

# KIC 003539521

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
003539521-01	OBS	No	3.037807	134.128381	30.8	13.831	10.4	7.8	2.88	6519	1.69	6368.89
003539521-02	OBS	No	6.077635	134.523968	180.2	52.742	13.9	16.6	2.88	6519	5.00	2526.38

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
003539521-01	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—CENT_KIC_POS
003539521-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE_ZUMA—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_KIC_POS

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

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

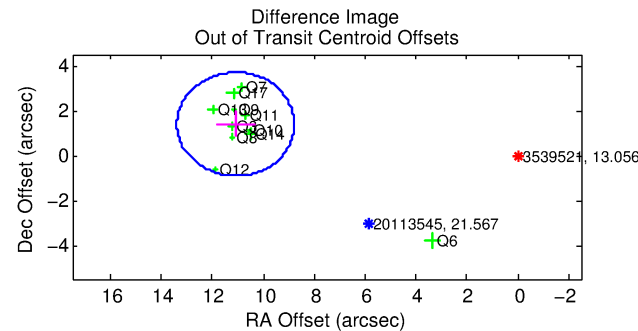
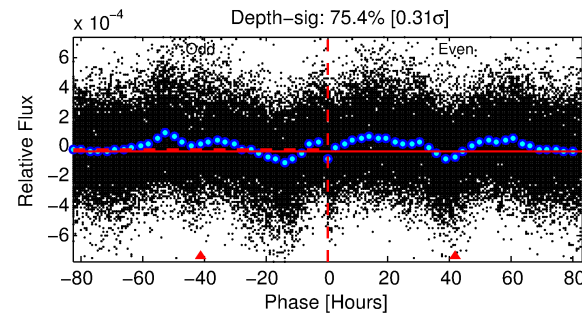
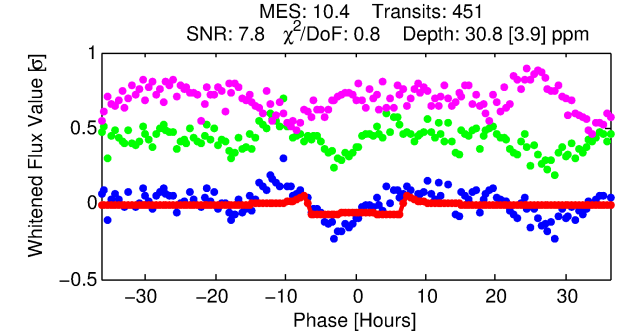
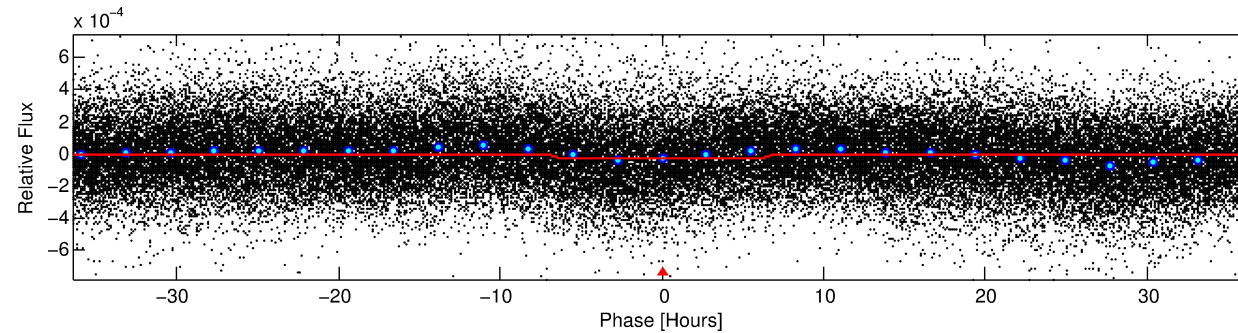
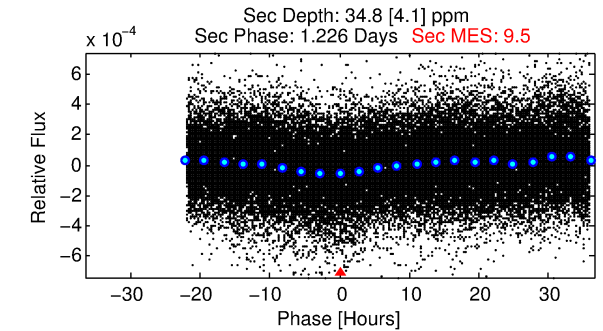
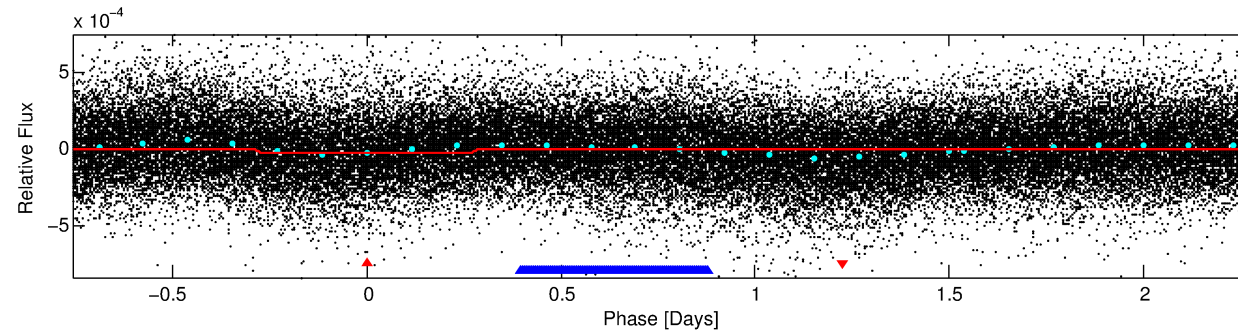
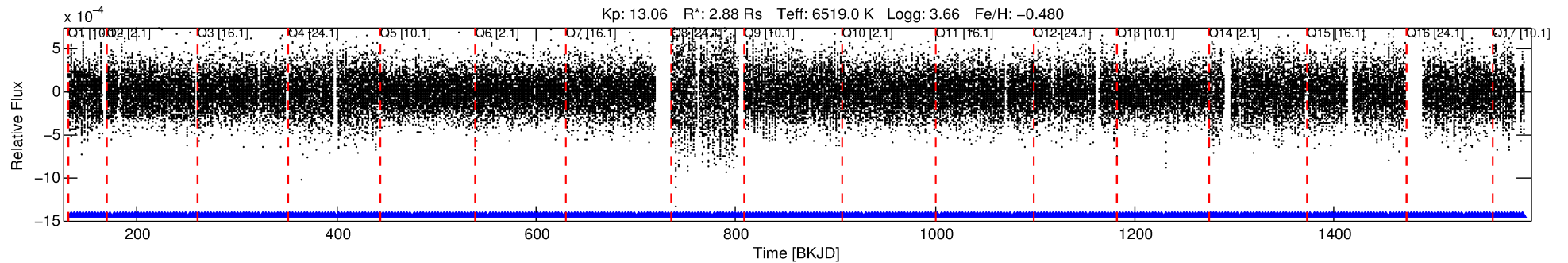
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 003539521-01

No Significant Match Found

# DV One-Page Summary

KIC: 3539521 Candidate: 1 of 2 Period: 3.038 d



## DV Fit Results:

Period = 3.03781 [0.00004] d  
Epoch = 134.1284 [0.0069] BKJD  
Rp/R\* = 0.0054 [0.0017]  
a/R\* = 1.50 [1.46]  
b = 0.66 [1.49]  
Seff = 6368.89 [3630.44]  
Teq = 2278 [325] K  
Rp = 1.69 [0.85] Re  
a = 0.0458 [0.0164] AU  
Ag = 14.04 [11.97] [1.09σ]  
Teff = 6817 [1112] K [3.92σ]

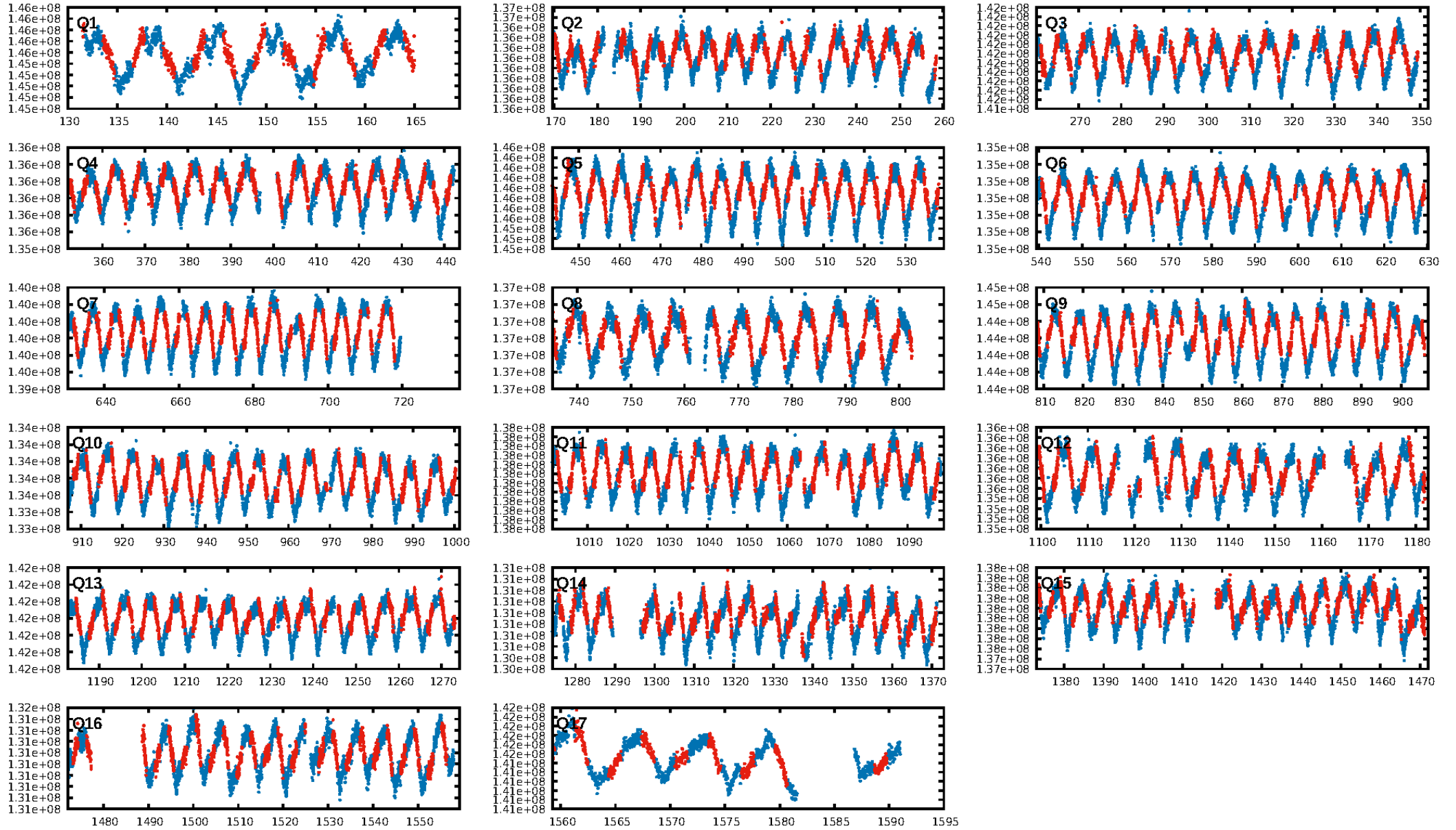
## DV Diagnostic Results:

ShortPeriod-sig: N/A  
LongPeriod-sig: 81.9% [1.34σ]  
ModelChiSquare2-sig: N/A  
ModelChiSquareGoF-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [432/432]  
GhostDiagnostic-chr: 1.889  
Centroid-sig: 0.0%  
Centroid-so: 2.745 arcsec [2.25σ]  
OotOffset-rm: 11.173 arcsec [14.54σ]  
KicOffset-rm: 0.309 arcsec [0.40σ]  
OotOffset-st: 3/3/2/3 [11]  
KicOffset-st: 3/3/2/3 [11]  
DiffImageQuality-fgm: 0.55 [6/11]  
DiffImageOverlap-fno: 1.00 [17/17]

Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 09:41:45 Z

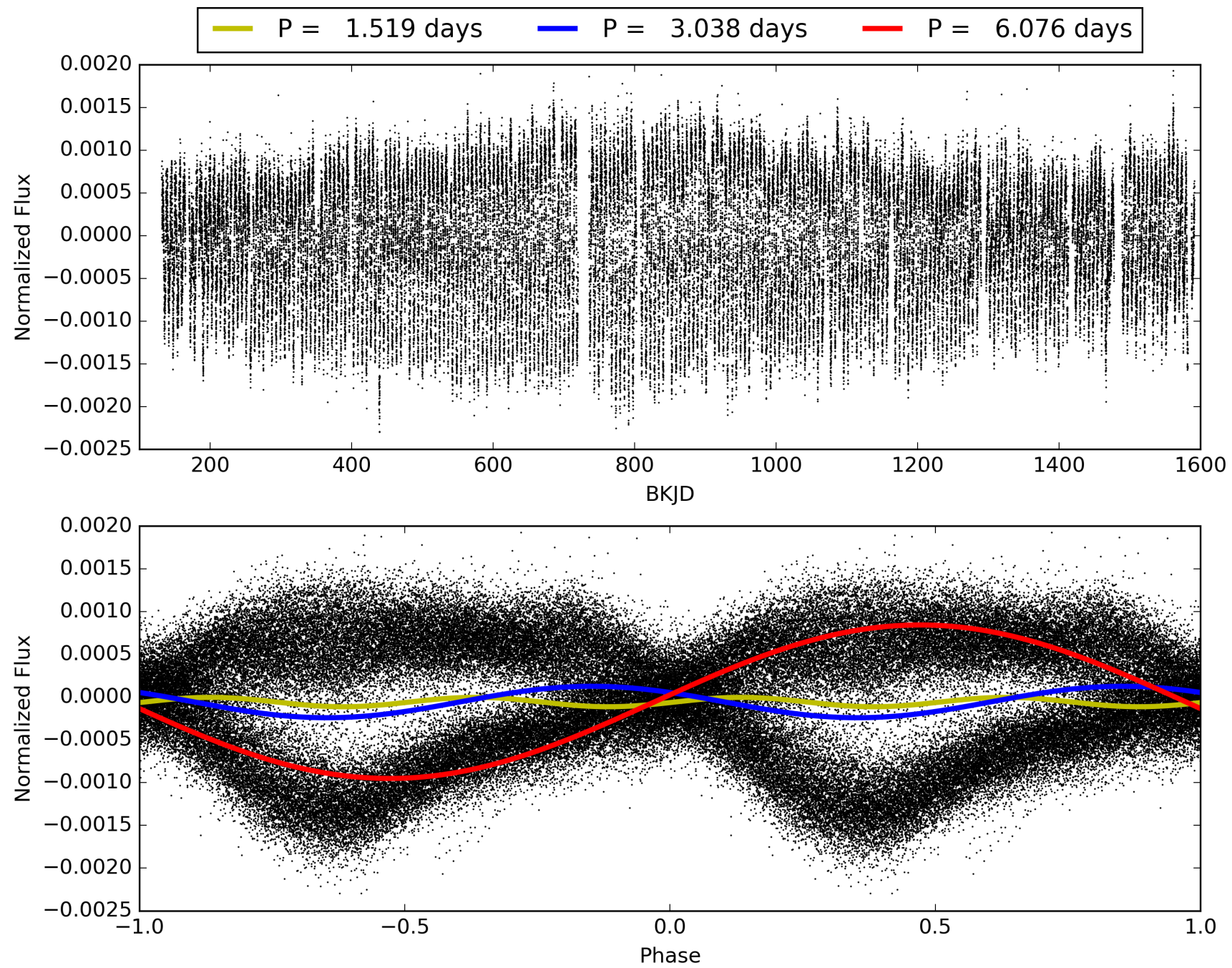
This Data Validation Report Summary was produced in the Kepler Science Operations Center Pipeline at NASA Ames Research Center

# TCE 003539521-01, PDC Light Curves



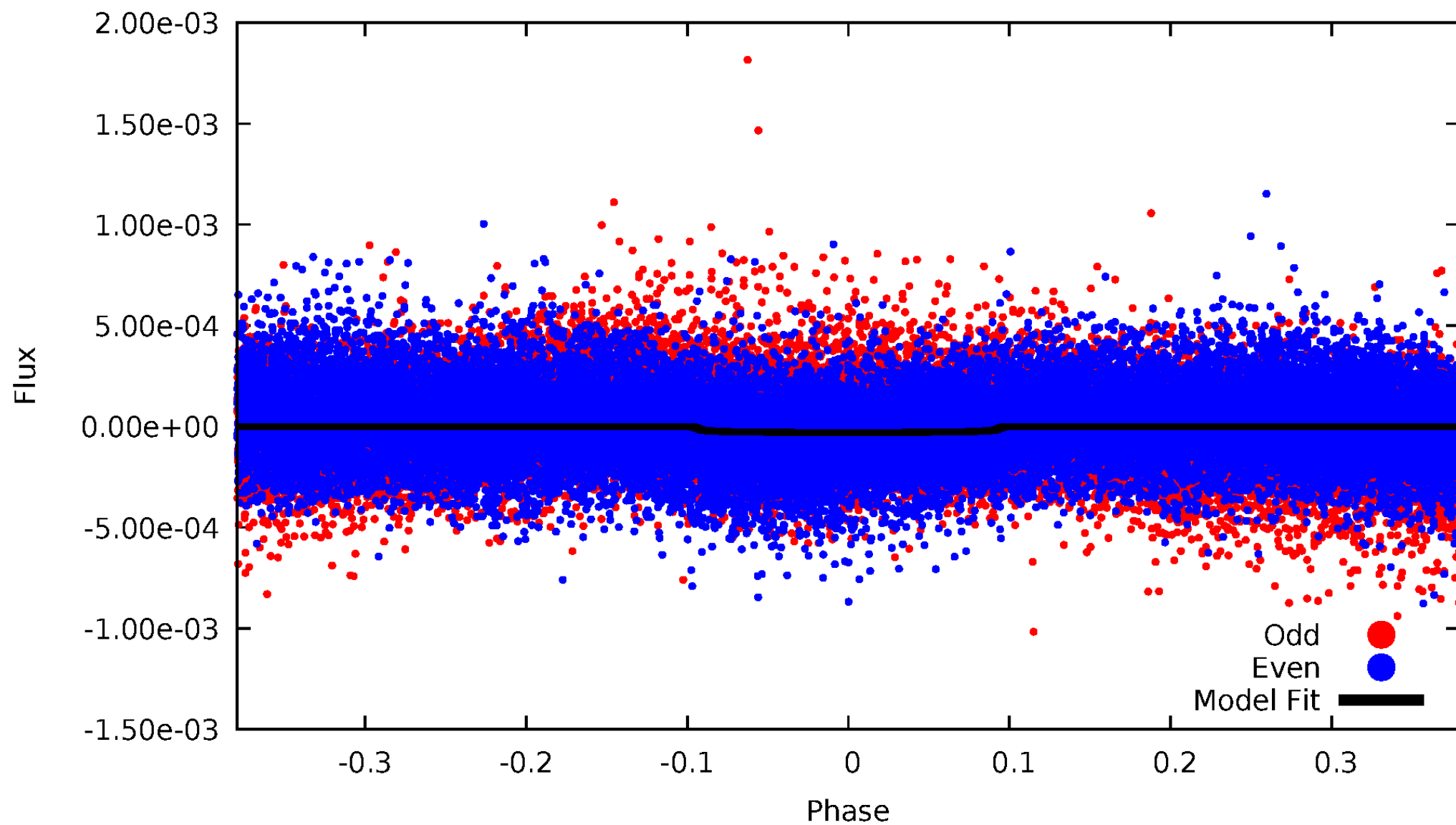


TCE 003539521-01



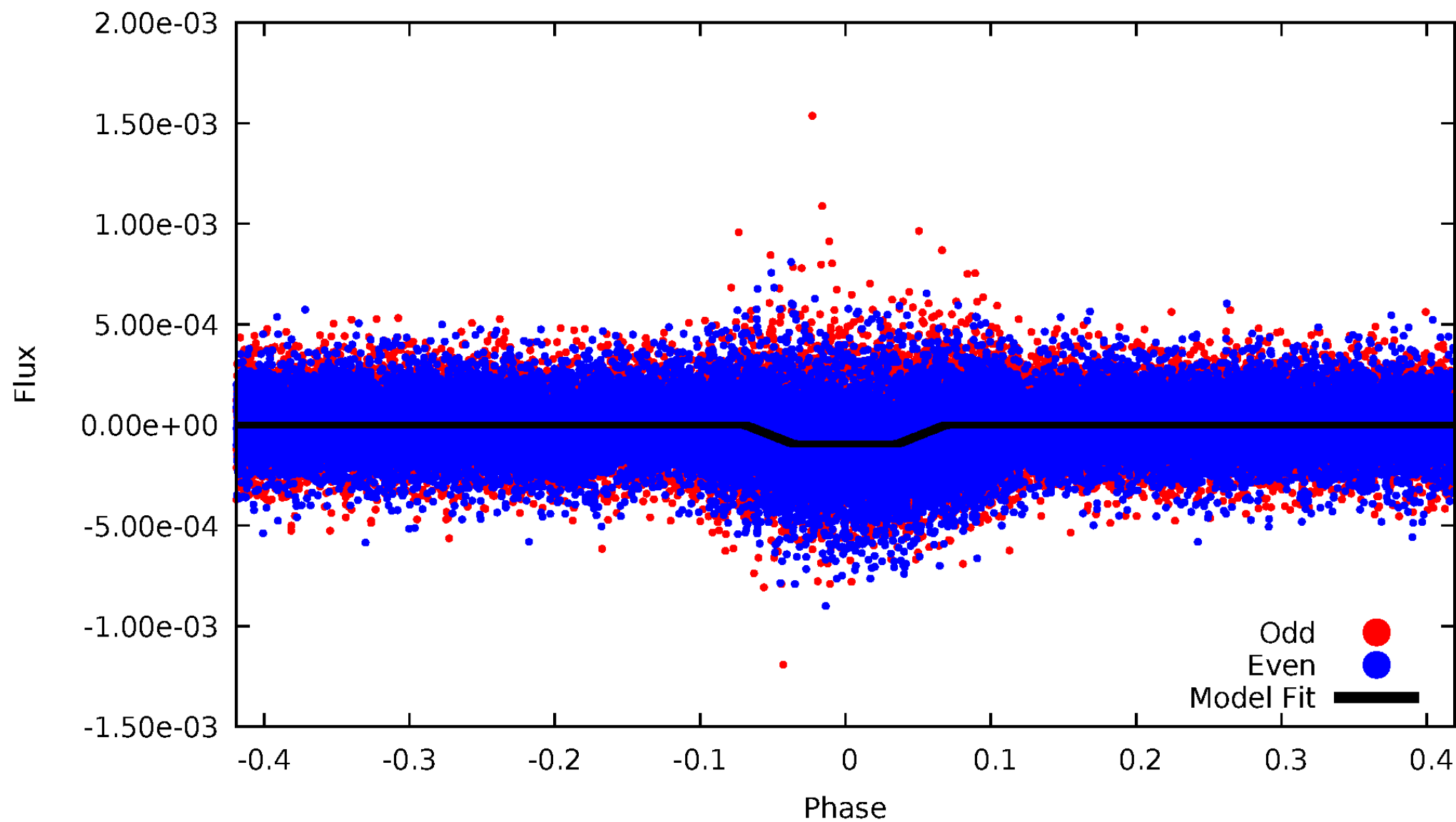
# DV Odd/Even

TCE 003539521-01



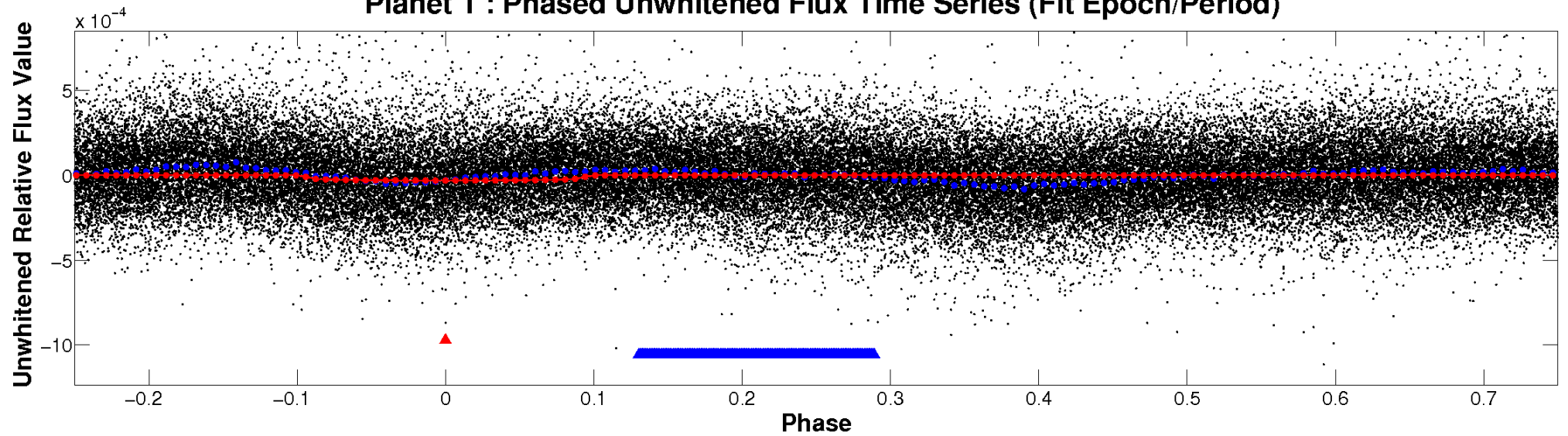
# ALT Odd/Even

TCE 003539521-01

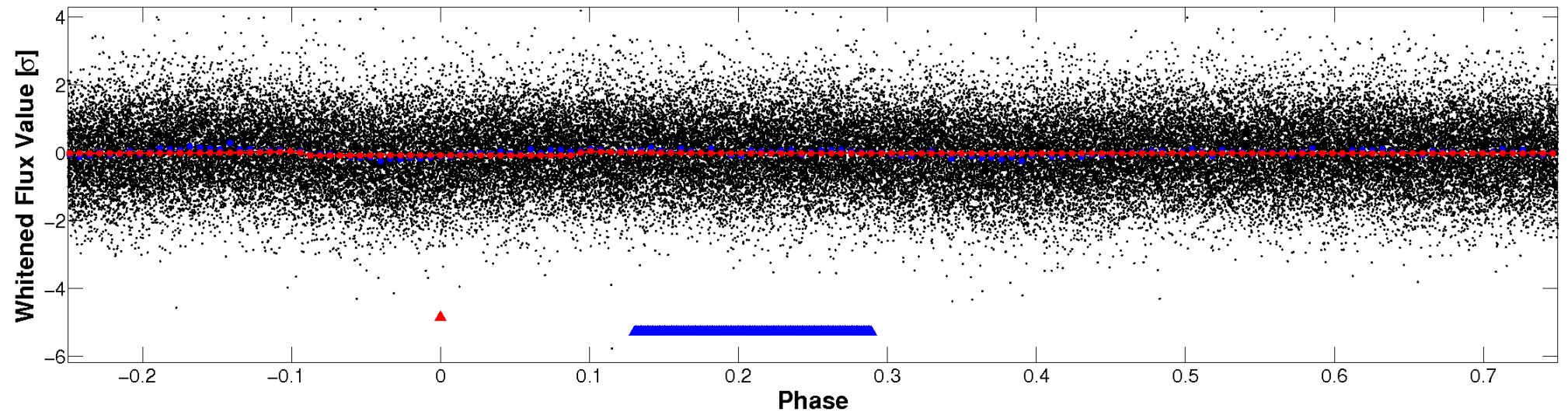


# Non-Whitened Vs. Whitened Light Curve

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



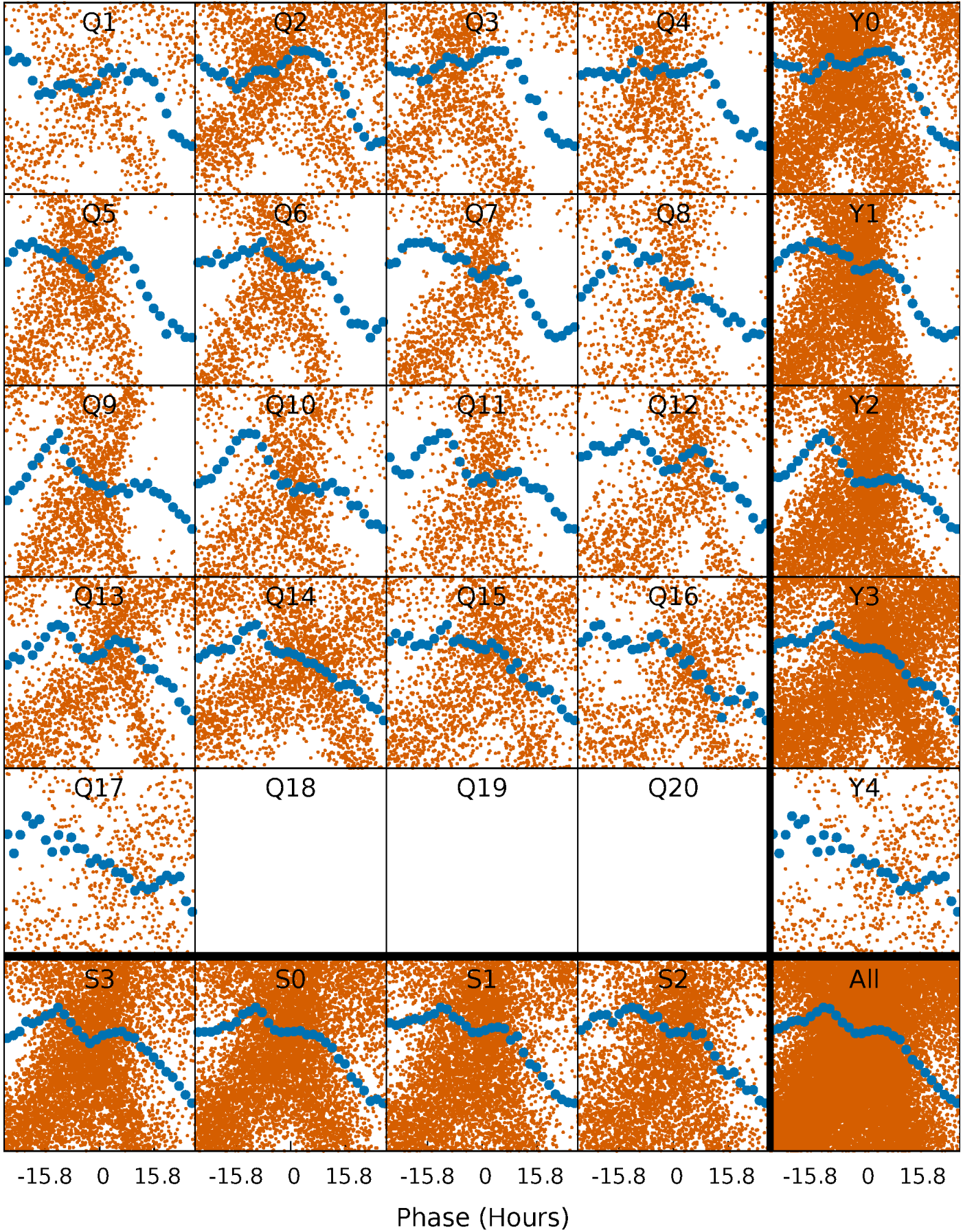
**Planet 1 : Phased Whitened Flux Time Series (Fit Epoch/Period)**





# PDC Quarter-Phased Transit Curves

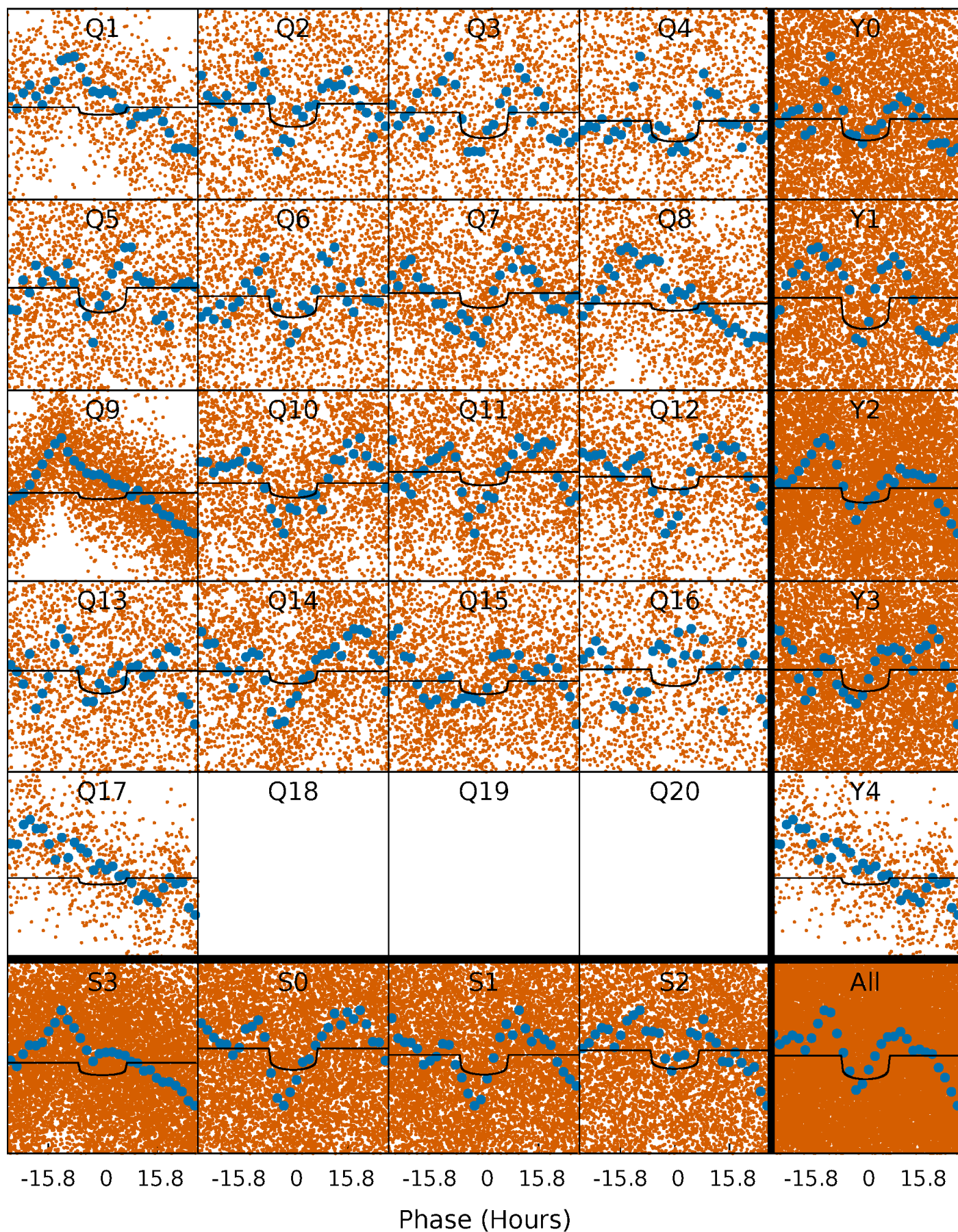
TCE 003539521-01 P= 3.037807 Days  $T_0=134.128381$  (BKJD)





# DV Quarter-Phased Transit Curves

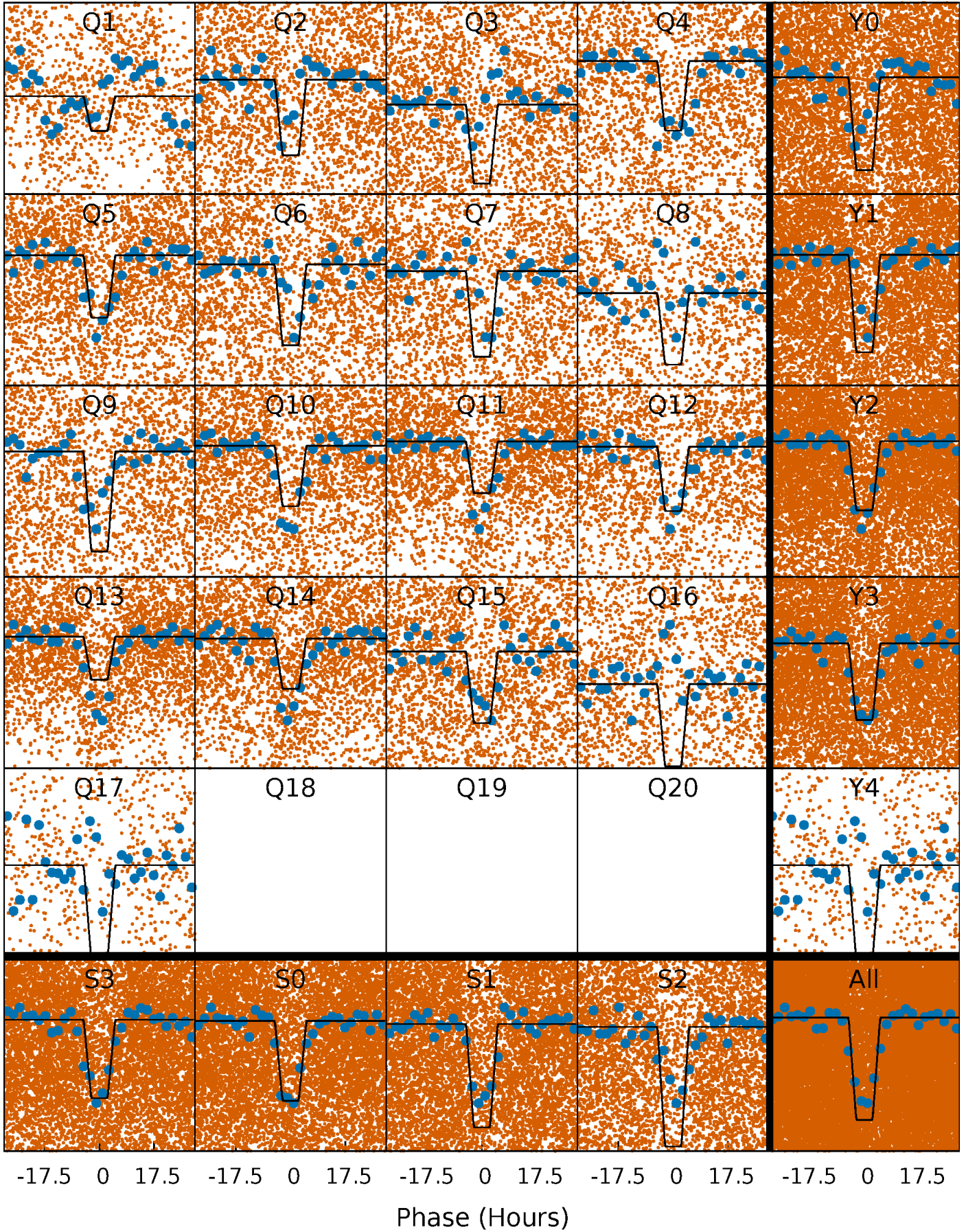
TCE 003539521-01   P= 3.037807 Days    $T_0=134.128381$  (BKJD)





# Alt. Detrend Quarter-Phased Transit Curves

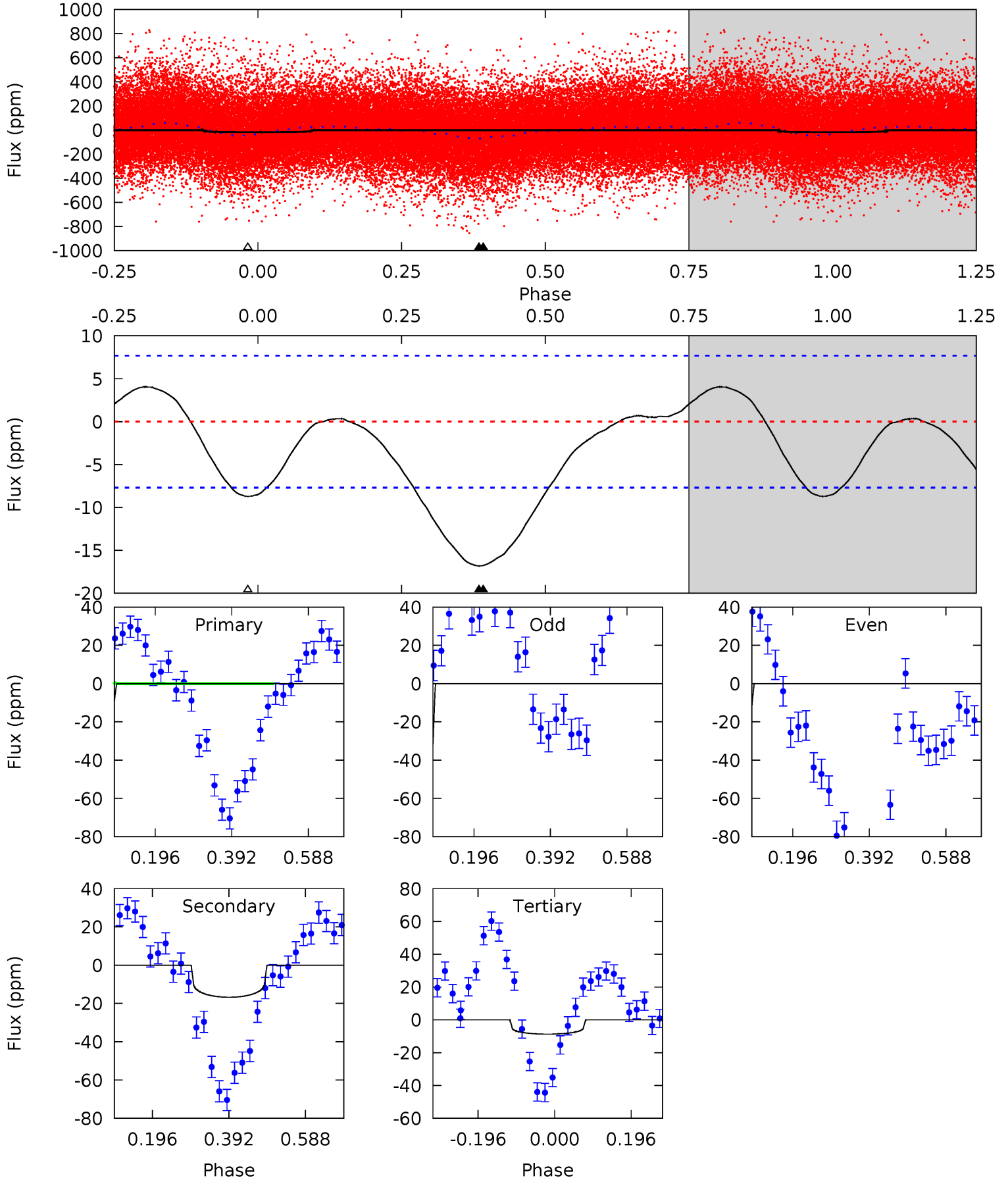
TCE 003539521-01 P= 3.037611 Days  $T_0=134.066701$  (BKJD)



# DV Model-Shift Uniqueness Test

003539521-01, P = 3.037807 Days, E = 131.090574 Days

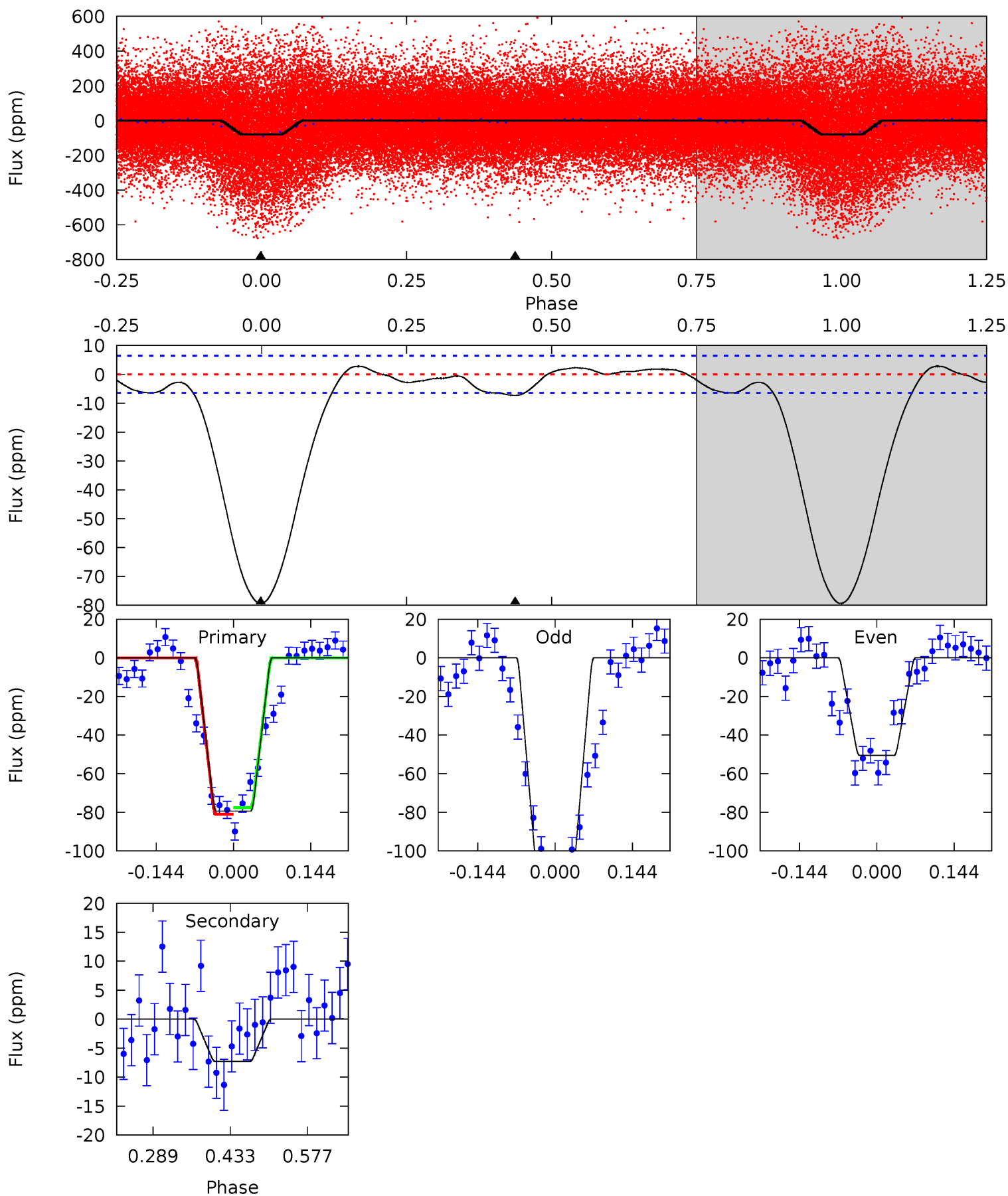
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
9.68	9.65	5.01	0	4.42	1.29	2.13	4.67	9.68	4.64	9.65	9.63	0.59	0.19	9.97



# Alt Model-Shift Uniqueness Test

003539521-01, P = 3.037611 Days, E = 131.029090 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
55.6	5.11	0	0	4.49	1.46	1.91	55.6	55.6	5.11	5.11	20.4	1.02	0.03	1.19





### Stellar Parameters For KIC 003539521

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$6519^{+178}_{-178}$	$3.664^{+0.323}_{-0.108}$	$-0.480^{+0.350}_{-0.300}$	$2.876^{+0.479}_{-1.118}$	$1.391^{+0.241}_{-0.294}$	$0.082^{+0.196}_{-0.028}$
	+3%/-3%	+9%/-3%	+73%/-62%	+17%/-39%	+17%/-21%	+237%/-34%
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 003539521-01 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{max}$ (K)	$T_{obs}$ (K)	$A_{obs}$
DV	$-17 \pm 2$	$1.61^{+0.62}_{-0.52}$	$3144^{+199}_{-296}$	$5577^{+1168}_{-661}$	$7.525^{+8.738}_{-3.657}$
Alt.	$-7 \pm 1$	$2.90^{+0.71}_{-0.69}$	$3132^{+186}_{-306}$	$3588^{+368}_{-355}$	$1.019^{+0.720}_{-0.398}$

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

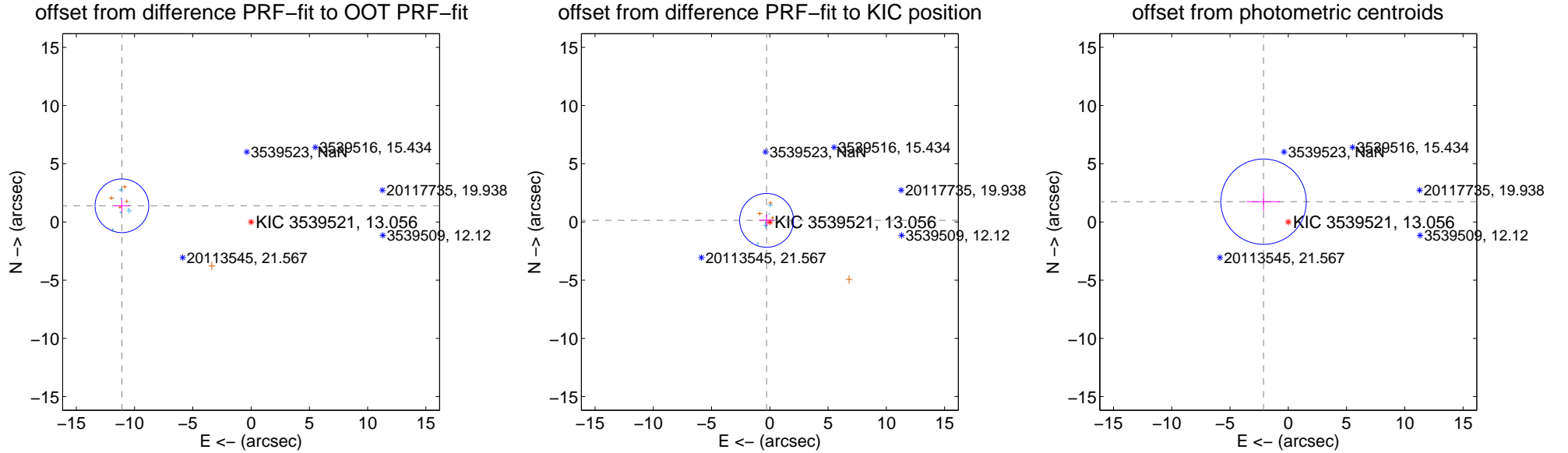
## DV Centroid Data

Supplemental centroid analysis for 003539521-01. Kepler magnitude: 13.06. Transit SNR 7.80

There are 6 quarters with good PRF difference image offsets

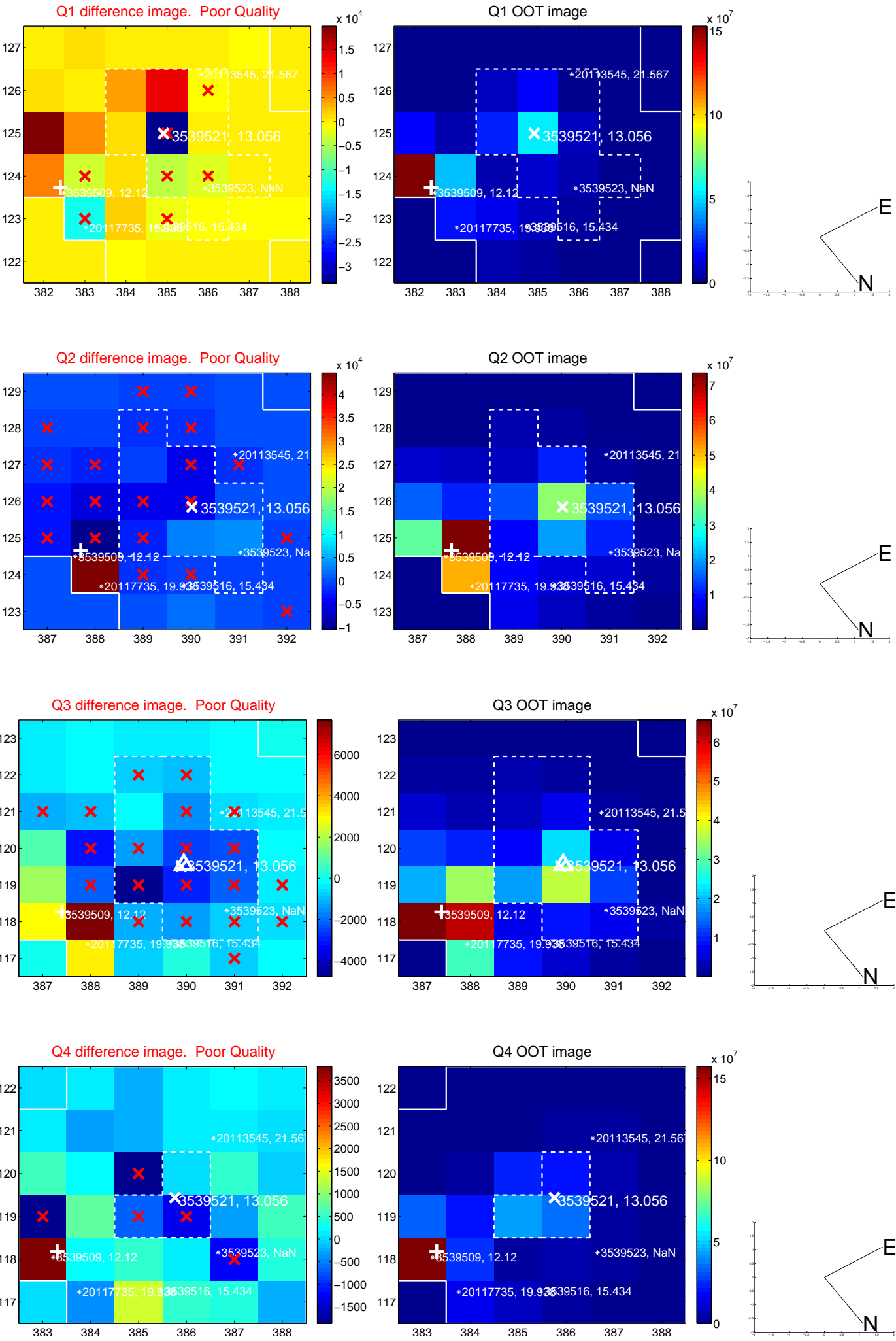
The OOT PRF centroid is offset from the target star catalog position by about 11.29 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	<b>11.173 <math>\pm</math> 0.768</b>	<b>14.54</b>	11.086 $\pm$ 0.719	1.390 $\pm$ 0.554
PRF-fit source offset from KIC position	0.309 $\pm$ 0.771	0.40	0.276 $\pm$ 0.635	0.139 $\pm$ 0.526
photometric centroid source offset	2.75 $\pm$ 1.22	2.25	2.12 $\pm$ 1.44	1.74 $\pm$ 0.79

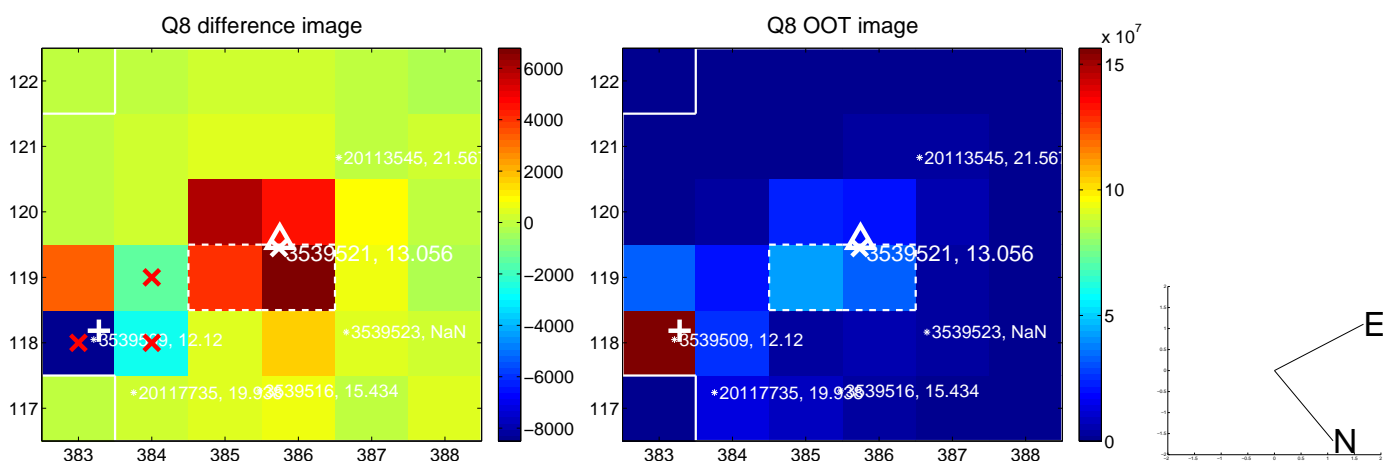
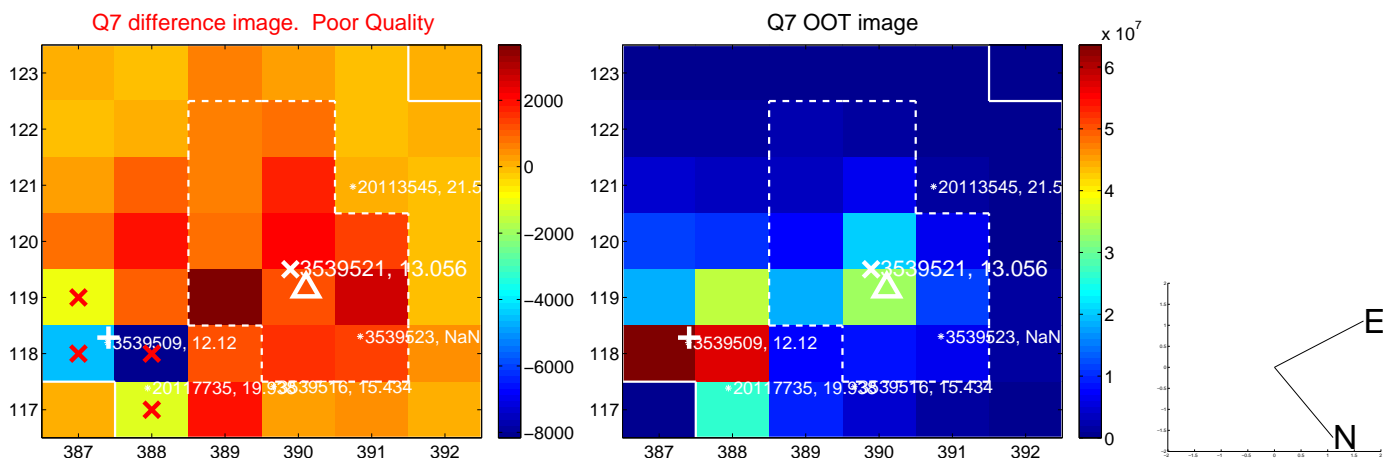
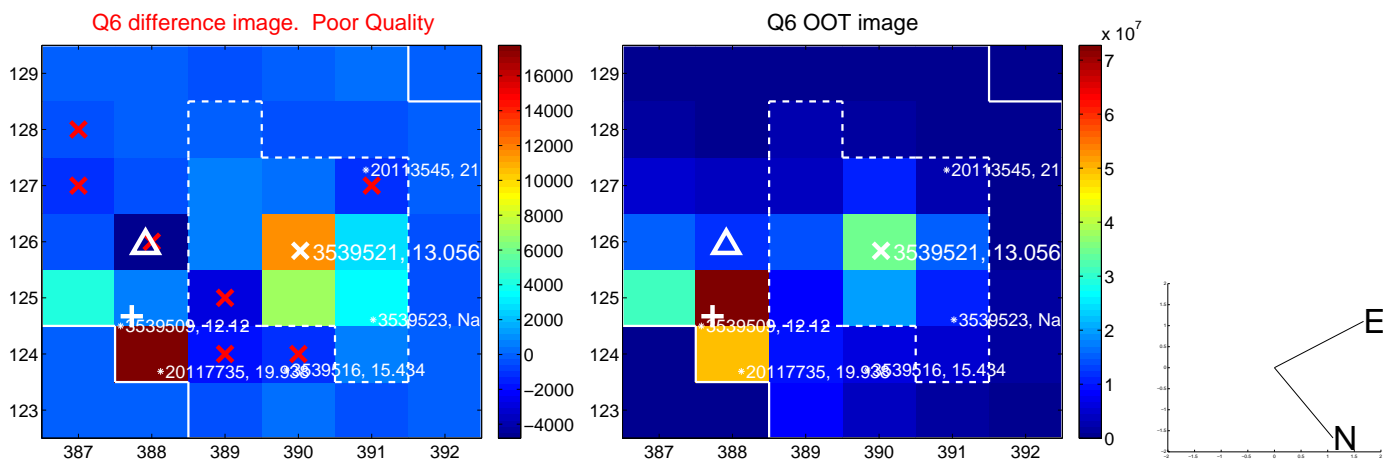
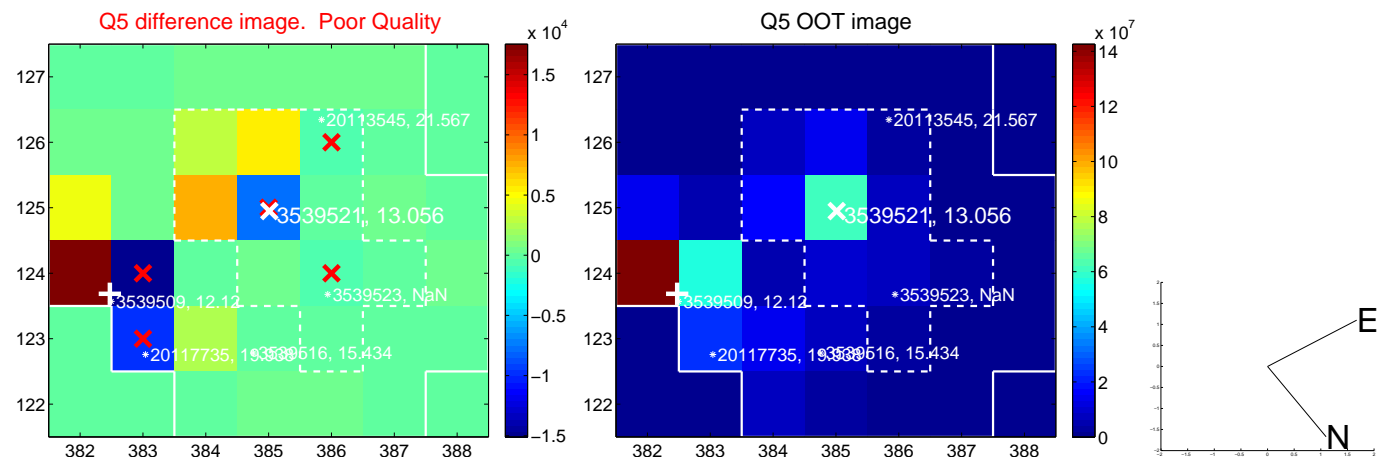


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. **Sky blue crosses: good quarterly centroid offsets**; **Vermillion crosses: bad quarterly centroid offsets**; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three- $\sigma$ . Red \*: target star. Blue \*: Other stars. Text next to a star gives its KIC ID and kepmag. KIC IDs > 15,000,000 are from the UKIRT catalog.

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

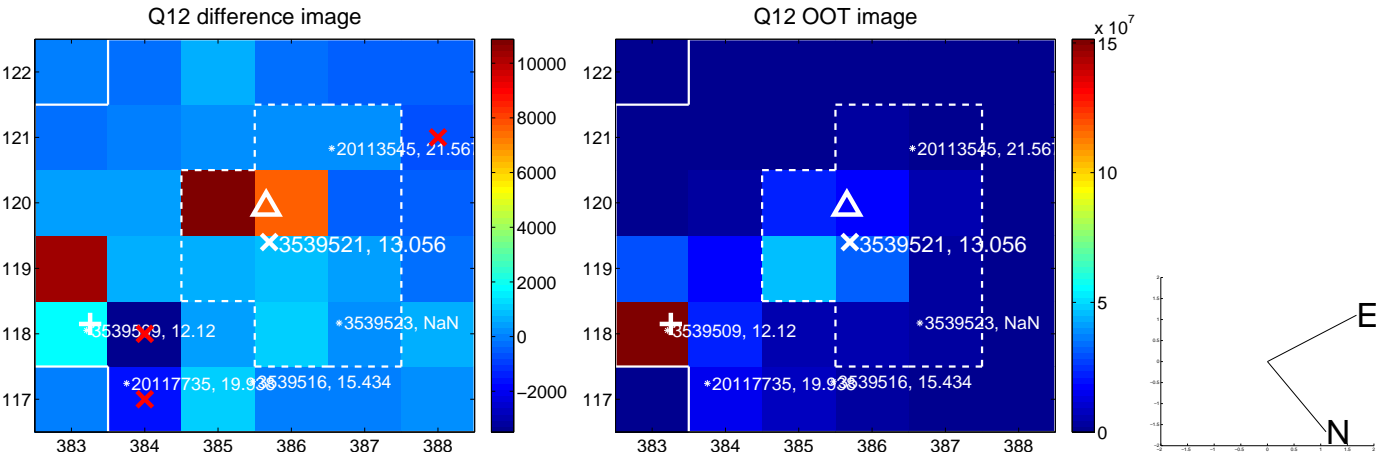
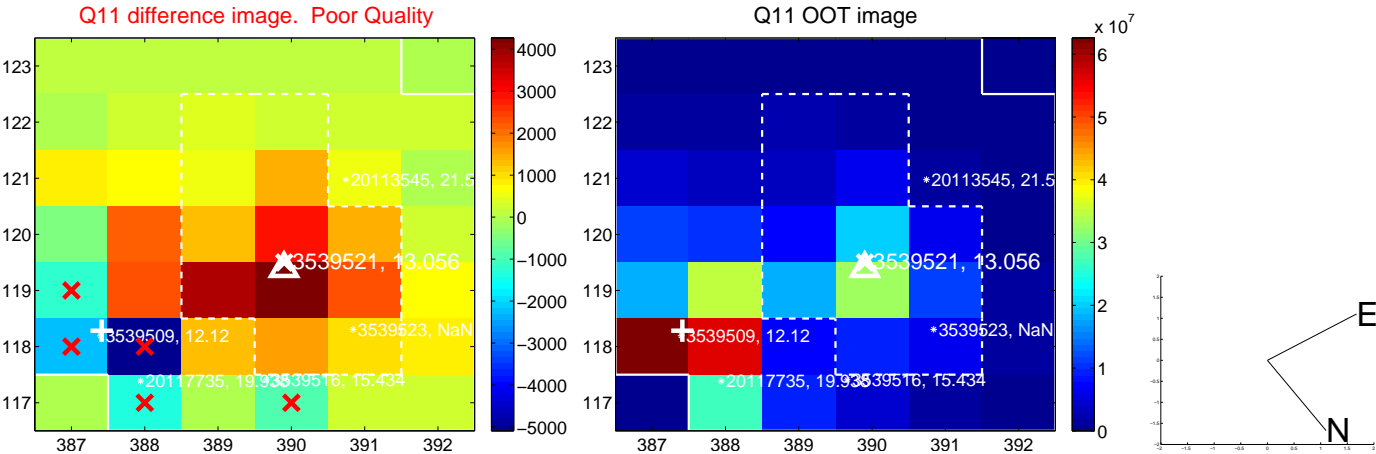
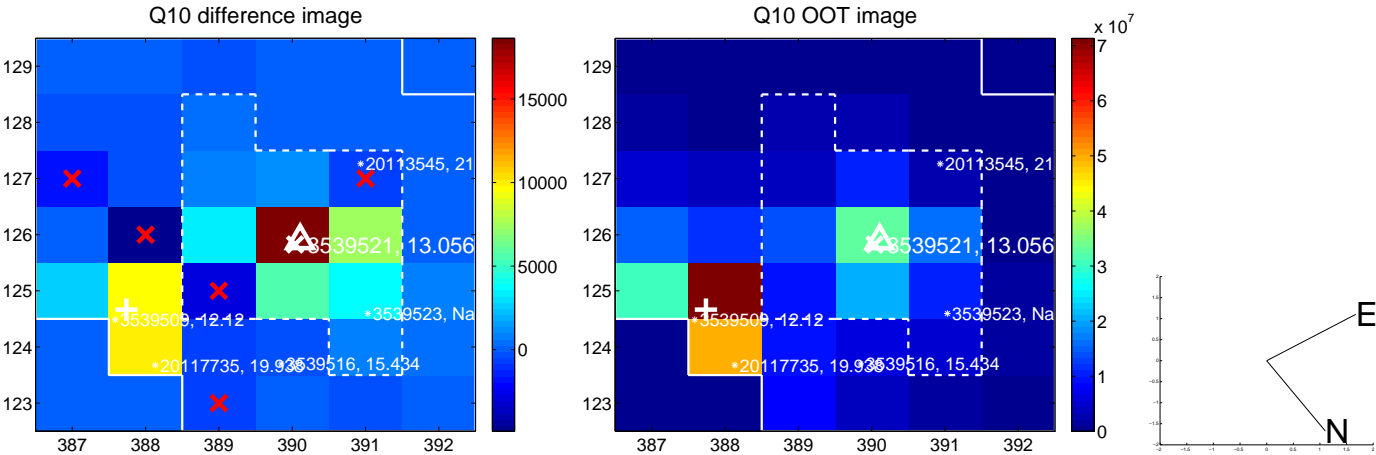
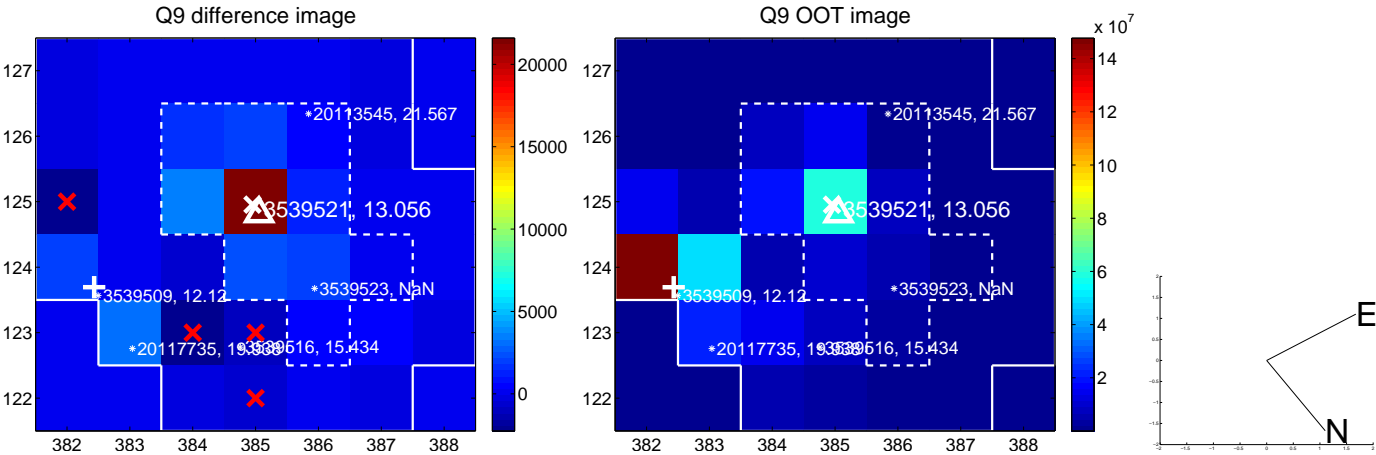


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

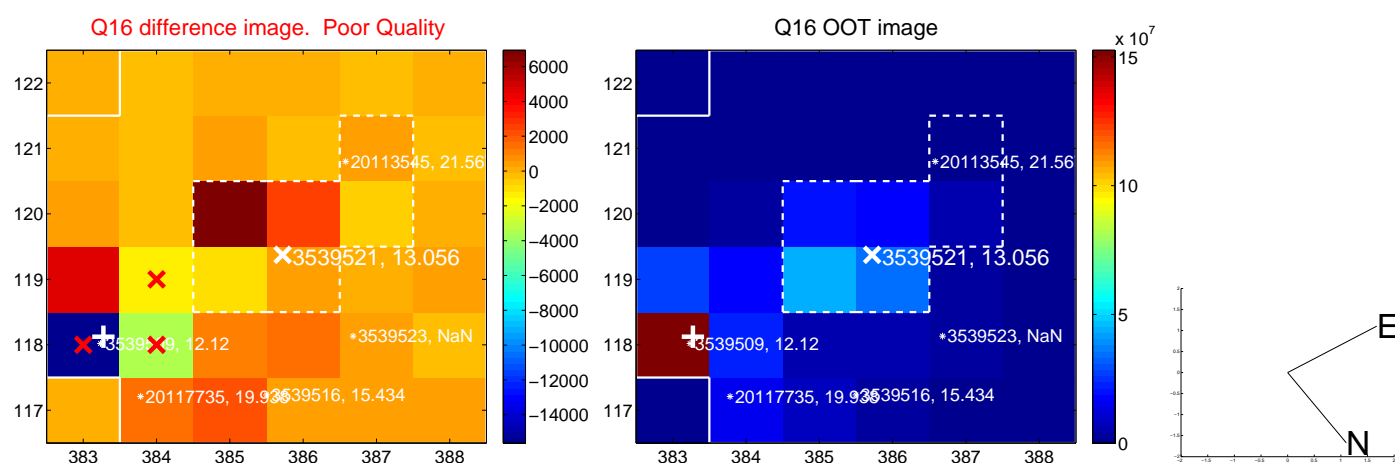
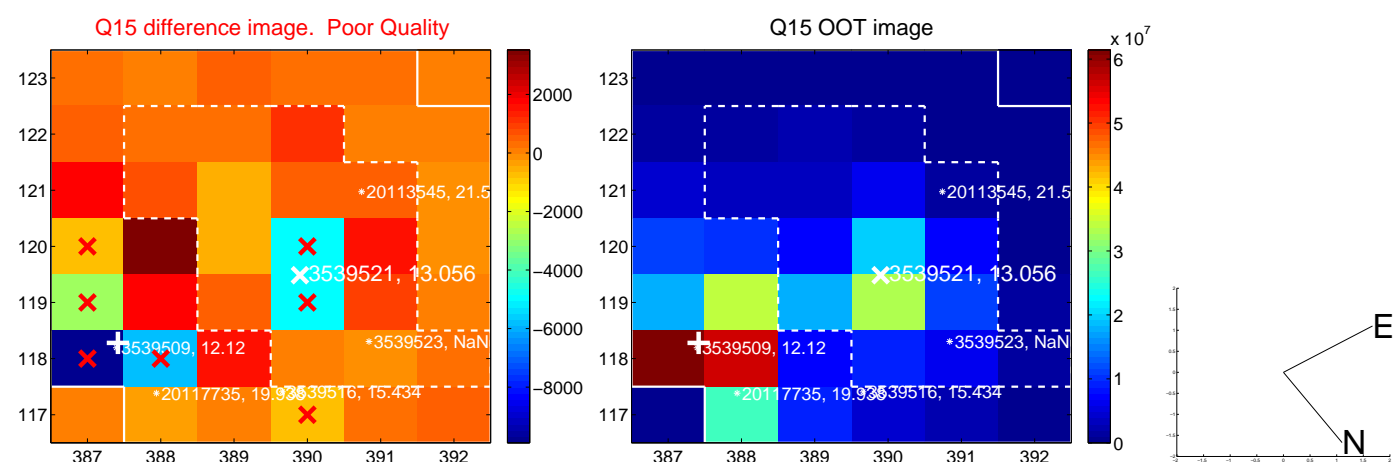
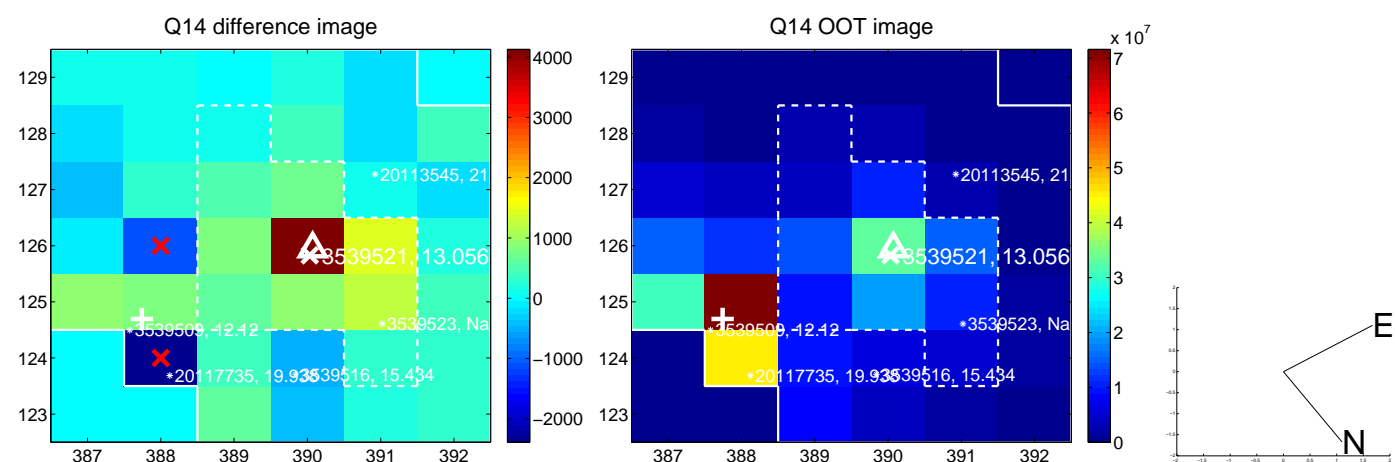
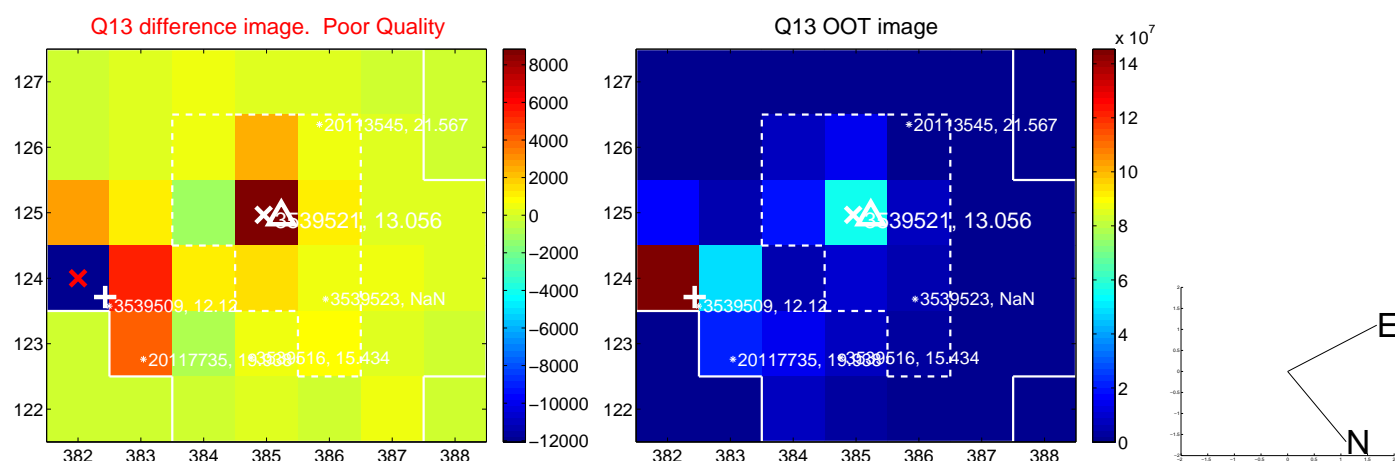




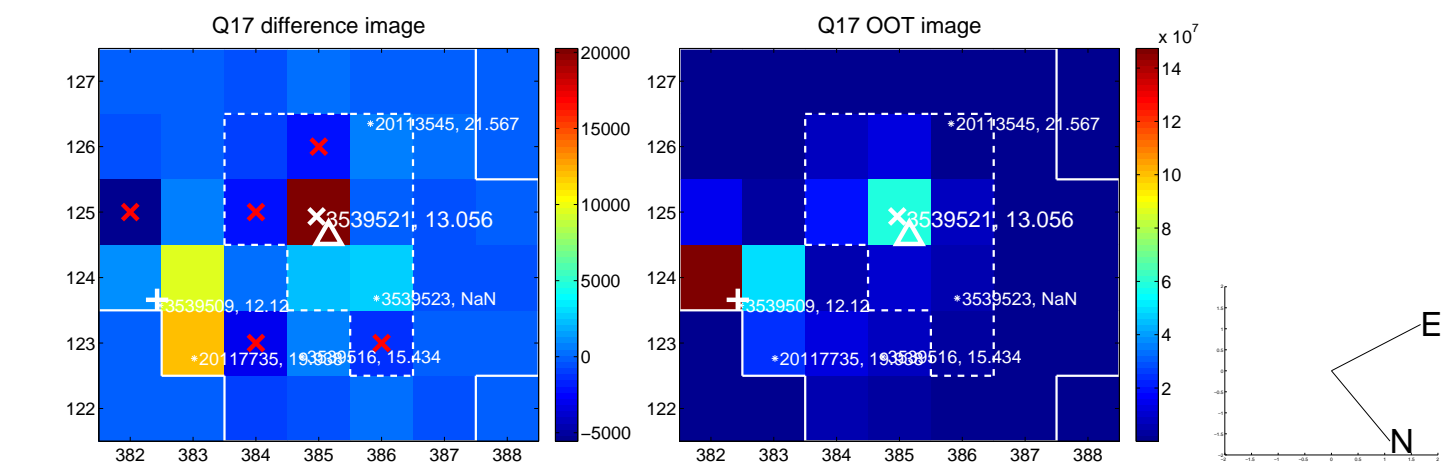
white  $\times$ : KIC target position; +: OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



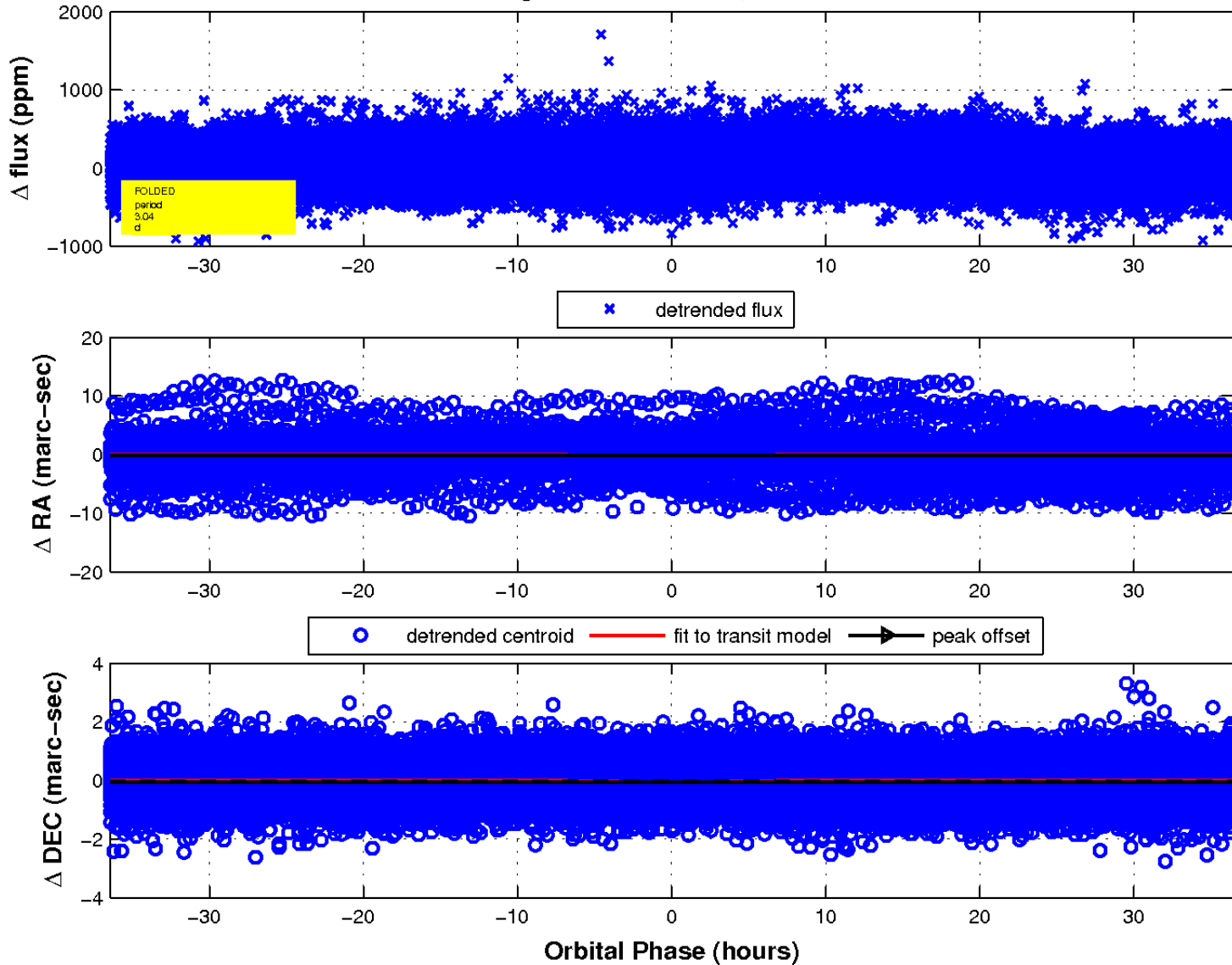
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

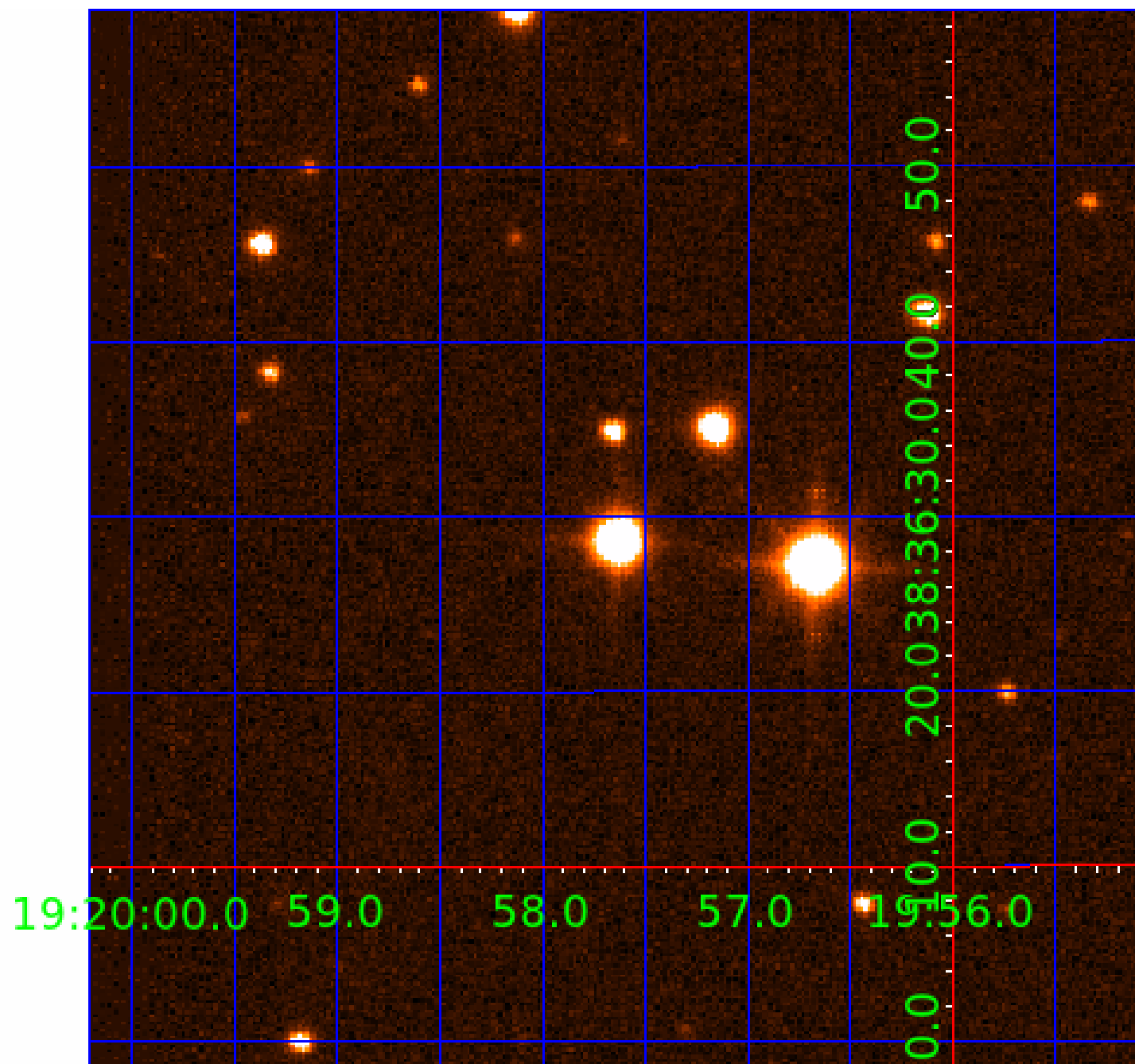


fluxWeightedCentroids, Planet 1 of 2



# UKIRT Image

Declination





# KIC 003539521

## 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)	$R_p$ ( $R_{\oplus}$ )	$S_p$ ( $S_{\oplus}$ )
003539521-01	OBS	No	3.037807	134.128381	30.8	13.831	10.4	7.8	2.88	6519	1.69	6368.89
003539521-02	OBS	No	6.077635	134.523968	180.2	52.742	13.9	16.6	2.88	6519	5.00	2526.38

## Robovetter Results

TCE	Run Type	Disp	Score	N	S	C	E	Comments
003539521-01	OBS	FP	0.00	1	0	0	0	SWEET_NTL—LPP_DV—CENT_KIC_POS
003539521-02	OBS	FP	0.00	1	0	0	0	INDIV_TRANS_RUBBLE_SKYE_ZUMA—LPP_DV—MOD_NONUNIQ_DV—MOD_NONUNIQ_ALT—CENT_KIC_POS

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

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

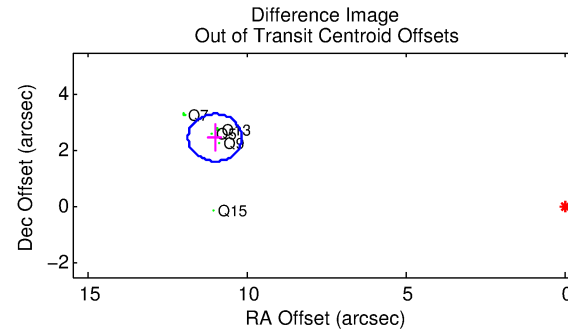
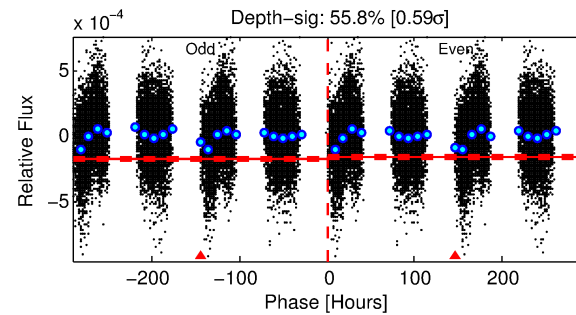
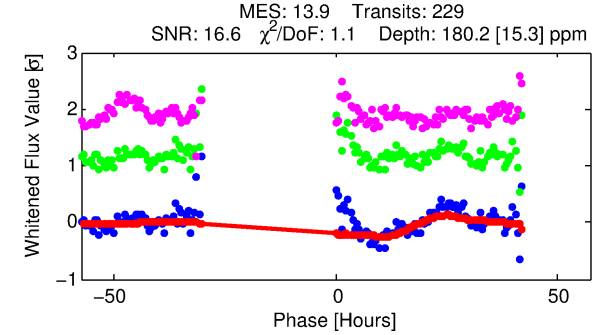
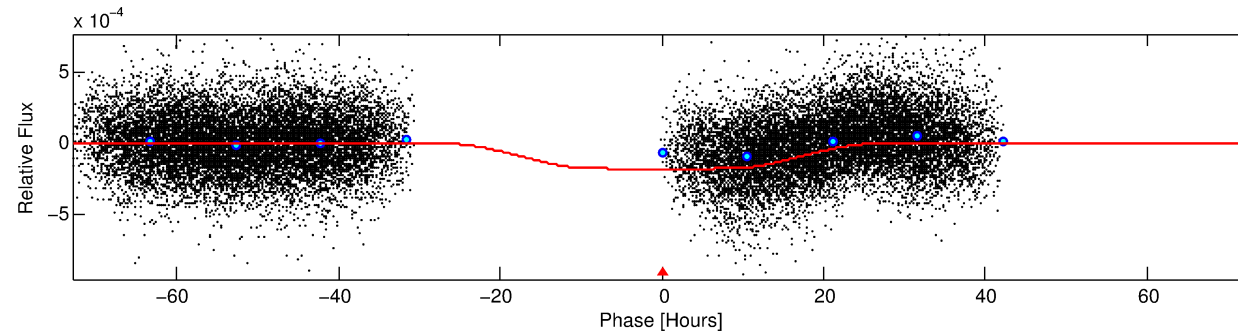
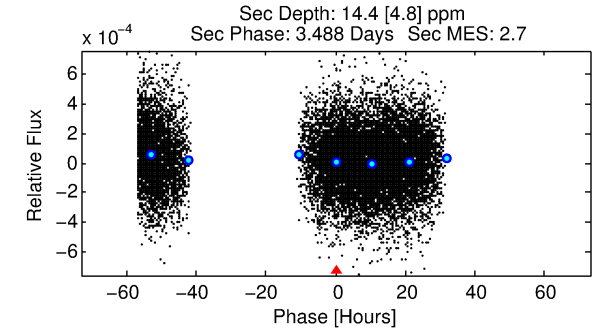
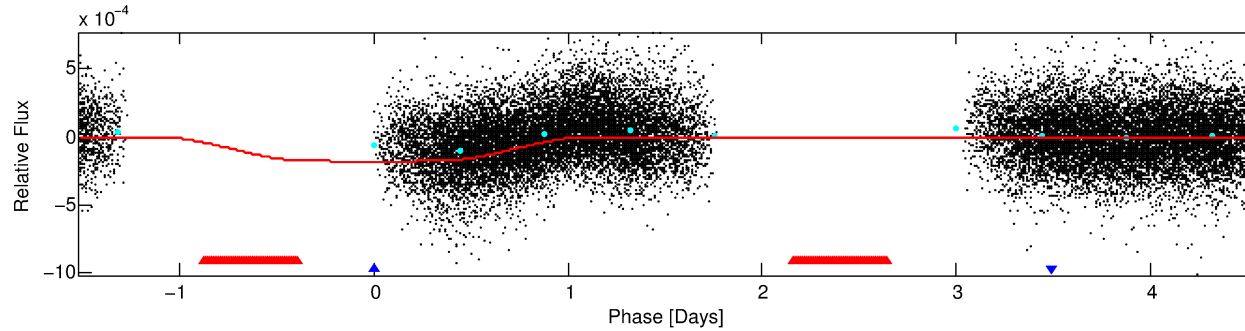
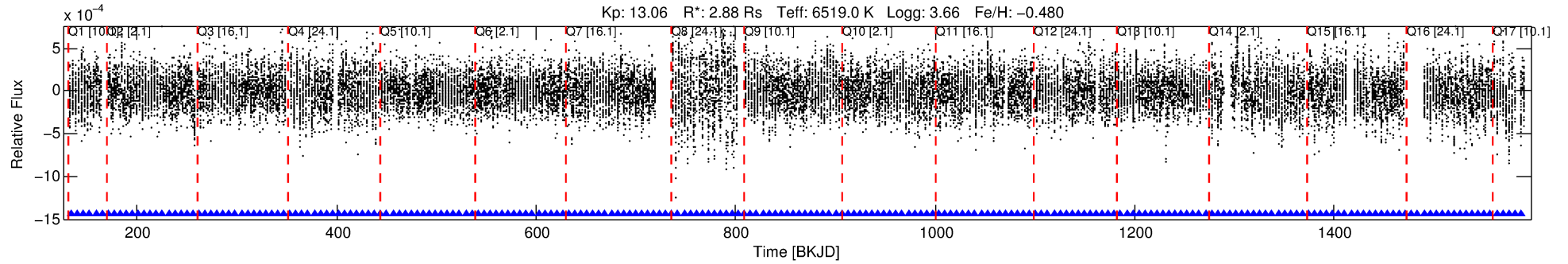
See [http://exoplanetarchive.ipac.caltech.edu/docs/API\\_kepcandidate\\_columns.html#proj\\_disp\\_col](http://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col) for comment definitions.

## Ephemeris Match Information For 003539521-02

No Significant Match Found

# DV One-Page Summary

KIC: 3539521 Candidate: 2 of 2 Period: 6.078 d



## DV Fit Results:

Period = 6.07764 [0.00029] d  
Epoch = 134.5240 [0.0908] BKJD  
Rp/R\* = 0.0159 [0.0007]  
a/R\* = 1.02 [0.00]  
b = 0.97 [0.01]  
Seff = 2526.38 [1440.10]  
Teq = 1808 [258] K  
Rp = 5.00 [1.95] Re  
a = 0.0728 [0.0261] AU  
Ag = 1.68 [1.11] [0.61σ]  
Teff = 3182 [289] K [3.55σ]

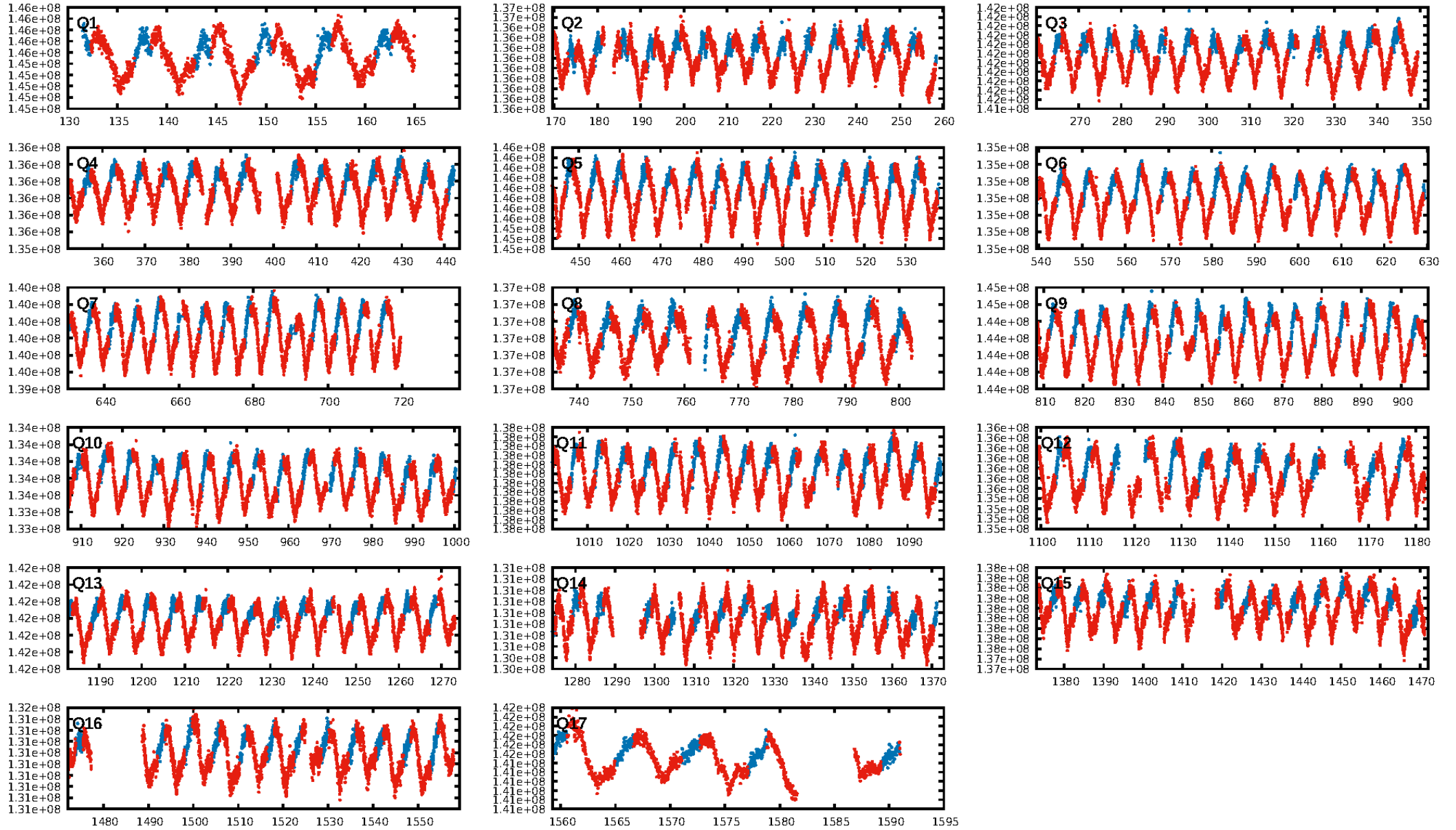
## DV Diagnostic Results:

ShortPeriod-sig: 81.9% [1.34σ]  
LongPeriod-sig: N/A  
ModelChiSquare2-sig: N/A  
ModelChiSquareGoF-sig: N/A  
Bootstrap-pfa: N/A  
RollingBand-fgt: 1.00 [219/219]  
GhostDiagnostic-chr: 1.085  
Centroid-sig: 0.0%  
Centroid-so: 1.322 arcsec [4.42σ]  
OotOffset-rm: 11.293 arcsec [40.28σ]  
KicOffset-rm: 1.158 arcsec [1.77σ]  
OotOffset-st: 0/2/0/3 [5]  
KicOffset-st: 0/2/0/3 [5]  
DiffImageQuality-fgm: 0.60 [3/5]  
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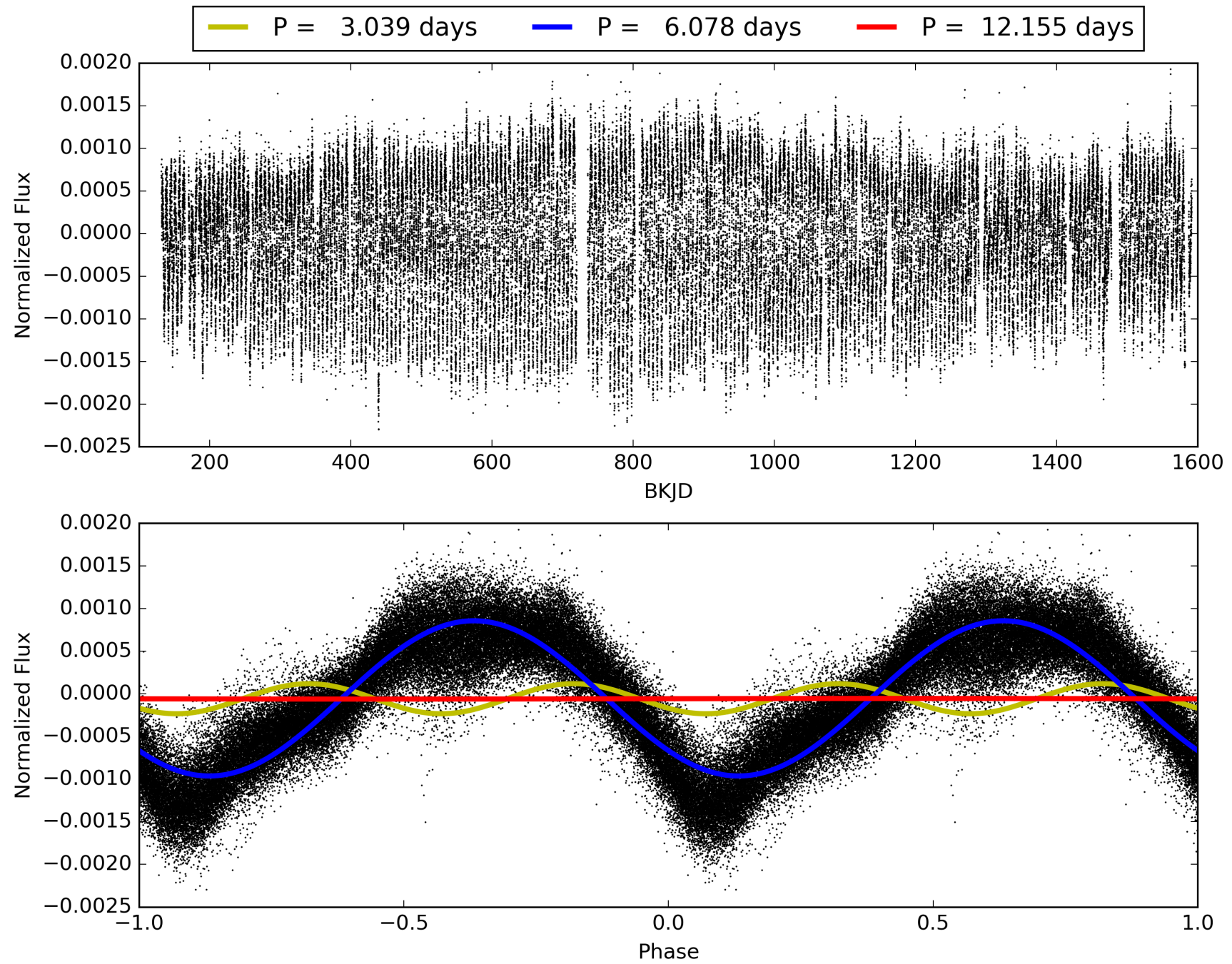
Software Revision: svn+ssh://murzim/repo/soc/tags/release/9.3.42@60958 -- Date Generated: 31-Jan-2016 09:42:02 Z

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

# TCE 003539521-02, PDC Light Curves



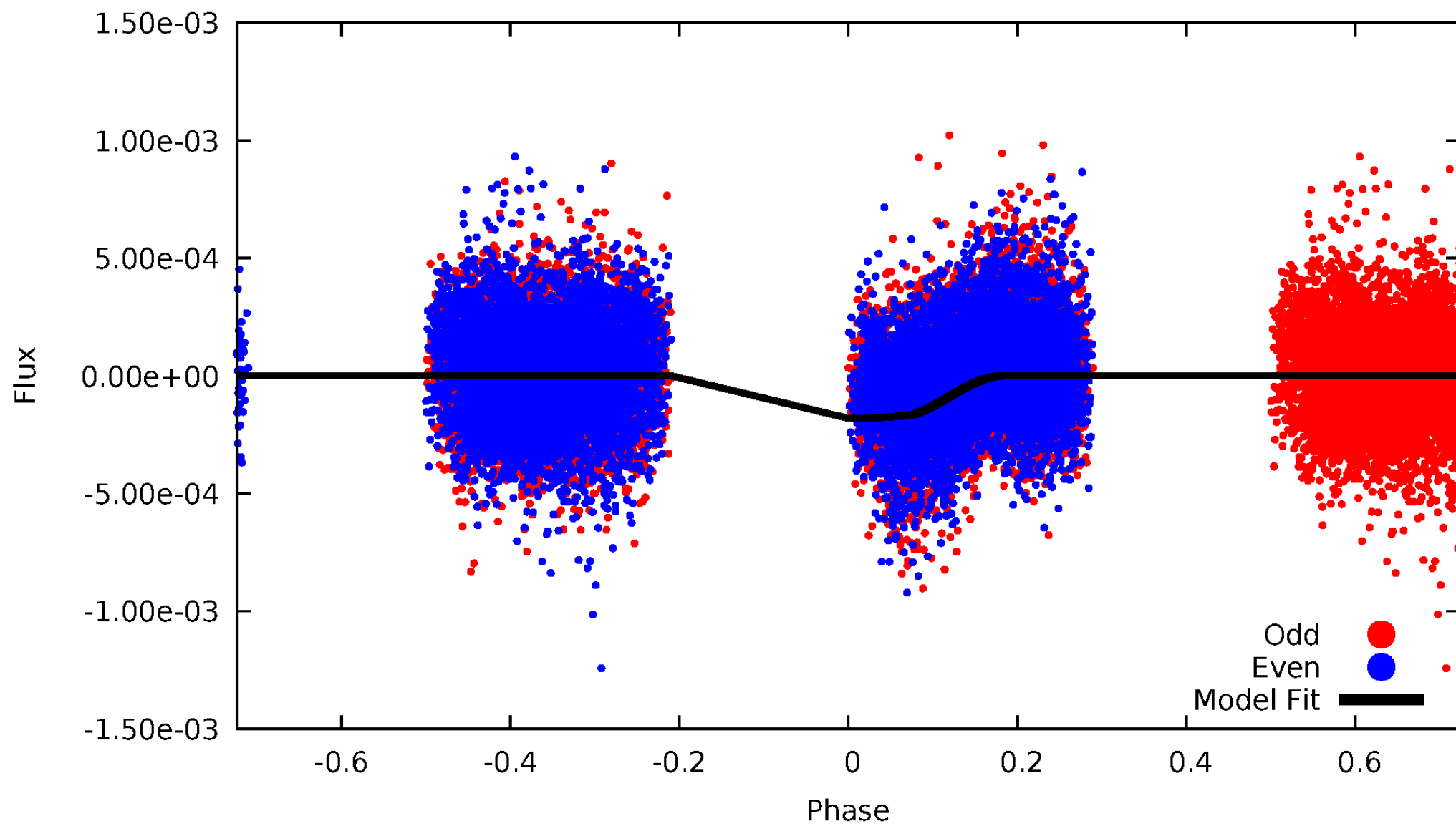
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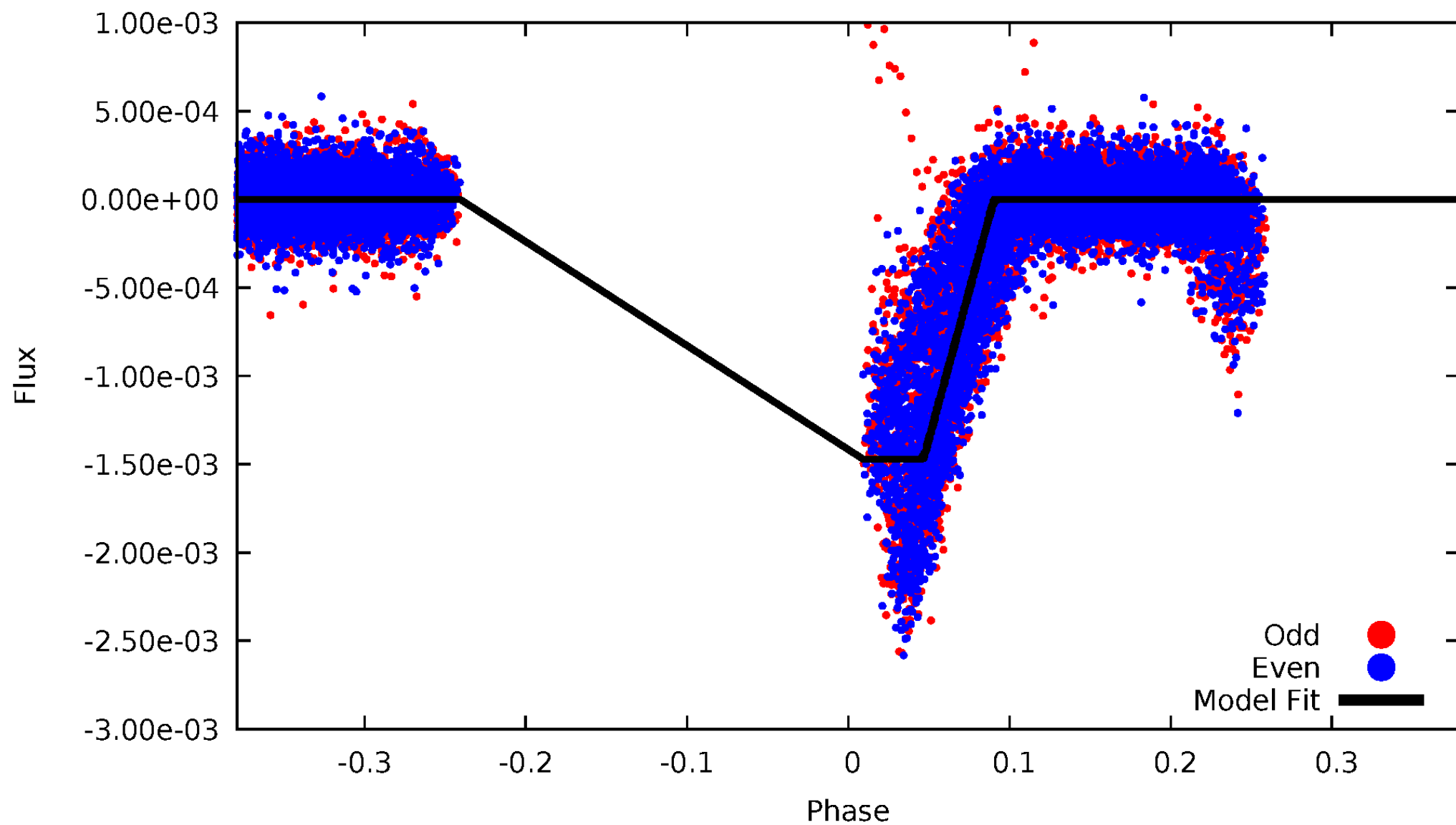
DV Odd/Even

TCE 003539521-02



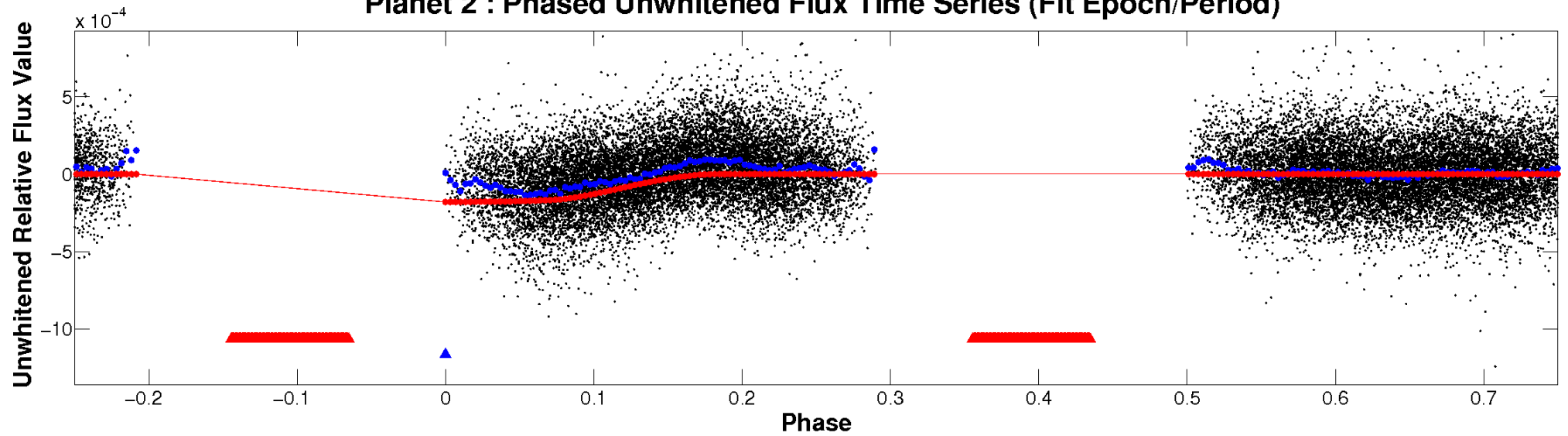
# ALT Odd/Even

TCE 003539521-02

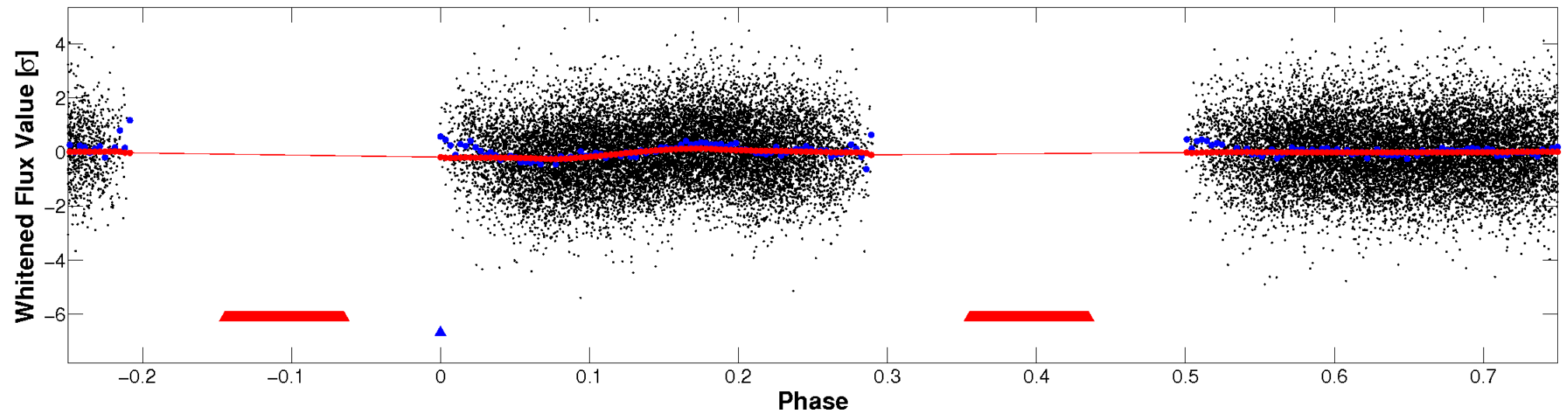


# Non-Whitened Vs. Whitened Light Curve

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

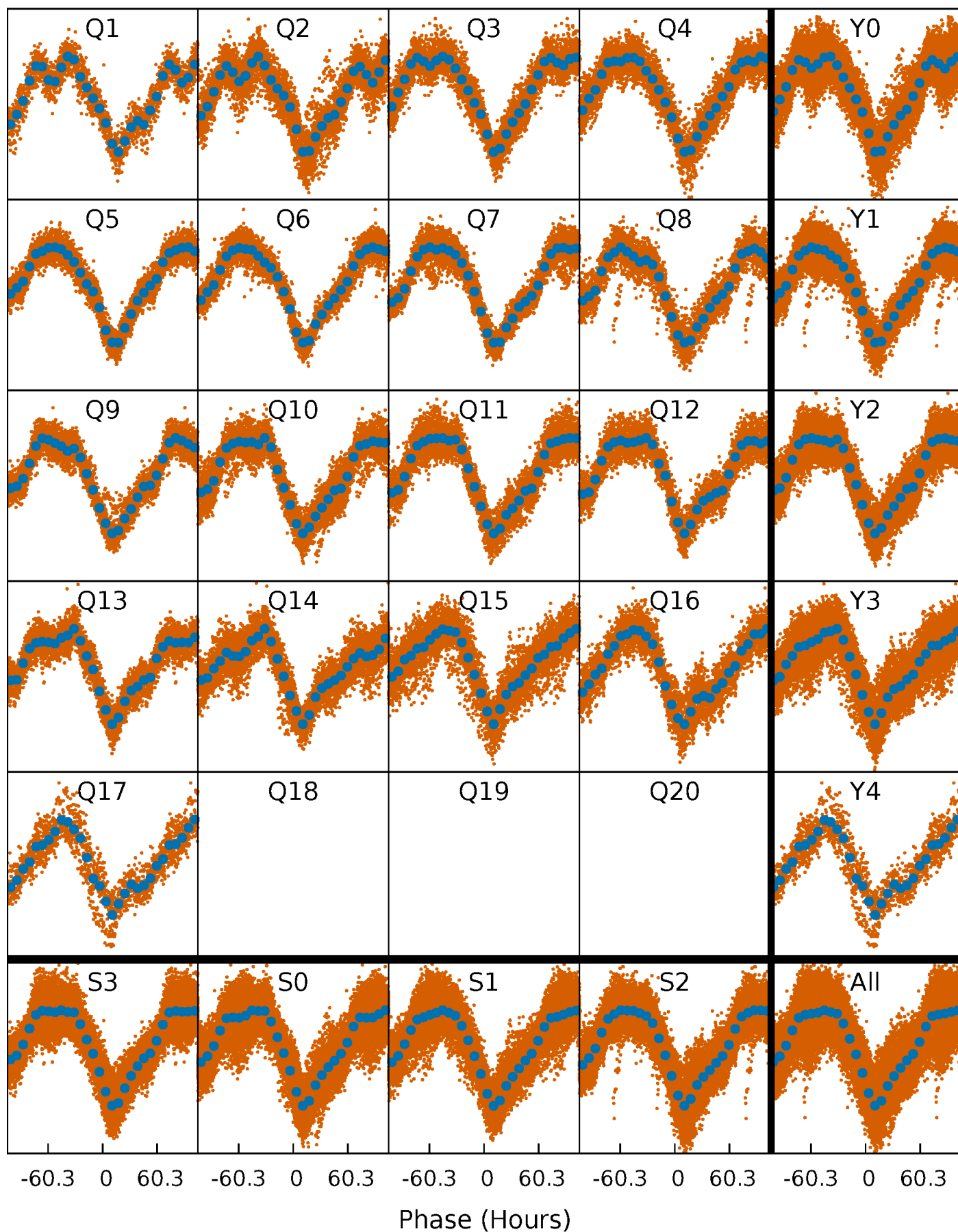


**Planet 2 : Phased Whitened Flux Time Series (Fit Epoch/Period)**



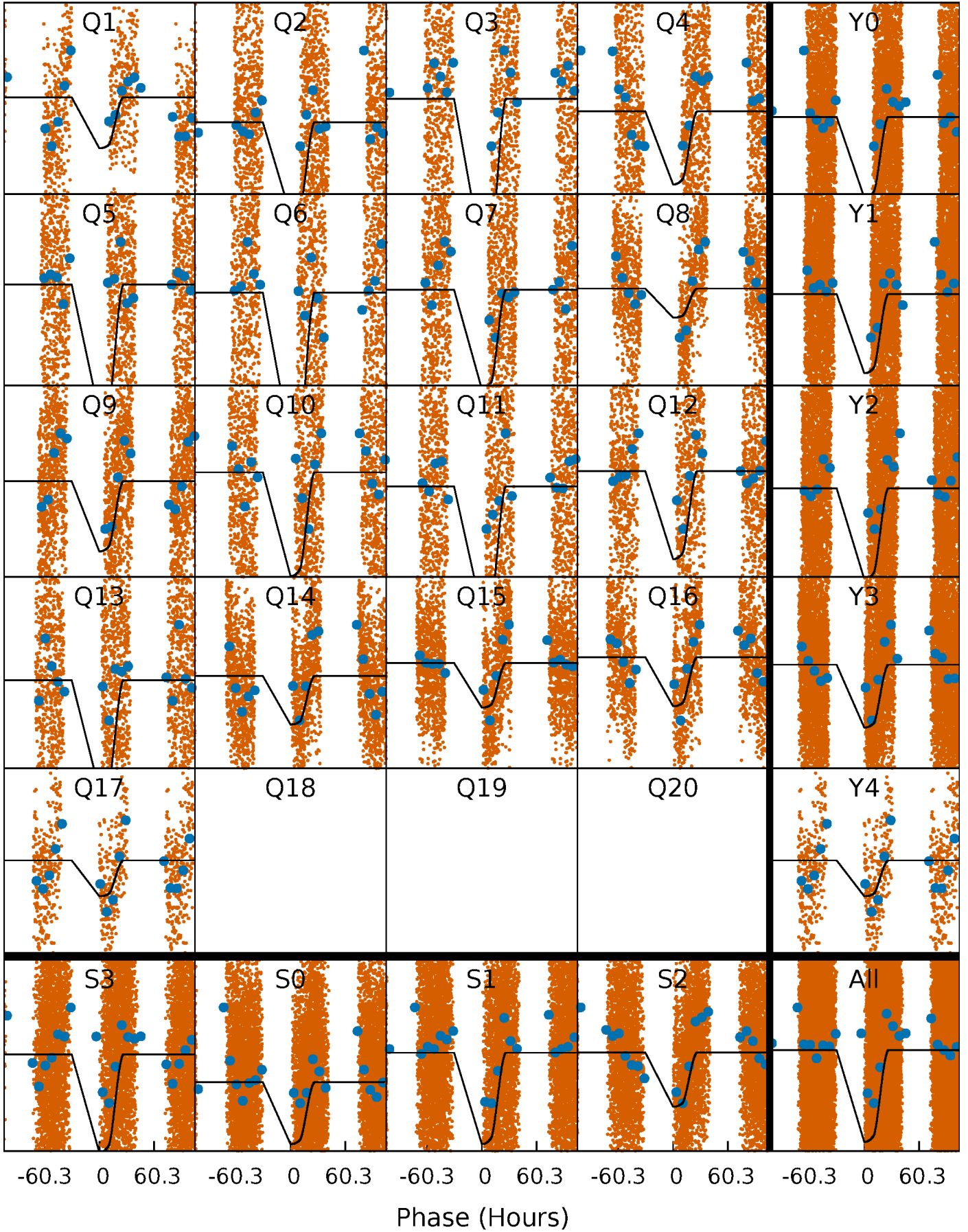
# PDC Quarter-Phased Transit Curves

TCE 003539521-02   P= 6.077635 Days    $T_0=134.523968$  (BKJD)



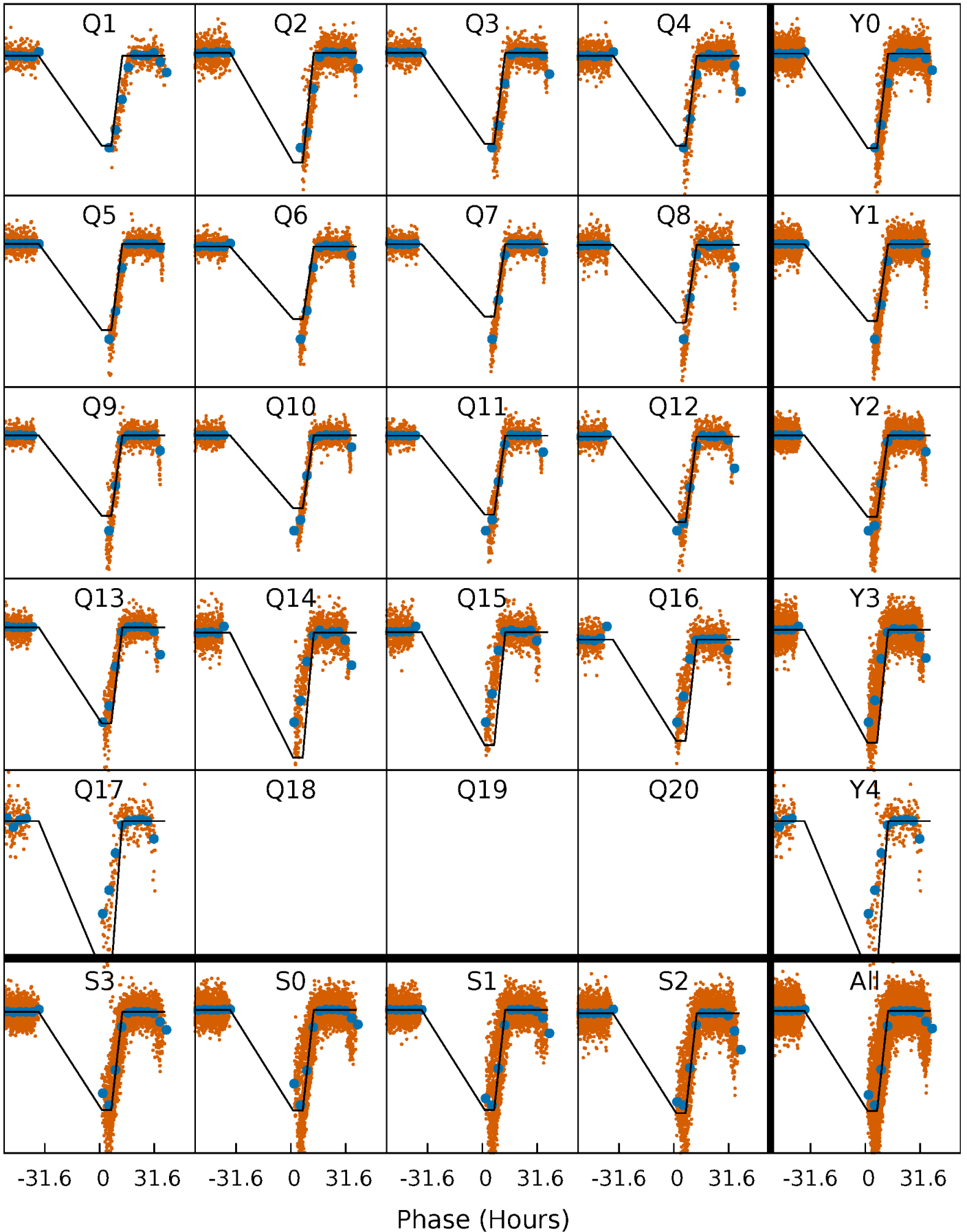
# DV Quarter-Phased Transit Curves

TCE 003539521-02   P= 6.077635 Days    $T_0=134.523968$  (BKJD)



# Alt. Detrend Quarter-Phased Transit Curves

TCE 003539521-02   P= 6.076616 Days    $T_0=134.713515$  (BKJD)

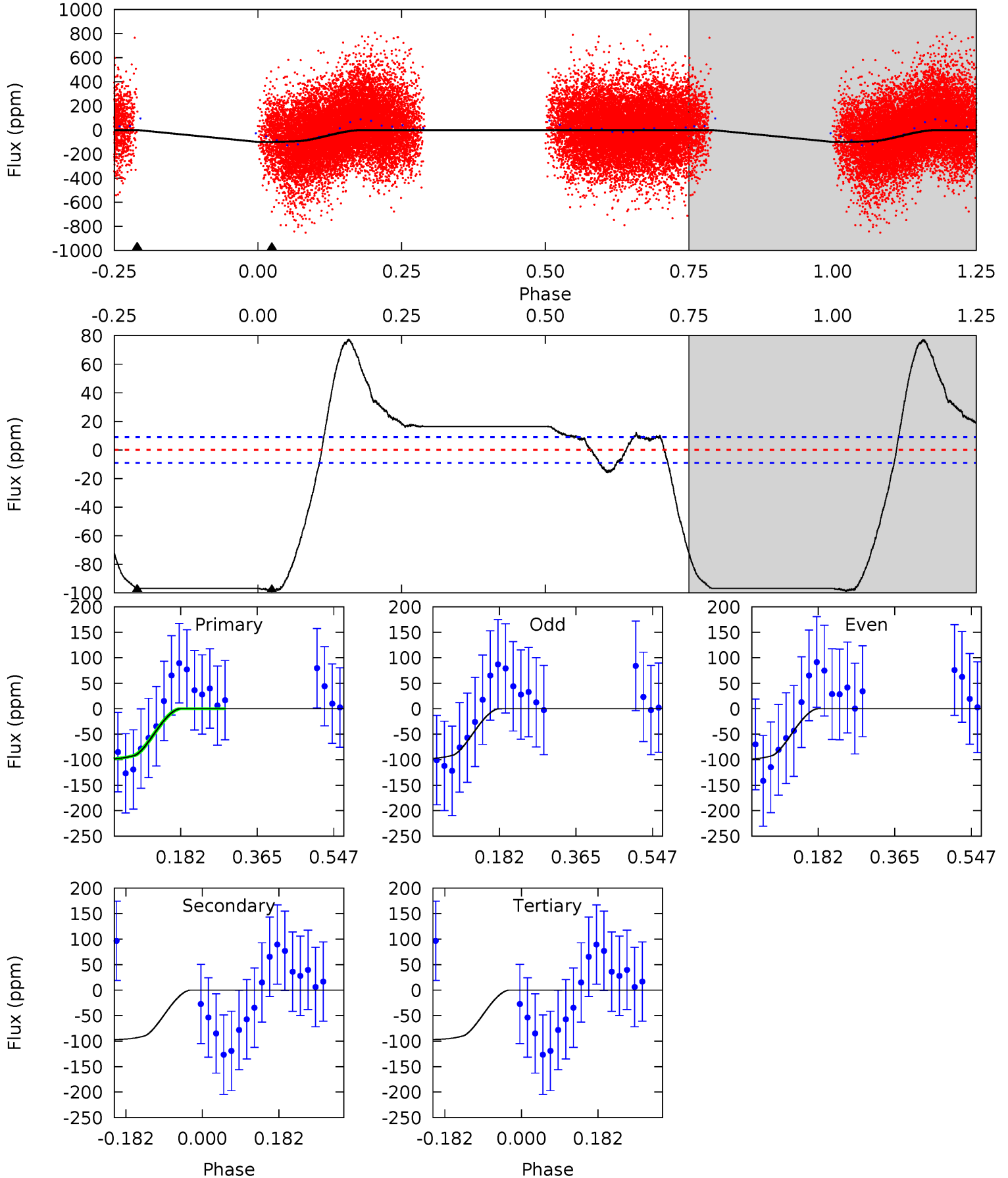




# DV Model-Shift Uniqueness Test

003539521-02, P = 6.077635 Days, E = 128.446333 Days

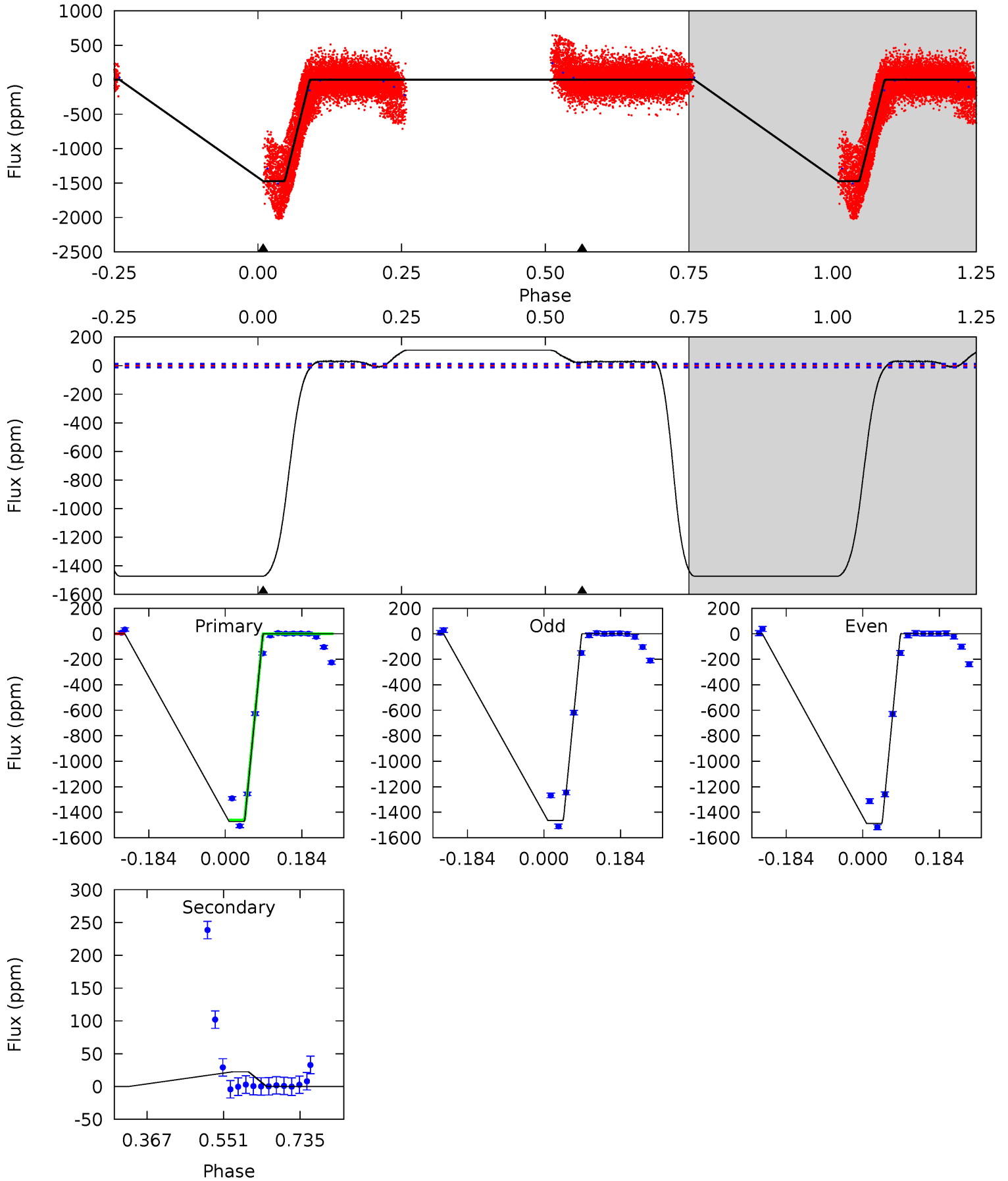
Pri	Sec	Ter	Pos	FA <sub>1</sub>	FA <sub>2</sub>	F <sub>Red</sub>	Pri-Ter	Pri-Pos	Sec-Ter	Sec-Pos	Odd-Evn	DMM	Shape	TAT
48.9	47.9	47.8	0	4.44	1.33	12.1	1.08	48.9	0.06	47.9	0.31	-0.38	0.44	0.00



# Alt Model-Shift Uniqueness Test

003539521-02, P = 6.076616 Days, E = 128.636899 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
503.1	-7.67	0	0	4.44	1.33	92.8	503.1	503.1	-7.67	-7.67	4.15	0.93	0.07	0



### Stellar Parameters For KIC 003539521

	$T_{\text{eff}}(K)$	$\log(g)$	[Fe/H]	$R$ ( $R_{\odot}$ )	$M(M_{\odot})$	$p_{\star}$ ( $\text{g}\cdot\text{cm}^{-3}$ )
	$6519^{+178}_{-178}$	$3.664^{+0.323}_{-0.108}$	$-0.480^{+0.350}_{-0.300}$	$2.876^{+0.479}_{-1.118}$	$1.391^{+0.241}_{-0.294}$	$0.082^{+0.196}_{-0.028}$
	+3%/-3%	+9%/-3%	+73%/-62%	+17%/-39%	+17%/-21%	+237%/-34%
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 003539521-02 / KOI

Detrend	Depth (ppm)	$R_p$ ( $R_{\oplus}$ )	$T_{\text{max}}$ (K)	$T_{\text{obs}}$ (K)	$A_{\text{obs}}$
DV	$-97 \pm 2$	$4.86^{+0.65}_{-1.04}$	$2480^{+153}_{-245}$	$5166^{+157}_{-151}$	$12^{+6}_{-3}$
Alt.	$22 \pm 3$	$12.09^{+1.27}_{-2.54}$	$2497^{+155}_{-218}$	$-3185^{+84}_{-76}$	$-0.471^{+0.115}_{-0.208}$

$T_{\text{max}}$  = 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

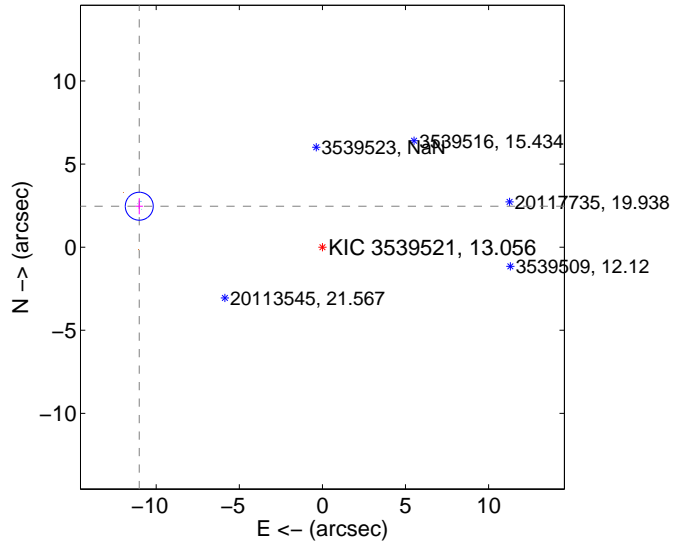
Supplemental centroid analysis for 003539521-02. Kepler magnitude: 13.06. Transit SNR 16.64

There are 3 quarters with good PRF difference image offsets

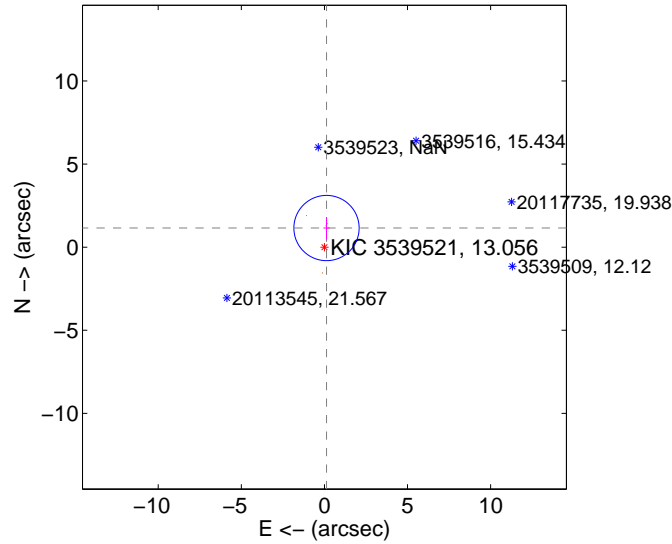
The OOT PRF centroid is offset from the target star catalog position by about 11.03 arcsec so the offset from difference PRF-fit to OOT-fit may be invalid.

	Distance in arcsec	Distance / $\sigma$	$\Delta$ RA	$\Delta$ Dec
PRF-fit source offset from OOT	$11.293 \pm 0.280$	40.28	$11.021 \pm 0.217$	$2.464 \pm 0.482$
PRF-fit source offset from KIC position	$1.158 \pm 0.655$	1.77	$-0.126 \pm 0.186$	$1.152 \pm 0.658$
photometric centroid source offset	$1.32 \pm 0.30$	4.42	$-1.26 \pm 0.31$	$-0.38 \pm 0.14$

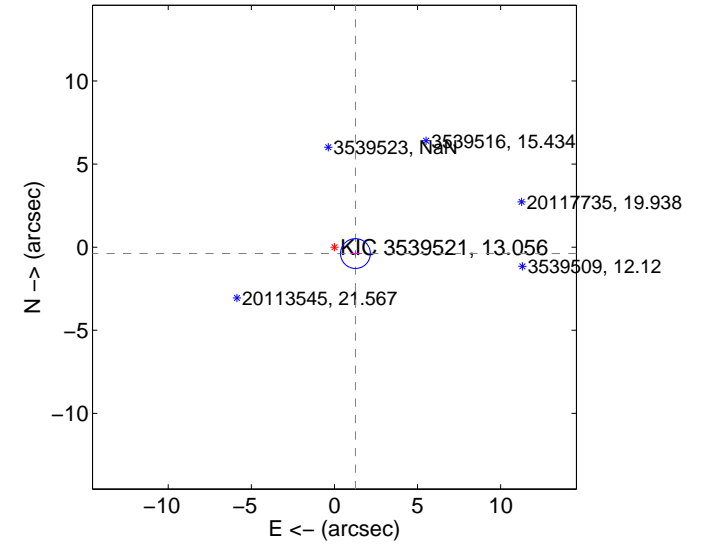
offset from difference PRF-fit to OOT PRF-fit



offset from difference PRF-fit to KIC position

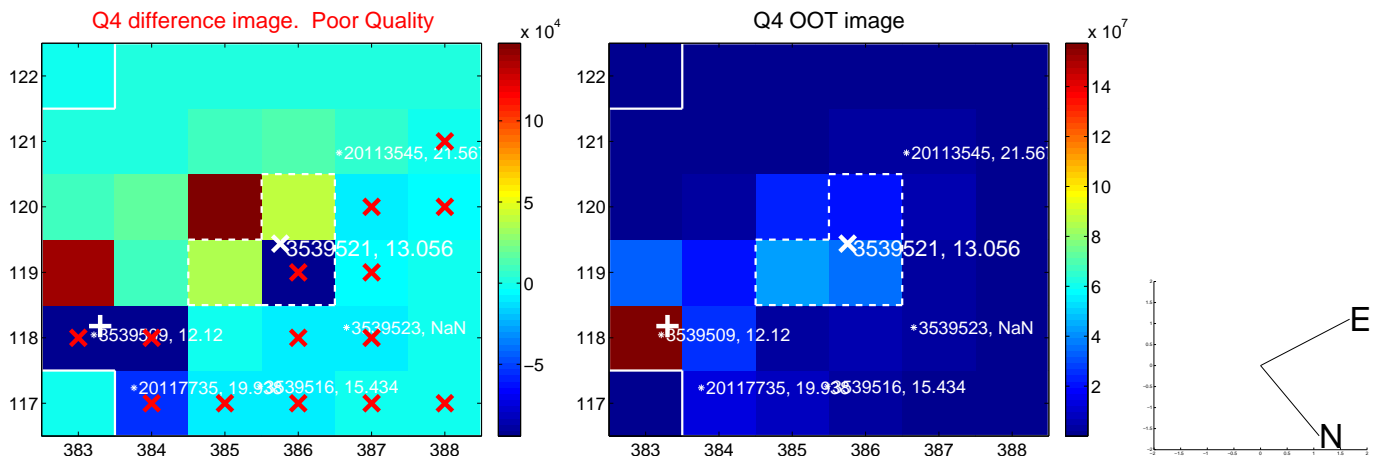
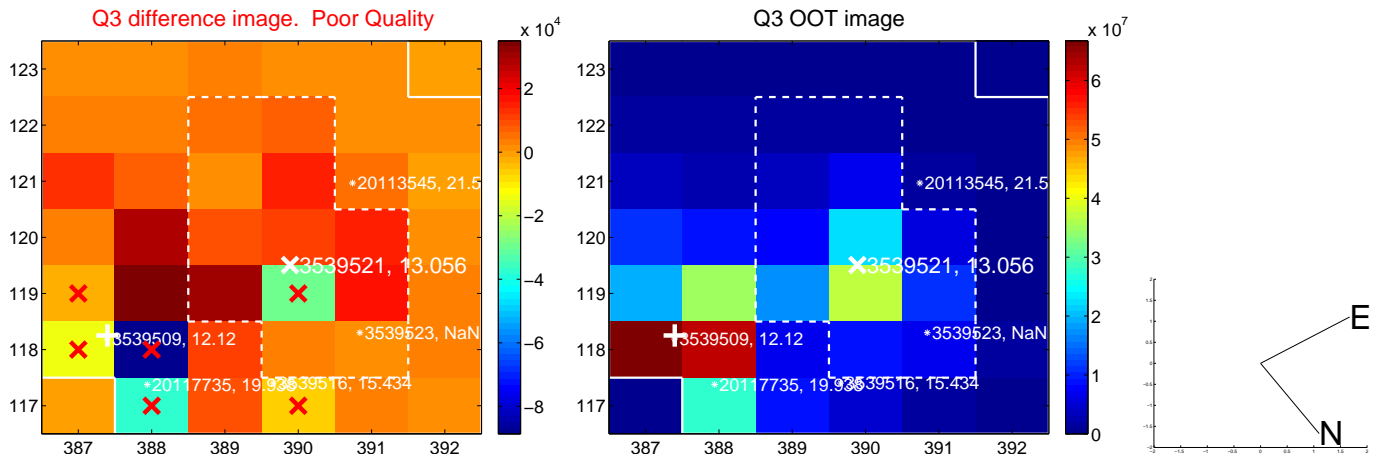
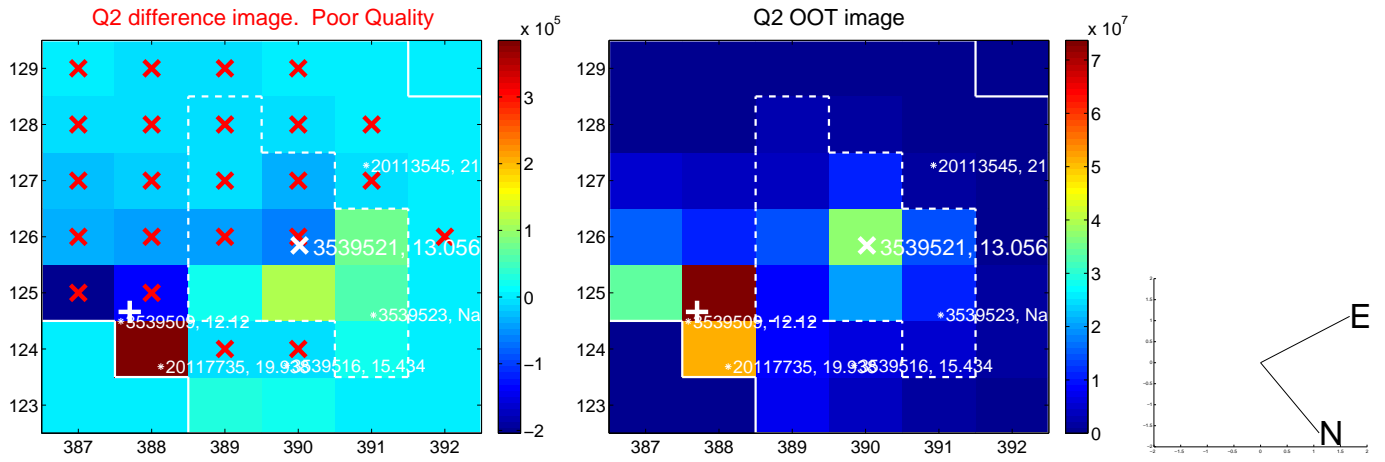
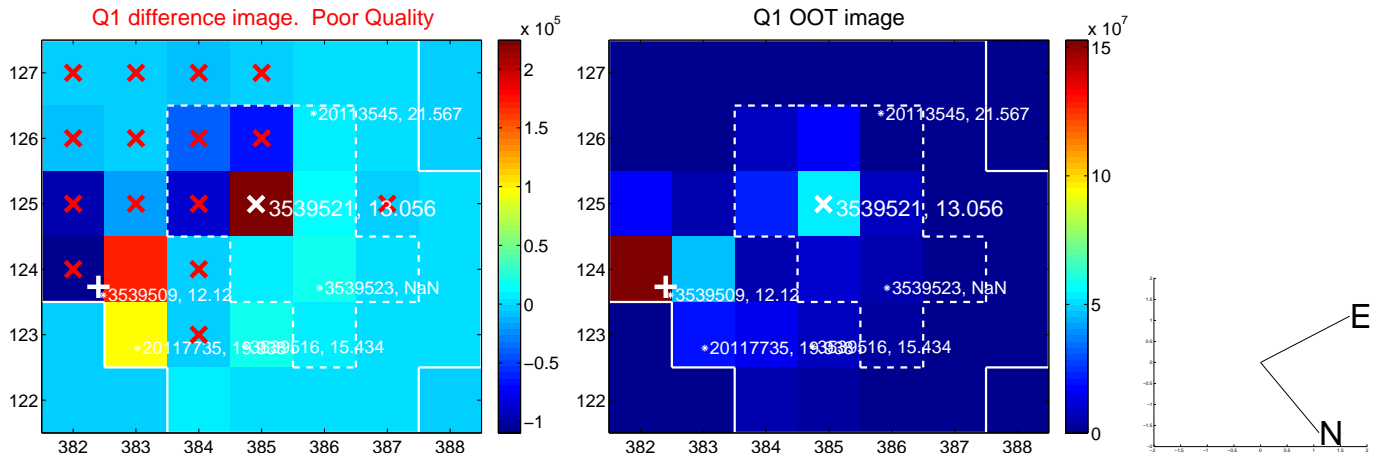


offset from photometric centroids

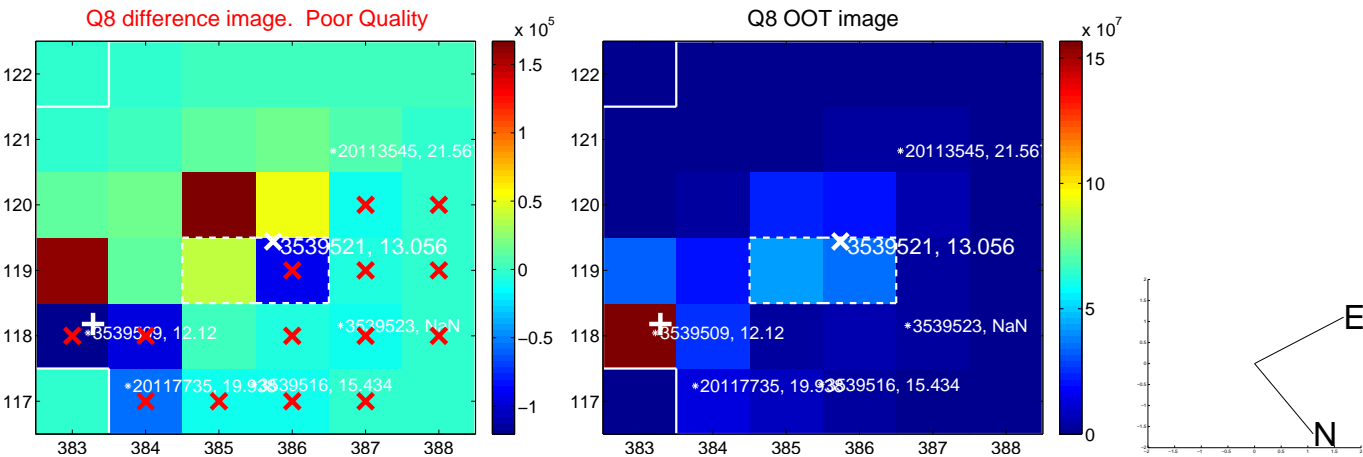
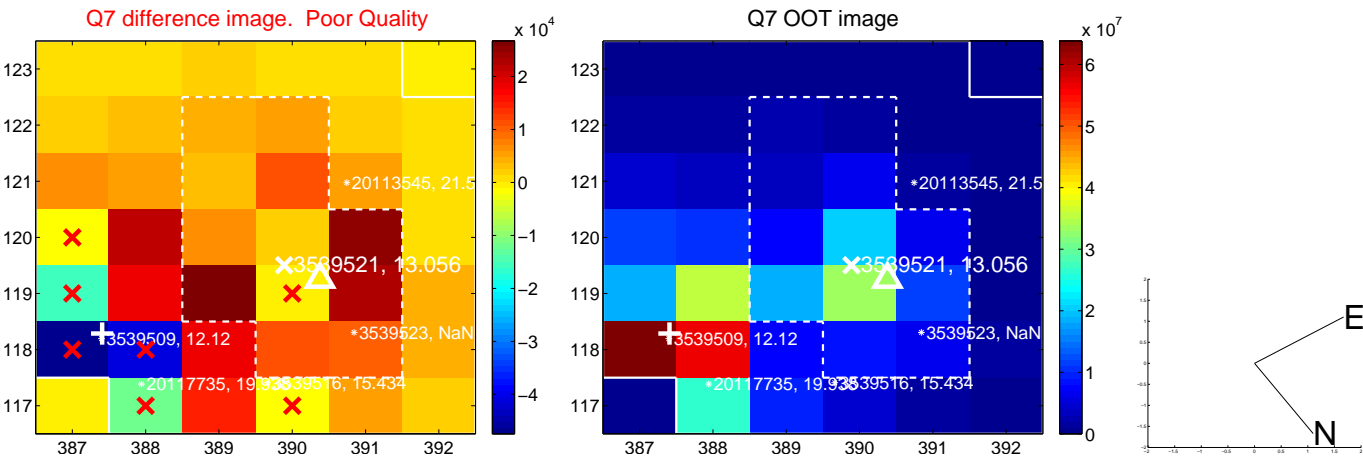
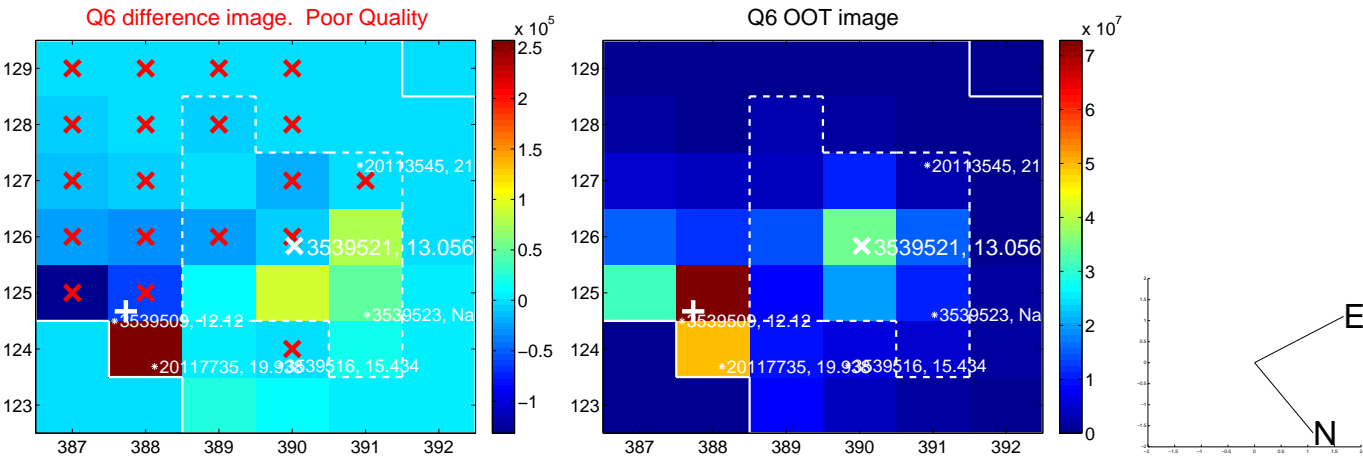
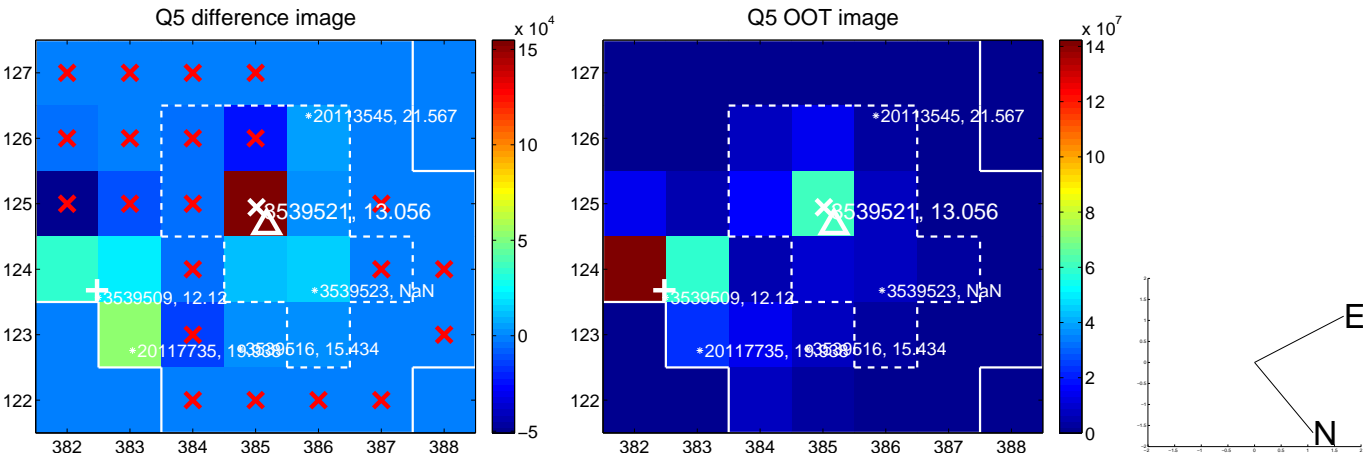


Centroid source offsets from the target star reconstructed from PRF and photometric centroids. Sky blue crosses: good quarterly centroid offsets; Vermillion crosses: bad quarterly centroid offsets; magenta cross: average over quarters. Length of the crosses: one- $\sigma$  uncertainty. Blue circle: three-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

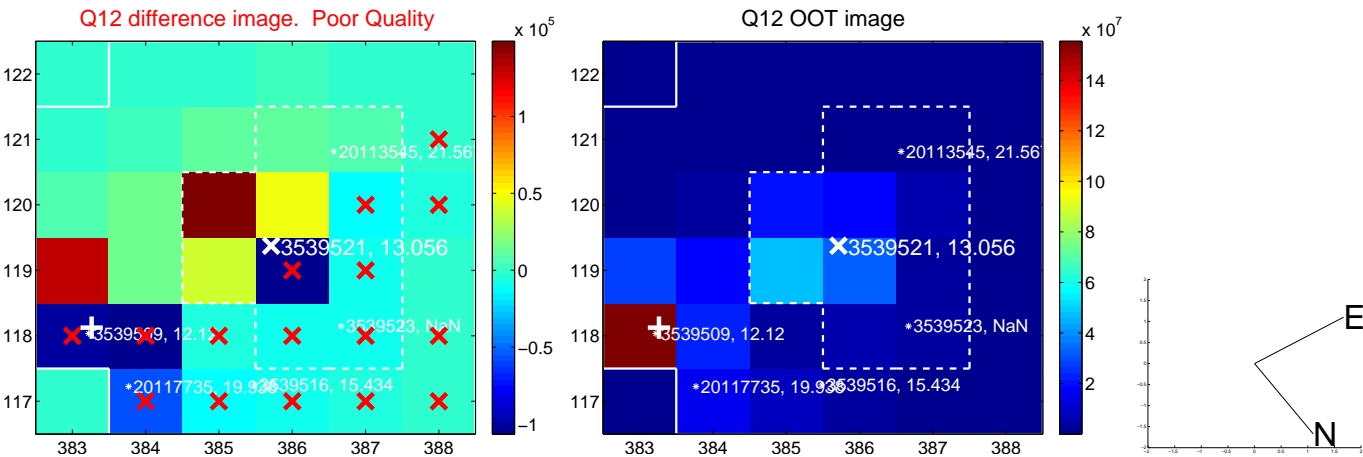
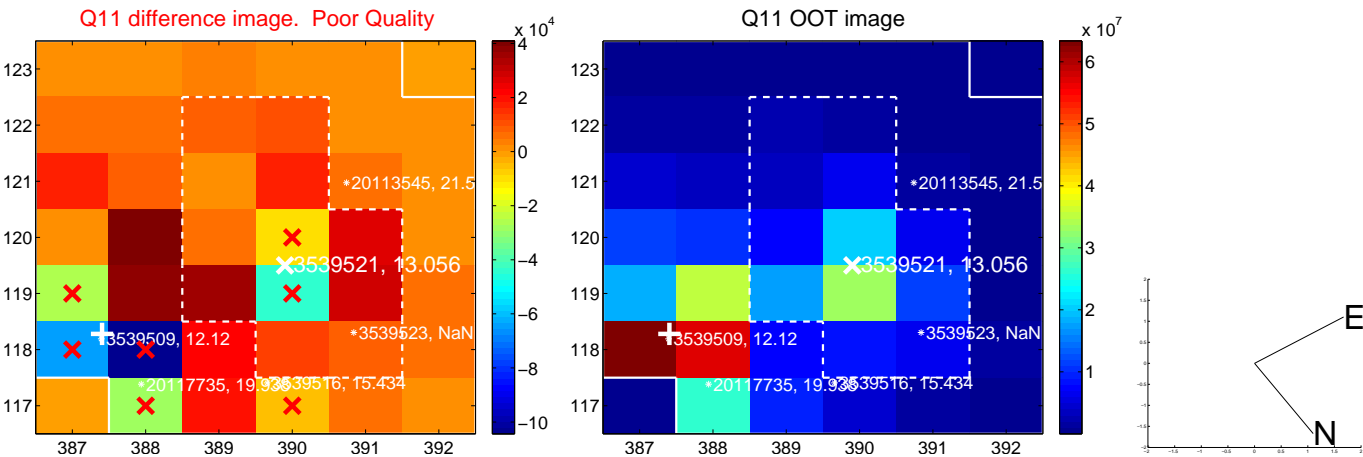
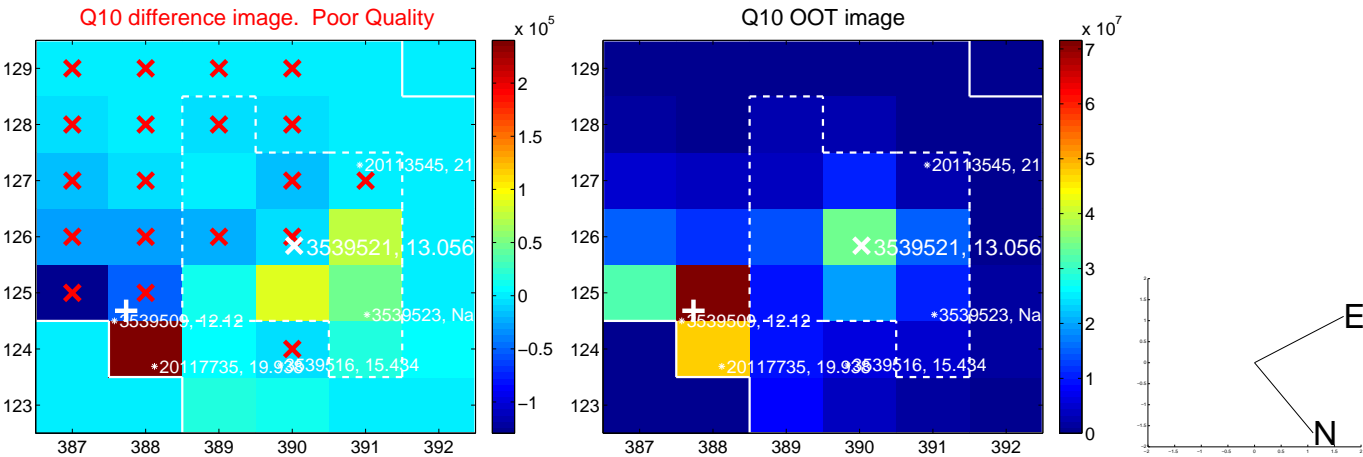
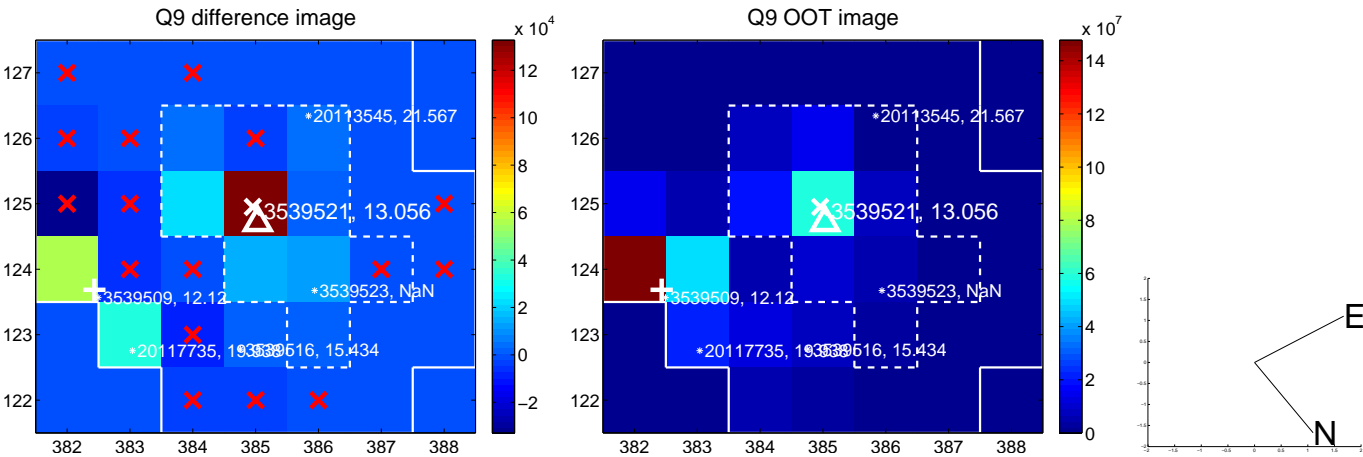


white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.

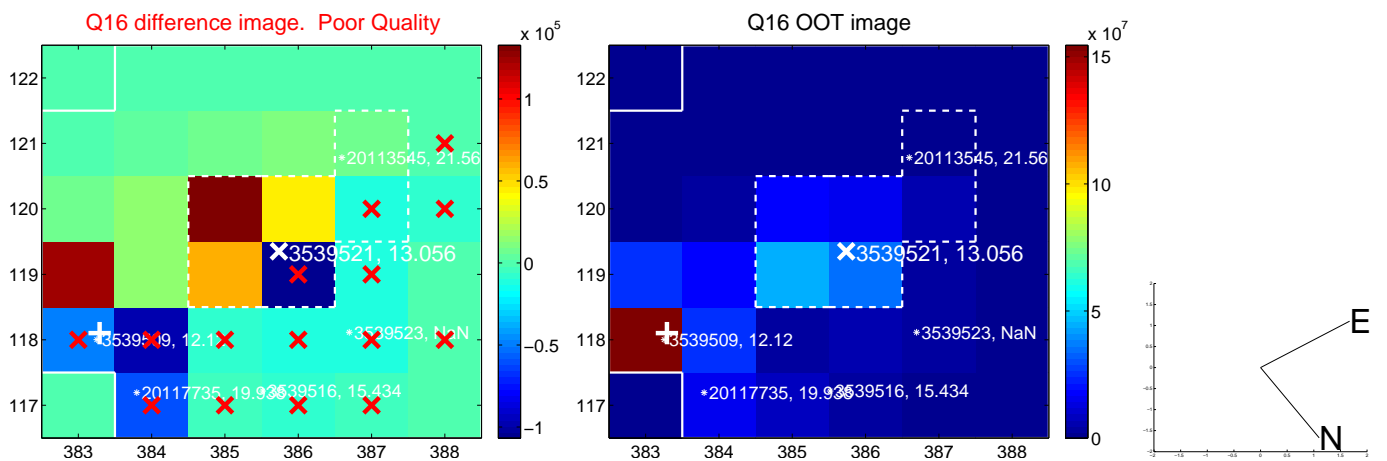
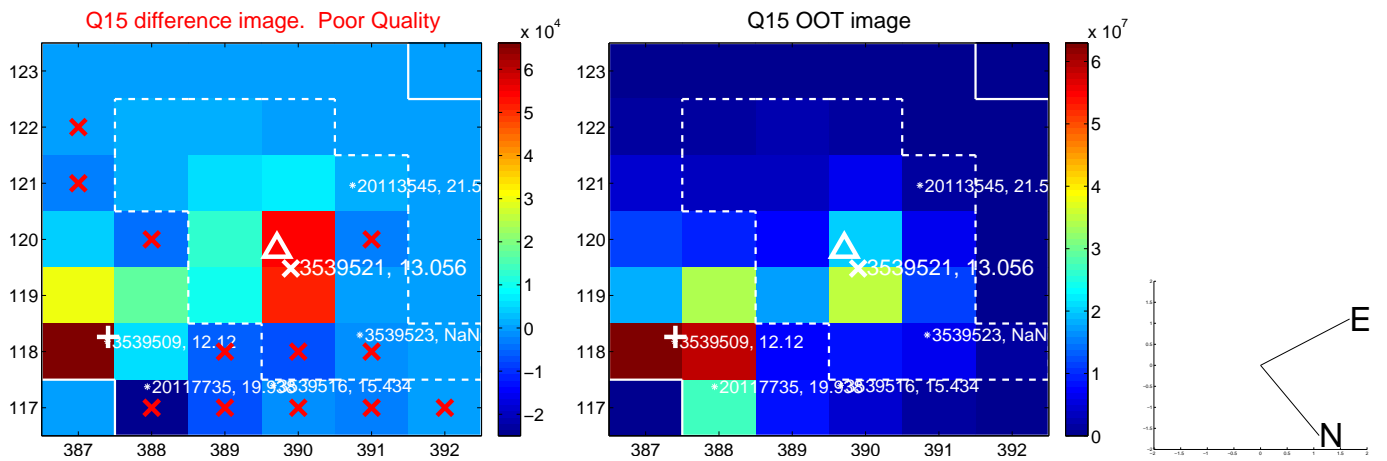
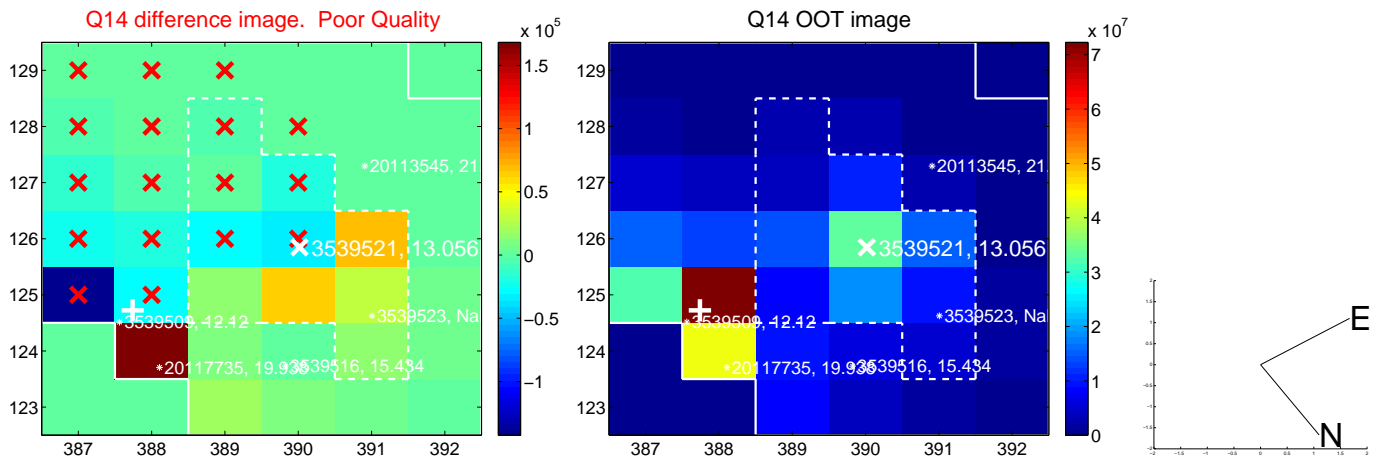
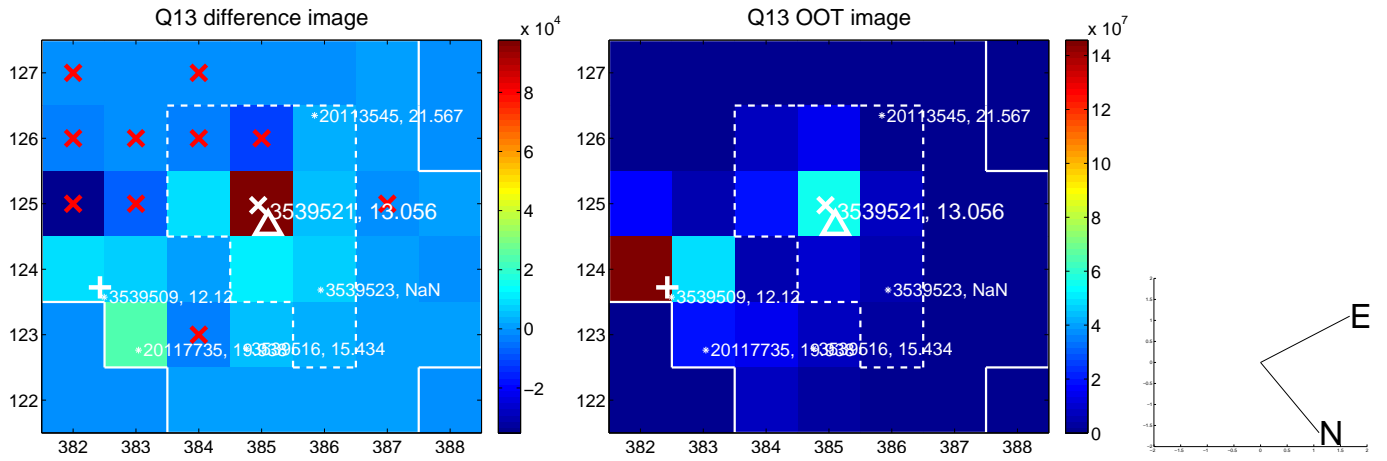




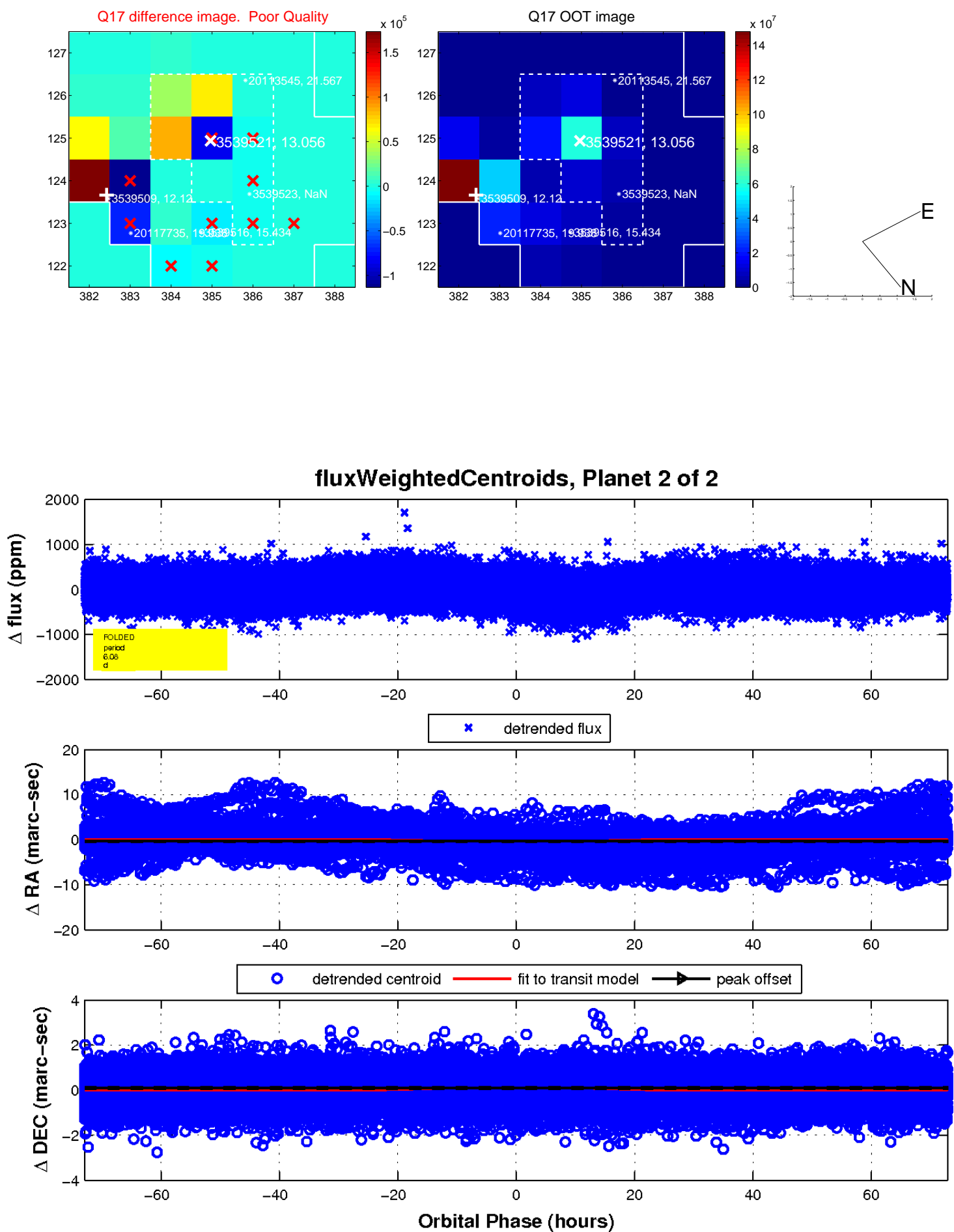
white  $\times$ : KIC target position;  $+$ : OOT centroid;  $\triangle$ : difference centroid. red  $\times$ : large negative pixel value.



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

