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ENVIROBANAT  
Common History, Common Future

# Modern tool to evaluate the Banat air quality. Emission dispersion (izo-concentration maps) studies with CERC ADMS5

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**ENVIROBANAT WORKSHOP**

*9 - 10 June 2014, Zrenjanin, Republic of Serbia*

*In the frame of the project*

***Sustainable development of an research center in Banat region and Danube flow area through scientific research and environmental simulation tools to asses and evaluate potential threats***

[www.envirobanat.ro](http://www.envirobanat.ro)



## **ADMS 5**

### ***World leading software for modelling industrial air pollution***

ADMS 5 is a dispersion model used to model the air quality impact of existing and proposed industrial installations. Current and future air quality can be assessed with respect to the air quality standards such as the EU Air Quality Directive and WHO guidelines.

Typical applications include:

- ✓ permitting/IPPC authorizations,
- ✓ stack height determination,
- ✓ odour modelling,
- ✓ environmental impact assessments and
- ✓ safety and emergency planning.

### ***Why choice of ADMS 5?***

ADMS 5 is a new generation Gaussian plume air dispersion model, which means that the atmospheric boundary layer properties are characterized by two parameters:

- ✓ the boundary layer depth, and
- ✓ the Monin-Obukhov length

*(rather than in terms of the single parameter Pasquill-Gifford class)*

## Why choice of ADMS 5?

	ADMS 5	AERMOD
<b>Meteorology</b>		
Meteorological pre-processor	✓	✓
<b>Dispersion</b>		
Boundary-layer structure	$h$ , $L_{MO}$ scaling	$h$ , $L_{MO}$ scaling
Plume rise	Advanced integral model	Briggs empirical expressions
Concentration distribution	Advanced Gaussian	Advanced Gaussian
<b>Complex effects</b>		
Buildings	ADMS buildings module <sup>1</sup>	PRIME buildings module <sup>1</sup>
Complex terrain	Based on calculation of flow field and turbulence field by FLOWSTAR model	Interpretation between identified representation of plume flow displacement over terrain (neutral), plume inspection (stable)
Deposition (wet and dry)	✓	✓
Chemistry	Reaction of NO with O <sub>3</sub> , photolysis of NO <sub>2</sub> , amine chemistry <sup>2</sup>	Ozone limiting or plume volume molar ratio models
<b>Other options</b>		
Modelling the effect of wind turbines on dispersion	✓	✗
Concentration fluctuations	✓	✗
Visible plumes	Condensed plume visibility	✗
Temperature and humidity	In-plume temperature and humidity output	✗
Radioactivity	Radioactive decay / $\gamma$ -ray dose; decay chain database	Simple decay
Puff model	✓	✗
Coastline module	✓	✗
Marine boundary layer	✓	✗
Input of vertical profiles of meteorological data	✓	✓

ADMS features  
contrasted with  
US-EPA model  
AERMOD

# ADMS5 case study.

ADMS 5 - F:\Lucru\Simulari\CERC\SurseBanatSerbia\200km\_all.APL

File Run! Results Utilities Help

Setup Source Meteorology Background Grids Output

Enter source data    Emissions...  
 Create groups   Geometry...

Name	Source type	Height (m)	Diameter (m)	Velocity (m/s)	Volume flux (m <sup>3</sup> /s)	Temp. (°C)	Xp (m)	Yp (m)	L1 (m)
Romag Cos 2	P	280	8.3	15.9	860.287	140	80000	-62070	1
CETSUD TM Cos1	P	165	5.04	14.5	289.28	151	-25000	-50000	1
CET SUD TM Cos 2	P	170	5.04	13.2	263.345	145	-25000	-50080	1
CET CEN TM Cos 1	P	48	2.5	15.2	74.613	125	-25270	-50700	1
CET CEN TM Cos 2	P	48	2.5	15.1	74.122	124	-25270	-50750	1
CET CEN TM Cos 3	P	48	2.5	15.4	75.595	124	-25310	-50720	1
CET Resita	P	125	5.1	17.2	351.365	143	25000	-20000	1
HIP Petrohemia C1	P	30	1.5	13.21	23.344	230	-50000	-60000	1
HIP Petrohemia C2	P	24	1.8	13.76	35.015	230	-50000	-60070	1
HIP Petrohemia C3	P	24	1.8	13.76	35.015	230	-50070	-60000	1

Time-varying source data

Source data from \*.var file    
 Emission factors from \*.fac file    
 Emission fac

Y coordinate of a p

Mir: -1.e+07 Max: 1.e+07

Emissions

CET SUD TM Cos 2

Pollutant species

New Delete

Pollutant name	Emission rate (g/s)
NOx	5.42654e+01
SO2	8.12125e+02
CO	2.23730e+01
TSP	8.61600e+00

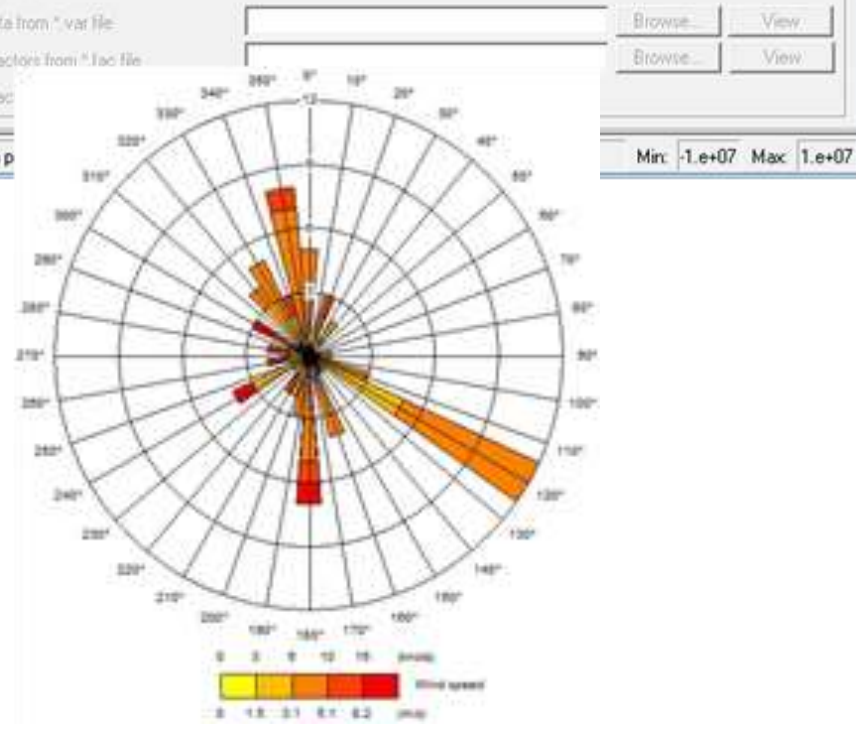
ADMSModel - [F:\Lucru\Simulari\CERC\SurseBanatSerbia\200km\_all.APL]

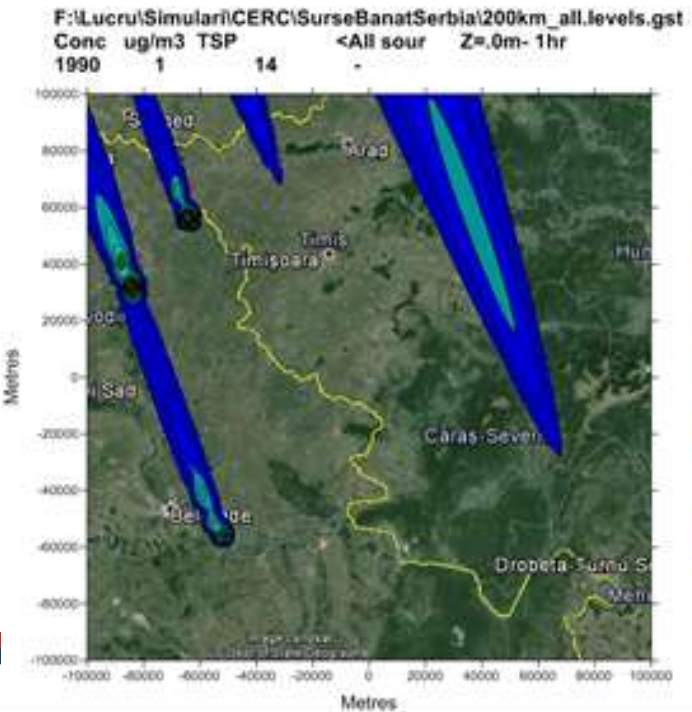
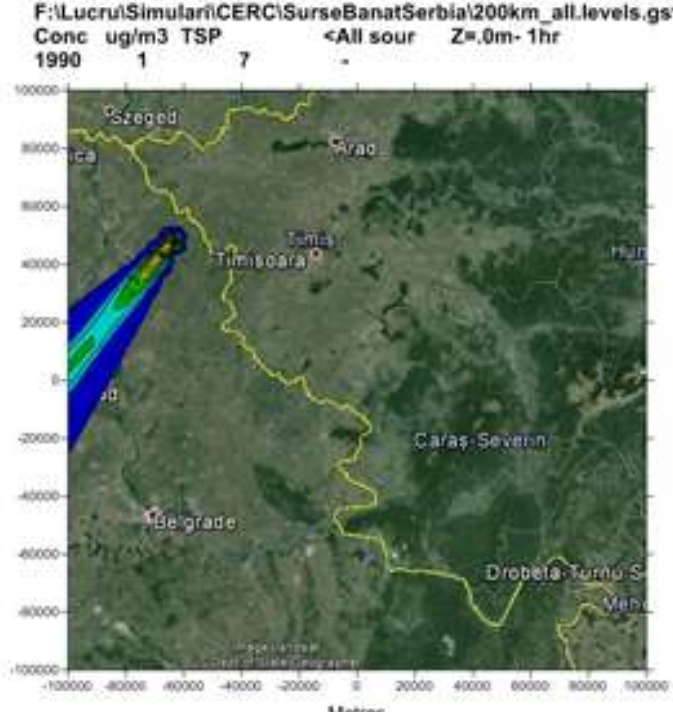
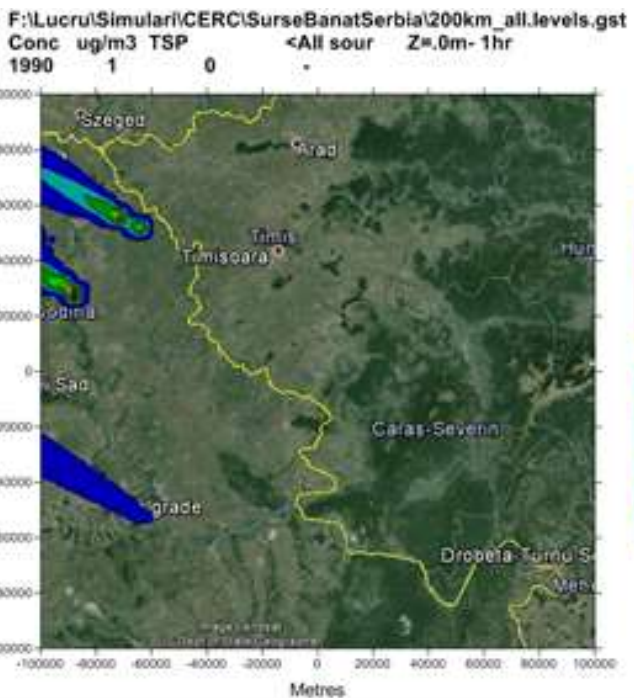
File Edit View State Window Help

```

.....
*          ADMS 5
*          Version 5.0.2.0
*          Build number 11.22
*          April 2013
*
*          Atmospheric Dispersion Modelling System
*
*          User Name:      Dr Pavlovic Milan
*          Company Name:  Univerzitet u Novom Sadu
*          Licence Number: P05-1449-R-AD500-SE
*
.....
INFO  : You have a permanent licence
INFO  : SHORT TERM CALCULATIONS:
WARNING: The met file contains an unrecognised variable name: STATION DCNN.
        The values given for this variable will be ignored
Met line 1 of 24
Met line 2 of 24
Met line 3 of 24
Met line 4 of 24
Met line 5 of 24
Met line 6 of 24
  
```

Running



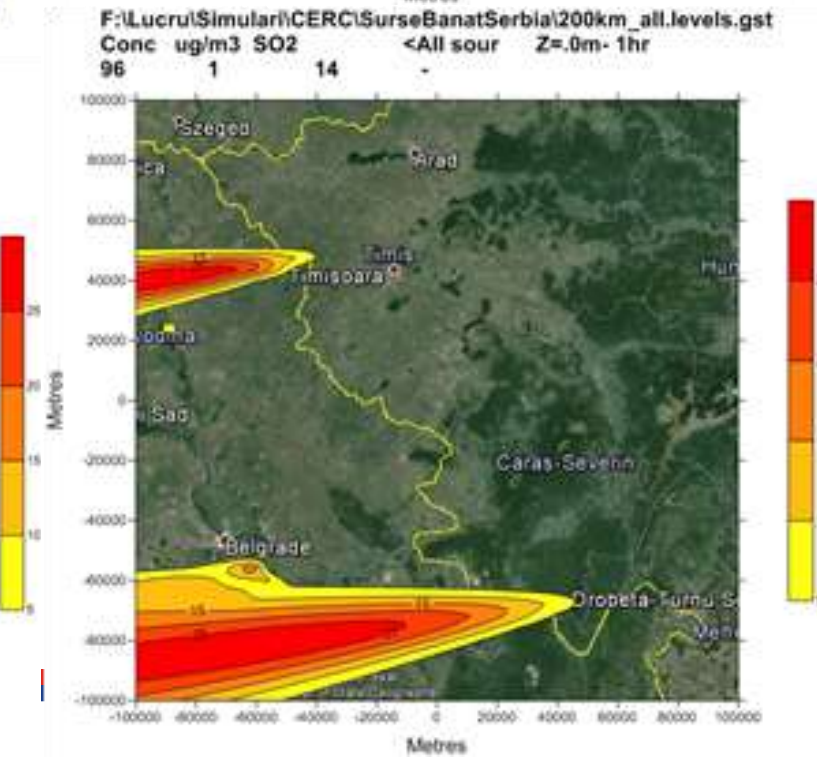
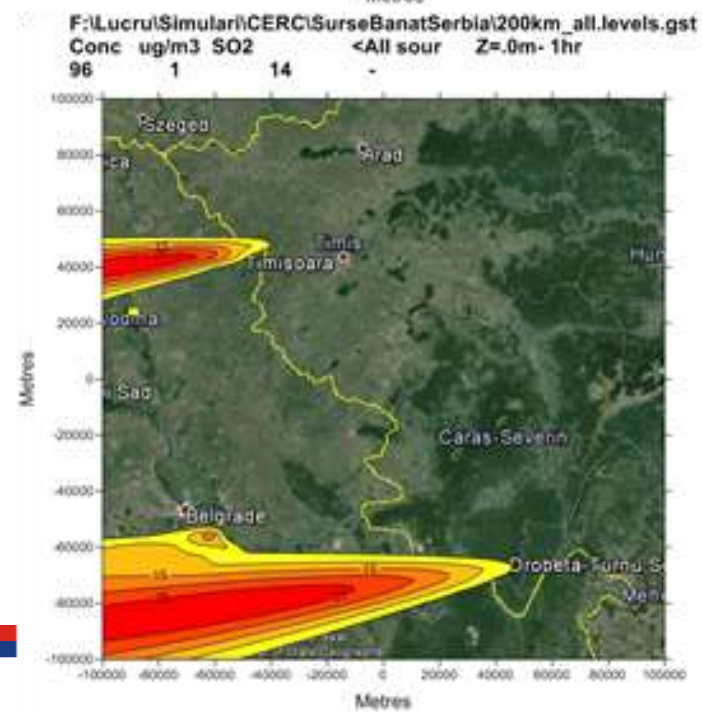
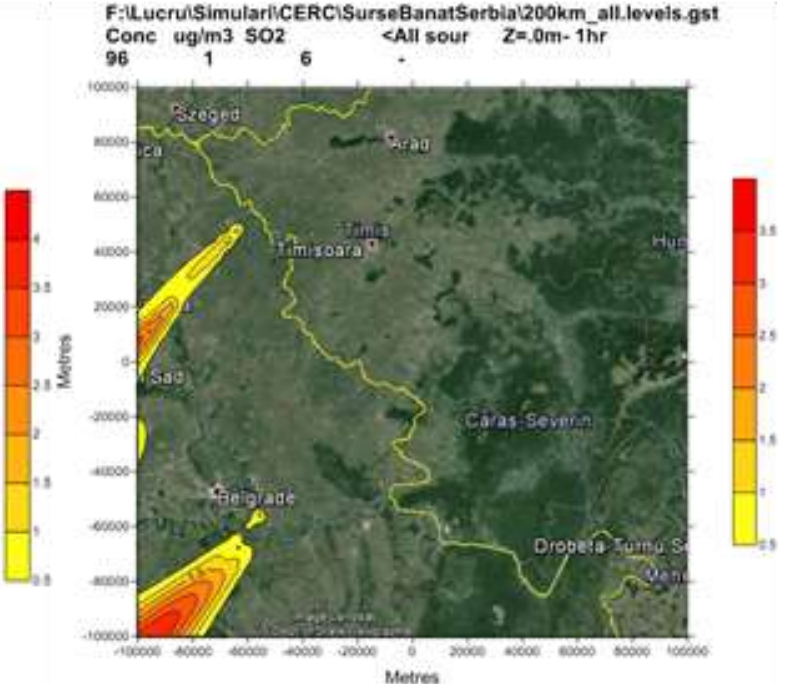
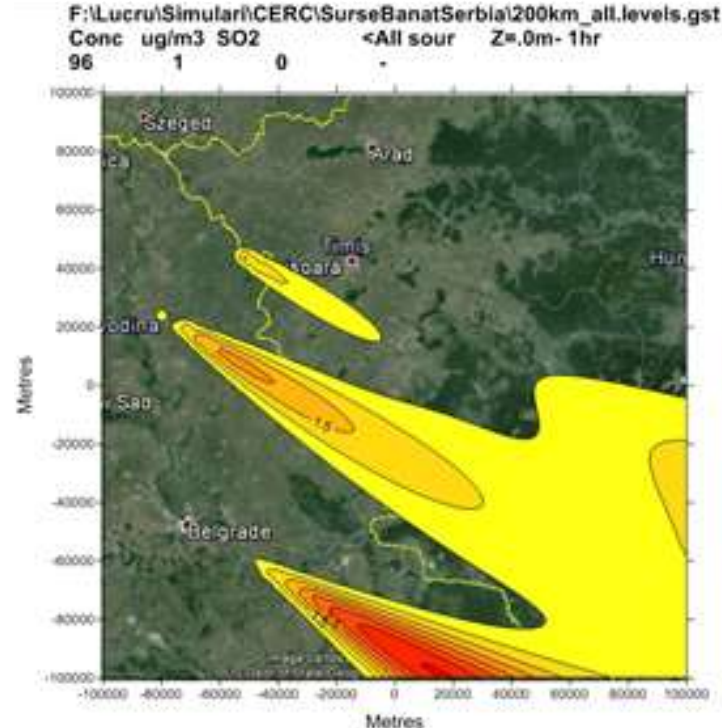


*Particles (TSP) dispersion in Banat region for several main industrial facilities*

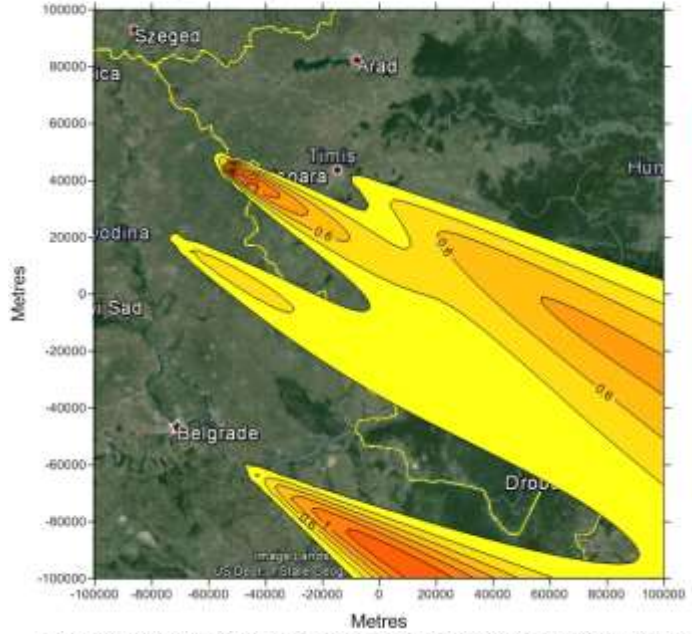
*dispersion study covered area - 40000 km<sup>2</sup>*



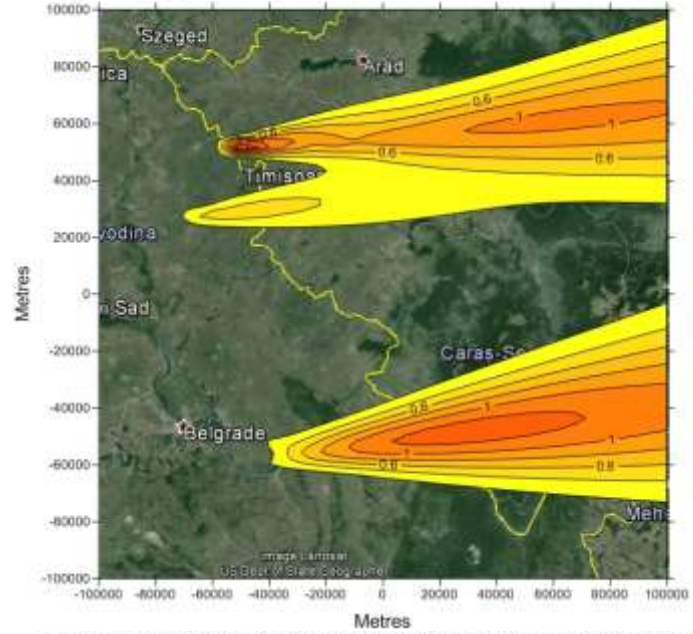
*SO<sub>2</sub> dispersion in Banat region for several main industrial facilities*



F:\Lucru\Simulari\CERC\SurseBanatSerbia\200km\_all.levels.gst  
 Conc ug/m3 NOx <All sour Z=.0m- 1hr  
 96 1 0 -



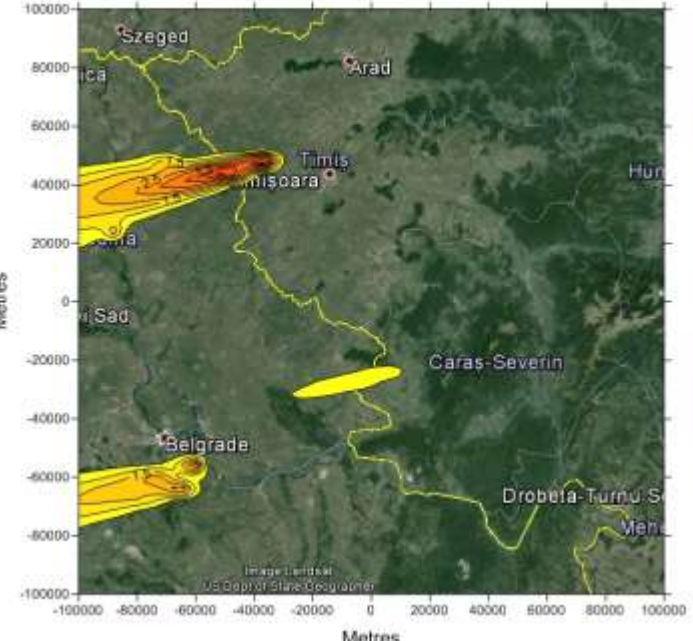
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 Conc ug/m3 NOx <All sour Z=.0m- 1hr  
 96 1 7 -



F:\Lucru\Simulari\CERC\SurseBanatSerbia\200km\_all.levels.gst  
 Conc ug/m3 NOx <All sour Z=.0m- 1hr  
 96 1 12 -



F:\Lucru\Simulari\CERC\SurseBanatSerbia\200km\_all.levels.gst  
 Conc ug/m3 NOx <All sour Z=.0m- 1hr  
 96 1 19 -



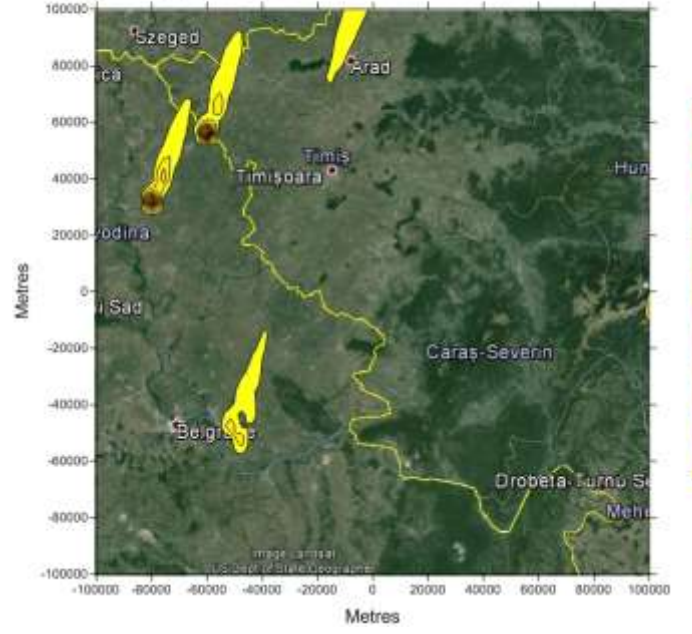
*NOx dispersion in Banat region for several main industrial facilities*



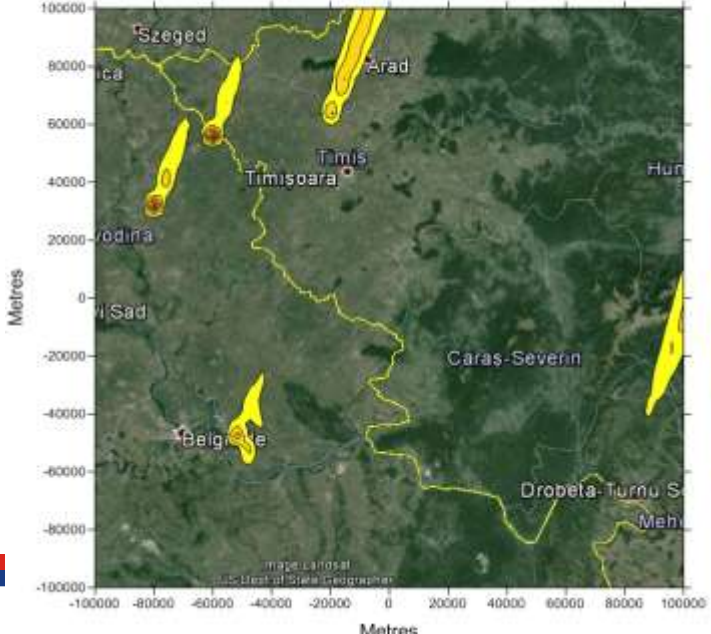
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 Conc ug/m3 TSP 5 <All sour Z=0m- 1hr



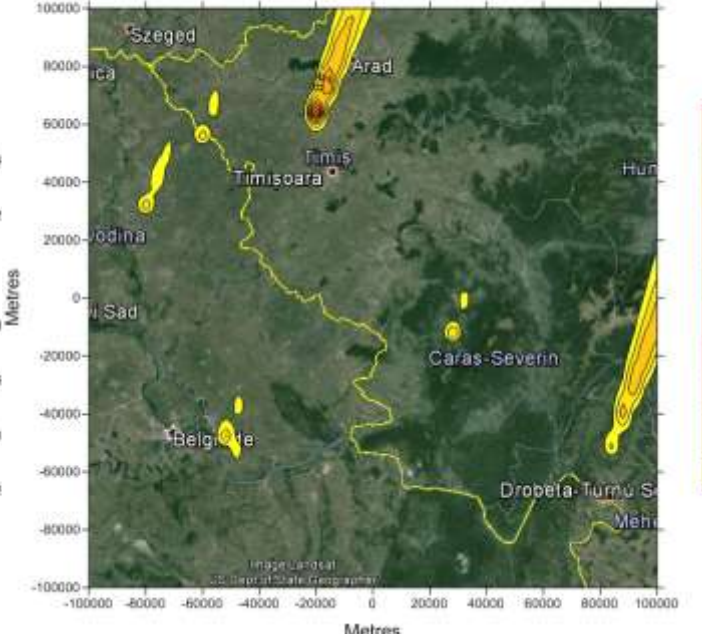
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 Conc ug/m3 TSP 5 <All sour Z=28.9m- 1hr



F:\Lucru\Simulari\CERC\SurseBanatSerbia\200km\_all.levels.gst  
 Conc ug/m3 TSP 5 <All sour Z=115.6m- 1hr



F:\Lucru\Simulari\CERC\SurseBanatSerbia\200km\_all.levels.gst  
 Conc ug/m3 TSP 5 <All sour Z=173.3m- 1hr



*NOx dispersion in Banat region for several main industrial facilities.*

*(height varying scenario)*





**More data are available to download from**  
**[envirobanat.ro/Database.php](http://envirobanat.ro/Database.php)**



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