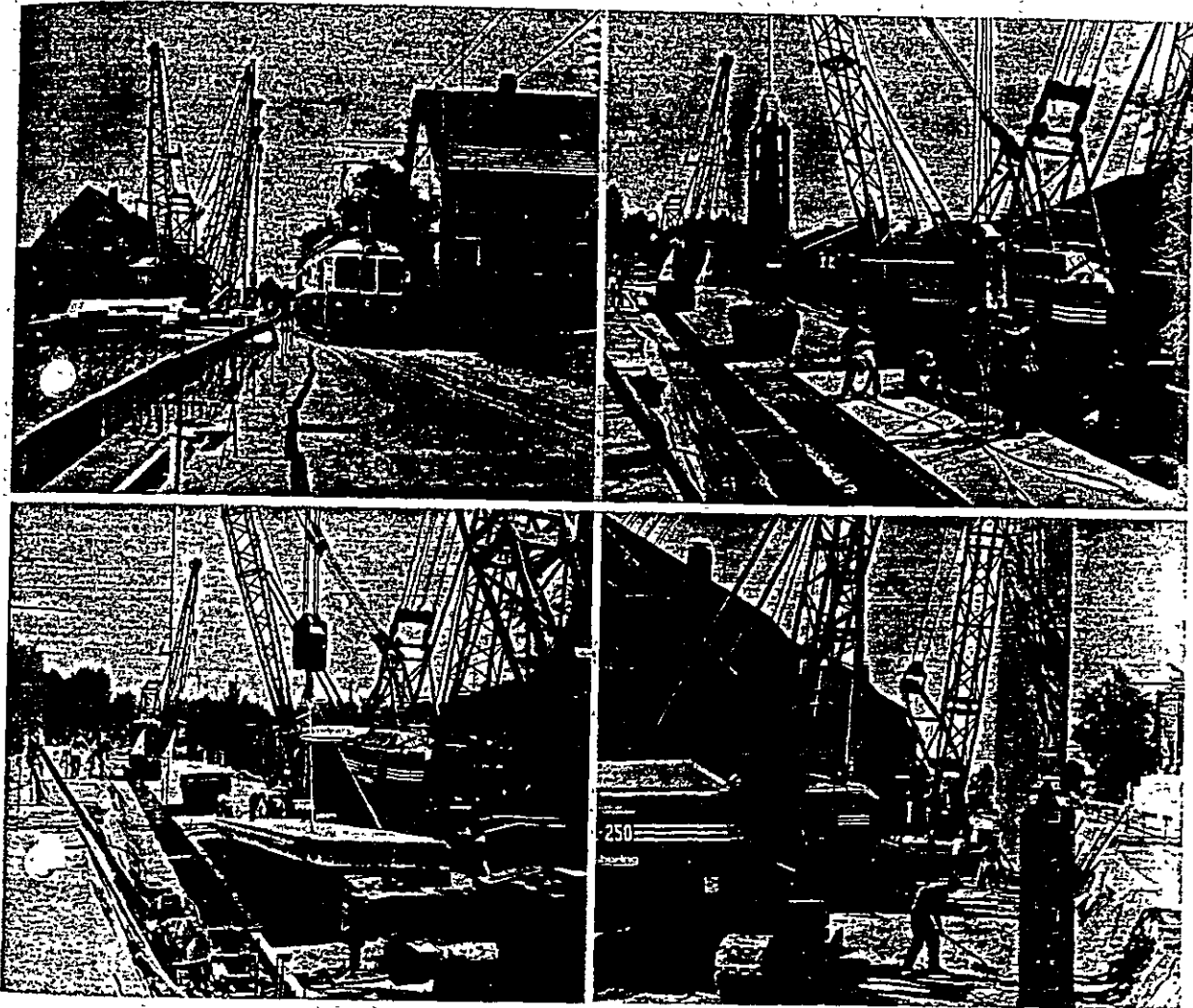
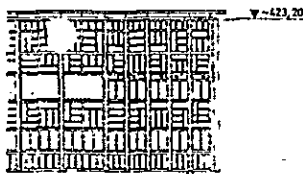


DIAPHRAGM WALLS

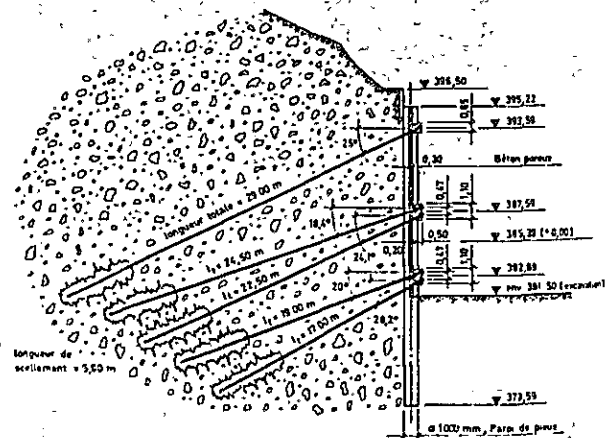
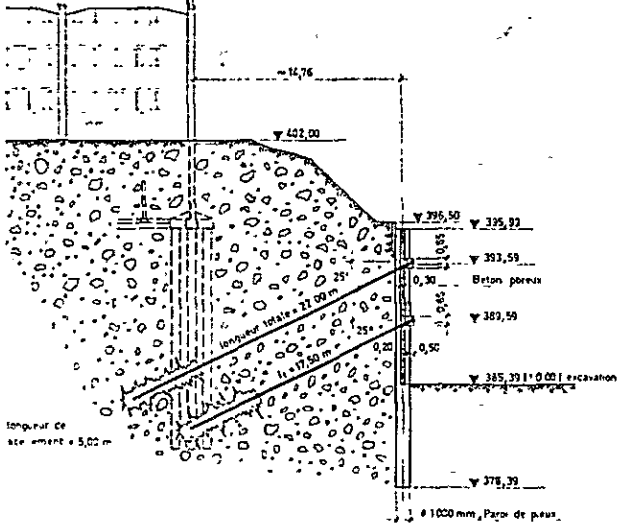
(Constructed under bentonite slurry)



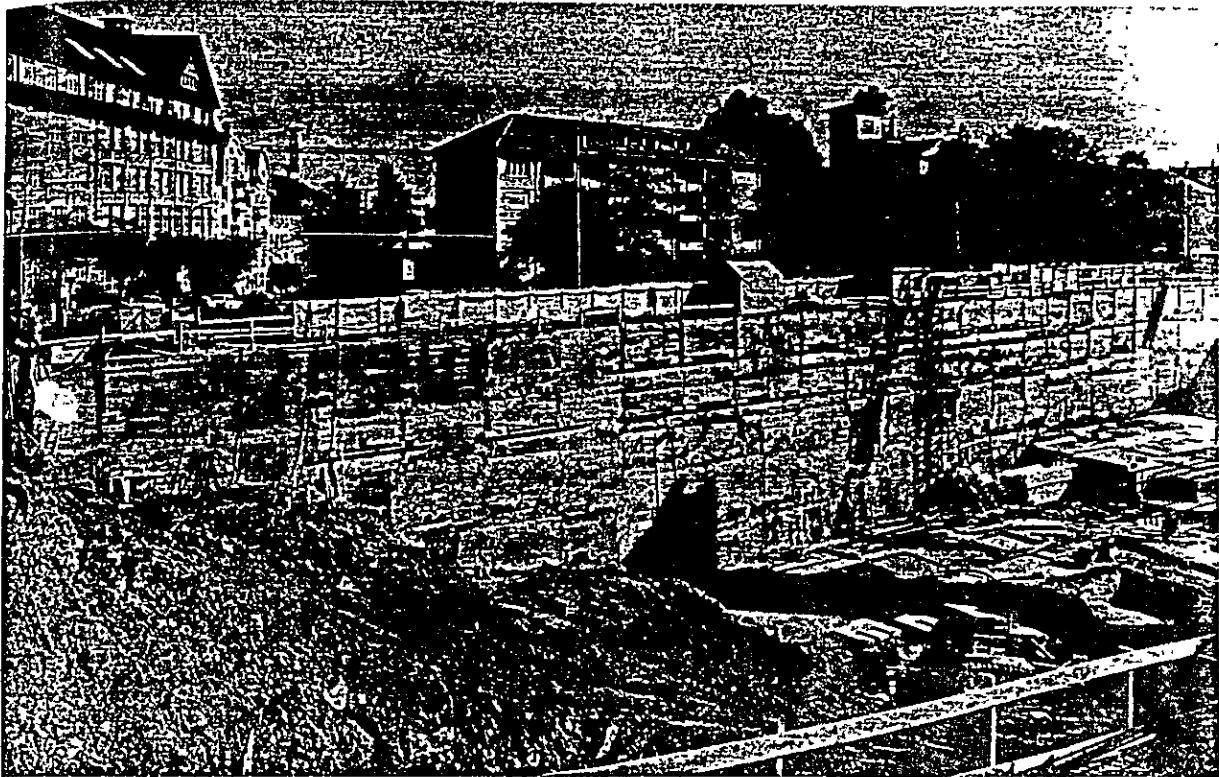


Coupe A-A

Coupe B-B

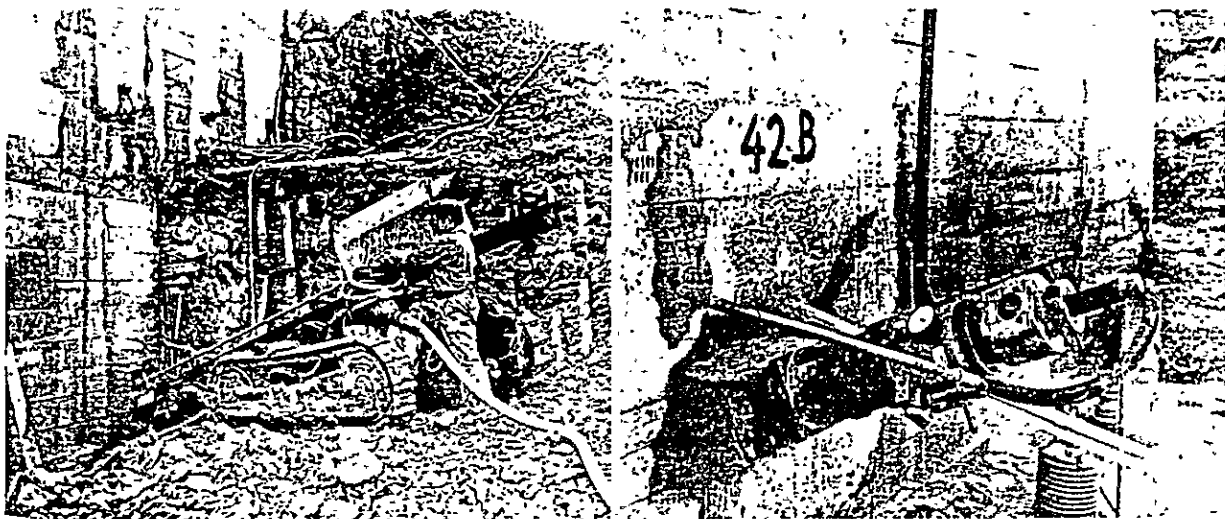


ANCHORAGES TIE-BACKS



Notwithstanding the fact that all types of anchors are sealed into the soil or rock by pressure grouting with cement, a distinction is made between temporary anchors and permanent anchors with a special protection against corrosion.

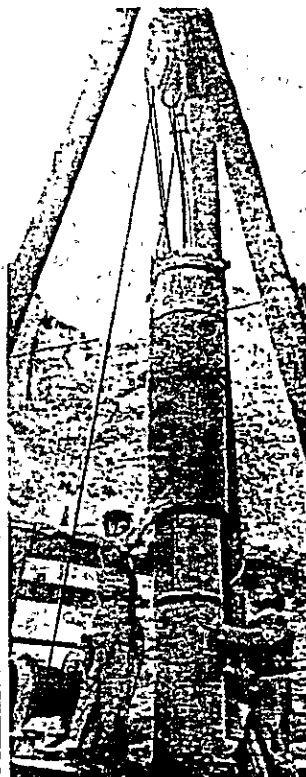
The bearing capacity of these anchors may vary from 10 to 250 tons depending on the soil conditions and the fixed length.



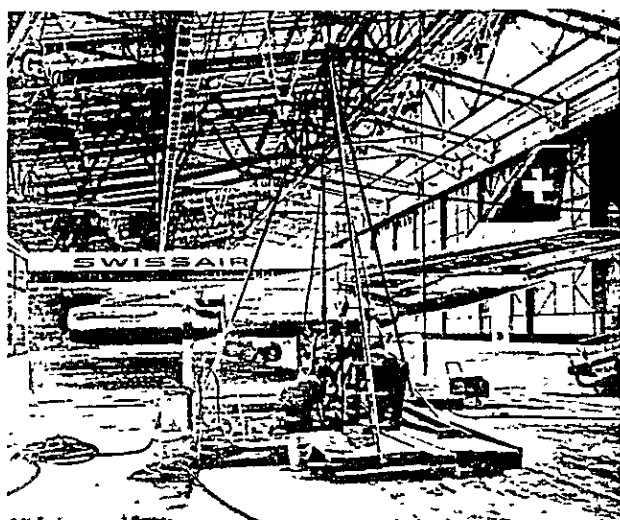
MISCELLANEOUS



Prefabricated load bearing elements, underpinning, drained retaining walls.



Tubewells and pumping tests, piezometers, sand drain dewatering.



Large diameter sampling in rock and concrete, etc.

STATEMENT OF SOIL INVESTIGATION

EXECUTED IN

UNITED ARAB EMIRATES

&

SULTANATE OF OMAN

SWISSBORING OVERSEAS CORPN. LTD.

P.O. Box 3905

DUBAI (U.A.E.)

EXPLORATORY BORINGS CARRIED OUT BY
SWISSBORING OVERSEAS CORP. LTD., DUBAI
IN THE GULF AREA

S.No.	Site	Client	Location	Value of Work
1.	The proposed multistoreyed Bldg. Intercontinental Hotel Muscat	Sogex Contracting & Trading, Dubai	Muscat	Dhs. 15,000.-
2.	Square Dry Dock, Reservoir Dorris	Sainrapt Et Drice, Abu Dhabi.	Abu Dhabi	Dhs. 38,505.-
3.	Sharjah-Istas Al Khaimah Bridge	Mothercat Ltd., Sharjah	Sharjah	Dhs. 32,000.-
4.	Al-Owais Flats	Mr. Mohammed Nassar Al-Owais, Dubai	Deira-Dubai	Dhs. 15,000.-
5.	Al-Otaiba Building	Arabconstruct Ltd., Abu Dhabi	Abu Dhabi	Dhs. 25,000.-
6.	Multistoreyed Building for M/s. Mohammed Bin Masood & Sons.	M/s. Mohammed Bin Masood & Sons, Deira-Dubai.	Deira-Dubai	Dhs. 12,000.-
7.	Hamaid Bin Naser Building.	A. Moez & Mohd. Higazi, Abu Dhabi	Abu Dhabi	Dhs. 12,000.-
8.	Cornish Road - Khor Fakkan Town Road Bridge - Stage I	Mothercat Ltd. Sharjah	Khor Fakkan	Dhs. 28,132.-
9.	Proposed Multistoreyed Hotel at Deira-Dubai.	Ahmed Majid Al-Ghuroir & Sons, Dubai	Deira-Dubai	Dhs. 6,000.-
10.	Cement Factory - Dubai Flour Mill - Dubai	-do- -do-	Dubai Dubai	Dhs. 18,000.- Dhs. 15,600.-

S.No.	Site	Client	Location	Value of Work
11.	Proposed Faraj Bin Hamoodah Multistoreyed Building.	Bin Hamoodah Trading & Gen. Service Co., Abu Dhabi.	Abu Dhabi	Dhs. 12,000.-
12.	Flour Mill - Dubai	Ahmed Majid Al-Ghurair & Sons, Dubai.	Dubai	Dhs. 15,600.-
13.	Multistoreyed Bldg. for Mr. Ahmed Al-Moosa.	Al-Masood Engineering, Dubai	Dubai	Dhs. 20,000.-
14.	Abu Dhabi Gas Project of Abu Dhabi Petroleum Co.	Abu Dhabi Petroleum Co., Abu Dhabi	Ruwais	Dhs. 50,417.-
15.	Proposed Multistoreyed Al-Ghurair Bldg. at Abu Dhabi.	Ahmed Majid Al-Ghurair & Sons, Dubai.	Abu Dhabi	Dhs. 10,000.-
16.	Essa Bin Yousuf Al-Nahfooz Bldg. at Abu Dhabi	Moez & Moh. Higazy, Abu Dhabi	Abu Dhabi	Dhs. 12,000.-
17.	Power House, Sharjah Electricity Dept.,	Sir William Halcrow & Partners, Sharjah.	Sharjah	Dhs. 10,000.-
18.	Cement Factory, Sharjah	Pacific Consultants Int., Abu Dhabi	Sharjah-Daid Road	Dhs. 14,000.-
19.	Sharjah Dock	John Howard & Co. England	Sharjah	Dhs. 14,700.-
20.	Cement Factory, Al-Ain	Pacific Consultants Int., Abu Dhabi	Al-Ain	Dhs. 34,900.-
21.	H.H. Sheikh Hamadan	Al-Ahmadiyah Company	Deira-Dubai	Dhs. 12,000.-
22.	Fuad Abbas Bldg. Block, Al-Buteen.	DeVries Fairhurst & Partners, Dubai.	Dubai	Dhs. 14,000.-
23.	Ruwais Site, Jabal Dhana, Abu Dhabi.	Dames & Moore, London	Abu Dhabi	Dhs. 114,436.-

S.No.	Site	Client	Location	Value of Work
23.	Ruweis Site, Jabal Dhanna, Phase II.	Dames & Moore, London	Jabal Dhanna	Dhs. 110,265.-
24.	Building Complex at Sharjah Water Front.	Khansaheb Civil Eng. Co., Dubai.	Sharjah	Dhs. 11,922.-
25.	Hotel Building, Sharjah	Al-Habtoor Engineering Enterprises, Dubai.	Sharjah	Dhs. 10,000.-
26.	I.T.S.C. Bldg., Dubai	Cable & Wireless Ltd., Dubai	Dubai	Dhs. 12,000.-
27.	Proposed Multistoreyed Bldg. for Mr. A. Butti near Green Market, Abu Dhabi.	Arabconstruct Limited, Abu Dhabi.	Abu Dhabi	Dhs. 12,000.-
28.	Well Point Drilling, Abu Dhabi.	Kharafi Company, Abu Dhabi	Abu Dhabi	Dhs. 10,000.-
29.	Sharjah Main Drainage Scheme, Sharjah.	Tarmac Overseas Division, Dubai.	Sharjah	Dhs. 23,750.-
30.	Bank Mellat Iran Bldg., Deira-Dubai.	Al-Borj Contracting Co., Dubai.	Deira-Dubai	Dhs. 12,500.-
31.	Proposed Multistoreyed Kanoo Bldg.	Kadri Builders & Engineers, Dubai.	Dubai	Dhs. 10,000.-
32.	H.H. Sheikh Rashid Bin Said Al-Maktoum Bldg.	Arencos, Dubai	Dubai	Dhs. 23,000.-
33.	Abu Dhabi Gas Liquefaction Co. Ltd.	Eastern Bechtel Corpn., Abu Dhabi	Das Island Abu Dhabi	Dhs. 68,270.-
34.	Hassan & Hussain Al-Fardan Building.	Arab Engineering Bureau, Dubai.	Sharjah	Dhs. 10,000.-

S. No.	Site	Client	Location	Value of Work
35.	Hire of Drilling Rig with operation on Das Island.	Consolidated Contractors Co., Abu Dhabi	Das Island	Dhs. 36,650.-
36.	Ghubrah Desalination Plant.	Sogex Contracting & Trading, Muscat Muscat.		R.O. 6,021,900
37.	Proposed Bank Saderat Iran Building, Dubai.	Al-Borj Contracting Co., Deira-Dubai.	Dubai	Dhs. 27,000.-
38.	Sharjah Core Sampling in Dhaid Hills.	Pacific Consultants International, Sharjah.	Dhaid	Dhs. 25,000.-
39.	Garden City Al-Khan Sharjah	Professional Group Austral-ia, Sharjah.	Sharjah	Dhs. 10,168.-
40.	Sharjah Main Drainage Scheme, Phase II.	Tarmac Overseas Division, Sharjah.	Sharjah	Dhs. 38,121.-
41.	New Campus for Dubai Defence Force at Jumeirah, Dubai.	A. Moez & Moh. Higazy, Dubai	Dubai	Dhs. 63,120.-
42.	Split Site - Sharjah	Professional Group Austral-ia, Sharjah.	Sharjah	Dhs. 10,308.-
43.	Sharjah Deep Water Harbour, Phase I.	Archosi J.V., Sharjah	Sharjah	Dhs. 20,491.-
44.	Diamond Core Drilling, Wadi Hatta.	H.H. Sheikh Rashid Bin Said Al-Maktoum - Sir William Halcrow & Partners, Dubai	Wadi Hatta	Dhs. 339,356.-
45.	Proposed Multistoreyed Building, Sharjah.	Professional Group Australia, Sharjah.	Sharjah	Dhs. 7,500.-
46.	Awaida Bin Rashid & Rashid Bin Awaida Bldg., Abu Dhabi	Abu Dhabi Contracting Co., Abu Dhabi	Abu Dhabi	Dhs. 29,000.-

S. No.	Site	Client	Location	Value of Work
47,	Proposed Oman Flour Mill at Muttrah - Muscat.	Mothercat. Limited, Muscat	Muscat	R.O. 5,371,660
48,	Hajra - Earth Station	Sogex Contracting & Trading, Muscat.	Muscat	R.O. 1,700,000
49,	Dubai Municipality Bldg.	Pacific Consultants, Sharjah.	Dubai	Dhs. 11,875,-
50,	Core Drilling in Khor Fakkan	Pacific Consultants, Sharjah.	Khor Fakkan	Dhs. 11,000,-
51.	New Pipe Mill Site, Ras al Khaima	McDermott, Dubai	Ras Al Khaima	Dhs. 21,050,-
52.	Sharjah Harbour	Westminister Dredging Co., Sharjah.	Sharjah	Dhs. 9,572,-
53.	Abu Dhabi New Airport	Aeroport De Paris, Paris France	Abu Dhabi	Dhs. 138,168,-
54.	Saadiyat Diesel Power Station.	Cairo Contracting Company, Abu Dhabi.	Abu Dhabi	Dhs. 10,400,-
55.	Sajwani Building	Arab Engineering Bureau, Dubai.	Sharjah	Dhs. 15,000,-
56.	Sharjah Khan Bridge	Pacific Consultants International, Sharjah.	Sharjah	Dhs. 35,000,-
57-	Al Mulla Hotel Building	Eastern Contracting & Trading Co., Sharjah.	Sharjah	Dhs. 11,000,-
<u>1975</u>				
58,	Trade Center	Bernard Sunley & Sons Ltd., Dubai.	Dubai	Dhs. 390,000,-

S.No.	Site	Client	Location	Value of Work
59.	Mecca Power Station	Saudi Electric Company, Jeddah.	Mecca	S.Pr. 29,410.-
60.	Flour Mill & Silo Project	Agriconsult A.B., Malmo, Sweden.	Abu Dhabi	Dhs. 85,000.-
61.	Hotel Intercontinental, Muscat	Sogex Contracting & Trading, Muscat.	Muscat	Dhs. 15,000.-
62.	Spinneys Building	De Vries Fairhurst & Partners, Dubai.	Sharjah	Dhs. 10,000.-
63.	Proposed Multistoreyed Bldg., Linpro, Sharjah	" do "	Sharjah	Dhs. 10,000.-
64.	Abu Dhabi National Oil Co., Abu Dhabi	CO.GE.CO., Abu Dhabi	Abu Dhabi	Dhs. 23,700.-
65.	Syed Ahmed Building	Eastern Contracting & Trading, Sharjah.	Sharjah	Dhs. 11,000.-
66.	Dr. Jaffer's Building	De Vries Fairhurst & Part- ners, Dubai	Sharjah	Dhs. 10,000.-
67.	Sharjah Khan Bridge	Pacific Consultants Inter- national, Sharjah.	Sharjah	Dhs. 37,000.-
68.	Sharjah Commercial Centre	Consolidated Contracting Co., Sharjah	Sharjah	Dhs. 46,322.-
69.	Reservoir & Water Tower Emirates of Sharjah	Sharjah Water Department, Govt. of Sharjah & Its Dependencies, Sharjah.	Sharjah	Dhs. 94,500.-
70.	Proposed Abu Dhabi Finance Building, Dept. of Finance Govt. of Abu Dhabi	Govt. of Abu Dhabi, Dept. of Finance Abu Dhabi	Abu Dhabi	Dhs. 34,860.-

S.No.	Site	Client	Location	Value of Work
71.	Arab African Bank Bldg.	TEST (Consultants) Technical Studies Bureau, Dubai.	Dubai	Dhs. 10,000.--
72.	Plot No.59 - Boytina - 10 Storeyed Bldg. for Mr. Amir Ali Moosa at Sharjah	Surti & Thariani Consulting Engineers, Karachi	Sharjah	Dhs. 8,000.--
73.	Proposed Multistoreyed Bldg. for H.E. Sheikh Abdul Aziz, Opp. Sharjah Cinema.	Gulf General Project Co., Sharjah.	Sharjah	Dhs. 10,480.--
74.	Proposed Multistoreyed Apart- ment Bldg., Sharjah.	H.H. Sheikh Sultan Bin Mohammed Al Qassimi (The Ruler of Sharjah)	Sharjah	Dhs. 89,624.--
75.	Hotel near Maqta Bridge - Abu Dhabi	Eastern Bechtel Corpn., Abu Dhabi	Abu Dhabi	Dhs. 67,099.--
76.	Al-Mansoori Building, Abu Dhabi	CO.GE.CO., Abu Dhabi	Abu Dhabi	Dhs. 77,643.--
77.	Umm Kanoor Hotel	ASCO (Sharjah) Ltd., Sharjah	Sharjah	Dhs. 10,000.--
78.	Hotel near Bechtel Camp Abu Dhabi	Eastern Bechtel Corpn., Abu Dhabi	Abu Dhabi	Dhs. 19,895.--
79.	Sultan Bin Sullayam Bldg.	Dubai Contracting Co., Abu Dhabi	Abu Dhabi	Dhs. 15,000.--
80.	Bridge Foundation in the mountain range of Oman (Drilling rig on Hire)	T. P. Dumez, Muttrah, Muscat	Oman	R.O. 18,803.660
81.	Manhal Palace	Eastern Bechtel Corpn., Abu Dhabi	Abu Dhabi	Dhs. 7,590.--

S.No.	Site	Client	Location	Value of Work
82.	Core Drilling at Quarry - Site near Dhaid, Sharjah.	Archosi J.V., Sharjah	Dhaid, Sharjah	Dhs. 44,615.-
83.	Ajman Power Station, Ajman	Hawkers Siddeley Eng. Ltd., Dubai	Ajman	Dhs. 26,397.-
84.	Mr. Lahaj Khalifa Al Basti- Al Karama, Dubai.	De Vries Fairhurst & Partners, Dubai,	Dubai	Dhs. 5,000.-
85.	Bank Mellat Iran, Sharjah	Mr. M. Daneshvar, Dubai	Dubai	Dhs. 15,927.-
86.	Dune Site - Summer Palace at Habab - for H.H. Sheikh Maktoum Rashid Al Maktoum)	Halcrow Middle East Ltd., Dubai	Habab	Dhs. 18,276.-
87.	ADNOC F.O.D. at Umm-al-Nar Abu Dhabi	DeVries Fairhurst & Partners, Dubai.	Abu Dhabi	Dhs. 53,787.-
88.	Bin Ladin Building	Bin Ladin, Sharjah	Sharjah	Dhs. 20,000.-
89.	Plot No.137, Al-Muteena, Dubai	DeVries Fairhurst & Partners, Dubai.	Dubai	Dhs. 8,554.-
90.	Hotel Intercontinental, Sharjah	Bechtel International, Dubai	Sharjah	Dhs. 44,061.-
91.	Sir Abu Nu'air Island	Sixconstruct, Sharjah	Abu Dhabi	Dhs. 49,115.-
92.	Sharjah Town Project	White Young & Partners, Amsterdam	Sharjah	Dhs. 11,999.-
93.	Wadi Gulfa I - Gulfa Mineral Water	Mr. Marwan Kalo - Dubai	Dubai	Dhs. 60,000.-
94.	Unit No.11 Sector W-18- Abu Dhabi	National Construction Co. (Pak) Ltd., Abu Dhabi	Abu Dhabi	Dhs. 30,855.-

S.No.	Site	Client	Location	Value of work
95.	Proposed Water Tank Site - Al Mafrag	National Construction Co. (Pak) Ltd., Abu Dhabi	Al-Mafrag Abu Dhabi	Dhs. 164,523.-
96.	Proposed Habib Bank Building at Ajman	National Construction Co. (Pak) Ltd., Abu Dhabi	Ajman	Dhs. 24,312.-
97.	Proposed Multistorcyed Bldg. for Mr. Thani Bin Mohammed.	Thani Construction Co., Abu Dhabi	Abu Dhabi	Dhs. 15,000.-
98.	National Bank of Dubai, New Creek Branch, Dubai	Malcrow Middle East Ltd., Dubai	Dubai	Dhs. 10,000.-
99.	Dubai Club, Dubai	Al-Naboodah Cont. Co., Dubai	Dubai	Dhs. 25,850.-
100.	Mr. Sultan Bin Ali Al-Owais Bldg., Project No.296.	Bin Ladin Organisation, Dubai	Sharjah	Dhs. 14,000.-
101.	Proposed Abu Dhabi Gulf Hotel Project, Abu Dhabi	Dar Al Mandasah, (Shair & Partners) Abu Dhabi	Abu Dhabi	Dhs. 62,459.-
102.	Proposed Housing at Safeia Area near Al-Shaab Cinema, Dubai	Arengo, Dubai	Dubai	Dhs. 51,686.-
103.	Proposed Water Reservoir Tank Site No.I, Abu Dhabi	National Construction Co. (Pak) Ltd., Abu Dhabi	Abu Dhabi	Dhs. 17,642.-
104.	Proposed Shipway Site, Ajman	Mitsui Ocean Development & Engineering Co. Ltd., Ajman	Ajman	Dhs. 7,000.-
105.	Proposed Hotel Site for Mr. Mohad Saeed Al Gaith, Dubai.	Al Habtoor Eng. Enterprise, Dubai.	Dubai	Dhs. 16,680.-
106.	Nasr Square Complex for H.H. Sheikh Mohammed Bin Rashid - Dubai.	John Snellgrove & Associat- Dubai	Dubai	Dhs. 48,843.-

S.No.	Site	Client	Location	Value of Work
107.	Factory for International Paint (Gulf) Ltd., Dubai	Arengo, Dubai	Dubai	Dhs. 6,000.-
108 & 109	Building site for Sheikh Mubarak & Mr. Al Asri Bin Hamoodah, Abu Dhabi	Al Geemi Transport Co., Abu Dhabi	Abu Dhabi	Dhs. 13,500.-
110.	Saqr Hospital at Al-Nakheel, Ras-al-Khaimah	Dar-al-Handasah, Ras-al-Khaimah	Ras-al-Khaimah	Dhs. 24,280.-
111.	Mr. Ali Bin Abdulla Al-Owais, Sharjah	Associated Construction, Dubai	Sharjah	Dhs. 27,886.-
112.	H.E. Sheikh Ahmed Bin Sultan Al-Qasimi, Ras/al-Khaima	Alistair McCowan & Asstes, Sharjah	Ras-al-Khaima	Dhs. 9,000.-
113.	Hire of Equipment & Personnel at Khor Fakkan.	Joannou & Paraskevaides, Deira-Dubai	Khor Fakkan	Dhs. 7,282.-
114.	Satellite Earth Station, Ras-al-Khaima	Siemens AG, W. Germany	Ras-al-Khaima	Dhs. 35,250.-
115.	Jabel Ali - Core Drilling for Gypsum.	Sir William Halcrow & Partners, Dubai	Jabel Ali, Dubai	Dhs. 539,583.-
116.	Proposed Building for Sheikh Al-Ghait, Abu Dhabi	Al-Habtoor Engineering Enterprises, Dubai	Abu Dhabi	Dhs. 16,000.-
<u>1976</u>				
117.	Proposed Borsa Tower Bldg. for H.H. Sheikh Sultan Al-Qasimi, Sharjah	Interconsult, Sharjah	Sharjah	Dhs. 25,895.-
118.	Sharjah Harbour, Sharjah	Archosi Contractors for Sharjah Harbour, Sharjah	Sharjah	Dhs. 44,600.-

S.No.	Site	Client	Location	Value of Work
119.	Steam Power Station	Halcrow Middle East Ltd., Dubai	Dubai	Dhs. 161,205.-
120.	Dubai Islamic Bank, Proposed Head Office Bldg., Dubai	Dubai Islamic Bank Directorate of Engineering & Construction Deira-Dubai.	Dubai	Dhs. 10,500.-
121.	New Airport, Abu Dhabi	Aeropot De Paris Paris, France	Abu Dhabi	Dhs. 162,650.-
122.	3 different sites at Abu Dhabi	Thani Construction Co., Abu Dhabi	Abu Dhabi	Dhs. 45,000.-
123.	Proposed House at Dhaid for H.H. Sheikh Sultan Bin Mohd. Al Qasimi.	H.H. Sheikh Sultan Bin Mohammed Al Qasimi, (Alistair McCowan & Asstes) Sharjah.	Daid-Sharjah	Dhs. 10,000.-
124.	Concrete Batching Plant at Sharjah	German Gulf Enterprises Ltd. Sharjah	Sharjah	Dhs. 12,000.-
125.	U.A.E. Fish Processing Project.	Norconsult A.B., Norway	Umm-Al-Jaiwan	Dhs. 86,601.-
126.	Proposed Building for H.H. Sheikh Khalid, Abu Dhabi.	Dar-Al-Handasah Consultant, Shair & Partners, Abu Dhabi.	Abu Dhabi	Dhs. 30,379.-
127.	Proposed Al-Shamsi Building	General Construction Co., Sharjah.	Sharjah	Dhs. 10,000.-
128.	Al Mulla Building near Police Head Quarters, Dubai	Pacific Consultants Int. Dubai.	Dubai	Dhs. 38,390.-

S.No.	Site	Client	Location	Value of Work
129.	Proposed Multistoreyed Bldg. for Mr. Mohd. Omar Bin Haider at Riga Al-Buteen, Deira-Dubai	Mr. Omar Bin Haider, Dubai	Dubai	Dhs. 10,000.--
130.	Plot at Dubai Sharjah Road, Sharjah	Mohammed Omar Bin Hyder Dubai	Dubai-Sharjah Road,	Dhs. 29,945.--
131.	Proposed 10 storeyed Bldg. hear Phoenicia Hotel.	Engineering Adnan Safarini, Dubai	Dubai	Dhs. 12,489.--
132.	Dr. Zulekha Bldg. Plot No.101, Al-Nabba Sharjah.	Saifas Contracting & Trading Co., Sharjah.	Sharjah	Dhs. 10,420.--
133.	Proposed Behbehani Building, Sharjah.	Arabconsultants, Safat, Kuwait.	Sharjah	Dhs. 10,000.--
134.	Sheikh Khalid Al Qasimi Bldg. Ras-Al-Khaima.	Dar-Al-Handasah Consultants, (Shair & Partners) Ras-Al-Khaima.	Ras-Al-Khaima	Dhs. 25,225.--
135.	Gulf Star Hotel, Sharjah	Typsa, Sharjah	Sharjah	Dhs. 19,695.--
136.	Proposed Multistoreyed Bldg. at Satwa for Mr. Abdullah Bin Ali Shafar.	Abdullah Bin Al Shafar, C/° Green Point Consultant, Dubai.	Dubai	Dhs. 14,389.--
137.	Proposed Multistoreyed Bldg. Site at Sharjah.	Nabil Abdul Baqui Co., Sharjah	Sharjah	Dhs. 10,000.--
138.	Proposed 20 storeyed Bldg. Sharjah	Ahli-Alt-Scot Int. Ltd. (Modern Printing Press) Dubai.	Dubai-Sharjah	Dhs. 7,000.--
139.	Proposed Multistoreyed Bldg.	Mr. Juma Al Naboodah & Mr. Saeed Al Naboodah, C/o Pacific Consultants Int., Dubai.	Dubai-Sharjah Rd.	Dhs. 12,850.--

S.No.	Site	Client	Location	Value of Work
140.	Proposed Multistoreyed Bldg. at Dubai-Sharjah Road.	Mr. Mirza Ali Fardan-Fardan Ali Fardan, C/o. Pacific Consultants Int., Dubai	Dubai-Sharjah Rd.	Dhs. 14,287.-
141.	Sharjah Harbour (SPT's)	Archosi, Sharjah	Sharjah	Dhs. 27,750.-
"	Sharjah Harbour	- do -	Sharjah	Dhs. 50,363.-
142.	Proposed Building for Mr. Abdu Hnbika, Sharjah.	Hashmi & Associates, Sharjah.	Sharjah	Dhs. 5,000.-
143.	Mr. Saeed Mohammed Ali Ghandi Bldg. on Plot No.32, Dubai-Sharjah Road.	Saeed Mohammed Ali Ghandi & Sons, C/o. Rais & Tukan, Dubai.	Dubai-Sharjah Road.	Dhs. 12,629.-
144.	Proposed Multistoreyed Bldg. for Mr. Sultan Bin Khalifa Plot No.41.	Mr. Sultan Bin Khalifa, C/o. Rais & Tukan, Dubai	Dubai-Sharjah Road.	Dhs. 12,629.-
145.	Proposed Bldg. site for Mr. Abdullah Rustamani on Plot No.10 & 11, Dubai-Sharjah Rd.	Khatib & Alami Dubai	Dubai-Sharjah Road.	Dhs. 17,735.-
146.	Proposed Bldg. for Mr. Sultan Bin Khalifa Plot No.182A Sharjah Lagoon.	Mr. Sultan Bin Khalifa, Sharjah.	Sharjah	Dhs. 18,630.-
147.	Proposed Multistoreyed Bldg. for Mr. Ali Mubarak Al Kuhaitor.	Mr. George Aziz Civil Contractors, Ras-Al-Khaima.	Ras-Al-Khaima	Dhs. 12,500.-
148.	Proposed Bldg. for Mr. Saeed Salim Al Musafir at Al-Nakheel.	- do -	Ras-Al-Khaima	Dhs. 12,500.-

S.No.	Site	Client	Location	Value of Work
149.	Yousuf Habib Al Yousuf Bldg. Al Vihdah Road, Sharjah.	Arab Engineering Bureau, Dubai.	Sharjah	Dhs. 17,000.-
150.	Galadari Block of Flats	Nabil Abdel Baki, Dubai.	Dubai	Dhs. 16,000.-
151.	Plot of land on Sharjah Industrial Area.	Cicon, Dubai	Sharjah	Dhs. 13,300.-
152.	Charles De Gaulle Centre	Adreco, Sharjah	Sharjah	Dhs. 8,500.-
153.	Proposed Industrial Centre for Mr. Mahmood Sadik.	Mr. Sadik, Sadik & Co., Sharjah	Sharjah	Dhs. 10,000.-
154.	T.V. Station & Radio Station at Fujairah.	Marubeni Corpn. Abu Dhabi	Fujairah	Dhs. 20,000.-
155.	Proposed Building site of Mr. Fardan Ali Fardan on Khalid Bin Valid Road.	Mr. Fardan Ali Fardan C/o. Green Point Consul- tants, Dubai.	Dubai	Dhs. 7,200.-
156.	Sharjah Khan Bridge	Pacific Consultants Int.	Sharjah	Dhs. 37,000.-
157.	Plot No.251 - Al Ras, Dubai	Abdul Wahab Galadari Con. Dubai	Dubai	Dhs. 11,630.-
158.	Site No.3 of Cesco near Zahra Clock Tower Sharjah	Cesco (Middle East) Ltd., Dubai.	Sharjah	Dhs. 5,000.-
159.	Proposed Saba & Co. Bldg.	Group Design Gulf, Deira-Dubai	Sharjah	Dhs. 8,000.-
160.	Proposed Youth Centre, Al-Nakheel	Saud Contracting Co., Ras-Al-Khaima.	Ras-Al-Khaima	Dhs. 7,000.-

S.No.	Site	Client	Location	Value of Work
151.	Proposed Hotel at Ras-Al-Khaima.	U.N.C.O., Ras-Al-Khaima	Ras-Al-Khaima	Dhs. 31,345.-
162.	Proposed Sheikh Salem Bin Mohammed Al-Qasimi Center.	Khatib & Alami, Dubai.	Sharjah	Dhs. 17,630.-
163.	Proposed Cornish Tower	General Aswan Establishment, Sharjah	Sharjah	Dhs. 10,000.-
164.	Proposed Union Public Square, Deira-Dubai.	M & R International, Belgium.	Deira-Dubai	Dhs. 30,000.-
165.	Proposed Villas for H.H. Sheikh Mohammed Bin Rashid near Dubai Club.	Al Naboodah Contracting Co., Dubai	Dubai	Dhs. 16,000.-
166.	Plot No.77 Wihdah Road, Sharjah	M/s,Dhajib Al Saleman Al Hamood, C/o. Consulate General of Kuwait, Dubai	Sharjah	Dhs. 15,454.-
167.	Plot No.432, 433 & 437 Sharjah Industrial Area & Plot No.77 on Wihdah Road.	Dhajib Al Saleman Al Hamood, Kefan, Kuwait.	Sharjah	Dhs. 17,650.-
158.	Plot No.3, Al Wihdah Road	Middle East Designers & Consultants, Sharjah.	Sharjah	Dhs. 11,000.-
169.	Proposed Commercial Center at Ras-Al-Khaima.	Contracting & Engineering Enterprises, Ras-Al-Khaima	Ras-Al-Khaima	Dhs. 30,360.-
170.	Drilling at Dubai Sharjah Road near Police Head Qtrs.	Cesco (Middle East) Ltd. Dubai	Dubai-Sharjah Road.	Dhs. 7,500.-
171.	Plot B/40 & B/31 on Dubai Sharjah Road.	Pacific Consultants Int. Dubai	Dubai-Sharjah Road.	Dhs. 10,490.-

S.No.	Site	Client	Location	Value of Work
172.	Proposed Multistoreyed Apartment Bldg. Cordoba & Granada Borj Avenue, Phase II.	H.H. Sheikh Sultan Bin Mohd. Al-Qasimi, Ruler of Sharjah. Typsa, Sharjah.	Sharjah	Dhs. 175,000.--
173.	Proposed Bldg. near Hotel Intercontinental Sharjah	DAFCO, Sharjah	Sharjah	Dhs. 21,195.--
174.	Proposed Marble Factory, Sharjah.	Marblo, Sharjah	Sharjah	Dhs. 6,000.--
175.	Proposed Bldg. for H.E. Sheikh Saeed Khalid Al-Qasimi, Abu Dhabi	Khatib & Alami	Abu Dhabi	Dhs. 12,010.--
176.	Proposed Bldg. for H.E. Sultan Bin Suroor at Sharjah.	Al-Montasser Contracting & Trading, Sharjah.	Sharjah	Dhs. 38,000.--
177.	Proposed Mosque at Jumairah, Dubai.	Al-Mulla Contracting Co., Dubai	Dubai	Dhs. 6,000.--
178.	Proposed Bldg. on Plot No. 906 and 907 - New Industrial Area, Sharjah.	Suidan & Associates, Sharjah.	Sharjah	Dhs. 9,000.--
179.	Project No.609, Sharjah	Ahli Alan Scott International, Dubai	Sharjah	Dhs. 9,500.--
180.	Plot No.121 New Industrial Area at Sharjah.	Suidan & Associates, Sharjah	Sharjah	Dhs. 9,000.--
181.	Project No.608 Near Khan Roundabout, Sharjah.	Ahli Alan Scott International, Dubai	Sharjah	Dhs. 10,000.--

S.No.	Site	Client	Location	Value of Work
182.	Core Drilling Sharjah Cement Works Jabel Fayyah & Clay at Daid.	Apccm Engineering Ltd. C/o. Marins Cement Ltd., Dubai	Jabel Fayyah Daid.	Dhs. 67,857.-
183.	Site B-63 Al-Maktoum Str., Dubai	Al-Futtaim Construction Co., Dubai	Dubai	Dhs. 38,600.-
184.	Proposed Borsely Hotel	UNCO, Ras-Al-Khaima	Ras-Al-Khaima	Dhs. 22,523.-
185.	Dubai Steam Power Station near Jabel Ali, Dubai	Shimuzu Construction Co., Dubai	Dubai	Dhs. 159,506.-
186.	Al-Naboodah Bldg. & Work- shop, Dubai-Sharjah Road.	Al-Naboodah Contrg. Co., Dubai	Dubai-Sharjah Road.	Dhs. 17,000.-
187.	Multistoreyed Bldg. Project in Sharjah.	Typsa, Sharjah	Sharjah	Dhs. 20,212.-
188.	Proposed Building for Mr. Rashid Al Maftool - Ras-Al-Khaima	ECCO, Ras-Al-Khaima	Ras-Al-Khaima	Dhs. 9,000.-
189.	Beach Hotel at Zubarah, near Khor Fakkan.	Gulf General Project Co. Sharjah	Khor Fakkan	Dhs. 35,548.-
190.	Proposed Building near Intercontinental Hotel, Sharjah.	DAFCO, Sharjah	Sharjah	Dhs. 11,200.-
191.	Proposed Caterpillar Work- shop, New Industrial Area, Sharjah.	Ferm-O-Person, Sharjah	Sharjah	Dhs. 16,500.-
192.	Plot No.401 Al-Mngaz, Sharjah-Dubai Road.	United Engineering Con- struction Co., Sharjah.	Sharjah	Dhs. 12,000.-

S.No.	Site	Client	Location	Value of Work
193.	Dubai Sea Corniche Complex, Dubai	Abdul Wahab Ebrahim Galadari, Dubai	Dubai	Dhs. 61,323.-
194.	Proposed Multistoreyed Bldg., Opp. Sheba Hotel, Sharjah	Dakhil Abdul Aziz Al-Usaimi Dubai.	Sharjah	Dhs. 15,660.-
195.	Proposed Caterpillar Factory, Abu Dhabi	Fer-o-Persson, Sharjah	Abu Dhabi	Dhs. 17,200.-
196.	Ras-Al-Khaima Water Supply, R.A.K.	Govt. of R.A.K. Electric & Water Adm. C/o.Dar-Al-Handasah.	Ras-Al-Khaima	Dhs. 32,906.-
197.	Proposed Site B-62 Al-Maktoum Str., Dubai	Gulfbeton (Pvt) Ltd. Dubai	Dubai	Dhs. 9,700.-
198.	Proposed Site No.B-63 Al Maktoum Street, Dubai	Al Futtaim Construction, Dubai	Dubai	Dhs. 13,300.-
199.	Plot No.30 Al-Muragabat, Deira-Dubai	Group Design Gulf, Dubai	Dubai	Dhs. 10,000.-
200.	Plot No.210 Al-Buteen, Sharjah	Arif & Bintook, Deira-Dubai	Sharjah	Dhs. 10,972.-
201.	Proposed Alawi Centre, Al-Wahdah Road, Sharjah	Al Nasser Contracting Co. Dubai	Sharjah	Dhs. 19,680.-
202.	Plot No.474 & 471, Al-Nabbah Area, Sharjah	Gulf Consulting Bureau, Sharjah	Sharjah	Dhs. 12,500.-
203.	Proposed Multistoreyed Bldg. for Sheikh Abdul Aziz at Ras-Al-Khaima	EMCON, Ras-Al-Khaima	Ras-Al-Khaima	Dhs. 17,270.-

S.No.	Site	Client	Location	Value of Work
204.	Proposed Multistoreyed Bldg. for Al-Fardan, Sharjah Lagoon.	Al-Fardan C/o. Arab Engineering Bureau Dubai.	Sharjah	Dhs. 65,734.-
205.	Proposed Building for Mr. Salim Obaid Al-Dhaheria, Ajman.	Rayyan Contracting Co., Abu Dhabi	Ajman	Dhs. 15,000.-
<u>1977</u>				
206.	Deep Boreholes in Sabkha Area, Abu Dhabi	Cesco, Dubai	Abu Dhabi	Dhs. 36,428.-
207.	Site No.IV-near Mafrag Roundabout on Abu Dhabi-Al Ain Road.	Cesco, Dubai	Abu Dhabi	Dhs. 35,883.-
208.	Proposed Bldg. on Plot No.7, Zehra Road, Sharjah.	Ismail Mohammed Zaroon, Sharjah	Sharjah	Dhs. 10,000.-
209.	Proposed Multistoreyed Bldg. on Dubai-Sharjah Road for Mr. Ahmed Zathari, near Khan Roundabout.	Mr. Zathari, Sharjah	Sharjah	Dhs. 9,000.-
210.	Proposed Bldg. for Mr. Abdullah Sultan Al-Sharhan on Zahra Road, Sharjah.	Mr. Ali Shamsi, Sharjah	Sharjah	Dhs. 12,500.-
211.	Mina Jabel Ali, Jabel Ali	Mina Jabel Ali Const. J.V. Dubai	Dubai	Dhs. 16,400.-
212.	Proposed Bldg. on Plot No.I & 2, Al-Buteen, Sharjah.	Mr. Abdullah Saeed Khadim, C/o. Gulf Consulting Bureau, Sharjah	Sharjah	Dhs. 8,500.-

S.No.	Site	Client	Location	Value of Work
213.	Proposed Bldg. for Mr. Hussain Makki Juma Plot No. 177 - Al-Maktoum Street, Deira-Dubai.	Fouad & Nicholas Yagazi, Dubai	Dubai	Dhs. 13,500.-
214.	Plot No.192- Bldg. for Mr. Mohd. Saadi & Hassan Sheikh Abdullah.	Nabil Abdul Baki, Dubai	Sharjah	Dhs. 13,000.-
215.	Proposed Bldg. for Mr. Dukhi & Salehi at Sharjah.	Ibrahim Habib Al-Salehi, C/O.Al-Salehi Contracting Co., Dubai	Sharjah	Dhs. 10,000.-
216.	Plot No.2-4 - Ajman	Hashmi & Associates, Dubai	Ajman	Dhs. 10,200.-
217.	Proposed Building for Talal Abu Ghazali & Co., Sharjah,	Talal Abu Ghazaleh & Co., Public Accountants, Sharjah	Sharjah	Dhs. 15,470.-
218.	Proposed Subway at Round-about No.2, Al-Aroba Road, Sharjah.	Pacific Consultants International, Sharjah.	Sharjah	Dhs. 14,000.-
219.	Proposed Factory at Sharjah for Mr. S. Persson.	F.P.P. International, Sharjah	Sharjah	Dhs. 28,090.-
220.	Diamond Core Drilling in Reinforced Concrete Piece at Sharjah.	Price International, Sharjah	Sharjah	Dhs. 5,760.-
221.	Steam Power Station, Jabel Ali, Dubai	Shimuzu Const. Co., Dubai	Dubai	Dhs. 12,200.-
222.	Proposed Site of Food Grain Silos at Port Khalid Area, Sharjah	Pacific Consultants Int. Sharjah.	Sharjah	Dhs. 13,850.-

S.No.	Site	Client	Location	Value of Work
223.	Plot No.17 Regga West Near Nasr Square, Deira-Dubai	Ghobash Humaid Bin Saqr Bin Ghobash, Dubai	Deira-Dubai	Dhs. 13,500.--
224.	Proposed Multistorcyed Bldg. for Mr. Saeed Bin Sultan Al-Darmaki behind Ajman Cinema.	United Engineering Con. Co. Sharjah	Ajman	Dhs. 15,000.--
225.	Plot No.511 Magaz Apartment Bldg. for Mr. Abdullah Al-Mazroui at Sharjah.	Montasser General Con. Co. Sharjah	Sharjah	Dhs. 31,000.--
226.	Proposed Guest House for H.H. Sheikh Mohd. Bin Rashid Al-Maktoum at Zabecl.	Al-Naboodah Const. Co., Dubai	Dubai	Dhs. 21,000.--
227.	Proposed Jabel Ali Penta Hotel, Jabel Ali, Dubai	Gulf Penta Private Ltd. C/o. Dubai Transport Co., Dubai	Jabel Ali Dubai	Dhs. 30,746.--
228.	Plot No.398 at Magaz, Sharjah	Mr. Ahmed Abdullah Al-Mossallah.	Sharjah	Dhs. 9,000.--
229.	Proposed Mosque at Zahra Road, Sharjah.	Al-Batha Contracting Co., Abu Dhabi	Sharjah	Dhs. 8,500.--
230.	Proposed Bldg. on Plot No. 785, for Mr. A. Rustamani at Fujairah.	Arif & Bintook, Dubai	Fujairah	Dhs. 9,500.--
231.	Proposed Supermarket at RAK for Mr. Shibanb Al Knat.	Unes Engineering Dept. Sharjah	Ras-Al-Khaima	Dhs. 10,000.--
232.	Retaining Wall, Jabel Ali	Mina Jabel Ali Con. J.V. Dubai	Jabel Ali	Dhs. 9,000.--

S.No.	Site	Client	Location	Value of Work
233.	Multistoreyed Bldg. for Khalid Ahmed Bin Khalid on Al-Khan Road, Sharjah	Bahman Consulting Architects, Sharjah	Sharjah	Dhs. 12,000.-
234.	Proposed High Tower Bldg. at Sharjah Lagoon for Mr. Yousuf Habibal Yousuf.	Arab Engineering Bureau, Sharjah.	Sharjah	Dhs. 67,000.-
235.	Dhow Harbour Mina Zayed	P.W.D. Emirates of Abu Dhabi, Abu Dhabi Consultants, Sir Alexander Gibb & Partners.	Abu Dhabi	Dhs. 137,000.-
236.	New Anqaf Apartment, Abu Dhabi	Al-Masood Engineering, Abu Dhabi	Abu Dhabi	Dhs. 20,000.-
237.	Proposed Marble Factory at Sharjah	Marblo Group, Sharjah	Sharjah	Dhs. 20,000.-
238.	Proposed Bldg. for Mr. Hassen Jamal at Ras-Al-Khaima.	Rahman Builders, Ras-al-Khaima	Ras-Al-Khaima	Dhs. 7,500.-
239.	Staff Quarters for Al-Futtaim.	T. Hiriyama, Dubai	Dubai	Dhs. 2,890.-
240.	Cement Factory, Ajman, Masfut	Gulf Investment & Real Estate, Ajman.	Ajman	Dhs. 135,000.-
241.	Industrial Area No.13, Plot No.575, Sharjah	Samer Group, Safat, Kuwait	Sharjah	Dhs. 35,000.-
242.	Proposed Zabil Secondary High School	Al-Jassmy Contrg. & Trdg. Dubai	Dubai	Dhs. 13,860.-
243.	Sharjah Creek Tunnel	Archosi, Sharjah	Sharjah	Dhs. 20,000.-

S.No.	Site	Client	Location	Value of Work
244.	Al-Maktoum Development, B-62	Gulfbeton/Sir William Halcrow, Dubai	Dubai	Dhs. 47,000.-
245.	Proposed Cement Silos, Ajman.	Arabian Construction Co.	Ajman	Dhs. 31,500.-
246.	Ajman Port Development	Lilley International, Ajman.	Ajman	Dhs. 6,500.-
247.	Hamid Al Huraidz Proposed Multistoreyed Bldg. at Dubai	Group Design Gulf	Dubai	Dhs. 12,000.-
248.	Holiday Inn, Abu Dhabi	Swissboring - Piling Work	Abu Dhabi	-.-
249.	Proposed School at R.A.K. on Sheikh Rashid Road.	G.M.C.C. Ras-al-Khaima	Ras-al-Khaima	Dhs. 17,500.-
250.	Mosque in Souk Area, Dubai	Dubai Contrg. Co., Dubai	Dubai	Dhs. 9,500.-
251.	Sharjah Steam Power Station, Phase II.	Studio Geotèchnico Italiano, Milan-Italy.	Sharjah	Dhs. 190,000.-
252.	Proposed Building on Plot No.152, Sharjah	Al-Zarooni General Const. Co., Sharjah	Sharjah	Dhs. 10,000.-
253.	Al-Ghadidar Centre Abu Dhabi	Al Waha Engineering, Abu Dhabi	Abu Dhabi	Dhs. 21,000.-
254.	Mohammed Rashid Abu Kara Building.	SETICO Constr. Co. Abu Dhabi	Abu Dhabi	Dhs. 5,000.-
255.	Proposed Chalet for H.H. Sheikh Butti Bin Maktoum at Zabli.	Al Sahel Contracting & Trading Co., Dubai	Dubai	Dhs. 6,500.-

S.No.	Site	Client	Location	Value of Work
256.	Proposed Building near Trade Centre Dubai-Abu Dhabi Road.	Al Sahel Contracting & Trading Co., Dubai	Dubai	Dhs. 6,500.-
257.	Drilling in the Island Sharjah Lagoon, Sharjah.	Bos-Kalis Westminster Dredging Co., Sharjah.	Sharjah	Dhs. 11,000.-
258.	Proposed Ahmed Mohammed Buglaf Building, Sharjah.	Bin Ladin Organisation, Dubai	Sharjah	Dhs. 12,000.-
259.	Creek Development, Sharjah	Pacific Consultants Int. Sharjah	Sharjah	Dhs. 5,500.-
260.	Fujairah Cement Factory, Fujairah.	Voest-Alpine A.G. Linz, Austria.	Fujairah	Dh.1,066,000.-
261.	Industrial Site Al-Ghilsais, Dubai	Mr. Abdullah Kayed Ahli, Dubai	Dubai	Dhs. 25,000.-
262.	Potential Quarry site for Fujairah Harbour.	Khansaheb Gammons Ltd. Sharjah	Fujairah	Dhs. 38,000.-
263.	Primary School for girls at Hox-Al-Anz, Dubai	Arab Engineering Bureau, Dubai	Dubai	Dhs. 7,000.-
264.	Al Ain Roundabout 21A, Al-Ain.	Europe Etudes Stup Int., Abu Dhabi.	Al-Ain	Dhs. 16,500.-
265.	Overbridge Site 20 Km from Al-Ain on Abu Dhabi Road.	- do -	Al-Ain	Dhs. 15,000.-
266.	Proposed Al-Muhairy Bldg., Abu Dhabi	Arab Building Co., Abu Dhabi	Abu Dhabi	Dhs. 10,000.-
267.	Proposed Social Development Centre, Ajman	Ministry of Public Works & Housing, Dubai	Ajman	Dhs. 6,500.-

S. No.	Site	Client	Location	Value of Work
268.	Proposed Palace Site at Hatta	Pioneer Contractors, Dubai	Hatta	Dhs. 78,000.-
269.	Proposed Primary School for Girls at Hamriya, Dubai	Arab Engineering Bureau, Dubai	Dubai	Dhs. 7,000.-
270.	Proposed Indian School Bldg.	Pheroze Kudianawala Consultants, Abu Dhabi	Abu Dhabi	Dhs. 7,000.-
271.	Proposed Jumairah Bazar	Emirates Consultants & Architects, Dubai	Dubai	Dhs. 27,500.-
272.	Proposed Nizwa Bridge Ibri-Nizwa Road, Oman	Strabag Bau A.G. Muscat	Ibri-Nizwa Muscat	Dhs. 42,000.-
273.	Proposed Health Centre at Malecha, Sharjah	Ministry of Public Works, Dubai	Sharjah	Dhs. 7,890.-
274.	Proposed Health Clinic at Madam, Sharjah.	- do -	Sharjah	Dhs. 7,890.-
275.	Proposed Galadari Bldg. Al-Massafa, Bar Dubai	Mr. W.A. Galadari M/s. Arif & Hintoak, Dubai	Dubai	Dhs. 15,000.-
276.	Creek Development, Sharjah - Proposed bridge locations.	Pacific Consultants Int. Sharjah	Sharjah	Dhs. 37,000.-
277.	Proposed Shariah Court Bldg. Abu Dhabi	Al-Masood Engineering & Contracting, Abu Dhabi	Abu Dhabi	Dhs. 25,000.-
278.	Proposed Layyah Sub-Station, Sharjah.	Sharjah Elec. Supply, Kennedy & Donkin, Sharjah	Sharjah	Dhs. 7,600.-
279.	Proposed D.C.C. Bldg. on Plot No.3, Al-Ghusais, Dubai	Dubai Contracting Co.	Dubai	Dhs. 10,000.-

S.No.	Site	Client	Location	Value of Work
280.	Proposed Deira Car Park, Dubai	Connix Ltd., Sharjah	Dubai	Dhs. 12,500.-
281.	132 KV Sub-Station Broadcasting Substation, Sharjah	Sharjah Elec. Dept. Kennedy & Donkin, Sharjah	Sharjah	Dhs. 7,360.-
282.	Proposed Rest House for H.E. Sheikha Mariam at Aweer, Dubai	Al Saheil Contracting & Trading Co.	Dubai	Dhs. 7,500.-
283.	Proposed Penta Hotel - Pumping Station, Jabel Ali	DUTCO Construction Co.	Jabel Ali	Dhs. 6,000.-
284.	Al-Mossaffa Area, Abu Dhabi	Bos Kalis Westminster M.E. Ltd., Dubai	Abu Dhabi	Dhs. 34,000.-
285.	Proposed Zayed Sports City, Abu Dhabi	Consolidated Contractors International, Abu Dhabi	Abu Dhabi	Dhs. 16,750.-
286.	Proposed DUBAL Project, Jabel Ali, Dubai	M & F Engineering, Dubai	Jabel Ali	Dhs. 12,000.-
287.	Proposed Mosque for Mr. Raees at Deira.	Al Saheil Contracting & Trading Co.	Dubai	Dhs. 7,000.-
288.	Proposed Petrol Pump & Supermarket on plot No.12, Al-Wasl Abu Dhabi/Dubai Rd.	Al-Haieli Trading Co.	Dubai	
289.	Proposed Dubai Tower Bldg., Deira-Dubai.	Arab Bank for Investment & Foreign Trade/Butech Engineering.	Dubai	Dhs. 25,000.-
290.	Proposed School at Al- Ghusais, Dubai	Arab Engineering Bureau, Dubai.	Dubai	Dhs. 7,000.-

S.No.	Site	Client	Location	Value of Work
291.	Proposed Overbridge at Al-Ain.	Europe Etudes Stup Int., Abu Dhabi	Al-Ain	Dhs. 6,500.-
292.	Proposed Water Reservoir at Al-Halwan, Sharjah.	G. I. E., Sharjah	Sharjah	Dhs. 15,800.-
<u>1979</u>				
293.	Bridge Site at Al-Ain	Strabag A.G.	Al-Ain	Dhs. 8,000.-
294.	School for Boys at Karama	Arab Engineering Bureau	Dubai	Dhs. 7,000.-
295.	Police Directorate Bldg. at Fujairah	Mass Engineering & Con. Co.	Fujairah	Dhs. 7,500.-
296.	Proposed Matam Hall and Mosque at Dubai	Dubai National Con. Co.	Dubai	Dhs. 7,250.-
297.	Proposed DCC Bldg. on Plot No.142, Regga East.	Dubai Contracting Co.	Dubai	Dhs. 18,600.-
298.	Police Officers Club, Abu Dhabi	Al Masood Engineering & Contracting Co.	Abu Dhabi	Dhs. 13,500.-
299.	DUBAL - Jabel Ali Foundation Block Core Drilling	DUBAL - Jabel Ali	Jabel Ali	Dhs. 5,500.-
300.	Police Training School at Sharjah.	Dept. of Public Works/ Alistair Mccowan & Asstes.	Sharjah	Dhs. 49,300.-
301.	Abu Dhabi Feed Mill Plant, Mina Zayed	Y.I.T. Abu Dhabi	Mina Zayed Abu Dhabi	Dhs. 12,500.-
302.	Masfut Power Station	Mitsubishi Corp., Dubai	Masfut	Dhs. 8,000.-

S.No.	Site	Client	Location	Value of Work
303.	Proposed Building in Defence Area.	COGECO, Abu Dhabi	Abu Dhabi	Dhs. 12,700.--
304.	Bridge No.3, Al-Ain	Strabag Bau AG, Al Ain	Al-Ain	Dhs. 13,500.--
305.	Artificial Lake at Ain Al Fidha, Al Ain.	RASCO, Abu Dhabi	Al-Ain	Dhs. 9,800.--
306.	Commercial cum Residential Building for Mr. Sharafi,	Arif & Bintoak	Dubai	Dhs. 7,500.--
307.	Proposed 18 storey Bldg. for Arab Monetary Fund at Abu Dhabi.	Arab Monetary Fund	Abu Dhabi	Dhs. 15,000.--
308.	Abdullah Saleh Al Darmakki Building, Plot No,83, Al Ain	Al-Nayli Trading & Constr. Co., Al Ain	Al Ain	Dhs. 9,000.--
309.	Building on plot at Al Ain	Emirates Transport & Gen. Contrg. Co., Al-Ain.	Al Ain	Dhs. 7,000.--
310.	Emirates University, Al Ain	ARENCO, Abu Dhabi	Al Ain	Dhs. 38,500.--
311.	Abu Dhabi Petroleum Co. Bldg. Abu Dhabi	ADPO/R.J. Crocker & Partners, Abu Dhabi	Abu Dhabi	Dhs. 8,500.--
312.	Jordanian Embassy Complex in Abu Dhabi	Jaffar Tukan & Partners, Abu Dhabi/Dubai	Abu Dhabi	Dhs. 20,000.--
313.	Drilling of Sumpwell Al-Garhoud	Al-Futtaim Real Estate	Dubai	Dhs. 17,000.--
314.	Al Ain Main Drainage at Zakher Village	Consolidated Contractors Int. Co. Ltd., Abu Dhabi	Al Ain	Dhs. 16,000.--

Sr. No.	Site	Client	Location	Value of Work Dhs.
315.	Drilling to locate depth of bedrock at Al-Ain Town Area.	Consolidated Contractors Int. Co. Ltd. Al-Ain/ Abu Dhabi	Al-Ain	14,000.--
316.	Villa for Sheikh Mohammed Bin Haider Al-Maktoum	Dubai National Constr. Co.	Dubai	9,000.--
317.	Drilling for collection of undisturbed sample at Sport City. Abu Dhabi	Consolidated Contractors Int. Co. Ltd. Abu Dhabi	Abu Dhabi	10,000.--
318.	Soil Investigation Flyover IP 11A, Al-Ain City.	Al Waha Engineering. Abu Dhabi	Al-Ain	78,220.--
319.	Students Hostel at Emirates University. Al-Ain	Saeed & Sultan Lootah. Dubai	Al-Ain	17,500.--
320.	T.V. Theatre. Abu Dhabi	Square General Contr. Abu Dhabi	Abu Dhabi	13,500.--
321.	Fujairah Cement Plant Proj. Exploratory core drilling for raw materials	Voest Alpine AG. Linz. Austria.	Dibba	1,600,000.--
322.	Umm-Al-Nar West. Power Station Extension. Abu Dhabi	Consolidated Contractors Int. Co. Ltd. Abu Dhabi	Umm-Al-Nar Abu Dhabi	158,000.--

Job No.	Project	Client	Location	Value of Work
323.	Primary School for Girls at Al-Hamriya. Abu Hail.	Arab Engineering Bureau. Dubai	Dubai	6,000.-
324.	Secondary School for Girls at Al-Hamriya. Abu Hail.	-do-	-do-	6,000.-
325.	Lighting Towers at Rams. Ras-Al-Khaima.	Gulf Reinforced Concrete Co. Ras-Al-Khaima.	Ras-Al-Khaima	18,900.-
326.	Building for Ali Bil Khasma Al Katby at Al Ain.	CINACO. Al-Ain	Al-Ain	8,000.-
327.	Building at Al-Ain	-do-	-do-	8,000.-
328.	Building at Al-Ain	-do-	-do-	8,000.-
329.	Proposed Water Tank in Ajman Power House.	Galadari Engineering Dubai	Ajman	7,500.-
330.	Proposed Water Tank in Umm-Al-Qaiwan	-do-	Umm-Al-Qaiwan	7,500.-
331.	P.W.D. Building. Ministry of Public Work. Abu Dhabi.	Rashid Al-Dousery Co. Abu Dhabi	Abu Dhabi	

Job No.	Project	Client	Location	Value of Work
331.	Pakistan/Islamia Educational & Cultural School, Dubai.	Pakistan Educational Board, Dubai.	Dubai	Free
332.	Fujairah Cement Project, Plantsite, Dibba.	Voest Alpine Austria	Fujairah	
333.	Exploration drilling for raw materials, Ras-Al-Khaima.	Gulf Cement Co. Ras-Al-Khaima.	Ras-Al-Khaima	556,140.-
334.	Wadi Bih Wadi Ham Dam, Fujairah.	Electrowatt, Dubai	Fujairah	180,000.-
335.	Microwave Towers, Ruwais (Jabel Dhanna) 10 Sites.	Square General Cont. Abu Dhabi.	Ruwais (Jabel Dhanna)	175,000.-
337.	Abu Dhabi Sewerage Project Contract 155/1	Abu Dhabi Sewerage Authority	Maftaq (Baniyas 2 Wathba Area)	846,000.-

List of firms working with

RODIO PROCESSES

(ING. G. RODIO & C., S. p. A.
Strada Pandina
CASALMAIOCCO (Milano), Italia
Mailing Address:
Casella postale 7
20077 Melegnano (Mi), Italia
Tel. 980 991, 981 691
Cables Telex 33095 Rodio Milano
Telex 33095 Rodio MI
Established 1921

CIMENTACIONES ESPECIALES S.A.
«Procedimientos Rodio»
Avenida Generalísimo, 20
MADRID 16, España
Tel. 2 62 46 10
Cables Procerodio
Telex 22604 Rodio E
Established 1929

SONDAGENS RODIO, LDA.
Rua de S. Bento, 644-3°
LISBOA 2, Portugal
Tel. 68 80 96
Cables Sofansol
Established 1935
Telex 6443 Rodio P

SWISSBORING AG
Theaterstrasse 20
Postfach 329
8022 ZÜRICH, Schweiz
Tel. 47 14 41
Cables Swissboring
Telex 54668 Rodio CH
Established 1937

A/S GRUNNBORING
Pilestredet 17
OSLO 1, Norge
Tel. 20 13 44, 33 23 48
Cables Grunnboring
Established 1943

INSOND Ges.m.b.H.
Gloriettegasse 8
1130 WIEN, Österreich
Tel. 8235 88
Cables Insond
Telex 12804

INSOND Ges.m.b.H.
Elisabethkai 58
5020 SALZBURG, Österreich
Mailing Address:
Postfach 295
5021 Salzburg
Tel. 71 3 71, 75 1 55
Cables Insond
Telex 06-3584
Established 1950

EUROSOND GmbH
Mathildenstrasse 12
8 MÜNCHEN 15
Mailing Address:
Postfach 200804
8 München 2
Tel. 53 96 45
Cables Eurosond
Telex 05-24879 Euros D
Established 1959

RODIO (SOUTH AFRICA) (PTY) LTD.
20, De Korte Street, Braamfontein
P.O. Box 31101 BRAAMFONTEIN
JOHANNESBURG,
Republic of South Africa
Tel. 724-8317
Cables Rodfound
Telex 43-8387
Established 1956

RODIO ARGENTINA S.A.
Av. Córdoba 1367, 7° P.
BUENOS AIRES, Argentina
Tel. 41 6084, 42 2759
Cables Ingrodio
Established 1953

RODIO S.A.
Rua Bambina, 17, Botafogo
Caixa Postal 1715 ZC-00
20000 RIO DE JANEIRO-ZC-02, Brasil
Tel. 46 7676, 46 7636, 46 7979
Cables Cimenrodio
Established 1956

RODIO FOUNDATION ENGINEERING LTD.
Theaterstrasse 20
Postfach 329
8022 ZÜRICH, Schweiz
Tel. 32 87 14/15
Cables Rodrotoc
Telex 54668 Rodio CH
Established 1959

RODIO FOUNDATION ENGINEERING LTD.
254-D, Dr. Annie Besant Road
Band Box House
BOMBAY 25 DD, India
Tel. 45 33 51/52/53
Cables Rodiotoc
Telex 011-3363
Established 1959

SWISSBORING OVERSEAS CORP. LTD.
Theaterstrasse 20
Postfach 329
8022 ZÜRICH, Schweiz
Tel. 32 87 14/15
Cables Swiboco
Telex 54668 Rodio CH
Established 1952

Branch Offices:

SWISSBORING OVERSEAS CORP. LTD.
P.O. Box 980
DUBAI, U.A.E.
Tel. 32 817
Cables Swiboco

SWISSBORING OVERSEAS CORP. LTD.
2a Calle P. no. 3-7, Santa Tecla
Apartado Postal 916
SAN SALVADOR, El Salvador, C.A.
Tel. 28-0842
Cables Swissboring
Established 1959

SWISSBORING OVERSEAS CORP. LTD.
3a. Calle 6-42, Zona 9, Local 4
Apartado postal 2435
GUATEMALA, Guatemala, C.A.
Tel. 63 980
Cables Swissboring
Established 1968

RODIO PROCESSES are also utilized in France by

SOLETANCHE ENTREPRISE SA

7, rue de Logelbach

Boite postale 309

75322 PARIS Cedex 17

Tel. 227 6573

Cables Soletancho

Telex 65654

QUALIFICATIONS

R.S.I. Co., LTD

(Ricoh Soil Investigation Co., LTD)

TOKYO , JAPAN

RSI CO., LTD.

1. GENERAL

* Name of Company

RICOH SOIL INVESTIGATION CO., LTD. (Abbreviation
R.S.I.C., Ltd.)

* President

Fumiaki ICHINO

* Tokyo Office

No. 303, 2-17-5 Nagatacho, Chiyoda-ku, Tokyo, Japan.
Tel: 03-593-0627
Telex: RSICOLTD J28106

* Kuwait Office

P.O.Box 20887, Safat, Kuwait.
Tel: 314935
Telex: 2138 RAKAN KT.

* Type of Organisation

Corporation

* Date of Establishment

September, 1977

* Financial Status

Capital: Japanese Yen 40,000,000
Kuwait Dinar 70,000

RSI CO., LTD.

* Bank reference

Bank of Tokyo
Mitsubishi Bank
Commercial Bank of Kuwait

RSI CO., LTD.

2. PRINCIPAL TYPE OF BUSINESS

- * General Soil Investigation
- * Laboratory Soil Test
- * Geophysical Prospecting
- * Geological Survey
- * Environmental Research
- * Oceanographic Survey
- * Waterwell Drilling
- * In-situ Borehole Piles
- * Dewatering System
- * Geotechnical Consulting Services
- * Hydrogeological Study
- * Geodetic Survey

RSI CO., LTD.

3. ASSOCIATED COMPANY

- * Ricoh Geological Engineering Co., Ltd.,
2-12-9, Misakicho Chiyodaku,
Tokyo, Japan.
Phone: Tokyo 264-6218

- * Central Engineering Co., Ltd., (Soil Engineering)
3-18-31, Minami-ikebukuro Toshimaku,
Tokyo, Japan.
Phone: Tokyo 988-7328

- * Ricoh Environmental Geology Consultants Co., Ltd.,
1-1-9, Shimura Itabashiku,
Tokyo, Japan.
Phone: 965-4240

- * Engineering Geology Co., Ltd.,
2-11-9, Yotsuya Shinjukuku,
Tokyo, Japan.

RSI CO., LTD.

4. COMPANY OWNED EQUIPMENTS AND INSTRUMENTS

1. BORING MACHINES

KR-100 Catapillar Mounted	3 Units
KR-100 Trailer Mounted	2 Units
KX-1A Skid Mounted	1 Unit
KX-2A Skid Mounted	1 Unit
Furukawa Rock Drill	1 Unit
Ingasoll Rock Drill	1 Unit
OR-100 Skid Mounted	1 Unit
OP-1 Truck Mounted	2 Units

2. BORING AND GROUTING PUMP

MG-25 Koken 300L/M, 25 kg/cm ²	1 Unit
BG-20 Toho 300L/M, 22 kg/cm ²	1 Unit
V-7 Kano 80L/M, 15 kg/cm ²	6 Units
BN-2-60 Tone, 60L/M, 40 kg/cm ²	1 Unit
MG-5 Koken, 60L/M, 15 kg/cm ²	2 Units

3. GEOPHYSICAL EQUIPMENT

Seismographic Apparatus 24 Channel	1 Unit
Seismographic Apparatus 10 Channel	1 Unit
Electric Resistivity Sounding	1 Unit
Corrosion Sounding	1 Unit
Magnetic Sounding	1 Unit
Pipe Locator	1 Unit

RSI CO., LTD.

4. IN-SITU TEST

Plate Load testing Apparatus	2 Units
Pile Load testing Apparatus	1 Unit
Lateral Load Testing Apparatus	1 Unit
Dutch Cone (10 tons)	1 Unit
Borehole Logging Apparatus	1 Unit

5. LABORATORY SOIL TEST

1 Set

Triaxial Compression Test
Consolidation Test
Unconfined Compression Test
CBR Test
Physical Test
Chemical Test

6. SURVEY

Echo Sounder	1 Unit
Theodrite	3 Sets
Levell	3 Sets
Electronic Distance Meter	1 Unit

RSI CO., LTD.

5. MAIN REFERENCES IN THE GULF AREA FOR 1977 - 1980

'76 Nov. - '77 March: IRAQ, Baghdad. Baghdad International Airport Project.
Pacific Consultants International,
Ministry of Communication.

Boring and SPT, CBR Test, Soil and
Material Test.

'77 March- Sept: Kuwait, Ras Al-Julayah. Naval Base
Project.
TOA Harbour Works, Ministry of
Defence.

Offshore and onshore boring, SPT.
Variant Sampling and Tests in
borehole, soil test, and material
test.

Aug - Sept: Kuwait, Shuweikh. New Cement Silo
Project. Kuwait Cement Company.

Offshore and onshore boring, SPT
Plate load test, Soil test.

Nov - Dec: Kuwait, Kuwait City.
United Fishery of Kuwait

Boring and SPT, Plate Load Test,
Soil Laboratory Test

RSI CO., LTD.

'78 Jan-Feb Kuwait, Shuiba Industrial Area.
Petrochemical Industry Co. (N-700 Project)

Offshore and onshore Boring, SPT, Soil
Laboratory Test.

April-August Iran, Japan Petrochemical Co. (TOA
Harbour Works). Iran, Abadan.

Offshore and onshore Boring, SPT, and
other tests in boreholes, Laboratory
test.

July- Nov. Kuwait, Extension of sixth Ring Road and
Assafar Motorway Project.
Freeman Fox Consultants, Ministry of
Public Works.

Boring and SPT, Plate Load Test, CBR
Test and Soil Laboratory Test.

Sept- March Kuwait, Extension of sixth Ring Motorway
and Fahaheel Motorway.
W.S. Atkins Overseas Consultants, Ministry
of Public Works

Boring and SPT, Laboratory Soil Test.

RSI CO., LTD.

- Oct-Dec. Saudi Arabia, Al-Khobal. N.P.C. Project,
Taisei Corporation, National Pipe Company.
- Boring and SPT, Permeability test, Plate
Load Test, Seismic Survey, Land Survey,
Laboratory Soil Test.
- Nov-March '79 North Yemen, Sanaa. New Sheraton Hotel
Project. S.A.E. Consultants.
Kuwait Real Estate Investment Consortium.
- Boring and SPT., Field Permeability Test,
Plate Load Test, Laboratory Soil Test.
- '79 May Jordan, Zarka. Hussein Thermal Power Station
Kulujan Consultants, C.Itoh Company,
Ministry of Electricity and Water,
- Geological Survey and establishing of
grouting work. Study of improvement of
foundation.
- '79 July Kuwait, Shuweikh Power Station, Soil
Investigation of New Shuweikh Power
Station.
Ministry of Electricity and Water,
Hydrosoil B.V.
- Boring, SPT, Land survey, dewatering well.

RSI CO., LTD.

- '79 July Kuwait, Kuwait City. Kuwait Flyover
Project. Kawada Inc. Ministry of
Public Works.

In-situ large bore hole piles.
- '79 Oct. Saudi Arabia, Al-Jubail. Al-Jubail 2,
Power and Desalination Plant. Saline
Water Conversion Corp. Kingdom of
Saudi Arabia.
Mitsubishi Corporation.

Boring and SPT, In-situ test,
Laboratory Soil Test.
- '79 Nov. Kuwait, Mina-Saud. New Jetty and office
building.
Getty Oil Company.

Offshore and onshore boring, SPT,
Laboratory Soil Test.
- '80 Jan. North Yemen, Amran. Amran Cement Plant
Project. Ministry of Planning, IHI Co.,

Geological survey, Boring, Land survey,
Laboratory Soil Test.

RSI CO., LTD.

- '80 March Kuwait, Mina-Ahmadi - Doha.
Liquid Fuel Supply to North Kuwait.
Power Station from Mina Ahmadi.
K.O.C. , J.G.C. Corporation.
- Boring, Laboratory Soil Test,
Electric resistivity sounding.
- '80 April Kuwait, MEW. Desalination Plant at
Doha West Power Station.
MEW, Ansaldo Meccanico N clear (AMN)
- Boring, Laboratory Soil Test, Plate
Bearing Test, Electric Resistivity
Sounding, Land Survey.
- '80 May North Yemen, Sheraton Hotel Project at
Hodeidah, Yemen.
Kuwait Real Estate Investment Consortium.
- Boring, Laboratory Soil Test, In-situ
test, Marine Survey.

RSI CO., LTD.

6. MAIN STAFF (ENGINEERS)

A) GEOTECHNICAL DIVISION

<u>Engineers</u>	<u>Graduation</u>	<u>Experience(Yrs)</u>	<u>QUALIFIC.</u>
KEIJI OTA	TOKYO University	35	Applied geology
KEITARO YASUDA	TOHOKU "	34	"
TANIO HONDA	TOKYO "	30	"
ROKUE SAITO	TOHOKU "	12	"
FUMIAKI ICHINO	NIIAGATA "	10	"
HIROMICHI SOMUKAWA	SHINSHU "	10	"
MASAYUKI SHIBA	TOKAI "	7	"

B) SOIL DIVISION

ZENJI ENDO	NIHON LAND Conservative College	23	Soil Eng.
IWAO UCHIUHI	CHUO University	20	"
ISAO NAGAMINE	NIHON University	17	"
MITUO KAWANISHI	"	17	"
YOSHIO SONE	Institute of Shibura Technology	10	"
RYUJI HAMADA	NIHON University	9	"

RSI CO., LTD.

SOIL DIVISION (cont.)

TOSHIYUKI HISAMOTO MEISEI University 9 Soil Eng.

C) ENVIRONMENTAL GEOLOGY DIVISION

<u>Engineer</u>	<u>Graduation</u>	<u>Exper. (Yrs.)</u>	<u>Qualification</u>
TOSHIAKI NAKAMURA	SHINSHU University	15	Hydrogeology
MICHIO SEKINE	"	15	"
YASUHIKO KAMEKAWA	KYUSHU University	13	"
YOSHIRO IZEKI	SHINSHU "	12	Engineering Geology.
MASUMI SAITO	TOKYO MEDICAL University	9	Geochemist

D) FOUNDATION ENGINEERING DIVISION

KIYOTO MOMMA	KEIO University	20	Civil Engineer
TOSHIHIKO KOGO	SHINSHU University	15	"
IKUO FUKUDA	"	15	"
MASAKI OYAMA	NIHON University	14	"

RSI CO., LTD.

E) SITE INVESTIGATION DIVISION

<u>Engineer</u>	<u>Graduation</u>	<u>Exper.(Yrs.)</u>	<u>Qualification</u>
KIYOKAZU DOI	NIHON LAND Conservative College	15	Geotech.Engin.
KAJUO IOKA	MINOWA Technical College	9	Drilling Eng.
PERVEZ NAQVI	PANTNAGAR University India	12	Irrigation Eng.
TAKASHI NAMEKAWA	KOMAZAWA Univers.	8	Drilling Eng.
TAKUMI OTSUBO	GAKUSHUIN University	8	"
NOBUHIKO YAMAMOTO	NIHON University	8	"

F) GEODETTIC DIVISION

SANSHIRO NAKANISHI	OSAKA University	20	Surveyor
YUKICHI NAKANISHI	TAKUSHOKU Univers.	13	"
OSAMU NOGOSHI	NIHON Land Conserv. College	9	"
TERUO OMURA	"	9	"
GENJI KANAMARU	TOKAI University	7	"

RSI CO., LTD.

7. MEMBERSHIP

JAPAN HYDROGRAPHY ASSOCIATION

JAPAN ASSOCIATION OF QUATERNARY RESEARCH

JAPAN SOCIETY OF GEODESY

THE JAPAN SOCIETY OF CIVIL ENGINEERS

GEOLOGICAL SOCIETY OF JAPAN

JAPANESE SOCIETY OF SOIL MECHANICS & FOUNDATION
ENGINEERING.

SOCIETY OF ENGINEERING GEOLOGY OF JAPAN

SOCIETY OF EXPLORATION GEOPHYSICISTS OF JAPAN

JAPAN SOCIETY OF LANDSLIDE

8. RANGE OF SERVICES

A) RECONNAISSANCE AND EVALUATION

To establish general feasibility and obtain preliminary information regarding the foundation, selection of materials, drainage, groundwater and environmental considerations, RSI's engineering geologists determine geological structure, surface soil conditions and general environment characteristics. Feasibility studies are based on the reconnaissance and on resultant site evaluations.

B) SUBSURFACE SOIL EXPLORATION

Knowing the underground geology and determining the site-soil engineering properties are the foundation of construction engineering. Above all, the exploration of sensitive alluvial clay requires

RSI CO., LTD.

SUBSURFACE SOIL EXPLORATION (Cont.)

- 1. advanced boring, sampling and sounding techniques.
- 1. RSI also conducts explorations to determine the dynamic characteristics of the ground.

C) SUBSURFACE ROCK EXPLORATION

For project involving rock mass of dams and tunnels, for example, it is important to analyse and evaluate on an overall basis the information obtained from geophysical prospecting and rock boring, based on detailed engineering geological surveys conducted by engineering geologists. RSI's engineering geology and accumulated knowhow are renowned in this field.

D) ENGINEERING OFFSHORE EXPLORATION

Exploration conducted for such offshore projects as bridge construction, harbour construction, gathering station, etc. involve many technological problems that differ from land explorations. Boring is the only method of obtaining base rock information. RSI therefore offer an overall logging system applicable to the borehole.

E) SOIL TESTING

For the purpose of knowing further detailed soil properties, obtained from undisturbed samples, complete set of laboratory soil testing apparatus are facilitated and conducted by qualified laboratory engineers.

RSI CO., LTD.

F) ROCK TESTING

The rock mechanical behaviour patterns of rock masses with joints , cracks and cleavages can be obtained only by the in-situ rock test. Basic rock evaluation is conducted with the help of laboratory tests, including those for physical properties, unconfined or triaxial compressive strength and others.

G) FOUNDATION ENGINEERING

This category of services includes engineering studies and recommendations regarding the foundation of all types of structures. RSI is conducting studies on the analysis of foundations subjected to horizontal force caused by earthquakes and other factors concentrating in particular on the analysis of the piles bearing the horizontal force.

H) EARTHWORK ENGINEERING

This is a field in which RSI excels in engineering judgement based on a long record of experience and achievement. We also offer services in designing for the cutting and banking of fill-type dams, highway and railways, and for tideland reclamation and land development, as well as in analysing of settlement and stability.

RSI CO., LTD.

I) SOIL STABILISATION

RSI designs and supervises the execution of all types of soil stabilisation, utilising our vast accumulation of achievements in this field to supply appropriate engineering determinations.

J) EXCAVATION, SHORING AND DEWATERING

In dealing with poor-quality ground, excavation, shoring and dewatering are of vital importance relative to warranting the safety of the operations. RSI's advanced ground exploration technology produces analyses which offer excellent guidance for excavating in poor ground.

K) CONSTRUCTION INSPECTION AND ENGINEERING SUPERVISION

RSI offers field inspection and engineering supervision services for all types of foundations, earthworks, excavations and soil or slope stabilisations. We offer supervision services with not only the necessary field and laboratory testing but also instrumentation for detection measurement and monitoring of the earth's movements.

L) LANDSLIDE CONTROL

Using exhaustive geological and geotechnical surveys and instrumentations, RSI is analysing the stability of slopes and designing preventative and remedial measures to deal with landslides. We are forecasting the failure time for dangerous landslides.

RSI CO., LTD.

M) GROUNDWATER AND SEEPAGE

RSI's achievement in the study of underground water deal with the forecasting and pursuing of changes over wide areas of the underground water level caused by river improvement, dam construction, tunnel construction and lake water utilisation; the analysis of areal ground subsidence caused by the pumping up of underground water; and evaluation of utilizable groundwater resources.

N) EARTHQUAKE ENGINEERING

Since earthquakes occur so frequently in Japan, earthquake engineering has intensified and broadened in this country with some outstanding results. RSI's services in this field range from dynamic soil investigation to daynamic anlalysis of structures or of the ground under anticipated earthquake conditions.

O) NATURAL DISASTER ENGINEERING

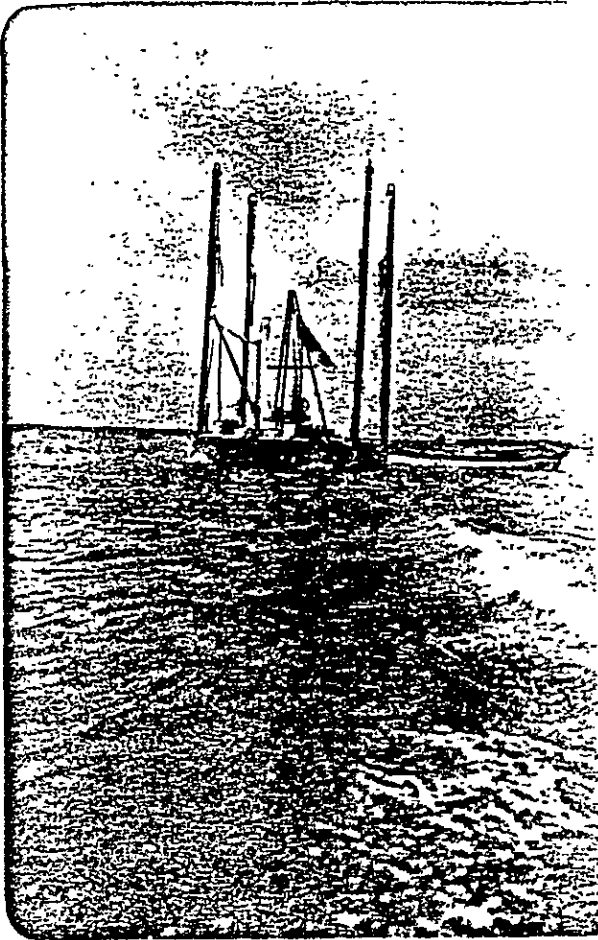
RSI's extensive services include slope collapse due to torrential rainfalls, soil washout on developed land, flood protection of embankments, planning and designing flood-retarding reservoirs and roads and railways in cold and mountainous districts with special attention to snow and ice engineering, and preventive and remedial studies on beach erosion caused by waves.

RSI CO., LTD.

P) ENVIRONMENTAL ENGINEERING

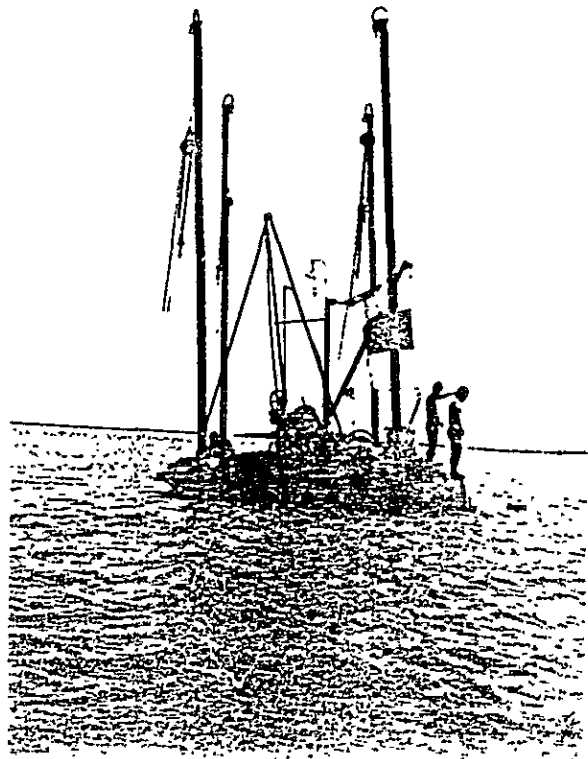
We collect long-range data on underground water, vibration, noise, and countermeasures and study the ground subsidence, contamination of underground water, and germination of oxygenless gas in certain soil layers. For assignments in this field, RSI's service include forecasting of environmental changes, studies of plans suitable for the environment, and recommendations.

Barge being mobilized to next location.

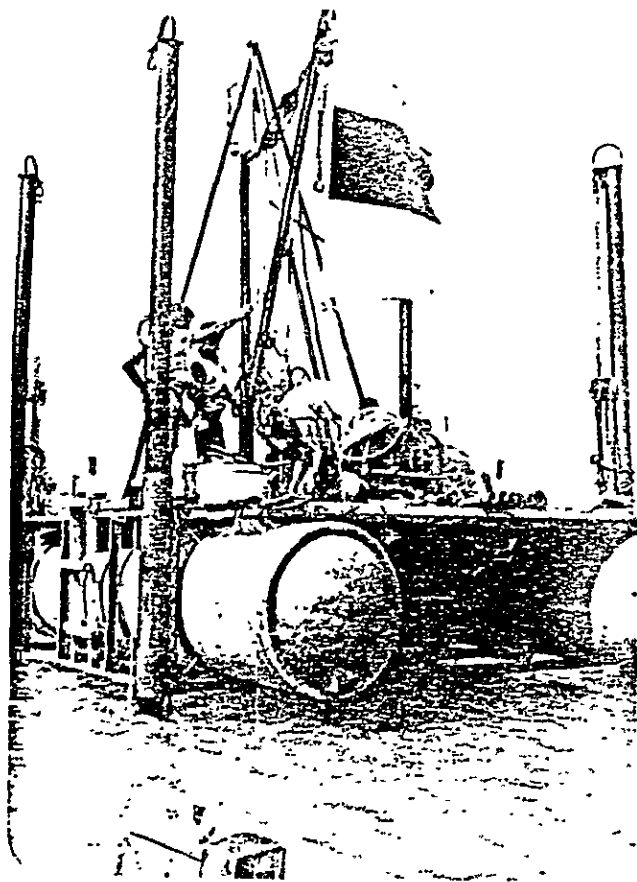


Jack-up Barge at Anchor.

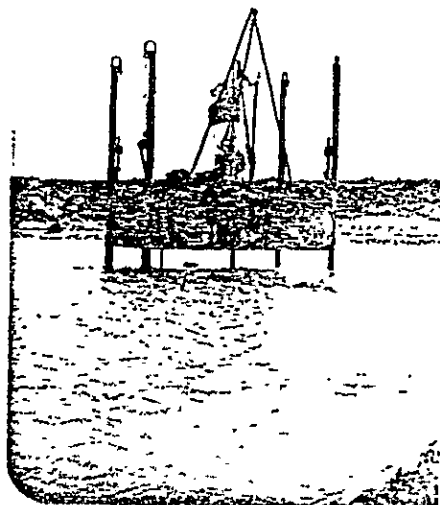
* Our mobile Jack-up Barge is self powered has a total weight including drilling equipments of 6 tons which can necessary after Jacking up, to provide reaction to the Dutch cone penetrometer apparratus. If is totaly dismentable & can be mobilized anywhere by truck.



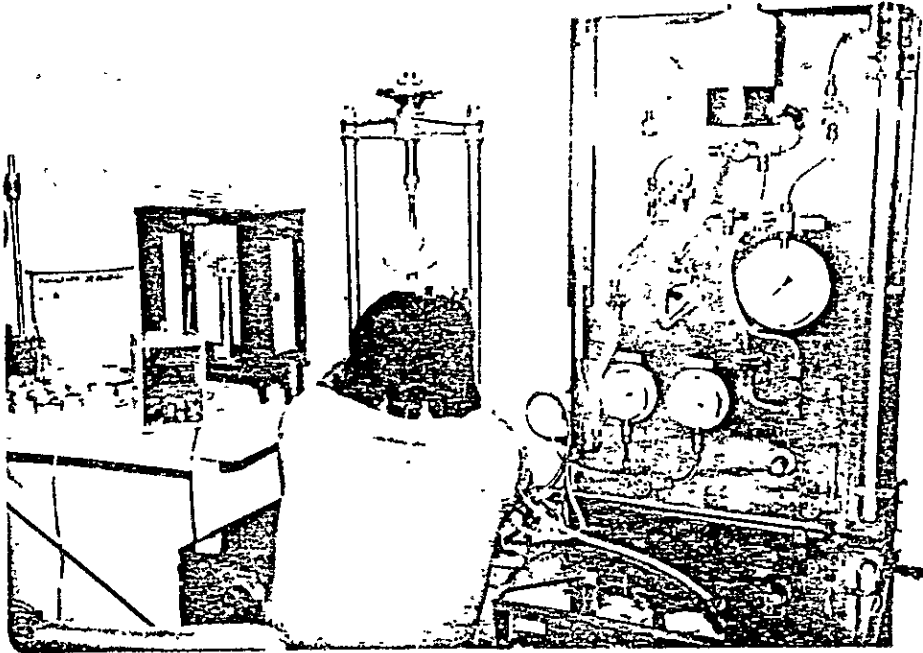
Drilling Operation under way.



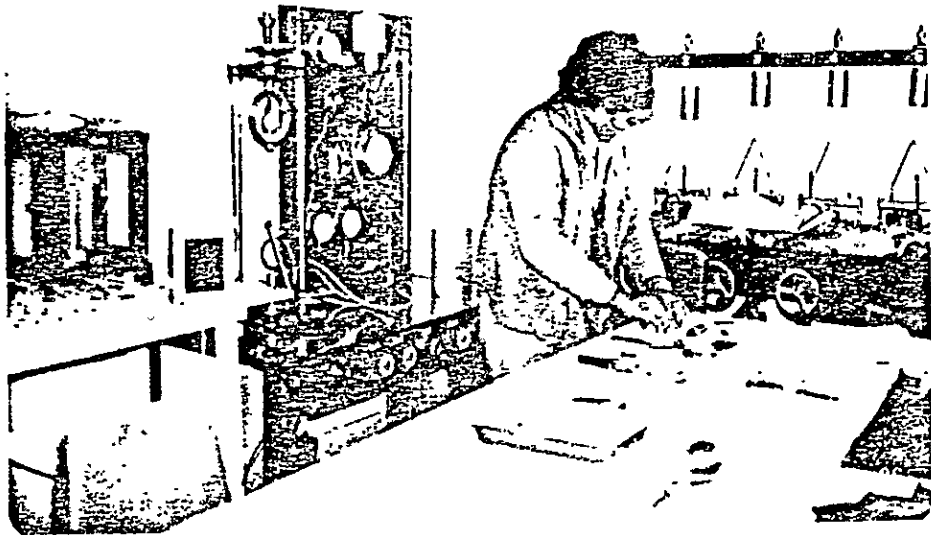
Barge after lifting & reader
for drilling.



Triaxial compression test
in Lab.



Sample preparation
consolidation test.

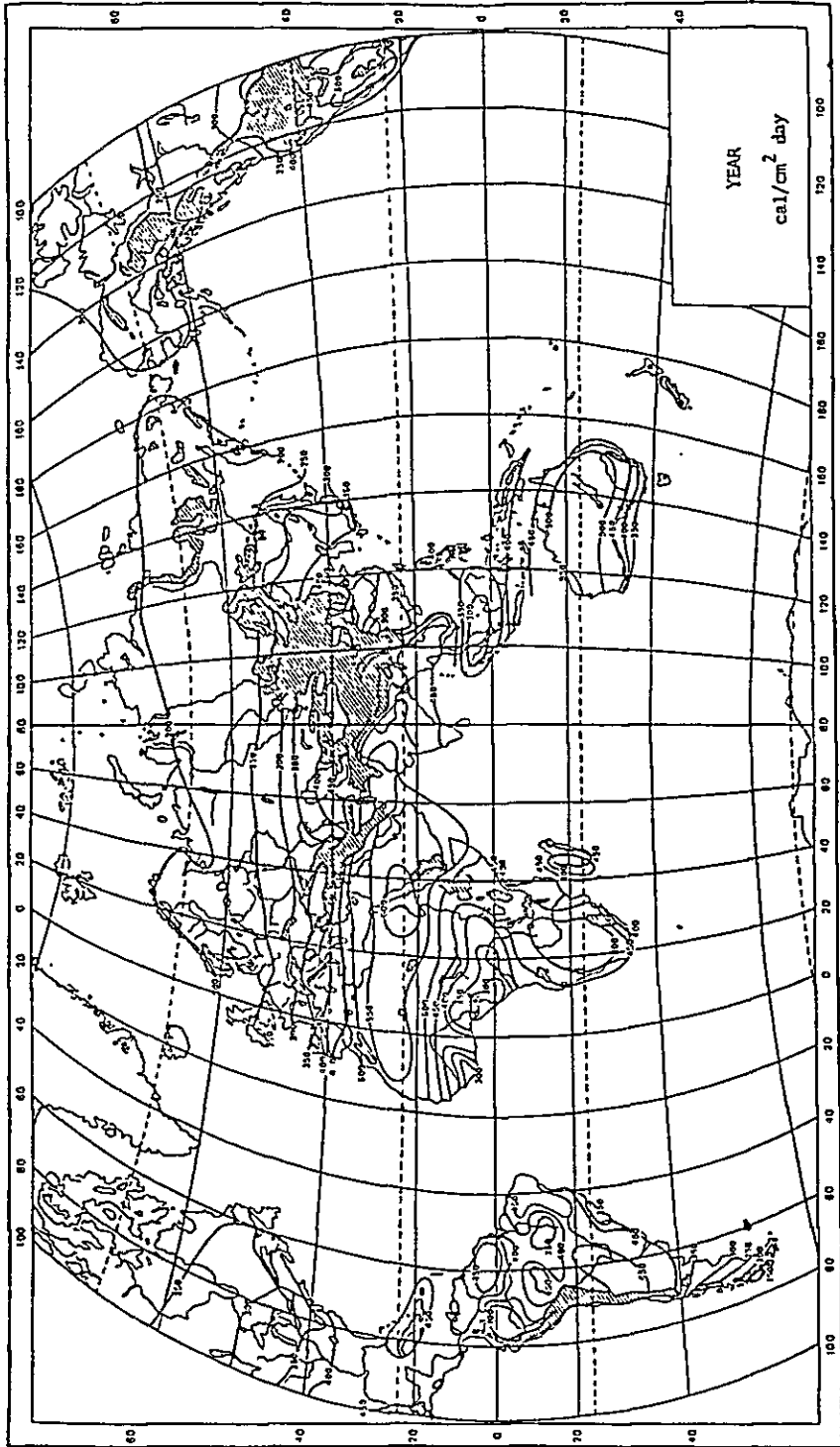


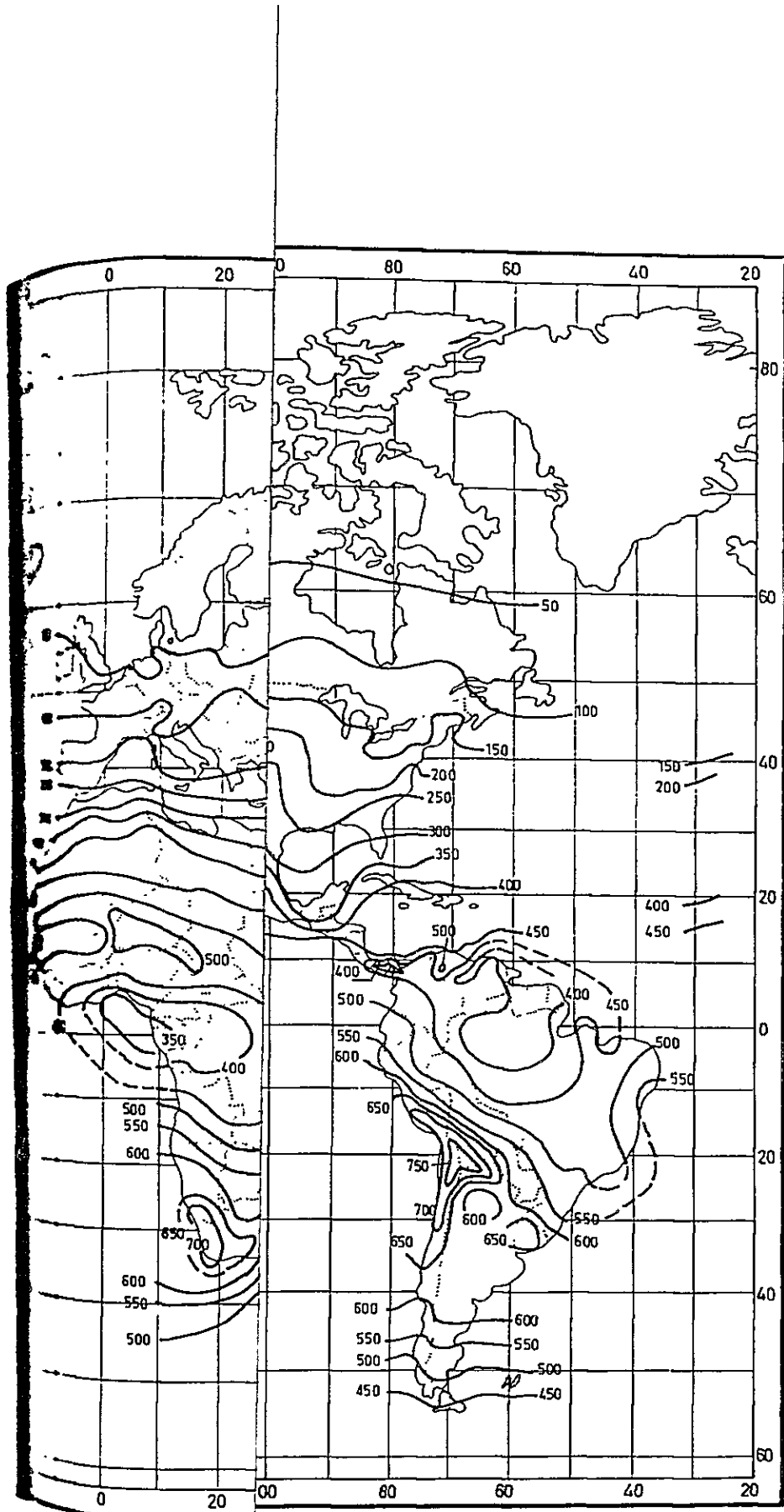
4.2 気象データ

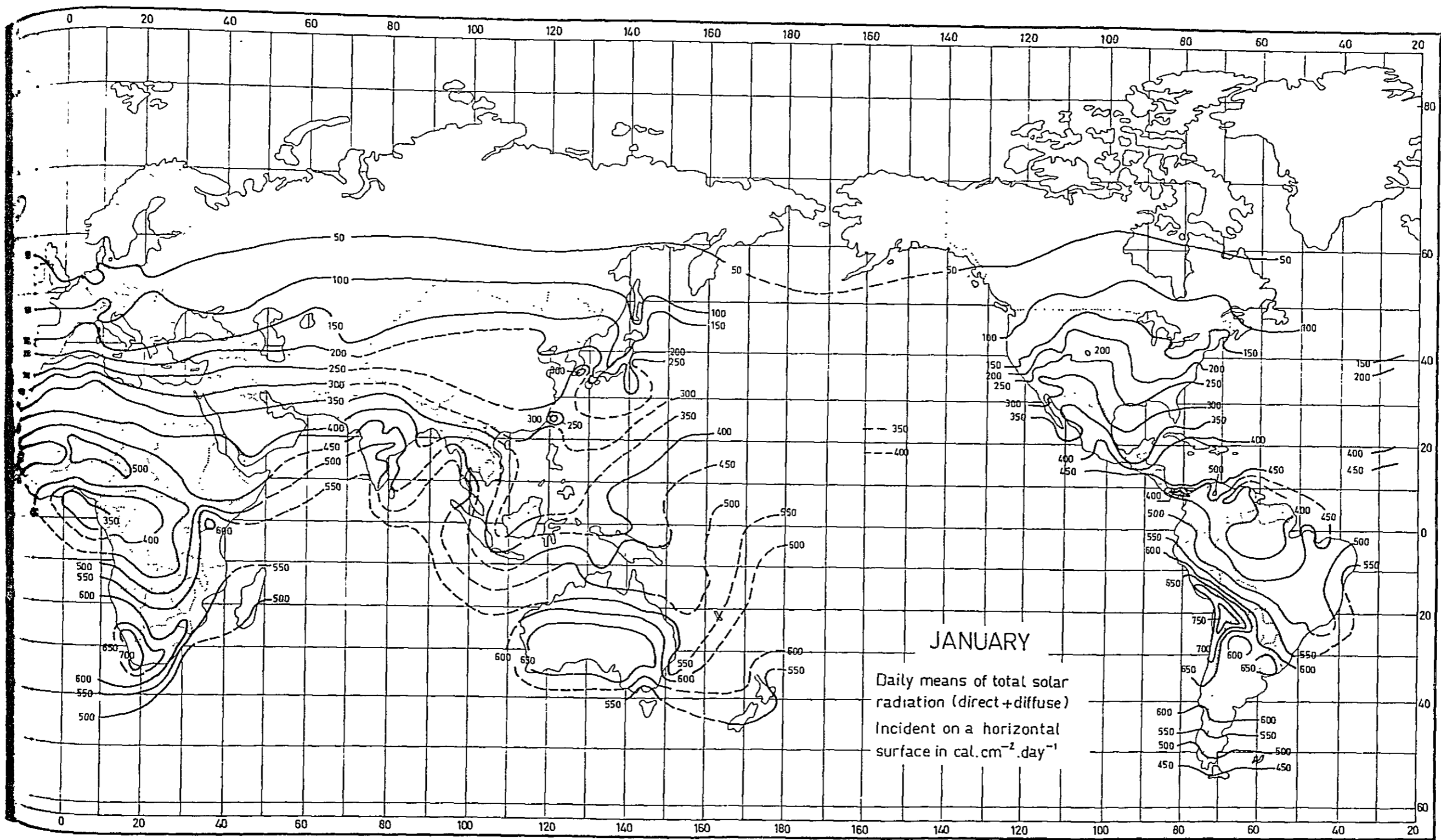
(1) 日本気象協会

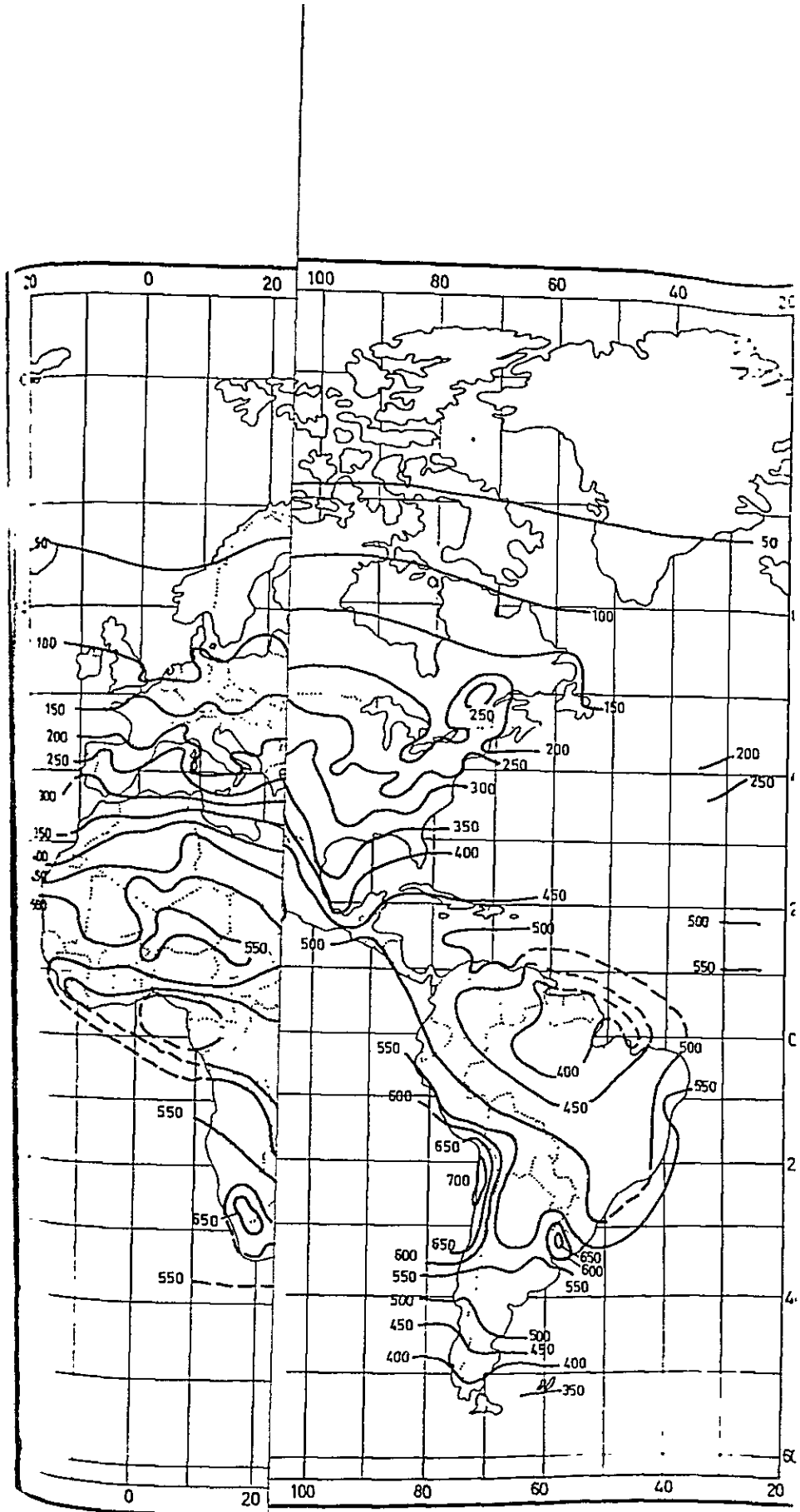
日本気象協会が所有していた世界の日射量分布図を入手した。また少し古い論文(英文)も添付する。

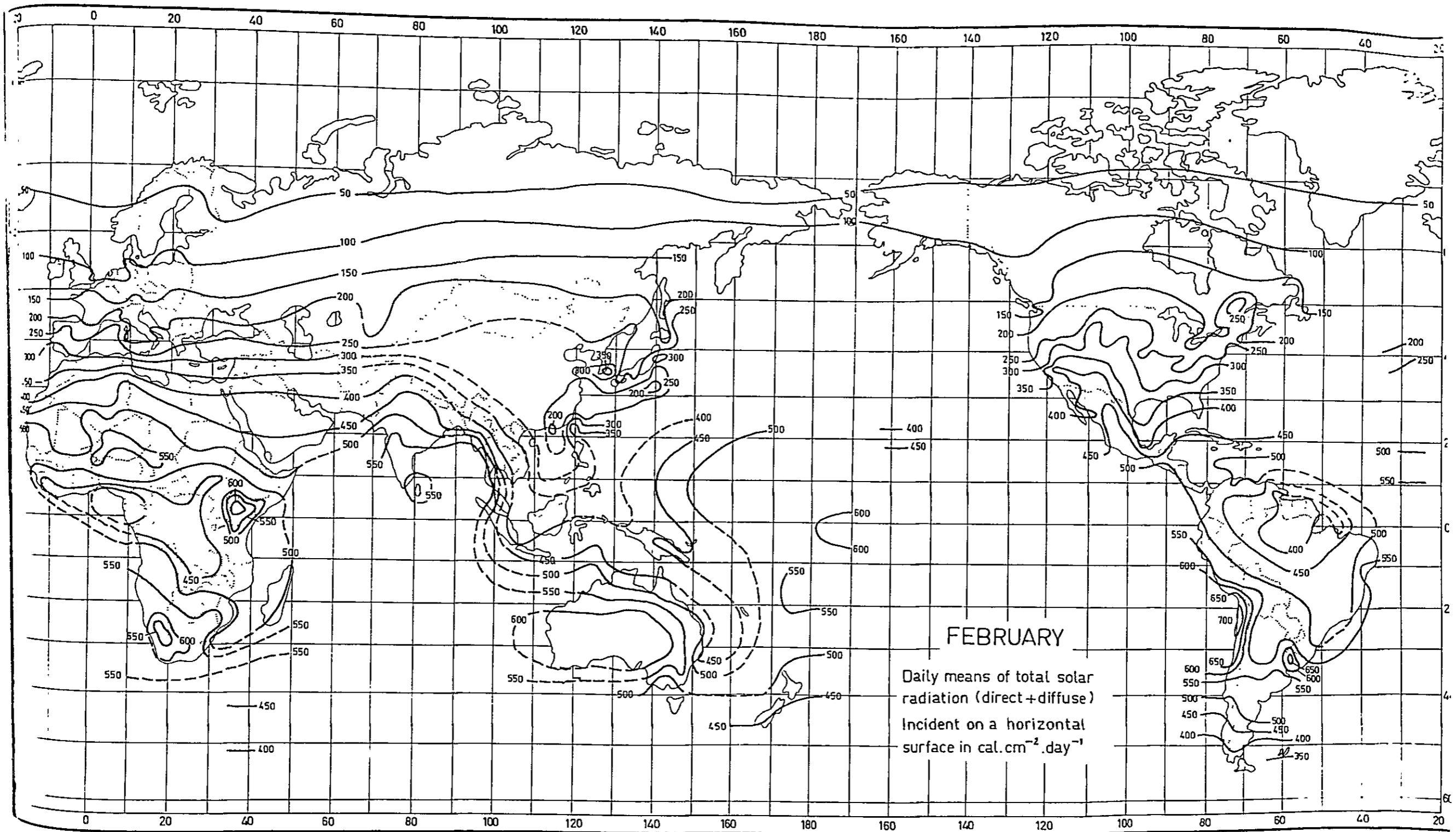
- WORLD SOLAR RADIATION MAP (YEAR, JANUARY TO DDCEMBER)
- WORLD DISTRIBUTION OF SOLAR RADIATION



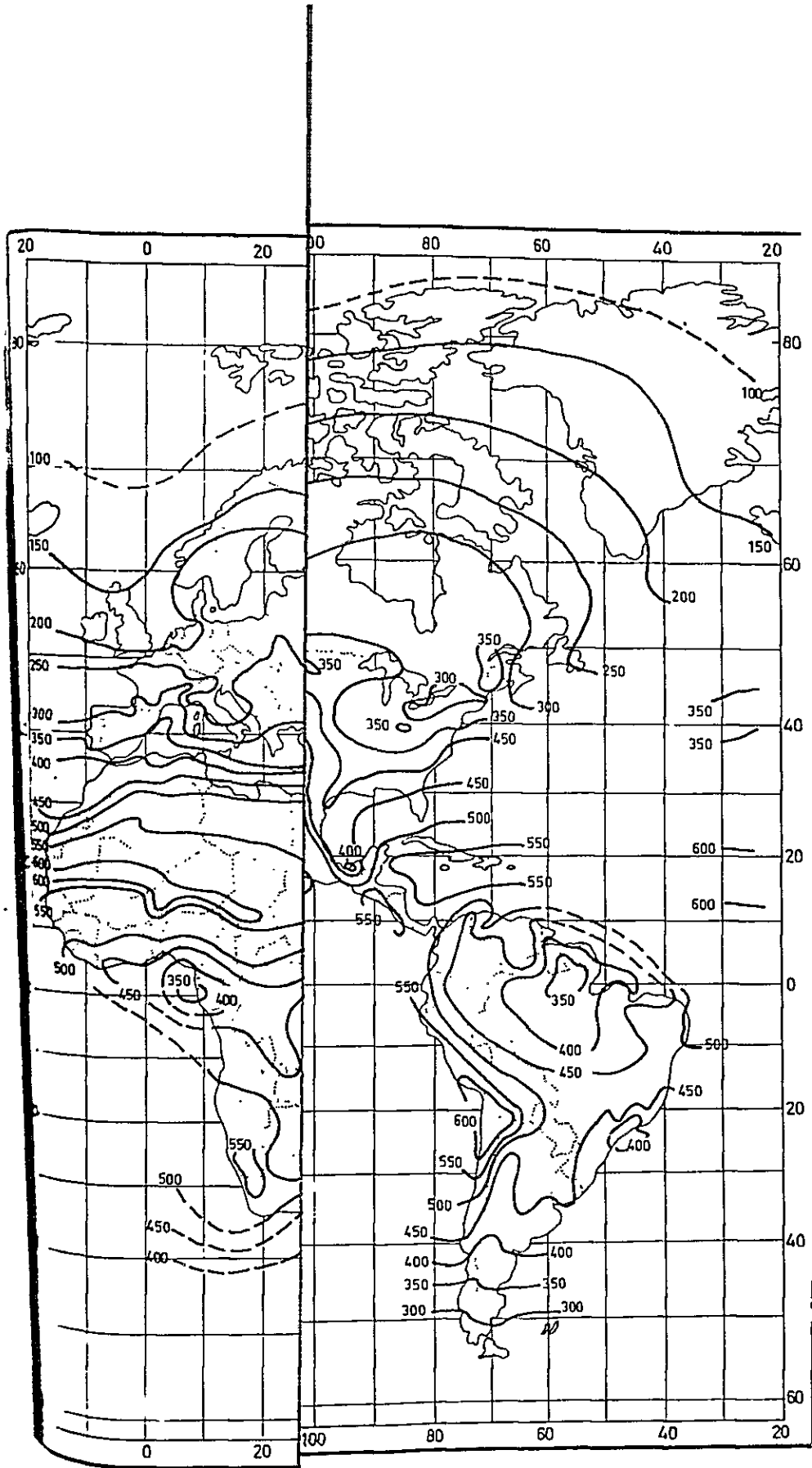


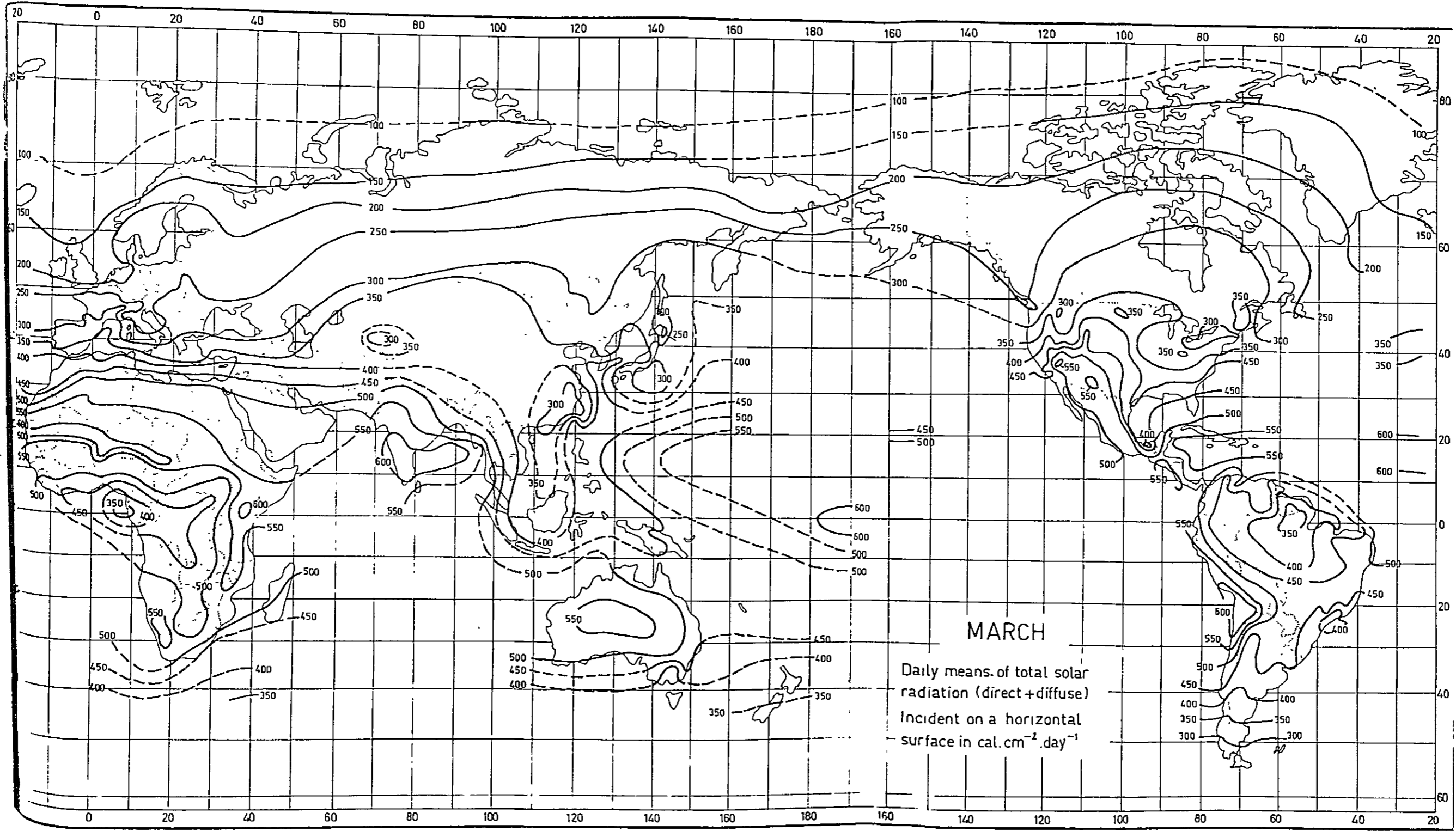


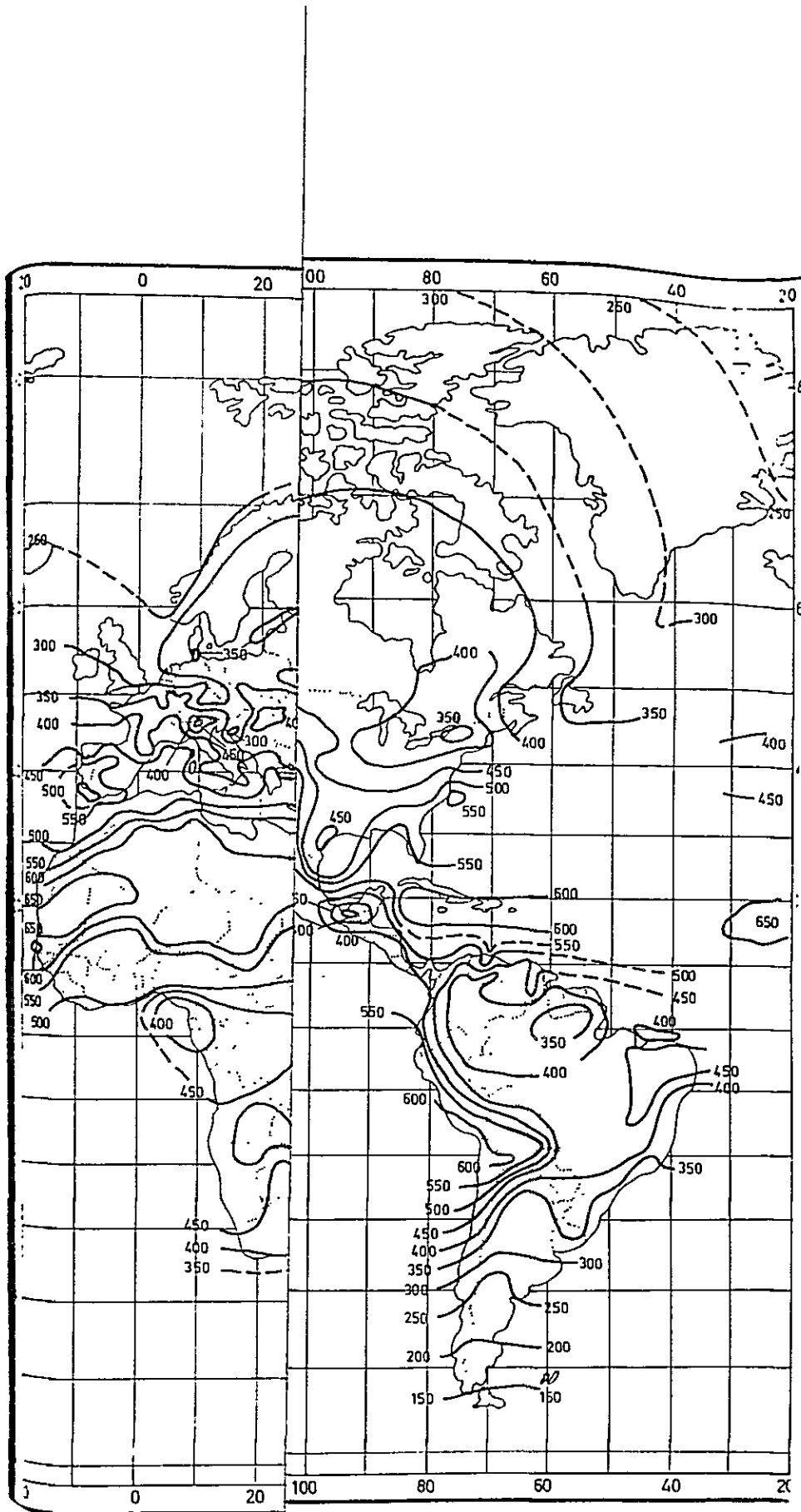


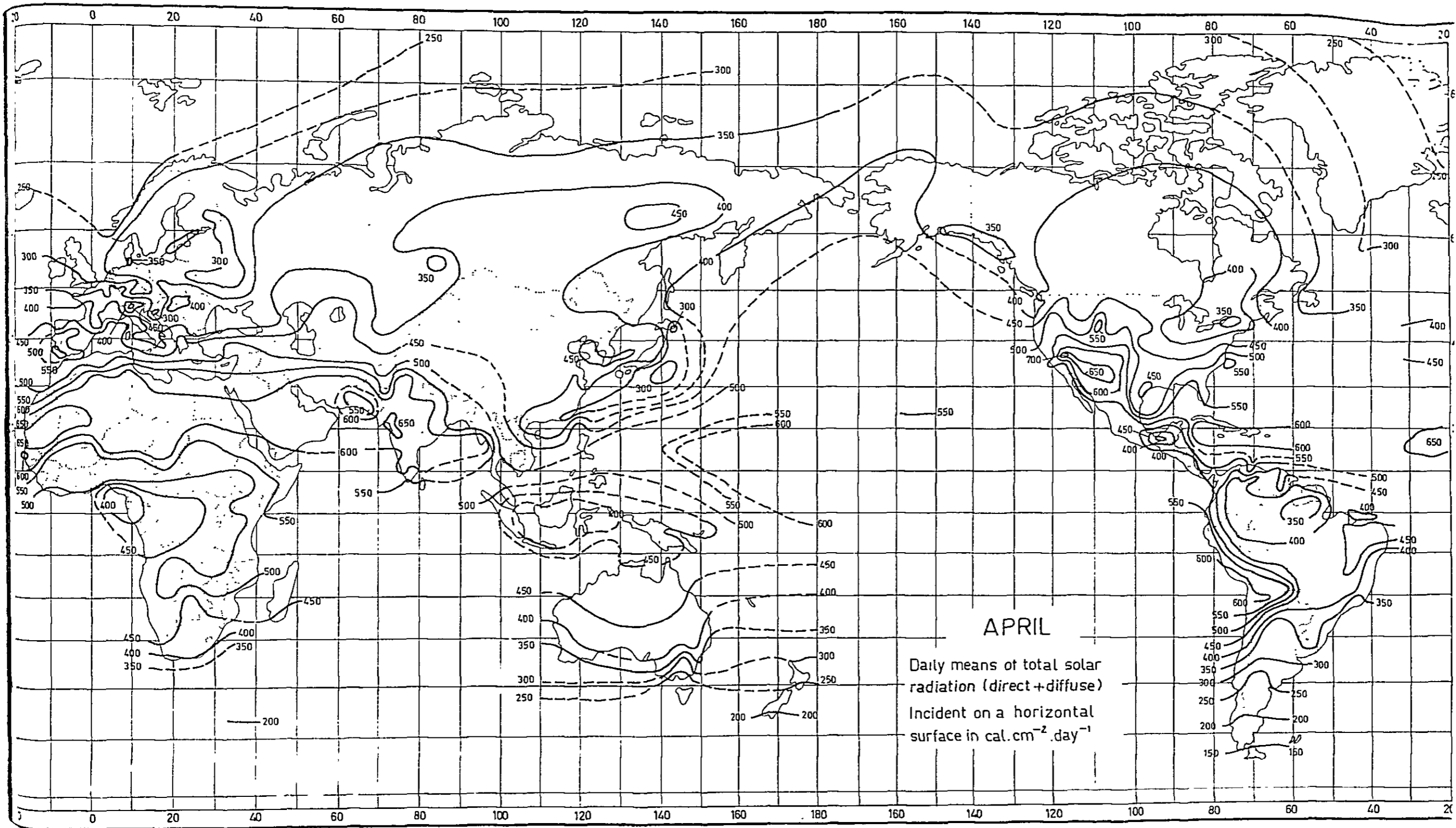


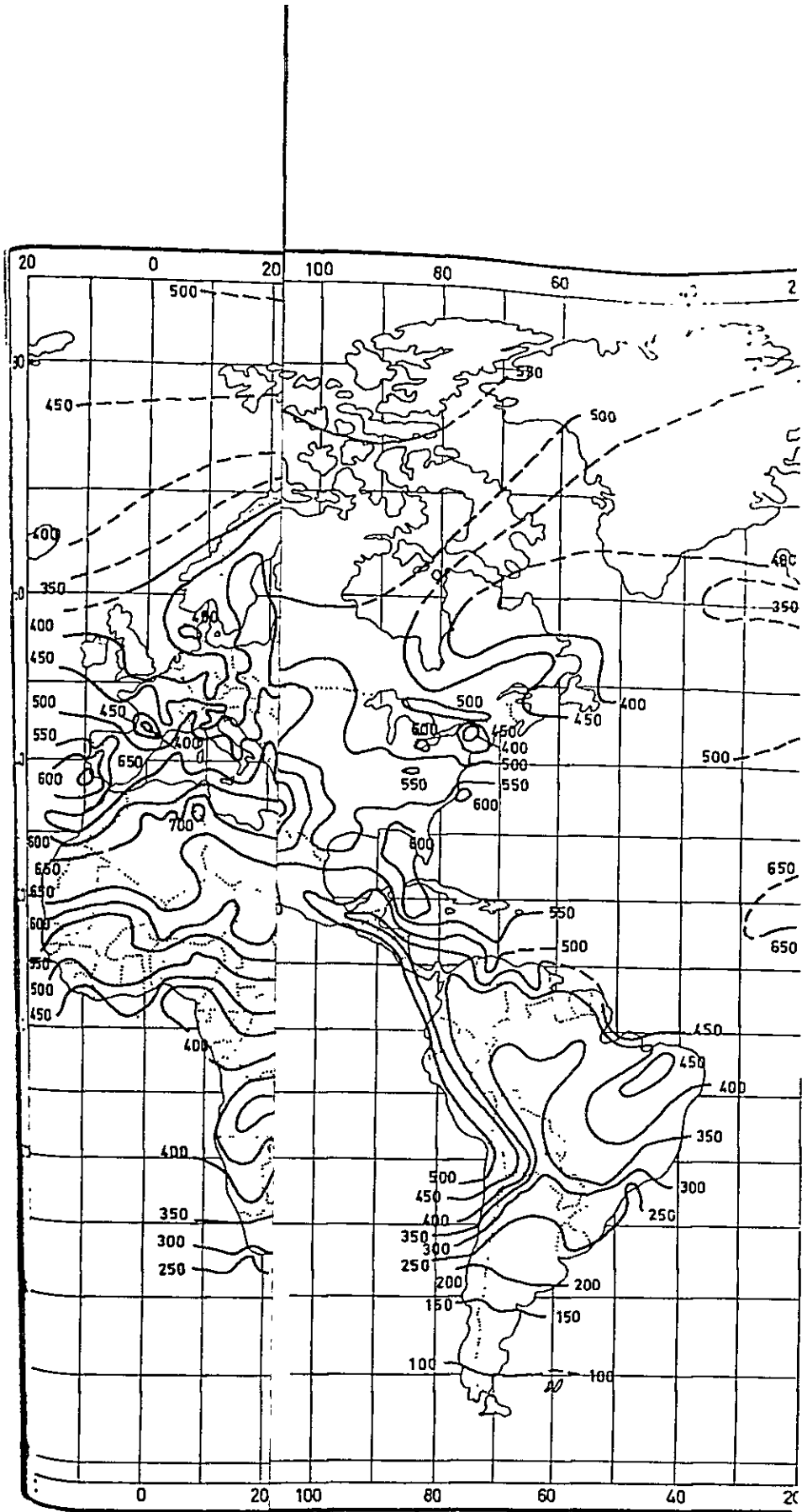
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100

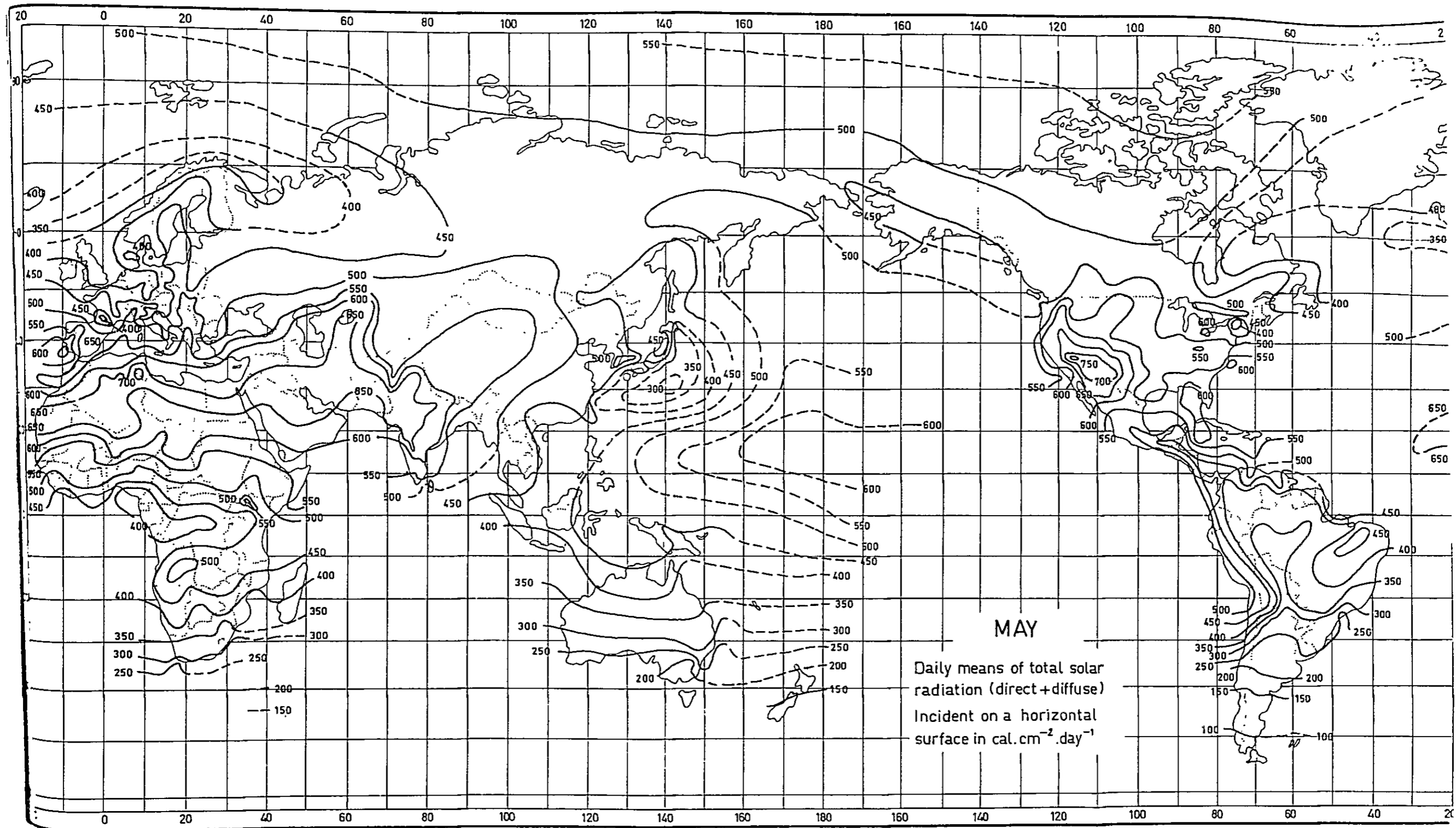


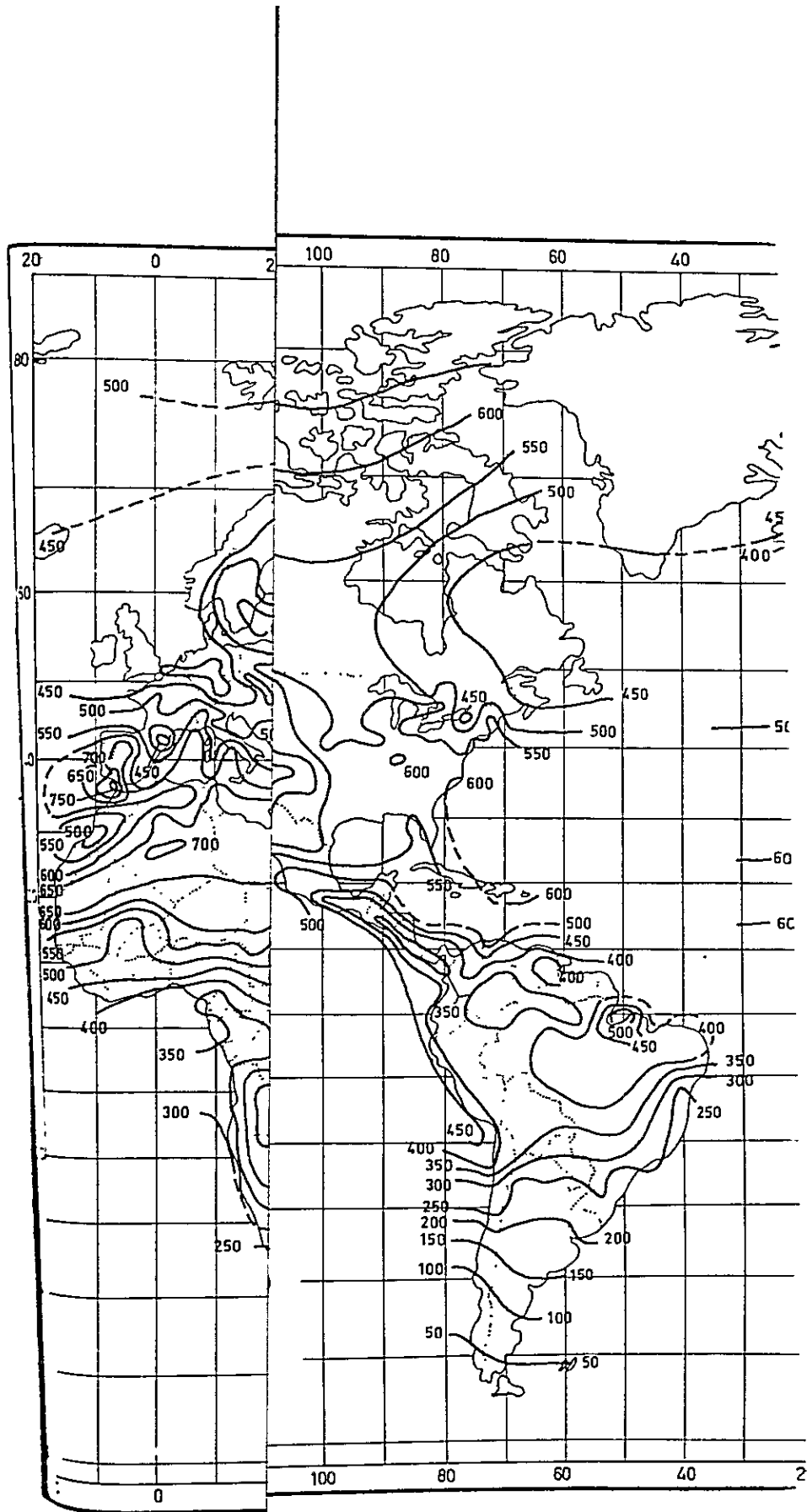


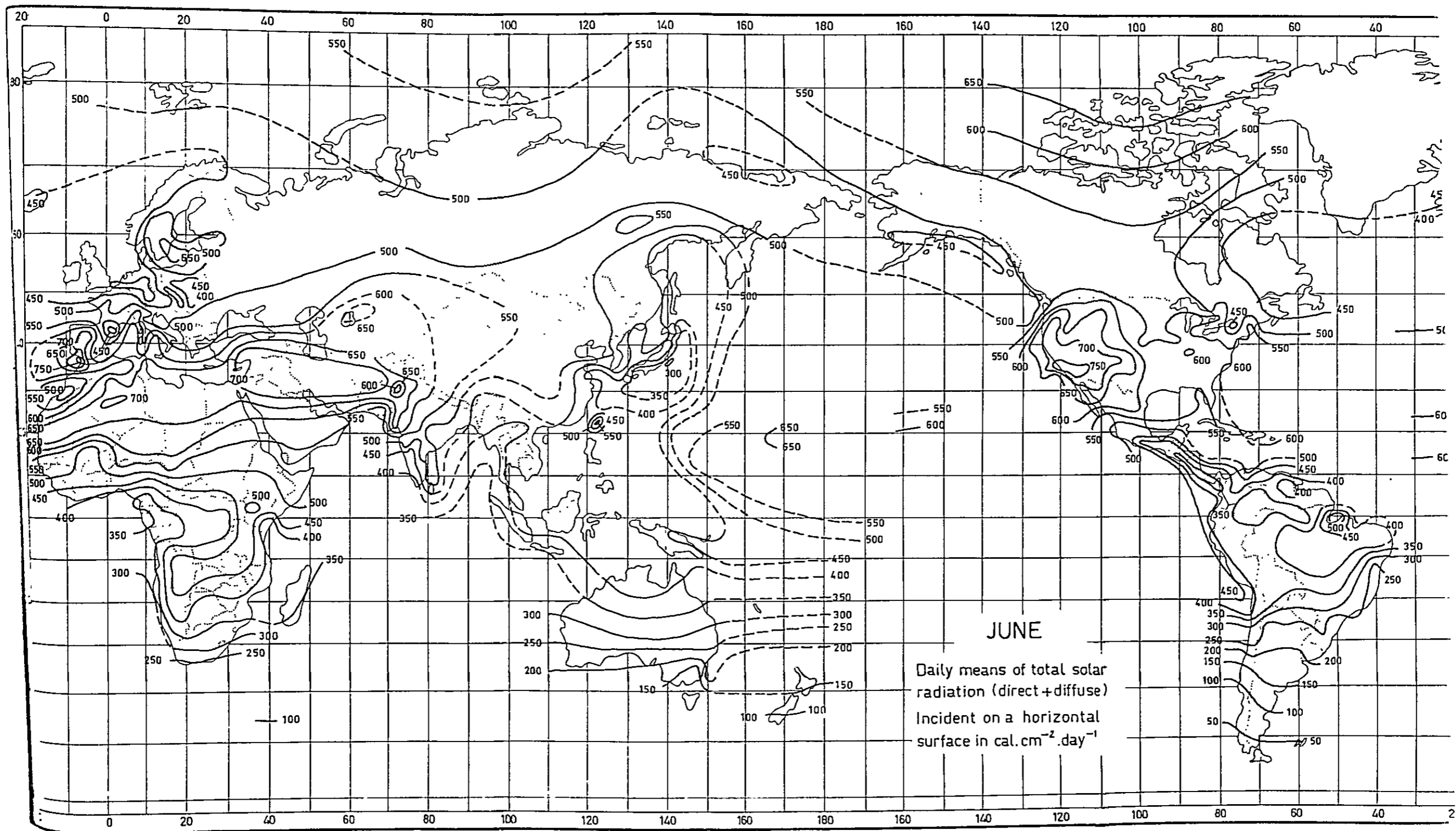


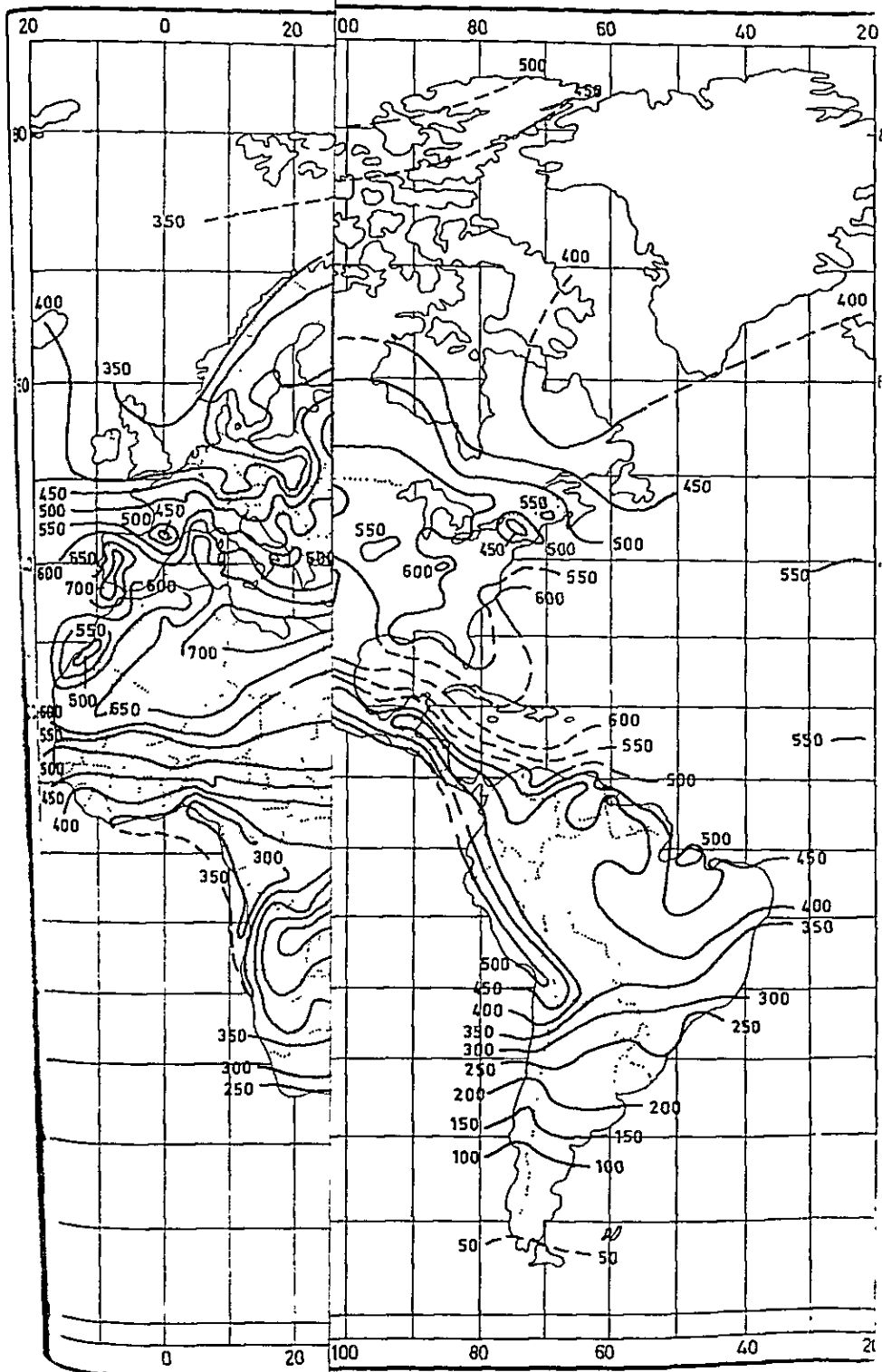


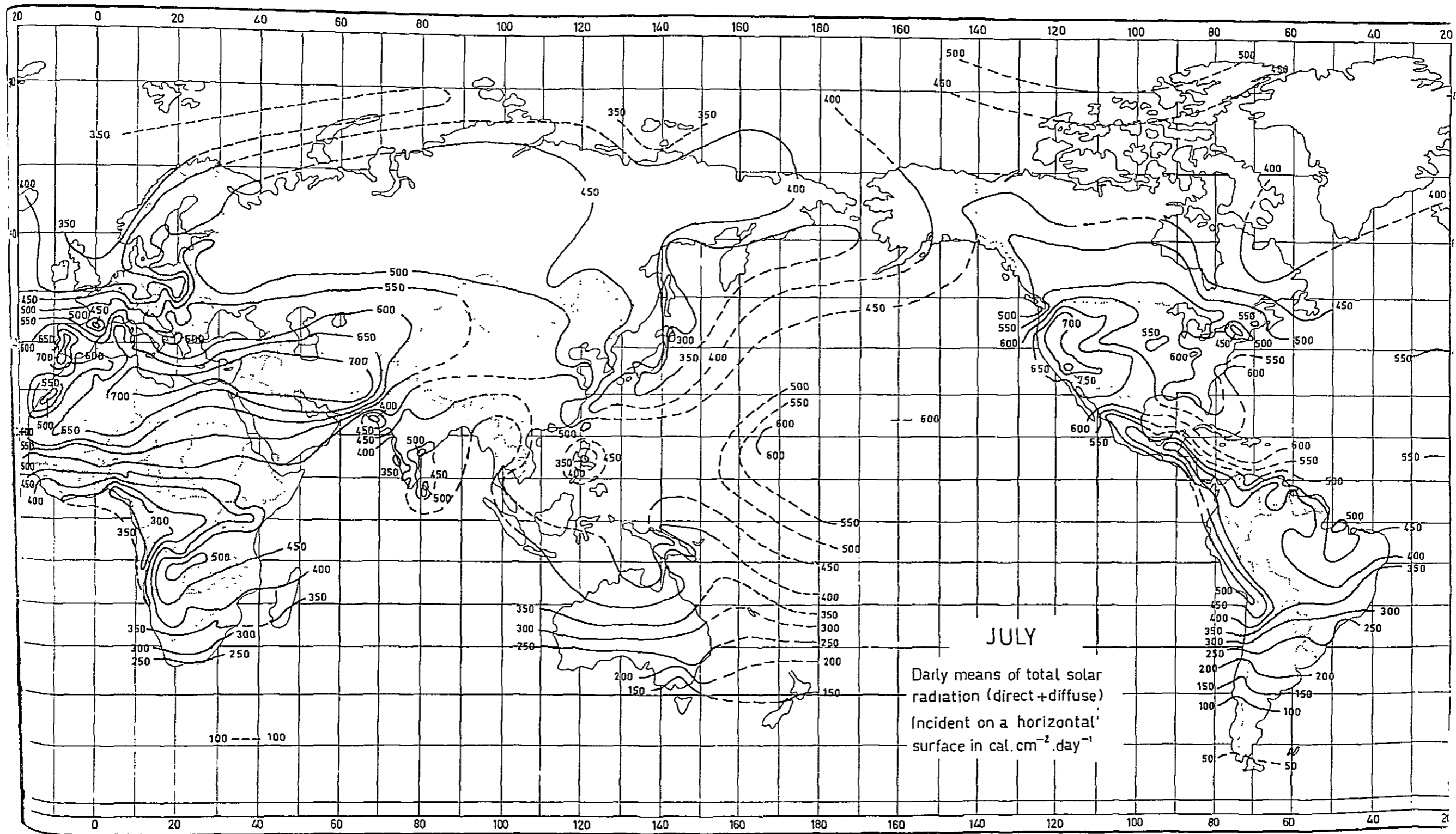


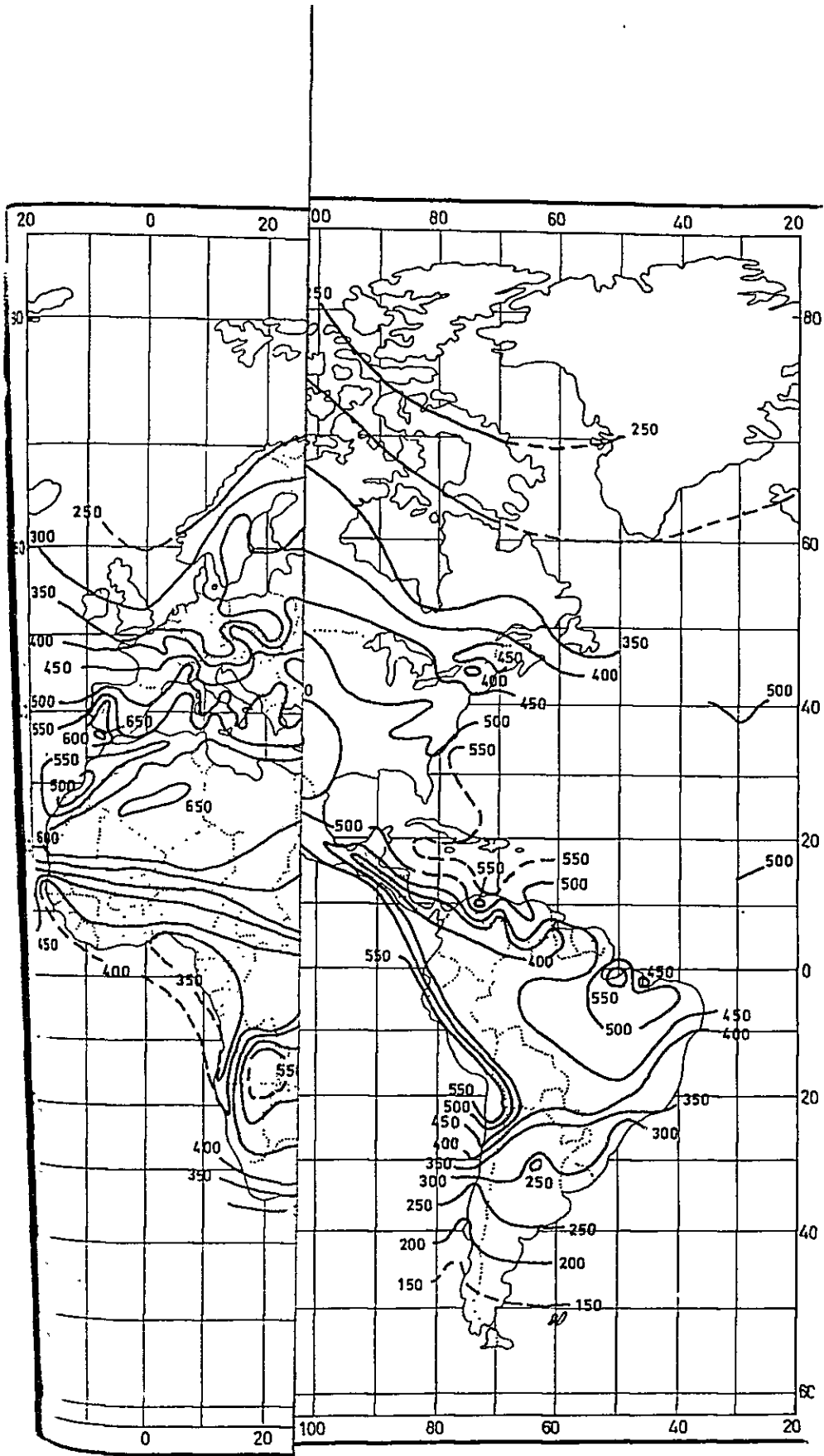


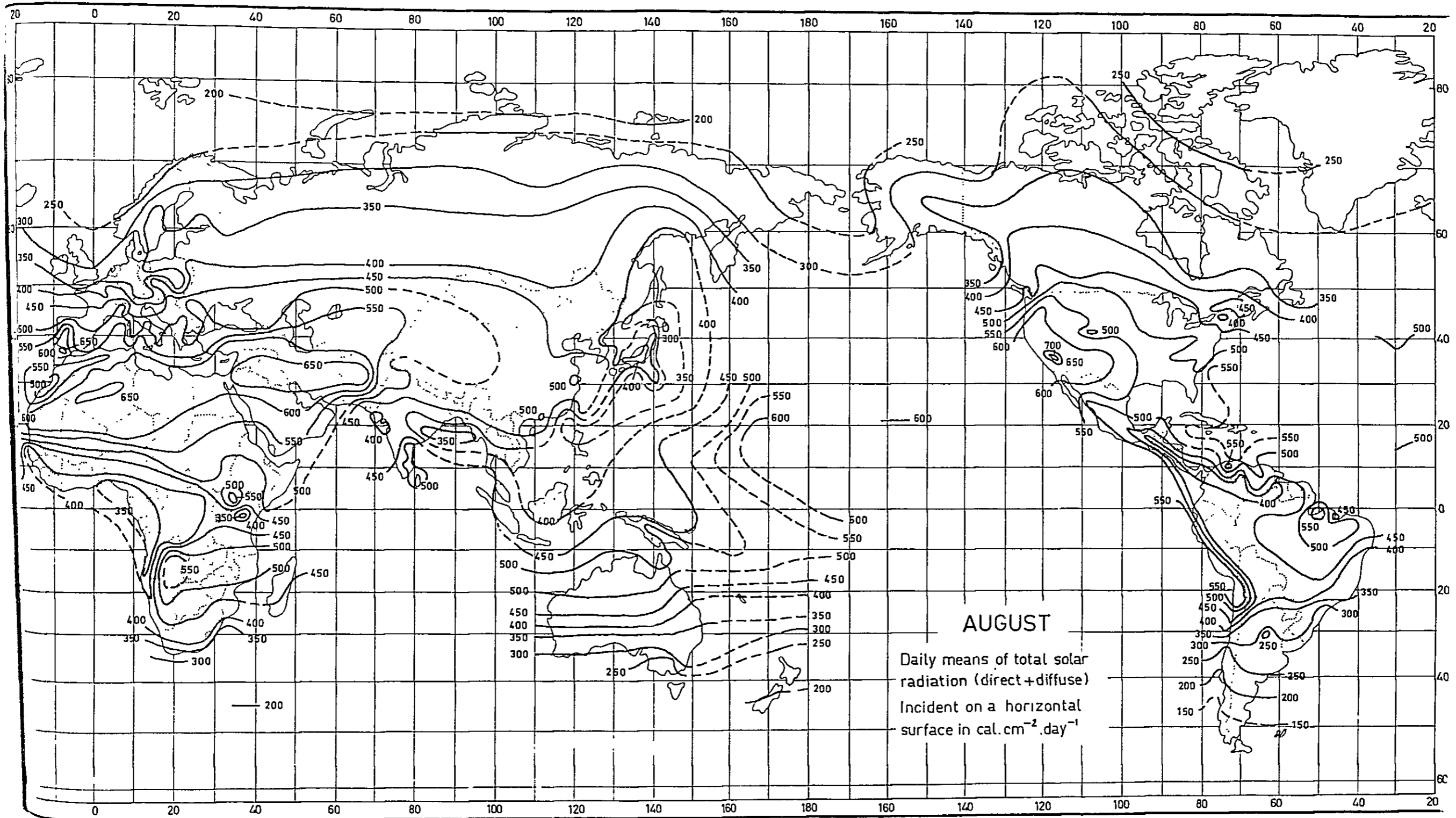


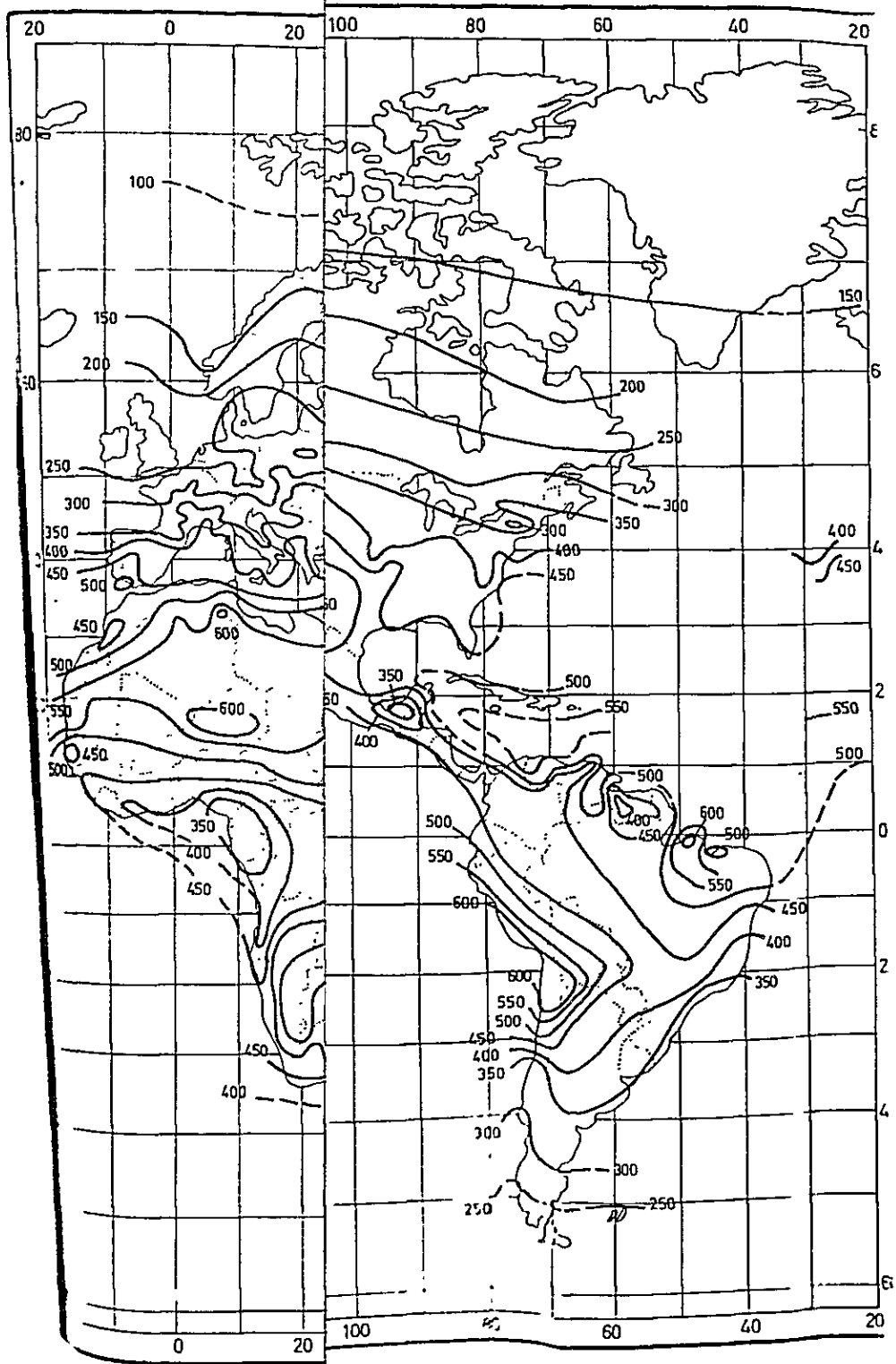


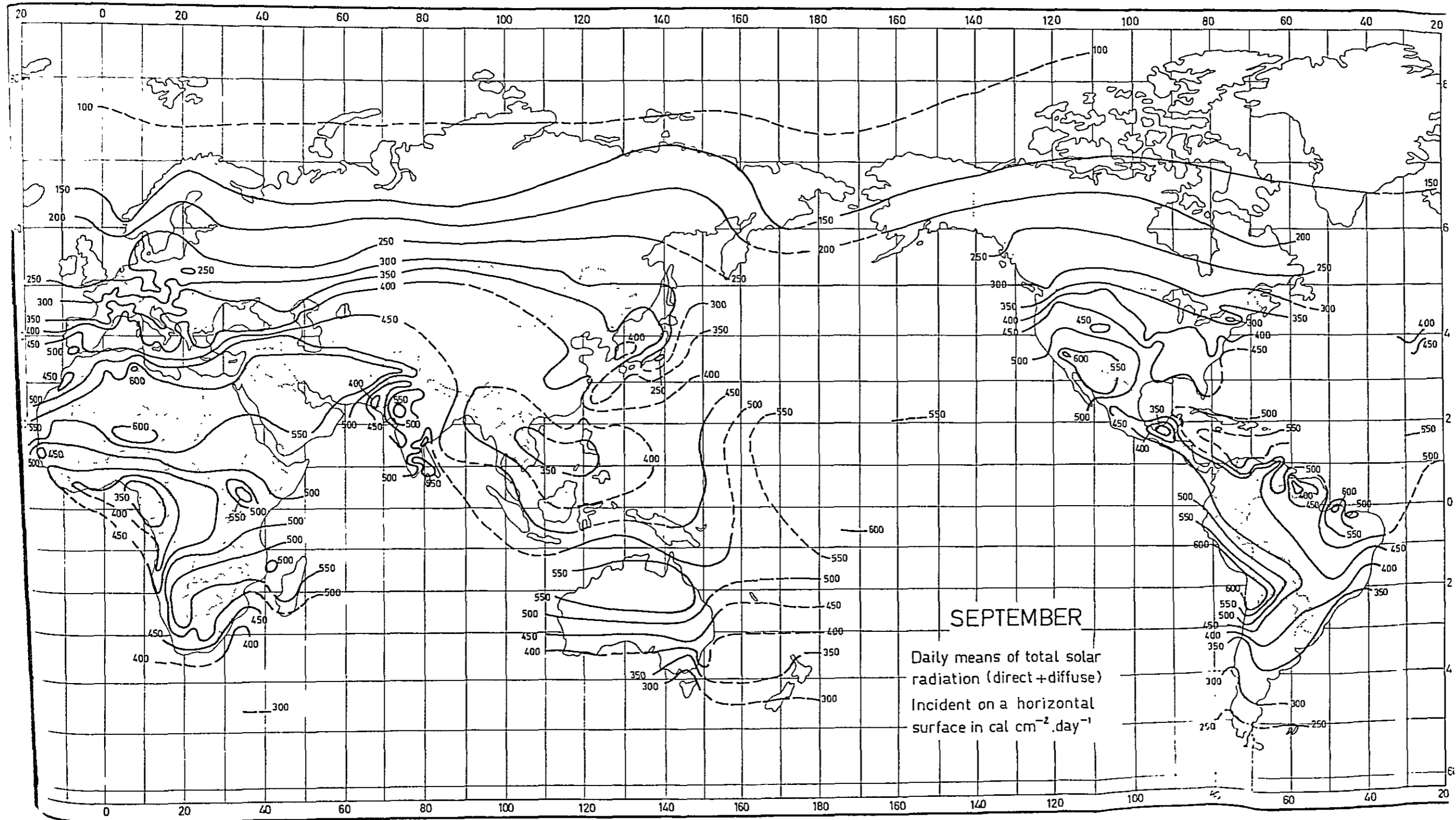


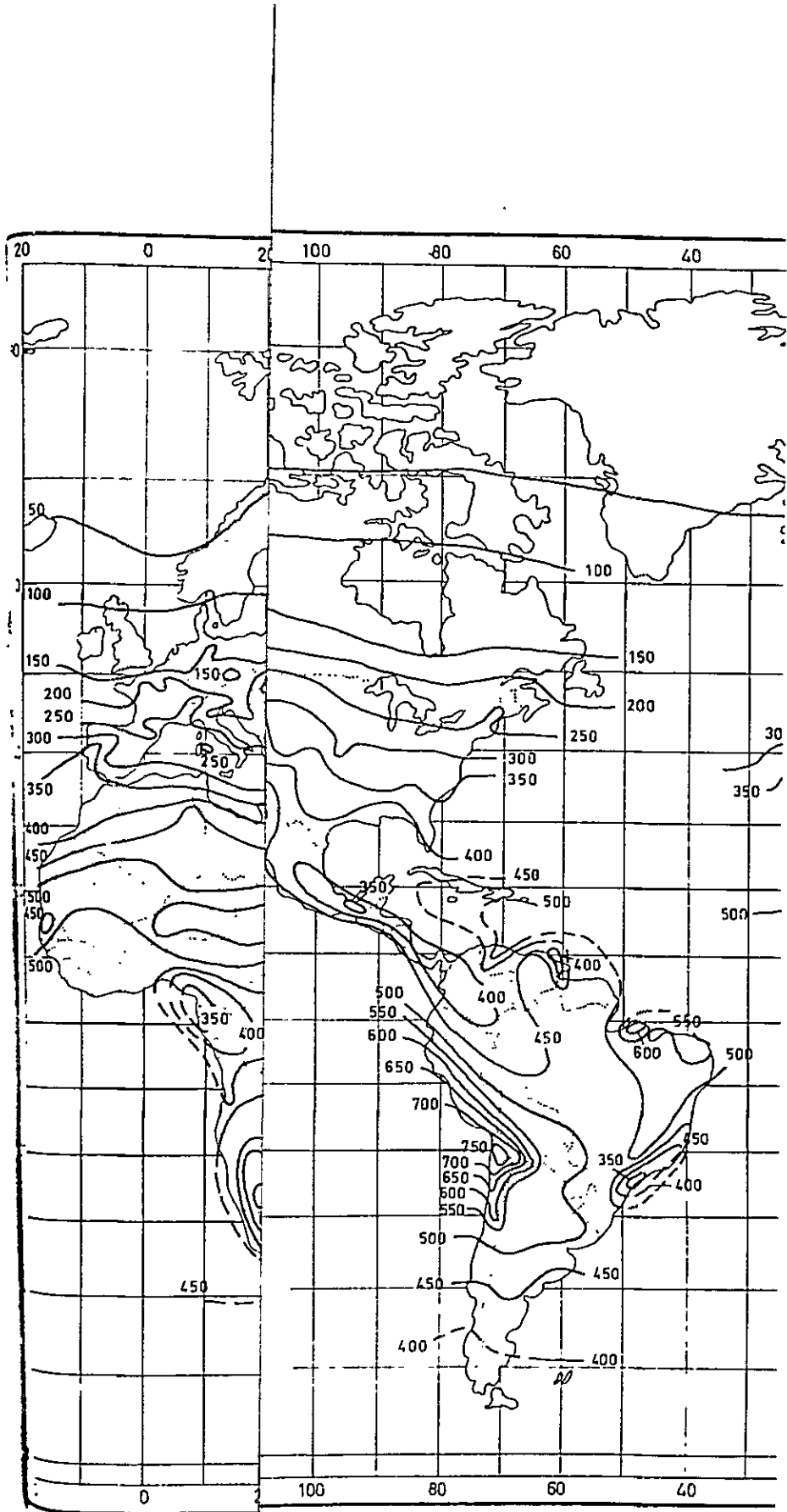


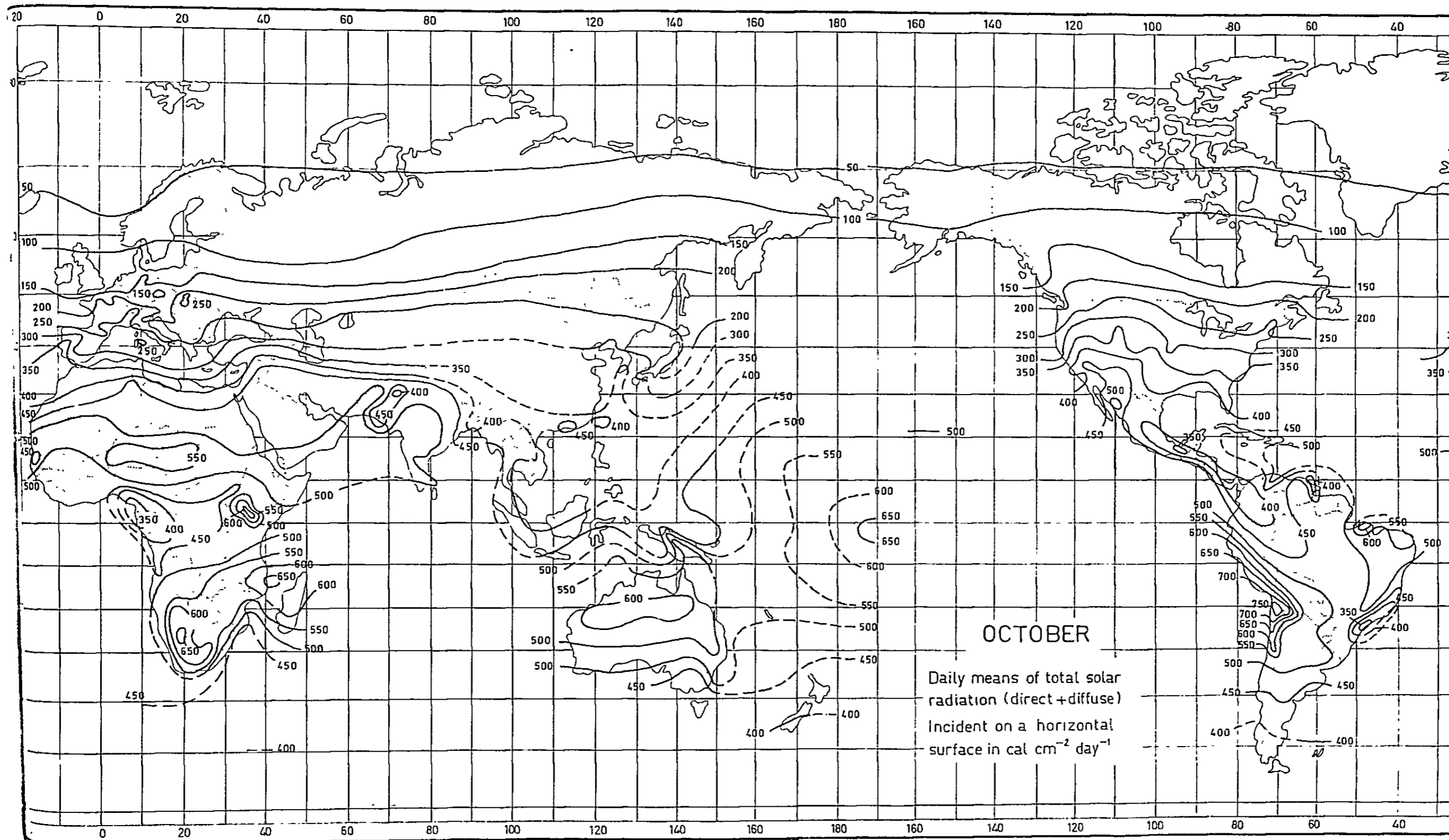


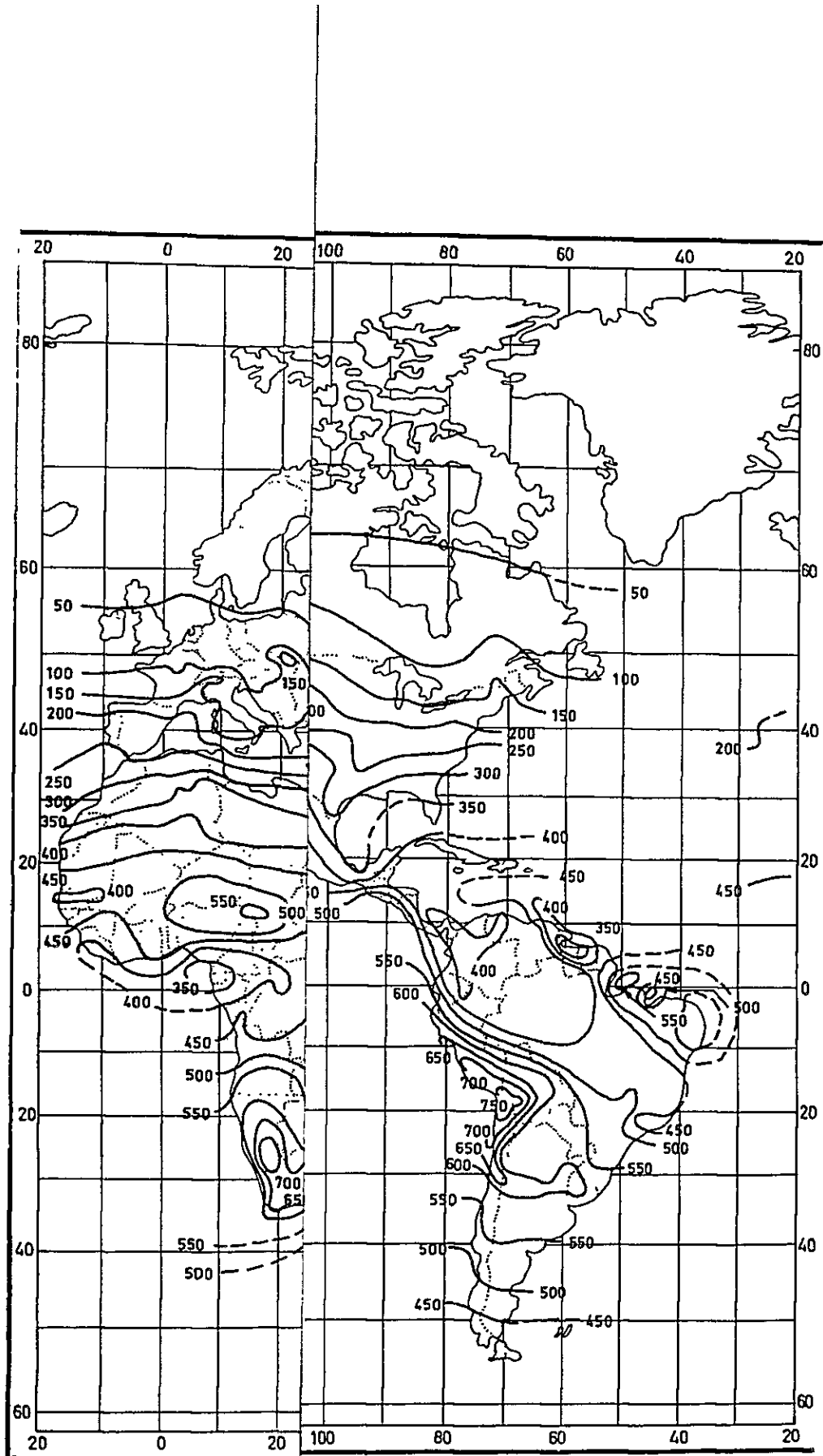


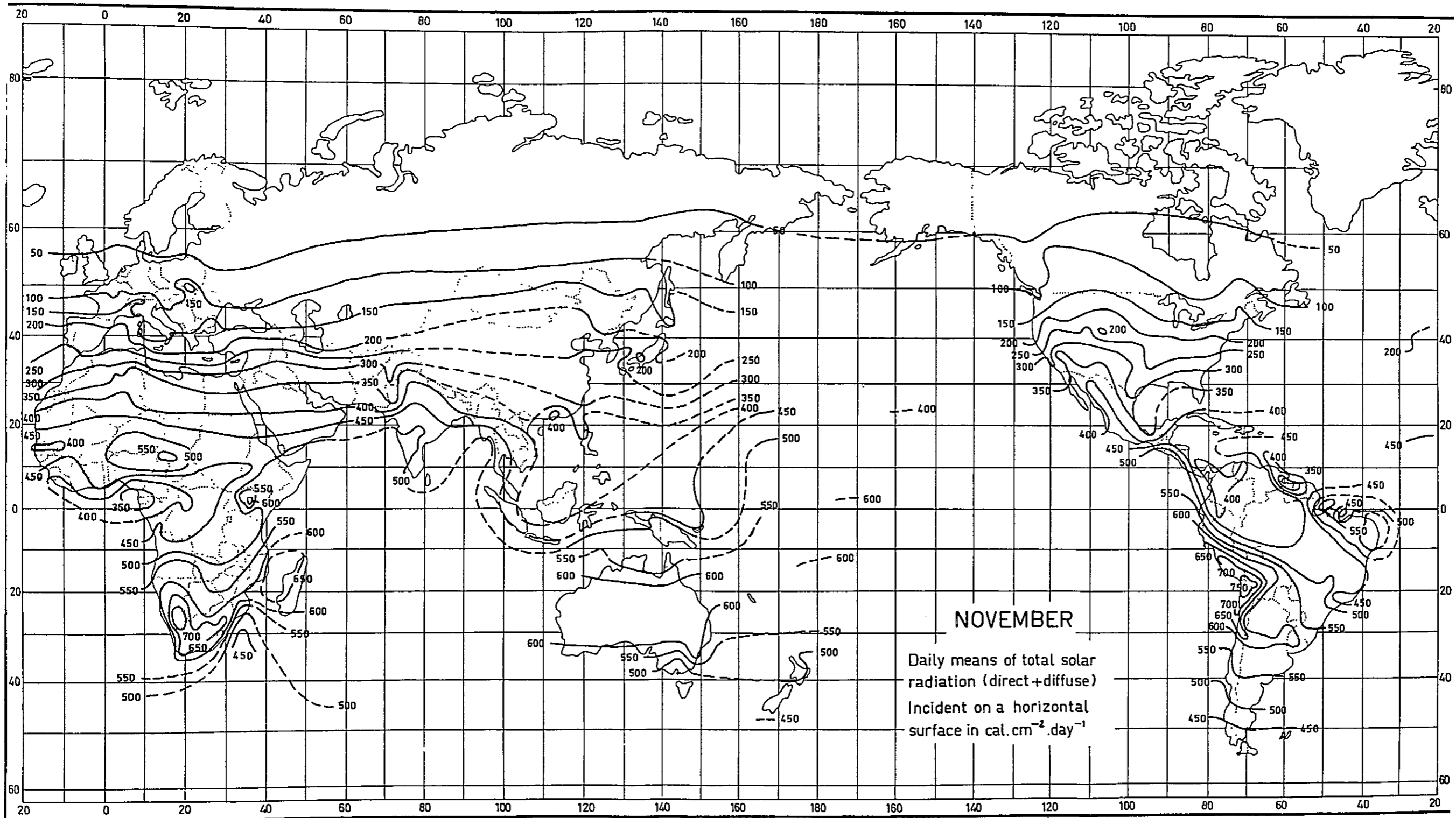


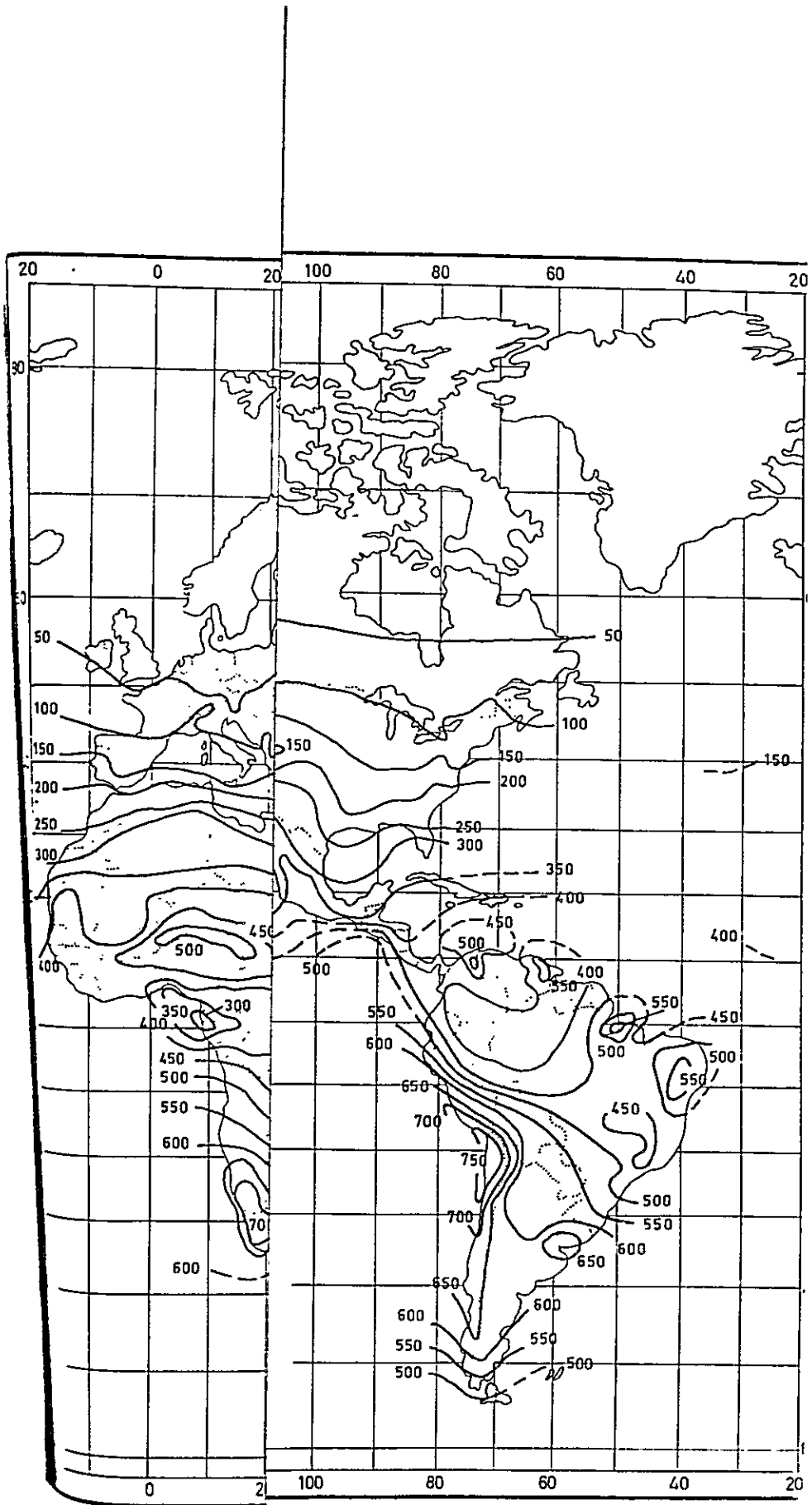


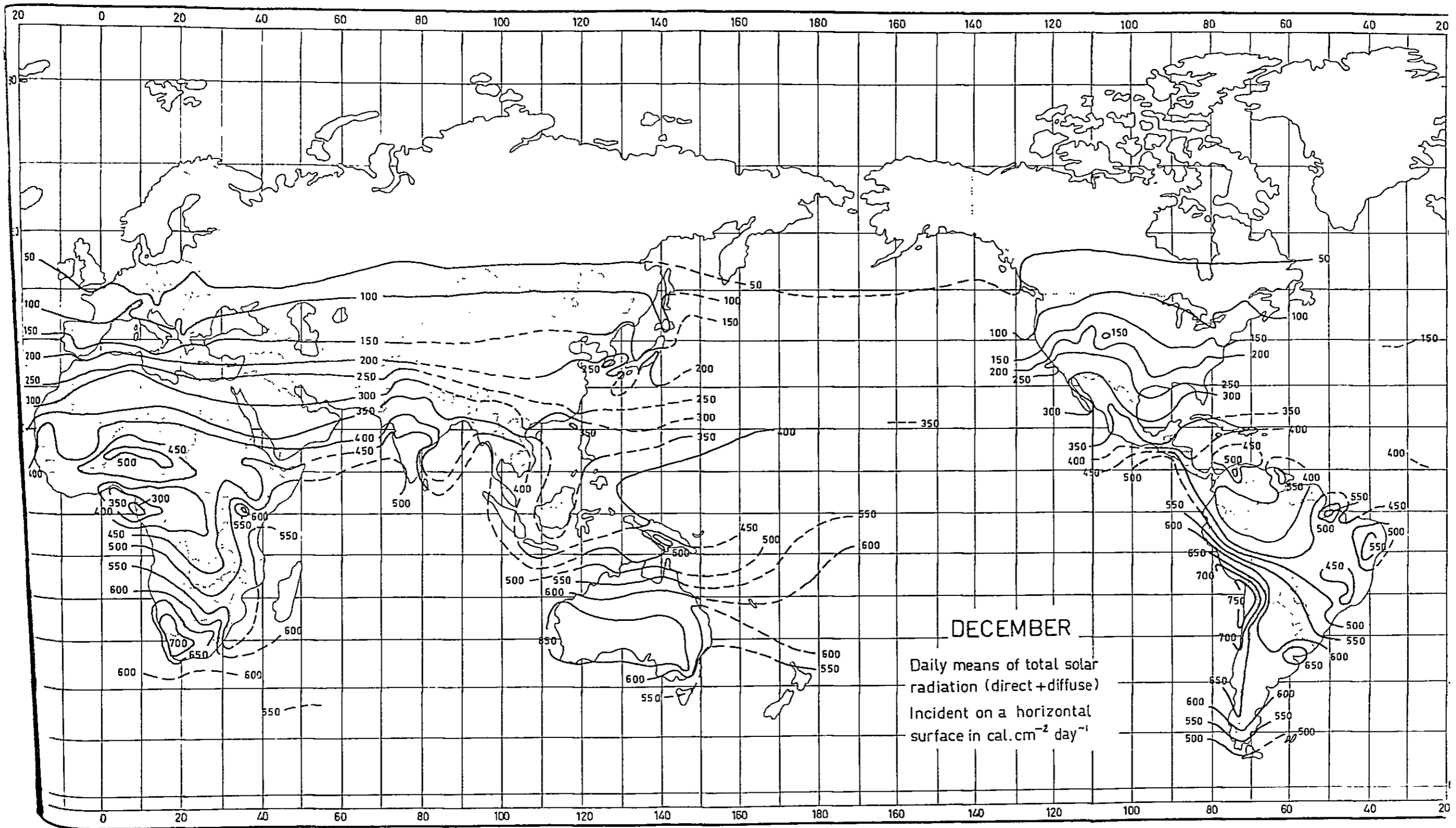












World Distribution of Solar Radiation

George O. G. Löf, J. A. Duffie, and C. O. Smith

Solar Energy Laboratory, The University of Wisconsin, Madison, Wisconsin

A series of 12 monthly world maps of the daily means of total solar radiation incident on a horizontal surface has been prepared. Isolines of constant radiation have been drawn at intervals of 50 langley's per day (cal/sq cm, day).

Data for the computation of mean radiation levels were compiled from many sources, including weather reports and summaries, personal communications from weather and research organizations, and IGY and IGC reports. For areas in which few or no radiation data were available, such information was synthesized by use of sunshine-hours data and approximation formulae applicable to the particular climate type. Radiation data were obtained for 668 stations, whereas sunshine-hours values were used in estimating radiation from 233 additional locations.

The maps are recommended for general use in appraising the collector area requirements for solar applications in broad regions. They do not, of course, reveal the influence of microclimatic factors on local solar-radiation levels.

In addition to the maps, the paper contains an explanation of the various radiation instruments, the methods for data handling, the estimation of radiation values from sunshine-hours data, and the limitations and utility of the radiation maps.

IN APPRAISING the economics of a proposed solar-energy application in a particular area and in designing a solar-energy conversion device to meet a potential demand, knowledge of the solar radiation obtainable at the place in question is essential. There are, of course, other uses for such information, including forecasts of evaporation from lakes and reservoirs, agricultural potential, and meteorological forecasting. It is evident that the utilization of solar energy, as with any other natural resource, requires detailed information on availability.

Some past surveys of solar incidence have been based

on very limited world-wide data on solar radiation, somewhat more extensive world data on hours of sunshine, and on fairly comprehensive solar radiation data in a few selected countries such as the United States and Japan¹⁻¹¹. The scarcity of radiation data throughout the world has limited the usefulness of these compilations, except in the few locations where meteorological networks have been extensive. The wider availability of sunshine records has not solved the problem because of uncertainties in the relationship between hours of sunshine and total energy received. Finally, in some cases, the results of the radiation surveys have been reported on an annual basis only, thereby precluding use of the information for rational design in most areas where seasonal variability of radiation is large.

During the past ten years, however, many new solar-radiation stations have been placed in operation throughout the world, and more data have become available. In addition, the intensive effort in the International Geophysical Year (July, 1957 to December, 1958) greatly increased the number of radiation-measuring stations and the availability of data. Many of these stations have continued to record solar radiation, and longer term averages are becoming available.

In view of the substantial increase in solar-radiation measurements, in recognition of the importance of reliable world-wide solar intensities, and as a part of a broader study of solar-energy economics, this survey and compilation was undertaken. The results of the solar-radiation survey will be published in a detailed report¹²; this paper summarizes the report.

There are several types of solar-radiation data, each of which has its particular utility. These include direct radiation at normal incidence, direct plus diffuse radiation at normal incidence, direct radiation on a horizontal surface, direct plus diffuse radiation on a horizontal surface, and each of these on tilted and on vertical surfaces. For each type of measurement, there are also the possible choices of maximum and minimum values in selected periods of time. Finally, it is necessary to decide on what sort of averaging should be employed; seasonal, monthly, daily, or hourly. For devices employing focusing systems, normal incidence of direct

Presented at the Solar Energy Society Conference in Phoenix, Arizona, March 15-17, 1965.

TABLE 1—DISTRIBUTION OF RADIATION AND SUNSHINE INSTRUMENTS*

Continent	Radiation Data						Sunshine Data		
	Total	Eppley	Kipp	Gunn-Bellani	Robitzsch	Other or Unspecified	Total	Campbell-Stokes	Other or Unspecified
North America	137	128	5	0	0	4	9	0	9
South America	49	0	2	0	47	0	68	0	68
Europe	219	4	65	0	107	43	40	0	40
Africa	71	4	30	4	16	17	42	33	9
Asia	142	7	17	0	89	29	69	2	67
Australia	10	0	1	0	7	2	2	0	2
Antarctica	14	8	2	0	1	3	0	0	0
Oceans and Islands	26	13	0	0	0	13	3	0	3

* Used in this compilation.

radiation would of course be preferred. For flat-plate systems, it would be preferable to have total (direct plus diffuse) radiation on a sloping surface if the collector is to be used in that position. Some design purposes would best be served by use of maximum radiation values; whereas, performance over a period of time might be determined most readily by an appropriate mean radiation figure and a distribution parameter. No single type of data or method of compiling will serve all needs.

The form of the data most available and most frequently reported is total radiation (direct plus diffuse) on a horizontal surface received each day or in some cases each hour. This is, moreover, probably the most generally useful form of radiation data, as methods are available for estimating other types from these figures. After consideration of various time periods for averaging, monthly averages were chosen as a practical compromise between averages on a seasonal basis (four per year) and on a weekly basis (fifty-two per year). Thus, the data are finally presented as monthly means of the daily totals of solar radiation (direct plus diffuse incident on a horizontal surface) and averaged over the period of record used in the analysis.

Solar radiation is measured by several different types of instruments having various characteristics and degrees of accuracy. With few exceptions, radiation-measuring instruments in use are of two main types: the thermoelectric type and the bimetallic expansion type. Each of these has variations. The thermoelectric types include the Kimball pyranometer (manufactured by Eppley) and the Moll-Gorczynski pyranometer (manufactured by Kipp and Zonen). A difference in temperature of black and white surfaces in a glass-enclosed chamber is caused by solar-radiation absorption; the electric output from thermopiles in these units is usually recorded on some type of chart or totalled by means of an integrator. If well calibrated and maintained, these instruments can provide daily totals of solar and sky radiation usually within three percent of true values¹²; most recorded data are probably less accurate.

The principal radiation meter of the bimetallic ex-

pansion type is the Fuess-Robitzsch pyranometer or pyranograph (with self-contained recorder). In this instrument, differential expansion of a metallic element due to solar absorption causes the movement of a stylus on a clock-driven chart. Its accuracy is lower than the thermoelectric types, deviations of ten percent from true value not being uncommon. Another meter of this type is the Michelson pyranometer.

Unless a pyranometer is provided with some type of integrator, the common method for obtaining hourly and daily total radiation values is by planimetry from the chart records.

Another radiation instrument used by a few stations is the Bellani pyranometer, which provides an indication of total solar radiation by the quantity of a liquid that has distilled from a solar-heated evaporating chamber. Periodic measurement of the distilled liquid permits estimation of the incident radiation during the interval.

In the United States, the Eppley pyranometer is most frequently used, whereas in Europe and Africa, the Kipp is more common. The Robitzsch bimetallic type is simpler and cheaper, and fairly widely used in South America and Asia, as well as in scattered stations elsewhere in the world.

The other type of data used in this study is the percentage of possible sunshine or the hours of sunshine per day as measured by the Campbell-Stokes sunshine recorder. This instrument employs a spherical lens to focus direct sunshine onto a paper chart. Discoloration of the chart occurs, due to heat, whenever the solar disc can be seen. The length of the discolored line divided by the total length of the chart corresponding to the time between sunrise and sunset is the percent possible sunshine for the day. This instrument is widely used and is actually a standard for this type of measurement.

Table 1, in addition to showing the number of the more widely used instrument types, is indicative of the degree of coverage and (indirectly) the reliability of the results. Thus, in North America where a rather dense network of accurate instruments exists, high confidence can be placed in the results. Conversely, a limited num-

ber of stations in South America and parts of Asia, coupled with the use of some pyranometers of lower accuracy, places the results for these areas at a lower confidence level. The need for use of sunshine data in many of these areas is evident, and the extent to which such observations were used in estimating radiation is indicated in the table.

Since mean values of total radiation were being sought for each month, a sufficient number of years of observations was desired to establish a reasonable long-term average. No fixed number can be assigned to the necessary period for all such data, there being considerably more variability year-to-year in some climates than others¹⁴. In general, averages were computed on the basis of all the available data, no matter what its duration. In some places, records of more than twenty years' duration were used. Approximately 220 stations can be considered to have good long-term averages. In many instances, however, data of only three years duration had to be used, and at a few stations only one year was available. In these cases, if nearby radiation records were not available, sunshine hours were also used to supplement the information. At nearly all locations, sunshine records were of sufficient duration to be representative averages. Table 2 shows the distribution of radiation data, by continent and by duration groups.

Methodology of Data Procurement

Data for the computation of monthly means of daily total radiation were procured through extensive literature searches, through personal communications with various weather bureaus and research organizations, and through use of World Meteorological Organization reports (particularly those reports and compilations resulting from IGY and IGC programs)¹⁵. As these data were received from the various sources they were standardized to monthly means of daily sums of total (direct and diffuse) solar radiation received on a horizontal surface in the units of gm cal per sq cm per day (langley per day). Generally, these data were provided in the form of daily or monthly totals and it was then necessary to convert these totals to cumulative monthly means for mapping purposes. These data were also standardized to the International Pyrheliometric Scale (IPS-1956). Data recorded on the Smithsonian (1913) scale were reduced by 2 percent and data recorded on the Angstrom (1905) scale were increased by 1.5 percent¹⁶.

Use of Sunshine Data for Estimating Radiation

The distribution of recorded solar radiation stations on the monthly maps shows that Central American, South American, polar and ocean regions, and Asia (with the exception of Japan) are characterized by either a sparseness or a very limited duration of radiation data. It was therefore necessary to supplement

TABLE 2—DURATION OF RADIATION RECORDS

Continent	Years of Radiation Records				
	10 or more	5 to 10	3 to 5	2	1
No. America.....	54	37	20	17	9
So. America.....	1	2	24	13	9
Europe.....	19	38	125	26	11
Africa.....	0	21	31	13	6
Asia.....	16	16	84	20	6
Australia.....	2	5	1	1	1
Antarctica.....	0	0	4	7	3
Oceans and Islands.....	0	5	14	4	3

these records by use of related information and approximation formulas.

Fortunately, in nearly all countries regular measurements of sunshine duration and cloudiness are made at numerous weather stations. These records generally cover long periods (i.e., 20 to 60 years) in contrast to the records of radiation. The daily sums of radiation have been shown to be functions of sunshine duration at a particular location, with the most common correlation being

$$Q = Q_0 \left(a + b \frac{S}{S_0} \right)$$

Here Q is the amount of radiation received at the surface location per day; Q_0 is the amount of radiation per day that is available at a point outside the atmosphere (a maximum for the location, assuming no atmospheric depletion); a and b are constants serving to correlate the radiation and sunshine; S is the number of hours of sunshine instrument-recorded at the site per day; and S_0 is the maximum number of hours of sunshine that are possible at the site per day, assuming an unobstructed horizon. This relationship is based on a development of Angstrom¹⁷; similar estimating procedures have been used by Fritz and MacDonald^{1, 2}, Black^{3, 4} and Ma-teer^{5, 6} for example.

The general method by which radiation was estimated from sunshine data involved first the determination of a and b by use of the equation for a location where both types of solar data are available. Values of a and b were determined for locations in several climatic types, in an effort to compensate for variations caused by general climatic differences. The use of universal-type constants and climatic-type constants was previously discussed by others^{14, 18}.

The resulting equations, with the computed values of a and b and with percent-of-possible sunshine data and Q_0 data, were then used in determining average radiation each month at locations in similar climates where only sunshine records were available.

The calculation of Q_0 and S_0 values for specific locations and months was simplified by use of existing ta-

bles. Values of Q_0 were obtained from Page¹⁸, who had listed monthly means at various latitudes 40°S to 40°N, based on the data of Milanovitch for the northern hemisphere and those of Drummond for the southern hemisphere. The solar constant used was 2.00 ly per min. Monthly curves were then plotted as Q_0 vs. latitude, so that values for specific locations and months could be readily determined. Values of S_0 were determined from tables of sunrise and sunset published by the U. S. Naval Observatory¹⁹.

The method of least squares was used for the determination of the constants a and b . Certain stations that offered fairly long-term radiation and sunshine records in a number of different climate types were then selected and the monthly averages analyzed by use of the relationships:

$$a = \frac{\sum y \sum x^2 - \sum x \sum xy}{N \sum x^2 - (\sum x)^2},$$

$$b = \frac{N \sum xy - \sum x \sum y}{N \sum x^2 - (\sum x)^2}$$

where N = the number of datum points, $x = S/S_0$, and $y = Q/Q_0$.

A quadratic expression and one using a square-root term were also fitted to the data, but the results did not vary significantly from those obtained with the linear fit. Hence, the linear relationship was selected.

Grouping the data in bimonthly, quarterly, and annual average values did not alter the constants significantly (± 5 percent deviation at the locations investigated), so for other than monsoon-type climates, where seasonal constants were computed, yearly constants were employed.

For climate classification, the world climatic maps of Trewartha were used^{21, 22}. Since these classifications are necessarily broad, differences within a given climatic classification were distinguished by reference to the vegetation maps of Kuchler²⁰.

After establishing a correlation between S/S_0 and Q (by determining a and b) for each climatic type (Table 3), sunshine records from each station which lacked radiation data were first reduced to monthly averages of daily percent possible sunshine (if not already in that form). Long-term monthly normals were next determined by averaging the monthly values. Each station was then classified as to climatic type, vegetation type, and the total range of variation in percentage possible sunshine. Monthly mean radiation levels were then calculated by use of the normal sunshine percentages and the equation derived specifically for each classification.

These computed radiation values are of course approximate, but they are found to be reasonably consistent with actual radiation measurements in a number of test locations.

Mapping

A cylindrical projection base map was selected for presenting the monthly maps of total solar radiation and for a map showing the location of data points. Both actual and estimated data were posted to the monthly base maps. Color coding was utilized to distinguish between actual and estimated data, and to indicate the term of the actual data. The color coding system was useful in judging the location of isolines for given radiation values.

An interval of 50 ly per day between radiation isolines was selected. This interval had been used in previous mapping efforts by others, thus facilitating comparisons. Other considerations were accuracy and utility. As the general distribution patterns became visible, this interval permitted distinguishing between isolines reasonably well. Moreover, the magnitude was small enough for climatic changes to be noted (i.e. as the interval became larger, the effects of variations in climate and topography tended to become obscured).

The base maps showing the radiation data were then used in positioning the isolines by interpolation. In addition to the radiation data, the following information was used in determining the final location of the isolines.

1—*Reliability of Averages*. Preference was given to longer-term data. Similarly, actual data representing relatively long-term periods were given greater weight than estimated values.

2—*Physical Situation*. Where reasonable and possible, consideration was given to macroclimate rather than micro-climate. That is, lines were drawn in recognition of the probable location of solar-process equipment. For example, radiation measurements made at the top of a mountain, above normal cloud levels and atmospheric pollutants, were not weighed heavily, as they would not indicate conditions at the probable sites of solar devices.

3—*Relationships Between Solar Radiation and Climate*. There is an interdependence of mean solar radiation and climate. In an effort to provide a more rational basis for interpolating between data points, climatic overlays (based on Trewartha's climate map^{21, 22}) were developed. Since climatic classifications are generalized and broad, vegetation overlays (based on maps of Kuchler²⁰) were also used. These helped, in certain cases, to provide a basis for estimating constants and interpreting differences in radiation levels within a given climatic classification.

Further assistance in locating the isolines was obtained through review of various publications on climate and meteorology. Local information was also provided by personal communication with meteorologists and solar workers in several geographic areas.

Upon evaluation of the data, it was decided to exclude most of the polar regions from the maps. Most of the

TABLE 3—CLIMATIC CONSTANTS FOR REGRESSION EQUATION

Location	Climate*	Veg.**	Sunshine Hours in Percentage of Possible		a	b
			Range	Avg		
Charleston, S. C.....	Cf	E	60-75	67	0.48	0.09
Atlanta, Ga.....	Cf	M	45-71	59	0.38	0.26
Miami, Fla.....	Aw	E-GD	56-71	65	0.42	0.22
Madison, Wis.....	Df	M	40-72	58	0.30	0.34
El Paso, Tex.....	BW	DSi	78-88	84	0.54	0.20
Poona, India (Monsoon) (Dry).....	Am	S	25-49	37	0.30	0.51
			65-89	81	0.41	0.34
Albuquerque, N. M.....	BS-BW	E	68-85	78	0.41	0.37
Malange, Angola.....	Aw-BS	GD	41-84	58	0.34	0.34
Hamburg, Germany.....	Cf	D	11-49	36	0.22	0.57
Ely, Nevada.....	BW	Bzi	61-89	77	0.54	0.18
Brownsville, Tex.....	BS	GD ^{sp}	47-80	62	0.35	0.31
Tamanrasset, Sahara.....	BW	DS ^p	76-88	83	0.30	0.43
Honolulu, Hawaii.....	Af	G	57-77	65	0.14	0.73
Blue Hill, Mass.....	D	D	42-60	52	0.22	0.50
Buenos Aires, Arg.....	Cf	G	47-68	59	0.26	0.50
Nice, France.....	Cs	SE	49-76	61	0.17	0.63
Darien, Manchuria.....	Dw	D	55-81	67	0.36	0.23
Stanleyville, Congo.....	Af	B	34-56	48	0.28	0.39

* Climatic classification based on Trewartha's climate map (see ref. 21, 22).

** Vegetation classification based on Küchler's map (see ref. 20).

Cf—Continental, continuously moist	BZ—Broadleaf evergreen, dwarf shrub form
Cs—Continental with dry season during summer	D—Broadleaf deciduous trees
Df—Snow forest, continuously moist	DS—Broadleaf deciduous, shrub form
Dw—Snow forest, dry season in winter	E—Needleleaf evergreen trees
Aw—Tropical forest, dry season in winter	G—Grass
Am—Tropical forest, monsoon rains	GD—Grass and broadleaf deciduous trees
Af—Tropical forest, continuously moist	M—Mixed: broadleaf deciduous and needle-leaf evergreen trees
B—Broadleaf evergreen	S—Semideciduous: broadleaf evergreen and broadleaf deciduous trees

data from these regions were compiled during the IGY-IGC program, and their duration was thus limited to a maximum of 2½ years. Sunshine-hours information was also inadequate.

Solar-Radiation Maps

The distribution of solar radiation throughout the world has been compiled in the form of twelve monthly maps¹² four of which are reproduced here. These are for March, June, September, and December, representing solar conditions for the months of equinoxes and solstices. Another map shows the location of radiation and sunshine recording stations from which data were obtained.

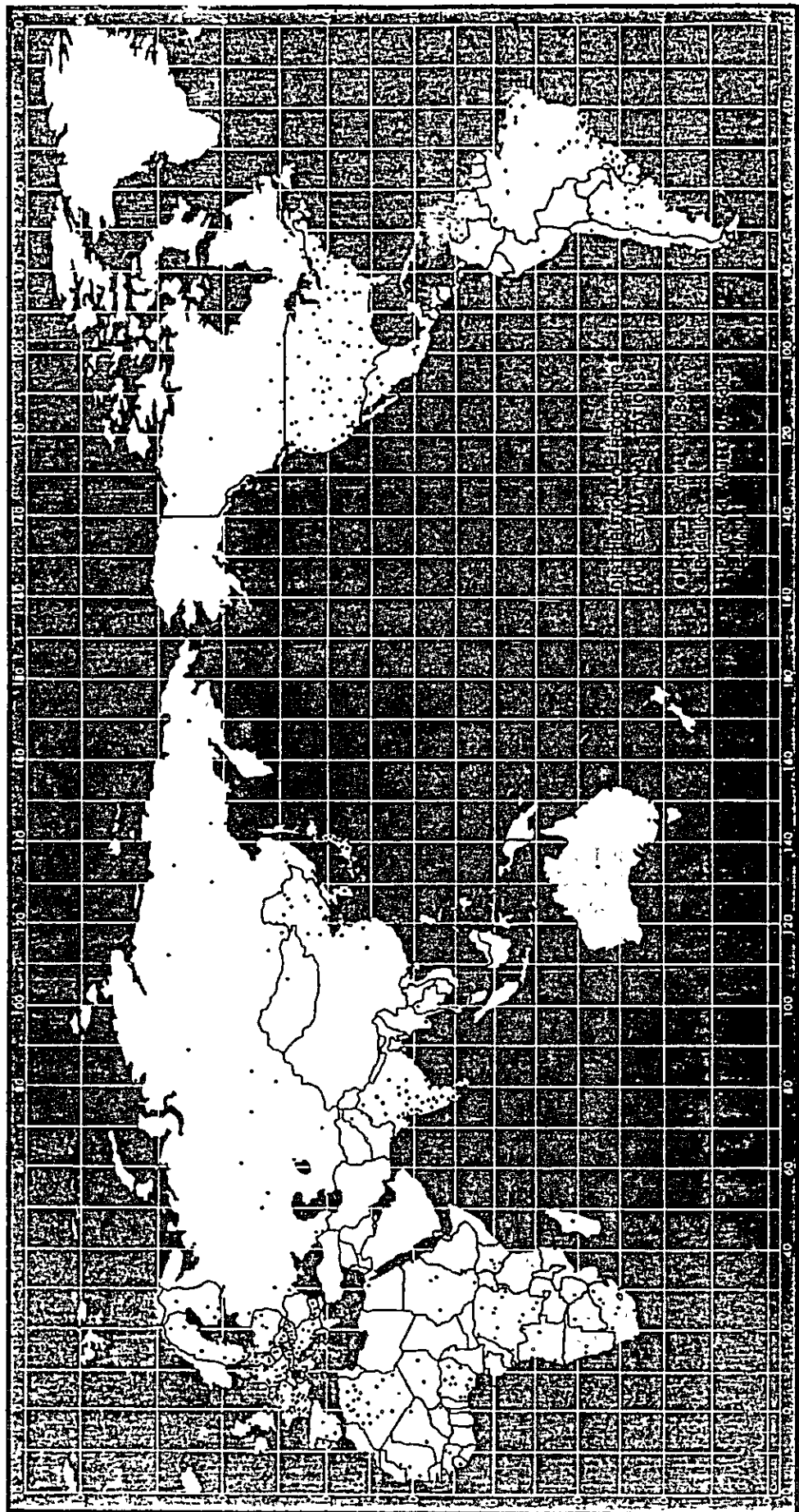
It is seen from the station map, Fig. 1, that abundant solar radiation data are available in the United States, in western Europe, in Japan, and to a somewhat lesser extent in Africa south of the equator. Limited radiation records are available in Australia, eastern Europe, and in parts of South America. The balance of the radiation measurements obtained are widely scattered. The regions where sunshine data were used to the greatest extent (i.e. where radiation data were sparse) include parts of South America and Mexico, China, India, northern and western Africa, and France.

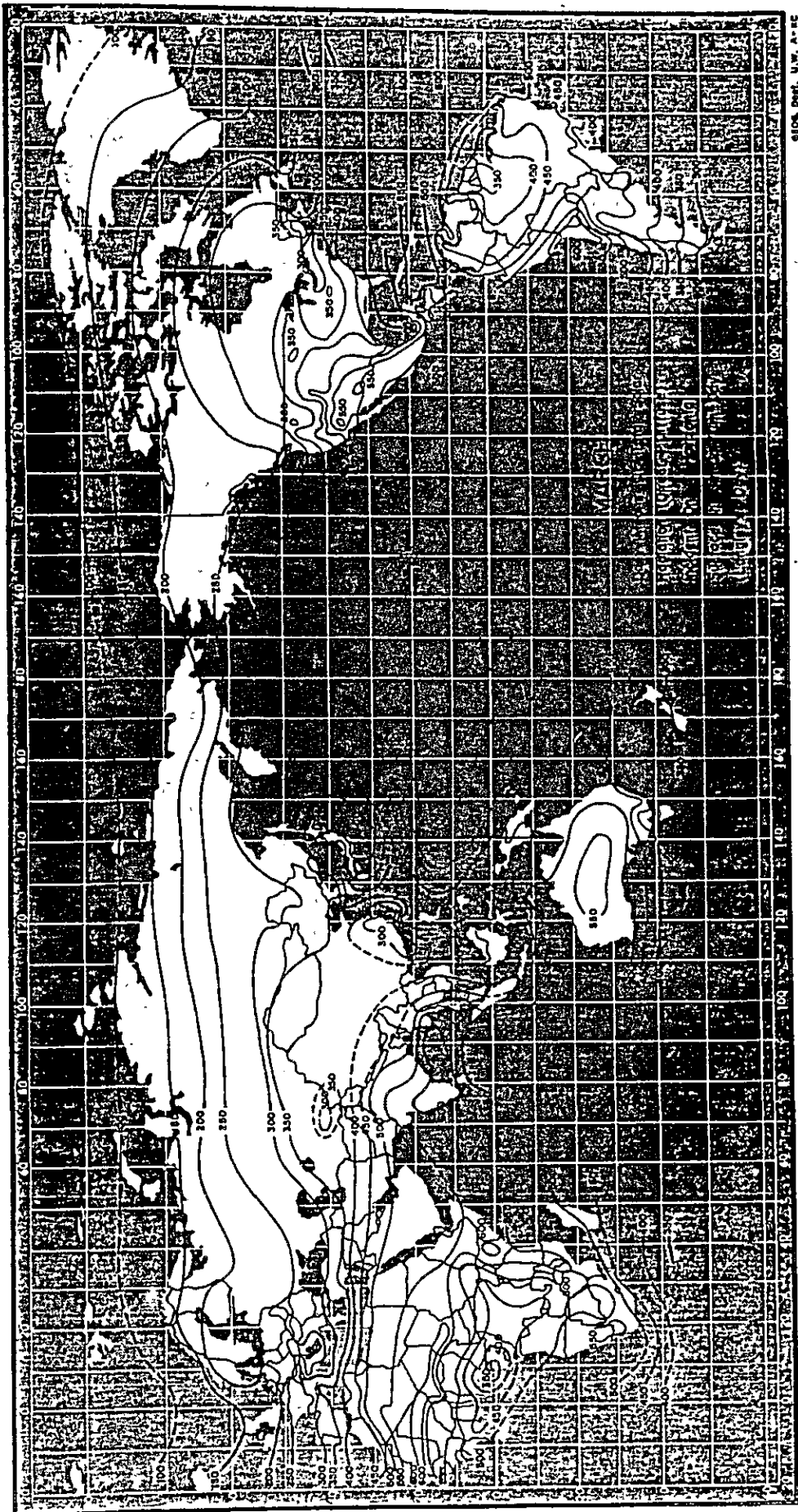
A few observations on the radiation maps are in order. First, it must be recognized that the scarcity of data in many areas necessarily limits the accuracy of the results in such regions. Secondly, there can be no attempt in such a broad world study to assess micro-climatic variability in regions where high mountains or other local geographic conditions cause substantial variation in cloud cover between points a few miles to a few hundred miles apart. However, variation in solar radiation due to major geographic factors such as large mountain chains, ocean currents, desert regions at high and low altitude, etc., are seen and are of major significance.

Values represented by the isolines range from fifty to maxima of 750 ly per day. Although not shown on the maps (but contained in the full tabulation of data from all stations used in the compilation¹²) the maximum average monthly value of solar radiation anywhere in the world is at the South Pole, where December averages are nearly 1,000 ly per day.

Isolines formed by dashes on the maps indicate rough estimates based upon very little data (perhaps one measurement) and symmetry with adjacent radiation contours of greater reliability. In some areas, dashes were used to connect solid lines to facilitate reading. No

(Continued on p. 37)





Scale Dept. U.S. A.C.