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The influence of nuclear facilities on the global radioxenon background

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Radioxenon isotopes are the sole signal that can confirm if an underground explosion was nuclear or not. Beside in nuclear explosions, radioxenon isotopes can also be created in among others nuclear power plants or medical isotope production facilities. It is of key importance to understand the atmospheric radioxenon background to be able to distinguish between signals from civil sources or nuclear explosions.

The International Noble Gas Experiment (INGE) was formed in 1999 to establish the noble gas verification component of the Comprehensive Nuclear Test Ban Treaty (CTBT), which prohibits nuclear explosions in any environment. By the middle of 2008, 18 stations of the worldwide International Monitoring System (IMS) network will be equipped with noble gas measurement equipment, which is each able to detect xenon-133 levels down to 0.2 mBq/m^3.

Regions with many nuclear facilities have a background of few mBq/m^3 of xenon-133. Nuclear power plants were thought to be the main emitters of noble gases. Based on several years of measurements, it was found, however, what might be the main source of radioxenon background in Europe, North America and South Africa: strong batch releases from very few radiopharmaceutical facilities. These releases can be up to three orders of magnitude above the ones from nuclear power plants.

This paper will review the current known environmental radioxenon background from INGE stations as well as the production process within a nuclear power plant and of certain radiopharmaceutical facilities where radioxenon isotopes are created and

compare calculated release scenarios with real measurements.