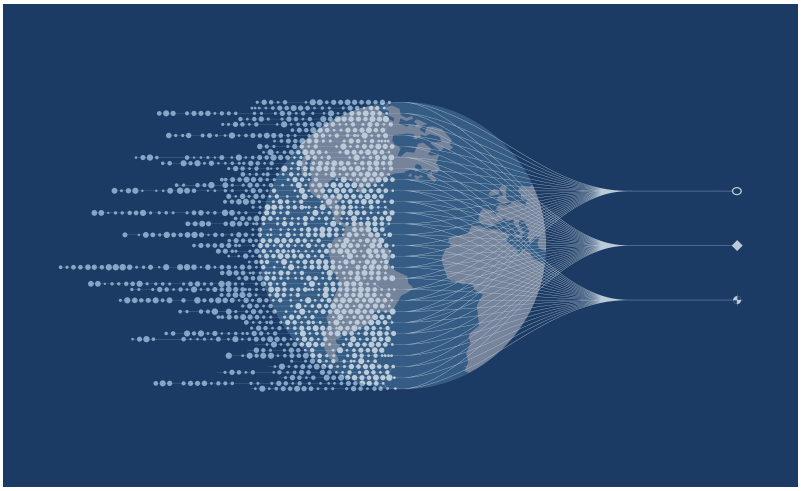
# CTBT: Science and Technology Conference 2025 - SnT2025



**Monday 8 September 2025 - Friday 12 September 2025**

**Hofburg Palace & Online**

# Scientific Programme

**Themes and Topics of SnT2025**

*Keywords* indicate what might fit under the Topic, including priorities. Possible submissions are not limited to the keywords.

*Glossary*
*ATM* atmospheric transport modelling
*CYG* CTBTO Youth Group
*FAIR* findability, accessibility, interoperability, and reusability
*HPC* high performance computing
*IDC* International Data Centre
*IMS* International Monitoring System
*NDC* National Data Centre
*OSI* On-Site Inspection
*SnT* CTBT: Science and technology
*vDEC* CTBTO virtual Data Exploitation Centre

# Theme 1. The Earth as a Complex System

Physical processes and parameters relevant for monitoring CTBT compliance

## T1.1 The Atmosphere and its Dynamics

*Keywords*: Acoustic propagation and attenuation; transport of radionuclides; global circulation; volcano-acoustics; climatology; meteorology; noise sources

## T1.2 The Solid Earth and its Structure

*Keywords*: Seismicity; seismic propagation and attenuation, tectonics, locating seismic disturbances, subsurface properties; subsurface pathways of radionuclides

## T1.3 The Oceans and their Properties

*Keywords*: Oceanography; hydroacoustics; ocean observatories, propagation, 2-D and 3-D models; T-phase modelling; acoustic blockage, ocean acoustic tomography and thermometry; undersea volcanoes; tsunamigenic events; soundscapes; marine mammals

## T1.4 Multidisciplinary Studies of the Earth’s Subsystems

*Keywords*: Data analysis; modelling, physics, data fusion, phase conversion, coupling across interfaces; climate change; interference between anthropogenic aspects and the Earth system processes

# Theme 2. Monitoring events and Nuclear Test Sites

Verification related aspects of nuclear tests

## T2.1 Characterization of Treaty-Relevant Events

*Keywords*: Announced tests; detection, understanding the full extent of signals that may be generated by a nuclear explosion; location in time and space, analysis, characterization of the

source, discrimination, screening criteria, differentiating nuclear tests from other human-made or natural events, discrimination and identification of small events; OSI-relevant observables

### T2.2 Seismoacoustic Sources in Theory and Practice

*Keywords*: Differences between earthquake and explosion signatures, differences between chemical and nuclear explosions, seismoacoustic sources that could be confused with those from a nuclear explosion

### T2.3 Atmospheric and Subsurface Radionuclide Background and Dispersion

*Keywords*: Natural and human-made sources of radioisotopes, release of radionuclides, atmospheric transport modelling, anomalies of atmospheric radioactivity, isotopic ratios that could be confused with those from a nuclear explosion, radionuclide migration

### T2.4 Historical Data from Nuclear Test Monitoring

*Keywords*: Historical records, digitizing, archive preservation; reprocessing; discrimination; metadata; event bulletin; lessons learned for current monitoring and future OSI; data for training and exercises

## Theme 3. Monitoring and On-Site Inspection Technologies and Techniques

Sensor technologies, algorithms, signal processing, accelerated computing

### T3.1 Seismic, Hydroacoustic and Infrasound Technologies and Applications

*Keywords*: Acquisition and forwarding of continuous and segmented data; data assimilation; design of sensor systems; advanced sensors

### T3.2 Radionuclide Technologies and Applications

*Keywords*: Sampling and sample processing, data acquisition, particulate sample systems, gamma–gamma coincidence counting; new generation noble gas systems, radionuclide laboratories

### T3.3 On-Site Inspection Relevant Techniques

*Keywords*: Visual observations; remote sensing including multispectral, satellite imagery; remotely controlled platforms; measurements of radioactivity and energy resolution analysis; environmental sampling and analysis in mobile and field-based facilities; seismic and non-seismic geophysical techniques; drilling; synergy between techniques; OSI-relevant equipment

### T3.4 Integrating Data from Different Monitoring Technologies

*Keywords*: Data fusion algorithms; integration of ancillary data to supplement IMS data for expert technical analysis; diverse sources of remotely sensed data; augmented reality

### T3.5 Analysis of Seismic, Hydroacoustic and Infrasound Monitoring Data

*Keywords*: Signal processing; data analysis algorithms; machine and deep learning, HPC; bulletin quality; advanced probability approaches; adaptation and integration of methods used in other fields

### T3.6 Analysis of Radionuclide Monitoring Data

*Keywords*: Spectrum calibration and analysis algorithms; enhancing quality of automated processing, machine and deep learning, HPC; estimation of radionuclide concentrations from known sources, improvement of event screening

## Theme 4. Sustainment of Networks, Performance Evaluation, and Optimization

Engineering and operational aspects

### T4.1 Performance Evaluation of the International Monitoring System

*Keywords*: Performance metrics; network coverage; data availability, quality and timeliness; resilience; preparedness exercises; feedback on IDC products and services; national operations and procedures

### T4.2 Systems Engineering for International Monitoring System and On-Site Inspection

*Keywords*: Power systems; system refurbishment and modernization; communication infrastructure; sensor network design and operation

### T4.3 Use of enabling Information Technologies

*Keywords*: Data protection; cyber security for Treaty monitoring and OSI; FAIR data; authentication of samples; simulation, computational models

### T4.4 International Monitoring System Sustainment into the future

*Keywords*: Maintenance strategies and quality assurance, failure risk mitigation, infrastructure assessment and upgrades, systems integration and optimization, technology obsolescence and foresight, enhanced monitoring and state of health, repair, predictive and preventative maintenance, life cycle, recapitalization, efficiency and cost effectiveness, reliability and security, equipment databases, information management and automation

### T4.5 On-Site Inspection Team Functionality

*Keywords*: Search logic; methodology, concept for operations and building capacities; OSI data processing tailored workflows; information flow; health and safety of inspectors; training, tabletop and build-up exercises

# Theme 5. CTBT Science and Technology in the Global Context

Impact from past SnTs and collaborations, broader perspectives

## T5.1 Synergies with Global Challenges

*Keywords*: Civil and scientific applications of IMS data; natural hazards early warning systems, disaster risk reduction, nuclear and radiological emergencies; climate change studies; sustainable development goals; international collaboration; vDEC projects

## T5.2 Regional Empowerment

Keywords: Capacity building and training; technical assistance; regional networking; cooperation among NDCs; multilingualism

## T5.3 Outreach

*Keywords*: Treaty advocacy; education, mentoring programme; science communication, public information, raising awareness and understanding, outreach initiatives; human resources development; early career professionals; diversity and gender equality