

# KIC 004912991

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004912991-01	OBS	5997.01	4.442517	133.608117	25213.5	2.449	6106.5	5105.6	1.12	6316	27.64	593.90
004912991-02	OBS	No	4.442503	131.770010	185.3	1.518	46.8	54.2	1.12	6316	1.79	593.90

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004912991-01	OBS	FP	0.00	0	1	0	0	MOD_SEC_DV—MOD_SEC_ALT—DEEP_V_SHAPED—HAS_SEC_TCE—CENT_SATURATED
004912991-02	OBS	FP	0.00	1	1	0	0	IS_SEC_TCE—CENT_SATURATED

**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 004912991-01

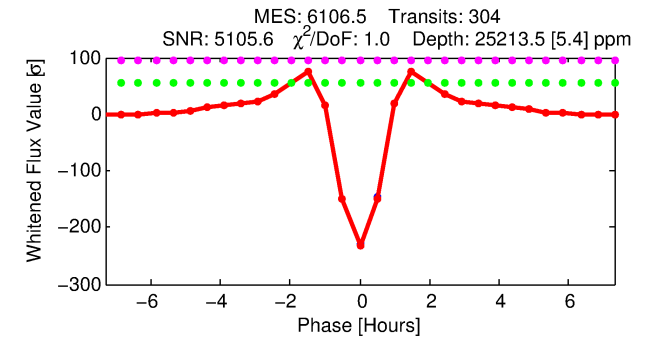
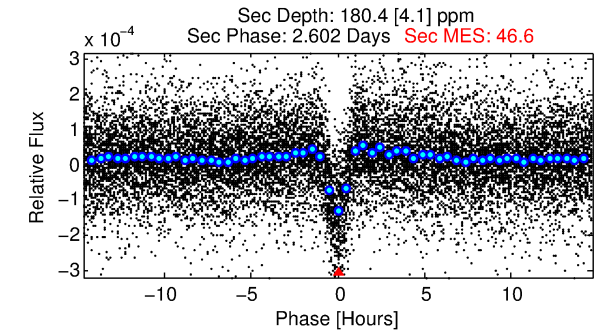
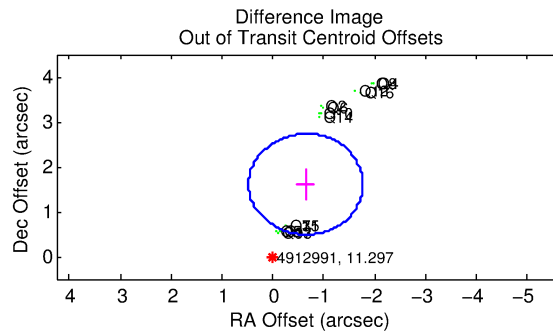
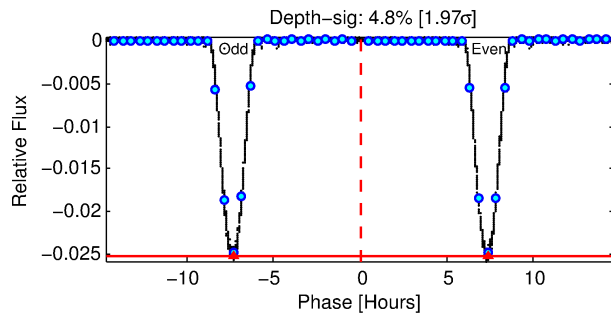
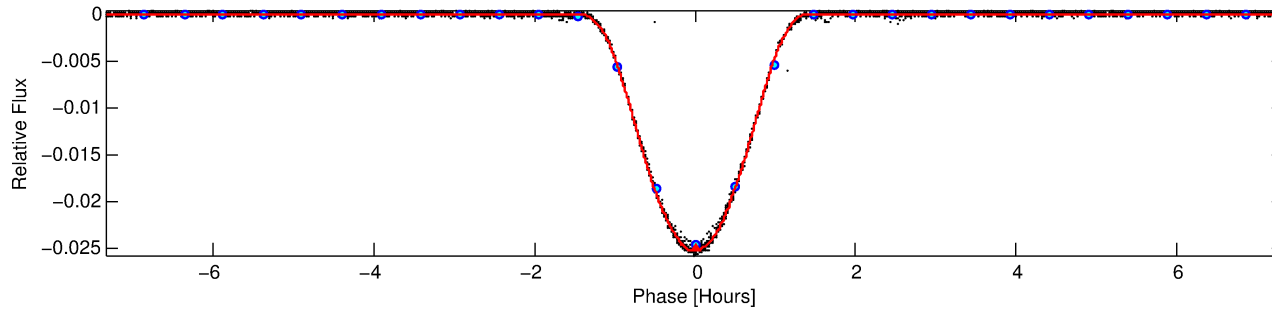
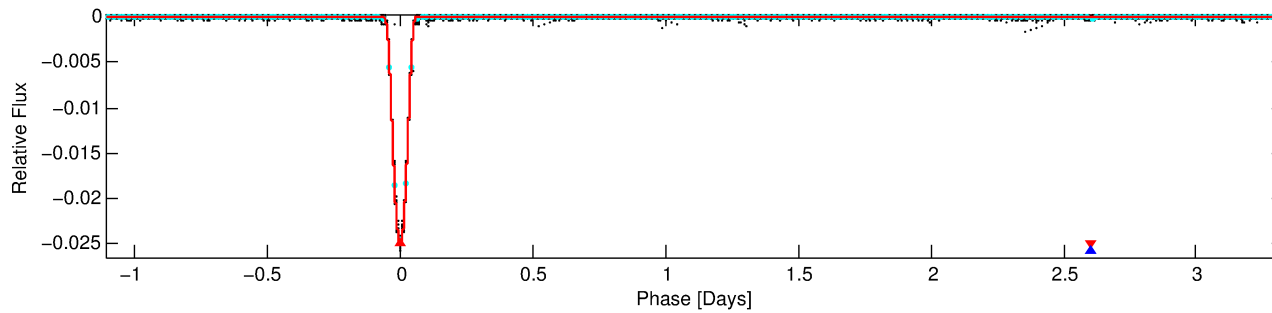
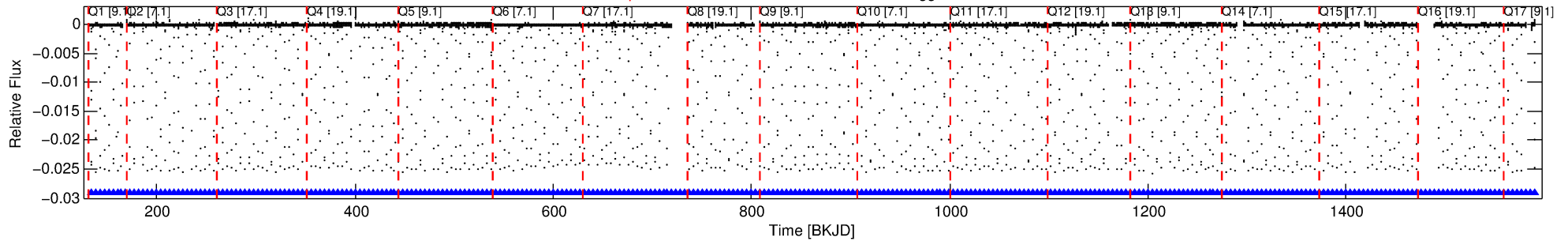
No Significant Match Found

# DV One-Page Summary

KIC: 4912991 Candidate: 1 of 2 Period: 4.443 d

KOI: K05997.01 Corr: 0.996

Kp: 11.30 R\*: 1.12 Rs Teff: 6316.0 K Logg: 4.39 Fe/H: -0.100



## DV Fit Results:

Period = 4.44252 [0.00000] d  
Epoch = 133.6081 [0.0000] BKJD  
Rp/R\* = 0.2263 [0.0018]  
a/R\* = 10.64 [0.01]  
b = 0.96 [0.00]  
Seff = 593.90 [181.82]  
Teq = 1259 [96] K  
Rp = 27.64 [6.08] Re  
a = 0.0548 [0.0103] AU  
Ag = 0.39 [0.11] [-5.58σ]  
Teffp = 1538 [50] K [2.57σ]

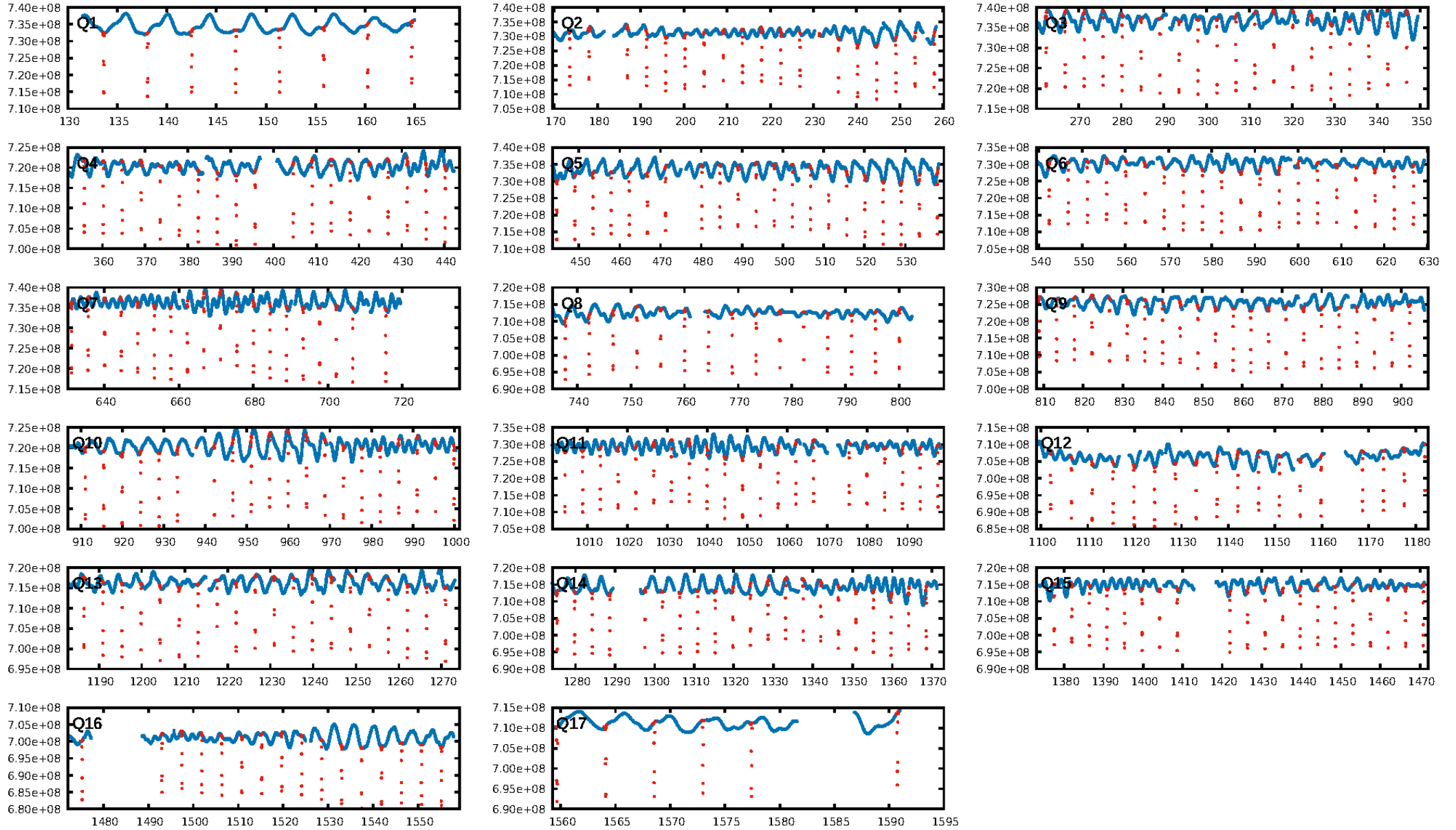
## DV Diagnostic Results:

ShortPeriod-sig: 0.0% [0.00σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [290/290]  
GhostDiagnostic-chr: 4.366  
Centroid-sig: 0.0%  
Centroid-so: 0.240 arcsec [144.90σ]  
OotOffset-rm: 1.734 arcsec [4.64σ]  
KicOffset-rm: 1.408 arcsec [3.88σ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 0.94 [16/17]  
DiffImageOverlap-fno: 1.00 [17/17]

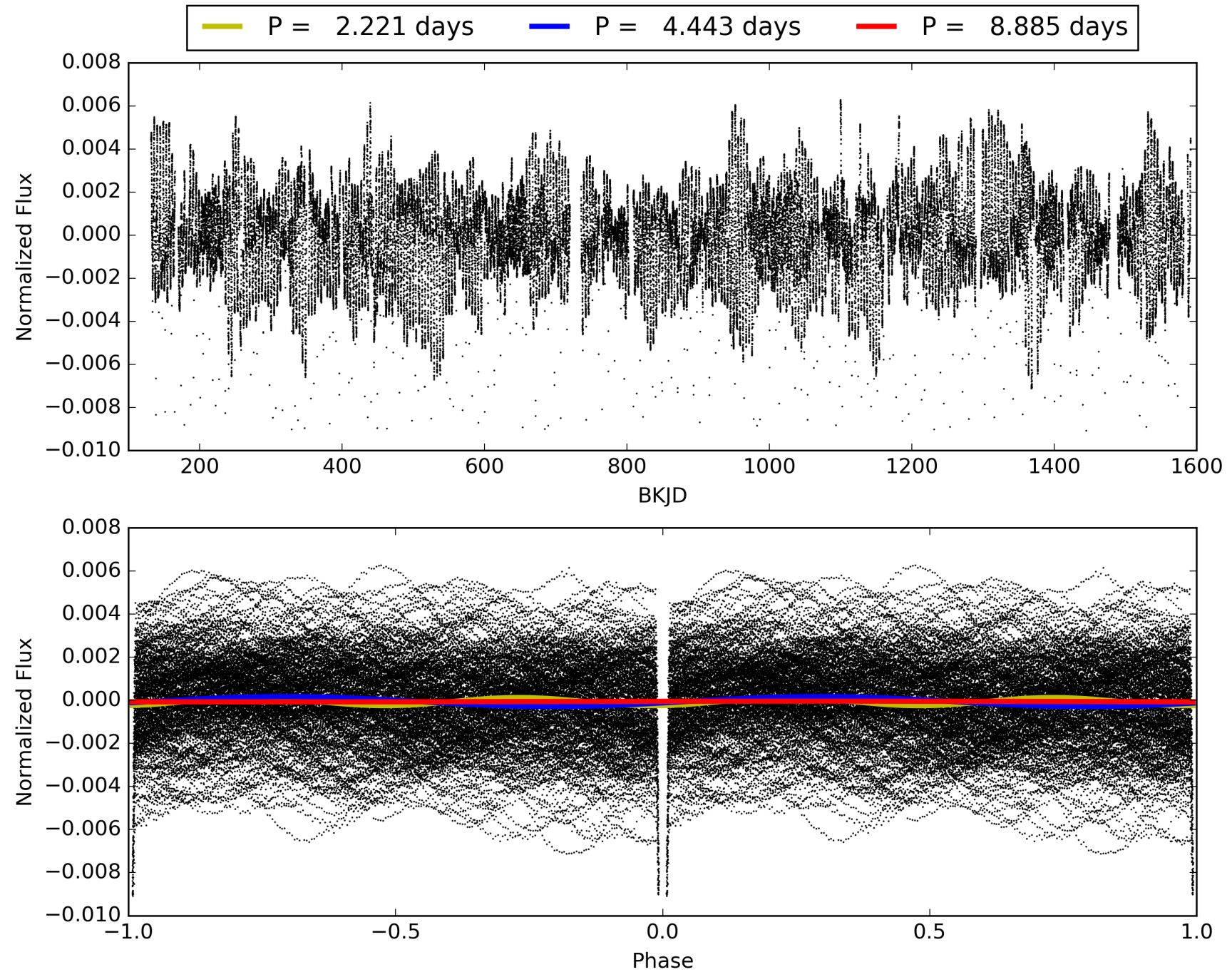
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 02-Feb-2016 00:21:05 Z

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

# TCE 004912991-01, PDC Light Curves

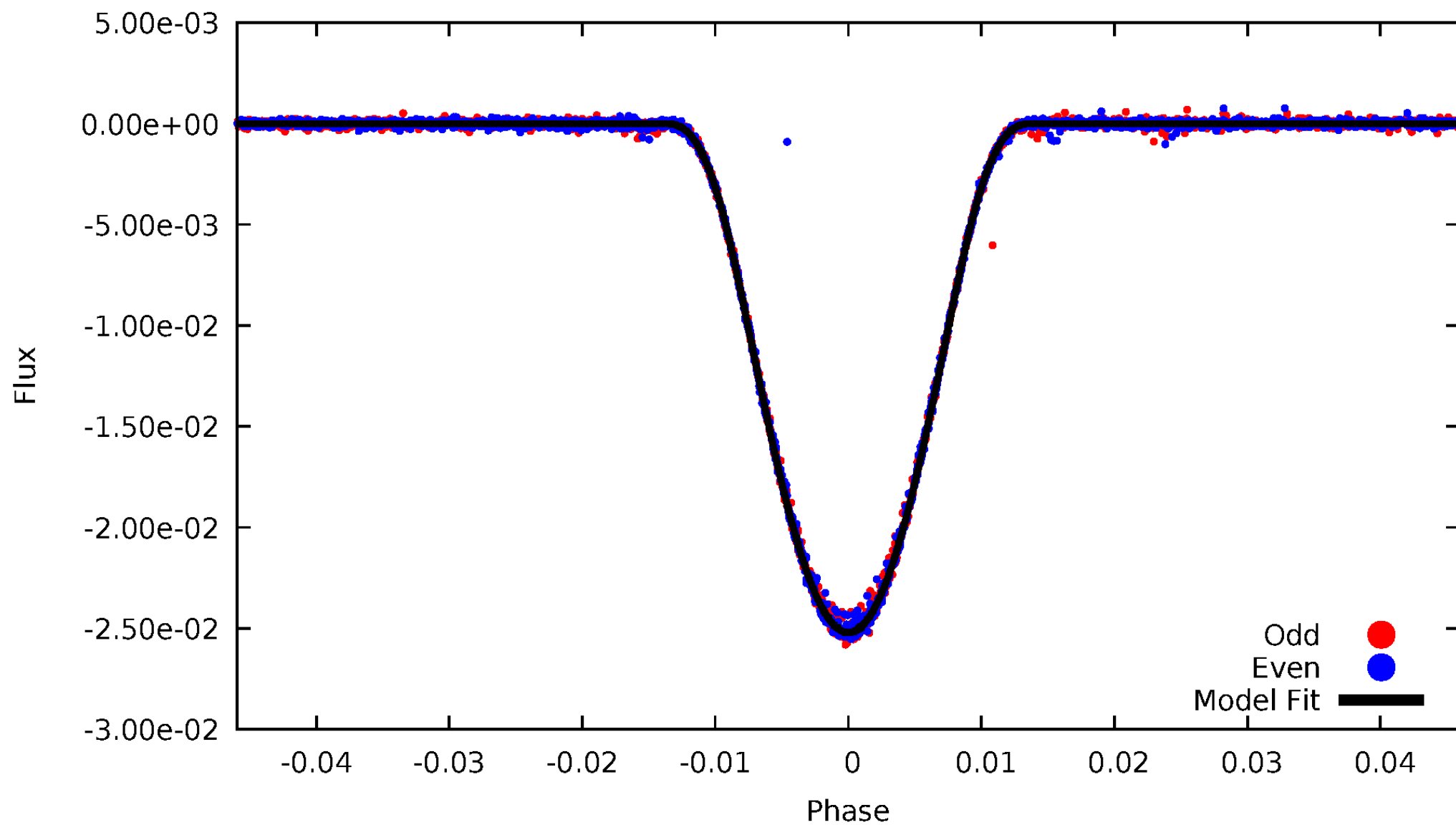


TCE 004912991-01



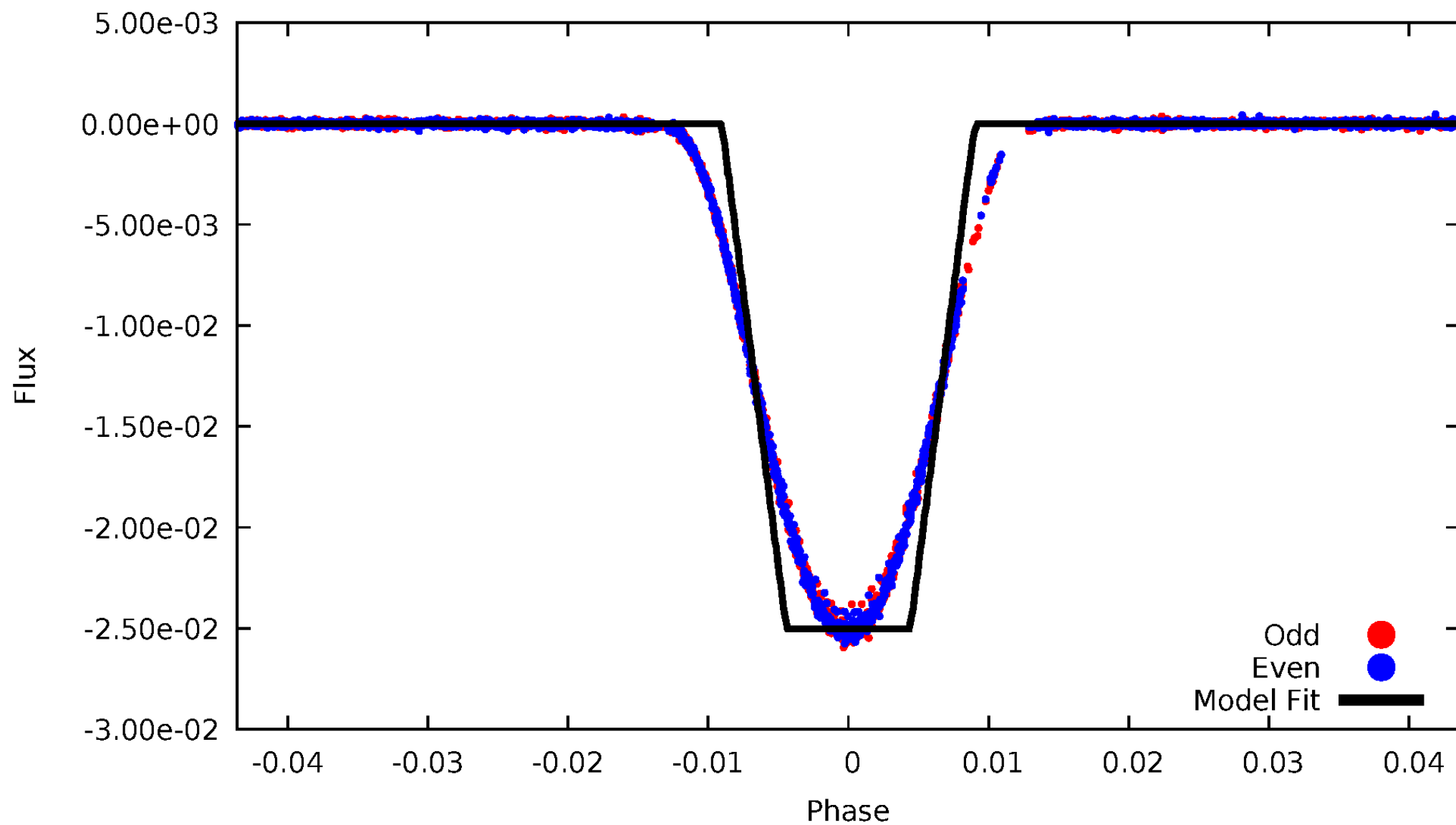
# DV Odd/Even

TCE 004912991-01



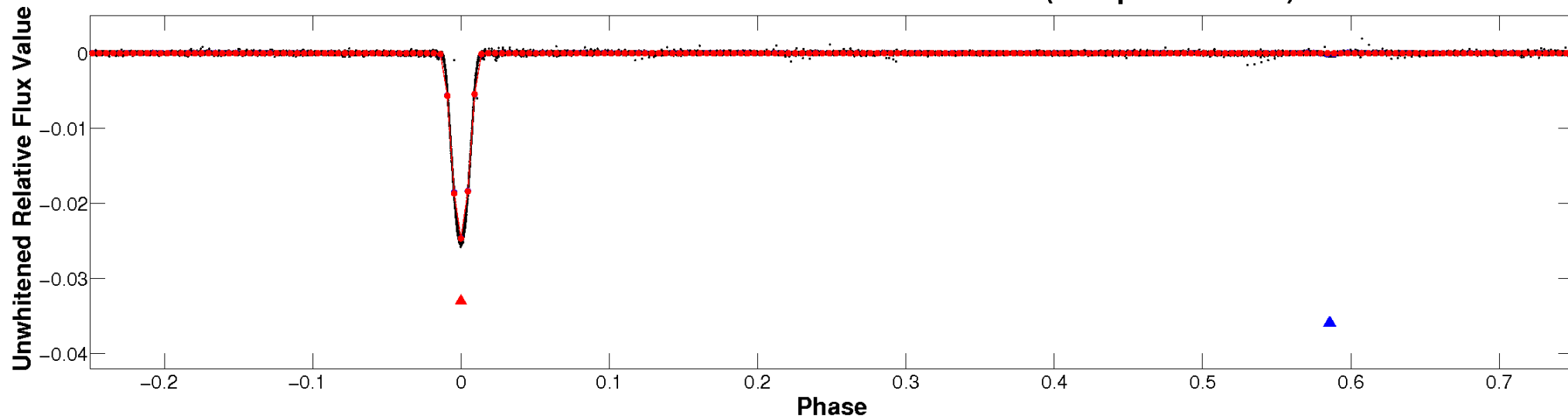
# ALT Odd/Even

TCE 004912991-01

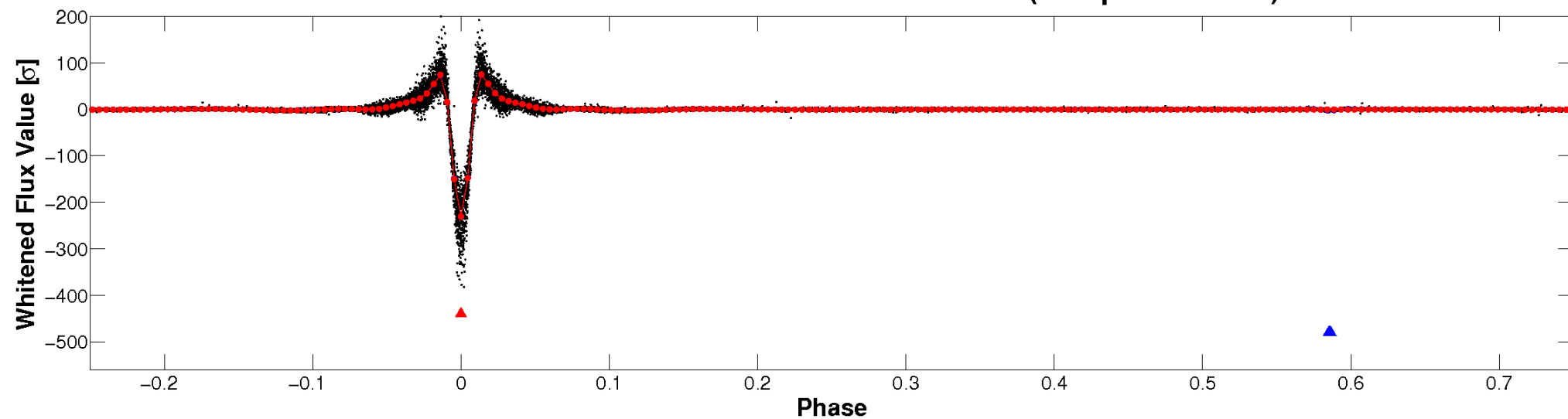


# Non-Whitened Vs. Whitened Light Curve

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

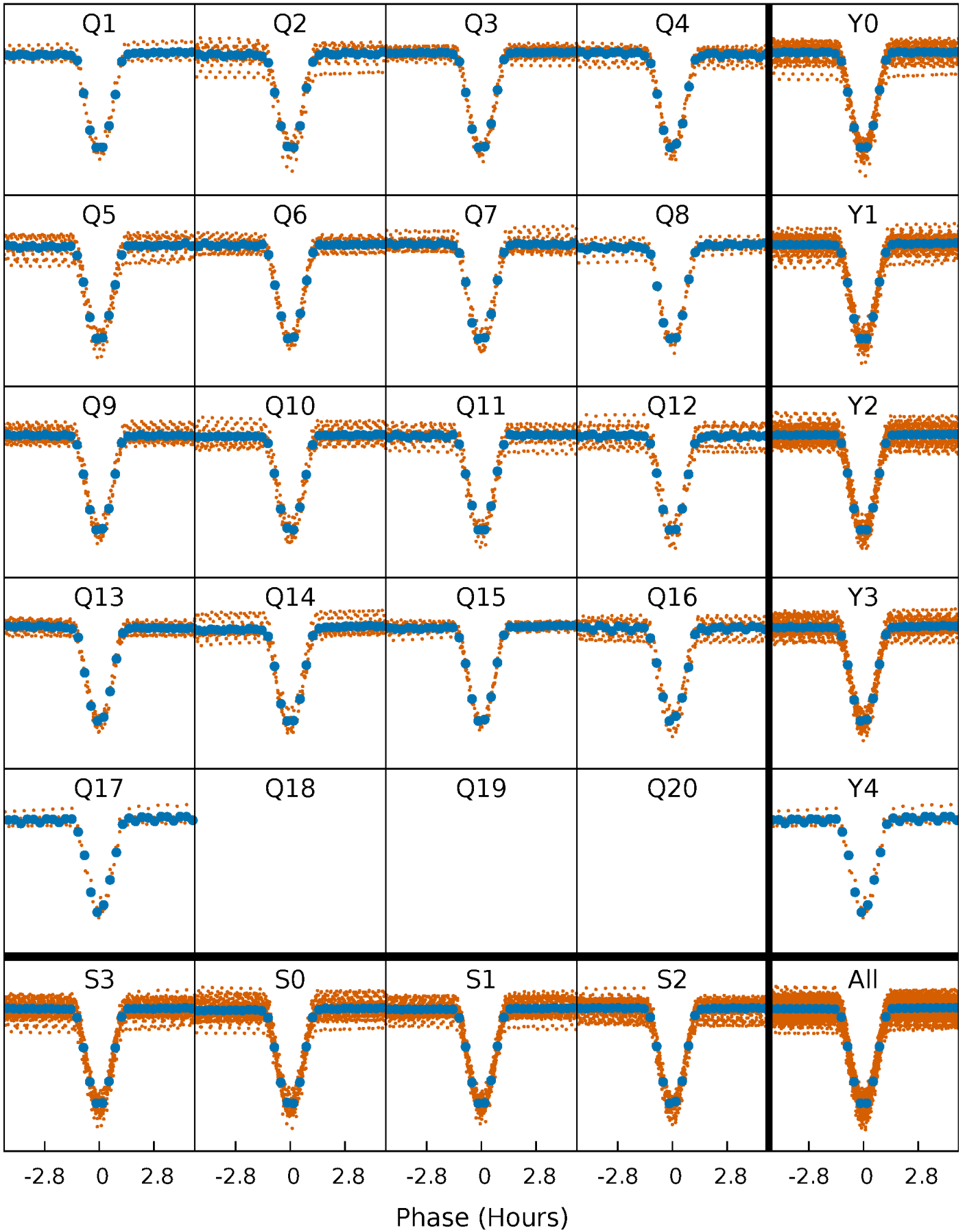


**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



# PDC Quarter-Phased Transit Curves

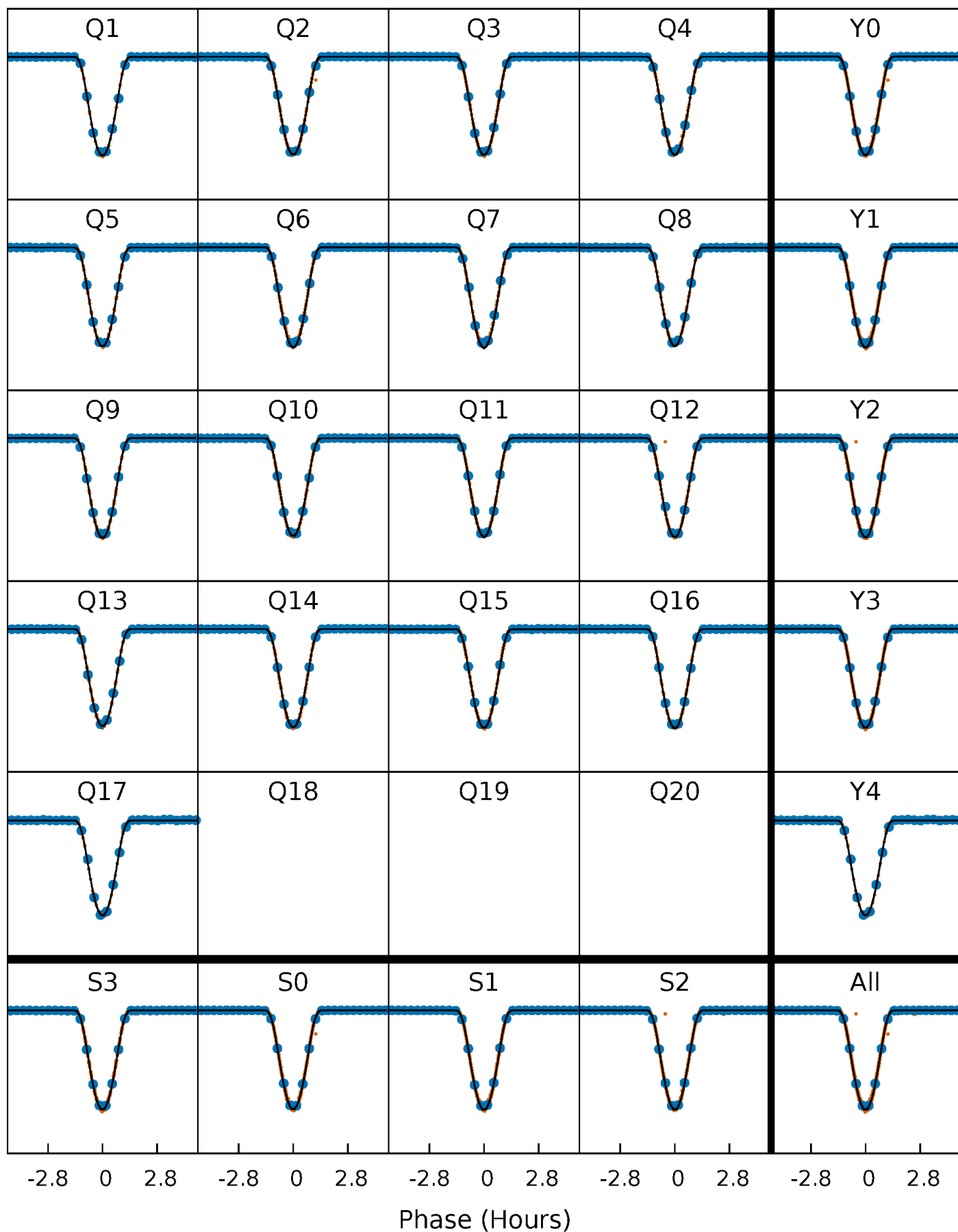
TCE 004912991-01   P= 4.442517 Days    $T_0=133.608116$  (BKJD)





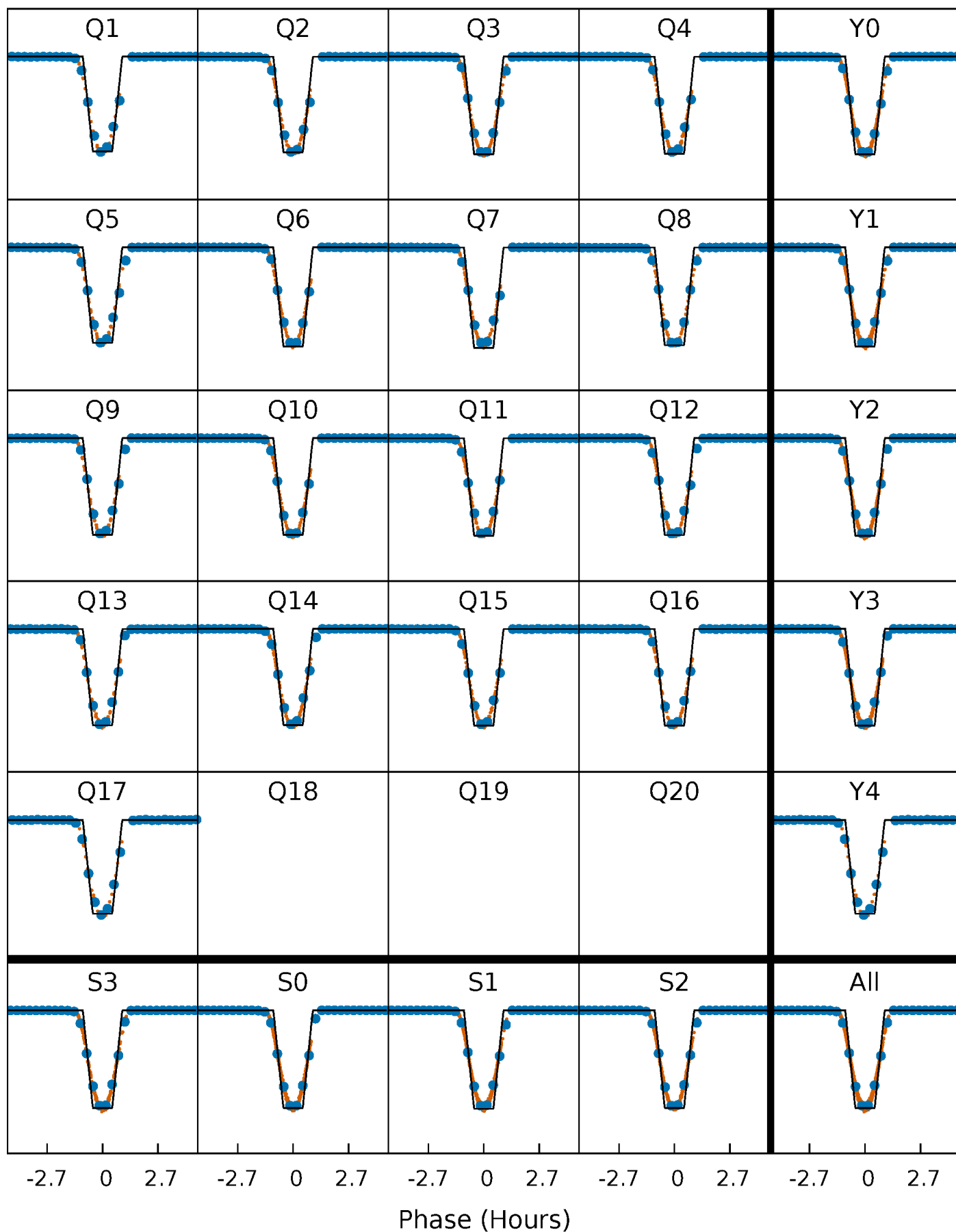
# DV Quarter-Phased Transit Curves

TCE 004912991-01 P= 4.442517 Days  $T_0=133.608116$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

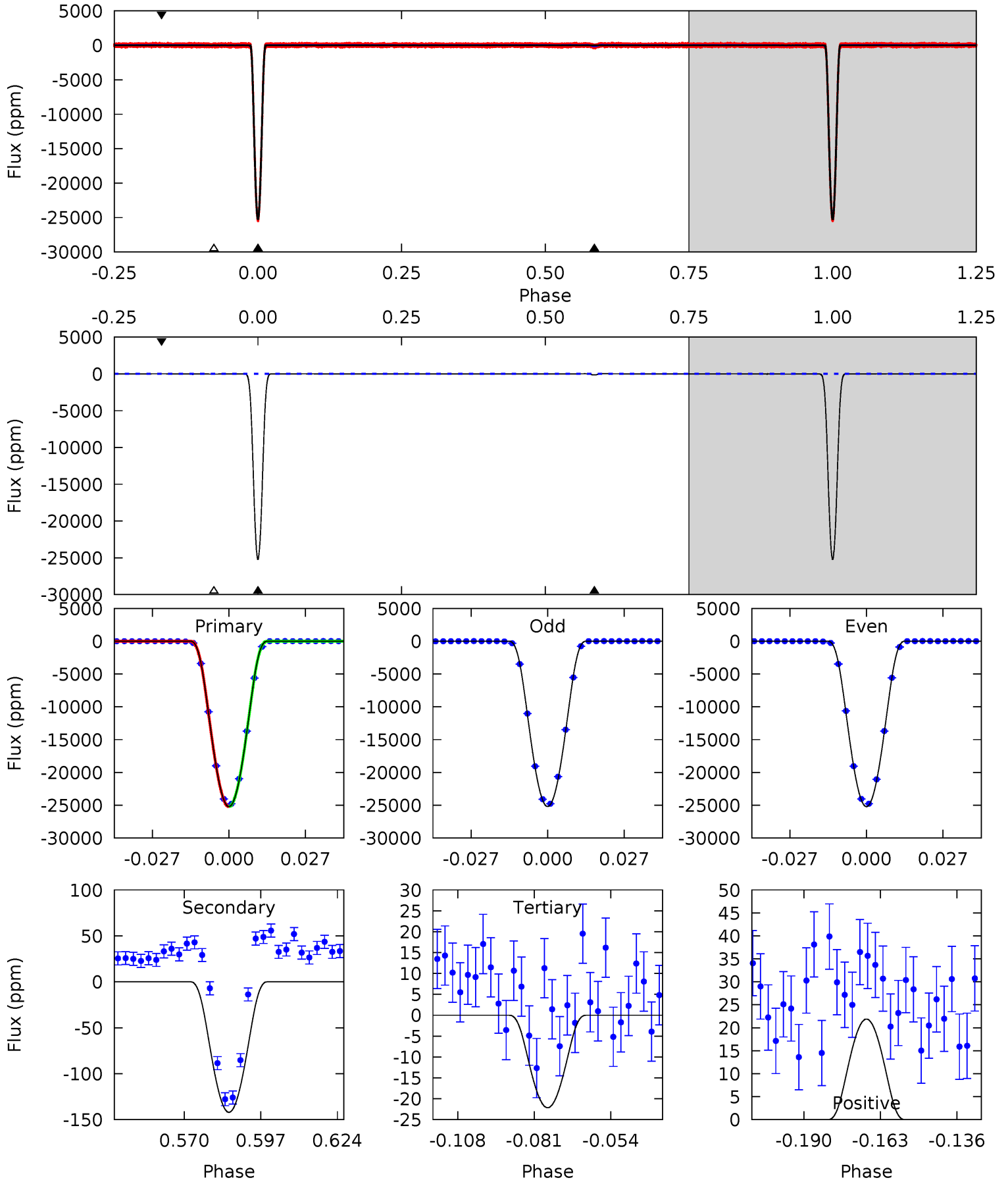
TCE 004912991-01   P= 4.442520 Days    $T_0=133.607600$  (BKJD)



# DV Model-Shift Uniqueness Test

004912991-01, P = 4.442517 Days, E = 129.165599 Days

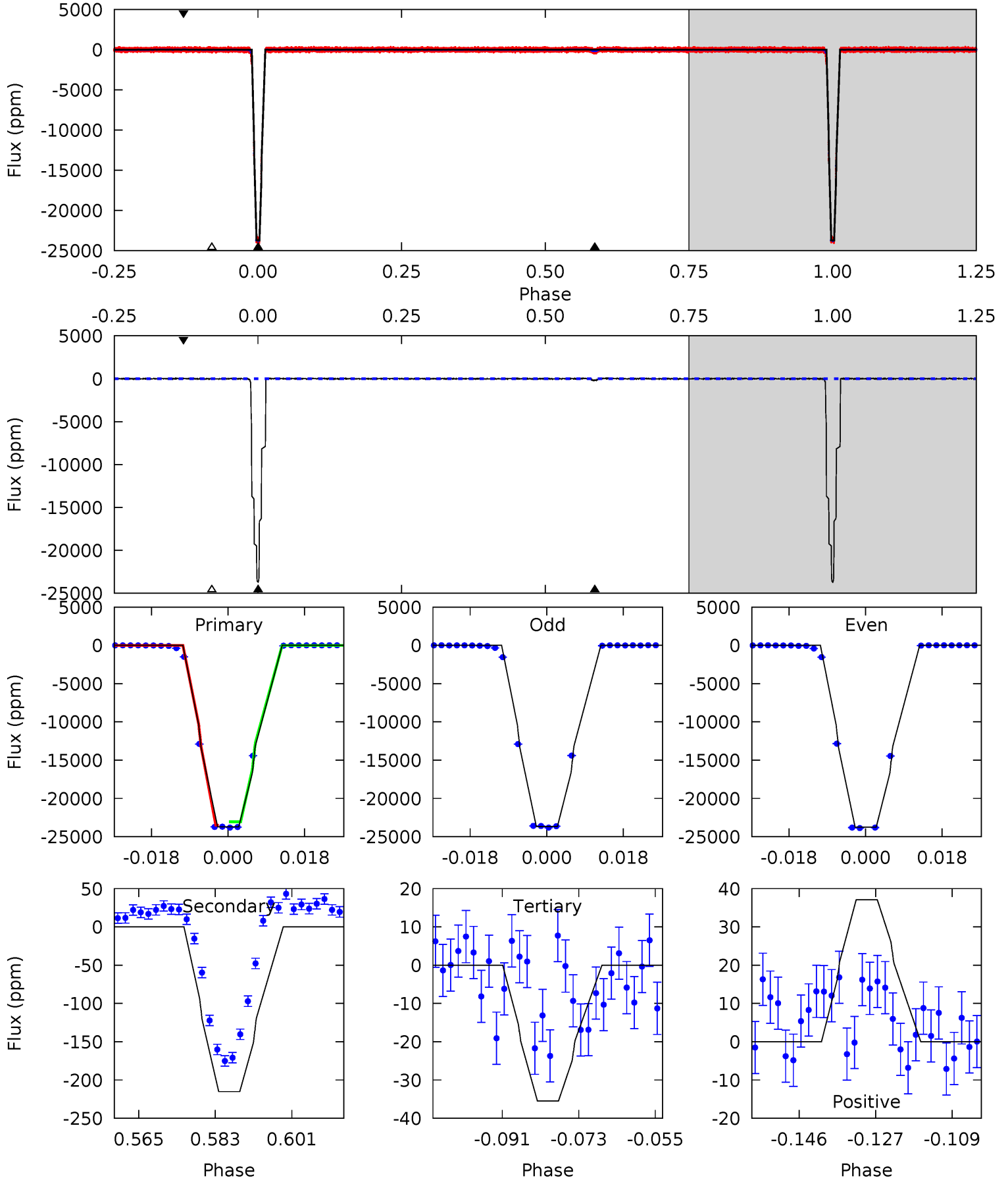
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
11096	62.5	9.75	9.63	4.83	2.21	4.08	11087	11087	52.8	52.9	4.85	1.00	0.00	1.92



# Alt Model-Shift Uniqueness Test

004912991-01, P = 4.442520 Days, E = 129.165080 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
2895	26.3	4.33	4.53	4.91	2.36	1.34	2890	2890	21.9	21.7	5.07	0.99	0.00	0



### Stellar Parameters For KIC 004912991

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6316^{+155}_{-202}$	$4.387^{+0.066}_{-0.154}$	$-0.100^{+0.250}_{-0.300}$	$1.119^{+0.246}_{-0.143}$	$1.109^{+0.144}_{-0.129}$	$1.116^{+0.383}_{-0.474}$
	+2%/-3%	+2%/-4%	+250%/-300%	+22%/-13%	+13%/-12%	+34%/-42%
Source	PHO1	FLK73	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 004912991-01 / KOI 5997.01

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-142 \pm 2$	$28.47^{+3.18}_{-2.37}$	$1784^{+93}_{-82}$	$-1679^{+3523}_{-345}$	$0.289^{+0.044}_{-0.049}$
Alt.	$-215 \pm 8$	$19.69^{+2.48}_{-1.45}$	$1777^{+99}_{-82}$	$2563^{+44}_{-59}$	$0.907^{+0.134}_{-0.180}$

$T_{\text{max}}$  = 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

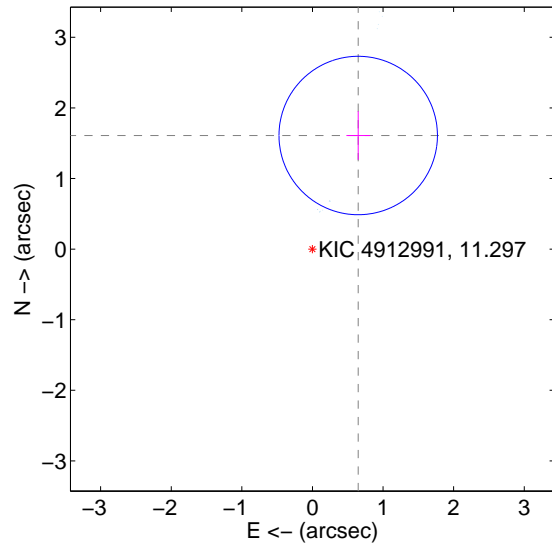
Supplemental centroid analysis for 004912991-01. **Kepler magnitude: 11.30.** Transit SNR 5105.61

There are 16 quarters with good PRF difference image offsets

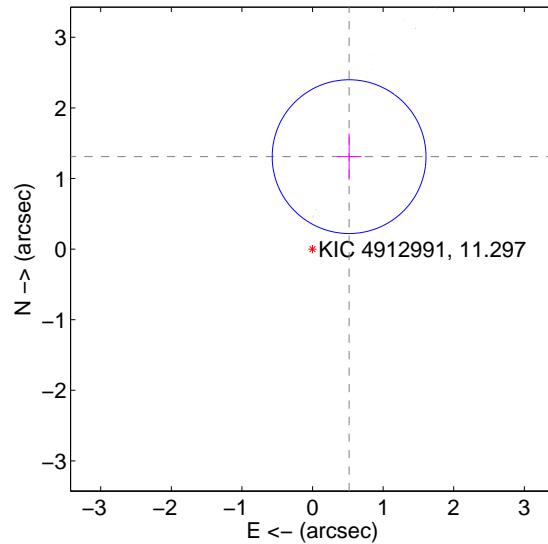
The direct PRF centroid is offset from the target star catalog position by about 0.06 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	<b>1.734 <math>\pm</math> 0.374</b>	<b>4.64</b>	-0.648 $\pm$ 0.167	1.609 $\pm$ 0.345
PRF-fit source offset from KIC position	<b>1.408 <math>\pm</math> 0.363</b>	<b>3.88</b>	-0.518 $\pm$ 0.173	1.309 $\pm$ 0.329
photometric centroid source offset	<b>0.24 <math>\pm</math> 0.00</b>	<b>144.90</b>	0.16 $\pm$ 0.00	0.18 $\pm$ 0.00

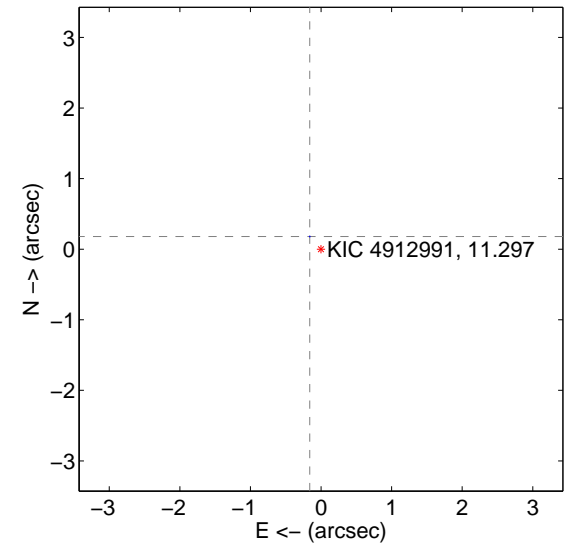
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

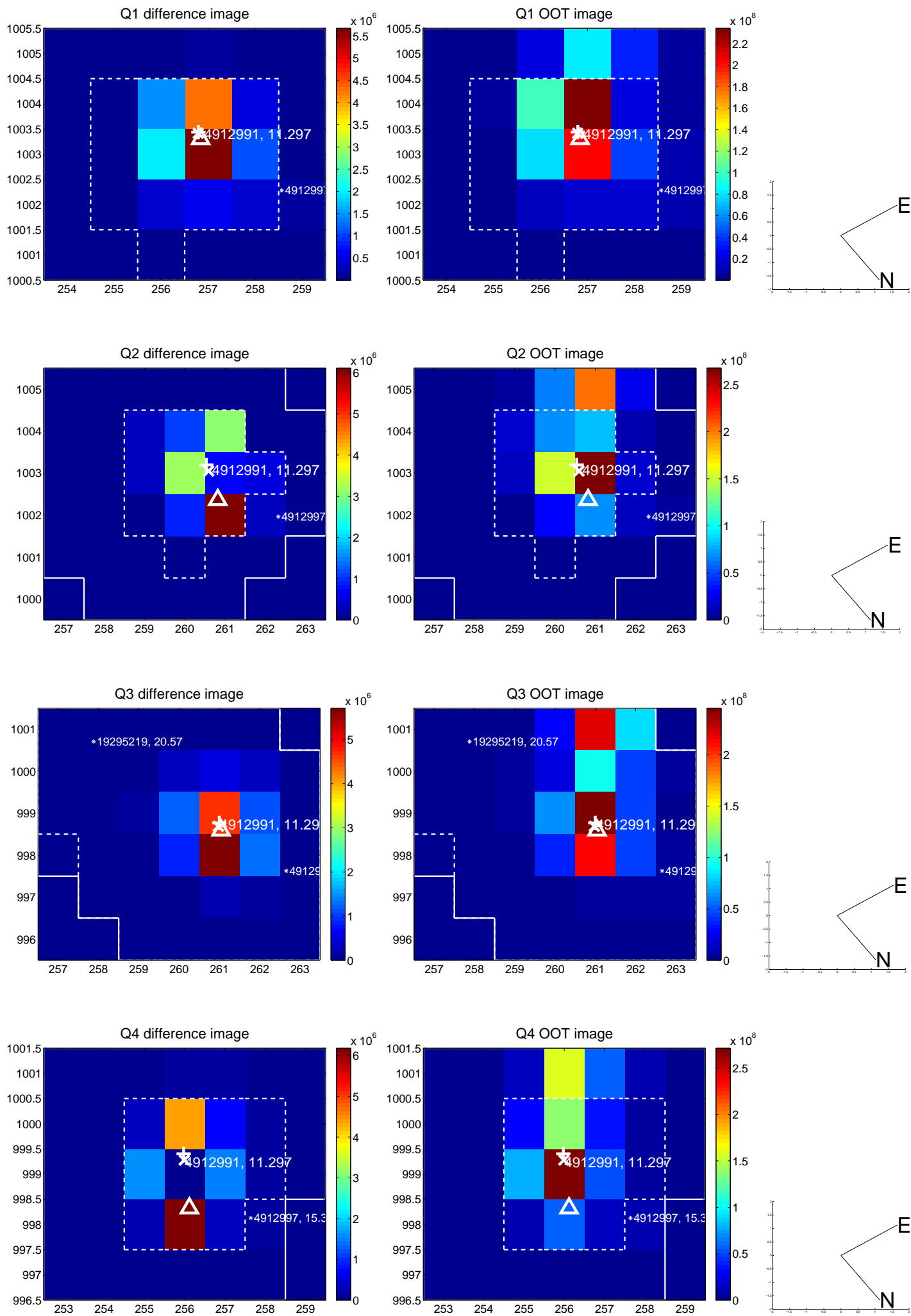


offset from photometric centroids

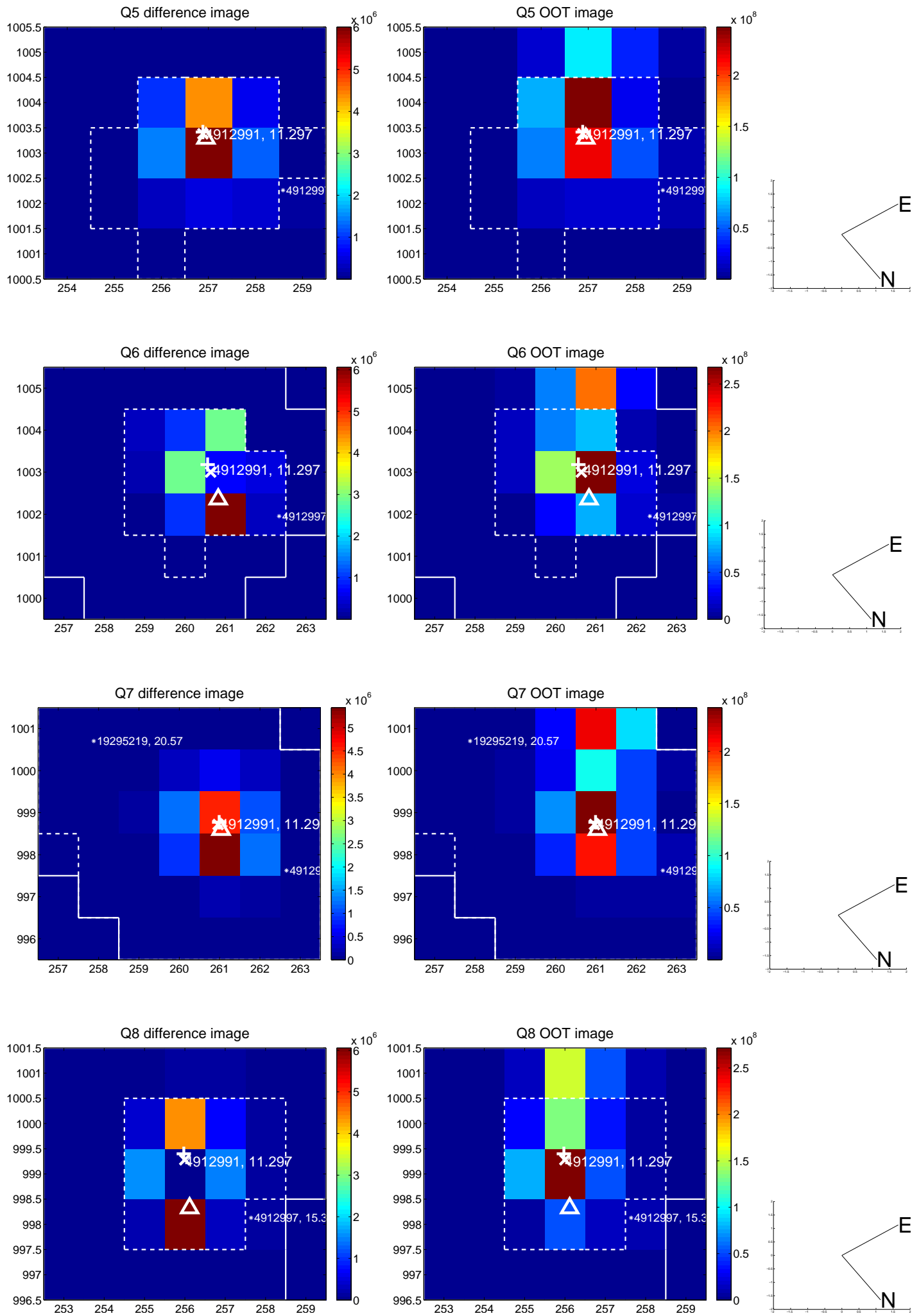


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

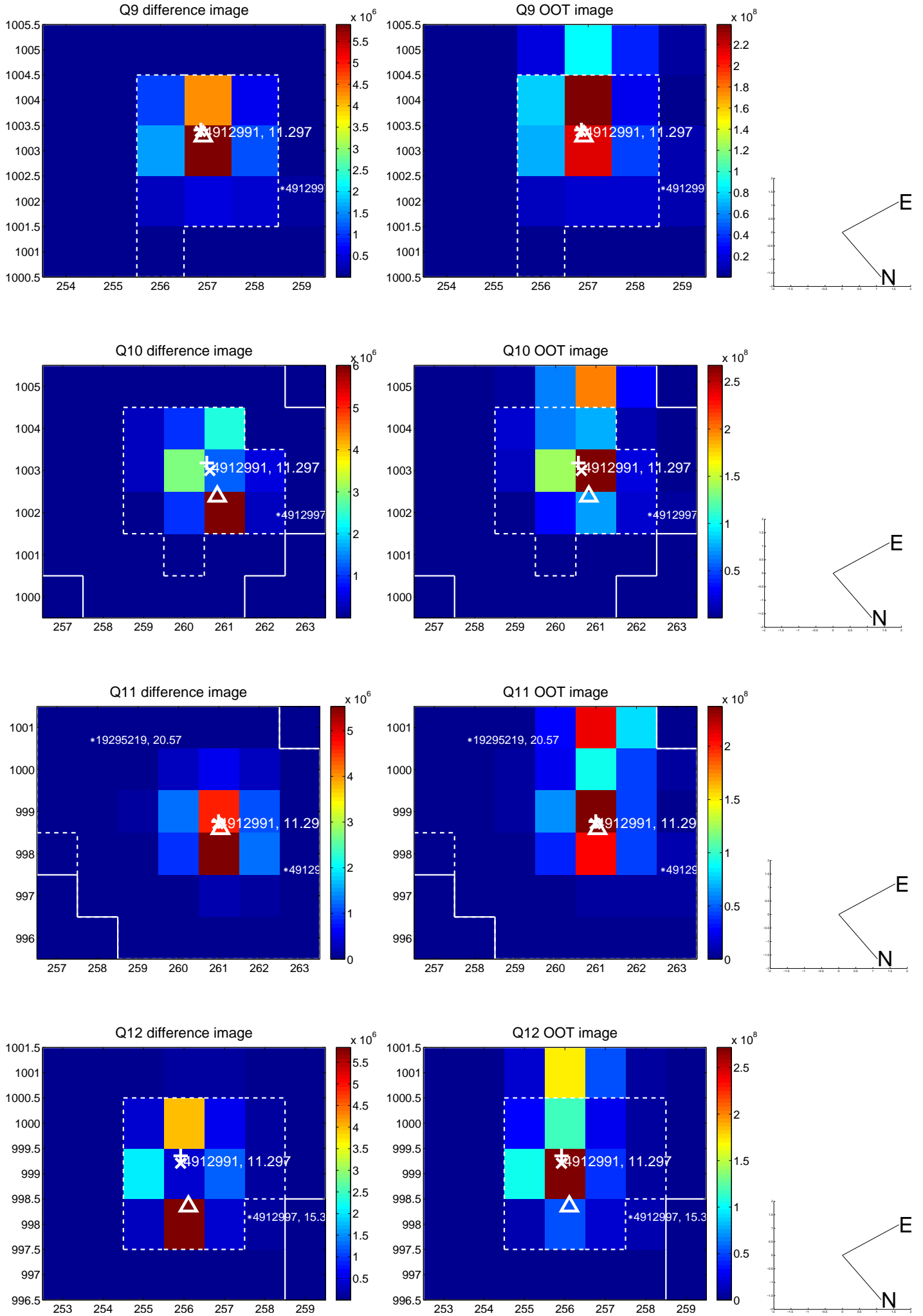


white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

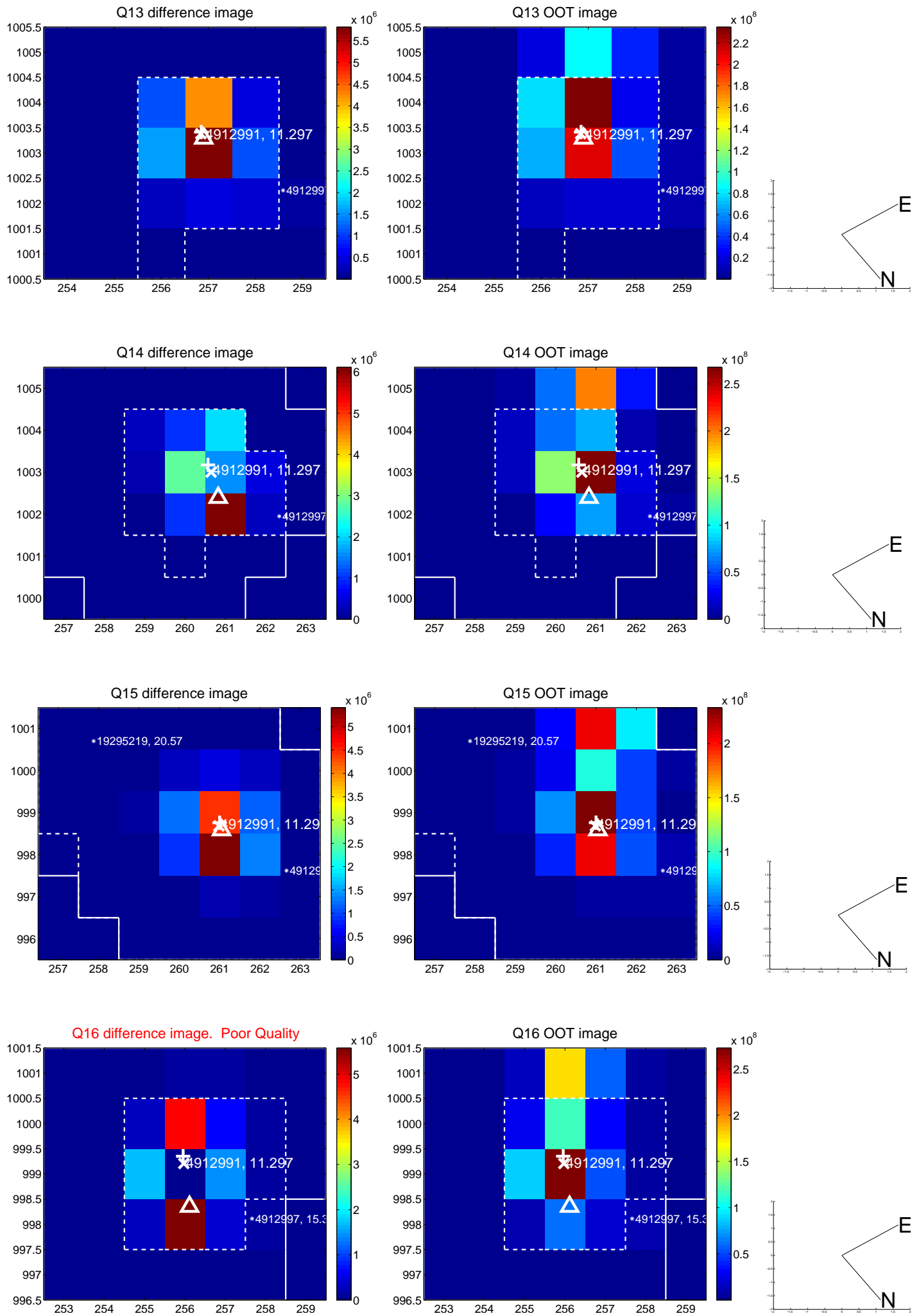




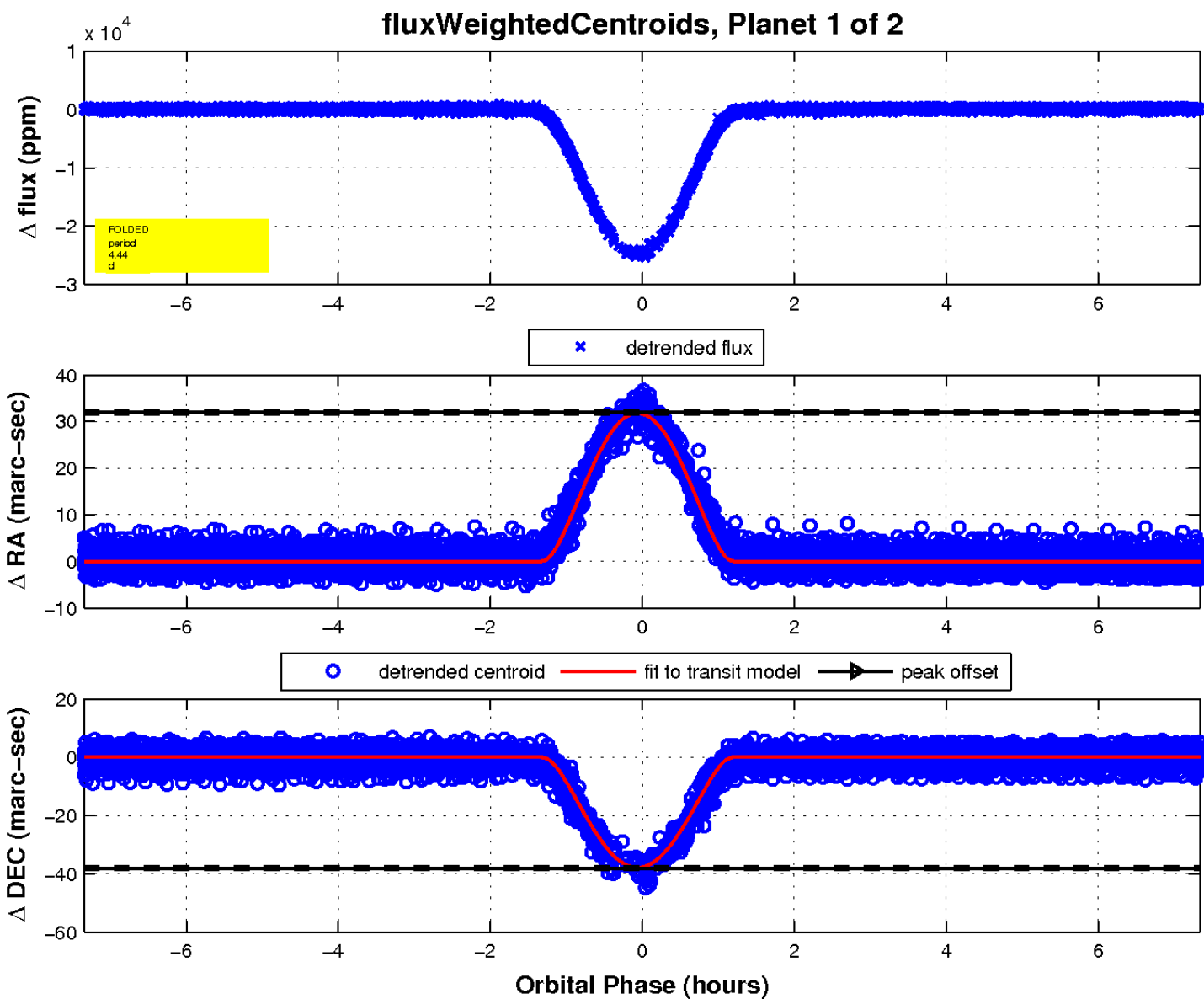
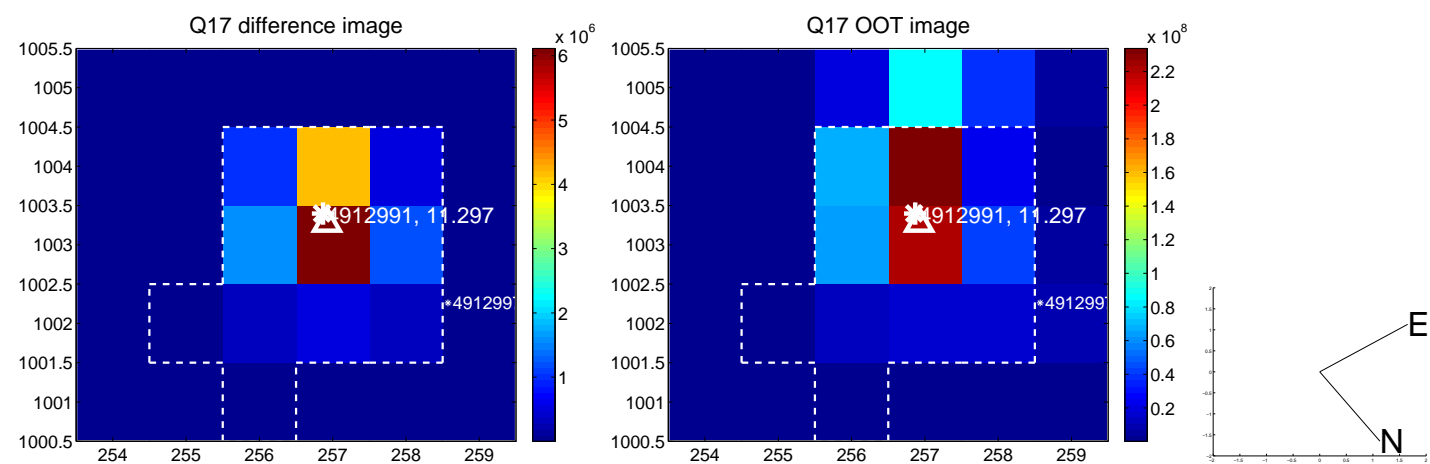
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

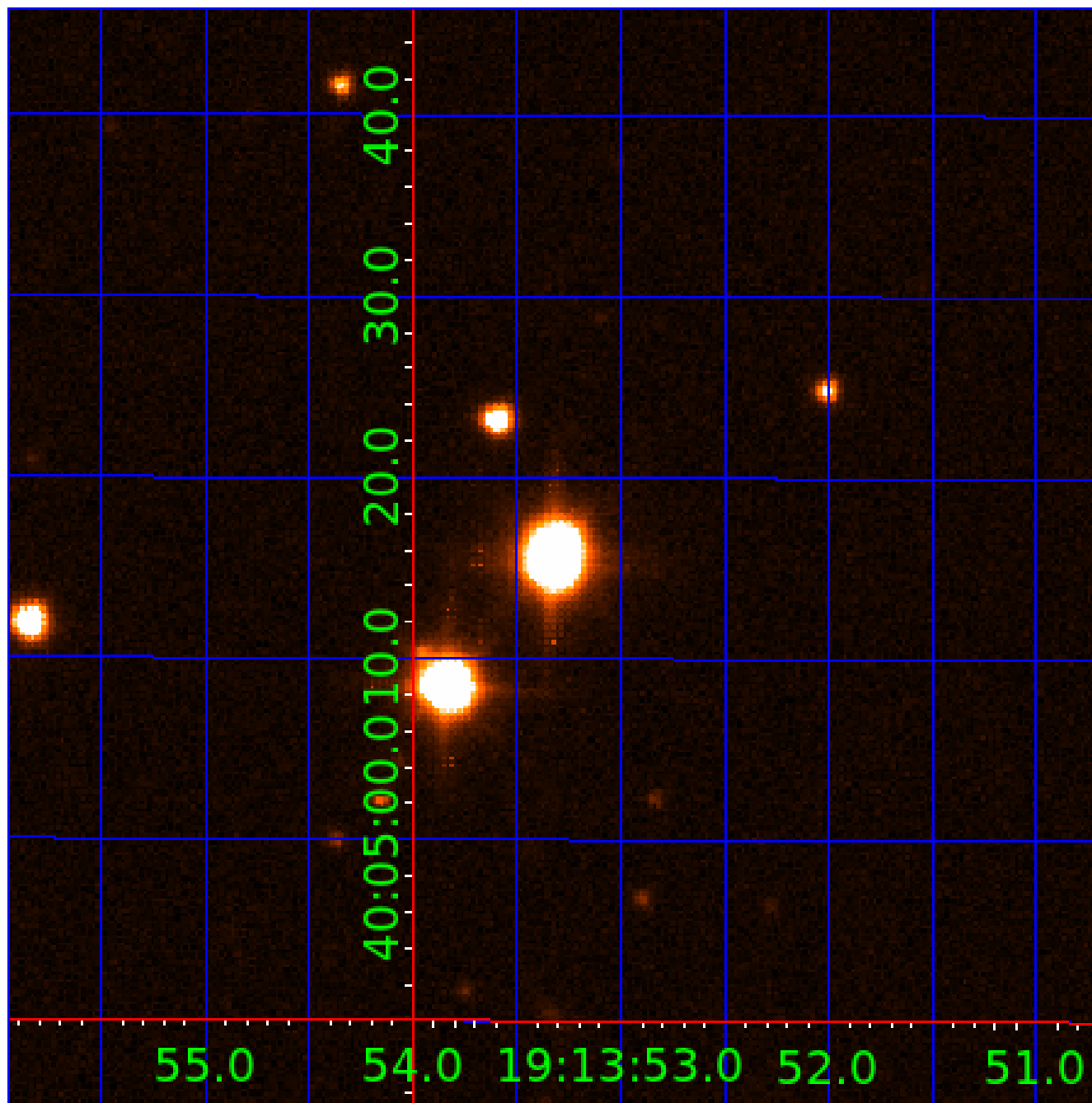


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 004912991

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
004912991-01	OBS	5997.01	4.442517	133.608117	25213.5	2.449	6106.5	5105.6	1.12	6316	27.64	593.90
004912991-02	OBS	No	4.442503	131.770010	185.3	1.518	46.8	54.2	1.12	6316	1.79	593.90

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
004912991-01	OBS	FP	0.00	0	1	0	0	MOD_SEC_DV—MOD_SEC_ALT—DEEP_V_SHAPED—HAS_SEC_TCE—CENT_SATURATED
004912991-02	OBS	FP	0.00	1	1	0	0	IS_SEC_TCE—CENT_SATURATED

**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 004912991-02

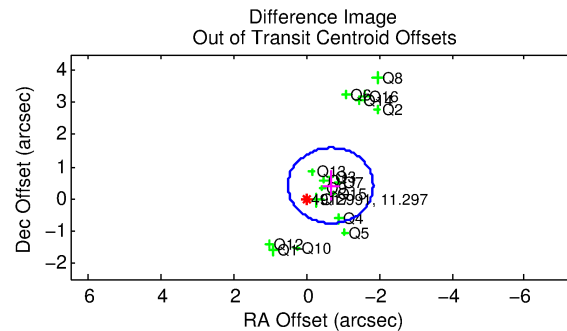
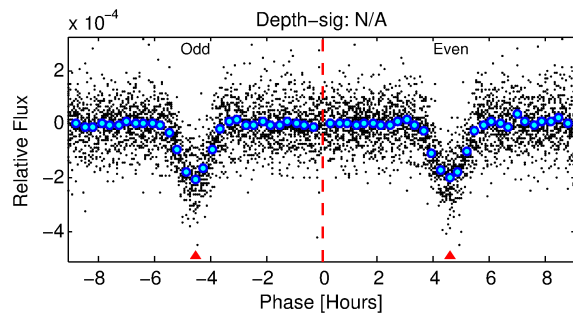
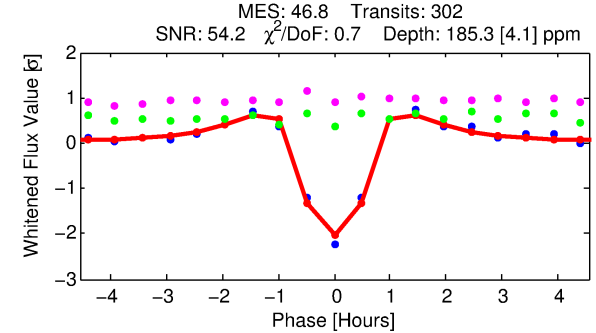
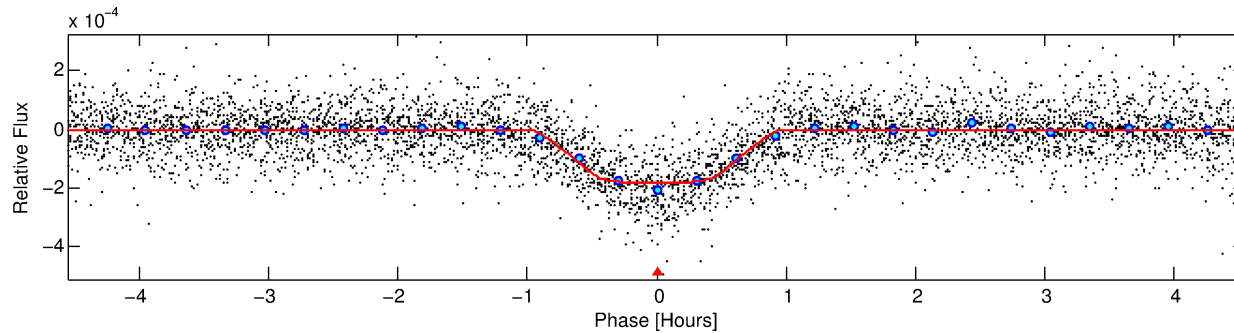
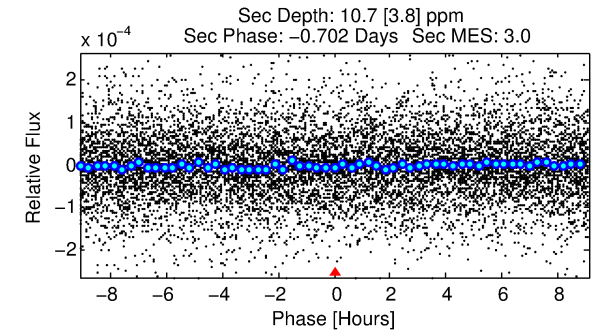
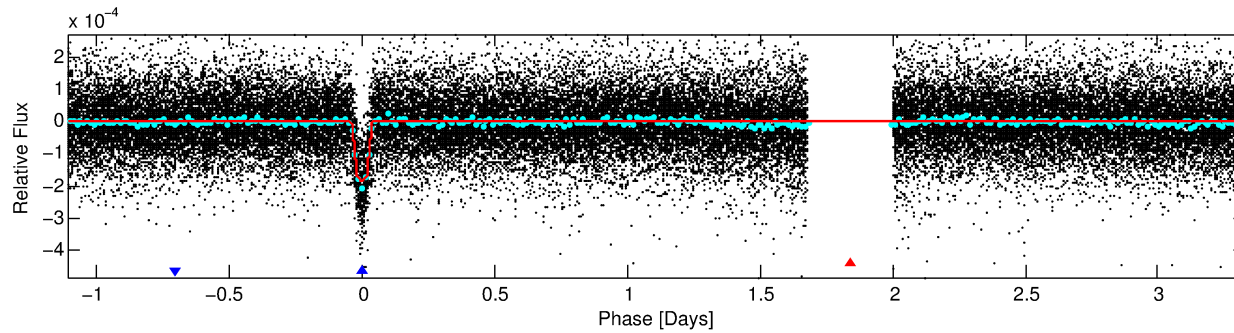
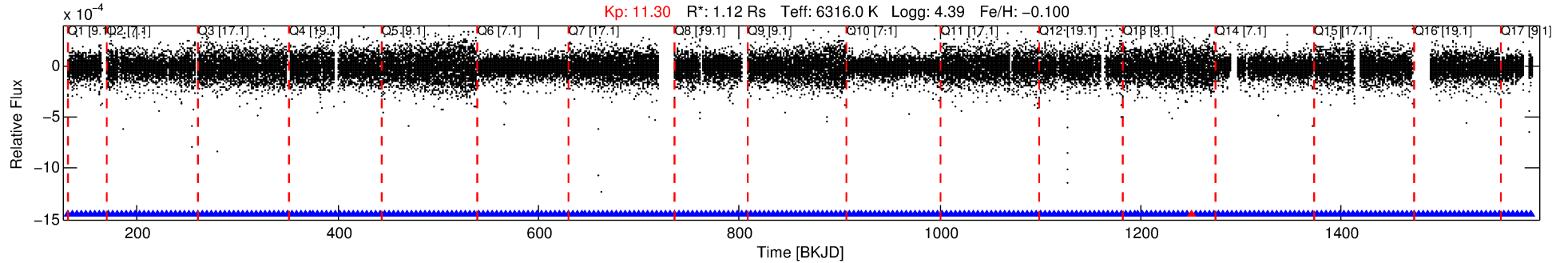
No Significant Match Found

# DV One-Page Summary

KIC: 4912991 Candidate: 2 of 2 Period: 4.443 d

KOI: K05997 Corr: No Ephemeris Match

Kp: 11.30 R\*: 1.12 Rs Teff: 6316.0 K Logg: 4.39 Fe/H: -0.100



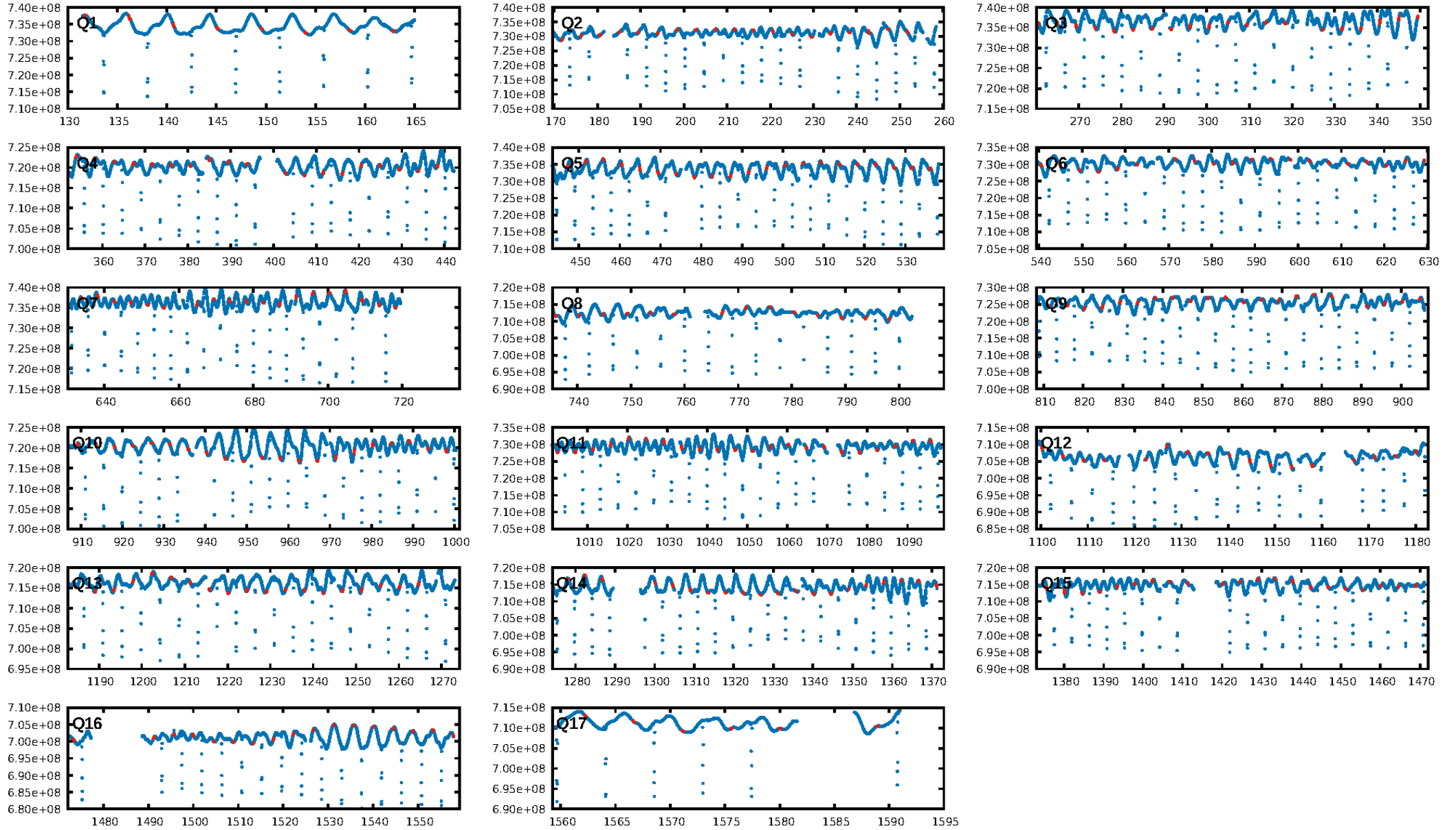
## DV Fit Results:

Period = 4.44250 [0.00000] d  
Epoch = 131.7700 [0.0004] BKJD  
Rp/R\* = 0.0147 [0.0017]  
a/R\* = 10.51 [6.51]  
b = 0.90 [0.13]  
Seff = 593.90 [181.82]  
Teq = 1259 [96] K  
Rp = 1.79 [0.44] Re  
a = 0.0548 [0.0103] AU  
Ag = 5.52 [2.77] [1.63σ]  
Teffp = 2983 [327] K [5.06σ]

## DV Diagnostic Results:

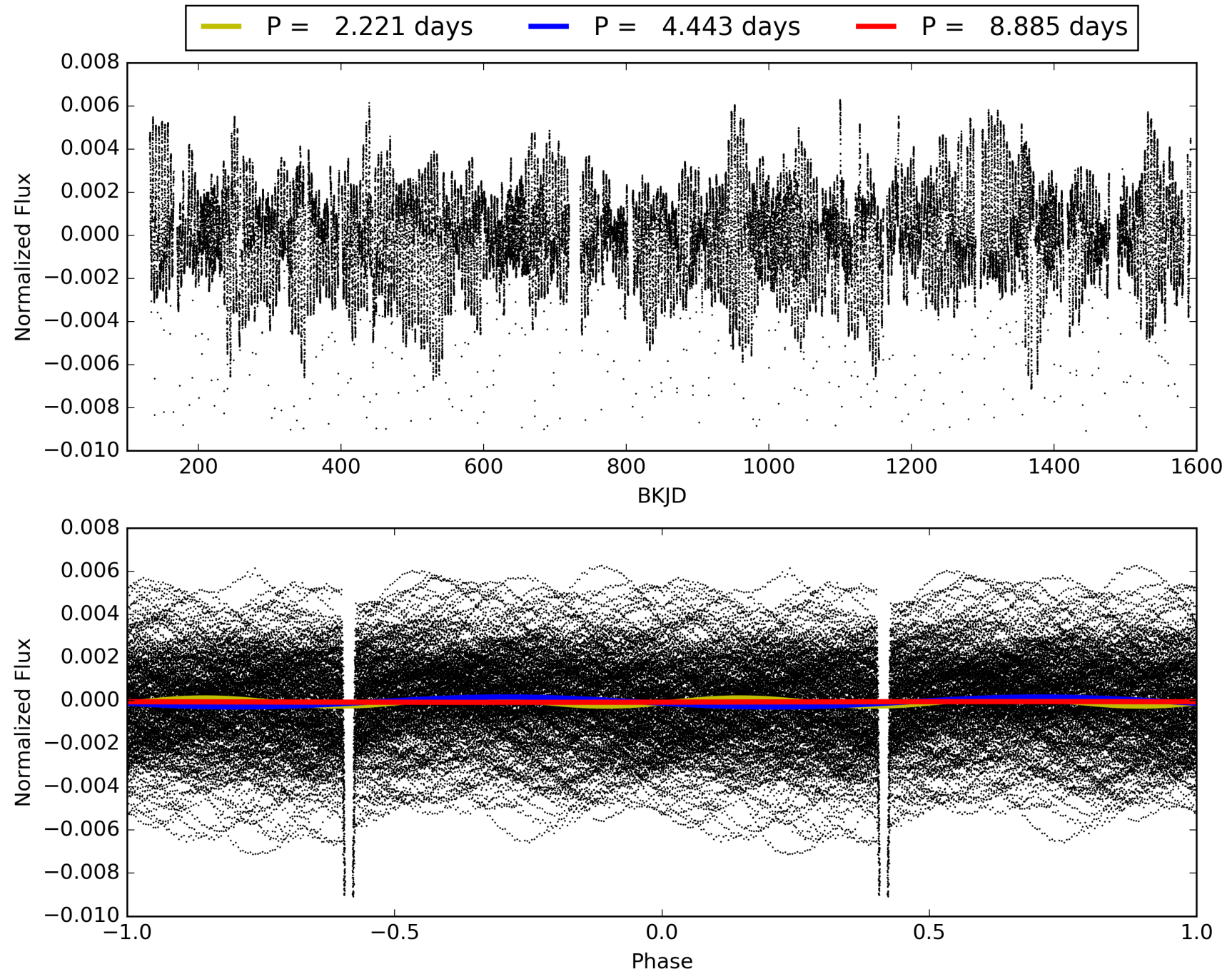
ShortPeriod-sig: N/A  
LongPeriod-sig: 0.0% [0.00σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [287/288]  
GhostDiagnostic-chr: 23.86  
Centroid-sig: 0.0%  
Centroid-so: 0.602 arcsec [3.56σ]  
OotOffset-rm: 0.782 arcsec [2.00σ]  
KicOffset-rm: 0.547 arcsec [1.75σ]  
OotOffset-st: 4/4/4/5 [17]  
KicOffset-st: 4/4/4/5 [17]  
DiffImageQuality-fgm: 0.76 [13/17]  
DiffImageOverlap-fno: 1.00 [17/17]

# TCE 004912991-02, PDC Light Curves





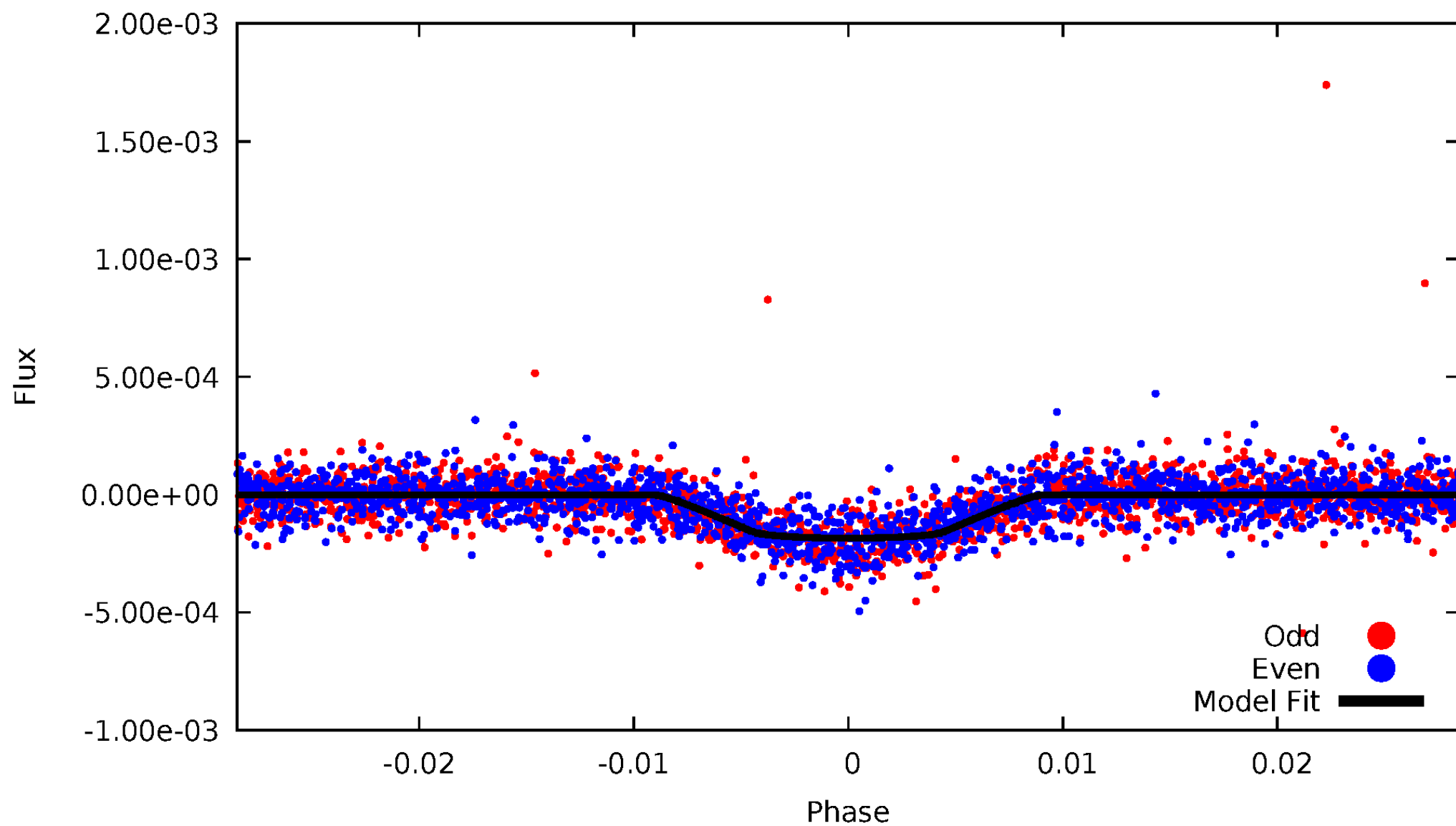
TCE 004912991-02





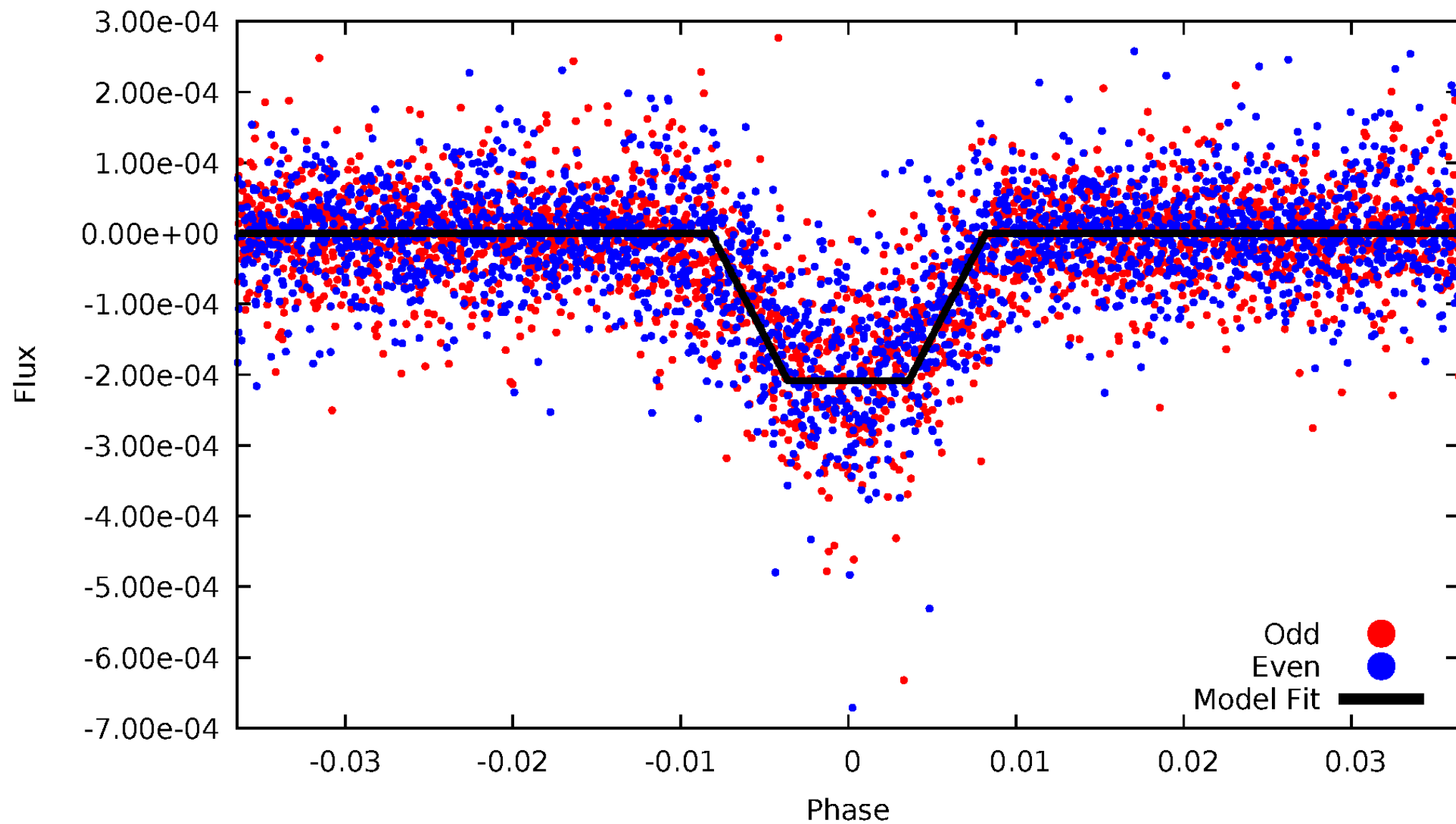
# DV Odd/Even

TCE 004912991-02



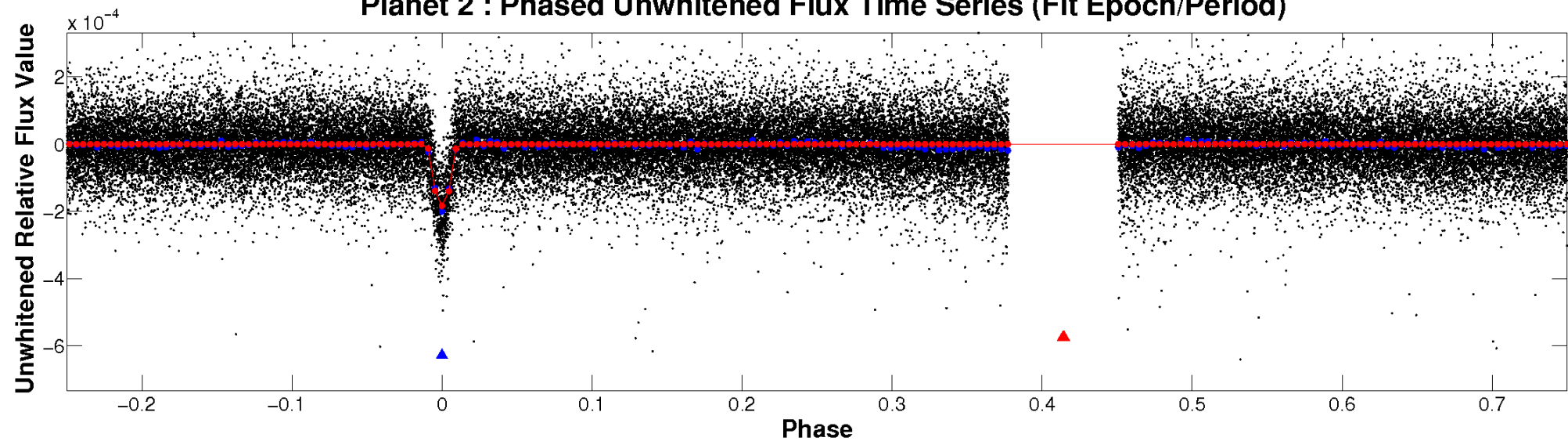
# ALT Odd/Even

TCE 004912991-02

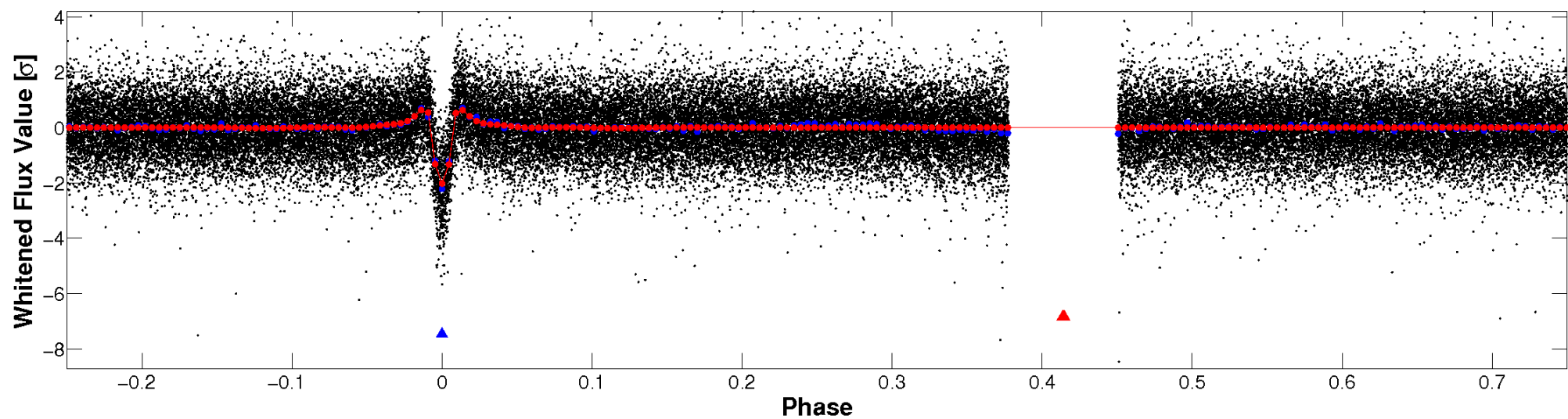


# Non-Whitened Vs. Whitened Light Curve

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

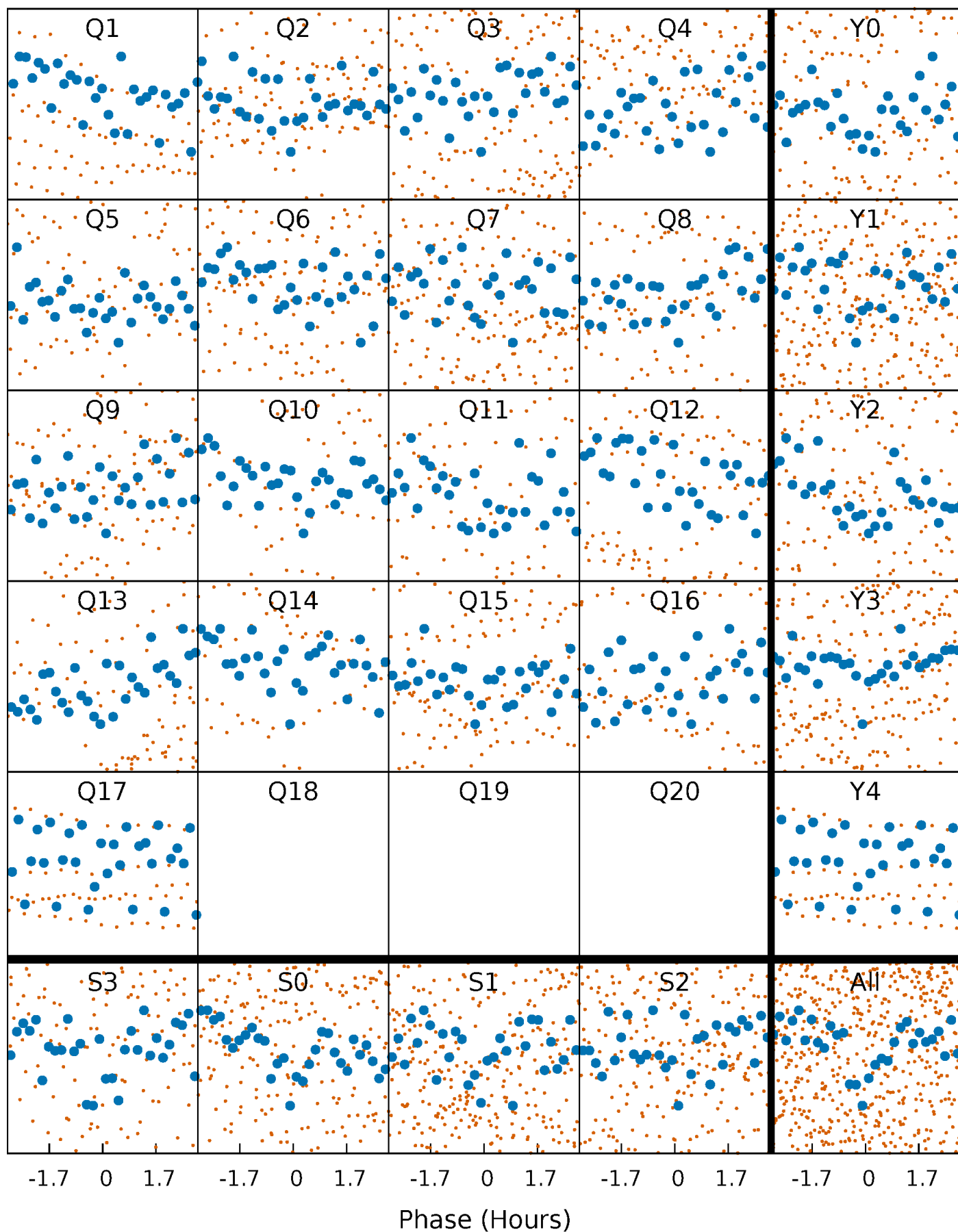


**Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



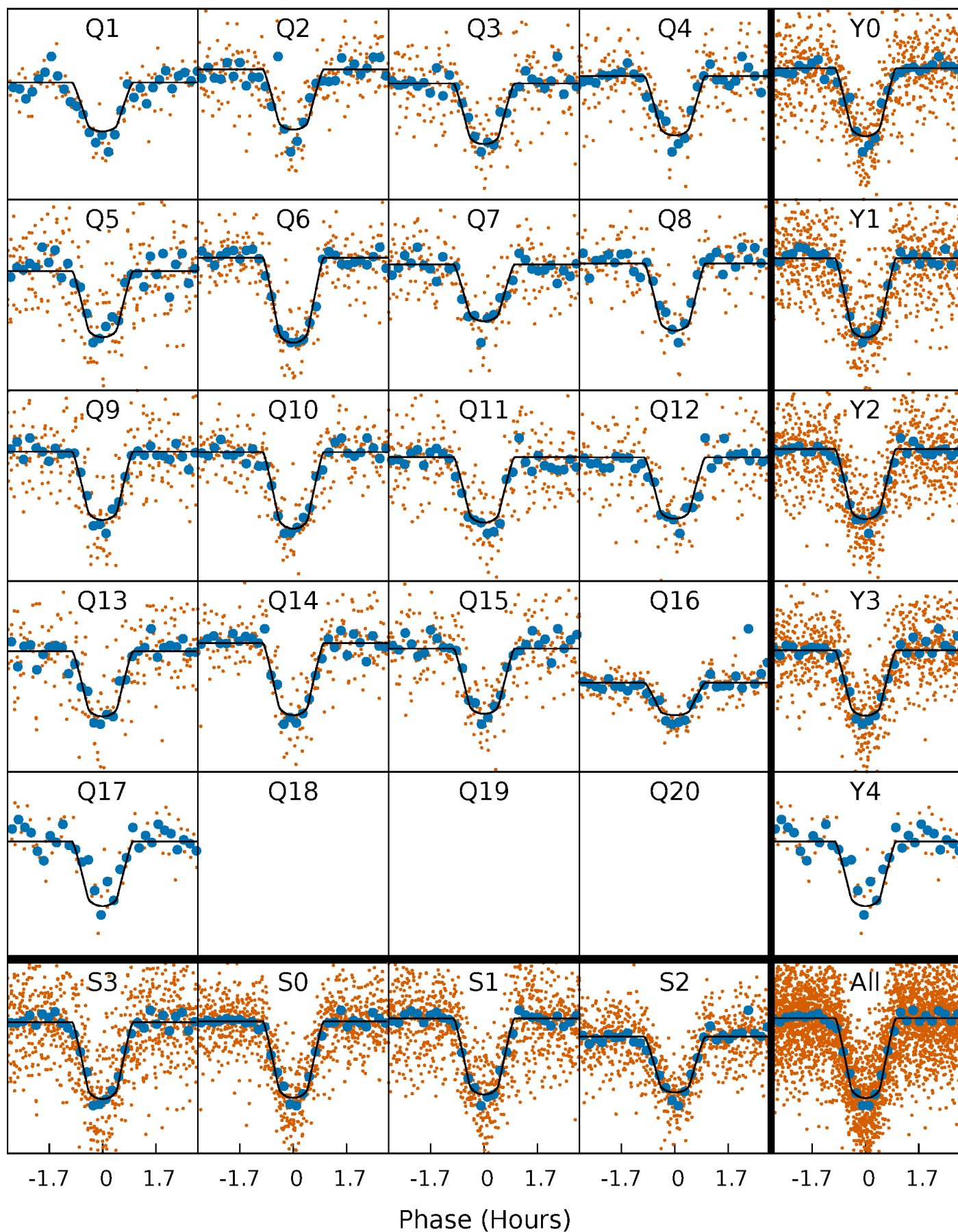
# PDC Quarter-Phased Transit Curves

TCE 004912991-02     $P = 4.442503$  Days     $T_0 = 131.770010$  (BKJD)



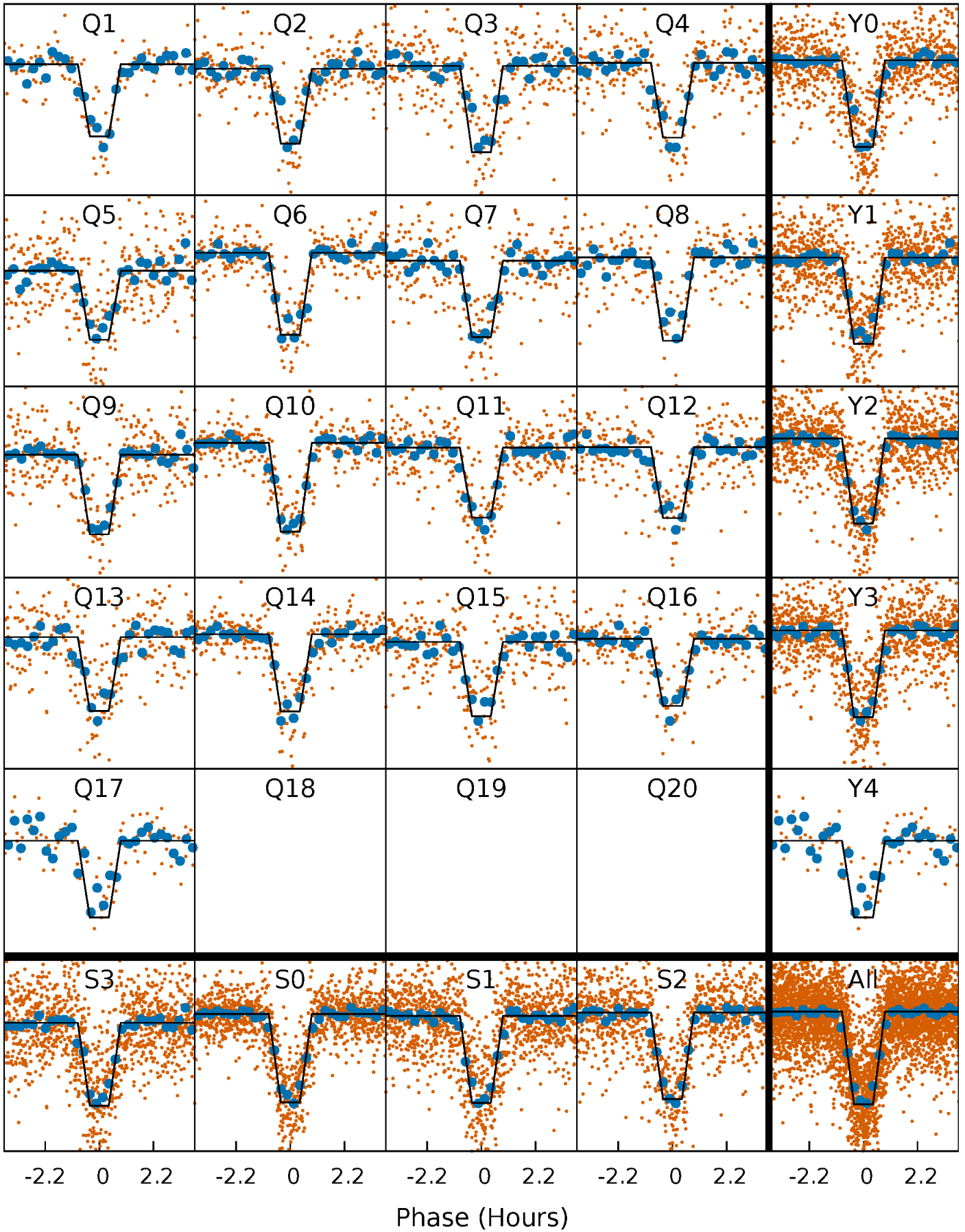
# DV Quarter-Phased Transit Curves

TCE 004912991-02   P= 4.442503 Days    $T_0=131.770010$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 004912991-02     $P = 4.442520$  Days     $T_0 = 131.767142$  (BKJD)

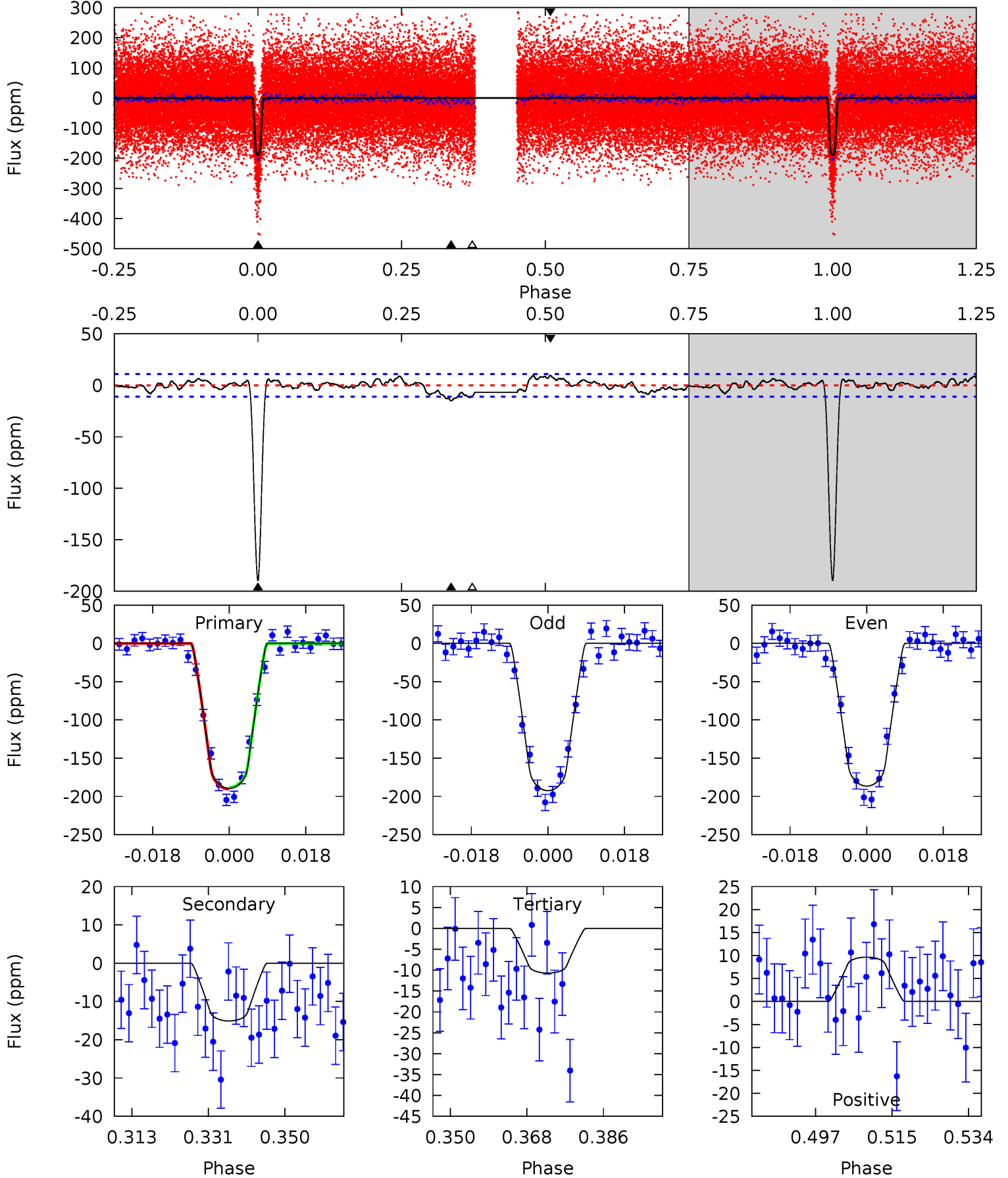




# DV Model-Shift Uniqueness Test

004912991-02, P = 4.442503 Days, E = 127.327507 Days

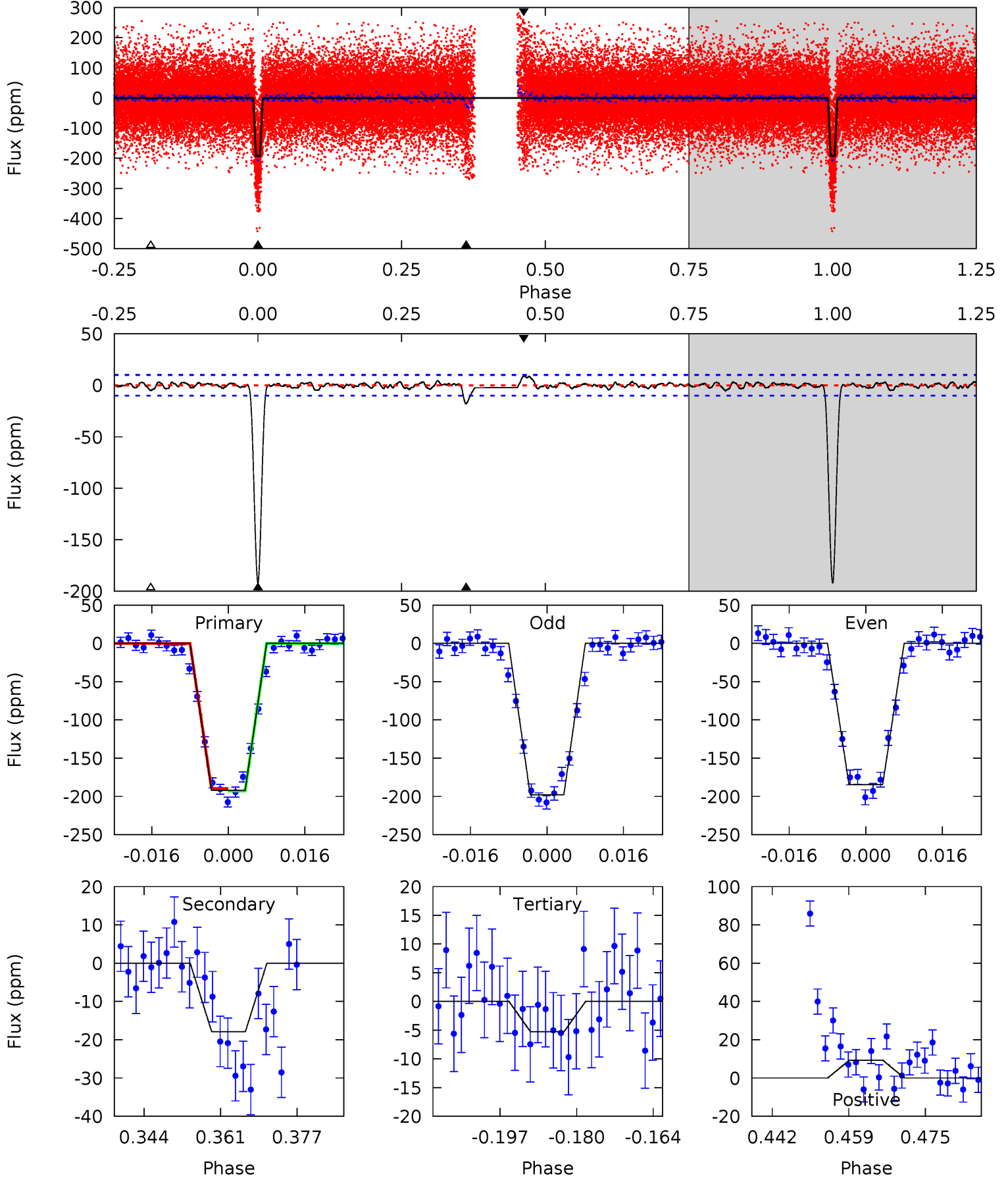
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
84.4	6.73	4.77	4.30	4.91	2.36	1.89	79.7	80.1	1.96	2.43	1.33	1.00	0.05	0.43



# Alt Model-Shift Uniqueness Test

004912991-02, P = 4.442520 Days, E = 127.324622 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
94.6	8.83	2.59	4.57	4.93	2.40	1.03	92.1	90.1	6.24	4.26	3.28	1.01	0.05	0.83





### Stellar Parameters For KIC 004912991

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R (R_{\odot})$	$M(M_{\odot})$	$p_{\star} (\text{g}\cdot\text{cm}^{-3})$
	$6316^{+155}_{-202}$	$4.387^{+0.066}_{-0.154}$	$-0.100^{+0.250}_{-0.300}$	$1.119^{+0.246}_{-0.143}$	$1.109^{+0.144}_{-0.129}$	$1.116^{+0.383}_{-0.474}$
	+2%/-3%	+2%/-4%	+250%/-300%	+22%/-13%	+13%/-12%	+34%/-42%
Source	PHO1	FLK73	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 004912991-02 / KOI

Detrend	Depth (ppm)	$R_p (R_{\oplus})$	$T_{\text{max}} (K)$	$T_{\text{obs}} (K)$	$A_{\text{obs}}$
DV	$-15 \pm 2$	$1.83^{+0.31}_{-0.26}$	$1785^{+101}_{-83}$	$3637^{+222}_{-161}$	$7.239^{+2.891}_{-1.963}$
Alt.	$-18 \pm 2$	$1.82^{+0.27}_{-0.26}$	$1779^{+100}_{-79}$	$3776^{+187}_{-195}$	$8.895^{+3.253}_{-2.433}$

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

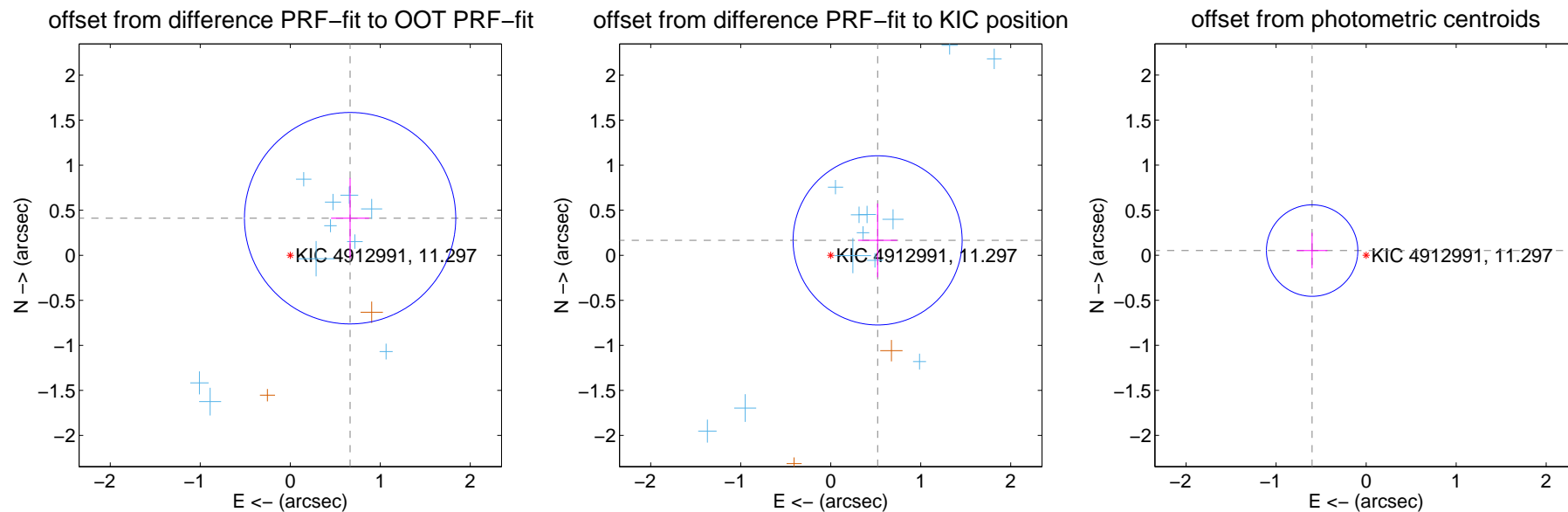
## DV Centroid Data

Supplemental centroid analysis for 004912991-02. **Kepler magnitude: 11.30.** Transit SNR 54.15

There are 13 quarters with good PRF difference image offsets

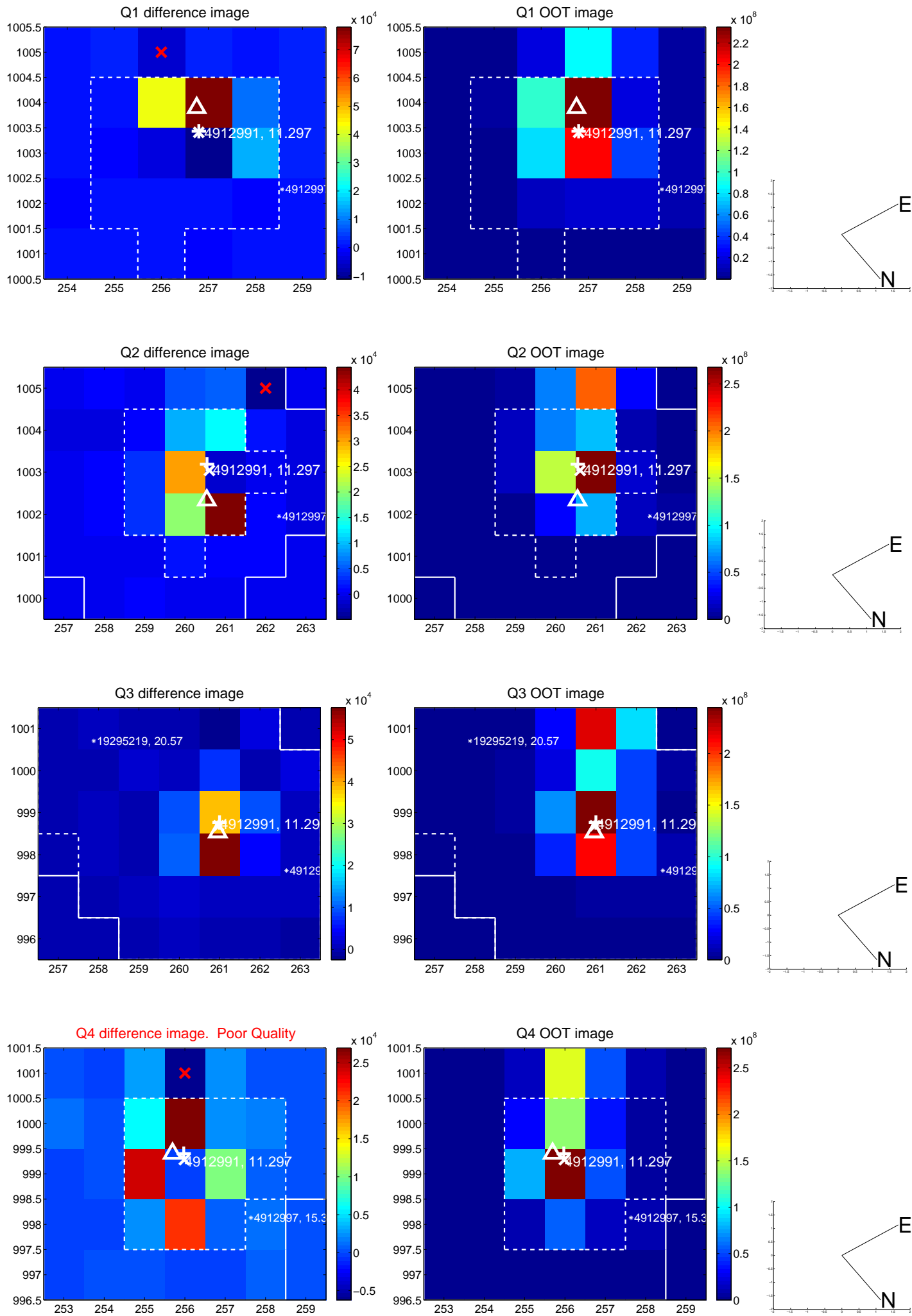
The direct PRF centroid is offset from the target star catalog position by about 0.05 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.782 \pm 0.391$	2.00	$-0.665 \pm 0.212$	$0.412 \pm 0.445$
PRF-fit source offset from KIC position	$0.547 \pm 0.313$	1.75	$-0.521 \pm 0.217$	$0.165 \pm 0.409$
photometric centroid source offset	<b><math>0.60 \pm 0.17</math></b>	<b>3.56</b>	$0.60 \pm 0.17$	$0.05 \pm 0.20$

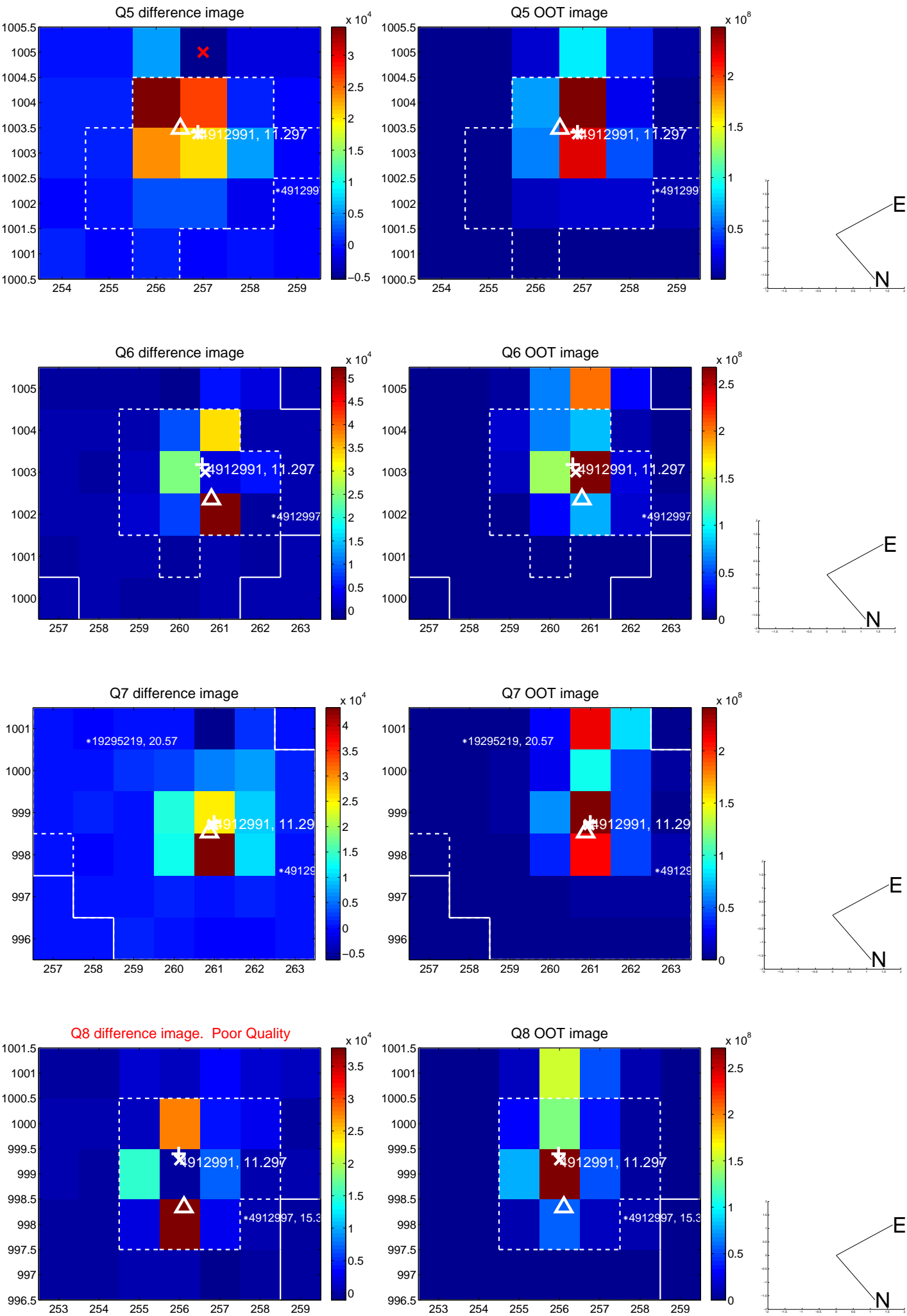


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets;** magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: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

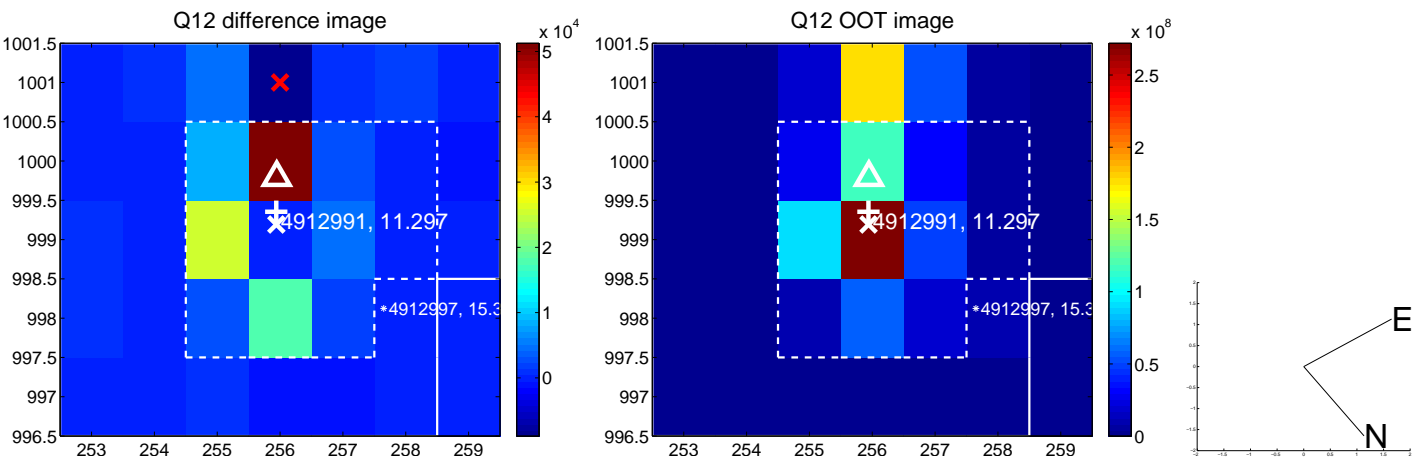
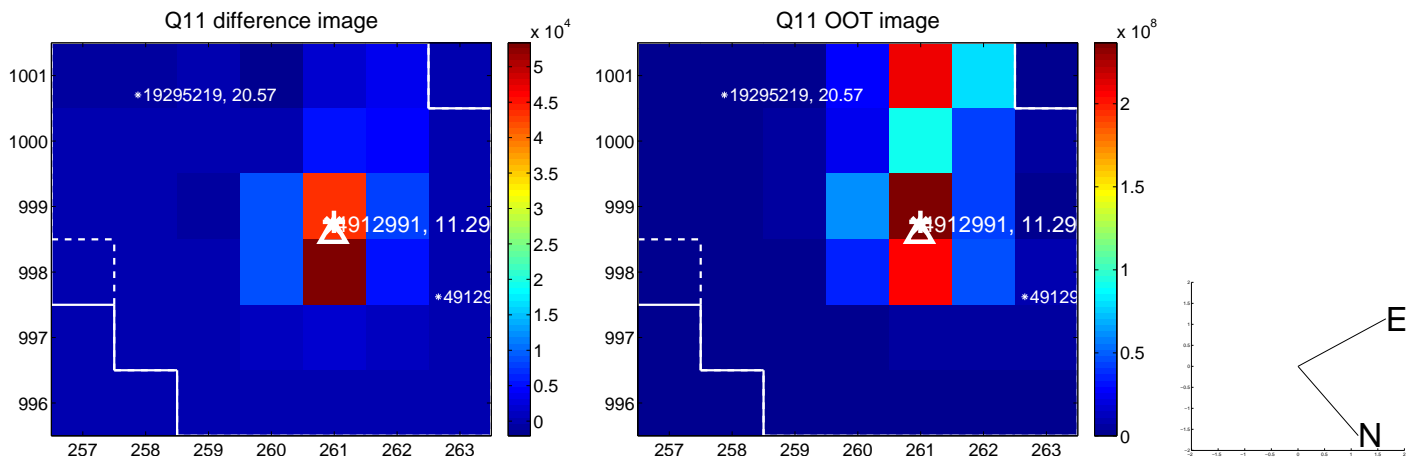
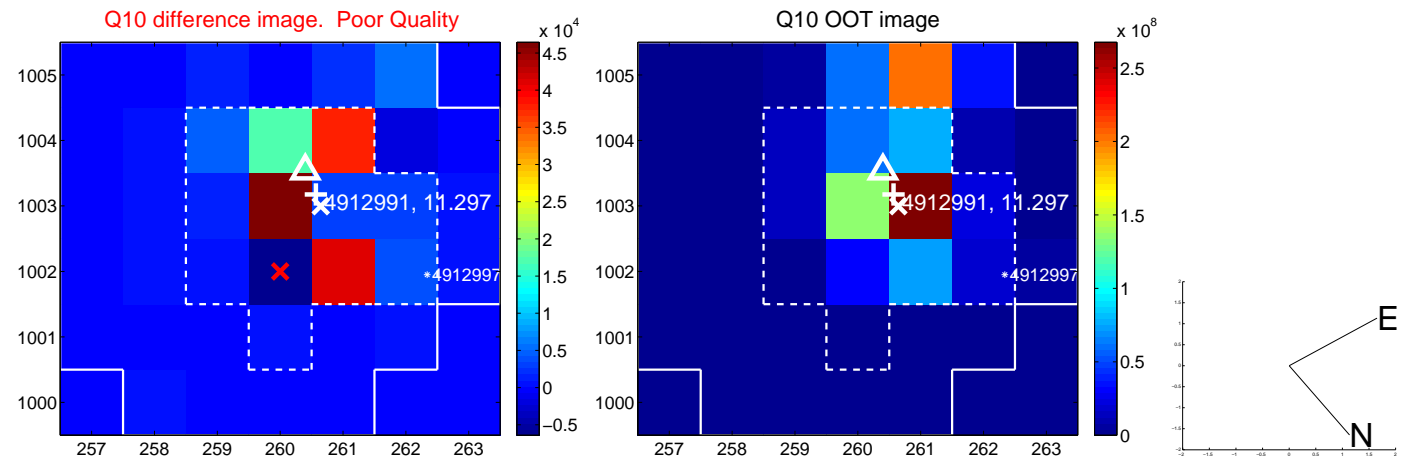
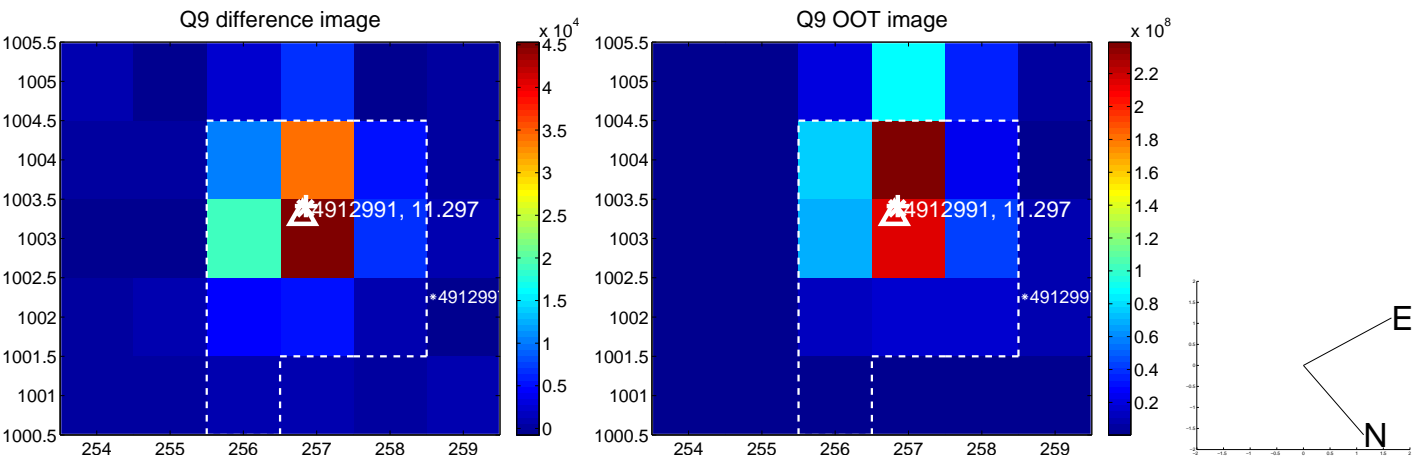
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



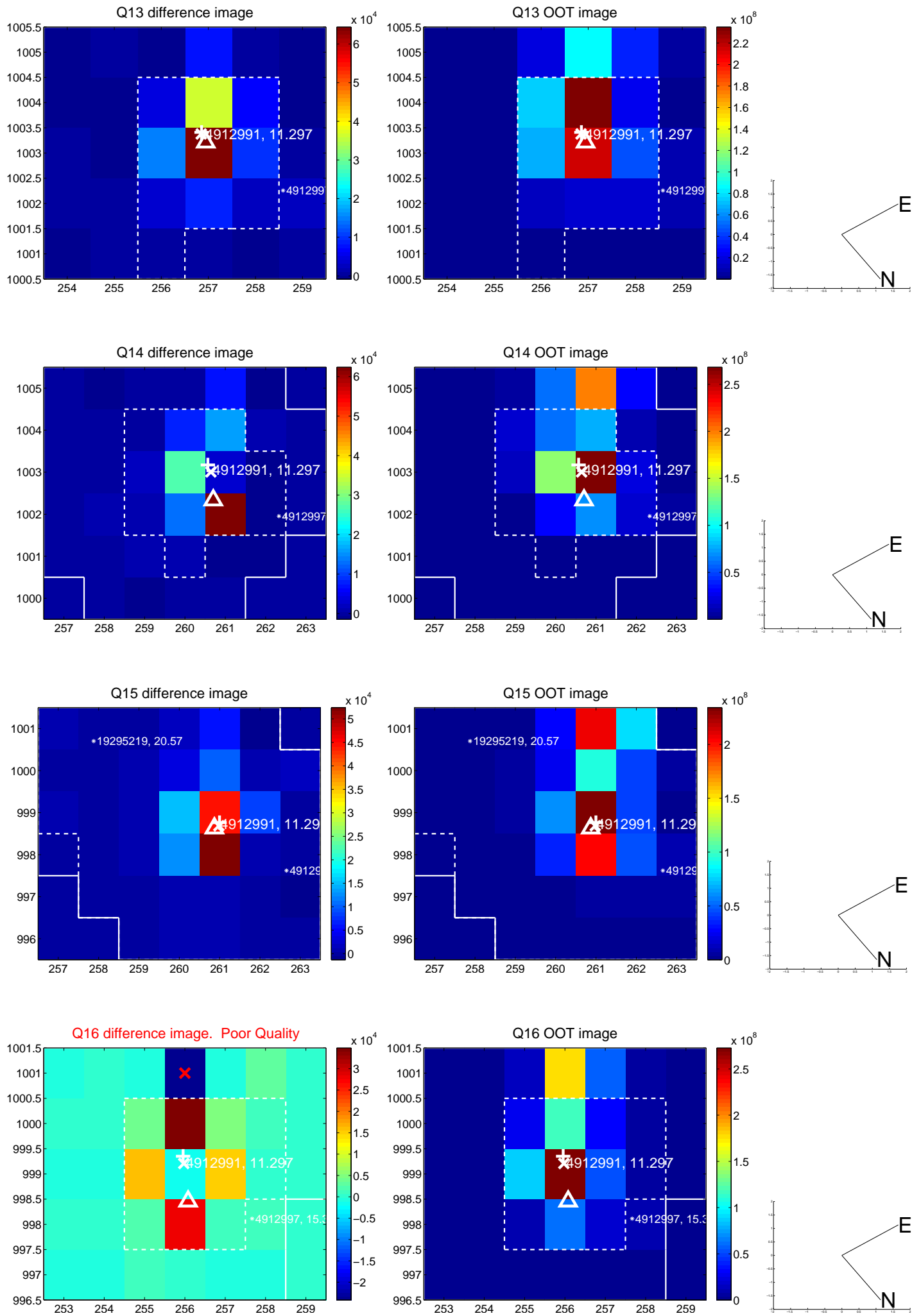
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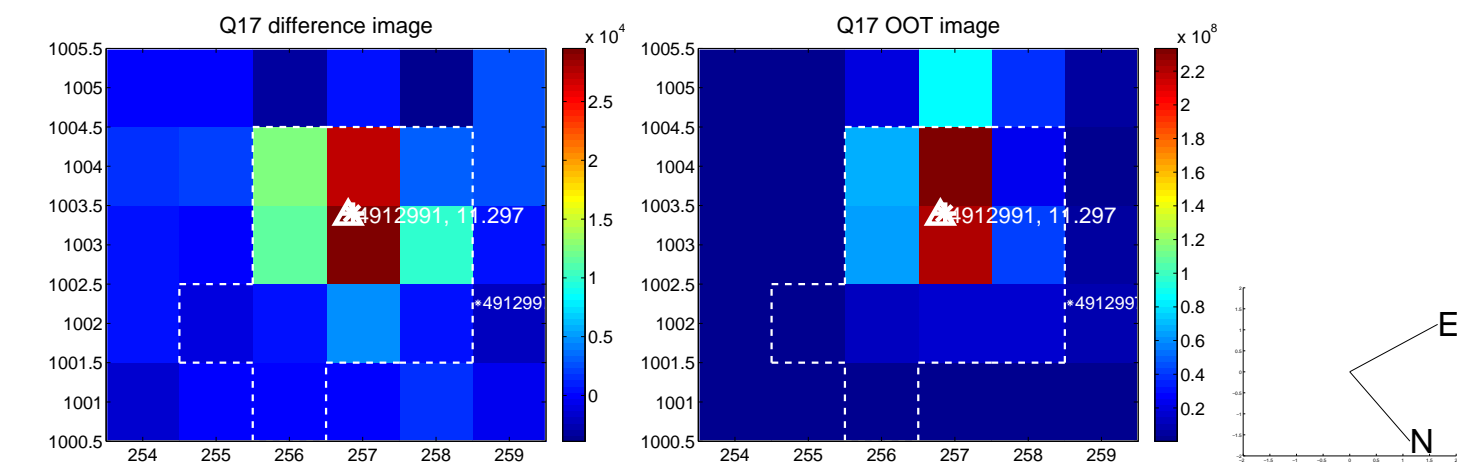
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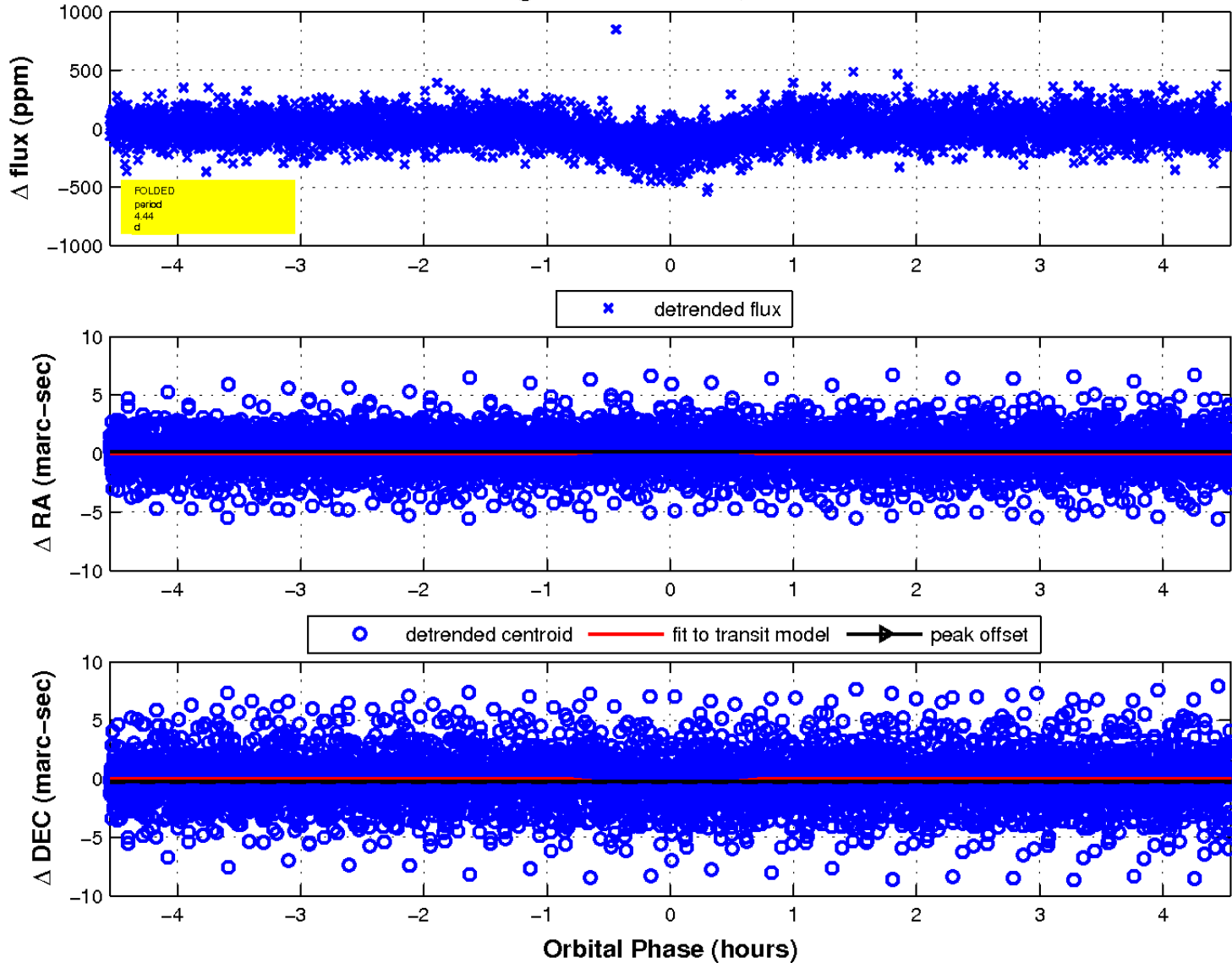
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fluxWeightedCentroids, Planet 2 of 2



UKIRT Image

Declination

