MFS- STRONG MOTION DATA BANK AND DATA BASE RELATED MANAGEMENT SOFTWARE

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INTRODUCTION

The Iberian Península is a region of moderate seismicity, where most of the accelerograms recorded until now correspond to earthquakes of low magnitude. These records are not enough to assess seismic hazard directly according to the instrumental parameters or to estimate specific response spectra for sites in the area. The possibility to access to strong ground motion recorded in other zones is specially interesting and provides a way out to this problem.

Extrapolation of the knowledge (source effects, attenuations, and local amplifications) obtained from accelerograms recorded in regions with similar characteristics to the region studied, could be carried out, within the adecuate margins of uncertainty.

For these reasons a research project has been developed, the DAÑOS project, financed by the Spanish Nuclear Safety Council and the National Enterprise for Radiactive Waste Disposal. The project has been aimed at the characterization of ground motions in the Iberian Peninsula´s sites. One of its main activities has been the design of a strong motion Data Bank, called MFS, by compiling and classifying accelerograms and spectra from all over the world. (Benito et al., 1998; Cabañas et al., 1999).

APPLICATIONS

The MFS Data Bank is aimed at making the studies and applications in seismic engineering field easier, such as:

- Development of empirical attenuation models for prediction of spectral accelerations and velocities.
- Selection of real response spectra for checking building spectra.
- Selection of time-histories for carrying out dinamic response analysis.
- Empirical studies of local site effect.
- Empirical studies of vulnerability and damage.
- Statistical studies of correlation between macroseismic information and strong motion parameters.

DESIGN

The design model adopted by the storing and proccesing of data include three different parts:

- The so-called **Data-Bank**, composed by an extensive collection of accelerograms and spectra from all over the world.
- The associated **Data Base**, including seismological characteristicas of data.
- The **Informatic Utilities**, with the software for the explotation and proccesing data.

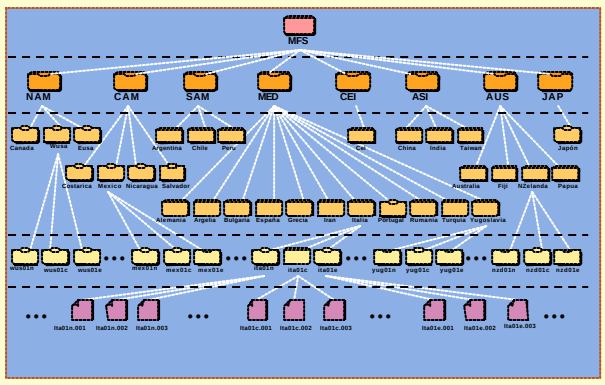
DATA BANK STRUCTURE

MFS-Data Bank

STRUCTURE
It is composed by the data files with time-history accelerations, Fourier Spectra and Response Spectra, corresponding to the strong motion records. Each file contains one component of the record and starts with a heading providing information about the earthquake, the station and the instrument followed by the digital data of the time history or the spectra.

The files (ASCII) have been stored in a Work Station, under UNIX (Solaris).

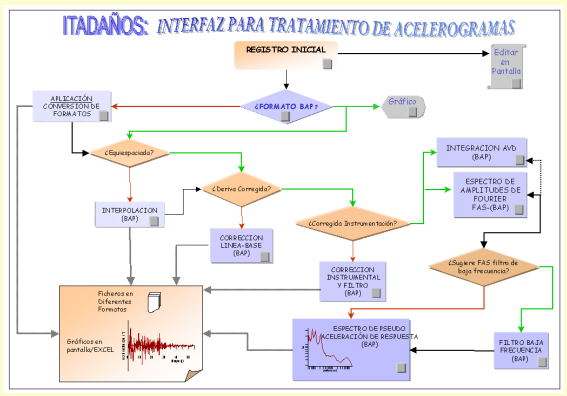
The classification of files is based on the geographical location of data, with a first level of clustering by extensive regions, a second level by countries and a third level by record of type: corrected accelerogram, non corrected accelerogram, Fourier spectrum and Response spectrum.

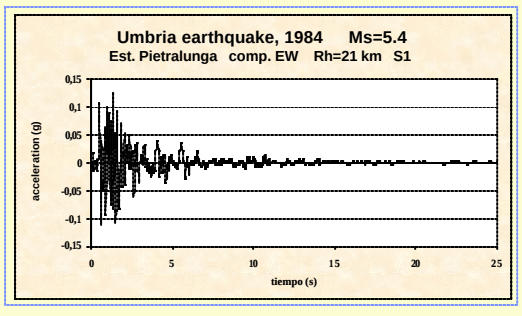


ITADaños (Interface Treatment de Accelerograms). It is an interface for proccessing strong motion records which allows reading and conversion between different formats, accelerograms correction, spectral estimation, and representation of different graphics output, with the possibility of connecting to other programs (as example with Excel-Microsoft).

The interface is linked with BAP software (Basic Accelerogram Procesing) developed at USGS (converse 1995) for proccesing records. The main menu of the program is shown in the above figure.

Right figure shows an example of a graphic obtained with the program: response spectra in acceleration, velocity and displacement.





MFS-Data Bank

Files (ASCII format):
- uncorrected accelerogram
- corrected accelerogram
- Fourier and response spectra

Data Base

Parametric catalogue with seismological information of the records of data bank

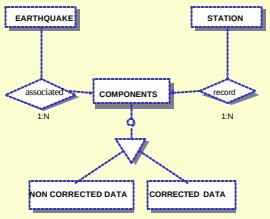
Software

Informatic utilities for management of data and proccesing records

Data Base

It is the catalogation system of the strong motion records and contains the seismological characyeristics of these, related to the earthquake, record station and instrumentation. It is an esential tool for the easy use of the data bank information.

The schedule followed is a relational model composed by 5 tables: Earthquake, Station, Components, Non corrected and Corrected.



Station Table: information about the characteristics of the recording station, type of soil and site.

Components Table: common information to each component: instrument model, distance measurement, etc..

Non-corrected Table: fields related to the record without correction.

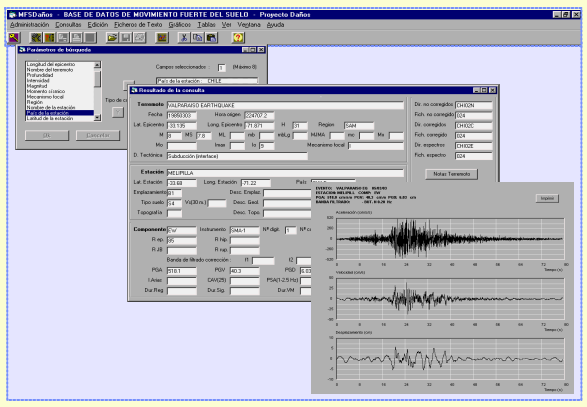
Corrected Table: information of the corrected record (peak ground values, estimated parameters, etc,).

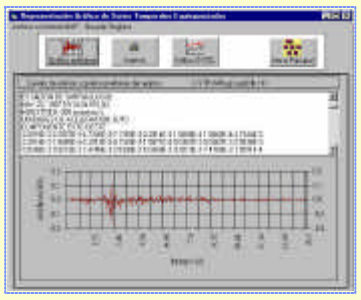
Software

Informatic utilities

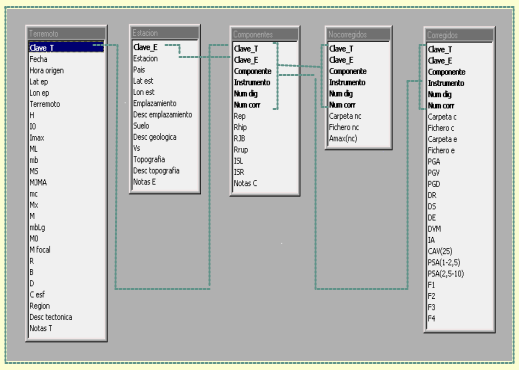
Different programs and macros (SAC-LLNL) have been developed for the analysis of data and their treatment, and two main programs have been designed for the selection and data processing: MFS-Daños and ITA-Daños.

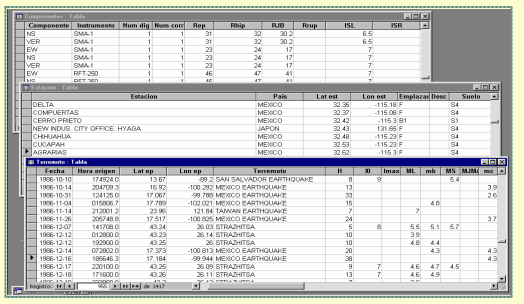
MFSDaños, It is an interface program of MFS Data Base, aimed at facilitating queries and handling these data or any user. The program allows making general queries involving all the tables and data, or other more specific questions by the selection of different parameters or interval values through the logic combination desired.
The results can be shown by means an individual card for each record or by tables with the required infomation for different records. It also is possible to see a preliminar graphic for the chosen component (acceleration, velocity or displacement).
An example of the progam management is shown in the figure.



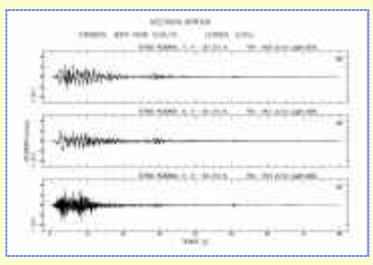


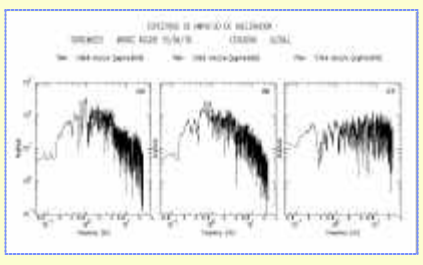
Data Base has been developed in Access -Microsoft, and it is suitable from any PC, and easy to use for management of data. Fixing some variables it is possible to obtain which records belong to the special configuration; for instance in some range of magnitudes, epicentral distances or soil conditions.





Other progams and macros (SAC-LLNL) have been developed for carring out differents task: conversion of formats, estimation of different parameters, graphic representation with output Postscript, filtering, spectral ratio, etc.

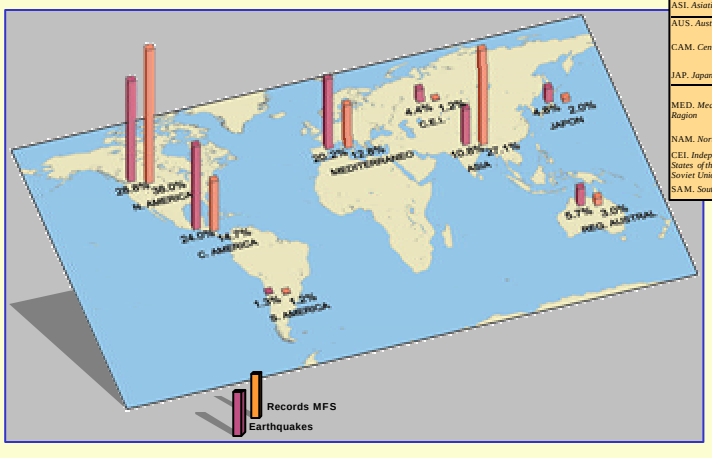




COMPOSITION OF DATA BANK

To date, the MFS Data Bank has stored more than 15.000 strong ground motion recorded components, corresponding to 1.400 events. Related information to these records is compiled in the associated Data Base.

Right figure shows the geographical distribution of data. The histograms represent number of records versus PGA and epicentral distance.



REGIÓN	Countries	% Earthquakes	% Records (1 comp
ASI. *Asiatic Region*	China, India, Taiwan	10.8	
AUS. *Austral Regionl*	Australia, Fiji, N. Zelanda, Papua	5.7	
CAM. *Centroamérica*	Costa Rica, México, Nicaragua, Salvador	24.0	
JAP. *Japan*	Japón	4.8	
MED. *Mediterranean Region*	Alemania, Argelia, Bulgaria, España, Grecia, Iran, Italia, Portugal, Rumania, Turquía, Yugoslavia	20.2	
NAM. *Northeamérica*	Canadá, EEUU	28.8	
CEI. *Independent States of the former Soviet Union*	Rusia y antiguas Repúblicas Soviéticas	4.4	
SAM. *Southamérica*	Argentina, Chile, Perú	1.3