

Detection of radionuclides from the third nuclear test ban by North Korea

After the third underground nuclear test conducted by North Korea on February 12, 2013, we analyzed the observation data from the radionuclide monitoring stations of the International Monitoring System in Japan and around North Korea for three weeks. There was no significant detection of artificial radionuclides as evidence of a nuclear test in this period. The radioactive xenon isotopes (Xe-133 and Xe-131m), however, were simultaneously detected at concentrations exceeding the normal range from the atmospheric samples collected at the Takasaki station on April 8 and 9, less than 2 months after the nuclear experiment (Fig.1). The timing of the nuclear fission was estimated from the concentration ratio of the detected radioactive xenon isotopes and was found to be consistent with the timing of the detection of artificial seismic waves from North Korea's third nuclear test, suggesting that the nuclides detected in April were derived from the nuclear test.

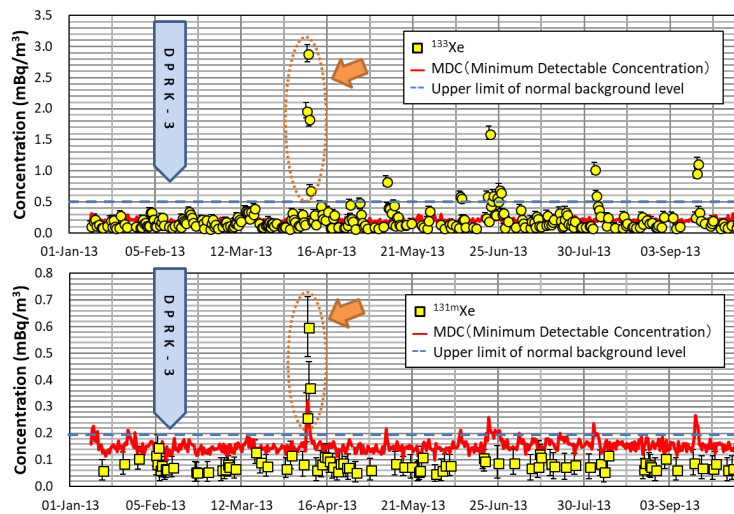


Fig. 1 Time series of the atmospheric concentration of radioactive xenon isotopes at the Takasaki station around the third North Korea nuclear test (top: Xe-133, bottom: Xe-131m)

In addition, we performed atmospheric dispersion simulations using atmospheric transport modeling (ATM) to investigate the release area of the detected radioactive xenon. Figure 2 shows the potential release source that was determined by simulating the movement of Xe-133 retroactively, starting from the Takasaki station, which simultaneously detected Xe-133 and Xe-131m. The area in yellow (Fig.2) is likely to be the source area. The results calculated every few hours are overlaid in Fig.2.

Figure 2 indicates the estimated location of the underground nuclear test based on seismic wave analysis. As the estimated point of the nuclear test is within the potential source area, this point was evaluated the release source of the Xe-133 and Xe-131m.

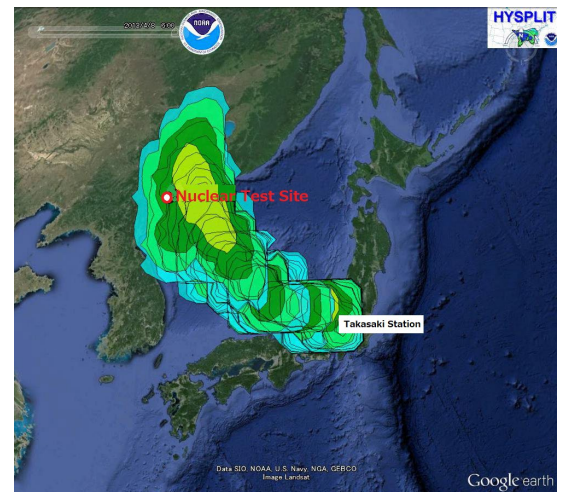


Fig. 2 Results of the release area estimation