Real Time Air Quality Forecasting System for a Large Industrial Facility

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Forecasts of air quality are provided using a weather forecasting model coupled with an air dispersion model. The advanced mesoscale WRF- NMM (Weather Research and Forecasting - Nonhydrostatic Mesoscale Model) is set up to provide meteorological forecasts initially over a larger domain with resolution 3 by 3 km which is subsequently nested down to a smaller domain of 1 by 1 km horizontal resolution around a copper smelter in Serbia. The refined meteorological forecast is used as input to drive the CALMET/CALPUFF modeling system to predict hour by hour concentrations of the facility's key pollutant (SO_2). CALMET/CALPUFF is the U.S. EPA's regulatory model for long-range transport and on a case by case basis is applied in complex terrain and shore-line settings. The CALMET/CALPUFF modeling system is accepted as a regulatory model for short-range applications in several jurisdictions in Canada.

The main goal of this paper is to demonstrate the good performance of the weather model in forecasting mode with fine resolution and in complex terrain, as well as the comparison of predicted SO_2 air concentrations with measurements taken at four nearby air quality ambient monitoring stations.

The forecasts of SO_2 concentrations are used by the facility to adjust the production schedule to avoid high level concentrations in the city and maximize production during favourable meteorological conditions. Since the facility is located in a valley, during stagnant meteorological conditions there is a potential for the build up of high concentrations of SO_2. With the use of this air quality forecasting system, the facility can avoid the worst meteorological situations and reduce concentrations in the populated areas.