Two years of continuous monitoring of ^{7}Be and ^{210}Pb in rainfall collected at the IPEN campus, São Paulo, Brazil

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The naturally occurring radionuclides ^{7}Be and ^{210}Pb are produced in the atmosphere and used as tracers of a wide variety of processes that occur in the Earth's atmosphere and surface. The cosmogenic radionuclide ^{7}Be (T1/2 = 53.3 d), is produced in the upper atmosphere by cosmic ray spallation of oxygen and nitrogen; ^{210}Pb (T1/2 = 22.3 y), a natural radionuclide from ^{238}U series can be found in the atmosphere, as a product of ^{222}Rn decay that emanates from the ground. Both natural radionuclides can be used as tracers for heavy metals and pollutants in the environment, tracer of soil erosion, transport processes in watershed and sedimentation in lakes, among other examples. The activity concentration results of these radionuclides in rainfall, when combined with meteorological information, help to understand how aerosol particles are transported in the air and removed from the atmosphere by the action of rainfall. The objectives of this work were to determine the activity concentrations of the natural radionuclides ^{7}Be and ^{210}Pb in rainfall samples over a period of two years, from January 2021 to December 2022, in each rainy event that occurred on the IPEN campus, located in the city of São Paulo, Brazil. Be-7 activity concentrations were measured by non-destructive gamma-ray spectrometry using a coaxial Be-layer HPGe detector with 25% relative efficiency and associated electronic devices and live counting time varying from 80,000 s to 300,000 s; ^{210}Pb activity concentrations were measured by gross beta counting in a low background gas flow proportional detector, after radiochemistry procedure. The annual rainfall indices for 2021 and 2022 were 1093 mm and 1391 mm, respectively. Activity concentrations for ^{7}Be ranged from 0.459 ± 0.038 Bq L^{-1} to 8.96 ± 0.57 Bq L^{-1} and for ^{210}Pb from 0.015 ± 0.001 to 0.98 ± 0.01 Bq L^{-1} in the studied period. The results obtained of ^{7}Be and ^{210}Pb in rainfall were correlated to seasons, precipitation, temperature, and sunspot number for ^{7}Be. The higher values obtained for the concentrations were in winter and spring time presenting good correlations with the amount of precipitation and sunspot number and a clear seasonal variation.