

Benefits of Installing the Capacity Building System at the Mexican NDC

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INTRODUCTION AND MAIN RESULTS

The installation of the CTBTO Capacity Building System at Mexico's NDC enables full access to data from IMS stations worldwide. Automatic event locations with SeisComP now integrate national and regional networks from Latin America, providing enhanced azimuthal coverage. This results in significantly improved accuracy in event location, magnitude, and depth, but also opens new avenues for advanced scientific research supporting disaster risk reduction and reinforcing Mexico's contribution to the CTBT verification regime.

Introduction

In a region marked by complex seismic dynamics, the ability to access and process real-time waveform data is critical not only for disaster risk reduction but also for scientific sovereignty. The installation of the CTBTO Capacity Building System (CBS) at Mexico's National Data Centre represents a strategic step towards enhancing regional monitoring autonomy and data-driven decision making.

By integrating the International Monitoring System (IMS) data with national and Latin American seismic networks, the CBS empowers analysts with cutting-edge tools for high-resolution event detection, location, and characterization. This synergy significantly improves azimuthal coverage and strengthens Mexico's contribution to global CTBT verification efforts.

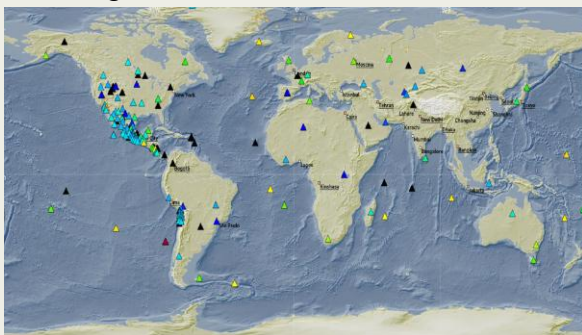


Figure 1. Stations used for automatic event location in SeisComP at Mexico's NDC, integrating IMS stations, national networks, and regional networks from Latin America.

CBS configuration and data sources

- **System Overview**
- The CBS installed at Mexico's NDC consists of a Lenovo ThinkSystem SR630 server running the NDC-in-a-Box v7.0 software package on Linux Rocky 9.4.
- Installed tools include: CDTools, SeisComP6, Geotool, aVDMS, and DTK-GPMCC
- **Real-time waveform data is received from:**
 - 16 IMS stations: TXAR, ROSC, NVAR, PDAR, ULM, SCHQ, LPAZ, BDFB, CPUP, PLCA, PPT, DBIC, H03, H06, ESDC, KEST.
 - Mexican national network (UNAM/SSN).
 - Regional and international networks via SEEDlink (e.g., IRIS/IDA, Nicaragua, Chile).
- This configuration ensures broad azimuthal coverage and dense seismic observation.
- Analysts access results through Geotool and DTK-GPMCC for interactive review and refinement.

Results

The CBS installation represents a technological leap for Mexico's NDC, particularly in the upgrade to a newer and more powerful version of SeisComP. All components of the CBS configuration—automatic detection, event location, and waveform archiving—are currently undergoing rigorous testing and benchmarking against the NDC's legacy seismic processing system, which also operates with SeisComP but in an older configuration.

This dual-system phase ensures a controlled comparison of performance, accuracy, and operational reliability. The enhanced modules of the CBS, including updated tools and real-time IMS integration, are expected to offer superior precision in automatic event characterization once fully calibrated.

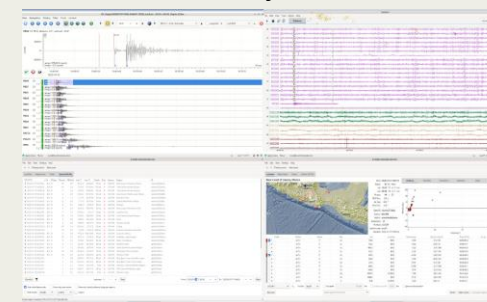


Figure 2. Ongoing calibration phase of the CBS system towards full integration with Mexico's NDC automatic control and publication workflows..



Conclusions

The installation of the CBS at the Mexican NDC not only enhances national capacities for treaty verification but also opens new avenues for advanced scientific research. IMS data is now accessible and processable through tools such as Geotool and DKT-PMCC; it will be a powerful tool for the Department of Seismology to analyze and research regional seismicity, ground motion modeling, early warning systems, and disaster risk reduction.

The CBS is currently being calibrated to eventually replace the legacy automatic location system, which also runs SeisComP but in an older version. Its upgraded modules enable improved event detection and location performance, aligning future operations with CTBTO standards for automated workflows and secure data dissemination.

Notably, during the CBS installation mission, the possibility of Mexico joining the CTBTO's Tsunami Warning Agreement was discussed; today, it is a reality—Mexico has formally signed the agreement, further reinforcing its commitment to regional safety and international cooperation.

Acknowledgements

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