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 30th Task Force Meeting

The 30th meeting of the Programme Task Force was held from 14 – 17 February 2017 in Poznan, Poland. The meeting was hosted by Poznan University of Life Sciences and organised together with the Institute of Biology, Polish Academy of Sciences, Krakow.

1. The meeting was attended by 88 experts from 23 countries, including Albania, Armenia, Belarus, Canada, Czech Republic, France, Georgia, Germany, Greece, Ireland, Italy, Latvia, Norway, Poland, Russian Federation, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom and USA. Participation included the Head of the Programme Centre for the ICP Forests.

2. The Programme Task Force adopted the agenda of the meeting.

3. The welcome address was given by Prof. Jan Pikul, rector of Poznan University of Life Sciences, Poland. He highlighted the importance of the meeting in providing evidence for impacts of air pollution on vegetation and the commitment of Poland, and the university in particular, to contribute to the work of the ICP Vegetation and to the abatement of air pollution under the auspice of the UNECE LRTAP Convention.

4. Mr. Harry Harmens (UK), Chair of ICP Vegetation, gave an overview of the activities and achievements of the ICP Vegetation in 2016. Important deliverables were:
   - Brochure on 'Field evidence of ozone impacts on vegetation in ambient air (2007 – 2015)';
   - Brochure on 'Impacts of ozone pollution on biodiversity' and a scientific paper on 'Current and future ozone risks to global biodiversity and ecosystem processes';
   - Contributions to the LRTAP Convention Scientific Assessment Report 2016 'Towards Cleaner Air';
   - UNECE 'Ozone Critical Levels' Workshop, 7 – 8 November, 2016, Madrid, Spain and preparatory workshop on 'Deriving ozone dose-response functions', 7 – 9 June, 2016, Deganwy, UK. At the workshop in Madrid the methodology for deriving ozone flux-based critical levels was reviewed and final analyses were agreed in preparation for the 30th ICP Vegetation Task Force meeting, where new and revised ozone critical levels for vegetation (crops, forest trees and (semi-)natural vegetation were proposed for adoption and inclusion in Chapter 3 of the Modelling and Mapping Manual of the LRTAP Convention.

   Mr. Harmens emphasised potential opportunities to stimulate participation of EU Member States in ICP Vegetation monitoring networks (ozone-induced damage to vegetation, reporting of exceedances of ozone critical levels for vegetation and nitrogen concentrations in mosses) with the implementation of the amended National Emissions Ceilings Directive

(Directive (EU) 2016/2284), in force since December 2016 (see its Article 9 and Annex V). Mr. Harmens also reported on:

- Contributions of the ICP Vegetation to the Tropospheric Ozone Assessment Report;
- A summary of the current status of data submission for the 2015/16 moss survey (see paragraph 5 for details);
- The outcome of an online survey conducted by the Programme Coordination Centre, showing that a large majority (generally more than 95%) of the users of ICP Vegetation outputs (reports, brochures, data, maps, manuals, website) find the outputs useful – very useful.

Finally, he proposed medium-term workplan items (2017 – 2020) for discussion and adoption by the Task Force during the meeting (see Annex II).

5. Ms. Marina Frontasyeva (Russian Federation), Chair Moss Survey Coordination Centre, described the history of the European moss survey (conducted every five years) and reported on the status of the 2015/16 moss survey, using naturally growing mosses to monitor atmospheric deposition of heavy metals, nitrogen and persistent organic pollutants (POPs). One third of the 36 participating countries had already submitted data. All participating countries will submit data on heavy metals by the end of May 2017, 13 will submit data on nitrogen and eight are expected to submit data on POPs. The following countries in Eastern Europe, the Caucasus and Central Asia (EECCA) are expected to submit data on heavy metals: Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Moldova, Russian Federation, Tajikistan and Ukraine.

6. Mr. Walter Seidling (Germany), Head of the Programme Coordination Centre of the ICP Forests, reported on the current activities of the ICP Forests of relevance to the ICP Vegetation, in particular:
   - Passive sampling of ozone at ICP Forests Level II sites;
   - Monitoring of ozone-induced leaf injury symptoms at sites close to Level II stands (2002 2014);
   - Co-location of ICP Forests Level II sites where moss were sampled for nitrogen and heavy metal analyses (see paragraph 5); in Slovenia, the relationship between measured nitrogen concentration in mosses and wet deposition was determined;
   - A new project on PRedicting Ozone Fluxes, Impacts, and critical Levels on European forests (PRO3FILE), with the aim to i) determine ozone fluxes, ii) assess ozone effects on selected endpoints; iii) derive and validate ozone critical levels for forests, using the Deposition of Ozone for Stomatal Exchange (DO_3SE) model.

7. Mr. Janusz Olejnik (Poland) gave an overview of long-term observations and different measurement techniques applied at field sites to determine greenhouse gasses and energy fluxes in different ecosystems. Using chamber robots, up to 400 measurements per day could be conducted. High inter-annual variations in CO_2 fluxes were measured (less so in dry years). Whereas young forests proved to be C source, mature forests are a C sink.

8. The next seven sessions consisted of two parallel sessions considering the ozone and moss survey sub-programmes. The topics of oral presentations and discussions in these parallel sessions are provided in Annex III. For further details on the content of the oral presentations we refer to the book of abstracts available on the ICP Vegetation web site (http://icpvegetation.ceh.ac.uk). In addition, over 30 posters were presented during the meeting, covering similar topics as the oral presentations. Further details of the content of the poster can be found in the book of abstracts too.

9. In the ozone sub-programme, the following themes were discussed:

    - Revision of ozone critical levels for vegetation and Chapter 3 of the Modelling and Mapping Manual of the LRTAP Convention (see Annex I);
    - Impacts of ambient ozone on sensitive vegetation;
    - Measuring and modelling ozone fluxes;
    - Extending outreach activities of the ICP Vegetation and an update of the Tropospheric Ozone Assessment Report (TOAR);

10. In the moss survey sub-programme, the following issues were discussed:

    - Submission, management and quality assurance of the 2015/16 data;
    - Schedule for processing and reporting of results of the 2015/16 survey;
    - National results of spatial patterns and temporal trends of concentrations of heavy metals, nitrogen, POPs and radionuclides in mosses;
    - Preparations for the 2020 survey, including revision of the monitoring manual and preparation of new moss reference material for quality assurance purposes.

11. In the final plenary session, a summary of the parallel sessions was provided, and conclusions and recommendations were presented, discussed and adopted by the Task Force as described in Annex I. An updated medium-term workplan (2017-20) was agreed and adopted by the Task Force (see Annex II). Mr. Harmens (UK) drew attention to various workshops and conferences in 2017. The Task Force accepted the offer from Germany to host the 31st Task Force Meeting of the ICP Vegetation in Dessau-Roßlau, scheduled for 5 – 8 March 2018. The Task Force took note of an offer from Romania to host a future Task Force meeting.

12. On behalf of the Task Force, Mr. Harmens (UK) closed the meeting by thanking Poznan University of Life Sciences, Poznan, in particular Ms. Klaudia Borowiak and all her colleagues, for hosting and co-organising the meeting, the Institute of Biology, Polish Academy of Sciences, Krakow, in particular Ms. Barbara Godzik, for co-organising the meeting, and all the funders for supporting the meeting. Mr. Harmens acknowledged the UK Department for Environment, Food and Rural Affairs (Defra), the United Nations Economic Commission for Europe (UNECE) and the Natural Environment Research Council (NERC) for their continuous financial support of the ICP Vegetation Programme Coordination Centre. Last but not least Mr. Harmens 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 as agreed at its 30th meeting, 14 – 17 February 2017, Poznan, Poland. Workplan items for 2017 -2020 are included in Annex II.

OZONE RELATED ACTIVITIES:

- The Task Force adopted the methodology for calculating flux-based ozone critical levels for vegetation and gave the editorial group the mandate to finalise the edits of Chapter 3 of the Modelling and Mapping Manual and associated scientific background documents containing (A) supplementary information and (B) new developments. See the ICP Vegetation website (http://icpvegetation.ceh.ac.uk) for further details.

- The Task Force adopted 16 species (group)-specific ozone flux-based (POD_YSPEC) critical levels (for crops (Table 1), forest trees (Table 2) and (semi-)natural vegetation (Table 3), where POD_Y = Phytotoxic Ozone Dose (POD) above of flux-threshold of Y nmol m^{-2} projected leaf area (PLA) s^{-1} and SPEC refers to use of a species-specific flux model and accumulation period. Note: As the parameterisation of the stomatal flux model and the accumulation period for calculating POD_Y is (group of) species (POD_YSPEC) and vegetation types (POD_YIAM, see below) specific, critical levels are not directly comparable with each other. For details of the stomatal flux model parameterisations and the accumulation period, see Chapter 3 of the Modelling and Mapping Manual.

- The species-specific flux models and associated response functions and critical levels are the most biologically relevant compared to concentration-based critical levels. They can be used at any geographical scale and are particularly useful for application at the local scale to quantify the degree of risk to a specific species or a group of plant species. For several species, biogeographical region-specific flux parameterisations are included.

Table 1. POD_6SPEC critical levels (CL) for crops.

Species	Effect parameter	Biogeo-graphical region*	Potential effect at CL (% reduction)	Critical level (mmol m^{-2} PLA)**	Ref10 POD_6 (mmol m^{-2} PLA)***	Potential maximum rate of reduction (%) per mmol m^{-2} PLA of POD_6SPEC****
Wheat	Grain yield	A,B,C,M (S,P)*****	5%	1.3	0.0	3.85
Wheat	1000-grain weight	A,B,C,M (S,P)*****	5%	1.5	0.0	3.35
Wheat	Protein yield	A,B,C,M (S,P)*****	5%	2.0	0.0	2.54
Potato	Tuber yield	A,B,C (M,S,P)	5%	3.8	0.0	1.34
Tomato	Fruit yield	M (A,B, C,S,P)	5%	2.0	0.0	2.53
Tomato	Fruit quality	M (A,B, C,S,P)	5%	3.8	0.0	1.30

* *A = Atlantic, B = Boreal, C = Continental, M = Mediterranean, P = Pannonian, S = Steppic; Derived for regions not in brackets, but could also be applied to regions in brackets.*

** *Represents the (POD_6SPEC – Ref10 POD_6SPEC) required for a 5% reduction;*

*** *Reference POD_Y at constant 10 ppb O_3, representing average 'pre-industrial' O_3 concentration*

**** *Calculate the % reduction using the following formula:*

*(POD_6SPEC – Ref10 POD_6SPEC) * potential maximum rate of reduction;*

***** *Calculated using different parameterisation for Mediterranean and non-Mediterranean regions.*

- **Crops (Table 1):** The species-specific flux models and associated response functions and critical levels for ozone-sensitive crops and cultivars can be used to quantify the potential negative impacts of O_3 on the security of food supplies at the local and regional scale. They can be used to estimate yield losses, including economic losses.

- **Forest trees (Table 2):** The species-group or species-specific flux models, associated response functions and critical levels were derived from experiments with young trees and can be used to quantify the potential negative impacts of O_3 on the annual growth of the living biomass of trees at the local and regional scale. They can be used as a starting point for calculation of impacts on carbon sequestration and tree diversity.

Table 2. POD_1SPEC critical levels (CL) for forest trees.

Species	**Effect parameter**	**Biogeo-graphi-cal region***	**Potential effect at CL (% annual growth reduction)**	**Critical level (mmol m^{-2} PLA)****	**Ref10 POD_1 (mmol m^{-2} PLA)*****	**Potential maximum rate of reduction (%) per mmol m^{-2} PLA of POD_1SPEC********
Beech and birch	Whole tree biomass	B,C (A,S,P)	4%	5.2	0.9	0.93
Norway spruce	Whole tree biomass	B,C (A,S,P)	2%	9.2	0.1	0.22
Med. deciduous oaks	Whole tree biomass	M	4%	14.0	1.4	0.32
Med. deciduous oaks	Root biomass	M	4%	10.3	1.4	0.45
Med. evergreen	Above-ground biomass	M	4%	47.3	3.5	0.09

* *A: Atlantic; B: Boreal; C: Continental, S: Steppic, P: Pannonian; M: Mediterranean. Derived for regions not in brackets, but could also be applied to regions in brackets.*

** *Represents the (POD_1SPEC – Ref10 POD_1SPEC) required for a x% reduction*

*** *Reference POD_Y at constant 10 ppb O_3, representing average 'pre-industrial' O_3 concentration*

**** *Calculate the % reduction using the following formula:*

*(POD_1SPEC – Ref10 POD_1SPEC) * potential maximum rate of reduction.*

- **(Semi-)natural vegetation (Table 3):** The species-group specific flux models, associated response functions and critical levels were derived from experiments with O_3-sensitive species grown in competition (Temperate perennial grasslands) or as single species and two-species mixtures (Mediterranean annual pastures). Response functions and critical levels can be used to quantify the risk of potential negative O_3 impacts on annual biomass and reproductive capacity. They can be used as a starting point for calculation of impacts on carbon sequestration and plant biodiversity.

Table 3. POD_1SPEC critical levels (CL) for (semi-)natural vegetation.

Species	Effect parameter	Biogeographical region*	Potential effect at CL (% reduction)	Critical level (mmol m^{-2} PLA)**	Ref10 POD_1 (mmol m^{-2} PLA)***	Potential maximum rate of reduction (%) per mmol m^{-2} PLA of POD_1SPEC****
Temperate perennial grassland	Above-ground biomass	A, B,C (S,P)	10%	10.2	0.1	0.99
Temperate perennial grassland	Total biomass	A, B,C (S,P)	10%	16.2	0.1	0.62
Temperate perennial grassland	Flower number	A, B,C (S,P)	10%	6.6	0.1	1.54
Med. annual pasture	Above-ground biomass	M	10%	16.9	5.2	0.85
Med. annual pasture	Flower/ seed biomass	M	10%	10.8	4.6	1.61

* *A: Atlantic; B: Boreal; C: Continental, S: Steppic, P: Pannonian; M: Mediterranean. Derived for species in growing in regions not in brackets, but could also be applied to regions in brackets.*

** *Represents the (POD_1SPEC – Ref10 POD_1SPEC) required for a x% reduction*

*** *Reference POD_Y at constant 10 ppb O_3, representing average 'pre-industrial' O_3 concentration*

**** *Calculate the % reduction using the following formula:*

*(POD_1SPEC – Ref10 POD_1SPEC) * potential maximum rate of reduction.*

- The Task Force adopted 5 vegetation type-specific ozone flux-based (POD_YIAM) critical levels (for crops, forest trees and (semi-)natural vegetation (**Table 4**);

Table 4. POD_YIAM critical levels (CL) for crops, forest trees and (semi-)natural vegetation.

Vegetation type (POD_YIAM)	Effect parameter	Use to assess risk of reduction in	Biogeographical region*	Potential effect at CL (% annual reduction)	Critical level (mmol m^{-2} PLA)**	Ref10 POD_Y (mmol m^{-2} PLA)***
Crops (POD_3IAM)	Grain yield	Grain yield	A, B,C,M (S,P)****	5%	7.9	0.1
Forest trees (POD_1IAM)	Total biomass	Annual growth of living biomass of trees	A, B,C (S,P)	4%	5.7	0.6
			M	4%	13.7	1.7
(Semi-) natural vegetation (POD_1IAM)						
Temperate perennial grasslands	Flower number	Vitality of species-rich grasslands	A, B,C (S,P)	10%	6.6	0.1
Med. annual pastures	Flower/ seed biomass		M	10%	10.8	4.6

* *A: Atlantic; B: Boreal; C: Continental, S: Steppic, P: Pannonian; M: Mediterranean. Suitable for vegetation types in regions not in brackets, but could also be applied to regions in brackets.*

** *Represents the (POD_ySPEC – Ref10 POD_ySPEC) required for a x% reduction*

*** *Reference POD_Y at constant 10 ppb O_3, representing average 'pre-industrial' O_3 concentration*

**** *Separate parameterisations should be used for Mediterranean and non-Mediterranean areas.*

- POD_YIAM flux models have simpler form than POD_YSPEC and have been developed specifically for use in large-scale integrated assessment modelling, including for scenario analysis and optimisation runs. Separate parameterisations are provided for Mediterranean and non-Mediterranean areas for application in risk assessments for crops, forest trees and (semi-)natural vegetation. The flux-effect relationships can be used for:

  - Crops: potential maximum yield loss calculation and indicative economic losses in worst case scenario;
  - Forest trees and (semi-)natural vegetation: indicative of the potential maximum risk for estimating environmental cost, but not economic losses.

  The critical levels can be used for calculating critical levels exceedances, both amount and area. For applications in a climate change context, the POD_YSPEC method is recommended as key factors such as phenology and soil moisture are not included in the parameterisation of POD_YIAM.

- Two discussion groups discussed further opportunities for ozone-related outreach activities in 1) Eastern Europe and 2) South and East Asia.

  Recommendations for Eastern Europe included:
  - Set up ozone gardens to monitor ozone impacts on sensitive plant species (using tolerant species or cultivars as a control);
  - Find suitable places for automatic monitoring stations, for example add ozone detectors to flux towers in Poland;
  - Improve manual for ozone gardens and make use of ICP Forests manual on ozone injury assessment;
  - Record ozone injury via citizen science (for example involve schools using ozone injury recording App), but data must be validated.

  Recommendations for South and East Asia included:

  - Provide training on flux modelling, using App for recording ozone-induced leaf injury (but validation required) and set up ozone gardens. Promote synergies with ICP Forests inter-calibration courses;
  - Include Asian-specific parameterization of flux model and dose response relationships in Chapter 3 of the Modelling and Mapping Manual or associated scientific background documents;
  - Promote use of ICP Vegetation tools in Asian Air Pollution Workshop;
  - Exchange knowledge on how trees can help to mitigate air pollution but at the same time raise awareness of trees as source of biogenic volatile organic compounds (BVOCs);
  - Stimulate research on nitrogen and particulate matter as well.

MOSS SURVEY RELATED ACTIVITIES:

- The Task Force agreed the following time schedule regarding the 2015/16 moss survey:
  - Data submission: 1 April 2017;
  - First draft maps and quality assurance of data: 1 October 2017;
  - Country reports to be included in final report (maximum of two pages): 1 October 2017;
  - Final approval of data and maps: 31st ICP Vegetation Task Force meeting, 5 – 8 March 2018;
  - Final report: 1 April 2018, to be translated into Russian too;
  - Launch of report (in English and Russian): July 2018 at 8th BioMAP (Biomonitoring of Air Pollutants, with emphasis on trace elements) workshop in Dubna, July 2018.

- A separate report will be produced for data submitted on radionuclides.

- Participants of the moss survey will have access to their own password-controlled area of the new data management system developed by the Moss Survey Coordination Centre at JINR, Dubna: http://moss.jinr.ru Participants are requested to fill in the registration form available from the website to receive a password.

- Data of moss reference material M2 and M3 will be processed by a group consisting of Mr. Eiliv Steinnes (Norway), Mr. Sébastien Leblond (France) and Mr. Stefan Fränzle (Germany), with input from Mr. Harry Harmens (UK). Ms. Marina Frontasyeva (Russian Federation) will explore the availability and preparation of additional reference material for future surveys with the International Atomic Energy Agency (IAEA).

- Participants of the moss survey will explore further analysis and publication of the 2015/16 data using detailed (geo)statistics and modelled deposition of nitrogen and heavy metals, in collaboration with Mr. Winfried Schröder (Germany) and colleagues at the University of Vechta (Germany), as done in previous moss surveys. Mr. Schröder has proposed some initial themes of joint publications.

- A working group was established under the leadership of Ms. Marina Frontasyeva (Russian Federation) to improve the moss monitoring manual for the 2020 survey, taking into consideration recommendations included in the paper Fernández et al., 2015. Science of the Total Environment 517: 132-150. Provisional recommendations for improvements were discussed during the 29th (see minutes) and 30th ICP Vegetation Task Force meetings. Other members of the working group are: Mr. Harry Harmens (UK), Mr. Eiliv Steinnes (Norway), Ms. Lotti Thöni (Switzerland), Mr. Sébastien Leblond (France), Mr. Stefan Fränzle (Germany), Mr. Harald Zechmeister (Austria) and Ms. Hilde Uggerud (Norway, specifically for POPs). The deadline for finalising the monitoring manual for the 2020 survey is 1 April 2019.

Annex II. Medium-term workplan (2017 – 2020) ICP Vegetation
(updated on 17 February 2017)

Workplan items for 2018 and 2019 have been proposed by the Task Force, to be included in the biannual workplan of the LRTAP Convention for 2018-2019.

Ongoing annual activities:

- Report on supporting evidence for ozone impacts on vegetation;
- Review scientific background documents for Chapter 3 of the Modelling and Mapping Manual;
- Report on new scientific developments, including in flux modelling, and understanding of interactions of ozone with other pollutants, climate change, and other biotic and abiotic stresses;
- Mapping of risk of ozone impacts on vegetation (including biodiversity) for use within the Convention;
- Report on progress with the moss survey 2015/2016 and preparations for 2020;
- Collaboration with other LRTAP Convention Bodies, including other ICPs (ICP Forests and ICP Modelling and Mapping in particular), EMEP (MSC-West and East, TFIAM and CIAM, TF HTAP) and WGSR (TFRN);
- Contributions to common workplan items of the WGE.

New activities:

2017:

- Revised ozone risk assessment methods for vegetation;
- Revision of Chapter 3 of the Modelling and Mapping Manual, including development of scientific background documents;
- Workshop on ozone risk assessment methodology for developing countries;
- Update App to record ozone-induced visible leaf injury (with latest technology).

2018:

- Establish networks of participants in developing regions (including regions outside the UNECE area);
- Validation and parameterisation of soil moisture index applied in EMEP model (in collaboration with EMEP and ICP Forests);
- Report on available evidence of ozone impacts on crops in developing regions;
- Report on outcome of the moss survey 2015/16.

2019:

- Ozone flux-based risk maps for HTAP regions for current and future air pollution emission scenarios (in collaboration with the Task Force on Hemispheric Transport of Air Pollution (HTAP));
- Ozone flux-based risk maps adapted for soil moisture limited areas (in collaboration with EMEP/MSC-West);
- Report on networking activities in developing regions, including first season field evidence ozone impacts;
- Revision of moss monitoring manual for use in 2020 moss survey (by 1st April).

2020:

- Report on ozone impacts in developing regions (risk assessment, evidence, policy).

Annex III. Programme of presentations 30th Task Force Meeting of the ICP Vegetation

Wednesday 15th February, 2017

Session 1: 9:00 – 10:45 Plenary session Chair: Klaudia Borowiak

09:00 Welcome address – Welcome by Prof. Jan Pikul, rector/vice-rector of Poznan University of Life Sciences

09:15 *Harry Harmens et al.* – Overview of the achievements of the ICP Vegetation in 2016 and future workplan (2017-2019).

09:40 *Marina Frontasyeva, Harry Harmens et al.* – Present status of the moss survey in 2015-2016.

10:00 *Walter Seidling* – Activities under ICP Forests with reference to ICP Vegetation.

10:20 *Janusz Olejnik* – Greenhouse gases and energy fluxes in different ecosystems – overview of long-term observations and different measurement techniques applied at PULS sites.

10:40 Discussion

Session 2: 11:30 – 13:00 (Two parallel sessions: Ozone and Moss survey)

Session 2a: Ozone – Revision of Chapter 3 of the Modelling and Mapping Manual (part 1) Chair: Gina Mills

11:30 *Harry Harmens et al.* – Restructuring Chapter 3 of Modelling and Mapping Manual and new scientific background document.

11:45 *Håkan Pleijel et al.* – Ozone critical levels for crops for inclusion in the Modelling and Mapping Manual.

12:00 *Felicity Hayes et al.* – Ozone critical levels for (semi-)natural vegetation in temperate perennial grasslands for inclusion in the Modelling and Mapping Manual.

12:15 *Ignacio González Fernández et al.* - New ozone critical levels for (semi-) natural vegetation for Mediterranean annual pastures, for inclusion in the Modelling and Mapping Manual.

12:30 General discussion – critical levels for crops and (semi-)natural vegetation.

Session 2b: Moss survey Chair: Marina Frontasyeva

11:30 *Eiliv Steinnes* – Monitoring of atmospheric deposition of metals: where do we stand after forty years of experience?

11:50 *Pranvera Lazo et al.* – Mineral particles dust important sources of trace metal in atmospheric deposition in Albania.

12:10 Discussion:
- Issues raised in previous two presentations;
- Further outreach activities, including Asia, South America and Africa;
- Schedule for data submission, including for moss reference material, and schedule for finalisation of report;
- Future moss reference material.

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

Session 3a: **Ozone – Revision of Chapter 3 of the Modelling and Mapping Manual (part 2)** **Chair: Håkan Pleijel**

14:00 *Patrick Büker et al.* – Ozone critical levels for trees for inclusion in the Modelling and Mapping Manual.

14:15 *Giacomo Gerosa, Rocio Alonso et al.* – Ozone critical levels for Mediterranean deciduous broadleaved and evergreen tree species for inclusion in the Modelling and Mapping Manual.

14:30 General discussion – critical levels for trees and other suggested changes to the chapter.

Session 3b: **Moss survey** **Chair: Eiliv Steinnes**

14:00 *Yulia Aleksiayenak et al.* – Ten year biomonitoring study of atmospheric deposition of trace elements in the territory of Belarus: trends and tendencies, optimization of the sample sites number for upcoming moss surveys.

14:20 *Hilde Thelle Uggerud et al.* – Atmospheric deposition of organic contaminants in Norway.

14:40 *Zaida Kosonen et al.* – PAH in Switzerland – results of the 2015 moss survey.

15:00 *Maria Zielińska et al.* – Execution of the biomonitoring research conducted within grants (OP CR-RP, JINR, POL-NOR) in selected areas in Poland and Norway.

15:20 General discussion.

Session 4: **16:00 – 17:30 (Two parallel sessions: Ozone and Moss survey)**

Session 4a: **Ozone: (Semi-)natural vegetation and crops** **Chair: Patrick Büker**

16:00 *Felicity Hayes et al.* – An overview of recent ozone experimental work at CEH Bangor.

16:20 *Håkan Pleijel et al.* – Current surface ozone significantly affect several aspects of wheat growth, yield and quality on three continents.

16:40 *Sabine Braun et al.* – Phenological models for budbreak calculation.

17:00 *Per Erik Karlsson et al.* – Estimated ozone sensitivity periods for trees in northern Europe.

17:20 General discussion.

Session 4b: **Moss survey:** **Chair: Marina Frontasyeva**

16:00 Discussion:
- Analysis of data, moss reference data, mapping.
- On line data availability: summary data and maps? Requests for original data per site via data access protocol?
- Recent and future joint publications.

16:30 *Alexander Uzinskiy et al.* – Data management of the UNECE ICP Vegetation monitoring network.

16:50 *Alexander Uzinskiy* – Training use data management system.

Thursday 16th February, 2017

Session 5: 09:00 – 10:30 (Two parallel sessions: Ozone and Moss survey)

Session 5a: Ozone **Chair: Per Erik Karlsson**

09:00 *Klaudia Borowiak et al.* – Ozone gardens in Poland in 2016 season.

09:20 *Kent Burkey et al.* – Potential impacts of ambient ozone on wheat rust diseases and the role of plant ozone sensitivity.

09:40 *Alexandra de Marco et al.* – Latest update of modelling ozone fluxes over Europe.

10:00 *Stan Cieslik et al.* – Total and stomatal ozone surface fluxes recorded during 3.5 years over a deciduous subalpine forest.

10:20 General discussion

Session 5b: Mosses **Chair: Pranvera Lazo**

09:00 *Helena Danielsson* et al. – Results from the national Swedish moss survey in 2015.

09:20 *Gunilla Pihl-Karlsson et al.* – Heavy metals, sulphur and nitrogen - correlation between concentrations in mosses and deposition.

09:40 *Lotti Thöni et al.* – Nitrogen concentration in moss compared with N load in precipitation and "total" N deposition in Switzerland.

10:00 *Stefan Nickel et al.* – Re-structuring the German Moss Survey Network.

10:20 General discussion.

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

Session 6a: Ozone **Chair: Gina Mills**

11:00 Introduction to discussion groups: Theme – Extending the outreach activities of the ICP Vegetation.

Discussion group 1: Ozone pollution problems in Eastern Europe.
Chair: Klaudia Borowiak.

Discussion group 2: Ozone pollution problems in South and East Asia.
Chair: Vicent Calatayud.

Session 6b: Moss survey **Chair: Zvonka Jeran**

11:00 *Julian Aherne et al.* – Moss biomonitoring in Ireland: 2015 survey.

11:20 *Guntis Tabors et al.* – Assessment of atmospheric pollution with heavy metals and nitrogen using *Pleurozium schreberi* mosses as bioindicator in Latvia.

11:40 Discussion:
– Preparations for 2020 survey, including improved monitoring manual.
– Any further outstanding issues.

Session 7: **13:30 – 15:00 (Two parallel sessions: Ozone and Moss survey)**

Session 7a: **Ozone** **Chair: Felicity Hayes**

13:30 *Giacomo Gerosa et al.* – Ozone flux-effect relationships for durum wheat and lettuce in Mediterranean conditions.

13:40 *Rocio Alonso et al.* – O_3 sensitivity of Spanish wheat cultivars: preliminary results.

13:50 *Gina Mills* – Update on the Tropospheric Ozone Assessment Report (TOAR).

14:05 Working groups session 6a report back.

14:30 General discussion of ICP Vegetation work plan for ozone activities.

Session 7b: **Moss survey** **Chair: Sebastien Leblond**

13:30 *Irena Pavlikova et al.* – Atmospheric deposition of heavy metals in Czech-Polish border region studied by moss survey, neutron activation analysis and GIS.

13:50 *Evdoxia Tsakiri et al.* – *Hypnum Cupressiforme* HEDW. as bioindicator of ^{137}Cs radionuclide in Northern Greece.

14:10 *Stefan Franzle et al.* – How do chitin adsorption-based data compare to biomonitoring using mosses?

14:30 *Oldrich Motyka et al.* – NAA and ICP-AES: comparison of approaches in biomonitoring campaign.

14:50 General discussion

Session 8: **15:30 – 17:00 (Two parallel sessions: Ozone and Moss survey)**

Session 8a: **Ozone: decisions ozone critical levels** **Chair: Gina Mills**

15:30 Finalise decisions on ozone critical levels – to be presented in plenary on Friday morning for consideration by the Task Force.

Session 8b: **Moss survey** **Chair: Marina Frontasyeva**

15:30 Final discussions on moss survey, workplan for coming year, decisions and actions to be reported back to plenary on Friday morning for consideration by the Task Force.

Friday 17th February, 2017

Session 9: **08:45 – 10:30 Plenary session** **Chair: Harry Harmens**

- Reporting back from ozone and moss sessions: decisions and actions;
- Medium-term work plan ICP Vegetation 2017 – 2020;
- Decisions and recommendations of the 30th Task Force Meeting;
- 31st ICP Vegetation Task Force Meeting;
- Any other business.