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Atmospheric Transport Modelling assessing dispersion patterns after the nuclear test conducted by the DPRK in September 2017 and confining origin of regional xenon detections

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The Comprehensive Nuclear-Test-Ban Treaty (CTBT) prohibits all kinds of nuclear explosions. The International Monitoring System (IMS) is in place and at about 90% complete to verify compliance with the CTBT. The stations of the waveform technologies are capable to detect seismic, hydro-acoustic and infrasonic signals for detection, localization, and characterization of explosions. For the definite proof of the nuclear origin of an explosion it is necessary that traces of radioactive fission products are released into the atmosphere and measured by radionuclide monitoring stations.
The nuclear explosion conducted and announced by the DPRK on 3rd September 2017 was the strongest so far as the seismological analysis shows (see presentation by Gaebler and Ceranna).
The dispersion of potential releases emitted after the September 2017 explosion is investigated using the Lagrangian Particle Dispersion Model HYSPLIT operated in forward mode with GFS/GDAS meteorological data provided by NCEP.
In the weeks after the DPRK test explosion occasionally the radioactive isotope xenon-133 was measured at various locations in the region. If measured without other isotopes xenon-133 is not specific for nuclear explosions as it is also produced by other nuclear facilities. Backward Atmospheric Transport Modelling is used to assess the potential source regions of those detections. Most of the xenon-133 occurrences in September 2017 seem to originate from background sources but some in October may have emerged from the DPRK test cavity.
Furthermore, the seasonality of the dispersion patterns of potential releases from the DPRK test-site is investigated using a dataset of four forecasts per day from 2012 until 2017. It is shown that the Japanese IMS station RN 38, Takasaki has nearly no chances to detect emissions from the DPRK test-site during northern summer.