

## Effect of surface ozone on mountain forests in the High Tatra Mts., Slovakia

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### Abstract:

This work deals with the analysis of potential impact of ozone pollution on coniferous forests in the High Tatra Mts., Slovakia. Study area covers forest zone from foothill (810 m a.s.l.) to just above timberline (1,778 m a.s.l.). The Norway spruce (*Picea abies* L. Karst) is the dominant native forest tree species in this area followed by the others wide-spread species as: European larch (*Larix decidua* Mill.), Scots pine (*Pinus sylvestris* L.) and Mountain pine (*Pinus mugo*). After huge windstorm in the November 2004 almost all mature spruce stands in the vicinity of the study site were destroyed. The subsequent young stands mostly consist of spruce and the accompanying pioneer species, mainly Silver birch (*Betula pendula* Roth) and Goat willow (*Salix caprea* L.).

Phytotoxic effect of surface ozone on forest vegetation was tested at five research sites using the approach of stomatal ozone flux-based critical level. At these sites the continuous measurements of ozone concentration and relevant meteorological variables as the important inputs to multiplicative deposition model DO<sub>3</sub>SE were carried. DO<sub>3</sub>SE model (Stockholm Environmental Institute) was developed to estimate the risk of O<sub>3</sub> damage to European vegetation and is capable of providing flux-modelling estimates according to UNECE LRTAP methodologies. Model calculates the accumulated stomatal flux of ozone above a flux threshold of 1 nmol m<sup>-2</sup> PLA s<sup>-1</sup> expressed as Phytotoxic Ozone Dose (POD1). Results of POD1 show exceedance of critical level approximately in half of growing season for both 2014 and 2015. At the end of growing season the final POD1 values reached almost twice the critical level. Overflow values of POD1 indicate a high potential risk of ozone in the mountain environment of the High Tatra Mts.

To clarify the effects of ozone on leaf CO<sub>2</sub> uptake, we investigated the relationships between ozone uptake in interaction with environmental factors and photosynthetic parameters of mountain pine (*Pinus mugo*) at the research plot Skalnaté Pleso (1,778 m a.s.l.). The initial measurements of stomatal conductance and photosynthesis using LI-6400XT equipment were conducted during three days in August 2015, one day in September 2015 and two days in October 2015. The preliminary results suggest that the high values of air temperature and vapor pressure deficit markedly reduce the photosynthetic activity and stomatal conductance of mountain pine.

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