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Faculty of Environment

Study material

MODELING OF OZONE DEPOSITION FLUX INTO THE FOREST
ECOSYSTEM IN CONDITIONS OF CLIMATE CHANGE

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EUROPEAN UNION
European Structural and Investment Funds
Operational Programme Research,
Development and Education



STUVIN - Education, research and innovation of science and technical doctoral programmes
on J. E. Purkyně University in Ústí n.L., reg. n. CZ.02.2.69/0.0/0.0/16_018/0002735

Objectives

The aim of the theoretical part is to understand the physical, chemical and biological aspects of ozone deposition flux into the forest ecosystem, to understand the theoretical aspects of modeling and measuring ozone deposition flux, to understand the impact of climate change on ozone precursor emissions and deposition flux on forest ecosystem. The aim of the applied part is to acquire the knowledge needed to measure and model the deposition flux of ozone into the forest ecosystem in climate change, calculate the critical dose of ozone and evaluate its impact on forest ecosystem health and evaluate scenarios of ozone precursor development, ozone concentration and flux in climate change.

Study topics

1. Basic information about the atmosphere. Composition and vertical division of the atmosphere.
2. Formation of ground-level ozone in the atmosphere. Characteristics of ground-level ozone. Influence of ozone precursor emissions on ozone concentration in the atmosphere.
3. Physical, chemical and biological factors influencing the concentration of ozone in the air.
4. Ozone transport through the atmosphere, ozone sinks and outlets.
5. Atmospheric ozone deposition. Physical, meteorological and chemical processes leading to ozone deposition flux.
6. Atmospheric ozone deposition on a local and regional scale. Atmospheric ozone deposition in the Czech Republic and in the world.
7. Micrometeorological methods for measuring ozone deposition flux. Gradient method. Eddy covariation method.
8. Modeling of total and stomatal ozone flux. Resistance models. Models of stomatal ozone uptake. Ozone transfer models.
9. Evaluation of the impact of ozone on the forest ecosystem. The role of monitoring. Air pollution monitoring and monitoring networks. Ozone pollution limits (AOT40, POD).
10. Influence of stomatal ozone flow on net ecosystem production.
11. Natural and anthropogenic influences on climate change. Impact of climate change on future ozone and reactive nitrogen deposition.
12. Effects of ozone on the forest ecosystem in the context of climate change.
13. Influence of reduction of precursor emissions on ozone concentrations in the years 2030 to 2100. Projection of reduction of NO_x and VOC emissions in the Czech Republic. Biogenic emissions of volatile organic compounds.

Study literature

Mandatory literature

LEFOHN, A.S. Surface level ozone exposure and their effects on vegetation. LEWIS PUBLISHERS, INC. Chelsea, 1991, 366 s.

BRIMBLECOMBE, P., HARA, H., HOULE, D., NOVAK, M. (Eds.), Acid Rain – Deposition to Recovery, Springer, Dordrecht, The Netherlands, 2007, 419 s.

ZAPLETAL, M., POLÁŠEK, M. Hodnocení přízemního ozonu ve vztahu k muzejním sbírkovým předmětům, lidské populaci a vegetaci. Opava: Slezské zemské muzeum, 2015, 123 s.

ZAPLETAL, M., CUDLÍN, P., CHROUST, P., URBAN, O., POKORNÝ, R., EDWARDS-JONÁŠOVÁ, M., CZERNÝ, R., JANOUŠ, D., TAUFAROVÁ, T., VEČEŘA, Z., MIKUŠKA, P., PAOLETTI, E. Ozone flux over a Norway spruce forest and correlation with Net Ecosystem Production. Environmental Pollution 159 (2011), s. 1024-1034.

Expanding literature

ZAPLETAL, M., PRETEL, J., CHROUST, P., CUDLÍN, P., EDWARDS-JONÁŠOVÁ, M., URBAN, O., POKORNÝ, R., CZERNÝ, R., HŮNOVÁ, I. The influence of climate change on stomatal ozone flux to a mountain Norway spruce forest. Environmental Pollution 169 (2012), s. 267-273.

Recommended literature

ZAPLETAL, M., EDWARDS-JONÁŠOVÁ, M., JURÁŇ, S., URBAN, O., POKORNÝ, R., PAVELKA, M., JANOUŠ, D., CUDLÍN, P. Effect of ozone concentration on net ecosystem production: A case study in a Norway spruce forest. In: URBAN, O., KLEM, K. (eds.): Global Change & Ecosystems: Predictions on Terrestrial Ecosystems, 1, Global Change Research Centre, Czech Academy of Sciences, Brno, 2015, s. 138-149.