P3.5-396

Analysis of the seismic event to the northwest of Costa Rica and events detected with the Portable Infrasound Station I69CR, including data from IMS stations

H. Villalobos

Volcanological and Seismological Observatory of Costa Rica

INTRODUCTION AND MAIN RESULTS

In this study on the use of IMS station data, the seismic event of October 12, 2024, at 17:43 UTC, in the northwest of Costa Rica will be analyzed, using nearby seismic stations and including non-IMS stations from the global network.

Additionally, the results of the analysis of the main infrasound events detected by the portable array station I69CR will be presented, along with data from nearby IMS infrasound stations in Costa Rica. The main infrasound events detected include the Aguas Zarcas meteor event on April 23, 2019, one of the unique events recorded in an infrasound network in Costa Rica, and the infrasound event in southern Puerto Rico on June 22, 2019, recorded by station I69CR and IMS infrasound stations.

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

Analysis of the seismic event to the northwest of Costa Rica and events detected with the Portable Infrasound Station I69CR, including data from IMS stations

Introduction

For the analysis of the seismic event on October 12, 2024, at 17:43 UTC, in the northwest of Costa Rica, IMS stations and global network stations were used, including primary and auxiliary IMS seismic stations, as well as stations from the global CU and IU networks. The waveform data were analyzed using the Geotool QT software version 7.2 and GMPCC version 7.4.1, which are tools that form part of the analysis systems for NDCs, such as SHI-NIAB-Jul2024 Rocky 9.4 version 7.1.

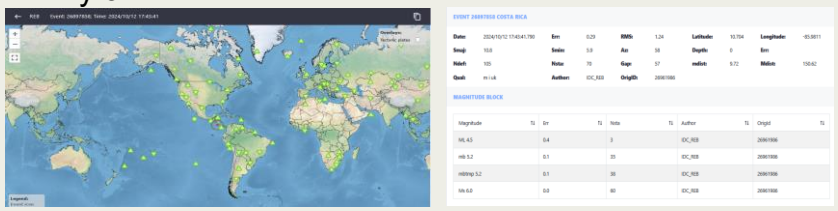

Fig 1. Event Reported by REB from IMS-IDC about 70 stations

Data Download using SHI-NIAB tools

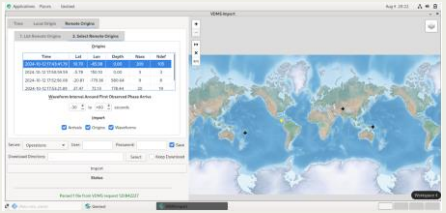

Fig 2. Data request by NMS with Geotool QT

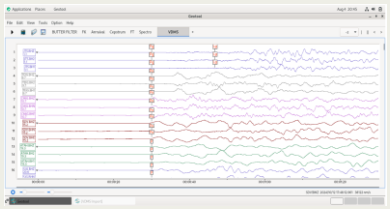

Fig 3. Waveforms networks IU, II, CU

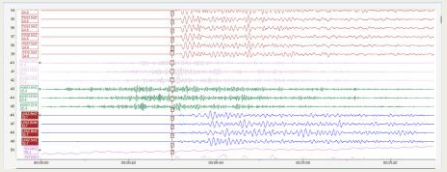

Fig 4. Hydro stations H06 and H11 and IMS

The NON-IMS stations and their waveforms were also downloaded using the same system.

The use of hydroacoustic stations H06 and H11 can be observed, while no arrivals were detected in the data from the infrasound stations.

Location/Data

For the location analysis, the Geotool QT program was used, including IMS stations, both primary and auxiliary seismic stations, as well as a couple of IMS hydroacoustic technology stations. In addition, stations from the nearby II, IU, and CU networks close to the seismic event in Costa Rica were also included.

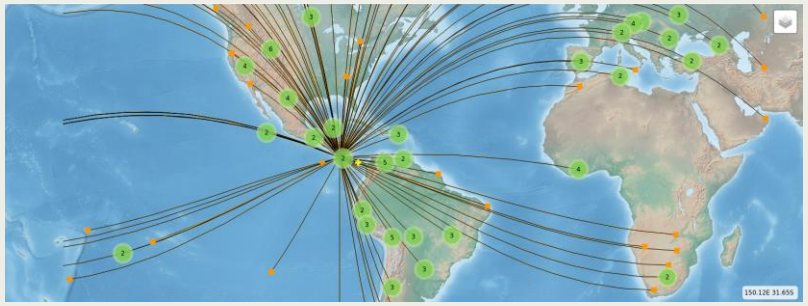

Fig 5. Location map with Geotol QT (IMS and Non-IMS)

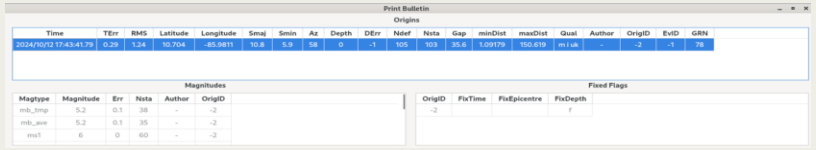

Fig 6. Location from REB-IDC

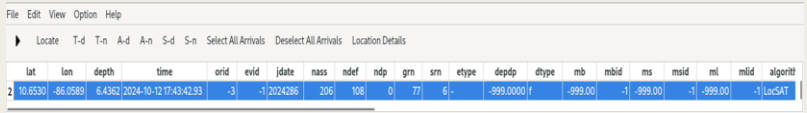

Fig 7. Location using Non-IMS – IMS stations (NDC User)

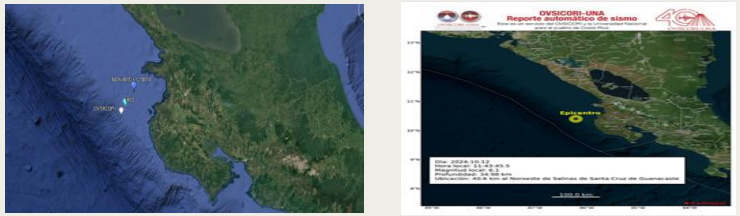

Fig 8. Comparison of event locations by OVSICORI, IRIS, and NDC User

Data Hydro Stations

P3.5-396

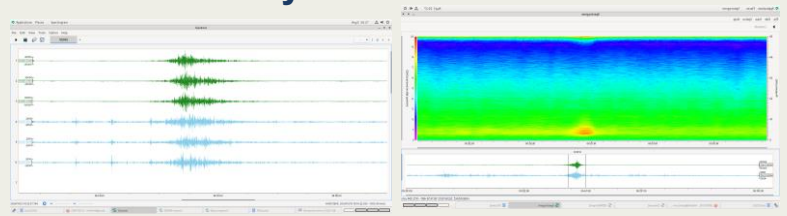

Fig 9. H06E1 and H06S1 data

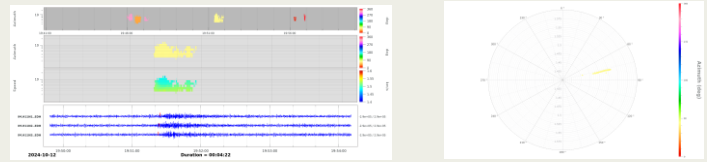

Fig 10. H11N Hydrophone station

Results

The event locations provided by the IMS should be improved by incorporating global seismic networks, as well as the local seismic networks of each country, in order to refine the accuracy of event locations. CTBTO State Parties, through their NDCs, could perform event relocations using their local seismic stations.

Conclusions

he NDC-in-a-Box tools, in their different operating versions, need to be stabilized in terms of the performance of the data analysis programs, as some issues still persist with the Geotool QT software.

OVSICORI-UNA
INSTITUTO DE INVESTIGACIÓN OBSERVATORIO VULCANOLÓGICO Y SISMOLÓGICO DE COSTA RICA
UNA
UNIVERSIDAD NACIONAL
COSTA RICA

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

Analysis of the seismic event to the northwest of Costa Rica and events detected with the Portable Infrasound Station I69CR, including data from IMS stations

Introduction

Additionally, the results of the analysis of the main infrasound events detected by the portable array station I69CR will be presented, along with data from nearby IMS infrasound stations in Costa Rica. The main infrasound events detected include the Aguas Zarcas meteor event on April 23, 2019, one of the unique events recorded in an infrasound network in Costa Rica, and the infrasound event in southern Puerto Rico on June 22, 2019, recorded by station I69CR and IMS infrasound stations

Meteorite Aguas Zarcas April 23, 2019 03:07:22 (UTC time) - 21:07:22 (local time)

I69CR

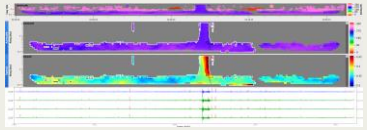

Fig 1. Waveforms I69CR

IVTCR

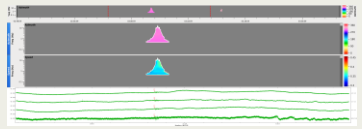

Fig 2. Waveforms IVTCR

I20EC

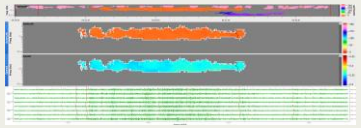

Fig 3. Waveforms I20EC

In Central America there were only 3 documented meteorites. The third is called “Heredia” in Costa Rica from April 1, 1857 and 162 years later, the fourth event took place on April 23, 2019, when the “Aguas Zarcas” meteorite fell in the canton of San Carlos, Alajuela. One of its fragments came to weigh up to 1871 grams.

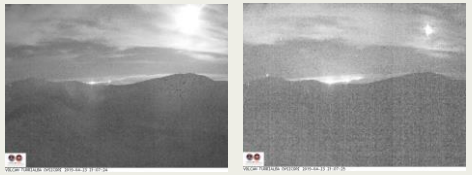

Fig 4. Web Cams OVSICORI-UNA

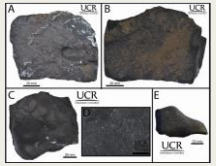

Fig 5. Meteorite event location with back azimuth

Fig 6. Installations Infrasound sensors I69CR -IVTCR

Fig 7. Detections I69CR and IVTCR

Event Fireball over the Caribbean near south of Puerto Rico June 22, 2019 21:25 (UTC Time)

P3.5-396

I69CR DATA ANALYSIS

4 Elements H1,H2,H3,H4. Back azimuth 72.672 deg
Event time 23:04:38 to 23:22:33. Speed 0.376 km/s
Mean Frequency 2.064 Hz. Amplitude 0.15 Pa

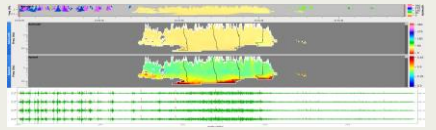

Fig 8. Waveforms I69CR

I51GB DATA ANALYSIS

3 Elements H1,H2,H3. Back azimuth 188.189 deg
Event time 23:16:25 to 23:21:17. Speed 0.361 km/s
Mean Frequency 0.616 Hz. Amplitude 0.3 Pa

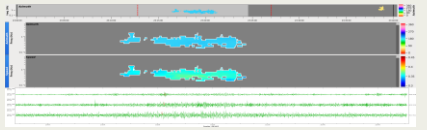

Fig 9. Waveforms I51GB

I20EC DATA ANALYSIS

7 Elements H1,H3,H4,H5,H6,H7,H8. Back azimuth 55 deg
Event time 00:15:33 to 00:31:39. Speed 0.351 km/s
Frequency 1.531 Hz. Amplitude 0.1 Pa

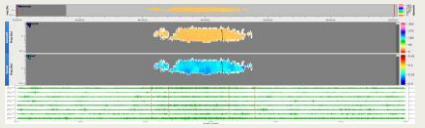

Figure 10. Waveforms I20EC

The results on arrival times in I69CR, I51GB, I20EC stations were calculated with Distaz option in DTK-GPMCC 5.7.3. About data analysis was performed using the DTK-GPMCC 6.3.0 program contained in the NDC-in-a-Box SHI Software ver. 5.0. Released in June 2019 and also the recognition of an offset problem in the H2 element with the Beam Interactive option.

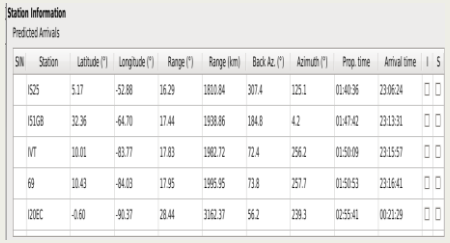

Fig 11. Arrival time in stations I69CR, I51GB, I20EC

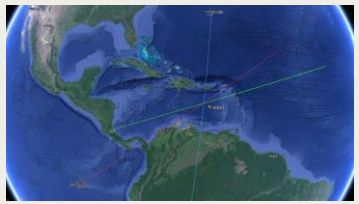

Fig 12. Fireball event location with back azimuth

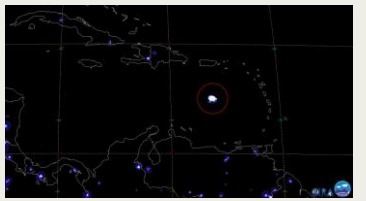

Fig 13. Lightning mapper's image of the fireball
Source: http://rammb-slider.cira.colostate.edu

CONCLUSIONS

Infrasound arrangements with the I69CR and IVTCR stations, integration with the IMS stations such as I20EC and I51GB has been achieved, as is locating regional events in the Central America and the Caribbean area.