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7Be in South America: detection by IMS radionuclide stations and possible applications for climate and environmental studies

7Be is one of the cosmogenic isotopes most efficiently produced in nuclear spallation reactions induced by the interaction of cosmic rays and atmosphere constituents, then it rapidly attaches to suspended aerosols and its fate is governed entirely by atmospheric dynamics. With a relative short half-life of 53.22(6)d it decays via electron capture and one of the by products of this transition is a gamma ray of 477.6 keV. Due to its abundance 7Be concentration is quantified with a high degree of precision by the IMS radionuclide network. The focus of this work is to characterize the spatial and temporal variability of 7Be concentration in South America analyzing the data collected by several IMS stations provided under a vDEC collaboration over the 2005-2016 time period. 7Be concentration in air is dominated by a seasonal cycle for which the stronger effects are more evident around mid-latitudes, with periodicities closely related to the ones found in climate. Anomaly time-series were compared with climate parameters of interest and a conceptual model was developed to explain 7Be interannual variability. Anomalous 7Be high concentration events were identified and using retro-trajectory analysis the enriched 7Be air masses were traced back to its source.

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