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25 years of CTBTO: progress with verification technologies and looking towards the future 25 years and beyond

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YOUTH FOR CTBT

POSTER

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INTRODUCTION

INTRODUCTION: CTBT and the Verification Regime

- 05 August 1963 – The Partial Nuclear Test Ban Treaty (LTBT) was signed
- This was following 54 tests conducted by the USA, 14 by the Soviet Union and a couple others by the United Kingdom and France
- The treaty banned nuclear tests in the atmosphere, outer space and under water thus confining them to underground only
- The treaty laid the foundation for a more comprehensive nuclear test ban treaty (CTBT) which would totally ban all nuclear weapon detonations
- The negotiations for a CTBT started in Geneva in 1994 and ended successfully in 1996
- Along with the establishment of the Preparatory Commission for the Comprehensive Nuclear Test Ban Treaty Organization (CTBTO) in 1996, one of the major resolutions of the treaty was the establishment of the International Monitoring System(IMS) which is part of the verification regime

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Overview of the verification regime

Its major purpose is to monitor compliance with the treaty and comprises;

- International Monitoring System(IMS) – a set of different technologies for detecting nuclear explosions in the atmosphere (radionuclide), underwater (hydro acoustic), on coasts and in the water near the earth's surface (infrasound) and underground (seismic)
- Global Communication Infrastructure (GCI) – for sending data obtained from the IMS to the International Data Center (IDC) for storage and analysis as well as sending raw data and bulletins to the member states
- International Data Center(IDC) – receives data from IMS stations for archiving as well as analysis. Located in Vienna

The following parts of the verification regime will be available after the treaty enters into force

- Consultations and Clarification
- On-Site Inspections

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Group of Scientific Experts(GSE)

Progress with verification technologies; Group of Scientific Experts (GSE)

- Organized in 1976 with a mandate to recommend a sustainable verification technology
- Successfully conducted 3 technical tests(GSETT) in 1984, 1991 and 1994
- GSETT-1 focused on the exchange of parameters from the data available
- GSETT-2 – data was collected and exchanged between 4 globally distributed data centers in Australlia, USSR, Sweden and the USA
- GSETT-3 looked into new concepts for a verification system based primarily on seismic monitoring with an experimental IMS set up under a Prototype International Data Center in Arlington, Virginia , USA
- GSETT-3 became the basis of the current IMS and IDC

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Progress with verification technologies; 1996 - 2005

1996 - 2005

- 1997 – The IDC established with 2 data centers working in parallel
- 1999 - The IDC now capable of sending data to member states of the CTBT
- October 1999 - On the invitation of the government of Kazakhstan, a field experiment simulating aspects of an on-site inspection of a 100 ton chemical explosion was conducted in Kazakhstan
- April 2000 - In his statement to the Treaty of Non-Proliferation of Nuclear Weapons (NPT) Review Conference, then Executive Secretary of the CTBTO Preparatory Commission Wolfgang Hoffmann noted that a background paper prepared by the United Nations Secretariat for this Review Conference offered comprehensive information on the CTBT and the global verification system
- According to the Hoffmann paper, 204 IMS site surveys had been completed, 77 site surveys for the GCI had been completed, 88 IMS stations had been installed with installation of 65 more stations either under way or pending contract, Virtual Small Aperture Terminals (VSATs) had been installed at 26 of IMS stations with installation at 41 more under way
- May 2002 – One hundredth VSAT installed

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Progress with verification technologies; 2006 - 2010

2006 - 2010

- February 2006 - Endorsement of planning for the preparation for an On-Site Inspection in Kazakhstan in 2008
- October 2006 – Announcement by the Democratic People's Republic of Korea (DPRK) about the country's first nuclear test. 60% of the IDC operational at the time and 22 IMS stations detected the associated seismic event which had a 4.1 local magnitude
- March 2007 – The Provisional Technical Secretariat (PTS) celebrates its tenth anniversary. At the same time, 193 IMS stations were now able to send data to the International Data Center (IDC)
- September 2008 – An On-Site Inspection Simulation exercise conducted near a former Soviet Union test site in Semipalatinsk, Kazakhstan
- May 2009 – 61 IMS stations detect a seismic event magnitude 4.52 associated with the nuclear test conducted by the DPRK the same day thus showing the ***reliability of the verification regime***
- January 2010 – Announcement from the CTBTO that it had completed replacing all IDC data processing machines with Linux machines

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2011 - 2015

Progress with verification technologies; 2011 - 2015

- March 2012 – The U.S National Academy of Sciences released a report which reviewed and updated a 2002 study on the technical issues regarding the CTBT. The report took note of the impressive build-up of the IMS, more than 80% complete at the time
- February 2013 - 96 stations detect a seismic event magnitude 4.9 associated with a nuclear test conducted by the DPRK
- April 2013 – Two radionuclide stations in Russia and Japan detect radioactive noble gases associated with the nuclear test conducted by the DPRK two months earlier
- November 2014 – Largest ever On-Site Inspection exercise conducted in Jordan. The exercise included over 200 experts, 150 tons of equipment after 4 years of preparation
- February 2015 – conclusion of facility agreement with Ecuador for the installation of one infrasound and one radionuclide station on the Galapagos Islands

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2016 - present

Progress with verification technologies; 2016 - present

- January 2016 – Fourth nuclear test by the DPRK initially detected by 27 IMS stations
- September 2016 – Over 100 IMS stations detected a magnitude 5.1 event associated with another nuclear test by the DPRK
- June 2017 – Announcement from the CTBTO that the installation of all the hydro acoustic stations in the IMS had been completed
- September 2017 – 38 IMS stations contributed to the technical analysis of a magnitude 6.1 seismic event associated with the sixth nuclear test conducted by the DPRK
- December 2017 – China announced that it had established 5 nuclear test monitoring stations, all built and certified in the same year.
- March 2020 – Announcement by the CTBTO that it will be constructing two monitoring facilities in the Central African Republic

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Other Achievements

Other Achievements by the CTBTO's verification Regime

- February 2010 – 20 seismic and hydro acoustic stations forwarded data in real time to tsunami warning centers in the Pacific region following the Chile earthquake
- March and April 2011 – CTBTO IMS stations released accurate and timely data regarding the 9.0 magnitude earthquake in Japan. CTBTO data also helped in issuing tsunami warnings within a few minutes of the earthquake
- February 2013 – The meteor that broke up Over Russia's Ural Mountains produced infrasonic waves detected by seventeen infrasound stations in the CTBTO's IMS
- February 2017 – CTBTO announced that no detections of Iodine-131 above historical levels had been detected in the last several months. This was in response to news stories about heightened levels of Iodine in Europe

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Conclusions

Conclusions; looking into the future 25 years and beyond

- The verification regime has been instrumental in detecting nuclear weapon tests in the DPRK
- The IMS currently consists 302 installed facilities, 9 installed, 5 under construction and 21 more planned. This means that going into future, no nuclear weapon test can go unnoticed
- The verification regime is also playing an important role in natural disaster warnings
- Looking into the future, we hope that the remaining Annex 2 states will ratify the treaty such that it comes into force
- This will enable On-Site Inspections as well as Consultation and Clarification to take place thus having the verification regime fully operational