



## **Task Force on Hemispheric Transport of Air Pollution**

**2<sup>nd</sup> Meeting of the TF HTAP  
Moscow, Russian Federation  
6-8 June 2006**

Hosted by Meteorological Synthesizing Center-East

**Task Force Co-Chairs**

**Terry J. Keating**

**U.S. EPA**

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**European Commission**

**<http://www.htap.org>**

# Overview of Presentation

- Introduction to the TF HTAP
- Review of Progress to Date
  - Model Intercomparison and Evaluation Organizational Workshop, 30-31 January 2006
- Expectations for Assessment Products
  - Outline for 2007 Interim Report

# CONVENTION ON LONG-RANGE TRANSBOUNDARY AIR POLLUTION

- Adopted in 1979, the first multi-lateral agreement on air pollution
- Created a framework on which has been built eight Protocols, all in force as of May 2005.
- The Protocols have aimed to increase ambition levels in a stepwise manner.
- Day to day activities supported by a Secretariat at the UN Economic Commission for Europe
- <http://www.unece.org/env/lrtap/>



# CONVENTION ON LONG-RANGE TRANSBOUNDARY AIR POLLUTION

**49 Parties in Europe, North America and Central Asia**



# CLRTAP Organigram

**Executive Body** — **Implementation Committee**

**Working Group on Effects**

**EMEP Steering Body**

**Working Group on Strategies and Review**

- ICP Forests Task Force — Programme Coordinating Centre
- ICP Integrated Monitoring Task Force — Programme Centre
- ICP Modelling and Mapping Task Force — Coordination Center for Effects
- ICP Materials Task Force — Main Research Centre
- ICP Vegetation Task Force — Programme Centre
- ICP Waters Task Force — Programme Centre
- Task Force Health

- Task Force on Emission Inventories and Projections
- Task Force on Measurement and Modelling
- Chemical Coordinating Centre
- Meteorological Synthesizing Centre-West
- Meteorological Synthesizing Centre-East
- Task Force on Integrated Assessment Modelling
- Centre for Integrated Assessment Modelling
- Task Force on Hemispheric Transport of Air Pollution**

- Expert Group on Ammonia Abatement
- Task Force on Heavy Metals
- Network of Experts on Benefits and Economic Instruments
- Expert Group on Techno-economic Issues
- Task Force on POPs
- Expert Group on Particulate Matter



## Task Force on Hemispheric Transport of Air Pollution

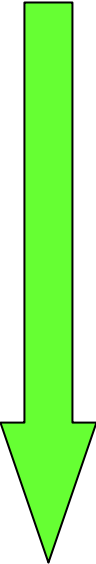
The Task Force is charged to “plan and conduct the technical work necessary to:

- develop a fuller understanding of the hemispheric transport of air pollution ...
- estimate the hemispheric transport of specific air pollutants for the use in reviews of protocols to the Convention
- prepare technical reviews thereon for submission to the Steering Body of EMEP”

# **Policy-Relevant Science Questions**

1. How does hemispheric transport affect air pollution?
2. How much do emissions in one country or region affect air pollution in another country or region?
3. How confident are we of the results and what is our best estimate of the uncertainties?
4. How will changes in emissions in one country or region affect air pollution in another country or region?
5. How may the source-receptor relationships change over the next 20 to 50 years due to changes in emissions?
6. How may the source-receptor relationships change due to climate change?
7. What efforts are needed to develop an integrated system of observation data and models?

# A Path to a 2009 Assessment

|      |              |                                                                                    | <b>Focused Workshops</b><br>Building Consensus | <b>TF Meetings</b><br>Reviewing Results,<br>Planning |
|------|--------------|------------------------------------------------------------------------------------|------------------------------------------------|------------------------------------------------------|
| 2006 | Jan          | New Research<br>& Report Writing                                                   | Model Comparison                               |                                                      |
|      | June         |                                                                                    |                                                | Arctic, Hg/POPs...                                   |
|      | Oct          |                                                                                    | Future Emissions,<br>Beijing                   |                                                      |
| 2007 | Jan          |  | Integrated Obs,<br>Geneva                      |                                                      |
|      | May-<br>June |                                                                                    | [London]                                       | Interim Report to<br>Protocol Review                 |
|      | Oct          |                                                                                    | ?                                              |                                                      |
| 2008 | Jan          |                                                                                    | ?                                              |                                                      |
|      | June         |                                                                                    |                                                | [Tropics, Climate]                                   |
|      | Oct          |                                                                                    | ?                                              |                                                      |
| 2009 | Jan          |                                                                                    | ?                                              |                                                      |
|      | June         | 1 <sup>st</sup> Assessment Report                                                  |                                                | (?)                                                  |

## **Objectives for This 2<sup>nd</sup> TF Meeting**

- Review Progress to Date
- Review Science Related to POPs and Mercury
- Initiate Discussion of Methane as an Ozone Precursor
- Discuss 2007 Interim Report to Review of Gothenburg Protocol
- Agree on Conclusions and 2007 Work Plan to be submitted to EMEP Steering Body
- Identify Topics for Future Meetings/Workshops

# **Model Intercomparison and Evaluation Organizational Workshop 30-31 January, Washington DC**

## **Objectives:**

- Develop recommendations about the methods and metrics for quantifying intercontinental source-receptor relationships
- Identify activities or analyses that will facilitate access to data and tools
- Identify specific coordinated multi-model studies that would explore important differences in model formulations and results
- Develop a plan for the identified studies and a schedule for producing new research results

A background document had prepared by a smaller group for the discussion

# **Model Intercomparison and Evaluation Organizational Workshop**

## **Outcomes:**

- Demonstrated significant interest
- Identified four sets of modelling experiments
- Identified need for cooperation on information integration tools and infrastructure.
- Began drafting outlines for 2007 interim and 2009 assessment reports.
- Continued outreach to experts from countries outside the UNECE region.

# **Model Intercomparison and Evaluation**

## **1) Decrease Regional Emissions (-20%)**

- North America, Europe, East Asia, South Asia (decrease emissions in one region at a time)
- NO<sub>x</sub>, NO<sub>x</sub>/NMVOC/CO/SO<sub>2</sub>/NH<sub>3</sub>, Hg, POPs, CH<sub>4</sub> (global mixing ratio)
- 2001 [ + 2004]
- Each group uses own emissions estimates.

## **2) Artificial Tracer Experiments**

- Based on Rn222, Pb210, CO, NO<sub>x</sub>, O<sub>3</sub>, SO<sub>2</sub>, SO<sub>4</sub>, ethane, propane, n-butane
- North America, Europe, East Asia, South Asia (simulate emissions in one region at a time)
- Emission and other input fields to be provided.

# Model Intercomparison and Evaluation

## 3) Further Detailed Experiments

- Pulsed NO<sub>x</sub> versus tagging of NO<sub>x</sub>
- Mercury
- Aerosols
- Comparison of model results to field campaigns
  - 2001: TRACE-P
  - 2004: ICARTT
- Role climate change and variability

## 4) Uncertainty in Source-Receptor Relationships

# Model Intercomparison and Evaluation

| Experiment                                                                                                                        | 2006 | 2007 | 2008 | 2009 |
|-----------------------------------------------------------------------------------------------------------------------------------|------|------|------|------|
| <b>Experiment Set 1: Delta Emission experiment</b>                                                                                |      |      |      |      |
| 1.1 Define experiment, prepare input/output                                                                                       | ■    |      |      |      |
| 1.2 Run experiments                                                                                                               |      | ■    |      |      |
| 1.3 Analyse experiment for Interim report in 2007                                                                                 |      | ■    |      |      |
| <b>INTERIM REPORT</b>                                                                                                             |      | ■    |      |      |
| <b>Experiment Set 2: Artificial Tracer experiment</b>                                                                             |      |      |      |      |
| 2.1 Define experiment, prepare input/output                                                                                       |      | ■    |      |      |
| 2.2 Run experiments                                                                                                               |      | ■    |      |      |
| 2.3 Analyse experiment for publication together with exp. 1                                                                       |      | ■    | ■    |      |
| <b>Experiment Set 3: Parallel detailed experiments for Mercury, Ozone, Aerosols, linkage to campaigns</b>                         |      |      |      |      |
| 3.1 Define experiment, prepare input/output                                                                                       |      | ■    |      |      |
| 3.2 Run experiments                                                                                                               |      | ■    | ■    |      |
| 3.3 Analyse experiment for publication                                                                                            |      | ■    | ■    |      |
| <b>Experiment Set 4: Further assessment of uncertainties in source receptor relationships including future emission scenarios</b> |      |      |      |      |
| 4.1 Define experiment, prepare input/output                                                                                       |      |      | ■    |      |
| 4.2 Run experiments                                                                                                               |      |      | ■    |      |
| 4.3 Analyse experiment for Assessment report                                                                                      |      |      | ■    |      |
| 4.4 Publish scientific results                                                                                                    |      |      |      | ■    |
| <b>TF HTAP ASSESSMENT REPORT</b>                                                                                                  |      |      |      | ■    |

## **Model Intercomparison and Evaluation**

### **Information Integration Tools & Infrastructure**

- Further Development of JRC's EuroDelta Tool
- Development of a standard naming convention for atmospheric chemistry
  - Building upon existing NetCDF/CF convention
  - See <http://wiki.esipfed.org/>
- Further discussion to be held at integrated observations workshop, Geneva, Jan 2007

# **TF HTAP Assessment Products**

## **2009 Assessment Report**

- State of knowledge concerning intercontinental transport of air pollutants in the Northern Hemisphere
- Covering all pollutants of interest under the LRTAP Convention
- Addressing identified policy-relevant science questions

## **2007 Interim Report**

- Significance of intercontinental transport of air pollutants within the Northern Hemisphere for attaining the objectives of the 1999 Gothenburg Protocol

# Objectives of the 1999 Gothenburg Protocol

To control and reduce anthropogenic air pollution emissions that cause or are likely to cause adverse effects on human health and the environment due to acidification, eutrophication and ground-level ozone as a result of long-range transport to ensure in the long term to reduce deposition **not to exceed**

- Critical loads of acidity (EMEP and Canada)
- Critical loads for nutrient nitrogen (EMEP)
- For ozone
  - Critical levels (EMEP)
  - Canada-wide ozone standards (Canada)
  - National Ambient Air Quality Standards for Ozone (U.S.A.)
- Ceilings and implementing measures (annexes)

# **Objectives of the Protocol Review**

- a review of the emission ceilings;
- a review of the adequacy of the obligations:
  - on the achievement of emission ceilings;
  - on the application of emission limit values to new and existing stationary sources;
  - on the evaluation of limit values (ELVs) for new and existing boilers and process heaters;
  - on the application of limit values for fuels and new mobile sources;
  - on the application of measures to control ammonia emissions;
  - on the application of measures to products.
- a review of the progress towards achieving the objective of the Protocol to meet the long term objective to avoid exceedance of Critical loads and levels.

# **Content of the Protocol Review**

- I. INTRODUCTION
- II. CONCENTRATION AND DEPOSITION LEVELS
- III. EFFECTS ON HUMAN HEALTH, NATURAL ECOSYSTEMS, MATERIALS AND CROPS
- IV. NATIONAL EMISSION CEILINGS
- V. EMISSION LIMIT VALUES
- VI. THE ROLE OF HEMISPHERIC TRANSPORT*
- VII. RELATION TO CLIMATE CHANGE ISSUES
- VIII. PARTICULATE MATTER
- IX. NORTH AMERICA
- X. PROGRESS TOWARDS ACHIEVING THE OBJECTIVE OF THE PROTOCOL

# *Expectations for Assessment Products*

## **Timeline for Review of the 1999 Gothenburg Protocol**

| <b>Meeting</b>                  | <b>Report tabled</b>       | <b>Deadline</b>             |
|---------------------------------|----------------------------|-----------------------------|
| • WGSR April 2006               | Preparation for review     | Early Feb 2006              |
| • TF/EG/ICP                     | Prep. for review           | Feedback by mid May 06      |
| • WGSR Sept 06<br>(WGE/EMEP SB) | Prep. for review (rev 1)   | End May 06                  |
| • EB 24 Dec 06                  | Prep. for review (rev 2)   | End Sept 06 ? Nov ? 06      |
| • WGSR April 2007               | 1st draft main report      | 3rd Feb 2007 (input Nov 06) |
| • TF/EG/ICP                     | Revised 1st draft main rpt | Feedback to secr. May 07    |
| • WGSR Sept 07                  | Final draft main report    | End May 07                  |
| – Groups                        | Draft subsidiary reports   | May/June 07                 |
| • EB25 Dec 2007                 | Main report                | End September 07            |
| – Groups                        | Subsidiary reports         | End September 07            |
| – Others                        | Unofficial report          | to Secr. Nov 2007           |

## *Expectations for Assessment Products*

# **The 2007 TF HTAP Interim Assessment Report**

0. Executive Summary
1. Introduction
2. Assessing Transport Processes (Conceptual overview)
3. Observations of Intercontinental Transport: Existing Evidence, Current Capabilities, and Future Needs
  - a. Observational Evidence of Intercontinental Transport
  - b. Current Observational Capabilities and Needs
4. Emission Inventories and Projections
5. Estimates of Intercontinental Transport from Global, Hemispheric, and Regional Models
6. Activities of the Task Force
7. Conclusions and Recommendations

## *Expectations for Assessment Products*

### **The 2007 TF HTAP Interim Assessment Report**

|                |                                                         |
|----------------|---------------------------------------------------------|
| June 2006      | List of Lead Authors                                    |
| October 2006   | Emissions Workshop (opportunity for some discussion)    |
| November 2006  | Outline of Chapters submitted to WGSR                   |
| January 2007   | Observations Workshop (opportunity for some discussion) |
| March 2007     | Drafts of Chapters to due to Co-Chairs                  |
| April 2007     | Full Draft circulated to TF                             |
| June 2007      | Full Draft discussed by TF                              |
| September 2007 | Full Draft submitted to EMEP SB and Exec Sum to WGSR    |
| December 2007  | Full Draft and Exec Sum submitted to EB                 |



## **Topics for Future Meetings and Workshops**

- Role of Tropics
- Impact of Climate Change
- Further Work on Satellite Observations
- Integrating Latest POPs and Hg into 2009 Assessment
- Uncertainty in Source-Receptor Relationships
- Role of Natural Emissions (VOC, NO<sub>x</sub>, Hg, PM)
- ...