A preliminary measurement and analysis of the altitudinal variation of beryllium-7 and other atmospheric isotopes in Colombo, Sri Lanka

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Beryllium-7 (Be-7) is a cosmogenic atmospheric radionuclide produced by cosmic rays in the Earth's stratosphere. These radionuclides are deemed remarkably useful as tracers in global atmospheric studies, due to their nature, whereupon production, the isotope is absorbed to aerosols, and is carried with atmospheric currents. These studies can be used to develop atmospheric models to provide data for highly economically and socially impactful purposes in any country. Such atmospheric studies have never been performed in Sri Lanka, even though a large majority of global studies are performed through air sampling techniques. This study aimed to establish a preliminary measurement through a combination of sampling followed by alpha spectroscopy, and in-situ gamma spectroscopy at the University of Colombo premises in Sri Lanka. Both spectroscopy techniques were performed at a low altitude (13 m above sea level) and at an elevated altitude (37 m above sea level), to obtain two sets of spectroscopical data. The Be-7 activity was recorded on average to be 17 ($\pm$1.6) Bq at low altitude and 71 ($\pm$1.6) Bq at high altitude. Alpha spectroscopy resulted in the detection of Po-210, Bi-212, Po-214 and Po-212, where the most prominent isotope, Po-214 was measured at 11 ($\pm$1.1) Bq at low altitude and 6 ($\pm$1.1) Bq at high altitude. The study revealed a distinct difference in the activity of atmospheric radionuclides, and conclusively provided preliminary evidence for altitudinal atmospheric movement, thus setting a baseline measurement in Colombo. Further studies to be carried out at other locations and altitudes are planned, to extend the study to the entire country, and to increase the robustness of the method used in the current study.

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