Measured vs modelled: ozone concentrations in the Romanian forest plots (ICP-Forests Level II and LTER)

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Introduction

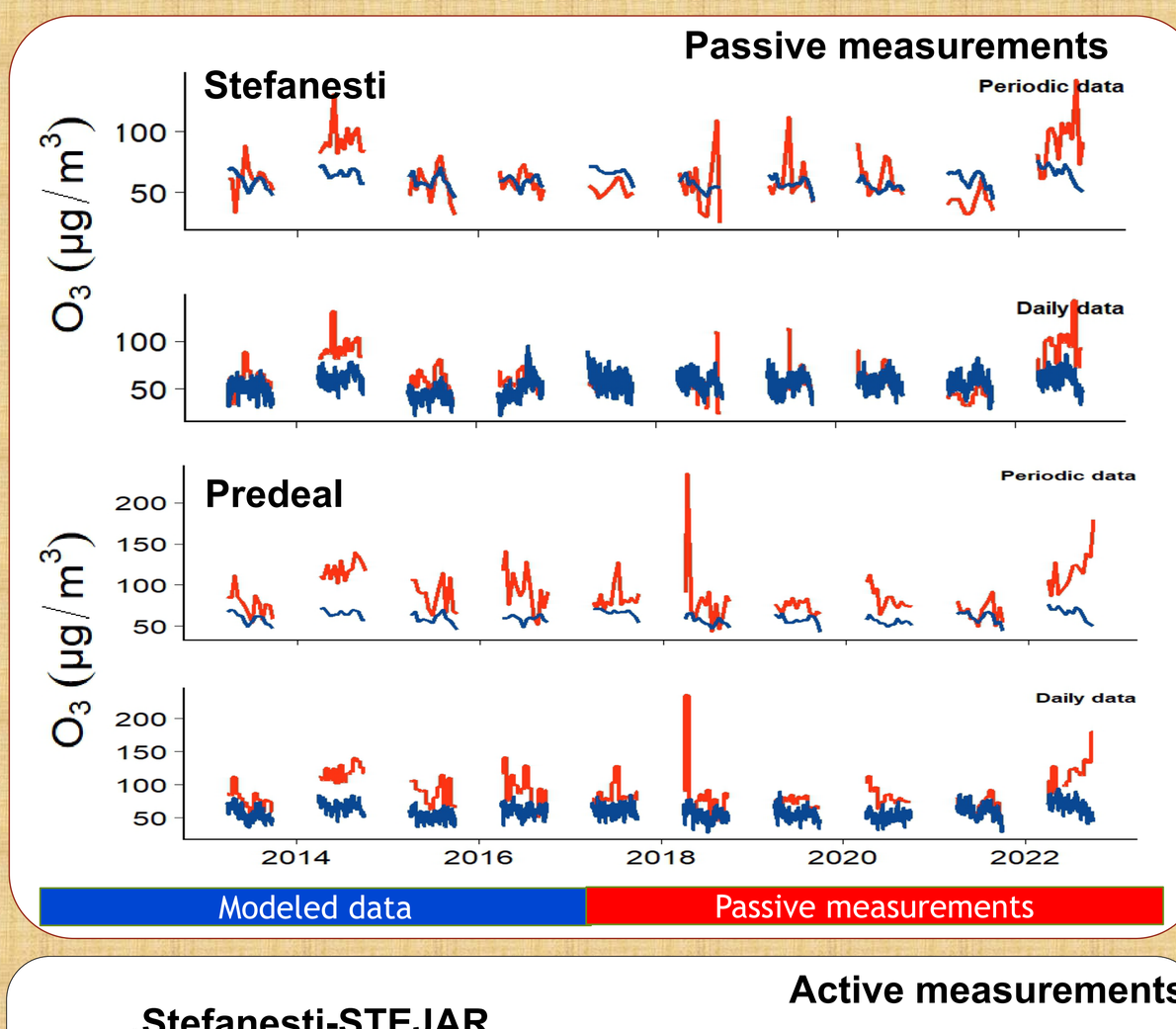
Ozone is a secondary pollutant, being formed as a result of complex photochemical reactions involving precursors (NOx and VOCs). When present in elevated concentrations, can have significant impacts on vegetation and act as a stressor with various ecological consequences. In Romania, ozone is measured in the ICP Forests Level II and LTER sites using both passive samplers and active monitors. Although direct measurements have the advantage to provide accurate and real-time information about the actual ozone levels in the atmosphere at a specific location, in analyzing its long term effects on vegetation often longer timeseries are necessary, thus using modelled data.

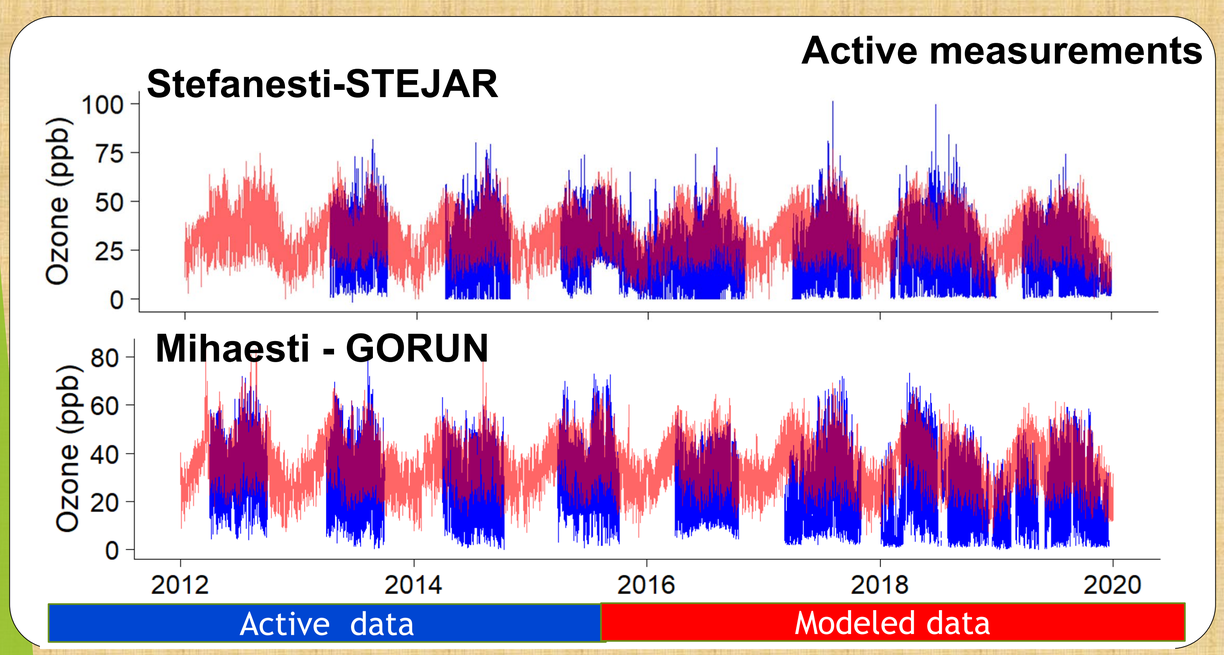
Material and Methods

Our study aims to compare measured and modelled ozone concentrations in Romanian forest plots for the vegetation periods between 2012-2023. We use measured data (both passive and active sampling) from Romanian ICP Forests Level II and Romanian Forest LTER sites plots and modelled data were extracted from the grid database Copernicus Atmosphere Monitoring Service (CAMS) Information platform. The spatial resolution of CAMS data are approx. 10 Km over Romania are based on an ensemble of eleven air quality models systems (e.g.. EMEP, CHIMERE) across Europe validated with data measurements from European Environment Agency.
Data were processed with a dedicated R script.

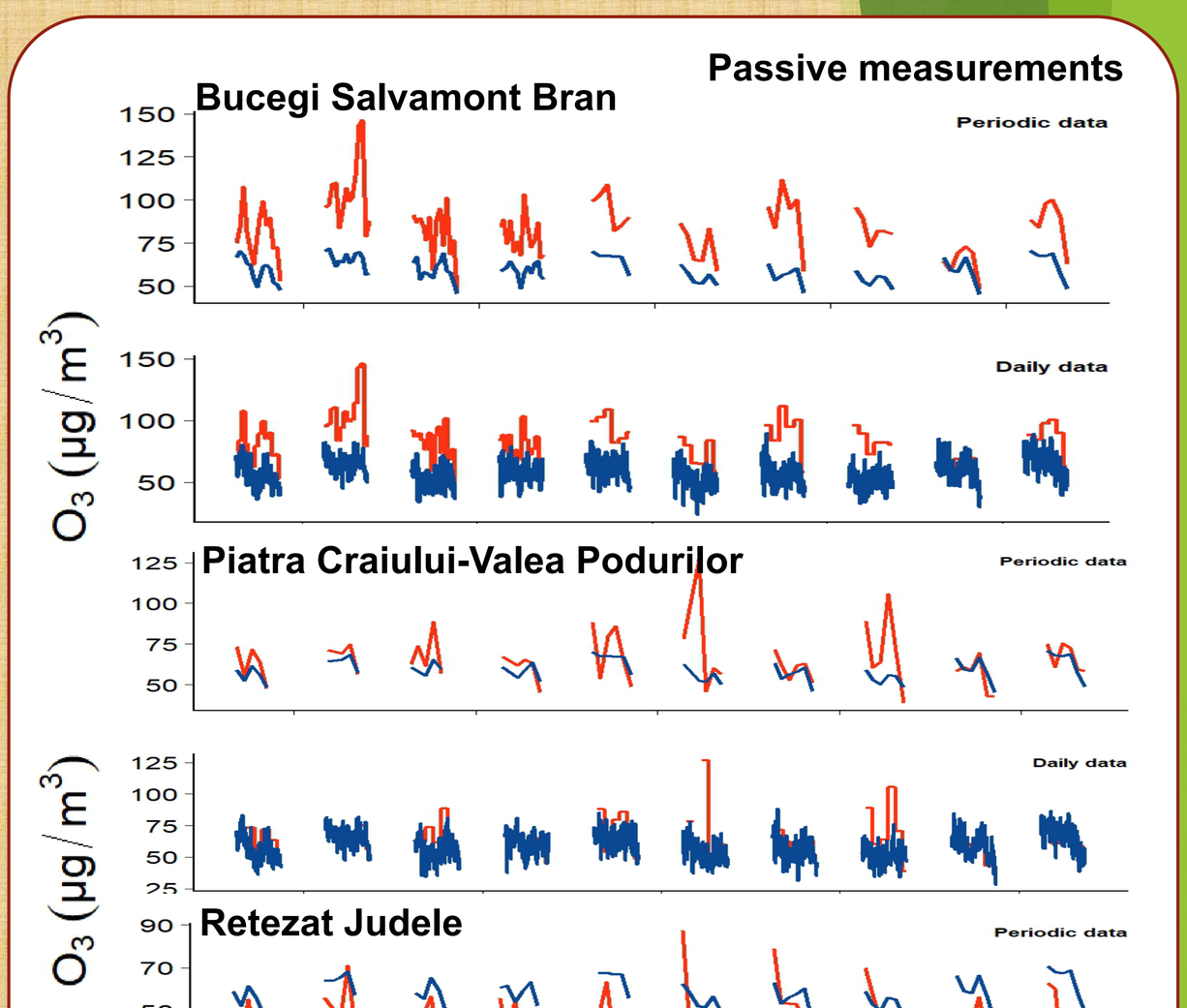
Results

ICP-Forests Level II





LTER



Preliminary results show that there are significant differences between measured (using passive samplers) and modelled data in core plots of the Romanian ICP Forests Level II network and LTER sites.
The obtained correlation (R=0.37) indicate possible ozone sources that are not properly quantified by models especially in the remote areas.

Conclusions

The comparative analysis was done for ozone modeled and measured. Our results highlight significant variability, time-dependent, between measured through passive measurements and modelled input data, respectively, between modeled and active measurements, with an important effect on output ozone metrics. In some cases, the modelled data/passive filters overestimate the ozone concentration. Our study offers new information on the reliability of applying models to estimate the ozone metrics at a large forest scale in Romanian vegetation and climate conditions.

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