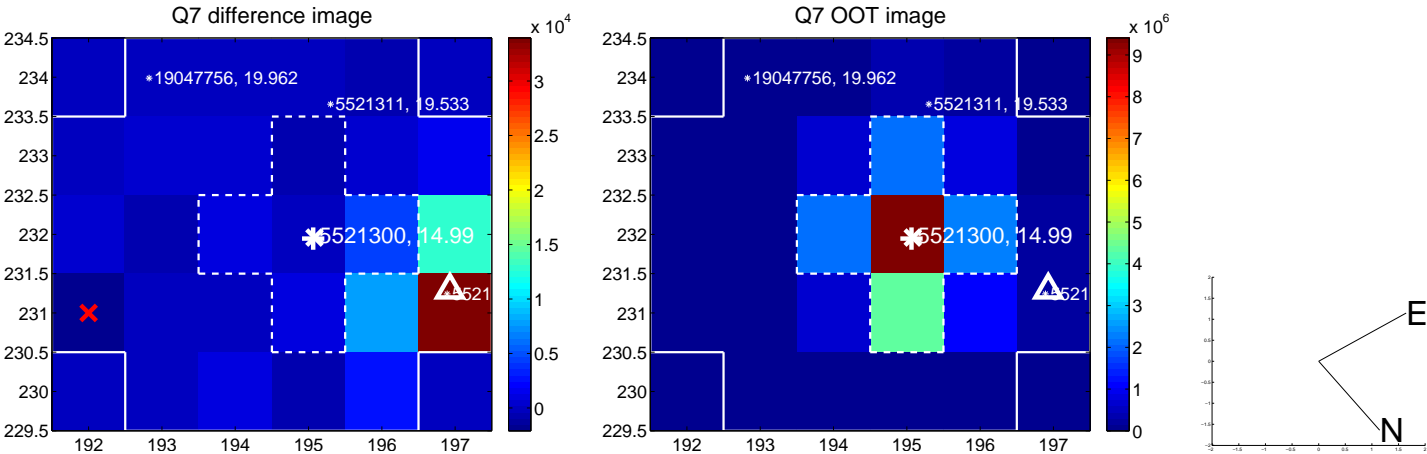
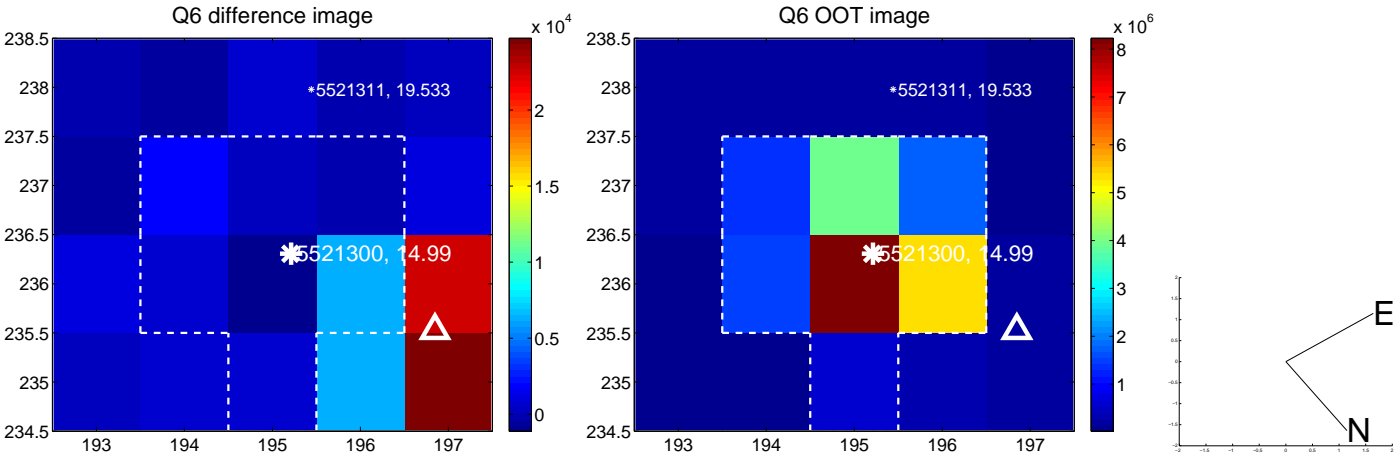
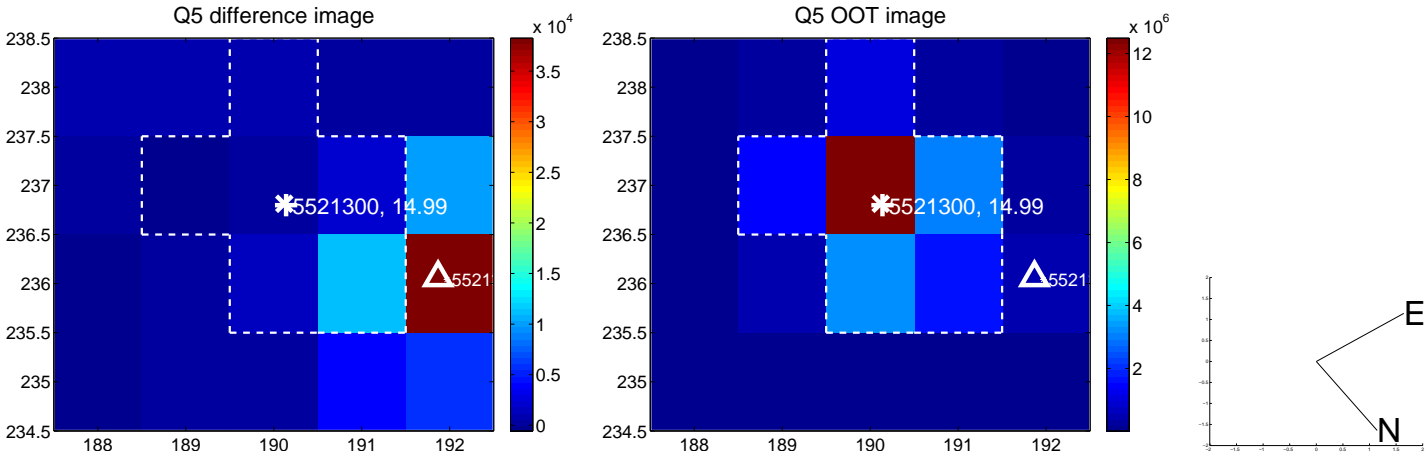
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	<b>7.566 <math>\pm</math> 0.098</b>	<b>76.88</b>	4.148 $\pm$ 0.109	6.328 $\pm$ 0.083
PRF-fit source offset from KIC position	<b>7.677 <math>\pm</math> 0.099</b>	<b>77.16</b>	4.126 $\pm$ 0.108	6.474 $\pm$ 0.081
photometric centroid source offset	<b>51.72 <math>\pm</math> 0.95</b>	<b>54.70</b>	25.31 $\pm$ 0.99	45.10 $\pm$ 0.93



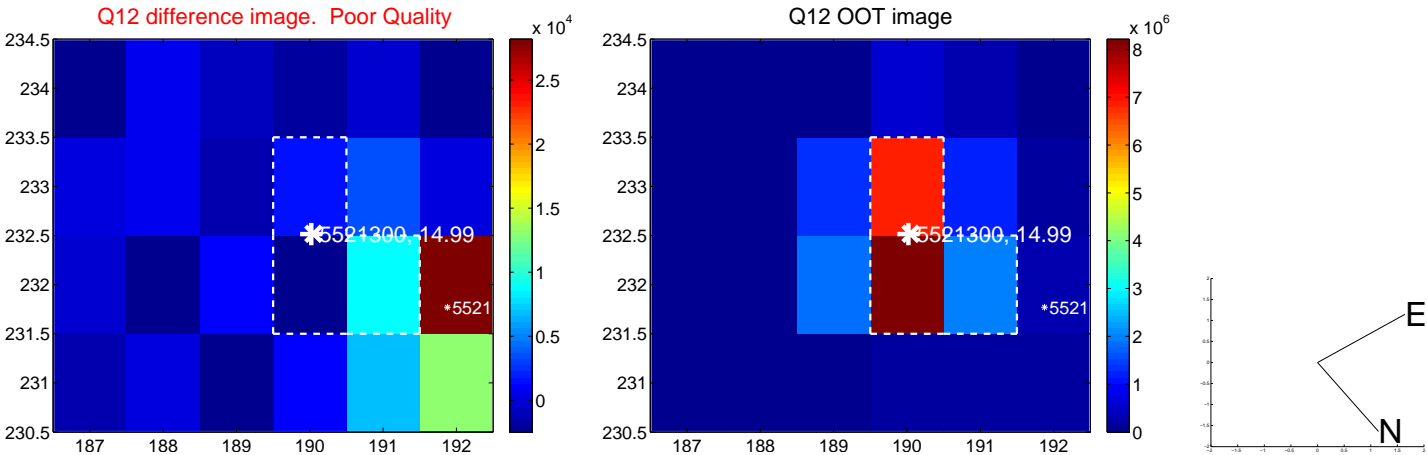
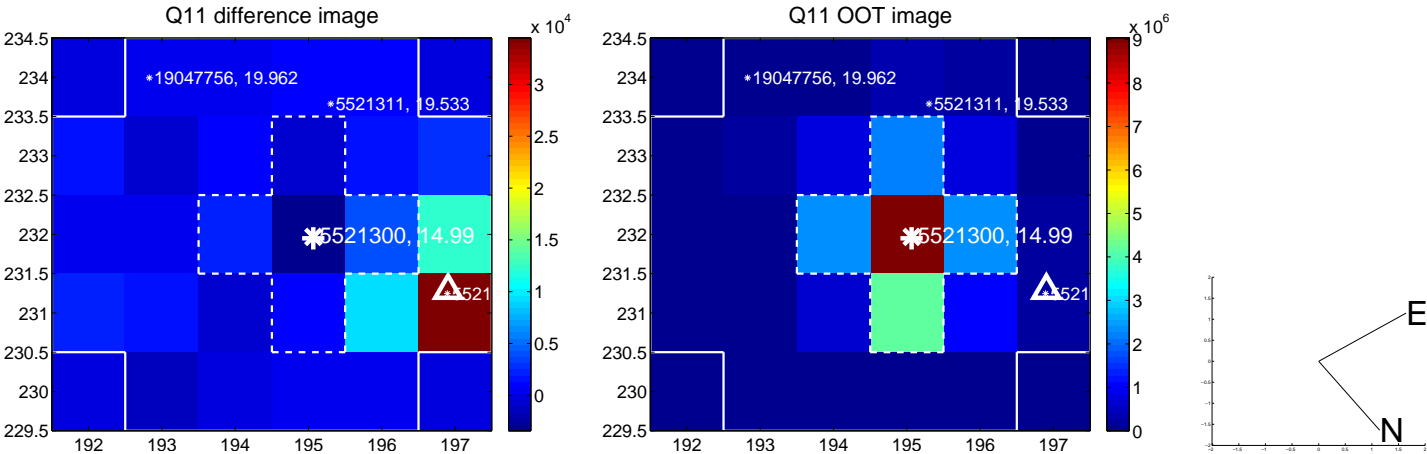
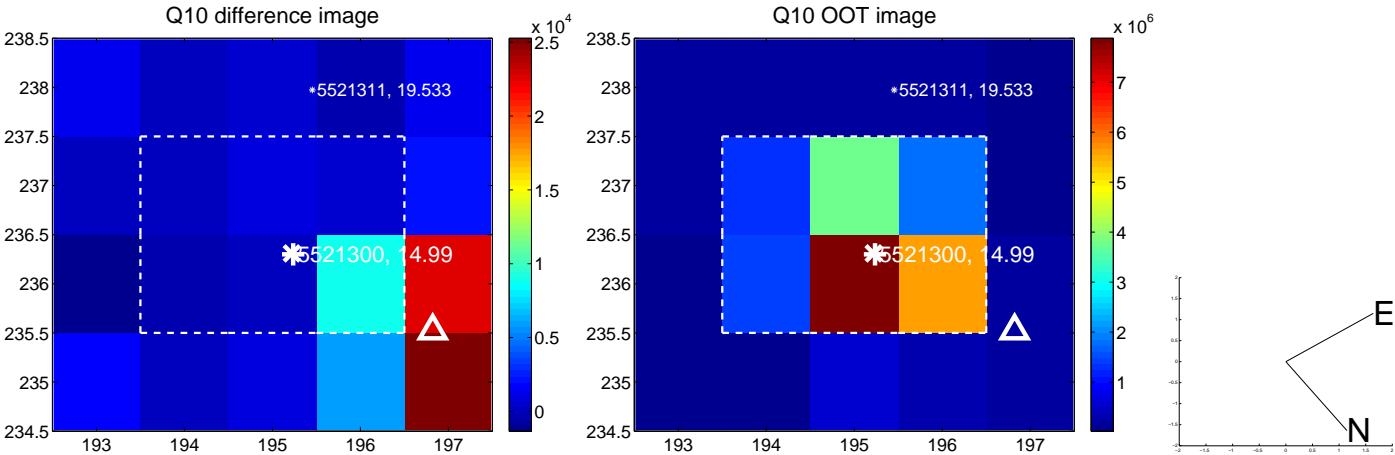
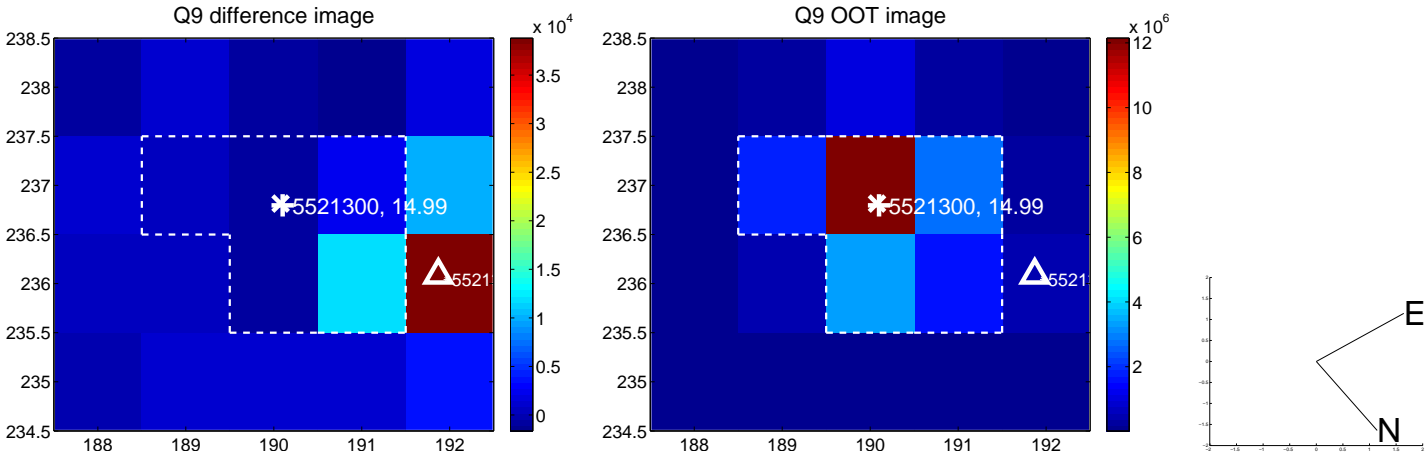
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



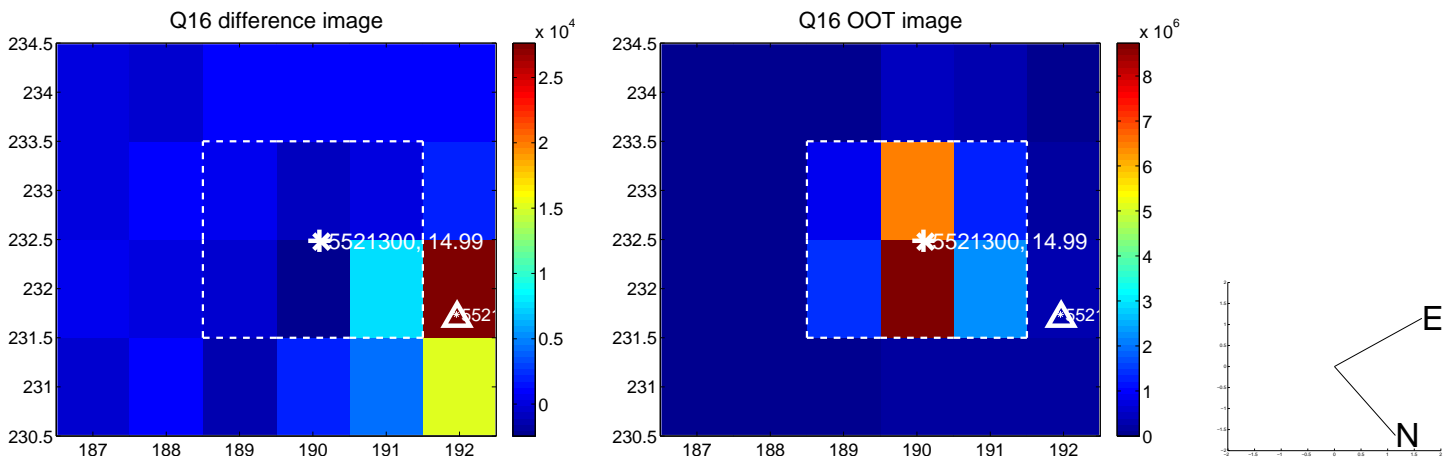
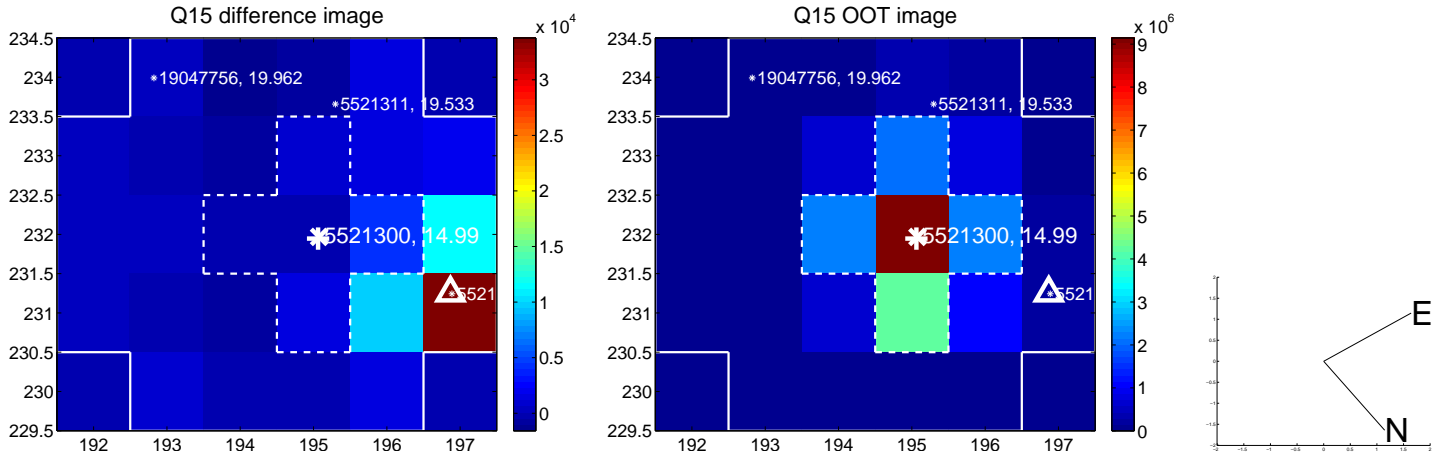
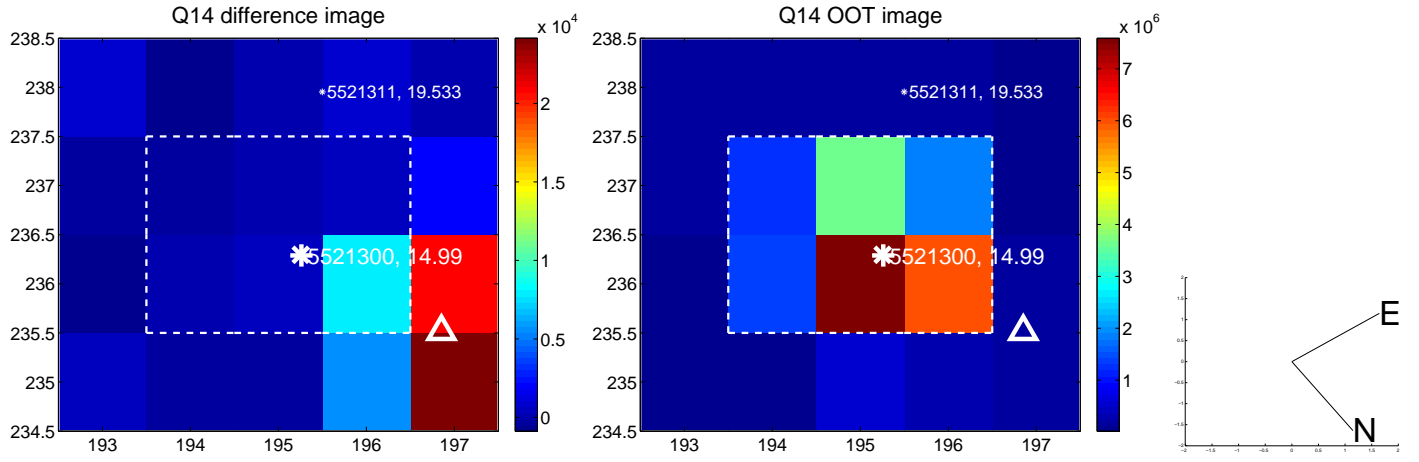
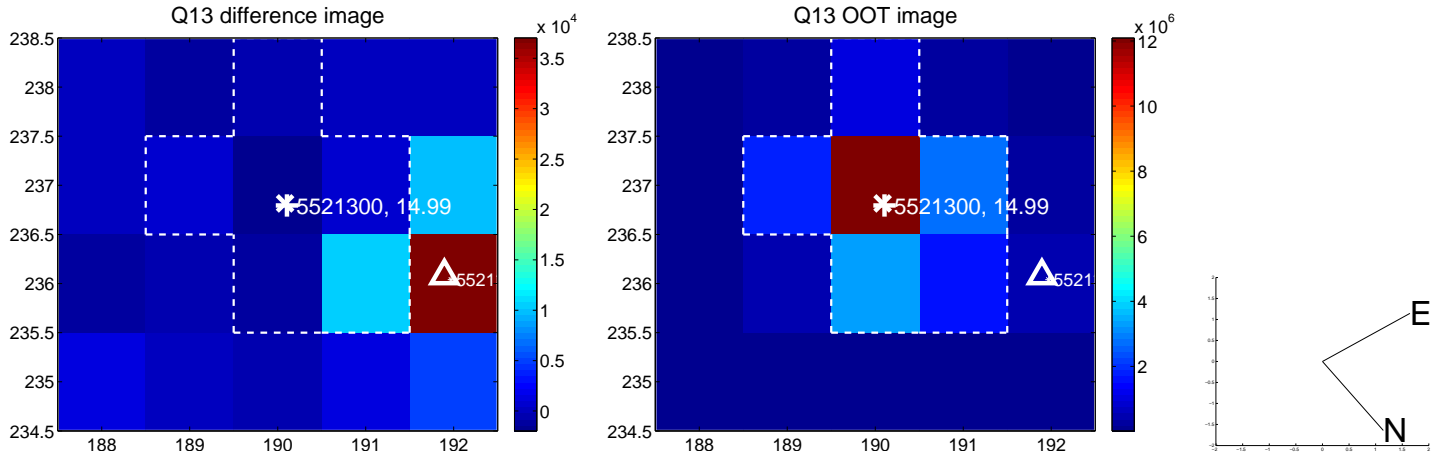
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

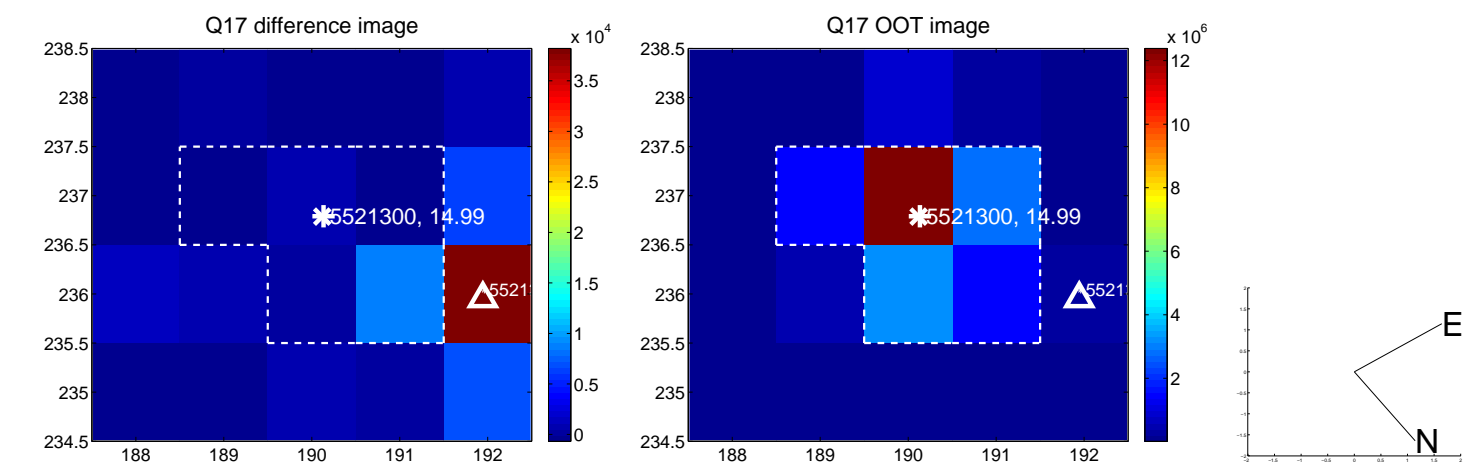


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

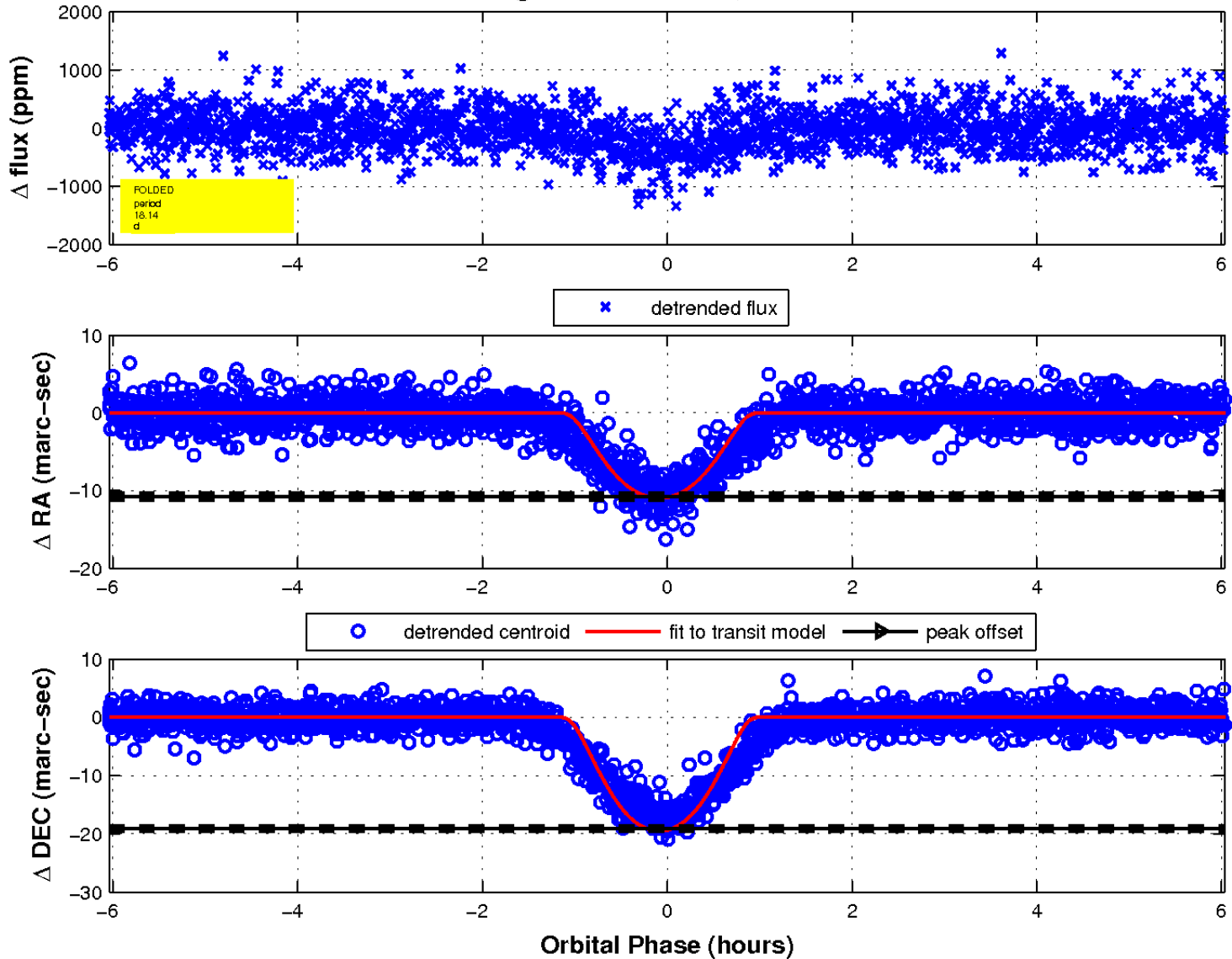




white ×: KIC target position; +: OOT centroid; △: difference centroid. red ×: large negative pixel value.

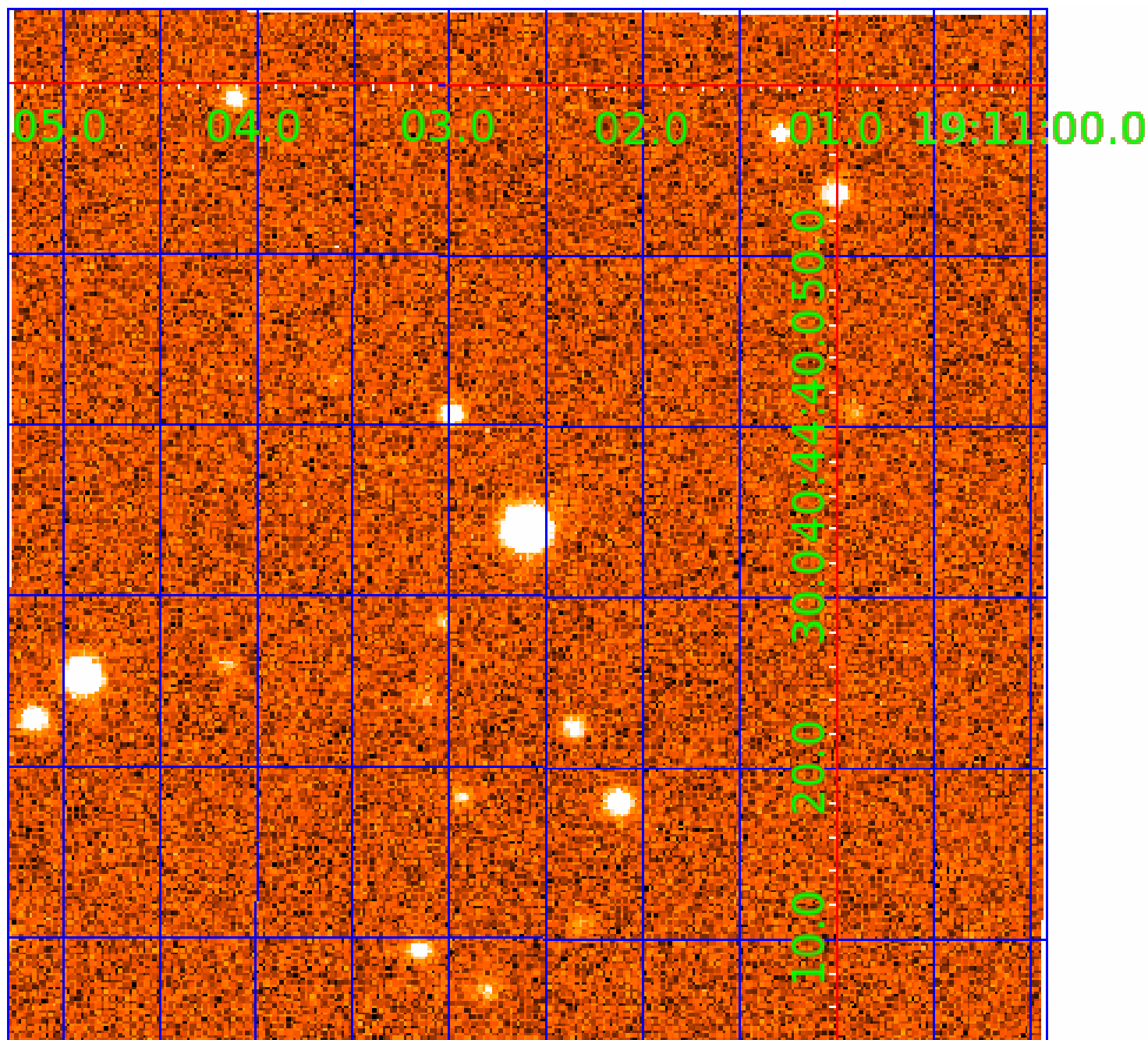


fluxWeightedCentroids, Planet 1 of 2



UKIRT Image

Declination



# KIC 005521300

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
005521300-01	OBS	2456.01	18.135647	138.313642	425.0	2.015	14.0	15.8	1.04	6184	3.09	72.45
005521300-02	OBS	No	18.135757	133.954978	268.1	3.752	12.3	12.9	1.04	6184	3.11	72.45

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
005521300-01	OBS	FP	0.00	0	1	1	0	MOD_SEC_DV—MOD_SEC_ALT—HAS_SEC_TCE—CENT_RESOLVED_OFFSET
005521300-02	OBS	FP	0.00	1	1	1	0	IS_SEC_TCE—CENT_RESOLVED_OFFSET

**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.

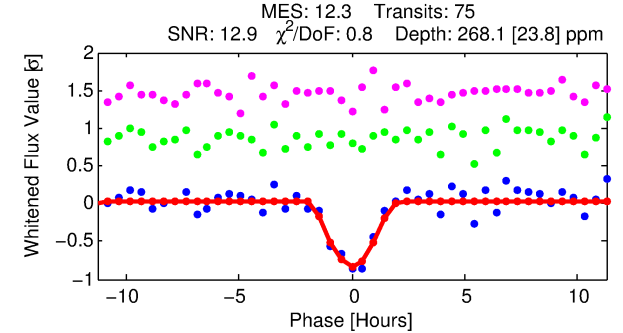
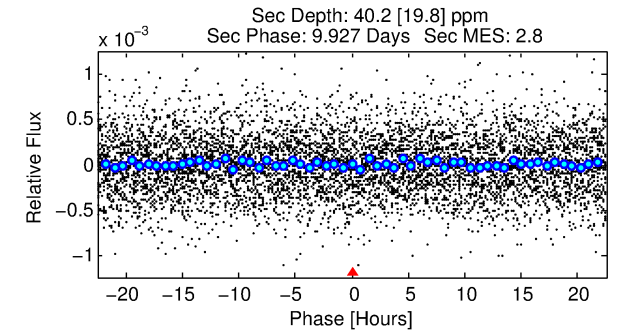
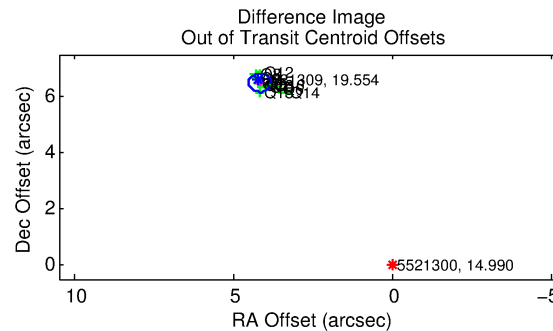
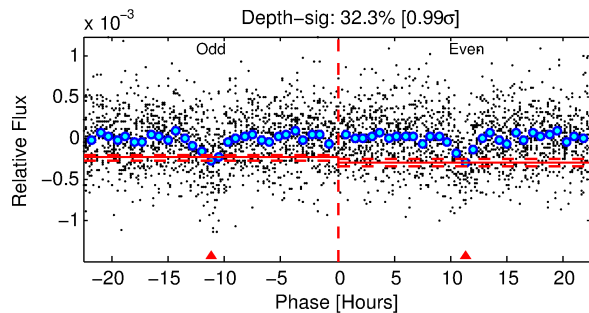
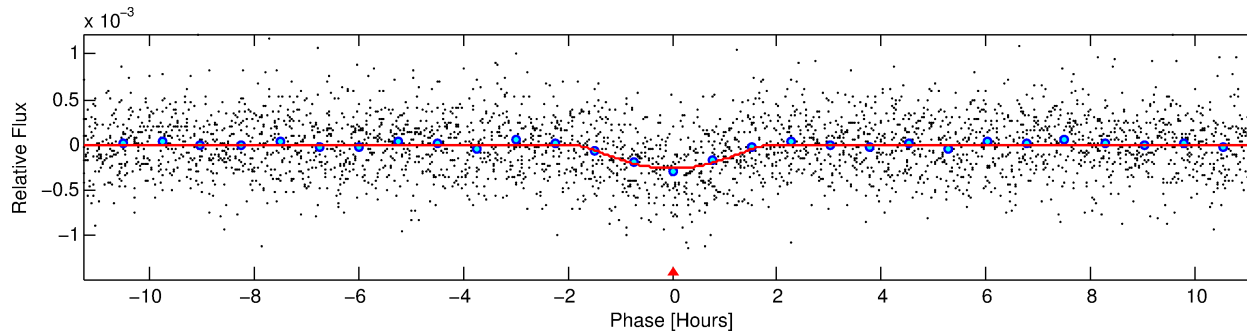
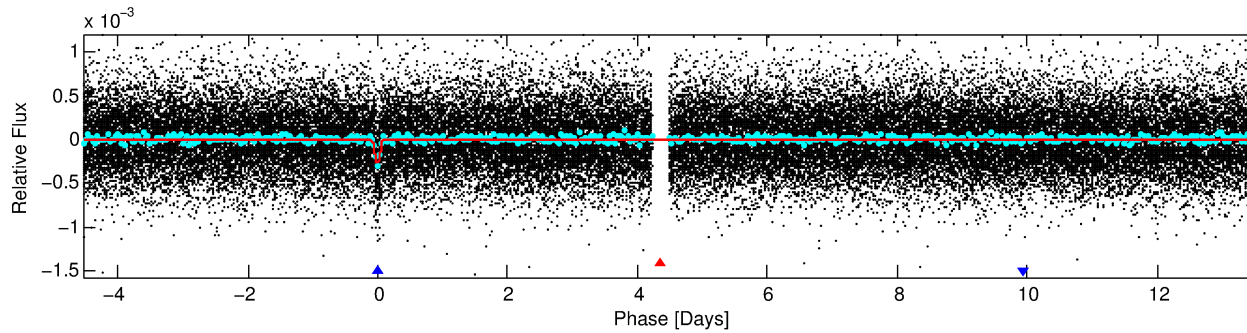
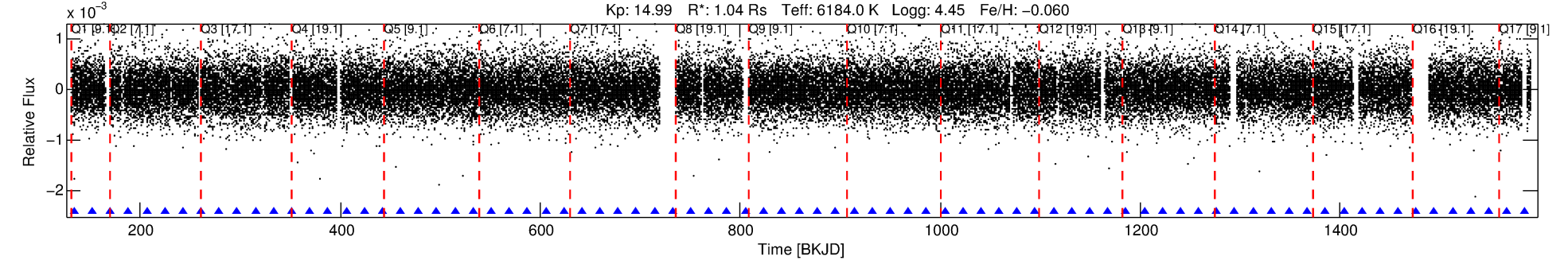
## Ephemeris Match Information For 005521300-02

No Significant Match Found

# DV One-Page Summary

KIC: 5521300 Candidate: 2 of 2 Period: 18.136 d  
KOI: K02456 Corr: No Ephemeris Match

Kp: 14.99 R\*: 1.04 Rs Teff: 6184.0 K Logg: 4.45 Fe/H: -0.060



## DV Fit Results:

Period = 18.13576 [0.00016] d  
Epoch = 133.9550 [0.0070] BKJD  
Rp/R\* = 0.0275 [0.0647]  
a/R\* = 9.35 [6.52]  
b = 1.00 [0.10]  
Seff = 72.45 [29.08]  
Teq = 744 [75] K  
Rp = 3.11 [7.40] Re  
a = 0.1396 [0.0368] AU  
Ag = 44.44 [211.24] [0.21σ]  
Teffp = 2970 [3519] K [0.63σ]

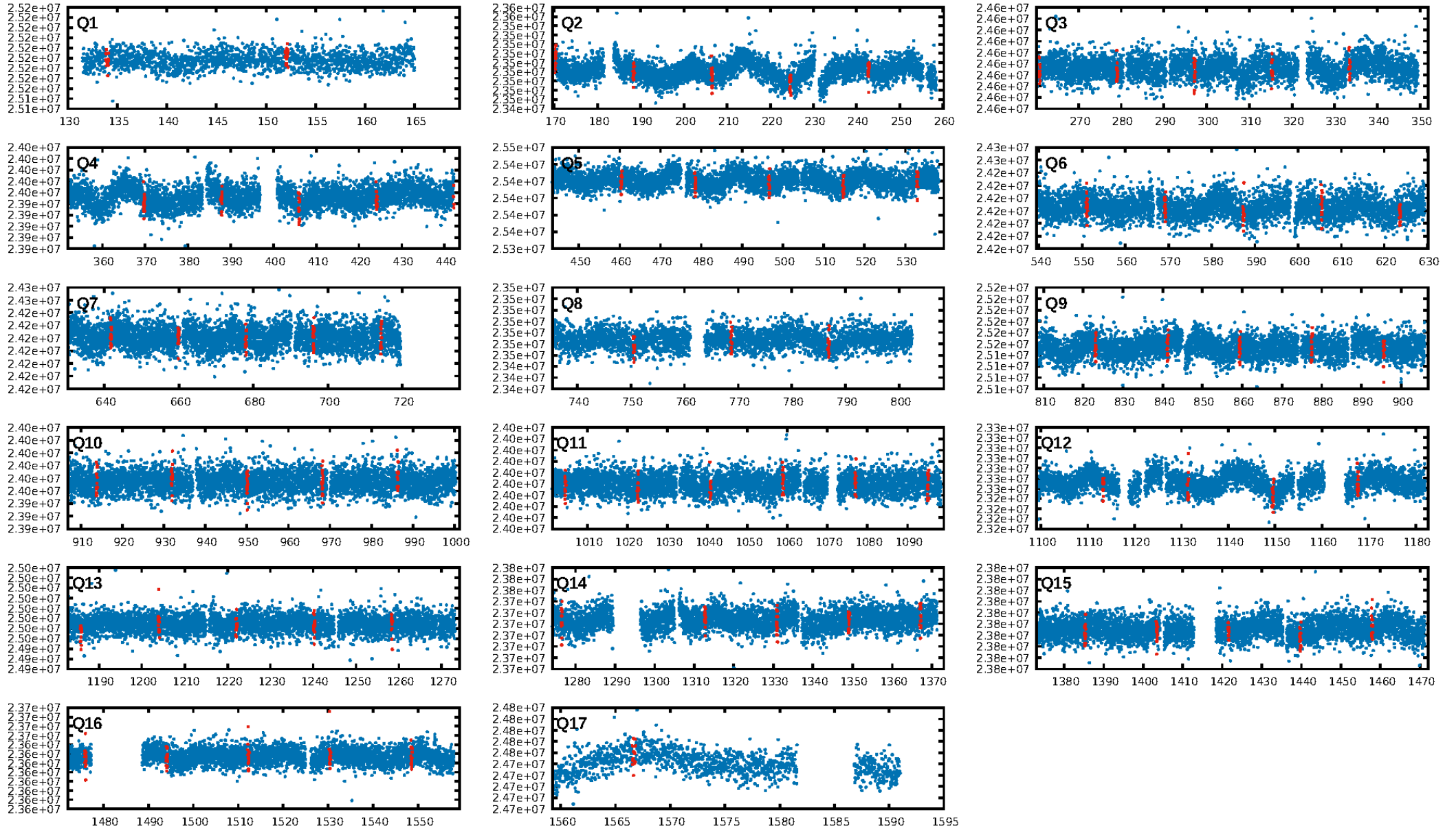
## DV Diagnostic Results:

ShortPeriod-sig: 0.0% [0.00σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 96.7%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 1.35e-33  
RollingBand-fgt: 1.00 [72/72]  
GhostDiagnostic-chr: -0.268  
Centroid-sig: 0.0%  
Centroid-so: 42.772 arcsec [36.46σ]  
OotOffset-rm: 7.723 arcsec [69.36σ]  
KicOffset-rm: 7.740 arcsec [74.22σ]  
OotOffset-st: 3/3/3/4 [13]  
KicOffset-st: 3/3/3/4 [13]  
DiffImageQuality-fgm: 1.00 [13/13]  
DiffImageOverlap-fno: 1.00 [17/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 18:49:34 Z

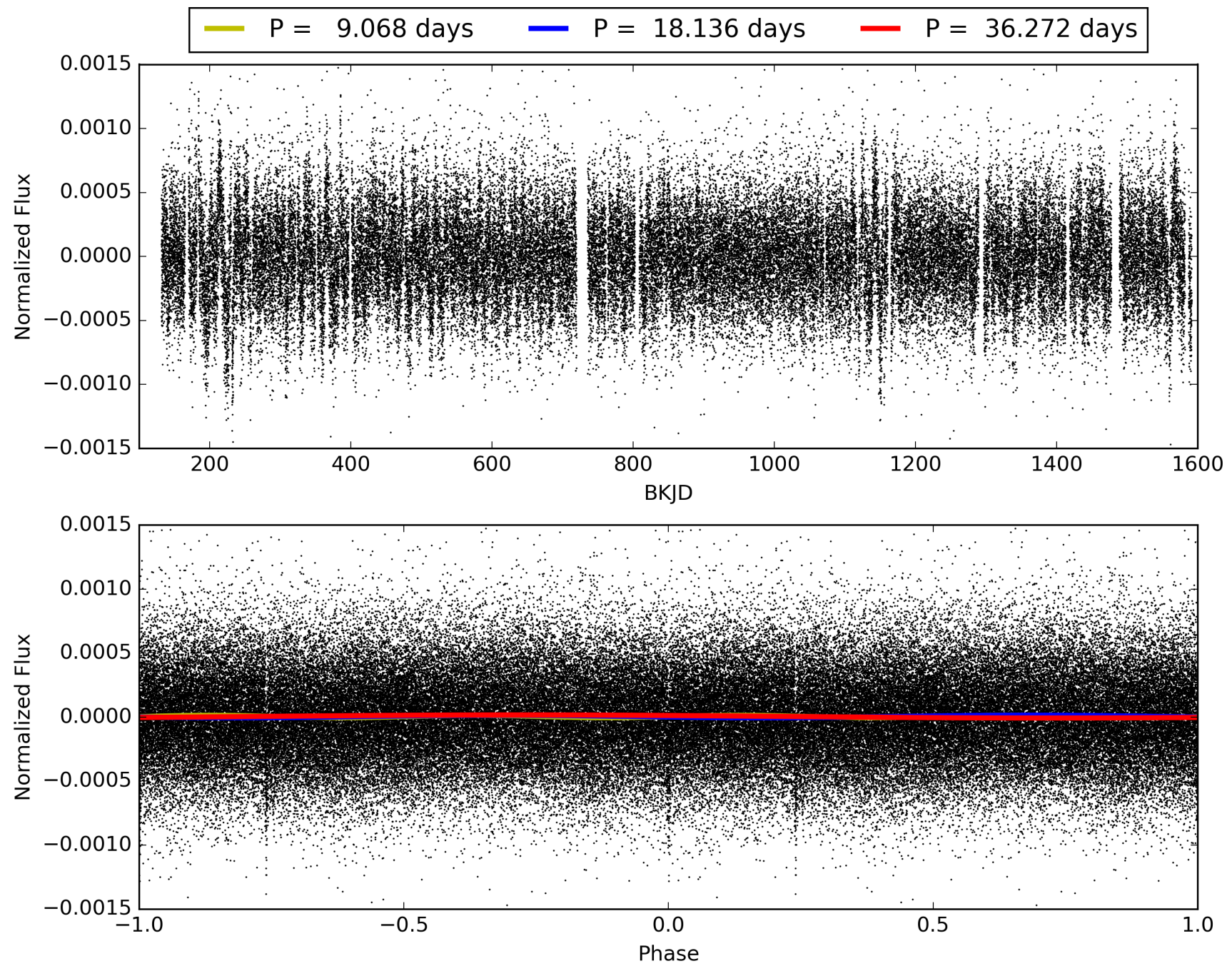
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 005521300-02, PDC Light Curves



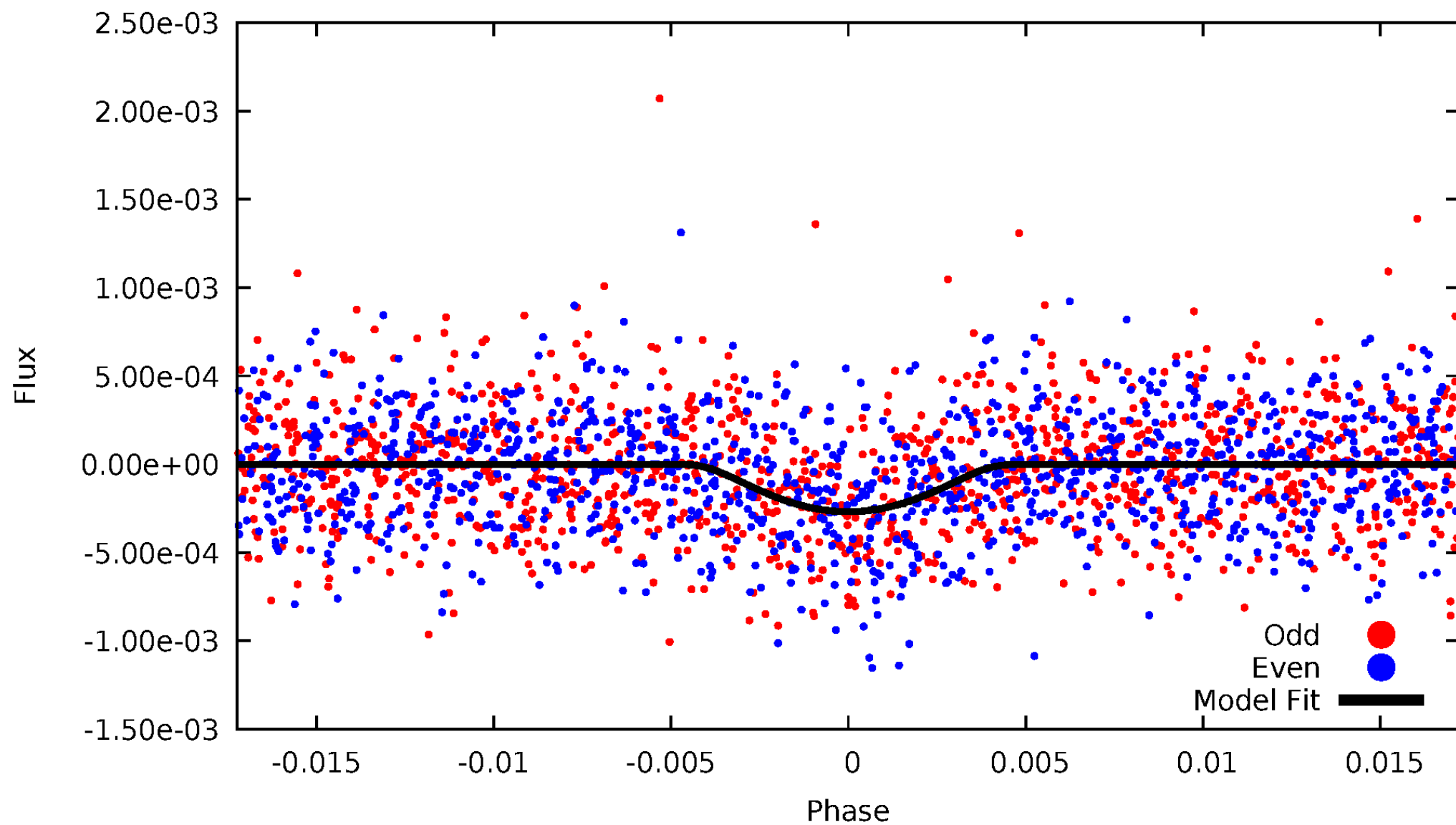


TCE 005521300-02



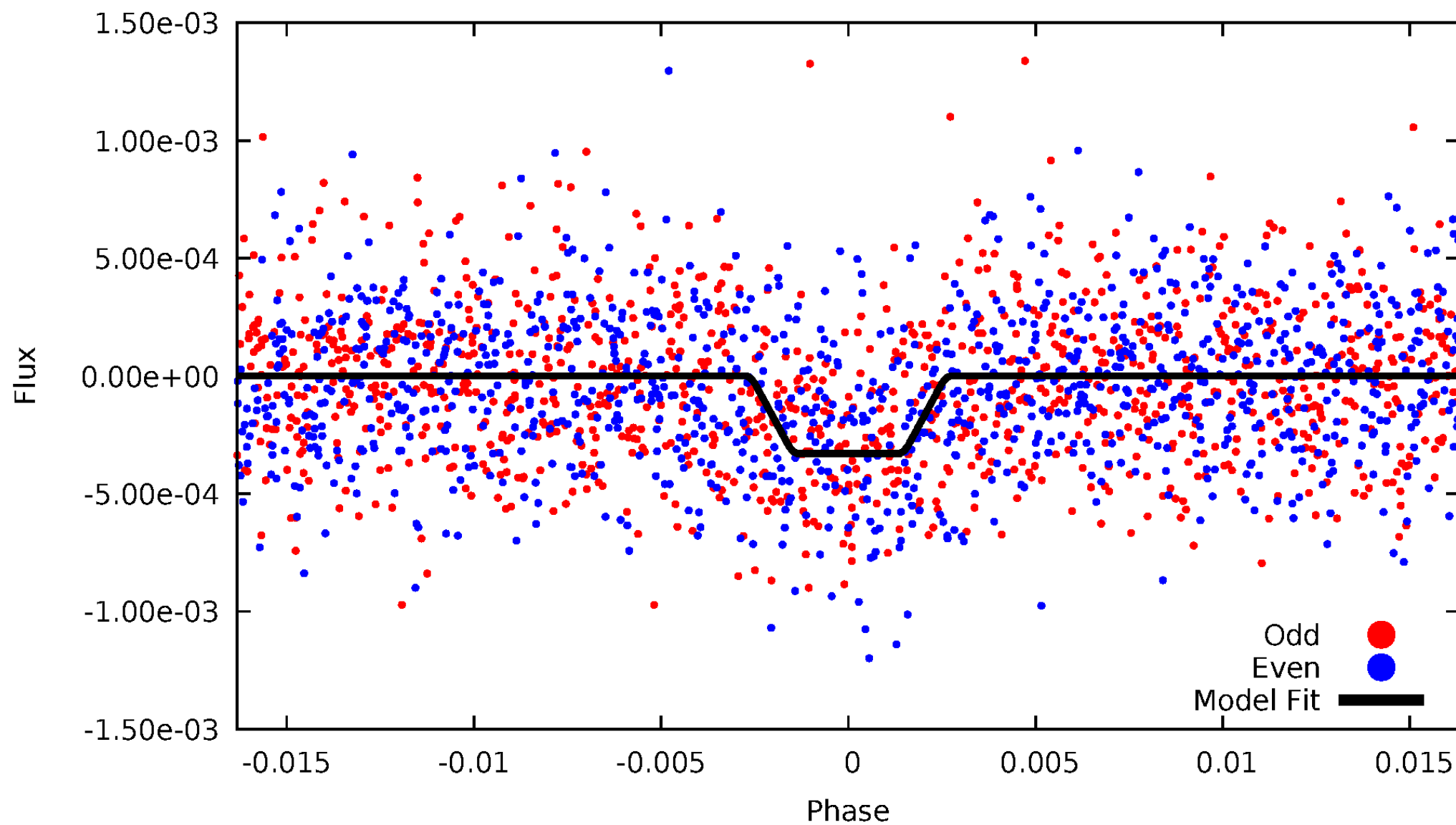
DV Odd/Even

TCE 005521300-02



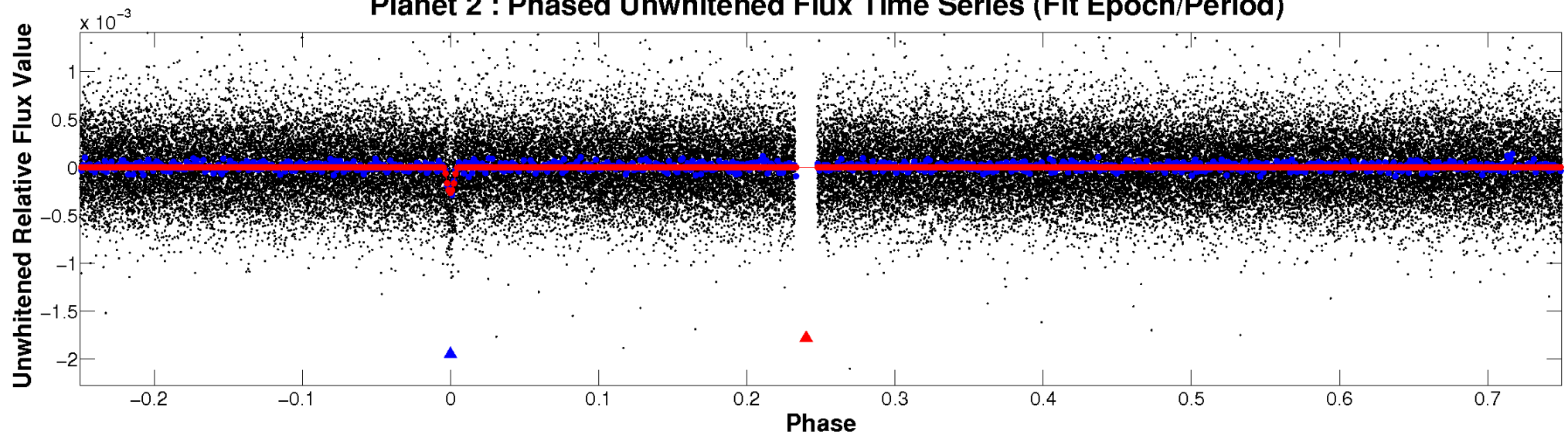
# ALT Odd/Even

TCE 005521300-02

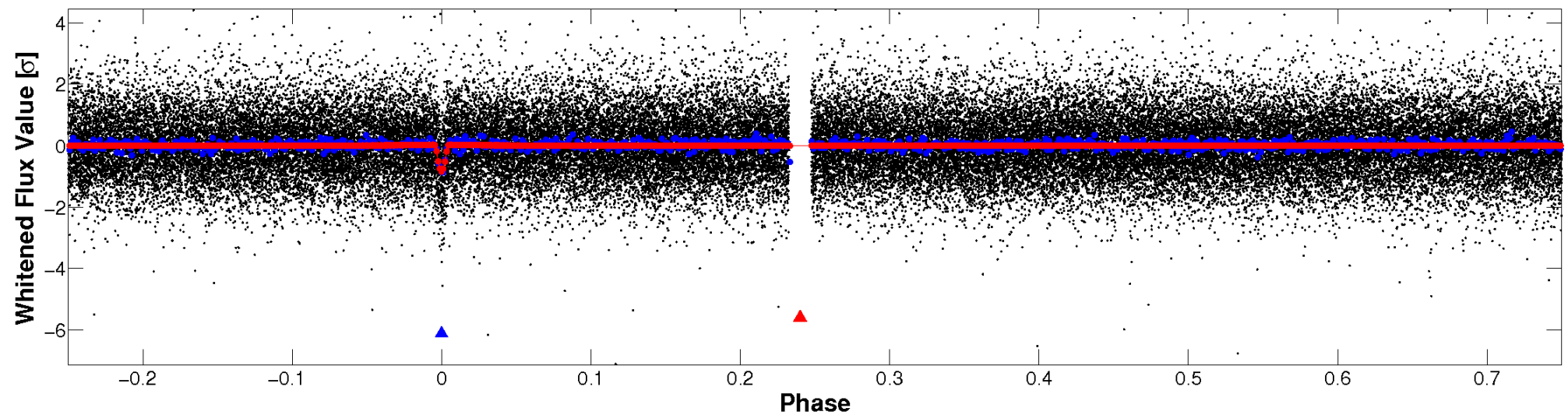


# Non-Whitened Vs. Whitened Light Curve

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

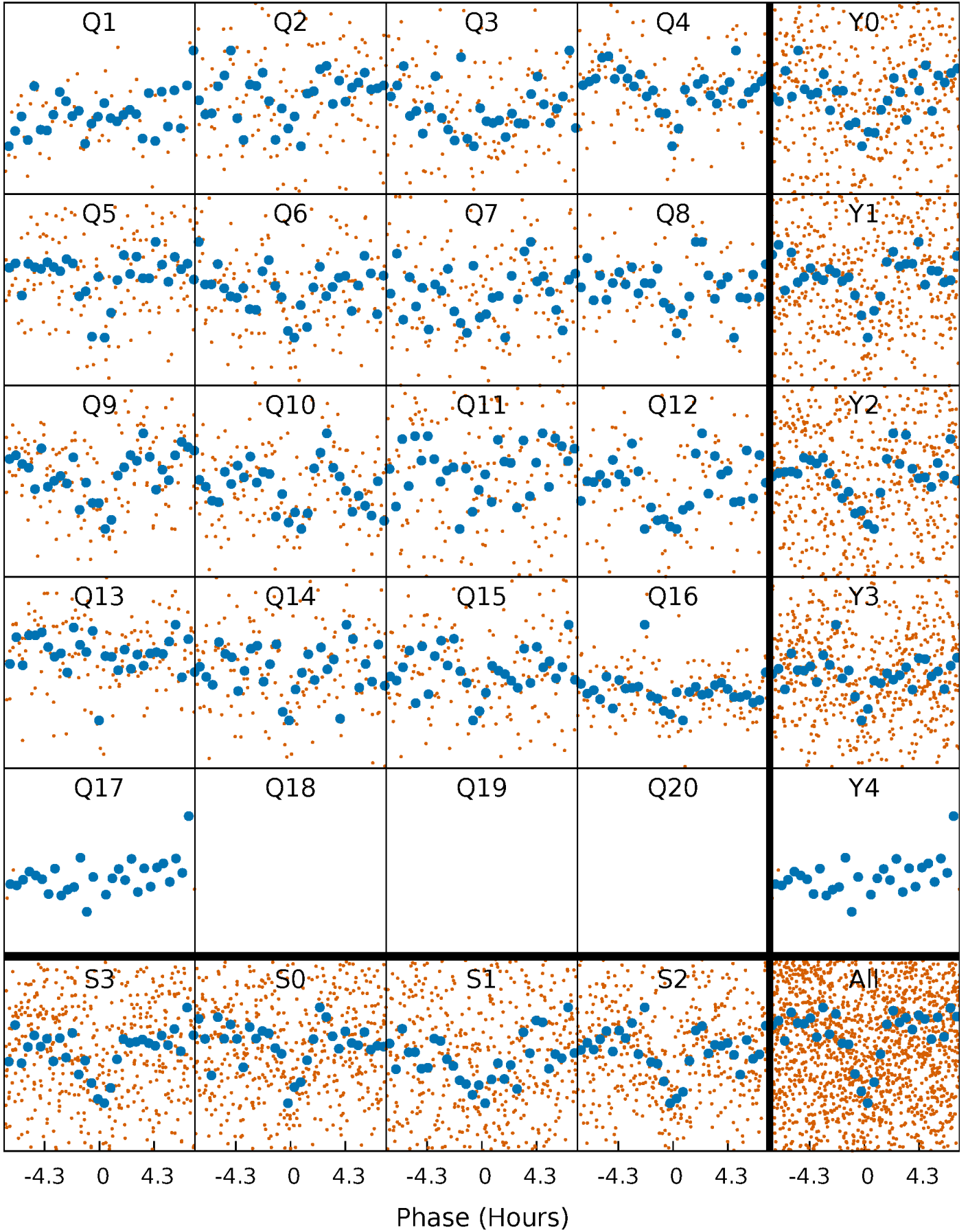


**Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

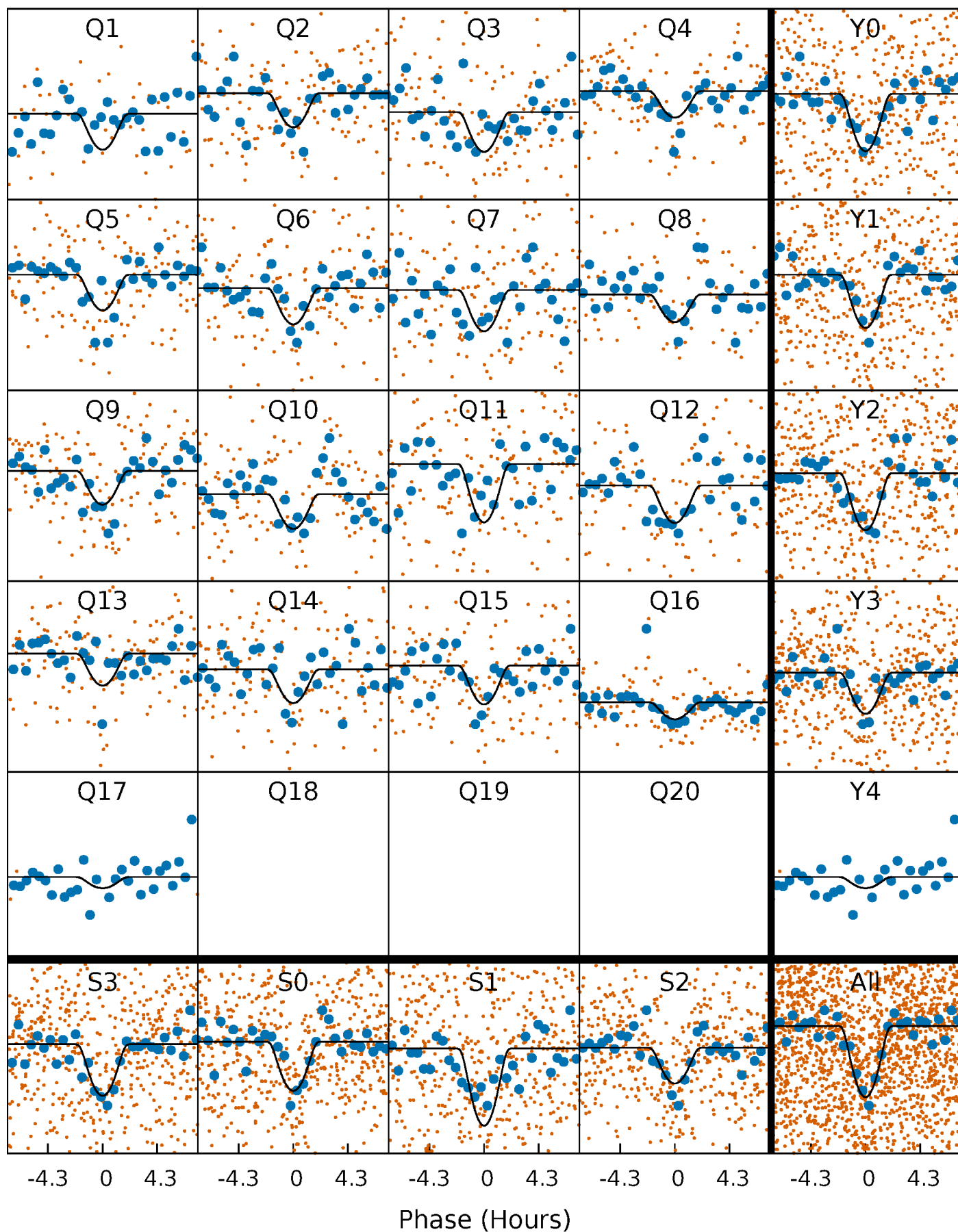
TCE 005521300-02 P= 18.135757 Days  $T_0=133.954978$  (BKJD)





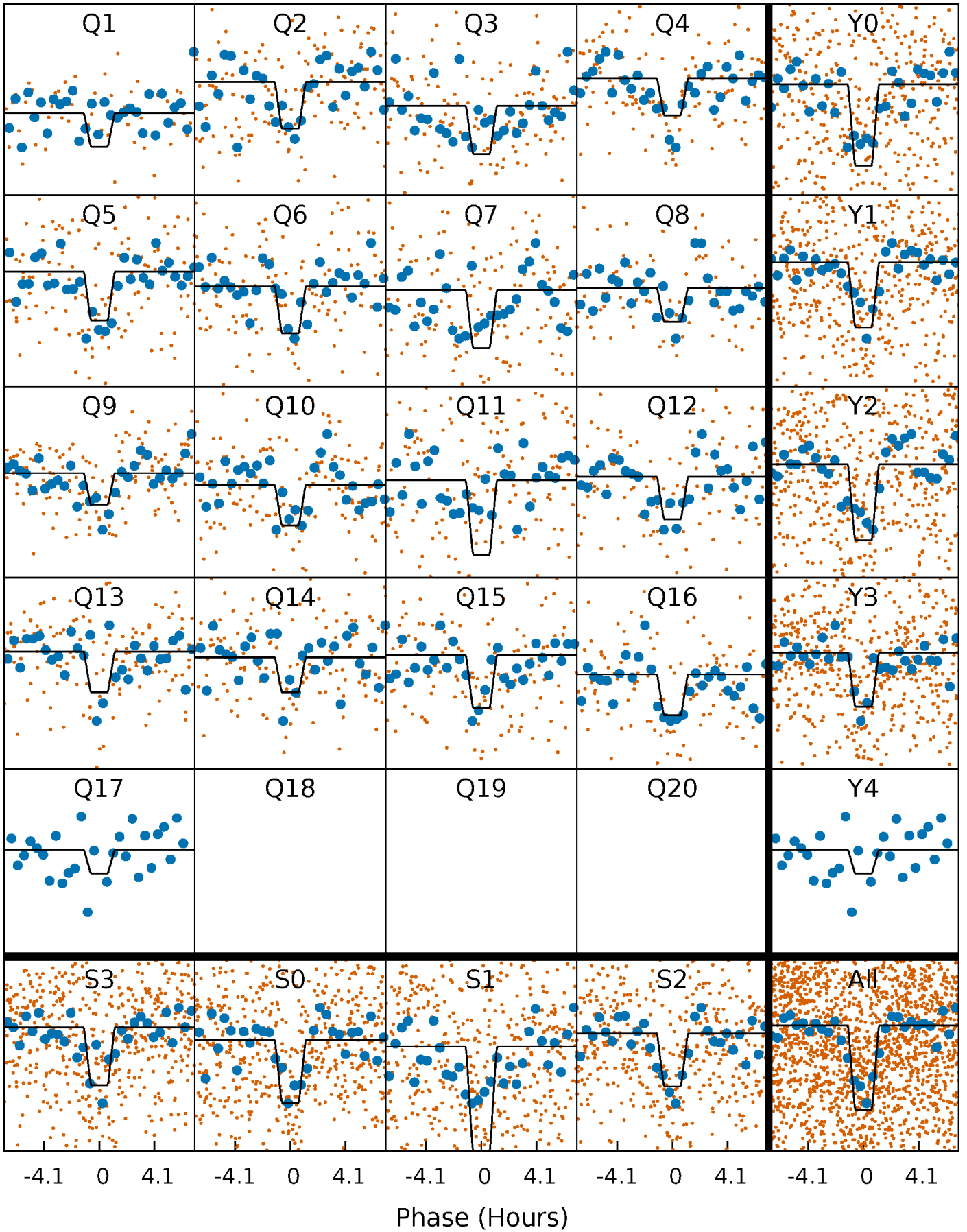
# DV Quarter-Phased Transit Curves

TCE 005521300-02 P= 18.135757 Days  $T_0=133.954978$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

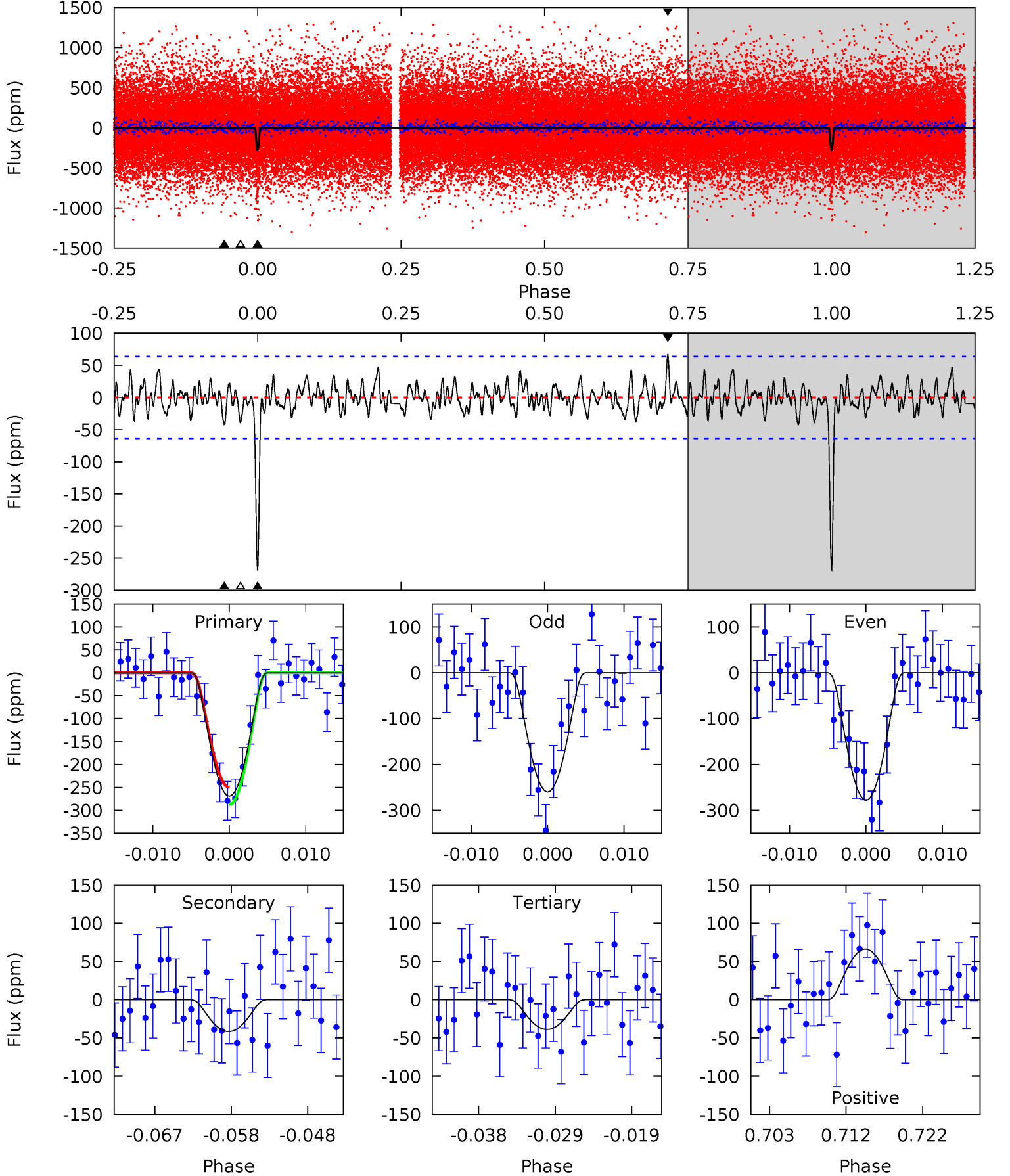
TCE 005521300-02 P= 18.135738 Days  $T_0=133.957809$  (BKJD)



# DV Model-Shift Uniqueness Test

005521300-02,  $P = 18.135757$  Days,  $E = 115.819221$  Days

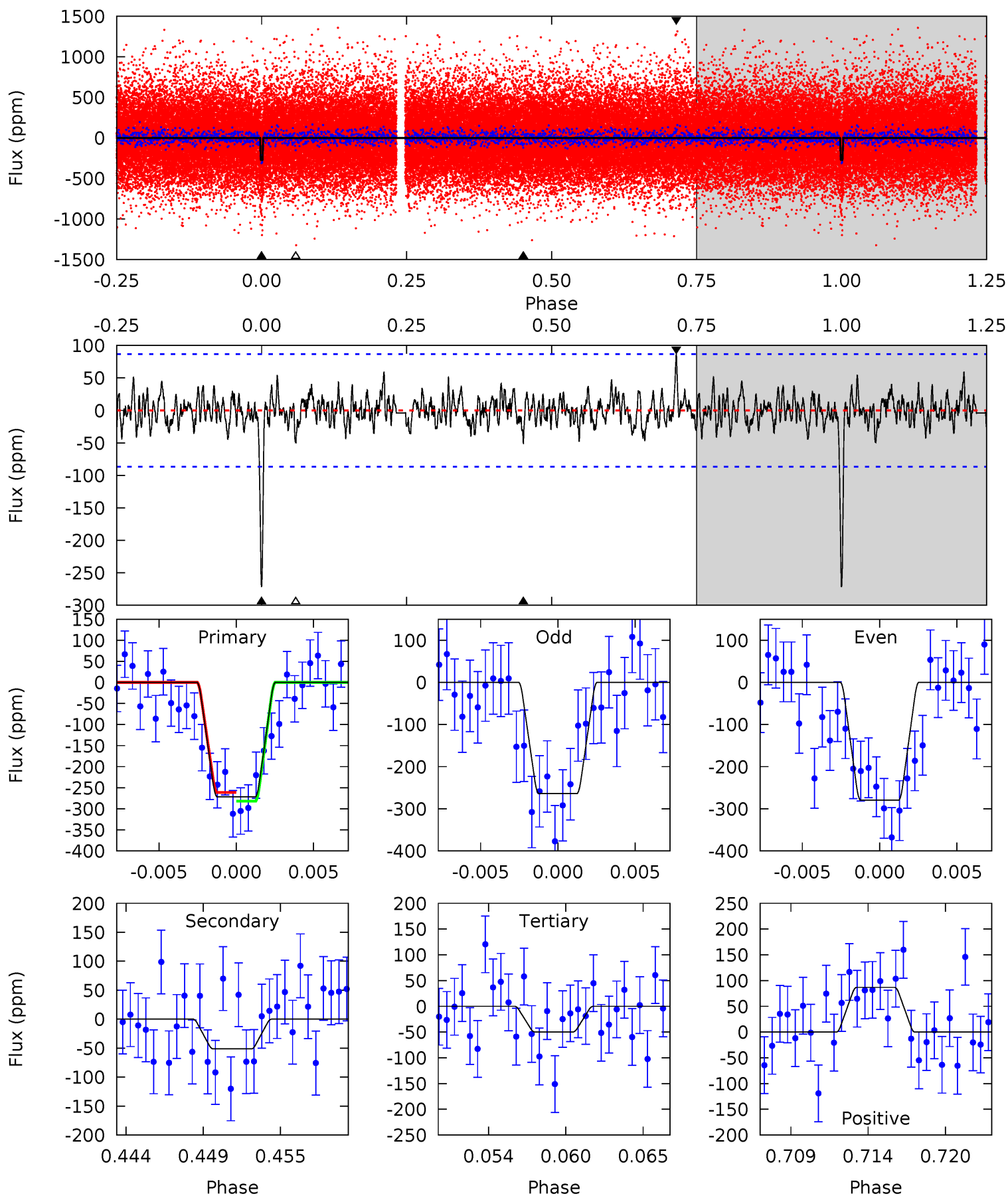
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
21.2	3.29	3.07	5.24	5.03	2.59	1.32	18.2	16.0	0.22	-1.95	0.72	1.08	0.20	1.49



# Alt Model-Shift Uniqueness Test

005521300-02,  $P = 18.135738$  Days,  $E = 115.822071$  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
16.1	3.04	2.95	5.14	5.14	2.78	1.09	13.2	11.0	0.09	-2.10	0.46	1.00	0.24	0.61



### Stellar Parameters For KIC 005521300

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6184^{+172}_{-216}$	$4.448^{+0.054}_{-0.202}$	$-0.060^{+0.250}_{-0.350}$	$1.038^{+0.332}_{-0.111}$	$1.100^{+0.141}_{-0.141}$	$1.387^{+0.397}_{-0.740}$
	+3%/-3%	+1%/-5%	+417%/-583%	+32%/-11%	+13%/-13%	+29%/-53%
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 005521300-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-42 \pm 13$	$6.66^{+6.44}_{-4.55}$	$1060^{+78}_{-55}$	$2807^{+1181}_{-479}$	$9.707^{+81.002}_{-7.384}$
Alt.	$-51 \pm 17$	$5.94^{+6.52}_{-4.13}$	$1056^{+77}_{-51}$	$2990^{+1404}_{-565}$	$15^{+151}_{-11}$

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

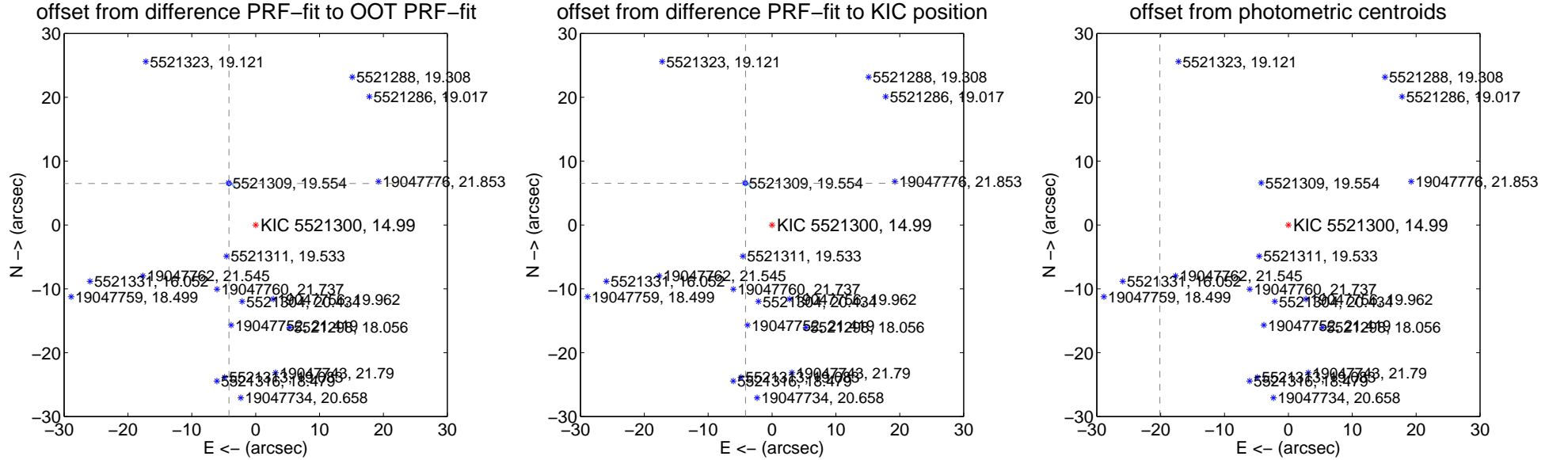
## DV Centroid Data

Supplemental centroid analysis for 005521300-02. Kepler magnitude: 14.99. Transit SNR 12.90

There are 13 quarters with good PRF difference image offsets

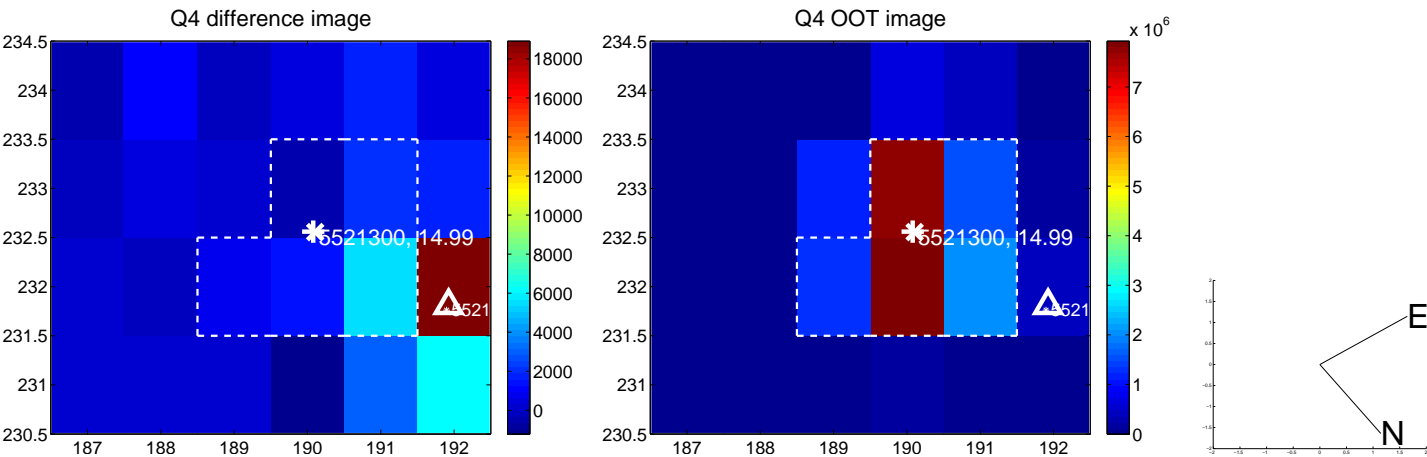
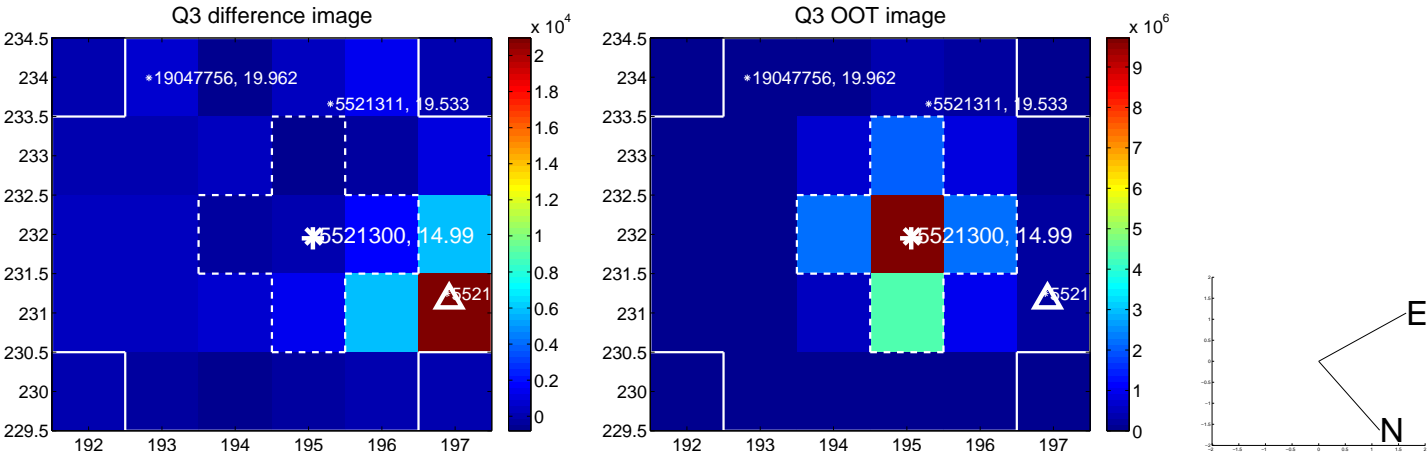
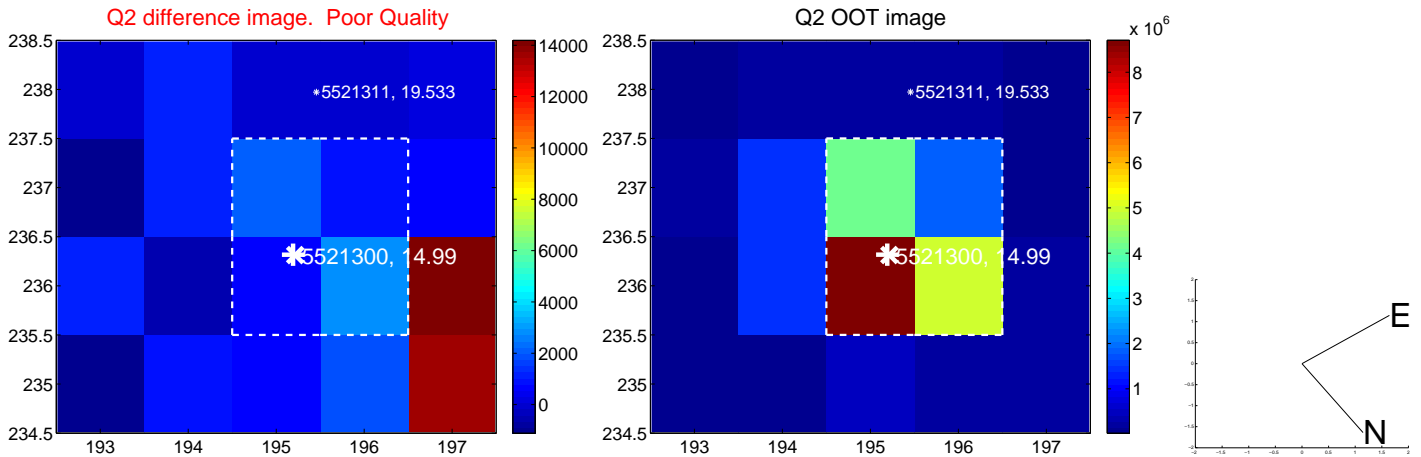
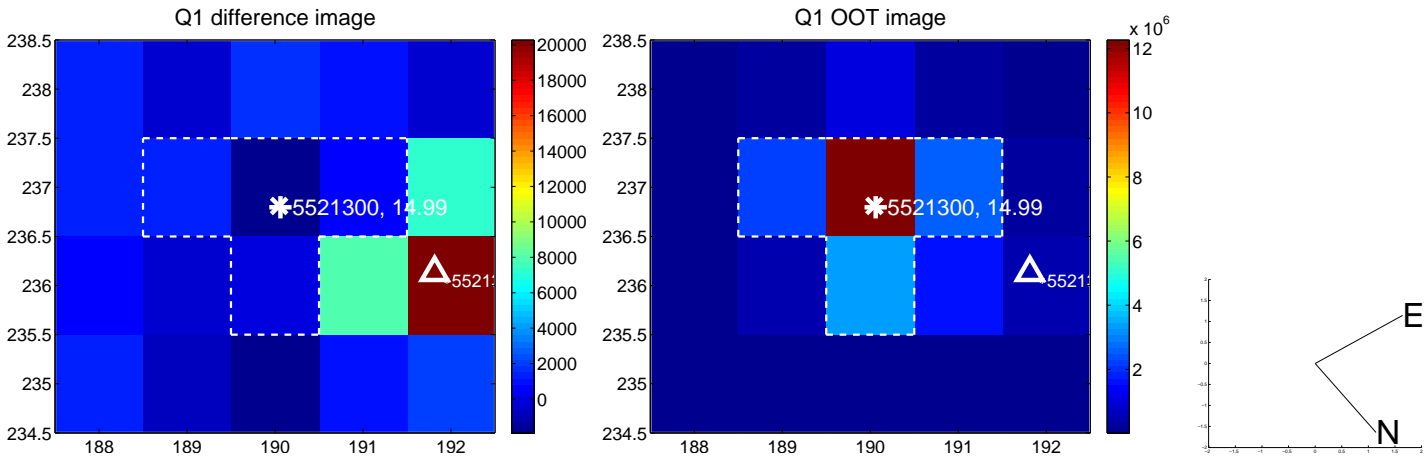
The direct PRF centroid is offset from the target star catalog position by about 0.10 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	7.723 $\pm$ 0.111	69.36	4.177 $\pm$ 0.103	6.496 $\pm$ 0.098
PRF-fit source offset from KIC position	7.740 $\pm$ 0.104	74.22	4.154 $\pm$ 0.099	6.531 $\pm$ 0.092
photometric centroid source offset	42.77 $\pm$ 1.17	36.46	20.13 $\pm$ 1.23	37.74 $\pm$ 1.16



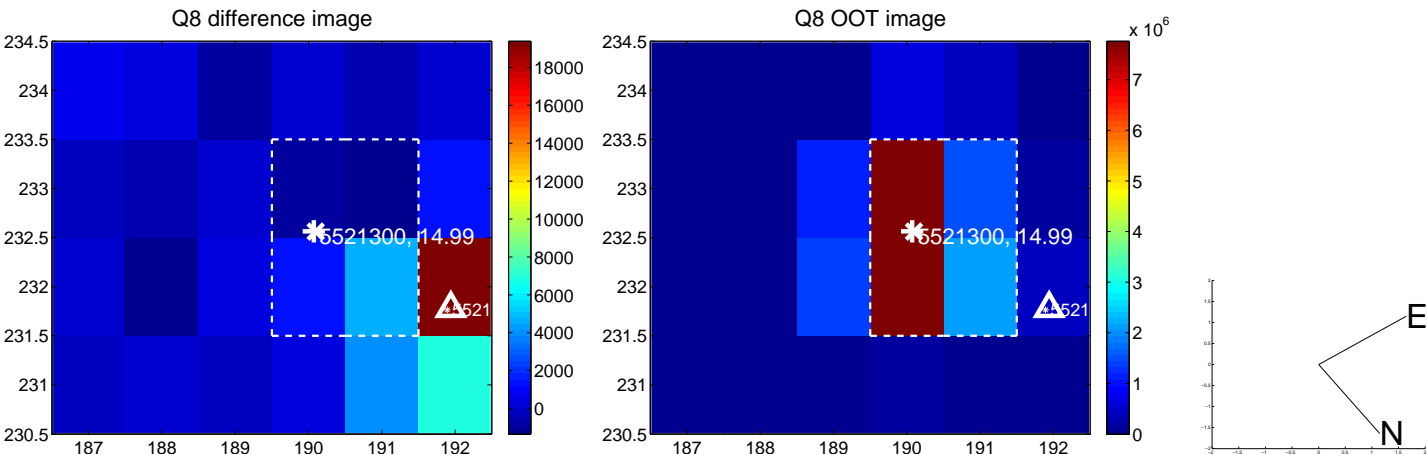
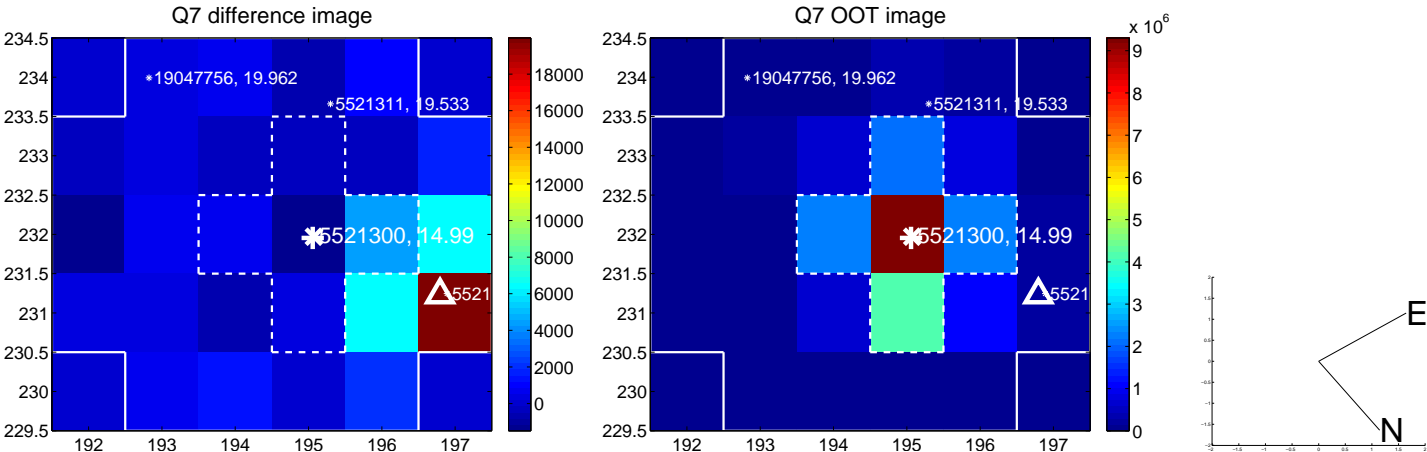
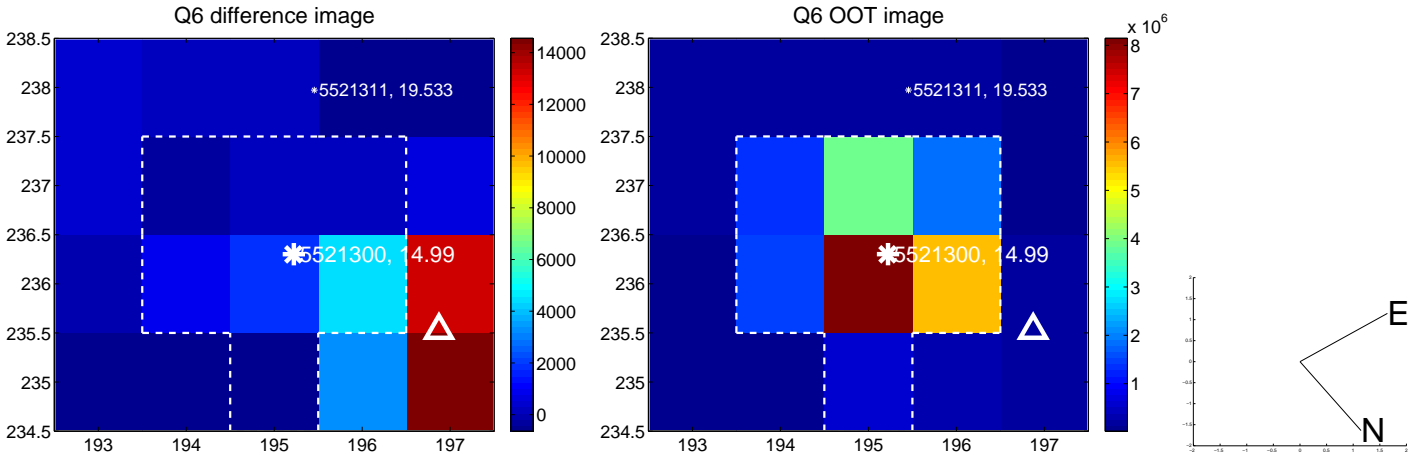
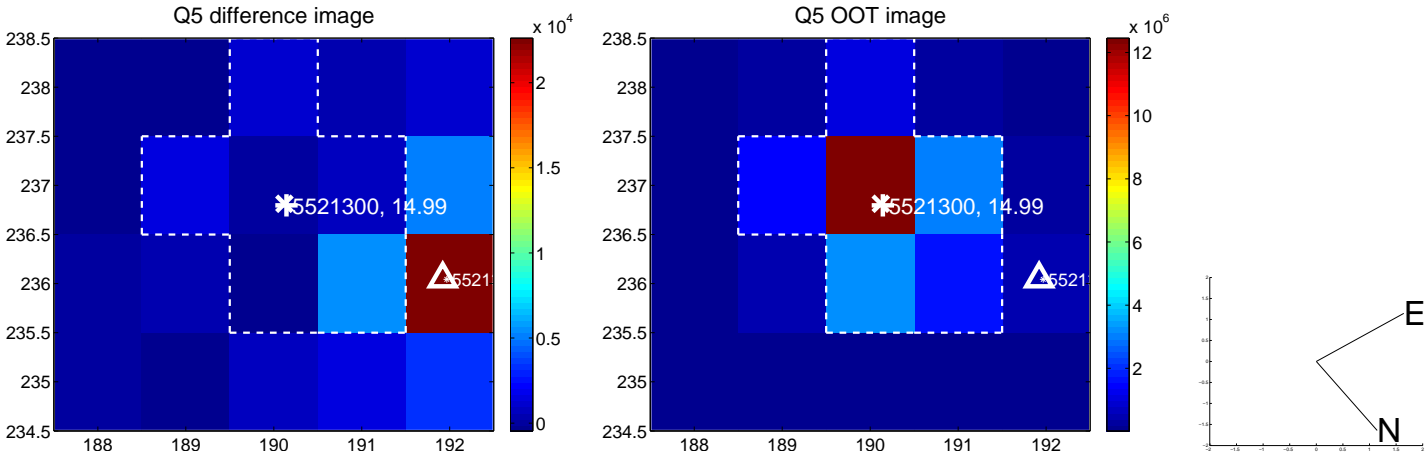
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses:** good quarterly centroid offsets; **Vermillion crosses:** bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: 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 ×: KIC target position; +: OOT centroid; △: difference centroid. red ×: large negative pixel value.

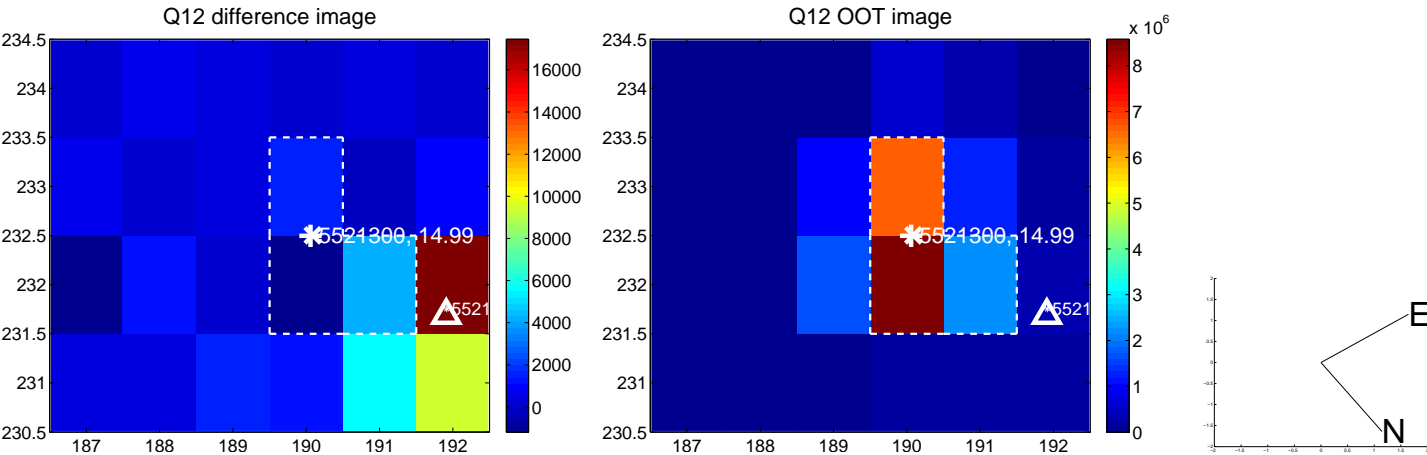
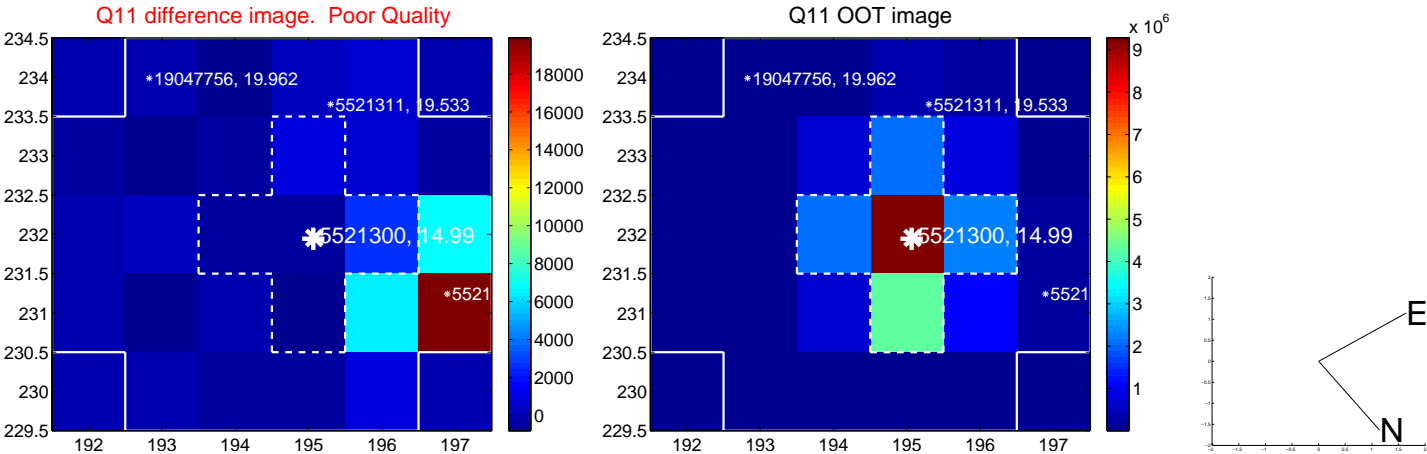
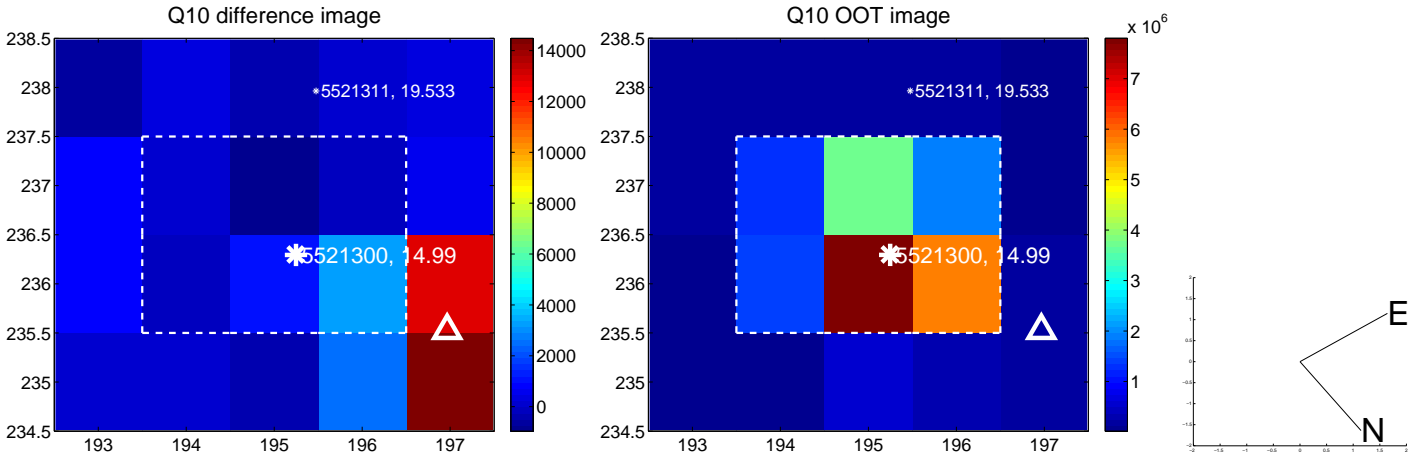
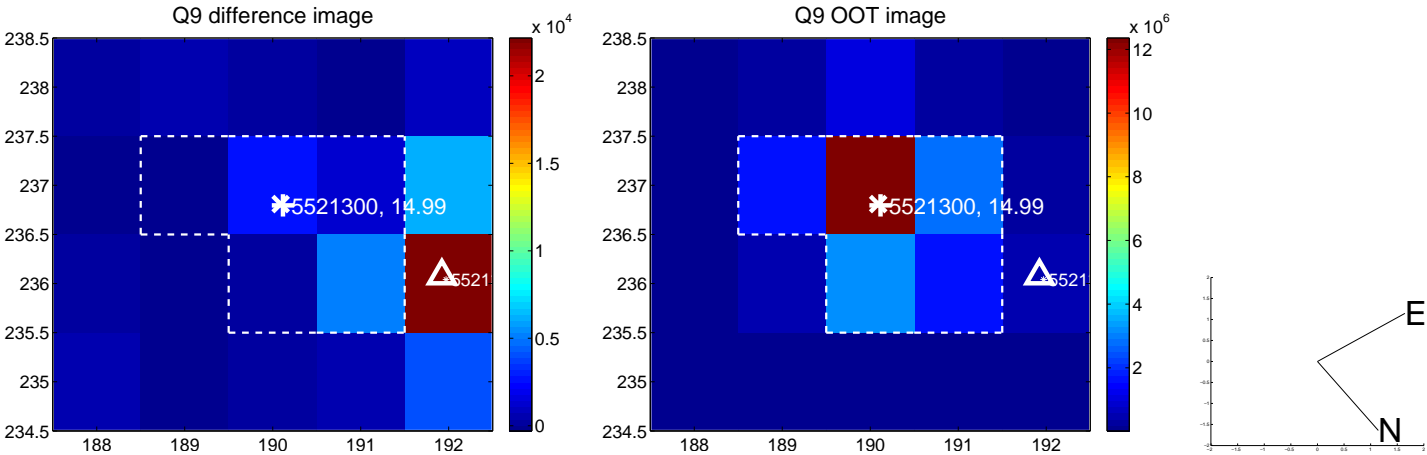




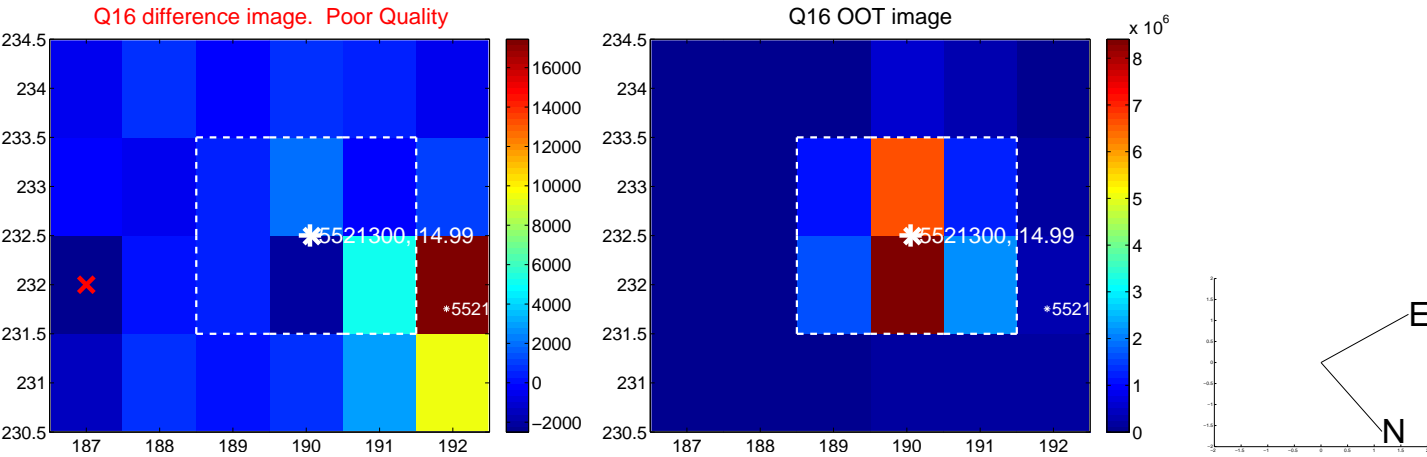
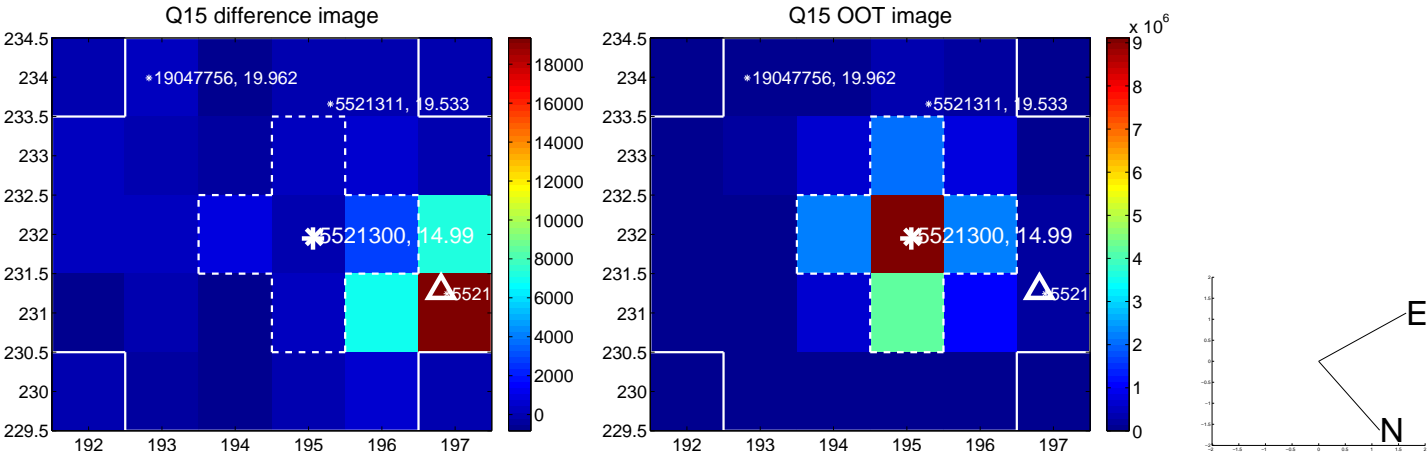
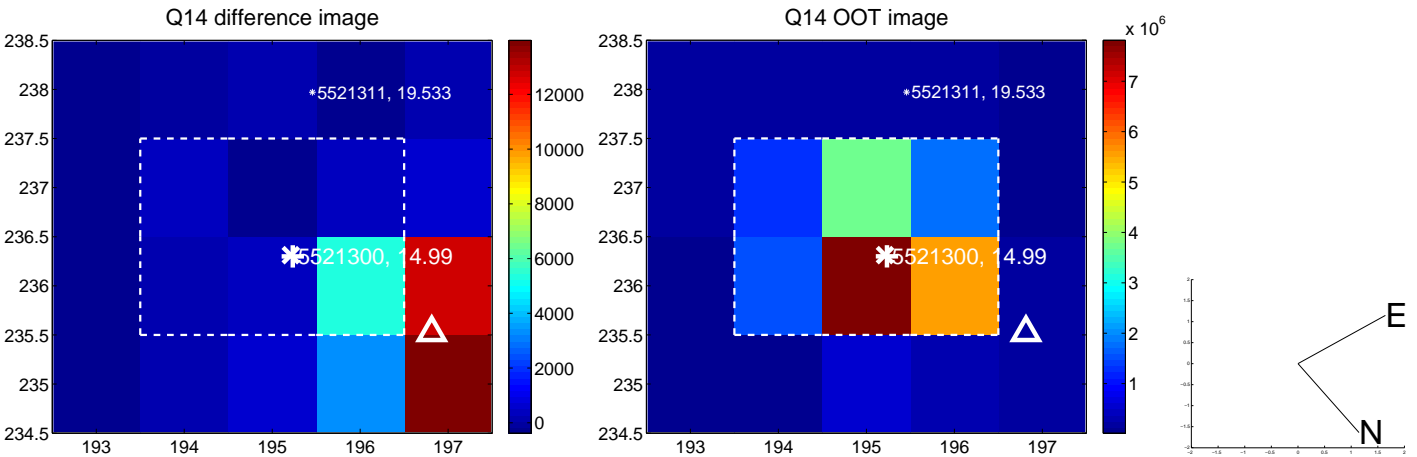
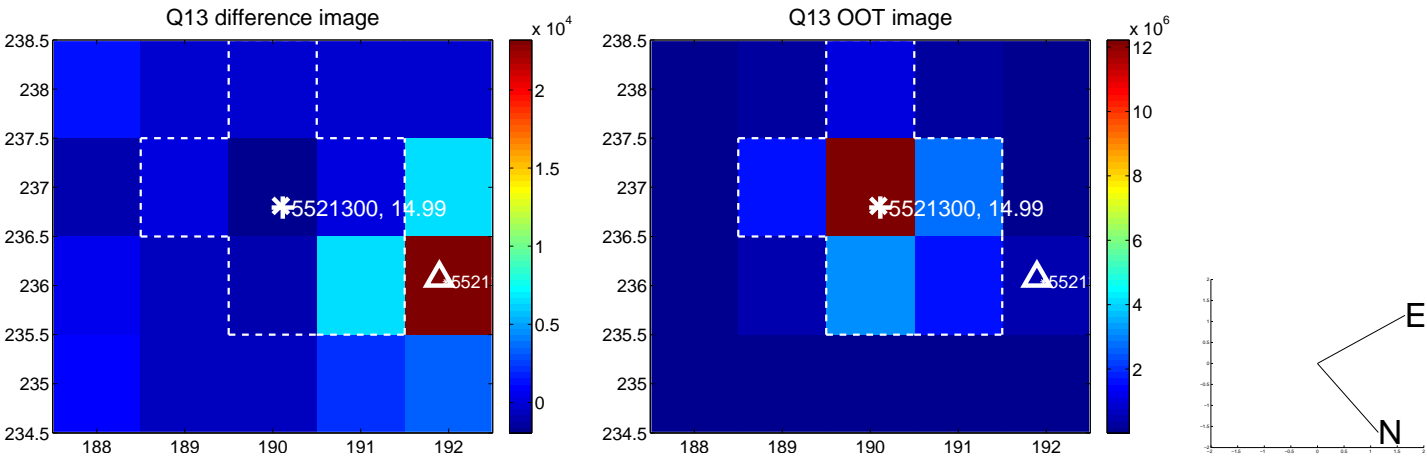
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



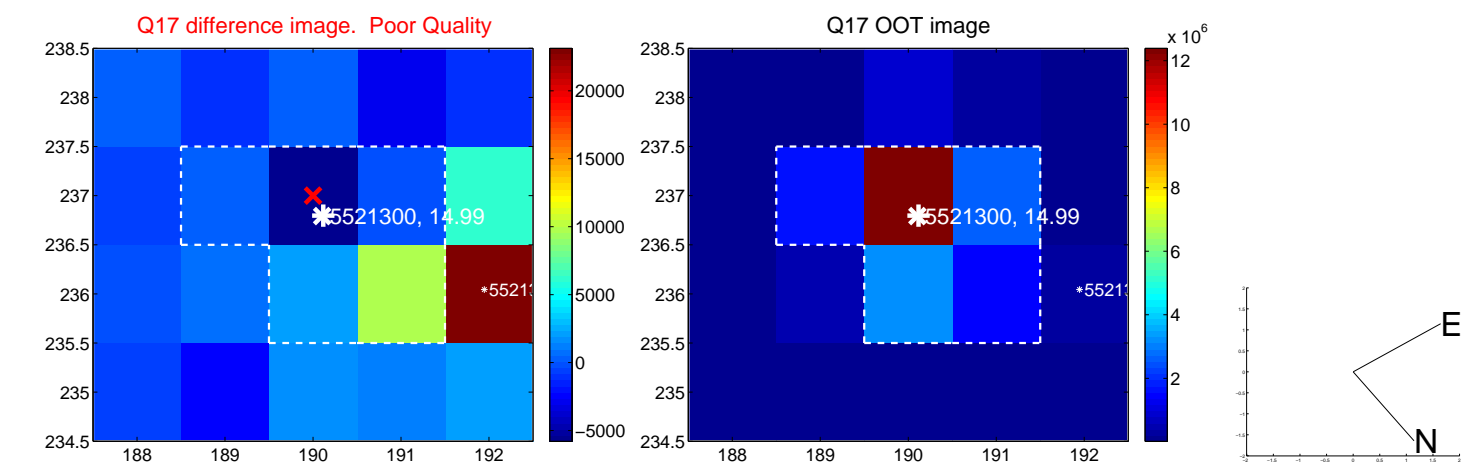
white ×: KIC target position; +: OOT centroid; △: difference centroid. red ×: large negative pixel value.



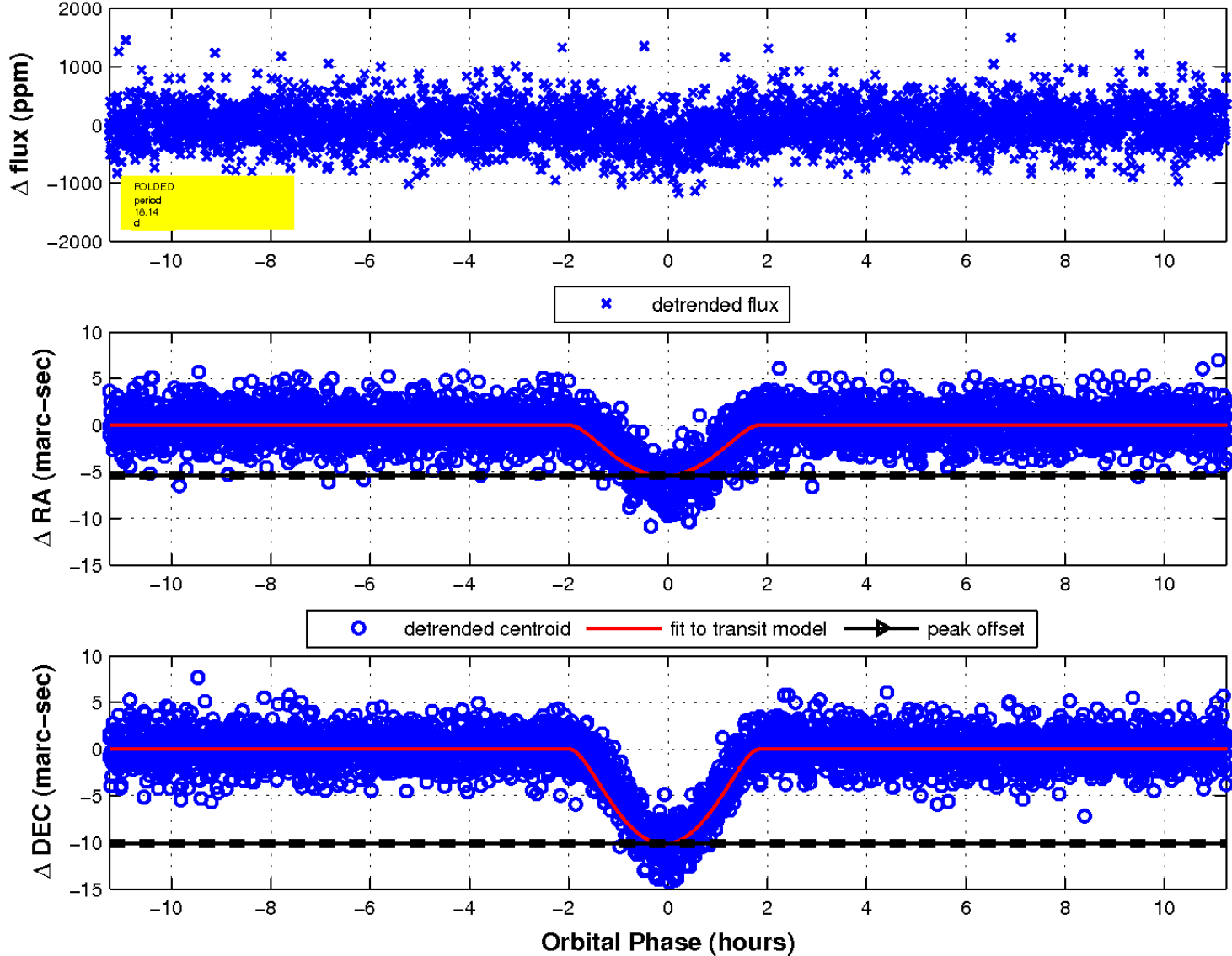
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



fluxWeightedCentroids, Planet 2 of 2



UKIRT Image

Declination

