THE INTERNATIONAL CONFERENCE ON THE 120TH ANNIVERSARY OF THE BULNAY EARTHQUAKE: ADVANCES IN ASTRONOMY AND GEOPHYSICS

CTBTO IMS stations in Mongolia

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Abstract.

The CTBTO, or the Comprehensive Nuclear-Test-Ban Treaty Organization, is an international organization dedicated to the implementation of the Comprehensive Nuclear-Test-Ban Treaty (CTBT). Mongolia signed and joined the Comprehensive Nuclear-Test-Ban Treaty (CTBT) on October 1, 1996, and the treaty was ratified by the Parliament on August 8, 1997. In 2000, the Preparatory Commission (PC) of the United Nations Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) and the Government of Mongolia signed the “Agreement on the Establishment and Further Cooperation in the Operation of an International Network of Nuclear Test Monitoring Stations in Mongolia. The Institute of Astronomy and Geophysics (IAG) of the Mongolian Academy of Sciences selected agent as operation and maintenance of the CTBTO stations in Mongolia. Institute of Astronomy and Geophysics (IAG) operates four types of IMS stations including seismic, infrasound, radionuclide and noble gas stations (PS25, IS34, MNP45 and MNX45). This poster will provide general information about the CTBTO stations in Mongolia. Key words: Noble gas, Radionuclide, CTBTO, seismic, infrasound

The Institute of Astronomy and Geophysics (IAG) of the Mongolian Academy of Sciences, in collaboration with the Department of Environmental Monitoring (DASE) of the French Nuclear Energy Commission, has established and reliably operates the PS25 seismic array, Infrasound array IS34, radionuclide station MNP45, and noble gas station MNX45, which are stations of the international monitoring system of the CTBTO.

The first President of Mongolia, P. Ochirbat, announced the initiative to grant Mongolia the status of a nuclear-weapon-free zone from the UN podium in September 1992. This initiative of Mongolia was supported by the United States, and later by our two neighboring superpowers, Russia and China. Mongolia signed and joined the Comprehensive Nuclear-Test-Ban Treaty (CTBT) on October 1, 1996, and the treaty was ratified by the Parliament on August 8, 1997. In 2000, the Preparatory Commission (PC) of the United Nations Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) and the Government of Mongolia signed the “Agreement on the Establishment and Further Cooperation in the Operation of an International Network of Nuclear Test Monitoring Stations in Mongolia,” which opened up a wide opportunity for Mongolia to actively participate in and contribute to international activities aimed at a global ban on and control of nuclear weapons testing.

Noble gas station MNX45 with SPALAX equipment

The SPALAX station, which aims to record radioactive elements in the noble gas xenon in the atmosphere, collects air from the atmosphere for 24 hours using compressor, separates xenon (Xe) from the sampled air, and collects radiation measurements using a highly sensitive gamma detector.

Xenon isotopes:
131mXe (11.9 d), 133Xe (5.243 d), 133mXe (2.19 d), 135Xe (9.10 h)

Air compressor

Xenon concentration, separation, and archiving

Measurement results will be transmitted to an international data center of the CTBTO via satellite communication every 2 hours.

Acquisition and Mail computers

Canberra CP5 detector for Radionuclide measurement

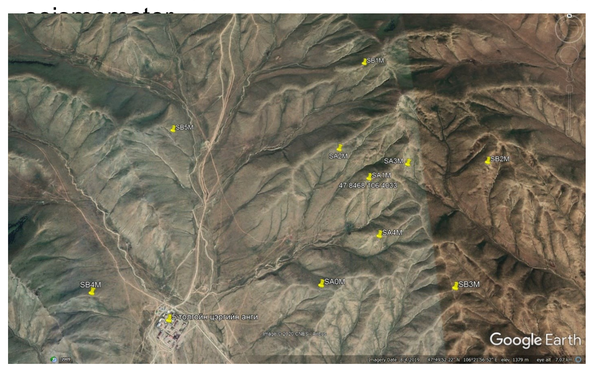
The presence of noble gases is particularly important in detecting releases from underground explosions.

PS25 seismic array

PS25 seismic array consists of 10 seismic stations.

SA0M – long period 3 component & short period 3 component seismometers

SA1M, SA2M, SA3M, SA4M, SB1M, SB2M, SB3M, SB4M and SB5M – vertical short period seismometer



The seismological component of the monitoring system detects and locates seismic events. PS25 seismic mini array station is one of 50 primary stations, which send its data in real time to the International Data Centre (IDC) in Vienna.

Seismic vault and energy vault

IAG engineers and technicians are providing maintenance of the CTBTO stations in Mongolia. IAG team of technicians and electronic engineers in two levels maintain and operate IMS facilities in Mongolia.

First level - consists of 8 technician operators and implements daily procedure of maintenance and operations of IMS.

Second level - consists of high qualified electronic engineers and responsible persons for each monitoring technology at IAG who provide preventive maintenance procedures at IMS facilities. In emergency case when first level could not fix it, specialist from second level team visits to the Songino relay station.

Certified dates of the IMS stations

Station	Installed year	Certified date	Min Data availability
I34MN	1998	2002/12/19	98%
PS25	2000	2003/12/05	98%
MNP45	2002	2003/05/26	95%
MNX45	2006	2013/06/28	95%

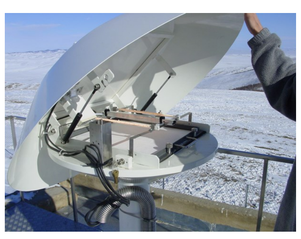
Satellite communication

Radionuclide station MNP45

The station collects atmospheric particles into high-tech paper filters for 24 hours, pumps them out with a compressor, and measures radioactivity using a highly sensitive gamma detector.

Air sampler and weather sensors

Measurement results will be transmitted to an international data center of the CTBTO via satellite communication every 2 hours.



Air sampler

filter compressor

Acquisition and Mail computers

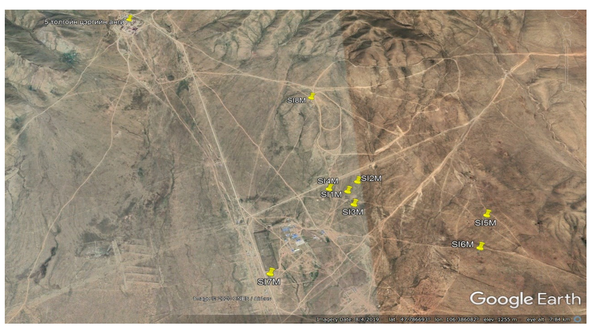
Canberra CP5 detector for Radionuclide measurement

The normal operation of the MNP45 system is monitored daily by measuring calibration samples containing Co, Cs, □ and other radioactive substances.

Radionuclide MNP45 station is one of the IMS radionuclide stations which are equipped by both radionuclide detection technologies: for observation of aerosol samples of solid radio nuclides or radionuclide particles and detection of noble gases.

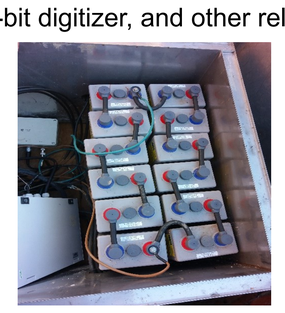
Infrasound array IS34

The IS34 infrasound network station was first installed in 1998 with four stations to record infrasound radiation from nuclear explosions, and was expanded to eight stations in 2006 to increase its data recording capacity.



Each station is equipped with an MB2000 microbarometer, an AUBRAC 24-bit digitizer, and other related equipment.

Microbarometer and digitizer



Power supply and communication hardwares

IS34 network uses MB2000 microbarometers (acoustic pressure sensors) to detect very low-frequency sound waves in the atmosphere produced by natural and man-made events.