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VEGETATION, LAND-USE AND SEASONAL ALBEDO
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ATLAS OF ARCHIVED VEGETATION, LAND-USE AND SEASONAL ALBEDO DATA SETS

Elaine Matthews

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National Aeronautics and
Space Administration

Goddard Space Flight Center
Institute for Space Studies
New York, New York 10025

Atlas of Archived Vegetation, Land-Use and
Seasonal Albedo Data Sets

E. Matthews
Sigma Data Services
NASA-Goddard Space Flight Center
Institute for Space Studies
2880 Broadway
New York, New York 10025

Introduction

Global digital data base of natural vegetation and land use were compiled at 1° resolution from over 100 published sources (Matthews, 1983) for use in climate studies. A series of 6 data sets, derived from the original compilations, was prepared and archived on tape at the National Center for Atmospheric Research (NCAR) (Matthews, 1984). The first is a vegetation data set representing natural (pre-agricultural) vegetation based on the UNESCO (1973) classification system. The 178 vegetation types distinguished in the original compilation were grouped into 32 types for the archived tape. The second, derived from the land-use compilation, is a cultivation-intensity data set defining the areal extent (expressed as %) of presently-cultivated land in the 1° cells. The land-use data, classified according to a system developed by the author, included 119 land-use types which were grouped into 5 cultivation-intensity groups (see Matthews, 1983) for the archived tape. The last four are present integrated surface albedo data sets (January, April, July, October) for snow-free conditions, incorporating natural-vegetation and cultivation characteristics from the vegetation and cultivation-intensity data sets. Each of these data sets covers the entire land surface of the earth. They all include non-zero data for permanent land only, including continental ice; water, including oceans and lakes, is zero.

This report includes maps, presented by continent, of the complete archived data, with the exception of Antarctica. This series of maps is designed to be used independently or as a complement to the archived data. For the sake of brevity, the reader is referred to Matthews (1983) for a complete discussion of the vegetation and land-use data bases, including classification systems, methodology, compilation sources and results.

There are several differences between the presentation of these data in Matthews (1983, 1984) and in the present work. First, both the original vegetation compilation and the archived vegetation data set include 81 points designated as cultivation in areas of Southwest Asia with long use histories for which vegetation data were not readily available. These 81 points have been revised with natural-vegetation designations and are mapped here with these revisions. The four seasonal albedo data sets, since they were derived from the vegetation and cultivation-intensity data bases, underwent associated revisions which are incorporated in the maps presented here. All revisions to the vegetation and albedo data sets are detailed in Appendices 1 and 2, respectively, for tape users. Secondly, several changes in map symbols have been made simply to allow for ease in reading the maps. These symbol modifications are noted in the legends that accompany the maps (Tables 1.A and 3.A.2). Lastly, albedo-map symbols in Matthews (1984) were associated with truncated albedo values; here, they are associated with rounded albedo values.

For easy reference, the figures and tables of this report have been numbered consistently as follows:

Fig. 1 : VEGETATION

- 1.A : North America
- 1.B : South America
- 1.C : Western Europe
- 1.D : Africa
- 1.E : Asia
- 1.F : Australia

Fig. 2 : CULTIVATION
INTENSITY

- 2.A : North America
 - 2.B : South America
 - 2.C : Western Europe
 - 2.D : Africa
 - 2.E : Asia
 - 2.F : Australia
-

Table 1 : VEGETATION

- 1.A : map legend for Figs.
1.A-1.F

Table 2 : CULTIVATION
INTENSITY

- 2.A : map legend for Figs.
2.A-2.F
-

Fig. 3 : ALBEDO

3.A - North America
3.A.1: January
3.A.2: April
3.A.3: July
3.A.4: October

3.B - South America
3.B.1: January
3.B.2: April
3.B.3: July
3.B.4: October

3.C - Western Europe
3.C.1: January
3.C.2: April
3.C.3: July
3.C.4: October

3.D - Africa
3.D.1: January
3.D.2: April
3.D.3: July
3.D.4: October

3.E - Asia
3.E.1: January
3.E.2: April
3.E.3: July
3.E.4: October

3.F - Australia
3.F.1: January
3.F.2: April
3.F.3: July
3.F.4: October

Table 3 : ALBEDO

3.A.1: 4 seasonal albedos
for 32 types
3.A.2: map legend for Figs.
3.A.1-3.F.4

Table 1.A. The thirty-two vegetation types, briefly described in col. 3, are mapped in Figs. 1.A through 1.F using map symbols listed in col. 2.

1	2	3
Vegetation Type	Map Symbol	Description
1	1 . . .	tropical evergreen rainforest, mangrove forest
2	2 . . .	tropical/subtropical evergreen seasonal broadleaved forest
3	3 . . .	subtropical evergreen rainforest
4	4 . . .	temperate/subpolar evergreen rainforest
5	5 . . .	temperate evergreen seasonal broadleaved forest, summer rain
6	6 . . .	evergreen broadleaved sclerophyllous forest, winter rain
7	7 . . .	tropical/subtropical evergreen needleleaved forest
8	8 . . .	temperate/subpolar evergreen needleleaved forest
9	9 . . .	tropical/subtropical drought-deciduous forest
10	A . . .	cold-deciduous forest, with evergreens
11	B . . .	cold-deciduous forest, without evergreens
12	C . . .	xeromorphic forest/woodland
13	D . . .	evergreen broadleaved sclerophyllous woodland
14	E . . .	evergreen needleleaved woodland
15	F . . .	tropical/subtropical drought-deciduous woodland
16	G . . .	cold-deciduous woodland
17	H . . .	evergreen broadleaved shrubland/thicket, evergreen dwarf-shrubland
18	I . . .	evergreen needleleaved or microphyllous shrubland/thicket

1	2	3
Vegetation Type	Map Symbol	Description
19	J . . .	drought-deciduous shrubland/thicket
20	K . . .	cold-deciduous subalpine/subpolar shrubland, cold-deciduous dwarf shrubland
21	L . . .	xeromorphic shrubland/dwarf shrubland
22	M . . .	arctic/alpine tundra, mossy bog
23	N . . .	tall/medium/short grassland with 10-40% woody tree cover
24	O . . .	tall/medium/short grassland with <10% woody tree cover or tuft-plant cover
25	P . . .	tall/medium/short grassland with shrub cover
26	Q . . .	tall grassland, no woody cover
27	R . . .	medium grassland, no woody cover
28	S . . .	meadow, short grassland, no woody cover,
29	T . . .	forb formations
30	- ¹ . . .	desert
31	* ² . . .	ice
32	W . . .	cultivation

¹ map symbol was 'U' in Matthews (1983; 1984)

² map symbol was 'V' in Matthews (1983; 1984)

Fig. 1.A. Vegetation map of North America. Legend: Table 1.A

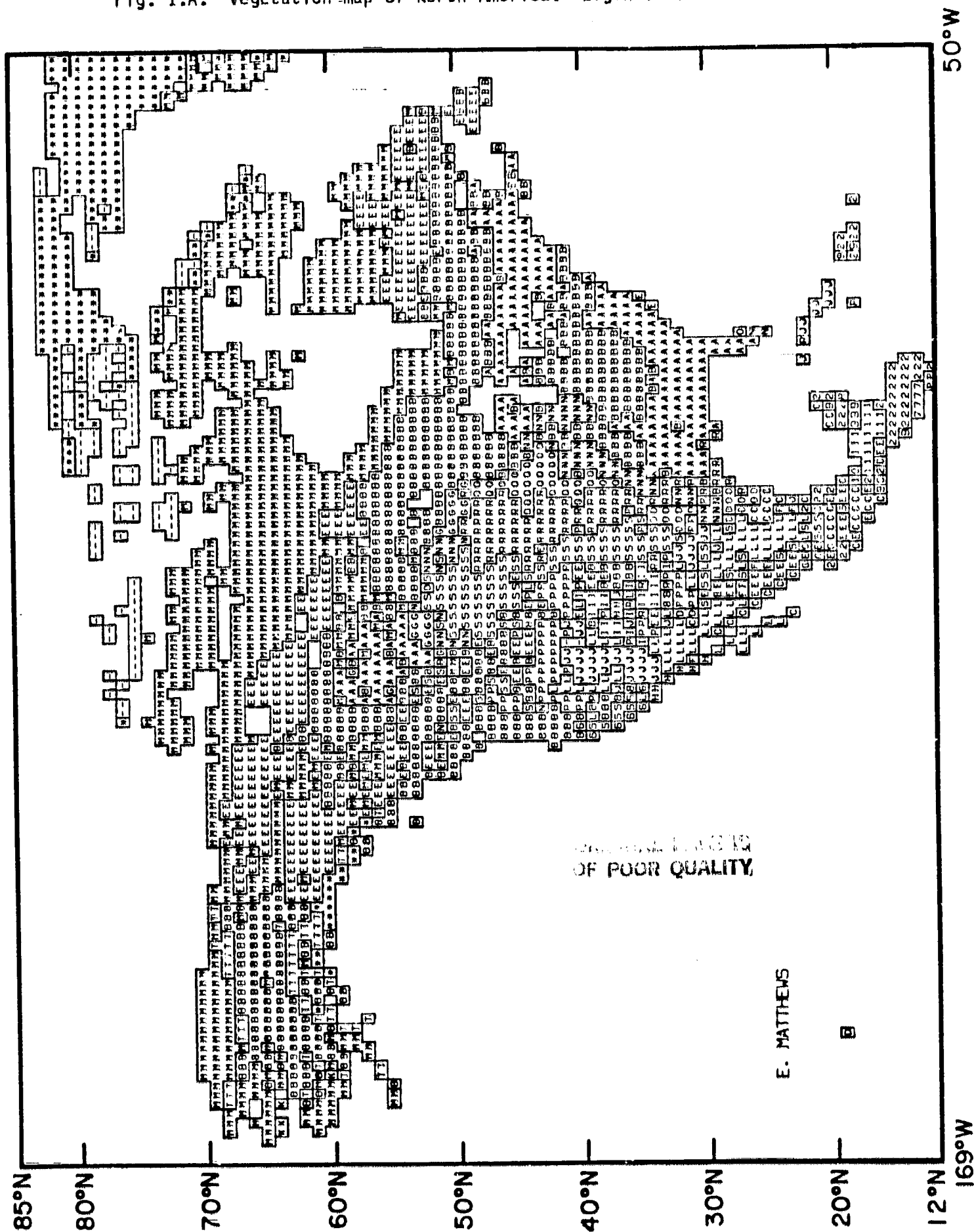


Fig. 1.B. Vegetation map of South America. Legend: Table 1.A

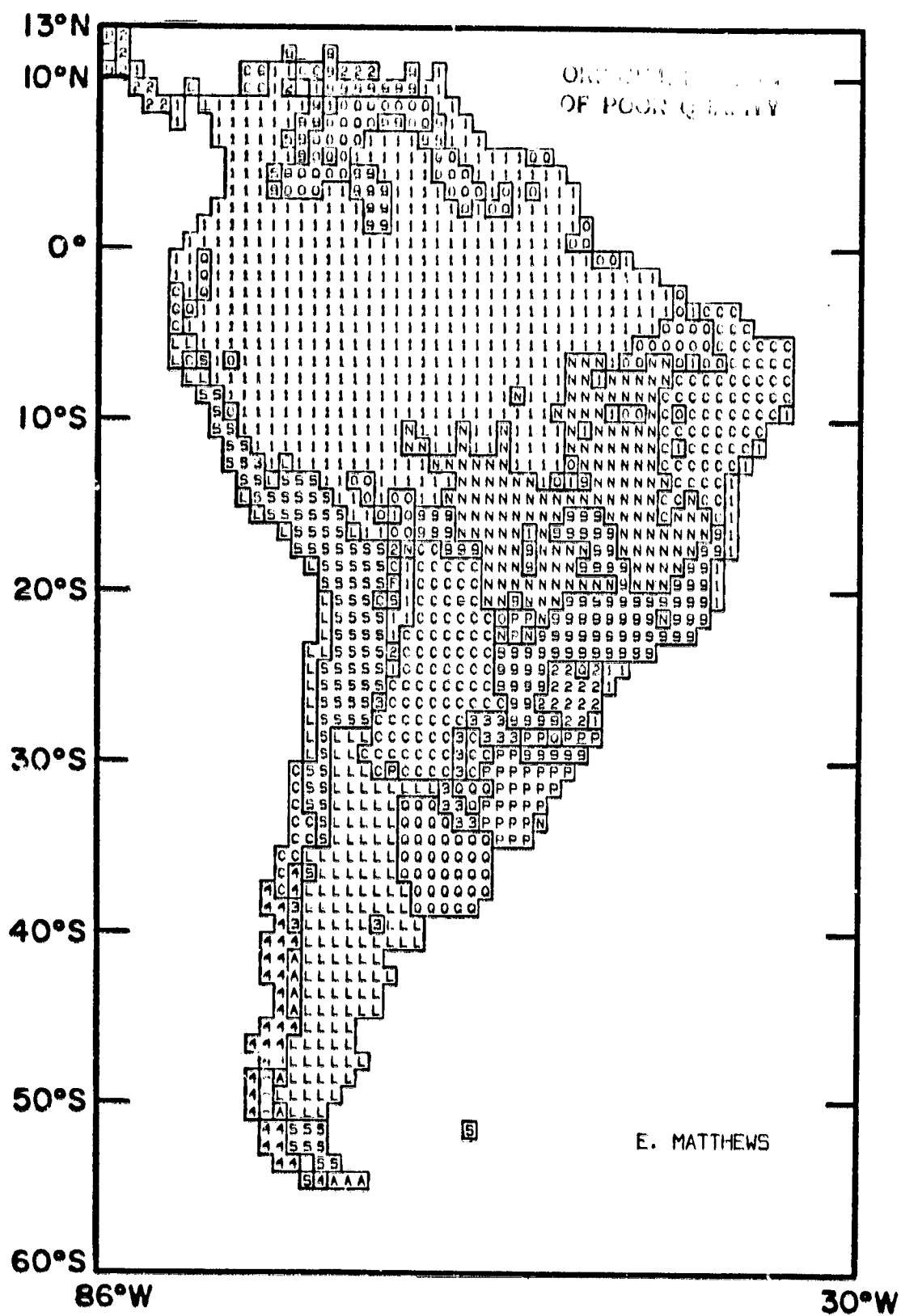


Fig. 1.C. Vegetation map of Western Europe. Legend: Table 1.A

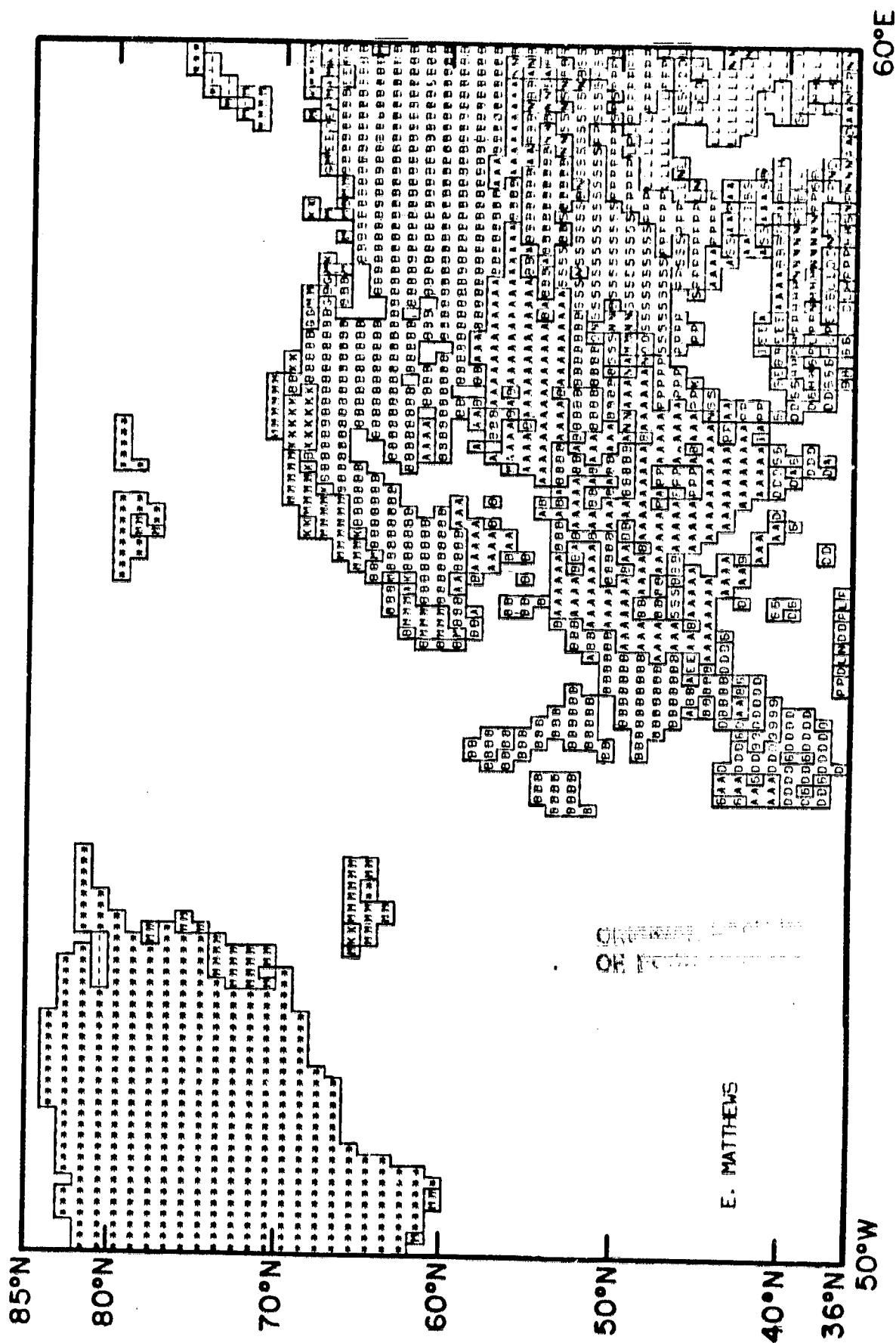


Fig. 1.D. Vegetation map of Africa. Legend: Table 1.A

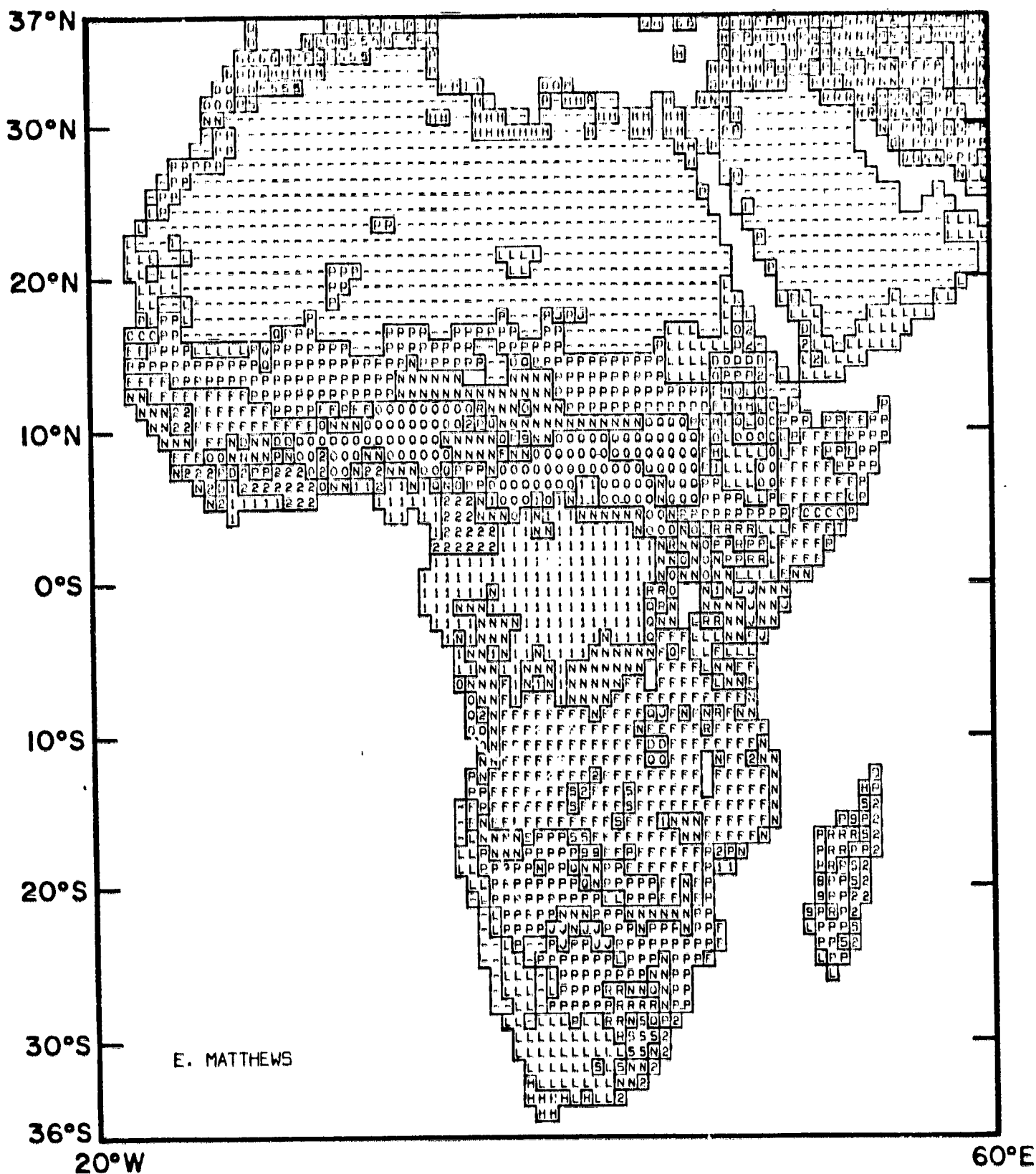


Fig. 1.E. Vegetation map of Asia. Legend: Table 1.A

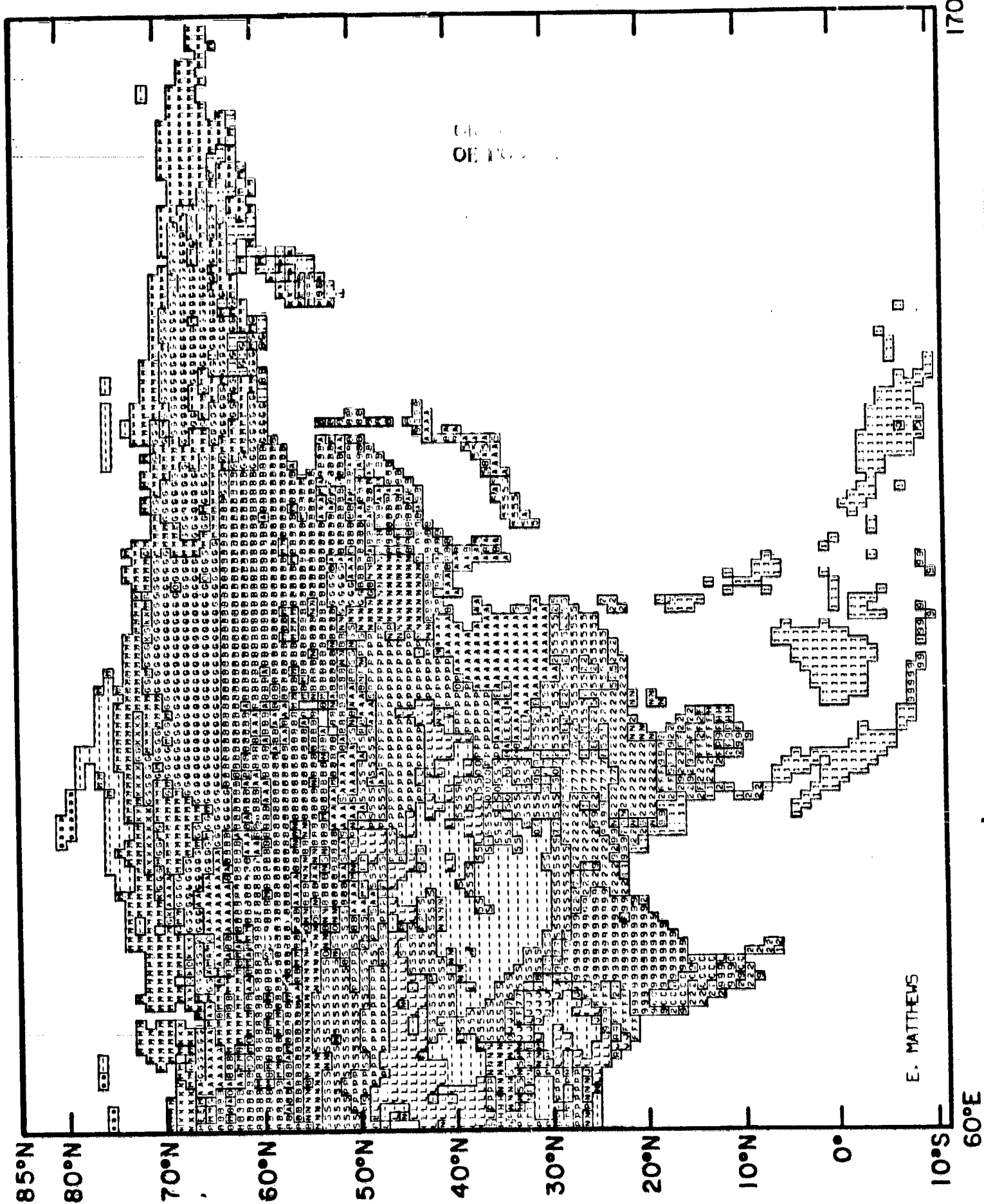


Fig. 1.F. Vegetation map of Australia. Legend: Table 1.A

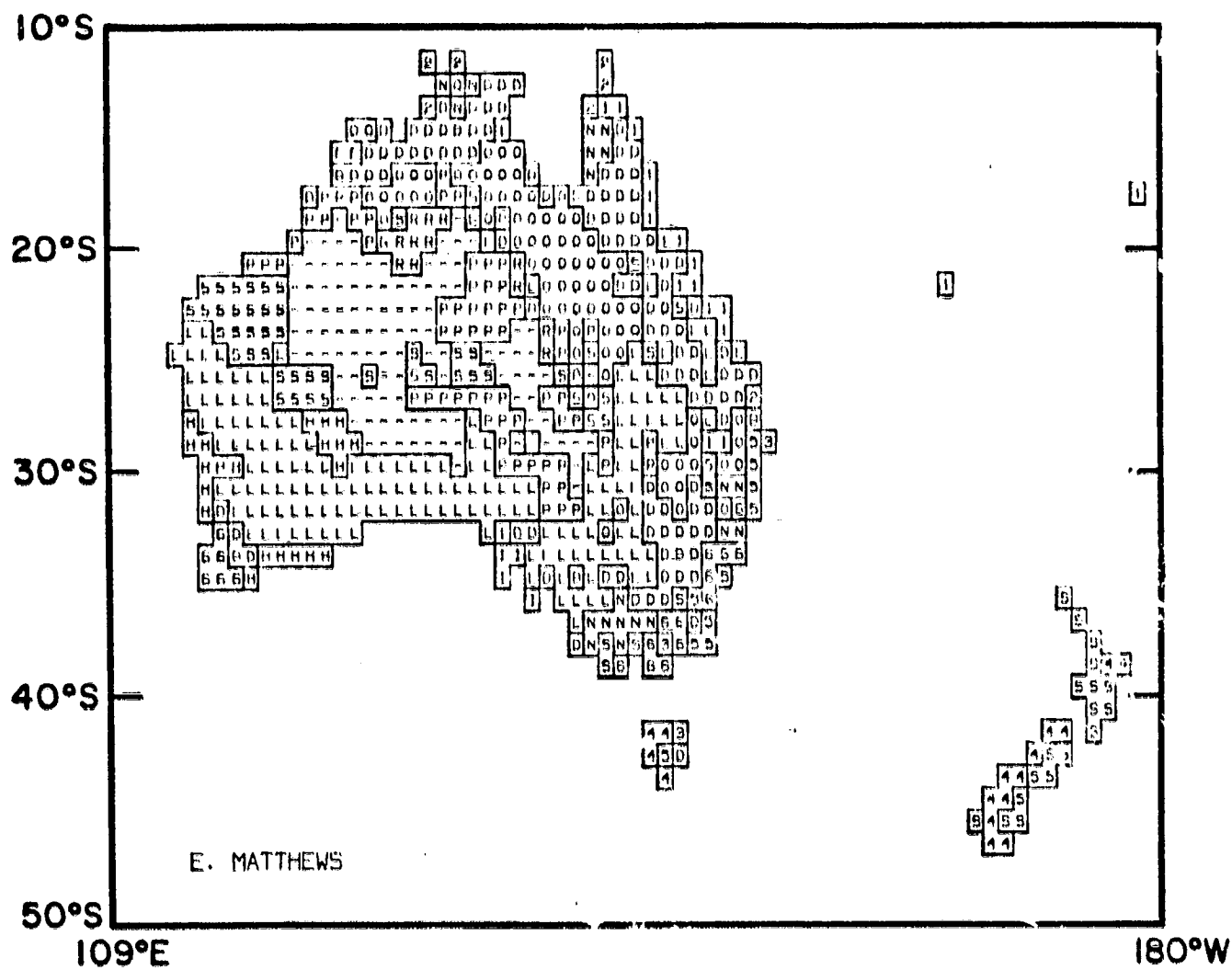


Table 2.A. Cultivation intensities, ranging from 1 to 5, translate into % cultivated and % natural vegetation as shown. Map symbols were used to map cultivation intensities in Figs. 2.A through 2.F.

Cultivation Intensity	Map Symbol	Description	
		% cultivated	% natural vegetation
1	-*	0	100
2	2	20	80
3	3	50	50
4	4	75	25
5	5	100	0

* map symbol was '1' in Matthews (1983; 1984)

Fig. 2.A. Cultivation-intensity map of North America. Legend: Table 2.A

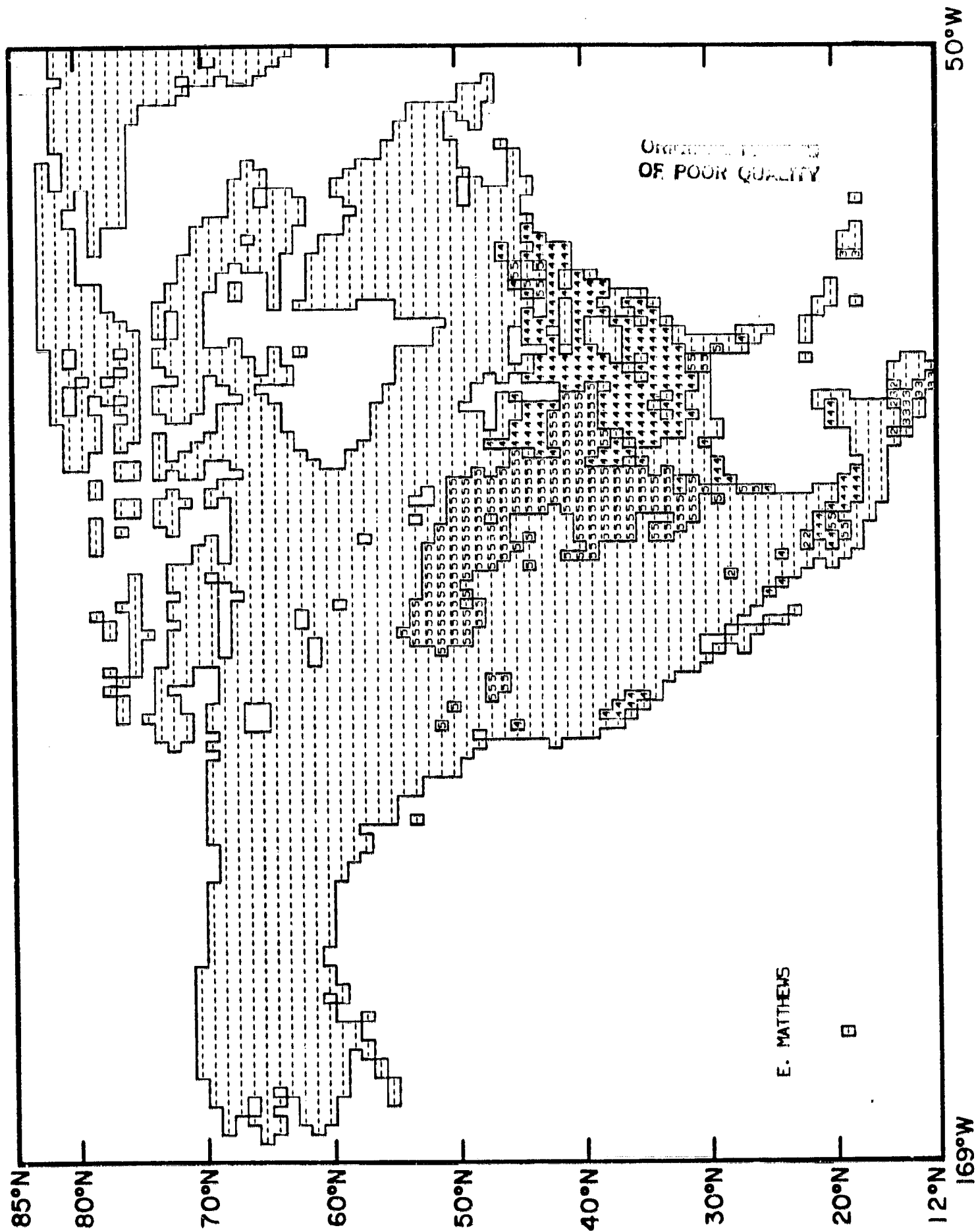
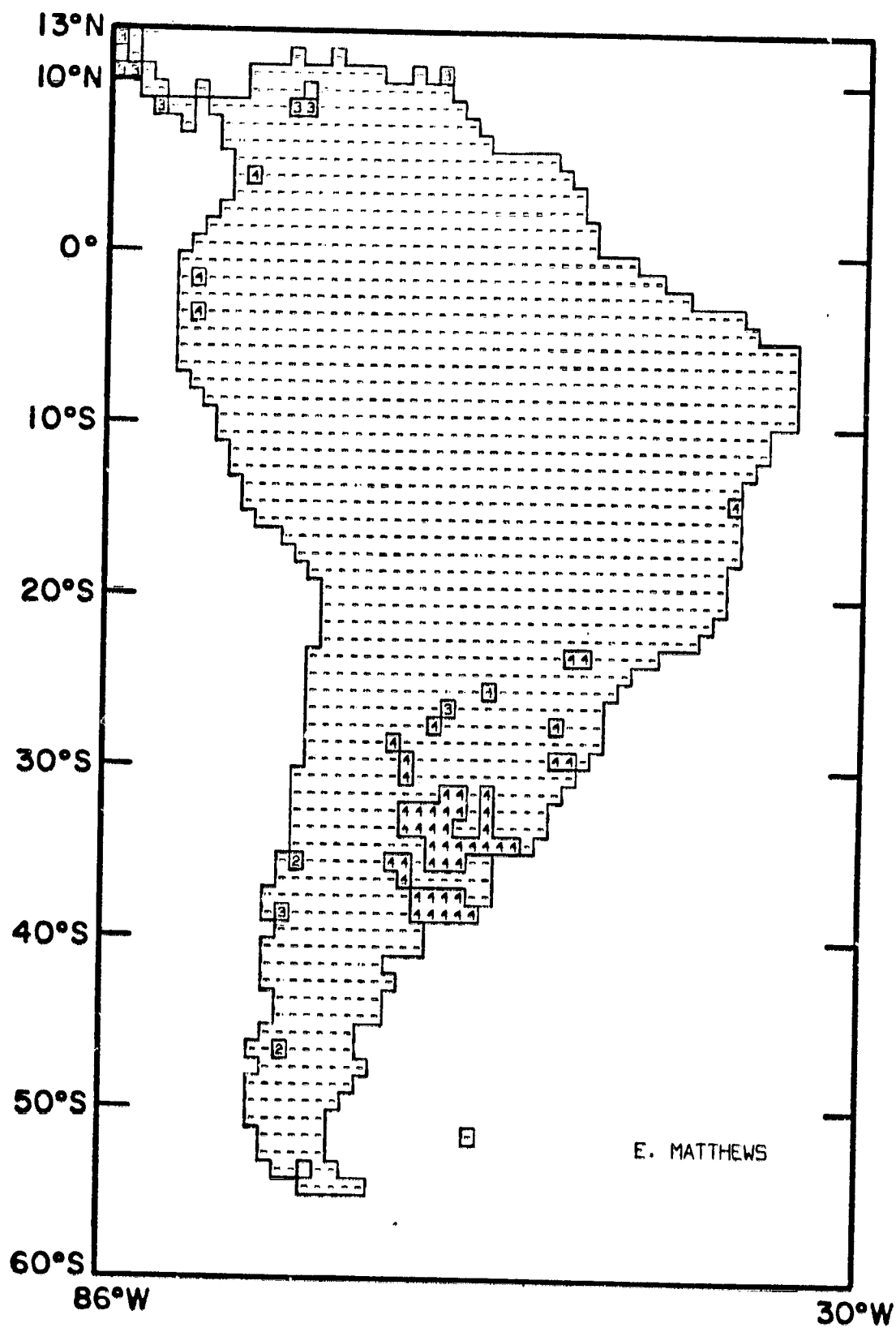


Fig. 2.B. Cultivation-intensity map of South America. Legend: Table 2.A



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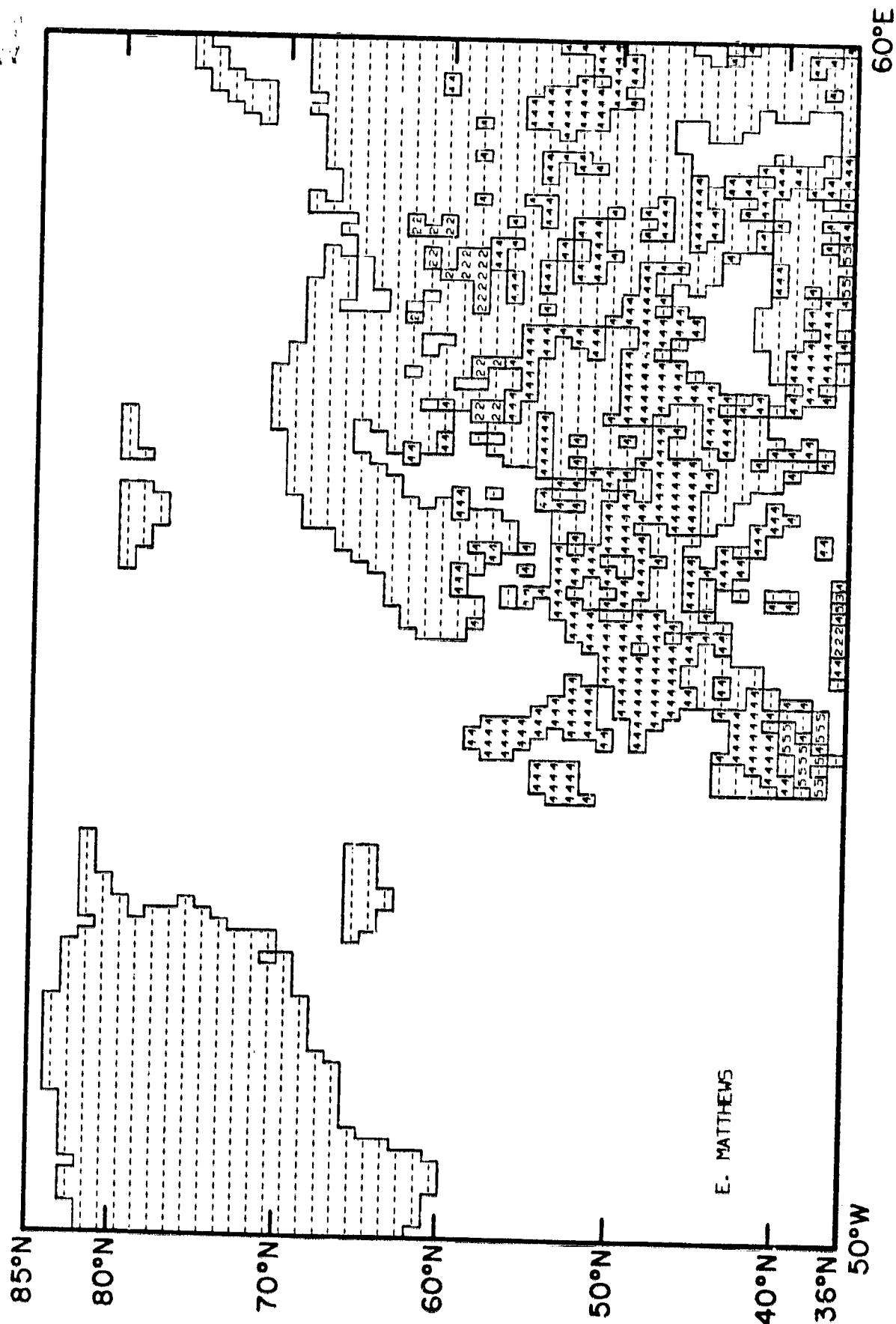


Fig. 2.D. Cultivation-intensity map of Africa. Legend: Table 2.A

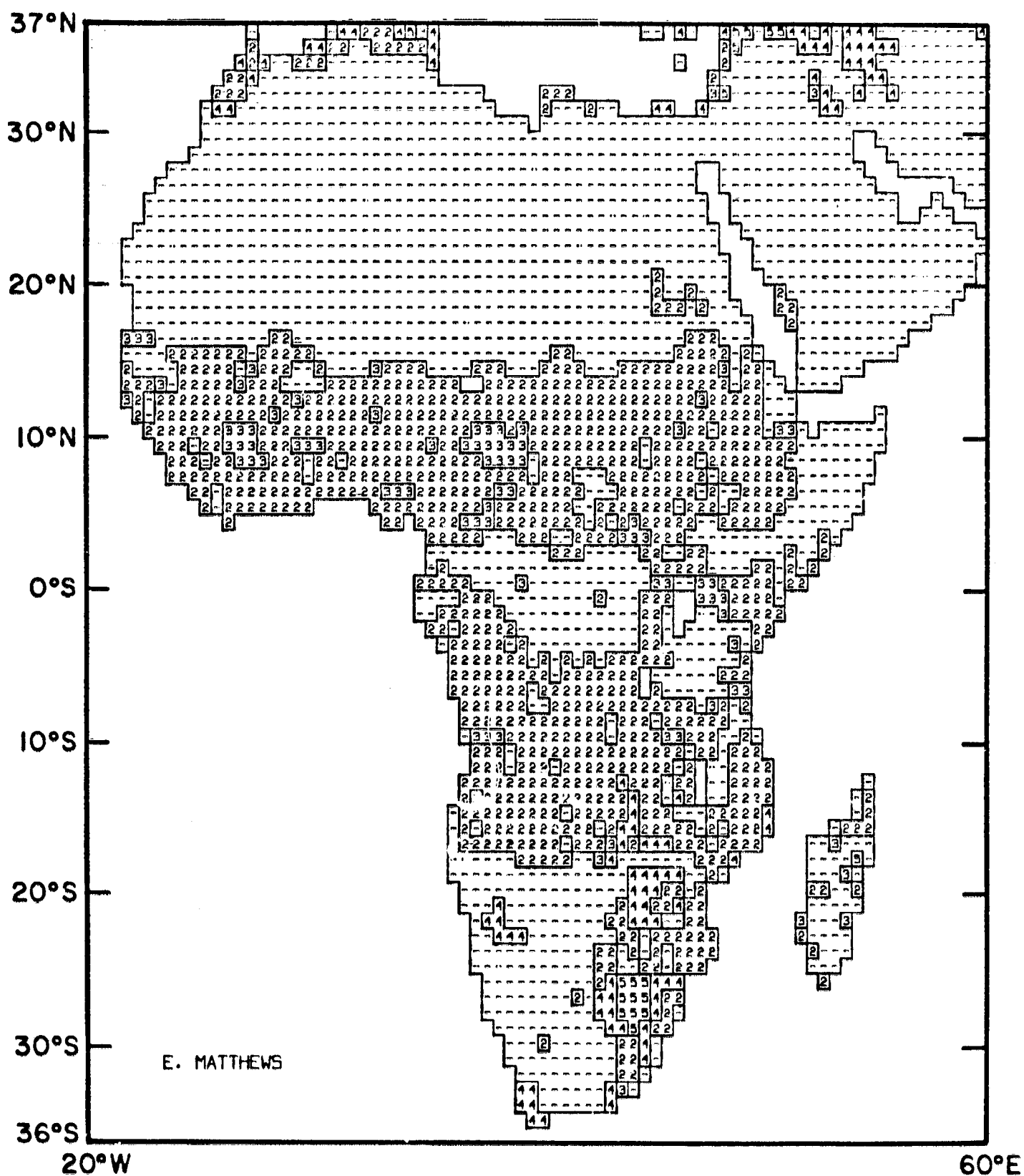
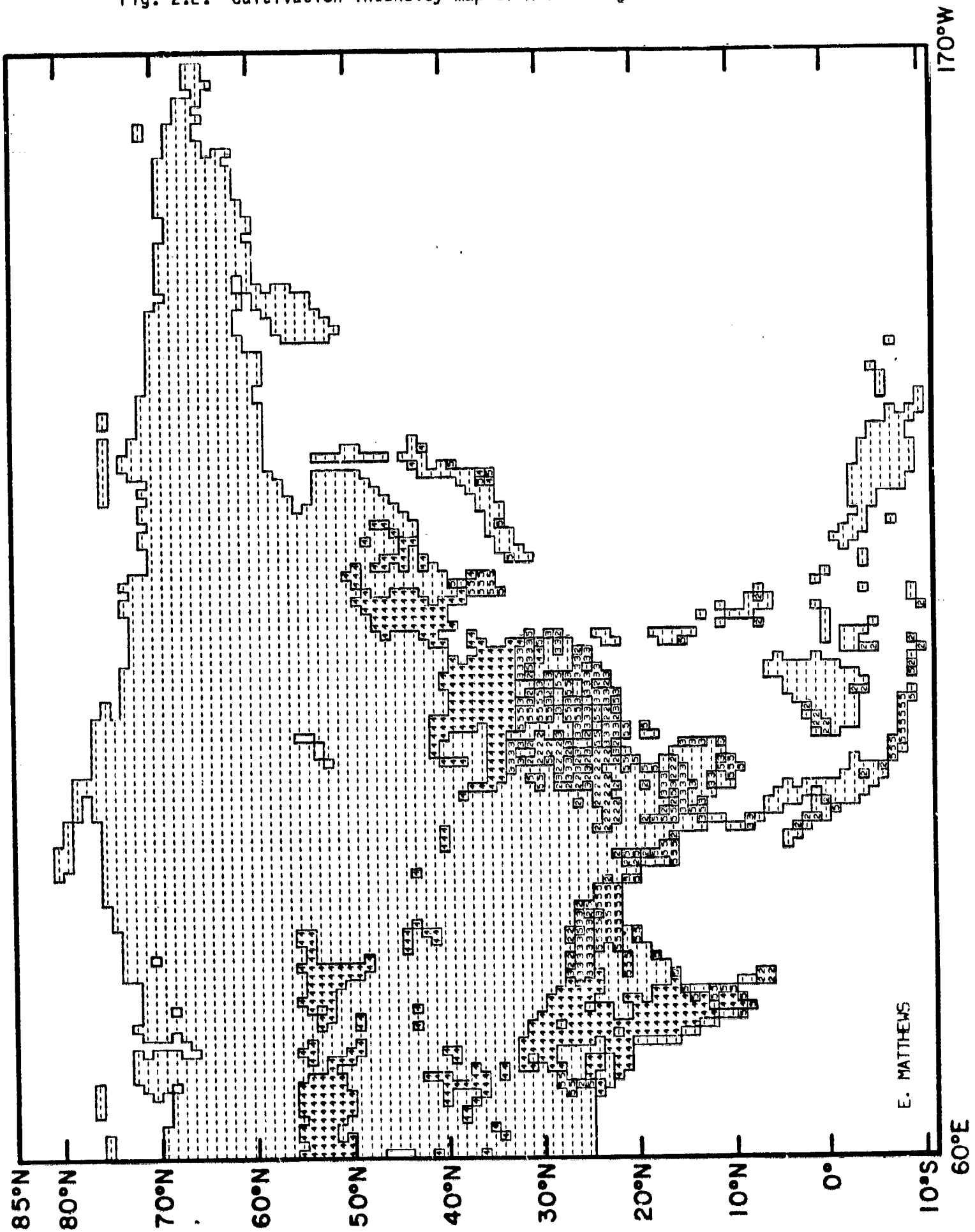


Fig. 2.E. Cultivation-intensity map of Asia. Legend: Table 2.A



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Fig. 2.F. Cultivation-intensity map of Australia. Legend: Table 2.A

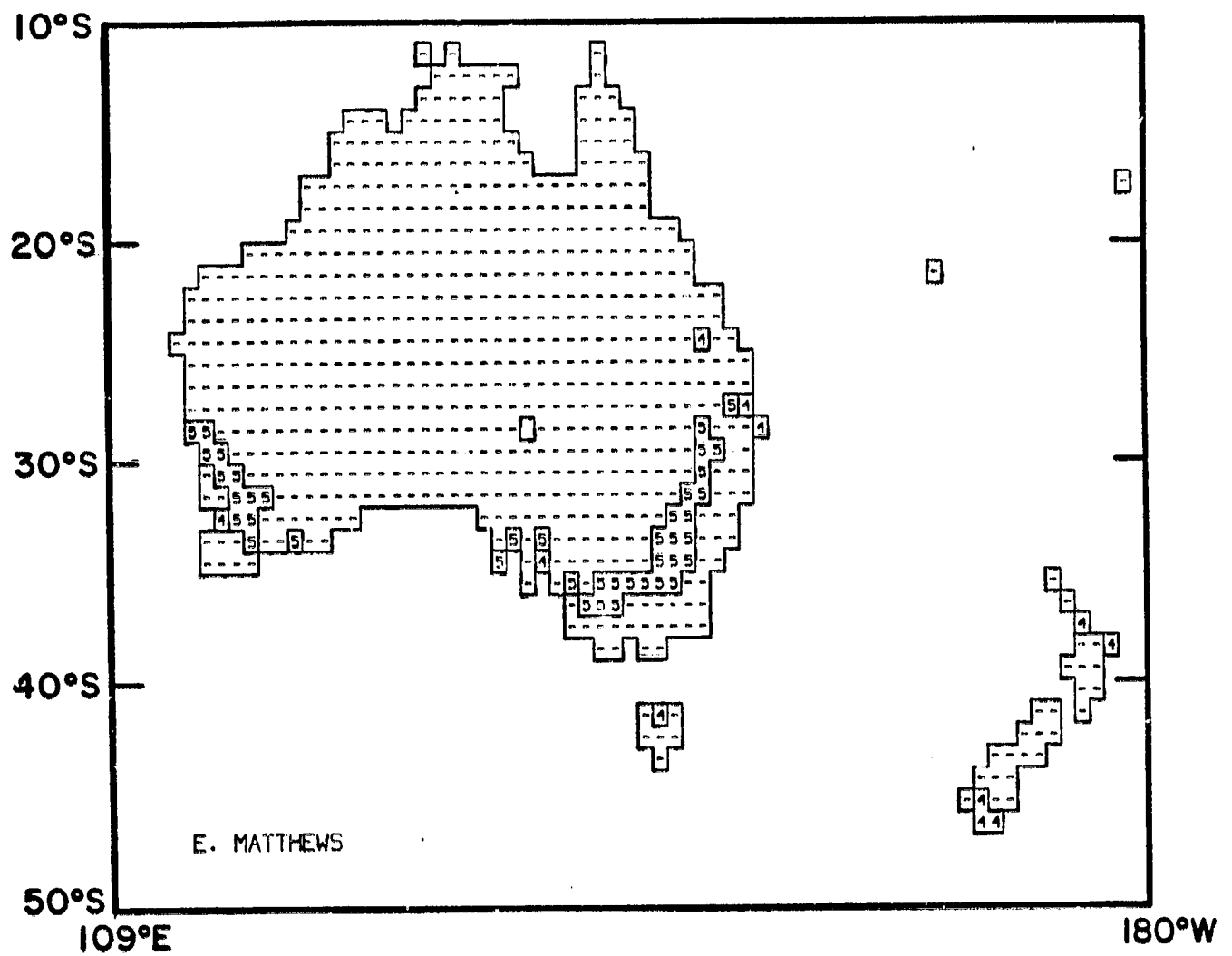


Table 3.A.1. Seasonal snow-free, integrated albedos for 32 vegetation types listed in Table 1.A. The winter, spring, summer and fall values correspond to January, April, July and October in the northern hemisphere and to July, October, January and April in the southern hemisphere. The appropriate seasonal values were used, in conjunction with the vegetation and cultivation-intensity data bases, to produce albedo data sets for January, April, July and October.

VEGETATION	WINTER	SPRING	SUMMER	FALL
1	11	11	11	11
2	11	11	11	11
3	11	11	11	11
4	12	12	12	12
5	12	13	14	13
6	17	14	13	14
7	13	14	16	13
8	11	12	15	12
9	18	16	15	16
10	12	15	18	13
11	12	15	18	13
12	28	32	28	28
13	15	13	12	13
14	14	14	16	14
15	20	18	17	18
16	14	14	17	14
17	15	15	18	15
18	15	15	18	15
19	17	20	20	17
20	17	20	20	17

VEGETATION	WINTER	SPRING	SUMMER	FALL
21	28	32	28	28
22	12	12	17	15
23	14	15	17	15
24	14	15	16	14
25	16	18	25	20
26	17	17	20	17
27	16	20	20	18
28	16	20	20	18
29	16	20	20	18
30	30	30	30	30
31	75	75	75	75
32	16	18	20	18

Table 3.A.2. Symbols used to map albedos in Figs. 3.A.1 through 3.F.4.

Albedo	Map Symbol
1.	1
2.	2
3.	3
4.	4
5.	5
6.	6
7.	7
8.	8
9.	9
10.	A
11.	B
12.	C
13.	D
14.	E
15.	F
16.	G
17.	H
18.	I
19.	J
20.	K
21.	L
22.	M
23.	N
24.	O
25.	P
26.	Q
27.	R
28.	S
29.	T
30.	U
31.	V
32.	W
33.	X
34.	Y
35.	Z
>35.	*

Fig. 3.A.1. January albedo map of North America. Legend: Table 3.A.2

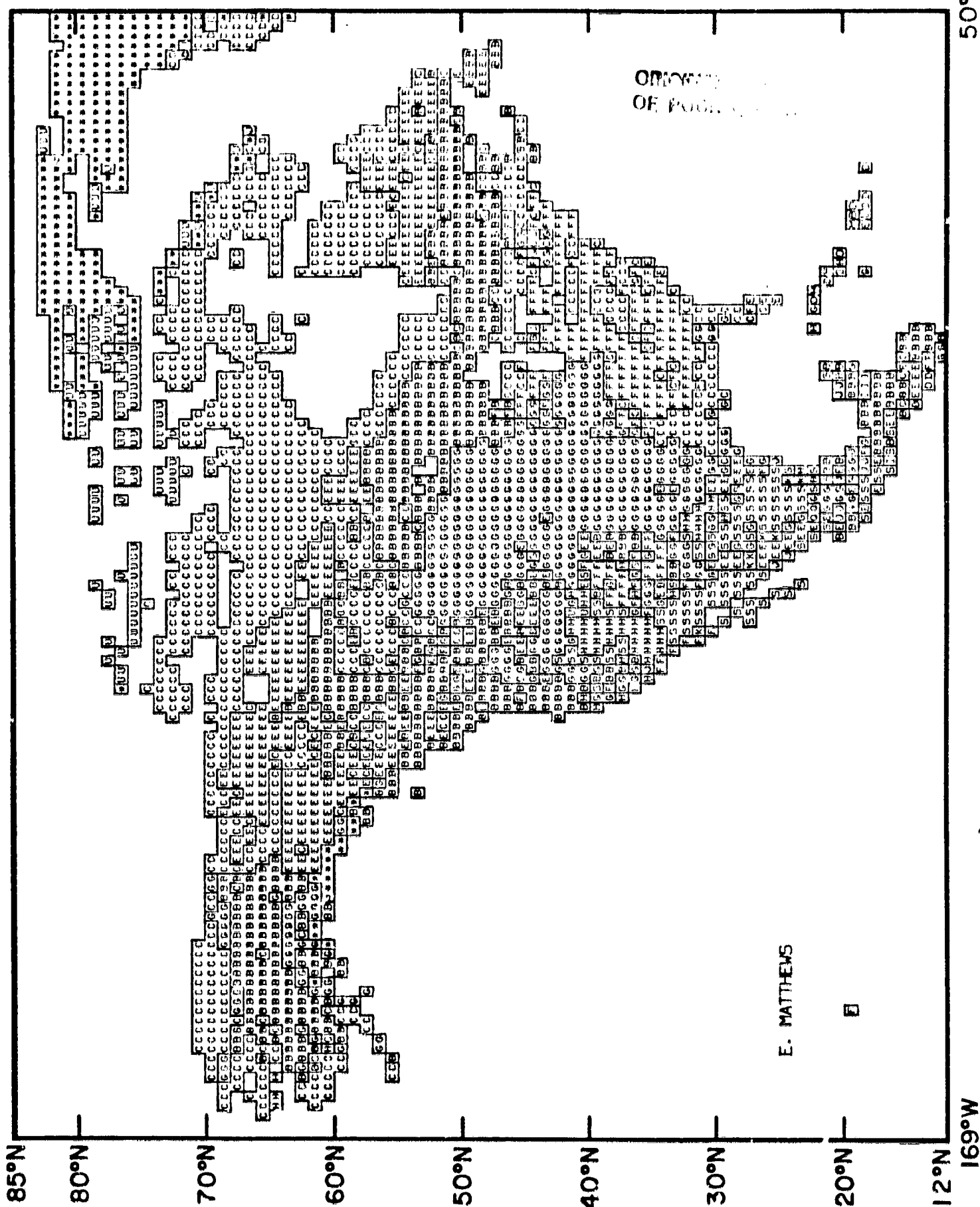


Fig. 3.A.2. April albedo map of North America. Legend: Table 3.A.2

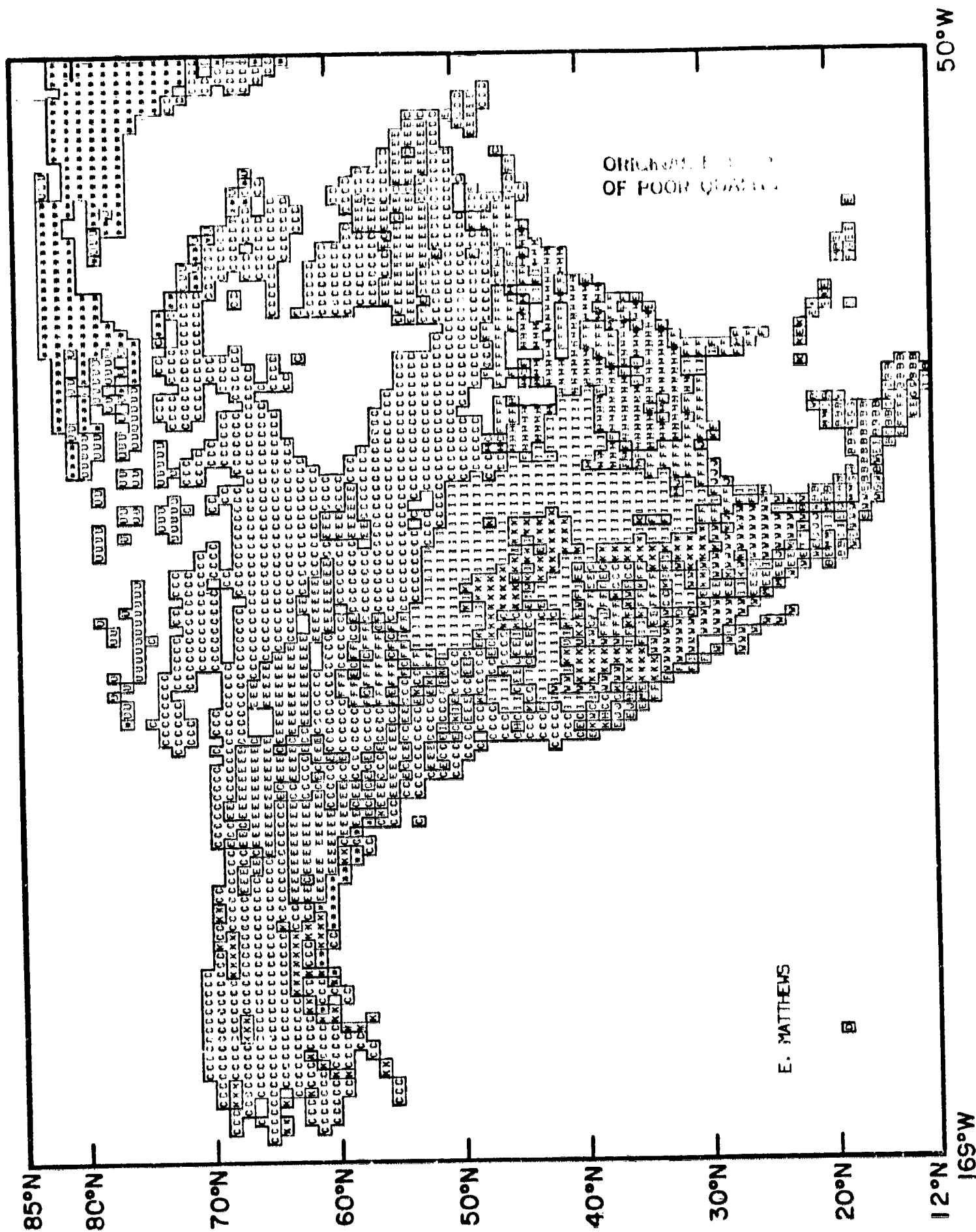


Fig. 3.A.3. July albedo map of North America. Legend: Table 3.A.2

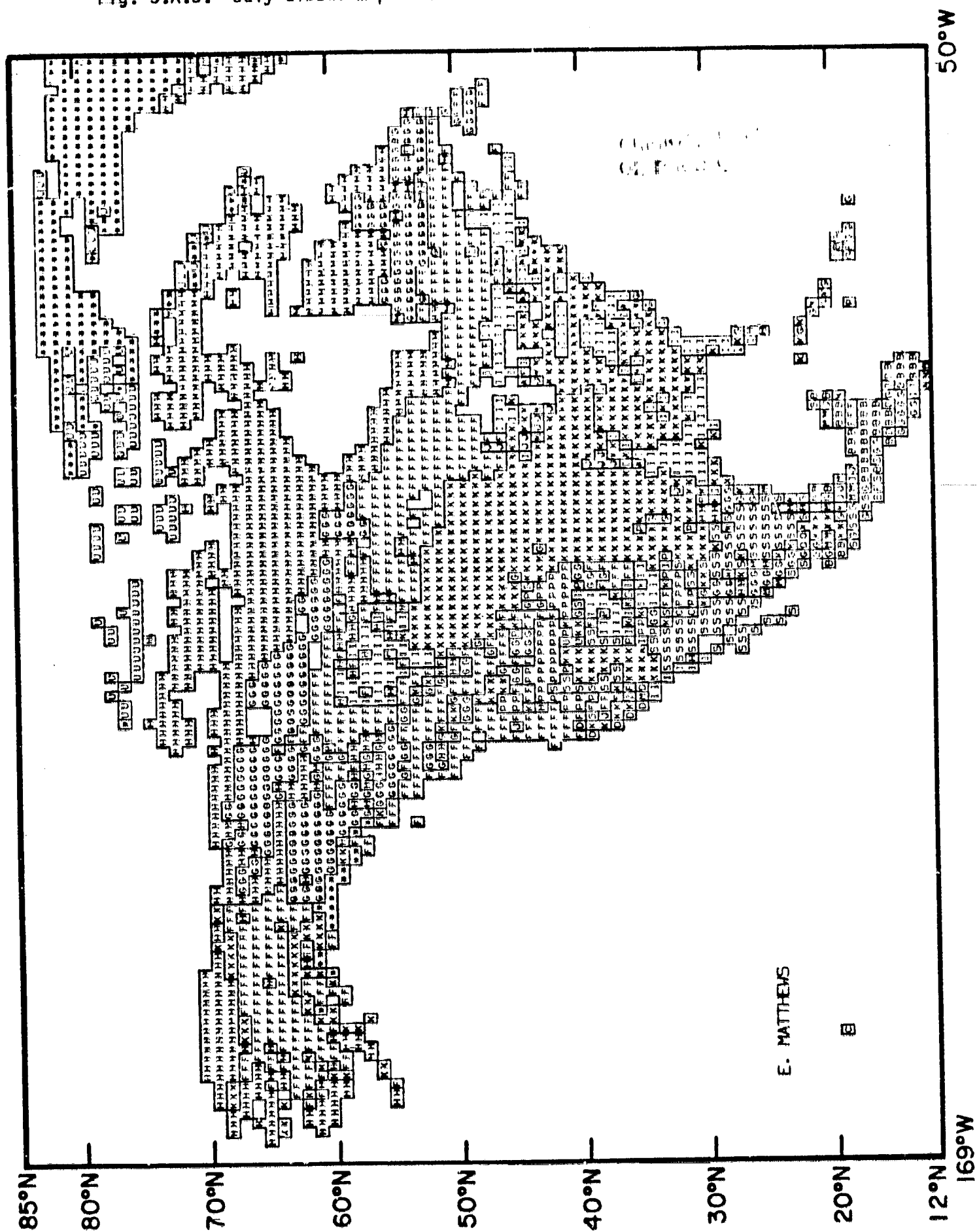


Fig. 3.A.4. October albedo map of North America. Legend: Table 3.A.2

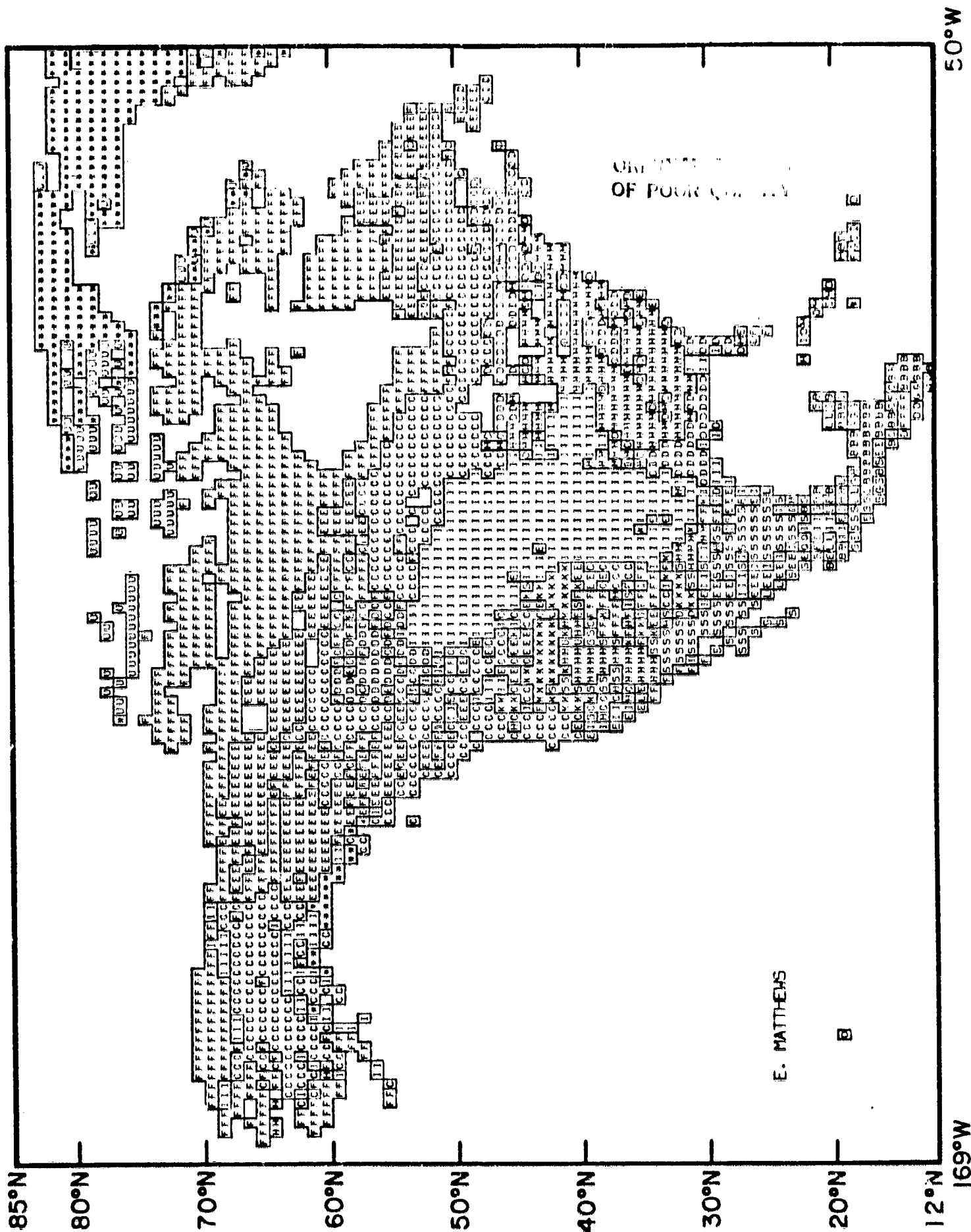


Fig. 3.B.1. January albedo map of South America. Legend: Table 3.A.2

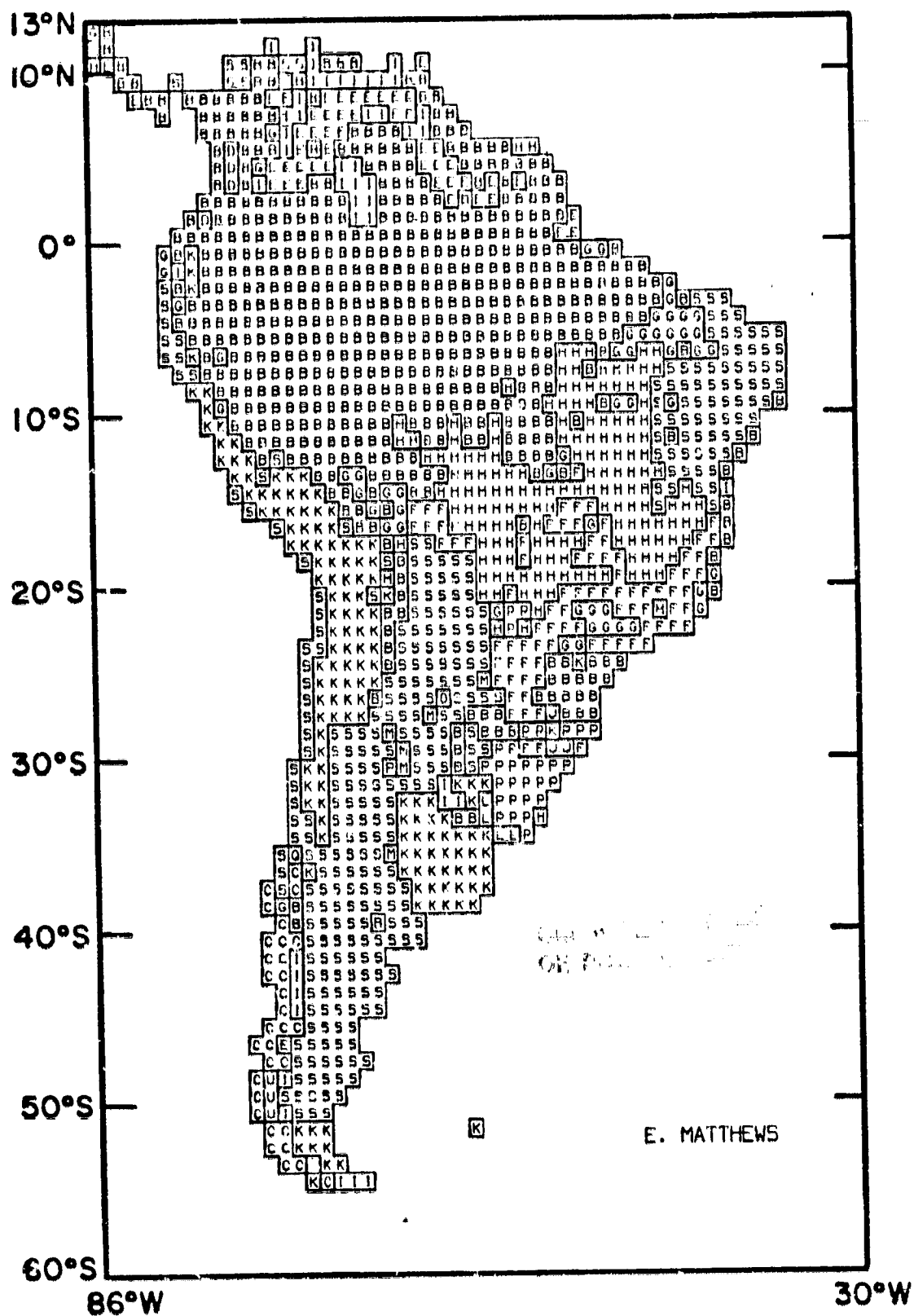


Fig. 3.B.2. April albedo map of South America. Legend: Table 3.A.2

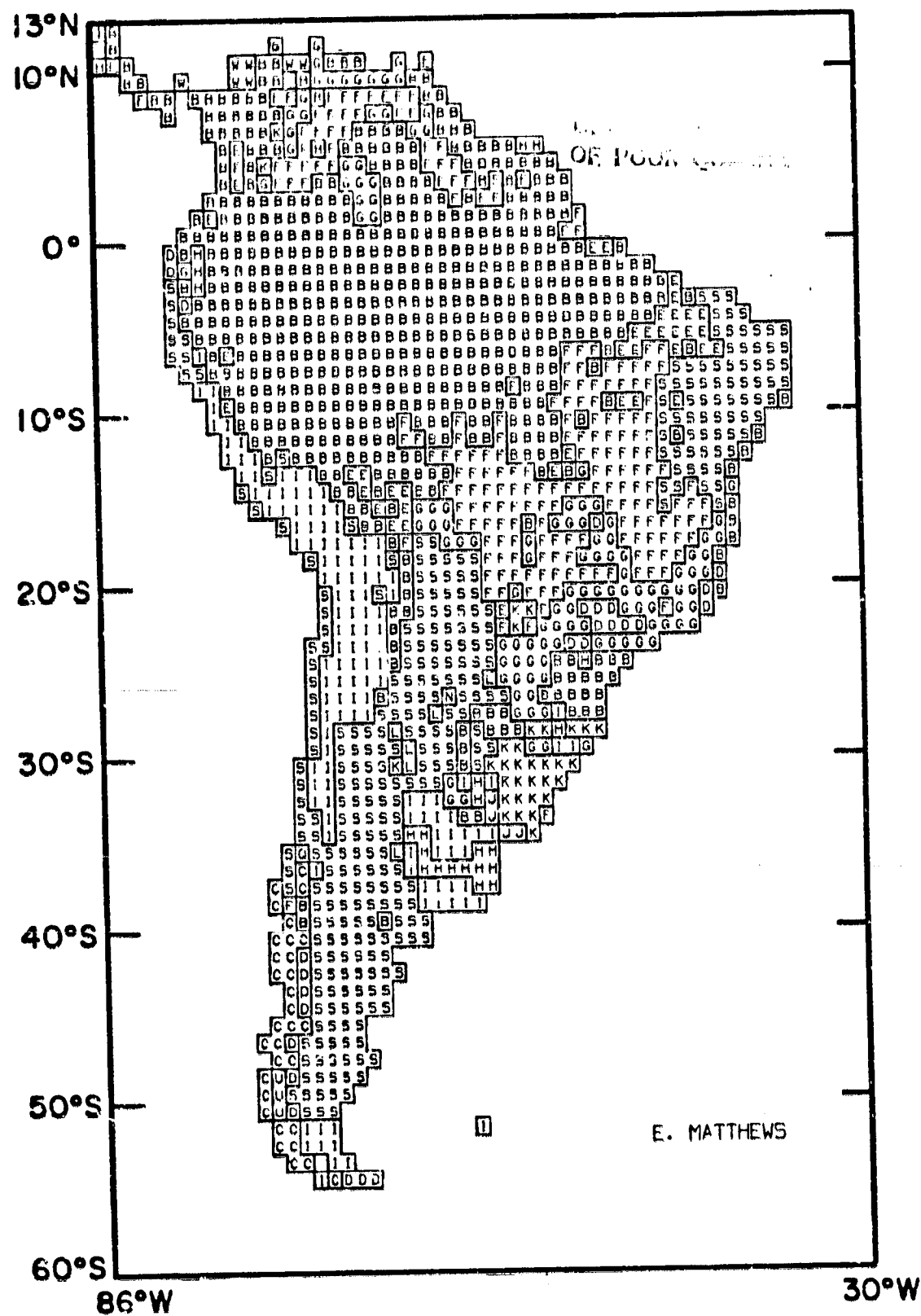


Fig. 3.B.3. July albedo map of South America. Legend: Table 3.A.2

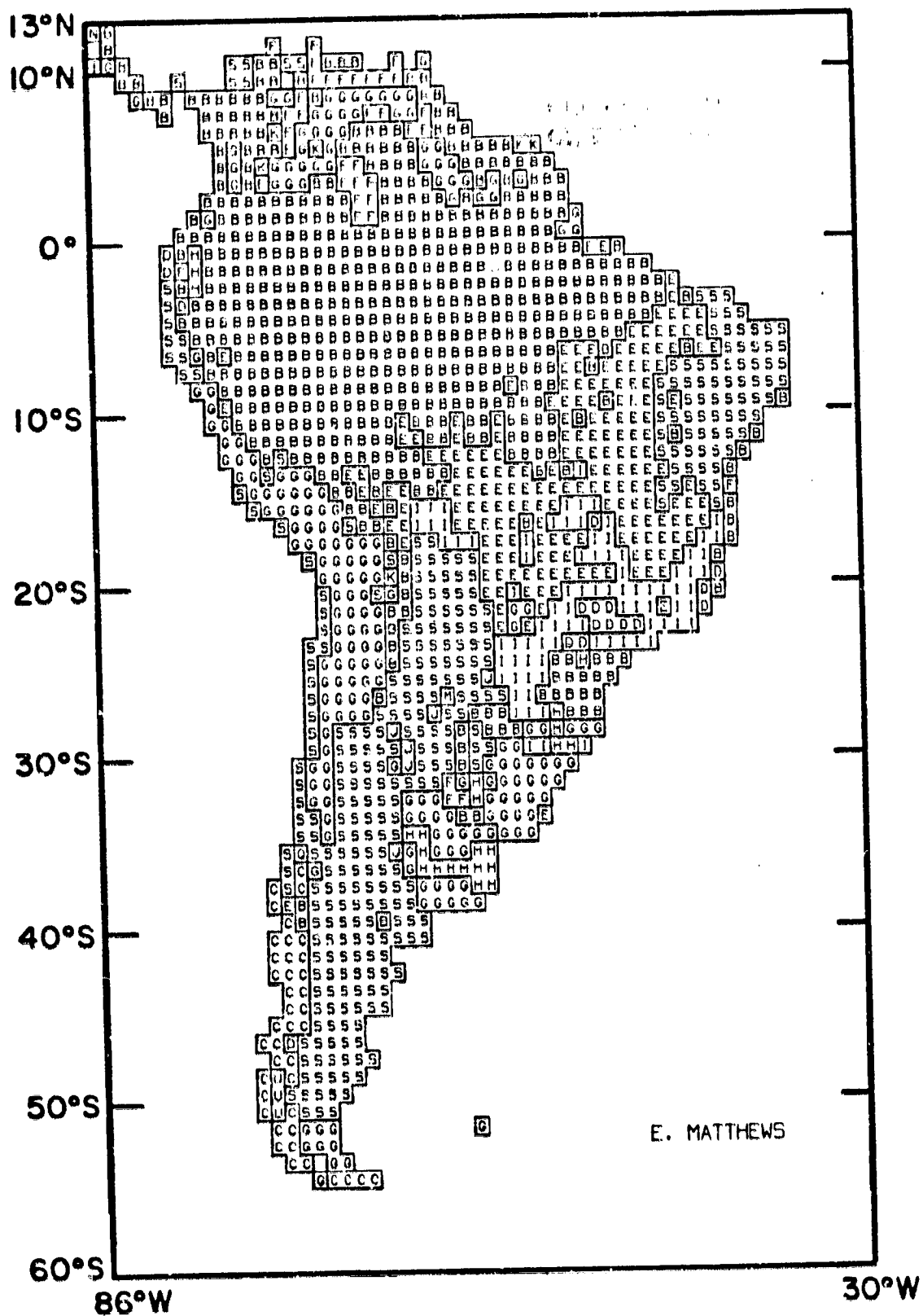


Fig. 3.B.4. October albedo map of South America. Legend: Table 3.A.2

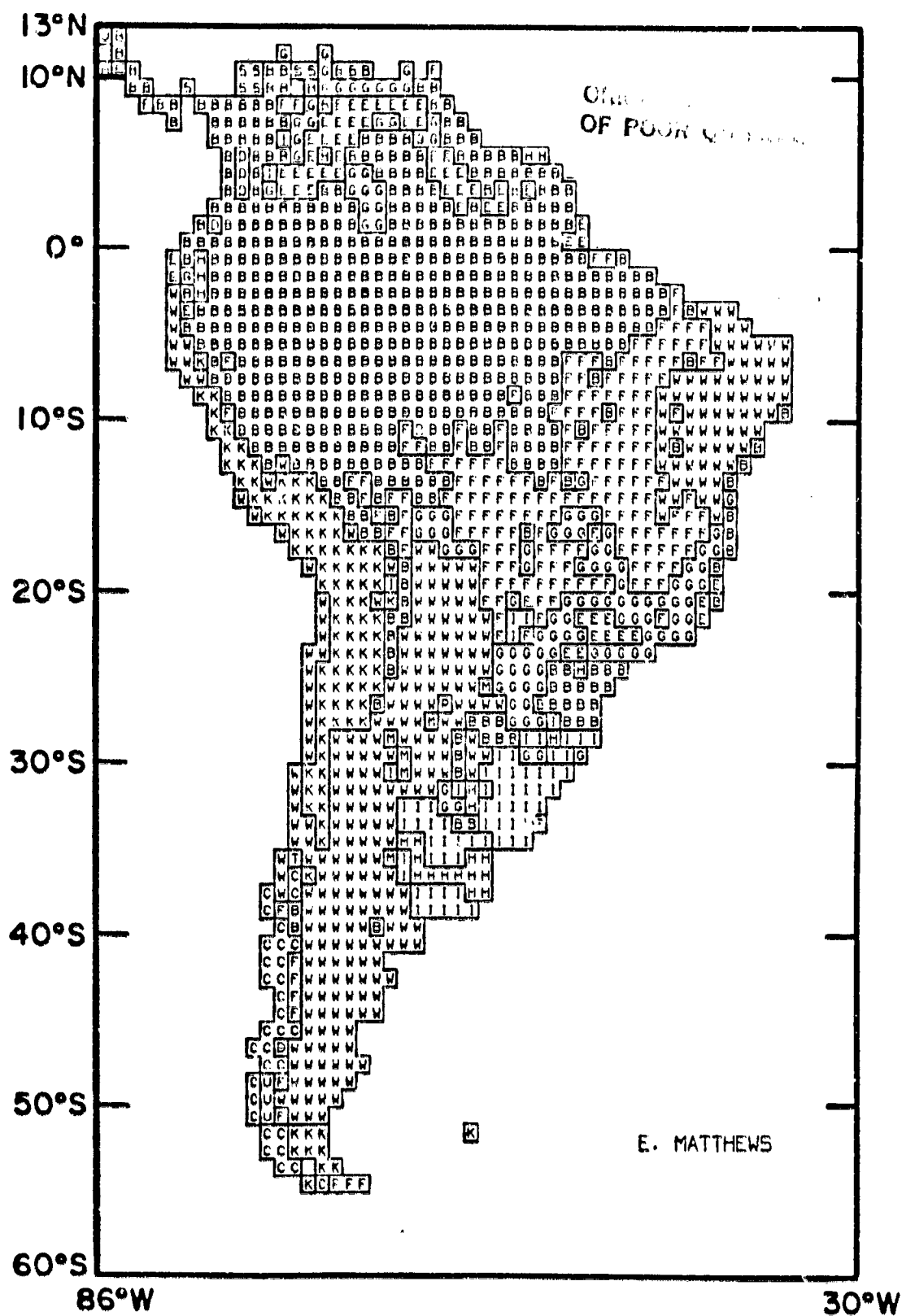


Fig. 3.C.1. January albedo map of Western Europe. Legend: Table 3.A.2

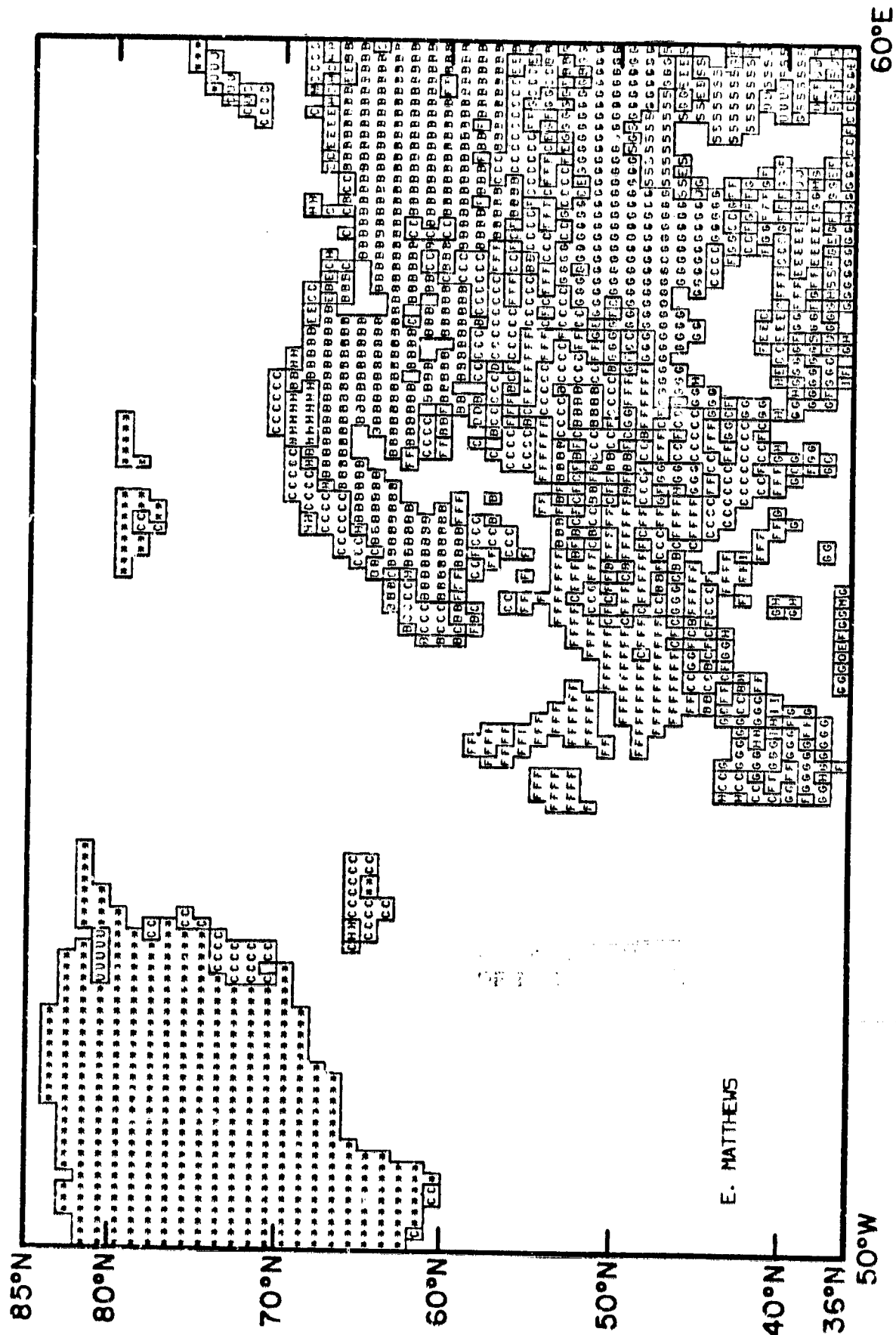
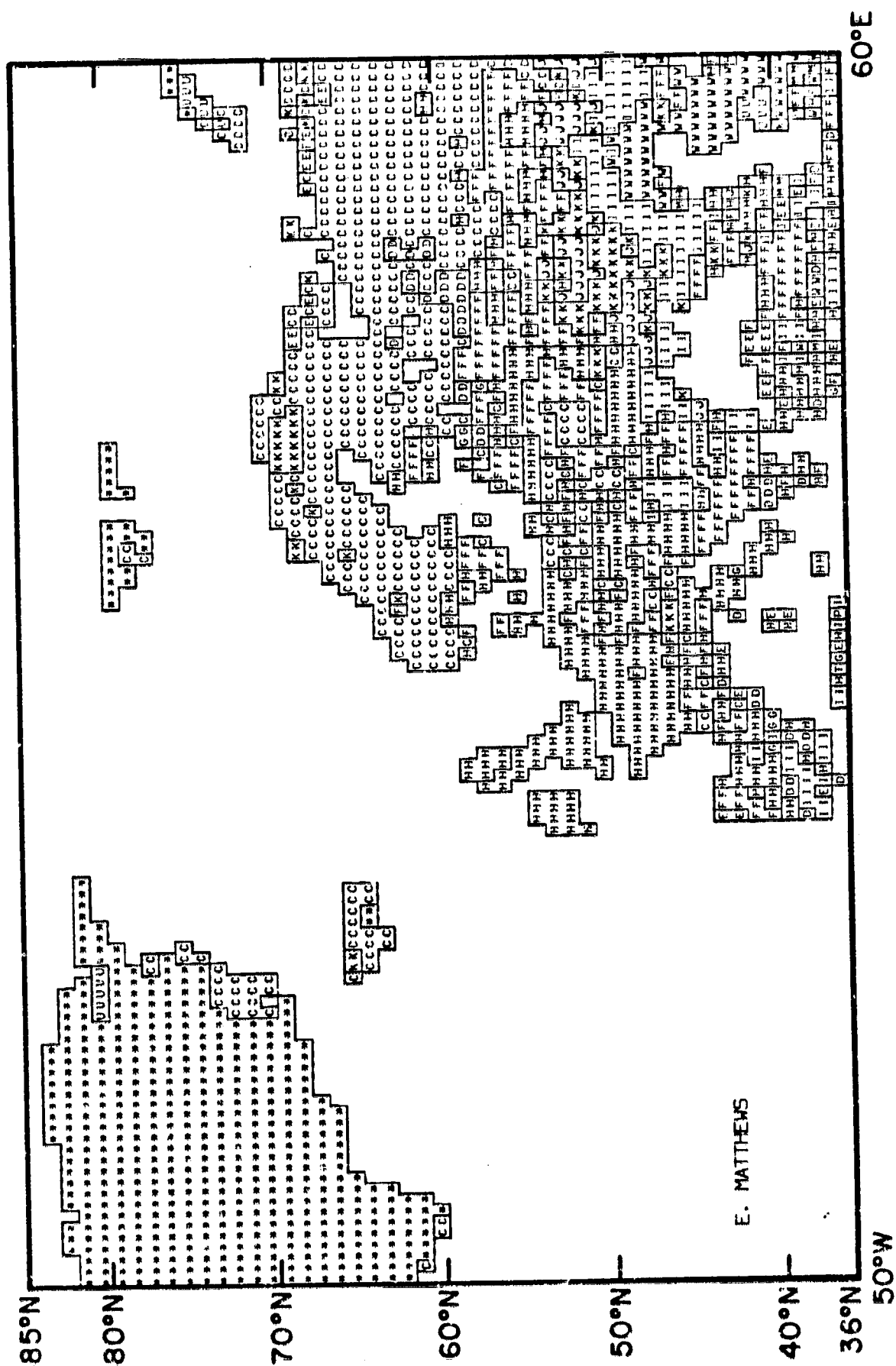


Fig. 3.C.2. April albedo map of Western Europe. Legend: Table 3.A.2



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Fig. 3.C.3. July albedo map of Western Europe. Legend: Table 3.A.2

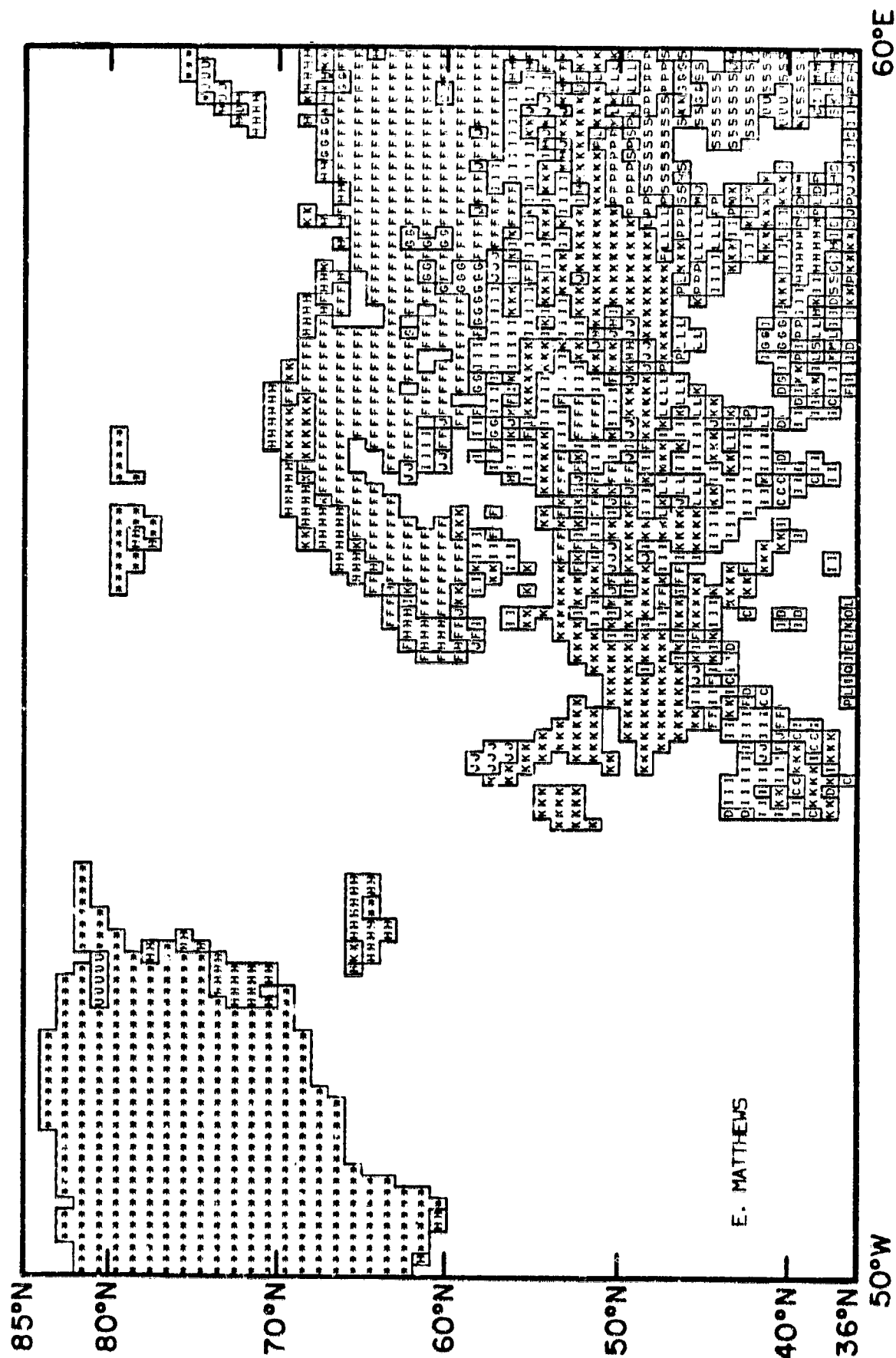


Fig. 3.C.4. October albedo map of Western Europe. Legend: Table 3.A.2

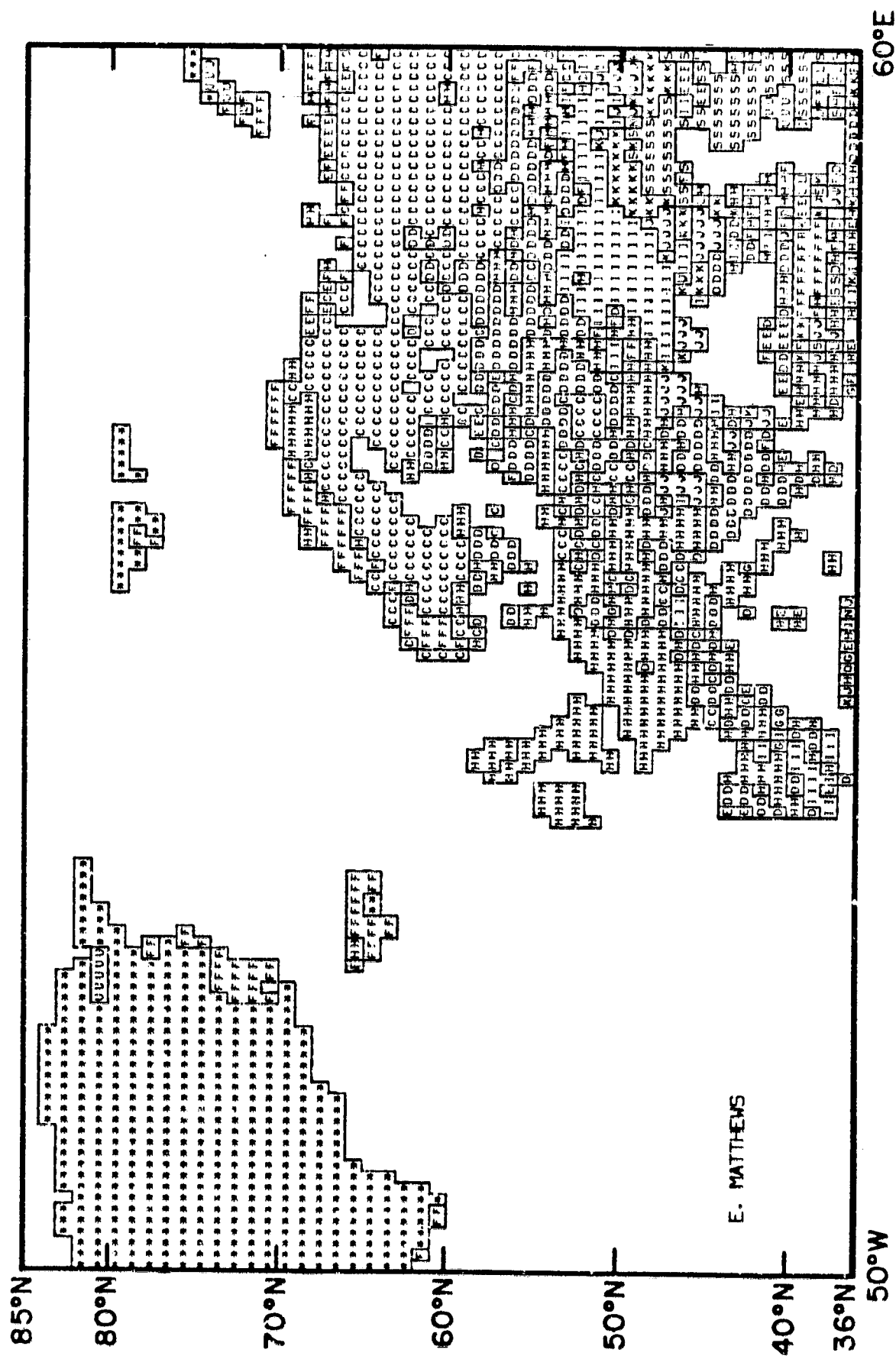


Fig. 3.D.2. April albedo map of Africa. Legend: Table 3.A.2

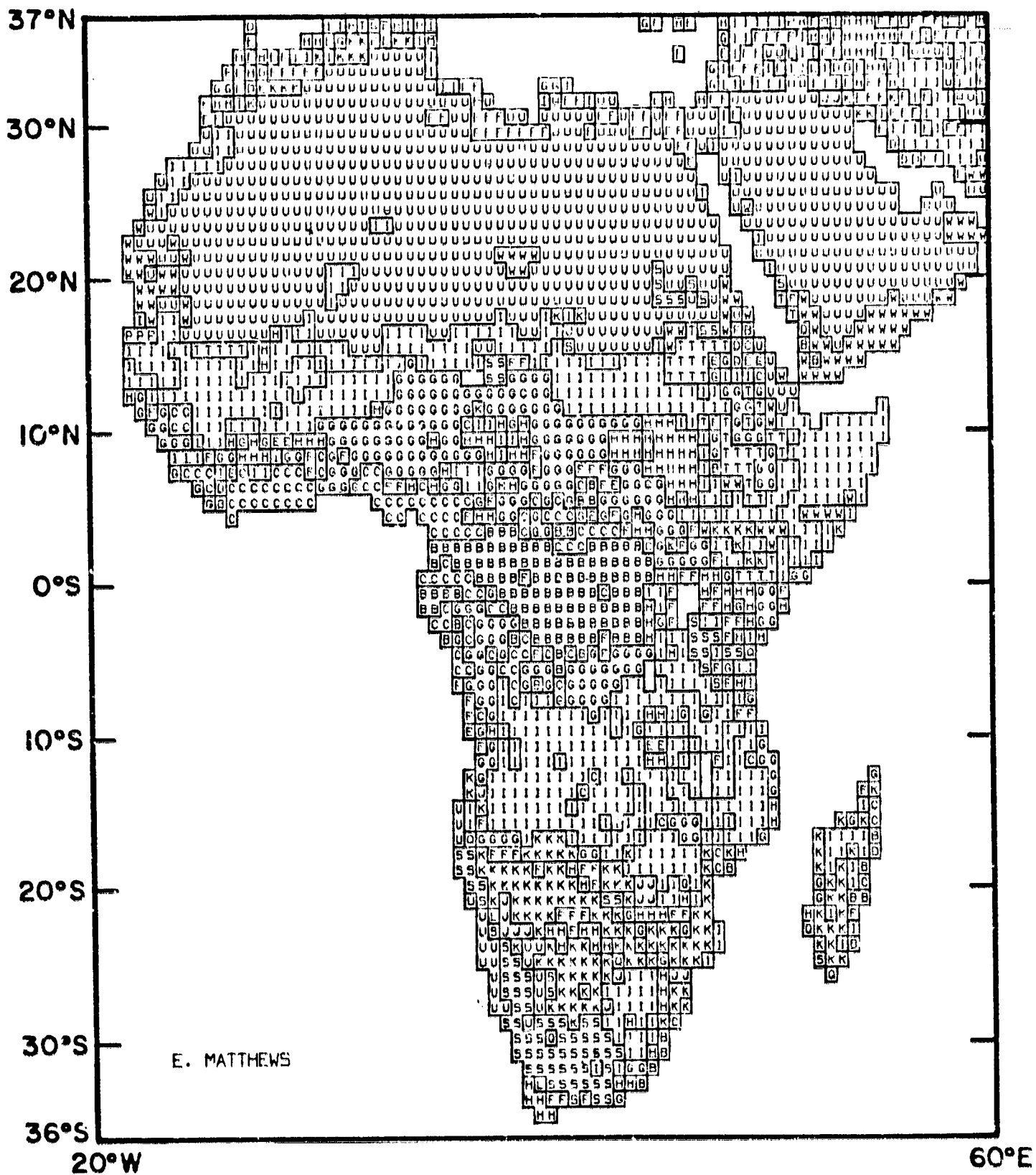


Fig. 3.D.3. July albedo map of Africa. Legend: Table 3.A.2

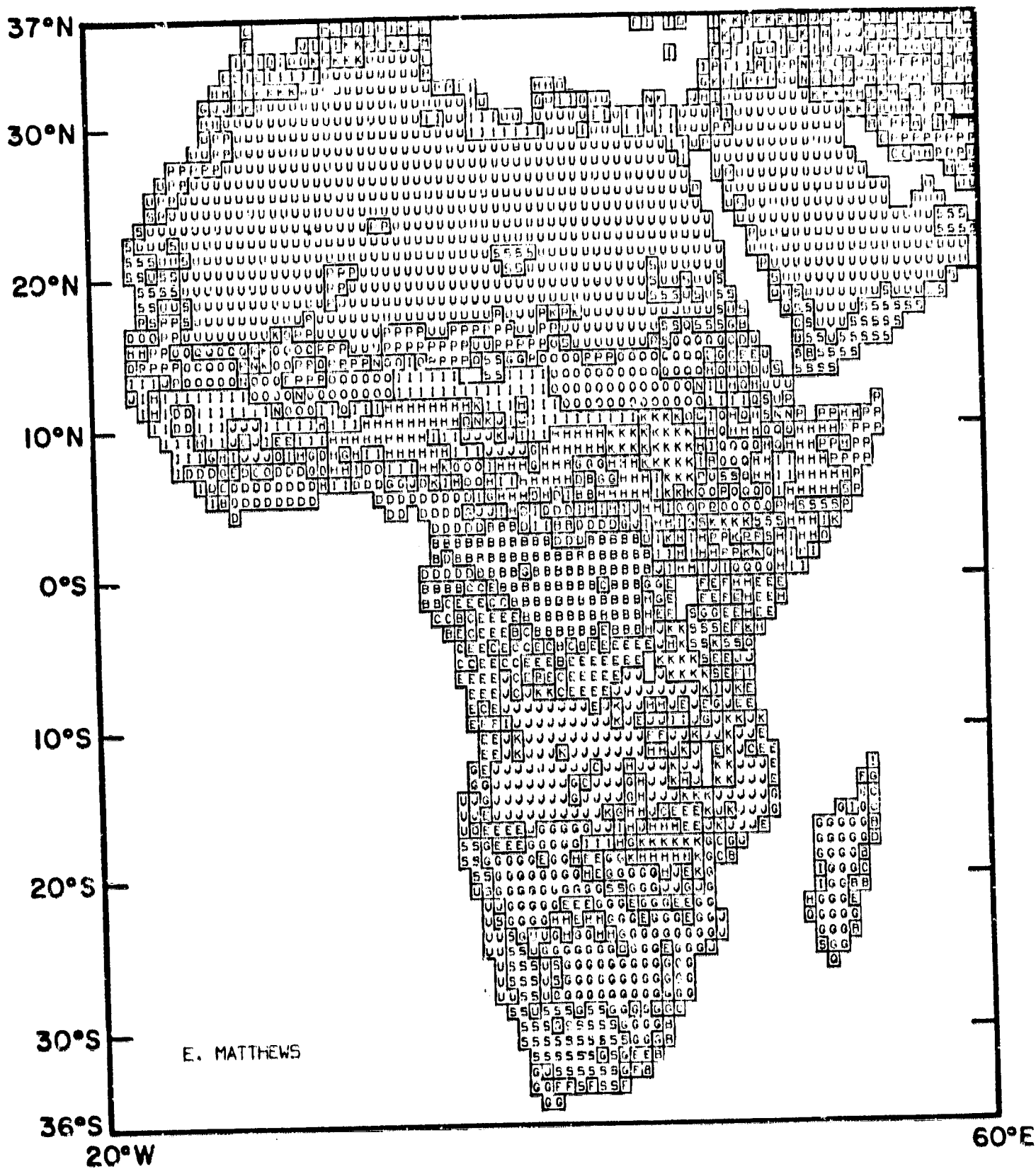


Fig. 3.D.4. October albedo map of Africa. Legend: Table 3.A.2

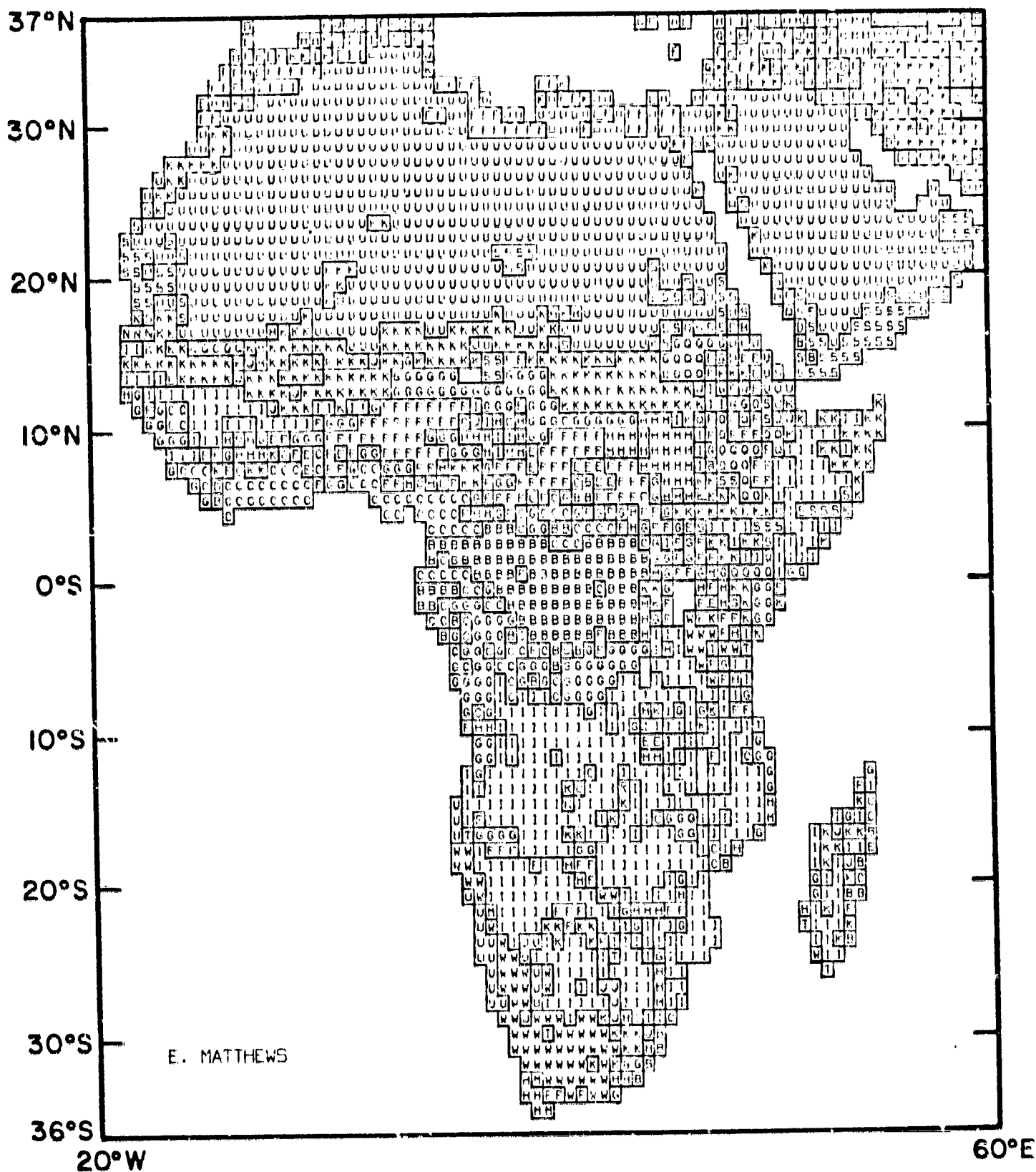


Fig. 3.E.1. January albedo map of Asia. Legend: Table 3.A.2

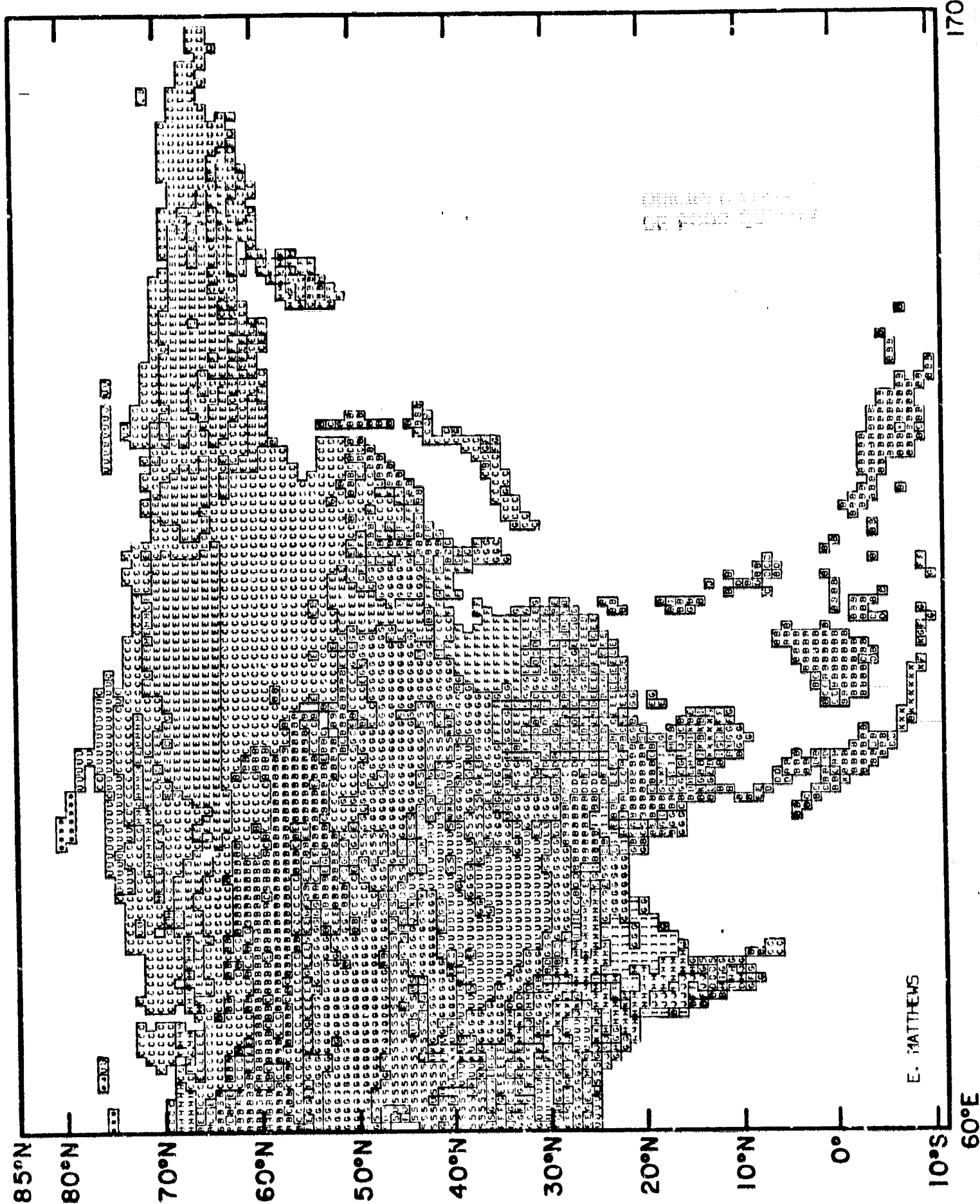


Fig. 3.E.2. April albedo map of Asia. Legend: Table 3.A.2

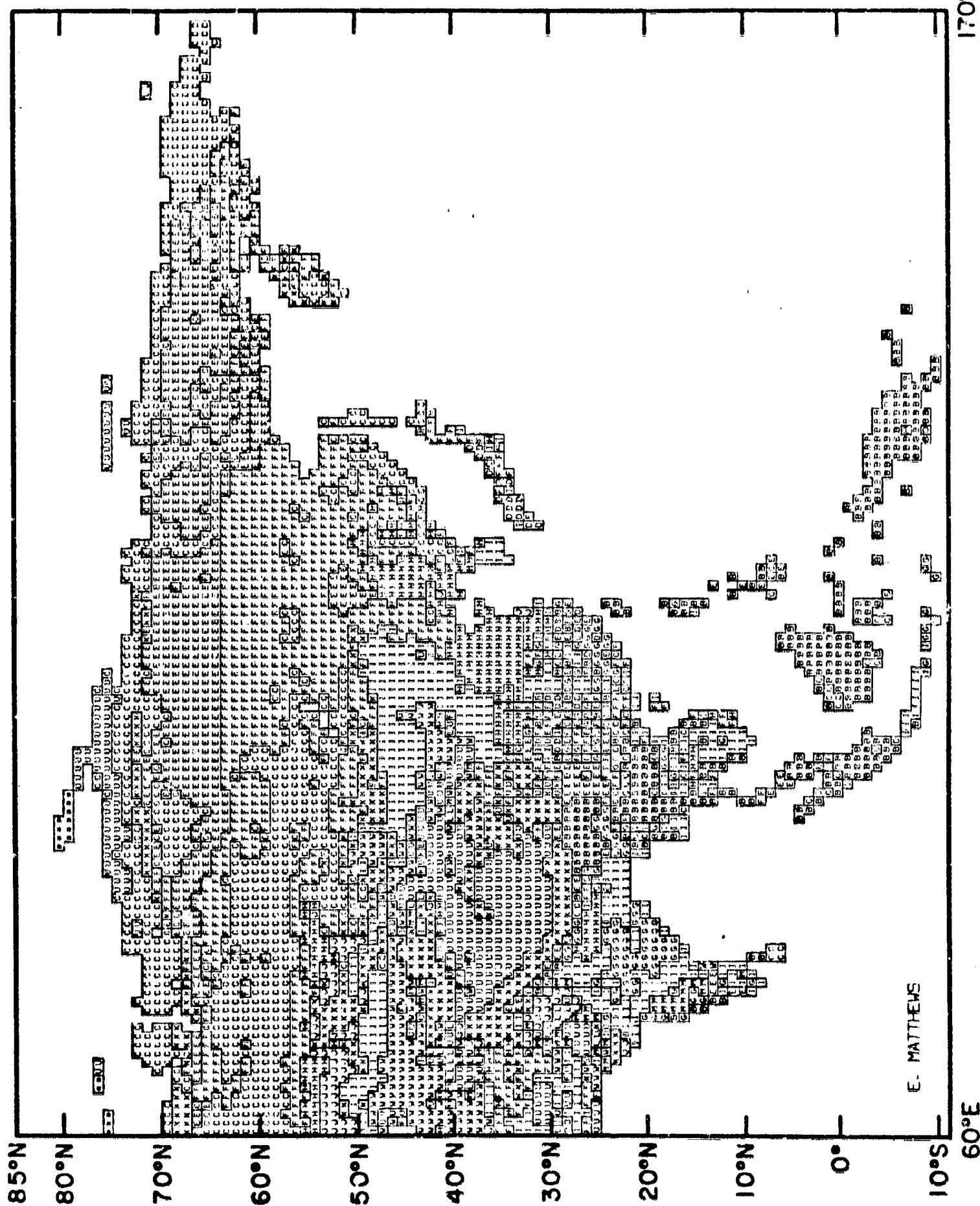


Fig. 3.E.3. July albedo map of Asia. Legend: Table 3.A.2

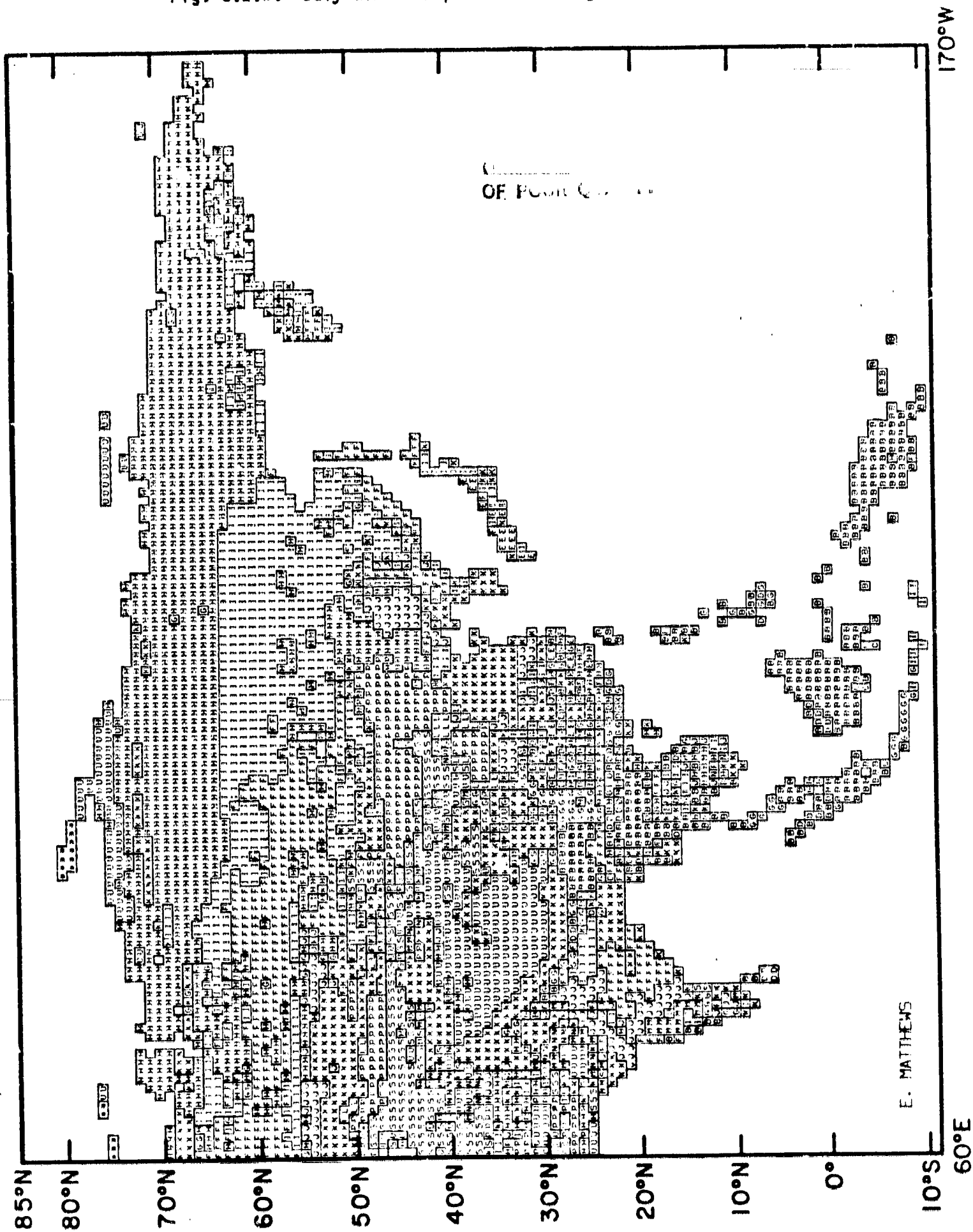


Fig. 3.E.4. October albedo map of Asia. Legend: Table 3.A.2

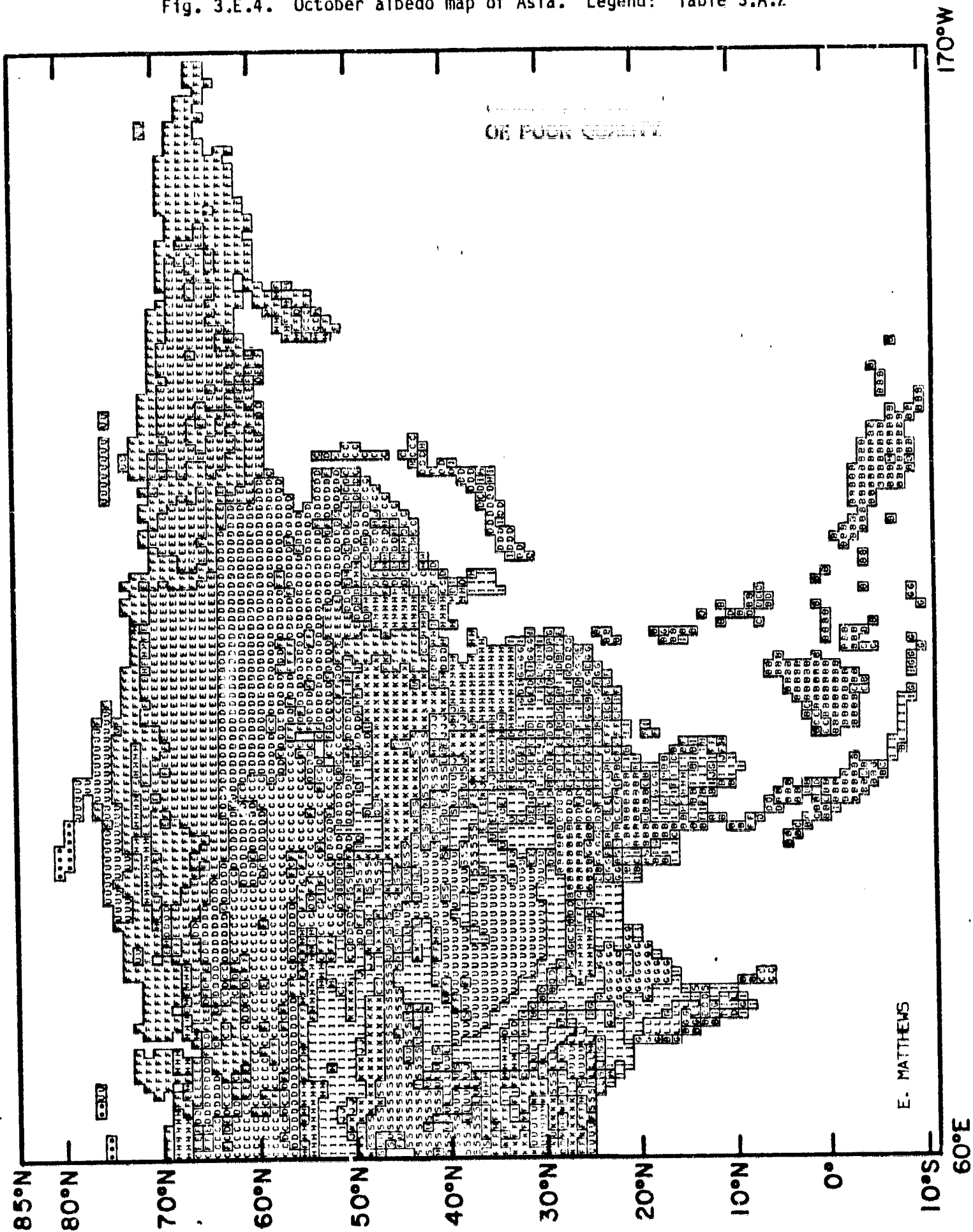
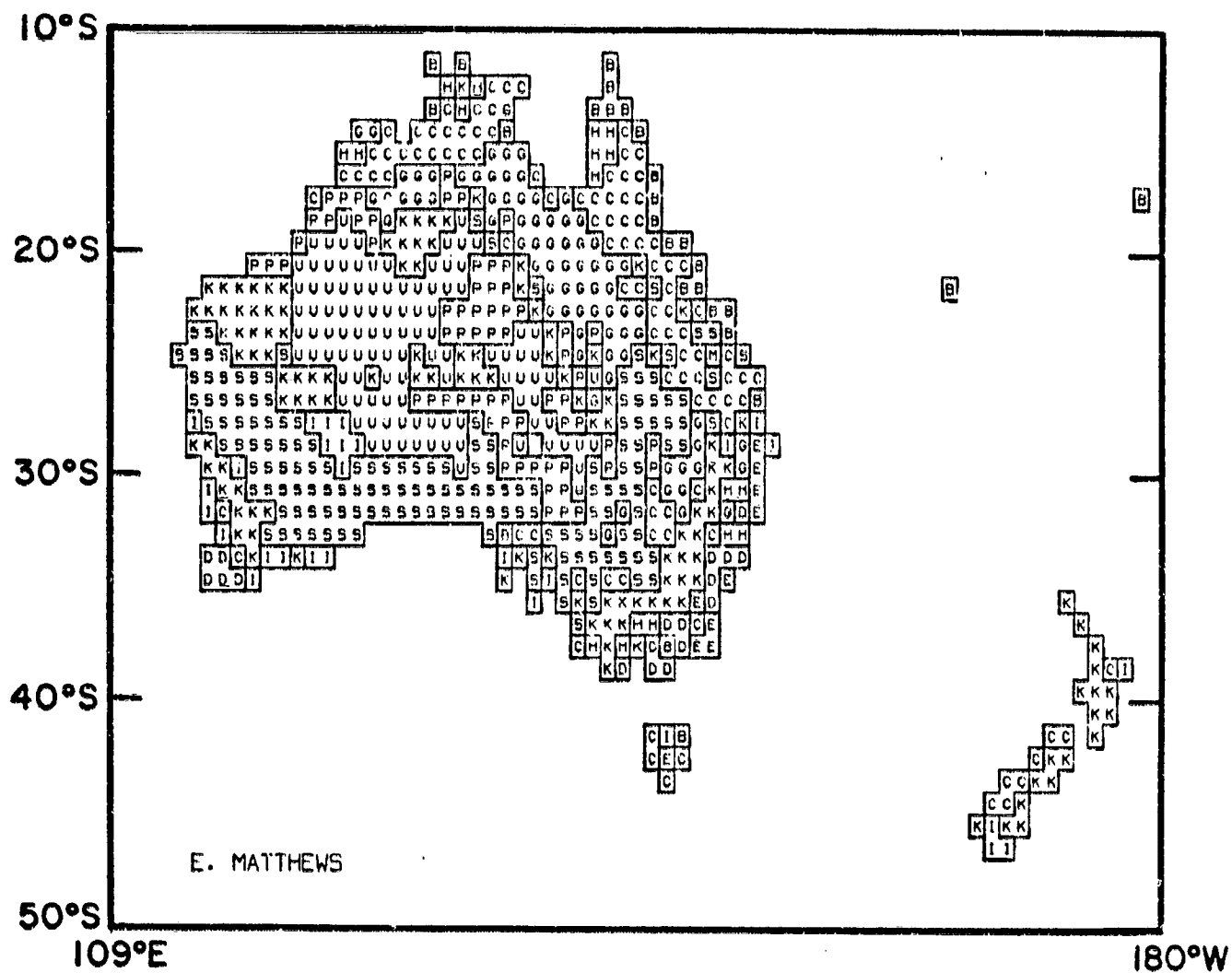


Fig. 3.F.1. January albedo map of Australia. Legend: Table 3.A.2

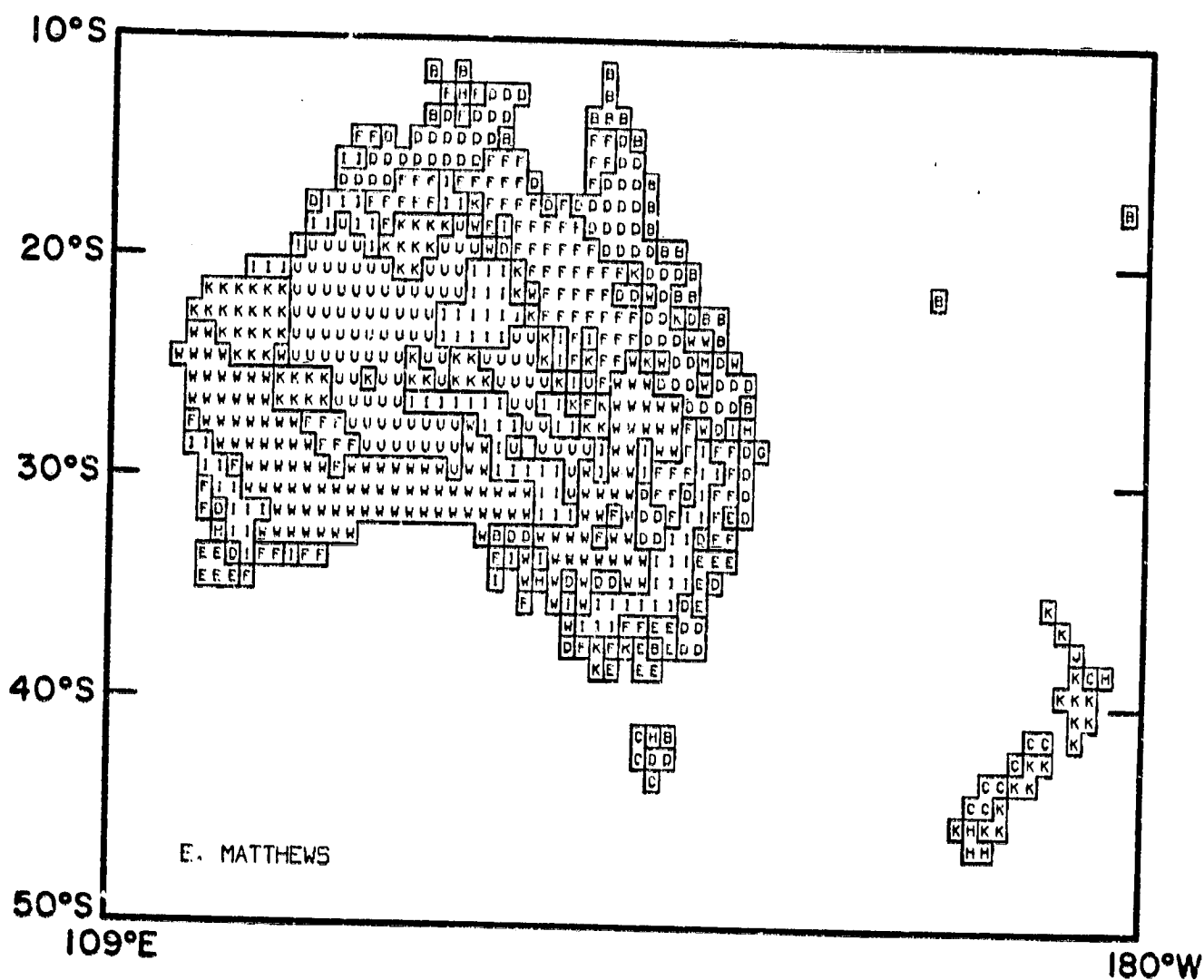




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 152. **PRINT SIGNATURE** _____
 153. **PRINT NAME** _____
 154. **PRINT ADDRESS** _____
 155. **PRINT CITY** _____
 156. **PRINT STATE** _____
 157. **PRINT ZIP** _____
 158. **PRINT PHONE** _____
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 160. **PRINT SIGNATURE** _____
 161. **PRINT NAME** _____
 162. **PRINT ADDRESS** _____
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 164. **PRINT STATE** _____
 165. **PRINT ZIP** _____
 166. **PRINT PHONE** _____
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 170. **PRINT ADDRESS** _____
 171. **PRINT CITY** _____
 172. **PRINT STATE** _____
 173. **PRINT ZIP** _____
 174. **PRINT PHONE** _____
 175. **PRINT DATE** _____
 176. **PRINT SIGNATURE** _____
 177. **PRINT NAME** _____
 178. **PRINT ADDRESS** _____
 179. **PRINT CITY** _____
 180. **PRINT STATE** _____
 181. **PRINT ZIP** _____
 182. **PRINT PHONE** _____
 183. **PRINT DATE** _____
 184. **PRINT SIGNATURE** _____
 185. **PRINT NAME** _____
 186. **PRINT ADDRESS** _____
 187. **PRINT CITY** _____
 188. **PRINT STATE** _____
 189. **PRINT ZIP** _____
 190. **PRINT PHONE** _____
 191. **PRINT DATE** _____
 192. **PRINT SIGNATURE** _____
 193. **PRINT NAME** _____
 194. **PRINT ADDRESS** _____
 195. **PRINT CITY** _____
 196. **PRINT STATE** _____
 197. **PRINT ZIP** _____
 198. **PRINT PHONE** _____
 199. **PRINT DATE** _____
 200. **PRINT SIGNATURE** _____
 201. **PRINT NAME** _____
 202. **PRINT ADDRESS** _____
 203. **PRINT CITY** _____
 204. **PRINT STATE** _____
 205. **PRINT ZIP** _____
 206. **PRINT PHONE** _____
 207. **PRINT DATE** _____
 208. **PRINT SIGNATURE** _____
 209. **PRINT NAME** _____
 210. **PRINT ADDRESS** _____
 211. **PRINT CITY** _____
 212. **PRINT STATE** _____
 213. **PRINT ZIP** _____
 214. **PRINT PHONE** _____
 215. **PRINT DATE** _____
 216. **PRINT SIGNATURE** _____
 217. **PRINT NAME** _____
 218. **PRINT ADDRESS** _____
 219. **PRINT CITY** _____
 220. **PRINT STATE** _____



Fig. 3.F.4. October albedo map of Australia. Legend: Table 3.A.2



APPENDICES

The following appendices outline all revisions to the vegetation and seasonal albedo data sets mentioned in the introduction. Points are identified by (I,J) locations, compatible with the tape format outlined in Matthews (1984). I locations, extending from the dateline eastward through the Greenwich meridian to the dateline, are analogous to longitude and range from 1-360; I(1) is the 1° longitude band between 180° (dateline)-179°W, I(2) between 179°W-178°W, ... , I(360) between 179°E-180° (dateline). J locations are analogous to latitude and range south-to-north from 1-180; J(1) is the 1° latitude band between 90°S-89°S, J(2) between 89°S-88°S, ... , J(180) between 89°N-90°N.

Appendix 1. Eighty one points, identified as cultivation (type 32) in the vegetation compilation and in the vegetation array on the archived data tape (VEGTYPE) have been revised and mapped here with vegetation designations as shown below.

<u>J</u>	<u>I</u>	<u>VEGTYPE</u>	<u>J</u>	<u>I</u>	<u>VEGTYPE</u>
100	257	2	108	276	1
100	259	2	109	256	12
100	286	9	109	257	9
101	258	9	109	258	9
101	259	12	111	259	9
101	260	12	112	262	9
101	285	9	112	263	9
101	286	9	112	264	9
101	237	15	113	269	2
102	258	9	114	256	2
102	260	12	114	257	2
102	286	9	114	269	2
103	257	9	114	270	2
103	260	21	114	271	2
104	257	2	115	249	21
104	258	12	115	252	9
104	280	1	115	269	2
104	281	2	115	270	2
105	257	12	116	249	21
105	258	12	116	250	21
105	259	12	116	257	9
105	281	2	116	267	9
105	284	15	118	249	21
106	256	2	119	251	21
106	257	2	120	252	21
106	258	12	121	253	30
106	259	9	121	254	19
106	260	12	121	255	19
106	281	9	121	256	19
106	283	9	121	257	9
106	284	9	122	211	30
106	285	9	122	212	17
106	286	15	122	226	27
106	289	2	122	227	27
107	259	9	122	253	19
107	260	9	122	254	19
107	261	9	123	225	25
107	262	9	123	226	25
108	257	2	138	208	25
108	259	9	138	209	25
108	260	9			

Appendix 2.A. Revisions to January albedo array on the archived data tape, resulting from revisions to the vegetation array (listed in Appendix 1).

<u>J</u>	<u>I</u>	<u>ALBEDO</u>	<u>J</u>	<u>I</u>	<u>ALBEDO</u>
101	250	16.50	109	256	19.00
101	259	19.00	109	257	16.50
102	258	16.50	109	258	16.50
103	257	16.50	111	259	16.50
104	280	13.50	114	256	14.75
105	257	19.00	114	257	14.75
105	258	19.00	115	249	19.00
105	284	18.00	115	252	16.50
106	256	14.75	115	269	13.50
106	257	14.75	116	250	19.00
106	258	19.00	116	257	16.50
106	259	16.50	116	267	17.00
106	281	17.00	119	251	19.00
106	283	17.00	120	252	19.00
106	284	17.00	121	253	19.50
106	285	17.00	121	254	16.25
106	286	18.00	121	255	16.25
106	289	13.50	121	256	16.25
107	259	16.50	121	257	16.50
107	260	16.50	122	211	19.50
107	261	16.50	122	212	15.75
108	257	14.75	122	253	16.25
108	259	16.50	122	254	16.25
108	260	16.50			

Appendix 2.B. Revisions to April albedo array on the archived data tape, resulting from revisions to the vegetation array (listed in Appendix 1).

<u>J</u>	<u>I</u>	<u>ALBEDO</u>	<u>J</u>	<u>I</u>	<u>ALBEDO</u>
101	258	17.50	109	258	17.50
101	259	21.50	111	259	17.50
102	258	17.50	114	256	16.25
103	257	17.50	114	257	16.25
104	280	14.50	115	249	21.50
105	257	21.50	115	252	17.50
105	258	21.50	115	269	14.50
106	256	16.25	116	250	21.50
106	257	16.25	116	257	17.50
106	258	21.50	116	267	17.00
106	259	17.50	119	251	21.50
106	281	17.00	120	252	21.50
106	283	17.00	121	253	21.00
106	284	17.00	121	254	18.50
106	285	17.00	121	255	18.50
106	289	14.50	121	256	18.50
107	259	17.50	121	257	17.50
107	260	17.50	122	211	21.00
107	261	17.50	122	212	17.25
108	257	16.25	122	226	18.50
108	259	17.50	122	227	18.50
108	260	17.50	122	253	18.50
109	256	21.50	122	254	18.50
109	257	17.50			

Appendix 2.C. Revisions to July albedo array on the archived data tape,
resulting from revisions to the vegetation array (listed in
Appendix 1).

<u>J</u>	<u>I</u>	<u>ALBEDO</u>	<u>J</u>	<u>I</u>	<u>ALBEDO</u>
101	258	18.75	108	260	18.75
101	259	22.00	109	256	22.00
102	258	18.75	109	257	18.75
103	257	18.75	109	258	18.75
104	280	15.50	111	259	18.75
105	257	22.00	114	256	17.75
105	258	22.00	114	257	17.75
105	284	18.50	115	249	22.00
106	256	17.75	115	252	18.75
106	257	17.75	115	269	15.50
106	258	22.00	116	250	22.00
106	259	18.75	116	257	18.75
106	281	17.50	116	267	17.50
106	283	17.50	119	251	22.00
106	284	17.50	120	252	22.00
106	285	17.50	121	253	22.50
106	286	18.50	121	257	18.75
106	289	15.50	122	211	22.50
107	259	18.75	122	212	19.50
107	260	18.75	123	225	22.50
107	261	18.75	123	226	21.25
108	257	17.75	138	208	21.25
108	259	18.75	138	209	21.25

Appendix 2.D. Revisions to October albedo array on the archived data tape,
resulting from revisions to the vegetation array (listed in
Appendix 1).

<u>J</u>	<u>I</u>	<u>ALBEDO</u>	<u>J</u>	<u>I</u>	<u>ALBEDO</u>
101	258	17.50	111	259	17.50
101	259	20.50	114	256	16.25
102	258	17.50	114	257	16.25
103	257	17.50	115	249	20.50
104	280	14.50	115	252	17.50
105	257	20.50	115	269	14.50
105	258	20.50	116	250	20.50
106	256	16.25	116	257	17.50
106	257	16.25	116	267	17.00
106	258	20.50	119	251	20.50
106	259	17.50	120	252	20.50
106	281	17.00	121	253	21.00
106	283	17.00	121	254	17.75
106	284	17.00	121	255	17.75
106	285	17.00	121	256	17.75
106	289	14.50	121	257	17.50
107	259	17.50	122	211	21.00
107	260	17.50	122	212	17.25
107	261	17.50	122	253	17.75
108	257	16.25	122	254	17.75
108	259	17.50	123	225	19.00
108	260	17.50	123	226	18.50
109	256	20.50	138	208	18.50
109	257	17.50	138	209	18.50
109	258	17.50			

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