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Progress in CTBT Monitoring since its 1999 Senate Defeat¹

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Progress in monitoring the Comprehensive Nuclear Test Ban Treaty (CTBT) is examined, beginning with the 2002 National Academy of Sciences CTBT study, followed by recent findings on regional seismology, array-monitoring, correlation-detection, seismic modeling and non-seismic technologies. The NAS-CTBT study concluded that the fully-completed International Monitoring System (IMS) will reliably detect and identify underground nuclear explosions with a threshold of 0.1 kt in hard rock, if conducted anywhere in Europe, Asia, North Africa, and North America. In some locations the threshold is 0.01 kt or lower, using arrays or regional seismic stations. As an example, the 0.6-kiloton North Korean test of October 9, 2006 was promptly detected by seismometers in Australia, Europe, North America and Asia. The P/S ratio between 1–15 Hz clearly showed that the event was an explosion and not an earthquake. Radioactive venting, observed as far as Canada, proved that it was a nuclear explosion. Advances in seismic monitoring strengthen the conclusions of the NAS study. Interferometric synthetic aperture radar can, in some cases, identify and locate 1-kt tests at 500 m depth by measuring subsidence to 2–5 mm. InSAR can discriminate between earthquakes and explosions from the subsidence pattern and it can locate nuclear tests to within 100 meters.

¹D. Hafemeister, *Science and Global Security* 15, 151–183 (2007), *Arms Control Today* 38, 6–12 (October 2008).