Geophysical Research Abstracts
Vol. 15, EGU2013-8506, 2013
EGU General Assembly 2013

Heavy - metal biomonitoring by using moss bags in Florence urban area, Italy

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In the last century, pollution has become one of the most important risks for environment. In particular, heavy metal presence in air, water and soil induces toxic effects on ecosystems and human health.
Monitoring airborne trace element over large areas is a task not easy to reach since the concentrations of pollutants are variable in space and time. Data from automatic devices are site-specific and very limited in number to describe spatial-temporal trends of pollutants. In addition, especially in Italy, trace elements concentrations are not often recorded by most of the automated monitoring stations. In the last decades, development of alternative and complementary methods as bio-monitoring techniques, allowed to map deposition patterns not only near single pollution sources, but also over relatively large areas at municipal or even regional scale. Bio-monitoring includes a wide array of methodologies finalised to study relationships between pollution and living organisms.
Mosses and lichens have been widely used as bio-accumulators for assessing the atmospheric deposition of heavy metals in natural ecosystems and urban areas.
In this study bio-monitoring of airborne trace metals was made using moss bags technique. The moss Hypnum cupressiforme was used as bio-indicator for estimating atmospheric traces metal deposition in the urban area of Florence. Moss carpets were collected in a forested area of central Sardinia (municipality of Bolotana – Nuoro), which is characterised by absence of air pollution. Moss bags were located in the urban area of Florence close to three monitoring air quality stations managed by ARPAT (Agenzia Regionale Protezione Ambiente Toscana). Two stations were located in high-traffic roads whereas the other one was located in a road with less traffic density.
In each site moss bags were exposed during three campaigns of measurement conducted during the periods March-April, May-July, and August-October 2010. Two moss bags, used as control, were not exposed. After exposure periods, moss bags were removed and moss samples were analyzed for As, Cr, Cu, Fe, Ni, Pb, V, and Zn by Inductively Coupled Plasma Atomic Emission Spectrometry.
Results show differences between mean concentration of trace metals in moss bags after-exposure and the respective blanks in the three sample sites of Florence during the three campaigns of measurement. The highest concentrations for almost all elements were recorded at high-traffic road sites. Whereas lower values were detected in site located in a road with less traffic density
In conclusion, Hypnum cupressiforme, for his high ability to accumulate trace metals, can be efficiently used as bio-indicator to estimate the trend of air pollution in a urban area during a period time.