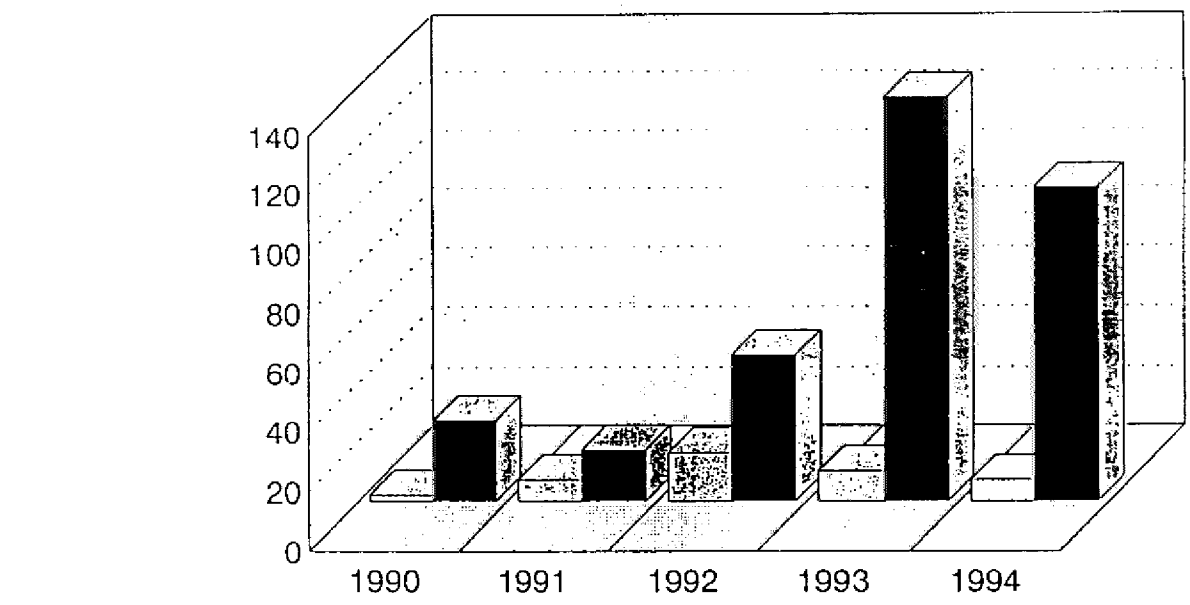
CHAPTER 6

DATABASE OF STRONG MOTION OBSERVATION

6.1. ACCELEROGRAPHIC DATABASE OF CENAPRED

Salvador Medina

CENAPRED's accelerographic network, composed by 15 digital autonomous stations, started operations in 1990. From then until December 1994, 334 three-component accelerograms have been collected, produced by 42 earthquakes with magnitudes between 3.8 (Mc) and 7.1 (Mw). Due to the constant increase in the number of accelerograms, it was decided to design a database system capable of managing this amount of information in an automated and efficient way, making easy the retrieval of information and the generation of statistical reports. This system was programmed to operate on a PC platform, and at present it allows consults through the screen as well as printed reports on key parameters of stored accelerograms, epicentral data of the earthquakes, and characteristics of the stations of CENAPRED's network.



	1990	1991	1992	1993	1994
EARTHQUAKES	2	7	16	10	7
ACCELEROGRAMS	27	17	49	136	105

Fig. 6.1.1. Number of earthquakes and accelerograms recorded each year (1990 - 1994)

6.2. HOW TO CONSTRUCT A DATABASE FOR EARTHQUAKE DISASTER PREVENTION

Yoshinori Furumoto, Hitoshi Taniguchi, Masato Sugito and Salvador Medina

An earthquake strong motion record database was developed using a Workstation at CENAPRED, Mexico. This database system provides not only strong motion records but also various kinds of software for data management and analysis for the use in the studies and applications of earthquake engineering, seismology and earthquake disaster prevention. The use of a Workstation makes maintenance cost of the database cheaper and data utilization higher. Furthermore, this set-up makes network access to this database by other institutions through the Internet, which connects to other remote Workstations easier.

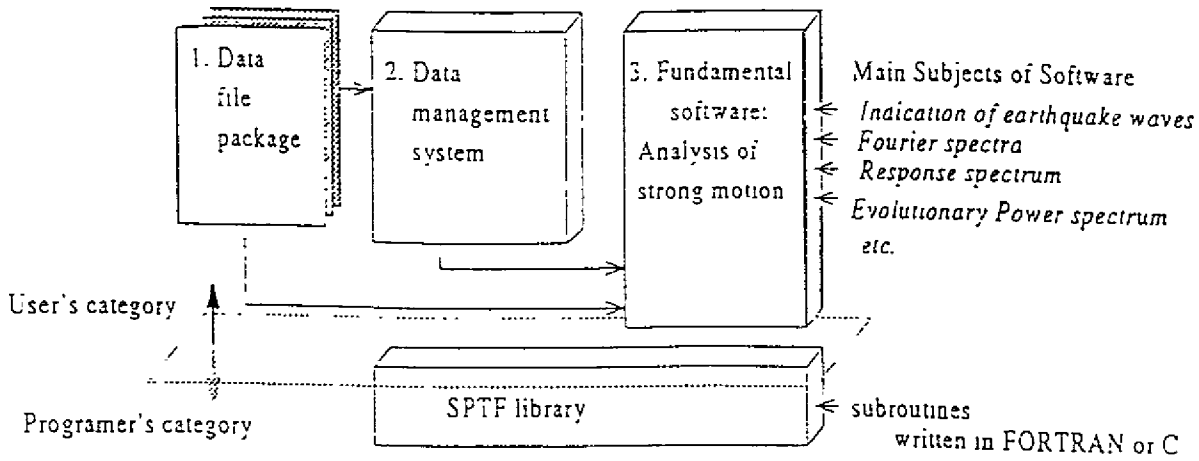


Fig. 6.2.1 Software for analysis of strong motion record

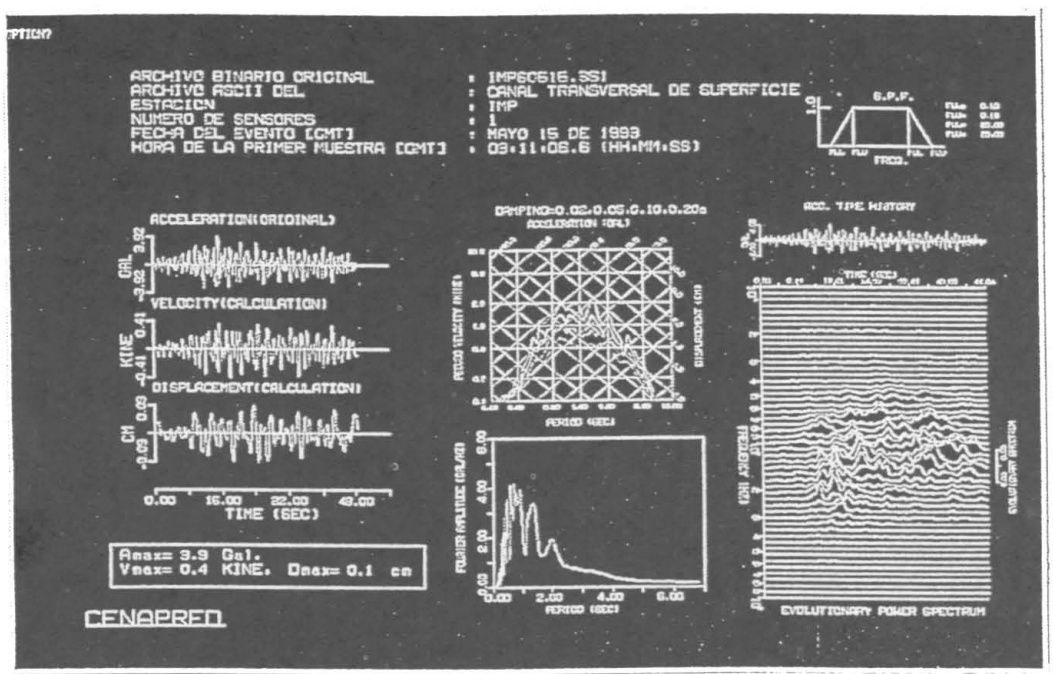


Fig. 6.2.2. Sample analysis using the fundamental software

APPENDIX

Some of the research papers introduced in this book have been published as books while others have been presented in proceedings of conferences and seminars or in research magazines among other souces, as listed below. Title of each publication is written in its original language (either in Spanish or in English). Information on those which do not refer to their data sources can be obtained through CENAPRED or from authors.

1.1. Singh, S.K. and M. Ordaz, "Sismicidad y movimientos fuertes en México: una visión actual", Cuaderno de Investigación No. 18, CENAPRED, July 1994.

1.2. Mikumo, T., "Source process of large earthquakes in the subduction zone along the Pacific Coast region of Mexico", September 1994.

1.3. Santoyo, M., "Estudio del proceso de ruptura del sismo del 25 de abril de 1989 usando registros de movimientos fuertes y telesísmicos"

2.1. Quaas, R., E. Guevara, R. González and B. López, "CENAPRED strong ground motion observation network", CENAPRED, 1996.

2.2. Gutiérrez M., C., T. Mikumo, S.K. Singh and K. Masaki, "Sismógrafos portátiles de banda ancha - características y alcances -"

2.3. Durán, R. and E. Miranda, "Respuesta sísmica de un edificio de poca altura desplantado en suelo blando en la Ciudad de México", Informe Técnico RG/02/94, CENAPRED, April 1994.

3.1. Nozaki, K., Y. Sato, K. Hamada, K. Tonouchi and Y. Kitagawa, "Basement structure of the central part of the Mexico basin as derived from a gravity survey", *Butsuri-tansa*, Vol. 46, No. 4, pp. 239-268, 1993.

3.2. Gutiérrez M., C., K. Kudo, E. Nava A., M. Yanagisawa, S.K. Singh, F.J. Hernández M. and K. Irikura, "Perfil de refracción en el sur de la Ciudad de México y su correlación con otras fuentes de información", Informe Técnico RG/01/94, CENAPRED, March 1994.

3.3. Seo, K., "Comparison of ground vibration characteristics among several districts mainly with microtremor measurements"

3.4. Masaki, K. and C. Gitierrez M., "Microzonificación sísmica de la Ciudad de Colima", Cuaderno de Investigación No. 33, CENAPRED, March 1996.

3.5. Singh, S.K., R. Quaas, M. Ordaz, F. Mooser, D. Almora, M. Torres and R. Vázquez, "Is there truly a 'hard' site in the valley of Mexico?", *Geophys. Res. Lett.*, Vol. 22, No. 4, pp. 481-484.

3.6. Kinoshita, S., "A statistical method for the investigation of site effects by means of downhole array - SH and Love waves -", Cuaderno de Investigación No 31, CENAPRED, January 1996.

3.7. Ordaz, M., M. Santoyo, S.K. Singh and R. Quaas, "Analysis of the bore-hole recordings obtained in Mexico City during the May 31, 1990 earthquake", International Symposium on the Effectrs of Surface Geology on Seismic Motion, ESG 1992, Odawara, Japan, pp 155-160

3.8. Iida, M., M Ordaz, H. Taniguchi, C. Gutiérrez M. and M. Santoyo, "Interpretation of wave field inside the Mexico Valley on the basis of borehole data", Japan Earthquake Engineering Symposium, 1994.

3.9 Singh, S.K and M. Ordaz, "On the origin of long coda observed in the lake-bed strong-motion records of Mexico City", *Bull. Seism. Soc. Am.*, Vol. 83, No. 3, pp 1298-1306, August 1993

3.10. Kawase, H. and K. Aki, "A study on the response of a soft basin for incident S, P and Rayleigh waves with special reference to the long duration observed in Mexico City"

4 1. Ordaz, M., S.K. Singh and A. Arciniega, "Bayesian attenuation regressions an application to Mexico City", *Geophys. J. Int.*, 117, pp 335-344, 1993.

4.2 Irikura, K. and J Aguirre, "The estimation of strong ground motion for future earthquakes in Mexico", Proceedings of International Symposium on Earthquake Disaster Prevention, Vol I, pp. 156-169, CENAPRED, 1992.

4.3. Ordaz, M., J. Arboleda and S.K. Singh, "A scheme of random summation of an empirical Green's function to estimate ground motions from future large earthquakes", *Bull. Seism. Soc. Am* , Vol. 85, 1995

5.1. Ordaz, M., R. Meli, C. Montoya-Dulché, L. Sánchez and L.E. Pérez-Rocha, "Database for the estimation of seismic risk in Mexico City", Cuaderno de Investigación No. 1, CENAPRED, March 1994.

5 2 Montoya-Dulché, C. and F. Vitiello S., "SRO-Seismic Risk Objects, general concepts for a risk evaluation and analysis system", Proceedings of the 9th International Seminar on Earthquake Prognostics, San José, Costa Rica, 1994.

5.3. Montoya-Dulché, C. and F Vitiello S , "Seismic hazard map in Colima City (tentative)", in preparation.

5.4. Montoya-Dulché, C. and F. Vitiello S , "Aplicación de los algoritmos genéticos al problema de la microzonación sísmica óptica", in print, *Revista Ingeniería Civil*, Mexico

6 1. Medina, S., "Base de datos acelerográfica del CENAPRED"

6.2 Taniguchi, H., Y Furumoto, M. Sugito and S. Medina, "Development of Strong Motion Record Database on Workstation"