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to
Prof. Zvjezdana Bencetić Klaić
Andrija Mohorovičić Geophysical Institute,
Department of Geophysics, Faculty of Science
University of Zagreb
Horvatovac bb, 10000 Zagreb, Croatia
zklaic@gfz.hr

Membership forms
to
Prof. Carlos Borrego
IDAD - Instituto do Ambiente e Desenvolvimento,
Campus Universitário de Santiago,
3810-193 Aveiro, PORTUGAL,
E-mail: rosamfreire@ua.pt

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EURASAP GOVERNING BODIES

CONTENTS

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EDITORIAL

Dear EURASAP members,

After a long time, finally we have a new issue of the Newsletter. It seems that the members are rather reluctant to prepare their contributions to the Newsletter, and thus, time intervals between the two issues are longer and longer. Therefore, I kindly urge you to take more active role in the Newsletter preparation, and, to send your contributions.

In the current issue you can find a paper on validation of the SILAM model applied to Estonian domain using two different emission databases. A couple of future events and a list of the past events are also given.

The Newsletter Editor

Scientist's contributions

SILAM MODEL IS IMPLEMENTED IN ESTONIA

Riinu Ots, Ardi Loot and Marko Kaasik

Institute of Physics, University of Tartu, Estonia

Abstract. The SILAM model is running in Finnish Meteorological Institute (FMI) for European air quality forecasts (http://silam.fmi.fi). The 7 km resolution of both TNO-MACC emission grid and Nordic model domain is too coarse for urban and industrial areas. The Estonian modelling domain, operated jointly by the University of Tartu and Estonian Meteorological and Hydrological Institute (http://meteo.physic.ut.ee/silam, resolution 3.3 km) includes the Baltic countries and southern Finland. In this study the database of pollution sources on the territory of Estonia is refined and performance of SILAM with the new database is studied. The new database presents better spatial distribution, differences in yearly emission budgets should be looked into in further studies. Average concentrations of NO_x, SO_2 and particulate matter are reproduced rather well, NO_x underestimated slightly and particulate matter significantly. The new database shows an improvement in hourly and daily correlations, especially for urban stations.

1. NEW EMISSION DATABASE AND MODEL SETUP

This study validates air quality forecasts made with SILAM dispersion model (System for Integrated modeLling of Atmospheric composition, http://silam.fmi.fi), using two different emission databases. Firstly with TNO-MACC emissions (7 km), secondly with a newly composed emission database. Data for the new database was provided by Estonian Centre of Environmental Research and it only concerns the territory of Estonia. All emissions outside Estonia still originate from TNO-MACC database. The new (further referred as EST) emission database includes over 2000 industrial stacks and other point sources, 5000 km of streets and roads and domestic heating, based on questionnaire study (Kaasik *et al*, 2007), upscaled for entire country (Kesanurm *et al.*, 2012). Emission grid resolution is 0.5 km in urban and 1 km in rural areas.

The SILAM 5.1 applied for these runs, includes formation of secondary aerosol from inorganic gaseous precursors, but no aerosol dynamics (condensation growth, coagulation etc.). Emissions of sea salt aerosol are included. For details see (Sofiev *et al.*, 2012).

This study uses two meteodrivers – HIRLAM model run in the Estonian Meteorological and Hydrological Institute with two different resolutions (ETB-HIRLAM 3.3 km and ETA-HIRLAM 11 km – see Figure 1). 11 km meteodriver is used for boundary conditions (whole Europe, TNO-MACC emissions), 3.3 km for Estonian modelling domain (forecasts with two different emission databases).

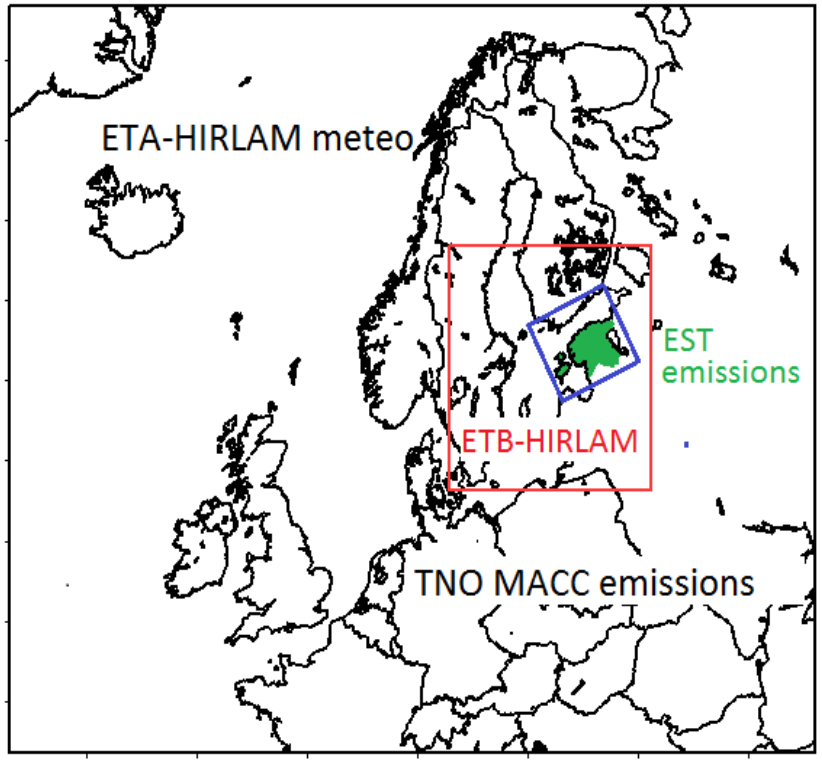

Figure 1. *Estonian (EST) modelling domain within surrounding HIRLAM meteorological field domains. TNO-MACC emssions are applied outside the borders of Estonia (green area).*

2. RESULTS

The modelled concentrations through 2011 were validated against measured ones in nine monitoring stations within Estonia:

- **Backround**: 1. Vilsandi, 2. Lahemaa, 3. Saarejärve;
- **Urban**: 4. Tartu, 5. Tallinn-Õismäe, 6. Tallinn-Liivalaia (street station), 7. Tallinn-Rahu;
- **Industrial**: 8. Kohtla-Järve, 9. Narva.

Figure 2 demonstrates the difference between two different datasets on an arbitrary time of
SILAM air quality forecast. Numbers in Figure 2 correspond to monitoring stations listed above.

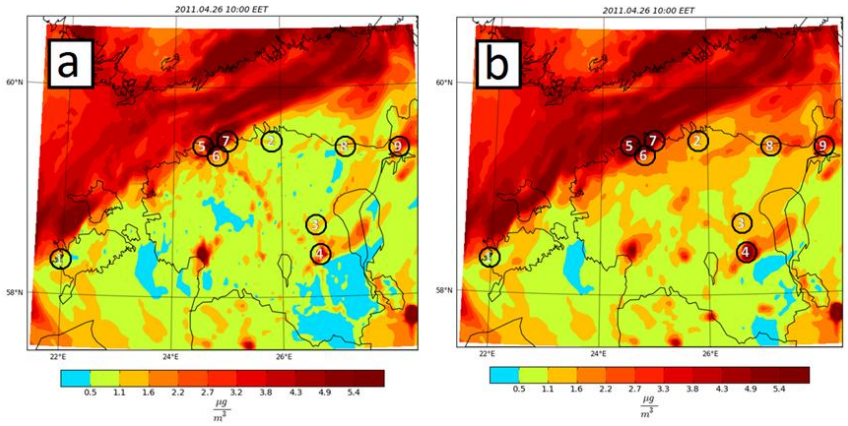

Figure 2. *NO concentrations in EST domain modelled with Estonian EST (a) and MACC (b) emission database, arbitrary time. Numbers indicate monitoring stations.*

The station-wise average concentrations are given in Figure 3. Tendency of underestimation is evident, except for SO_2 (severe underestimation in Kohtla-Järve is due to non-resolved local sources). Expected reasons are incomplete PM emission data – no SOA and soil erosion. The differences between runs with MACC and EST database are indecisively small.

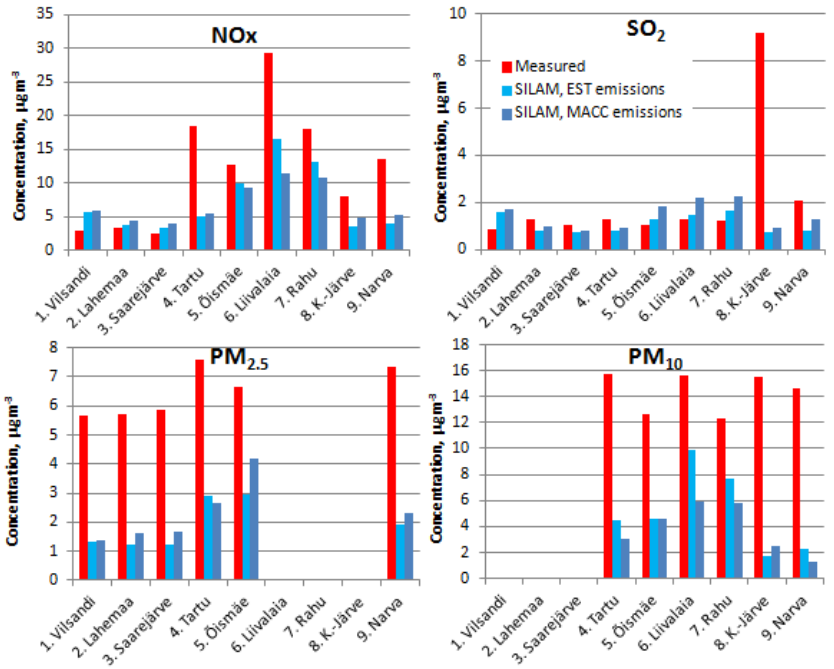

Figure 3. *Average measured and modelled concentrations. Not all stations measure both $PM_{2.5}$ and PM_{10}.*

The correlations between modelled and measured concentrations (Table 1) are slightly, but rather systematically higher with EST database. The latter performs best for urban sites – evidently due to better resolution of small urban areas. Correlations based on daily averaged values are much higher than hourly ones, because the time series include many narrow peaks: missing a peak by a few hours highly damages correlations, but prediction of possible high concentrations for given day, although not perfectly timed, would still constitute valuable decision-support information.

Table 1. *Correlation coefficients between measured and modelled concentrations. Correlations larger than 0.5 are marked in bold.*

Station	PM_{10}	$PM_{2.5}$	SO_2	NO	NO_2	NOx
MACC emissions, hourly values						
Vilsandi		0.50	0.32	0.44	0.48	0.49
Lahemaa		0.32	0.39	0.18	0.33	0.33
Saarejärve		0.42	0.29	0.30	0.33	0.35
Tartu	0.25	0.44	0.39	0.27	0.20	0.29
Õismäe	0.41	0.45	**0.53**	0.45	0.50	**0.58**
Liivalaia	0.24		0.49	**0.53**	0.40	**0.56**
Rahu	0.30		0.46	0.39	0.41	0.48
Kohtla-Järve	0.16		-0.06	0.17	0.25	0.25
Narva	0.22	0.45	0.17	0.17	0.26	0.26

Table 1. *Continuation.*

Station	PM_{10}	$PM_{2.5}$	SO_2	NO	NO_2	NOx
EST emissions, hourly values						
Vilsandi		**0.54**	0.28	0.45	0.48	0.50
Lahemaa		0.36	0.35	0.18	0.34	0.33
Saarejärve		0.44	0.29	0.27	0.30	0.31
Tartu	0.26	0.36	0.44	0.32	0.33	0.41
Õismäe	0.40	0.41	**0.53**	0.46	0.48	**0.56**
Liivalaia	0.33		**0.51**	**0.55**	0.39	**0.54**
Rahu	0.30		**0.52**	0.35	0.42	0.45
Kohtla-Järve	0.15		0.00	0.22	0.26	0.27
Narva	0.22	0.48	0.14	0.21	0.27	0.28
EST emissions, daily averages						
Vilsandi		**0.62**	0.34	**0.53**	**0.62**	**0.63**
Lahemaa		0.45	0.47	0.13	0.40	0.40
Saarejärve		**0.56**	0.44	0.09	0.36	0.37
Tartu	0.48	**0.65**	**0.54**	**0.56**	**0.61**	**0.65**
Õismäe	**0.56**	**0.56**	**0.66**	**0.77**	**0.78**	**0.87**
Liivalaia	0.44		**0.68**	**0.77**	**0.65**	**0.77**
Rahu	0.44		**0.68**	**0.58**	**0.74**	**0.73**
Kohtla-Järve	0.28		0.03	0.49	0.35	0.36
Narva	0.25	**0.58**	0.30	0.47	0.36	0.44

3. CONCLUSIONS AND OUTCOMES

- In this study a new emission database (resolution 0.5 – 1 km) for Estonia was composed. The performance of the new database with SILAM (System for Integrated modeLling of Atmospheric coMposition) model was validated against Estonian monitoring stations. SILAM air quality forecasts were also done with MACC emission database, results of two different databases were compared.

- The main advantage of Estonian emissions database, compared to the MACC database, is better performance for urban areas; no significant disdvantages in this comparision are found.

- The new database is mplemented in operational runs, which are available at web site *http://meteo.physic.ut.ee/silam*.

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Past events

THE INTERNATIONAL CONFERENCE ON ENVIRONMENTAL POLLUTION AND PUBLIC HEALTH (EPPH2012)
Shanghai, China, 17-20 May 2012

More information at http://www.icbbe.org/epph2012/.

FIFTH INTERNATIONAL SCIENTIFIC CONFERENCE ON WATER, CLIMATE AND ENVIRONMENT
Ohrid, Macedonia, 28 May - 02 June 2012

More information at http://www.balwois.com/2012/ .

PROTECTION AND RESTORATION OF THE ENVIRONMENT XI
Thessaloniki, Greece, 3 – 6 July, 2012

More information at http://www.pre11.org/.

THE 3rd CONFERENCE ON ENVIRONMENTAL POLLUTION AND PUBLIC HEALTH (CEPPH 2012)
Shanghai, China, August 10-12, 2012

More information at

www.scirp.org/conf/cepph2012/ and
www.scirp.org/conf/cepph2012/CallForPapers.aspx

Future events

4TH INTERNATIONAL WORKSHOP ON AIR QUALITY FORECASTING RESEARCH (IWAQFR)
Geneva, Switzerland, 12 – 14 December 2012

More information at
http://www.wmo.int/pages/prog/arep/gaw/IWAQFR_4.html.

15TH INTERNATIONAL CONFERENCE ON HARMONISATION WITHIN ATMOSPHERIC DISPERSION MODELLING FOR REGULATORY PURPOSES
Madrid, Spain, 6-9 May 2013

More information at www.harmo.org/harmo15.

A conference leaflet can be downloaded from:
http://titanio.lma.fi.upm.es/harmo15/sites/default/files/HARMO15_2.pdf.

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