CTBT: SCIENCE AND TECHNOLOGY 2017

CONFERENCE GOALS

→ To enlarge the scientific community engaged in test ban monitoring, including among young scientists

→ To promote the wider scientific application of data that are used for test ban verification

→ To enhance the exchange of knowledge and ideas between the CTBTO and the broader scientific community

→ To present to the scientific community the needs of nuclear test monitoring and verification

INVITATION

To further enhance the strong relationship between the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) and the scientific and technological community, the CTBTO invites you to the SnT2017 conference:

Scientists and technologists, science administrators, academics, representatives to the CTBTO’s policy making organs, representatives of agencies involved in research and development in areas potentially relevant to the Treaty’s verification regime and media representatives.

CALL FOR PAPERS

Deadline for submission of abstracts: 6 FEBRUARY 2017

CTBTO.ORG/SnT2017 #SnT2017

26 TO 30 JUNE
HOFBURG PALACE
VIENNA, AUSTRIA
This theme focuses on the dynamic or static properties of the earth whose characterization is necessary for the optimum processing and interpretation of monitoring data. Scientific and technical advances in monitoring the globe for nuclear explosions require an understanding of the way in which features of the earth influence relevant signals as they travel from their point of origin to where they are observed. The signals from monitoring networks, as well as noise recorded by those networks, constitute a huge reservoir of data that can support advances in earth sciences on a global, regional and local scale.

One focus area continues to be seismic and acoustic wave speed and attenuation, which are essential for locating seismoacoustic disturbances in the earth and its atmosphere and oceans. Another focus is atmospheric dynamics relevant to the transport of radionuclides and the propagation of atmospheric infrasound. Yet another focus is subsurface properties relevant to the detection of a nuclear explosion by geophysical, radionuclide or other methods during an on-site inspection (OSI). However, relevant characteristics of the earth are not limited to those required by current monitoring technologies: novel methods of monitoring, including those using satellites or other remote sensing methods, also depend upon the specific properties of the earth or its atmosphere.

The ability of the IMS infrasound network to detect small signals depends upon signal attenuation, the ambient noise level at each station and prevailing atmospheric conditions that vary with position, altitude and time.

Many elements of the current monitoring effort also find use in a diversity of other contexts, for example in the characterization of earthquakes, the study of climate change, environmental monitoring, mitigation of natural hazards, and the monitoring of releases from nuclear facilities. Such civil, scientific and industrial uses of International Monitoring System (IMS) data and International Data Centre (IDC) products are also brought together under this theme.

**TOPICS**

1. **Infrasound and Atmospheric Dynamics**
2. **Solid Earth Structure**
3. **Atmospheric and Subsurface Radionuclide Dispersion and Depletion**
4. **Hydroacoustics and Physical Properties of the Oceans**
5. **Civil and Scientific Applications of IMS Data and IDC Products**

The CTBTO relies on close cooperation with the scientific community to constantly refine its methods and ensure that the verification regime operates at the cutting edge of scientific knowledge. The exploration of the potential of IMS data for civil uses, such as disaster early warning, and other scientific applications, also requires a close partnership with the wider scientific community.

The CTBTO has conducted five multidisciplinary scientific conferences since 2006 that have attracted scientists and experts from a wide range of disciplines. Over 500 scientists from around the globe participated in the last conference, SnT2015, from 22 to 26 June 2015.
Events such as earthquakes, explosions and releases of radionuclides produce signals and surface features that may be observed locally, regionally or globally. Such events can be located in time and space, and their characteristics can be estimated from the data that are collected.

This theme covers the characterization of the source, the signals emitted and what these reveal about the event and its environment. Only if the source is well characterized can its associated signals and anomalies be correctly analysed and interpreted. To ensure compliance with the Treaty, it is essential to understand the full range of signals that may be generated by a nuclear explosion occurring in any medium and to be familiar with other seismic, acoustic, radionuclide or other signals that could be mistaken for those from a nuclear explosion.

The Treaty’s provision for on-site inspections depends upon knowledge of the observables that may be expected after a nuclear test and how these could be detected and assessed as geophysical, radioactive, thermal or other anomalies or artefacts of testing at or near the surface. The methods permitted for on-site inspections under the Treaty may be utilized over an area of 1000 square kilometres, and studies of the signatures that may be observable can assist in OSI design.

Data observed from past nuclear test explosions include a diversity of historical records, many of which are not easily available to researchers and need digitizing, reformatting, and the reconstruction of metadata such as calibration parameters. The possibility that such records may become degraded, lost or discarded gives rise to an urgent need to safeguard such legacy data. Moreover, observations from the aftermath of nuclear test explosions shed light on the physical and radiological characteristics that are the subject of on-site inspections.

**TOPICS**

1. Treaty-Relevant Events
2. Characterization of Events Through On-Site Inspection
3. Seismoacoustic Sources in Theory and Practice
4. Atmospheric Background of Radioxenon
5. Historical Data from Nuclear Test Monitoring

**THE VERIFICATION REGIME**

The IMS, when complete, will consist of 337 facilities worldwide to monitor the planet for signs of nuclear explosions. Over 90% are already in operation.

The IDC continuously processes this data stream. Both IMS raw data and analysis results are made available to all 183 States Signatories.

The processing and analysis of data from different sources must ultimately present an integrated picture to assist those who have to decide if an OSI should be conducted in order to clarify whether the Treaty has been violated.
This theme focuses on the sensors used for nuclear explosion monitoring and processing of the recorded data. This includes advances in traditional areas such as seismic and radionuclide instrumentation, sensor networks and processing methodologies, as well as exploration of novel methods and the adaptation and integration of methods used in other fields, such as satellite photography.

Diverse sources of remotely sensed data, whether from satellites, aircraft or unmanned aerial vehicles, may be used in nuclear explosion monitoring.

On-site inspections pose special challenges for sensors and associated equipment, which must be capable of detecting observables related to an event that triggered an OSI, especially observables related to a nuclear test.

### TOPICS

1. Design of Sensor Systems and Advanced Sensor Technologies
2. Laboratories Including Mobile and Field Based Facilities
3. Remote Sensing, Satellite Imagery and Data Acquisition Platforms
4. Geophysical Methods Applied to On-Site Inspection
5. Data Processing and Interpretation
6. Fusion of Data from Different Monitoring Technologies
7. Algorithms

### ABOUT THE TREATY

The 1996 Comprehensive Nuclear-Test-Ban Treaty (CTBT) bans all nuclear explosions, everywhere and by everyone.

Before the CTBT can enter into force, all of the 44 countries listed in Annex 2 of the Treaty must ratify. These countries possessed nuclear power or research reactors when the CTBT was negotiated. Eight of these Annex 2 States have not yet ratified: China, the Democratic People’s Republic of Korea, Egypt, India, the Islamic Republic of Iran, Israel, Pakistan and the United States of America.
Sustained operation of a globally distributed network of sensors poses substantial logistical challenges and requires a rational approach to life cycle management. Near real time acquisition and forwarding of continuous and segmented data from the global IMS and subsequent processing and analysis at the IDC also pose great challenges. Strict specifications for data availability, quality and timeliness must be met and sustained and the results of processing and analysis must also meet quality and timeliness criteria. Special demands are placed upon the handling of OSI data, which will be governed by the requirements outlined in the Treaty and the OSI Operational Manual. The integration of IMS data and Treaty monitoring into national operations and procedures is also essential.

The optimization of performance has many facets, and contributions are invited on any subject relating to the efficiency, quality, timeliness, reliability and cost effectiveness of the verification process.

**THE FOUR IMS TECHNOLOGIES**

**Seismic** stations monitor elastic waves in the earth. The vast majority of these are caused by earthquakes. However, the stations also detect man-made explosions such as the announced nuclear tests by the Democratic People’s Republic of Korea in 2006, 2009, 2013 and 2016.

**Infrasound** stations can detect ultra-low frequency sound waves – inaudible to the human ear – that are emitted by large explosions.

**Radionuclide** stations measure the atmosphere for radioactive particles; 40 of them also pick up noble gases. Only these measurements can give a clear indication as to whether an explosion was nuclear. The stations are supported by 16 radionuclide laboratories.

**Hydroacoustic** stations ‘listen’ for sound waves in the oceans. Sound waves from explosions can travel extremely far under water.
The CTBTO verification system exists within the broader context of international organizations, global policy making, international collaboration and citizen awareness.

This theme explores these relationships with respect to the CTBT and explosion monitoring data.

The Sustainable Development Goals have resulted from a United Nations initiative and are relevant to the global monitoring of many natural phenomena.

**TOPICS**

2. Science in Support of International Treaties and Sustainable Development Goals
3. Comparative Roles of Global Verification and On-Site Verification
4. Capacity Building, Education and Public Awareness

**REGISTRATION AND SUBMISSION OF ABSTRACTS**

To register for SnT2017 or submit an abstract, visit the online registration platform accessible through ctbto.org/SnT2017, where more information on topics and submission is provided. No registration fee will be charged. Authors can request either an oral or poster presentation. By submitting an abstract, authors implicitly agree to the publication of their abstract and presentation material by the CTBTO. Abstracts will be made available on our web site and in a book of abstracts. The working language of the conference is English.

If you do not find the answer to your query on the ctbto.org/SnT2017 pages, please email SnT@ctbto.org.

**FINANCIAL SUPPORT**

Financial support may be available to a limited number of participants. Such assistance must be requested at the time of registration and no later than 6 FEBRUARY 2017.

Financial support will be considered only for participants who have submitted an abstract. Participants are strongly encouraged to first seek travel and participation funds from non-CTBTO sources.