EMEC21

21st European Meeting on Environmental Chemistry
November 30 – December 3, 2021, Novi Sad, Serbia

Association of Chemistry and the Environment

Serbian Chemical Society

Matica Srpska

www.emec21.rs

Scientific Committee
Jan Schwarzbauer, president

Organisational Committee
Branimir Jovančićević, president

Executive Committee
Vladimir Beškoski, president

BOOK OF ABSTRACTS

ASSOCIATION OF CHEMISTRY AND THE ENVIRONMENT

21st European Meeting on Environmental Chemistry

BOOK OF ABSTRACTS

EMEC 21

November 30 – December 3, 2021

Novi Sad, Serbia

Book of Abstracts

21st European Meeting on Environmental Chemistry

Publisher

Serbian Chemical Society

Karnegijeva 4/III, Belgrade, Republic of Serbia

For the publisher

Dušan Sladić

President of the Serbian Chemical Society

Editors

Ivana Ivančev-Tumbas

Vladimir P. Beškoski

Aleksandra Šajnović

Cover page photo

Branko Lučić

Design and prepress

Beoživković, Belgrade

Printed by

RIS Studio, Belgrade

Circulation

150

ISBN

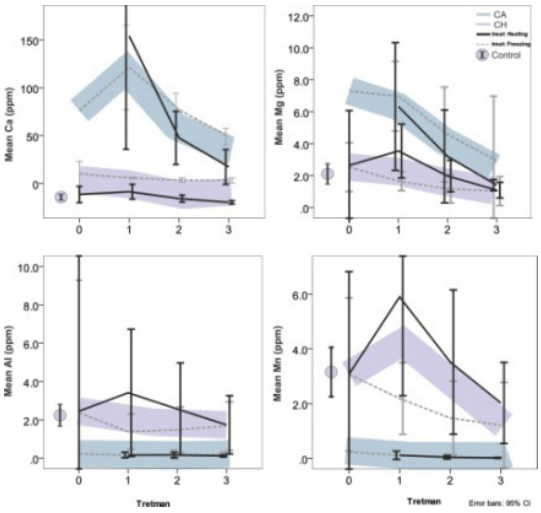
978-86-7132-078-8

Year

2021

Do Freezing and Heating Cycles Influence Differently on Soil Elements Leaching?

E. Hukić[1], M. Subašić[1], T. Tosti[3], S. Đogo Mračević[4], S. Štrbac[2], S. Stojadinović[2], M. Kašanin-Grubin[2]. (1), University of Sarajevo Forestry of Faculty, Zagrebačka 20, 71000-SA, Bosnia and Herzegovina (2), University of Belgrade, Institute of Chemistry, Technology and Metallurgy, Njegoševa 12, 11000-BG, Serbia, (3) University of Belgrade, Faculty of Chemistry, Studentski trg 12, Belgrade, Serbia, (4), University of Belgrade, Faculty of Pharmacy, Vojvode Stepe 450, Belgrade, Serbia*
[*]e.hukic@sfsa.unsa.ba.



Research in forest ecosystems is focused on recent and past extreme events caused by drought, heat, storms and frost [1,2]. This research aims at exploring soil-specific processes of element leaching in relation to the impact of soil wetting cycles after freezing and heating. Loosely bound nutrients (ions/elements) react differently to thermodynamic conditions, which are interesting to analyze associated with climate change and soil water depletion. Soil drying is related to the increase in air temperature. Repeated drying and wetting increases mineralization of the organic matter, and thus increases the availability and losses of nutrients. The effect of freezing-wetting alters solution fluxes. Both processes are far from being predictable, and there is a lack of knowledge on this subject. The objective of this experiment was to investigate the effects of soil freezing-wetting and heating-wetting cycles on soil leaching processes. Our hypothesis is that freezing and heating of the soil, change the quality of the soil solute, i.e. mineral ions (Na^+, K^+, Ca^{2+}, Mg^{2+}, Al^{3+}, Fe^{3+}, $Mn^{2+,}$ NO_2^-, SO_4^{2-}, NO_3^-, PO_4^{3-}) concentrations in leachate.

Two forest soil profiles, in European beech dominated stand on Mt Bjelašnica in Bosnia and Herzegovina (18˘15'44"E, 43˘42'25"N) were sampled. Soil type corresponded to Calcaric Cambisol (CA) and Chromic Cambisol (CH) according to IUSS Working Group WRB (2015). Soil was sampled by horizons (O, Ah, A/Brz, Brz1, Brz2). Porous plastic glasses were filled with 120g of air-dried soil, two representing different treatments (rewetting-freezing vs. rewetting-heating) and one representing the control. Treatments involved: a) four cycles of wetting the soil (2% intensity, 30', 120cm^3) and freezing (-10˘C) vs b) four cycles of wetting the soil (2% intensity, 30', 120cm^3) and heating for 3 hours at 40˘C. Control state involved wetting and drying at room temperature. After each wetting cycle, leachate was captured and left in freezer until determining concentrations of cations using Inductively coupled plasma optical emission spectrometer (Thermo scientific iCAP 6000 series) and anions using Dionex ICS 3000. We analyzed 16 samples per profile and per treatment, and 14 control samples, in total 78 samples.

The results obtained through this study point that different thermodynamic conditions influence different leaching intensity of soil ions. On the one hand, higher intensity of leaching of Al, Fe and Mn in CH soil was linked with heating-wetting treatments. On the other hand, more intense leaching of Ca, Mg and Na in CC soil was observed after freezing-wetting treatment. The experiment also showed lower leaching intensity of anions after heating-rewetting compare to freezing-wetting. Freezing-wetting cycles, like in our experiment, seems to have higher effect on the ion losses from temperate forest soils.

Acknowledgements

We acknowledge CLIMO COST Action CA15226 STSM support for project: Evaluation of the criteria of climate-smart forestry based on soil chemical properties in Bosnian beech forest sites.

References

[1] D. Brödlin, K. Kaiser, A. Kessler, F. Hagedron 2019. Drying and rewetting foster phosphorus depletion of forest soils. Soil Biology and Biochemistry 128: 22-34. https://doi.org/10.1016/j.soilbio.2018.10.001

[2] K. Hentschel, W. Borken, T. Zuber, C. Bogner, B. Huwe, E. Matzner 2009. Effects of soil frost on nitrogen net mineralization, soil solution chemistry and seepage losses in a temperate forest soil. Global change biology, 15, 825-836. doi: 10.1111/j.1365-2486.2008.01753.