



CONVENTION ON LONG-RANGE TRANSBOUNDARY AIR POLLUTION

WORKING GROUP ON EFFECTS

INTERNATIONAL COOPERATIVE PROGRAMME ON EFFECTS OF AIR POLLUTION ON NATURAL VEGETATION AND CROPS (ICP VEGETATION)



Minutes of the 21st Task Force Meeting

The twenty-first meeting of the Programme Task Force was held from 26th – 29th February, 2008 in Oulu, Finland and hosted by the Muhos Research Unit of the Finnish Forest Research Institute.

1. The meeting was attended by 52 delegates from 19 Parties to the Convention: Belgium, Finland, France, Germany, Greece, Hungary, Italy, Latvia, Netherlands, Norway, Poland, Romania, Russian Federation, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom. Also present were the chairman of the Working Group on Effects (WGE), the secretariat for the LRTAP Convention at the United Nations Economic Commission for Europe (UNECE) and a representative from ICP Modelling and Mapping.
2. The Programme Task Force adopted the agenda of the meeting.
3. Mr H Harmens (chairman of the ICP Vegetation, UK) welcomed all participants on behalf of the ICP Vegetation Programme Centre and thanked the Finnish Forest Research Institute for hosting the meeting. Mr Heikki Aronpää, Director of North Ostrobothnia Regional Environment Centre welcomed the participants to Oulu on behalf of the Finnish Ministry of Environment.
4. Mr T Johannessen (chairman of the WGE) gave an overview of the status of work on the effects of major air pollutants on human health and the environment as reported at the 26th session of the Working Group on Effects (29 – 31 August 2007, Geneva; see <http://www.unece.org/env/wge/26meeting.htm> for details). He highlighted the major achievements of the ICPs, Task Force on Health and Joint Expert Group on Dynamic Modelling and thanked the ICP Vegetation for its valuable input to the work under the LRTAP Convention. Whereas currently no revision of the Aarhus Protocol on heavy metals is required and only draft amendments are requested for persistent organic pollutants (POPs), the revision of the Gothenburg Protocol on acidification, eutrophication and ground-level ozone was initiated by the 25th session of the Executive Body of the LRTAP Convention.

5. Mr M Johansson (secretary to the WGE) gave an overview of the organisation of the Convention and its protocols (see paragraph 4). A new Task Force on Reactive Nitrogen (TFRN), jointly led by the Netherlands and the United Kingdom, was established by the Executive Body in December 2007 to operate under the Working Group on Strategy and Review. The first meeting of the TFRN will be held from 21-23 May in Wageningen, the Netherlands. Mr Johansson also informed the Task Force of the wish of the Convention to reach out to areas outside the UNECE region and for example initiate (or intensify) collaboration with the Malé declaration countries (South Asia). In addition, the Executive Body had invited the WGE to consider further quantification of policy-relevant effects indicators such as biodiversity change and link them to the integrated modelling work, conducted by the Task Force in Integrated Assessment Modelling (TFIAM) and the Centre for Integrated Assessment Modelling (CIAM), with which the collaboration in general should be enhanced.
6. On behalf of the ICP Modelling and Mapping (M&M), Ms G Schütze (Germany) reported on the collaboration with the ICP Vegetation, including the revision of chapter 3 of the Modelling and Mapping Manual and the initiative of the ICP Vegetation to develop a meta-database on evidence for the impacts of nitrogen on vegetation, extracted from primarily field survey data. Ms Schütze also reported on the outcome of the 23rd ICP M&M Task Force Meeting and the 17th Coordination Centre for Effects (CCE) workshop held from 23 - 27 April 2007 in Sofia, Bulgaria (see ECE/EB.AIR/WG.1/2007/3, 10, 14 for further details). The next ICP M&M Task Force Meeting and CCE workshop will be held from 21-25 April 2008 in Bern, Switzerland.
7. Mr H Harmens (UK) gave an overview of ICP Vegetation activities and achievements in 2007. He informed the Task Force on progress made with the work-plan items for 2008 (see ECE/EB.AIR/WG.1/2007/4/Rev.1). The items will be presented at the 27th session of the WGE, 24 - 26 September 2008, Geneva (for further details see <http://www.unece.org/env/wge/documents.htm>, where meeting documents can be downloaded).

Workplan items common to bodies under the WGE (all ICPs and the Task Force on Health):

- *Updated review of robustness of monitored and modelled air pollution impacts.* Mr Harmens asked the Task Force to discuss any further updates during its 21st meeting.
- *Updated compilation of observed parameters, monitoring methodologies and intensities of effects-oriented activities.* Mr Harmens summarised progress and showed that 39 (13) sites in 20 (11) countries contribute to the collection of data (modelling) for ozone and that mosses were sampled at 6041 (2927) sites in 28 (16) countries for the determination of their heavy metal (nitrogen) concentration in 2005/6.
- *Updated summary of effects-oriented activities in countries of Eastern Europe, Caucasus and Central Asia (EECCA countries).* Currently, the Russian Federation, Belarus, Ukraine and Uzbekistan contribute to the ICP Vegetation programme.

In addition, the ICP Vegetation has provided text for the report on dose-response relationships/stock at risk and links between field observations and critical loads/ levels (see below for further details), to be published by the WGE later this year.

Mr Harmens continued to report on progress with the specific ICP Vegetation work-plan items for 2008, which will be reported in more detail in ECE/EB.AIR/WG.1/2008/3 and 9:

- *Annual report on experimental responses of vegetation to ozone.* Participation in the biomonitoring experiments with white clover has declined over recent years. In 2007, data were received from only seven sites, including new sites in Hungary and Ukraine. On the other hand, Parties are contributing more and more to other ozone risk assessment activities such as collecting data from fields/naturally growing vegetation and experimental exposure experiments. Together these data contribute to the further development of flux models and dose-response relationships, used to derive flux-effect relationships and the identification of vegetation at risk.
- *Report on the evidence for effects of current ambient ozone on vegetation in 1990 – 2006* (see ECE/EB.AIR/WG.1/2008/9). The final report on ‘Evidence of widespread ozone damage to vegetation in Europe (1990-2006)’ was published. The main conclusions were:
 - Leaf injury provides an early indicator of damage;
 - AOT40 works best as regional-scale indicator of ozone damage;
 - AOT40-based maps underestimate risk of damage across Europe as effects were detected in areas where the three-months AOT40 was below the critical level for agricultural crops and (semi-)natural vegetation;
 - Generic flux maps for crops are better at predicting the widespread occurrence of ozone damage than AOT40 maps;
 - Increasing generic flux was associated with increasing incidences/severity of ozone leaf injury and biomass reduction;
 - A tentative generic flux threshold for effects on crops is 12 mmol m^{-2} .
- *Flux-based maps of ozone damage risks to crop and tree species using localised parameterisations (with EMEP/MSC-W and ICP Forests).* The forest sub-group, established at the ozone critical level workshop in Obergurgl (see ECE/EB.AIR/WG.1/2006/11) had met on 6-7 December 2007 in Rome to further discuss the parameterisation of the ‘real’ tree species ozone flux model, using localised parameterisation. Although good progress was made and many key points were agreed at the meeting in Rome, the parameterisations of the ‘real’ tree species model could not be finalised before the 21st ICP Vegetation Task Force Meeting. The forest sub-group aims to deliver the final parameterisations by the 24th ICP Modelling and Mapping Task Force Meeting in Bern, 24-25 April 2008. Subsequently, flux-based maps of ozone damage risks will be produced in collaboration with EMEP/MSC-W. It is not currently possible to progress with local parameterisations for crops due to funding shortages.
- *Progress report on flux-based methods for (semi-)natural vegetation.*
 - New datasets are now available for the development of a canopy flux model (e.g. Dehesa grasslands) and modelling methods are being established;
 - A generic ‘grassland’ flux-based risk assessment may be possible in next two years;
 - Canopy flux-effect modelling is ongoing but hampered by shortage of suitable experimental data;
 - The development of the Ellenberg modelling method for the identification of ozone sensitive communities is continuing.
- *Report on European heavy metals in the 2005-6 mosses survey.* Twenty-eight countries submitted data on the metal concentrations in mosses. Preliminary data and maps indicate that the spatial trends were similar as reported for previous surveys.

Since the 2000/1 survey, the metal concentrations in mosses either did not change or showed a further decline, however, trends were metal- and country-specific. The final report will be published in the summer of 2008.

- *Report on the nitrogen concentration in mosses in the 2005-2006 mosses survey.* For the first time, 16 countries submitted data on the total nitrogen concentration in mosses. The highest nitrogen concentrations in mosses were found in central and eastern Europe and the lowest values in northern Finland and Scotland/Northern Ireland. Further data analysis is required before the report can be published in the summer of 2008.

The ICP Vegetation will provide further details on its activities since the 26th Session of the WGE, including the 21st Task Force Meeting in Oulu, in ECE/EB.AIR/WG.1/2008/3 and 9 (in preparation). Mr Harmens concluded by summarising the outputs to which the Programme Coordination Centre had contributed in 2007, i.e. annual ICP Vegetation report, ozone evidence report, four documents to the 26th Session of the WGE, revision of chapter 3 of the Modelling and Mapping Manual, ozone experimental protocol and 10 refereed papers (6 on ozone and 4 on heavy metals).

8. Mr Eero Kubin (Finland) gave an overview of the heavy metal surveys in Finland since 1985. The heavy metal concentrations were in all surveys relatively low in most parts of Finland and they generally decreased on moving northwards. The concentrations of cadmium, lead and vanadium had declined considerably and that of chromium, copper, iron and zinc to some degree between 1985 and 2000. However, after 2000 the concentrations did not decline further except for arsenic.
9. Four presentations were given on ongoing activities on the pollutant nutrient nitrogen. First of all, Mr Ben Gimeno (Spain) gave an overview of the European Science Foundation (ESF) programme 'Nitrogen in Europe' (NinE; www.nine-esf.org). It provides for example funding for travel grants, summer schools and targeted workshops. Mr Gimeno continued with a presentation on nitrogen deposition in Mediterranean ecosystems, defining empirical critical loads and identifying conceptual problems for the calculation of nitrogen critical loads in Mediterranean ecosystems. Mr Jarmo Poikolainen (Finland) gave an overview of the nitrogen concentration in mosses in Finland between 1990 and 2006. Nitrogen concentrations were highest in southern Finland and declined gradually moving northwards. The mean nitrogen concentration in mosses had decreased between 1990 and 2000, but increased between 2000 and in 2005. Finally, Mr Harry Harmens (UK) reported on ongoing nitrogen work under the ICP Vegetation and potential new developments. Regarding the moss survey the challenge will be to relate the nitrogen concentration to an effect on ecosystems, which could then potentially be used as an indicator to validate the critical loads approach. One of the new developments includes the establishment of a meta-database describing national surveys that could provide field-based evidence on nitrogen impacts on vegetation. Further development and application of this meta-database should be explored in the future.
10. The meeting split into two parallel sessions considering the ozone and heavy metals sub-programmes. The titles of oral presentations in the parallel session are given below, for further details on the content of oral presentations and posters we refer to the book of abstracts and powerpoint files, both available on the ICP Vegetation web site (<http://icpvegetation.ceh.ac.uk>). In addition, several ozone and heavy metals in mosses posters were displayed throughout the meeting, covering subjects such as ozone flux

measurements, dose-response relationships and biomonitoring of ozone and heavy metal pollution.

11. The first ozone session was on 'Progress and new developments'. Ms Felicity Hayes (UK) gave an overview of the evidence of widespread ozone damage to vegetation in Europe (1990-2006). Mr Patrick Büker (UK) gave an update on ozone flux modelling for forest trees and mapping using localised parameterization. Subsequently, Ms Gina Mills (UK) and Mr Håkan Pleijel (Sweden) discussed potential new developments regarding ozone critical levels for (semi-)natural vegetation and agricultural crops, respectively. At the end of the first session, Ms Gina Mills and Ms Felicity Hayes provided a summary of the results of the 2007 ICP Vegetation ozone experimental programme and gave an introduction to discussion groups for the next session.
12. In the second session, the ozone group was split into the following three discussion groups: i) Ozone steering group, discussing further development of the Modelling and Mapping Manual, a potential future ozone workshop and themes for future ICP Vegetation ozone state of knowledge reviews; ii) Central and northern Europe; iii) Southern Europe. Group (ii) and (iii) discussed the following issues: 'where next with biomonitoring studies', 'subjects for synthesis of known results of ozone impacts on vegetation' and 'contributions to modelling'. The ozone group concluded that future activities would fall into three main subject areas: state of knowledge reviews, biomonitoring (with an in depth study to be conducted in 2010), and contributions to flux-effect modelling (see Annex I, Table 1).
13. The third ozone session included presentations on 'Effects on vegetation'. Mr Per Erik Karlsson (Sweden) discussed the increasing risk for negative ozone impacts on vegetation in northern Sweden. Mr Matthias Volk (Switzerland) presented results on substantial carbon allocation changes as suggested by CO₂ fluxes of sub-alpine grassland under high ozone and nitrogen deposition. Ms Gina Mills (UK) reported on the impacts of increasing background ozone on competition, stomatal control and carbon turnover in grassland mesocosms, followed by a presentation from Mr Håkan Pleijel (Sweden) on visible ozone injury, ozone uptake and effects on growth of four *Phleum pratense* genotypes.
14. The final ozone session focussed on 'Field surveys and flux models'. Mr Ignacio González-Fernández (Spain) gave an overview of data collection and the development of flux models for Dehesa grasslands. Progress with the development of flux models for (semi-)natural vegetation was outlined by Mr P Büker (UK). At the end Ms Gina Mills (UK) summarised the outcome of the ozone sessions with regard to next stages in ICP Vegetation ozone programme (experimental, modelling, mapping) and Parties pledged their contributions; further details are provide in Annex I, Table 1.
15. The first heavy metal session was on 'Critical loads and quality assurance in the 2005/6 survey'. Ms Gudrun Schütze (Germany) reported on the status of the review of the Heavy Metals Protocol and the outcome of a workshop on critical loads for heavy metals, 21 - 22 November 2007, Windermere, UK (see ECE/EB.AIR/WG.1/2008/15). Mr Harry Harmens (UK) gave an overview of data received and further data processing and plans for the writing of the 2005/6 moss survey report. Subsequently, Mr Eiliv Steinnes (Norway) reported on the outcome of the inter-laboratory comparison using moss reference samples in the 2005/6 European moss survey. He concluded that the mean values for the ten priority elements, after rejection of outliers, were sufficiently close to

the recommended values from 1995 that there was no need for adjustment of them. Further data processing is required to determine which countries should consider routine adjustment of moss data by a constant factor or even withdrawal of data for selected elements. Mr Sébastien Leblond (France) described the quality control of the 2006 French moss survey, including cross-border calibration exercises with Belgium and Germany and uncertainty analysis.

16. In the second heavy metal session Mr Winfried Schröder (Germany) gave an overview of the final results of the 2005 moss survey in Germany and provided examples of how the moss data should be linked to data from other monitoring programmes, e.g. ICP Forests. Mr Harry Harmens (UK) reported on the preliminary results of the European moss survey 2005/6 and showed the draft EMEP maps of the heavy metal and nitrogen concentration in mosses. Preliminary analysis indicates country-specific relationships between the nitrogen concentration in mosses and atmospheric nitrogen deposition rates. In the discussion that followed the Programme Coordination Centre encouraged Parties to report on the following:
 - The relationships between the nitrogen concentrations in mosses and atmospheric nitrogen deposition rates. In addition, Parties were encouraged to investigate any relationship between the nitrogen concentration in mosses and effects on ecosystems;
 - The robustness/uncertainties of element concentrations in mosses;
 - Important changes in local emission sources since 2000 and consequences for temporal trends and spatial variation in the 2005/6 moss survey;
 - Any discrepancies in the draft maps and explanations for any steep gradients in element concentrations across country borders.
17. The third heavy metal session focussed on 'Biomonitoring around local sources' Mr. Eiliv Steinnes (Norway) reported on the use of indigenous moss sampling in metal deposition surveys around point sources. Ms Marina Frontasyeva (Russian Federation) followed with a presentation on trace element atmospheric pollution in the Balkans as studied by the moss technique. In a study in northern Spain, Ms Laura Gonzalez (Spain) investigated atmospheric heavy metals accumulation in *Hypnum cupressiforme* in the surroundings of two steel plants. At the end Mr Matti Niemelä (Finland) described the use of mosses for biomonitoring traffic-related platinum and rhodium deposition near traffic lanes.
18. The final heavy metal session included presentations on heavy metal concentrations in food. Mr John Derome (Finland) reported on heavy metal concentrations in forest berries and edible wild mushrooms in eastern Finnish Lapland and western parts of the Kola Peninsula (NW Russia). Ms Hanna Hokana (Finland) had investigated the metal concentrations in food plants adjacent to a stainless steel works in Finland. Finally, Ms Raluca Mocanu (Romania) gave an overview of moss biomonitoring studies on transboundary heavy metal pollution between Romania and the Republic of Moldova.
19. The heavy metal session concluded with a general discussion on future plans for the moss survey. The heavy metal sub-group strongly advised, supported by the chairman of the WGE, to conduct the next moss survey in 2010 and urged Parties to the LRTAP Convention to continue to provide the necessary financial support. The use of the moss data base within the Convention should be further explored and exploited, not only at the European level but also at the national and regional level. The group made the following specific recommendations:

- Mosses should be sampled in one year, i.e. 2010 for the next survey;
- For quality assurance purposes participating laboratories have to include the analysis of moss reference samples M2 and M3, which will be made available;
- Mosses should also be sampled at EMEP heavy metal and nitrogen monitoring sites to establish relationships between element concentrations in mosses and empirical element deposition data;
- Sampling at other ICP monitoring sites (e.g. ICP Forests and ICP Integrated Monitoring) was encouraged to further integrate deposition data and element concentrations in mosses;
- The development of a detailed (possibly electronic) field sheet.

Finally, Germany proposed to make available to them, via the ICP Vegetation Coordination Centre, European moss data for detailed geostatistical analysis. The heavy metal group supported the proposal, in agreement with the new data rules of the LRTAP Convention (see ECE/EB.AIR/89/add.1, decision 2006/1).

20. In the final plenary session, Ms Gina Mills (United Kingdom) gave an overview of presentations, conclusions and recommendations from the ozone sub-group, followed by a summary from Mr Ludwig De Temmerman (Belgium) on the presentations and the outcome of discussions in the heavy metal sub-group. The meeting took note of the conclusions and recommendations of both sub-groups (as described above). The Task Force discussed and adopted the medium-term work-plan of the ICP Vegetation as described in Annex I. The Task Force took note of progress made in the forest sub-group, established at the ozone critical level workshop in Obergurgl (see ECE/EB.AIR/WG.5/2006/11), regarding the local parameterisations of the ‘real’ tree species ozone stomatal flux model. The Task Force recommended adoption of the final parameterisations at the 24th ICP Modelling and Mapping Task Force Meeting in Bern, Switzerland, 24-25 April 2008, and the 24th ICP Forests Task Force Meeting in Larnaca, Cyprus, 24 -28 May 2008.
21. The Task Force discussed the ‘Draft guidelines for reporting on the monitoring and modelling effects of air pollution to human health and the environment under the Convention of Long-range Transboundary Air Pollution’. The draft document was prepared by the Coordination Centre for Effects (CCE) of the ICP Modelling and Mapping, as agreed by the Extended Bureau of the WGE, in consultation with the secretariat of the WGE (second version, 18 February 2008). The comments of the Task Force will be fed back by the chairman to CCE and the secretariat of the WGE.
22. The Task Force discussed collaboration with other organisations/bodies:
- i) *Task Force on Integrated Assessment Modelling (TFIAM) and Centre for Integrate Assessment Modelling (CIAM)*. The ICP Vegetation will conduct a short study in which locations of effects of ozone on vegetation will be superimposed onto SOMO35 ozone risk maps for health effects. The outcome will be compared with locations of effects superimposed onto the AOT40 and generic flux maps as shown in the Evidence Report. The ICP Vegetation will continue to report on the robustness of data.
 - ii) *Task Force on Reactive Nitrogen*. The chair of the ICP Vegetation will attend the first meeting of this Task Force (21-23 May 2008, Wageningen, The Netherlands) to inform the Task Force on ongoing work on nitrogen within the ICP Vegetation.
 - iii) *Malé declaration*. The Malé declaration has requested to establish formal links with the LRTAP Convention. Mr Patrick Büker (UK) gave a background

presentation on the Malé declaration and the Air Pollution Crops Effect Network (APCEN) led by the Stockholm Environment Institute in York (see <http://www.sei.se/apcen/>). APCEN has already established good links and performed experimental ozone research in Malé declaration countries. In the future, the ICP Vegetation could act as an advisory body on how to further develop ozone experimental protocols and risk assessments in South Asia.

- iv) *Convention on Biological Diversity (CBD)*. Although tried in the past, currently the ICP Vegetation has no formal links with CBD. The ICP Vegetation is willing to establish links with CBD. The LRTAP Convention has requested new biodiversity indicators from the WGE but it's too early for the ICP Vegetation to suggest any at present.

23. Any other business:

- *Next ICP Vegetation Task Force Meeting*. The Task Force kindly accepted an offer from Mr Jürgen Bender (Germany) to host the 22nd ICP Vegetation Task Force Meeting in Braunschweig, 2 – 5 February 2009. The Steering Group of the ICP Vegetation would like to thank Mr Victor Urumov for his kind offer to host the next Task Force Meeting in Macedonia, but felt unable to accept the offer at this time. An offer from Mr Fausto Manes (Italy) to hold a future meeting in Rome was also gratefully received.
- *Workshops*. Mr Per Erik Karlsson (Sweden) and Mr Håkan Pleijel (Sweden) will organise a workshop in Gothenburg in June 2008 on 'Ozone exposure and impacts on vegetation in the Nordic countries and the Baltic States' Ms Laurence Galsomies (France) announced a workshop that will be held in Nice to inform French policy makers on ozone effects on Mediterranean forests and natural vegetation (presentations will be in French).

24. Mr H Harmens (United Kingdom) closed the meeting by thanking Mr Eero Kubin and his colleagues at Metla for hosting the meeting. He acknowledged the financial support for the meeting from the Finnish Ministry of Environment, the Council of Oulu, Oulu University and the Outukumpu Stainless Steel Plant. He thanked Ms L Emberson (UK) for the contributions of the forest sub-group and acknowledged the UK Department for Environment, Food and Rural Affairs (Defra) and the Centre for Ecology and Hydrology for their continuous financial support of the ICP Vegetation Programme Coordination Centre. Mr H Harmens also thanked the Secretariat and the Bureau of the WGE for their continuous support of the ICP Vegetation. Last but not least he thanked his colleagues at the Programme Coordination Centre and the participants of the ICP Vegetation for their continuing support of the programme.

Annex I. Medium-term work-plan (2009-2011) of the ICP Vegetation

See table 1 for further details on the ozone work-programme

2009:

- Report on the risk of damage to (semi-)natural vegetation communities in Europe [O];
- Report on flux-based assessment of risk of damage to managed pastures in Europe [O];
- A glossy brochure and associated web page for the general public and other interested parties on field-based evidence for the impacts of ozone on vegetation [O];*
- Report on the temporal trends in heavy metal concentrations in mosses between 1990 and 2005 [HM];
- Report on causes of variation in heavy metal and nitrogen concentrations in mosses [HM, N].

2010:

- Progress report on European heavy metals and nitrogen in mosses survey 2010 [HM, N];
- Review of the relationship between heavy metal and nitrogen concentrations in mosses and impacts on ecosystems [HM, N].

2011:

- Progress report on European heavy metals and nitrogen in mosses survey 2010 [HM; N].

* Item not included in the official Convention's work-plan. [N]: Nutrient nitrogen, [O]: Ozone, [HM]: Heavy metals.

Table 1. Overview of the ICP Vegetation work-programme for ozone (2008 – 2011). The exact timing of deliverables to the WGE will be decided in due course.

Main Year of Study	2008	2009	2010	2011	
STATE OF KNOWLEDGE REVIEW/REPORTS (Lead country or Programme Coordination Centre; PCC led, contributions offered at TFM, others welcomed)	SUMO35, AOT40 and Flux map comparison; why O3 impacts on vegetation important (PCC, Sweden)	1. O3 impacts in Nordic and Baltic areas (Sweden) 2. O3 impacts in Med areas (Italy, Spain, Greece)	Review of flux models and application to different climatic regions (PCC, Spain, Germany, UK, Sweden)	O3 impacts on crop yield and quality (regions, outreach to EECCA and MALE) (PCC, all)	
	Evidence Report (interactive web-page, PCC)	O3, carbon sequestration, linkages between air pollution and climate change policy (PCC, Sweden, UK)		Report of 2010 biomonitoring network & survey (PCC, all)	
FLUX MODEL DEVELOPMENT (contributions offered at TFM, others welcomed)	Measurements from naturally growing crops & (semi-)natural vegetation (Spain, Italy, UK, Germany) Main data requirements: LAI of fractions, vertical distributions of climate and O3, soil water availability, gs To include eddy covariance and sap-flow measurements				
	Measurements from O3 exposure experiments (UK, Spain, Switzerland)				
	Further development of flux methods, test different flux model types, streamlining of methods, flux-effect modelling (UK, Germany, Italy)				
WORKSHOP	Tentatively in Autumn, 2009 on "Quantification of ozone impacts on crops and (semi-)natural vegetation", possibly at Ispra, Italy				
BIOMONITORING/ BIOINDICATORS (Groups agreed at TFM, other contributions welcomed)	Test NC-S clover against other <i>Trifolium</i> spp (found in NATURA2000 sites) (UK)		Data collation, analysis and report of 2010 survey (PCC)		
	Exposure experiments to link O3 injury to senescence & biomass (UK)				
	Pilot study: bean (<i>Phaseolus vulgaris</i>) experiment for southern areas (Italy, Spain, Slovenia, Greece, Germany, Hungary). Spain to request seeds In 2009, possibly try in parallel in Asia				Full clover experiment, extensive network, including training (ALL) Visible injury, ratio (optional), gs?
					Survey of nearby NATURA2000 habitat for injury on <i>Trifolium</i> spp when injury found on NCS clover (ALL) Bean experiment