



# ***Interactive comment on “Subsoil seismic characterization through Vs30 for future structural assessment of buildings (Ciudad del Carmen, Mexico)” by Leonardo Palemón-Arcos et al.***

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Response to comments of Referee #1 "Subsoil seismic characterization through Vs30 for future structural assessment of buildings (Ciudad del Carmen, Mexico)"

nhess-2020-194 Comments to Author The paper has been written as a technical report, needs to be rewritten, and it should be clear what they want to solve. Likewise, its results should be presented in terms of a characterization of seismic site effects as a preliminary step for quantification studies of seismic hazard. Some remarks 1. An abstract summarizes, usually in one paragraph of 300 words or

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less, the major aspects of the entire paper in a prescribed sequence that includes: 1) the overall purpose of the study and the research problem(s) you investigated; 2) the basic design of the study; 3) major findings or trends found as a result of your analysis; and, 4) a brief summary of your interpretations and conclusions (See <https://libguides.usc.edu/writingguide/abstract#:text=An%20abstract%20summarizes%2C%20usually%20in%20a%20>

RESPONSE: We thank the reviewer for providing many constructive comments that allow us to improve the manuscript presentation. Furthermore, a thorough revision on the manuscript writing has been conducted. For comment number 1, this information has been included in the revised manuscript (see Page 1, Line 14 to 29). “Not all sites in a country are characterized geotechnical or seismically, especially those classified as low seismicity by the country’s regulations. However, nearby earthquakes with epicenters no greater than 500 km may arise at a site of interest, for example, due to the soil type, on September 8, 2017, the intraslab Chiapas-Mexico earthquake was felt causing damage to the facades of the buildings in Ciudad del Carmen Campeche, and major structural damage in the state neighboring. Therefore, for the purpose of mitigating subsequent damage with another earthquake equal to or greater magnitude, it is important to have the subsoil shear-waves velocities as a preliminary phase for quantification studies of seismic hazard as well as analysis and design structural seismic considering soil-structure interaction and soil liquefaction. For this reason, in this study under the seismic approach, an assessment of Ciudad del Carmen Campeche subsoil is presented. Active and passive Multichannel Analysis of Surface Waves and Refraction Microtremor technique to investigate seismically subsoil characteristics have been employed. Shear wave velocities were obtained up to a depth of 30 m with magnitudes of 172.45 m/s to 353.90 m/s. Based on the Vs30 values, the subsoil is seismically classified into D and E according to the criterion of the National Earthquake Hazards Reduction Program and International Building Code, turning out to be very vulnerable to high damage during the earthquake shaking. Furthermore, Ciudad del Carmen was regionalized into three types, where type I being a dense soil or averagely soft rock with Vs30 greater than 360 m/s, type II when the

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soil has an intermediate dynamic amplification with  $V_{s30}$  between 180 to 360 m/s, and type III correspond to a soil with large dynamic amplifications and  $V_{s30}$  less than 180 m/s”.

2. The goal of the study is not clear. RESPONSE: For comment number 2, this information has been included in the revised manuscript (see Page 2, Line 39 to 41). “Therefore, the purpose of this project is to characterize the subsoil through shear wave velocities as a preliminary step for the quantification studies of the seismic hazard as well as the analysis and structural seismic design considering the soil-structure interaction and soil liquefaction”.

3. The section Introduction must be focusing in describe the importance of know the subsoil seismic response in areas with the absence of seismic studies and what methodologies are recommended applied. RESPONSE: The reviewer is right, this suggestion has been incorporated in the new version of the manuscript (see lines 40-46, page 2).

4. Is it necessary to change the focus of the geological framework section to a seismotectonic framework only for southern Mexico. RESPONSE: The reviewer is right, this suggestion has been incorporated in the new version of the manuscript (see lines 94-102, page 4). Southeast Mexico is lying in a complex tectonic zone because the movements of the North American, Caribbean and Cocos plates (Fig. 1b) converge in this region from the late Oligocene (Morán Zenteno et al., 2000), that is, the North American Plate moves to the west with respect to the Caribbean, while the Cocos Plate moves to the Northeast with respect to the previous ones. The boundary between North American and Caribbean plate is driven by the Polochic Motagua fault system, in which North American plate laterally moves with respect to the Caribbean to 1.7 cm/year, while the Cocos Plate subducts under North American with a convergence rate of 7 cm/year. This regional tectonic involve an interesting subduction process in the region of Tehuantepec Ridge, a transform fault. The geometry of Cocos Plate changes drastically from the East to West near the Tehuantepec Isthmus, the dip angle

changes from  $\sim 45^\circ$  to a low angle subduction of  $\sim 25^\circ$  in the same direction (Manea et al., 2014).

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