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ANALYSIS OF EXTREME BERYLLIUM-7 SPECIFIC ACTIVITIES IN SURFACE AIR

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The maxima in a large dataset of the beryllium-7 specific activities measured in surface air in Helsinki, Finland, over 25 years (1987-2011), are analysed. The measurements at this station were performed with a varying temporal resolution: weekly until 1999, and daily, or once in two days, in the subsequent years, with a final dataset consisting of more than 4000 measurements. These data are stored by the online Radioactivity Environmental Monitoring (REM) Database.

The beryllium-7 extremes in this dataset are defined as events with the beryllium-7 specific activity above the 95th percentile, or in other words, as the maximum 5 % of the measured values. Specifically, for the Helsinki data set, this threshold is $4.82 \cdot 10^{-3} \text{ Bq m}^{-3}$. The beryllium-7 specific activity in Helsinki shows a seasonal pattern with the monthly means above $2.00 \cdot 10^{-3} \text{ Bq m}^{-3}$ during the warm season (April–September), and below $2.00 \cdot 10^{-3} \text{ Bq m}^{-3}$ during the cold season (October–March). The analysis of the extremes shows that 90 % occurred in the warm season, and the remaining 10 % in the cold season. The occurrence of the extreme beryllium-7 events during the cold season is therefore of particular interest, and these "cold extremes" are analysed in more detail.

Amongst the cold extremes, three extreme episodes are identified. These episodes, which occurred in March 1999, February 2003 and February 2005, show extremely high beryllium-7 specific activities measured over several consecutive days. Potential vorticity and surface temperature maps over Europe are investigated in attempt to find underlying mechanisms that cause high concentrations of beryllium-7 in surface air during the cold season.



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