J. Environ. Radioactivity **18** (1993) 85–87

Letter to the Editor

GLOBAL DECREASE OF BERYLLIUM-7 IN SURFACE AIR

Dear Sir,

For many years air filter samples have been continuously collected for the Environmental Measurements Laboratory's Surface Air Sampling Program (SASP) at locations around the globe (Fig. 1) to study the temporal and spatial distribution of specific natural and anthropogenic radionuclides in the surface air. Detailed information on SASP is periodically published (Larsen & Sanderson, 1991).

Two naturally occurring radionuclides, ^{7}Be and ^{210}Pb, are readily detected in all SASP samples. Beryllium-7 ($T_{1/2}$ = 53 days), a product of the bombardment of the stratosphere and upper-troposphere by cosmic rays, and ^{210}Pb ($T_{1/2}$ = 22 years), a decay product of ^{222}Rn that is emitted from soils, serve as excellent tracers for upper and lower tropospheric source and transport processes. In the past, the data on anthropogenic radionuclides provided information on the rate of atmospheric transport of fresh debris from nuclear weapons tests, on the latitudinal distribution of such debris, and on its transport between the Northern and Southern Hemispheres. More recently, Feely *et al.* (1989) used the data on natural radionuclides to identify some of the factors that can cause seasonal variations of ^{7}Be concentrations in the surface air. Following the Chernobyl accident, Larsen *et al.* (1989) used the data in a study of the transport processes associated with the initial elevated concentrations of the Chernobyl debris in the surface air in the United States.

In recent years, we have observed that the concentrations of ^{7}Be at

J. Environ. Radioactivity 0265-931X/92/$05.00

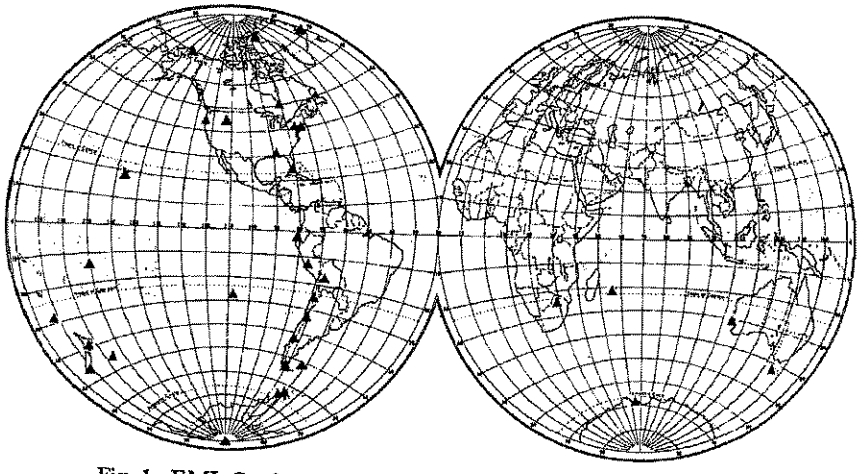

Fig. 1. EML Surface Air Sampling Program sampling locations.

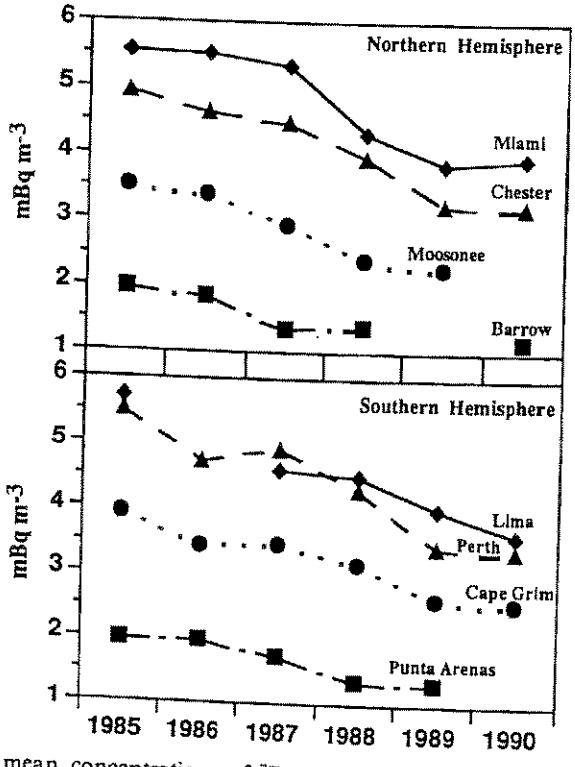

Fig. 2. Annual mean concentrations of ^{7}Be for 1985–1990 at Barrow, Alaska, USA (71°N); Moosonee, Ontario, Canada (51°N); Chester, New Jersey, USA (41°N); and Miami, Florida, USA (26°N) in the Northern Hemisphere; and at Lima, Peru (12°S); Perth, Australia (32°S); Cape Grim, Tasmania, Australia (41°S); and Punta Arenas, Chile (53°S) in the Southern Hemisphere.

most of the SASP sites have been decreasing. Annual mean concentrations at eight representative sites for 1985–1990 are shown in Fig. 2. It has long been known that the galactic cosmic-ray intensity varies with solar activity (O'Brien, 1979). Hotzl *et al.* (1991) recently correlated variations in concentrations of ^{7}Be at three sites in Germany with the changes in cosmic-ray neutron flux to earth during the last two solar cycles. A decrease in galactic cosmic-ray intensity has accompanied the recent increase in solar activity. A decrease in the production rate of cosmic-ray products, such as ^{7}Be is therefore expected, and our data indicate that it has occurred on a global scale.

REFERENCES

Feely, H. W., Larsen, R. J. & Sanderson, C. G. (1989). Factors that cause seasonal variations in beryllium-7 concentrations in surface air. *J. Environ. Radioactivity,* **9,** 223–49.

Hotzl, H., Rosner, G. & Winkler, R. (1991). Correlation of ^{7}Be concentrations in surface air and precipitation with the solar cycle. *Naturwissenschaften,* **78,** 215–17.

Larsen, R., Haagenson, P. & Reiss, N. (1989). Transport processes associated with the initial elevated concentrations of Chernobyl radioactivity in surface air in the US. *J. Environ. Radioactivity,* **10,** 1–18.

Larsen, R. J. & Sanderson, C. G. (1991). Report of the surface air sampling program, 1989 data. US Department of Energy Report EML-541, New York, NY.

O'Brien, K. (1979). Secular variations in the production of cosmogenic isotopes in the earth's atmosphere. *J. Geophysical Research,* **84,** 423–31.

Richard J. Larsen
Environmental Studies Division,
Department of Energy,
Environmental Measurements Laboratory,
376 Hudson St,
New York, New York 10014-3621, USA

(Received 15 October 1991; accepted 25 November 1991)