# The CCRIF Earthquake Model
## Historical events database

***SPHERA: System for Probabilistic Hazard Evaluation and Risk Assessment – Data collected and sources***

CCRIF has created a database of **historical earthquakes** with the list of the main earthquakes that occurred in the Central American and Caribbean regions, and the **resulting economic losses**. A number of reports and databases were considered, such as those from GEM[1], EM-DAT[2], Local sources (ECLAC[3], local newspapers, local websites, etc.), Wikipedia, Swiss Re, Munich Re, AON. Table 1 shows the information type available from each source.

*Table 1. Information type available from each source*

| Source | Period | Fatalities & Overall Losses | Insured Losses | People Affected | Structures Affected |
|---|---|---|---|---|---|
| **Swiss Re** | 1990 – 2017 | X | X | | X |
| **Munich Re** | 1980 – 2017 | X | X | | |
| **AON** | 2009 – 2017 | X | X | | X |
| **EM-DAT** | 1900 – Present | X | | X | |
| **Wikipedia** | 1900 – Present | X | | | |
| **GEMECD** | 1972 – 2010 | X | X | X | |

The information collected includes the occurrence date, country or the region affected, event magnitude, and consequences (e.g., damaged buildings, economic losses, and fatalities). Figure 1**Errore. L'origine riferimento non è stata trovata.** shows the available consequence data divided by magnitude interval.

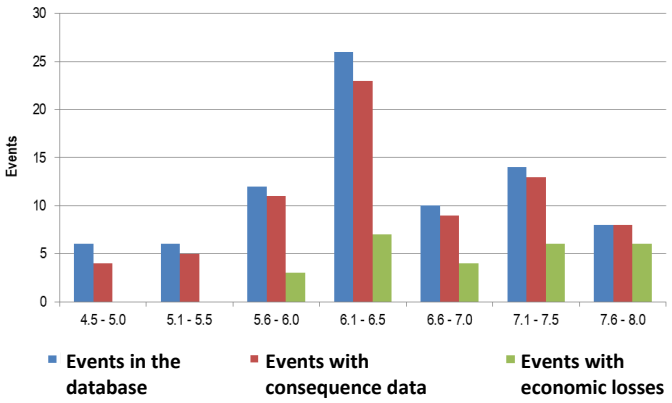


*Figure 1. Distribution of events depending on the magnitude. The red bars refer to events with at least one report (not necessarily including an estimation of economic losses), while the green bars refer to events with reported losses*

According to the United States Geological Survey (USGS) earthquake catalogue, more than 8,000 events with magnitude greater than 4.5 occurred since 1900 in the considered region. In the consequence database all the events with at least one loss datum (either human or economic) were reported. The final earthquake consequence database developed for Caribbean and Central America contains loss data for approximately 85 earthquakes.

[1] *GEM: Global Earthquake Model Earthquake Consequences Database*
[2] *EM-DAT: Emergency Events Database, Centre for Research on the Epidemiology of Disasters (CRED)*
[3] *ECLAC: United Nations Economic Commission for Latin America and the Caribbean*

Since the Central American countries (Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama) were affected more frequently by severe seismic events than the Caribbean countries, most of the reported losses are from these countries, as depicted in Figure 2.

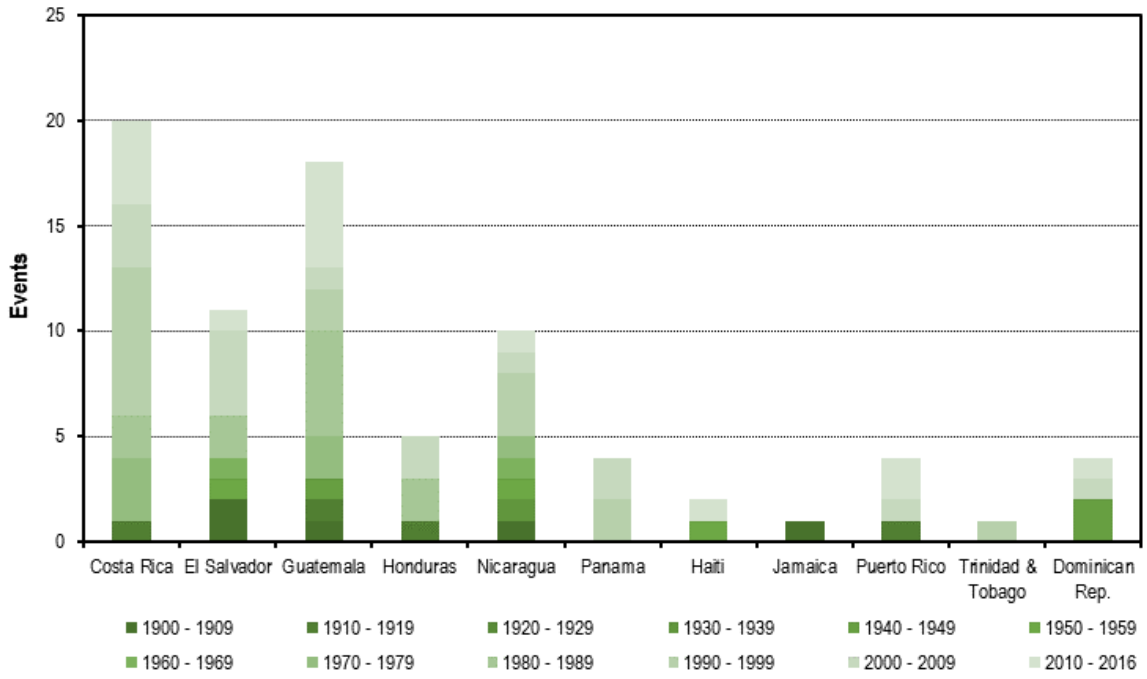


*Figure 2. Number of events for some countries in Central America and the Caribbean from 1900 to 2017*

## *Most harmful events*

Although in this region earthquakes are not as frequent as other types of hazard such as hurricanes, the harm to populations and the economic impact they cause is high. In the Caribbean and Central America region some seismic events left countries recovering for years. At least 6 earthquakes were reported with more than US$700 million of overall economic losses, with the earthquakes in Haiti (January 2010) and El Salvador (January 2001) the most damaging events (in economic terms) since the records started. Considering an average of the economic losses reported by the different sources, the Haiti 2010 earthquake caused a loss of US$8.2 billion, while the El Salvador January 2001 earthquake caused a loss of US$1.4 billion.

Figure 3 shows the losses classified by magnitude. The analysis has indicated that overall loss values not only depend on the magnitude of the event but other factors, such as exposure concentration and vulnerability also have a relevant role. Figure 4 shows the ranking of overall losses normalized by the gross domestic product (GDP) of the affected country.

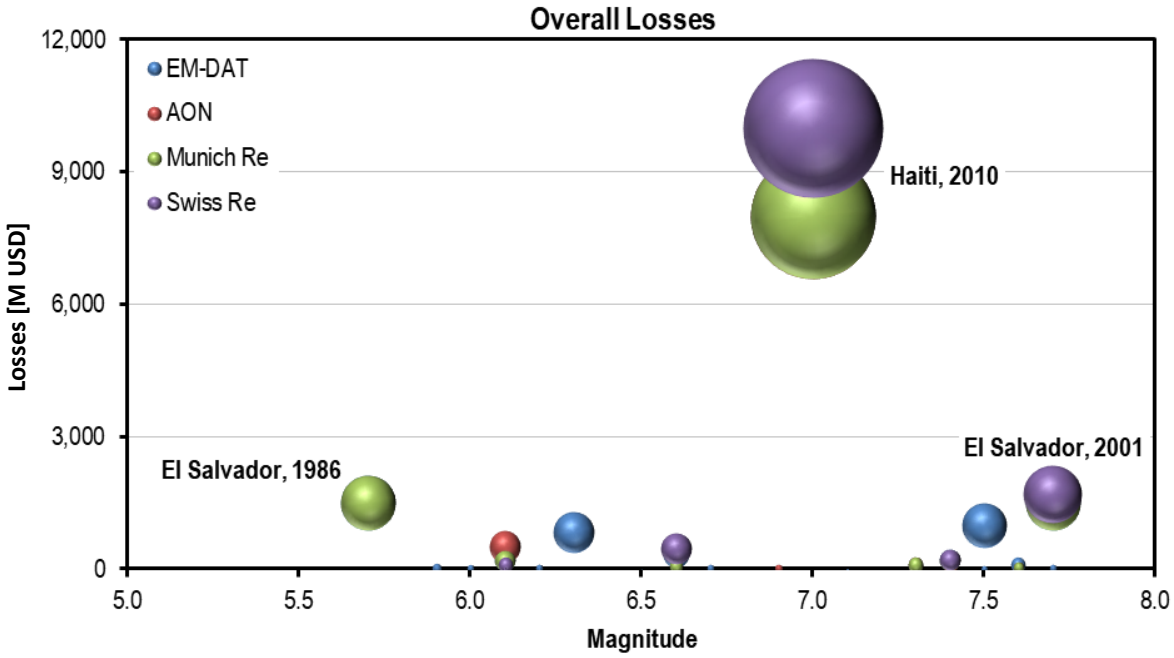


*Figure 3. Historical event losses classified by magnitude*

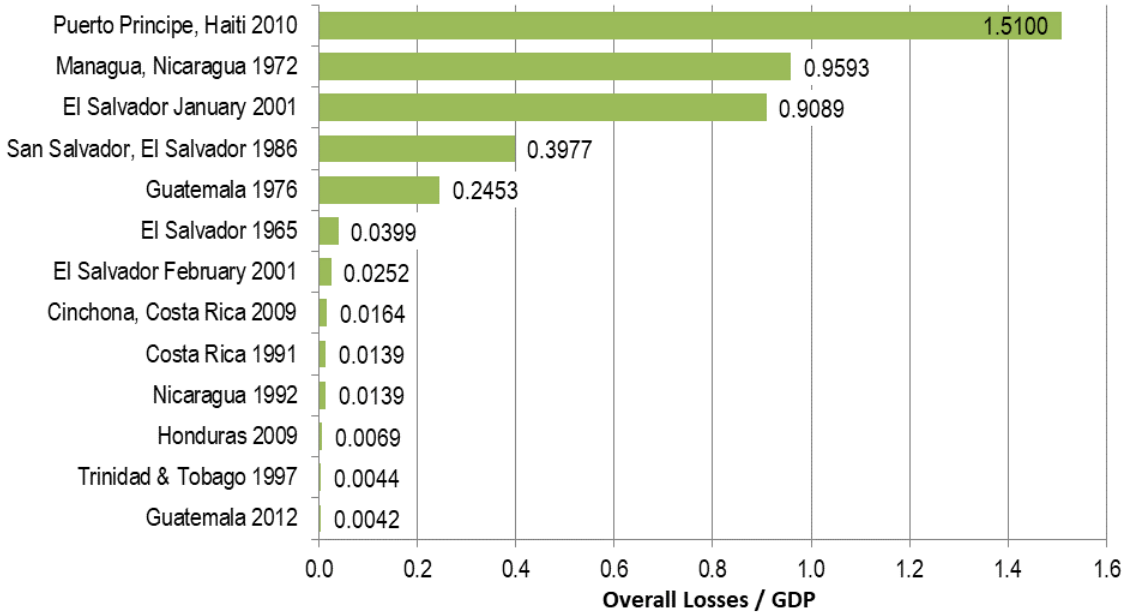


*Figure 4. Ratio of losses to GDP for the most harmful earthquakes*

**The current members of CCRIF are:**

**Caribbean – Anguilla, Antigua & Barbuda, Barbados, Belize, Bermuda, British Virgin Islands, Cayman Islands, Dominica, Grenada, Haiti, Jamaica, Montserrat, Saint Kitts & Nevis, Saint Lucia, Sint Maarten, Saint Vincent & the Grenadines, The Bahamas, Trinidad & Tobago and Turks & Caicos Islands**

**Central America – Nicaragua and Panama**