

Historic Soviet nuclear test site offers insights for today's nuclear monitoring

17 April 2008

Newly published data from the Semipalatinsk Nuclear Test Site, the Soviet Union's primary nuclear weapons testing ground during the Cold War, can help today's atomic detectives fine-tune their monitoring of nuclear explosions around the world, according to research presented at the annual meeting of the Seismological Society of America.

From 1949 to 1989, Semipalatinsk was scrutinized furtively by U2 spy planes, satellites and seismologists hoping to learn more about the Soviet Union's weapons capabilities. Now, for the first time, researchers can compare the information gleaned from these operations with the actual records from the test site to see how accurate Western researchers were in predicting the number and size of Semipalatinsk's nuclear detonations.

The treasure trove of data from Semipalatinsk are especially important in light of the fact that only three nuclear tests—back-to-back tests in India and Pakistan in 1998 and a 2006 test in North Korea—have been conducted since the Comprehensive Nuclear Test Ban Treaty of 1996, said Paul Richards of Lamont-Doherty Earth Observatory of Columbia University.

As nuclear monitoring techniques have improved over the past ten years, "there has also been a lack—thank goodness—of weapons tests to actually record, from which to gain monitoring experience," Richards, an expert in using seismological methods to detect nuclear tests, said. "It is therefore helpful in training ourselves today, in the work of monitoring, to look back at monitoring efforts in the past --- to see how well we did and what the challenges were."

The first nuclear detonations near Semipalatinsk in the 1940s were above ground, and the U.S. Air Force collected atmospheric traces of the explosions. Testing moved underground in later

decades, and seismological data became the primary way of monitoring the tests. In all, 456 nuclear tests took place at the site, with the last occurring in 1989. The veil of secrecy surrounding the site was lifted in the 1990s, when details of the tests were published in numerous books and scientific papers in Russia and Kazakhstan.

By comparing historical monitoring data with information from the new publications, Richards and colleagues can determine which underground tests were detected through seismic data at great distances, versus which kinds of tests would be detected by regional seismic stations today. They can also compare the monitors' estimates of weapons yield—the size of the explosions—with the official estimates in the publications.

So far, the comparisons suggest "that today we can do a very good job indeed" of monitoring nuclear tests using seismological and other data, Richards said.

The new publications also offer a glimpse at how the Soviet-era nuclear program was organized and led, how radioactivity from the explosions affected people and animals, and how the overall environmental health of the area was altered by decades-long testing, he noted.

Source: Seismological Society of America

APA citation: Historic Soviet nuclear test site offers insights for today's nuclear monitoring (2008, April 17) retrieved 1 December 2020 from <https://phys.org/news/2008-04-historic-soviet-nuclear-site-insights.html>

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