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Statistical Study of the Atmospheric Background and Anomalous Values of the Radioxenon Activity Concentrations at some IMS Stations

The main goal is to perform a detailed statistical analysis of the atmospheric background and of the "Abnormal Concentrations" of radioxenon, measured at some IMS stations. For each IMS station considered, a descriptive statistical analysis of the empirical distribution was performed and two types of "Statistical Process Control Charts" were applied to the measured values. The Shewhart "Control Chart for Individual Measurements", sensitive to large variations and the "Exponentially Weighted Moving Average (EWMA) Control Chart", sensitive to small variations, were used to analyze the overall chronology of the observations and to identify and study those values that significantly deviate from the average value. The "Control Charts" method were then compared with the "Inter-Quartile Range" method currently used by the IDC. The results show that the "Control Chart for Individual Measurements" is particularly meaningful for the periodic monitoring of IMS stations in order to identify large variations of radio-xenon activity concentrations, while the "EWMA Control Chart" is more suitable for specific studies on the atmospheric background and on the "anomalies" of radioxenon activity concentrations. The use of "Control Charts" method as a possible complement to the "Inter-Quartile Range" method, could be further investigated.

Primary author: GUERNELLI, Sofia (University of Bologna, Italy)

Presenter: GUERNELLI, Sofia (University of Bologna, Italy)

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