Changes in spatial patterns of ozone exposures and nitrogen deposition in Czech forests over 2000–2015

Iva Hunova, Pavel Kurfurst, and Lea Balakova

Czech Hydrometeorological Institute, Ambient Air Quality Department, Prague, Czech Republic (hunova@chmi.cz)

With respect to ambient air pollution, the ambient ozone (O_3) and atmospheric deposition of nitrogen (N) remain to be the major threads for European forests (EEA, 2016). The aim of our study was to indicate hostspots, where combined effects of elevated O_3 and N deposition are to be expected, and where the Czech forests are endangered due to excessive O_3 exposures and N deposition. We examined the time period between 2000 and 2015.

We used the long-term series monitored within the Czech ambient air quality monitoring network: (1) ambient O_3 measured continuously with 1-hour resolution, (2) total nitrogen deposition (sum of wet and dry deposition), and (3) precipitation amounts. The input data were retrieved from the nation-wide ambient air pollution database ISKO (CHMI, 2017). We created maps using the observed-data driven geostatistical model in 1 x 1 km spatial resolution.

Our results indicated that forests at risk due to high O_3 exposures are situated in southern portions of Czechia, whereas forests at risk due to excessive N deposition are situated in northern parts, with only a minor overlap. Out of the total forested area of 28,782 km2, only 1322 km2, i.e. 4.6% of all forests are overlapping areas with a risk due both to high O_3 exposure and N deposition (Hůnová et al., 2019). That these two important stress factors for forests are spatially disjunct in Czech forests means that, the areas under high O_3 loads receive low N deposition and vice versa. It is apparently good news with respect to the potential impact on forest health. This indication has to be verified, however, in a check of forest health status based on field forestry monitoring. In future research, it would be of interest to examine to what extent the indicated areas at risk are associated with the real negative impacts on Czech forests.

References:
CHMI, 2017. Air Pollution in the Czech Republic in 2016. Czech/English. CHMI, Prague.
EEA, 2016. Air quality in Europe – 2016 report. European Environment Agency, Luxembourg.
Hůnová I., Kurfurst P., Baláková L., 2019. Areas under high ozone and nitrogen loads are spatially disjunct in Czech forests. Science of the Total Environment 656, 567–575.