SnT 2019
CTBT: SCIENCE AND TECHNOLOGY CONFERENCE

# Geodynamic Network of Seismic and Volcanic Monitoring OVSICORI-UNA a Possibility of Data Integration with the Costa Rica National Data Center (NDC-CR)

T4.1-P9

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## ABSTRACT

OVSICORI-UNA is a University Research Institute dedicated to research of volcanoes, earthquakes and other tectonic processes, in order to find useful applications that help society to mitigate the adverse effects of these events to economic and social development. The purpose of the seismic network was to obtain information on the location of the generators of volcanic tremors and characterize sources. Our Data Center has been expanded with a contribution of CTBTO with a National Data Centre installed in September 2010, to acquire seismic data from stations in the region and the globe, which will be very useful to improve the precision of the location parameters provided by the OVSICORI -UNA to national and international scientific community. The country last 3 decades has faced significant seismic and volcanic events which thanks to a seismographic- volcanic as operating the OVSICORI-UNA network has allowed to go steadily monitoring, recording and orderly documenting each of these events, which allowed significant knowledge of the volcanic-seismic-tectonic conditions in the country forward and that in the past were unknown for lack of a good seismic and volcanic monitoring and seismic-volcanic data bank.

## INTRODUCTION

The Volcanological and Seismological Observatory of Costa Rica is a institute part of the National University, operates the densest broadband seismological instrumentation network in Latin America in order to monitor the country's seismotectonic and volcano-tectonic activity (Figure 1). During 2018, this network, composed of 70 "state-of-the-art" stations, registered more than 15 thousand earthquakes occurred around the world, just over 9800 of them occurred within of the limits of the national territory. Figure 2 shows the spatial distribution of the seismicity that was located using at least 5 seismic stations. The color of each event corresponds to the hypocentral depth of the earthquake and the size of the circle with its magnitude.

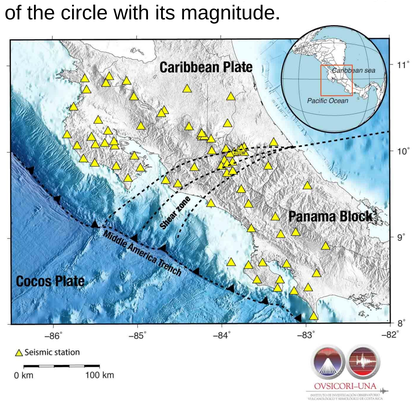


Figure 1. Broadband seismic network of OVSICORI

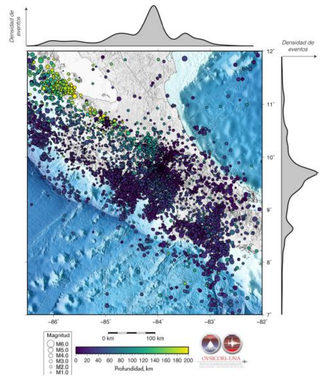


Figure 2. Seismic activity in Costa Rica during 2018

## STATIONS PART OF NDC COSTA RICA

NDC Costa Rica currently operates and maintains part of the IMS network, auxiliary seismic station AS025 JTS and a station I69CR in the temporary project of cooperation with infrasound technology locate in Sarapiqui, Costa Rica.

Figure 3. IMS Auxiliary seismic station AS025

Figure 4. Infrasound station I69CR

**Disclaimer:** The views expressed on this poster are those of the author and do not necessarily reflect the view of the CTBTO

## NEW DEVOLOPMENTS NDC COSTA RICA

The NDC-CR was installed in August 2008. Currently the NDC-CR is in virtualized system VMware and NetApp Storage that we can avoid having system crashes by energy systems or atmospheric discharges. NDC makes the acquisition of the IMS station, such as: PCRV (Venezuela), ROSC (Colombia), BDFB (Brasil).


Figure 5. Installation of NDC-CR

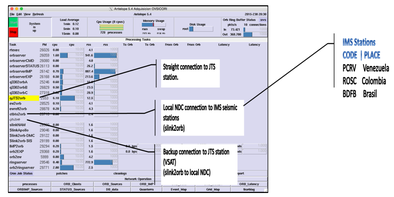


Figure 6. Monitoring system with IMS stations

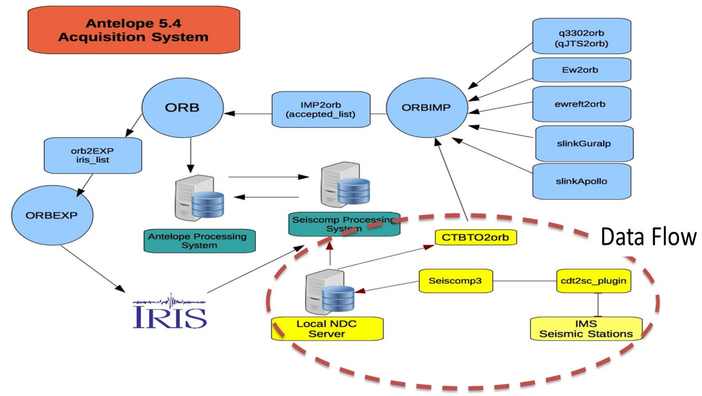


Figure 7. Network architecture OVSICORI and NDC-CR

OVSICORI uses the waveforms of approximately 350 stations worldwide, including local ones within the SeisComP3 and Antelope acquisition system. The seismic data of the OV, CTBTO and IRIS network are obtained through the Internet. Data flows from local seismic stations in the OV network have changed from VSAT communication, analog radio frequency links through digital communication systems over 3G/4G cellular networks, 5.8 GHz and 2.4 GHz broadband links. OVSICORI is part of a private network from where the seismic data of a group of stations is transmitted in case of problems with the connection to Internet. A possible problem that we could face in the event of a failure in the seismic data services of the OV network and the IRIS server has been identified.

Figure 8. Map IMS stations proposed integration

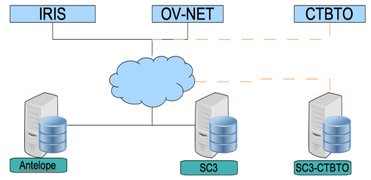


Figure 9. Redundant architecture OV networks, IRIS, IMS

Since there is a current network connection for streaming data for some seismic stations from Vienna to NDC-Costa Rica, we are considering the possibility to deploy a complete automatic processing system in the NDC server using the data of primary and secondary stations. In the ANTELOPE case, a defined numbers of primary and auxiliary stations in the region around Costa Rica are being used for both automatic real time and manual processing. Currently, ANTELOPE as well as SeisComP3 use the NDC-Costa Rica SeedLink server to stream and process the data of 3 stations.

## INTEGRATION OF SEISMIC DATA WITH STATION IMS AS025 (JTS)

OVSICORI network (OV) integrates 70 seismic stations, they complement the seismic station AS025 to achieve local, regional and global locations of seismic events close to Costa Rica. Two seismic events are shown from September 05, 2012 and May 20, 2010 (Figure 10).

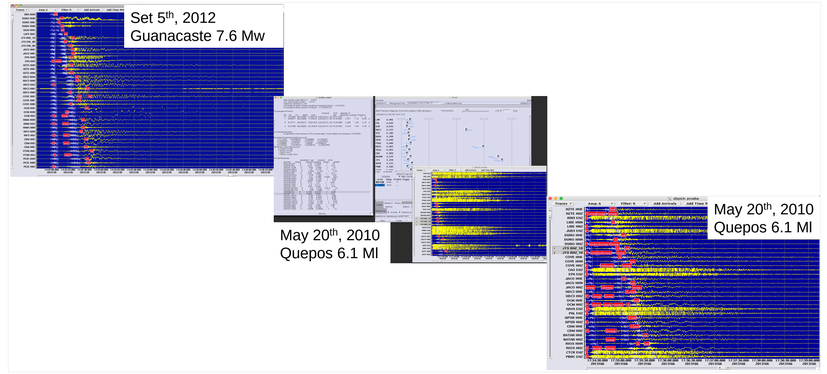


Figure 10. Seismic events with IMS station AS025 (JTS) and OVSICORI network

## INFRASOUND DATA INTEGRATION WITH PORTABLE ARRAY I69CR

On April 23, 2019; at 21:07:22 local time, the web cams located on the top of Turrialba volcano and Poas volcano captured a luminosity in the atmosphere, that luminosity was associated with a meteorite (Figure 12). The Meteorite fell in Aguas Zarcas de San Carlos, province of Alajuela, Costa Rica. It is possible to monitor the meteorite through the territory of Costa Rica with the I69CR portable infrasound station (CTBTO temporary project).In addition, infrasound signals are also captured in the IVTCR, VTCE, VTCV infrasound stations in the Turrialba Volcano and VRBA infrasound station in Rincon de la Vieja Volcano (Figure 11).

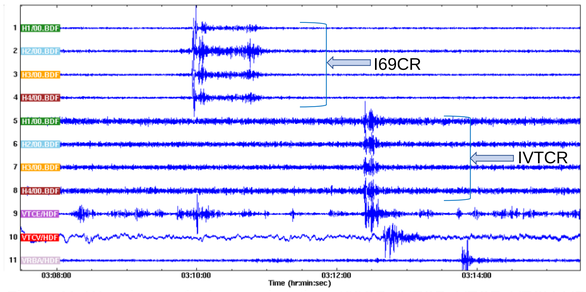


Figure 11. Waveforms of infrasound stations I69CR, IVTCR, VTCE, VTCV, VRBA

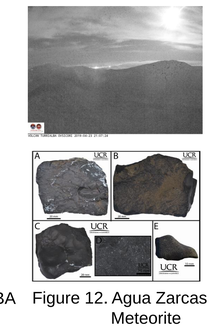


Figure 12. Agua Zarcas Meteorite

## CONCLUSIONS

Improve data analysis capabilities by NDC-CR in Infrasound, Hydroacoustic and Radionuclide technologies to locate different kind of events.Have more cooperation in research projects between NDCs in the region of Central America, the Caribbean and South America. Include more national institutions such as the Oceanographic Institute, Meteorological Institute that cooperate in the use of the data available in the NDCs. Host in the future with Workshops on NDC and OSI technologies.

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## ACKNOWLEDGMENT

Thank you for all the collaboration to NDC Costa Rica Team, Ministry of Foreign Affairs and Worship of Costa Rica.