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# **CONVENTION ON LONG-RANGE TRANSBOUNDARY**

# **AIR POLLUTION (LRTAP)**

**WORKING GROUP ON EFFECTS (WGE)**

**INTERNATIONAL COOPERATIVE PROGRAMME ON**

**EFFECTS OF AIR POLLUTION ON NATURAL VEGETATION AND CROPS**

**(ICP VEGETATION)**

## Minutes of the 38th Task Force Meeting

The 38th meeting of the Programme Task Force was held 10-13 February 2025, in Tirana, Albania, and hosted by the Faculty of Natural Sciences, University of Tirana, Albania.

1. The meeting was attended by 62 participants from countries within the UNECE region, representatives from countries within the EECCA region, and from outreach countries outside of the UNECE region.
2. The meeting was opened by Ms. Felicity Hayes (UK), Chair of ICP Vegetation, and Ms. Pranvera Lazo (Albania), local host, welcoming the opportunity to meet in-person.
3. A welcome address was given by Ms. Ana Kapaj (Albanian Ministry of Education and Sports), Ms. Anila Paparisto (Vice Rector, University of Tirana) and Ms. Eglantina Kalluci (Dean of the Faculty of Natural Sciences, University of Tirana).
4. Ms. Pranvera Lazo (Albania) gave an overview of the scientific contributions from the University of Tirana to the ICP Vegetation Program, highlighting many completed and ongoing studies relating to quantification of metal deposition to mosses in urban and rural regions across the territory of Albania. These have shown the importance of local emission sources of mineral particle dust in the atmospheric deposition of elements accumulated in the moss samples. Additional studies showed that the concentration of elements in soil had negligible correlation with the concentrations in moss samples.
5. Ms. Felicity Hayes (UK), Chair of ICP Vegetation, gave an overview of the activities and achievements of the ICP Vegetation in 2024 and reported on progress with items included in the workplan of the LRTAP Convention. Important activities and deliverables included:
* Contributions to the review of the Gothenburg Protocol, which will continue to be important work for the ICP Vegetation over the coming few years. To complement the Gothenburg Protocol work, ICP Vegetation has completed ex-post analysis of some scenario data from IIASA and MSC-W which has shown the importance of methane as an ozone-precursor and the potential benefit to addressing methane for wheat production within the region.
* An assessment of the risk of reduction in annual growth of living biomass due to ambient ozone for deciduous trees in Europe, indicating a potential increase in carbon sequestration if ambient ozone concentrations are reduced. Similar work investigating the impact of ozone on tropical forests has shown that NPP was reduced by ambient ozone, and that secondary forest and areas of potential forest restoration in tropical forests are at greater risk of ozone impacts than existing intact forests, which is likely due to their location generally being nearer regions of land-use change and/or urbanization.
* Progress with the review of critical levels for NOx, which has revealed that there is evidence of impacts on sensitive ecosystem components below the current critical levels from recent studies. However, there has been a changing pollution landscape since the earlier studies, that are particularly pertinent for impacts of NOx due to interactive responses with other pollutants such as SO2.
* Progress with analysis of data from the current (2020-2022) moss survey, for content of selected metals, N and POPs, including the draft report. Many (but not all) of the measured heavy metals have shown a decline in concentration within the moss tissue since 1990. In some cases, such as lead, this has mirrored the decline in emissions within the EU27 countries, however, in many cases the decline in concentration in moss tissue has been more modest (e.g. chromium and nickel). For arsenic and mercury there has been very little change since these were first measured in 1995.
* The pilot study on mosses as biomonitors of microplastics as an indication of atmospheric deposition (MADAME). Analysis of samples is almost complete, with a wide range of microplastics found in samples from across the region. Additional presentation on microplastics, including results of the MADAME project, were given later in the meeting.
* Update of the ICP Vegetation website (<https://icpvegetation.ceh.ac.uk>).
1. Ms. Felicity Hayes gave an overview of the relevant policy framework for the ICP Vegetation, based on contributions from Ms. Anna Kaplina (UNECE). This included additional recommendations relating to investigations on nature restoration and air pollution, information on the E-learning course on the Convention and its Protocols, Ex-Post to be done by the ICP Vegetation for the revision of the Gothenburg Protocol, and the establishment of the new MSC-East in Slovenia. Ms. Hayes also presented some information received from Mr. Kai Schwärzel and Mr. Marco Ferretti (ICP Forests) and Ms. Alice James (ICP Modelling and Mapping). Information from ICP Forests highlighted the recent report on forest condition in Europe, and the impact of tropospheric ozone on broadleaved forest vegetation. Updates from the CCE included an update of contributions to the EMEP status report 2024 and policy relevant datasets on acidification, eutrophication and empirical Critical Loads for nitrogen.
2. Ms. Marina Frontasyeva (Russian Federation) gave an update on collaborations with ESCAP, and provided information on how the moss survey will be used to evaluate deposition of metals to mosses in countries of the ESCAP region. Some potential participants from the ESCAP region have already been identified, and the ESCAP survey will use the same Protocol for monitoring and analysis as the ICP Vegetation survey.
3. Mr. Oleg Travnikov (MSC-East, Slovenia) provided some perspectives on how the results from the moss survey could be used to inform and evaluate the deposition model, including complex analysis of heavy metal pollution. Preliminary information, based on draft results from the 2020 moss survey, showed the link to some emissions trends. Some sources of atmospheric metals may be outside of the UNECE area, but additional characterization and quantification of emissions from areas outside the EU27 countries, including the EECCA region, could be possible.
4. Ms. Marta Segura Roux (Sweden) showed how metal concentration in moss from the moss survey compared to deposition of metals measured at EMEP background stations in Sweden. Analysis of metals in moss for Sweden since 1975 showed decreasing levels of metals in all regional areas of Sweden. For arsenic, chromium, copper and lead the reductions of levels in moss have been in good agreements with the emissions reductions, whereas for cadmium, mercury and zinc the concentrations in moss decreased less compared to the emissions reductions. Within Sweden there are a small number of EMEP stations monitoring heavy metals in precipitation, which show similar trends but at a much lower spatial resolution.
5. Mr. Stefan Wallek (Germany) provided some insights into how gaps in time series data could be filled using machine learning. This technique is particularly applicable when there is a requirement to interpolate values in instances when the profile of missing data is not linear, such as hourly meteorological and ozone data that has a pronounced diurnal profile. Mr. Wallek showed that machine learning methods could be deployed in such situations in an accessible and cost-effective solution, with examples from 89 monitoring stations and a time period of 2009 to 2021 showing a good prediction of modelled vs measured data.
6. Ms. Mehriban Jafarova (Italy; Canada) presented the latest results from the MADAME (Microplastic atmospheric deposition assessment using moss in Europe) project. This analysis had a particular focus on plastic fibres within the moss samples, and Ms. Jafarova showed that these fibres were present in samples collected from across the UNECE region. These fibres were clearly identifiable in the processed samples, were of varying size, and were from a variety of different sources.
7. The importance of relating information on concentration of metals and microplastics in moss and lichens to either the weight or the surface area of the respective biomonitor was highlighted by Mr. Stefano Loppi (Italy), who presented analysis from moss and lichen samples where estimates of deposition were calculated using both methods. In addition, Mr. Loppi demonstrated the importance of different definitions of blanks and LOD values and how these could influence interpretation of the results found from analysis. These considerations are important for all aspects of biomonitoring using moss and lichens, but particularly when using active biomonitoring by transplantation.
8. The potential use of active biomonitoring for microplastics was presented by Mr. Julian Aherne (Canada). Mr. Aherne presented data to show that the size and shape of moss bags for active transport was influential for accurate determination of microplastic contamination, however, the mesh size of the bag was less important. Mr. Aherne proposed an activity for the ICP Vegetation based on active biomonitoring with moss bags, which was adopted by the ICP Vegetation later in the meeting.
9. Ms. Lisa Grifoni (Italy) showed that for a comparative study on the use of moss and lichen transplants to monitor airborne microplastics, the ability to accumulate microfibres was similar across a range of urban exposure sites in Italy. There was a strong correlation between the data from moss and lichens and for lichens there was a notable difference when analysis was based on surface area rather than by mass.
10. Ms. Sonila Kane Shehu (Albania) presented results from an active moss biomonitoring campaign in Tirana, Albania using transplants of *Hypnum cupressiforme* in moss bags in summer and winter seasons. The elements antimony, chromium, copper, iron, nickel, vanadium and zinc showed high relative accumulation factors, indicating local emission sources. Some differences between summer and winter were found, due to the influence of Saharan dust storms.
11. Three sessions considered the ozone and moss survey sub-programmes. The topics of the oral presentations are provided in Annex III. For further details of the content of the oral presentations we refer to the book of abstracts and copies of the presentations available on the ICP Vegetation web site (http://icpvegetation.ceh.ac.uk). In addition, posters were presented during the meeting, covering similar topics as the oral presentations.

The ozone sessions covered topics including:

* Progress with additional chapters to Scientific Background Document B.
* New studies on ozone impacts on crops and trees
* New studies on plant-insect interactions under elevated ozone conditions.
* Results from global modelling of ozone impacts on crops.
* Risk assessments for air pollution effects monitoring under the NECD framework.
* Use of process-based and empirical models to perform stomatal conductance-based risk assessments.
* Potential use of hyperspectral leaf reflectance to identify ozone damage.
* Potential use of wood distillate as an ozone protectant.

The moss sessions covered topics including:

* Results from national studies for biomonitoring of metals and other potentially toxic elements including radionuclides and PFAS
* Source attribution of atmospheric metals and PAHs
* New considerations and techniques relating to biomonitoring with mosses, such as active vs passive monitoring, comparisons on the suitability of different moss species, tracking environmental changes, use of chitin and lichens for metal and N biomonitoring, and potential use of x-ray fluorescence in biomonitoring.
* Potential cooperative work with the MSC-East Centre in Slovenia, who have a shared interest in deposition of metals and POPs.
1. At the end of the ozone and moss survey specific sessions, conclusions and recommendations were presented, discussed and adopted by the Task Force as described in Annex I. In particular,
* Encouraging participants to contribute to biomonitoring of ozone impacts using wood distillate as an ozone protectant, using a newly established biomonitoring protocol
* Preparation of a position paper on assessing the impacts of ambient ozone on vegetation.
* Welcoming the new initiative on biomonitoring microplastics using moss bags (MADAME3)
* Recommending outreach activities for the moss survey
1. The medium-term workplan was reviewed and agreed and adopted by the Task Force (see Annex II). Ms. Hayes (UK) drew attention to various workshops and conferences in 2025.
2. On behalf of the Task Force, Ms. Hayes (UK) closed the meeting by thanking Ms. Pranvera Lazo and colleagues at the University of Tirana for hosting the meeting. Ms. Hayes thanked colleagues at the PCC. Ms. Hayes acknowledged the UK Department for Environment, Food and Rural Affairs (Defra) and the United Nations Economic Commission for Europe (UNECE) for their continuous financial support of the ICP Vegetation Coordination Centre. Ms. Hayes thanked the participants of the ICP Vegetation for their valuable contributions to the programme.

**Annex I. Decisions and recommendations by the Task Force of the ICP Vegetation at its 38th meeting, 10-13 February 2025, Tirana, Albania. Workplan items are included in Annex II.**

**OZONE RELATED ACTIVITIES:**

* The TF took note of progress with the development of new chapters for Scientific Background Document B (SBD-B), associated with Chapter 3 of the Modelling and Mapping Manual of the LRTAP Convention. The table below provides an overview of the topics proposed for inclusion, who is taking the lead and who is going to contribute (subject to available funding).

|  |  |  |
| --- | --- | --- |
| **Topic** | **Lead** | **Contributions** |
| *Biomonitoring ozone impacts by using wood distillate as an ozone-protectant* | Andrea Vannini | Participants willing to test effectiveness under different climate and ozone levels using exposure facilities. Including Ignacio González-Fernández (Spain), Victoria Bermejo-Bermejo (Spain), Felicity Hayes (UK) |
| *Guidelines for assessing ozone-induced foliar damage and yield loss of horticultural crops* | Ignacio González Fernández and Victoria Bermejo (Spain) | Vicent Calatayud (Spain), Giacomo Gerosa and Riccardo Marzuoli (Italy) |
| *Impacts of ozone on pasture quality* | Felicity Hayes (Coordination Centre, UK), Ignacio González Fernández (Spain) |  |
| *Ozone flux-effect relationships and methodology for net annual increment (NAI) of trees* | Lisa Emberson (UK) | Sabine Braun (Switzerland), Per Erik Karlsson (Sweden) |
| *Ozone removal by vegetation in urban areas* | Lina Fusaro and Fausto Manes (Italy) | Rocio Alonso (Spain), Pierre Sicard (France), Giacomo Gerosa (Italy) |
| *Ozone-induced injury guidance for educational and awareness raising purposes* | Klaudia Borowiak (Poland) | Felicity Hayes (UK), Felix Leung (Hong Kong, China), Vicent Calatayud and Victoria Bermejo (Spain), Pierre Vollenweider (Switzerland) |
| *Critical levels for ozone-sensitive clones of poplar* | Yasutomo Hoshika (Italy) | Vicent Calatayud (Spain), Riccardo Marzuoli (Italy), Pierre Sicard (France) |
| *Ozone impacts on insects* | Valda Araminiene (Lithuania) | Coordination Centre (UK) |
| *Improved phenology for ozone flux modelling in trees* | Sabine Braun (Switzerland) | Per Erik Karlsson (Sweden) |
| *Interactive impacts of ozone and nitrogen on (semi-)natural vegetation* | Felicity Hayes (Coordination Centre, UK), Ignacio González Fernández (Spain) |  |
| *Harmonization of the ozone damage indicators in the framework of the NEC Directive* | Ignacio. González-Fernández (CIEMAT, Spain), Yasutomo Hoshika (CNR, Italy) | Stefan Wallek (Germany) |
| *Validation of soil moisture index for natural vegetation and rain fed crops* |  | Ignacio González Fernández, Yasutomo Hoshika (Italy) |
| *Opportunities for using external data in data poor situations, including suitability for use in OTC experiments* |  | Pierluigi Guaita (Italy) |
| *Opportunities for exploring and using data from ozone flux towers* | Giacomo Gerosa (Italy) | Pierluigi Guaita (Italy) |
| *Investigating and representing uncertainty relating to flux-effect modelling* |  | Felicity Hayes (Coordination Centre, UK), Katrina Sharps (Coordination Centre, UK), Pierluigi Guaita (Italy) |

* The TF took note of the ongoing collaboration between ICP Vegetation and EMEP Task Forces and Centres and encouraged to continue such collaboration as described in further detail of the workplan of the ICP Vegetation (Annex II).
* The TF took note of a chapter update of the Scientific Background Document B, associated with Chapter 3 of the Modelling and Mapping Manual of the LRTAP Convention, on “Handling of soil moisture effect on ozone flux for large-scale modelling using the soil moisture index”. The updated chapter includes new species-specific fSMI parametrizations for flux-based ozone risk assessment in water-limited areas. This update is the result of the activity on validation of soil moisture index used in EMEP model coordinated by CIEMAT (Spain), with contributions from CEAM (Spain), Unicatt (Brescia, Italy) and EMEP MSC-West.
* The TF took note of the need to incorporate a greater number of participants and research groups also by expanding the TF topics, for example to include N effects on vegetation and interactions of ozone or nitrogen impacts with climate change and/or crop management, to encourage scientific exchange of relevant information. It was suggested that this could be encouraged by online meetings with other ICPs, side meetings involving international research forums on air pollution, and bringing together ICP-Vegetation participants for joint participation in European level research projects.
* The TF took note of the outreach activities of the ICP Vegetation and encouraged to continue such activities, especially in developing regions. The TF encouraged further collaboration with international scientific networks at the global scale.
* The TF agreed to the continued inclusion in the future meetings of a session focused on nitrogen impacts on vegetation and its interactions with other pollutants and climate change, to discuss methodologies and exchange results.
* The TF took note that the progress in the application of flux-based ozone critical levels and other ozone damage indicators in the framework of the European directive on national emission reductions, as well as other national-level initiatives, are considered as relevant policy initiatives for the ICP-Vegetation. The TF recommended that these initiatives are discussed in future Task Force meetings, with the aim to facilitate the harmonization of methodologies between CLRTAP and the EU and other regions in terms of monitoring and risk assessment of ozone impacts in vegetation.

**MOSS SURVEY RELATED ACTIVITIES:**

* The TF recommended that important information and new developments of relevance to the moss survey should be documented into a scientific background document that can be updated with new chapters as required – similar to SBD-B of the ozone group. The table below provides an overview of the topics proposed for inclusion, who is taking the lead and who is going to contribute (subject to available funding).

|  |  |  |
| --- | --- | --- |
| **Topic** | **Lead** | **Contributions** |
| *Canopy Drip Effect on Element Concentrations in Mosses* | *Winfried Schroder* | *Sebastien Leblond* |
| *The use of mosses as bioindicators of PAH and other organic pollutants (e.g. are mosses suitable as bioindicators for all PAH, or only some?)* |  *Zaida Ehrenmann* |  |
| *impact of deposition on plant/moss growth and physiology (with a focus on air deposition rather than soil contamination).*  | *Sebastien Leblond* |  |
| *ecosystem links and impacts, e.g. N influencing uptake of metals?* | *Stefan Franzle* |  |
| *Nitrogen influence on metal uptake* |  |  |
| *How to robustly use moss monitoring for monitoring ‘at the edges and beyond the core region’*  |  |  |
| *Review metals and pollutants of focus* |  |  |

* The TF reiterated the importance to participants of the 2025-26 moss survey to:

- Sample mosses in agreement with the monitoring manual and recommended sampling in areas with a defined humus layer (where possible);

- Conduct quality checks of data before submitting the final data, including data on moss reference material;

- Remember that the focus of the LRTAP Convention is at rural sites, rather than at local point sources, although noting that local issues may be of importance to ancillary studies using mosses.

* The TF reiterated that quality checks of submitted data are the responsibility of the data provider. Subsequently, the Moss Survey Coordination Centre is tasked to check data for outliers, discuss any country border effects with respective data providers and agree with the data providers on the final data to be included.
* The TF took note of the importance of avoiding collection of moss where there would be ‘canopy drip’ from trees and shrubs. In addition the TF took note that often managed grassland can be unsuitable for sampling mosses due to sparse occurrence of moss and that shoots may be less than three years old.
* The TF recommended the formation of a sub-group to review and update the Protocol for the Moss Survey, including consideration of the metals and pollutants of focus for the 2025/6 survey, bearing in mind potential emerging pollutants. The TF noted the following recommendations:
* Heavy metals accumulation in mosses should continue to be measured, even though they have been decreasing since 1990. The decreases are not continuous for all elements, it is important to report stagnations and renewed increase, and even low accumulation can cause critical concentrations in ecosystems to be reached or exceeded.
* Nitrogen must also continue to be measured, because in many countries, nitrogen emission and related accumulation in mosses has been monitored at unchanged high levels since 2005, exceeding critical effect thresholds.
* POP measurements started since 2010 should be continued and could be part of the standard measurement program.
* Microplastics should be measured where possible, to build the evidence base for the occurrence of airborne microplastic deposition, and to allow validation of models when such models are developed.

**Annex II. Medium-term workplan (2026 – 2027) of the ICP Vegetation**

Workplan items in*italics* are not specifically included in the biannual workplan of the LRTAP Convention for 2026 and 2027 but remain important ongoing activities.

* Call for data for the moss survey 2025-2026 on heavy metals, nitrogen, POPs and microplastics.
* Investigation of potential for active biomonitoring of microplastics in moss using moss bags
* Additional work investigating importance of methane as an ozone precursor, using scenario data from EMEP-MSC-W
* Position paper on assessing impacts of ambient ozone on vegetation.
* Work relating to the LOW methane scenario from EMEP-MSC-W (details to be confirmed), and other work as required relating to the review / revision of the Gothenburg Protocol, including ozone impacts on biodiversity, including effects on different ecosystem components and ecosystem processes important for biodiversity conservation such as pollination.
* Investigation of ambient ozone impacts on biomonitor species using wood-distillate as an ozone-protectant
* Use of metals in moss data to inform models of deposition, and comparison of trends in emissions with trends in moss data (Collaboration with MSC-E)

**Selected ongoing annual activities:**

* *Review and update Scientific Background Document B for Chapter 3 of Modelling and Mapping Manual of LRTAP Convention*
* *Further development and applications of ozone modified photosynthesis-based flux-response models (with EMEP/MSC-West)*
* *Outreach and networking activities in developing regions, linking with other international networks*

**Annex III. Programme of the 38th Task Force Meeting of the ICP Vegetation**

**Monday 10th February, 2025**

**19:30** Welcome dinner at 19.30 in Mondial Hotel [about 2 km from the Faculty of Natural Sciences or 1.7 km from Tirana Centre (Skanderbeg Square). It is a public bus from Tirana Centre to Mondial Hotel.]

**Tuesday 11th February, 2025**

**09:00 Registration and putting up posters**

**Session 1: 9:00 – 10:30 Plenary Chair: Flora Qarri**

09:30 Opening of meeting

09:35 Welcome address:

*Professor Dr. Anila Paparisto,* Vice Rector, University of Tirana

  *Professor Dr. Eglantina Kalluci*, Dean of the Faculty of Natural Sciences, University of Tirana.

09:45 *Pranvera Lazo* – An overview of the scientific contributions from the University of Tirana.

10:00 *Felicity Hayes* – An overview of the ICP Vegetation’s work.

**10:30 – 11:00 Coffee/tea and viewing posters**

**Session 2: 11:00 – 12:30 Plenary Chair: Nensi Lsak**

11:00 *Felicity Hayes* – Current policy developments and other activities of UNECE.

11:15 *Marina Frontasyeva* – Collaborations with ESCAP.

11:30 *Oleg Travnikov* – Perspectives from MSC-E on moss measurements for model evaluation and complex analysis of heavy metal pollution.

11:50 *Marta Segura Roux* - Metal concentration in moss in comparison to deposition measured at EMEP background stations, in Sweden.

12:10  *Stefan Wallek -* Filling gaps in data time series with machine learning.

12:25 General discussion

**12:30 – 14:00 Lunch**

**Session 3: 14:00 ‒ 15:30 (Two parallel sessions: Ozone and Moss survey)**

# **Session 3a: Ozone Chair: Giacomo Gerosa**

14:00*Lisa Emberson* – Latest developments and applications of the DO3SE model.

14:20 *Ignacio**González Fernández et al.* – Phytotoxic ozone dose risk assessment for national air pollution effects monitoring network in Spain in the framework of the EU national emission ceilings Directive.

14:40 *Andrea Vannini* - Progress in understanding the protective effect of wood distillate against ozone phytotoxicity in ozone-sensitive plants.

15:00 *Ripley Tisdale* – Ozone impacts on soybean production, agroecosystems— and a solution, a newly developed climate-smart soybean.

15:20 *General Discussion*

**Session 3b: Moss survey Chair: Julian Aherne**

14:00 *Sébastien Leblond* – lead isotopes in urban mosses help identifying sources of atmospheric metal contamination.

14:20 *Isabel Garcia Arevalo* – Integrating Moss Biomonitoring and GLEMOS Modelling to Investigate the Spatial Distribution and Source Attribution of Polycyclic Aromatic Hydrocarbons (PAHs) in Europe.

14:40 *Zaida Ehrenmann* – Moss monitoring in Switzerland. Pilot analyses on PFAS.

15:00 *Aničić Urošević M.* – Should different moss species be included in a single survey?

15:20 *General Discussion*

**15:30 – 16:00 Coffee and view posters**

**Session 4: 16:00 – 17:00 (Two parallel sessions: Ozone and Moss survey)**

**Session 4a: Ozone Chair: Anna Jones**

16:00 *Yasutomo Hoshika* – FO3X: Challenges of ozone FACE Experiments in the Mediterranean Europe.

16:20 *Giacomo Gerosa* – Performance of process-based and empirical models in predicting stomatal conductance (and ozone dose): a preliminary comparative analysis on a mature forest stand.

16:40 *John Jones* – Ozone impacts on carbon sequestration in mangroves.

**Session 4b: Moss survey Chair**: **Sébastien Leblond**

16:00 *Stefan Fränzel -* Lichens, chitin, nitrogen effects, chitin-modified HM electrochemistry and sensor development.

16:20 *Riccardo Fedeli* – Assessing the potential of x-ray fluorescence in biomonitoring surveys .

16:40 *Konstantin Vergel* – Accumulation of elements in mosses: passive versus active biomonitoring.

**Wednesday 12th February, 2025**

**Session 5: 09:00 – 10:30 Plenary Chair Zaida Ehrenmann**

09:00 *Mehriban Jafarova* – Microplastic Atmospheric Deposition Assessment using Moss in Europe: MADAME.

09:20 *Stefano Loppi* – Biomonitoring with moss and lichen: issues for consideration.

09:40 *Julian Aherne* - In search of an optimal moss transplant biomonitor for airborne microplastics

10:00 *Lisa Grifoni* - Comparative study on the use of lichen and moss transplants as bioindicators of atmospheric microfiber deposition.

10:20 *Sonila Kane Shehu* – Active moss biomonitoring in Tirana city, Albania during summer and winter of 2023.

**10:30 – 11:00 Coffee/tea and poster viewing**

# **Session 6: 11:00 – 12:30 (Two parallel sessions: Ozone and Moss survey)**

**Session 6a: Ozone Chair: Yasutomo Hoshika**

11:00 *Katrina Sharps* – Reductions in methane emissions could reduce the ozone yield penalty for crops.

11:20 *Pierluigi Guaita* – Global flux-based analysis of changes to O3 risk for wheat during the 21st century under different climate and emission scenarios.

11.40 *Sara Campos-Saelices* - A plant-insect-atmosphere interaction case study: differential herbivory between cyanogenic and non-cyanogenic white clover under increasing ozone levels.

12.00 Ozone discussion session – workplan, cooperations and priorities.

**Session 6b: Moss survey Chair: Musaj Paçarizi**

11:00 *Jana Borovská* – The moss survey 2020-23 in Slovakia.

11:20 *Marina Frontasyeva* – Atmospheric deposition of radionuclides: assessment based on passive moss biomonitoring.

11:40 *Omari Chaligava* – Tracking environmental changes in Moscow region with mosses: from pre-pandemic to post-restriction periods.

12:00 Moss discussion session – including workplan and potential cooperations with MSC-East.

**12:30 – 14.00 Lunch**

# **Session 7: 14:00 – 15:30 (Two parallel sessions: Ozone and Moss survey)**

**Session 7a: Ozone Chair: Ignacio González-Fernández**

14:00 *Anna Jones* – Hyperspectral detection of ozone damage in broadleaf trees.

14:20 *Felicity Hayes* – Ozone impacts on crops.

14.40 Ozone discussion session – including planning for a position paper on assessing impacts of ambient ozone on vegetation.

**Session 7b: Moss survey Chair: Stefano Loppi**

14:00 *Musaj Paçarizi* – Biomonitoring of atmospheric deposition of potentially toxic elements in Kosovo in 2020.

14:20 *Inga Zinicovscaia* – Active moss biomonitoring in areas affected by ashfalls of Shiveluch volcano (Kamchatka).

14:40 *Pranvera Lazo* – Moss biomonitoring an important tool for air quality assessment – a national study in Albania.

15:00 Moss discussion session – including workplan and potential cooperations with MSC-East.

**15:30 – 16:00 Coffee and take down posters**

**Session 8: 16:00 ‒ 17:00 Final plenary session Chair: Felicity Hayes**

16:00 *Ignacio González-Fernández -* Report back of main ozone decisions / discussions.

16:10 *Caroline Meyer* - Report back of main moss decisions/discussions.

16:20 Final discussions: workplan, decisions, AOB.

17:00 ***Close of Meeting***

**LIST OF POSTERS**

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| --- | --- |
| **Author(s)** | **Title** |
| Menéndez A. | Does ozone differentially influence the performance of *Trifolium* *repens* cyanotypes? |
| Nensi Lsak | Assessment of air quality in Albania using mosses as biomonitoring indicators for trace metals and microplastics |
| Flora Qarri | Bryophyte moss – substrate soil interaction in atmospheric trace metal deposition: a national study in Albania |
| Sonila Shehu (Kane) | Active moss biomonitoring in Tirana city, Albania during summer and winter of 2023 |
| Lirim Bekteshi | Moss biomonitoring for air quality assessment around a metallurgical complex in Elbasan, Albania |
| Albert Maxhuni | Assessment of air pollution in some locations of Kosovo using mosses as a bioindicator |
| Grzegorz Kosior | Comparison of radionuclides activity in live and devitalized transplanted mosses H*ylocomium splendens* (hedw.) Schimp. From former uranium mines in lower Silesia (SW Poland) |
| Majlinda Ramadani | Chemical elements and microplastics in air of the Prishtina region using mosses as biomonitors |
| Shaniko Allajbeu | Preliminary analysis of total kjeldahl nitrogen content in moss samples from Albania during EMS 2021 and preparations for EMS 2025 |
| Aničić Urošević M | How to overcome the lack of mosses in agricultural and urban areas? Moss bag biomonitoring for the ICP Vegetation moss surveys |
| Harshita Singh | Tracing the concerted modulations in the metabolome and carbon sequestration efficacy of tropical tree species under simulated particulate matter stress |
| Dinesh Kumar Saxena | Temporal analysis of atmospheric metal precipitation using moss as a bioindicator |
| Susanna Elvira | Impact of Ozone on Phenolic Compound Concentration and Pigment Levels in the High-Mountain Species *Pilosella vahlii* |