ESTIMATION OF THE IMPACT OF DIFFERENT EMISSION SOURCES IN THE AIR QUALITY CONCENTRATIONS

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INTRODUCTION

Environmental problems are growing in complexity and scope. Local management solutions alone can no longer address many of today's problems. Awareness of the significant influence that human activities have on natural environment and ecosystems is increasing.

The air quality impact of the industrial emissions is one of the most important areas of research in the last years due to public interest of environmental issues and also from the view of industrial approach. Knowing of different air concentrations in the area where an industrial plant is located in real-time and forecasting opens new possibilities for the public, environmental authorities and industrial managers.

The project is focusing on developing an integrated software tool to assist industrial plants on assessing the air quality impact of their emissions on the surrounding areas and also to optimize the cost/effective balance and also the production processes based on the air quality forecasts (*Byun et al., 1998*).

It was developed basic modules of an air quality impact management system for Lithuanian industrial plants by taking into consideration the characteristics of these industrial plants on emissions and processes. The system is using meteorological data from satellite, MM5 (mesoscale meteorological model) and CMAQ (community multiscale air quality modelling system) and working in almost on real time and allow to take appropriate actions on industrial production to avoid the exceedences on pollution concentrations when the main reason is due to industrial activities and no other alternative method is applied.

RESULTS AND DISCUSSION

In order to confirm the applicability and reliability of the system an exemplary application to the industrial plant was performed. The system was applied for analyzing and evaluating the impact of various air quality regulations concerning technical measures for the reduction of SO_2, NO_X, and VOC emissions from the most important emission sources of the area. These legislative modulations have already been implemented or will be implemented by 2010. Apart from the "business as usual" scenario which assumes full compliance with the European legislation until the year 2010, three hypothetical situations involving 50% reduction of SO_2, NO_X, VOC emissions on top of the "business as usual" scenario were simulated. The assessment was performed for the period 1990-2010, considering the year 1990 as the base case scenario to serve as the reference for the evaluation of the proposed measures.

The maps of concentration distribution over large industrial plant for sulphur and nitrogen compounds are also were built (Figures 1 and 2). Concentration distributions of sulphur dioxide and nitrogen dioxide have been mapped for the large industrial, using recently available calculation methods. As example, the results of calculation showed that concentration distribution of nitrogen compounds lay in the range from 0.001 to 0.005 mg/m^3 with the highest values in the eastern and northeastern parts of the plant. The range of concentration distribution of sulphur dioxide was found to be from 0.003 to 0.019 mg/m^3 with the largest values in the surrounding area of the stack and in the eastern parts of the plant.

Also, the maps of exceedances of critical loads for sulphur and nitrogen compounds are were built. Critical loads of sulphur and nitrogen compounds have been mapped for forest ecosystems, using recently available calculation methods. The results of calculation showed that critical loads of nitrogen compounds lay in the range from 1.7 to 3.0 gN/m^2·yr with the lowest values in western and southeastern parts of plant. The range of critical loads of sulphur compounds was found to be from 0.9 to 1.5 gS/m^2·yr with the lowest values in southern and northeastern parts of plant. Comparison of the calculated critical loads with modelling data indicated that exceedances of critical loads of sulphur and nitrogen compounds can be as high as 1gS (or N)/m^2·yr.

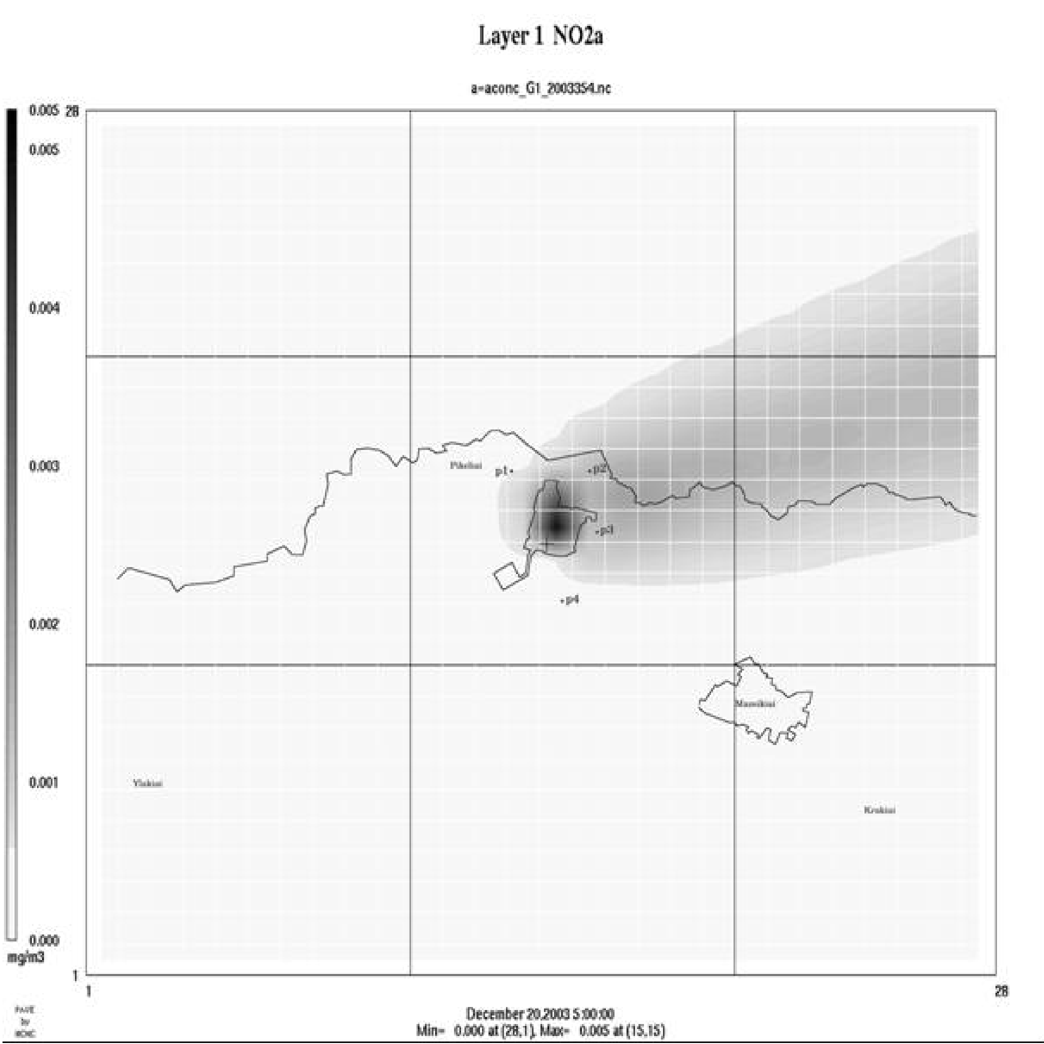

Fig. 26; The map of NO_2 concentration distribution over large industrial plant.

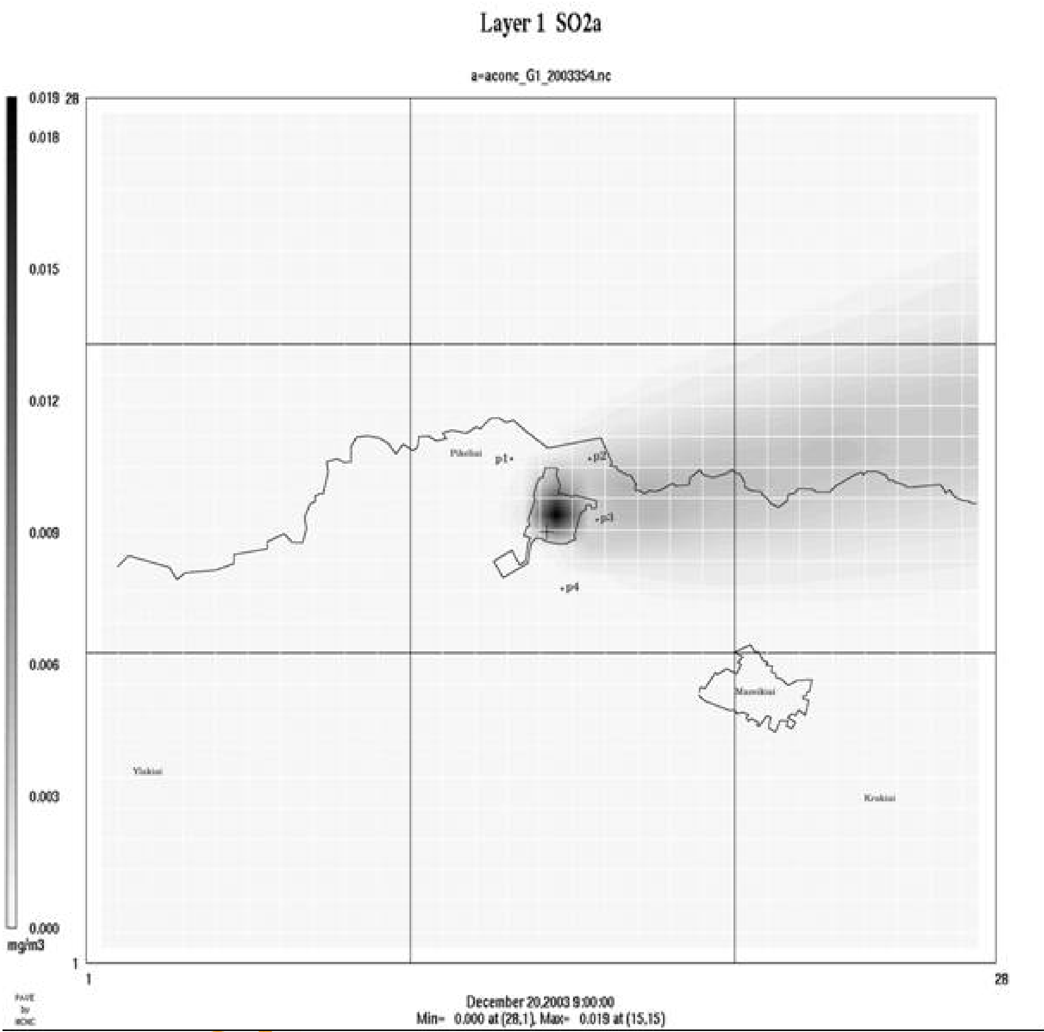

Fig. 2; The map of SO_2 concentration distribution over large industrial plant.

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