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Statistical study of the IMS 133Xe data distributions, using both a parametric and a non-parametric method

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The aim of this work is to apply both a parametric and a non-parametric statistical method to the 133Xe activity concentrations measured at noble-gas stations of the IMS of the CTBTO, in order to investigate the atmospheric background and the anomalous values. The parametric method consists of two control charts: a single-observation chart sensitive to large variations with respect to the mean value, and an EWMA chart sensitive to small variations with respect to the mean value. The results show that the control charts could be useful for an NDC carrying out daily monitoring to easily detect significant variations of the activity concentrations, and to perform more specific analysis of the anomalous values. The parametric method is expected to be useful to better understand the false positives. The non-parametric method is based on a Recursive Segmentation and Permutation (RS/P) algorithm, it does not require any assumption about the underlying probability distribution, and it associates a significance level to the results. The RS/P method is useful for detecting single or multiple mean shifts and/or scale shifts, and the results show that it can be useful to highlight any random oscillations of the phenomenon providing a likely better understanding of anomalous values.

Promotional text

The main contribution of the present abstract is about a better understanding of the Xe-133 background and anomalous values applying two advanced statistical methods to the activity concentration values measured at the noble gas stations of the IMS.

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