North Korean seismic event of May 2010 likely was earthquake, not nuclear test

December 19 2016

A tiny seismic event that occurred in North Korea on 12 May 2010 appears to have bene an earthquake rather than a small underground nuclear explosion, according to a new analysis published in the *Bulletin of the Seismological Society of America* (*BSSA*).

The new study led by seismologists from Columbia University's Lamont-Doherty Earth Observatory contradicts the findings of a 2015 report which concluded that the magnitude 1.5 seismic 12 May event was a small nuclear explosion.

The seismic signature of an explosion can be distinguished from that of a natural earthquake by looking at the ratio of two different types of seismic waves produced by the event. In the BSSA paper, Dr. Paul G. Richards and his colleagues suggest that that the 12 May event's signature is much more like that of an earthquake than an explosion.

More importantly, Richards noted, their analysis demonstrates how even very small seismic events can be monitored and analyzed for signs of being a nuclear explosion. The 12 May event produced seismic signals that are about three thousand times smaller than those coming from confirmed nuclear tests in North Korea conducted in 2013 and 2016.

Seismological monitoring of underground nuclear explosions has been underway since the late 1950s, "but we can now monitor down to extraordinarily small sizes of seismic events with high confidence," Richards said. "That wasn't the case 30 or even 10 years ago."

"We'll never be able to do it perfectly, but we can do it down to such a low magnitude that for all practical purposes we can know whether a nuclear explosion has taken place in a nuclear weapon development program," he added.

The first signs that a nuclear explosion might have taken place in North Korea in May 2010 came from stations located in South Korea, Japan and Russia that picked up traces of radioactive isotopes indicative of a nuclear explosion. By retracing the path of these unusual radionuclides through the atmosphere, researchers suggested that they were produced in a region of North Korea where earlier confirmed nuclear tests had taken place.

At first, scientists including Richards and his colleagues could find no signs of the sort of small seismic event that would indicate a low-yield nuclear explosion related to the radionuclide release. But in 2015, a team of Chinese seismologists identified a very small seismic event in the region that occurred 12 May 2010, and concluded that the event came from a nuclear explosion.

"The event they found was so small that we did not detect it during our original study, but it all seemed to fit together with the radionuclide data," Richards said.

Richards and colleagues examined the seismic event discovered by the Chinese team, with the help of newly available data from a temporary network of seismic stations deployed in China that captured the May 2010 event. But when they compared these data to seismic signatures from confirmed nuclear explosions and earthquakes captured on another Chinese network, "we realized that the problem event turns out to look more like an earthquake," Richards said.

The main types of seismic waves produced by earthquakes and

explosions are called P- and S-waves. (P-waves compress rock in the same direction as the wave's movement, while S-waves move rock perpendicular to the direction of the wave). The P/S-wave ratio is distinctively different for earthquakes and explosions.

If the seismic event on 12 May was an earthquake and not an explosion, how to explain the similarly-timed radionuclide data? Richards noted that the best way to confirm whether an explosion has taken place is an on-site inspection, which would only be possible if the United Nations' Comprehensive Test Ban Treaty (CTBT) was under full force. Several nations, including North Korea and the United States, have not ratified the treaty, keeping it from going into effect.

"You can imagine that every now and then you will get conflicting technical information on a seismic event when you only use data collected from a distance," Richards said. "Under the CTBT, it would be possible to conduct an on-site inspection to resolve this sort of disagreement."

The methods used in the BSSA paper to characterize very small seismic events could prove useful to earthquake scientists as well, Richards said. "If you're studying earthquakes and you're trying to build up the history of tectonics of a region, you do not want your list of earthquakes contaminated by all of the mining blasts and construction explosions."

More information: "Evaluation of a Seismic Event, 12 May 2010, in North Korea," *Bulletin of the Seismological Society of America*, DOI: 10.1785/0120160111 , bssa.geoscienceworld.org/conte … 016/12/09/0120160111

Provided by Seismological Society of America

Citation: North Korean seismic event of May 2010 likely was earthquake, not nuclear test (2016, December 19) retrieved 21 September 2024 from https://phys.org/news/2016-12-north-korean-seismic-event-earthquake.html

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.