Seismicity of the State of Puebla, Mexico, 1986-1989

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Received: June 22, 1994; accepted: February 15, 1995.

RESUMEN

En este trabajo se presenta un análisis de la actividad sísmica del estado de Puebla y sus inmediaciones, registrada durante el periodo de enero 1986 a agosto de 1989 por la Red Sísmica del Estado de Puebla (RESEP), perteneciente a la Universidad Autónoma de Puebla (UAP). La localización epicentral de los eventos fue determinada mediante la aplicación de los programas HYPO71PC y HYPOCENT. Se calcularon los errores teóricos en la localización de eventos mediante el programa HYPOERR los cuales coinciden con los errores estimados en las localizaciones. El análisis de los 350 eventos localizados con un residual cuadrático menor de 2, muestra que la mayoría de eventos tienen una profundidad menor de 50 km con excepción de la región sur de la zona de estudio, en la cual ocurren también sismos con profundidades mayores de 50 km. Estos últimos parecen estar asociados al contacto entre la litosfera oceánica y la continental que corresponden a las placas de Cocos y Norteamericana, respectivamente. El 92% de los eventos estudiados tiene una magnitud de coda entre 2 y 4, aunque es im-portante resaltar que en el área de estudio se han registrado eventos con magnitud mayor de 7.0.

PALABRAS CLAVE: Sismicidad, hipocentro, magnitud, estado de Puebla.

ABSTRACT

The seismic activity in the State of Puebla, Mexico and its surroundings, between January 1986 and August 1989, is discussed using data from the seismic network of the University of Puebla. The hypocentral locations were obtained using the programs HYPO71PC and HYPOCENT. The calculated theoretical errors using the program HYPOERR coincide with the estimated errors from the location procedure. A total of 350 earthquakes were located with rms less to 2. Most of the hypocenters are at depths less than 50 km, with the exception of the southern region, where events deeper than 50 km are found. These deeper events are probably associated with the contact between the oceanic and continental lithospheres, which correspond to the Cocos and North American plates. 92% of the events have coda magnitude between 2 and 4, although events with magnitudes greater than 7 have occurred in this region.

KEY WORDS: Seismicity, hypocenter, magnitud, Puebla State.

INTRODUCTION

Studies of the seismic activity in a region contribute to the determination of seismogenic zones and the elaboration of seismic zonation maps for engineering and disaster management purposes (Gutiérrez *et al*, 1991). The State of Puebla is located in a region with intermediate depth seismicity, as in the Orizaba earthquake of 1973 (M=7.3) and the October 24, 1980 Huajuapan de León earthquake (M=7.0), (González-Ruiz, J., 1986). The State is also located relatively close (\approx 350 km) to other zones of major seismic activity in south-east Mexico (Figure 1). The State of Puebla has four major urban centers, including the state capital, with a strong population, economic and industrial growth.

The State of Puebla is located between 17.8° and 20.8°N, and between 96.0° and 99.7°W. To the north and to the east, it shares boundaries with the State of Veracruz. The Sierra Norte de Puebla is a continuation of the Sierra Madre Oriental, the Cofre de Perote mountain, the Derrumbadas mountain zone and the Citlaltépetl volcano. To the south, the State borders with the States of Guerrero and

Oaxaca where we find the Sierra Negra, the Mixteca Poblana and the continuation of the Sierra Madre Occidental in the Sierra Madre del Sur, its most important feature is the Tehuacán fault. To the west it borders with the States of Morelos and Mexico, where the Popocatépetl and Iztaccihuatl strato-volcanoes are located, and with the States of Tlaxcala and Hidalgo where the Malintzi volcano is situated (Figure 2). The State is traversed by five lower Miocene fault systems (Mooser, 1972); the more important ones are Popocatépetl-Chignahuapan, Malintzi and Atoyac-Minas. The seismic activity in the region may be due to tectonic movements or to volcanism.

An early seismic study of the State of Puebla and its sourroundings is by Figueroa (1974). His catalog covered from 1523 to October of 1973, including historic investigations of major earthquakes up to 1910, plus instrumental earthquakes with magnitudes greater than 3 from 1911 to October 1973. He reports a total of 231 earthquakes; 108 historical events and 123 instrumental earthquakes.

Gómez and González-Pomposo (1983), report 104 earthquakes of all magnitudes from 1976 to February 1983.

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Fig. 1. Location map of the study area.

Thus all previous studies report only 227 earthquakes between 1911 and February 1983. This small number may be attributed mainly to the lack of seismic instrumentation in the region.

On November 29, 1985 the Seismic Network of the State of Puebla (RESEP) began operation. Initially RESEP had three seismic stations, in Chiautla de Tapia (CHP), Molcaxac (MOP) and Cuyoaco (CUP) (Serrano and González-Pomposo, 1985). In 1986 a station was added in Coxcatlán (CXP). In 1987 RESEP installed three more stations in Chila de las Flores (CIP), Ciudad Universitaria (UAP) and Xalitzintla (XLP) (González-Pomposo *et al.*, 1987). These seven seismic stations operated through

August 1989 (Figure 3). The geographical coordinates of the RESEP stations, and of supporting stations belonging to SISMEX (IIT, IIS, IIA, IIC, III), plus those belonging to the National Seismic Network, (VHO, OXM, LVM and TPM) are shown in Table 1. All together, these stations provide a wide coverage and adequate control of hypocentral determinations in the region of interest.

INSTRUMENTATION

The equipment used in the RESEP stations was analogic, one-component Vertical and with smoke paper recording. Each station had a Ranger SS-1 seismometer



Fig. 2. Orography of State of Puebla.

with a natural period of 1 sec, with an MEQ-800-B seismograph, and a UTC radio time receiver in the 5, 10 and 15 MHZ frequency band. The housing for the equipment was designed at the School of Civil Engineering, and the power systems were built at the Department of Electronic Maintenance of the School of Physics and Mathematics, also of the University of Puebla. The stations CHP, CUP, CIP, and XLP, are on bedrock, while for stations MOP, UAP, and CXP are on a one cubic-meter concrete piers due to poorly consolidated ground. The seismic stations were visited once a week for recollection of data and for maintenance up to 1989 (Serrano and González-Pomposo, 1985).



Table 1

Coordenates of stations of RESEP

NAME	Code	Lat. N	Log. W A	Altitude (m)
Chiautla de Tapia, Pue.	CHP	18.298	98.613	1030
Chila de las Flores, Puebla.	CIP	17.963	97.854	1765
Cuyoaco, Puebla.	CUP	19.603	97.619	2450
Coxcatlán, Puebla.	CXP	18.274	97.142	1280
Molcaxac, Puebla.	MOP	18.733	97.917	1840
Ciudad Universitaria, Pue.	UAP	19.001	98.203	2114
Xalitzintla, Puebla.	XLP	19.079	98.521	2600

Coordenates of station of SSN and SIXMEX

NAME	Code	Lat. N	Log. W	Altitude (m)
Alzomoni, Edo. de México.	IIA	19.143	98.655	3900
Santa Rita Coyotepec	IIC	19.757	99.258	2725
Iguala, Guerrero	Ш	18.376	99.468	1750
Ciudad Serdán, Puebla.	IIS	18.986	97.372	
Tonanzintla, Puebla.	IIT	19.021	98.308	2205
Laguna Verde, Veracruz	LVM	19.613	96.395	160
Oxotitlán, Edo. de México.	OXM	19.296	99.688	2700
Tepoztlán, Morelos.	TPM	18.983	99.061	1500
Observatorio, Oaxaca Oax.	VHO	17.079	96.732	1685

DATA PROCESSING

Locations of event were evaluated with the program HYPOERR (Lienert *et al.*, 1986). This program provides uncertainties estimated for a specific station distribution with a given layered model. It calculates vertical and horizontal uncertainties in hypocentral locations, as well as origin-time uncertainties. An analysis was carried on with all 16 stations in Table 1 to determine the precision in origin time, latitude, longitude and depth determination for events located within the region 96.2 to $99.2^{\circ}W$ and 17.3° to $21.0^{\circ}N$, and 0 to 60 km depth at 10 km intervals.

The data collected by RESEP were processed as follows. First, the arrival times for the P and S waves (T_p and T_s) were read as well as they characteristics, the signal duration, and maximum amplitud of each record. We applied the criteria that the seismic events should have a $\Delta t = T_s$ - T_p of less than 20 seconds at three stations for the event to be included as belonging to the region. Records from SISMEX and SSN stations were included. If the s-p difference was larger, the readings were sent to SSN to be used in the location of regional events.

The events were then located using the computer location program HYPO71 (Lee and Stewart, 1975). This program calculates in an iterative way the hypocentral parameters. The program uses an analytic expression of first arrival travel times in a flat layered model using non-linear least squares. For the hypocentral determinations we also used HYPO-PC (Lee and Valdés, 1985). This program was tested with more than 20 stations and with a seismic model of up to 10 flat layers. In order to improve the hypocentral determination, we also used HYPOCENTER (Linert *et al.*, 1986) with the seismic model in Table 2.

Table 2

Layered velocity model								
	Thickness (km)	Velocity (km/s)						
	0 - 5	5.00						
	5 - 20	6.10						
	20 - 25	6.95						
	25 - 45	7.60						
	45 - 00	8.10						

The flat layer model used in the present study (Table 2) is in agreement with the one proposed by Valdés *et al.* (1986). This model was constructed by P-wave ray-tracing in two dimensions. The seismic profile was oriented north-south across the central part of the region of study. The explosions were located in Lake Alchichica, north of the city of Puebla, and off the Coast of the Pacific Ocean. This model provided hypocentral determinations with the smallest residuals. In comparison with the layer models from SISMEX, SSN and RESMAC the hypocentral locations were less scattered and had lower residuals. Layered seismic models based on other seismic profiles (Nuñez-Cornú, 1988; Singh and Pardo, 1993) were also tested, but found to be inadequate.

Coda magnitudes were computed after Havskov and Macías (1982)

$$Mc = 0.09 + 1.85 \log(Z) + 0.0004(D),$$



Fig. 4. Origin time (error in sec.).

where Z is the signal duration in seconds and D is the epicentral distance in km.

RESULTS

The results for the evaluation of the seismic network using the program HYPOERR at a depth of 30 km, shows that for the central region (~98.5° to 99.5°W and 18.5° to 19.5°N) the origin time error is less that 0.11 seconds. For the outer area the error is up to 0.23 seconds (Figure 4). The uncertainties in the latitude and longitude determination at a depth of 30 km and for the same regions values of 1.4 km and 3.5 km were calculated, respectively. In the case of the depth uncertainty, the values obtained were 1.4 km and 1.8 km for the same regions as before (Figure 5).

The maximum errors found in hypocentral determination for the central region was 1 to 3 km error in the depth calculation, and 9 to 11 km error for the outer region. The origin time errors were in the range of 0.3 to 0.4 seconds. Larger estimated errors in the north region are due to the sparse network coverage. The south region has the highest seismic activity. The evaluation of the uncertainty in the hypocenter parameter determination indicates an acceptable error range.

Figure 6 shows the seismic events located with the program HYPOCENT, as well as their errors in the latitude and longitude estimation. These errors disagree with those calculated by HYPOERR, because not all 16 stations used in HYPOERR recorded P and S waves arrivals for all events. There were a total of 580 of events registered by RESEP between January 1986 and August 1989. From these, only 350 (60 %) have an RMS error smaller than 2

seconds in origin time. Table 3 shows the hypocentral parameters.

Among 350 events, 43% had magnitudes between 2 and 3, 49% between 3 and 4, 8% between 4 and 5, and only one event greater than 5. This events is on the edge of the region of study. Figure 7 shows the magnitude vs number of events distribution. The catalog appears to be complete for magnitudes between 1.5 and 3.3. The b value estimated is 1, which is the expected value for shallow tectonic events (Bullen and Bolt, 1993).

Figure 8 shows a histogram of the monthly seismicity for the period of time studied. We observe an increment of seismicity starting in June, 1986 and reaching a peak in June, 1988, then a decrease until August 1989 when the network stopped operation. The months with hihg activity are: June, 1986 (17 events); January, 1988 (16 events), June, 1988 (28 events), September, 1988 (17 events), February 1989, (19 events) and March, 1989 (15 events).

Between 96° and 100°W and 17° and 18.5°N, we located 241 earthquakes (69%). This corresponds to the Chiautla, Tehuacán, Acatlan, border of Puebla-Guerrero and Puebla-Oaxaca active regions. Thus the seismicity of the State of Puebla is concentrated in the South region. In the Central zone (18.5° to 20° N) only 26% of the events are located; this includes the regions of Zacatlán, Atlixco, Puebla City, Serdán and the border between Puebla-Veracruz, a region of moderate seismic activity. At the borders of the States of Tlaxcala-Mexico-Hidalgo (98.3° to 99.1°W and 19.4° to 20°N), only 18 events were located, 11 during May, 1986. They are probably associated with the Tlaloc-Actopan fault system. In the region know as Derrumbadas, close to

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Table 3

Table 3 (Cont.)

b b c b c	no	Date	Hr: Min	Sec	Lat N	Log W	Depth	Mag	rms		no	Date	Hr: Min	Sec	Lat N	Log W	Depth	Mag	rms
2 880108 1220 55.15 17.9570 97.0412 24 3.7 0.6 71 870400 529 24.88 18.7.9445 99.6603 73 3.1 3.3 4 86010 917 25.66 15.65 93.6148 73 5.0 73 870406 529 24.88 18.3498 99.6603 73 1.0	1	860104	1538	16.00	19.6053	99.0142	37	4.2	1.3		70	870326	1029	56.43	17.8025	98.1123	37	3.8	1.3
3 800109 3.29 3.80 1.77 72 870403 522 4.38 1.9445 99.4607 50. 1.2 1.8 1.12 98.4532 1.12 1.12 98.4532 1.12 1.12 98.4532 1.12 1.12 98.4532 1.12 1.12 98.4532 1.12 1.12 98.4532 1.12 98.4532 1.12 98.4532 1.12 98.4532 1.1 1.0 7.7 87.010 1.0 1.0 1.0 7.7 87.010 1.0 1.0 1.0 7.8 87.0422 1.11 1.0 1.0 7.8 7.0422 1.11 1.0 1.0 7.7 87.0425 1.0 7.8 7.0421 1.0 1.0 1.1 1.0 1.0 1.1 8.8 7.03 1.1 8.8 7.03 1.2 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0	2	860108	1220	35.15	17.9550	99.0412	24	3.7	0.6		71	870401	616	9.46	18.0305	99.6802	22	4.0	1.2
* *	3	860109	329	58.02	18.7260	99.3515	37	3.9	1.7		72	870403	529	24.88	17.9445	99.6653	37	3.3	1.3
6 80220 2034 51.78 18.122 63.017 41 49 17 725 870416 524 93.84 17.7745 98.3342 31 17.775 860329 107 22.33 18.0110 100.0128 37 39 1.4 77 870422 1841 10.5631 97.8033 98.3342 37 39 1.9 860302 22.2 42.28 18.110 100.0128 37 3.9 1.9 78 870423 130 12.89 18.0065 98.000 37 4.7 0.7 18 1.0 88 87051 12.89 18.0065 99.5918 37 1.9 18 877069 86.03 1.7 17.0900 97.9117 1.2 2.8 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.1 1.0 1.0 1.0 1.1 1.0 1.0 1.1 1.0 1.1 1.0 1.1 1.0 1.1 1.0 </td <td>5</td> <td>860210</td> <td>1913</td> <td>28.00</td> <td>18.0158</td> <td>98.6148</td> <td>37 16</td> <td>3.5</td> <td>0.6</td> <td></td> <td>73 74</td> <td>870406</td> <td>523</td> <td>43.84</td> <td>18.5498</td> <td>99.4697</td> <td>50</td> <td>4.2</td> <td>1.1</td>	5	860210	1913	28.00	18.0158	98.6148	37 16	3.5	0.6		73 74	870406	523	43.84	18.5498	99.4697	50	4.2	1.1
7 860320 1012 34.07 19.3457 27 31. 17. 8 860320 2322 42.81 81.110 100.1283 39. 14. 77 870424 87 35.93 17.848 98.833 37 28. 0.31 15. 9 860320 2322 2328 18.110 100.3603 14 0.17 78 870424 87 35.91 78.83 0.33 17.8 14 860509 0.43 19.7905 88.6422 27 3.6 1.4 88 870510 2328 50.27 73.5 19.4 88 17.6 17.8	6	860220	2054	51.78	18.1322	96.3017	41	4.9	1.7		75	870410	524	59.84	17.7740	99.0977	21	3.2	0.4
8 88 0107 26.35 18.0110 100.0128 37 39 1.4 77 870422 18.1 16.06 17.0712 97.608 40 1.1 15. 10 860308 18.44 30.25 19.6685 86.472 30 40 1.9 78 870424 87 55.30 77.673 32 31 1.4 860308 2404 4.87 19.5988 86.672 37 3.5 1.9 88 870509 66 6.41 18.3689 90.0360 37 3.8 1.4 860510 1645 55.79 1.6767 86.622 37 3.7 1.4 87 870512 1.43 1.0 3.8 3.0 3.8 870513 4.8 770511 47.7 72.0 98.1812 47 1.0 1.3 1.4 870512 1.44 1.0 1.4 1.0 1.4 1.0 1.3 1.4 1.0 1.4 1.0 1.0	7	860320	1012	34.07	19.3457	97.6137	20	3.4	1.7		76	870418	830	42.89	19.5335	98.3342	37	3.1	0.7
9 90002 222 222 222 118 <td>8</td> <td>860329</td> <td>10 7</td> <td>26.35</td> <td>18.0110</td> <td>100.0128</td> <td>37</td> <td>3.9</td> <td>1.4</td> <td></td> <td>77</td> <td>870422</td> <td>1841</td> <td>16.06</td> <td>17.0712</td> <td>97.6508</td> <td>40</td> <td>3.1</td> <td>1.5</td>	8	860329	10 7	26.35	18.0110	100.0128	37	3.9	1.4		77	870422	1841	16.06	17.0712	97.6508	40	3.1	1.5
101 102 103 103 103 103 104 103 104 103 104 103 <td>9</td> <td>860502</td> <td>2322</td> <td>49.28</td> <td>18./183</td> <td>100.3603</td> <td>41</td> <td>4.0</td> <td>1.7</td> <td></td> <td>78 70</td> <td>870424</td> <td>87</td> <td>35.93</td> <td>17.8638</td> <td>97.8013</td> <td>37</td> <td>2.8</td> <td>0.3</td>	9	860502	2322	49.28	18./183	100.3603	41	4.0	1.7		78 70	870424	87	35.93	17.8638	97.8013	37	2.8	0.3
12 860508 1940 2.13 10.84728 37 3.2 1.6 81 8770508 76 6.41 8843 90.5080 37 3.5 1.4 13 860509 0.44 39.41 19.7687 98.6623 37 3.5 1.5 88 880510 1645 35.77 97.733 2.3 7.1 1.8 870513 48 47.961 3.919 97.917 97.4115 25 3.4 0.6 860511 1014 2.010 18.80507 98.6632 24 1.2 0.87 870617 43 3.939 18.143 97.615 37 2.4 0.6 18 860511 1024 5.56 19.6738 87.062 2.4 1.90 870612 1014 4.391 1.8141 97.615 37 2.8 0.8 10 860511 1054 5.671 9.6732 37 3.7 2.0 1.4 98 870612 141 1.4318	11	860508	1929	22.18	19.0085	98.6622	29	4.0	1.9		79 80	870501	2328	12.89	18.0065	99.8690	3/	4.7	0.7
13 860508 2040 4,87 19.5992 88,8405 37 3.5 1.9 82 870503 856 31,17 70,032 27 3.6 0.8 15 860510 1645 53,42 18,3777 99,7703 32 3.7 1.1 84 870525 2143 3.20 17.8013 96,902 37 1.1 1.8 870517 37 0.20 18,3777 99,9297 37 3.1 3 17 806511 2348 28,141 19,6573 98,6032 37 1.0 88 870617 86 33.89 18,143 97,6715 37 2.8 0.4 28 806511 1054 3.67118 98,7707 37 2.8 0.4 89 707612 191 14.39 18.0707 37 2.8 0.4 89 1.4 193 18.0707 37 2.8 0.4 98 70761 143 18.16.468 18.517 18.68 <	12	860508	1940	2.13	19.8372	98.7243	37	3.2	1.6		81	870508	60	6.41	18.8845	99.0360	37	3.8	1.9
14 860509 0.4 39.41 10.7687 98.6622 37 3.6 1.4 83 870513 48 47.961 2.919 97.4115 25 3.4 0.8 16 860511 645 35.73 19.5807 98.8105 32 3.5 0.5 85 870525 2143 3.20 17.31 39.7 3.7 3.7 4.0 6.6 18 860511 1227 2.6 1.6 533 87.632 37 3.7 2.0 88 70617 4.6 3.8 18.1413 97.615 37 2.8 0.8 18 860511 55 57.42 9.7118 87.702 23 0.1 90 870626 415 3.511 6.6427 99.8103 7 2.8 0.8 28 666151 55 57.42 9.96 870627 413 9.8102 7 4.0 1.6 6.65660 870602 124 41.518.303 9.8283 7.6 0.6 6.6660 860602 124 41.518.303 9.86133 3.5 <td>13</td> <td>860508</td> <td>2040</td> <td>4.87</td> <td>19.5992</td> <td>98.8405</td> <td>37</td> <td>3.5</td> <td>1.9</td> <td></td> <td>82</td> <td>870509</td> <td>856</td> <td>31.17</td> <td>17.0990</td> <td>97.7032</td> <td>37</td> <td>3.6</td> <td>0.6</td>	13	860508	2040	4.87	19.5992	98.8405	37	3.5	1.9		82	870509	856	31.17	17.0990	97.7032	37	3.6	0.6
15 80010 1043 5.42 18.377 97.703 32 37 1.1 84 870252 1240 1.301 29.001 88.812 41 1.1 17 860511 1014 29.10 18.80573 99.438 24 0.0 38 870517 77 20.29 18.70152 92.41 20.00 18.8775 99.2797 77 31 13 18 860512 2552 55.67 77 27.029 18.70170 14.39 16.70175 77 22.8 0.4 11 105 57.47 19.7778 98.87022 22 1.4 88 77.0171 18.818 14.39 14.1918 12.144 13.018.17.3417 98.8122 41 1.9 24 860523 12 13.4518 99.073 77 37 2.8 0.2 98.70627 13.83 18.818 2.4 11.9 13.018.733 13.31 13.31 13.31 13.31 13.31 13.3	14	860509	04	39.41	19.7687	98.6622	37	3.6	1.4		83	870513	48	47.96	19.2917	97.4115	25	3.4	0.8
10 20211 01 02.00 80 87/02.5 214 3.2.01 96.410.3 2.4 0.6 8 600512 234.8 66.73 96.672 37 37 17 0.0 87 870031 73 0.2.9 18.143 97.0715 37 23 13 11 00 860512 234.8 6.872 37 37 28 0.4 89 870021 10 21.8 61.8 89.707 37 28 0.4 2 860513 1055 57.42 17.17 28 0.4 18 9700567 153.1 16.6625 90.105 37 4.0 10 23 860520 17 12.14 18.942 98.611 31.2 6 970071 13.1 14.9 98 870701 12.1 6.18 16.85 98.6063 97.62 49 77 10.3 77.43 97.114 8.4 10.0 77.12 97.114 <	15	860510	1645	53.42	18.3777	99.7703	32	3.7	1.1		84 95	870525	1240	1.30	19.2708	98.8182	41	3.0	0.3
18 860511 1227 24.2 9 4.1 2.0 67 870617 8.015 99.2597 37 2.3 1.5 19 860512 2348 25.4 19.6538 87.6677 87.0617 83 18.143 19.1631 97.6715 37 2.8 0.4 18 80513 1054 55.74 19.7178 87.0617 88.70617 85.11 16.521 98.1013 37 2.8 0.4 28 860520 17 12.46 19.77777 37 2.8 0.2 92 370627 10.9 11 98.6717 37 3.2 0.2 92 370627 14.8 30.18 10.6 0.6 28 860523 2.3 1.3 1.2 0.1 19 870701 1921 6.85 18.060 97.7520 37 0.6 0.6 28 860630 3.0 94.16 19.238 8707070 121 1.6 18.06029	17	860511	1014	29 10	19.5892	98.8105	34 24	3.5	0.5		85 . 86	870525	2143	32.03	17.8013	96.9402	37	4.1	1.2
19 860512 2348 28.14 19.6722 88.782 37 2.0 88 870617 86 23.89 41.42 97.6713 37 2.8 0.4 21 860513 1054 36.97 19.6773 98.7822 37 2.0 1.4 90 870621 19.1 18.8470 98.8101 37 2.8 0.4 28 860513 1055 57.42 1.97118 98.7402 25 3.06 91 870627 150 49.21 17.9637 97.433 41 0.9 28 860520 171 2.1469 99.2823 21 3.7 1.2 94 870670 131 46.052 97.7452 40 0.0 1 2.6 0.6 28 860620 124 41.50 18.303 98.288 37 3.5 1.9 97.0712 43.5 1.8.143 97.7513 3.0 0.6 28 860812 1216 16.18	18	860511	1227	26.26	19.6573	98.6503	29	4.1	2.0		87	870612	1014	20.05	18.9757	99.2597	37	2.4	0.0
20 860512 255.66 19.6722 98.7022 98.7022 99.870629 439 1439 18.0707 98.8010 37 2.8 0.4 22 860513 1054 55.74 19.7118 98.71062 1859 13.84 16.5817 98.8218 32 1.4 1.9 24 860523 2.2 3.453 19.4905 99.0175 37 1.2 94 870627 1438 18.18.16.669 97.7532 37 2.6 0.4 97 870703 550 4.61 18.0697 97.5332 37 2.6 0.4 97 870703 550 4.61 18.2987 97.51 1.9 96 870721 14 15.03 97.6752 92 2.6 0.4 1.0 10.19 18.16.498 98.80712 12 1.0.19 18.16.498 98.0727 95 3.1 1.9 870723 12 1.4 1.53 1.0.4 1.0 1.0.4 1.0 1.0.4 1.0.4	19	860512	2348	28.14	19.6538	98.7682	37	3.7	2.0		88	870617	86	33.89	18.1443	97.6715	37	2.8	0.8
21 860513 1055 7.4.0 155 7.4.0 15 7.4.0 18 23 860513 1056 57.4.2 17.11 9.7.7.02 35 3.0.8 91 870622 1041 58.7 17.9.8.218 2.4 1.9.3 23 860520 17.1 21.4.6 18.9730 98.7067 17.83 3.0.8 91 870627 150 49.21 17.9.637 97.300 37 2.6 0.6 66 66.60602 12.4 18.7380 98.7017 17 2.0 98 870703 147 48.18 18.0697 97.3303 37 2.6 0.6 0.6 58.70701 147 4.91 18.337 98.6148 41 3.0 0.9 38 860715 2.3 3.8 1.4 98 870720 121 10.19 18.16.6623 99.60717 3.3 1.0 0.4 98 870720 121 10.19 18.14 3.7 1.0 0.6 7.30 0.6 3.33 99.0373 3.7 1.0 0.7 1.0 870721 121	20	860512	2352	55.66	19.6722	98.7822	37	2.0	1.4	~ 1	89	87:0619	439	14.39	18.0707	98.8010	37	2.8	0.4
22 8 8 0 3 1 10 5 0 3 7 4 2 19.711 8 95.740 2 3 3.3 0.8 91 8 7 10 26 10 49.21 19.663 97.430 2 3 3.6 0.0 92 8 7 10 49.21 19.663 97.430 2 3 3.6 0.0 92 24 8 6 0 3 2 2 3 4.3 19.490 5 99.0175 3 7 3.2 0.5 93 8 7 0 6 2 7 1438 3 0.1 8 17.636 97.1435 3 1.4 0.9 25 8 6 0 5 2 1 2 3 10.8 18.840 99.223 21 3 7 1.2 94 8 7 0 6 5 16 5 4.5 4.6 18.006 97.530 3 7 2.6 0.4 0.9 26 8 6 0 6 2 1 2 4 4.15.0 18.300 3 98.298 3 7 3.5 1.9 95 8 7 0 7 0 1 1 21 1 6.4 18.264 2 97.819 5 1 2.1 0.3 28 8 6 0 7 2 7 2.6 6 1.8 6.602 97.467 2 3 3.8 1.4 98 98 7 0 7 0 1 2 1 1 0.1 91 8.164 0 98.625 5 0 2.6 0.4 28 8 6 0 7 2 7 2.6 6 1.8 1.238 99.740 5 3 2 3.9 1.1 99 8 7 0 7 2 1 1 2 7 1 4.5 18.367 97.117 7 3 2.8 0.8 28 2 1 2 1 7 1 4.5 6 1.8 1.238 99.740 5 4 2.0 5 1 00 8 70 7 2 1 7 2 7 4.4 5 9 1.5 7 97.117 9 2.8 0.8 28 2 1 2 1 7 1 4.5 6 1.3 8 99.79 7 5 4 2.0 5 1 00 8 70 7 2 1 7 2 4 4.5 9 1.5 7 97.117 9 2.8 0.8 38 2 3 0 1 2 3 6.6 7 1 9 .8 13 0 3 98.303 3 7 3.2 0.7 1 0 8 70 7 2 1 1 2 0 .4 17.8 30 97.031 3 6 4.0 0.9 38 2 3 0 1 2 4 6 7 .8 0 0 9 .8 13 3 7 3.4 0.5 1 0 8 70 7 2 1 1 1 0 1 8.1 8.4 7 0 9 .8 7 7 3 3.1 3 38 3 6 0 8 0 3 0 1 2 4 6 .7 0 1 9 .6 0 2 9 .5 11 8 7 4 .0 0 4 10 4 7 0 4 10 4 7 0 4 4 7 .0 0 4 7 0 4 4 7 .0 0 4 7 0 4 4 7 .0 0 4 7 0 4 4 7 .0 0 4 7 0 4 4 7 .0 0 4 7 0 4 4 7 .0 0 4 7 0 4 4 7 .0 0 4 7 0 4 4 7 .0 0 4	21	860513	1054	36.97	19.6778	98.7065	23	4.0	1.1		90	870622	1041	58.51	16.6625	99.0195	37	4.0	1.8
24 800235 12 24 800225 31022 3102	22	860520	1056	57.42	19./118	98.7402	35	3.3	0.8		91 02	870626	1859	13.84	16.5817	98.8218	32	4.1	1.9
25 860524 123 10.83 18.8460 99.2823 21 3.7 1.2 64 870630 615 846 18.00667 97.5303 37 2.6 0.6 27 860620 124 41.50 18.3003 98.2988 37 3.5 1.9 96 870703 350 42.46 18.2062 97.8152 51 2.1 0.3 28 860737 350 42.64 18.2042 97.8156 37 2.6 0.4 97 870703 350 42.46 18.2042 97.8156 51 2.1 0.3 28 860727 92.5 31.10 18.3039 94.033 22 0.7 100 870721 121 10.1640 89.022 37 3.0 0.6 38 860810 1217 14.530 97.9133 68 2.7 1.3 101 870721 152 2.64 17.830 97.0313 36 40 0.9 35 1.9 55 10.5 15 35 1.9 10 1.4 108 <	23	860523	22	34.53	19.4905	99.0175	37	2.0	0.2		92 93	870627	1438	49.21	17.9037	97.4302	37 41	3.0	0.0
26 860602 10 2 8.87 18.932 98.6310 31 2.6 0.1 95 870701 1921 6.85 18.0660 97.7652 49 2.0 0.1 28 860630 430 34.62 19.860757 37 2.6 0.4 97 870703 510 4.26 18.2642 97.8557 50 2.6 0.4 30 860727 955 31.10 18.3338 99.4093 22 3.9 1.1 99 870721 43 59.24 18.1640 96.0555 50 2.6 0.4 31 860727 955 31.10 18.7359 97.9183 68 2.0 0.7 100 870721 121 1520 2.66 1.7.830 97.9133 64 0.9 38 860824 144 3.29 18.350 97.9183 64 2.0 0.7 102 870721 152 2.66 1.7.830 97.913 3.0 0.0 1.4 104 870801 1152 2.66 1.4.5029 9.5 1.9 3	25	860524	1323	10.83	18.8460	99.2823	21	3.7	1.2		94	870630	615	45.46	18.0967	97.5303	37	2.6	0.9
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	26	860602	10 2	8.87	18.9382	98.6310	31	2.6	0.1	1	95	870701	1921	6.85	18.0660	97.7652	49	2.0	0.1
28 8800530 430 34.62 19.286 37 2.6 0.4 97 870703 530 42.46 18.640 98.0525 50 2.1 1.0 98 870720 121 10.16 18.640 98.0525 50 2.6 0.4 30 860727 955 31.10 18.3938 99.4078 32 3.9 1.1 99 870721 72 4.5 19.17 1.15 99.870721 727 74.55 19.7577 37 3.0 0.6 31 860830 144 3.29 1.0 19.87723 141 52.46 17.8309 97.013 36 4.0 0.9 35 860830 1923 46.67 19.6812 37.3 3.1 3.3 3.2 0.7 103 870723 126 17.8 16.06 18.018 98.0203 17.2 4.59 14.0 10.05 18.018 18.018 98.2023 12.4 0.9 806091	27	860620	124	41.50	18.3003	98.2988	37	3.5	1.9		96	870703	147	4.91	18.5387	98.6148	41	3.0	0.9
25 600/12 25 2.5 1.6 99.4038 2.5 3.8 1.4 98 8/0721 1.2 1.0 1.6 99.7637 37 3.0 0.6 31 860729 1217 14.55 18.1238 99.7497 56 4.2 0.5 100 870721 14.5 97.418 56 4.0 99.7637 37 3.0 0.6 33 860824 144 3.29 18.3003 98.3033 37 3.2 0.7 103 870723 145 2.6 17.8620 96.417.8330 97.0313 3.6 0.0 3.5 1.9 3.5 1.9 35 860830 1223 4.6 1.0 97.0733 1.9 1.4 10.4 870801 11.1 18.4 4.2 97.0833 3.5 1.9 3.5 1.9 3.5 1.9 36 80002 161 17.0 9.6373 3.3 1.4 1.0 870803 1814	28	860630	430	34.62	19.2867	98.7268	37	2.6	0.4		97	870703	530	42.46	18.2642	97.8195	51	2.1	0.3
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	29 30	860727	23 / 955	31 10	18 3938	99.4097	23 32	30	1.4		98 00	870721	12 1	10.19	18.1640	98.0525	37	2.0	0.4
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	31	860729	1217	14.56	18.1238	99.7497	56	4.2	0.5		100	870721	727	44.59	17.5767	97.1177	39	2.8	0.8
33 860824 14 3.29 18.3003 98.3053 37 3.2 0.7 102 870723 952 75.4 1.7012 97.083 3.3 1.3 35 860830 1923 46.67 19.6802 98.5718 37 3.4 0.5 104 870823 952.5 76.4 1.7012 97.085 37 3.4 1.5 36 860830 1234 2.5.5 19.6915 98.6877 37 3.4 1.9 106 870805 644 2.8.8 1.8 1.2 98.6101 37 3.4 1.9 106 870807 152 20.88 1.8 1.0 98.5803 41 2.8 1.3 37 85002 357 3.19 18.4420 97.9183 64 2.9 1.4 109 870810 1956 52.97 18.0680 98.5612 35 2.7 0.2 48 81010 0.44 3.5 111 870814 940 3.52 18.2028 96.8687 77 1.0 1.3 1.1 1.0	32	860812	2119	6.19	18.7350	97.9183	68	2.7	1.3		101	870721	1520	29.64	17.8330	97.0313	36	4.0	0.9
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	33	860824	14 4	3.29	18.3003	98.3053	37	3.2	0.7		102	870723	141	52.46	17.8620	96.8202	37	3.0	0.5
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	34	860830	1047	25.41	18.9575	99.5048	37	3.2	0.7		103	870723	952	57.64	17.0712	97.0985	37	3.3	1.3
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	35	860830	1923	46.67	19.6802	98.5/18	31	4.0	0.4		104	870801	2116	18.18	18.4272	99.4507	59	3.5	1.9
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	37	860901	340	33.53	19.6363	98.6877	37	3.4	1.9		105	870805	644	9.81	18.4622	98.6148	41	2.8	1.3
99 860911 216 54.70 99.8713 14 3.7 1.4 108 870807 1814 46.82 18.8238 100.0258 37 3.8 0.8 40 860925 357 3.19 18.4420 97.9183 64 2.9 1.4 109 870807 18.14 46.82 18.8238 100.0258 37 3.8 0.8 41 861010 047 30.31 18.7405 98.5857 37 3.3 0.4 109 870807 18.14 46.82 18.2328 97.6515 48 3.2 0.6 42 861010 047 19.38 18.132 98.5867 37 3.9 0.8 112 870814 940 32.52 81.2028 96.8687 37 3.0 0.4 45 861123 934 23.68 18.7477 98.8773 39 0.0 114 1370818 114 11.08 17.8719 3.4 0.3 46 861207 452 27.51 18.8358 99.4697 31 3.5 1.1	38	860902	1617	30.60	18.7303	98.6382	37	2.9	1.6		107	870805	1152	20.88	18.3003	98.2803	41	2.4	0.9
40 860925 357 33.19 18.4420 97.9183 64 2.9 1.4 100 870810 1956 52.97 18.0680 98.5612 35 2.7 0.2 41 861013 312 31.80 19.1682 98.5867 11 3.3 0.4 110 870810 1956 52.97 18.0680 98.5612 35 2.7 0.2 0.4 43 861030 242 28.00 18.4592 99.4697 37 3.9 0.8 112 870816 93 54.11 19.330 98.1713 32 3.1 1.0 45 861123 934 23.68 18.7747 98.6778 39 3.0 0.1 114 870819 1347 32.91 1.7247 98.1583 39 3.0 0.4 48 861213 030 29.88 17.7875 98.6727 37 3.6 0.2 117 870909 71 19.29 18.8260 96.3187 32 2.8 1.8 49 861215 2315 41.73	39	860911	216	54.70	19.6375	98.7713	14	3.7	1.4		108	870807	1814	46.82	18.8238	100.0258	37	3.8	0.8
41 861010 047 30.34 18.7605 98.587 37 3.3 0.4 110 870814 534 30.85 17.9153 97.6515 48 53.2 0.8 17.9153 97.6515 48 53.2 0.8 17.9153 97.6515 48 53.2 0.8 111 870814 940 32.52 18.2028 96.6867 37 7.7 1.0 44 861119 77 19.38 18.1332 98.4383 37 2.9 0.4 113 870818 1149 11.08 17.9177 98.4280 37 30.0 0.4 45 861120 1013 11.18 17.8485 98.2333 37 3.0 0.4 115 870818 149 10.7 17.8417 98.77937 23 2.9 0.3 47 861215 2315 41.73 18.4938 97.9483 62 3.8 0.6 118 870909 71 10.2 17.87090 97.1437 37 3.6 0.5 59 17.2352 96.9662 37 3.6 0.5 <td>40</td> <td>860925</td> <td>357</td> <td>33.19</td> <td>18.4420</td> <td>97.9183</td> <td>64</td> <td>2.9</td> <td>1.4</td> <td></td> <td>109</td> <td>870810</td> <td>1956</td> <td>52.97</td> <td>18.0680</td> <td>98.5612</td> <td>35</td> <td>2.7</td> <td>0.2</td>	40	860925	357	33.19	18.4420	97.9183	64	2.9	1.4		109	870810	1956	52.97	18.0680	98.5612	35	2.7	0.2
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	41	861010	312	30.34	18./605	98.3837	3/ 11	3.3	0.4		110	870814	534 940	30.85	18 2028	97.0010	48	3.2	0.6
44 861119 77 19.38 18.132 98.4383 37 2.9 0.4 113 870818 1149 11.08 17.9207 98.4280 37 3.0 0.4 45 861123 934 23.68 18.7747 98.6778 39 3.0 0.1 114 870818 1149 11.08 17.9207 98.4280 37 3.0 0.4 45 861207 452 27.51 18.8355 99.4697 41 3.5 1.9 116 870831 720 32.21 17.5242 97.4147 37 3.1 1.4 48 861215 2315 41.73 18.4938 97.9483 62 3.8 0.6 118 870909 71 19.29 18.8260 96.3187 32 2.8 1.8 49 861215 2315 41.73 18.4938 97.9483 62 3.8 0.6 118 870909 16 55.59 17.2522 96.662 37 3.6 0.5 58 861224 726 4.69 17.7973	42	861030	242	28.00	18.4592	99.4697	37	3.9	0.5		112	870814	93	54.11	19.3930	98.1713	32	3.1	1.0
45 861123 934 23.68 18.7747 98.6778 39 3.0 0.1 114 870819 1347 32.95 17.7447 98.1583 39 3.4 0.3 46 861206 1013 11.18 17.8485 98.2333 37 3.0 0.4 115 870823 945 16.71 17.8417 97.7937 23 2.9 0.3 47 861207 452 27.51 18.8365 99.4697 41 3.5 1.9 116 870823 945 16.71 17.8417 97.7937 22 2.8 1.8 48 861215 2315 41.73 18.4938 97.9483 62 3.8 0.6 118 870909 160 55.59 17.2352 96.9662 37 3.6 0.5 3.5 1.5 116.117.8178 98.5415 20 4.1 1.0 120 870915 121 55.99 17.2352 96.9662 37 3.5 1.7 53 861224 726 4.69 17.7973 97.5567 37 3.0 0.1 </td <td>44</td> <td>861119</td> <td>77</td> <td>19.38</td> <td>18.1332</td> <td>98.4383</td> <td>37</td> <td>2.9</td> <td>0.4</td> <td></td> <td>113</td> <td>870818</td> <td>1149</td> <td>11.08</td> <td>17.9207</td> <td>98.4280</td> <td>37</td> <td>3.0</td> <td>0.4</td>	44	861119	77	19.38	18.1332	98.4383	37	2.9	0.4		113	870818	1149	11.08	17.9207	98.4280	37	3.0	0.4
46 861206 1013 11.18 17.8485 98.2333 37 3.0 0.4 115 870823 945 16.71 17.8417 97.9797 23 2.9 0.3 47 861207 452 27.51 18.8365 99.4697 41 3.5 1.9 116 870823 945 16.71 17.8417 97.4147 37 3.3 1.2 48 861215 2315 41.73 18.4938 97.9483 62 3.8 0.6 118 870909 71 19.29 18.8260 96.3187 32 2.8 1.8 50 861219 1536 20.30 18.5418 99.5415 20 4.1 10 20 870914 2357 2.74 18.1342 97.567 3.5 1.1 51 861224 726 4.69 17.7973 97.5567 37 3.0 0.1 121 870917 1010 0.68 17.9800 97.7435 37 3.5 1.7 53 861231 2053 18.017 18.985608 41	45	861123	934	23.68	18.7747	98.6778	39	3.0	0.1		114	870819	1347	32.95	17.7447	98.1583	39	3.4	0.3
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	46	861206	1013	11.18	17.8485	98.2333	37	3.0	0.4		115	870823	945	16.71	17.8417	97.7937	23	2.9	0.3
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	47	861207	452	27.51	18.8365	99.4697	41	3.5	1.9		116	870831	720	33.21	17.5242	97.4147	37	3.3	1.2
10 10111 1011 1011	48 40	861215	2315	29.00	18 4938	98.0727	57 62	3.8	0.2		118	870909	16.0	19.29	17 2352	96.3187	37	2.0	1.0
51 861219 1536 20.30 18.5418 99.5415 20 4.1 1.0 120 870915 1921 55.94 17.9800 97.7683 54 3.4 0.3 52 861224 726 4.69 17.7973 97.5567 37 3.0 0.1 121 870915 1921 55.94 17.9800 97.7683 54 3.4 0.3 53 861226 1621 58.54 17.6758 96.7338 37 4.0 0.6 122 870919 738 15.72 17.3697 97.2348 40 2.8 0.5 54 861231 2033 19.67 17.4805 96.6615 48 4.4 1.1 123 870920 1434 55.95 18.0080 98.5832 19 2.7 0.3 55 870117 233 56.6417 78.323 98.1990 33 2.9 0.4 125 871004 417 6.94 18.7555 98.6593 37 2.9 0.7 58 870121 341 49.25 18.6940 <td>50</td> <td>861219</td> <td>84</td> <td>8.56</td> <td>18.3003</td> <td>99.3323</td> <td>59</td> <td>2.0</td> <td>1.4</td> <td></td> <td>119</td> <td>870914</td> <td>2357</td> <td>2.74</td> <td>18.1342</td> <td>97.5567</td> <td>45</td> <td>3.3</td> <td>1.1</td>	50	861219	84	8.56	18.3003	99.3323	59	2.0	1.4		119	870914	2357	2.74	18.1342	97.5567	45	3.3	1.1
52 861224 726 4.69 17.7973 97.5567 37 3.0 0.1 121 870917 1010 0.68 17.9802 97.1435 37 3.5 1.7 53 861226 1621 58.54 17.6758 96.615 48 4.4 1.1 123 870910 738 15.72 17.3697 97.2348 40 2.8 0.5 54 861231 2053 19.67 17.4805 96.6615 48 4.4 1.1 123 870920 1434 55.95 18.0080 98.5832 19 2.7 0.3 55 870115 2034 59.20 18.1780 98.5608 41 3.2 1.0 124 870925 747 44.84 17.8335 98.5102 13 3.5 0.7 56 870117 234 59.20 18.7852 98.5453 37 2.9 1.8 126 871014 17 54.03 18.9892 99.2318 32 3.6 1.8 57 870122 539 8.35 17.8828	51	861219	1536	20.30	18.5418	99.5415	20	4.1	1.0		120	870915	1921	55.94	17.9800	97.7683	54	3.4	0.3
53861226162158.5417.675896.7338374.00.612287091973815.7217.369797.2348402.80.554861231205319.6717.480596.6615484.41.1123870920143455.9518.008098.5832192.70.355870115203459.2018.178098.5608413.21.012487092574744.8417.833598.5102133.50.756870117233536.3417.832398.1990332.90.41258710044176.9418.755598.6593372.90.7578701194957.4619.908797.1978372.91.81268710147754.0318.989299.2318323.61.8588701225398.3517.882897.4492464.01.9128871020202134.5019.791098.5415373.31.960870126235753.0319.057799.1708303.30.612987102274721.0218.236299.8140373.80.86187012735135.0018.162398.4622344.41.413087102543241.5217.963797.8557413.01.26287012994342.74	52	861224	726	4.69	17.7973	97.5567	37	3.0	0.1		121	870917	1010	0.68	17.9802	97.1435	37	3.5	1.7
54861231205319.6717.480596.6615484.41.1123870920143455.9518.008098.5832192.70.355870115203459.2018.178098.5608413.21.012487092574744.8417.833598.5102133.50.756870117233536.3417.832398.1990332.90.41258710044176.9418.755598.6593372.90.7578701194957.4619.908797.1978372.91.81268710147754.0318.989299.2318323.61.8588701225398.3517.882897.4492464.01.9128871020202134.5019.791098.5415373.31.960870126235753.0319.057799.1708303.30.612987102274721.0218.236299.8140373.80.86187012735135.0018.162398.4622344.41.413087102543241.5217.963797.8557413.01.262870208194038.5919.369399.1965372.31.113287110261426.4317.292598.4443413.50.46487021812637.35	53	861226	1621	58.54	17.6758	96.7338	37	4.0	0.6		122	870919	738	15.72	17.3697	97.2348	40	2.8	0.5
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	54	861231	2053	19.67	17.4805	96.6615	48	4.4	1.1		123	870920	1434	35.95	18.0080	98.5832	19	2.7	0.3
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	55	870117	2034	36.34	17 8323	98.3008	41	29	0.4		124	871004	417	6 94	18 7555	98.5102	37	$\frac{3.3}{2.9}$	0.7
5887012134149.2518.694096.5423463.81.3127871017181922.0018.232897.2910372.80.6598701225398.3517.882897.4492464.01.9128871020202134.5019.791098.5415373.31.960870126235753.0319.057799.1708303.30.612987102274721.0218.236299.8140373.80.86187012735135.0018.162398.4622344.41.413087102543241.5217.963797.8557413.01.26287012994342.7418.098298.3563373.62.01318711024230.5117.900398.8988412.80.66387021812637.3519.242097.6203243.10.713387110261426.4317.292598.4443413.50.46487021812637.3519.242097.6203243.10.713387110261426.4317.292598.4443413.50.46587022573832.4619.501799.1758372.90.9135871105161623.1418.186398.1378372.60.566870302175454.12	57	870119	49	57.46	19.9087	97.1978	37	2.9	1.8		126	871014	77	54.03	18.9892	99.2318	32	3.6	1.8
598701225398.3517.882897.4492464.01.9128871020202134.5019.791098.5415373.31.960870126235753.0319.057799.1708303.30.612987102274721.0218.236299.8140373.80.86187012735135.0018.162398.4622344.41.413087102543241.5217.963797.8557413.01.26287012994342.7418.098298.3563373.62.01318711024230.5117.900398.8988412.80.663870208194038.5919.369399.1965372.31.113287110261426.4317.292598.4443413.50.46487021812637.3519.242097.6203243.10.7133871104184524.4819.708796.7987373.11.3658702198738.6818.377799.4697373.71.5134871105161623.1418.186398.1378372.60.56687022573832.4619.501799.1758372.90.9135871105162326.8118.226297.9192373.00.467870302175454.1	58	870121	341	49.25	18.6940	96.5423	46	3.8	1.3		127	871017	1819	22.00	18.2328	97.2910	37	2.8	0.6
60870126235753.0319.057799.1708303.30.612987102274721.0218.236299.8140373.80.86187012735135.0018.162398.4622344.41.413087102543241.5217.963797.8557413.01.26287012994342.7418.098298.3563373.62.01318711024230.5117.903798.8988412.80.663870208194038.5919.369399.1965372.31.113287110261426.4317.292598.4443413.50.46487021812637.3519.242097.6203243.10.713387110261426.4317.292598.4443413.50.4658702198738.6818.377799.4697373.71.5134871105161623.1418.186398.1378372.60.56687022573832.4619.501799.1758372.90.9135871105162326.8118.26297.9192373.00.467870302175454.1217.168394.1063375.10.413687110725421.9218.157298.0785372.30.468870309113327.34	59	870122	539	8.35	17.8828	97.4492	46	4.0	1.9		128	871020	2021	34.50	19.7910	98.5415	37	3.3	1.9
61 8/0127 351 35.00 18.1623 98.4622 34 4.4 1.4 130 8/1025 432 41.52 17.9637 97.8557 41 3.0 1.2 62 870129 943 42.74 18.0982 98.3563 37 3.6 2.0 131 871102 423 0.51 17.9037 97.8557 41 3.0 1.2 63 870208 1940 38.59 19.3693 99.1965 37 2.3 1.1 132 871102 614 26.43 17.2925 98.4443 41 3.5 0.4 64 870218 126 37.35 19.2420 97.6203 24 3.1 0.7 133 871102 614 26.43 17.2925 98.4443 41 3.5 0.4 65 870219 87 38.68 18.3777 99.4697 37 3.7 1.5 134 871105 1616 23.14 18.1863 98.1378 37 2.6 0.5 66 870225 738 32.46 19.5017	60	870126	2357	53.03	19.0577	99.1708	30	3.3	0.6		129	871022	747	21.02	18.2362	99.8140	37	3.8	0.8
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	61	870127	351	35.00	18.1623	98.4622 08 2562	34 37	4.4 3.6	1.4		130	8711025	452	41.52	17 0002	91.8221 98 8088	41 1	3.U 2.8	1.2
64 870218 126 37.35 19.2420 97.6203 24 3.1 0.7 133 871104 1845 24.48 19.7087 96.7987 37 3.1 1.3 65 870219 87 38.68 18.3777 99.4697 37 3.7 1.5 134 871104 1845 24.48 19.7087 96.7987 37 3.1 1.3 66 870225 738 32.46 19.5017 99.1758 37 2.9 0.9 135 871105 1616 23.14 18.1863 98.1378 37 2.6 0.5 66 870225 738 32.46 19.5017 99.1758 37 2.9 0.9 135 871105 1616 23.14 18.1863 98.1378 37 2.6 0.5 67 870302 1754 54.12 17.1683 94.1063 37 5.1 0.4 136 871107 254 21.92 18.1572 98.0785 37 2.3 0.4 68 870309 1133 27.34 19.2467 <td>62 63</td> <td>870208</td> <td>943 1940</td> <td>42.74</td> <td>19.3693</td> <td>99.1965</td> <td>37</td> <td>2.3</td> <td>1.1</td> <td></td> <td>132</td> <td>871102</td> <td>614</td> <td>26.43</td> <td>17.2925</td> <td>98.4443</td> <td>41</td> <td>3.5</td> <td>0.4</td>	62 63	870208	943 1940	42.74	19.3693	99.1965	37	2.3	1.1		132	871102	614	26.43	17.2925	98.4443	41	3.5	0.4
658702198738.6818.377799.4697373.71.5134871105161623.1418.186398.1378372.60.56687022573832.4619.501799.1758372.90.9135871105162326.8118.226297.9192373.00.467870302175454.1217.168394.1063375.10.413687110725421.9218.157298.0785372.30.468870309113327.3419.246797.3785372.91.5137871107225033.2118.377799.7020372.80.869870312184756.4719.384399.1107373.31.413887111532921.7117.357297.3707533.90.5	64	870218	126	37.35	19.2420	97.6203	24	3.1	0.7		133	871104	1845	24.48	19.7087	96.7987	37	3.1	1.3
6687022573832.4619.501799.1758372.90.9135871105162326.8118.226297.9192373.00.467870302175454.1217.168394.1063375.10.413687110725421.9218.157298.0785372.30.468870309113327.3419.246797.3785372.91.5137871107225033.2118.377799.7020372.80.869870312184756.4719.384399.1107373.31.413887111532921.7117.357297.3707533.90.5	65	870219	87	38.68	18.3777	99.4697	37	3.7	1.5		134	871105	1616	23.14	18.1863	98.1378	37	2.6	0.5
67 87/0302 1754 54.12 17.1683 94.1063 37 5.1 0.4 136 87/1107 254 21.92 18.1572 98.0785 37 2.3 0.4 68 870309 1133 27.34 19.2467 97.3785 37 2.9 1.5 137 871107 2250 33.21 18.3777 99.7020 37 2.8 0.8 69 870312 1847 56.47 19.3843 99.1107 37 3.3 1.4 138 871115 329 21.71 17.3572 97.3707 53 3.9 0.5	66	870225	738	32.46	19.5017	99.1758	37	2.9	0.9		135	871105	1623	26.81	18.2262	97.9192	37	3.0	0.4
68 870312 1847 56.47 19.3443 99.1107 37 3.3 1.4 138 871115 329 21.71 17.3572 97.3707 53 3.9 0.5	67	870302	1754	54.12	17.1683	94.1063	31	5.1	0.4		130	871107	254	21.92	18.13/2	98.0/83 00 7020	37	2.3 2.8	0.4
	08 69	870312	1847	21.34	19.3843	99.1107	37	3.3	1.4		138	871115	329	21.71	17.3572	97.3707	53	3.9	0.5

Table 3 (Cont).

Log W Depth Mag rms

2.4 0.2

3.6 1.4

3.5 1.5

2.8 1.0

4.6 1.1

4.0 1.9

2.8 0.9

3.8 0.3

3.0 1.6

3.7 0.7

3.1 0.4

2.6 0.1

2.6

2.8 0.1

2.6 0.3

3.9

3.9 0.7

2.6 1.5

3.2 1.1

2.4 0.7

3.4 1.7

3.4 1.2

3.1

2.9 0.1

3.4

2.6 0.4

3.2 1.9

4.2 1.2

2.6 0.7

2.9 0.8

3.6 1.3

2.4 0.3

2.7

3.4 1.0

2.6

3.9 0.8

4.2

3.6 0.4

4.1 1.2

3.3 1.0

4.2 1.8

3.9 1.5

2.9 1.7

2.5 0.2

3.2 0.3

2.6 0.1

3.9 1.1

2.5 0.4

3.9

2.8 0.4

2.0 1.2

3.8 0.4

4.0 0.3

2.8 0.0

2.5 0.4

2.7 0.2

3.6 0.4

3.0

3.2 0.3

3.4 1.1

2.5

3.1 0.2

3.4 0.4

3.4 0.6

3.0 0.9

3.4 0.6

3.3

2.9 0.8

0.8

1.1

0.0

1.2

0.2

0.3

1.9

0.9

1.1

0.1

0.4

3.5 0.7

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Table 3 (Cont).

	no	Date	Hr: Min	Sec	Lat N	Log W	Depth	Mag	rms	no	Date	Hr: Min	Sec	Lat N	Log W
-	139	871124	558	44.32	17.4280	98.1970	37	3.4	0.6	208	880518	1014	30.78	17.4172	97.2178
	140	871127	834	30.90	17.3417	98.2540	37	3.7	0.3	209	880525	923	56.51	16.7777	99.1543
	141	871206	2236	12.91	18.3960	97.7587	37	3.2	0.6	210	880525	1541	12.96	19.3713	97.5155
	142	871207	2246	11.88	18.5217	98.8010	32	2.6	0.2	211	880527	821	50.99	18.8077	99.2045
	143	871208	92	54.56	18.1387	98.4640	37	2.3	0.2	212	880528	1413	20.74	17.8515	98.5348
	144	871210	424	15.76	18.0068	98.6333	31	2.9	0.3	213	880529	611	48.92	18.3777	99.4697
	145	871213	130	46.06	18.0277	98.2748	34	2.7	0.1	214	880529	1029	17.92	18.2242	99.4697
	140	8/1214	1244	14.49	18 2642	98.0005	31	3.0	0.7	215	880530	96	32.15	17.3337	98.2168
	147	871214	/1054	20.03	17 8017	97.9782	37	2.5	1.4	210	880602	1120	21 26	18 6568	97.1433
	140	871215	1115	20.53	17 7085	96 9287	41	3.6	1.7	218	880610	1434	28.13	17 7045	08 0108
	150	871218	256	36.78	18.7767	99.2733	24	2.8	0.4	219	880611	939	17.68	18 2455	98 5865
	151	871221	410	3.72	18.5338	97.1435	41	2.9	1.2	220	880612	10 5	47.71	18.1530	97.8845
	152	871223	1148	54.09	16.6512	98.2598	44	3.1	0.4	221	880615	10 8	36.16	18.2078	97.8167
	153	871225	720	21.22	17.7747	97.5695	40	3.1	0.8	222	880616	1557	42.57	17.9848	98.4027
	154	871225	2139	1.38	17.5310	94.6473	37	3.9	0.5	223	880617	10 6	7.11	18.1192	97.9957
	155	871226	2011	2.04	17.6983	97.8407	64	3.8	1.1	224	880625	1227	27.06	17.5967	97.4992
	150	8/1229	2337	47.27	17.1445	97.1100	23	3.6	0.5	225	880629	15.9	52.06	18.0618	97.9520
	157	880103	1522	40.17	17.9408	98.2392	27	2.0	0.3	220	880/00	1957	42.40	17.9037	97.5205
	150	880124	1323	44 46	17 5133	99.3233	37	2.0	1.7	221	880700	33	19.44	18 0005	98.4023
	160	880124	17 9	35 39	18 0293	98 1980	37	$\frac{2.0}{2.0}$	0.3	220	880709	1058	2 23	17.8705	97.0452
	161	880129	1429	7.54	18.2250	96.9800	37	2.0	0.6	230	880714	538	25.83	18 0212	96.0407
	162	880130	2325	54.10	18.1303	96.2203	32	2.0	1.9	231	880718	2120	34.33	17.2693	96.7338
	163	880131	617	9.58	18.3777	99.0992	37	2.0	1.4	232	880724	1542	8.46	17.8558	97.9887
	164	880131	1046	22.14	17.2818	99.4227	37	2.0	0.9	233	880725	431	42.41	17.9465	98.2090
	165	880201	744	56.98	19.2527	97.5857	28	2.0	1.6	234	880728	2342	38.77	17.7945	98.6148
	166	880203	741	44.17	17.0163	98.2963	37	2.0	0.8	235	880801	1621	7.36	18.0622	99.2058
	167	880211	343	39.41	17.9230	97.9713	53	2.0	0.6	236	880802	055	52.90	18.3003	98.8675
	160	880210	1530	24.30	18./14/	96.6928	44	2.0	0.0	237	880802	623	3.43	17.4783	96.7338
	170	880218	1830	34.97	18.0050	98.9303	41	2.0	1.0	238	880802	2326	24.64	17.9825	97.08/7
	171	880221	022	34 22	19,2157	96.0003	32	$\frac{2.0}{2.0}$	0.4	239	880804	240	39.30	17 8117	90.0380
	172	880221	2017	42.36	19.2887	97.1887	37	2.0	1.7	240	880809	2357	0.16	18 2770	97 3800
	173	880222	457	54.26	18.1738	100.4007	37	2.0	0.4	242	880810	2048	24.01	18.2770	96.1347
	174	880225	1159	37.41	18.7777	99.1807	37	2.0	0.1	243	880810	2318	55.43	17.9598	98.1648
	175	880226	712	23.31	18.0032	97.4437	46	2.0	0.3	244	880811	1036	31.98	17.3158	97.6425
	176	880228	2241	49.75	18.1047	98.3322	37	2.0	0.6	245	880813	2218	20.75	17.7805	95.6303
	177	880307	333	25.16	17.8360	96.1337	22	2.0	0.6	246	880816	1236	39.63	18.0843	98.4622
	170	880312	2213	3.11	17.9040	97.5487	37	2.6	1.0	247	880819	1111	31.35	16.7538	96.1847
	1/9	000324	1323	42.45	18.0017	98.7050	31	4.1	1.5	248	880820	322	45.75	17.8338	96.2387
	181	880325	720	14.49	17.0637	98.0813	37	2.6	0.9	249	880820	616	37.05	15.9653	98.2555
	182	880326	2358	21.83	17.8955	97.8913	42	2.0	0.2	250	880831	421	28.12	10.0297	97.1993
	183	880401	330	37.73	18.0230	97.9275	51	3.6	0.3	252	880908	1419	29.82	18.0957	93.7337
	184	880401	2358	26.30	19.3247	97.4220	26	2.7	1.0	253	880912	755	38.48	17.1953	96.6915
	185	880409	615	41.94	18.3027	97.2497	43	2.4	0.1	254	880913	2212	46.71	17.9037	97.6123
	186	880417	645	7.61	19.4107	97.1603	37	2.8	1.1	255	880914	2121	0.55	17.1117	96.6912
	187	880426	2339	54.73	18.1437	97.7132	45	3.0	0.1	256	880919	19 0	36.19	18.1497	98.1227
	188	880430	236	1.16	18:1077	98.1790	37	3.1	0.6	257	880922	824	43.29	17.0323	99.2933
	189	880501	1041	21.43	18.1032	98.1668	37	2.3	0.5	258	880925	1747	0.13	18.1527	98.5375
	190	880503	1032	0.92	18 1150	97.4912	37	4.1	0.2	259	880925	2354	2.00	18.4342	98.0170
	192	880504	49	25.18	18 7902	99.3440	37	3.0	0.5	261	881010	13 /	13.92	18.5285	97.8557
	193	880506	83	15.14	17.8918	99.0113	37	2.7	0.0	262	881012	1145	51 75	17.9497	97.2472
	194	880507	2333	47.49	18.0535	96.8910	46	3.9	0.7	263	881012	1642	0.16	18 0347	98 2797
	195	880507	2340	10.35	17.9345	98.9672	37	3.4	0.5	264	881017	2230	54.63	17.7830	98.1440
	196	880509	037	49.10	17.9883	98.9437	40	3.8	0.4	265	881022	1234	48.91	18.0633	98.4790
	197	880509	82	1.21	18.1950	97.6250	47	2.7	0.2	266	881023	1334	9.92	17.9783	96.9270
	198	880509	2251	35.05	18.0638	98.4368	37	2.5	0.2	267	881028	1315	33.64	17.5172	99.4077
	199	880510	033	43.21	19.1638	99.0060	15	3.8	0.9	268	881029	22 5	2.21	19.1603	96.2747
	200	880512	2314 615	17 72	10.1520	91.5/35	27	3.1	0.1	269	881104	1515	2.97	17.9528	97.8603
	2.02	880512	10.1	50 00	10 0075	99.0033 00 NK22	31 27	3.2	2.0	270	881110	11 1	29.72	18.1012	98.1488
	203	880512	2122	40.11	17.9637	98.0848	50	2.4	1 4	272	881120	023	49 47	16 7005	91.3223
	204	880514	557	26.62	17.6080	97.4795	41	2.8	0.3	273	881125	1830	45.96	17.3140	96 7250
	205	880515	83	15.49	17.9008	98.1925	37	2.6	0.2	274	881205	1231	58.47	18.1923	98.0553
	206	880516	010	42.28	18.4605	96.8252	20	3.0	0.6	275	881208	826	7.87	16.9590	97.8557
	207	880517	2133	27.79	18.2142	97.6800	37	2.2	0.3	276	881209	1547	28.69	17.9223	96.9240

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Table 3 (Cont).

no	Date	Hr: Min	Sec	Lat N	Log W	Depth	Mag	rms
277	881210	2117	53.86	18.1983	97.6915	37	2.6	0.6
278	881212	643	40.30	17.2082	96.0435	18	3.8	1.2
279	881224	1732	54.79	16.7858	99.0988	32	4.3	1.8
280	881230	736	46.13	17.9567	98.3662	37	3.3	1.6
281	890101	36	1.47	17.9865	98.3553	37	2.2	0.2
282	890101	53	17.37	18.0917	98.0663	44	2.6	0.3
283	890101	93	4.67	18.0250	97.7878	41	3.6	0.5
284	890101	2332	28.67	17.5982	97.2697	50	3.1	0.1
285	890104	1320	6.03	17.9947	97.8422	49	3.0	0.0
286	890106	531	39.98	17.0547	98.9157	37	3.8	0.3
287	890114	2314	55.05	18.0698	97.9073	44	2.7	0.1
288	890115	178	33.87	17.9637	97.7228	37	2.4	0.8
289	890117	442	40.17	18.0858	98.2123	37	2.8	0.4
290	890118	44	32.84	17.9637	97.5710	40	2.8	0.7
291	890118	1643	19.46	17.5930	97.0255	34	3.0	0.4
292	890120	618	47.66	17.9657	97.3742	48	2.8	0.2
293	890122	530	19.02	18.0677	97.0527	37	3.2	1.5
294	890122	1633	15.55	17.7913	95.9080	41	4.0	1.3
295	890124	752	12.86	17.1785	96.9332	37	4.0	0.6
296	890124	1146	8.41	18.5705	99.5563	30	3.9	1.1
297	890125	05	2.20	16.2997	98.4878	37	4.1	0.9
298	890126	1555	8.40	17.3988	97.2583	37	3.2	0.3
299	890126	16 0	13.18	17.5822	97.0005	51	3.1	0.2
300	890201	1650	17.63	17.8792	97.8765	47	2.5	0.1
301	890201	2321	14.12	17.9637	97.6312	39	2.5	0.7
302	890203	454	20.65	17.8283	99.4697	37	2.5	1.2
303	890206	651	22.21	17.4395	97.2737	48	2.9	0.1
304	890207	1241	54.38	17.9453	97.9355	43	2.8	0.0
305	890209	14 6	59.31	18.0902	98.7662	40	3.5	0.8
306	890209	2149	53.70	17.9928	99.1067	33	2.3	0.4
307	890212	1120	9.85	17.9178	98.6942	37	3.1	0.6
308	890213	149	4.21	19.1678	95.9627	24	3.8	0.1
309	890224	20 0	56.21	19.0588	98.6148	37	2.4	1.5
310	890226	1413	8.42	18.0837	95.9550	41	3.5	0.6
311	890227	2011	25.43	17.9467	98.6837	43	2.7	0.3
312	890313	330	59.90	16.8142	99.6528	37	3.8	0.5
313	890313	16.0	16 99	16 2342	98 2430	37	4.0	1.9

Citlaltépetl volcano, 13 events were located as shown in Figure 6. North of the State no events were located. Figure 6 shows the overall seismicity between January, 1986 and August, 1989.

Figure 9 is a north-south profile of the seismicity in the region. The vertical and horizontal hypocentral errors are indicated, as well as the boundary of the oceanic and continental lithosphere, proposed by Valdés *et al.* (1986). The suggested Benioff zone from Bevis and Isacks (1984) and Pardo (1993) were also compared, but these two profiles either fell out of the region of study or did not agree with the hypocenters in the present study. Only 28 events occur beneath the Benioff zone. The deep seismicity ends at about 18.8°N. A concentration of events is observed at 18°N at about 45 km depth, which matches the location of the Benioff zone.

CONCLUSIONS

Ninety-two percent of the seismic events located in the region of the State of Puebla have coda magnitudes ranging between 2 and 4. Only one event, slightly outside of the region of study, had a magnitude greater than 5. This suggests that the earthquakes in this region are mainly small.

Tabla 3 (Cont.)

no	Date	Hr: Min	Sec	Lat N	Log W	Depth	Mag	rms
314	890316	2121	58.09	17.6120	98.0462	41	3.8	2.0
315	890318	749	53.39	17.9637	98.0837	41	2.7	2.0
316	890320	2022	29.03	18.0345	97.7945	49	2.6	0.1
317	890321	97	34.66	17.8880	98.3725	37	2.2	0.2
318	890325	1750	15.35	18.1315	98.1425	37	2.8	0.6
319	890327	1717	37.29	18.1697	98.8403	37	2.6	0.3
320	890401	548	43.69	17.9895	97.8873	40	2.8	0.4
321	890402	225	27.14	19.0877	99.3035	18	2.7	0.6
322	890403	833	26.80	18.8875	98.7517	29	3.2	1.1
323	890403	1129	37.97	18.1233	99.2930	33	4.0	2.0
324	890404	1328	27.83	19.0227	98.7057	18	3.5	1.3
325	890404	1854	0.88	18.3522	98.0278	37	2.5	1.0
326	890408	18 4	54.07	16.9543	98.4625	29	4.0	1.3
327	890412	547	14.37	17.9637	97.5187	64	2.4	1.1
328	890412	1040	14.98	19.3355	97.4428	37	3.0	1.1
329	890412	1042	3.41	19.6053	97.2820	32	2.9	1.3
330	890420	741	25.16	18.9315	99.9492	29	2.6	0.2
331	890420	830	1.42	18.7477	97.5202	42	2.2	1.5
332	890425	2234	15.86	17.8127	99.3987	37	3.3	0.4
333	890428	929	39.44	16.7128	99.4498	37	3.2	0.2
334	890428	1641	59.78	18.3145	97.6100	41	2.3	1.7
335	890503	736	1.87	18.1068	97.7102	37	2.3	0.3
336	890504	011	29.80	17.2342	99.5718	32	3.2	0.2
337	890508	1114	39.04	17.8693	97.7782	47	2.5	0.2
338	890528	1712	58.48	17.2782	99.7218	37	3.2	0.2
339	890529	48	9.56	17.6435	98.9272	37	3.5	0.3
340	890630	1919	10.63	17.8143	97.2815	41	2.7	1.4
341	890707	2212	12.83	17.7297	97.5310	37	2.7	0.4
342	890708	627	45.09	19.3375	97.6995	32	3.0	1.2
343	890713	1354	5.94	18.0802	98.3837	37	3.2	1.7
344	890716	1159	18.34	19.1433	99.5712	37	3.2	1.5
345	890724	1030	1.63	17.9032	97.9605	58	3.4	1.9
346	890727	1237	14.36	17.7940	99,1638	37	3.4	1.2
347	890813	23 9	24.36	18.1077	97.0500	58	2.9	0.2
348	890816	329	30.34	16.9168	98.1487	37	3.2	0.0
349	890818	029	5.61	19.3533	97.2443	37	2.7	1.7
350	890828	2025	52.80	16.4120	98.0048	37	3.4	1.4

Some earthquakes in the region attain large magnitudes, such as the Orizaba earthquake (M=7.0) of 1973 and the Huajuapan de León earthquake (M=7.0) of 1980 (González-Ruiz, 1986). About 69 % of the seismicity is located south of 18.5°N, basically in the region of the Mixteca range near the boundary between the States of Puebla-Guerrero and Puebla-Oaxaca. In the central region, between 18.5° and 20°N, 26 % of the events was located, corresponding to the Trans-Mexican Volcanic Belt. Several clusters of earthquakes occurred at the boundary between the States of Tlaxcala, Mexico and Hidalgo, where 18 shallow events with maximum magnitudes of 4.2 were located plus a cluster of 13 events in the region of Derrumbadas, near Citlaltépetl volcano.

Deep seismicity occurs in the south of the State, probably related to the contact between the Cocos and North American plates as suggested by the seismic profile of Valdés *et al.* (1986). In the central region, seismicity is shallower than in the south. It does not appear to be related to this contact, but to crustal tectonic stresses.

The larger seismic risk in the State of Puebla may be due to the subduction zone in the Pacific coast. This risk is now being studied using records from the Accelerograph



Fig. 6. Seismic epicentral distribution in the State of Puebla 1986-1989.

Network of Puebla City (Avilés *et al.* 1989). It is important to continue monitoring the seismicity in the State of Puebla, in order to understand the seismic hazard in the region and to contribute to the mitigation of destructive seismic effects.

ACKNOWLEDGEMENTS

We thank Dr. Raúl Serran L. and Eng. Jorge A. De Gante González for their contribution to the installation, maintenance and operation of RESEP; Patricia Gertrudis Júarez Serran, Franco Martínez Sánchez and Gustavo Adolfo Diego Taboada for their participation in reading the seismograms; the students of social service in the School of Civil Engineering at the UAP who participated and contributed in many different ways to the operation of RESEP; the Instituto Tecnológico de Oaxaca for providing the station Coxcatlán in 1986; and Ana Elena Posada Sánchez for her assistance in the elaboration of the seismic catalog. G. J. González-Pomposo and C. Valdés-González



Fig. 9 Seismic cross section.

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