ATOMIC WEAPONS RESEARCH ESTABLISHMENT

AWRE REPORT NO. 07/87

World Seismicity Maps Suitable for the Study of Seismic and Geographical Regionalisation (UK UNCLASSIFIED)

J B Young
R C Lilwall
A Douglas

Recommended for issue by

A Douglas, Superintendent

Approved by

B L Elphick, Head of Division

CONTENTS

SUMMARY

This report consists of a series of maps showing the seismicity of the earth with the epicentres computed by the International Seismological Centre (ISC) for the 22 year period 1964-1985 but using body-wave (m_b) magnitudes computed by the "maximum-likelihood" method. These maps are intended to be used by the Working Group on Regionalisation of the Commission on Practice of the International Association of Seismology and Physics of the Earth's Interior (IASPEI) which has the task of redefining the regionalisation of the earth. But it is hoped that they will be useful to all who study the current seismicity of the active areas of the earth.

There are two appendices to this report. The first appendix proposes a regionalisation of the earth based on the current Flinn and Engdahl geographical regions but still incorporating the Gutenberg and Richter seismic regions and also allowing a further subdivision of the geographical regions for use by local seismological agencies. The second appendix summarises the scheme for the regionalisation of the earth as agreed by the Working Group in Vancouver, Canada in August 1987. The proposed scheme maintains the existing Flinn and Engdahl regions with a few additional regions with the third tier of local regions being devised by the Working Group themselves.

1. INTRODUCTION

In the 1940's, Gutenberg and Richter [1] published the first systematic set of maps showing the seismicity of the earth using only earthquakes which had been instrumentally recorded. These maps include a world map divided up into 50 regions and showing the main areas of seismicity.

In the 1960's, Flinn and Engdahl [2] proposed dividing the earth into about 730 separate regions delineated by tectonic, geographical, and political boundaries. Their proposal was quickly accepted by all the major seismological agencies. Flinn and Engdahl's [3] framework for regionalisation (which is referred to as the "F-E Code" in the Universal Decimal Classification system used by libraries) closely follows Gutenberg and Richter's 50 seismic areas so that their geographical regions form a mosaic of smaller regions within a seismic region.

In the 1980's, the Commission on Practice of IASPEI asked Dr Flinn [4] to review the current definition of the F-E Code and to form a Working Group on Regionalisation to produce a new standard for the regionalisation of the earth. One of the authors of this report (JBY) is a member of the Working Group.

Maps showing the seismicity of the earth, [eg, 1,5,6,7,8] are not new but no one appears to have published seismicity maps of the earth in relation to the F-E Code. But as one of the original aims of the F-E Code was to assign a number and name to regions of high seismicity such maps would obviously be useful to those attempting a revision of regionalisation. This report presents such seismicity maps.

2. WORLD SEISMICITY MAPS

Work on extending and enhancing the current F-E Code, in particular to allow certain "classifiers" [9] of the regions has already been published. That report points to particular regions of the F-E Code that are, at best, misleading and at worst, wrong. The maps presented contain only region numbers and "classifier" plots with a full table of numbers, names, and "classifiers". It was known before that report was published that the seismicity of the earth superimposed on the regions illustrates most of the problems and shortcomings of the current F-E Code. In this report the same 12 maps which show the region numbers are reproduced but with seismicity added. However, these maps cover too large an area for the requirements of the Working Group on Regionalisation so each regional map has been subdivided into four producing a further 48 maps.

One of the requirements of the F-E Code was that region boundaries follow integral lines of latitude and longitude. The original maps [2] published in 1965 used a cylindrical projection with a degree of latitude and longitude at the same scale thus producing distortion towards the poles. We see no reason not to continue using this projection as it provides the necessary rectangular basis for regionalisation. The inclusion of coastlines (from a database of nearly 60,000 latitude and longitude points) first used in the "classifiers" report [9] clearly shows the polar distortions. A cylindrical projection is also simple in terms of computing and plotting which is a significant factor when searching a database of over 100,000 earthquakes.

To complete the picture of global seismicity, a world map with the same seismicity as plotted on the regional maps superimposed on the seismic regions of the F-E Code is presented. Eight further maps some of which have been used in various forms for many years are also included. These maps are plotted on an azimuthal great circle projection [10] showing two hemispheres of the world on arbitrary centres with the seismicity split into shallow earthquakes and intermediate and deep earthquakes. No regions have been included in these eight maps. The maps have been used for display purposes and have been used in various publications [eg, 11, 12] but this is the first time they have been published as a set.

All the maps have been produced by computer and drawn on a Versatec plotter with a 200 dots to the inch capability giving a uniform display but perhaps not providing the quality of the maps in the previous "classifiers" report [9] which were produced on an FR80 graphics plotter. However, for the set of 48 maps of the seismicity of the earth for use by the Working Group on Regionalisation the Versatec plotter provides an adequate display.

The earthquakes used are those published by the ISC [eg, 13] for the 22 year period 1964-1985 inclusive. Only those earthquakes which have sufficient station readings for the ISC to recompute the hypocentres and which have assigned magnitudes greater than m_b 4.0 are plotted. Above this magnitude, six levels (m_b 4.0-4.5; 4.5-5.0; 5.0-5.5; 5.5-6.0; 6.0-6.5; 6.5+) are indicated by the size of dot. This dot is a square if the earthquake is shallow (ie, the depth is less than 60 km) or a diamond if it is intermediate or deep (greater than 60 km). The magnitudes used have been recomputed using the "maximum-likelihood" method [14, 15] which removes much of the bias present in standard magnitude estimates. In general, large (m_b {ISC} 6.0+) magnitudes remain unchanged by this procedure but there is a progressive reduction at lower values reaching an average of 0.2 to 0.3 around m_b {ISC} 4.5. The largest changes are usually for earthquakes with spuriously high conventional magnitudes based on a small number of station readings. The above procedure gives an improvement in the resolution of the seismicity plots because many poorly recorded (and hence poorly located) earthquakes are either removed or given less emphasis. In addition the use of a lower magnitude limit of m_b 4.0 means that the strong regional changes in the number of epicentres resulting from variation in station network coverage are reduced. Hence, the world seismicity presented here contains about 104,000 earthquakes from the nearly 350,000 published by the ISC in the 22 year period 1964-1985.

The detail in the seismicity plotted on the computer-drawn maps showing both large and small tectonic features reflects the improvements in seismology over the last 50 years. Gutenberg and Richter's one tier system of seismic regions was based on large earthquakes for which epicentres were thought to be accurate to a degree. When Flinn and Engdahl introduced their two tier F-E Code Electronic Data Processing (EDP) - computers - had taken over the task of calculating epicentres with an apparent improvement in the accuracy of the result. With earthquake epicentres from the ISC for the 22 year period 1964-1985 and improved magnitude estimates computed by the "maximum-likelihood" method the seismicity of the earth is traced in greater detail on the regional maps than ever before. Large tectonic features can be encompassed by minor changes to the current F-E Code but the small scale features require sub-division of the present geographical regions. There is a need to define new areas not only now but in the future. A third tier of regionalisation meets this requirement.

A proposal for a three tier framework of seismic and geographical regionalisation is presented in appendix A and the actual three tier framework as agreed by the Working Group is presented in appendix B.

3. ACKNOWLEDGEMENTS

We thank the Director of the ISC for permission to use the ISC Bulletin Data and his staff for their help in the preparation of the earthquake database.

APPENDIX A

A THREE TIER FRAMEWORK OF SEISMIC AND GEOGRAPHICAL REGIONALISATION

This proposal for a three tier framework of seismic and geographical regionalisation is presented here for consideration and discussion by the Working Group on Regionalisation of the Commission on Practice of IASPEI and is in no way intended to be binding on either the Working Group or the authors.

A1. First tier - large or seismic regions

The basic structure of the three tier system of the regionalisation of the earth is that defined in the current F-E framework [3] which is based on the work of Gutenberg and Richter [1]. Minor adjustments of boundaries are necessary to follow changes made to the second tier of small or geographical regions. The numbering remains unchanged from 01 to 50.

A2. Second tier - small or geographical regions

The second tier is the existing F-E framework of geographical regions which has been corrected using the ISC epicentres with the "maximum-likelihood" magnitudes to trace the significant seismicity taking into account the modern ideas of plate tectonics and heat flow and using data like tectonic, geographic, bathymetric, political, and other boundaries. The major part of the current F-E regionalisation of the earth should remain after correction and minor adjustments, and the splitting up of some of the larger regions in the USSR, Eastern Europe and China, and in the Southern Hemisphere. Peculiarities like one degree regions and boundary areas are tidied up and placed in the third tier of local regions. Small or geographical regions are numbered within each large or seismic region starting at 01 or 001 in some sort of logical order but not of necessity and not necessarily in sequence. To identify a small or geographical region uniquely it is necessary to append this number to the large or seismic region number. This method allows easy addition and deletion of small or geographical regions within the large or seismic region.

A3. Third tier - local regions

A third tier is added to the F-E framework allowing local seismological agencies to allocate local names, numbers to areas of interest, minor seismicity, etc. As each large or seismic region is made up of a mosaic of small or geographical regions, each small or geographical region is made up of a mosaic of local regions. Numbering is arbitrary but would be two, perhaps three or four, digits starting at 02 (01 being reserved for the majority of the small or geographical region left after subdividing and also to indicate that there is a third tier, see A4). These local regions are defined outside the jurisdiction of the Working Group which is responsible only for the first and second tiers of the framework of regionalisation. However, if it is shown that a local region in a third tier splitting should be used as a small or geographical region in the second tier then the provision for easy addition and deletion can be applied. Classifiers [9] would be introduced in this third tier, again relieving the Working Group of the need to decide on their specification.

A4. Example

To illustrate the three tier framework of seismic and geographical regionalisation the first region of the current F-E Code is chosen. This region is "Central Alaska" in the "ALASKA - ALEUTIAN ARC".

On the three tier framework --

Large or seismic region 01 is "ALASKA - ALEUTIAN ARC"

Small or geographical region 01.000 is also "ALASKA - ALEUTIAN ARC"

Local region 01.000:0000 is also "ALASKA - ALEUTIAN ARC"

Small or geographical region 01.001 is "Central Alaska"

Local region 01.001:0000 is also "Central Alaska"

Local region 01.001:0001 would also be "Central Alaska"
(indicating the majority of a geographical region left after subdivision)

A region defined by a local agency would appear as 01.001:0002, etc
(with names which have been assigned by a local agency)

Classifiers on a geographical region would appear as 01.001:0000,SC
(the SC indicating the Seismicity and Continental Classifiers).

A5. Alternative numbering

	2.3:4 digit	2 digits	integer
Large or seismic region	01	01	01
Small or geographical region	01.001	01.01	0101
Local region	01.001:0001	01.01:01	010101
Classifiers on local region	01.001:0001,SC	01.01:01,SC	010101SC

A6. Advantages

The main advantage of the three tier framework is the maintenance of links with the current F-E Code. The historical link with the seismic regions of Gutenberg and Richter is kept and it is hoped that there remains some similarity with the existing F-E Code. The introduction of local regions gives local seismological agencies full control over naming, numbering, classifiers, and the shape of local areas without having to seek the approval of the Working Group.

The insistence on an easy method of adding and deleting small or geographical regions is a major improvement over the existing F-E Code.

This new system of regionalisation will mean less work for the Working Group and hence quicker publication of the new standard.

A7. Disadvantages

The major disadvantage of the three tier framework which is also inherent in the current F-E Code stems from the original definition of the seismic regions by Gutenberg and Richter. Sometimes there is a need to know which regions border a particular small or geographical region. In the current F-E Code the geographical region numbers are usually close together unless the neighbouring region is in a different seismic region. In the three tier framework this problem is further aggravated. Only good maps of the regionalisation can indicate neighbouring small or geographical regions.

Another disadvantage of the three tier framework is the lengthy numeric code needed to define a region and the additional definition tables that are required involving effort from local seismological agencies.

APPENDIX B

THE THREE TIER FRAMEWORK OF SEISMIC AND GEOGRAPHICAL REGIONALISATION AS DECIDED BY THE WORKING GROUP IN VANCOUVER, CANADA

The three tier framework of seismic and geographical regionalisation presented here is based on the discussions and decisions made by the Working Group on Regionalisation of the Commission on Practice of IASPEI in Vancouver, Canada in August 1987 and may be altered at subsequent meetings.

B1. First tier - seismic regions

The basic structure of the three tier system of the regionalisation of the earth is that defined in the current F-E framework [3] which is based on the work of Gutenberg and Richter [1]. No changes will be made to the definition of the regions and the numbering remains unchanged from 01 to 50.

B2. Second tier - geographical regions

The second tier is the existing F-E framework of geographical regions which remains unchanged except for the addition of four new regions [16] to correct some of the errors and mistakes as outlined in the "classifiers" report [9]. All other problems are relegated for correction in the third tier. Numbering remains unchanged from 001 to 729 with the four new regions numbered 730 to 733.

B3. Third tier - local regions

A third tier is to be added to the F-E framework to allocate local names, numbers to areas of interest, to delineate political boundaries, seismicity, etc. As each seismic region is made up of a mosaic of geographical regions, each geographical region is made up of a mosaic of local regions. These local regions are to be defined as polygons with sides no longer than one degree and must be completely contained within the geographical region. Hence, areas spanning more than one geographical region would be defined by two (or more) local regions with possibly the same name but with different numbers. Numbering is arbitrary but would be four digits starting at 0002 (0001 being reserved for the majority of the geographical region left after subdividing and also to indicate that there is a third tier, see B4) up to 9999 for each geographical region. The Working Group is to define these local regions, send them to local agencies for review and comment, and then, hopefully, to reconcile any differences. Classifiers [9] may be introduced in this thrd tier but the Working Group has deferred the decision on inclusion till their next meeting.

B4. Example

To illustrate this three tier framework of seismic and geographical regionalisation the first region of the current F-E Code is chosen. This region is "Central Alaska" in the "ALASKA - ALEUTIAN ARC".

On this three tier framework --

Seismic region 01 stays as "ALASKA - ALEUTIAN ARC"

Geographical region 001 stays as "Central Alaska"

Local region 001.0000 is also "Central Alaska"

Local region 1.0001 would also be "Central Alaska" (indicating the majority of a geographical region left after subdivision)

A local region would appear as 1.0002, etc., up to 1.9999 (but not necessarily in order and with names up to 40 characters)

Classifiers on a local region could appear as 1.0001,SC (the SC indicating the Seismicity and Continental Classifiers).

B5. Advantages

The main advantage of this three tier framework is that the current F-E Code is retained with the only proposed changes being the addition of four new geographical regions with corresponding corrections to three existing ones. Retention of the F-E Code means that seismological agencies and other users who wish to maintain existing computer software can do so with minimum disruption. It is proposed to keep local region definitions in sub-files so that users not needing to use local regions will not have to sort through large amounts of data.

B6. Disadvantages

The major disadvantage of this three tier framework is the lengthy numeric code needed to define the series of local regions within a geographical region. However, as local region definitions will be kept in sub-files users can choose which local regions they need to hold for their own work.

Another disadvantage of this three tier framework is that most of the problems with the current F-E Code not corrected by the proposed four additional regions remain. It will be up to users to decide whether to accept the shortcomings of the current two tier framework or to use corrected region information which will be available in the third tier of local regions.

REFERENCES

1. B Gutenberg and C F Richter: "Seismicity of the Earth". Princeton University Press, (1954)

2. E A Flinn and E R Engdahl: "A Proposed Basis for Geographical and Seismic Regionalization". Rev Geophys, 3, 123-149, (1965)

3. E A Flinn, E R Engdahl and A R Hill: "Seismic and Geographical Regionalisation". Bull Seis Soc Am, 64, No. 3,2, 771-993 (1974)

4. E A Flinn: Private Communication

5. J P Rothe: "The Seismicity of the Earth 1953-1965". UNESCO, (1969)

6. V Karnik: "Seismicity of the European Area, Part 2". Czechoslovak Academy of Sciences, (1971)

7. S Crampin, C J Fyfe, D P Bickmore and R H W Linton: "Atlas of Seismic Activity 1909 to 1968". IGS Seismological Bulletin No. 5 (1976)

8. "Map of Located Earthquakes in the World from 1964 to 1970". International Seismological Centre, (1971)

9. J B Young and Catherine I Pooley: "Classifiers of Seismic and Geographical Regionalisation". AWRE Report No. 06/85, (1986)

10. J B Young and A Douglas: "Map, Time Series and Other Plotting Routines for use with the Stromberg-Carlson 4020 Plotter". AWRE Report No. 041/68, (1968)

11. D H and M P Tarling: "Continental Drift" Penguin Books Ltd, Harmondsworth, (1974)

12. J D Fairhead and R W Girdler: "The Seismicity of the Red Sea, Gulf of Aden and Afar Triangle". Phil Trans Roy Soc Lond A.267, 49-74 (1970)

13. "Bulletin of the International Seismological Centre". 22, (12), December 1985, (1987)

14. F Ringdal: "Study of Magnitudes, Seismicity and Earthquake Detectability Using a Global Network". Centre for Seismic Studies Technical Report C84-01, (1984)

15. R C Lilwall and J M Neary: "Redetermination of Earthquake Body-Wave Magnitudes (m_b) Using ISC Bulletin Data". AWRE Report No. 021/85, (1986)

16. J B Young: "A Proposal for Additional Regions for the Flinn-Engdahl Regionalization Scheme". Geophysical Journal 93 583-586 (1988)

DESCRIPTION OF THE MAPS

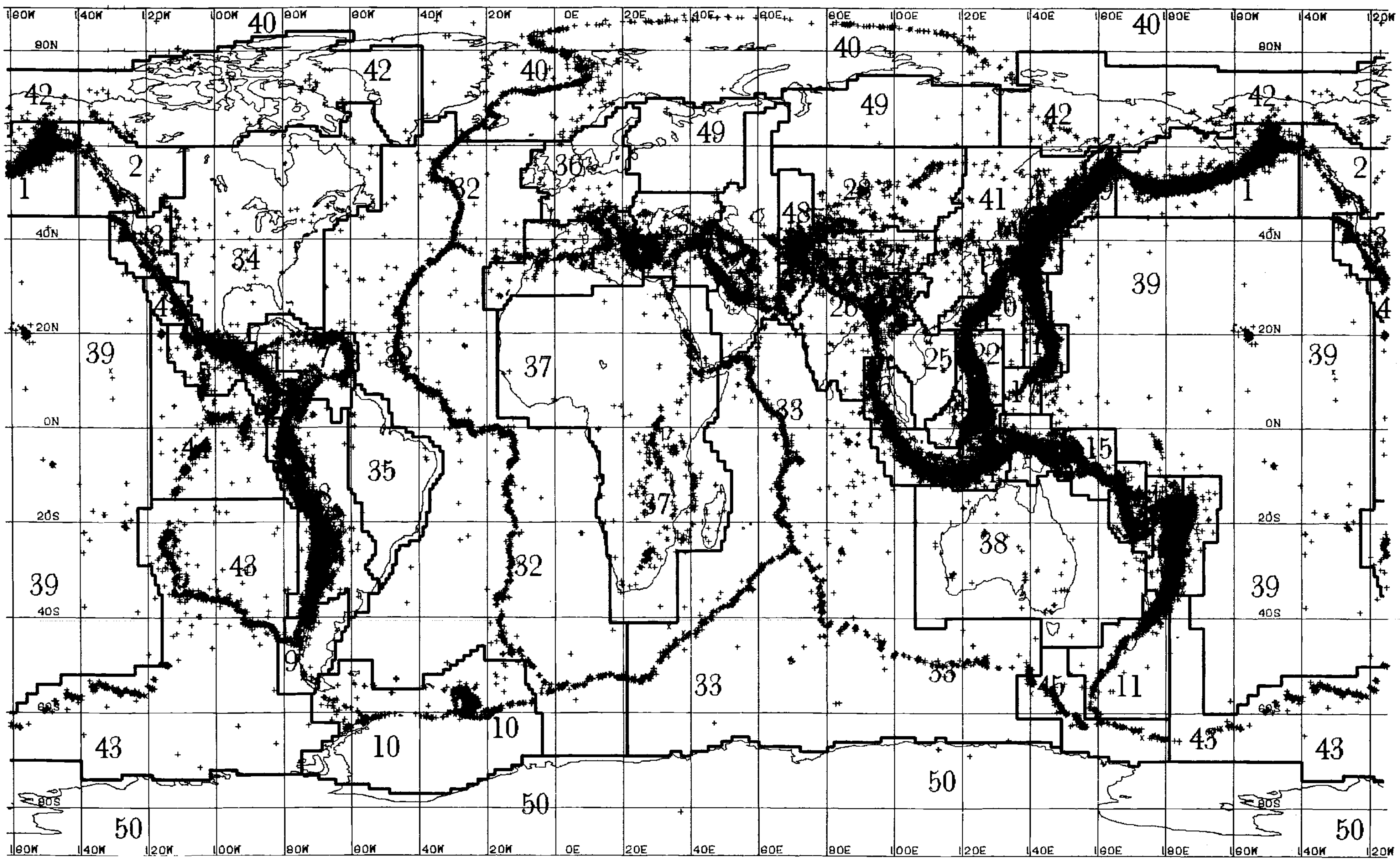
Map 1	F-E Seismic regions plotted on a repeating cylindrical projection of the earth centred on longitude 40°E and showing the global pattern of the seismicity.
Maps 2 - 9	Azimuthal equidistant maps centred on arbitrary points showing the distribution of shallow (<60km) earthquakes (+ symbol) and intermediate and deep (>60km) earthquakes (× symbol) for two hemispheres of the earth but without any F-E regions.
Map 2	Map centred on 0°N 20°E with radius 110° showing the distribution of shallow (<60km) earthquakes.
Map 3	Map centred on 0°N 160°W with radius 110° showing the distribution of shallow (<60km) earthquakes.
Map 4	Map centred on the North Pole (90°N) with radius 110° showing the distribution of shallow (<60km) earthquakes.
Map 5	Map centred on the South Pole (90°S) with radius 110° showing the distribution of shallow (<60km) earthquakes.
Map 6	Map centred on 0°N 20°E with radius 110° showing the distribution of intermediate and deep (>60km) earthquakes.
Map 7	Map centred on 0°N 160°W with radius 110° showing the distribution of intermediate and deep (>60km) earthquakes.
Map 8	Map centred on the North Pole (90°N) with radius 110° showing the distribution of intermediate and deep (>60km) earthquakes.
Map 9	Map centred on the South Pole (90°S) with radius 110° showing the distribution of intermediate and deep (>60km) earthquakes.
Maps 10 - 21	F-E Geographical regions plotted on a series of two overlapping cylindrical plots, one for north of the Equator and the other for south of the Equator, centred at selected longitudes covering the whole earth. These maps are identical to Maps 2-13 in the "classifiers" report [9] with the addition of the seismicity and the special logo plotted.
Map 10	North of the Equator centred on longitude 145°W.
Map 11	South of the Equator centred on longitude 145°W.
Map 12	North of the Equator centred on longitude 85°W.
Map 13	South of the Equator centred on longitude 85°W.
Map 14	North of the Equator centred on longitude 25°W.
Map 15	South of the Equator centred on longitude 25°W.
Map 16	North of the Equator centred on longitude 25°E.
Map 17	South of the Equator centred on longitude 25°E.
Map 18	North of the Equator centred on longitude 85°E.
Map 19	South of the Equator centred on longitude 85°E.
Map 20	North of the Equator centred on longitude 145°E.
Map 21	South of the Equator centred on longitude 145°E.
Maps 22 - 69	F-E Geographical regions plotted on a series of overlapping cylindrical plots similar to Maps 10-21 but at twice the grid spacing and hence a quarter of the area. The maps which show the fine detail of the seismicity are presented in four "strips" from 180°W to 180°E so covering the whole earth.
Map 22	Centred on latitude 65°N and longitude 163°W.
Map 23	Centred on latitude 65°N and longitude 135°W.
Map 24	Centred on latitude 65°N and longitude 105°W.
Map 25	Centred on latitude 65°N and longitude 75°W.

Map 26	Centred on latitude 65°N and longitude 45°W.
Map 27	Centred on latitude 65°N and longitude 15°W.
Map 28	Centred on latitude 65°N and longitude 15°E.
Map 29	Centred on latitude 65°N and longitude 45°E.
Map 30	Centred on latitude 65°N and longitude 75°E.
Map 31	Centred on latitude 65°N and longitude 105°E.
Map 32	Centred on latitude 65°N and longitude 135°E.
Map 33	Centred on latitude 65°N and longitude 163°E.
Map 34	Centred on latitude 20°N and longitude 163°W.
Map 35	Centred on latitude 20°N and longitude 135°W.
Map 36	Centred on latitude 20°N and longitude 105°W.
Map 37	Centred on latitude 20°N and longitude 75°W.
Map 38	Centred on latitude 20°N and longitude 45°W.
Map 39	Centred on latitude 20°N and longitude 15°W.
Map 40	Centred on latitude 20°N and longitude 15°E.
Map 41	Centred on latitude 20°N and longitude 45°E.
Map 42	Centred on latitude 20°N and longitude 75°E.
Map 43	Centred on latitude 20°N and longitude 105°E.
Map 44	Centred on latitude 20°N and longitude 135°E.
Map 45	Centred on latitude 20°N and longitude 163°E.
Map 46	Centred on latitude 20°S and longitude 163°W.
Map 47	Centred on latitude 20°S and longitude 135°W.
Map 48	Centred on latitude 20°S and longitude 105°W.
Map 49	Centred on latitude 20°S and longitude 75°W.
Map 50	Centred on latitude 20°S and longitude 45°W.
Map 51	Centred on latitude 20°s and longitude 15°W.
Map 52	Centred on latitude 20°S and longitude 15°E.
Map 53	Centred on latitude 20°S and longitude 45°E.
Map 54	Centred on latitude 20°S and longitude 75°E.
Map 55	Centred on latitude 20°S and longitude 105°E.
Map 56	Centred on latitude 20°S and longitude 135°E.
Map 57	Centred on latitude 20°S and longitude 163°E.
Map 58	Centred on latitude 65°S and longitude 163°W.
Map 59	Centred on latitude 65°S and longitude 135°W.
Map 60	Centred on latitude 65°S and longitude 105°W.
Map 61	Centred on latitude 65°S and longitude 75°W.
Map 62	Centred on latitude 65°S and longitude 45°W.
Map 63	Centred on latitude 65°S and longitude 15°W.
Map 64	Centred on latitude 65°S and longitude 15°E.
Map 65	Centred on latitude 65°S and longitude 45°E.
Map 66	Centred on latitude 65°S and longitude 75°E.
Map 67	Centred on latitude 65°S and longitude 105°E.
Map 68	Centred on latitude 65°S and longitude 135°E.
Map 69	Centred on latitude 65°S and longitude 163°E.

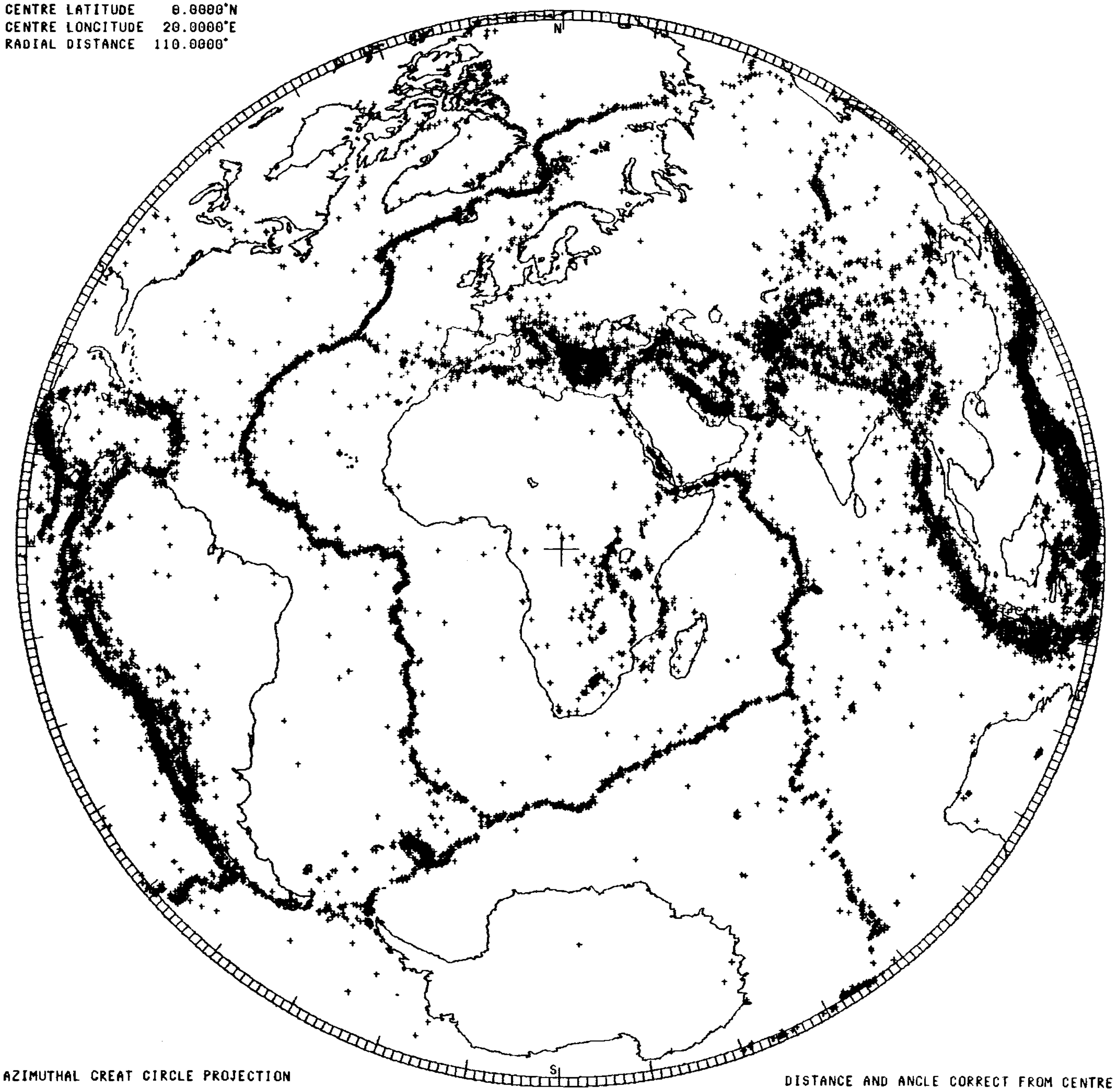
MAP NO. 1 -- ISC DATA 1964-1985

DEPTH<60KM MAG>4.0 +

DEPTH>60KM MAG>4.0 x



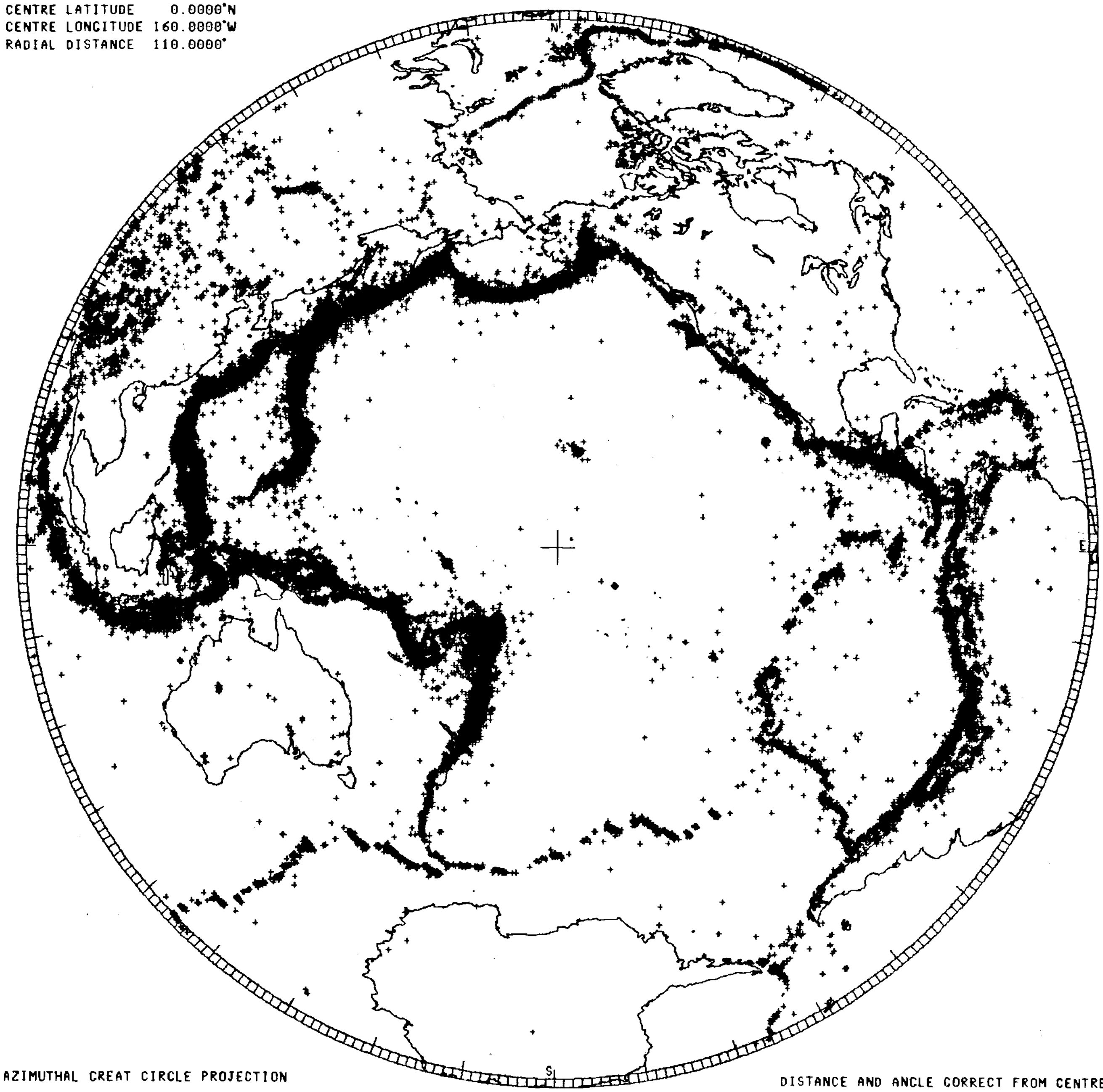
TITLE MAP 2 DEPTH<60KM MAG>4 ISC 64-85
CENTRE LATITUDE 0.0000°N
CENTRE LONGITUDE 20.0000°E
RADIAL DISTANCE 110.0000°



AZIMUTHAL GREAT CIRCLE PROJECTION

DISTANCE AND ANGLE CORRECT FROM CENTRE

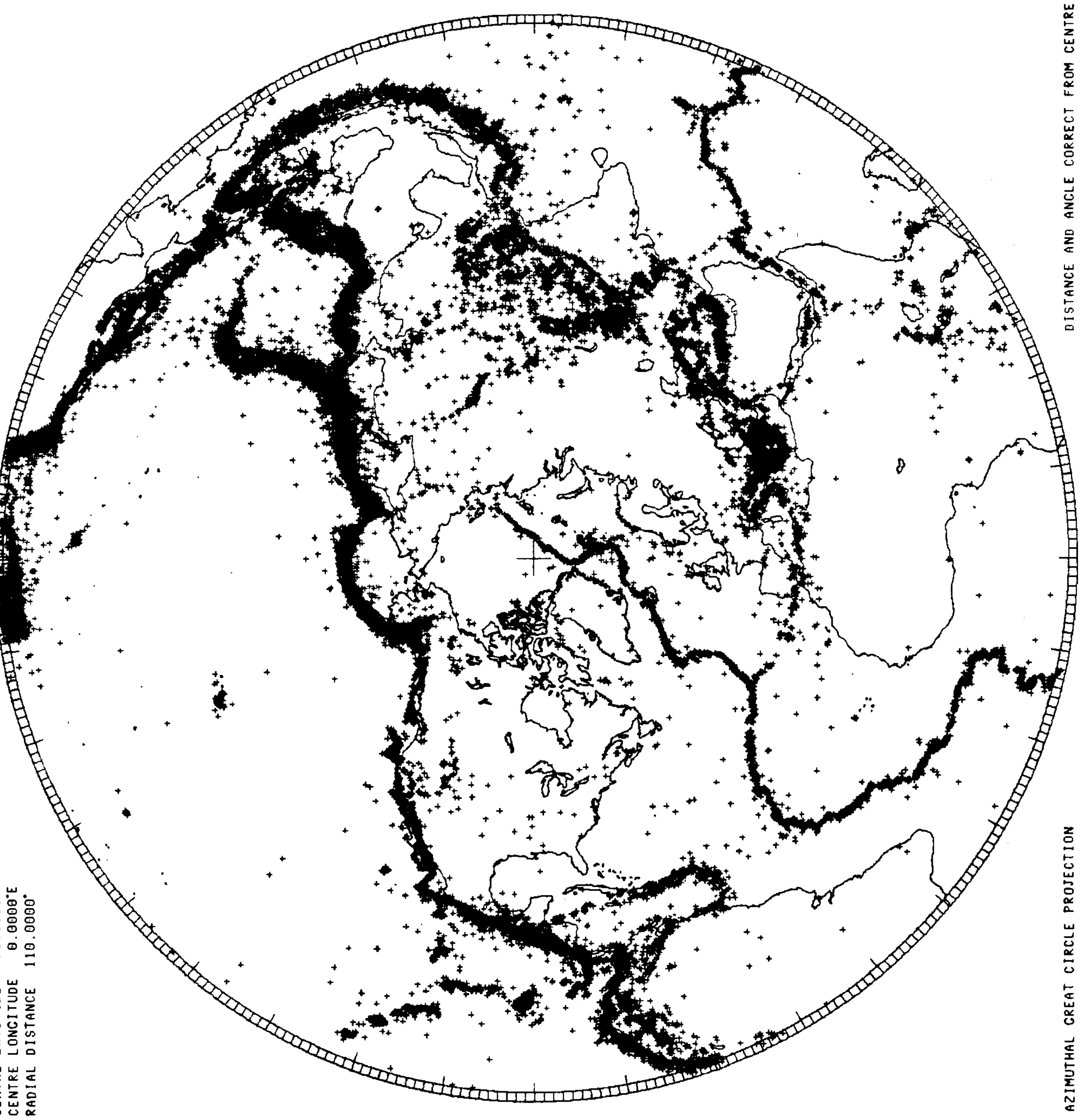
TITLE MAP 3 DEPTH<60KM MAG>4 ISC 64-85
CENTRE LATITUDE 0.0000°N
CENTRE LONGITUDE 160.0000°W
RADIAL DISTANCE 110.0000°



AZIMUTHAL GREAT CIRCLE PROJECTION

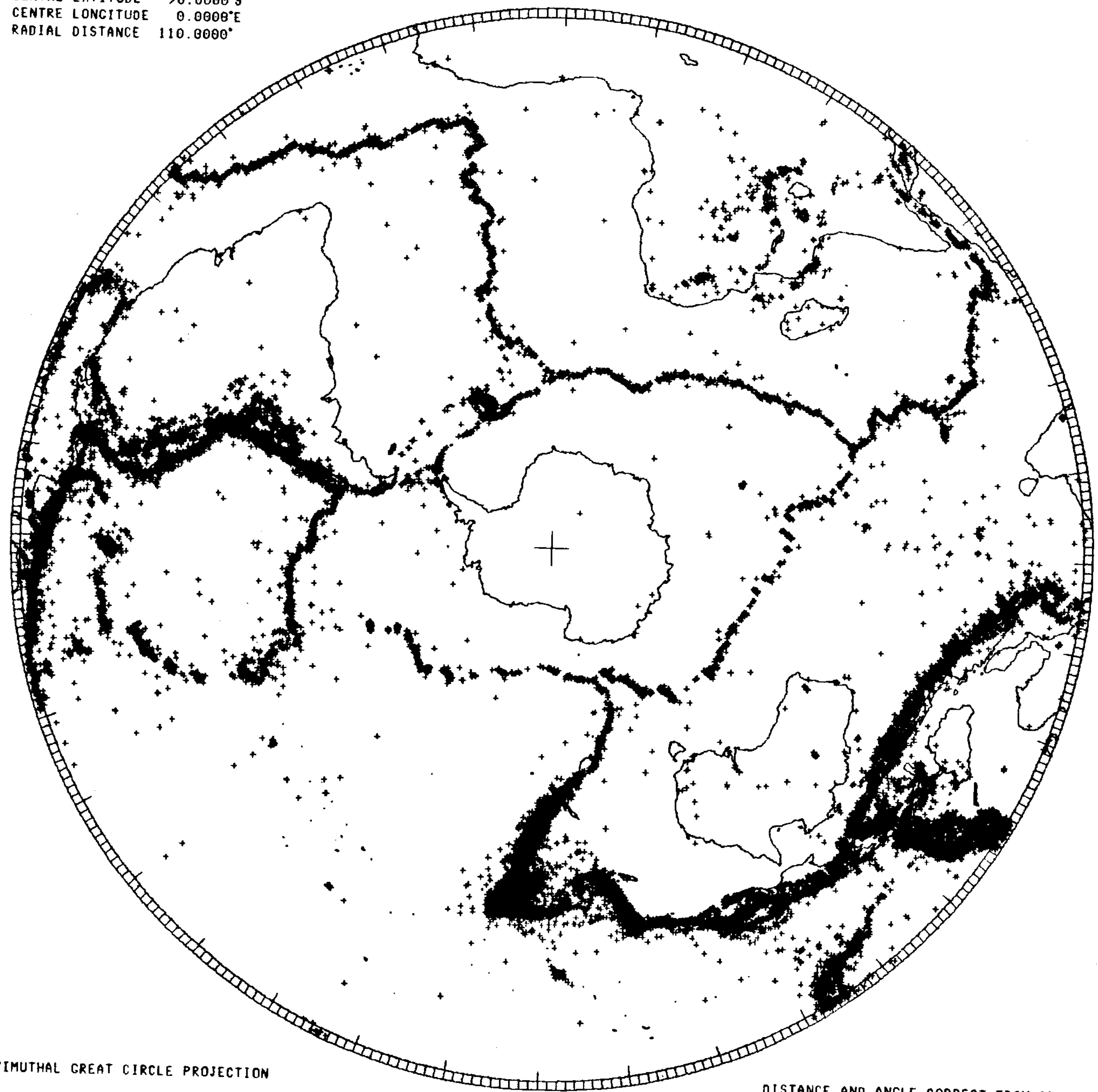
DISTANCE AND ANGLE CORRECT FROM CENTRE

TITLE MAP 4 DEPTH<60KM MAG>4 ISC 64-85
CENTRE LATITUDE 90.0000°N
CENTRE LONGITUDE 0.0000°E
RADIAL DISTANCE 110.0000°



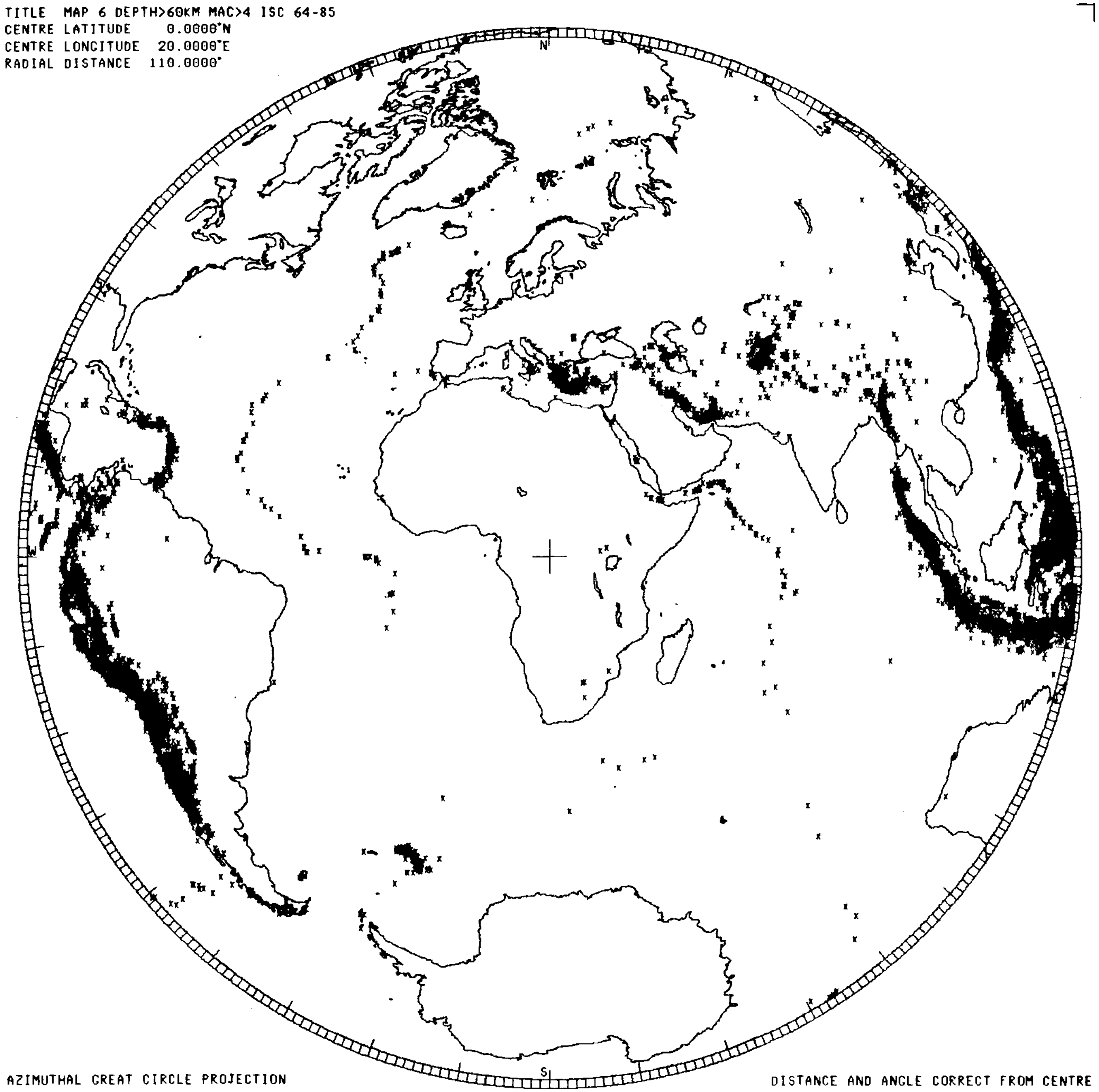
AZIMUTHAL GREAT CIRCLE PROJECTION
DISTANCE AND ANGLE CORRECT FROM CENTRE

TITLE MAP 5 DEPTH<60KM MAG>4 ISC 64-85
CENTRE LATITUDE 90.0000°S
CENTRE LONGITUDE 0.0000°E
RADIAL DISTANCE 110.0000°

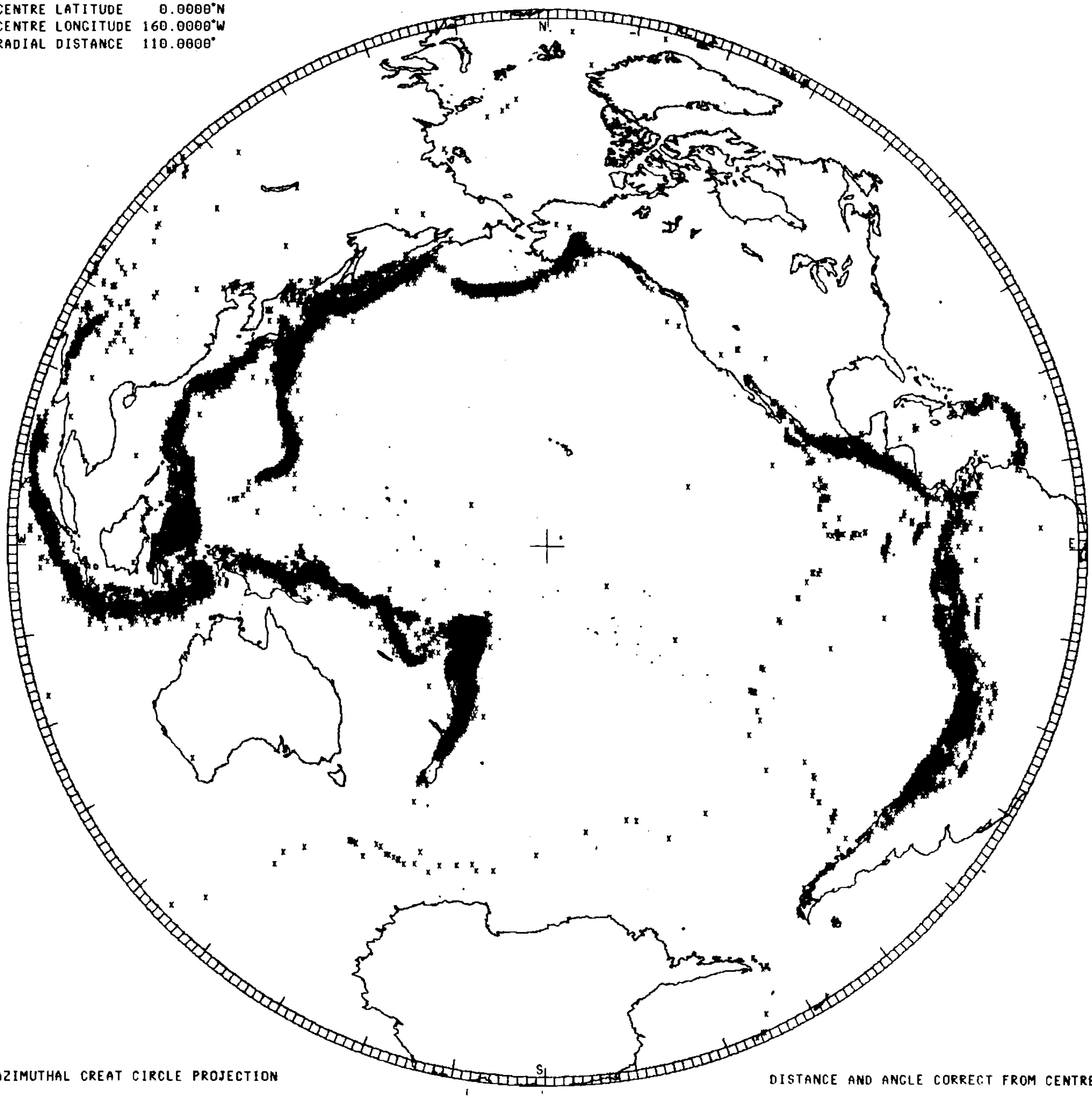


AZIMUTHAL GREAT CIRCLE PROJECTION

DISTANCE AND ANGLE CORRECT FROM CENTRE

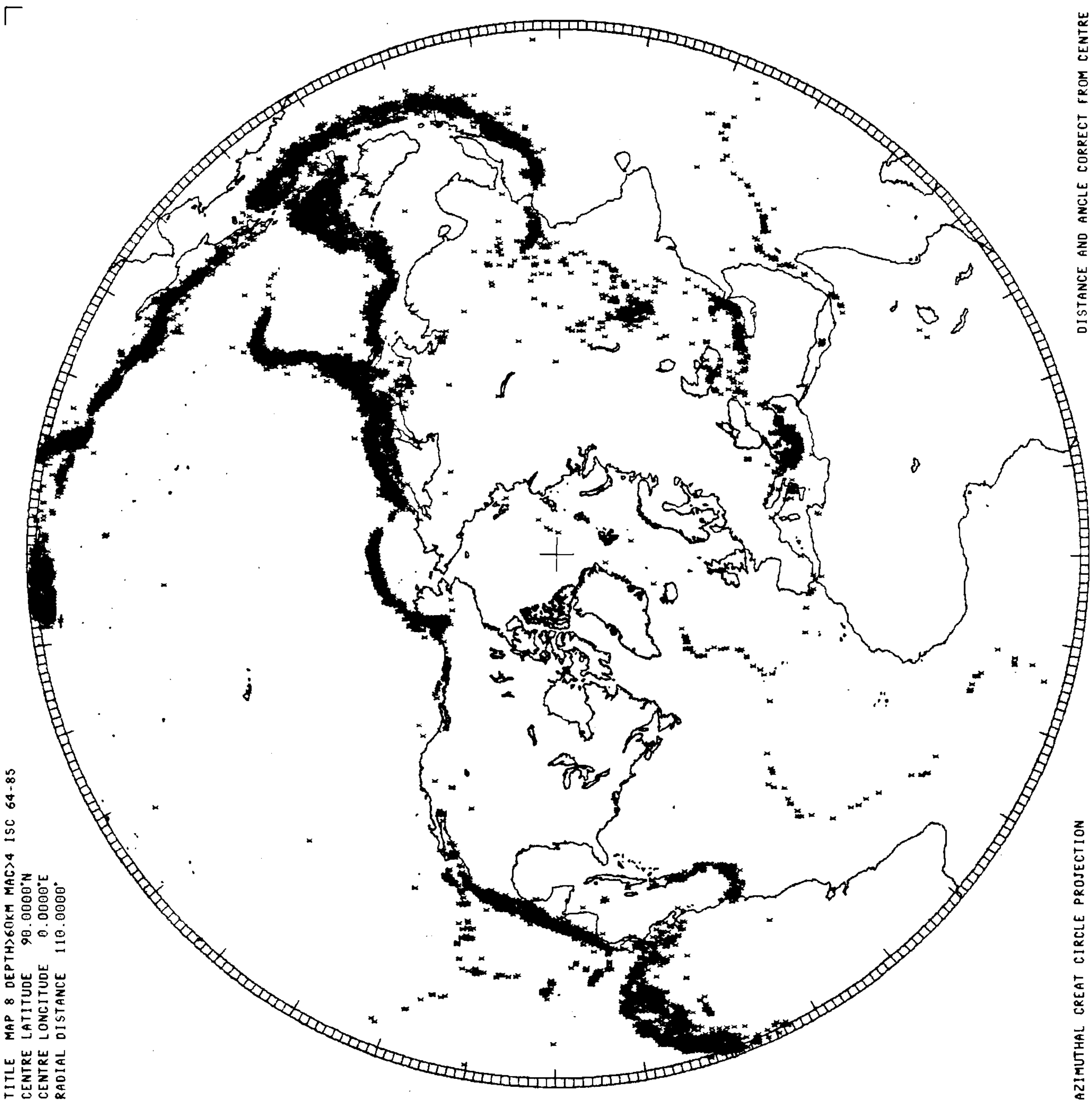

TITLE MAP 6 DEPTH>60KM MAC>4 ISC 64-85
CENTRE LATITUDE 0.0000°N
CENTRE LONGITUDE 20.0000°E
RADIAL DISTANCE 110.0000°
N
S
AZIMUTHAL GREAT CIRCLE PROJECTION
DISTANCE AND ANGLE CORRECT FROM CENTRE

TITLE MAP 7 DEPTH>60KM MAG>4 ISC 64-85
CENTRE LATITUDE 0.0000°N
CENTRE LONGITUDE 160.0000°W
RADIAL DISTANCE 110.0000°

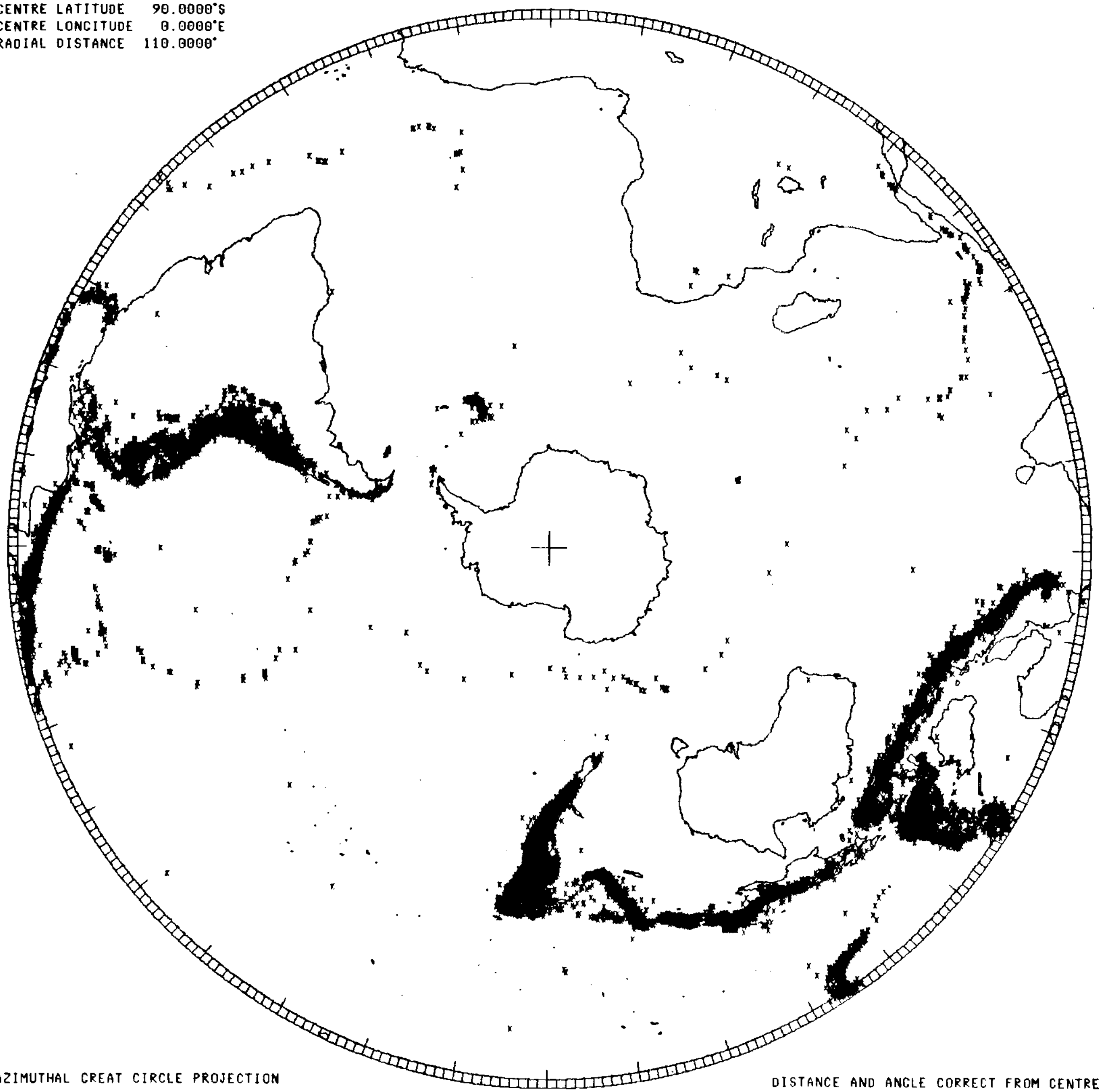


AZIMUTHAL GREAT CIRCLE PROJECTION

DISTANCE AND ANGLE CORRECT FROM CENTRE

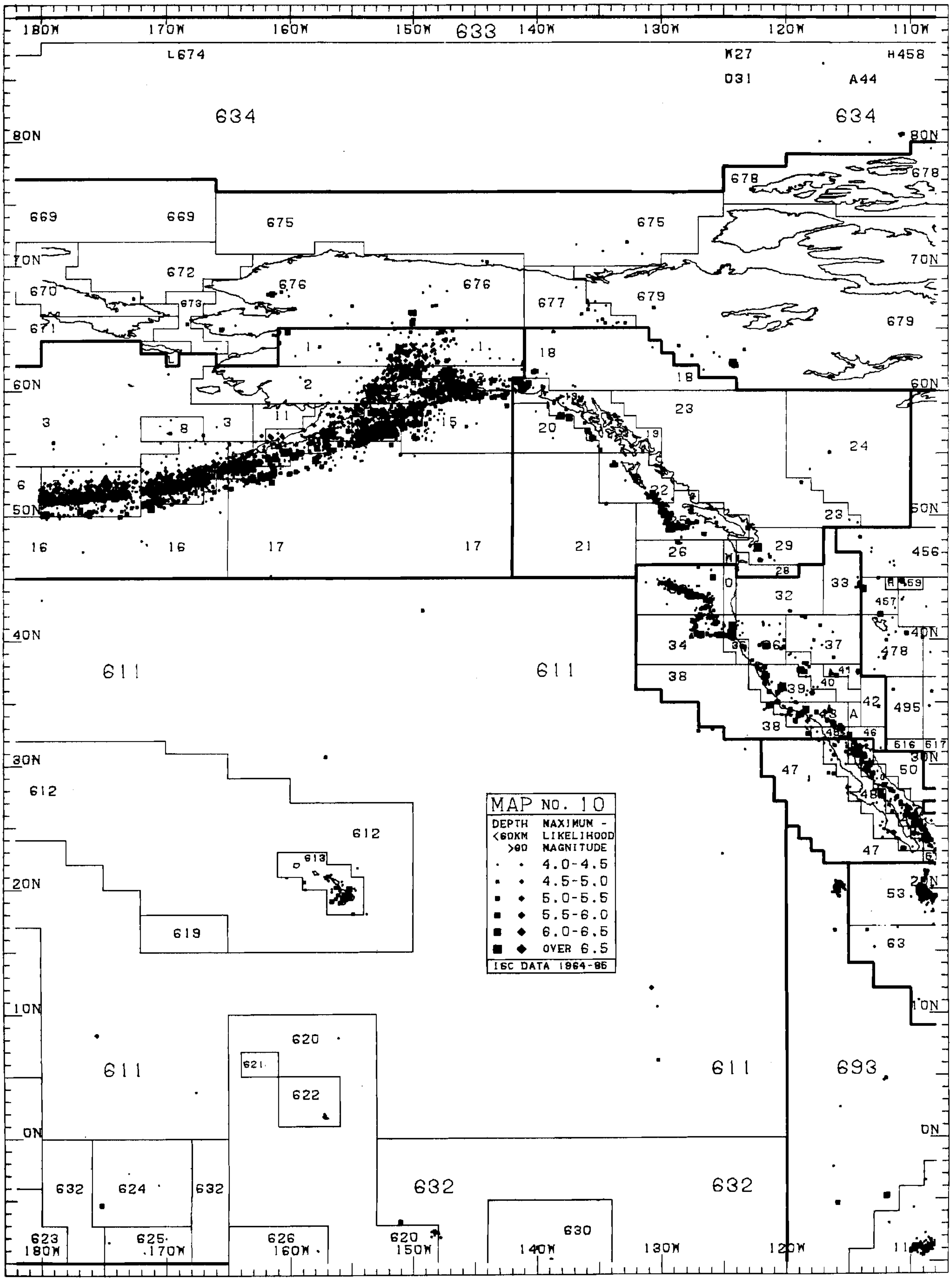

TITLE MAP 8 DEPTH>60KM MAG>4 ISC 64-85
CENTRE LATITUDE 90.0000°N
CENTRE LONGITUDE 0.0000°E
RADIAL DISTANCE 110.0000°
AZIMUTHAL GREAT CIRCLE PROJECTION
DISTANCE AND ANGLE CORRECT FROM CENTRE

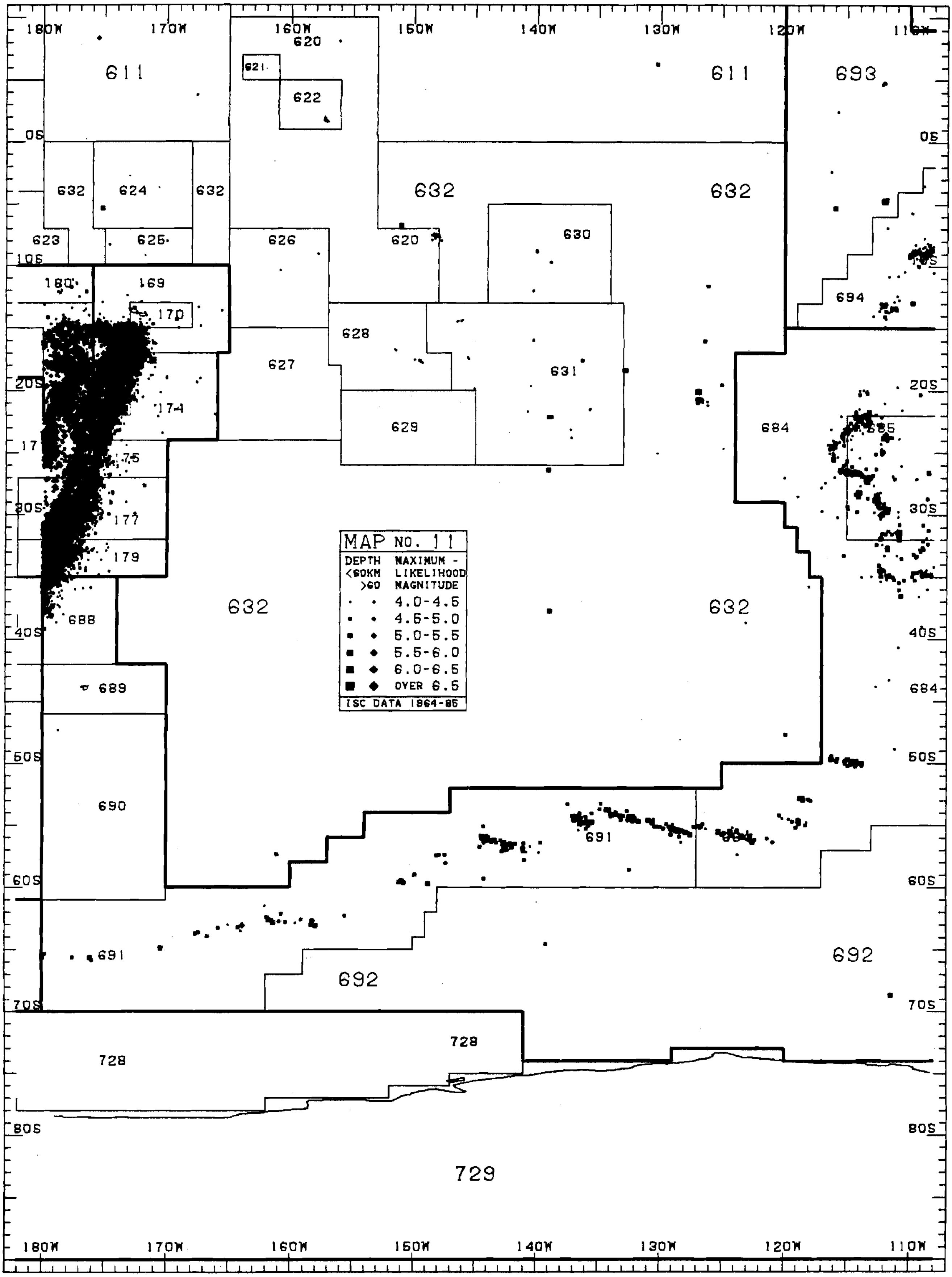
TITLE MAP 9 DEPTH>60KM MAC>4 ISC 64-85
CENTRE LATITUDE   90.0000°S
CENTRE LONCITUDE   0.0000°E
RADIAL DISTANCE 110.0000°

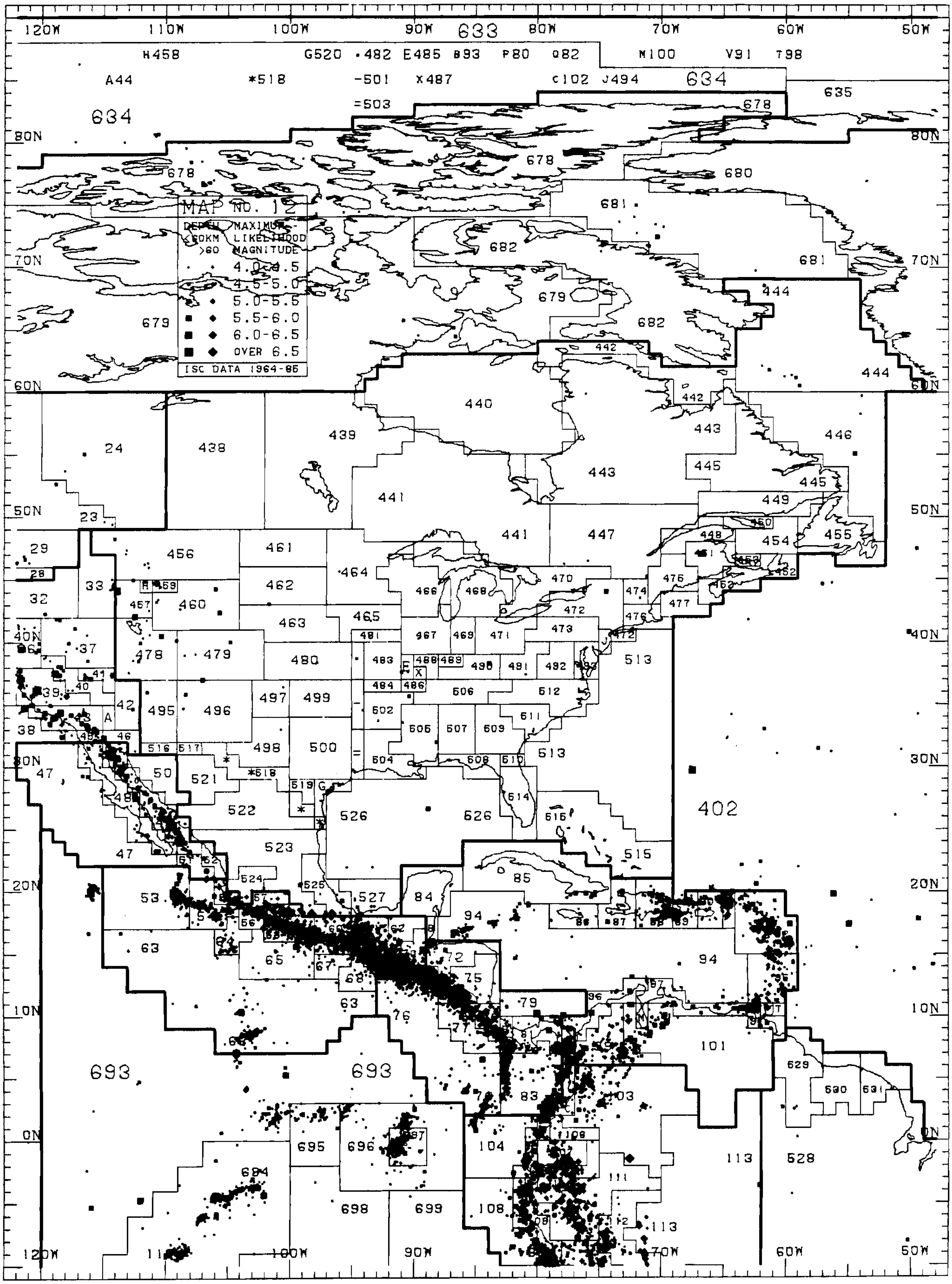


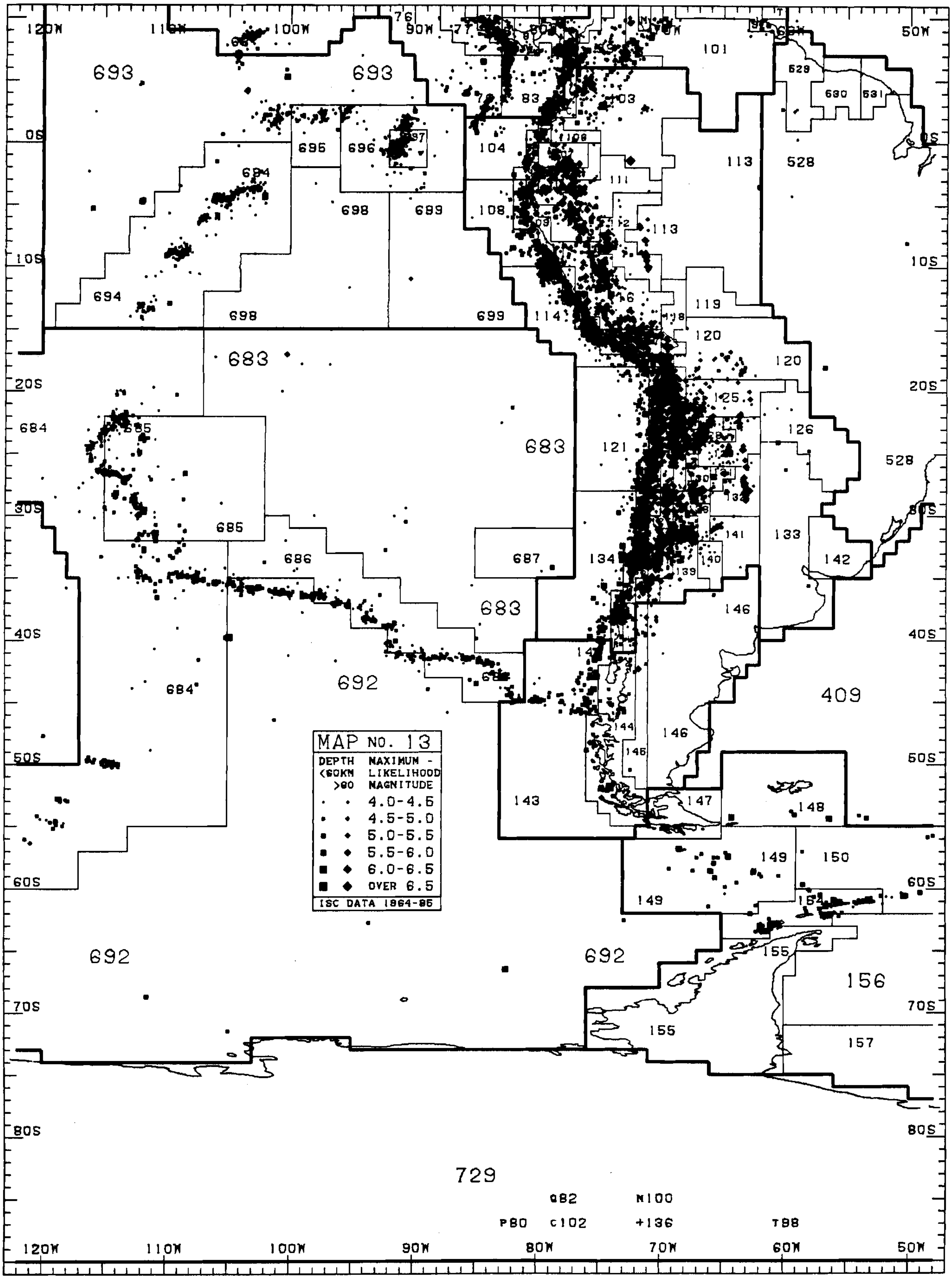
AZIMUTHAL CREAT CIRCLE PROJECTION

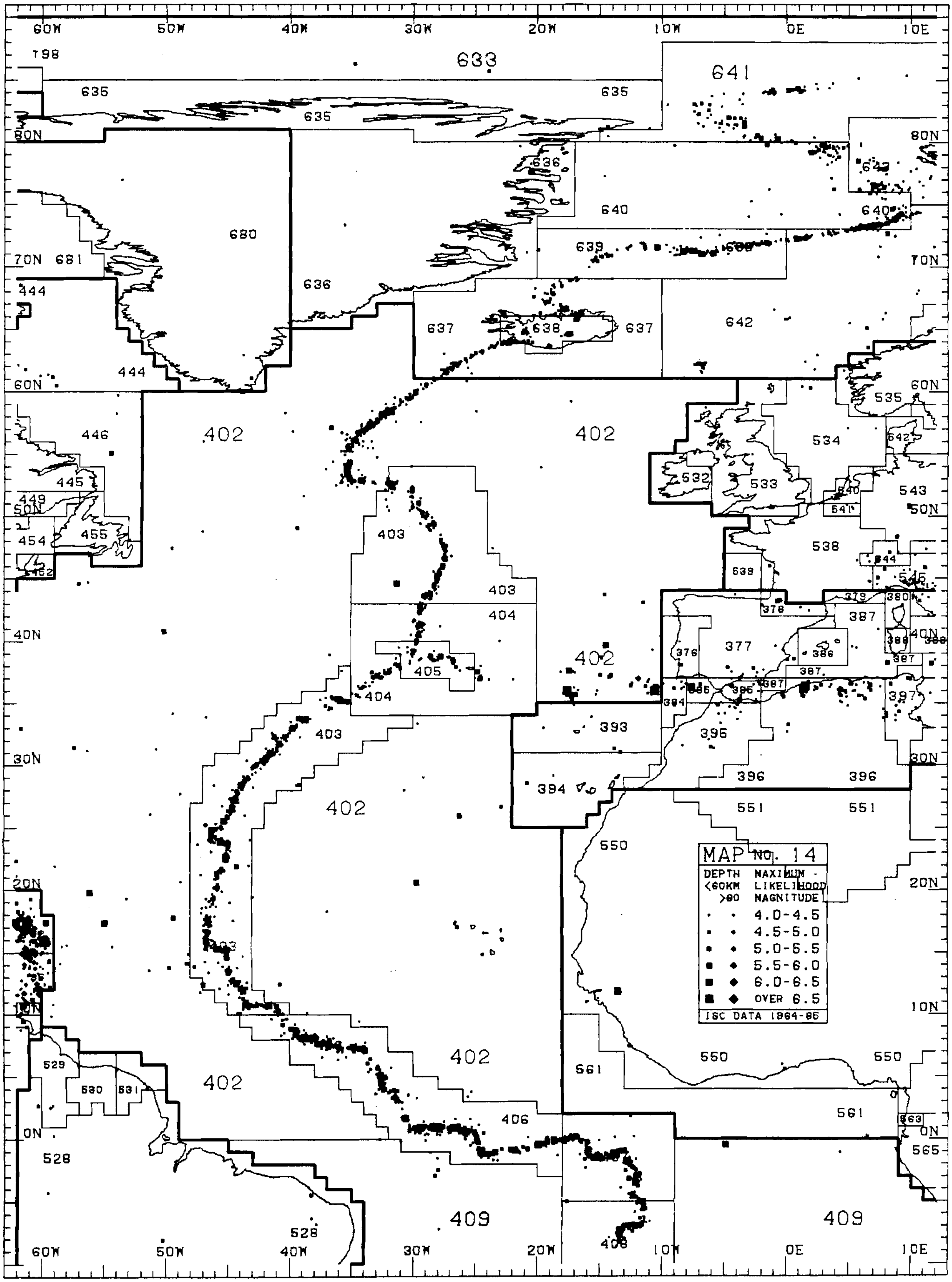
DISTANCE AND ANCLE CORRECT FROM CENTRE


MAP NO. 10
DEPTH <60KM >60
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
180W
170W
160W
150W
140W
130W
120W
110W
633
634
80N
70N
60N
50N
40N
30N
20N
10N
0N
611
612
619
620
621
622
623
624
625
626
630
632
693
669
670
671
672
673
675
676
677
678
679

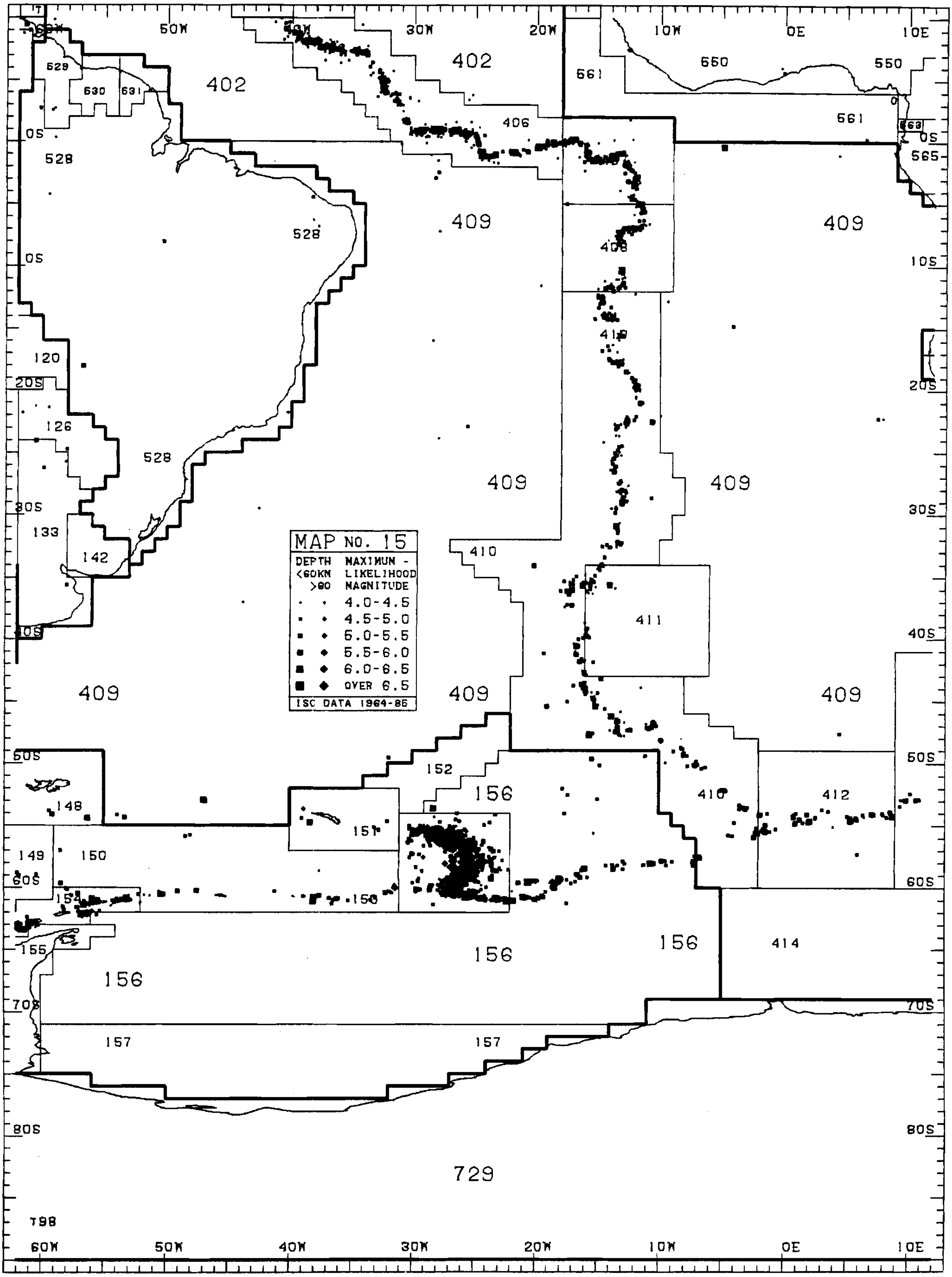

MAP NO. 11
DEPTH <60KM >60
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
180W
170W
160W
150W
140W
130W
120W
110W
0S
10S
20S
30S
40S
50S
60S
70S
80S
611
620
621
622
632
624
625
623
626
630
180
169
170
628
627
631
174
629
684
685
175
177
179
693
694
688
689
690
691
692
728
729

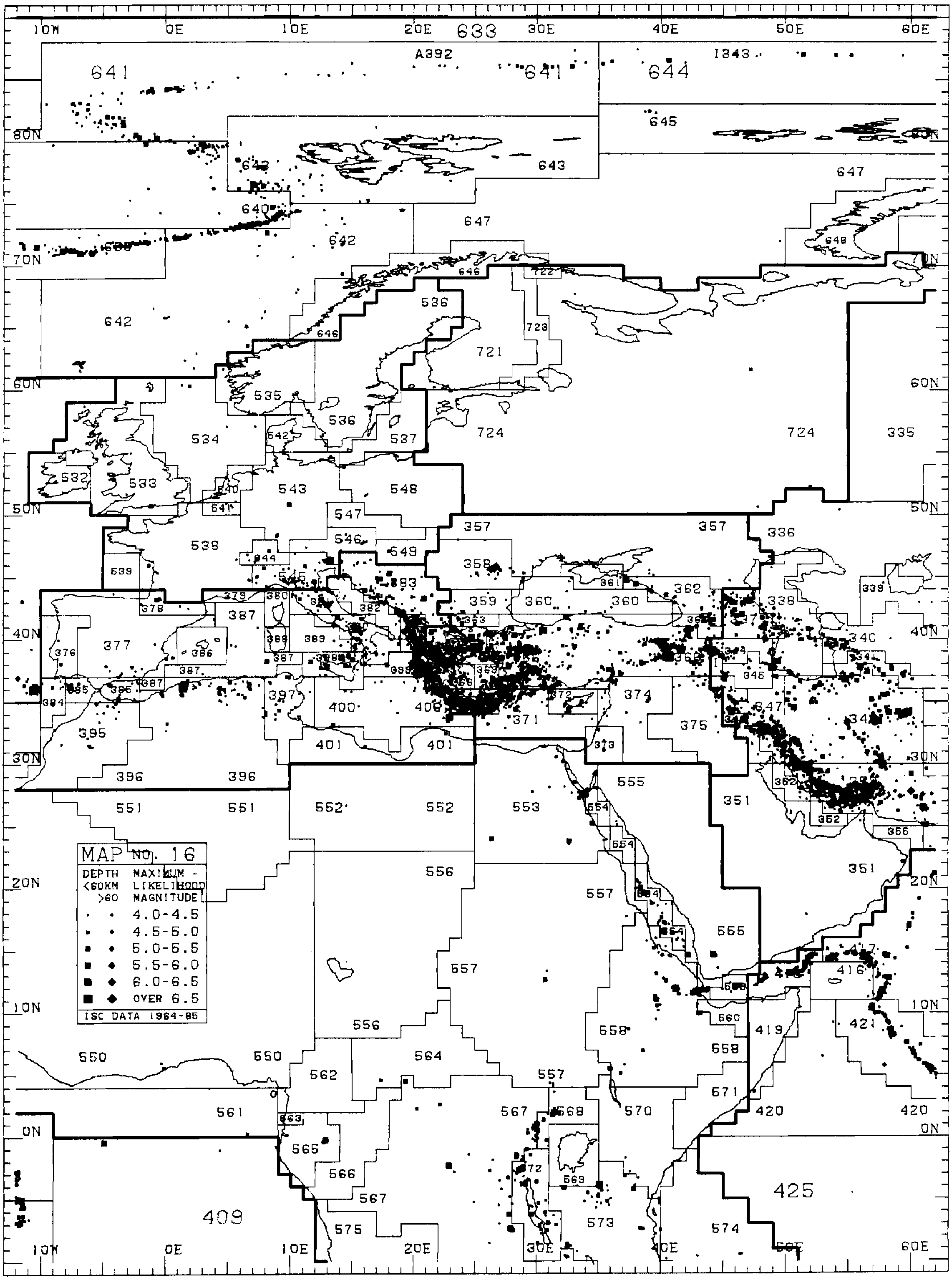

MAP NO. 12
DEPTH
<60KM
>60
MAXIMUM-LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-86
120W
110W
100W
90W
80W
70W
60W
50W
80N
70N
60N
50N
40N
30N
20N
10N
0N
633
634
635
H458
G520
•482
E485
B93
F80
Q82
N100
V91
T98
A44
*518
-501
X487
C102
J494
=503
678
680
681
682
679
444
442
440
439
438
24
23
441
443
446
445
449
447
455
454
450
448
29
28
456
461
464
462
466
468
470
476
474
477
472
473
33
32
469
460
457
463
465
467
471
37
478
479
480
481
483
488
489
490
491
492
513
41
40
39
484
486
506
512
42
495
496
497
499
502
38
505
507
509
511
46
516
517
498
500
504
508
510
47
50
521
518
519
514
515
522
526
626
516
402
523
53
524
525
527
84
85
94
63
65
67
86
87
88
89
72
75
68
76
77
79
101
693
629
630
631
83
103
695
696
697
104
109
113
528
694
111
698
699
108

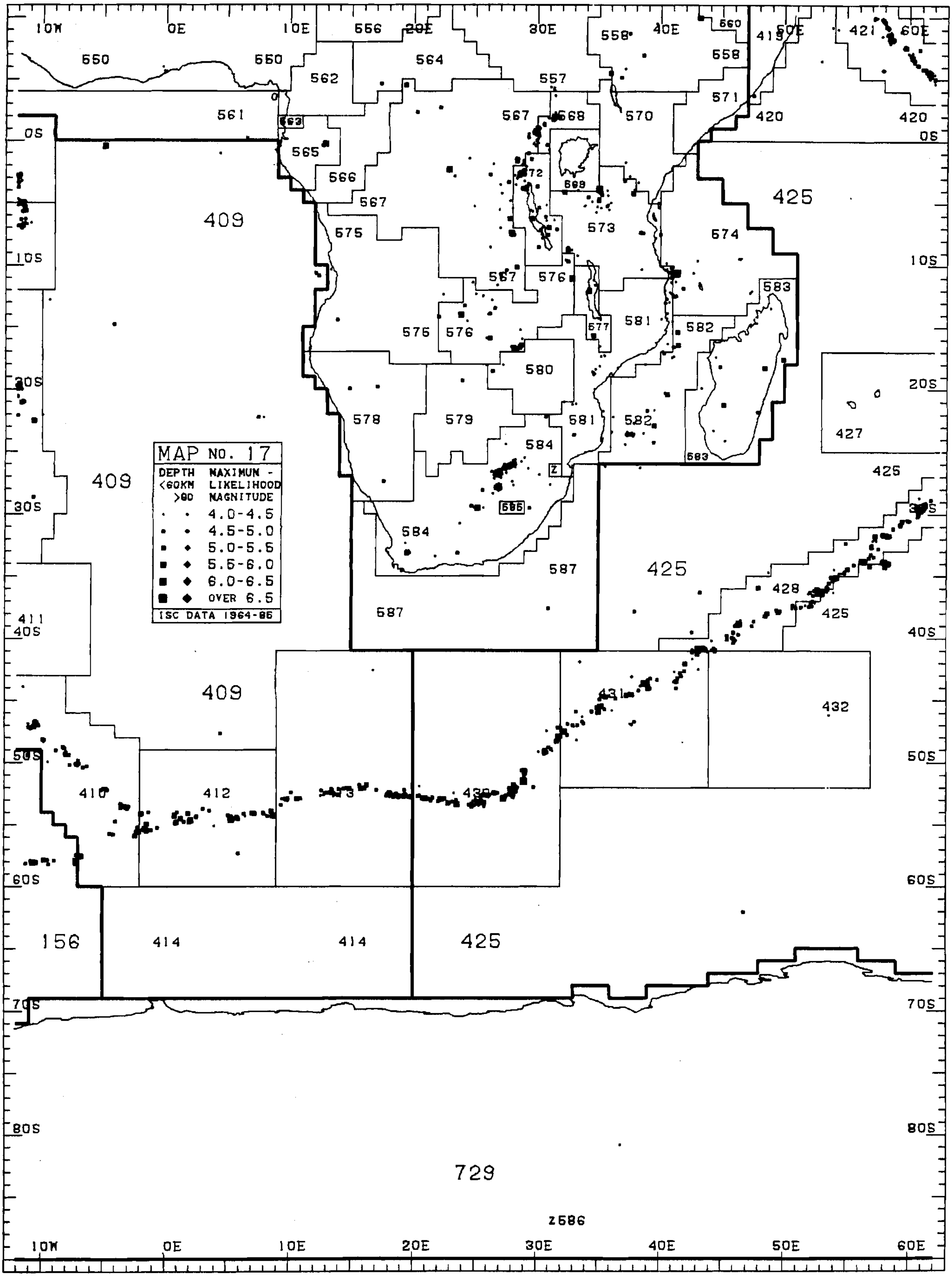

MAP NO. 13
DEPTH <60KM >60
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
120W
110W
100W
90W
80W
70W
60W
50W
0S
10S
20S
30S
40S
50S
60S
70S
80S
693
683
684
692
729
409
528
P80
Q82
C102
N100
+136
T88



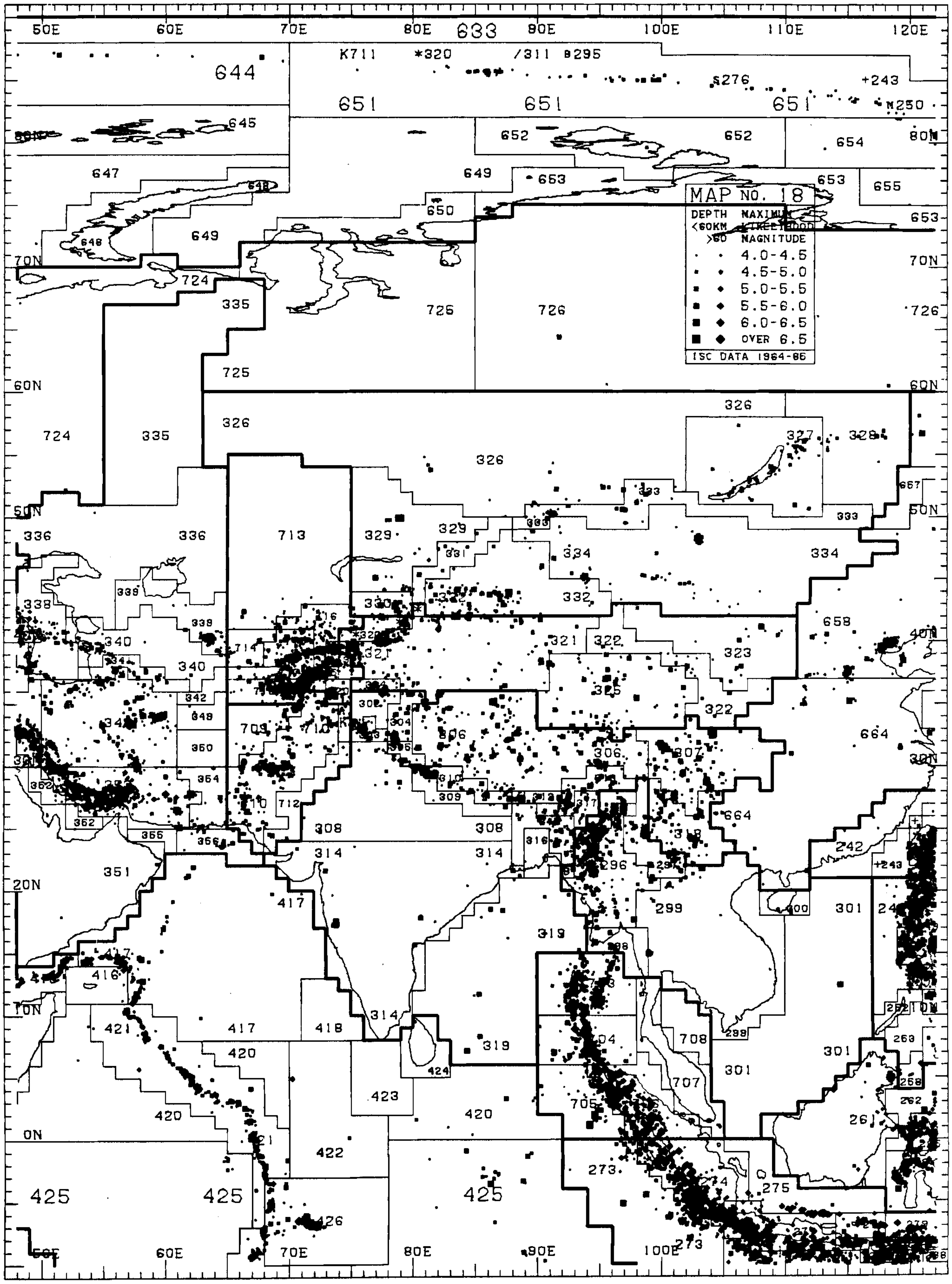
MAP NO. 14
DEPTH <60KM >60
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-86
60W
50W
40W
30W
20W
10W
0E
10E
80N
70N
60N
50N
40N
30N
20N
10N
0N

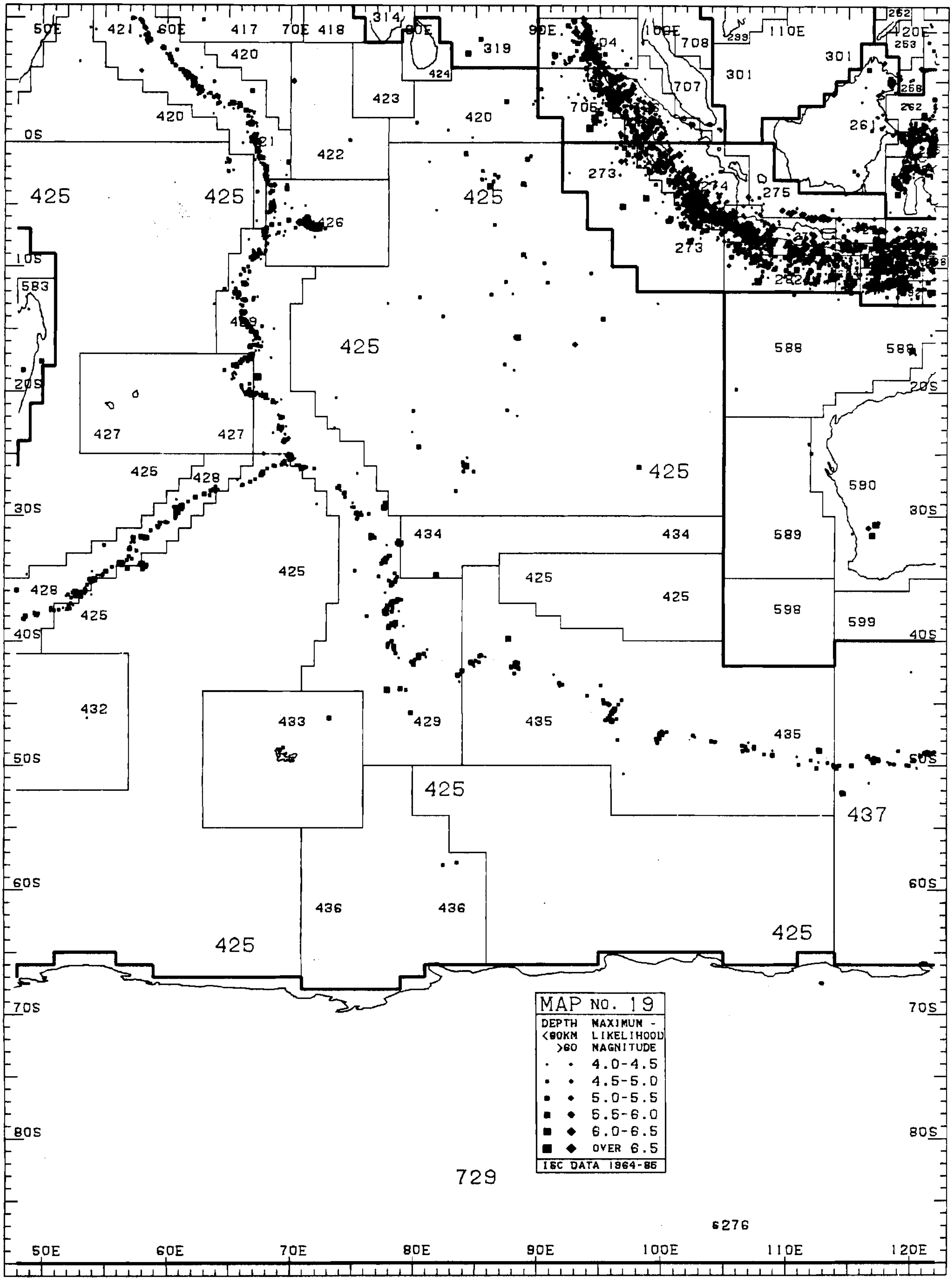

MAP NO. 15
DEPTH <60KM >60
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
60W
50W
40W
30W
20W
10W
0E
10E
0S
10S
20S
30S
40S
50S
60S
70S
80S
402
406
408
409
410
411
412
414
528
529
530
531
550
561
563
565
120
126
133
142
148
149
150
151
152
154
155
156
157
729
T98

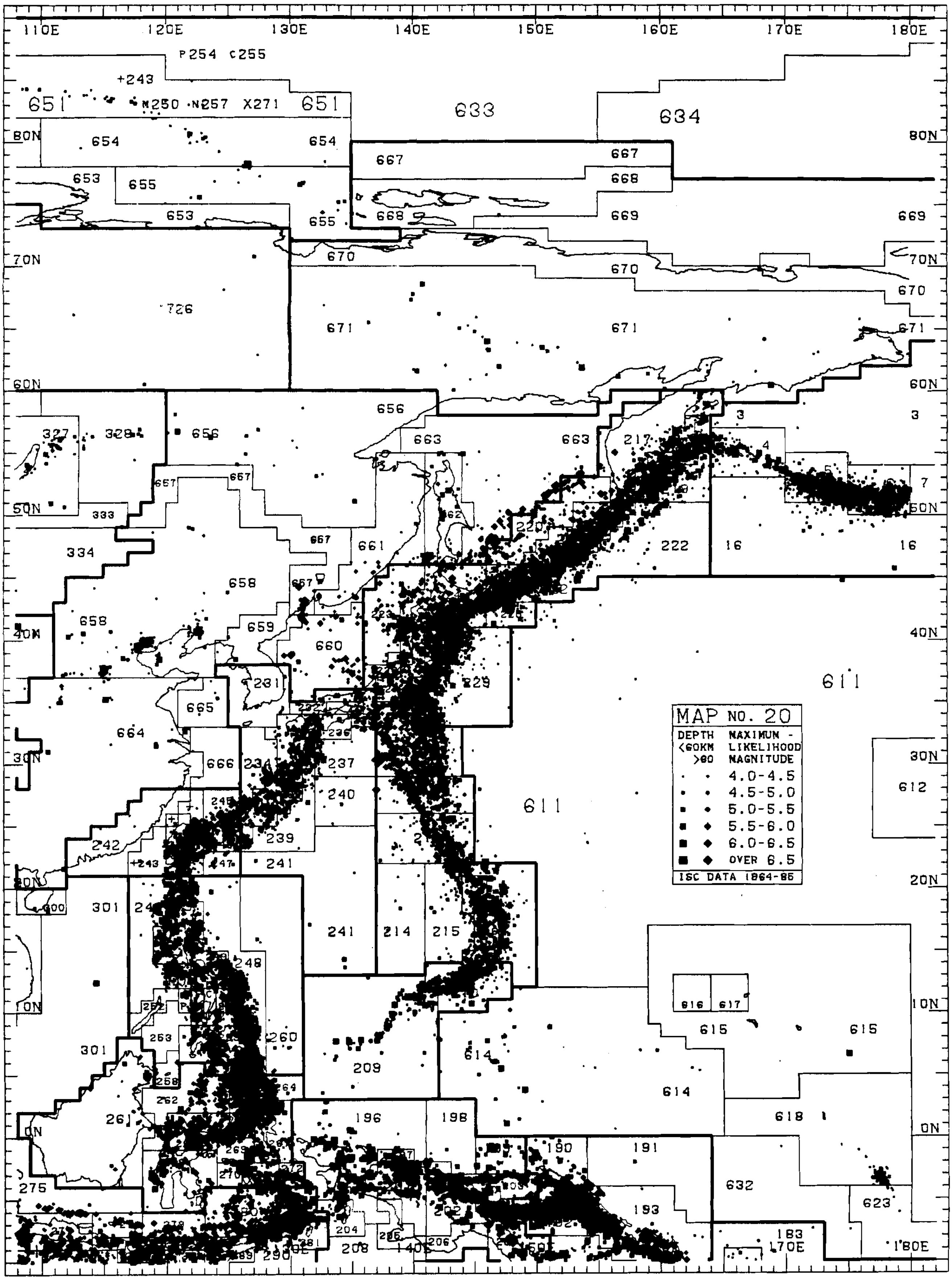

MAP NO. 16
DEPTH
<60KM
>60
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
10W
0E
10E
20E
30E
40E
50E
60E
80N
70N
60N
50N
40N
30N
20N
10N
0N

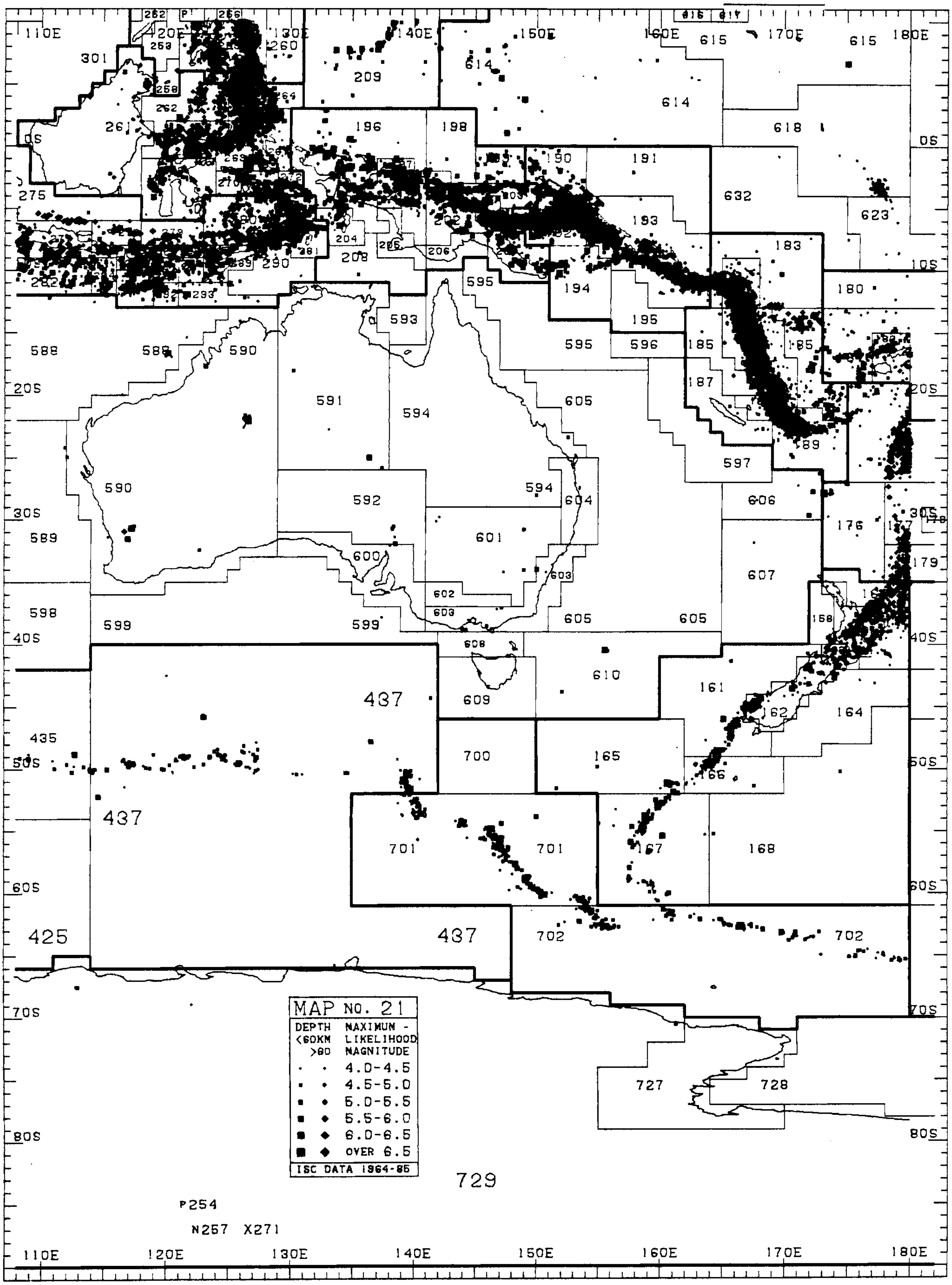


MAP NO. 17
DEPTH
<60KM
>60
MAXIMUN - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-86
10W
0E
10E
20E
30E
40E
50E
60E
0S
10S
20S
30S
40S
50S
60S
70S
80S
409
410
411
412
414
425
427
428
431
432
156
729
z586

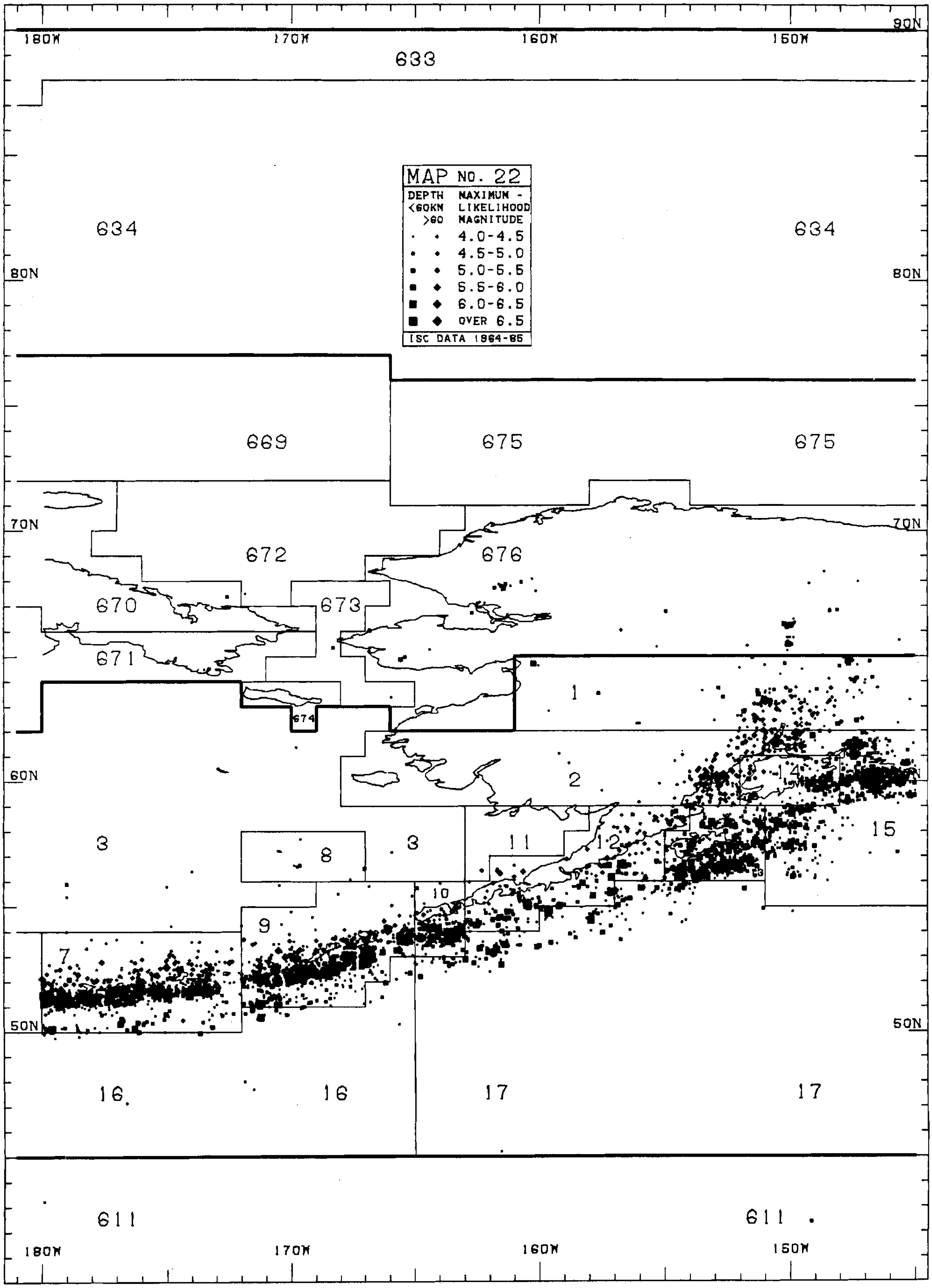

MAP NO. 18
DEPTH
MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-86
50E
60E
70E
80E
90E
100E
110E
120E
80N
70N
60N
50N
40N
30N
20N
10N
0N


MAP NO. 19
DEPTH <60KM >60
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
50E
60E
70E
80E
90E
100E
110E
120E
0S
10S
20S
30S
40S
50S
60S
70S
80S
425
427
428
432
433
434
435
436
437
729
6276

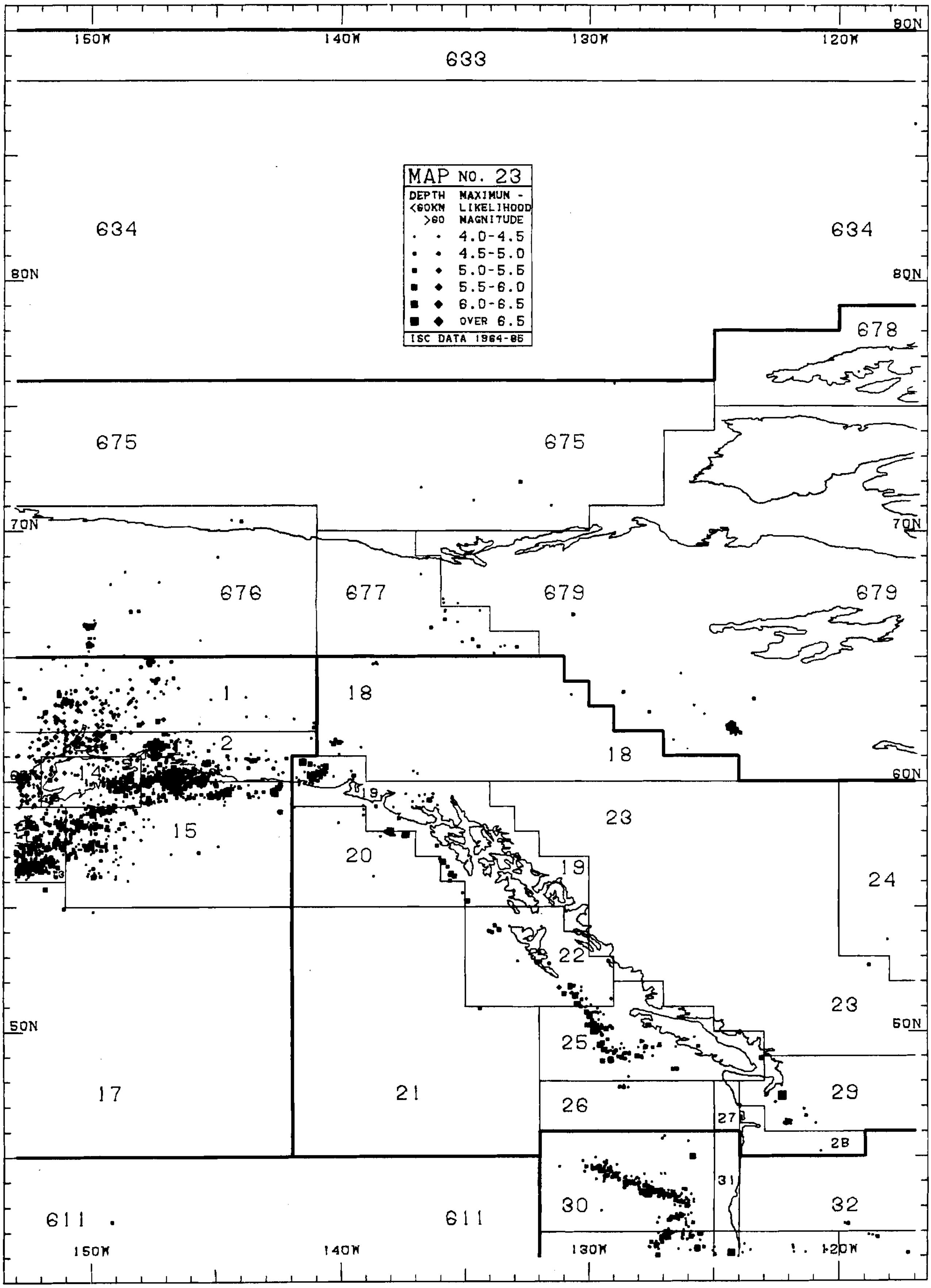

MAP NO. 20
DEPTH <60KM >60
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
110E
120E
130E
140E
150E
160E
170E
180E
80N
70N
60N
50N
40N
30N
20N
10N
0N
611
633
634
651

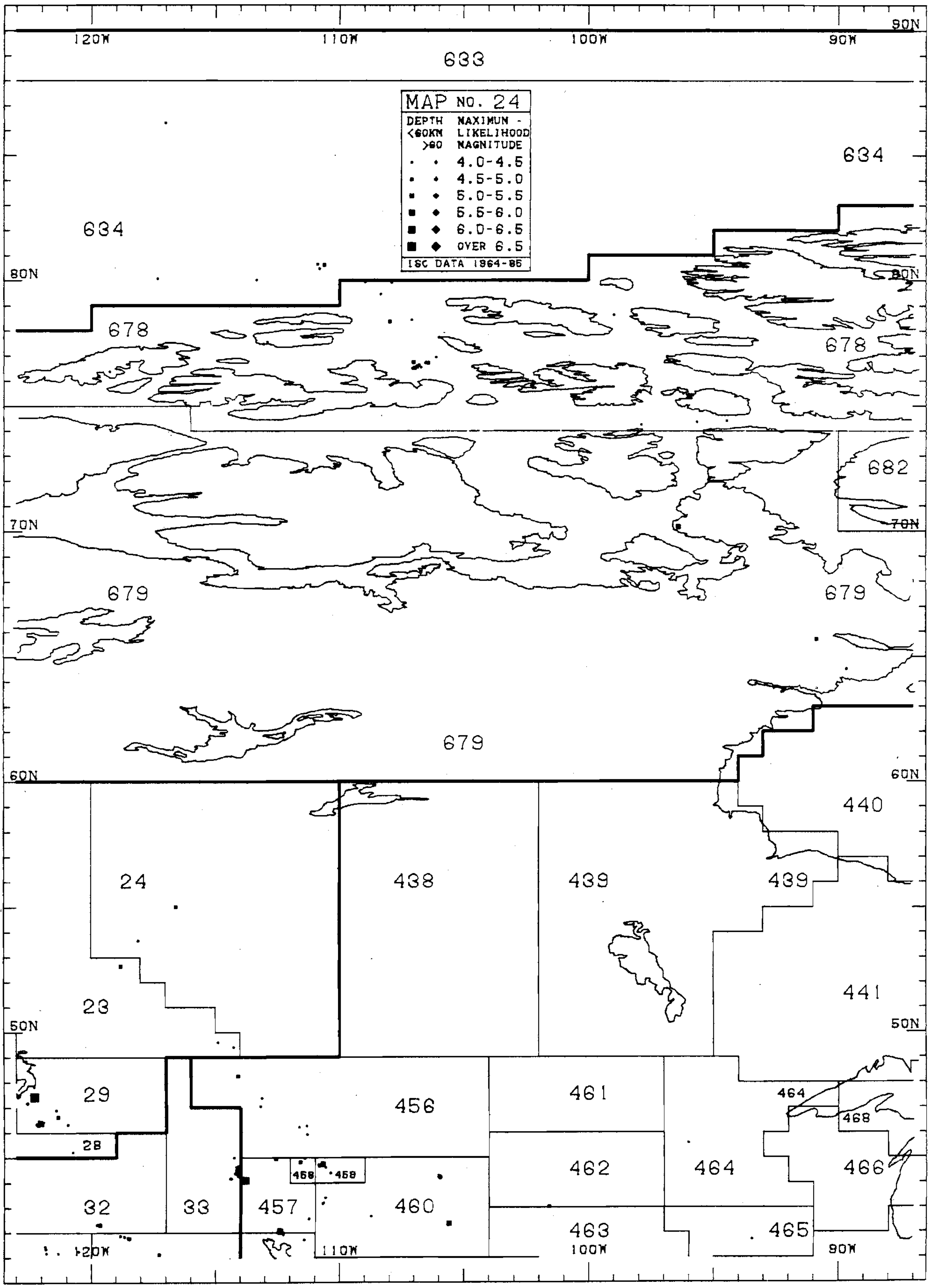


MAP NO. 21
DEPTH <60KM >80
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
110E
120E
130E
140E
150E
160E
170E
180E
0S
10S
20S
30S
40S
50S
60S
70S
80S
P254
N257 X271

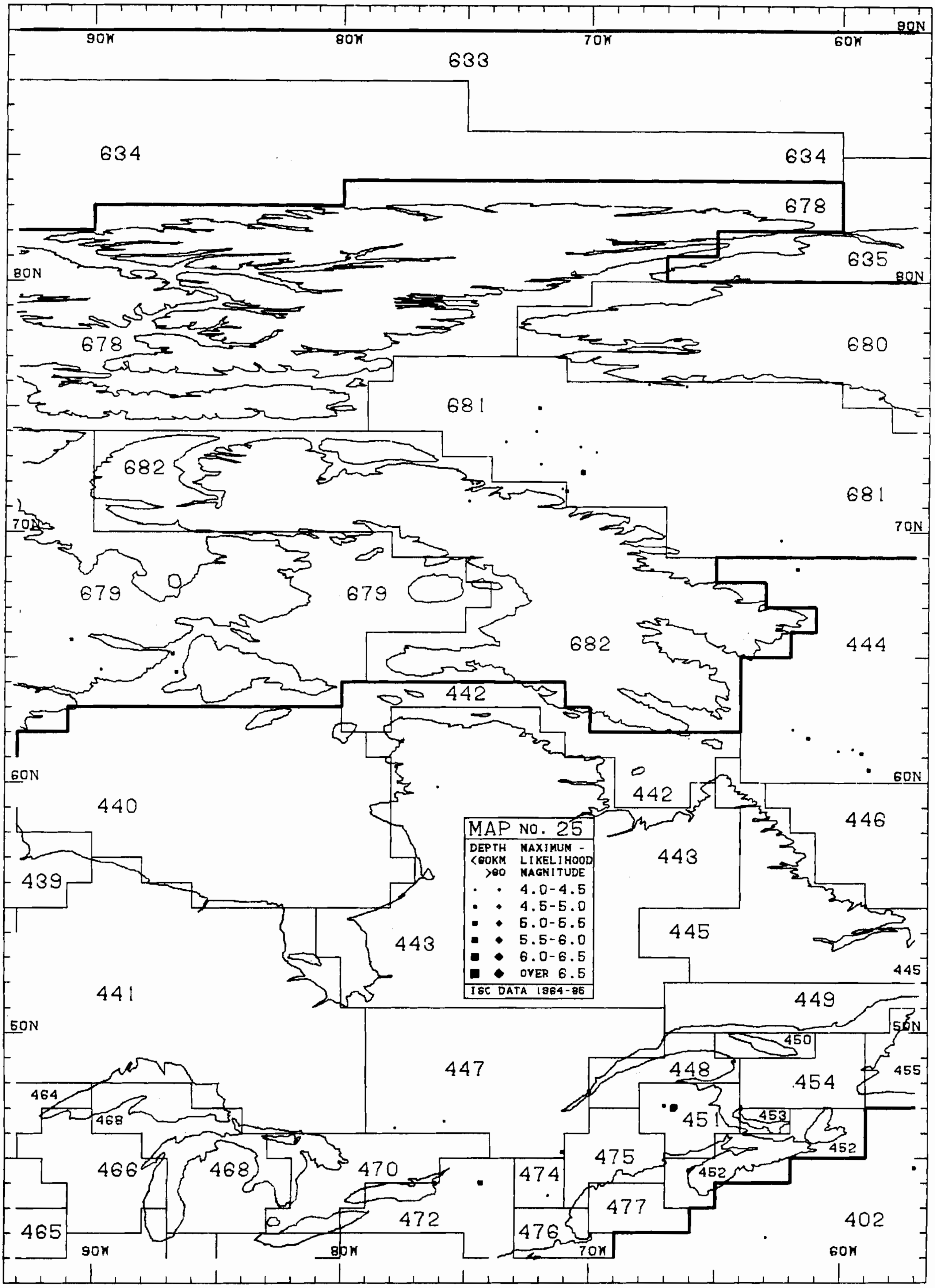


180W
170W
160W
150W
90N
80N
70N
60N
50N
633
634
669
675
672
676
670
673
671
674
1
2
3
8
11
12
14
15
10
9
7
16
17
611
MAP NO. 22
DEPTH <60KM >60
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85

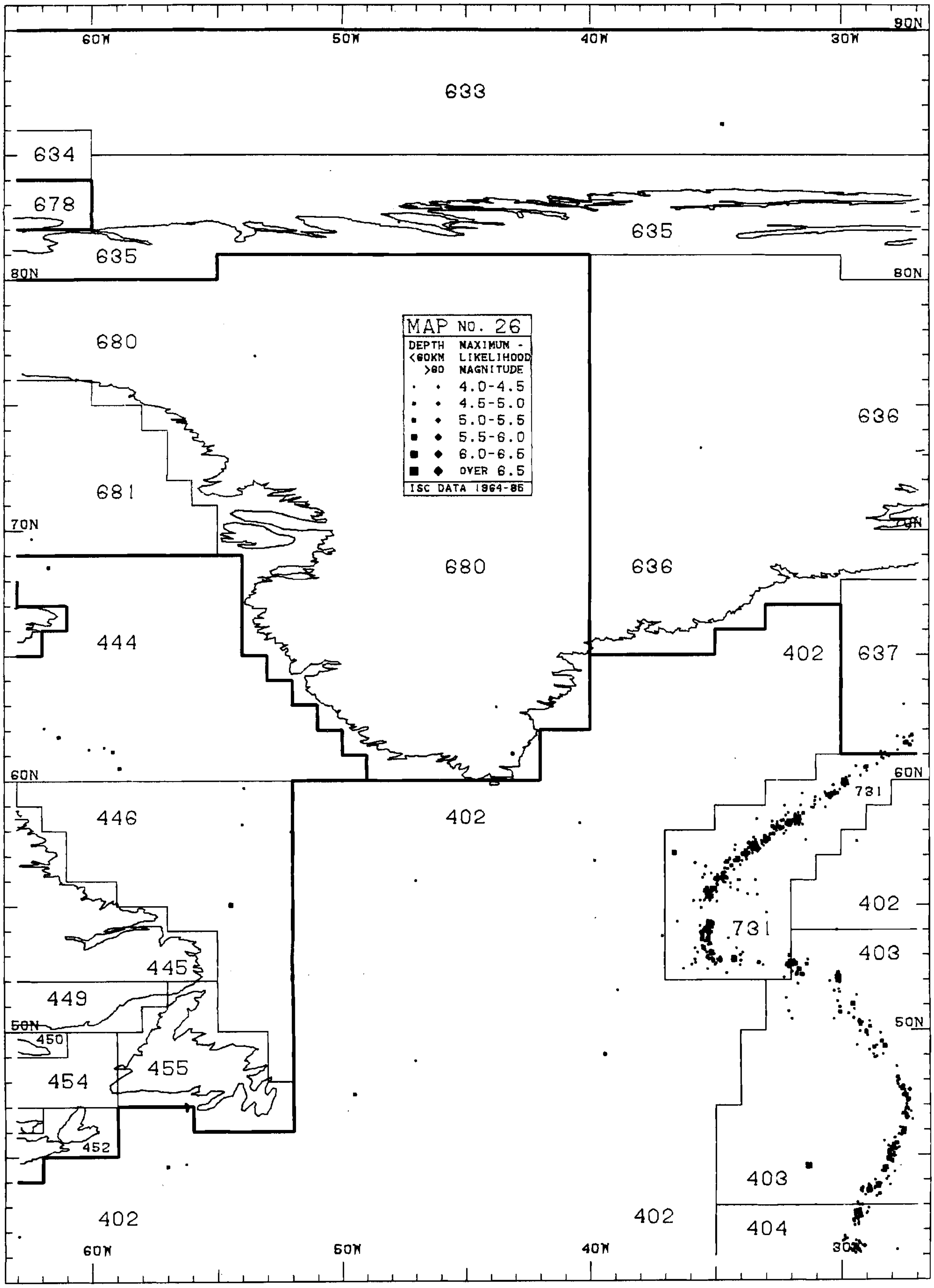

MAP NO. 23
DEPTH <60KM >60
MAXIMUN - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
150W
140W
130W
120W
80N
70N
60N
50N
633
634
675
676
677
678
679
611
1
2
14
15
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32



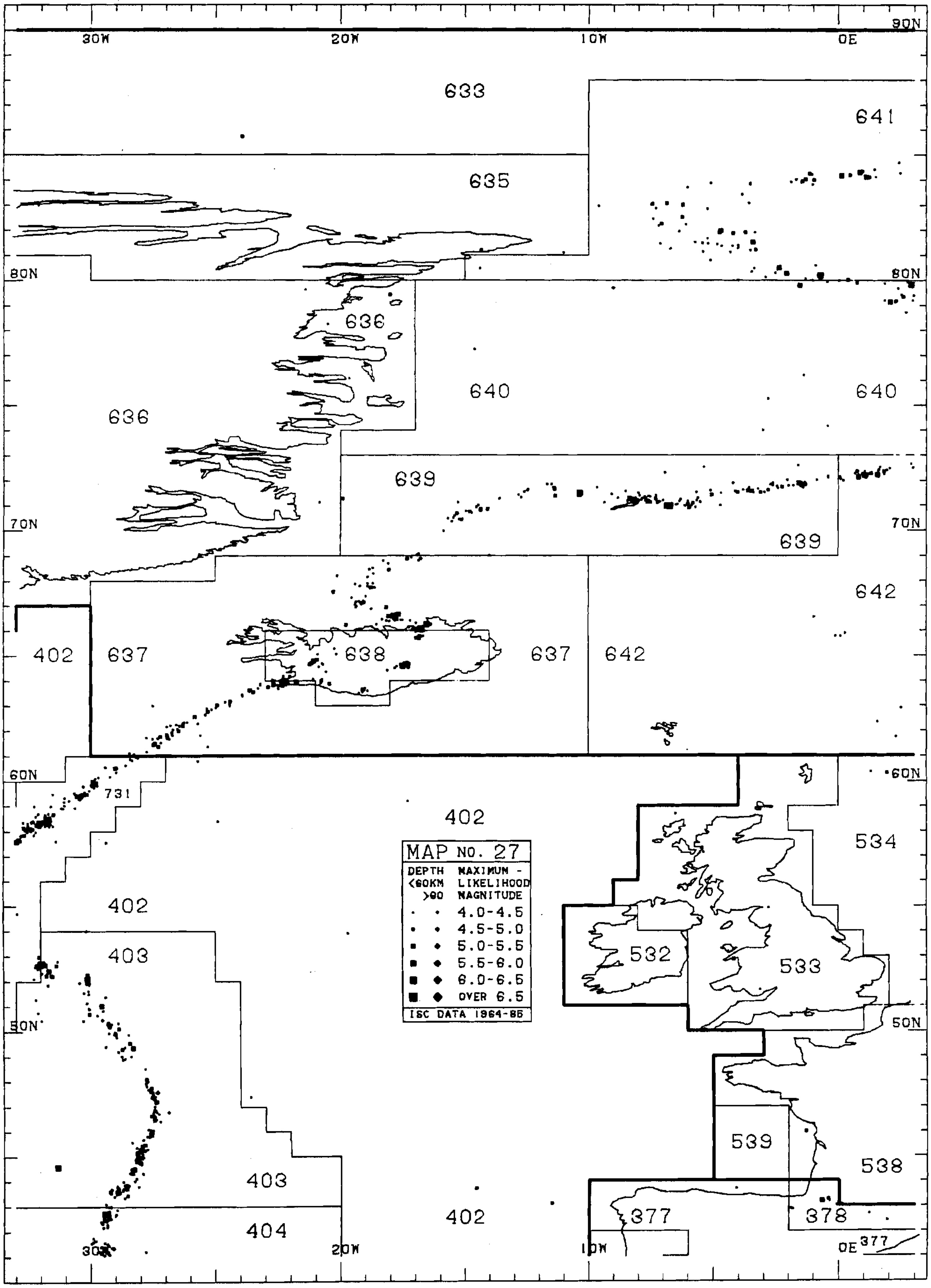
MAP NO. 24
DEPTH <60KM >60
MAXIMUN - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
120W
110W
100W
90W
90N
80N
70N
60N
50N
633
634
678
679
682
24
23
438
439
440
441
29
28
32
33
456
457
458
459
460
461
462
463
464
465
466
468



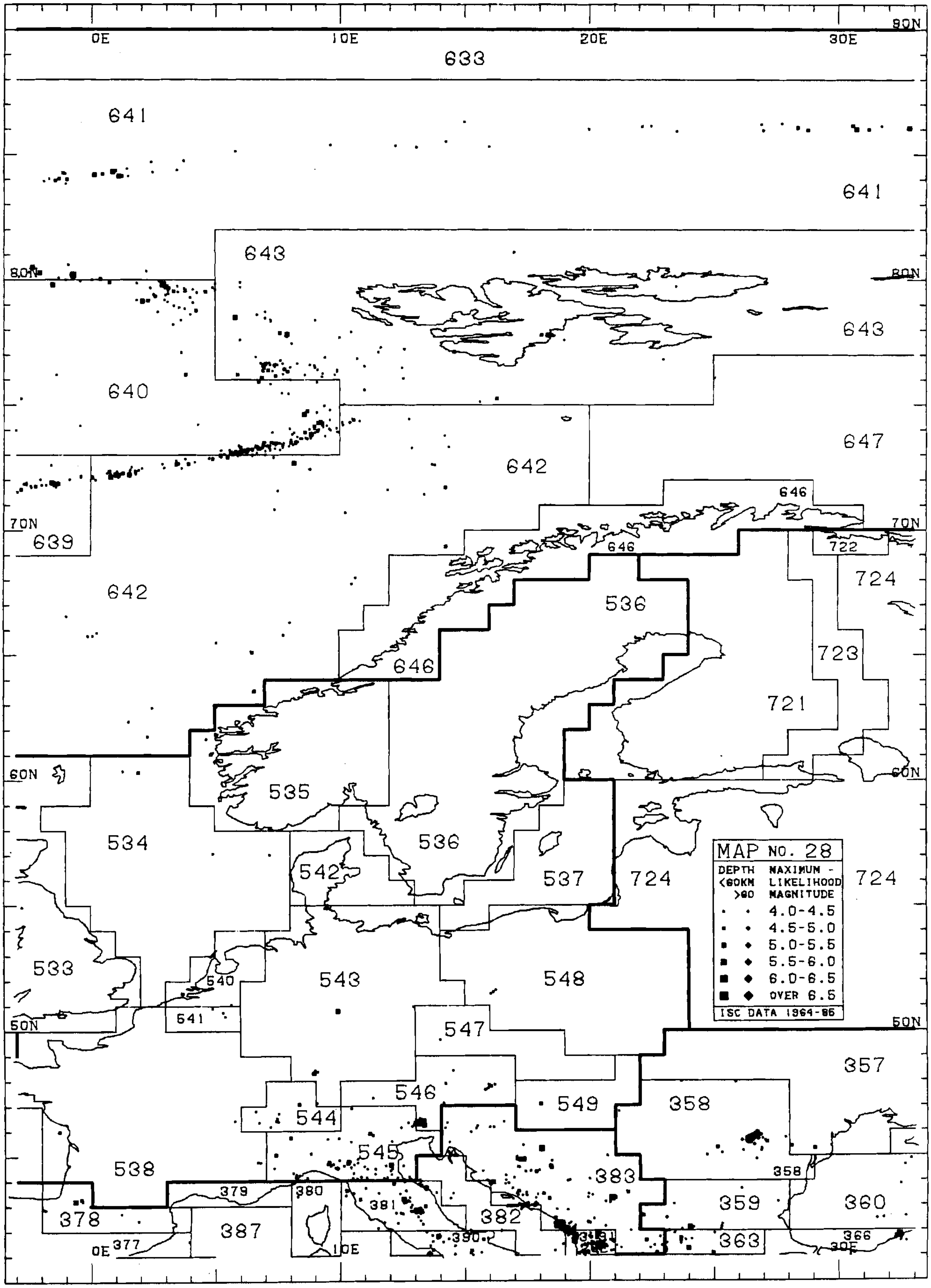
MAP NO. 25
DEPTH <60KM >60
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-86
90W
80W
70W
60W
80N
70N
60N
50N
633
634
678
635
680
681
682
679
444
442
440
439
443
446
445
441
449
450
447
448
454
455
464
468
451
453
452
466
470
474
475
465
472
476
477
402

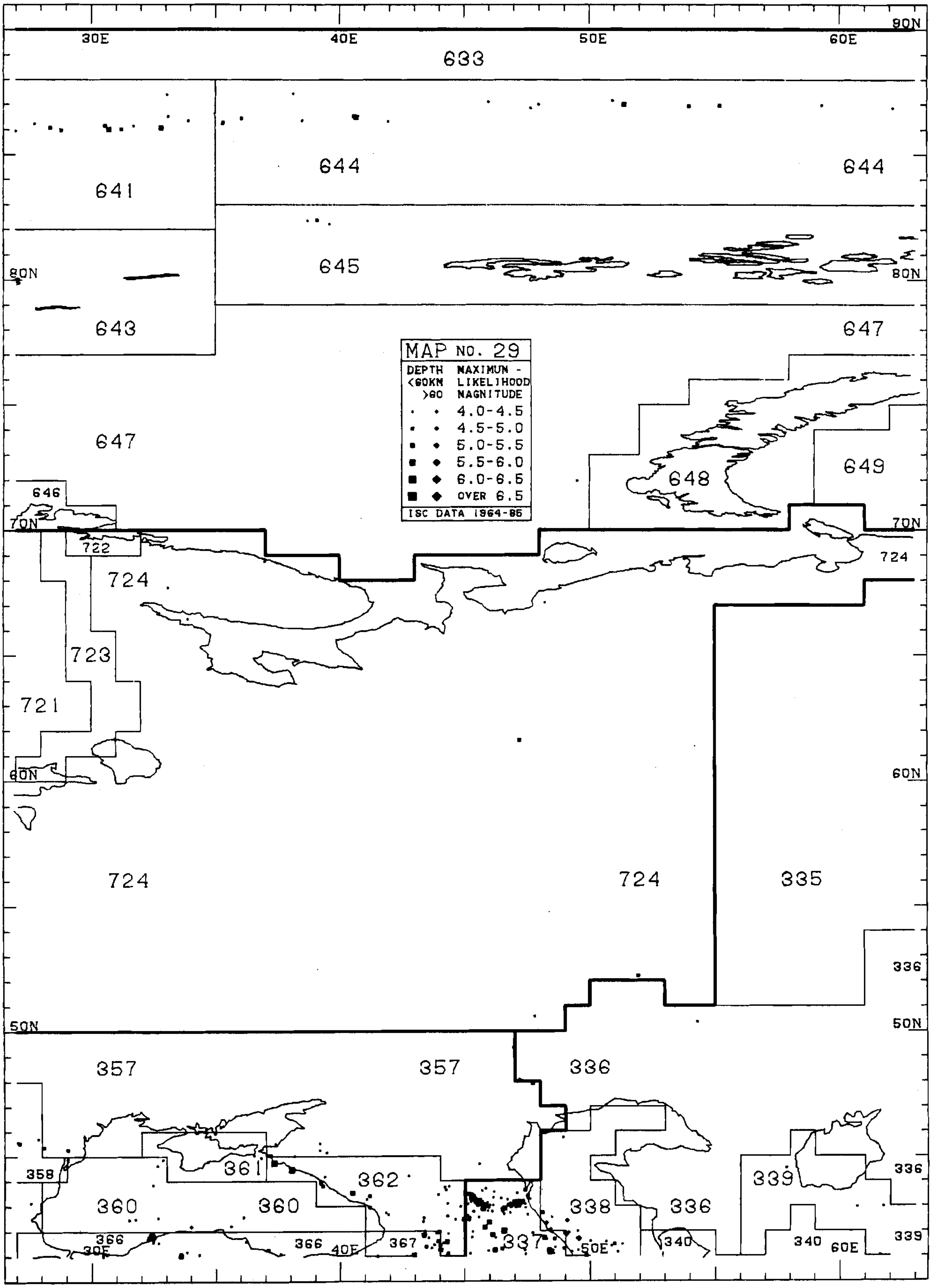


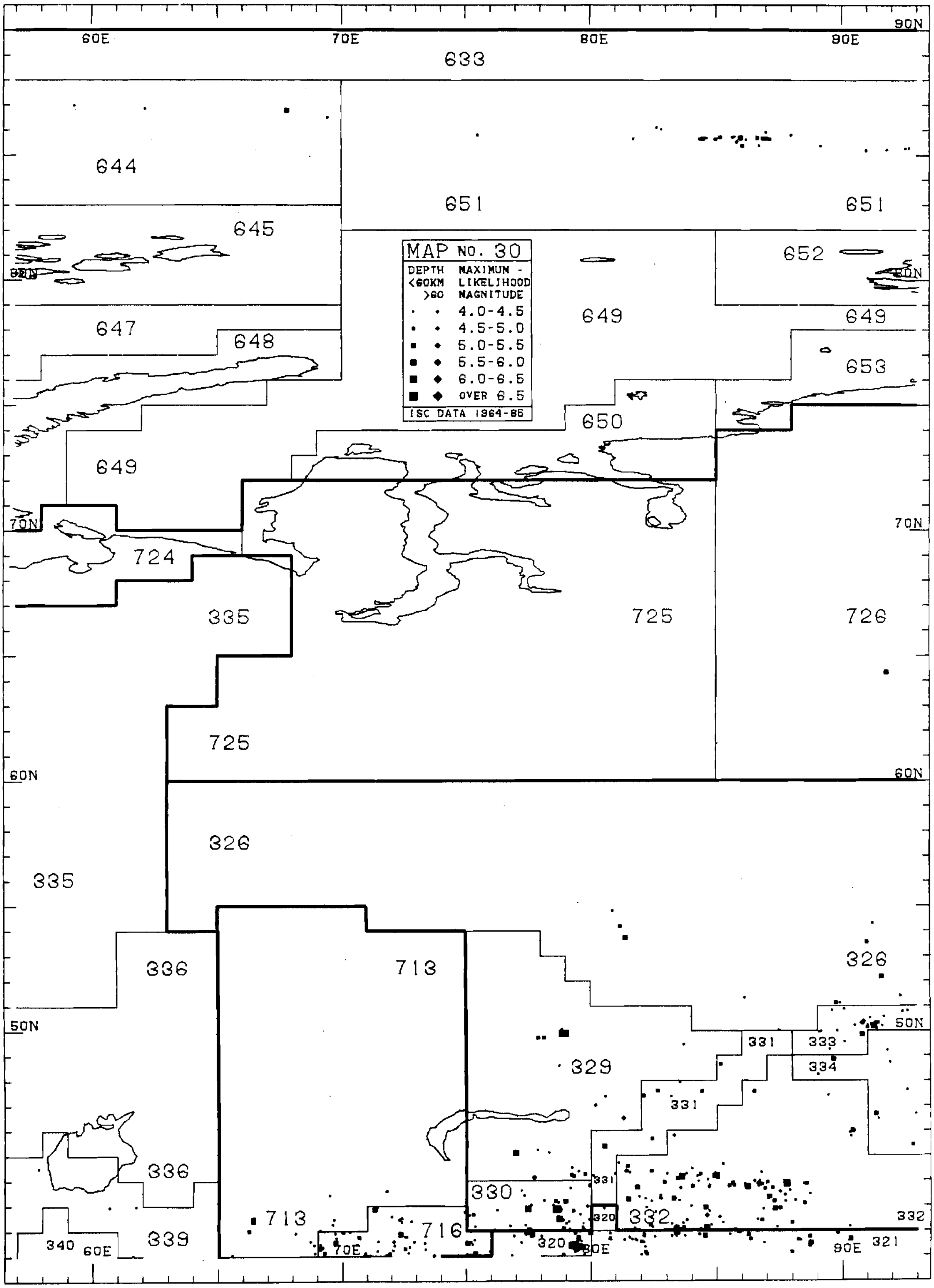
MAP NO. 26
DEPTH <60KM >60
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
90N
80N
70N
60N
50N
60W
50W
40W
30W
633
634
678
635
636
637
680
681
444
446
445
449
450
454
455
452
402
403
404
731

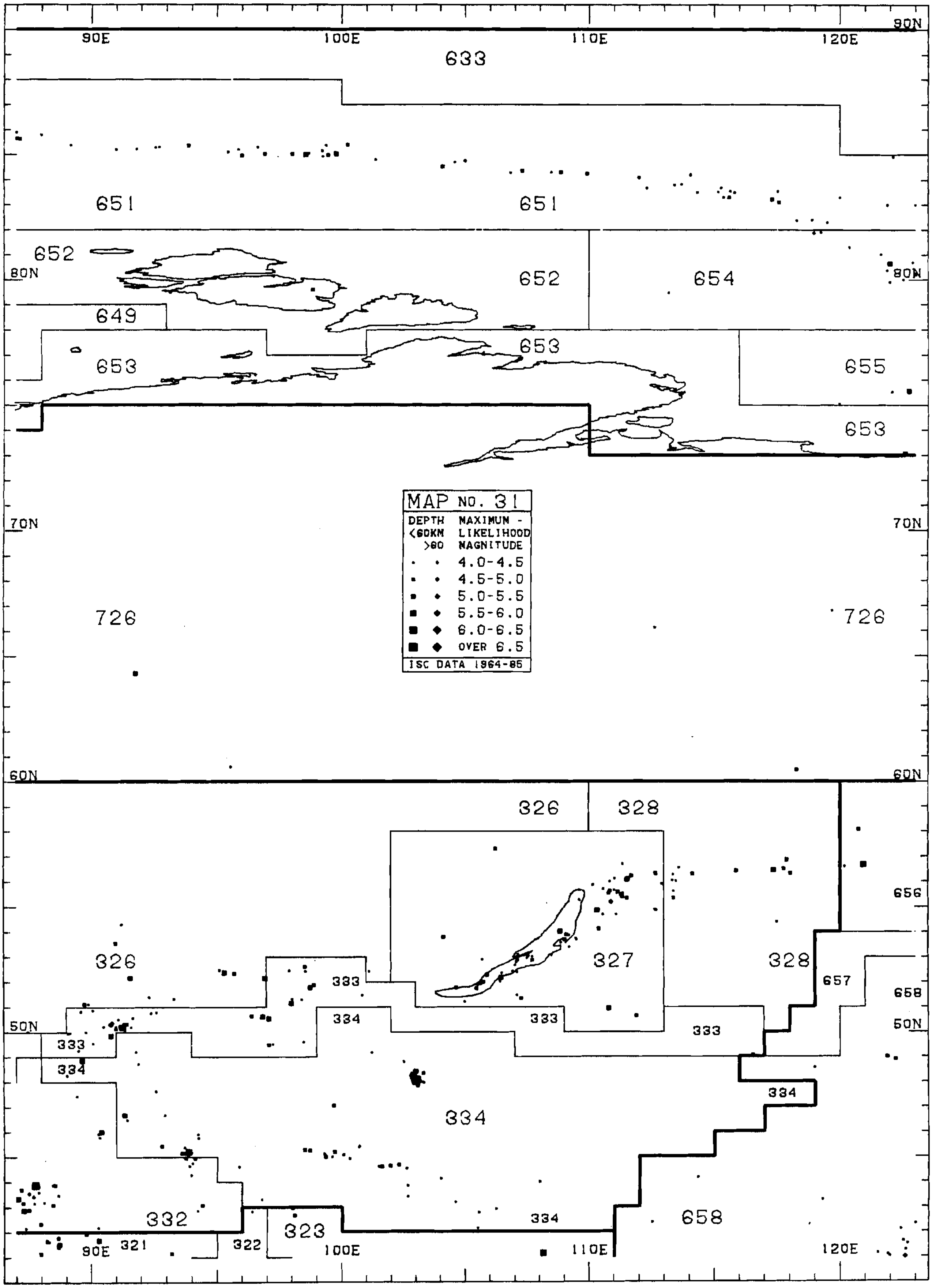


MAP NO. 27
DEPTH <60KM >60
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
30W
20W
10W
0E
90N
80N
70N
60N
50N
633
641
635
636
640
639
637
638
642
402
731
403
404
534
532
533
539
538
377
378

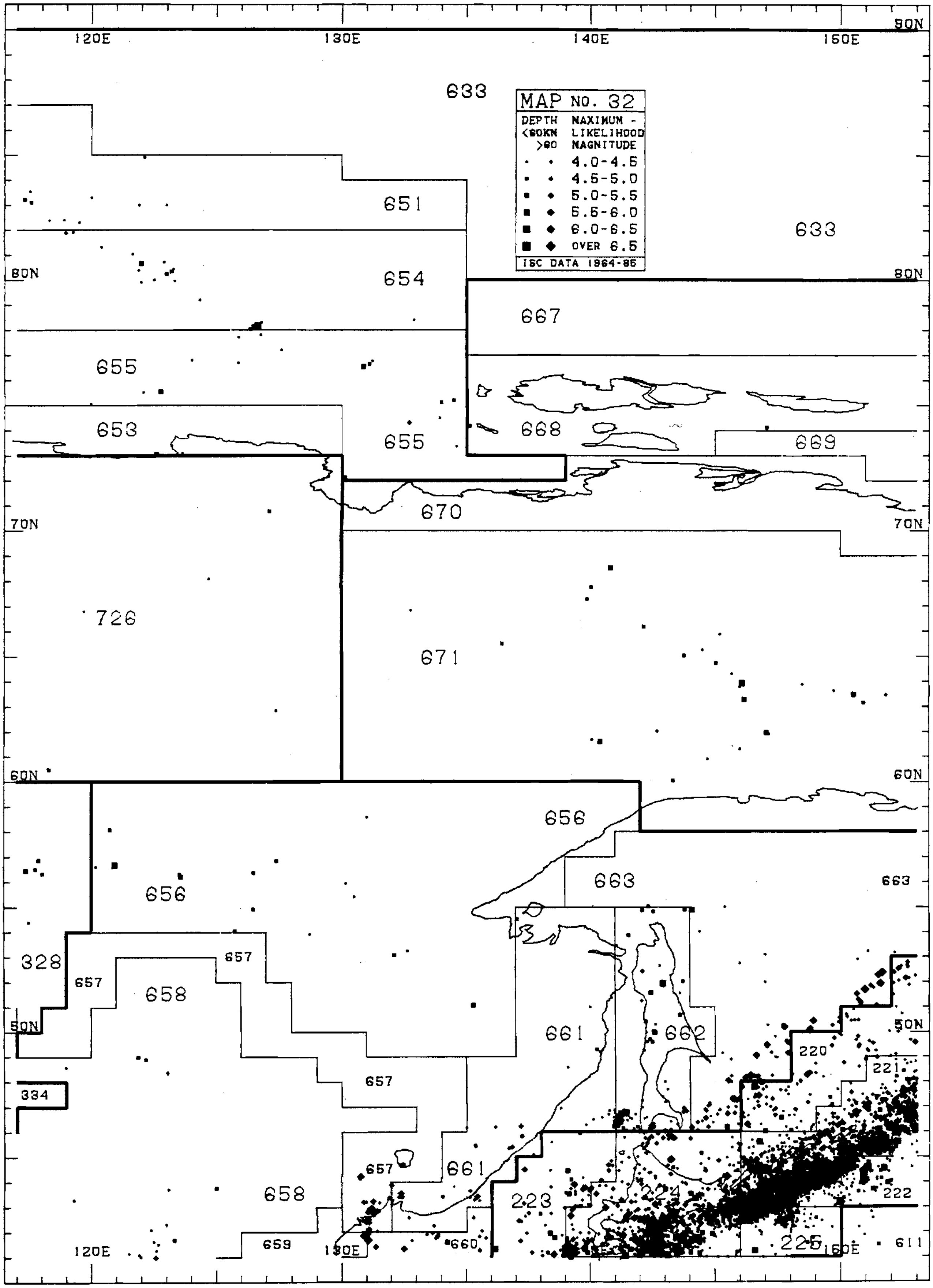

80N
0E
10E
20E
30E
633
641
641
643
643
80N
640
647
642
646
70N
639
642
646
722
724
536
723
646
721
60N
535
534
536
542
537
724
724
MAP NO. 28
DEPTH <60KM >60
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
533
540
543
548
50N
541
547
50N
357
546
549
358
544
545
538
383
358
379
380
381
382
359
360
378
387
390
363
366
0E
377
10E
30E


MAP NO. 29
DEPTH <60KM >60
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
30E
40E
50E
60E
80N
70N
60N
50N
633
641
643
644
645
646
647
648
649
721
722
723
724
335
336
337
338
339
340
357
358
360
361
362
366
367

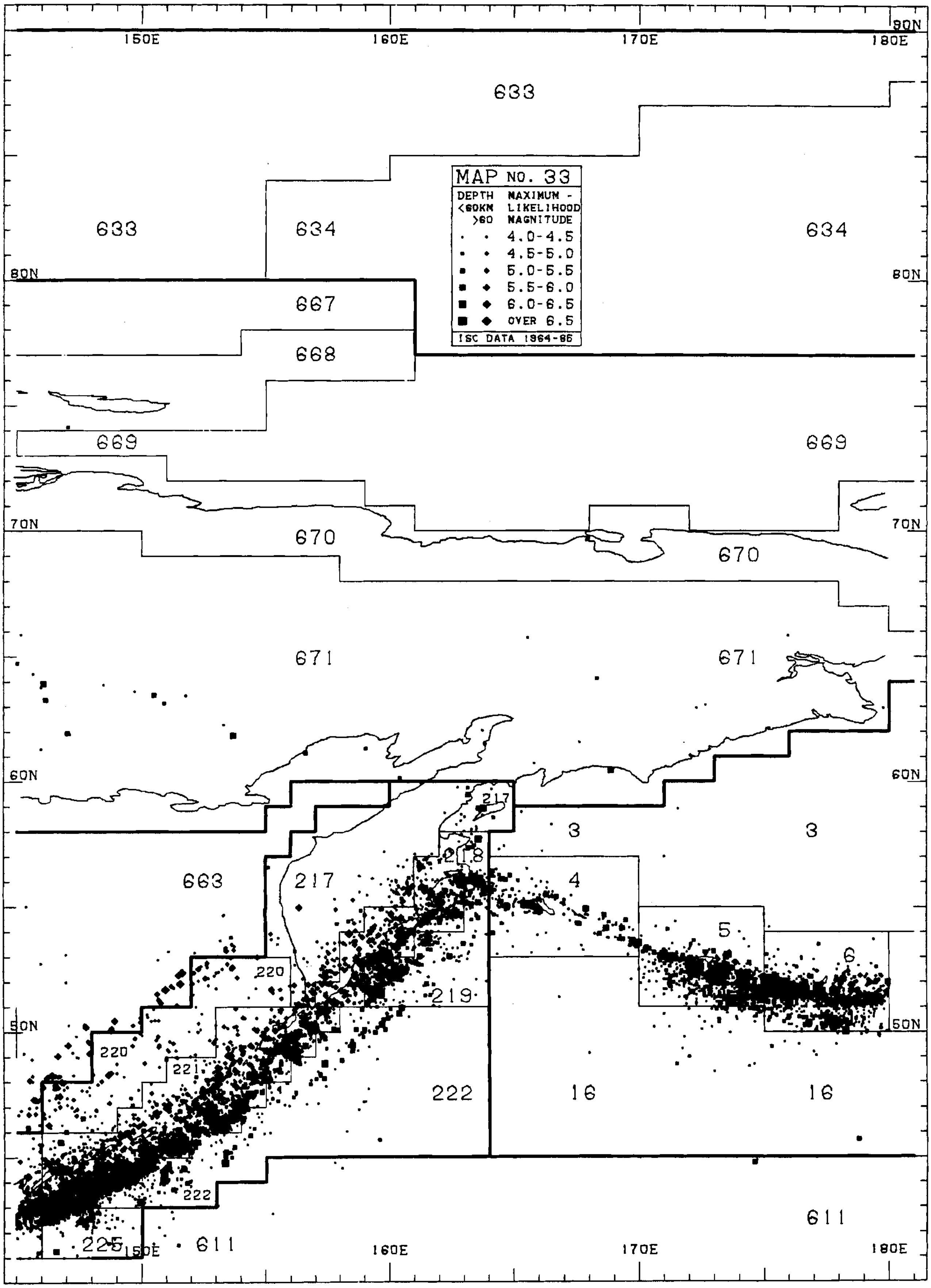

MAP NO. 30
DEPTH <60KM >60
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
90N
60E
70E
80E
90E
70N
60N
50N
633
644
645
647
648
649
650
651
652
653
724
725
726
335
336
326
713
716
329
330
331
332
333
334
320
321
339
340

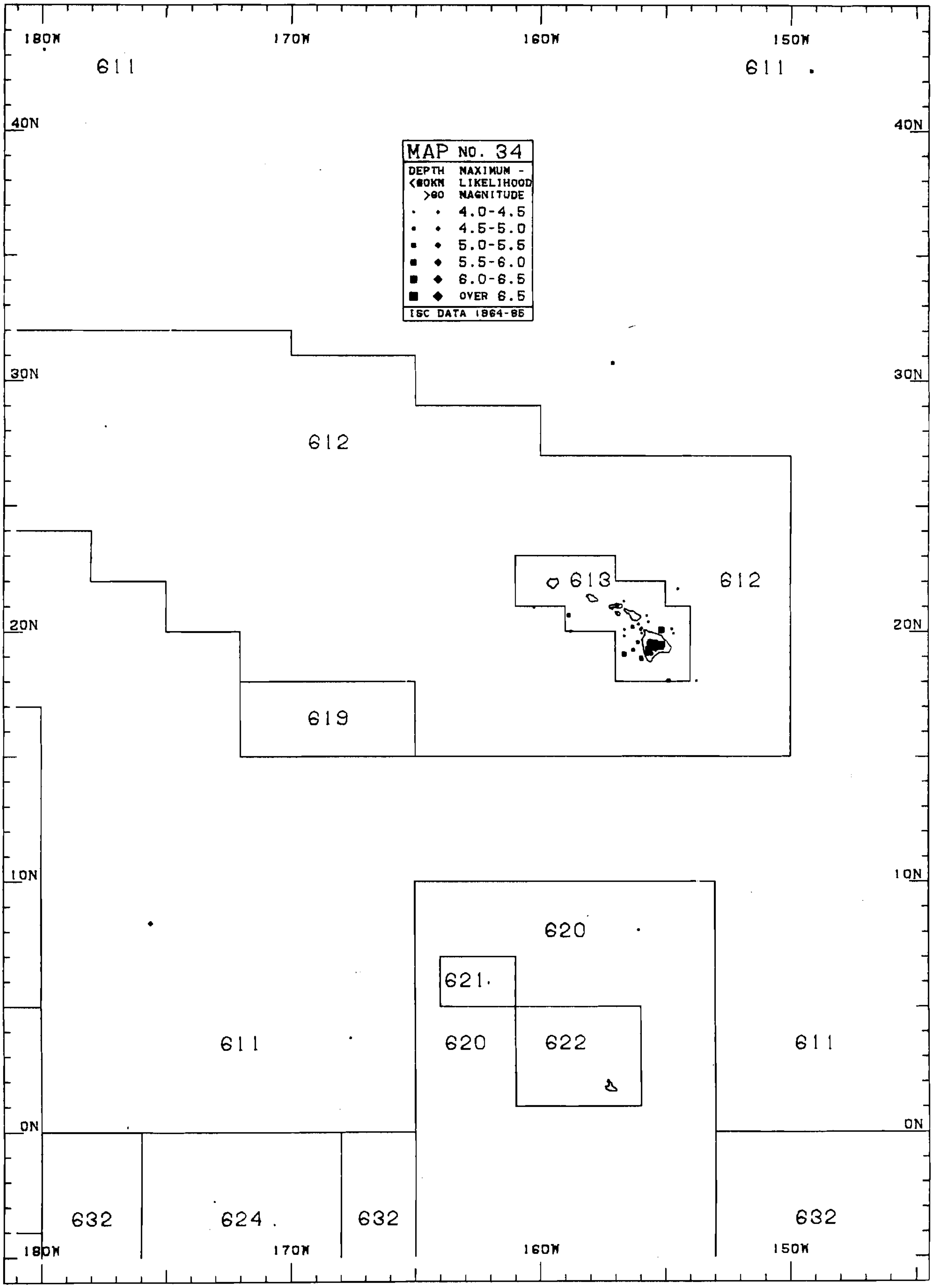


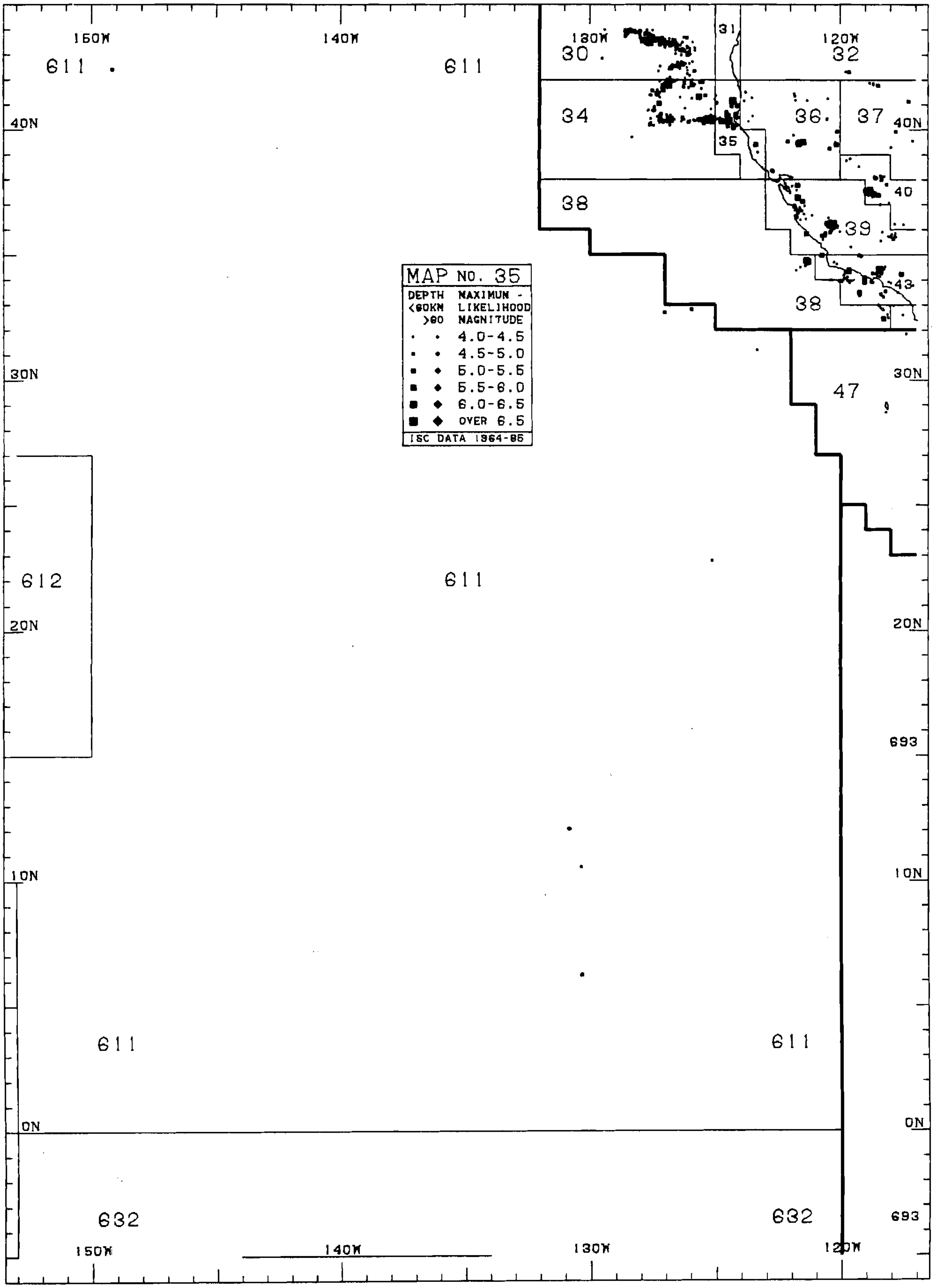
90N
90E
100E
110E
120E
633
651
651
652
80N
652
654
80N
649
653
653
655
653
MAP NO. 31
DEPTH <60KM >60
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
70N
70N
726
726
60N
60N
326
328
656
326
327
328
333
657
658
50N
333
334
333
50N
333
334
334
334
334
332
323
334
658
90E
321
322
100E
110E
120E

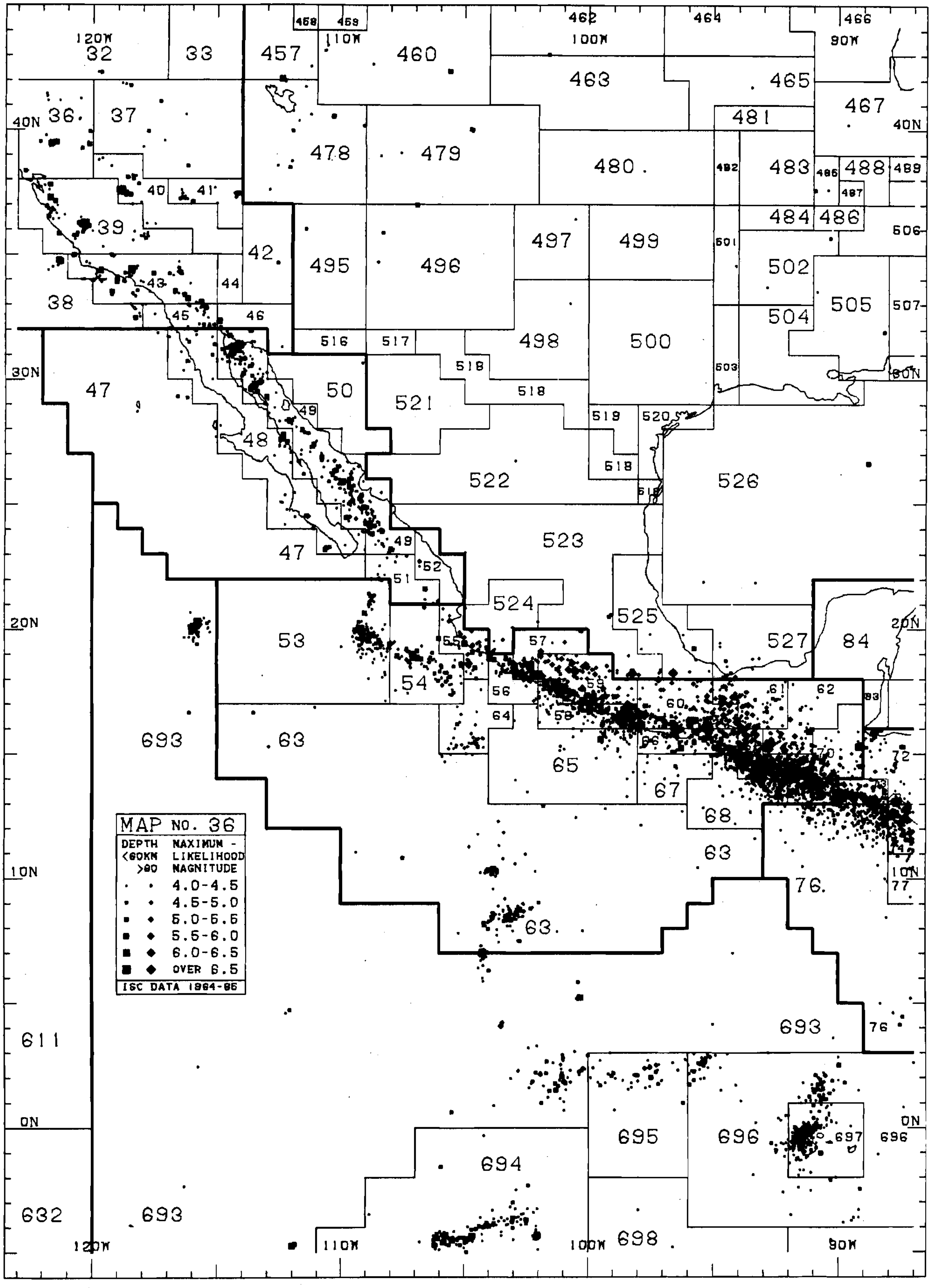


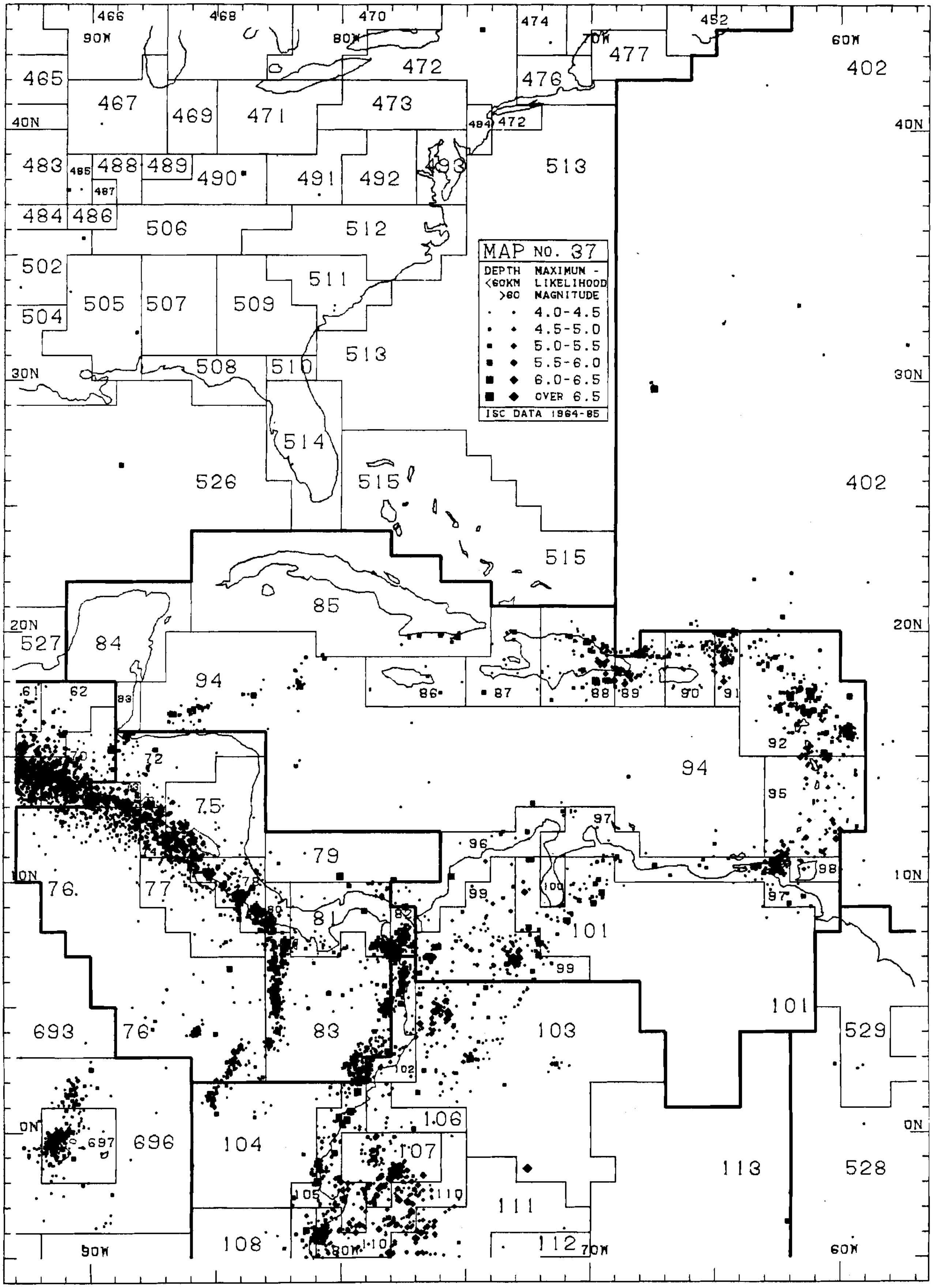
MAP NO. 32
DEPTH
<60KM
>60
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
90N
80N
70N
60N
50N
120E
130E
140E
150E
633
651
654
655
653
667
668
669
670
726
671
656
663
328
657
658
661
662
220
221
334
222
223
224
225
659
660
611

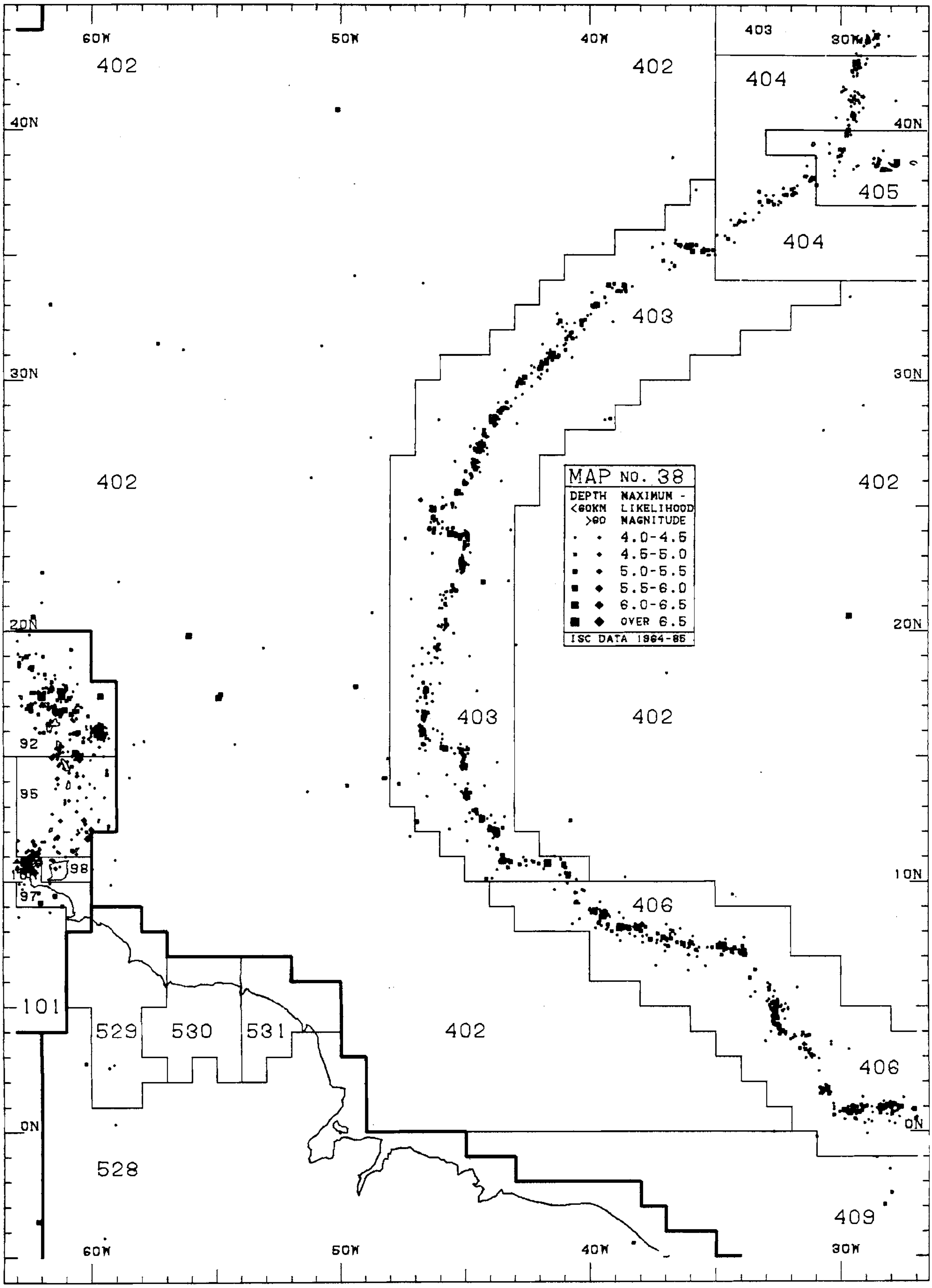

MAP NO. 33
DEPTH <60KM >60
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-86
150E
160E
170E
180E
80N
70N
60N
50N
633
634
667
668
669
670
671
663
217
218
219
220
221
222
225
3
4
5
6
16
611

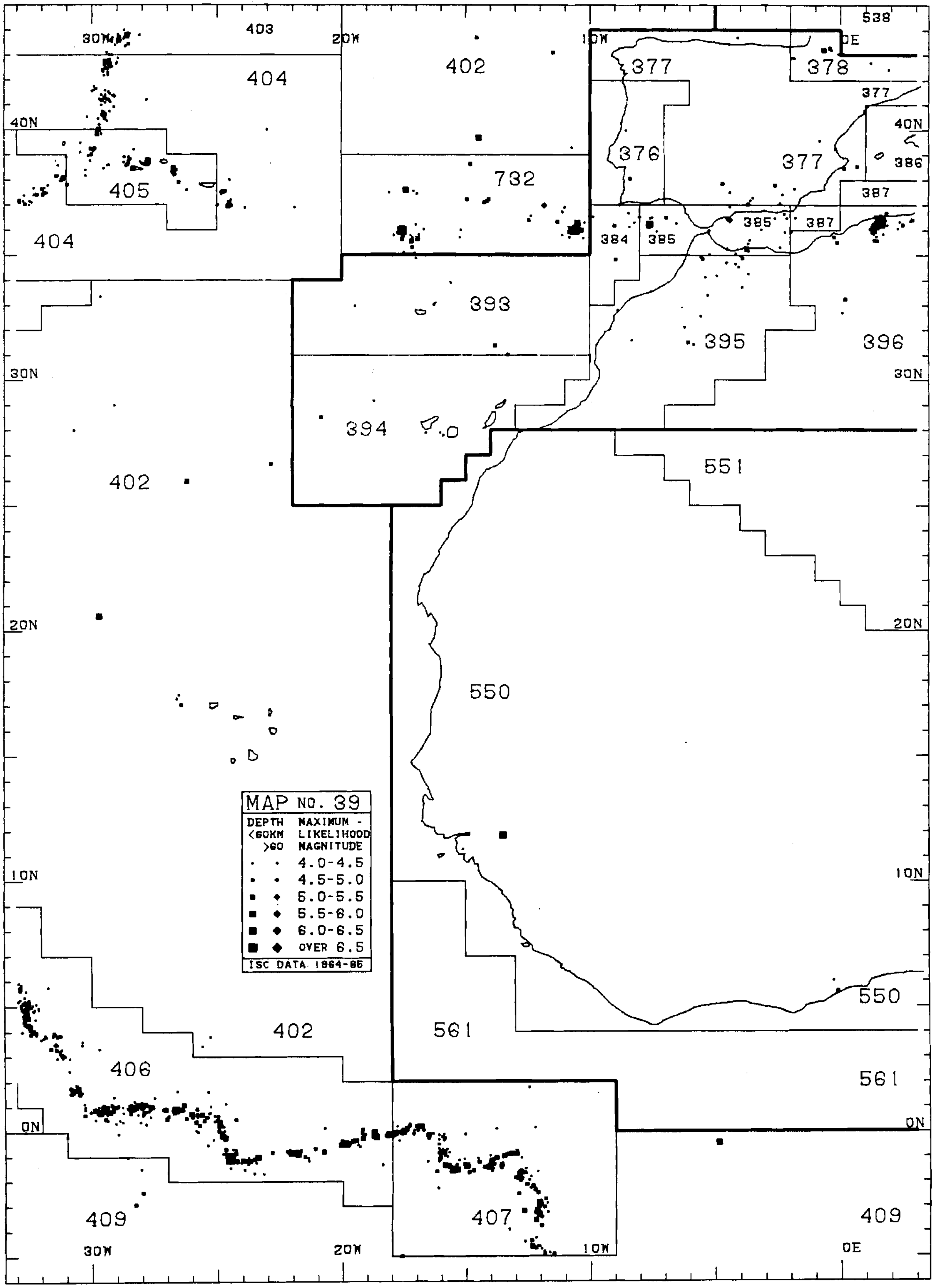

MAP NO. 34
DEPTH <60KM >60
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
180W
170W
160W
150W
40N
30N
20N
10N
0N
611
612
613
619
620
621
622
624
632

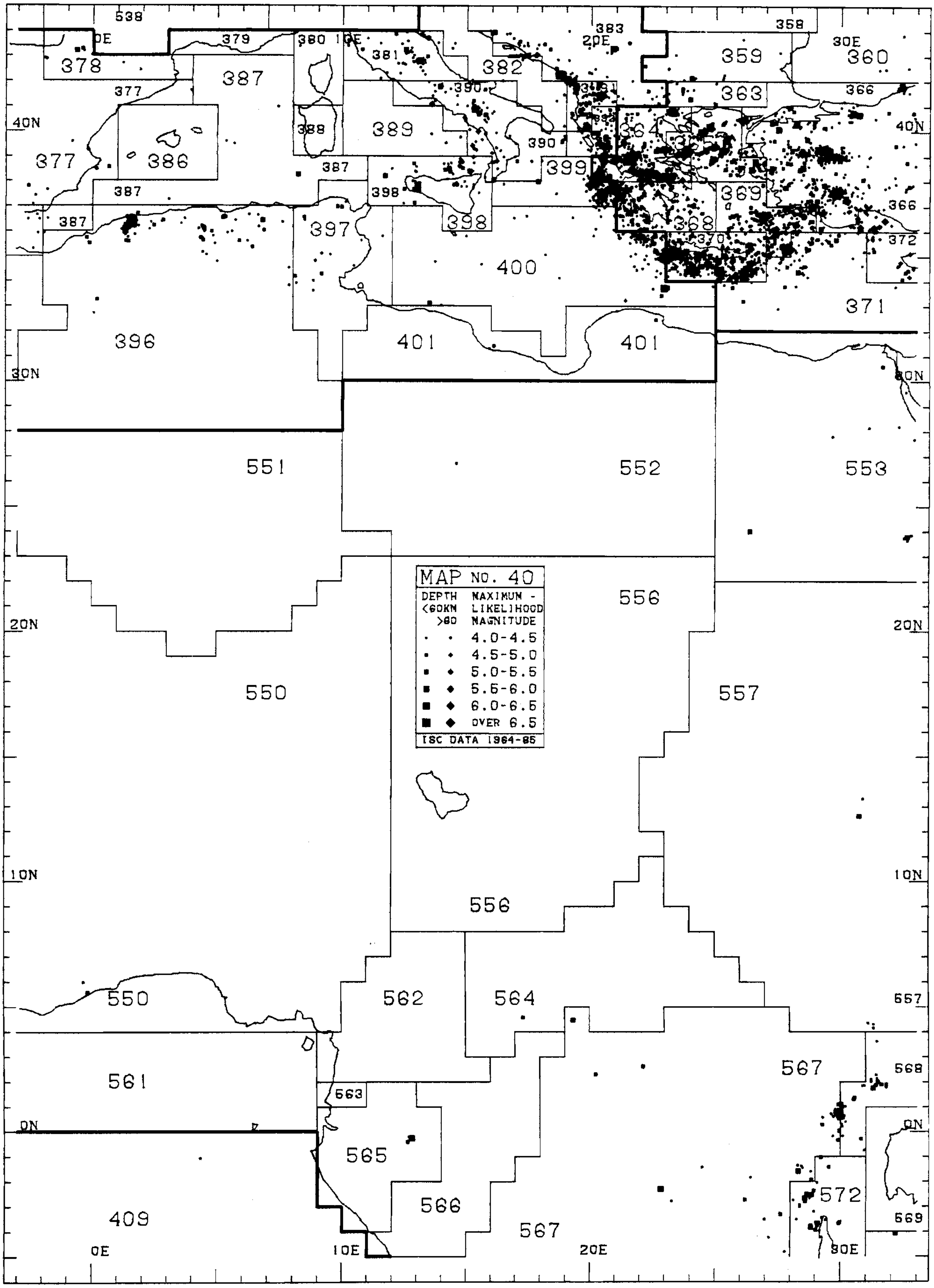

MAP NO. 35
DEPTH <60KM >60
MAXIMUN - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
150W
140W
130W
120W
40N
30N
20N
10N
0N
611
612
632
693
30
31
32
34
35
36
37
38
39
40
43
47

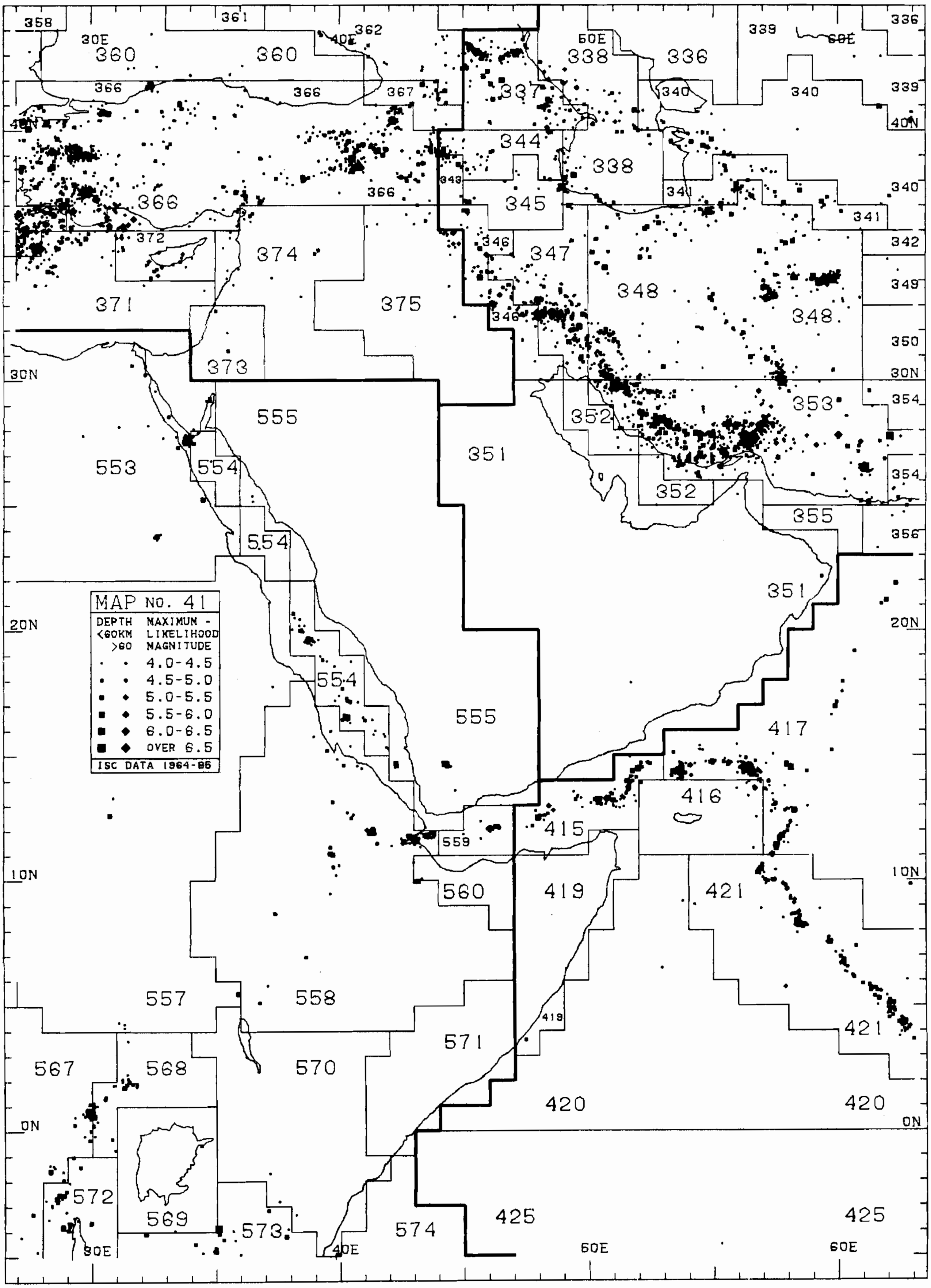

MAP NO. 36
DEPTH <60KM >60
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
120W
110W
100W
90W
40N
30N
20N
10N
0N


MAP NO. 37
DEPTH <60KM >60
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
90W
80W
70W
60W
40N
30N
20N
10N
0N

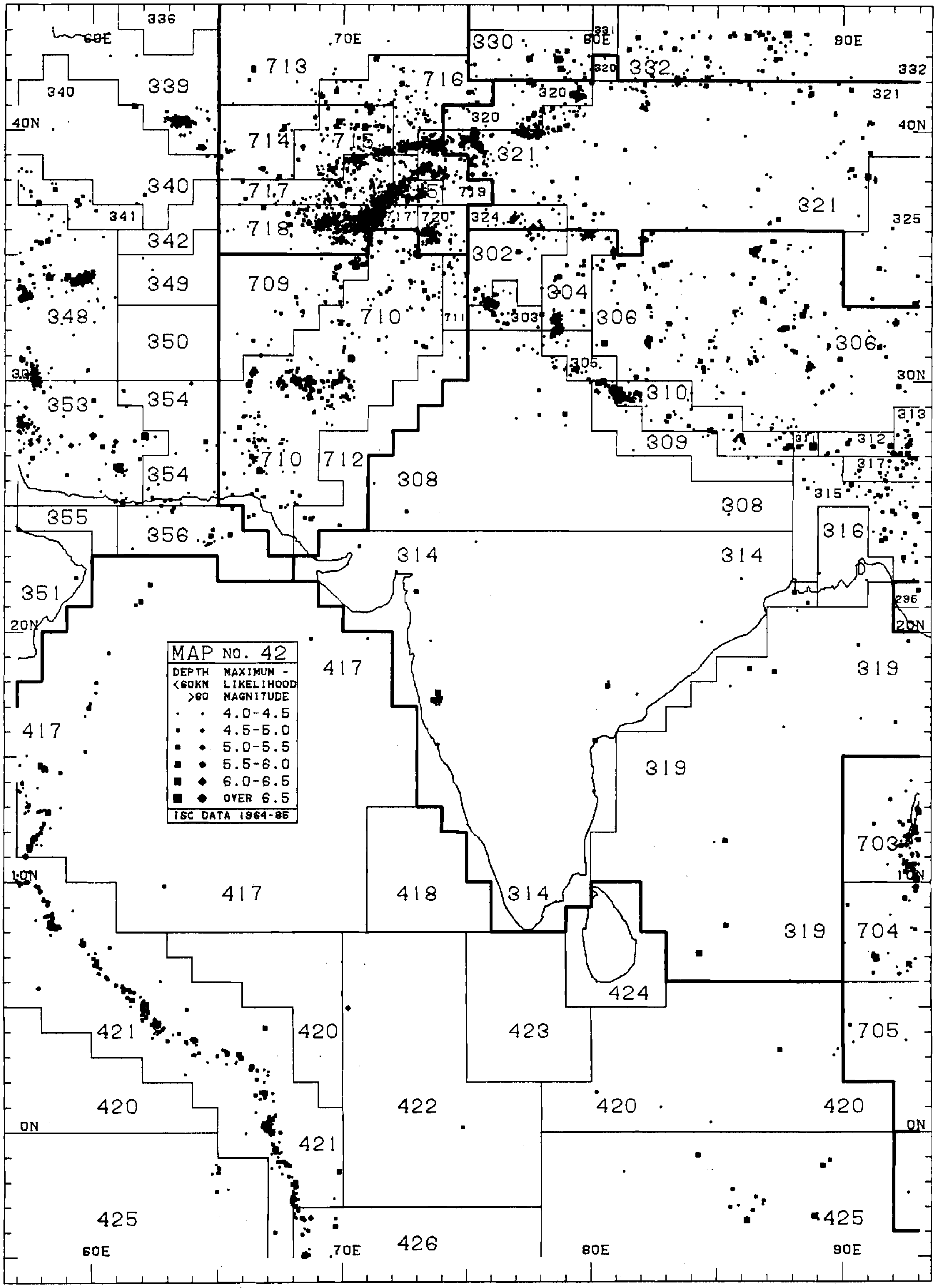

MAP NO. 38
DEPTH <60KM >60
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
60W
50W
40W
30W
40N
30N
20N
10N
0N
402
403
404
405
406
409
92
95
97
98
101
528
529
530
531

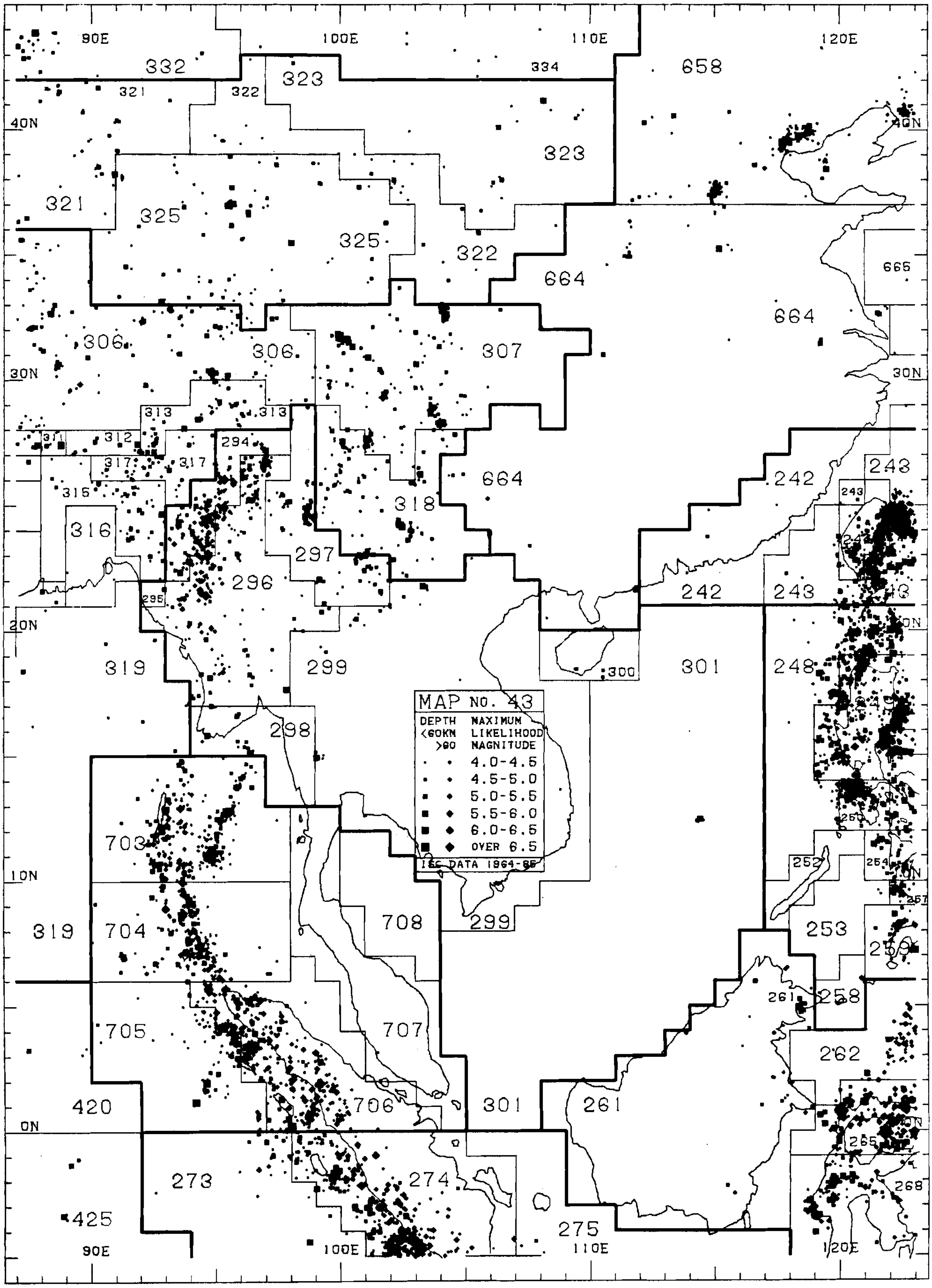

MAP NO. 39
DEPTH <60KM >60
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
30W
20W
10W
0E
40N
30N
20N
10N
0N
403
404
405
402
732
377
378
538
376
386
387
384
385
393
394
395
396
551
550
561
406
407
409

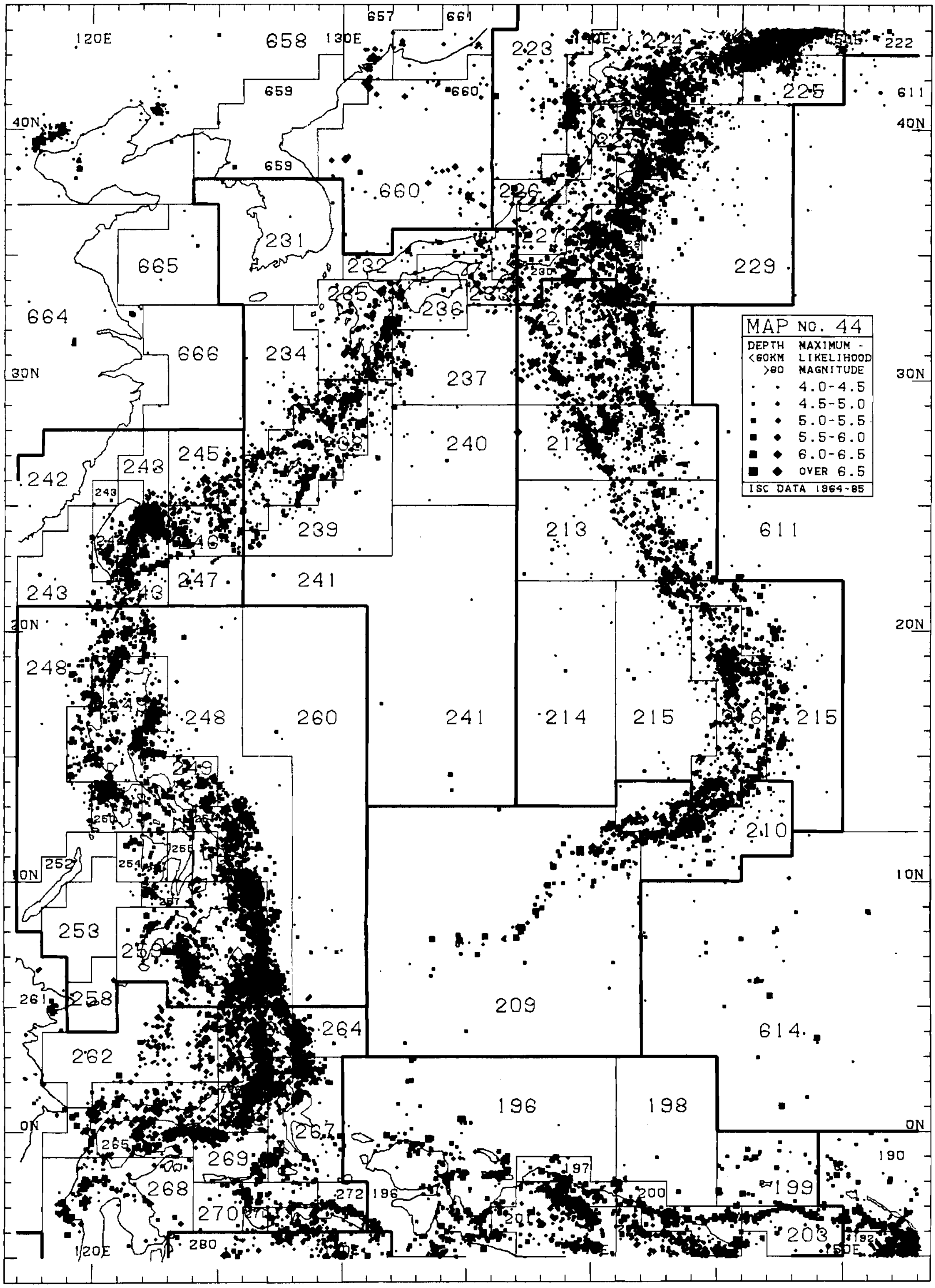

MAP NO. 40
DEPTH <60KM >60
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
40N
30N
20N
10N
0N
0E
10E
20E
30E
378
379
380
381
382
383
359
358
360
363
366
377
387
386
388
389
390
399
364
369
368
370
372
371
397
398
400
401
396
551
552
553
556
550
557
562
564
561
563
565
566
567
568
572
569
409

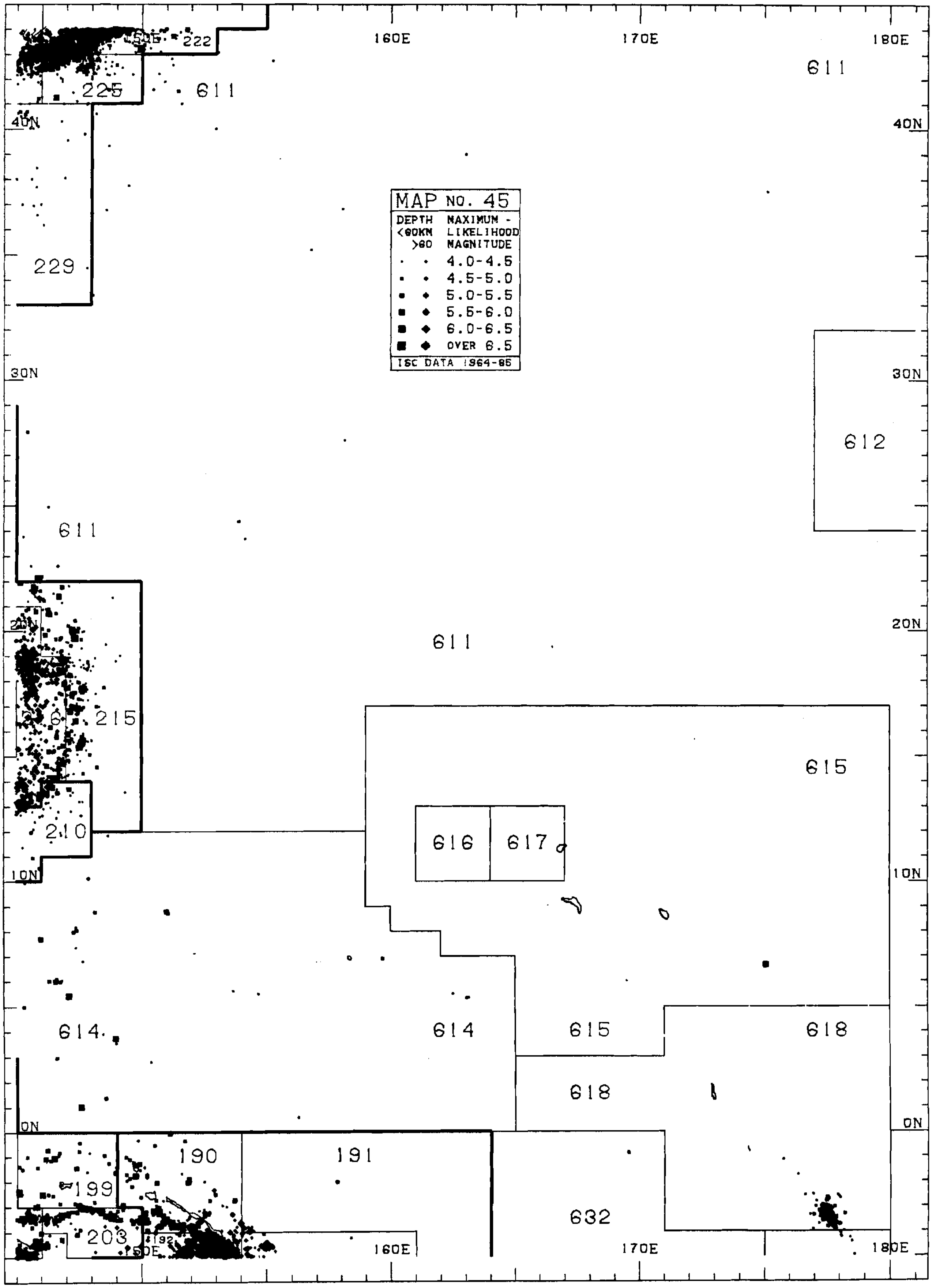


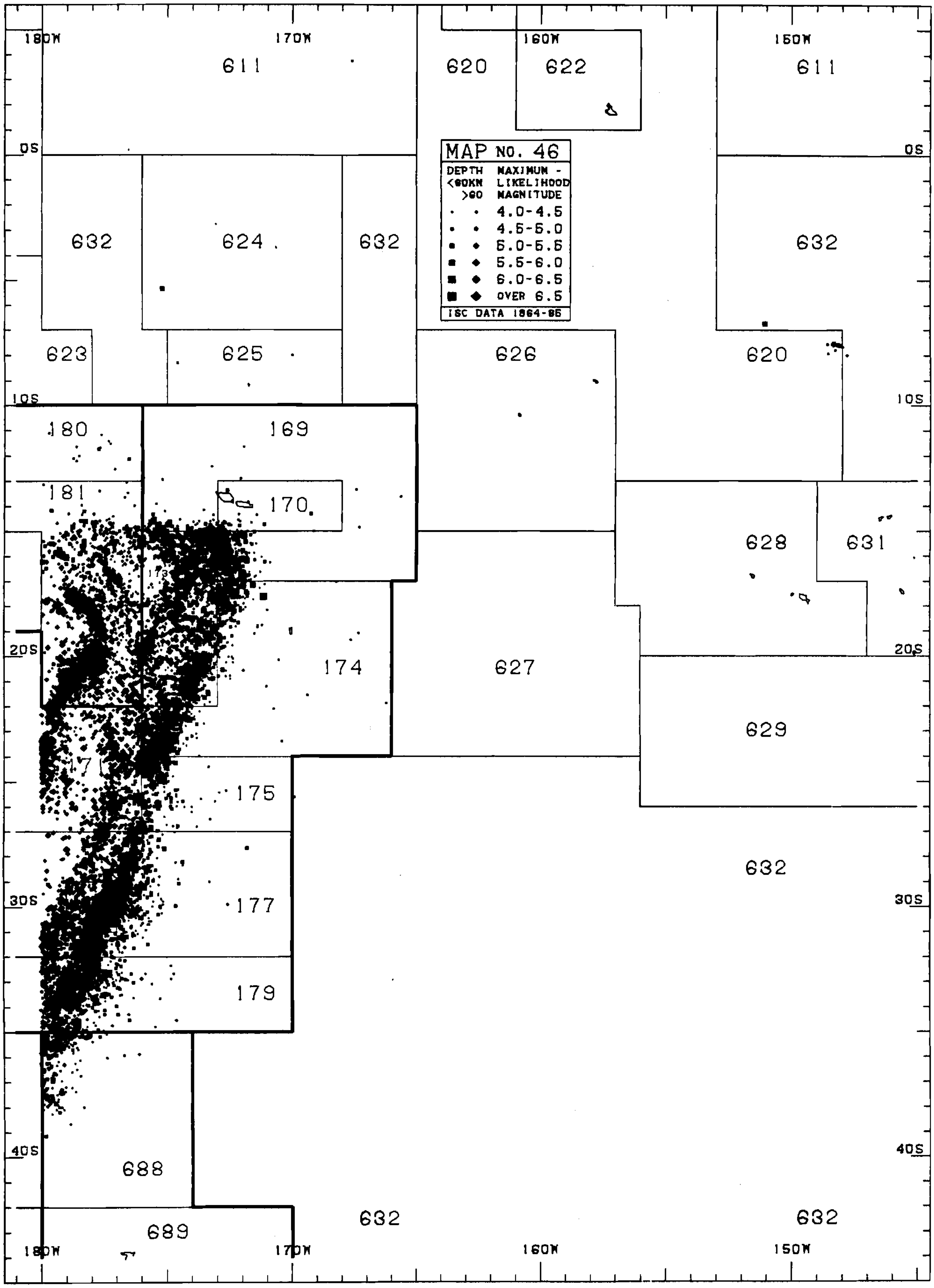
MAP NO. 41
DEPTH <60KM >60
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
30E
40E
50E
60E
40N
30N
20N
10N
0N

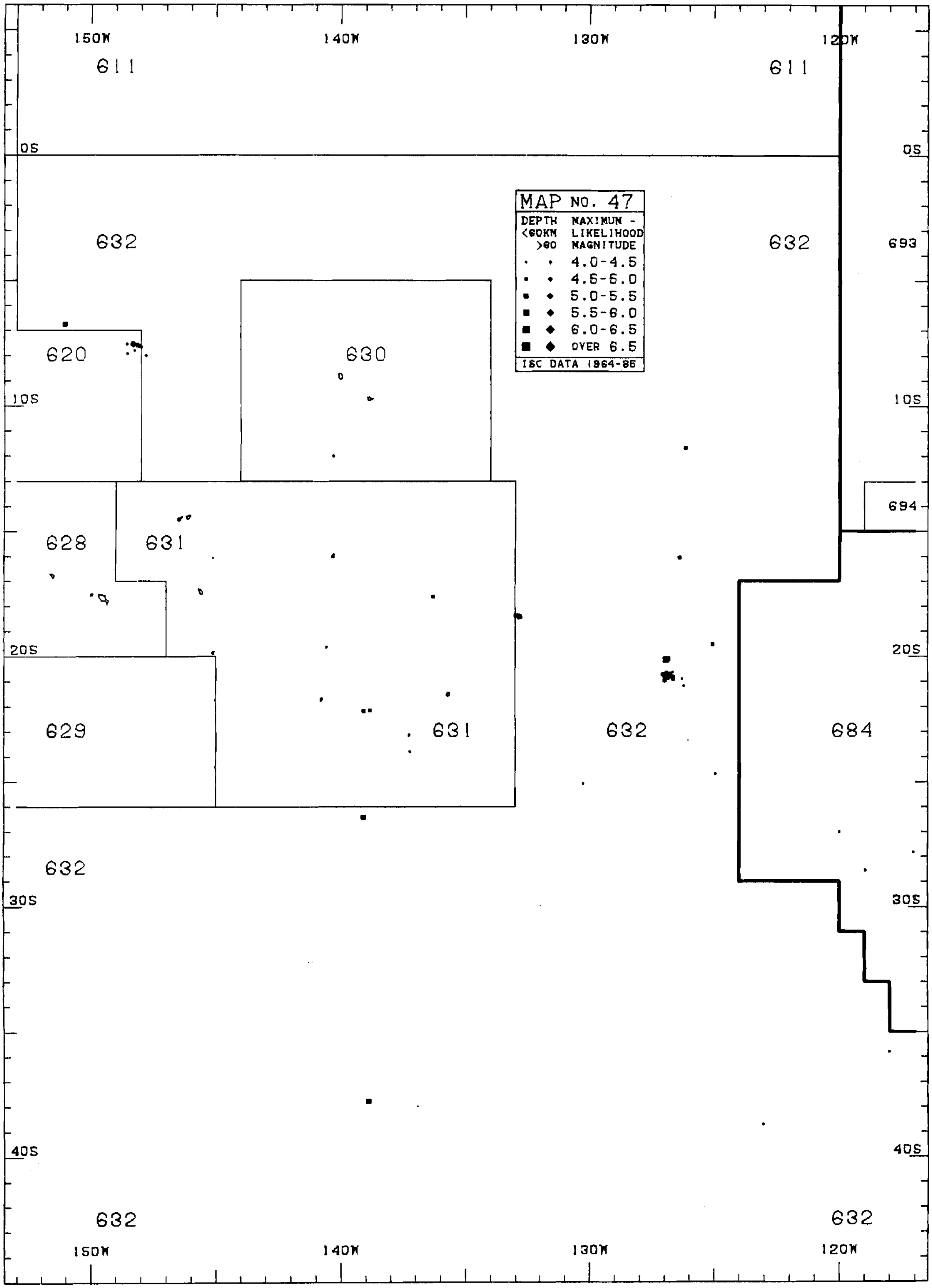

MAP NO. 42
DEPTH <60KM >60
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
60E
70E
80E
90E
40N
30N
20N
10N
0N
713
714
715
716
717
718
709
710
712
308
314
417
418
419
420
421
422
423
424
425
426
319
306
310
309
321
332
330
339
340
348
349
350
353
354
355
356
351
703
704
705

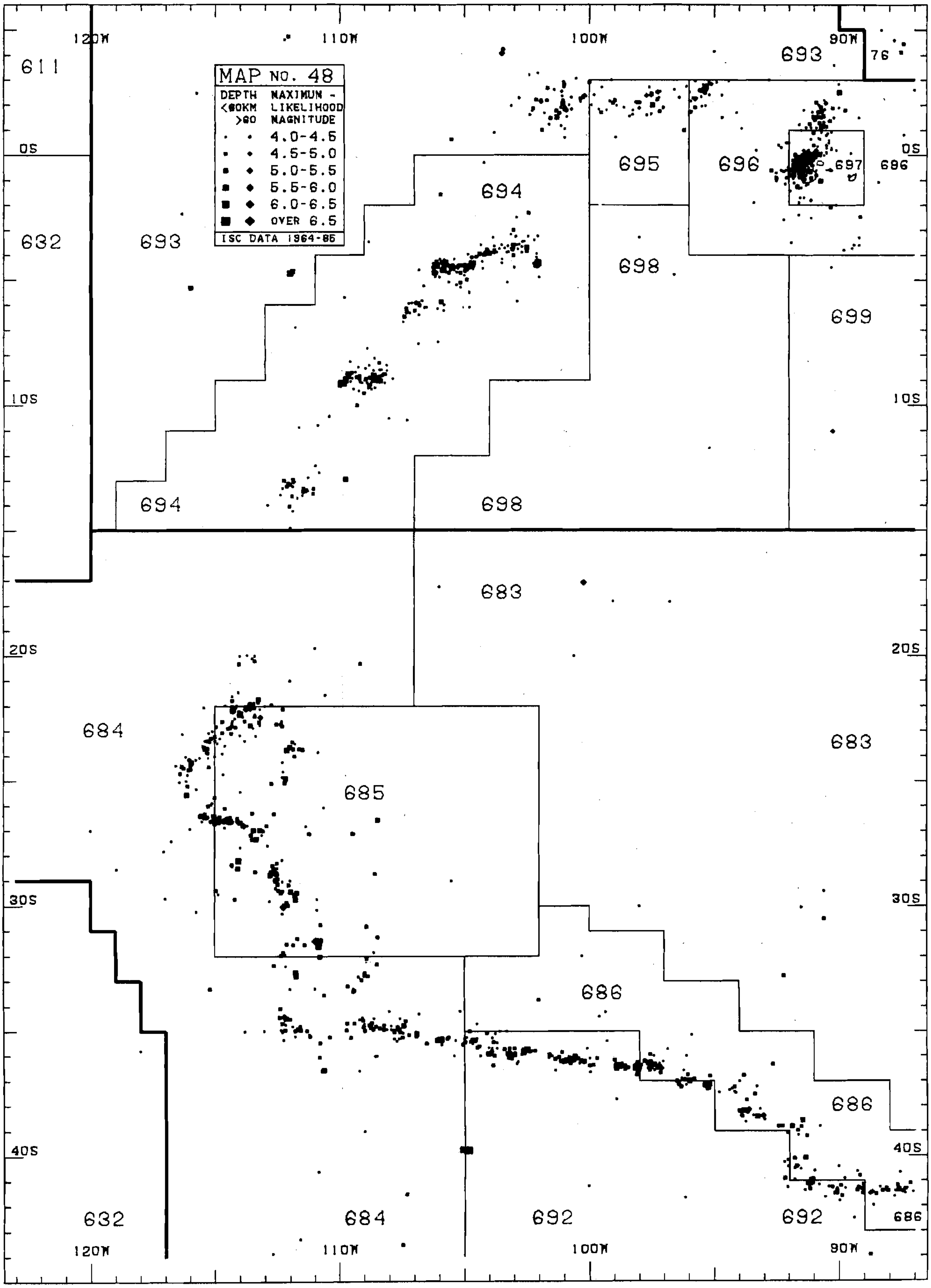

MAP NO. 43
DEPTH <60KM >60
MAXIMUM LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
90E
100E
110E
120E
40N
30N
20N
10N
0N

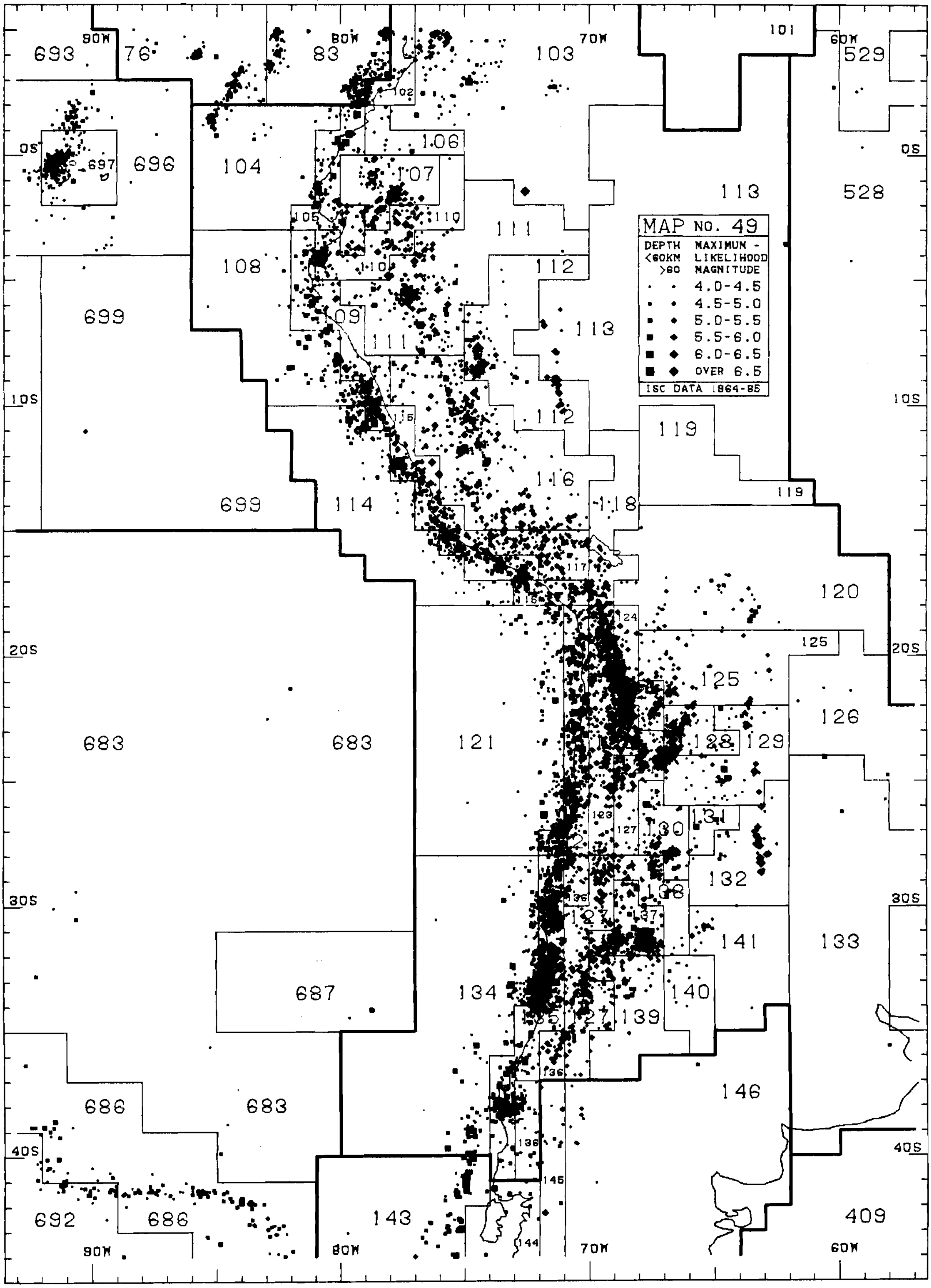

MAP NO. 44
DEPTH <60KM >60
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
120E
130E
40N
30N
20N
10N
0N
658
657
661
659
660
223
224
222
225
611
226
227
229
231
665
664
232
235
236
666
234
237
240
242
245
212
213
239
241
243
247
248
260
214
215
249
252
254
253
209
261
258
262
264
614
196
198
190
265
267
269
268
270
272
197
200
199
280
203

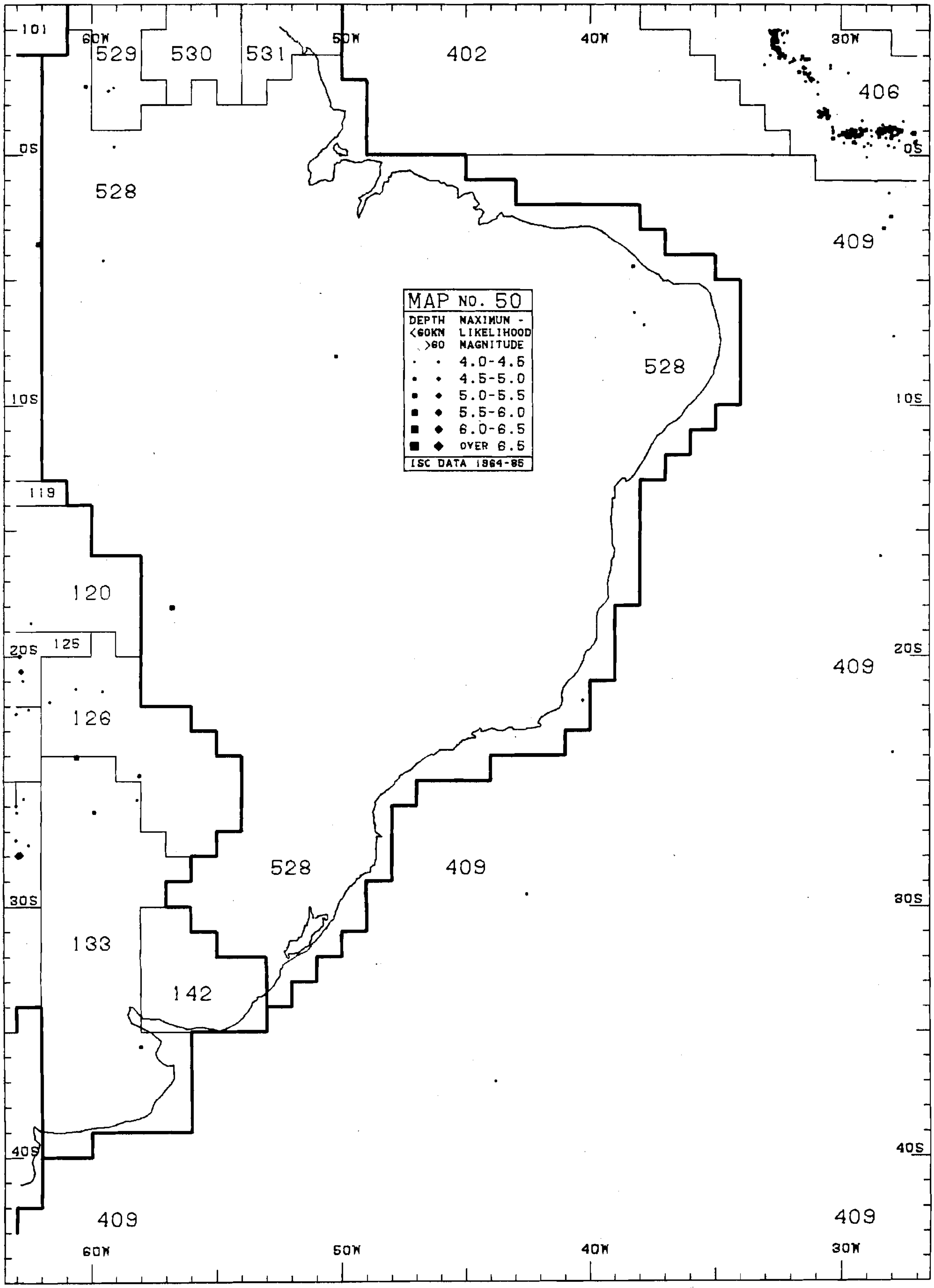

MAP NO. 45
DEPTH <60KM >60
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
160E
170E
180E
40N
30N
20N
10N
0N
611
222
225
229
215
210
612
615
616
617
614
618
190
191
199
203
632


MAP NO. 46
DEPTH <60KM >60
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
180W
170W
160W
150W
0S
10S
20S
30S
40S
611
620
622
632
624
623
625
626
180
169
181
170
174
627
628
631
629
175
177
179
688
689

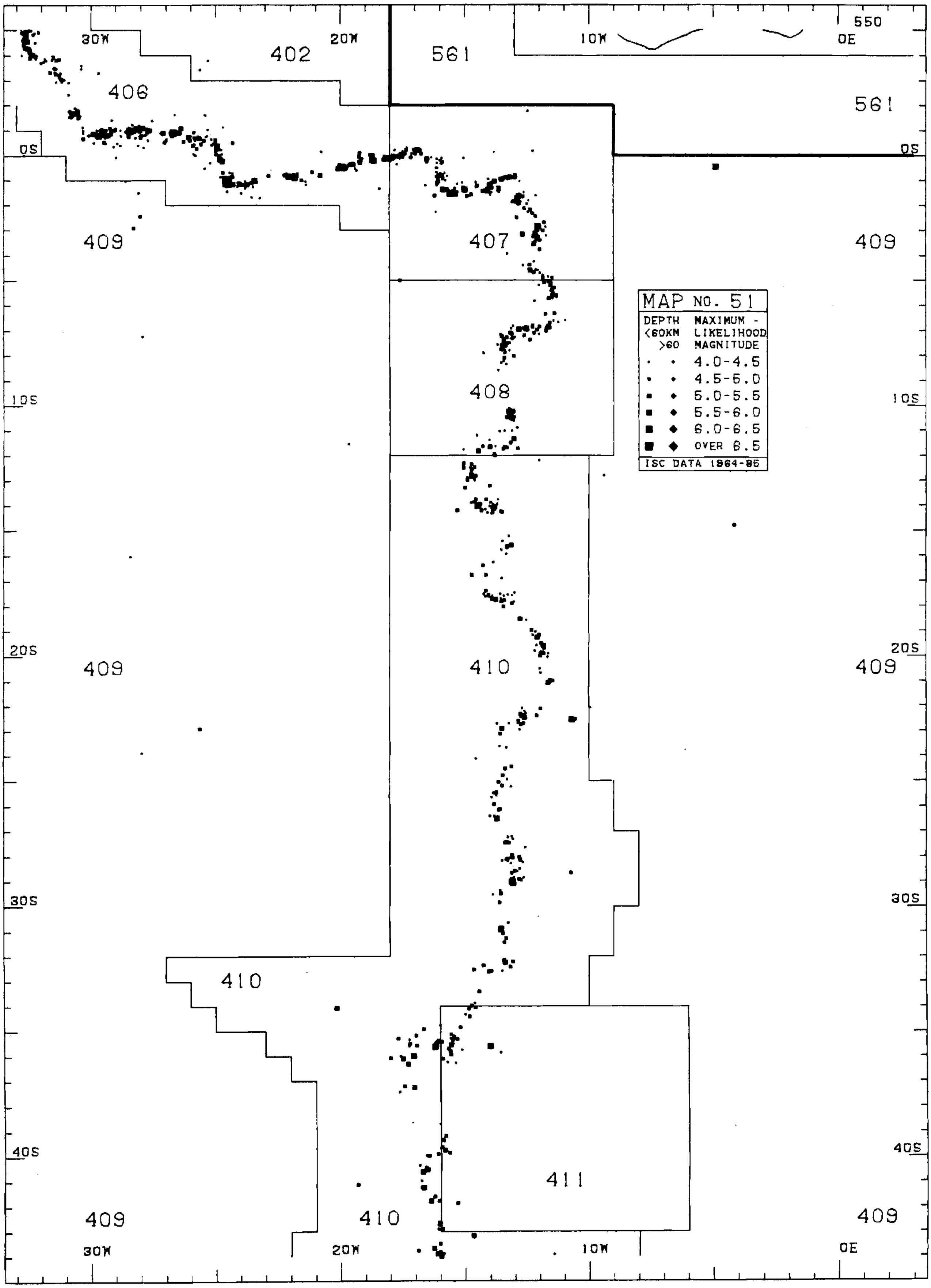

150W
140W
130W
120W
611
611
0S
0S
MAP NO. 47
DEPTH <60KM >60
MAXIMUN - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
632
632
693
620
630
10S
10S
694
628
631
20S
20S
629
631
632
684
632
30S
30S
40S
40S
632
632


MAP NO. 48
DEPTH <60KM >60
MAXIMUN - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
120W
110W
100W
90W
0S
10S
20S
30S
40S
611
632
693
694
695
696
697
698
699
76
683
684
685
686
692

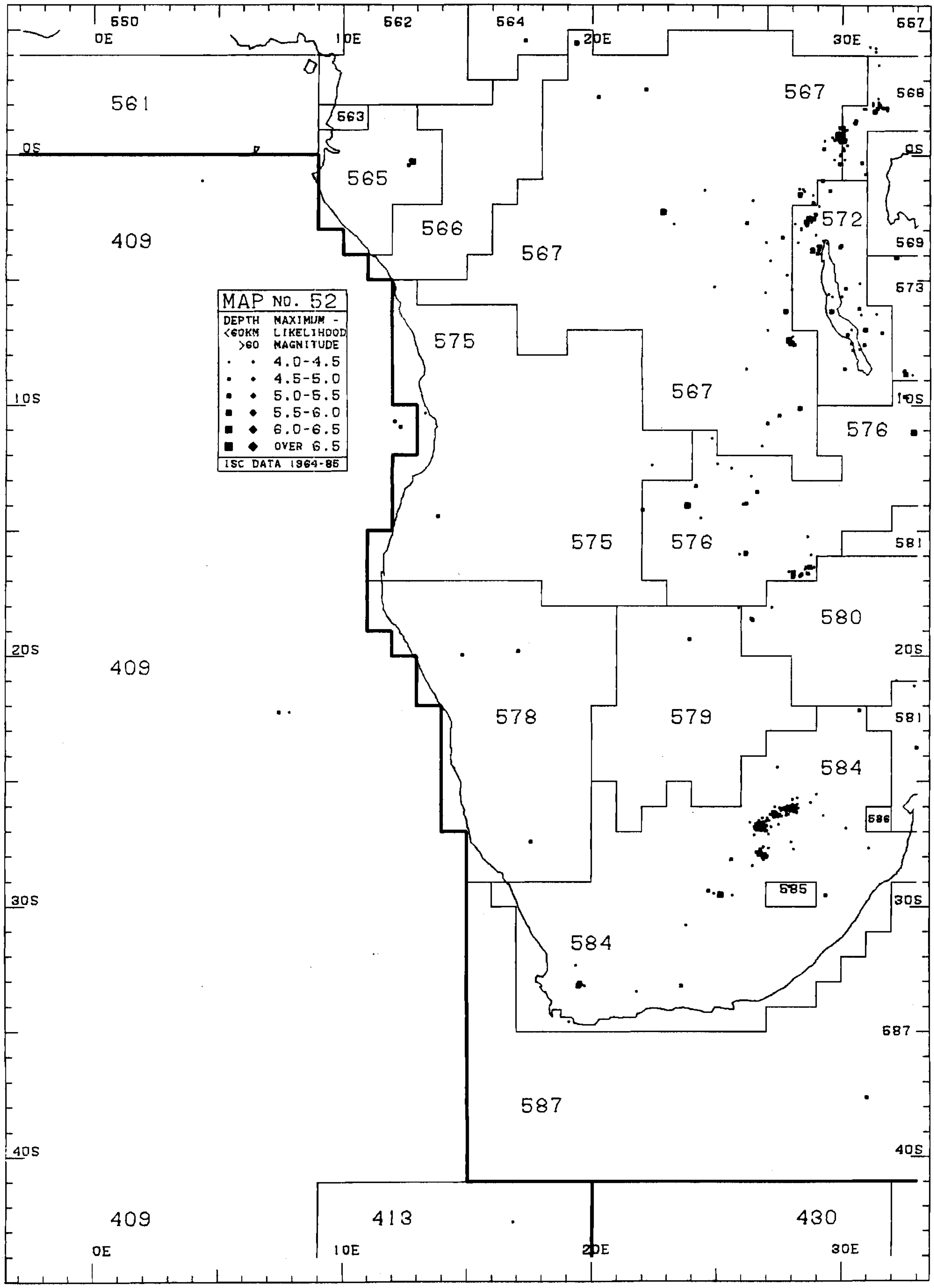

MAP NO. 49
DEPTH <60KM >60
MAXIMUN - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
90W
80W
70W
60W
0S
10S
20S
30S
40S
693
76
83
103
101
529
697
696
104
106
107
110
113
528
105
108
111
112
699
109
115
116
119
114
118
117
120
124
125
121
683
126
128
129
123
127
130
131
132
133
141
137
687
134
140
139
135
146
686
692
143
145
144
409

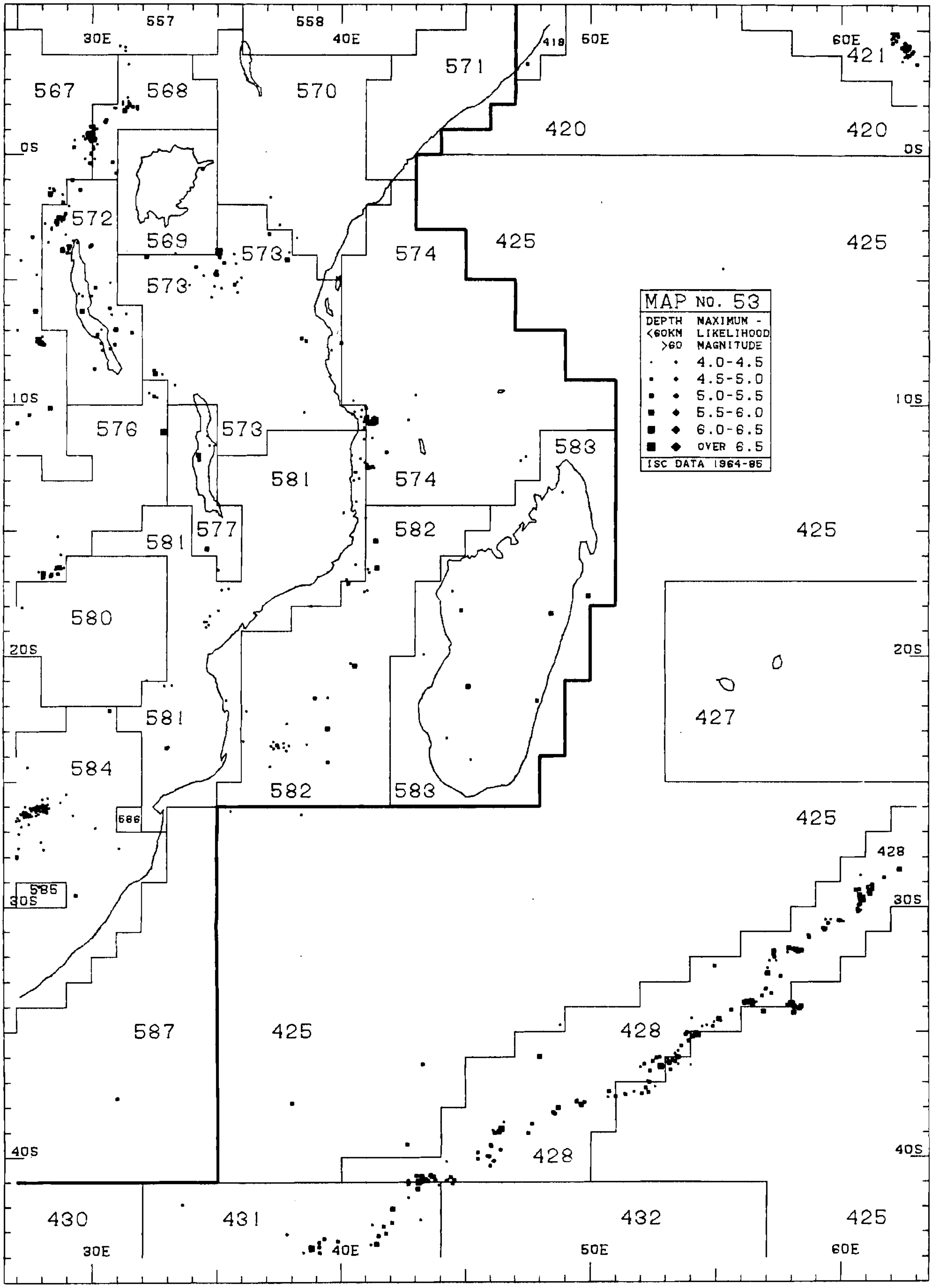


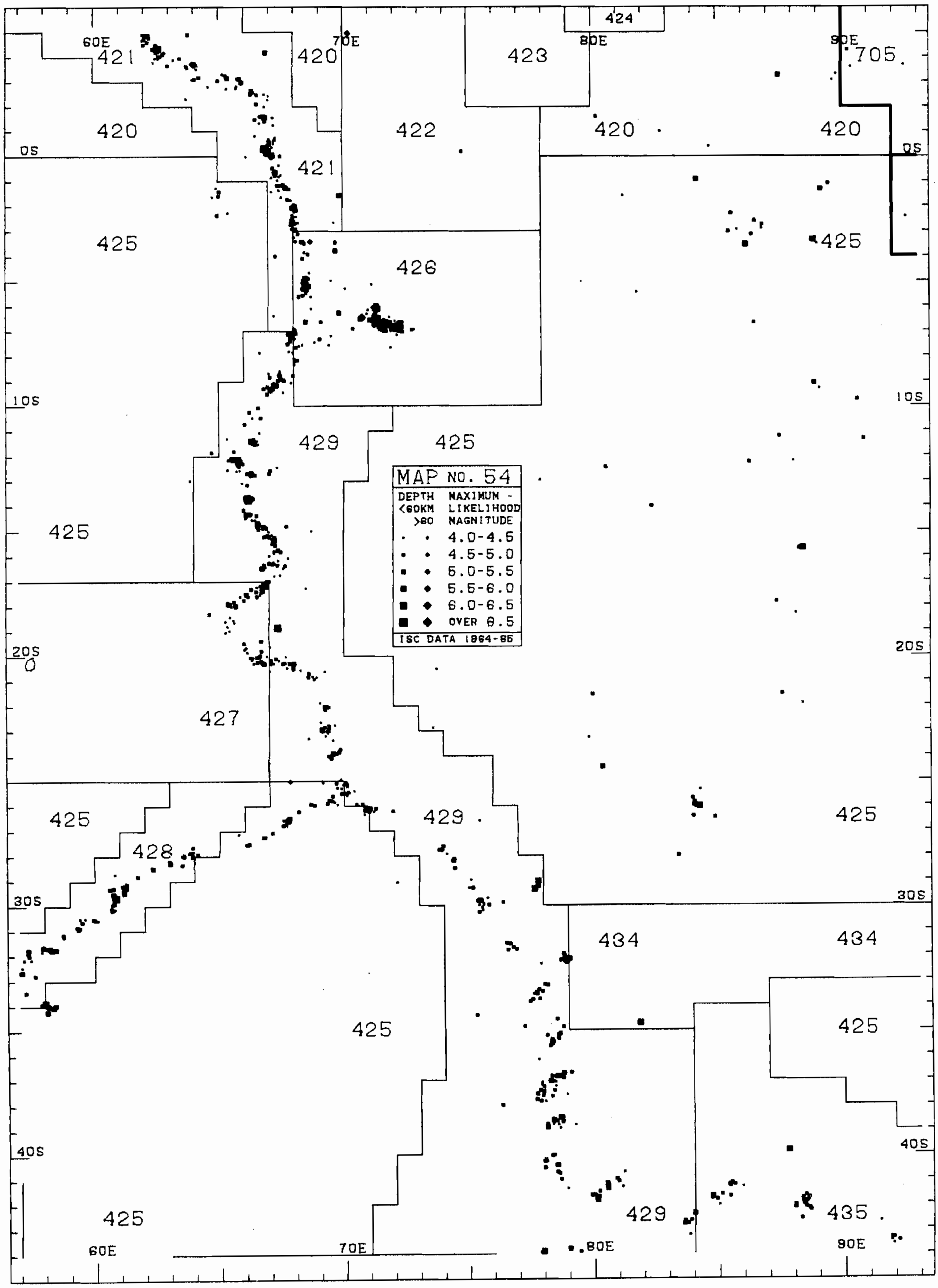
MAP NO. 50
DEPTH <60KM >60
MAXIMUN - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
60W
50W
40W
30W
0S
10S
20S
30S
40S
101
119
120
125
126
133
142
402
406
409
528
529
530
531



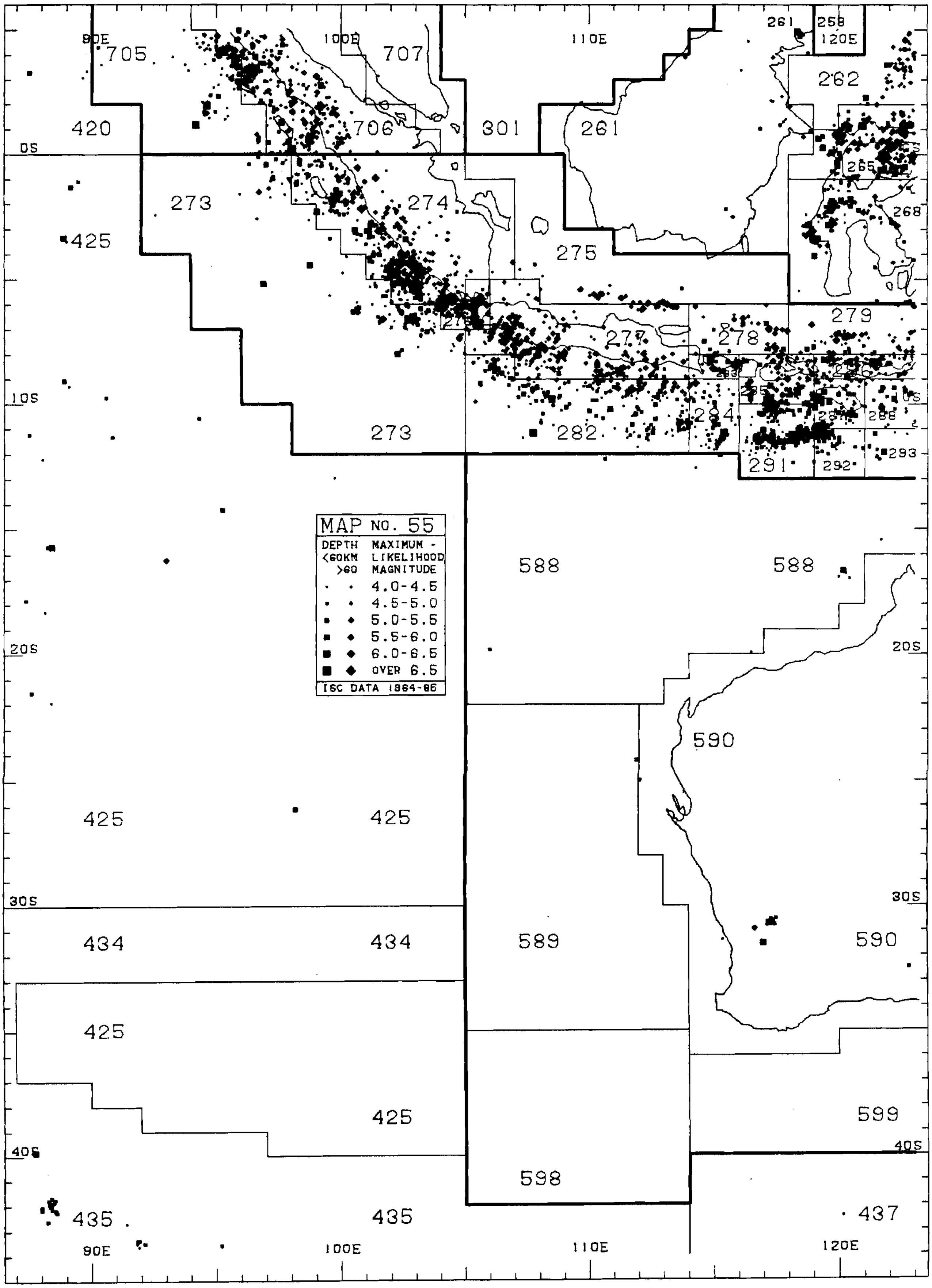
MAP NO. 51
DEPTH <60KM >60
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
402
406
561
550
407
408
409
410
411
30W
20W
10W
0E
0S
10S
20S
30S
40S

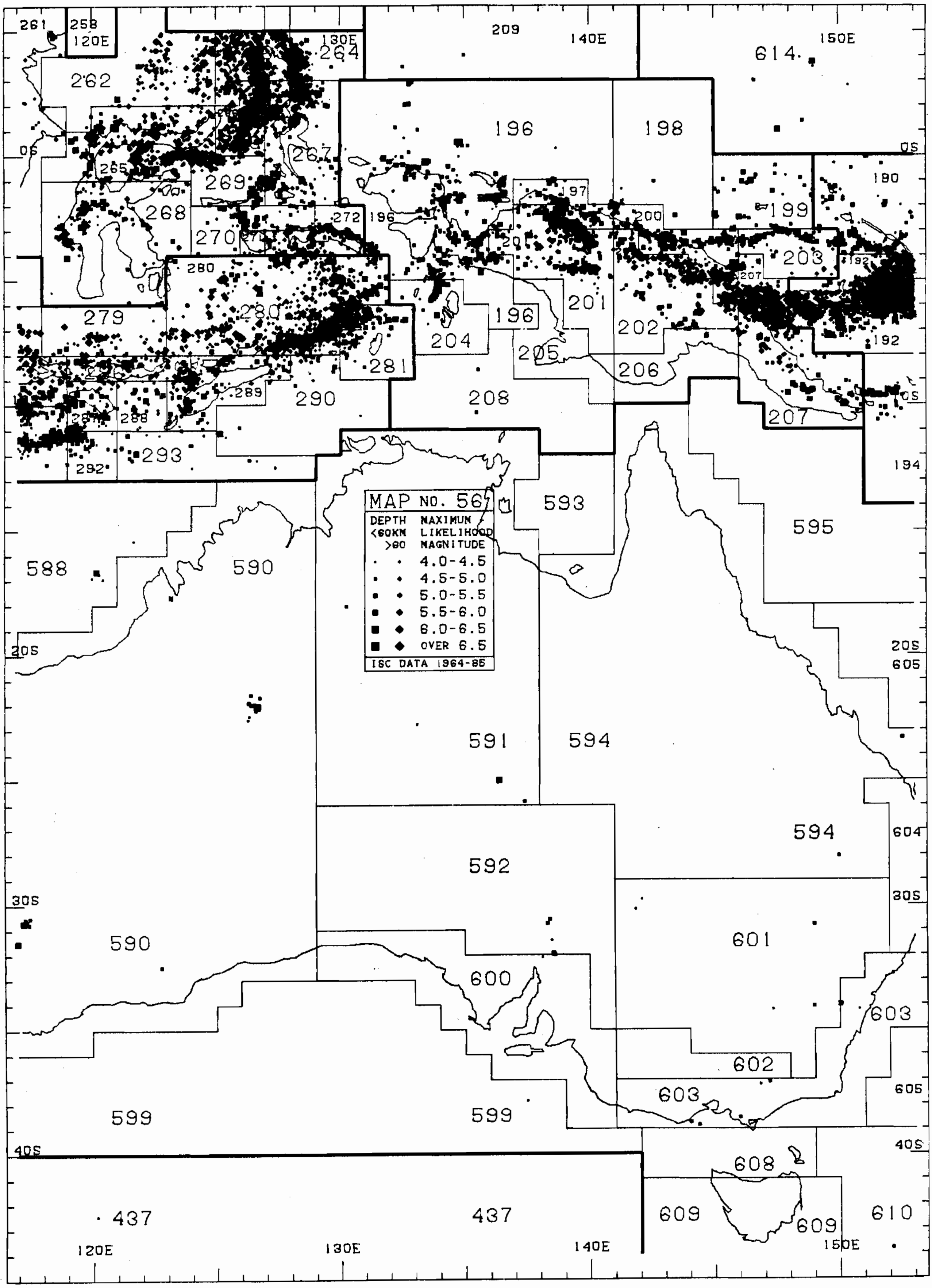

MAP NO. 52
DEPTH <60KM >60
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
550
562
564
567
568
569
572
573
576
581
580
584
585
586
587
561
563
565
566
575
578
579
409
413
430
0E
10E
20E
30E
0S
10S
20S
30S
40S

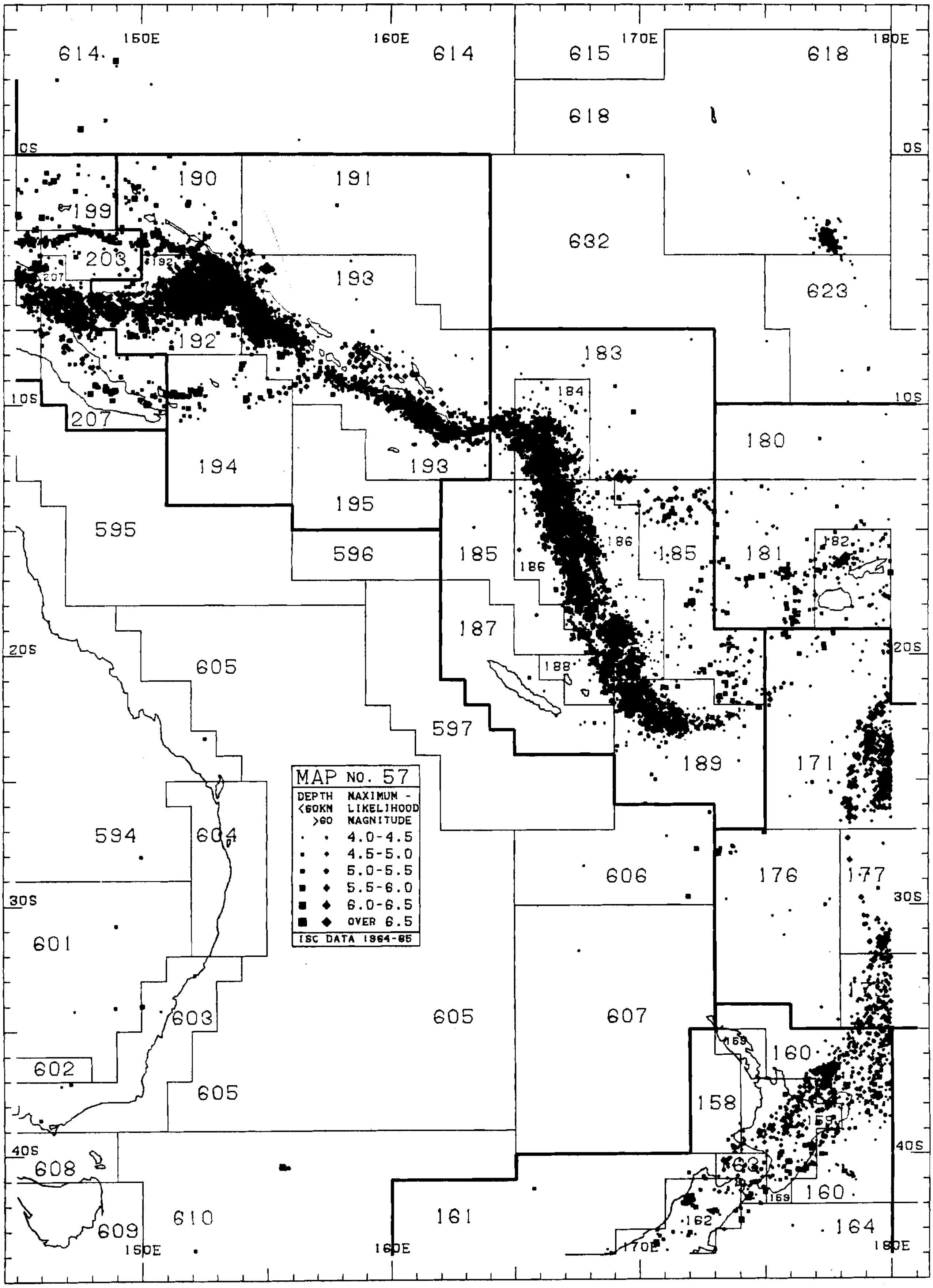

MAP NO. 53
DEPTH <60KM >60
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
30E
40E
50E
60E
0S
10S
20S
30S
40S
557
558
567
568
569
570
571
572
573
574
576
577
580
581
582
583
584
585
586
587
418
420
421
425
427
428
430
431
432

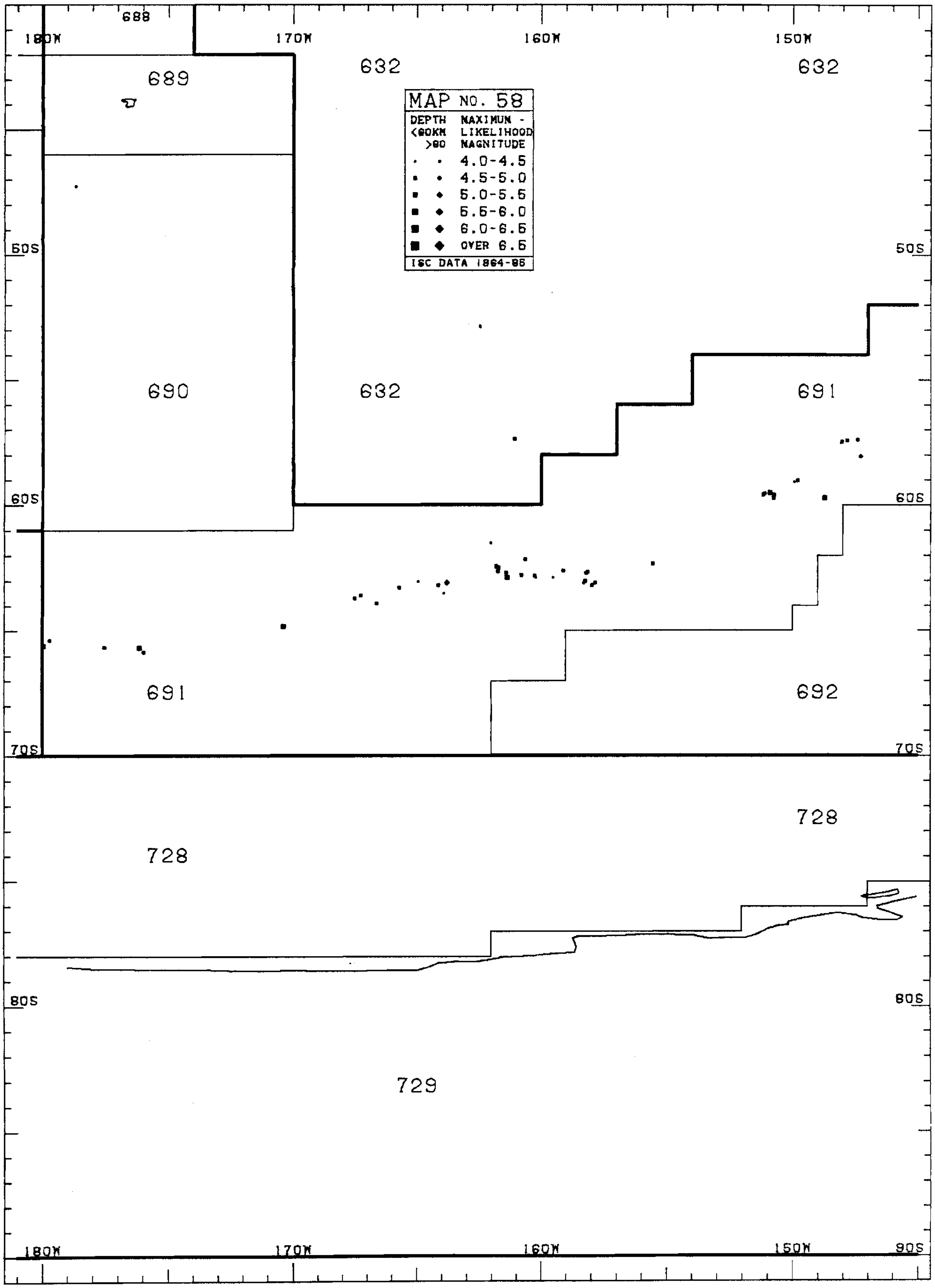


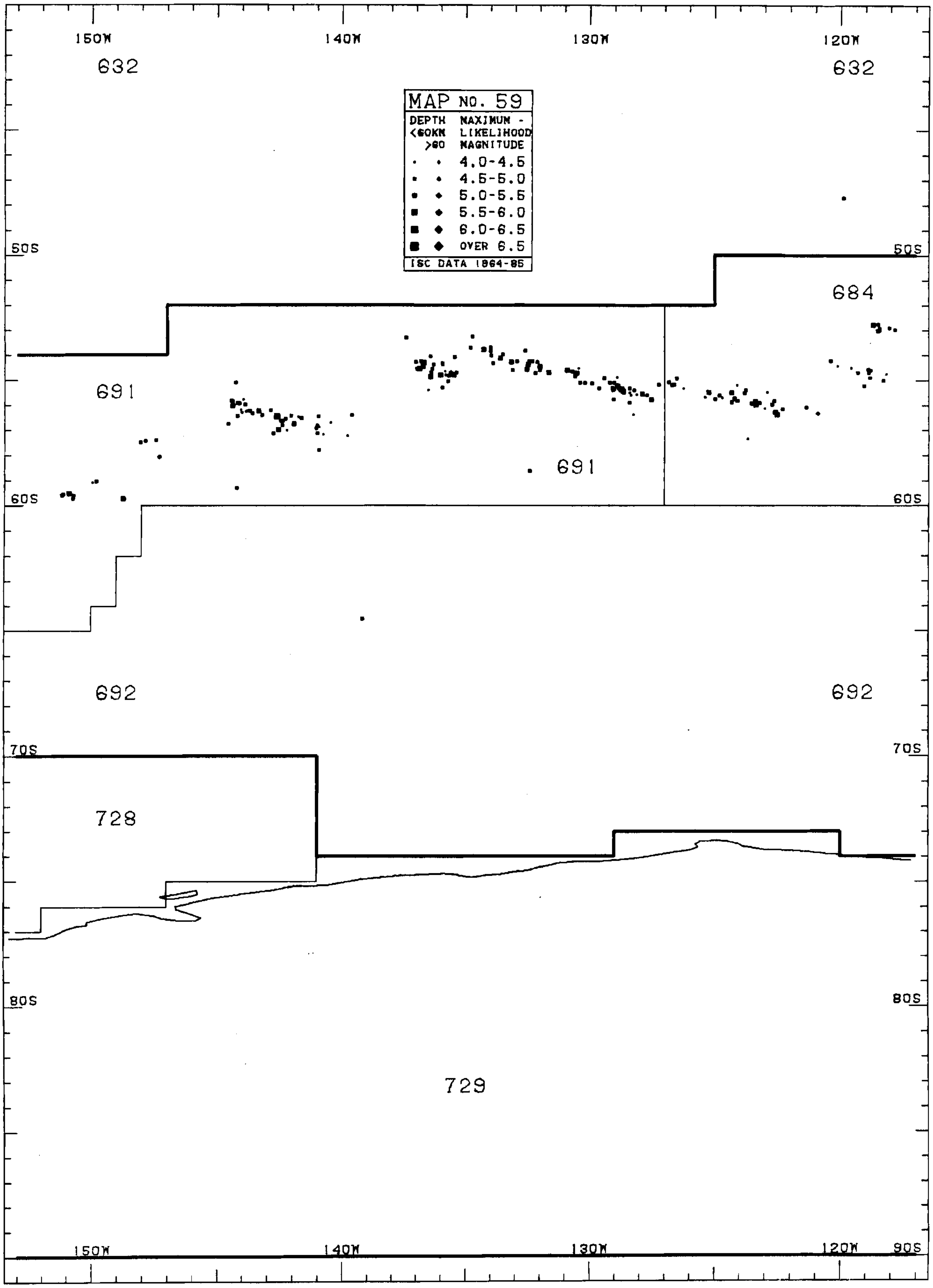
MAP NO. 54
DEPTH <60KM >60
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.6
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
60E
70E
80E
90E
0S
10S
20S
30S
40S
420
421
422
423
424
425
426
427
428
429
434
435
705


MAP NO. 55
DEPTH <60KM >60
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-86
90E
100E
110E
120E
0S
10S
20S
30S
40S
705
707
706
420
301
261
262
258
265
268
273
274
275
425
277
278
279
282
284
291
292
293
588
590
589
434
599
598
435
437

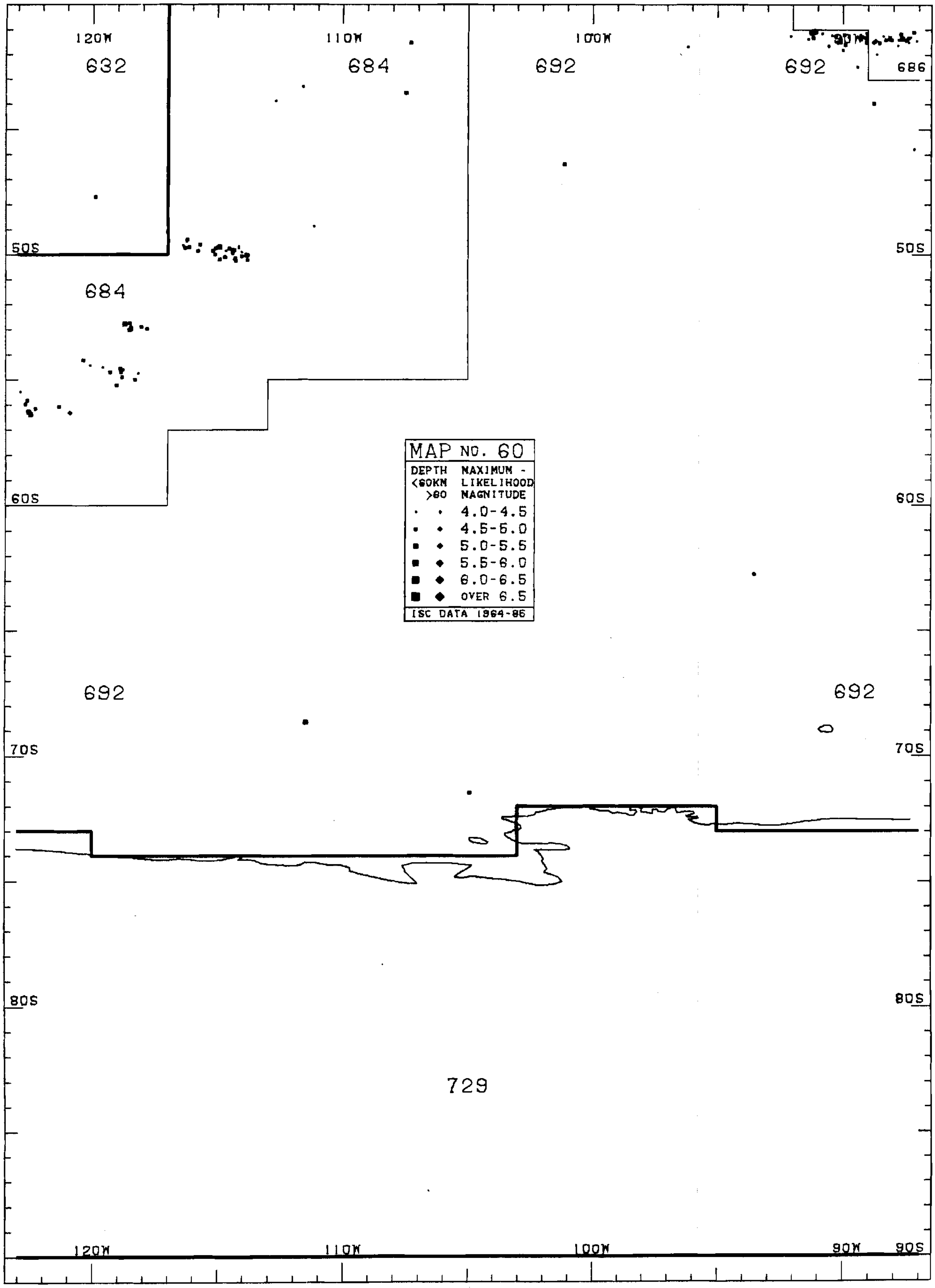

MAP NO. 56
DEPTH <60KM >60
MAXIMUM LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
120E
130E
140E
150E
0S
20S
30S
40S

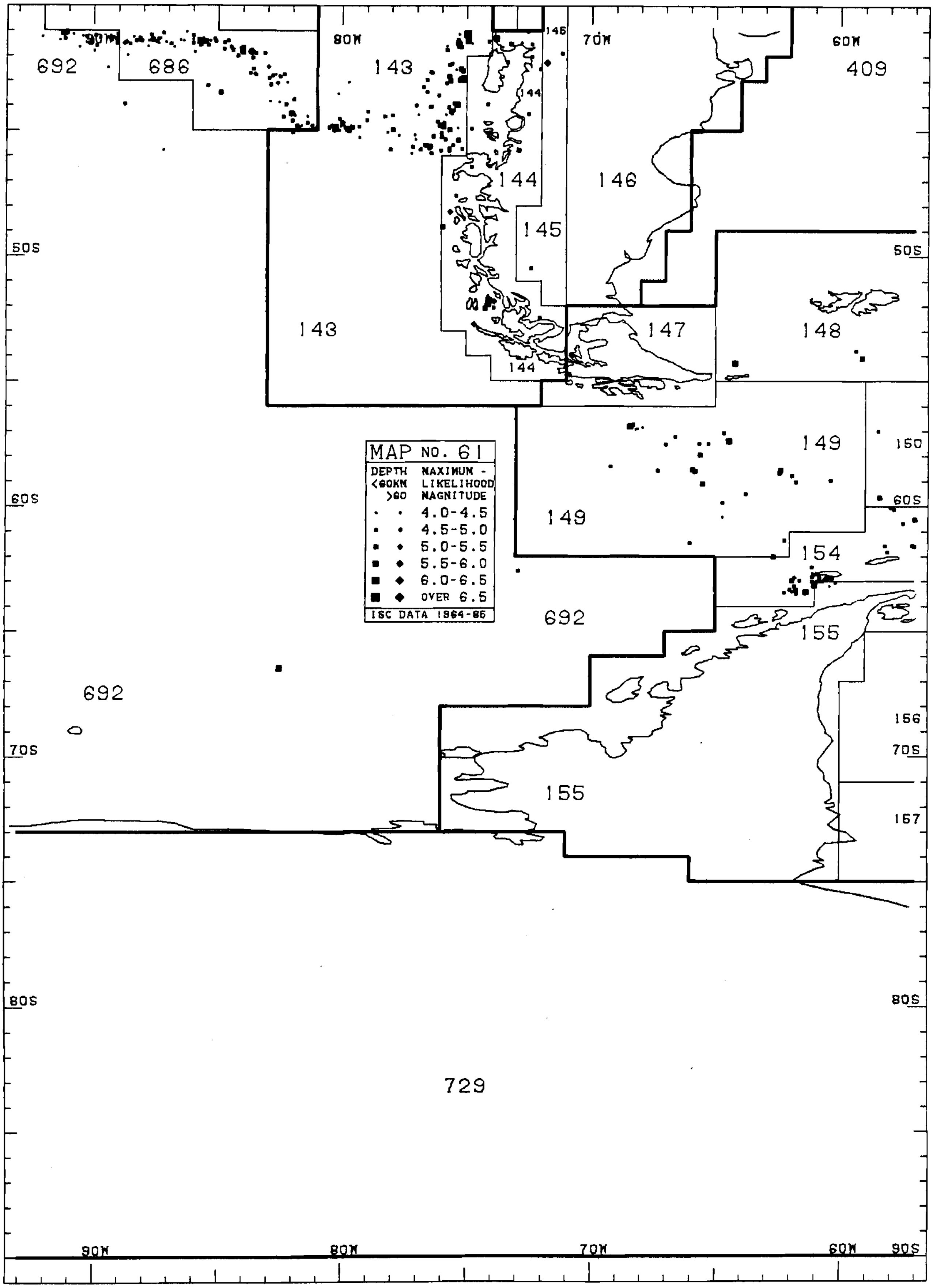

MAP NO. 57
DEPTH <60KM >60
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
150E
160E
170E
180E
0S
10S
20S
30S
40S

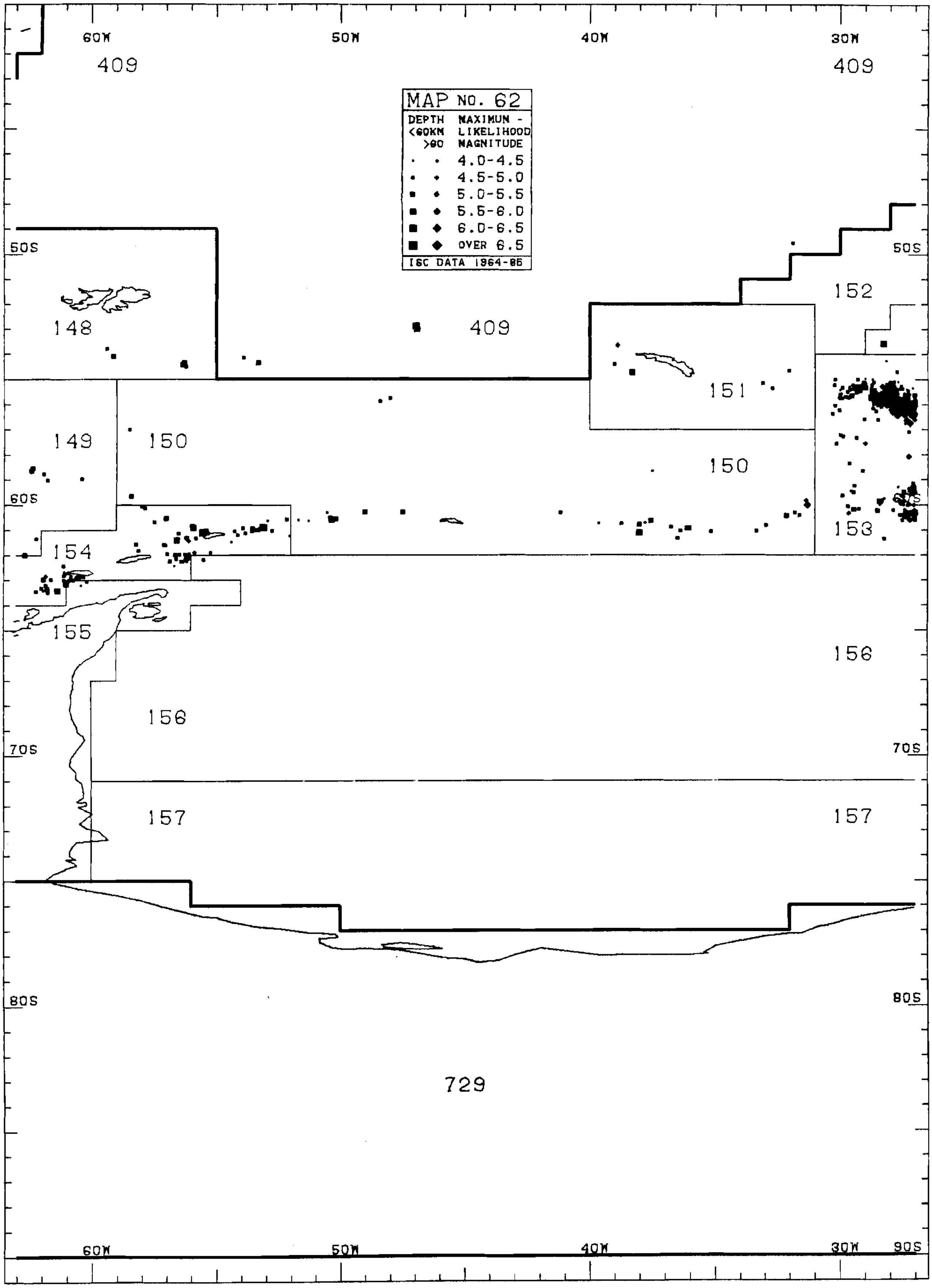

MAP NO. 58
DEPTH <60KM >60
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
688
689
690
691
692
632
728
729
180W
170W
160W
150W
50S
60S
70S
80S
90S

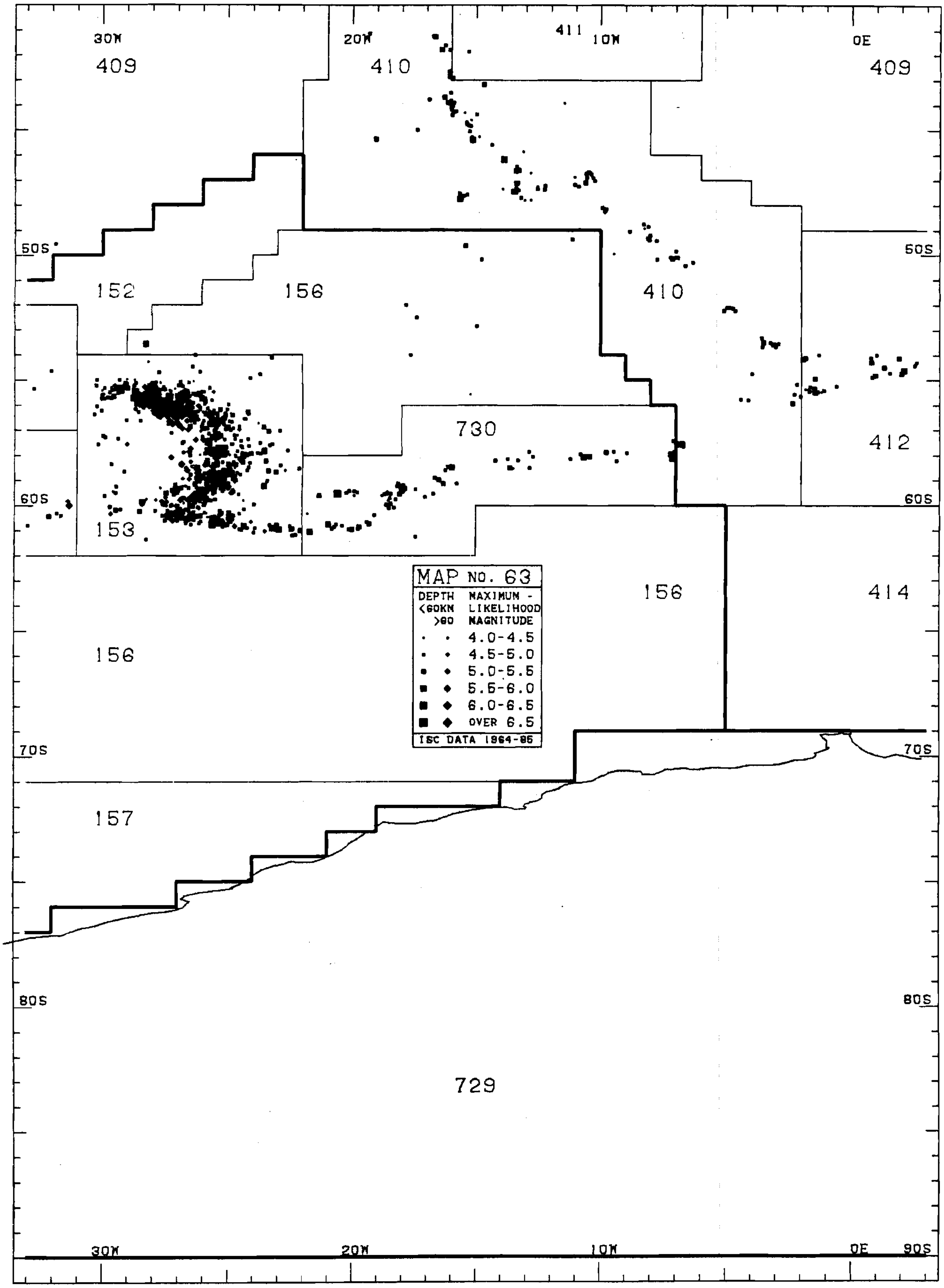


MAP NO. 59
DEPTH <60KM >60
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
150W
140W
130W
120W
50S
60S
70S
80S
90S
632
684
691
692
728
729

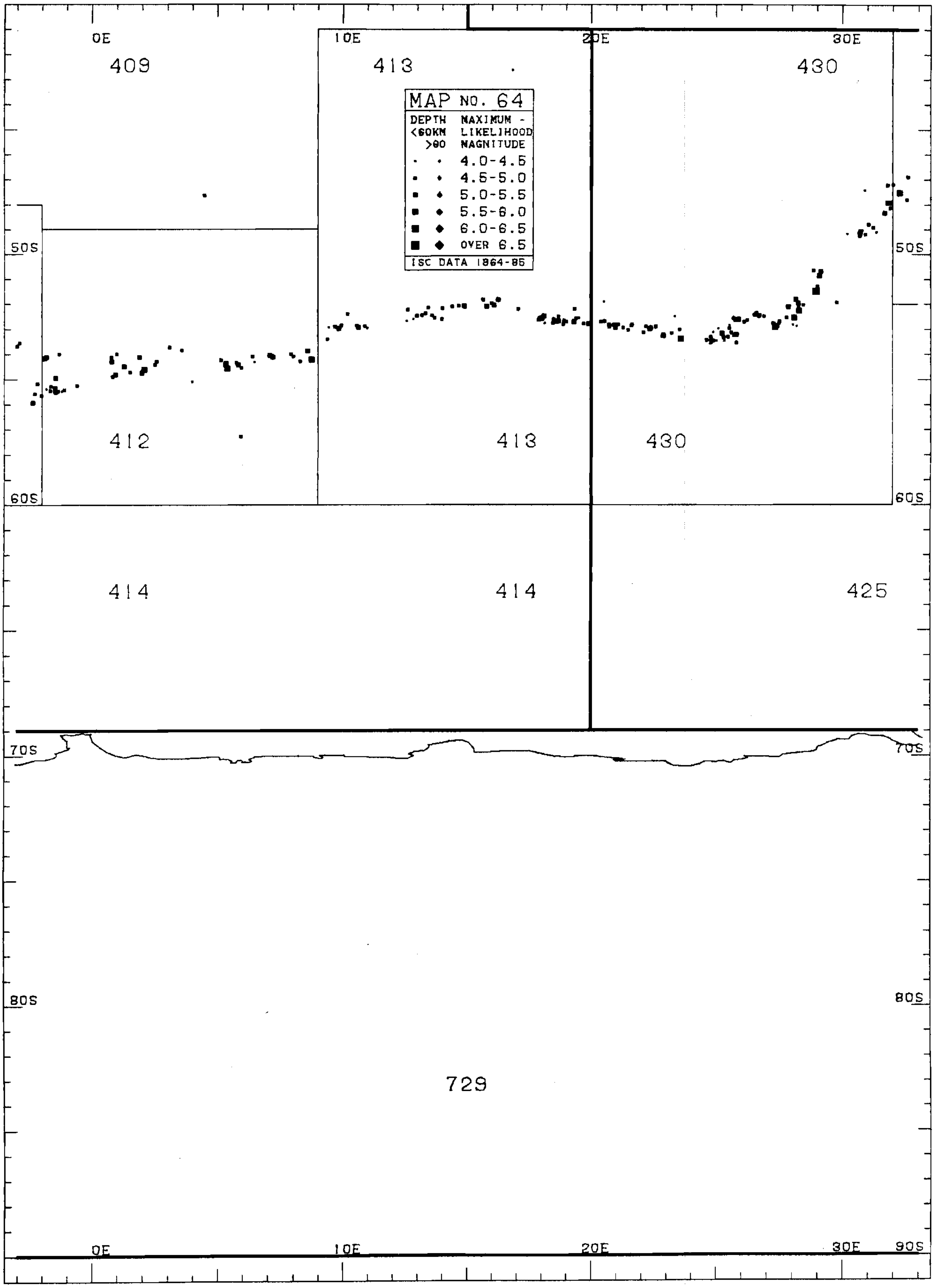

120W
110W
100W
90W
632
684
692
692
686
50S
50S
684
MAP NO. 60
DEPTH
<60KM
>60
MAXIMUM -
LIKELIHOOD
MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-86
60S
60S
692
692
70S
70S
80S
80S
729
120W
110W
100W
90W
90S

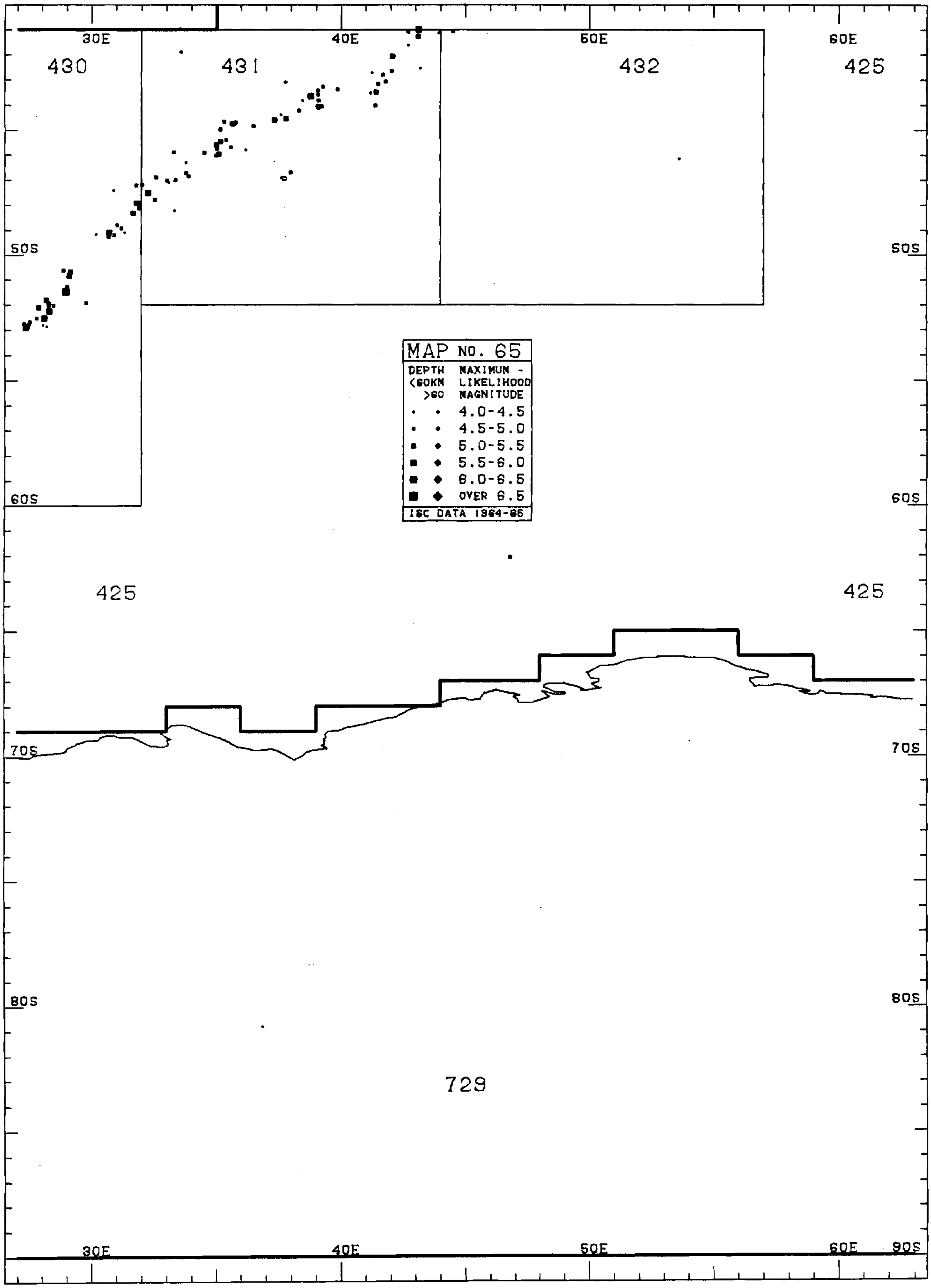

MAP NO. 61
DEPTH <60KM >60
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
90W
80W
70W
60W
50S
60S
70S
80S
90S
692
686
143
144
145
146
147
148
149
150
154
155
156
157
409
729


MAP NO. 62
DEPTH <60KM >60
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
60W
50W
40W
30W
50S
60S
70S
80S
90S
409
148
149
150
151
152
153
154
155
156
157
729

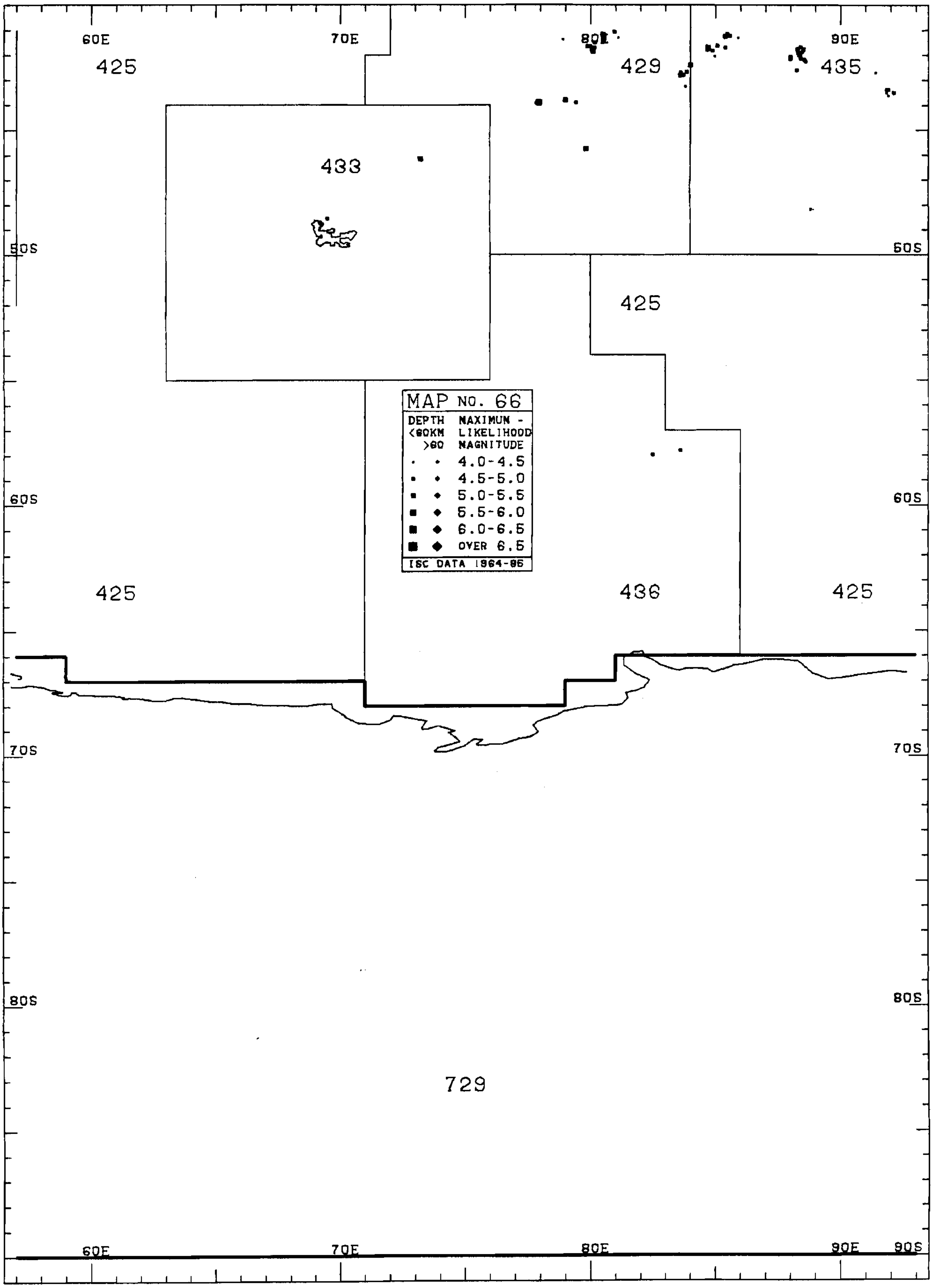


MAP NO. 63
DEPTH <60KM >60
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
30W
20W
10W
0E
50S
60S
70S
80S
90S
409
410
411
152
156
153
730
412
414
157
729

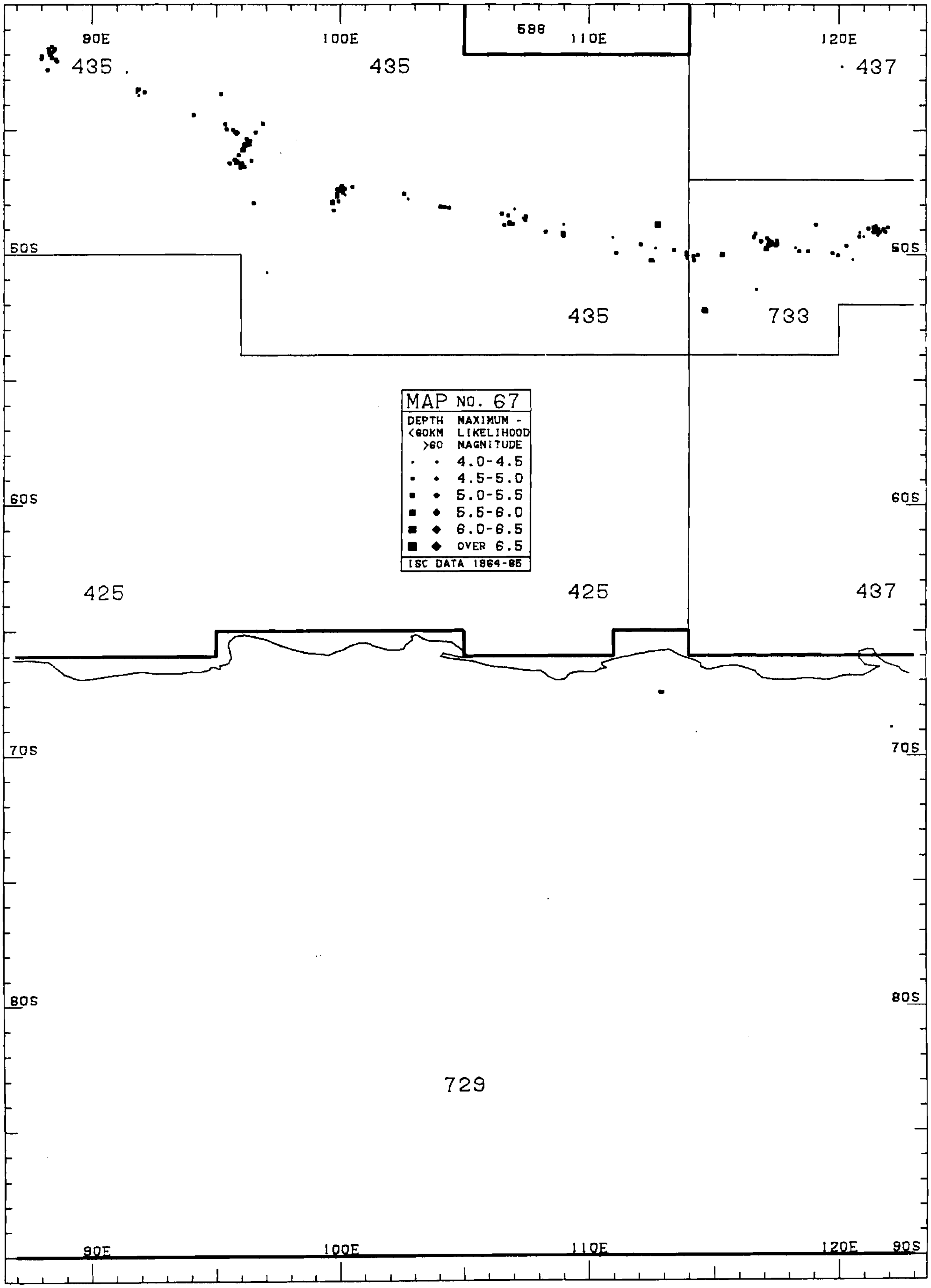

MAP NO. 64
DEPTH <60KM >60
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
0E
10E
20E
30E
50S
60S
70S
80S
90S
409
413
430
412
414
425
729

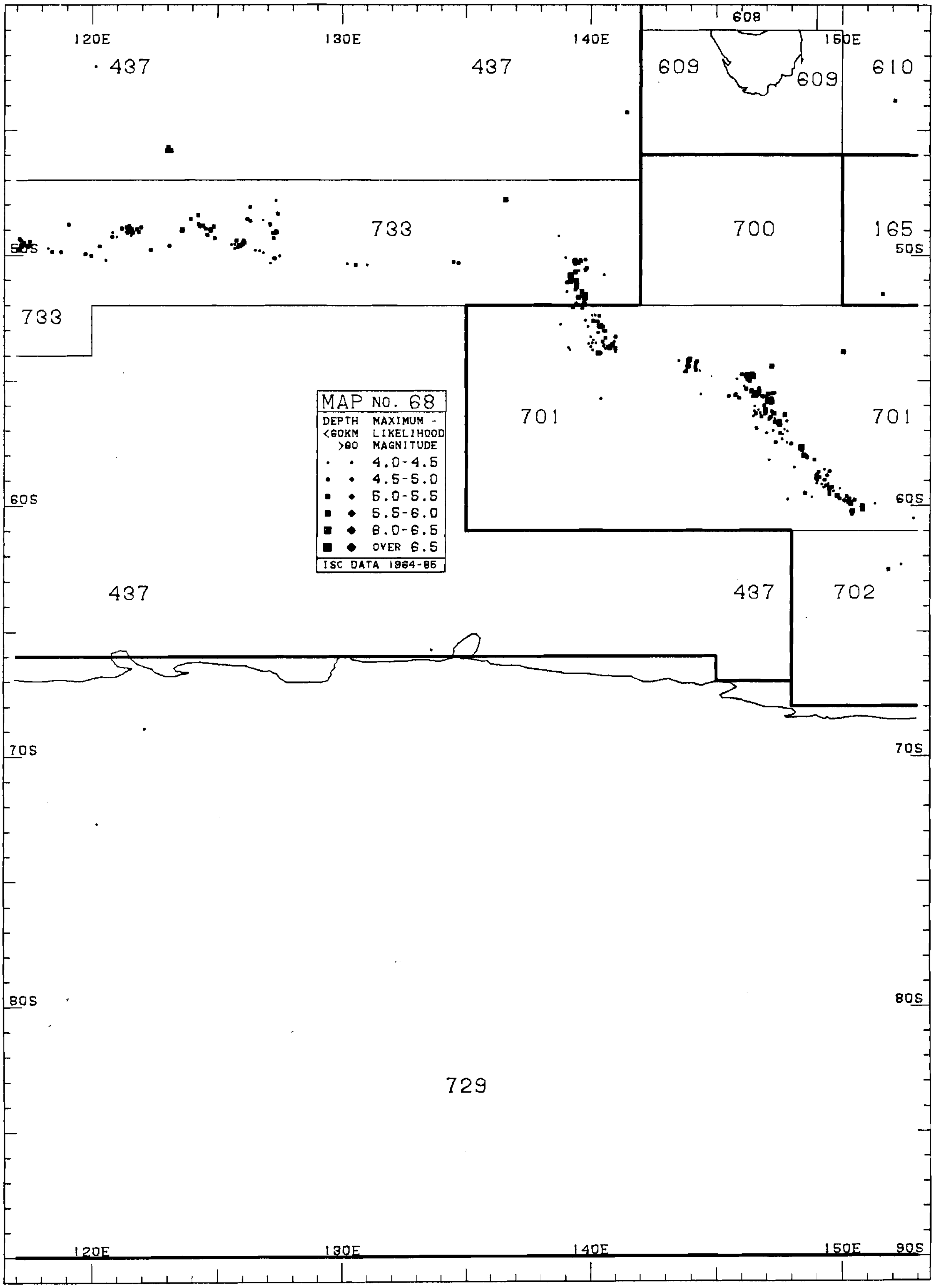


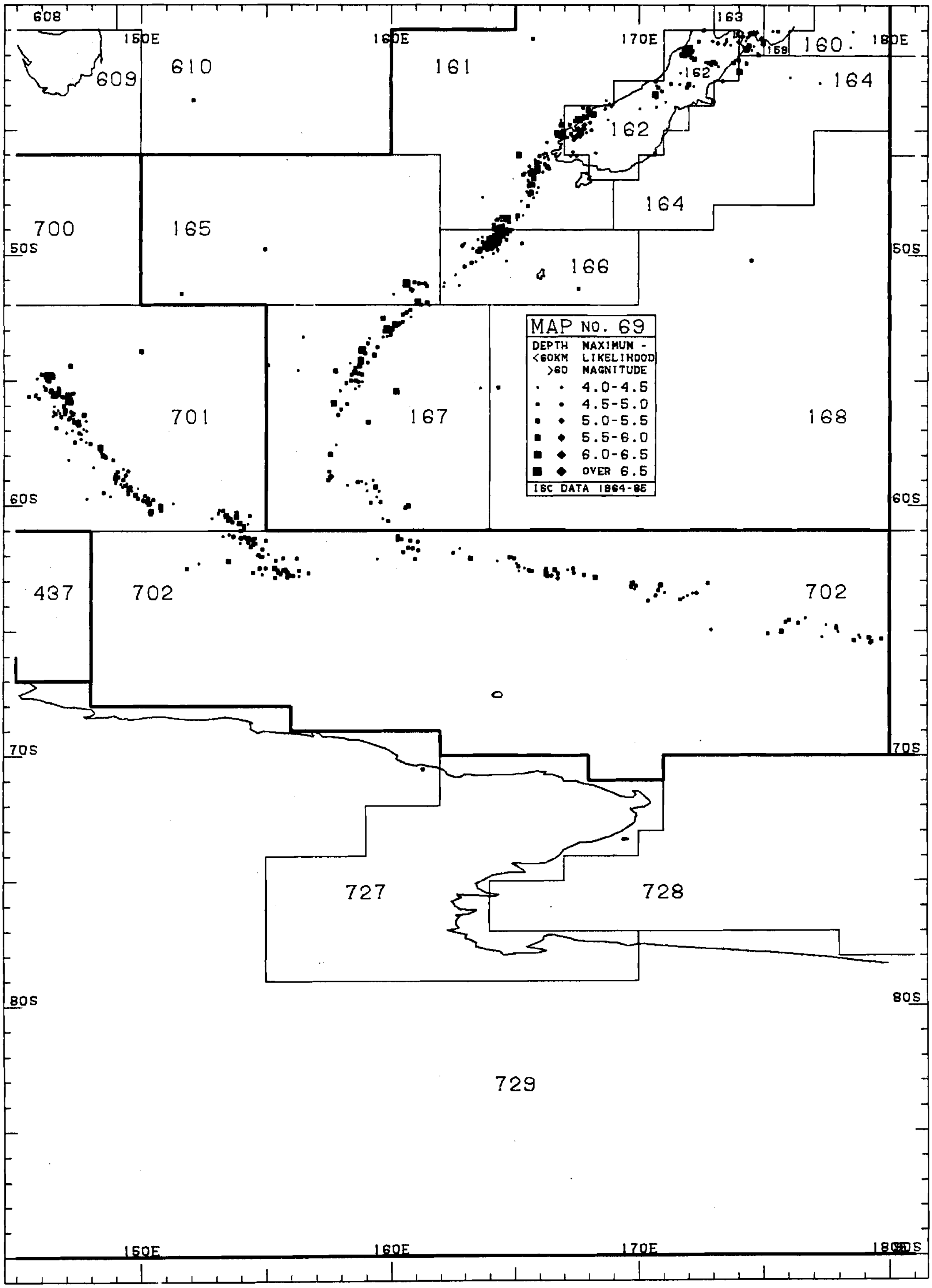
30E
40E
50E
60E
430
431
432
425
50S
60S
70S
80S
90S
MAP NO. 65
DEPTH
<60KM
>60
MAXIMUM -
LIKELIHOOD
MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-86
425
425
729



60E
70E
80E
90E
425
429
435
433
50S
425
MAP NO. 66
DEPTH <60KM >60
MAXIMUN - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-86
60S
425
436
425
70S
80S
729
90S


90E
100E
588
110E
120E
435
435
437
50S
435
733
MAP NO. 67
DEPTH <60KM >60
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
60S
425
425
437
70S
80S
729
90S


MAP NO. 68
DEPTH <60KM >60
MAXIMUM - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-85
120E
130E
140E
150E
50S
60S
70S
80S
90S
608
609
610
437
733
700
165
701
702
729


MAP NO. 69
DEPTH <60KM >60
MAXIMUN - LIKELIHOOD MAGNITUDE
4.0-4.5
4.5-5.0
5.0-5.5
5.5-6.0
6.0-6.5
OVER 6.5
ISC DATA 1964-86
150E
160E
170E
180E
50S
60S
70S
80S
608
609
610
161
162
163
160
164
165
166
167
168
169
700
701
702
437
727
728
729

UK UNLIMITED

Available from
HER MAJESTY'S STATIONERY OFFICE
49 High Holborn, London W.C.1
13a Castle Street, Edinburgh 2
41 The Hayes, Cardiff CF1 1JW
Brazennose Street, Manchester 2
Southey House, Wine Street, Bristol BS1 2BQ
258-259 Broad St., Birmingham 1
80 Chichester Street, Belfast BT1 4JY
or through any bookseller.

Printed in England

ISBN 0 85518183 4

UK UNLIMITED