

# KIC 009020426

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009020426-01	OBS	No	0.913400	131.528617	451818.5	3.130	5376.2	5024.4	1.07	5986	77.79	4097.74
009020426-02	OBS	No	0.913394	131.985994	64707.9	1.500	7544.4	-1.0	1.07	5986	27.41	4097.78

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009020426-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT
009020426-02	OBS	FP	0.00	1	0	0	0	SAME_NTL_PERIOD—CENT_NOFITS

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

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

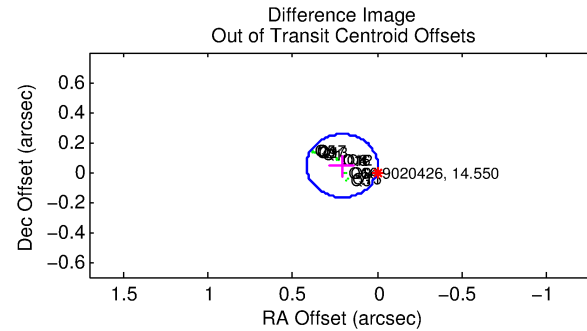
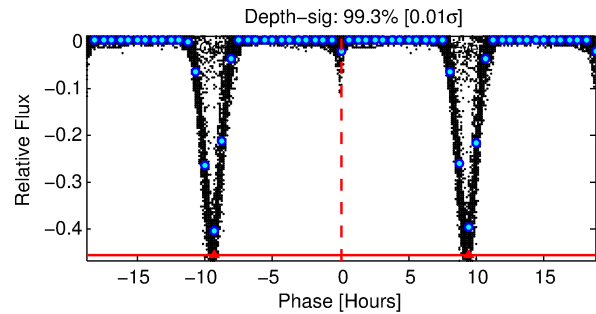
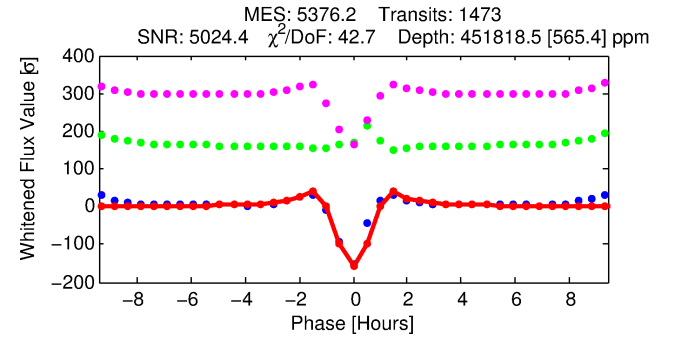
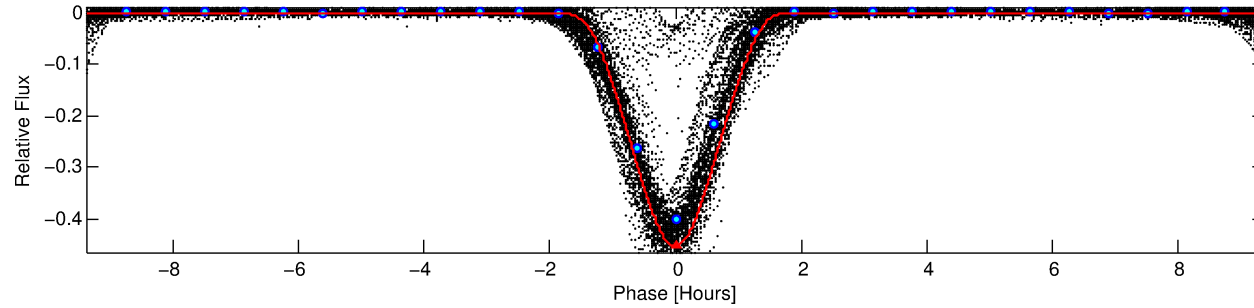
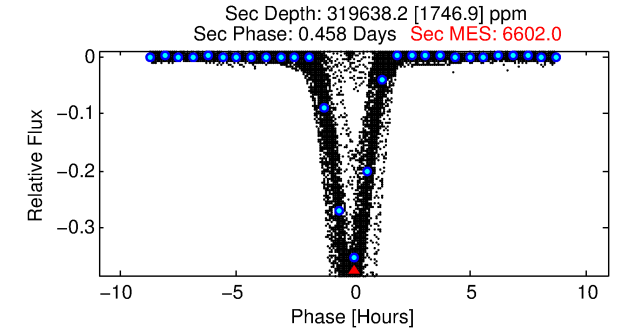
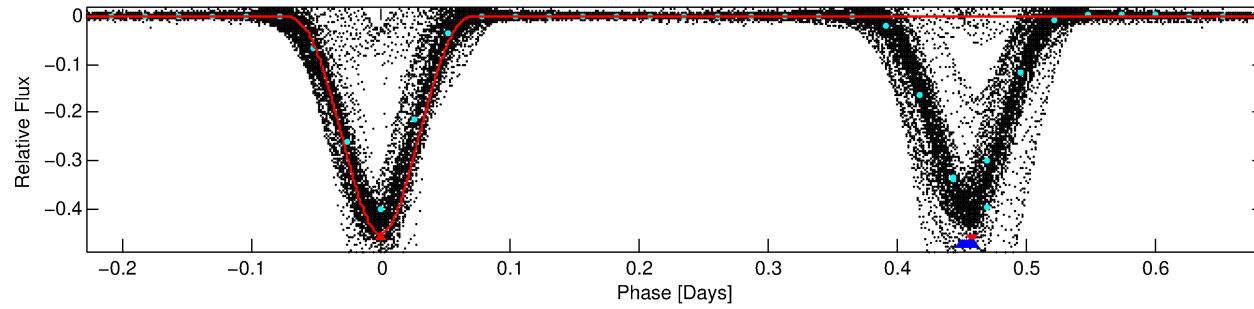
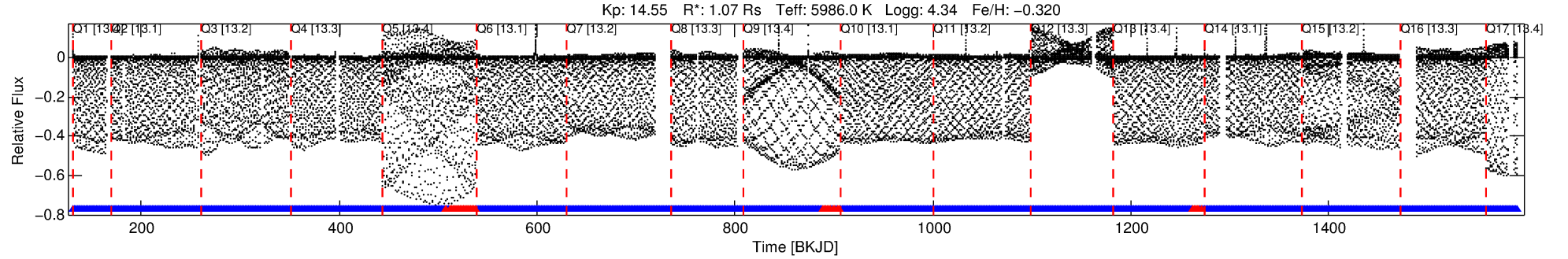
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009020426-01

No Significant Match Found

# DV One-Page Summary

KIC: 9020426 Candidate: 1 of 2 Period: 0.913 d



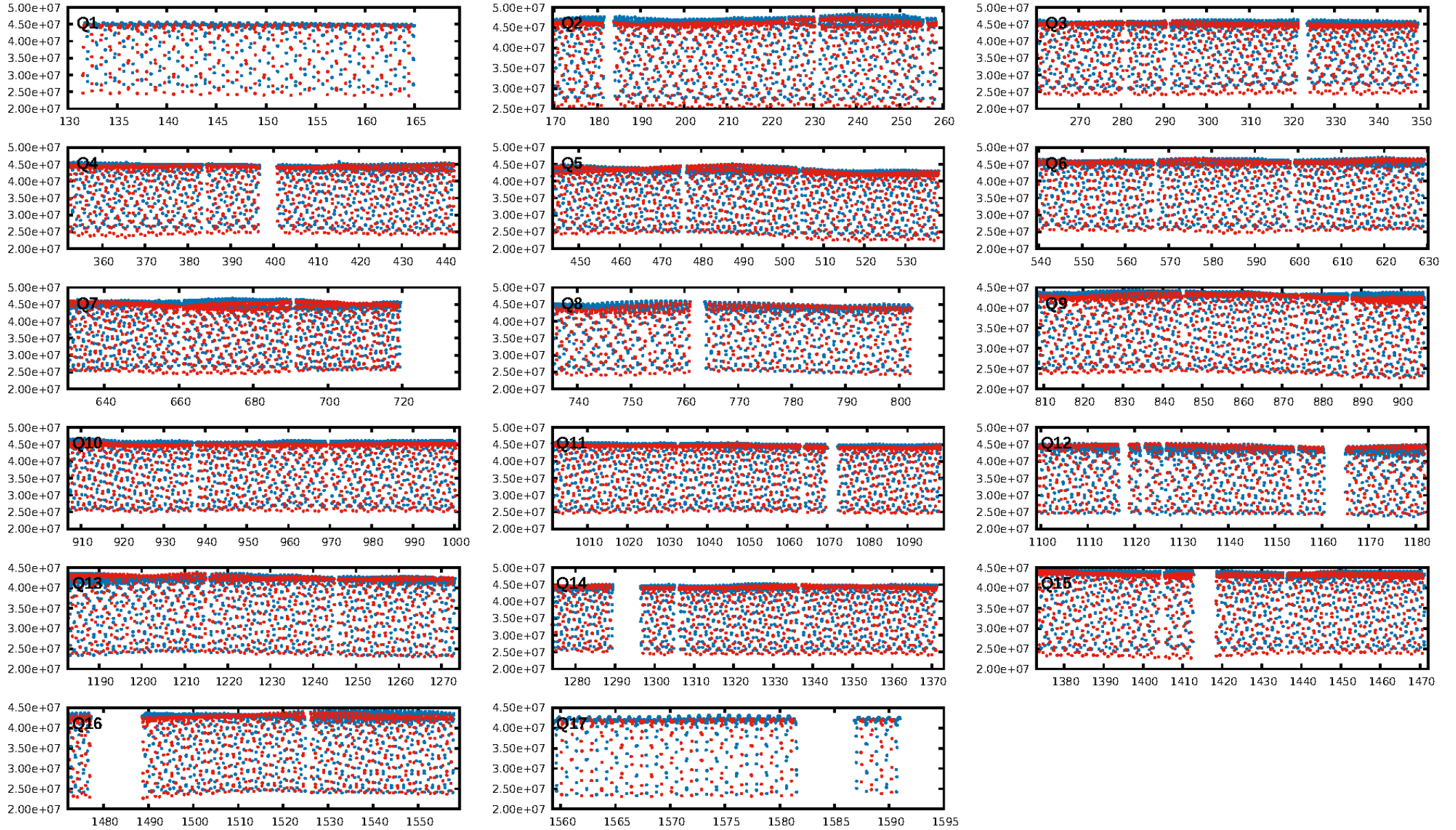
## DV Fit Results:

Period = 0.91340 [0.00000] d  
Epoch = 131.5286 [0.0000] BKJD  
Rp/R\* = 0.6669 [0.0041]  
a/R\* = 3.76 [0.01]  
b = 0.39 [0.01]  
Seff = 4097.74 [1490.70]  
Teff = 2040 [186] K  
Rp = 77.79 [21.98] Re  
a = 0.0179 [0.0042] AU  
Ag = 9.32 [3.20] [2.60σ]  
Teffp = 5512 [167] K [13.92σ]

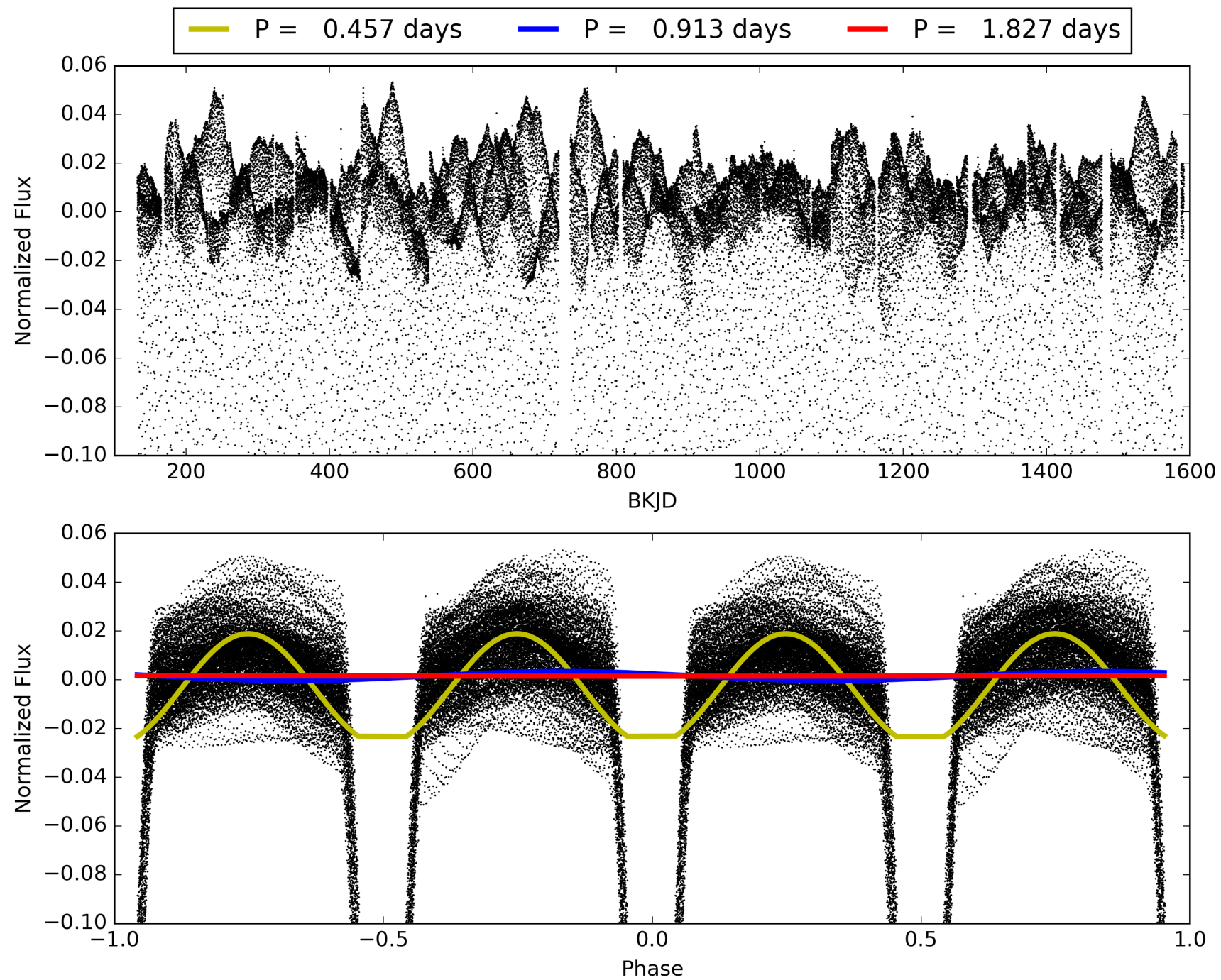
## DV Diagnostic Results:

ShortPeriod-sig: 0.0% [0.00σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 0.97 [1358/1407]  
GhostDiagnostic-chr: 1.177  
Centroid-sig: N/A  
Centroid-so: N/A  
OotOffset-rm: 0.213 arcsec [3.03σ]  
KicOffset-rm: 0.040 arcsec [0.59σ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 1.00 [17/17]  
DiffImageOverlap-fno: 1.00 [17/17]

# TCE 009020426-01, PDC Light Curves

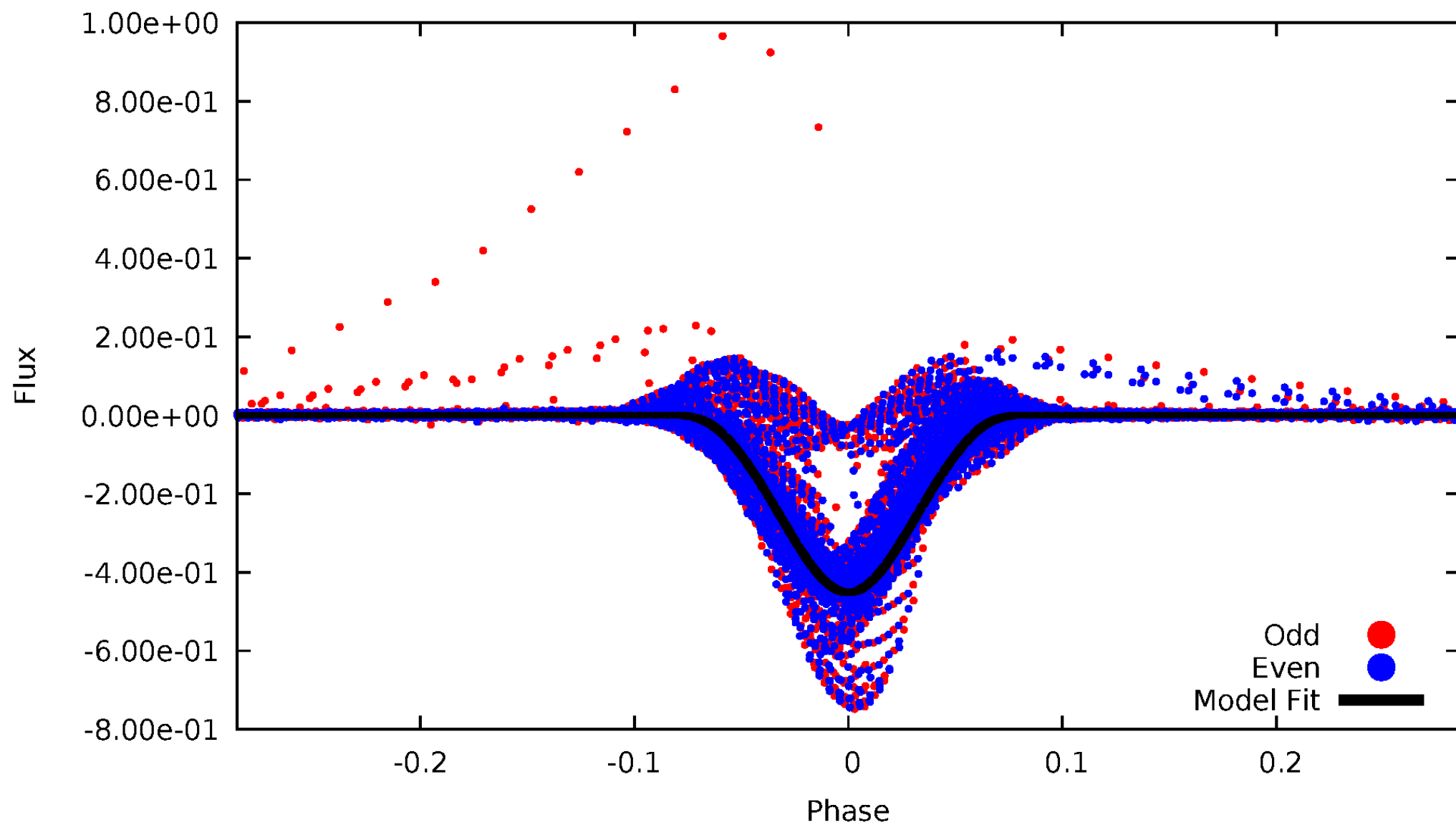


TCE 009020426-01



# DV Odd/Even

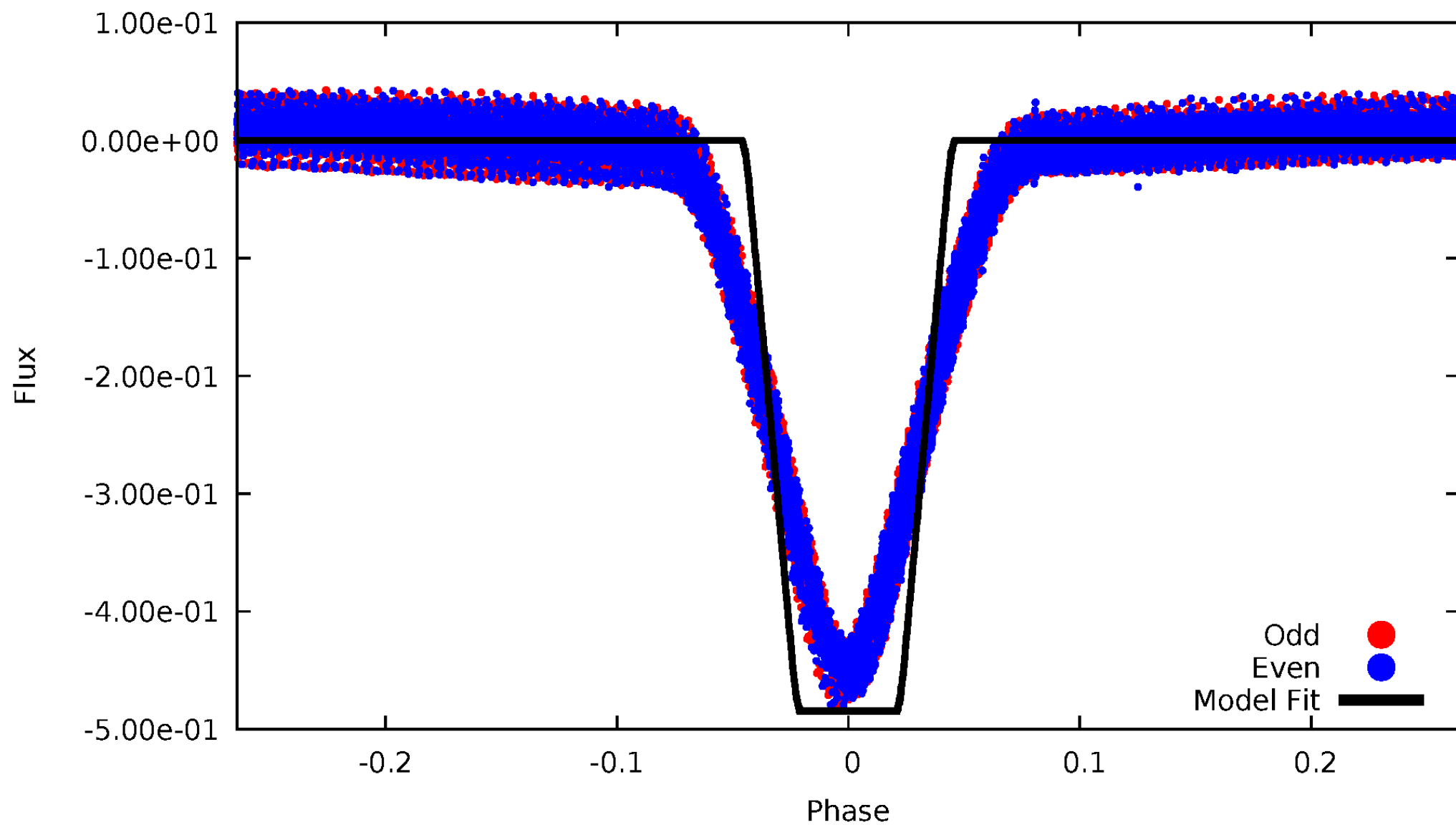
TCE 009020426-01





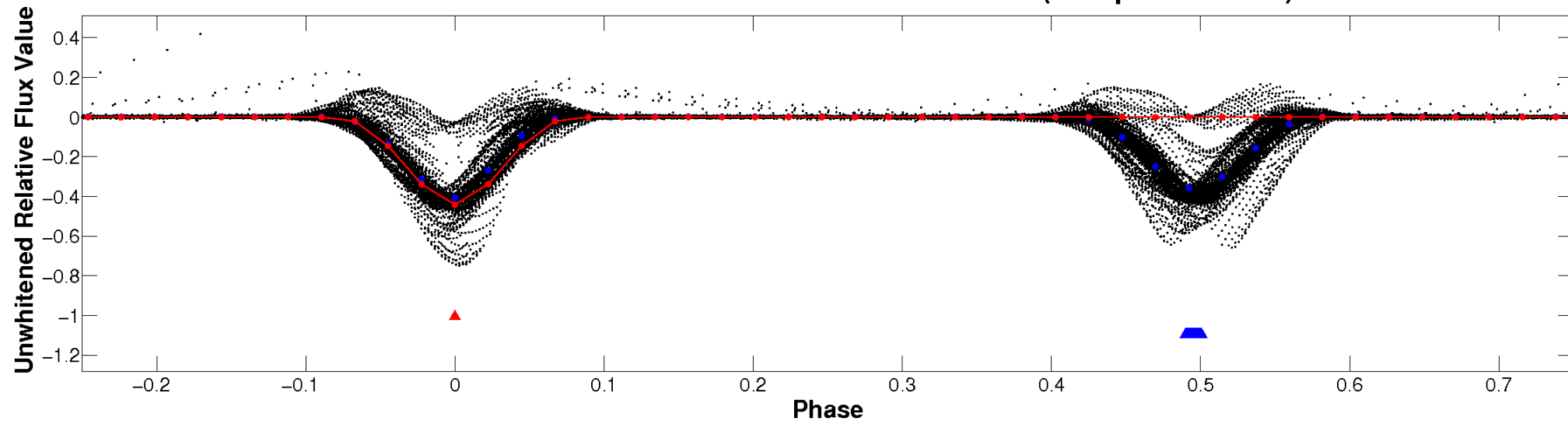
# ALT Odd/Even

TCE 009020426-01

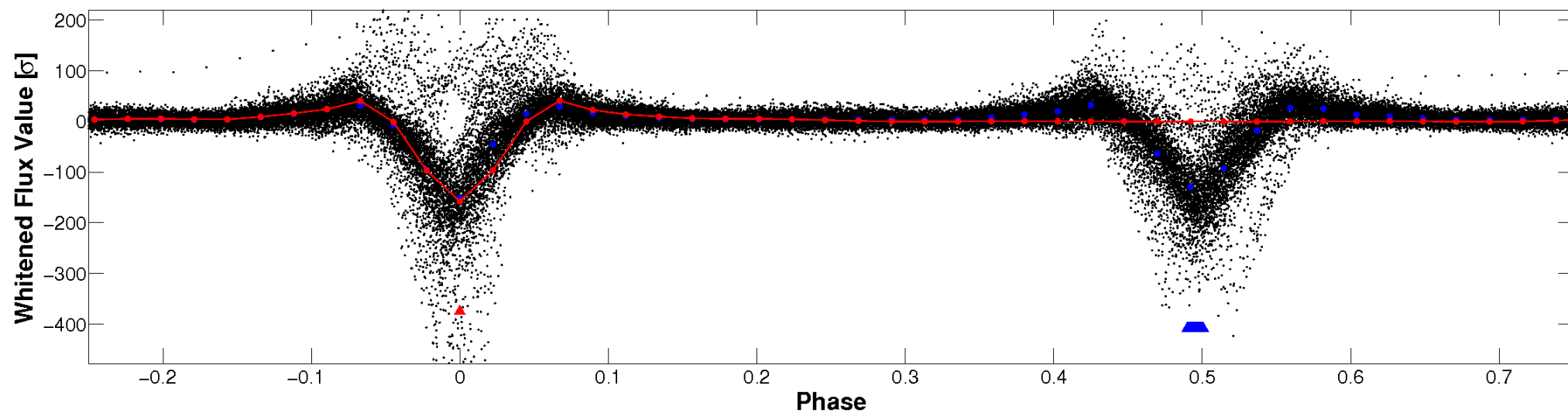


# Non-Whitened Vs. Whitened Light Curve

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

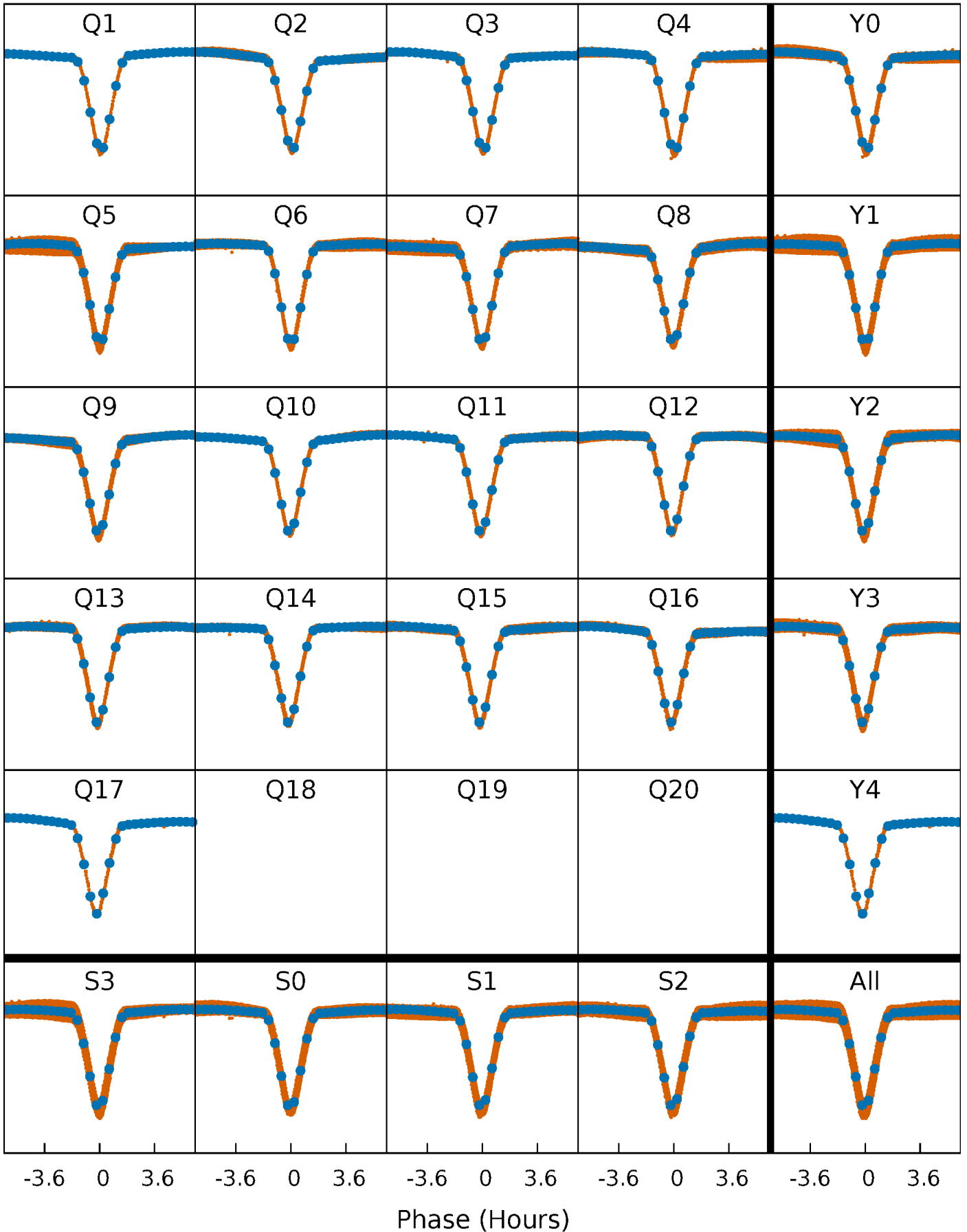


## Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

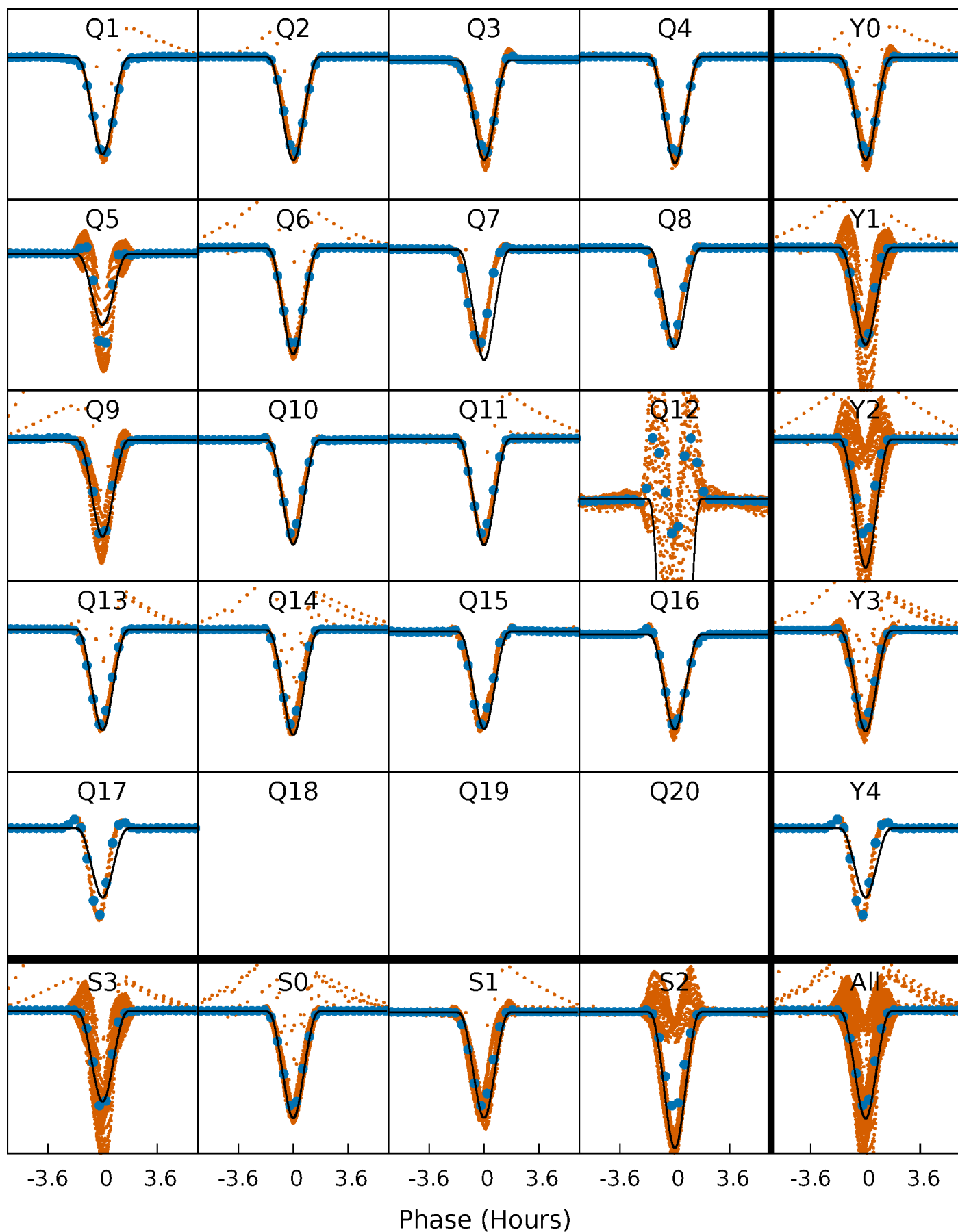
TCE 009020426-01 P= 0.913400 Days  $T_0=131.528617$  (BKJD)





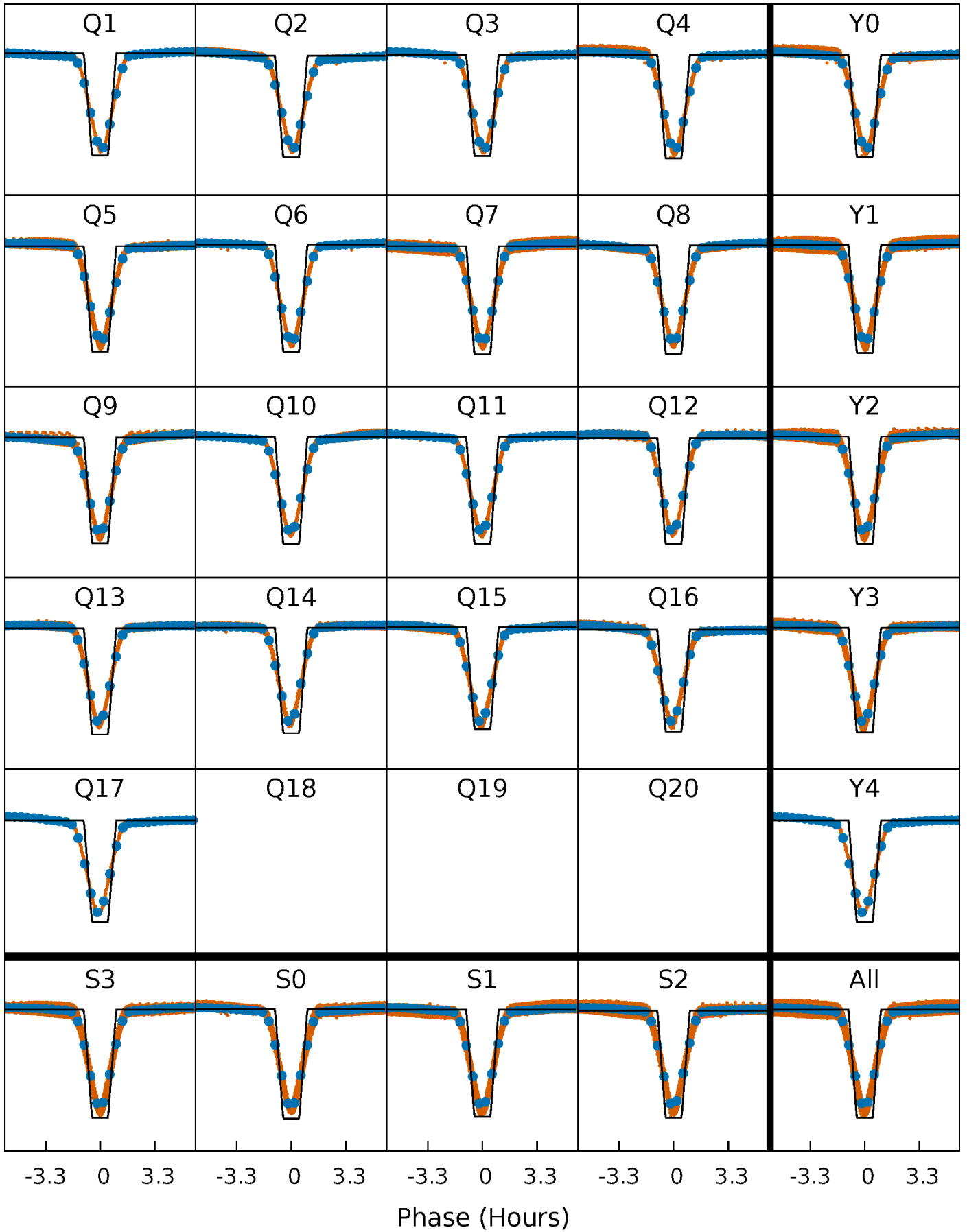
# DV Quarter-Phased Transit Curves

TCE 009020426-01 P= 0.913400 Days  $T_0=131.528617$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

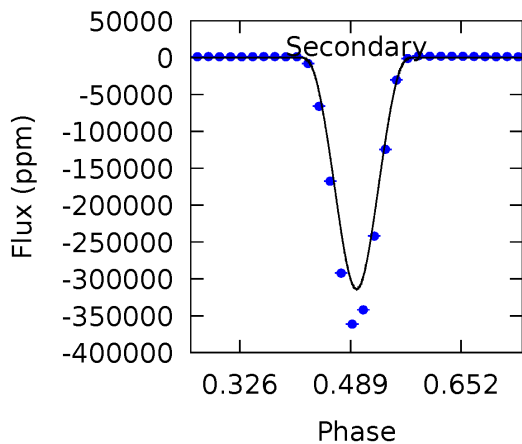
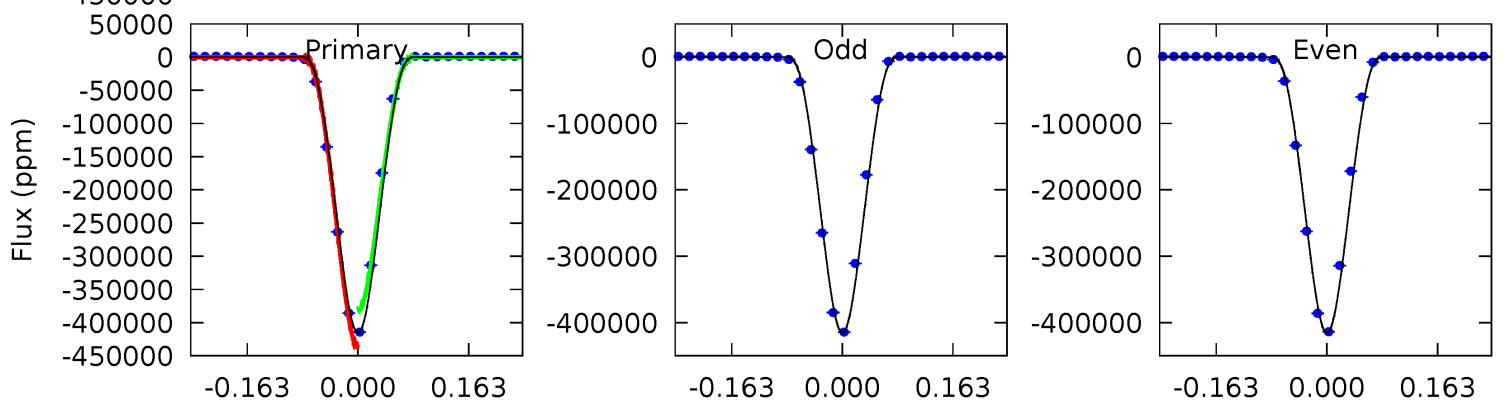
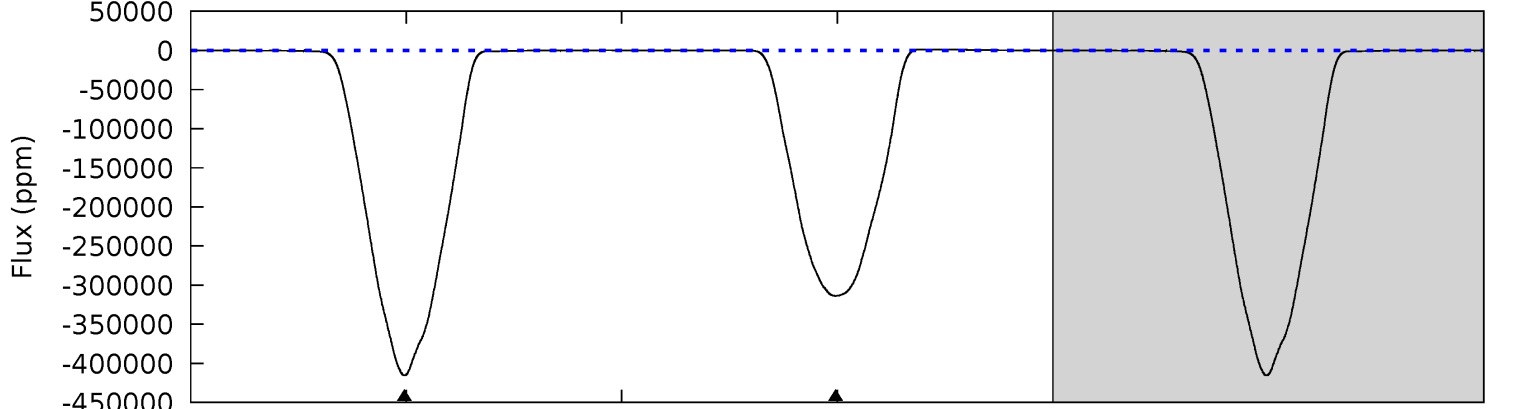
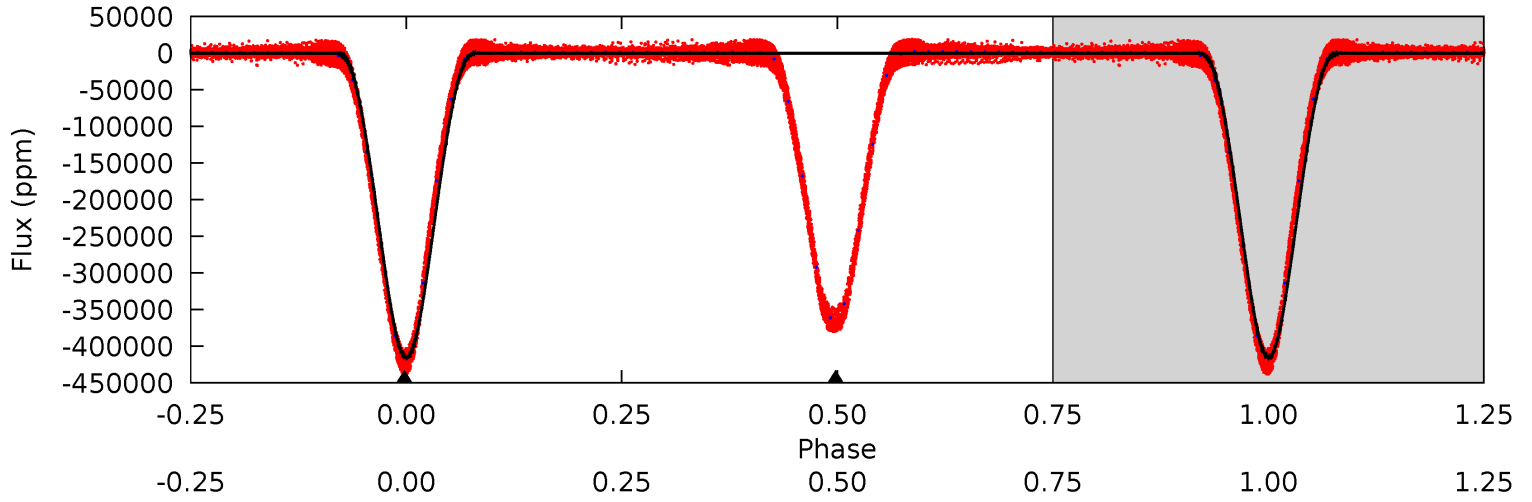
TCE 009020426-01   P= 0.913398 Days    $T_0=131.528904$  (BKJD)



# DV Model-Shift Uniqueness Test

009020426-01, P = 0.913400 Days, E = 130.615217 Days

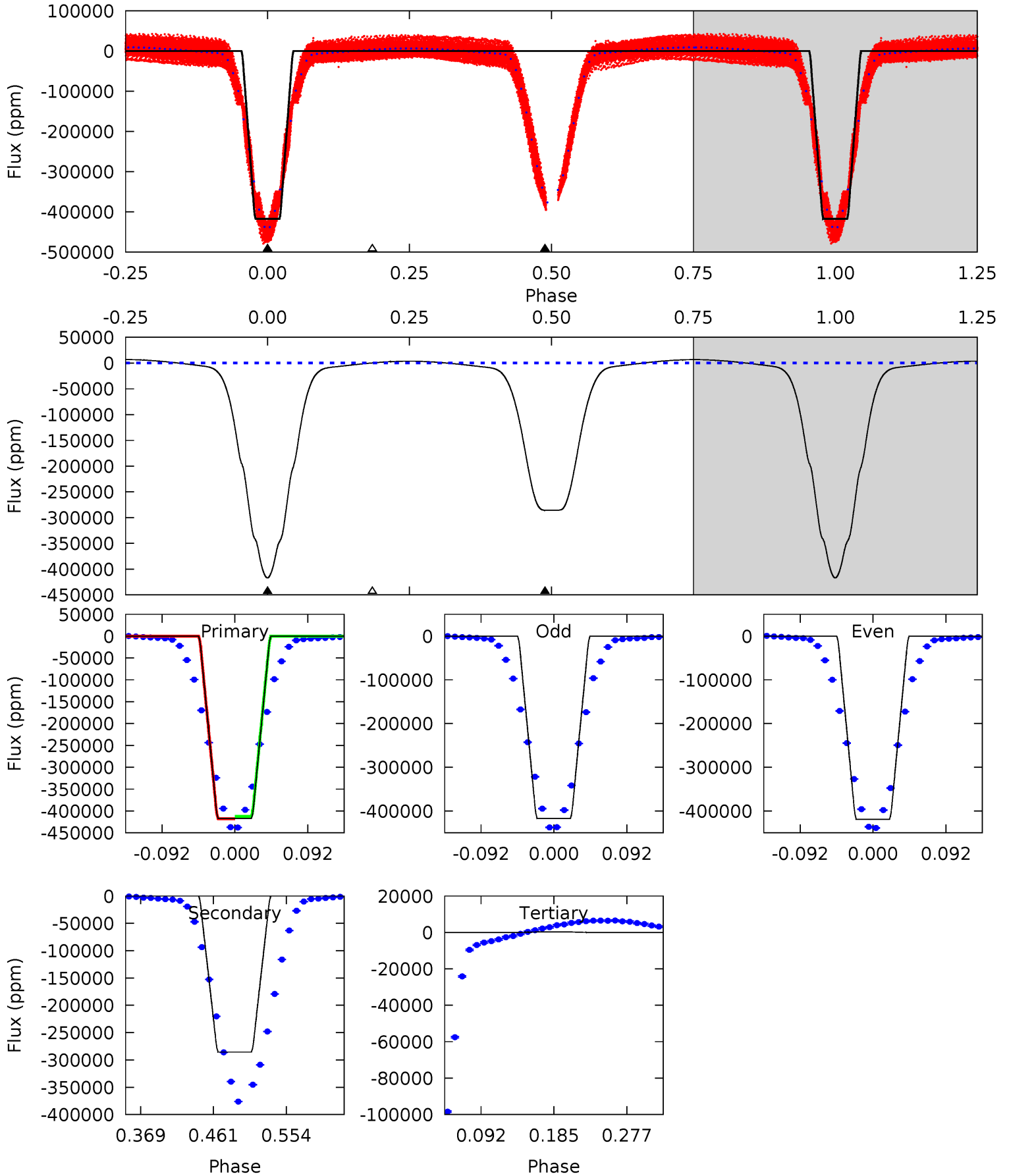
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
10350	7818	0	0	4.46	1.39	4.49	10350	10350	7818	7818	5.27	0.94	0.00	701.9



# Alt Model-Shift Uniqueness Test

009020426-01, P = 0.913398 Days, E = 130.615506 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
2598	1779	-1.43	0	4.58	1.68	34.7	2599	2598	1781	1779	5.47	1.00	0.02	17.1



### Stellar Parameters For KIC 009020426

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5986^{+162}_{-180}$	$4.343^{+0.153}_{-0.187}$	$-0.320^{+0.300}_{-0.300}$	$1.069^{+0.302}_{-0.201}$	$0.918^{+0.129}_{-0.094}$	$1.059^{+0.764}_{-0.510}$
	+3%/-3%	+4%/-4%	+94%/-94%	+28%/-19%	+14%/-10%	+72%/-48%
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 009020426-01 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-313772 \pm 40$	$77.97^{+11.93}_{-7.66}$	$2866^{+177}_{-174}$	$5985^{+165}_{-187}$	$13^{+3}_{-3}$
Alt.	$-285703 \pm 161$	$82.34^{+12.21}_{-8.60}$	$2869^{+194}_{-168}$	$5665^{+154}_{-152}$	$10^{+3}_{-2}$

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

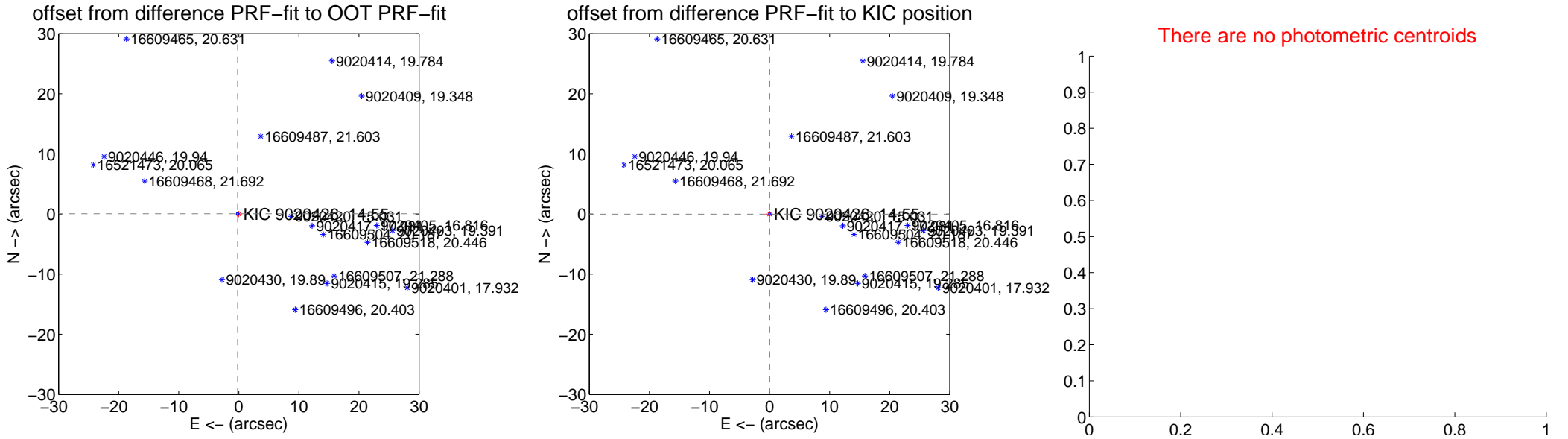
## DV Centroid Data

Supplemental centroid analysis for 009020426-01. Kepler magnitude: 14.55. Transit SNR 5024.36

There are 17 quarters with good PRF difference image offsets

The direct PRF centroid is offset from the target star catalog position by about 0.51 arcsec

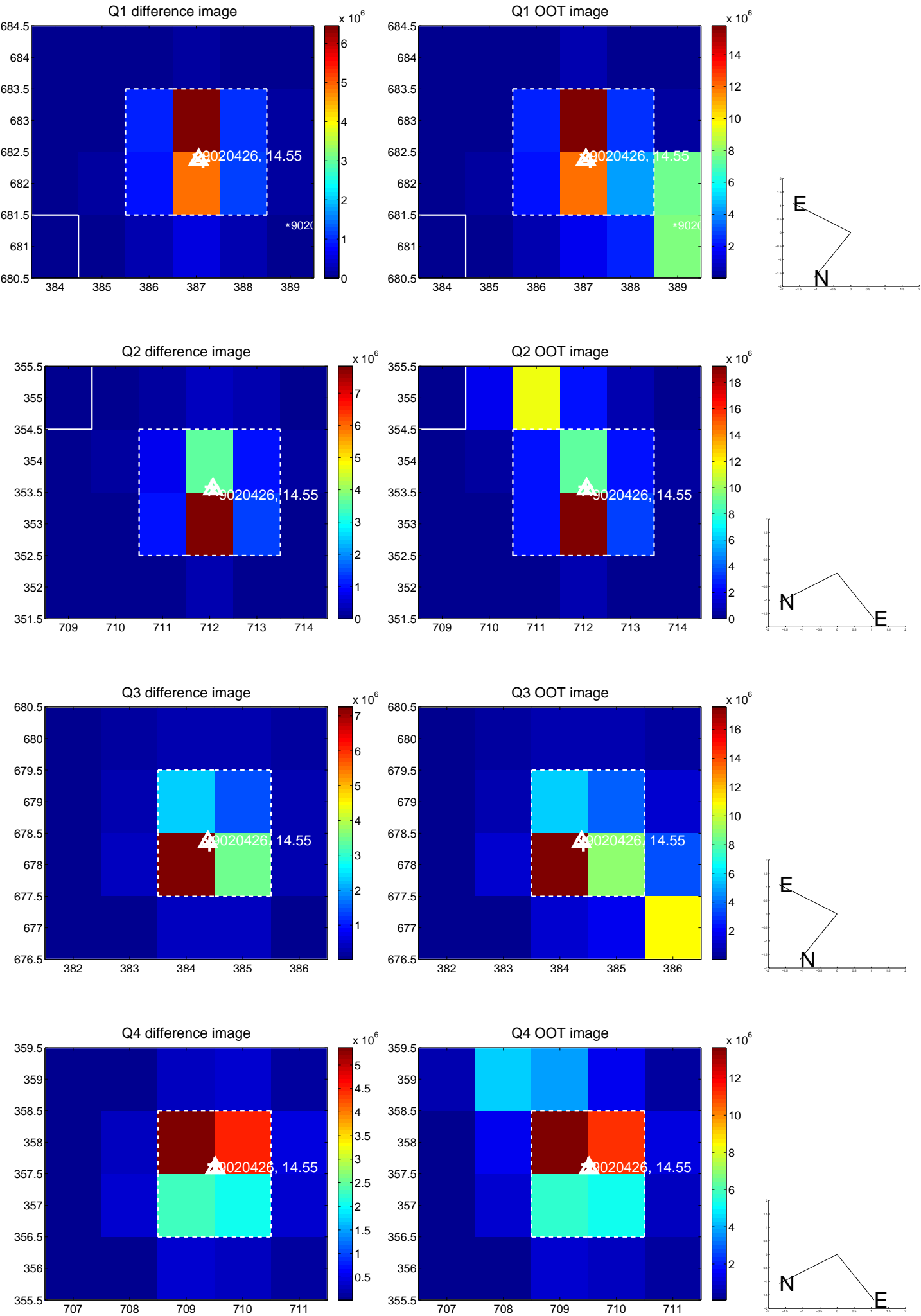
	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	<b>0.213 <math>\pm</math> 0.070</b>	<b>3.03</b>	0.209 $\pm$ 0.069	0.043 $\pm$ 0.069
PRF-fit source offset from KIC position	0.040 $\pm$ 0.068	0.59	-0.037 $\pm$ 0.068	-0.016 $\pm$ 0.067
photometric centroid source offset	—	—	—	—



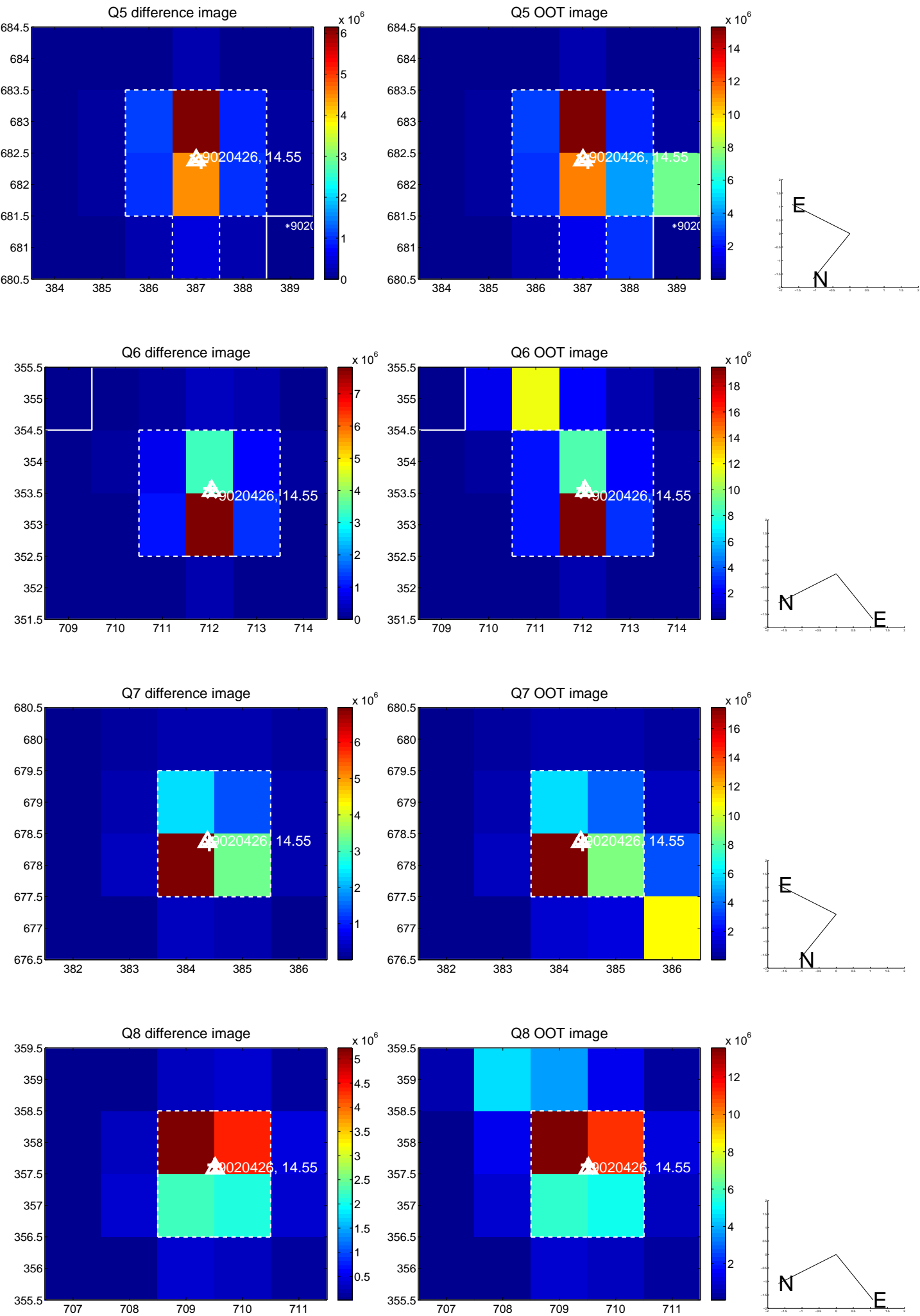
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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



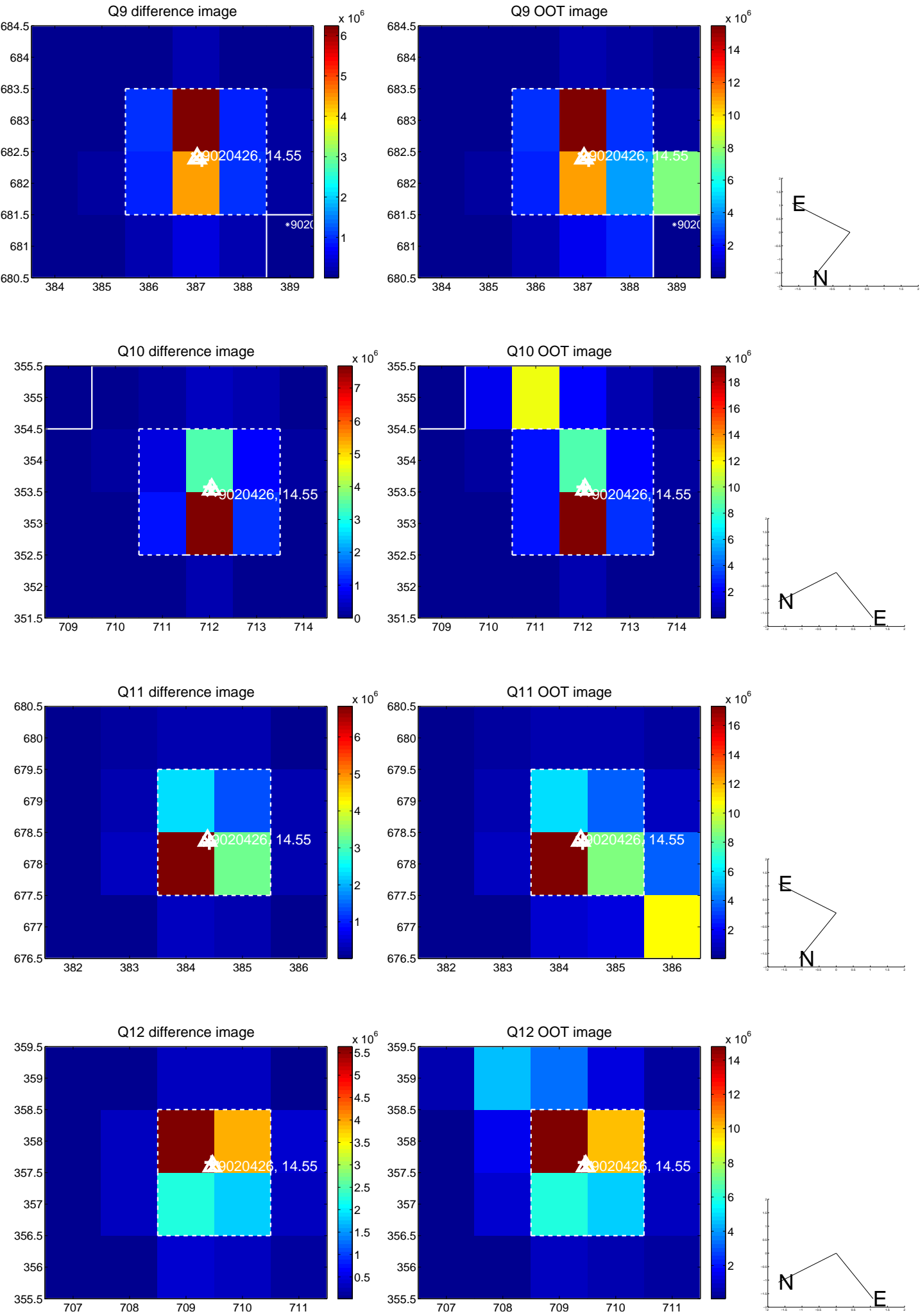
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



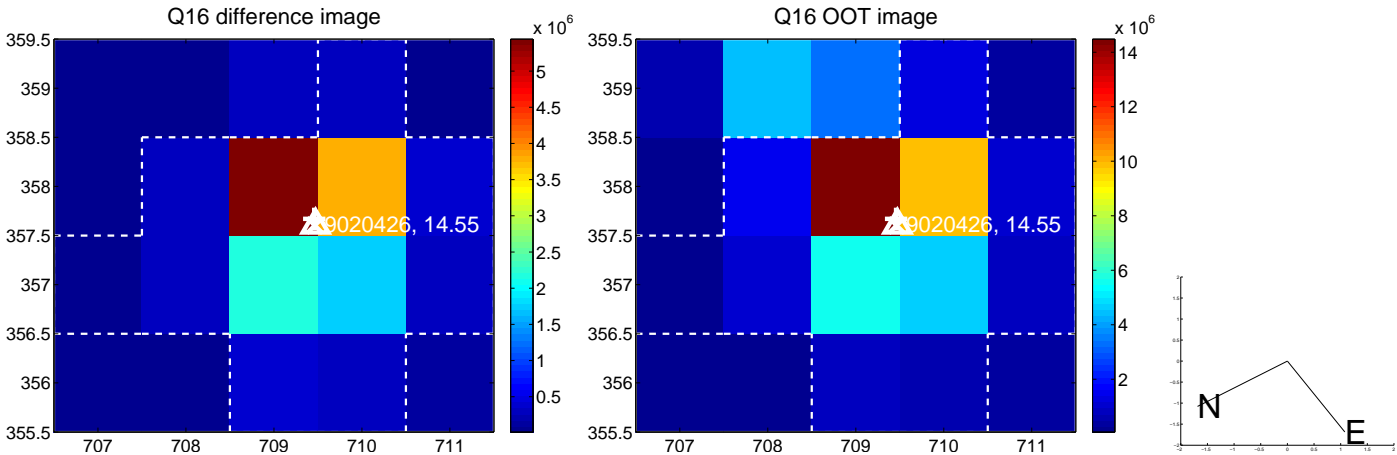
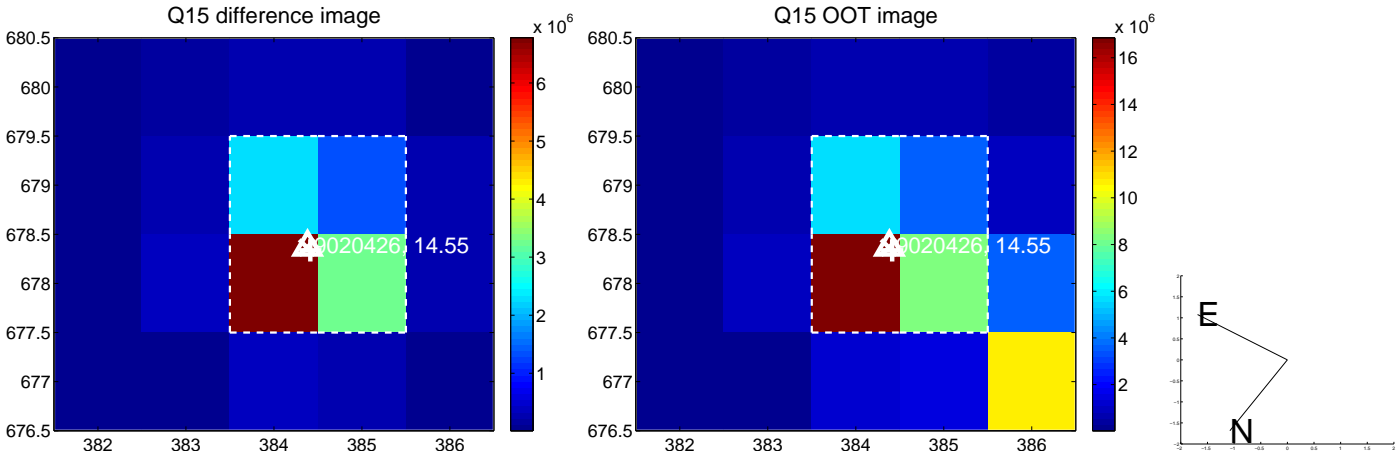
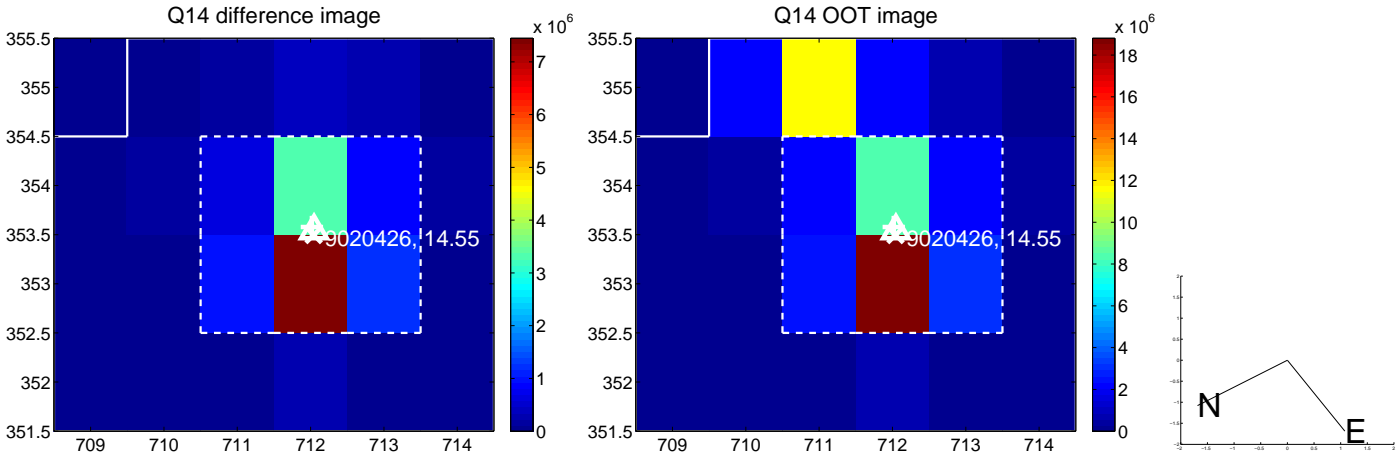
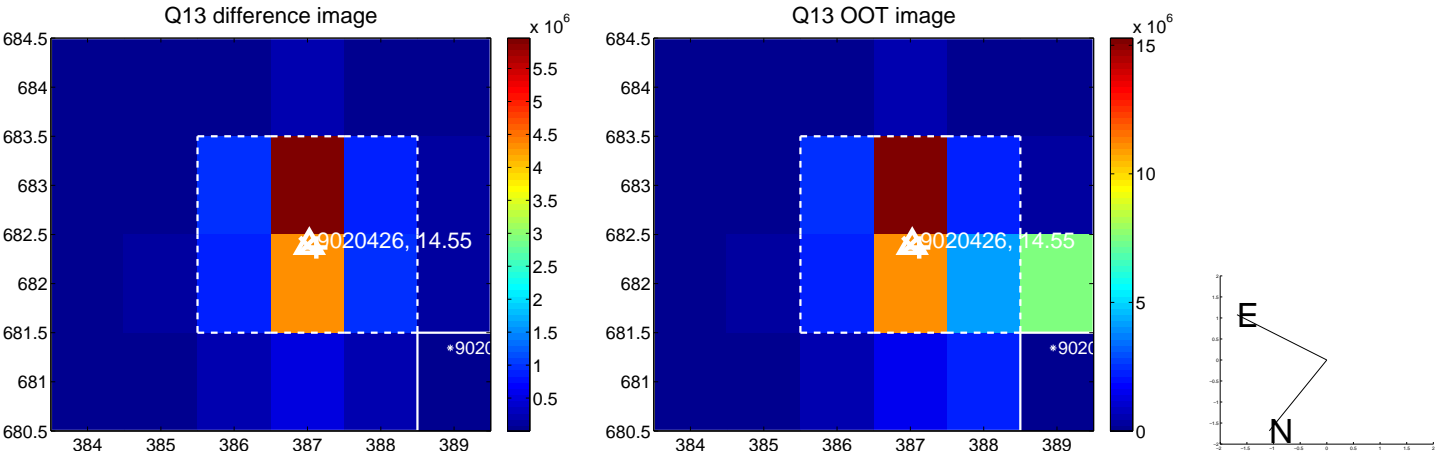
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



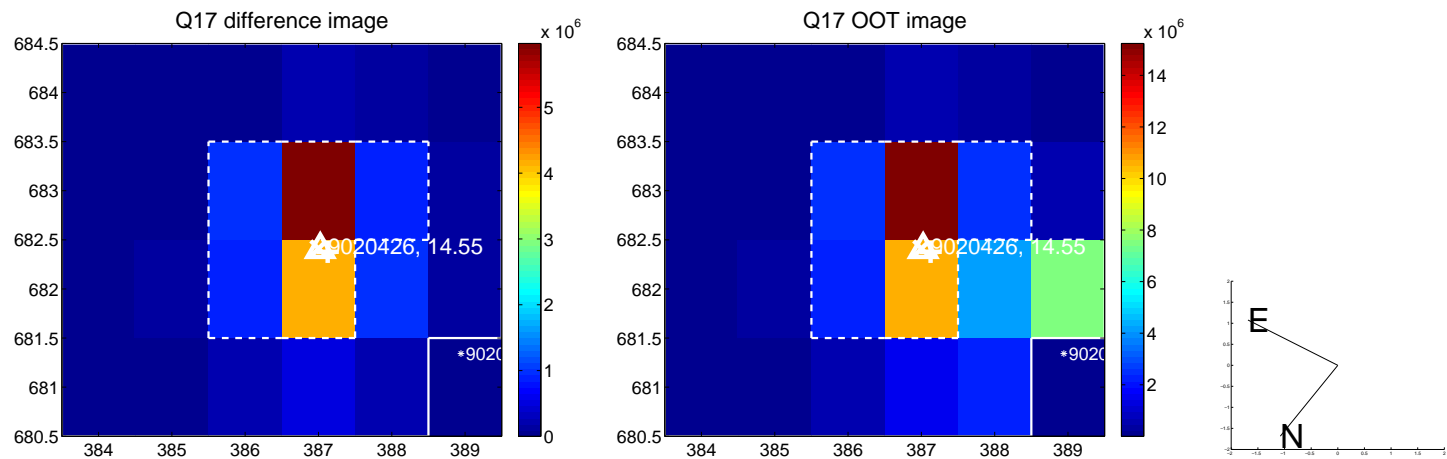
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



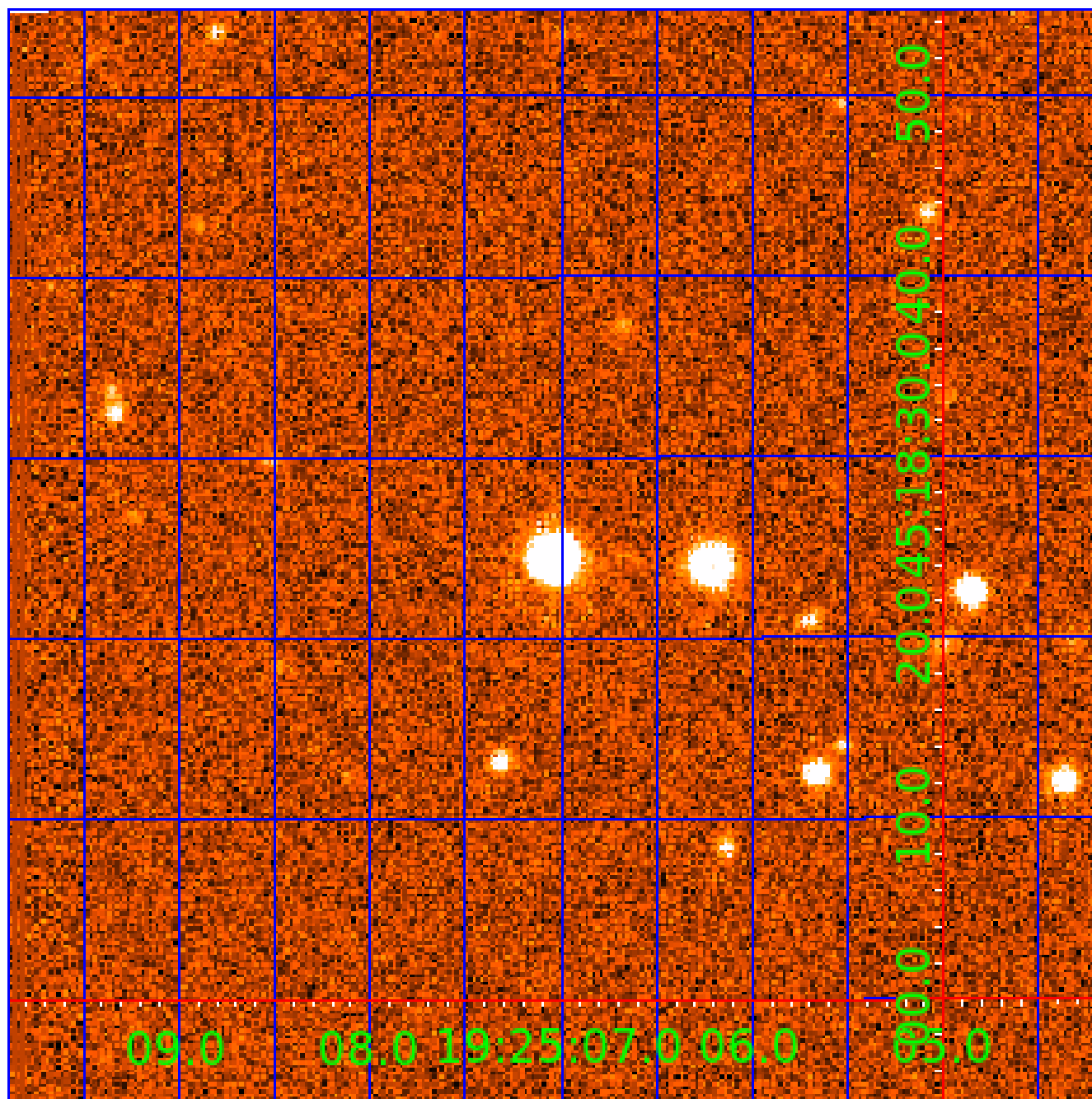
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



folded centroid time series figure for this object.

# UKIRT Image

Declination





# KIC 009020426

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
009020426-01	OBS	No	0.913400	131.528617	451818.5	3.130	5376.2	5024.4	1.07	5986	77.79	4097.74
009020426-02	OBS	No	0.913394	131.985994	64707.9	1.500	7544.4	-1.0	1.07	5986	27.41	4097.78

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
009020426-01	OBS	FP	0.00	1	0	0	0	LPP_DV—LPP_ALT
009020426-02	OBS	FP	0.00	1	0	0	0	SAME_NTL_PERIOD—CENT_NOFITS

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

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

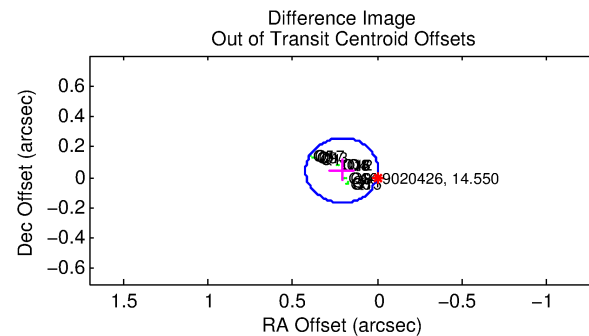
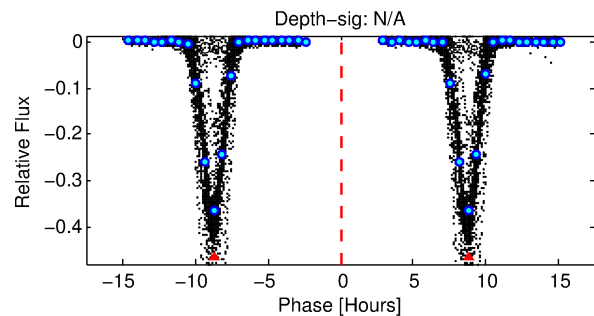
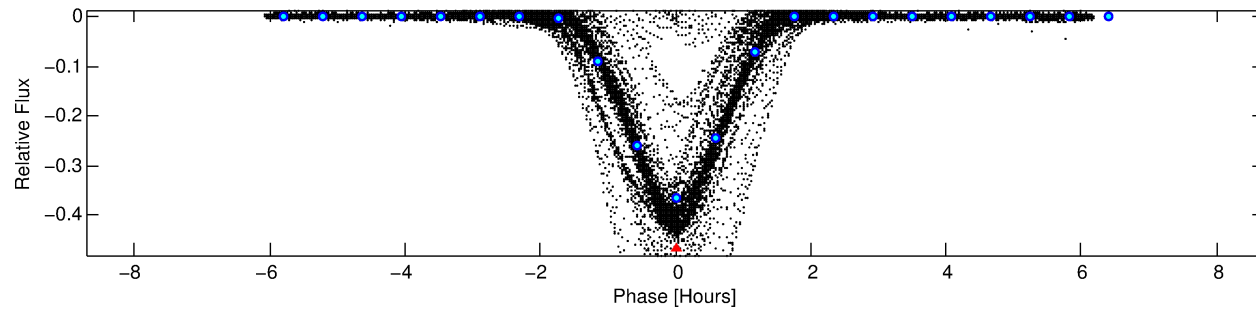
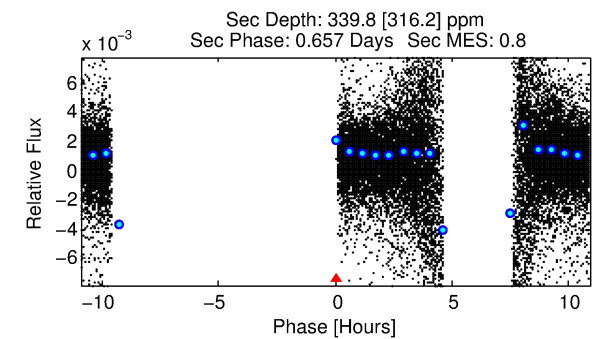
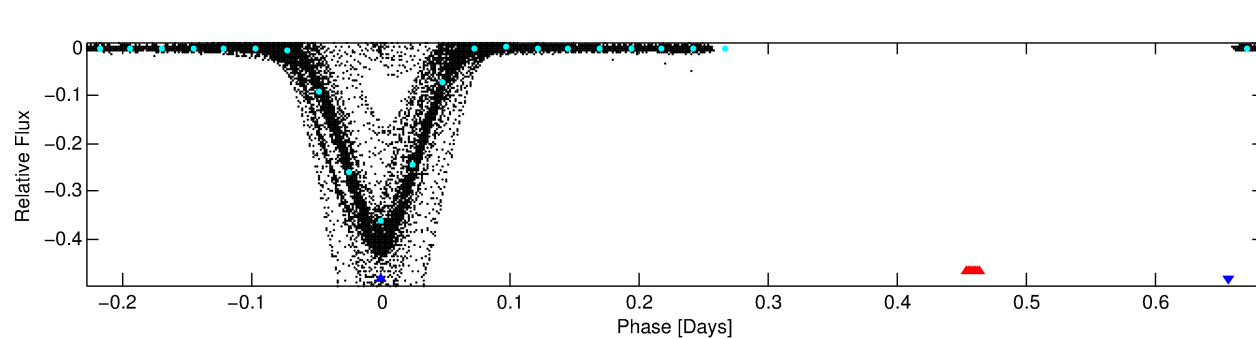
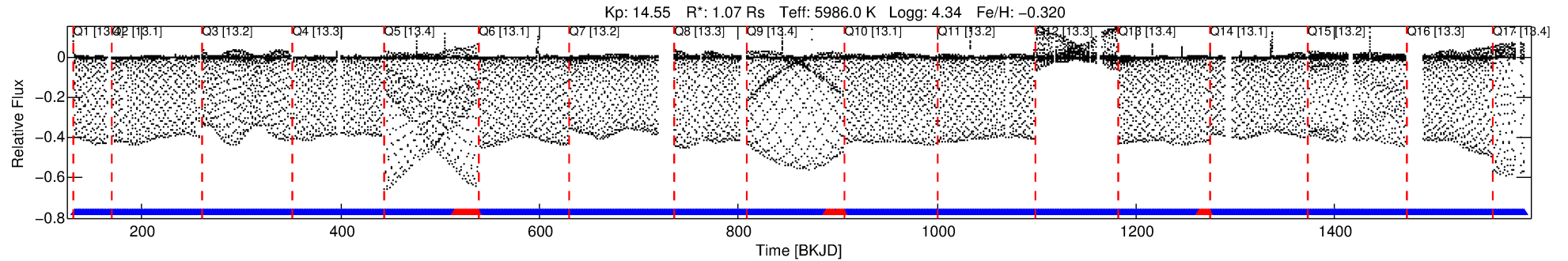
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 009020426-02

No Significant Match Found

# DV One-Page Summary

KIC: 9020426 Candidate: 2 of 2 Period: 0.913 d



## TPS TCE Results:

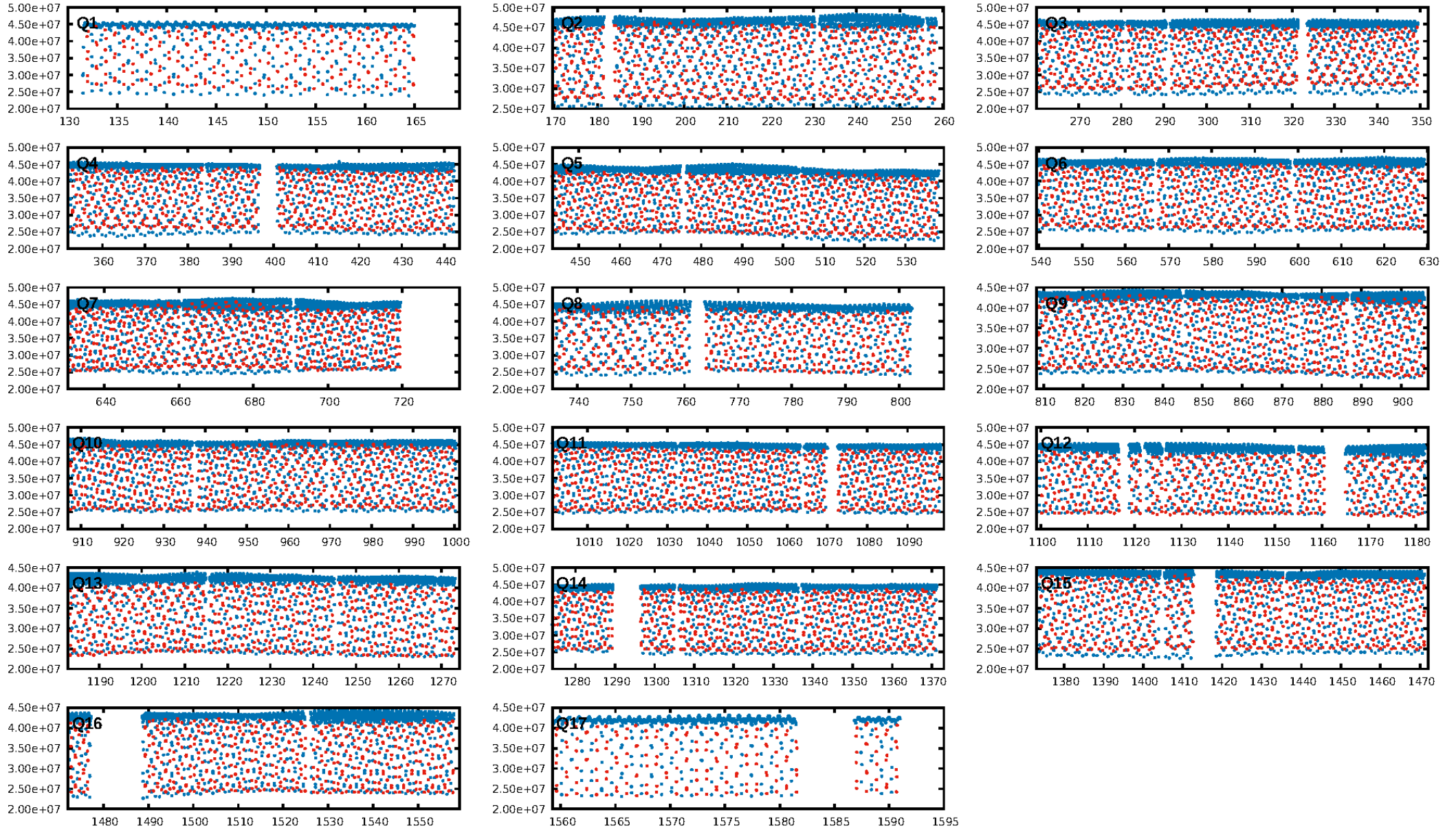
Period = 0.91339 d  
Epoch = 131.9860 BKJD

DV fit results are unavailable

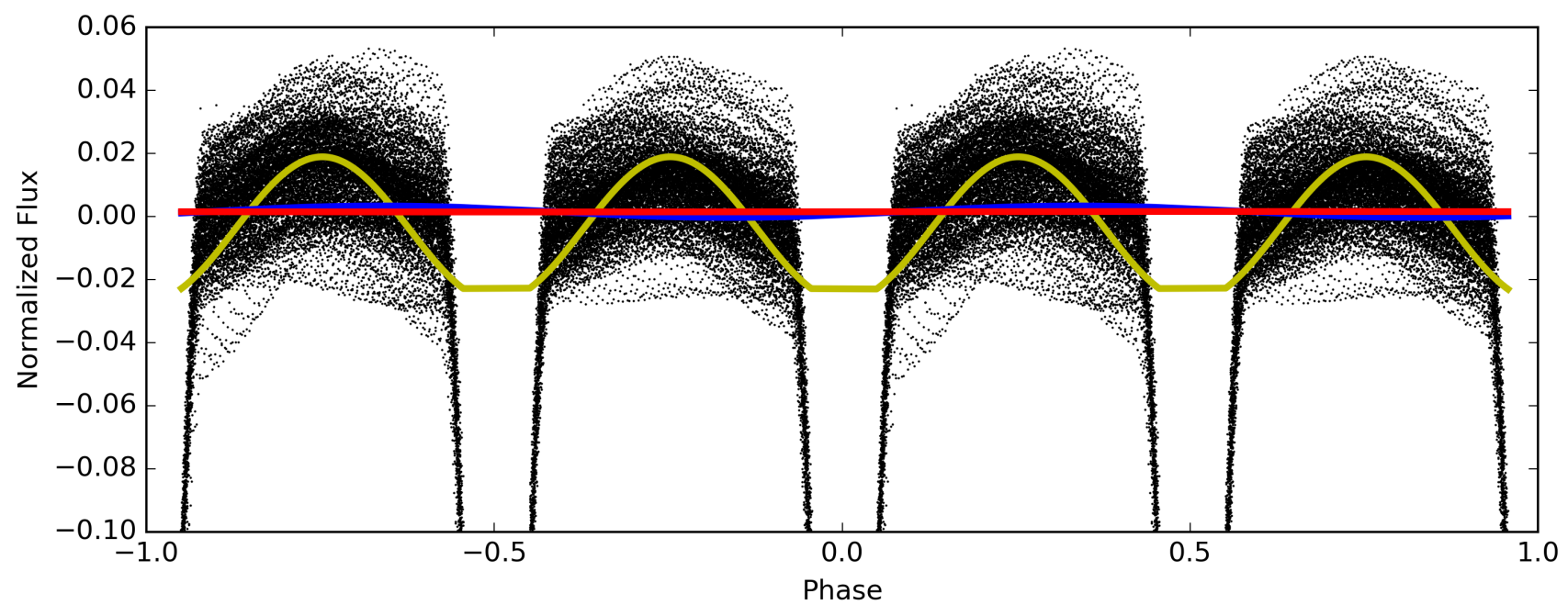
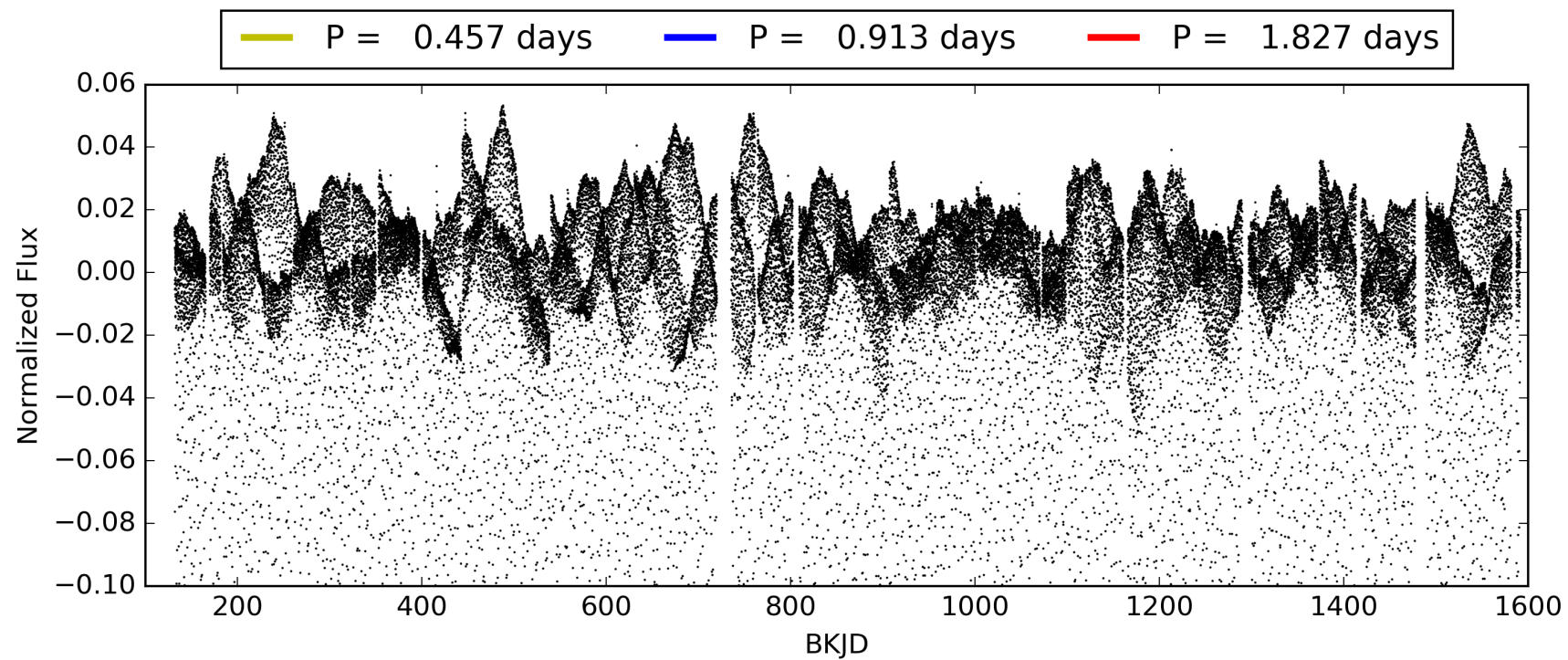
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 0.0% [0.00σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 0.96 [1352/1402]  
GhostDiagnostic-chr: 1.044  
Centroid-sig: N/A  
Centroid-so: N/A  
OotOffset-rm: 0.214 arcsec [3.01σ]  
KicOffset-rm: 0.041 arcsec [0.61σ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 1.00 [17/17]  
DiffImageOverlap-fno: 1.00 [17/17]

# TCE 009020426-02, PDC Light Curves

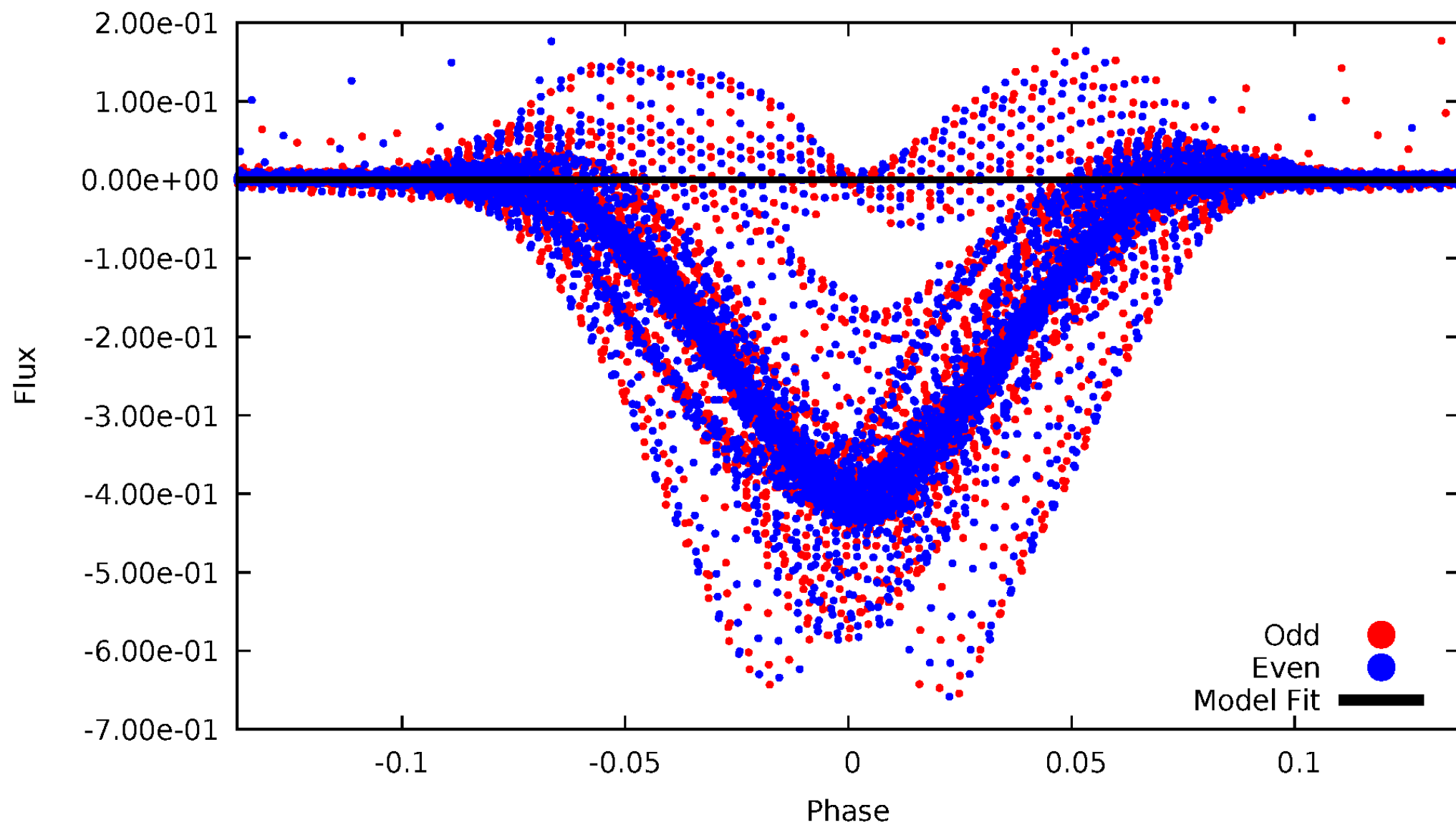


TCE 009020426-02



# DV Odd/Even

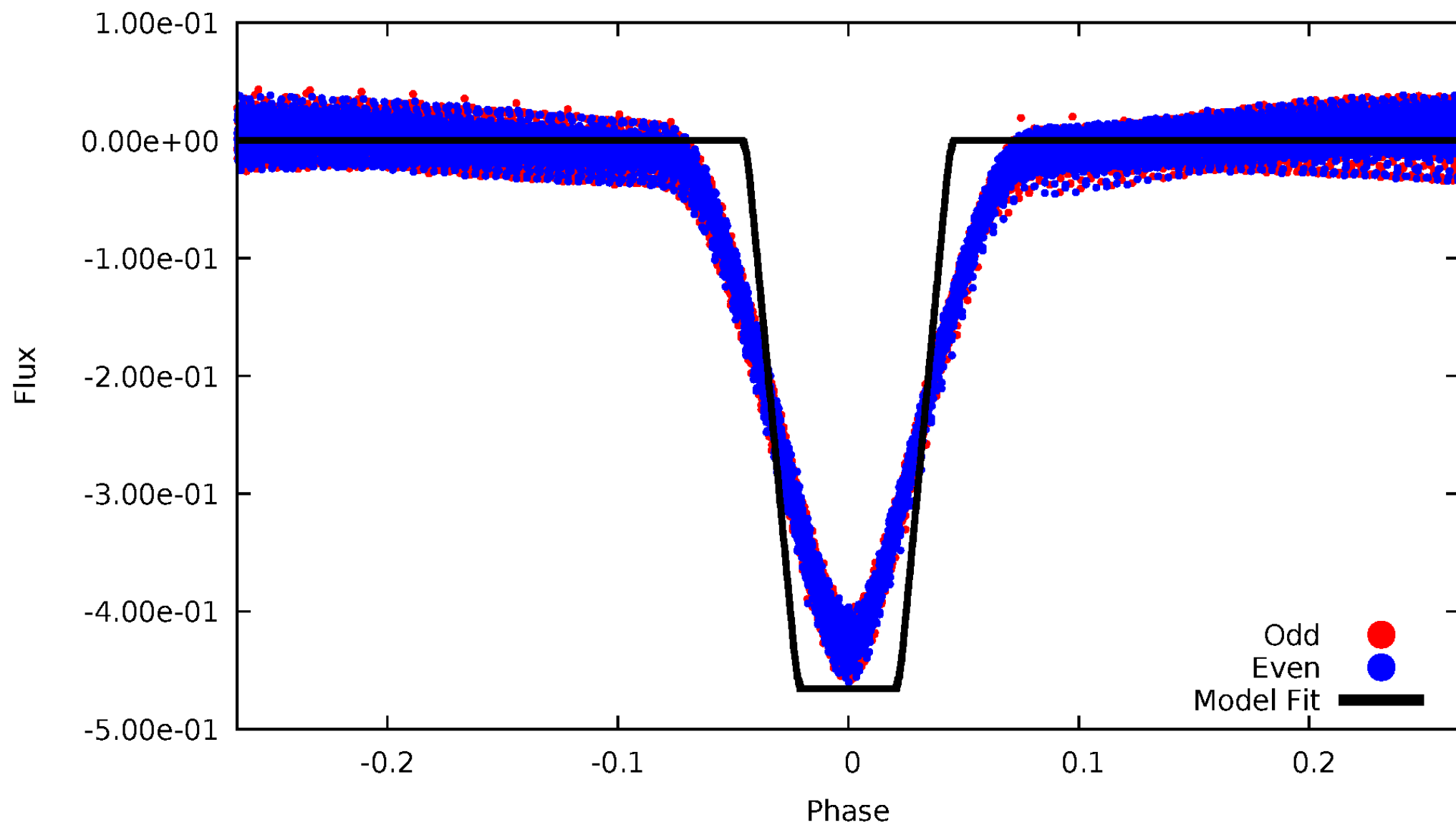
TCE 009020426-02





# ALT Odd/Even

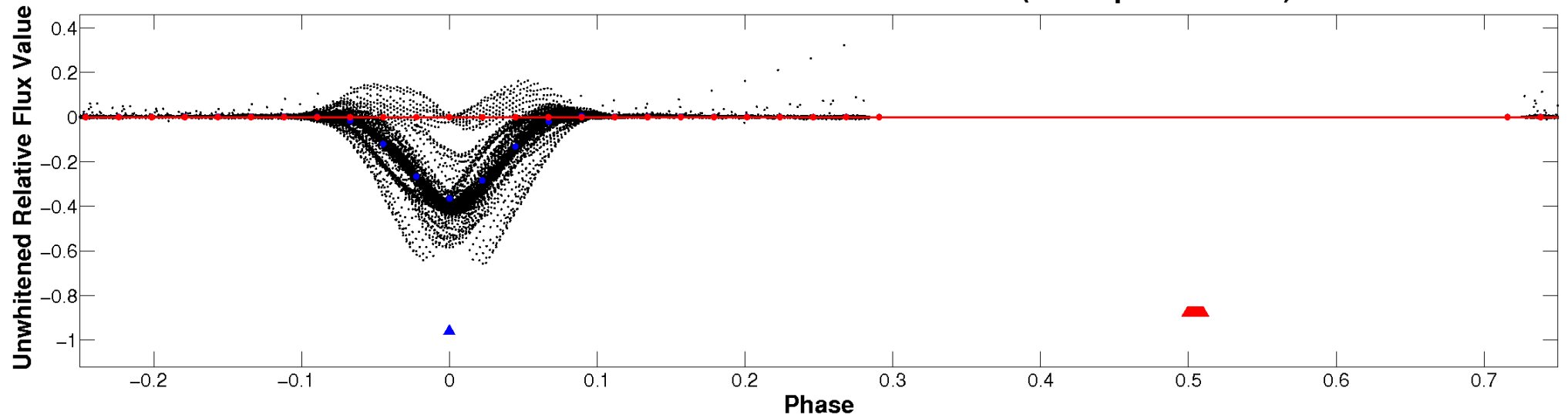
TCE 009020426-02



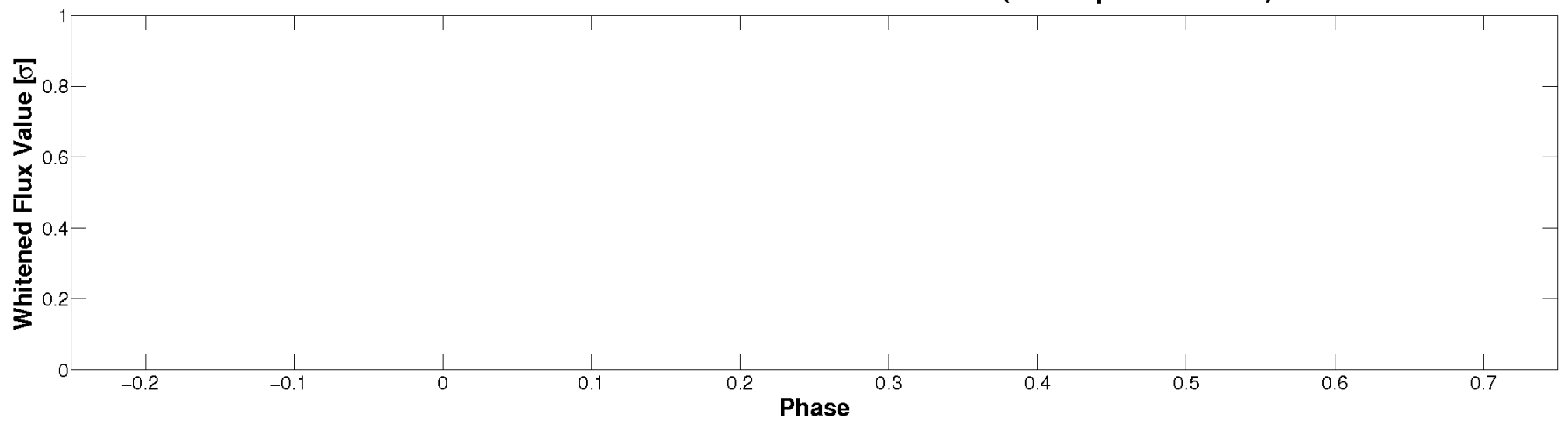


# Non-Whitened Vs. Whitened Light Curve

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

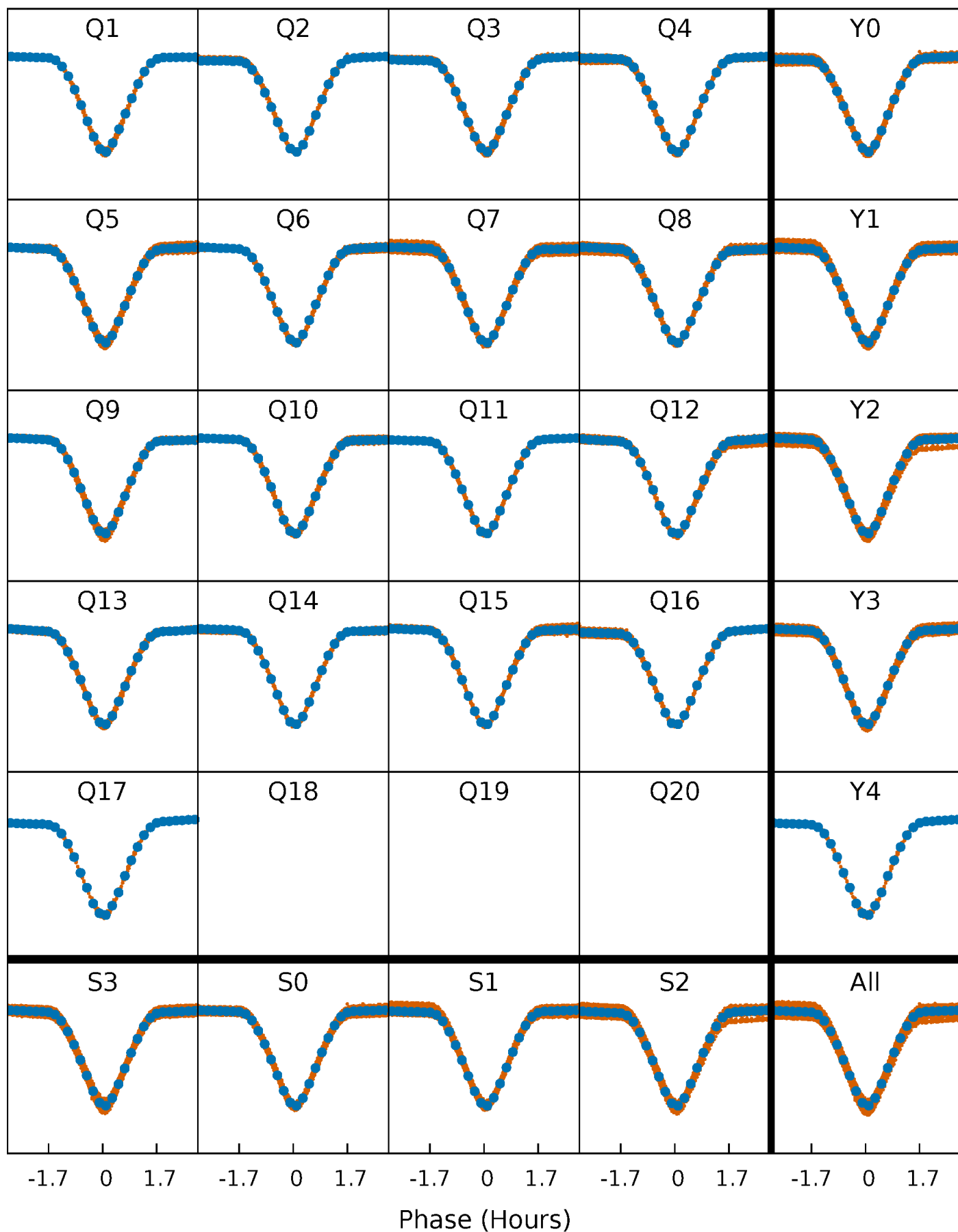


**Planet 2 : Phased Whitened Flux Time Series (TPS Epoch/Period)**



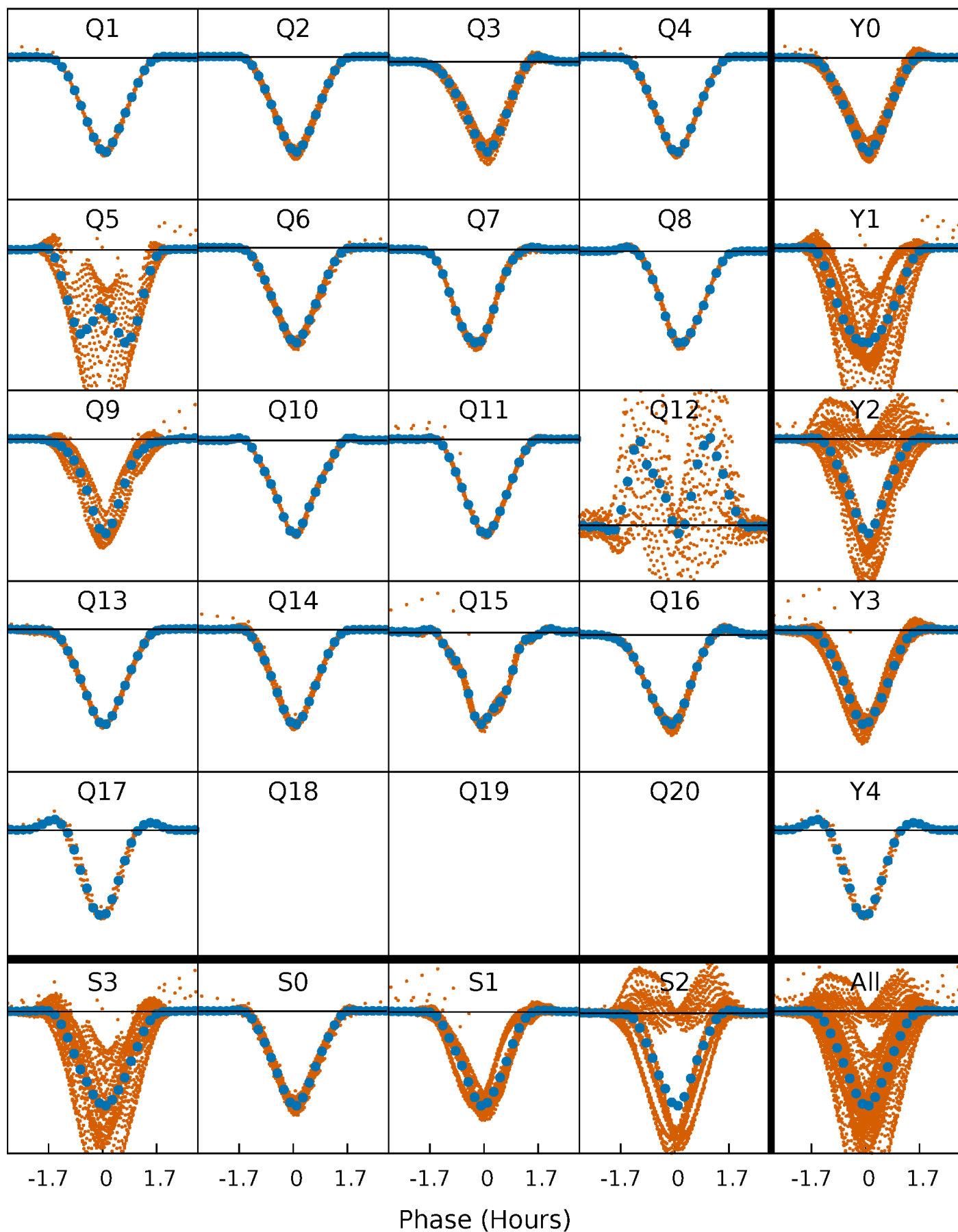
# PDC Quarter-Phased Transit Curves

TCE 009020426-02   P= 0.913394 Days    $T_0=131.985994$  (BKJD)



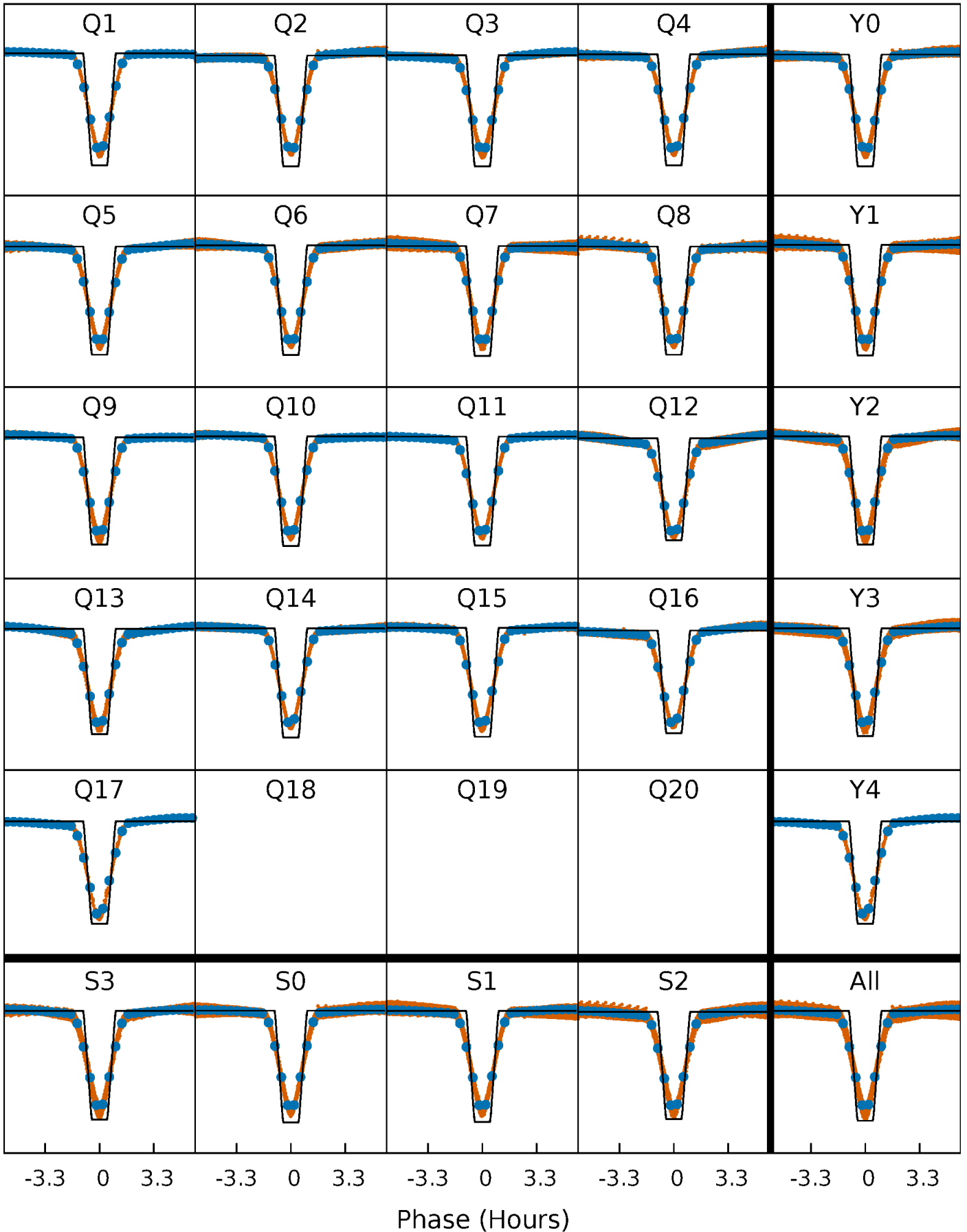
# DV Quarter-Phased Transit Curves

TCE 009020426-02   P= 0.913394 Days    $T_0=131.985994$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

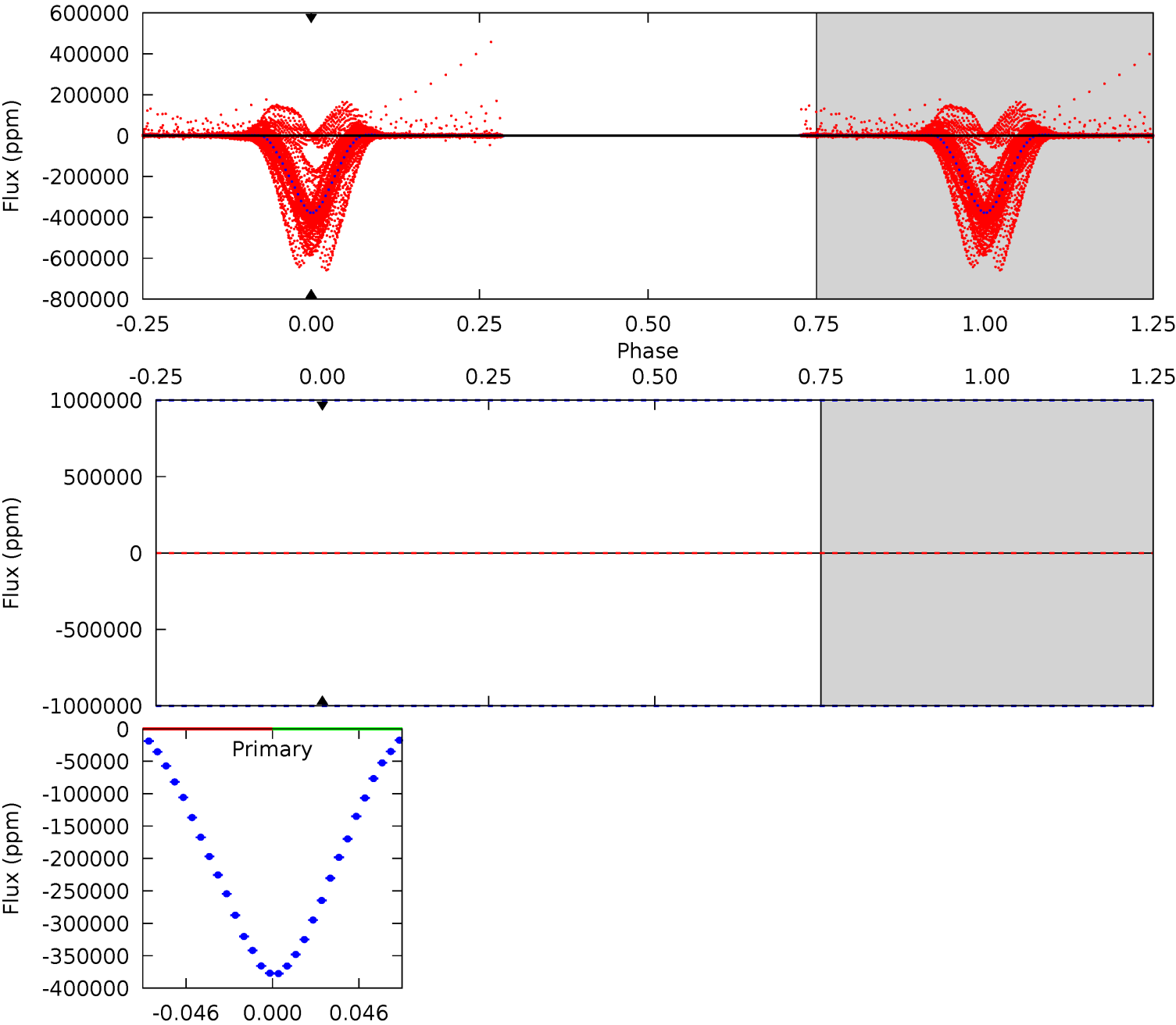
TCE 009020426-02     $P = 0.913394$  Days     $T_0 = 131.988320$  (BKJD)



# DV Model-Shift Uniqueness Test

009020426-02, P = 0.913394 Days, E = 131.072600 Days

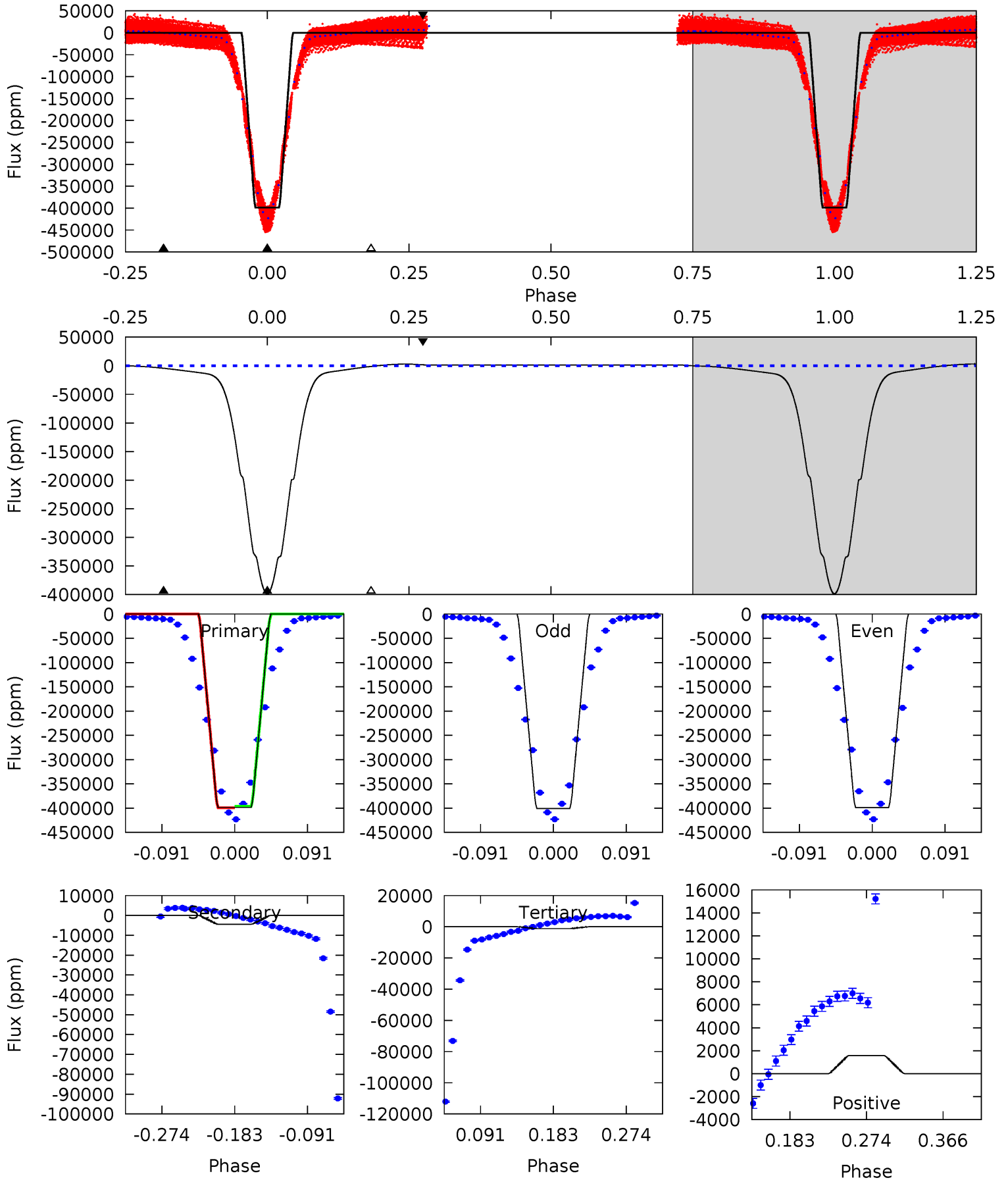
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
0	0	0	0	1.00	1.00	1.00	0	0	0	0	0	0	0	0



# Alt Model-Shift Uniqueness Test

009020426-02, P = 0.913394 Days, E = 131.074926 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
2412	26.9	7.24	9.58	4.58	1.69	32.4	2405	2402	19.6	17.3	4.81	1.00	0.01	9.42





### Stellar Parameters For KIC 009020426

	$T_{\text{eff}} (K)$	$\log(g)$	$[\text{Fe}/\text{H}]$	$R (R_{\odot})$	$M (M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$5986^{+162}_{-180}$	$4.343^{+0.153}_{-0.187}$	$-0.320^{+0.300}_{-0.300}$	$1.069^{+0.302}_{-0.201}$	$0.918^{+0.129}_{-0.094}$	$1.059^{+0.764}_{-0.510}$
	+3%/-3%	+4%/-4%	+94%/-94%	+28%/-19%	+14%/-10%	+72%/-48%
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 009020426-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$0 \pm 1000000$	$27.58^{+12.57}_{-10.94}$	$2864^{+192}_{-180}$	$2752^{+4712}_{-9875}$	$0.482^{+30.253}_{-25.159}$
Alt.	$-4445 \pm 165$	$80.49^{+17.84}_{-14.34}$	$2867^{+201}_{-191}$	$-2794^{+202}_{-175}$	$0.124^{+0.057}_{-0.042}$

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

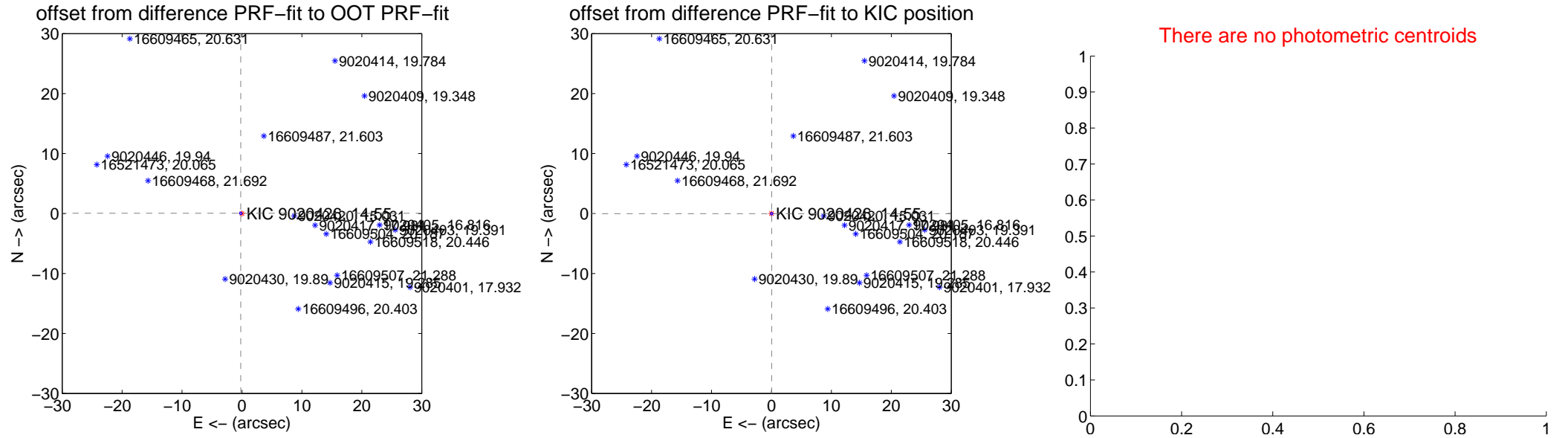
## DV Centroid Data

Supplemental centroid analysis for 009020426-02. Kepler magnitude: 14.55. Transit SNR -1.00

There are 17 quarters with good PRF difference image offsets

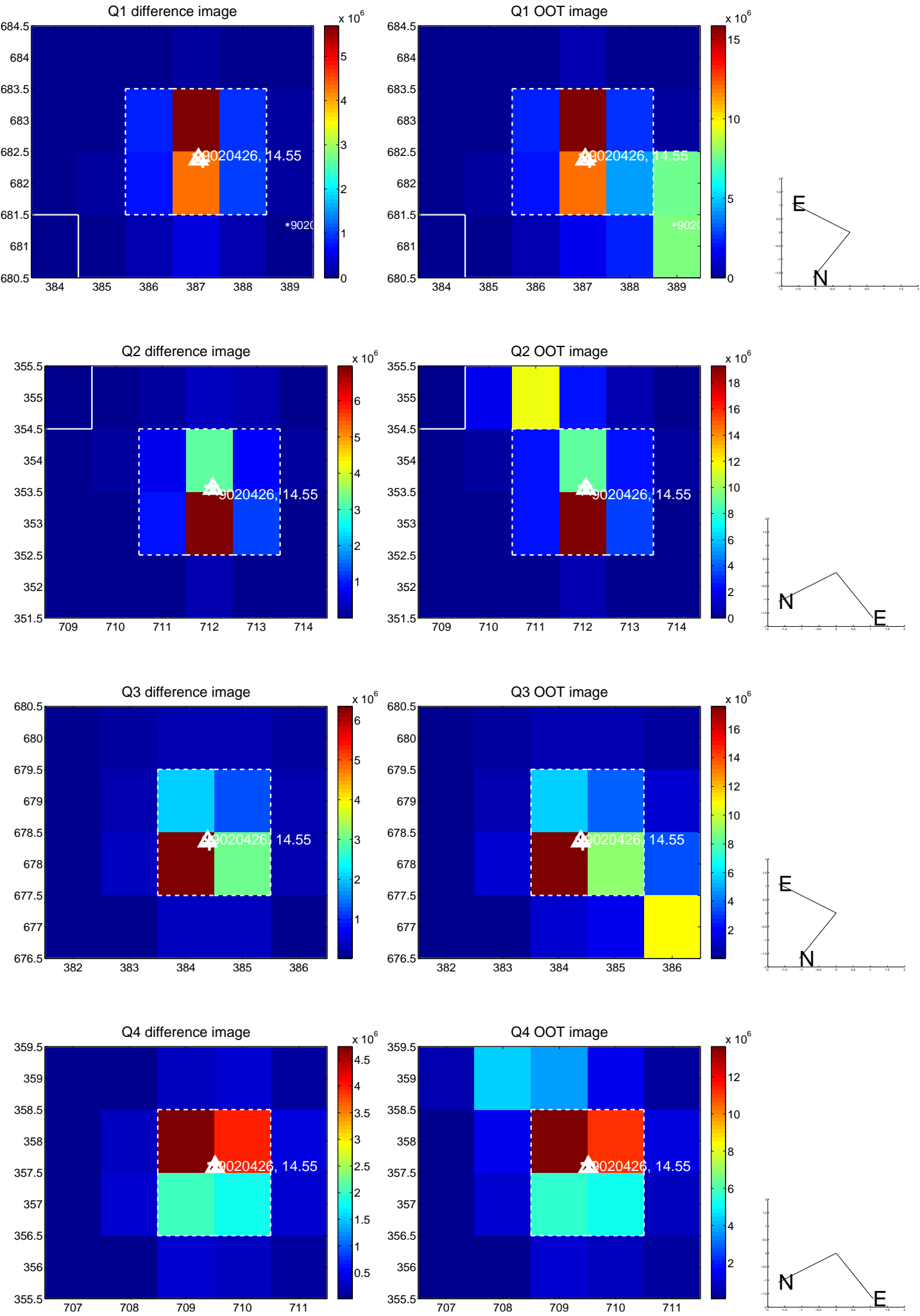
The direct PRF centroid is offset from the target star catalog position by about 0.51 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	<b><math>0.214 \pm 0.071</math></b>	<b>3.01</b>	$0.210 \pm 0.070$	$0.045 \pm 0.069$
PRF-fit source offset from KIC position	$0.041 \pm 0.068$	0.61	$-0.037 \pm 0.068$	$-0.019 \pm 0.067$
photometric centroid source offset	—	—	—	—

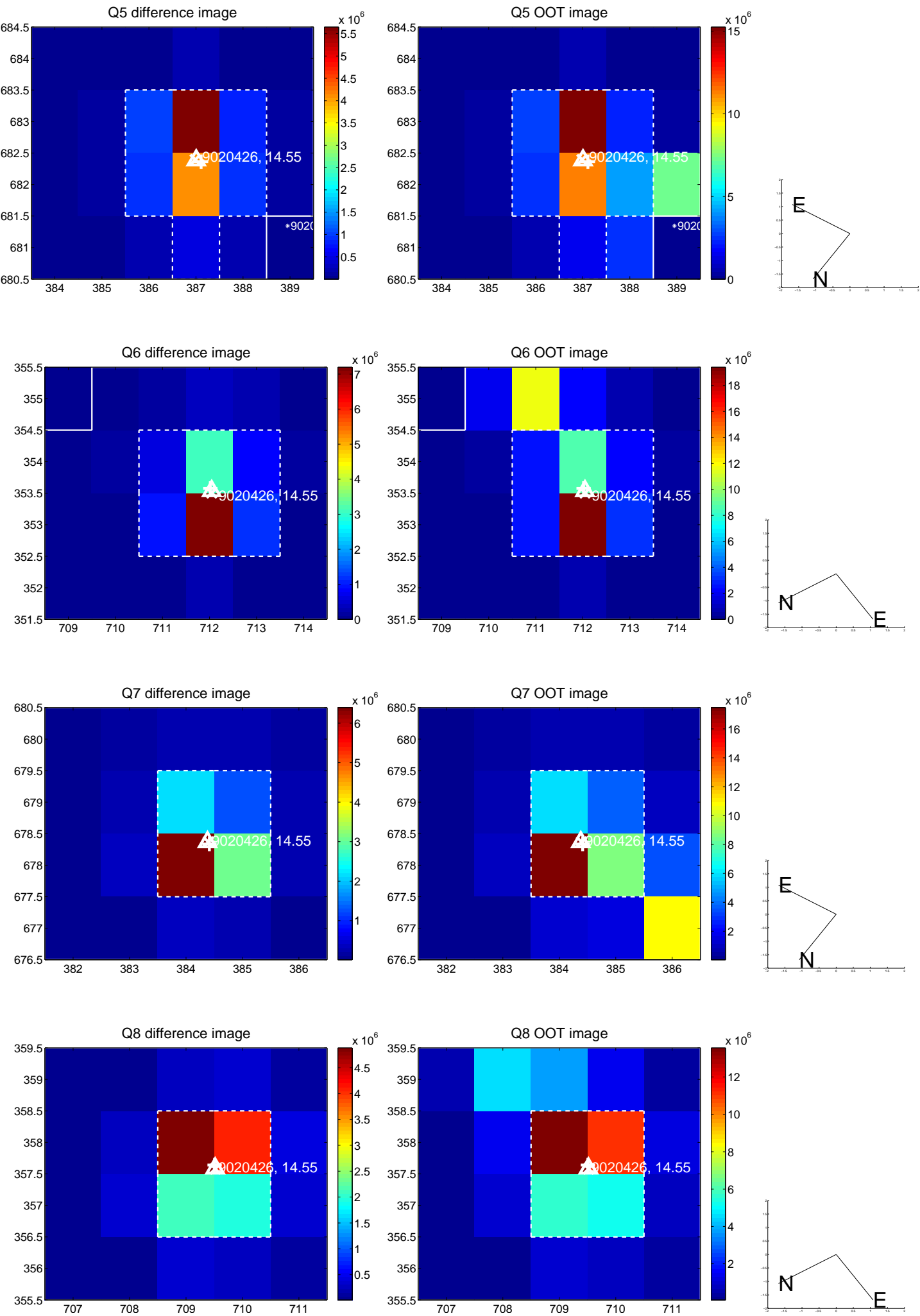


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

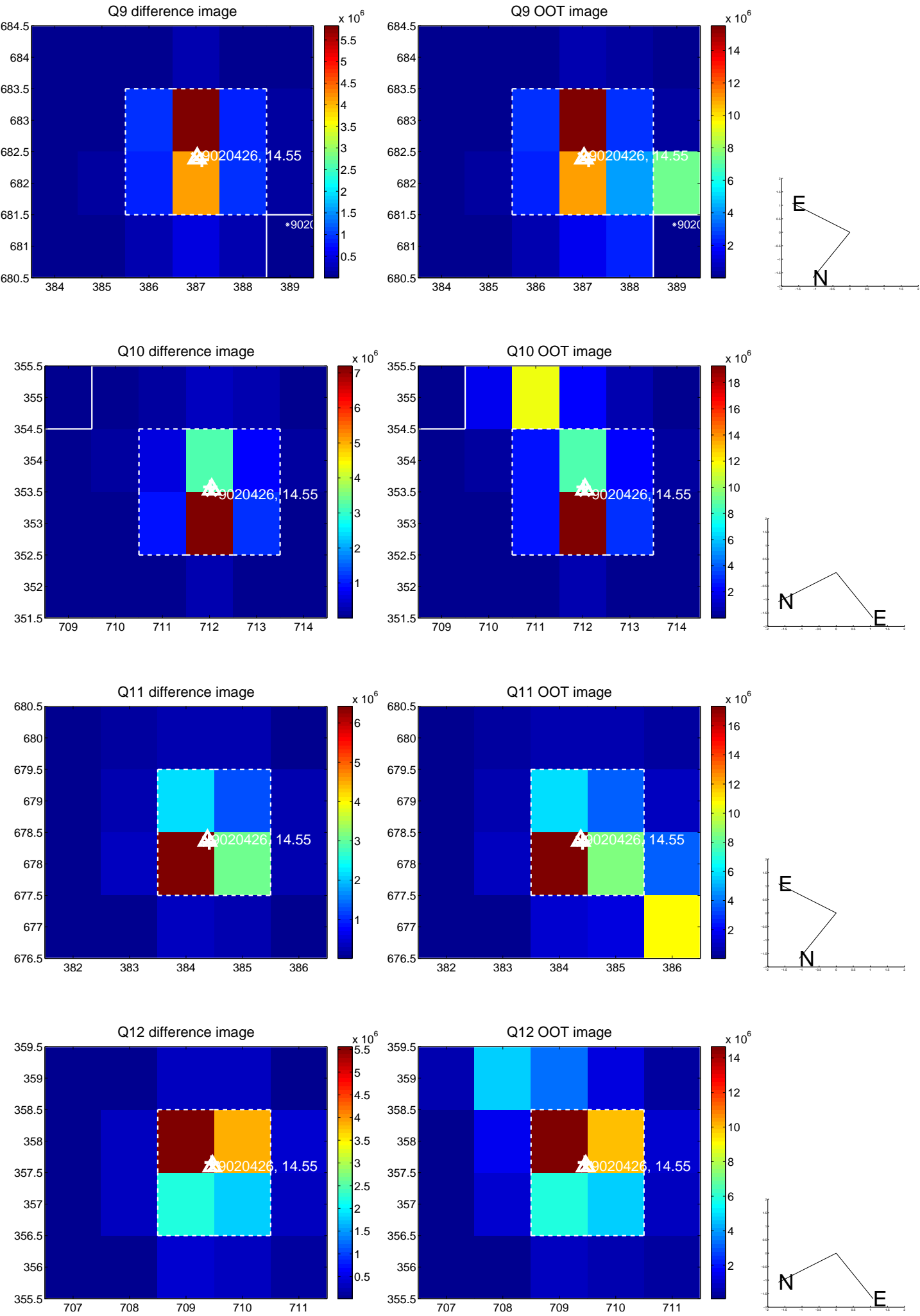
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



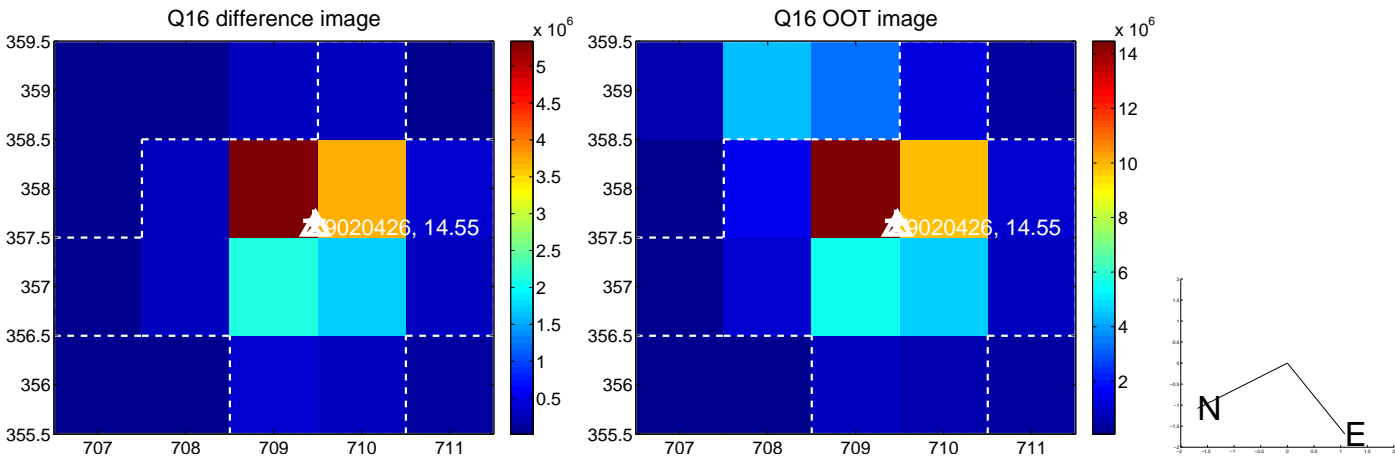
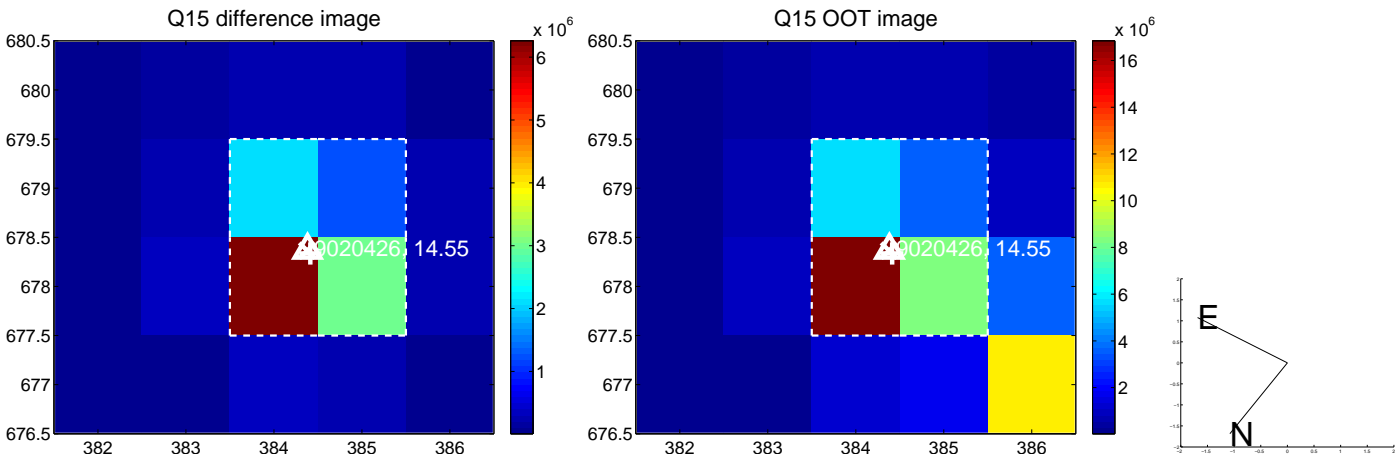
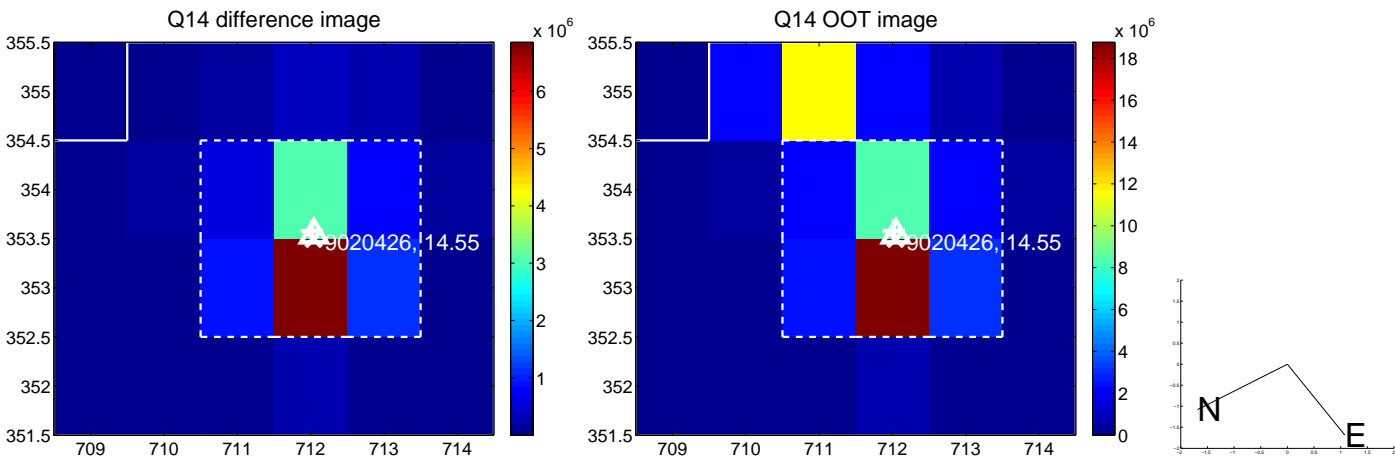
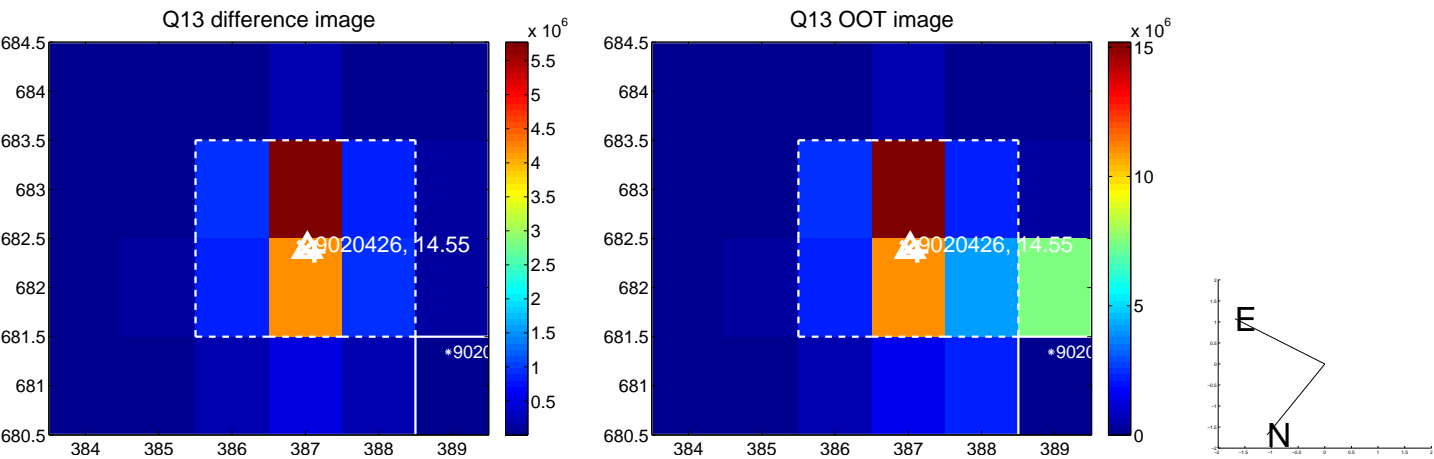
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



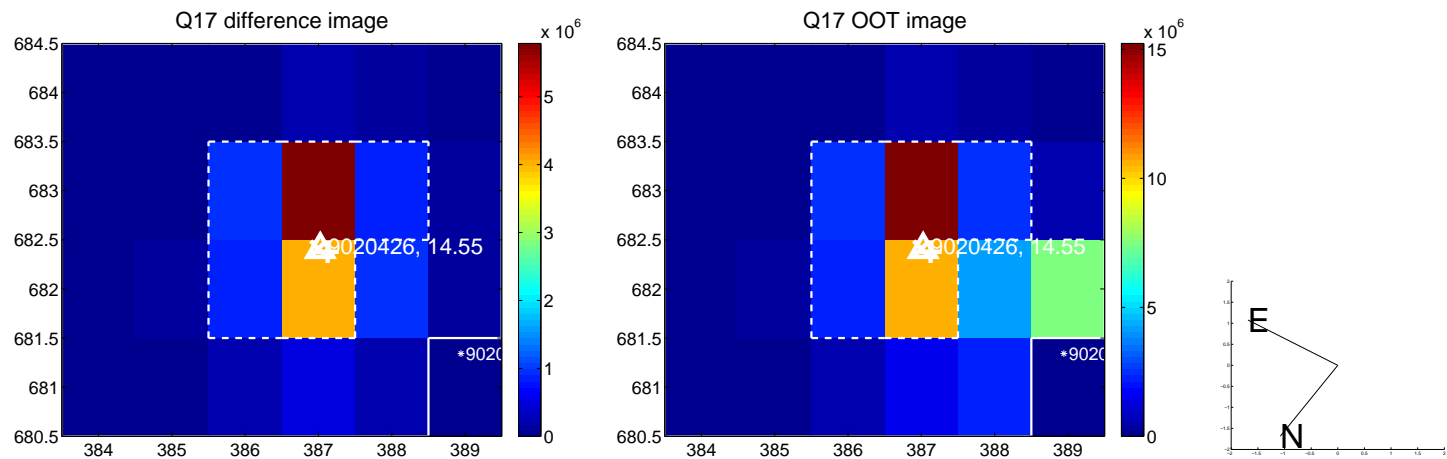
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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.



folded centroid time series figure for this object.

# UKIRT Image

Declination

