

Growth and advancement of the Seismology Laboratory at the National Data Center of Paraguay

Alcides Caballero
Moisés Gadea

National Data Center - Paraguay



INTRODUCTION AND MAIN RESULTS

The CPUP seismic station was established in the 1990s. Later, an agreement with the CTBTO and the installation of the I41PY infrasound station led to the National Data Center, starting continuous technological improvements. Enhanced analytical capabilities enabled collaboration with the University of São Paulo (USP), producing research and publications.

Alcides Caballero & Moisés Gadea.

P5.2-012

Seismic monitoring: Its beginnings

Before the agreement with the CTBTO, the CPUP station, part of the Global Telemetric Seismic Network (GTSN), had been transmitting its data exclusively to Albuquerque, New Mexico - USA, since August 4, 1994.

Waveforms were displayed and analyzed by the software “seatool” provided by AFTAC Team.



Machine room and real-time data transmission since August 4, 1994

Infrasound Station Installation

In 2001, the I41PY station was installed. It consists of four elements and transmitted data via radio frequency to the CPF, where the CPUP borehole is located.



H4 element: WNRS, tower, vault and the view of the CPF of Infrasound station

Alcides Caballero & Moisés Gadea.

P5.2-012

National Data Center Installation

Infrasound Station upgrade

CBS maintenance

In July 2018, the I41PY has been updated and improved.

In July 2019, the Capacity Building system was maintained with a software package update.



Lunch

CTBTO Officer Mr. Mario Villagran with Mr. Vincent Figueres installing the NDC, and lunch time.

In 2012 the National Data Center have been installed by CTBTO. Seismic and infrasound waveforms were received in near real time. NDC-in-a-box package available for data analysis.



I41PY upgrade successfully



CTBTO Officer Mr. Alexander Poplavskiy with Mr. Vincent Figueres adding disk to the CBS.



Alcides Caballero & Moisés Gadea.

P5.2-012

New software packages

Getting started with the SeisComP3, DTK-GPMCC as well as Geotool.



Mr. Alcides Caballero learning how to add station from USP network and picking in SeisComP3 with the CTBTO Officer Mr. Alxeander Poplavskiy.

From Seatool to Geotool

CPUP data Comparison in geotool and seatool.



Mr. Moisés Gadea analyzing data.

Satisfactory results: Analysis and journal publications

Improving the analysis capacity and working with new softwares, the outstanding results can be watched here.

Reportes Científicos
de la FACEN

Reportes científicos de la FACEN, enero-junio 2021, 12(1): 10-20
<http://doi.org/10.18004/rfacen2021120110-20>

Artículo Original

Las Zonas Sísmicas en Paraguay

The Seismic Zones in Paraguay

Rafael Fugarazzo^{1,3}, Moisés Gadea^{1,4}, Maximiliano Caballero^{1,5}, Marcelo Souza de Assumpção^{2,6} & Vincent Figueres^{1,7}

¹Universidad Nacional de Asunción, Facultad de Ciencias Exactas y Naturales, Laboratorio de Sismología.
²Universidade de São Paulo, Instituto de Astronomia, Geofísica e Ciências Atmosféricas.
³<https://orcid.org/0000-0002-0298-2613> - Email: rfugarazzo@facen.una.py ⁴<https://orcid.org/0000-0002-4628-5668>
⁵<https://orcid.org/0000-0002-5951-7297> ⁶<https://orcid.org/0000-0002-0378-8406> ⁷<https://orcid.org/0000-0002-1308-6767>

Resumen: Habiendo recurrido a una revisión de catálogos de eventos sísmicos históricos y recientes, publicados por instituciones de monitoreo regionales de Argentina, Bolivia, Brasil y los registros de la Estación Sismológica de FaCEN – UNA (CPUP) de aquellos sismos con epicentros dentro del territorio paraguayo, se reporta un inventario de sismos ocurridos en Paraguay y se proponen sus zonas sísmicas.

Palabras Clave: Sismos, Paraguay, Intraplaca, Subducción.

Abstract: Having checked catalogs of historical and recent seismic events, posted by regional monitoring stations of Argentina, Bolivia, Brazil and the seismic records of the Seismological Station at FaCEN – UNA (CPUP) of those earthquakes with epicenters in the paraguayan territory, an inventory of earthquakes occurred in Paraguay is reported and its seismic zones are proposed.

Key Words: Earthquakes, Paraguay, Intraplate, Subduction.

Two scientific papers published in local journals.

REVISTA

Artículo Original

EFFECTS OF REGIONAL EARTHQUAKES ON BUILDINGS IN ASUNCIÓN – PARAGUAY

EFECTOS DE LOS TERREMOTOS REGIONALES EN LAS EDIFICACIONES EN ASUNCIÓN – PARAGUAY

Alcides Caballero
Laboratorio de Sismología, Facultad de Ciencias Exactas y Naturales, Universidad Nacional de Asunción
San Lorenzo, Paraguay
Email: alcides@facen.una.py ORCID: <https://orcid.org/0000-0002-1308-6767>

Moisés Gadea
Laboratorio de Sismología, Facultad de Ciencias Exactas y Naturales, Universidad Nacional de Asunción
San Lorenzo, Paraguay
Email: moises@facen.una.py ORCID: <https://orcid.org/0000-0002-4628-5668>

Investigador Independiente
Paraguay
Email: moises@facen.una.py ORCID: <https://orcid.org/0000-0002-1308-6767>

Autor correspondiente: alcides@facen.una.py

Cómo citar este artículo:
Caballero A, Gadea M, Alxeander M. Efectos de los terremotos regionales en las edificaciones en Asunción - Paraguay. Rev. Sci. Tech. Parag. 2021;12(1):10-20.

RESUMEN: Paraguay experimenta una actividad sísmica de moderada a baja magnitud. Además, el país se ve afectado por terremotos regionales, cuyo impacto es particularmente notable en las edificaciones de Asunción. Cuando la energía sísmica proveniente de terremotos en Argentina o Chile alcanza al territorio paraguayo y algunas edificaciones experimentan lesiones debido a un efecto de resonancia, lo que genera incómodas perturbaciones y causa alarmas en la población. El análisis y caracterización de estos eventos constituyen el objetivo de este estudio. A través de una revisión de registros de prensa, comunicaciones oficiales, datos recopilados por el laboratorio de sismología y registros de centros de monitoreo regionales, se han obtenido consideraciones preliminares sobre la naturaleza de los sismos en los edificios asuncionenses. Se ha recopilado el menor número de registros, los cuales fueron representados en un mapa temático de la geografía de Asunción. Estas vibraciones son más pronunciadas en los niveles superiores de las estructuras, donde la percepción de inestabilidad es mayor. Se estima que estos efectos continuará ocurriendo de manera aleatoria en el tiempo y con mayor frecuencia, considerando la alta actividad sísmica en el norte de Argentina y al centro-norte de Chile, así como el constante crecimiento del parque edilicio en Asunción. Hasta la fecha, la respuesta de los edificios a los terremotos regionales ha sido impredecible debido a la falta de estudios específicos sobre comportamiento y efectos de sismos.

Palabras clave: Ciudad de Asunción, Edificios, Paraguay, Patrones regionales, Terremotos.

ABSTRACT: Paraguay experiences seismic activity of moderate to low magnitude. Additionally, the country is affected by regional earthquakes, whose impact is particularly notable in the buildings of Asunción. When seismic energy from earthquakes in Argentina or Chile reaches Paraguayan territory some buildings undergo flexing due to a resonance effect, generating perceptible oscillations and causing alarm among the population. The analysis and the aftermaths of these events are the objective of this study. Through a review of press reports, official statements, data compiled by the seismology laboratory, and regional monitoring centers, some preliminary considerations have been made regarding the nature of tremors in the capital's buildings. At least thirty reports have been recorded and presented a thematic map of Asunción's geography. These vibrations are more pronounced in the upper levels of structures, where the perception of instability is greater. It is estimated that these effects will continue to occur randomly over time and with increasing frequency, considering the high seismic activity in northern Argentina and central-northern Chile, as well as the ongoing expansion of Asunción's building infrastructure. So far, the response of buildings to regional earthquakes has been unpredictable due to the lack of specific studies on behavior, resistance and site effects.

Keywords: City of Asunción, Buildings, Earthquakes, Paraguay, Regional reports.

