
Capability to Monitor the Comprehensive Nuclear-Test-Ban Treaty

The Geological Society of America endorsed this position statement in October 2009. The Seismological Society of America and the American Geophysical Union first issued a joint position statement on the seismic verification of the Comprehensive Nuclear Test-Ban Treaty (CTBT) in 1999. In late 2007 both organizations reviewed, updated and reaffirmed the statement.

In September 1996, the United States was the first country to sign the Comprehensive Nuclear-Test-Ban Treaty (CTBT), an international agreement to ban all nuclear test explosions, now signed by 177 nations. The treaty is intended to impede the development of nuclear weapons as part of the international nonproliferation regime. The treaty is not yet in effect because it has not been ratified by enough countries—including the United States. As a result, many of its verification provisions have not yet been fully implemented. When implemented, the American Geophysical Union (AGU) and the Seismological Society of America (SSA) are confident that the combined worldwide monitoring resources will meet the verification goals of the CTBT.

The CTBT will be monitored by: 1) the national intelligence means of various countries, 2) the International Monitoring System (IMS) negotiated under the CTBT that consists of seismic, hydroacoustic, radionuclide, and infrasound networks, along with on-site inspections, and 3) the efforts of numerous independent scientists and institutions worldwide. It is this combination of resources that gives confidence in the ability to uncover CTBT violations. AGU and SSA expect that this overall monitoring capability will continue to strengthen as more data are collected, more research is performed, and as global communications networks expand.

The seismic component of the International Monitoring System is to consist of 170 seismic stations. This network (which in 2007 was more than half built) will be able to detect all seismic events of about magnitude 4 or larger and to locate those events within 1000 square kilometers (a circle with a diameter of approximately 35 km), which is the maximum area permitted by the treaty for an on-site inspection. A seismic magnitude of 4 corresponds to an explosive yield of approximately 1 kiloton (the explosive yield of 1,000 tons of TNT). AGU and SSA are confident that the verification system, if built as planned, can be relied upon to meet that goal.

One of the biggest challenges to monitoring the CTBT is the possibility that testing could be successfully hidden by conducting nuclear explosions in an evasive manner. The concern is partly based on U.S. and Russian experiments which have demonstrated that seismic signals can be muffled, or decoupled, if a nuclear explosion is detonated in a large underground cavity. The decoupling scenario, however, as well as other evasion scenarios demand extraordinary technical expertise and the likelihood of detection is high. AGU and SSA consider such technical scenarios credible only for nations with extensive practical testing experience and only for yields of at most a few (that is, 1 or 2) kilotons. Furthermore, no nation could rely upon successfully concealing a program of nuclear testing, even at low yields.

Data from the treaty's monitoring system will also contribute to our scientific understanding of the Earth and efforts to mitigate earthquake hazards. Article IV.A.10 of the treaty states "The provisions of this treaty shall not be interpreted as restricting the international exchange of data for scientific purposes". AGU and SSA support a broad interpretation of this article and strongly urge that all data from the International Monitoring System be made openly available without any restriction or delay.