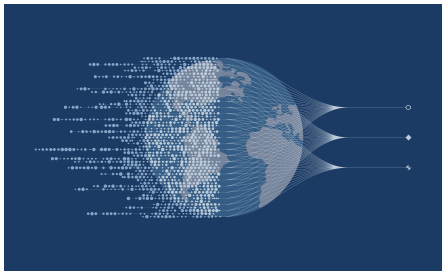

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# (Subsurface-Atmosphere Tracer Experiment): Ground truth for the atmospheric detectability of xenon emitted from an underground cavity

The detection of underground nuclear explosions by means of the radioactive gases generated during the explosion requires a sufficient fraction of radionuclides to be emitted to the atmosphere. In the case of late seepage observed after a few days to a few weeks, this fraction is very small and results from the transport of gases under the combined effects of thermal gradient and barometric pumping. However, a model suggests that these diffuse emissions at the ground surface, integrated in space and time, could together constitute a source term sufficient to be detectable with current technology. The SATEx (Subsurface-Atmosphere Tracer Experiment) project proposes to verify this model by experimentally injecting stable xenon from an underground cavity and monitoring it in the geosphere and atmosphere at the small-scale instrumented site of the Roselend natural laboratory (France). Numerous infrastructures, devices and instruments allow measurements in rock, soil and atmosphere, including a xenon concentration enrichment device (based on silver-doped zeolite) coupled to a mass spectrometer. A transport model was calibrated on the basis of previous experiments and was used for the design of the experiment.

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