The day SENECA started thinking about earthquakes

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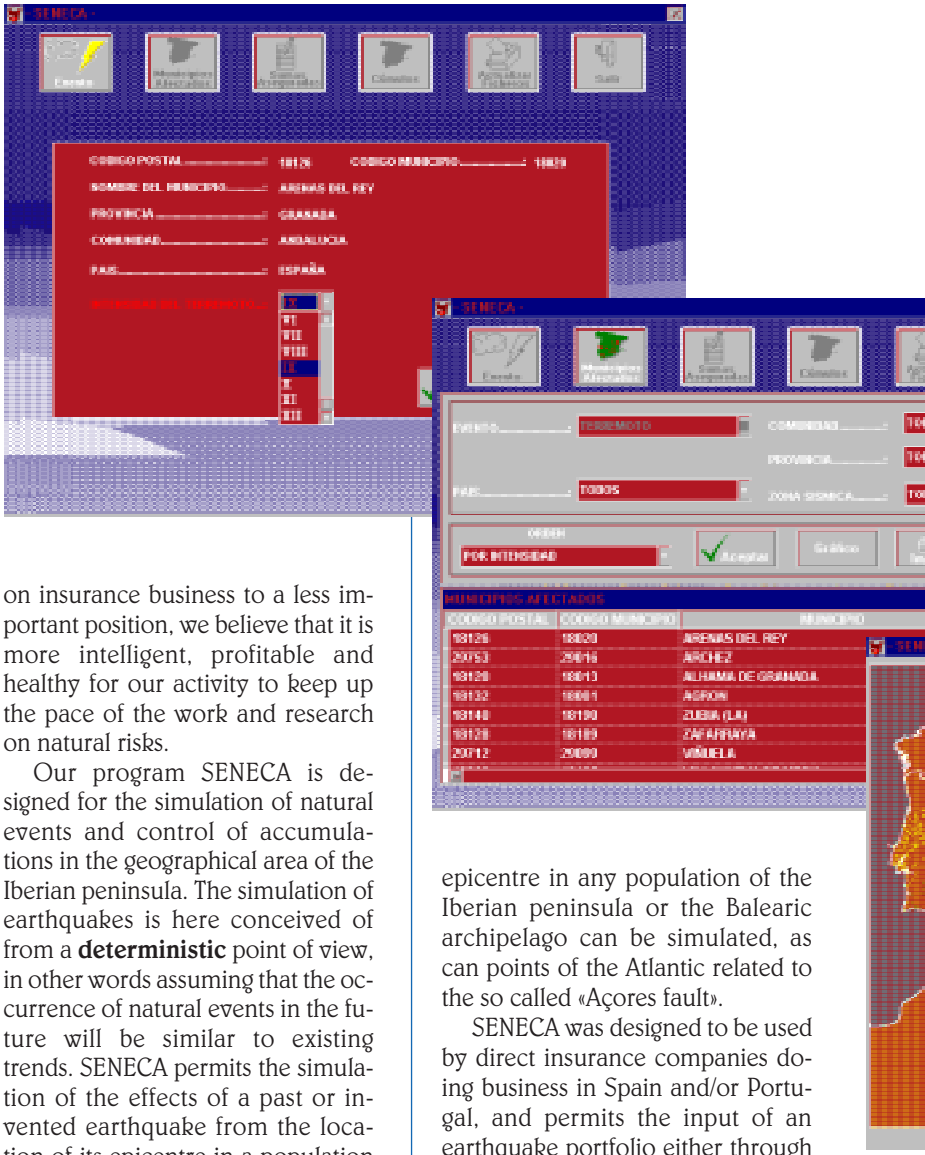

It will soon be the second anniversary of the earthquake Kobe which struck on January 17,1995, and this short time, together with the fact that a number of catastrophic events have been well dealt with by the insurance and reinsurance market, has been enough for the coverage of natural risks to recover from the tensions felt during the last phase of hardening of the markets.

Rather than to relegate the analysis of the impact of the catastrophe on insurance business to a less important position, we believe that it is more intelligent, profitable and healthy for our activity to keep up the pace of the work and research on natural risks.

Our program SENECA is designed for the simulation of natural events and control of accumulations in the geographical area of the Iberian peninsula. The simulation of earthquakes is here conceived of from a **deterministic** point of view, in other words assuming that the occurrence of natural events in the future will be similar to existing trends. SENECA permits the simulation of the effects of a past or invented earthquake from the location of its epicentre in a population and the epicentral intensity, and then to calculate its effects on a previously entered portfolio. The extent to which the populations in the relevant area would be affected is calculated through attenuation curves for each seismogenetic area, i.e., where earthquakes are produced. This is done using mathematical models which have been validated by the Instituto Geográfico Nacional de España and the Laboratório Nacional de Engenharia Civil de Lisboa (Portugal). In summary, it can be deduced from those models that the greater the distance, the larger will be the attenuation or weakening of the energy of the earthquake. Earthquakes with their epicentre in any population of the Iberian peninsula or the Balearic archipelago can be simulated, as can points of the Atlantic related to the so called «Açores fault».

SENECA was designed to be used by direct insurance companies doing business in Spain and/or Portugal, and permits the input of an earthquake portfolio either through a direct connection with the company computer, from magnetic media or by inputting the portfolio policy by policy. The program also calculates the distribution of insured capitals of each risk following a previously entered reinsurance program and gives information on earthquake accumulations by geographical area (countries, provinces, municipal areas, postal codes), type of risk and reinsurance contract, among other options. For each of the earthquakes which has been simulated the program gives a distribution of the insured sums which would be affected by the various degrees of intensity, and, once this point has been reached, standard

Probable Maximum Loss (PML) tables are used to calculate the approximate cost of the simulated earthquake for each category, type of risk and seismic intensity.

Internally SENECA works on the level of municipal areas and/or postal codes in such a way that each one has associated with it its corresponding policies, the seismic area in which it is situated, the associated level of seismic hazard, the seismogenetic area and the geographical coordinates, amongst other factors.

In contrast to the deterministic approach to natural risks which has been described, the probabilistic approach, using a knowledge of the history of a phenomenon, aims to deduce the statistical laws to which this phenomenon conforms, and thereby obtain its associated probability of occurrence. The probabilistic treatment of the occurrence of natural events helps, amongst other things, to optimise the management of these covers, allowing adequate rates according to the type and location of the risk to be calculated. In addition to this there is now a whole new range of new technologies and computing tools which until only a few years ago did not exist, and which have now become the solution to some of the insurance industry's needs. Of special note amongst these new computing tools are the Geographic Information Systems (G.I.S.), which, together with new mathematical models and powerful statistical calculation programs, allow a large quantity of information to be handled and to obtain satisfactory results in a reasonable period of time. Although SENECA is designed to carry out simulations from a deterministic point of view, to a certain extent a small G.I.S. system has been included, as the postal codes and the municipal areas have been georelated to their associated data (seismic area, policies, etc.) through their geographical coordinates.

Traditionally earthquakes have been the stars of natural risk analysis, but since the end of the 80's international reinsurers have been aware that they share the stage with tropical cyclones and winter storms, phenomena which are surprising because of their erratic behaviour, destructive potential and their wide sphere of action. After the hurricane season of 1995 in the North Atlantic with its frenzied pace of creation of tropical disturbances, the experts reanalysed the climatic variables which together produced this explosive combination. This led to the prediction of a season of significant activity in 1996, but without reaching the levels of the previous year; this prediction turned out to be correct.

The study of the dangers and the risks of the phenomena related to wind is different from that of earthquakes, but the G.I.S., for example, are of great help in the handling of a good number of georeferential data such as the variables which describe the trajectory of the hurricane (geographical co-ordinates, pressure, wind velocity).

Both because the volume of catastrophe business is continuing to grow, and because the insurance industry needs to be in a good state of health and to be able to establish catastrophe reserves which can provide an adequate response for society in the case of a loss, it is necessary to continue doing research and investing human resources and materials in a better understanding, modelling and simulation of catastrophes. This is why, both in MAPFRE RE and in ITSEMAP STM, we will shortly be starting a series of projects, using the resources which the new technologies today offer us, which will attempt to satisfy the requirements of the insurance and reinsurance sector.