EGU21-12100
https://doi.org/10.5194/egusphere-egu21-12100
EGU General Assembly 2021

Data-based kernel density equations for probability distributions of releases of CTBT-relevant radioxenon isotopes from nuclear facilities and when arriving at IMS stations after atmospheric transport

Martin Kalinowski and Boxue Liu
CTBTO, International Data Centre Division, Austria (martin.kalinowski@ctbto.org)

For the International Monitoring System (IMS) to be effective, it is vital that nuclear explosion signals can be distinguished from natural and man-made radioactivity in the atmosphere. The International Data Centre (IDC) of the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) applies standard event screening criteria, with the objective of characterizing, highlighting, and thereby screening out, events considered to be consistent with natural phenomena or non-nuclear explosive, man-made phenomena. The objective of this study is to apply the kernel density (KD) approach to generate and investigate probability distributions of isotopic ratios for radioxenon releases from certain types of sources. The goal is to create probability density functions that could be applied e.g. with a Bayesian method to determine the probability whether an IMS observation can be explained by known sources or could possibly be caused by a nuclear explosion. KD equations for nuclear facility releases are derived from the data set of the radioxenon emission inventory of all nuclear power plants and all nuclear research reactors, as well as selected medical isotope production facilities in the calendar year 2014. For all types of sources, KD equations will be linked with isotopic ratio calculations that connect the sources and IMS stations as receiver.