



AIR DISPERSION MODELING IN ORDER TO ASSESS IMPACT OF POWER AND INDUSTRIAL PLANTS

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INTRODUCTION

Since 2010. University of Belgrade Faculty of Mechanical Engineering, Department of Process Engineering possesses licensed Gaussian Plume Air Dispersion Model *AERMOD View*.

Model is used for teaching purposes and preparation of environmental impact assessment studies.

Over the past few years numerous studies have been carried out for industrial and power plants.

Why AERMOD View?

- Possibility to provide input data,

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- Since 2006, USEPA approved default model,

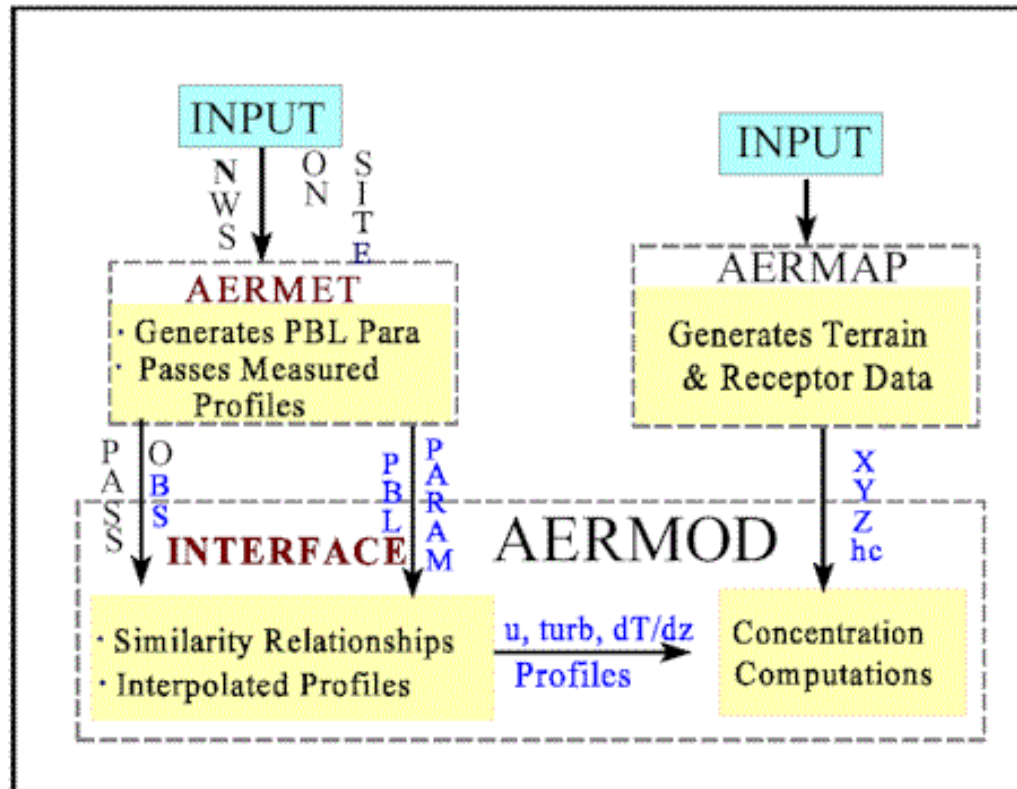
- Possibility to provide input data,
- Since 2006, USEPA approved default model,
- Integrated Graphical User Interface.

AERMOD VIEW

- Short range (less than 50 km transport) Gaussian steady state plume model.
- Possibility of modeling a number of sources of pollution, including:
 - point,
 - line,
 - surface,
 - and volume.
- Building downwash effect.



The modeling system consists of one main program (AERMOD) and two pre-processors (AERMET and AERMAP).



AERMET

The basic purpose of AERMET is to use meteorological measurements, representative of the modeling domain, to compute certain boundary layer parameters used to estimate profiles of wind, turbulence and temperature.

Two types of data:

- **Hourly Surface Data**
- **Upper Air Data**

Hourly Surface Data

<u>Hourly Surface Data</u>		<u>QA Surface Variables</u>
Hourly Surface Data File		
Format:	SAMSON	
File:	SCRAM (MET 144)	
	CD-144	
	SAMSON	
Surface Stat	HUSWO (Metric Units)	
	NCDC TD-3505	
Station ID:	NCDC TD-3280 (Fixed Block)	
	NCDC TD-3280 (Variable Block)	
Name:		

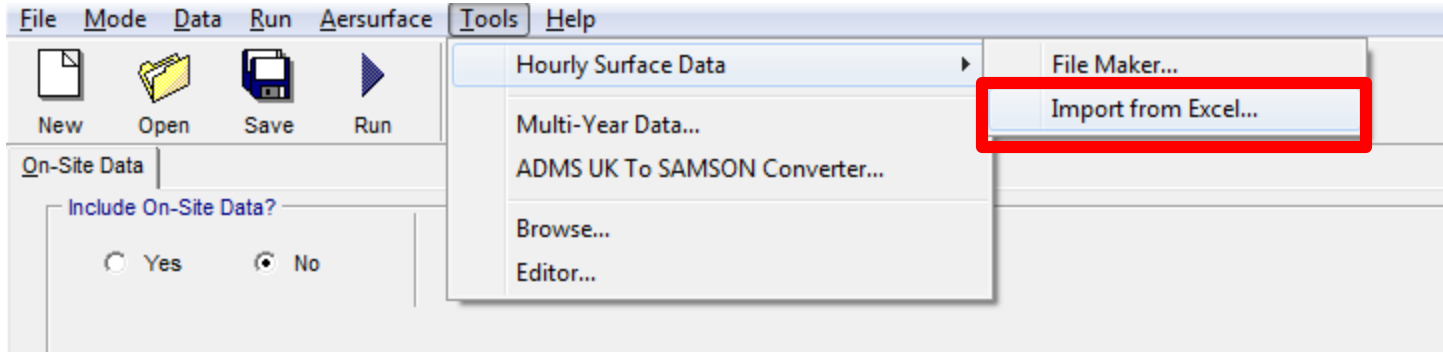
Hourly Surface Data

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None of them is available in Serbia!

Republic Hydrometeorological Service of Serbia is in charge for the collection and keeping of meteorological data. According to the Law on Ministries, adopted on March 11th, 2011, air quality monitoring within the national network of air quality stations was entrusted to the Serbian Environmental Protection Agency (SEPA) at the Ministry of Energy, Development and Environmental Protection, so meteorological data are collected as well within automatic stations for monitoring air quality.

Solution of issue

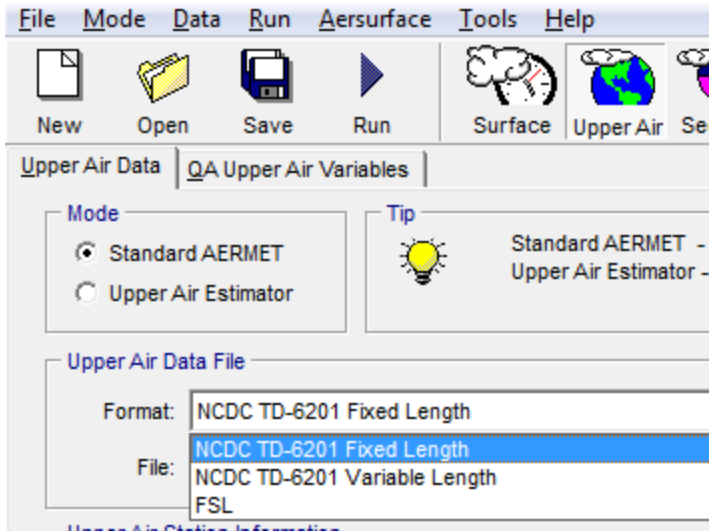


Minimum hourly surface date:

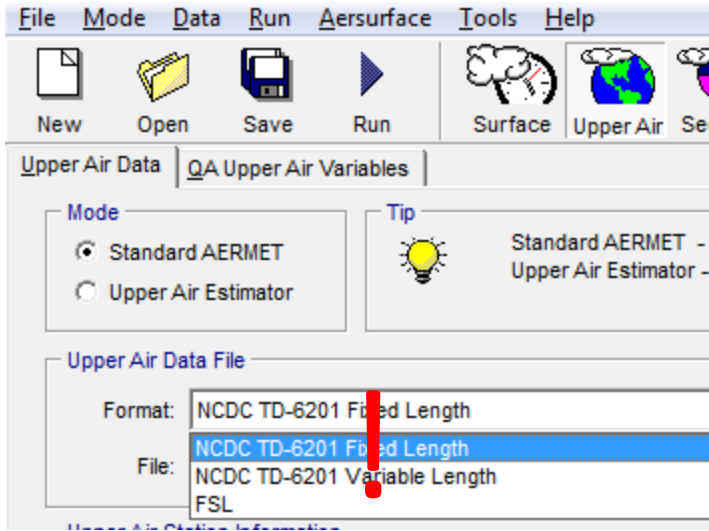
- wind speed,
- wind direction,
- ambient temperature,
- relative humidity,
- atmospheric pressure,
- cloud cover-opaque.

Output is Surface Data File in SAMSON Format.

Upper Air Data



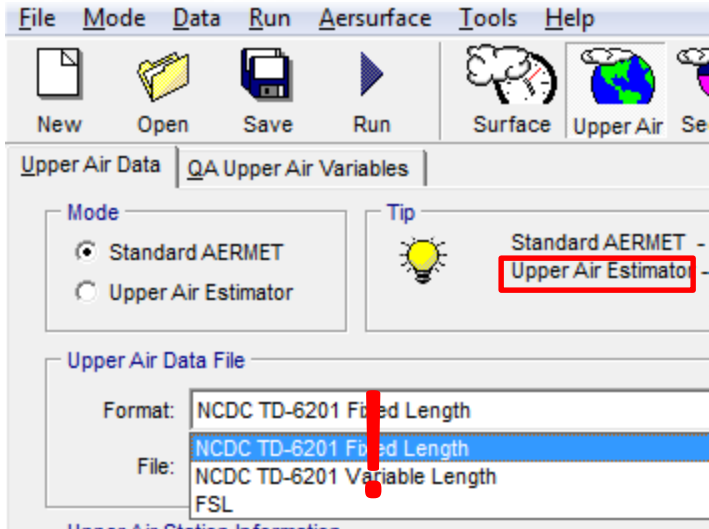
Upper Air Data



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Upper Air Data

Common borders. Common solutions.



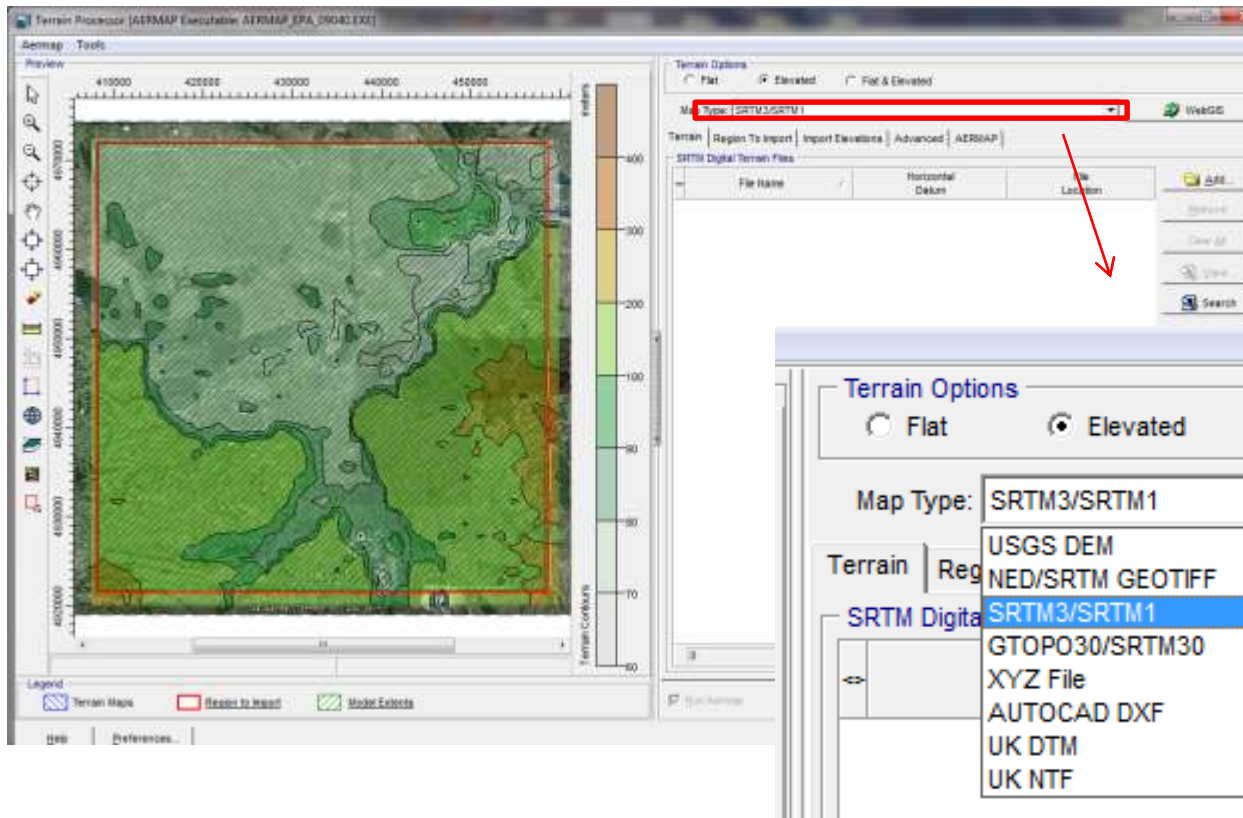
None of them is available in Serbia!

Solution of issue

Besides meteorological measurement data, it is possible to be ordered modeled meteorological data for defined time and area, but such information should be used only in case if the field data are not available.

AERMAP

Terrain preprocessor for AERMOD. AERMAP uses gridded terrain data for the modeling area to calculate a representative terrain-influence height associated with each receptor location.

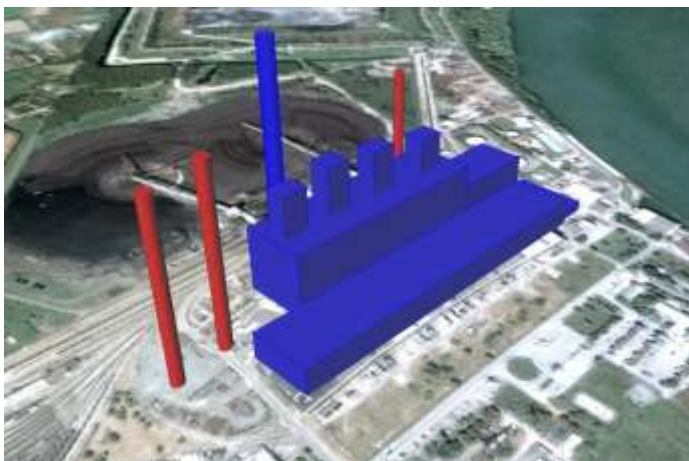


Source of pollution

- the type of pollutants,
- physical stack height,
- geographic coordinates of stack,
- diameter of the stack,
- the flow of flue gases through the stack,
- the temperature of flue gases in the stack,
- emission values of the pollutants.



RESULTS

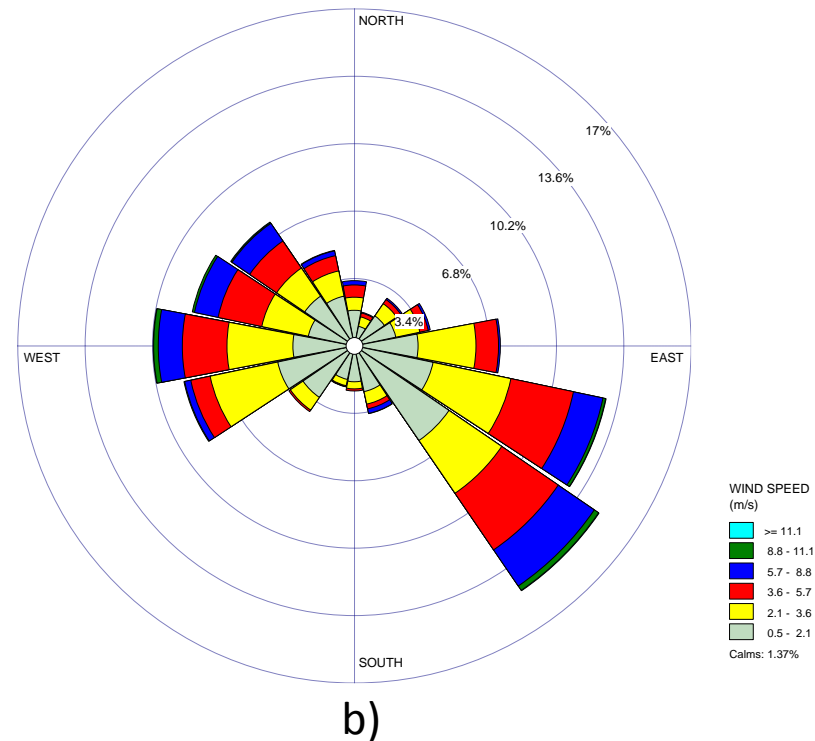
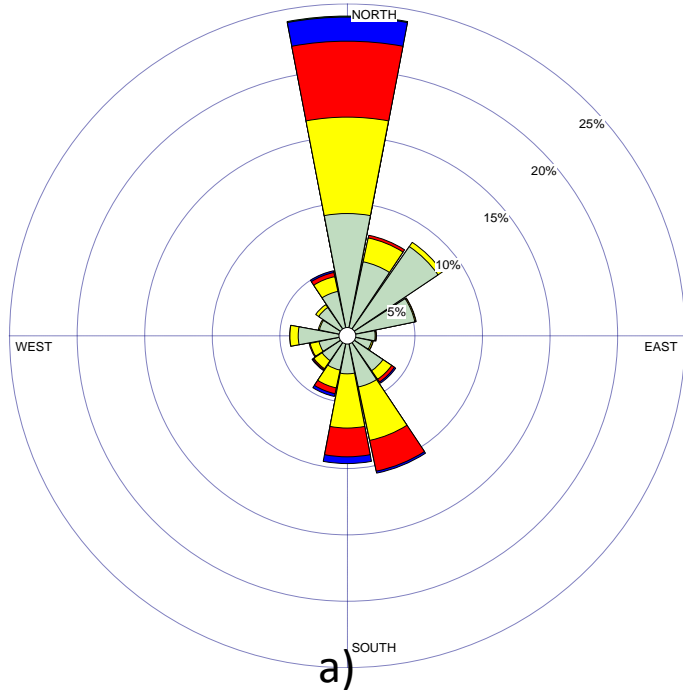


a)

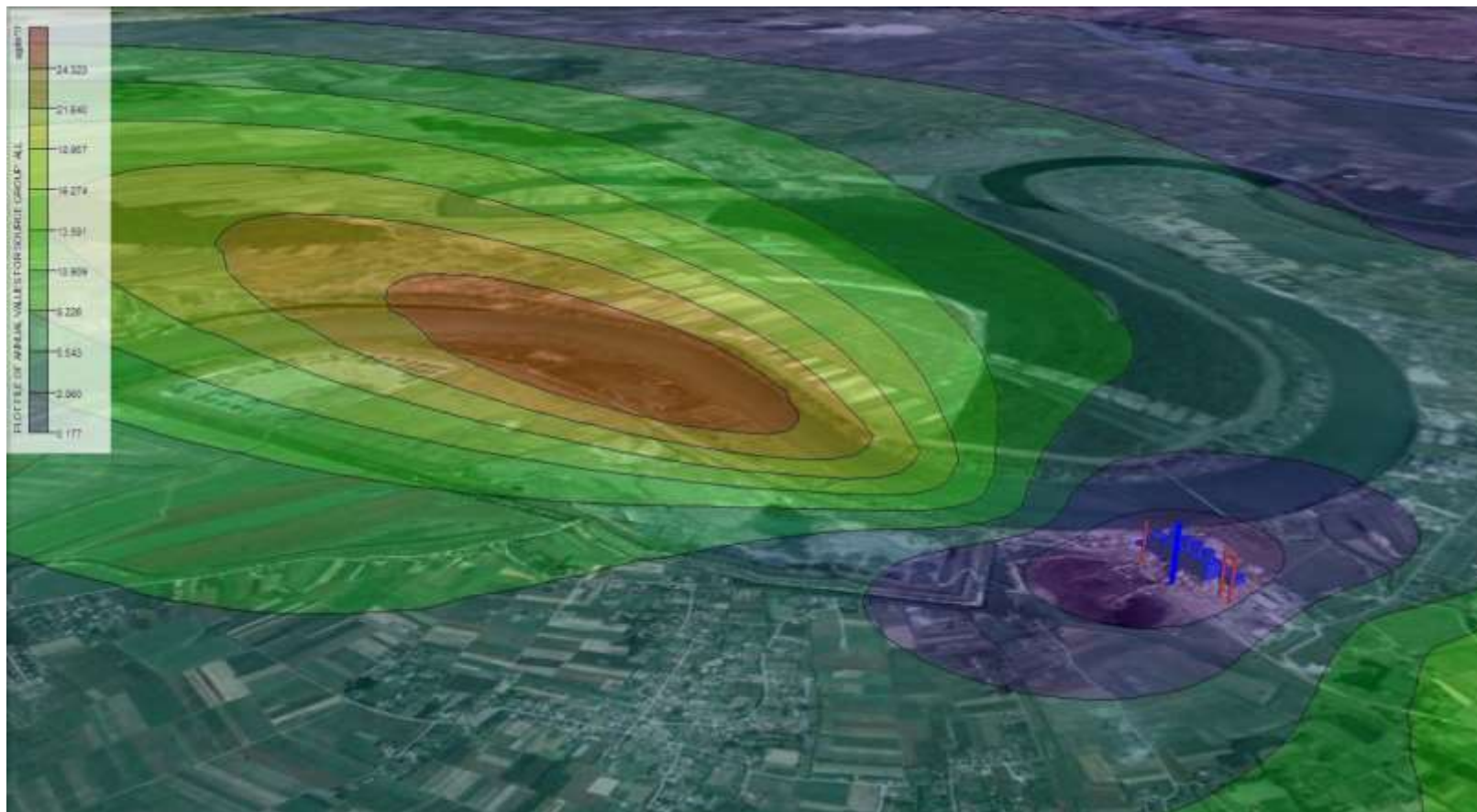


b)

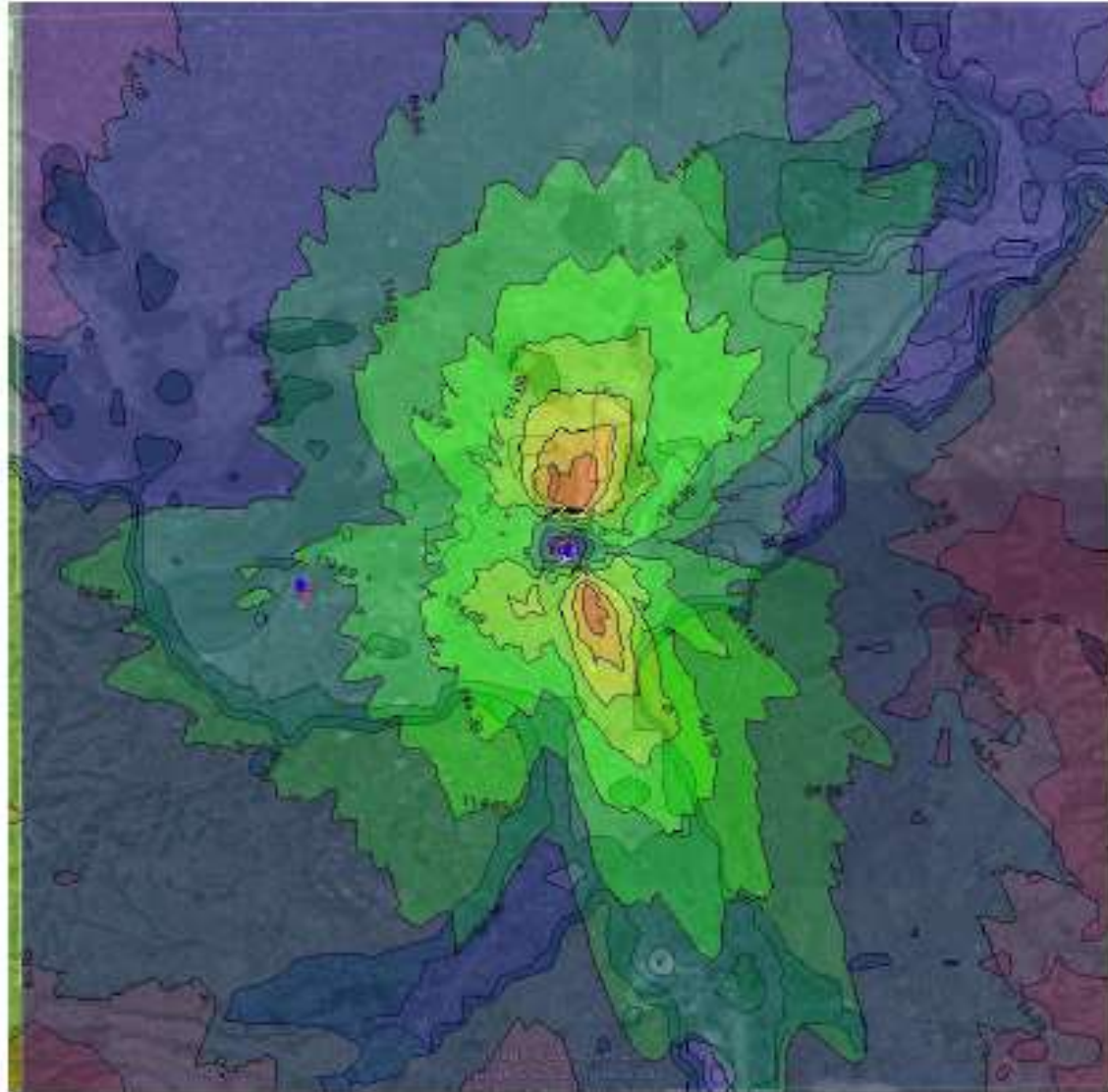
**3D models with all sources (red stacks) of a) coal power plant and
b) cement plant.**



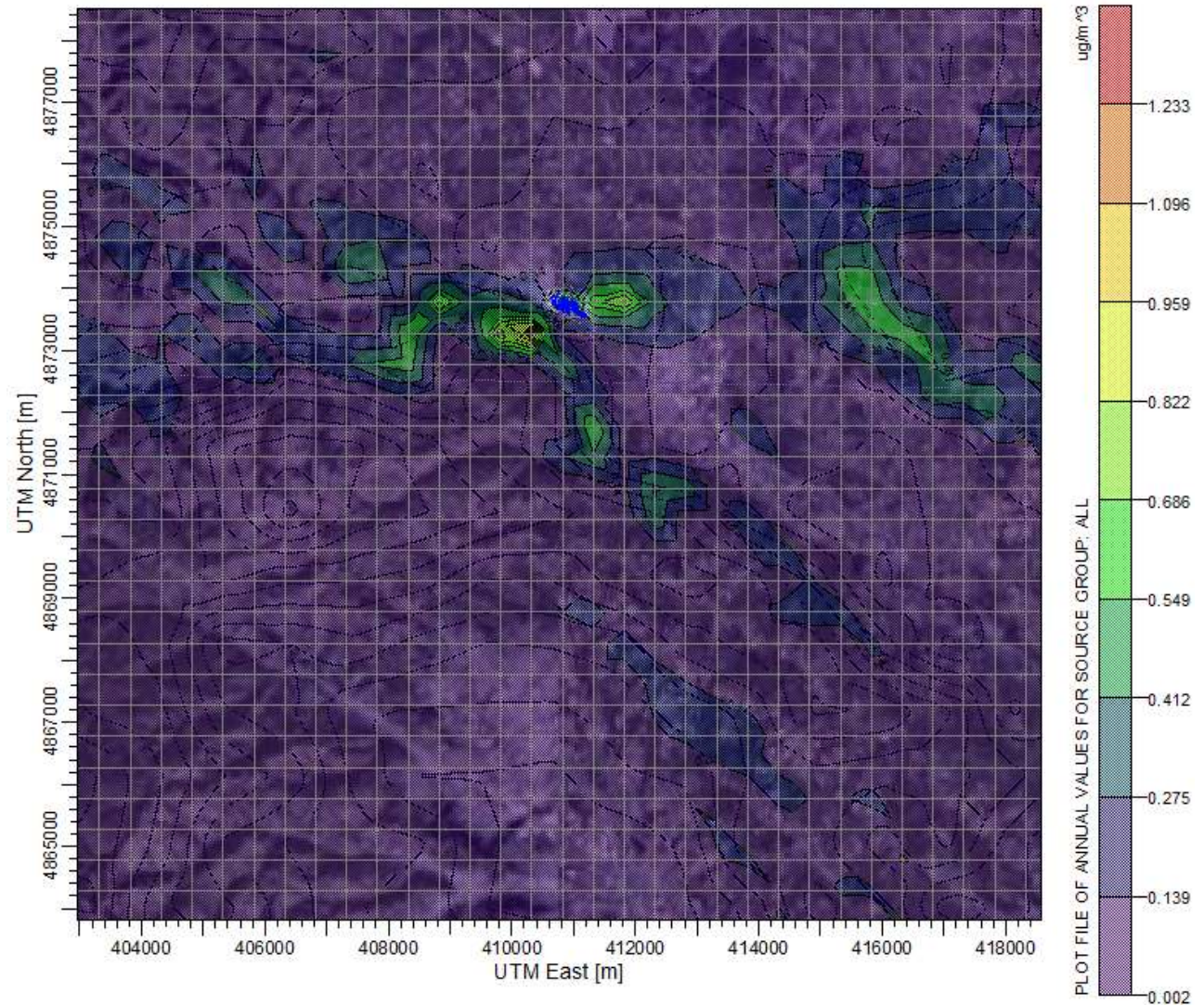
Wind roses plots and frequency analysis for location of a) coal power plant and b) cement plant in 2010.



3D plot of 2010 SO₂ of annual mean, µg m⁻³, for coal power plant.



2D plot of 2010 SO₂ 99.73 percentile of hourly means, $\mu\text{g m}^{-3}$, for coal power plant.



2D plot of 2010 CO of annual mean, $\mu\text{g m}^{-3}$, for cement plant.

Conclusions

- **Air dispersion modeling presents complex, but very important procedure and should be integral part of each environmental impact assessment studies.**
- **Presented air modeling results for coal power plant and cement plant are just example, but they shows possibilities of modeling package.**
- **Although results obtained by AERMOD are very good, better meteorological and terrain data would give even better results and enable the use of more complex models, which would provide more accurate results.**

THANK YOU FOR ATTENTION!

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