

Temporal Trends (1990-2001) in the Heavy Metal Concentrations in Mosses Across Europe

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The heavy metals in mosses survey was originally established in 1980 as a joint Danish-Swedish initiative and has, since then, been repeated at five-yearly intervals with an increasing number of countries and individuals participating across Europe. The survey provides data on concentrations of ten heavy metals (arsenic, cadmium, chromium, copper, iron, lead, mercury, nickel, vanadium, zinc) in naturally growing mosses. The technique of moss analysis provides a surrogate measure of the spatial and temporal patterns of heavy metal deposition from the atmosphere to terrestrial systems, and is easier and cheaper than conventional precipitation analysis.

Data for the most recent three European moss surveys (1990/1, 1995/6 and 2000/1) were converted into EMEP¹ maps (grid square: 50 km × 50 km) and temporal trends were analysed. Metal-specific and country-specific temporal trends were observed. In general, the concentration of lead and cadmium in mosses decreased between 1990/1 and 2000/1. The decline was higher for lead than cadmium, in agreement with the by EMEP reported reductions in anthropogenic emissions and total wet depositions for lead and cadmium across Europe. The arsenic concentration in mosses declined between 1990/1 and 2000/1 in countries that determined arsenic in all three recent surveys. For mercury not enough data were available, in particular for the 1990/1 survey, to establish temporal trends across Europe. For the other metals either (1) no or only small changes were observed or (2) no clear temporal trends were detected, i.e. increases, decreases or no changes in the heavy metal concentration in mosses were found with time, depending on country. The temporal trend analysis within countries was confounded by the fact that sampling sites, sampled moss species and applied analytical techniques were not always identical between surveys. Currently the 2005/6 moss survey is being conducted to establish longer-term temporal trends.

¹ Cooperative programme for monitoring and evaluation of long-range transmission of air pollutants in Europe.