2.015 Detecting short-term ozone deposition impacts on ecosystems in remote sensing observations.

Presenting Author:
Laurens Ganzeveld, Wageningen University, laurens.ganzeveld@wur.nl

Co-Authors:
Cornelis Valk, Wageningen University
Jan Verbesselt, Wageningen University

Abstract:

Assessments of ozone deposition impacts on vegetation functioning is generally limited to small-scale laboratory and field experiments and some large-scale modelling studies. In this explorative study we demonstrate the potential to apply MODIS Gross Primary Production (GPP) data to assess short-term (~weeks) ecosystem scale ozone deposition impacts on vegetation functioning. Seven sites in France, Belgium, Spain and Italy were selected near measurement stations that monitor ambient ozone concentration. Multiple linear regression models were fitted to MODIS 8-day GPP data using temperature, soil moisture, evapotranspiration, land cover classes and the ozone exposure index, AOT40. The inputs were retrieved from various sources, mostly raster data with continental or global coverage of varying spatial and temporal resolution. Three land cover classes were distinguished: needle-leaved evergreen forest, broad-leaved deciduous forest and rain-fed agriculture. Thresholds beyond which short-term ozone impacts were found were set empirically for land cover classes at an 8-day AOT40 of ~250 ppb x h. A significantly negative impact of short-term ozone exposure was found beyond these thresholds resulting in an ~~5% decrease in GPP decrease for an 8-day AOT40 increase of 0.1 ppm x h. Differences in sensitivity between land cover classes could not be shown due to limited amount of – as well of uncertainty in – input data, the simplicity of the used regression models and the large differences in response to ozone exposure between individual species and plants. However, despite these limitations, this study demonstrates the potential of integrating remote sensing and air quality and micrometeorological observations and model data to quantify ecosystem-scale ozone impacts on vegetation functioning.