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Site specific frequency distributions of xenon measurements at IMS stations

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Four xenon isotopes are key radionuclides to detect and identify nuclear explosions. They are also routinely released from civil nuclear facilities and are thus detected at existing noble gas monitoring facilities of the International Monitoring System (IMS). Atmospheric transport and dilution over thousands of kilometers renders concentration levels which vary in time and also close to the detection limit of the existing systems. In order to get the maximum information from the raw data, the statistical concepts of critical limit and detection limit are discussed. A method has been developed to distinguish the site specific variability of the real concentrations from statistical fluctuations of the detecting system. The knowledge of the site and detector specific characteristics of the distribution of measurement data is crucial to establish reliable and sound methodologies, which enables the CTBT verification system to distinguish between traces of nuclear explosions and the existing civil background.