

AD618209

AFCRL-65-463

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

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Cambridge 39, Massachusetts

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

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 contiguously 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 $1, 2, \dots, M$.
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 $+90.0^{\circ}$, 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 $+360.0^{\circ}$, 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 form 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., $LNGHIW = LNGLOW = 0.0^\circ$, $LNGHIE = LNGHIW = 360.0^\circ$.

A single region is the region enclosed by any set of trapezoidal regions, associated with which set there is defined a circumscribing and an inscribing 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 9 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.

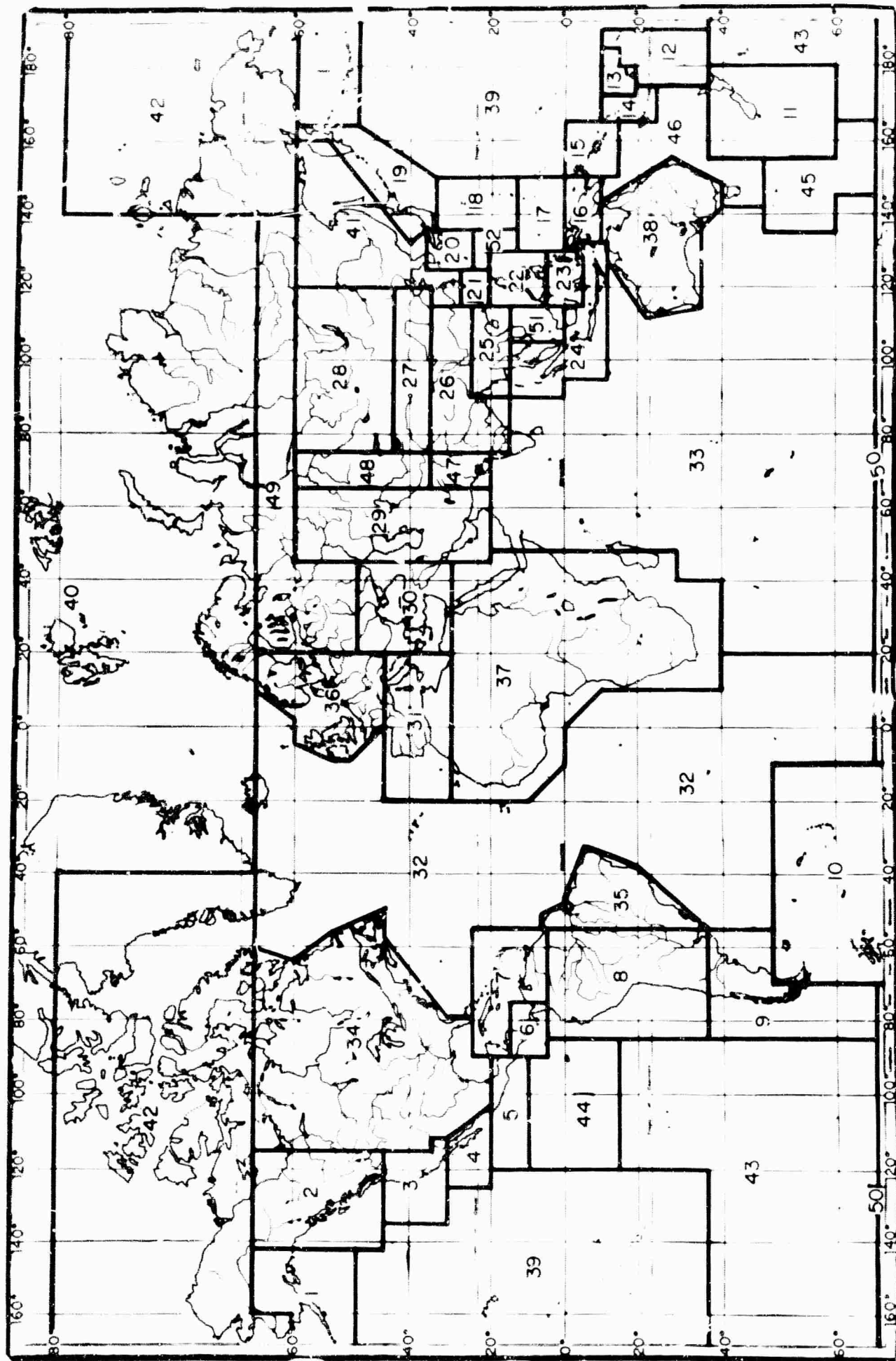


Figure 1. Gutenberg and Richter's Division of Earthquake Regions

THE GUTENBERG AND RICHTER DIVISION

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	LNGLHW	LNGLHE	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	LNGLHW	LNGLHE	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	LNGLHW	LNGLHE	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	LNGLHW	LNGLHE	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	LNGLHW	LNGLHE	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	LNGLHW	LNGLHE	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

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

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

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	25.0	125.0	136.0	125.0

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

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
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1 TRAPEZOIDAL SUBREGIONS ARE

1	21.0	05.0	115.0	130.0	115.0	130.0
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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
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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
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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
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3 TRAPEZOIDAL SUBREGIONS ARE

1	15.0	0.0	90.0	105.0	90.0	105.0
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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
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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
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1 TRAPEZOIDAL SUBREGIONS ARE

1	25.0	15.0	90.0	115.0	90.0	115.0
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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
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2 TRAPEZOIDAL SUBREGIONS ARE

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

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

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

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

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

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	296.0	362.0
2	60.0	54.5	296.0	355.0	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	212.0	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	LNGLH	LNGLIE	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	LNGLH	LNGLIE	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	294.0	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	350.0	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	409.0	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	112.0	155.5
4	-28.5	-36.0	112.0	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	223.0
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	-55.0	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	155.0
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	155.0
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	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	140.0
2	60.0	50.0	20.0	45.0	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	650.0
2	-70.0	-89.9	0.0	360.0	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	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	136.0
2	21.0	13.5	130.0	136.0	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, AF-CRL 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" division.

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.

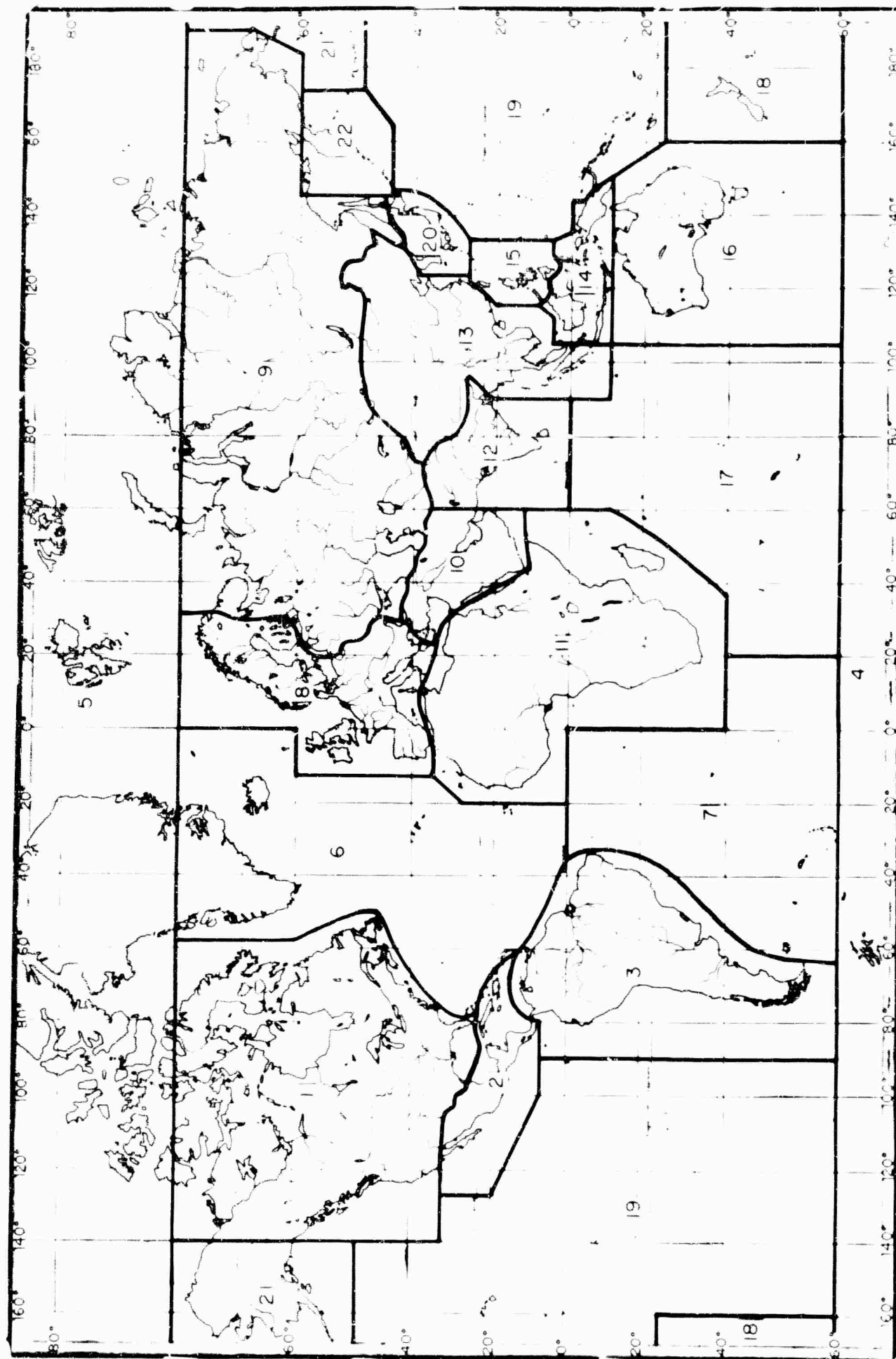


Figure 2. The T. I. 1960 Division of Earthquake Regions

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.1. 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.1. 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
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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.1. 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
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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.1. 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
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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	LNGLHI	LNGLIE	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	LNGLHI	LNGLIE	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.1. 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
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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.1. 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
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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.1. 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
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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

7.1. 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
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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.1. 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
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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.1. 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
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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.1. 1960 REGION NUMBER 017 INDIAN OCEAN
 CIRCUMSCRIBED BY TRAPEZOID
 LATHI LATLO LNGLHW LNGLHE LNGLW LNGLUE
 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.1. 1960 REGION NUMBER 018 NEW ZEALAND
 CIRCUMSCRIBED BY TRAPEZOID
 LATHI LATLO LNGLHW LNGLHE LNGLW LNGLUE
 -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.1. 1960 REGION NUMBER 019 PACIFIC OCEAN
 CIRCUMSCRIBED BY TRAPEZOID
 LATHI LATLO LNGLHW LNGLHE LNGLW LNGLUE
 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.1. 1960 REGION NUMBER 020 JAPAN AND KOREA
 CIRCUMSCRIBED BY TRAPEZOID
 LATHI LATLO LNGLHW LNGLHE LNGLW LNGLUE
 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 seismicity 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.

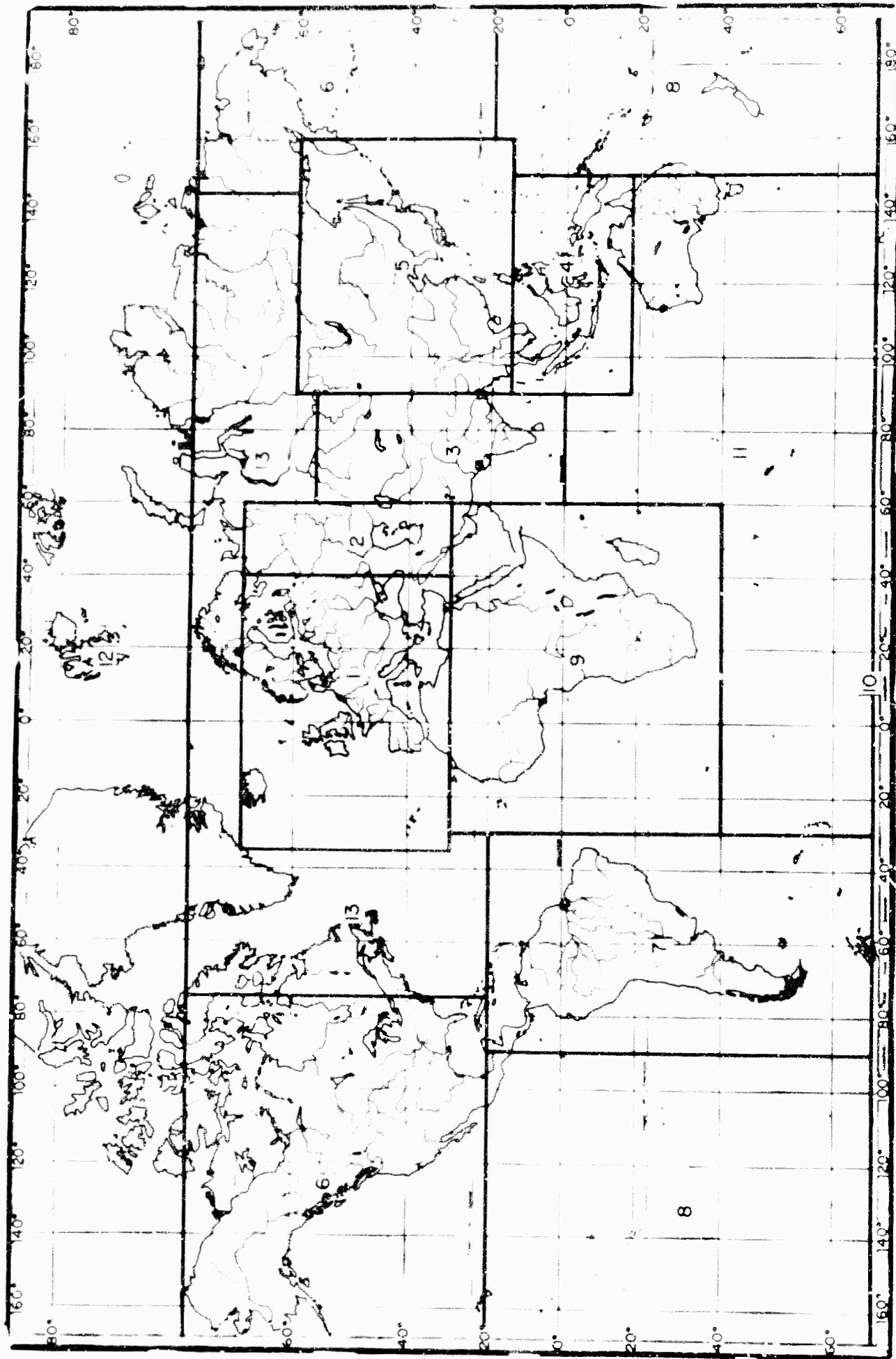


Figure 3. Schaeffner's Division of Earthquake Regions

THE SCHAEFFNER DIVISION

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
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1 TRAPEZOIDAL SUBREGIONS ARE

1	66.5	30.0	325.0	400.0	325.0	400.0
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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
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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
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1 TRAPEZOIDAL SUBREGIONS ARE

1	57.0	0.0	60.0	90.0	60.0	90.0
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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
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1 TRAPEZOIDAL SUBREGIONS ARE

1	15.0	-18.0	90.0	150.0	90.0	150.0
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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.

Outline of QSCAN1

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

*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. AFCL-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 function 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

RLO₁, RHI₁ 1=1...NMR defining the low and high ends of the magnitude ranges

NQ₁ 1=1...NMR defining the desired number of randomly sampled events in the 1-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_1 , and RHI_1 form

MQ_1 = 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 $1, 2, \dots, MQ_1$
 - b) save the first NQ_1 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_1 -th such event where k_1 is counted by QSCAN2 for each i ,
 - if k_1 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, GIVLOT, 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 QUAKE 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 GIVLOT)
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 QUAKE
C   IDAYLO = EARLIEST DAY ACCEPTABLE FOR SELECTED QUAKE
C   IYRLO = EARLIEST YEAR ACCEPTABLE FOR SELECTED QUAKE
C   IMOHI = LATEST MONTH ACCEPTABLE FOR SELECTED QUAKE
C   IDAYHI = LATEST DAY ACCEPTABLE FOR SELECTED QUAKE
C   IYRHI = LATEST YEAR ACCEPTABLE FOR SELECTED QUAKE
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 0000000001111111111222222222233333333334444444444555555555566666666...7
C 12345678901234567890123456789012345678901234567890123456...2
C XXXXXXXXXXXXXXXXXXXXXXXX REGION NUMBER NOR YYYYYYYYYYYYYYYYYYYY...Y
C CIRCUMSCRIBED BY TRAPEZOID
C   LATHI LATLO LNCHI LNCHIE 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 (13).
 YY...Y REPRESENTS 30 HOLLERITH CHARACTERS IN FORMAT (5A6)
 GIVING THE GEOGRAPHICAL LOCATION OF THE REGION.
 TRPCRC(I) I=1...6 IN FORMAT(5X6F10.2) DESIGNATES THE
 CIRCUMSCRIBING TRAPEZOID.
 TRPINC(I) I=1...6 IN FORMAT(5X6F10.2) DESIGNATES THE
 INSCRIBING TRAPEZOID.
 NSREG IN FORMAT(15) IS TOTAL NUMBER OF TRAPEZOIDS THAT
 ACTUALLY DEFINE THE REGION.
 TRPS(I,J) I=1...6, J=1...NSREG IN FORMAT(5X6F10.2) DESIGNATES
 THE TRAPEZOIDS THAT ACTUALLY DEFINE THE REGION.
 THE MAXIMUM TOTAL NO. OF TRAPEZOIDS FOR ALL REGIONS
 IS 1000.

TRPCRC, TRPINC, AND TRPS ARE MEASURED IN DEGREES, EAST
 LONGITUDE AND NORTH LATITUDE.

A QUAKE IS SELECTED ONLY IF IT FALLS ON OR WITHIN ALL
 REGION LIMITS, TIME LIMITS AND DEPTH LIMITS.

OUTPUTS ON SYSTEM OUTPUT TAPE

THE FIRST OUTPUT IS A COPY OF THE DATA CARD DECK, COLUMNS
 1 THRU 80 BEING COPIED INTO COLUMNS 2 THRU 81

THEN A PAGE RESTORE OCCURS AND THE NEW PAGE IS HEADED BY
 THE PHRASE - LISTING OF QUAKE CARDS SELECTED, PLUS TWO
 BLANK LINES

A LIST OF QUAKE CARDS SELECTED OCCURS NEXT, COLUMNS 1
 THRU 84 BEING COPIED INTO COLUMNS 2 THRU 85

A PAGE RESTORE OCCURS NEXT WITH A NEW HEADING -
 MAGNITUDE DISTRIBUTION FOR XXXXXX QUAKES SELECTED
 WHERE XXXXXX GIVES THE TOTAL COUNT OF SELECTIONS

THE DISTRIBUTION FUNCTION IS THEN PRINTED AS A MATRIX OF
 INTEGERS, WITH 10 COLUMNS AND 9 ROWS CORRESPONDING TO
 THE 90 MAGNITUDE RANGES 0.0,0.1, THRU 8.9, ARRAYED
 AS FOLLOWS

0.0	0.1	0.2	.	.	.	0.9
1.0	1.1					1.9
2.0						2.9
.						.
.						.
.						.
8.0	8.1	8.2	.	.	.	8.9

EACH INTEGER ELEMENT GIVING THE COUNT OF SELECTED
 EVENTS OF THE CORRESPONDING MAGNITUDE. EVENTS FOR
 WHICH THE MAGNITUDES ARE UNKNOWN ARE TREATED AS THOUGH
 THEY HAD MAGNITUDE ZERO.

OUTPUTS ON THE QSCAN1 OUTPUT TAPE (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,15,/,/(1X,1015))
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                  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 GIVIOY (ITPIN,ITPOUT)
      READ INPUT TAPE ITPIN, 10,  ITPOIN,ITPQOW,ITPNCH
10  FORMAT(315)
      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,IMOH1,IDAYH1,IYRH1,
1  DLO,DH1,NREGNS
20  FORMAT(/615/2F10.2/15)
      ITILO=XTIMEF(IYRLO,IMOLO,IDAYLO)
      ITIHI=XTIMEF(IYRH1,IMOH1,IDAYH1)
      JTRP(1)=1
      DO 30 I=1,NREGNS
      READ INPUT TAPE ITPIN,25,(TRPCRC(J,1),J=1,6),(TRPINS(J,1),J=1,6),

```

```

1 NSREG
25  FORMAT(///5X6F10.2//5X6F10.2/15)
    ITRP1=JTRP(1)
    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))
29  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,MAG
70  FORMAT(3I2,8X,F4.1,A1,F5.1,A1,F3.0,F3.1)
    CALL REREAD
    READ INPUT TAPE ITPQIN,46C,(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-ITIM1) 90,90,1000

```

```

90  CONTINUE
    NFILES=XMAXOF(0,12*(IYRLO-IYEAR)+IMOLO-1MONTH)
    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-ITIMI) 160,160,1000
C
C QUAKE IS WITHIN TIME LIMITS, NOW CHECK DEPTH LIMITS
C
160  IF (QDEPTH-CLO) 170,180,410
170  IF (QDEPTH-CHI) 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(1)
        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=XF!XF(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,15,/,/(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 16,16H QUAKES SELECTED//
1(1X10I5))
9999  REWIND ITPQOW
      CALL EXIT
      END

```


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.

SAMPLED EVENTS OCCURS. THE LIST IS IN TERMS OF THE YEAR, MONTH, AND SERIALIZATION NUMBERS OF THE EVENTS. IF THE REQUESTED NO. OF EVENTS IS LARGER THAN THE NO. AVAILABLE IN THE GIVEN RANGE, THEN ALL THE AVAILABLE EVENTS ARE LISTED.

OUTPUTS ON THE QSCAN2 OUTPUT TAPE
(BOTH FILES BCD)

```

FILE 1  CONTAINS
        A COPY OF THE  QSCAN2  DATA CARD DECK
        A COPY OF FILE 1 OF THE  QSCAN1  TAPE
        A COPY OF FILE 2 OF THE  QSCAN1  TAPE
FILE 2  CONTAINS ONE RECORD FOR EACH EVENT
        SELECTED BY  QSCAN2  IN THE ORDER OF THEIR
        SELECTION.  EACH RECORD CONTAINS  IORD, (CARD(I),I=1,14)
                IN FCRMAT (014,14A6)
        WHERE  CARD(I)  IS THE QUAKE CARD
                IORD  IS A COMPOSITE OF
                THE MAGNITUDE INDEX      BITS 5...10
                THE YEAR                  BITS 11...17
                THE MONTH                 BITS 18...21
                THE SERIALIZATION         BITS 22...35

```

OUTPUTS ON THE PUNCH TAPE
(NO OUTPUTS HERE IF ITPNCH=0)

ONE BCD FILE CONTAINING

- A COPY OF THE QSCA'2 DATA CARD DECK
- A COPY OF FILES 1 AND 2 OF THE QSCAN1 TAPE
- A COPY OF EACH OF THE CARDS SELECTED BY QSCAN2
IN THE ORDER OF THEIR SELECTION
- A COPY OF THE SELECTED EVENTS IN THE FORMAT USED ON
THE SYSTEM OUTPUT TAPE

C PROGRAM FOLLOWS BELOW

```

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 EOFSEY (0,EOF,ITAPE)
IF (EOF) 2,2,1
1 CALL DUMP
2 CONTINUE

```

C FIRST OUTPUT THE DATA DECK

```

CALL GIVIOT(ITP!NP,ITP!OUT)
READ INPUT TAPE ITP!NP,5, ITPQS2,ITP!NCH
5  FORMAT(2I5)
CALL CARIGE (ITP!OUT,-1)
WRITE OUTPUT TAPE ITP!OUT,10
WRITE OUTPUT TAPE ITPQS2,10

```

```

10  FORMAT(///51H THE DATA DECK FOR THIS RUN OF QSCAN2 FOLLOWS BELOW )
    CALL DACECK(ITPINP,ITPOUT)
    CALL DACECK(ITPINP,ITPQS2)
    IF (ITPNCH) 16,16,14
14  WRITE OUTPUT TAPE ITPNCH, 10
    CALL DACECK (ITPINP,ITPNCH)
16  CONTINUE
C
C THEN ACQUIRE THE DATA
C
    READ INPUT TAPE ITPINP,20,ITPQS1,ITPRD,
      1  NDSKIP,NRANGE,(RANMAG(1,1),RANMAG(1,2),NQSDS(1),I=1,NRANGE)
20  FORMAT(/315/15/(2F5.),15))
C
C REWIND ITPQS1 AND OUTPUT THE DATA DECK USED IN FORMING 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 DACECK (ITPQS1,ITPNCH)
26  CONTINUE
30  FORMAT(///60H THE FIRST FILE OF THE QUAKE TAPE FOR THIS RUN FOLLOW
    IS BELOW )
    CALL DACECK(ITPQS1,ITPOUT)
    CALL CPYFL2(ITPQS1-ITPQS2,25,1.,SPACE,1ANS)
C
C ACQUIRE NQSTOT, MAGDIS(1..J90) FROM SECOND FILE OF ITPQS1 AND
C OUTPUT IT
C
    READ INPUT TAPE ITPQS1,40,NQSTOT,(MAGDIS(1),I=1,90)
40  FORMAT(29X16//11X1015))
    WRITE OUTPUT TAPE ITPOUT,50,NQSTOT,(MAGDIS(1),I=1,90)
    WRITE OUTPUT TAPE ITPQS2,50,NQSTOT,(MAGDIS(1),I=1,90)
    IF (ITPNCH) 46,46,44
44  WRITE OUTPUT TAPE ITPNCH,50,NQSTOT,(MAGDIS(1),I=1,90)
46  CONTINUE
50  FORMAT(///21H QUAKE TAPE CONTAINS ,15,35H QUAKE, WITH DISTRIBUTIO
    IN FUNCTION ,/,15X,1015))
    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,1ANS(1))
    IF (1ANS(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=FLCATF(IXR-1)/10.0
    DO 90 IXR2=1,NRANGE

```

```

      ITEM=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(ITEM)=NEWDIS(ITEM)+MAGDIS(IXR)
100   CONTINUE

C
C NEXT WE HAVE TO SET UP THE SHUFFLED INDEX TABLE IXTABL
C       IXTABL(1...NQSDIS(IXR),IXR)  IXR=1...NRANGE
C
C DEFINE A "TAPE INDEX WITH RESPECT TO A MAGNITUDE RANGE" AS THE
C   CRDCKING INDEX WITHIN A MAGNITUDE RANGE OF QUAKE 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...NQSDIS(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 NQSDIS(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=NQSDIS(IXR)
        IF (NITEMS-NWANT) 200,210,220
200     NWANT=NITEMS
        NQSDIS(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 QUAKE
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 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      CMAG = 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,CMAG,INO
      310 FORMAT(12,2X12,22XF3.1,49X14)
          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 (CMAG-RANMAG(IXR,1)) 340,350,330
      330 IF (CMAG-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-NQSDCS(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, IMC, 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(012,14A6)
          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,NQSDS(IXMAG),NEWDIS(IXMAG),
    1 RANMAG(IXMAG,1),RANMAG(IXMAG,2)
    IF (ITPNCH) 516,516,514
514  WRITE OUTPUT TAPE ITPNCH,520,NQSDS(IXMAG),NEWDIS(IXMAG),
    1 RANMAG(IXMAG,1),RANMAG(IXMAG,2)
516  CONTINUE
520  FORMAT(/1X,13,15H QUAKES CUT OF 13,20H IN MAGNITUDE RANGE F5.1,
    1 3H TO,F5.1)
C
C INNER LOOP STARTS
C
    NQS=NQSDS(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, IMO
C
    ITEMP1=IXTABLE(IXQ,IXMAG)
    IMO=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
    INDV(NNOS)=IMO
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,12,1H/,12,3H - ,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(3X14HGETRO1 IANS = I3)
9999 CONTINUE
      CALL EXIT
      END

```



```

•
•   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
•           MTR      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 XLCTOP (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
•

```

```

TRYNS 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 SWCHSID,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 SWCHSID,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
*
      KDI 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-77 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)

```

INPLTS

```

•   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.
      LSAGE      -      DO 10 I=1,8
      GZFR1(1)=WCHSIDF(XT1,YT1,X1,Y1,X2(1),Y2(1))
      GZFR2(1)=WCHSIDF(XT2,YT2,X1,Y1,X2(1),Y2(1))
      10 GZFR3(1)=WCHSIDF(XT3,YT3,X1,Y1,X2(1),Y2(1))

      CPUTPUTS - 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. LSAGE      -      GZFR1 = WCHSIDF(2.,0.,1.,1.,1.,1.)
      GZFR2 = WCHSIDF(0.,2.,1.,1.,1.,1.)
      GZFR3 = WCHSIDF(1.,1.,1.,1.,1.,1.)
      CPUTPUTS - GZFR1 = G  GZFR2 = L  GZFR3 = Z
      =
      PROGRAM FOLLOWS BELOW
      =
      NC 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
      STJ      Y2MY1
      CLA      32763      Y2
      FSB      32765      X2-X1
      STO      X2MX1
      LDC      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
      FSR      Y
      LDC      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      GIVLOT (SUBROUTINE)
C      LABEL
CGIVLOT
C
      SUBROUTINE GIVLOT(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
*           LUQ*    3,4          TL2
*           TLQ      FSB
*           XCA
*   FSB      FSB      K360          BIGGEST MINUS 360
*           LDQ*    1,4          CLONG TO MQ
*
*   SET QLNG = QLONG IF AC 0.0 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      360          CLONG + 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 CIRCUMFERENTIAL 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 LNGLHW LNGLHE LNGLW 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 LNGLHW LNGLHE LNGLW 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 LNGLHW LNGLHE LNGLW 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 LNGLHW LNGLHE LNGLW 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 LNGLHW LNGLHE LNGLW 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 LNGLHW LNGLHE LNGLW 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

(QSCAN1 printed output)

LISTING OF QUAKE CARDS SELECTED

010163125021.7 7.4N 74.1W 53	COLOMBIA.	3
010163233905.656.6N157.7W 506.5	PALASKA 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 70.4W 42	NEAR COAST OF CENTRAL CHILE.	95
011563135028.311.5N 97.8W 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 334.7	PBAJA CALIFORNIA.	186
012863130050.754.7N161.6W 336.3	PALASKA 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 336.5	P SANDWICH 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
020263120936.938.0N122.8W 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
020463122838.1 5.1N 82.4W 45	SOUTH OF PANAMA.	27
020563071930.059.4N156.4W 33	ALASKA.	35
020563120820.653.1N165.4W 33	FOX IS., ALEUTIAN IS.	37
020563174938. 14.2N 94.0W 23	OFF COAST OF CHIAPAS, MEXICO.	39
020563203921.638.4S 73.2W 416.4	PNEAR COAST OF CENTRAL CHILE.	41
020663012129.038.4S 73.6W 335.4	LNEAR COAST OF CENTRAL CHILE.	42
020663061339. 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	334.5C	ANDREANOF IS., ALEUTIAN IS.	77
021063050234. 7.8N 83.4W	334.0C	SOUTH OF PANAMA.	84
021063051040. 54.1N166.5W	334.1C	FOX IS., ALEUTIAN IS.	85
021263084337.919.0N107.4W	334.4C	REVILLA GIGEDO IS. REGION.	102
021263150946.051.5N177.9W	333.7C	ANDREANOF IS., ALEUTIAN IS.	103
021463083159.5 8.2N 82.5W	334.2C	SOUTH OF PANAMA.	118
021463085936.511.2N 61.3W	334.0C	NEAR NORTH COAST OF TRINIDAD.	119
021663213222.4 8.5S 80.1W	334.8C	OFF COAST OF PERU.	153
021763035041.217.2N100.8W	334.1C	GUERRERO, MEXICO.	157
021963163915.155.3S 78.0W	33	SANDWICH IS. REGION.	180
022063143207.751.9N177.9E	334.7C	CRAT IS., ALEUTIAN IS.	188
022063170732.545.7S 78.7W	334.6C	OFF COAST OF SOUTHERN CHILE.	191
022163120119.140.4N125.0W	33	NEAR COAST OF NORTHERN CALIFORNIA.	195
022163234234.712.7N 94.9W	334.3C	NICARAGUA.	205
022263211406.118.1N 71.3W	305.5C	NEAR SOUTH COAST OF DOMINICAN REPUBLIC.	216
022263131957.758.8N137.2W	334.1C	NEAR COAST OF SOUTHEASTERN ALASKA.	218
022363070237.944.8S 76.1W	334.9C	NEAR COAST OF SOUTHERN CHILE.	220
022463003701. 32.2S 68.5W	334.3C	MENDOZA PROVINCE, ARGENTINA.	222
022463232935.953.6N164.3W	334.3C	FOX IS., ALEUTIAN IS.	232
022563080820.128.1S 65.4W	325.3C	SAN LUIS PROVINCE, ARGENTINA.	238
022561085840.812.2N 88.2W	334.2C	OFF COAST OF EL SALVADOR.	239
022563155434.862.5N150.1W	334.1C	ALASKA.	241
022663163013. 12.4N 87.4W	334.2C	NEAR COAST OF NICARAGUA.	246
022663232319.539.1S 75.1W	334.7C	NEAR COAST OF SOUTHERN CHILE.	250
022763160111.216.9N100.5W	334.5C	OFF COAST OF GUERRERO, MEXICO.	257
022763211132.5 5.6S 79.3W	33	NORTHERN PERU.	260
022763233620.454.8N161.6W	335.3C	ALASKA PENINSULA.	267
030163002557.434.8N119.3W	164.8P	VENTURA COUNTY, CALIFORNIA.	1
030163040234.115.6N 93.1W	334.3C	CHIAPAS, MEXICO.	3
030263220917. 14.8N 94.0W	334.1C	OFF COAST OF CHIAPAS, MEXICO.	23
030463154304.0 4.5S 81.6W	335.4C	OFF COAST OF NORTHERN PERU.	38
030463183151.915.7S 75.3W	454.9C	NEAR COAST OF SOUTHERN PERU.	39
030563024829.911.0N 90.4W	334.1C	SOUTH OF GUATEMALA.	44
030563070501.7 4.5S 81.5W	315.6C	OFF COAST OF NORTHERN PERU.	46
030763121628.544.3S 75.3W	455.6C	NEAR COAST OF SOUTHERN CHILE.	64
030763134301.250.8N178.6E	334.1C	CRAT IS., ALEUTIAN IS.	66
030763235325.844.8N123.4W	334.6C	NORTHWESTERN OREGON.	68
030863222626. 9.0N 84.1W	33	NEAR WEST COAST OF COSTA RICA.	78
031063012604.156.2N153.8W	335.1C	KODIAK ISLAND, ALASKA.	91
031063060433. 14.2N 89.5W	334.3C	NEAR COAST OF EL SALVADOR.	94
031063114029. 38.4N127.2W	706.1P	NEAR COAST OF CENTRAL CHILE.	97
031063114029. 38.4N127.2W	33	OFF COAST OF NORTHERN CALIFORNIA.	99
031163150007.617.6N100.8W	334.8C	GUERRERO, MEXICO.	110
031363103919.119.5N 69.5W	334.1C	DOMINICAN REPUBLIC.	121
031463181319.153.0N164.9W	334.6C	FOX IS., ALEUTIAN IS.	126
031763061852.4 7.1N 62.2W	534.6C	SOUTH OF PANAMA.	142
031963141318.127.0N115.0W	334.1C	BAJA CALIFORNIA.	160
032163181922.750.6N129.4W	334.0C	VANCOUVER ISLAND REGION.	181
032263014425.819.3N 67.0W	394.3C	MONA PASSAGE.	183
032463022449.251.6N173.3W	554.7C	ANDREANOF IS., ALEUTIAN IS.	203
032463203056. 17.0N 99.6W	333.6C	NEAR COAST OF GUERRERO, MEXICO.	212
032463213524.451.8N178.1W	576.0P	ANDREANOF IS., ALEUTIAN IS.	213
032563023947.952.2N171.2W	443.4C	ANDREANOF IS., ALEUTIAN IS.	214
032663182308.351.3N178.8E	504.4C	CRAT IS., ALEUTIAN IS.	230
032763023151.5 6.8N 73.8W	33	COLOMBIA.	235
032763091143.751.1N130.1W	233.5C	QUEEN CHARLOTTE IS.	240
032763211901.251.2N172.1W	334.2C	ANDREANOF IS., ALEUTIAN IS.	244
032863062716.040.9S 84.2W	334.5C	OFF COAST OF CHILE.	251
032863002331.855.4N166.0E	334.1C	CHAMORRUE IS.	258
032863051222. 13.8N 91.8W	334.5C	GUATEMALA.	261

(QSCAN1 printed output)

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
033163041600.8 6.5S 81.1W	335.2CNEAR COAST OF SOUTHERN PERU.	279
033163055100.910.7S 78.5W	335.0CNEAR COAST OF PERU.	281
023163153325.353.1N167.2W	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
040663234020.820.0N109.3W	444.3COFF WEST COAST OF MEXICO.	68
040963122057.934.6S 76.2W	334.6COFF COAST OF CHILE.	93
041063082930. 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 70.2W	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	74.7CCENTRAL 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	644.6CANDREANOF 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
050363011444.437.7N110.8W	154.2PMONO COUNTY, CALIFORNIA.	11
050463044118.9 4.7N 73.8W	434.0CCOLOMBIA.	16
050463055604.151.8N175.4W	695.5CANDREANOF IS., ALEUTIAN IS.	17

(QSCAN1 printed output, 9 pages omitted)

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, ARGENTINA.	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 252.017.0N108.4W 333.7COFF COAST OF JALISCO, MEXICO.	298
12266321111.1.951.2N169.6W 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 7CGUATEMALA.	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 34128.0'8.8N106.2W 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
123163125'58.063.7N146.0W 333.8CCENTRAL ALASKA.	372
123163173732.156.5S 26.0W 306.3CSANDWICH IS.	374
123163214143.016.6N 99.0W 334.3CGUERRERO, MEXICO.	377

(QSCAN1 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)

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
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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

(OSCAN2 printed output)

CIRCUMSCRIBED BY TRAPEZOID
 LATHI LATLO LNGLHW LNGLHE LNGLW LNGLJE
 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 LNGLHW LNGLHE LNGLW LNGLJE
 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 LNGLHW LNGLHE LNGLW LNGLJE
 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 LNGLHW LNGLHE LNGLW LNGLJE
 -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 LNGLHW LNGLHE LNGLW LNGLJE
 -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	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	

(QSCAN2 printed output)

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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