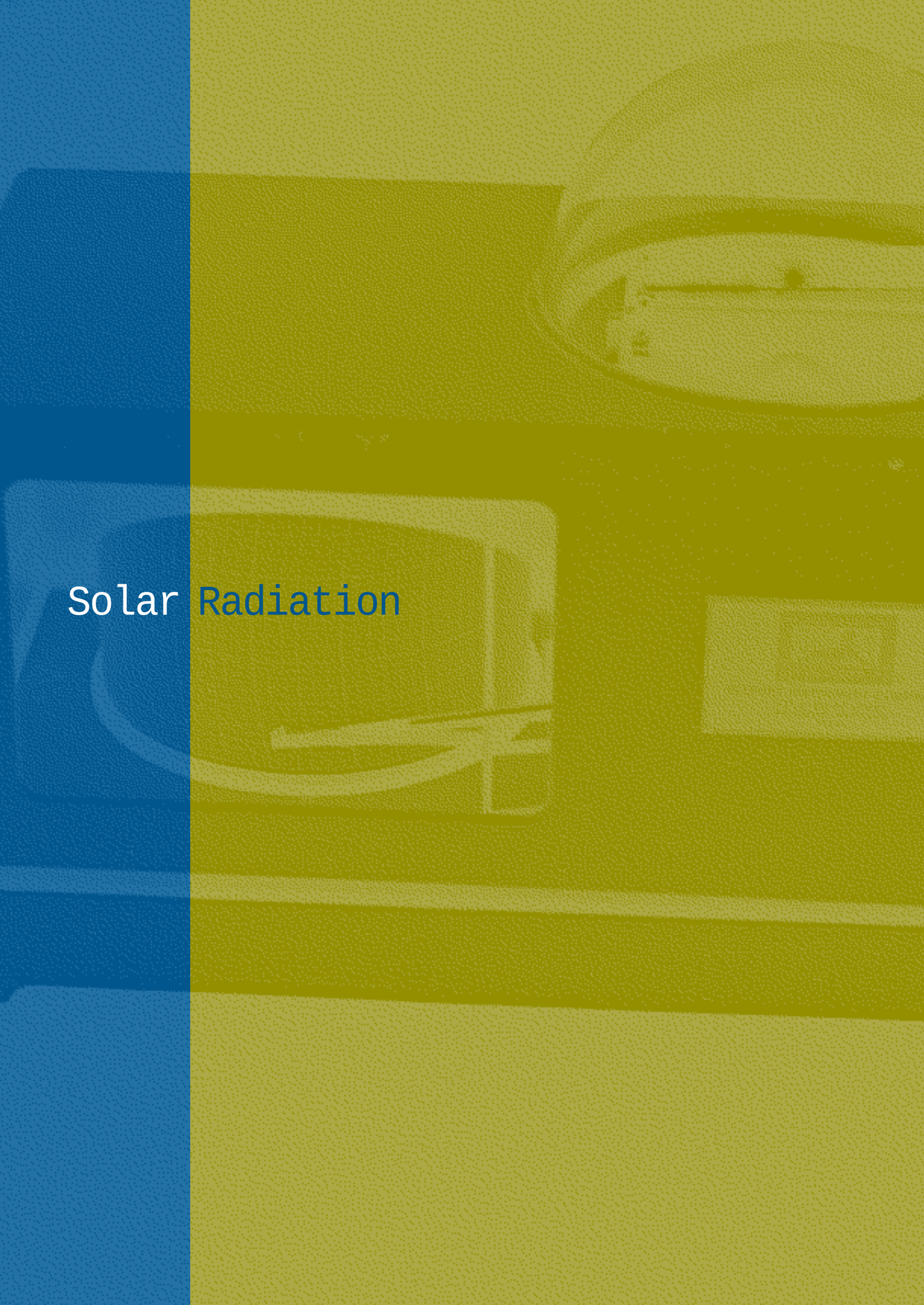
Solar Radiation



Solar *radiation was measured at each agroclimate station located near Bakersfield. Monthly summaries of those data are listed in Table 2 . Solar radiation data summarized into weekly amounts are presented in Table 3.*

Radiation was also measured monthly at each of five other locations in the Valley for various periods of time. Data for those locations are listed in Table 4. Radiation data for an agroclimate station site located just north of the Valley in the southern Sacramento-San Joaquin River Delta are also included. That station (Thornton 2-S) was installed in July 1963 and operated until December 1968 by DWR's Central District.(See Figure 1).

USWB measured incoming radiation at its Fresno airport station. That radiation record is one of the oldest in California. It begins in 1928 and extends to the late 1970s. Monthly data are reported in DWR Bulletin 187, *California Sunshine – Solar Radiation Data,* dated August 1978. Data for the period 1959 to 1975 were extracted from Table 3 of the 1978 bulletin for this report. The USWB measurements were made with an Eppley pyranometer.

DWR data were collected with mechanical pyranometers (actinographs) manufactured by Instruments Corporation of America. These instruments are self-contained. The chart drum is driven by an eight-day, spring-wound clock. The pen arm is actuated by a blackened, bi-metal strip which moves in response to thermal energy received. The strip is covered by a glass dome which filters out long-wave radiation. The manufacturer reports that this instrument responds to wavelengths between about 0.4 and 4.0 microns.

DWR pyranometers were installed with the bottom of the instrument at 1 meter above ground near the south side of the station enclosure. Care was taken to mount the instruments in a level position. Instruments were checked frequently with a spirit level to insure that they remained level. For the first 20 years (1958 to 1978), instruments were standardized by operating them adjacent to the USWB Eppley at the Fresno airport for about two weeks each year. This was usually done in mid-summer when the incoming radiation was near maximum. The black coating on the bi-metal strip was renewed and the pen linkages were checked and adjusted before standardization. After 1978, when the USWB Eppley at Fresno was taken out of service, the pyranometers were standardized by comparing them to the Eppley at UC Davis.

Daily radiation amounts were determined from instrument charts by measuring the areas under the inked chart trace with a planimeter. Daily amounts of radiation were tabulated, then summarized into averages for weekly and monthly periods.

A radiation record for 28 years was obtained from agroclimate stations located near Bakersfield during the period 1958 to 1991. Monthly radiation measured near Bakersfield is listed for each year in Table 2, and weekly radiation amounts are summarized in Table 3. Weekly average solar radiation for sites near Bakersfield is shown on Figure 5.

Analysis of the weekly radiation data shows that, for the winter to early summer period (January 18 to May 3, which includes weeks 3 to 18), incoming solar radiation increased at a remarkably uniform rate of 27 langleys per week (3.9 langleys per day). Similarly, for the late summer to fall months (August 23 to November 29, which includes weeks 34 to 48), incoming radiation decreased at a uniform rate of 27 langleys per week (3.9 langleys per day).

Table 4 shows monthly solar radiation measured at five other DWR agroclimate stations and one dryland location near Los Banos (at the Bureau of Reclamation Los Banos equipment yard.) Bureau of Reclamation's Delta Mendota canal operations staff changed charts on the DWR-owned instrument each week, and a DWR technician checked it about once each month.

Monthly radiation for each of the six outlying sites was extrapolated to a long-term average, using radiation measured near Bakersfield as a basis. Those estimates of normal monthly radiation are listed in Table 5. That table also shows measured amounts of radiation for the Bakersfield area and for the USWB Fresno airport station.

Response of the pyranometer to change in the incoming radiation rate is fairly rapid. This fast response is illustrated in the charts for July 11, 1991, when a partial eclipse of the sun occurred. For latitude 35 degrees north, the eclipse was predicted by astronomers to begin at about 10:15 a.m., last for about two hours, and reach a maximum reduction of 60 percent. Two DWR pyranometers were in operation on the day of the eclipse: Bakersfield 12-S and Lamont 2-NW. Actual measured reduction in

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Mechanical pyranometer is used at DWR sites.

TABLE 2

Monthly Solar Radiation Near Bakersfield 1958-1991[1]
(average langleys per day)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mar-Oct Average	Jan-Dec Average
1958	–	–	–	–	–	643	660	574	486	354	249	195	–	–
1959	217	323	483	590	676	692	665	630	539	412	303	211	586	478
1960	233	312	470	588	669	716	653	655	533	398	259	193	585	473
1961	179	327	421	586	607	665	638	566	517	365	251	165	546	441
1962	233	243	423	557	628	666	654	608	520	371	257	160	553	443
1963	229	288	438	500	557	634	658	567	465	322	221	146	518	419
1964	201	341	406	509	592	651	648	582	516	391	252	187	537	440
1965	224	320	397	414	607	605	640	580	484	–	216	157	–	–
1966	230	320	430	542	577	663	655	624	524	400	256	144	552	447
1967	230	275	419	444	604	643	662	597	465	390	209	194	528	428
1969	–	–	–	–	524	535	568	496	400	302	218	180	–	–
1970	183	284	348	482	549	526	–	–	–	–	–	–	–	–
1975	191	278	374	491	615	634	604	555	451	350	265	209	509	418
1976	231	280	421	516	623	634	604	535	385	339	206	203	507	415
1977	114	311	450	547	543	606	613	540	471	346	242	137	515	410
1978	154	217	363	470	651	667	646	579	457	377	237	147	526	414
1979	202	316	403	592	641	685	650	592	506	367	288	221	555	455
1980	166	260	429	525	632	717	661	607	510	360	246	178	555	441
1981	181	312	406	585	657	713	695	629	519	404	263	170	576	461
1982	242	319	339	530	678	671	687	604	461	388	228	209	545	446
1983	148	272	445	523	656	676	667	544	459	333	195	129	538	421
1984	130	262	385	498	602	664	600	559	454	363	212	96	516	402
1985	162	357	435	595	706	701	667	649	499	379	242	154	579	462
1986	159	254	360	532	664	711	680	586	486	376	271	146	549	435
1987	180	286	381	560	614	657	676	613	482	345	212	186	541	433
1988	194	337	482	488	628	653	656	597	506	378	255	200	549	448
1989	226	288	431	574	658	718	694	627	475	378	276	187	569	461
1990	212	317	424	527	645	710	686	603	501	384	272	222	560	459
1991	189	294	369	547	647	680	656	584	472	341	237	171	537	432
Average	194	296	412	530	623	660	652	589	484	367	244	175	540	436
Std. Dev.	34	32	38	46	43	47	30	35	36	26	26	30	22	20
Std. Error	6	6	7	8	8	8	5	7	6	5	5	5	4	4

[1] No data for 1968. Stations: Arvin-Jewett 4/58-5/59; Arvin-Frick 6/59-10/65; Old River 3-S 11/65-12/67; Bakersfield 10-S 5/69-6/70; Wasco 8-SW 1/75-12/80; Bakersfield 10-NW 1/81-12/85; Bakersfield 10-NW and 12-S (average) 1/86-12/89; Bakersfield 12-S and Lamont 2-NW (average) 1/90-12/91.

TABLE 3

Weekly Solar Radiation Near Bakersfield 1958-1991[1]
(average langleys per day)

Week No.	Ending Date	Day of Year	1958	1959	1960	1961	1962	1963	1964	1965
1	Jan 4	4		254	232	113	216	165	194	231
2	11	11		231	229	137	219	247	208	251
3	18	18		194	234	163	224	272	173	159
4	25	25		169	249	153	272	229	233	212
5	Feb 1	32		272	310	248	217	167	223	278
6	8	39		300	218	247	120	244	312	155
7	15	46		270	258	301	280	245	285	358
8	22	53		292	377	317	297	367	415	375
9	Mar 1	60		363	346	393	397	416	322	391
10	8	67		442	372	359	350	415	378	412
11	15	74		488	384	451	434	413	393	321
12	22	81		513	503	414	443	486	442	459
13	29	88		438	445	386	450	438	456	418
14	Apr 5	95		551	499	527	522	464	385	243
15	12	102		505	578	543	580	497	566	292
16	19	109		636	544	627	568	469	504	553
17	26	116		645	599	562	555	566	589	502
18	May 3	123		582	490	620	628	624	483	509
19	10	130		585	617	579	577	539	539	647
20	17	137		630	667	607	661	621	645	616
21	24	144		749	675	594	621	509	609	562
22	31	151		718	655	647	673	536	603	597
23	Jun 7	158	587	721	685	635	683	589	629	586
24	14	165	639	721	672	667	628	600	628	537
25	21	172	688	710	683	674	669	673	685	609
26	28	179		651	726	643	685	676	657	656
27	Jul 5	186	706	673	682	668	677	652	679	696
28	12	193	681	699	686	656	638	661	655	709
29	19	200	667	667	675	632	644	655	671	592
30	26	207	613	625	590	650	652	668	622	702
31	Aug 2	214	545	666	583	630	643	626	623	529
32	9	221	594	670	672	521	627	499	578	634
33	16	228	519	659	621	580	588	592	614	503
34	23	235	598	625	617	597	594	577	570	589
35	30	242	586	572	611	561	591	560	575	573
36	Sep 6	249	545	620	595	583	556	483	506	546
37	13	256	489	547		564	547	489	527	487
38	20	263	502		526	498	503	389	529	472
39	27	270	422		514	490	456	474	499	485
40	Oct 4	277	436		470	478	411	391	443	450
41	11	284	415	466	370	414	381	364	427	411
42	18	291	331	430	425	425	391	226	374	331
43	25	298	318	405	390	319	316	334	386	
44	Nov 1	305	321	347	325	309	322	267	323	
45	8	312	298	349	236	291	296	229	267	309
46	15	319	247	334	247	289	215	248	220	242
47	22	326	248	269	269	290	265	252	279	180
48	29	333	201	290	247	195	216	83	239	174
49	Dec 6	340	231	274	223	191		126	213	79
50	13	347	179	222	229	185		155	166	
51	20	354	203	227	220	190		133	210	180
52	27	361	164	138	96	168		179	183	177
Mar-Oct Average			–	578[2]	561[2]	546	550	515	537	511[2]
Jan-Dec Average			–	476[2]	459[2]	442	446[2]	419	441	406[2]

TABLE 3 (continued)

Weekly Solar Radiation Near Bakersfield 1958-1991[1]
(average langleys per day)

Week No.	Ending Date	Day of Year	1966	1967	1969	1970	1975	1976	1977	1978
1	Jan 4	4	249	200		217	215	217	171	54
2	11	11	238	245		137	164	164	122	162
3	18	18	142	254		153	209	208	84	212
4	25	25	252	176		187	182	278	123	211
5	Feb 1	32	274	252		248	236	270	102	111
6	8	39	153	203			211	188	283	155
7	15	46	333	174			258	274	308	210
8	22	53	403	365		305	322	305	333	301
9	Mar 1	60	325	333		249	358	351	366	223
10	8	67	384	404		254	242	354	435	285
11	15	74	419	426		353	364	363	454	385
12	22	81	423	392		399	423	447	448	445
13	29	88	447	457		452	482	484	455	433
14	Apr 5	95	531	431		479	423	507	538	368
15	12	102	515	396		488	473	464	555	508
16	19	109	519	451		446	473	434	580	447
17	26	116	544	408		496	545	584	516	483
18	May 3	123	528	543	542	520	590	611	537	594
19	10	130	531	584	511	516	627	590	452	648
20	17	137	540	591	579	562	617	626	537	637
21	24	144	648	647	608	561	593	629	534	692
22	31	151	657	594	400	578	632	651	645	657
23	Jun 7	158	673	633	499	515	629	635	608	660
24	14	165	627	652	485	536	615	604	590	679
25	21	172	631	587	522	518	656	641	641	682
26	28	179	687	663	612	528	637	649	603	644
27	Jul 5	186	699	684	610		644	666	606	685
28	12	193	663	686	533		591	635	636	660
29	19	200	688	635	578		573	596	578	650
30	26	207	687	690	561		582	596	626	605
31	Aug 2	214	565	622	483		596	549	572	619
32	9	221	608	668	514		568	592	615	582
33	16	228	665	602	530		572	524	541	572
34	23	235	629	593	489		527	473	506	602
35	30	242	609	554	472		553	543	573	568
36	Sep 6	249	599	496	433		502	506	530	365
37	13	256	583	516	422		446	324	502	479
38	20	263	534	453	375		439	387	476	532
39	27	270	513	448	367		429	412	428	463
40	Oct 4	277	395	434	361		399	314	375	408
41	11	284	416	444	343		323	380	382	382
42	18	291	424	391	272		362	384	339	382
43	25	298	385	380	262		367	286	317	353
44	Nov 1	305	363	336	260		308	306	334	361
45	8	312	286	280	192		265	316	297	296
46	15	319	293	235	199		261	232	236	213
47	22	326	245	189	253		274		233	192
48	29	333	219	154	200		233		193	220
49	Dec 6	340	138	237	184		228	237	168	228
50	13	347	181	161	204		107	206	114	223
51	20	354	86	190	157		246	206	163	117
52	27	361	111		167		190	196	78	52
Mar-Oct Average			552	528	–	–	509	507	516	529
Jan-Dec Average			447	429[2]	–	–	418	420[2]	412	417

TABLE 3 (continued)

Weekly Solar Radiation Near Bakersfield 1958-1991[1]
(average langleys per day)

Week No.	Ending Date	Day of Year	1979	1980	1981	1982	1983	1984	1985	1986
1	Jan 4	4	197	74	154	188	167	52	184	113
2	11	11	204	149	135	279	64	94	175	121
3	18	18	139	144	166	126	183	163	202	184
4	25	25	202	237	213	280	172	156	132	168
5	Feb 1	32	259	166	308	329	257	152	185	208
6	8	39	340	162	190	302	270	216	287	232
7	15	46	388	307	315	298		251	319	239
8	22	53	271	215	401	339	282	301	353	259
9	Mar 1	60	364	342	281	313	244	336	471	299
10	8	67	379	247	432	324	429	346	401	320
11	15	74	386	402	359	261	452	362	389	240
12	22	81	345	443	418	418	402	407	432	461
13	29	88	460	472	493	394	570	428	482	484
14	Apr 5	95	558	547	655	486	573	430	534	406
15	12	102	522	533	652	369		423	606	456
16	19	109	629	597	456	630	538	499	577	508
17	26	116	612	491	659	633		573	565	597
18	May 3	123	572	466	720	624	551	572	664	633
19	10	130	612	580	709	658	692	615	695	663
20	17	137	677	562	620	699	690	592	731	710
21	24	144	650	689	576	693	654	624	734	629
22	31	151	664	693	702	741	625	584	690	677
23	Jun 7	158	676	691	732	749	655	646	657	691
24	14	165	685	741	732	656	682	629	739	724
25	21	172	694	740	687	641	709	694	719	726
26	28	179	682	762	691	610	686	678	733	698
27	Jul 5	186	697	583	687	714	667	655	688	702
28	12	193	656	693	692	711	691	644	625	690
29	19	200	647	700	700	701	681	569	665	688
30	26	207	602	674	699	630	656	568	635	661
31	Aug 2	214	669	594	680	681	629	595	708	668
32	9	221	625	679	626	637	542	617	694	642
33	16	228	596	633	611	610	509	503	675	617
34	23	235	587	610	622	565		567	622	502
35	30	242	553	575	596	522	543	541	616	566
36	Sep 6	249	575	526	573	483	529	486	563	556
37	13	256	522	530	537	501	525	459	512	536
38	20	263	509	523	523	468	454	450	504	495
39	27	270	505	491	383	374	353	444	494	401
40	Oct 4	277	384	473	453	455	374	417	429	448
41	11	284	418	421	446	446	333	301	424	396
42	18	291	363	375	399	398	353	382	415	376
43	25	298	349	340	339	302	311	349	337	378
44	Nov 1	305	333	305	361	235	218	326	305	300
45	8	312	276	271	249	275	206	296	311	350
46	15	319	332	243	259	211	165	277	309	295
47	22	326	289	263	253	178	198	168	233	168
48	29	333	258	232	220	224	205	111	134	258
49	Dec 6	340	268	205	112	221	226	107	182	191
50	13	347	236	211	191	218	95	132	192	132
51	20	354	241	241	186	180	102	114	176	132
52	27	361	180	174	154	205	108	67	87	123
Mar-Oct Average		554	554	578	543		541[2]	514	579	550
Jan-Dec Average		458	443	462	446		426[2]	403	465	437

TABLE 3 (continued)

Weekly Solar Radiation Near Bakersfield 1958-1991[1]
(average langleys per day)

Week No.	Ending Date	Day of Year	1987	1988	1989	1990	1991	Average	Std. Dev.	Std. Dev.
1	Jan 4	4	153	148	152	212	172	174	54	10
2	11	11	141	161	181	227	134	178	53	10
3	18	18	153	202	227	164	141	181	41	8
4	25	25	258	265	228	201	263	211	45	9
5	Feb 1	32	218	308	314	258	267	238	59	11
6	8	39	243	270	220	263	286	233	56	11
7	15	46	210	321	265	354	258	283	49	10
8	22	53	370	359	329	288	322	329	47	9
9	Mar 1	60	337	310	340	312	338	338	52	10
10	8	67	282	364	401	295	304	356	59	11
11	15	74	362	458	406	385	341	387	55	11
12	22	81	344	486	444	462	401	433	40	8
13	29	88	482	486	453	518	400	458	38	7
14	Apr 5	95	506	558	571	508	480	492	80	15
15	12	102	546	560	569	504	571	510	76	15
16	19	109	558	468	560	494	566	531	62	12
17	26	116	616	548	572	552	519	559	55	11
18	May 3	123	588	618	638	654	607	582	59	11
19	10	130	614	537	513	638	628	596	62	12
20	17	137	584	638	640	657	619	627	48	10
21	24	144	612	711	730	681	686	627	61	12
22	31	151	651	716	746	568	695	643	70	11
23	Jun 7	158	554	712	701	732	715	651	62	12
24	14	165	662	727	716	668	686	653	63	12
25	21	172	710	664	740	703	711	669	54	10
26	28	179	696	676	706	718	719	670	46	9
27	Jul 5	186	704	734	733	706	645	677	35	7
28	12	193	685	689	692	670	606	662	39	7
29	19	200	654	687	702	658	698	652	42	8
30	26	207	668	634	672	696	672	641	40	8
31	Aug 2	214	658	650	688	670	625	620	53	10
32	9	221	644	626	610	583	646	611	49	9
33	16	228	634	643	632	578	515	587	51	10
34	23	235	598	619	622	604	586	581	43	8
35	30	242	572	574	620	595	576	570	30	6
36	Sep 6	249	492	546	574	565	482	529	53	10
37	13	256	504	532	540	525	508	506	50	10
38	20	263	496	462	410	492	448	476	45	9
39	27	270	460	451	447	434	445	447	44	8
40	Oct 4	277	442	432	410	443	427	420	37	7
41	11	284	418	406	419	430	362	398	39	7
42	18	291	391	380	384	384	338	372	44	8
43	25	298	288	356	322	342	321	339	34	7
44	Nov 1	305	199	319	341	332	290	309	41	8
45	8	312	238	304	306	345	267	282	38	7
46	15	319	196	254	258	289	225	251	40	8
47	22	326	212	276	275	226	202	236	39	8
48	29	333	225	202	256	242	246	210	46	9
49	Dec 6	340	217	232	240	246	218	201	49	9
50	13	347	198	218	195	198	103	179	41	8
51	20	354	172	178	210	214	148	179	43	8
52	27	361	184	136	116	260	209	150	49	10
Mar-Oct Average			539	562	569	556	538	538	22	4
Jan-Dec Average			435	458	462	457	435	436	19	4

[1] No data for 1968. Stations: Arvin-Jewett 4/58-5/59; Arvin-Frick 6/59-10/65; Old River 3-S 11/65-12/67; Bakersfield 10-S 5/69-6/70; Wasco 8-SW 1/75-12/80; Bakersfield 10-NW 1/81-12/85; Bakersfield 10-NW and 12-S (average) 1/86-12/89; Bakersfield 12-S and Lamont 2-NW (average) 1/90-12/91.

[2] Includes estimates for one to four weeks.

TABLE 4

Monthly Solar Radiation at Six Stations in the San Joaquin Valley 1959-1968 (average langleys per day)

Location	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average Mar-Oct	Average Jan-Dec
Los Banos[1]	1959					658	657	599	553	468	367	272	198		
	1960	213	349	438	606	686	738	567	589	465	348	232	172	555	450
	1961	167	327		598	666	663	643	554	503	370	250			
	1962	212	270	428											
	Avg.	197	315	433	602	670	686	603	565	479	362	251	185	550	446
Berenda 2-N	1962					644	677	691	640	513	351	244	156		
	1963	180	274	453	525	613	698	711	588	438	331	175	54	545	420
	Avg.	180	274	453	525	629	688	701	614	476	341	210	105	553	433
Kerman 2-ESE	1964	186	321	411	552	603	648	693	553	496	366	229	152	540	434
Stockton 9-S	1960										389	221	173		
	1961	128	316	433	601	667	733	719	611	555	392	229		589	
	Avg.	128	316	433	601	667	733	719	611	555	391	225	173	589	439
Maze Bridge 2-S	1962						708	683	617	513	342	269	135		
	1963	196	296	422	472	605	699	689	583	458	345	180	89	534	420
	1964	178	348	395	541	595	621	673	587	496	350	253	183	532	435
	1965	176	341	415	424	604									
	Avg.	183	328	411	479	601	676	682	596	489	346	234	136	535	442
Thornton 2-S	1963							663	541	438	341	173	108		
	1964	152	324	392	566	615	598	662	528	432	289	177	148	510	407
	1965	220	308	367	388	557	682	671	600	477	348	234	156	511	417
	1966	244	306	441	643	651	675	690	635	530	385	209	127	581	461
	1967	181	264	381	446	697	672	731	642	550	475	316	246	573	466
	1968	190	286	379	504	598	642	698	515	462	397	220	191	524	424
	Avg.	197	298	392	509	624	654	686	577	482	373	222	163	537	431

[1] Bureau of Reclamation equipment yard.

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radiation due to the eclipse was close to that predicted – 64 percent for each of those stations. The duration was two hours as was predicted. The pyranometer charts for Bakersfield 12-S and Lamont 2-NW show the effect of the July 11 solar eclipse (Figure 6).

Figure 7 shows the relationship between monthly radiation measured by USWB at Fresno airport and by DWR near Bakersfield. The data used are for 12 years of common record between January 1959 and December 1975.

Average monthly radiation at Bakersfield was within Å30 langleys per day of the radiation at Fresno.

Figure 8 shows the linear relationship between long-term monthly radiation at Fresno and the average for six outlying DWR locations (excluding those stations near Bakersfield).

The six outlying DWR locations averaged just 1 percent higher than radiation measured at USWB Fresno airport.

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FIGURE 5

Solar Radiation Near Bakersfield
Average Daily Rate for Weekly Periods 1958-1991

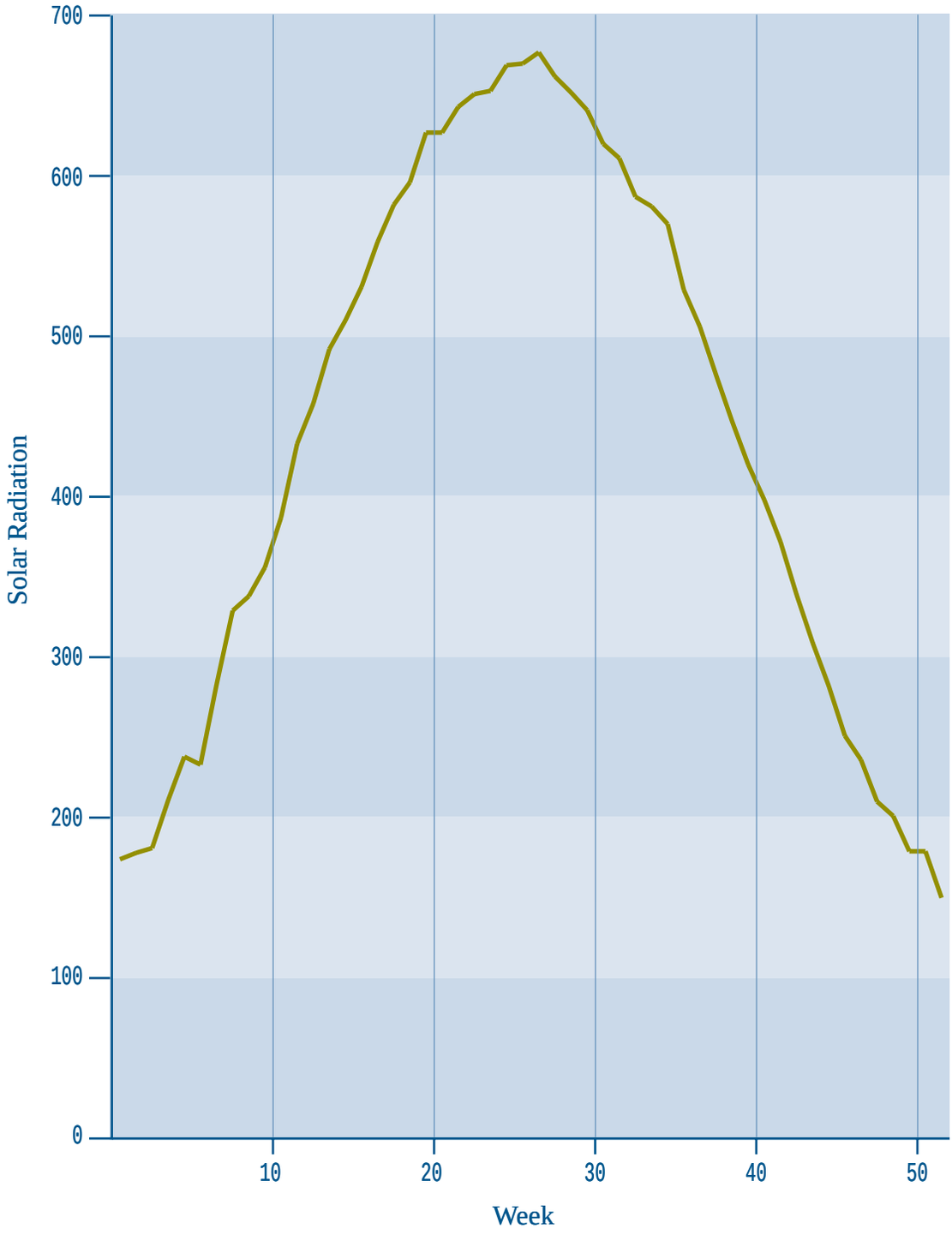
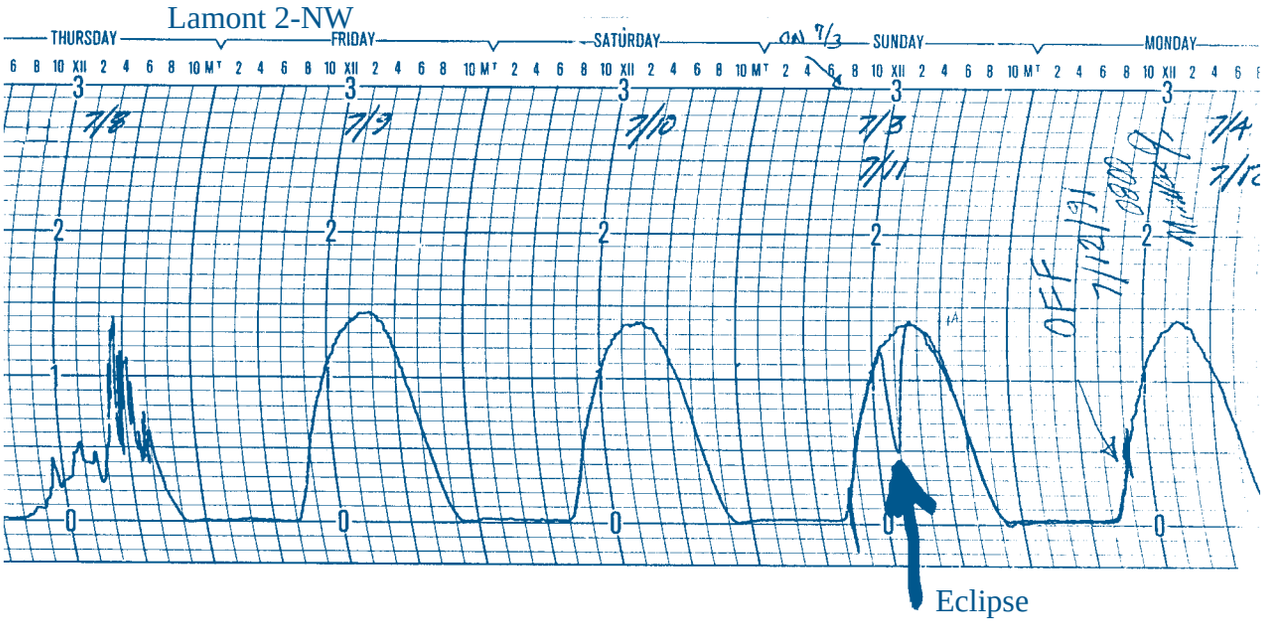


FIGURE 6

Instrument Charts Showing Effect of July 11, 1991 Eclipse on Incoming Radiation

Lamont 2-NW



Bakersfield 12-S

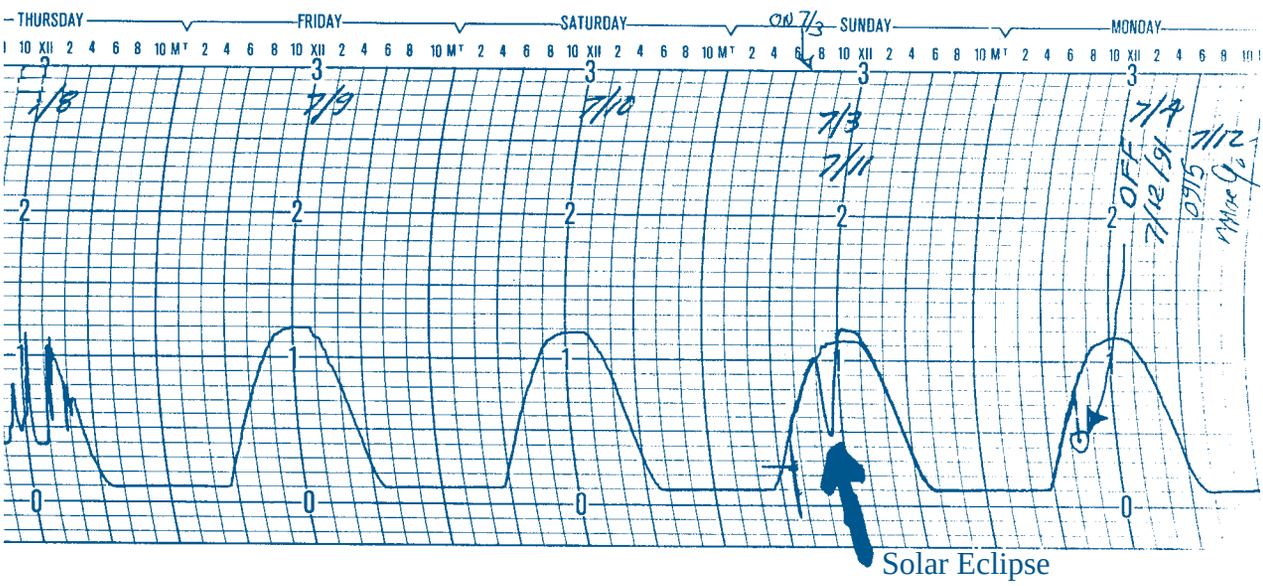


FIGURE 7

Relationship Between Solar Radiation at USWB Fresno A.P. and Near Bakersfield 1958-1991

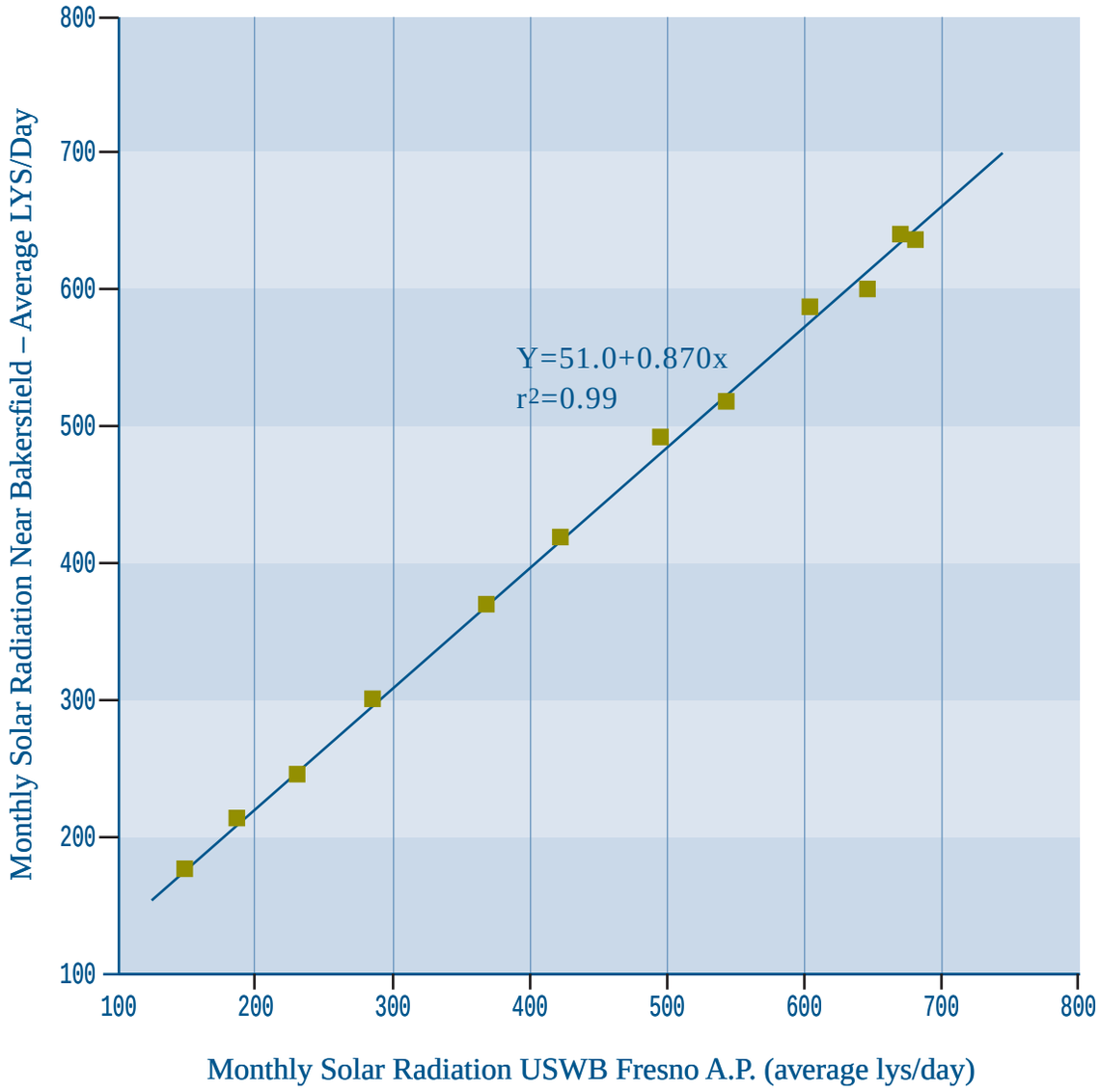


FIGURE 8

Relationship Between Solar Radiation at USWB Fresno A.P. and Average for Six DWR Sites Normalized to Long-Term

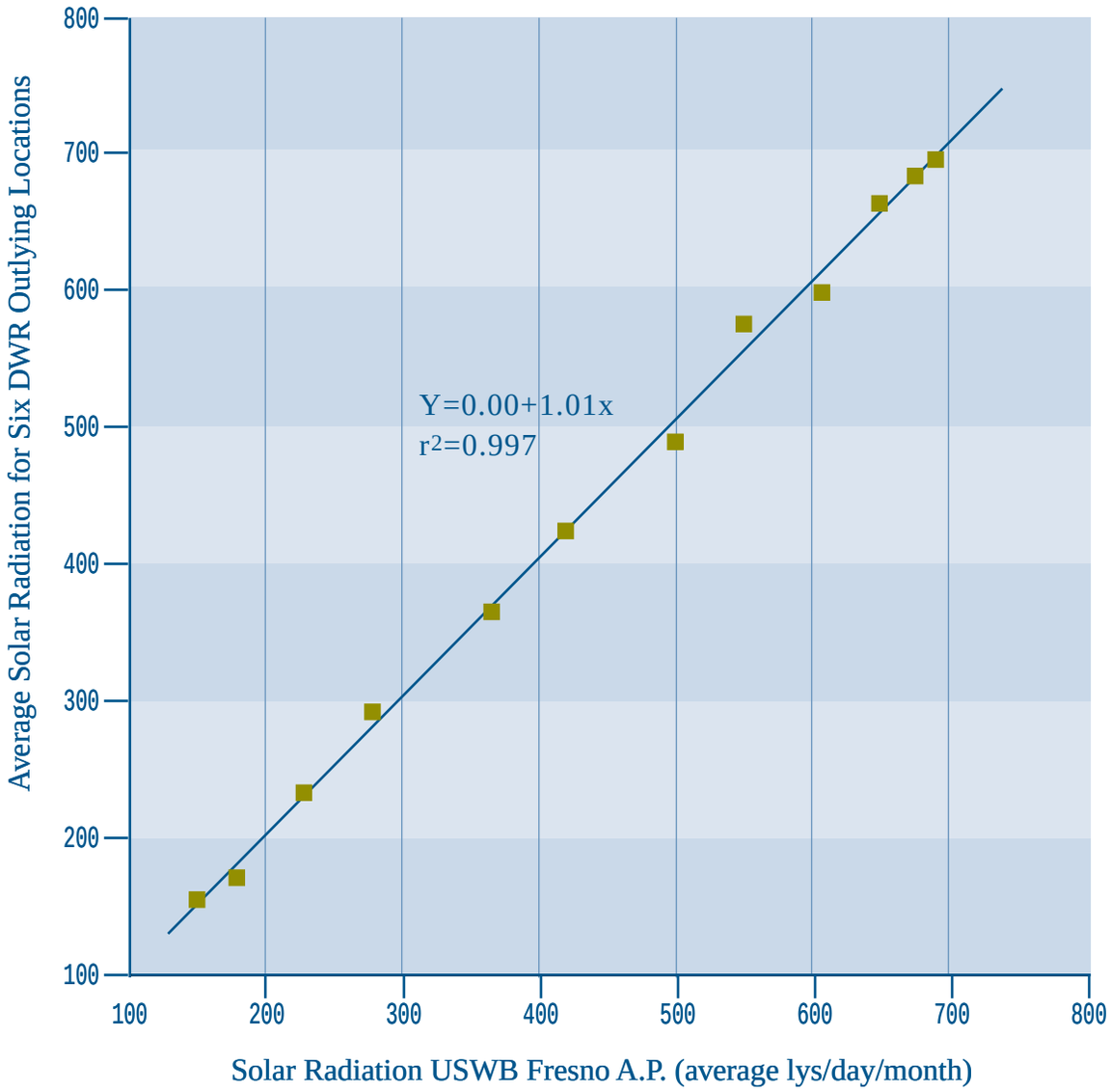


TABLE 5

Solar Radiation (Normalized to Long-Term Monthly Averages) In The San Joaquin Valley[1] (average langleys per day)

Month	THORNTON 2-S	STOCKTON 9-S	MAZE BRIDGE	LOS BANOS EQUIPMENT YARD	BERENDA 2-N	KERMAN 2-ESE	U.S. WEATHER BUREAU, FRESNO[2]	NEAR BAKERSFIELD[3]	Average	Std. Dev.	Std. Error
Jan	175	139	163	219	153	179	178	194	175	23	8
Feb	283	287	307	312	282	279	277	296	290	12	4
Mar	395	425	411	468	427	419	418	412	422	20	7
Apr	568	541	538	668	558	575	548	530	566	41	15
May	656	688	639	697	662	635	647	623	656	24	9
Jun	677	726	690	720	702	655	688	660	690	24	9
Jul	683	734	682	603	694	700	673	652	678	36	13
Aug	589	636	596	593	614	558	605	589	598	21	8
Sep	480	519	475	527	467	464	498	484	489	22	8
Oct	368	376	353	387	359	345	364	367	365	12	4
Nov	234	216	234	279	214	222	227	244	234	19	7
Dec	165	157	145	202	121	142	149	175	157	23	8
Mar-Oct	552	581	548	583	560	544	555	540	558	25	9
Jan-Dec	439	454	436	473	438	431	439	436	443	23	8

[1] Extrapolated to long-term average by correlation to "near Bakersfield" measured monthly data shown in Table 2.

[2] Average of measured values for 1/59-12/75; data from Table 3, DWR Bulletin 187, *California Sunshine-Solar Radiation Data*, August 1978.

[3] Average of measured data 6/58-12/91; see Table 2.

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In conclusion, radiation data collected in this investigation vary little from year to year for the same area and vary little between different geographic locations in the Valley for the same year.