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Nonlinear Deterministic Study of Seismic Microzoning of a City in North of Algeria

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Abstract

This paper presents also an overview of seismic microzonation studies of the city of Mohammadia-Algiers, which are important for a detailed ground movement modeling of urban cities. According to the seismic history of the city, one extraordinary earthquake event has been taken into consideration is Boumerdes earthquake (Algeria, May 21, 2003, magnitude Mw=6.5), that caused a huge damage. Thereby, the variability prediction of the seismic ground movement in a given built-up area, it is considered as an effective tool for planning appropriate urban development and understanding both seismic risk and damage pattern, caused by a strong movement event. We note that the shaking level is mainly described in terms of both maximum ground acceleration and visualized amplification by using response spectra. The study is carried out in two steps: - a detailed mapping of the geology and geotechnical properties of the area - numerical modeling of expected ground motions during earthquakes. A qualitative microzonation of the Mohammadia-Algiers city is presented, and it is discussed by comparing it to the historically reported damage of the 2003 Boumerdes earthquake. Finally, this study deals with the seismic microzonation map development, based on a SIG geological model.

Keywords: Seismic Microzonation; Site Effects; Shear Wave Velocity; Ground Response Analysis.

1. Introduction

The town of Mohammadia city is located in the heart of Algiers, about 10 km to the east. It is bounded, on the west, by Oued El Harrach, on the north, by the sea, on the south, by the national road (NR.5) and, on the east, by the municipalities of Bordj El Kiffan and Bab Ezzouar. It is located according to the following geodetic coordinates 36° 44' 00" North 3° 08' 00" East (Figure 1). This zone is known by its great seismic activity due to the approximation of the Eurasia and Africa tectonic plates. Algeria's north has witnessed several destructive earthquakes whose the majority has been registered. To illustrate, the Setif earthquake (419) which is the first historically known list, postponed by Miniati (1995) [1], then Algiers in 1365 and 1716, Oran in 1790, and Gouraya in 1891. In the recent period, we can list the cheleff / (The city of Orleans) earthquakes on September 09th, 1954, El Asnam on October 10th, 1980, M = 7.3 [2 -4], Constantine on October 27th,1985, M = 6 [5], Tipaza on October 10th, 1986, M = 6.1 [6] Mascara on August 17th, 1994 [7], Ain Temouchent on December 22nd, 1999 [8], Beni-Ouartilane on November 10th, 2000, M = 5.7 [9] and Boumerdes on May 21st, 2003, M = 6.8 [10-12].

The crust quake is the reason for the majority of damages, which are generated by an earthquake. Therefore, they can represent the direct repercussions of soil vibrations coming directly from the focus. However, lands movements can be

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