

# KIC 010989281

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010989281-01	OBS	No	409.828295	173.205933	1727.7	20.240	20.9	5.5	1.84	5398	8.75	2.52
010989281-03	OBS	No	284.986710	161.644539	1875.1	5.832	16.5	8.5	1.84	5398	8.58	4.10
010989281-04	OBS	No	314.376633	242.864486	1959.4	7.932	15.0	10.3	1.84	5398	8.24	3.59
010989281-05	OBS	No	189.034203	282.857029	1423.2	14.037	14.8	5.9	1.84	5398	6.95	7.08
010989281-06	OBS	No	254.895582	261.529736	1639.9	3.500	14.4	-1.0	1.84	5398	7.39	4.75

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010989281-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
010989281-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_SKYE—LPP_DV—LPP_ALT—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
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010989281-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—INCONSISTENT_TRANS—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.

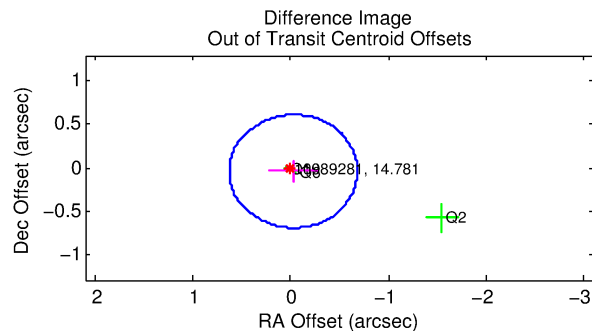
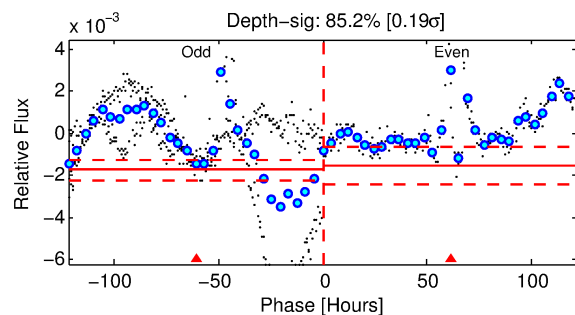
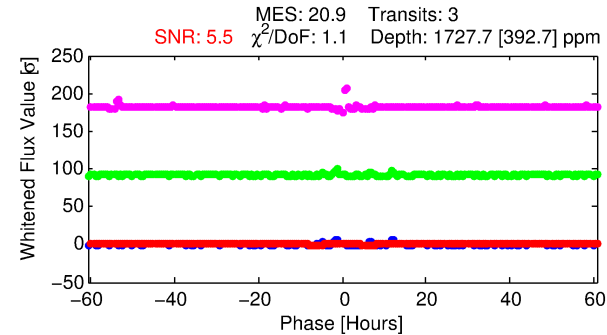
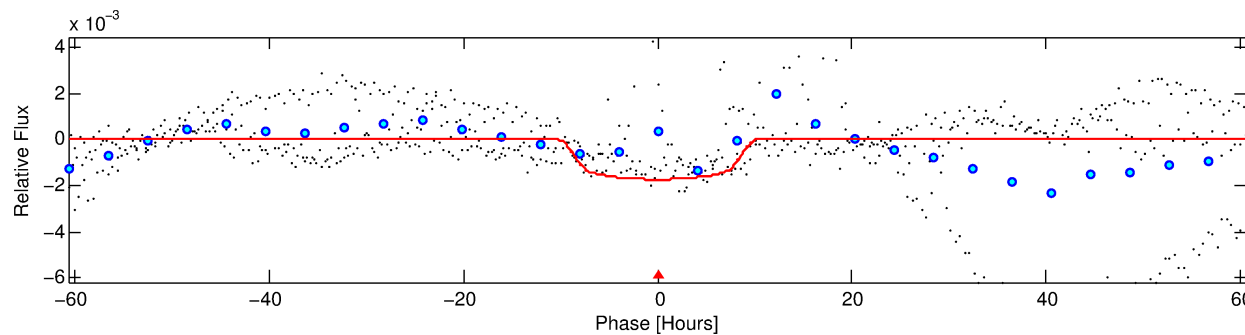
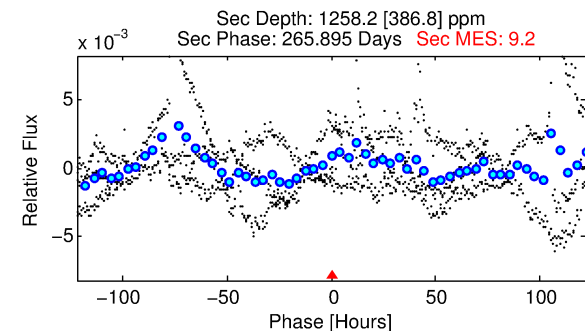
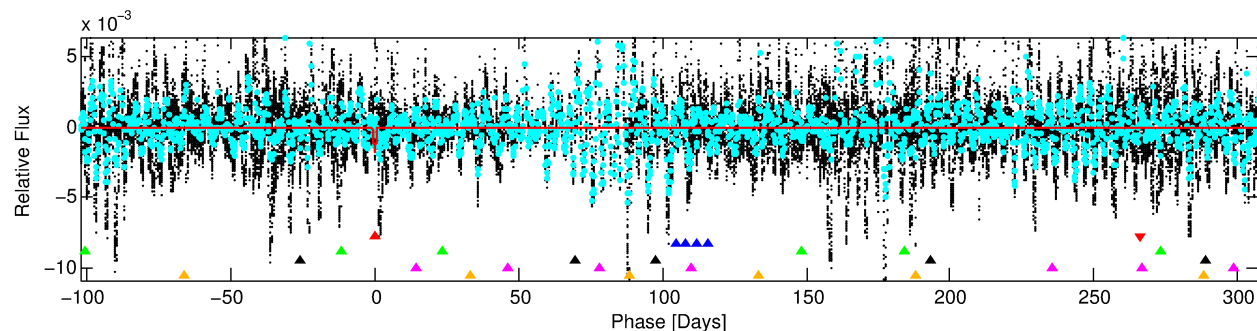
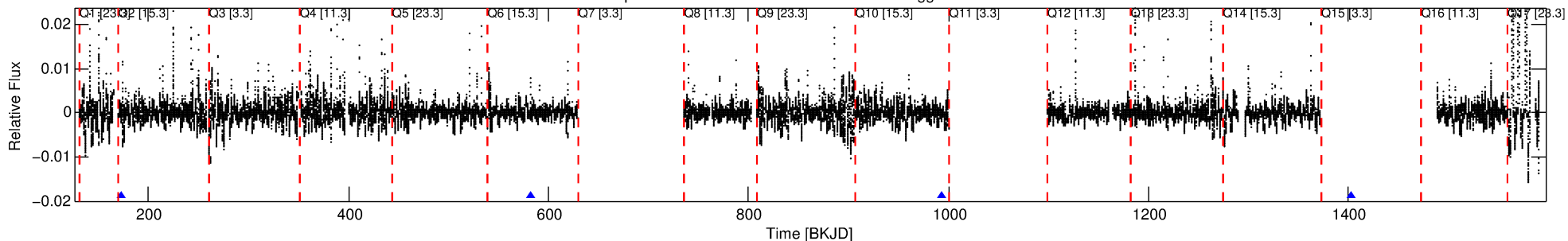
Ephemeris Match Information For 010989281-01

No Significant Match Found

# DV One-Page Summary

KIC: 10989281 Candidate: 1 of 6 Period: 409.828 d

Kp: 14.78 R\*: 1.84 Rs Teff: 5398.0 K Logg: 3.82 Fe/H: -0.640



## DV Fit Results:

Period = 409.82830 [0.01608] d  
Epoch = 173.2059 [0.0210] BKJD  
Rp/R\* = 0.0435 [0.0055]  
a/R\* = 93.72 [15.40]  
b = 0.85 [0.05]  
Seff = 2.52 [3.31]  
Teq = 321 [105] K  
Rp = 8.75 [6.33] Re  
a = 1.0118 [0.7800] AU  
Ag = 9252.13 [12614.90] [0.73σ]  
Teffp = 4873 [521] K [8.56σ]

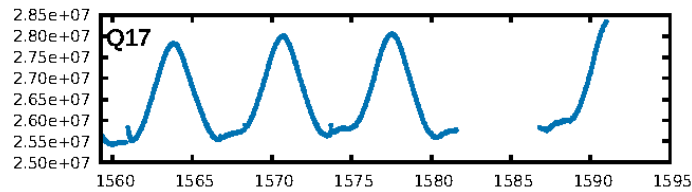
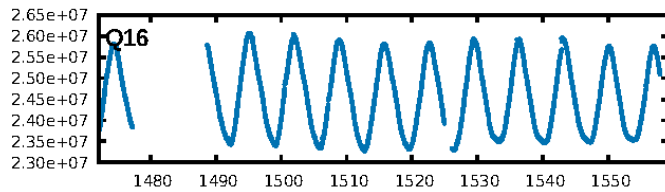
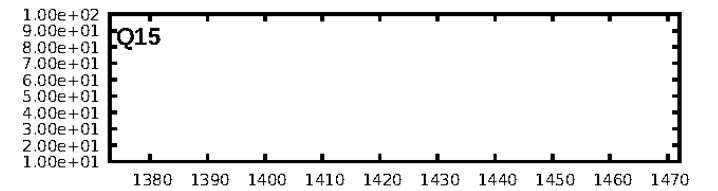
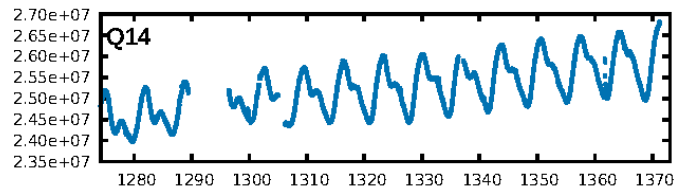
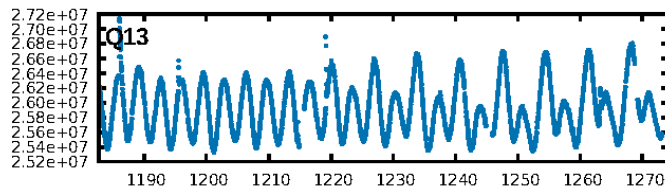
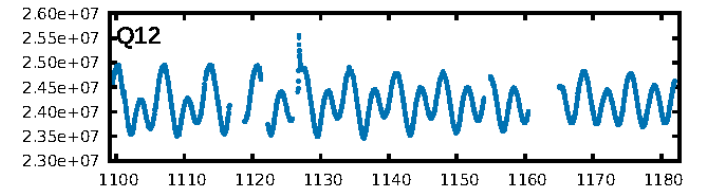
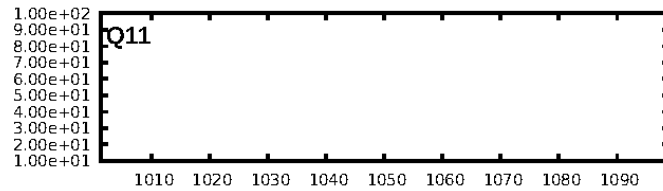
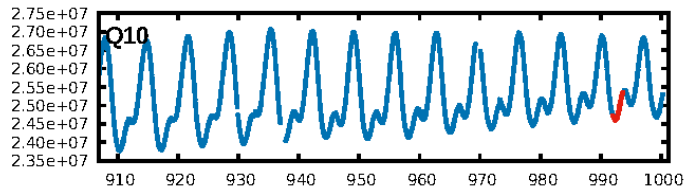
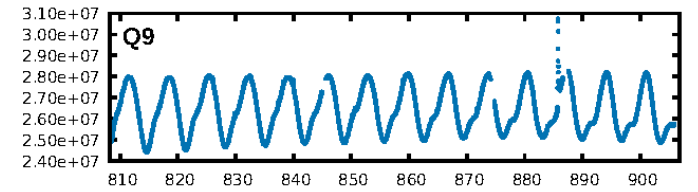
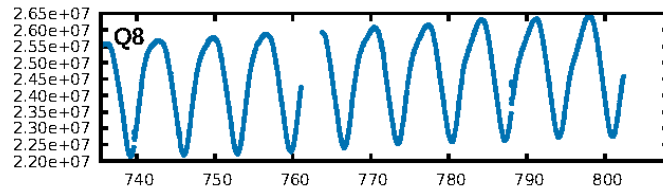
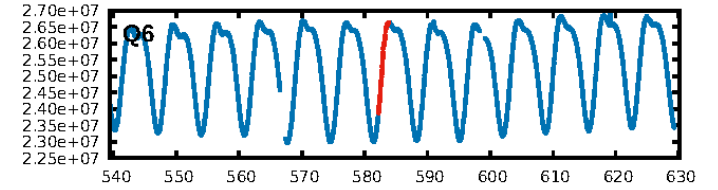
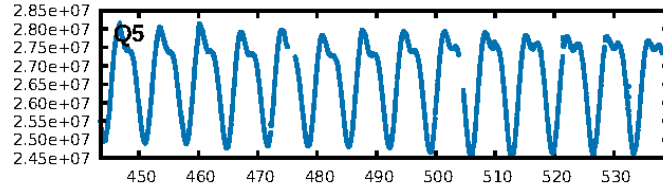
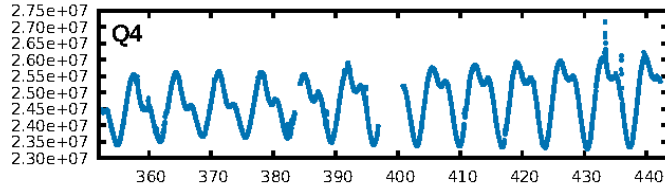
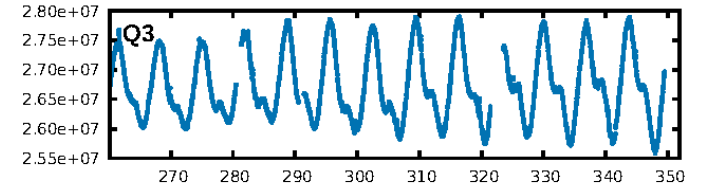
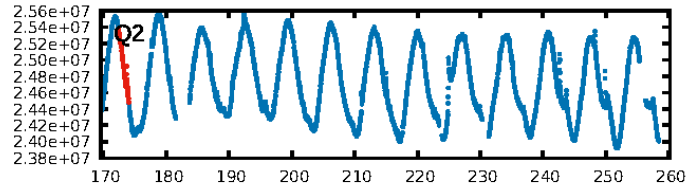
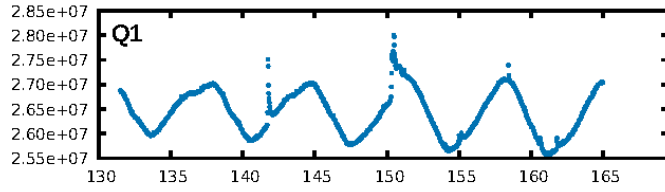
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [4.39σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: 19.1%  
ModelChiSquareGof-sig: 95.4%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [3/3]  
GhostDiagnostic-chr: 0.8566  
Centroid-sig: 3.8%  
Centroid-so: 1.239 arcsec [2.44σ]  
OotOffset-rm: 0.051 arcsec [0.23σ]  
OotOffset-st: 3/0/0/0 [3]  
KicOffset-rm: 0.114 arcsec [0.51σ]  
KicOffset-st: 3/0/0/0 [3]  
DiffImageQuality-fgm: 0.67 [2/3]  
DiffImageOverlap-fno: 1.00 [3/3]

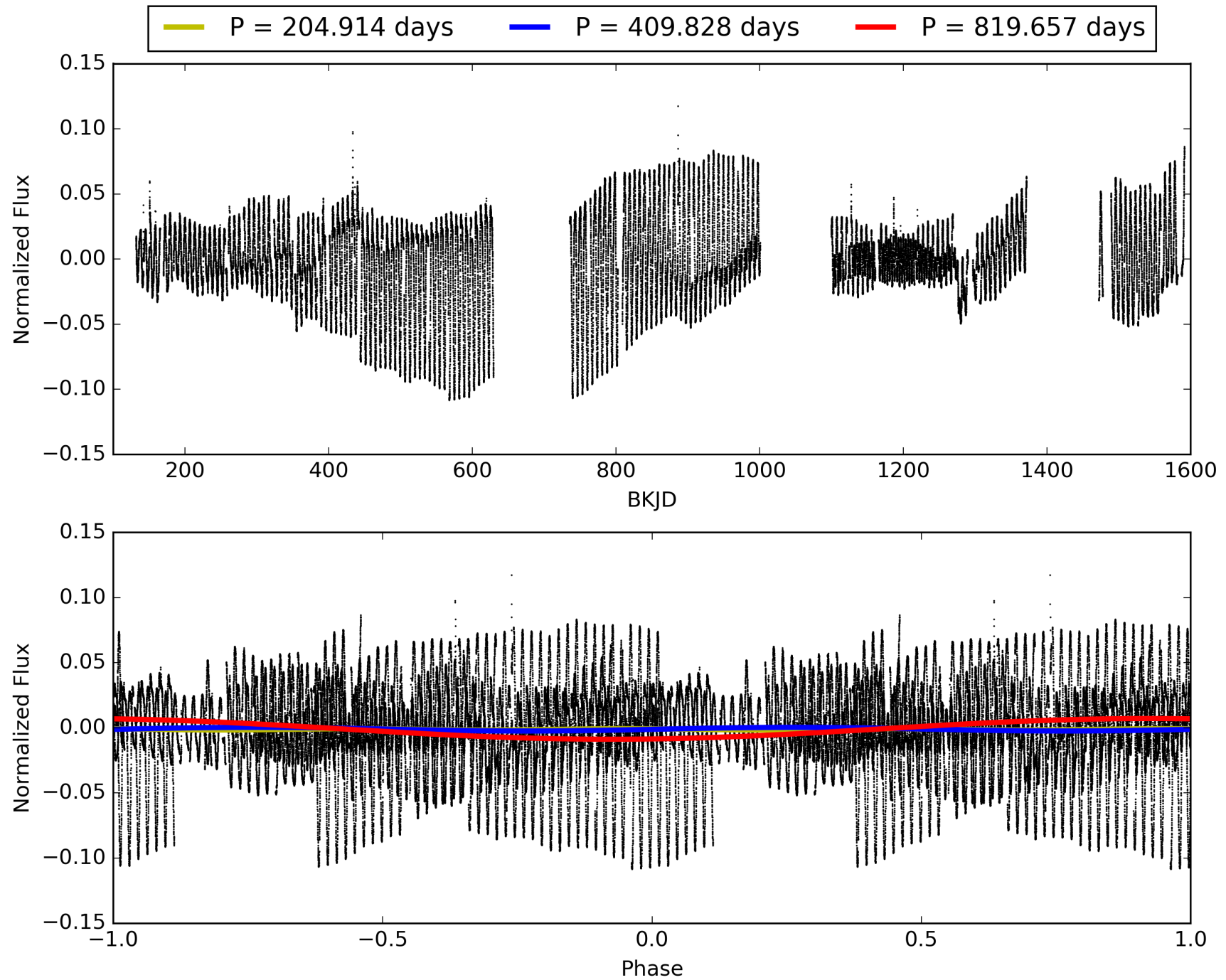
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 10:10:03 Z

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

# TCE 010989281-01, PDC Light Curves



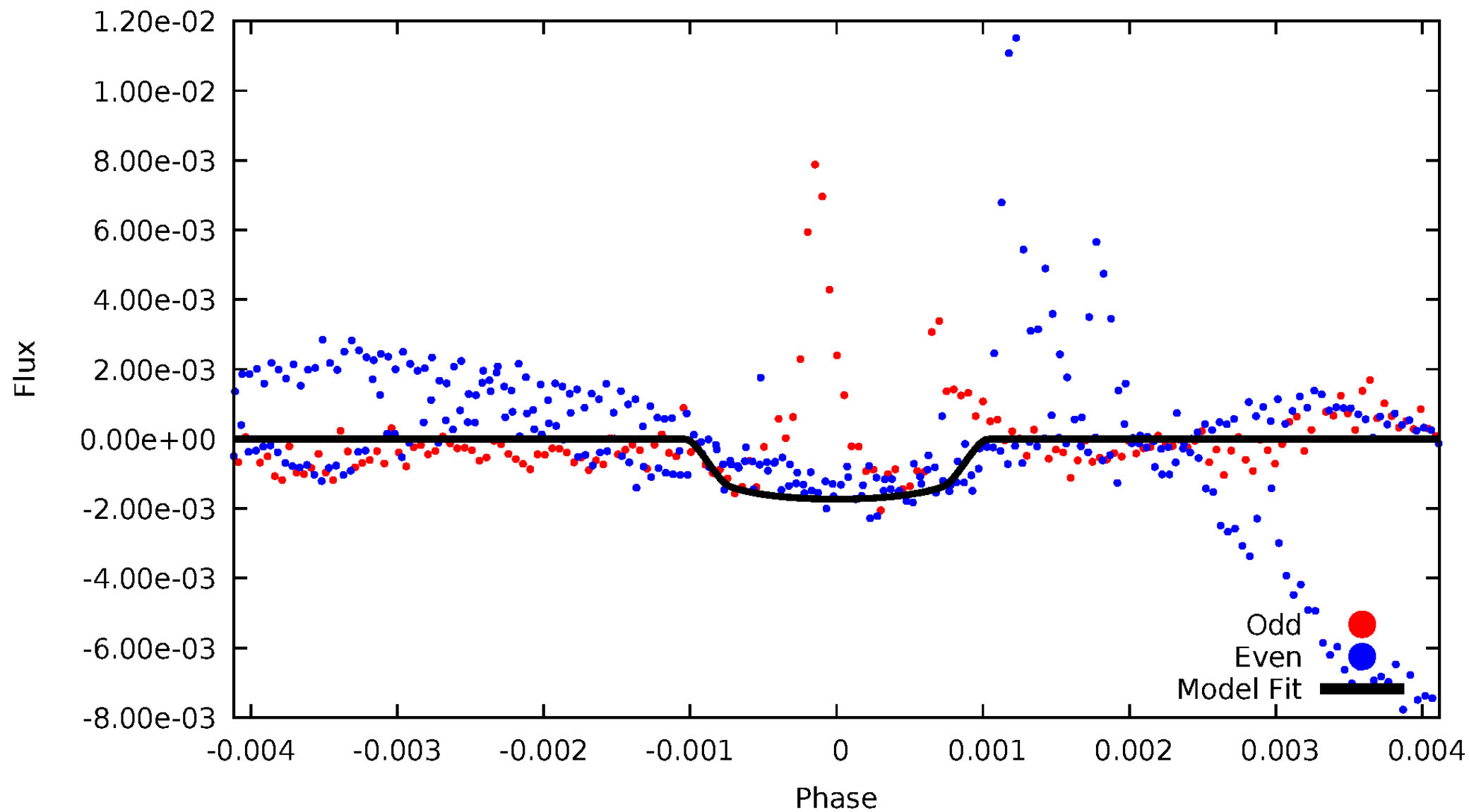
# TCE 010989281-01





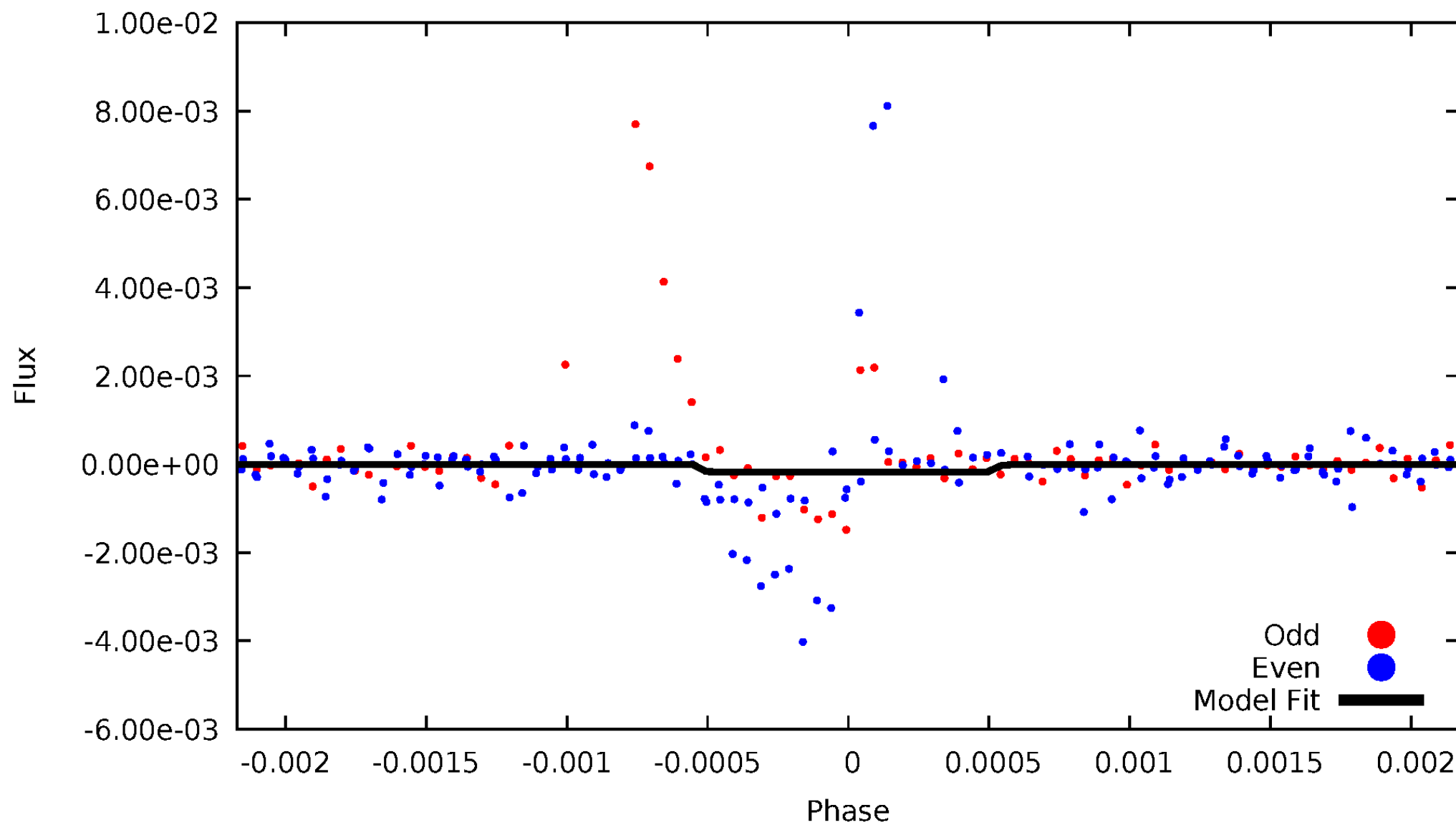
# DV Odd/Even

TCE 010989281-01



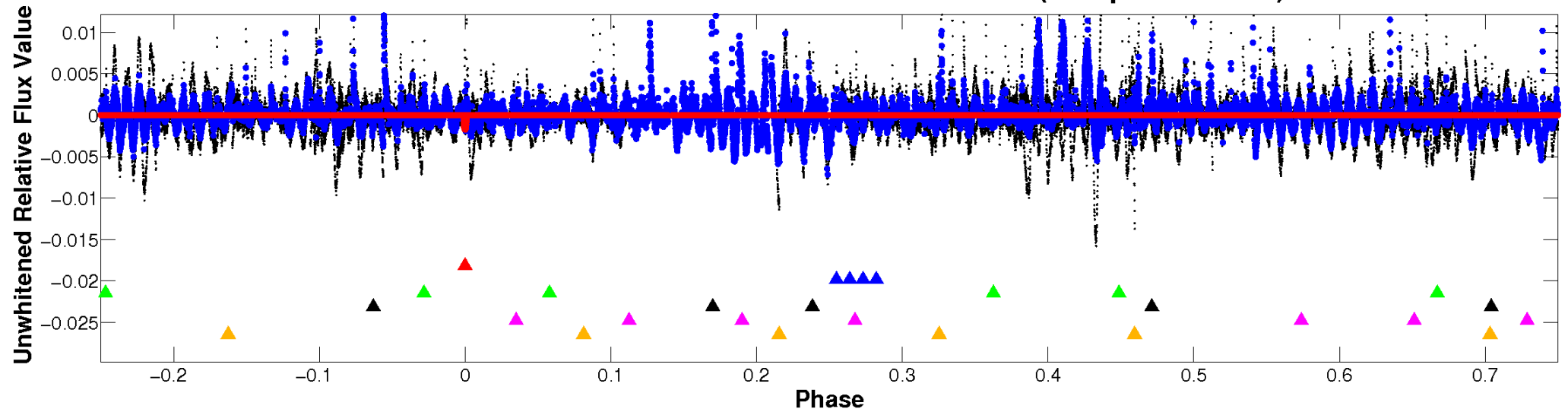
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TCE 010989281-01

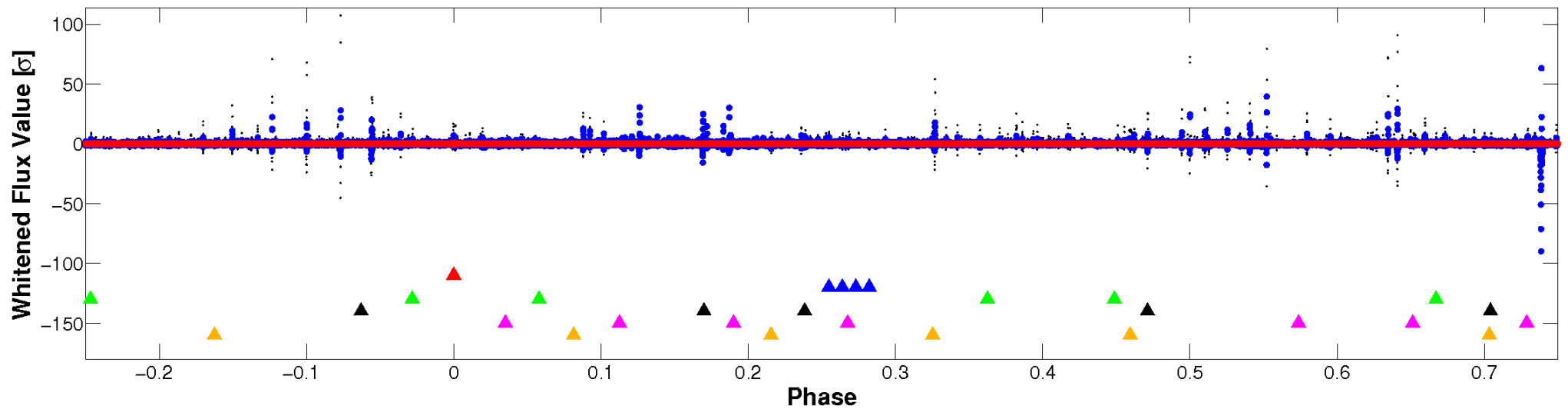


# Non-Whitened Vs. Whitened Light Curve

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

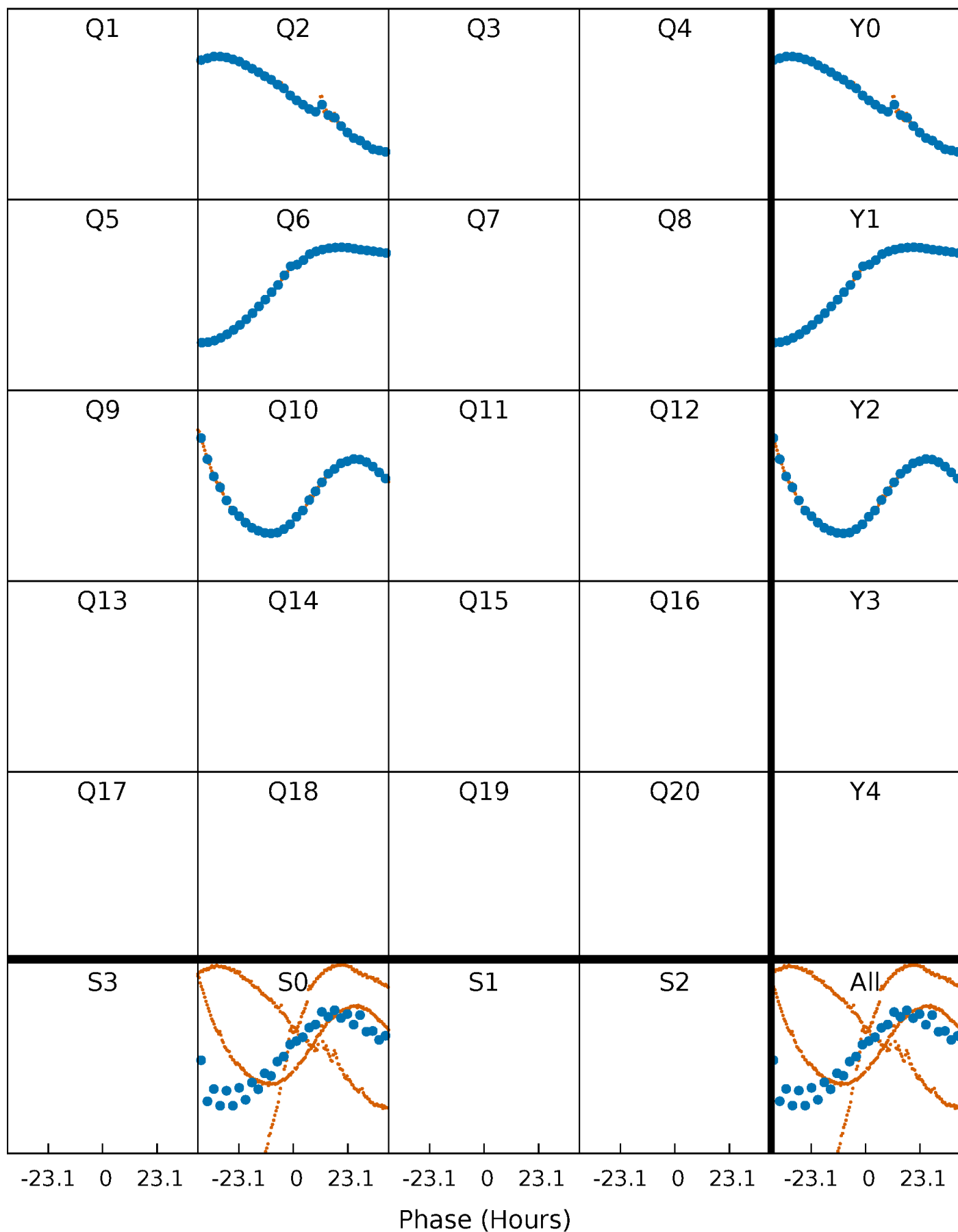


**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



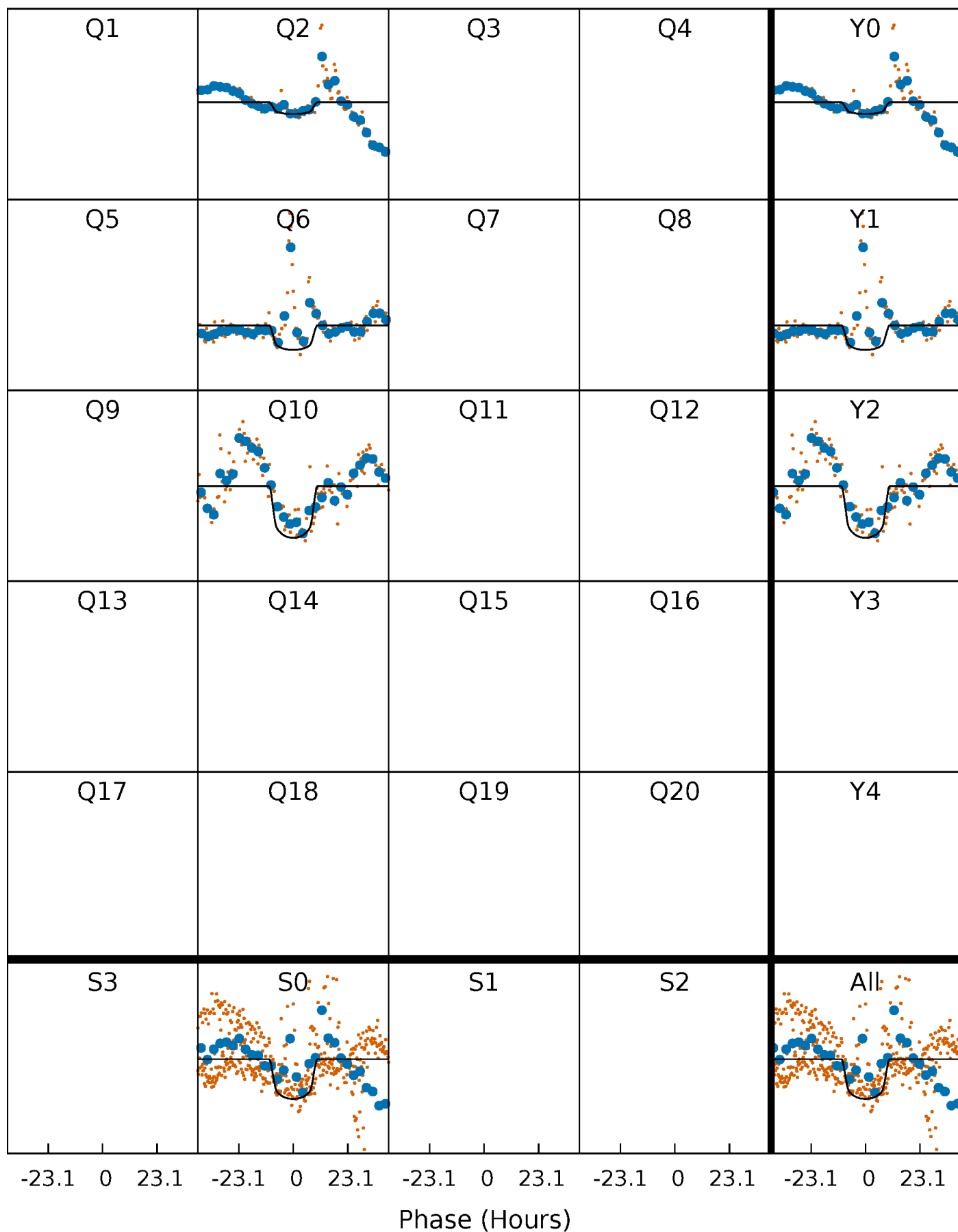
# PDC Quarter-Phased Transit Curves

TCE 010989281-01     $P=409.828295$  Days     $T_0=173.205933$  (BKJD)



# DV Quarter-Phased Transit Curves

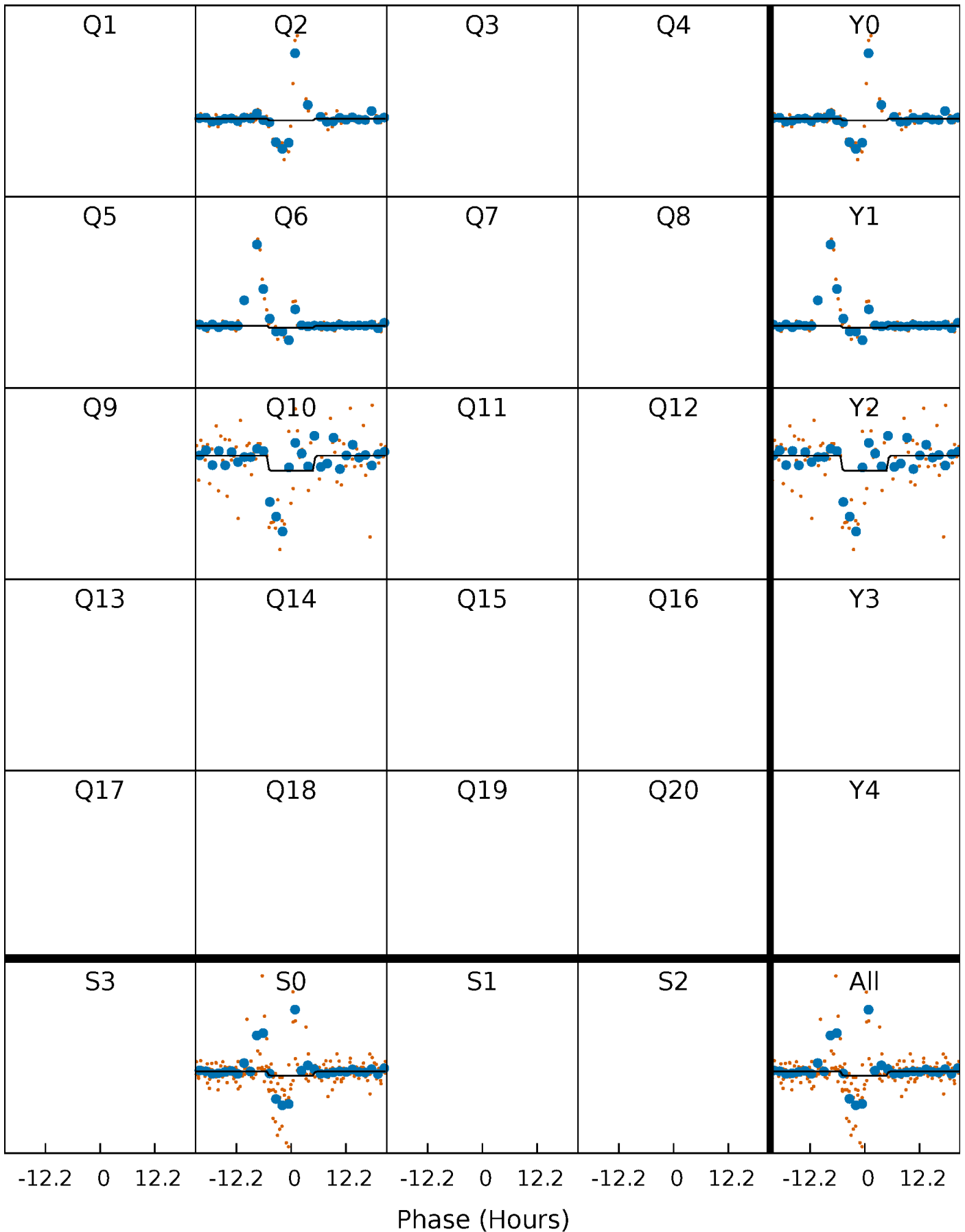
TCE 010989281-01     $P=409.828295$  Days     $T_0=173.205933$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

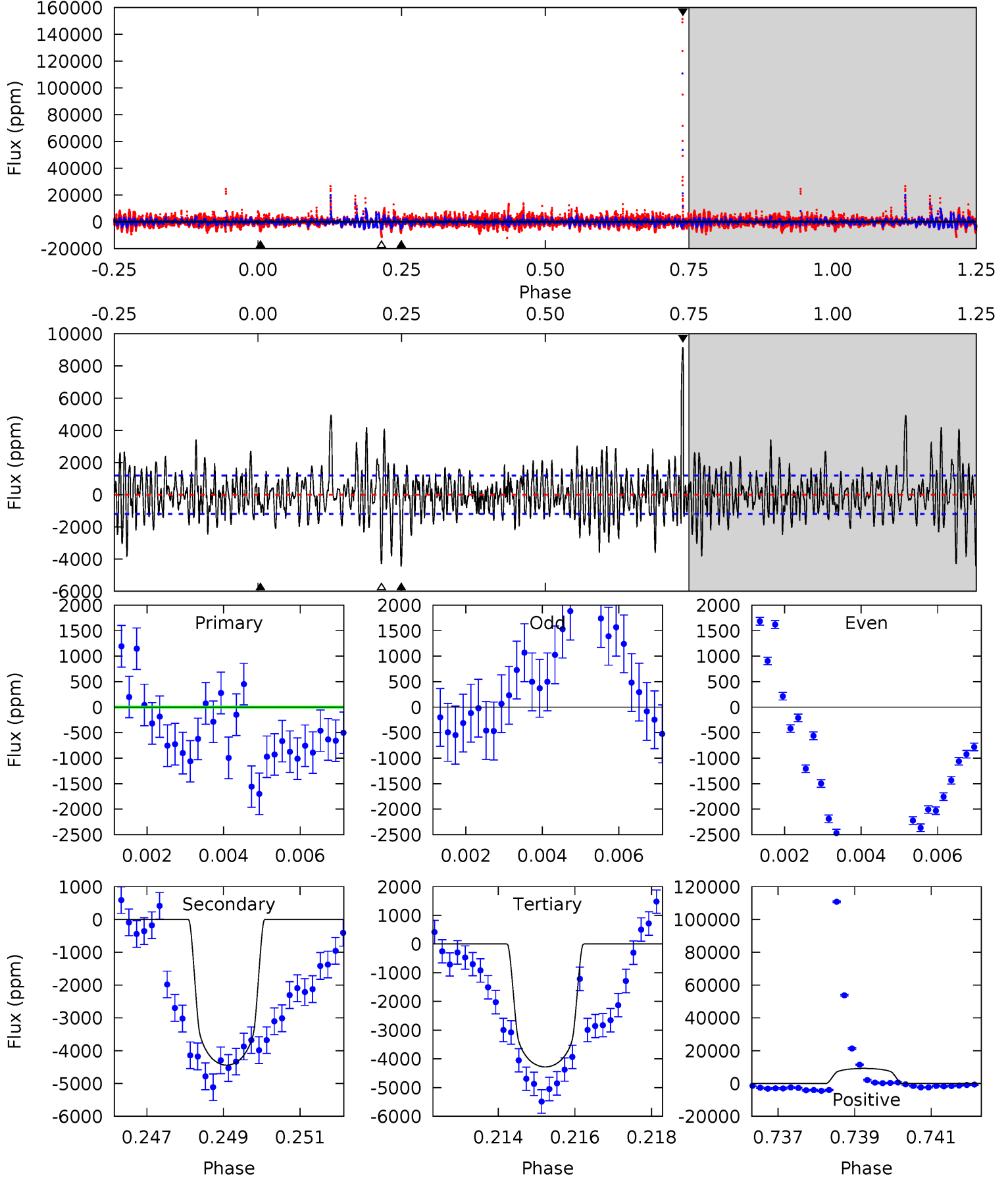
TCE 010989281-01 P=409.631577 Days  $T_0=173.651964$  (BKJD)



# DV Model-Shift Uniqueness Test

010989281-01, P = 409.828295 Days, E = 173.205933 Days

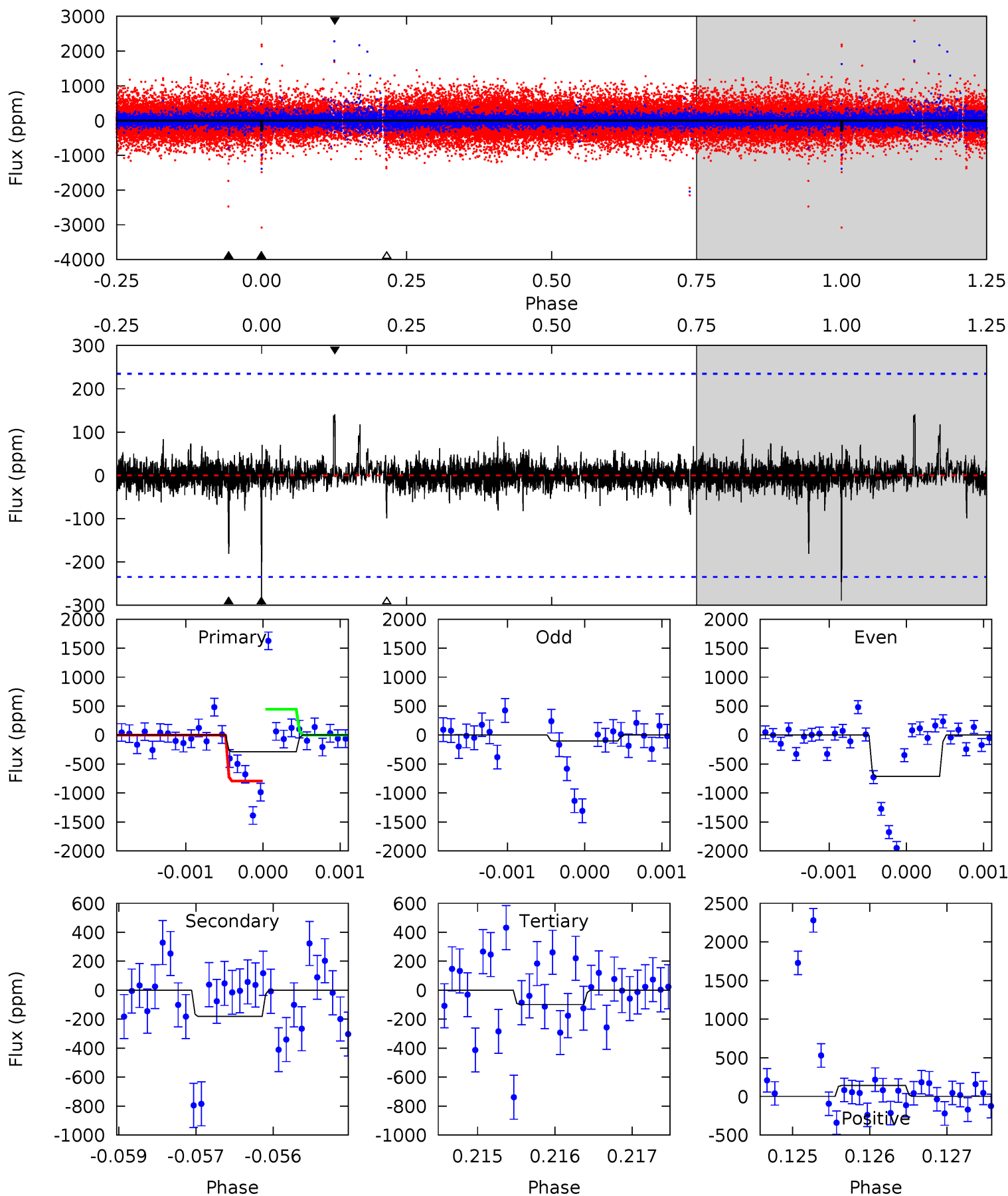
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
2.71	19.8	19.1	40.9	5.32	3.08	5.32	-16.4	-38.2	0.72	-21.1	0.63	0.44	0.67	1.64



# Alt Model-Shift Uniqueness Test

010989281-01, P = 409.631577 Days, E = 173.651964 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
6.69	4.18	2.29	3.27	5.43	3.25	0.42	4.41	3.43	1.90	0.92	7.20	1.36	0.33	4.08



### Stellar Parameters For KIC 010989281

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5398^{+208}_{-170}$	$3.822^{+0.791}_{-0.339}$	$-0.640^{+0.350}_{-0.250}$	$1.843^{+1.313}_{-1.074}$	$0.821^{+0.194}_{-0.105}$	$0.185^{+2.882}_{-0.123}$
	+4%/-3%	+21%/-9%	+55%/-39%	+71%/-58%	+24%/-13%	+1560%/-66%
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 010989281-01 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-4442 \pm 224$	$8.29^{+3.26}_{-2.76}$	$441^{+74}_{-79}$	$6665^{+621}_{-452}$	$37110^{+46986}_{-17158}$
Alt.	$-181 \pm 43$	$2.43^{+1.69}_{-1.21}$	$436^{+74}_{-80}$	$5410^{+1742}_{-852}$	$16713^{+51059}_{-10966}$

$T_{max}$  = 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

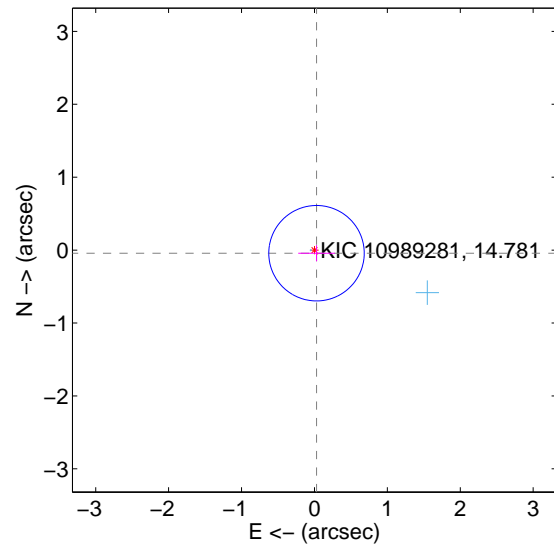
Supplemental centroid analysis for 010989281-01. Kepler magnitude: 14.78. Transit SNR 5.50

There are 2 quarters with good PRF difference image offsets

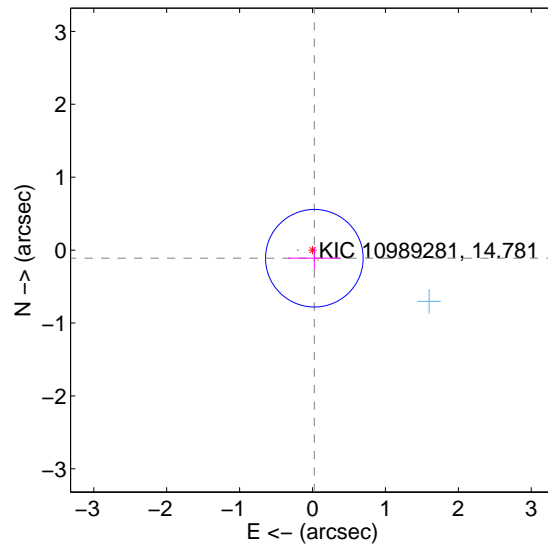
The direct PRF centroid is offset from the target star catalog position by about 0.15 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.051 \pm 0.218$	0.23	$-0.028 \pm 0.251$	$-0.043 \pm 0.111$
PRF-fit source offset from KIC position	$0.114 \pm 0.223$	0.51	$-0.025 \pm 0.362$	$-0.111 \pm 0.154$
photometric centroid source offset	$1.24 \pm 0.51$	2.44	$1.22 \pm 0.50$	$0.20 \pm 0.64$

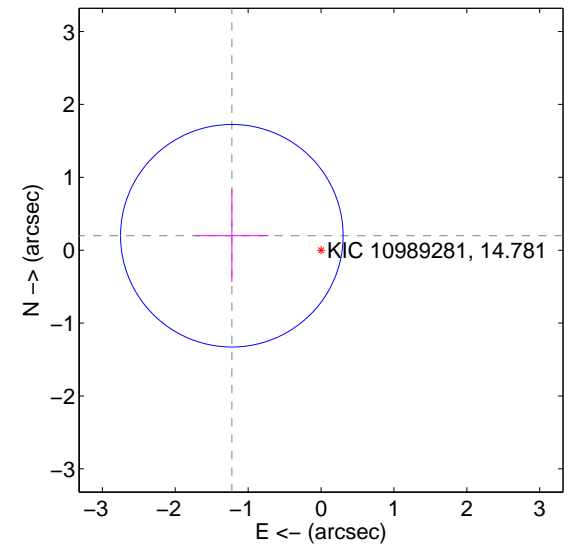
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position



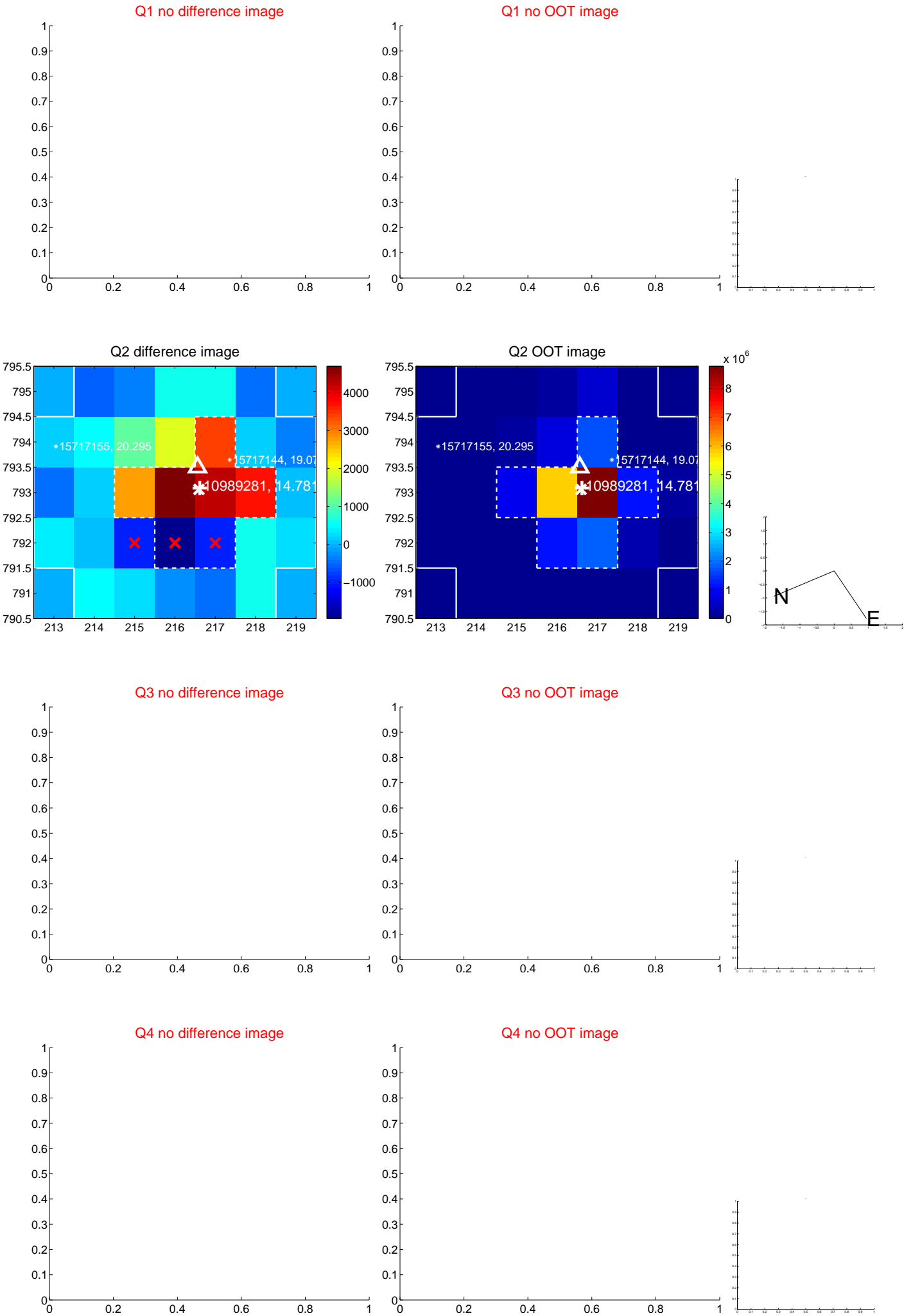
offset from photometric centroids



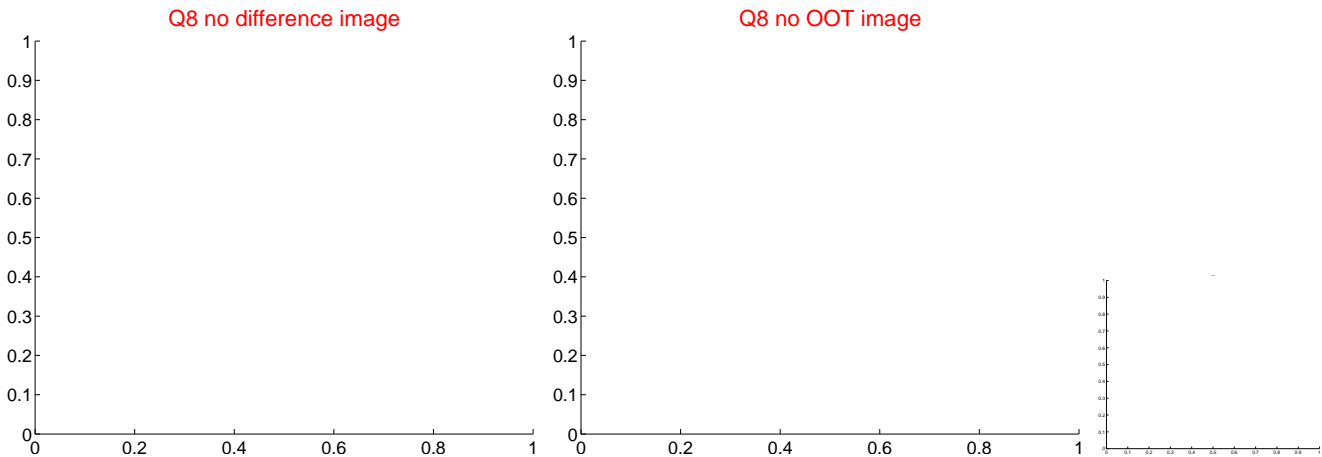
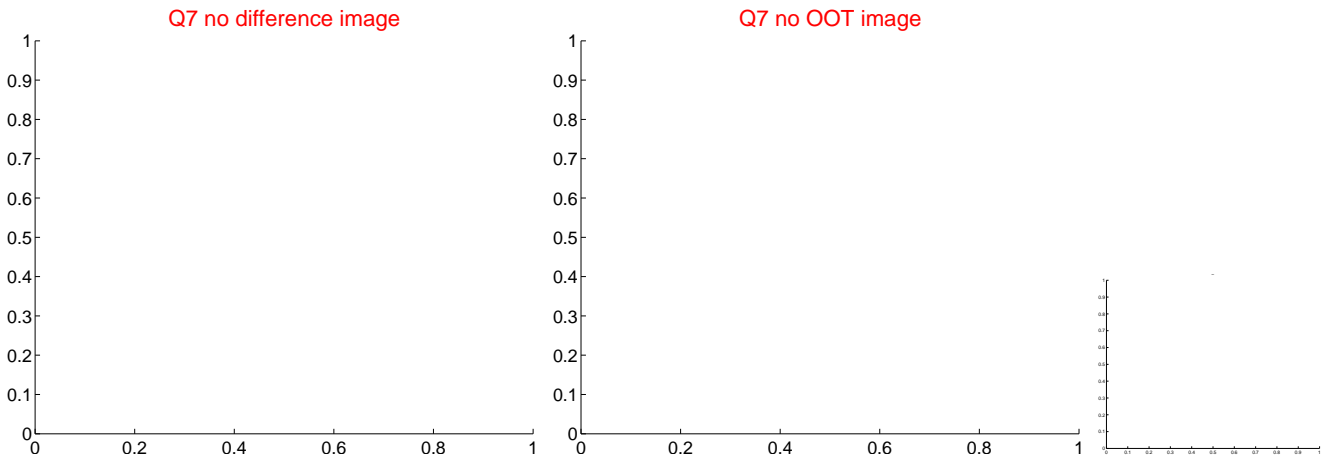
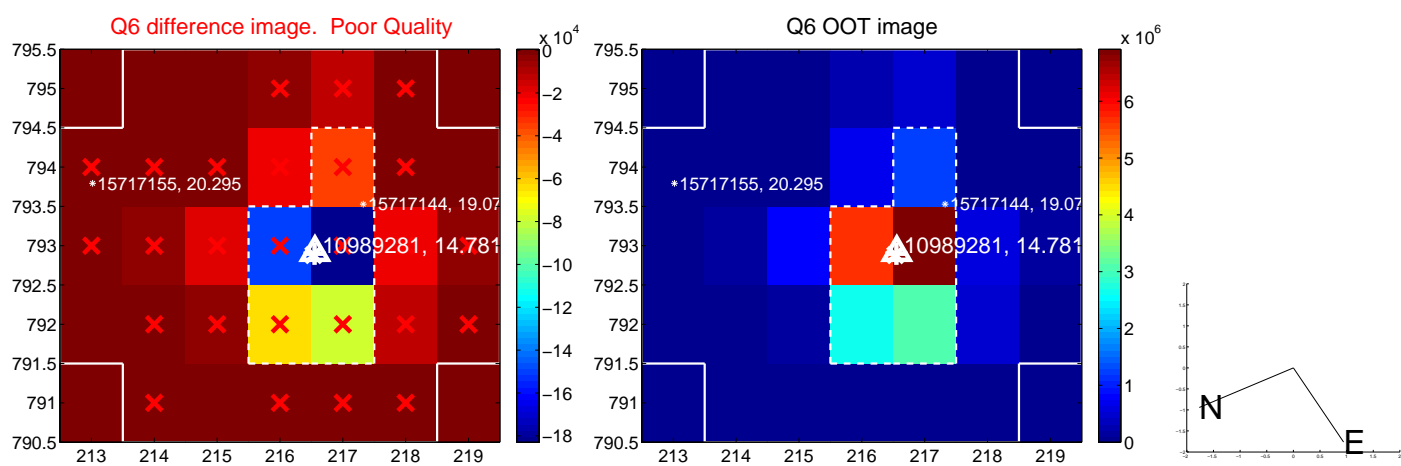
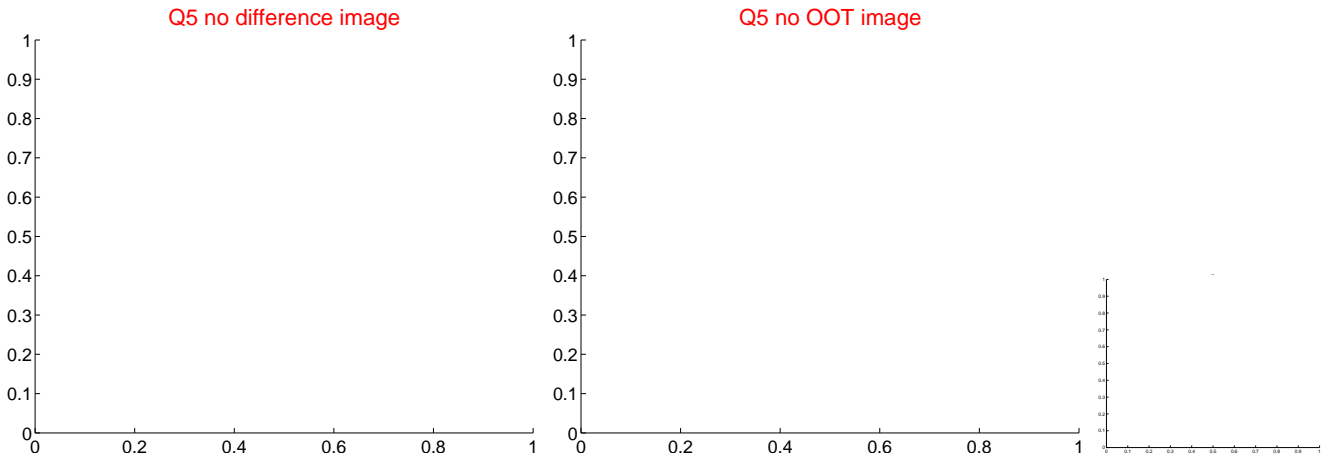
Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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



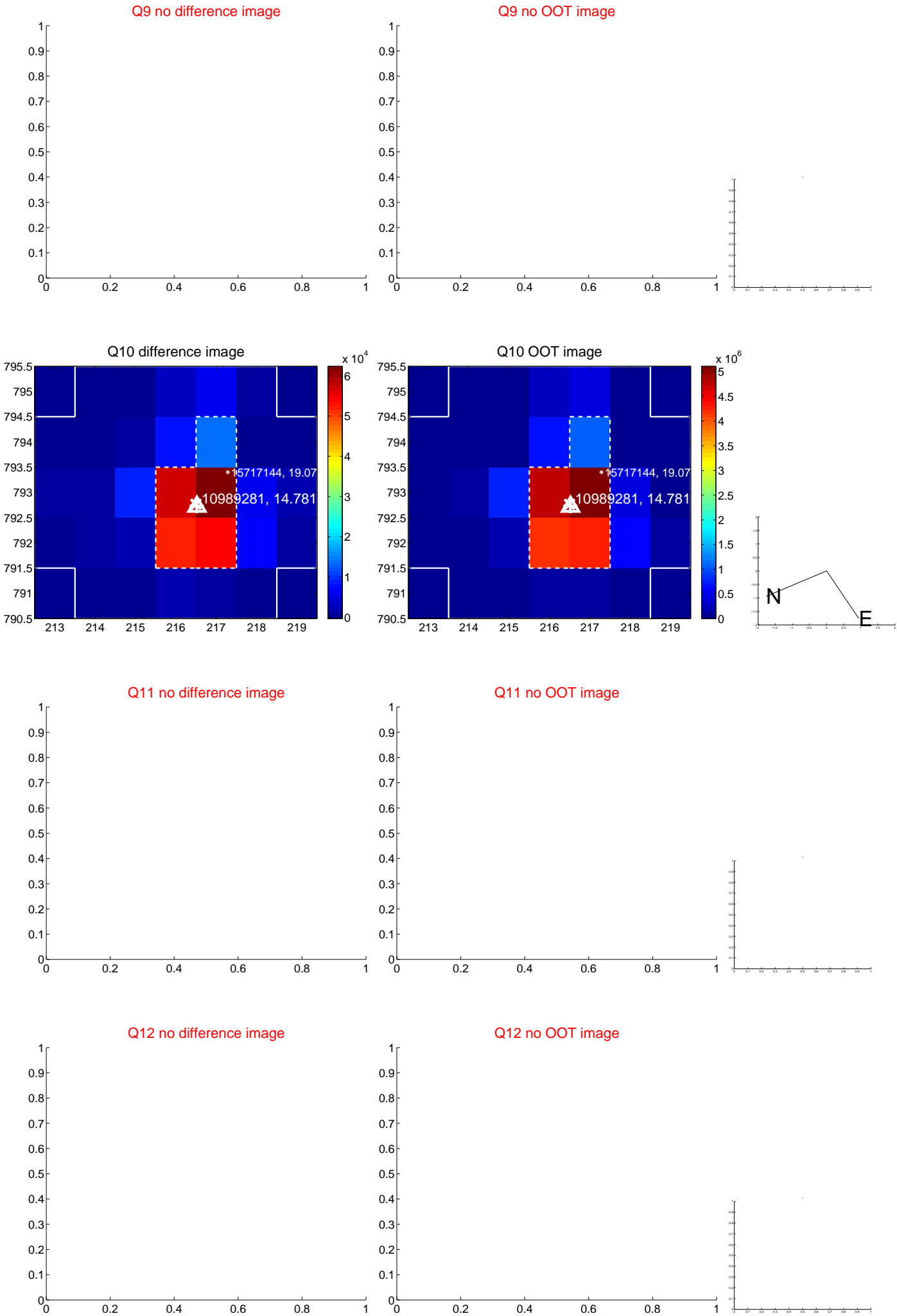
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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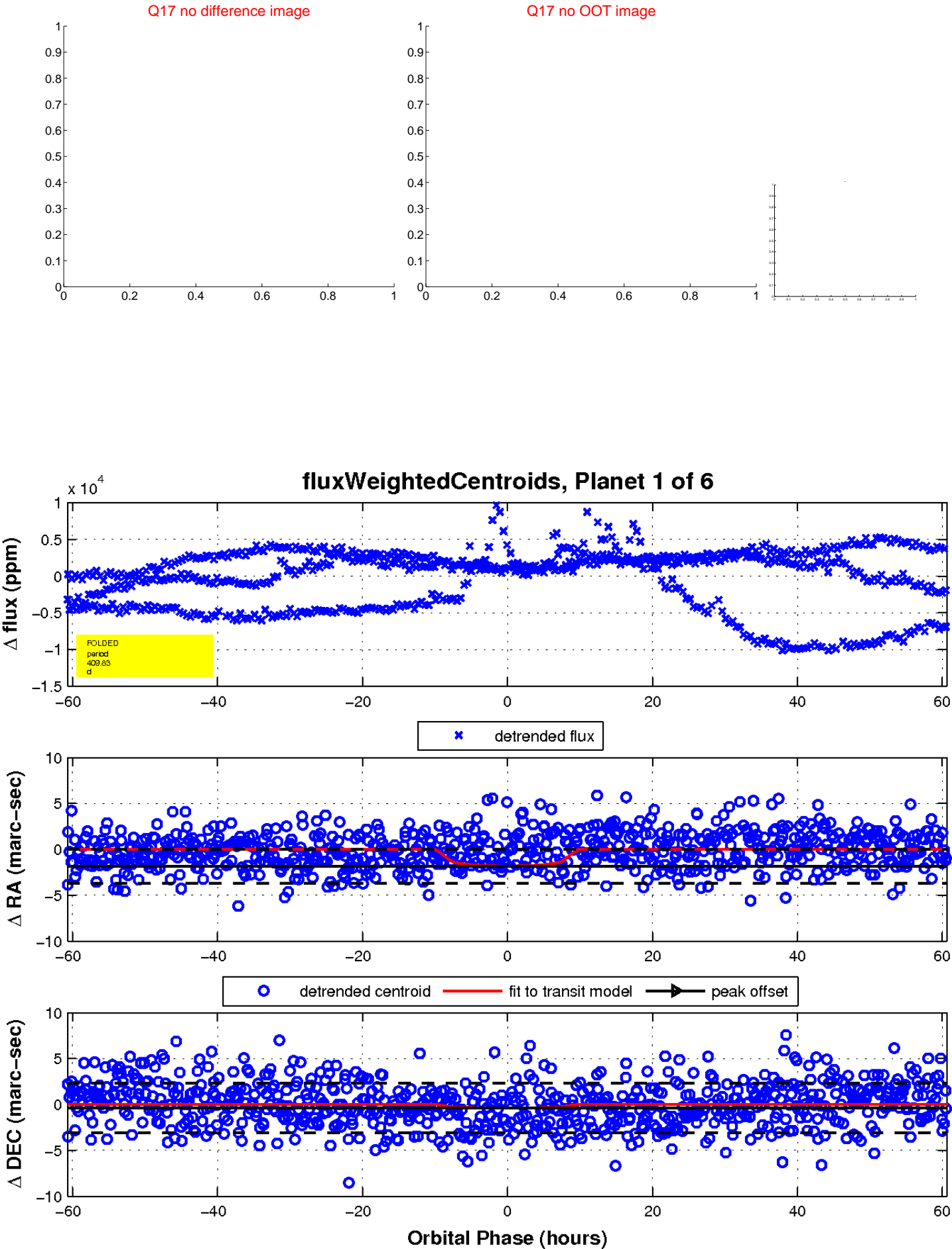
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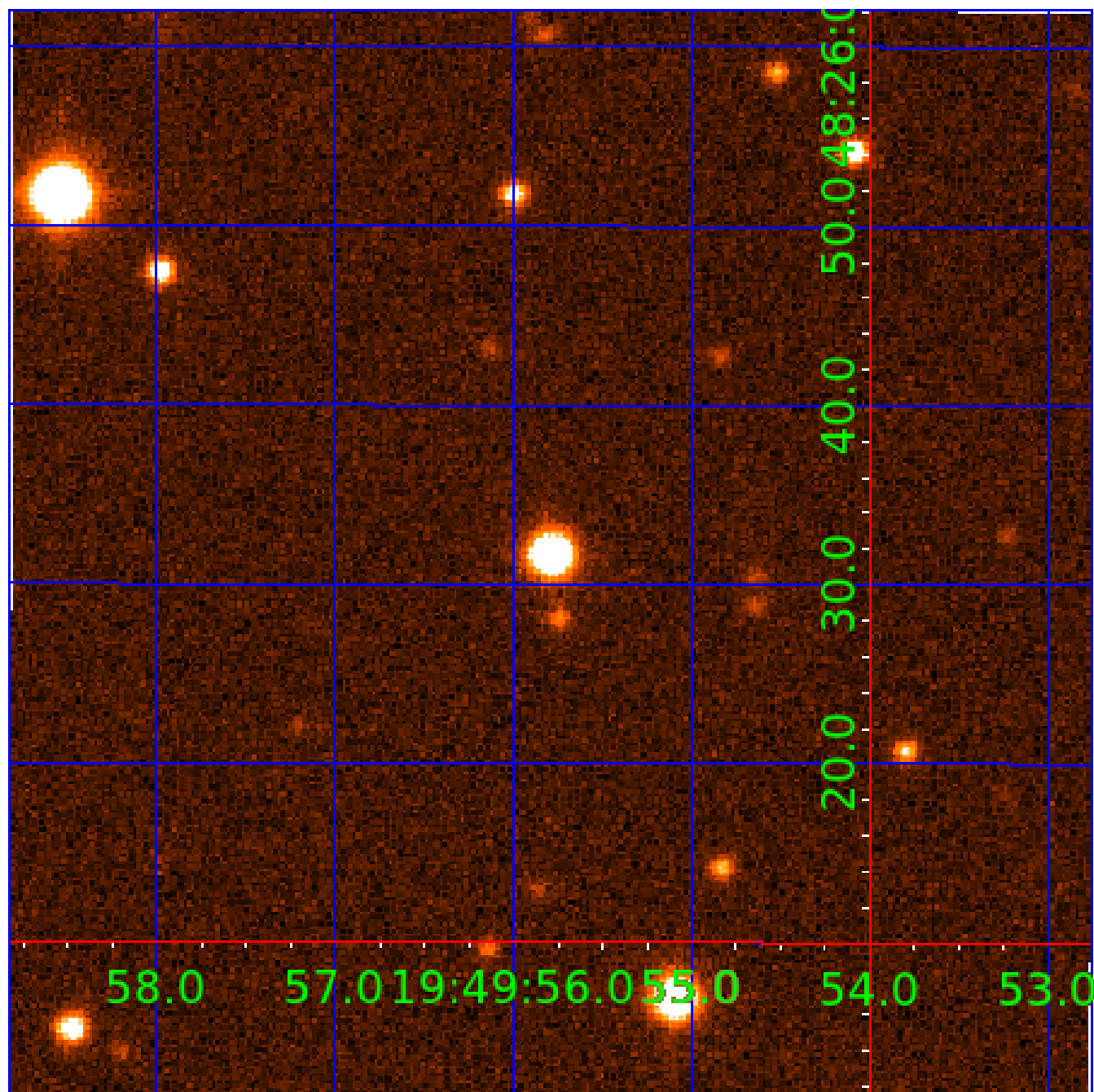
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UKIRT Image

Declination



# KIC 010989281

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010989281-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_SKYE—LPP_DV—LPP_ALT—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
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010989281-05	OBS	FP	0.00	1	0	0	0	LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS
010989281-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_NOFITS

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

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

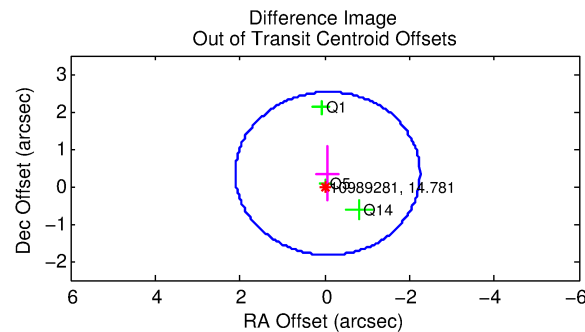
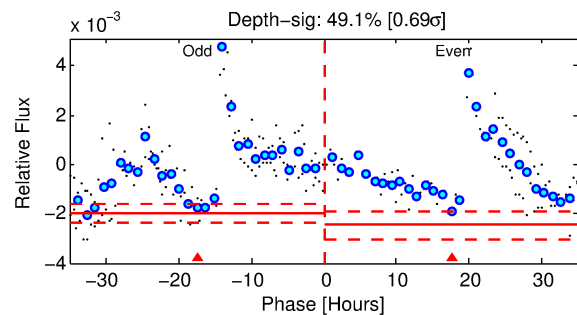
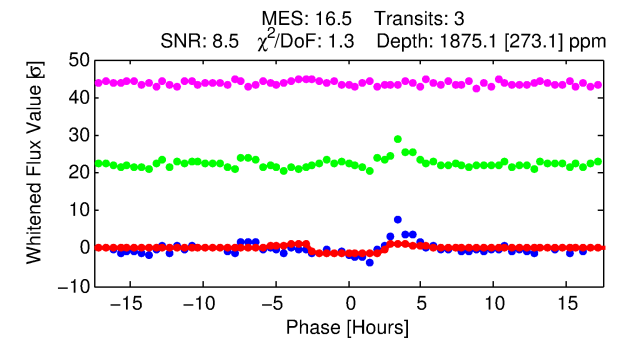
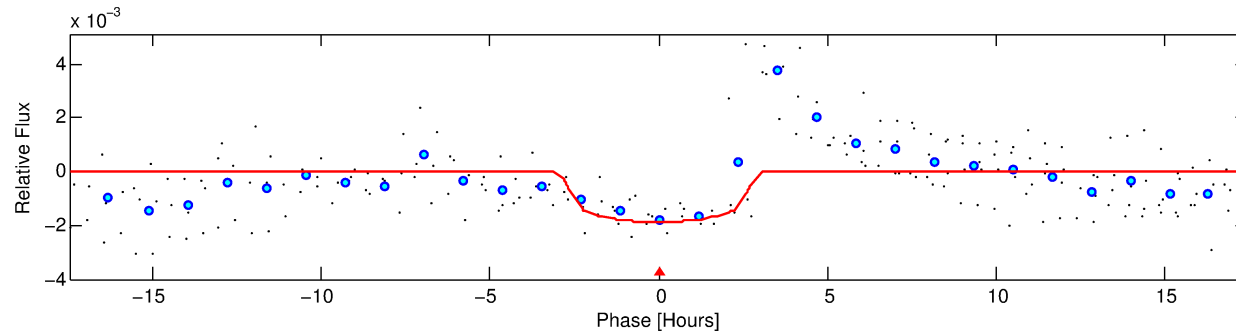
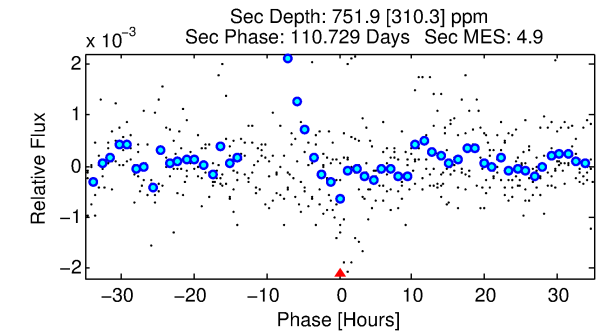
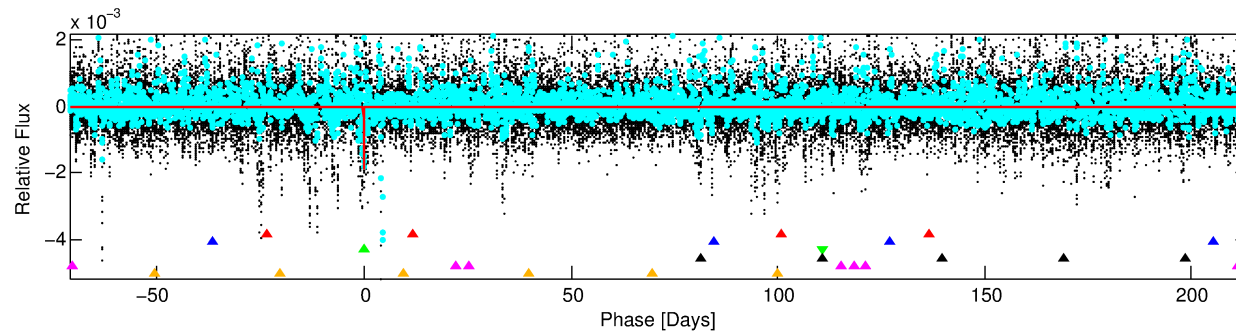
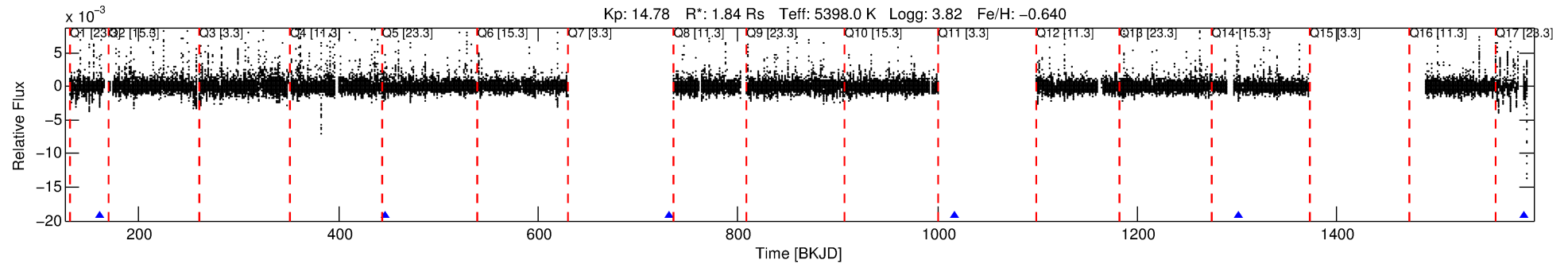
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 010989281-03

No Significant Match Found

# DV One-Page Summary

KIC: 10989281 Candidate: 3 of 6 Period: 284.987 d



## DV Fit Results:

Period = 284.98671 [0.00254] d  
Epoch = 161.6445 [0.0069] BKJD  
Rp/R\* = 0.0427 [0.0158]  
a/R\* = 281.21 [423.08]  
b = 0.72 [1.02]  
Seff = 4.10 [5.38]  
Teq = 363 [119] K  
Rp = 8.58 [6.89] Re  
a = 0.7942 [0.6122] AU  
Ag = 3542.42 [5507.86] [0.64 $\sigma$ ]  
Teffp = 4327 [931] K [4.22 $\sigma$ ]

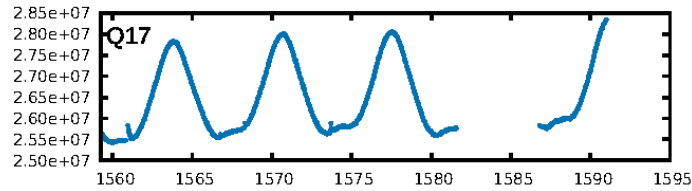
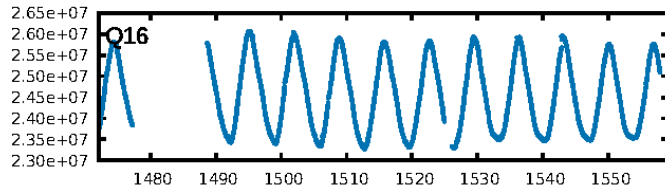
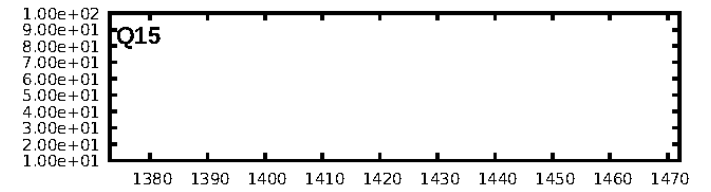
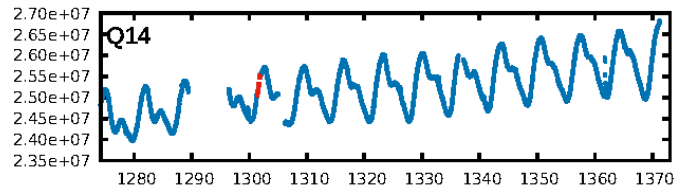
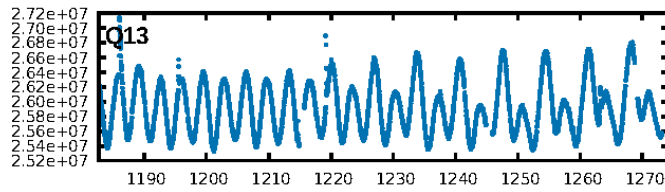
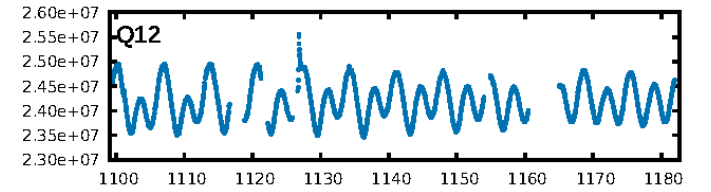
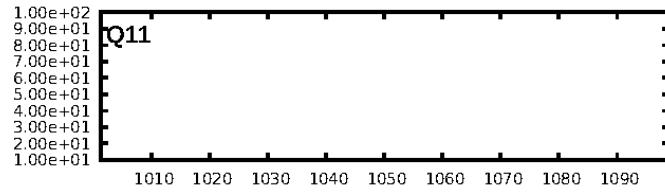
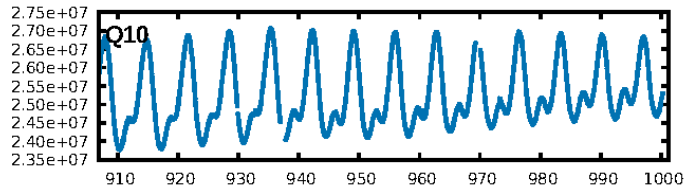
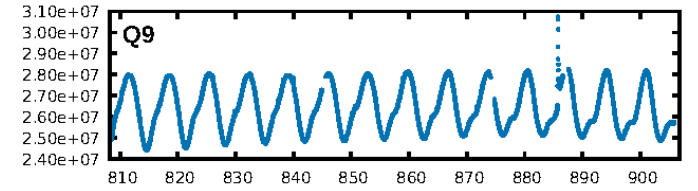
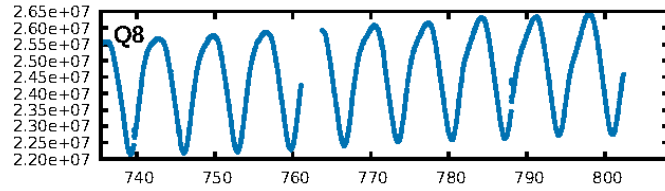
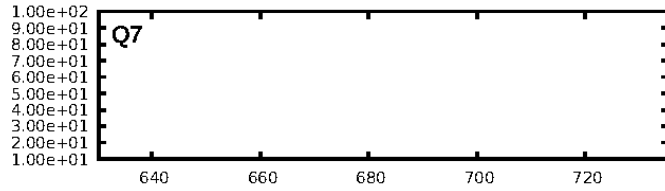
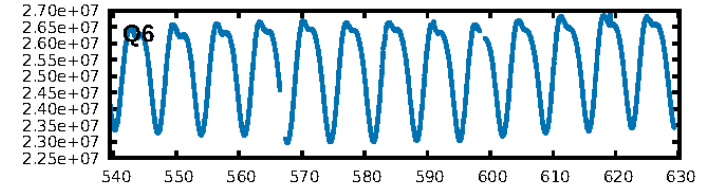
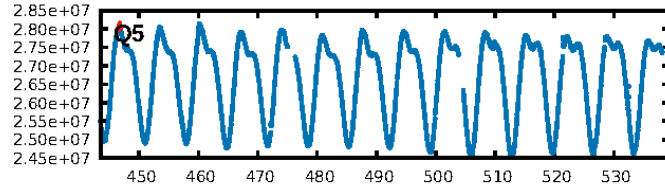
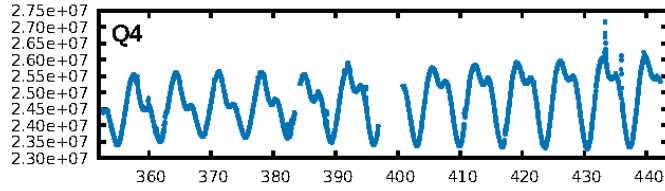
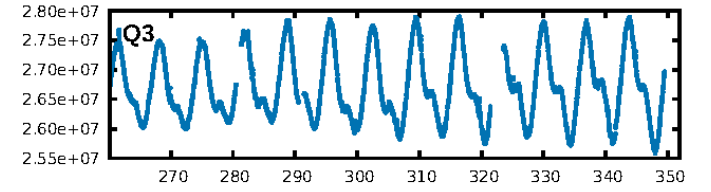
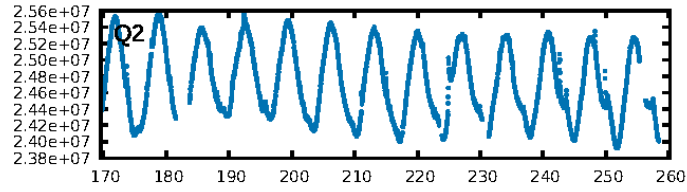
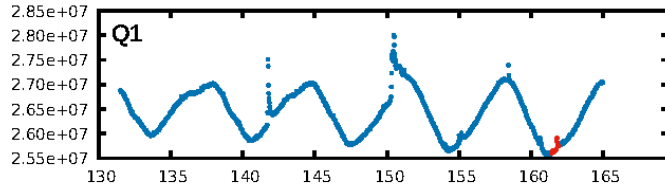
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [106.18 $\sigma$ ]  
LongPeriod-sig: 100.0% [71.64 $\sigma$ ]  
ModelChiSquare2-sig: 52.3%  
ModelChiSquareGof-sig: 51.3%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [2/2]  
**GhostDiagnostic-chr: 0.3705**  
Centroid-sig: 8.0%  
Centroid-so: 1.030 arcsec [1.76 $\sigma$ ]  
OotOffset-rm: 0.349 arcsec [0.48 $\sigma$ ]  
KicOffset-rm: 0.292 arcsec [0.33 $\sigma$ ]  
OotOffset-st: 1/0/0/2 [3]  
KicOffset-st: 1/0/0/2 [3]  
DiffImageQuality-fgm: 0.67 [2/3]  
DiffImageOverlap-fno: 1.00 [3/3]

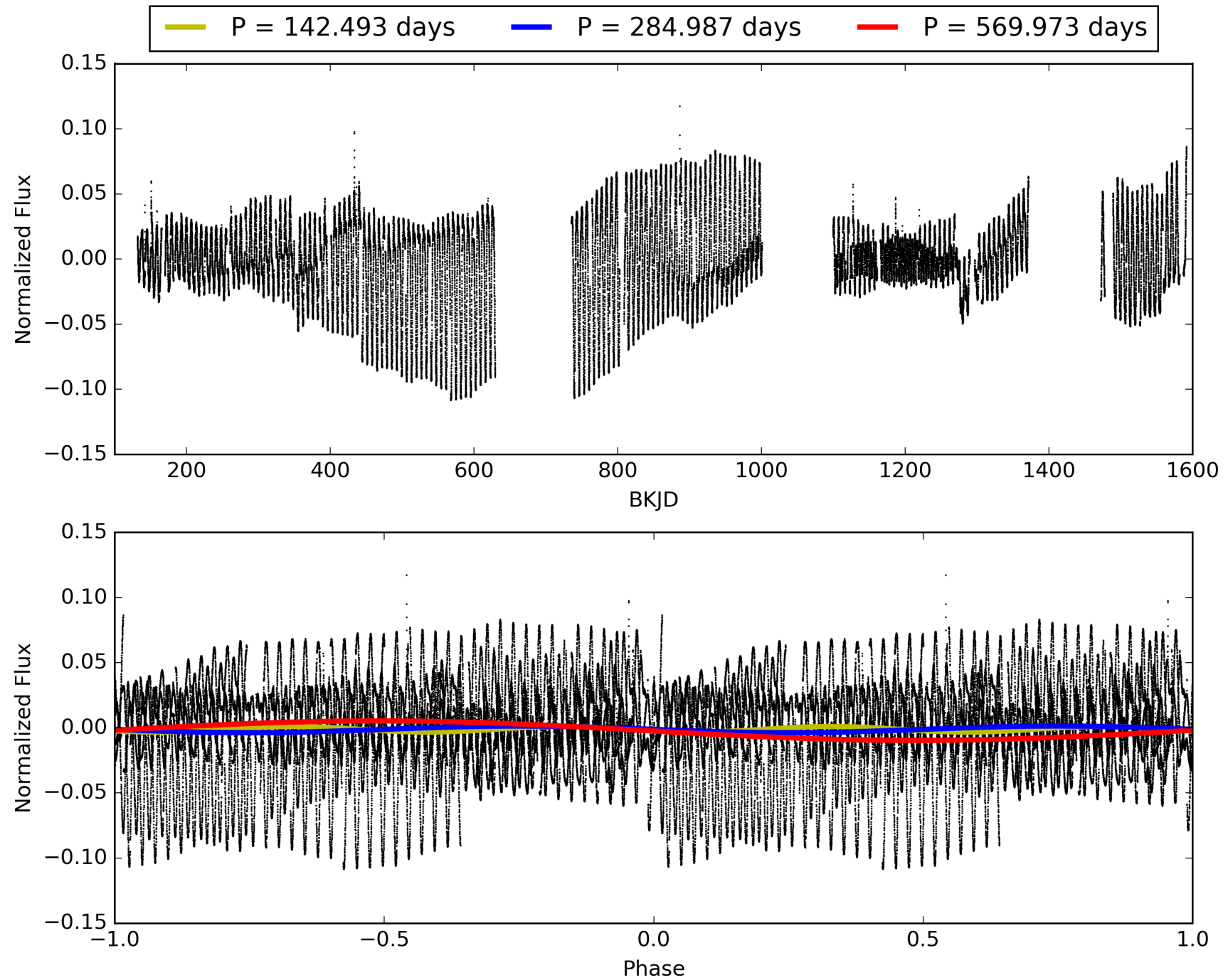
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 10:10:28 Z

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

# TCE 010989281-03, PDC Light Curves



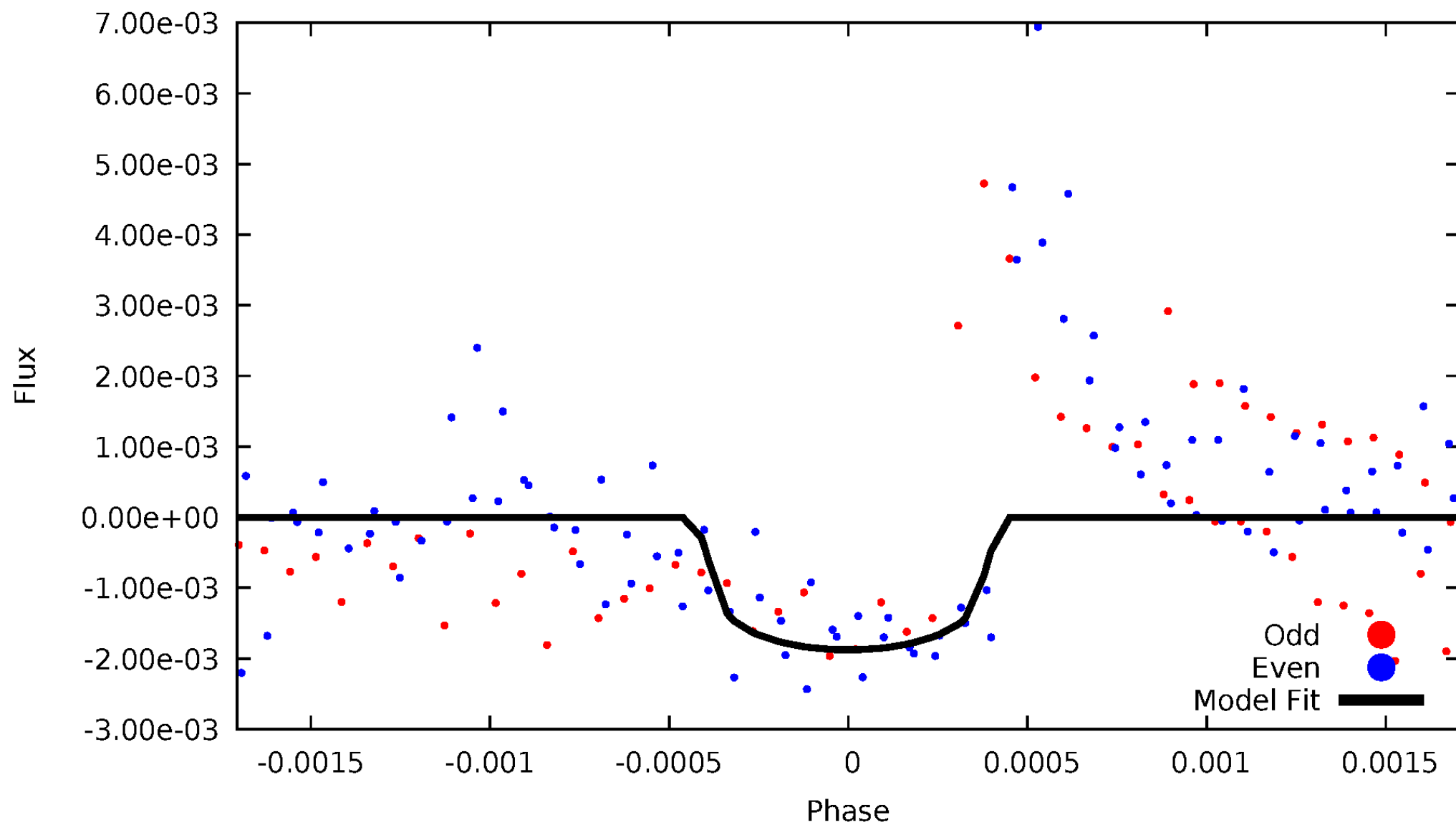
TCE 010989281-03





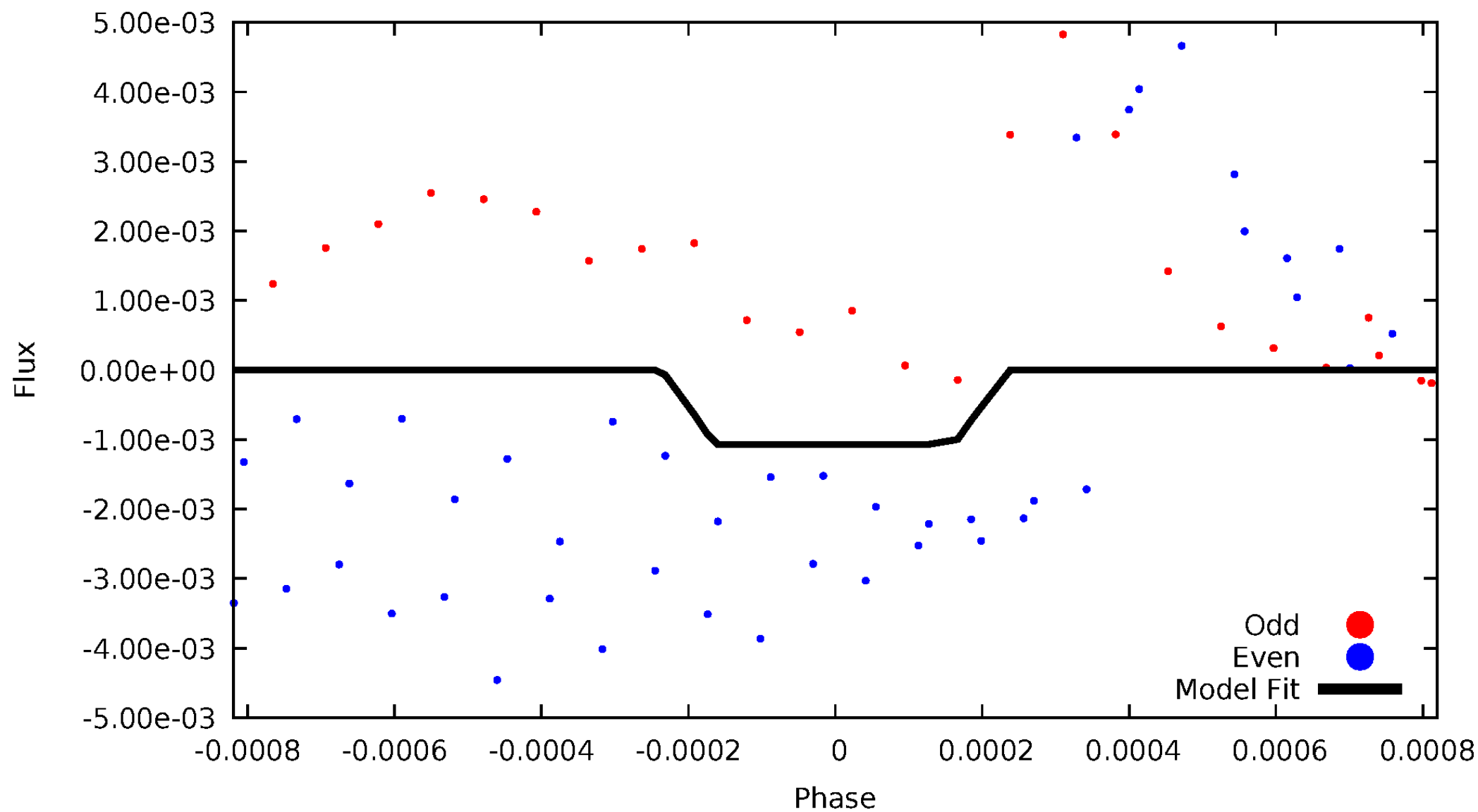
# DV Odd/Even

TCE 010989281-03



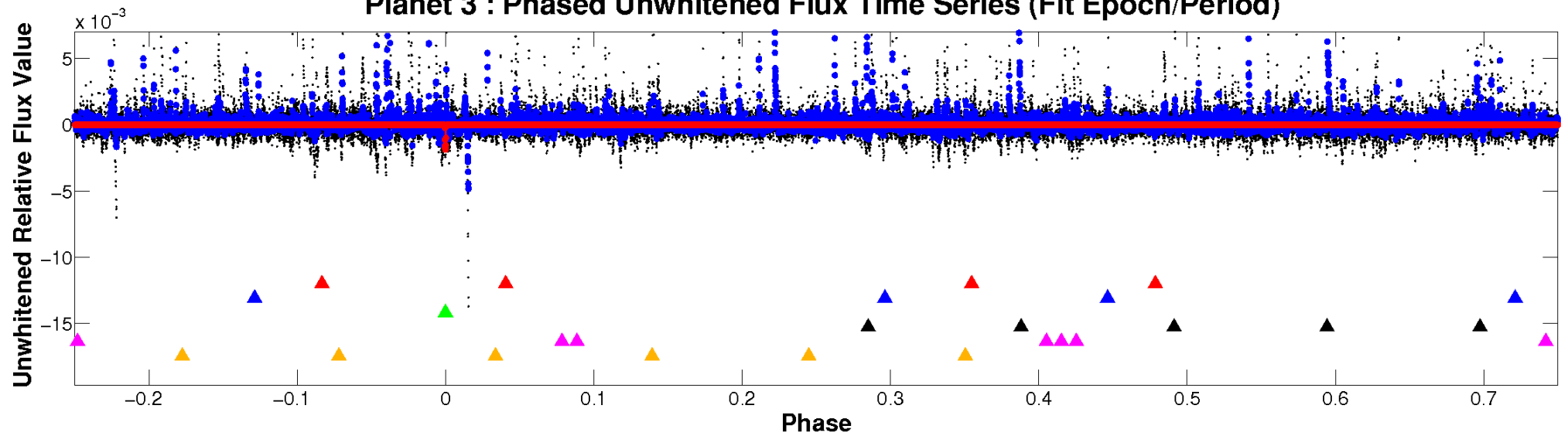
# ALT Odd/Even

TCE 010989281-03

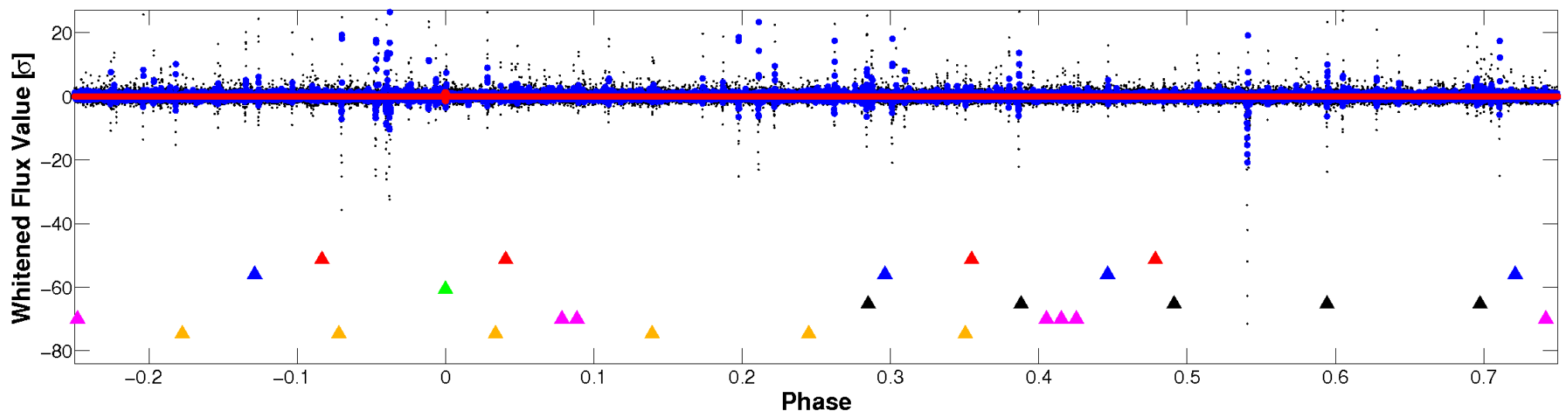


# Non-Whitened Vs. Whitened Light Curve

Planet 3 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

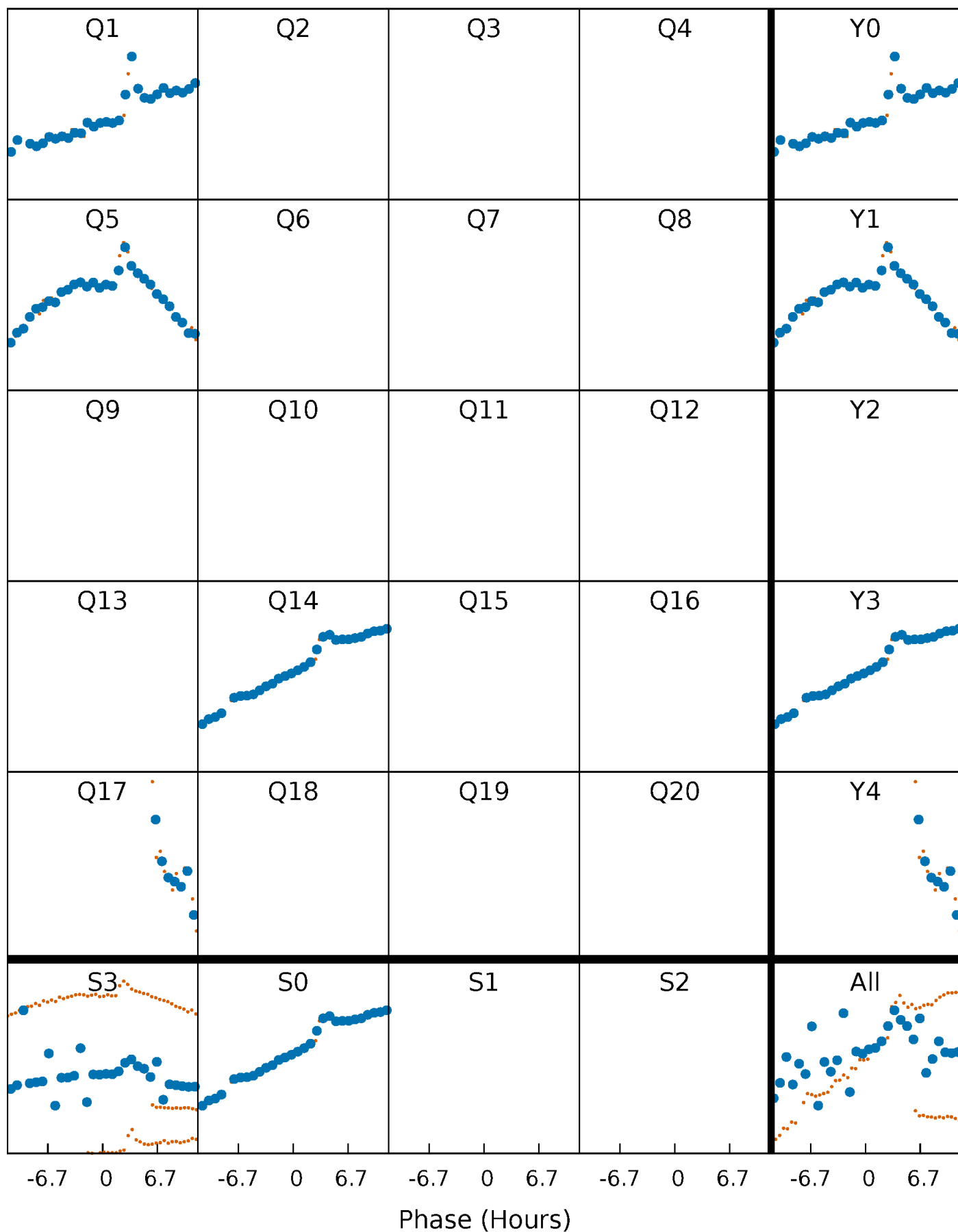


Planet 3 : Phased Whitened Flux Time Series (Fit Epoch/Period)



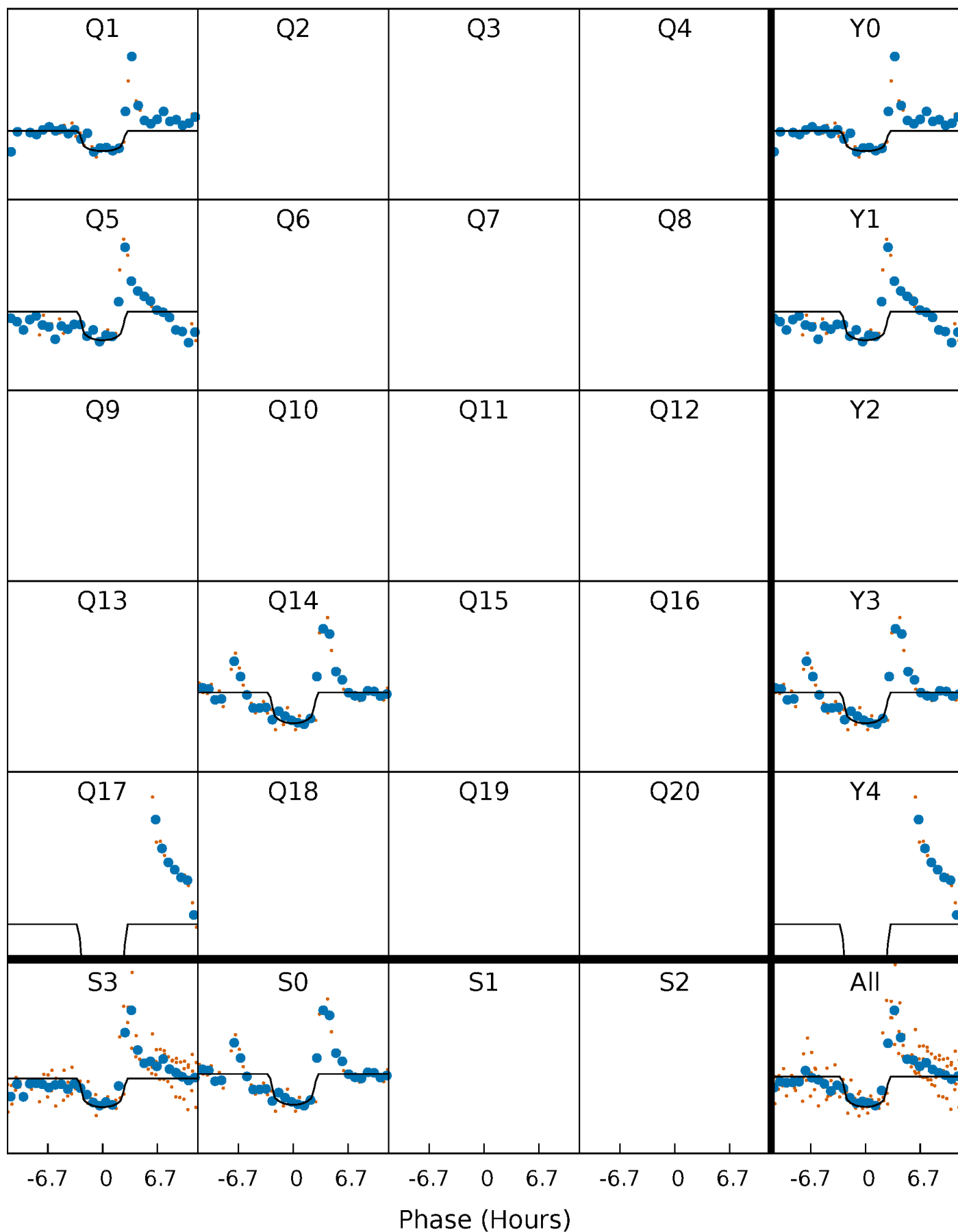
# PDC Quarter-Phased Transit Curves

TCE 010989281-03     $P=284.986710$  Days     $T_0=161.644539$  (BKJD)



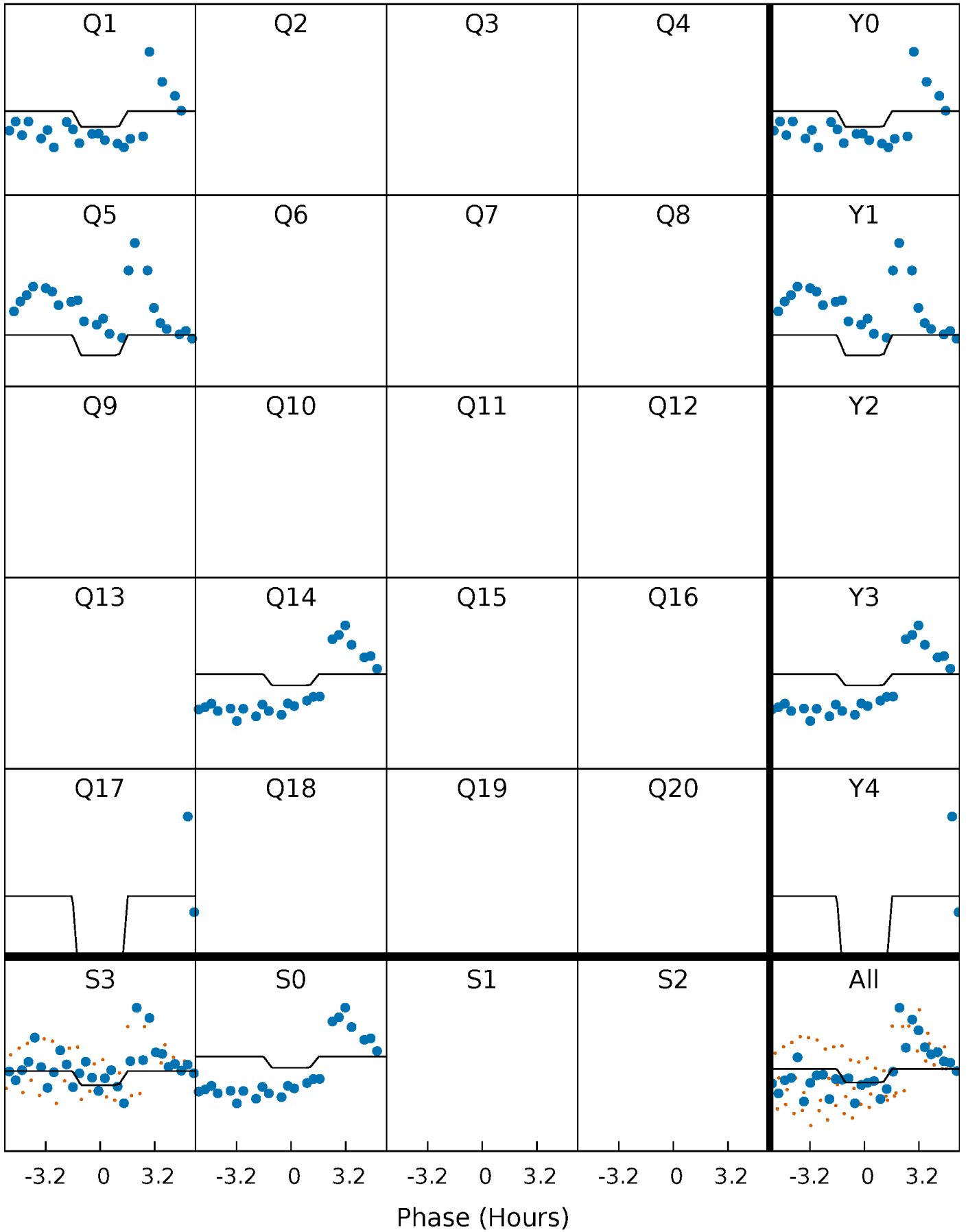
# DV Quarter-Phased Transit Curves

TCE 010989281-03     $P=284.986710$  Days     $T_0=161.644539$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

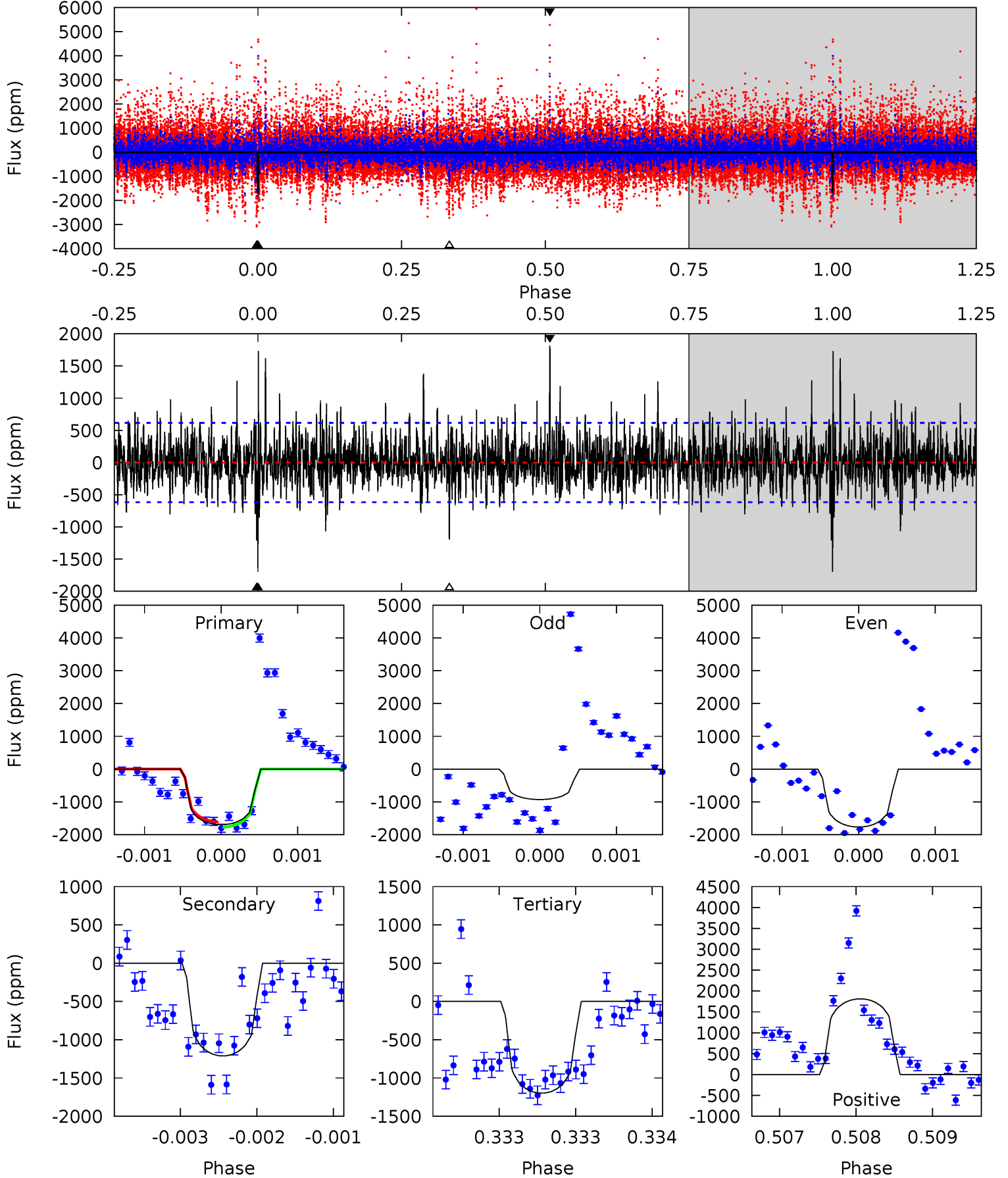
TCE 010989281-03     $P=284.993673$  Days     $T_0=161.657034$  (BKJD)



# DV Model-Shift Uniqueness Test

010989281-03, P = 284.986710 Days, E = 161.644539 Days

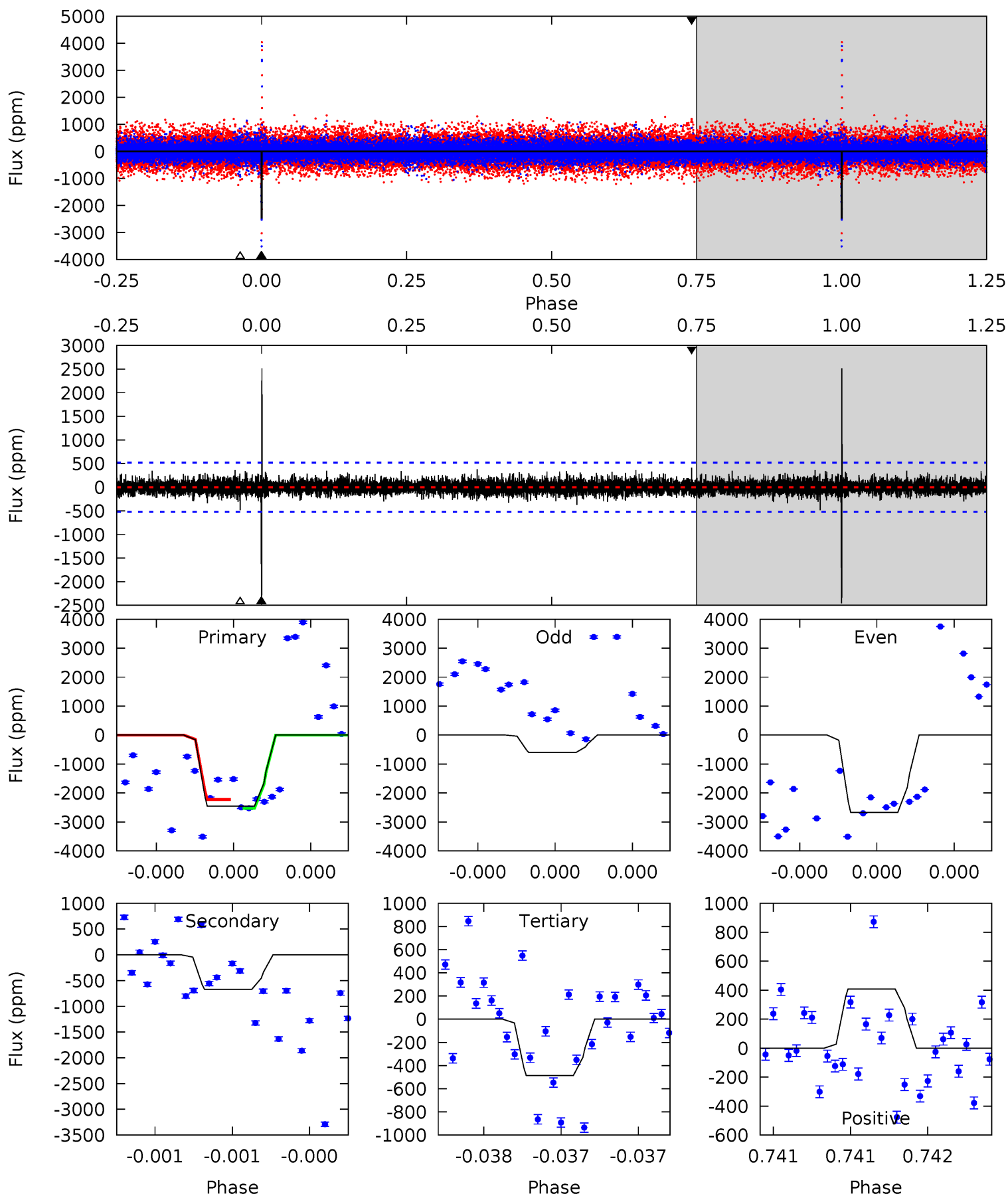
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
15.1	10.8	10.6	16.1	5.48	3.33	2.55	4.41	-1.04	0.12	-5.33	2.75	0.89	0.52	0.71



# Alt Model-Shift Uniqueness Test

010989281-03, P = 284.993673 Days, E = 161.657034 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
26.4	7.21	5.22	4.39	5.58	3.50	0.91	21.2	22.0	1.99	2.83	13.4	0.76	0.51	1.55





### Stellar Parameters For KIC 010989281

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5398^{+208}_{-170}$	$3.822^{+0.791}_{-0.339}$	$-0.640^{+0.350}_{-0.250}$	$1.843^{+1.313}_{-1.074}$	$0.821^{+0.194}_{-0.105}$	$0.185^{+2.882}_{-0.123}$
	+4%/-3%	+21%/-9%	+55%/-39%	+71%/-58%	+24%/-13%	+1560%/-66%
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 010989281-03 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-1212 \pm 113$	$7.79^{+4.98}_{-3.56}$	$498^{+87}_{-98}$	$4931^{+1191}_{-596}$	$6881^{+17078}_{-4299}$
Alt.	$-672 \pm 93$	$5.81^{+4.20}_{-2.90}$	$497^{+79}_{-90}$	$4906^{+1501}_{-688}$	$6912^{+21097}_{-4554}$

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

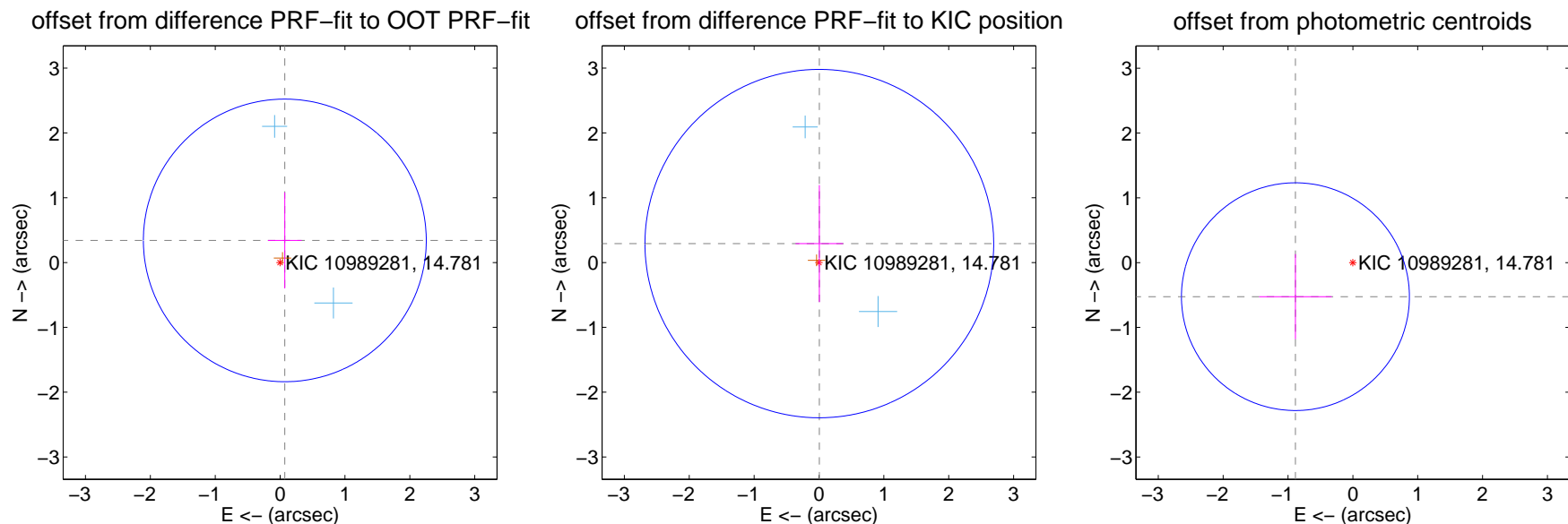
## DV Centroid Data

Supplemental centroid analysis for 010989281-03. Kepler magnitude: 14.78. Transit SNR 8.48

There are 2 quarters with good PRF difference image offsets

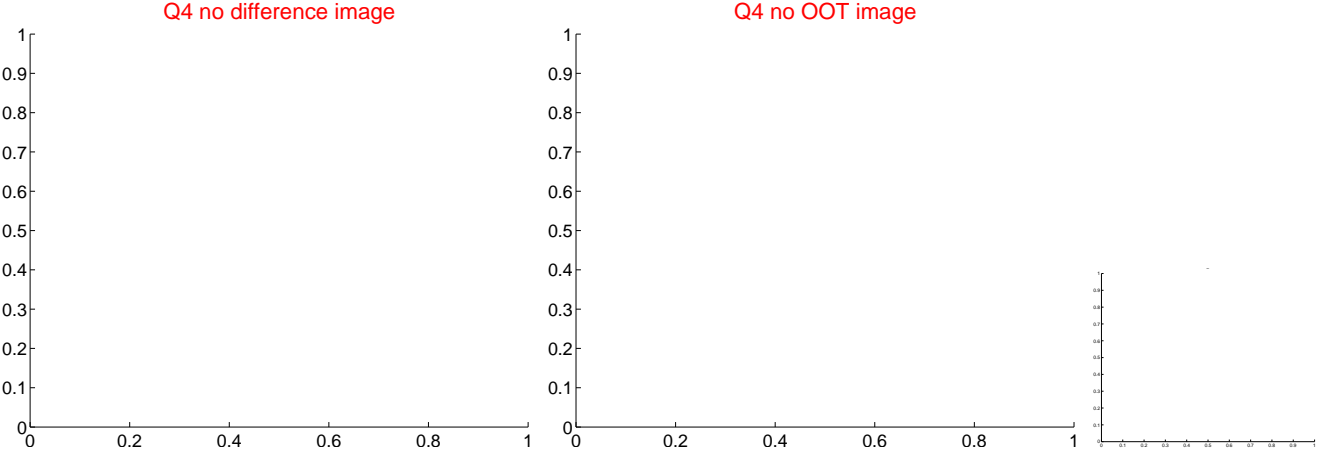
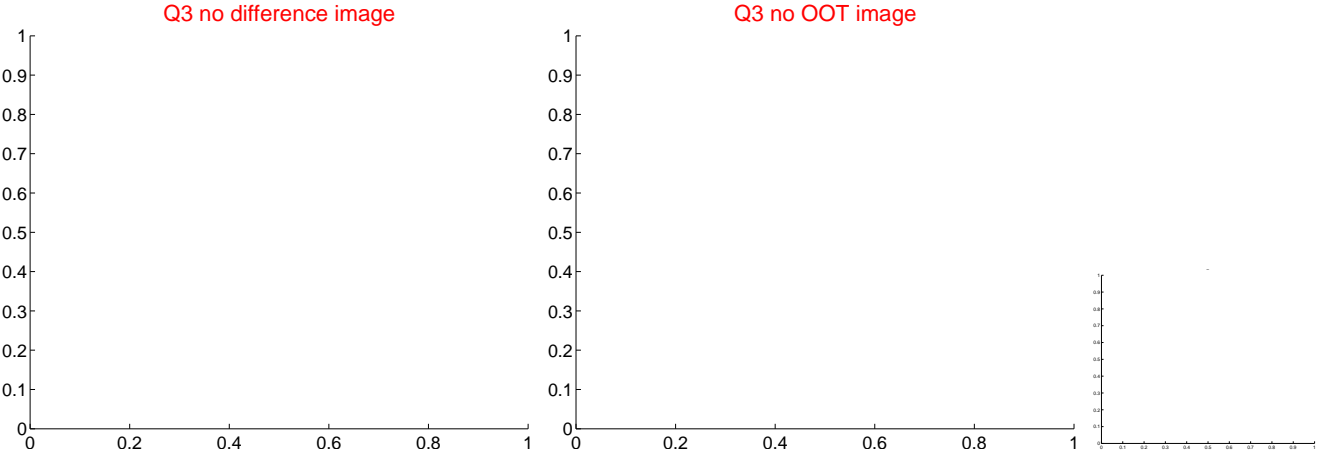
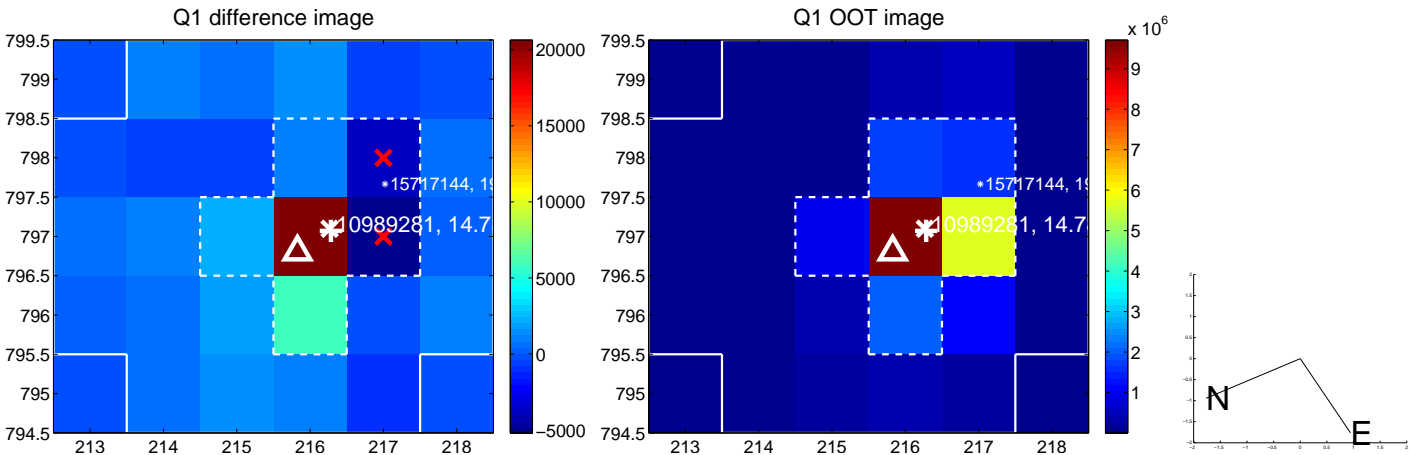
The direct PRF centroid is offset from the target star catalog position by about 0.16 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.349 \pm 0.727$	0.48	$-0.073 \pm 0.258$	$0.342 \pm 0.741$
PRF-fit source offset from KIC position	$0.292 \pm 0.896$	0.33	$-0.005 \pm 0.366$	$0.292 \pm 0.902$
photometric centroid source offset	$1.03 \pm 0.59$	1.76	$0.89 \pm 0.56$	$-0.53 \pm 0.66$

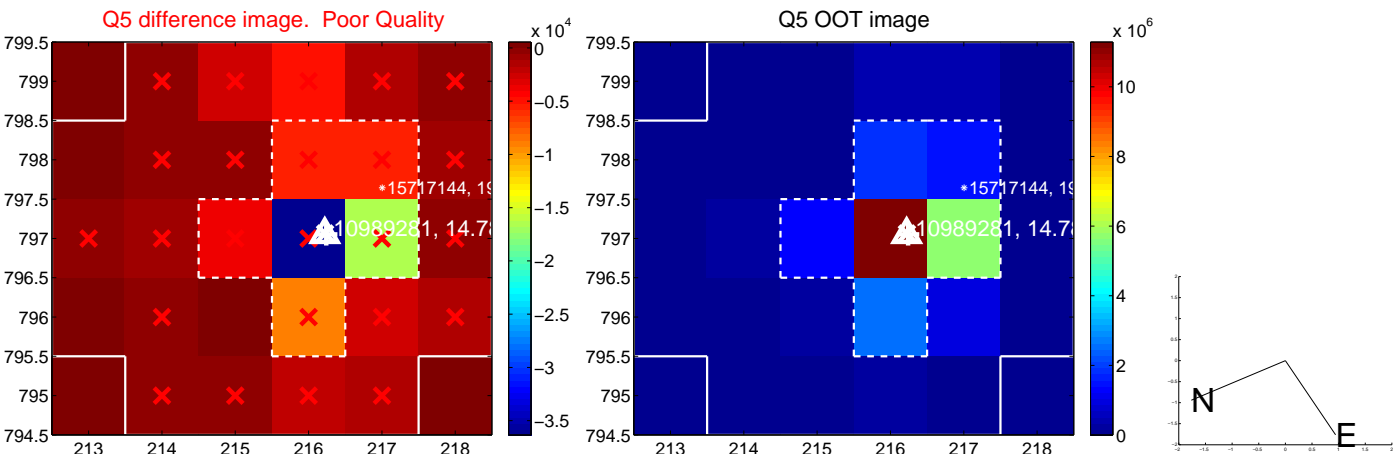


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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



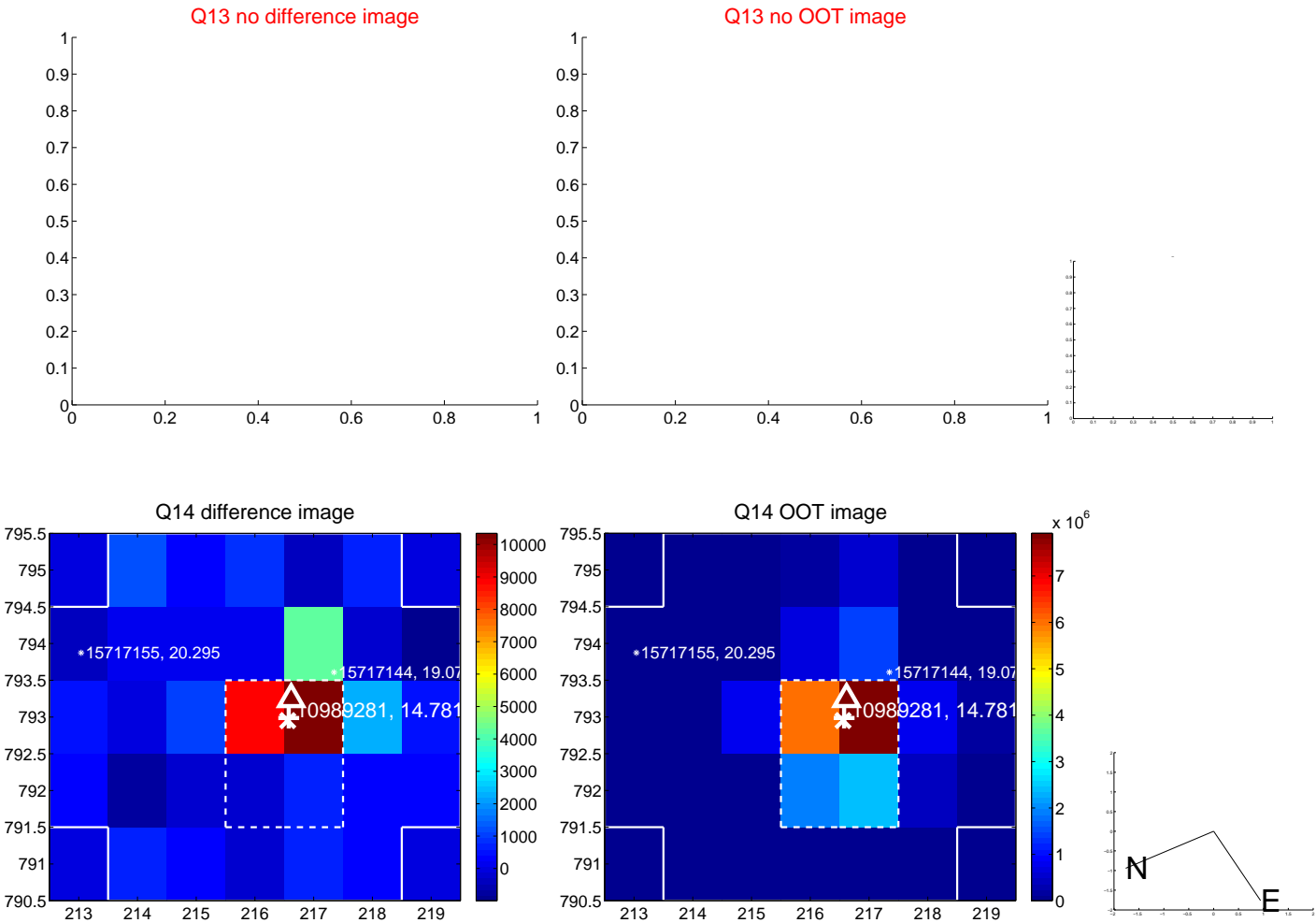
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



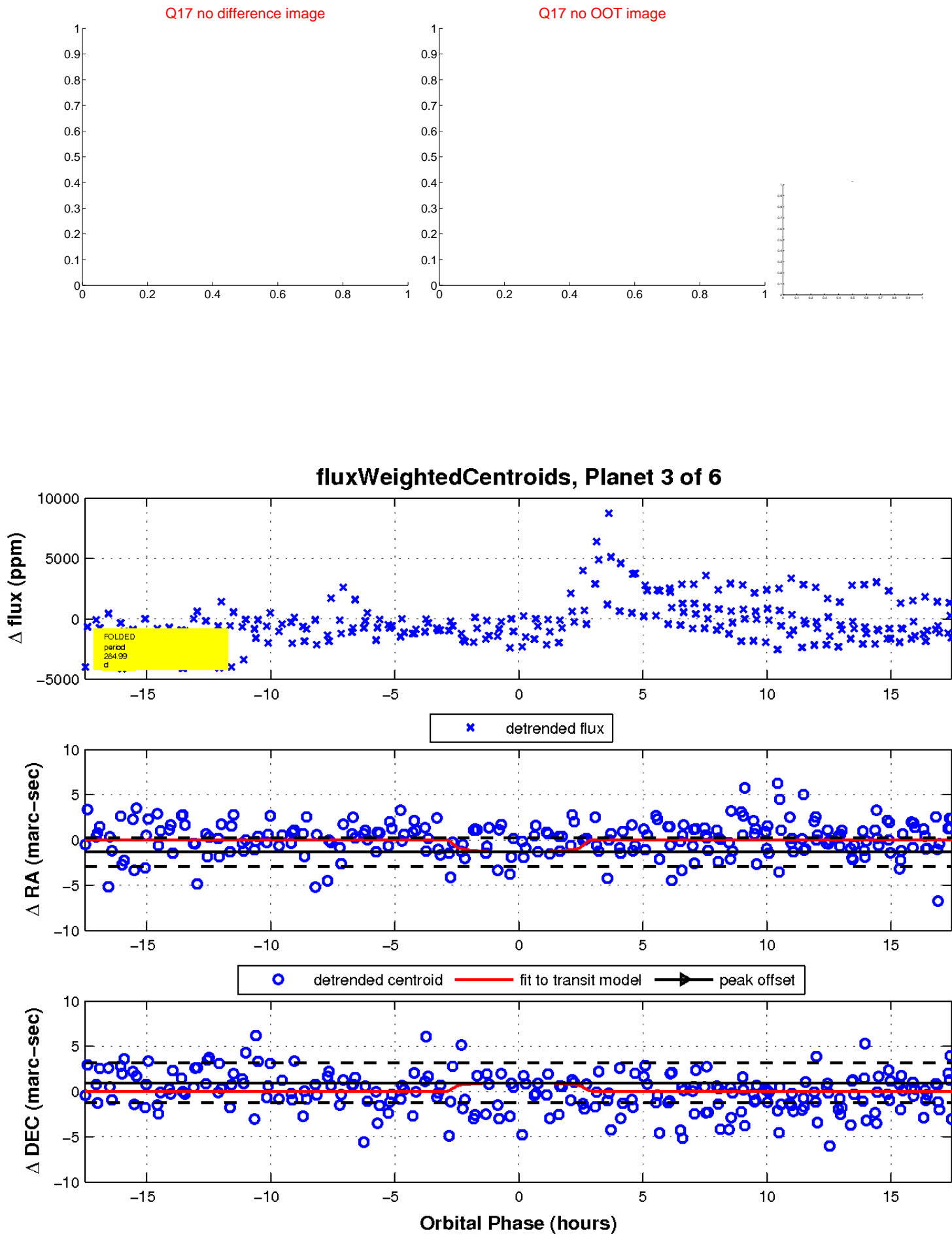
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

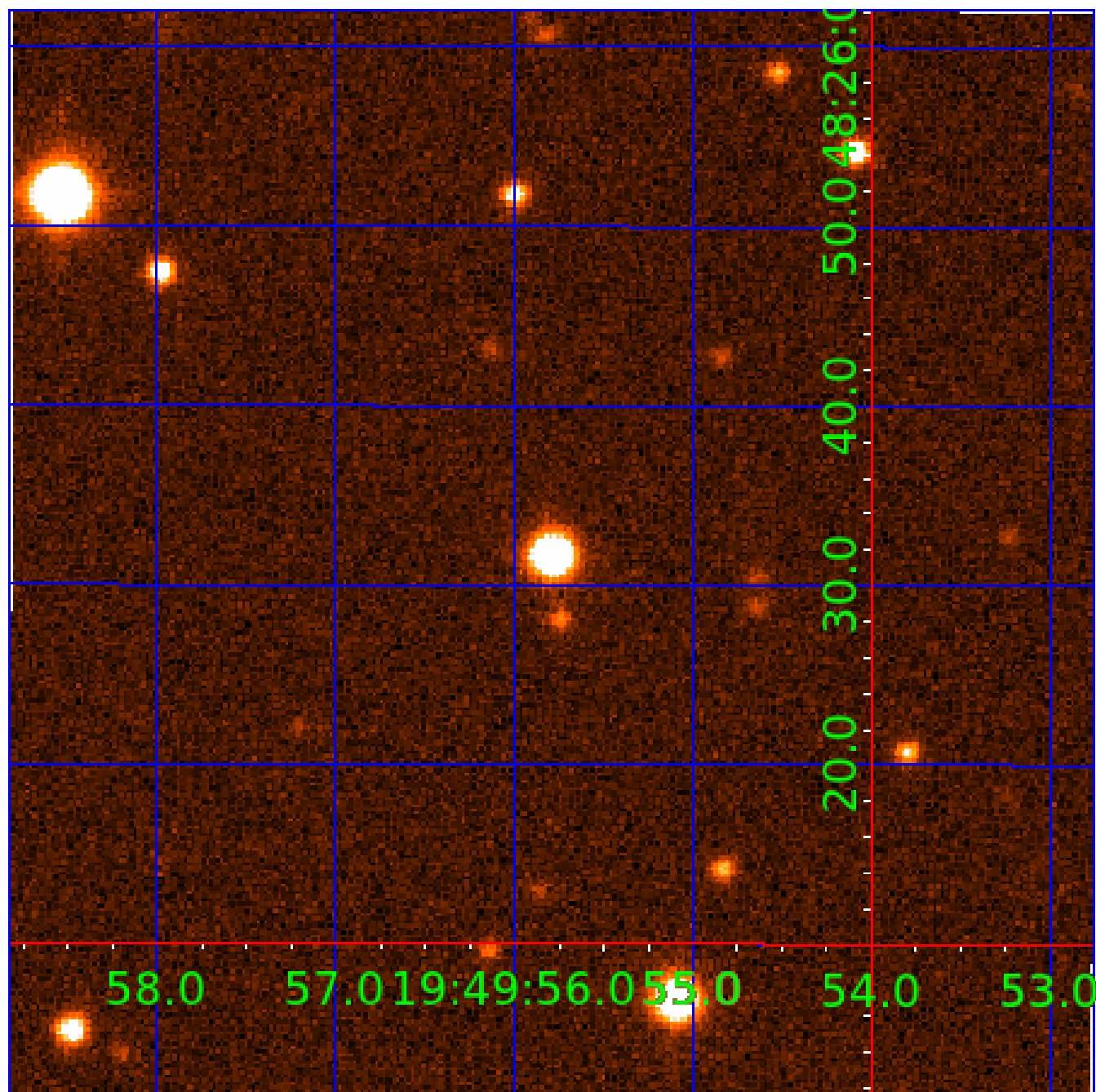


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 010989281

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010989281-01	OBS	No	409.828295	173.205933	1727.7	20.240	20.9	5.5	1.84	5398	8.75	2.52
010989281-03	OBS	No	284.986710	161.644539	1875.1	5.832	16.5	8.5	1.84	5398	8.58	4.10
010989281-04	OBS	No	314.376633	242.864486	1959.4	7.932	15.0	10.3	1.84	5398	8.24	3.59
010989281-05	OBS	No	189.034203	282.857029	1423.2	14.037	14.8	5.9	1.84	5398	6.95	7.08
010989281-06	OBS	No	254.895582	261.529736	1639.9	3.500	14.4	-1.0	1.84	5398	7.39	4.75

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010989281-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
010989281-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_SKYE—LPP_DV—LPP_ALT—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
010989281-04	OBS	FP	0.00	1	0	0	0	LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS
010989281-05	OBS	FP	0.00	1	0	0	0	LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS
010989281-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_NOFITS

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

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

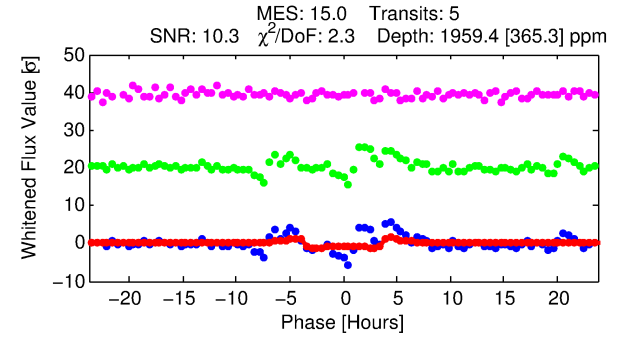
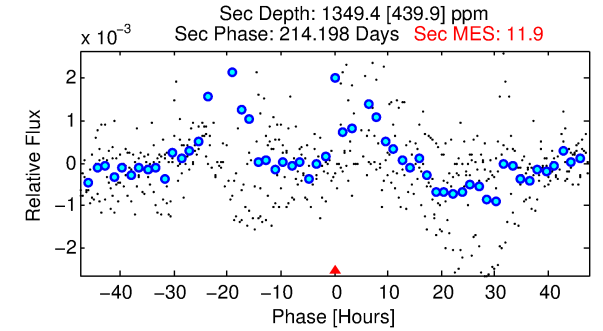
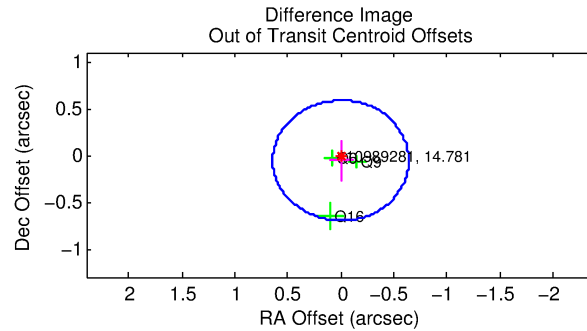
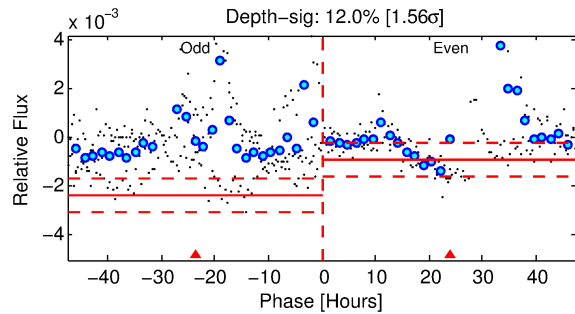
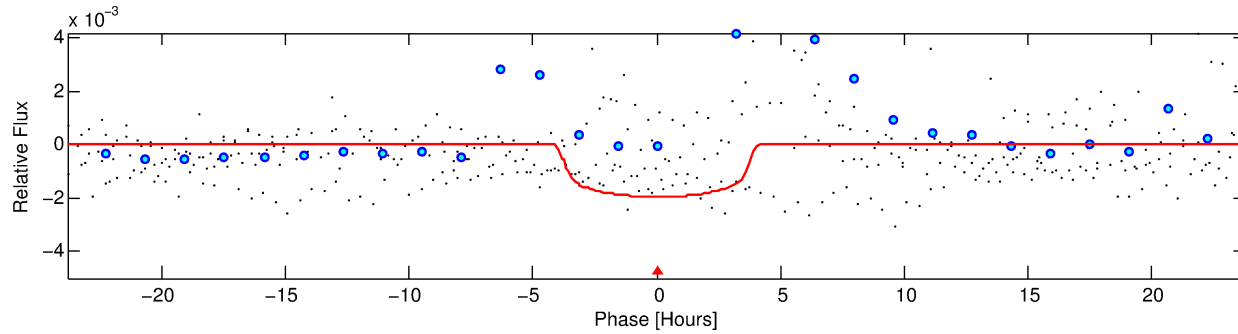
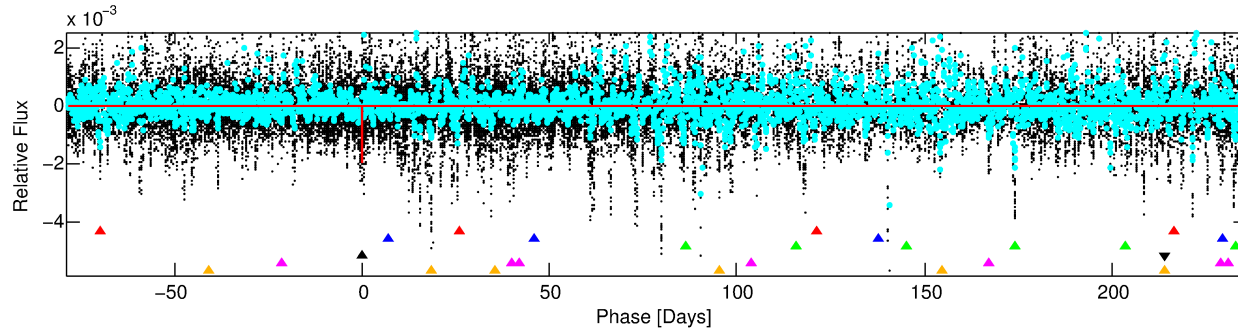
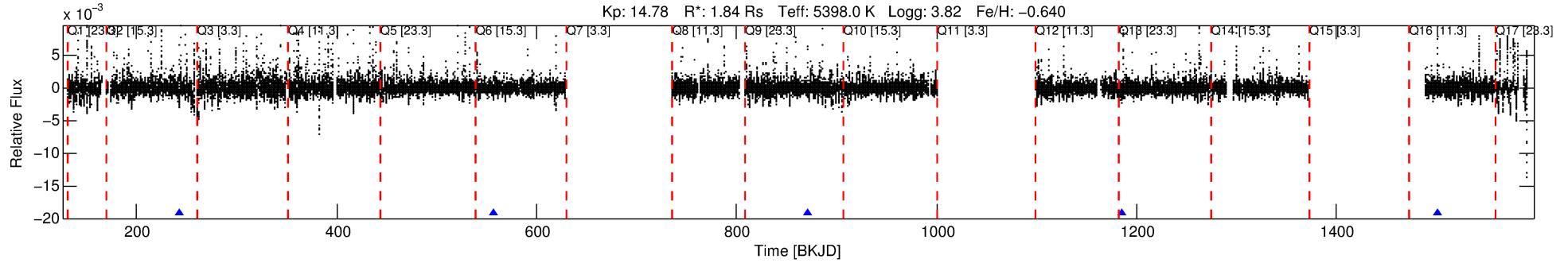
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 010989281-04

No Significant Match Found

# DV One-Page Summary

KIC: 10989281 Candidate: 4 of 6 Period: 314.377 d



## DV Fit Results:

Period = 314.37663 [0.00347] d  
Epoch = 242.8645 [0.0090] BKJD  
Rp/R\* = 0.0410 [0.0200]  
a/R\* = 288.81 [572.69]  
b = 0.42 [3.96]  
Seff = 3.59 [4.72]  
Teq = 351 [115] K  
Rp = 8.24 [7.11] Re  
a = 0.8479 [0.6536] AU  
Ag = 7857.54 [13043.99] [0.60 $\sigma$ ]  
Teffp = 5111 [1328] K [3.57 $\sigma$ ]

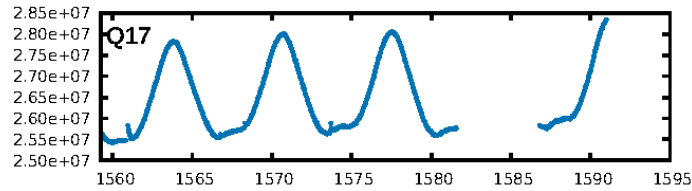
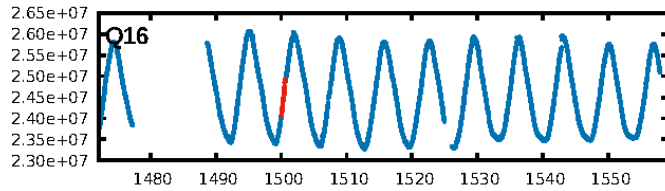
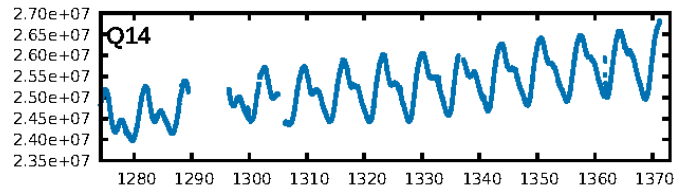
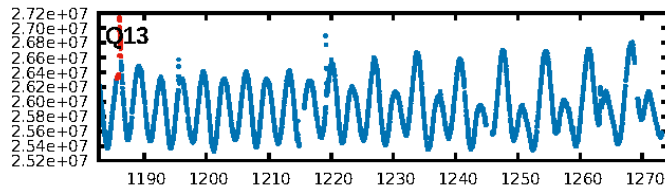
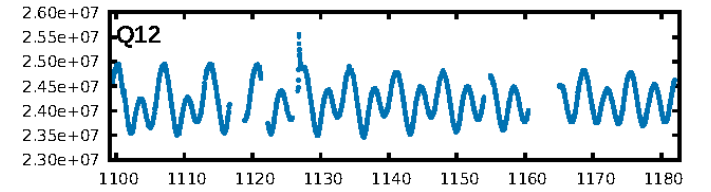
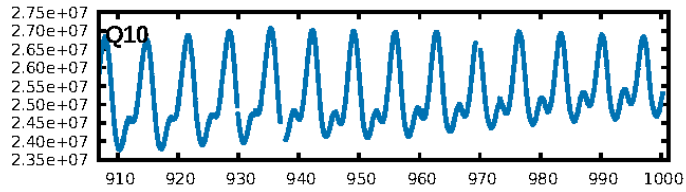
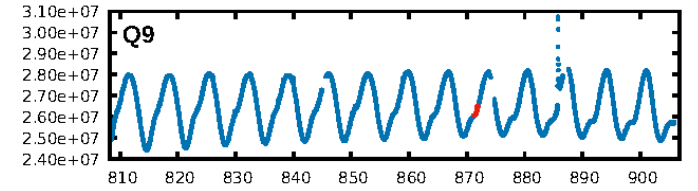
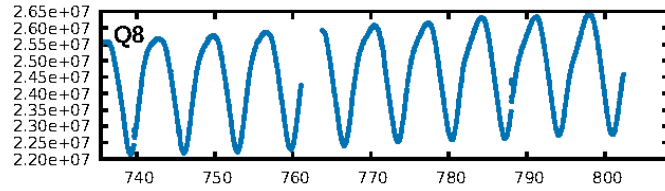
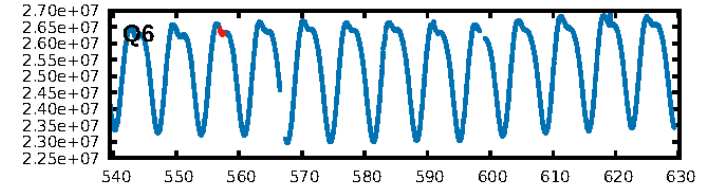
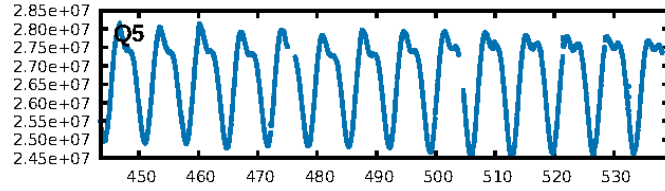
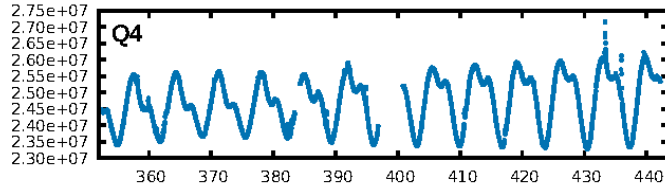
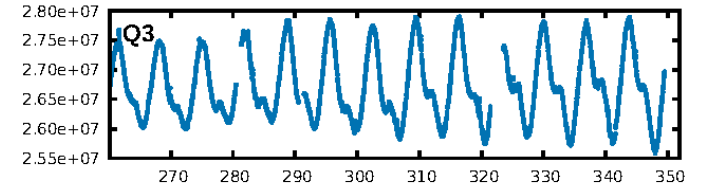
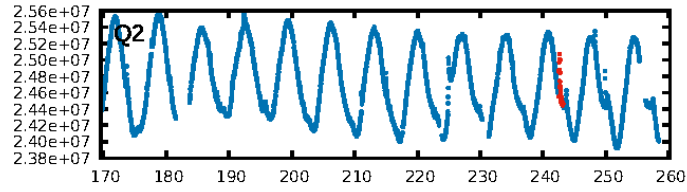
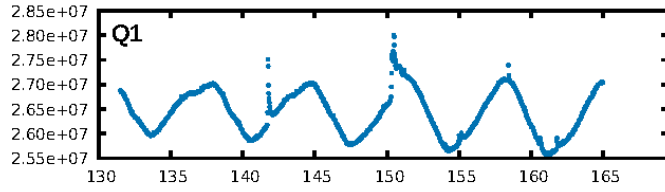
## DV Diagnostic Results:

ShortPeriod-sig: 100.0% [71.64 $\sigma$ ]  
LongPeriod-sig: 100.0% [260.24 $\sigma$ ]  
ModelChiSquare2-sig: 0.0%  
ModelChiSquareGof-sig: 0.1%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [5/5]  
GhostDiagnostic-chr: 6.185  
Centroid-sig: 1.0%  
Centroid-so: 1.055 arcsec [2.20 $\sigma$ ]  
OotOffset-rm: 0.056 arcsec [0.26 $\sigma$ ]  
OotOffset-st: 1/0/1/1 [3]  
KicOffset-rm: 0.136 arcsec [1.08 $\sigma$ ]  
KicOffset-st: 1/0/1/1 [3]  
DiffImageQuality-fgm: 0.67 [2/3]  
DiffImageOverlap-fno: 1.00 [4/4]

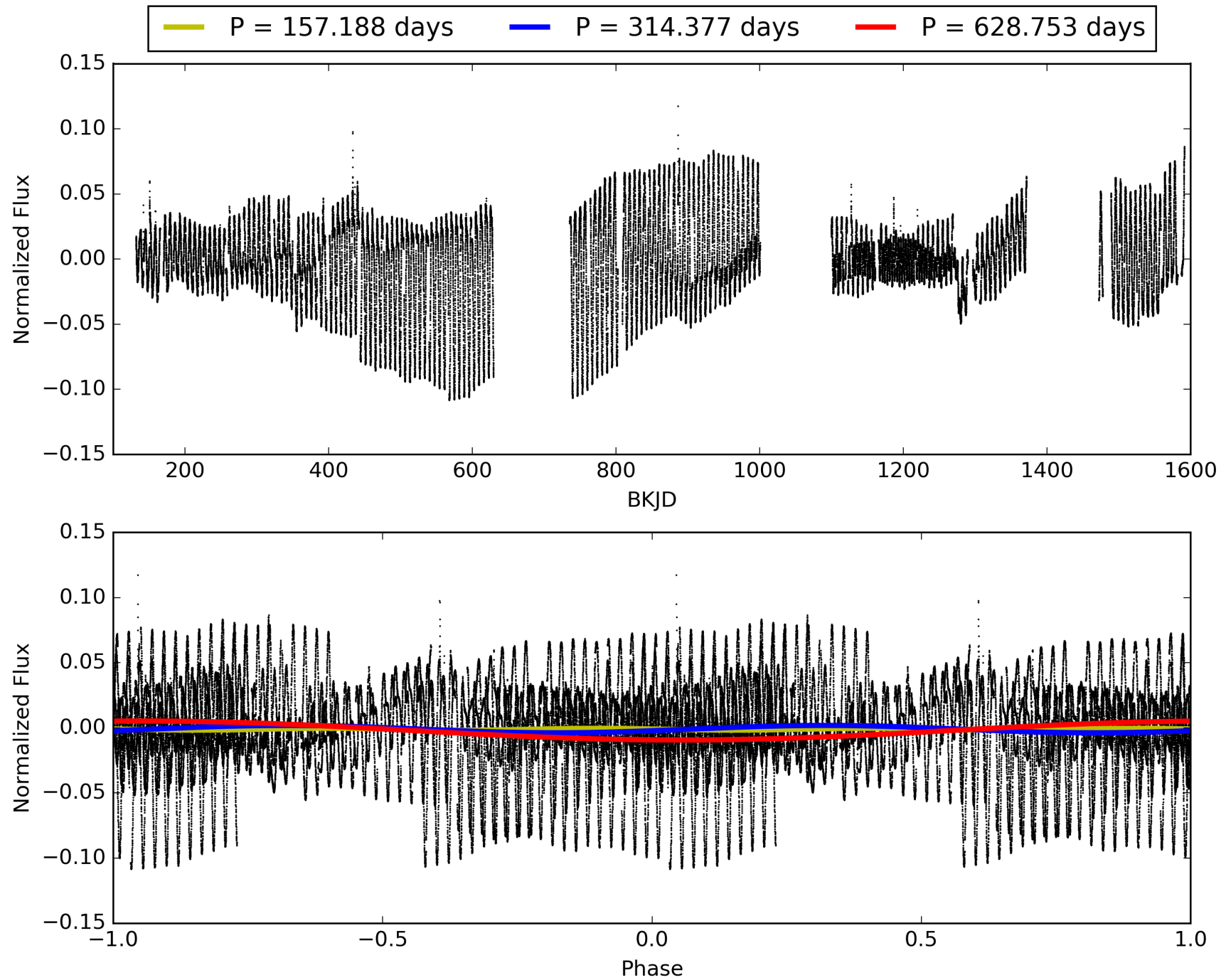
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 10:10:37 Z

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

# TCE 010989281-04, PDC Light Curves

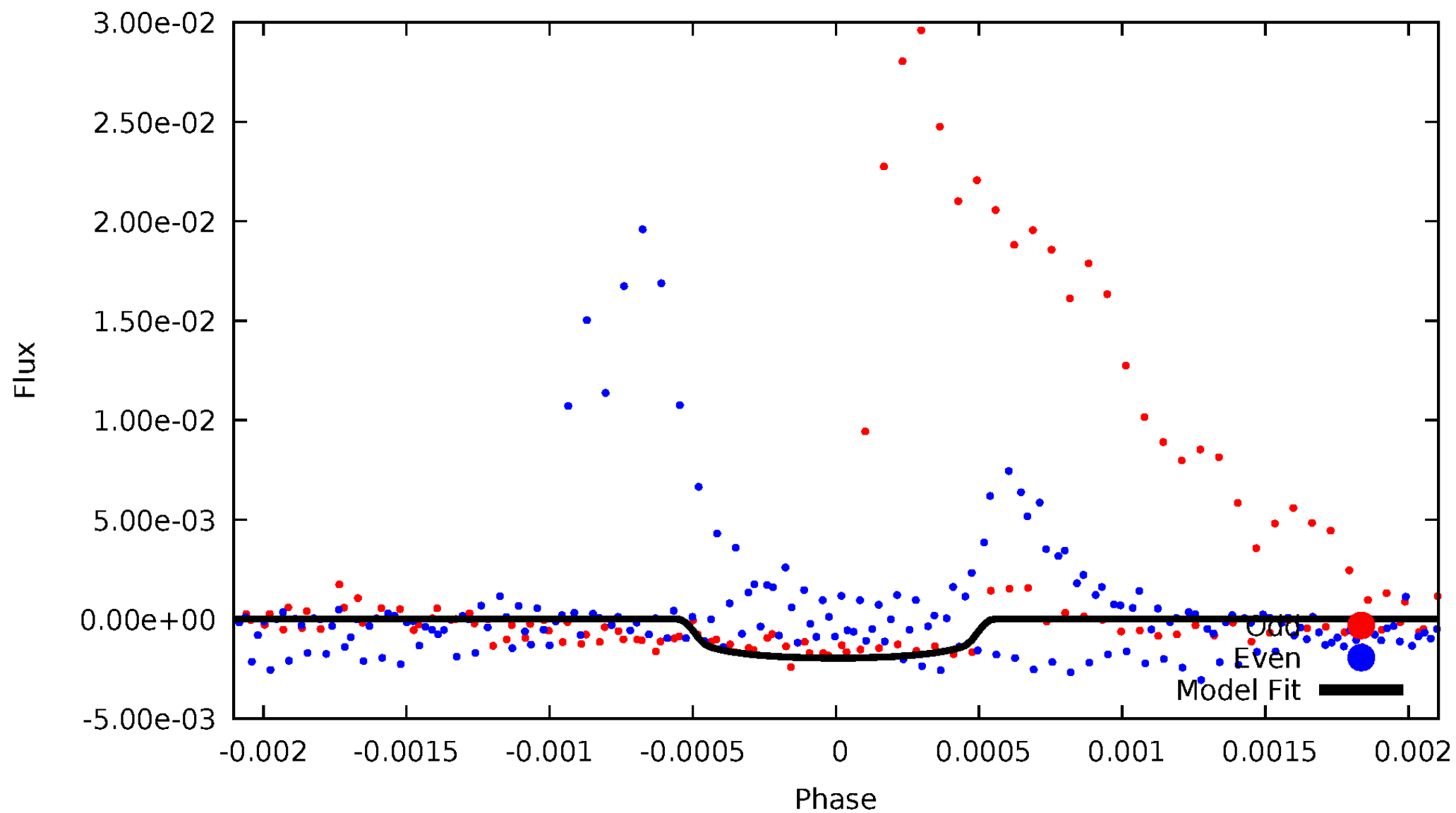


# TCE 010989281-04



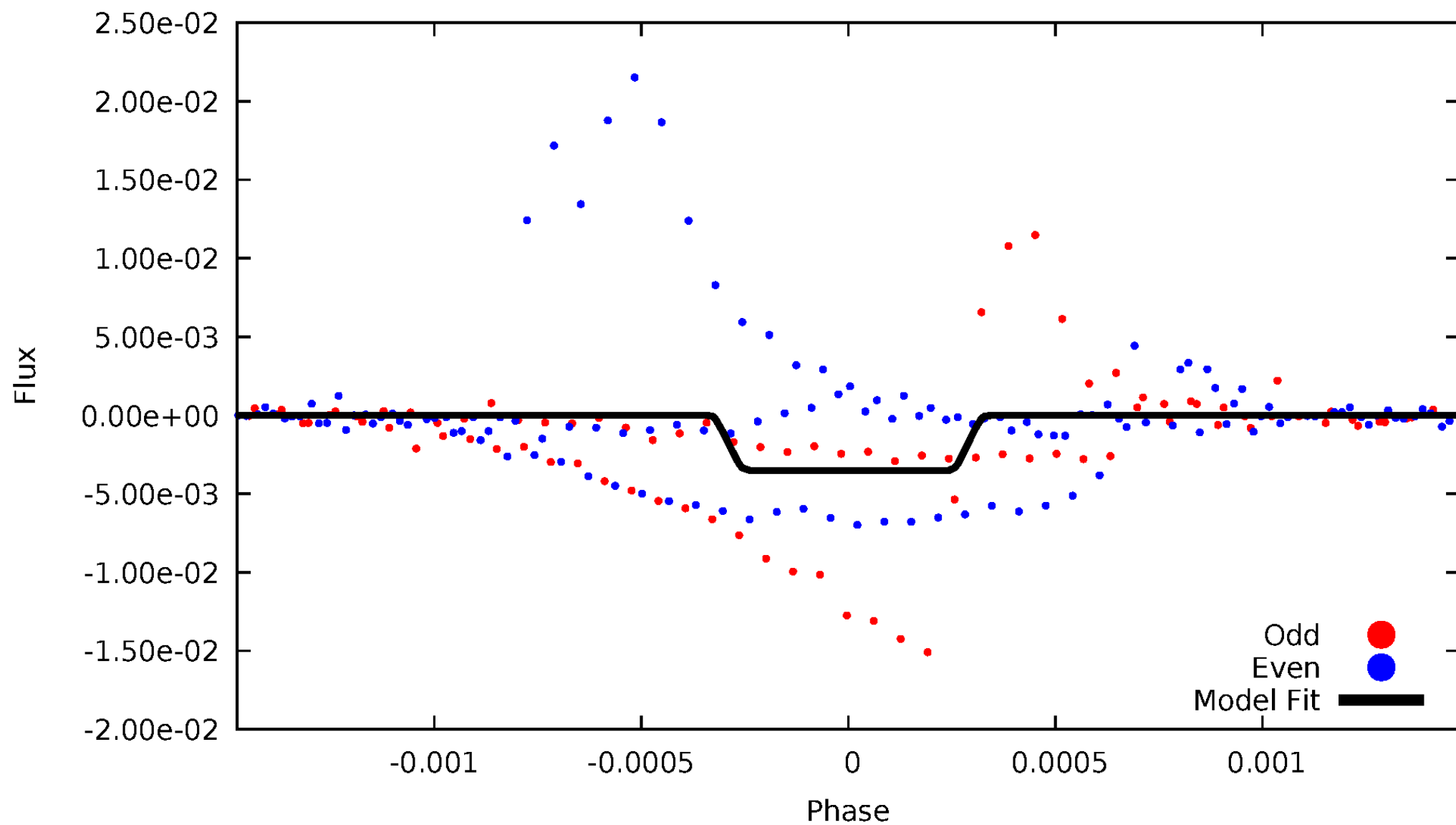
# DV Odd/Even

TCE 010989281-04



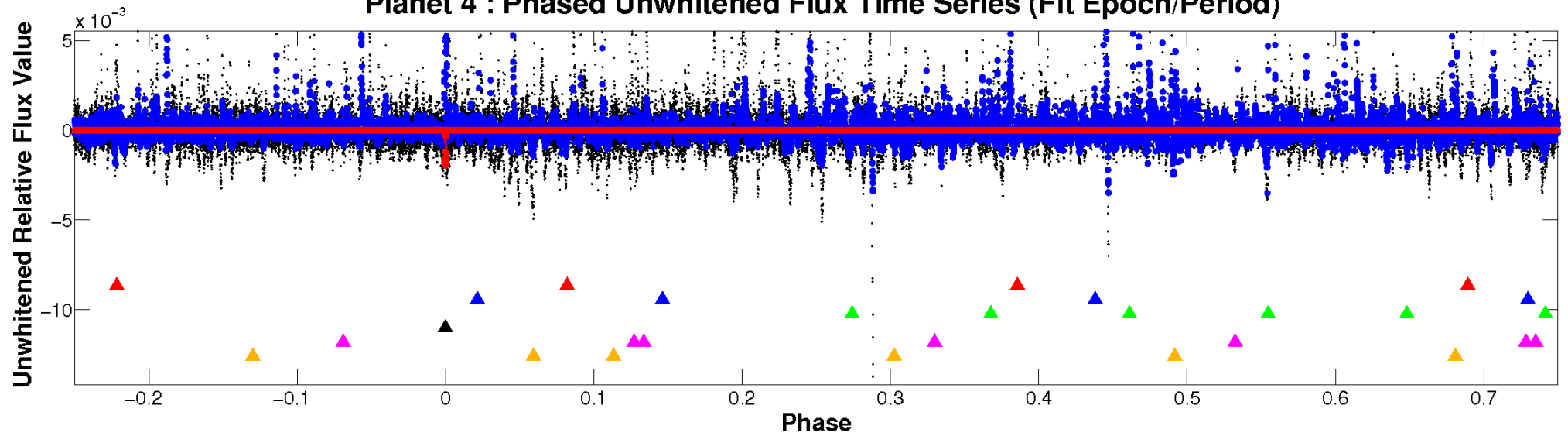
# ALT Odd/Even

TCE 010989281-04

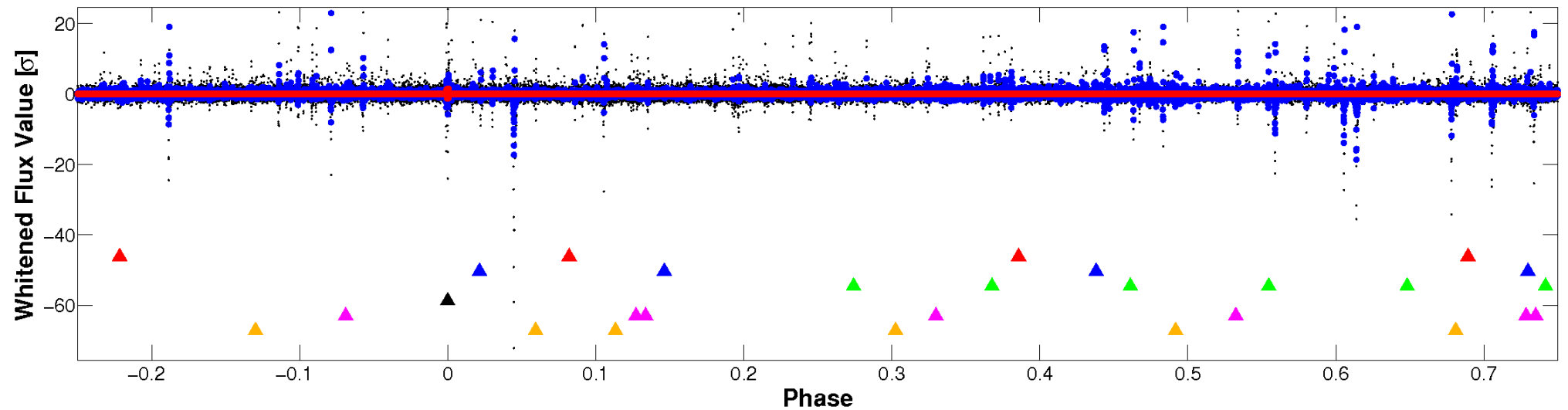


# Non-Whitened Vs. Whitened Light Curve

## Planet 4 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

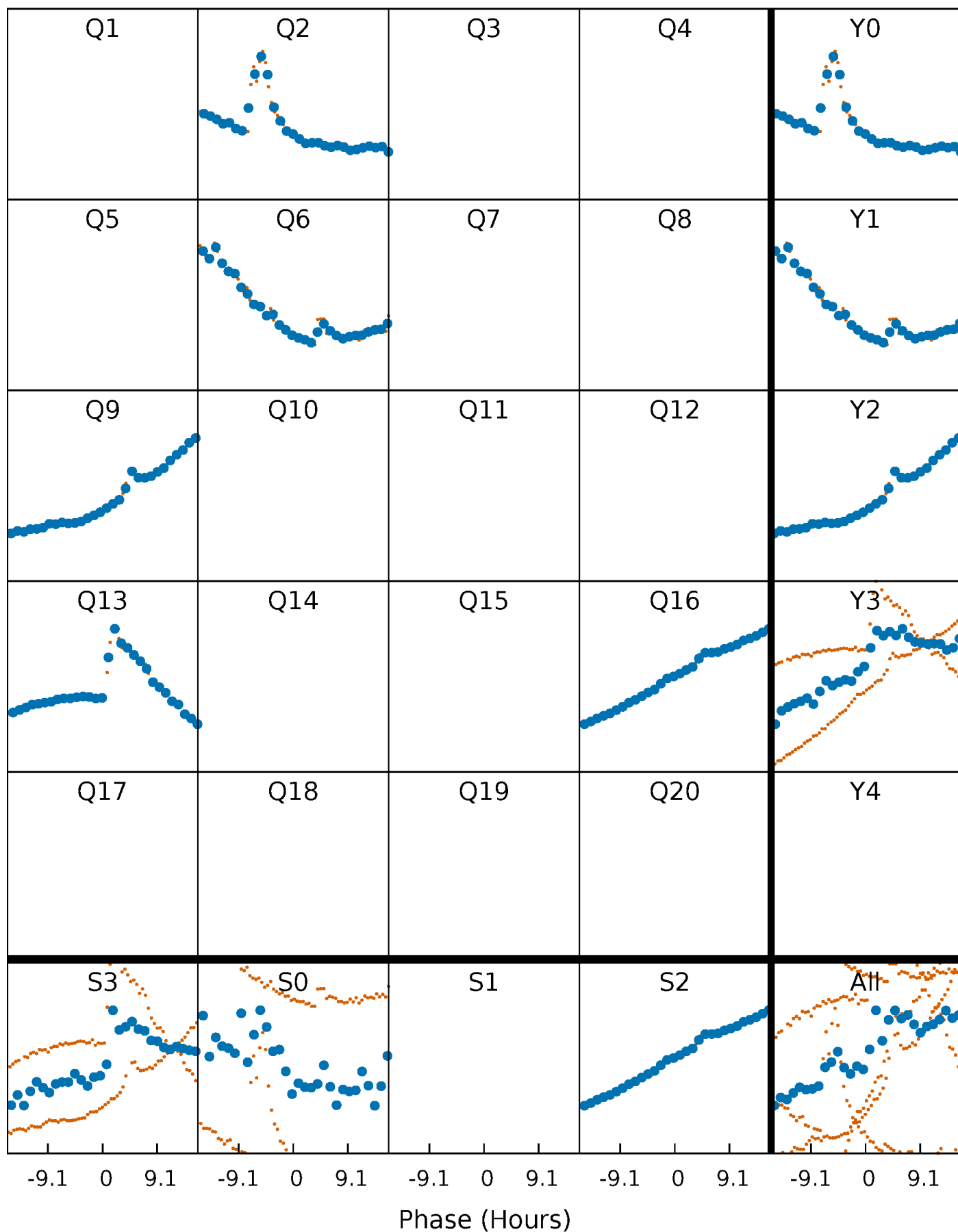


## Planet 4 : Phased Whitened Flux Time Series (Fit Epoch/Period)



# PDC Quarter-Phased Transit Curves

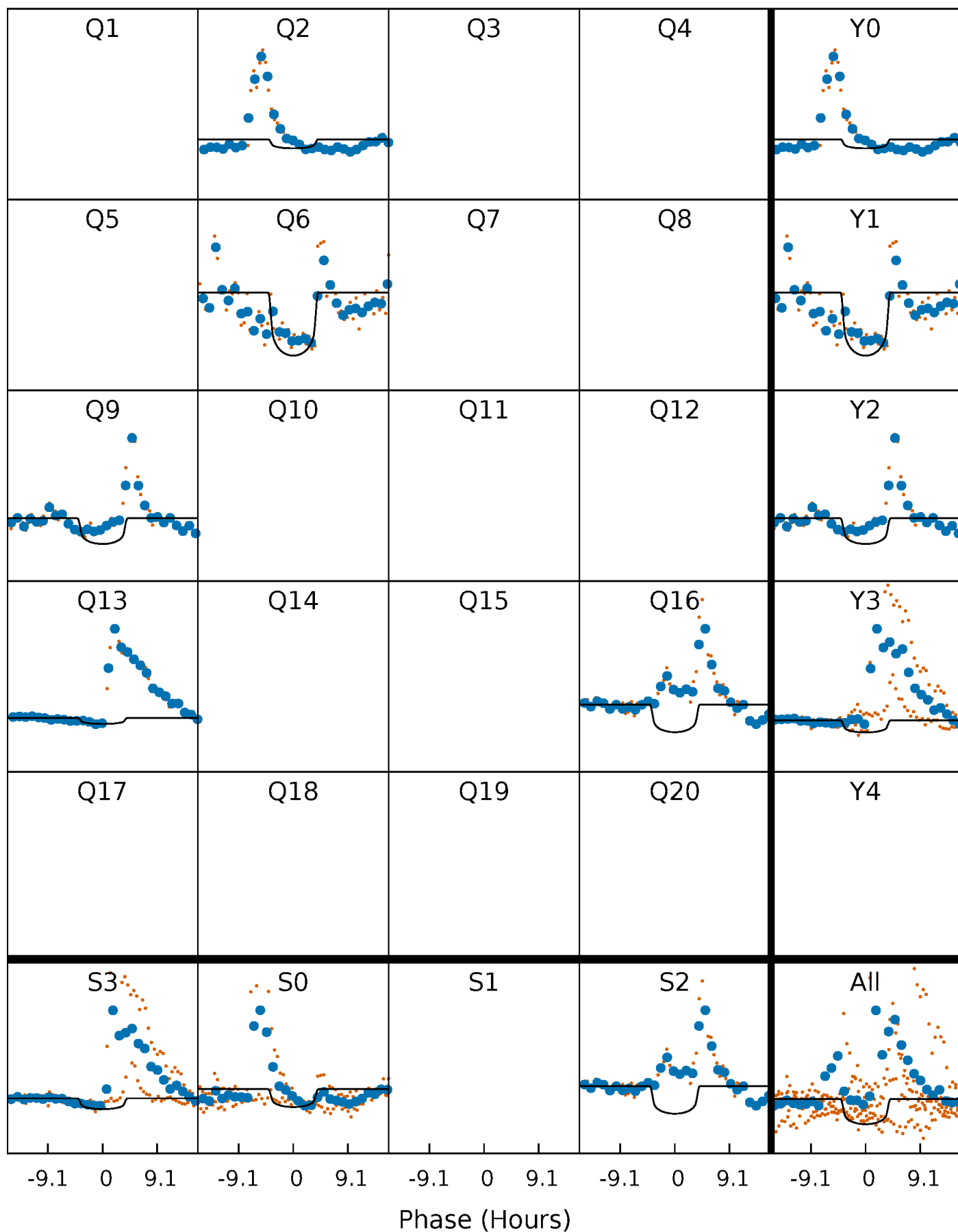
TCE 010989281-04     $P=314.376633$  Days     $T_0=242.864486$  (BKJD)





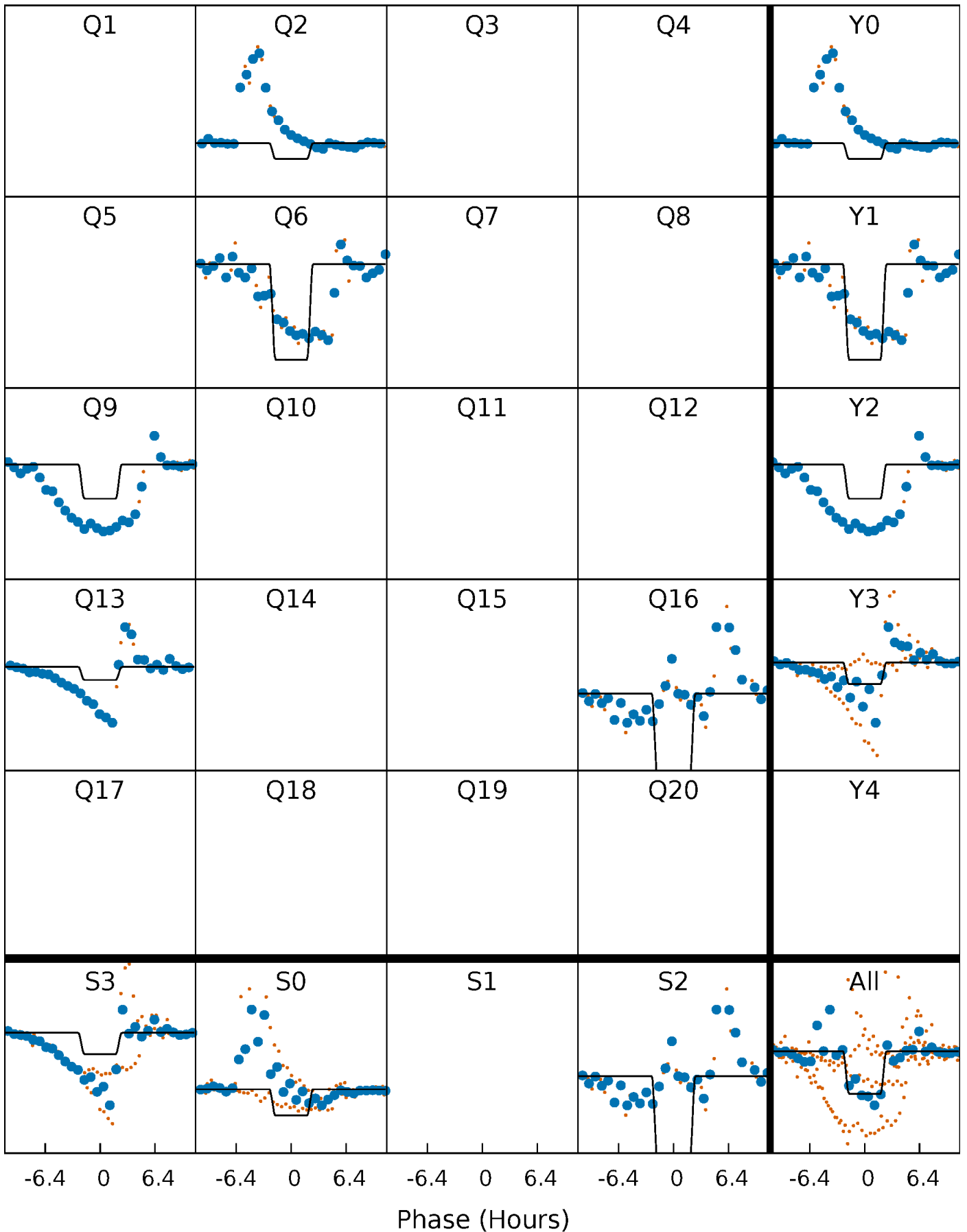
# DV Quarter-Phased Transit Curves

TCE 010989281-04     $P=314.376633$  Days     $T_0=242.864486$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

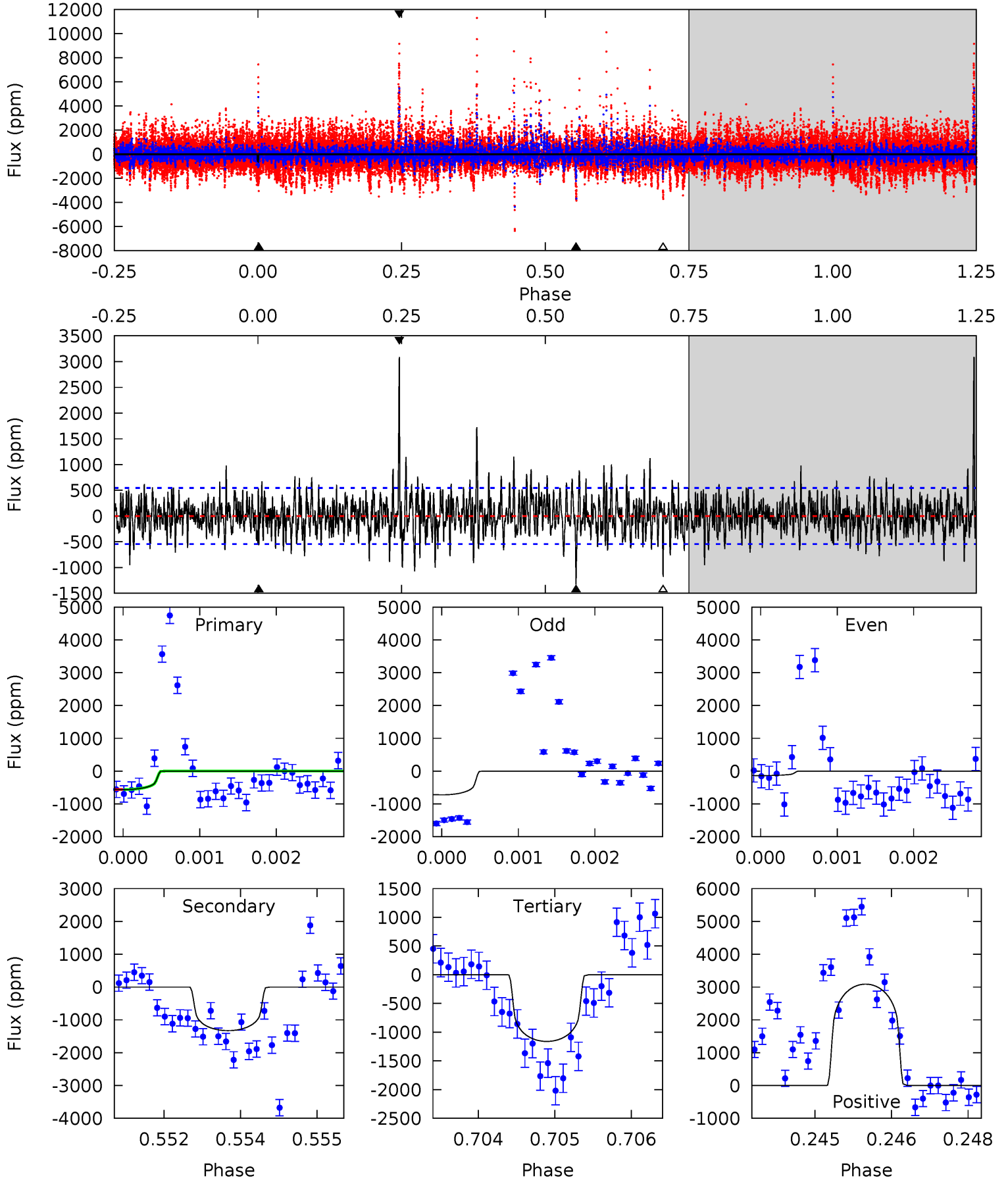
TCE 010989281-04     $P=314.377132$  Days     $T_0=242.814567$  (BKJD)



# DV Model-Shift Uniqueness Test

010989281-04, P = 314.376633 Days, E = 242.864486 Days

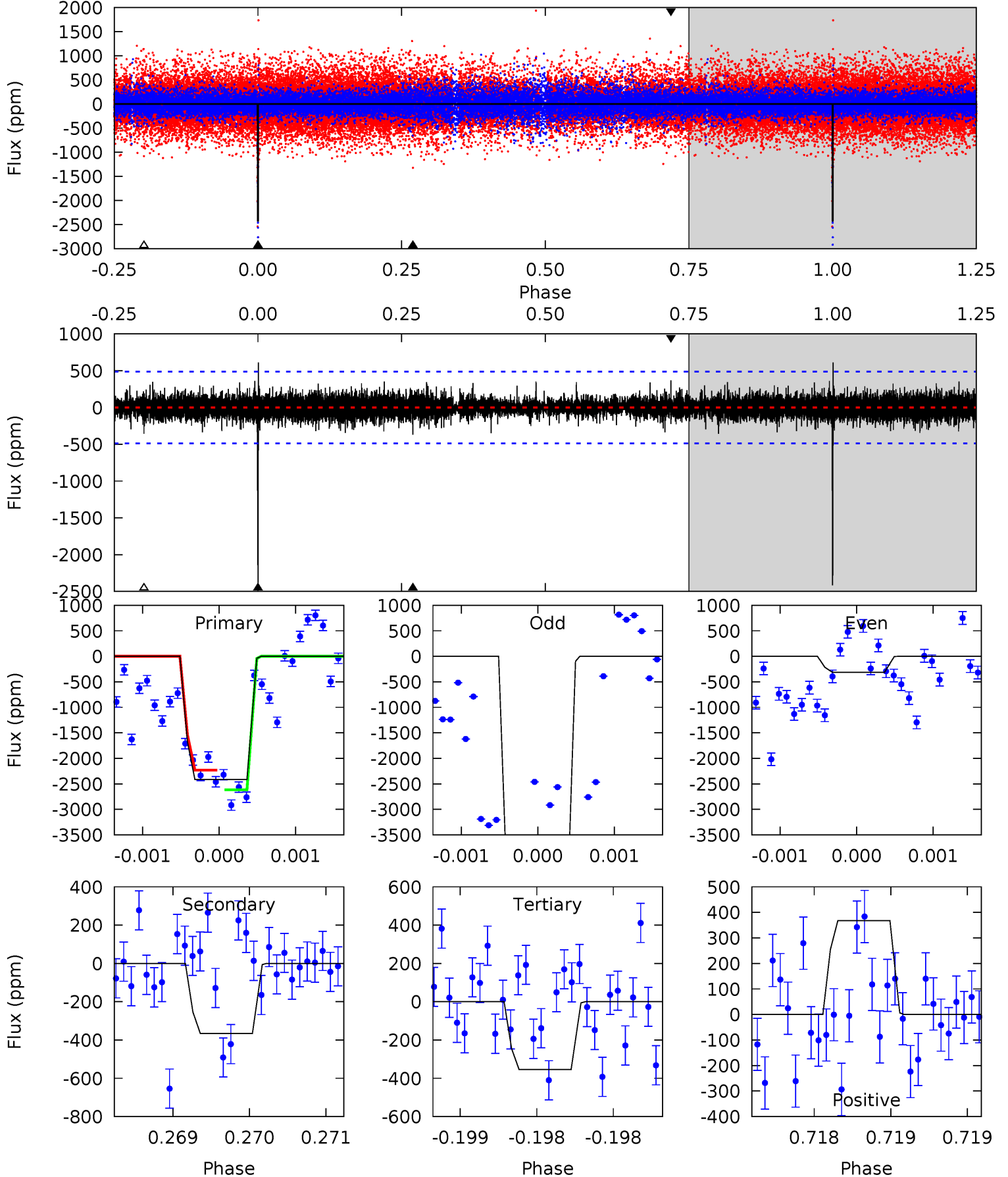
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
5.63	13.3	11.6	30.8	5.43	3.26	3.15	-5.96	-25.2	1.67	-17.6	2.03	7.87	0.70	0.00



# Alt Model-Shift Uniqueness Test

010989281-04, P = 314.377132 Days, E = 242.814567 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
27.3	4.15	4.01	4.16	5.52	3.40	0.94	23.3	23.2	0.14	-0.02	48.2	1.44	0.20	0



### Stellar Parameters For KIC 010989281

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5398^{+208}_{-170}$	$3.822^{+0.791}_{-0.339}$	$-0.640^{+0.350}_{-0.250}$	$1.843^{+1.313}_{-1.074}$	$0.821^{+0.194}_{-0.105}$	$0.185^{+2.882}_{-0.123}$
	+4%/-3%	+21%/-9%	+55%/-39%	+71%/-58%	+24%/-13%	+1560%/-66%
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 010989281-04 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-1328 \pm 100$	$7.62^{+5.46}_{-4.10}$	$478^{+86}_{-86}$	$5114^{+1880}_{-758}$	$9225^{+34220}_{-6138}$
Alt.	$-366 \pm 88$	$10.82^{+6.92}_{-4.83}$	$480^{+83}_{-88}$	$3523^{+565}_{-332}$	$1250^{+2879}_{-796}$

$T_{\text{max}}$  = 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

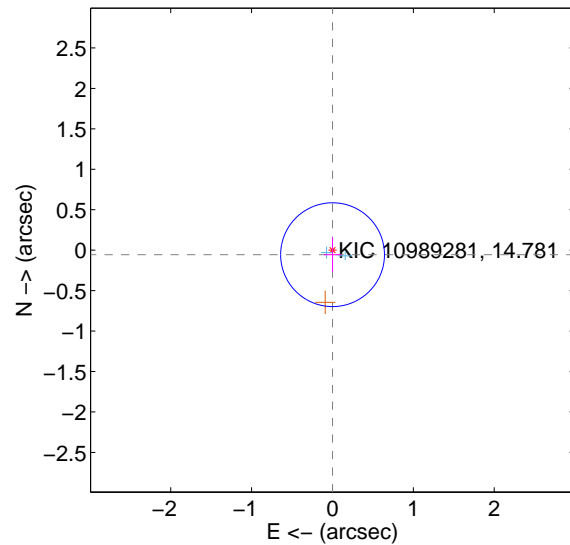
Supplemental centroid analysis for 010989281-04. Kepler magnitude: 14.78. Transit SNR 10.35

There are 2 quarters with good PRF difference image offsets

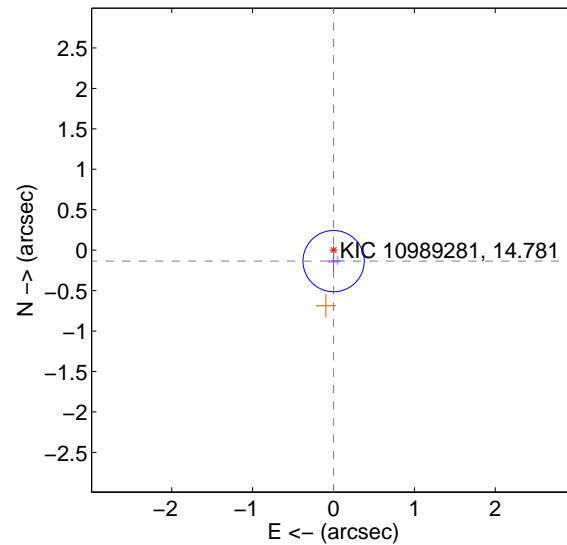
The direct PRF centroid is offset from the target star catalog position by about 0.04 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.056 \pm 0.214$	0.26	$-0.001 \pm 0.106$	$-0.056 \pm 0.215$
PRF-fit source offset from KIC position	$0.136 \pm 0.126$	1.08	$-0.001 \pm 0.069$	$-0.136 \pm 0.126$
photometric centroid source offset	$1.05 \pm 0.48$	2.20	$0.60 \pm 0.44$	$-0.87 \pm 0.50$

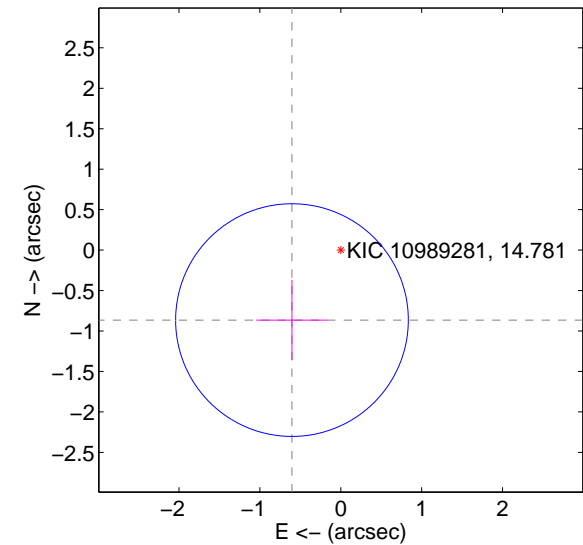
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

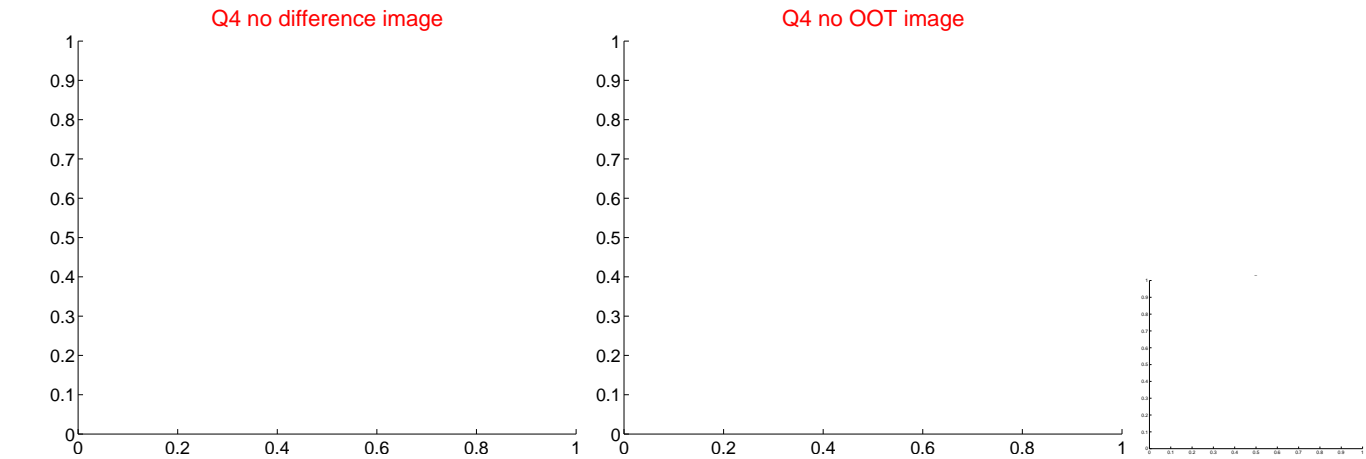
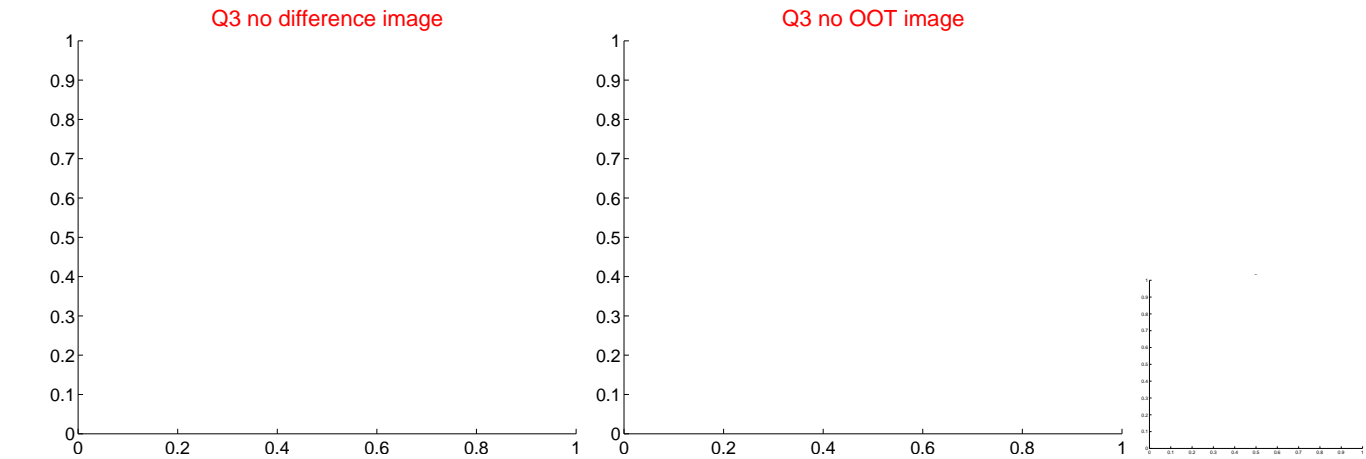
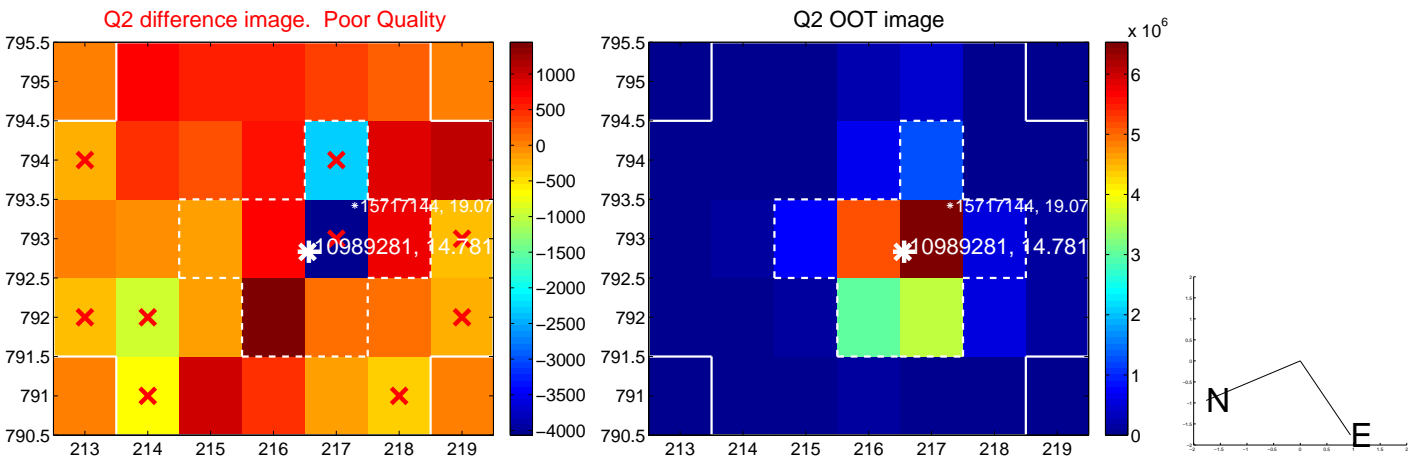
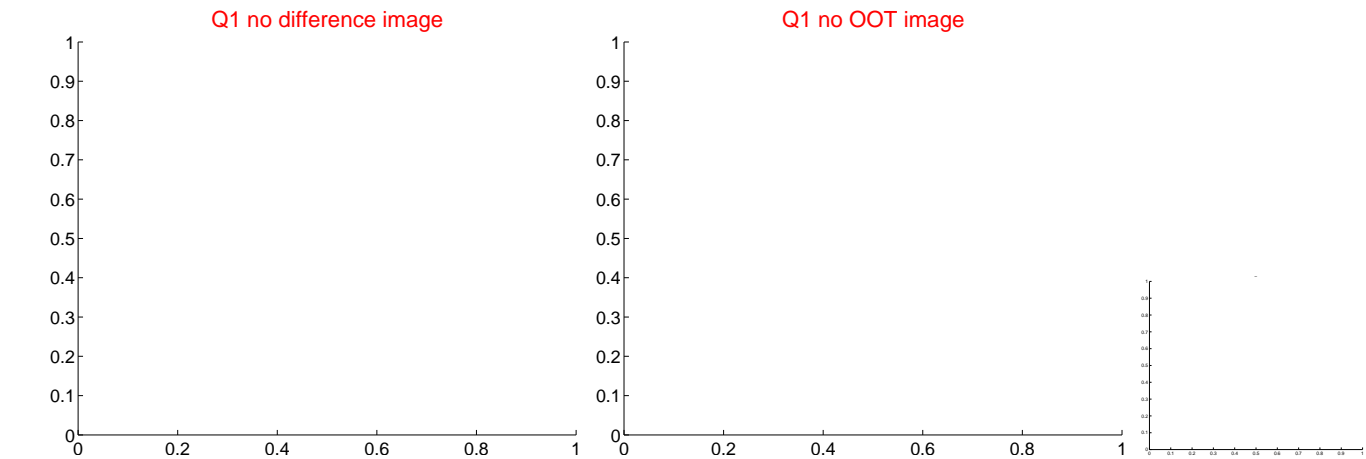


offset from photometric centroids

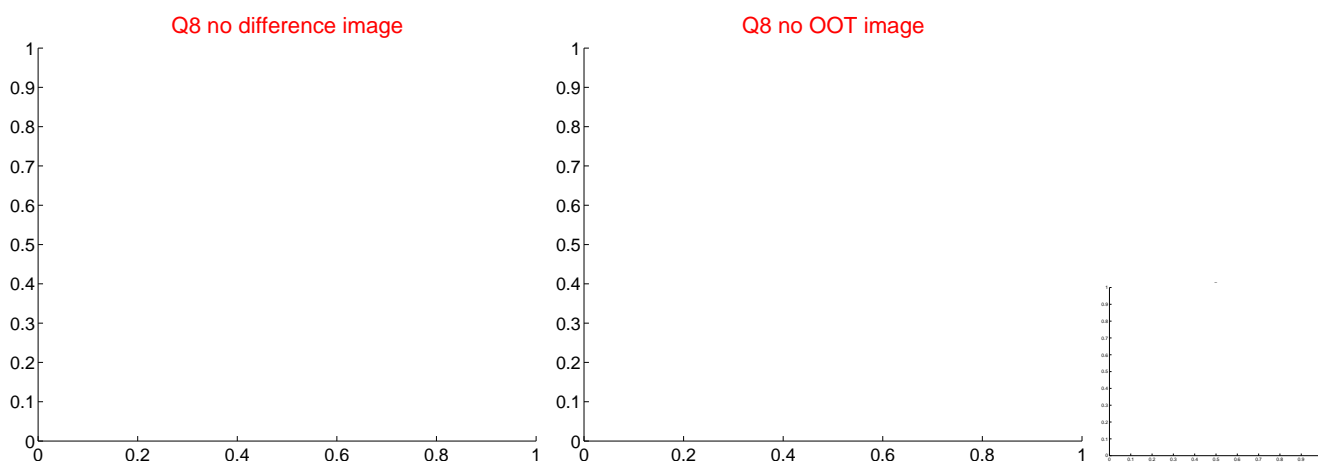
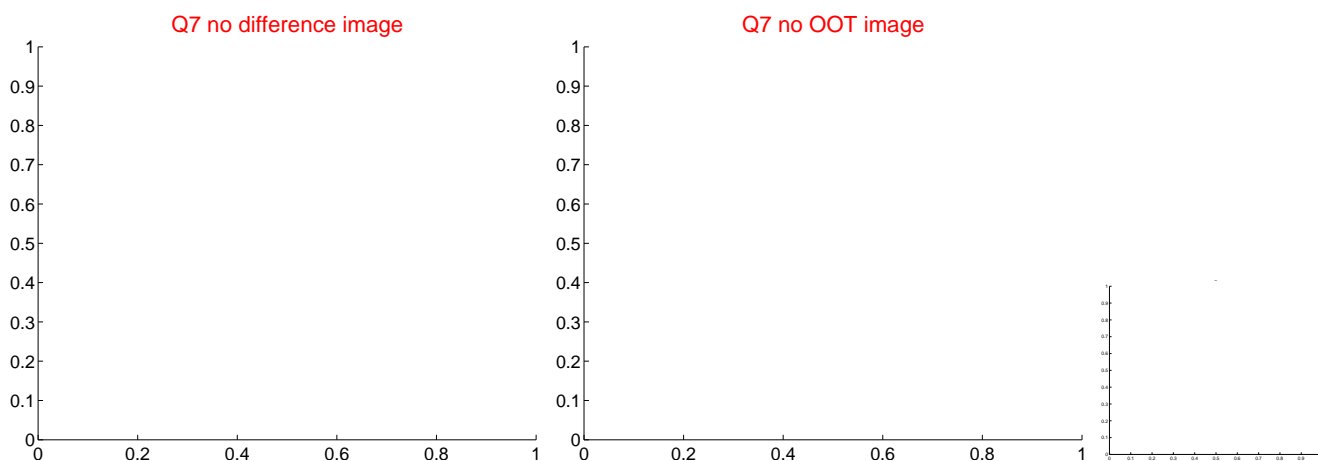
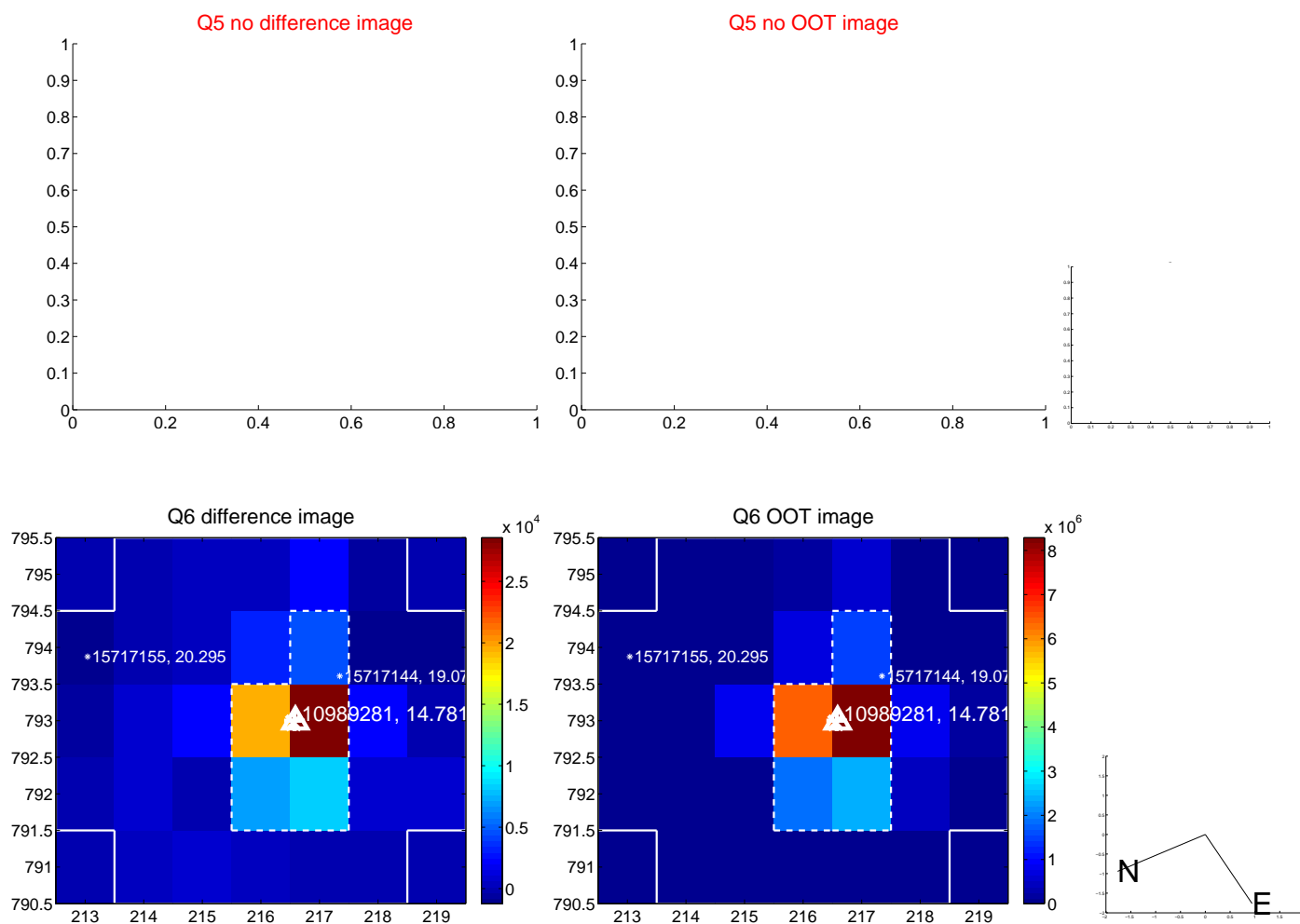


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

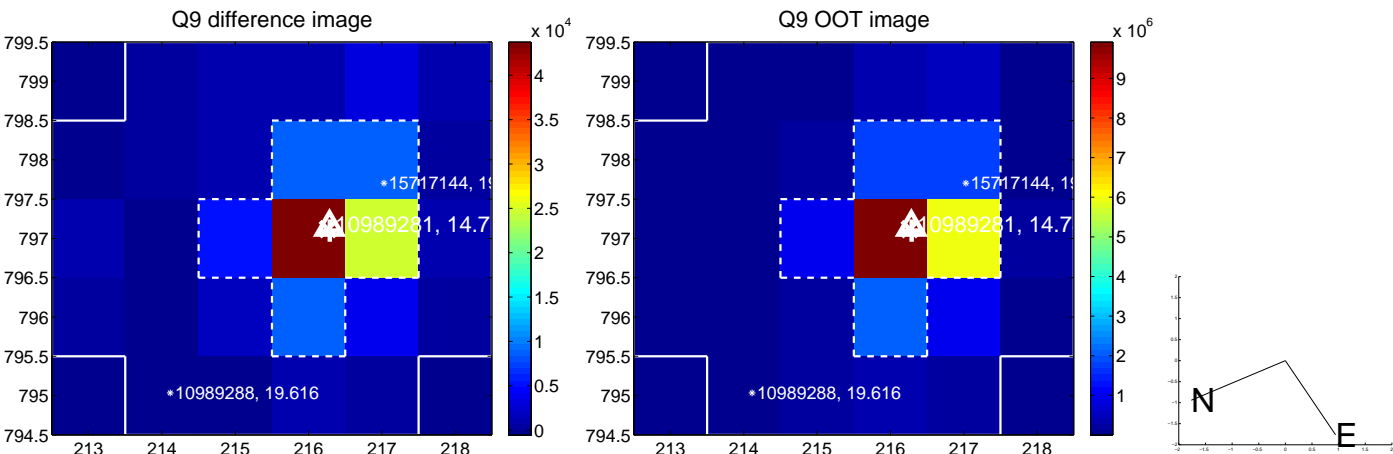


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value

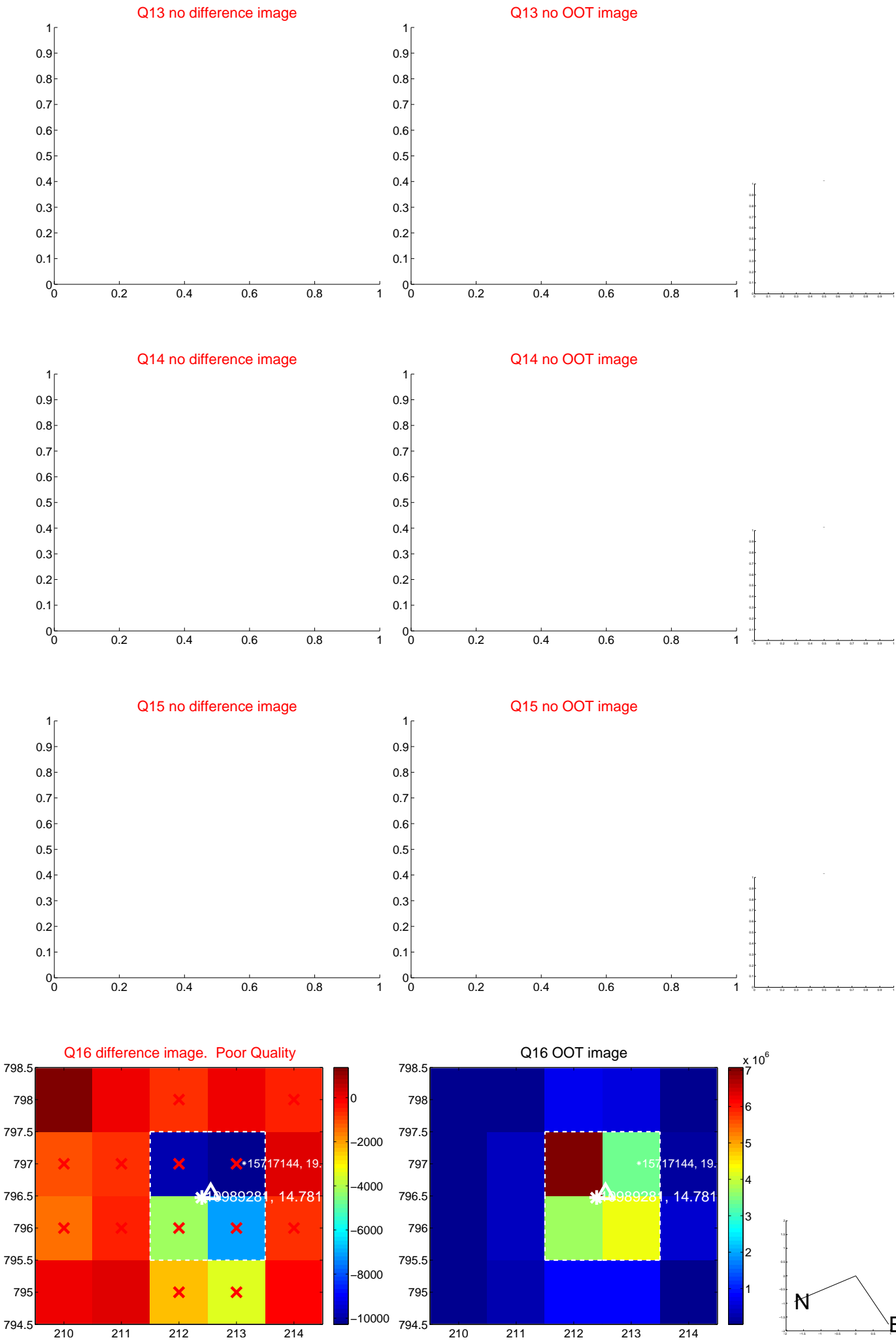




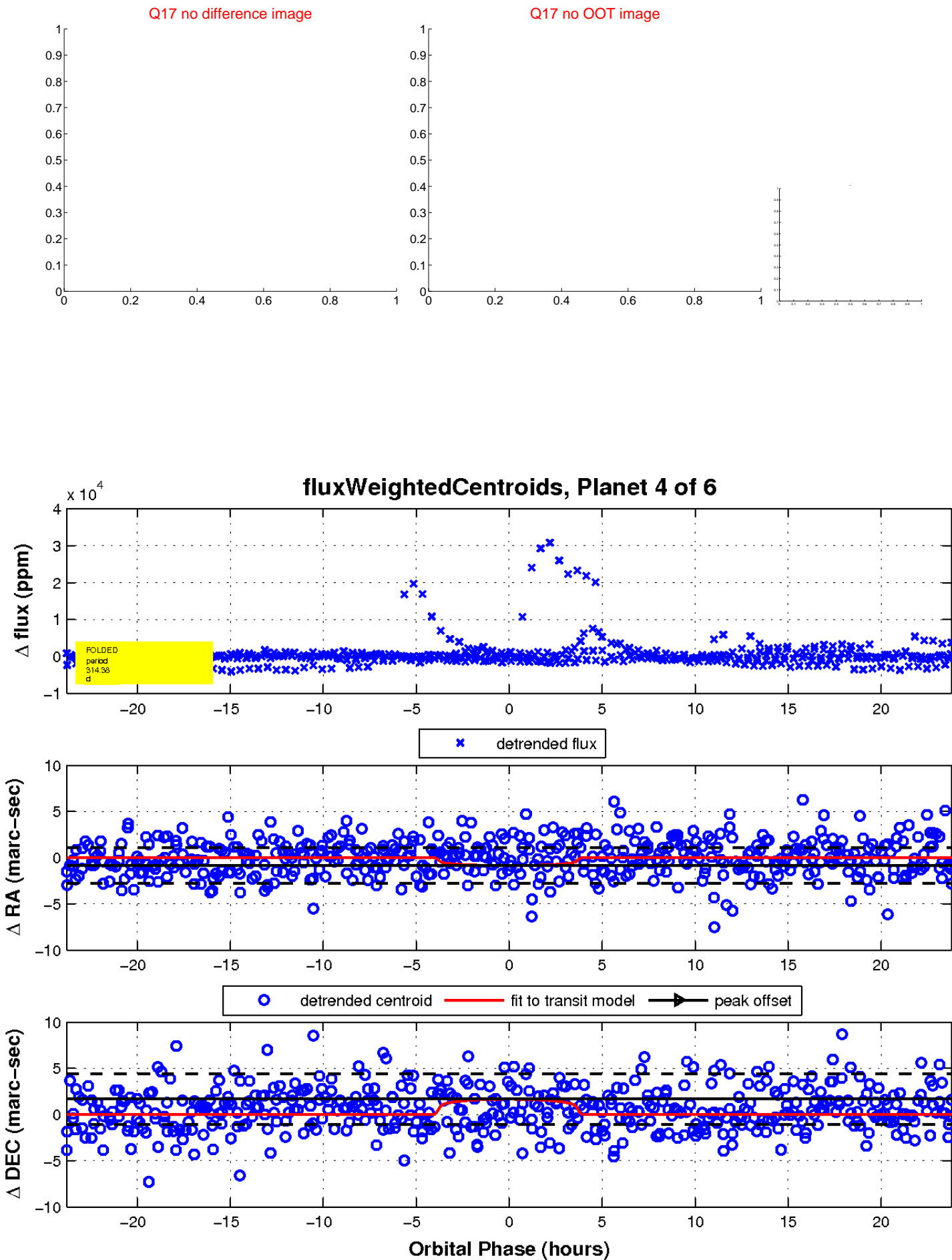
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

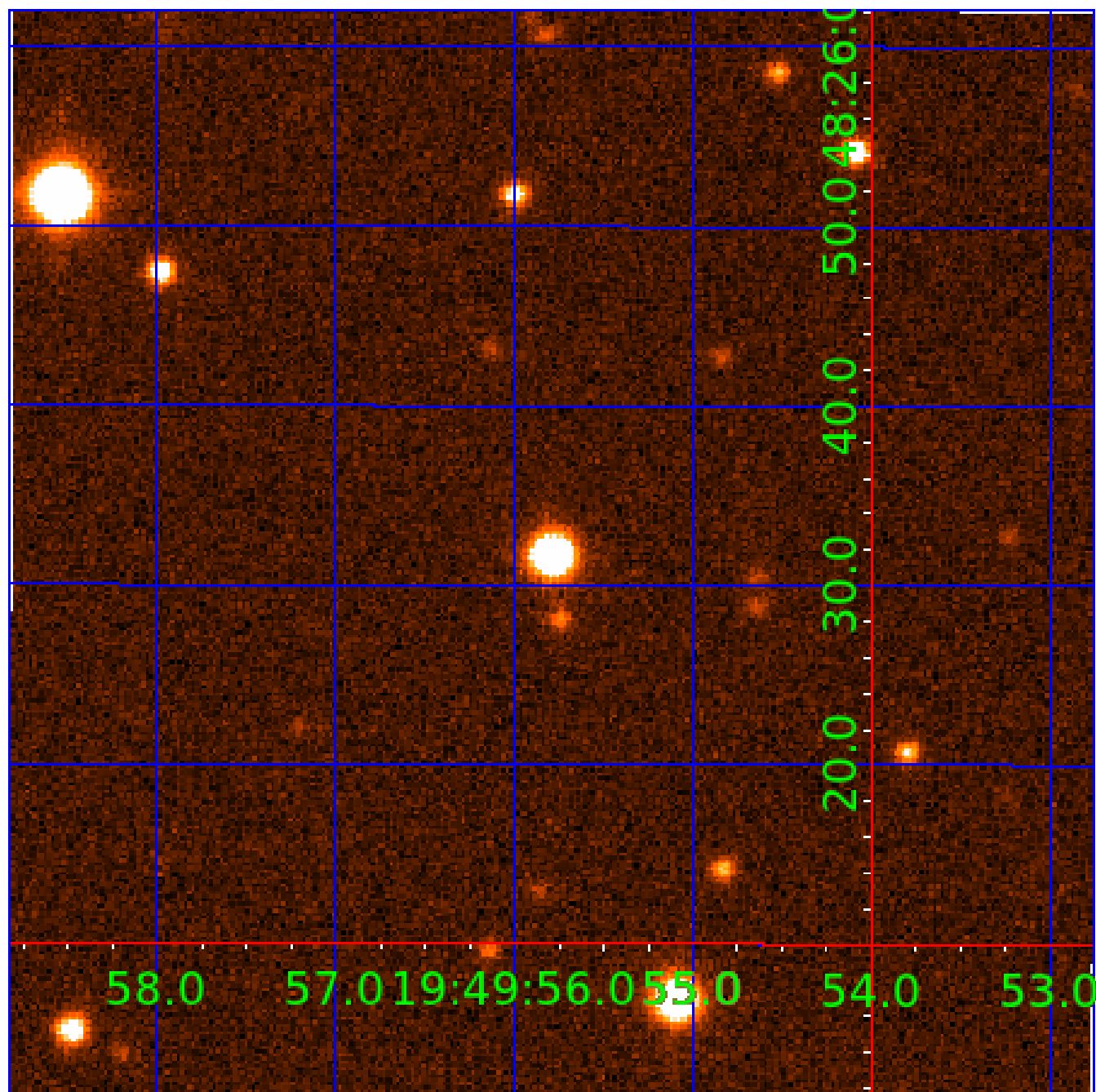


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination



# KIC 010989281

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010989281-01	OBS	No	409.828295	173.205933	1727.7	20.240	20.9	5.5	1.84	5398	8.75	2.52
010989281-03	OBS	No	284.986710	161.644539	1875.1	5.832	16.5	8.5	1.84	5398	8.58	4.10
010989281-04	OBS	No	314.376633	242.864486	1959.4	7.932	15.0	10.3	1.84	5398	8.24	3.59
010989281-05	OBS	No	189.034203	282.857029	1423.2	14.037	14.8	5.9	1.84	5398	6.95	7.08
010989281-06	OBS	No	254.895582	261.529736	1639.9	3.500	14.4	-1.0	1.84	5398	7.39	4.75

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010989281-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
010989281-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_SKYE—LPP_DV—LPP_ALT—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
010989281-04	OBS	FP	0.00	1	0	0	0	LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS
010989281-05	OBS	FP	0.00	1	0	0	0	LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS
010989281-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_NOFITS

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

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

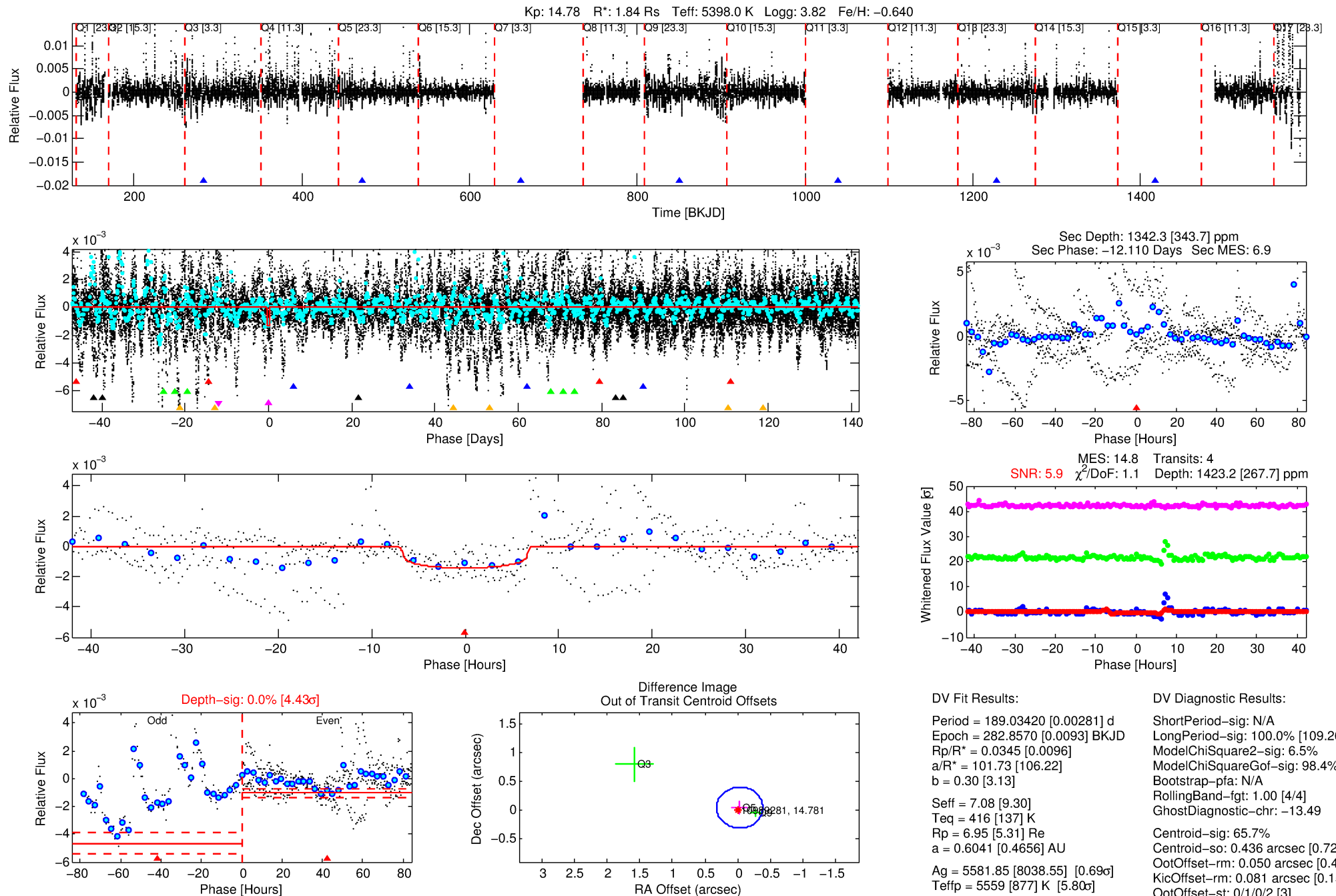
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 010989281-05

No Significant Match Found

# DV One-Page Summary

KIC: 10989281 Candidate: 5 of 6 Period: 189.034 d



## DV Fit Results:

Period = 189.03420 [0.00281] d  
Epoch = 282.8570 [0.0093] BKJD  
Rp/R\* = 0.0345 [0.0096]  
a/R\* = 101.73 [106.22]  
b = 0.30 [3.13]  
Seff = 7.08 [9.30]  
Teq = 416 [137] K  
Rp = 6.95 [5.31] Re  
a = 0.6041 [0.4656] AU  
Ag = 5581.85 [8038.55] [0.69σ]  
Teff = 5559 [877] K [5.80σ]

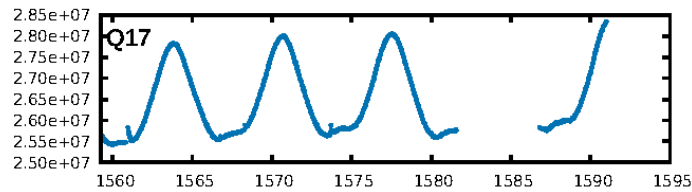
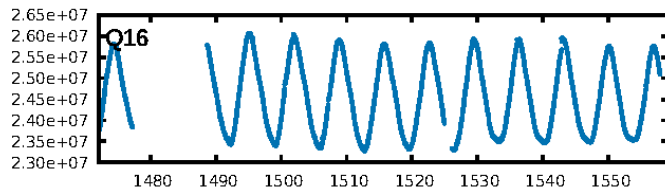
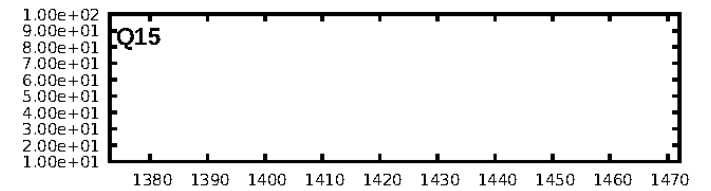
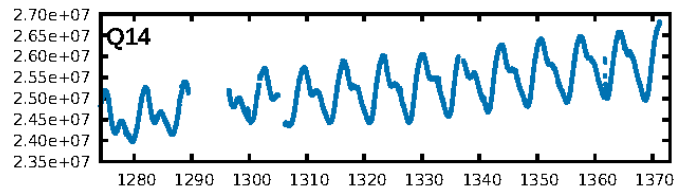
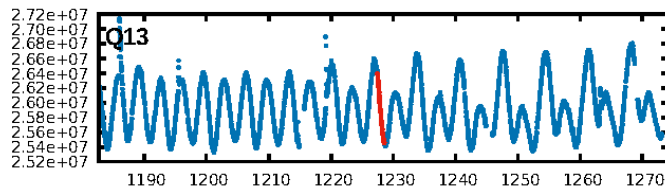
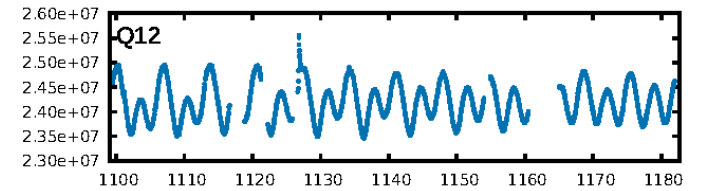
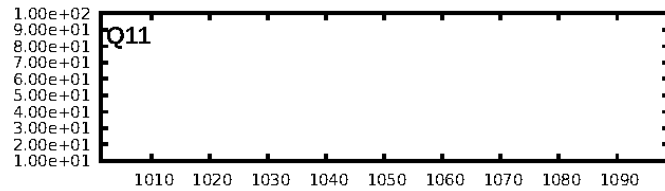
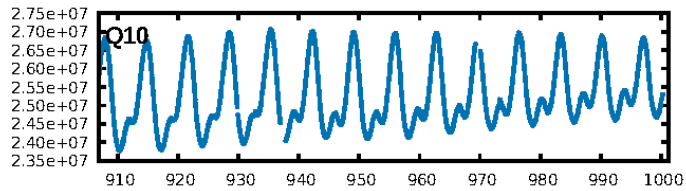
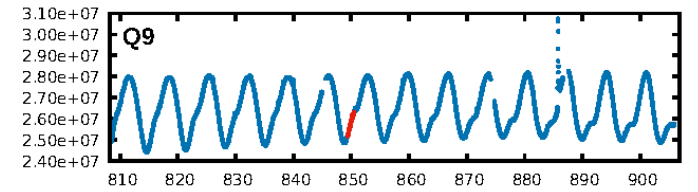
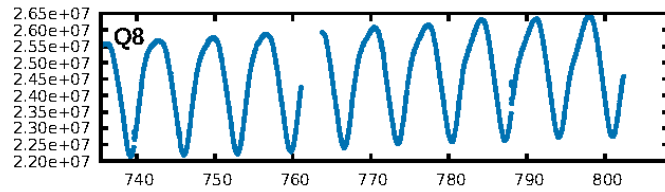
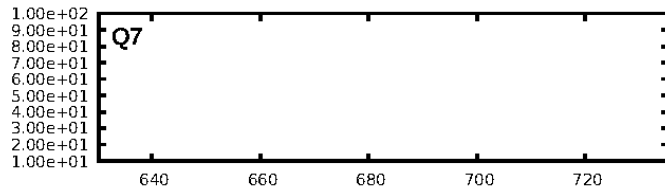
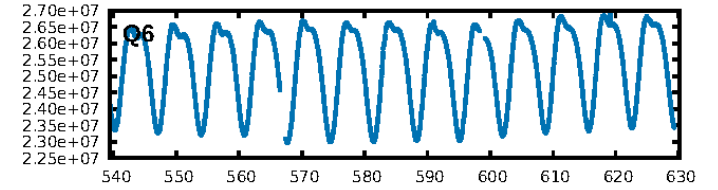
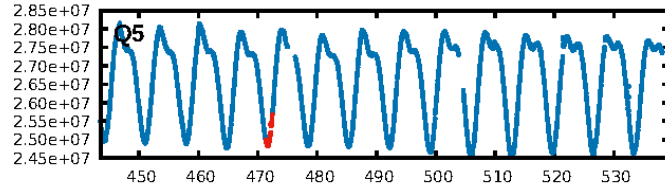
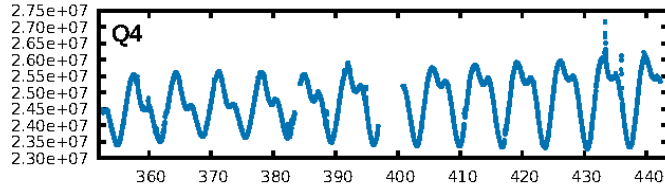
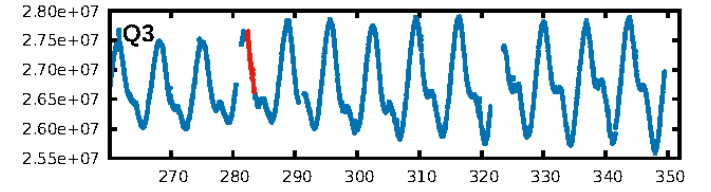
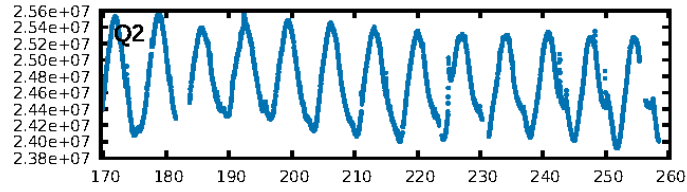
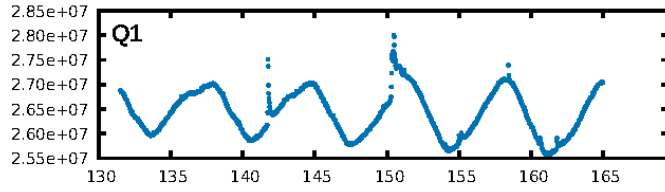
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 100.0% [109.26σ]  
ModelChiSquare2-sig: 6.5%  
ModelChiSquareGof-sig: 98.4%  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [4/4]  
GhostDiagnostic-chr: -13.49  
Centroid-sig: 65.7%  
Centroid-so: 0.436 arcsec [0.72σ]  
OotOffset-rm: 0.050 arcsec [0.42σ]  
KicOffset-rm: 0.081 arcsec [0.15σ]  
OotOffset-st: 0/1/0/2 [3]  
KicOffset-st: 0/1/0/2 [3]  
DiffImageQuality-fgm: 0.33 [1/3]  
DiffImageOverlap-fno: 1.00 [3/3]

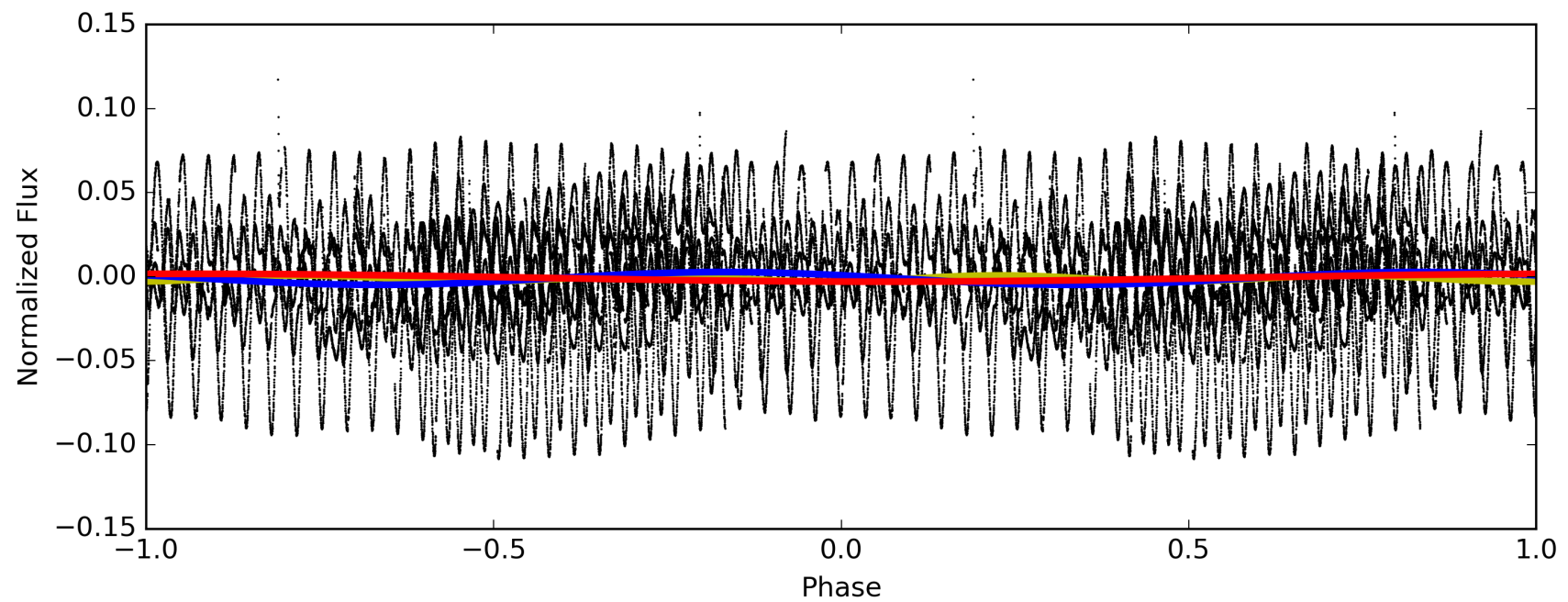
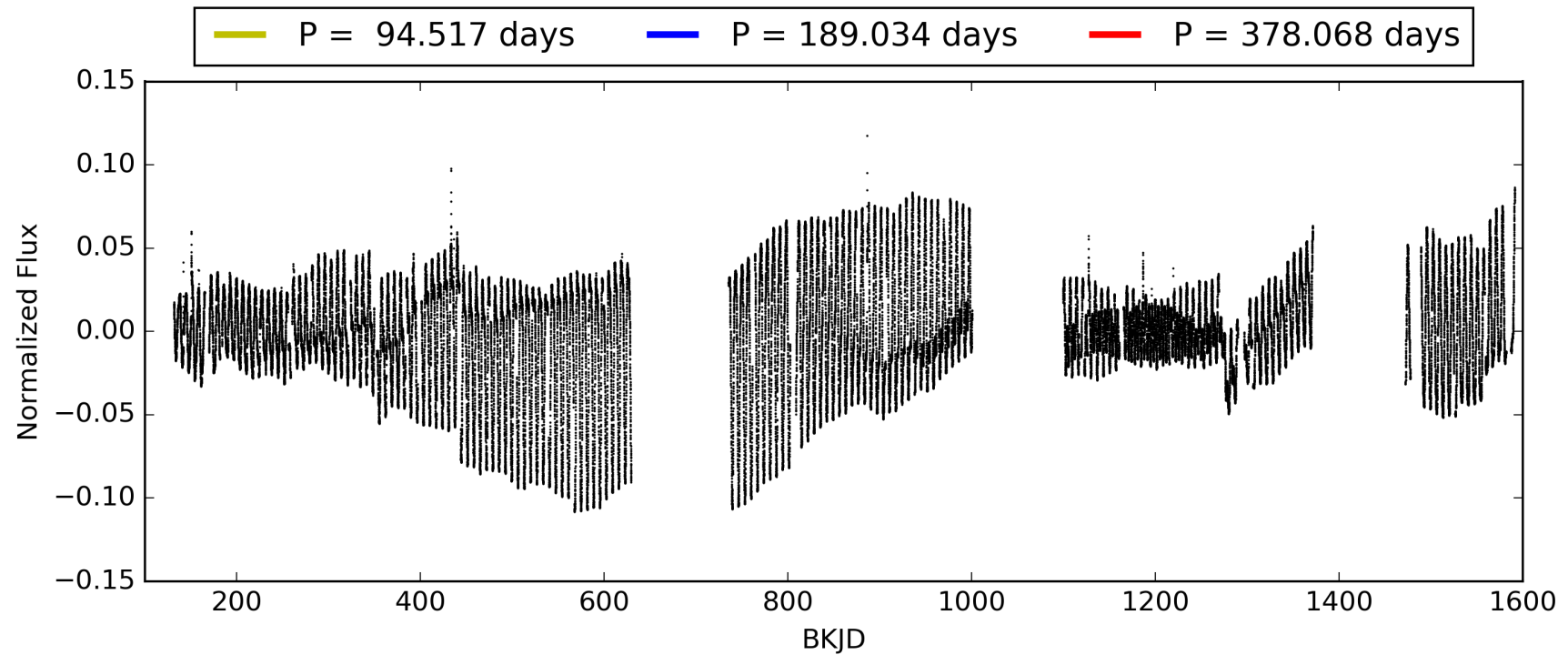
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 10:10:43 Z

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

# TCE 010989281-05, PDC Light Curves



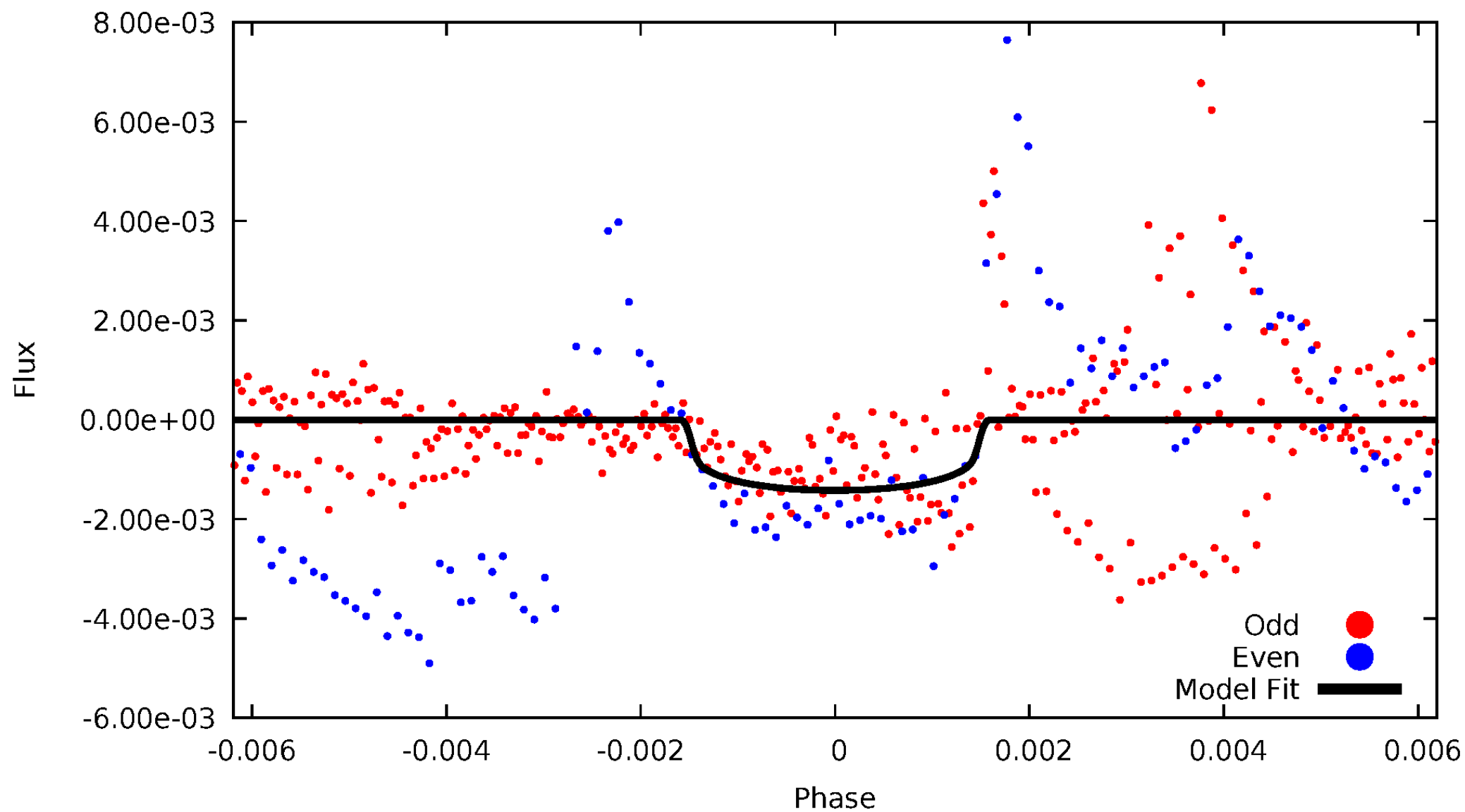
TCE 010989281-05





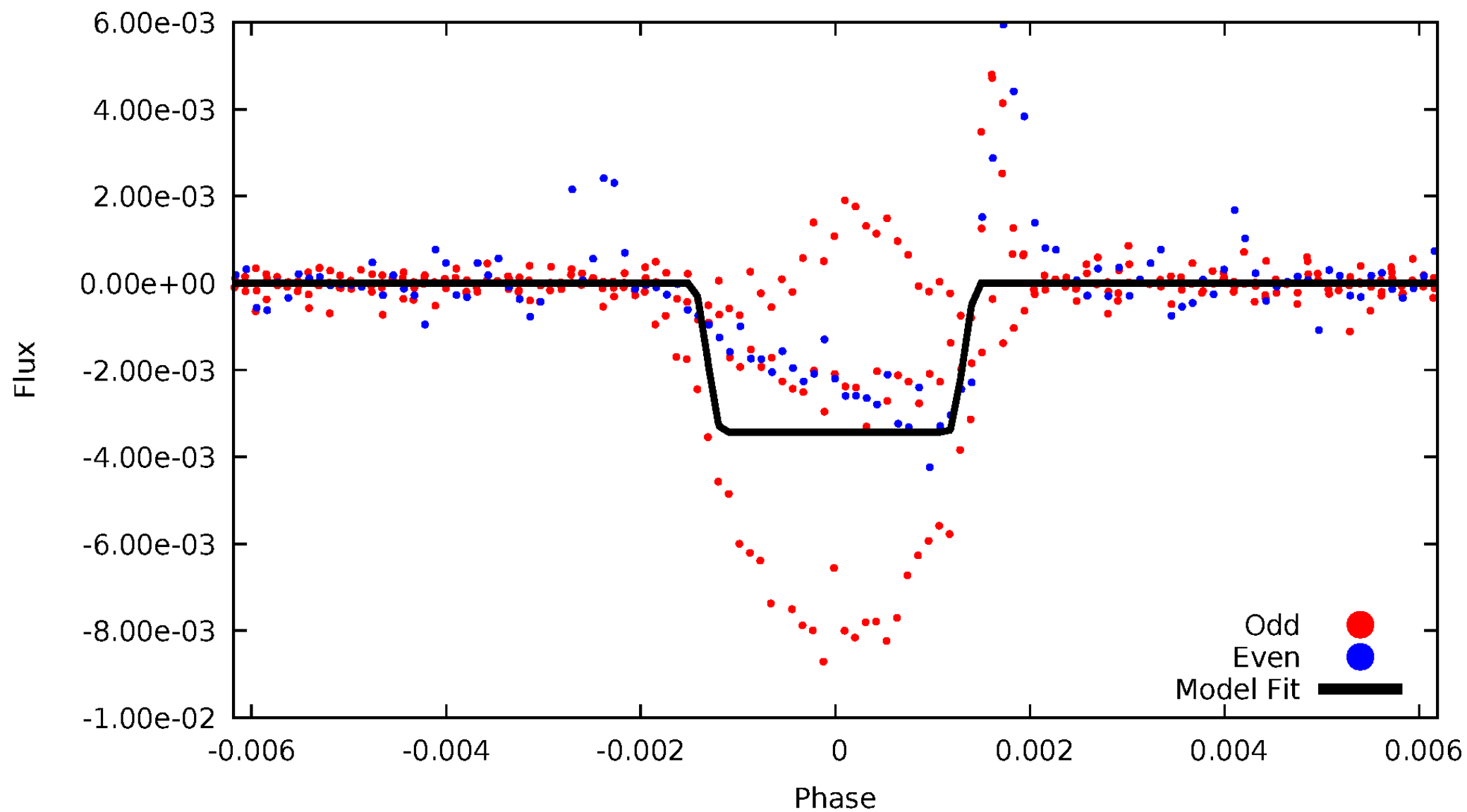
# DV Odd/Even

TCE 010989281-05



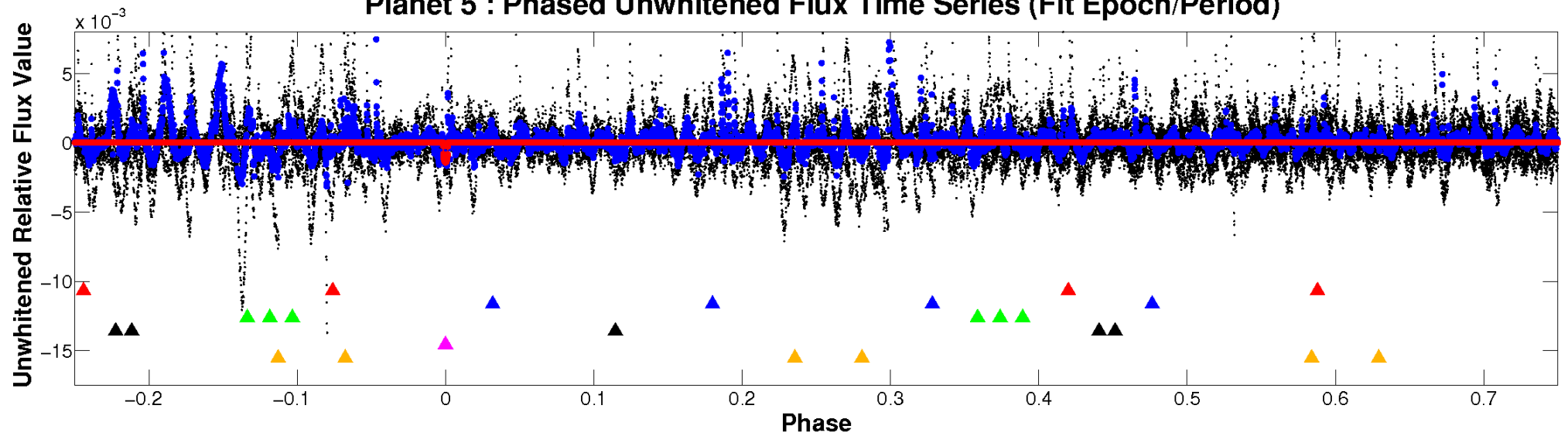
# ALT Odd/Even

TCE 010989281-05

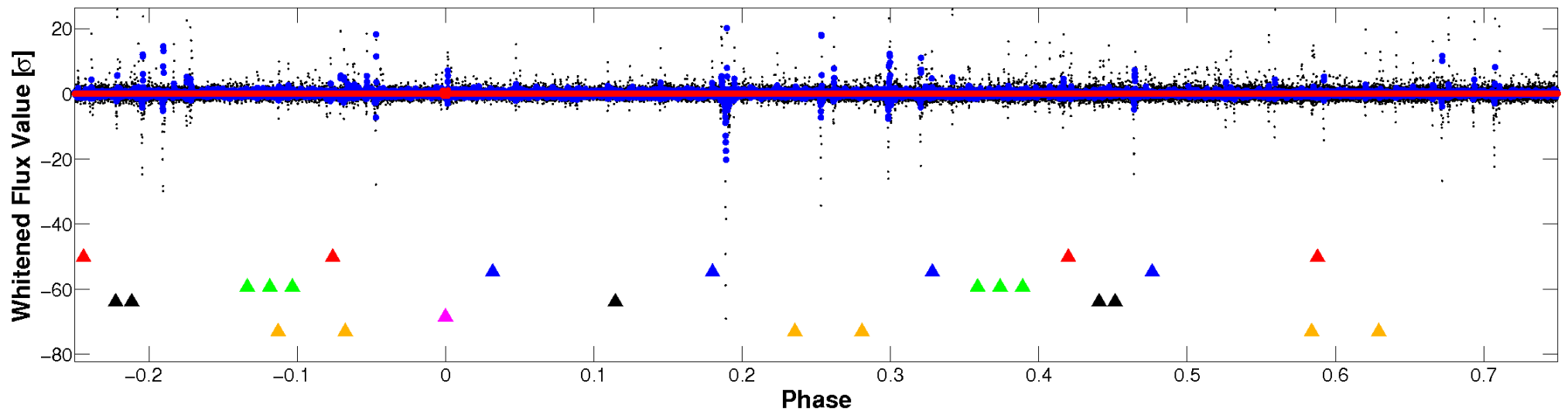


# Non-Whitened Vs. Whitened Light Curve

## Planet 5 : Phased Unwhitened Flux Time Series (Fit Epoch/Period)

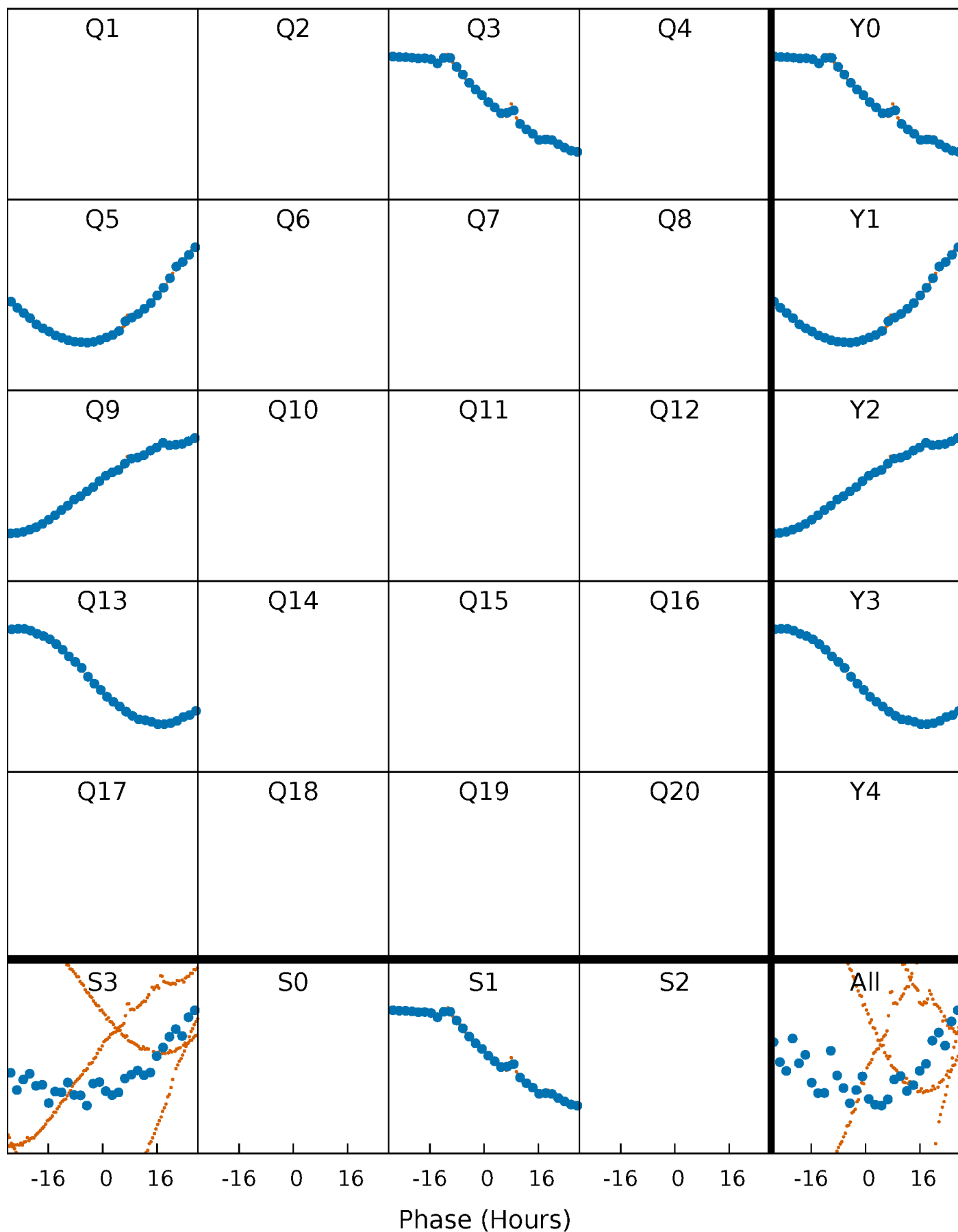


## Planet 5 : Phased Whitened Flux Time Series (Fit Epoch/Period)



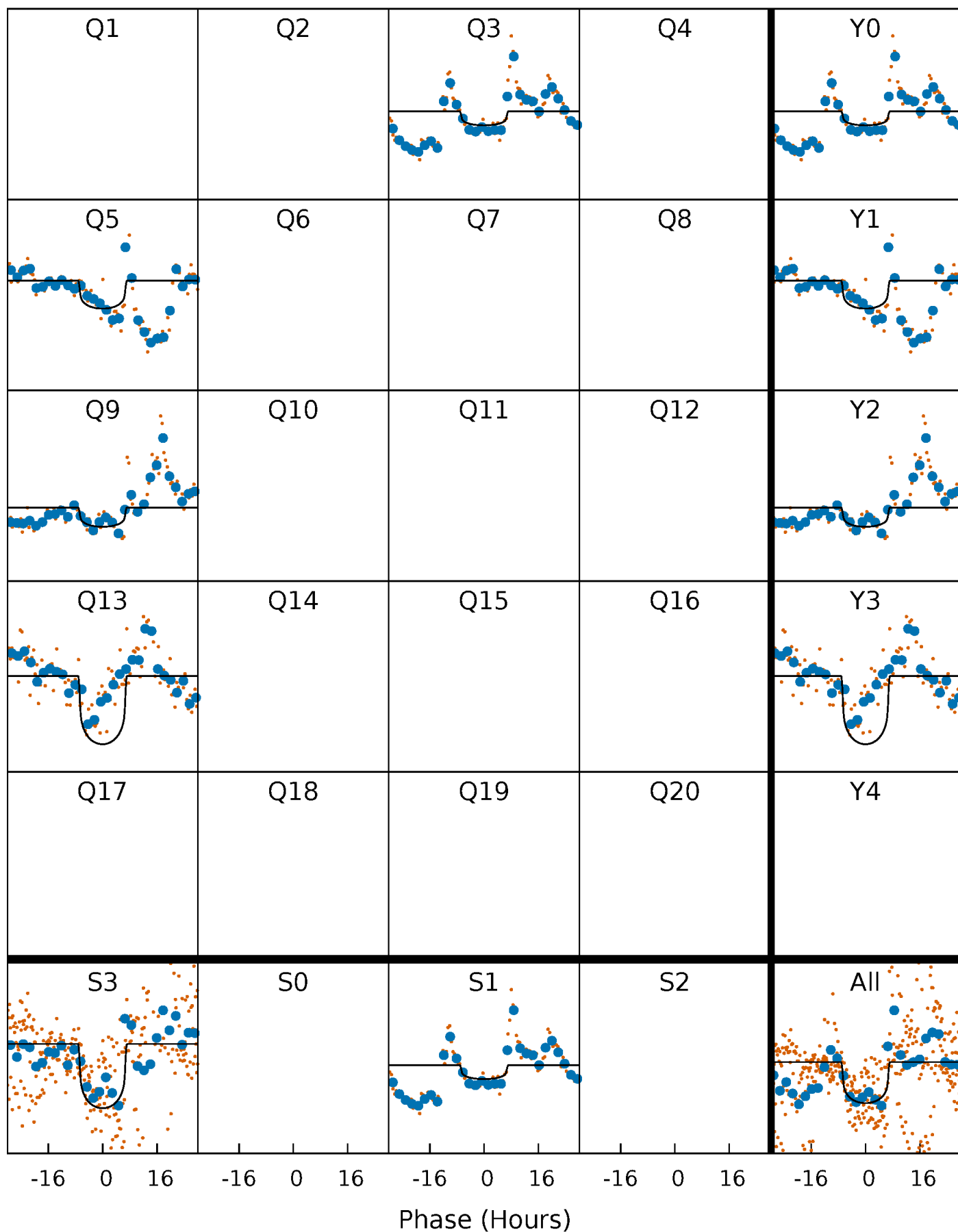
# PDC Quarter-Phased Transit Curves

TCE 010989281-05     $P=189.034203$  Days     $T_0=282.857029$  (BKJD)



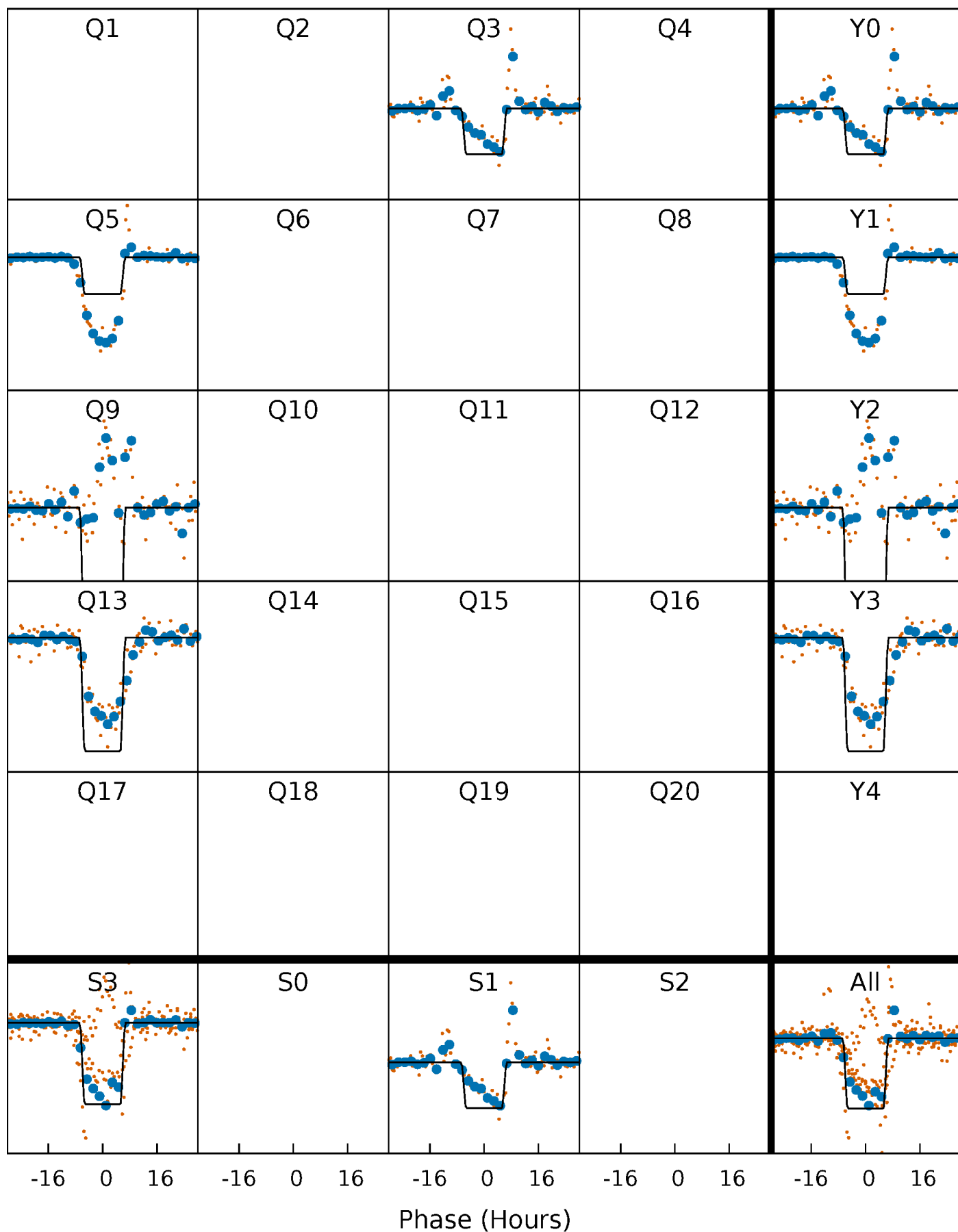
# DV Quarter-Phased Transit Curves

TCE 010989281-05     $P=189.034203$  Days     $T_0=282.857029$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

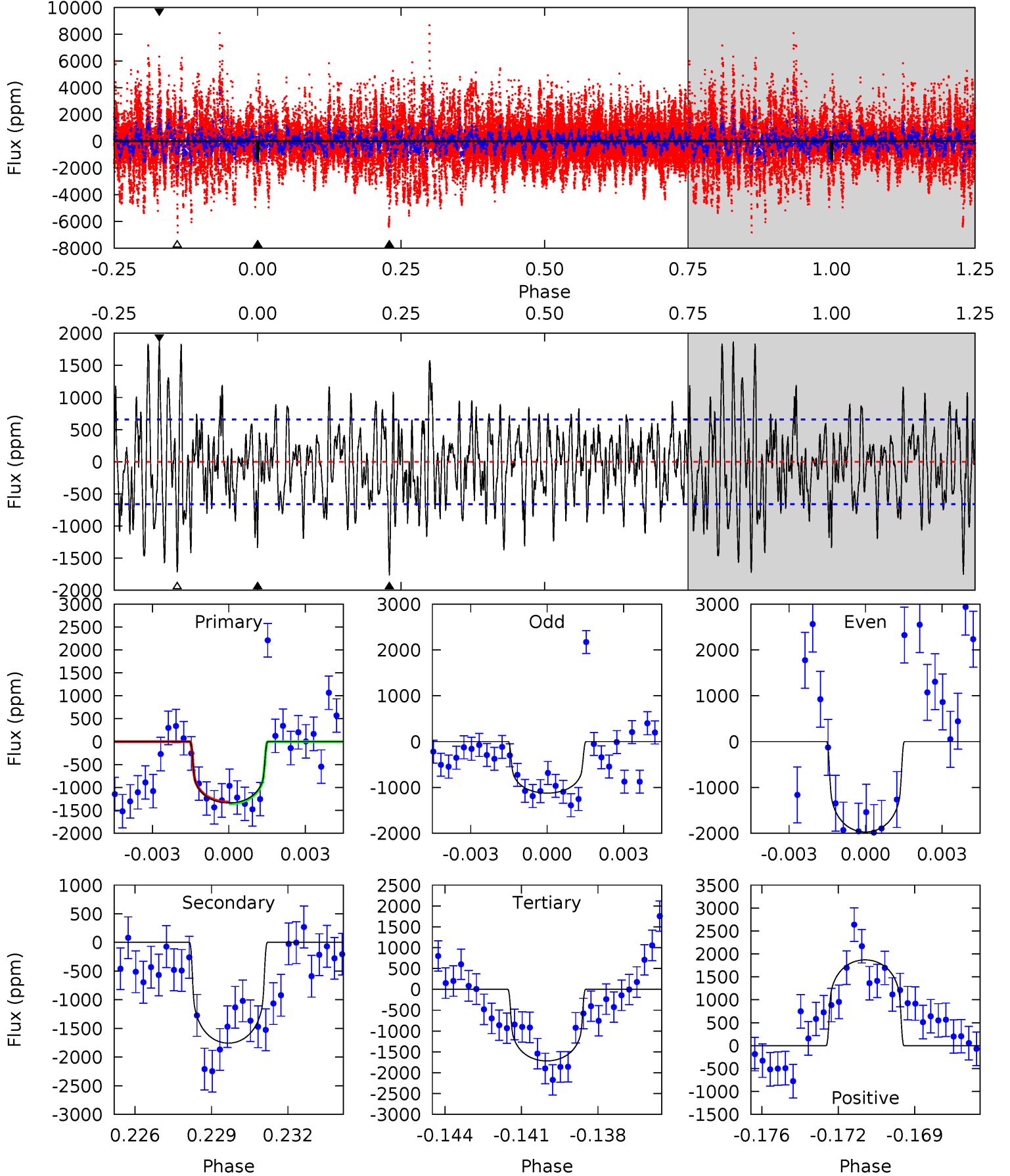
TCE 010989281-05     $P=189.030864$  Days     $T_0=282.865516$  (BKJD)



# DV Model-Shift Uniqueness Test

010989281-05, P = 189.034203 Days, E = 93.822826 Days

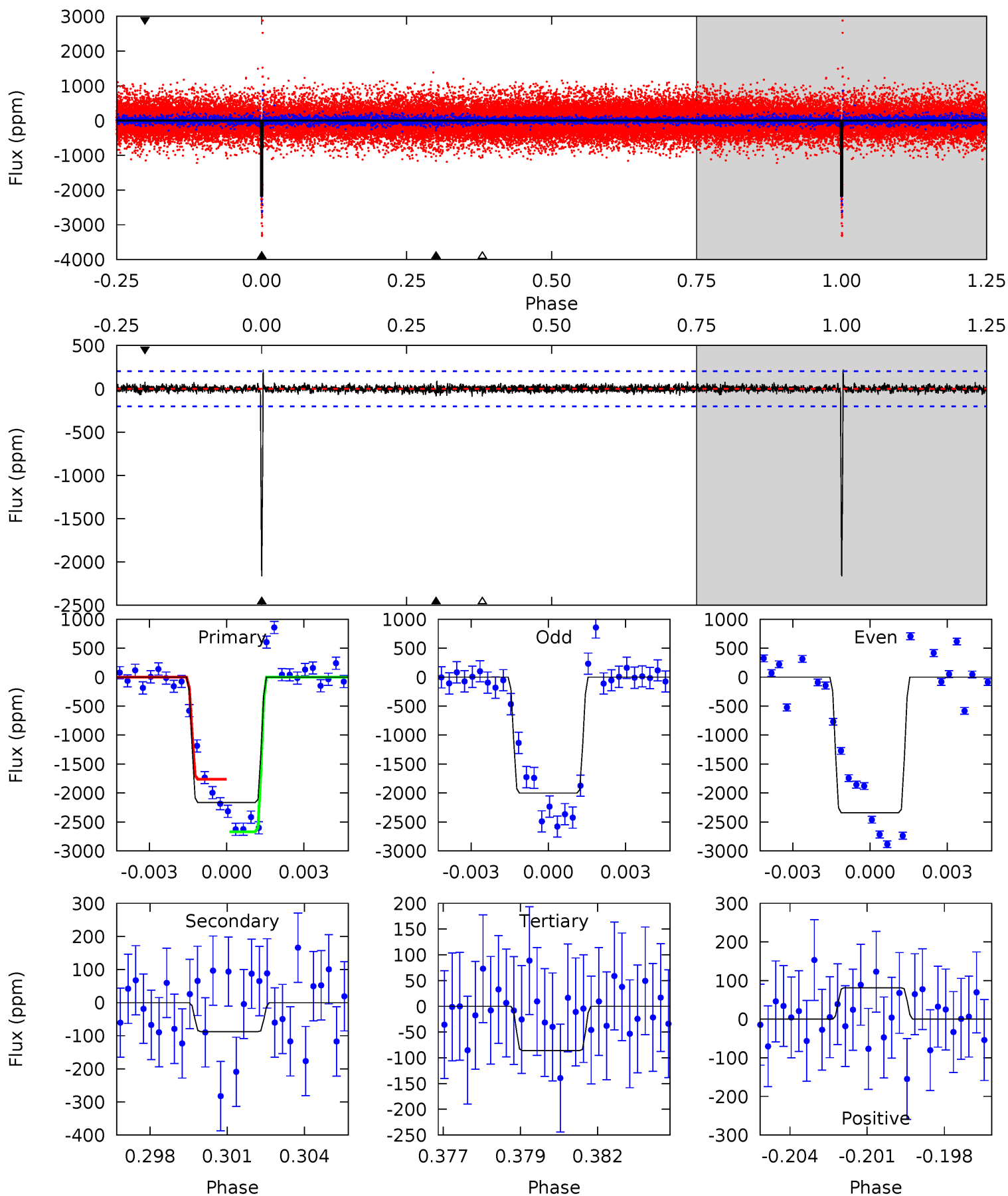
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
10.6	14.0	13.7	14.9	5.24	2.95	4.09	-3.01	-4.22	0.31	-0.90	2.79	0.95	0.52	0.16



# Alt Model-Shift Uniqueness Test

010989281-05, P = 189.030864 Days, E = 93.834652 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
56.1	2.27	2.23	2.10	5.26	2.98	0.53	53.9	54.0	0.04	0.17	4.44	1.22	0.09	11.7





### Stellar Parameters For KIC 010989281

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5398^{+208}_{-170}$	$3.822^{+0.791}_{-0.339}$	$-0.640^{+0.350}_{-0.250}$	$1.843^{+1.313}_{-1.074}$	$0.821^{+0.194}_{-0.105}$	$0.185^{+2.882}_{-0.123}$
	+4%/-3%	+21%/-9%	+55%/-39%	+71%/-58%	+24%/-13%	+1560%/-66%
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 010989281-05 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-1757 \pm 126$	$6.40^{+3.28}_{-2.78}$	$563^{+100}_{-109}$	$5911^{+1245}_{-679}$	$8704^{+18677}_{-4885}$
Alt.	$-88 \pm 39$	$10.90^{+4.93}_{-3.89}$	$567^{+99}_{-104}$	$2881^{+211}_{-238}$	$142^{+228}_{-83}$

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

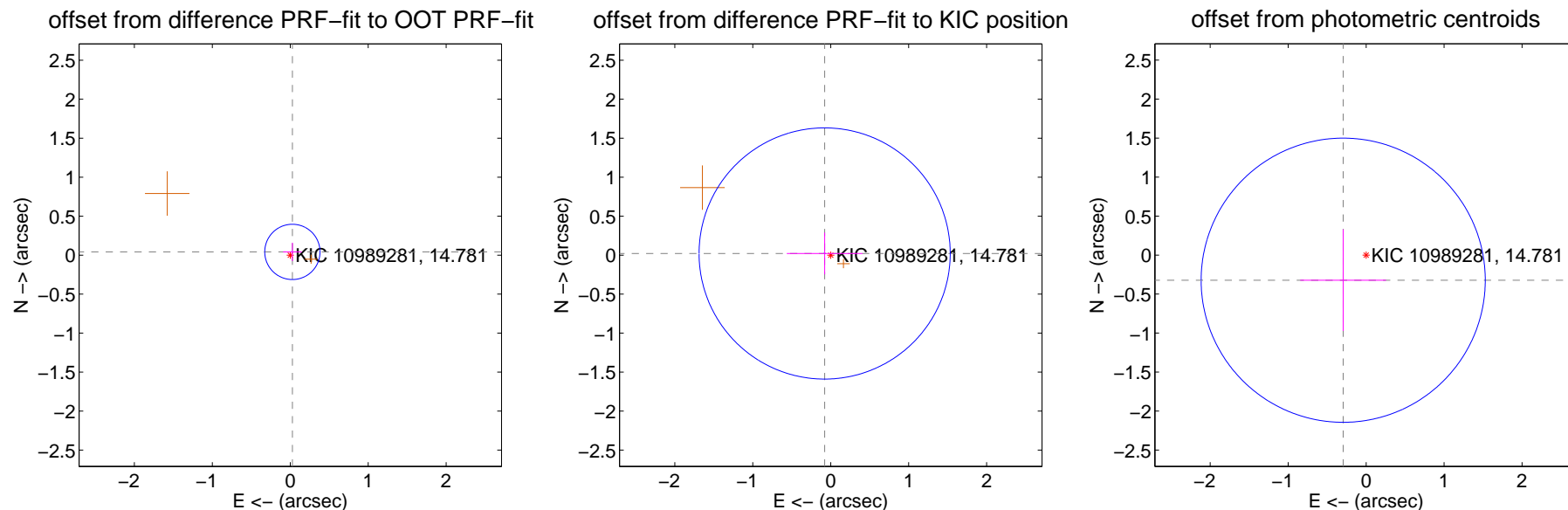
## DV Centroid Data

Supplemental centroid analysis for 010989281-05. Kepler magnitude: 14.78. Transit SNR 5.93

There are 1 quarters with good PRF difference image offsets

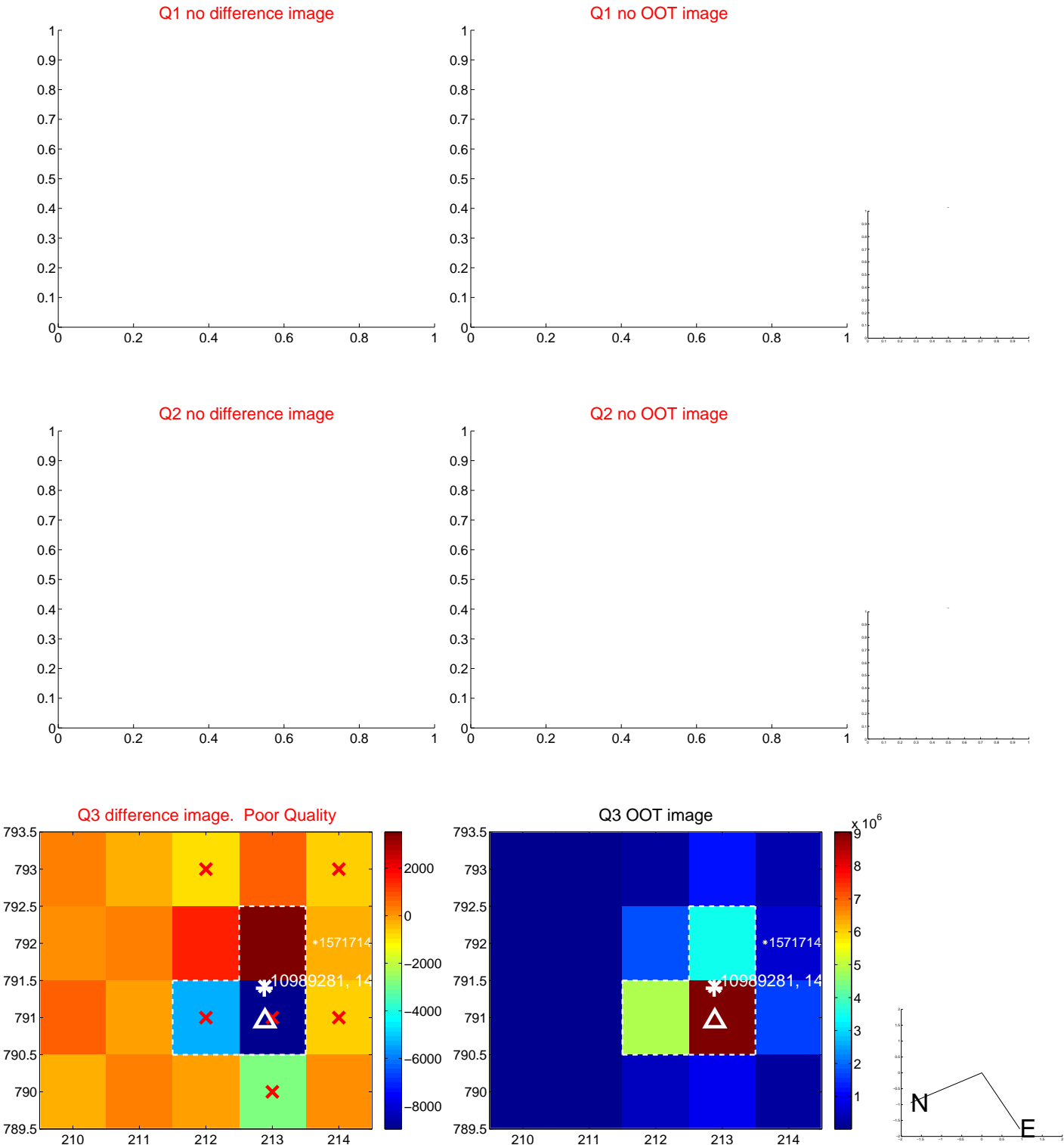
The direct PRF centroid is offset from the target star catalog position by about 0.12 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.050 \pm 0.118$	0.42	$-0.027 \pm 0.119$	$0.042 \pm 0.118$
PRF-fit source offset from KIC position	$0.081 \pm 0.537$	0.15	$0.078 \pm 0.486$	$0.021 \pm 0.268$
photometric centroid source offset	$0.44 \pm 0.61$	0.72	$0.29 \pm 0.55$	$-0.32 \pm 0.65$

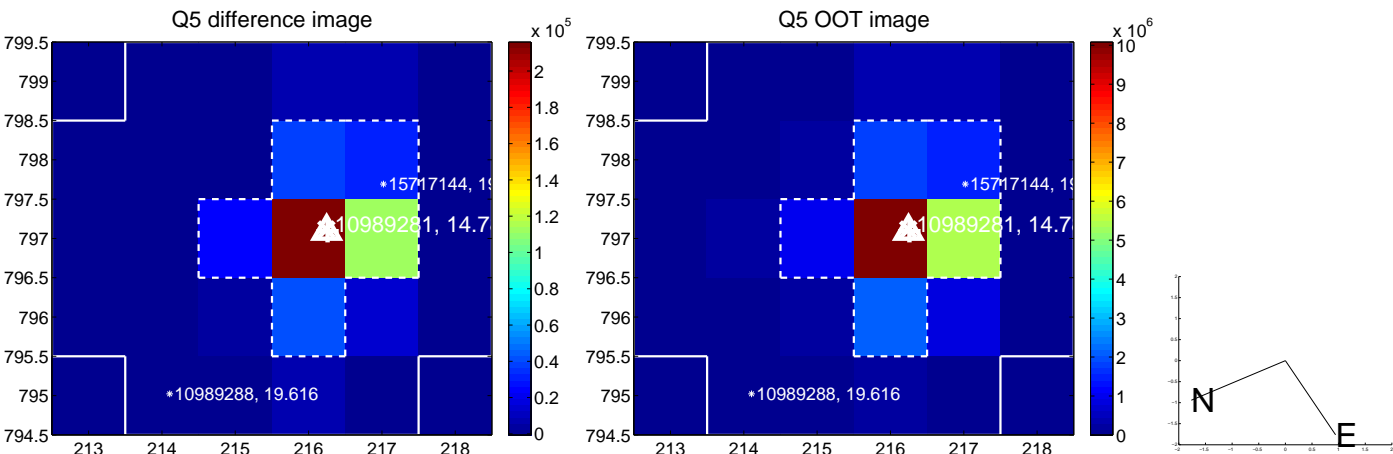


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

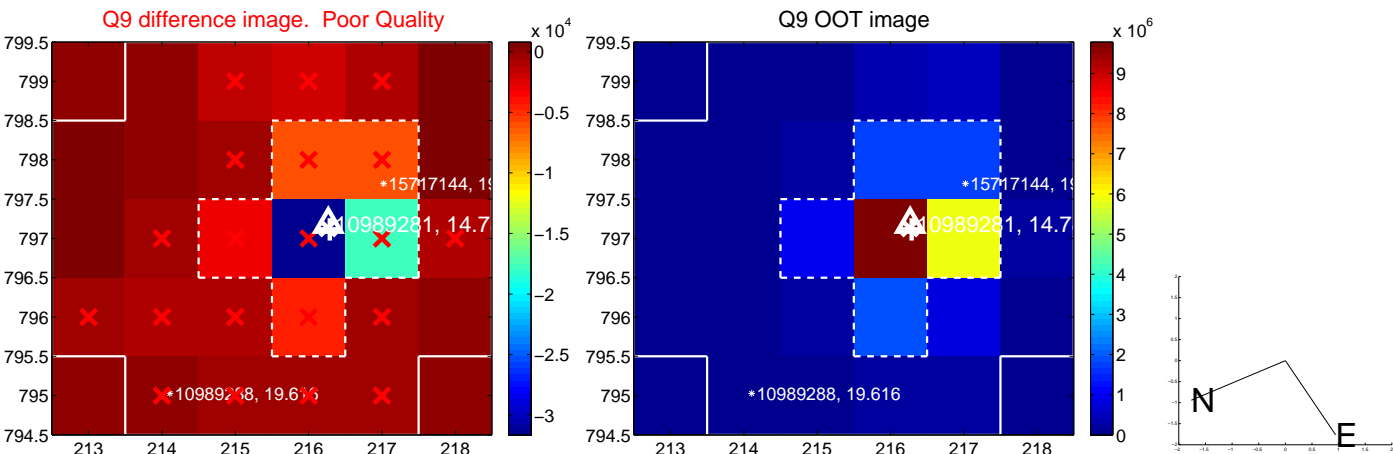
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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



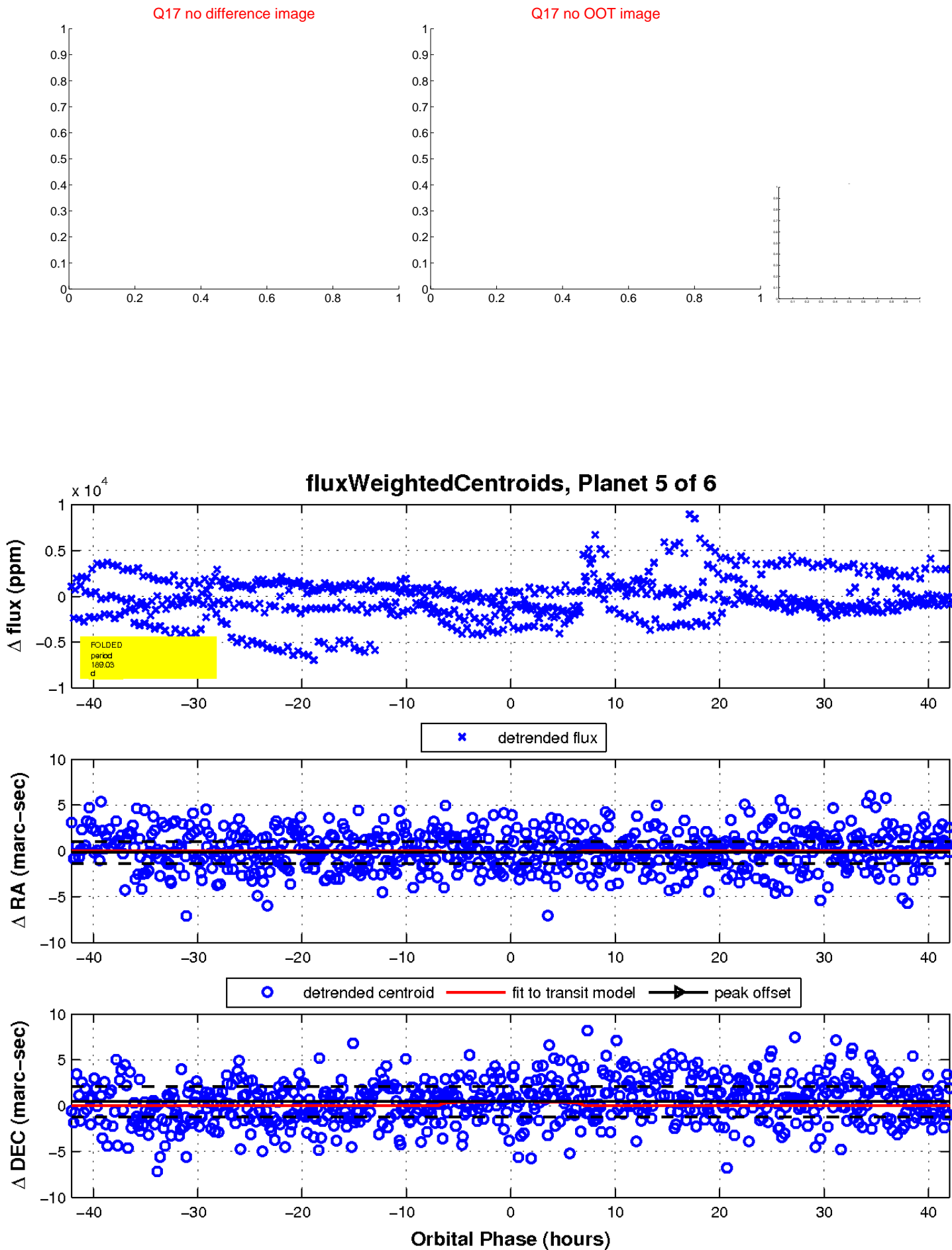
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

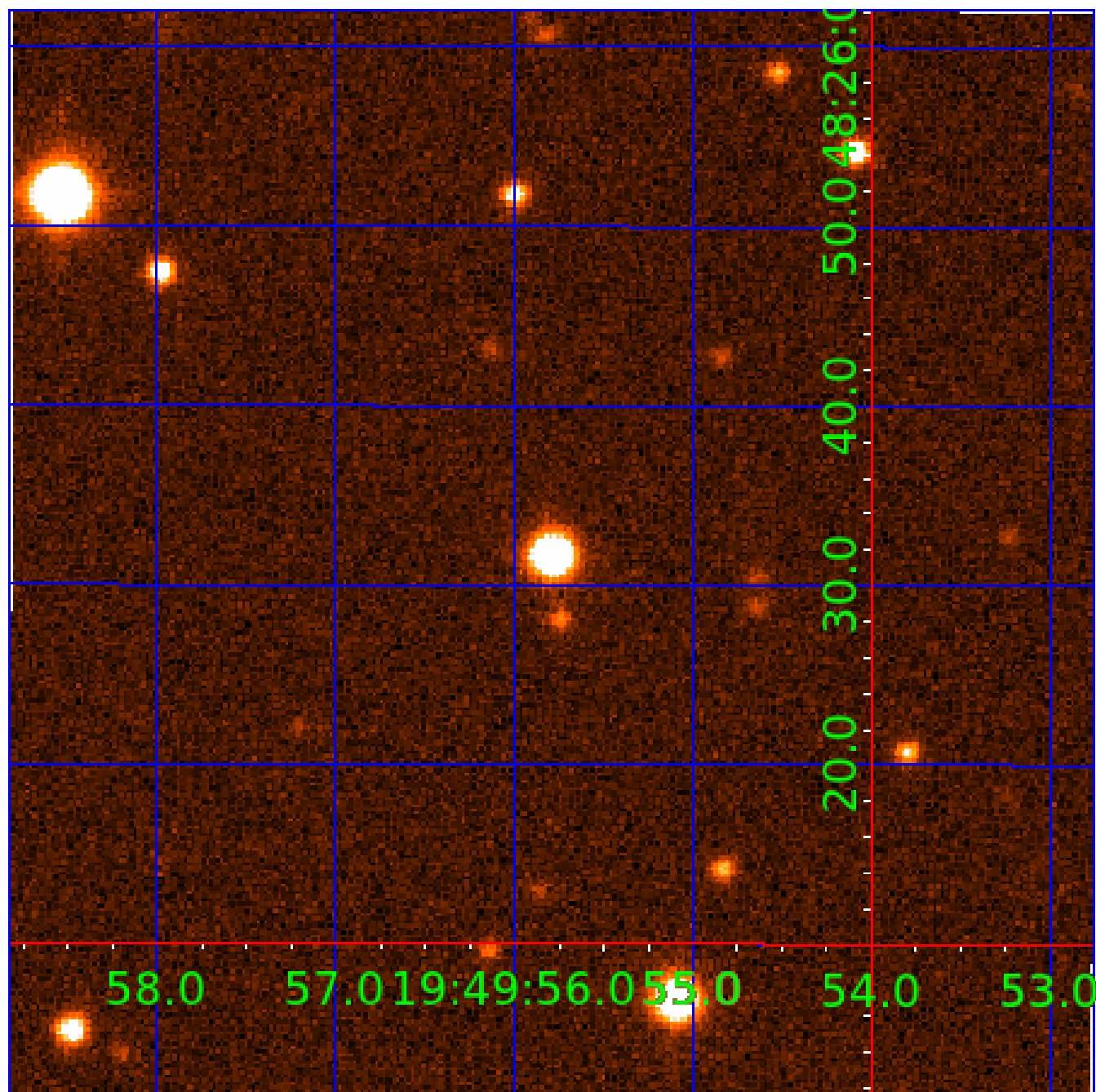


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



UKIRT Image

Declination





# KIC 010989281

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
010989281-01	OBS	No	409.828295	173.205933	1727.7	20.240	20.9	5.5	1.84	5398	8.75	2.52
010989281-03	OBS	No	284.986710	161.644539	1875.1	5.832	16.5	8.5	1.84	5398	8.58	4.10
010989281-04	OBS	No	314.376633	242.864486	1959.4	7.932	15.0	10.3	1.84	5398	8.24	3.59
010989281-05	OBS	No	189.034203	282.857029	1423.2	14.037	14.8	5.9	1.84	5398	6.95	7.08
010989281-06	OBS	No	254.895582	261.529736	1639.9	3.500	14.4	-1.0	1.84	5398	7.39	4.75

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
010989281-01	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES—LPP_DV—LPP_ALT—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
010989281-03	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_MARSHALL_SKYE—LPP_DV—LPP_ALT—MOD_POS_DV—INCONSISTENT_TRANS—CENT_FEW_DIFFS
010989281-04	OBS	FP	0.00	1	0	0	0	LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS
010989281-05	OBS	FP	0.00	1	0	0	0	LPP_DV—MOD_NONUNIQ_DV—MOD_TER_DV—MOD_POS_DV—CENT_FEW_DIFFS
010989281-06	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_CHASES_MARSHALL—LPP_DV—ALL_TRANS_CHASES—INCONSISTENT_TRANS—CENT_NOFITS

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

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

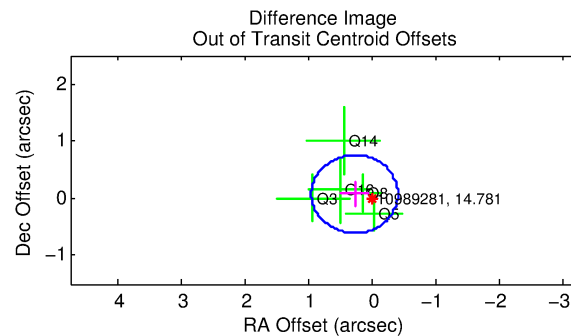
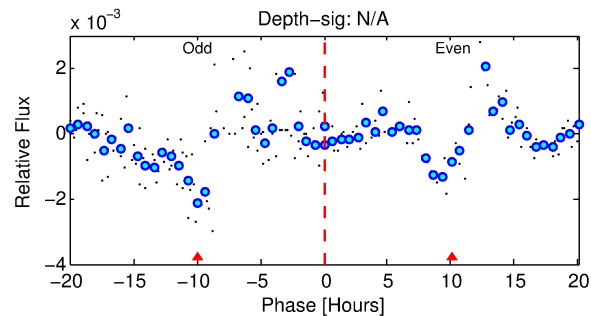
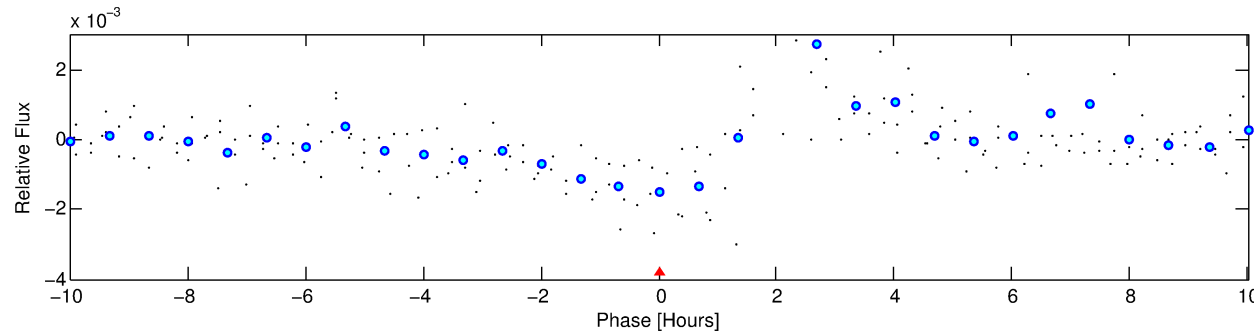
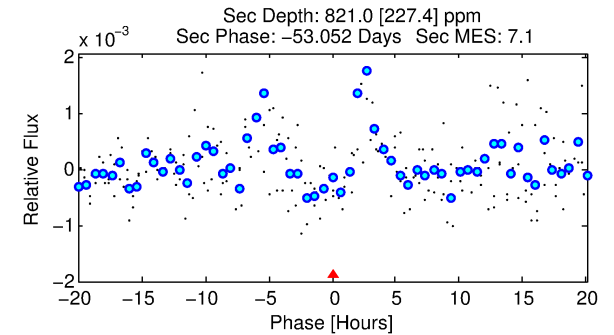
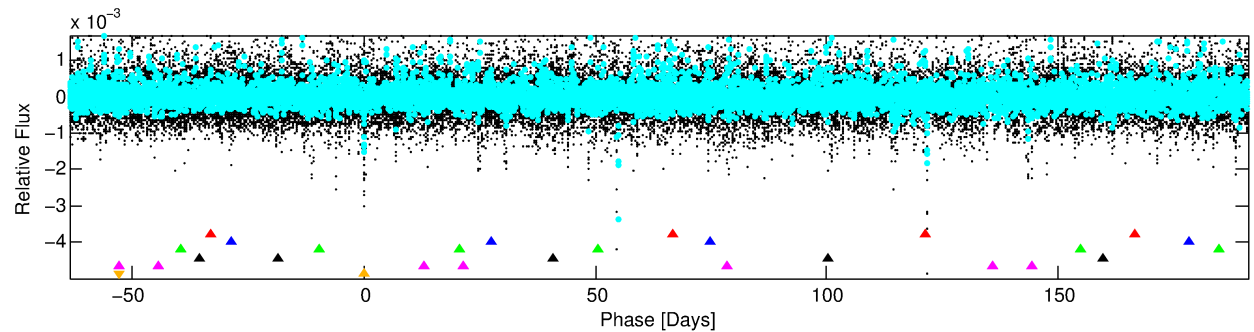
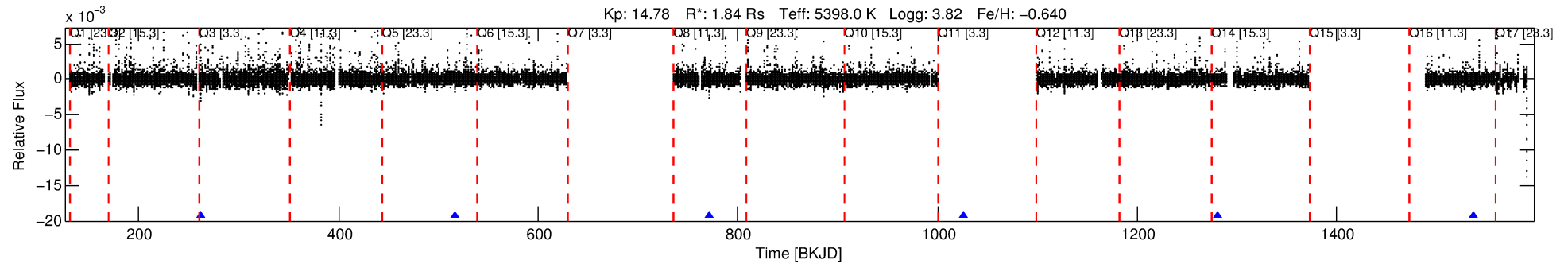
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

Ephemeris Match Information For 010989281-06

No Significant Match Found

# DV One-Page Summary

KIC: 10989281 Candidate: 6 of 6 Period: 254.896 d



## TPS TCE Results:

Period = 254.89558 d  
Epoch = 261.5297 BKJD

DV fit results are unavailable

## DV Diagnostic Results:

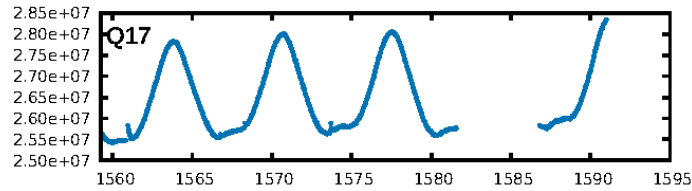
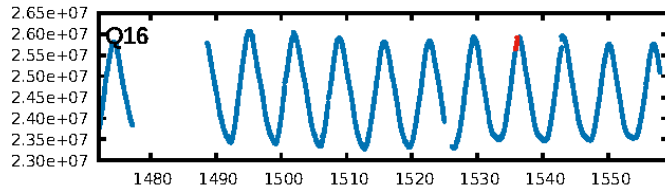
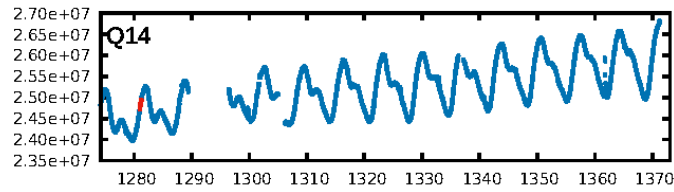
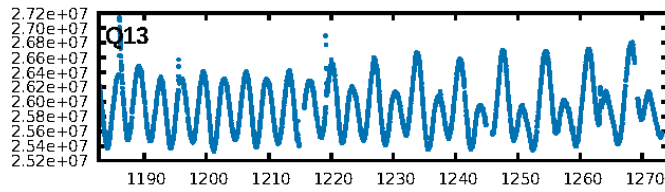
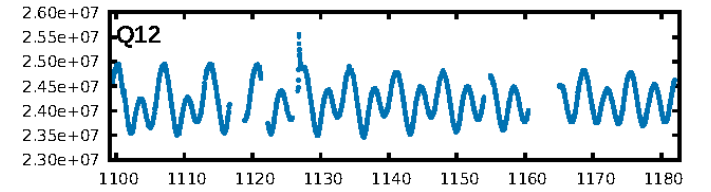
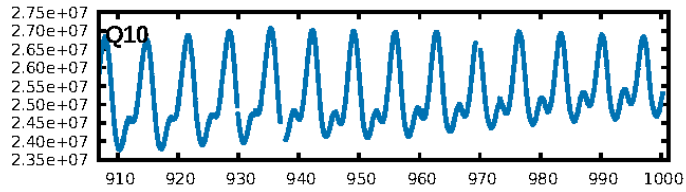
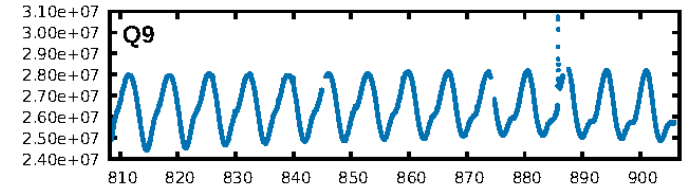
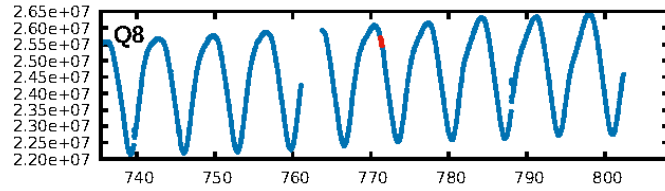
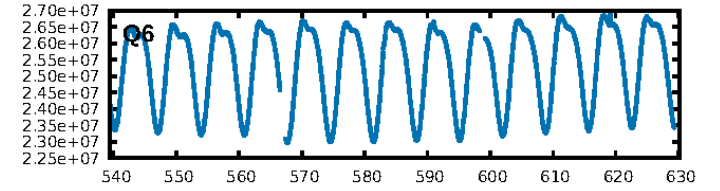
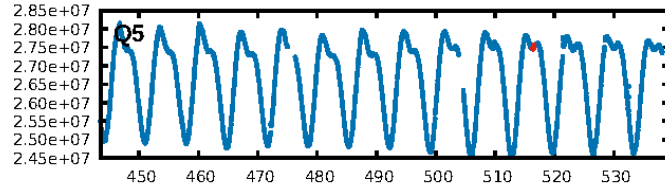
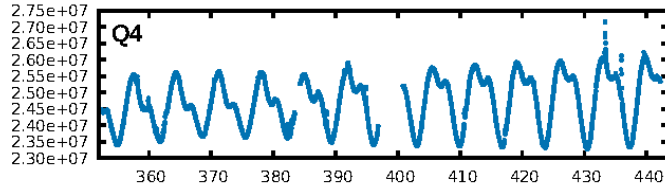
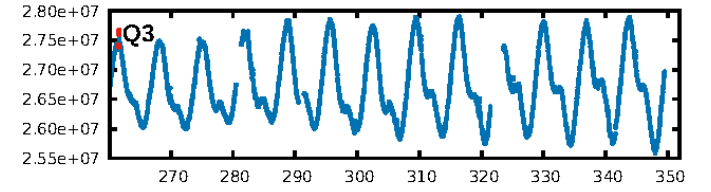
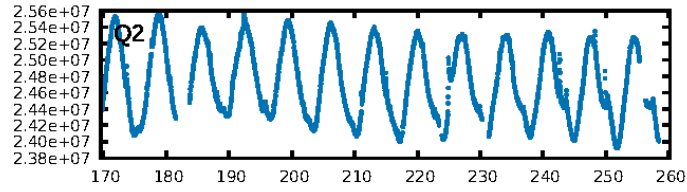
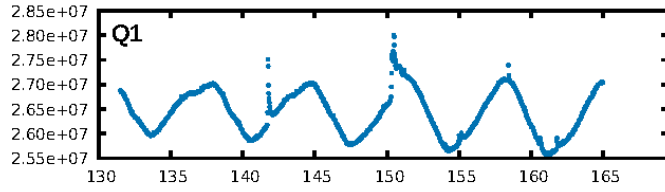
ShortPeriod-sig: 100.0% [109.26σ]  
LongPeriod-sig: 100.0% [106.18σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGof-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [5/5]  
GhostDiagnostic-chr: 0.4948

Centroid-sig: 2.0%  
Centroid-so: 0.888 arcsec [1.67σ]  
OotOffset-rm: 0.289 arcsec [1.27σ]  
KicOffset-rm: 0.328 arcsec [1.44σ]  
OotOffset-st: 1/1/2/1 [5]  
KicOffset-st: 1/1/2/1 [5]  
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DiffImageOverlap-fno: 1.00 [5/5]

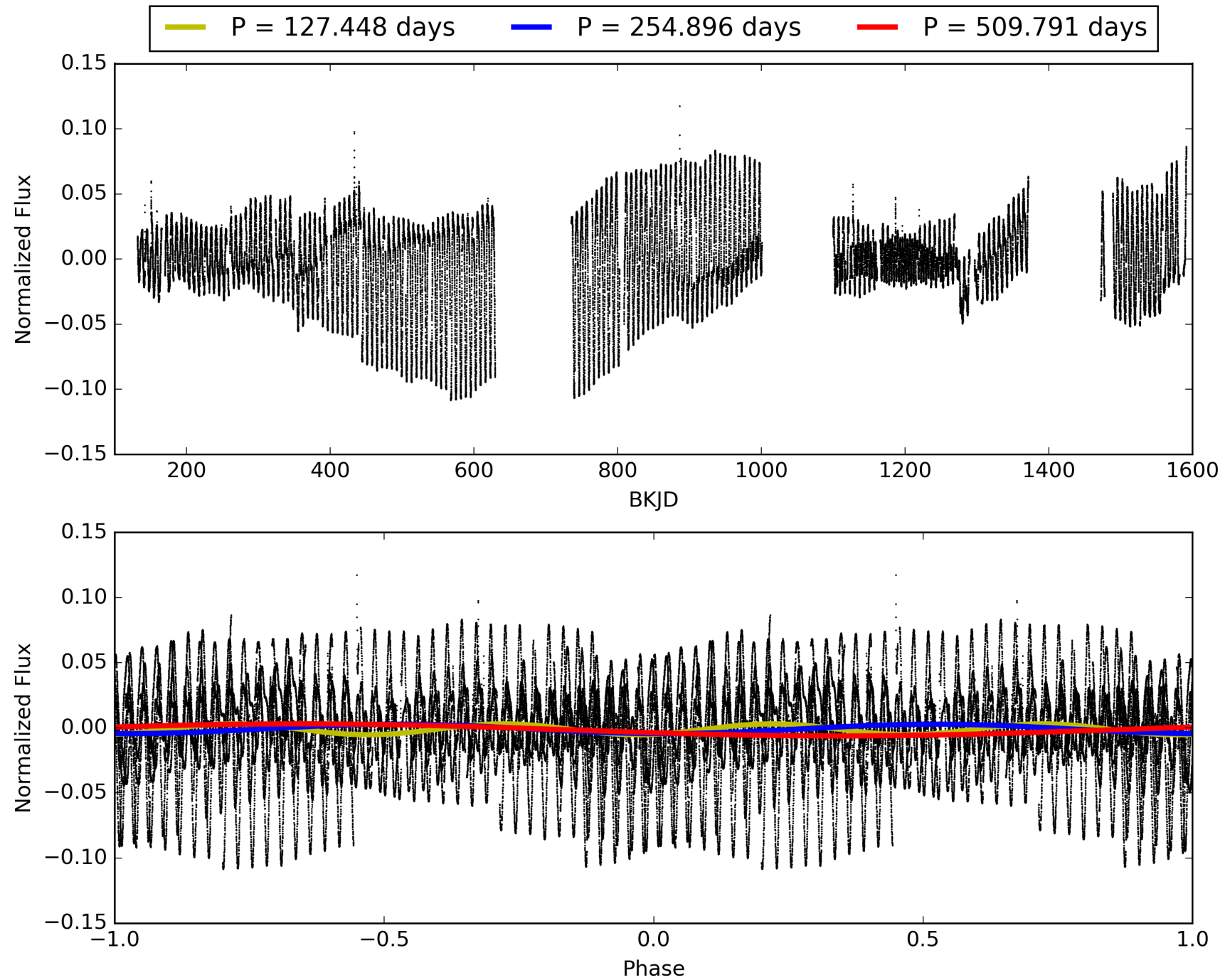
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 01-Feb-2016 10:10:54 Z

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

# TCE 010989281-06, PDC Light Curves

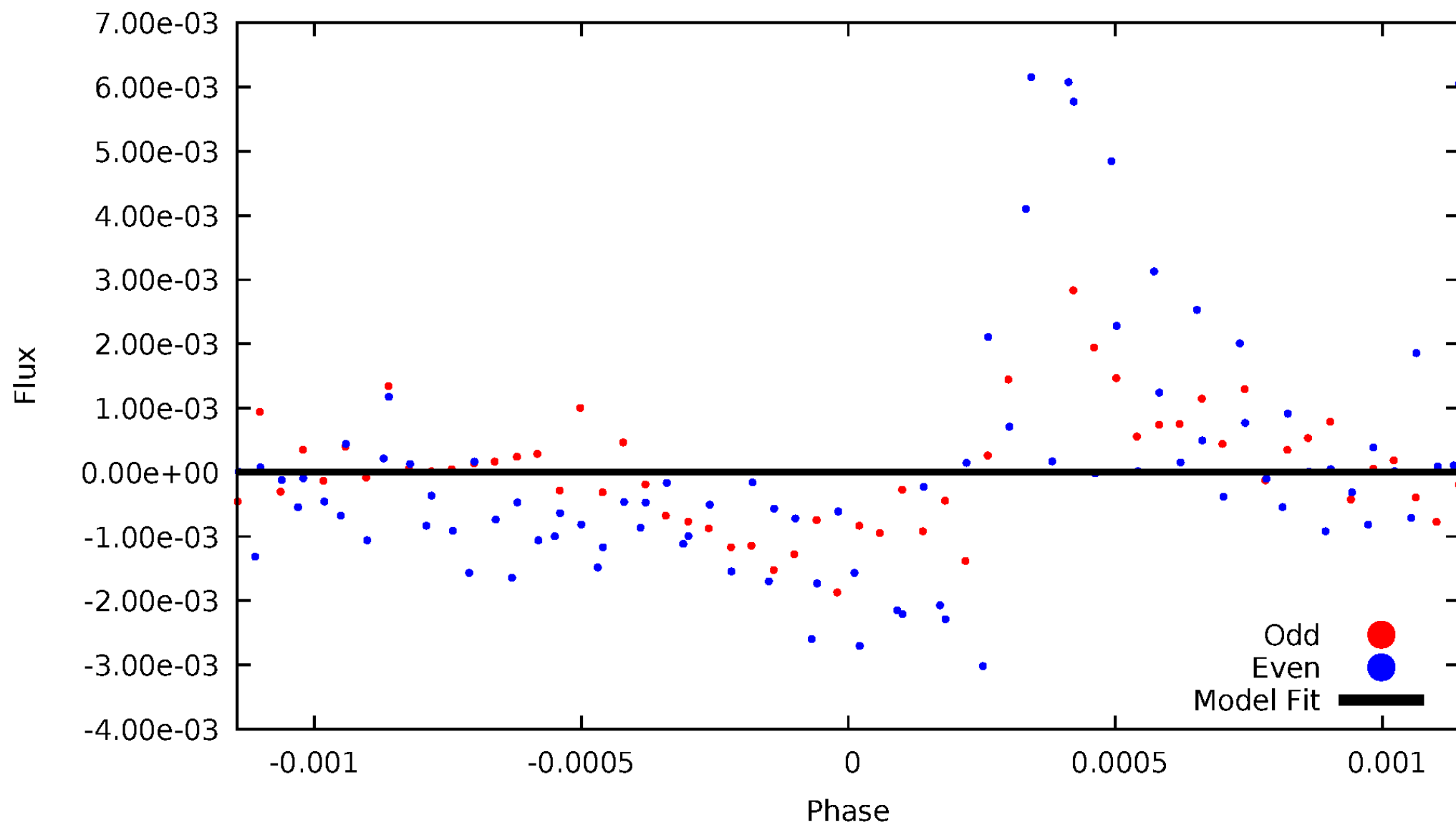


# TCE 010989281-06



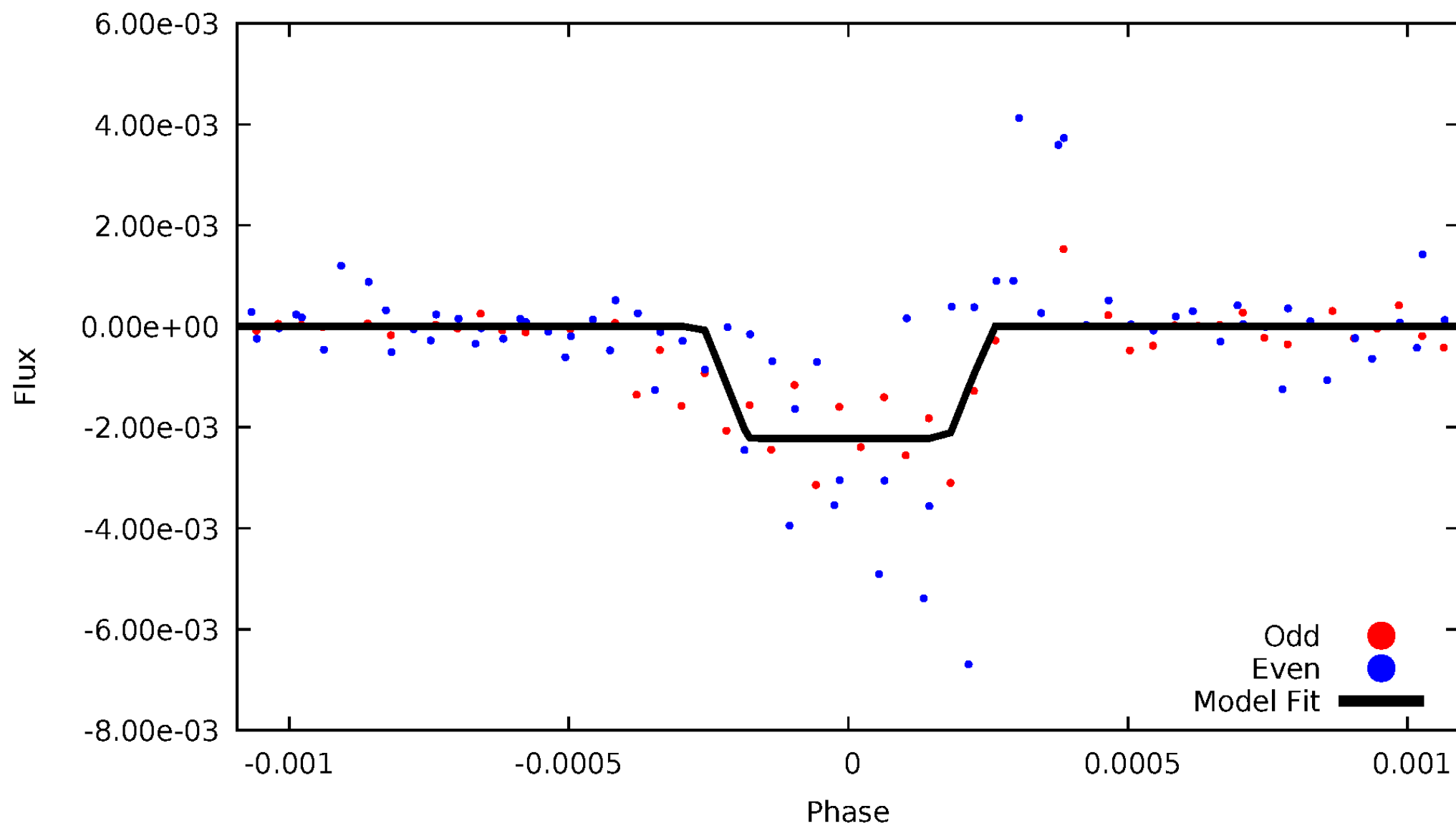
# DV Odd/Even

TCE 010989281-06



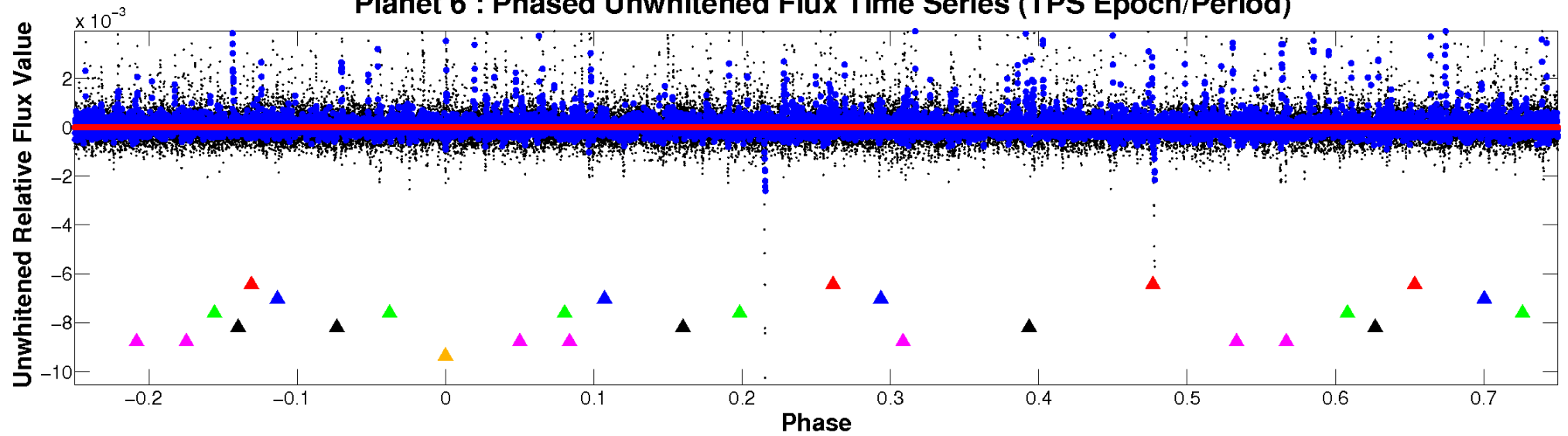
# ALT Odd/Even

TCE 010989281-06

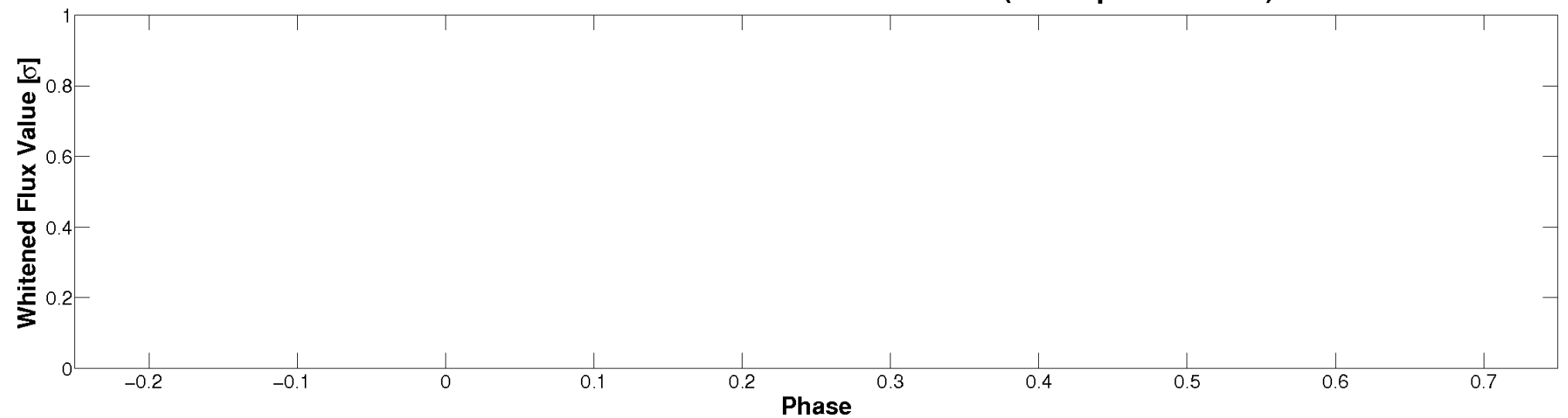


# Non-Whitened Vs. Whitened Light Curve

**Planet 6 : Phased Unwhitened Flux Time Series (TPS Epoch/Period)**



**Planet 6 : Phased Whitened Flux Time Series (TPS Epoch/Period)**



# PDC Quarter-Phased Transit Curves

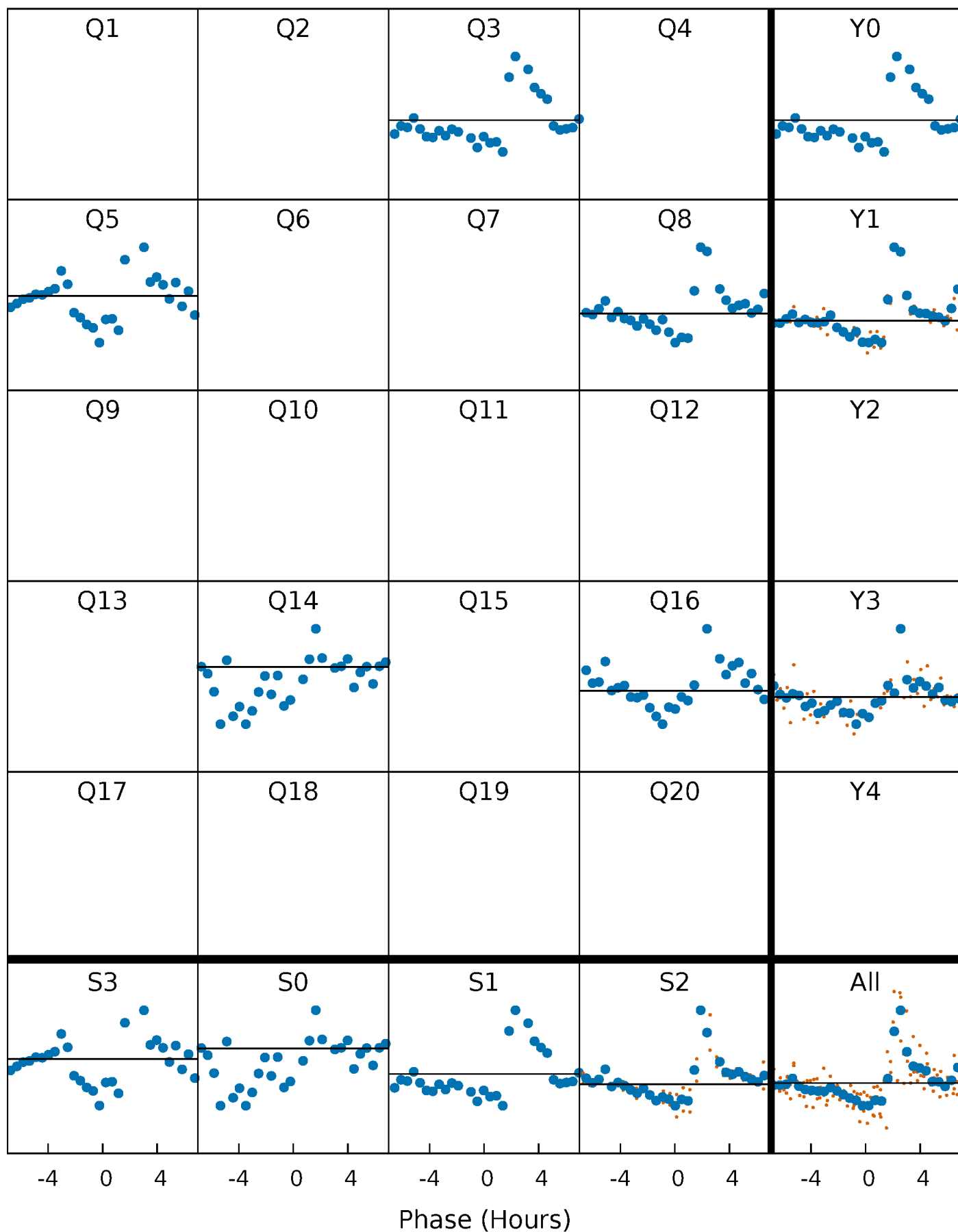
TCE 010989281-06     $P=254.895582$  Days     $T_0=261.529736$  (BKJD)





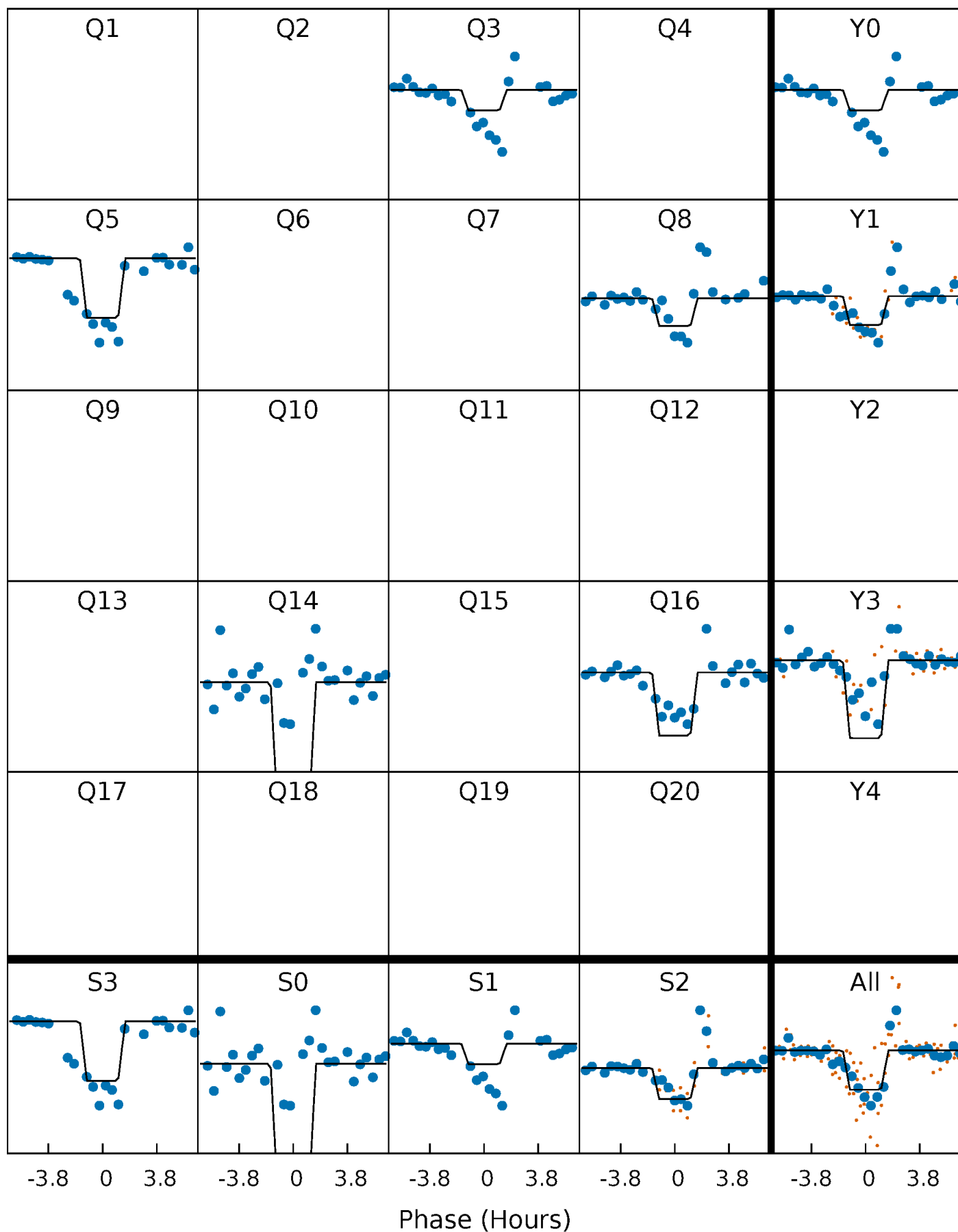
# DV Quarter-Phased Transit Curves

TCE 010989281-06     $P=254.895582$  Days     $T_0=261.529736$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

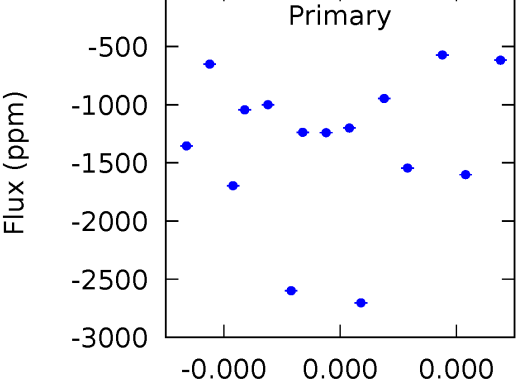
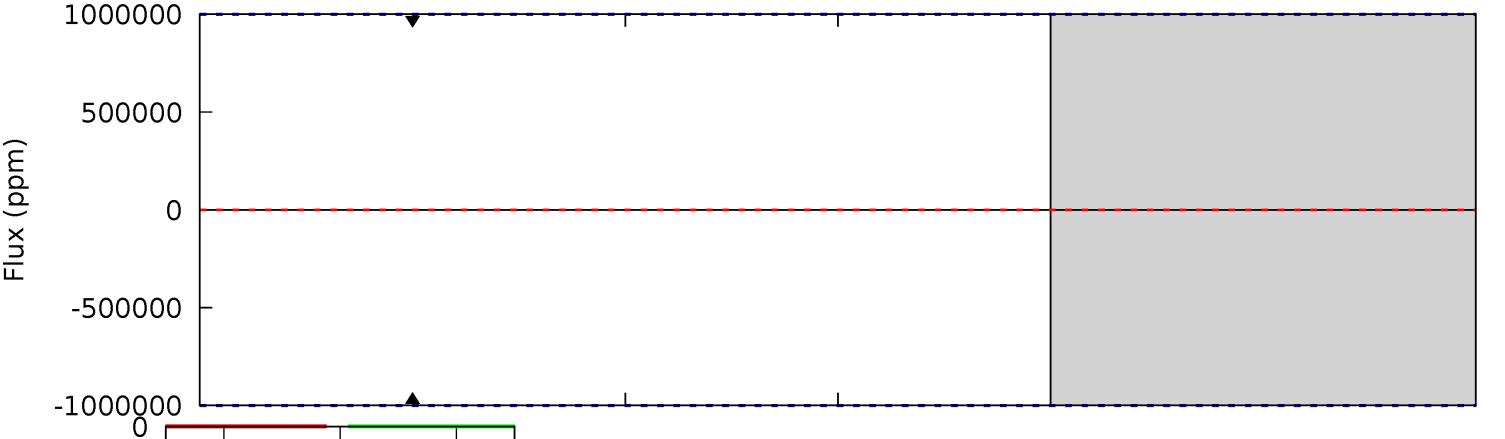
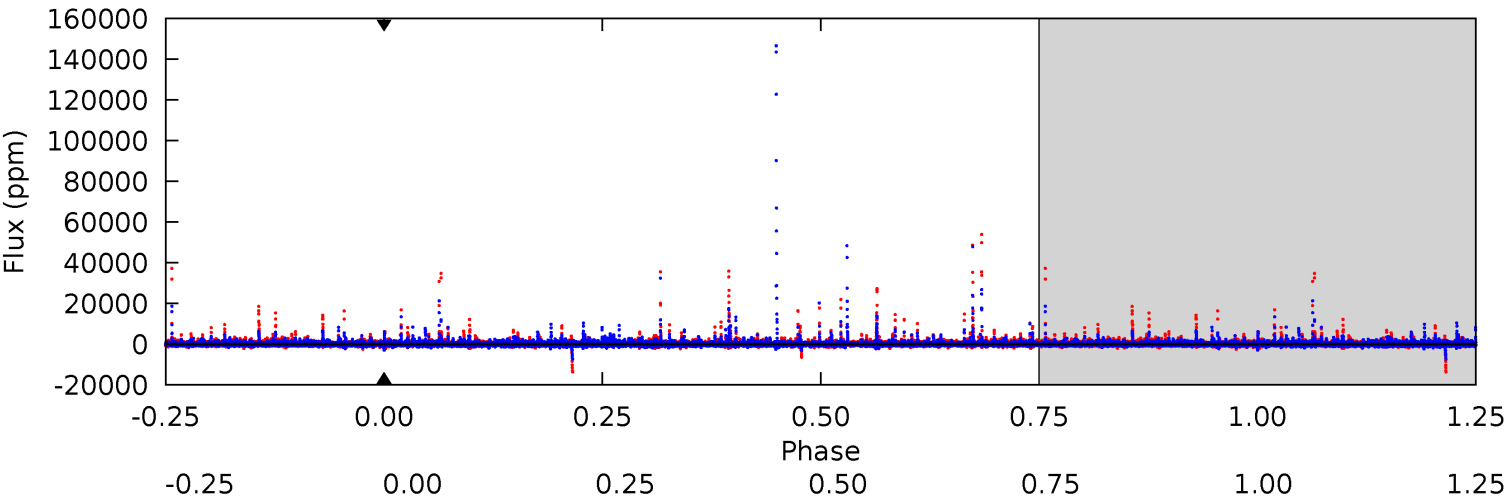
TCE 010989281-06 P=254.895582 Days  $T_0=261.539121$  (BKJD)



# DV Model-Shift Uniqueness Test

010989281-06, P = 254.895582 Days, E = 6.634154 Days

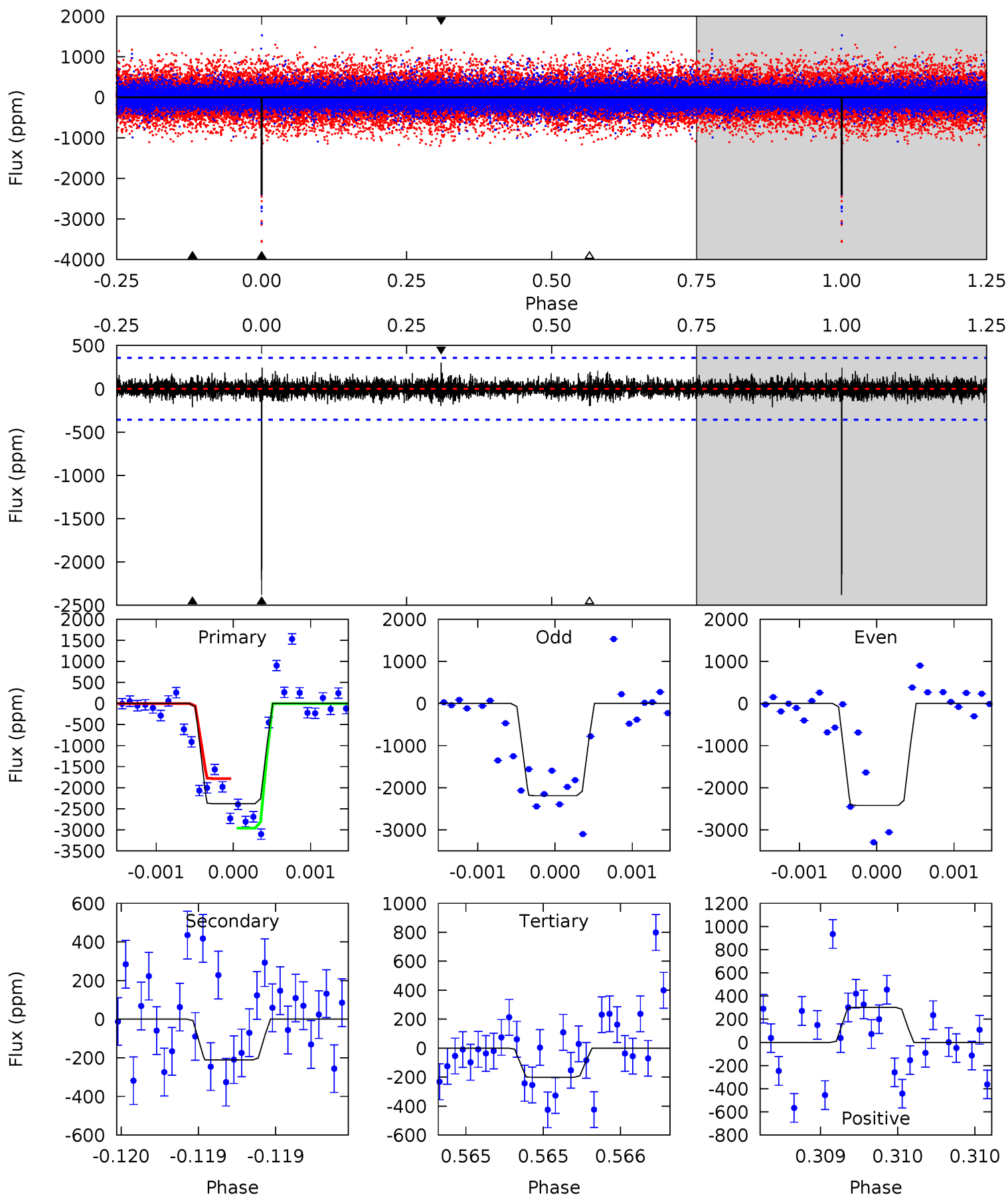
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
0	0	0	0	1.00	1.00	1.00	0	0	0	0	0	0	0	0



# Alt Model-Shift Uniqueness Test

010989281-06, P = 254.895582 Days, E = 6.643539 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
37.1	3.30	3.13	4.70	5.57	3.47	0.73	34.0	32.4	0.17	-1.40	1.85	1.04	0.11	8.14



### Stellar Parameters For KIC 010989281

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$5398^{+208}_{-170}$	$3.822^{+0.791}_{-0.339}$	$-0.640^{+0.350}_{-0.250}$	$1.843^{+1.313}_{-1.074}$	$0.821^{+0.194}_{-0.105}$	$0.185^{+2.882}_{-0.123}$
	+4%/-3%	+21%/-9%	+55%/-39%	+71%/-58%	+24%/-13%	+1560%/-66%
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 010989281-06 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$0 \pm 1000000$	$13.70^{+19.27}_{-9.61}$	$515^{+96}_{-86}$	$4645^{+13342}_{-22345}$	$3547^{+287046}_{-310594}$
Alt.	$-211 \pm 64$	$15.20^{+19.08}_{-10.71}$	$514^{+93}_{-85}$	$2885^{+1276}_{-455}$	$257^{+2665}_{-205}$

$T_{max}$  = 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

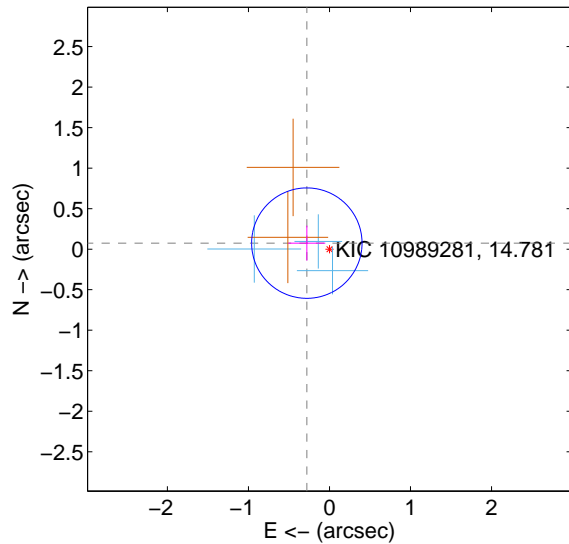
Supplemental centroid analysis for 010989281-06. Kepler magnitude: 14.78. Transit SNR -1.00

There are 3 quarters with good PRF difference image offsets

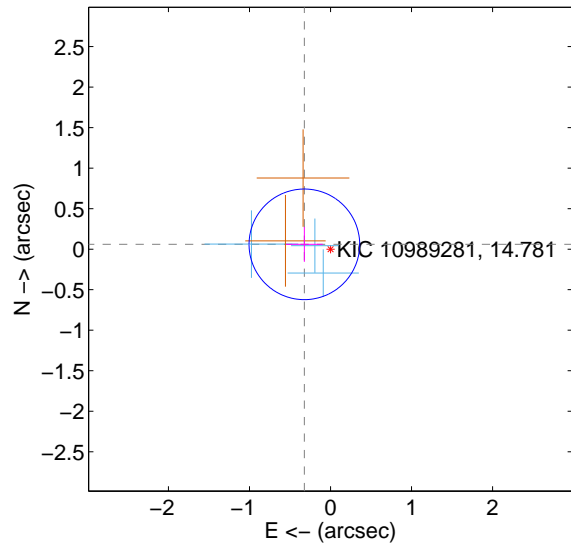
The direct PRF centroid is offset from the target star catalog position by about 0.06 arcsec

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$0.289 \pm 0.227$	1.27	$0.279 \pm 0.228$	$0.075 \pm 0.216$
PRF-fit source offset from KIC position	$0.328 \pm 0.227$	1.44	$0.323 \pm 0.228$	$0.060 \pm 0.216$
photometric centroid source offset	$0.89 \pm 0.53$	1.67	$-0.11 \pm 0.49$	$-0.88 \pm 0.53$

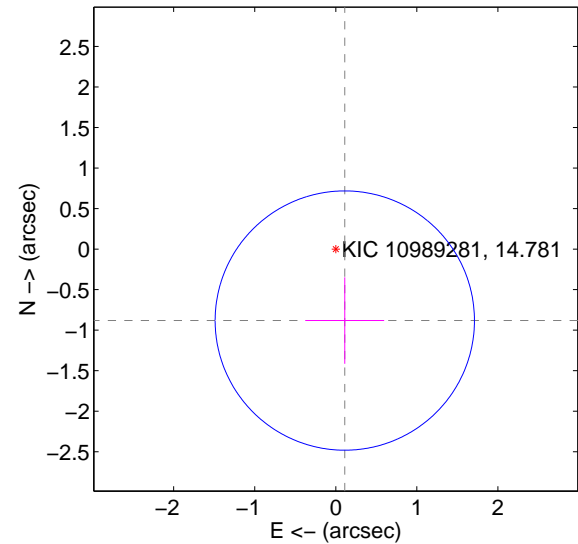
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

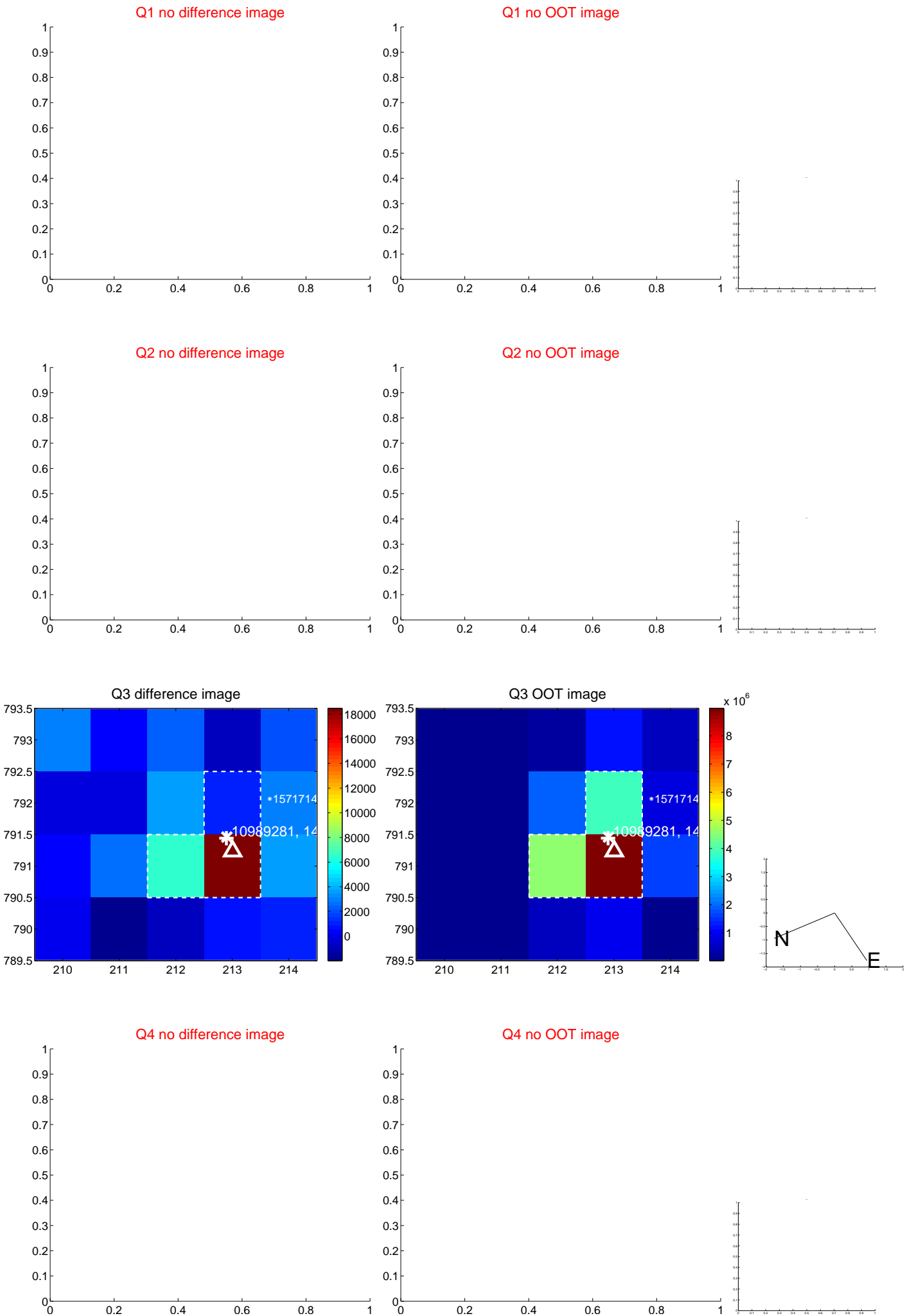


offset from photometric centroids

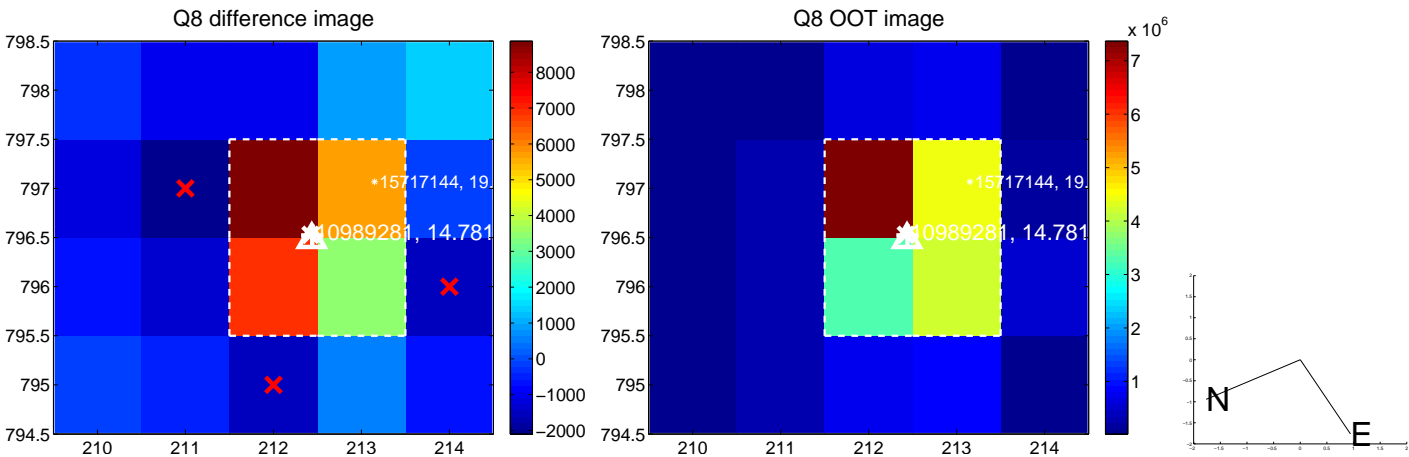
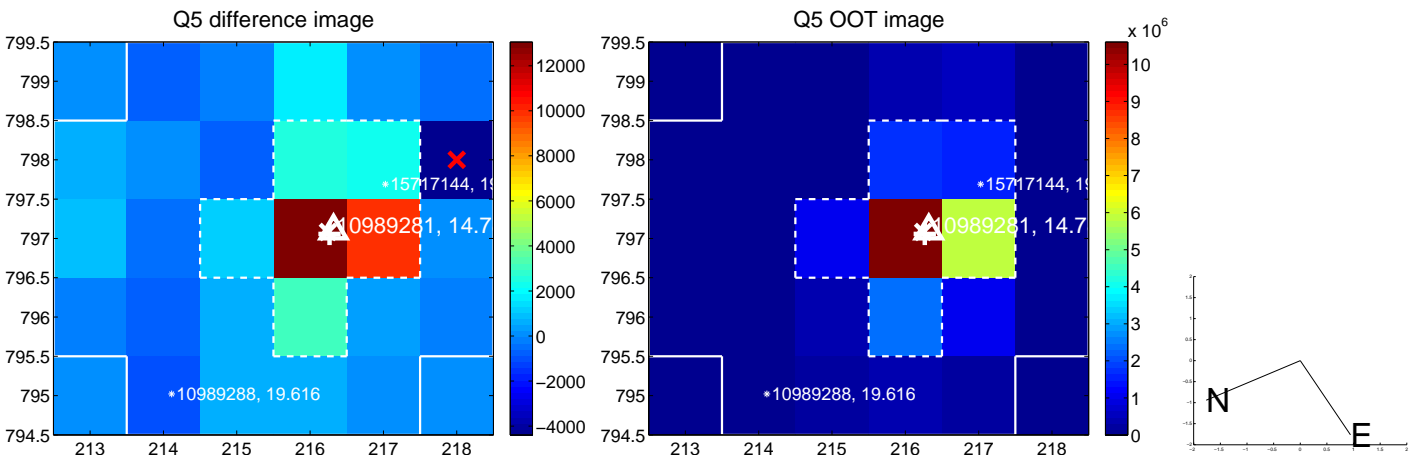


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

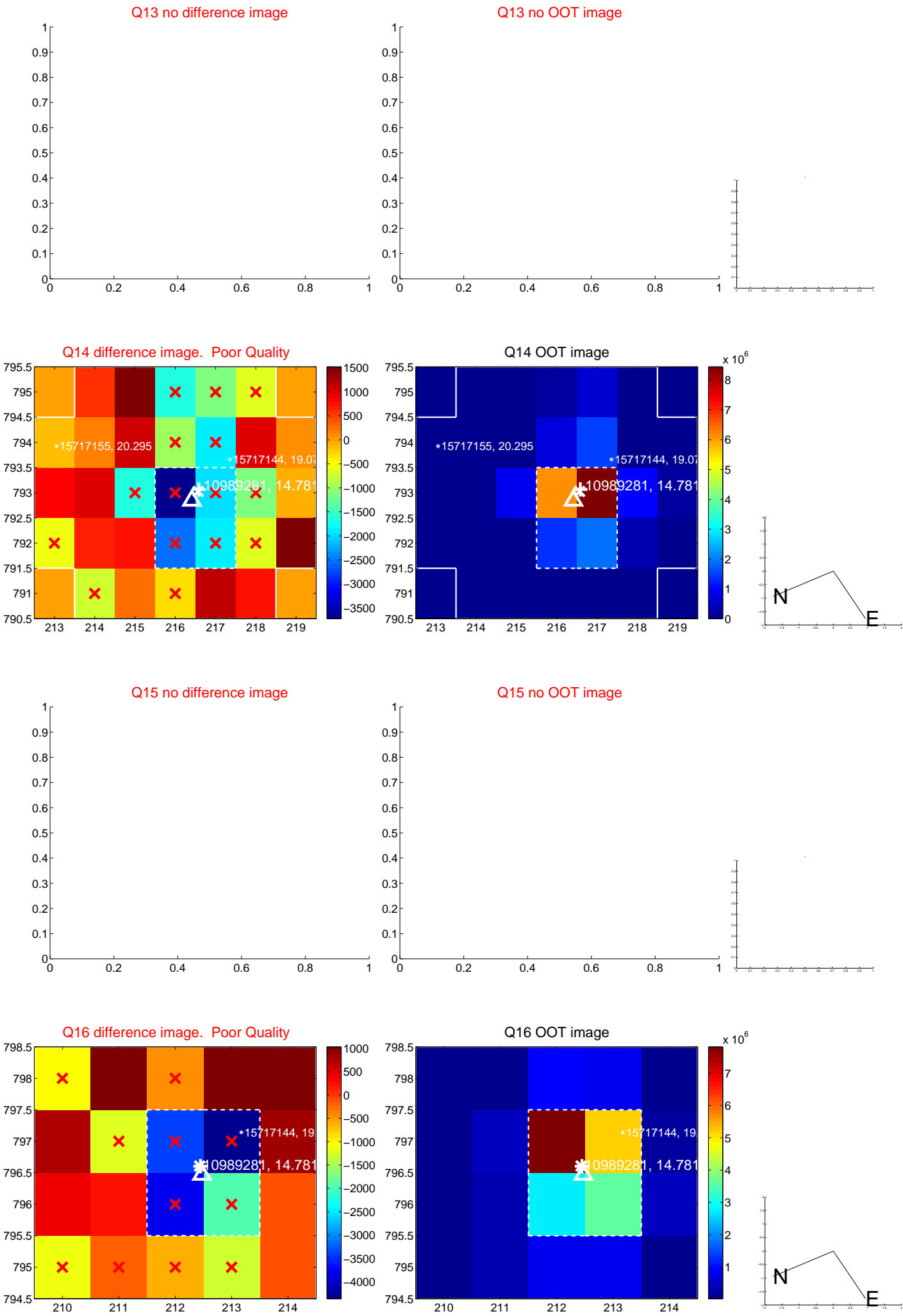




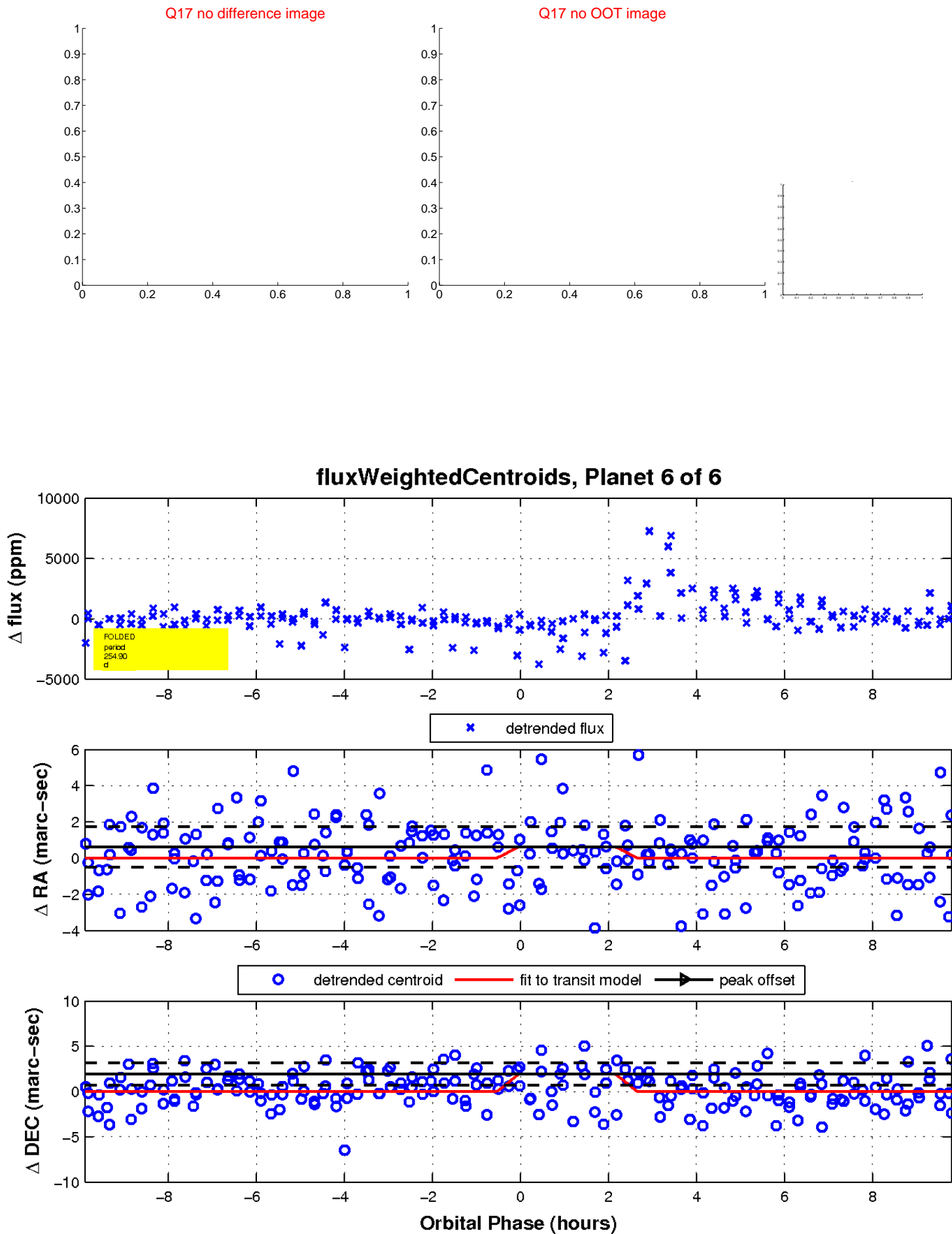
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

