



COMPILATION OF EMISSIONS INVENTORY FOR THE CITY OF ISTANBUL AND VERIFICATION VIA AIR QUALITY MODEL

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INTRODUCTION

Istanbul :

- Turkey's most populous city, 12.6 million population
- Center of Turkish economy
- Has 16 % of national employment
- Makes 42 % of national tax revenue
- Generates 27 % of Turkey's GDP
- Contributes 38% of total industrial output, more than 50% of services

Air Pollution in Istanbul:

Istanbul faces air pollution problem, especially PM.

Istanbul is exposed to aerosol from :

- Local Sources
 - Anthropogenic (city and surrounding regions)
 - Natural (forests of Istanbul)
- Long-Range Sources
 - Anthropogenic (Europe)
 - Natural (Sahara)

Air Quality Stations in Istanbul:

- 10 air quality stations
- CO, SO₂, NO_x, PM10, O₃ and HCs are being measured for the last 10 years
- O₃ is below 30 µg/m³ between years 1998-2008, over all the stations.

METHODOLOGY

Emission Inventory:

- High spatially and temporally resolved emission inventory
- Anthropogenic sources
- Covering the greater Istanbul area (92 x 57 km was covered)
- CO, NO_x, SO_x, NH₃, PM₁₀, PM_{2.5} and NMVOCs
- Temporalization : hourly emissions data
- Chemical speciation : PM and NMVOCs.
- PM₁₀ and PM_{2.5} are chemically split into Organic carbon, Elemental carbon, Sulfates, Nitrates, Ammonium and other particles
- VOCs are chemically speciated into 23 chemical compounds.

Episode Selection

- January 10-20 2008 was selected as the episode to be modeled in this study.
- The average PM₁₀ concentrations of the monitoring stations in Istanbul seems to be increasing in last two years (Figure 2).
- PM₁₀ concentrations reach significant values in the selected episode and this played a major role in this selection.

Modelling:

Models 3 Framework/CMAQ chemistry and transport model was employed to simulate the PM₁₀.

RESULTS

- Road transport sector is the main contributor for the most of the pollutants.
- The NMVOC emissions were mainly emitted by the solvent use category.
- Weekend emissions are lower than week days.

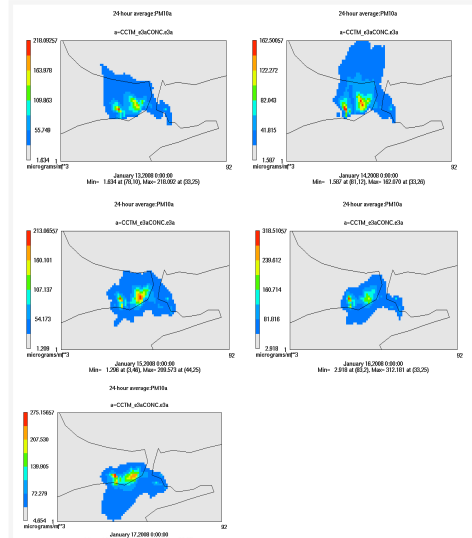


Fig 4: 24-hour average PM₁₀ concentrations for a) 13th, b) 14th, c) 15th, d) 16th and e) 17th of January, 2008 for the Istanbul domain.

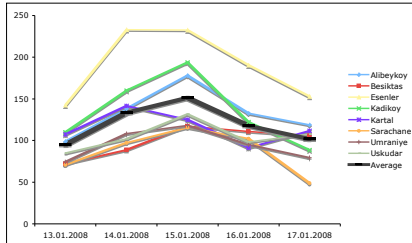


Fig 1: 24 hour averaged PM10 concentrations at the municipality stations

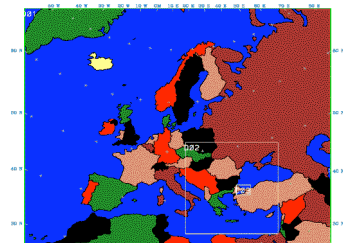


Fig 3: Air Quality modeling domains

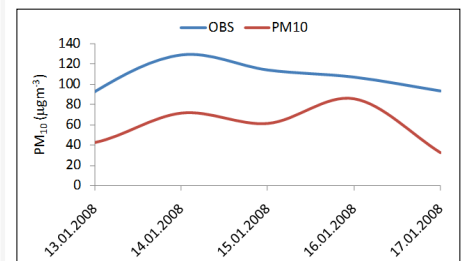


Fig 5: Comparison of 24-hour averaged CMAQ calculations and observations for PM₁₀

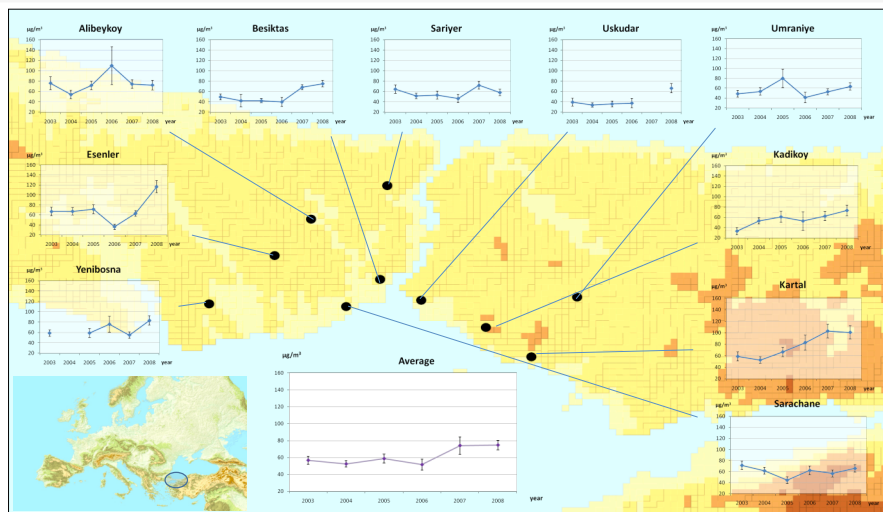


Fig 2: Time series of PM₁₀ observations illustrated on the map of Istanbul with the locations of the monitoring stations

Table: Statistical results for the comparison of CMAQ results with the observations

Measures	PM10
Correlation	0.62
Observed Mean (mgm ⁻³)	81.74
Model Mean/Obs. Mean	0.55
Observed STDEV (mgm ⁻³)	15.14
Model STDEV/Obs. STDEV	1.25
BIAS (mgm ⁻³)	-47.73
ABSE (mgm ⁻³)	47.73
RMSE (mgm ⁻³)	49.77
IOA	0.38

