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The Response of CTBT Radionuclide Monitoring System to the Fukushima Accident

The CTBT radionuclide monitoring system comprises a total of 80 stations; 63 were operational in March 2011 and able to detect particulate airborne radioactivity worldwide. When completed, 40 of the 80 stations will operate systems that can also detect the noble gas xenon. Certification of the stations results in a high level of technical standardization of the equipment and QA procedures are in place to demonstrate compliance with agreed data reproducibility standards during operation. However, the CTBTO monitoring system and procedures are tailored for detecting traces of radioactive material from clandestine nuclear tests and are not per se appropriate for monitoring comparatively high levels of radionuclides following a reactor accident.

The "stress test" of the CTBT radionuclide monitoring system in March and April 2011, when the releases of radioactive material from the Fukushima Daiichi nuclear power plant to the atmosphere were detected by 41 particulate stations and 19 stations designed to detect noble gases demonstrated a high standard of operational capabilities and resilience. Initial detections of radioactive materials were made on 12 March at the IMS station at Takasaki in Japan, just 300 km away from the accident site. Key radionuclides such as Iodine-131 and Caesium-137, which provide major contributions to public exposures were detected continuously and reported to the International Data Centre in Vienna. The detection of Niobium-95 and Ruthenium-103 was an early indicator of a meltdown inside one or more of the reactors.

Nine days after the accident the radioactive cloud had crossed North America. Three days later trace amounts of radionuclides had reached Europe, the first detection was reported in Iceland. By day 15, traces from the Fukushima accident were detectable all across the northern hemisphere. By 13 April, radioactivity had spread to the southern hemisphere of the Asia-Pacific region where it was detected at stations located in Australia, Fiji, Malaysia and Papua New Guinea.

The CTBT data contributed to the better understanding of the radiological situation world-wide by predicting the global dispersion of radioactive material based on its ATM tools. Forward ATM predictions proved to be highly reliable; the radionuclides were detected at the stations within hours of the time predicted. This "precision" was very reassuring to the public; it contributed to trust and public confidence in recommendations issued by authorities dealing with radiological protection and public health issues.

The sharing of CTBT data with the IAEA and other international organizations such as UNSCEAR has been highly beneficial for both the CTBT and science. The CTBT used the lessens learned to improve the operational capabilities and the robustness of the radionuclide network. The data on radionuclide concentrations in air received from the CTBT for the period 15 March to 24 May 2011 were reviewed by UNSCEAR internally under arrangements made by the Committee taking into account detailed description of sampling, measurement and analysis methods applied by the CTBT monitoring system. UNSCEAR has made particular use of the radionuclide ratios obtained from the CTBT data with the emphasis on the characterization of the nuclide spectrum of the released radioactive material as an input to public exposure assessments and the assessment of the source term. The results will be documented in a report to the General Assembly of the United Nations, which is prepared for publication in 2013.

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