

## TEMPORAL TRENDS (1990 – 2000) IN THE HEAVY METAL CONCENTRATION IN MOSSES ACROSS EUROPE

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of the European heavy metals in mosses surveys

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The European heavy metals in mosses biomonitoring network provides data on the concentration of ten heavy metals in naturally growing mosses and is currently coordinated by the UNECE ICP Vegetation (United Nations Economic Commission for Europe International Cooperative Programme on Effects of Air Pollution on Natural Vegetation and Crops). The technique of moss analysis provides a surrogate, time-integrated measure of metal deposition from the atmosphere to terrestrial systems. It is easier and cheaper, less prone to contamination and allows a much higher sampling density than conventional precipitation analysis. The moss survey has been repeated at five-yearly intervals and in this paper we report on the temporal trends in the concentration of arsenic, cadmium, chromium, copper, iron, lead, mercury, nickel, vanadium and zinc between 1990 and 2000. Maps were produced of the metal concentration in mosses for 1990, 1995 and 2000, showing the mean concentration per metal per 50 km x 50 km EMEP grid square (Harmens et al., submitted a,b).

Metal- and country-specific temporal trends were observed. In general, the concentration of lead and cadmium in mosses decreased between 1990 and 2000; the decline was higher for lead (57%) than cadmium (42%). For mercury not enough data were available to establish temporal trends between 1990 and 1995, but between 1995 and 2000 the mercury concentration in mosses did not change significantly (-8%) across Europe. The observed temporal trends for the concentrations in mosses were similar to the trends reported by EMEP (Co-operative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutant in Europe) for the modelled total deposition of cadmium (-45%), lead (-52%) and mercury (-8%) in Europe (Harmens et al., submitted a). Although the metal concentration in mosses generally decreased with time for the other metals too, only the decreases for arsenic (75%), copper (16%), vanadium (32%) and zinc (19%) were statistically significant. The observed temporal trends for the other metals were compared with emission trends for Europe reported by EMEP as modelled total deposition data are not available yet for these other metals (Harmens et al., submitted b).

### References

Harmens et al. (submitted a). Temporal trends (1990 – 2000) in the concentration of cadmium, lead and mercury in mosses across Europe. *Environmental Pollution*.

Harmens et al. (submitted b). Temporal trends (1990 – 2000) in the concentration of arsenic, chromium, copper, iron, nickel, vanadium and zinc in mosses across Europe. *Atmospheric Environment*.