

Chapter I

Macroseismic data from documentary sources

1. Introduction

Documentary source materials are essential for a retrospective reconstruction of the macroseismic field data of past earthquakes. However, it is clear that the results of any study based mainly on an inventory of data available from different sources is subject to the quality and completeness of the information. Thus, the earthquake data available today will determine the accuracy of this research and the significance of the conclusions drawn. In order to assess the seismicity of the region with a certain degree of reliability, great care must be taken in analyzing the information retrieved. Sources of information are found in local and European documentary materials, newspapers, administrative records, special studies, scientific reports, private diaries and various books. Such materials are available in libraries and archive centres throughout the Maghreb and in Mediterranean European countries such as Spain, Italy and, particularly, France. These sources may provide important macroseismic data (Ambraseys and Melville, 1982, for Iran and 1983a, for Yemen; Ambraseys, 1985a, for Scandinavia and Ambraseys and Vogt, 1988, for Algeria) for any research on past seismic events. It is helpful that for many of the twentieth century earthquakes, the sources of macroseismic information are more numerous and detailed, especially through the proliferation of local newspapers. Mainly, the

knowledge of the seismicity of the Maghreb region, during the early years of this century and before, is based on press information. The contribution of the newspapers in the survival of macroseismic information is noteworthy. However, in many parts of the Maghreb and other parts of the world with similar literacy and population density, macroseismic information alone may be insufficient to locate and study completely earthquakes of magnitude of less than about 6.5 during this century (Ambraseys and Adams, 1991). Even today, in sparsely populated area in the Maghreb region, it would not be easy to retrieve damage data that would enable one to locate with reliability the macroseismic epicentre.

Many factors influence the survival of information. These include site accessibility, geographical position of the region, socio-economic conditions, political and military situations, and building stock characteristics. Indeed, each region and period of time has its own particular characteristics. For instance, during the colonization period of the region, the information for native settlements was obviously limited by the lack of interest since the press was particularly read in the urban and European sites (Vogt, 1993). There is also the difficulty of information in the isolated sites with sparse population. It may be thought that the lack of information in the native settlements could have been produced by some kind of censorship imposed by the French administration; but the press was very agitated and at-

tacked continuously the administration and would not accept, in general, such censorship (Vogt, 1993). During that period, the administration was more interested in the damage caused to buildings which represent a certain capital and which could be technically examined. No interest was given to the *gourbis* which are easily rebuilt. Also we should keep in mind the political pressure that may be exercised by the European settlers on the administration; a possibility that the native Algerians did not have (Vogt, 1993). In order to avoid gross errors the effects of the shortcomings in the source materials should always be taken into account when analyzing the macroseismic data. Many of the drawbacks associated with the source documentary materials are considered in this chapter.

2. A perspective on source material data

The quality and completeness of macroseismic data depend considerably on geographical, socio-economic conditions and political and military situations which are seldom constant for any region during its history. Particular features of each period of time and each region make the analysis of historical data unique to each event. It is evident that the results are different from one region to another; they depend considerably on the quality, the availability and the quantity of the sources and, naturally, on the degree of research. To understand better the importance of the earthquake and the macroseismic data contained in the contemporary source documents, it is imperative that retrieved information be carefully analyzed in their whole historical context, to avoid serious miscalculations. The data collected from different original sources provide useful details about the effects of the earthquake on man-made structures, humans and on nature itself. When available in sufficient quantity, the macroseismic data allow the determination of very useful parameters such as intensity distribution and its attenuation, macroseismic epicentral location and depth.

The wide extent of the Atlas mountains and their topographical and historical characteristics have helped to make the regions more or less isolated from each other, but connected by natural features. Even for some of the twentieth century earthquakes, in sparsely populated and remote areas, macroseismic information is insufficient to reconstruct a reliable description of the event. Local urban centres have greatly participated in the reports of earthquakes, in regions whose histories have been agitated and violent as in the Maghreb. In the whole process of collecting information, investigation, when possible, should also be conducted into the modern instrumental seismology. The knowledge of the historical development in locations and time of the seismographic stations, in the region under survey as well as in the world, is very important.

For many parts of the Maghreb countries and other parts of the world with comparable literary production and density of habitation, it is well known that the cities, large towns or major *douars* constitute the main sources of macroseismic information, particularly when the event occurs within the surroundings of such a town; damage information is more likely to be well reported, while that occurring in remoter sites could be left unclear. In this context it has been noticed in the course of the investigation that the geographical distribution of relatively well described earthquakes is significantly associated with the density of the population of the area. Thus, particularly in the early years of this century and before, when reports depended mainly on macroseismic information, the quantity of damage data available for towns or large settlements in contrast with that of the remote rural sites could not only misstate the true picture of the earthquake and the real macroseismic location, but also affect the whole model of seismic activity within the region.

As the political and economic situations of the Maghreb countries have changed considerably during the twentieth century, it is obvious that the characteristics of the

information are largely related to the historical development of the region. Thus, the period under survey in this investigation may be divided with respect to two main historical periods for the region: colonization and independence periods. The first period, from 1900 to independence (Algeria, 1962; Morocco and Tunisia, 1956), is defined by the fact that almost all the sources of macroseismic information are French sources. The second period, from the independence to today, is marked by local works, which represent the main source of information, and international expertise. Fortunately, these two periods are characterized by a certain continuity in the early years of independence. However, since the political situations have changed, it is wise to keep two distinct periods, as various factors of each may affect considerably the quality and quantity of the information.

A concise description of these periods is meant to show some of the factors that influenced the information in the sources used.

3. The first period (1900 – independence)

This period represents the French colonial epoch during the twentieth century in the Maghreb region. It is possible to survey the Maghreb region as a whole due to the fact that Algeria, Morocco and Tunisia have characteristics in common in both their ancient and modern histories. These include religion, cultural background, socio-economic conditions, political situations and building stock types.

It should be noted that this period is marked by three important wars, the First World War (1914-1918), the Second World War (1939-1945) and the Algerian Liberation War (1954-1962), all of which had greatly influenced both the macroseismic and instrumental information. Instrumental data were available but still uncertain and macroseismic information continued to be not only useful but irreplaceable. The his-

torical development of instrumental data is discussed in Chapter IV. Macroseismic information in Algeria, Morocco and Tunisia started to be published in both the local and European press well before 1900. From 1919, the data of the seismological bulletin (monthly) of the Observatory of Alger-Bouzareah were published in the *Annales de l'Institut de Physique du Globe de Strasbourg* (France). From 1929, the *Institut Scientifique Cherifien* (Morocco) was sending macroseismic information to the *Bureau Central Séismologique Français* (BCSF). These macroseismic investigations were organized by the *Service de Physique du Globe et de Météorologie* (Morocco) using inquiries by questionnaire and to a great extent, the network of the meteorological observers.

The result of this investigation, relative to source documents containing macroseismic information, is a collection of contemporary accounts of various types. These documentary source materials could be classified under two general headings which are: the official works and the general public information (press reports). The first type includes published and unpublished scientific works, official reports, administrative correspondence, private letters, military records and bulletins of the BCSF. During this period, about twenty national and regional macroseismic catalogues were published some of which date from before 1900; they contain very important data about earthquakes in the Maghreb region. These catalogues, despite their incompleteness and inhomogeneity, constitute important references, in terms both of felt and recorded seismic activity, and should be considered as the starting point for the revision of the seismicity of the region. Invaluable macroseismic data were published in reports by Hée (up to 1937) and Rothé (up to 1962). These works enhanced considerably the knowledge of the seismic phenomenon in the Maghreb countries; they were derived mainly from field visits or teachers' network, which were least affected by political conditions. Some of

these reports are relatively complete and include distribution of intensities, local magnitude, isoseismal maps, macroseismic as well as instrumental epicentres.

The macroseismic information available during this period is mainly due to the large number of European settlers (farmers, military personnel, health organisations...) who moved to regions previously considered isolated and little known and brought with them their curiosity, mobility and technology which extended substantially the potential of perception of shocks in a greater territorial area in the Maghreb. An important goal of their penetration in the hinterland was the accumulation and transmission of all types of information (religious, cultural, administrative, economical, political...) about the zone, which could be used for strategic, political and colonization ends. As an example, these documents are known as the Archives of the General Governor of Algeria, they are kept in the Archive and Documentation Centre of the Wilaya of Alger. They contain invaluable information on all aspects of the colonization period, and most of them are still unpublished and thus unknown to the public. The progress of information available is reflected by the increasing number of recorded earthquakes in the Maghreb since the second half of the nineteenth century. This amount of data is greatly enhanced by the second type of source documentary material, which is described below.

To a great extent, the knowledge of seismicity of the Maghreb region during the early years of this period relies on press reports. The overall contribution of the press has played a major role in the revision of the knowledge of the seismicity of the region. This type of source document, although written for public consumption, presents the effects of the event according to the geographical and political circumstances. Some of these reports contain very detailed information, mentioning names of damaged cities, villages, douars and even buildings, houses and streets, behaviour of the population and animals, effects on na-

ture, relief operations, photographs and interviews with people, while others give a bare minimum of data for the assessment of intensities or simply mention «the earth quaked» in such and such a region.

Newspapers began to appear in the Maghreb countries in the middle of the nineteenth century with a few titles such as *Le Mobacher*, *Le Moniteur d'Algérie*, *L'Akhbar*, *La Dépêche Algérienne*, *Le Tell...* etc. and many more local ones, as in *Batna (Echo du Sahara)*, *Bone (La Gazette Algérienne)*... etc., for Algeria; *Le Reveil du Maroc*, *Times of Morocco*, *Echo Mauritanie*, *El Maghreb El Aksa...* etc. for Morocco and *La Tunisie*, *Le Petit Tunisien*, *Tunis Journal*, *L'Echo de Tunis...* etc. for Tunisia. The twentieth century has seen an important development of the press by the addition of several new titles and an improved coverage of information from remoter zones. The collections of newspapers are kept in the National Libraries, National Archive and Departmental Archive Centres. For instance, numerous titles collected and kept at the Archive and Documentation Centre of the Wilaya of Alger (*Centre de Documentation et d'Archives de la Wilaya d'Alger*) have been used in this work. Naturally, some collections of the Algerian local press are kept in the *Bibliothèque Nationale de Paris (France)*, but with some left out which may be due to the negligence of the administration in Algeria. Due to the difference in legal status, no collection of the Moroccan and Tunisian press are kept in the *Bibliothèque Nationale de Paris (Vogt, 1993)*.

In the early years of this century, the emphasis of the press remained on court, national and local affairs or foreign news, and coverage of information from remote zones was very poor. Between 1900 and the independence of the Maghreb countries, information from the press concerning the native population was rather scarce. In all the daily newspapers, it can easily be seen that news was limited to colonial towns, villages and even farms. Sparsely distributed douars, in many intermediate colonial set-

tlements within the radius of perceptibility of several events, which could have enriched the macroseismic data, are not mentioned by name. Official colonial reports rarely communicated loss statistics for non-European settlements, a subject which has been discussed in the previous chapter. Therefore, it can be assumed that the lack of detail concerning the native population, which is clearly noticeable in the press, was probably due to the lack of interest of the French administration. This fact is clearly shown in the *Echo d'Alger* (12/02/1937) as a journalist stated: «...we cannot report the considerable damage in the native settlements». For earthquakes that occurred during the Algerian Liberation War (1954-1962), in addition to the lack of interest of the administration in native Algerians, the press and scientists were generally prevented from visiting isolated settlements, which made the information to concentrate on urban centres or important douars in the plain only. From desert zones, no macroseismic information at all is available from the press. This may be explained by several obvious reasons (population density, types of construction, lack of communication systems...). With the exception of large earthquakes originating in the desert, which may be felt in the main towns or oasis around its borders, others of less intensity could left unknown for ever.

Of foreign newspapers, the most informative were those of France such as *La Gazette de France*, *La Dépêche Coloniale*, *Le Figaro*, *L'Humanité* and *Le Monde*. The *Times* (U.K.), *New York Times* (U.S.A.) and some Spanish, Italian and Belgian newspapers were consulted but did not add more information than that found in the local and French press. All the press reports were used only for specific earthquakes, the titles mentioned in the references are those giving most detailed accounts describing the event.

Another new source of information appearing during this period is unpublished technical reports related to the construction of large engineering structures. Most of these works contain invaluable information

accumulated in situ by engineers or geologists after an earthquake or in specific studies made to evaluate local seismic hazard. A collection of some of these reports concerning the construction of dams in Algeria is kept in the library of the Algerian National Agency of Dams (*Agence Nationale des Barrages*). This collection was comprehensively consulted during this research.

4. Recent period (since independence)

Since the independence of the Maghreb countries, the availability of information continues to improve as the century advances; this is true up to about 1965, when many regional newspapers disappeared. As an example, in Algeria from twenty titles which were distributed over different parts of the country, only six were still in production in 1967 and all state owned. Complete sets of the Maghreb newspapers produced during this period are well kept through National and Departmental Libraries and Archive Centres, ... in their respective countries. In fact, macroseismic documentary information is available for almost anywhere in the Maghreb region, except for shocks of low significance. The press, state owned and controlled, was also very much influenced by the political and socio-economic circumstances during this period.

As for the previous period, published and unpublished professional reports continue to improve the knowledge of the seismicity in the Maghreb countries, as modern large engineering structures such as nuclear power plants and dams require a certain degree of accuracy in the evaluation of the seismic hazard of a region.

Seismological studies, damage statistics, reconstruction projects, as well as relief operations reports, are prepared by different Ministries, research institutes, national and international bodies, as well as many scientific papers produced after specific earthquakes (Agadir, 1960; El-Asnam, 1980); in this period the macroseismic data available from other sources also increased substantially.

In addition to those already in existence, about ten other national or regional catalogues have been published since 1963 for the Maghreb or Ibero-Maghreb regions. These catalogues, very often, contain useful information about earthquakes in the region. Most of them cover different time periods, use or mix different magnitudes and intensity scales and are never complete for any given region.

This research has the aim of presenting a new homogeneous seismic catalogue for the twentieth century, for the region limited by 20°-38°N, 10°W-12°E, using all the documentary materials available.

5. Conclusions

This general survey of source documentary materials, during the period under investigation, shows the scope of the survival of the macroseismic information in the Maghreb region. During this period, several historical changes or events have taken place which have in some way affected the information in general. Depending on the circumstances, the information may be exaggerated or simply minimized. The extent of the report of a destructive earthquake is generally dependent on many factors such socio-economic conditions, political situation and peace or war time; the event may be commented on in great detail for a long period of time (as El-Asnam 1980 earthquake) or simply mentioned briefly and quickly forgotten (as Constantine 1985 earthquake). In other words, the information has always been used, if the opportunity offered, to achieve political or socio-economic aims. During the colonization period, macroseismic data came mainly from European settlements of which the distribution and density vary considerably. Photographs taken shortly after some destructive earthquakes show that the press exaggerated the damage in European quarters, but not in native settlements. Meanwhile, names of cities or important villages have always been given to the earthquake occur-

ring in their zones, this seriously affected the recorded location of the event and thus made macroseismic information available for densely populated sites rather than outlying villages and douars (Aumale 1910 earthquake). This is still happening today; the Chenoua 1989 earthquake was referred to as Tipaza (chief town of Tipaza Wilaya) earthquake by the Algerian press which had the effect of directing all the relief effort towards that town and simply neglected much more seriously affected surrounding villages and douars throughout the region, and particularly around the Chenoua Mount. This may be easily explained by the political circumstances of that period (see Chenoua 1989 earthquake). At the same time, reports giving evidence of extensive destruction of buildings and a high casualty toll in a city may still not imply that a large earthquake was implicated: the Agadir earthquake of 29 February 1960, which caused the loss of 12000 lives, injuring about 12000 and destroying 80 percent of the city, was widely reported by media all over the world, had a surfacewave magnitude only of 5.70.

These shortcomings in written accounts of earthquake impacts have to be dealt with by the use of sources and investigations adapted for each particular case. To reduce these drawbacks, one must take care in analyzing the accounts and, when possible, in comparing more than one source of information. Since independence, the press of these countries is state owned and controlled, which limits the number of sources and thus makes impossible the comparison of reports.

Another source of macroseismic data has been the invaluable field studies which contributed considerably to the understanding of the earthquake phenomenon, in the correlation and the reconstruction of past destructive events. Field knowledge of damaging earthquakes is indispensable for the understanding of liquefaction, earthquake-induced rockfalls and landslides and scope of damage. This investigation method is discussed in more details in the next chapter.