## Does the surface ozone affect the radial increment of Scots pine (*Pinus sylvestris* L.) on territories under regional pollution load? Step III of Lithuanian studies

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The relationships between atmospheric pollutants and tree growth have been extensively documented, however, strong evidence is rare and causal relationships are difficult to detect despite sophisticated approaches. First of all, biomass of leaves/needles (crown defoliation) results in increment changes. Tree parameters and age have an additional effect, with their increase the increment decreases. Therefore, the presented study aimed to explain the relationship between air pollution ( $O_3$  and acidifying compounds) and the residual of stem squares increment of dominant pine trees when the impact of tree dendrometric parameters (age, diameter) and crown defoliation are accounted. Impact of the later was accounted due to the elimination of the direct impact of pollutants on tree crown in order to avoid double effect of pollution on trees.

Radial increment of 200 trees from 12 pine stands, where crown defoliation has been assessed since 1994 were used to achieve the objectives. Stands are located on territories of 3 Integrated Monitoring Stations where environmental pollution and climatic conditions have been monitored since 1994. Active sampler methodology was used for air pollution monitoring. Pollution variables used in the analysis included average and maximum concentrations of O<sub>3</sub>, averaged values of NO<sub>3</sub><sup>-</sup>, NH<sub>4</sub><sup>+</sup>, SO<sub>4</sub><sup>2-</sup>,SO<sub>2</sub> in the air, and NO<sub>3</sub><sup>-</sup>, NH<sub>4</sub><sup>+</sup>, SO<sub>4</sub><sup>2-</sup> in precipitation, and their deposition within the region. Meteorological parameters included mean temperature and amount of precipitation of the aggregated months of the seasons.

Results of our earlier study indicated that the key factor contributing to changes in pine defoliation is SO<sub>2</sub>. O<sub>3</sub> only reinforces this effect. Crown defoliation, tree diameter and age accounted for 80% of the variation in increment. When the effect of these parameters was accounted, correlation analysis between residual of increment and pollution variable as well as meteorological variables revealed the highest significance of the ozone effect (p<0.001). Other parameters of pollution had no significance to residual changes. Significance of meteorological parameters especially precipitation was lower than that of O<sub>3</sub> and made about p<0.01. Integrated impact of O<sub>3</sub> and amount of precipitation over the winter season increased determination coefficient by 7% up to 86% what confirmed that ambient ozone, concentration of which did not exceed the level of toxicity reinforced negative water stress and reduced growth in larger trees affecting metabolic processes.

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