MOTTLES

LIFE15 ENV/IT/000183

A new method to monitor and define limits of ozone pollution to protect European forests

THE PROBLEM

At present, ozone (O_3) is the greenhouse gas and air pollutant which is most dangerous for forests. The traditional O_3 monitoring system produces limits based on the O_3 concentration in the air (AOT40 index). **This is not accurate enough to avoid damage to forests.**

The right threshold to protect forests should be based on what is actually uptaken by plants (stomatal O_3 flux).

Must be calculated on the basis of hourly values of environmental variables (e.g. O_3 concentrations, soil moisture, solar radiation, relative humidity, wind, air temperature)

STOMATAL FLUXES

Require an ACTIVE monitoring approach (real-time sensors with 1-h resolution) rather than a PASSIVE approach (long-term sensors with 2-3 week resolution).

MOTTLES NUMBERS

To defining and testing a new monitoring method:

- **10.625** Leaves/needles analysed for visible injuries every year
- **4** Biogeographical areas
- **340** Trees evaluated for crown defoliation every year
- **11** Target species
- **9** Forest types
- **77** Trees monitored continuously for radial growth
- **1** Controlled area for testing and checking (3D O_3 FACE)
- **5.304** Measures recorded in every single day

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THE SOLUTIONS

Given that different tree species and environmental conditions have different sensitivity to ozone, the solution is to define the right species-specific PODY, i.e. a Phytotoxic Ozone Dose absorbed into the tree leaves, and accumulated over a species-specific detoxification "Y" threshold.

The LIFE project MOTTLES allows to:

Produce maps of critical level exceedances for European forests

Elaborate 2.2 million data per year to estimate the stomatal O_3 fluxes for 11 tree species (broadleaf and conifer species) in 17 different forest sites

Link O_3 level to **3 forest responses:**

- visible foliar O_3 injury
- tree radial growth
- crown defoliation

Set up a new generation monitoring system of O_3 effects on European forests (based on real-time active O_3 sensors) with less environmental impact than the traditional system (based on passive O_3 sensors)

Definition of 7 new critical levels, i.e. the levels of pollution not to be exceeded for the protection of forests

THE RESULTS

1

A new on-line atlas of typical foliar ozone injuries in different forest species

2

Improved modelling approaches

3

New criteria and thresholds for **legislative standards** to protect forests from O_3

4

Solid support for EU air quality decision making

5

Contribution of LIFE MOTTLES sites to the NEC implementation (**National Emission Ceiling** - EU Directive 2016/2284)

6

Definition of the best forest response to O_3: visible **foliar O_3 injury**