



gobierno del estado

Secretaría
General de Gobierno



Social Aspects about the Earthquake Early Warning System in Oaxaca, Mexico

California Institute of Technology



Pasadena, California, US July, 2005

Where we are?



We are located in the southeast of the Mexican United States Republic



Why an earthquake warning system in Oaxaca?



Evento	Fecha	Hora	Lat.	Long.	Prof. (Km)	Mag.	Zona
1	1903/01/14	01:47:36	15	98	33	8.3	Costa de Oaxaca
2	03/02/1911	20:41:55	18.2	96.2	80	7.3	Veracruz-Oaxaca
3	27/03/1911	00:00:00	16.77	95.9	80	7	Oaxaca
4	02/06/1916	14:00:54	17.4	94.85	100	7	Istmo de Tehuantepec
5	29/12/1917	22:50:20	15	97	33	7.1	Costa de Oaxaca
6	22/03/1928	04:18:24	15.83	96.15	0	7.7	Costa de Oaxaca
7	17/04/1928	03:25:29	17.26	96.44	115	7.7	Oaxaca
8	17/06/1928	03:20:31	16.22	97.18	50	8	Oaxaca
9	04/08/1928	18:27:17	16.37	97.8	0	7.4	Oaxaca
10	09/10/1928	03:02:05	16.37	97.8	0	7.8	Oaxaca
11	15/01/1931	01:51:45	16.13	96.8	0	8	Oaxaca
12	16/01/1931					7	Costa de Oaxaca
13	05/06/1935					7	Oaxaca
14	26/07/1937	03:47:13	18.19	96.03	85	7.2	Veracruz-Oaxaca
15	23/12/1937	13:18:37	17.1	98.07	0	7.7	Guerrero-Oaxaca
16	02/01/1938					7.2	Costa de Oaxaca
17	20/11/1942	04:05:47	16.47	94.43	100	7.2	Istmo de Tehuantepec
18	25/11/1942					7.2	Costa de Oaxaca
19	11/10/1945	10:53:02	18.32	97.65	95	7.1	Oaxaca
20	07/06/1946	04:13:20	16.5	94	100	7.1	Istmo de Tehuantepec

We get approximately 300 earthquakes every year

The last century we got 39 earthquakes bigger than 6.0°R

Why an earthquake warning system in Oaxaca?

Evento	Fecha	Hora	Lat.	Long.	Prof. (Km)	Mag.	Zona
21	11/07/1946	04:46:46	17.23	94.62	70	7.1	Istmo de Tehuantepec
22	11/08/1948	04:36:19	17.75	-95.25	100	7	Oaxaca
23	14/12/1950	14:15:49	17.22	98.12	0	7.3	Guerrero-Oaxaca
24	09/07/1951					6.2	Oaxaca
25	23/08/1965	19:45:55	16.3	95.8	28	7.8	Oaxaca
26	22/08/1968	14:06:37	16.6	97.7	40	7.4	Oaxaca
27	28/08/1973	09:50:40	18.3	96.54	82	7.3	Veracruz-Oaxaca
28	29/11/1978	10:52:48	15.86	96.64	33	7.8	Costa de Oaxaca
29	22/06/1979	06:30:55	16.99	94.73	85	6.5	Istmo de Tehuantepec
30	24/04/1983	08:17:38	15.87	95.4	33	6.7	Golfo de Tehuantepec
31	13/07/1986	09:12:15	16.08	94.2	90	6	Istmo de Tehuantepec
32	15/07/1987	07:16:13	17.39	97.26	68	6	Oaxaca
33	14/09/1995	08:04:33	16.75	-98.67	21	7	Costa de Oaxaca
34	25/02/1996	03:08:13	15.83	98.25	3	6.9	Costa de Oaxaca
35	19/03/1996	17:12:39	15.49	97.55	15	6	Costa de Oaxaca
36	19/07/1997	09:19:43	16	98.23	9	6.3	Costa de Oaxaca
37	02/02/1998	21:02:01	15.65	96.43	15	6.4	Costa de Oaxaca
38	15/06/1999	14:42:04	18.13	-97.54	63	7	Huajuapam
39	30/09/1999	11:31:14	15.89	-97.07	12	7.4	Costa de Oaxaca

Who we are as Society?

- We are a half million people in Oaxaca and 100 thousand houses
- We have 200 basic schools, 10 high schools, and 5 Universities



How is our System?

- Our system has 29 sensors and 8 repeating stations

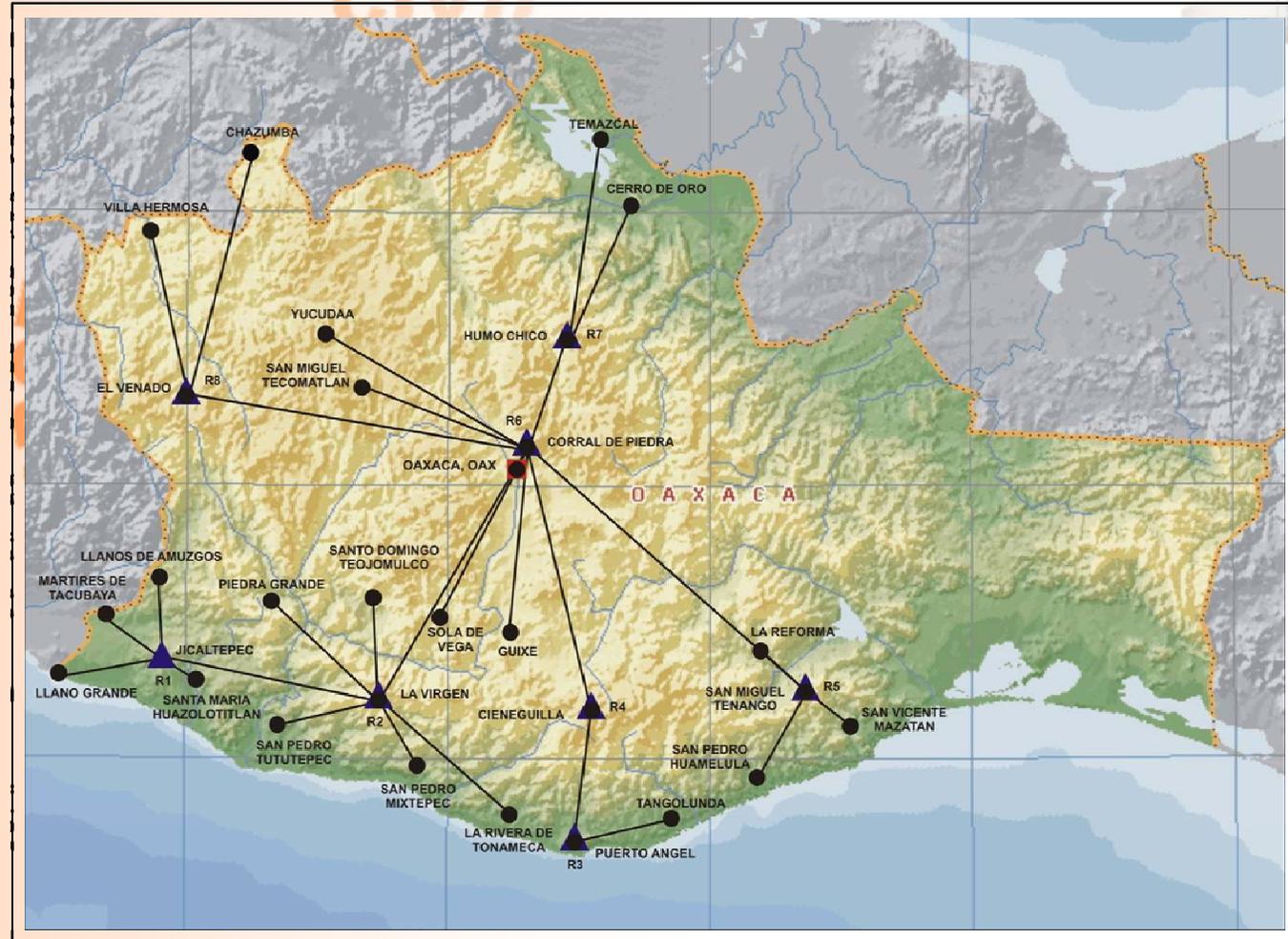


ESTACIONES SENSORAS DE CAMPO

- 1 TEPEXTLA, LLANO GRANDE
- 2 MÁRTIRES DE TACUBAYA 2
- 3 LLANOS DE AMUZGOS
- 4 STA. MARIA HUAZOLOTITLAN
- 5 SAN PEDRO TUTUTEPEC
- 6 LA VIRGEN
- 7 MIXTEPEC, SAN PEDRO
- 8 LA RIVERA DE TONAMECA
- 9 PUERTO ÁNGEL 2
- 10 TANGOLUNGA
- 11 SAN PEDRO HUAMELULA
- 12 SAN MIGUEL TENANGO
- 13 SAN VICENTE MAZATAN
- 14 LA REFORMA
- 15 CORRAL DE PIEDRA
- 16 STO. DOMINGO TEJOJOMULCO
- 17 LOS REYES, SOLA DE VEGA
- 18 GUIXE
- 19 CIENEGUILLA, SAN FELIPE
- 20 YUCUDAA
- 21 EL VENADO
- 22 SAN LORENZO VILLA HERMOSA
- 23 SAN MIGUEL TECOMATLAN
- 24 HUMO CHICO
- 25 CERRO DE ORO
- 26 PIESA TENASCAL
- 27 CHAZUMBA
- 28 PIEDRA GRANDE
- 29 OAXACA, OAXACA

ESTACIONES REPETIDORAS

- R1 JICALTEPEC
- R2 LA VIRGEN
- R3 PUERTO ANGEL
- R4 CIENEGUILLA
- R5 SAN MIGUEL TENANGO
- R6 CORRAL DE PIEDRA
- R7 HUMO CHICO
- R8 EL VENADO



How is our System?

RELACIÓN DE USUARIOS DEL SASO

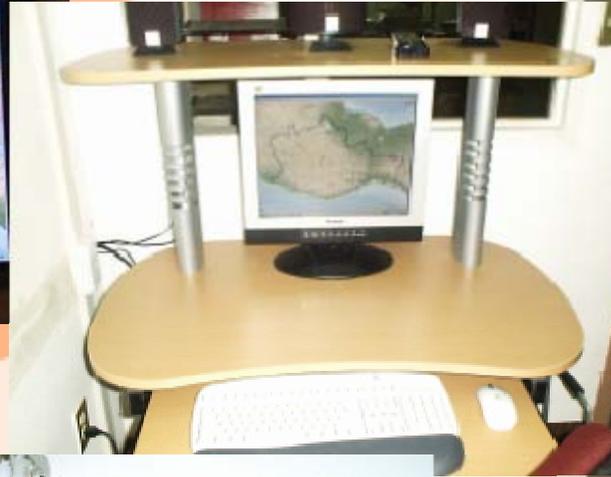
1	ARO. CORPORACIÓN OAXAQUEÑA DE RADIO Y TELEVISIÓN	Dr. Miguel Morín No. 116, Col. San Jacinto Amilpas
2	GRUPO ORO	Gómez Fariás No. 113
3	GRUPO RPO. RADIO PUBLICIDAD DEL SURESTE DE OAXACA	Av. Nezahualcoyotl No. 216, Col. Reforma
4	GRUPO ORM. ORGANIZACIÓN RADIOFÓNICA DE MÉXICO	Alcalá No. 915
5	CORO. CORPORACIÓN RADIOFÓNICA DE OAXACA	Valerio Trujano No. 708, Col. Centro
6	GRUPO ACIR. ASOCIACION DE CONCESIONARIOS INDEPENDIENTES DE LA RADIO	Jazminez No. 907
7	RADIO UNIVERSIDAD	Av. Tecnológico S/N
8	ARO. CORPORACIÓN OAXAQUEÑA DE RADIO Y TELEVISIÓN	Av. Universidad S/N
9	EQUIPO EN BODEGA CIRES	Araxágoras 814, Col. Narvarte
10	UNIDAD ESTATAL DE PROTECCIÓN CIVIL	Diagonal de Margaritas No. 109 B, Col. Reforma
11	UNIDAD ESTATAL DE PROTECCIÓN CIVIL INSTALADO EN ESCERE, TESTIGO	Diagonal de Margaritas No. 109 B, Col. Reforma
12	UNIDAD ESTATAL DE PROTECCIÓN CIVIL	Diagonal de Margaritas No. 109 B, Col. Reforma
13	CAPFCE	Boulevard Eduardo Vasconcelos No. 298
14	PALACIO DE GOBIERNO	Flores Magon y Bustamante, Zocalo
15	SECRETARIA DE FINANZAS	Boulevard Eduardo Vasconcelos No. 280
16	IEEPO INSTITUTO ESTATAL DE EDUCACIÓN PUBLICA DE OAXACA	Carretera Cristobal Colón Km. 5.5 Sta. María Ixcotel, Col. Guelaguatza
17	SEDUCOP	Calle Dr. Leon Pardo No. 2, Col. Centro, C.P. 78000
18	UNIVERSIDAD AUTONOMA "BENITO JUAREZ" DE OAXACA	Ex-hacienda de Aguilera s/n, Carretera San Felipe del Agua
19	PROCURADURIA GENERAL DE JUSTICIA DEL ESTADO	Av. Luis Echeverría s/n, la experimental San Antonio de la Cal. C.P. 71236
20	SERVICIOS DE ADMINISTRACIÓN PLAZA DEL VALLE A. C.	Av. Universidad No. 139, Ex-Hacienda de Cándiani
21	INSTITUTO TECNOLÓGICO DE OAXACA	Calzada Tecnológico y Av. Victor Bravo A. No. 125, Col. Centro
22	CBTIS No 26	Calzada Porfirio Díaz s/n, Col. Centro
23	CBTIS No. 123	Av. Lázaro Cárdenas No. 2018, Municipio de Sta Lucía
24	CONTRALORIA GENERAL DEL PODER EJECUTIVO DEL ESTADO DE OAXACA	Av. Manuel Alvarez Bravo No. 101, Col. Reforma
25	HOSPITAL GENERAL "AURELIO VALDIVIEZO"	Calzada Porfirio Díaz No. 400, Col. Naranjos
26	HOSPITAL DEL ISSSTE "PRESIDENTE JUAREZ"	Gerardo Barrera No. 417, Col. Foviste
27	HOSPITAL DEL IMSS	Calzada Héroes de Chapultepec No. 621, Col. Centro
28	DIF ESTATAL DE OAXACA	Calle Gral. Vicente Guerrero No. 114, Col. Miguel Alemán
29	ESCUELA SECUNDARIA TÉCNICA No. 6	Boulevard Eduardo Vasconcelos No. 300, Col. Centro
30	ESCUELA PRIMARIA "21 DE AGOSTO"	Boulevard Eduardo Molina
31	ESCUELA SECUNDARIA TÉCNICA N. 1	Boulevard Eduardo Vasconcelos No. 621
32	CASA OFICIAL DE GOBIERNO	Pino Suárez No. 509, Col. Centro
33	CÁMARA DE DIPUTADOS	Av. Juárez No. 713, Col. Centro, C.P. 68000
34	COBAO "PUEBLO NUEVO" COLEGIO DE BACHILLERES DEL EDO DE OAXACA	Carretera Internacional Oaxaca- México S/N
35	COBAO "DEL TULE" COLEGIO DE BACHILLERES DEL ESTADO DE OAXACA	Camino Nacional S/N, Col. Santa María del Tule
36	SEPROCI SECRETARIA DE PROTECCIÓN CIUDADANA	Carretera a Puerto Angel Km 9.5, Col. Sta. Ma. Coyotepec

- 39 receptors which are in schools, hospitals, supermarkets, commercial radio stations, congress and so fort.



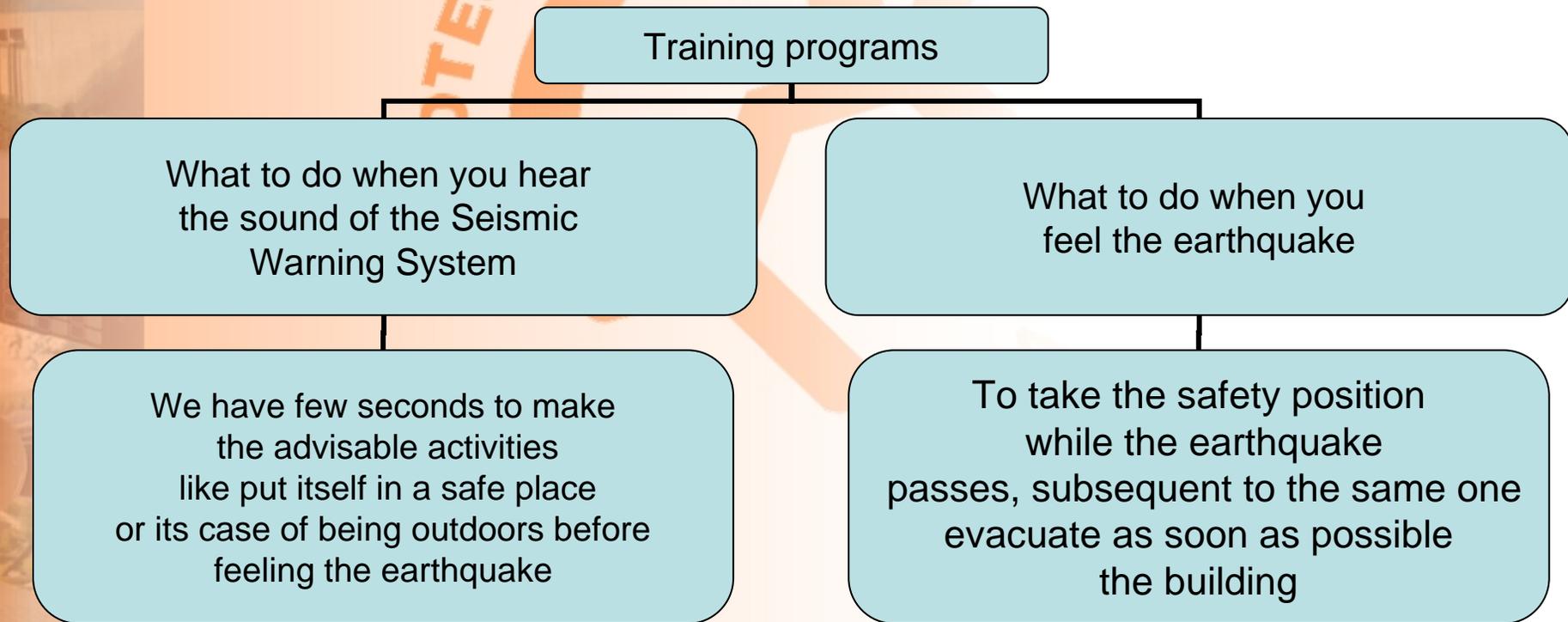
How is our System?

- One Central Station which is located at the Civil Defense office



What we did for the implementation of the seismic warning system?

Two kinds of training programs



What we did for the implementation of the seismic warning system?



- We train all the students at the schools, employers of all kind of stores, business, banks, governmental offices
- We visit the 100 thousand houses

What we did for the implementation of the seismic warning system?

- We improve with the “city response plan” which include:
 - Alternative hospitals in case of disaster
 - Traffic system with 60 groups of “voluntaries government employers”
 - We use each hour a radio spot in the comercial radio station for one year
 - To promote an multiplying effect (with profesors and students of medicine, architecture, and others fields) in order to attend the emergency.



What we did?

- We organize the whole people in Oaxaca city after November 2003 for a “simulation”
- The results:
 - The real participation was 70% of people: most of them in schools, governmental office, stores, banks, the poor participation was with the housewives.

How many times the System has been activated?

- The seismic warning system has been activated two times:

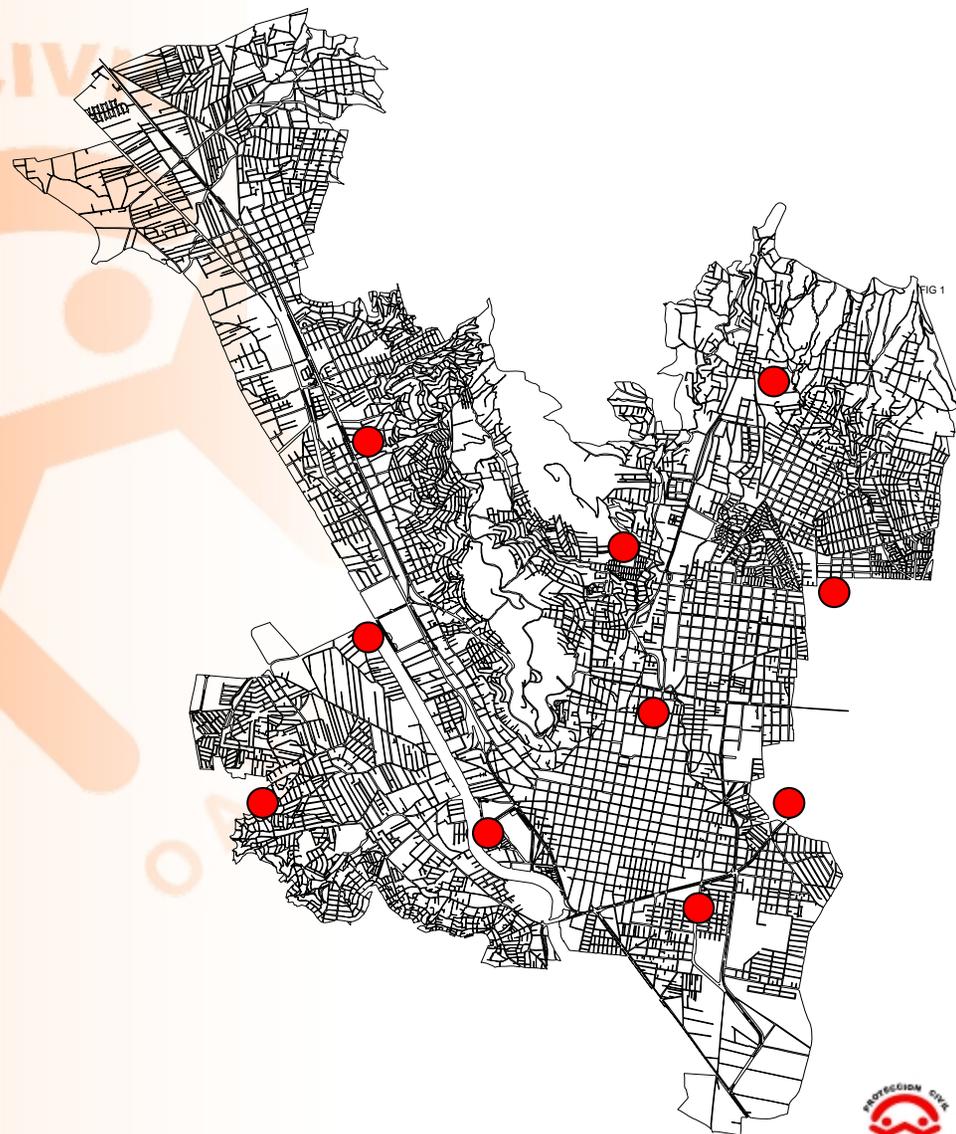
Evento	Fecha	Hora	Lat	Long	Prof(Km)	Mag	Zona.
13	13/01/2004	15:28:56	15.9	-97.03	16	5.5	DISTRITO DE JUQUILA
117	14/06/2004	17:54:23	16.03	-97.84	10	5.8	DISTRITO DE JAMILTEPEC

What were the results? **EXCELENT;**

People response was good because the hour everybody was at home. The adults said that they were helped by children and they feel very proud about that. They mind both sides.

What is next?

- The installation of 10 high frequency speakers at the city of Oaxaca in order to be sure that everybody can hear the sound.
- To put more seismic warning system receptors in bussines and industries, stores
- To put more seismic warning system in houses and bipers including
- To do again the seismic simulation involving everybody



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TODOS!*

