7Be behaviour and meteorological conditions associated with 7Be peak events in Spain

Abstract:
This work regards a comprehensive analysis of the overall distribution of 7Be activity concentrations in Spain and the synoptic meteorological conditions associated with the highest 7Be peaks (> 8 mBq/m³). The use of four sampling stations (Barcelona, Bilbao, Madrid, and Sevilla) included in the sparse monitoring network of the Radioactivity Environmental Monitoring database (REMdb), with different latitudinal location, as well as the relatively long time period used in this study (2001-2010), allowed to improve the understanding of 7Be spatio-temporal distribution in Spain. The comparison of the four time series indicated a north-south increasing gradient for the 7Be activity concentrations mean values (from 3.1 ± 1.1 mBq/m³ in Bilbao to 4.0 ± 1.8 mBq/m³ in Sevilla), even though not statistically significant (t-test). However, the analysis of frequency distributions and temporal evolutions of 7Be activity concentrations have suggested the presence of two main areas, namely northern (Bilbao and Barcelona) and southern (Sevilla) Spain. The identification and analysis of periods associated with the highest values of 7Be (> 8 mBq/m³) in each area have allowed to study the different synoptic patterns associated with stratospheric-tropospheric transport (STT) with which they are potentially associated. In particular, three episodes (one in the north and two in the south) potentially associated with vigorous STT have been identified and analysed in detail. The results displayed that the omega block configuration, extending either over western Russia and Scandinavia or into the Atlantic Ocean, forced the prevailing jet stream to the northeast and south of Spain respectively with subsequent subsidence. In summer, this blocking configuration at high latitudes was combined with the presence of the Azores high pressure system to the west of Spain, affecting the 7Be activity concentration recorded in the south.

URI:

Authors:
HERNANDEZ CEBALLOS Miguel Angel
BRATTICH Erika
LOZANO Rafael Luis
CINELLI Giorgia

Publication Year:
2017

Science Areas:
Environment and climate change [2]
Nuclear safety and security [3]