The Role of Meteorology in Nuclear Disarmament

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Even though it may not be widely known, atmospheric science has a role to play in the context of nuclear disarmament and related international treaties. The main function of atmospheric science in these contexts is to calculate the transport, diffusion and deposition of radioactive material in the atmosphere. In combination with measurements of radionuclides, inverse modelling can be used to locate and quantify sources of these radionuclides.

Therefore, meteorology is a key element in the verification system for the Comprehensive Nuclear-Test-Ban Treaty (CTBT), connecting measurements in the global radionuclide network with potential sources. The infrasound component of the CTBT verification system makes use of stratospheric wind and temperature fields, and its radionuclide stations also provide standard meteorological measurements.

Meteorology may play a role in a future Fissile Material Cutoff Treaty (FMCT).

Atmospheric processes are also decisive for the consequences of nuclear weapons use, and thus atmospheric science is higly relevant for the Treaty on the Prohibition of Nuclear Weapons (TPNW) as well as for the panel to assess the effects of nuclear war which the UN General Assembly decided in 2024 to create. The panel is tasked to submit a comprehensive report in 2027.

Among the consequences of nuclear war, nuclear winter is a prominent topic. Recent interdisciplinary research has confirmed that, by reducing agricultural yields and impacting fishery, widespread famine with billions of deaths can be expected to result from a large-scale nuclear war. The upcoming UN panel will consult with a wide range of stakeholders, including the scientific community. Meteorologists working in relevant fields should be prepared and proactive to support the assessment to be conducted by the UN panel.