

ANNEX R  
To  
CRITIQUE OF ALL NASA MARS WEATHER DATA

Comparison of Ultraviolet Radiation and Pressures at Gale Crater, Mars for MSL Years 1 and 2.

**FINAL REPORT FOR MSL YEARS 1 AND 2: ULTRAVIOLET RADIATION AND CLOUD COVER AT MSL.**

**2016** it appears that for the **1,338 sols** (2 full Martian Years) accounted for so far the UV values recorded (or missing) indicate the following:

This Annex explores ultraviolet radiation, pressure and opacity on Mars. As of **May 14,**

TABLE 1A		
Table 1A shows $\mu v$ for 1,256 MSL sols. This chart was prepared before we double checked medium and high $\mu v$ values. The check was necessary because medium and high $\mu v$ values were only distinguished with a slight color difference unless the $\mu v$ icon was clicked (see Figure 2). Table 1B with the red background is what remains after the REMS Team eliminated all low $\mu v$ values. We believe that its credibility is highly suspect.		
UV INDEX	NUMBER OF SOLS	% of SOLS
EXTREMELY HIGH ( $\mu v$ value 5)	0	0%
VERY HIGH ( $\mu v$ value 4)	192	15.3866%
HIGH ( $\mu v$ value 3)	491	39.0127%
MEDIUM ( $\mu v$ value 2)	465	36.9427%
LOW ( $\mu v$ value 1)	19	1.5127%
N/A	91	7.2452%
Average $\mu v$ value = 2.733906 (for 1,167 sols; 91 had no data).		

TABLE 1B		
FIGURES BELOW ARE FROM THE REMS TEAM AFTER THEY VISITED OUR SITES AND REVISED THEIR DATA AGAIN. Table 1B shows $\mu v$ for 1,338 MSL sols.		
UV INDEX	NUMBER OF SOLS	% of SOLS
EXTREMELY HIGH ( $\mu v$ value 5)	0	0%
VERY HIGH ( $\mu v$ value 4)	192	14.3498
HIGH ( $\mu v$ value 3)	543	40.583%
MEDIUM ( $\mu v$ value 2)	495	36.9955%
LOW ( $\mu v$ value 1)	0	0%
N/A	108	8.0717%
Average $\mu v$ value = 2.753659 for 1,230 sols (108 had no data).		

*Table 1B: Ultraviolet radiation reported through 1,330 sols at MSL after the REMS Team read our sites, and dropped all 19 original low  $\mu v$  values.*

We noted on 2/22/2016 that after a visit to our sites by the Finnish Meteorological Institute (*IP address 193.166.22.5*)\* which, working for REMS and NASA bears responsibility for all MSL weather instruments, all 19 low  $\mu v$  values were altered to N/A or medium. We believe that this action is based on an attempt to sidestep concerns expressed on this page and throughout our websites. \*193.166.223.5 - - [22/Feb/2016:03:51:55 MST7MDT] "GET http://marscorrect.com/custom3.html HTTP/1.1" 200 - "Mozilla/5.0 (Windows NT 6.1; WOW64; rv:44.0) Gecko/20100101 Firefox/44.0" "https://www.google.fi"

As was the case with pressures, temperatures, winds (all changed to N/A after I confronted JPL's Guy Webster) and even sunrise sunset times (all changed to agree with my son's calculations), JPL and the REMS Team on occasion changed  $\mu v$  values. **The results (shown on Table 1A above before they made major revisions and Table 1B after they made them) as of May 14, 2016** were a bit surprising. One might think that with the ultra-thin atmosphere espoused by NASA, and no ozone layer, ultraviolet radiation on Mars would be extremely high on at least some days. But it never was, even though NASA alleged that every single day at MSL so far has been "sunny." On 19 sols before we discovered their major revisions it was low! None of these low results survived their massacre of original data. If we use a number of 5 to represent a  $\mu v$  index of extremely high, 4 for very high, 3 for high, 2 for medium, and 1 for low, then (ignoring 91 sols where there was no data on Table 1A), the average  $\mu v$  index was about **2.7334** – between medium and

high. For Table 1B where there was no data for 108 sols, the average  $\mu v$  index was about **2.753659**.

While Viking 1, Viking 2 and MSL high pressure air measurements were close to perihelion (closest approach to the sun) as shown on Table 2, the relationship of perihelion to UV was far less certain. Table 2 on this article details what the current JPL position is with respect to each sol's Solar Longitude (Ls), pressure, and reported UV value. The data published by JPL also mention opacity, but **as of May 14, 2016 none of the 1,338 reports ever varied from SUNNY**. Before their major revision there were 4 categories given by JPL (the Rover Environmental Monitoring Station/REMS team) for UV values found – low, moderate, high and very high. The revision only included moderate, high and very high. Current results are summed up in Figure 1 and Tables 1B and 2.

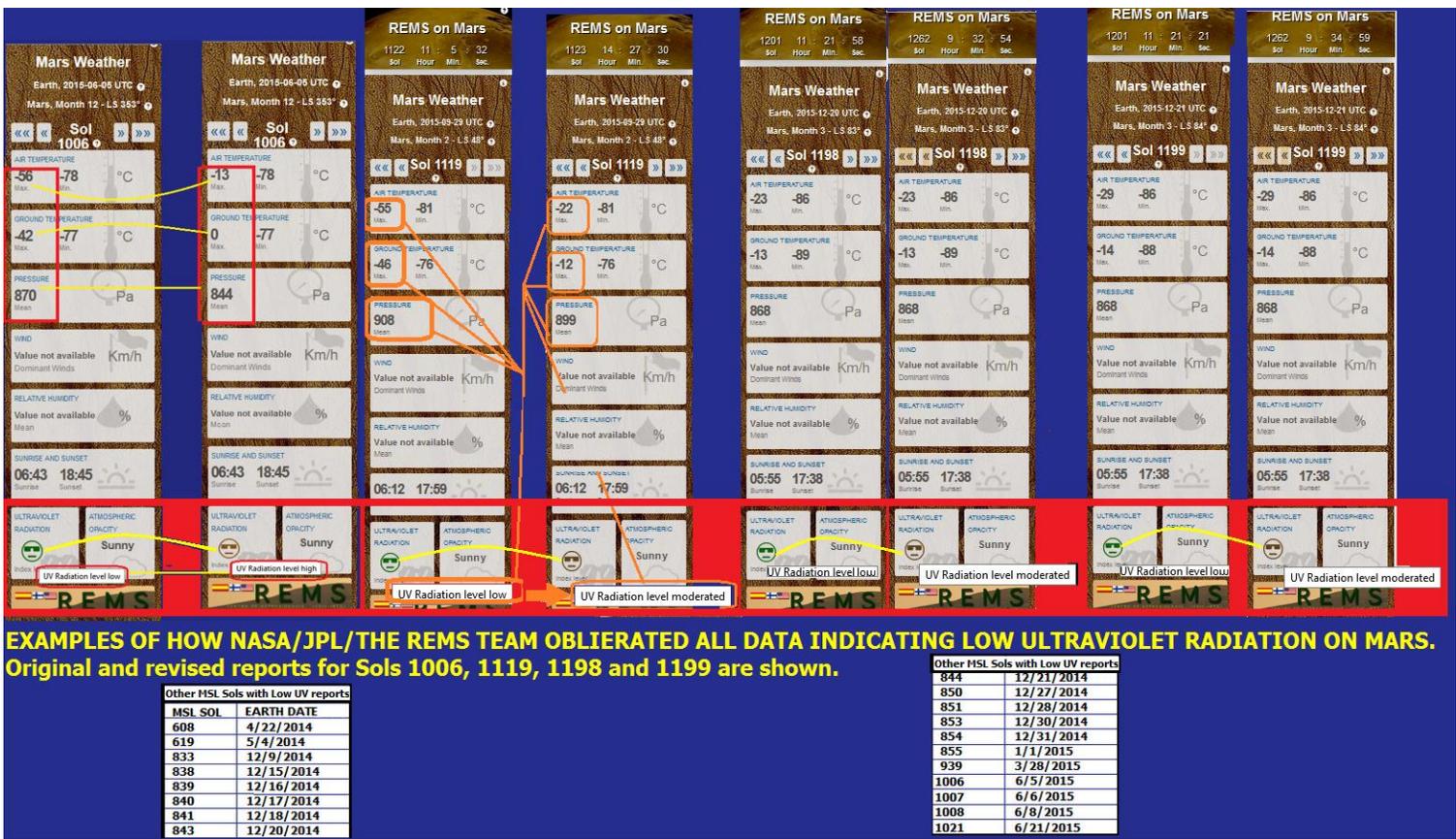


Figure 1 - UV at MSL in Gale Crater, Mars up through its sol 1021 and the beginning of its second autumn on Mars. The REMS Team/JPL dropped all low values by February, 2016.

**Table 2 below - Solar Longitude, Pressures and Ultraviolet Radiation for MSL During its First Two Martian Years. Note: On 3/20/2016 there was an adjustment to all MSL Year 2 data after Sol 880 due to an improperly split cell that is corrected below.**

SOL YR 1	LS	PRESSURE	UV	UV#	SOL YR 2	UV	UV#	LS	PRESSURE	ΔUV	COMMENTS
1	150	N/A			670	H	3	151	737	N/A	
2	151	N/A			671	H	3	151	740	N/A	
3	152	N/A			672	H	3	152	739	N/A	
4	152	N/A			673	H	3	152	738	N/A	
5	153	N/A			674	H	3	153	734	N/A	
6	153	N/A			675	H	3	153	740	N/A	
7	154	N/A			676	H	3	154	738	N/A	
8	155	N/A			677	M	2	154	737	N/A	
9	155	N/A			678	M	2	155	739	N/A	
10	155	739	VH	4	679	M	2	155	738	2	
11	156	740	VH	4	680	M	2	156	740	2	
12	156	741	VH	4	681	M	2	156	738	2	
13	157	732	VH	4	682	H	3	157	739	1	
14	157	740	VH	4	683	H	3	158	741	1	
15	158	740	VH	4	684	M	2	158	741	2	
16	158	740	VH	4	685	H	3	159	740	1	
17	159	742	VH	4	686	H	3	159	738	1	
18	160	N/A			687	H	3	160	739	N/A	
19	160	N/A			688	H	3	160	741	N/A	
20	161	N/A			689	H	3	161	742	N/A	
21	161	741	VH	4	690	H	3	161	741	1	
22	162	742	VH	4	691	H	3	162	741	1	
23	162	741	VH	4	692	H	3	162	742	1	
24	163	742	VH	4	693	H	3	163	741	1	
25	163	743	VH	4	694	H	3	164	740	1	
26	164	745	VH	4	695	H	3	164	741	1	
27	164	743	VH	4	696	H	3	165	743	1	
28	165	745	VH	4	697	H	3	165	743	1	
29	166	747	VH	4	698	H	3	166	743	1	
30	166	747	VH	4	699	H	3	166	744	1	
31	167	745	VH	4	700	H	3	167	745	1	
32	167	N/A			701	H	3	167	745	N/A	
33	168	748	VH	4	702	H	3	168	745	1	
34	168	748	VH	4	703	H	3	169	747	1	
35	169	749	VH	4	704	H	3	169	747	1	
36	169	750	VH	4	705	H	3	170	746	1	
37	170	750	VH	4	706	H	3	170	748	1	
38	171	750	VH	4	707	H	3	171	749	1	
39	171	751	VH	4	708	H	3	171	749	1	
40	172	753	VH	4	709	H	3	172	750	1	
41	172	753	VH	4	710	H	3	172	751	1	
42	173	754	VH	4	711	H	3	173	751	1	
43	173	756	VH	4	712	H	3	174	752	1	
44	174	757	VH	4	713	H	3	174	754	1	
45	175	758	VH	4	714	M	2	175	754	2	
46	175	758	VH	4	715	M	2	175	755	2	
47	176	758	VH	4	716	H	3	176	755	1	
48	176	759	VH	4	717	H	3	176	756	1	
49	177	761	VH	4	718	H	3	177	757	1	
50	177	761	VH	4	719	H	3	178	758	1	
51	178	762	VH	4	720	H	3	178	761	1	
52	179	762	VH	4	721	H	3	179	761	1	
53	179	764	VH	4	722	H	3	179	760	1	
54	180	766	VH	4	723	H	3	180	761	1	First day of spring
55	180	766	VH	4	724	H	3	181	763	1	
56	181	768	VH	4	725	H	3	181	764	1	
57	181	769	VH	4	726	H	3	182	766	1	
58	182	769	VH	4	727	H	3	182	766	1	

SOL YR 1	LS	PRESSURE	UV	UV#	SOL YR 2	UV	UV#	LS	PRESSURE	ΔUV	COMMENTS
59	183	771	VH	4	728	H	3	183	766	1	
60	183	772	VH	4	729	H	3	183	768	1	
61	184	772	VH	4	730	H	3	184	770	1	
62	184	774	VH	4	731	H	3	185	771	1	(Pressure altered from 754)
63	185	775	VH	4	732	H	3	185	773	1	
64	186	776	VH	4	733	H	3	186	773	1	
65	186	777	VH	4	734	H	3	186	776	1	
66	187	778	VH	4	735	H	3	187	776	1	
67	187	780	VH	4	736	H	3	188	776	1	
68	188	781	VH	4	737	H	3	188	777	1	
69	189	778	H	3	738	H	3	189	778	0	
70	189	783	VH	4	739	H	3	189	779	1	
71	190	784	VH	4	740	H	3	190	782	1	
72	190	785	VH	4	741	H	3	191	784	1	
73	191	788	VH	4	742	H	3	191	784	1	
74	192	790	VH	4	743	H	3	192	786	1	
75	192	791	VH	4	744	H	3	192	788	1	
76	193	792	VH	4	745	H	3	193	787	1	
77	193	792	VH	4	746	H	3	194	788	1	
78	194	793	VH	4	747	H	3	194	789	1	
79	195	795	VH	4	748	H	3	195	791	1	
80	195	796	VH	4	749	H	3	195	794	1	
81	196	798	VH	4	750	H	3	196	796	1	
82	196	799	VH	4	751	H	3	197	797	1	
83	197	801	VH	4	752	H	3	197	798	1	
84	198	801	VH	4	753	H	3	198	800	1	
85	198	805	VH	4	754	H	3	198	803	1	
86	199	808	VH	4	755	H	3	199	806	1	
87	199	808	VH	4	756	M	2	200	806	2	
88	200	811	VH	4	757	H	3	200	807	1	
89	201	813	VH	4	758	H	3	201	810	1	
90	201	813	VH	4	759	H	3	201	809	1	
91	202	817	VH	4	760	H	3	202	810	1	
92	202	820	VH	4	761	H	3	203	814	1	
93	203	819	VH	4	762	H	3	203	814	1	
94	204	822	VH	4	763	H	3	204	817	1	
95	204	822	VH	4	764	H	3	205	821	1	
96	205	826	VH	4	765	H	3	205	820	1	
97	206	828	VH	4	766	H	3	206	824	1	
98	206	828	VH	4	767	H	3	206	824	1	
99	207	829	VH	4	768	H	3	207	826	1	
100	207	829	VH	4	769	H	3	208	829	1	
101	208	830	VH	4	770	H	3	208	829	1	
102	209	833	VH	4	771	H	3	209	836	1	
103	209	836	VH	4	772	H	3	210	835	1	
104	210	838	VH	4	773	H	3	210	838	1	
105	211	839	H	3	774	H	3	211	838	0	
106	211	841	H	3	775	H	3	211	838	0	(Pressure altered from 823 to 838)
107	212	844	H	3	776	H	3	212	841	0	
108	212	845	H	3	777	H	3	213	841	0	
109	213	844	H	3	778	H	3	213	846	0	
110	214	848	H	3	779	H	3	214	845	0	
111	214	849	VH	4	780	H	3	215	852	1	
112	215	852	VH	4	781	M	2	215	849	2	
113	216	857	VH	4	782	M	2	216	854	2	
114	216	857	VH	4	783	M	2	216	853	2	

SOL YR 1	LS	PRESSURE	UV	UV#	SOL YR 2	UV	UV#	LS	PRESSURE	ΔUV	COMMENTS
115	217	857	VH	4	784	M	2	217	857	2	
116	217	859	VH	4	785	M	2	218	858	2	
117	218	861	VH	4	786	M	2	218	861	2	
118	219	864	VH	4	787	M	2	219	860	2	
119	219	866	VH	4	788	M	2	220	862	2	
120	220	867	VH	4	789	M	2	220	862	2	
121	221	869	H	3	790	M	2	221	864	1	
122	221	869	VH	4	791	M	2	222	867	2	
123	222	875	H	3	792	M	2	222	873	1	
124	223	876	VH	4	793	M	2	223	877	2	
125	223	880	VH	4	794	M	2	223	874	2	
126	224	880	VH	4	795	M	2	224	875	2	
127	224	884	VH	4	796	M	2	225	877	2	
128	225	883	H	3	797	M	2	225	879	1	
129	226	886	H	3	798	M	2	226	883	1	
130	226	888	H	3	799	M	2	227	884	1	
131	227	889	VH	4	800	M	2	227	884	2	
132	228	890	VH	4	801	M	2	228	884	2	
133	228	891	VH	4	802	M	2	229	887	2	
134	229	893	VH	4	803	M	2	229	888	2	
135	230	894	VH	4	804	M	2	230	891	2	
136	230	897	VH	4	805	M	2	231	893	2	
137	231	896	VH	4	806	M	2	231	893	2	
138	232	899	VH	4	807	M	2	232	892	2	
139	232	899	VH	4	808	M	2	232	893	2	
140	233	903	VH	4	809	M	2	233	891	2	
141	233	904	VH	4	810	M	2	234	897	2	
142	234	906	VH	4	811	M	2	234	900	2	
143	235	908	VH	4	812	M	2	235	902	2	
144	235	907	VH	4	813	M	2	236	904	2	
145	236	909	VH	4	814	M	2	236	902	2	
146	237	908	VH	4	815	M	2	237	905	2	
147	237	914	VH	4	816	M	2	238	908	2	
148	238	912	VH	4	817	M	2	238	913	2	
149	239	914	VH	4	818	M	2	239	914	2	
150	239	913	VH	4	819	M	2	240	913	2	
151	240	915	VH	4	820	M	2	240	910	2	
152	241	914	VH	4	821	M	2	241	910	2	
153	241	915	VH	4	822	M	2	242	911	2	
154	242	917	VH	4	823	M	2	242	912	2	
155	243	917	VH	4	824	M	2	243	914	2	
156	243	922	VH	4	825	M	2	243	914	2	
157	244	920	VH	4	826	M	2	244	914	2	
158	245	922	VH	4	827	M	2	245	911	2	
159	245	918	VH	4	828	M	2	245	914	2	
160	246	919	VH	4	829	M (was L)	2 (was 1)	246	923	2	Altered from L
161	246	919	VH	4	830	M	2	247	918	2	
162	247	919	VH	4	831	M	2	247	920	2	
163	248	919	VH	4	832	M	2	248	924	2	
164	248	919	H	3	833	M (was low)	2 (was 1)	249	910	2	
165	249	922	H	3	834	H	3	249	918	0	
166	250	922	H	3	835	H	3	250	917	0	
167	250	920	H	3	836	M	2	251	916	1	PERIHELION

SOL YR 1	LS	PRESSURE	UV	UV#	SOL YR 2	UV	UV#	LS	PRESSURE	ΔUV	COMMENTS
168	251	923	H	3	837	M	2	251	916	1	PERIHELION
169	252	922	H	3	838	N/A (was L)	N/A (was 1)	252	917	2	
170	252	925	H	3	839	N/A (was L)	N/A (was 1)	253	917	2	HIGH PRESSURE FOR BOTH MSL MSL YEARS
171	253	925	H	3	840	N/A (was L)	N/A (was 1)	253	913	2	
172	254	923	H	3	841	N/A (was L)	N/A (was 1)	254	914	2	
173	254	920	H	3	842	M	2	255	914	1	
174	255	921	H	3	843	N/A (was L)	N/A (was 1)	255	916	2	
175	256	921	H	3	844	N/A (was L)	N/A (was 1)	256	917	2	
176	256	920	H	3	845	M	2	257	920	1	
177	257	921	H	3	846	M	2	257	925	1	HIGH PRESSURE FOR BOTH MSL MSL YEARS
178	258	920	H	3	847	M	2	258	918	1	
179	258	920	H	3	848	M	2	258	918	1	
180	259	919	H	3	849	M	2	259	918	1	
181	260	918	H	3	850	N/A (was L)	N/A (was 1)	260	918	2	
182	260	921	H	3	851	N/A (was L)	N/A (was 1)	260	919	2	
183	261	921	H	3	852	M	2	261	916	1	
184	261	923	H	3	853	N/A (was L)	N/A (was 1)	262	913	2	
185	263	923	H	3	854	N/A (was L)	N/A (was 1)	262	910	2	
186	263	922	H	3	855	N/A (was L)	N/A (was 1)	263	912	2	
187	264	921	H	3	856	M	2	264	912	1	
188	264	920	VH	4	857	M	2	264	911	2	
189	265	920	H	3	858	M	2	265	913	1	
190	265	917	H	3	859	M	2	266	915	1	
191	266	921	VH	4	860	M	2	266	916	2	
192	267	N/A			861	M	2	267	917	N/A	
193	267	N/A			862	M	2	268	917	N/A	
194	268	N/A			863	H	3	268	916	N/A	
195	269	N/A			864	H	3	269	914	N/A	
196	269	916	H	3	865	M	2	270	913	1	Summer starts at MSL
197	270	915	H	3	866	M	2	270	911	1	Summer starts at MSL
198	271	914	H	3	867	M	2	271	910	1	
199	271	917	H	3	868	M	2	272	908	1	
200	272	N/A			869	M	2	273	906	N/A	
201		N/A			870	M	2	273	909	N/A	
202		N/A			871	M	2	274	903	N/A	
203		N/A			872	M	2	275	902	N/A	
204		N/A			873	N/A		275	No Report	N/A	
205		N/A			874	N/A		276	No Report	N/A	

SOL YR 1	LS	PRESSURE	UV	UV#	SOL YR 2	UV	UV#	LS	PRESSURE	ΔUV	COMMENTS
206		N/A			875	N/A		277	No Report	N/A	
207		N/A			876	N/A		277	No Report	N/A	
208		N/A			877	N/A		278	No Report	N/A	
209		N/A			878	N/A		278	No Report	N/A	
210		N/A			879	N/A		279	No Report	N/A	
211		N/A			880	N/A (was M)	2 (was 2)	279	872 (was 858)	N/A	1st sol 880 report altered.
212		N/A			881	M	2	280	895	N/A	
213		N/A			882	M	2	280	901	N/A	
214		N/A			883	M	2	281	897	N/A	
215	281	N/A			884	M	2	282	897	N/A	
216		N/A			885	M	2	282	895	N/A	
217		N/A			886	M	2	283	894	N/A	
218		N/A			887	M	2	284	897	N/A	
219		N/A			888	H	3	284	896	N/A	
220		N/A			889	H	3	285	895	N/A	
221		N/A			890	H	3	286	892	N/A	
222	286	N/A			891	H	3	286	892	N/A	
223	287	895	VH	4	892	H	3	287	892	1	
224	287	894	VH	4	893	H	3	287	890	1	
225	288	894	VH	4	894	M	2	288	891	2	
226	288	894	VH	4	895	H	3	289	889	1	
227	289	892	VH	4	896	H	3	289	888	1	
228	290	894	VH	4	897	H	3	290	884	1	
229	290	894	VH	4	898	VH	4	291	883	0	
230	291	888	VH	4	899	H	3	291	881	1	
231	292	890	VH	4	900	H	3	292	883	1	
232	292	888	VH	4	901	H	3	292	885	1	
233	293	889	VH	4	902	H	3	293	883	1	
234	293	890	VH	4	903	H	3	294	882	1	
235	294	886	VH	4	904	H	3	294	878	1	
236	295	886	VH	4	905	H	3	295	880	1	
237	295	883	VH	4	906	H	3	296	878	1	
238	296	885	VH	4	907	H	3	296	879	1	
239	297	885	VH	4	908	H	3	297	883	1	
240	297	884	VH	4	909	H	3	297	878	1	
241	298	884	VH	4	910	H	3	298	878	1	
242	298	881	VH	4	911	H	3	299	874	1	
243	299	884	VH	4	912	H	3	299	875	1	
244	300	878	VH	4	913	H	3	300	871	1	
245	300	879	VH	4	914	H	3	300	874	1	
246	301	878	VH	4	915	H	3	301	878	1	
247	301	873	VH	4	916	H	3	302	872	1	
248	302	877	H	3	917	H	3	302	871	1	
249	303	873	H	3	918	H	3	303	867	1	
250	303	877	VH	4	919	H	3	304	870	1	
251	304	876	VH	4	920	H	3	304	868	1	
252	304	874	VH	4	921	VH	4	305	867	0	
253	305	877	VH	4	922	VH	4	305	870	0	
254	306	871	VH	4	923	VH	4	306	867	0	
255	306	877	VH	4	924	VH	4	307	867	0	
256	307	871	VH	4	925	H	3	307	862	1	
257	308	871	VH	4	926	H	3	308	864	1	
258	308	869	VH	4	927	VH	4	308	862	1	
259	309	871	H	3	928	VH	4	309	862	1	
260	309	875	H	3	929	VH	4	310	866	1	

SOL YR 1	LS	PRESSURE	UV	UV#	SOL YR 2	UV	UV#	LS	PRESSURE	ΔUV	COMMENTS
261	310	868	H	3	930	VH	4	310	865	1	
262	311	N/A			931	VH	4	311	864	N/A	
263		N/A			932	VH	4	311	859	N/A	
264		N/A			933	VH	4	312	863	N/A	
265		N/A			934	VH	4	313	858	N/A	
266		N/A			935	VH	4	313	862	N/A	
267	313	N/A			936	VH	4	314	865	N/A	
268	314	864	H	3	937	VH	4	314	865	1	
269	315	866	H	3	938	N/A	N/A	N/A	N/A	N/A	
270	315	863	H	3	939	N/A (was L)	N/A (was 1)	316	827	N/A	Low UV altered, pressure seems too low
271	316	864	H	3	940	VH	4	316	861	1	
272	316	864	H	3	941	H	3	317	857	0	
273	317	861	H	3	942	H	3	317	857	0	
274	318	861	H	3	943	H	3	318	854	0	
275	318	860	H	3	944	H	3	318	852	0	
276	319	858	H	3	945	H	3	319	851	0	
277	319	857	H	3	946	H	3	320	850	0	
278	320	855	H	3	947	H	3	320	853	0	
279	321	856	H	3	948	H	3	321	854	0	
280	321	856	H	3	949	H	3	321	851	0	
281	322	855	H	3	950	H	3	322	850	0	
282	322	856	H	3	951	H	3	323	849	0	
283	323	854	H	3	952	H	3	323	847	0	
284	323	854	H	3	953	H	3	324	847	0	
285	324	852	H	3	954	H	3	324	847	0	
286	325	854	H	3	955	N/A	N/A	324	N/A	N/A	No data for sols 955 to 956
287	325	856	H	3	956	N/A	N/A	325	N/A	N/A	
288	326	854	H	3	957	N/A (was H)	N/A (was 3)	326	823	N/A	Pressure is low.
289	326	854	H	3	958	H	3	327	848	0	
290	327	853	H	3	959	H	3	327	846	0	
291	327	853	H	3	960	H	3	328	846	0	
292	328	853	H	3	961	H	3	329	845	0	
293	329	850	H	3	962	H	3	328	849	0	
294	329	852	H	3	963	H	3	329	850	0	
295	330	853	H	3	964	H	3	330	847	0	
296	330	850	H	3	965	H	3	331	847	0	
297	331	849	H	3	966	H	3	331	850	0	
298	331	850	H	3	967	H	3	332	844	0	
299	332	849	H	3	968	H	3	332	848	0	
300	333	852	H	3	969	H	3	333	844	0	
301	334	852	H	3	970	H	3	333	849	0	
302	334	850	H	3	971	M	3	334	848	0	
303	334	849	H	3	972	H	3	334	847	0	
304	335	848	H	3	973	H	3	335	844	0	
305	335	847	H	3	974	H	3	336	842	0	
306	336	848	H	3	975	H	3	336	843	0	
307	336	851	H	3	976	M	2	337	842	1	
308	337	850	H	3	977	M	2	337	841	1	
309	338	848	H	3	978	M	2	338	842	1	
310	338	849	H	3	979	M	2	338	841	1	
311	339	846	H	3	980	M	2	339	840	1	

SOL YR 1	LS	PRESSURE	UV	UV#	SOL YR 2	UV	UV#	LS	PRESSURE	ΔUV	COMMENTS
312	340	845	H	3	981	M	2	339	841	1	
313	340	849	H	3	982	M	2	340	840	1	
314	340	848	H	3	983	M	2	340	840	1	
315	341	850	H	3	984	M	2	341	840	1	
316	341	851	H	3	985	M	2	342	840	1	
317	342	849	H	3	986	M	2	342	840	1	
318	342	848	H	3	987	M	2	343	839	1	
319	343	847	H	3	988	M	2	343	840	1	
320	344	846	H	3	989	M	2	344	841	1	
321	344	847	H	3	990	H	3	345	839	0	
322	345	849	H	3	991	H	3	345	840	0	
323	345	847	H	3	992	H	3	345	842	0	
324	346	850	H	3	993	H	3	346	840	0	
325	346	847	H	3	994	H	3	346	842	0	
326	347	848	H	3	995	H	3	347	842	0	
327	347	848	VH	4	996	H	3	348	842	1	
328	348	847	H	3	997	H	3	348	842	0	
329	348	847	H	3	998	H	3	349	842	0	
330	349	848	H	3	999	N/A	N/A	349	N/A	N/A	
331	349	848	H	3	1000	H	3	350	841	0	
332	350	849	H	3	1001	H	3	350	853	0	
333	350	849	H	3	1002	H	3	351	844	0	
334	351	852	H	3	1003	H	3	351	843	0	
335	352	852	H	3	1004	H	3	352	842	0	
336	352	852	H	3	1005	H	3	352	843	0	
337	353	853	H	3	1006	L (was H)	1 (was 3)	353	870 revised to 844	2 revised to 0	
338	353	848	H	3	1007	L (was H)	1 revised to 3	353	832 revised to 845	2 revised to 0	
339	354	849	H	3	1008	L (was H)	1 revised to 3	354	867 revised to 844	2 revised to 0	
340	354	851	H	3	1009	H	3	354	845	0	Conjunction
341	354	852	H	3	1010	H	3	355	846	0	
342	355	851	H	3	1011	H	3	356	845	0	

SOL YR 1	LS	PRESSURE	UV	UV#	SOL YR 2	UV	UV#	LS	PRESSURE	ΔUV	COMMENTS
343	356	850	H	3	1012	H	3	356	846	0	
344	356	851	H	3	1013	H	3	356	846	0	
345	357	853	H	3	1014	H	3	356	846	0	
346	357	853	H	3	1015	H	3	357	847	0	
347	358	851	H	3	1016	H	3	358	847	0	
348	358	850	H	3	1017	H	3	359	850	0	
349	359	852	H	3	1018	H	3	359	850	0	
350	359	853	H	3	1019	M	2	0	819	1	Fall starts at MSL. Low Pressure.
351	0 Fall	853	H	3	1020	H	3	0 (Fall)	832	0	
352	0 Fall	854	H	3	1021	L (was H)	3 (was H)1	1	848 changed to 850	2	
353	1	855	H	3	1022	H	3	1	852	0	
354	1	857	H	3	1023	H	3	2	827	0	Pressure unusually low
355	2	857	H	3	1024	H	3	2	851	0	
356	2	856	H	3	1025	H	3	3	851	0	
357	3	857	H	3	1026	N/A (was L)	N/A (was 1)	3	868	N/A (was 2)	
358	3	N/A			1027	N/A	N/A	N/A	N/A	N/A	
359	4	N/A			1028	H	3	4	853	N/A	
360	4	N/A			1029	H	3	5	856	N/A	
361	5	N/A			1030	H	3	5	855	N/A	
362	5	N/A			1031	H	3	6	858	N/A	
363	6	N/A			1032	H	3	6	854	N/A	
364	6	N/A			1033	H	3	7	856	N/A	
365	7	N/A	N/A	3	1034	H	3	7	859	0	
366	7	861	H	3	1035	H	3	8	857	0	
367	8	862	H	3	1036	H	3	8	860	0	
368	8	863	H	3	1037	H	3	9	856	0	
369	9	865	H	3	1038	H	3	9	858	0	
370	9	Initial pressure 1149, then dropped to 865 after we made an issue of it.	H	3	1039	H	3	10	857	0	

SOL YR 1	LS	PRESSURE	UV	UV#	SOL YR 2	UV	UV#	LS	PRESSURE	ΔUV	COMMENTS
371	10	865	H	3	1040	H	3	10	858	0	
372	10	866	H	3	1041	H	3	11	859	0	
373	11	866	H	3	1042	M	2	11	859	1	
374	11	866	H	3	1043	M	2	12	860	1	
375	12	867	H	3	1044	M	2	12	860	1	
376	12	870	H	3	1045	H	3	13	861	0	
377	13	870	H	3	1046	H	3	13	862	0	
378	13	869	H	3	1047	H	3	14	863	0	
379	14	870	H	3	1048	H	3	14	864	0	
380	14	870	H	3	1049	H	3	15	864	0	
381	15	871	H	3	1050	H	3	15	863	0	
382	15	872	H	3	1051	H	3	16	864	0	
383	16	874	M	2	1052	H	3	16	865	1	
384	16	875	H	3	1053	H	3	17	865	0	
385	17	874	H	3	1054	H	3	17	867	0	
386	17	873	H	3	1055	H	3	17	868	0	
387	18	874	H	3	1056	H	3	18	868	0	
388	18	875	H	3	1057	H	3	18	867	0	
389	19	875	H	3	1058	H	3	19	868	0	
390	19	875	H	3	1059	H	3	19	870	0	
391	20	875	H	3	1060	H	3	20	870	0	
392	20	876	H	3	1061	H	3	20	871	0	
393	21	877	H	3	1062	H	3	21	871	0	
394	21	878	H	3	1063	H	3	21	871	0	
395	22	878	H	3	1064	H	3	22	871	0	
396	22	879	H	3	1065	H	3	22	873	0	
397	23	880	H	3	1066	H	3	23	875	0	
398	23	880	H	3	1067	M	2	23	875	1	
399	24	881	H	3	1068	H	3	24	874	0	
400	24	881	H	3	1069	H	3	24	876	0	
401	25	882	H	3	1070	H	3	25	877	0	
402	25	883	H	3	1071	H	3	25	878	0	
403	25	883	H	3	1072	H	3	26	879	0	
404	26	884	M	2	1073	M	2	26	879	0	

SOL YR 1	LS	PRESSURE	UV	UV#	SOL YR 2	UV	UV#	LS	PRESSURE	ΔUV	COMMENTS
405	26	885	M	2	1074	H	3	27	878	1	
406	27	886	H	3	1075	M	2	27	879	1	
407	27	887	M	2	1076	M	2	28	880	0	
408	28	887	M	2	1077	M	2	28	880	0	
409	28	887	M	2	1078	M	2	29	881	0	
410	29	888	H	3	1079	M	2	29	882	1	
411	29	887	M	2	1080	M	2	29	882	0	
412	30	888	M	2	1081	M	2	30	882	0	
413	30	888	H	3	1082	M	2	30	882	1	
414	31	889	H	3	1083	M	2	31	883	1	
415	31	890	H	3	1084	H	3	31	885	0	
416	32	889	H	3	1085	M	2	32	886	1	
417	32	890	H	3	1086	H	3	32	885	0	
418	33	891	H	3	1087	H	3	33	885	0	
419	33	891	H	3	1088	H	3	33	885	0	
420	33	892	H	3	1089	H	3	34	885	0	
421	34	891	H	3	1090	H	3	34	886	0	
422	34	891	M	2	1091	H	3	35	886	1	
423	35	892	M	2	1092	H	3	35	886	1	
424	35	893	M	2	1093	H	3	36	887	1	
425	36	893	M	2	1094	H	3	36	888	1	
426	36	893	M	2	1095	M	2	36	888	0	
427	37	893	M	2	1096	M	2	37	888	0	
428	37	894	M	2	1097	M	2	37	889	0	
429	38	895	M	2	1098	M	2	38	890	0	
430	38	896	M	2	1099	M	2	38	891	0	
431	39	895	M	2	1100	M	2	39	890	0	
432	39	896	M	2	1101	M	2	39	891	0	
433	40	895	M	2	1102	M	2	40	892	0	
434	40	896	M	2	1103	M	2	40	893	0	
435	40	897	M	2	1104	M	2	41	893	0	
436	41	897	M	2	1105	M	2	41	892	0	
437	41	898	M	2	1106	M	2	42	893	0	

SOL YR 1	LS	PRESSURE	UV	UV#	SOL YR 2	UV	UV#	LS	PRESSURE	ΔUV	COMMENTS
438	42	899	M	2	1107	M	2	42	893	0	
439	42	899	M	2	1108	M	2	42	895	0	
440	43	899	M	2	1109	M	2	43	895	0	
441	43	900	M	2	1110	M	2	43	895	0	
442	44	900	M	2	1111	H	3	44	896	1	
443	44	901	M	2	1112	H	3	44	895	1	
444	45	N/A			1113	M	2	45	895	N/A	
445	45	N/A			1114	M	2	45	896	N/A	
446	46	N/A			1115	M	2	46	897	N/A	
447	46	N/A			1116	M	2	46	898	N/A	
448	47	N/A			1117	M	2	47	898	N/A	
449	47	N/A			1118	M	2	47	898	N/A	
450	48	N/A			1119	L changed to M after we highlighted it.	1 changed to 2.	48	908 altered to 898 after we highlighted it.	N/A	
451	48	N/A			1120	M	2	48	900	N/A	
452	49	N/A			1121	M	2	48	901	N/A	
453	49	N/A			1122	M	2	49	901	N/A	
454	50	N/A			1123	M	2	49	900	N/A	
455	50	905	M	2	1124	H	3	50	900	1	
456	50	905	H	3	1125	H	3	50	900	0	
457	51	N/A			1126	M	2	51	901	N/A	
458	51	N/A			1127	M	2	51	910 altered to 901	N/A	
459	52	N/A			1128	M	2	52	902	N/A	
460	52	N/A			1129	M	2	52	902	N/A	
461	53	N/A			1130	M	2	53	902	N/A	
462	53	N/A			1131	M	2	53	902	N/A	
463	53	906	H	3	1132	M	2	53	902	1	
464	54	906	M	2	1133	M	2	54	902	0	
465	54	906	H	3	1134	M	2	54	902	1	
466	55	907	M	2	1135	M	2	55	901	0	Report posted late.
467	55	907	M	2	1136	M	2	55	901	0	

SOL YR 1	LS	PRESSURE	UV	UV#	SOL YR 2	UV	UV#	LS	PRESSURE	ΔUV	COMMENTS
468	55	907	M	2	1137	M	2	56	901	0	
469	56	908	M	2	1138	M	2	56	901	0	
470	56	907	M	2	1139	M	2	57	901	0	
471	57	906	M	2	1140	M	2	57	901	0	
472	57	907	M	2	1141	M	2	57	902	0	
473	58	907	M	2	1142	M	2	58	902	0	
474	58	906	M	2	1143	M	2	58	901	0	
475	59	906	M	2	1144	M	2	59	902	0	
476	59	906	M	2	1145	M	2	59	907 revised to 903	0	
477	60	907	M	2	1146	M	2	60	902	0	
478	60	N/A			1147	M	2	60	901	N/A	
479	61	N/A			1148	M	2	61	901	N/A	
480	61	N/A			1149	M	2	61	902	N/A	
481	62	N/A			1150	M	2	62	902	N/A	
482	62	N/A			1151	M	2	62	901	N/A	
483	63	N/A			1152	M	2	62	901	N/A	
484	63	N/A			1153	M	2	63	900	N/A	
485	63	N/A			1154	M	2	63	900	N/A	
486	64	904	M	2	1155	M	2	64	900	0	
487	64	904	M	2	1156	M	2	64	900	0	
488	64	903	M	2	1157	M	2	65	900	0	
489	65	904	M	2	1158	M	2	65	898	0	
490	65	904	M	2	1159	M	2	66	898	0	
491	66	903	M	2	1160	M	2	66	1177, later dropped to 899 after we made an issue out of it.	0	Initial pressure 898, then raised to 1177, then dropped to 899.
492	66	903	M	2	1161	M	2	66	1200 changed to 898.	0	
493	67	902	M	2	1162	M	2	67	897	0	
494	67	902	M	2	1163	M	2	67	896	0	
495	68	900	M	2	1164	M	2	68	896	0	
496	68	901	M	2	1165	M	2	68	897	0	

SOL YR 1	LS	PRESSURE	UV	UV#	SOL YR 2	UV	UV#	LS	PRESSURE	ΔUV	COMMENTS
497	69	901	M	2	1166	M	2	69	895	0	
498	69	901	M	2	1167	M	2	69	894	0	
499	69	899	M	2	1168	M	2	70	894	0	
500	70	897	M	2	1169	H	3	70	894	1	
501	70	898	M	2	1170	H	3	71	893	1	APHELION
502	71	898	M	2	1171	H	3	71	892	1	
503	71	N/A	M	2	1172	H	3	71	892	1	
504	72	895	M	2	1173	M	2	72	892	0	
505	72	895	M	2	1174	M	2	72	891	0	
506	73	894	M	2	1175	M	2	73	890	0	
507	73	894	M	2	1176	M	2	73	890	0	
508	73	893	M	2	1177	M	2	74	888	0	
509	74	895	M	2	1178	M	2	74	888	0	
510	74	892	M	2	1179	M	2	75	887	0	
511	75	892	M	2	1180	M	2	75	886	0	
512	75	890	M	2	1181	M	2	75	885	0	
513	76	889	M	2	1182	M	2	76	884	0	
514	76	888	M	2	1183	M	2	76	883	0	
515	77	888	M	2	1184	M	2	77	882	0	
516	77	888	M	2	1185	H	3	77	881	1	Note change to high UV. Last high was on Sol 1,094
517	77	885	M	2	1186	H	3	78	881	1	
518	78	885	M	2	1187	M	2	78	881	0	
519	78	884	M	2	1188	M	2	79	881	0	
520	79	884	M	2	1189	M	2	79	879	0	
521	79	882	M	2	1190	H	3	79	877	1	
522	80	881	M	2	1191	H	3	80	876	1	
523	80	881	M	2	1192	H	3	80	875	1	
524	81	880	M	2	1193	M	2	81	875	0	
525	81	878	M	2	1194	M	2	81	873	0	
526	82	878	M	2	1195	M	2	82	871	0	
527	82	877	H	3	1196	M	2	82	871	1	
528	82	876	M	2	1197	M	2	83	869	0	

SOL YR 1	LS	PRESSURE	UV	UV#	SOL YR 2	UV	UV#	LS	PRESSURE	$\Delta$ UV	COMMENTS
529	83	875	M	2	1198	M (was L)	2 (was 1)	83	868	0 (was 1)	
530	83	873	M	2	1199	M (was L)	2 (was 1)	84	868	0 (was 1)	
531	84	872	M	2	1200	M (was L)	2 (was 1)	84	866	0 (was 1)	
532	84	872	M	2	1201	M	2	84	866	0	
533	85	871	M	2	1202	M	2	85	864	0	
534	85	869	M	2	1203	M	2	85	863	0	
535	86	868	M	2	1204	M	2	86	862	0	
536	86	867	M	2	1205	M	2	86	861	0	
537	86	865	M	2	1206	M	2	87	859	0	
538	87	865	M	2	1207	M	2	87	858	0	
539	87	864	M	2	1208	M	2	88	857	0	
540	88	862	M	2	1209	M	2	88	855	0	
541	88	861	M	2	1210	M	2	88	854	0	
542	89	867	M	2	1211	M	2	89	853	0	
543	89	858	M	2	1212	M	2	89	851	0	
544	90 WINTER	857	M	2	1213	M	2	90	851	0	START WINTER
545	90	856	M	2	1214	M	2	90	850	0	
546	91	855	M	2	1215	H	3	91	848	1	
547	91	853	H	3	1216	M	2	91	847	1	
548	91	852	H	3	1217	M	2	92	846	1	
549	92	851	M	2	1218	M	2	92	845	0	
550	92	850	M	2	1219	M	2	93	844	0	
551	93	848	H	3	1220	M	2	93	842	1	
552	93	847	M	2	1221	M	2	93	847	0	
553	94	845	M	2	1222	M	2	94	840	0	
554	94	843	M	2	1223	M	2	94	839	0	
555	95	843	M	2	1224	M	2	95	837	0	
556	95	842	M	2	1225	M	2	95	836	0	
557	96	840	M	2	1226	M	2	96	835	0	
558	96	839	M	2	1227	M	2	96	833	0	

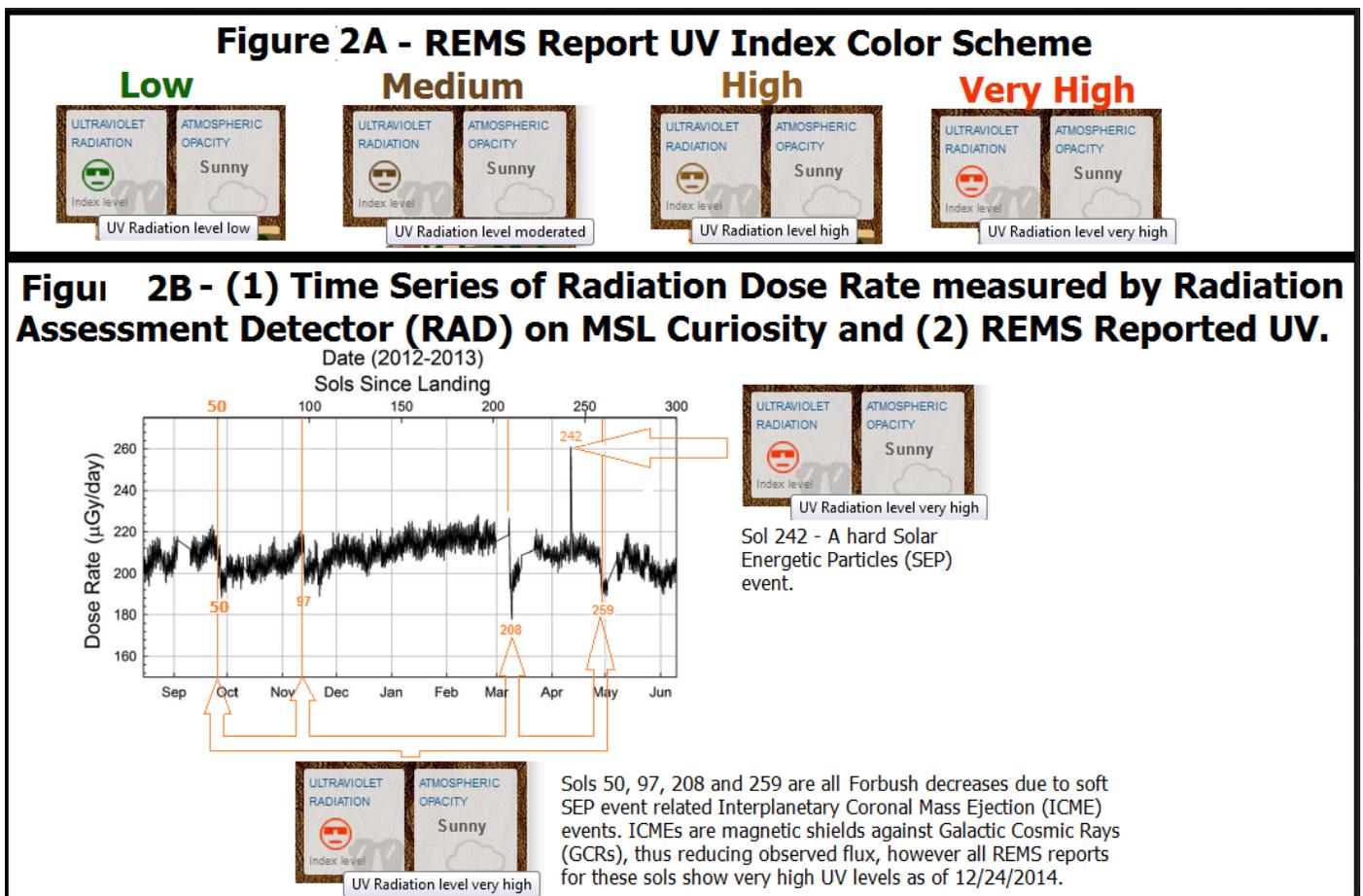
SOL YR 1	LS	PRESSURE	UV	UV#	SOL YR 2	UV	UV#	LS	PRESSURE	ΔUV	COMMENTS
559	96	838	H	3	1228	M	2	97	832	1	
560	97	836	M	2	1229	M	2	97	832	0	
561	97	835	M	2	1230	M	2	98	830	0	
562	98	834	M	2	1231	M	2	98	828	0	
563	98	833	M	2	1232	M	2	99	827	0	
564	99	831	M	2	1233	M	2	99	826	0	
565	99	830	H	3	1234	M	2	99	824	1	
566	100	829	H	3	1235	M	2	100	824	1	
567	100	827	H	3	1236	M	2	100	822	1	
568	101	825	H	3	1237	M	2	101	820	1	
569	101	825	M	2	1238	M	2	101	819	0	
570	102	823	M	2	1239	M	2	102	818	0	
571	102	821	M	2	1240	M	2	102	816	0	
572	102	820	M	2	1241	M	2	103	816	0	
573	102	819	M	2	1242	M	2	103	815	0	
574	103	817	H	3	1243	M	2	104	814	1	
575	104	816	M	2	1244	M	2	104	812	0	
576	104	815	M	2	1245	M	2	105	811	0	
577	105	813	M	2	1246	M	2	105	810	0	
578	105	812	M	2	1247	M	2	105	809	0	
579	106	811	M	2	1248	M	2	106	807	0	
580	106	810	M	2	1249	M	2	106	806	0	
581	107	808	M	2	1250	M	2	107	804	0	
582	107	807	M	2	1251	M	2	107	803	0	
583	108	806	M	2	1252	M	2	108	802	0	
584	108	804	M	2	1253	M	2	108	800	0	
585	109	802	M	2	1254	M	2	109	799	0	
586	109	802	M	2	1255	M	2	109	798	0	
587	109	801	M	2	1256	M	2	110	795	0	
588	110	799	M	2	1257	M	2	110	794	0	
589	110	798	M	2	1258	M	2	111	794	0	
590	111	797	M	2	1259	M	2	111	794	0	
591	111	795	M	2	1260	M	2	112	792	0	

SOL YR 1	LS	PRESSURE	UV	UV#	SOL YR 2	UV	UV#	LS	PRESSURE	ΔUV	COMMENTS	
592	112	795	M	2		1261	M	2	112	793	0	
593	112	795	M	2		1262	M	2	112	790	0	
594	113	793	M	2		1263	M	2	113	788	0	
595	113	792	M	2		1264	M	2	113	787	0	
596	114	791	M	2		1265	M	2	114	787	0	
597	114	790	H	3		1266	M	2	114	787	1	
598	115	787	M	2		1267	M	2	115	786	0	
599	115	788	M	2		1268	M	2	115	784	0	
600	116	787	M	2		1269	M	2	116	782	0	
601	116	785	M	2		1270	M	2	116	782	0	
602	117	784	M	2		1271	M	2	117	781	0	
603	117	783	H	3		1272	M	2	117	780	1	
604	118	782	M	2		1273	M	2	118	778	0	
605	118	781	M	2		1274	M	2	118	777	0	
606	118	780	M	2		1275	M	2	119	775	0	
607	119	779	M	2		1276	L changed to M	2	119	774	0	UV difference is 1 if original low value is used
608	119	777	M (was L)	2 (was 1)		1277	H	3	120	774	1	UV difference is 1 if original low value is used
609	120	777	M	2		1278	M	2	120	778	0	
610	120	776	M	2		1279	H	3	121	772	1	
611	121	775	M	2		1280	H	3	121	771	1	
612	121	774	M	2		1281	H	3	122	769	1	
613	122	773	M	2		1282	M	2	122	768	0	
614	122	772	M	2		1283	H	3	123	768	1	
615	123	771	M	2		1284	M	2	123	767	0	
616	123	769	M	2		1285	M	2	123	766	0	
617	124	769	M	2		1286	M	2	124	765	0	
618	124	769	M	2		1287	M	2	124	764	0	
619	125	766	N/A (was L)	N/A (was 1)		1288	M	2	125	763	N/A (was 1)	
620	125	765	M	2		1289	N/A	N/A	125	N/A	N/A	
621	126	765	M	2		1290	N/A	N/A	126	N/A	N/A	
622	126	763	M	2		1291	H	3	126	760	1	
623	127	763	M	2		1292	H	3	127	760	1	
624	127	762	M	2		1293	M	2	127	758	0	
625	128	761	M	2		1294	M	2	128	758	0	
626	128	760	M	2		1295	M	2	128	758	0	
627	129	759	M	2		1296	M	2	129	756	0	
628	129	759	M	2		1297	M	2	129	755	0	

SOL YR 1	LS	PRESSURE	UV	UV#	SOL YR 2	UV	UV#	LS	PRESSURE	ΔUV	COMMENTS
629	130	759	M	2	1298	M	2	130	755	0	
630	130	757	H	3	1299	M	2	130	753	1	
631	131	756	H	3	1300	M	2	131	945 changed to 752	1	Sol 1300 and 1301 pressure changes were after we flagged them.
632	131	755	H	3	1301	M	2	131	1154 changed to 752	1	Sol 1300 and 1301 pressure changes were after we flagged them.
633	132	754	H	3	1302	M	2	132	751	1	
634	132	753	H	3	1303	H	3	132	751	0	
635	133	754	H	3	1304	M	2	133	750	1	
636	133	752	H	3	1305	H	3	133	749	0	
637	134	752	M	2	1306	H	3	134	748	0	
638	134	751	M	2	1307	H	3	134	748	1	
639	135	750	M	2	1308	H	3	135	748	1	
640	135	750	M	2	1309	H	3	135	747	1	
641	136	749	H	3	1310	M	2	136	745	1	
642	136	749	H	3	1311	H	3	136	745	0	
643	137	748	H	3	1312	H	3	137	745	0	
644	137	748	H	3	1313	H	3	137	745	0	
645	138	746	H	3	1314	H	3	138	744	0	
646	138	746	H	3	1315	H	3	138	744	0	
647	139	746	H	3	1316	H	3	139	744	0	
648	139	746	H	3	1317	H	3	139	743	0	
649	140	745	H	3	1318	H	3	140	743	0	
650	140	743	H	3	1319	H	3	140	742	0	
651	141	743	H	3	1320	H	3	141	741	0	
652	141	745	H	3	1321	H	3	141	740	0	
653	142	744	H	3	1322	H	3	142	740	0	
654	142	742	H	3	1323	H	3	142	738	0	PREDICTION: At this rate JPL should claim a Year 2 minimum pressure of about 728 to 730 Pa around Ls 147 to 150 between MSL Sols 1332 and 1338.
655	143	741	H	3	1324	H	3	143	738	0	
656	143	740	M	2	1325	H	3	144	738	1	
657	144	739	H	3	1326	H	3	144	738	0	
658	144	739	M	2	1327	H	3	145	736	1	
659	145	738	M	2	1328	H	3	145	735	1	
660	145	735	M	2	1329	H	3	146	735	1	
661	146	735	H	3	1330	H	3	146	734	0	
662	146	735	H	3	1331	H	3	147	734	0	
663	147	734	H	3	1332	H	3	147	734	0	
664	147	732	H	3	1333	H	3	148	733	0	
665	148	742	H	3	1334	H	3	148	732	0	
666	148	736	H	3	1335	H	3	149	732	0	
667	149	736	H	3	1336	H	3	149	732	0	
668	150	734	H	3	1337	H	3	150	734	0	
669	150	735	H	3	1338	H	3	150	734	0	

Perhaps because all REMS reports for the **1,338 sols** (2 full Martian year) covered so far have opacity listed as “sunny,” we didn’t pay much attention to the UV readings until December, 2014. We didn’t notice much variation in the UV intensity either. Perhaps this is because the UV Index scale in the United States, which conforms with international guidelines for UVI reporting established by the [World Health Organization \(WHO\)](#), has 11 numerical levels while only four levels are seen on the REMS reports. The WHO UVI index is color coded and divided as follows: **0 to 2: Low (low danger from the sun's UV rays for the average person)**, **3 to 5: Moderate (moderate risk of harm from unprotected sun exposure)**, **6 to 7: High (high risk of harm from unprotected sun exposure. Protection against skin and eye damage is needed)**, **8 to 10: Very High (unprotected skin and eyes will be damaged and can burn quickly)**, and **11+: Extreme (unprotected skin and eyes can burn in minutes)**. There has not yet been an incident of extreme UV reported from MSL. Low UV is currently indicated for Sols 609, 619, 838, 839, 840, 841, 843, 844, 800, 851, 853, 854, 855, 939, 1006, 1007, 1008, and 1021. Low UV was initially reported for Sols 829 (see Figure 1) and 833, but altered to moderate. Figure 2A below shows the REMS color scheme used for UV levels.

Figure 2B, adapted from Hassler *et al.* (2014) shows ~300 sols of time series of radiation dose rate measured by Radiation Assessment Detector (RAD) on the surface of Mars and we have added to it the REMS Team reported UV index data for one incident of a hard Solar Energetic Particle (SEP) event on Sol 242, and four incidents of [Forbush decreases](#) due to soft SEP event related interplanetary coronal mass ejection (ICME) events. ICMEs are magnetic shields against galactic cosmic rays (GCRs), thus the observed flux is reduced. The REMS UV observations were added to Figure 2B to see if there was a correlation between what Hassler *et al.* showed and the UV reported. While the hard SEP was matched by very high UV, the Forbush decreases all occurred when there was also very high UV. A quick check of the Hassler *et al.* article showed no mention of UV. Although high frequencies of UV are considered to be ionizing radiation (radiation with enough energy to remove tightly bound electrons from atoms, thus creating ions); the article deals with galactic cosmic rays (GCRs) and solar energetic particles (SEPs). Both GCRs and SEPs interact with the atmosphere and, if energetic enough, penetrate into the Martian soil, or regolith, where they produce secondary particles (including neutrons and gamma rays) that contribute to the complex radiation environment on the Martian surface.

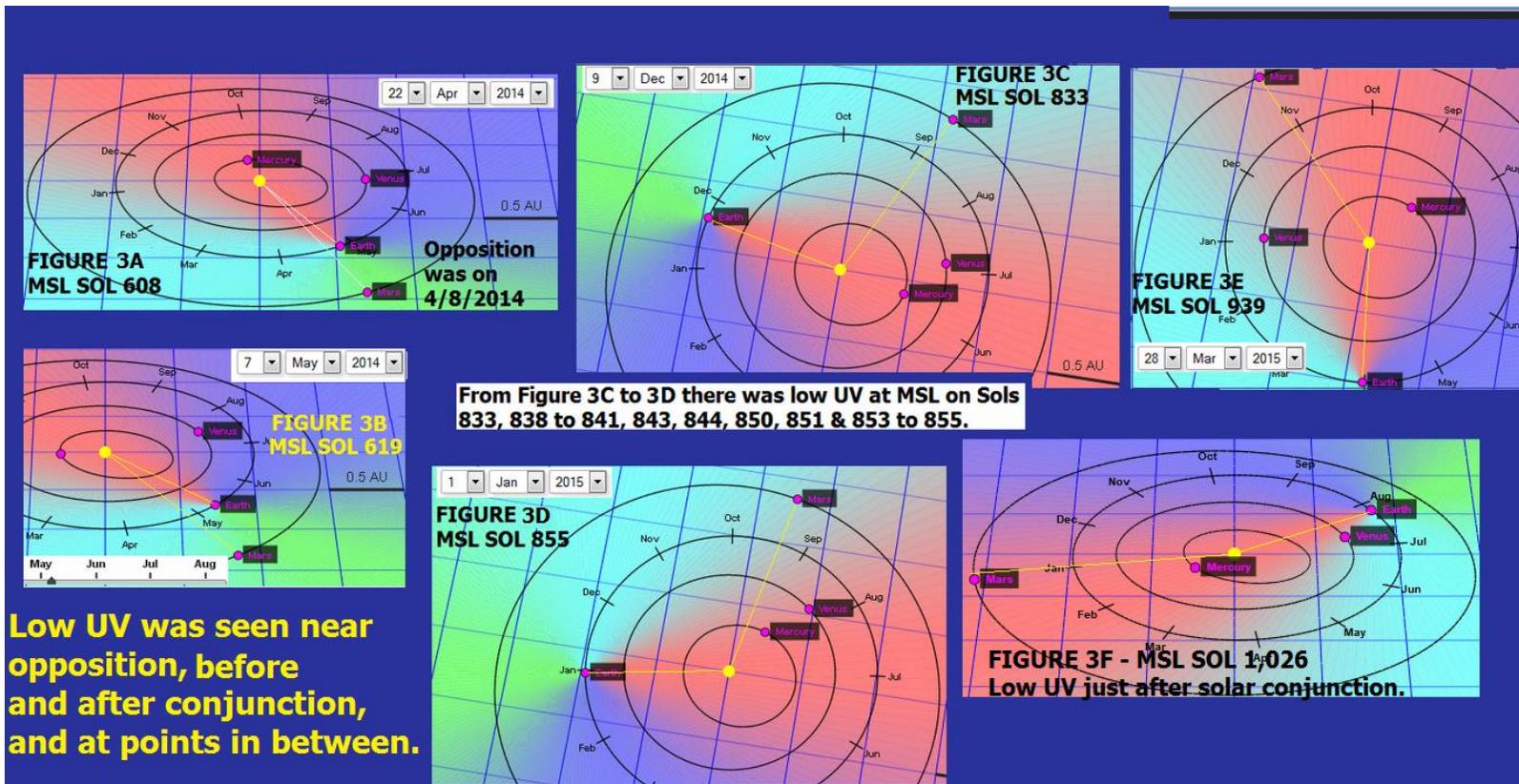


**Figure 2A: The color for UV used on REMS reports. Figure 2B relates dose rate at MSL in micrograys per day to UV levels published on the REMS reports (see Table 2) for ~300 sols.**

**Table 3 - The relationships (if any) of solar longitude (Ls), lander altitude, lander latitude, day light hours each sol and UV recorded.**

$\lambda_{sun}$ (0 for spring in northern hemisphere). This is Ls.	Event	Latitude (phi) of MSL	$\delta$ degrees = $\arcsin((\sin(25.19)*\sin(\lambda_{sun}))$	$H = \arccos((\sin(-.17) - \sin(lw)*\sin(\delta))/(\cos(lw)*\cos(\delta)))$	Day Length = $2*1.027491*H/360$	Daylight in Hours David Roffman's Calculation (=E value * 24)	Pressure hPa/mb	UV at MSL
	MSL altitude at landing = -4,400 m	SOUTH						
251	Perihelion at MSL	-4.59	-23.73035947	92.20894369	0.526354776	12.63251463	9.23	M
252	Max Pressure MSL Year 1	-4.59	-23.8779663	92.22332264	0.526436856	12.63448453	9.25	H
257	Max Pressure MSL Year 2	-4.59	-24.50122608	92.2844177	0.526785603	12.64285448	9.25	M
270	Summer begins at MSL	-4.59	-25.19	92.35267298	0.527175224	12.65220537	9.15	H
	VL-1 altitude at landing = -3,637 m	NORTH						
251	Perihelion at VL-1	22.48	-23.73035947	79.72333454	0.455083382	10.92200116	9.12	
270	Winter begins at VL-1	22.48	-25.19	78.98389113	0.450862429	10.8206983	8.94	

277	Max Pressure VL-1 Year 1	22.48	-24.98929018	79.08669714	0.451449275	10.8347826	9.57	
	VL-2 altitude at landing = -4,495 m	NORTH						
251	Perihelion at VL-2	47.97	-23.73035947	61.12684504	0.348929351	8.374304418	10.03	
270	Winter begins at VL-2	47.97	-25.19	58.87340259	0.336066063	8.065585506	10.2	
279	Max Pressure VL-2 Year 1	47.97	-24.85866022	59.39411199	0.33903842	8.13692207	10.72	
277	Max Pressure VL-2 Year 2	47.97	-24.96453989	59.22832995	0.338092089	8.114210129	10.24	



Figures 3A through 3F show relative positions of Mars and Earth when Low Ultraviolet radiations was originally reported by REMS on Mars.

Using an interactive 3D Diagram of the Solar System available at <https://in-the-sky.org/solarsystem.php>, at first look it appeared that, as is shown in Figures 3A to 3F, it did not appear that there is a correlation between UV and the relative positions of Mars and Earth in their orbits around the sun (at least with respect to when Gale Crater, Mars was experiencing low UV).

In the first 1031 sols that MSL was on Mars there were 19 sols where the UV at MSL was initially categorized as low. All days were sunny there. For comparison purposes (without checking on sky cover) we looked at Las Vegas, Nevada for the same on the first 15 of these dates (by June 25, 2015 UV was at the extreme level in Las Vegas, details for the full month of June will be checked later). Eleven of the first 15 days showed low UV readings there too, one was

moderate, one was high and two were very high. As for the low readings in Las Vegas, it appears the general trend there is for low UV in the winter and high or very high UV in the summer (see Figure 7). Las Vegas was chosen for comparison purposes because it is found in a desert environment where most days are sunny. On average there are [210 sunny days each year](#) (cloud cover 30% or less), and 82 partly sunny days with cloud cover between 40% and 70%, and 73 days that are cloudy. Given findings of relative humidity that is higher than expected at Gale Crater, and brine underground, it seems odd that not one day at MSL has been cloudy. Clouds can be seen drifting by behind the Telltale wind device on [Phoenix on its Sol 103 here](#), but Phoenix landed in the Martian arctic. Status clouds were seen 16 km above the Mars Pathfinder - see Figure 4. It landed at 19.1 degrees North (which like MSL Curiosity is in the tropics).

Table 4 - 15 Sols with low ultraviolet radiation at Gale Crater Mars and the corresponding UV for these dates in Las Vegas, Nevada BEFORE the REMS Team and JPL dropped all low pressure data.

MSL SOL	DATE ON EARTH	UV ON MARS	UV AT LAS VEGAS
608	4/22/2014	LOW	8 (VERY HIGH)
619	5/4/2014	LOW	9 (VERY HIGH)
833	12/9/2014	LOW	3 (MODERATE)
838	12/15/2014	LOW	2 (LOW)
839	12/16/2014	LOW	2 (LOW)
840	12/17/2014	LOW	2 (LOW)
841	12/18/2014	LOW	2 (LOW)
843	12/20/2014	LOW	2 (LOW)
844	12/21/2014	LOW	2 (LOW)
850	12/27/2014	LOW	2 (LOW)
851	12/28/2014	LOW	2 (LOW)
853	12/30/2014	LOW	2 (LOW)
854	12/31/2014	LOW	2 (LOW)
855	1/1/2015	LOW	2 (LOW)
939	3/28/2015	LOW	7 (HIGH)



Figure 4 - Stratus clouds seen 1 hours 40 minutes before sunrise at Mars Pathfinder. If the atmosphere there is as thin as NASA claims it is doubtful that there would be light so far before sunrise.

**CLOUDS DO FORM AT LATITUDES SIMILAR TO THAT OF MSL CURIOSITY.** So it is curious that no cloudy days have been seen on REMS reports for the first 1,215 sols at MSL. However a search on line reveals that clouds have been seen at MSL.

The paper to read is **Atmospheric movies acquired at the Mars Science Laboratory landing site: Cloud morphology, frequency and significance to the Gale Crater water cycle and Phoenix mission results by John E. Moore et al. (2015).** The abstract states that, "We report on the first 360 sols ( $L_S$  150° to 5°), representing just

over half a Martian year, of atmospheric monitoring movies acquired using the NavCam imager from the Mars Science Laboratory (MSL) Rover Curiosity. Such **movies reveal faint clouds that are difficult to discern in single images.** The data set acquired was divided into two different classifications depending upon the orientation and intent of the observation. Up to sol 360, 73 Zenith movies and 79 Supra-Horizon movies have been acquired and time-variable features could be discerned in 25 of each. The data set from MSL is compared to similar observations made by the Surface Stereo Imager (SSI) onboard the Phoenix Lander and suggests a much drier

environment at Gale Crater (4.6°S) during this season than was observed in Green Valley (68.2°N) as would be expected based on latitude and the global water cycle. **The optical depth of the variable component of clouds seen in images with features are up to  $0.047 \pm 0.009$  with a granularity to the features observed which averages  $3.8^\circ$ . MCS also observes clouds during the same period of comparable optical depth at 30 and 50 km that would suggest a cloud spacing of 2.0 to 3.3 km. Multiple motions visible in atmospheric movies support the presence of two distinct layers of clouds. At Gale Crater, these clouds are likely caused by atmospheric waves given the regular spacing of features observed in many Zenith movies and decreased spacing towards the horizon in sunset movies consistent with clouds forming at a constant elevation.** Reanalysis of Phoenix data in the light of the NavCam equatorial dataset suggests that clouds may have been more frequent in the earlier portion of the Phoenix mission than was previously thought."

## CLOUDS AT MER OPPORTUNITY



[http://mars.nasa.gov/mer/spotlight/20080324\\_Opportunity.html](http://mars.nasa.gov/mer/spotlight/20080324_Opportunity.html)

Figure 5 above - Opportunity turned its rover eyes skyward to observe clouds drifting overhead that look like cirrus clouds on Earth -- featherlike formations composed mostly of ice crystals. Image courtesy: NASA/JPL-Caltech/Cornell/ASU/Texas A&M/Navigation camera.

These clouds were seen at MER Opportunity. It landed at [1.9462°S 354.4734°E<sup>\[6\]</sup>](#) The MSL curiosity landed at a latitude of 4.59 degrees South. The approximate difference in latitude (4.59-1.95) is only 2.64 degrees. As each [one degree difference of latitude in Mars is about 59 km](#), these clouds, though not at the longitude of MSL, were only 155.76 km (96.7847769 miles) north of Curiosity's latitude.

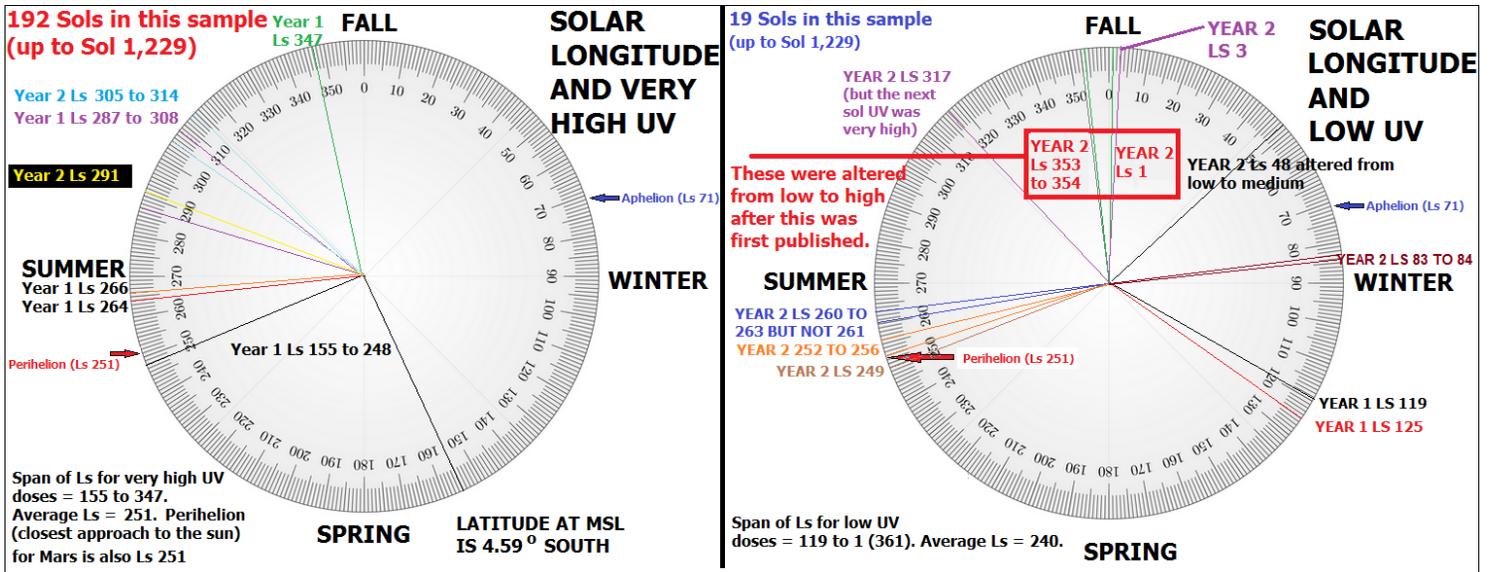


Figure 6 - Solar longitude (Ls) for Mars when MSL Curiosity originally measured very high UV or low UV. Again, after they read this article, they dropped all the low UV values.

**LS FOR SOLS AT MSL WITH VERY HIGH AND LOW ULTRAVIOLET RADIATION.** In the first 1,254 sols of MSL operations at Gale Crater, Mars, there were 191 sols with Very High UV. The range in solar longitude (Ls) for UV ratings was between 155 and 347, with the average Ls 251 degrees. Of interest, the Ls at perihelion, when Mars is closest to the sun, is also 251 degrees. Thus it appears that if the data is trustworthy, UV is highest at MSL Curiosity (in the southern hemisphere) when Curiosity is closest to the sun. The season in the southern hemisphere when high UV was recorded was from spring to summer. Ls 251 is late spring. However, it does not follow that lowest UV is when Mars is at aphelion (further from the sun) at Ls 71 although it was reported for Ls 83 and 84. Low UV was originally found on 15 sols (actually on 4 more sols, but JPL revised the data) between Ls 119 and 317 and one at Ls 3 but the fact that Low UV was claimed for all four seasons (winter - Ls 119), spring (intermittently from Ls 249 to 263), summer (intermittently from Ls 317 to 354), and fall (intermittently from Ls 3 to 84) before the REMS Team/JPL throughout all low UV values. However, before they took this action it did not appear that LS was a critical factor.

**UV VARIATION ON EARTH.** Figure 7 shows how UV varies in the United States month. With respect to Earth's perihelion (closest approach to the sun), it occurs near January 4th, in the dead of winter in the northern hemisphere. The highest UV in the continental United States is in South Florida where the mean is UV is between 4 and 5. Across most of the U.S. at the latitude of San Francisco it's down to 1 to 2 except in the Rocky Mountains where the air is thinner and the mean UV value is about 2 to 3. Clearly the U.S. does not see maximum UV at perihelion. Rather it sees maximum UV values around July 4th when Earth is at aphelion. Mean UV values in South Florida are around 8 to 9 then, and in Colorado in the Rocky Mountains it hits 12 the top of the scale. Again, Earth is farthest from the sun then. High to very high UV values are seen as far north as Idaho and Wyoming with Earth so far from the sun. However it should be noted that when Earth is at perihelion in January it is 147.5 million km from the sun, whereas when it is at aphelion in July it is 152.6 million km from the sun. The difference is only 5.1 million km (about 3.875 million miles). When Mars is at perihelion it is 206.7 million km from the sun, whereas at aphelion it is 249.2 million km from it, a difference of 42.5 million km (26.5625 million miles).

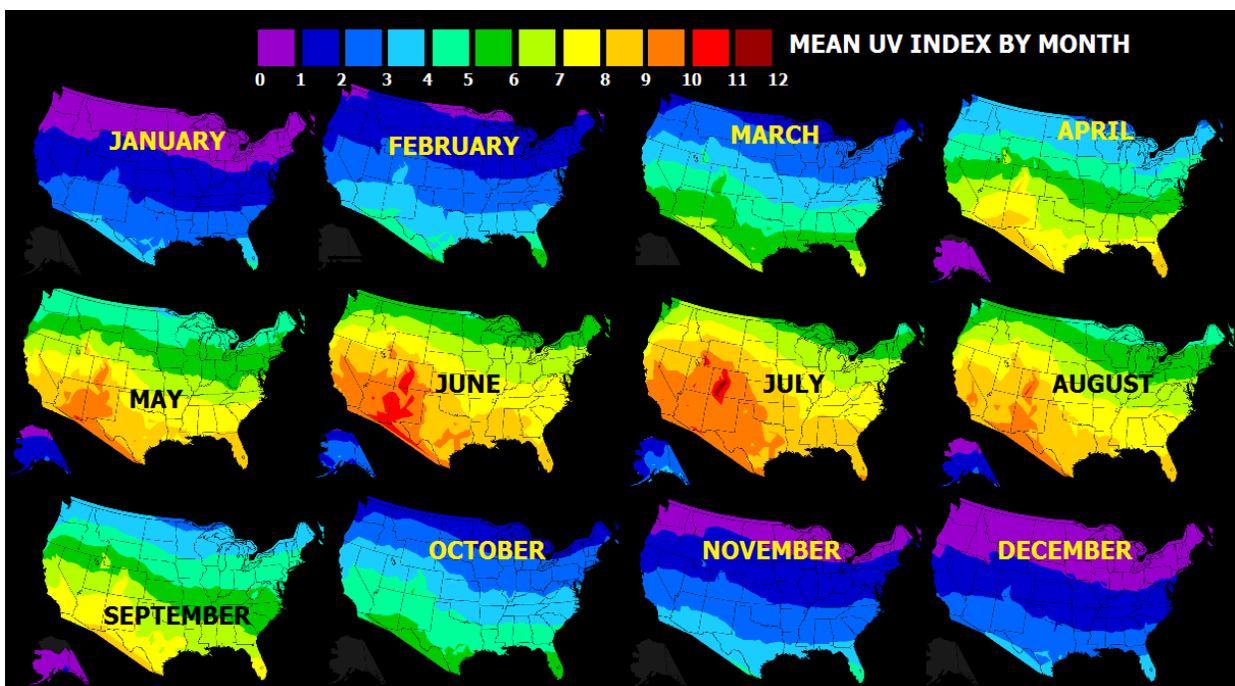


Figure 7: UV, Latitude and Altitude