Cooperation with international organizations - UN Environment

Global concern over mercury pollution resulted in development of the Minamata Convention on Mercury a legally-binding multilateral environmental agreement that was adopted by governments in 2013 and will enter into force in August 2017 [http://www.mercuryconvention.org/]. To support the negotiation process the United Nations Environment Programme (UN Environment) coordinated preparation of a series of Global Mercury Assessments (GMA) [*UNEP*, 2002; *AMAP/UNEP*, 2008; *AMAP/UNEP*, 2013; *AMAP/UNEP*, 2015]. EMEP participated in all the assessments sharing information on mercury pollution and coordinating activities on global scale modelling.

A new Global Mercury Assessment 2018 (GMA 2018) is now under development in accordance with the request of the UN Environment Governing Council (Decision 27/12). MSC-E takes part in the assessment coordinating work of an international group of experts focused on modelling of mercury pollution on global and regional scales. The expert group includes modelling teams from different scientific institutions of Europe and North America: Helmholtz-Zentrum Geesthacht (HZG, Germany), Institute of Atmospheric Pollution Research (CNR-IIA, Italy), Massachusetts Institute of Technology (MIT, USA), Environment and Climate Change Canada (ECCC, Canada), National Oceanic and Atmospheric Administration (NOAA, USA), Lamar University (LU, USA). The research co-ordination work of MSC-E for GMA 2018 is funded by the Arctic Monitoring and Assessment Programme as a part of a bi-lateral contract.

The part of GMA 2018 focused on assessment of mercury fate and transport in the atmosphere consists of both review of recent studies on model assessment of mercury pollution and new model estimates of mercury intercontinental transport involving an updated global inventory of mercury anthropogenic emissions. The literature survey of recent modelling studies consider various aspects of mercury pollution on global and regional scales including new findings in atmospheric chemistry and other processes governing mercury cycling in the atmosphere, estimates of mercury transport between continents and regions, evaluation of historical trends and future scenarios, and peculiarities of mercury pollution in different regions such as Europe, North America, East Asia and the polar regions.

Atmospheric chemistry plays a key role in the fate of mercury in the atmosphere defining its long-range transport potential and deposition to the ground. Despite decades of intensive studies by international scientific community, the nature and details of mercury oxidation and reduction chemistry remain very uncertain. A number of recent studies continue investigation of chemical mechanisms involving both theoretical methods [e.g. *Auzmendi-Murua et al*., 2014; *Dibble et al.,* 2012, 2014; *Jiao and Dibble*, 2015, 2017; *Dibble and Schwid*, 2016] and chemical transport models [e.g. *Kos et al.,* 2013; *Weiss-Penzias et al*., 2015; *Shah et al.,* 2016; *Travnikov et al*., 2017; *Bieser et al.,* 2017; *Horowitz et al.,* 2017]. A thorough discussion of possible oxidation and reduction mechanisms as well as associated uncertainties is given by *Ariya et al.* [2015]. Other important processes of mercury transport and fate, which include dry and wet deposition as well as air-surface exchange, were also addressed in the recent studies [*Zhang et al.,* 2012; *Wright and Zhang*, 2015; *Zhang et al.,* 2016; *Nair et al*., 2013; *Holmes et al*., 2016; *Kaulfus et al*., 2017; *Fu et al.,* 2016; *Wang et al*., 2016; *Wright et al*., 2016].

Evaluation of historical trends of Hg atmospheric concentration and deposition to other environmental media is important because it helps understanding how legacy of previous anthropogenic emissions affects the present-day Hg pollution levels and future environmental responses to expected emission

control measures. Long-term changes of mercury content in the environment since pre-industrial times were investigated in a series of studies, which applied a multi-media box model coupling the atmosphere, ocean, and terrestrial reservoirs [*Amos et al*., 2013; 2014; 2015]. More recent trends of mercury deposition over two last decades in Europe, North America and other regions were also evaluated in a number of modelling studies [*Soerensen et al.,* 2012; *Muntean et al*., 2014; *Colette et al*., 2016; *Zhang et al.,* 2016]. Future changes of Hg atmospheric concentration and deposition to the ground as a result of changes in anthropogenic emissions, land use and land cover as well as climate change were also investigated [*Lei et al.,* 2014; *Pacyna et al*,. 2016; *Zhang et al.,* 2016].

A variety of regional scale models was applied to investigate peculiarities of mercury pollution in different geographical regions. The studies were focused on evaluation of model performance, assessment of pollution levels, and combined model-measurement analysis in Europe [*Gencarelli et al.*, 2014; *Bieser et al*., 2014; 2017; *Gencarelli et al*., 2016], North America [*Myers et al*., 2013; *Megaritis et al*., 2014; *Grant et al.,* 2014; *Cohen et al*., 2016], East Asia [*Chen et al*., 2014; *Zhu et al.*, 2015; *Wang et al.*, 2016], as well as in the Arctic and Antarctica [*Fisher et al.,* 2013; *Dastoor and Durnford*, 2014; *Chen et al*., 2015; *Zhang et al*., 2015; *Dastoor et al*., 2015; *Angot et al.*, 2016].

A new multi-model study of mercury pollution on global and regional scales was initiated to support GMA 2018 with new modelling results. It will be based on updated mercury emissions inventory for 2015 that is developed within the framework of GMA 2018. The simulations program of the study was discussed and accepted by the participating modelling groups at the web conference held in June 2017. The work on the model assessment has been started and will be continued next year. Results of the study will be included to the final version of GMA 2018.

Co-operation with UN Environment broaden dissemination of the experience as well as scientific and policy oriented information generated within the Convention and improves visibility of the Convention on the international scene. On the other hand, it supports pollution assessment within EMEP by variety of data (including emission inventories and observations).

References: EMEP Status Report 2/2017