LEAD, ZINC, AND COPPER DEPOSITION OVER THE PAST ±200 YEARS FOR EIGHT SITES SPANNING A POLLUTION GRADIENT IN THE CZECH REPUBLIC

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A pollution gradient exists within the Czech Republic such that the northern regions rank among the most severely polluted in the world, while the southern regions are relatively pristine in comparison to their northern counterpart. Pollution in the northern regions is mainly the result of burning lignite coal, which contains substantial amounts of both sulphur and heavy metals. Presently, monitoring programs exist to determine current releases of heavy metals into the environment in many regions of the world. However, in the Czech Republic, only a limited amount of information exists with regard to the extent of heavy metal pollution in the past, especially while the Czech Republic was under a Socialist regime. We have eight sites that are arrayed along this known pollution gradient within the Czech Republic, and for each site, historical rates of Pb, Zn, and Cu deposition were determined over the past ± 200 years using ^{210}Pb-dated cores from *Sphagnum*-dominated peatlands.

One peat core was collected from each site, ^{210}Pb-dated, and acid digested for Pb, Zn, and Cu determinations. Peak Pb deposition ranged from less than 12 mg m^{-2} yr^{-1} to almost 80 mg m^{-2} yr^{-1}. Peak Pb deposition occurred between 1965 and 1992 for seven of the eight sites, and decreased at ages older than those where peak deposition was recorded. Peak Zn deposition ranged from less than 18 mg m^{-2} yr^{-1} to 100 mg m^{-2} yr^{-1}. Peak Zn deposition occurred more recently than 1965 for six out of the eight sites. As with Pb, Zn deposition generally decreased at ages older than those where peak deposition was recorded. Peak Cu deposition ranged from less than 1.5 mg m^{-2} yr^{-1} to 14 mg m^{-2} yr^{-1}. The records of Pb, Zn, and Cu reflect a pattern of increasing industrialization over the past 100–200 years, with evidence of a more rapid industrialization in the post World War II era. Overall, deposition patterns differed among all eight sites, with sites located in northern Czech Republic having the greatest rates of Pb, Zn, and Cu deposition.

High deposition of Pb, Zn, and Cu in the north-western Czech Republic is due at least in part to their situation in a heavily industrialized region. Additionally, prevailing winds are from west to east so that the north-western regions of the Czech Republic receive polluted air masses originating in the former East Germany. In addition to geographic patterns in metal deposition, temporal patterns are revealed in the peat cores. The records in the peat cores generally reflect a pattern of increasing industrialization over the past 100–200 years, with evidence of a more rapid industrialization in the post World War II era. Results from this study place current high rates of Pb, Zn, and Cu deposition within a historical context. Since the fall of the Iron Curtain, the world has become more aware of the magnitude of pollution problems in the former Soviet bloc countries. This study, through use of ^{210}Pb dating, and metal concentration determinations has allowed for quantification of the magnitude of Pb, Zn, and Cu deposition throughout the Czech Republic. All sites receive some background deposition, but regionally or locally deposited Pb, Zn, and Cu originating from leaded gasoline, fossil fuel combustion without pollution controls, and mining can result in substantially enhanced deposition. Prior to the 19th century, deposition rates in the Czech Republic were similar to those recently measured in the eastern United States for Pb, Zn, and Cu of 4.1, 6.6, and 1.0 mg m^{-2} yr^{-1}, respectively.

This research has documented recent metal deposition rates at locations within the Czech Republic that are fifteen times greater than those recently measured in the eastern United States. As such, the extent to which the biota have been affected by high rates of atmospherically-deposited Pb, Zn, and Cu in the extremely polluted northern regions of the Czech Republic emerges as a major concern.