

# KIC 008453431

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
008453431-01	OBS	No	2.919299	132.457808	27.9	7.529	9.4	8.7	3.60	7184	2.09	12021.22
008453431-02	OBS	No	1.751678	132.995460	29.5	5.590	8.1	9.7	3.60	7184	2.17	23752.77

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008453431-01	OBS	FP	0.00	1	0	1	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_UNRESOLVED_OFFSET
008453431-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT

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

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

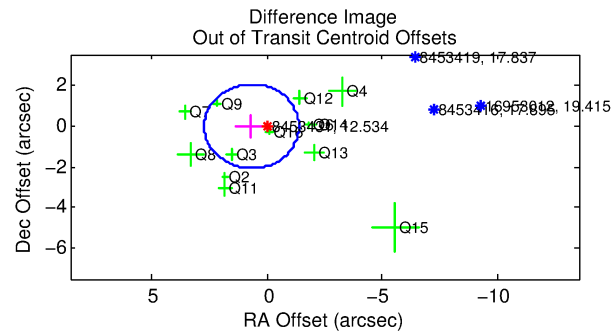
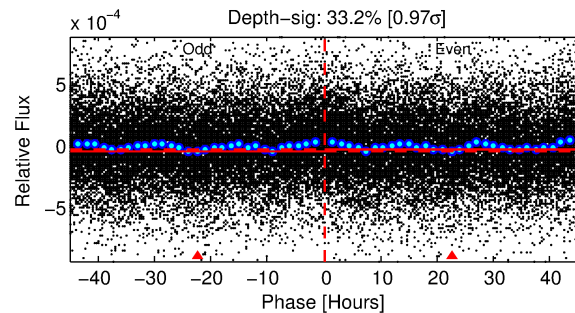
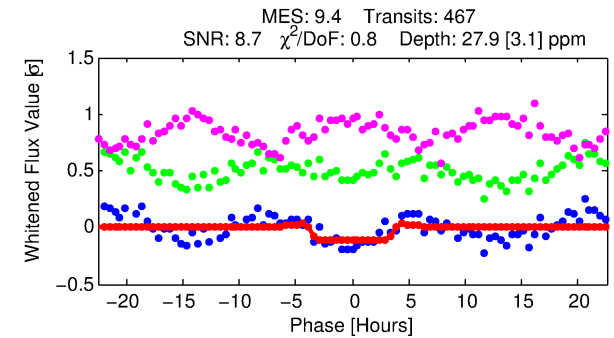
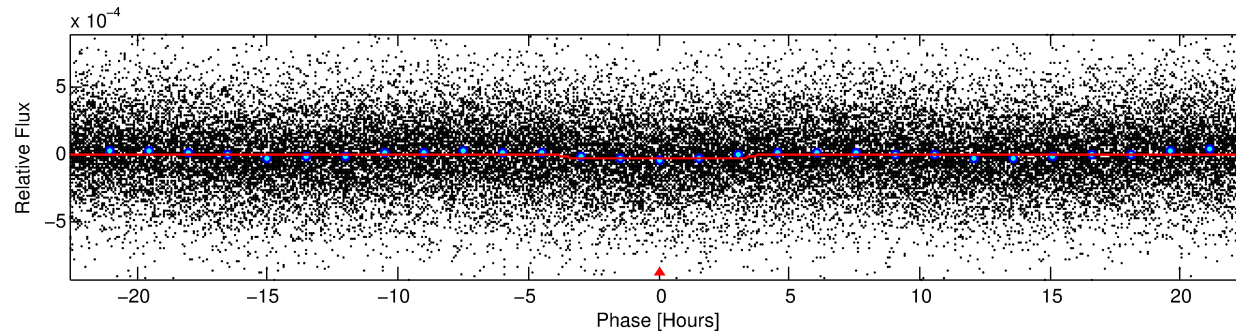
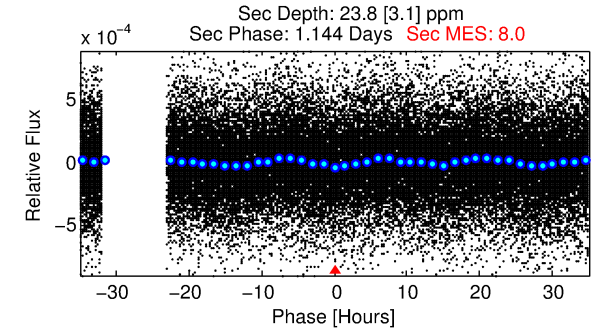
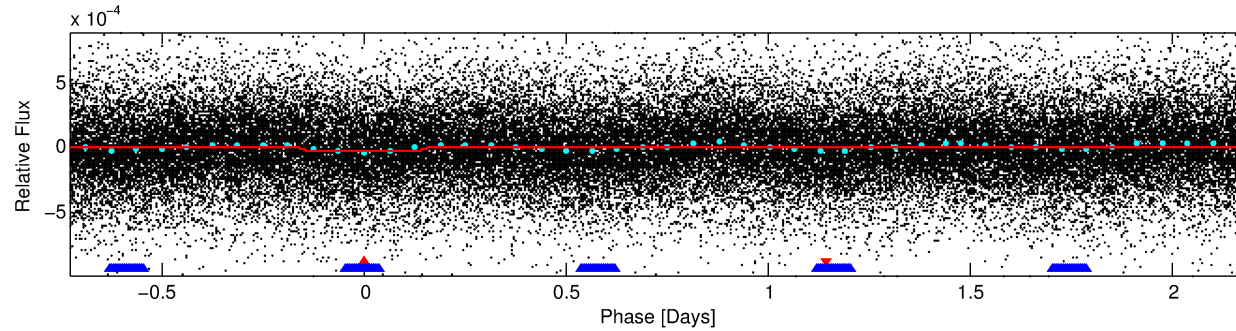
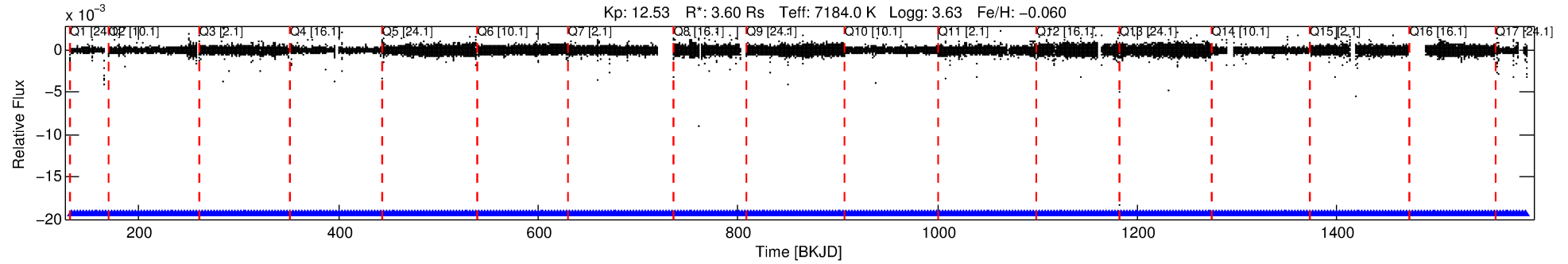
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 008453431-01

No Significant Match Found

# DV One-Page Summary

KIC: 8453431 Candidate: 1 of 2 Period: 2.919 d



## DV Fit Results:

Period = 2.91930 [0.00004] d  
Epoch = 132.4578 [0.0073] BKJD  
Rp/R\* = 0.0053 [0.0015]  
a/R\* = 2.01 [2.62]  
b = 0.80 [0.79]  
Seff = 12021.22 [10276.39]  
Teq = 2670 [571] K  
Rp = 2.09 [1.24] Re  
a = 0.0507 [0.0261] AU  
Ag = 7.68 [7.81] [0.86σ]  
Teffp = 6872 [1044] K [3.53σ]

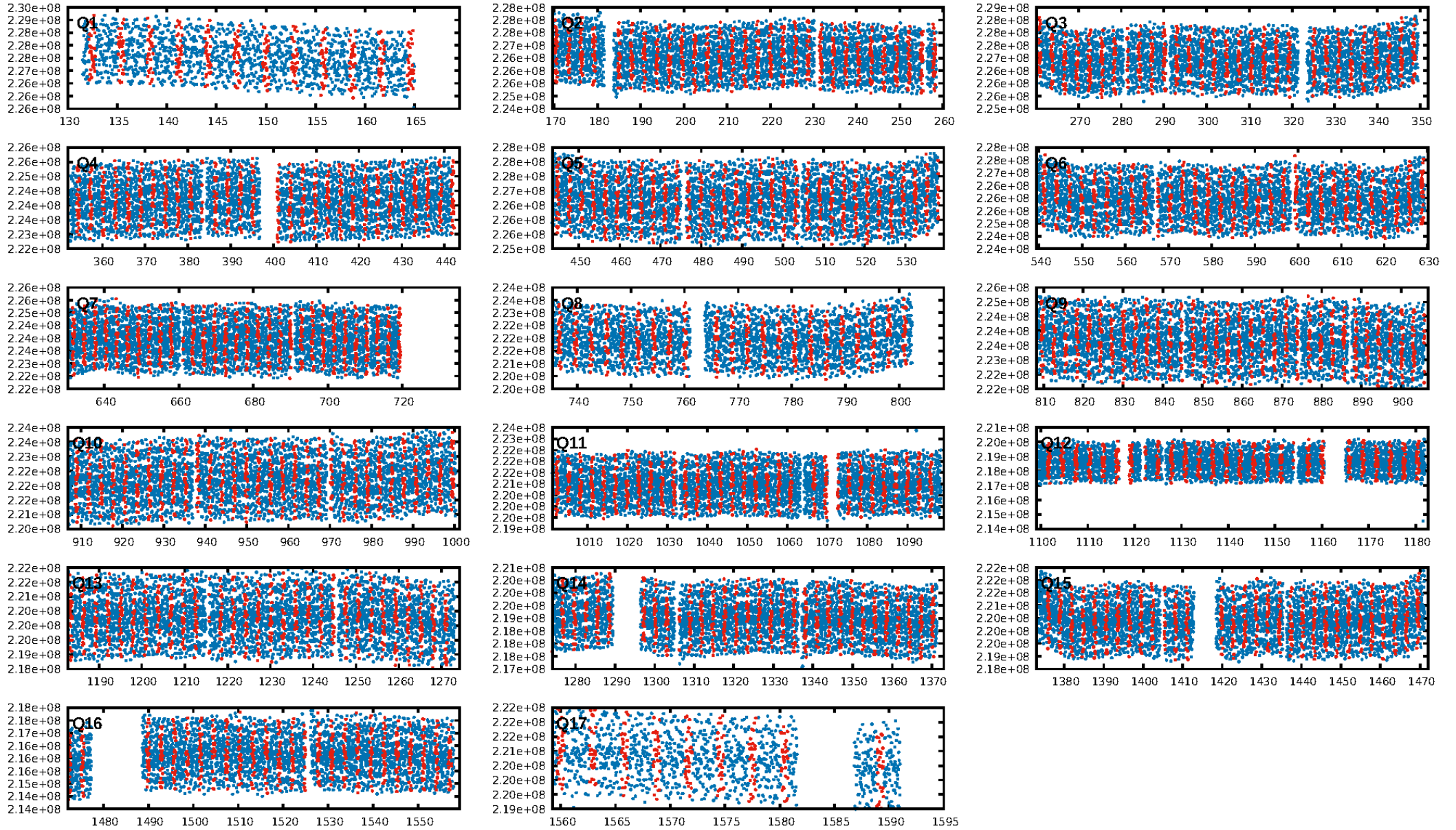
## DV Diagnostic Results:

ShortPeriod-sig: 99.7% [2.99σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 1.49e-13  
RollingBand-fgt: 1.00 [446/446]  
GhostDiagnostic-chr: 2.002  
Centroid-sig: 90.3%  
Centroid-so: 0.353 arcsec [0.48σ]  
OotOffset-rm: 0.662 arcsec [0.97σ]  
OotOffset-st: 3/4/4/2 [13]  
KicOffset-rm: 0.606 arcsec [0.87σ]  
KicOffset-st: 3/4/4/2 [13]  
DiffImageQuality-fgm: 0.38 [5/13]  
DiffImageOverlap-fno: 0.00 [0/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 01:30:31 Z

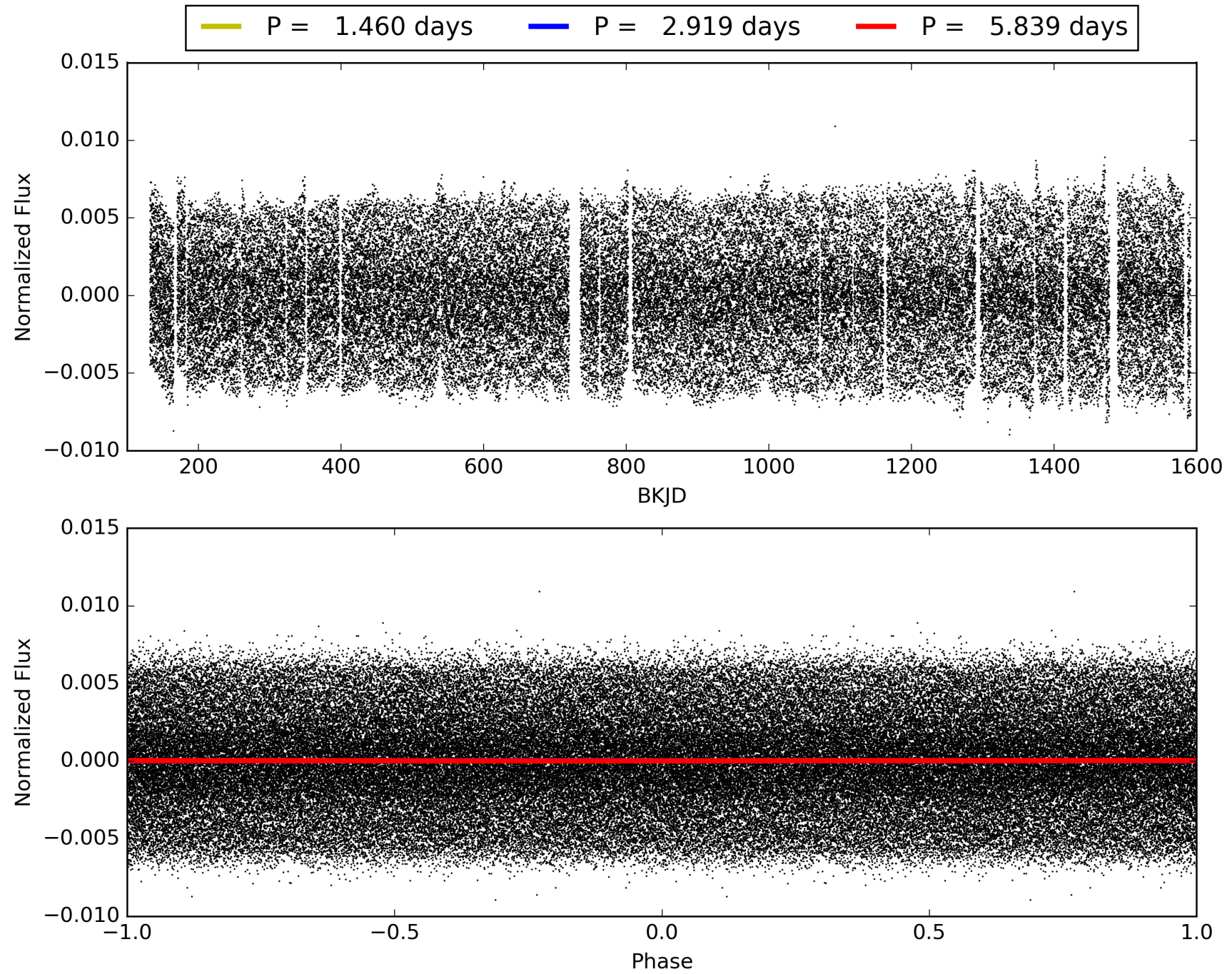
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 008453431-01, PDC Light Curves



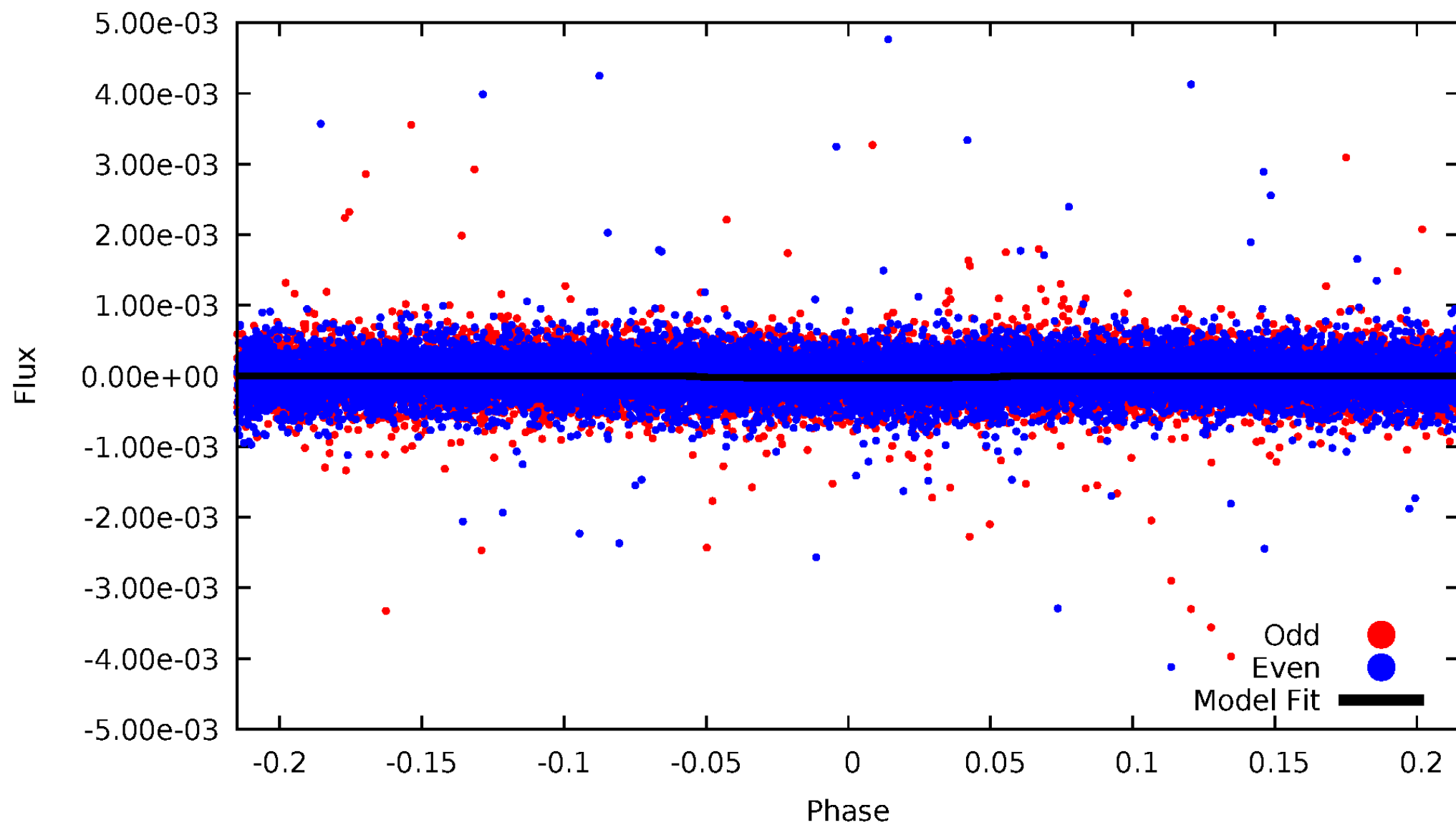


TCE 008453431-01



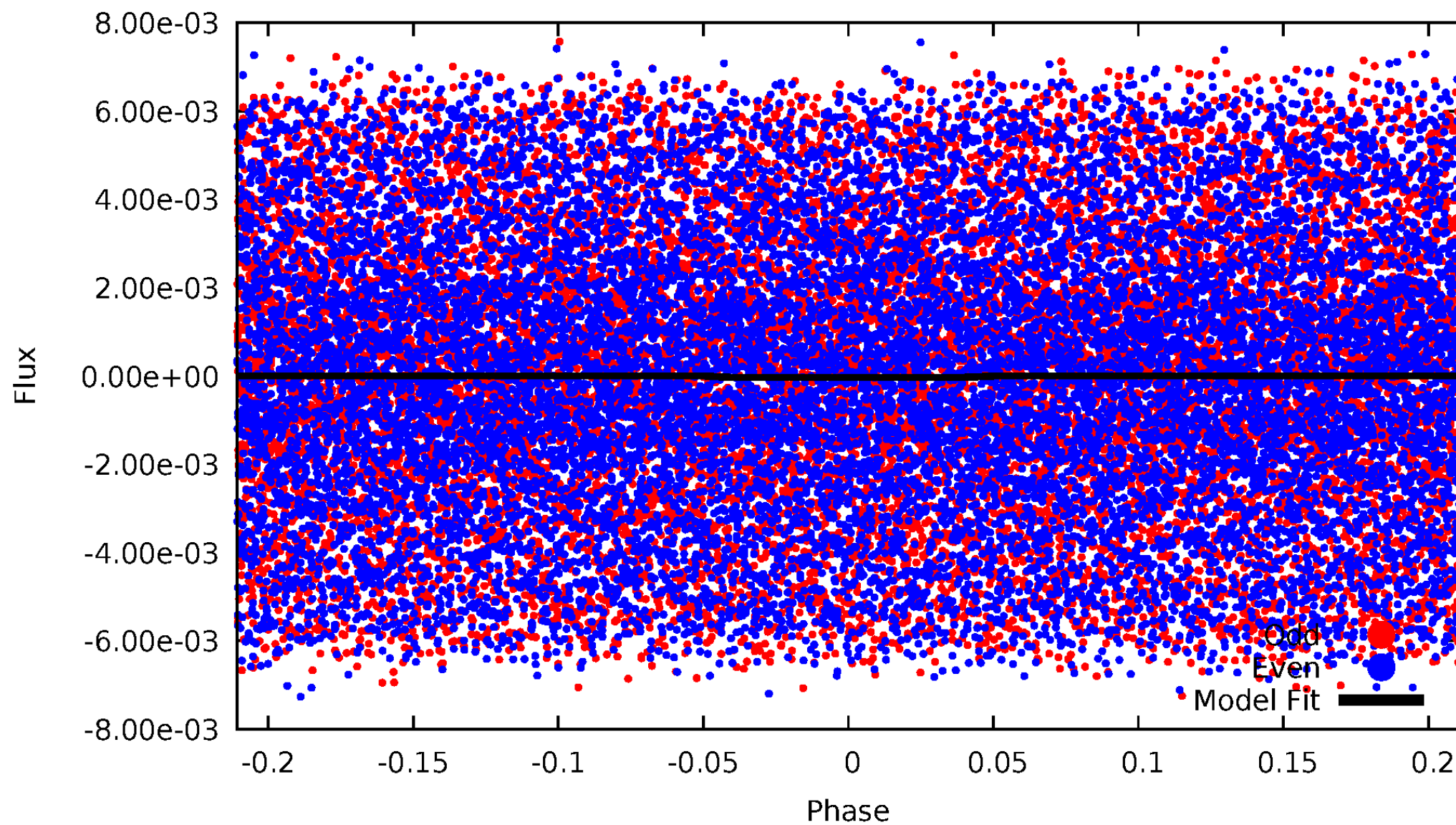
# DV Odd/Even

TCE 008453431-01



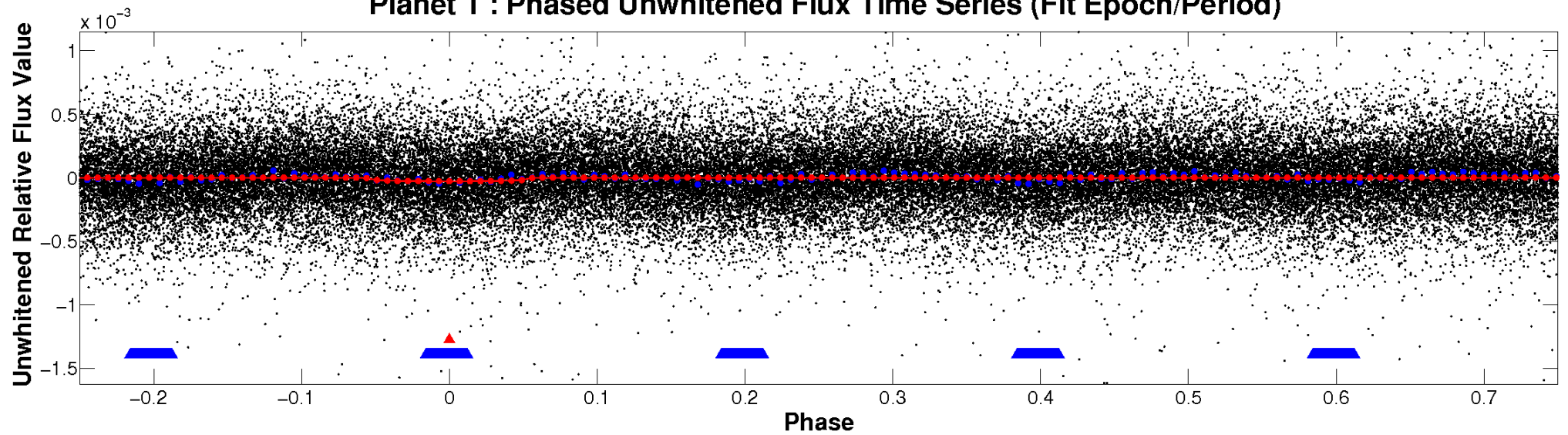
# ALT Odd/Even

TCE 008453431-01

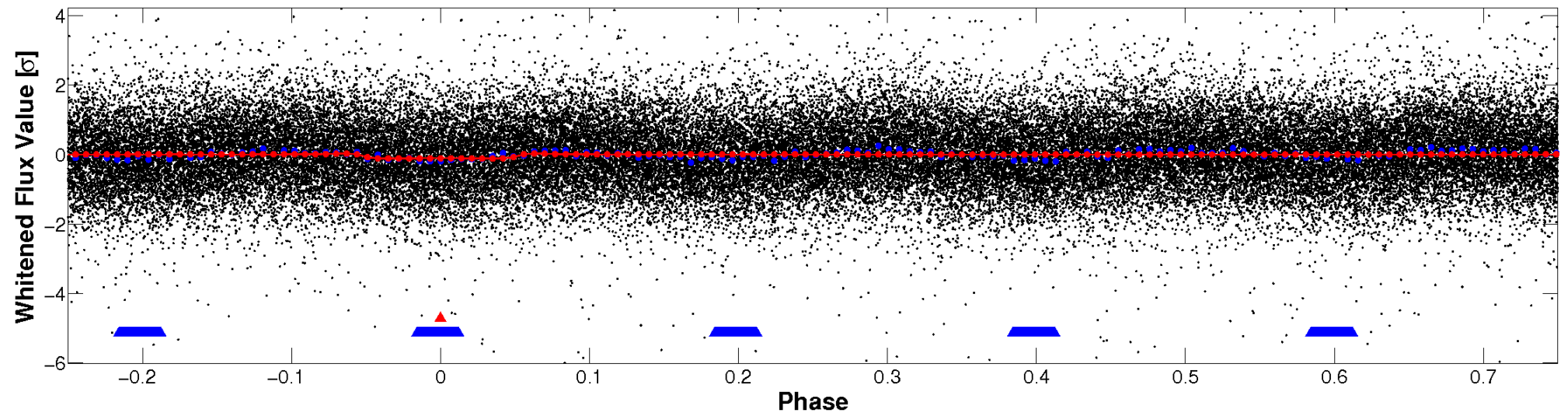


# Non-Whitened Vs. Whitened Light Curve

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



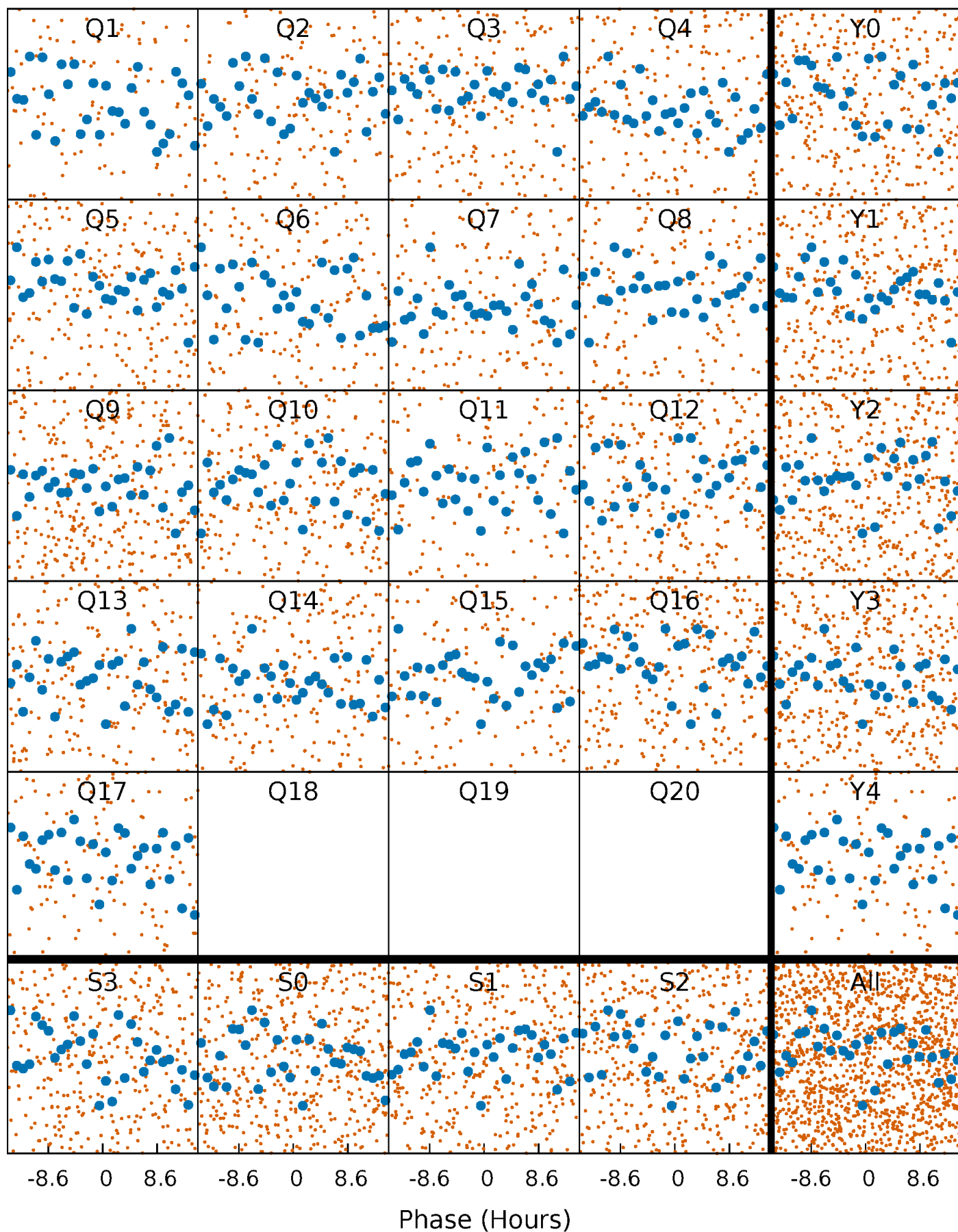
**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**





# PDC Quarter-Phased Transit Curves

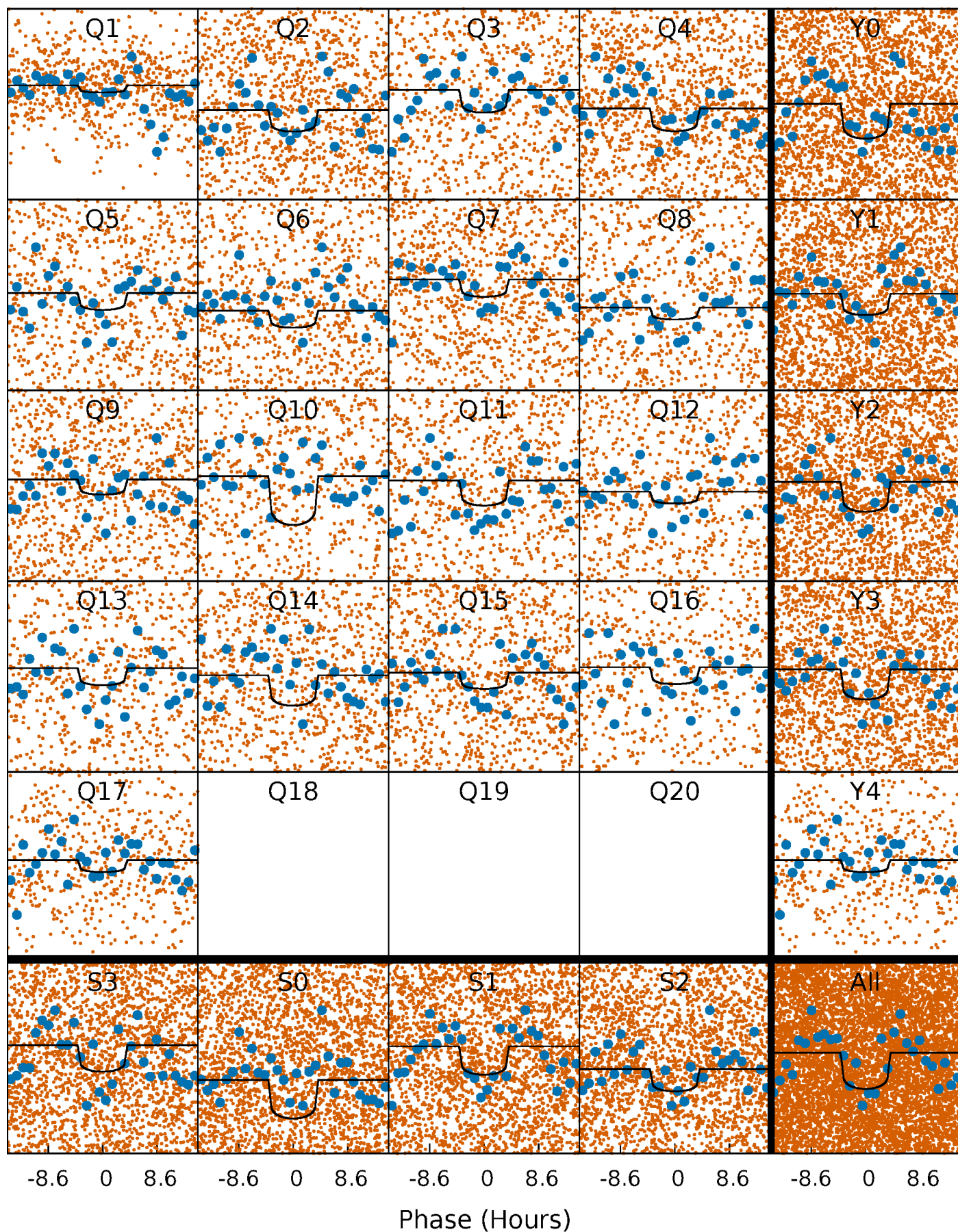
TCE 008453431-01 P= 2.919299 Days  $T_0=132.457808$  (BKJD)





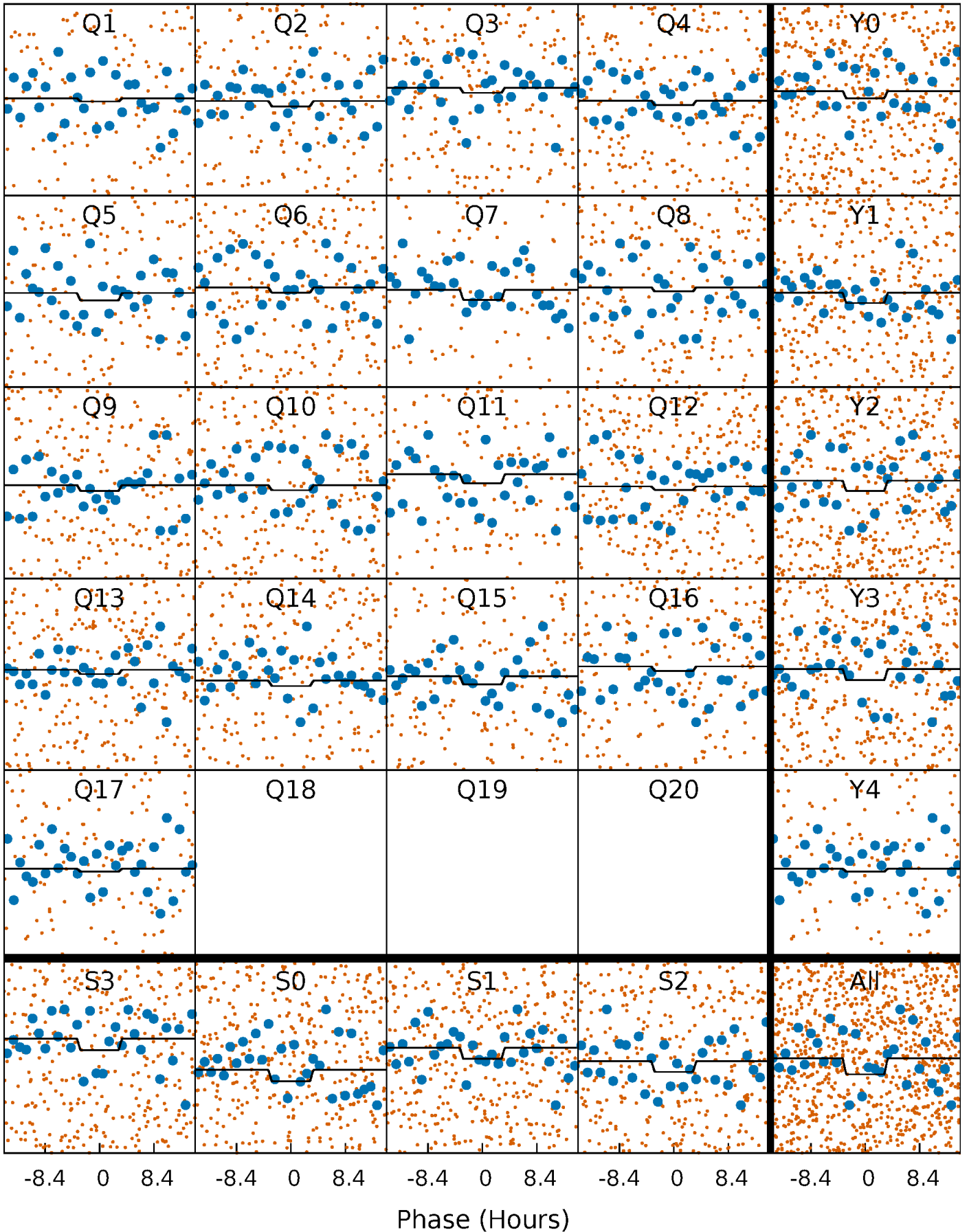
# DV Quarter-Phased Transit Curves

TCE 008453431-01 P= 2.919299 Days  $T_0=132.457808$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

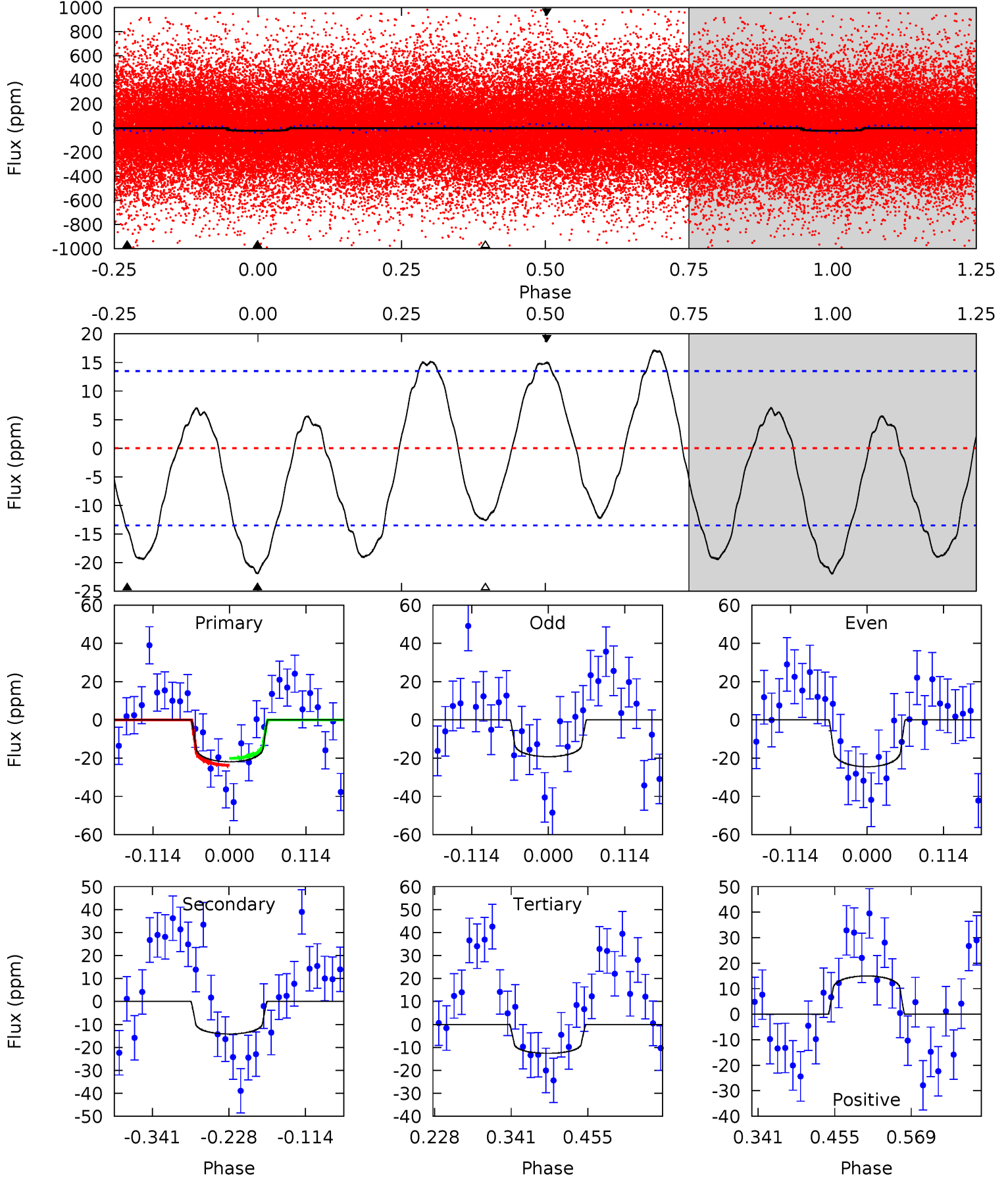
TCE 008453431-01   P= 2.919243 Days    $T_0=132.474594$  (BKJD)



# DV Model-Shift Uniqueness Test

008453431-01, P = 2.919299 Days, E = 129.538509 Days

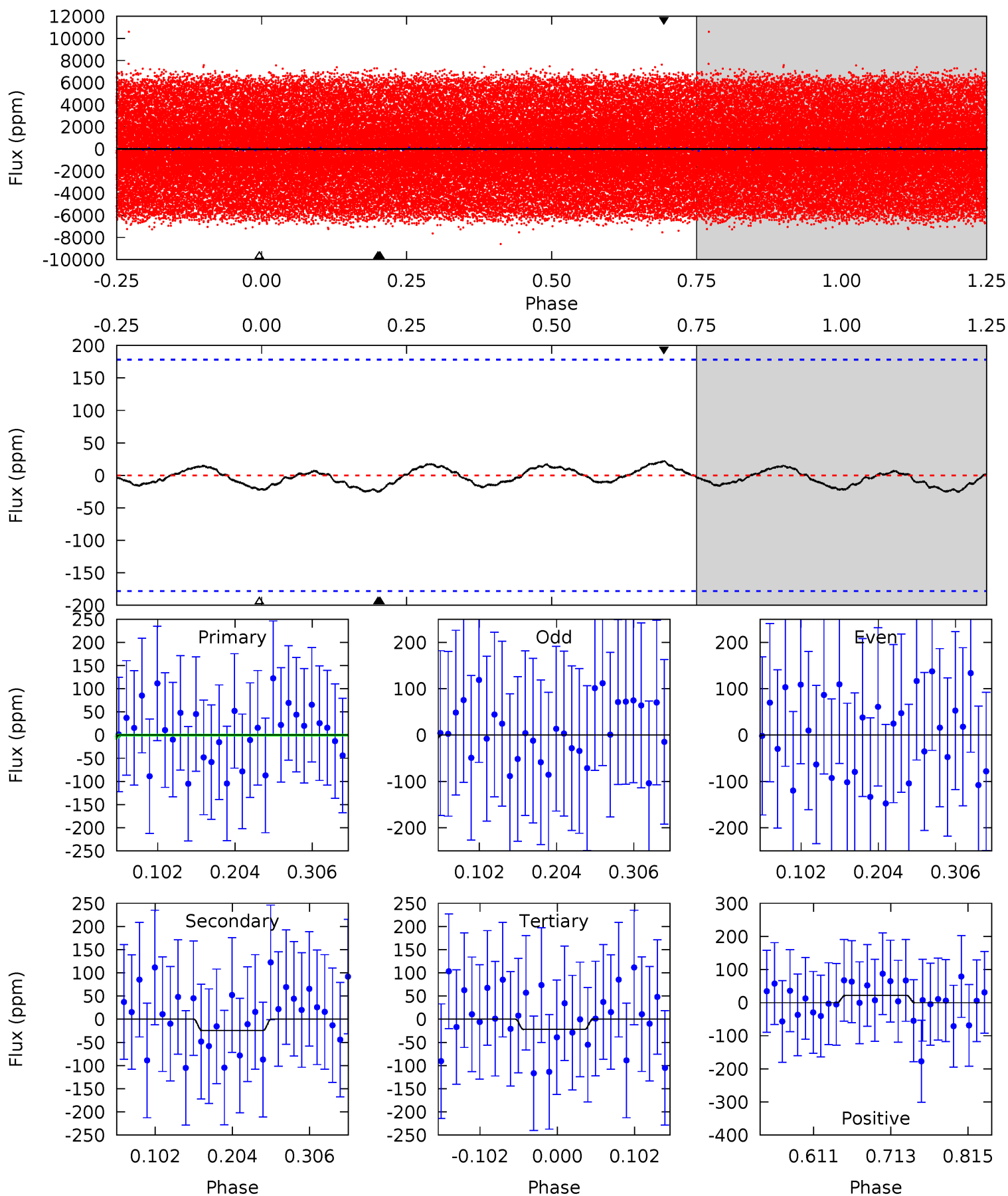
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
7.37	4.77	4.23	5.04	4.54	1.58	3.61	3.14	2.33	0.53	-0.27	0.89	1.00	0.44	0.61



# Alt Model-Shift Uniqueness Test

008453431-01, P = 2.919243 Days, E = 129.555351 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
0.64	0.62	0.56	0.56	4.56	1.64	0.28	0.08	0.08	0.06	0.06	0.18	1.33	0.47	0.14





### Stellar Parameters For KIC 008453431

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$7184^{+201}_{-327}$	$3.635^{+0.495}_{-0.055}$	$-0.060^{+0.250}_{-0.300}$	$3.597^{+0.330}_{-1.871}$	$2.035^{+0.068}_{-0.610}$	$0.062^{+0.328}_{-0.011}$
	+3%/-5%	+14%/-2%	+417%/-500%	+9%/-52%	+3%/-30%	+532%/-18%
Source	KIC0	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 008453431-01 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-14 \pm 3$	$1.83^{+0.71}_{-0.62}$	$3571^{+260}_{-415}$	$5815^{+1197}_{-757}$	$5.667^{+7.367}_{-2.799}$
Alt.	$-24 \pm 39$	$1.75^{+0.69}_{-0.62}$	$3588^{+245}_{-481}$	$6767^{+3345}_{-12946}$	$9.667^{+28.116}_{-16.623}$

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

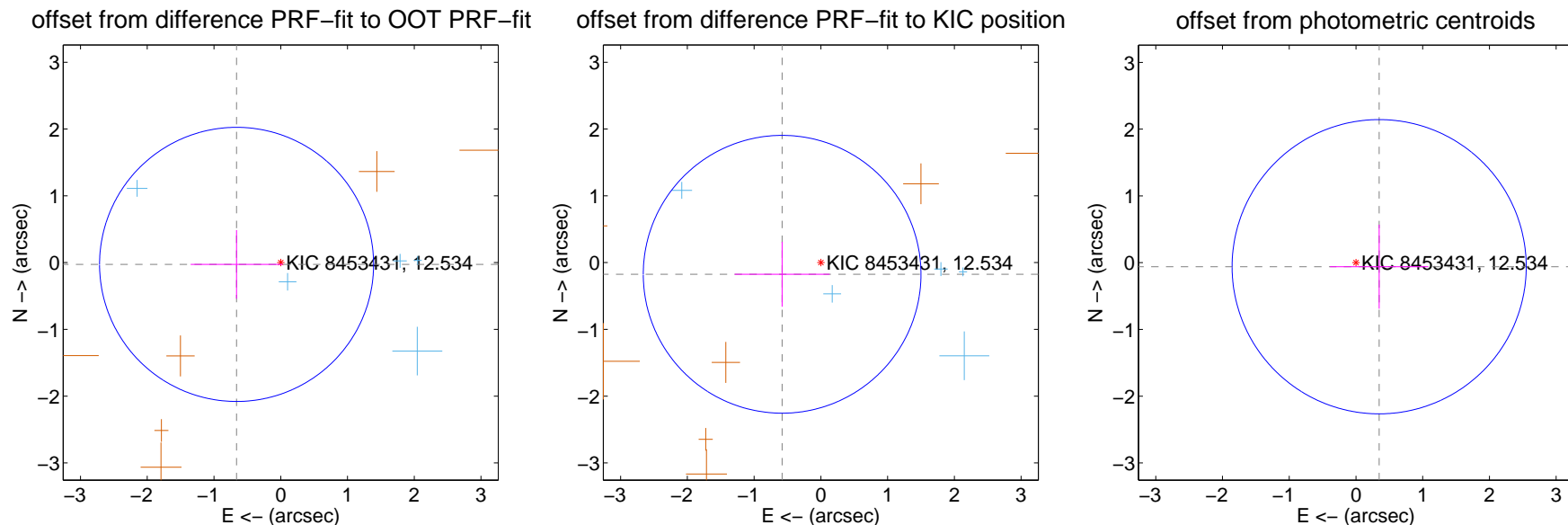
## DV Centroid Data

Supplemental centroid analysis for 008453431-01. Kepler magnitude: 12.53. Transit SNR 8.71

There are 5 quarters with good PRF difference image offsets

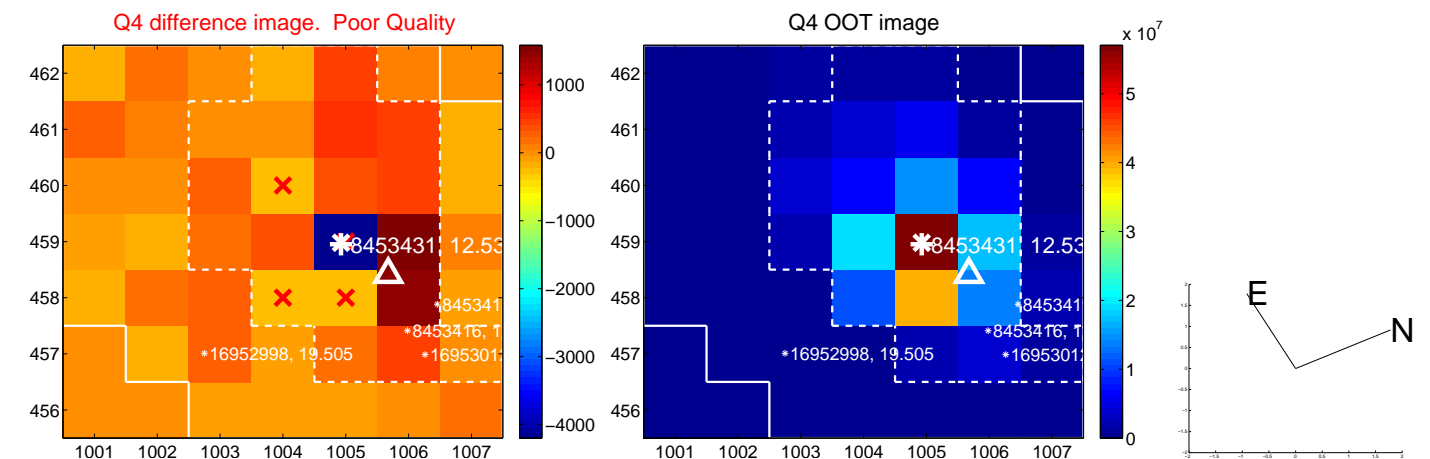
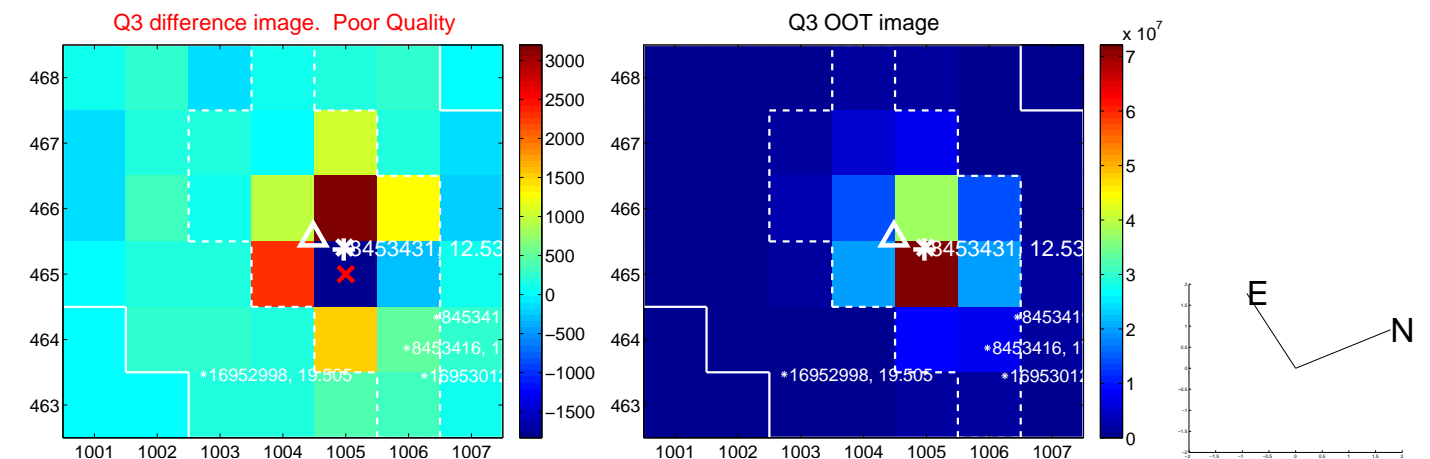
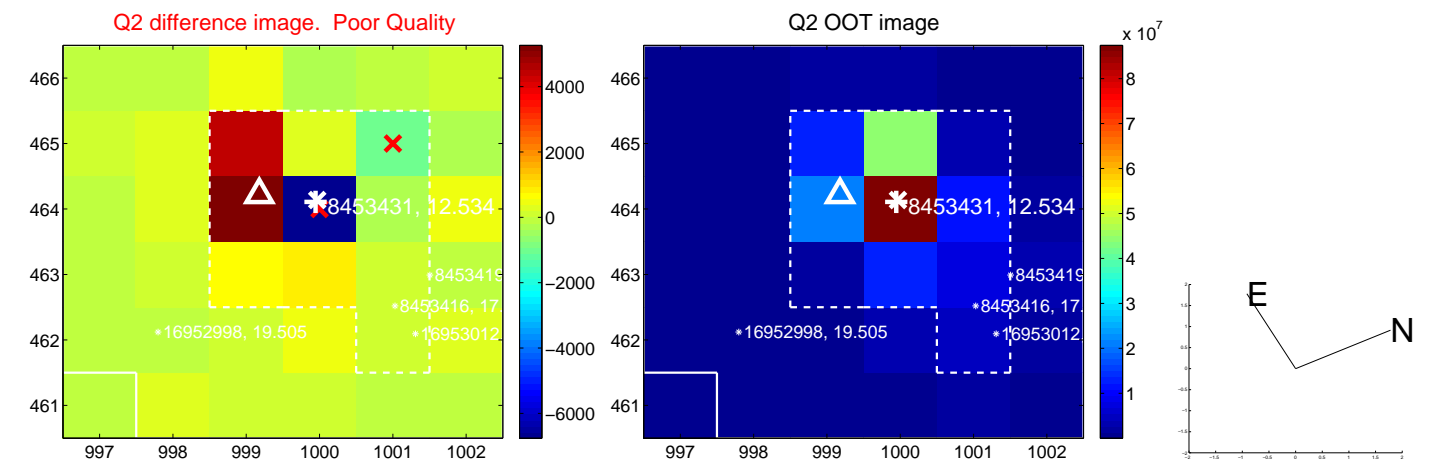
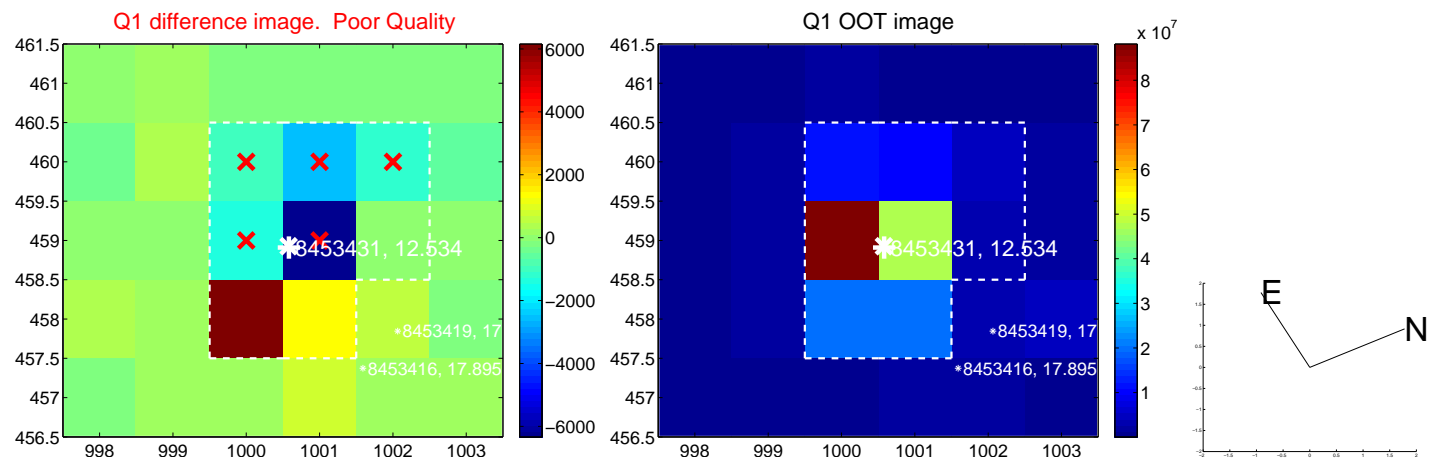
The direct PRF centroid is offset from the target star catalog position by about 0.19 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.662 \pm 0.684$	0.97	$0.662 \pm 0.688$	$-0.027 \pm 0.514$
PRF-fit source offset from KIC position	$0.606 \pm 0.693$	0.87	$0.580 \pm 0.712$	$-0.175 \pm 0.486$
photometric centroid source offset	$0.35 \pm 0.73$	0.48	$-0.35 \pm 0.74$	$-0.06 \pm 0.63$

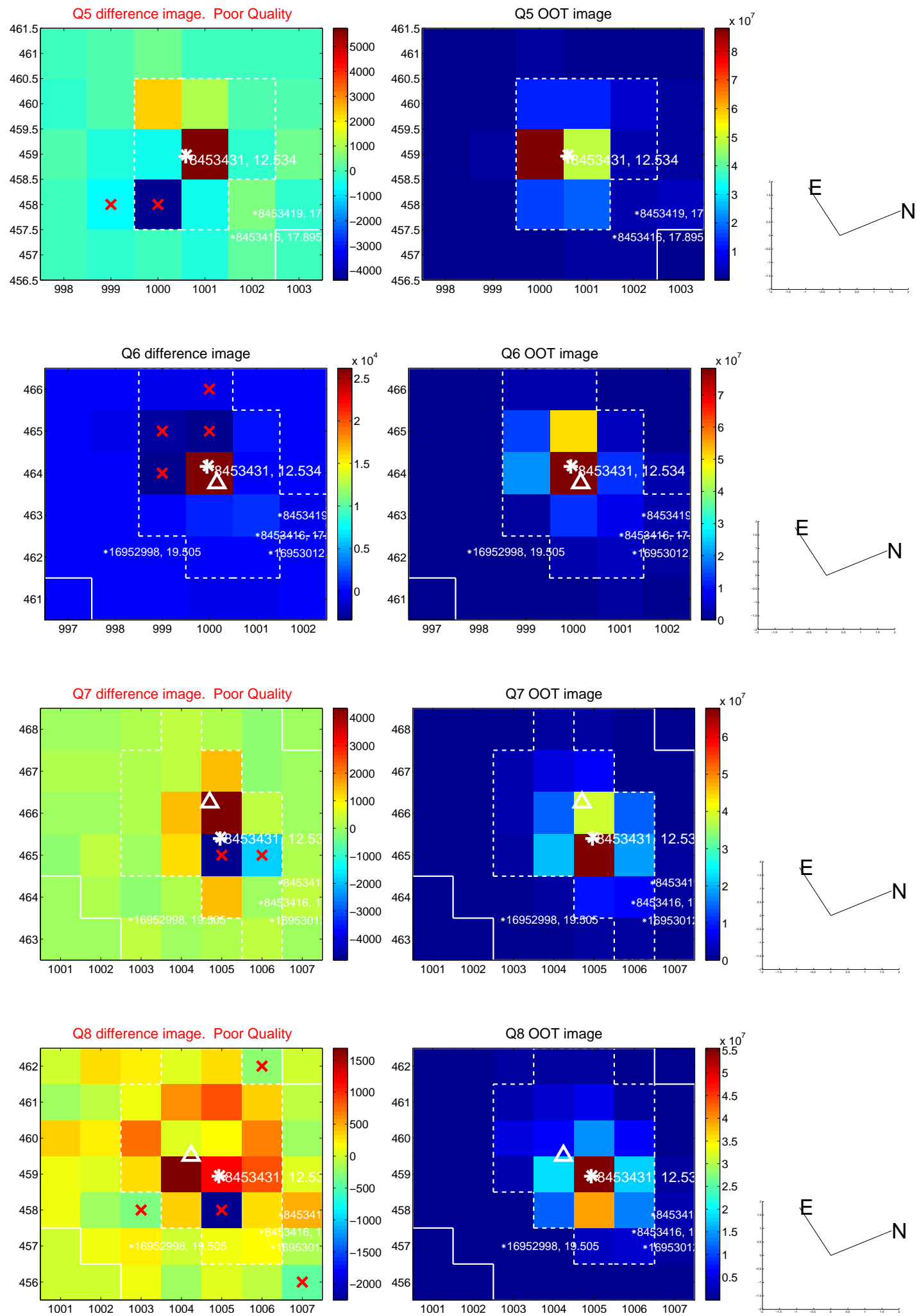


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

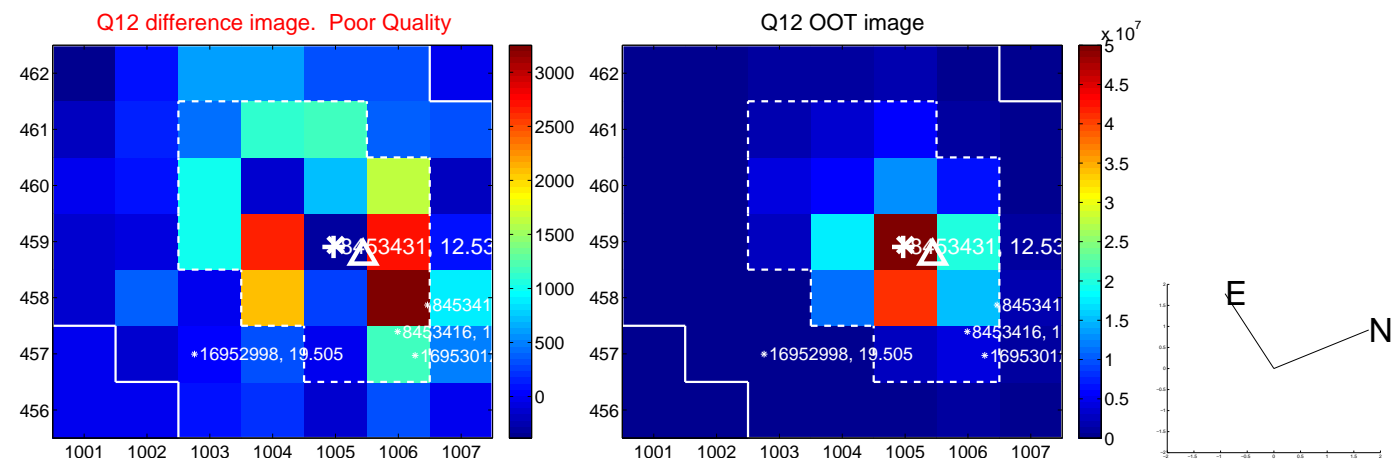
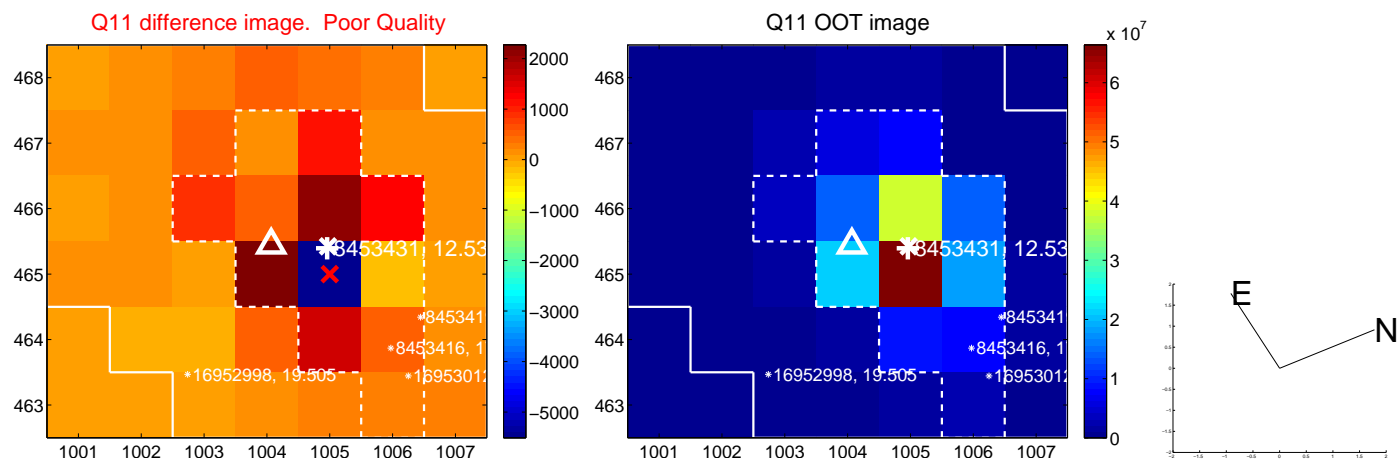
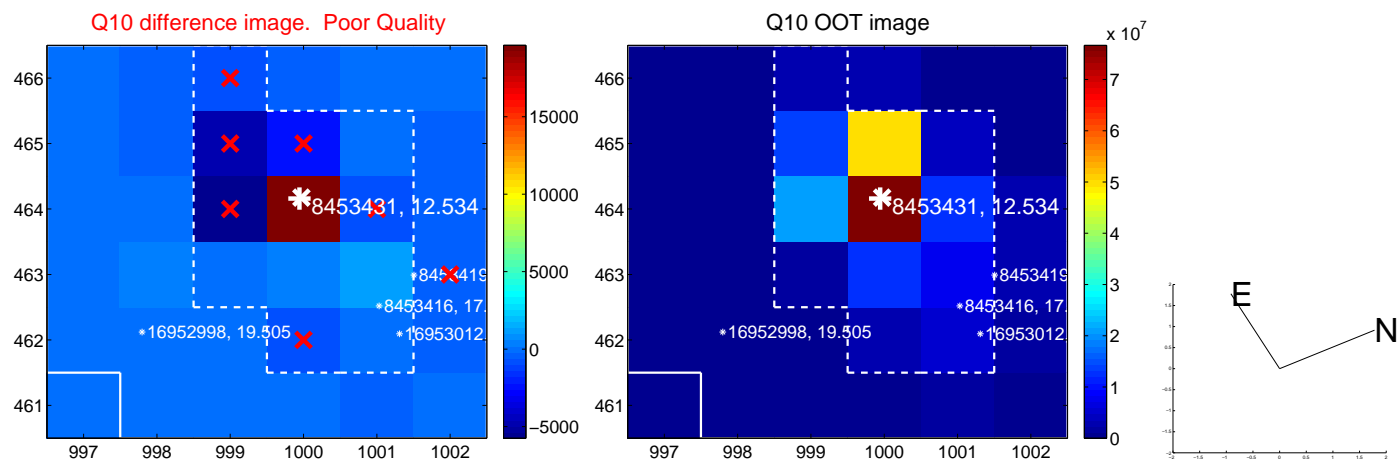
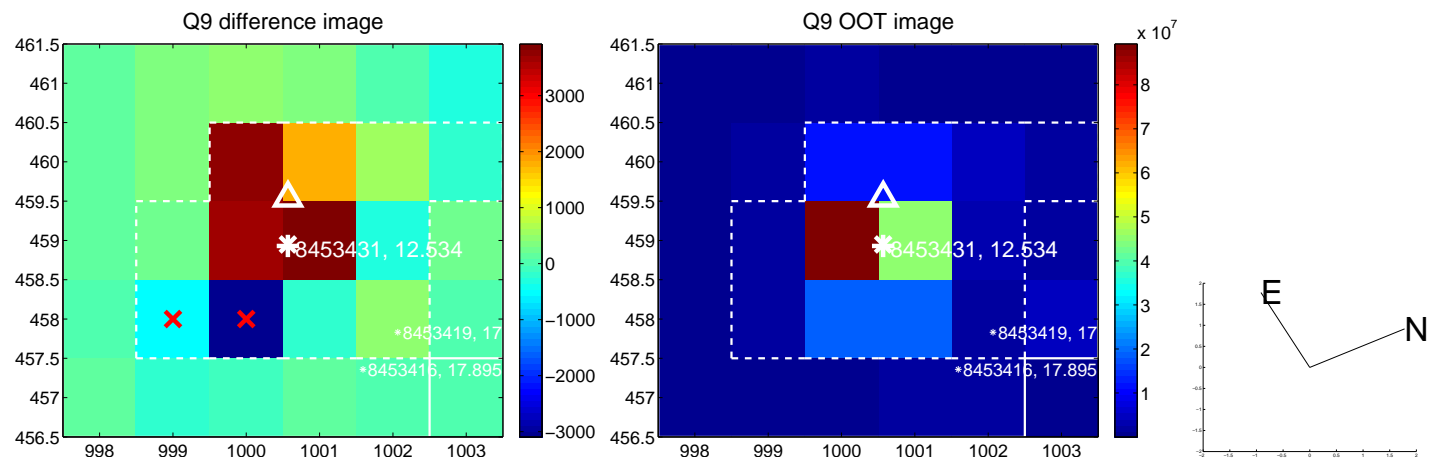


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

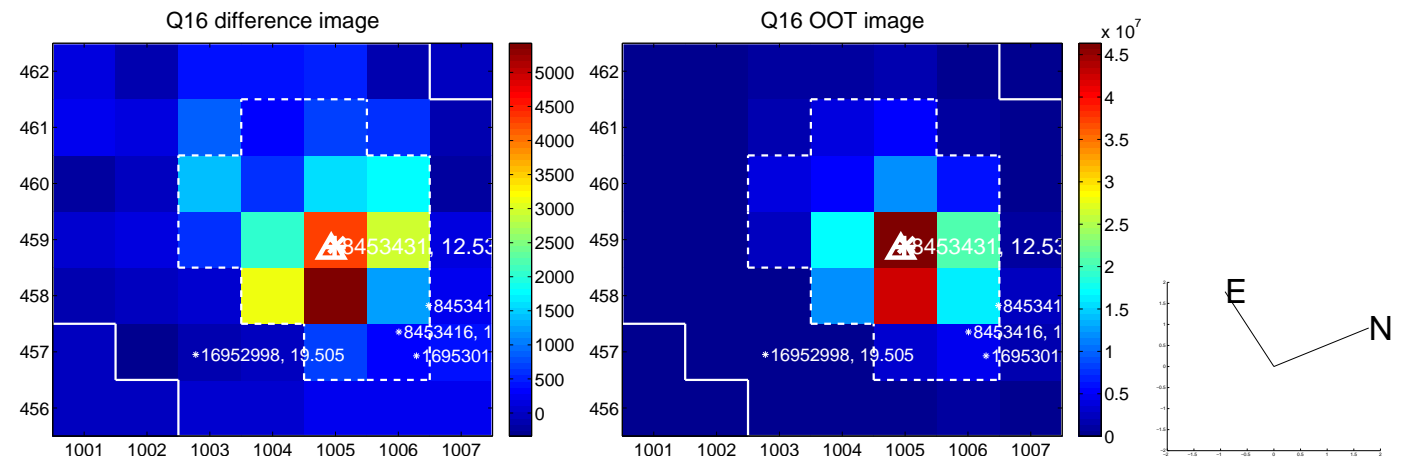
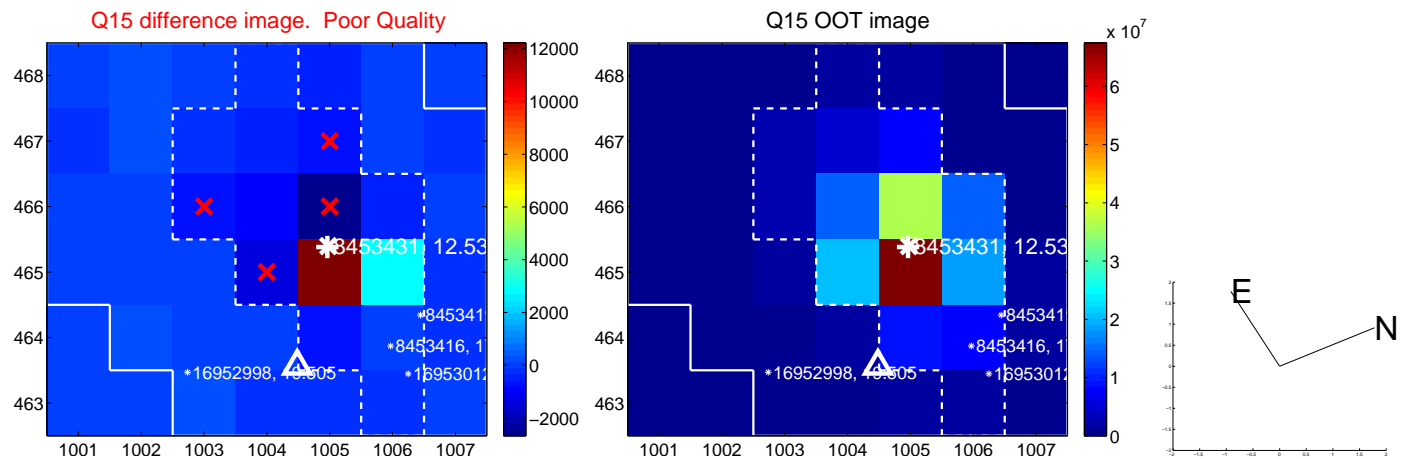
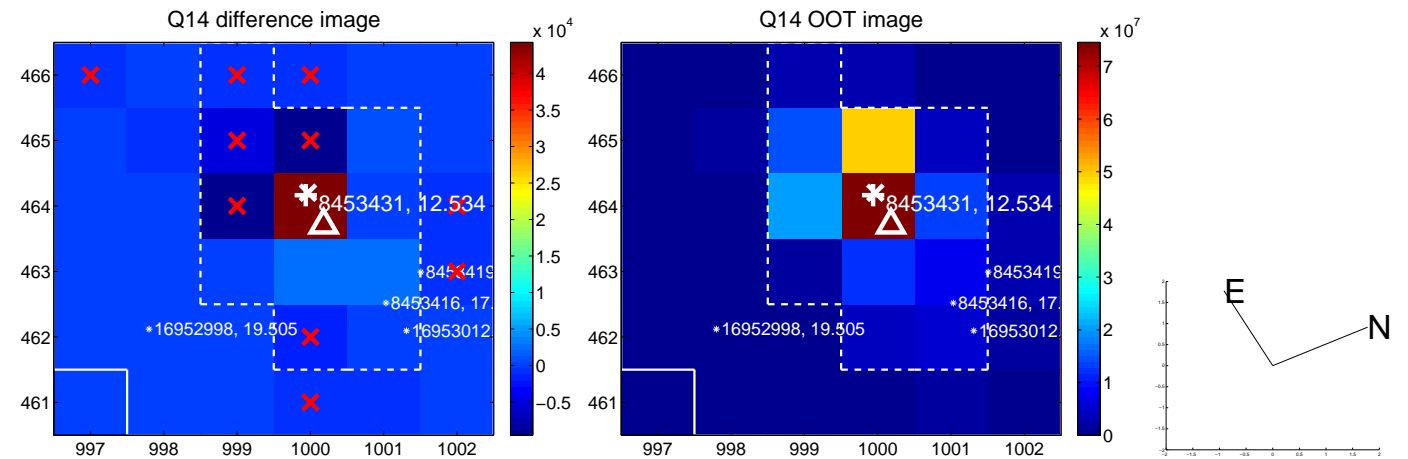
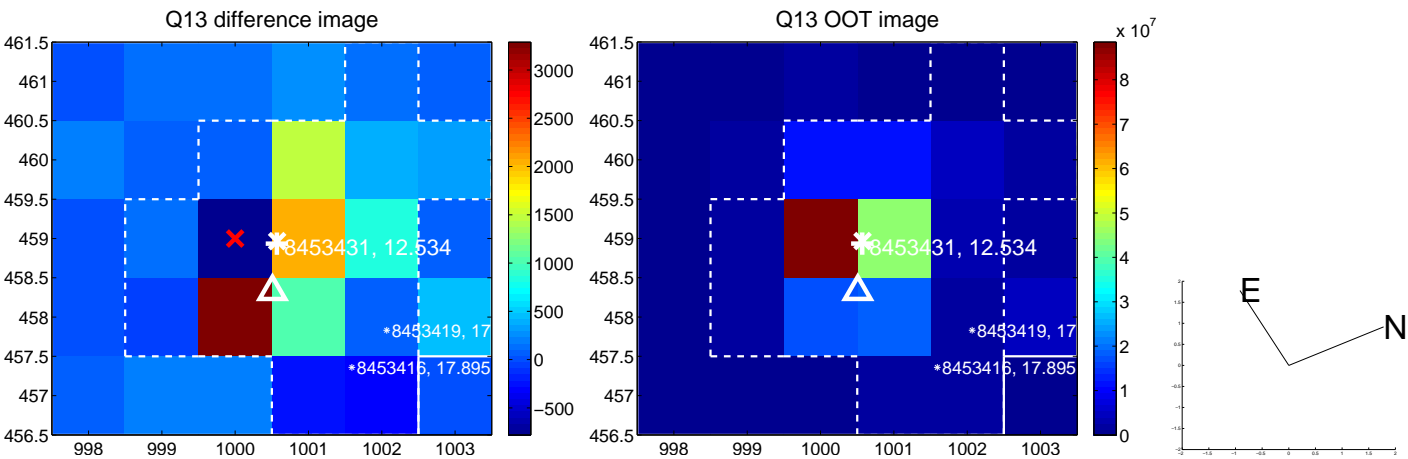




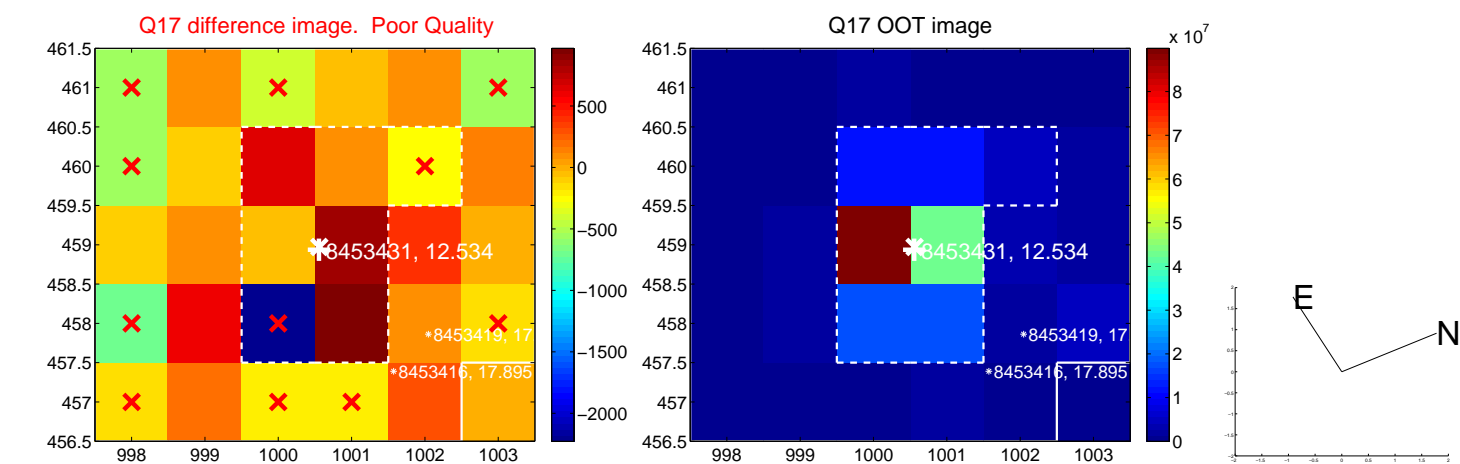
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



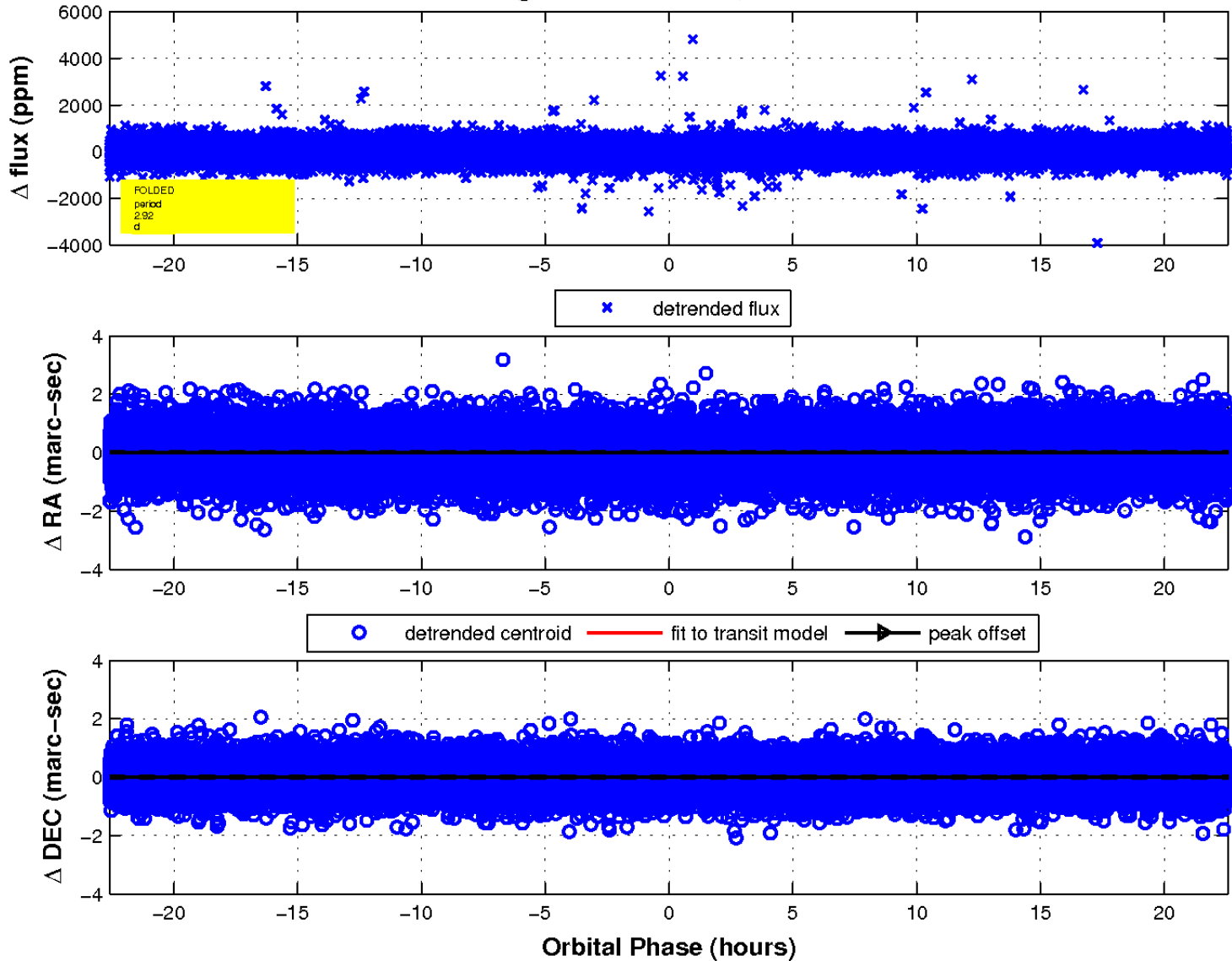
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

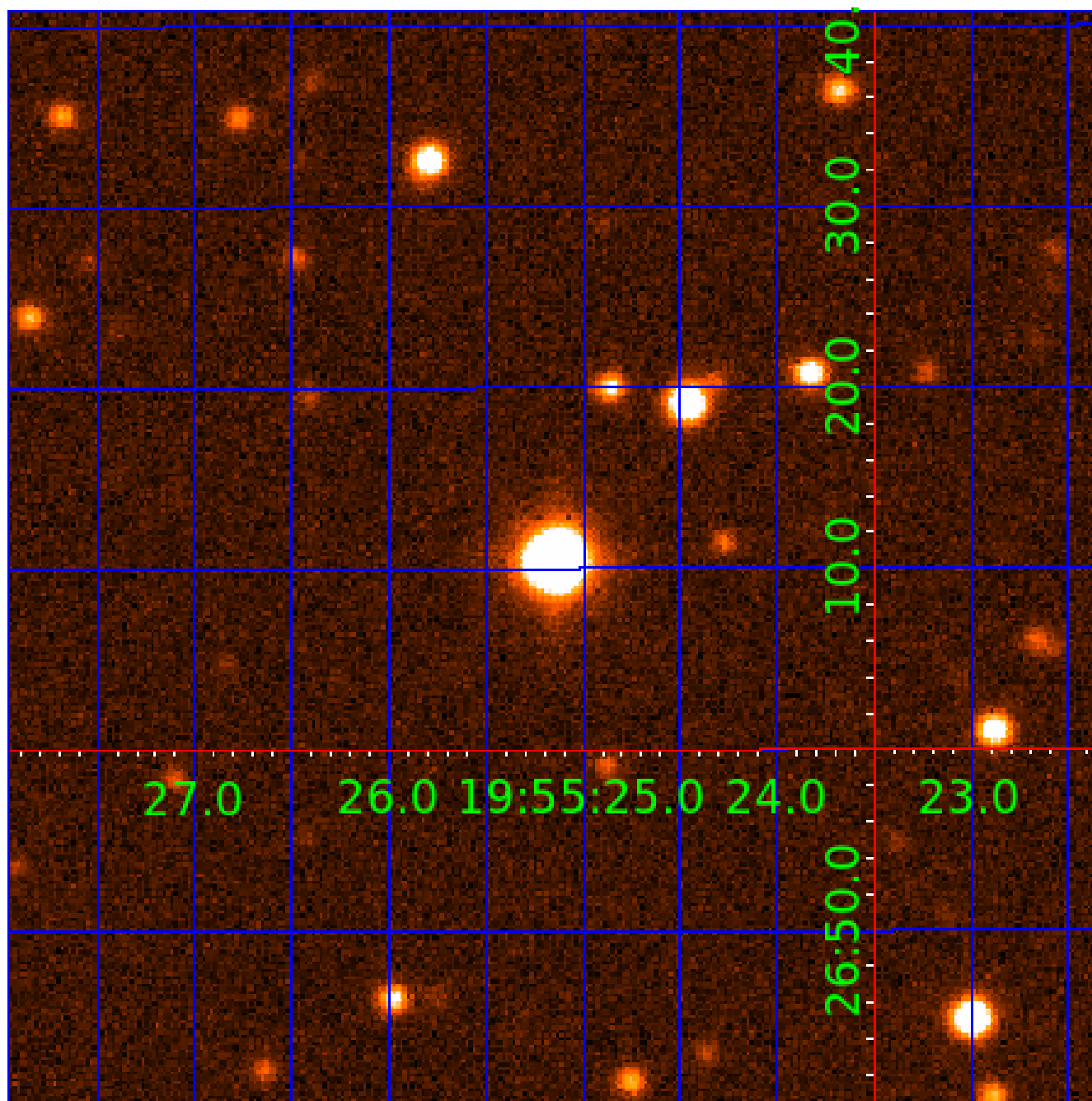


fluxWeightedCentroids, Planet 1 of 2



UKIRT Image

Declination





# KIC 008453431

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
008453431-01	OBS	No	2.919299	132.457808	27.9	7.529	9.4	8.7	3.60	7184	2.09	12021.22
008453431-02	OBS	No	1.751678	132.995460	29.5	5.590	8.1	9.7	3.60	7184	2.17	23752.77

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
008453431-01	OBS	FP	0.00	1	0	1	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT—MOD_POS_ALT—CENT_UNRESOLVED_OFFSET
008453431-02	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—MOD_TER_ALT

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

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

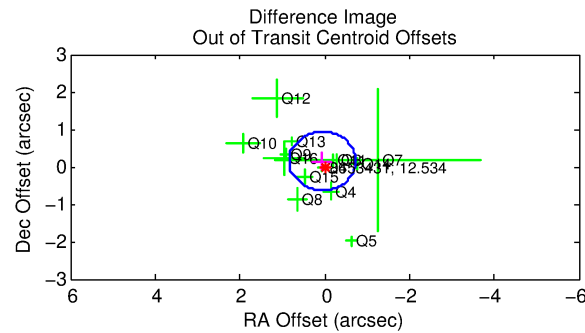
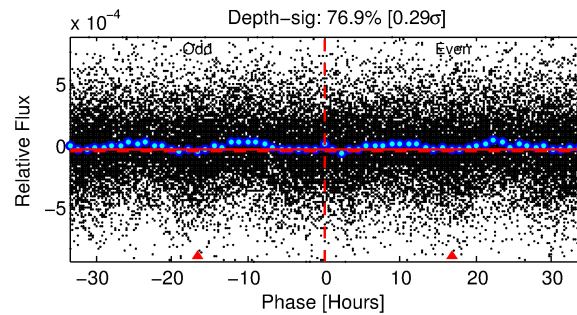
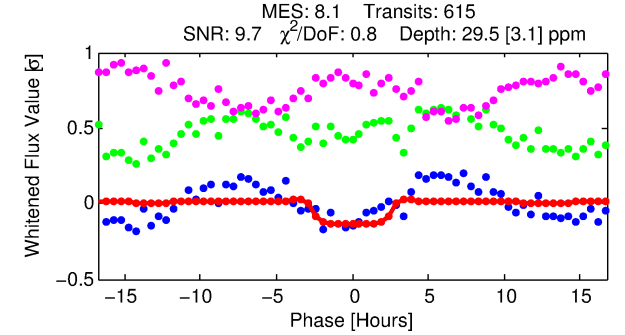
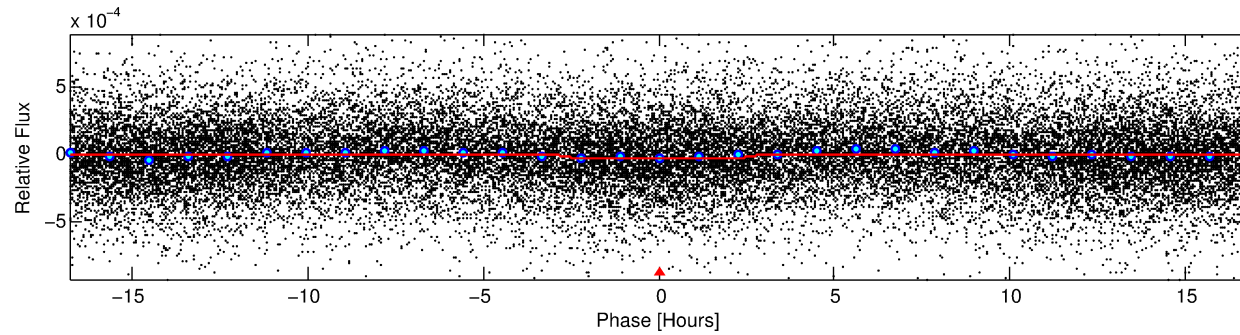
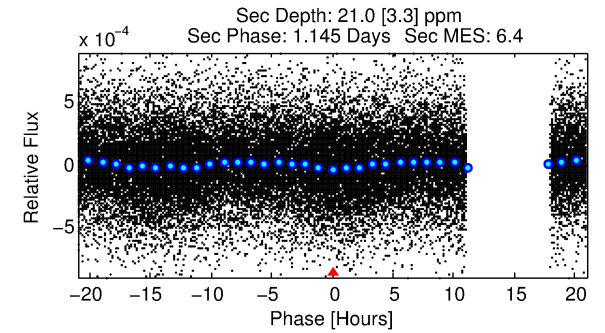
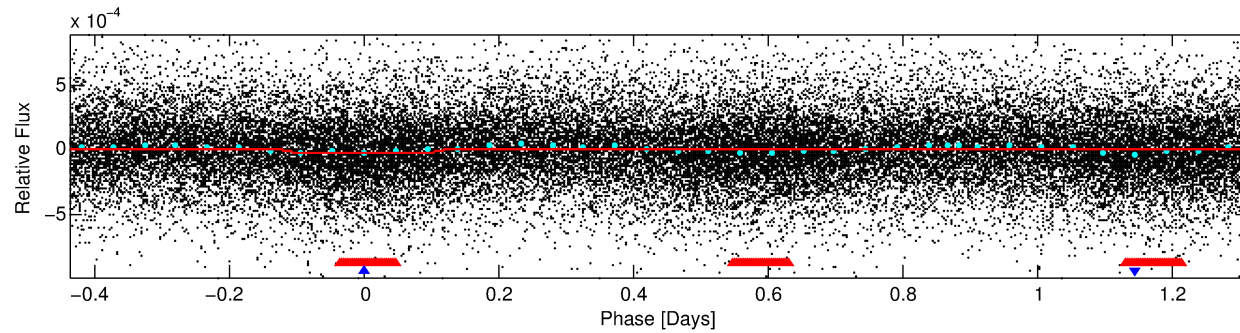
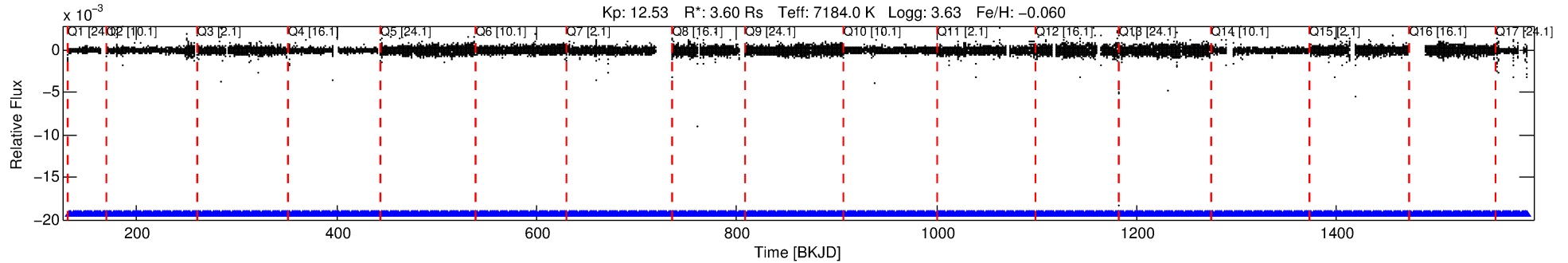
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 008453431-02

No Significant Match Found

# DV One-Page Summary

KIC: 8453431 Candidate: 2 of 2 Period: 1.752 d



## DV Fit Results:

Period = 1.75168 [0.00002] d  
Epoch = 132.9955 [0.0058] BKJD  
Rp/R\* = 0.0055 [0.0022]  
a/R\* = 1.67 [2.69]  
b = 0.81 [1.05]  
Seff = 23752.77 [20305.16]  
Teq = 3166 [677] K  
Rp = 2.17 [1.43] Re  
a = 0.0361 [0.0185] AU  
Ag = 3.20 [3.77] [0.59σ]  
Teffp = 6549 [1388] K [2.19σ]

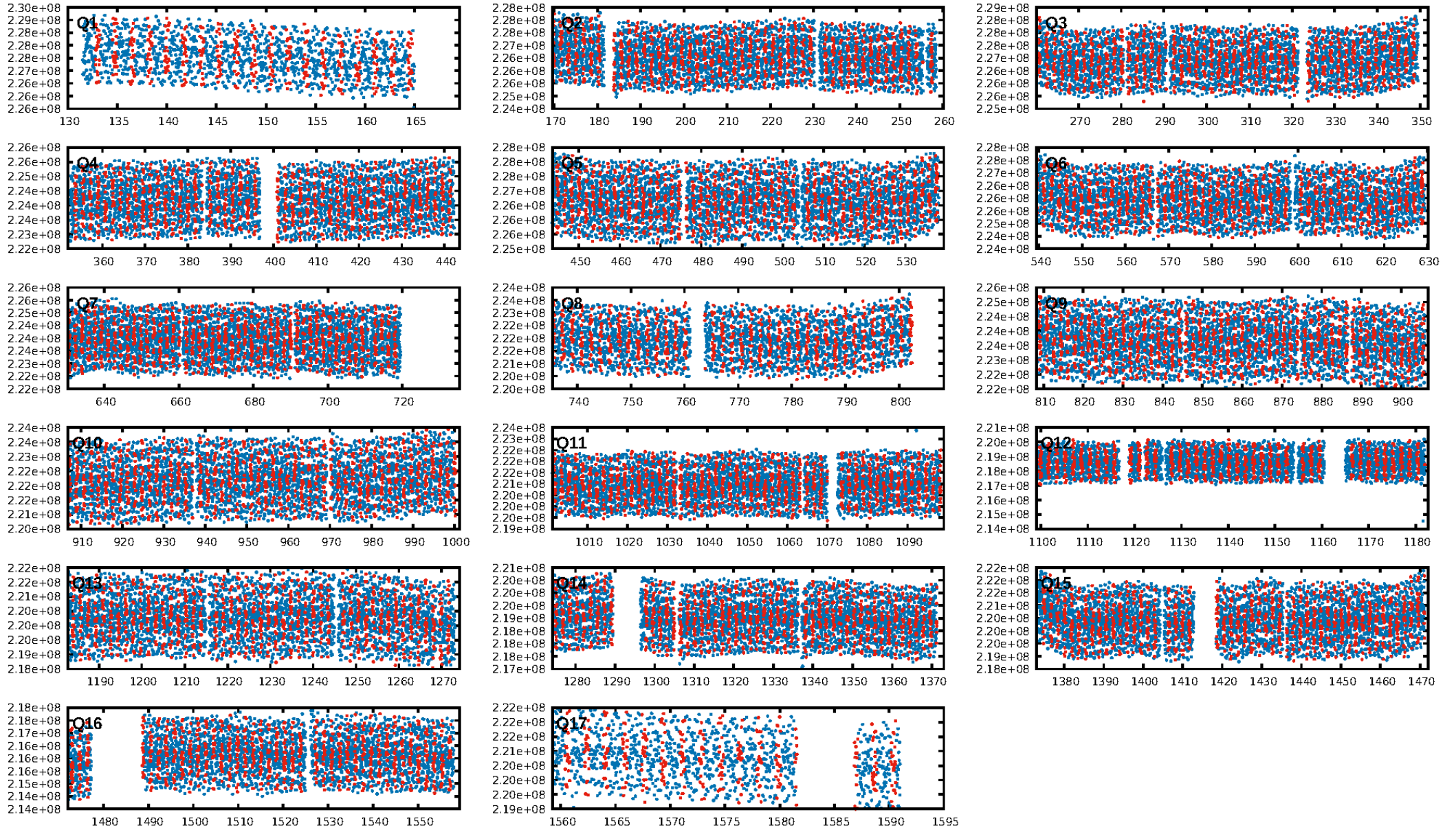
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 99.7% [2.99σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
**Bootstrap-pfa: 1.37e-11**  
RollingBand-fgt: 1.00 [586/586]  
GhostDiagnostic-chr: 1.953  
Centroid-sig: 54.5%  
Centroid-so: 0.389 arcsec [0.68σ]  
OotOffset-rm: 0.159 arcsec [0.61σ]  
KicOffset-rm: 0.050 arcsec [0.22σ]  
OotOffset-st: 3/4/4/3 [14]  
KicOffset-st: 3/4/4/3 [14]  
DiffImageQuality-fgm: 0.57 [8/14]  
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Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 01:30:42 Z

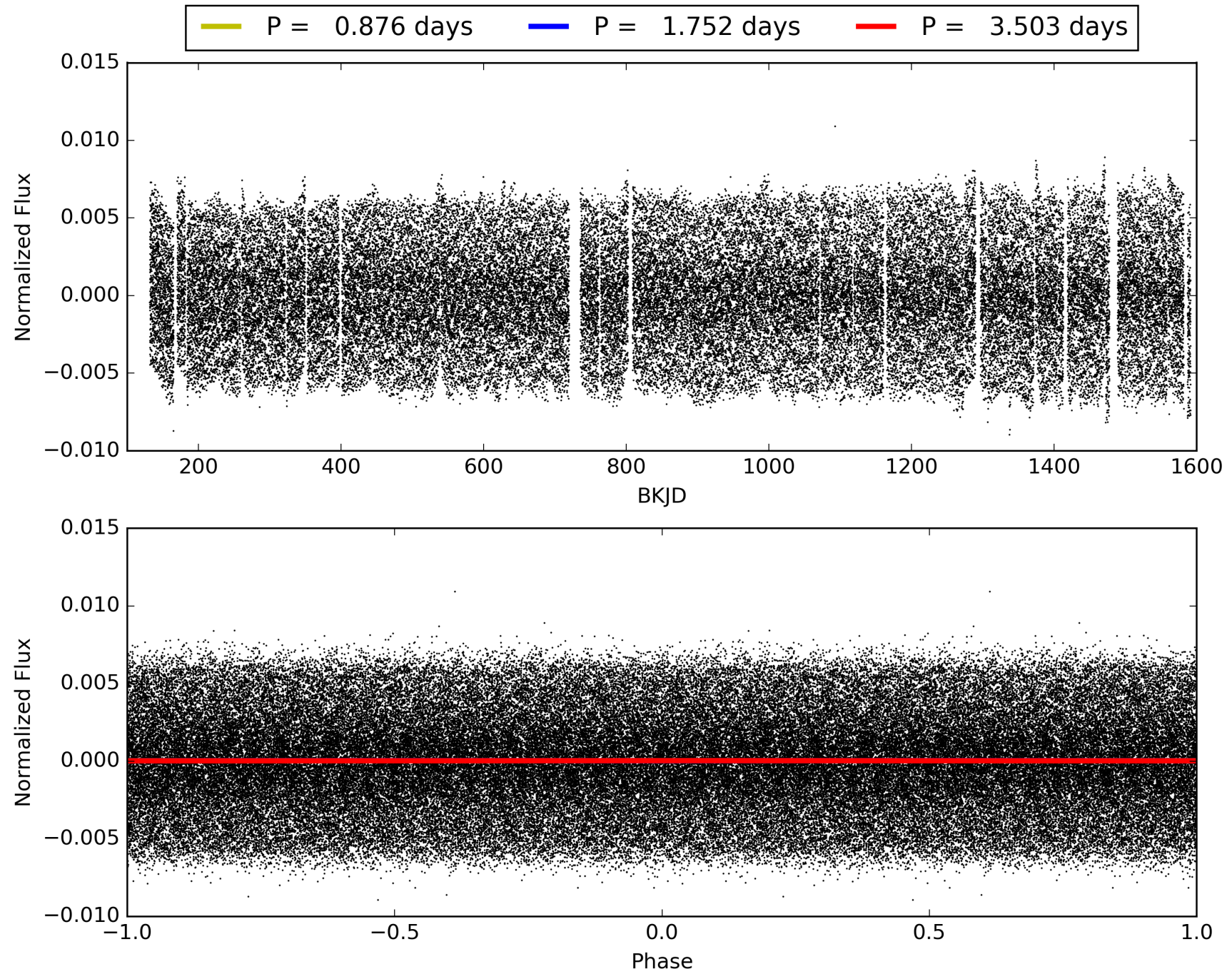
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 008453431-02, PDC Light Curves



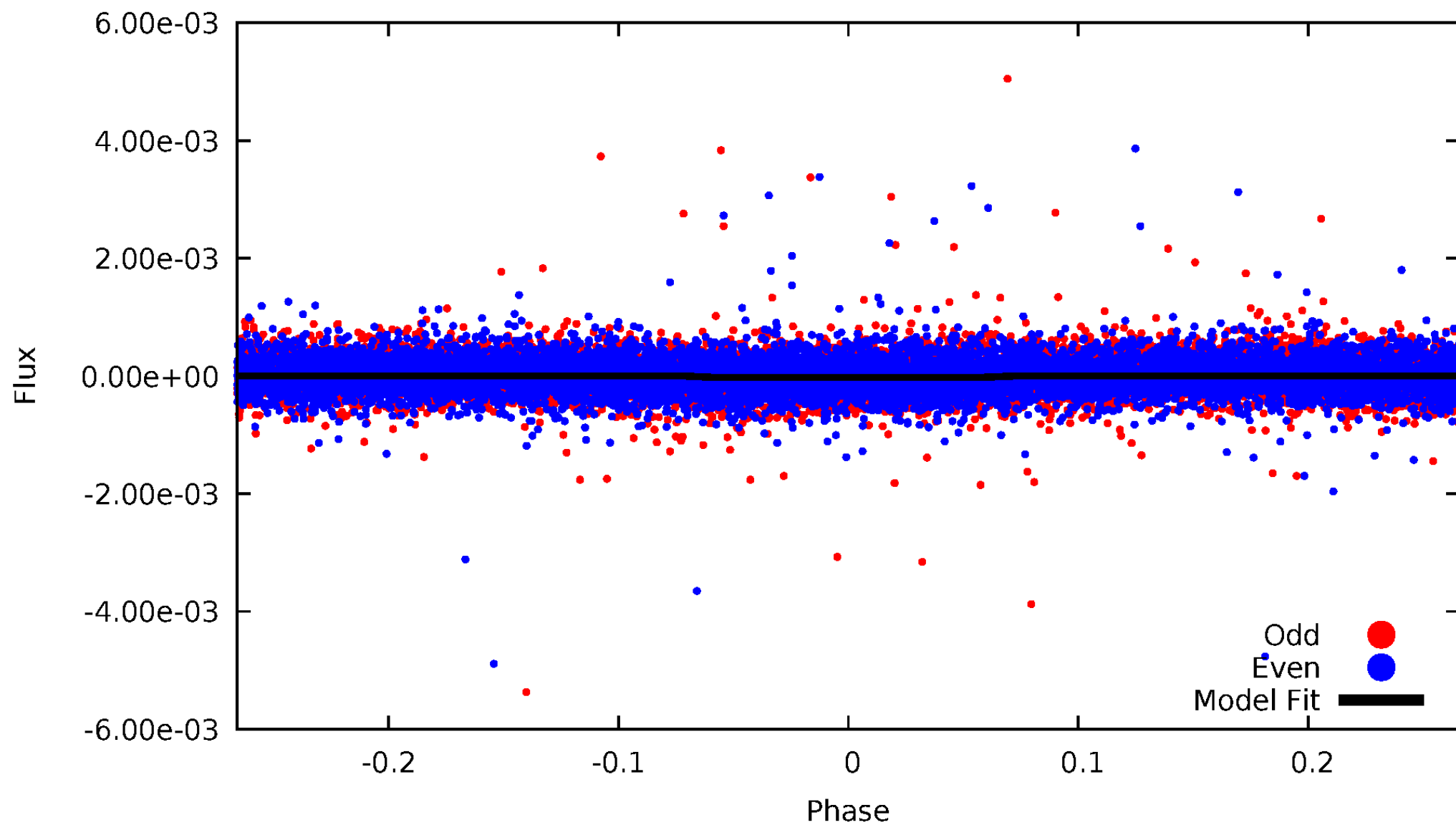


TCE 008453431-02



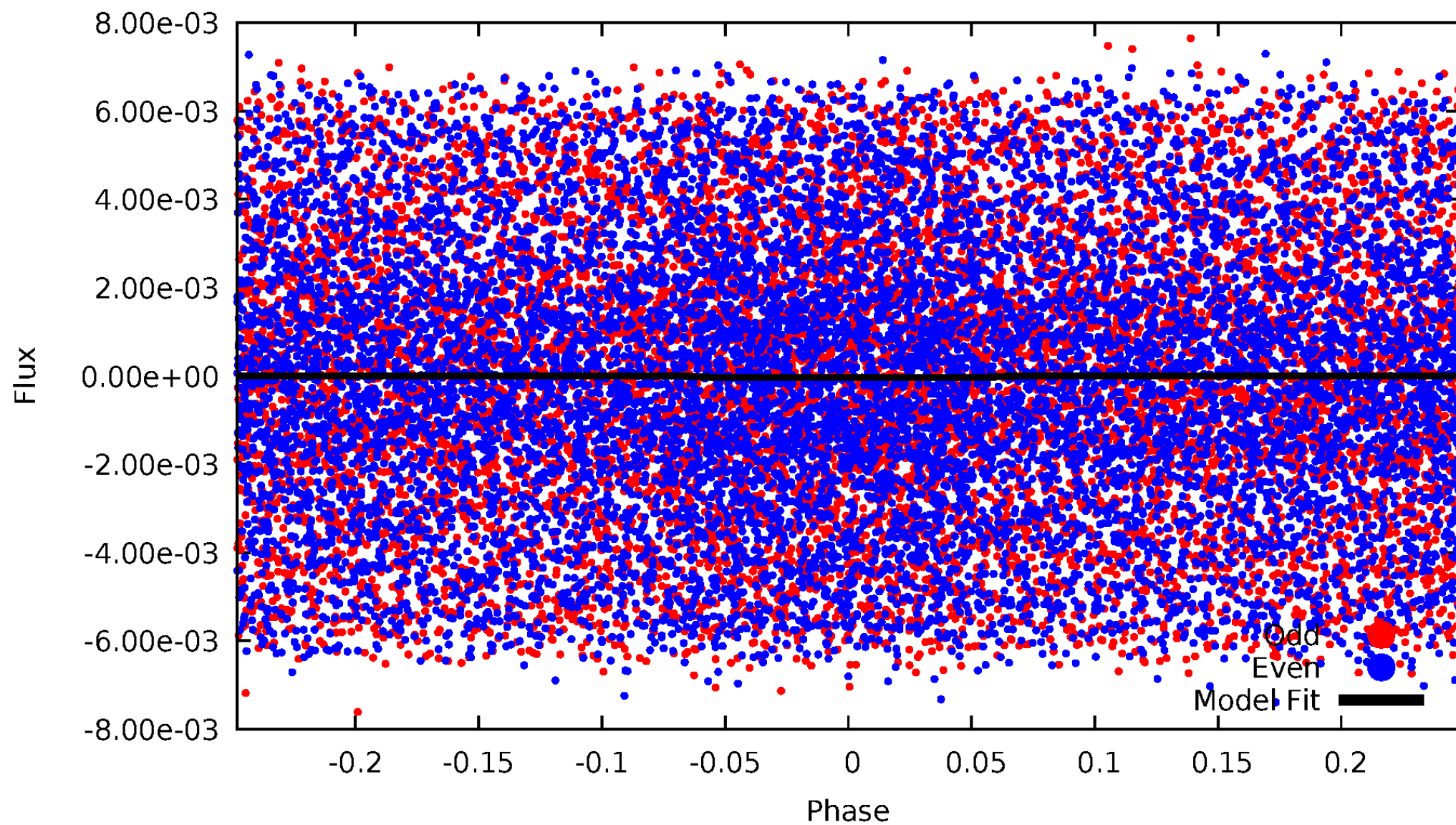
# DV Odd/Even

TCE 008453431-02



# ALT Odd/Even

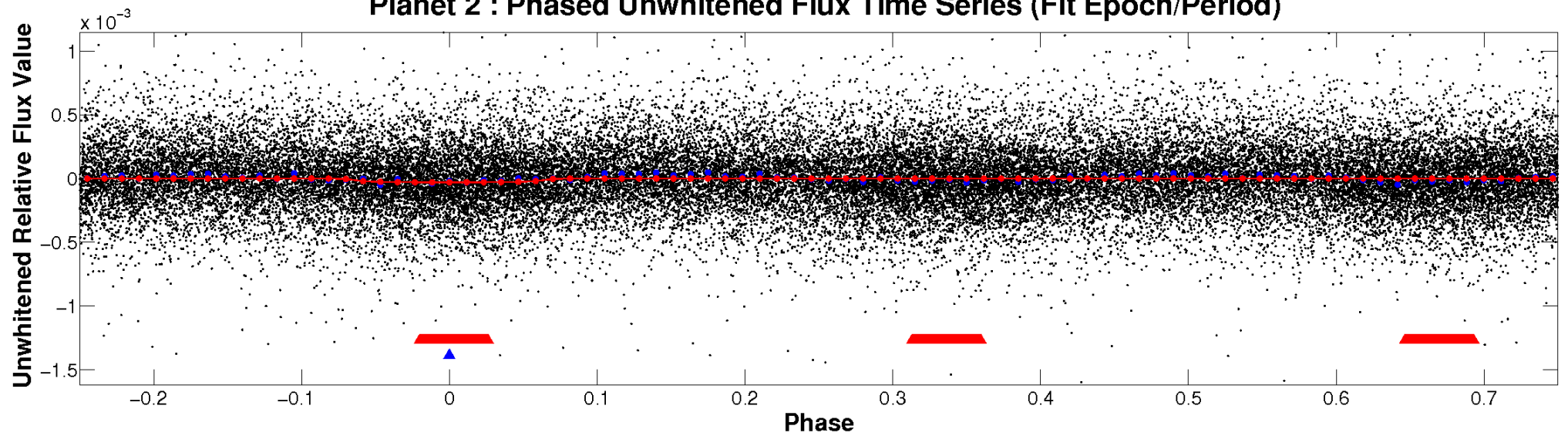
TCE 008453431-02



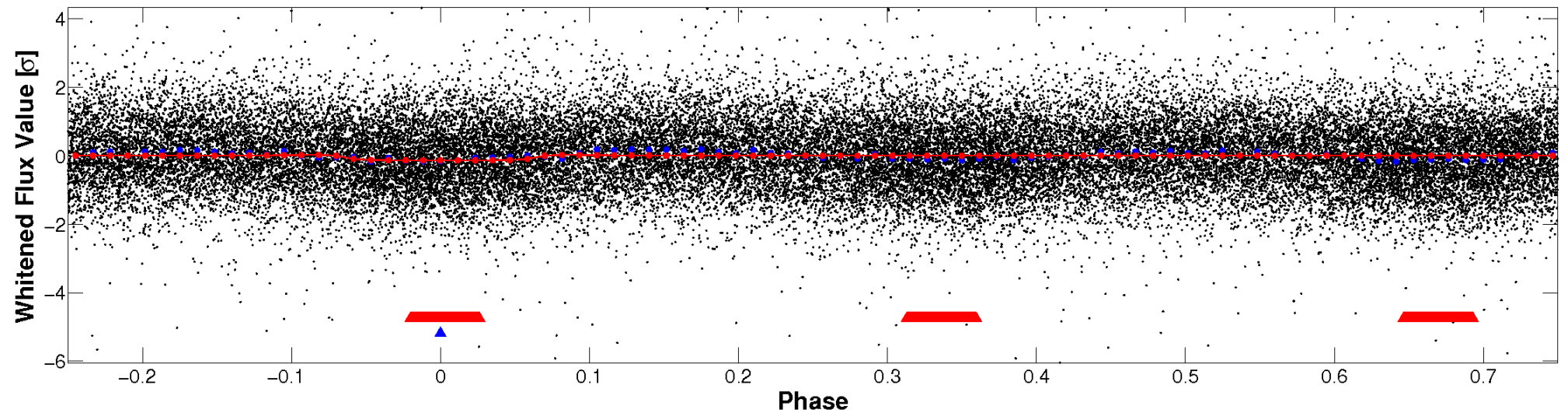


# Non-Whitened Vs. Whitened Light Curve

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

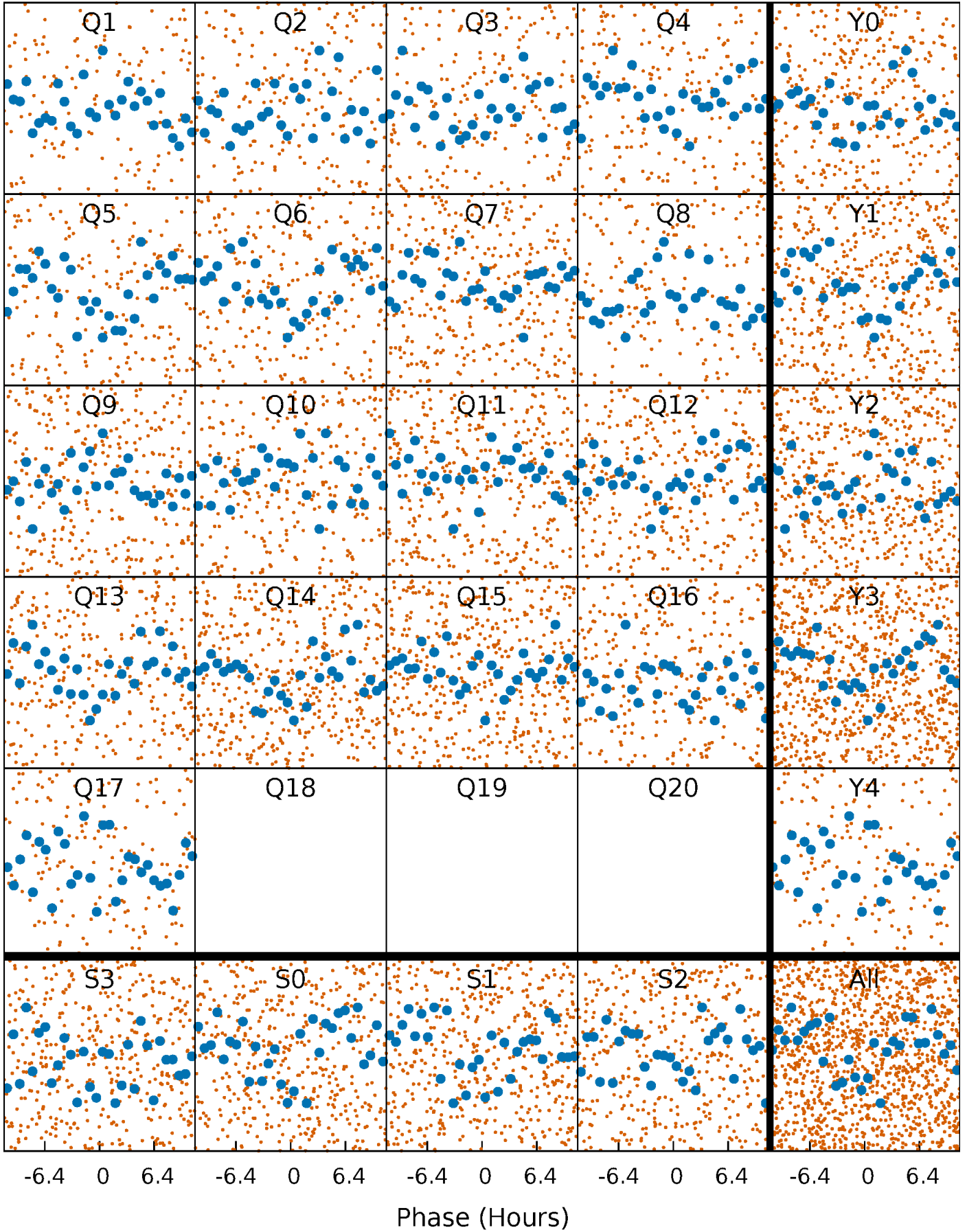


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



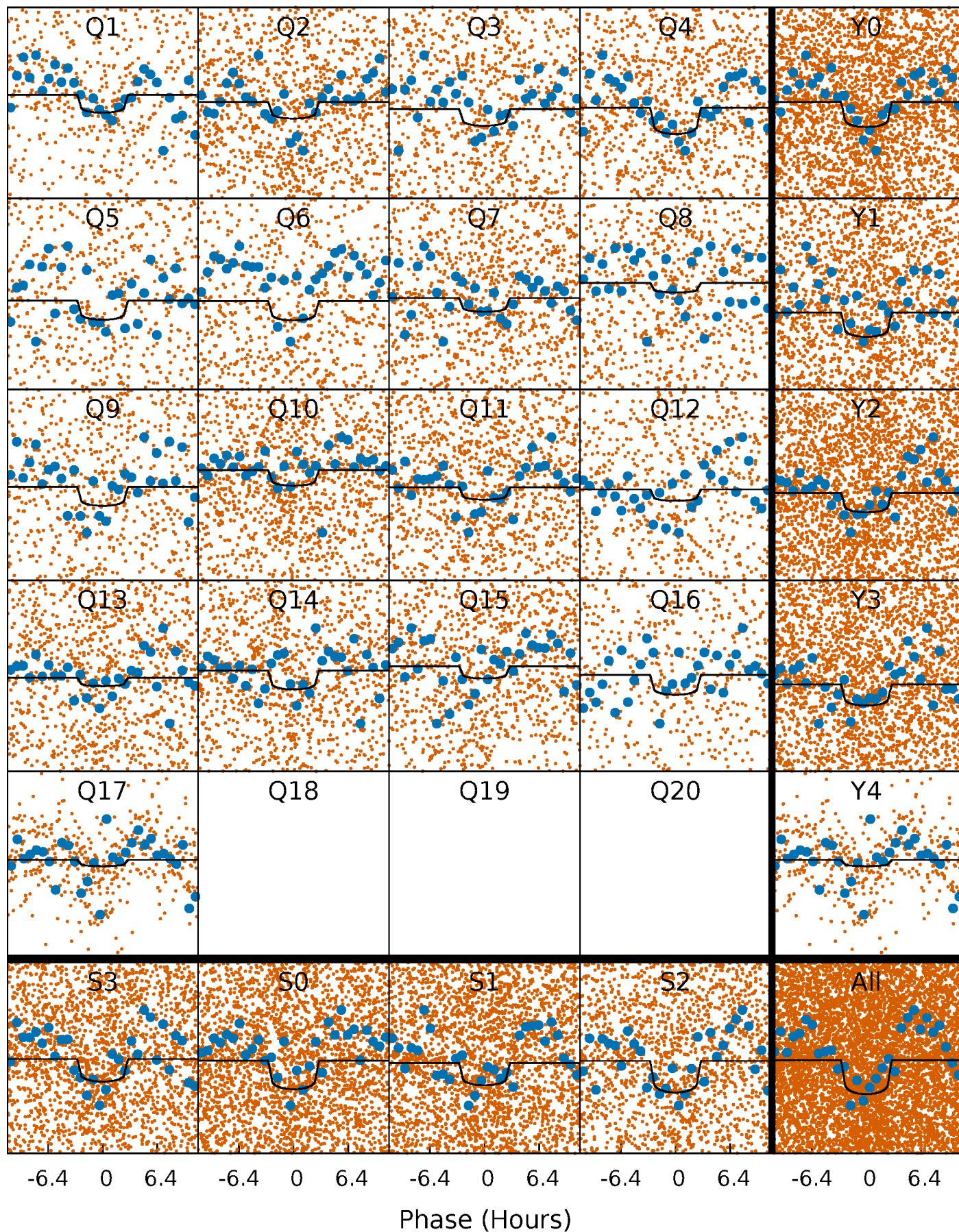
# PDC Quarter-Phased Transit Curves

TCE 008453431-02   P= 1.751678 Days    $T_0=132.995460$  (BKJD)



# DV Quarter-Phased Transit Curves

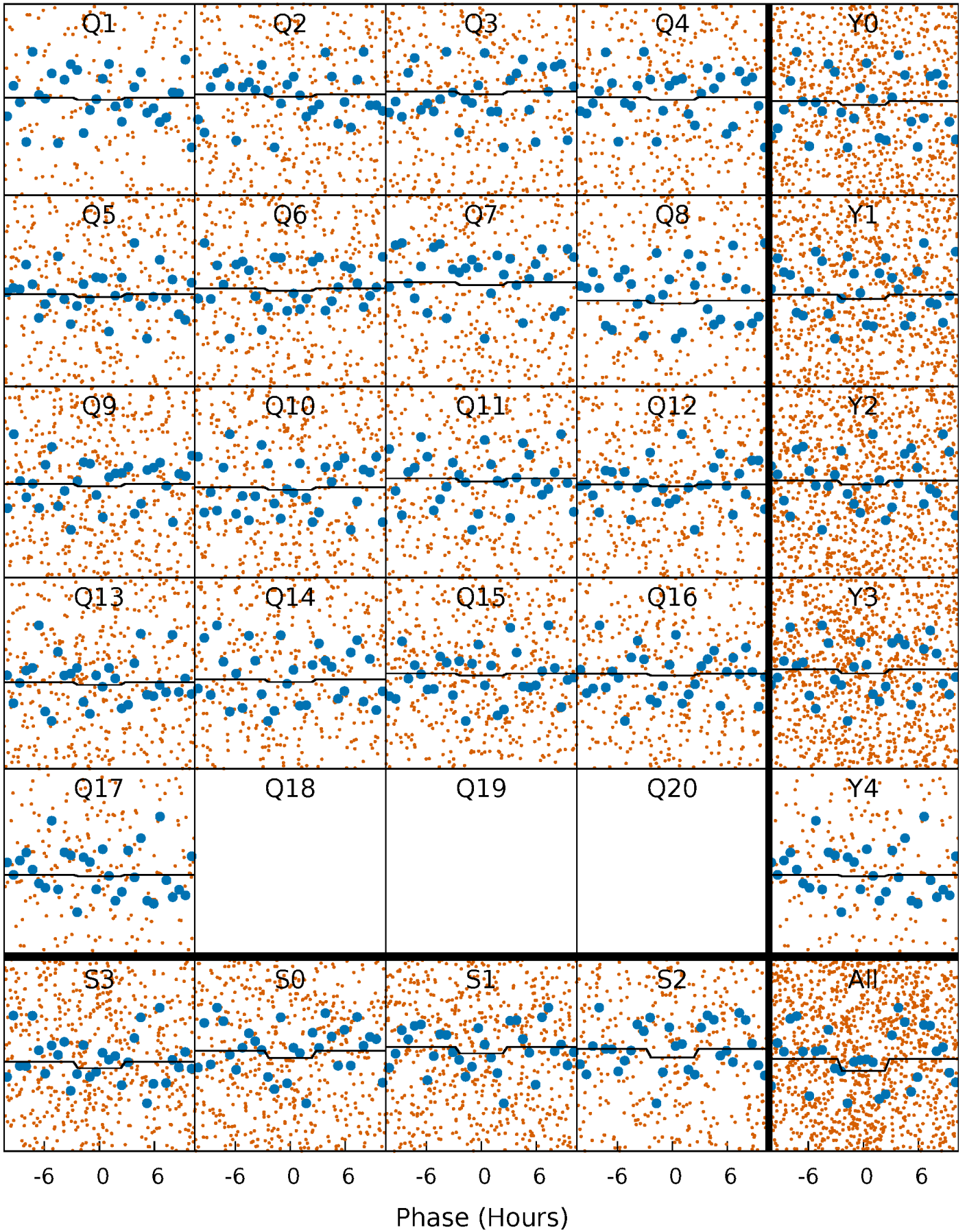
TCE 008453431-02   P= 1.751678 Days    $T_0=132.995460$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

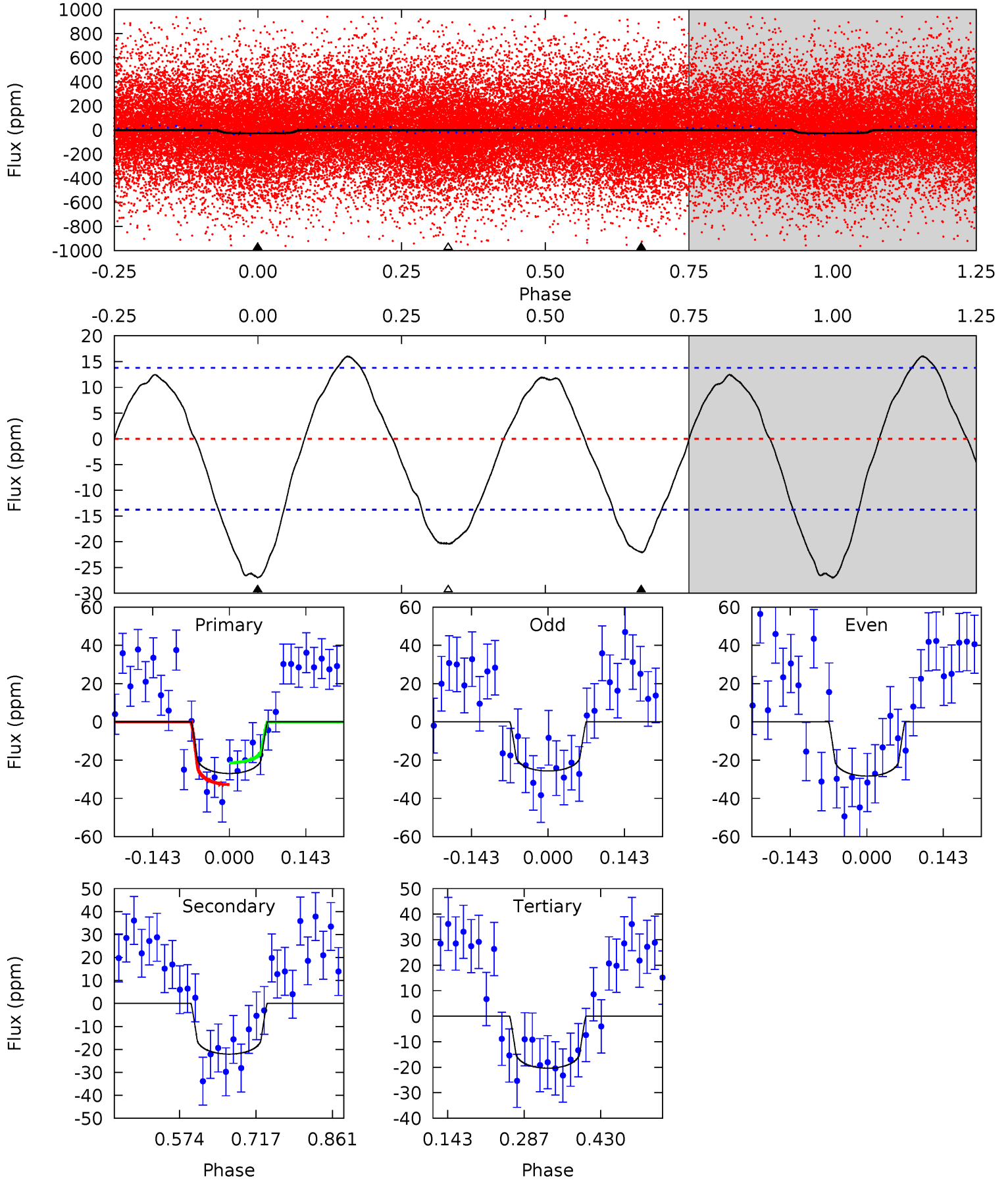
TCE 008453431-02 P= 1.751618 Days  $T_0=133.044438$  (BKJD)



# DV Model-Shift Uniqueness Test

008453431-02, P = 1.751678 Days, E = 131.243782 Days

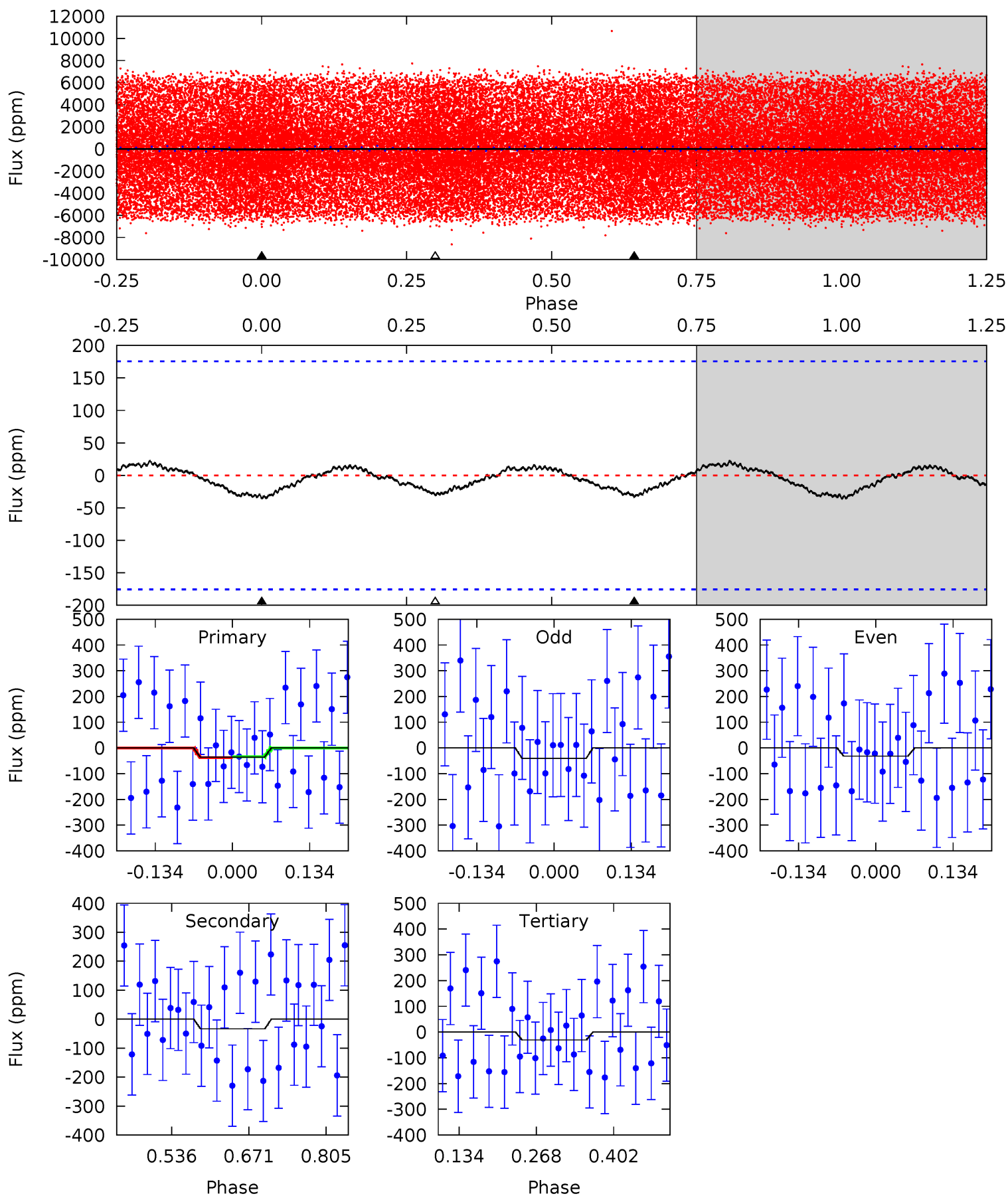
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
8.78	7.18	6.64	0	4.49	1.46	4.12	2.14	8.78	0.54	7.18	0.44	0.73	0.37	1.89



# Alt Model-Shift Uniqueness Test

008453431-02, P = 1.751618 Days, E = 131.292820 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
0.92	0.85	0.79	0	4.50	1.50	0.38	0.14	0.92	0.07	0.85	0.11	0.88	0.38	0.05





### Stellar Parameters For KIC 008453431

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$7184^{+201}_{-327}$	$3.635^{+0.495}_{-0.055}$	$-0.060^{+0.250}_{-0.300}$	$3.597^{+0.330}_{-1.871}$	$2.035^{+0.068}_{-0.610}$	$0.062^{+0.328}_{-0.011}$
	+3%/-5%	+14%/-2%	+417%/-500%	+9%/-52%	+3%/-30%	+532%/-18%
Source	KIC0	KIC0	KIC0	DSEP		

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

### Secondary Eclipse Parameters for KIC 008453431-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{max} (K)$	$T_{obs} (K)$	$A_{obs}$
DV	$-22 \pm 3$	$1.80^{+0.96}_{-0.78}$	$4232^{+310}_{-581}$	$6469^{+2398}_{-1167}$	$4.668^{+9.869}_{-2.696}$
Alt.	$-33 \pm 39$	$1.86^{+0.97}_{-0.78}$	$4220^{+314}_{-598}$	$6909^{+3872}_{-11953}$	$5.786^{+17.513}_{-6.758}$

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

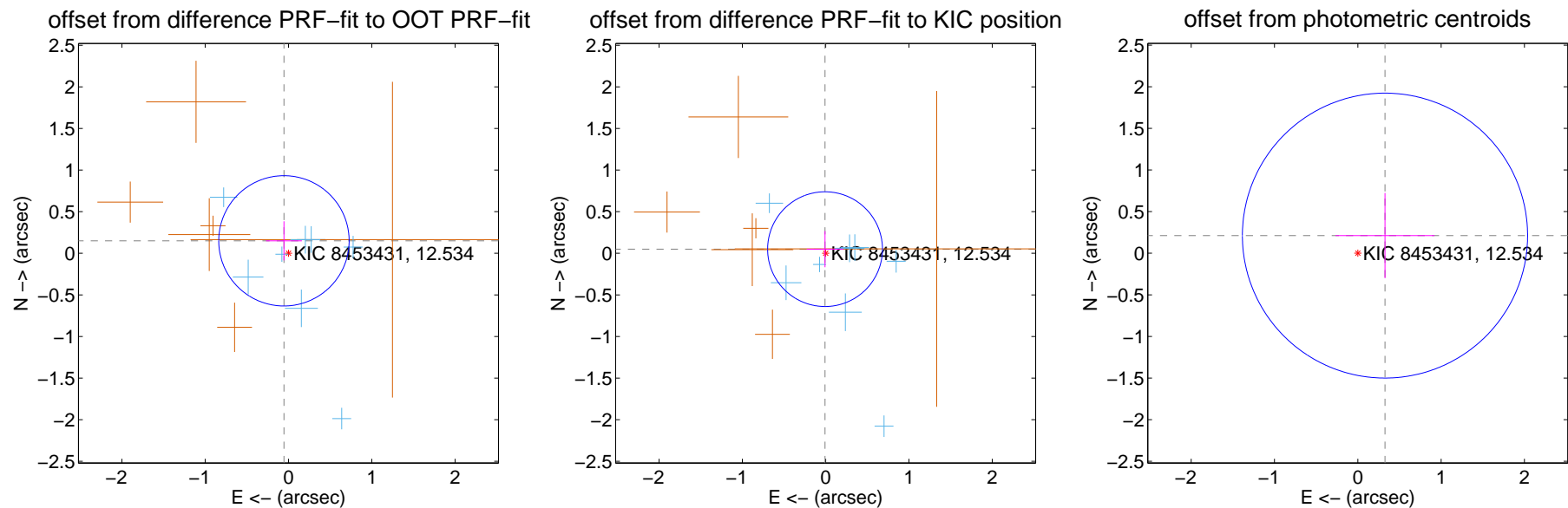
## DV Centroid Data

Supplemental centroid analysis for 008453431-02. Kepler magnitude: 12.53. Transit SNR 9.71

There are 8 quarters with good PRF difference image offsets

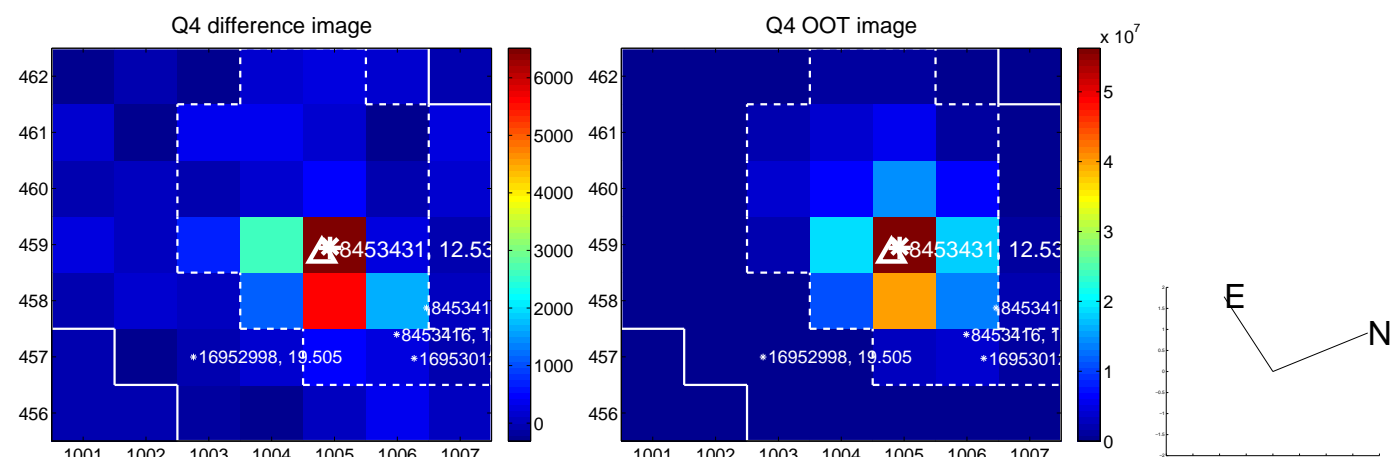
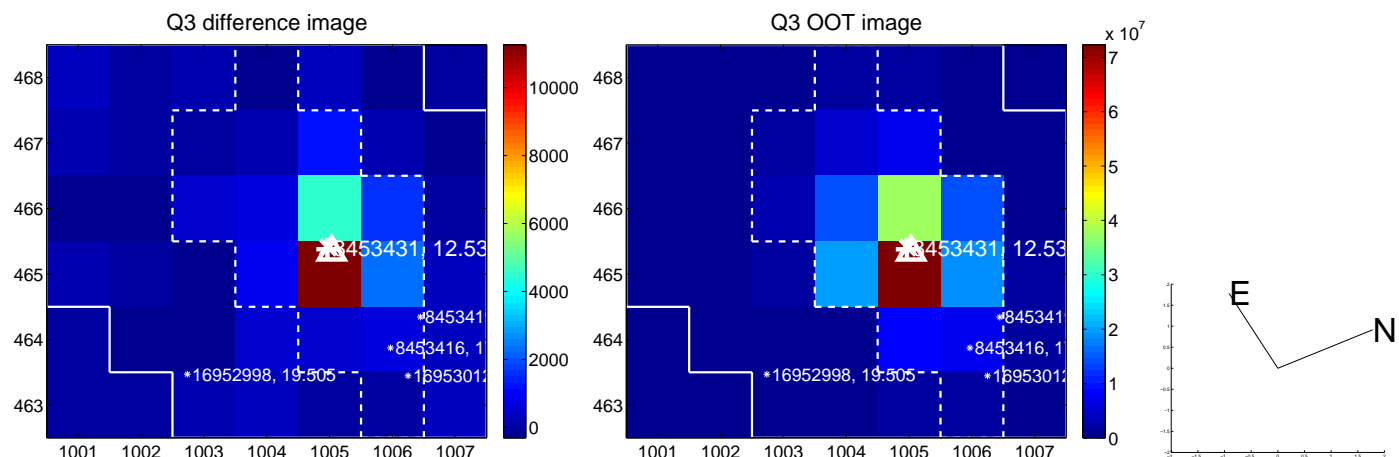
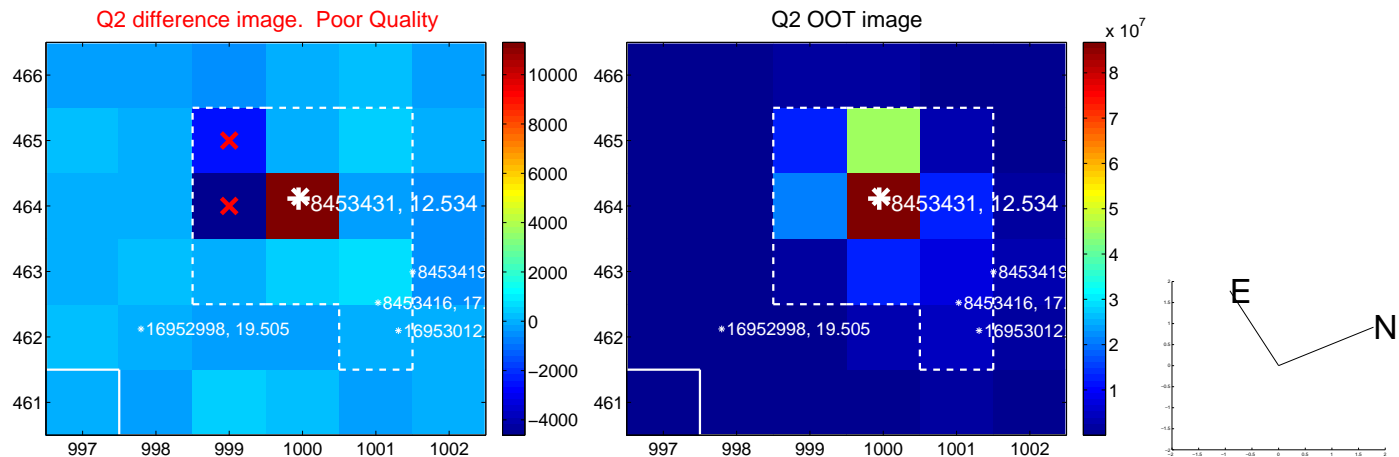
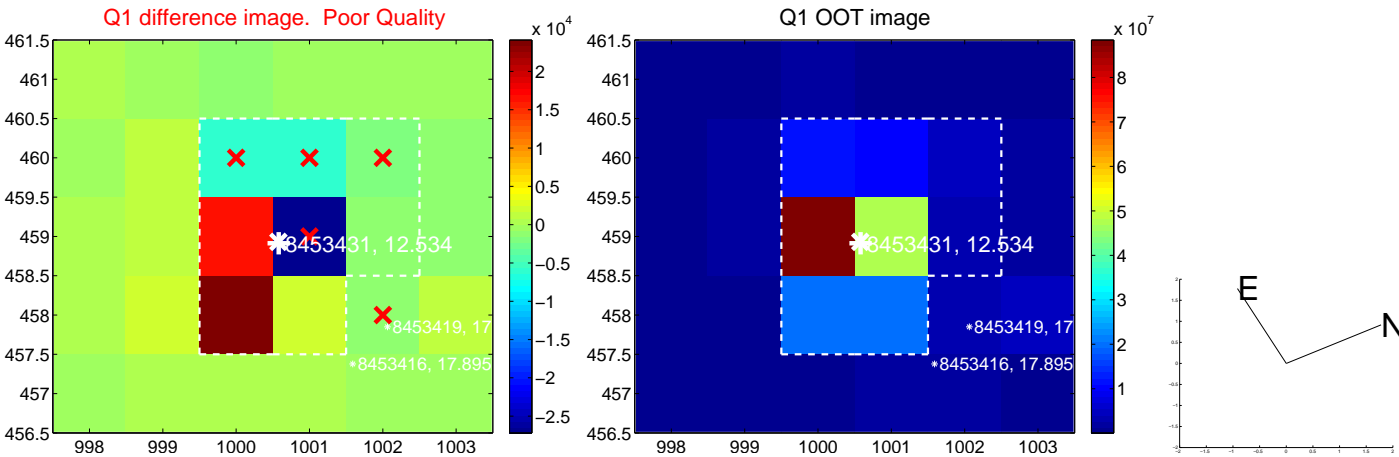
The direct PRF centroid is offset from the target star catalog position by about 0.19 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.159 \pm 0.261$	0.61	$0.055 \pm 0.215$	$0.150 \pm 0.235$
PRF-fit source offset from KIC position	$0.050 \pm 0.230$	0.22	$0.007 \pm 0.220$	$0.050 \pm 0.217$
photometric centroid source offset	$0.39 \pm 0.57$	0.68	$-0.33 \pm 0.59$	$0.21 \pm 0.51$

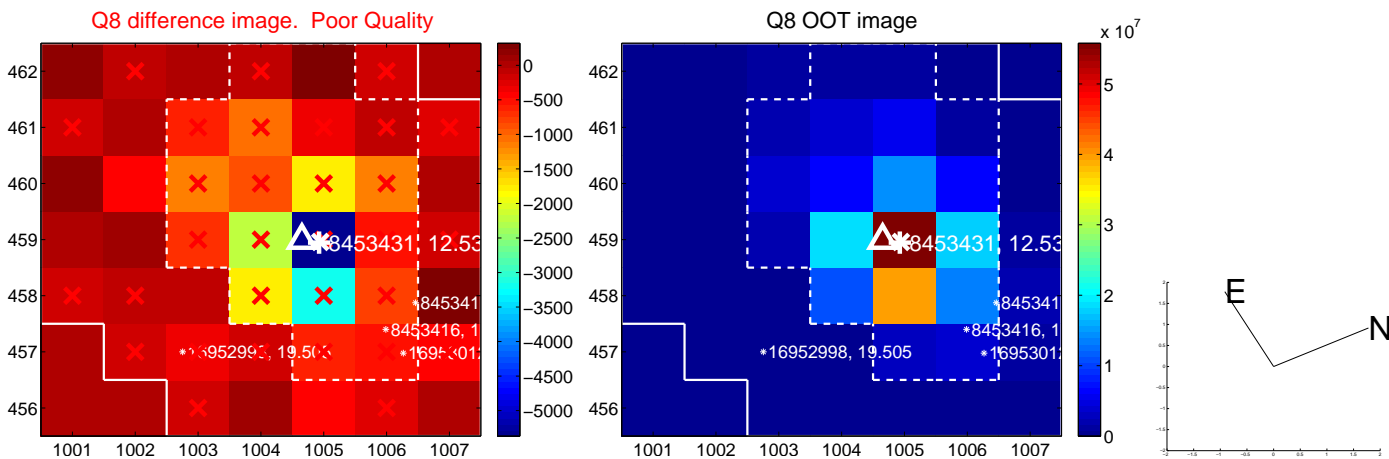
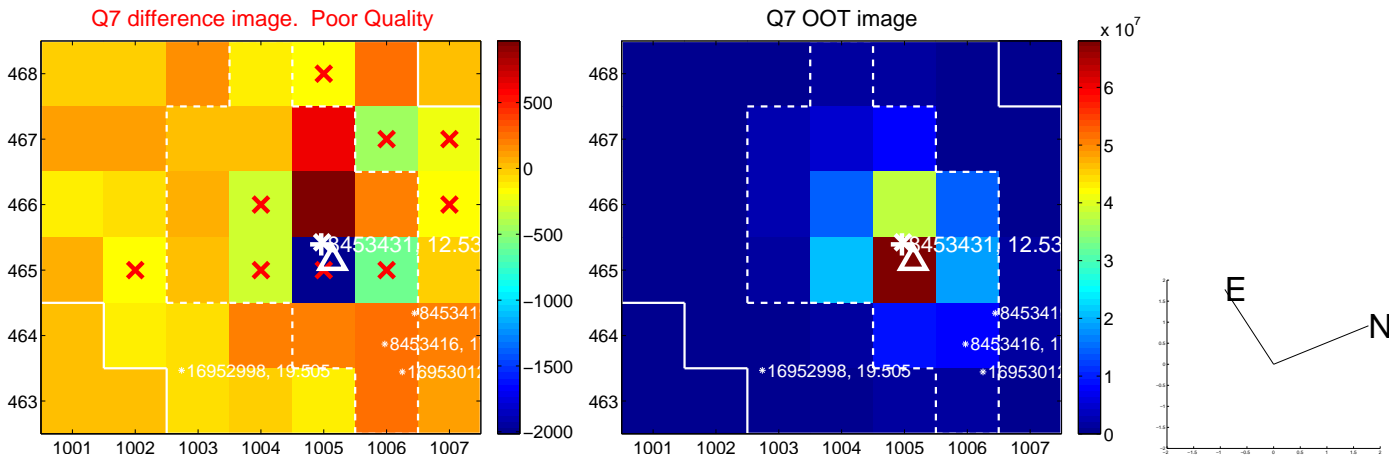
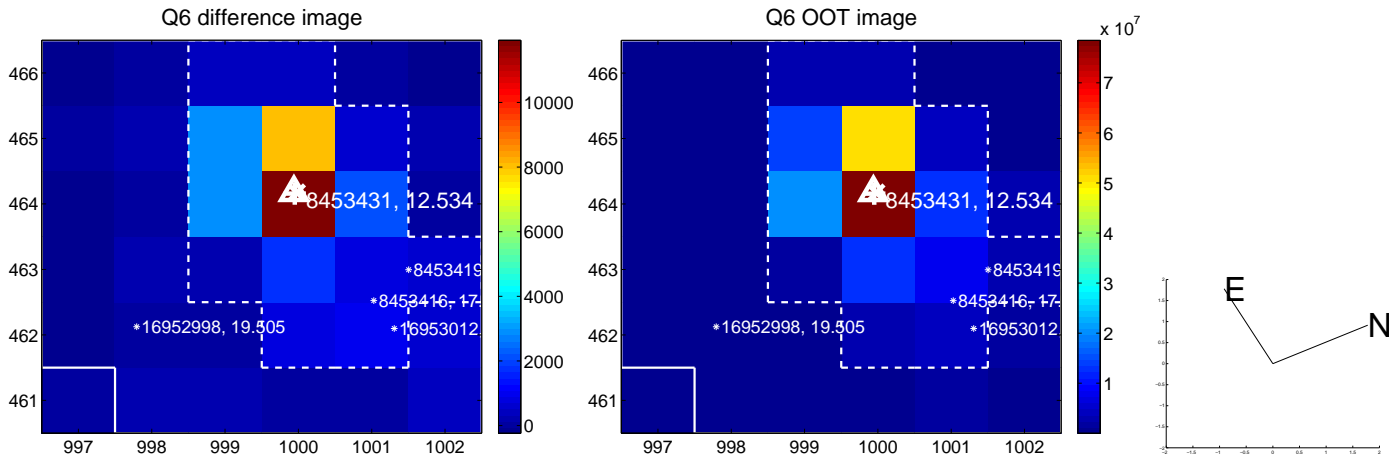
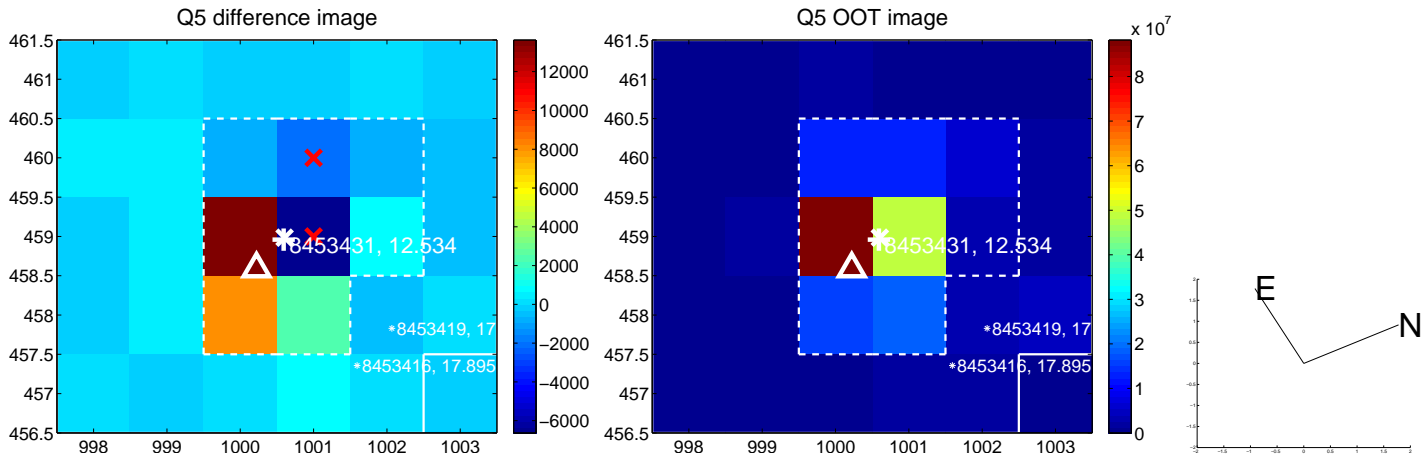


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

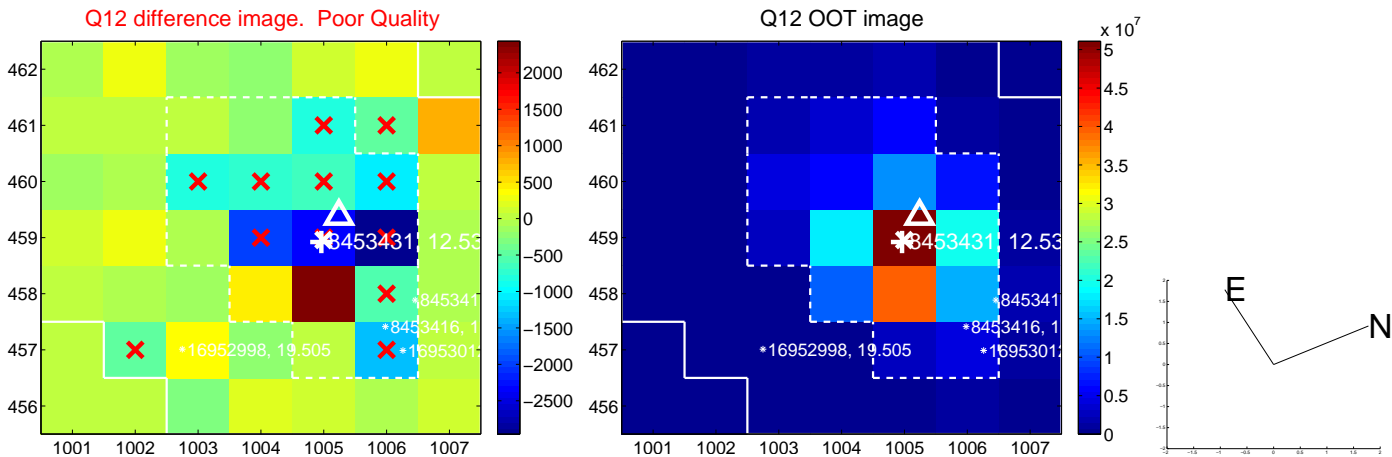
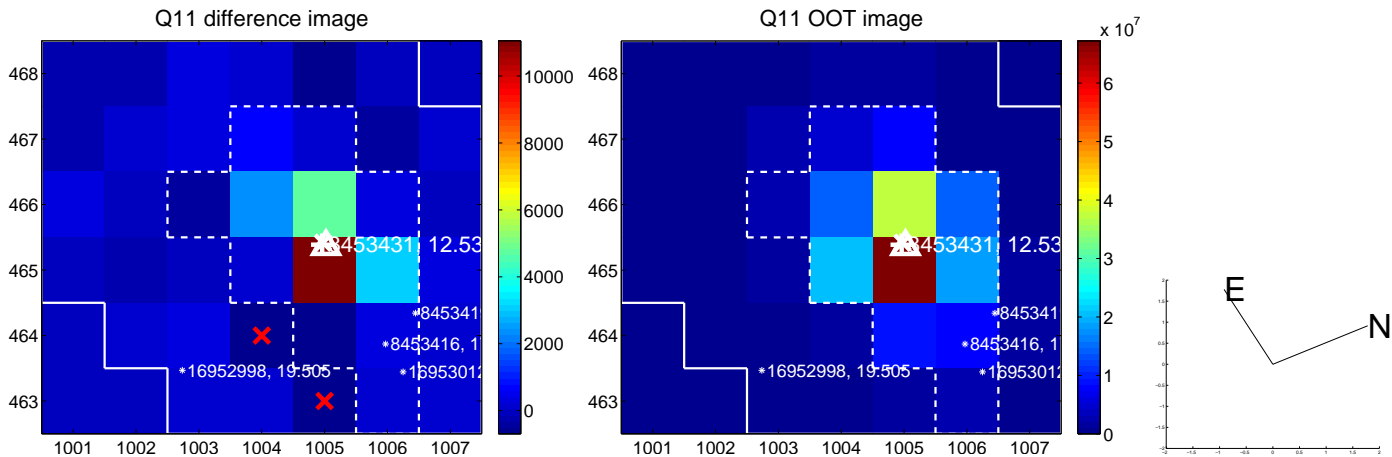
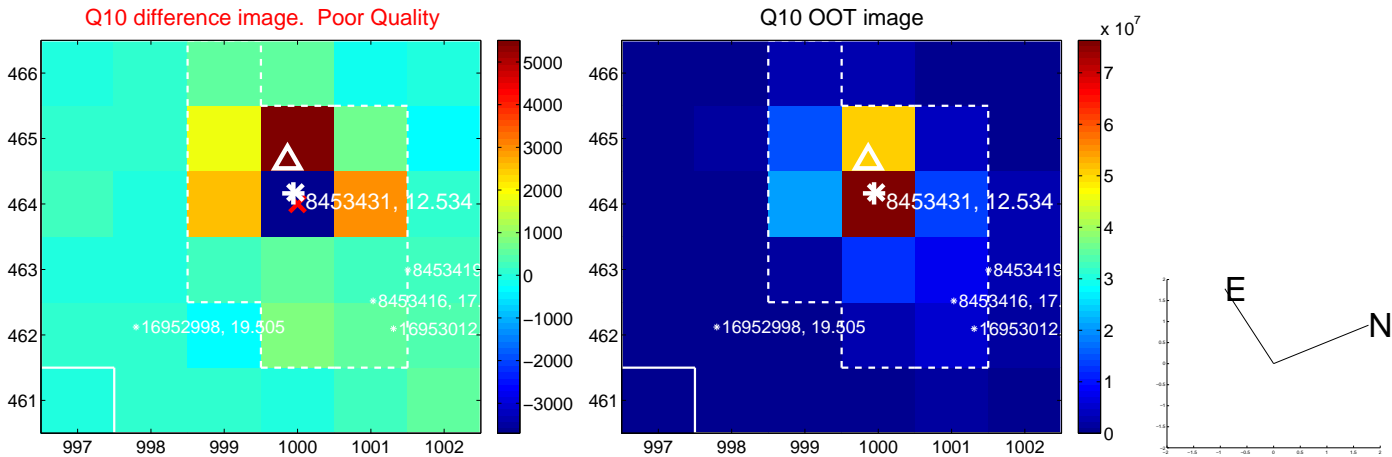
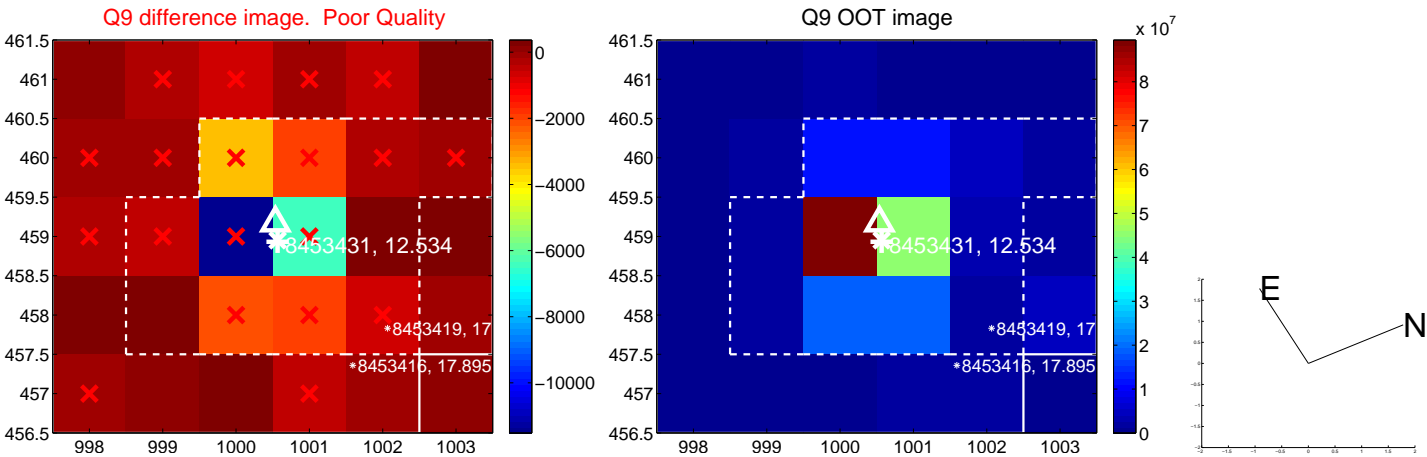
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



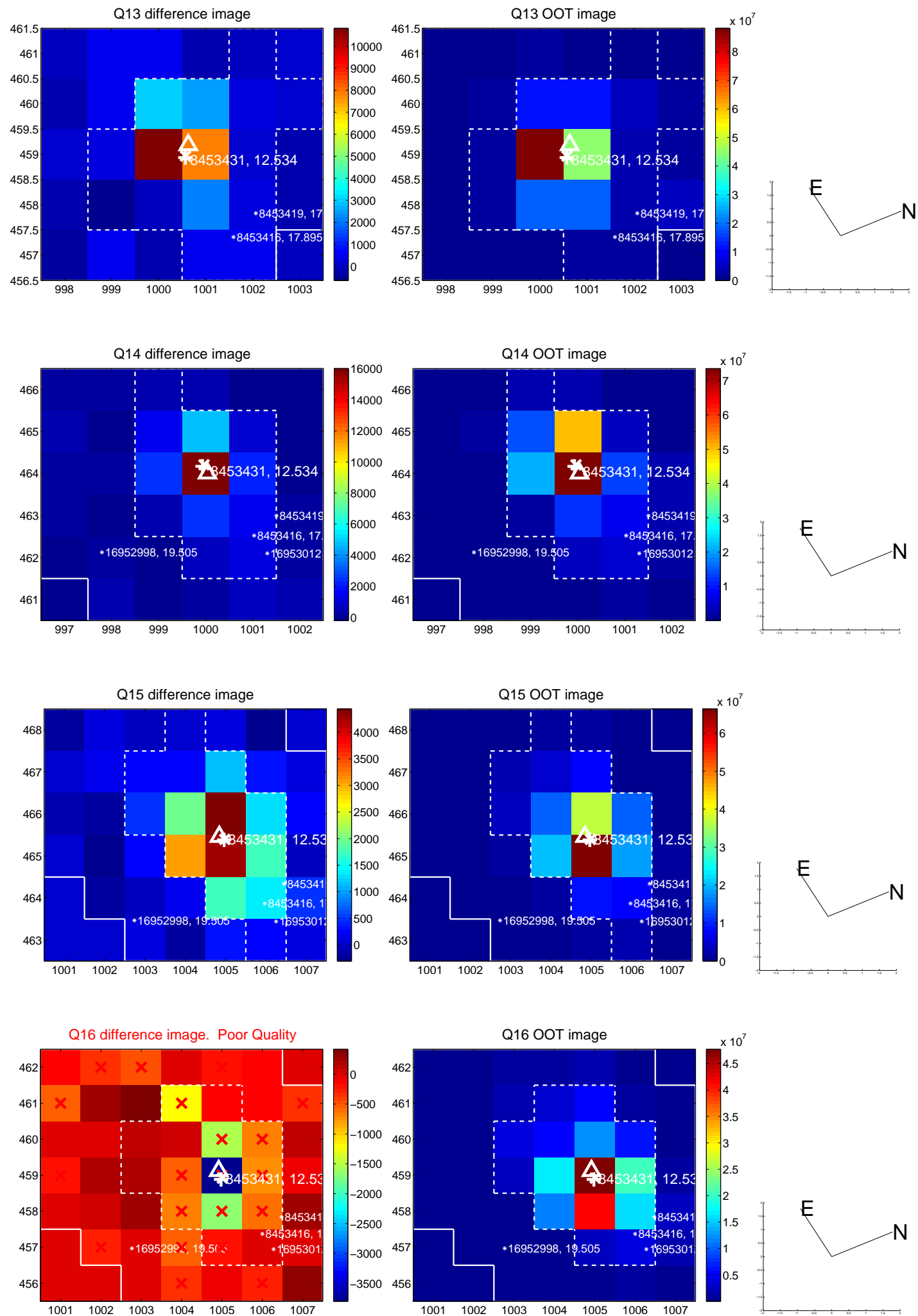
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

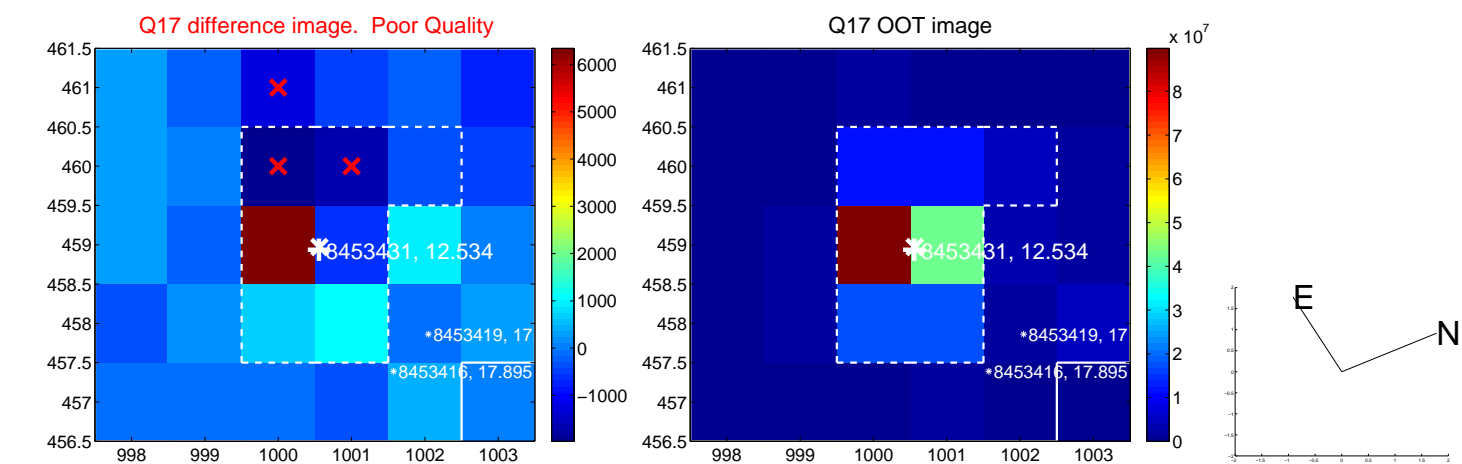


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

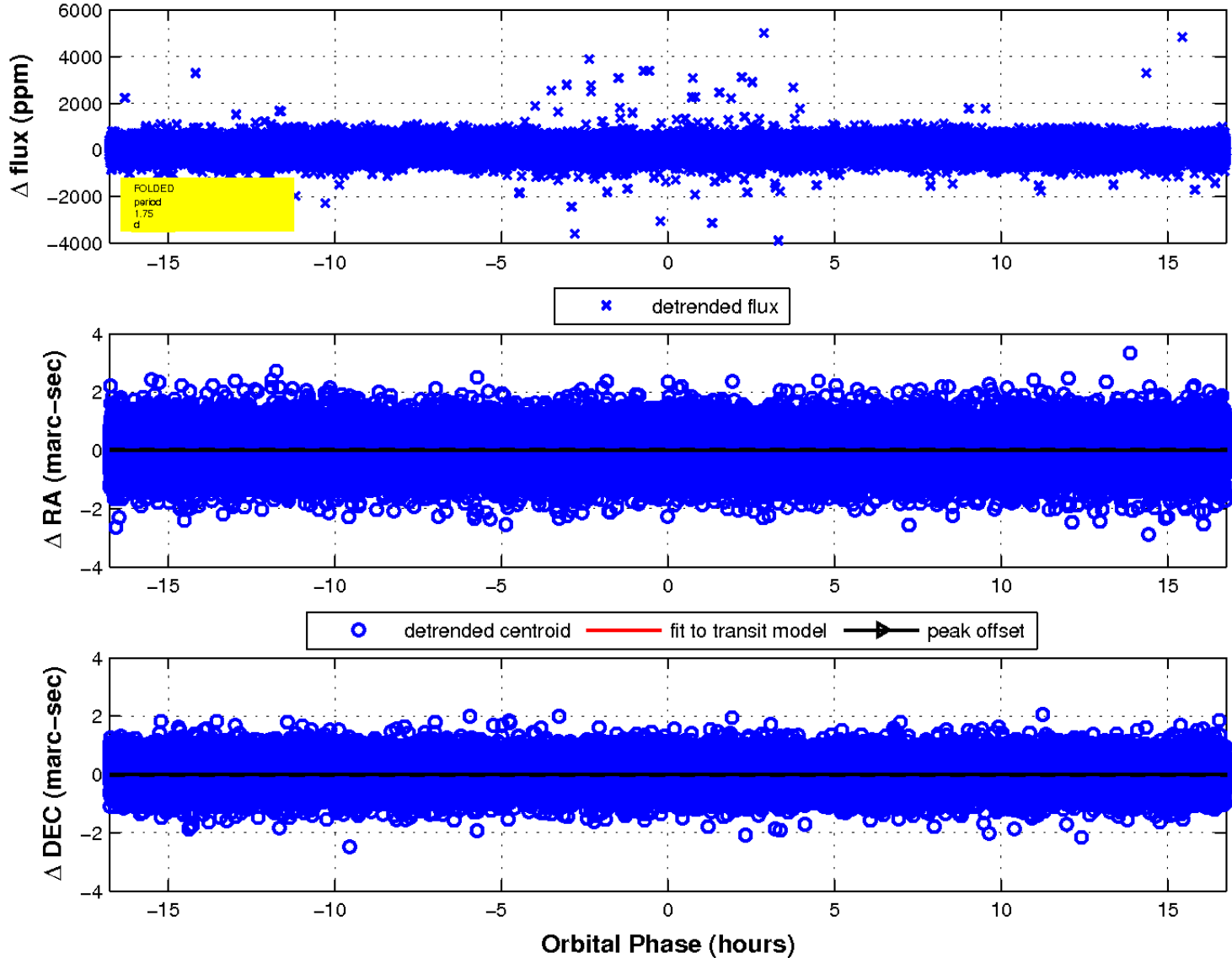




white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



fluxWeightedCentroids, Planet 2 of 2



UKIRT Image

Declination

