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SAMPLING EVENTS FROM U.S.C.&G.S. EARTHQUAKE CARDS

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Massachusetts Institute of Technology
Cambridge 39, Massachusetts

Contract No. AF 19(604)7378
S.M. Simpson, Jr., Director
Project No. 8652
Task No. 865203

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Scientific Report No. 11
and
Final Report
June 30, 1965

Period Covered: April 1, 1965 to June 15. 1965

Work Sponsored by Advanced Research Projects Agency
Project VELA UNIFORM
ARPA Order No. 180-61, Amendment 2

Prepared for

AIR FORCE CAMBRIDGE RESEARCH LABORATORIES
OFFICE OF AEROSPACE RESEARCH
UNITED STATES AIR FORCE
BEDFORD, MASSACHUSETTS

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ABSTRACT

Two computer programs are presented and illustrated for statistical selection of events from magnetic tapes containing images of U.S. Coast & Geodetic Survey Earthquake Cards. The first program produces an output tape containing cards for all events within a given time range, depth range, and geographical area. The area is specified by arbitrary sets of trapezoids whose parallel sides are latitude lines. Three major seismic regionalizations (Gutenberg and Richter's, Schaeffner's and Texas Instruments') have been card coded into such sets.

The second program selects, from the output tape of the first program, all events in given magnitude ranges. It then shuffles the events using the Rand random digits and deals out a selected number of them.

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1. Introduction

The approach to sorting embodied by the programs presented herein was motivated by the requirements of an unbiased approach to discrimination technique evaluation. Given a well-defined decision criterion to be evaluated one wishes to estimate both its failure probability by trials on records from nuclear events, and its false-alarm rate by trials on records from earthquakes. Inasmuch as such estimates figure in international negotiations it is clearly imperative to minimize the possibility of charges of bias in the design of the experiments leading to the estimates. A critical aspect of this design is the selection of events on whose records trials are to be made. The selection should constitute as representative a sample as possible of the ensemble of events to be experienced by the detection network for the territory in question.

On the assumption that the vast earthquake compilations of the U.S. Coast & Geodetic Survey are a reasonable approximation to the true ensemble of events in any given territory, then we merely have to draw our sample randomly from the U.S.C.&G.S. compilation, of course within constraints, pertaining, e.g., to territory or to depth of focus, implied by grosser discriminations than the technique under examination. Such is the type of sampling enabled by the programs presented here.

Certainly this assumption is open to serious question on various grounds such as non-ideal distribution of recording stations and the changing nature of instrumentation. But at least these are matters of record so that in principle we could examine and correct for the biases inherent in the U.S.C.&G.S. compilation.

The two programs permit an experimenter to make requests of the following form.

> "Select N events randomly in the time period A to B, of magnitude range X to Y and depth range D to E, and which took place in the following geographical area: "

Thus the function performed is rather simple in concept. But the forms used to realize this retrieval are complicated by the need to minimize retrieval time, and are worth some comments.

Consider first the question of computational representation of geographical areas. Perhaps the most efficient representation of a simply-connected region would be in terms of its perimeter and would consist of an ordered sequence of latitude-longitude pairs on the perimeter, a corresponding sequence of indicators as to whether the arcs assumed to join successive pairs are great circles or rhumb lines, and a right or left hand rule for sense of traverse. In our application each event from thousands of events must be tested to determine whether or not it falls in the given area, and the test would be exceedingly time consuming working from this type of areal specification.

The simplest shape from a test point of view is a rectangle in latitude and longitude, which suggests decomposition of areas into rectangle sets. We have preferred however to decompose areas into sets of trapezoids of which two sides are latitudes and the others are rhumb lines, on the conviction that the advantage of smaller sets required for comparable accuracy significantly outweighs, for the geo-political areas of present concern, the disadvantage of the longer test time for trapezoids.

Finally in this connection we should note that the geographical areas of interest may not always coincide with one of the individual regions as given in the breakdowns of Section 3 but may consist of the logical sum of a number of these regions. To allow for this type of eventuality the sorting programs take, as their concept of a single geographical area, an arbitrary number of regions each of which consists of its own number of subtrapezoids and each with its own circumscribing and inscribing trapezoids.

Next consider the tape motion and storage problems in the light of the random selection requirement. The U.S. C.&G.S. tape contains one BCD card image record per event and the events are chronologically ordered. As a first approximation we could have the computer wheel the tape to the low end of the desired time window and then start performing multiple tests on the successive cards, punching out a copy of each card accepted until the desired number of events has been selected. The trouble with this procedure, of course, is that such selections are not random but contigously bunched in the from end of the time window.

Of course one might forego the random selection feature for the sake of simplicity, seeking justification in the empirical evidence indicating that earthquake occurrences form a stationary process with no seasonal variation. In some applications this might be adequate reasoning but not in the detection evaluation problem. For here we are vitally concerned with microseismic noise levels which are known to be strongly seasonal.

To get our N random samples we must note every event that passes the sorting tests, then shuffle them all and deal out the first N. Since it is restrictive to

assume that the set of cards for all events passing the sorting test can be stored in core memory (say there are M of these events) our procedure runs basically as follows.

1. Select and copy the M cards onto a scratch tape and rewind it.
2. Shuffle the integers 1, 2, ..., M.
3. Take the first N of the shuffled integers and order them by increasing size.
4. Pass through the scratch tape selecting out and copying onto the output tape all cards whose physical ordering indices are successively picked up from the integer list produced in process 3.

The principal elaboration of this process actually incorporated in the programs is a feature allowing the simultaneous sampling of events for a number of magnitude ranges rather than for just one. This is achieved with no additional scratch tapes and no additional passes through either tape and the details may be studied from Section 4.

A final feature worth noting is that the shuffling logic, which is based on the use of the Rand million random digits, i.e., a magnetic tape of these digits, permits, via an origin control parameter, independent shufflings from successive runs of the program.

2. U.S.C.&G.S. Earthquake Cards

For reference purposes we review here the information format of the U.S.C.&G.S. earthquake cards. There is one PDE card for each event and each card specifies time, location, magnitude, and geographical area as follows.

Columns	Contents	Format
1-2	Month (i.e., 01,02,...,12)	I2
3-4	Day (i.e., 01,02,...,31)	I2
5-6	Year (e.g., 60,61,...)	I2
7-8	Hour (z) (i.e., 00,...,23)	I2
9-10	Minutes (z) (i.e., 00,...,59)	I2
11-14	Seconds (z)	F4.1
15-18	Latitude in degrees (unsigned)	F4.1
19	Latitude North-South indicator	A1 {1HN or 1HS}
20-24	Longitude in degrees (unsigned)	F5.1
25	Longitude East-West indicator	A1 {1HE or 1HW}
26-28	Depth in Km.	I3 (or F3.0)
29-30*	Magnitude	F3.1
32*	Magnitude source indicator	A1 {1HB 1HP 1HC}
33-80	Comment field (geographical location)	8A6
81-84	Serialization index within given month	I4

*Field left blank if magnitude unknown.

3. Seismic Regionalization Cards

For purposes of the sorting programs of the next section, a geographical area is a collection of regions each of which is composed of a group of trapezoidal subregions. This section defines the card coding of regions and lists the codings corresponding to three different seismic divisions of the world. These divisions, previously published, are due to Gutenberg and Richter, to Texas Instruments, and to Schaeffner.

Coding Conventions

A trapezoidal region is the region enclosed by any trapezoid drawn on a Mercator projection map where two of the sides are constant latitude lines. The more northerly of these two sides is specified by its latitude, LATHI, the longitude of its western end, LNGHIW, and that of its eastern end, LNGHIE. The southerly side is specified similarly by the analogous quantities LATLO, LNGLOW, and LNGLOE. The following conventions are used in card coding these six quantities.

1. Latitudes are considered to be in the exclusive range, -90.0° to +90.0°, positive direction northerly, the poles being excluded.
2. LATHI is always the most northerly latitude, i.e., LATHI > LATLO.
3. Longitudes are considered to be in the inclusive range, 0.0° to +360.0°, positive direction easterly, except* that 360.0° is added in cases where the meridian runs through the trapezoid in order to guarantee that the corner longitudes from a monotonely increasing sequence as one moves eastward.

---

*This is an aggravation that should have been left for the program to worry about.

4. Triangles are permitted, i.e., either LNGHIE = LNGHIW or LNGLOE = LNGLOW.

5. Strips around the world are permitted, i.e., LNGHIW = LNGLOW = 0.0°, LNGHIE = LNGHIW = 360.0°.

A <u>single region</u> is the region enclosed by any set of trapezoidal regions, associated with which set there is defined a <u>circumscribing</u> and an <u>inscribing</u> trapezoid. The circumscribing (inscribing) trapezoid is the smallest (largest) trapezoidal region which encloses (is enclosed by) the single region. The single region need not be simply connected although in all cases of the present section it is. A single region is coded onto 8 or more punched cards as follows.

Card No. 1

cols. 1-24	contain 24 alphanumeric characters giving author who defined the region
cols. 25-37	contain the 13 characters "REGION NUMBER"
col. 38	blank
cols. 39-41	contain a 3-digit region number in FORMAT(I3)
col. 42	blank
cols. 43-80	contain 36 alphanumeric characters giving the geographical name of the region

Card No. 2 contains the 26 characters "CIRCUMSCRIBED BY TRAPEZOID" in cols. 4-29

Card No. 3 contains alphanumeric defined by

```
      FORMAT(7X, 5HLATHI, 5X, 5HLATLO, 5X, 6HLNGHIW,
     1       4X, 6HLNGHIE, 4X, 6HLNGLOW, 4X, 6HLNGLOE)
```

Card No. 4 contains LATHI, LATLO, LNGHIW, LNGHIE, LNGLOW, LNGLOE, in FORMAT(2X, 6F10.1), defining the circumscribing trapezoid of the region

Card No. 5 contains the 22 characters "INSCRIBED BY TRAPEZOID" in cols 4-29

Card No. 6 contains LATHI, LATLO, LNGHIW, LNGHIE, LNGLOW, LNGLOE, in FORMAT(2X, 6F10.1), defining the inscribing trapezoid of the region

Card No. 7

cols. 1-5	contain NTSR in FORMAT(I5), where NTSR = no. of trapezoidal subregions
col. 6	blank
cols. 7-32	contain the 26 characters "TRAPEZOIDAL SUBREGIONS ARE"

Cards No. 8, 9, ..., 8+NTSR-1 contain

IXSR, LATHI, LATLO, LNGHIW, LNGHIE, LNGLOW, LNGLOE, in FORMAT(I5, F7.1, 5F10.1), defining the successive trapezoidal subregions, where IXSR is the subregion index running from 1 to NTSR.

The Gutenberg and Richter Division

The first division we have coded is from "Seismicity of the Earth" by B. Gutenberg and C. R. Richter (Princeton University Press, 1954).

The principal criterion used in forming the divisions was primarily geographical, but the intensity of seismic activity and the geological structures of the regions were also considered. In their original work, Gutenberg and Richter delineated the world into 53 regions, but they did not assign two of them region numbers. Moreover, in the original work, two of the regions, Region 46 (Manchuria) and Region 51 (Rumania), are not only limited to deep and intermediate shocks, but are also ill-delineated (Region 46) and very small in size (Region 51). For generalization, we have omitted these two regions, assigning Region 46 to the region of Tasmania Island and Coral Sea

(which is separated from the portion of the original Region 33 - Indian Ocean - east of Australia), and Region 51 to one of the two unassigned regions of the original work, South China Sea and Vicinity. The other unassigned region of the original work is the portion of the Pacific Ocean south of the Ryukyu Islands, which we have designated to be Region 52. Thus this division we used is actually a slight modification of the original Gutenberg and Richter's.

Furthermore, the delineations of four continental regions (Region 34 - North America, Region 35 - Brazilian Shield, Region 36 - Western Europe, and Region 38 - Australia) in the original division are not clear-cut. There are merely region numbers assigned but no thick-lined boundaries. Presumably the regional boundary follows the natural boundary of the continents. But, this is inconvenient for our purpose of subdividing them into trapezoidal groups. Thus, some modification is also made in this case. For instance, we drew straight lines as close as possible along those continental boundaries and hence made those regions into rather simple geometrical shapes.

The regional names we have assigned for this division primarily follow Gutenberg and Richter's original work, but the geographical names assigned by them do not always correspond to a single earthquake region and may extend to several regions. Therefore, we have made some adjustments so that the names of the earthquake regions correspond more with their geographical trends. Furthermore, Gutenberg and Richter did not assign names to some regions, and to those we have given names.

Figure 1. shows the Gutenberg and Richter division with the above modifications, and the following pages list the corresponding card decks.

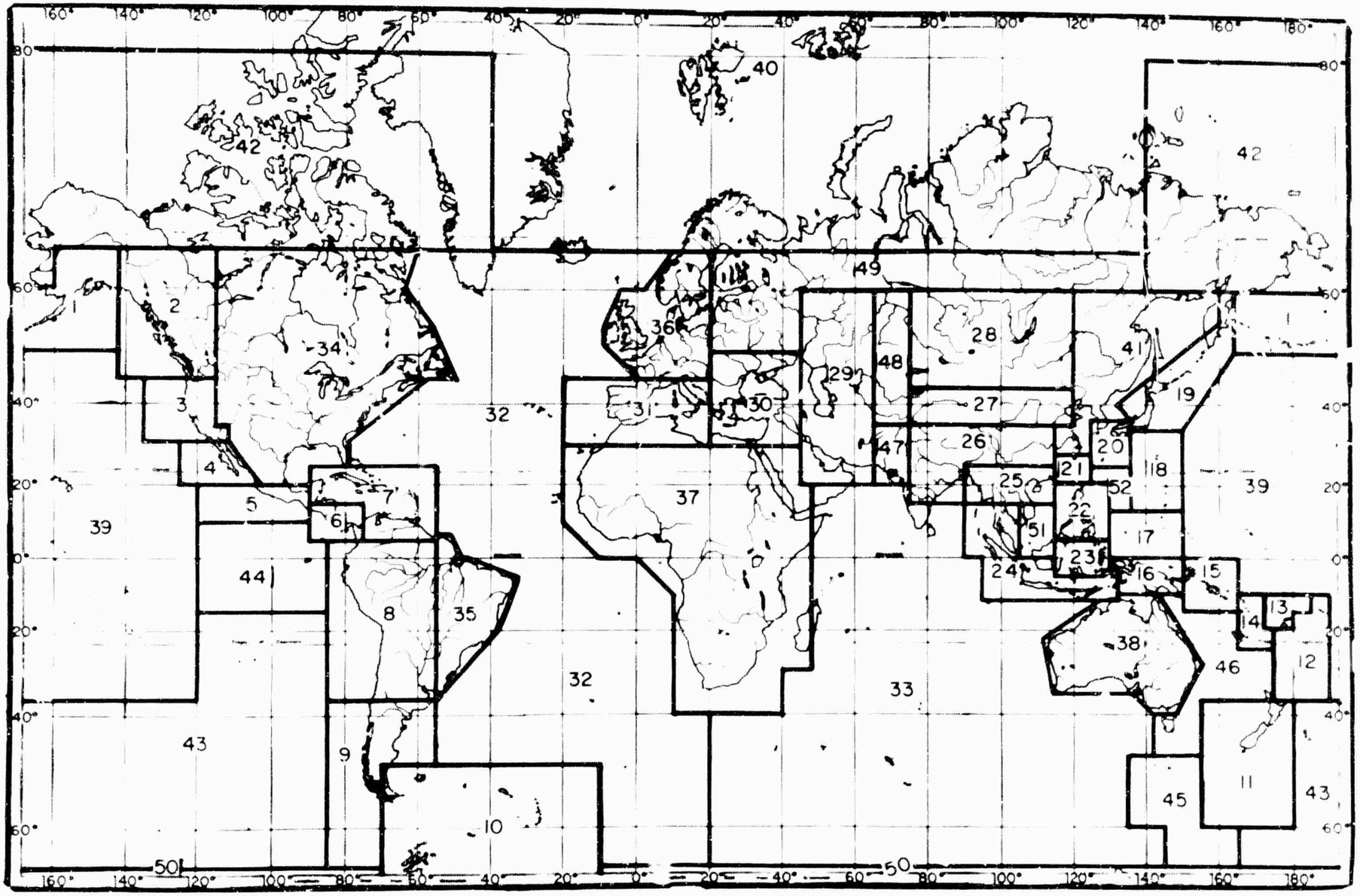

Figure 1. Gutenberg and Richter's Division of Earthquake Regions

GUTENBERG AND RICHTER REGION NUMBER 001 ALEUTIAN ARC

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
65.0	50.0	164.0	218.0	164.0	218.0

INSCRIBED BY TRAPEZOID

60.0	50.0	164.0	218.0	164.0	218.0

2 TRAPEZOIDAL SUBREGIONS ARE

1	65.0	60.0	200.0	218.0	200.0	218.0
2	60.0	50.0	164.0	218.0	164.0	218.0

GUTENBERG AND RICHTER REGION NUMBER 002 ALASKA TO BRITISH COLUMBIA

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
65.0	45.0	218.0	245.0	218.0	245.0

INSCRIBED BY TRAPEZOID

65.0	45.0	218.0	245.0	218.0	245.0

1 TRAPEZOIDAL SUBREGIONS ARE

1	65.0	45.0	218.0	245.0	218.0	245.0

GUTENBERG AND RICHTER REGION NUMBER 003 CALIFORNIA

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
45.0	31.0	225.0	248.0	225.0	248.0

INSCRIBED BY TRAPEZOID

45.0	31.0	225.0	245.0	225.0	245.0

2 TRAPEZOIDAL SUBREGIONS ARE

1	45.0	34.5	225.0	245.0	225.0	245.0
2	34.5	31.0	225.0	248.0	225.0	248.0

GUTENBERG AND RICHTER REGION NUMBER 004 BAJA CALIFORNIA

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
31.0	20.0	235.0	248.0	235.0	257.0

INSCRIBED BY TRAPEZOID

31.0	20.0	235.0	248.0	235.0	257.0

1 TRAPEZOIDAL SUBREGIONS ARE

1	31.0	20.0	235.0	248.0	235.0	257.0

GUTENBERG AND RICHTER REGION NUMBER 005 SOUTHERN MEXICO

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
20.0	10.0	240.0	270.0	240.0	270.0

INSCRIBED BY TRAPEZOID

20.0	10.0	240.0	270.0	240.0	270.0

1 TRAPEZOIDAL SUBREGIONS ARE

1	20.0	10.0	240.0	270.0	240.0	270.0

GUTENBERG AND RICHTER REGION NUMBER 006 CENTRAL AMERICA

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
15.0	05.0	270.0	285.0	270.0	285.0

INSCRIBED BY TRAPEZOID

15.0	05.0	270.0	285.0	270.0	285.0

1 TRAPEZOIDAL SUBREGIONS ARE

1	15.0	05.0	270.0	285.0	270.0	285.0

GUTENBERG AND RICHTER REGION NUMBER 007 THE CARIBBEAN LOOP

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
25.0	05.0	270.0	305.0	270.0	305.0

INSCRIBED BY TRAPEZOID

25.0	05.0	270.0	305.0	300.0	305.0

2 TRAPEZOIDAL SUBREGIONS ARE

1	25.0	15.0	270.0	305.0	270.0	305.0
2	15.0	05.0	285.0	305.0	285.0	305.0

GUTENBERG AND RICHTER REGION NUMBER 008 ANDEAN ZONE

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
05.0	-37.0	275.0	305.0	275.0	305.0

INSCRIBED BY TRAPEZOID

05.0	-37.0	275.0	305.0	275.0	305.0

1 TRAPEZOIDAL SUBREGIONS ARE

1	05.0	-37.0	275.0	305.0	275.0	305.0

GUTENBERG AND RICHTER REGION NUMBER 009 SOUTHERN SOUTH AMERICA

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
-37.0	-65.0	275.0	305.0	275.0	305.0

INSCRIBED BY TRAPEZOID

-37.0	-65.0	275.0	290.0	275.0	290.0

2 TRAPEZOIDAL SUBREGIONS ARE

1	-37.0	-50.0	275.0	305.0	275.0	305.0
2	-50.0	-65.0	275.0	290.0	275.0	290.0

GUTENBERG AND RICHTER REGION NUMBER 010 SOUTHERN ANTILLES

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
-50.0	-70.0	290.0	350.0	290.0	350.0

INSCRIBED BY TRAPEZOID

-50.0	-70.0	290.0	350.0	290.0	350.0

1 TRAPEZOIDAL SUBREGIONS ARE

1	-50.0	-70.0	290.0	350.0	290.0	350.0

GUTENBERG AND RICHTER REGION NUMBER 011 NEW ZEALAND

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
-37.0	-60.0	155.0	180.0	155.0	180.0

INSCRIBED BY TRAPEZOID

-37.0	-60.0	155.0	180.0	155.0	180.0

1 TRAPEZOIDAL SUBREGIONS ARE

1	-37.0	-60.0	155.0	180.0	155.0	180.0

GUTENBERG AND RICHTER REGION NUMBER 012 THE TONGA SALIENT

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
-10.0	-37.0	175.0	190.0	175.0	190.0

INSCRIBED BY TRAPEZOID

-19.5	-37.0	175.0	190.0	175.0	190.0

3 TRAPEZOIDAL SUBREGIONS ARE

1	-10.0	-15.0	185.0	190.0	185.0	190.0
2	-15.0	-19.5	180.0	190.0	180.0	190.0
3	-19.5	-37.0	175.0	190.0	175.0	190.0

GUTENBERG AND RICHTER REGION NUMBER 013 FIJI ISLANDS AND VICINITY

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
-10.0	-19.5	172.0	185.0	172.0	185.0

INSCRIBED BY TRAPEZOID

-10.0	-19.5	172.0	180.0	172.0	180.0

2 TRAPEZOIDAL SUBREGIONS ARE

1	-10.0	-15.0	172.0	185.0	172.0	185.0
2	-15.0	-19.5	172.0	180.0	172.0	180.0

GUTENBERG AND RICHTER REGION NUMBER 014 NEW HEBRIDES

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
-10.0	-25.0	165.0	175.0	165.0	175.0

INSCRIBED BY TRAPEZOID

-10.0	-25.0	165.0	172.0	165.0	172.0

2 TRAPEZOIDAL SUBREGIONS ARE

1	-10.0	-19.5	165.0	172.0	165.0	172.0
2	-19.5	-25.0	165.0	175.0	165.0	175.0

GUTENBERG AND RICHTER REGION NUMBER 015 SOLOMON ISLANDS

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
0.0	-15.0	150.0	165.0	150.0	165.0

INSCRIBED BY TRAPEZOID

0.0	-15.0	150.0	165.0	150.0	165.0

1 TRAPEZOIDAL SUBREGIONS ARE

1	0.0	-15.0	150.0	165.0	150.0	165.0

GUTENBERG AND RICHTER REGION NUMBER 016 NEW GUINEA

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
0.0	-10.0	130.0	150.0	130.0	150.0

INSCRIBED BY TRAPEZOID

0.0	-10.0	132.0	150.0	132.0	150.0

2 TRAPEZOIDAL SUBREGIONS ARE

1	0.0	-03.0	130.0	150.0	130.0	150.0
2	-03.0	-10.0	132.0	150.0	132.0	150.0

GUTENBERG AND RICHTER REGION NUMBER 017 CAROLINE ISLANDS

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
13.5	0.0	130.0	150.0	130.0	150.0

INSCRIBED BY TRAPEZOID

13.5	0.0	130.0	150.0	130.0	150.0

1 TRAPEZOIDAL SUBREGIONS ARE

1	13.5	0.0	130.0	150.0	130.0	150.0

GUTENBERG AND RICHTER REGION NUMBER 018 OGASAWA AND MARIANAS ISLANDS

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
34.0	13.5	136.0	150.0	136.0	150.0

INSCRIBED BY TRAPEZOID

34.0	13.5	136.0	150.0	136.0	150.0

1 TRAPEZOIDAL SUBREGIONS ARE

1	34.0	13.5	136.0	150.0	136.0	150.0

GUTENBERG AND RICHTER REGION NUMBER 019 HONSHU,HOKKAIDO,KURIL ISLANDS

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
60.0	34.0	160.0	164.0	123.5	164.0

INSCRIBED BY TRAPEZOID

55.0	34.0	160.0	164.0	136.0	150.0

5 TRAPEZOIDAL SUBREGIONS ARE

1	60.0	55.0	160.0	164.0	160.0	164.0
2	55.0	50.0	160.0	164.0	150.5	164.0
3	50.0	40.0	150.5	164.0	132.0	155.3
4	40.0	36.5	132.0	155.3	136.0	152.2
5	36.0	34.0	136.0	152.2	136.0	150.0

GUTENBERG AND RICHTER REGION NUMBER 020 SHIKOKU,KYUSHU,RYUKYU ISLANDS

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
36.5	25.0	125.0	136.0	125.0	136.0

INSCRIBED BY TRAPEZOID

36.5	25.0	125.0	136.0	125.0	136.0

1 TRAPEZOIDAL SUBREGIONS ARE

1	36.5	.0	125.0	136.0	125.0	136.0

GUTENBERG AND RICHTER REGION NUMBER 021 TAIWAN AND VICINITY

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
28.0	21.0	115.0	125.0	115.0	125.0

INSCRIBED BY TRAPEZOID

28.0	21.0	115.0	125.0	115.0	125.0

1 TRAPEZOIDAL SUBREGIONS ARE

1	28.0	21.0	115.0	125.0	115.0	125.0

GUTENBERG AND RICHTER REGION NUMBER 022 PHILIPPINES

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
21.0	05.0	115.0	130.0	115.0	130.0

INSCRIBED BY TRAPEZOID

21.0	05.0	115.0	130.0	115.0	130.0

1 TRAPEZOIDAL SUBREGIONS ARE

1	21.0	05.0	115.0	130.0	115.0	130.0

GUTENBERG AND RICHTER REGION NUMBER 023 CELEBES AND MOLUCCAS

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
05.0	-05.0	115.0	132.0	115.0	132.0

INSCRIBED BY TRAPEZOID

05.0	-05.0	115.0	130.0	115.0	130.0

2 TRAPEZOIDAL SUBREGIONS ARE

1	05.0	-03.0	115.0	130.0	115.0	130.0
2	-03.0	-05.0	115.0	132.0	115.0	132.0

GUTENBERG AND RICHTER REGION NUMBER 024 SUNDA ARC AND BANDA SEA

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
15.0	-12.0	90.0	132.0	90.0	132.0

INSCRIBED BY TRAPEZOID

0.0	-12.0	95.0	115.0	95.0	115.0

3 TRAPEZOIDAL SUBREGIONS ARE

1	15.0	0.0	90.0	105.0	90.0	105.0
2	0.0	-05.0	95.0	115.0	95.0	115.0
3	-05.0	-12.0	95.0	132.0	95.0	132.0

GUTENBERG AND RICHTER REGION NUMBER 025 BURMA ARC

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
25.0	15.0	90.0	115.0	90.0	115.0

INSCRIBED BY TRAPEZOID

25.0	15.0	90.0	115.0	90.0	115.0

1 TRAPEZOIDAL SUBREGIONS ARE

1	25.0	15.0	90.0	115.0	90.0	115.0

GUTENBERG AND RICHTER REGION NUMBER 026 HIMALAYAN ARC

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
35.0	15.0	75.0	115.0	75.0	115.0

INSCRIBED BY TRAPEZOID

35.0	25.0	75.0	115.0	75.0	115.0

2 TRAPEZOIDAL SUBREGIONS ARE

1	35.0	25.0	75.0	115.0	75.0	115.0
2	25.0	15.0	75.0	90.0	75.0	90.0

GUTENBERG AND RICHTER REGION NUMBER 027 NORTH CHINA AND CENTRAL ASIA

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
43.0	35.0	75.0	120.0	75.0	120.0

INSCRIBED BY TRAPEZOID

43.0	35.0	75.0	120.0	75.0	120.0

1 TRAPEZOIDAL SUBREGIONS ARE

1	43.0	35.0	75.0	120.0	75.0	120.0

GUTENBERG AND RICHTER REGION NUMBER 028 THE PAMIR-BAIKAL ACTIVE ZONE

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
60.0	43.0	75.0	120.0	75.0	120.0

INSCRIBED BY TRAPEZOID

60.0	43.0	75.0	120.0	75.0	120.0

1 TRAPEZOIDAL SUBREGIONS ARE

1	60.0	43.0	75.0	120.0	75.0	120.0

GUTENBERG AND RICHTER REGION NUMBER 029 IRAN AND CAUCASUS

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
60.0	20.0	45.0	65.0	45.0	65.0

INSCRIBED BY TRAPEZOID

60.0	20.0	45.0	65.0	45.0	65.0

1 TRAPEZOIDAL SUBREGIONS ARE

1	60.0	20.0	45.0	65.0	45.0	65.0

GUTENBERG AND RICHTER REGION NUMBER 030 ASIA MINOR, LEVANT, BALKANS

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
50.0	30.0	20.0	45.0	20.0	45.0

INSCRIBED BY TRAPEZOID

50.0	30.0	20.0	45.0	20.0	45.0

1 TRAPEZOIDAL SUBREGIONS ARE

1	50.0	30.0	20.0	45.0	20.0	45.0

GUTENBERG AND RICHTER REGION NUMBER 031 WEST MEDITERRANEAN TO AZORES

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
45.0	30.0	340.0	380.0	340.0	380.0

INSCRIBED BY TRAPEZOID

45.0	30.0	340.0	380.0	340.0	380.0

1 TRAPEZOIDAL SUBREGIONS ARE

1	45.0	30.0	340.0	380.0	340.0	380.0

GUTENBERG AND RICHTER REGION NUMBER 032 ATLANTIC OCEAN

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
65.0	-65.0	286.0	380.0	286.0	380.0

INSCRIBED BY TRAPEZOID

65.0	-41.5	327.5	340.0	327.5	340.0

16 TRAPEZOIDAL SUBREGIONS ARE

1	65.0	60.0	299.0	370.0	296.0	362.0
2	60.0	54.5	296.0	355.0	304.0	350.5

CONTINUED NEXT PAGE

3	54.5	51.5	304.0	350.5	306.0	350.5
4	51.5	45.0	306.0	350.5	310.0	360.0
5	45.0	31.0	303.0	340.0	281.0	340.0
6	31.0	25.0	281.0	340.0	281.0	340.0
7	25.0	10.0	305.0	340.0	305.0	340.0
8	10.0	06.5	305.0	340.0	305.0	343.5
9	06.5	0.0	309.0	343.5	312.0	350.0
10	0.0	-05.0	313.5	360.0	327.5	365.0
11	-05.0	-10.0	327.5	365.0	325.7	370.0
12	-10.0	-20.0	325.7	370.0	322.0	370.0
13	-20.0	-37.0	322.0	370.0	305.0	370.0
14	-37.0	-40.0	305.0	370.0	305.0	370.0
15	-40.0	-50.0	305.0	380.0	305.0	380.0
16	-50.0	-65.0	350.0	380.0	350.0	380.0

GUTENBERG AND RICHTER REGION NUMBER 033 INDIA OCEAN

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
20.0	-65.0	48.0	142.0	2.0	145.0

INSCRIBED BY TRAPEZOID

15.0	-65.0	48.0	90.0	48.0	90.0

10 TRAPEZOIDAL SUBREGIONS ARE

1	20.0	15.0	48.0	75.0	48.0	75.0
2	15.0	0.0	48.0	90.0	48.0	90.0
3	0.0	-12.0	48.0	95.0	48.0	95.0
4	-12.0	-22.5	48.0	127.5	48.0	111.5
5	-22.5	-30.0	48.0	111.5	48.0	113.0
6	-30.0	-36.0	40.0	113.0	40.0	114.5
7	-36.0	-40.0	40.0	136.0	40.0	142.0
8	-40.0	-48.0	20.0	142.0	20.0	142.0
9	-48.0	-60.0	20.0	135.0	20.0	135.0
10	-60.0	-65.0	20.0	145.0	20.0	145.0

GUTENBERG AND RICHTER REGION NUMBER 034 NORTH AMERICA

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
65.0	20.0	245.0	299.0	245.0	320.0

INSCRIBED BY TRAPEZOID

65.0	25.0	245.0	299.0	253.0	274.0

7 TRAPEZOIDAL SUBREGIONS ARE

1	65.0	60.0	245.0	299.0	245.0	296.0
2	60.0	54.5	245.0	296.0	245.0	304.0
3	54.5	45.0	245.0	304.0	245.0	310.0
4	45.0	34.5	245.0	303.0	245.0	286.5
5	34.5	31.0	248.0	286.5	248.0	281.0
6	31.0	25.0	248.0	281.0	253.0	281.0
7	25.0	20.0	253.0	270.0	257.0	270.0

GUTENBERG AND RICHTER REGION NUMBER 035 BRAZILIAN SHIELD

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
06.5	-37.0	305.0	331.5	305.0	315.0

INSCRIBED BY TRAPEZOID

-05.0	-37.0	305.0	327.5	305.0	305.0

4 TRAPEZOIDAL SUBREGIONS ARE

1	06.5	0.0	305.0	309.0	305.0	312.0
2	0.0	-05.0	305.0	313.5	305.0	327.5
3	-05.0	-20.0	305.0	327.5	305.0	322.0
4	-20.0	-37.0	305.0	322.0	305.0	305.0

GUTENBERG AND RICHTER REGION NUMBER 036 WESTERN EUROPE

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
65.0	45.0	350.5	380.0	350.5	380.0

INSCRIBED BY TRAPEZOID

65.0	45.0	370.0	380.0	360.0	380.0

4 TRAPEZOIDAL SUBREGIONS ARE

1	65.0	60.0	370.0	380.0	362.0	380.0
2	60.0	54.5	355.0	380.0	350.5	380.0
3	54.5	51.5	350.5	380.0	350.5	380.0
4	51.5	45.0	350.5	380.0	360.0	380.0

GUTENBERG AND RICHTER REGION NUMBER 037 AFRICA

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
30.0	-40.0	327.5	408.0	370.0	408.0

INSCRIBED BY TRAPEZOID

30.0	-40.0	340.0	405.0	394.0	399.0

6 TRAPEZOIDAL SUBREGIONS ARE

1	30.0	20.0	340.0	405.0	340.0	405.0
2	20.0	10.0	340.0	408.0	340.0	408.0
3	10.0	0.0	340.0	408.0	350.0	408.0
4	0.0	-10.0	360.0	408.0	370.0	408.0
5	-10.0	-30.0	370.0	408.0	370.0	408.0
6	-30.0	-40.0	370.0	400.0	370.0	400.0

GUTENBERG AND RICHTER REGION NUMBER 038 AUSTRALIA

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
-10.0	-40.0	109.0	143.0	115.0	164.0

INSCRIBED BY TRAPEZOID

-12.0	-36.0	127.5	144.5	114.5	151.0

5 TRAPEZOIDAL SUBREGIONS ARE

1	-10.0	-12.0	132.0	143.0	132.0	144.5
2	-12.0	-22.5	127.5	144.5	111.5	151.5
3	-22.5	-28.5	111.5	151.5	112.8	155.5
4	-28.5	-36.0	112.8	155.5	114.5	151.0
5	-36.0	-40.0	136.0	151.0	142.0	148.5

GUTENBERG AND RICHTER REGION NUMBER 039 PACIFIC BASIN

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
50.0	-37.0	150.0	240.0	150.0	240.0

INSCRIBED BY TRAPEZOID

50.0	-37.0	164.0	216.0	202.0	240.0

7 TRAPEZOIDAL SUBREGIONS ARE

1	50.0	45.0	164.0	218.0	159.7	218.0
2	45.0	34.0	159.7	225.0	150.0	225.0
3	34.0	31.0	150.0	225.0	150.0	225.0
4	31.0	20.0	150.0	235.0	150.0	235.0
5	20.0	0.0	150.0	240.0	150.0	240.0
6	0.0	-10.0	165.0	240.0	165.0	240.0
7	-10.0	-37.0	190.0	240.0	190.0	240.0

GUTENBERG AND RICHTER REGION NUMBER 040 ARCTIC BELT

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
89.9	65.0	320.0	680.0	320.0	680.0

INSCRIBED BY TRAPEZOID

89.9	65.0	320.0	460.0	320.0	460.0

2 TRAPEZOIDAL SUBREGIONS ARE

1	89.9	80.0	320.0	680.0	320.0	680.0
2	80.0	65.0	320.0	460.0	320.0	460.0

GUTENBERG AND RICHTER REGION NUMBER 041 EASTERN SIBERIA AND MANCHURIA

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
60.0	20.0	120.0	168.0	114.0	127.0

INSCRIBED BY TRAPEZOID

60.0	36.5	120.0	160.0	120.0	127.0

5 TRAPEZOIDAL SUBREGIONS ARE

1	60.0	55.0	120.0	160.0	120.0	160.0
2	55.0	40.0	120.0	160.0	120.0	132.0
3	40.0	36.5	120.0	132.0	120.0	136.0
4	36.5	35.0	120.0	125.0	120.0	125.0
5	35.0	28.0	115.0	125.0	115.0	125.0

GUTENBERG AND RICHTER REGION NUMBER 042 N-E SIBERIA,N.CANADA, VICINITY

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
80.0	60.0	140.0	320.0	140.0	320.0

INSCRIBED BY TRAPEZOID

80.0	65.0	140.0	320.0	140.0	320.0

2 TRAPEZOIDAL SUBREGIONS ARE

1	80.0	65.0	140.0	320.0	140.0	320.0
2	65.0	60.0	140.0	200.0	140.0	200.0

GUTENBERG AND RICHTER REGION NUMBER 043 SOUTHEASTERN PACIFIC OCEAN

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
-15.0	-65.0	165.0	275.0	165.0	275.0

INSCRIBED BY TRAPEZOID

-37.0	-65.0	180.0	275.0	180.0	275.0

3 TRAPEZOIDAL SUBREGIONS ARE

1	-15.0	-37.0	240.0	275.0	240.0	275.0
2	-37.0	-60.0	180.0	275.0	180.0	275.0
3	-60.0	-65.0	165.0	180.0	165.0	180.0

GUTENBERG AND RICHTER REGION NUMBER 044 GALAPAGOS ISLANDS AND VICINITY

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
10.0	-15.0	240.0	275.0	240.0	275.0

INSCRIBED BY TRAPEZOID

10.0	-15.0	240.0	270.0	240.0	270.0

2 TRAPEZOIDAL SUBREGIONS ARE

1	10.0	05.0	240.0	270.0	240.0	270.0
2	05.0	-15.0	240.0	275.0	240.0	275.0

GUTENBERG AND RICHTER REGION NUMBER 045 INDIAN-ANTARCTIC SWELL

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
-48.0	-65.0	135.0	155.0	135.0	170.5

INSCRIBED BY TRAPEZOID

-48.0	-65.0	135.0	155.0	150.5	155.0

2 TRAPEZOIDAL SUBREGIONS ARE

1	-48.0	-60.0	135.0	155.0	135.0	155.0
2	-60.0	-65.0	145.0	165.0	145.0	165.0

GUTENBERG AND RICHTER REGION NUMBER 046 TASMANIA ISLAND AND CORAL SEA

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
-10.0	-48.0	142.0	175.0	142.0	175.0

INSCRIBED BY TRAPEZOID

-15.0	-37.0	146.3	165.0	161.5	165.0

6 TRAPEZOIDAL SUBREGIONS ARE

1	-10.0	-15.0	143.0	150.0	146.3	150.0
2	-15.0	-25.0	146.3	165.0	153.1	165.0
3	-25.0	-28.5	153.1	175.0	155.5	175.0
4	-28.5	-37.0	155.5	175.0	150.4	175.0
5	-37.0	-40.0	150.4	155.0	148.5	155.0
6	-40.0	-48.0	142.0	155.0	142.0	155.0

GUTENBERG AND RICHTER REGION NUMBER 047 BALUCHISTAN

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
35.0	20.0	65.0	75.0	65.0	75.0

INSCRIBED BY TRAPEZOID

35.0	20.0	65.0	75.0	65.0	75.0

1 TRAPEZOIDAL SUBREGIONS ARE

1	35.0	20.0	65.0	75.0	65.0	75.0

GUTENBERG AND RICHTER REGION NUMBER 048 CENTRAL ASIA

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
60.0	35.0	65.0	75.0	65.0	75.0

INSCRIBED BY TRAPEZOID

60.0	35.0	65.0	75.0	65.0	75.0

1 TRAPEZOIDAL SUBREGIONS ARE

1	60.0	35.0	65.0	75.0	65.0	75.0

GUTENBERG AND RICHTER REGION NUMBER 049 EURASIAN STABLE MASS

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
65.0	50.0	20.0	140.0	20.0	140.0

INSCRIBED BY TRAPEZOID

65.0	60.0	20.0	140.0	20.0	140.0

2 TRAPEZOIDAL SUBREGIONS ARE

1	65.0	60.0	20.0	140.0	20.0	140.0
2	60.0	50.0	20.0	45.0	20.0	45.0

GUTENBERG AND RICHTER REGION NUMBER 050 ANTARCTICA

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
-65.0	-89.9	0.0	360.0	0.0	360.0

INSCRIBED BY TRAPEZOID

-70.0	-89.9	0.0	360.0	0.0	360.0

2 TRAPEZOIDAL SUBREGIONS ARE

1	-65.0	-70.0	350.0	650.0	350.0	650.0
2	-70.0	-89.9	0.0	360.0	0.0	360.0

GUTENBERG AND RICHTER REGION NUMBER 051 SOUTH CHINA SEA AND VICINITY

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
15.0	0.0	105.0	115.0	105.0	115.0

INSCRIBED BY TRAPEZOID

15.0	0.0	105.0	115.0	105.0	115.0

1 TRAPEZOIDAL SUBREGIONS ARE

1	15.0	0.0	105.0	115.0	105.0	115.0

GUTENBERG AND RICHTER REGION NUMBER 052 OCEAN SOUTH OF RYUKYU ISLANDS

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
25.0	13.5	125.0	136.0	125.0	136.0

INSCRIBED BY TRAPEZOID

25.0	13.5	130.0	136.0	130.0	136.0

2 TRAPEZOIDAL SUBREGIONS ARE

1	25.0	21.0	125.0	136.0	125.0	136.0
2	21.0	13.5	130.0	136.0	130.0	136.0

The T. I. 1960 Division

The second seismic division, due to R. L. Fisher, R. G. Baker, and R. R. Guidroz, is given in

> "Worldwide Collection and Evaluation of Earthquake Data, Final Report on Evaluation of 1960 Seismicity", Special Report No. 3, AFCRL 64-520, June, 1964, Terrestrial Sciences Laboratory Project 8652, Air Force Cambridge Research Laboratories, Bedford, Massachusetts,

which was prepared by Texas Instruments Incorporated as part of a VELA UNIFORM project. We call it the "T. I. 1960" divison.

The intended purpose of this division was for studies of underground nuclear test detection in various countries or camps of countries. Thus its delineation is primarily political and partly supplemented by geographical consideration at regions of less political importance. There are 22 regions in this division; each region is assigned a region number. In addition, we have also assigned a regional name to each region; for example, North America is Region 1; Central America is Region 2; etc.

The T. I. 1960 division is shown in Figure 2. and the 22 card decks are listed on succeeding pages.

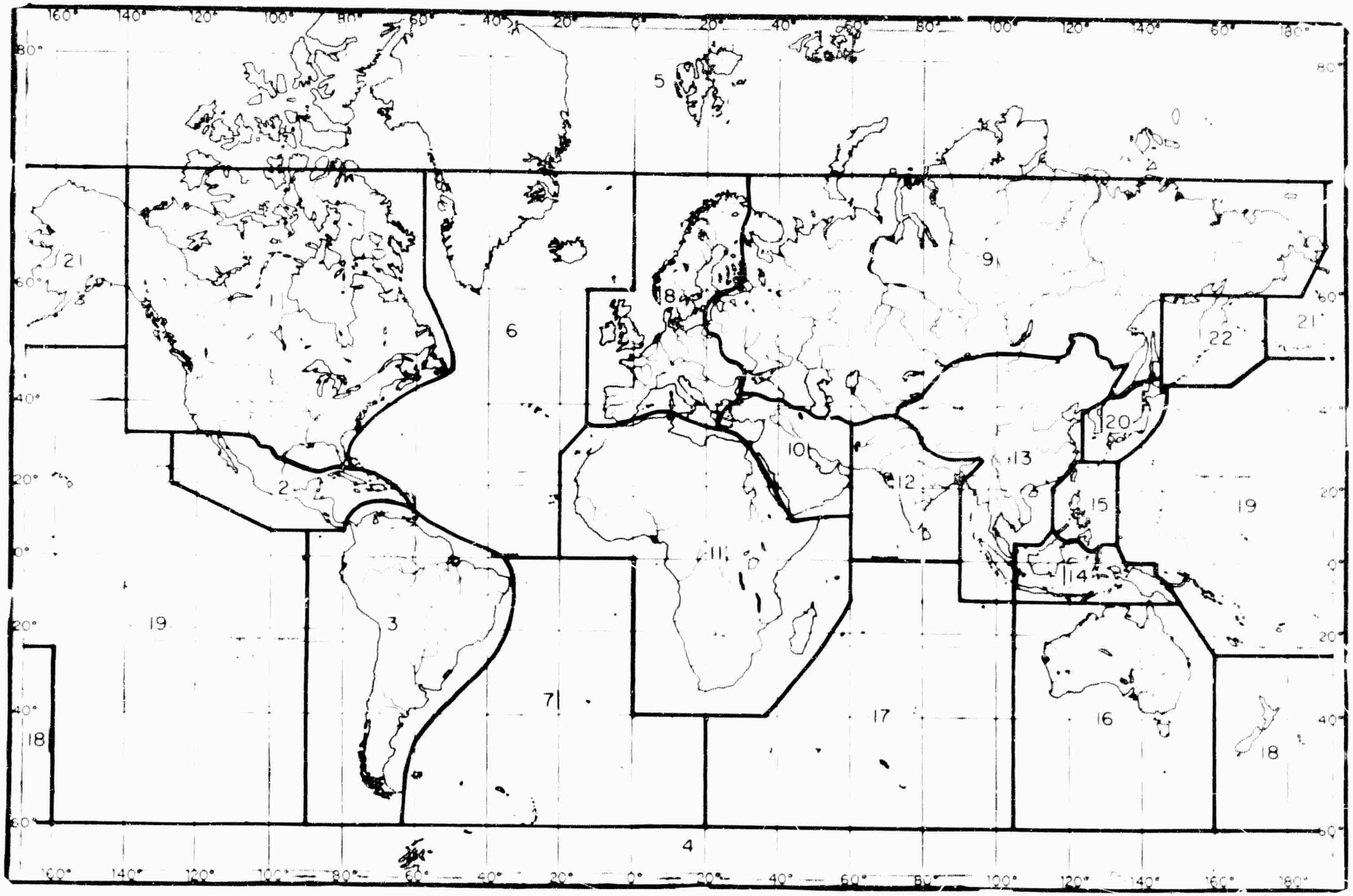

Figure 2. The T. I. 1960 Division of Earthquake Regions

THE T.I. 1960 DIVISION

T.I. 1960 REGION NUMBER 001 NORTH AMERICA

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
70.0	24.5	220.0	311.5	220.0	311.5

INSCRIBED BY TRAPEZOID

70.0	32.5	220.0	302.0	220.0	283.5

7 TRAPEZOIDAL SUBREGIONS ARE

1	70.0	60.0	220.0	302.0	220.0	302.0
2	60.0	46.5	220.0	302.0	220.0	311.5
3	46.5	39.0	220.0	311.5	220.0	291.0
4	39.0	32.5	220.0	291.0	220.0	283.5
5	32.5	29.5	254.0	283.5	257.0	282.3
6	29.5	26.0	259.5	282.3	262.0	281.0
7	26.0	24.5	263.5	281.0	271.0	282.5

T.I. 1960 REGION NUMBER 002 CENTRAL AMERICA

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
32.5	07.0	233.0	283.5	233.0	305.0

INSCRIBED BY TRAPEZOID

32.5	07.0	233.0	254.0	260.0	280.0

6 TRAPEZOIDAL SUBREGIONS ARE

1	32.5	29.5	233.0	254.0	233.0	257.0
2	29.5	26.0	233.0	259.5	233.0	262.0
3	26.0	24.5	233.0	263.5	233.0	271.0
4	24.5	20.0	233.0	282.5	233.0	294.0
5	20.0	15.0	233.0	294.0	244.5	298.0
6	15.0	07.0	244.5	235.0	260.0	280.0

T.I. 1960 REGION NUMBER 003 SOUTH AMERICA

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
15.0	-60.0	270.0	328.0	270.0	328.0

INSCRIBED BY TRAPEZOID

07.0	-60.0	270.0	308.0	270.0	296.0

7 TRAPEZOIDAL SUBREGIONS ARE

1	15.0	07.0	285.0	298.0	280.0	308.0
2	07.0	0.0	270.0	308.0	270.0	324.0
3	0.0	-05.5	270.0	324.0	270.0	328.0
4	-05.5	-20.0	270.0	328.0	270.0	328.0
5	-20.0	-40.0	270.0	328.0	270.0	307.0
6	-40.0	-50.0	270.0	307.0	270.0	298.0
7	-50.0	-60.0	270.0	298.0	270.0	296.0

T.I. 1960 REGION NUMBER 004 ANTARCTICA

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
-60.0	-89.9	0.0	360.0	0.0	360.0

INSCRIBED BY TRAPEZOID

-60.0	-89.9	0.0	360.0	0.0	360.0

1 TRAPEZOIDAL SUBREGIONS ARE

1	-60.0	-89.9	0.0	360.0	0.0	360.0

T.I. 1960 REGION NUMBER 005 ARCTIC OCEAN

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
89.9	70.0	0.0	360.0	0.0	360.0

INSCRIBED BY TRAPEZOID

89.9	70.0	0.0	360.0	0.0	360.0

1 TRAPEZOIDAL SUBREGIONS ARE

1	89.9	70.0	0.0	360.0	0.0	360.0

T.I. 1960 REGION NUMBER 006 NORTHERN ATLANTIC OCEAN

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
70.0	0.0	302.0	360.0	274.0	360.0

INSCRIBED BY TRAPEZOID

70.0	02.0	302.0	340.0	320.0	340.0

12 TRAPEZOIDAL SUBREGIONS ARE

1	70.0	60.0	302.0	360.0	302.0	360.0
2	60.0	46.5	302.0	347.0	311.5	347.0
3	46.5	39.0	311.5	347.0	291.0	347.0
4	39.0	35.0	291.0	347.0	286.5	347.0
5	35.0	32.5	286.5	347.0	283.5	344.3
6	32.5	28.0	283.5	344.3	281.7	340.0
7	28.0	26.0	281.7	340.0	281.0	340.0
8	26.0	24.5	281.0	340.0	282.5	340.0
9	24.5	20.0	282.5	340.0	294.0	340.0
10	20.0	15.0	294.0	340.0	298.0	340.0
11	15.0	07.0	298.0	340.0	308.0	340.0
12	07.0	00.0	308.0	340.0	324.0	340.0

T.I. 1960 REGION NUMBER 007 SOUTHERN ATLANTIC OCEAN

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
0.0	-60.0	324.0	380.0	291.0	380.0

INSCRIBED BY TRAPEZOID

0.0	-60.0	340.0	360.0	296.0	360.0

5 TRAPEZOIDAL SUBREGIONS ARE

1	0.0	-05.5	324.0	360.0	328.0	360.0
2	-05.5	-20.0	328.0	360.0	328.0	360.0
3	-20.0	-40.0	328.0	360.0	307.0	360.0
4	-40.0	-50.0	307.0	380.0	298.0	380.0
5	-50.0	-60.0	298.0	380.0	296.0	380.0

T.I. 1960 REGION NUMBER 008 EUROPE

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
70.0	35.0	347.0	392.0	347.0	392.0

INSCRIBED BY TRAPEZOID

70.0	38.0	360.0	380.0	360.0	380.0

15 TRAPEZOIDAL SUBREGIONS ARE

1	70.0	69.5	360.0	391.5	360.0	392.0
2	69.5	66.3	360.0	392.0	360.0	390.0
3	66.3	62.0	360.0	390.0	360.0	390.5
4	62.0	60.0	360.0	390.5	360.0	386.5
5	60.0	59.0	347.0	386.5	347.0	382.0

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6	59.0	57.5	347.0	382.0	347.0	380.0
7	57.5	54.0	347.0	380.0	347.0	380.0
8	54.0	52.5	347.0	380.0	347.0	383.5
9	52.5	49.5	347.0	383.5	347.0	384.5
10	49.5	46.5	347.0	384.5	347.0	390.5
11	46.5	41.0	347.0	390.5	347.0	389.0
12	41.0	40.0	347.0	389.0	347.0	386.0
13	40.0	38.0	347.0	386.0	347.0	384.8
14	38.0	35.0	347.0	368.5	347.0	357.0
15	38.0	35.0	368.5	384.8	383.0	383.0

T.I. 1960 REGION NUMBER 009 SOVIET UNION

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
70.0	36.0	20.0	190.0	20.0	190.0

INSCRIBED BY TRAPEZOID

70.0	42.5	32.0	190.0	32.0	57.0

27 TRAPEZOIDAL SUBREGIONS ARE

1	70.0	69.5	031.5	190.0	032.0	190.0
2	69.5	66.3	032.0	190.0	030.0	190.0
3	66.3	62.0	030.0	190.0	030.5	185.0
4	62.0	60.0	030.5	185.0	026.5	183.5
5	60.0	59.0	026.5	145.5	022.0	145.5
6	59.0	57.5	022.0	145.5	020.0	145.5
7	57.5	54.0	020.0	145.5	020.0	145.5
8	54.0	52.5	020.0	117.5	023.5	121.0
9	52.5	50.0	023.5	121.0	024.3	118.0
10	50.0	49.5	024.3	096.0	024.5	092.0
11	49.5	49.0	024.5	092.0	025.4	088.5
12	49.0	46.5	025.4	088.5	030.5	084.8
13	46.5	46.0	030.5	084.8	030.4	084.0
14	46.0	42.5	030.4	084.0	029.5	080.0
15	42.5	41.0	035.0	080.0	037.5	076.4
16	41.0	40.0	041.0	076.4	043.5	073.5
17	40.0	38.5	046.5	073.5	048.5	073.0
18	38.5	37.0	048.5	073.0	050.5	073.0
19	37.0	36.0	056.5	066.0	060.0	062.0
20	40.0	39.0	043.5	046.5	044.0	047.7
21	54.0	53.0	117.5	121.5	120.0	120.0
22	54.0	52.5	124.0	145.5	127.0	145.5
23	52.5	50.0	127.0	145.5	127.5	145.5
24	50.0	49.0	127.5	145.5	131.5	145.5
25	49.0	46.0	135.0	145.5	133.5	145.5
26	46.0	42.5	133.5	140.0	130.5	130.5
27	49.0	48.0	131.5	135.0	131.5	133.0

T.I. 1960 REGION NUMBER 010 MIDDLE EAST

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
42.5	12.0	15.0	60.0	43.5	60.0

INSCRIBED BY TRAPEZOID

36.0	12.0	27.6	60.0	43.5	60.0

8 TRAPEZOIDAL SUBREGIONS ARE

1	42.5	41.0	029.5	35.0	029.0	037.5

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2	41.0	40.0	29.0	41.0	026.0	043.5
3	40.0	39.0	26.0	43.5	25.4	44.0
4	39.0	37.0	25.4	47.7	24.2	50.5
5	37.0	36.0	24.2	56.5	23.6	60.0
6	36.0	35.0	23.6	60.0	23.0	60.0
7	35.0	32.5	23.0	60.0	30.0	60.0
8	32.5	12.0	30.0	60.0	43.5	60.0

T.I. 1960 REGION NUMBER 011 AFRICA

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
38.0	-40.0	340.0	420.0	340.0	420.0

INSCRIBED BY TRAPEZOID

12.0	-40.0	360.0	420.0	360.0	396.0

7 TRAPEZOIDAL SUBREGIONS ARE

1	38.0	35.0	368.5	368.5	357.0	383.0
2	35.0	32.5	347.0	383.0	344.3	390.0
3	32.5	28.0	344.3	390.0	340.0	393.0
4	28.0	12.0	340.0	393.0	340.0	403.5
5	12.0	0.0	340.0	420.0	340.0	420.0
6	0.0	-11.0	0.0	60.0	0.0	60.0
7	-11.0	-40.0	0.0	60.0	0.0	36.0

T.I. 1960 REGION NUMBER 012 INDIAN PENINSULA

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
37.0	0.0	60.0	98.0	60.0	90.0

INSCRIBED BY TRAPEZOID

27.5	0.0	60.0	90.0	60.0	90.0

6 TRAPEZOIDAL SUBREGIONS ARE

1	37.0	36.0	66.0	73.0	62.0	76.0
2	36.0	35.0	60.0	76.0	60.0	78.5
3	35.0	31.0	60.0	78.5	60.0	79.5
4	31.0	27.5	60.0	79.5	60.0	86.5
5	27.5	21.0	60.0	96.0	60.0	90.0
6	21.0	0.0	60.0	90.0	60.0	90.0

T.I. 1960 REGION NUMBER 013 CHINA AND INDO-CHINA

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
54.0	-11.0	64.5	140.0	90.0	105.0

INSCRIBED BY TRAPEZOID

49.0	03.0	88.5	131.5	102.5	102.5

18 TRAPEZOIDAL SUBREGIONS ARE

1	54.0	53.0	121.5	124.0	120.0	126.0
2	53.0	52.5	120.0	126.0	121.0	127.0
3	52.5	50.0	121.0	127.0	118.0	127.5
4	50.0	49.0	096.0	127.5	88.5	131.5
5	49.0	46.0	88.5	131.5	84.0	131.5
6	46.0	42.5	84.0	133.5	80.0	130.5
7	42.5	40.0	80.0	130.5	73.5	126.4
8	40.0	38.5	73.5	126.4	73.0	123.5
9	38.5	37.0	73.0	123.5	73.0	123.5
10	37.0	35.0	73.0	123.5	78.5	123.5

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11	35.0	31.0	78.5	123.5	79.5	123.5
12	31.0	27.5	79.5	123.5	86.5	123.5
13	27.5	21.0	96.0	121.5	90.0	115.5
14	21.0	09.5	90.0	115.5	90.0	115.5
15	09.5	05.0	90.0	115.5	90.0	112.0
16	05.0	-11.0	90.0	105.0	90.0	105.0
17	48.0	46.0	131.5	134.5	131.5	133.5
18	49.0	48.0	135.0	135.0	133.0	134.5

T.I. 1960 REGION NUMBER 014 EAST INDIES

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
09.5	-11.0	105.0	137.5	105.0	150.5

INSCRIBED BY TRAPEZOID

03.0	-11.0	105.0	131.0	105.0	150.5

7 TRAPEZOIDAL SUBREGIONS ARE

1	09.5	06.5	115.5	115.5	113.2	117.5
2	06.5	05.0	113.2	122.0	112.0	124.0
3	05.0	03.0	105.0	124.0	105.0	125.0
4	03.0	0.0	105.0	126.5	105.0	123.5
5	0.0	-04.0	105.0	143.5	105.0	144.0
6	-04.0	-11.0	105.0	144.0	105.0	150.5
7	05.0	0.0	128.5	133.0	123.5	135.5

T.I. 1960 REGION NUMBER 015 TAIWAN AND PHILIPPINES

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
27.5	03.0	115.5	133.0	115.5	133.0

INSCRIBED BY TRAPEZOID

27.5	06.5	121.5	133.0	117.5	133.0

5 TRAPEZOIDAL SUBREGIONS ARE

1	27.5	21.0	121.5	133.0	115.5	133.0
2	21.0	09.5	115.5	133.0	115.5	133.0
3	09.5	06.5	115.5	133.0	117.5	133.0
4	06.5	05.0	122.0	133.0	124.0	133.0
5	05.0	03.0	124.0	128.5	125.0	126.5

T.I. 1960 REGION NUMBER 016 AUSTRALIA

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
-11.0	-60.0	105.0	160.0	105.0	160.0

INSCRIBED BY TRAPEZOID

-11.0	-60.0	105.0	150.5	105.0	150.5

2 TRAPEZOIDAL SUBREGIONS ARE

1	-11.0	-25.0	105.0	150.5	105.0	160.0
2	-25.0	-60.0	105.0	160.0	105.0	160.0

T.I. 1960 REGION NUMBER 017 INDIAN OCEAN

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
0.0	-60.0	20.0	105.0	20.0	105.0

INSCRIBED BY TRAPEZOID

-11.0	-60.0	60.0	105.0	20.0	105.0

3 TRAPEZOIDAL SUBREGIONS ARE

1	0.0	-11.0	60.0	90.0	60.0	90.0
2	-11.0	-40.0	60.0	105.0	36.0	105.0
3	-40.0	-60.0	20.0	105.0	20.0	105.0

T.I. 1960 REGION NUMBER 018 NEW ZEALAND

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
-25.0	-60.0	160.0	200.0	160.0	200.0

INSCRIBED BY TRAPEZOID

-25.0	-60.0	160.0	200.0	160.0	200.0

1 TRAPEZOIDAL SUBREGIONS ARE

1	-25.0	-60.0	160.0	200.0	160.0	200.0

T.I. 1960 REGION NUMBER 019 PACIFIC OCEAN

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
50.0	-60.0	133.0	270.0	133.0	270.0

INSCRIBED BY TRAPEZOID

45.0	-25.0	147.0	207.0	160.0	270.0

13 TRAPEZOIDAL SUBREGIONS ARE

1	50.0	45.0	173.5	220.0	164.0	220.0
2	45.0	42.5	147.0	220.0	147.0	220.0
3	42.5	38.5	147.0	220.0	146.0	220.0
4	38.5	32.5	146.0	220.0	141.0	220.0
5	32.5	27.5	141.0	233.0	133.0	233.0
6	27.5	20.0	133.0	233.0	133.0	233.0
7	20.0	07.0	133.0	233.0	133.0	260.0
8	07.0	05.0	133.0	270.0	133.0	270.0
9	05.0	00.0	133.0	270.0	135.5	270.0
10	00.0	-04.0	143.5	270.0	144.0	270.0
11	-04.0	-11.0	144.0	270.0	150.5	270.0
12	-11.0	-25.0	150.5	270.0	160.0	270.0
13	-25.0	-60.0	200.0	270.0	200.0	270.0

T.I. 1960 REGION NUMBER 020 JAPAN AND KOREA

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
46.0	27.5	123.5	147.0	123.5	147.0

INSCRIBED BY TRAPEZOID

45.0	27.5	137.5	147.0	123.5	133.0

5 TRAPEZOIDAL SUBREGIONS ARE

1	46.0	45.0	140.0	145.5	137.5	145.5
2	45.0	42.5	137.5	147.0	130.5	147.0
3	42.5	38.5	130.5	147.0	123.5	146.0
4	38.5	32.5	123.5	146.0	123.5	141.0
5	32.5	27.5	123.5	141.0	123.5	133.0

T.I. 1960 REGION NUMBER 021 ALASKA AND ALEUTIAN ISLANDS

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
70.0	50.0	173.5	220.0	173.5	220.0

INSCRIBED BY TRAPEZOID

70.0	50.0	190.0	220.0	190.0	220.0

3 TRAPEZOIDAL SUBREGIONS ARE

1	70.0	66.3	190.0	220.0	190.0	220.0
2	66.3	60.0	190.0	220.0	176.5	220.0
3	60.0	50.0	173.5	220.0	173.5	220.0

T.I. 1960 REGION NUMBER 022 KAMCHATKA AND KURIL ISLANDS

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
60.0	45.0	145.5	173.5	145.5	173.5

INSCRIBED BY TRAPEZOID

60.0	45.0	145.5	173.5	145.5	164.0

2 TRAPEZOIDAL SUBREGIONS ARE

1	60.0	50.0	145.5	173.5	145.5	173.5
2	50.0	45.0	145.5	173.5	145.5	164.0

The Schaeffner Division

H. J. Schaeffner's seimicity division is given in "Tabellen kinematischer EndRebenherdparameter", (Pub. Inst. Angew. Geophysik, Freiberg, 1961). A facsimile of his division map also appears in "A New Catalogue of Earthquake Fault Plane Solutions", by H. D. Fara (Bull. Seism. Soc. Am., Vol. 54, No. 5, Part A, 1964).

Schaeffner simply divided the earthquake-active parts of the world into nine more or less rectangular (in Mercator's projection) "earthquake areas" and neglected the remaining parts of the world. But, for our purposes, we wished to cover the whole world. Thus, besides the nine "areas" assigned by Schaeffner, we also divided the rest of the world into four more "areas"; that is, Antarctica as Region 10, the unassigned part of the southern hemisphere as Region 11, Arctica as Region 12, and the unassigned part of the northern hemisphere as Region 13.

The resulting division is shown in Figure 3. and the card decks follow.

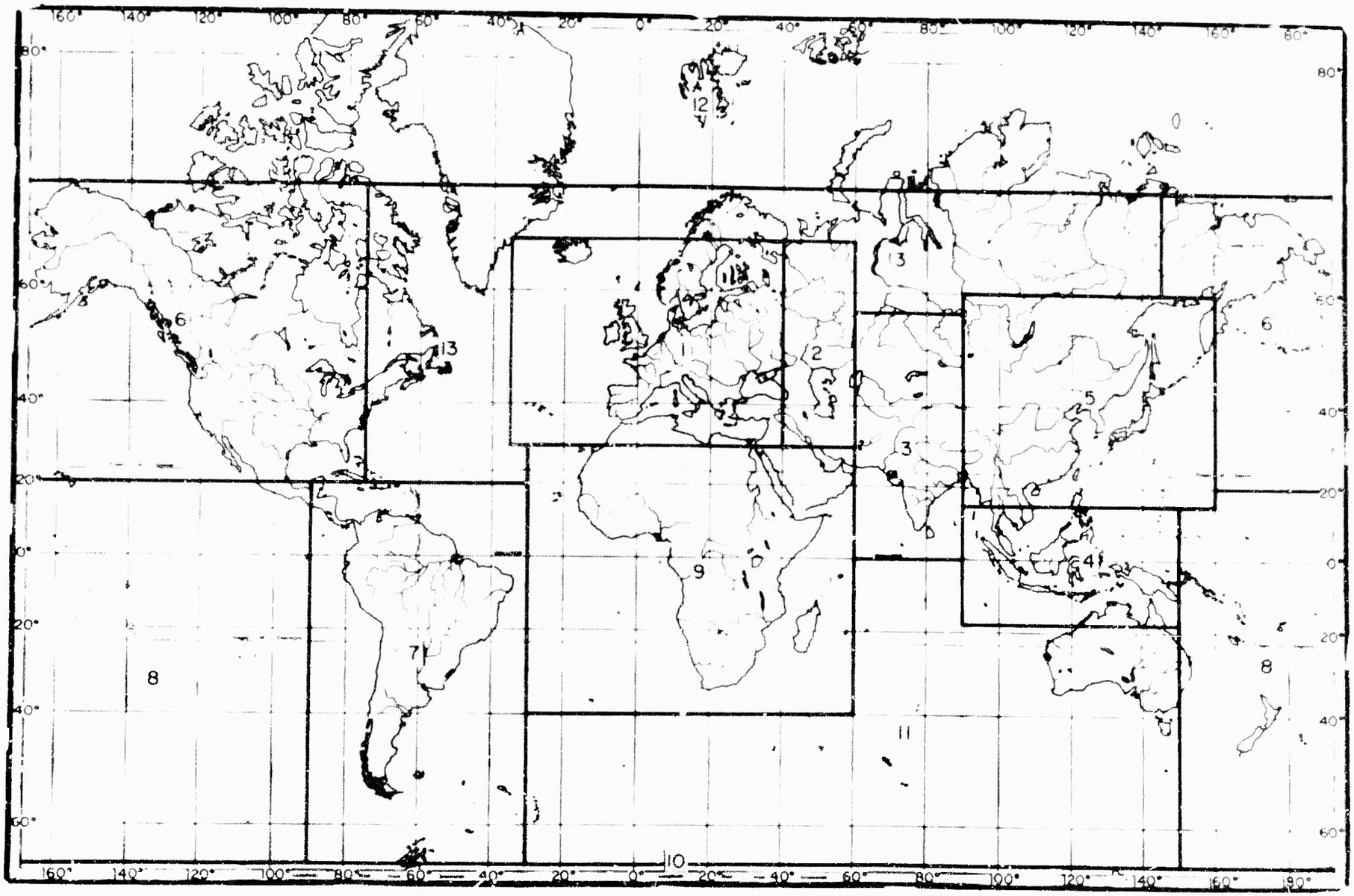

Figure 3. Schaeffner's Division of Earthquake Regions

SCHAEFFNER REGION NUMBER 001 EUROPE AND VICINITY

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
66.5	30.0	325.0	400.0	325.0	400.0

INSCRIBED BY TRAPEZOID

66.5	30.0	325.0	400.0	325.0	400.0

1 TRAPEZOIDAL SUBREGIONS ARE

1	66.5	30.0	325.0	400.0	325.0	400.0

SCHAEFFNER REGION NUMBER 002 CENTRAL ASIA

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
66.5	30.0	40.0	60.0	40.0	60.0

INSCRIBED BY TRAPEZOID

66.5	30.0	40.0	60.0	40.0	60.0

1 TRAPEZOIDAL SUBREGIONS ARE

1	66.5	30.0	40.0	60.0	40.0	60.0

SCHAEFFNER REGION NUMBER 003 WESTERN CHINA AND INDIA

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
57.0	0.0	60.0	90.0	60.0	90.0

INSCRIBED BY TRAPEZOID

57.0	0.0	60.0	90.0	60.0	90.0

1 TRAPEZOIDAL SUBREGIONS ARE

1	57.0	0.0	60.0	90.0	60.0	90.0

SCHAEFFNER REGION NUMBER 004 EAST INDIES

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
15.0	-18.0	90.0	150.0	90.0	150.0

INSCRIBED BY TRAPEZOID

15.0	-18.0	90.0	150.0	90.0	150.0

1 TRAPEZOIDAL SUBREGIONS ARE

1	15.0	-18.0	90.0	150.0	90.0	150.0

SCHAEFFNER REGION NUMBER 005 CHINA,JAPAN AND VICINITY

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
60.0	15.0	90.0	160.0	90.0	160.0

INSCRIBED BY TRAPEZOID

60.0	15.0	90.0	160.0	90.0	160.0

1 TRAPEZOIDAL SUBREGIONS ARE

1	60.0	15.0	90.0	160.0	90.0	160.0

SCHAEFFNER REGION NUMBER 006 EAST SIBERIA AND NORTH AMERICA

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
72.0	20.0	145.0	285.0	145.0	285.0

INSCRIBED BY TRAPEZOID

72.0	20.0	160.0	285.0	160.0	285.0

2 TRAPEZOIDAL SUBREGIONS ARE

1	72.0	60.0	145.0	285.0	145.0	285.0
2	60.0	20.0	160.0	285.0	160.0	285.0

SCHAEFFNER REGION NUMBER 007 SOUTH AMERICA

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
20.0	-65.0	270.0	330.0	270.0	330.0

INSCRIBED BY TRAPEZOID

20.0	-65.0	270.0	330.0	270.0	330.0

1 TRAPEZOIDAL SUBREGIONS ARE

1	20.0	-65.0	270.0	330.0	270.0	330.0

SCHAEFFNER REGION NUMBER 008 SOUTHERN PACIFIC OCEAN

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
20.0	-65.0	150.0	270.0	150.0	270.0

INSCRIBED BY TRAPEZOID

20.0	-65.0	160.0	270.0	160.0	270.0

2 TRAPEZOIDAL SUBREGIONS ARE

1	20.0	15.0	160.0	270.0	160.0	270.0
2	15.0	-65.0	150.0	270.0	150.0	270.0

SCHAEFFNER REGION NUMBER 009 AFRICA AND VICINITY

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
30.0	-40.0	330.0	420.0	330.0	420.0

INSCRIBED BY TRAPEZOID

30.0	-40.0	330.0	420.0	330.0	420.0

1 TRAPEZOIDAL SUBREGIONS ARE

1	30.0	-40.0	330.0	420.0	330.0	420.0

SCHAEFFNER REGION NUMBER 010 ANTARCTICA

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
-65.0	-89.9	0.0	360.0	0.0	360.0

INSCRIBED BY TRAPEZOID

-65.0	-89.9	0.0	360.0	0.0	360.0

1 TRAPEZOIDAL SUBREGIONS ARE

1	-65.0	-89.9	0.0	360.0	0.0	360.0

SCHAEFFNER REGION NUMBER 011 REST PART OF SOUTH. HEMISPHERE

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
0.0	-65.0	330.0	510.0	330.0	510.0

INSCRIBED BY TRAPEZOID

-40.0	-65.0	330.0	510.0	330.0	510.0

3 TRAPEZOIDAL SUBREGIONS ARE

1	0.0	-18.0	420.0	450.0	420.0	450.0
2	-18.0	-40.0	420.0	510.0	420.0	510.0
3	-40.0	-65.0	330.0	510.0	330.0	510.0

SCHAEFFNER REGION NUMBER 012 ARCTICA

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
89.9	72.0	0.0	360.0	0.0	360.0

INSCRIBED BY TRAPEZOID

89.9	72.0	0.0	360.0	0.0	360.0

1 TRAPEZOIDAL SUBREGIONS ARE

1	89.9	72.0	0.0	360.0	0.0	360.0

SCHAEFFNER REGION NUMBER 013 REST PART OF NORTH. HEMISPHERE

CIRCUMSCRIBED BY TRAPEZOID

LATHI	LATLO	LNGHIW	LNGHIE	LNGLOW	LNGLOE
72.0	20.0	285.0	505.0	285.0	505.0

INSCRIBED BY TRAPEZOID

72.0	66.5	285.0	505.0	285.0	505.0

5 TRAPEZOIDAL SUBREGIONS ARE

1	72.0	66.5	285.0	505.0	285.0	505.0
2	66.5	30.0	285.0	325.0	285.0	325.0
3	30.0	20.0	285.0	330.0	285.0	330.0
4	66.5	60.0	420.0	505.0	420.0	505.0
5	60.0	57.0	420.0	450.0	420.0	450.0

4. The Sampling Programs

This section presents listings of the two sampling programs, titled QSCAN1 and QSCAN2, developed to perform the sorting of U.S.C.&G.S. cards by the techniques discussed in Section 1 and utilizing the geographical specifications of Section 3. QSCAN1 and QSCAN2 are FORTRAN II main programs with transfer vectors referring to numerous lower level routines. Some are system routines and most of the remaining are included in MIT Geophysics Program Set II*. There are four non-system routines needed but not included in Set II - TRAPCK, WCHSID, LNGSET, and GIVIOT - and listings of these four are given here. The majority of the lower level routines are written in machine language, FAP, for the IBM 709, 7090, 7094. Consequently the use of QSCAN1 and QSCAN2 is limited to these machines.

QSCAN1 performs sorting according to time, depth, and area. QSCAN2 samples the results of QSCAN1 according to multiple magnitude ranges. Their operations may be summarized as follows.

<u>Outline of QSCAN1</u>

Tapes: system input; system output; system punch (optional); the U.S.C.&G.S. tape; one fresh output tape (the QSCAN1 tape).

1. Acquire the data cards specifying desired time window, depth window, and geographical area, and copy

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*See S.M. Simpson, Jr., "Magnetic tape copies of MIT Geophysics Program Set II"", Sci. Rpt. No. 10 of Contract AF 19(604)7378, Rpt. AFCRL-65-306 of Air Force Cambridge Res. Labs., Bedford, Mass., March 1965.

these as file no. 1 on the QSCAN1 tape, and also write them out on the system output tape.

2. Create a dummy file no. 2 on the QSCAN1 tape.
3. Scan the U.S.C.&G.S. tape for all events acceptable with respect to time, depth, and area, and copy them one by one as file no. 3 on the QSCAN1 tape. Also copy them onto the system output tape and, optionally, onto the punch tape. Simultaneously build up a frequency distribution funtion of the magnitudes of the events so copied.
4. Rewind the U.S.C.&G.S. tape. End file the QSCAN1 tape, skip back two files on it, dub in the distribution function as file no. 2, and then rewind it. Write out the distribution function on the output tape.

Outline of QSCAN2

Tapes: system input; system output; system punch (optional); the QSCAN1 output tape; the Rand random digits tape; one fresh output tape (the QSCAN2 tape).

1. Acquire the data cards specifying

   NMR = number of magnitude ranges

   RLO_i, RHI_i i=1...NMR defining the low and high ends of the magnitude ranges

   NQ_i i=1...NMR defining the desired number of randomly sampled events in the i-th range

   NDS = desired number of random digits to skip prior to performing the first shuffle

   Copy these cards onto the output tape and onto the QSCAN2 tape. Copy the first file of the QSCAN1 tape onto the QSCAN2 tape and onto the output tape and onto the punch tape (optionally). Copy the second file (containing the magnitude distribution function)

from the QSCAN1 tape onto the output tape, onto the QSCAN2 tape, onto the punch tape (optionally), and into the memory.

2. Using the distribution function, NMR, RLO_i, and RHI_i form

   MQ_i = actual number of events of the third file of the QSCAN1 tape which are in the i-th magnitude range

3. For each i=1...NMR

   a) shuffle the integers $1,2,\ldots,MQ_i$

   b) save the first NQ_i of these to be used as selection indices

4. Scan each of the events in the third file of the QSCAN1 tape and

   if it falls in none of the magnitude ranges ignore it,

   if it falls in the i-th magnitude range then it is the k_i-th such event where k_i is counted by QSCAN2 for each i,

   if k_i is one of the integers from 3b) above then select the event. Otherwise ignore it.

   If the event is selected,

   a) copy its card together with the magnitude index i onto tape QSCAN2 and, optionally, onto the punch tape.

   b) save its year, month and serialization index in the memory.

5. When the scan is done order the selections saved in memory by magnitude range and write them out on the output tape.

The detailed operation of the programs is explained in the listings which follow, and sample execution results are shown in the next section.

```
*     QSCAN1 (MAIN)
*     LISTG
*     LABEL
CQSCAN1
C
C
C TRANSFER VECTOR (EXCLUDING SYSTEM ROUTINES) -
C          CMPRA, DADECK, EOFSET, FSKIP, GIVIOT, LNGSET, REREAD, RND,
C          STZ, TRAPCK, XLSHFT
C
C
C                    DATA CARD INPUT
C
C  CARD 1.      CONTAINS ITPQIN,ITPQOW,ITPNCH IN FORMAT (3I5)
C    ITPQIN     = INPUT TAPE OF ALL EARTHQUAKES (THE U.S.C.+G.S. TAPE)
C    ITPQOW     = OUTPUT TAPE OF QUAKES SELECTED FROM ITPQIN
C    ITPNCH     = OUTPUT TAPE FOR PUNCHED COPY OF ITPQOW
C               = 0  IF NO PUNCHING WANTED.
C (NOTE THAT SYSTEM INPUT AND OUTPUT TAPES NOS. FURNISHED BY
C     SUBROUTINE  GIVIOT)
C
C  CARD 2.      CONTAINS RUNLBL(I) I=1,12  IN FORMAT (12A6)
C                  THIS IS 72 CHARACTERS DESCRIBING THE EXECUTION
C
C  CARD 3.      CONTAINS IMOLO,IDAYLO,IYRLO,IMOHI,IDAYHI,IYRHI
C               IN FORMAT (6I5)
C    IMOLO      = EARLIEST MONTH ACCEPTABLE FOR SELECTED QUAKES
C    IDAYLO     = EARLIEST DAY   ACCEPTABLE FOR SELECTED QUAKES
C    IYRLO      = EARLIEST YEAR  ACCEPTABLE FOR SELECTED QUAKES
C    IMOHI      = LATEST MONTH ACCEPTABLE FOR SELECTED QUAKES
C    IDAYHI     = LATEST DAY   ACCEPTABLE FOR SELECTED QUAKES
C    IYRHI      = LATEST YEAR  ACCEPTABLE FOR SELECTED QUAKES
C
C  CARD 4.      CONTAINS DLO,DHI  IN FORMAT (2F10.2)
C    DLO        = GREATEST DEPTH ACCEPTABLE FOR SELECTED QUAKE
C    DHI        = SMALLEST DEPTH ACCEPTABLE FOR SELECTED QUAKE
C
C
C  CARD 5.      CONTAINS  NREGNS  IN FORMAT (I5)
C                  NREGNS  MUST BE LSTHN=50
C
C  CARDS 6.,7.,.... CONTAIN THE REGION SPECIFICATION CARDS FOR  NREGNS
C               REGIONS.  ONE REGION IS SPECIFIED BY A SET OF CARDS AS
C               ILLUSTRATED BELOW THE COLUMN NUMBERS
C
C 000C000001111111111222222222233333333334444444444555555555556666666...7
C 123456789012345678901234567890123456789012345678901234567890123456...2
C XXXXXXXXXXXXXXXXXXXXXX REGION NUMBER NOR YYYYYYYYYYYYYYYYYYYYYYYY...Y
C    CIRCUMSCRIBED BY TRAPEZOID
C        LATHI     LATLO     LNGHIW    LNGHIE    LNGLOW    LNGLOE
C       TRPCRC(1) TRPCRC(2) TRPCRC(3) TRPCRC(4) TRPCRC(5) TRPCRC(6)
C    INSCRIBED BY TRAPEZOID
C       TRPINS(1) TRPINS(2) TRPINS(3) TRPINS(4) TRPINS(5) TRPINS(6)
C NSREG TRAPEZOIDAL SUBREGIONS ARE
C     1 TRPS(1,1) TRPS(2,1) TRPS(3,1) TRPS(4,1) TRPS(5,1) TRPS(6,1)
C     2 TRPS(1,2) TRPS(2,2) TRPS(3,2) TRPS(4,2) TRPS(5,2) TRPS(6,2)
C
C   ETC.
C
C WHERE  XX...X   REPRESENTS 23 HOLLERITH CHARACTERS IN FORMAT (3A6,A5)
C                   DESIGNATING THE SOURCE OF THE REGION DEFINITION.
```

```
C         NOR        IS THE OFFICIAL REGION NUMBER IN FORMAT (I3).
C         YY...Y     REPRESENTS 30 HOLLERITH CHARACTERS IN FORMAT (5A6)
C                      GIVING THE GEOGRAPHICAL LOCATION OF THE REGION.
C         TRPCRC(I) I=1...6  IN FORMAT(5X6F10.2)  DESIGNATES THE
C                      CIRCUMSCRIBING TRAPEZOID.
C         TRPINC(I) I=1...6  IN FORMAT(5X6F10.2)  DESIGNATES THE
C                      INSCRIBING TRAPEZOID.
C         NSREG      IN FORMAT(I5) IS TOTAL NUMBER OF TRAPEZOIDS THAT
C                      ACTUALLY DEFINE THE REGION.
C         TRPS(I,J) I=1...6, J=1...NSREG  IN FORMAT(5X6F10.2)  DESIGNATES
C                      THE TRAPEZOIDS THAT ACTUALLY DEFINE THE REGION.
C                      THE MAXIMUM TOTAL NO. OF TRAPEZOIDS FOR ALL REGIONS
C                      IS  1000.
C
C         TRPCRC, TRPINS, AND TRPS  ARE MEASURED IN DEGREES, EAST
C           LONGITUDE AND NORTH LATITUDE.
C
C              A QUAKE IS SELECTED ONLY IF IT FALLS ON OR WITHIN ALL
C              REGION LIMITS, TIME LIMITS AND DEPTH LIMITS.
C
C
C
C
C                        OUTPUTS ON SYSTEM OUTPUT TAPE
C
C              THE FIRST OUTPUT IS A COPY OF THE DATA CARD DECK, COLUMNS
C                 1 THRU 80 BEING COPIED INTO COLUMNS 2 THRU 81
C
C              THEN A PAGE RESTORE OCCURS AND THE NEW PAGE IS HEADED BY
C                 THE PHRASE - LISTING OF QUAKE CARDS SELECTED, PLUS TWO
C                 BLANK LINES
C
C              A LIST OF QUAKE CARDS SELECTED OCCURS NEXT, COLUMNS 1
C                 THRU 84 BEING COPIED INTO COLUMNS 2 THRU 85
C
C              A PAGE RESTORE OCCURS NEXT WITH A NEW HEADING -
C                    MAGNITUDE DISTRIBUTION FOR XXXXXX QUAKES SELECTED
C                 WHERE XXXXXX GIVES THE TOTAL COUNT OF SELECTIONS
C
C              THE DISTRIBUTION FUNCTION IS THEN PRINTED AS A MATRIX OF
C                 INTEGERS, WITH 10 COLUMNS AND 9 ROWS CORRESPONDING TO
C                 THE 90 MAGNITUDE RANGES  0.0,0.1, THRU 8.9 ,  ARRAYED
C                 AS FOLLOWS
C
C                  0.0   0.1   0.2 . . . 0.9
C                  1.0   1.1             1.9
C                  2.0                   2.9
C                   .                     .
C                   .                     .
C                   .                     .
C                  8.0   8.1   8.2 . . . 8.9
C
C                  EACH INTEGER ELEMENT GIVING THE COUNT OF SELECTED
C                 EVENTS OF THE CORRESPONDING MAGNITUDE.  EVENTS FOR
C                 WHICH THE MAGNITUDES ARE UNKNOWN ARE TREATED AS THOUGH
C                 THEY HAD MAGNITUDE ZERO.
C
C
C
C                        OUTPUTS ON THE QSCAN1 OUTPUT TAPE
C                              (ALL FILES IN BCD MODE)
```

```
C
C               FILE 1.  CONTAINS A COPY OF THE DATA CARDS
C
C               FILE 2.  CONTAINS  NQOUT. (MAGDIS(I),I=1,90)
C                                  IN FORMAT(1X,I5,//,(1X,10I5))
C                        WHERE  NQOUT = TOTAL NO. EVENTS SELECTED
C                               MAGDIS(I)  I=1...90  ARE THE 90 COUNTS
C                                         OF THE DISTRIBUTION MATRIX
C
C               FILE 3.  CONTAINS  NQOUT BCD RECORDS, EACH RECORD BEING
C                        BEING  84  CHARACTERS OF A SELECTED QUAKE CARD.
C
C
C
C                        OUTPUTS ON THE PUNCH TAPE
C                          (NONE IF  ITPNCH=0)
C
C               ONE BCD FILE CONTAINING
C                   A COPY OF THE DATA CARDS
C                   A HEADING FOR THE QUAKE CARDS
C                   THE SAME QUAKE CARDS AS IN FILE 3 OF THE QSCAN1
C                      OUTPUT TAPE
C                   A HEADING, NQOUT, AND MAGDIS(1...90) IN SAME FORMAT
C                      AS ON SYSTEM OUTPUT TAPE
C
C PROGRAM FOLLOWS BELOW
C
      MERCF(X) = LOGF((1.0+SINF(.0174533*X))/COSF(.0174533*X))
      XTIMEF(IYR,IMO,IDA) =XLSHFTF(18,IDA)+XLSHFTF(13,IMO)+
     1  XLSHFTF(9,IYR)
      DIMENSION  RUNLBL(12),TRPCRC(6,50),TRPINS(6,50),TRPS(6,1000)
      DIMENSION  JTRP(50),QCARD(14),MAGDIS(90)
      CALL GIVIOT (ITPIN,ITPOUT)
      READ INPUT TAPE ITPIN, 10, ITPQIN,ITPQOW,ITPNCH
 10   FORMAT(3I5)
      REWIND ITPQIN
      REWIND ITPQOW
C
C COPY INPUT DATA AND LIMITS OF QUAKES NEEDED ONTO 2 TAPES.
C
      CALL DADECK(ITPIN,ITPQOW)
      CALL DADECK(ITPIN,ITPOUT)
      IF (ITPNCH)  16,16,14
 14   CALL DADECK (ITPIN,ITPNCH)
 16   CONTINUE
C
C WRITE EOF ON ITPQOW - FIRST FILE
C
      END FILE ITPQOW
C
C READ INPUT DATA FROM LOGICAL ITPIN, CONVERTING LATITUDES TO MERCATOR
C PROJECTION.
C
      READ INPUT TAPE ITPIN,20,IMOLO,IDAYLO,IYRLO,IMOHI,IDAYHI,IYRHI,
     1  DLO,DHI,NREGNS
 20   FORMAT(/6I5/2F10.2/I5)
      ITILO=XTIMEF(IYRLO,IMOLO,IDAYLO)
      ITIHI=XTIMEF(IYRHI,IMOHI,IDAYHI)
      JTRP(1)=1
      DO 30 I=1,NREGNS
      READ INPUT TAPE ITPIN,25,(TRPCRC(J,I),J=1,6),(TRPINS(J,I),J=1,6),
```

```
     1 NSREG
 25   FORMAT(///5X6F10.2//5X6F10.2/I5)
      ITRP1=JTRP(I)
      ITRP2=ITRP1+NSREG-1
      JTRP(I+1)=ITRP2+1
      READ INPUT TAPE ITPIN,26,((TRPS(J,K),J=1,6),K=ITRP1,ITRP2)
 26   FORMAT(5X6F10.2)
      DO 28  I=1,2
      TRPCRC(J,I) = MERCF(TRPCRC(J,I))
      TRPINS(J,I) = MERCF(TRPINS(J,I))
      DO 27  K=ITRP1,ITRP2
 27   TRPS(J,K)   = MERCF(TRPS(J,K))
 28   CONTINUE
 30   CONTINUE
C
C MAKE BLANK FILE OF 100 RECORDS FOR LATER INFO
C
      DO 40  I=1,100
 40   WRITE OUTPUT TAPE ITPQOW,50
 50   FORMAT(79X,1H )
C
C SECOND FILE
C
      END FILE ITPQOW
      WRITE OUTPUT TAPE ITPOUT, 51
      IF (ITPNCH)  3060,3060,3050
 3050 WRITE OUTPUT TAPE ITPNCH,51
 3060 CONTINUE
 51   FORMAT(33H1 LISTING OF QUAKE CARDS SELECTED//)
C
C CLEAR "SELECTED QUAKE" COUNTER
C
      ASSIGN 80 TO INDEX
      NQOUT=0
      HLT=1HS
      HLN=1HW
      CALL STZ (90,MAGDIS)
C
C SET UP EOF CONTROL TO CONTINUE READING
C
 55   CONTINUE
      CALL EOFSET(0,EOF,ITAPE)
      IQKN=0
 500  CONTINUE
C
C READ QUAKES FROM INPUT TAPE
C
 60   READ INPUT TAPE ITPQIN,70,IMONTH,IDAY,IYEAR,QLAT,
     1                          XLT,QLONG,XLN,QDEPTH,QMAG
 70   FORMAT(3I2,8X,F4.1 A1,F5.1,A1,F3.0,F3.1)
      CALL REREAD
      READ INPUT TAPE ITPQIN,460,(QCARD(I),I=1,14)
      IQKN=IQKN+1
      ITIM=XTIMEF(IYEAR,IMONTH,IDAY)
      GO TO INDEX, (80,120)
C
C CHECK ALL LIMITS - FIRST - TIME LIMITS. IF QUAKE TIME EXCEEDS LATER
C   TIME LIMIT, WRITE OUT SELECTED QUAKES AND LEAVE.
C
 80   ASSIGN 120 TO INDEX
      IF (ITIM-ITIHI) 90,90,1000
```

```
 90    CONTINUE
       NFILES=XMAXOF(0,12*(IYRLO-IYEAR)+IMOLO-IMONTH)
       CALL FSKIP (ITPQIN,NFILES)
       IF (NFILES) 120,120,55
C
C CHECK TIME LIMIT
C
 120   CONTINUE
       IF (ITIM-ITILO) 410,160,130
 130   IF (ITIM-ITIHI) 160,160,1000
C
C QUAKE IS WITHIN TIME LIMITS, NOW CHECK DEPTH LIMITS
C
 160   IF (QDEPTH-DLO)  170,180,410
 170   IF (QDEPTH-DHI)  410,180,180
C
C CONVERT SOUTH ZONE TO - AND CHANGE WEST READINGS TO EAST.
C FIRST MIGRATE EVENT AWAY FROM POLE IF NECESSARY, AND CONVERT
C LATITUDE TO MERCATOR LATITUDE.
C
 180   IF (QLAT)       190,200,185
 185   QLAT = MIN1F(QLAT,89.9)
       GO TO 195
 190   QLAT = MAX1F(QLAT,-89.9)
 195   QLAT = MERCF(QLAT)
 200   IF (CMPRAF(XLT,HLT))  220,210,220
 210   QLAT =-QLAT
 220   IF (CMPRAF(XLN,HLN))  240,230,240
 230   QLONG =360.-QLONG
C
C NOW CHECK TO SEE IF QUAKE IS IN A BLOCK.
C
 240   CONTINUE
       DO 280 I=1,NREGNS
       CALL LNGSET(QLONG, TRPCRC(4,I), TRPCRC(6,I), QLNG)
       CALL TRAPCK(QLNG,QLAT,TRPCRC(2,I),TRPCRC(1,I),TRPCRC(5,I),
      1 TRPCRC(3,I),TRPCRC(6,I),TRPCRC(4,I),IANS)
       IF (IANS) 280,280,250
 250   CALL LNGSET(QLONG, TRPINS(4,I), TRPINS(6,I), QLNG)
       CALL TRAPCK(QLNG,QLAT,TRPINS(2,I),TRPINS(1,I),TRPINS(5,I),
      1 TRPINS(3,I),TRPINS(6,I),TRPINS(4,I),IANS)
       IF (IANS)  260,260,450
 260   CONTINUE
       ITRP1=JTRP(I)
       ITRP2=JTRP(I+1)-1
       DO 270 J=ITRP1,ITRP2
       CALL LNGSET(QLONG, TRPS(4,J), TRPS(6,J), QLNG)
       CALL TRAPCK(QLNG,QLAT,TRPS(2,J),TRPS(1,J),TRPS(5,J),TRPS(3,J),
      1 TRPS(6,J),TRPS(4,J),IANS)
       IF (IANS)  270,270,450
 270   CONTINUE
 280   CONTINUE
C
C QUAKE NOT ACCEPTABLE, GO BACK AND TRY ANOTHER.
C
 400   CONTINUE
 410   GO TO 500
C
C QUAKE PASSES ALL TESTS.  NOW INDEX SELECTED QUAKE COUNT AND WRITE
C   OUT QUAKE ON BOTH TAPES.
C
```

```
 450  NQOUT=NQOUT+1
      WRITE OUTPUT TAPE ITPQOW,460,(QCARD(I),I=1,14),IQKN
      IF (ITPNCH)  454,454,452
 452  WRITE OUTPUT TAPE ITPNCH,460,(QCARD(I),I=1,14)
 454  CONTINUE
 460  FORMAT(13A6,A2,I4)
      WRITE OUTPUT TAPE ITPOUT,470,(QCARD(I),I=1,14),IQKN
 470  FORMAT(1X13A6,A2,I4)
C
C MAKE RECORD OF QUAKES WITH SAME MAGNITUDES.
C
      IX=XFIXF(RNDF(10.*QMAG))+1
      MAGDIS(IX)=MAGDIS(IX)+1
      GO TO 500
C
C WRITE EOF'S FOR THIRD AND FINAL FILE, FILL IN SECOND FILE, AND EXIT.
C
 1000 END FILE ITPQOW
      REWIND ITPQIN
      REWIND ITPQOW
C
C POSITION TAPE TO WRITE OUT SECOND FILE CONTAINING QUAKE COUNT AND
C   MAGNITUDE DISTRIBUTIONS.
C
      CALL FSKIP(ITPQOW,1)
      WRITE OUTPUT TAPE ITPQOW,480,  NQOUT,(MAGDIS(I),I=1,90)
 480  FORMAT(1X,I5,//,(1X,10I5))
      WRITE OUTPUT TAPE ITPOUT,490,  NQOUT,(MAGDIS(I),I=1,90)
      IF (ITPNCH)  484,484,482
 482  WRITE OUTPUT TAPE ITPNCH,490,NQOUT,(MAGDIS(I),I=1,90)
      END FILE ITPNCH
 484  CONTINUE
 490  FORMAT(29H1 MAGNITUDE DISTRIBUTION FOR I6,16H QUAKES SELECTED//
     1(1X10I5))
 9999 REWIND ITPQOW
      CALL EXIT
      END
```

```
*     QSCAN2 (MAIN)
*     LIST8
*     LABEL
CQSCAN2
C
C
C TRANSFER VECTOR (OTHER THAN SYSTEM ROUTINES) -
C          CARIGE, CPYFL2, DADECK, EOFSET, FSKIP, GETRD1, GIVIOT, IGETX,
C          REREAD, RSKIP, SAME, SHUFFL, SIZEUP, STZ, STZS, XLSHFT,
C          XSAME, XSTLIN
C
C
C              DATA CARD INPUT
C
C CARD 1.  CONTAINS  ITPQS2, ITPNCH  IN FORMAT (2I5)
C              ITPQS2  =  OUTPUT TAPE PRODUCED BY QSCAN2.
C              ITPNCH  =  OUTPUT TAPE NUMBER ON WHICH ALL OUTPUTS OF
C                         QSCAN2 WILL BE WRITTEN FOR PUNCHING.
C                      =  0  IF NO PUNCHING DESIRED.
C
C CARD 2.  CONTAINS  RUNLBL(I) I=1,12 IN FORMAT(12A6),DESCRIPTION OF RUN
C
C CARD 3.  CONTAINS  ITPQS1,ITPRD,NDSKIP,  IN FORMAT(3I5)
C              ITPQS1  =  QUAKE TAPE PRODUCED BY QSCAN1
C              ITPRD   =  RAND RANDOM DIGITS TAPE
C              NDSKIP  =  NO. OF RANDOM DIGITS TO SKIP AT FRONT
C                         OF ITPRD (50 DIGITS PER RECORD).  MAY BE ZERO.
C                         IF NEGATIVE, ITPRD IS USED AS IS.   NOTE THAT
C                         THE MAXIMUM NO. DIGITS USED IN ONE EXECUTION
C                         OF  QSCAN2  IS  5  TIMES THE NO. OF EVENTS
C                         ON THE  QSCAN1  OUTPUT TAPE.
C
C CARD 4.  CONTAINS  NRANGE IN FORMAT(I5)
C              NRANGE  =  NO. OF MAGNITUDE RANGES AS DEFINED ON
C                         THE FOLLOWING NRANGE CARDS.
C                         MUST BE LSTHN= 50
C
C CARD 5.  CONTAINS RANMAG(1,1),RANMAG(1,2),NQSDES(1)  FORMAT(2F5.1,I5)
C
C CARD 6.  CONTAINS RANMAG(2,1),RANMAG(2,2),NQSDES(2)  FORMAT(2F5.1,I5)
C                         ETC.
C      4+NRANGE.     RANMAG(NRANGE,1),RANMAG(NRANGE,2),NQSDES(NRANGE)
C                                                      FORMAT(2F5.1,I5)
C      WHERE
C          RANMAG(I,1) IS THE LOWER LIMIT (INCLUSIVE) OF THE I-TH RANGE
C          RANMAG(I,2) IS THE UPPER LIMIT (INCLUSIVE) OF THE I-TH RANGE
C          NQSDES(I)   IS THE DESIRED NO. OF QUAKES FOR THE I-TH RANGE
C          RANMAG(I,2) LSTHN RANMAG(I+1,1)
C
C
C
C
C                       OUTPUTS ON SYSTEM OUTPUT TAPE
C
C      THE PRINTED OUTPUT SEQUENCE IS
C              A COPY OF THE  QSCAN2  DATA CARD DECK
C              A COPY OF FILE 1 OF THE  QSCAN1  TAPE
C                 (GIVING THE DATA DECK WHICH FORMED THE  QSCAN1  TAPE)
C              A COPY OF FILE 2 OF THE  QSCAN1  TAPE
C                 (GIVING THE DISTRIBUTION MATRIX)
C              THEN FOR EACH MAGNITUDE RANGE A LIST OF THE RANDOMLY
```

```
C                   SAMPLED EVENTS OCCURS.  THE LIST IS IN TERMS OF THE
C                   YEAR, MONTH, AND SERIALIZATION NUMBERS OF THE EVENTS.
C                   IF THE REQUESTED NO. OF EVENTS IS LARGER THAN THE NO.
C                   AVAILABLE IN THE GIVEN RANGE, THEN ALL THE AVAILABLE
C                   EVENTS ARE LISTED.
C
C
C                         OUTPUTS ON THE  QSCAN2  OUTPUT TAPE
C                               (BOTH FILES BCD)
C
C       FILE 1  CONTAINS
C               A COPY OF THE  QSCAN2  DATA CARD DECK
C               A COPY OF FILE 1 OF THE  QSCAN1  TAPE
C               A COPY OF FILE 2 OF THE  QSCAN1  TAPE
C       FILE 2  CONTAINS ONE RECORD FOR EACH EVENT
C               SELECTED BY  QSCAN2  IN THE ORDER OF THEIR
C               SELECTION.  EACH RECORD CONTAINS  IORD, (CARD(I),I=1,14)
C                           IN FORMAT (O14,14A6)
C                  WHERE  CARD(I)  IS THE QUAKE CARD
C                         IORD  IS A COMPOSITE OF
C                           THE MAGNITUDE INDEX    BITS 5,1...10
C                           THE YEAR               BITS 11...17
C                           THE MONTH              BITS 18...21
C                           THE SERIALIZATION      BITS 22...35
C
C
C                         OUTPUTS ON THE PUNCH TAPE
C                       (NO OUTPUTS HERE IF  ITPNCH=0)
C
C       ONE BCD FILE CONTAINING
C               A COPY OF THE  QSCAN2  DATA CARD DECK
C               A COPY OF FILES 1 AND 2 OF THE  QSCAN1  TAPE
C               A COPY OF EACH OF THE CARDS SELECTED BY  QSCAN2
C                  IN THE ORDER OF THEIR SELECTION
C               A COPY OF THE SELECTED EVENTS IN THE FORMAT USED ON
C                  THE SYSTEM OUTPUT TAPE
C
C
C PROGRAM FOLLOWS BELOW
C
C
      DIMENSION  RANMAG(50,2),NGSDES(50)
      DIMENSION  MAGDIS(90),SPACE(6000),NEWDIS(50),IANS(10)
      DIMENSION  IXTABL(200,50),ISPACE(6000),QCARD(14)
      DIMENSION  IXTAPE(50),IXDES(50),INOV(20)
      EQUIVALENCE  (SPACE,ISPACE)
      COMMON SPACE,,XTABL
      CALL EXECMP
      CALL EOFSET (0,EOF,ITAPE)
      IF (EOF) 2,2,1
 1    CALL DUMP
 2    CONTINUE
C
C FIRST OUTPUT THE DATA DECK
C
      CALL GIVIOT(ITPINP,ITPOUT)
      READ INPUT TAPE ITPINP,5,  ITPQS2,ITPNCH
 5    FORMAT(2I5)
      CALL CARIGE (ITPOUT,-1)
      WRITE OUTPUT TAPE ITPOUT,10
      WRITE OUTPUT TAPE ITPQS2,10
```

```
 10    FORMAT(///51H THE DATA DECK FOR THIS RUN OF QSCAN2 FOLLOWS BELOW )
       CALL DADECK(ITPINP,ITPOUT)
       CALL DADECK(ITPINP,ITPQS2)
       IF (ITPNCH)  16,16,14
 14    WRITE OUTPUT TAPE ITPNCH, 10
       CALL DADECK (ITPINP,ITPNCH)
 16    CONTINUE
C
C THEN ACQUIRE THE DATA
C
       READ INPUT TAPE ITPINP,20,ITPQS1,ITPRD,
      1     NDSKIP,NRANGE,(RANMAG(I,1),RANMAG(I,2),NQSDES(I),I=1,NRANGE)
 20    FORMAT(/3I5/I5/(2F5.1,I5))
C
C REWIND ITPQS1 AND OUTPUT THE DATA DECK USED I'  ORMING ITPQS1
C
       REWIND ITPQS1
       WRITE OUTPUT TAPE ITPOUT,30
       WRITE OUTPUT TAPE ITPQS2,30
       IF (ITPNCH)  26,26,24
 24    WRITE OUTPUT TAPE ITPNCH, 30
       CALL DADECK (ITPQS1,ITPNCH)
 26    CONTINUE
 30    FORMAT(///60H THE FIRST FILE OF THE QUAKE TAPE FOR THIS RUN FOLLOW
      1S BELOW )
       CALL DADECK(ITPQS1,ITPOUT)
       CALL CPYFL2(ITPQS1,ITPQS2,25,1.,SPACE,IANS)
C
C ACQUIRE NQSTOT, MAGDIS(1..J90) FROM SECOND FILE OF ITPQS1 AND
C   OUTPUT IT
C
       READ INPUT TAPE ITPQS1,40,NQSTOT,(MAGDIS(I),I=1,90)
 40    FORMAT(29X I6//(1X10I5))
       WRITE OUTPUT TAPE ITPOUT,50,NQSTOT,(MAGDIS(I),I=1,90)
       WRITE OUTPUT TAPE ITPQS2,50,NQSTOT,(MAGDIS(I),I=1,90)
       IF (ITPNCH)  46,46,44
 44    WRITE OUTPUT TAPE ITPNCH,50,NQSTOT,(MAGDIS(I),I=1,90)
 46    CONTINUE
 50    FORMAT(///21H QUAKE TAPE CONTAINS ,I5,35H QUAKES, WITH DISTRIBUTIO
      1N FUNCTION ,/,(5X,10I5))
       CALL FSKIP(ITPQS1,1)
       END FILE ITPQS2
       CALL CARIGE (ITPOUT,-1)
C
C NOW POSITION THE RANDOM DIGITS TAPE
C
       NDSKIP=XMAXOF(0,NDSKIP)
       NRSKIP=NDSKIP/50
       NDSKIP=NDSKIP-NRSKIP*50
       CALL RSKIP(ITPRD,NRSKIP,ECF)
       IF (NDSKIP) 70,70,65
 65    CALL GETRD1(ITPRD,NDSKIP,SPACE,IANS(1))
       IF (IANS(1))  9000,70,70
C
C NOW WE NEED TO FORM THE NEW DISTRIBUTION FUNCTION, NEWDIS(1...NRANGE),
C WITH RESPECT TO RANMAG RANGE..
C
 70    CALL STZ(50,NEWDIS)
       DO 100  IXR=1,90
       TRUMAG=FLOATF(IXR-1)/10.0
       DO 90  IXR2=1,NRANGE
```

```
      ITEMP=IXR2
      IF (TRUMAG-RANMAG(IXR2,1))  90,95,85
 85   IF (TRUMAG-RANMAG(IXR2,2))  95,95,90
 90   CONTINUE
      GO TO 100
 95   NEWDIS(ITEMP)=NEWDIS(ITEMP)+MAGDIS(IXR)
 100  CONTINUE
C
C NEXT WE HAVE TO SET UP THE SHUFFLED INDEX TABLE IXTABL
C                IXTABL(1...NQSDES(IXR),IXR)  IXR=1...NRANGE
C
C DEFINE A 'TAPE INDEX WITH RESPECT TO A MAGNITUDE RANGE' AS THE
C    ORDERING INDEX WITHIN A MAGNITUDE RANGE OF QUAKES ON THE TAPE.
C    I.E., TAPE INDEX 17 WITH RESPECT TO MAGNITUDE RANGE 4 SELECTS
C    THE 17-TH QUAKE FROM THE BEGINNING OF THE TAPE WHOSE MAGNITUDE
C    FALLS IN THE RANGE DEFINED BY RANMAG(4,1) AND RANMAG(4,2).
C
C THE ENTRIES OF IXTABL(1...,IXR) FOR A PARTICULAR IXR WILL BE THE
C    SET OF TAPE INDICES WITH RESPECT TO MAGNITUDE RANGE IXR, WHICH
C    ARE TO BE CHOSEN AS THE OUTPUT ENSEMBLE.
C
C IXTABL(1...NQSDES(IXR),IXR)  IS FORMED ESSENTIALLY AS FOLLOWS.
C    1. THE SET OF INTEGERS 1,2,...,NEWDIS(IXR) IS SCRAMBLED BY
C       SUBROUTINE SHUFFL INTO THE SPACE VECTOR.
C    2. THE FIRST NQSDES(IXR) OF THESE SCRAMBLED INTEGERS WILL BE
C       THE ONES USED IN IXTABL.
C    3. HOWEVER, PRIOR TO MOVING THIS SELECTED SUBSET OF INTEGERS
C       INTO IXTABL, THE SUBSET IS ORDERED MONOTONELY USING SUBROUTINE
C       SIZEUP.
C
      DO 250  IXR=1,NRANGE
      NITEMS=NEWDIS(IXR)
      NWANT=NQSDES(IXR)
      IF (NITEMS-NWANT) 200,210,220
 200  NWANT=NITEMS
      NQSDES(IXR)=NWANT
 210  CALL XSTLIN (1,1,NWANT,IXTABL(1,IXR))
      GO TO 250
 220  CONTINUE
      CALL SHUFFL(ITPRD,NITEMS,SPACE(3001),SPACE(1))
      CALL SIZEUP(SPACE(1),NWANT,ISPACE(3001))
      DO 240  IXQ=1,NWANT
      IXTABL(IXQ,IXR)=IGETX (ISPACE,ISPACE,IXQ*3000)
 240  CONTINUE
 250  CONTINUE
C
C WE NOW SCAN THE QUAKE TAPE, PASSING ONCE THRU THE NQSTOT QUAKES
C       FOR EACH QUAKE WE
C          1. DETERMINE WHICH MAGNITUDE RANGE IT BELONGS TO
C          2. THEN DETERMINE ITS TAPE INDEX WITH RESPECT TO
C             THIS RANGE (WITH THE AID OF A TABLE IXTAPE(1...NRANGE))
C          3. PROCEED TO THE NEXT QUAKE IF THIS TAPE INDEX IS
C             NOT THE NEXT ONE NEEDED ACCORDING TO IXTABL
C             (THIS INVOLVES USE OF A COUNTER TABLE IXDES(1...NRANGE))
C          4. IF THIS TAPE INDEX IS THE NEXT ONE NEEDED
C             THEN SAVE THIS QUAKE BY REPLACING THE IXTABL
C             ENTRY BY A PACKED VERSION OF THE YEAR, MONTH,
C             AND EVENT NO., OF THIS QUAKE.  THEN PROCEED TO
C             NEXT QUAKE.
C
C
```

```
C
C FIRST CLEAR IXTAPE,IXDES, AND THE QUAKE COUNTER IXQUAK
C
      CALL STZS(50,IXTAPE,50,IXDES,1,IXQUAK)
C
C INDEX IXQUAK AND CHECK FOR COMPLETION
C
 300  IXQUAK=IXQUAK+1
      IF (IXQUAK-NQSTOT)  305,305,500
 305  CONTINUE
C
C OK.  READ THE NEXT QUAKE CARD
C     QMAG = MAGNITUDE
C     IYR  = 2 DIGIT YEAR
C     IMO  = 2 DIGIT MONTH NO.
C     INO  = 1-4 DIGIT SERIAL NO. OF QUAKE WITHIN MONTH.
C
      READ INPUT TAPE ITPQS1,310,IMO,IYR,QMAG,INO
 310  FORMAT(I2,2XI2,22XF3.1,49XI4)
      CALL REREAD
      READ INPUT TAPE ITPQS1,320,(QCARD(I),I=1,14)
 320  FORMAT(14A6)
C
C FIND THE MAGNITUDE INDEX, IF ANY
C
      DO 340  IXR=1,NRANGE
      IXMAG=IXR
      IF (QMAG-RANMAG(IXR,1))  340,350,330
 330  IF (QMAG-RANMAG(IXR,2))  350,350,340
 340  CONTINUE
      GO TO 300
C
C GOT IT, FIND ITS TAPE INDEX IXTP AND INDEX IXTAPE TABLE
C
 350  IXTP=IXTAPE(IXMAG)+1
      IXTAPE(IXMAG)=IXTP
C
C FIGURE WHICH ENTRY NO. WE WANT AND WHETHER WE ARE DONE
C WITH THIS MAGNITUDE.
C
      IXD=IXDES(IXMAG)+1
      IF (IXD-NQSDES(IXMAG))  370,370,300
C
C IF NOT DONE SEE IF THE TAPE INDEX MATCHES THAT OF IXTABL
C
 370  IF (IXTP-IXTABL(IXD,IXMAG))  300,380,300
C
C GOT A MATCH.  PACK UP IYR, IMO,INO AND GO BACK
C
 380  CONTINUE
      IXTABL(IXD,IXMAG)=XLSHFTF(18,INO)+100*IMO+IYR
      IORD=XLSHFTF(18,INO)+XLSHFTF(4,IMO)+IYR+XLSHFTF(-7,IXMAG)
      WRITE OUTPUT TAPE ITPQS2,390,IORD,(QCARD(I),I=1,14)
      IF (ITPNCH)  386,386,384
 384  WRITE OUTPUT TAPE ITPNCH,390,(QCARD(I),I=1,14)
 386  CONTINUE
 390  FORMAT(O12,14A6)
      IXDES(IXMAG)=IXD
      GO TO 300
C
C OUTPUT THE IXTABL DATA
```

```
C
 500  CONTINUE
      END FILE ITPQS2
      REWIND ITPQS1
      REWIND ITPQS2
      DO 600 IXMAG=1,NRANGE
C
C HEADING OUTPUT FOR EACH MAGNITUDE RANGE
C
      WRITE OUTPUT TAPE ITPOUT,520,NQSDES(IXMAG),NEWDIS(IXMAG),
     1 RANMAG(IXMAG,1),RANMAG(IXMAG,2)
      IF (ITPNCH)  516,516,514
 514  WRITE OUTPUT TAPE ITPNCH,520,NQSDES(IXMAG),NEWDIS(IXMAG),
     1 RANMAG(IXMAG,1),RANMAG(IXMAG,2)
 516  CONTINUE
 520  FORMAT(/1X,I3,15H QUAKES CUT OF I3,20H IN MAGNITUDE RANGE ,F5.1,
     1 3H TO,F5.1)
C
C INNER LOOP STARTS
C
      NQS=NQSDES(IXMAG)
      IF (NQS) 600,600,530
 530  CONTINUE
      NNOS=0
      DO 590  IXQ=1,NQS
C
C GET AND UNSCRAMBLE NEXT IXTABLE ENTRY GIVING IMO, IYR, INO
C
      ITEMP1=IXTABL(IXQ,IXMAG)
      INO=XLSHFTF(-18,ITEMP1)
&     TEMP=777777000000*SAMEF(ITEMP1)
      ITEMP1=XSAMEF(TEMP)
      IMO=ITEMP1/100
      IYR=ITEMP1-100*IMO
C
C IS THIS QUAKE TO BE THE FIRST ENTRY ON A NEW LINE
C         (YES, IF NNOS=0)
C IF SO, GO ADD THE ENTRY WITHOUT CHECKING IYR, IMO
C
      IF (NNOS)  540,550,540
C
C IF NOT FIRST ENTRY CHECK FOR SAME IYR, IMO
C     AND GO ADD THE ENTRY IF SAME.  GO OUTPUT IF DIFF.
C     (THE INEW SWITCH SETTING IS ANTICIPATORY.  IT IS OVERRIDDEN AT 550)
C
 540  INEW=1
      IF (IYRNOW-IYR)  570,545,570
 545  IF (IMONOW-IMO)  570,550,570
C
C ADD NEW QUAKE
C
 550  INEW=0
      IMONOW=IMO
      IYRNOW=IYR
      NNOS=NNOS+1
      INOV(NNOS)=INO
C
C AND THEN CHECK FOR LINE COMPLETION
C     COMPLETE IF NNOS=15, OR IF IXQ=NQS
C     IF COMPLETE, GO OUTPUT.  OTHERWISE CONTINUE SUBLOOP.
C
```

```
      IF (NNOS-15)  560,570,570
 560  IF (IXQ-NOS)  590,570,570
C
C OUTPUT A LINE, CLEAR NNOS AND CHECK INEW TO SEE IF WE HAVE TO START
C A NEW LINE BEFORE PROCEEDING
C
 570  WRITE OUTPUT TAPE ITPOUT,575,IMONOW,IYRNOW,(INOV(I),I=1,NNOS)
      IF (ITPNCH)  573,573,571
 571  WRITE OUTPUT TAPE ITPNCH,575,IMONOW,IYRNOW,(INOV(I),I=1,NNOS)
 573  CONTINUE
 575  FORMAT(4X,I2,1H/,I2,3H - ,15I4)
      NNOS=0
      IF (INEW)  550,590,550
C
C CONTINUE INNER LOOP
C
 590  CONTINUE
C
C CONTINUE OUTER LOOP
C
 600  CONTINUE
      IF (ITPNCH)  620,620,610
 610  END FILE ITPNCH
 620  CONTINUE
      GO TO 9999
 9000 CONTINUE
C
C ERROR COMMENTS
C
      WRITE OUTPUT TAPE ITPOUT,9010,(IANS(I),I=1,1)
 9010 FORMAT(3X14HGETR01 IANS = I3)
 9999 CONTINUE
      CALL EXIT
      END
```

```
*       TRAPCK (SUBROUTINE)
*       FAP
*TRAPCK
        COUNT    225
        LBL      TRAPCK
        ENTRY    TRAPCK (X, Y, YBOT, YTOP, XLOBOT, XLOTOP,
*                        XHIBOT, XHITOP, IANS)
*
*
*                      ----ABSTRACT----
*
* TITLE - TRAPCK
*         FAST TEST OF POINT IS INSIDE TRAPEZOID
*
*                TRAPCK  DETERMINES WHETHER OR NOT A POINT  (X,Y)  IS
*                INSIDE OF A TRAPEZOID DEFINED BY THE FOUR CORNER POINTS
*                (XLOBOT,YBOT),  (XLOTOP,YTOP),  (XHITOP,YTOP),  AND
*                (XHIBOT,YBOT)  UNDER THE (UNCHECKED) RESTRAINTS  YTOP
*                GRTHN YBOT,  XLOBOT LSTHN= XHIBOT,  XLOTOP LSTHN= XHITOP.
*                POINTS ON THE PERIMETER ARE CONSIDERED TO BE INSIDE.
*
* LANGUAGE    - FAP SUBROUTINE (FORTRAN-II COMPATIBLE)
* EQUIPMENT   - 709, 7090, 7094 (MAIN FRAME ONLY)
* STORAGE     - 79 REGISTERS
* SPEED       - TIME REQUIRED, IN MACHINE CYCLES ON THE 7090, IS
*                20 M.C.  IF Y GRTHN YTOP OR LSTHN YBOT,          OTHERWISE
*                33 M.C.  IF X LSTHN MINIMUM(XLOBOT,XLOTOP),      OTHERWISE
*                43 M.C.  IF X GRTHN MAXIMUM(XHIBOT,XHITOP),      OTHERWISE
*                68 M.C.  IF THE TRAPEZOID HAS AN INTERNAL
*                         RECTANGLE AND THE POINT  (X,Y)
*                         LIES INSIDE IT,                         OTHERWISE
*               187 M.C.  IF POINT LIES TO LEFT OF TRAPEZOID,     OTHERWISE
*               290 M.C.
*
* AUTHOR      - S.M. SIMPSON, SEPT 1964
*
*
*                      ----USAGE----
*
* TRANSFER VECTOR CONTAINS ROUTINES - WCHSIO
*       AND FORTRAN SYSTEM ROUTINES - (NOT ANY)
*
* FORTRAN USAGE
*     CALL TRAPCK(X, Y, YBOT, YTOP, XLOBOT, XLOTOP,
*    1            XHIBOT, XHITOP, IANS)
*
*
* INPUTS
*
*    X          IS HORIZONTAL COORDINATE OF POINT BEING TESTED
*
*    Y          IS VERTICAL   COORDINATE OF POINT BEING TESTED
*
*    YBOT       VERTICAL COORDINATE OF BOTTOM OF TRAPEZOID
*
*    YTOP       VERTICAL COORDINATE OF TOP    OF TRAPEZOID
*               MUST BE GRTHN=  YBOT  (NOT CHECKED)
*
*    XLOBOT     DEFINES LOWER  LEFT CORNER TO BE  (XLOBOT,YBOT)
*
*    XLOTOP     DEFINES UPPER  LEFT CORNER TO BE  (XLOTOP,YTOP)
```

```
*
*    XHIBOT     DEFINES LOWER  RIGHT CORNER TO BE  (XHIBOT,YBOT)
*               MUST BE GRTHN=  XLOBOT  (NOT CHECKED)
*
*    XHITOP     DEFINES UPPER  RIGHT CORNER TO BE  (XHITOP,YTOP)
*               MUST BE GRTHN=  XLOTOP  (NOT CHECKED)
*
*
* OUTPUTS       (ILLEGAL INPUTS MAY GIVE MEANINGLESS ANSWERS
*                BUT CONTROL IS MAINTAINED.)
*
*    IANS       = 1  IF POINT  (X,Y)  LIES INSIDE TRAPEZOID,
*                    OR ON ITS PERIMETER
*               =-1  IF POINT LIES OUTSIDE THE TRAPEZOID
*
*
* EXAMPLES
*
* 1. INPUTS  - X(1...14) =  0., 20., 35., 45., 55., 65., 75.,
*                          85., 95., 60., 60., 60., 60., 60.
*              Y(1...14) = 20., 20., 20., 20., 20., 20., 20.,
*                          20., 20.,  0., 10., 20., 30., 40.
*              YBOT = 10.     YTOP = 30.     XLOBOT = 50.     XHIBOT = 70.
*              XLOTOP(1...9)=10., 10., 10., 10., 10., 30., 50., 70., 90.
*              XHITOP(1...9)=10., 30., 50., 70., 90., 90., 90., 90., 90.
*    USAGE   -        DO 10     IXY=1,14
*                     DO 10  IXTOP=1, 9
*                 10  CALL TRAPCK(X(IXY), Y(IXY), YBOT, YTOP, XLOBOT,
*                    1             XLOTOP(IXTOP), XHIBOT, XHITOP(IXTOP),
*                    2             IANS(IXTOP,IXY))
*    OUTPUTS - IANS(1...9,1)  =  -1, -1, -1, -1, -1, -1, -1, -1, -1
*              IANS(1...9,2)  =  -1, -1, -1, -1, -1, -1, -1, -1, -1
*              IANS(1...9,3)  =   1,  1,  1,  1,  1, -1, -1, -1, -1
*              IANS(1...9,4)  =  -1,  1,  1,  1,  1,  1, -1, -1, -1
*              IANS(1...9,5)  =  -1, -1,  1,  1,  1,  1,  1, -1, -1
*              IANS(1...9,6)  =  -1, -1, -1,  1,  1,  1,  1,  1, -1
*              IANS(1...9,7)  =  -1, -1, -1, -1,  1,  1,  1,  1,  1
*              IANS(1...9,8)  =  -1, -1, -1, -1, -1, -1, -1, -1, -1
*              IANS(1...9,9)  =  -1, -1, -1, -1, -1, -1, -1, -1, -1
*              IANS(1...9,10) =  -1, -1, -1, -1, -1, -1, -1, -1, -1
*              IANS(1...9,11) =   1,  1,  1,  1,  1,  1,  1,  1,  1
*              IANS(1...9,12) =  -1, -1,  1,  1,  1,  1,  1,  1, -1
*              IANS(1...9,13) =  -1, -1, -1,  1,  1,  1,  1, -1, -1
*              IANS(1...9,14) =  -1, -1, -1, -1, -1, -1, -1, -1, -1
*
*
* PROGRAM FOLLOWS BELOW
*
*
* TRANSFER VECTOR CONTAINS WCHSID
      HTR     0                 XR4
      BCI     1,TRAPCK
*
* ONLY ENTRY. TRAPCK(X,Y, YBOT,YTOP, XLOBOT,XLOTOP, XHIBOT,XHITOP, IANS)
*
TRAPCK SXD    TRAPCK-2,4
*
* FIRST CHECK FOR  YBOT  LSTHN=  Y  LSTHN=  YTOP
*
      CLA*    2,4               Y
      CAS*    4,4               Y MUST BE LSTHN= YTOP
```

```
        TRA     NOTIN
        TRA     CLA1
        CAS*    3,4                 AND GRTHN* YBOT
        TRA     CLA1
        TRA     CLA1
 NOTIN  CLS     KD1
        TRA     LEAVE
*
* THEN CHECK FOR   MIN(XLOBOT,XLOTOP) LST  := X LSTHN= MAX(XHIBOT,XHITOP)
*
 CLA1   CLA*    1,4                 X
        CAS*    5,4                 AGAINST XLOBOT
        TRA     CAS7
        TRA     CAS7
        CAS*    6,4   AGAINST XLOTOP (ONLY IF X LSTHN XLOBOT)
        TRA     CAS7
        TRA     CAS7
        TRA     NOTIN
 CAS7   CAS*    7,4   AGAINST XHIBOT
        TRA     CAS8
        TRA     IRCK
        TRA     IRCK
 CAS8   CAS*    8,4                 AGAINST XHITOP (ONLY IF X GRTHN XHIBOT)
        TRA     NOTIN
        NOP                         CK
*
* THEN FIND OUT IF THERE IS AN INTERNAL RECTANGLE
*       (YES I.F.F.  MAX(XLOBOT,XLOTOP)  LSTHN  MIN(XHIBOT,XHITOP)
*
 IRCK   CLA*    7,4   XHIBOT
        CAS*    8,4
        CLA*    8,4                 XHITOP
        NOP
        STO     XRIGHT
        CLA*    5,4                 XLOBOT
        CAS*    6,4
        TRA     CASXR
        TRA     CASXR
        CLA*    6,4                 XLOTOP
 CASXR  CAS     XRIGHT              (XLEFT IN AC)
        TRA     TRYWS               NO INTERNAL RECTANGLE
        NOP                         ZERO WIDTH INTERNAL RECTANGLE
*
* YES THERE IS.  SEE IF  (X,Y)  FALLS IN IT
*
        CAS*    1,4                 XLEFT AGAINST X
        TRA     TRYWS
        TRA     IN
        CLA*    1,4                 X
        CAS     XRIGHT
        TRA     TRYWS
        TRA     IN
*
* IT DOES
*
 IN     CLA     KD1
        TRA     LEAVE
*
* FINALLY USE  WCHSID  AS LAST RESORT
*       FIRST EXCLUDE IF  (X,Y)  IS TO LEFT OF LEFT SIDE
*
```

```
TRYWS CLA*     5,4              XLOBOT
      STO      32765
      CLA*     3,4              YBOT
      STO      32764
      CLA*     6,4              XLOTOP
      STO      32763
      CLA*     4,4              YTOP
      STO      32762
      CLA*     1,4              X
      LDQ*     2,4              Y
      TSX      $WCHSID,4
      LXD      TRAPCK-2,4
      TZE      IN
      TMI      NOTIN
*
* OTHERWISE EXCLUDE IF  (X,Y)  IS TO RIGHT OF RIGHT SIDE
*
      CLA*     7,4              XHIBOT
      STO      32765
      CLA*     8,4              XHITOP
      STO      32763
      CLA*     1,4              X
      LDQ*     2,4              Y
      TSX      $WCHSID,4
      LXD      TRAPCK-2,4
      TZE      IN
      TMI      IN
      TRA      NOTIN
*
* EXIT, SETTING  IANS  =  AC
*
LEAVE STO*     9,4              IANS
      TRA      10,4
*
* CONSTANTS, VARIABLES
*
KD1   PZE      0,0,1
XRIGHT PZE     **,**,**
      END
```

```
*       WCHSID (FUNCTION)
*       FAP
*WCHSID
        COUNT    150
        LBL      WCHSID
        ENTRY    WCHSID F(X,Y,X1,Y1,X2,Y2)
*
*                      ----ABSTRACT----
*
* TITLE - WCHSID
*         FIND ON WHICH SIDE OF LINE A GIVEN POINT LIES
*
*               WCHSID  DETERMINES WHETHER A GIVEN POINT  (X,Y)  LIES
*               ON, TO THE RIGHT OF, OR TO THE LEFT OF A GIVEN DIRECTED
*               LINE SEGMENT (OR OF ITS EXTENSIONS) FROM THE POINT
*               (X1,Y1)  TO THE POINT  (X2,Y2).
*
* LANGUAGE    - FAP SUBROUTINE (FORTRAN-II COMPATIBLE)
* EQUIPMENT   - 709,7090,7094 (MAIN FRAME ONLY)
* STORAGE     - 31 REGISTERS
* SPEED       - 83 MACHINE CYCLES (7090)
* AUTHOR      - S.M. SIMPSON,  SEPT.,1964
*
*
*                      ----USAGE----
*
* TRANSFER VECTOR CONTAINS ROUTINES - (NOT ANY)
*        AND FORTRAN SYSTEM ROUTINES - (NOT ANY)
*
*
* FORTRAN USAGE
*     GZFRGT = WCHSIDF(X,Y,X1,Y1,X2,Y2)
*
*
* INPUTS
*
*    X          IS THE HORIZONTAL COORDINATE OF POINT TO BE TESTED
*    Y          IS THE VERTICAL   COORDINATE OF POINT TO BE TESTED
*
*    X1         IS HORIZONTAL COORDINATE OF FIRST LINE-DEFINING POINT
*    Y1         IS VERTICAL   COORDINATE OF FIRST LINE-DEFINING POINT
*
*    X2         IS HORIZONTAL COORDINATE OF SECOND LINE-DEFINING POINT
*    Y2         IS VERTICAL   COORDINATE OF SECOND LINE-DEFINING POINT
*
*
* OUTPUTS
*
*    GZFRGT     GRTHN 0.0  IF (X,Y) LIES TO RIGHT OF THE LINE
*                 =   0.0  IF (X,Y) LIES ON THE LINE
*               LSTHN 0.0  IF (X,Y) LIES TO LEFT OF THE LINE
*
*               THE LINE IS CONSIDERED VERTICAL IF THE DEFINING POINTS
*               ARE IDENTICAL (DIRECTED UPWARDS IF Y1 POSITIVE, DOWNWARDS
*               OTHERWISE)
*
*
* EXAMPLES
*
* 1. INPUTS  - XT1,YT1=4.0,1.5  XT2,YT2=0.0,2.0  XT3,YT3=1.0,1.0
*              X1,Y1=2.0,2.0  X2(1...8) = 3., 3., 3., 2., 1., 1., 1., 2.
```

```
*                                Y2(1...8) = 1., 2., 3., 3., 3., 2., 1., 1.
*    USAGE    -        DO 10 I=1,8
*                      GZFR1(I)=WCHSIDF(XT1,YT1,X1,Y1,X2(I),Y2(I))
*                      GZFR2(I)=WCHSIDF(XT2,YT2,X1,Y1,X2(I),Y2(I))
*                 10   GZFR3(I)=WCHSIDF( T3,YT3,X1,Y1,X2(I),Y2(I))
*
*    OUTPUTS - GZFR1(1...8) = L,G,G,G,G,L,L,L
*              GZFR2(1...8) = G,Z,L,L,L,Z,G,G
*              GZFR3(1...8) = G,G,Z,L,L,L,Z,G
*                WHERE G = GRTHN 0, L = LSTHN 0, Z = ZERO (MAGNITUDE)
*
* 2. USAGE    -        GZFR1 = WCHSIDF(2.,0.,1.,1.,1.,1.)
*                      GZFR2 = WCHSIDF(0.,2.,1.,1.,1.,1.)
*                      GZFR3 = WCHSIDF(1.,1.,1.,1.,1.,1.)
*    OUTPUTS - GZFR1 = G    GZFR2 = L    GZFR3 = Z
*
*
* PROGRAM FOLLOWS BELOW
*
*
* NO TRANSFER VECTOR
*
        HTR      0                XR4
        BCI      1,WCHSID
*
* ONLY ENTRY.  WCHSID F(X,Y,X1,Y1,X2,Y2)
*
WCHSID  SXD      WCHSID-2,4
        STQ      Y
*
* SET  X-X1,  Y2-Y1,  X2-X1  AND CHECK FOR VERTICAL LINE  (X2 = X1)
*
        FSB      32765            X-X1
        STO      XMX1
        CLA      32762            Y2
        FSB      32764            Y2-Y1
        STO      Y2MY1
        CLA      32763            Y2
        FSB      32765            X2-X1
        STO      X2MX1
        LDQ      Y2MY1
        TNZ      NOTVRT
*
* FOR VERTICAL LINE SET  VALUE  =  (X-X1) * SIGN BIT OF (Y2-Y1)
*
        CLA      XMX1
        TQP      LEAVE
        CHS
        TRA      LEAVE
*
* OTHERWISE SET VALUE
*                = (Y1+(X-X1)*Y2-Y1)/(X2-X1)-Y)*(SIGN BIT OF X2-X1)
*
NOTVRT  FMP      XMX1             (Y2-Y1)*(X-X1)
        FDP      X2MX1
        XCA
        FAD      32764            Y1
        FSB      Y
        LDQ      X2MX1
        TQP      LEAVE
        CHS
```

```
*
* EXIT
*
 LEAVE TRA      1,4
*
* VARIABLES
*
 Y      PZE      **,**,**          INPUT Y
 XMX1   PZE      **,**,**          X-X1
 X2MX1  PZE      **,**,**          X2-X1
 Y2MY1  PZE      **,**,**          Y2-Y1
        END
```

```
C       GIVIOT (SUBROUTINE)
C       LABEL
CGIVICT
C
        SUBROUTINE GIVIOT(ITPIN, ITPOUT)
C
C THIS SUBROUTINE FURNISHES THE CALLING PROGRAM WITH THE LOGICAL
C TAPE NUMBERS OF THE SYSTEM INPUT TAPE AND THE SYSTEM OUTPUT TAPE
C
        ITPIN  = 4
        ITPOUT = 2
        RETURN
        END
```

```
*       LNGSET (SUBROUTINE)
*       FAP
*LNGSET
        COUNT   75
        LBL     LNGSET
        ENTRY   LNGSET (QLONG, TL1, TL2, QLNG)
*
*
*                       ----ABSTRACT----
*
* TITLE - LNGSET
*         BOOST A LONGITUDE BY 360 DEGREES CONDITIONALLY
*
*               LNGSET  IS A SPECIAL PURPOSE SUBROUTINE FOR MAIN PROGRAM
*               QSCAN1  WHOSE PURPOSE IS TO MAKE AN ADJUSTMENT OF A TRIAL
*               LONGITUDE,  QLONG,  IN CASES WHERE THE TRAPEZOIDAL REGION
*               CROSSES THE MERIDIAN.  THE EASTERN CORNERS OF THE
*               TRAPEZOID HAVE LONGITUDES  TL1  AND  TL2.  LET  TLMAX  =
*               MAXIMUM(TL1,TL2).  THEN  LNGSET  SETS
*
*                  QLNG  =  QLONG         IF  TLMAX  LSTHN=  360.0
*                                      OR IF  TLMAX  EXCEEDS 360.0 AND
*                                             QLONG  GRTHN=  (TLMAX-360.0)
*
*                  QLNG  =  QLONG+360.0  OTHERWISE.
*
*
* PROGRAM FOLLOWS BELOW
*
*
* FIRST SET  AC  =  MAX(TL1,TL2)-360.0,   MQ  =  QLONG
*
LNGSET CLA*     2,4             TL1
       LDQ*     3,4             TL2
       TLQ      FSB
       XCA
FSB    FSB      K360            BIGGEST MINUS 360
       LDQ*     1,4             QLONG TO MQ
*
* SET  QLNG = QLONG  IF  AC  0.C OR LESS
*                 OR IF  AC  GRTHN 0.0 BUT LSTHN=  MQ
*
       TMI      STQ
       TZE      STQ
       TLQ      XCA
 STQ   STQ*     4,4             STORE QLNG
       TRA      5,4             EXIT
*
* OTHERWISE SET  QLNG = QLONG + 360.0
*
 XCA   XCA
       FAD      .3c0            QLONG + 360.0
       STO*     4,4   STORE QLNG
       TRA      5,4             EXIT
*
* CONSTANT
*
 K360  DEC      360.0
       END
```

5. Illustrative Results

For illustration we take the problem of sampling shallow focus events in the eastern half of the circum-pacific belt during 1963. Referring to Gutenberg's divisions in Figure 1 this area may be defined by the set of regions numbered 1 through 10, extending from the Aleutian Arc to the Southern Antilles. Let us say that we want 50 events in the inclusive magnitude range 4.0 to 4.9, and 50 in the range 5.0 to 5.9, all having focal depths in the range 0 to 70 km. Assume that the logical tape assignments are as follows.

Logical 9 is for the U.S.C.&G.S. tape
Logical 5 is for the QSCAN1 output tape
Logical 12 is for the Rand random digits tape
Logical 6 is for the QSCAN2 output tape

and that no punch tape is desired. Then the data cards controlling the QSCAN1 execution would be as follows.

```
*     DATA
    9    5    0
 EVENTS IN EAST HALF OF PACIFIC CIRC' 'ERENTIAL BELT, 0-70KM, 1963
    1    1   63   12   31   63
        0.0       70.0
   10
GUTENBERG AND RICHTER   REGION NUMBER 001 ALEUTIAN ARC
   CIRCUMSCRIBED BY TRAPEZOID
        etc. as shown on pages 11 and 12 for the first
        10 regions, except that no blank cards may appear
        in this deck (the listings of Section 3 have a
        blank spacer card between the decks for each region)
```

The subsequent QSCAN2 execution would be controlled by the following data cards.

```
*     DATA
    6    0
 SELECTION OF QUAKES IN RANGES 4.0 TO 4.9 AND 5.0 TO 5.9
    5   12    0
    2
  4.0  4.9   50
  5.0  5.9   50
```

The execution results are shown on the next few pages.

(QSCAN1 printed output)

```
      EXECUTION
 EVENTS IN EAST HALF OF PACIFIC CIRCUMFERENTIAL BELT, 0-70 KM, 1963
    1     1    63    12    31    63
      70.0          0.
   10
GUTENBERG AND RICHTER   REGION NUMBER 001 ALEUTIAN ARC
   CIRCUMSCRIBED BY TRAPEZOID
       LATHI      LATLO      LNGHIW     LNGHIE     LNGLOW     LNGLOE
        65.0       50.0      164.0      218.0      164.0      218.0
   INSCRIBED BY TRAPEZOID
        60.0       50.0      164.0      218.0      164.0      218.0
    2 TRAPEZOIDAL SUBREGIONS ARE
    1   65.0       60.0      200.0      218.0      200.0      218.0
    2   60.0       50.0      164.0      218.0      164.0      218.0
GUTENBERG AND RICHTER   REGION NUMBER 002 ALASKA TO BRITISH COLUMBIA
   CIRCUMSCRIBED BY TRAPEZOID
       LATHI      LATLO      LNGHIW     LNGHIE     LNGLOW     LNGLOE
        65.0       45.0      218.0      245.0      218.0      245.0
   INSCRIBED BY TRAPEZOID
        65.0       45.0      218.0      245.0      218.0      245.0
    1 TRAPEZOIDAL SUBREGIONS ARE
    1   65.0       45.0      218.0      245.0      218.0      245.0
GUTENBERG AND RICHTER   REGION NUMBER 003 CALIFORNIA
   CIRCUMSCRIBED BY TRAPEZOID
       LATHI      LATLO      LNGHIW     LNGHIE     LNGLOW     LNGLOE
        45.0       31.0      225.0      248.0      225.0      248.0
   INSCRIBED BY TRAPEZOID
        45.0       31.0      225.0      245.0      225.0      245.0
    2 TRAPEZOIDAL SUBREGIONS ARE
    1   45.0       34.5      225.0      245.0      225.0      245.0
    2   34.5       31.0      225.0      248.0      225.0      248.0
GUTENBERG AND RICHTER   REGION NUMBER 004 BAJA CALIFORNIA
   CIRCUMSCRIBED BY TRAPEZOID
       LATHI      LATLO      LNGHIW     LNGHIE     LNGLOW     LNGLOE
        31.0       20.0      235.0      248.0      235.0      257.0
   INSCRIBED BY TRAPEZOID
        31.0       20.0      235.0      248.0      235.0      257.0
    1 TRAPEZOIDAL SUBREGIONS ARE
    1   31.0       20.0      235.0      248.0      235.0      257.0
GUTENBERG AND RICHTER   REGION NUMBER 005 SOUTHERN MEXICO
```

(QSCAN1 printed output)

```
   CIRCUMSCRIBED BY TRAPEZOID
       LATHI      LATLO      LNGHIW     LNGHIE     LNGLOW     LNGLOE
        20.0       10.0      240.0      270.0      240.0      270.0
   INSCRIBED BY TRAPEZOID
        20.0       10.0      240.0      270.0      240.0      270.0
    1 TRAPEZOIDAL SUBREGIONS ARE
    1   20.0       10.0      240.0      270.0      240.0      270.0
GUTENBERG AND RICHTER   REGION NUMBER 006 CENTRAL AMERICA
   CIRCUMSCRIBED BY TRAPEZOID
       LATHI      LATLO      LNGHIW     LNGHIE     LNGLOW     LNGLOE
        15.0       05.0      270.0      285.0      270.0      285.0
   INSCRIBED BY TRAPEZOID
        15.0       05.0      270.0      285.0      270.0      285.0
    1 TRAPEZOIDAL SUBREGIONS ARE
    1   15.0       05.0      270.0      285.0      270.0      285.0
GUTENBERG AND RICHTER   REGION NUMBER 007 THE CARIBBEAN LOOP
   CIRCUMSCRIBED BY TRAPEZOID
       LATHI      LATLO      LNGHIW     LNGHIE     LNGLOW     LNGLOE
        25.0       05.0      270.0      305.0      270.0      305.0
   INSCRIBED BY TRAPEZOID
        25.0       05.0      270.0      305.0      300.0      305.0
    2 TRAPEZOIDAL SUBREGIONS ARE
    1   25.0       15.0      270.0      305.0      270.0      305.0
    2   15.0       05.0      285.0      305.0      285.0      305.0
GUTENBERG AND RICHTER   REGION NUMBER 008 ANDEAN ZONE
   CIRCUMSCRIBED BY TRAPEZOID
       LATHI      LATLO      LNGHIW     LNGHIE     LNGLOW     LNGLOE
        05.0      -37.0      275.0      305.0      275.0      305.0
   INSCRIBED BY TRAPEZOID
        05.0      -37.0      275.0      305.0      275.0      305.0
    1 TRAPEZOIDAL SUBREGIONS ARE
    1   05.0      -37.0      275.0      305.0      275.0      305.0
GUTENBERG AND RICHTER   REGION NUMBER 009 SOUTHERN SOUTH AMERICA
   CIRCUMSCRIBED BY TRAPEZOID
       LATHI      LATLO      LNGHIW     LNGHIE     LNGLOW     LNGLOE
       -37.0      -65.0      275.0      305.0      275.0      305.0
   INSCRIBED BY TRAPEZOID
       -37.0      -65.0      275.0      290.0      275.0      290.0
    2 TRAPEZOIDAL SUBREGIONS ARE
    1  -37.0      -50.0      275.0      305.0      275.0      305.0
    2  -50.0      -65.0      275.0      290.0      275.0      290.0
GUTENBERG AND RICHTER   REGION NUMBER 010 SOUTHERN ANTILLES
   CIRCUMSCRIBED BY TRAPEZOID
       LATHI      LATLO      LNGHIW     LNGHIE     LNGLOW     LNGLOE
       -50.0     -70.0       290.0      350.0      290.0      350.0
   INSCRIBED BY TRAPEZOID
       -50.0      -70.0      290.0      350.0      290.0      350.0
    1 TRAPEZOIDAL SUBREGIONS ARE
    1  -50.0      -70.0      290.0      350.0      290.0      350.0
```

(Q3CAN1 printed output)

LISTING OF QUAKE CARDS SELECTED

```
010163125021.7 7.4N 74.1W 53     COLOMBIA.                                    3
010163233905.656.6N157.7W 506.5PALASKA PENINSULA.                             9
010263005349.117.5N 82.7W 33     SWAN IS. REGION.                            10
010263115721.251.4N178.4W 29     ANDREANOF IS., ALEUTIAN IS.                 16
010563212702.741.0N126.1W 33     160 KM. OFF COAST OF HUMBOLT CO., CALIF.    42
010663044014. 23.6N108.6W 33     GULF OF CALIFORNIA.                         46
011063051836.918.8N106.3W 33     OFF COAST OF JALISCO, MEXICO.               66
011163121216.245.0S 75.7W 33     NEAR COAST OF SOUTHERN CHILE.               72
011163143611.012.6N 88.2W 33     OFF COAST OF EL SALVADOR.                   73
011263060210. 16.7N 98.3W 33     NEAR COAST OF OAXACA, MEXICO.               78
011363023938.732.9N116.5W 33     SAN DIEGO COUNTY, CALIFORNIA.               81
011563063229.537.4S 73.4W 42     NEAR COAST OF CENTRAL CHILE.                95
011563135028.311.5N 87.8W 33     OFF WEST COAST OF NICARAGUA.                99
011663035256.1 7.5N 74.5W 33     COLOMBIA.                                  106
011663054452.351.3N179.9W 38     ANDREANOF IS., ALEUTIAN IS.                108
011763032702. 43.6S 83.6W 33     600 KM WEST OF CHILOE, CHILE.              118
011763042222.510.6S 78.7W 46     OFF COAST OF PERU.                         120
011963192903.616.9N 85.0W 33     OFF NORTH COAST OF HONDURAS.               130
011963195059.417.0N 85.0W 33     OFF NORTH COAST OF HONDURAS.               131
012063085606.251.9N173.2W 30     ANDREANOF IS., ALEUTIAN IS.                133
012063105651.450.3N129.4W 31     VANCOUVER ISLAND REGION.                   135
012063131627.026.4N110.7W 27     GULF OF CALIFORNIA.                        136
012063222128.726.7N110.7W 37     GULF OF CALIFORNIA.                        138
012163070045. 60.5S 27.2W 33     SANDWICH IS. REGION.                       143
012163144705.459.5N151.2W 67     KENAI PENINSULA, ALASKA.                   146
012263083233.211.3S 74.7W 33     PERU.                                      152
012263112941.330.8S 72.2W 33     NEAR COAST OF CENTRAL CHILE.               153
012463025209.0 8.4N 60.8W 66     NEAR COAST OF VENEZUELA.                   162
012463214313. 47.5N121.9W 33     KING COUNTY, WASHINGTON.                   167
012563130153.351.4N178.1E 33     RAT IS., ALEUTIAN IS.                      175
012763030038.731.6N115.7W 334.7PBAJA CALIFORNIA.                            186
012863130050.754.7N161.6W 336.3PALASKA PENINSULA.                           200
012863134954.755.8N162.9W 33     ALASKA PENINSULA.                          201
012963043129.6 5.8N 78.4W 31     SOUTH OF PANAMA.                           206
012963225022.752.7N168.4W 33     FOX IS., ALEUTIAN IS.                      214
013063043956.354.8N161.6W 33     ALASKA PENINSULA.                          215
013063101004.155.6S 28.3W 336.5PSANDWICH IS. REGION.                        219
013163030958.363.5N149.4W 56     CENTRAL ALASKA.                            222
013163112730.754.7N161.7W 33     ALASKA PENINSULA.                          224
013163184400.252.7N168.7W 33     FOX IS., ALEUTIAN IS.                      228
013163191022.654.2N167.5E 53     BERING SEA.                                229
020263115141.739.0N122.8W 33     LAKE COUNTY, CALIFORNIA.                     9
020263120936.939.0N122.8W 33     LAKE COUNTY, CALIFORNIA.                    10
020263135818.936.8N121.5W 16     SAN BENITO COUNTY, CALIFORNIA.              11
020263180113. 51.3N179.1W 33     ANDREANOF IS., ALEUTIAN IS.                 14
020263212538. 13.9N 92.1W 33     OFF WEST COAST OF GUATEMALA.                16
020363111808.  8.8S 75.8W 33     PERU.                                       19
020363125213.8 7.6N 72.1W 33     VENEZUELA-COLOMBIA BORDER.                  20
020463100403.451.6N176.6W 33     ANDREANOF IS., ALEUTIAN IS.                 26
020563122838.1 5.1N 82.4W 45     SOUTH OF PANAMA.                            27
020563071930.059.4N156.4W 33     ALASKA.                                     35
020563120820.653.[illegible]N165.4W 33     FOX IS., ALEUTIAN IS.             37
020563174938. 14.2N 94.0W 33     OFF COAST OF CHIAPAS, MEXICO.               39
020563203921.638.4S 73.2W 416.4PNEAR COAST OF CENTRAL CHILE.                 4[illegible]
020663012129.038.4S 73.6W 335.4LNEAR COAST OF CENTRAL CHILE.                42
020663061539. 14.9N 95.0W 33     OFF COAST OF CHIAPAS, MEXICO.               48
020663070147.0 7.4N 82.6W 61     NEAR SOUTH COAST OF PANAMA.                 49
020663181710.955.6N166.1E 33     KOMANDORSKIE IS. REGION.                    53
020663204650.756.7S 28.8W 33     SANDWICH IS. REGION.                        54
```

(QSCAN1 printed output)

```
020662214316.328.2S 67.4W 19    LA RIOJA PROVINCE, ARGENTINA.                    55
020963075952.951.2N179.8W 336.5CANDREANOF IS., ALEUTIAN IS.                      77
021063050234.  7.8N 83.4W 334.0CSOUTH OF PANAMA.                                 84
021063051040. 54.1N166.5W 334.1CFOX IS., ALEUTIAN IS.                            85
021263084337.919.0N107.4W 334.4CREVILLA GIGEDO IS. REGION.                      102
021263150946.051.6N177.9W 333.7CANDREANOF IS., ALEUTIAN IS.                     103
021463083159.5 6.2N 82.5W 334.2CSOUTH OF PANAMA.                                118
021463085036.511.0N 61.3W 334.0CNEAR NORTH COAST OF TRINIDAD.                   119
021663213222.4 8.5S 80.1W 334.8COFF COAST OF PERU.                              153
021763035041.217.2N100.8W 334.1CGUERRERO, MEXICO.                               157
021963163915.155.3S 28.8W 33    SANDWICH IS. REGION.                            180
022063143207.751.9N177.9E 334.7CRAT IS., ALEUTIAN IS.                           188
022063170732.545.7S 78.7W 334.6COFF COAST OF SOUTHERN CHILE.                    191
022163120119.140.4N125.0W 33    NEAR COAST OF NORTHERN CALIFORNIA.              195
022163234234.712.7N 94.9W 334.3CNICARAGUA.                                      205
022263211406.118.1N 71.3W 305.5CNEAR SOUTH COAST OF DOMINICAN REPUBLIC.         216
022263231957.758.8N137.2W 334.1CNEAR COAST OF SOUTHEASTERN ALASKA.              218
022363070237.944.8S 76.1W 334.9CNEAR COAST OF SOUTHERN CHILE.                   220
022463003701. 32.2S 68.5W 334.3CMENDOZA PROVINCE, ARGENTINA.                    222
022463232935.953.6N164.3W 334.3CFOX IS., ALEUTIAN IS.                           232
022563080820.128.1S 65.4W 325.3CSAN LUIS PROVINCE, ARGENTINA.                   238
022563085840.812.2N 88.2W 334.2COFF COAST OF EL SALVADOR.                       239
022563155434.862.5N150.1W 334.1CALASKA.                                         241
022663163013. 12.4N 87.4W 334.2CNEAR COAST OF NICARAGUA.                        248
022663232319.539.1S 75.1W 334.7CNEAR COAST OF SOUTHERN CHILE.                   250
022763160111.216.9N100.5W 334.5COFF COAST OF GUERRERO, MEXICO.                  257
022763211132.5 5.6S 79.3W 33    NORTHERN PERU.                                  260
022763233620.454.8N161.6W 335.3CALASKA PENINSULA.                               267
030163002557.434.8N119.3W 164.8PVENTURA COUNTY, CALIFORNIA.                     1
030163040234.115.6N 93.1W 334.3CCHIAPAS, MEXICO.                                3
030263220917. 14.8N 94.0W 334.1COFF COAST OF CHIAPAS, MEXICO.                   23
030463154304.0 4.5S 81.6W 335.4COFF COAST OF NORTHERN PERU.                     38
030463183151.915.7S 75.3W 454.9CNEAR COAST OF SOUTHERN PERU.                    39
030563024829.911.0N 90.4W 334.1CSOUTH OF GUATEMALA.                             44
030563070503.7 4.5S 81.5W 315.6COFF COAST OF NORTHERN PERU.                     46
030763121628.544.3S 75.3W 455.6CNEAR COAST OF SOUTHERN CHILE.                   64
030763134301.250.8N178.6E 334.1CRAT IS., ALEUTIAN IS.                           66
030763235325.844.8N123.4W 334.6CNORTHWESTERN OREGON.                            68
030863222626.  9.0N 84.1W 33    NEAR WEST COAST OF COSTA RICA.                  78
031063012604.156.2N153.8W 335.1CKODIAK ISLAND, ALASKA.                          91
031063060433. 14.2N 89.5W 334.3CNEAR COAST OF EL SALVADOR.                      94
031063135748.129.9S 71.2W 706.1PNEAR COAST OF CENTRAL CHILE.                    97
031063114029. 38.4N127.2W 33    OFF COAST OF NORTHERN CALIFORNIA.               99
031163155007.617.6N100.8W 334.8CGUERRERO, MEXICO.                               110
031363103919.119.5N 69.5W 334.1CDOMINICAN REPUBLIC.                             121
031463181319.153.0N164.9W 334.6CFOX IS., ALEUTIAN IS.                           126
031763061852.4 7.1N 82.2W 534.6CSOUTH OF PANAMA.                                142
031963141318.127.0N115.0W 334.1CBAJA CALIFORNIA.                                160
032163181922.750.6N129.4W 334.0CVANCOUVER ISLAND REGION.                        181
032263014425.819.3N 67.0W 394.3CMONA PASSAGE.                                   183
032463022449.251.6N173.3W 554.7CANDREANOF IS., ALEUTIAN IS.                     203
032463203056. 17.0N 99.6W 333.6CNEAR COAST OF GUERRERO, MEXICO.                 212
032463213524.451.8N178.1W 576.0PANDREANOF IS., ALEUTIAN IS.                     213
032563023947.952.2N171.2W 443.4CANDREANOF IS., ALEUTIAN IS.                     214
032663182308.351.3N178.8E 504.4CRAT IS., ALEUTIAN IS.                           230
032763023151.5 6.8N 73.8W 33    COLOMBIA.                                       235
032763091143.751.1N130.1W 333.5CQUEEN CHARLOTTE IS.                             240
032763211901.251.6N179.1W 334.2CANDREANOF IS., ALEUTIAN IS.                     244
032863062716.040.9S 84.2W 334.5COFF COAST OF CHILE.                             251
032963002331.855.4N166.0E 334.1CPRIBILOF IS.                                    258
032963051222. 13.8N 91.8W 334.5CGUATEMALA.                                      261
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032963074756.213.4N 91.0W 334.3CGUATEMALA.                                264
033063003440.151.1N129.4W 334.2CQUEEN CHARLOTTE IS.                       269
033063065459.651.8N170.5W 33    FOX IS., ALEUTIAN IS.                     271
03316304 600.8 6.5S 81.1W 335.2CNEAR COAST OF SOUTHERN PERU.              279
03316305 100.910.7S 78.5W 335.0CNEAR COAST OF PERU.                       281
033163153325.353.1N167.2W 334.3CFOX IS., ALEUTIAN IS.                     288
040163012510.529.8S 67.5W 33    LARIOJA PROVINCE, ARGENTINA.               1
040363013559.3 4.8S 78.4W 334.5CPERU-ECUADOR BORDER.                      28
040463060715.3 3.3N 74.5W 314.2CCOLOMBIA.                                 41
040663111923.363.4N149.5W 395.5CCENTRAL ALASKA.                           59
040663120709.563.6N149.5W 554.5CCENTRAL ALASKA.                           60
040663201819.340.7N128.3W 334.2COFF COAST OF NORTHERN CALIFORNIA.         65
040863234020.820.0N109.3W 444.3COFF WEST COAST OF MEXICO.                 68
040963122057.934.6S 76.2W 334.6COFF COAST OF CHILE.                       93
041063002930. 52.4N170.5W 333.8CFOX IS., ALEUTIAN IS. REGION.            100
041063183230.636.4S 73.3W 404.4CNEAR COAST OF CENTRAL CHILE.             104
041163011344.351.9N176.2W 704.4CANDREANOF IS., ALEUTIAN IS.              108
041163041239. 14.8N 92.2W 333.9CGUATEMALA.                               110
041163113556.063.7N148.6W 70    CENTRAL ALASKA.                          114
041163121021.519.7N108.9W 334.6COFF COAST OF MEXICO.                     115
041163130229.953.8N164.8W 334.3CFOX IS., ALEUTIAN IS.                    116
041163164525.160.2S 18.7W 33    SANDWICH IS. REGION.                     118
041263041323.761.2N147.3W 614.3CCENTRAL ALASKA.                          121
041263133803.051.6N175.0W 334.2CANDREANOF IS., ALEUTIAN IS.              124
041363075143. 32.0S 68.4W 334.6CSAN JUAN PROVINCE, ARGENTINA.            130
041363185318.011.7N 87.8W 334.4COFF COAST OF NICARAGUA.                  136
041563051704.223.5S 68.9W 41    NORTHERN CHILE.                          146
041563073259.360.8N147.5W 57    KENAI PENINSULA REGION, ALASKA.          148
041563223559.715.0N 92.2W 334.6CMEXICO-GUATEMALA BORDER.                 152
041663165412.448.1N128.5W 33    WEST OF VANCOUVER ISLAND.                170
041763182427.654.9S 28.2W 265.3CSANDWICH IS.                             185
041763190826.7 5.4N 81.5W 334.2CSOUTH OF PANAMA.                         186
041863042740.619.4N109.1W 334.5COFF COAST OF JALISCO, MEXICO.            190
041863220433.622.0S 64.3W 33    SOUTHERN BOLIVIA.                        194
041963032111.635.7N118.1W 33    KERN COUNTY, CALIFORNIA.                 196
041963061916.831.6N115.7W 14    BAJA CALIFORNIA.                         198
042063054659.527.5S 70.2  34.7CNORTHERN CHILE.                           211
042063143037.617.5N 98.6W 33.9CGUERRERO, MEXICO.                         213
042363023539.832.3S 72.5W 33    NEAR COAST OF CENTRAL CHILE.             230
042363033744.119.9N109.2W 334.2CREVILLA GIGEDO IS. REGION.               233
042363071944.860.7S 24.7W 335.2CSANDWICH IS. REGION.                     234
042363125806.650.9N128.8W 433.3CVANCOUVER ISLAND REGION.                 237
042563072009.212.4N 87.4W 33    NEAR WEST COAST OF NICARAGUA.            256
042563210644.028.1S 70.0W 68    NORTHERN CHILE.                          266
042663053730.816.6S 73.7W 23    NEAR COAST OF SOUTHERN PERU.             267
042763151010.561.4N148.3W 39    SOUTHERN ALASKA.                         278
042763192943.730.3S 70.3W  34.7CCENTRAL CHILE.                           280
042863052208.012.1S 78.0W  4.9CNEAR COAST OF PERU.                       286
042863215722.124.0S 68.1W 33    NORTHERN CHILE.                          293
042963203541.617.4N 92.7W 275.2CCHIAPAS, MEXICO.                         301
042963214417.151.4N178.6E 606.0PANDREANOF IS., ALEUTIAN IS.              302
043063003603.051.3N178.5E 666.6CANDREANOF IS., ALEUTIAN IS.              303
043063031852.151.4N179.1E 504.5CRAT IS., ALEUTIAN IS.                    306
043063032604.251.2N178.6E 504.9CRAT IS., ALEUTIAN IS.                    307
043063070755.951.6N178.4E 645.1CRAT IS., ALEUTIAN IS.                    309
043063110359.615.2N 93.0W 334.3CCHIAPAS, MEXICO.                         312
043063184314.0 8.2S 79.9W 604.8CNEAR COAST OF PERU.                      313
050163163843.413.3N 91.8W 704.2COFF WEST COAST OF GUATEMALA.               3
050363031444.437.7N118.8W 154.2PMONO COUNTY, CALIFORNIA.                  11
050463044118.9 4.7N 73.8W 434.0CCOLOMBIA.                                 16
050463055604.151.8N175.4W 695.5CANDREANOF IS., ALEUTIAN IS.               17
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(QSCAN1 printed output, 9 pages omitted)

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121563165423.616.3N 97.7W 354.2COAXACA, MEXICO.                          185
121663 62320.412.2N 88.4W 344.3COFF COAST OF EL SALVADOR.                196
121663104952.513.9N 90.9W 594.3CNEAR COAST OF GUATEMALA.                 198
121763232211.252.9N165.4W 334.9CFOX IS., ALEUTIAN IS.                    210
121863 14213.5 7.4S 76.0W 334.0CCENTRAL PERU.                            212
12186310 651.043.7N126.9W 334.2COFF COAST OF OREGON.                     217
121963 14734.039.0S 70.4W 334.3CNEUQUEN PROVINCE, ARGENTINA.             221
121963 43451.533.1S 68.7W 454.5CMENDOZA PROVINCE, ARGENTINA.             222
121963145444.0 8.3S 80.6W 334.3COFF COAST OF CENTRAL PERU.               224
12196317 4 7.8 9.7S 79.1W 565.1CNEAR COAST OF CENTRAL PERU.              225
121963203350.135.2S 68.0W 325.3CMENDOZA PROVINCE, ARGEN INA.             227
121963223459.852.0N170.8W 334.4CFOX IS., ALEUTIAN IS                     228
1220631048 4.2 5.2S 80.8W 555.2CNEAR COAST OF NORTHERN PERU.             235
122063172948.751.8N177.7W 334.4CANDREANOF IS., ALEUTIAN IS.              240
122063222831.213.2N 88.0W 644.3CNEAR COAST OF EL SALVADOR.               242
122263 12011.014.3N 93.0W 334.4COFF COAST OF CHIAPAS, MEXICO.            253
122263 35616.032.3S 69.2W 334.3CMENDOZA PROVINCE, ARGENTINA.             255
122263 55629.535.1S 67.9W 334.7CMENDOZA PROVINCE, ARGENTINA.             257
122363223422.112.3N 72.8W 334.5COFF NORTH COAST OF COLOMBIA.             270
122463 217 9.051.7N177.1W 334.0CANDREANOF IS., ALEUTIAN IS.              273
122563 9 0 2.752.0N172.1W 454.7CANDREANOF IS., ALEUTIAN IS.              293
12256323 252.019.0N108.4W 333.7COFF COAST OF JALISCO, MEXICO.            298
122663211111.951.2N169.8W 334.3CFOX IS., ALEUTIAN IS.                    309
122763 0 959.513.4S 72.7W 424.1CSOUTHERN PERU.                           311
122763 23622.345.7N123.3W 374 5CNORTHWEST OREGON.                        312
122763 35710.014.5N 90.7W 333 9CGUATEMALA.                               313
122763234648 0 6.7N 83.9W 334.1CSOUTH OF COSTA RICA.                     319
122863 657 9.914.4N 92.3W 334.5CNEAR COAST OF GUATEMALA.                 323
122863124451.018.1N106.3W 333.9COFF COAST OF JALISCO, MEXICO.            326
122863164837.018.4N106.0W 334.3COFF COAST OF JALISCO, MEXICO.            329
122863175833.160.4S 51.8W 495.4CSOUTH SHETLAND IS. REGION.               330
122863191724.018.5N105.8W 333.9COFF COAST OF JALISCO, MEXICO.            331
122863232026.662.9N154.0W 334.2CCENTRAL ALASKA.                          333
122963 23139.018.4N106.1W 333.8COFF COAST OF JALISCO, MEXICO.            335
122963 34128.018.8N106.2W 334.1COFF COAST OF JALISCO, MEXICO.            337
122963 43431.019.1N105.9W 333.8COFF COAST OF JALISCO, MEXICO.            341
122963 62248.018.6N105.8W 334.4COFF COAST OF JALISCO, MEXICO.            342
123063 82745.118.8N105.8W 333.9COFF COAST OF JALISCO, MEXICO.            357
1230631347 8.138.8N122.8W 334.7CMENDOCINO COUNTY, CALIFORNIA.            360
123063233927.2 2.5S 78.4W 334.3CECUADOR.                                 366
123163101750.019.0N105.8W 333.8COFF COAST OF JALISCO, MEXICO.            369
123163125158.063.7N146.0W 333.8CCENTRAL ALASKA.                          372
123163173732.156.5S 26.0W 306.3CSANDWICH IS.                             374
123163214143.016.6N 99.0W 334.3CGUERRERO, MEXICO.                        377
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(QSCAM1 printed output)

MAGNITUDE DISTRIBUTION FOR 774 QUAKES SELECTED

131	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	1	1	1	5	2	17	18	32
51	59	64	73	50	55	45	37	28	14
14	12	9	10	10	6	5	1	2	0
5	2	2	2	1	1	0	5	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

(QSCAN2 printed output)

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THE DATA DECK FOR THIS RUN OF QSCAN2 FOLLOWS BELOW
 SELECTION OF QUAKES IN RANGES 4.0-4.9 AND 5.0-5.9
    5   12    0
    2
  4.0  4.9   50
  5.0  5.9   50


THE FIRST FILE OF THE QUAKE TAPE FOR THIS RUN FOLLOWS BELOW
  EVENTS IN EAST HALF OF PACIFIC CIRCUMFERENTIAL BELT, 0-70 KM, 1963
     1    1   63   12   31   63
       70.0        0.
    10
 GUTENBERG AND RICHTER   REGION NUMBER 001 ALEUTIAN ARC
    CIRCUMSCRIBED BY TRAPEZOID
        LATHI      LATLO      LNGHIW     LNGHIE     LNGLOW     LNGLOE
         65.0       50.0      164.0      218.0      164.0      218.0
    INSCRIBED BY TRAPEZOID
         60.0       50.0      164.0      218.0      164.0      218.0
     2 TRAPEZOIDAL SUBREGIONS ARE
     1   65.0       60.0      200.0      218.0      200.0      218.0
     2   60.0       50.0      164.0      218.0      164.0      218.0
 GUTENBERG AND RICHTER   REGION NUMBER 002 ALASKA TO BRITISH COLUMBIA
    CIRCUMSCRIBED BY TRAPEZOID
        LATHI      LATLO      LNGHIW     LNGHIE     LNGLOW     LNGLOE
         65.0       45.0      218.0      245.0      218.0      245.0
    INSCRIBED BY TRAPEZOID
         65.0       45.0      218.0      245.0      218.0      245.0
     1 TRAPEZOIDAL SUBREGIONS ARE
     1   65.0       45.0      218.0      245.0      218.0      245.0
 GUTENBERG AND RICHTER   REGION NUMBER 003 CALIFORNIA
    CIRCUMSCRIBED BY TRAPEZOID
        LATHI      LATLO      LNGHIW     LNGHIE     LNGLOW     LNGLOE
         45.0       31.0      225.0      248.0      225.0      248.0
    INSCRIBED BY TRAPEZOID
         45.0       31.0      225.0      245.0      225.0      245.0
     2 TRAPEZOIDAL SUBREGIONS ARE
     1   45.0       34.5      225.0      245.0      225.0      245.0
     2   34.5       31.0      225.0      248.0      225.0      248.0
 GUTENBERG AND RICHTER   REGION NUMBER 004 BAJA CALIFORNIA
    CIRCUMSCRIBED BY TRAPEZOID
        LATHI      LATLO      LNGHIW     LNGHIE     LNGLOW     LNGLOE
         31.0       20.0      235.0      248.0      235.0      257.0
    INSCRIBED BY TRAPEZOID
         31.0       20.0      235.0      248.0      235.0      257.0
     1 TRAPEZOIDAL SUBREGIONS ARE
     1   31.0       20.0      235.0      248.0      235.0      257.0
 GUTENBERG AND RICHTER   REGION NUMBER 005 SOUTHERN MEXICO
    CIRCUMSCRIBED BY TRAPEZOID
        LATHI      LATLO      LNGHIW     LNGHIE     LNGLOW     LNGLOE
         20.0       10.0      240.0      270.0      240.0      270.0
    INSCRIBED BY TRAPEZOID
         20.0       10.0      240.0      270.0      240.0      270.0
     1 TRAPEZOIDAL SUBREGIONS ARE
     1   20.0       10.0      240.0      270.0      240.0      270.0
 GUTENBERG AND RICHTER   REGION NUMBER 006 CENTRAL AMERICA
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(QSCAN2 printed output)

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   CIRCUMSCRIBED BY TRAPEZOID
       LATHI      LATLO      LNGHIW     LNGHIE     LNGLOW     LNGLOE
        15.0       05.0      270.0      285.0      270.0      285.0
   INSCRIBED BY TRAPEZOID
        15.0       05.0      270.0      285.0      270.0      285.0
    1 TRAPEZOIDAL SUBREGIONS ARE
    1   15.0       05.0      270.0      285.0      270.0      285.0
GUTENBERG AND RICHTER   REGION NUMBER 007 THE CARIBBEAN LOOP
   CIRCUMSCRIBED BY TRAPEZOID
       LATHI      LATLO      LNGHIW     LNGHIE     LNGLOW     LNGLOE
        25.0       05.0      270.0      305.0      270.0      305.0
   INSCRIBED BY TRAPEZOID
        25.0       05.0      270.0      305.0      300.0      305.0
    2 TRAPEZOIDAL SUBREGIONS ARE
    1   25.0       15.0      270.0      305.0      270.0      305.0
    2   15.0       05.0      285.0      305.0      285.0      305.0
GUTENBERG AND RICHTER   REGION NUMBER 008 ANDEAN ZONE
   CIRCUMSCRIBED BY TRAPEZOID
       LATHI      LATLO      LNGHIW     LNGHIE     LNGLOW     LNGLOE
        05.0      -37.0      275.0      305.0      275.0      305.0
   INSCRIBED BY TRAPEZOID
        05.0      -37.0      275.0      305.0      275.0      305.0
    1 TRAPEZOIDAL SUBREGIONS ARE
    1   05.0      -37.0      275.0      305.0      275.0      305.0
GUTENBERG AND RICHTER   REGION NUMBER 009 SOUTHERN SOUTH AMERICA
   CIRCUMSCRIBED BY TRAPEZOID
       LATHI      LATLO      LNGHIW     LNGHIE     LNGLOW     LNGLOE
       -37.0      -65.0      275.0      305.0      275.0      305.0
   INSCRIBED BY TRAPEZOID
       -37.0      -65.0      275.0      290.0      275.0      290.0
    2 TRAPEZOIDAL SUBREGIONS ARE
    1  -37.0      -50.0      275.0      305.0      275.0      305.0
    2  -50.0      -65.0      275.0      290.0      275.0      290.0
GUTENBERG AND RICHTER   REGION NUMBER 010 SOUTHERN ANTILLES
   CIRCUMSCRIBED BY TRAPEZOID
       LATHI      LATLO      LNGHIW     LNGHIE     LNGLOW     LNGLOE
       -50.0      -70.0      290.0      350.0      290.0      350.0
   INSCRIBED BY TRAPEZOID
       -50.0      -70.0      290.0      350.0      290.0      350.0
    1 TRAPEZOIDAL SUBREGIONS ARE
    1  -50.0      -70.0      290.0      350.0      290.0      350.0


QUAKE TAPE CONTAINS   774 QUAKES, WITH DISTRIBUTION FUNCTION
      131    0    0    0    0    0    0    0    0    0
        0    0    0    0    0    0    0    0    0    0
        0    0    0    0    0    0    0    0    0    0
        0    0    1    1    1    5    2   17   18   32
       51   59   64   73   50   55   45   37   28   14
       14   12    9   10   10    6    5    1    2    0
        5    2    2    2    1    4    0    5    0    0
        0    0    0    0    0    0    0    0    0    0
        0    0    0    0    0    0    0    0    0    0
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(QSCAN2 printed output)

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50 QUAKES OUT OF 476 IN MAGNITUDE RANGE   4.0 TO  4.9
   1/63 -  186
   2/63 -  153 205 241 248 257
   3/63 -   23  44 126 142 244
   4/63 -  190 306 312
   5/63 -   11 151 224
   6/63 -  128 166 298
   7/63 -   98 165 181 244
   8/63 -  154 191 276
   9/63 -   46 228 257 359 380
  10/63 -   15  73 316 431 637 643 644
  11/63 -   45 170 260 263 314
  12/63 -   48 136 139 166 185 309

50 QUAKES OUT OF  69 IN MAGNITUDE RANGE   5.0 TO  5.9
   2/63 -   42 216 262
   3/63 -   38  64  91 279 281
   4/63 -   59 185 234 301 309
   5/63 -   59 124 187 190 193
   6/63 -   20  29  36 108 157
   7/63 -  127
   8/63 -   23  68 101 219 268
   9/63 -   68 117 197 325 360 407
  10/63 -   22  27  36  64 442 572 682
  11/63 -  313 374
  12/63 -   99 131 225 227 235 330
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