SnT 2025 8 SEPTEMBER ONLINE DAY 9 TO 12 SEPTEMBER AT HOFBURG PALACE, VIENNA & ONLINE
CTBT: SCIENCE AND TECHNOLOGY CONFERENCE

International Monitoring System data contribution to the first building code in Bolivia (Plurinational State of).

Fernńadez G.A.[1], Assumpcao M.[2], Nieto M.[1], Arce W.[1], Condori F.[1], Baldivieso J.[1], Griffiths T.[1], Barrios L.[1], Vidaurre M.R[1]., Machaca Z.[1]

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INTRODUCTION AND MAIN RESULTS

The International Monitoring System (IMS) of the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) provides high-quality data from seismic, hydroacoustic, infrasound, and radionuclide stations and laboratories. All State Parties have access to these data and can apply them in both scientific and civil contexts within the framework of the CTBTO treaty. In the Plurinational State of Bolivia, seismic and acoustic data from certified IMS stations have been used to support the development of the country's first seismic building code. Two key seismic stations—LPAZ (PS06) on the Altiplano and SIV (AS08) in the Sub-Andean region—have allowed systematic recording of earthquakes across Bolivia over the past 50 years. The high quality of calibrated data, in terms of instrumental response, enabled the derivation of an empirical law to convert magnitudes from ML to Mw and facilitated the production of Bolivia's first probabilistic seismic hazard map with ground acceleration values. These results directly contributed to the creation of the nation's first seismic building code.

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Background and Introduction

LPAZ-PS06 and SIV-08 seismic station have been recording earthquakes for more than 50 years, both stations are under strict supervision of international cooperation, AFTAC and CEA-DASE. On 1999 the LPAZ-PS06 was certified as primary seismic station for IMS and on 2008 the SIV-AS08 was certified as secondary seismic station. The high signal to noise ratio and the certified instrumental responses permits to obtain waveforms in displacement (nm), velocity (nm/s) and acceleration (nm/s²), a proper calibration routine is conducted by CTBTO, so there are certainty that instrumental response are well calibrated. Figure 1 presents an example of a ML1.7 earthquake recorded at LPAZ and SIV.

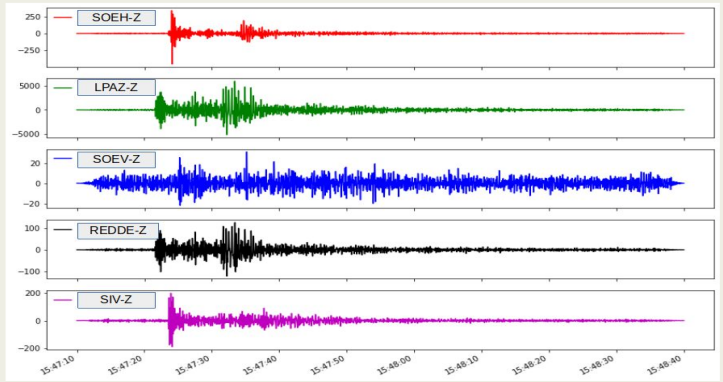

Figure 1. ML1.7 earthquake on 2023/07/18 depth 19 km recorded at LPAZ (green color) and SIV (magenta color).

The empirical magnitude conversion law

Since 2008 many efforts were made to have a national building code by different institutions. Until 2019 where the OSC produced the first Probabilistic Seismic Hazard Map (PSHBO-2019). The empirical magnitude conversion was done with LPAZ-PS06 and SIV-AS08 data. In 2023 the first "Norma Boliviana de Diseño Sísmico (NBDS-2023)" was published. The design spectrums were done with LPAZ-PS06 data too, as shown in Figure 2.

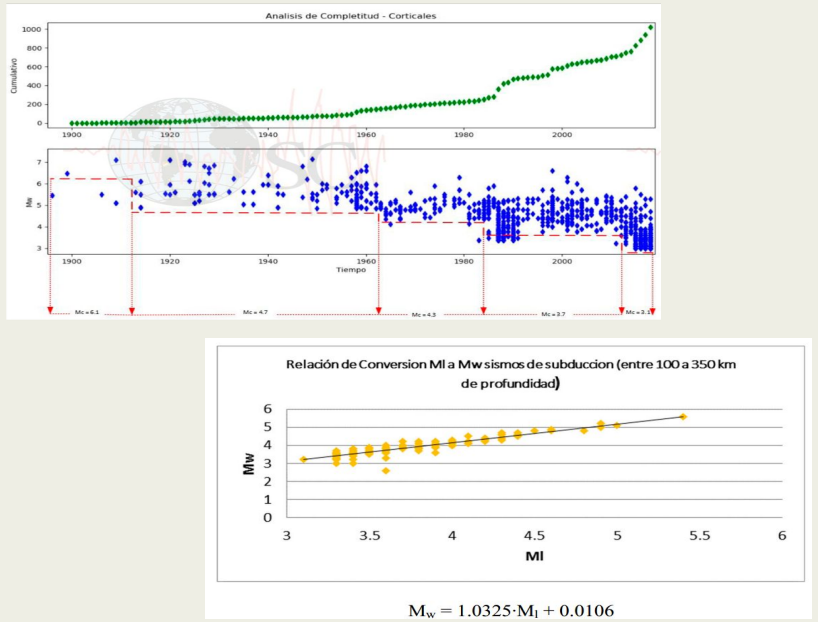

Figure 2. Upper figure presents the completeness magnitudes for different periods, lower figure show the empirical equation to convert from ML to Mw.

The "Norma Boliviana de Diseño Sísmico"

The "Norma Boliviana de Diseño Sísmico" was officially presented by the Ministry of Public Works in November 2023, it includes the Observatorio San Calixto's hazard map and the design spectrums done with LPAZ - PS06 data, as shown in Figure 3.

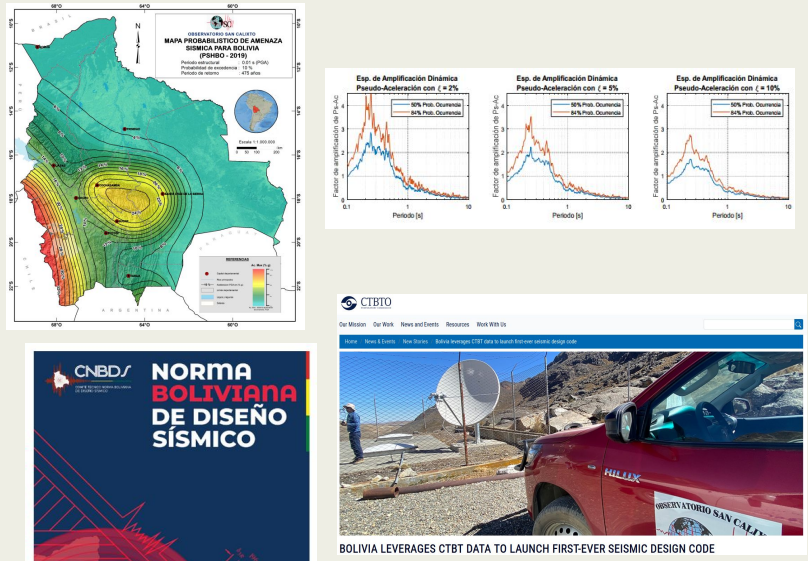

Figure 3. Upper left figure the PSHBO hazard map, upper right figure the design spectrum. Lower left figure the building national code, lower right figure the CTBTO news highlighting the IMS data used in this research.

OBSERVATORIO SAN CALIXTO
CTBTO PREPARATORY COMMISSION