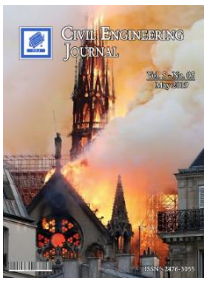
Available online at www.CivileJournal.org

Civil Engineering Journal

Vol. 5, No. 5, May, 2019



Peruvian Subduction Surface Model for Seismic Hazard Assessments

Luis F. Vergaray [a*], Zenón Aguilar B. [b], Renzo S. Cornejo [a]

[a] *National University of Engineering, Lima 051, Perú.*

[b] *Japanese Peruvian Center for Seismic Research and Disaster Mitigation (CISMID), Lima 051, Perú.*

Received 30 March 2019; Accepted 12 May 2019

Abstract

Throughout the years seismic hazard calculations in Peru have been developed using area sources models, having to date a great variety of models, however, since they are discretized planar models, they cannot adequately represent the continuity and subduction characteristics of the Nazca Plate. The main objective of this work is the developing of a surface subduction model (SSM), useful for seismic hazard assessments as well as the revision and control of previous models used in this sort of assessments. In this study a spatial interpolation was performed employing the Local Polynomial Interpolation method to capture short-range variation in addition to long-range trends. The data base is based on the compilation of seismic catalogs from Peruvian and international institutions such as the IGP, the USGS, the ISC and others, subsequently, in order to have independent events the elimination of duplicate events, aftershocks and foreshocks was carried out. Then, by interpolation of the focal depths of the independent events, a subduction surface model (SSM) was generated as well as a Standard Error Surface which supports a good correlation of the model. Furthermore, 14 transversal sections of the SSM was employed to compare with the hypocenter's distributions, evidencing a good correlation with the spatial distribution of the events, in addition to adequately capturing the subduction characteristics of the Nazca Plate. Finally, a comparison was made between 2 Peruvian area models for seismic hazard and SSM developed in the present research, evidencing that seismic source models of the area type have deficiencies mainly in the depths they consider, thus is recommended the use of the present model for future seismic hazard assessments.

Keywords: Subduction Surface Model; Seismic Hazard; Seismic Sources.

1. Introduction

Definition of seismogenic source are one of the most crucial parts in probabilistic seismic hazard assessments because it models the spatial distribution of earthquake events. Castillo and Alva [1] proposed the first seismotectonic model for seismic hazard assessments in Peru, his models was composed by 20 seismogenic area sources of which 12 were to model the subduction and the rest a continental sources. As a part of their work, the author developed the first national seismic hazard assessment in Peru. This model was extended employed, many years later, Bolanos and Monroy [2] developed an actualization of the national seismic hazard using this model.

Later, Gamarra [3] developed an actualized a model of 20 area sources, 14 of these were subduction sources. Some years later, Aguilar et al. [4] presented an actualization of the models trying to capture the spatial distribution of earthquakes that previous models could not adequately represent. This last model considers 29 area sources and 20 of them are used to model the intraplate and interface seismic zones. Although each time the models presented a greater discretization of the area, the sources in order to better represent the subduction characteristics, these do not necessarily

* Corresponding author: lvergaraya@uni.pe

http://dx.doi.org/10.28991/cej-2019-03091305