

# KIC 002019477

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
002019477-01	OBS	6093.01	20.571350	149.254919	79.5	12.559	9.5	9.9	4.52	5440	4.44	485.98
002019477-02	OBS	6093.02	27.247428	131.933396	78.3	15.037	9.2	9.1	4.52	5440	4.61	334.10

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
002019477-01	OBS	FP	0.28	0	0	1	0	CENT_RESOLVED_OFFSET
002019477-02	OBS	PC	0.48	0	0	0	0	CENT_FEW_DIFFS

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

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

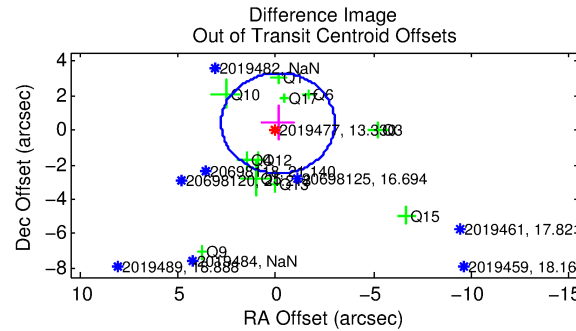
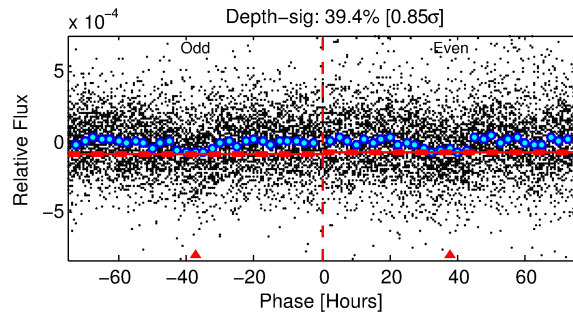
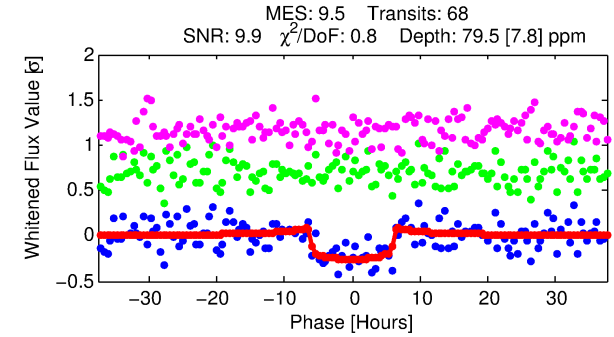
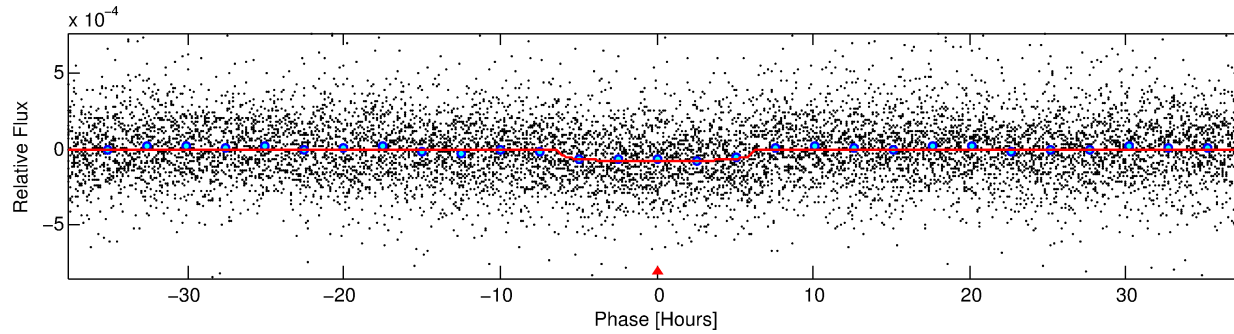
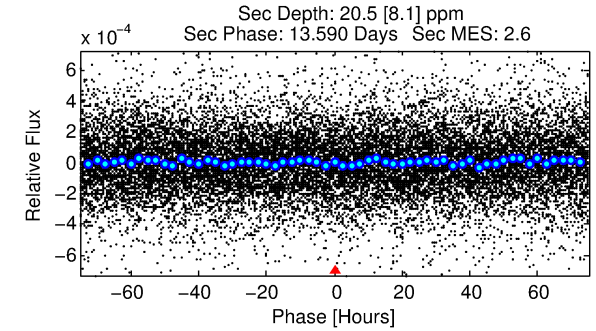
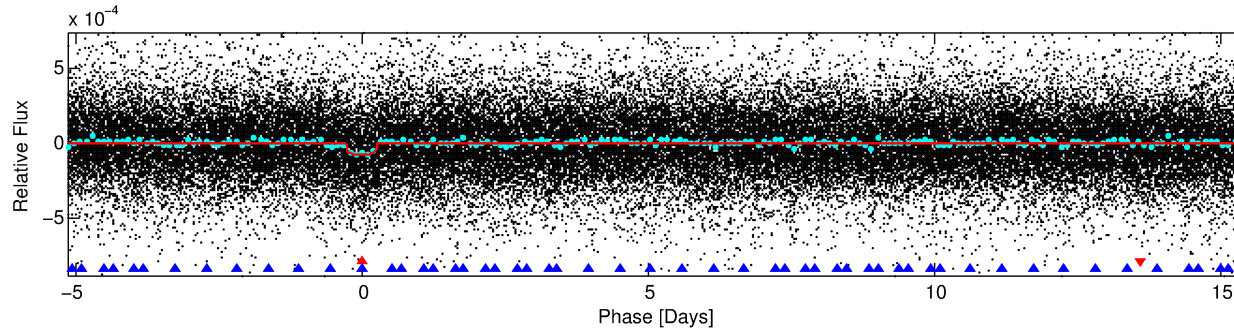
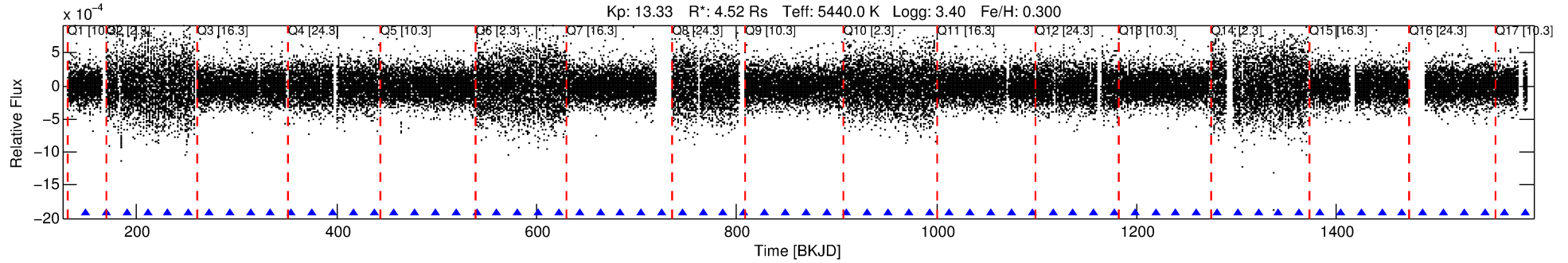
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 002019477-01

No Significant Match Found

# DV One-Page Summary

KIC: 2019477 Candidate: 1 of 2 Period: 20.571 d  
KOI: K06093.01 Corr: 0.921



## DV Fit Results:

Period = 20.57135 [0.00036] d  
Epoch = 149.2549 [0.0147] BKJD  
Rp/R\* = 0.0090 [0.0032]  
a/R\* = 8.12 [11.53]  
b = 0.78 [0.75]  
Seff = 485.98 [248.33]  
Teq = 1197 [153] K  
Rp = 4.44 [2.28] Re  
a = 0.1818 [0.0601] AU  
Ag = 18.90 [18.24] [0.98σ]  
Teffp = 3860 [795] K [3.29σ]

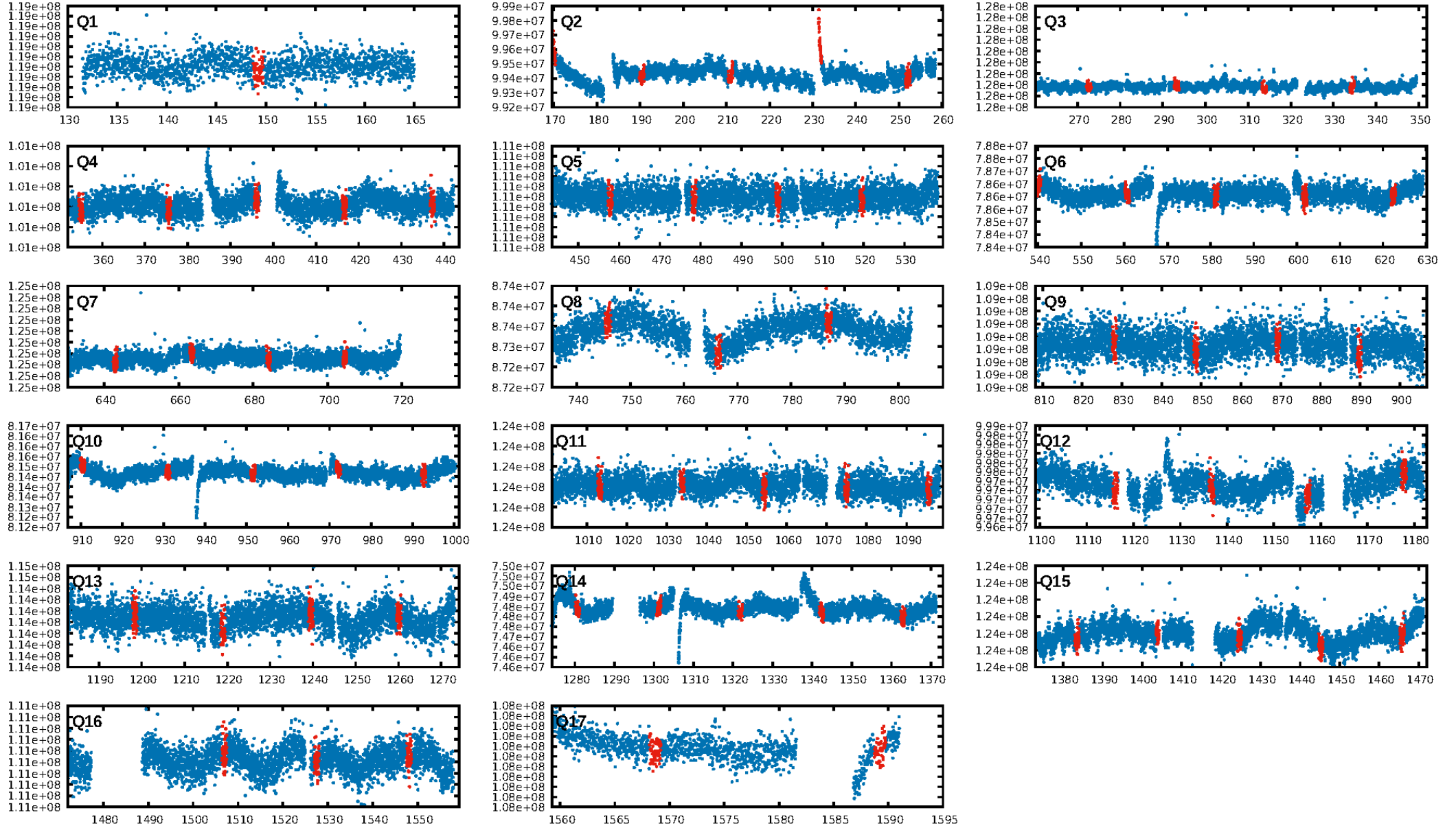
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [8.18σ]  
ModelChiSquare2-sig: 98.7%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 1.76e-20  
RollingBand-fgt: 1.00 [65/65]  
GhostDiagnostic-chr: 3.751  
Centroid-sig: 0.0%  
Centroid-so: 0.898 arcsec [0.99σ]  
OotOffset-rm: 0.420 arcsec [0.43σ]  
KicOffset-rm: 0.250 arcsec [0.28σ]  
OotOffset-st: 2/2/2/5 [11]  
KicOffset-st: 2/2/2/5 [11]  
DiffImageQuality-fgm: 0.09 [1/11]  
DiffImageOverlap-fno: 1.00 [17/17]

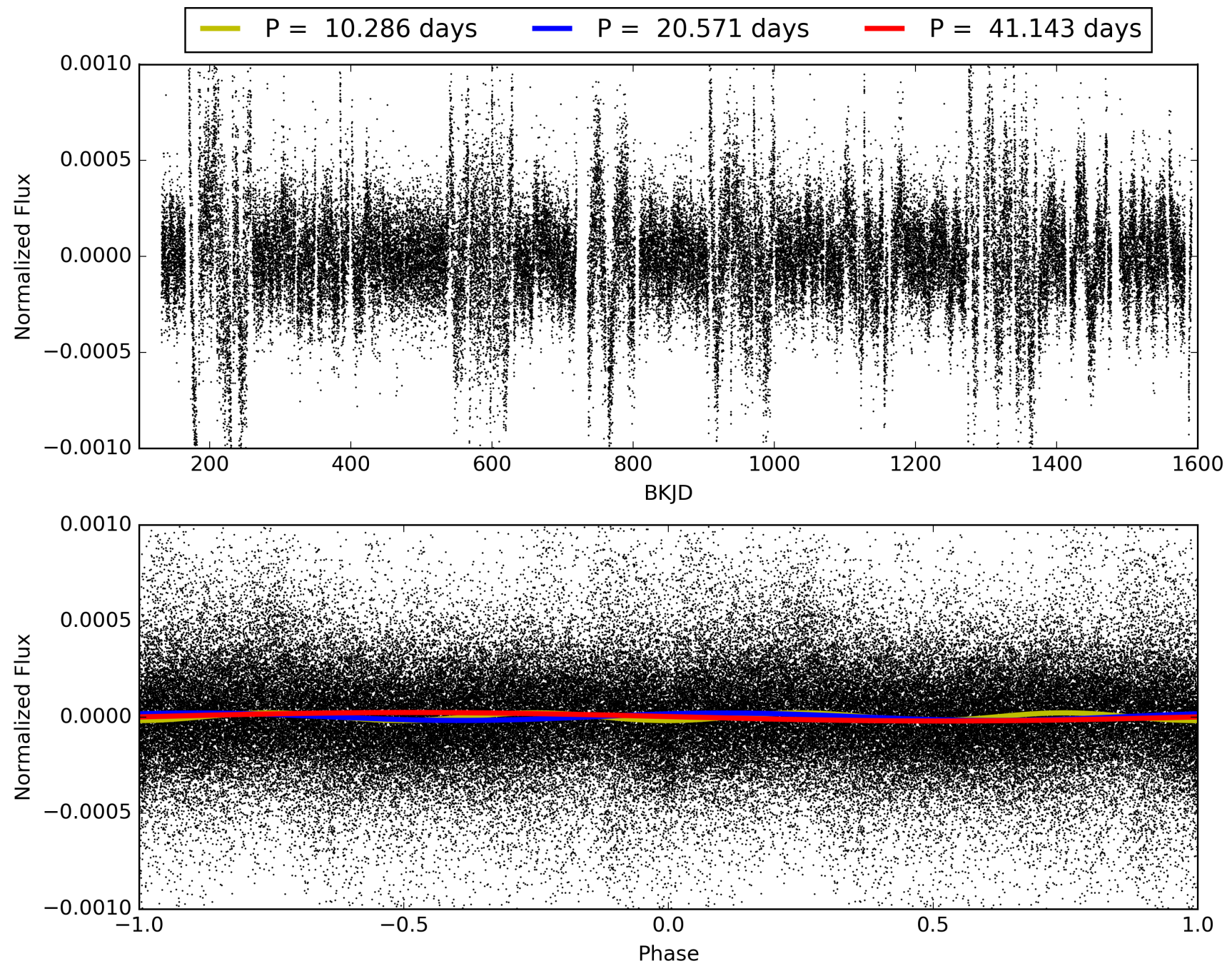
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 01:46:45 Z

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

# TCE 002019477-01, PDC Light Curves



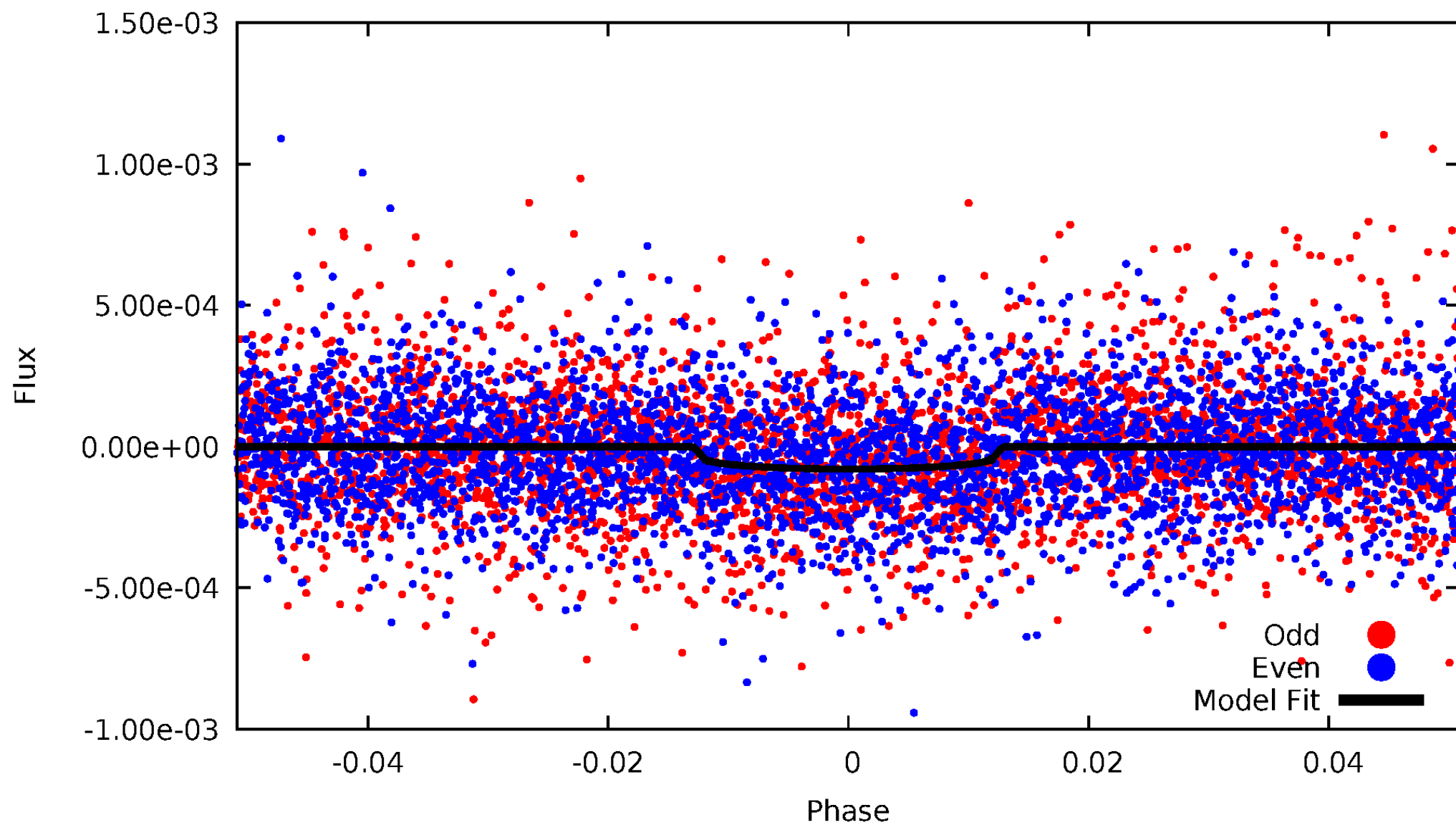
TCE 002019477-01





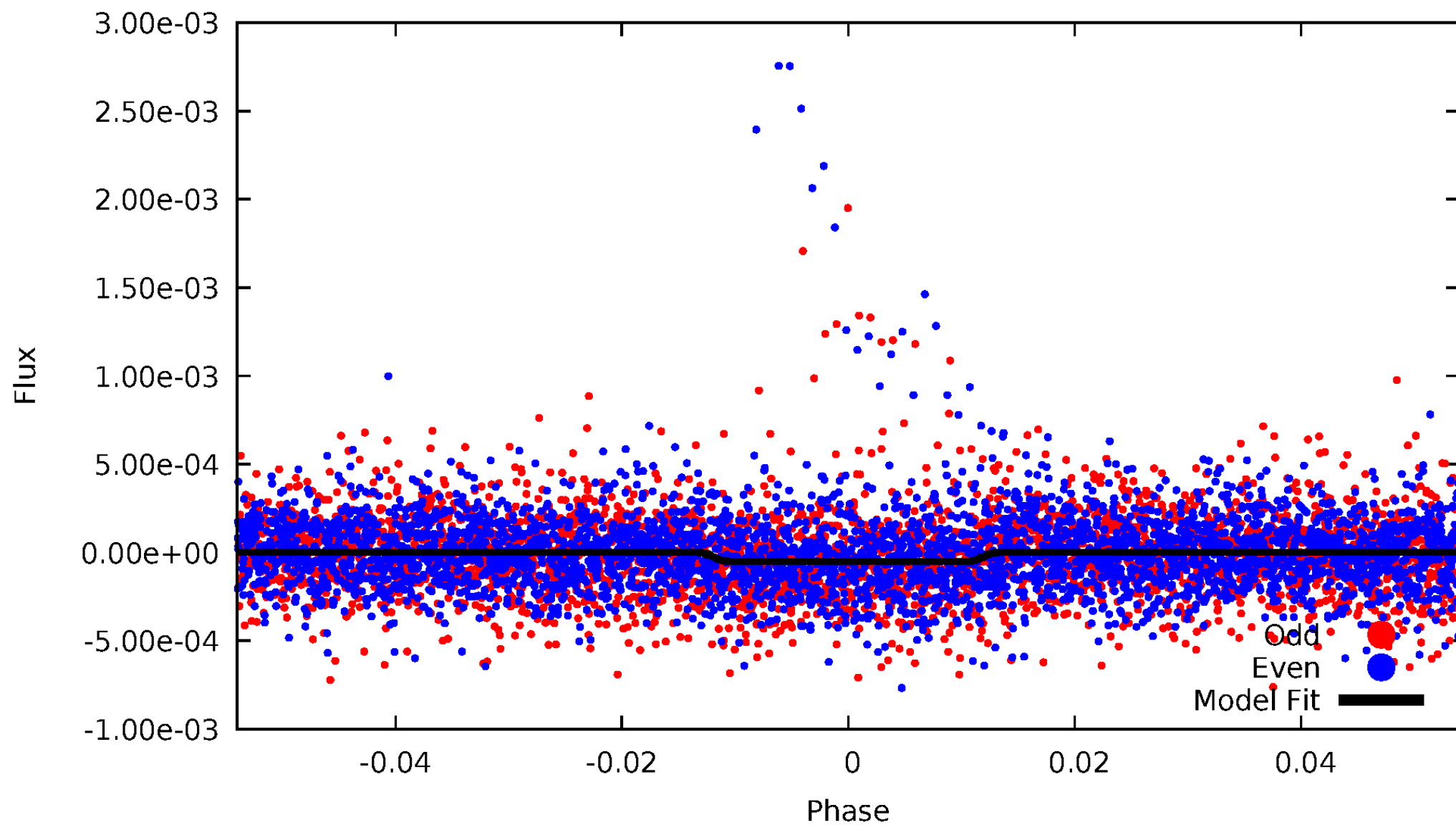
# DV Odd/Even

TCE 002019477-01



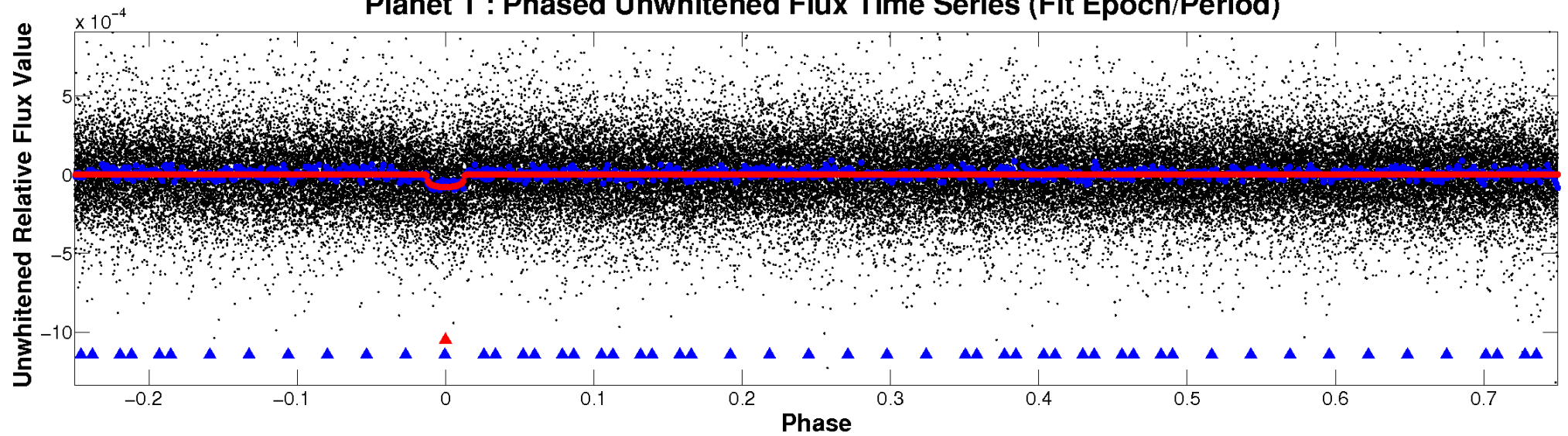
# ALT Odd/Even

TCE 002019477-01

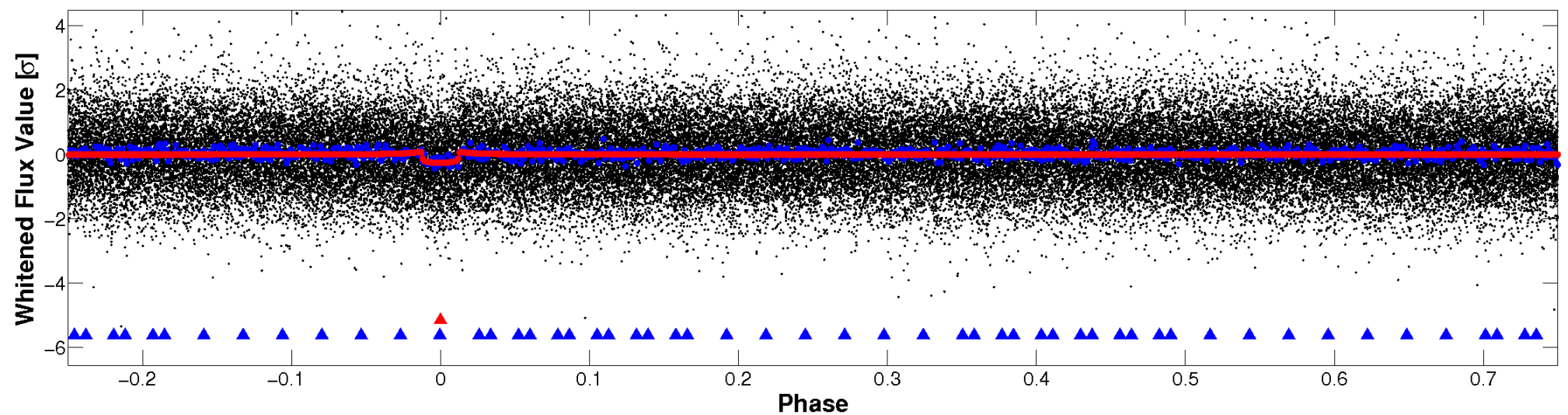


# Non-Whitened Vs. Whitened Light Curve

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

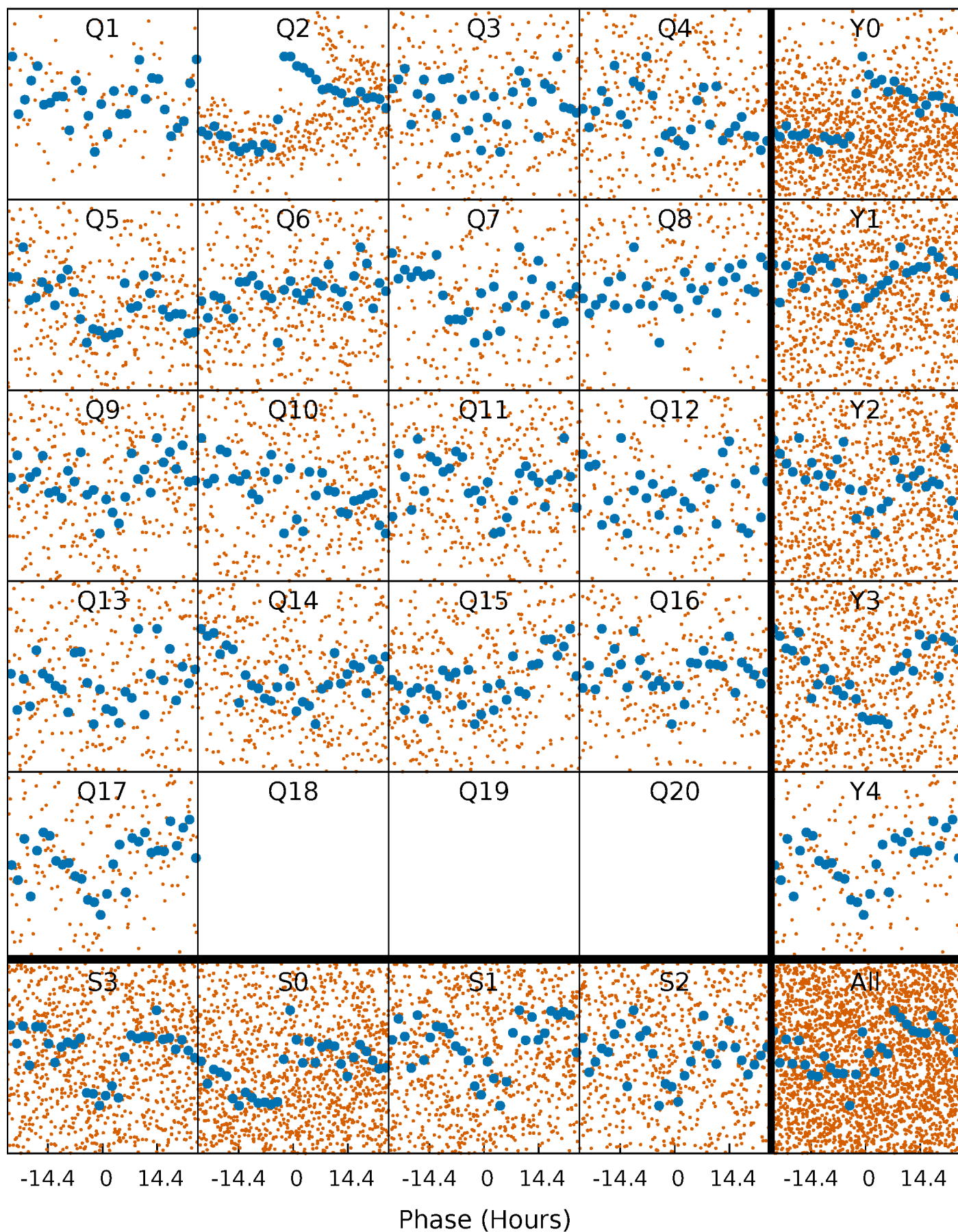


Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

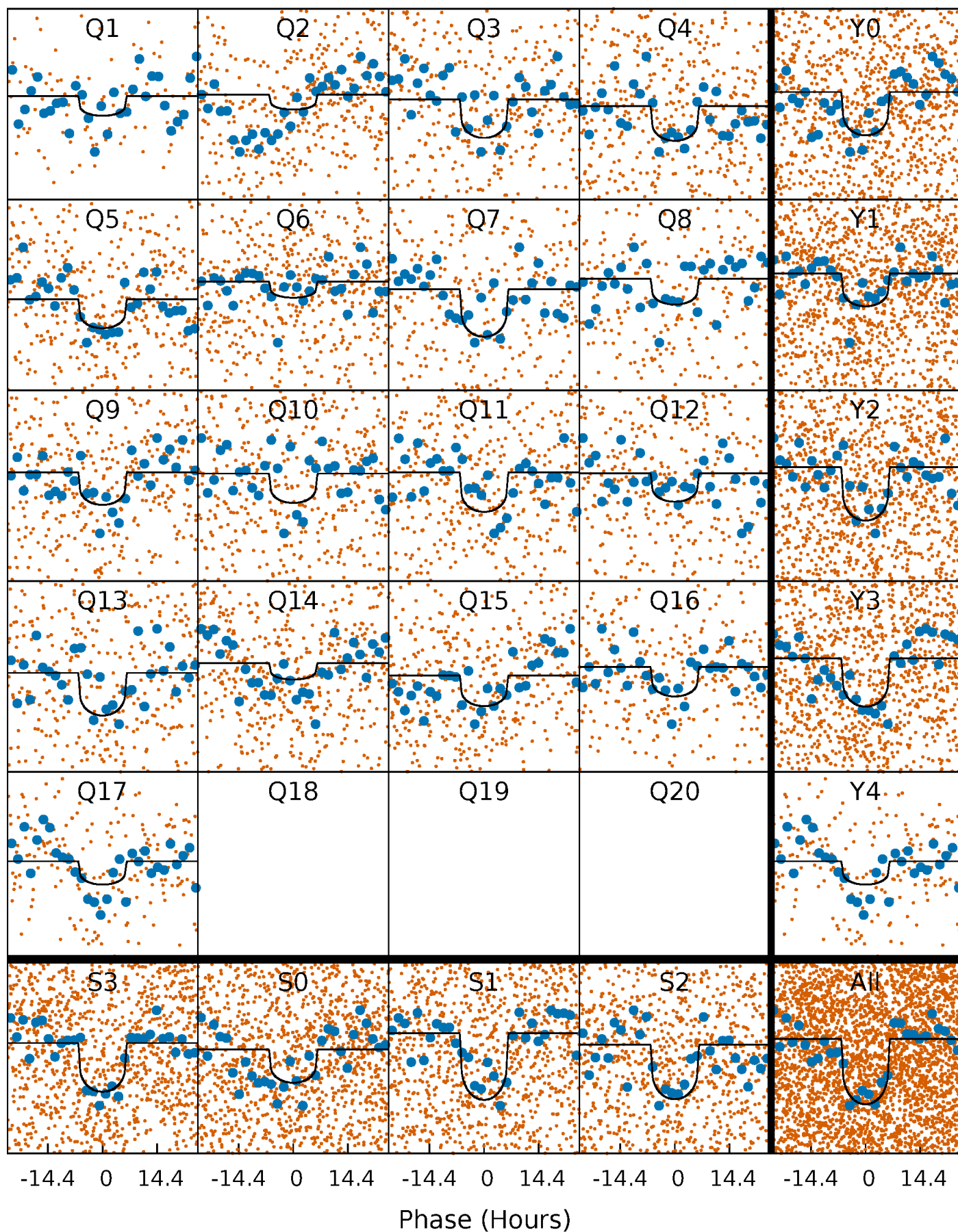
TCE 002019477-01 P= 20.571350 Days  $T_0=149.254919$  (BKJD)





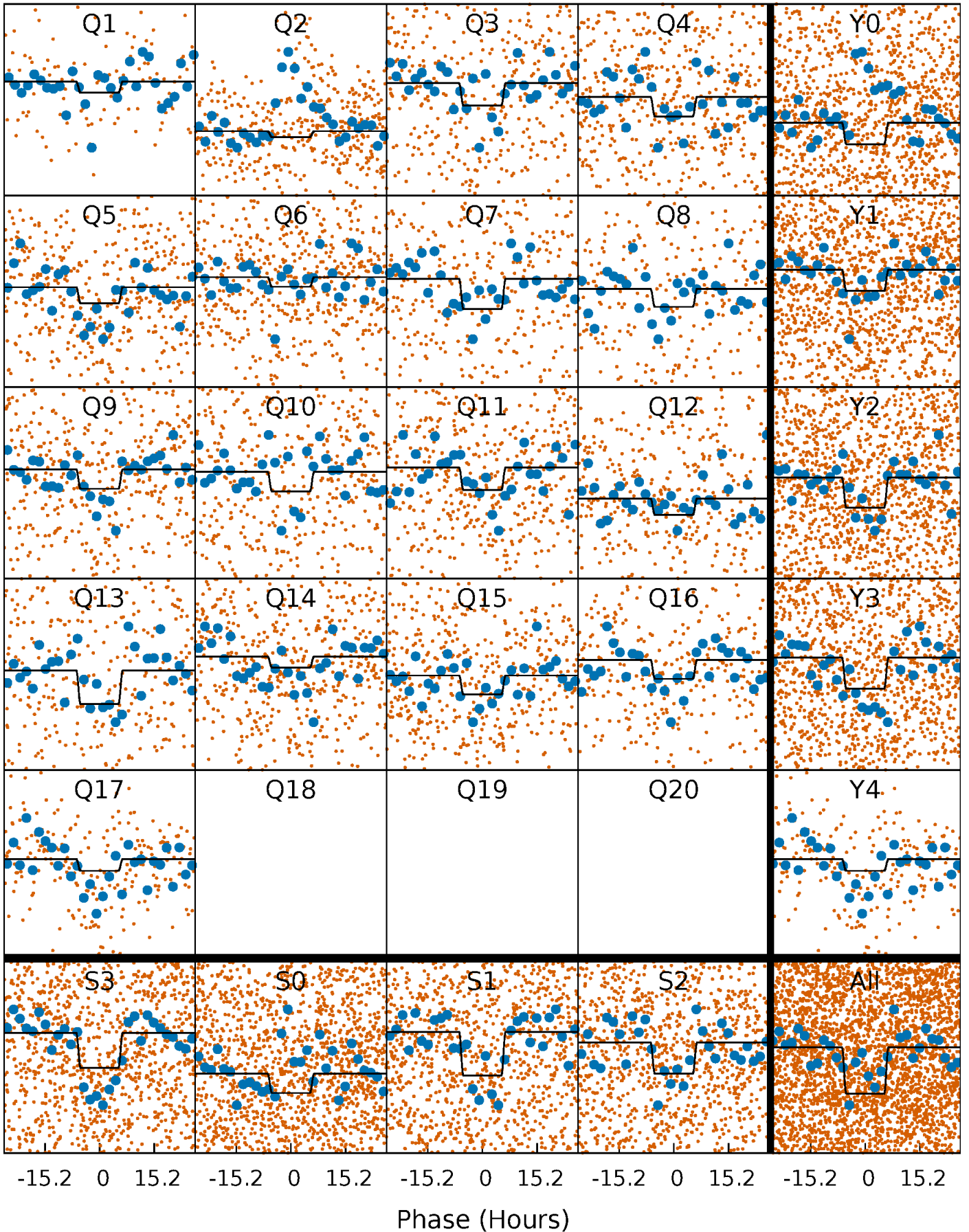
# DV Quarter-Phased Transit Curves

TCE 002019477-01 P= 20.571350 Days  $T_0=149.254919$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

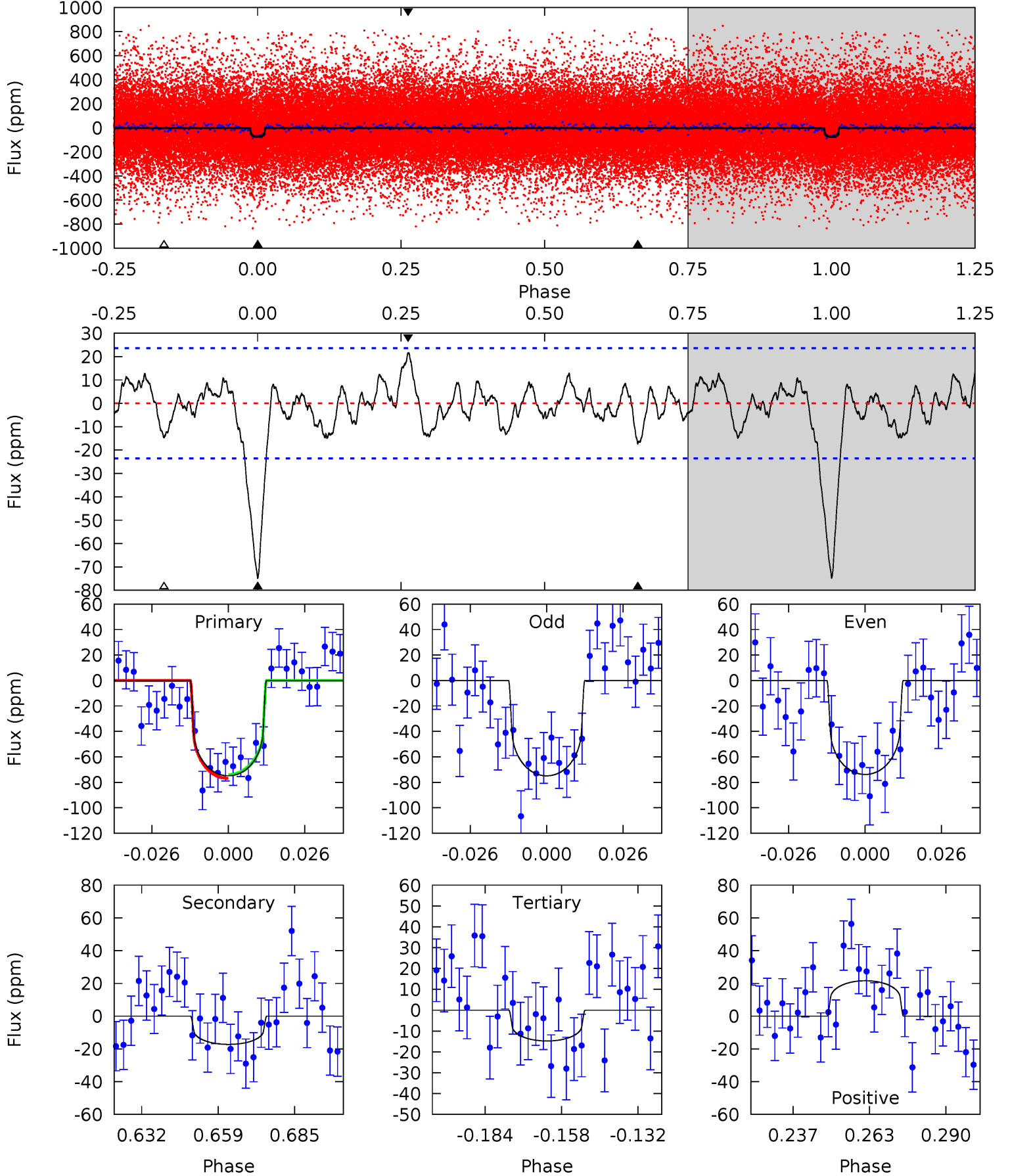
TCE 002019477-01 P= 20.571026 Days  $T_0=149.277510$  (BKJD)



# DV Model-Shift Uniqueness Test

002019477-01,  $P = 20.571350$  Days,  $E = 128.683569$  Days

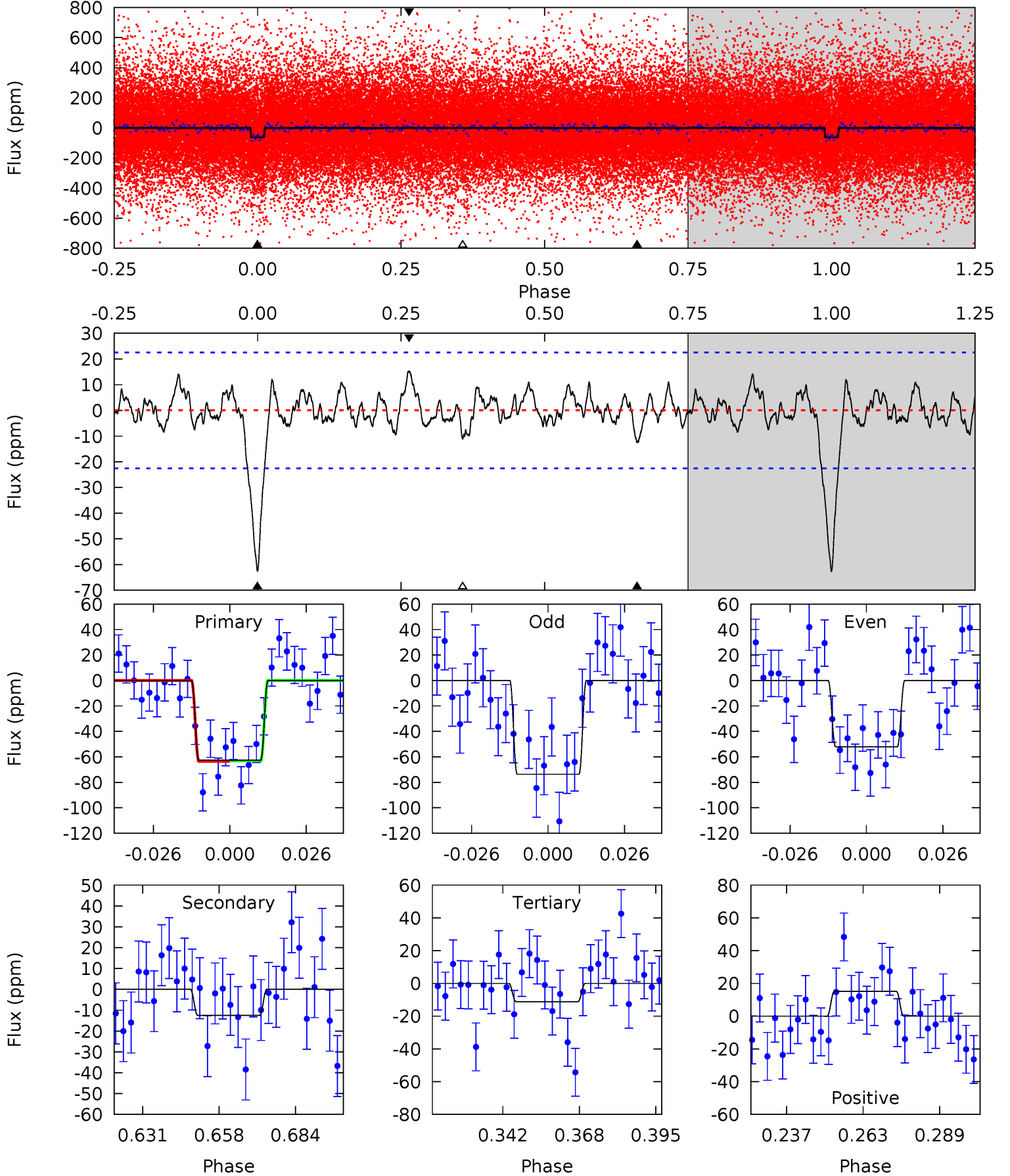
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
15.3	3.54	3.03	4.43	4.84	2.22	1.42	12.3	10.9	0.51	-0.89	0.11	1.01	0.22	0.29



# Alt Model-Shift Uniqueness Test

002019477-01,  $P = 20.571026$  Days,  $E = 128.706484$  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
13.4	2.68	2.39	3.25	4.84	2.22	1.05	11.0	10.2	0.29	-0.57	2.33	0.37	0.20	0.05





### Stellar Parameters For KIC 002019477

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5440^{+87}_{-76}$	$3.404^{+0.289}_{-0.051}$	$0.300^{+0.150}_{-0.150}$	$4.524^{+0.416}_{-1.665}$	$1.894^{+0.142}_{-0.398}$	$0.029^{+0.058}_{-0.007}$
	+2%/-1%	+8%/-1%	+50%/-50%	+9%/-37%	+7%/-21%	+202%/-23%
Source	SPE90	SPE90	SPE90	DSEP		

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

### Secondary Eclipse Parameters for KIC 002019477-01 / KOI 6093.01

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-17 \pm 5$	$4.13^{+1.65}_{-1.66}$	$1645^{+68}_{-139}$	$3973^{+799}_{-456}$	$18^{+32}_{-10}$
Alt.	$-12 \pm 5$	$3.08^{+1.49}_{-1.36}$	$1646^{+67}_{-140}$	$4094^{+1061}_{-538}$	$21^{+50}_{-12}$

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

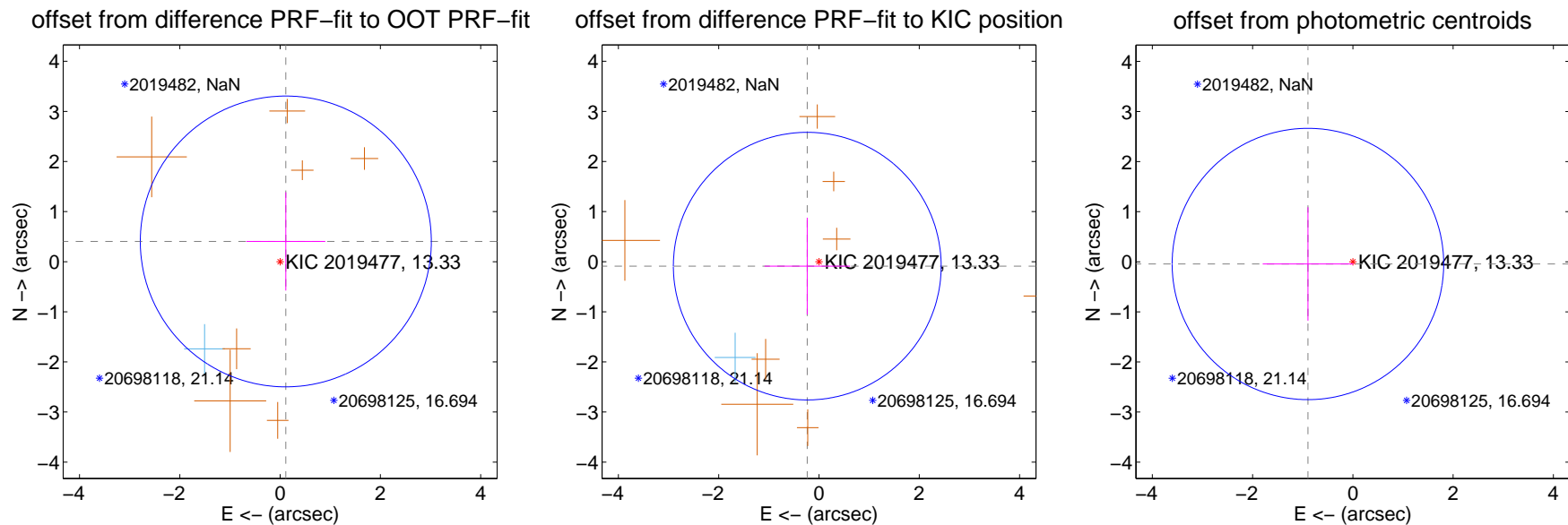
## DV Centroid Data

Supplemental centroid analysis for 002019477-01. Kepler magnitude: 13.33. Transit SNR 9.94

There are 1 quarters with good PRF difference image offsets

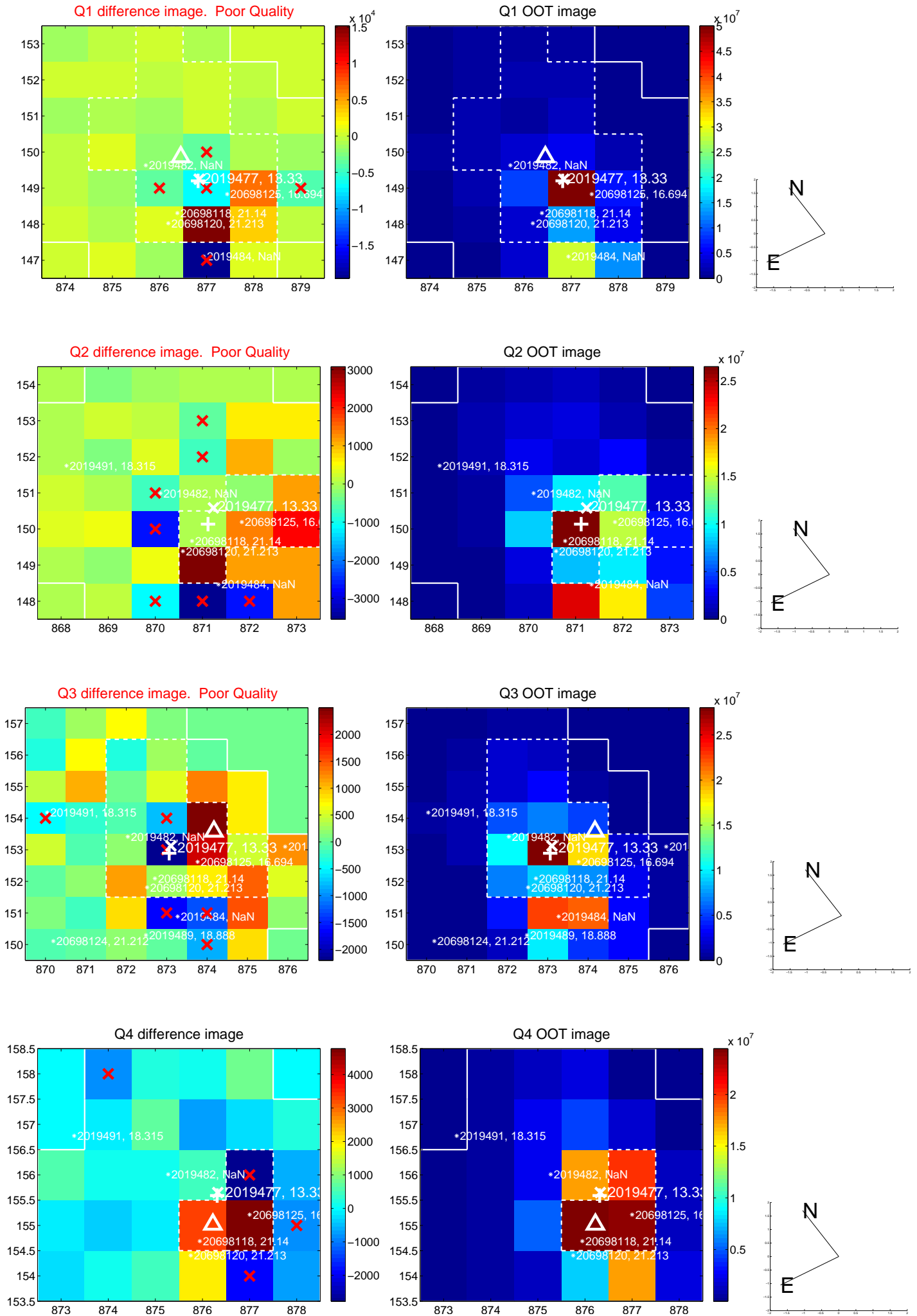
The direct PRF centroid is offset from the target star catalog position by about 0.27 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.420 \pm 0.967$	0.43	$-0.114 \pm 0.789$	$0.404 \pm 0.980$
PRF-fit source offset from KIC position	$0.250 \pm 0.890$	0.28	$0.234 \pm 0.853$	$-0.089 \pm 0.966$
photometric centroid source offset	$0.90 \pm 0.90$	0.99	$0.90 \pm 0.90$	$-0.04 \pm 1.13$

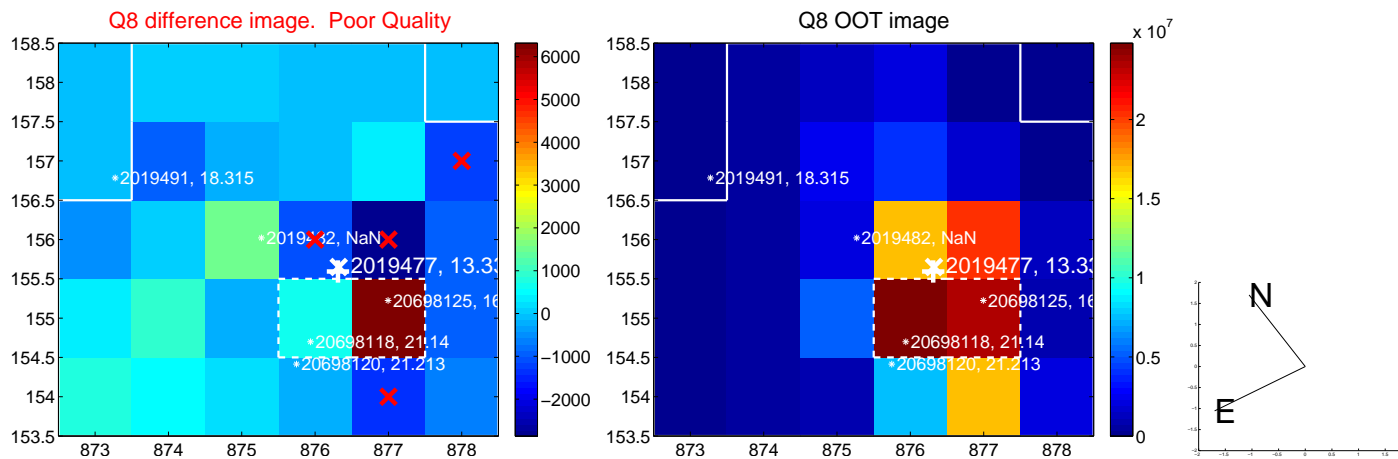
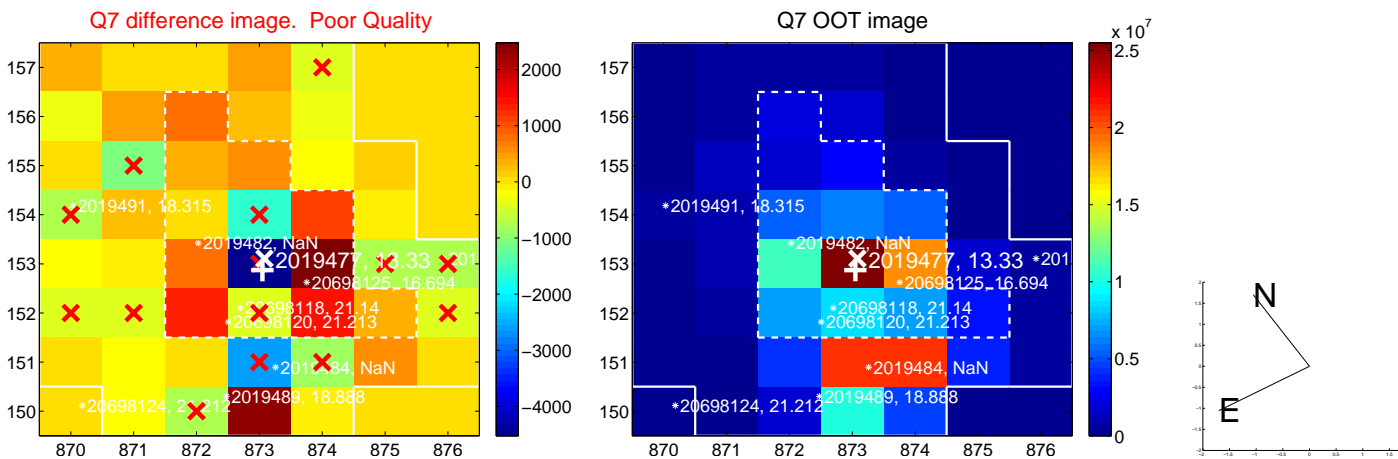
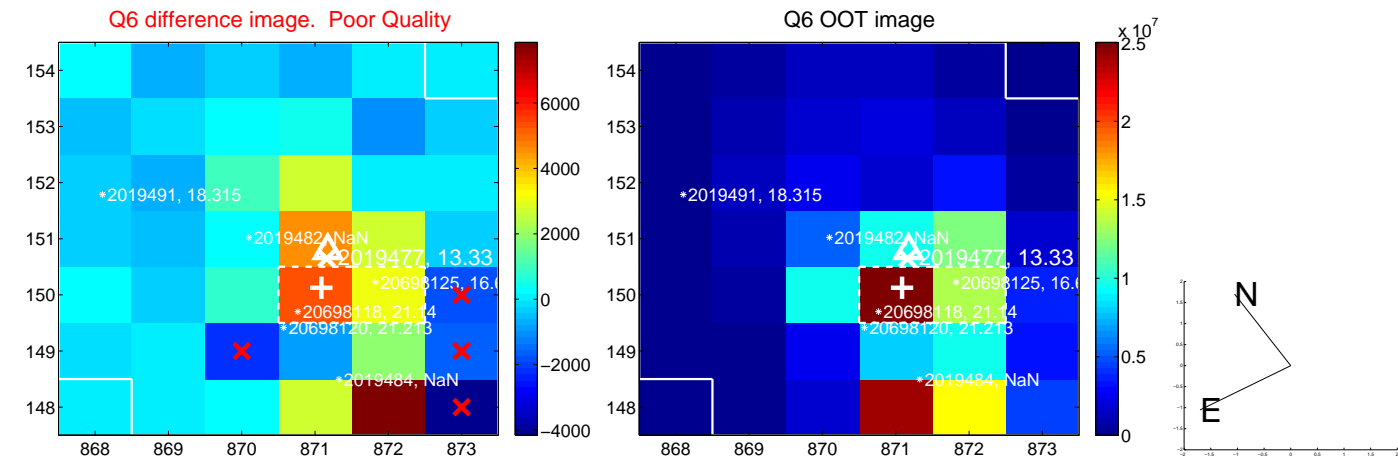
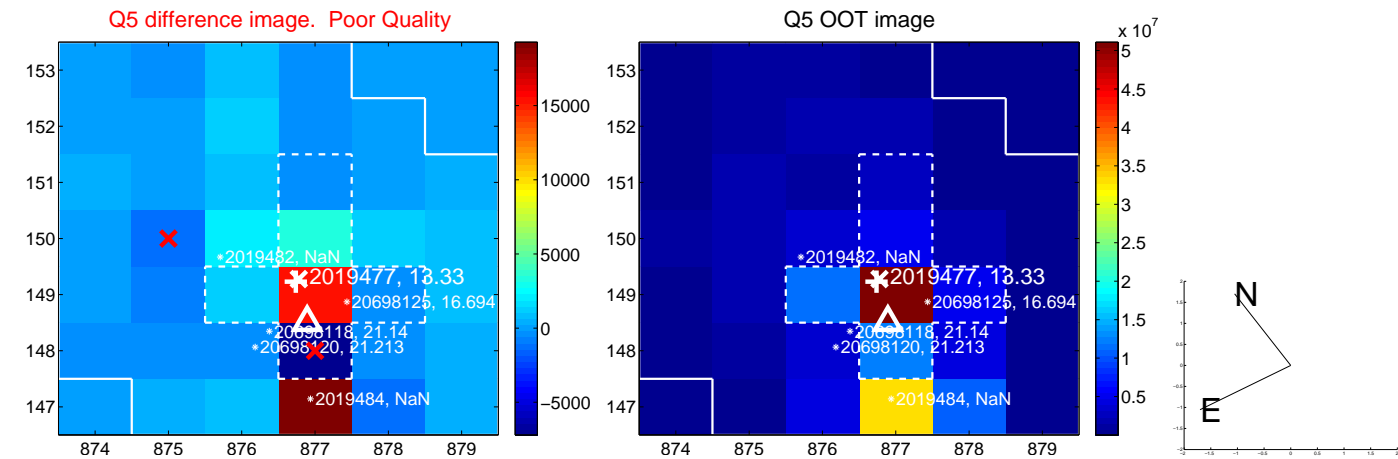


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

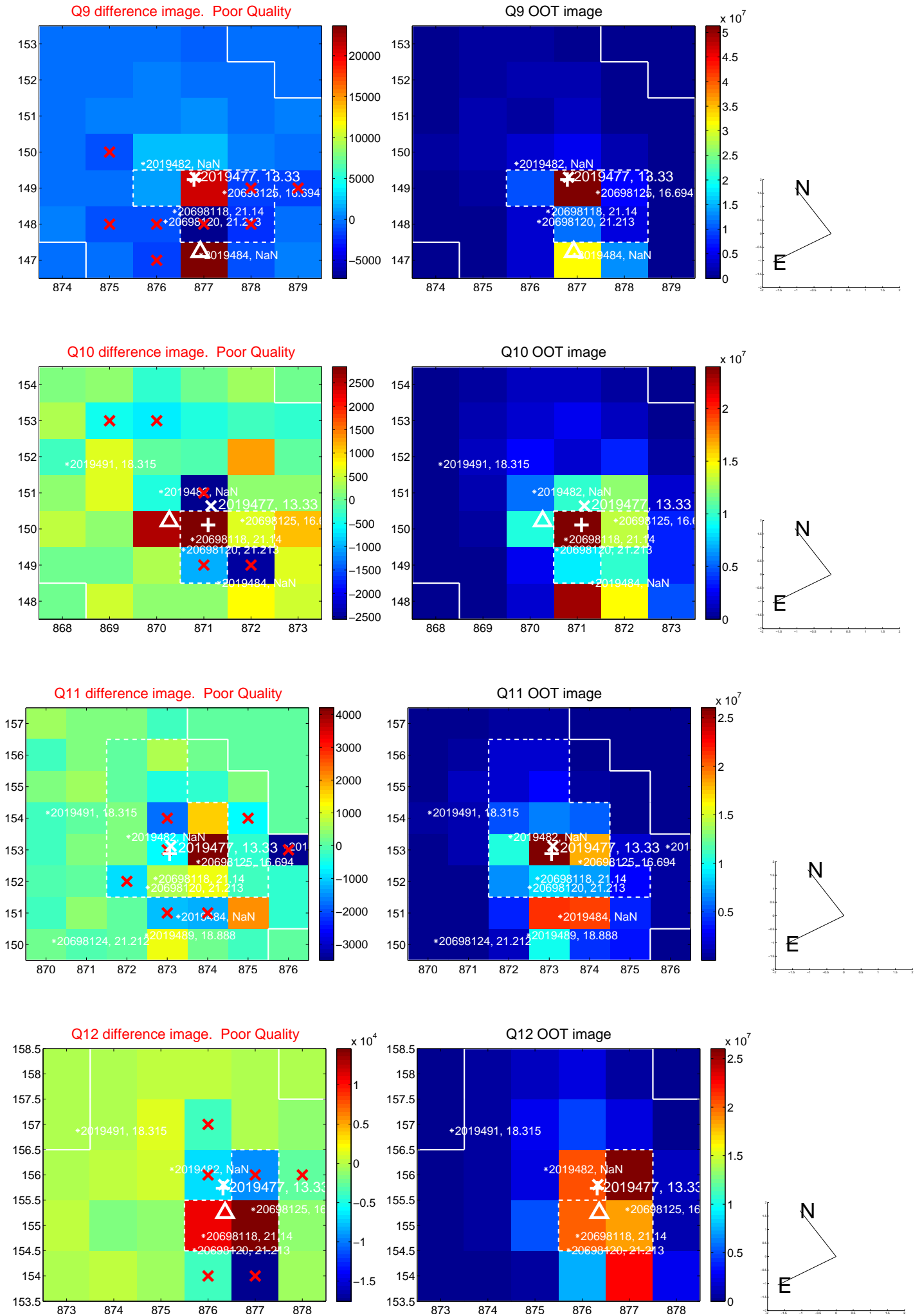


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

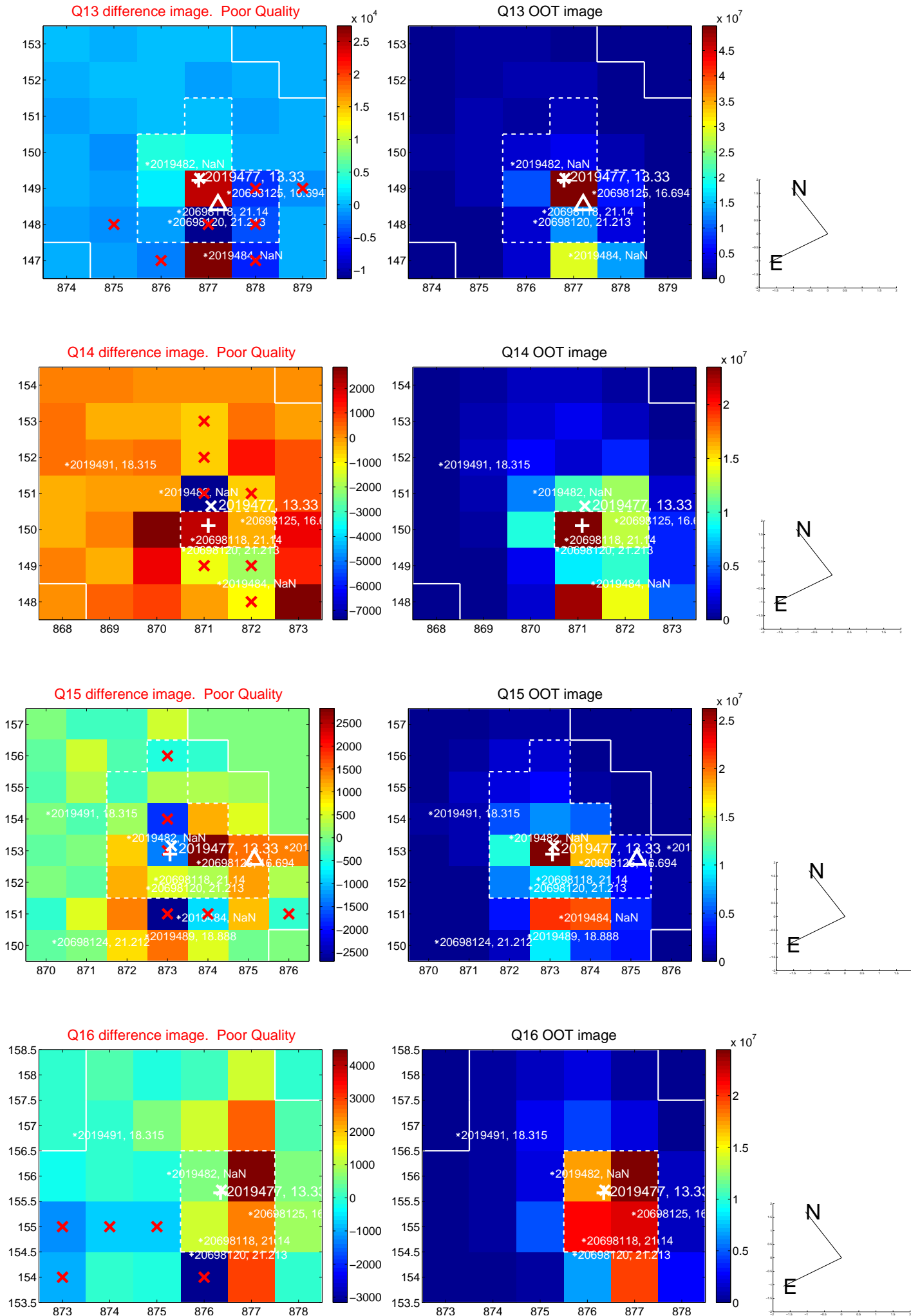




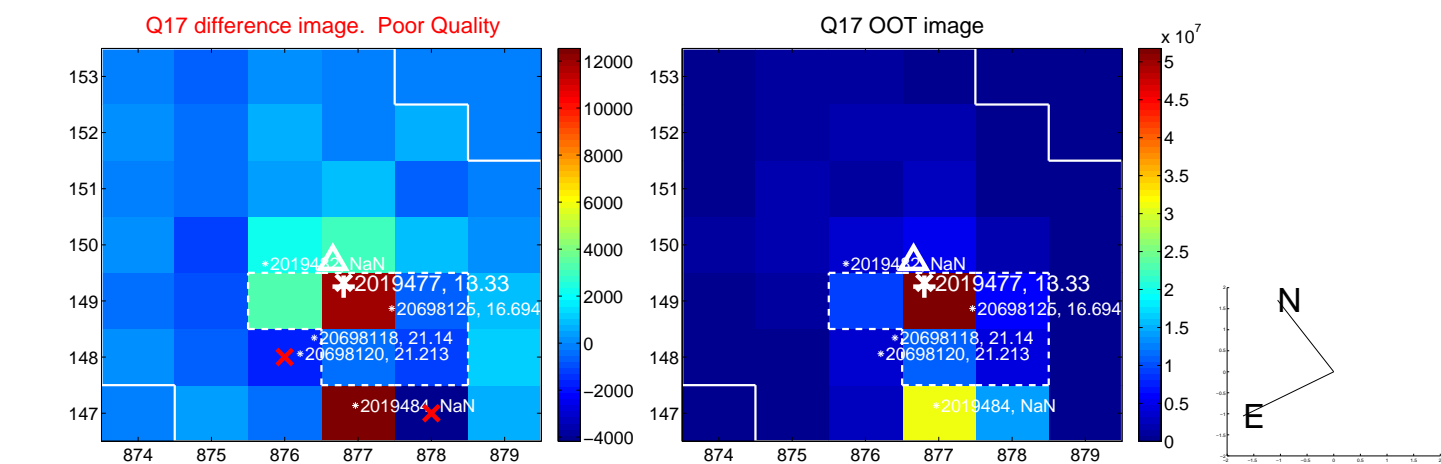
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



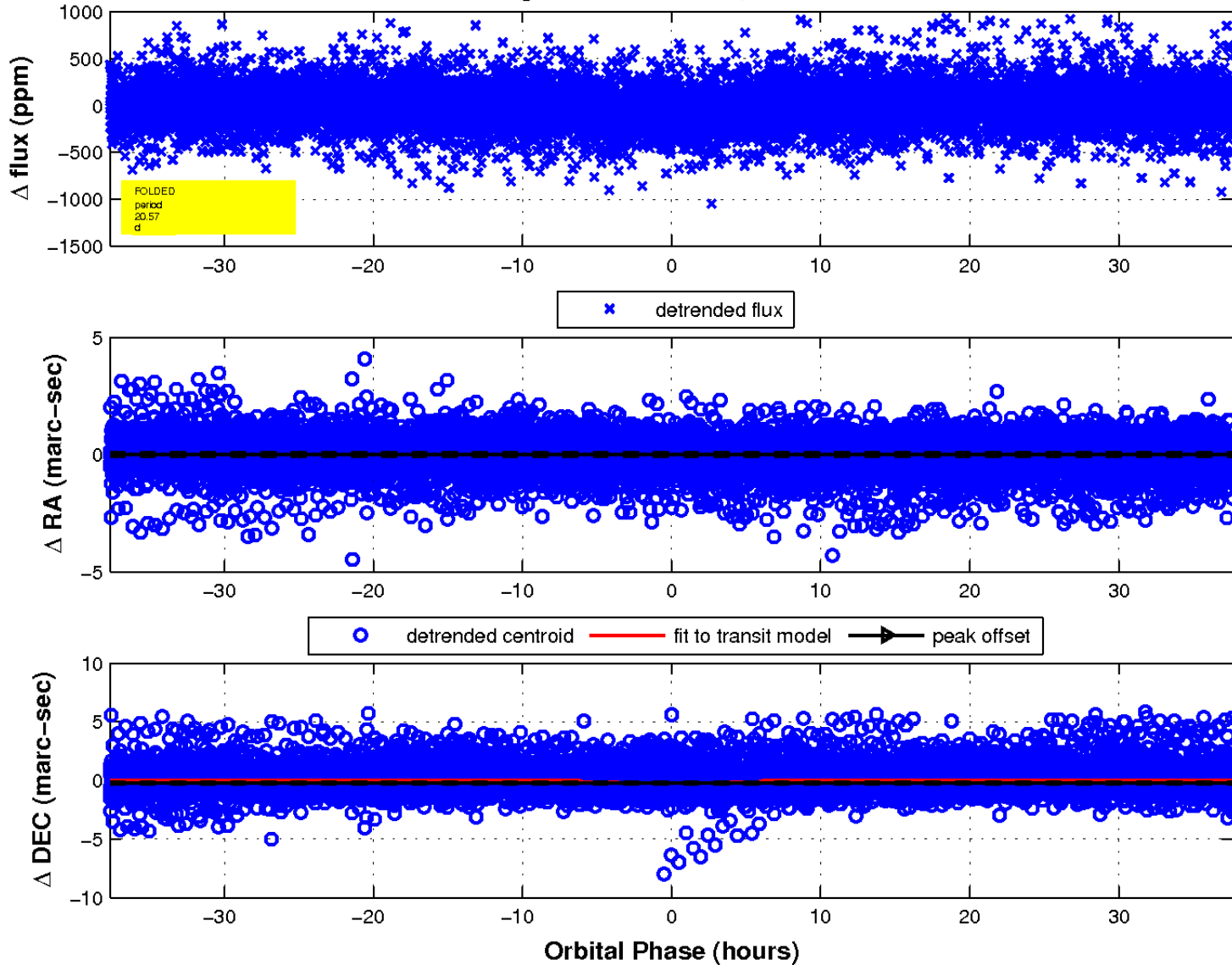
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



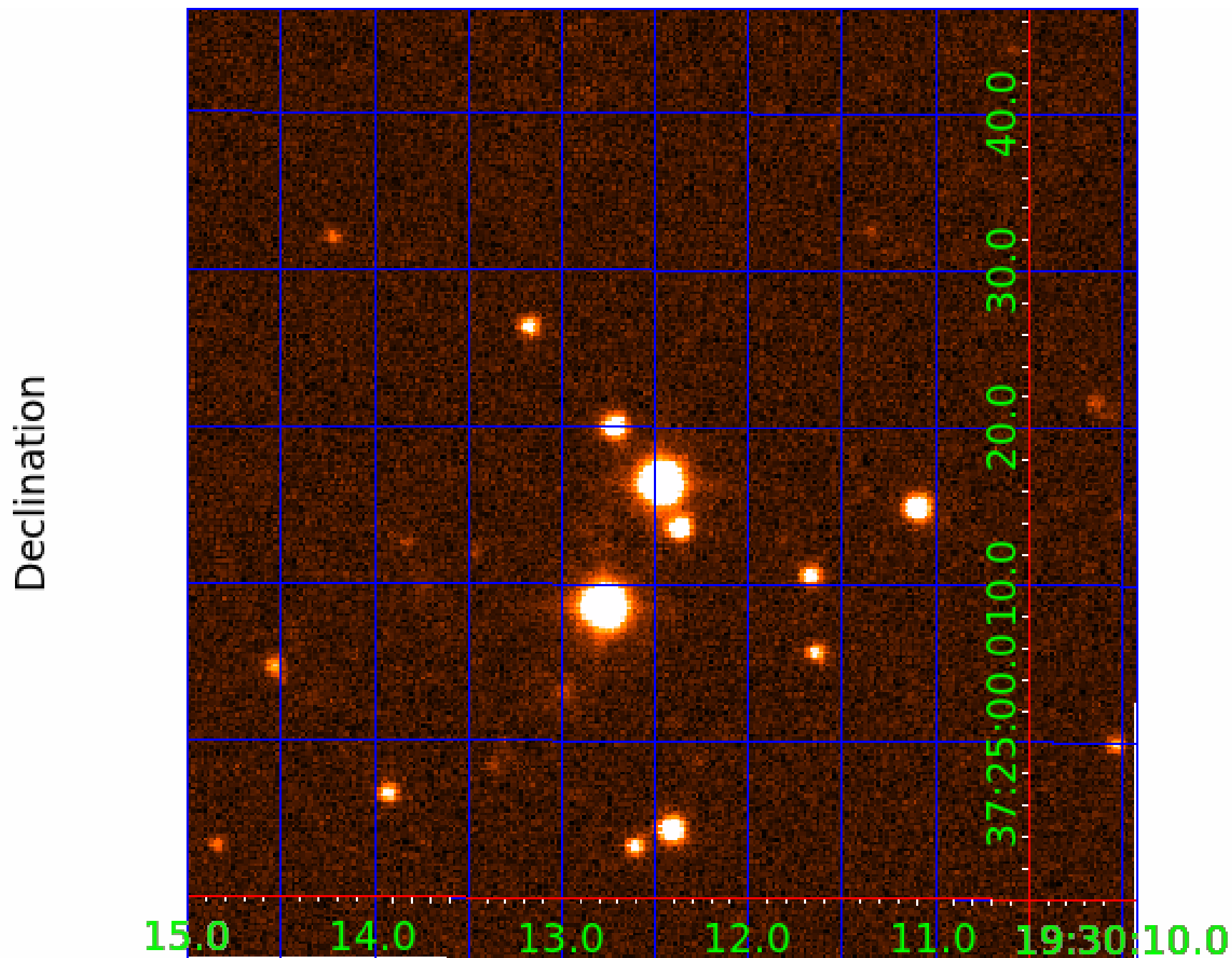
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



fluxWeightedCentroids, Planet 1 of 2



UKIRT Image





# KIC 002019477

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
002019477-01	OBS	6093.01	20.571350	149.254919	79.5	12.559	9.5	9.9	4.52	5440	4.44	485.98
002019477-02	OBS	6093.02	27.247428	131.933396	78.3	15.037	9.2	9.1	4.52	5440	4.61	334.10

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
002019477-01	OBS	FP	0.28	0	0	1	0	CENT_RESOLVED_OFFSET
002019477-02	OBS	PC	0.48	0	0	0	0	CENT_FEW_DIFFS

**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.

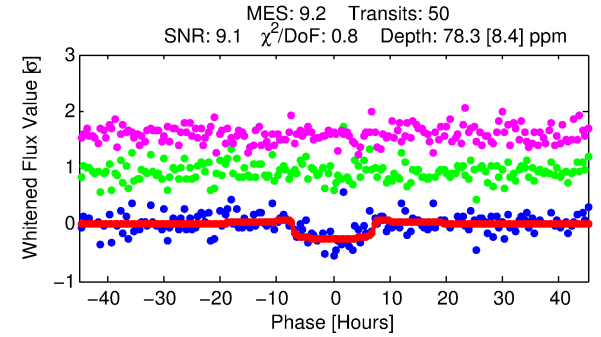
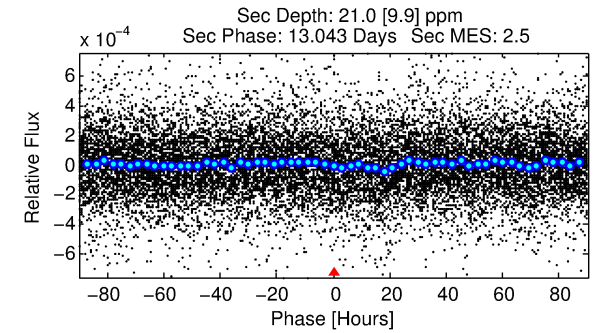
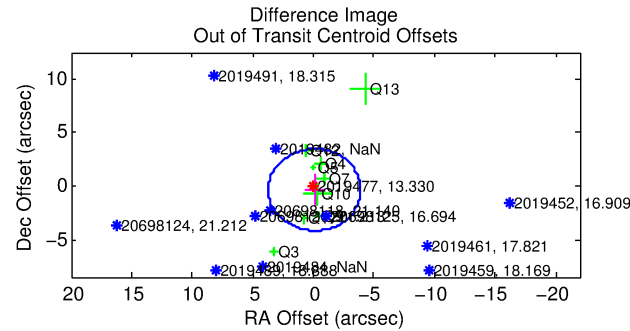
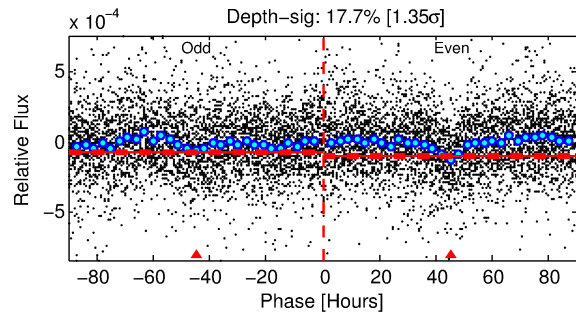
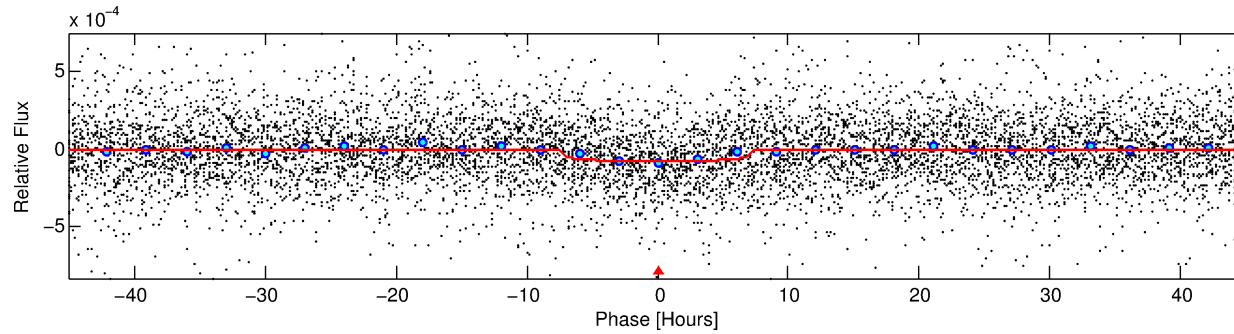
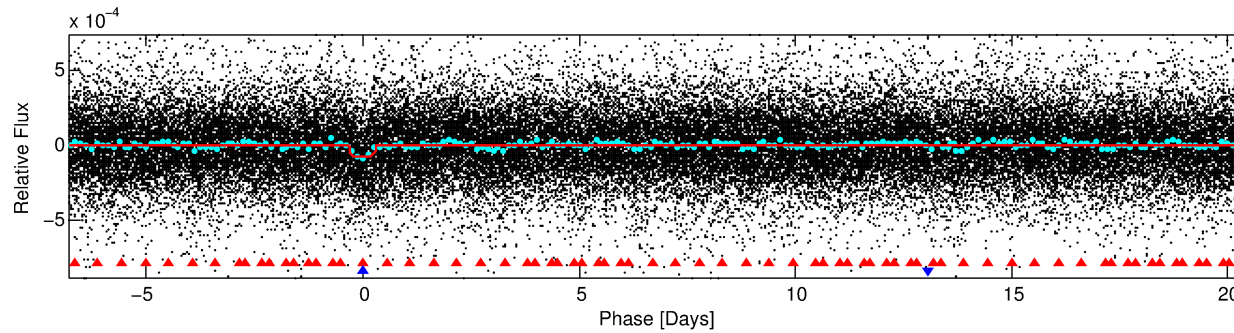
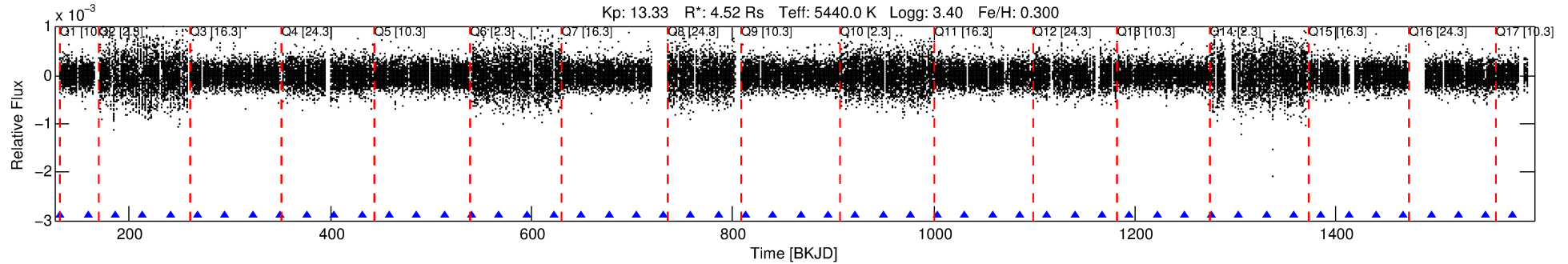
## Ephemeris Match Information For 002019477-02

No Significant Match Found

# DV One-Page Summary

KIC: 2019477 Candidate: 2 of 2 Period: 27.247 d

KOI: K06093.02 Corr: 0.828



## DV Fit Results:

Period = 27.24743 [0.00059] d  
Epoch = 131.9334 [0.0188] BKJD  
Rp/R\* = 0.0093 [0.0021]  
a/R\* = 7.59 [6.81]  
b = 0.85 [0.30]  
Seff = 334.10 [170.72]  
Teq = 1090 [139] K  
Rp = 4.61 [1.99] Re  
a = 0.2192 [0.0725] AU  
Ag = 26.13 [21.58] [1.16 $\sigma$ ]  
Teff = 3811 [624] K [4.25 $\sigma$ ]

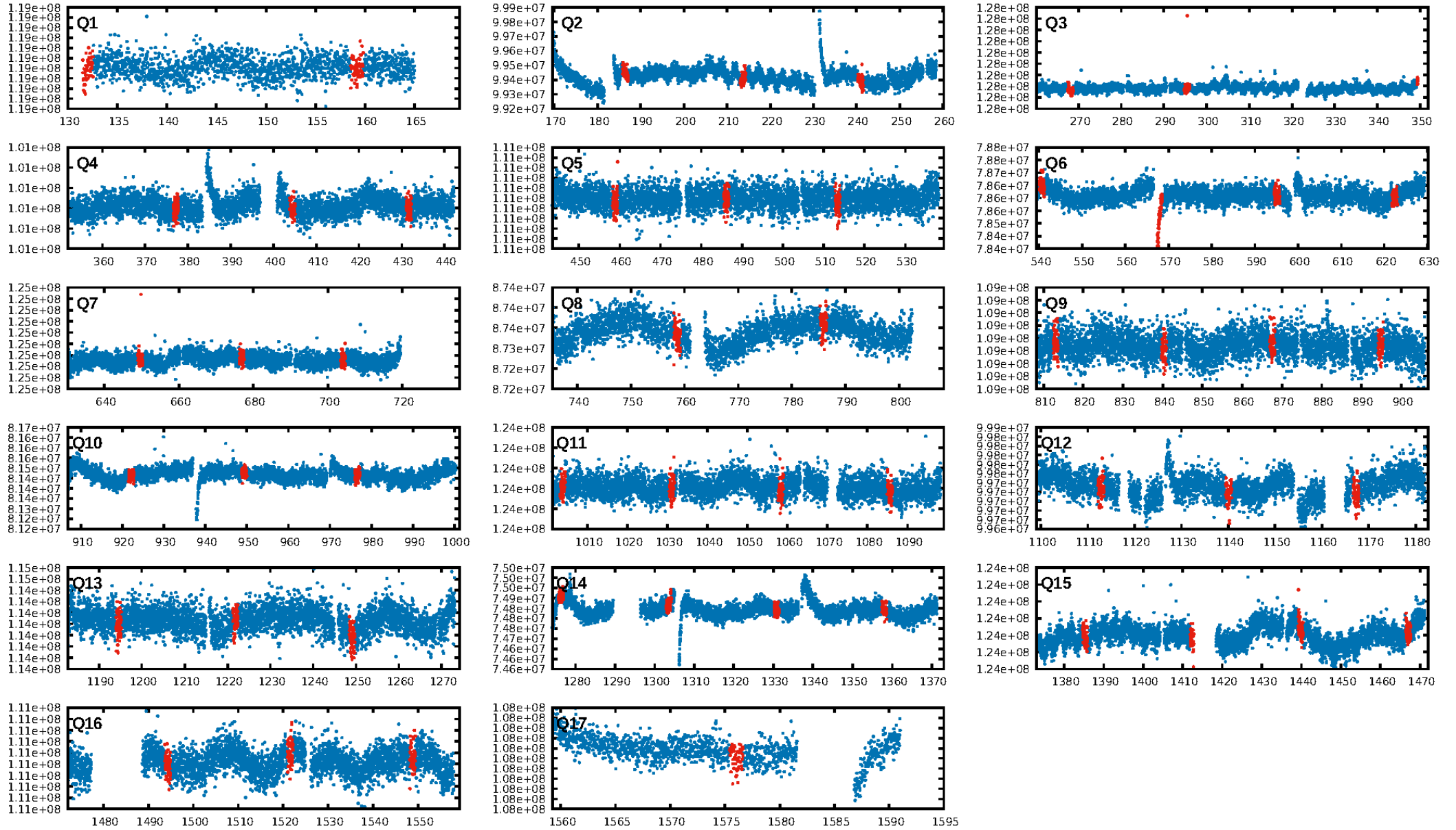
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [8.18 $\sigma$ ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 86.8%  
ModelChiSquareGof-sig: 100.0%  
Bootstrap-pfa: 1.82e-18  
RollingBand-fgt: 1.00 [47/47]  
GhostDiagnostic-chr: 4.174  
Centroid-sig: 0.1%  
Centroid-so: 5.266 arcsec [4.14 $\sigma$ ]  
OotOffset-rm: 0.367 arcsec [0.29 $\sigma$ ]  
KicOffset-rm: 0.627 arcsec [0.38 $\sigma$ ]  
OotOffset-st: 1/2/2/4 [9]  
KicOffset-st: 1/2/2/4 [9]  
DiffImageQuality-fgm: 0.00 [0/9]  
DiffImageOverlap-fno: 1.00 [17/17]

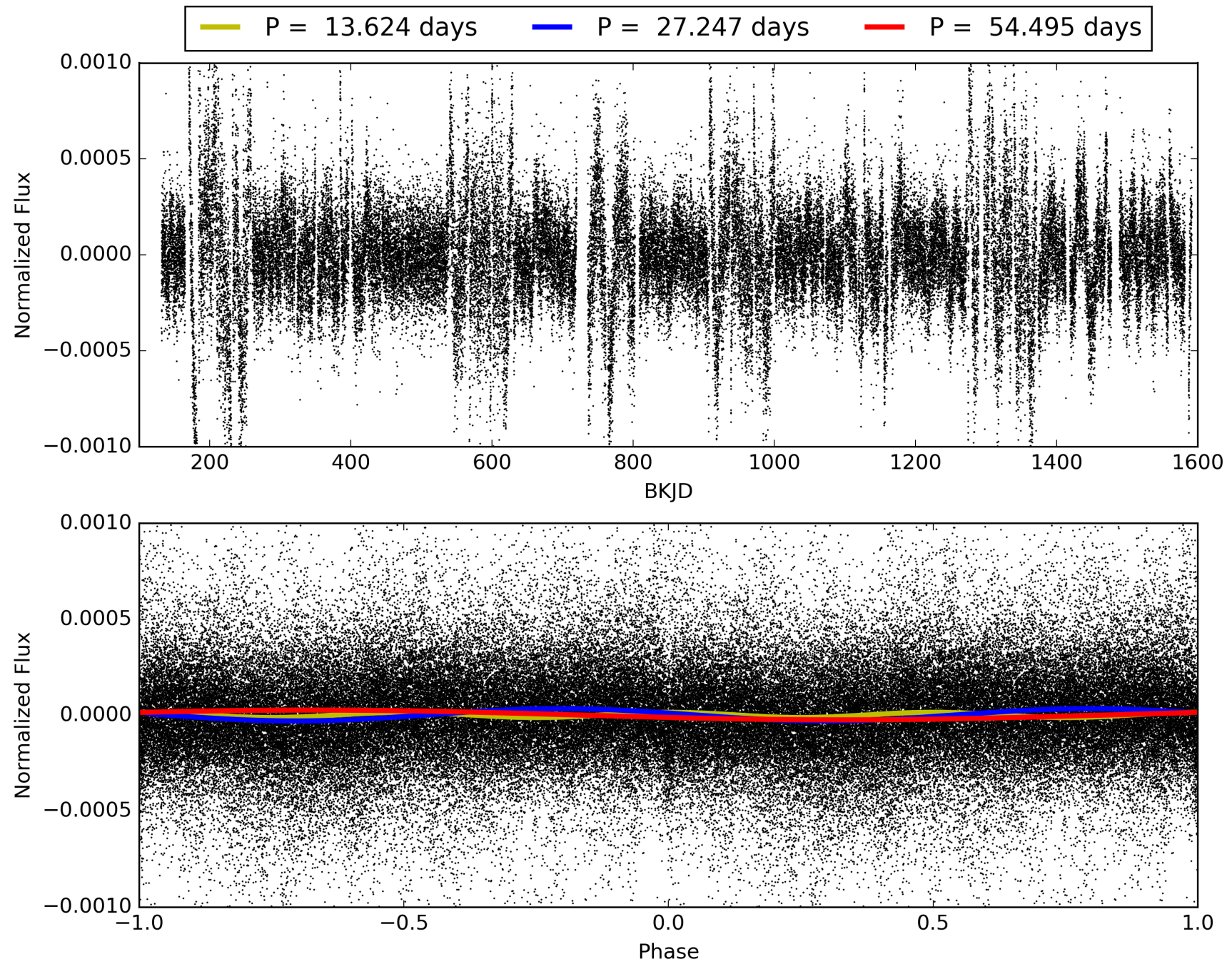
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 30-Jan-2016 01:46:52 Z

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

# TCE 002019477-02, PDC Light Curves



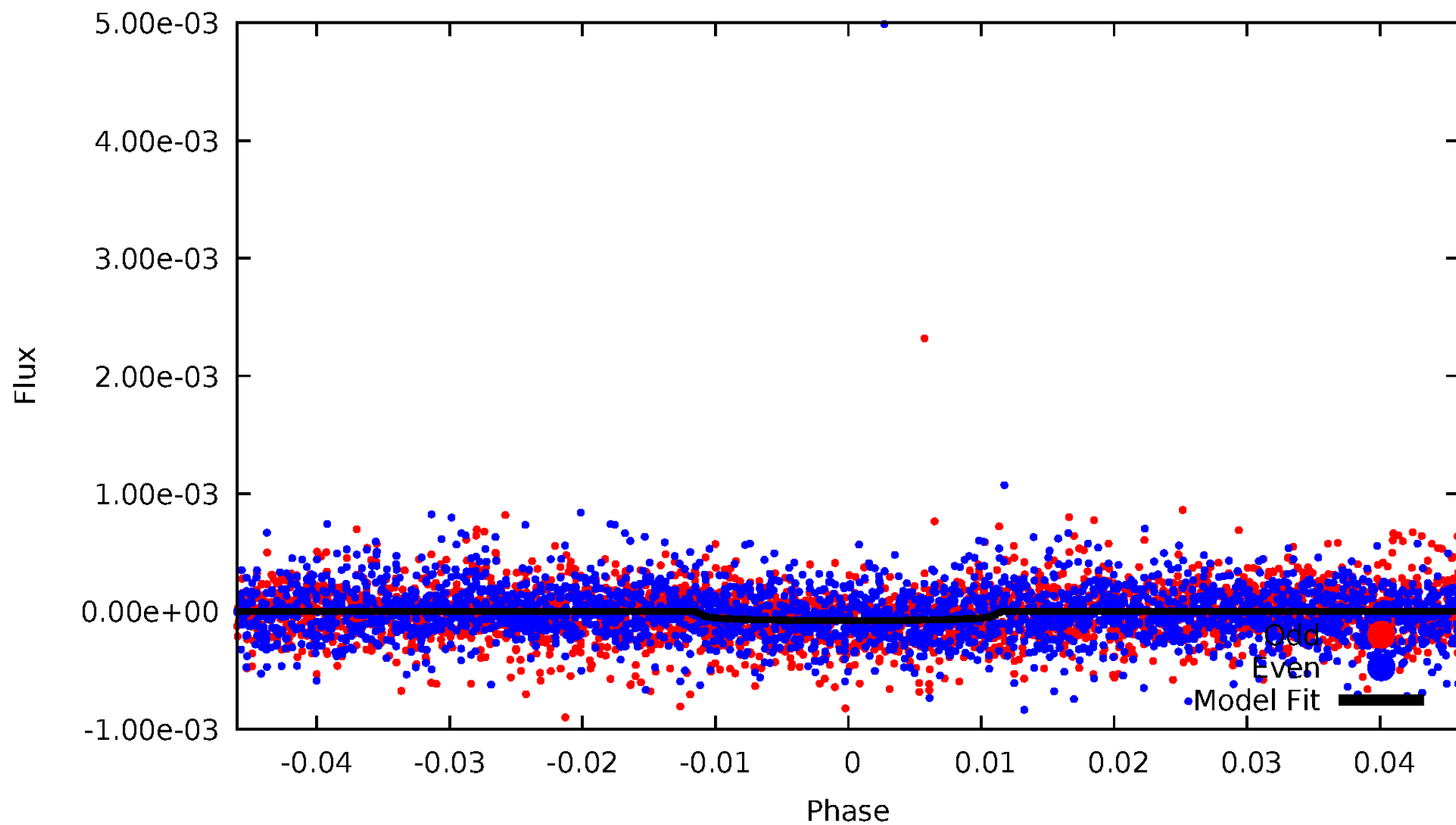
TCE 002019477-02





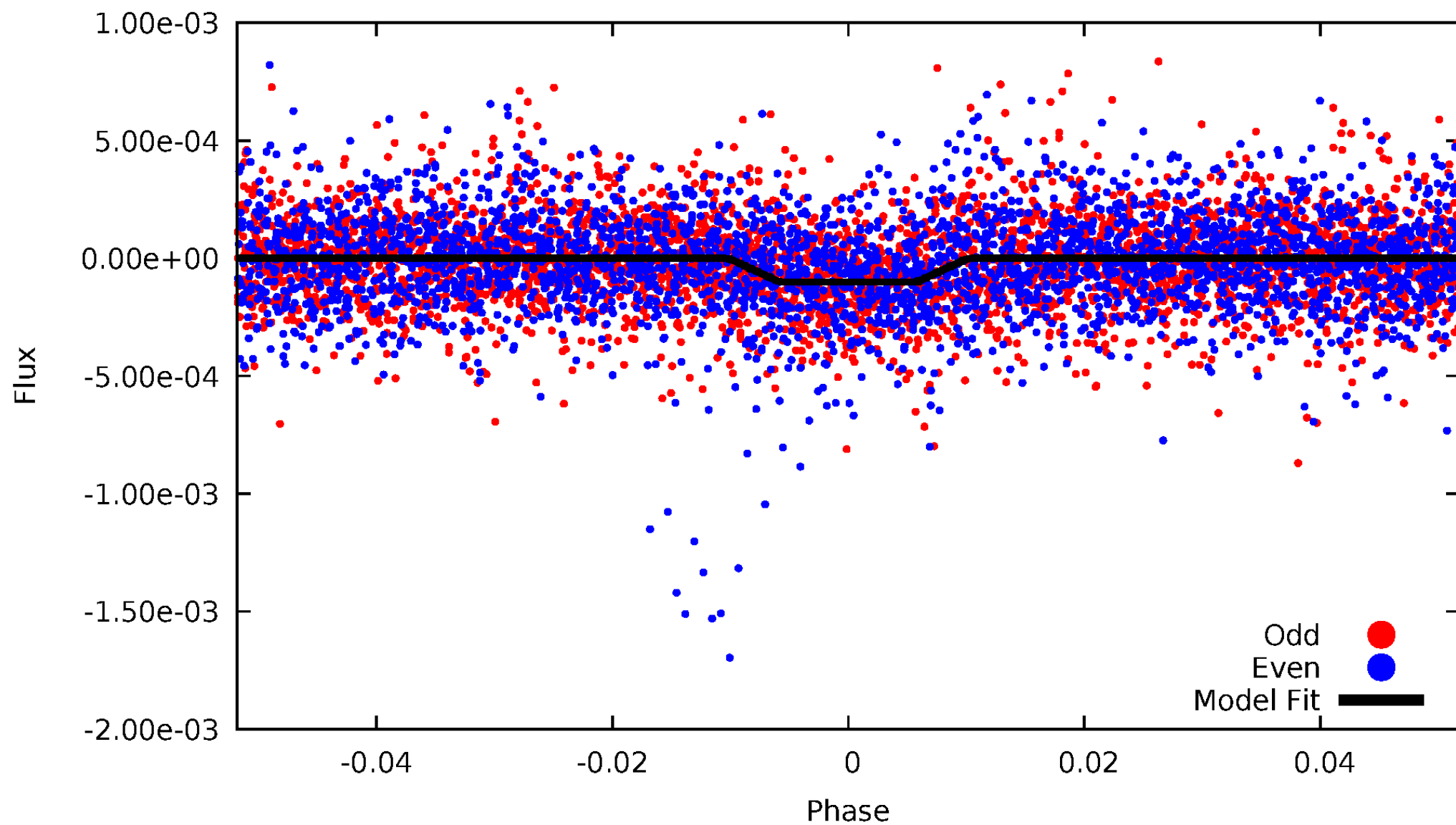
# DV Odd/Even

TCE 002019477-02



# ALT Odd/Even

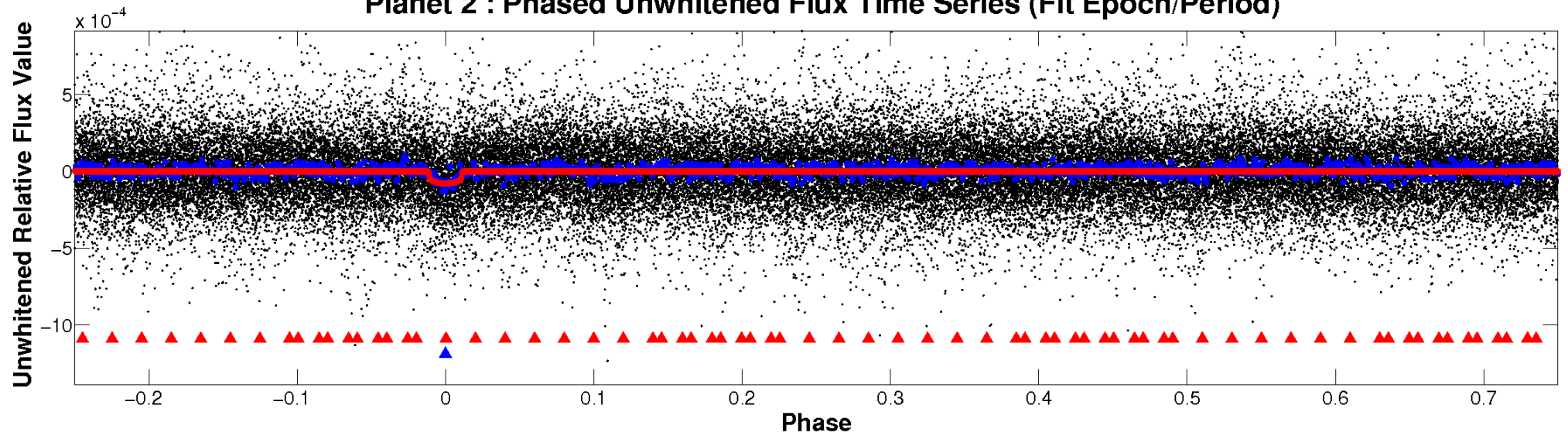
TCE 002019477-02



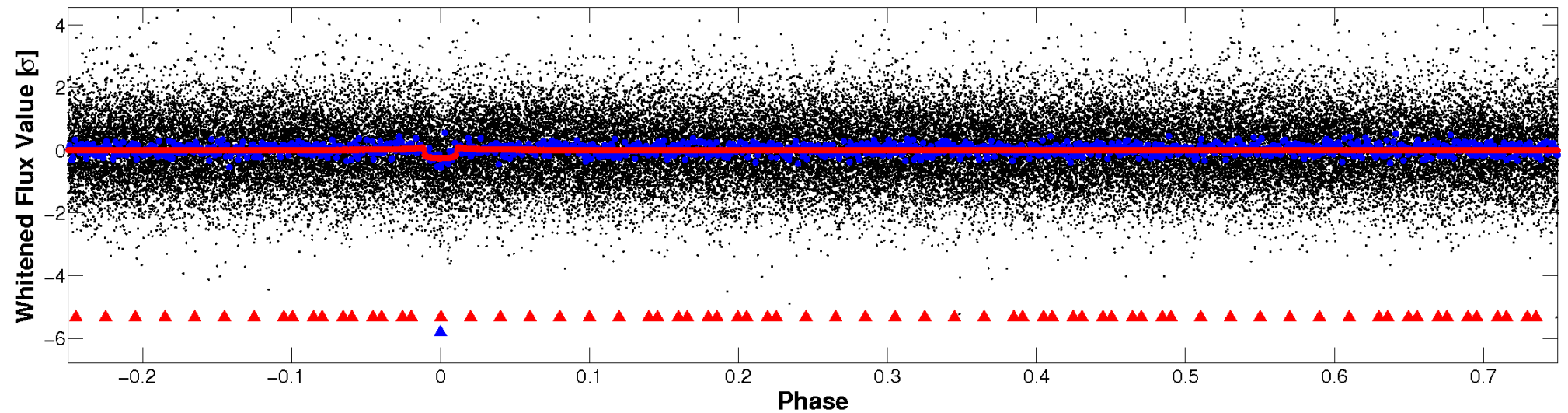


# Non-Whitened Vs. Whitened Light Curve

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

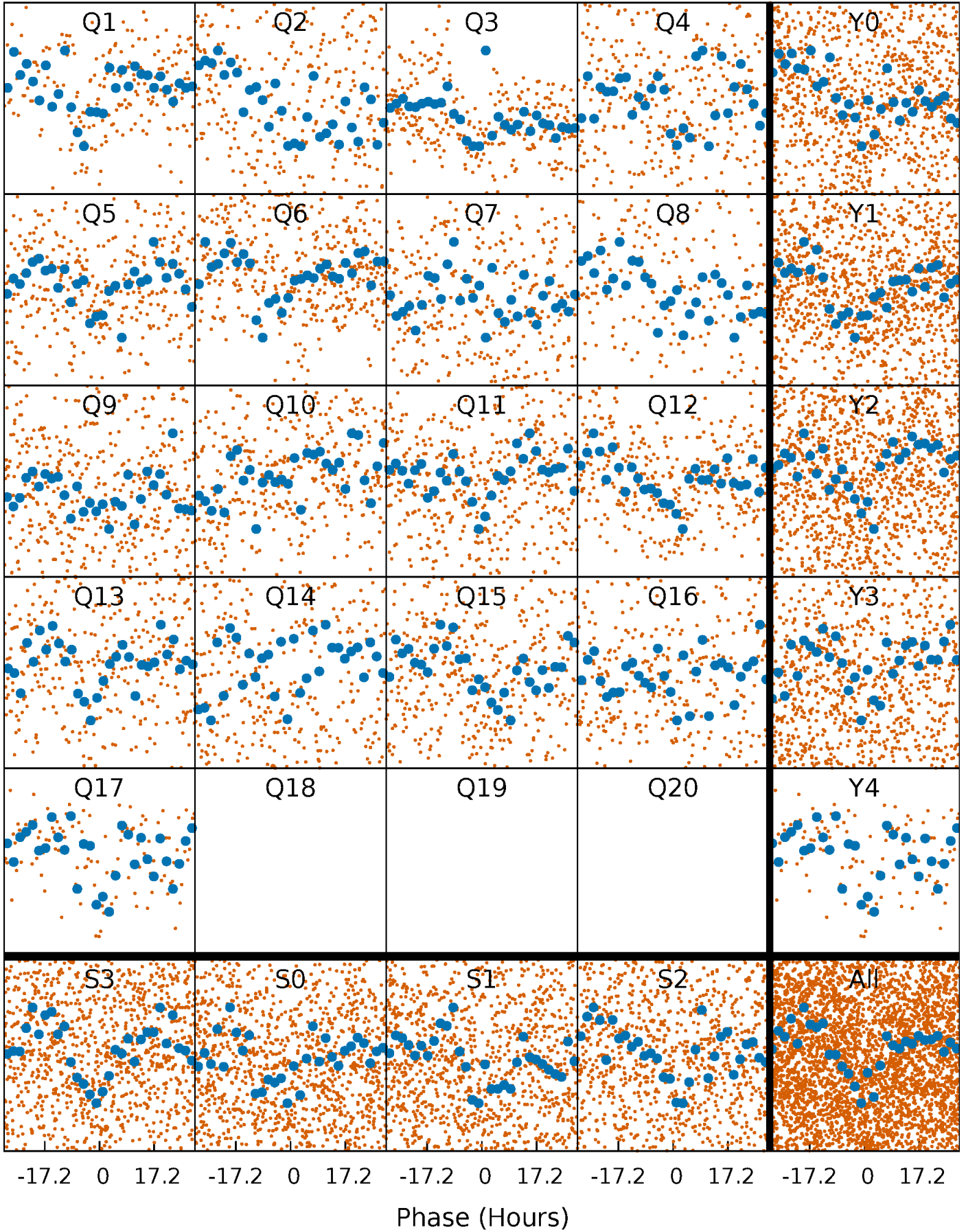


## Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)



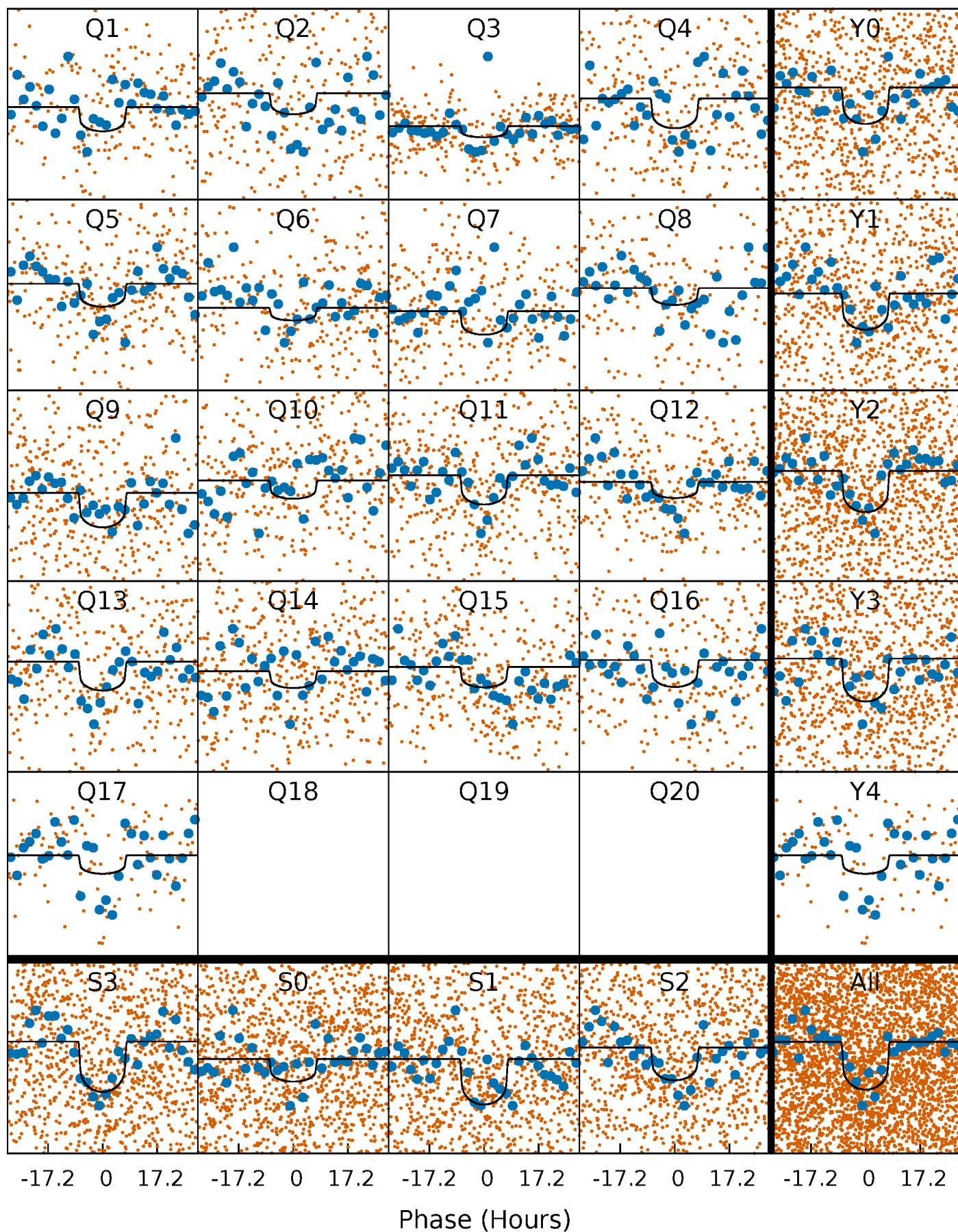
# PDC Quarter-Phased Transit Curves

TCE 002019477-02     $P = 27.247428$  Days     $T_0 = 131.933396$  (BKJD)



# DV Quarter-Phased Transit Curves

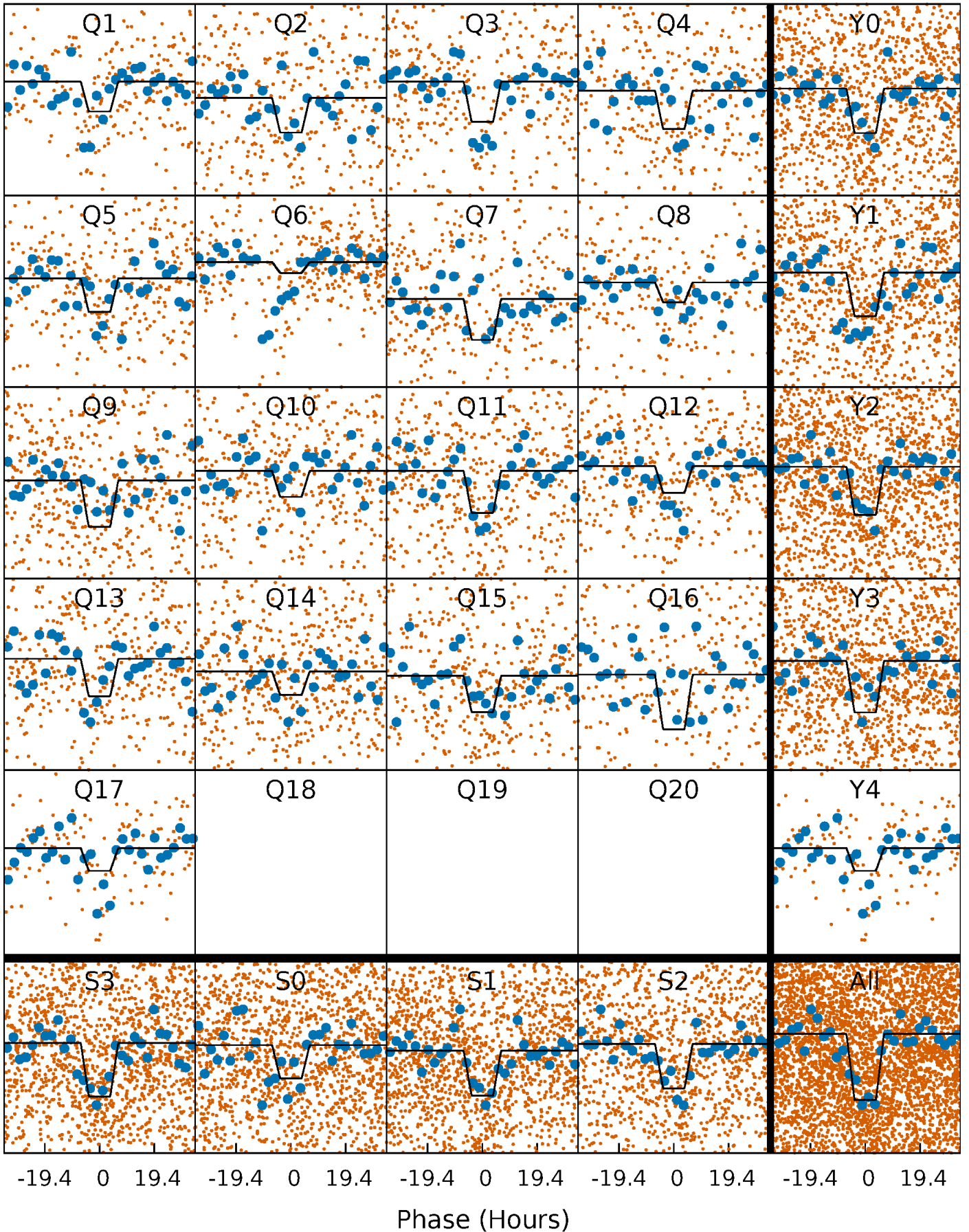
TCE 002019477-02 P= 27.247428 Days  $T_0=131.933396$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

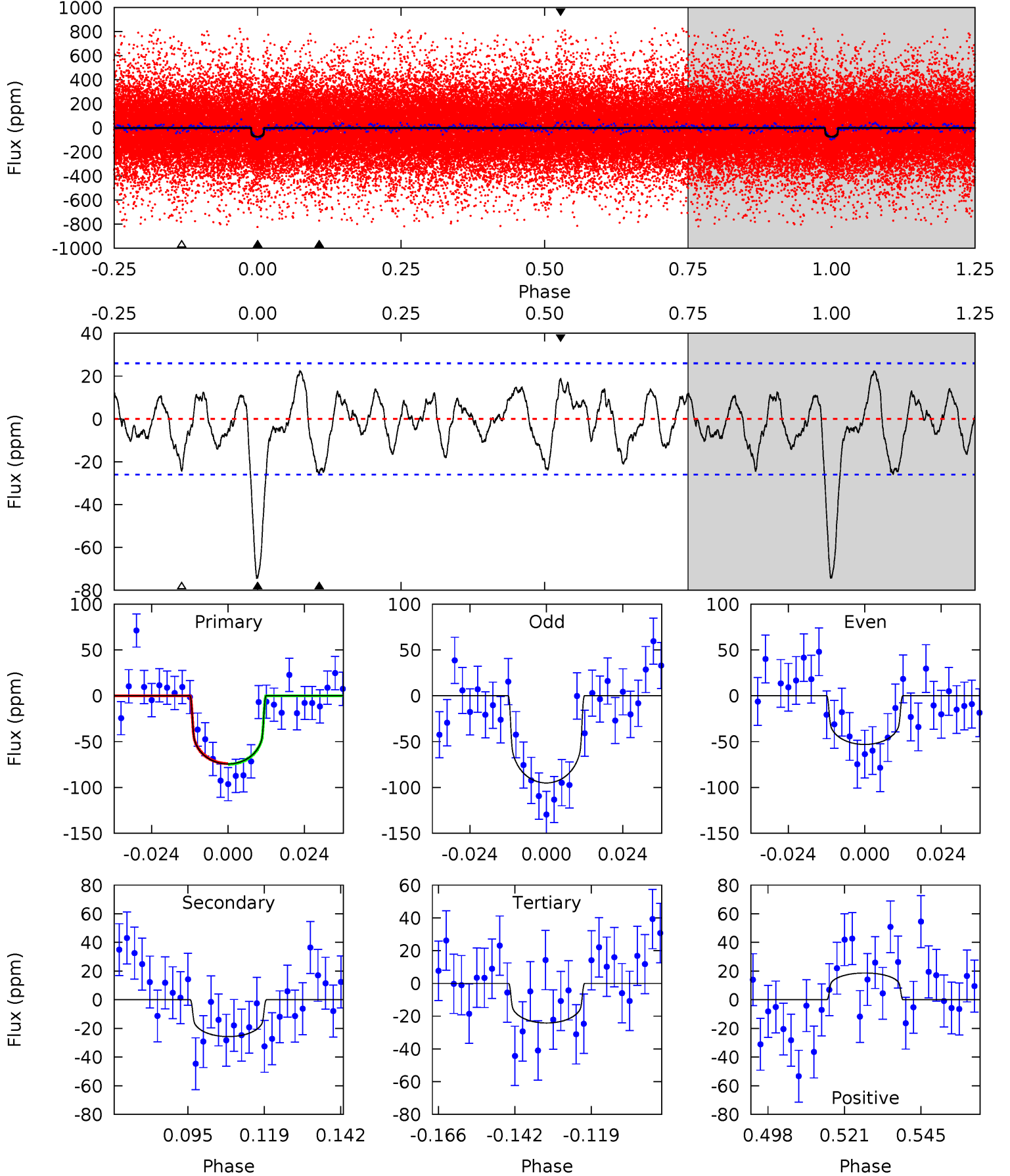
TCE 002019477-02 P= 27.248382 Days  $T_0=131.888254$  (BKJD)



# DV Model-Shift Uniqueness Test

002019477-02, P = 27.247428 Days, E = 104.685968 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
13.9	4.81	4.52	3.49	4.86	2.26	1.74	9.38	10.4	0.29	1.32	3.93	0.87	0.23	0.07

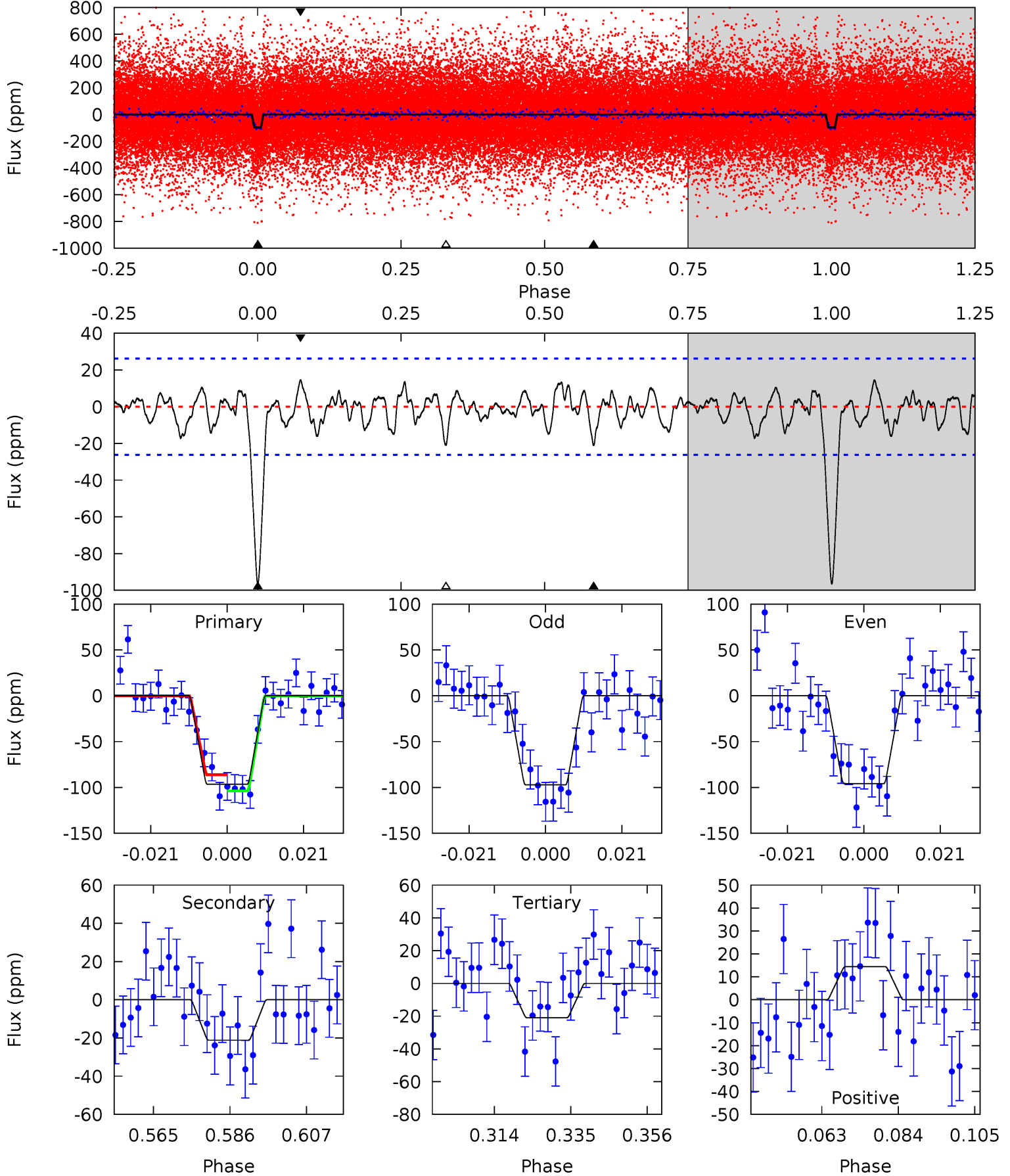




# Alt Model-Shift Uniqueness Test

002019477-02, P = 27.248382 Days, E = 104.639872 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
18.0	3.94	3.91	2.69	4.88	2.31	1.23	14.1	15.3	0.03	1.25	0.14	0.96	0.13	1.66



### Stellar Parameters For KIC 002019477

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M$ ( $M_{\odot}$ )	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5440^{+87}_{-76}$	$3.404^{+0.289}_{-0.051}$	$0.300^{+0.150}_{-0.150}$	$4.524^{+0.416}_{-1.665}$	$1.894^{+0.142}_{-0.398}$	$0.029^{+0.058}_{-0.007}$
	+2%/-1%	+8%/-1%	+50%/-50%	+9%/-37%	+7%/-21%	+202%/-23%
Source	SPE90	SPE90	SPE90	DSEP		

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

### Secondary Eclipse Parameters for KIC 002019477-02 / KOI 6093.02

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-26 \pm 5$	$4.32^{+1.24}_{-1.11}$	$1502^{+59}_{-128}$	$4217^{+456}_{-349}$	$36^{+30}_{-15}$
Alt.	$-21 \pm 5$	$4.62^{+1.31}_{-1.09}$	$1497^{+57}_{-117}$	$3956^{+411}_{-300}$	$25^{+20}_{-10}$

$T_{\text{max}}$  = Theoretical Maximum Planetary Temperature

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

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

If a secondary eclipse is present, the system is likely an EB if  $T_{\text{obs}} \gg T_{\text{max}}$  AND  $A_{\text{obs}} \gg 1.0$

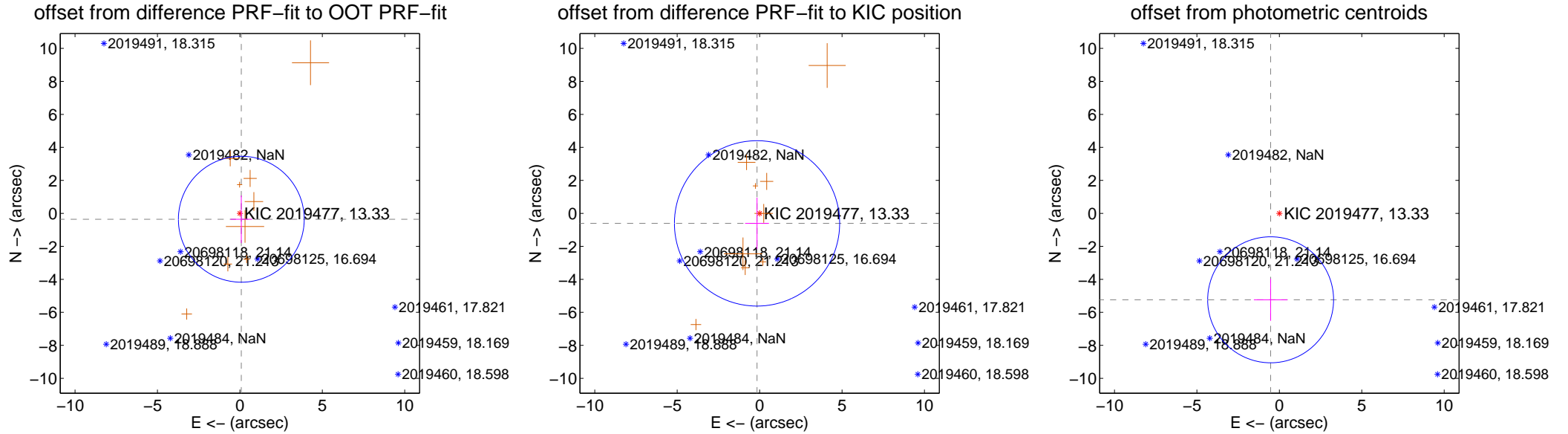
## DV Centroid Data

Supplemental centroid analysis for 002019477-02. Kepler magnitude: 13.33. Transit SNR 9.07

There are 0 quarters with good PRF difference image offsets

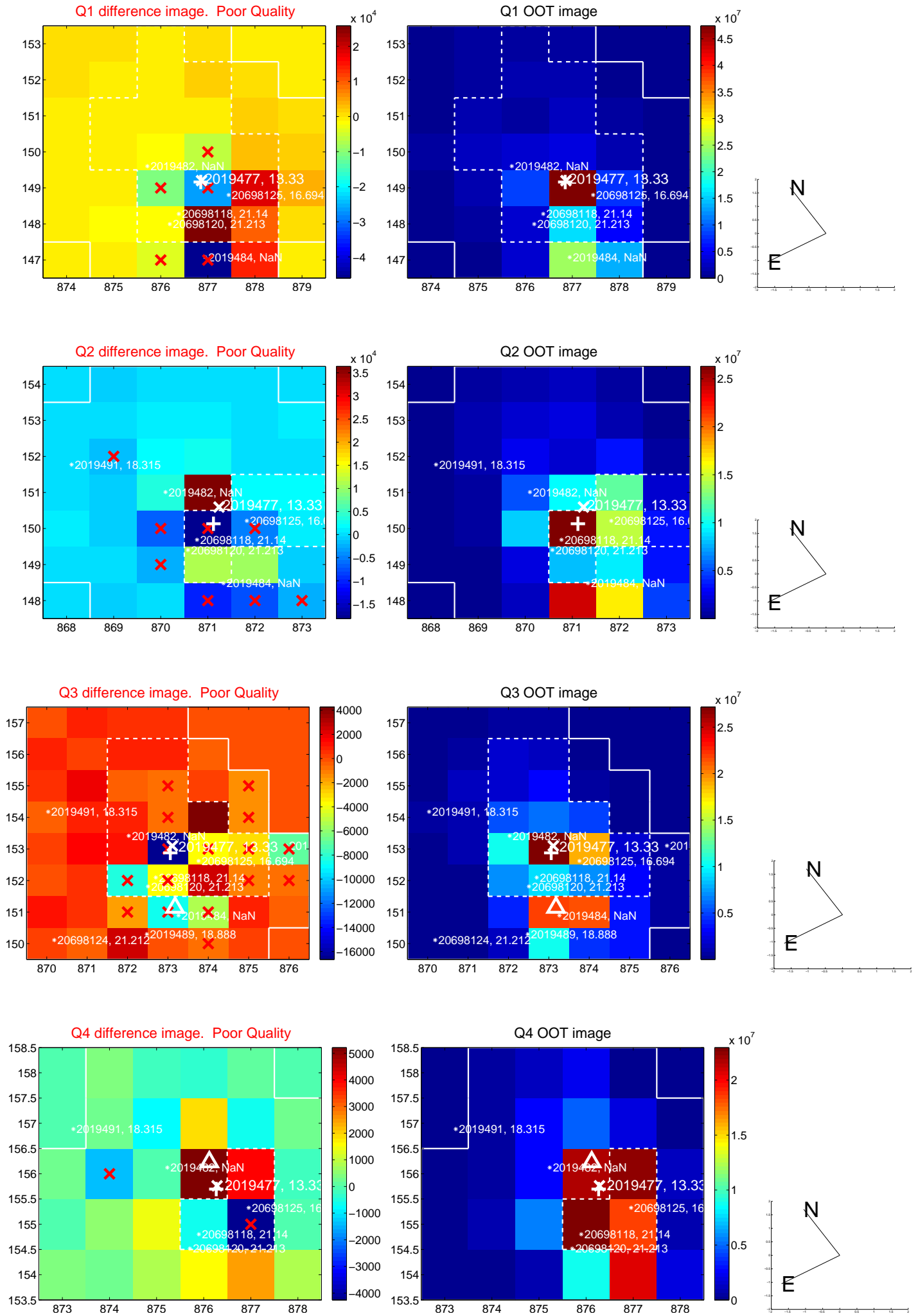
The direct PRF centroid is offset from the target star catalog position by about 0.26 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.367 \pm 1.272$	0.29	$-0.086 \pm 0.656$	$-0.357 \pm 1.440$
PRF-fit source offset from KIC position	$0.627 \pm 1.671$	0.38	$0.157 \pm 0.724$	$-0.607 \pm 1.562$
photometric centroid source offset	$5.27 \pm 1.27$	4.14	$0.53 \pm 1.02$	$-5.24 \pm 1.28$

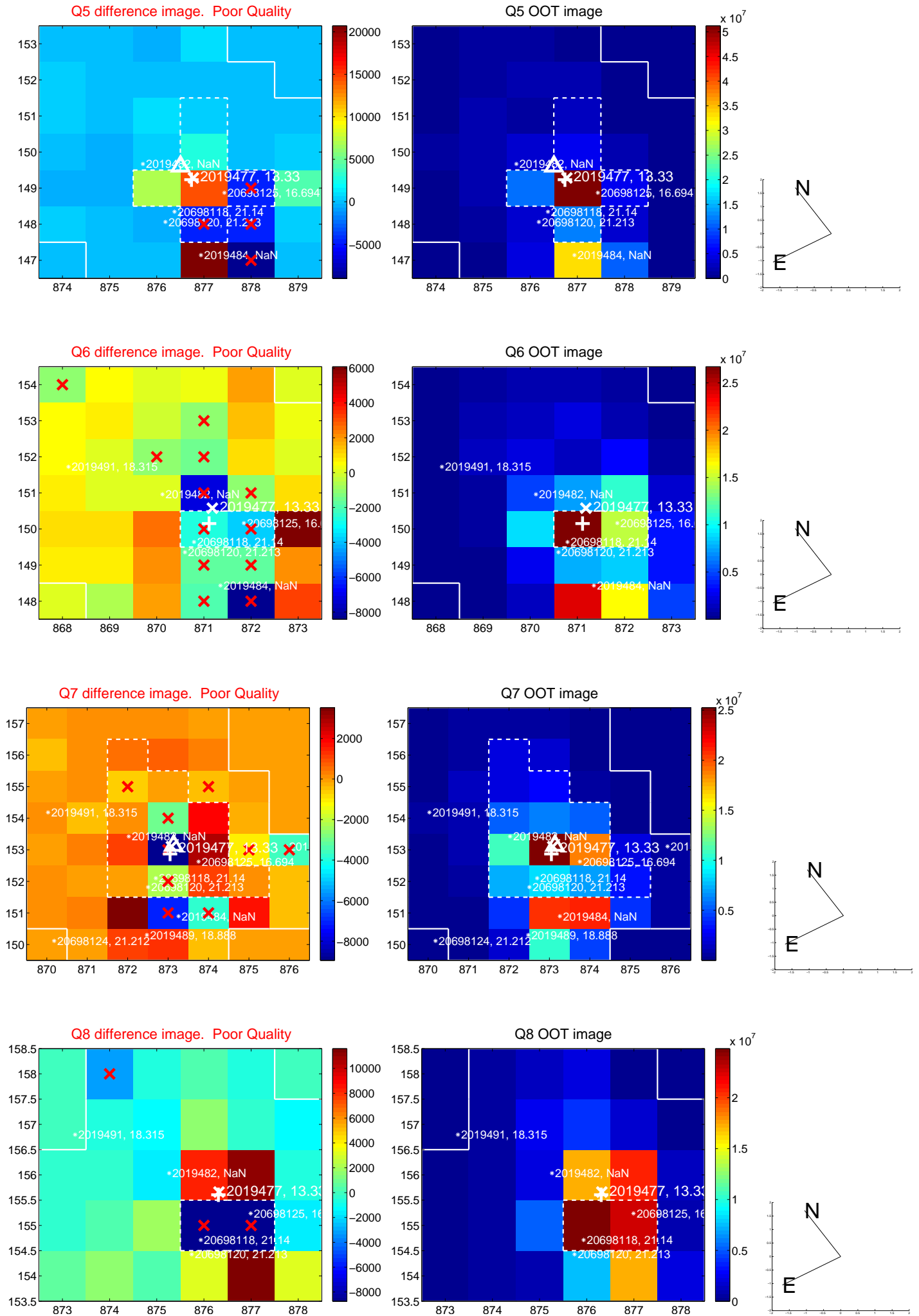


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

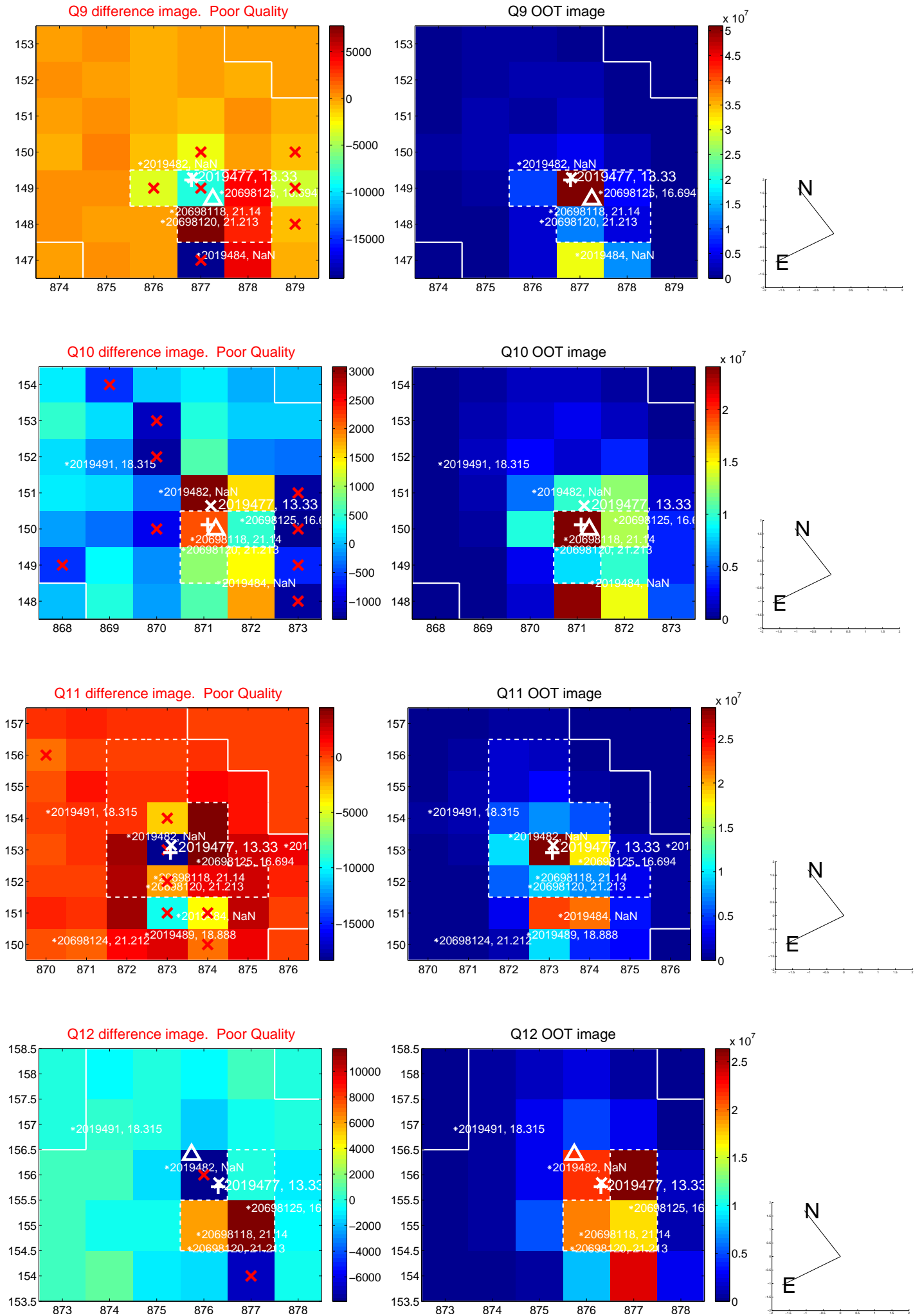


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

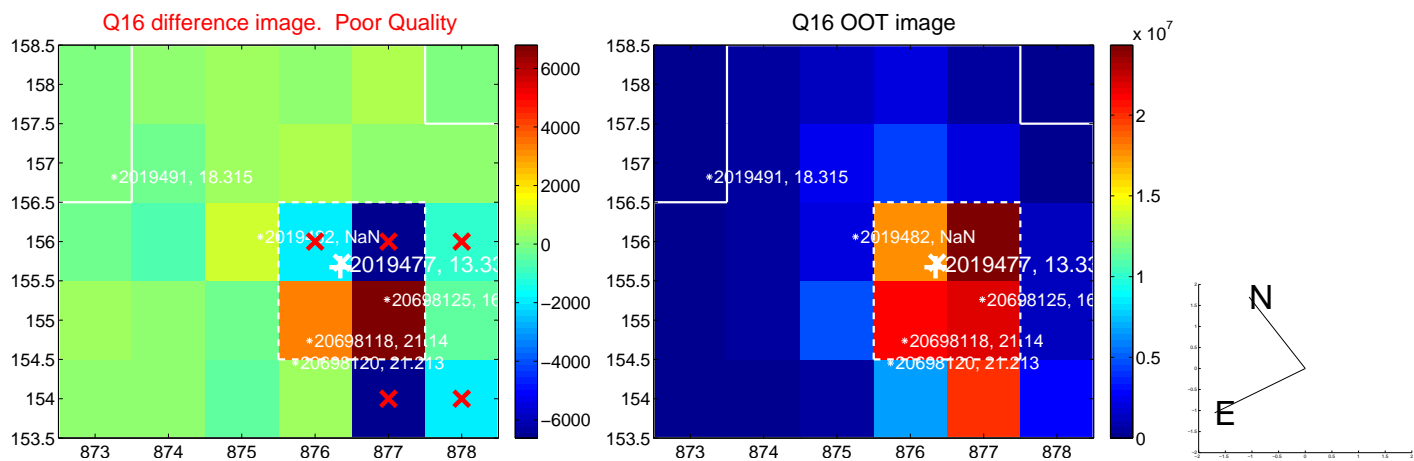
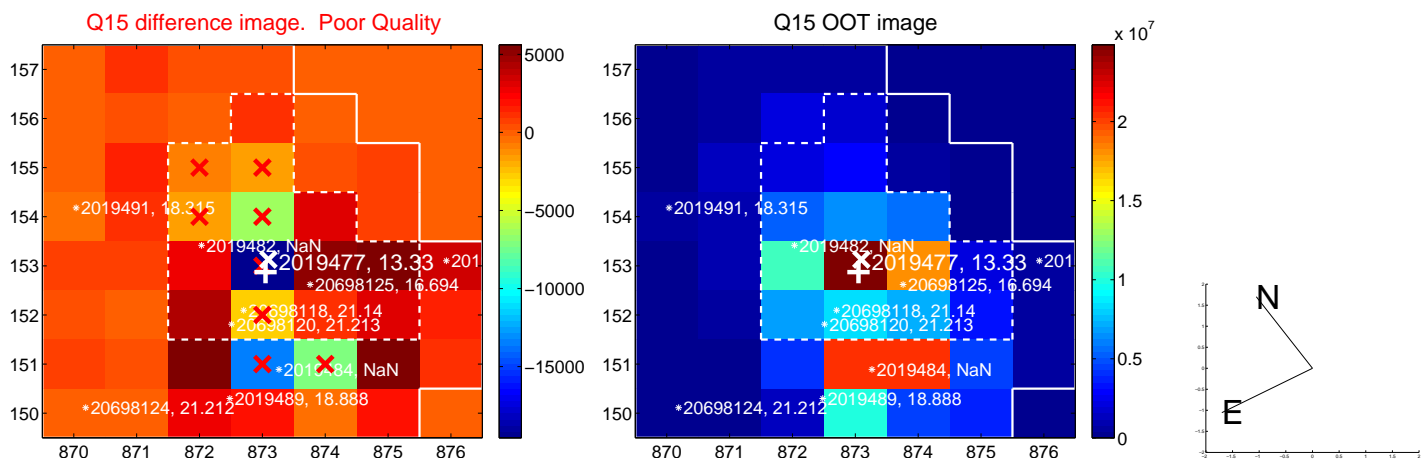
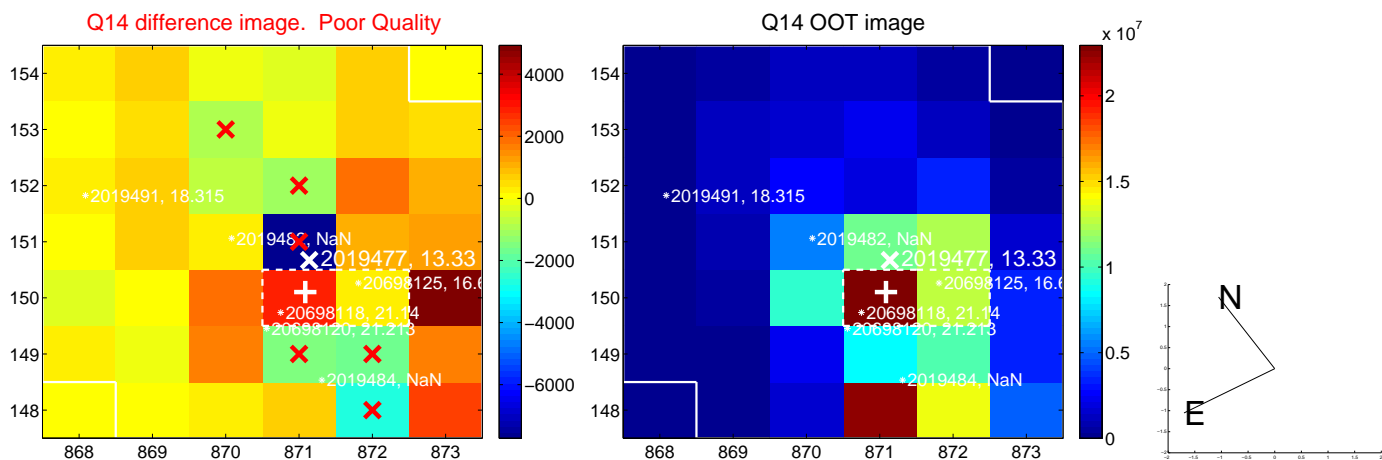
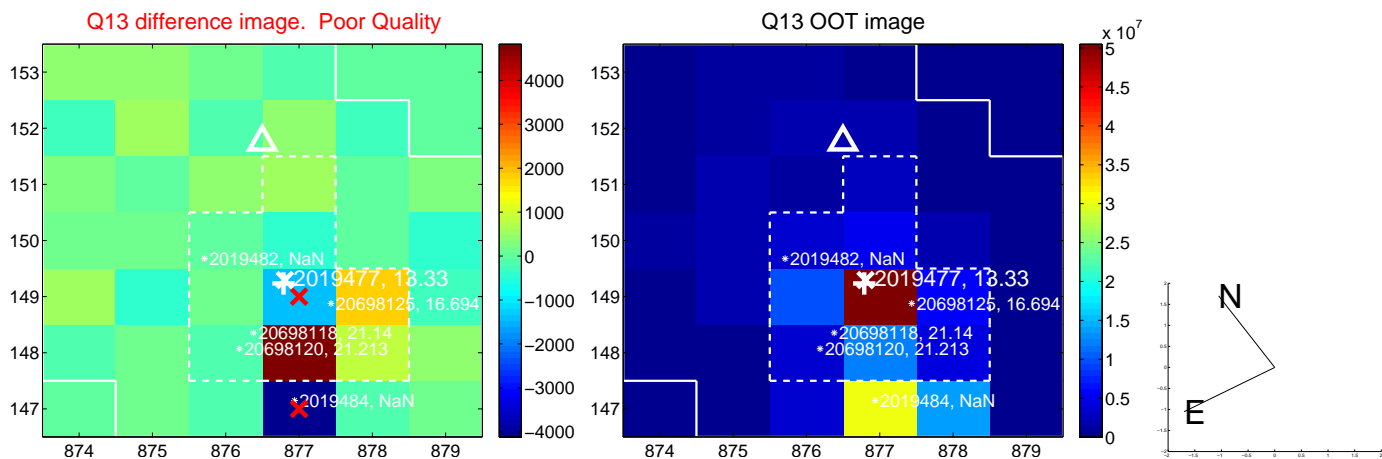




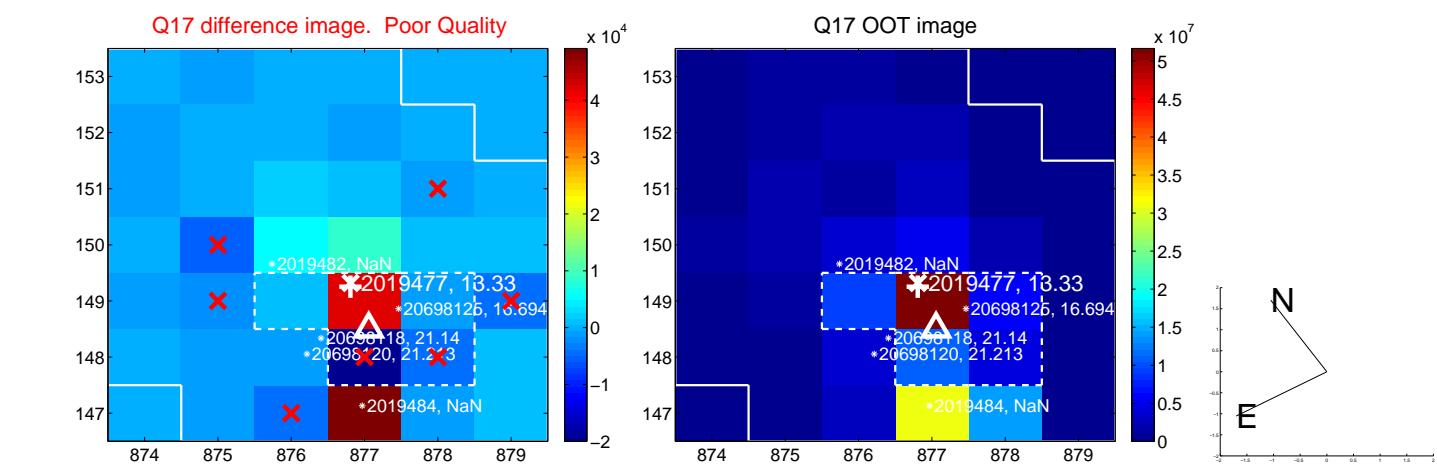
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



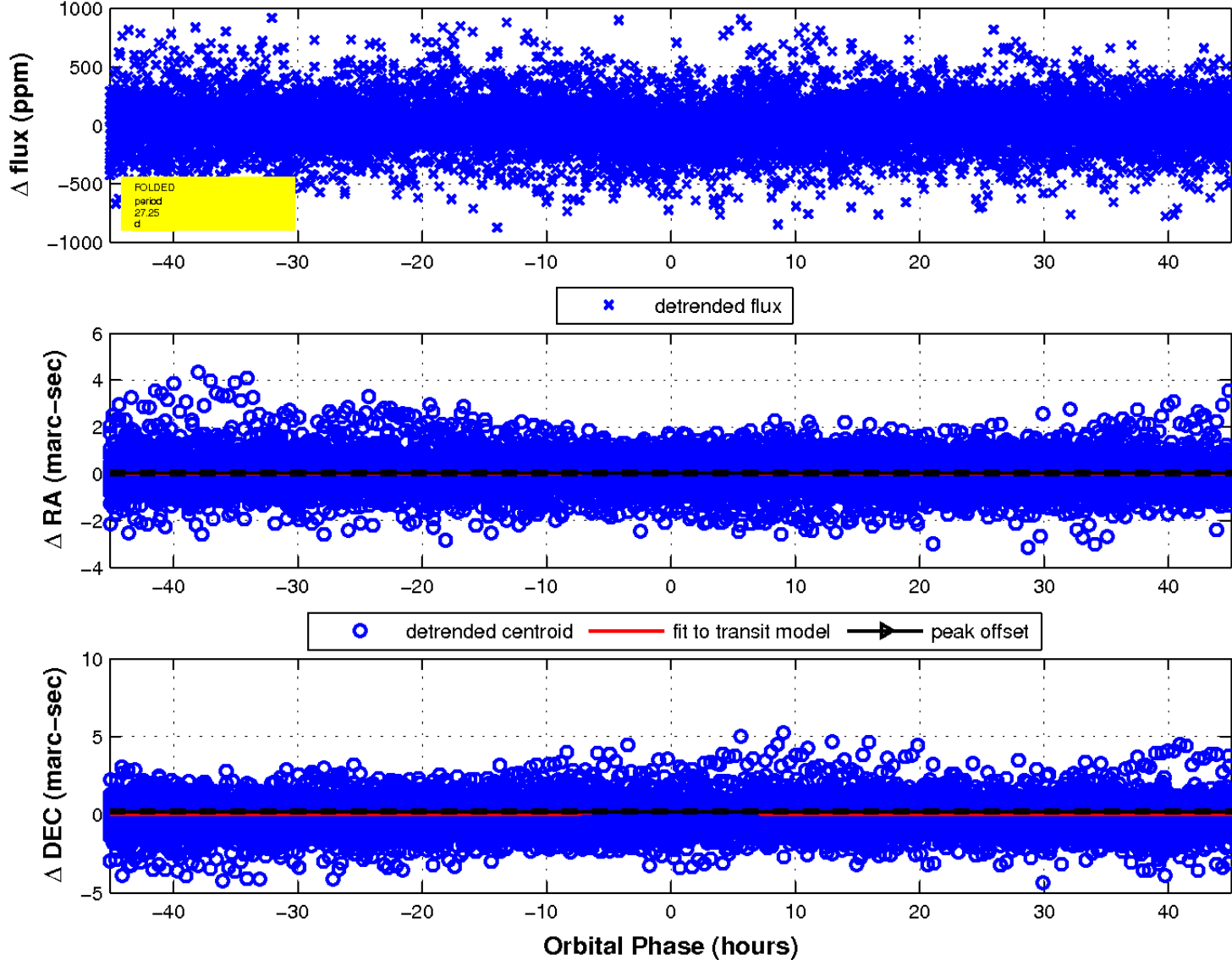
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



### fluxWeightedCentroids, Planet 2 of 2



UKIRT Image

