

ABSTRACT

The study summarizes methods of ozone AOT40 index estimation from time intergrated passive sampler measurements in forests.

Ground-level ozone is a highly phytotoxic atmospheric pollutant. In recent years negative impacts of elevated concentrations of ground-level ozone on vegetation and ecosystems have been studied and atmospheric levels of ozone have been measured. There is a noticeable negative impact of elevated concentrations of ground-level ozone on forests in the Czech Republic, mainly in rural areas that are far away from the emission sources.

The AOT40F exposure index is a tool to assess the geographical areas with vegetation potentially at risk due to elevated ground-level ozone concentrations. The AOT40 index is the accumulated hourly exposure during daytime hours above cut-off concentration of 40 ppb, during the growing season.

Passive samplers are used for measuring ground-level ozone in high spatial resolution. Passive samplers are easy to use. However this metod provides time intergrated values of pollutant concentrations (1–2 weeks). It is not possible to estimate AOT40 index by using just data of mean ozone concentrations over the sampling period.

Three methods were used to estimate the exposure index AOT40F for forests by mean ozone concentrations measured in the Jizerské Hory Protected Landscape Area during the growing season 2006. The Czech Hydrometeorological Institute provided data of mean fortnightly ozone concentrations measured by 13 passive samplers and hourly concentrations by co-located continuous measurement.

The lowest error of the predicted value, between predicted and measured index AOT40F, was 1,8 % for the method B – polynomial curve-fit for the relation between 14-day AOT40 and 14-day 24-h mean ozone concentration. The highest error of the predicted value 57 % was obtained for a simple method A – setting fortnightly ozone concentrations to a target period $12 \mu\text{g}\cdot\text{m}^{-3}$. It is possible to apply this method to locations where no hourly records are available. The error of the predicted value of the last method C ,Weibull probability model that simulates hourly ozone concentrations for passive samplers, was 42 %. The method B, polynomial curve-fit, had the closest estimation of the index AOT40F. This method is supposed to be the best of used methods in this study for estimation of the index AOT40F.

The critical level of ozone AOT40F for forests $10\,000 \mu\text{g}\cdot\text{m}^{-3}\cdot\text{h}^{-1}$ was exceeded on all locations of passive samplers Jizerské Hory PLA during the growing season 2006.