

T1.3-O6. Noble Gas Migration Experiment to Support Comprehensive Nuclear-Test-Ban Treaty Verification

A Noble Gas Migration Experiment (NGME) conducted at the Nevada National Security Site (NNSS) studied the detection of an underground nuclear explosion (UNE) event using noble gas signatures, as might occur in a CTBT on-site inspection (OSI). The NGME project injected 2.49 Ci of Xe-127, 1.21 Ci of Ar-37, and 121 kg of sulfur hexafluoride (SF₆), diluted in air, into a former UNE shot cavity. These tracer gases were allowed to migrate from the cavity to near-surface and surface sampling locations and were detected in soil gas samples collected using various OSI sampling approaches. Based on the detection of SF₆, Ar-37, and Xe-127 in the soil gas samples, the project found the following: (1) the dilution factors calculated for SF₆, Ar-37, and Xe-127 demonstrated that SF₆ was enriched in all of the samples relative to both Ar-37 and Xe-127; (2) when Xe-127 and Ar-37 were present in soil gas samples there were no significant differences in the Xe-127 to Ar-37 ratio relative to the ratio injected into the cavity; (3) the migratory behavior of the chemical and radioactive tracers did not fit typical diffusion modeling scenarios which predicted different arrival times and dilution factors for the three tracers.

Track Classification: 1. The Earth as a complex system