

## ABSTRACT

Regarding the vegetation, the most affected areas by high levels of surface ozone ( $O_3$ ) are the mountain ridges. Our study has been carried out in the Jizerske hory Mts. High  $O_3$  levels together with the convenient environmental conditions for stomatal conductance could be a threat for the health of recovering ecosystems in this area. The aims of this study was both to assess the influence of  $O_3$  on vegetation in the Czech mountains and to provide recommendations and outlooks for possible future using of relatively new methods (visible symptoms and stomatal  $O_3$  flux modelling) used for  $O_3$  impact assessment on native vegetation in the field; that means physiologically relevant methods for the determination of  $O_3$  influence.

During 2006 and 2007,  $O_3$ -like visible symptoms were assessed on the leaves of seven species at four sites. Symptoms on only two species (*Fagus sylvatica* L. and *Rubus idaeus* L.) have been determined as  $O_3$ -induced. To our knowledge, it is the first study in the Czech Republic in which the  $O_3$ -like symptoms on native plants have been verified by the Ozone Validation Centre for Central Europe.

Our results based on  $O_3$ -induced symptoms indicate that ambient  $O_3$  is likely to have a much lower impact than expected, considering the measured  $O_3$  concentrations (measured with passive samplers) and favourable environmental conditions for  $O_3$  uptake. Conclusions based on visible foliar injury assessment in the Jizerske hory Mts. are not clear. Nevertheless, the small amount of visible injury does not have to mean that vegetation is not influenced. A few reasons for the small amount of visible injury have been determined. Visible symptoms, as the first information including biological significance from the area where no similar assessment has been carried out, are helpful for further research and assessment.

After assessment of results from 2006 and 2007 seasons, the study has been focused on *Fagus sylvatica* L. as a symptomatic and an important tree species for mountainous forests and on stomatal  $O_3$  flux modelling. The study concerning  $O_3$  flux was carried out at six sites. At all these sites in altitude between 460 and 962 m.a.s.l. during the period from June to September in 2008,  $O_3$  concentrations and environmental parameters necessary for the accumulated stomatal  $O_3$  flux ( $AF_{st}$ ) into *Fagus sylvatica* leaves and AOT40 index calculation. At five out of these six sites, visible injury on *Fagus sylvatica* juvenile trees leaves has been observed. Combination of  $O_3$  levels and environmental conditions, though relative air humidity and air temperature significantly limited stomatal conductance, has been sufficient to cause  $O_3$  uptake exceeding critical level (CL) for forest ecosystems.

The  $AF_{st}Y$  value (the accumulated stomatal flux of  $O_3$  above a flux threshold of  $Y = 1.6 \text{ nmol. m}^{-2} \cdot \text{s}^{-1}$ ) ranged between 5.8 and 14.8  $\text{mmol.m}^{-2}$  PLA. The CL of stomatal  $O_3$  uptake ( $4 \text{ mmol. m}^{-2}$ ) was exceeded at all sites from cca 45% to 270% (160% on average). The conclusions based on AOT40 and  $AF_{st}$  are not the same. The CL for AOT40 (5 ppm.h) exceeded at four out of all sites (94% on average). The dependence of the visible injury amount on  $O_3$  indices was significant.  $AF_{st}$  has been determined as better predictor of visible injury than AOT40. Nevertheless, to make the generalized conclusion concerning values of  $O_3$  uptake related to visible injury onset is impossible since there are many factors influencing this values.