

EARTHQUAKE HAZARD IN THE CARIBBEAN AREA ON THE BASIS OF HISTORICAL STUDIES

by

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SYNOPSIS

This is a preliminary report of a study still in progress towards the elucidation of the historical occurrence of destructive earthquakes in the Caribbean area from Columbus up to 1900. A large number of descriptive sources have been consulted in order to establish any reported earthquake since the discovery of America in 1492. The cumulative time sequence of destructive events in the region is presented; no particular intensity nor earthquake risk could be assessed from the obtained data at the present stage due to lack homogeneity.

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Recent theories of tectonics in which large plates of lithosphere move with respect to one another have suggested that the Caribbean area might very well be one of these tectonic units. Looking at modern world-seismicity maps in which information from a wide instrumental network is taken into consideration, the boundaries between any adjacent plates are defined by belts of high seismic activity. Although these type of maps only cover a relatively limited number of years, part of the boundaries tend to be clearly delineated and in some cases reveal several small aseismic units. The recent seismicity of the Caribbean area strongly suggests that it is one of these units.

The length of time covered by instrumental data is negligibly short when compared with the geological time scale involved in the seismicity of a region. This fact is particularly relevant in a region where destructive earthquakes are relatively scarce compared with others, but in any case occasionally they are destructive and therefore of paramount importance from the earthquake engineering standpoint.

Keeping in mind these ideas, the historical seismicity of the zone is a useful piece of evidence in a further analysis of the earthquake hazard, as Ambraseys (1) has very well pointed out. The present paper constitutes an advance of a work still in progress towards the elucidation of the historical occurrence of destructive earthquakes in the Caribbean area from Columbus up to 1900.

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A large number of references have been consulted in order to establish any reported earthquake since the discovery of America in 1492 (2). This search was focused towards original descriptions of eyewitnesses, and when first hand references could not be found, second hand accounts or statements were used. This has particularly happened with the XVIth and XVIIth century chroniclers; the XVIIIth century is richer in descriptions from local living missionaries, residents, european travelers and traders who experienced such phenomena. Later on, during the last century, all kind of local sources from newspapers to pseudo-scientific analysis of destructive events.

No useful information could be found in relation to precolombian times within this area, aside from unprecise accounts of the autochthonous population. After Columbus discovery the first reference of any earthquake relates to the presumed destruction of the first spanish settlement, Santo Domingo in the island of Hispaniola, apparently due to a strong quake during 1502. Nevertheless there exists founded doubts due to the fact of the occurrence of a damaging hurricane in the same region that same year (earthquakes and hurricanes have been mixed up at least in two other occasions). Therefore, being this a questionable event, it appears in dotted lines in Figure 1.

It is in 1530, september the first, on the northeastern venezuelan coast near the island of Cubagua, that the first destructive event should be placed. Fiedler (3) has thoroughly studied this case and gives epicentral intensity ($I_0 = 10-11$ MCS) and coordinates ($10,7^{\circ}N$; $64,1^{\circ}W$) on the basis of Castellanos elegies (4). Incidentally, Poey (5) refers to an earthquake in Cuba that same year stating as source "... ma propre autorité..."; most likely this is a miscitation between the names Cuba and Cubagua, since being Poey's catalogues very rich in bibliography in this case his assertion rests only on his authority.

Figure 1 indicates the time cumulative frequency of destructive earthquakes and a map of the studied region. The time distribution along three areas indicated as Zones I, II and III is separated and appears in the same figure. Periods of relative quiescence up to about the end of the XVIIth century may be attributed to lack of information. The homogeneity of the data relies only on the fact that out of more than 3000 events listed, less than 7% were destructive. No particular intensity can be assessed to the given frequency curves, since data corresponding to different degrees of damage on different types of constructions have been placed together on the same curve within an area of variable density of population.

It is premature therefore to advance any figures whatsoever for the estimate of earthquake risk. Further work is under way towards the location of epicentral areas and intensity estimates. Matching with modern instrumental information will be also necessary.

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