

# KIC 002449053

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
002449053-01	OBS	7633.01	0.739741	131.819809	50.2	3.028	10.8	7.9	0.94	5271	0.80	2587.62
002449053-02	OBS	No	141.152849	137.388237	610.9	5.066	7.9	7.7	0.94	5271	2.47	2.36

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
002449053-01	OBS	FP	0.00	0	1	1	1	MOD_SEC_ALT—CENT_RESOLVED_OFFSET—HALO_GHOST—EPHEM_MATCH
002449053-02	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_ALT—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.

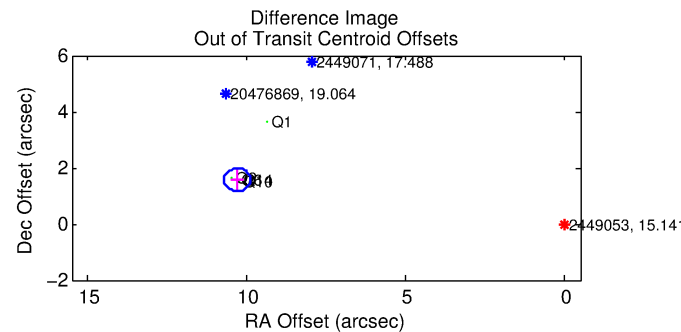
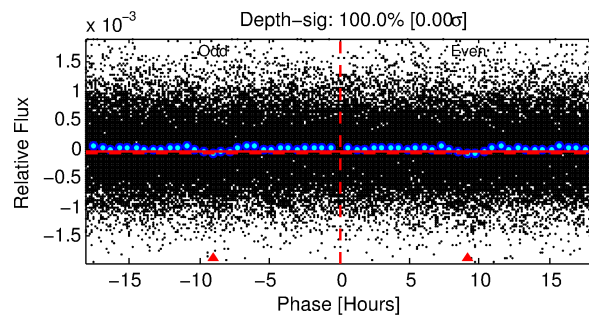
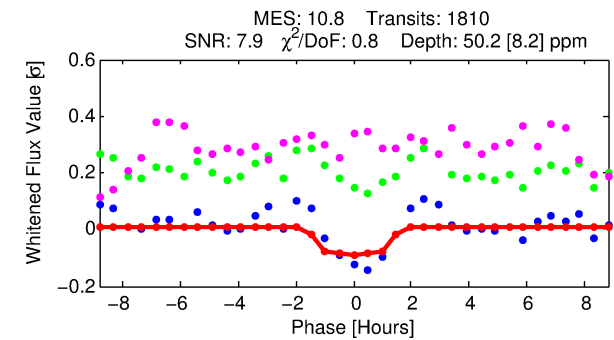
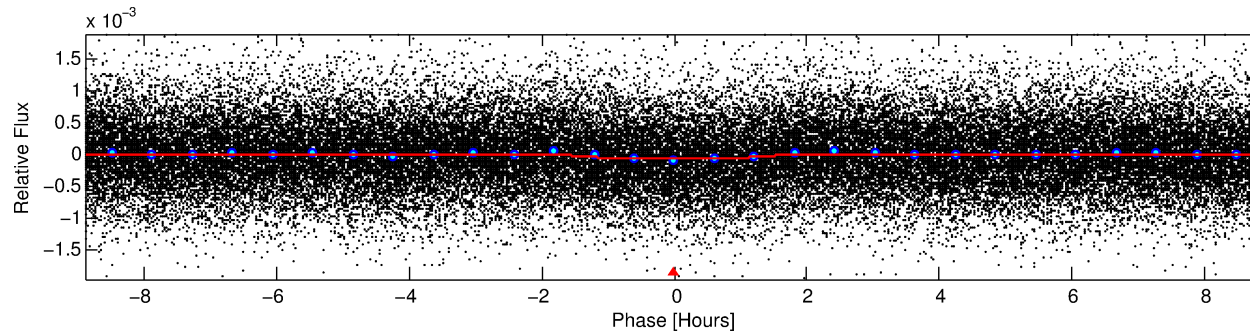
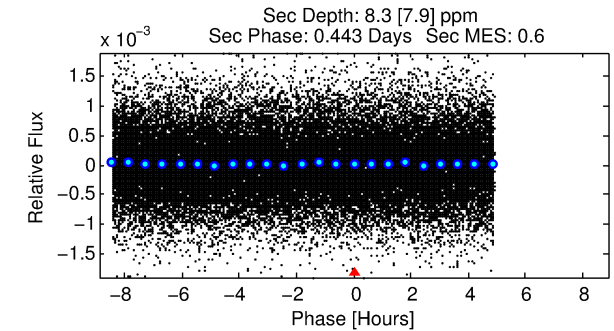
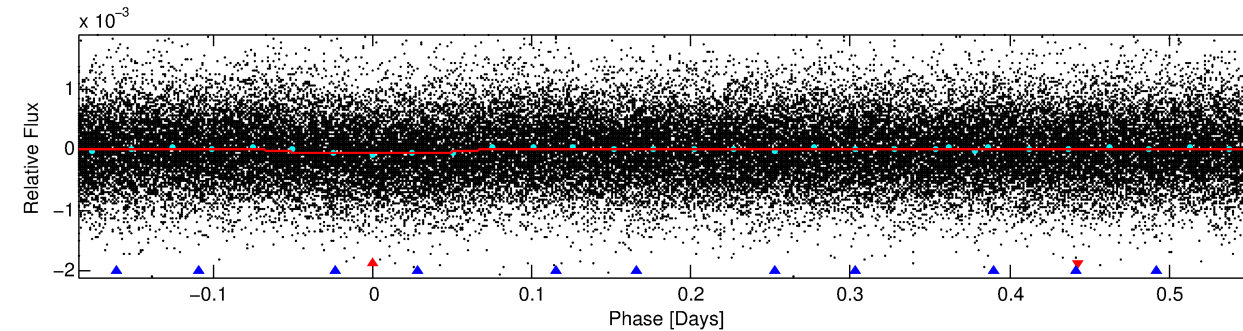
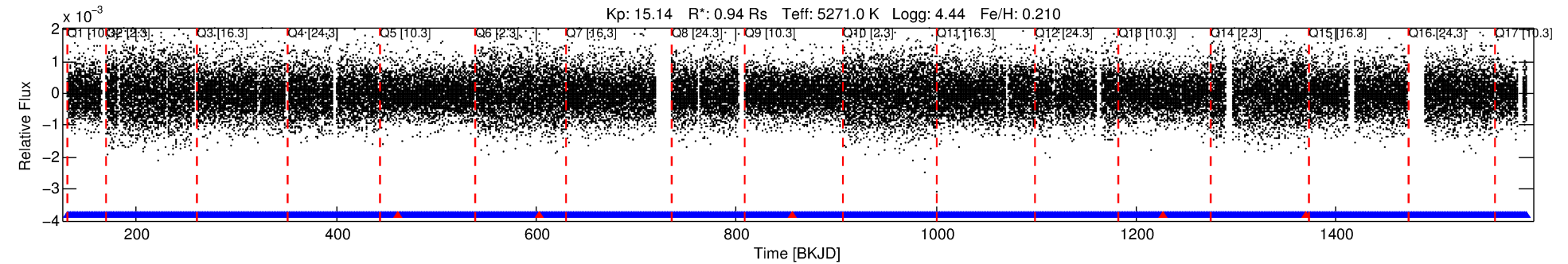
## Ephemeris Match Information For 002449053-01

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	$\sigma_P$	$\sigma_T$
002449053-01	2449053	002449084-pri	2449084	1:1	18.4	4	2	15.02	15.14	7704.00	Direct-PRF	0	2.21	0.61

**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: 2449053 Candidate: 1 of 2 Period: 0.740 d



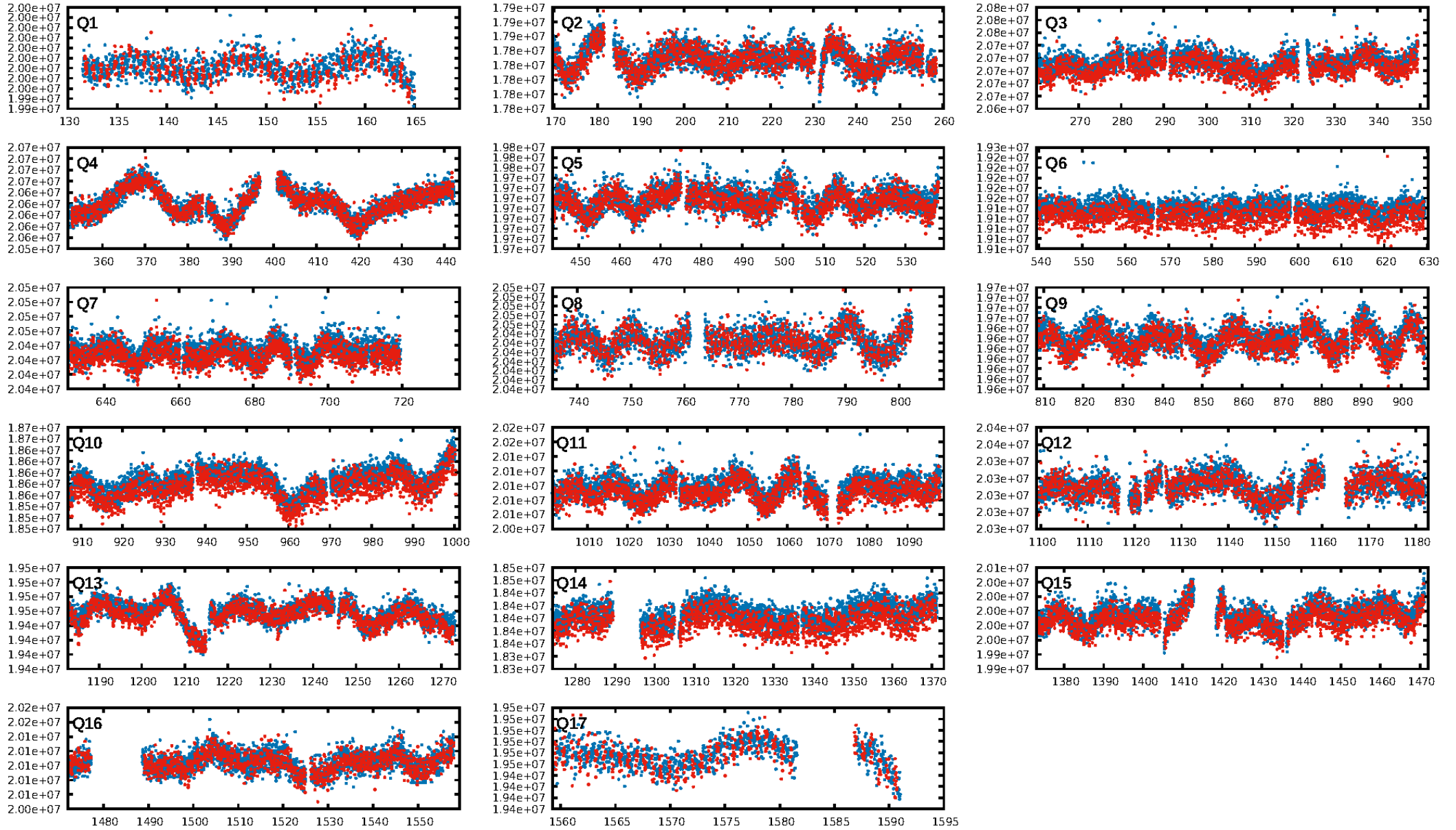
## DV Fit Results:

Period = 0.73974 [0.00001] d  
Epoch = 131.8198 [0.0044] BKJD  
Rp/R\* = 0.0079 [0.0070]  
a/R\* = 1.26 [1.78]  
b = 0.90 [0.81]  
Seff = 2587.62 [789.69]  
Teq = 1819 [139] K  
Rp = 0.80 [0.73] Re  
a = 0.0153 [0.0028] AU  
Ag = 1.66 [3.36] [0.20σ]  
Teffp = 3191 [1607] K [0.85σ]

## DV Diagnostic Results:

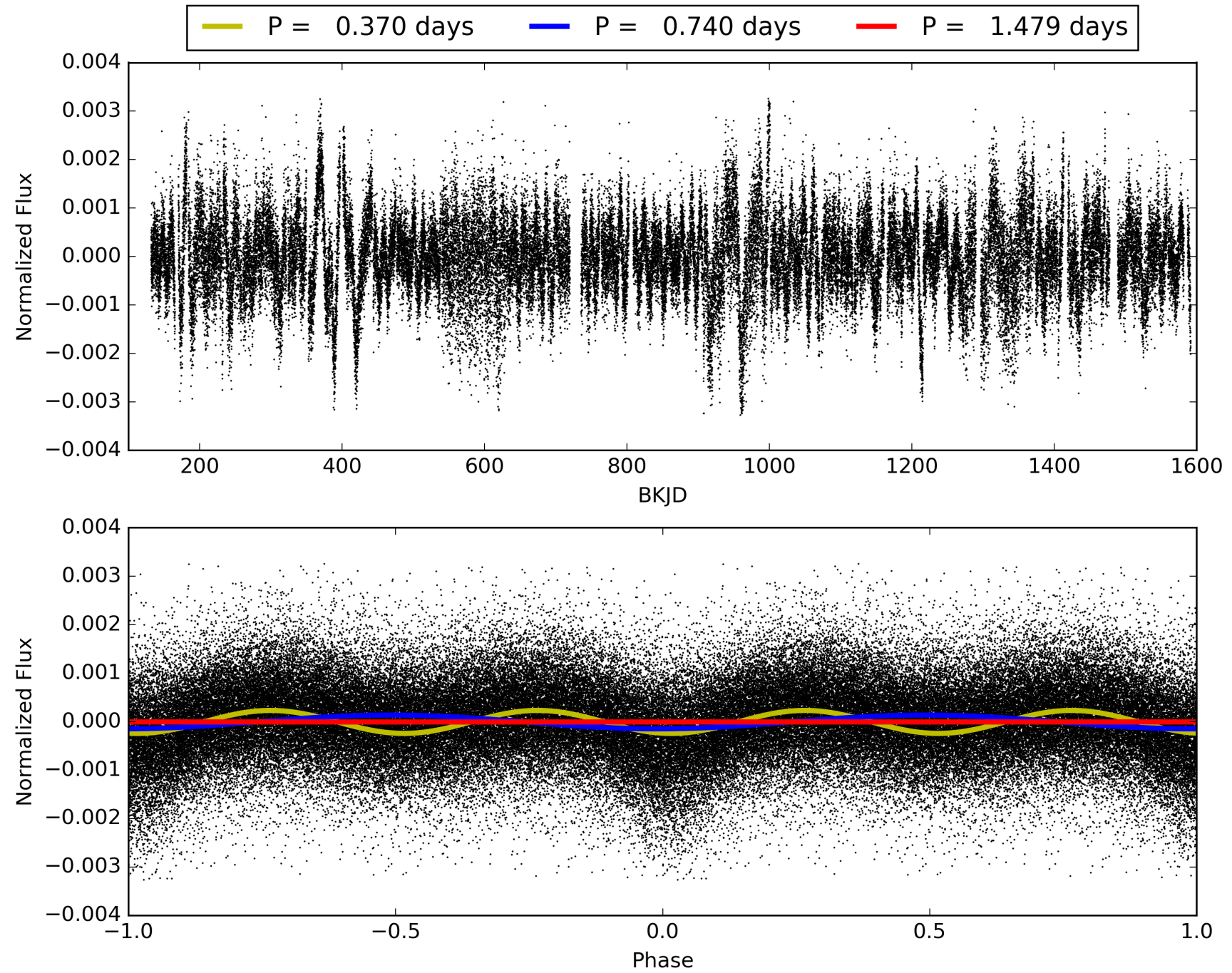
ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [570.99σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: 2.09e-27  
RollingBand-fgt: 1.00 [1724/1729]  
**GhostDiagnostic-chr: -0.147**  
Centroid-sig: N/A  
Centroid-so: N/A  
**OotOffset-rm: 10.419 arcsec [77.31σ]**  
**KicOffset-rm: 10.603 arcsec [80.47σ]**  
OotOffset-st: 4/0/0/1 [5]  
KicOffset-st: 4/0/0/1 [5]  
DiffImageQuality-fgm: 1.00 [5/5]  
DiffImageOverlap-fno: 1.00 [17/17]

# TCE 002449053-01, PDC Light Curves



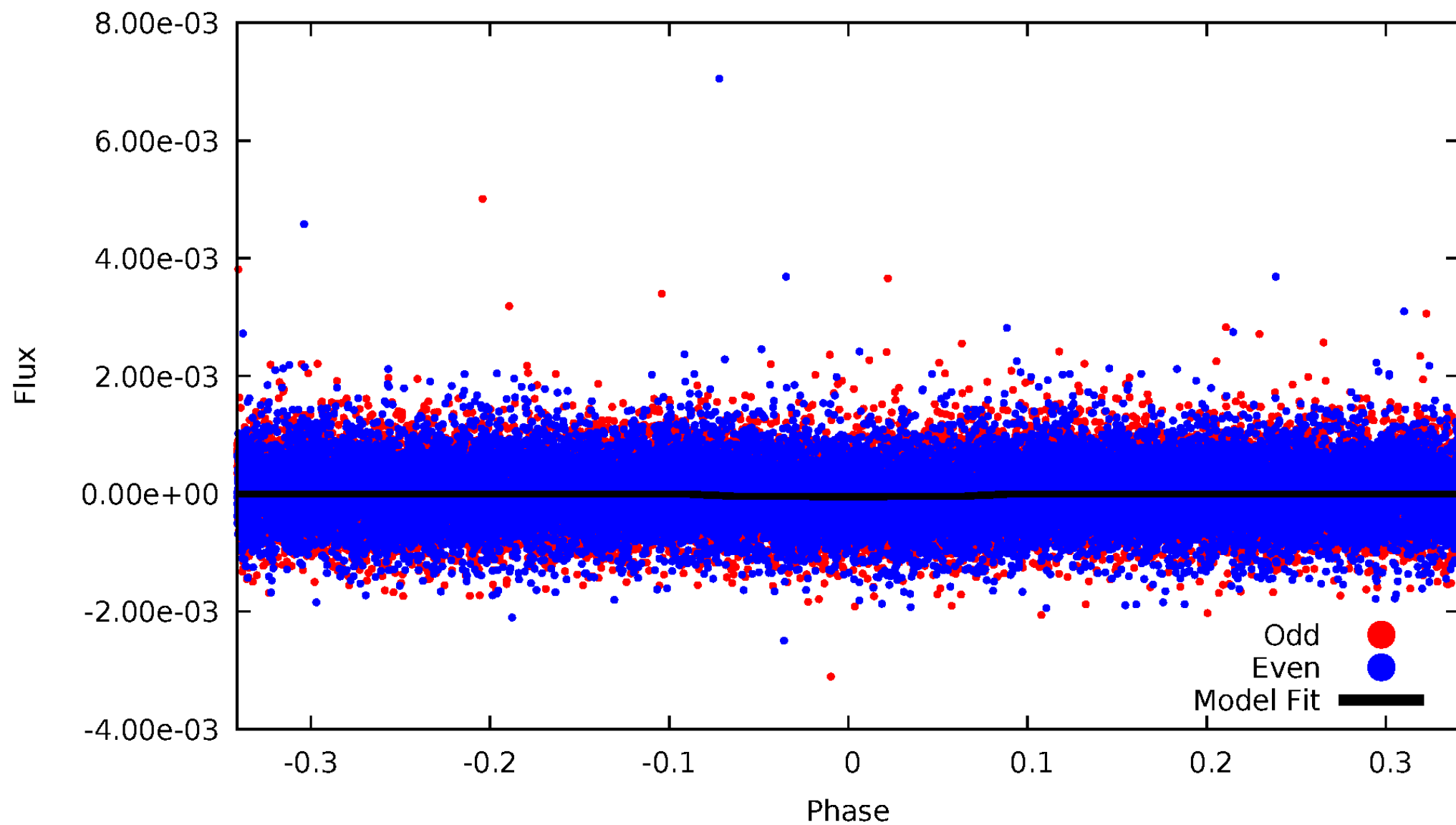


TCE 002449053-01



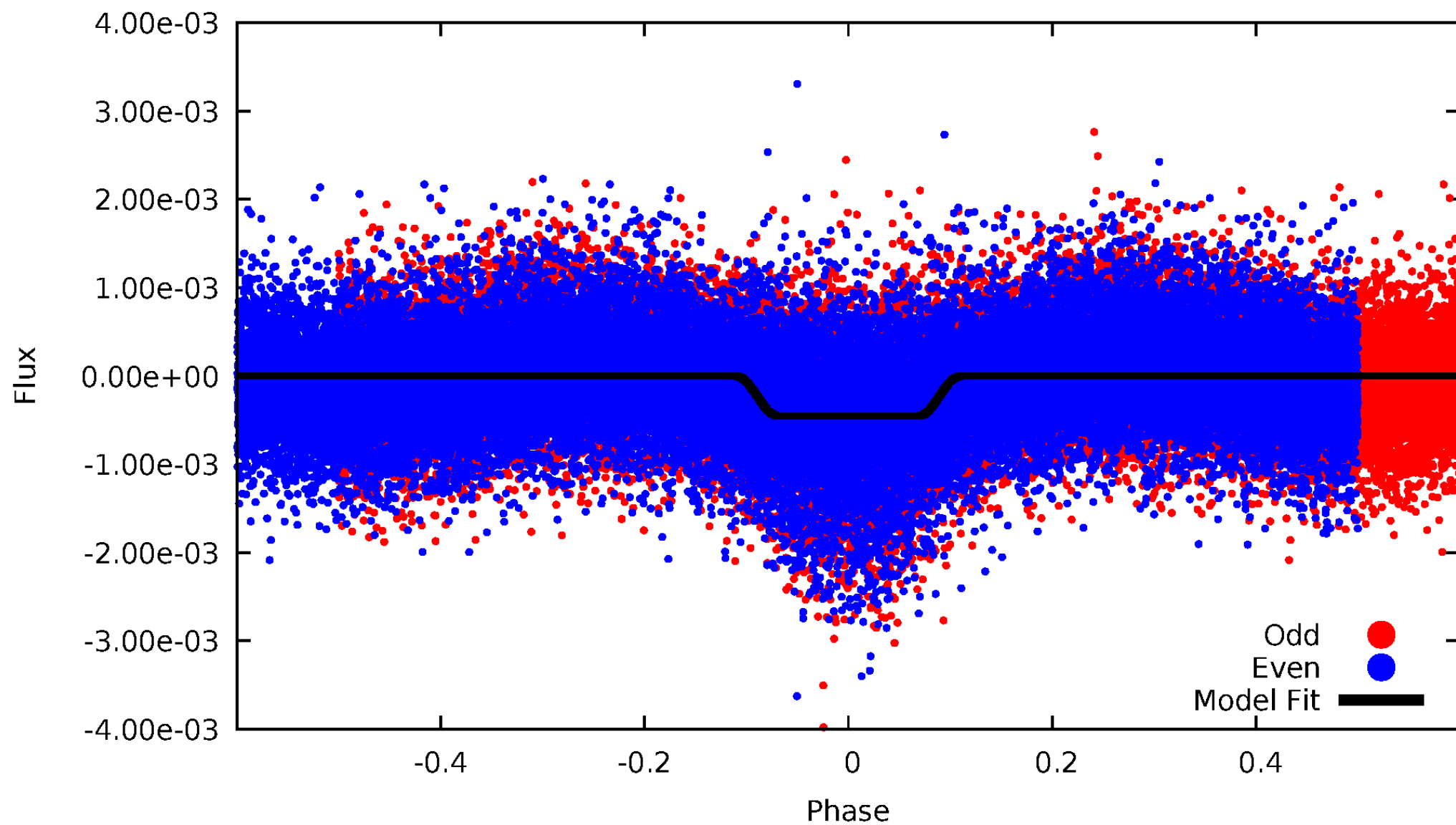
# DV Odd/Even

TCE 002449053-01



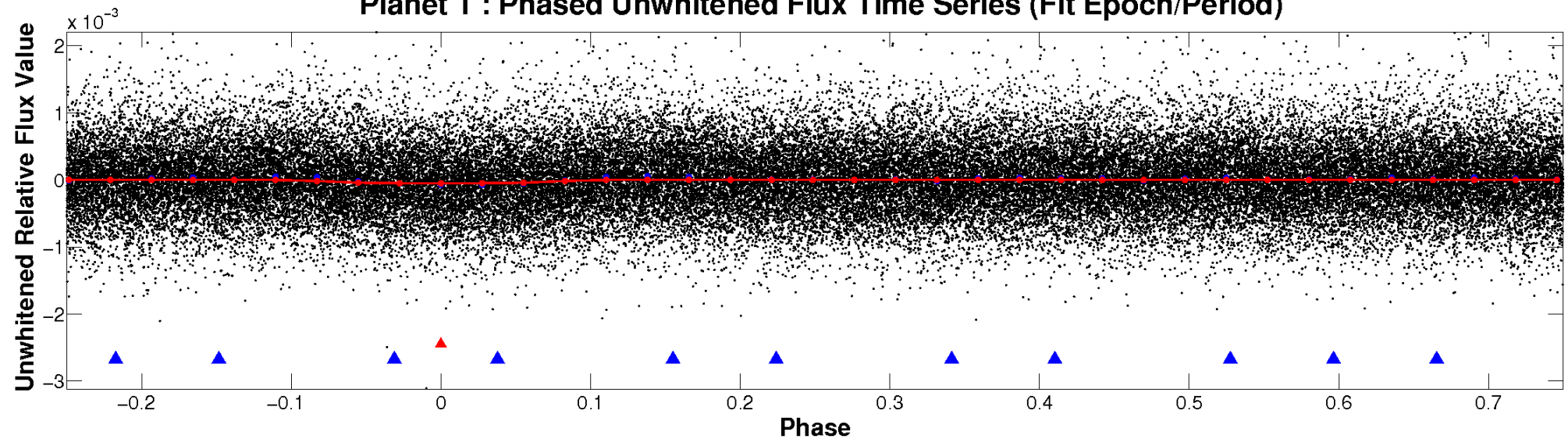
# ALT Odd/Even

TCE 002449053-01

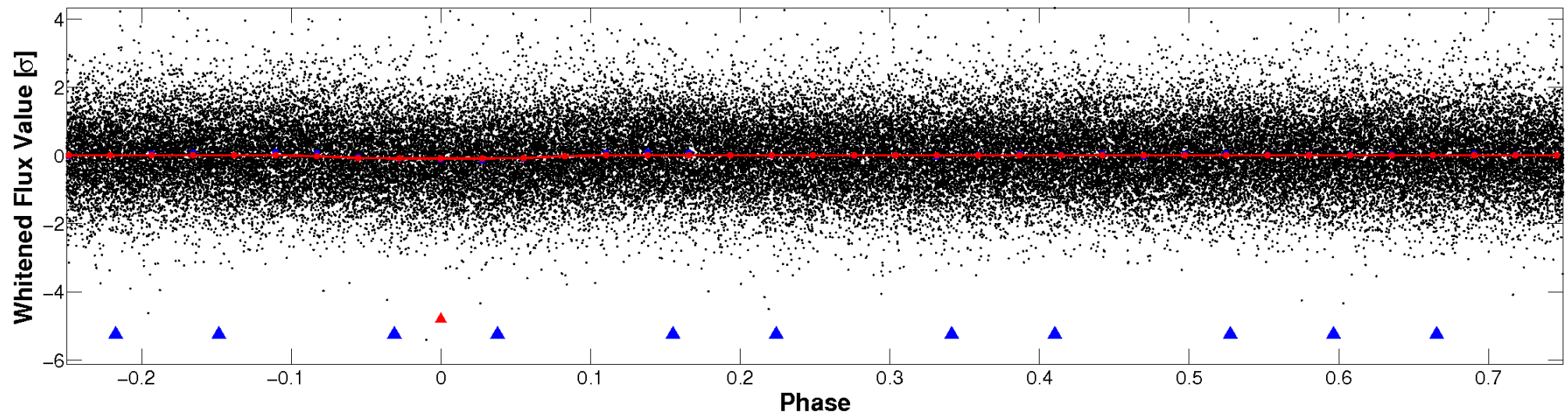


# Non-Whitened Vs. Whitened Light Curve

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



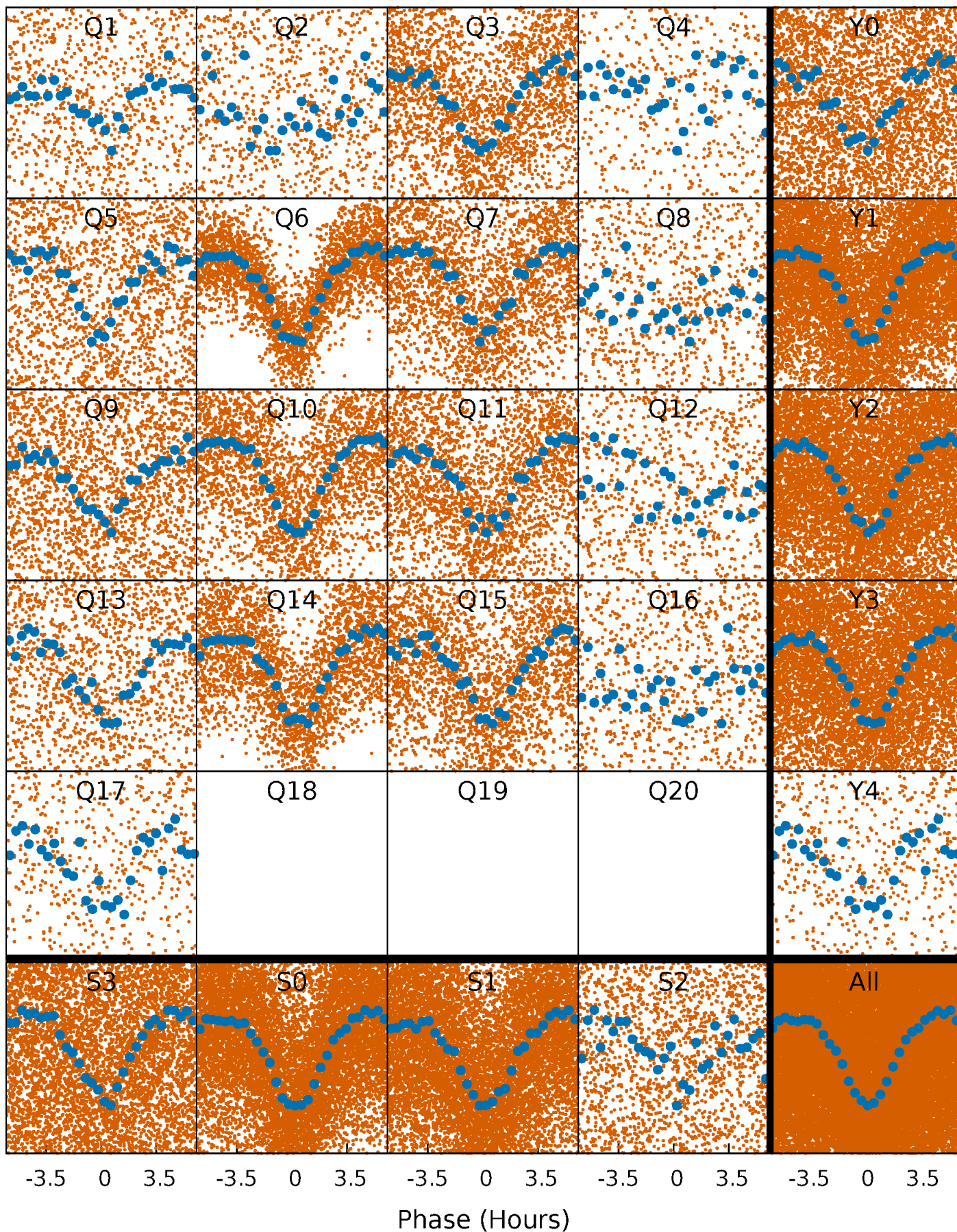
**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**





# PDC Quarter-Phased Transit Curves

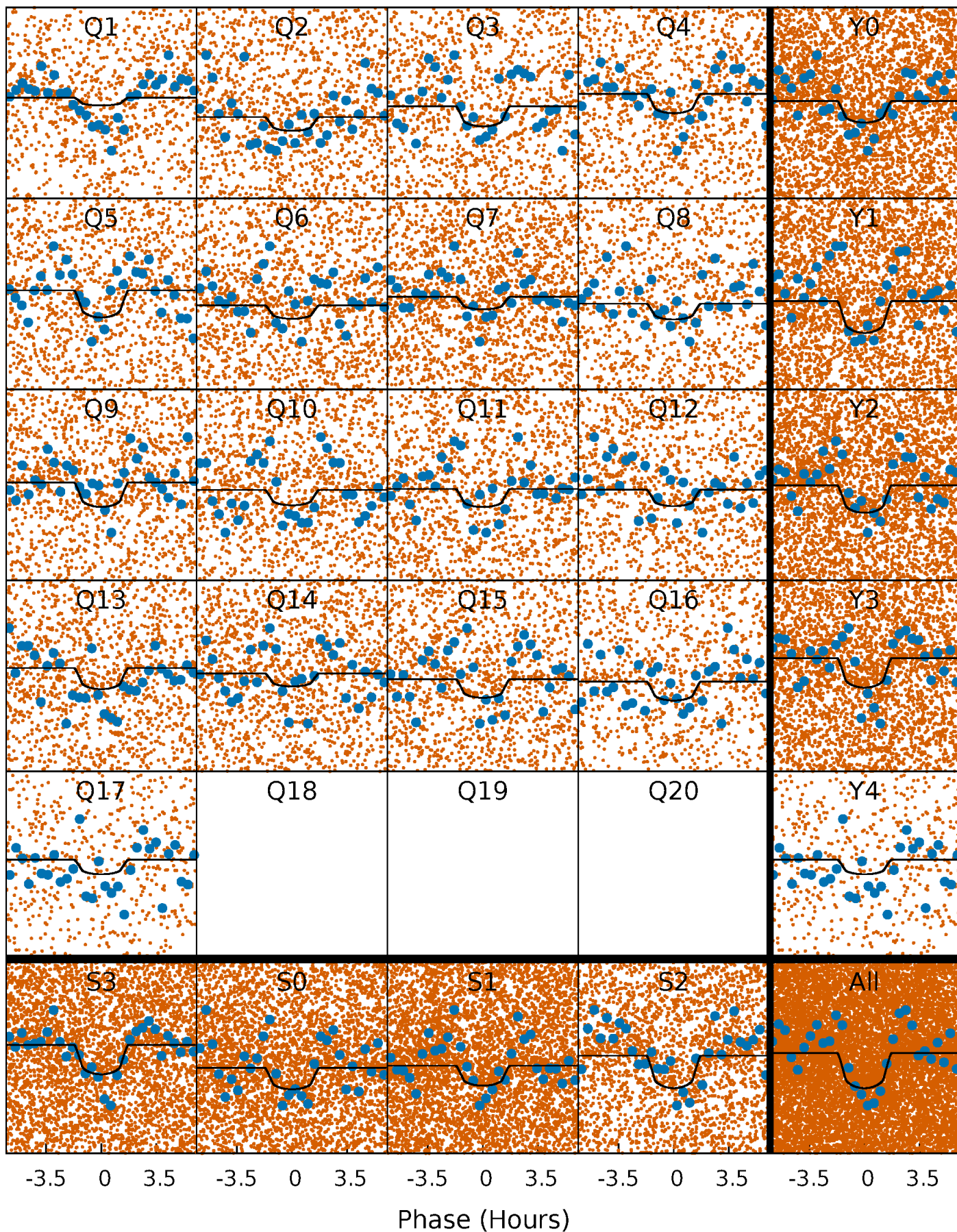
TCE 002449053-01 P= 0.739741 Days  $T_0=131.819809$  (BKJD)





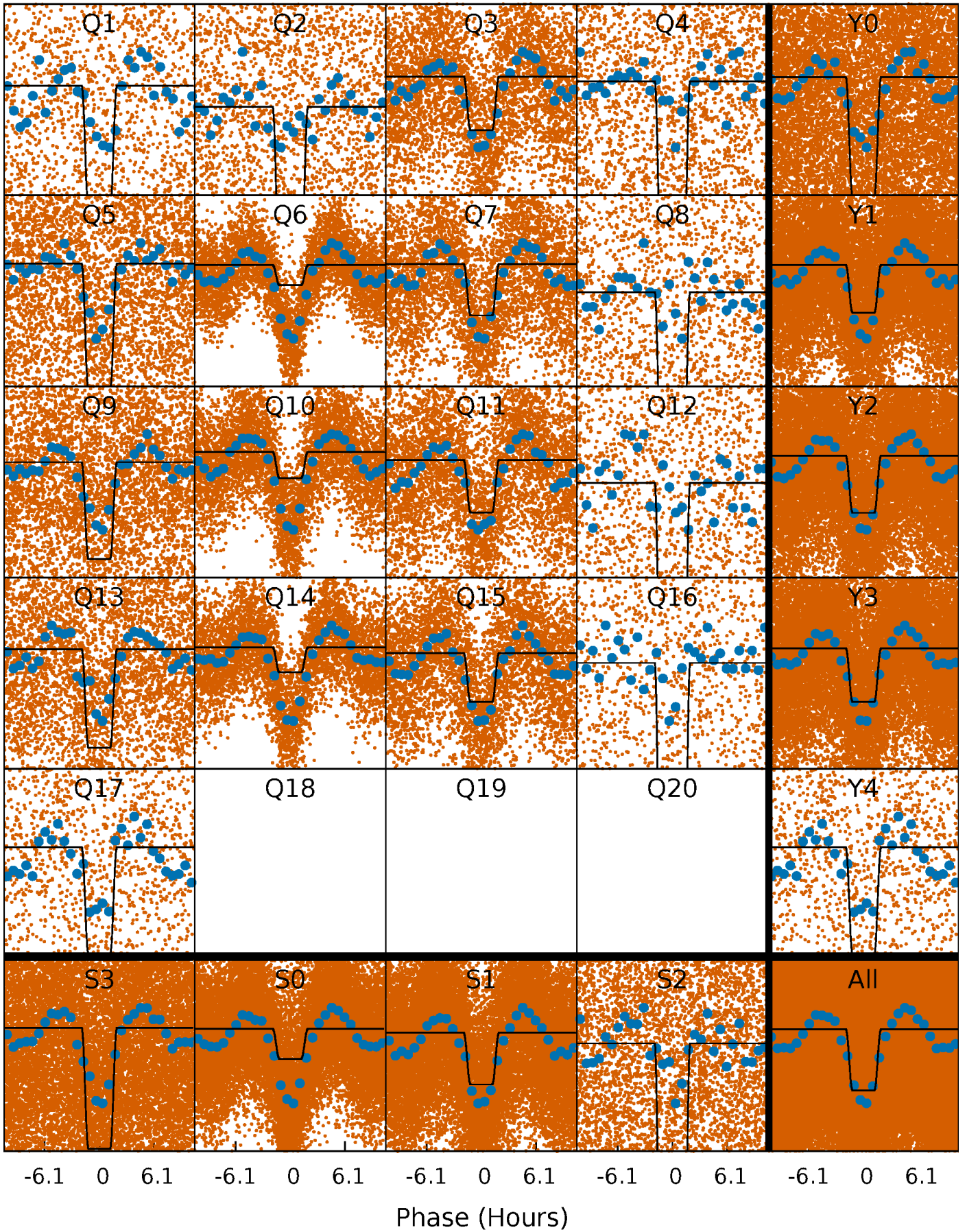
# DV Quarter-Phased Transit Curves

TCE 002449053-01 P= 0.739741 Days  $T_0=131.819809$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 002449053-01 P= 0.739760 Days  $T_0=131.809300$  (BKJD)

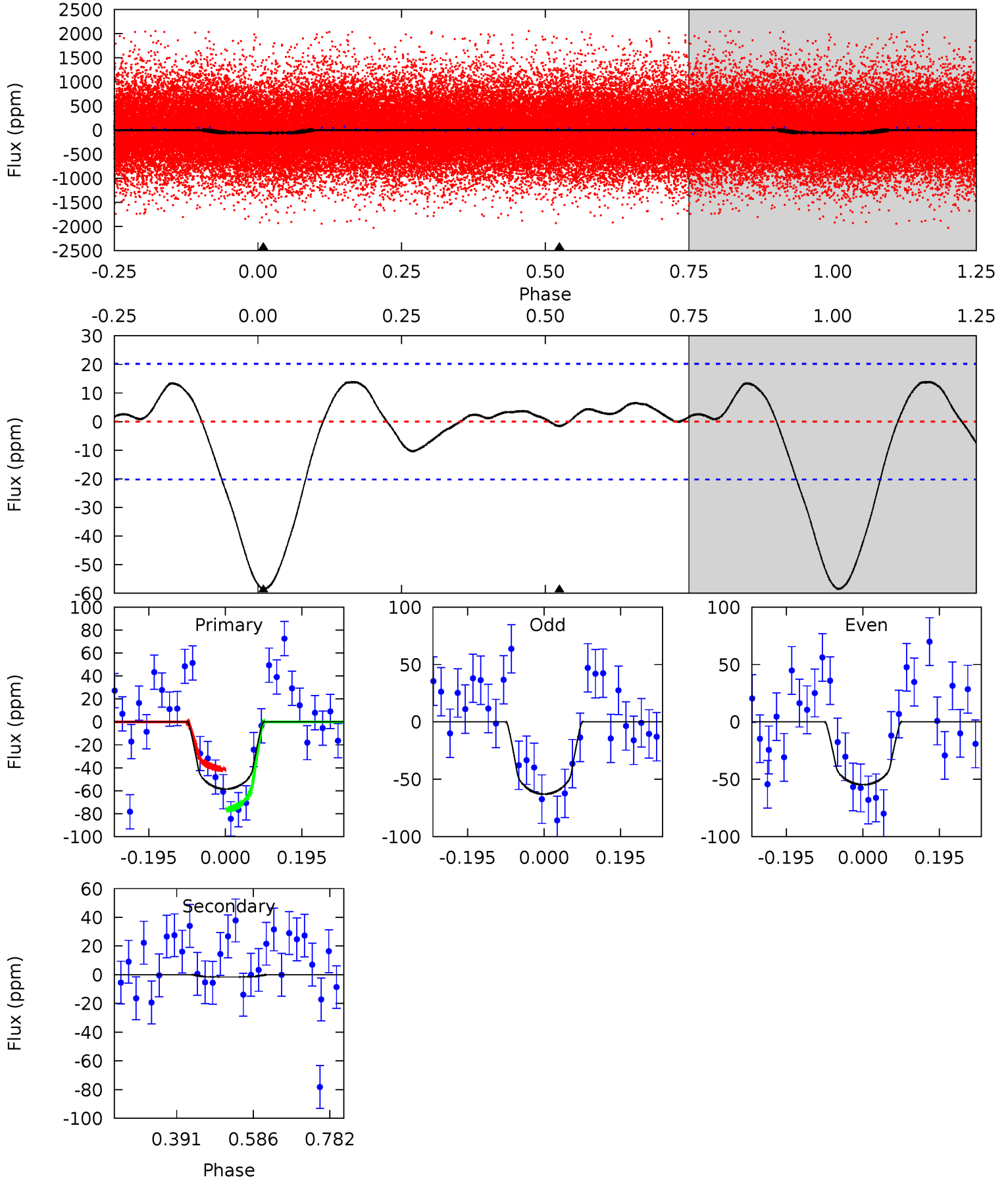




# DV Model-Shift Uniqueness Test

002449053-01, P = 0.739741 Days, E = 131.080068 Days

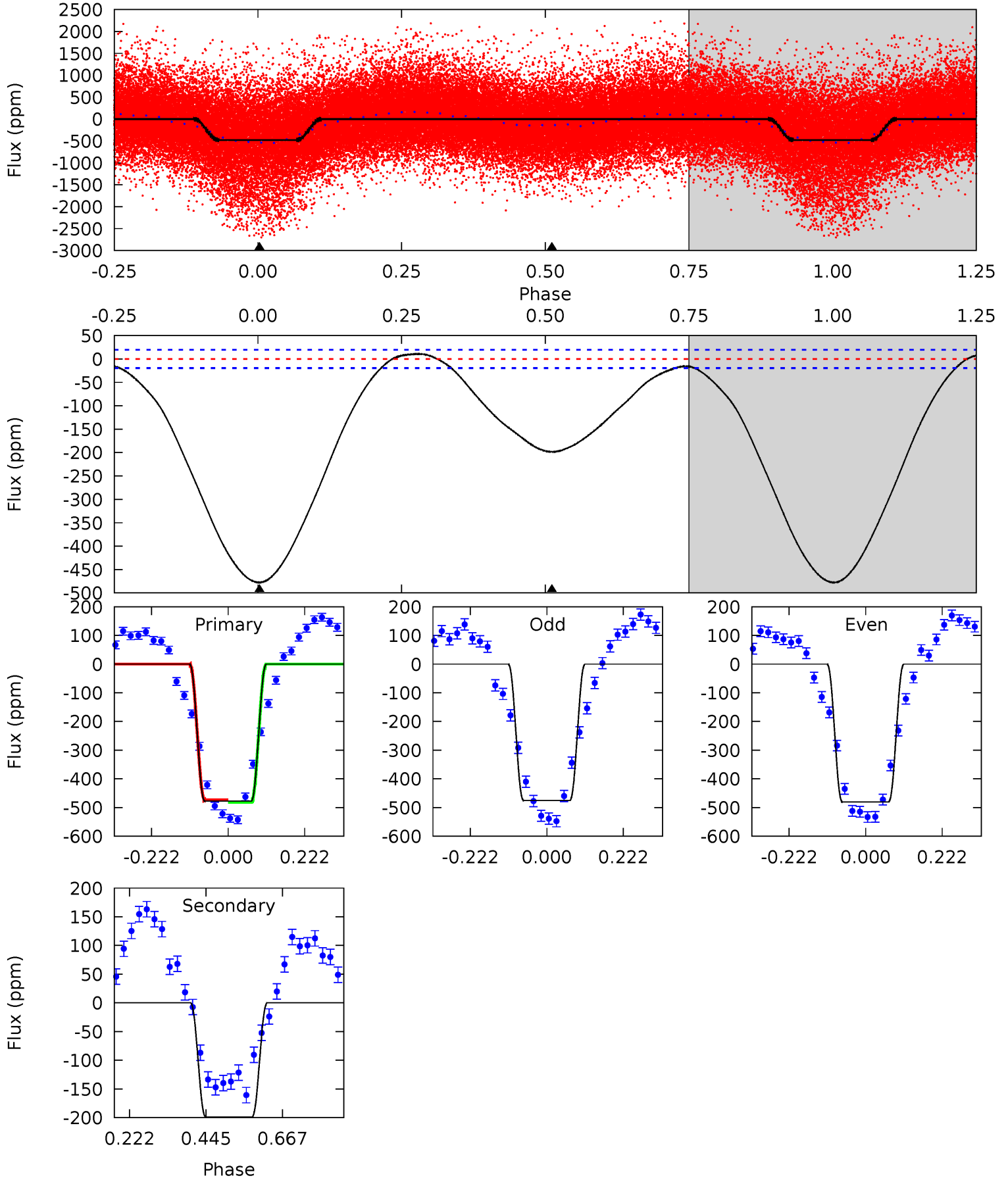
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
12.8	0.35	0	0	4.42	1.29	1.02	12.8	12.8	0.35	0.35	0.90	0.91	0.19	3.86



# Alt Model-Shift Uniqueness Test

002449053-01, P = 0.739760 Days, E = 131.069540 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
106.8	44.4	0	0	4.39	1.22	3.27	106.8	106.8	44.4	44.4	0.59	1.26	0.02	0.94





### Stellar Parameters For KIC 002449053

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5271^{+174}_{-158}$	$4.436^{+0.104}_{-0.156}$	$0.210^{+0.200}_{-0.300}$	$0.935^{+0.190}_{-0.111}$	$0.869^{+0.082}_{-0.068}$	$1.498^{+0.700}_{-0.618}$
	+3%/-3%	+2%/-4%	+95%/-143%	+20%/-12%	+9%/-8%	+47%/-41%
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 002449053-01 / KOI 7633.01

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-2 \pm 5$	$0.91^{+0.75}_{-0.52}$	$2560^{+158}_{-132}$	$-2522^{+6106}_{-724}$	$0.172^{+1.568}_{-0.643}$
Alt.	$-199 \pm 4$	$2.19^{+0.86}_{-0.77}$	$2560^{+146}_{-129}$	$4400^{+886}_{-508}$	$5.312^{+7.575}_{-2.527}$

$T_{max}$  = Theoretical Maximum Planetary Temperature

$T_{obs}$  = Observed Planetary Temperature (Assuming  $A=0.3$ )

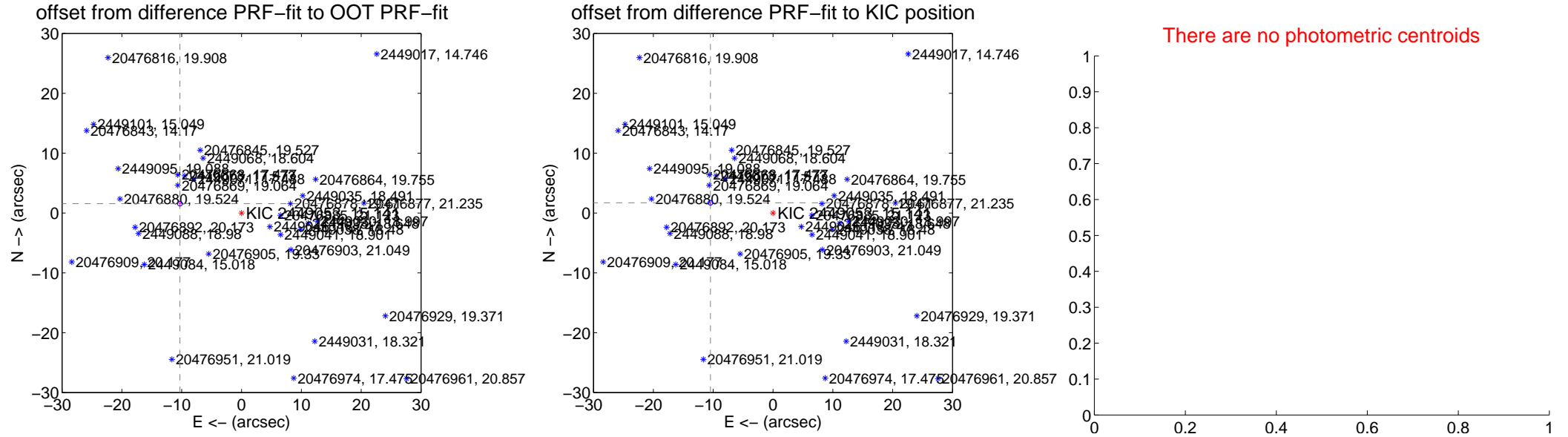
$A_{obs}$  = Observed Albedo (Assuming  $T=0$ )

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

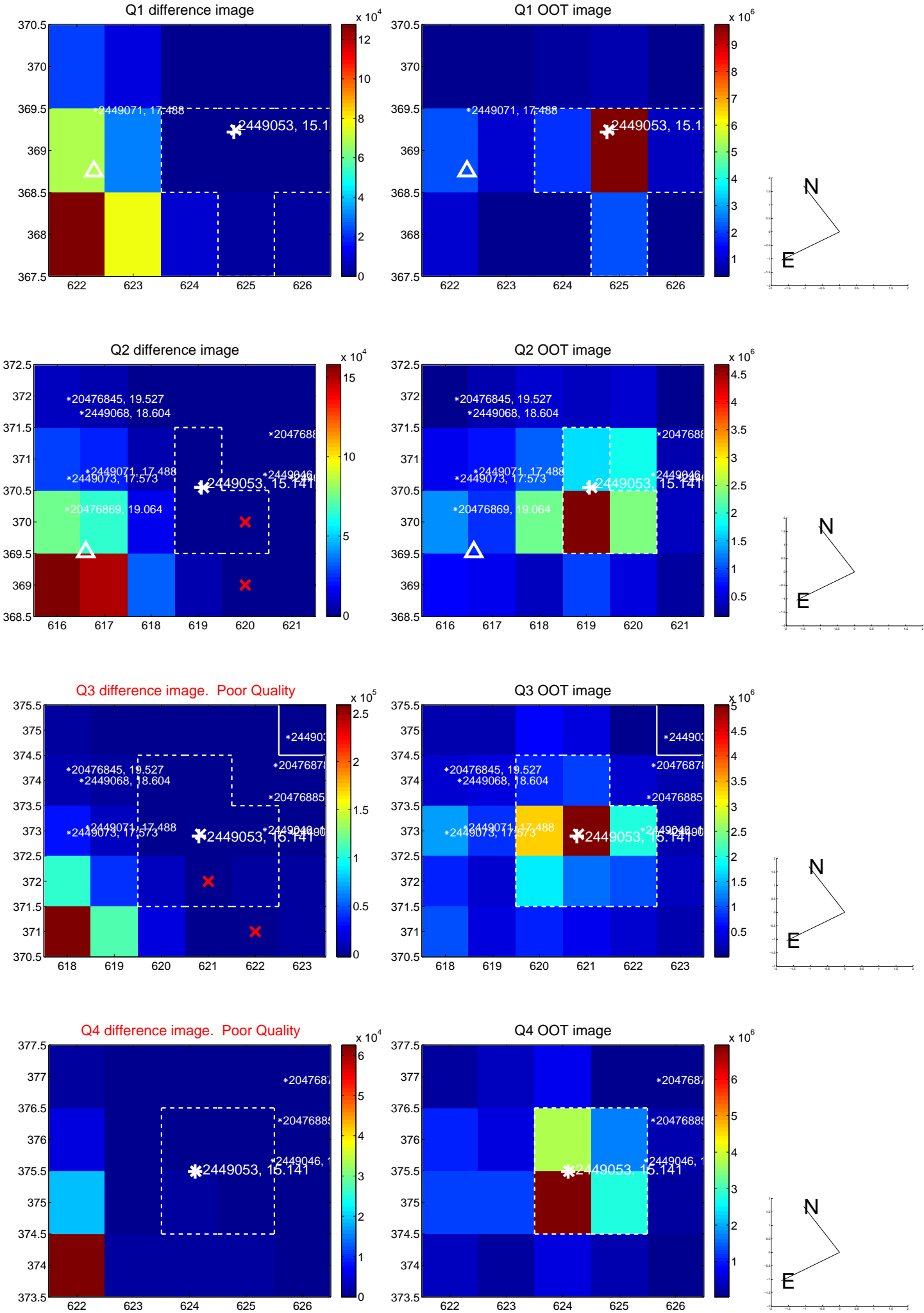
Supplemental centroid analysis for 002449053-01. Kepler magnitude: 15.14. Transit SNR 7.90  
 There are 5 quarters with good PRF difference image offsets  
 The direct PRF centroid is offset from the target star catalog position by about 0.26 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	10.419 $\pm$ 0.135	77.31	10.300 $\pm$ 0.185	1.569 $\pm$ 0.377
PRF-fit source offset from KIC position	10.603 $\pm$ 0.132	80.47	10.463 $\pm$ 0.180	1.716 $\pm$ 0.336
photometric centroid source offset	—	—	—	—

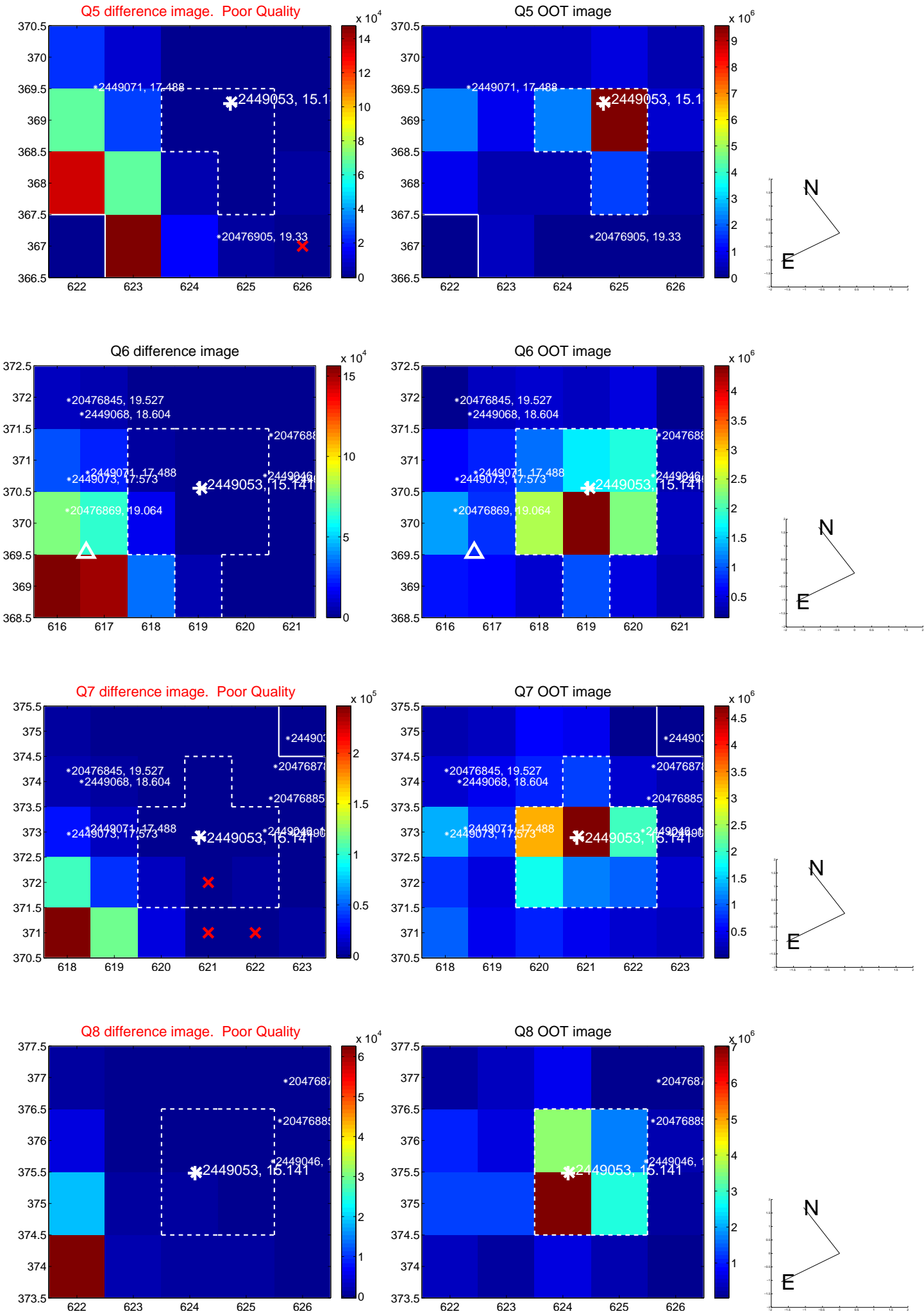


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

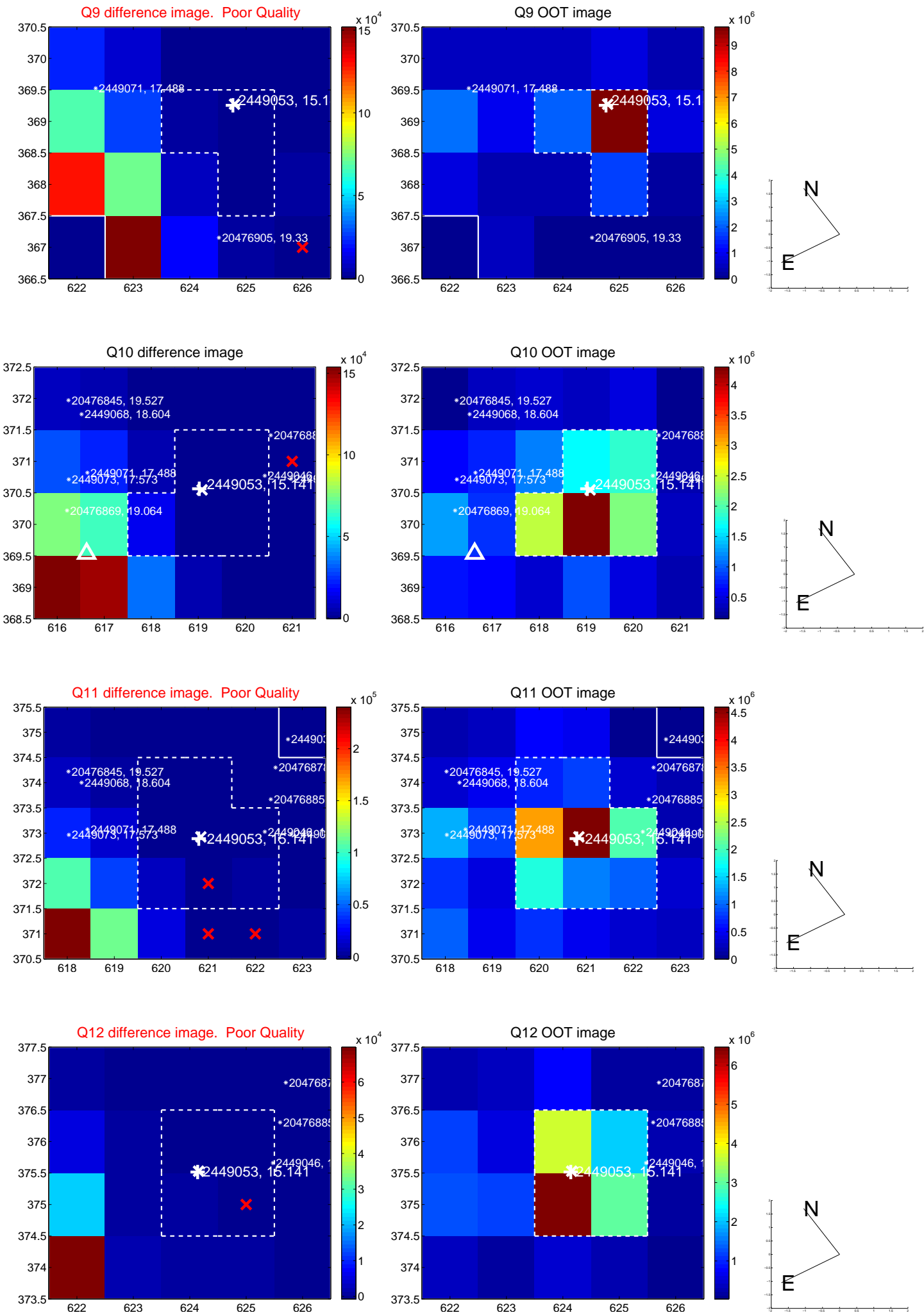


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

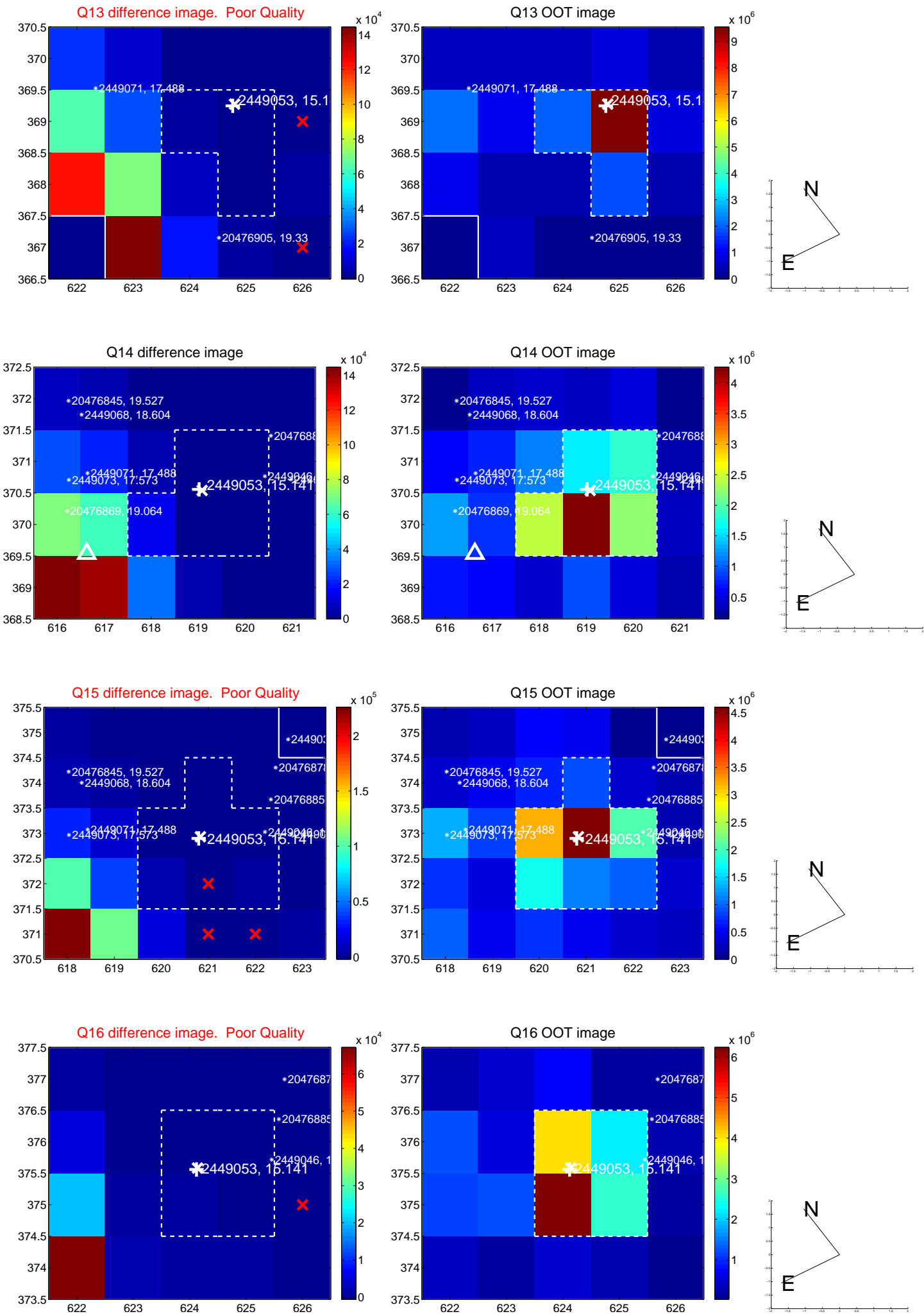




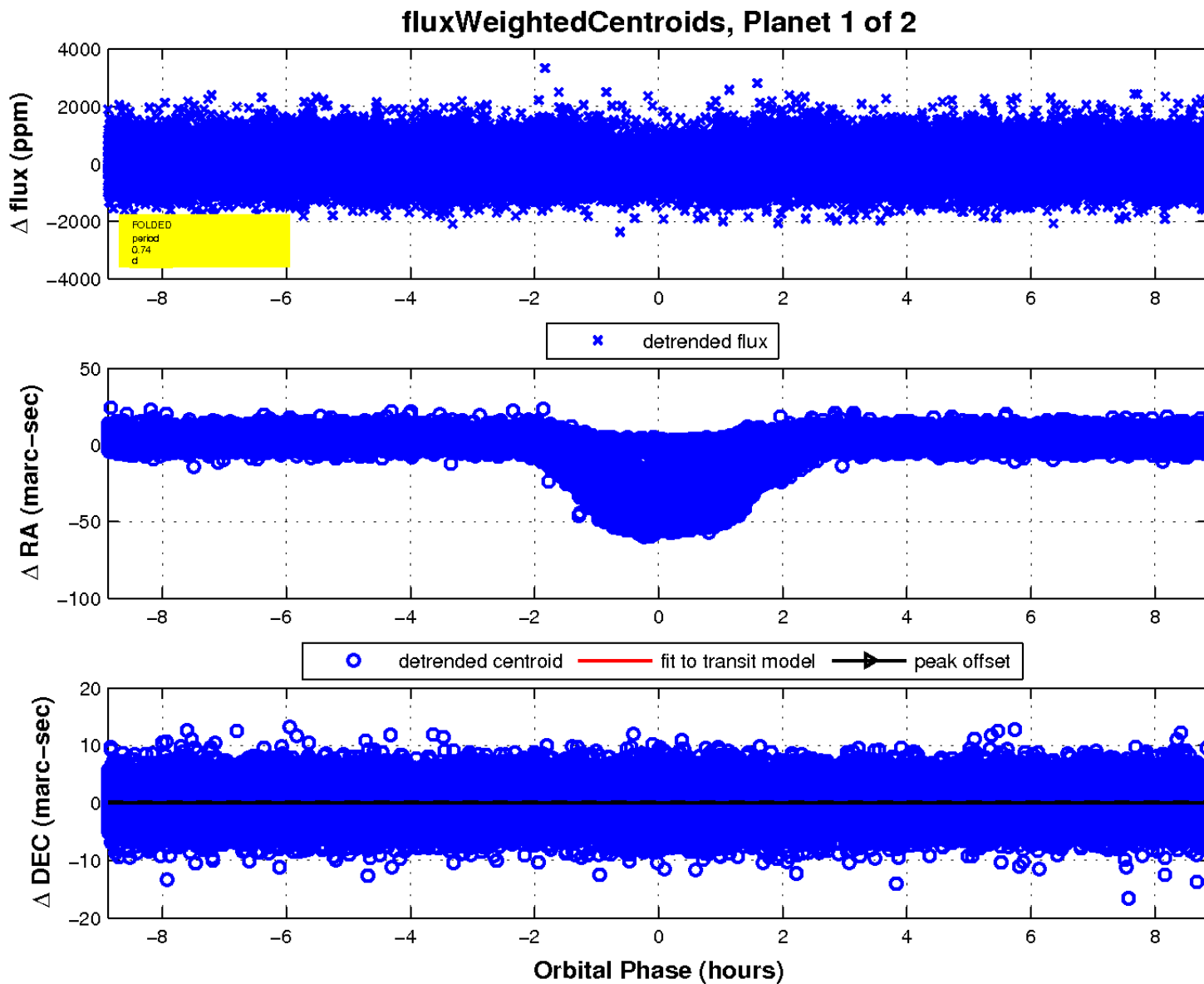
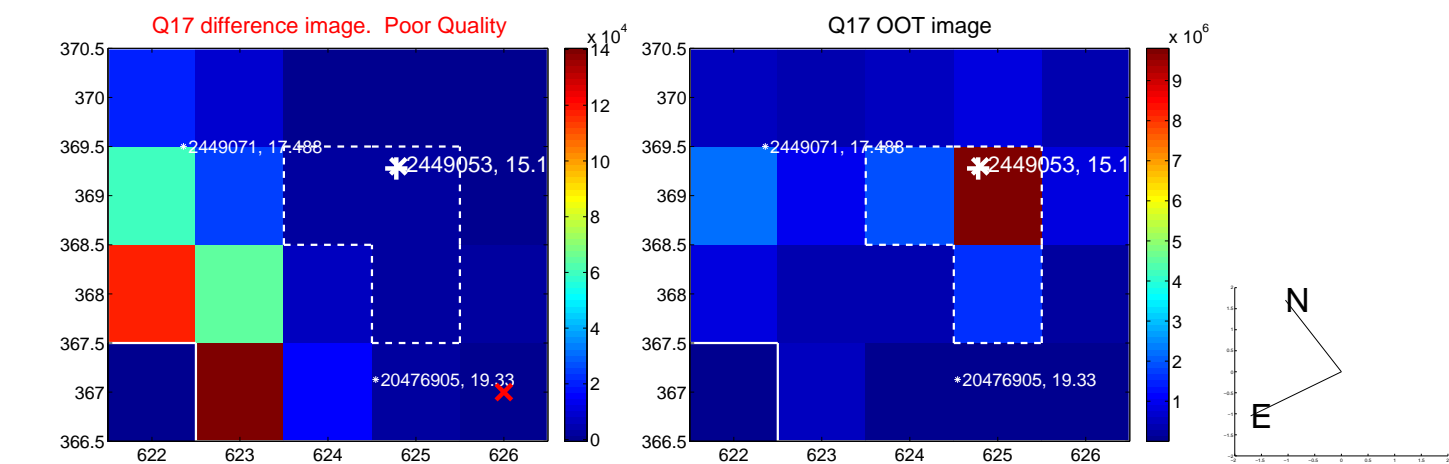
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



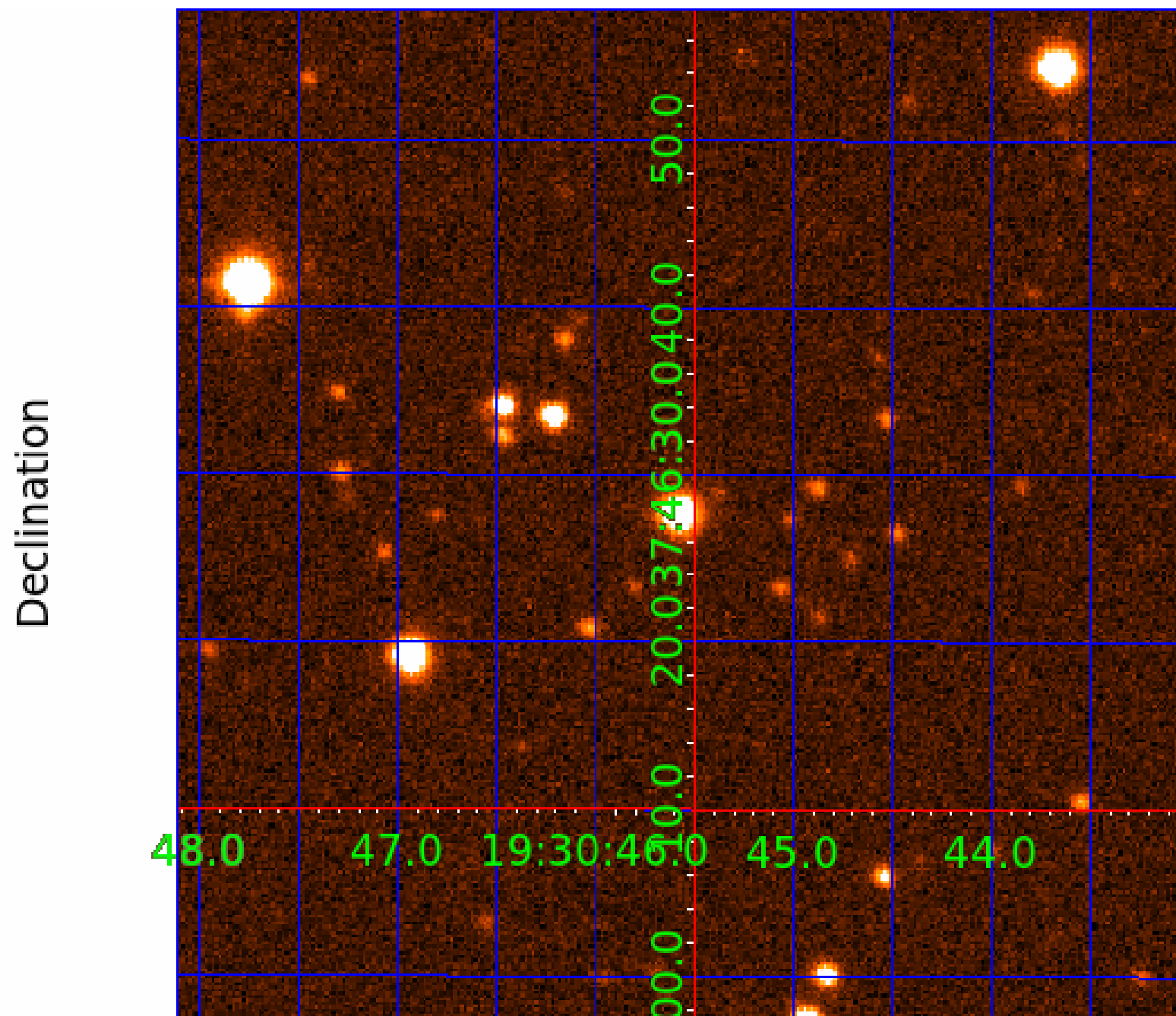
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



UKIRT Image





# KIC 002449053

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
002449053-01	OBS	7633.01	0.739741	131.819809	50.2	3.028	10.8	7.9	0.94	5271	0.80	2587.62
002449053-02	OBS	No	141.152849	137.388237	610.9	5.066	7.9	7.7	0.94	5271	2.47	2.36

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
002449053-01	OBS	FP	0.00	0	1	1	1	MOD_SEC_ALT—CENT_RESOLVED_OFFSET—HALO_GHOST—EPHEM_MATCH
002449053-02	OBS	FP	0.00	1	0	1	0	INDIV_TRANS_RUBBLE—TRANS_GAPPED—LPP_DV—MOD_NONUNIQ_ALT—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.

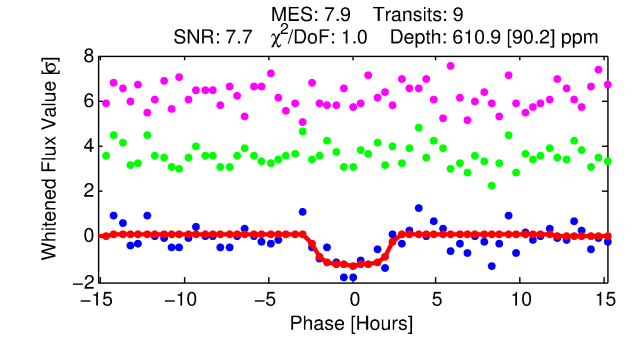
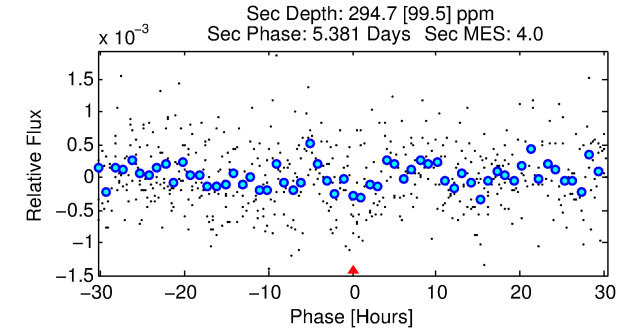
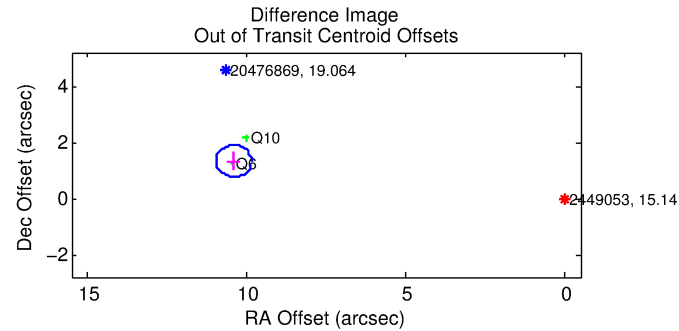
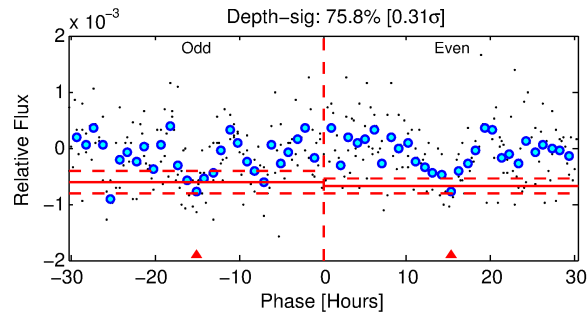
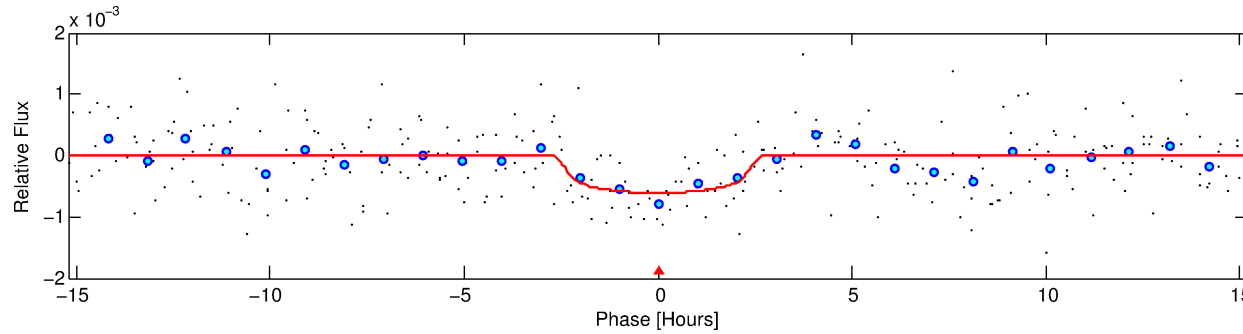
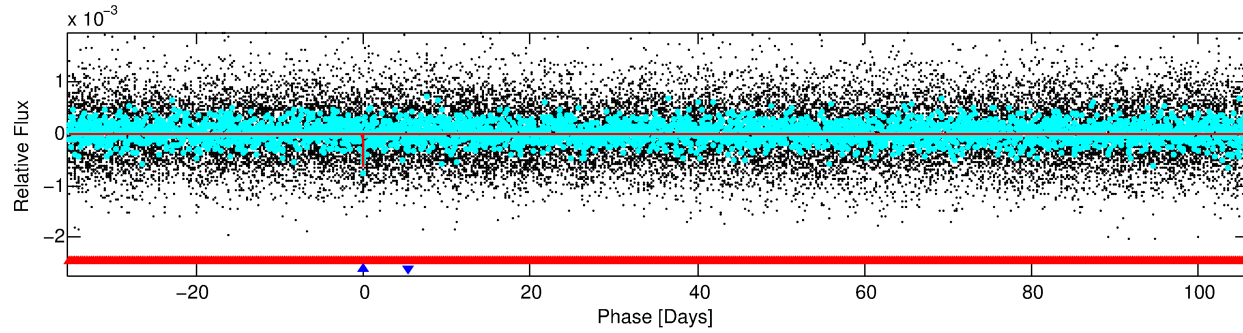
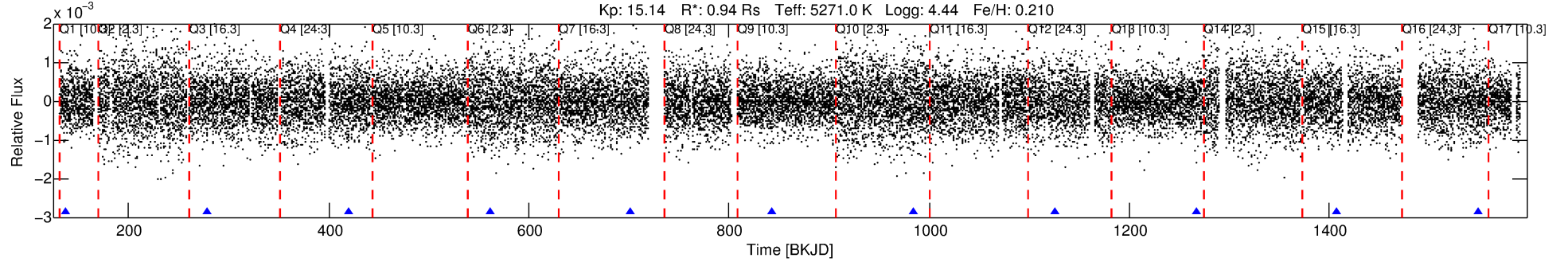
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 002449053-02

No Significant Match Found

# DV One-Page Summary

KIC: 2449053 Candidate: 2 of 2 Period: 141.153 d



## DV Fit Results:

Period = 141.15285 [0.00264] d  
Epoch = 137.3882 [0.0123] BKJD  
Rp/R\* = 0.0242 [0.0289]  
a/R\* = 158.35 [699.34]  
b = 0.70 [3.21]  
Seff = 2.36 [0.72]  
Teq = 316 [24] K  
Rp = 2.47 [2.99] Re  
a = 0.5066 [0.0916] AU  
Ag = 6828.69 [16563.28] [0.41σ]  
Teff = 4440 [2679] K [1.54σ]

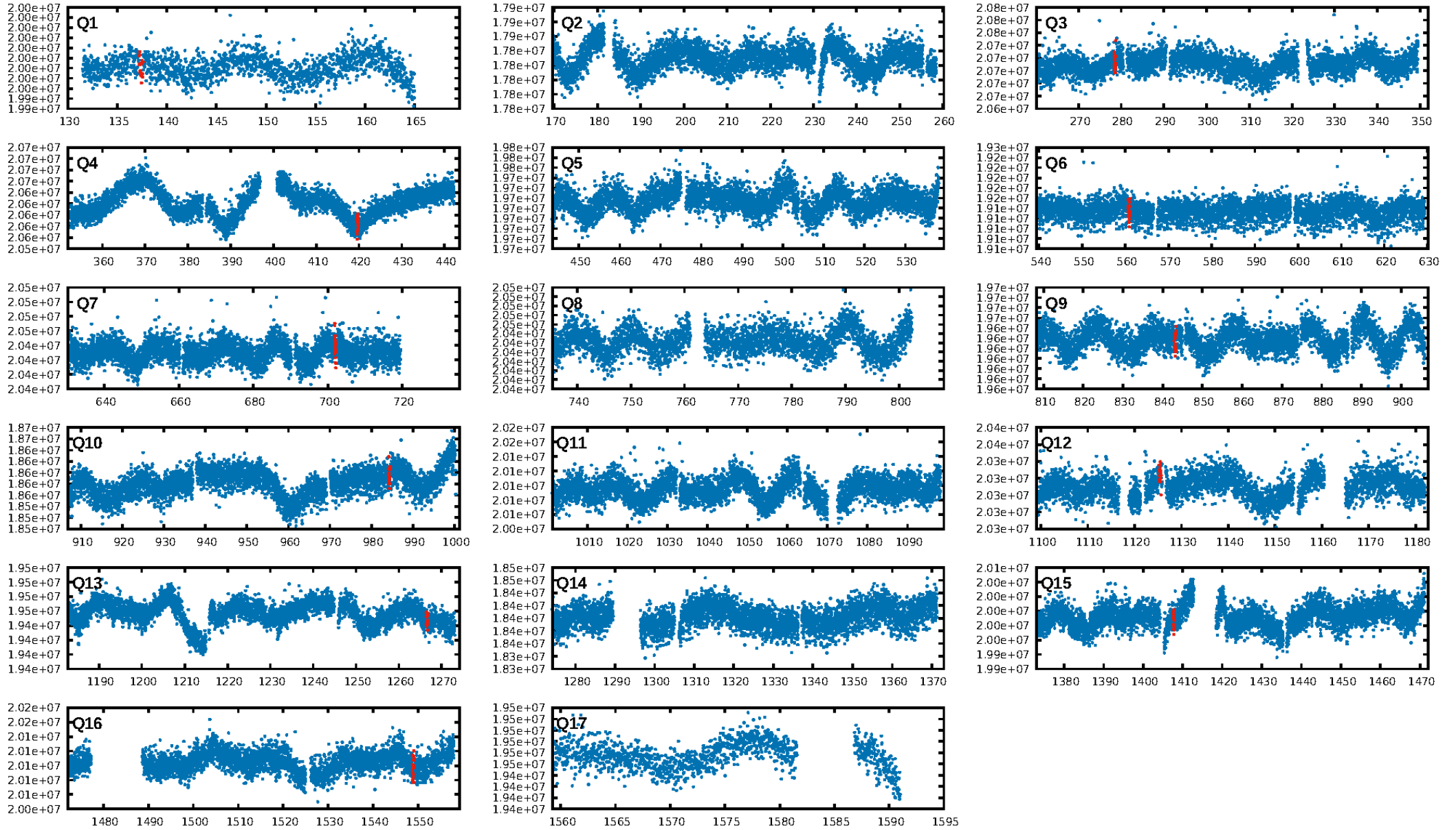
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [570.99σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 19.6%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 5.86e-13  
RollingBand-fgt: 1.00 [8/8]  
GhostDiagnostic-chr: -1.03  
Centroid-sig: N/A  
Centroid-so: 2.795 arcsec [1.32σ]  
OotOffset-rm: 10.497 arcsec [55.98σ]  
KicOffset-rm: 10.663 arcsec [75.18σ]  
OotOffset-st: 2/0/0/0 [2]  
KicOffset-st: 2/0/0/0 [2]  
DiffImageQuality-fgm: 0.50 [1/2]  
DiffImageOverlap-fno: 0.00 [0/11]

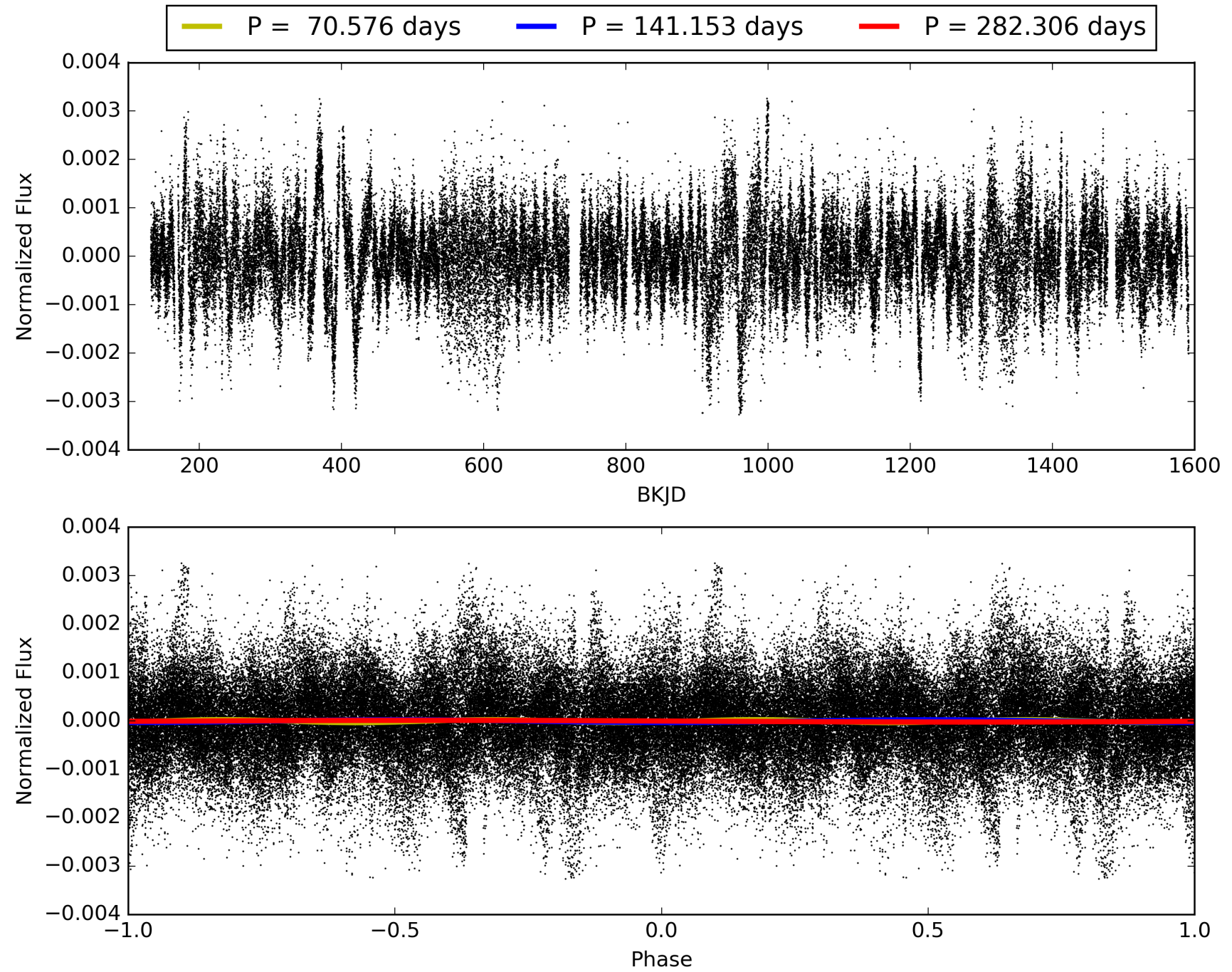
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 06:10:25 Z

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

# TCE 002449053-02, PDC Light Curves



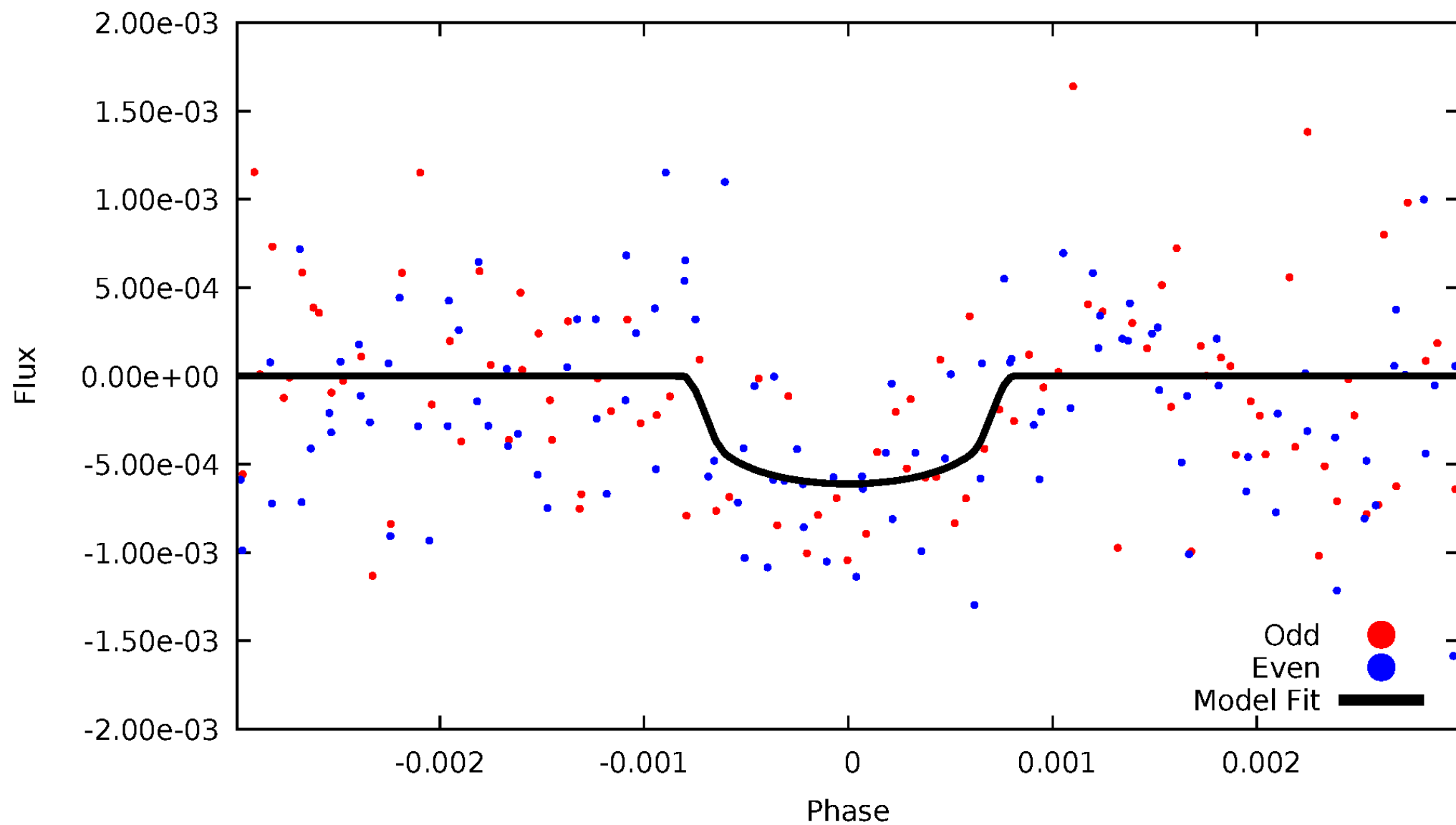
# TCE 002449053-02





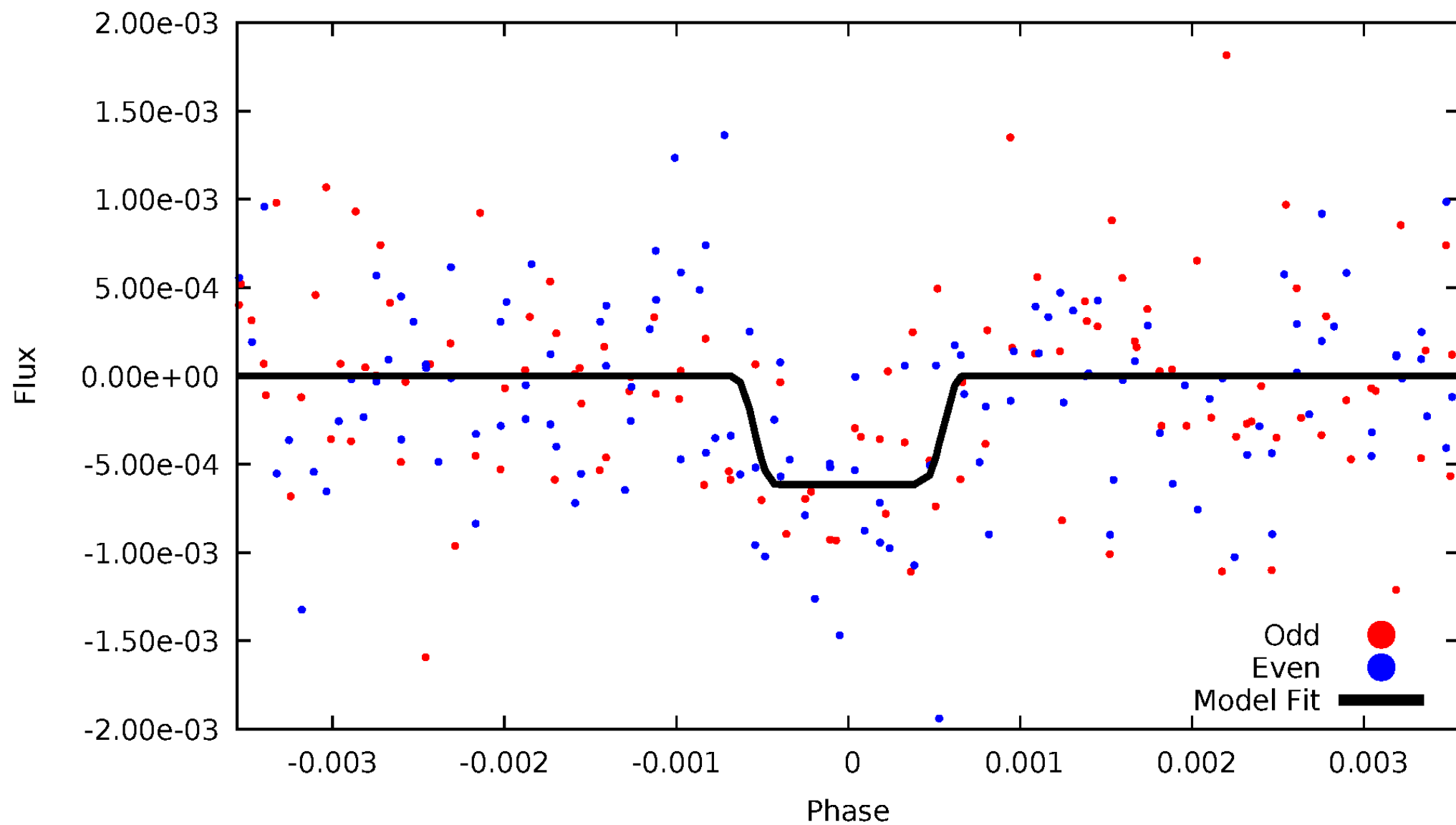
# DV Odd/Even

TCE 002449053-02



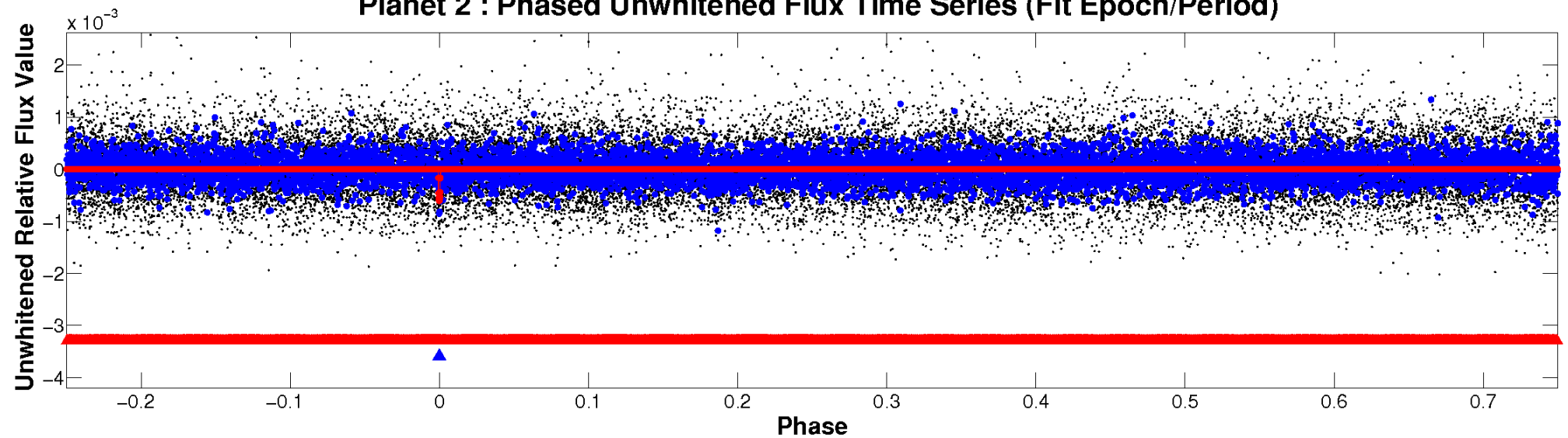
# ALT Odd/Even

TCE 002449053-02

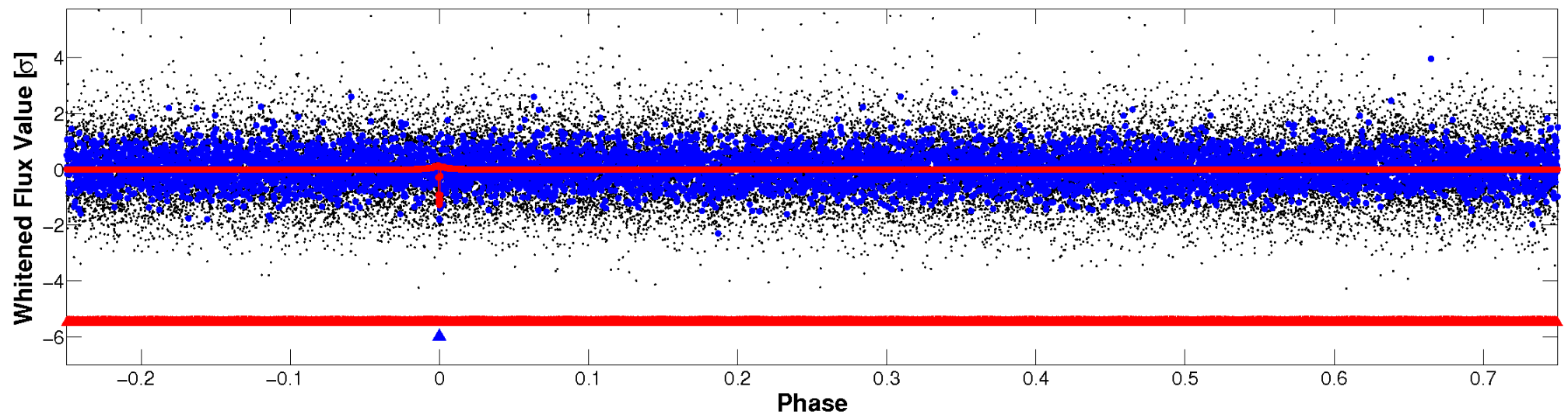


# Non-Whitened Vs. Whitened Light Curve

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

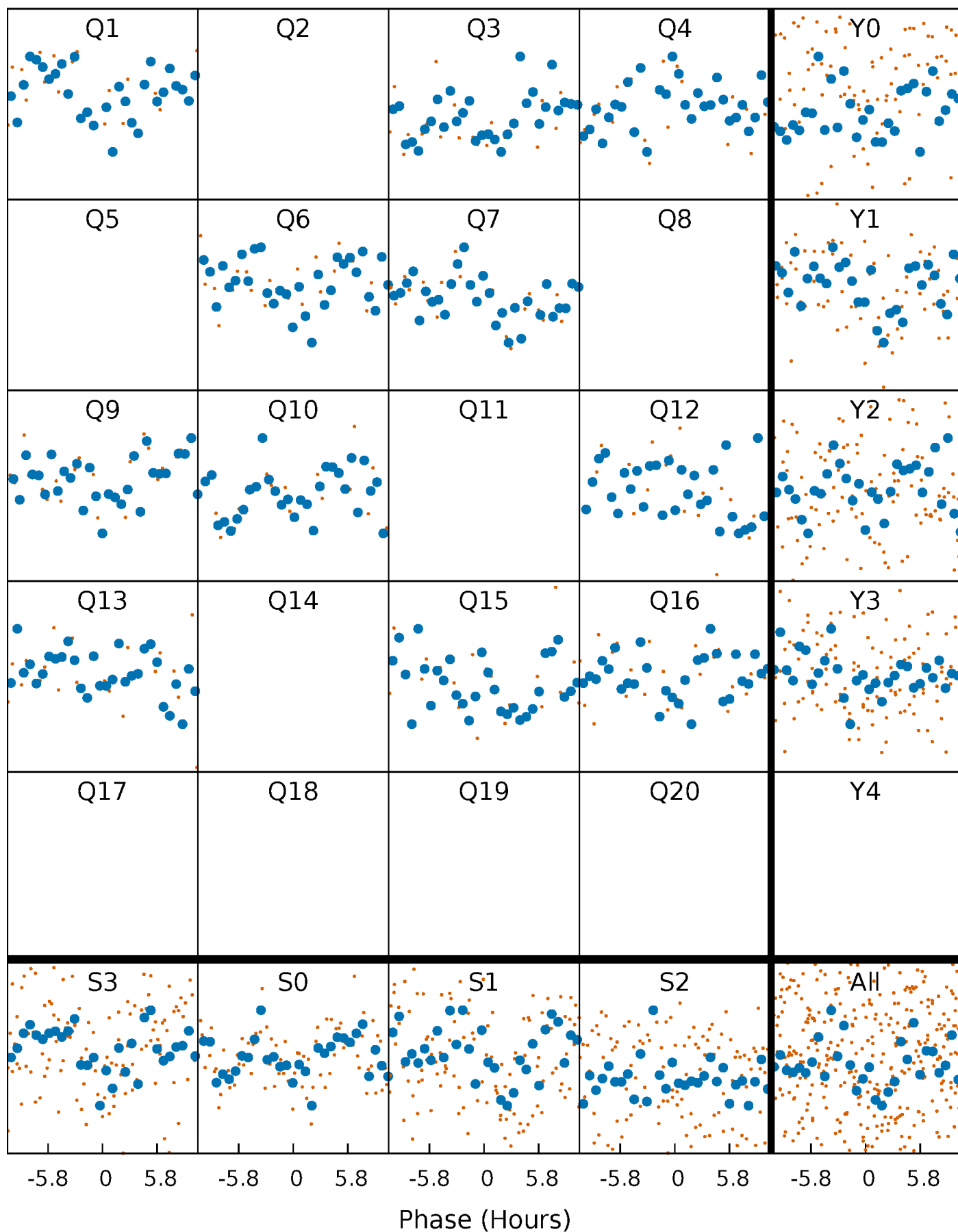


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



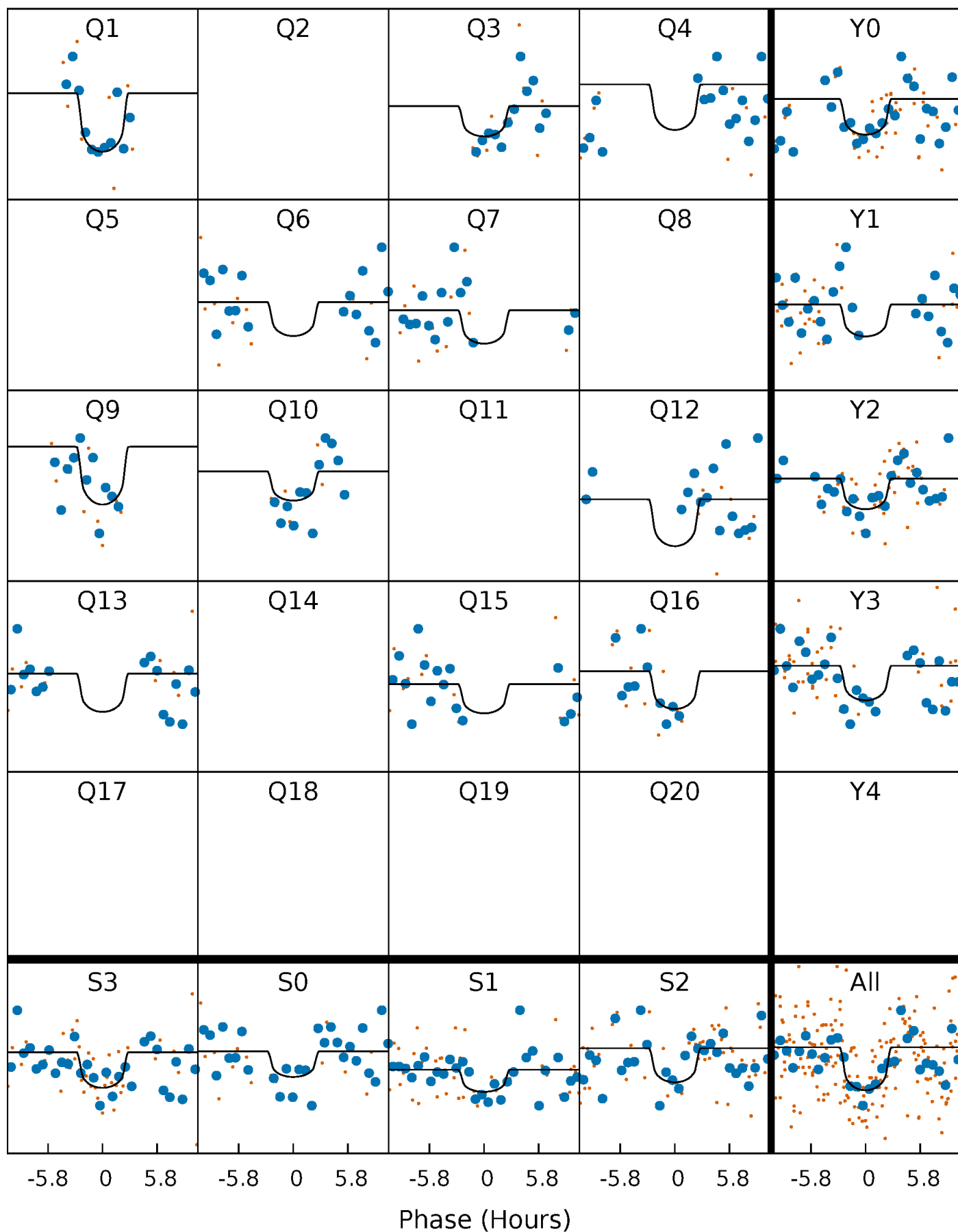
# PDC Quarter-Phased Transit Curves

TCE 002449053-02   P=141.152849 Days    $T_0=137.388237$  (BKJD)



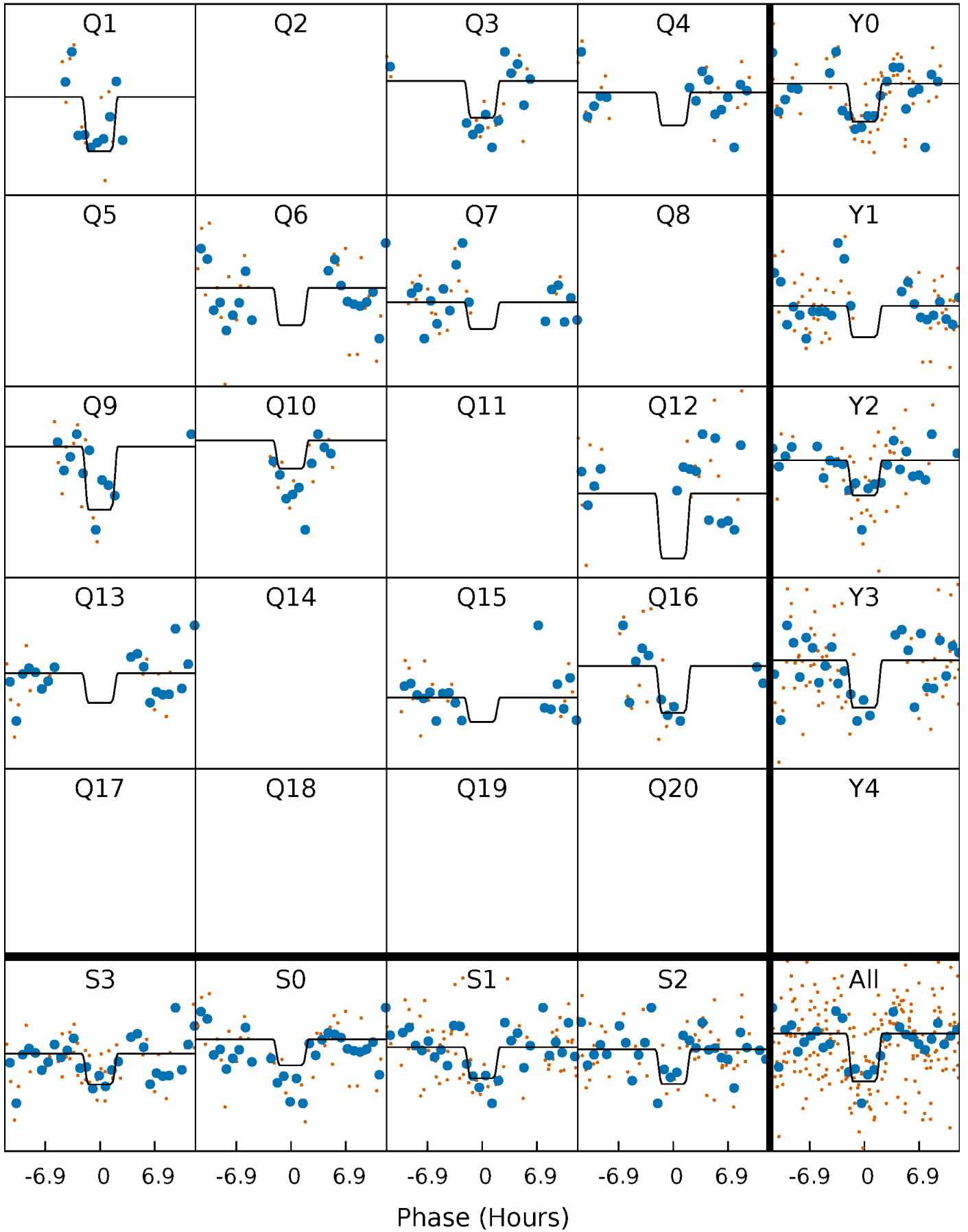
# DV Quarter-Phased Transit Curves

TCE 002449053-02 P=141.152849 Days  $T_0=137.388237$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 002449053-02   P=141.150900 Days    $T_0=137.412474$  (BKJD)

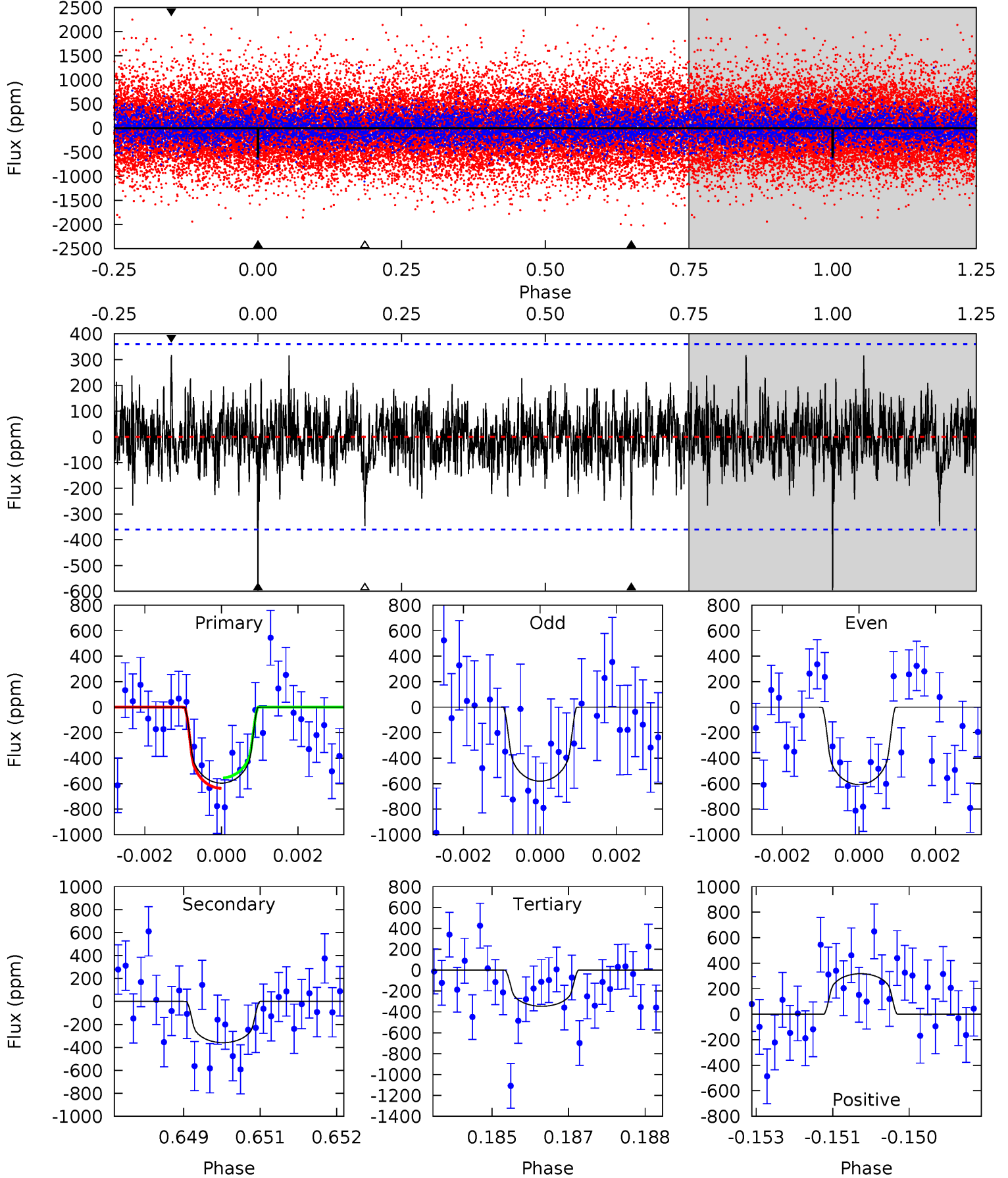




# DV Model-Shift Uniqueness Test

002449053-02, P = 141.152849 Days, E = 137.388237 Days

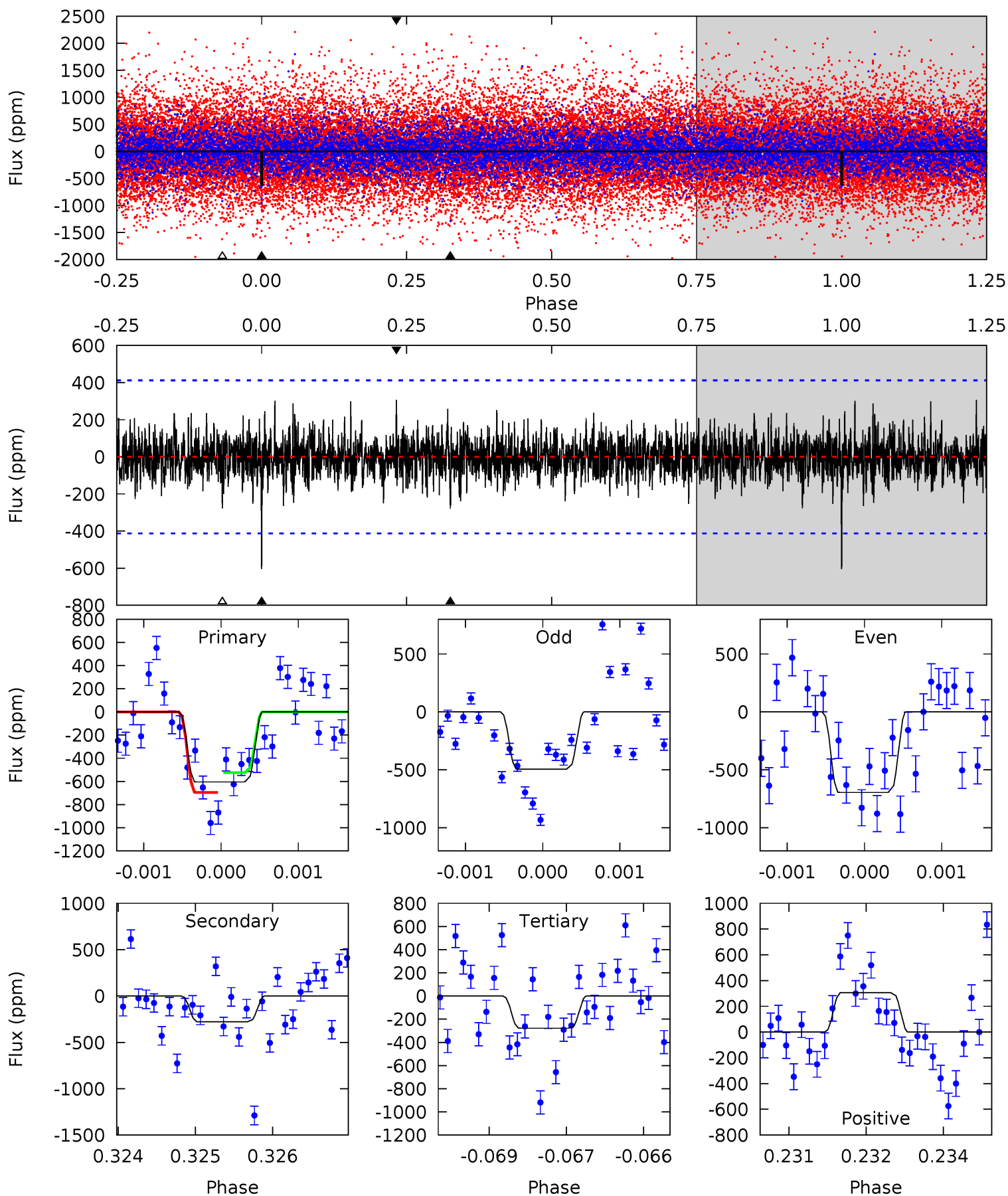
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
8.86	5.34	5.15	4.73	5.36	3.14	1.22	3.71	4.14	0.19	0.61	0.19	0.84	0.35	0.61



# Alt Model-Shift Uniqueness Test

002449053-02, P = 141.150900 Days, E = 137.412474 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
7.94	3.65	3.65	4.03	5.41	3.23	1.06	4.29	3.91	0.01	-0.38	1.31	0.92	0.34	1.11



### Stellar Parameters For KIC 002449053

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5271^{+174}_{-158}$	$4.436^{+0.104}_{-0.156}$	$0.210^{+0.200}_{-0.300}$	$0.935^{+0.190}_{-0.111}$	$0.869^{+0.082}_{-0.068}$	$1.498^{+0.700}_{-0.618}$
	+3%/-3%	+2%/-4%	+95%/-143%	+20%/-12%	+9%/-8%	+47%/-41%
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 002449053-02 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-359 \pm 67$	$3.34^{+2.88}_{-2.12}$	$444^{+28}_{-24}$	$4244^{+2309}_{-815}$	$4509^{+28082}_{-3217}$
Alt.	$-278 \pm 76$	$3.37^{+2.61}_{-2.06}$	$444^{+27}_{-22}$	$4008^{+2021}_{-674}$	$3322^{+19364}_{-2268}$

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

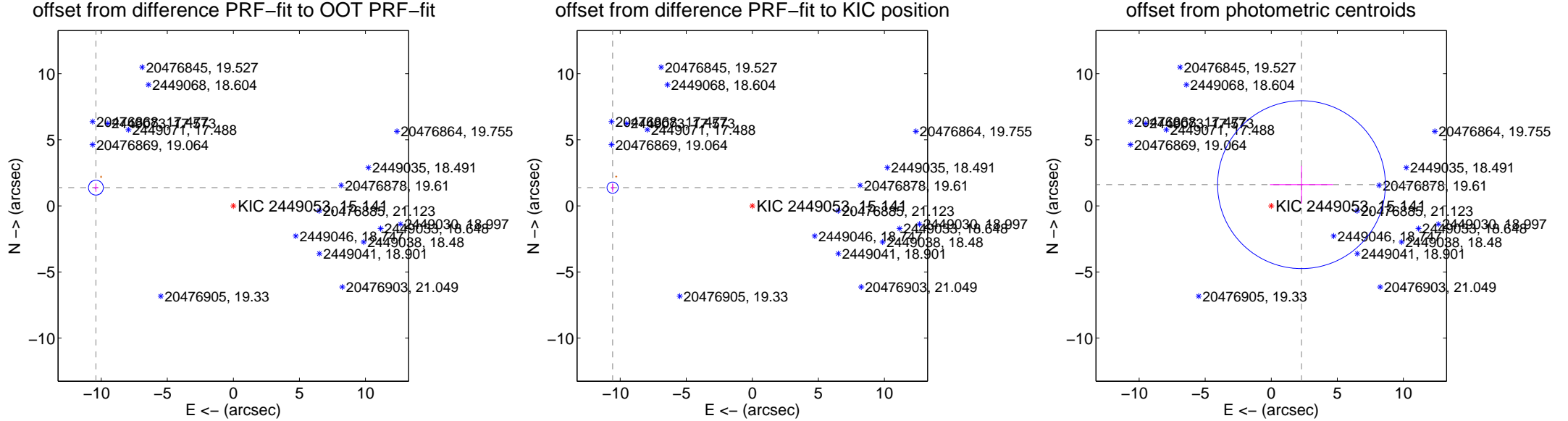
## DV Centroid Data

Supplemental centroid analysis for 002449053-02. Kepler magnitude: 15.14. Transit SNR 7.69

There are 1 quarters with good PRF difference image offsets

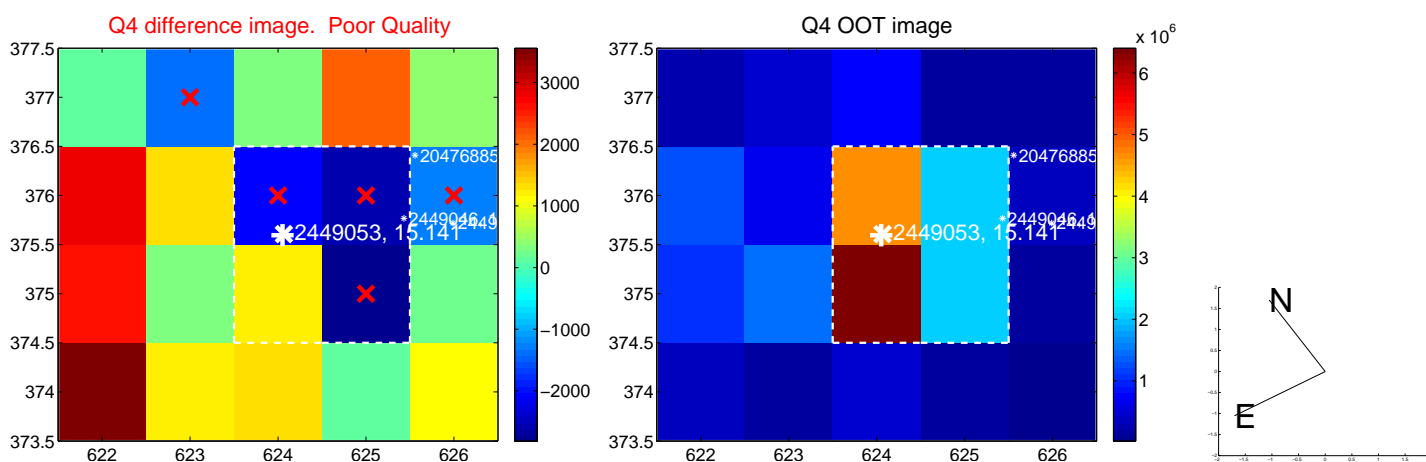
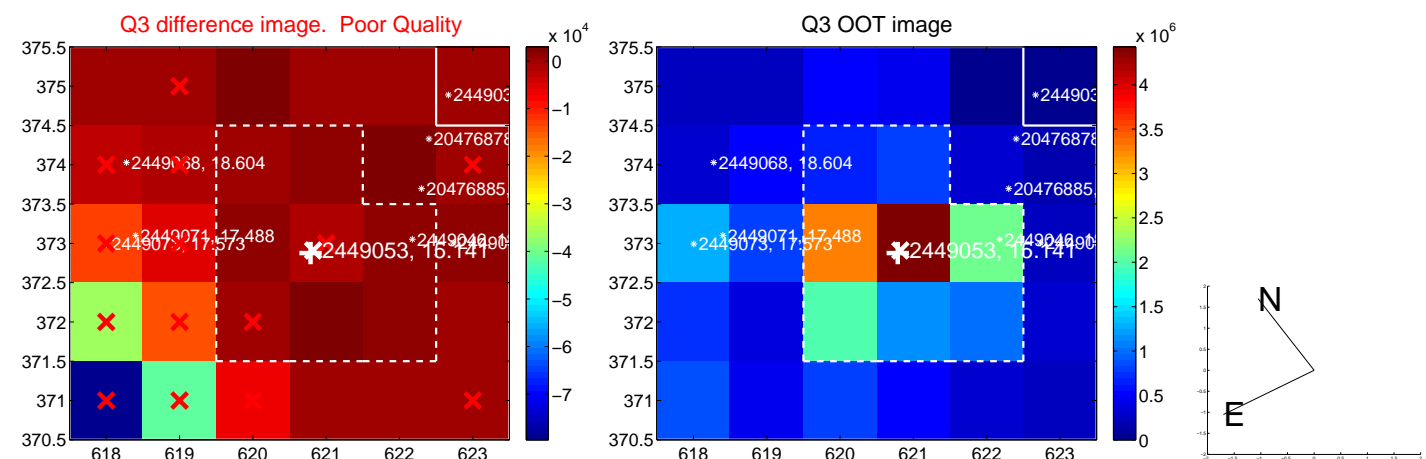
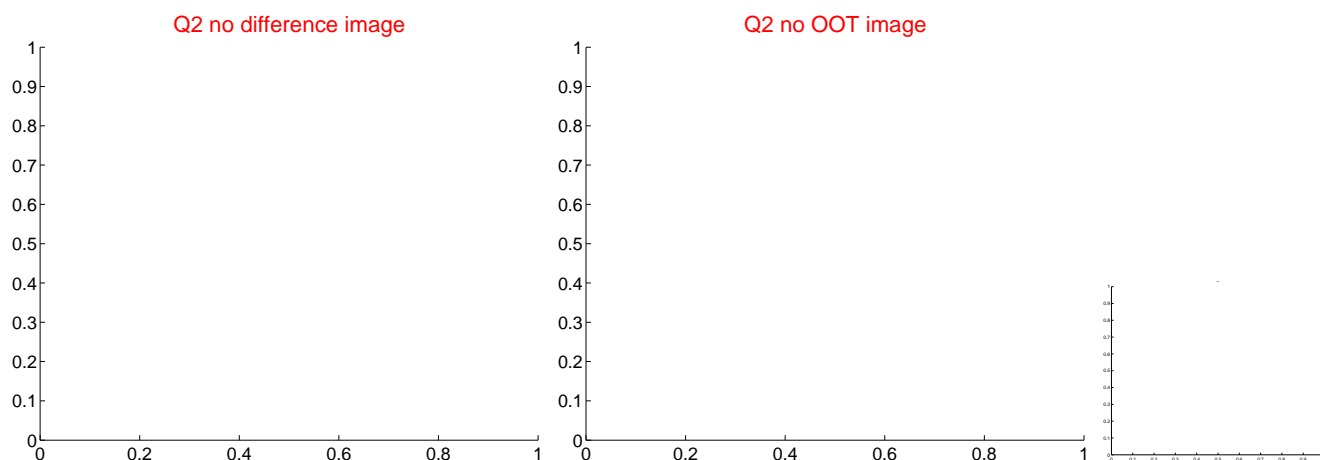
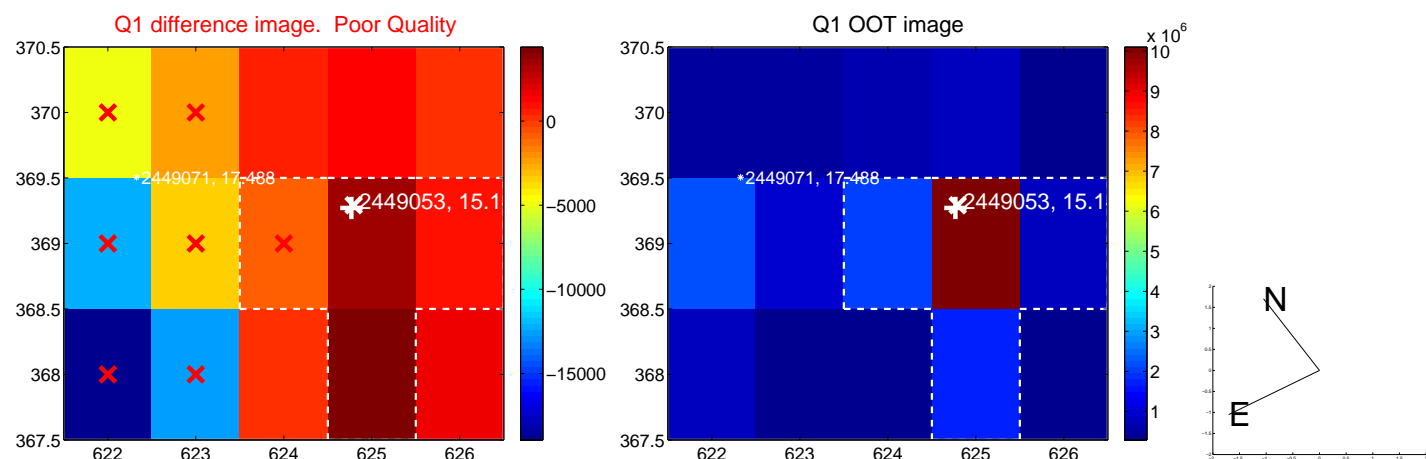
The direct PRF centroid is offset from the target star catalog position by about 0.29 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	10.497 $\pm$ 0.188	55.98	10.406 $\pm$ 0.184	1.377 $\pm$ 0.318
PRF-fit source offset from KIC position	10.663 $\pm$ 0.142	75.18	10.574 $\pm$ 0.137	1.377 $\pm$ 0.324
photometric centroid source offset	2.80 $\pm$ 2.12	1.32	-2.29 $\pm$ 2.39	1.60 $\pm$ 1.42



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.

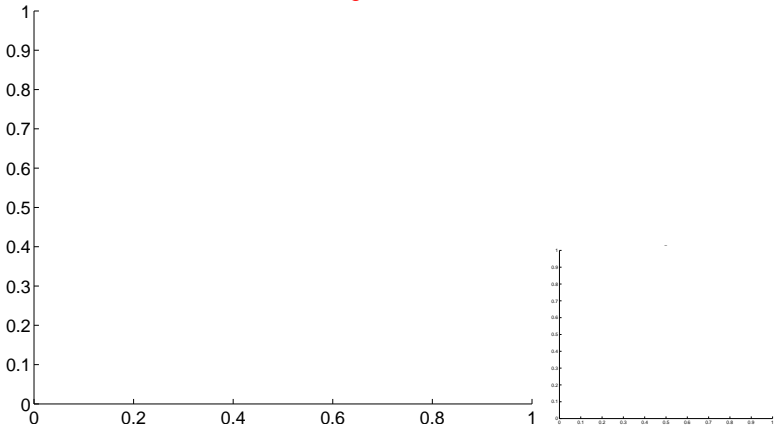


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

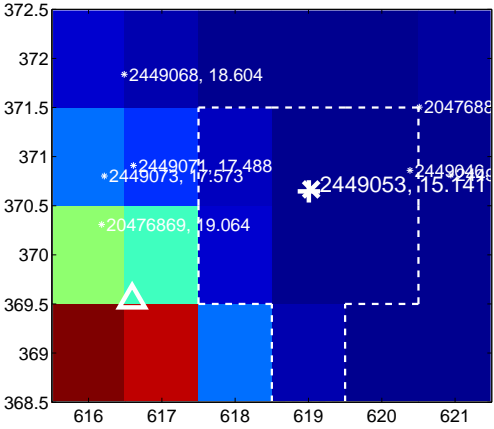
Q5 no difference image



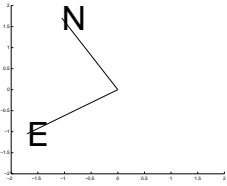
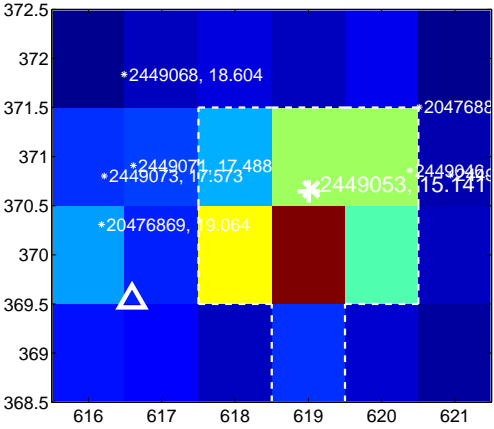
Q5 no OOT image



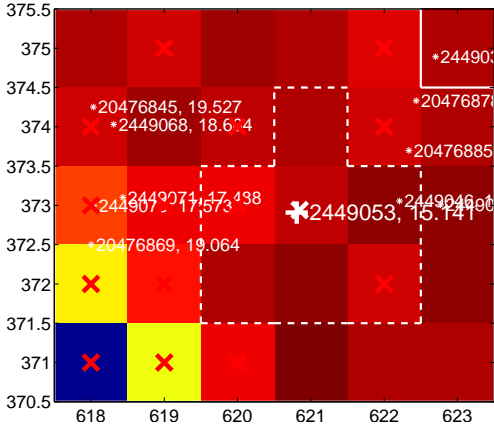
Q6 difference image



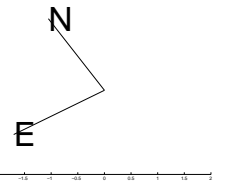
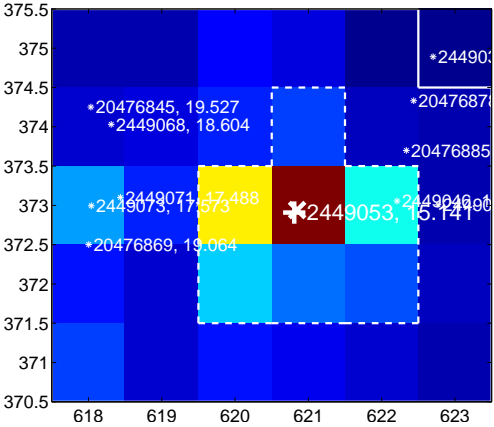
Q6 OOT image



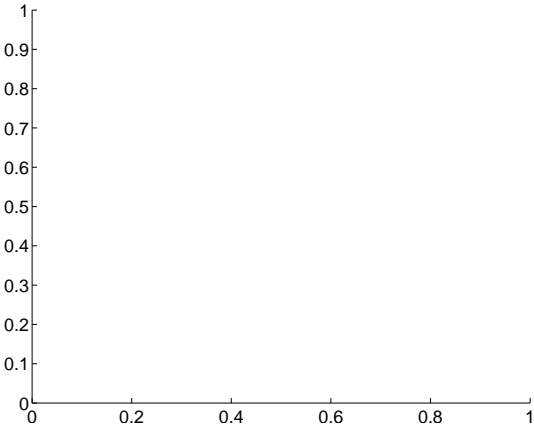
Q7 difference image. Poor Quality



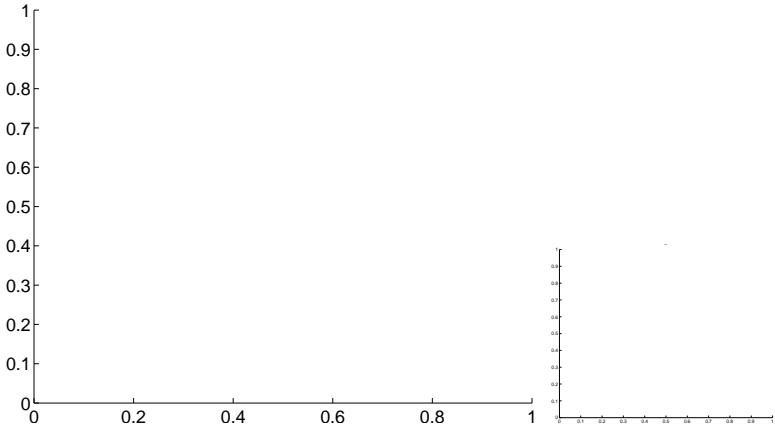
Q7 OOT image



Q8 no difference image

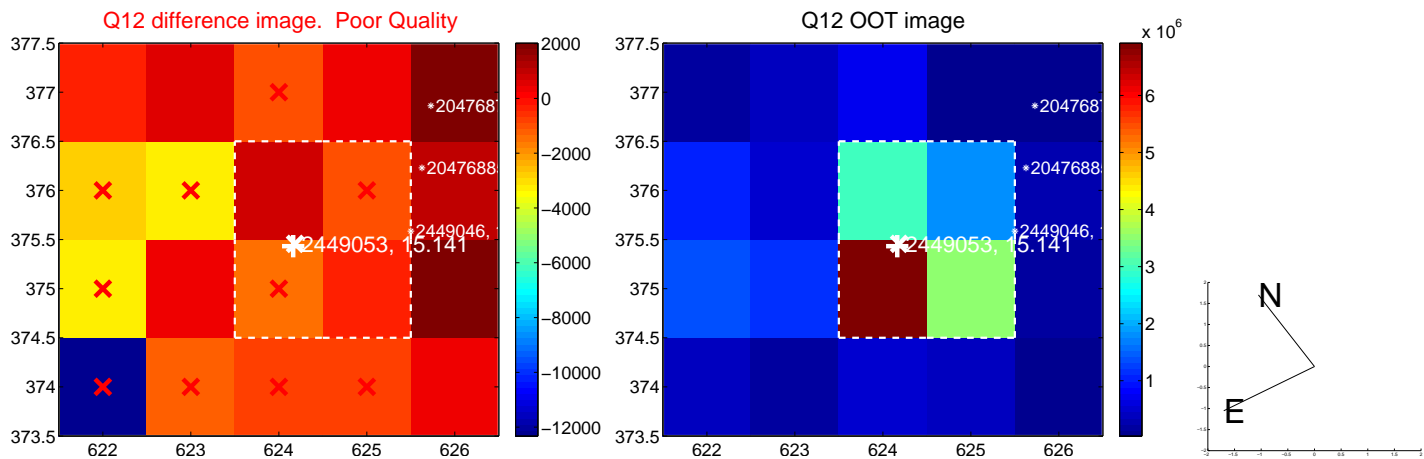
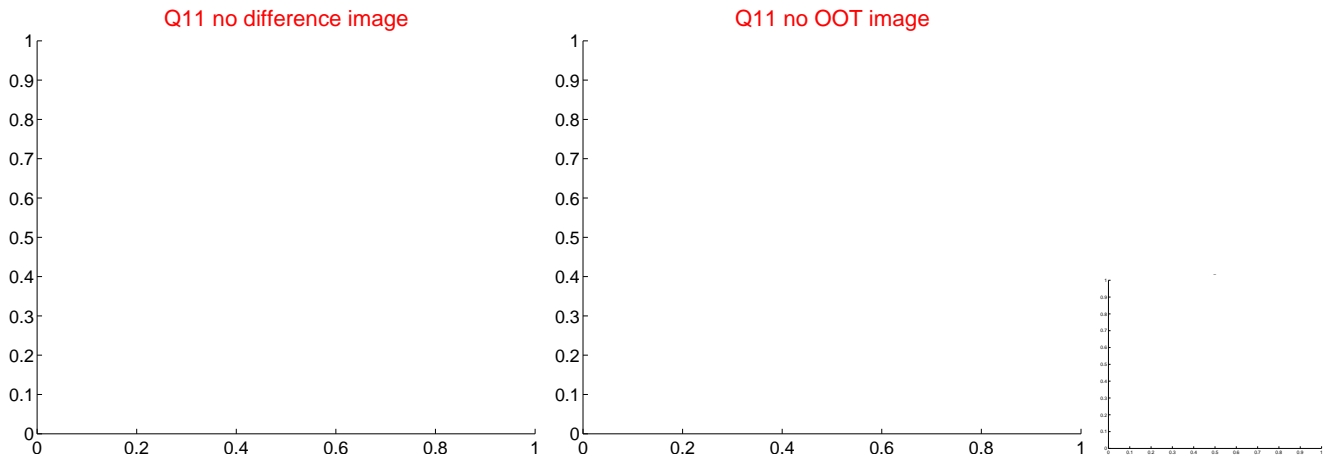
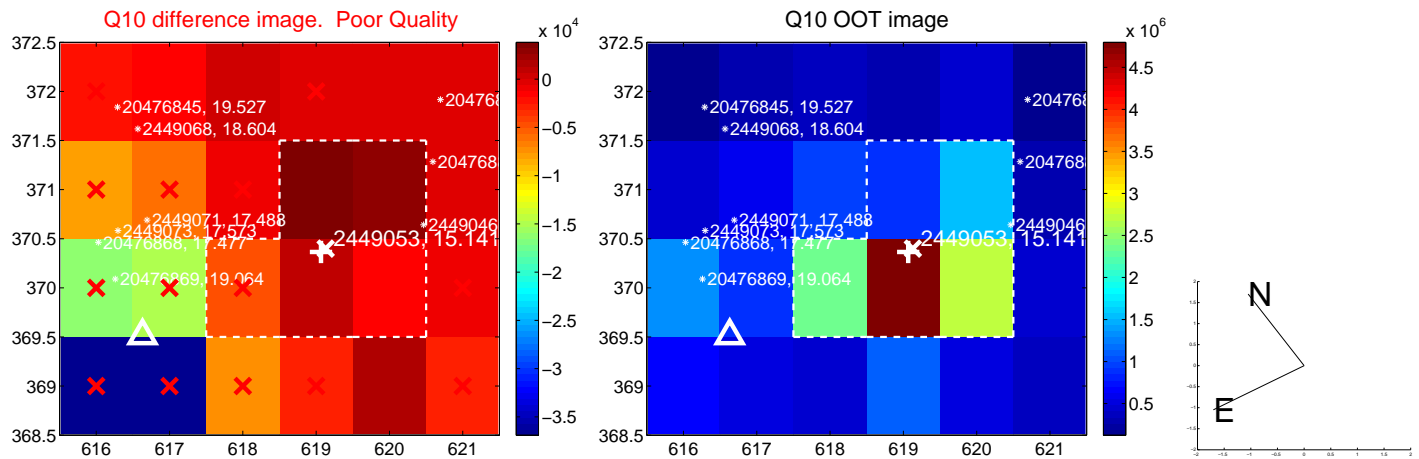
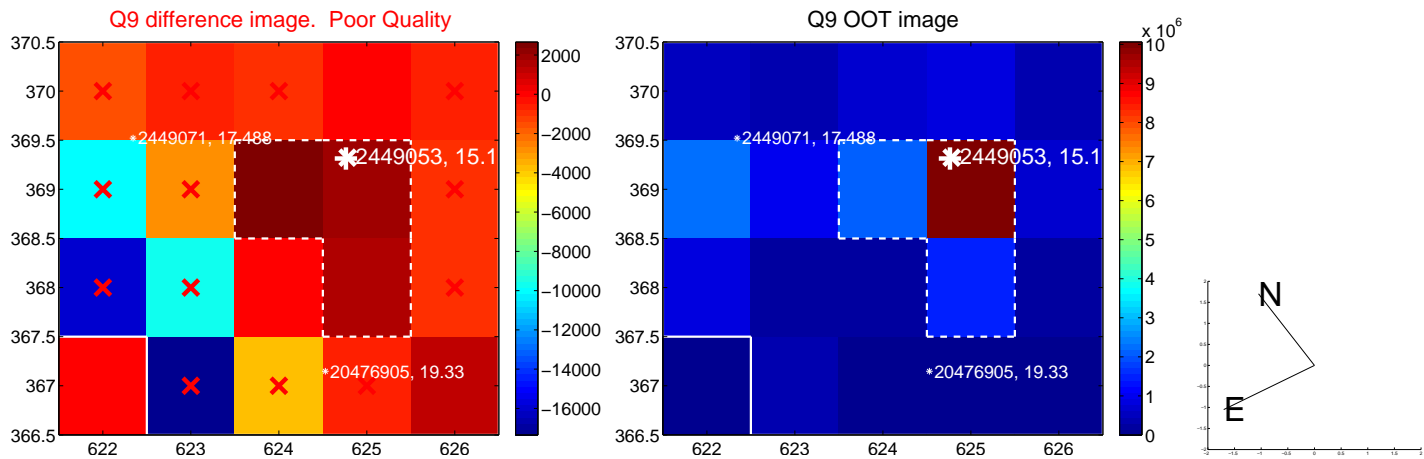


Q8 no OOT image

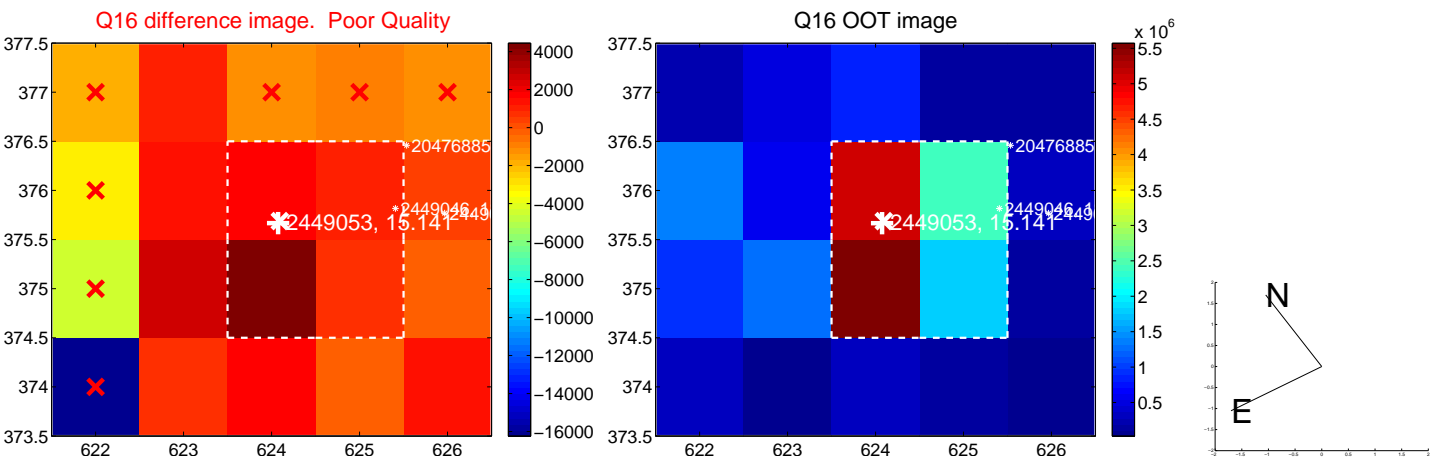
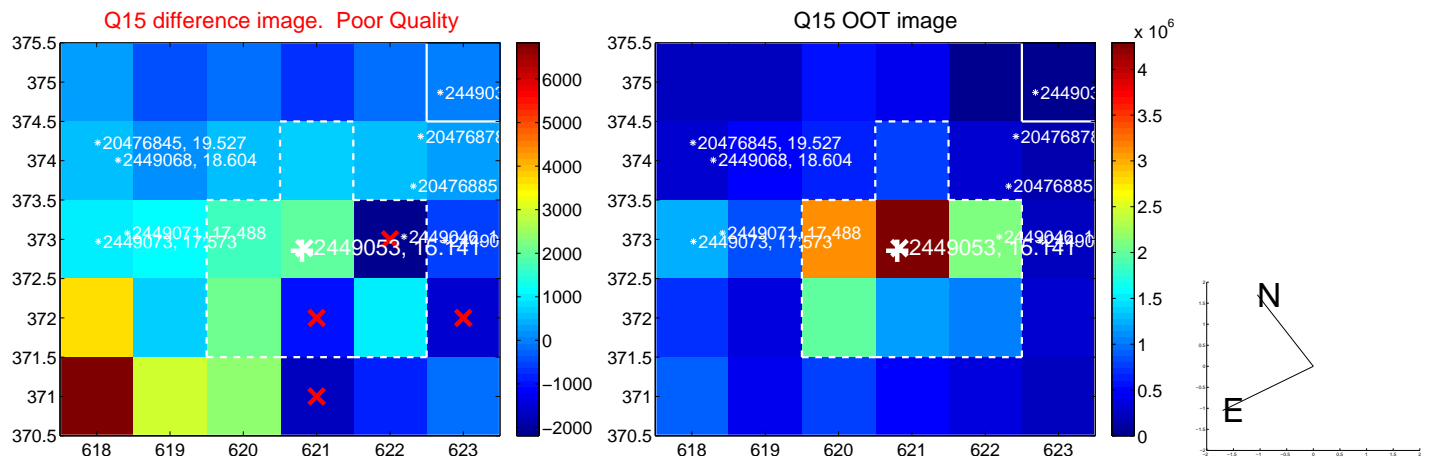
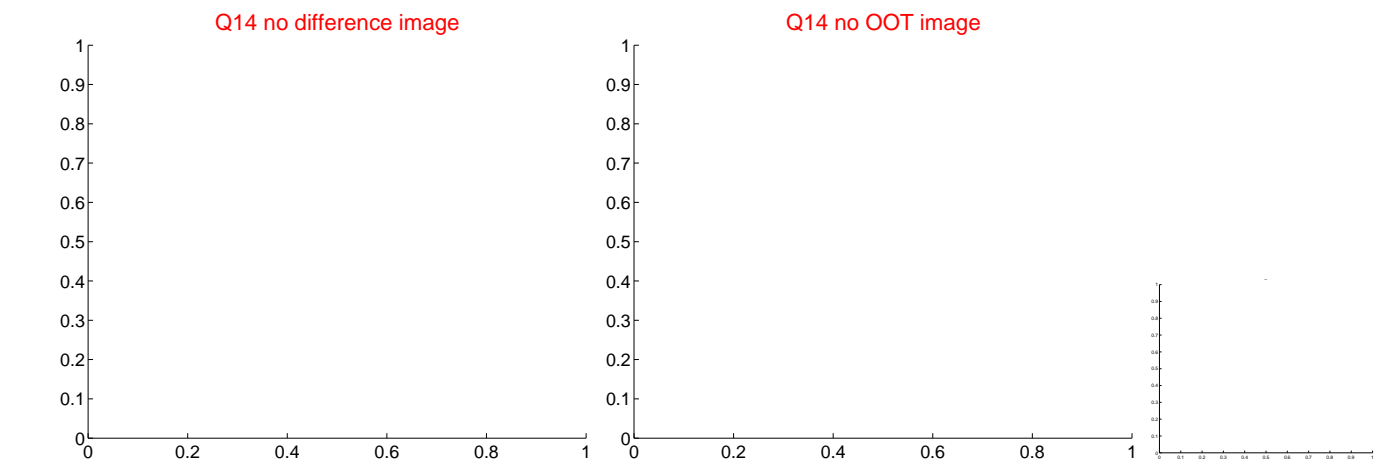
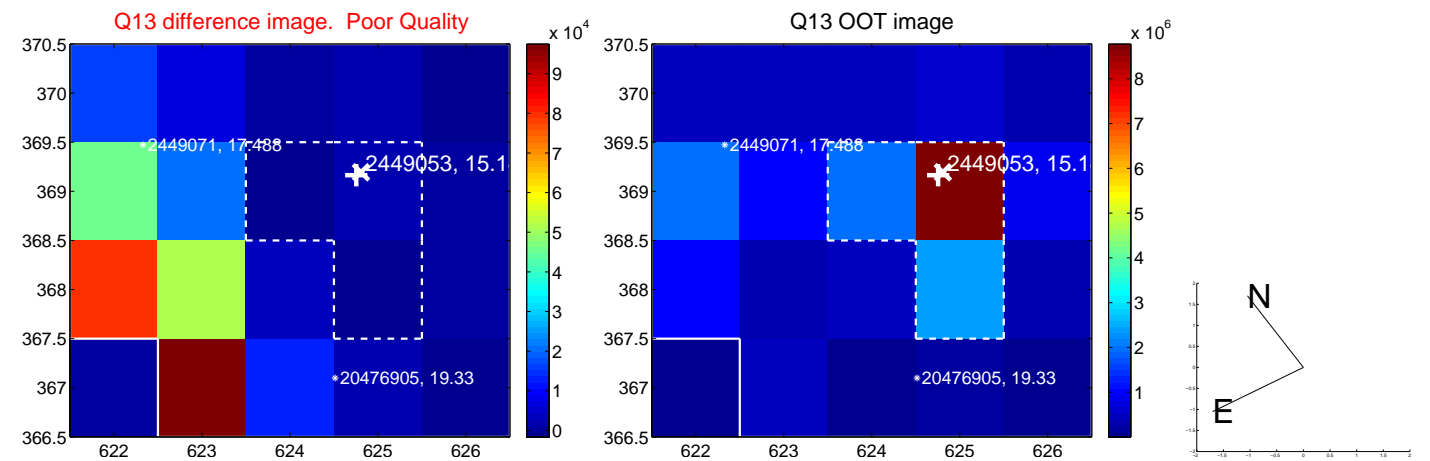




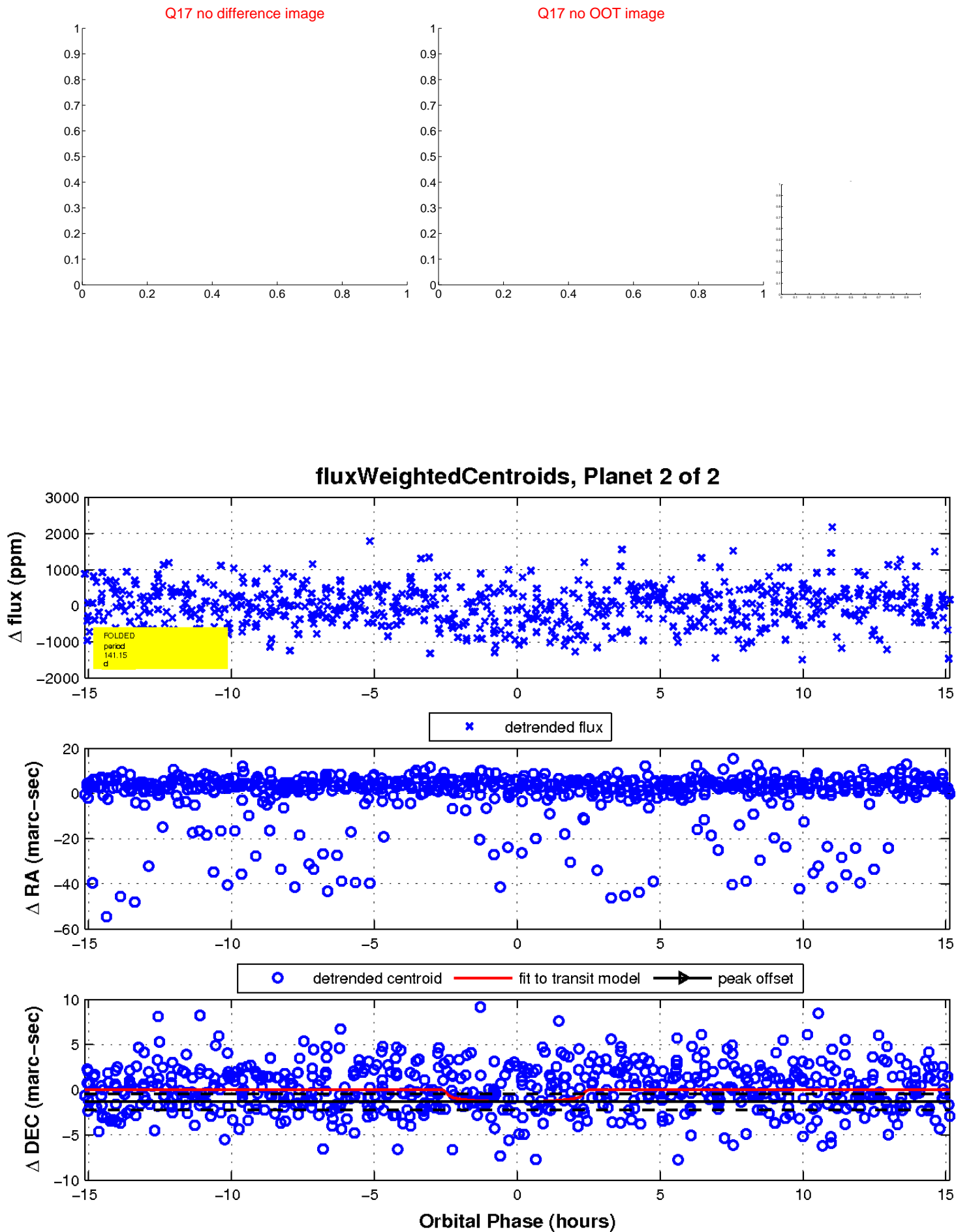
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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.



UKIRT Image

