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**EXECUTIVE BODY FOR THE CONVENTION ON LONG-RANGE
TRANSBOUNDARY AIR POLLUTION**

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of the Long-range Transmission of Air Pollutants in Europe (EMEP)

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PROGRESS IN ACTIVITIES IN 2008 AND FUTURE WORK

HEMISPHERIC TRANSPORT OF AIR POLLUTION

Report by the Co-Chairs of the Task Force on Hemispheric Transport of Air Pollution

INTRODUCTION

1. This report summarizes the activities of the Task Force on Hemispheric Transport of Air Pollution held in accordance with the workplan of the Executive Body (ECE/EB.AIR/91/Add.2, item 2.4). It is divided into four parts. Part I is a report of the workshop on global and regional modelling for assessing hemispheric air pollution held on 17 to 19 October 2007 in Juelich, Germany. Part II is a report of the fourth meeting of the Task Force, which was held jointly with the United Nations Environment Programme (UNEP) Global Partnership on Atmospheric Mercury Transport and Fate Research on 7 to 11 April 2008 in Rome. Part III is a report of a workshop on atmospheric chemistry, climate, and transboundary air pollution, which was held

jointly with the United States National Academy of Sciences and the International Global Atmospheric Chemistry - Stratospheric Processes and their Role in Climate (IGAC-SPARC) Atmospheric Chemistry and Climate Initiative on 9 to 13 June 2008 in Washington D.C. Task Force activities for the remainder of 2008 and the proposed workplan for 2009 are presented in part IV.

2. The Task Force's interim assessment report, *Hemispheric Transport of Air Pollutants 2007*, Air Pollution Studies No. 16 (ECE/EB.AIR/94), was published and released in April 2008. The executive summary of the report was submitted to the EMEP Steering Body and the Executive Body in 2007 (ECE/EB.AIR/GE.1/2007/13).

3. Further details of the workshops and the fourth Task Force meeting may be found at <http://www.htap.org>.

I. WORKSHOP ON GLOBAL AND REGIONAL MODELLING FOR ASSESSING HEMISPHERIC AIR POLLUTION

4. The workshop was organized by the Task Force and hosted by Forschungszentrum Juelich (FZJ), with additional support from Interdisciplinary Tropospheric Research (INTROP), an initiative of the European Science Foundation (ESF).

5. The workshop was attended by more than 60 experts. Participants came from the following Parties to the Convention: Canada, Belgium, the European Community, France, Germany, Italy, the Netherlands, Norway, Poland, Russian Federation, Spain, Sweden, Switzerland, the United Kingdom and the United States. From outside the UNECE region, experts from India, Japan and Thailand participated. Representatives of EMEP's Chemical Coordinating Centre (CCC), Meteorological synthesizing Centre- West (MSC-W) and Meteorological Synthesizing Centre-East (MSC-E) participated as well as representatives from the European Commission's Joint Research Centre (JRC) and the World Meteorological Organization (WMO). A member of the secretariat attended.

6. Mr. T. Keating (United States) and Mr. A. Zuber (European Community), Co-Chairs of the Task Force, chaired the workshop. The presentation materials and the chairs' summary of the presentations are available at <http://www.htap.org/>.

A. Workshop objectives

7. The main objectives of the workshop were to report on progress on the on-going multi-model experiments organized under the Task Force and to plan further experiments to inform the

Task Force's next assessment report. In particular, the workshop aimed at identifying next steps that would:

- (a) Link regional and global modelling efforts to improve the assessment of intercontinental transport of air pollution;
- (b) Enable an assessment of the impact of climate change and future emission scenarios on intercontinental transport; and
- (c) Improve model evaluation and uncertainty characterization.

B. Summary of conclusions

8. The workshop participants concluded that information from the first set of multi-model experiments (study SR1-6) had been useful for the *Hemispheric Transport of Air Pollution 2007* report and that several of the findings based on the common methodology should be considered new scientific findings. The workshop recommended that efforts be made to document the experiments properly and to publish the results in scientific journals.

9. The workshop participants recommended further analysis of the multi-model experiment results, including investigation of seasonality, resolution dependence, linearity of concentration responses, sensitivities to individual precursors or components (e.g. nitrogen oxides (NO_x), volatile organic compounds (VOCs), methane (CH₄), carbonaceous particles, deposited nitrogen (N)), receptor or source analyses in specific regions (e.g. the Arctic, North Africa, South Asia/East Asia border), the role of individual pollution transport events and contributions to high concentration episodes, the impacts of different source types (e.g. particles, dust, biomass burning and anthropogenic components) and the role of stratosphere-troposphere exchange.

10. The workshop participants took note of a number of on-going efforts to evaluate model performance with observational data and recommended further such efforts. This should include repeating some experiments for other years to allow comparison and evaluation of models with intensive field campaigns, such as the International Consortium for Atmospheric Research on Transport and Transformation (ICARTT) campaign in 2004 or for Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observation (CALIPSO) in 2006. A number of concrete experiments were also suggested to allow systematic evaluation of key processes (Task Force transport study TP1x), including additional diagnostics to look at different types of aerosols. The workshop participants agreed that these diagnostic tracers should be simulated by all of the participating models in the various experiments. The workshop participants recognized the need

to coordinate these further model efforts with other multi-model initiatives like AEROCOM¹ and EUCAARI², as well as efforts to understand dry deposition processes (e.g. IGAC/Deposition of Biogeochemically Important Trace Species (DEBITS), Atmospheric Composition Change the European Network of Excellence (ACCENT)/Biosphere Atmospheric Change of Pollutants (BIAFLUX), and ESF/Volatile Organic Compounds in the Biosphere-Atmosphere System (VOCBAS)).

11. The workshop participants discussed recent efforts to assess the impacts of climate change on air quality and intercontinental transport. The participants acknowledged that existing studies suggest that climate change might decrease the importance of long-range transport, multiple years of simulation were needed to address interannual variability; available emissions scenarios were relatively similar up to 2050, making this a good target year. The participants recommended that future simulations be conducted with fully coupled chemistry-climate models capable of examining the potential for changes in transport pathways and stratospheric-tropospheric exchange. They could be coordinated with the International Geosphere.Biosphere Programme (IGBP)/IGAC – World Climate Research programme (WCRP)/SPARC Atmospheric Chemistry & Climate Initiative.³

12. The workshop participants recommended that regional models be used to improve understanding of the importance of grid resolution in estimating intercontinental transport and to explore differences in the parameterization of key processes such as vertical mixing and exchange, and convection and deposition processes. Participants recommended that such efforts be explored through existing regional frameworks, such as the Task Force on Measurements and Modelling, the Model Intercomparison study (MICS)-Asia and United States-Canada cooperation.

13. The workshop participants took note of new efforts to create reference data sets for relevant surface observations (by the Norwegian Institute for Air Research (NILU)) and aircraft observations (by the National Aeronautics and Space Administration (NASA)), and recommended that these efforts proceed in close coordination with modelling groups to define needs and formats related to model evaluation. The participants recommended that detailed

¹ <http://nansen.ipsl.jussieu.fr/AEROCOM/aerocomhome.html>

² <http://www.atm.helsinki.fi/eucaari/>

³ <http://www.igac.noaa.gov/ACandC.php>

composition observations be compiled to enable process diagnostics and source apportionment analyses.

II. FOURTH MEETING OF THE TASK FORCE ON HEMISPHERIC TRANSPORT OF AIR POLLUTION

14. The fourth meeting of the Task Force was jointly organized by the Task Force and the UNEP Global Partnership on Atmospheric Mercury Transport and Fate Research (hereafter referred to as the Mercury Partnership), as part of the Joint International Conference on Intercontinental Transport of Atmospheric Mercury and Persistent Organic Pollutants. The conference was hosted by the Italian Ministry of Environment and the Consiglio Nazionale delle Ricerche (CNR)-Institute for Atmospheric Pollution.

15. The conference was attended by approximately 100 experts. Participants came from 19 Parties to the Convention: Canada, Croatia, the Czech Republic, Denmark, the European Community, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Poland, the Russian Federation, Spain, Sweden, Switzerland, the United Kingdom and the United States. In addition, experts from China, Comoros, Japan, Nepal, Nigeria, Pakistan, South Africa and Thailand participated. Representatives from JRC, the Arctic Monitoring and Assessment Programme (AMAP), MSC-E, CCC, and the UNECE secretariat also participated.

16. Mr. N. Pirrone (Italy), Chair of Mercury Partnership, chaired the conference and, with Mr. R. Mason (United States), chaired the sessions related to mercury and the work of the Partnership. Mr. S. Dutchak (MSC-E) and Mr. I. Holoubek (Czech Republic) chaired the sessions related to persistent organic pollutants (POPs). Mr. T. Keating (United States), Co-Chair of the Task Force, chaired the business meeting of the Task Force.

A. Conference objectives

17. The specific objectives of the conference were to:

- (a) Present and discuss scientific findings and quantifications of intercontinental transport of mercury and POPs;
- (b) Review the draft assessment produced by the Mercury Partnership to inform the UNEP Governing Council's 2009 meeting;
- (c) Recommend and plan further studies for global and regional modelling of these pollutants;
- (d) Outline the mercury and POP elements of the Task Force's next assessment report;
- (e) Review progress under the Task Force's workplan and agree to the elements of the proposed work plan for 2009.

B. Summary of conclusions

18. The conference participants reviewed the draft findings of the Mercury Partnership's assessment report. The participants took note of the new information presented regarding mercury emissions from anthropogenic sources (including fossil fuel combustion, industrial and artisan smelting, coal-bed fires and waste incineration) and natural sources (including fluxes from water surfaces, snow, soil, vegetation, volcanoes and forest fires). The participants recognized the need to obtain more information about the speciation of mercury emissions from different sources and to reconcile regional emission estimates with ambient observations. The participants recommended that appropriate terminology be developed to distinguish between "new" mercury emissions from anthropogenic and natural sources and "recycling" mercury that was released at some time in the past from anthropogenic and natural sources.

19. The participants noted that chemical observations from lake sediments, ice cores and peat deposits indicated a three-fold increase in mercury deposition since pre-industrial times. The spatial and temporal coverage of observations of current mercury levels were sufficient to distinguish some regional differences and temporal trends and had helped identify some unexpected chemical processes. However, recent trends in emissions were not reproduced in the available observational evidence. The participants concluded that more long-term observations of ambient concentrations, chemical speciation and dry deposition, especially in the Southern Hemisphere and by aircraft in the free troposphere, were needed to understand the intercontinental transport of mercury better.

20. The conference participants noted the significant gaps in our understanding of the atmospheric chemistry of mercury, especially the need to identify the reaction mechanisms responsible for oxidizing elemental mercury in the gaseous, aqueous, and particle phases. Recognizing the inherent limitations of current models, the conference participants noted the results of recent multi-model experiments using regional and global models. The participants noted the large differences in the estimates of natural emissions and dry deposition rates and the resulting differences in the magnitudes of mercury deposition. However, the participants also noted the strong similarity of the predicted relative regional responses of mercury deposition to changes in regional emissions. The participants concluded that further multi-model experiments, which were designed to characterize the influence of key uncertainties in the chemistry and cycling of mercury, would be useful.

21. The participants discussed the process for finalizing the Mercury Partnership assessment and for incorporating its findings into UNEP Chemicals report to the 2009 UNEP Governing Council, referred to as the UNEP Emissions Report. The UNEP Emissions Report, which is being completed with the assistance of AMAP, is expected to build upon the Mercury

Partnership assessment, incorporating some new information including updated estimates of emissions from the intentional use of mercury in products and new global modelling results. The Mercury Partnership will pursue separate publication of their assessment by a commercial publisher.

22. The conference participants reviewed the findings related to POPs from the Task Force's second meeting in Moscow in 2006, and noted the progress that had been made since that time in working towards the Task Force's next assessment report. The participants concluded that the Task Force needed to build upon the effort under the Stockholm Convention on POPs to develop a Global Monitoring Plan, to be completed by the Conference of the Parties of the Stockholm Convention in May 2009. The participants also noted the opportunity to build upon the work of AMAP which was developing assessments to present to its ministerial meeting in April 2009.

23. The conference participants noted the growing database of observational information from passive sampling programmes, including the Global Atmospheric Passive Sampling (GAPS) network (Canada) and studies by the Research Centre for Environmental Chemistry and Ecotoxicology (RECETOX), Czech Republic and Lancaster Environment Centre, United Kingdom). These passive monitoring programmes complimented the active monitoring conducted by EMEP and national programmes, which were relatively sparse.

24. The participants noted that emissions inventories existed for some POPs for some regions, including a recent European inventory for "listed" and "candidate" POPs developed by the Dutch Research Organization TNO as well as a national and global inventory of polycyclic aromatic hydrocarbon (PAH) emissions developed by Peking University, China. The participants took note of the difficulties faced by developing countries in managing POPs and the poor quality of available information for some types of emission sources. The participants also took note of evidence for the re-emission via forest fires of POPs that were previously deposited and the subsequent transport to the Arctic. The participants concluded that emissions inventories for POPs could be improved by some targeted efforts to fill in data gaps and resolve inconsistencies with official national estimates.

25. The participants discussed the value of screening models and ranking metrics for overall persistence and long-range transport potential. The participants concluded that these methods were useful for comparing currently listed POPs with new candidate substances.

26. The participants concluded that current multi-compartmental box and spatially-resolved models of POPs transport provided useful insights regarding the relative magnitudes of long-range transport of different chemicals from different source regions as well as the influence of different transport mechanisms and chemical properties. The participants noted that the

calculation of source-receptor relationships must address the re-emission of previously deposited compounds. The participants concluded that the variability in the estimates of current models was due in part to differences in assumptions regarding land cover, emissions and physical-chemical properties, which could be minimized by further efforts to harmonize these assumptions. Comparisons between model estimates and observations could provide valuable insights related to emission sources and transport and transformation processes and should be emphasized in future work.

27. The conference participants agreed that the Task Force's efforts to assess the state of knowledge related to POPs could benefit from closer coordination with the information collection and assessment efforts under the Stockholm Convention, AMAP, the Strategic Approach to International Chemicals Management (SAICM) and the European Community's Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) regulation.

28. The participants reviewed the progress of on-going activities under the Task Force workplan, including efforts to improve emissions inventories and projections, compile relevant observational databases and perform multi-model experiments. The participants took note of related activities in South-East Asia and the Russian Federation and by indigenous groups in North America.

29. The participants discussed the structure, content and overall schedule for the Task Force's next assessment report, which would address the intercontinental transport of ozone, aerosols, nitrogen and sulphur deposition, mercury and POPs. The participants identified the need to consider impacts associated with long-range transport (and to coordinate with the Working Group on Effects) and the potential for emission mitigation for different sources in different regions of the world (and to coordinate with the Task Force on Emission Inventories and Projections and the Expert Group on Techno-Economic Issues). For ozone and aerosols, a high priority was placed on the integration of emissions, observations and modelling information to better explain trends, as well as on the extension of the multi-model experiments to look at impacts on the regional scale, simulations of observed transport events and future scenarios. A cost-effectiveness analysis of potential investments in observational capabilities was suggested to refine the monitoring recommendations in the report. For mercury, a high priority was placed on developing a unified global emissions inventory for use in multi-model experiments and the need to fund a coordinated global network of surface, aircraft and ship-based observations. For POPs, a high priority was placed on interpreting data from passive sampling networks, using inverse modelling to evaluate emissions inventories and analyse the results of multi-model experiments.

30. Taking into account the timelines for the current activities under Task Force and the timelines for related assessment efforts in other international and national forums, the participants recommended that the target completion date for the next Task Force assessment report be delayed by 6 months from December 2009 to June 2010.

31. The participants recommended that three meetings or workshops be considered for the Task Force's 2009 workplan: a workshop in St. Petersburg, Russian Federation, that would address emissions in the Eastern Europe, the Caucasus and Central Asia (EECCA) countries; a joint meeting with the Task Force on Measurements and Modelling that would address global-regional linkages; and, an authors' workshop to begin the writing of the next assessment report.

III. WORKSHOP ON ATMOSPHERIC CHEMISTRY, CLIMATE AND TRANSBOUNDARY AIR POLLUTION

32. The workshop was organized by the Task Force, in conjunction with the U.S. National Academy of Sciences Committee on the Significance of International Transport of Air Pollutants and the IGAC-SPARC Atmospheric Chemistry and Climate Initiative, on 9 to 13 June 2008 in Washington D.C. The workshop was hosted by the U.S. Environmental Protection Agency.

33. It was attended by more than 165 experts. Participants came from the following 13 Parties to the Convention: Canada, Croatia, the Czech Republic, Denmark, the European Community, France, Germany, the Netherlands, Norway, the Russian Federation, Spain, Switzerland, the United Kingdom and the United States. From outside the UNECE region, experts from Cambodia, China, India, Japan, Nigeria, Nepal and Thailand participated. Representatives of JRC, WMO, North American Commission on Environmental Cooperation (CEC), the East Asian Acid Deposition Monitoring Network (EANET), as well as EMEP's Centre for Integrated assessment Modelling (CIAM), CCC, and MSC-W also participated.

34. The workshop was chaired by Mr. T. Keating (United States), Co-Chair of the Task Force.

35. The workshop was divided into two parts. The objective of the first part was to review the state of science regarding air pollution transport across North America and the Northern Hemisphere, primarily to inform the U.S. National Academy of Sciences study on the significance of international transport of air pollutants, taking stock of the work of the Task Force and other cooperative efforts. The objective of the second part was to plan future cooperative analyses under the Task Force, and to inform the next Task Force assessment, the Atmospheric Chemistry and Climate Initiative (AC&C Initiative) and the next Intergovernmental Panel on Climate Change (IPCC) assessment.

A. Review of air pollution transport across North America and the Northern Hemisphere

36. Mr. T. Keating introduced the objectives of the three separate but overlapping activities brought together in the workshop: the Task Force, the U.S. National Academy of Sciences (NAS) study and the AC&C Initiative. Representatives of each of the U.S. agencies funding the NAS study presented their perspective on the study objectives.

37. The workshop participants reviewed the state of science with respect to the intercontinental transport of mercury, drawing upon the assessment report of the UNEP Mercury Partnership and the multi-model experiments conducted on behalf of the Task Force and the Mercury Partnership. The trans-Pacific transport of mercury, in particular, was explored through observations, emissions and modelling information, leading to conclusions that current Asian emissions were significantly underestimated and that oxidation of elemental mercury in the free troposphere was an important contributor to reactive gaseous mercury over North America. Reviewing results related to mercury impacts on terrestrial and aquatic ecosystems in the North-East United States, the participants noted the importance of local watershed and ecosystem characteristics, along with atmospheric deposition, as determinants of mercury bioaccumulation and exposure. The participants took note of ongoing efforts to design a new mercury monitoring programme in the United States and discussed the possibility of collaboration with EMEP and other monitoring programmes in other parts of the world.

38. The workshop participants discussed the scientific and policy dimensions of which compounds were defined as POPs and the challenges in selecting a small set of representative species for assessment. The participants took note of the observational evidence for POPs transport available from the Integrated Atmospheric Deposition Network around the North American Great Lakes and the recent Western Airborne Contaminants Assessment Project in the national parks of the contiguous western United States and Alaska. The participants reviewed the current abilities of different types of regional and global models, including trajectory, box and spatially-resolved multi-compartment grid models, to represent POPs transport and fate, and emphasized the importance of conveying uncertainty when model estimates were presented in a policy context.

39. The participants took note of the diverse efforts to understand and address transboundary air pollution within North America, including recent developments in Canadian air quality policy and science activities; the 2006 Megacity Initiative: Local and Global Research Observations (MILAGRO) intensive field campaign studying the pollutant outflow of Mexico City; the North American Commission on Environmental Cooperation's Sound Management of Chemicals

Program; and the air quality and environmental management programme of the Yakama Nation, a native American tribe in Washington State.

40. The participants discussed the findings of the Royal Society (United Kingdom) study entitled “Ground-level Ozone in the 21st Century,” to be released by August 2008 (<http://royalsociety.org/>), and noted the new emissions scenarios for 2050 developed for the report, as well as the emphasis on the interaction of climate change and ozone pollution and the significant effect of ground-level ozone on food security.

41. The participants reviewed the observed trends for ozone and aerosol transport into and out of North America and explored the use of satellite observations to calculate aerosol transport fluxes and surface fine particle concentrations. The participants concluded that intercontinental transport of ozone had altered the chemical environment of the North Pacific atmosphere and recognized the need to explain the observed long-term trends.

42. The participants discussed the efforts to construct an improved global emissions inventory for assessing intercontinental transport, JRC’s Emissions Database for Global Atmospheric Research (EDGAR)-hemispheric transport of air pollution (HTAP), by integrating emissions information from the national and regional scale and developing improved emission projections taking into account the evolution of technology and the implementation of air pollution controls. The participants also discussed the growing absolute and relative importance of shipping emissions and the potential influence of shipping emissions on concentration trends observed at coastal sites.

43. The participants reviewed the results of the multi-model experiments conducted under the auspices of the Task Force and the Aerosol Comparisons between Observations and Models (AEROCOM) initiative, noting the need for further study of the linearity and variability of source-receptor relationships, the coupling and intercomparison of regional and global models as well as vertical exchange and wet scavenging processes. The participants discussed the likely effects of changes in climate on the long-range transport of pollutants, concluding that future emissions changes are likely to be more important than changes in climate. The participants also discussed the relative importance of long-range transport within North America as compared to intercontinental transport, concluding that there was a need for further analysis at the sub-continental level.

44. The participants examined evidence for the impacts of long-range transport of air pollutants on human health, agriculture, climate and the Arctic. The participants acknowledged the importance of considering the effects of pollutants at global, regional and local scales, due to

the non-linearity of ozone chemistry, the non-uniform distribution of population and the sensitivities of particular ecosystems or regions.

B. Planning of future cooperative analyses

45. The workshop participants reviewed the current status of cooperative analyses and efforts under the Task Force, the objectives of the AC&C Initiative, the status and recent findings from related multi-model experiments, including AEROCOM and the Chemistry-Climate Model Validation Activity (CCMVal), as well as the status of related efforts under the IGAC programme. The participants also began to consider the revision of the 10-year EMEP Strategy. The participants agreed that future cooperative efforts should build upon the foundation created by the work to date and should stay focused on the goals of informing the next Task Force and IPCC assessments.

46. As part of AC&C Activity 1, the workshop participants specified a set of multi-decadal hindcast experiments to evaluate the performance of global chemistry-transport models in preparation for their use in future climate projections. Simulations were specified for ozone, aerosols, nearly inert tracers (e.g. chlorofluorocarbons (CFCs), sulphur hexafluoride (SF₆) and nitrous oxide (N₂O)) and methane for different time periods ranging from 1980 to the present. Recommended emissions inputs and observational datasets for comparison were identified for each set of pollutants. Some pilot simulations would be conducted with groups using their own emissions data. The main multi-model experiments for ozone, aerosols and tracers would be conducted with prescribed emissions, based in part on the hindcast emissions being prepared for IPCC and the EDGAR-HTAP project. After analysis of these initial results, further sensitivity simulations for ozone and aerosols would be conducted. Further definition of the methane hindcasts was postponed until after the ozone hindcast results were available.

47. To help understand the range of results in the multi-model experiments, the participants agreed that the Task Force's TP1x (passive tracer) experiment for 2001 was a very useful benchmark and should be conducted by as many groups as possible. The participants took note of the useful analyses that had already been conducted looking at the results of tracers with varying lifetimes. As part of AC&C Activity 2, which was focused on characterizing the processes that determined atmospheric composition in the upper troposphere, the participants recommended designing a set of additional tracer simulation experiments focused on scavenging processes (using sulphate and nitric acid tracers) and convection processes (using propane and methyl iodide). It was anticipated that these simulations would not be conducted until after the AC&C Activity 1 hindcast simulations with prescribed emissions.

48. The participants discussed the design of the ongoing Task Force Event Simulation (ES) experiments focused on simulating events observed during the ICARTT intensive field campaign examining trans-Atlantic transport in 2004. The participants agreed that it would be helpful for participating modelling groups to conduct the TP1x experiment for 2004 and the TP2 pulse experiment. The participants welcomed NASA's complementary effort to develop a reference database of aircraft campaign data (starting with the ICARTT observations) and to convene a measurements evaluation panel to provide guidance on the use of the aircraft observations. The participants encouraged the NASA project team to make the reference database and evaluation panel as inclusive as possible, bringing in data from Europe and Asia. The participants noted the wealth of information that was being gathered in 2008 through the POLARCAT field campaigns, but concluded that it was too early to begin identifying analyses that could be conducted with the data.

49. The participants discussed what additional experiments or analyses were needed to characterize the impacts of intercontinental transport on air quality. The participants agreed that more analysis of the existing Task Force Source-Receptor (SR) global simulations should be performed including a closer examination of air pollution episodes, analyses of chemical ratios and other budget terms to evaluate the ability of the models to capture processes, as well as comparisons to carefully selected regionally representative observations. Additional simulations should be performed with regional-scale models and for different or more recent years, to examine interannual variability and recent emission trends. The participants did not recommend specific approaches for partitioning the contribution of local and intercontinental sources to predicted concentrations.

50. The participants discussed what future scenarios for climate and emissions should be conducted under Task Force and AC&C Activity 4. The integrated assessment modelling community supporting IPCC was expected to produce a set of four emission scenarios (known as Reference Concentrations Pathways) by the end of the year. The participants discussed what lessons could be learned from existing emission scenarios about the likely nature of the new scenarios, and concluded that there might be significant differences between the scenarios in the air pollutant emissions, even for 2030 to 2050. The participants also examined the linearity of the model responses to emission changes in the Task Force simulations performed to date, and concluded that the model responses were sufficiently linear for modest emissions changes (up to 20%). The workshop participants agreed that it should be a high priority for the Task Force to conduct several additional SR sensitivity simulations, decreasing emissions by 20% globally. From these and the previous SR results, the effects of modest changes in emissions around the globe could be estimated. It was also suggested that a sensitivity simulation that isolated the role of shipping emissions might be useful. It was agreed that simulations of an extreme emission scenario that maximized the difference in the spatial distribution of global emissions might be

useful, but that selection of this scenario could wait until the future emission scenarios being developed for IPCC were available in autumn 2008.

51. The participants discussed the tradeoffs involved in selecting specific years for future scenarios (e.g. 2030, 2050, and 2100). It was acknowledged that the climate change signal would increase into the future. Air pollutant emissions might rise to 2030 and then might begin to decline globally as emission controls were implemented. It was recommended that some models should repeat the SR series experiments (SR1 and SR6) for a future climate, exploring how climate affects the pathways and magnitudes of transport and the sensitivity of concentrations to emission changes. It was also recommended that a limited number of additional sensitivity runs be identified to explore the role of stratosphere-troposphere exchange, natural emissions as well as other important processes under a changed climate. As part of AC&C Activity 4, it was agreed that the potential for setting up an archive for the atmospheric chemistry simulations performed for IPCC AR5 should be explored.

IV. ACTIVITES FOR THE REMAINDER OF 2008 AND DRAFT WORKPLAN FOR 2009

52. A Task Force workshop was being planned for 13 to 14 October 2008 in Hanoi, Vietnam, in conjunction with the annual EANET Scientific Advisory Committee meeting. The workshop would focus on intercontinental transport into and out of Asia and the modelling, observations and emissions efforts in the region.

53. The main activities and time schedule proposed for 2009 were:

- (a) Continue to conduct and analyze multi-model experiments to evaluate intercontinental transport;
- (b) Provide input to the development of an improved emissions inventory for assessing intercontinental transport (EDGAR-HTAP) by incorporating emission estimates developed at the national and regional level;
- (c) Provide input to the development of reference databases of observational information from surface networks, aircraft campaigns and satellites;
- (d) Support the development of an electronic information network to facilitate the integration of relevant emissions, observations and modelling information for the assessment of intercontinental transport;
- (e) Organize a workshop in St. Petersburg, Russian Federation, tentatively in February 2009, focused on emissions inventories (especially for the Russian Federation and other EECCA countries), future emission scenarios, and mercury and POPs multi-model experiments;

- (f) Organize a joint meeting with the Task Force on Measurements and Modelling in spring 2009, focusing on linkages between global and regional models and air quality and climate;
- (g) Hold a workshop in autumn 2009 focused on the preparation of the next assessment report, *Hemispheric Transport of Air Pollution 2010*;
- (h) Prepare for the 2010 assessment report on intercontinental transport of air pollution;
- (i) Continue the cooperation with the EMEP centres and individual Convention task forces, including the Task Force on Measurement and Modelling and the Task Force on Emission Inventories and Projections;
- (j) Continue outreach efforts directed at experts in countries outside the UNECE region.
