

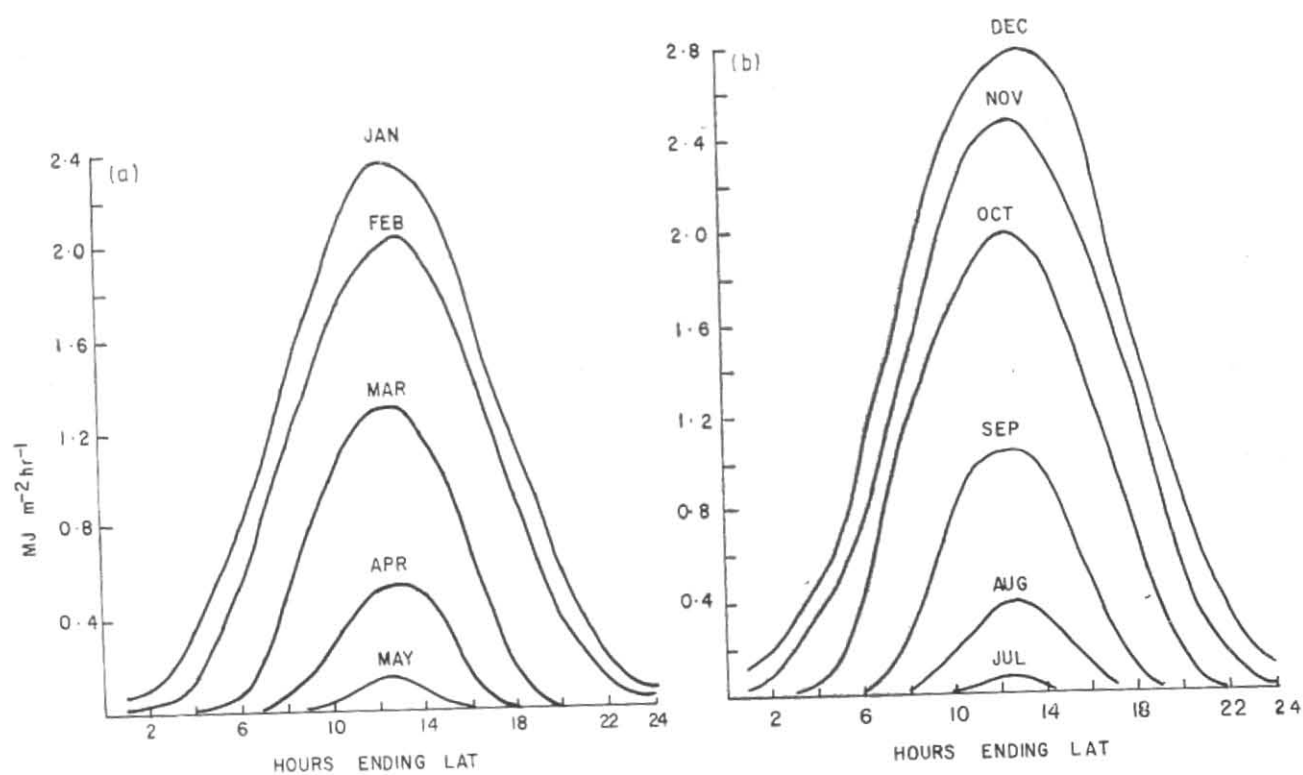
SHORT-TERM CLIMATOLOGY OF GLOBAL SOLAR RADIATION AT *DAKSHIN GANGOTRI*, ANTARCTICA

1. Global solar radiation is being measured at the Indian Antarctic Research Station continuously since 1984-85. The station was located on the ice-shelf at 70°S, 12°E till the summer of 1990. It is now located on an exposed land in the Schirmacher hills about 100 km south of the earlier location. The 7th wintering team occupied the new station in February 1990 and the measurement of global solar radiation has been continued at the new site. Thus, in view of the change in the location it is pertinent to work out the short-term climatological normals of mean hourly and mean daily global

solar radiation received in different months at the erstwhile station based on 5 years data from 1984 to 1988. Only the January and February data for 1989 was available and the same has been included in this study.

Kulkarni *et al.* (1986) have studied the global solar radiation data recorded at *Dakshin Gangotri* based on data for 1984-85. The present study is on similar lines.

2. *Data* — Global solar radiation was measured by a pyranometer on a raised platform on the roof of the station structure. Effectively the instrument was placed at 2.5 m above the snow surface. Hourly radiation value for a given hour was extracted from the chart and computed. Such values for the corresponding hour and month were averaged for the five-year data set to get the normal values.



Figs. 1(a & b). Mean hourly global solar radiation (MJ m^{-2})

TABLE 1

Mean daily global solar radiation (MJ m^{-2}) in different months

Month	Max.	Min.	Mean
Jan	41.71	10.57	26.18
Feb	34.36	10.05	19.99
Mar	26.02	3.19	10.13
Apr	7.16	0.37	2.89
May	2.56	0.01	0.46
Jun	00	0.0	0.0
Jul	0.30	0.09	0.15
Aug	7.94	0.22	1.99
Sep	21.65	2.80	7.18
Oct	31.36	6.35	17.81
Nov	36.55	10.17	26.57
Dec	41.99	12.09	33.12
Annual mean	18.18	8.90	13.33

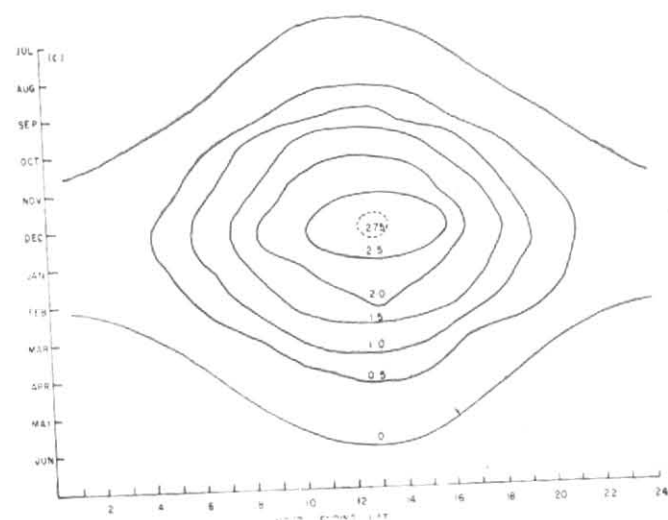


Fig. 1(c). Mean hourly global solar radiation (MJ m^{-2})

TABLE 1
Mean hourly global solar radiation (MJ m^{-2}) in different months

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.07	0.015									0.03	0.12
2	0.10	0.03									0.06	0.19
3	0.19	0.05								0.01	0.19	0.32
4	0.35	0.15								0.03	0.35	0.49
5	0.55	0.32	0.02							0.14	0.48	0.69
6	0.79	0.55	0.07						0.01	0.44	0.75	1.09
7	1.09	0.83	0.22	0.01					0.09	0.96	1.09	1.38
8	1.39	1.13	0.48	0.07				0.02	0.25	1.18	1.46	1.80
9	1.69	1.38	0.76	0.14	0.01			0.10	0.51	1.33	1.79	2.16
10	1.98	1.67	0.99	0.29	0.03		0.01	0.20	0.76	1.66	2.11	2.42
11	2.20	1.86	1.19	0.42	0.07	No	0.03	0.20	0.96	1.81	2.35	2.62
12	2.35	1.94	1.30	0.52	0.12	sun-	0.065	0.38	1.05	1.99	2.44	2.74
13	2.34	2.04	1.31	0.52	0.13	shine	0.065	0.39	1.05	1.95	2.47	2.79
14	2.27	1.95	1.20	0.54	0.08		0.03	0.32	0.94	1.83	2.34	2.76
15	2.08	1.91	1.02	0.32	0.03		0.01	0.23	0.75	1.62	2.16	2.68
16	1.81	1.53	0.92	0.22	0.01			0.11	0.49	1.43	1.90	2.58
17	1.85	1.23	0.43	0.05				0.04	0.26	1.06	1.60	1.94
18	1.20	0.92	0.19	0.01					0.09	0.68	1.23	1.55
19	0.91	0.63	0.05						0.01	0.43	0.88	1.16
20	0.59	0.39	0.01							0.18	0.55	0.84
21	0.39	0.33								0.05	0.29	0.56
22	0.21	0.11								0.01	0.15	0.34
23	0.12	0.06									0.07	0.19
24	0.07	0.045									0.03	0.12
Total	26.59	21.07	10.16	3.11	0.48	—	0.21	1.99	7.22	18.79	26.77	33.53

3. Results and discussion

3.1. *Distribution of mean hourly global solar radiation*—The distribution of mean hourly global solar radiation is given in Table 2 and depicted in Fig 1(c). Isolines drawn for every 0.5 megajoules per metre square (MJ m^{-2}) show highest values of 2.8 MJ m^{-2} occur around noon in December, obviously because the solar elevation reaches maximum angle of 45° in the second fortnight of this month. Kulkarni *et al.* (1986) have reported 2.94 MJ m^{-2} as the highest noon-time value in December 1984. Noon-time lowest values of 0.065 MJ m^{-2} occur in the month of July when the radiation

intensity is weakest, the solar elevation being less than 0.5° , since the annual sunrise occurs in the 3rd week of this month. It is interesting to note that the maximum decrease and increase in the radiation values occur in the month following the equinoctial dates of 21 March and 23 September respectively.

Values of mean hourly irradiance [with hours LAT (Local Apparent Time)] for all the 12 months are depicted in Figs. 1(a) & 1(b). The irradiance received is in direct correspondence with the duration of sunshine and solar elevation. Possible hours of sunshine at 70°S Lat. are given by Kulkarni *et al.* (1988).

3.2. *Month to month variation of mean daily global solar radiation* — Values of normal daily global solar radiation are given in Table 1. The mean daily global solar radiation is maximum in December, the value being 3.33 MJ m^{-2} and minimum in July, the value being 0.16 MJ m^{-2} . Highest and lowest values of mean daily radiation for each month are also given in Table 1.

4. The authors wish to acknowledge the help provided by Shri. P. G. Thorat and Smt. S. N. Wadekar in Agri-met, Pune in collecting and tabulating the data.

Reference

- Kulkarni, N.V., Desai, C.S. and Iyer, N.V., 1988, Global solar radiation at *Dakshin Gangotri* in Antarctica, *Mausam*, **39**, 1, pp. 113-115.

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