

Temporal trends of heavy metals air pollution in Romania assessed by neutron activation analysis, complementary atomic techniques, and moss biomonitoring

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The first moss survey at the Romanian scale was conducted in 2010 and has been repeated after five years, in the framework of the International Cooperative Programme on Effects of Air Pollution on Natural Vegetation and Crops (ICP Vegetation).

An international research network was developed for the investigation of heavy and trace element atmospheric deposition, based on the research projects jointly implemented by the Romanian partners “Valahia” University of Targoviste (UVT) and “Dunarea de Jos” University of Galati (UDJG), and Joint Institute for Nuclear Research (JINR) at Dubna, Russian Federation.

The moss surveys undertaken in 2010/2011 and 2015/2016 campaigns comprised 303 and 214 sampling sites, respectively, over the Romanian territory.

A total of 29 elements: Na, Mg, Al, K, Ca, Sc, Ti, V, Cr, Mn, Fe, Co, Ni, Cu*, Zn, As, Rb, Sr, Cd*, Sb, Ba, Cs, La, Ce, Sm, Tb, Pb*, Th and U, were determined in mosses samples, in the large-scale concentration range: from 10000 mg/kg for Al, Fe, Ca and K to 0.001 mg/kg for some rare earths — by two complementary methods: INAA at the IBR-2 reactor in JINR and GFAAS/FAAS* in 2010 and ICP-MS* in 2015 at Institute of Multidisciplinary Research for Science and Technology of UVT, Romania.

The temporal trends for median concentration of selected metals revealed a decrease in 2015 for all elements; in the case of mean concentration, there was a decrease in 2015 for Zn, Cd, Cu, and Pb and a slight increase for V, Cr, Fe, and Ni.

Statistical processing of data was carried out at INPOLDE research center of UDJG. Maps of metal load in mosses were generated by Data Management System on the cloud platform of JINR Dubna.

A new campaign already started in the summer of 2020 and moss samples were collected from 128 sampling sites, the sampling work continuing in the summer of 2021. Through the existing research network, the heavy metals concentrations in mosses will be determined to complete the temporal trends of heavy metals air pollution and report to ICP Vegetation.