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275 of 499

Daily variation of radon gas and its short-lived progeny concentration near ground level and estimation of aerosol residence time

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Abstract

Atmospheric concentrations of radon (Rn-222) gas and its short-lived progenies Po-218, Pb-214, and Po-214 were continuously monitored every four hours at the ground level in Jeddah city, Kingdom of Saudi Arabia. The measurements were performed three times every week, starting from November 2014 to October 2015. A method of electrostatic precipitation of positively charged Po-218 and Po-214 by a positive voltage was applied for determining Rn-222 gas concentration. The short-lived Rn-222 progeny concentration was determined by using a filter holder connected with the alpha-spectrometric technique. The meteorological parameters (relative air humidity, air temperature, and wind speed) were determined during the measurements of Rn-222 and its progeny concentrations. Rn-222 gas as well as its short-lived progeny concentration display a daily and seasonal variation with high values in the night and early morning hours as compared to low values at noon and in the afternoon. The observed monthly atmospheric concentrations showed a seasonal trend with the highest values in the autumn/winter season and the lowest values in the spring/summer season. Moreover, and in parallel with alpha-spectrometric measurements, a single filter-holder was used to collect air samples. The deposited activities of Pb-214 and the long-lived Rn-222 daughter Pb-210 on the filter were measured with the gamma spectrometric technique. The measured activity concentrations of Pb-214 by both techniques were found to be relatively equal largely. The highest mean seasonally activity concentrations of Pb-210 were observed in the autumn/winter season while the lowest mean were observed in the spring/summer season. The mean residence time (MRT) of aerosol particles in the atmospheric air could be estimated from the activity ratios of Pb-210/Pb-214.

Keywords

Author Keywords: [daily variation](#); [radon progeny concentration](#); [meteorological variables](#)

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