SRE-01-11
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VIRS IR Dark Analysis Report 1: Operational Changes
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1. Introduction and Motivation

Based on laboratory and in-flight calibration from the MESSENGER lunar flyby, it was recommended that the IR detectors on VIRS be operated at below 10°C. Unfortunately, the thermal environment around Mercury has resulted in considerably warmer temperatures. The goal of this study is to evaluate the current dark subtraction methodology and to determine whether the additional dark signal introduced by these higher temperatures has a regular structure that could be better removed with more frequent dark measurements. A secondary goal is to determine whether there are any other operational changes that could improve the scientific return of VIRS IR data.

2. Data Sets

We investigated these issues with two primary data sets: (1) commissioning orbits where the temperature was warm (generally >30°C) and a long sequence of data was obtained over the unilluminated surface of the planet (1000+ spectra collected in the dark). A shorter test CDR at a lower temperature (~16°C) and a dark interleave of 2 was used to evaluate different dark interleaves for cooler operating temperatures.); (2) extended dark sequences taken during quick-cals (20 consecutive dark spectra at integration times of 1 second followed by 20 darks at 2 second integration times).

3. Testing the Dark Interleave

Currently, dark measurements are interleaved every 40 spectra (~every 40-80 seconds depending on integration time). In the calibration pipeline, dark measurements from a given EDR are modeled with a 3rd order polynomial, which is then subtracted from the shutter-open measurements. Shown in Figure 1 an example of the measured raw counts for a single detector from shutter-open but dark surface measurements taken over >2000 seconds (from commissioning orbit). Shown in black is a 3rd order polynomial, fit to every 40th data point. A 3rd order polynomial fits the overall slope of the data well, with an R^2 value of 0.99. Increasing the number of points used to calculate the polynomial in this long data series results in almost an identical polynomial fit. Some residual structure is evident; thus, we seek to explore whether this structure is regular enough to be better subtracted from the data.

Shown in Figure 2 are cubic splines to various dark interleaves. To calculate the splines, every nth (n=40, 30, 20, etc.) data point was extracted for a 'dark' data set to fit the spline to. The residual is the difference between the data and the curve fit. Since the entire data set is dark, this residual should represent the quadratic sum of the readout noise and the dark current shot noise. For the subset of data shown, a cubic spline with a dark interleave

of 40 results in a similar residual (Figure 3) to a 3rd order polynomial fit at a dark interleave of 40. Spline fits to higher cadence dark interleaves begin to fit the shorter frequency variability in the dark, though any regular structure is still similar in magnitude to the random noise in the data (Figure 3).

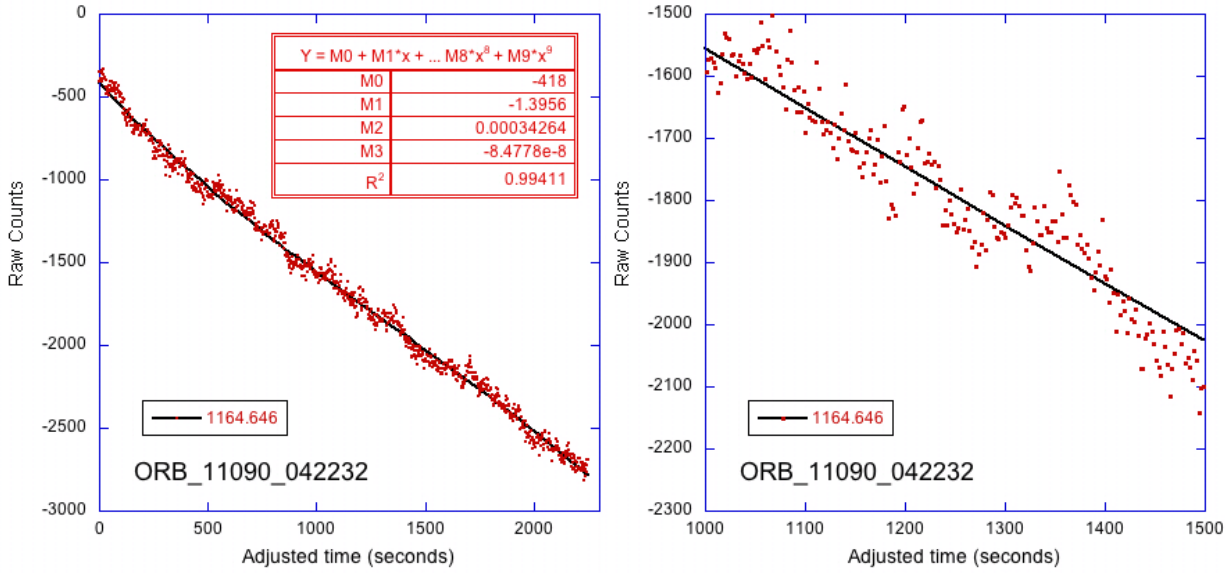

Figure 1. Polynomial fit to the 1164.646 nm pixel.

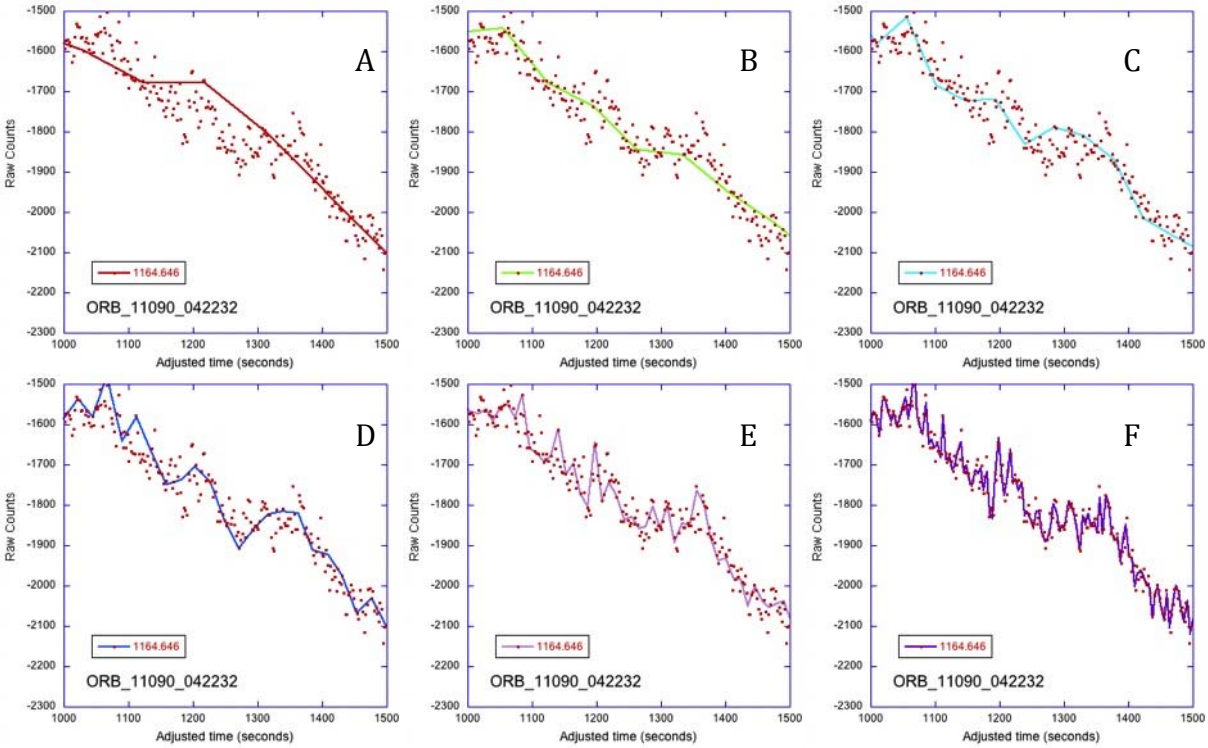

Figure 2. Spline fits to the same data in Fig. 1 using dark interleaves of (A) 40; (B) 30; (C) 20; (D) 10; (E) 5; (F) 2.

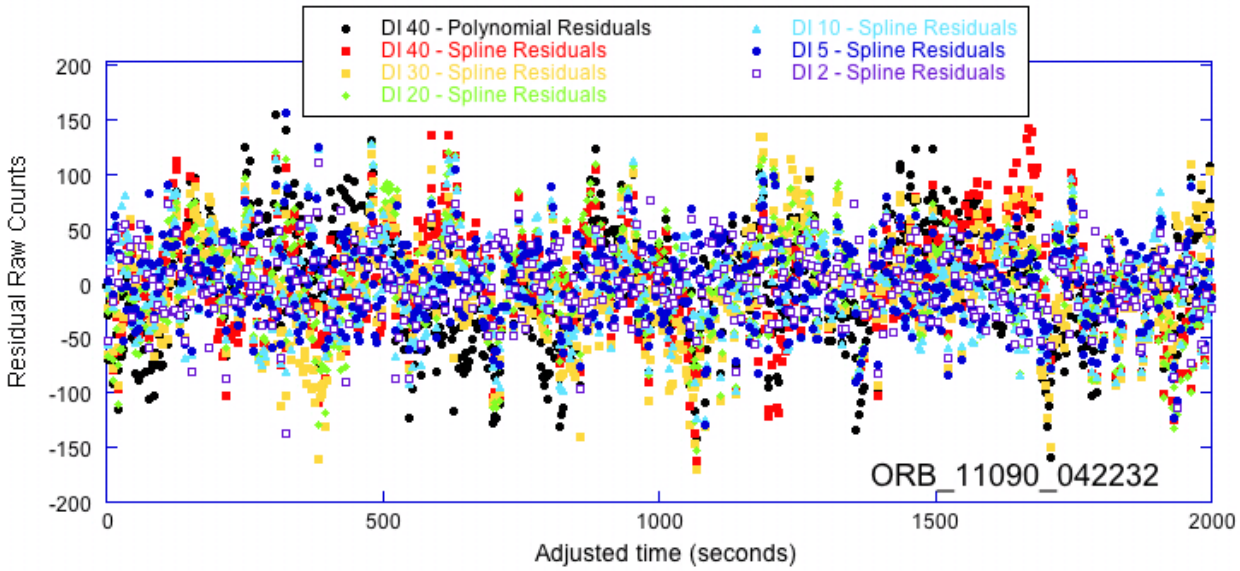

Figure 3. Residual counts after a polynomial fit to every 40th data point and after cublic splines at various dark interleaves (DI).

To numerically evaluate the success of the spline fits, we calculated the standard deviation of the residuals at each dark interleave. Shown in Figure 4 are the standard deviations of residual raw counts after different dark subtractions for eight pixels across the detector. Pixels with both low average noise (ie. 165) and high average noise (ie. 104) are both included. In general, a polynomial fit to every 40th spectrum models the dark current as effectively (or better than) splines up to a dark interleave of 20. Higher frequency dark measurements (interleaves of 10, 5, 2) decrease the residual counts, but even in the most extreme case a dark interleave of two decreases the noise roughly by half. Increasing the dark frequency decreases the total number of surface observations, so as a metric of how many surface measurements are collected relative to the average standard deviation, we have divided the percentage of 'lit' surface observations using a given interleave by the standard deviation of the residual counts (Figure 5). When the loss of surface measurements resulting from taking additional darks is considered, any benefit of more frequent dark measurements drops dramatically.

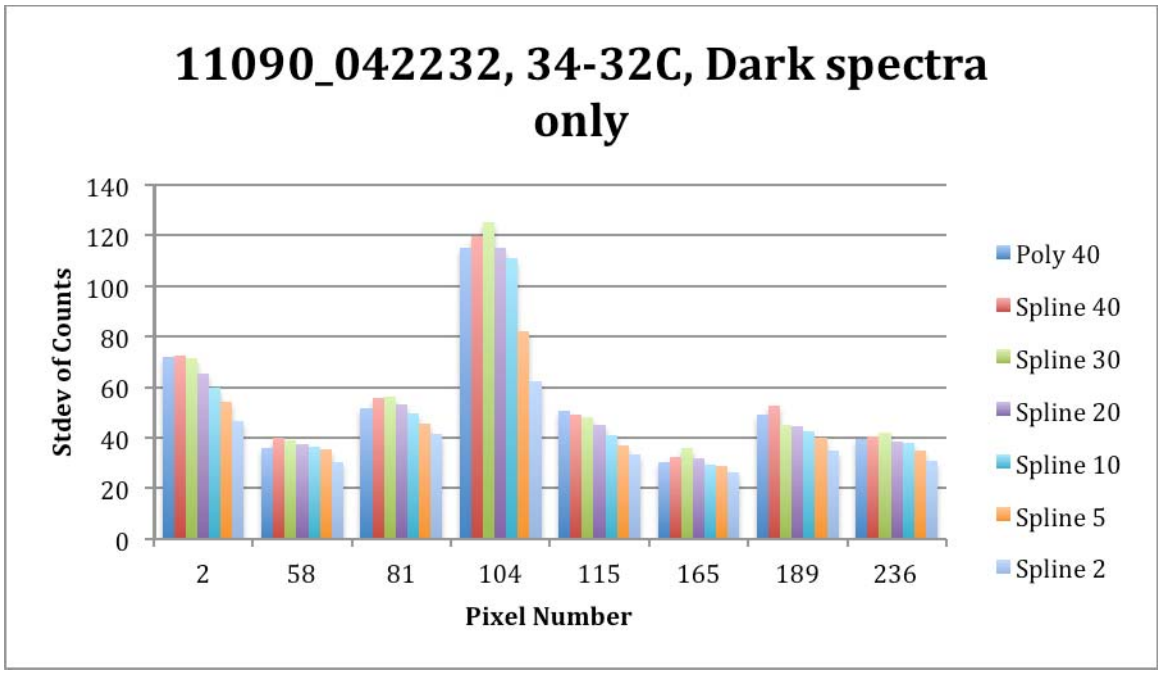

Figure 4. Standard deviation of residual counts using different dark interleaves for various pixels.

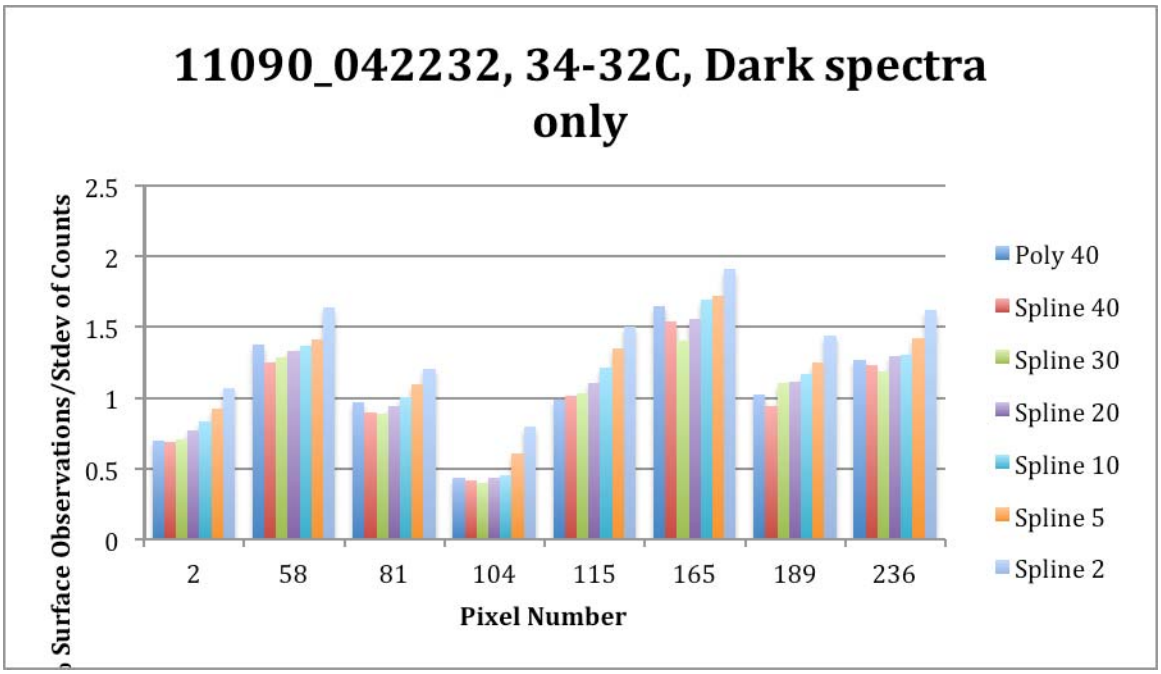

Figure 5. Percentage of measurements that are 'lit' for a given interleave divided by standard deviation of residual counts for various pixels.

4. Assessing Individual Detector Performance

Some detector elements have been observed to saturate much earlier than others, and others are consistently more affected by the thermal noise. To examine this behavior, over 19110 dark spectra taken during quick cals at temperatures ranging from 6-53°C were compiled. We first identified the temperatures at which individual pixels were observed to

saturate in dark measurements. The temperature at which 1 and 2 second integration time dark measurements are first observed to saturate for each wavelength is shown in Table 1, and a plot showing the raw count trends for a subset of pixels as a function of temperatures recorded by each of the detector temperature sensors is shown in Figure 6. About 20% of the pixels exhibit a break in slope between 30-40 degrees. This may be a result of the temperature sensors not accurately measuring the detector temperature at the higher temperatures. Pixel 165 (Fig. 6) is the only pixel to exhibit a slight decrease in dark current followed by an increase starting around 25 degrees.

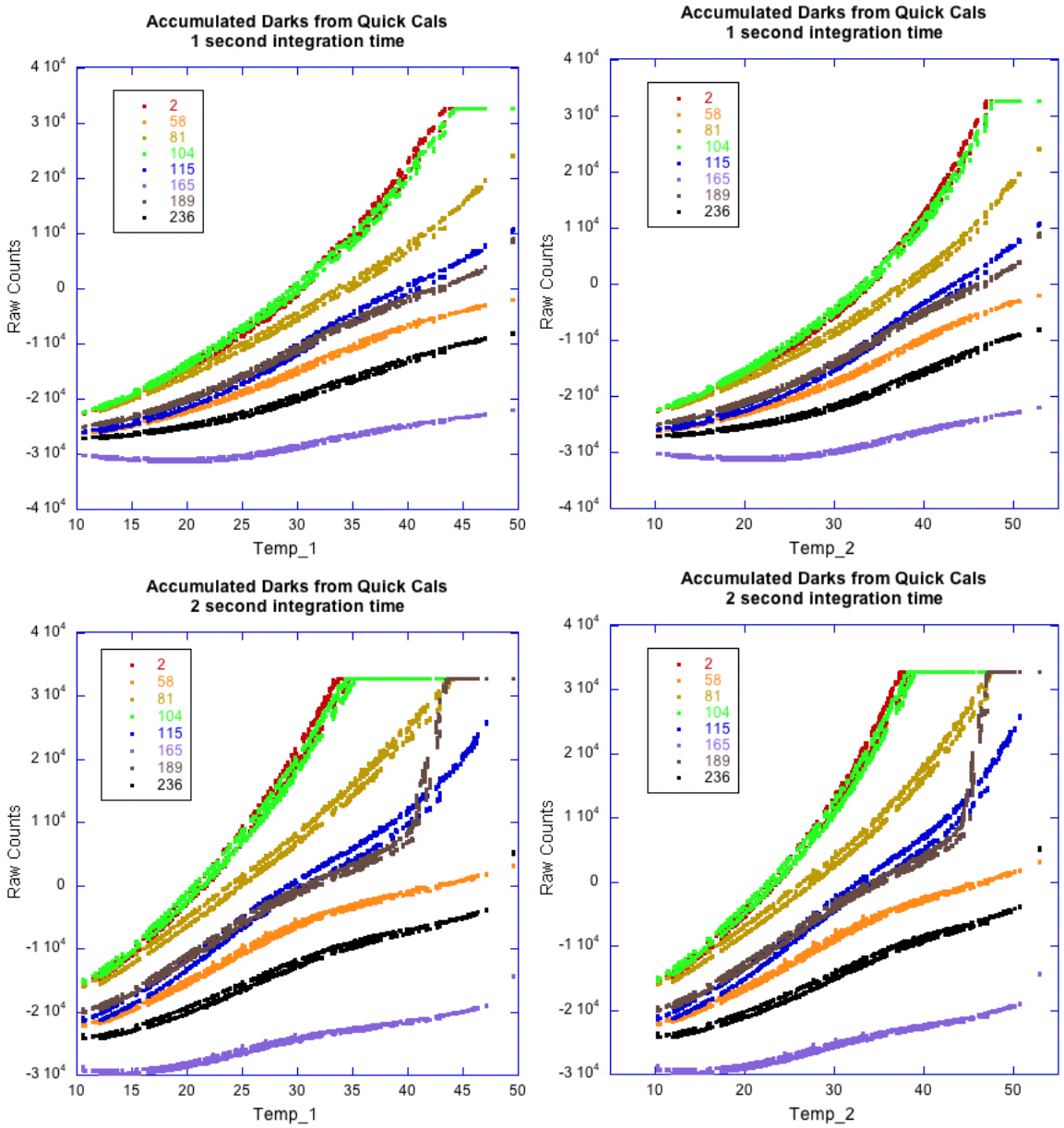

Figure 6. Raw dark counts as a function of temperature measured on each of the temperature sensors. A one second integration time saturates pixels 2 and 104, and a two second integration time saturates pixels 2, 81, 104 and 189.

To evaluate the performance of individual pixels as a function of temperature, we calculated the standard deviation of corrected counts in 2°C temperature bins. The binned standard deviations are included in Table 2, and the standard deviations vs. temperature for several pixels at a 1 and 2 second integration time are shown in Figure 7.

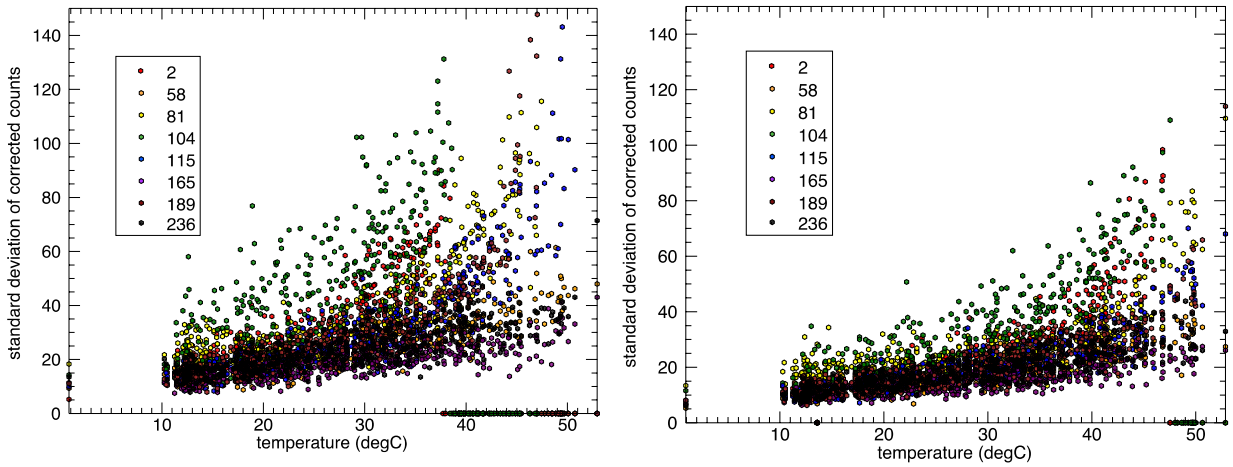

Figure 7. Standard deviation of corrected counts for several pixels as a function of temperature (temp_2) for one second integration time (left) and two second integration time (right).

As a whole, there is an increase in pixel noise at temperatures above 14°C (Table 2). However, there is a range in the average pixel noise over all temperatures. Pixels were separated into groups by their average standard deviation, and shown in Figure 8 is an example of the residual corrected counts for representative pixels from each group. Though only two pixels maintain a standard deviation of <20 counts over all temperatures, 23 pixels remain at or below a standard deviation of 23 counts, and 59 remain at or below a standard deviation of 25 counts. As can be seen in Figure 8, these pixels are distributed across the full wavelength range. The pixels that tend to saturate more quickly are also distributed across the detector. Thus, if data is collected binned by two, saturated or noisy data are being combined with the less noisy pixels.

The overall pixel noise and number of saturating pixels increase most significantly after 30°C. However, the well-behaved pixels stay reasonably low. Shown in Figure 9 are example corrected-count spectra for a dark and a lit spectrum at full resolution, as well as with the SD>30 and SD>25 (191 total) pixels omitted. The distribution of better-performing pixels is sufficient to maintain around a 10 nm spectral resolution, even with the noisiest pixels omitted.

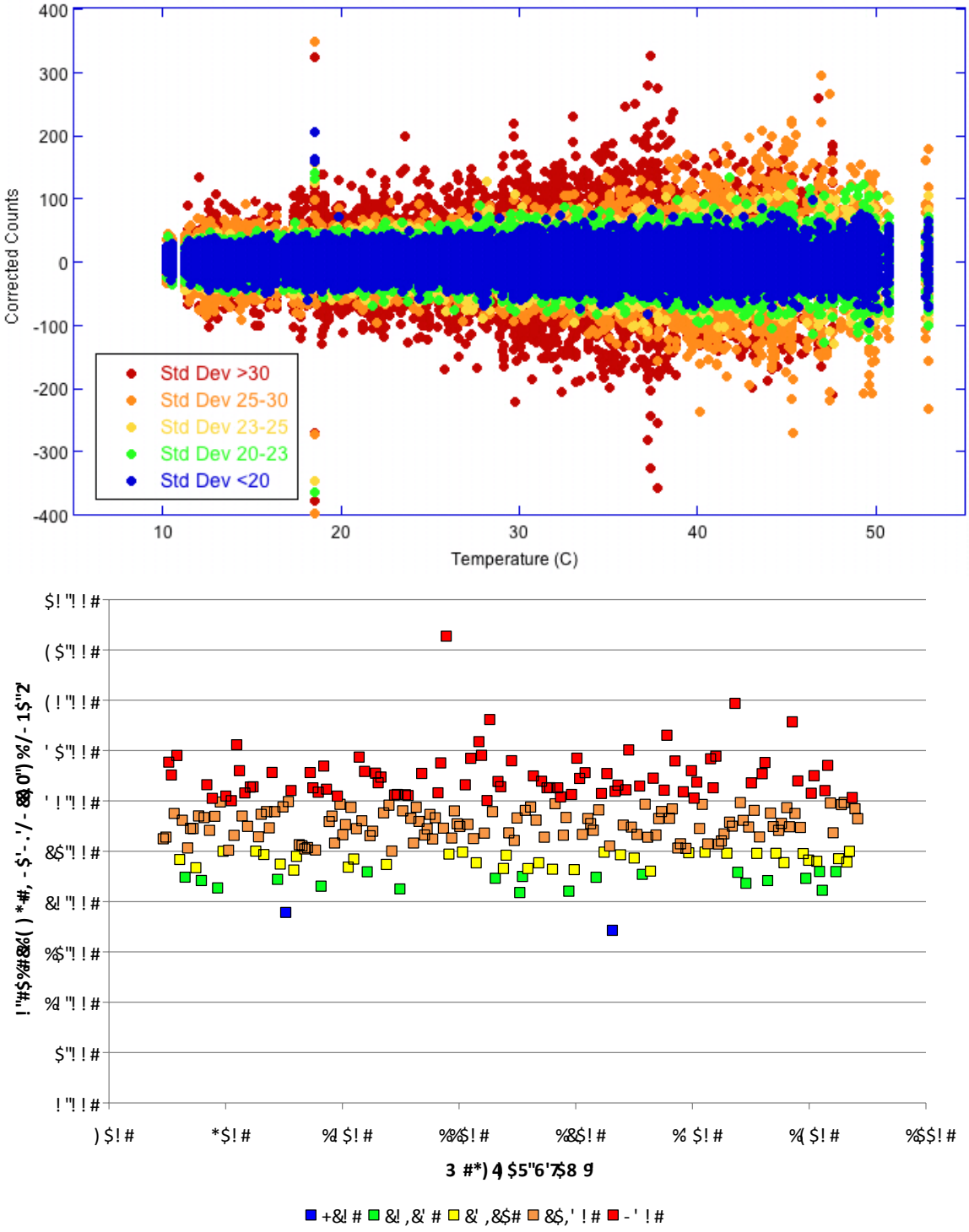

Figure 8. (top) Corrected IR counts for dark quick-cal measurements at several wavelengths. Temperature shown is Temp 2. The 1281.35 detector is among the most stable across all temperatures, whereas 1138.98 is among the noisiest. Measurements taken at 1 and 2 second integration times are both shown. The apparent decrease in noise after about 37°C is a result of the 2 second integration time measurements saturating (the calibration sets corrected counts for saturated pixels to zero). (bottom) Standard deviation of corrected IR counts as a function of wavelengths. Pixels with lower standard deviations are distributed across the array. Over 100 detectors have a standard deviation of 30 counts or less, and ~65 have a standard deviation of 25 counts or less.

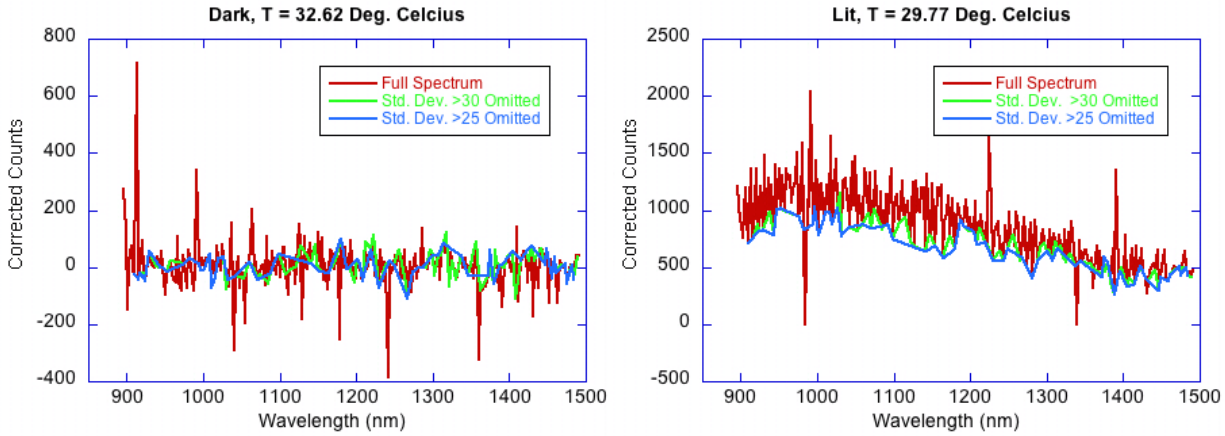

Figure 9. Example spectra using the full spectrum as measured (red), a spectrum omitting pixels with a standard deviation (across all temperatures) of >30 counts (green) and a spectrum omitting pixels with a standard deviation of >25 counts (blue). Both panels are spectra from VIRSNC_ORB_11088_035817, the panel on the left is of a spectrum collected in the dark (i.e., spectrum should ideally be a flat line at zero) and the panel on the right is corrected counts of the lit surface.

5. Results/Recommendations

Based on these observations, data are now collected unbinned, to preserve the maximum number of good channels. The dark interleave has been changed to collect a minimum of 4 darks per observation, but otherwise an increase in dark frequency has not been recommended.

Though the dark fitting procedure behaves nominally for temperature changes on the order of degrees, the 3rd order polynomial fit breaks down when there is a large change in temperature across the observation. In addition, data that are unbounded by dark measurements (ie. the first 39 spectra and final x spectra in an observation) often are poorly fit by the polynomial. To remedy these issues we are exploring several different options. First, we are exploring the options for fitting the dark currents as a moving function, with a restricted temperature range. We are also exploring the effects of using darks from observations immediately preceding or following a given observation, to alleviate the issues with the spectra taken before the first dark and after the last dark are taken. Finally, we are exploring the effectiveness of modeling the dark current as a function of temperature instead of time. The results of further calibration testing, as well as descriptions of any changes implemented to the pipeline calibration, will be detailed in a second dark analysis report.

Table 1. Saturation temperatures and average variation in corrected counts for each wavelength.

Pixel	T Sat 20	T Sat 40	StDev Cor. Cts.	Pixel	T Sat 20	T Sat 40	StDev Cor. Cts.
0	40.78	31.95	27.07	53	-999	48.31	23.22465
1	43.9	34.49	26.80	54	49.6	39.69	27.70005
2	46.9	37.72	27.79	55	45.68	36.32	27.35243
3	50.58	41.19	28.91	56	-999	49.76	22.78312
4	43.9	34.49	25.86	57	-999	47.68	25.29167
5	46.75	37.72	25.39	58	-999	-999	18.82912
6	-999	50.74	20.25	59	49.92	40.64	26.55006
7	41.19	31.95	25.69	60	46.75	37.46	23.87762
8	-999	50.74	20.24	61	-999	44.49	26.43525
9	-999	-999	20.18	62	43.03	32.97	26.45379
10	43.03	34.14	24.54	63	-999	50.08	22.85509
11	-999	46.14	25.19	64	45.68	35.95	26.062
12	-999	-999	21.16	65	52.76	42.17	27.20994
13	48.63	39.16	24.78	66	44.49	34.49	24.84718
14	-999	-999	20.67	67	-999	50.74	24.86405
15	44.49	35.46	25.50	68	41.89	32.97	25.23306
16	52.76	42.17	27.88	69	52.76	43.61	25.55096
17	41.19	32.06	24.70	70	-999	-999	21.46624
18	-999	46.14	26.46	71	45.68	35.95	25.59911
19	-999	44.04	25.49	72	46.9	37.72	26.67959
20	-999	-999	18.26	73	-999	46.14	24.8497
21	48.63	39.16	24.66	74	46.75	37.72	23.40788
22	-999	46.75	24.22	75	-999	-999	21.58228
23	48.79	40.1	24.11	76	-999	47.37	25.05513
24	-999	50.74	23.24	77	44.19	34.49	25.7861
25	50.58	41.05	26.63	78	52.76	42.46	29.14784
26	-999	50.74	24.17	79	-999	46.14	25.89922
27	46.9	37.46	26.73	80	47.53	38.37	23.84905
28	49.27	39.83	26.84	81	-999	47.68	27.73994
29	46.75	35.95	27.88	82	-999	-999	19.18186
30	50.58	41.05	26.52	83	52.76	44.04	24.1058
31	52.76	42.46	26.95	84	-999	-999	21.29841
32	49.27	39.83	24.81	85	46.75	37.21	27.04952
33	44.49	35.46	26.29	86	45.68	35.83	27.48686
34	-999	-999	21.63	87	-999	-999	18.68167
35	-999	45.23	24.89	88	52.76	44.04	24.47645
36	43.9	34.49	25.38	89	49.27	40.64	24.52467
37	-999	49.76	21.20	90	52.76	43.61	27.10954
38	38.76	28.93	25.46	91	-999	47.68	24.63348
39	-999	45.23	25.11	92	45.08	35.83	24.51143
40	52.76	43.32	27.05	93	52.76	43.61	26.78306
41	40.92	31.95	25.59	94	-999	47.68	24.4121
42	-999	50.74	19.33	95	48.95	39.69	24.68716
43	-999	50.74	21.72	96	52.76	43.32	27.31524
44	46.9	38.37	25.27	97	-999	-999	21.36284
45	-999	-999	16.86	98	45.83	36.45	24.47866
46	52.76	42.74	25.17	99	-999	-999	22.2244
47	50.58	41.61	26.18	100	45.08	34.97	27.47074
48	-999	-999	20.63	101	49.43	40.1	25.69173
49	-999	-999	20.90	102	48	38.76	24.47072
50	52.76	43.32	23.28	103	45.08	34.97	25.31987
51	-999	50.74	21.31	104	48	38.37	35.10923
52	43.32	34.49	23.59	105	-999	-999	20.5147

Pixel	T Sat 20	T Sat 40	StDev Cor. Cts.	Pixel	T Sat 20	T Sat 40	StDev Cor. Cts.
106	44.49	34.97	24.5268	159	-999	-999	20.02448
107	-999	50.74	25.243	160	45.68	35.83	27.88392
108	-999	34.14	23.9995	161	52.76	42.17	27.97
109	43.9	34.14	25.9474	162	-999	-999	21.41908
110	-999	-999	22.519	163	52.76	43.61	27.60032
111	52.76	42.74	27.6334	164	43.03	34.14	24.70131
112	45.08	34.97	27.4928	165	-999	-999	15.41742
113	46.9	37.85	29.3537	166	48.63	39.69	24.0077
114	43.03	34.14	24.7898	167	48.79	40.1	24.83288
115	-999	50.74	21.5935	168	-999	-999	22.81316
116	49.43	39.69	28.9012	169	-999	50.08	22.83033
117	46.9	37.85	25.9862	170	49.6	40.64	27.29637
118	45.83	36.83	24.182	171	46.9	37.33	29.49842
119	-999	46.9	26.3075	172	-999	47.68	24.18727
120	46.75	36.95	27.3105	173	-999	-999	21.51183
121	41.89	32.97	24.6356	174	-999	46.14	24.01535
122	-999	-999	19.0182	175	46.75	37.46	25.67786
123	48.16	38.76	24.9601	176	-999	-999	20.82294
124	50.58	42.17	28.0377	177	-999	45.23	25.20894
125	-999	-999	22.1944	178	-999	48	22.81833
126	-999	50.74	22.7485	179	-999	-999	21.93223
127	-999	44.78	26.5197	180	49.27	40.1	27.28866
128	48.79	40.1	24.7472	181	-999	50.74	23.31983
129	-999	50.74	23.1503	182	-999	-999	23.37797
130	-999	44.78	26.1511	183	46.75	37.21	25.3341
131	-999	-999	18.2037	184	-999	46.75	26.04187
132	-999	-999	19.2823	185	49.6	40.37	27.78897
133	46.9	37.85	24.5129	186	-999	47.68	24.48578
134	-999	-999	20.4569	187	43.9	34.49	24.49192
135	-999	46.14	24.5207	188	49.27	39.69	26.52676
136	50.58	41.61	27.3787	189	-999	47.37	22.65967
137	52.76	43.61	26.3394	190	37.59	28.21	26.46331
138	-999	50.74	22.4994	191	49.27	40.1	26.56999
139	52.76	42.46	26.2256	192	-999	49.27	23.7253
140	-999	47.68	24.1152	193	-999	-999	22.32973
141	40.78	30.73	26.3614	194	47.53	38.37	25.37566
142	45.83	35.83	28.0734	195	52.76	42.17	26.89943
143	-999	-999	21.5495	196	52.76	42.17	27.67751
144	49.92	40.37	25.8487	197	-999	50.74	23.52073
145	52.76	42.46	29.4259	198	-999	44.19	26.46052
146	43.9	34.14	30.2549	199	42.17	32.97	24.35137
147	-999	50.74	22.8247	200	-999	50.74	21.12546
148	43.03	33.2	27.4764	201	48	38.76	25.1379
149	-999	-999	19.1794	202	-999	48.31	28.3805
150	52.76	43.32	28.3362	203	52.76	42.17	27.59327
151	-999	-999	20.566	204	-999	50.74	23.1937
152	46.75	37.46	25.148	205	-999	46.9	24.69708
153	-999	46.14	27.2539	206	-999	50.08	22.70822
154	-999	47.37	24.298	207	-999	-999	22.86855
155	52.76	41.61	28.6354	208	-999	50.08	23.10785
156	44.49	35.1	26.3449	209	-999	50.74	24.2171
157	45.08	35.83	24.5811	210	46.9	37.85	29.54325
158	-999	-999	23.6154	211	-999	-999	20.02155

Pixel	T Sat 20	T Sat 40	StDev Cor. Cts.
212	39.96	30.73	24.5173
213	-999	47.68	25.2756
214	-999	-999	20.4799
215	-999	49.11	22.8557
216	52.76	42.74	27.4613
217	45.68	35.95	29.5306
218	-999	-999	22.0016
219	-999	-999	23.8059
220	-999	44.49	28.039
221	52.76	41.61	28.9802
222	-999	-999	19.3821
223	45.23	35.95	25.3105
224	50.58	41.61	27.9543
225	-999	47.68	22.6332
226	39.83	29.66	23.5192
227	-999	46.75	24.9947
228	-999	-999	19.7128
229	42.17	32.4	27.1927
230	-999	-999	22.2386
231	49.92	40.23	30.0751
232	49.6	37.07	25.5109
233	48.63	39.69	25.0874
234	-999	50.74	22.5804
235	43.9	34.49	24.8793
236	-999	-999	19.3169
237	-999	-999	21.327
238	50.58	41.61	26.7028
239	50.58	41.19	29.972
240	-999	-999	19.1856
241	-999	-999	19.6273
242	-999	-999	19.125
243	50.58	41.61	28.0944
244	46.9	37.85	26.5641
245	-999	46.75	25.334
246	-999	44.78	24.9738
247	-999	-999	20.0411
248	-999	-999	20.9347
249	-999	49.11	25.0012
250	50.58	42.17	27.1843
251	-999	48.79	23.674
252	-999	-999	22.6944
253	52.76	42.46	27.5487
254	-999	50.74	25.5186
255	43.9	35.46	27.1569

T Sat 20 = temperature that dark saturates with an integration time of 20 (1 sec); T Sat 40 = temperature that darks saturate with an integration time of 40 (2 sec); StDev Cor. Cts. = standard deviation of corrected counts, averaged over all unsaturated temperatures (1 second integration time)

Table 2. Standard deviation of corrected counts for each wavelength, averaged over temperature bins.

Pixel	T Sat 20	<14	14-16	16-18	18-20	20-22	22-24	24-26	26-28	28-30	30-32	32-34	34-36	36-38	38-40	40-42	>42
0	40.78	13.75	31.26	29.54	29.07	22.40	22.85	20.02	25.59	24.25	26.39	26.74	32.50	27.32	29.05	Sat	!"#
1	43.9	12.77	30.30	29.19	28.54	23.77	22.60	22.88	28.15	24.74	26.00	25.01	31.08	28.64	28.13	Sat	!"#
2	46.9	12.14	33.92	31.83	31.70	29.47	25.94	29.36	30.73	28.61	30.23	31.85	31.31	37.03	31.59	Sat	Sat
3	50.58	13.40	31.05	30.01	29.39	27.71	25.21	31.79	29.05	30.01	27.62	29.80	29.94	33.12	28.79	Sat	Sat
4	43.9	11.35	29.27	30.38	28.31	25.31	24.41	25.13	29.42	23.89	26.67	27.79	28.99	29.31	29.98	Sat	Sat
5	46.75	10.76	32.29	32.36	30.56	29.06	25.70	29.70	28.38	29.69	27.58	32.35	30.71	33.80	31.00	Sat	Sat
6	-999	10.89	23.93	23.82	22.76	21.17	20.22	23.08	22.92	22.81	21.46	23.83	23.83	24.36	23.18	24.33	33.58
7	41.19	12.63	31.24	31.19	28.86	22.28	23.49	21.09	23.78	24.77	27.44	28.44	32.41	30.02	29.79	Sat	!"#
8	-999	10.15	22.92	22.85	22.57	19.80	18.62	21.15	21.97	21.52	20.62	21.99	22.25	23.35	22.20	23.38	34.81
9	-999	11.82	24.06	25.29	22.78	22.52	21.83	24.02	23.16	23.84	22.55	24.43	24.47	25.65	24.59	24.47	31.75
10	43.03	11.49	30.49	30.48	28.14	22.93	22.75	21.90	25.87	24.53	26.58	28.35	31.46	29.14	31.15	Sat	!"#
11	-999	11.99	27.82	26.75	26.80	23.59	22.84	27.42	26.73	27.69	24.51	26.64	26.23	28.74	25.61	27.45	49.43
12	-999	10.76	24.08	23.46	22.81	20.63	19.15	22.86	22.74	22.97	21.66	23.01	24.04	24.09	23.17	23.89	35.98
13	48.63	11.18	27.55	27.21	27.14	24.89	22.19	24.90	25.82	24.84	24.39	27.17	26.02	29.26	27.98	Sat	!"#
14	-999	11.80	21.90	21.63	21.10	19.24	18.56	21.20	20.36	21.41	20.31	21.15	21.13	23.03	21.40	21.30	35.48
15	44.49	12.74	27.90	28.69	27.62	24.53	24.97	25.90	29.59	24.79	25.55	27.50	29.39	28.30	28.28	Sat	!"#
16	52.76	13.48	28.84	29.51	27.68	27.07	25.33	30.76	28.26	29.99	26.81	29.50	27.74	30.51	29.07	Sat	Sat
17	41.19	14.94	29.62	30.59	25.41	22.32	23.19	20.79	23.59	23.02	25.52	27.46	30.03	27.30	28.34	Sat	Sat
18	-999	12.64	29.62	28.60	28.14	26.81	24.47	29.91	27.02	28.28	26.25	29.54	27.71	31.66	29.09	29.24	53.03
19	-999	11.21	26.35	27.12	25.98	24.40	21.70	27.41	26.07	26.46	24.51	26.94	26.35	28.92	26.67	25.77	52.64
20	-999	10.35	22.16	21.40	20.88	19.20	17.95	20.24	20.72	20.42	19.82	20.69	21.61	22.96	20.27	21.29	27.72
21	48.63	12.38	27.69	27.23	27.21	24.56	22.27	25.71	25.58	25.25	24.94	27.64	26.95	30.72	27.49	Sat	Sat
22	-999	11.04	24.77	24.29	24.58	21.79	20.22	24.40	24.60	24.92	22.28	24.24	23.57	25.91	23.34	24.25	48.51
23	48.79	10.23	28.26	28.27	27.09	25.49	22.79	26.09	26.39	25.38	24.80	29.15	26.27	30.26	28.17	Sat	Sat
24	-999	11.23	24.91	23.29	23.65	22.28	21.27	25.75	23.52	24.24	22.33	25.38	23.23	25.31	24.13	24.77	42.60
25	50.58	11.19	27.58	27.43	26.77	25.66	22.86	29.87	26.99	27.43	24.49	28.48	26.41	29.39	26.96	Sat	!"#
26	-999	12.93	26.55	26.56	24.97	23.36	21.94	25.88	23.89	25.09	24.30	26.39	24.32	28.33	27.35	25.37	44.41
27	46.9	11.21	34.64	32.85	31.55	29.30	26.13	30.21	29.85	29.28	29.57	33.93	31.66	37.61	32.62	Sat	!"#
28	49.27	11.49	30.64	30.57	29.54	27.71	25.13	30.25	28.83	29.53	27.34	31.35	29.39	34.03	30.72	Sat	Sat
29	46.75	12.18	29.27	28.80	30.88	25.12	21.78	24.72	29.48	27.51	26.57	26.40	28.20	28.98	28.52	Sat	!"#
30	50.58	11.28	29.79	28.42	27.56	25.99	23.72	29.27	27.12	28.45	25.65	29.15	26.92	31.40	28.11	Sat	Sat
31	52.76	13.43	27.21	25.82	26.33	24.56	22.62	28.79	26.65	27.39	24.34	26.83	25.54	27.99	25.75	Sat	Sat
32	49.27	10.96	29.39	29.34	27.96	26.11	24.05	28.06	27.73	27.66	25.69	30.09	27.76	30.79	29.26	Sat	!"#
33	44.49	11.06	29.88	31.54	30.82	26.30	25.20	26.01	30.94	25.34	26.98	30.25	32.24	30.99	30.44	Sat	Sat
34	-999	11.47	24.08	25.16	23.07	22.29	20.89	24.75	23.43	23.06	22.21	24.52	24.05	25.36	25.06	24.35	38.34
35	-999	11.87	25.37	25.59	24.88	23.38	21.39	25.78	25.68	25.46	22.96	25.60	24.66	25.85	24.28	25.44	50.21
36	43.9	12.36	29.94	29.80	28.46	25.62	23.85	24.25	27.79	23.88	26.90	28.22	30.70	29.71	29.03	Sat	Sat
37	-999	12.15	23.76	24.45	23.53	21.77	21.44	24.17	24.25	23.50	21.89	24.49	24.25	25.72	23.90	24.20	34.51
38	38.76	13.76	31.32	31.75	28.21	23.84	24.91	21.81	25.29	23.89	26.93	29.28	34.85	28.26	Sat	Sat	!"#
39	-999	10.38	26.00	25.10	24.81	23.64	21.74	26.99	26.23	25.63	23.17	26.19	24.84	27.07	25.64	25.77	52.97
40	52.76	12.01	30.58	30.75	28.89	28.14	25.21	30.76	30.05	29.04	27.20	31.19	29.86	32.91	29.57	Sat	!"#
41	40.92	13.82	34.01	32.11	28.70	23.29	24.51	21.38	24.48	25.61	28.81	29.17	34.12	31.42	31.83	Sat	Sat
42	-999	10.23	21.77	22.21	20.73	20.06	18.84	21.33	21.45	21.08	20.11	22.00	21.64	23.36	22.62	21.32	33.45
43	-999	10.23	23.16	22.80	22.59	20.52	19.62	23.52	22.84	23.09	21.10	23.08	22.04	24.47	22.88	22.87	41.46
44	46.9	12.80	28.45	27.38	27.56	25.15	22.94	26.48	28.56	26.26	25.54	28.34	26.34	30.24	27.07	Sat	Sat
45	-999	10.32	19.20	18.10	18.70	17.18	16.64	18.20	18.29	18.54	17.87	18.76	18.11	19.73	18.80	18.65	26.21
46	52.76	10.94	28.16	28.01	26.89	25.00	23.32	28.44	27.12	26.91	25.37	28.80	26.34	30.58	27.97	Sat	Sat
47	50.58	11.66	29.25	28.78	27.72	25.95	23.74	30.41	27.89	29.16	25.76	30.04	28.43	30.77	28.25	Sat	Sat
48	-999	11.86	23.35	22.55	22.83	21.15	19.87	21.94	22.18	22.22	21.70	22.46	23.27	24.58	22.81	22.11	30.10
49	-999	11.60	25.15	25.09	23.89	21.26	20.55	22.85	22.95	23.67	22.82	24.56	24.62	25.32	24.34	25.77	35.95
50	52.76	10.05	24.73	24.85	23.56	22.95	20.41	25.33	23.43	24.46	21.99	25.17	23.50	26.91	25.09	Sat	Sat
51	-999	11.55	24.64	25.33	23.09	22.39	21.29	24.88	24.02	23.81	22.24	25.56	24.73	25.21	24.85	25.19	36.10
52	43.32	10.39	26.87	28.37	25.06	22.06	22.57	21.86	25.52	22.66	23.44	25.72	28.15	25.74	27.23	Sat	Sat
53	-999	10.98	23.95	23.75	23.70	22.76	20.59	25.42	23.27	24.54	22.11	24.54	23.23	25.34	23.63	23.12	47.34

54	49.6	13.07	30.52	30.23	30.13	28.69	25.64	31.31	28.57	29.54	27.56	30.26	28.41	32.65	30.23	Sat	Sat	
55	45.68	12.20	30.85	31.98	31.19	27.74	24.69	26.47	31.50	27.62	27.51	30.33	31.54	30.96	29.88	Sat	Sat	
56	-999	11.24	23.22	23.16	23.63	21.83	19.64	24.23	22.94	24.32	21.39	22.98	23.63	26.12	22.45	22.81	46.20	
57	-999	12.40	28.95	28.26	27.74	26.19	23.93	28.94	27.04	27.92	26.10	29.63	27.84	31.61	28.04	28.33	50.58	
58	-999	10.67	22.46	21.78	20.92	19.29	17.95	20.30	20.67	20.70	20.01	21.47	21.44	23.23	20.67	22.31	28.92	
59	49.92	11.18	30.98	30.47	29.63	28.27	24.97	31.16	30.16	28.96	26.95	31.81	30.04	33.70	29.87	Sat	Sat	
60	46.75	11.21	28.99	29.11	28.21	25.76	23.67	25.82	26.88	26.83	25.03	28.99	27.30	31.14	29.34	Sat	Sat	
61	-999	11.39	26.95	26.68	26.47	23.85	21.65	28.02	26.60	27.11	23.82	26.95	26.07	28.10	25.89	26.64	54.67	
62	43.03	12.15	31.66	31.95	28.20	25.47	24.66	24.27	28.09	24.72	27.12	29.20	32.23	28.88	30.96	Sat	Sat	
63	-999	10.60	25.51	25.89	23.78	23.02	20.94	25.24	24.70	24.63	22.83	25.72	24.92	25.99	24.72	25.35	44.10	
64	45.68	11.25	30.56	30.77	29.28	26.26	23.98	25.13	29.00	26.77	27.31	28.22	31.54	30.87	29.67	Sat	!"#	
65	52.76	11.20	28.16	27.84	28.04	25.42	22.24	28.24	27.03	28.09	25.27	27.89	27.29	30.18	27.33	Sat	!"#	
66	44.49	11.18	28.12	27.72	27.53	23.10	22.19	23.00	27.68	23.54	25.18	26.27	28.41	27.53	27.37	Sat	Sat	
67	-999	12.95	27.23	26.85	26.04	24.19	22.47	27.16	25.64	26.43	24.51	26.94	26.55	28.60	26.79	27.51	46.20	
68	41.89	11.94	28.21	28.56	26.21	21.54	21.88	21.73	24.79	23.24	25.02	24.97	29.28	25.99	26.74	Sat	Sat	
69	52.76	11.25	28.32	26.64	26.73	24.72	22.50	28.09	26.62	27.21	24.66	27.49	26.40	29.21	26.86	Sat	Sat	
70	-999	10.75	23.67	23.72	22.63	21.33	20.07	24.32	22.95	23.51	21.63	23.47	23.14	24.40	23.57	23.74	38.38	
71	45.68	11.49	27.42	28.03	28.02	23.80	21.78	23.53	28.73	25.72	24.13	25.58	27.20	25.77	26.62	Sat	Sat	
72	46.9	12.11	33.50	31.69	31.82	29.09	26.05	28.81	30.65	29.58	29.16	32.70	30.78	34.94	31.91	Sat	Sat	
73	-999	10.97	27.04	25.97	26.11	23.88	21.81	27.44	25.16	26.55	23.97	26.69	25.21	29.05	26.01	27.15	51.60	
74	46.75	11.20	30.39	30.64	28.10	27.87	24.01	27.37	27.83	26.10	26.38	30.57	29.46	32.71	29.72	Sat	Sat	
75	-999	10.56	23.90	22.42	22.98	20.01	19.16	22.94	23.32	23.69	21.57	22.25	23.79	24.35	22.13	23.00	38.26	
76	-999	12.60	25.35	25.58	25.38	23.32	22.17	27.58	26.08	25.98	23.19	25.93	24.45	26.63	25.85	25.35	48.48	
77	44.19	13.53	29.39	28.69	29.16	24.22	21.58	22.53	27.52	24.29	25.49	25.22	30.19	28.96	27.10	Sat	Sat	
78	52.76	13.24	31.21	30.43	30.71	29.23	26.31	31.63	30.56	31.51	28.56	30.74	29.31	33.44	30.68	Sat	Sat	
79	-999	10.76	29.19	29.86	27.79	27.20	23.96	30.05	28.08	27.57	25.51	30.58	28.45	32.00	28.88	29.59	53.65	
80	47.53	10.53	30.21	29.84	27.76	27.28	24.72	27.45	27.13	26.40	26.35	30.74	28.22	31.39	29.27	Sat	!"#	
81	-999	17.27	28.44	28.64	27.84	26.95	24.37	28.88	27.39	28.49	26.84	27.91	27.88	29.00	28.34	28.25	52.75	
82	-999	10.02	23.82	23.55	22.17	20.38	19.23	21.75	21.32	21.57	20.95	22.72	23.24	24.11	22.42	23.81	32.77	
83	52.76	10.98	27.23	27.76	25.84	25.32	22.98	28.42	26.88	27.02	24.11	28.40	27.15	29.92	27.25	Sat	!"#	
84	-999	11.01	25.13	24.94	23.72	21.92	20.00	23.84	23.37	22.99	22.26	24.53	24.84	25.52	24.64	24.79	39.06	
85	46.75	12.68	30.25	29.58	30.98	26.41	22.84	25.07	29.36	27.46	26.89	27.96	29.95	31.55	27.23	Sat	!"#	
86	45.68	12.38	30.47	32.06	29.28	27.76	25.73	27.46	30.13	27.92	27.88	30.03	32.30	30.90	30.21	Sat	Sat	
87	-999	10.60	21.90	21.54	20.55	19.55	17.68	20.41	20.93	20.48	19.38	20.86	22.10	21.94	20.64	20.71	28.39	
88	52.76	10.72	27.01	27.33	25.92	24.45	22.36	28.35	26.99	26.23	24.16	28.07	26.15	28.69	26.61	Sat	Sat	
89	49.27	10.57	29.29	28.10	27.89	25.96	23.18	27.72	26.22	27.04	25.92	29.26	27.92	30.92	28.71	Sat	Sat	
90	52.76	14.36	29.88	28.17	28.95	26.71	24.34	29.56	29.01	28.44	26.85	28.40	28.63	30.62	27.46	Sat	Sat	
91	-999	11.90	27.34	26.05	26.02	24.13	21.59	27.19	25.38	26.71	23.93	27.19	26.77	29.80	26.20	26.67	49.81	
92	45.08	10.76	27.20	26.98	26.13	22.31	21.15	22.22	27.21	22.91	23.78	25.44	26.86	27.28	26.45	Sat	Sat	
93	52.76	12.17	28.59	27.29	27.75	25.83	23.60	29.16	26.55	28.29	25.39	28.50	25.72	30.05	27.64	Sat	!"#	
94	-999	10.58	26.68	26.92	25.82	23.41	22.15	27.12	25.13	25.89	24.05	27.70	25.48	28.08	26.58	26.92	49.77	
95	48.95	10.55	29.79	30.35	28.31	26.99	25.12	28.90	26.96	27.12	26.95	31.03	28.26	32.98	30.20	Sat	Sat	
96	52.76	12.88	25.79	24.40	25.99	23.24	20.99	26.85	26.93	28.06	23.45	24.65	24.71	27.76	24.22	Sat	Sat	
97	-999	10.88	26.68	27.21	23.94	23.08	21.97	25.21	23.18	24.14	23.29	27.27	26.01	27.85	25.84	26.98	37.15	
98	45.83	10.86	28.54	30.61	28.17	24.19	22.32	24.74	27.75	25.78	25.75	27.74	29.53	28.52	28.91	Sat	Sat	
99	-999	11.88	26.22	26.21	24.31	23.21	21.62	24.93	24.06	23.76	23.78	26.65	25.59	26.77	25.47	26.25	34.98	
100	45.08	12.73	30.04	30.26	28.89	25.96	24.03	24.87	28.77	25.03	26.54	28.40	30.50	29.25	29.91	Sat	!"#	
101	49.43	11.66	29.88	29.67	28.35	25.77	23.45	28.75	27.10	27.42	26.31	29.02	28.08	31.93	29.04	Sat	Sat	
102	48	10.71	32.02	30.63	29.25	28.30	25.27	28.22	28.85	28.18	26.98	32.06	29.93	33.96	31.43	Sat	Sat	
103	45.08	11.00	29.69	29.94	28.50	23.71	22.22	22.09	27.92	23.18	25.99	27.18	29.71	28.50	28.91	Sat	Sat	
104	48	13.55	43.64	44.03	42.48	38.56	32.97	38.83	40.96	38.51	37.87	42.25	43.79	47.02	42.58	Sat	!"#	
105	-999	11.96	25.59	25.45	23.92	22.72	20.39	22.72	22.42	22.64	22.84	24.61	24.39	25.75	24.32	25.42	29.88	
106	44.49	11.60	27.96	28.02	26.61	23.27	22.53	22.99	27.78	23.07	24.93	26.50	27.82	26.85	26.58	Sat	!"#	
107	-999	12.76	28.81	27.17	27.39	25.15	23.65	28.89	27.68	28.08	25.31	28.58	27.36	29.90	28.08	29.36	46.54	
108	-999	11.84	26.64	25.66	25.59	23.95	21.64	26.55	25.13	25.64	23.69	26.72	25.46	28.92	25.76	26.74	47.11	
109	43.9	12.92	29.70	30.06	27.62	25.07	23.15	23.58	27.48	24.19	26.35	26.42	30.10	27.49	28.73	Sat	!"#	

110	-999	11.34	24.96	23.69	23.93	21.98	20.47	24.79	23.52	23.39	22.22	24.75	23.51	25.96	23.73	24.58	42.54
111	52.76	11.68	28.35	28.77	28.56	26.33	24.39	31.14	29.75	30.03	26.15	29.80	28.11	31.93	27.87	Sat	Sat
112	45.08	11.51	28.90	29.32	29.47	23.84	23.27	24.52	29.54	26.26	25.57	25.85	29.70	28.70	28.14	Sat	Sat
113	46.9	13.15	34.02	32.64	32.37	29.16	27.01	30.34	32.27	30.05	30.07	33.35	30.56	36.50	32.19	Sat	!"#
114	43.03	11.12	28.80	29.20	27.02	23.84	22.43	22.44	25.70	23.50	25.04	25.86	29.91	26.99	27.87	Sat	Sat
115	-999	10.50	24.03	23.22	22.52	21.11	20.09	23.77	21.73	22.82	21.33	23.21	23.20	24.97	23.77	23.09	39.48
116	49.43	12.70	33.50	32.62	32.64	30.58	27.21	34.13	32.54	32.89	30.08	34.02	32.41	36.65	32.62	Sat	!"#
117	46.9	11.13	32.71	31.76	31.69	28.21	25.09	28.23	29.33	28.95	28.55	32.30	30.30	35.65	31.36	Sat	Sat
118	45.83	10.98	26.03	27.22	25.63	23.53	22.09	23.80	27.17	24.37	23.27	25.07	26.70	25.57	26.39	Sat	!"#
119	-999	11.41	28.07	28.57	27.24	25.89	22.99	29.30	26.80	27.64	25.05	29.43	26.52	29.73	28.52	28.92	54.47
120	46.75	11.92	36.29	34.38	34.39	31.43	27.73	31.32	32.05	31.33	30.33	36.71	33.23	38.53	35.74	Sat	Sat
121	41.89	12.32	30.08	31.09	26.83	23.02	23.92	23.18	25.56	23.69	26.11	29.00	32.07	27.89	29.71	Sat	!"#
122	-999	10.21	22.40	21.97	21.28	19.78	18.55	21.18	21.57	21.16	20.47	22.32	22.26	22.91	21.99	21.62	29.51
123	48.16	10.40	31.03	30.94	29.07	26.91	24.23	27.68	28.33	27.01	27.28	31.04	29.74	33.18	29.60	Sat	Sat
124	50.58	12.81	31.48	31.00	29.70	27.24	24.81	28.85	28.65	29.79	27.68	29.85	29.83	32.64	29.21	Sat	!"#
125	-999	11.32	22.61	22.51	22.50	21.00	19.23	22.90	22.62	22.50	21.01	23.02	22.50	24.18	22.76	22.50	42.47
126	-999	10.21	25.05	23.77	23.62	21.35	19.87	24.89	23.94	24.83	22.24	23.18	24.18	25.86	23.06	23.90	43.57
127	-999	12.58	27.13	26.08	26.96	23.99	21.07	26.55	25.65	26.39	24.15	25.80	26.81	28.80	25.71	27.17	53.05
128	48.79	11.21	30.69	30.79	28.98	27.76	25.54	29.05	28.42	26.76	26.83	32.35	29.34	34.16	30.20	Sat	Sat
129	-999	10.67	25.14	25.28	24.19	22.58	21.32	25.25	24.90	24.75	23.06	25.48	24.57	27.20	25.79	24.99	45.75
130	-999	11.24	27.16	26.41	26.20	24.25	22.21	27.66	26.42	27.60	25.05	26.45	25.93	29.28	25.95	26.44	54.44
131	-999	10.54	22.02	21.45	20.42	18.47	17.97	19.94	20.11	19.89	19.64	21.12	21.15	22.09	21.44	21.65	28.44
132	-999	10.79	23.43	22.81	21.53	20.02	19.04	21.26	21.38	21.25	20.75	22.47	22.38	23.57	22.35	22.54	30.41
133	46.9	11.16	28.65	27.80	28.26	24.60	22.06	24.52	26.31	25.90	25.31	27.21	26.70	28.92	27.42	Sat	Sat
134	-999	10.94	22.61	23.02	22.20	21.17	20.14	22.69	22.23	22.49	21.27	22.78	22.52	23.64	23.21	22.68	34.74
135	-999	10.47	27.40	26.67	25.84	24.68	22.83	28.72	26.10	27.11	24.05	28.10	26.97	30.04	26.72	27.87	50.82
136	50.58	10.94	30.65	29.95	28.53	27.65	25.11	32.41	29.39	29.41	26.55	31.69	28.63	32.57	29.36	Sat	Sat
137	52.76	11.63	28.38	27.65	28.23	23.61	21.76	27.05	26.36	27.30	25.13	27.07	27.88	29.03	26.46	Sat	!"#
138	-999	11.45	24.42	23.83	23.14	20.79	19.22	23.79	22.93	23.08	20.98	22.74	23.61	24.48	23.56	23.53	41.11
139	52.76	10.51	28.49	28.64	26.51	26.41	23.81	30.55	27.15	27.81	25.22	29.77	26.84	32.53	27.81	Sat	Sat
140	-999	10.74	24.96	24.09	24.31	22.50	20.89	26.65	25.09	25.26	22.19	25.76	24.68	26.96	25.03	24.79	50.15
141	40.78	13.70	32.74	34.47	29.85	24.84	26.12	23.48	25.81	26.23	29.24	30.14	35.24	31.40	33.20	Sat	Sat
142	45.83	13.60	30.45	32.23	30.83	27.55	24.89	26.61	30.38	28.63	27.85	30.03	30.49	29.96	28.87	Sat	Sat
143	-999	11.48	23.20	22.37	22.32	20.86	19.97	22.78	22.70	22.29	20.99	23.14	22.16	23.85	23.28	23.46	35.73
144	49.92	10.28	28.08	28.03	28.26	25.45	21.67	27.94	26.85	26.82	25.46	27.35	27.45	30.98	27.18	Sat	!"#
145	52.76	14.44	31.31	30.60	29.78	27.19	25.29	31.24	29.82	30.65	28.28	29.85	30.37	32.92	29.97	Sat	Sat
146	43.9	15.21	33.87	32.96	32.32	27.09	26.38	26.14	31.41	27.58	29.98	30.10	35.18	32.64	31.96	Sat	Sat
147	-999	11.22	25.99	26.34	24.32	23.65	21.61	26.00	24.11	24.58	23.01	26.12	24.77	26.97	25.07	26.22	43.85
148	43.03	11.31	31.65	31.71	29.75	24.93	24.82	24.22	28.78	26.11	27.96	29.16	32.64	29.71	30.43	Sat	!"#
149	-999	10.78	21.46	21.09	20.76	19.60	18.63	21.45	21.02	20.79	19.50	21.60	20.97	21.74	21.40	21.46	30.22
150	52.76	11.71	30.30	29.03	28.45	26.51	23.15	29.09	28.84	29.94	26.59	28.45	29.17	31.39	27.68	Sat	!"#
151	-999	11.51	23.22	22.44	22.41	20.46	19.38	22.57	21.68	22.16	21.27	22.87	22.28	23.29	22.43	23.02	34.34
152	46.75	11.26	31.72	31.13	30.68	28.61	25.35	28.62	27.88	28.25	28.01	32.63	30.06	34.07	31.47	Sat	Sat
153	-999	12.01	30.59	31.05	28.95	27.76	25.79	31.77	28.33	30.10	27.45	31.70	29.83	32.75	30.85	31.07	55.34
154	-999	11.05	26.77	25.23	25.44	23.11	21.16	26.51	25.04	26.36	23.82	25.84	25.52	28.77	25.49	26.18	50.33
155	52.76	12.15	31.56	30.53	29.74	27.20	24.48	31.38	29.64	30.36	27.80	31.23	29.83	33.86	30.22	Sat	Sat
156	44.49	12.52	29.76	29.19	29.59	25.14	23.38	24.35	29.96	24.53	26.13	27.68	29.73	29.46	28.65	Sat	Sat
157	45.08	11.05	27.63	28.39	27.05	23.86	22.05	23.49	26.75	24.13	24.53	26.59	28.79	27.73	27.11	Sat	!"#
158	-999	13.55	26.14	26.37	26.15	24.50	22.95	26.43	25.46	25.81	24.28	27.14	25.78	28.39	26.79	27.16	38.88
159	-999	12.76	23.10	22.14	22.49	20.59	19.25	21.24	21.58	22.29	21.02	21.82	23.30	23.13	21.62	22.93	29.51
160	45.68	12.98	30.01	30.07	30.31	26.48	23.93	25.27	30.80	28.67	27.10	27.42	30.53	29.52	29.01	Sat	!"#
161	52.76	11.97	30.01	29.38	27.63	25.87	24.89	30.42	29.11	29.46	26.67	29.97	27.62	31.58	29.51	Sat	Sat
162	-999	12.74	24.13	23.82	23.40	22.38	21.79	23.99	24.07	24.29	22.37	24.41	24.21	25.08	23.23	23.68	32.30
163	52.76	11.15	30.36	29.69	28.92	27.43	24.60	30.37	28.85	29.20	26.77	30.31	30.03	32.58	29.14	Sat	!"#
164	43.03	12.68	28.32	28.90	25.62	24.42	22.93	22.34	24.50	23.17	24.60	25.50	30.37	26.56	27.13	Sat	Sat
165	-999	10.40	17.32	16.81	16.95	15.85	14.71	16.60	16.34	16.17	16.22	17.03	16.99	17.64	17.08	17.55	22.99

166	48.63	10.53	29.01	29.41	27.84	25.76	22.64	26.33	26.66	25.17	25.76	30.21	28.19	31.19	28.88	Sat	Sat	
167	48.79	10.80	29.69	29.29	27.71	26.61	23.88	27.56	26.38	26.54	26.29	29.72	27.92	32.37	28.42	Sat	!"#	
168	-999	12.41	24.87	24.32	24.10	22.61	21.33	24.59	23.98	25.12	22.47	24.25	23.72	25.71	23.84	24.68	41.01	
169	-999	10.88	26.60	26.18	24.69	24.15	21.97	26.38	24.43	25.02	23.16	26.83	26.17	28.04	26.15	26.08	44.53	
170	49.6	11.14	29.29	29.68	28.78	27.00	24.39	29.58	29.07	28.86	25.81	30.01	28.29	30.65	29.12	Sat	Sat	
171	46.9	18.49	32.98	32.52	32.43	29.95	26.66	29.93	31.40	29.89	29.49	33.41	31.34	35.50	32.28	Sat	!"#	
172	-999	10.97	26.41	25.45	25.16	23.20	22.00	26.85	26.36	26.32	23.52	26.04	25.03	27.46	26.10	25.79	48.32	
173	-999	10.70	23.60	23.75	22.89	21.30	20.08	23.64	23.23	22.94	21.16	23.27	23.72	24.35	23.28	23.50	40.78	
174	-999	10.58	25.79	25.55	24.52	22.45	21.06	26.31	24.44	25.73	22.83	25.99	24.40	27.55	25.16	25.71	50.09	
175	46.75	11.72	30.14	29.65	29.38	26.73	23.49	26.28	29.08	27.46	26.47	29.09	29.36	32.97	27.69	Sat	!"#	
176	-999	11.72	22.39	22.16	22.16	20.32	19.50	22.20	23.06	22.02	21.08	22.08	21.79	23.13	21.93	22.57	32.39	
177	-999	11.89	27.61	28.35	26.66	26.29	23.47	28.06	27.38	26.84	24.92	28.42	27.73	29.52	28.24	27.72	50.85	
178	-999	10.18	25.16	24.56	24.54	22.49	20.71	25.87	23.58	24.34	22.37	25.84	24.42	26.85	24.22	25.62	45.38	
179	-999	10.42	23.50	22.42	22.44	20.63	18.59	22.97	23.30	22.80	20.59	22.32	23.61	23.34	21.72	22.27	40.62	
180	49.27	12.18	31.40	30.46	28.98	28.36	25.99	30.57	28.78	29.18	27.77	32.11	27.81	32.29	30.66	Sat	Sat	
181	-999	10.99	25.42	25.54	24.61	23.60	21.88	25.27	24.36	24.59	23.47	25.96	24.34	26.73	25.89	25.44	44.69	
182	-999	13.73	28.22	27.18	26.71	25.39	24.03	26.80	26.72	26.49	25.20	27.88	25.89	28.70	27.96	27.82	38.01	
183	46.75	10.73	27.59	27.54	29.09	24.58	21.66	24.69	28.47	26.44	25.03	27.21	28.24	30.21	26.74	Sat	Sat	
184	-999	10.81	28.95	29.89	26.95	25.98	23.31	29.17	27.88	27.84	26.26	29.25	28.89	31.77	28.58	28.28	56.22	
185	49.6	11.55	34.00	33.40	31.87	30.10	27.18	33.75	31.58	31.56	29.38	34.44	32.47	35.91	33.18	Sat	!"#	
186	-999	10.56	27.72	26.58	26.12	24.04	21.95	27.05	24.51	26.23	24.46	27.61	25.68	28.83	26.99	27.55	49.67	
187	43.9	11.25	29.65	30.58	28.83	25.23	23.60	23.38	29.23	24.42	26.29	27.96	31.60	29.37	28.75	Sat	Sat	
188	49.27	11.56	31.65	31.60	29.85	28.83	26.58	31.00	29.89	29.20	27.80	32.48	31.49	33.83	31.13	Sat	!"#	
189	-999	11.33	25.61	25.12	24.25	22.23	20.12	24.84	24.19	24.46	22.31	24.79	24.64	25.43	23.71	24.78	39.89	
190	37.59	14.47	25.89	29.34	23.52	25.07	25.75	22.23	23.01	19.09	24.02	28.11	28.63	Sat	Sat	Sat	Sat	
191	49.27	11.27	28.85	28.70	28.59	25.72	23.68	28.50	27.12	28.41	25.94	29.37	26.57	31.83	29.17	Sat	Sat	
192	-999	11.81	25.50	24.81	23.72	22.06	21.27	25.53	24.61	24.92	22.93	24.77	23.71	25.80	24.14	24.79	45.85	
193	-999	11.29	24.80	24.16	24.05	22.23	21.10	24.29	23.69	24.03	23.07	24.76	24.10	25.92	24.84	24.02	39.72	
194	47.53	12.48	30.51	29.51	30.04	29.41	26.00	29.43	29.99	27.73	27.30	30.56	29.43	33.74	29.60	Sat	Sat	
195	52.76	10.51	28.39	28.67	26.86	26.11	23.47	30.02	27.66	28.44	25.68	28.50	27.36	31.57	27.91	Sat	Sat	
196	52.76	11.65	28.97	29.17	28.58	27.30	24.21	30.09	28.97	29.12	25.78	30.15	27.73	30.88	28.48	Sat	Sat	
197	-999	11.33	27.14	27.24	25.24	24.01	22.75	26.53	25.14	26.18	24.06	27.44	26.24	28.52	26.70	27.30	44.77	
198	-999	11.50	27.96	28.30	27.10	24.76	22.55	28.13	27.75	27.90	24.75	27.95	28.25	29.74	27.57	28.02	54.64	
199	42.17	11.38	29.52	29.89	25.64	22.90	22.85	21.86	24.40	23.55	25.75	26.04	29.77	26.75	28.79	Sat	Sat	
200	-999	10.95	25.25	25.77	23.87	22.75	21.34	24.21	23.33	23.56	22.93	25.29	24.63	26.48	25.03	25.83	35.51	
201	48	11.75	32.22	32.12	29.77	28.11	25.54	28.82	28.24	27.83	27.90	31.85	30.71	34.02	31.09	Sat	Sat	
202	-999	13.63	31.33	29.76	29.23	28.16	25.41	31.00	28.93	29.95	27.89	30.23	28.07	32.83	29.75	28.90	58.02	
203	52.76	12.81	33.41	33.01	30.41	29.87	27.59	33.06	29.76	31.57	29.16	33.35	31.03	34.81	32.08	Sat	!"#	
204	-999	11.10	25.36	25.58	24.59	22.67	21.42	25.48	24.19	25.16	23.10	25.18	24.52	26.89	25.01	24.57	45.53	
205	-999	10.65	25.28	24.91	24.21	22.54	20.93	26.06	24.18	25.17	22.94	25.36	23.40	27.23	25.78	24.19	51.06	
206	-999	10.38	26.02	25.38	24.26	22.83	20.92	25.98	23.30	25.38	23.29	25.51	25.86	27.79	25.22	25.03	44.55	
207	-999	12.40	25.11	24.28	23.99	21.81	20.64	24.65	23.68	24.21	22.62	24.50	24.70	25.88	23.93	24.89	42.20	
208	-999	10.73	26.73	26.65	25.16	24.21	22.67	27.12	25.63	26.08	23.50	27.71	27.17	27.93	26.38	27.13	44.46	
209	-999	12.80	26.10	26.66	25.63	23.95	23.16	27.53	25.11	26.58	24.00	27.66	25.04	28.11	26.79	27.14	42.91	
210	46.9	12.44	36.61	36.32	34.96	33.56	31.91	35.50	34.03	33.08	32.87	38.72	34.52	40.59	37.32	Sat	Sat	
211	-999	12.02	23.16	22.57	22.50	20.79	19.85	21.81	21.21	22.26	21.19	22.80	22.60	23.57	23.19	23.34	29.47	
212	39.96	11.38	32.66	31.89	29.07	23.75	23.79	21.44	25.23	23.76	26.28	30.00	35.00	30.30	Sat	Sat	Sat	
213	-999	11.88	27.76	27.77	26.78	24.61	22.70	26.46	25.96	26.38	25.38	27.10	27.35	29.28	27.12	26.98	48.30	
214	-999	10.96	22.08	22.02	21.50	19.91	19.00	21.57	21.60	21.84	20.58	21.47	20.88	22.55	21.74	21.84	33.06	
215	-999	10.73	26.31	26.12	25.08	23.52	21.86	26.35	25.35	24.52	23.39	26.89	25.77	27.82	26.56	26.54	44.36	
216	52.76	11.72	30.73	30.20	28.41	26.83	24.04	30.56	27.85	28.44	26.71	30.05	28.68	32.11	29.42	Sat	Sat	
217	45.68	13.36	28.84	29.89	29.46	26.29	24.56	26.55	31.59	28.44	26.71	27.45	29.45	28.93	28.62	Sat	Sat	
218	-999	10.95	25.20	25.46	24.42	22.19	21.46	24.33	23.65	23.87	22.83	24.67	23.63	26.26	25.10	24.36	36.79	
219	-999	12.17	26.07	26.22	24.89	23.73	22.06	25.67	26.02	25.17	23.80	25.56	26.70	27.00	24.54	25.58	42.09	
220	-999	12.26	31.25	30.43	30.06	28.16	25.40	31.99	29.91	31.19	28.10	30.41	29.97	33.83	30.42	30.96	58.07	
221	52.76	11.05	31.29	30.84	30.16	28.10	25.94	32.48	30.03	30.63	27.57	31.93	28.45	34.71	31.08	Sat	Sat	

222	-999	11.31	21.93	21.92	22.06	19.84	18.77	21.00	21.95	21.36	20.43	22.03	21.31	22.49	22.12	22.27	28.96
223	45.23	11.20	28.05	29.18	28.20	25.13	23.19	25.11	28.89	24.63	25.76	27.40	28.75	29.38	28.98	Sat	Sat
224	50.58	11.24	26.76	26.27	25.94	24.11	21.82	28.53	27.30	27.86	24.13	26.11	26.09	27.88	25.82	Sat	Sat
225	-999	11.17	25.74	24.73	23.67	21.99	20.90	24.63	24.56	24.53	23.02	24.56	24.13	25.60	24.15	24.75	40.15
226	39.83	13.63	27.47	28.41	24.74	22.47	22.48	20.17	22.30	20.97	23.51	26.94	30.69	25.60	Sat	Sat	Sat
227	-999	10.52	26.63	27.00	25.72	23.93	21.77	27.40	25.50	26.97	24.32	26.65	26.47	28.83	26.82	27.05	50.41
228	-999	10.57	23.49	23.03	22.26	21.29	20.28	23.04	22.22	21.99	21.13	23.41	23.38	24.75	22.63	22.69	31.31
229	42.17	12.62	35.00	33.92	31.61	24.36	24.97	24.71	29.06	27.85	29.72	29.75	37.62	32.75	31.87	Sat	Sat
230	-999	11.67	26.07	26.68	25.28	23.39	22.03	24.63	25.02	24.85	23.52	26.41	26.38	27.13	26.43	25.82	37.83
231	49.92	14.12	35.73	34.60	34.20	32.86	28.94	33.74	32.45	33.23	31.34	34.86	34.60	36.53	34.34	Sat	Sat
232	49.6	10.28	27.98	26.76	27.32	23.71	21.82	26.78	26.37	26.56	24.66	26.68	26.50	30.56	26.86	Sat	Sat
233	48.63	10.74	29.58	29.67	28.99	26.60	23.86	26.62	26.95	26.32	26.13	29.88	27.57	31.92	29.24	Sat	!"#
234	-999	11.07	26.99	27.31	25.36	24.05	21.97	26.49	25.38	25.64	23.44	26.49	26.18	27.30	25.95	27.65	41.43
235	43.9	10.73	26.99	26.98	27.52	21.48	20.63	21.39	26.69	22.90	23.27	23.98	27.84	25.41	25.82	Sat	!"#
236	-999	10.59	22.01	21.92	21.60	20.46	18.84	21.11	21.72	20.72	20.14	21.88	22.09	22.48	21.61	21.87	30.17
237	-999	11.12	24.46	23.74	23.19	21.29	19.58	23.45	22.34	23.41	21.95	23.04	23.77	25.89	22.69	23.59	37.15
238	50.58	10.68	29.47	28.72	28.19	25.33	22.69	29.67	27.15	28.02	25.91	29.09	27.57	30.89	27.81	Sat	!"#
239	50.58	13.79	30.45	30.01	29.95	27.90	25.10	31.53	29.71	30.84	27.61	30.64	28.79	31.93	30.04	Sat	Sat
240	-999	10.90	22.93	24.32	21.67	21.47	19.65	22.04	21.40	21.12	20.98	23.26	23.58	23.89	23.48	23.12	29.77
241	-999	11.17	24.23	23.48	22.72	21.09	18.99	22.25	21.87	21.88	21.68	22.61	23.61	24.05	22.55	23.19	30.60
242	-999	10.95	20.76	20.60	21.28	19.17	18.41	20.50	20.38	21.47	20.13	20.34	21.36	22.32	21.14	20.44	29.74
243	50.58	10.67	29.77	28.64	28.29	26.82	23.68	30.72	28.82	29.32	26.23	29.85	27.64	31.95	29.28	Sat	Sat
244	46.9	11.04	33.26	31.39	31.84	28.04	25.00	28.89	28.83	29.29	28.74	31.64	30.03	35.37	31.83	Sat	Sat
245	-999	11.09	28.79	28.46	27.99	24.79	22.22	28.05	26.68	27.25	25.78	28.62	28.16	31.06	27.69	27.61	50.56
246	-999	10.59	26.58	25.87	25.97	22.88	21.19	26.45	25.34	26.97	23.35	25.52	26.10	26.90	25.36	25.61	50.80
247	-999	10.68	22.97	23.35	22.54	20.36	19.35	21.93	22.43	21.61	21.15	23.14	22.70	23.91	23.06	23.45	33.84
248	-999	10.66	24.20	24.01	23.35	21.43	20.05	23.04	23.19	23.03	21.91	23.80	24.15	24.82	23.19	24.87	37.23
249	-999	12.00	29.74	29.18	27.27	25.91	24.34	28.45	27.31	27.27	25.90	29.27	28.73	30.76	28.74	29.13	48.07
250	50.58	11.21	29.33	27.97	28.18	24.95	21.86	28.00	27.21	27.91	25.91	27.83	28.08	31.14	27.09	Sat	!"#
251	-999	10.90	23.64	22.62	23.30	20.80	20.08	24.68	23.13	24.42	21.34	23.00	23.09	24.44	23.05	22.89	46.66
252	-999	10.99	25.73	24.35	25.03	22.14	20.40	24.16	23.91	23.97	22.86	24.28	24.99	27.18	24.25	25.00	41.62
253	52.76	11.06	30.57	29.50	28.08	26.74	23.70	30.13	27.53	28.44	26.41	29.80	28.37	31.25	28.69	Sat	!"#
254	-999	12.10	28.80	28.40	27.91	25.85	24.28	28.05	27.31	27.57	25.77	29.63	27.43	30.25	28.50	28.34	48.09
255	43.9	10.91	30.69	32.19	28.82	25.46	24.00	23.88	28.73	25.23	27.20	27.95	31.95	30.37	30.60	Sat	Sat
Avg		11.64	27.80	27.55	26.61	24.42	22.62	26.12	26.22	25.86	24.77	27.27	27.15	28.85	27.05	25.00	41.71