GROUND BASED MEASUREMENTS COMPARISON WITH FORECAST AIR POLLUTION MODEL MAP3D FOR A SUBURBAN BUCHAREST AREA

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INTRODUCTION

- The health of the population from urban areas is seriously threatened by air pollution.
- European and national regulations impose the reduction of pollutants, in developing countries the level of pollution is still rising.
- Quick and effective decisions ➔ good predictive models for different pollutants.
- Identify the degree of correlation between modeled data, obtained with Map3D software, and measured data for O_3 and PM10, indicative of road traffic pollution and SO_2, related to industrial activity.

MAP3D

- Map3D is an informational system designed to forecast and detect the air pollution episodes, in order to improve the management of air quality at regional scale.

- Permanent modeling system which offers both the daily meteorological forecast at local and regional scale and the pollutants concentration (gases and particles).

- Map3D software has been implemented for the first time in an urban area near Bucharest, at INOE site in Magurele.

MAP3D

- Map3D Mesoscale Air Pollution model for Air Quality forecast.
- Map3D includes the meteorological module MM5, the atmospheric chemical module CHIMERE and the meteorological photochemistry module METPHOMOD.
- Uses the EMEP inventory sources (biogenic and anthropogenic) as emission input.
- First step - 3 days air quality forecasting over Europe, with a resolution of 50x50 km.
- Second step - 3 days air quality forecasting over Romania, with a resolution of 15x15 km.

MAP3D

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Map3D

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Pollution | Indicators | Meteo | Vertical | About

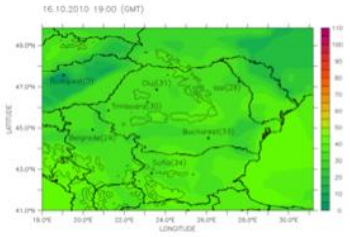
Romania

Forecast for 16 October 2010

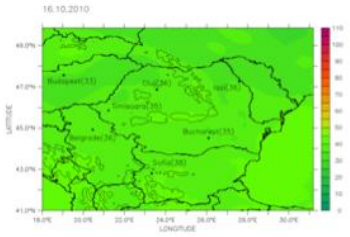
Site: Romania | Date: 16.10.2010 | Chemical species: Ozone | Standards: Europe

Hour

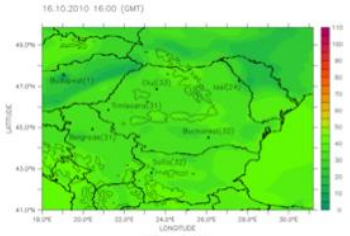
19:00



Daily maximum



Daily animation



Hourly means

	Daily (16.10)			Over 3 days (16.10-18.10)			
	min	max	hour	min	max	day	hour
Ozone [ppb]	0	45	8h	0	45	16.10	8h
NO_2 [ppb]	0	37	17h	0	37	16.10	17h

Daily means

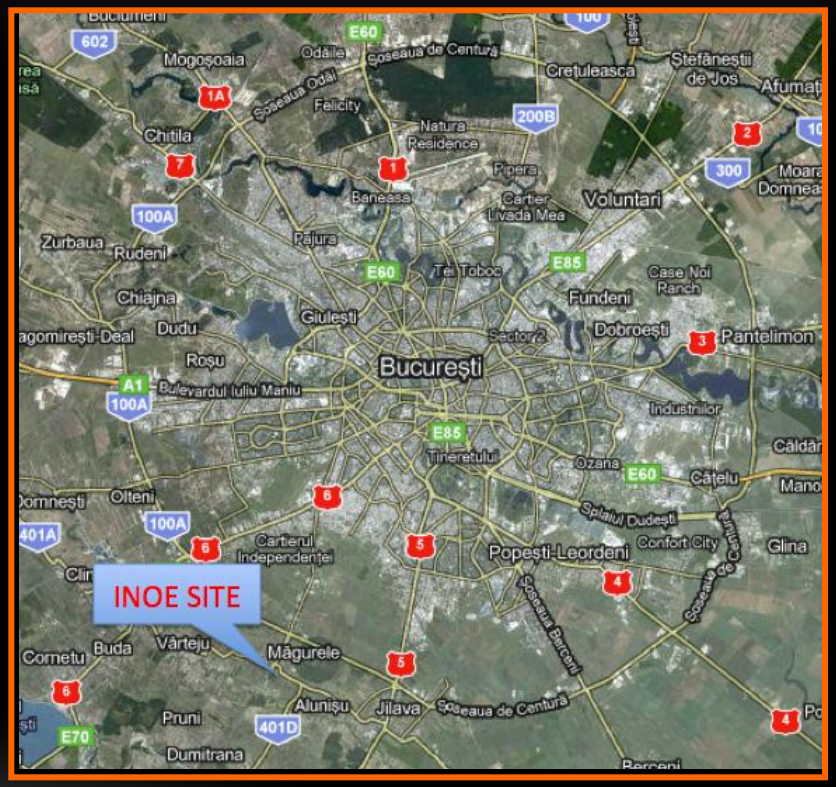
	Daily (16.10)		Over 3 days (16.10-18.10)		
	min	max	min	max	day
PM10 [$\mu g/m^3$]	2	41	1	107	17.10
PM2.5 [$\mu g/m^3$]	1	22	0	42	17.10
NO_2 [ppb]	0	21	0	21	16.10

- *Columns "day" and "hour" give the time when the maximum is reached.*
- *Overpassing concentrations are highlighted in red.*

- *Daily maximum is computed for each cell.*

METHODOLOGY

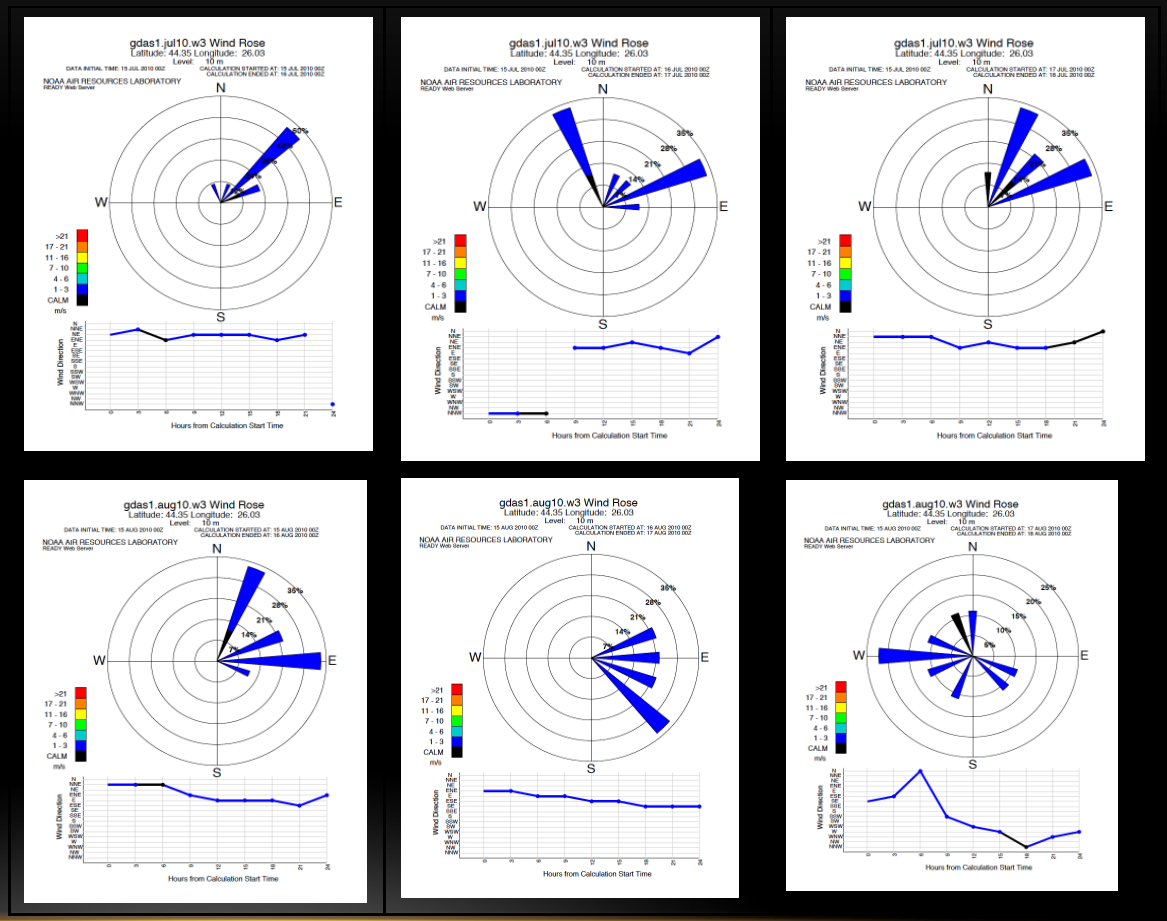
- 15 - 17 July 2010 for PM10 measurements
- 15 - 17 August for O_3 and SO_2 measurements
- INOE site in Magurele
- O_3 - Horiba point monitor based on ozone UV absorbtion at 253.7nm; resolution of ± 1ppb
- SO_2 - Horiba point monitor based on SO_2 UV fluorescence in the range of 220-240 nm; resolution of ±0.5 ppb
- PM10 particles - optical particle counter, TSI DustTrak, based on 90° light scattering; resolution of ± 0.001mg/m^3



Introduction	Methodology	Results	Conclusions

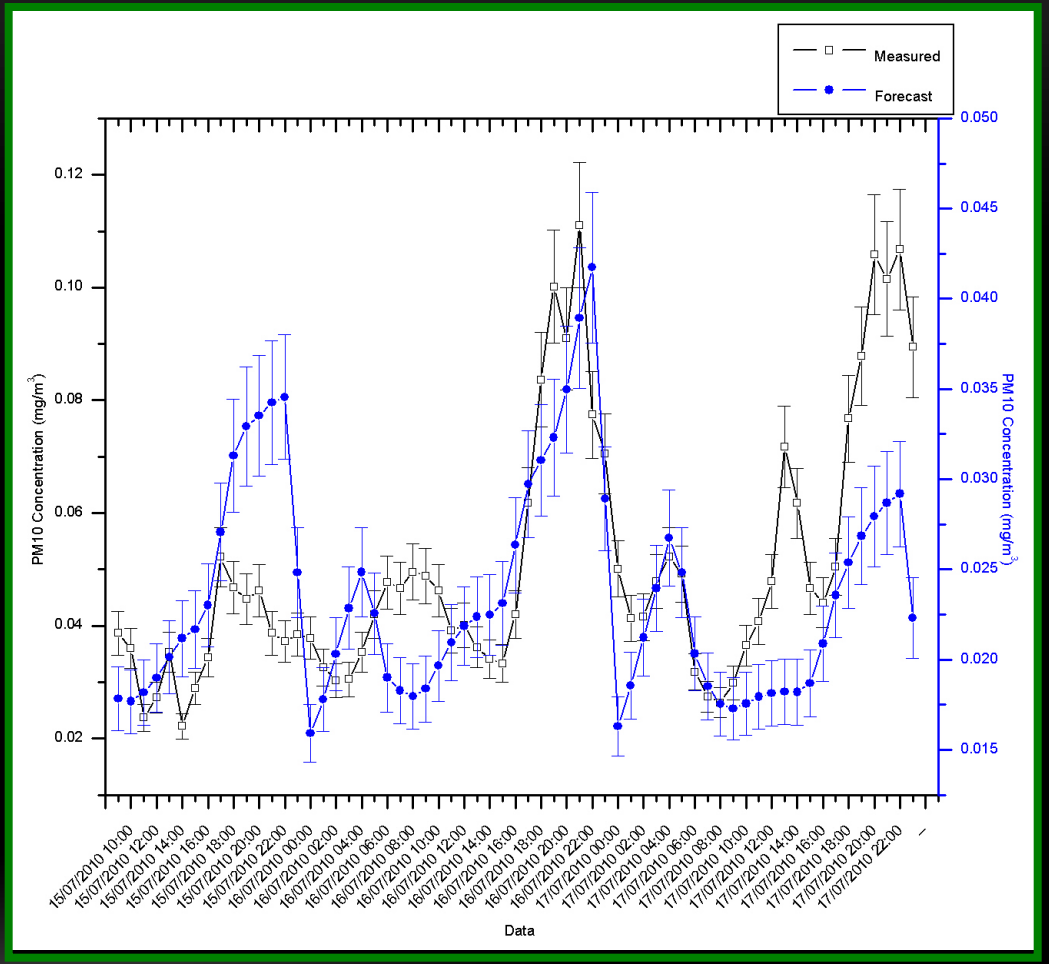
RESULTS

- No precipitation and average daytime temperatures of 30^0 C.
- First period, 15 – 17 July, the wind direction was mostly from Bucharest to the INOE site.
- In the second period the wind direction was inconstant.
- Wind speeds between 1 – 3 m/s, above the calm wind level.
- Windroses provided by NOAA Air Resources Laboratory.



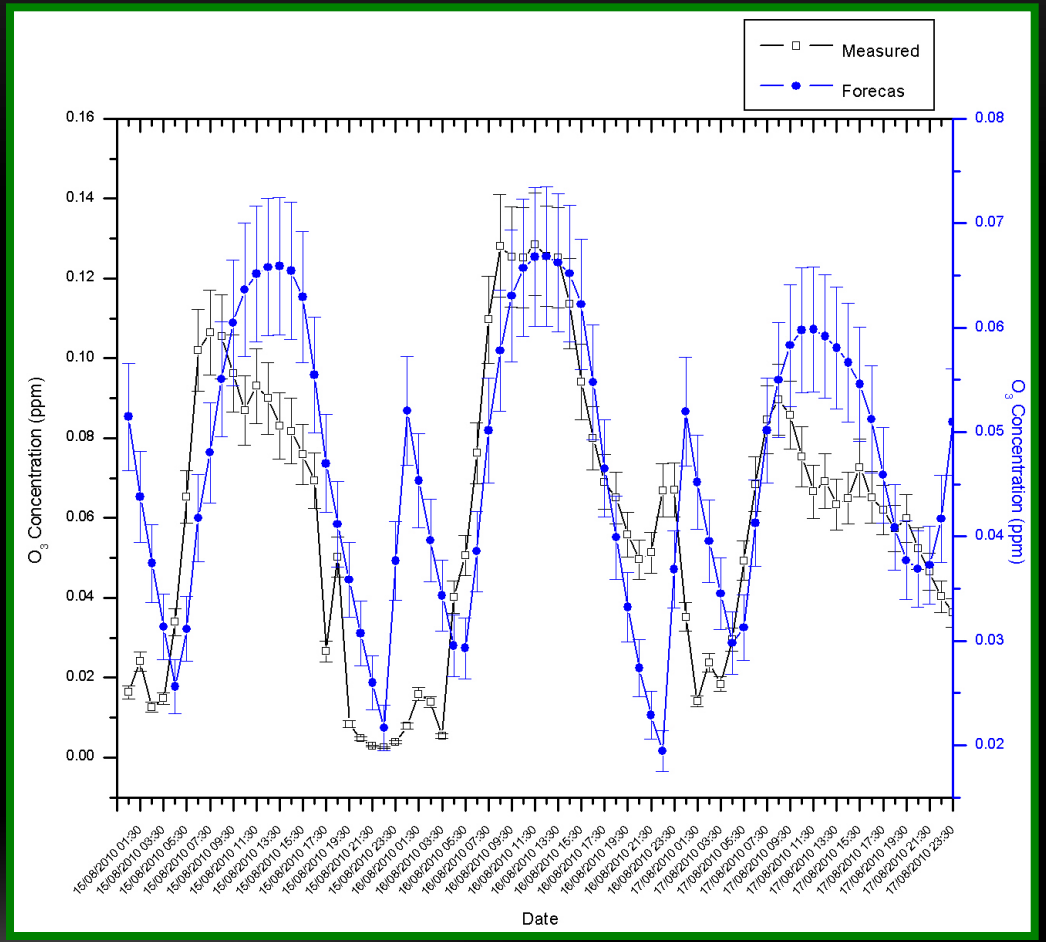
PM_{10}

- Values 3 times higher then the threshold value imposed by the EU regulation.
- Daily variation - higher values during the evening compared to morning hours.
- PM10 values reflect the city activity – wind direction.
- PM10 diurnal levels correlated with the increase in traffic circulation and city activities , and number of leisure and outdoor activities in the evening.
- Correlation coefficient between measured and modeled data - **0.6**



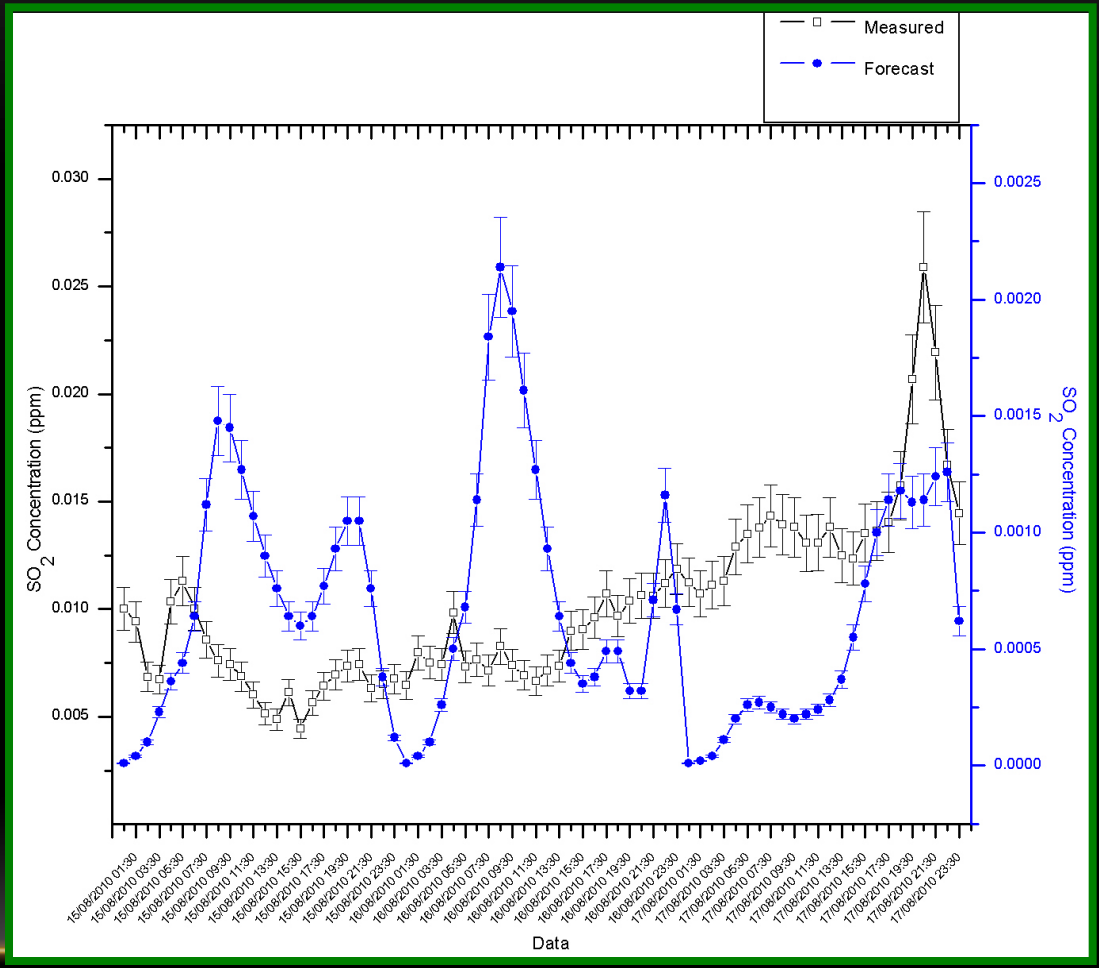
O_3

- Values exceed the threshold value imposed by EU regulation.
- Daily variation with higher values during the day compared to night values.
- Ozone formed through photochemical reactions ➔ the highest concentrations have appeared during the noon, reaching maximum levels between 11 am and 3 pm.
- Concentration peaks during the night - attributed to regional sources.
- Correlation coefficient of 0.7 for modeled and measured data.



SO_2

- Very little variation in data, slightly higher values being recorded towards the last day compared to the other days.
- SO_2 values were under the threshold imposed by EU regulation.
- Modeled and measured data for SO_2 showed no correlation.
- Presence of regional sources which have not been taken into account by the Map3D prediction model.



CONCLUSIONS

- Modeled and measured data has revealed very good agreements for PM10 and O3.
- No correlation for SO_2, caused by the fact that the Map3D system does not take into account the local sources.
- PM10 and ozone concentration exceeded the level established by the EU standards.
- PM10 also correlated with traffic circulation and Bucharest activity.
- A daily variation was seen with high values during the evening, which dropped at midnight.
- Further studies are needed.