Jan Evangelista Purkyně University in Ústí nad Labem

Faculty of Environment

Study material

FLUXES OF OZONE AND VOLATILE ORGANIC COMPOUNDS

Ing. Stanislav Juráň, Ph.D.

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Objectives

The course is focused on the detailed understanding of tropospheric ozone formation and its precursors. Various indices (PODy, AOT40) and its calculation as well as modelling approaches to estimate harmful effects on vegetation and carbon uptake are presented. Moreover, volatile organic compounds, important catalyzing agents in ozone formation, are presented in terms of their sources and sinks. The focus is on those of biogenic origin. Methods of measurements of ozone and volatile organic compounds are part of the course too, together with case studies in Czech and other parts of Europe.

Study topics

1. Basic informaiton – Tropospheric ozone in the past up to current times
2. Effect of ozone in carbon uptake by plants
3. Modelling and measurements of ozone fluxes
4. Indices (AOT40, PODy) representing critical levels for vegetation damage
5. Biogenic volatile organic compounds, sources and sinks
6. Role of volatile organic compounds and nitrogen oxides in ozone formation
7. Measurement techniques of volatile organic compounds in the atmosphere
8. Examples and case studies
9. Perspectives of modelling of ozone in mitigating climate change within cities
10. Future outlooks

Study literature

COOPER, O.R.; PARRISH, D.D.; ZIEMKE, J.; BALASHOV, N.V.; CUPEIRO, M.; et al. Global distribution and trends of tropospheric ozone: An observation- based review. Elementa 2014, 2, 000029.

EMBERSON, L.D.; ASHMORE, M.R.; CAMBRIDGE, H.M.; SIMPSON, D.; TUOVINEN, J.-P. Modelling stomatal ozone flux across Europe. Environ. Pollut. 2000, 109, 403–413.

GUENTHER, A.B., JIANG, X., HEALD, C.L., SAKULYANONTVITTAYA, T., DUHL, ET al. 2012. The model of emissions of gases and aerosols from nature version 2.1 (MEGAN2.1): an extended and updated framework for modelling biogenic emissions. Geosci. Model Dev. 5, 1471–1492.

JURÁŇ, S., GRACE, J., URBAN, O. 2021. Temporal changes in ozone concentrations and their impact on vegetation, Atmosphere, 12 (1), 82.

PAOLETTI, E.; ALIVERNINI, A.; ANAV, A.; BADEA, O.; CARRARI, E.; et al. Toward stomatal-flux based forest protection against ozone: The MOTTLES approach. Sci. Total Environ. 2019, 691, 516–527.