FINE-RESOLUTION MODELING OF CONCENTRATION AND DEPOSITION OF NITROGEN AND SULPHUR COMPOUNDS FOR POLAND – APPLICATION OF THE FRAME MODEL

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Abstract: The main source of spatial information on concentration and deposition of air pollutants in Poland is the continental scale EMEP model with 50 km x 50 km grid. The coarse resolution of the EMEP model may be insufficient for regional scale studies. A new proposal is the application of the national scale atmospheric transport model FRAME (Fine Resolution Atmospheric Multi-pollutant Exchange), originally developed for the United Kingdom. The model works with 5 km x 5 km spatial resolution and the air column is divided into 33 layers. FRAME was used here to assess the spatial patterns of yearly averaged air concentrations, and wet and dry deposition of sulphur and nitrogen compounds for the area of Poland. This study presents preliminary results of the modeling of the yearly average concentrations as well as dry and wet depositions of SO_x, NO_y and NH_x for Poland. FRAME results were compared with available measurements from the monitoring sites and national deposition budget with the EMEP and IMGW estimates. The results show close agreement with the measured concentrations expressed by determination coefficient close to 0.7 for both SO_2 and NO_x. The dry and wet deposition budgets for FRAME are also in close agreement with the EMEP and GIOŚ estimates. The FRAME model, despite its relatively simple meteorological parameterizations, is well suited to calculate the spatial pattern of annual average concentration and yearly deposition of atmospheric pollutants which was earlier presented for the UK and was shown in this paper for Poland. The model can also be used to analyze the impact of individual point sources or different emission sectors on spatial pattern of air concentration and deposition as well as testing the changes in deposition resulting from future emissions reduction scenarios.